

This Service Manual was revised based on the service manual as per parts No. B51-8523-00, in order to include new variants with the following destination codes : E3.



CONTENTS

| | | | |
|--|-----------|--------------------------------------|-----------|
| GENERAL | 2 | PC BOARD VIEWS | |
| OPERATING FEATURES | 3 | PLL/VCO (X58-4712-70) | 54 |
| REALIGNMENT | 16 | SUB UNIT (X58-4850-10) : E3 | 54 |
| INSTALLATION | 19 | TX-RX UNIT (X57-6142-XX) (A/2) | 55 |
| CIRCUIT DESCRIPTION | 26 | TX-RX UNIT (X57-6142-XX) (B/2) | 61 |
| SEMICONDUCTOR DATA | 31 | SCHEMATIC DIAGRAM | 65 |
| DESCRIPTION OF COMPONENTS | 32 | BLOCK DIAGRAM | 73 |
| PARTS LIST | 34 | LEVEL DIAGRAM | 76 |
| EXPLODED VIEW | 43 | TERMINAL FUNCTION | 78 |
| PACKING | 44 | SPECIFICATIONS | 79 |
| ADJUSTMENT | 45 | | |

GENERAL

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 data. 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 if someone is within two feet (0.6 meter) of the antenna.
- 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.
- All equipment should be properly grounded before power-up for safe operation.
- This equipment should be serviced by a qualified technician only.

NOTE

The terms, "Wide" and "Semi wide" this service manual, are same as "Wide 5k" and "Wide 4k" in the KPG-60D (Field Programming Unit) menu and help text, respectively.

PRE-INSTALLATION CONSIDERNATIONS

1. UNPACKING

Unpack the radio from its shipping container and check for accessory items. If any item is missing, please contact KENWOOD immediately.

2. PRE-INSTALLATION CHECKOUT

2-1. Introduction

Each radio is adjusted and tested before shipment. However, it is recommended that receiver and transmitter operation be checked for proper operation before installation.

2-2. Testing

The radio should be tested complete with all cabling and accessories as they will be connected in the final installation. Transmitter frequency, deviation, and power output should be checked, as should receiver sensitivity, squelch operation, and audio output. QT equipment operation should be verified.

3. PLANNING THE INSTALLATION

3-1. General

Inspect the vehicle and determine how and where the radio antenna and accessories will be mounted.

Plan cable runs for protection against pinching or crushing wiring, and radio installation to prevent overheating.

3-2. Antenna

The favored location for an antenna is in the center of a large, flat conductive area, usually at the roof center. The trunk lid is preferred, bond the trunk lid and vehicle chassis using ground straps to ensure the lid is at chassis ground.

3-3. Radio

The universal mount bracket allows the radio to be mounted in a variety of ways. Be sure the mounting surface is adequate to support the radio's weight. Allow sufficient space around the radio for air cooling. Position the radio close enough to the vehicle operator to permit easy access to the controls when driving.

3-4. DC Power and wiring

1. This radio may be installed in negative ground electrical systems only. Reverse polarity will cause the cable fuse to blow. Check the vehicle ground polarity before installation to prevent wasted time and effort.
2. Connect the positive power lead directly to the vehicle battery positive terminal. Connecting the Positive lead to any other positive voltage source in the vehicle is not recommended.

CAUTION

If DC power is to be controlled by the vehicle ignition switch, a switching relay should be used to switch the positive power lead. The vehicle ignition switch then controls DC to the relay coil.

3. Connect the ground lead directly to the battery negative terminal.
4. The cable provided with the radio is sufficient to handle the maximum radio current demand. If the cable must be extended, be sure the additional wire is sufficient for the current to be carried and length of the added lead.

GENERAL / OPERATING FEATURES

4. INSTALLATION PLANNING – CONTROL STATIONS

4-1. Antenna system

Control station. The antenna system selection depends on many factors and is beyond the scope of this manual. Your KENWOOD dealer can help you select an antenna system that will best serve your particular needs.

4-2. Radio location

Select a convenient location for your control station radio which is as close as practical to the antenna cable entry point. Secondly, use your system's power supply (which supplies the voltage and current required for your system). Make sure sufficient air can flow around the radio and power supply to allow adequate cooling.

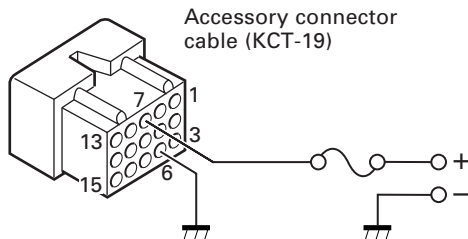
SERVICE

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

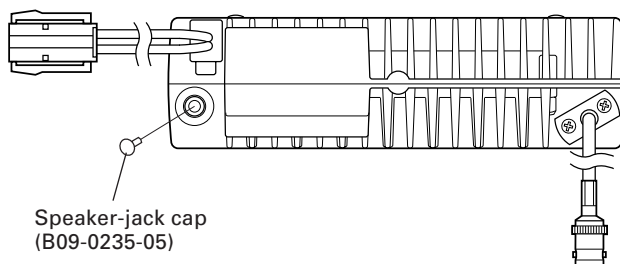
Note

When you modify your radio as described in system set-up, take the following precaution.

The rating of pin 7 (SB) of the accessory connector cable (KCT-19) on the rear of the radio is 13.2V (0.75A). Insert a 1A fuse if you use the SB pin for external equipment.



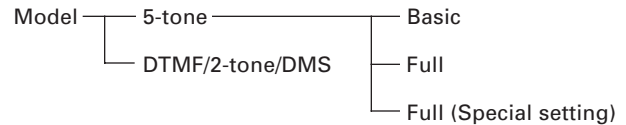
If you do not intend to use the 3.5-mm jack for the external speaker, fit the supplied speaker-jack cap (B09-0235-05) to stop dust and sand getting in.



1. Operation Features

The TK-780 is a VHF FM radio designed in both 5-tone model and DTMF/2-tone/DMS model. The programmable features are summarized.

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



1-1. 5-tone Model

In this model, you can program Basic or Full level features. When you select Basic level, only 1 frame 5-tone 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/2-tone/DMS Model

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

2. Transceiver Controls and Indicators (Fig. 1)

2-1. Front Panel Controls

All the keys on the front panel are momentary-type push buttons. The functions of these keys are explained below.

- **POWER key**

Transceiver POWER key. When the power is switched off, all the parameters, such as the group and channel, are stored in memory. When the power is switched on again, the transceiver returns to the previous conditions.

- **CHANNEL UP/DOWN key**

- **CALL key (Programmable)**

- **■ key (Programmable)**

- **A, B, C and D key (Programmable)**

- **VOLUME UP/DOWN key (Programmable)**

- **BUSY/TX LED**

The BUSY indicator (Green LED) shows that the channel is in use. The TX indicator (Red LED) shows that you are transmitting.

OPERATING FEATURES

2-2. Programmable Keys

The FPU (KPG-60D) enables programmable keys to select the following functions.

■ Auto Dial

To transmit the stored DTMF code automatically. When you select DTMF encode in the "Auto dial mode" menu, Auto dial, Redial, Dial ID and Store & Send modes are available.

Press the [Auto dial] key to enter the "Auto dial mode". Select the desired number to send. It is use the [Channel up] and [Channel down] keys, or the [2] and [8] keys on the microphone to select. Press the [*] key to transmit the numbers.

■ Auto Dial Programming

You can store the DTMF code and name, or erase it at the transceiver.

• To store a DTMF code

Press the [Auto dial programming] key to enter "Auto dial programming mode". Select the desired memory number you wish to store.

Press the [*] key to select the desired memory number (Enter auto dial memory name).

Press the [*] key to store the memory name. Now, enter the DTMF codes you want to store.

Press the [*] key to store the numbers. A beep sound confirms that the numbers are stored in the memory.

• To erase the stored DTMF code

Press the [Auto dial programming] key to enter "Auto dial programming mode".

Press the [#] key to enter "Auto dial clear mode". Select the memory number you want to erase.

Press the [*] key to erase the stored numbers and exit "Auto dial clear mode".

■ AUX A

If this key is pressed, "AUX" icon lights on the LCD and Horn alert port which is inside of the transceiver turns to the high level. If pressed again, the "AUX" icon goes off and the Horn alert ports turns to the lower level.

■ AUX B

This function can be programmed when the voice scrambler board is not installed.

If this key is pressed, an underscore ("_") appears at the extreme right of the LCD and OPT port which is inside of the transceiver turns to the active level (low). If pressed again, the underscore disappears and the OPT ports turns to the deactive level (high).

■ 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 group #/channel #.

■ Channel Up/Down

When this key is pressed each time, the channel number to be selected is increased/decreased and repeats if held for one second or longer.

■ Call 1 to 6 (5-tone)

Press the [CALL #] key to transmit the 5-tone code that is programmed to "Call #" in the system parameters.

■ Channel Entry

You can directly recall the channel using the numeric keypad without using the [Channel up], [Channel down].

To access the channel directly, enter 1 to 3 digit numbers, depending on the number of the programmed channels.

For example, if the radio has 199 programmed channels (the maximum channel number is a 3-digit number) and you would like to recall channel 5, you must enter [0],[0],[5]. If the radio has 99 channels (2-digit number), you must enter [0],[5] to access channel 5.

■ 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 microphone mute while transmitting. After finishing transmission, the transceiver receivers for programmed "Duration of receiving". The transceiver mutes 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.

OPERATING FEATURES

■ Group Up/Down

When this key is pressed each time, the group number to be selected is increased/decreased and repeats if held for one second or longer.

■ Home Channel

Press this key once, the channel switches to the preprogrammed home channel.

■ Horn Alert

If you are called from the base station using 5-tone/2-tone/DTMF/DMS while you are away from your transceiver, you will be alerted by the vehicle horn or some other type of external alert. To turn the horn alert function on, press this key. A confirmation tone sounds. If this key pressed again, the horn alert function is turned off.

■ 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 and Volume up/down, are locked.

"LOCKED" appears momentarily when the [Key lock] key is pressed.

■ Monitor

• DTMF/2-tone/DMS

When this key is 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.

• 5-tone

Depend on monitor function and monitor key action in the system parameters.

You can select either QT/DQT or 5-tone decoding to be canceled when [Monitor] key is pressed. When monitor function is activated, "MON" icon appears.

■ Monitor Momentary

• DTMF/2-tone/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.

• 5-tone

Depend on monitor function in the system parameters.

You can select either QT/DQT or 5-tone 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 preset.

When this key is held down for one second, 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 [Channel up], [Channel down] key.

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.

16 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.

■ Public Address

Public address amplifies the microphone audio, and outputs it through a PA speaker. PA is activated by pressing this key. A confirmation tone sounds, and the display shows "PA". PA can be activated at anytime (scanning or non-scanning).

The transceiver continues to scan & receive calls while in PA mode. Pressing PTT activated PA, and will override an incoming call anytime; however no transceiver transmission takes place.

If this key is pressed again, a confirmation tone will sound, the display will return to the normal channel or SCAN display, and the PA function will turn off.

■ 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 [Channel up], [Channel down] or [2]/[8] keys on the microphone.

When you are in Queue mode, [D] or [6] key to toggle the Selcall and Status displays. When you are in Queue mode, press the [C] or [4] key to toggle the Code and Selcall/Status displays.

Hold down the [D] or [6] key to delete the top stack of the Queue buffer. Hold down the [C] or [4] key to cancel Queue mode and return to normal operation.

■ Radio Password

Backup is done even if the power supply is cut off. A lock is not canceled unless a proper password is inputted. The character which can be inputted is to 6 digits with the number of 0 to 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 "LOCK1" screen.

OPERATING FEATURES

■ Receive Entry (5-tone)

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. To enter Selcall number, use the keypad (keypad model) or use the [Channel up], [Channel down] keys to select a number. Then press [C] key to enter the selected number. The selected digit will shift left to enter the next digit.

Press [D] key to move the cursor 1 position right. Hold down [D] key ([6] key on a keypad) to clear the entered number.

■ Scan

Press the [Scan] key to toggle scanning the channels on and off. When the transceiver is scanning, "Revert channel 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.

■ Scrambler

Press the [Scrambler] key to toggle the Scrambler on or off. When it is activated, "_" (underscore) appears on LCD.

If you hold down the [Scrambler] key for more than 2 seconds, the transceiver enters "Scrambler code select mode". You can select the Scrambler code [1 to 16] using the [Channel up], [Channel down], or [2], [8] keys. (Voice scrambler unit must be installed.)

■ Selcall Entry

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

• 5-tone

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.

• DTMF/2-tone/DMS

A transceivers unit ID is defined by a combination of 3-digit fleet and 4-digit ID numbers.

To enter Selcall number, use the keypad (keypad model) or use the [Channel up], [Channel down] keys to select a number. Then press [C] key to enter the selected number. The selected digit will shift left to enter the next digit.

Press [D] key to move the cursor 1 position right. Hold down [D] key ([6] key on a keypad) to clear the entered number.

■ Selcall List

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

• 5-tone

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.

• DTMF/2-tone/DMS

The ID list code of DMS will appear on LCD.

To select the Selcall list, use [Channel up]/[Channel down] key or [2]/[8] key on the microphone keypad.

■ Selcall + Status Entry

Select the selcall number you wish to call. Press [Selcall + Status entry] key to enter "Selcall entry mode". It works as "Selcall entry mode" mode. If you press [CALL] or [*] 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". It works as "Status list" mode. If you press [Selcall + Status list] key again, it works as "Status list select mode".

■ Send GPS (DTMF/2-tone/DMS)

You can send the GPS location data manually. To perform the operation, you have to install a GPS receiver with NMEA-0183 output. (GPS receiver must be installed.)

■ 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 [Channel up]/[Channel down] key or [2]/[8] key on the microphone keypad. 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.

OPERATING FEATURES

■ Status Entry (5-tone)

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.

Enter the desired code using a numeric keypad. If the transceiver does not have the numeric keypad, you can use [Channel up]/[Channel down] key to select the desired number and press [C] key to enter. The cursor moves to next position.

■ Status List (5-tone)

Press [Status list] key to enter Status list mode. Select the check box of "5-tone - System parameters - Selectable status digit". The number of digit you selected in "5-tone - 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 [Channel up]/[Channel down] key or [2]/[8] key on the microphone keypad.

■ 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).

■ Transfer (5-tone)

When you select "5-tone" for "Signalling type for decode", this function is used for transmitting 5-tone code. Press the [Transfer] key to activate the transfer function. "TRANSFER" appears on the LCD.

When the target 5-tone code is received, you can select to transfer the code to another transceiver. When a mobile transceiver receives the target 5-tone code, a mobile transceiver transfers the received 5-tone code to a portable.

When "Special setting" is selected (enabled) and using decode format, this parameter is not valid.

■ None

When you press this key, the transceiver emits the "Key input error tone" (no function is performed).

■ Volume Up/Down

When this key is pressed, the volume level is increased/decreased and repeats if held for 200ms or longer.

■ Function Table

| Function | DTMF/2-tone/DMS | 5-tone |
|---|-----------------|--------|
| None | Yes | Yes |
| Auto dial | Yes | Yes |
| Auto dial programming | Yes | Yes |
| AUX A | Yes | Yes |
| AUX B | Yes | Yes |
| Note : Only when voice scrambler is not selected. | | |
| 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 entry | Yes | Yes |
| Channel name | Yes | Yes |
| Channel up | Yes | Yes |
| Emergency call | Yes | Yes |
| Fixed volume | Yes | Yes |
| Group down | Yes | Yes |
| Group up | Yes | Yes |
| Home channel | Yes | Yes |
| Horn alert | Yes | Yes |
| Key lock | Yes | Yes |
| Monitor | Yes | Yes |
| Monitor momentary | Yes | Yes |
| Operator selectable tone | Yes | Yes |
| Public address | Yes | Yes |
| Queue | Yes | Yes |
| Radio password | Yes | Yes |
| Receive entry | No | Yes |
| Scan | Yes | Yes |
| Scan delete/add | Yes | Yes |
| Scrambler | Yes | Yes |
| Selcall entry | Yes | Yes |
| Selcall list | Yes | Yes |
| Selcall + Status entry | Yes | Yes |
| Selcall + Status list | Yes | Yes |
| Send GPS | Yes | No |
| Shift | 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 |
| Transfer | Yes | Yes |
| Volume down | Yes | Yes |
| Volume up | Yes | Yes |

OPERATING FEATURES

2-3. Front Panel Displays and Indicators

① Sub display

Displays the system, channel and group numbers. Also displays various functions, such as TA.

② P (Priority) indicator

The P indicator (P) appears when a selected channel is programmed as priority.

③ MON (Monitor) indicator

The MON indicator appears when the button programmed as MONITOR is pressed.

④ SVC (Service) indicator

This icon is not used this transceiver.

⑤ SCN (Scan) indicator

The SCN indicator appears when using scan mode.

⑥ AUX (Auxiliary) indicator

Appears when the auxiliary function is activated (ON) by pressing the AUX-A key.

⑦ Handset indicator

This icon is not used this transceiver.

⑧ MAIL indicator

Flashes when a status message (5-tone or DMS) is received. Lights when a status message is stored in the stack memory.

⑨ Alphanumeric display

The twelve-character dot matrix alphanumeric display shows the system/group numbers. You can program system/group names with up to ten characters in place of these numbers. The left display is used as an add indicator (▼) and the right is used for the selective call (*) or scrambler () function. The add indicator shows the channels unlocked out of the scanning sequence. Selective call and scrambler are optional functions that can be programmed.

Displays received messages when using 5-tone or DMS.

⑩ A,B,C,D key

These keys are programmable function (PF) keys.

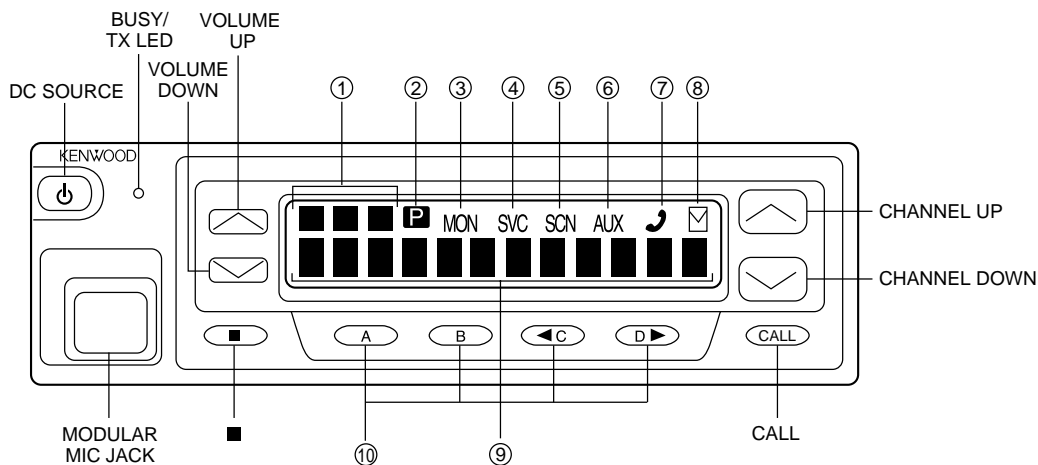


Fig. 1

3. Scan Operating

■ Scan types

• Single group scan

You can scan all valid (ADD) channels in the displayed group that can be selected with the group up/down key.

• Multiple group scan

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

■ 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.

■ 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 channels for which receiving signalling is not set by the programming software or when the monitor (signalling cancel) function is activated.

OPERATING FEATURES

■ 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 up/down key when the scan does not occur, adds an indicator "▼" lights.

■ Priority channel setting

A priority channel can be set as follows with the programming software (KPG-60D).

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

■ 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.

■ Revert channel

The revert channel is used to transmit during scanning and set by the programming software (KPG-60D).

- 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.

■ 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.

■ 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.

■ Keypad operation

This parameter selects the default use of the numerical field of the keypad. You can select from "DTMF", "Selcall entry", "Status entry" and "OST".

In the case of "OST"; Enter to use the keypad to recall OST directly. To recall OST memory 1 to 9, press the OST number directly for 1 second. To recall OST memory 10 to 16, press [*] for 1 second, then press [0] to [6].

Example; Recall OST memory 15 : [*] [5]

When OST memory is recalled by keypad [1] to [9], the "OST" display lights and OST is turned on. If the keypad [#] is pressed, OST is turned off, and the "OST" display goes off.

■ Squelch logic signal

This signal is useful for external radio control units which require a signal at the time of carrier operate relay or tone operate relay.

■ TX sense

Select one of the following three output functions for data communication.

• MIC PTT

Indicates the state of the microphone PTT.
MIC PTT on = Low, MIC PTT off = High

• Ext PTT

Indicates the state of the Acc PTT input.
Ext PTT on = Low, Ext PTT off = High

• TX line

Indicates the actual transmitter activity.
TX on = Low, TX off = High

OPERATING FEATURES

■ Com port

• Com 0

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

• Com 1

This function selects the external COM1 pin serial port function on the KCT-19 accessory jack. If the transceiver is installed GPS unit, this function must be set up in "GPS".

• Com 2

This function selects the external COM2 pin serial port function on the KCT-19 accessory (RXD2 (AHK)/TXD2 (PTT)) and the external serial port function (TXD2/RXD2).

4. Details of Features

■ Time-out timer

The time-out timer can be programmed off or in 30 seconds 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.

■ 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.

■ 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.

■ 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.

■ 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 key, and [CALL] key.

■ Off hook decode

If the Off hook decode function has been enabled, removing and replacing the microphone on the hook has no effect for decoding QT/DQT and option signalling.

■ Timed power off

This function works as "Automatic Power Switch Off".

Timed power off timer starts from the ignition-off. After the timer expires, the radio will automatically turn off. The timer will be reset if the ignition is turned on and off.

This function requires ignition-sense. Connect the ignition-line to the 9-pin connector which is located at the rear of the radio.

After the timer expires, press the power switch to turn on the radio.

If you configured the 5-tone model, the transceiver executes the encode script defined in KPG-60D. After the encode script is finished, the transceiver turns off itself.

■ Horn alert

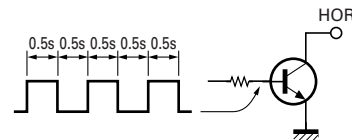
If you are called from the base station using 2-tone/DTMF/5-tone while you are away from your transceiver, you will be alerted by the vehicle horn or some other type of external alert. To turn horn alert function on, press the [Horn Alert] key.

Either continuous or non-continuous operation can be set by the FPU. The horn alert port is enabled or disabled as follows;

| Off hook horn alert | Hook off | Hook on |
|---------------------|----------|---------|
| Enable | Yes | Yes |
| Disable | No | Yes |

• Non-continuous (Pulse)

The horn alert port, HOR, is turned on and off as follows;



• Continuous

Horn alert can be reset by setting an expiration time from the FPU or setting off hook.

OPERATING FEATURES

■ "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.

■ "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.

■ "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.

■ OST (Operator Selectable Tone)

The transceiver is capable to have "OST" function and 16 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".

■ Clear to transpond

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

5. Option Signalling (DTMF/2-Tone)

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.

If the option signalling matches, a predetermined action will occur.

If option signalling matches on a group/channel which is set up with option signalling, the option signalling indicator (✳) will flash and option signalling will be released. The transpond or alert tone will sound.

If the selective call alert LED is set up, the orange LED will flash.

While option signalling matches (or if option signalling is deactivated when you are transmitting), you can mute or unmute ID/QT/DQT/Carrier.

■ AND/OR

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

| | Alert/Transpond |
|-----|--|
| AND | Triggers at match with QT/DQT/ID+DTMF (2-tone); Both |
| OR | Triggers only for match with DTMF (2-tone); Option |
| | AF mute open |
| AND | Triggers at match with QT/DQT/ID+DTMF (2-tone); Both |
| OR | Triggers only for match with QT/DQT/ID; Signalling |

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

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

■ Auto Reset

If option signalling matches a group set up with option signalling, option signalling is released. After matching option signalling, option signalling will temporarily reset automatically.

■ 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 ("LOCK2" 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-60D) to operation again.

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

■ 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.

■ 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.

OPERATING FEATURES

■ 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

Encode ID Block can be set to limit manual dial ID. The radio unit will not accept an ID other than these IDs which are entered from the keypad. 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.

• Status 80~99 (Special)

Status numbers from 80 to 99 are reserved for special purposes. Entering these statuses from the DTMF keypad can be inhibited.

Please notice that the following status numbers are used for special purposes;

80~89 : Reserved for future use.

90 : Remote kill on. Disable all transceiver functions.

91 : Remote stun on. The transceiver cannot operate.

92 : Turns stun off.

93 : Spare.

94 : Acknowledgement status sent when the radio unit is in stun mode.

95~98 : Reserved for future use.

99 : Emergency Status.

Note : Remote stun works with DTMF stun function also.

• 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

Either "Horn" or "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

• Manual Dial

Fleet, ID and Status numbers can be entered from DTMF keypad. (DTMF microphone is required.)

• 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

Inter-fleet calls allow a radio of one fleet number to call a radio with a different fleet number (radio users can manually dial a unit ID with a different fleet number).

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

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

• Status/Short/Unit ID Message Serial Output

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

OPERATING FEATURES

■ GPS Report

A NMEA-0183 GPS unit must be installed.

• GPS Report Mode

GPS data can be sent automatically or upon request. Manually sending GPS data works regardless of this setting.

Auto : GPS data is sent both automatically and by request. GPS Auto TX Interval and GPS Time Mark must be adjusted if required.

Poll : GPS data is sent upon request from dispatcher.

• GPS Report Interval

Interval time between automatic GPS data transmissions.

• GPS Time Mark (Per Mobile)

The amount of time from the 0 (zero) minute of the standardized GPS UTC time to starting the first transmission of GPS data. It must be set to a different value for each radio unit to avoid a transmission crash.

• Send GPS

Pressing this key causes the transceiver to send a single GPS data.

• GPS Report On Data Group/Channel

GPS data transmission is made on the Data Group/Channel in conventional format.

• Received GPS Data Output

Any selected sentence can be output through the radio serial port (COM1).

1) MAP HEADER NMEA1 (\$GPGGA), NMEA2 (\$GPGLL), NMEA3 (\$GPRMC)
NMEA-0183 standard command. This should be set according to your PC application.

2) MAP HEADER KW1 (\$PKLDS)
This is a Kenwood original sentence which consists of "\$GPGLL + Fleet + ID + Status". This item should be set according to your PC application.

3) MAP HEADER KW2 (\$PKLID)
This is a Kenwood original sentence which consists of "Fleet + ID". This should be set according to your PC application.

■ 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.

7.5-Tone

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

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

When you select full level features, up to 3 frame 5-tone 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.

■ 5-tone Standard

The selected 5-tone standard is used for 5-tone encoding and decoding.

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

OPERATING FEATURES

■ Monitor Function

You can select either QT/DQT or 5-tone 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 "5-tone", cancels the decoding in 5-tone 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.

■ Digit Entry Method

Receive, Selcall or Status digit appears when you enter their entry mode, pressing [Receive entry], [Selcall entry] or [Status entry] key, or "Keypad operation" is programmed to "Selcall entry" or "Status entry" and press [0] to [9] key.

You can select the operation of the function. Or the digit number when entering their entry mode appears.

When the transceiver is set up in "Overwrite", new their digit number will overwrite the previous their digit when entering their entry mode.

When the transceiver is set up in "Replace", new their digit number will overwrite the their digit that is programmed in RX address or TX address menu when entering their entry mode.

■ 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 5-tone 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. 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 5-tone 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 or "Keypad operation" 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 5-tone code, #5940167 when you have 6th and 7th digit checked in selectable status digit menu.

Press [Selcall entry] key or "Keypad operation" 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 5-tone signaling. If the selected digits matches to the received 5-tone 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 [Channel up], [Channel down] key. The memory represents the code that is displayed by the keypad. Or key buffer, "^K1 ... ^K8" used by encode format.

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 to 6] key is pressed. You can select up to 3 codes to transmit 3-frame 5-tone 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.

OPERATING FEATURES

■ 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 "5-tone 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 stand-by for decoding 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 acknowledgment to the base station. Furthermore, you can activate the Horn alert, Transfer, 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 5-tone 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 5-tone 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-60D.

You can create 32 different types of encode/decode formats. You can assign a name up to 12 characters for each encode/decode format.

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

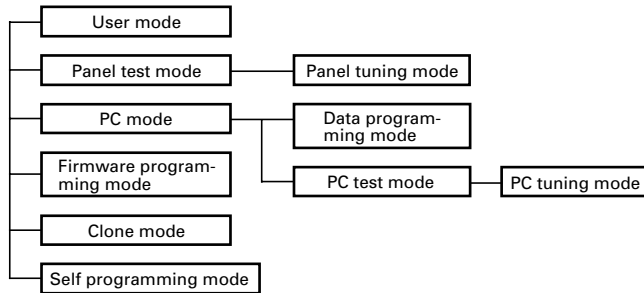
Sounds when an individual call with the correct DTMF/2-tone option signalling is received. For group calls, only the group tone will sound, not the transpond tone.

■ 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 | [B]+Power ON |
| PC mode | Received commands from PC |
| Panel tuning mode | [Panel test mode]+[A] |
| Firmware programming mode | [A]+Power ON |
| Clone mode | [D]+Power ON |
| Self programming mode | [CALL]+Power ON |

3. Panel Test Mode

Setting method refer to ADJUSTMENT.

4. Panel Tuning Mode

Setting method refer to ADJUSTMENT.

5. PC Mode

5-1. Preface

The TK-780 transceiver is programmed by using a personal computer, programming interface (KPG-46) and programming software (KPG-60D).

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-780 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-780 to PC mode, then attach the interface cable.

5-3. KPG-46 Description

(PC programming interface cable : Option)

The KPG-46 is required to interface the TK-780 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-46 connects the modular microphone jack of the TK-780 to the computers RS-232C serial port.

5-4. Programming Software KPG-60D Description

The KPG-60D is the programming software for the transceiver supplied on two 3.5" floppy disks. This software runs under MS-Windows 95 or later 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-60D for example to hard disk first then use it.

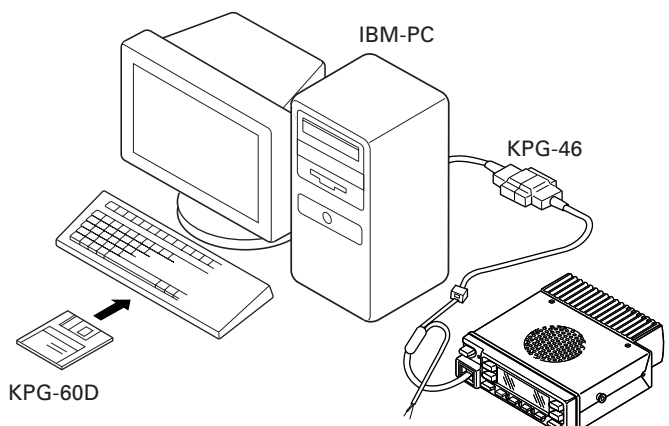


Fig. 1

TK-780

REALIGNMENT

5-5. Programming With IBM PC

If data is transferred to the transceiver from an IBM PC with the KPG-60D, 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 modular microphone jack.

KPG-60D instruction manual parts No. : B62-1315-XX.

6. Firmware Programming Mode

6-1. Preface

Flash memory is mounted on the TK-780. This allows the TK-780 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-780 to the personal computer (IBM PC or compatible) with the interface cable (KPG-46). (Connection is the same as in the PC Mode.)

6-3. Programming

1. Start up the 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-780 Power ON with the [A] 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-780 and the personal computer, and make sure that the TK-780 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-780 starts to receive data, the [P] icon is blinking.
7. If writing ends successfully, the LED on the TK-780 lights and the checksum is displayed.
8. If you want to continue programming other TK-780, 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-60D).
- 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.

6-4. Function

1. If you press the [■] switch while "PROG 57600" is displayed, the version is displayed. If you press the [■] switch again while the version is displayed, "PROG 57600" is redisplayed.

2. If you press the [D] switch 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 [D] switch again while "PROG 19200" is displayed, the display changes to "PROG 38400", and the write speed becomes the middle speed (38400 bps). If you press the [D] switch again while "PROG 38400" is displayed, the display returns to "PROG 57600".
3. If you press the [D] switch while the version is displayed, the checksum is displayed. If you press the [D] switch again while the checksum is displayed, the version is redisplayed.

Note :

Normally, write in the high-speed mode.

7. Self Programming Mode

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

7-1. Enter to the Self Programming Mode

Delete R614 (SELF, Figure 2) in the TX-RX unit (B/2) and turn the power switch on while pressing the [CALL] 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 KPG-60D.

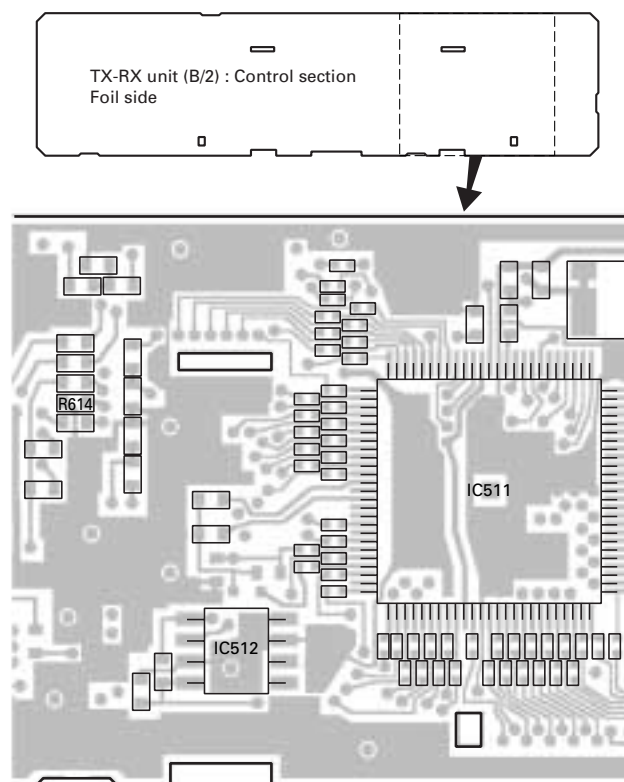


Fig. 2

REALIGNMENT

7-2. Channel Setting Mode

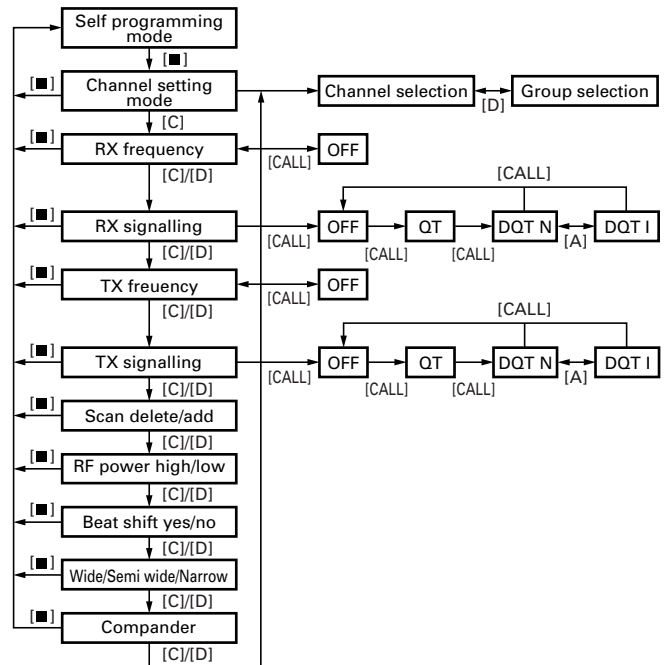
Each channel can be setup in its action mode by using the panel keys.

- Pressing [■] while "SELF PROG" is displayed will change to channel setting mode.
- Press [D] to select a setup item, then press [Channel up/down] to change the selection.
- By pressing [C], the displayed information is stored in memory, and the next item appears. By pressing [D], the displayed information is not stored in memory, and the next item appears.
- Press [■] to return to the original display ("SELF PROG").

The setup items fro channel setting mode are listed below.

| Setup function | Display (3 character) | Remarks |
|-------------------|-----------------------|--|
| Channel selection | CH or GRP | |
| RX frequency | RXF | [CALL] : Switches frequency on/off |
| | | [B] : Changes the step value between 5kHz, 6.25kHz, and 1MHz |
| RX signalling | RXS | [CALL] : Switches between off, QT, and DQT. |
| | | [B] : Switches between 1 step and standard |
| | | [A] : Switches between DQT normal and invert |
| TX frequency | TXF | Same as RX frequency |
| TX signalling | TXS | Same as RX signalling |
| Scan del/add | SCN | DEL/ADD |
| RF power | PWR | HIGH/LOW |
| Beat shift | SFT | YES/NO |
| Wide/Narrow | W/N | WIDE 5k/WIDE 4k/NARROW |
| Compander | CMP | ON/OFF |

7-3. Flow Chart



7-4. Memory Reset Mode

You can clear all settings you made in self programming mode, or you can return to the original display.

- Press [A] while "SELF PROG" is displayed will change the display to "CLEAR NO?".
- Press [Channel up/down] to change the display between "CLEAR NO?" and "CLEAR YES?".
- When "CLEAR YES?" is displayed, pressing [A] will set all data to default, and "ALL CLEAR" will appear on the display. Press [A] again to display "SELF PROG".
- When "CLEAR NO?" is displayed, pressing [A] will cancel the reset, and "SELF PROG" will be displayed.

INSTALLATION

1. Accessory Connection Cable (KCT-19 : Option)

The KCT-19 is an accessory connection cable for connecting external equipment. The connector has 15 pins and the necessary signal lines are selected for use.

1-1. Installing the KCT-19 in the transceiver

1. Remove the upper and lower halves of the transceiver case, and lift the DC cord bushing (❶) from the chassis.
2. Remove the pad as shown in Figure 1 (❷).
3. Insert the KCT-19 cable (❸) into the chassis (❹).
The wire harness band (❺) must be inside the chassis.
4. Replace the DC cord bushing (❻).
5. Connect the KCT-19 to the TX-RX unit (A/2) as shown in Figure 2 (❼).
6. Connect the KCT-19 to the external accessory by inserting the crimp terminal (❸) into the square plug (❾), both of which are supplied with the KCT-19.

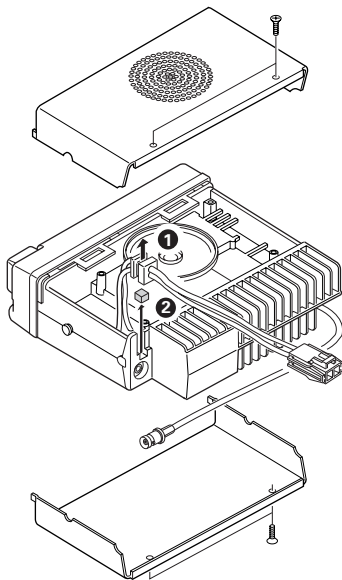


Fig. 1

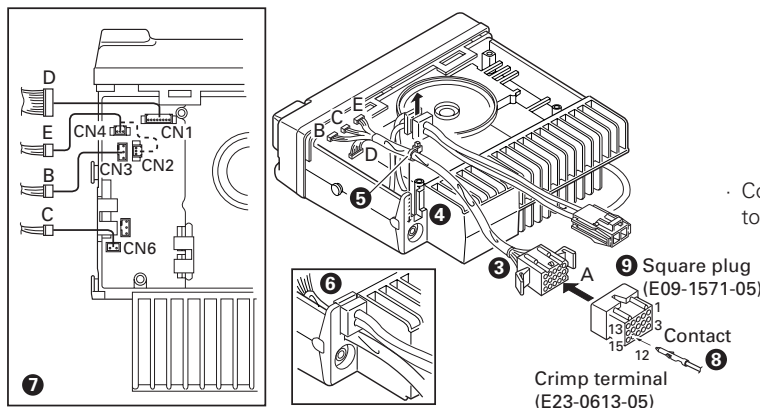


Fig. 2

1-2. KCT-19 Accessory Port Function

| No. (A) | No. (B,C,D,E) | Name | Function | Note | |
|---------|---------------|-------------|---|----------|--|
| 1 | D-2 | AHK | External hook input | | |
| 2 | D-5 | ME | Microphone ground | *1 | |
| | | AM | Speaker audio mute input | | |
| 3 | D-3 | IGN | Ignition sense input | | |
| 4 | D-1 | DEO | Receiver detector output | | |
| 5 | D-6 | MI | External microphone input | *1 | |
| | | TXS | Transmitter sense output | | |
| 6 | B-2 | E | Ground | | |
| 7 | B-3 | SB | Switched B+, DC 13.2V output. Maximum 0.75A | | |
| 8 | D-7 | PTT | External PTT input, active low. During DTC is low, it works as DATA PTT. | | |
| 9 | D-4 | DI | Data modulation input | | |
| 10 | B-1 | HOR | Horn alert/call output | | |
| 11 | D-8 | SQ | Squelch detect output, active low. | | |
| 12 | C-1 | SP | Speaker audio output. | | |
| 13 | E-1 | CN2 and CN4 | LOK | *1 *2 | |
| | | CN2 | AM | | Speaker mute input. |
| 14 | E-2 | CN4 | RXD | *2 | |
| | | CN2 | MM | | MIC mute input, active high. |
| 15 | E-3 | CN4 | TXD | *2 | |
| | | CN2 | DTC | | Data control channel signal input, Data channel : Low |
| | | LOK | TX logic signal output, active low. | | |
| | | TXS | Transmitter sense output, Active high | | |
| | | FSW | Foot switch input, active low | | |

Note

*1 : The functions of A-2, A-5, A-13 (when connector E is connected to CN2), and A-15 (when connector E is connected to CN2) are changed as described in the jumper chart.

*2 : The functions of A-13, A-14 and A-15 are changed if the connector E is connected to CN2 or CN4 of the radio.

| No. | CN2 | CN4 |
|-----|-----------------|-----|
| E-1 | LOK/AM | LOK |
| E-2 | MM | RXD |
| E-3 | LOK/DTC/TXS/FSW | TXD |

· Connect CN6 of the radio to connector C of the KCT-19 instead of to the internal speaker connector, if use external speaker.

INSTALLATION

1-3. Data Equipment Connection

The jumpers must be set to either one for each function. Otherwise, the radio will not work properly.

ME/AM

| R12 (0Ω) | R167 (0Ω) | Function / Default | |
|----------|-----------|--------------------|---------|
| Yes | No | AM | Default |
| No | Yes | ME | |

MI/TXS

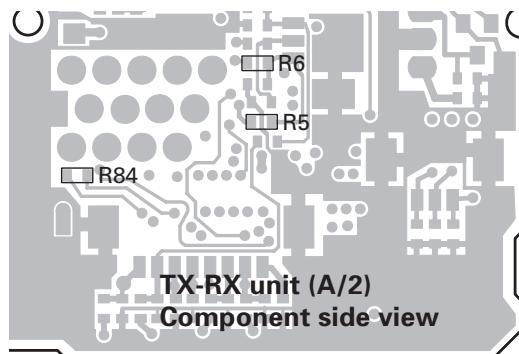
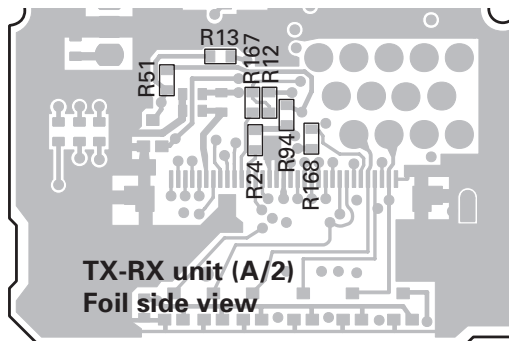
| R94 (0Ω) | R24 (0Ω) | Function / Default | |
|----------|----------|--------------------|---------|
| Yes | No | TXS | Default |
| No | Yes | MI | |

LOK/AM

| R5 (0Ω) | R6 (0Ω) | Function / Default | |
|---------|---------|--------------------|---------|
| Yes | No | AM | |
| No | Yes | LOK | Default |

DTC/LOK/TXS/FSW

| R168 (0Ω) | R84 (0Ω) | R51 (0Ω) | R13 (0Ω) | Function / Default | |
|-----------|----------|----------|----------|--------------------|---------|
| No | No | No | Yes | LOK | |
| Yes | No | No | No | DTC | Default |
| No | No | Yes | No | TXS | |
| No | Yes | No | No | FSW | |



Note : The following parts are not installed at the time of shipping; R5,R13,R24,R51,R84,R167

2. Accessory Terminal (TX-RX Unit A/2)

2-1. External Connector Accessory Terminal Method

| Connector No. | Pin No. | Pin name | I/O | Function |
|---------------|---------|----------|--|--|
| CN1 | 1 | DEO | O | Detect signal output. (Output level : 250mVrms; standard modulation) |
| | 2 | AHK | I | External hook signal input. On hook : L, Off hook : H |
| | 3 | IGN | I | Ignition sense input. |
| | 4 | DI | I | External modulation signal input. |
| | 5 | ME | - | MIC earth. |
| | | AM | I | Audio mute signal input. |
| | 6 | MI | I | Internal MIC input. |
| | | TXS | O | Signal indicating whether the transceiver is transmitting or not. TX : H |
| 7 | PTT | I | External PTT signal input. TX : L | |
| CN2 | 1 | AM | I | Audio mute signal input. |
| | | LOK | O | TX logic signal output. Active logic level is low. Active type can be selectable in the KPG-60D. |
| | 2 | MM | I | MIC mute input. |
| | 3 | DTC | I | Data control channel signal input. Data channel : L, Normal channel : H |
| | | TXS | O | Signal indicating whether the transceiver is transmitting or not. TX : H |
| | FSW | I | Foot switch signal input. Foot sw on : L, Foot sw off : H | |
| | | LOK | O | TX logic signal output. Active logic level is low. Active type can be selectable in the KPG-60D. |
| | CN3 | 1 | HOR | O |
| 2 | | E | - | Earth. |
| 3 | | SB | O | Power output after power switch (DC 13.2V±15%, 0.75A max.). |
| CN4 | 1 | LOK | O | TX logic signal output. Active logic level is low. Active type can be selectable in the KPG-60D. |

INSTALLATION

| Connector No. | Pin No. | Pin name | I/O | Function |
|---------------|---------|----------|-----|--|
| | 2 | RXD | I | Serial data input 1. "Com1" port must be select "DATA"/"GPS" function in the KPG-60D. |
| | 3 | TXD | O | Serial data output 1. "Com1" port must be select "DATA"/"GPS" function in the KPG-60D. |
| CN5 | 1 | PA | O | Relay for PA function in KAP-1 control signal. PA on : H, PA off : L |
| | 2 | SPO | O | Audio signal input from KAP-1. |
| | 3 | SPI | I | Audio signal output to KAP-1. |
| CN6 | 1 | SP | O | Output for internal/external speaker. |
| | 2 | E | - | Earth. |

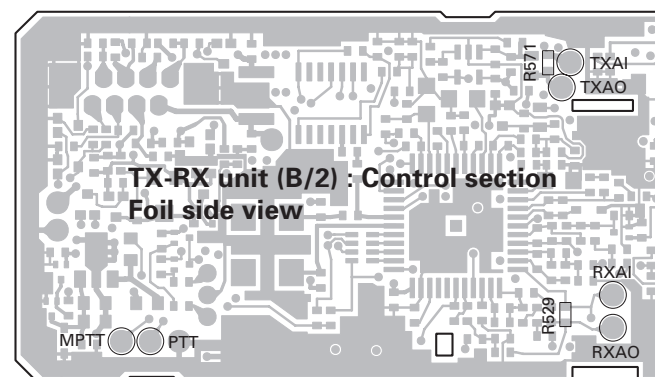
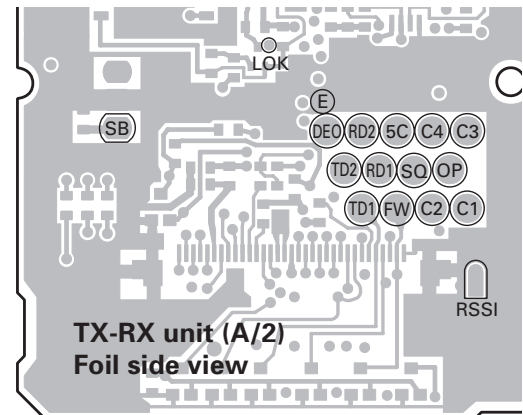
| Schematic diagram | | | PC board view | |
|-------------------|-----|--|---------------|-------------|
| Name | I/O | Function | Name | Unit |
| CODE3 | O | Option code 1 (for voice scrambler code 3) | C3 | TX-RX (A/2) |
| CODE4 | O | Option code 1 (for voice scrambler code 4) | C4 | TX-RX (A/2) |
| SQ | O | Squelch signal output. Signal logic type can select "Carrier operate relay" or "Tone operate relay". Active logic level or type can select in the KPG-60D. | SQ | TX-RX (A/2) |
| TXD1 | O | Serial data output 1 | TD1 | TX-RX (A/2) |
| RXD1 | I | Serial data input 1 | RD1 | TX-RX (A/2) |
| TXD2 | O | Serial data output 2 | TD2 | TX-RX (A/2) |
| RXD2 | I | Serial data input 2 | RD2 | TX-RX (A/2) |
| RSSI | O | Receive signal strength indication | RSSI | TX-RX (A/2) |
| PTT | I | PTT | PTT | TX-RX (B/2) |
| MPTT | I | MIC PTT | MPTT | TX-RX (B/2) |
| FSW | I | Foot switch input | FW | TX-RX (A/2) |

3. Optional Board Terminal

Terminal is for mounting the option board are provided at the TX-RX unit (A/2) and TX-RX unit (B/2); Control section. The table below shows the correspondence between the board and terminals. Disconnect R529 and R571 in control unit when the scrambler board is attached.

The table below shown the differences between the schematic terminals and the PC board terminals.

| Schematic diagram | | | PC board view | |
|-------------------|-----|---|---------------|-------------|
| Name | I/O | Function | Name | Unit |
| SB | O | Switched B+ (13.2V, 0.75A) | SB | TX-RX (A/2) |
| 5C | O | 5C | 5C | TX-RX (A/2) |
| GND | - | Earth | E | TX-RX (A/2) |
| DEO | O | Detect signal output (Output level : 250mVrms; standard modulation) | DEO | TX-RX (A/2) |
| RXAI | I | RX audio input | RXAI | TX-RX (B/2) |
| RXAO | O | RX audio output | RXAO | TX-RX (B/2) |
| TXAI | I | TX audio input | TXAI | TX-RX (B/2) |
| TXAO | O | TX audio output | TXAO | TX-RX (B/2) |
| LOK | O | TX logic signal output. Active type can be selectable in the KPG-60D. | LOK | TX-RX (A/2) |
| OPT (EMG) | O | Option board select. Please select option board type in the KPG-60D. | OP | TX-RX (A/2) |
| CODE1 | O | Option code 1 (for voice scrambler code 1) | C1 | TX-RX (A/2) |
| CODE2 | O | Option code 1 (for voice scrambler code 2) | C2 | TX-RX (A/2) |



INSTALLATION

4. Ignition Sense Cable (KCT-18 : Option)

The KCT-18 is an optional cable for enabling the ignition function. The ignition function lets you turn the power to the transceiver on and off with the car ignition key.

If you use the Horn Alert function or the Manual Relay function, you can turn the function off while driving with the ignition key.

2-1. Connecting the KCT-18 to the Transceiver

1. Install the KCT-19 in the transceiver. (See the KCT-19 section.)
2. Insert the KCT-18 lead terminal (②) into pin 3 of the square plug (①) supplied with the KCT-19, then insert the square plug into the KCT-19 connector (③).

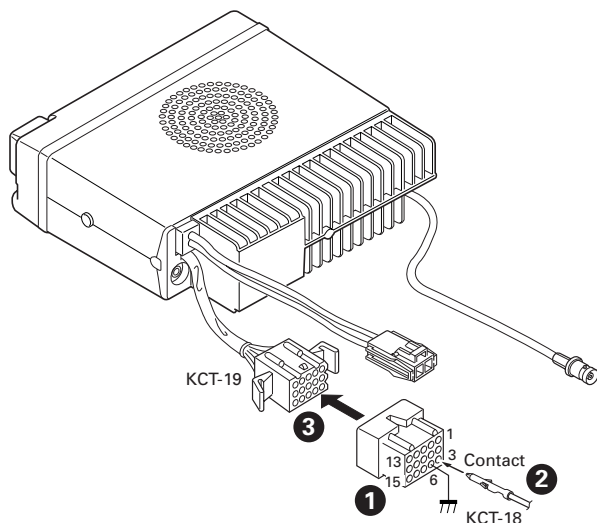


Fig. 3

4-2. Modifying the Transceiver

Modify the transceiver as follows to turn the power or the Horn Alert or Manual Relay function on and off with the ignition key.

1. Remove the lower half of the transceiver case.
2. Set jumper resistors (0Ω) R151 and R152 of the TX-RX unit (A/2) as shown in Table 1.

| Operation when KCT-18 is connected | R151 | R152 |
|---|---------|---------|
| KCT-18 cannot be connected | Enable | Enable |
| Power on/off and Horn Alert or AUX-A on/off | Disable | Enable |
| Horn Alert or AUX-A on/off, Timed power off | Enable | Disable |
| Power cannot be turned on | Disable | Disable |

Table 1 R151 and R152 setup chart

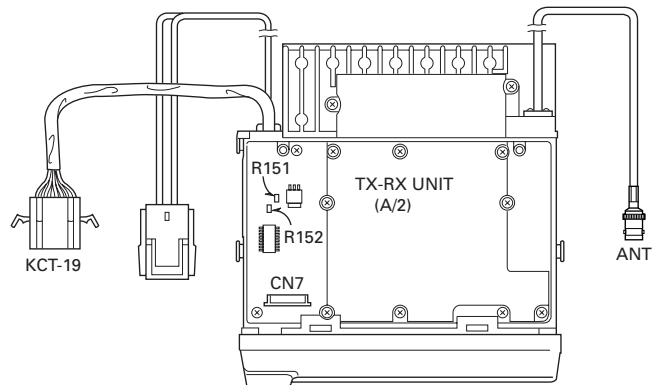


Fig. 4

5. Optional Voice Scrambler Function

The optional voice scrambler function can be used by two methods.

1. Assign this function to the Scrambler key by using the programming software (KPG-60D).
When the Scrambler key is pressed, the [...] indicator comes on, and the optional (scrambler) function is enabled.
When the key is pressed again, the [...] indicator goes off and the function is disabled.
2. Assign the optional scrambler function to each channel by using the programming software (KPG-60D). The optional scrambler function can be used without pressing the Scrambler key.

5-1. Code Setting

The code can be set by two methods.

1. Hold down the Scrambler key to enter the code setting mode. Codes 1 to 16 will be displayed. Set a code by turning the [Up/Down] key. When the Scrambler key is pressed again, the code setting mode terminates.
2. Set a code for each channel by using the programming software (KPG-60D).

5-2. Voice Scrambler Board Connection

• Modification

1. Remove the upper half of the case of the TK-780.
2. Remove R529 and R571 on the TX-RX unit (X57-614 B/2).

INSTALLATION

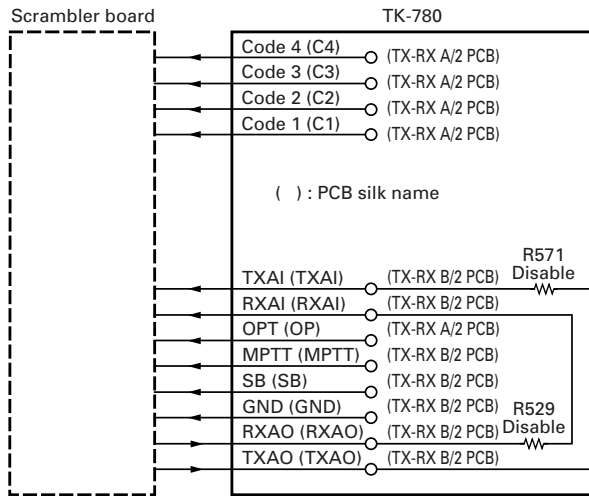
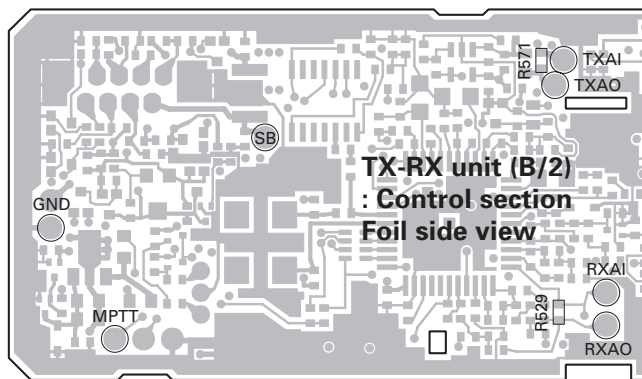
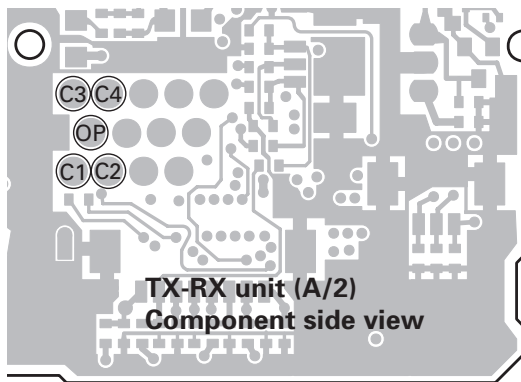


Fig 5



6. PA/HA Unit (KAP-1 : Option)

6-1. Installing the KAP-1 in the Transceiver

The Horn Alert (max. 2A drive) and Public Address functions are enabled by inserting the KAP-1 W1 (3P; white/black/red) into CN3 on the TX-RX unit (A/2), inserting W2 (3P; green) into CN5 on the TX-RX unit (A/2), and connecting the KCT-19 (option) to CN2 and CN3 of the KAP-1.

• Installation procedure

1. Open the upper case of the transceiver.
2. Insert the two cables (❶) with connectors from the KAP-1 switch unit into the connectors on the transceiver.
3. Secure the switch unit board to the chassis with a screw (❸). The notch (❷) in the board must be placed at the front left side.
4. Attach the cushion on the top of the KAP-1 switch unit.

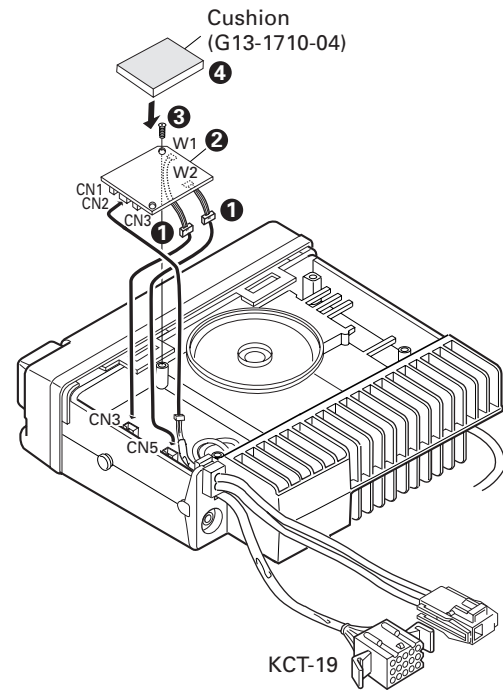


Fig. 6

6-2. Modifying the Transceiver

• Horn alert

The signal from pin 4 of IC7 on the TX-RX unit (A/2) turns Q4 and Q6 on and off and drives KAP-1 HA relay to drive the horn with a maximum of 2A.

The default output is HR1. The relay open output can be obtained between HR1 and HR2 by removing R1 in the KAP-1.

| | R1 | Output form |
|---------------|---------|-------------|
| HR1 (Default) | Enable | |
| HR2 | Disable | |

INSTALLATION

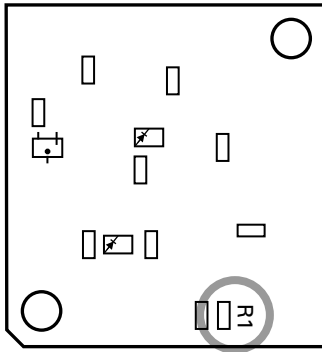


Fig. 7 KAP-1 foil side view

• Public address

The signal from pin 13 of IC7 on the TX-RX unit (A/2) drives PA relay in the KAP-1 and switches the audio power amplifier output between the external PA system (through KCT-19) and internal and external speakers.

To use the PA function, R109 on the TX-RX unit (A/2) must be removed.

| | |
|----------------------------|------|
| | R109 |
| Use the PA function | No |
| Do not use the PA function | Yes |

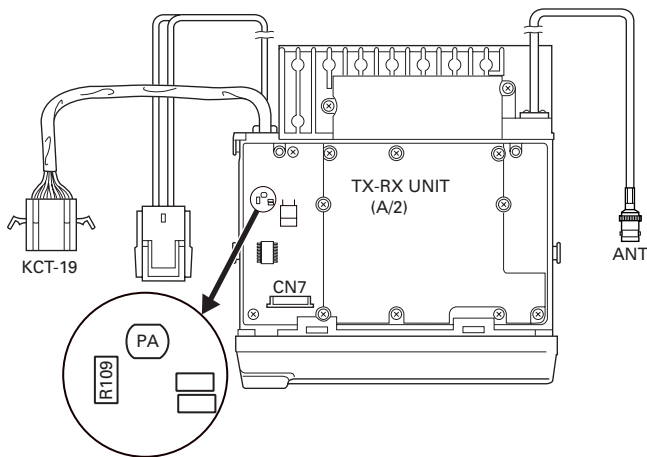


Fig. 8

7. Fitting the Control Panel Upside Down

The TK-780 control panel can be fitted upside down, so the transceiver can be mounted with its internal speaker (in the upper half of the case) facing down in your car.

1. Remove the control panel and the TX-RX unit (B/2) control section. (Fig. 9)

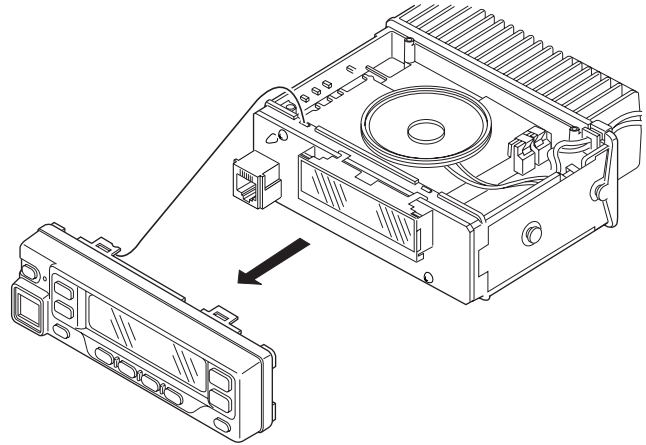


Fig. 9

2. Fold the flat cable (❶) in the opposite direction (❷).
3. Rotate the control section (❸) 180 degrees (❹).
4. Insert the flat cable into the control section connector, CN502 (❺).
5. Mount the control section on the transceiver (❻).

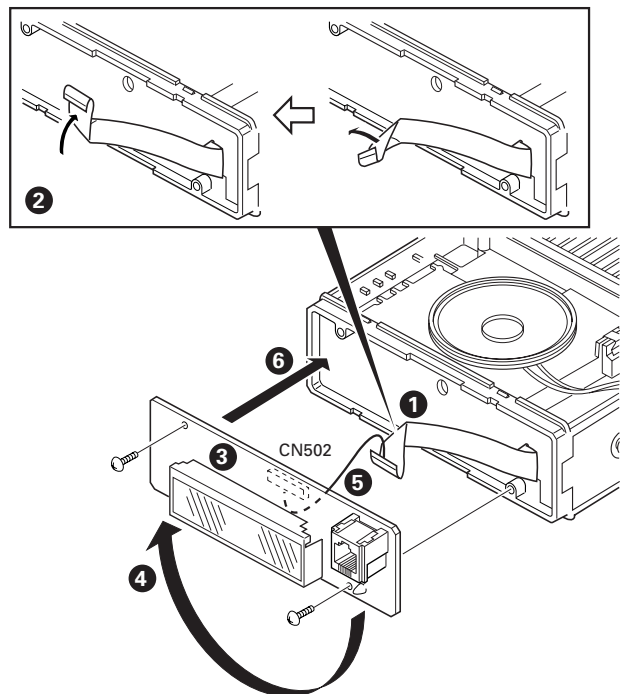


Fig. 10

INSTALLATION

6. Rotate the control panel 180 degrees and mount it on the transceiver. Refit the two halves of the case to complete installation. (Fig. 11)

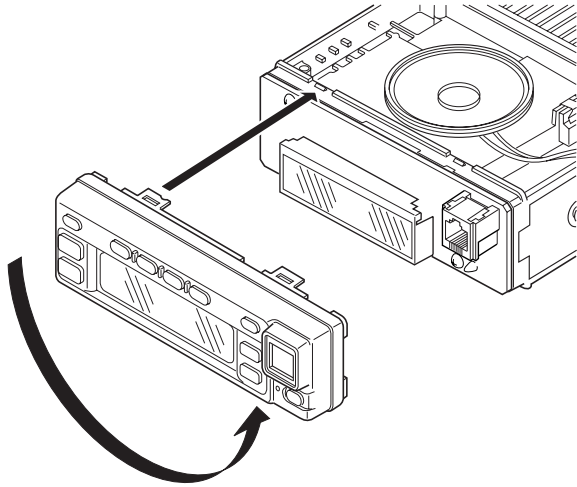


Fig. 11

8-2. KES-4 : Option

The KES-4 is an external speaker used with the accessory connection cable.

• Connection procedure

1. Install the KCT-19 in the transceiver. (See the KCT-19 section.)
2. Insert the crimp terminal into the square plug supplied with the KCT-19.
3. Connect CN5 of the transceiver to connector C of the KCT-19 instead of to the internal speaker connector.

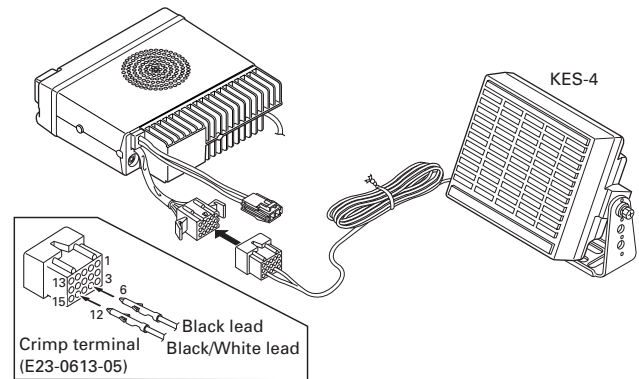


Fig. 13

8. External Speaker

8-1. KES-3 : Option

The KES-3 is an external speaker for the 3.5-mm-diameter speaker jack.

• Connection procedure

1. Connect the KES-3 to the 3.5-mm-diameter speaker jack on the rear of the transceiver.

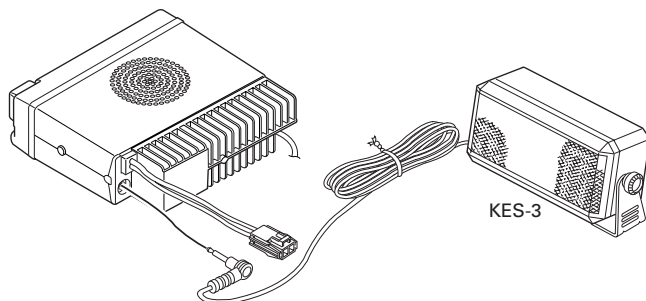


Fig. 12

CIRCUIT DESCRIPTION

Frequency Configuration

The TX-RX unit (A/2) incorporates a VCO, based on a fractional N type PLL synthesizer system, that allows a channel step of 5, 6, and 25kHz to be selected. The incoming signal from the antenna is mixed with a first local oscillation frequency to produce a first intermediate frequency of 44.85MHz.

The signal is then mixed with a second local oscillation frequency of 44.395MHz to produce a second intermediate frequency of 455kHz. This is called a double-conversion system. The TX-RX unit (A/2) contains a wide/narrow MCF and CFs. The transmit signal is produced by the PLL circuit for direction oscillation and division. The signal output from the VCO is amplified by a straight amplifier and transmitted.

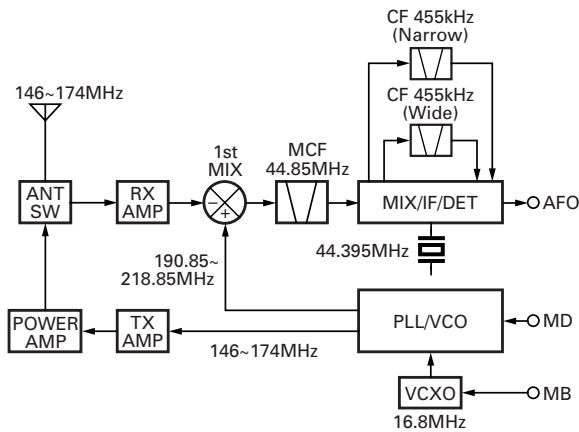


Fig. 1 Frequency configuration

Receiver System

Outline

The incoming signal from the antenna passes through a low-pass filter and a transmission/reception selection diode switch (D211) and goes to the front end of the receiver. The front-end filter is a variable BPF consisting of three coils and three varicap diodes (D206, D207, D208) to eliminate unwanted out-of-band signal components. The low-noise amplifier (LNA) (Q202) uses a bipolar transistor to achieve wide-band and low-distortion amplification.

The signal passes through the BPF and is down-converted with the first local signal by IC202 to produce the first IF signal of 44.85 MHz. The first local signal passes through

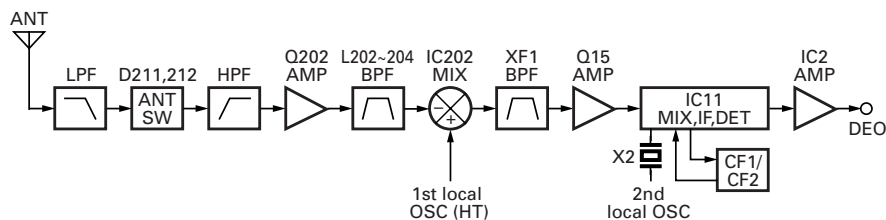


Fig. 2 Receiver system

an LPF and an attenuator to eliminate unwanted harmonics components and implement the optimum input level to the mixer, then enters IC202. A DBM is used as a mixer to achieve a high potential.

The signal output from the mixer passes through two MCFs (XF1). The signal is amplified by an intermediate frequency amplifier and input to the FM IF IC (IC11).

The first intermediate frequency signal is mixed with the second local signal of 44.395MHz to produce the second IF signal of 455kHz.

The unwanted near-by signal components are then eliminated by a wide ceramic filter (CF1) or a narrow ceramic filter (CF2) and the resulting signal goes back to the FM IF IC. The signal is quadrature-detected in the IC to produce an audio signal, which is amplified by a DET amplifier (IC2) and output to the TX-RX unit (B/2).

Wide/Narrow Changelog Circuit

The W/N port (pin 11) of the shift register (IC7) is used to switch between ceramic filters. When the W/N port is high, Q24 turns on and the ceramic filter SW diode (D22, D23) CF1 turns on to receive a Wide signal. At the same time, Q16 turns on and one of the filters is selected so that the wide and narrow audio output levels are equal.

When the W/N port is low, Q23 turns on and the ceramic filter SW diode (D22, D23) CF2 turns on to receive a Narrow signal.

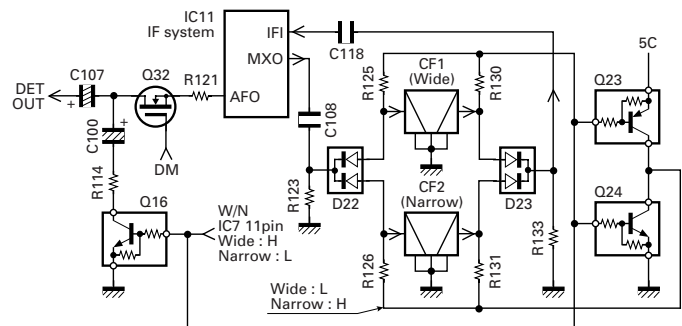


Fig. 3 Wide/Narrow changelog circuit

CIRCUIT DESCRIPTION

■ AF Signal System

The detection signal (DEO) from the TX-RX unit (A/2) goes to the audio processor (IC504) of the TX-RX unit (B/2). The signal passes through a filter in the audio processor to adjust the gain, and is output to IC502. IC502 sums the AF signal and the DTMF signal and returns the resulting signal to the TX-RX unit (A/2). The signal (AFO) sent to the TX-RX unit (A/2) is input to the D/A converter (IC5). The AFO output level is adjusted by the D/A converter. The signal output from the D/A converter is added with the BEEP signal (BPO) and the resulting signal is input to the audio power amplifier (IC10). The AF signal from IC10 switches between the internal speaker and speaker jack (J1) output.

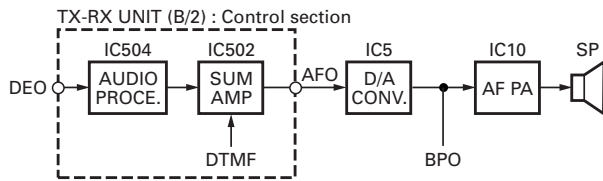


Fig. 4 AF signal system

■ Squelch Circuit

The detection output from the FM IF IC (IC11) is amplified by IC2 and the signal (DEO) is sent to the TX-RX unit (B/2). The signal passes through a high-pass filter and a noise amplifier (Q503) in the TX-RX unit (B/2) to detect noise. A voltage is applied to the CPU (IC511). The CPU controls squelch according to the voltage (ASQ) level. The signal from the RSSI pin of IC11 is monitored. The electric field strength of the receive signal can be known before the ASQ voltage is input to the CPU, and the scan stop speed is improved.

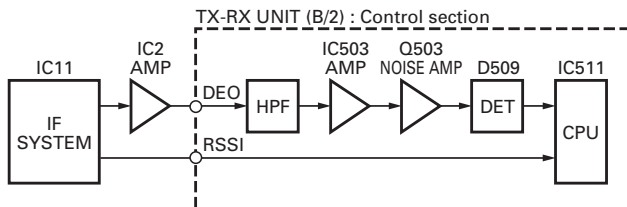


Fig. 5 Squelch circuit

Transmitter System

■ Outline

The transmitter circuit produces and amplifies the desired frequency directly. It FM-modulates the carrier signal by means of a varicap diode.

■ VCO/PLL Circuit

The TK-780 has a VCO for the transmitter and a VCO for the receiver in a sub-unit (A1). They are housed in a solid shielded case and connected to the TX-RX unit (A/2) through CN101. One of the VCOs is selected with an ST signal. A filtered low-noise power supply is used for the VCOs and varicap diodes.

The VCO for the transmitter is described below. It is designed so that Q103 turns on with a prescribed frequency when a reverse bias is applied to D102 and D107 by using the control voltage (CV) through CN101. The control voltage is changed by turning the trimmer capacitor (IC102). The output from Q103 is applied to the buffer amplifier (Q106) to generate a VCO output signal. This signal is used as a drive input signal or a local signal of the first mixer. Since a signal output from Q160 is input to the PLL IC, it passes through CN101 and buffer amplifier (Q300) and goes to the PLL IC (IC300). The modulation signal from CN101 is applied to D109 and passes through C125 and C126 to modulate the carrier.

The PLL IC uses a fractional N type synthesizer to improve the C/N ratio and lock-up speed. The VCO output signal input to the pin 5 of the PLL IC is divided to produce a comparison frequency according to a channel step. This signal is compared with the reference frequency which is output from the VCXO (X1). VCXO provides 16.8MHz, 2.5ppm (-30 to +60°C) and guarantees stable performance when the temperature changes. The output signal from the phase comparator passes through a charge pump and an external active LPF (Q301, Q302) in the PLL IC to generate a DC VCO control voltage CV. Serial data (DT, CK, EP) are output from the CPU (IC511) and shift register (IC8) in the TX-RX unit (B/2) to control the PLL IC. The PLL lock status is always monitored by the CPU.

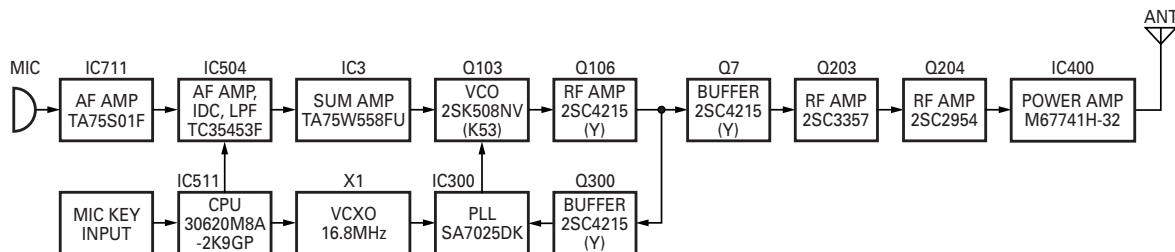


Fig. 6 Transmitter system

CIRCUIT DESCRIPTION

■ Unlock Circuit

During reception, the TR signal goes high, the KEY signal goes low, and Q10 turns on. Q11 turns on and a voltage is applied to the collector (8R). During transmission, the TR signal goes low, the KEY signal goes high and Q13 turns on. Q12 turns on and a voltage is applied to 8T.

The CPU in the TX-RX unit (B/2) monitors the PLL (IC300) LD signal directly. When the PLL is unlocked during transmission, the PLL LD signal goes low. The CPU detects this signal and makes the KEY signal low. When the KEY signal goes low, no voltage is applied to 8T, and no signal is transmitted.

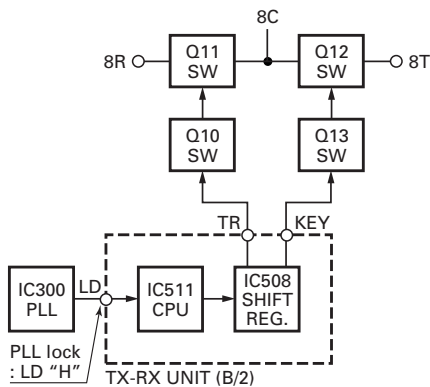


Fig. 7 Unlock circuit

■ Power Amplifier Circuit

The transmit output signal from the VCO is amplified to a specified level of the power module (IC400) by the drive block (Q203, Q204). The amplified signal passes through the transmission/reception selection diode (D211) and goes to a low-pass filter. The low-pass filter removes unwanted high-frequency harmonic components, and the resulting signal is sent to the antenna terminal.

■ APC Circuit

The automatic transmission power control (APC) circuit detects part of a power module output with a diode (D27, D30) and applies a voltage to Q21. Q21 compares the APC control voltage (PC) generated by the D/A converter (IC5) and DC amplifier (IC6) with the detection output voltage to control Q19 and Q20, generates DB voltage from B voltage, and stabilizes transmission output.

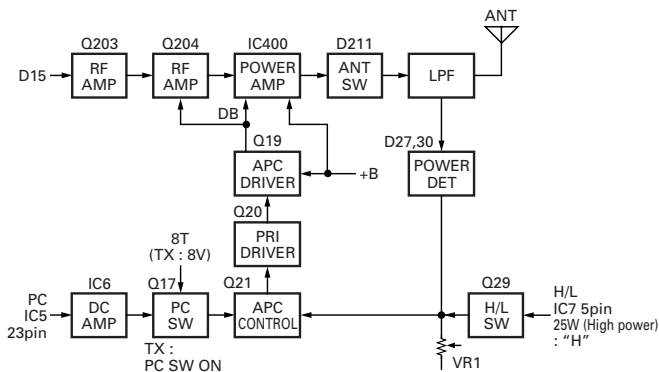


Fig. 8 APC circuit

Q17 turns the PC signal on or off using 8T so that the circuit works only during transmission. With stability at low power in mind, Q29 turns off to optimize the detection voltage.

The APC circuit is configured to protect overcurrent of the power module due to fluctuations of the load at the antenna end and to stabilize transmission output at voltage and temperature variations.

Control Circuit

The CPU carries out the following tasks:

- 1) Controls the shift register (IC7, IC8, IC508) AF MUTE, WIDE/NARROW, T/R KEY outputs.
- 2) Adjusts the AF signal level of the audio processor (IC504) and turns the filter select compounder on or off.
- 3) Controls the DTMF decoder (IC507).
- 4) Controls the LCD assembly display data.
- 5) Controls the PLL (IC300).
- 6) Controls the D/A converter (IC5) and adjusts the volume, modulation and transmission power.

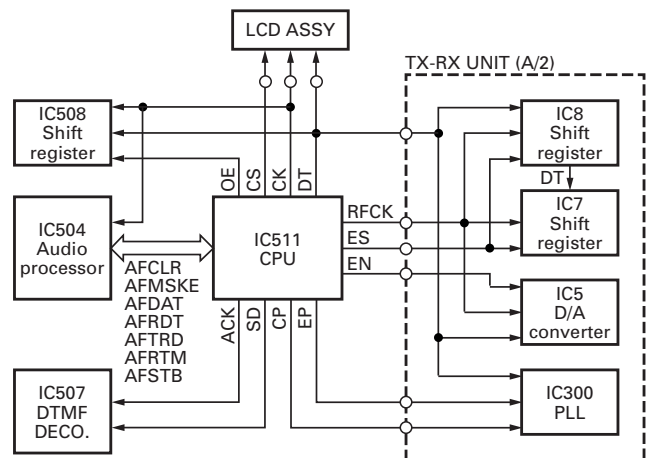


Fig. 9 Control circuit

■ Memory Circuit

The transceiver has a 2M-bit (256k x 8) flash ROM (IC510) and an 16k-bit EEPROM (IC512). The flash ROM contains firmware programs, data and user data which is programmed with the FPU. The EEPROM contains adjustment data. The CPU (IC511) controls the flash ROM through an external address bus and an external data bus. The CPU controls the EEPROM through two serial data lines.

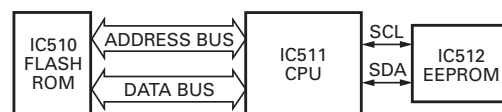


Fig. 10 Memory circuit

CIRCUIT DESCRIPTION

■ Display Circuit

The CPU (IC511) controls the shift register (IC508) and display LEDs. When the LG line goes high when the transceiver is busy, Q508 turns on and the green LED on D511 lights. In transmit mode, the LR line goes high, Q509 turns on and the red light lights. Backlighting LEDs for the key operation unit (D512~D517) and LCD are provided.

When the KBLC line goes high, Q512 turns on, then Q513 turns on, and the key illumination LED lights. A voltage is applied to the LEDA line to turn on the LCD backlight.

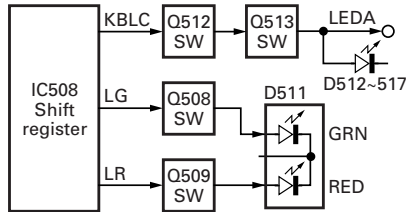


Fig. 11 Display circuit

■ Key Matrix Circuit

The TK-780 front panel has ten keys. Each of them is connected to a cross point of a matrix of the KEY1 to KEY7 ports of the microprocessor. The KEY5 to KEY7 ports are always high, while the KEY1 to KEY4 ports are always low.

The microprocessor monitors the status of the KEY1 to KEY7 ports. If the state of one of the ports changes, the microprocessor assumes that the key at the matrix point corresponding to that port has been pressed. Unused points (KEY1 to KEY7) are also used for foot switch (FSW) input.

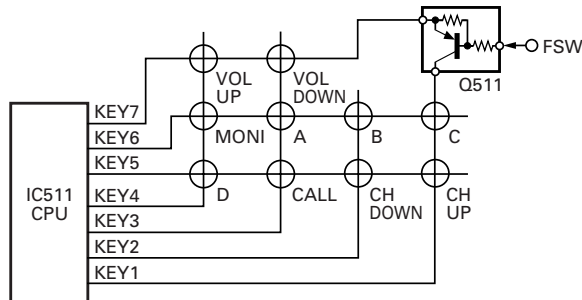


Fig. 12 Key matrix circuit

■ Encode

The QT, DQT signals are output from LSDO of the CPU (IC511) and go to the D/A converter (IC5) of the TX-RX unit (A/2). The DTMF and single/5-tone signals are output from HSDO of the CPU and goes to the audio processor (IC504). An MSK signal is output from the audio processor according to the data (AFDAT) from the CPU. The signal is summed with a MIC/MSK signal by the audio processor (IC504), and the resulting signal passes through an analog switch (IC506) and goes to the TX-RX unit (A/2) (MO).

MO is summed with the external pin DI line by the summing amplifier (IC3) and the resulting signal goes to the D/A converter (IC5). The D/A converter (IC5) adjusts the MO level and the balance between the MO and TO levels. Part of a TO signal is summed with an output signal from pin 3 (MO) of IC5 and the resulting signal goes to the MD pin of the VCO. This signal is applied to a varicap diode in the VCO for direct FM modulation.

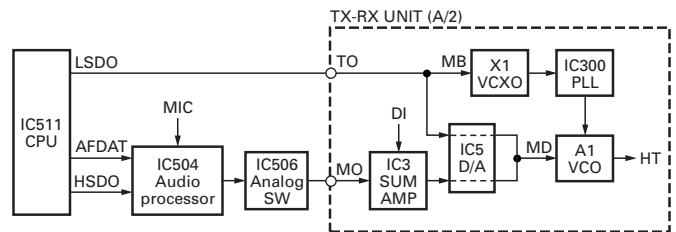


Fig. 13 Encode

■ Decode

The signal (DEO) detected by the TX-RX unit (A/2) passes through two low-pass filters of IC501, goes to LSDI of the CPU (IC511) to decode QT, DQT. The DTMF signal is decoded by a dedicated IC (IC507) and the resulting signal is sent to the CPU (IC511) as serial data (STD).

The 5-tone signal passes through high-pass filter, IC504 and then through low-pass filter, IC710. After passing through these filters, only the audio signal between 300Hz and 3kHz is extracted and input to comparator, IC502. The comparator converts the input signal into a square waveform (0 and 5V). This square waveform is then fed to the HSDI line of CPU (IC511).

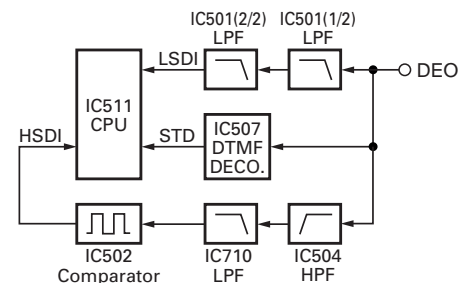


Fig. 14 Decode

■ D/A Converter

The D/A converter (IC5) is used to adjust TONE and MO modulation, beep, AF volume, TV voltage, FC reference voltage, and PC POWER CONTROL voltage level.

Adjustment values are sent from the CPU as serial data. The D/A converter has a resolution of 256 and the following relationship is valid:

$$D/A \text{ output} = (V_{in} - V_{DAref}) / 256 \times n + V_{DAref}$$

V_{in} : Analog input

V_{DAref} : D/A reference voltage

n : Serial data value from the microprocessor (CPU)

CIRCUIT DESCRIPTION

■ Horn Control

The horn switch, consisting of Q4, Q5, and Q6, controls the horn relay. It is supplied by the dealer to provide the external horn alert function.

Q5 disables horn alert, turning on when its base is high, to inhibit the function. Normally, the output from IC7 is low, and Q6 is off; the base of Q4 is about 0V and Q4 is off. When horn alert is enabled, the output from IC7 goes high and Q6 turns on. The base current flows through R58 to Q4 to turn Q4 on. Q4 can sink a maximum of 100mA. If the operational KAP-1 is used, it can drive up to 2A.

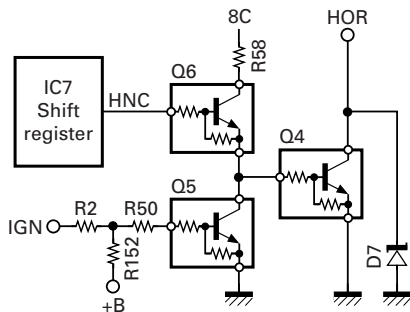


Fig. 15 Horn control

■ PA Switch

If the optional KAP-1 is used, the PA (Public Address) function becomes available. In this case, the signal flow changes as follows;

| "PA2" | Q507 | SW.A | SW.B | SW.D | Public address |
|-------|------|------|------|------|----------------|
| L | L | L | H | H | OFF |
| H | H | H | L | L | ON |

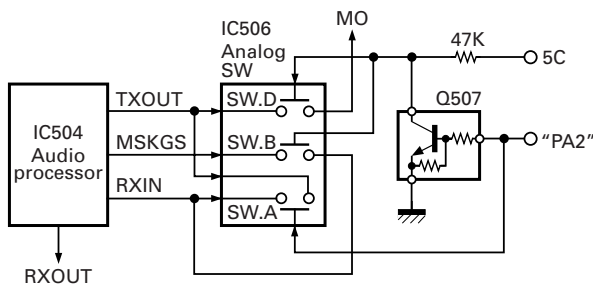


Fig. 16 PA switch

Power Supply Circuit

When the POWER switch on the control unit is pressed, the PSW signal goes low. This signal is inverted by Q26 and sent to a flip-flop IC (IC15). This IC outputs a control signal when the PSW goes low. When the power turns on, pin 1 of IC15 outputs a low signal and Q30 turns on. The base of Q28 goes high, Q28 turns on, SB SW (Q27) turns on and power (SB) is supplied to the set.

This circuit has an over-voltage protection circuit. If a DC voltage of 20V or higher is applied to the power cable, D34 turns on and a voltage is applied to the base of Q31. This voltage turns Q31 on and turns Q28 and SBSW off. This circuit has a TIMED POWER OFF (TOF) function which can be programmed by software.

It is controlled through pin 6 of IC7. When the TOF line goes high, Q22 turns on and then Q25 turns on. Pin 6 of IC15 goes high, then pin 1 goes high to turn Q27 off.

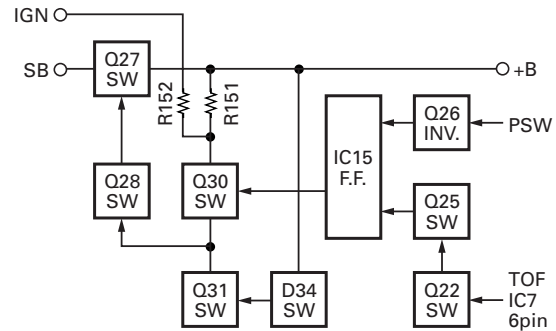


Fig. 17 Power supply circuit

SEMICONDUCTOR DATA

Microprocessor : 30620M8A-2K9GP (TX-RX Unit B/2 : Control Section IC511)

■ Terminal function

| Pin No. | Name | I/O | Function |
|---------|--------|-----|--|
| 1 | LSDOUT | O | Low speed data output. |
| 2 | HSDOUT | O | High speed data output. |
| 3 | HSDIN | I | High speed data input. |
| 4 | DTMSTD | I | DTMF decode IC data detect input. |
| 5 | SELF | I | Self programming mode input. |
| 6 | BYTE | I | +5V. |
| 7 | CNVSS | I | GND. |
| 8 | SFTOE | O | Shift register output enable. |
| 9 | LCDCS | O | LCD driver chip select output. |
| 10 | RESET | I | Microcomputer reset input. |
| 11 | XOUT | - | 9.8304MHz (System clock). |
| 12 | VSS | - | GND. |
| 13 | XIN | - | 9.8304MHz (System clock). |
| 14 | VCC | - | +5V. |
| 15 | IGN | I | Ignition input. |
| 16 | AFTRD | I | FFSK modulation data output timing pulse input. |
| 17 | AFRTM | I | FFSK demodulation data input timing pulse input. |
| 18 | MICDAT | O | MIC key data output. |
| 19 | CP | O | PLL IC clock output. |
| 20 | BEEP | O | Beep data output. |
| 21 | AFRDT | I | FFSK demodulation data input. |
| 22 | AFREG1 | O | AF IC register switching data output 1. |
| 23 | AFREG2 | O | AF IC register switching data output 2. |
| 24 | EEPDAT | O | EEPROM data output. |
| 25 | EN | O | D/A converter IC data strobe output. |
| 26 | AFCLR | O | FFSK flame reset output. |
| 27 | RXCOM2 | I | External hook input / External serial interface input. |
| 28 | TXCOM2 | I/O | External PTT input / External serial interface output. |
| 29 | TXCOM1 | O | External serial interface output. |
| 30 | RXCOM1 | I | External serial interface input. |
| 31 | LD | I | PLL unlock detect input. |
| 32 | AFMSKE | O | FFSK modulation enable. (Enable active "H") |
| 33 | TXD | O | Serial interface output. |
| 34 | HOOK | I | Hook input / Serial interface input. |
| 35 | AFDAT | O | FFSK data output. |
| 36 | RFCLK | O | Common clock output. (TX-RX unit A/2) |
| 37 | RDY | - | Not used. |
| 38 | ALE | - | Not used. |
| 39 | HOLD | - | Not used. |
| 40 | HLDA | - | Not used. |
| 41 | BLCK | - | Not used. |
| 42 | RD | - | Flash memory RD bus. |
| 43 | BHE | - | Not used. |
| 44 | WR | - | Flash memory WR bus. |
| 45 | DTMCLK | O | DTMF decode IC clock output. |
| 46 | CNTCLK | O | Common clock output. (TX-RX unit B/2) |

| Pin No. | Name | I/O | Function |
|---------|-----------|-----|--|
| 47 | EP | O | PLL IC data strobe output. |
| 48 | CSO | O | Flash memory chip enable. |
| 49 | A19 | - | Not used. |
| 50~59 | A18~A9 | - | Flash memory address bus. |
| 60 | VCC | - | +5V. |
| 61 | A8 | - | Flash memory address bus. |
| 62 | VSS | - | GND. |
| 63~70 | A7~A0 | - | Flash memory address bus. |
| 71~74 | KEY1~KEY4 | I/O | Key matrix data input/output 1~4. |
| 75 | MINDAT | O | Common data output. |
| 76~78 | KEY5~KEY7 | I | Key matrix data input 5~7. |
| 79~86 | D7~D0 | - | Flash memory data bus. |
| 87 | DTMDAT | I | DTMF decode IC data input. |
| 88 | AUXDTC | I | External DTC input. |
| 89 | MICBLC | O | MIC back light control output. |
| 90 | POWSW | I | Power switch input. |
| 91 | ANLSQL | I | Squelch level input. |
| 92 | PTT | I | PTT switch input. |
| 93 | RSSI | I | Received signal strength indicator input. |
| 94 | AVSS | - | GND. |
| 95 | LSDIN | I | Low speed data input. |
| 96 | VREF | - | +5V. |
| 97 | AVCC | - | +5V. |
| 98 | ES1 | O | Shift register data strobe output. (Control unit) |
| 99 | ES2 | O | Shift register data strobe output. (TX-RX unit) |
| 100 | AFSTB | O | AF IC data strobe output. |

Shift Register : BU4094BCFV

■ Terminal function (TX-RX unit B/2 IC508)

| Pin No. | Port | Name | Function |
|---------|------|--------|---|
| 1 | ES | ES1 | Strobe |
| 2 | DT | DAT | Data |
| 3 | CK | | Clock |
| 4 | Q1 | LEDR | Red LED. H : ON, L : OFF |
| 5 | Q2 | LEDG | Green LED. H : ON, L : OFF |
| 6 | Q3 | KEYBLT | Key back light. H : ON, L : OFF |
| 7 | Q4 | MMUTE | MIC mute. H: Mute, L : Unmute |
| 8 | VSS | | GND |
| 9 | | | NC |
| 10 | | | NC |
| 11 | Q8 | PA2 | Public address control 2. H : ON, L : OFF |
| 12 | Q7 | BSHIFT | Beat shift. H : ON, L : OFF |
| 13 | Q6 | KEY | TX power switching. H : TX, L : RX |
| 14 | Q5 | T/R | TX/RX switching. H : RX, L : TX |
| 15 | OE | | Output enable |
| 16 | VDC | | +5V |

SEMOCONDUCTOR DATA / DESCRIPTION OF COMPONENTS

■ Terminal function (TX-RX unit A/2 IC8)

| Pin No. | Port | Name | Function |
|---------|------|-------|--|
| 1 | STB | ES | Strobe |
| 2 | SI | DT | DATA |
| 3 | CLK | CK | Clock |
| 4 | Q1 | AM1 | Audio mute 1. H : Mute, L : Unmute |
| 5 | Q2 | LOK | Link complete. (Programmable active H/L) |
| 6 | Q3 | STR | VCO shift switching. H : TX, L : RX |
| 7 | Q4 | DM | Dead mute. H : RX, L : TX |
| 8 | VSS | | GND |
| 9 | QS | | IC7 data output |
| 10 | | | NC |
| 11 | Q8 | SQ | External squelch. (Programmable active H/L) |
| 12 | Q7 | CODE2 | Option board data 2. H : ON, L : OFF |
| 13 | Q6 | CODE1 | Option board data 1. H : ON, L : OFF |
| 14 | Q5 | OPT | Option board control. H : ON, L : OFF / Auxiliary B. (Programmable active H/L) |
| 15 | OE | | Output |
| 16 | VDC | | +5V. |

■ Terminal function (TX-RX unit A/2 IC7)

| Pin No. | Port | Name | Function |
|---------|------|--------|---|
| 1 | STB | ES | Strobe |
| 2 | SI | DT | Data |
| 3 | CLK | CK | Clock |
| 4 | Q1 | HORN | Horn alert. H : ON, L : OFF / Auxiliary A. H : ON, L : OFF |
| 5 | Q2 | HL | RF power switching. H : High, L : Low |
| 6 | Q3 | TIMOFF | Timed power off. H : Power off |
| 7 | Q4 | CODE3 | Option board data 1. H : ON, L : OFF |
| 8 | VSS | | GND |
| 9 | | | NC |
| 10 | | | NC |
| 11 | Q8 | W/N | Wide/Narrow switching. H : Wide, L : Narrow |
| 12 | Q7 | | NC |
| 13 | Q6 | PA1 | Public address 1. H : ON, L : OFF |
| 14 | Q5 | CODE4 | Option board data 1. H : ON, L : OFF |
| 15 | OE | | Output enable |
| 16 | VDC | | +5V |

DESCRIPTION OF COMPONENTS

TX-RX Unit (A/2)

| Ref. No. | Use / Function | Operation / Condition |
|----------|-------------------------|---|
| IC1 | DC amp | FC, TCXO control |
| IC2 | DET amp | External DEO, internal DEO |
| IC3 | Amp/Summing amp | DI / DI and MO addition |
| IC4 | Analog switch | DI switch |
| IC5 | A/D converter | PC, TV, FC, AFO, BEEP, TO, MO control |
| IC6 | DC amp | PC |
| IC7 | Shift register | HNC, H/L, TOF, CODE3, CODE4, PA, W/N control |
| IC8 | Shift register | AM, LOK, STR, DM, OPT, CODE1, CODE2, SQ control |
| IC9 | 5V AVR | External 5C |
| IC10 | AF power amp | |
| IC11 | FM IF DET | Quadrature detector, 2nd mixer, OSC, IF amplifier, RSSI |
| IC12 | 5V AVR | 5C |
| IC13 | 9V AVR | 9C |
| IC14 | 8V AVR | 8C |
| IC15 | Flip-flop | Power on/off control |
| IC201 | DC amp | TV |
| IC202 | Mixer | DBM |
| IC300 | PLL | Reference 16.8MHz. PLL lock : LD "H" |
| IC400 | Power module | RF power 25W |
| IC401 | Short protection | |
| Q1 | DC switch | R17 connection and, PTT "H" time DI off |
| Q2 | Ripple filter | 8CL |
| Q3 | Ripple filter | 9CL |
| Q4 | HOR switch | IGN |
| Q5 | HOR SW control | IGN |
| Q6 | HOR SW control | HNC "H" time on |
| Q7 | Buffer amp | HT |
| Q8 | AF mute | AM "H" time on |
| Q9 | AF mute | Power off time on |
| Q10 | 8R SW control | TR "H" time on |
| Q11 | 8R switch | Q10 on time on |
| Q12 | 8T switch | Q13 on time on |
| Q13 | 8T SW control | KEY "H" time on |
| Q15 | IF amp | 44.85MHz |
| Q16 | DET output level switch | Wide time on |
| Q17 | PC switch | TX (8T) time on |
| Q18 | DET mute | KEY "H" time on |
| Q19 | APC | APC driver |
| Q20 | APC | APC pre-driver |
| Q21 | APC control | |
| Q22 | TOF switch | TOF "H" time on |
| Q23 | W/N switch | Wide time off |

DESCRIPTION OF COMPONENTS

| Ref. No. | Use / Function | Operation / Condition |
|----------|--------------------------|----------------------------|
| Q24 | W/N switch | Wide time on |
| Q25 | TOF switch | Q22 on time on |
| Q26 | Inverter | Power switch "L" time on |
| Q27 | SB switch | Q28 on time on |
| Q28 | SB SW control | Q30 on and Q31 off time on |
| Q29 | H/L switch | High power time "H" |
| Q30 | SB SW control | Power on time on |
| Q31 | SB SW control | DC 20V and over time on |
| Q32 | DET mute | TX time on |
| Q202 | LNA | |
| Q203 | RF amp | TX drive first |
| Q204 | RF amp | TX drive last |
| Q300 | Buffer amp | PLL |
| Q301,302 | Active filter | |
| Q401 | Short protection | IC400 out short time on |
| Q402 | W/N switch | Wide time off |
| Q403 | W/N switch | Wide time on |
| D1~6 | Protection | |
| D7 | HOR protection | |
| D8,9 | Protection | |
| D11 | OR gate | AF mute |
| D12~14 | Protection | |
| D15 | HT switch | |
| D16 | Reverse protection | |
| D17 | Protection | |
| D20 | Reverse protection | IGN |
| D21 | Protection | 5V (IGN) |
| D22,23 | W/N CF change | |
| D24 | Over current protection | |
| D26 | Reverse protection | |
| D27 | Power detection | |
| D28 | Protection | |
| D30 | Power detection | |
| D31 | Reverse protection | |
| D32 | Surge absorption | B |
| D34 | Protection | DC 20V and over time on |
| D35 | Charge | DEO |
| D37 | Reverse protection | |
| D206~208 | BPF tune | |
| D209,210 | Usable temperature range | |
| D211 | ANT switch | TX time on |
| D212,213 | ANT switch | |

TX-RX Unit (B/2) : Control Section

| Ref. No. | Use / Function | Operation / Condition |
|----------|-----------------------------|---|
| IC501 | LPF, amplification | LSD |
| IC502 | Amplification | AF, HSD |
| IC503 | Base voltage/ Buffer amp | ASQ |
| IC504 | Audio processor | Compander, MIC amplifier, ALC, Modem, AF filter, IDC |

| Ref. No. | Use / Function | Operation / Condition |
|----------|----------------------------|--|
| IC506 | Analog switch | MO, DEO, EMG, MI switch |
| IC507 | DTMF decoder | DTMF detection |
| IC508 | Shift register | LR, LG, KBLC, MM1, T/R, KEY, BSFT, PA2 output |
| IC509 | Reset | Power on time "L" output |
| IC510 | Flash ROM | |
| IC511 | CPU | |
| IC512 | EEPROM | |
| IC513 | 5V AVR | 5C (Control unit) |
| IC710 | Buffer amp | HSD |
| IC711 | Buffer amp | MIC |
| Q501 | MIC mute | MM "H" and MM1 "H" time mute on |
| Q502 | AF mute | KEY "H" time mute on |
| Q503 | Noise amp | |
| Q507 | Inverter | PA2 H/L switch |
| Q508 | LED switch | LG "H" time on, Busy time green on |
| Q509 | LED switch | LR "H" time on, TX time red on |
| Q510 | Clock switch shift | BSFT "H" time clock shift on |
| Q511 | FSW switch | FSW "L" time foot switch on |
| Q512 | Key backlight switch | KBLC "H" time on |
| Q513 | Key backlight switch | KBLC "H" time key backlight on |
| Q515 | Key backlight switch | |
| D501 | Surge absorption | BLC |
| D502 | Over current protection | PSB |
| D503 | Surge absorption | CM |
| D504 | Surge absorption | PTT/TXD |
| D505 | Surge absorption | HOOK/RXD |
| D507 | OR gate (MIC mute) | MM/MM1 |
| D508 | Limiter | MIC |
| D509 | Limiter | ASQ |
| D510 | Reverse current protection | C575 charge |
| D511 | BUSY/TX LED (Green/Red) | Busy time green on, TX time red on |
| D512~517 | Key backlight | KBLC "H" time on |
| D518 | Current regulation | Key backlight |
| D520 | Discharge | Reset pulse |

VCO Unit

| Ref. No. | Use / Function | Operation / Condition |
|----------|----------------|-----------------------|
| Q101 | Inverter | TX (ST "H") time on |
| Q102 | Oscillator | RX |
| Q103 | Oscillator | TX |
| Q104 | TX/RX switch | TX (ST "H") time on |
| Q105 | TX/RX switch | Q101 off time on |
| Q106 | Buffer amp | |
| D101 | RX VCO | |
| D102 | TX VCO | |
| D104 | RX VCO | |
| D107 | TX VCO | |
| D109 | Modulation | |

TK-780

PARTS LIST

* New Parts. ⚠ indicates safety critical components.

Parts without **Parts No.** are not supplied.

Les articles non mentionnés dans le **Parts No.** ne sont pas fournis.

Teile ohne **Parts No.** werden nicht geliefert.

L : Scandinavia

K : USA

P : Canada

Y : PX (Far East, Hawaii)

T : England

E : Europe

Y : AAFES (Europe)

X : Australia

M : Other Areas

TK-780

TX-RX UNIT (X57-6142-XX)

| Ref. No. | Address | New parts | Parts No. | Description | Destination |
|---------------|----------|-----------|-------------|--------------------------------|-------------|
| TK-780 | | | | | |
| 1 | 1A | | A01-2165-23 | CABINET UPPER | |
| 2 | 2A | | A01-2166-23 | CABINET LOWER | |
| 3 | 2A | | A62-0642-03 | PANEL ASSY | |
| 5 | 1D | | B09-0235-05 | CAP ACC | |
| 6 | 2B | | B38-0835-05 | LCD ASSY | |
| 9 | 1D | | B42-5999-14 | RATING LABEL | |
| 7 | 2D | * | B62-1438-10 | INSTRUCTION MANUAL | |
| 8 | 1C | * | B72-1998-14 | MODEL NAME PLATE | E |
| 8 | 1C | * | B72-2092-04 | MODEL NAME PLATE | E3 |
| 11 | 1C | | E30-3340-05 | DC CORD RADIO | |
| 12 | 1C | | E30-3405-05 | ANTENNA CABLE BNC | |
| 10 | 1D | | E30-3438-05 | DC CORD ACC | |
| 13 | 2B | | E37-0789-05 | FLAT CABLE CONT-TX/RX | |
| 14 | 1B | | E37-0790-25 | LEAD WIRE WITH CONNECTOR (SP) | |
| 16 | 2B | | F10-2234-04 | SHIELDING COVER APC,AVR | |
| 15 | 2B | | F10-2280-12 | SHIELDING COVER | |
| 17 | 1C | | F10-2354-03 | SHIELDING PLATE LOWER PM | |
| 18 | 2C | | F10-2355-04 | SHIELDING COVER UPPER PM | |
| 20 | 2B | | F20-1192-04 | INSULATING SHEET CONT | |
| 21 | 1D | | F52-0006-05 | FUSE (BLADE) 10A | |
| 23 | 1B,1C | | G02-0791-04 | FLAT SPRING AF,APC,AVR | |
| 25 | 2B | | G02-0862-14 | EARTH SPRING ANT | |
| 39 | 2C | * | G02-0897-05 | EARTH SPRING UPPER PM | E3 |
| 26 | 1B,1C | | G10-1221-04 | FIBROUS SHEET SIDE | |
| 27 | 1B | | G10-1222-14 | FIBROUS SHEET UP,DOWN | |
| 28 | 1A,2A,2B | | G10-1223-14 | FIBROUS SHEET SHIELD CASE | |
| - | | | G11-4068-04 | SHEET CONT | |
| 29 | 1C | | G13-1468-04 | CUSHION DC CODE | |
| 32 | 2B | | G13-1839-04 | CUSHION SHIELD | E3 |
| 30 | 1B | | G13-1873-04 | CUSHION SP | |
| 31 | 2C | | G53-0796-04 | PACKING PHONE JACK | |
| 33 | 3D | | H10-6618-12 | POLYSTYRENE FOAMED FIXTURE (F) | |
| 34 | 2E | | H10-6619-12 | POLYSTYRENE FOAMED FIXTURE (R) | |
| 35 | 1E | | H12-1391-03 | INNER PACKING CASE | |
| 36 | 1D | | H25-0103-04 | PROTECTION BAG (125/250/0.07) | |
| 37 | 2E | | H25-0720-04 | PROTECTION BAG (200X350) | |
| 38 | 3E | | H52-1569-02 | ITEM CARTON CASE | E |
| 38 | 3E | * | H52-1931-02 | ITEM CARTON CASE | E3 |
| 40 | 1D | | J29-0627-23 | BRACKET ACC | |
| 42 | 2B | | K29-9105-02 | KEY TOP | |
| A | 1A,2A | | N33-2606-45 | OVAL HEAD MACHINE SCREW | |
| B | 2C | | N67-3008-46 | PAN HEAD SEMS SCREW W | |
| C | 1A,2B,1C | | N87-2606-46 | BRAZIER HEAD TAPTITE SCREW | |
| D | 2B | | N87-2612-46 | BRAZIER HEAD TAPTITE SCREW | |
| 44 | 1D | | N99-0395-05 | SCREW SET | |
| 46 | 1B | | T07-0246-05 | SPEAKER | |

| Ref. No. | Address | New parts | Parts No. | Description | Destination |
|--|---------|-----------|---------------|----------------------|-------------|
| TX-RX UNIT (X57-6142-XX) -70 : E -71 : E3 | | | | | |
| D511 | | | B30-2151-05 | LED (RED/GREEN) | |
| D512-517 | | | B30-2171-05 | LED (D) | |
| C1-15 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C16 | | | C92-0507-05 | CHIP-TAN 4.7UF 6.3WV | |
| C17 | | | CK73GB1C104K | CHIP C 0.10UF K | |
| C18 | | | C92-0507-05 | CHIP-TAN 4.7UF 6.3WV | |
| C19 | | | CC73GCH1H100D | CHIP C 10PF D | |
| C20 | | | CK73GB1E103K | CHIP C 0.010UF K | |
| C21,22 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C23 | | | C92-0507-05 | CHIP-TAN 4.7UF 6.3WV | |
| C24 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C25 | | | C92-0507-05 | CHIP-TAN 4.7UF 6.3WV | |
| C27 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C28 | | | CC73GCH1H470J | CHIP C 47PF J | |
| C29 | | | C92-0628-05 | CHIP-TAN 10UF 10WV | |
| C30 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C31 | | | C92-0628-05 | CHIP-TAN 10UF 10WV | |
| C32 | | | CC73GCH1H220J | CHIP C 22PF J | |
| C33 | | | CK73GB1E103K | CHIP C 0.010UF K | |
| C34 | | | C92-0505-05 | CHIP-TAN 10UF 16WV | |
| C35 | | | CK73GB1E103K | CHIP C 0.010UF K | E |
| C36 | | | C92-0628-05 | CHIP-TAN 10UF 10WV | |
| C37 | | | C92-1341-05 | ELECTRO 100UF 16WV | |
| C38 | | | C92-0505-05 | CHIP-TAN 10UF 16WV | E |
| C39 | | | CK73GB1E103K | CHIP C 0.010UF K | |
| C40 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C41 | | | C92-1341-05 | ELECTRO 100UF 16WV | E |
| C42 | | | C92-0546-05 | CHIP-TAN 68UF 6.3WV | |
| C43 | | | CK73GB1E103K | CHIP C 0.010UF K | |
| C44 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C45 | | | C92-0507-05 | CHIP-TAN 4.7UF 6.3WV | |
| C46 | | | C92-0004-05 | CHIP-TAN 1.0UF 16WV | |
| C47 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C48 | | | CK73FF1C105Z | CHIP C 1.0UF Z | |
| C49 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C51,52 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C54 | | | CK73GB1C104K | CHIP C 0.10UF K | |
| C55 | | | CC73GCH1H180J | CHIP C 18PF J | |
| C56 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C57 | | | CK73GB1E103K | CHIP C 0.010UF K | |
| C58-60 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C61 | | | CK73GB1E103K | CHIP C 0.010UF K | |
| C62 | | | CC73GCH1H180J | CHIP C 18PF J | |
| C63 | | | CK73FB1H103K | CHIP C 0.010UF K | E3 |
| C63 | | | CK73FF1C105Z | CHIP C 1.0UF Z | E |
| C64 | | | CK73GB1E103K | CHIP C 0.010UF K | |
| C65 | | | CK73GB1C104K | CHIP C 0.10UF K | |
| C66 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C68 | | | CK73GB1C104K | CHIP C 0.10UF K | |
| C69 | | | CC73GCH1H151J | CHIP C 150PF J | |
| C70 | | | C92-0719-05 | ELECTRO 47UF 25WV | |
| C71 | | | CK73GB1C104K | CHIP C 0.10UF K | |
| C72,73 | | | CK73GB1H102K | CHIP C 1000PF K | |

PARTS LIST

TX-RX UNIT (X57-6142-XX)

| Ref. No. | Address | New parts | Parts No. | Description | Desti-nation | Ref. No. | Address | New parts | Parts No. | Description | Desti-nation |
|----------|---------|-----------|---------------|---------------------|--------------|----------|---------|-----------|---------------|-----------------------|--------------|
| C74 | | | C92-0719-05 | ELECTRO 47UF 25WV | | C147 | | | CC73FCH1H0R5B | CHIP C 0.5PF B | |
| C75 | | | C92-0044-05 | CHIP-ELE 47UF 10WV | | C148 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C76 | | | CK73GB1H102K | CHIP C 1000PF K | | C149 | | | CC73FCH1H020B | CHIP C 2.0PF B | E |
| C77 | | | C92-0719-05 | ELECTRO 47UF 25WV | | C149 | | | CC73FCH1H1R5B | CHIP C 1.5PF B | E3 |
| C78 | | | CK73GB1E103K | CHIP C 0.010UF K | | C150 | | | CK73GB1H221K | CHIP C 220PF K | |
| C79 | | | C92-0722-05 | ELECTRO 470UF 25WV | | C151 | | | CC73GCH1H820J | CHIP C 82PF J | |
| C80 | | | CK73GB1C104K | CHIP C 0.10UF K | | C153 | | | CC73GCH1H040C | CHIP C 4.0PF C | |
| C84 | | | CC73GCH1H080D | CHIP C 8.0PF D | | C154,155 | | | CK73GB1E103K | CHIP C 0.010UF K | |
| C87 | | | CK73GB1H471K | CHIP C 470PF K | | C156 | | | CK73GB1C104K | CHIP C 0.10UF K | |
| C88 | | | CK73GB1E103K | CHIP C 0.010UF K | | C157 | | | CK73GB1E103K | CHIP C 0.010UF K | |
| C89 | | | CK73GB1H471K | CHIP C 470PF K | | C161 | | | CC73GCH1H101J | CHIP C 100PF J | |
| C90 | | | CK73GB1H102K | CHIP C 1000PF K | | C162 | | | C92-0555-05 | CHIP-TAN 0.047UF 35WV | |
| C91,92 | | | CK73GB1E103K | CHIP C 0.010UF K | | C163 | | | CC73GCH1H221J | CHIP C 220PF J | |
| C93 | | | CK73GB1H102K | CHIP C 1000PF K | | C167 | | | CC73GCH1H100D | CHIP C 10PF D | |
| C94 | | | CK73GB1H471K | CHIP C 470PF K | | C168 | | | C92-0585-05 | CHIP-TAN 4.7UF 16WV | |
| C95 | | | CC73GCH1H150J | CHIP C 15PF J | | C173 | | | C92-0606-05 | CHIP-TAN 4.7UF 10WV | |
| C96 | | | CC73GCH1H180J | CHIP C 18PF J | | C175 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C97 | | | CK73GB1H102K | CHIP C 1000PF K | | C176,177 | | | CC73GCH1H470J | CHIP C 47PF J | |
| C98 | | | CC73GCH1H150J | CHIP C 15PF J | | C188 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C99 | | | CK73GB1H102K | CHIP C 1000PF K | | C196-198 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C100 | | | C92-0628-05 | CHIP-TAN 10UF 10WV | | C201 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C101 | | | CK73GB1H102K | CHIP C 1000PF K | | C202 | | | C93-0552-05 | CHIP C 2.0PF C | |
| C102 | | | CC73GCH1H270J | CHIP C 27PF J | | C204 | | | CK73GB1E103K | CHIP C 0.010UF K | |
| C103 | | | CK73GB1C104K | CHIP C 0.10UF K | | C207,208 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C104 | | | CK73GB1E103K | CHIP C 0.010UF K | | C209 | | | CK73GB1C104K | CHIP C 0.10UF K | |
| C105,106 | | | C92-0516-05 | CHIP-TAN 4.7UF 16WV | | C210 | | | CK73GB1E103K | CHIP C 0.010UF K | |
| C107 | | | C92-0628-05 | CHIP-TAN 10UF 10WV | | C211 | | | CC73GCH1H160J | CHIP C 16PF J | |
| C108 | | | CK73GB1C104K | CHIP C 0.10UF K | | C212 | | | CC73GCH1H020B | CHIP C 2.0PF B | |
| C109 | | | CK73GB1H471K | CHIP C 470PF K | | C213 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C111,112 | | | CK73GB1H471K | CHIP C 470PF K | | C214 | | | CC73GCH1H150J | CHIP C 15PF J | |
| C113 | | | CK73GB1E103K | CHIP C 0.010UF K | | C215 | | | CC73GCH1H020B | CHIP C 2.0PF B | |
| C114 | | | C92-0543-05 | CHIP-TAN 3.3UF 10WV | | C216 | | | CC73GCH1H160J | CHIP C 16PF J | |
| C115 | | | CC73GCH1H270J | CHIP C 27PF J | | C217 | | | CC73GCH1H180J | CHIP C 18PF J | |
| C116 | | | C92-0712-05 | CHIP-TAN 22UF 6.3WV | | C222 | | | CK73GB1H471K | CHIP C 470PF K | |
| C117 | | | CK73GB1E103K | CHIP C 0.010UF K | | C224 | | | CK73GB1H471K | CHIP C 470PF K | |
| C118 | | | CK73GB1C104K | CHIP C 0.10UF K | | C225,226 | | | CK73GB1C104K | CHIP C 0.10UF K | |
| C119 | | | C92-0543-05 | CHIP-TAN 3.3UF 10WV | | C228 | | | CK73GB1C104K | CHIP C 0.10UF K | |
| C120 | | | CK73GB1H102K | CHIP C 1000PF K | | C229 | | | CK73GB1H471K | CHIP C 470PF K | |
| C121 | | | C92-0628-05 | CHIP-TAN 10UF 10WV | | C230 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C123 | | | CK73GB1C104K | CHIP C 0.10UF K | | C231 | | | CC73GCH1H101J | CHIP C 100PF J | |
| C124 | | | CK73GB1E103K | CHIP C 0.010UF K | | C232 | | | CK73GB1E103K | CHIP C 0.010UF K | |
| C125 | | | CK73GB1H471K | CHIP C 470PF K | | C233-236 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C126 | | | CK73GB1C104K | CHIP C 0.10UF K | | C237 | | | CC73GCH1H270J | CHIP C 27PF J | |
| C127 | | | CK73GB1E103K | CHIP C 0.010UF K | | C238 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C128 | | | CK73GB1H471K | CHIP C 470PF K | | C239 | | | CC73GCH1H180J | CHIP C 18PF J | |
| C129 | | | CK73GB1E103K | CHIP C 0.010UF K | | C240 | | | CK73GB1H471K | CHIP C 470PF K | |
| C130 | | | CK73GB1H102K | CHIP C 1000PF K | | C241 | | | CC73GCH1H470J | CHIP C 47PF J | |
| C131 | | | CK73GB1H471K | CHIP C 470PF K | | C242 | | | CC73FCH1H220J | CHIP C 22PF J | |
| C132 | | | CK73GB1C104K | CHIP C 0.10UF K | | C243 | | | CC73GCH1H470J | CHIP C 47PF J | |
| C133 | | | C92-0720-05 | ELECTRO 100UF 25WV | | C245 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C134 | | | CK73FB1E224K | CHIP C 0.22UF K | | C246 | | | CK73GB1E103K | CHIP C 0.010UF K | |
| C135 | | | CK73GB1H102K | CHIP C 1000PF K | | C247 | | | C92-0719-05 | ELECTRO 47UF 25WV | |
| C136 | | | CK73FB1E224K | CHIP C 0.22UF K | | C250 | | | C92-0719-05 | ELECTRO 47UF 25WV | |
| C137 | | | CK73GB1H471K | CHIP C 470PF K | | C251 | | | C93-0558-05 | CHIP C 8.0PF D | E |
| C138 | | | CC73FCH1H0R5B | CHIP C 0.5PF B | | C251 | | | C93-0562-05 | CHIP C 15PF J | E3 |
| C139 | | | CC73FCH1H020B | CHIP C 2.0PF B | E3 | C252 | | | C93-0553-05 | CHIP C 3.0PF C | |
| C139 | | | CC73FCH1H030B | CHIP C 3.0PF B | E | C253 | | | C93-0603-05 | CHIP C 1000PF K | |
| C140-143 | | | CK73GB1H471K | CHIP C 470PF K | | C254 | | | C93-0666-05 | CERAMIC 24PF 500V | |
| C144 | | | CK73GB1H102K | CHIP C 1000PF K | | C255 | | | CC73FCH1H040C | CHIP C 4.0PF C | |
| C145,146 | | | CK73GB1H471K | CHIP C 470PF K | | C256 | | | C93-0556-05 | CHIP C 6.0PF D | E |

PARTS LIST

TX-RX UNIT (X57-6142-XX)

| Ref. No. | Address | New parts | Parts No. | Description | Destination | Ref. No. | Address | New parts | Parts No. | Description | Destination |
|----------|---------|-----------|---------------|----------------------|-------------|----------|---------|-----------|---------------|----------------------|-------------|
| C256 | | | C93-0557-05 | CHIP C 7.0PF D | E3 | C512 | | | CK73GB1H471K | CHIP C 470PF K | |
| C257 | | | C93-0666-05 | CERAMIC 24PF | | C513 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C258 | | | C93-0668-05 | CERAMIC 43PF | | C514 | | | CK73GB1H152K | CHIP C 1500PF K | |
| C259 | | | C93-0562-05 | CHIP C 15PF J | | C515 | | | CK73GB1C104K | CHIP C 0.10UF K | |
| C261 | | | CC73GCH1H221J | CHIP C 220PF J | | C516,517 | | | CK73GB1H103K | CHIP C 0.010UF K | |
| C262-264 | | | CC73GCH1H820J | CHIP C 82PF J | | C518 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C265 | | | C93-0564-05 | CHIP C 22PF J | | C519 | | | C92-0507-05 | CHIP-TAN 4.7UF 6.3WV | |
| C266 | | | CC73GCH1H220J | CHIP C 22PF J | | C520 | | | CC73GCH1H221J | CHIP C 220PF J | |
| C267 | | | CC73GCH1H330J | CHIP C 33PF J | | C521,522 | | | CK73GB1C104K | CHIP C 0.10UF K | |
| C271 | | | CC73GCH1H820J | CHIP C 82PF J | | C523 | | | CK73GB1H103K | CHIP C 0.010UF K | |
| C272 | | | CC73GCH1H470J | CHIP C 47PF J | | C524 | | | CK73GB1C104K | CHIP C 0.10UF K | |
| C273 | | | CC73GCH1H820J | CHIP C 82PF J | | C525 | | | CK73GB1H103K | CHIP C 0.010UF K | |
| C274 | | | CC73GCH1H470J | CHIP C 47PF J | | C526 | | | CK73GB1C104K | CHIP C 0.10UF K | |
| C277-282 | | | CC73GCH1H470J | CHIP C 47PF J | | C527 | | | CK73GB1C683K | CHIP C 0.068UF K | |
| C283 | | | CC73GCH1H060D | CHIP C 6.0PF D | | C528 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C284 | | | CC73GCH1H1R5C | CHIP C 1.5PF C | | C529 | | | CK73GB1H562J | CHIP C 5600PF J | |
| C285 | | | CC73GCH1H060D | CHIP C 6.0PF D | | C531 | | | CK73GB1H562J | CHIP C 5600PF J | |
| C286 | | | CC73GCH1H470J | CHIP C 47PF J | | C533 | | | CK73GB1H562J | CHIP C 5600PF J | |
| C288 | | | CC73GCH1H270J | CHIP C 27PF J | | C535 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C289 | | | CC73GCH1H101J | CHIP C 100PF J | | C536 | | | CC73GCH1H030C | CHIP C 3.0PF C | |
| C290 | | | CC73GCH1H270J | CHIP C 27PF J | | C537 | | | CK73GB1H272K | CHIP C 2700PF K | |
| C292-296 | | | CC73GCH1H820J | CHIP C 82PF J | | C539 | | | CK73GB1H272K | CHIP C 2700PF K | |
| C297 | | | CC73GCH1H220J | CHIP C 22PF J | | C540 | | | CC73GCH1H391J | CHIP C 390PF J | |
| C298 | | | CC73GCH1H100D | CHIP C 10PF D | | C541 | | | CC73GCH1H100D | CHIP C 10PF D | |
| C299 | | | CC73GCH1H220J | CHIP C 22PF J | | C542 | | | CC73GCH1H391J | CHIP C 390PF J | |
| C303 | | | C92-0565-05 | CHIP-TAN 6.8UF 10WV | | C543 | | | CK73GB1H272K | CHIP C 2700PF K | |
| C304-306 | | | CK73GB1H102K | CHIP C 1000PF K | | C544 | | | CC73GCH1H030C | CHIP C 3.0PF C | |
| C307 | | | CC73GCH1H130J | CHIP C 13PF J | | C545 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C309 | | | CC73GCH1H270J | CHIP C 27PF J | | C546 | | | CK73GB1H122K | CHIP C 1200PF K | |
| C311 | | | CC73GCH1H130J | CHIP C 13PF J | | C547 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C312 | | | CC73GCH1H180J | CHIP C 18PF J | | C548 | | | C92-0560-05 | CHIP-TAN 10UF 6.3WV | |
| C313 | | | CK73GB1H103K | CHIP C 0.010UF K | | C549 | | | CK73GB1C104K | CHIP C 0.10UF K | |
| C314 | | | C92-0511-05 | CHIP-TAN 0.15UF 35WV | | C550 | | | CC73GCH1H101J | CHIP C 100PF J | |
| C315 | | | CK73GB1C104K | CHIP C 0.10UF K | | C552 | | | CK73GB1C333K | CHIP C 0.033UF K | |
| C316 | | | CK73GB1A224K | CHIP C 0.22UF K | | C553 | | | CK73GB1H472K | CHIP C 4700PF K | |
| C317 | | | CK73GB1H102K | CHIP C 1000PF K | | C554-558 | | | CK73GB1C104K | CHIP C 0.10UF K | |
| C318,319 | | | CK73GB1C104K | CHIP C 0.10UF K | | C559 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C320 | | | C92-0514-05 | CHIP-TAN 2.2UF 10WV | | C560 | | | C92-0507-05 | CHIP-TAN 4.7UF 6.3WV | |
| C321 | | | CC73GCH1H060D | CHIP C 6.0PF D | | C561 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C322 | | | C92-0514-05 | CHIP-TAN 2.2UF 10WV | | C562,563 | | | CK73GB1H472K | CHIP C 4700PF K | |
| C324 | | | CK73FB1E104K | CHIP C 0.10UF K | | C564 | | | CK73GB1E223K | CHIP C 0.022UF K | |
| C325 | | | C92-0002-05 | CHIP-TAN 0.22UF 35WV | | C565 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C326 | | | CK73FF1C105Z | CHIP C 1.0UF Z | | C566 | | | CC73GCH1H101J | CHIP C 100PF J | |
| C327 | | | CK73FB1E104K | CHIP C 0.10UF K | | C567 | | | CK73GB1C273K | CHIP C 0.027UF K | |
| C401 | | | CK73GB1H102K | CHIP C 1000PF K | | C568 | | | C92-0507-05 | CHIP-TAN 4.7UF 6.3WV | |
| C402 | | | C92-0628-05 | CHIP-TAN 10UF 10WV | | C569 | | | CC73GCH1H470J | CHIP C 47PF J | |
| C406 | | | CC73FCH1H102J | CHIP C 1000PF J | | C570 | | | CK73GB1C104K | CHIP C 0.10UF K | |
| C407 | | | CC73FCH1H221J | CHIP C 220PF J | | C571 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C408 | | | C92-0628-05 | CHIP-TAN 10UF 10WV | | C572 | | | CK73FB1H563K | CHIP C 0.056UF K | |
| C430 | | | CE04EW1A101M | ELECTRO 100UF 10WV | E3 | C574 | | | CK73GB1C104K | CHIP C 0.10UF K | |
| C431 | | | CC73GCH1H020C | CHIP C 2.0PF C | E3 | C575 | | | CK73FB1C334K | CHIP C 0.33UF K | |
| C501 | | | CK73GB1H471K | CHIP C 470PF K | | C576 | | | CK73GB1C473K | CHIP C 0.047UF K | |
| C502 | | | CC73GCH1H221J | CHIP C 220PF J | | C577 | | | CK73GB1C104K | CHIP C 0.10UF K | |
| C503,504 | | | CK73GB1H471K | CHIP C 470PF K | | C578 | | | CK73GB1H103K | CHIP C 0.010UF K | |
| C505 | | | CK73GB1C683K | CHIP C 0.068UF K | | C579 | | | CK73GB1H472K | CHIP C 4700PF K | |
| C506 | | | CK73GB1E123K | CHIP C 0.012UF K | | C580 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C508 | | | CK73GB1C104K | CHIP C 0.10UF K | | C581,582 | | | CK73GB1H103K | CHIP C 0.010UF K | |
| C509 | | | CK73GB1H222K | CHIP C 2200PF K | | C583 | | | CK73GB1H102K | CHIP C 1000PF K | |
| C510 | | | C92-0507-05 | CHIP-TAN 4.7UF 6.3WV | | C584 | | | CK73GB1H471K | CHIP C 470PF K | |
| C511 | | | CK73GB1H103K | CHIP C 0.010UF K | | C592 | | | CK73GB1H102K | CHIP C 1000PF K | |

PARTS LIST

TX-RX UNIT (X57-6142-XX)

| Ref. No. | Address | New parts | Parts No. | Description | Desti-nation | Ref. No. | Address | New parts | Parts No. | Description | Desti-nation |
|----------|---------|-----------|---------------|-----------------------------|--------------|----------|---------|-----------|--------------|---------------------------------|--------------|
| C593 | | | CK73GB1H103K | CHIP C 0.010UF K | | L2 | | | L92-0138-05 | FERRITE CHIP | |
| C594,595 | | | CC73GCH1H270J | CHIP C 27PF J | | L3 | | | L40-4775-44 | SMALL FIXED INDUCTOR (47.0NH) | |
| C596 | | | CC73GCH1H680J | CHIP C 68PF J | | L4 | | | L40-8272-37 | SMALL FIXED INDUCTOR (0.082UH) | |
| C597 | | | CK73GB1H103K | CHIP C 0.010UF K | | L5 | | | L40-1092-34 | SMALL FIXED INDUCTOR | |
| C598,599 | | | CC73GCH1H101J | CHIP C 100PF J | | L6 | | | L34-4459-05 | COIL | |
| C600,601 | | | CK73GB1H102K | CHIP C 1000PF K | | L7 | | | L40-8275-92 | SMALL FIXED INDUCTOR (82NH) | |
| C602 | | | CK73GB1H103K | CHIP C 0.010UF K | | L14 | | | L92-0191-05 | FERRITE CHIP | |
| C603 | | | CK73GB1C104K | CHIP C 0.10UF K | | L202-204 | | | L34-4641-05 | COIL | |
| C604 | | | C92-0560-05 | CHIP-TAN 10UF 6.3WV | | L207-209 | | | L39-1272-05 | TOROIDAL COIL | |
| C605 | | | CK73GB1H102K | CHIP C 1000PF K | | L211,212 | | | L40-6871-34 | SMALL FIXED INDUCTOR (68NH) | |
| C606 | | | CK73GB1H122K | CHIP C 1200PF K | | L213 | | | L34-4478-05 | AIR-CORE COIL | |
| C607 | | | CK73GB1H103K | CHIP C 0.010UF K | | L214 | | | L34-4480-05 | AIR-CORE COIL | |
| C608 | | | CK73GB1H392K | CHIP C 3900PF K | | L215 | | | L34-0742-05 | AIR-CORE COIL | |
| C609,610 | | | CK73GB1H103K | CHIP C 0.010UF K | | L216 | | | L34-4482-05 | AIR-CORE COIL | |
| C613 | | | C92-0606-05 | CHIP-TAN 4.7UF 10WV | | L217,218 | | | L34-0742-05 | AIR-CORE COIL | |
| C614 | | | CK73GB1H102K | CHIP C 1000PF K | | L219 | | | L40-3978-67 | SMALL FIXED INDUCTOR (39NH) | |
| C616 | | | CK73GB1H102K | CHIP C 1000PF K | | L220 | | | L40-2288-67 | SMALL FIXED INDUCTOR (220NH) | |
| C617 | | | CC73GCH1H101J | CHIP C 100PF J | | L221 | | | L40-2778-67 | SMALL FIXED INDUCTOR (27NH) | |
| C620 | | | CC73GCH1H101J | CHIP C 100PF J | | L222 | | | L40-6878-67 | SMALL FIXED INDUCTOR (68NH) | |
| C622,623 | | | CK73GB1H102K | CHIP C 1000PF K | | L223 | | | L40-4778-67 | SMALL FIXED INDUCTOR (47NH) | |
| C624 | | | CC73GCH1H101J | CHIP C 100PF J | | L225 | | | L92-0193-05 | FERRITE CHIP | |
| C625 | | | CK73GB1H102K | CHIP C 1000PF K | | L226 | | | L92-0155-05 | FERRITE CHIP | |
| C626 | | | CC73GCH1H101J | CHIP C 100PF J | | L227 | | | L40-3378-67 | SMALL FIXED INDUCTOR (33NH) | |
| C627 | | | CK73GB1H102K | CHIP C 1000PF K | | L228 | | | L40-1575-54 | SMALL FIXED INDUCTOR (15NH) | |
| C628 | | | CC73GCH1H101J | CHIP C 100PF J | | L300,301 | | | L40-3371-36 | SMALL FIXED INDUCTOR (33NH) | |
| C630 | | | CK73GB1H102K | CHIP C 1000PF K | | L302 | | | L40-1005-34 | SMALL FIXED INDUCTOR (10UH) | |
| C631-634 | | | CC73GCH1H101J | CHIP C 100PF J | | L303 | | | L40-4775-34 | SMALL FIXED INDUCTOR (47NH) | |
| C710 | | | CK73GB1C104K | CHIP C 0.10UF K | | L501-508 | | | L92-0138-05 | FERRITE CHIP | |
| C711,712 | | | CK73GB1H222K | CHIP C 2200PF K | | X1 | | | L77-1864-05 | TCXO (16.8MHZ) | |
| C713 | | | CK73GB1H102K | CHIP C 1000PF K | | X2 | | | L77-1762-05 | CRYSTAL RESONATOR (44.395MHZ) | |
| C714 | | | CC73GCH1H331J | CHIP C 330PF J | | X501 | | | L77-1708-05 | CRYSTAL RESONATOR (3.579545MHZ) | |
| C715 | | | CK73GB1H102K | CHIP C 1000PF K | | X502 | | | L78-0462-05 | RESONATOR (9.8304M) | |
| C718 | | | C92-0606-05 | CHIP-TAN 4.7UF 10WV | | XF1 | | | L71-0572-05 | MCF (44.85MHZ) | |
| C720 | | | CC73GCH1H470J | CHIP C 47PF J | | CP501 | | | R90-0724-05 | MULTI-COMP 1K X4 | |
| C721-723 | | | CC73GCH1H221J | CHIP C 220PF J | | R1 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | |
| C724 | | | CK73GB1H822K | CHIP C 8200PF K | | R2 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| C726 | | | CK73GB1C104K | CHIP C 0.10UF K | | R3,4 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | |
| C728 | | | C92-0772-05 | CHIP-TAN 10UF 6.3WV | | R6,7 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| - | | | E37-0966-05 | PROCESSED LEAD WIRE | E3 | R8 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | |
| CN1 | | | E40-5737-05 | PIN ASSY | | R9 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| CN2 | | | E40-5738-05 | PIN ASSY | | R10,11 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | |
| CN3 | | | E40-3247-05 | PIN ASSY | | R12 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| CN4 | | | E40-5738-05 | PIN ASSY | | R14 | | | RK73GB1J473J | CHIP R 47K J 1/16W | |
| CN5 | | | E40-3247-05 | PIN ASSY | | R15 | | | RK73GB1J103J | CHIP R 10K J 1/16W | |
| CN6 | | | E40-3246-05 | PIN ASSY | | R16 | | | RK73GB1J104J | CHIP R 100K J 1/16W | |
| CN7 | | | E40-5982-05 | FLAT CABLE CONNECTOR | | R17,18 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| CN501 | | | E40-5823-05 | FLAT CABLE CONNECTOR | | R19 | | | RK73GB1J153J | CHIP R 15K J 1/16W | |
| CN502 | | | E40-5982-05 | FLAT CABLE CONNECTOR | | R20 | | | RK73GB1J104J | CHIP R 100K J 1/16W | |
| J1 | 2C | | E11-0442-05 | 3.5D PHONE JACK (3P) | | R21 | | | RK73GB1J563J | CHIP R 56K J 1/16W | |
| J501 | 1B | | E08-0877-05 | MODULAR JACK | | R22 | | | RK73GB1J104J | CHIP R 100K J 1/16W | |
| - | | | F20-3321-04 | INSULATING SHEET | E3 | R23 | | | RK73GB1J184J | CHIP R 180K J 1/16W | |
| - | | | J31-0543-05 | COLLAR (LH-5-1.5) | | R25 | | | RK73GB1J394J | CHIP R 390K J 1/16W | |
| - | | | | | | R26 | | | RK73GB1J104J | CHIP R 100K J 1/16W | |
| CF1 | | | L72-0372-05 | CERAMIC FILTER | | R27 | | | RK73GB1J473J | CHIP R 47K J 1/16W | |
| CF1 | | * | L72-0998-05 | CERAMIC FILTER | | R28 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| CF2 | | | L72-0376-05 | CERAMIC FILTER | | R29 | | | RK73GB1J220J | CHIP R 22 J 1/16W | |
| CF2 | | | L72-0986-05 | CERAMIC FILTER | | R30,31 | | | RK73GB1J104J | CHIP R 100K J 1/16W | |
| L1 | | | L40-1005-34 | SMALL FIXED INDUCTOR (10UH) | | R32 | | | RK73GB1J474J | CHIP R 470K J 1/16W | |
| | | | | | | R33 | | | RK73GB1J153J | CHIP R 15K J 1/16W | |

PARTS LIST

TX-RX UNIT (X57-6142-XX)

| Ref. No. | Address | New parts | Parts No. | Description | Destination | Ref. No. | Address | New parts | Parts No. | Description | Destination |
|----------|---------|-----------|--------------|----------------------|-------------|----------|---------|-----------|--------------|----------------------|-------------|
| R34 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R121 | | | RK73GB1J472J | CHIP R 4.7K J 1/16W | E3 |
| R35 | | | RK73GB1J223J | CHIP R 22K J 1/16W | | R122 | | | RK73GB1J392J | CHIP R 3.9K J 1/16W | |
| R36 | | | RK73GB1J103J | CHIP R 10K J 1/16W | | R123 | | | RK73GB1J153J | CHIP R 15K J 1/16W | |
| R37 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R124-126 | | | RK73GB1J223J | CHIP R 22K J 1/16W | |
| R39 | | | RK73GB1J101J | CHIP R 100 J 1/16W | | R127 | | | RK73FB2A152J | CHIP R 1.5K J 1/10W | E |
| R40 | | | RK73GB1J103J | CHIP R 10K J 1/16W | | R127 | | | RK73FB2A822J | CHIP R 8.2K J 1/10W | E3 |
| R41 | | | RK73GB1J122J | CHIP R 1.2K J 1/16W | | R128 | | | RK73GB1J223J | CHIP R 22K J 1/16W | |
| R42 | | | RK73GB1J104J | CHIP R 100K J 1/16W | | R129 | | | RK73GB1J220J | CHIP R 22 J 1/16W | |
| R44 | | | RK73GB1J473J | CHIP R 47K J 1/16W | | R130,131 | | | RK73GB1J223J | CHIP R 22K J 1/16W | |
| R45 | | | RK73GB1J104J | CHIP R 100K J 1/16W | | R132 | | | RK73GB1J104J | CHIP R 100K J 1/16W | |
| R46 | | | RK73GB1J103J | CHIP R 10K J 1/16W | E | R133 | | | RK73GB1J153J | CHIP R 15K J 1/16W | |
| R47 | | | RK73GB1J473J | CHIP R 47K J 1/16W | | R134 | | | RK73GB1J473J | CHIP R 47K J 1/16W | |
| R48 | | | RK73GB1J122J | CHIP R 1.2K J 1/16W | | R135 | | | R92-1261-05 | CHIP R 150 J 1/2W | |
| R49 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | | R137 | | | RK73GB1J473J | CHIP R 47K J 1/16W | |
| R50 | | | RK73GB1J103J | CHIP R 10K J 1/16W | | R138 | | | RK73FB2A100J | CHIP R 10 J 1/10W | |
| R52 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R139 | | | R92-0670-05 | CHIP R 0 OHM | |
| R55 | | | RK73GB1J153J | CHIP R 15K J 1/16W | | R140 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| R56 | | | RK73GB1J103J | CHIP R 10K J 1/16W | | R141 | | | RK73GB1J104J | CHIP R 100K J 1/16W | |
| R57 | | | RK73GB1J473J | CHIP R 47K J 1/16W | | R142 | | | R92-0699-05 | CHIP R 10 J 1/2W | |
| R58 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | | R143 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | |
| R59 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R144 | | | RK73GB1J223J | CHIP R 22K J 1/16W | |
| R60 | | | RK73GB1J472J | CHIP R 4.7K J 1/16W | | R145 | | | RK73GB1J104J | CHIP R 100K J 1/16W | |
| R61 | | | RK73GB1J223J | CHIP R 22K J 1/16W | | R146 | | | R92-1215-05 | CHIP R 470 J 1/2W | |
| R62 | | | RK73GB1J101J | CHIP R 100 J 1/16W | | R147 | | | RK73FB2A103J | CHIP R 10K J 1/10W | E3 |
| R63 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R147 | | | RK73FB2A563J | CHIP R 56K J 1/10W | E |
| R65 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R148 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | |
| R66 | | | RK73GB1J103J | CHIP R 10K J 1/16W | | R149 | | | RK73FB2A123J | CHIP R 12K J 1/10W | E3 |
| R67 | | | RK73GB1J101J | CHIP R 100 J 1/16W | | R149 | | | RK73FB2A183J | CHIP R 18K J 1/10W | E |
| R68 | | | RK73GB1J390J | CHIP R 39 J 1/16W | | R150 | | | R92-0670-05 | CHIP R 0 OHM | |
| R69 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | | R151-153 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| R70-73 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R154 | | | RK73GB1J103J | CHIP R 10K J 1/16W | |
| R74 | | | RK73GB1J473J | CHIP R 47K J 1/16W | | R155 | | | RK73GB1J333J | CHIP R 33K J 1/16W | |
| R75 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | | R156 | | | RK73GB1J471J | CHIP R 470 J 1/16W | |
| R76 | | | RK73GB1J153J | CHIP R 15K J 1/16W | | R157 | | | RK73GB1J101J | CHIP R 100 J 1/16W | |
| R77 | | | RK73GB1J333J | CHIP R 33K J 1/16W | | R158 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | |
| R78 | | | RK73GB1J561J | CHIP R 560 J 1/16W | | R161 | | | RK73GB1J474J | CHIP R 470K J 1/16W | |
| R80 | | | RK73GB1J473J | CHIP R 47K J 1/16W | | R162,163 | | | RK73FB2A103J | CHIP R 10K J 1/10W | |
| R85 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | E | R164 | | | RK73GB1J122J | CHIP R 1.2K J 1/16W | |
| R85 | | | RK73GB1J122J | CHIP R 1.2K J 1/16W | E3 | R165,166 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| R86 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R168 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| R89 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R169 | | | RK73GB1J474J | CHIP R 470K J 1/16W | |
| R90 | | | RK73GB1J2R2J | CHIP R 2.2 J 1/16W | | R170 | | | R92-0670-05 | CHIP R 0 OHM | |
| R91 | | | RK73GB1J472J | CHIP R 4.7K J 1/16W | | R171 | | | RK73GB1J3R3J | CHIP R 3.3 J 1/16W | |
| R94 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R172 | | | RK73GB1J561J | CHIP R 560 J 1/16W | |
| R96 | | | RK73GB1J181J | CHIP R 180 J 1/16W | | R173 | | | RK73GB1J181J | CHIP R 180 J 1/16W | |
| R97,98 | | | RK73GB1J473J | CHIP R 47K J 1/16W | | R174 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| R99 | | | RK73GB1J152J | CHIP R 1.5K J 1/16W | | R176 | | | R92-0670-05 | CHIP R 0 OHM | |
| R104 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R179 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| R106 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R201 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| R107 | | | RK73GB1J473J | CHIP R 47K J 1/16W | | R209 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| R109 | | | R92-0670-05 | CHIP R 0 OHM | | R211 | | | RK73GB1J472J | CHIP R 4.7K J 1/16W | |
| R110 | | | RK73GB1J470J | CHIP R 47 J 1/16W | | R212 | | | RK73GB1J272J | CHIP R 2.7K J 1/16W | |
| R111 | | | RK73GB1J331J | CHIP R 330 J 1/16W | | R213 | | | RK73GB1J150J | CHIP R 15 J 1/16W | |
| R112 | | | RK73GB1J473J | CHIP R 47K J 1/16W | | R214 | | | RK73GB1J272J | CHIP R 2.7K J 1/16W | |
| R113 | | | RK73GB1J472J | CHIP R 4.7K J 1/16W | | R215 | | | RK73GB1J104J | CHIP R 100K J 1/16W | |
| R114 | | | RK73GB1J392J | CHIP R 3.9K J 1/16W | | R217 | | | RK73GB1J470J | CHIP R 47 J 1/16W | |
| R116 | | | RK73GB1J473J | CHIP R 47K J 1/16W | | R218-220 | | | RK73GB1J104J | CHIP R 100K J 1/16W | |
| R119 | | | RK73GB1J103J | CHIP R 10K J 1/16W | | R221 | | | RK73GB1J274J | CHIP R 270K J 1/16W | |
| R120 | | | RK73GB1J332J | CHIP R 3.3K J 1/16W | E3 | R222 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| R120,121 | | | RK73GB1J472J | CHIP R 4.7K J 1/16W | E | R223 | | | RK73GB1J104J | CHIP R 100K J 1/16W | |

PARTS LIST

TX-RX UNIT (X57-6142-XX)

| Ref. No. | Address | New parts | Parts No. | Description | Desti-nation | Ref. No. | Address | New parts | Parts No. | Description | Desti-nation |
|----------|---------|-----------|--------------|----------------------|--------------|----------|---------|-----------|--------------|----------------------|--------------|
| R224 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R509 | | | RK73GB1J103J | CHIP R 10K J 1/16W | |
| R225 | | | RK73GB1J820J | CHIP R 82 J 1/16W | | R510 | | | RK73GB1J105J | CHIP R 1.0M J 1/16W | |
| R226 | | | RK73GB1J472J | CHIP R 4.7K J 1/16W | | R511 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | |
| R228 | | | RK73GB1J271J | CHIP R 270 J 1/16W | | R512 | | | RK73GB1J681J | CHIP R 680 J 1/16W | |
| R229 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | | R513 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| R230 | | | RK73GB1J180J | CHIP R 18 J 1/16W | | R514 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | |
| R231 | | | RK73GB1J271J | CHIP R 270 J 1/16W | | R515 | | | RN73GH1J913D | CHIP R 91K D 1/16W | |
| R232 | | | RK73GB1J222J | CHIP R 2.2K J 1/16W | | R516 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | |
| R233 | | | RK73GB1J103J | CHIP R 10K J 1/16W | | R517 | | | RK73GB1J103J | CHIP R 10K J 1/16W | |
| R234 | | | RK73GB1J100J | CHIP R 10 J 1/16W | | R518 | | | RN73GH1J333D | CHIP R 33K D 1/16W | |
| R235 | | | RK73GB1J222J | CHIP R 2.2K J 1/16W | | R519 | | | RN73GH1J913D | CHIP R 91K D 1/16W | |
| R236 | | | RK73GB1J560J | CHIP R 56 J 1/16W | | R520 | | | RN73GH1J683D | CHIP R 68K D 1/16W | |
| R237 | | | RK73GB1J470J | CHIP R 47 J 1/16W | | R521 | | | RK73GB1J105J | CHIP R 1.0M J 1/16W | |
| R238 | | | RK73GB1J152J | CHIP R 1.5K J 1/16W | | R522 | | | RN73GH1J913D | CHIP R 91K D 1/16W | |
| R239 | | | RK73FB2A100J | CHIP R 10 J 1/10W | | R523 | | | RK73GB1J154J | CHIP R 150K J 1/16W | |
| R240 | | | R92-0685-05 | CHIP R 22 J 1/2W | | R524 | | | RN73GH1J274D | CHIP R 270K D 1/16W | |
| R241 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | R525 | | | RK73GB1J823J | CHIP R 82K J 1/16W | |
| R246 | | | RK73GB1J182J | CHIP R 1.8K J 1/16W | | R526 | | | RK73GB1J104J | CHIP R 100K J 1/16W | |
| R247 | | | RK73GB1J2R7J | CHIP R 2.7 J 1/16W | | R527 | | | RK73GB1J103J | CHIP R 10K J 1/16W | |
| R248 | | | RK73GB1J182J | CHIP R 1.8K J 1/16W | | R528 | | | RK73GB1J153J | CHIP R 15K J 1/16W | |
| R249 | | | RK73FB2A221J | CHIP R 220 J 1/10W | E3 | R529 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| R250 | | | RK73FB2A220J | CHIP R 22 J 1/10W | E3 | R530 | | | RK73GB1J394J | CHIP R 390K J 1/16W | |
| R250 | | | R92-0670-05 | CHIP R 0 OHM | E | R531 | | | RK73GB1J473J | CHIP R 47K J 1/16W | |
| R251 | | | RK73FB2A221J | CHIP R 220 J 1/10W | E3 | R532 | | | RK73GB1J394J | CHIP R 390K J 1/16W | |
| R300-303 | | | RK73GB1J470J | CHIP R 47 J 1/16W | | R533 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| R304 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R535 | | | RK73GB1J155J | CHIP R 1.5M J 1/16W | |
| R305 | | | RK73GB1J103J | CHIP R 10K J 1/16W | | R536 | | | RN73GH1J682D | CHIP R 6.8K D 1/16W | |
| R306 | | | RK73GB1J271J | CHIP R 270 J 1/16W | | R537,538 | | | RK73GB1J473J | CHIP R 47K J 1/16W | |
| R307 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R540 | | | RK73GB1J474J | CHIP R 470K J 1/16W | |
| R308 | | | RK73GB1J101J | CHIP R 100 J 1/16W | | R541 | | | RK73GB1J274J | CHIP R 270K J 1/16W | |
| R309 | | | RK73GB1J333J | CHIP R 33K J 1/16W | | R542 | | | RN73GH1J683D | CHIP R 68K D 1/16W | |
| R310 | | | RK73GB1J103J | CHIP R 10K J 1/16W | | R544 | | | RK73GB1J101J | CHIP R 100 J 1/16W | |
| R311 | | | RK73GB1J271J | CHIP R 270 J 1/16W | | R545 | | | RK73GB1J182J | CHIP R 1.8K J 1/16W | |
| R312 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | | R546 | | | RK73GB1J224J | CHIP R 220K J 1/16W | |
| R313 | | | RK73GB1J153J | CHIP R 15K J 1/16W | | R547 | | | RK73GB1J103J | CHIP R 10K J 1/16W | |
| R314 | | | RK73GB1J273J | CHIP R 27K J 1/16W | | R548 | | | RK73GB1J183J | CHIP R 18K J 1/16W | |
| R315 | | | RK73GB1J103J | CHIP R 10K J 1/16W | | R550 | | | RN73GH1J682D | CHIP R 6.8K D 1/16W | |
| R316 | | | RK73GB1J101J | CHIP R 100 J 1/16W | | R551 | | | RK73GB1J223J | CHIP R 22K J 1/16W | |
| R317 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R552 | | | RK73GB1J334J | CHIP R 330K J 1/16W | |
| R318 | | | RK73GB1J471J | CHIP R 470 J 1/16W | | R553 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | |
| R319 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | | R554 | | | RK73GB1J332J | CHIP R 3.3K J 1/16W | |
| R320 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R555 | | | RK73GB1J394J | CHIP R 390K J 1/16W | |
| R401 | | | RK73GB1J103J | CHIP R 10K J 1/16W | | R556 | | | RK73GB1J223J | CHIP R 22K J 1/16W | |
| R402 | | | RK73GB1J153J | CHIP R 15K J 1/16W | E3 | R558 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| R402 | | | RK73GB1J822J | CHIP R 8.2K J 1/16W | E | R562 | | | RK73GB1J273J | CHIP R 27K J 1/16W | |
| R403 | | | RK73GB1J122J | CHIP R 1.2K J 1/16W | | R564 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| R404 | | | RK73GB1J473J | CHIP R 47K J 1/16W | | R566 | | | RK73GB1J470J | CHIP R 47 J 1/16W | |
| R405 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R567 | | | RK73GB1J220J | CHIP R 22 J 1/16W | |
| R406 | | | RK73GB1J124J | CHIP R 120K J 1/16W | | R568 | | | RK73GB1J473J | CHIP R 47K J 1/16W | |
| R408 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R569 | | | RK73GB1J333J | CHIP R 33K J 1/16W | |
| R411 | | | RK73GB1J472J | CHIP R 4.7K J 1/16W | | R571,572 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| R413 | | | RK73GB1J473J | CHIP R 47K J 1/16W | | R573 | | | RK73GB1J104J | CHIP R 100K J 1/16W | |
| R414 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R574 | | | RK73GB1J473J | CHIP R 47K J 1/16W | |
| R501 | | | RK73GB1J472J | CHIP R 4.7K J 1/16W | | R575 | | | RK73GB1J103J | CHIP R 10K J 1/16W | |
| R502 | | | RK73GB1J184J | CHIP R 180K J 1/16W | | R576 | | | RK73GB1J473J | CHIP R 47K J 1/16W | |
| R503 | | | RK73GB1J223J | CHIP R 22K J 1/16W | | R577 | | | RK73GB1J153J | CHIP R 15K J 1/16W | |
| R504 | | | RK73GB1J184J | CHIP R 180K J 1/16W | | R579 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| R505 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | | R580 | | | RK73GB1J103J | CHIP R 10K J 1/16W | |
| R506 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R581 | | | RK73GB1J472J | CHIP R 4.7K J 1/16W | |
| R507,508 | | | RK73GB1J154J | CHIP R 150K J 1/16W | | R582 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |

PARTS LIST

TX-RX UNIT (X57-6142-XX)

| Ref. No. | Address | New parts | Parts No. | Description | Destination | Ref. No. | Address | New parts | Parts No. | Description | Destination |
|----------|---------|-----------|--------------|----------------------|-------------|----------|---------|-----------|----------------|------------------------------|-------------|
| R584 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R712,713 | | | RK73GB1J473J | CHIP R 47K J 1/16W | |
| R585,586 | | | RK73GB1J473J | CHIP R 47K J 1/16W | | R714 | | | RK73GB1J103J | CHIP R 10K J 1/16W | |
| R587 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R716 | | | RK73GB1J472J | CHIP R 4.7K J 1/16W | |
| R588 | | | RK73GB1J473J | CHIP R 47K J 1/16W | | R718 | | | RK73GB1J154J | CHIP R 150K J 1/16W | |
| R589 | | | R92-1368-05 | CHIP R 0 OHM | | R719 | | | RK73GB1J103J | CHIP R 10K J 1/16W | |
| R590-600 | | | RK73HB1J102J | CHIP R 1.0K J 1/16W | | R720 | | | RK73GB1J683J | CHIP R 68K J 1/16W | |
| R601-603 | | | R92-1368-05 | CHIP R 0 OHM | | R721 | | | RK73GB1J334J | CHIP R 330K J 1/16W | |
| R608-610 | | | RK73HB1J102J | CHIP R 1.0K J 1/16W | | R722 | | | RK73FB2A680J | CHIP R 68 J 1/10W | |
| R611 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R723 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| R612 | | | RK73GB1J224J | CHIP R 220K J 1/16W | | R724 | | | RK73GB1J392J | CHIP R 3.9K J 1/16W | |
| R613 | | | RK73HB1J102J | CHIP R 1.0K J 1/16W | | R725 | | | RK73GB1J562J | CHIP R 5.6K J 1/16W | |
| R614 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | R726 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| R615 | | | RK73HB1J102J | CHIP R 1.0K J 1/16W | | R727 | | | RK73GB1J472J | CHIP R 4.7K J 1/16W | |
| R616 | | | RK73GB1J473J | CHIP R 47K J 1/16W | | R730 | | | RK73GB1J472J | CHIP R 4.7K J 1/16W | |
| R617,618 | | | RK73HB1J102J | CHIP R 1.0K J 1/16W | | VR1 | | | R32-0658-05 | SEMI FIXED VARIABLE RESISTOR | |
| R619 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | D1-6 | | | DA204U | DIODE | |
| R620 | | | RK73HB1J102J | CHIP R 1.0K J 1/16W | | D1-6 | | | HSB123 | DIODE | |
| R621 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | D7 | | | 02DZ20(Y,Z) | ZENER DIODE | |
| R622,623 | | | RK73HB1J102J | CHIP R 1.0K J 1/16W | | D8,9 | | | DA204U | DIODE | |
| R624 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | | D8,9 | | | HSB123 | DIODE | |
| R625-627 | | | RK73HB1J102J | CHIP R 1.0K J 1/16W | | D11 | | | DAN202U | DIODE | |
| R628,629 | | | R92-1368-05 | CHIP R 0 OHM | | D12-14 | | | DA204U | DIODE | |
| R630 | | | RK73HB1J102J | CHIP R 1.0K J 1/16W | | D12-14 | | | HSB123 | DIODE | |
| R631 | | | R92-1368-05 | CHIP R 0 OHM | | D15 | | | DAN235E | DIODE | |
| R632 | | | RK73HB1J102J | CHIP R 1.0K J 1/16W | | D16 | | | 1SS355 | DIODE | |
| R633 | | | R92-1368-05 | CHIP R 0 OHM | | D17 | | | DA204U | DIODE | |
| R634 | | | RK73HB1J102J | CHIP R 1.0K J 1/16W | | D17 | | | HSB123 | DIODE | |
| R635 | | | R92-1368-05 | CHIP R 0 OHM | | D20 | | | 1SS355 | DIODE | |
| R636,637 | | | RK73HB1J102J | CHIP R 1.0K J 1/16W | | D21 | | | 02DZ5.6(X,Y) | ZENER DIODE | |
| R638 | | | R92-1368-05 | CHIP R 0 OHM | | D22,23 | | | DAN235E | DIODE | |
| R639 | | | RK73HB1J102J | CHIP R 1.0K J 1/16W | | D24 | | | MINISMDC075-02 | VARISTOR | |
| R640 | | | R92-1368-05 | CHIP R 0 OHM | | D26 | | | 1SS355 | DIODE | |
| R641 | | | RK73HB1J102J | CHIP R 1.0K J 1/16W | | D27 | | | HSM88AS | DIODE | |
| R642 | | | R92-1368-05 | CHIP R 0 OHM | | D28 | | | 02DZ15(X,Y) | ZENER DIODE | |
| R643 | | | RK73HB1J102J | CHIP R 1.0K J 1/16W | | D30 | | | HSM88AS | DIODE | |
| R644 | | | R92-1368-05 | CHIP R 0 OHM | | D31 | | | 1SS355 | DIODE | |
| R645 | | | RK73GB1J472J | CHIP R 4.7K J 1/16W | | D32 | | | 22ZR-10D | SURGE ABSORBER | |
| R646,647 | | | RK73HB1J102J | CHIP R 1.0K J 1/16W | | D34 | | | 02DZ18(X,Y) | ZENER DIODE | |
| R649 | | | RK73HB1J102J | CHIP R 1.0K J 1/16W | | D35 | | | MA742 | DIODE | |
| R650-652 | | | R92-1368-05 | CHIP R 0 OHM | | D37 | | | DSA3A1 | DIODE | |
| R653,654 | | | RK73HB1J102J | CHIP R 1.0K J 1/16W | | D206-208 | | | 1SV282 | VARIABLE CAPACITANCE DIODE | |
| R655-657 | | | R92-1368-05 | CHIP R 0 OHM | | D209,210 | | | HSB123 | DIODE | |
| R658 | | | RK73HB1J472J | CHIP R 4.7K J 1/16W | | D211 | | | MA4PH633 | DIODE | |
| R659-666 | | | R92-1368-05 | CHIP R 0 OHM | | D212,213 | | | XB15A709 | DIODE | |
| R667,668 | | | RK73GB1J181J | CHIP R 180 J 1/16W | | D501 | | | DA204U | DIODE | |
| R670 | | | RK73GB1J473J | CHIP R 47K J 1/16W | | D501 | | | HSB123 | DIODE | |
| R672,673 | | | RK73GB1J473J | CHIP R 47K J 1/16W | | D502 | | | MINISMDC075-02 | VARISTOR | |
| R674 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | D503-505 | | | DA204U | DIODE | |
| R675 | | | RK73GB1J473J | CHIP R 47K J 1/16W | | D503-505 | | | HSB123 | DIODE | |
| R676 | | | RK73GB1J103J | CHIP R 10K J 1/16W | | D507 | | | DAN202U | DIODE | |
| R677 | | | RK73GB1J223J | CHIP R 22K J 1/16W | | D508,509 | | | MA742 | DIODE | |
| R678 | | | RK73GB1J103J | CHIP R 10K J 1/16W | | D510 | | | HSC119 | DIODE | |
| R679 | | | RK73FB2A390J | CHIP R 39 J 1/10W | | D518 | | | 02DZ9.1(X,Y) | ZENER DIODE | |
| R680 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | D520 | | | MA2S111 | DIODE | |
| R682 | | | RK73GB1J473J | CHIP R 47K J 1/16W | | IC1 | | | TA75W01FU | MOS IC | |
| R683 | | | RK73GB1J103J | CHIP R 10K J 1/16W | | IC2,3 | | | TA75W558FU | MOS IC | |
| R701 | | | RK73GB1J102J | CHIP R 1.0K J 1/16W | | IC4 | | | TC4S66F | MOS IC | |
| R702 | | | RK73GB1J101J | CHIP R 100 J 1/16W | | IC5 | | | M62363FP | MOS IC | |
| R705,706 | | | RK73GB1J473J | CHIP R 47K J 1/16W | | IC6 | | | TA75W01FU | MOS IC | |
| R710,711 | | | RK73GB1J104J | CHIP R 100K J 1/16W | | IC7,8 | | | BU4094BCFV | MOS IC | |

PARTS LIST

TX-RX UNIT (X57-6142-XX)
PLL/VCO (X58-4712-70)

| Ref. No. | Address | New parts | Parts No. | Description | Destination | Ref. No. | Address | New parts | Parts No. | Description | Destination |
|-----------|---------|-----------|----------------|--------------------|-------------|------------------------------|---------|-----------|---------------|-----------------------------|--------------|
| IC9 | | | TA78L05F | MOS IC | | Q502 | | | DTC144EE | DIGITAL TRANSISTOR | |
| IC10 | | | LA4422 | BI-POLAR IC | | Q503 | | | 2SC4617(S) | TRANSISTOR | |
| IC11 | | | TA31136FN | MOS IC | | Q507 | | | DTC144EE | DIGITAL TRANSISTOR | |
| IC12 | | | TA78L05F | MOS IC | | Q508,509 | | | 2SC4617(S) | TRANSISTOR | |
| IC13 | | | AN8009M | MOS IC | | Q510 | | | 2SC4619 | TRANSISTOR | |
| IC14 | | | TA7808S | MOS IC | | Q511 | | | DTA144WE | DIGITAL TRANSISTOR | |
| IC15 | | | TC4013BF(N) | MOS IC | | Q512 | | | DTC114EE | DIGITAL TRANSISTOR | |
| IC201 | | | LMC7101BIM5 | MOS IC | | Q513 | | | 2SC2873(Y) | TRANSISTOR | |
| IC202 | | | GN2011(Q) | MOS IC | | Q515 | | | DTC114EE | DIGITAL TRANSISTOR | |
| IC300 | | | SA7025DK | MOS IC | | - | | | 212-0702-05 | INSULATING TUBE | E3 |
| IC400 | 1C | | M67741H-32 | HYBRID IC | | PLL/VCO (X58-4712-70) | | | | | |
| IC401 | | | NJM2904V | MOS IC | | C102,103 | | | CK73GB1H102K | CHIP C | 1000PF K |
| IC501 | | | TA75W558FU | MOS IC | | C104 | | | CC73GCH1H680J | CHIP C | 68PF J |
| IC502 | | | TC75W51FU | MOS IC | | C105 | | | CK73GB1H102K | CHIP C | 1000PF K |
| IC503 | | | TA75W558FU | MOS IC | | C107 | | | CC73GCH1H150J | CHIP C | 15PF J |
| IC504 | | | TC35453F | MOS IC | | C108 | | | CC73GCH1H470J | CHIP C | 47PF J |
| IC506 | | | BU4066BCFV | MOS IC | | C109 | | | CK73GB1C104K | CHIP C | 0.10UF K |
| IC507 | | | LC73872M | MOS IC | | C110 | | | CK73GB1H102K | CHIP C | 1000PF K |
| IC508 | | | BU4094BCFV | MOS IC | | C111 | | | CK73FB1C474K | CHIP C | 0.47UF K |
| IC509 | | | RH5VL42C | MOS IC | | C113 | | | CC73GCH1H100D | CHIP C | 10PF D |
| IC510 | | | AT29C020-90TI | ROM IC | | C114 | | | CK73GB1H471K | CHIP C | 470PF K |
| IC510 | | | W29C020C90 | SRAM IC | | C115 | | | CK73GB1H102K | CHIP C | 1000PF K |
| IC511 | | * | 30620M8A-2K9GP | MPU | | C117 | | | CC73GCH1H060B | CHIP C | 6.0PF B |
| IC512 | | | AT2416N10SI2.5 | ROM IC | | C119 | | | CK73GB1H102K | CHIP C | 1000PF K |
| IC513 | | | TA78L05F | MOS IC | | C120 | | | CC73GCH1HR75B | CHIP C | 0.75PF B |
| IC710,711 | | | TA75S01F | MOS IC | | C121 | | | CK73GB1H102K | CHIP C | 1000PF K |
| Q1 | | | 2SK1824 | FET | E3 | C122 | | | CC73GCH1H080B | CHIP C | 8.0PF B |
| Q2 | | | 2SC2412K(S) | TRANSISTOR | E | C125,126 | | | CC73GCH1H020B | CHIP C | 2.0PF B |
| Q2,3 | | | 2SC2412K(S) | TRANSISTOR | | C127 | | | CK73GB1H102K | CHIP C | 1000PF K |
| Q4 | | | DTD114EK | DIGITAL TRANSISTOR | | C129 | | | CK73GB1H102K | CHIP C | 1000PF K |
| Q5,6 | | | DTC114EE | DIGITAL TRANSISTOR | | C130,131 | | | CC73GCH1H060B | CHIP C | 6.0PF B |
| Q7 | | | 2SC4215(Y) | TRANSISTOR | | C132 | | | CC73GCH1H120J | CHIP C | 12PF J |
| Q8 | | | DTC363EU | DIGITAL TRANSISTOR | | C133,134 | | | CK73GB1H102K | CHIP C | 1000PF K |
| Q9 | | | DTA114YUA | DIGITAL TRANSISTOR | | C135,136 | | | CC73GCH1H020B | CHIP C | 2.0PF B |
| Q10 | | | DTC114EE | DIGITAL TRANSISTOR | | C138 | | | CC73GCH1H150J | CHIP C | 15PF J |
| Q11 | | | 2SA1362(Y) | TRANSISTOR | | C139 | | | CK73GB1H102K | CHIP C | 1000PF K |
| Q12 | | | 2SB1132(Q,R) | TRANSISTOR | | C142 | | | CK73GB1H102K | CHIP C | 1000PF K |
| Q13 | | | DTC114EE | DIGITAL TRANSISTOR | | TC101,102 | | | C05-0384-05 | CERAMIC TRIMMER CAP (10P) | |
| Q15 | | | 2SC2059K(P) | TRANSISTOR | | CN101 | | | E40-5699-05 | PIN ASSY | |
| Q16 | | | DTC144EE | DIGITAL TRANSISTOR | | - | | | F10-2279-04 | SHIELDING CASE | |
| Q17 | | | 2SC2412K(S) | TRANSISTOR | | L101-104 | | | L40-1005-34 | SMALL FIXED INDUCTOR (10UH) | |
| Q18 | | | 2SK1824 | FET | | L105 | | | L40-6878-67 | SMALL FIXED INDUCTOR (68NH) | |
| Q19 | | | 2SD2394 | TRANSISTOR | | L106 | | | L40-1005-34 | SMALL FIXED INDUCTOR (10UH) | |
| Q20 | | | 2SB1188(Q) | TRANSISTOR | | L107 | | | L40-3978-67 | SMALL FIXED INDUCTOR (39NH) | |
| Q21 | | | FMW1 | TRANSISTOR | | L109,110 | | | L40-1005-34 | SMALL FIXED INDUCTOR (10UH) | |
| Q22 | | | DTC114EE | DIGITAL TRANSISTOR | | L111 | | | L40-4778-67 | SMALL FIXED INDUCTOR (47NH) | |
| Q23 | | | DTA114EE | DIGITAL TRANSISTOR | | R101,102 | | | RK73GB1J470J | CHIP R | 47 J 1/16W |
| Q24 | | | DTC144EE | DIGITAL TRANSISTOR | | R103 | | | RK73GB1J102J | CHIP R | 1.0K J 1/16W |
| Q25,26 | | | DTA114EE | DIGITAL TRANSISTOR | | R104 | | | RK73GB1J154J | CHIP R | 150K J 1/16W |
| Q27 | | | 2SA1641(S,T) | TRANSISTOR | | R105 | | | RK73GB1J221J | CHIP R | 220 J 1/16W |
| Q28,29 | | | DTC114EE | DIGITAL TRANSISTOR | | R106 | | | RK73GB1J222J | CHIP R | 2.2K J 1/16W |
| Q30 | | | DTA114EE | DIGITAL TRANSISTOR | | R107-110 | | | RK73GB1J103J | CHIP R | 10K J 1/16W |
| Q31 | | | DTC114EE | DIGITAL TRANSISTOR | | R111 | | | RK73GB1J151J | CHIP R | 150 J 1/16W |
| Q32 | | | 2SK1824 | FET | | R113 | | | RK73GB1J221J | CHIP R | 220 J 1/16W |
| Q202,203 | | | 2SC3357 | TRANSISTOR | | | | | | | |
| Q204 | | | 2SC2954 | TRANSISTOR | | | | | | | |
| Q300 | | | 2SC4215(Y) | TRANSISTOR | | | | | | | |
| Q301,302 | | | 2SC3722K(S) | TRANSISTOR | | | | | | | |
| Q401-403 | | | DTC114EE | DIGITAL TRANSISTOR | | | | | | | |
| Q501 | | | DTC314TU | DIGITAL TRANSISTOR | | | | | | | |

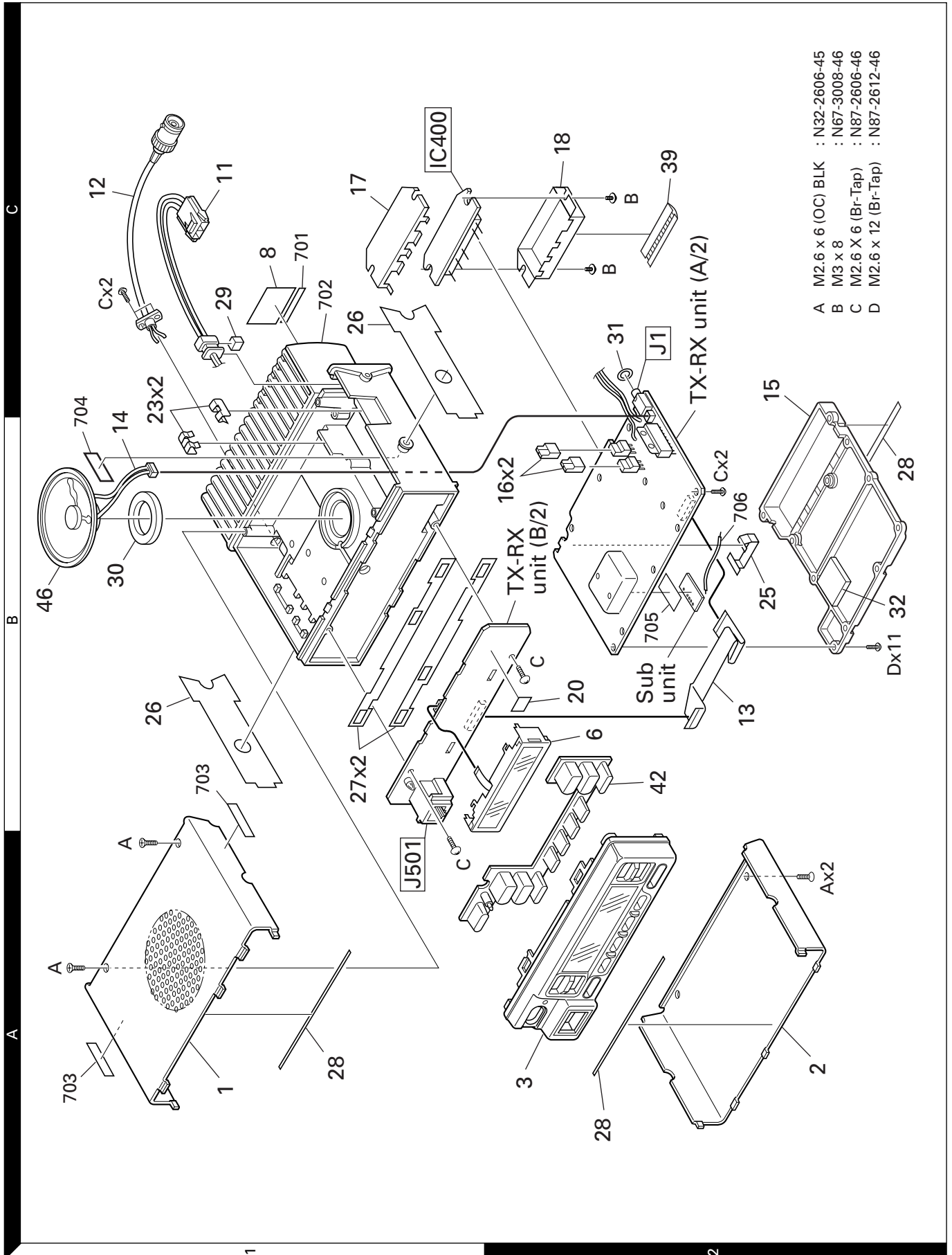
PARTS LIST

PLL/VCO (X58-4712-70)

SUB UNIT (X58-4850-10) : E3

| Ref. No. | Address | New parts | Parts No. | Description | Destination |
|------------------------------------|---------|-----------|---------------|----------------------------|-------------|
| R114 | | | RK73GB1J271J | CHIP R 270 J 1/16W | |
| R115,116 | | | RK73GB1J470J | CHIP R 47 J 1/16W | |
| R117 | | | RK73GB1J473J | CHIP R 47K J 1/16W | |
| R118 | | | RK73GB1J103J | CHIP R 10K J 1/16W | |
| R119 | | | RK73GB1J101J | CHIP R 100 J 1/16W | |
| R120 | | | RK73GB1J390J | CHIP R 39 J 1/16W | |
| R121,122 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | |
| D101,102 | | | 1SV283 | VARIABLE CAPACITANCE DIODE | |
| D104 | | | 1SV283 | VARIABLE CAPACITANCE DIODE | |
| D107 | | | 1SV283 | VARIABLE CAPACITANCE DIODE | |
| D109 | | | 1SV214 | VARIABLE CAPACITANCE DIODE | |
| Q101 | | | DTC114EUA | DIGITAL TRANSISTOR | |
| Q102 | | | 2SK508NV(K52) | FET | |
| Q103 | | | 2SK508NV(K53) | FET | |
| Q104,105 | | | 2SC4081 | TRANSISTOR | |
| Q106 | | | 2SC4215(Y) | TRANSISTOR | |
| SUB UNIT (X58-4850-10) : E3 | | | | | |
| C1 | | | CK73GB1C104K | CHIP C 0.10UF K | E3 |
| C2 | | | C92-0505-05 | CHIP-TAN 10UF 16WV | E3 |
| R1 | | | RK73GB1J103J | CHIP R 10K J 1/16W | E3 |
| R3 | | | R92-1252-05 | CHIP R 0 OHM J 1/16W | E3 |
| Q1 | | | 2SC2412K(S) | TRANSISTOR | E3 |

EXPLODED VIEW



Parts with the exploded numbers larger than 700 are not supplied.

ADJUSTMENT

Test Mode

■ Test Mode Operating Features

This transceiver has a test mode. **To enter test mode, press [B] key and turn power on. Hold [B] 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 ("SFT" appears)



| | |
|-------------------|----------------------------------|
| [PTT] | Used when making a transmission. |
| ■ | Shift off. |
| [A] | FFSK 1200 bps and 2400 bps. |
| [B] | Shift off. |
| [C] | Compander function on and off. |
| [D] | Beat shift on and off. |
| [CALL] | Shift off. |
| [Channel Up/Down] | Shift off. |
| [Volume Up/Down] | Shift off. |

• Controls ("SFT" not appears)

| | |
|-------------------|------------------------------------|
| [PTT] | Used when making a transmission. |
| ■ | Monitor on and off. |
| [A] | Sets to the tuning mode. |
| [B] | Shift on. |
| [C] | RF power high and low. |
| [D] | Changes signalling. |
| [CALL] | Changes wide, semi-wide and narrow |
| [Channel Up/Down] | Changes channel. |
| [Volume Up/Down] | Volume up/down. |

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

• LCD indicator

| | |
|---|--------------------------|
| "SCN" | Unused |
| "  | Lights at compander on. |
| "AUX" | Unused. |
| "P" | Lights at RF power low. |
| "MON" | Lights at monitor on. |
| "SVC" | Unused. |
| "  | Lights at FFSK 2400 bps. |

• 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,E3 | |
|-------------|-----------|-----------|
| | RX | TX |
| 1 | 160.05000 | 160.10000 |
| 2 | 146.05000 | 146.10000 |
| 3 | 173.95000 | 173.90000 |
| 4 | 160.00000 | 160.00000 |
| 5 | 160.20000 | 160.20000 |
| 6 | 160.40000 | 160.40000 |
| 7~16 | - | - |

• 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 9 |
| 11 | 2-tone (321.7/928.1Hz) | None |
| 12 | Single tone 1200Hz | Single tone 1200Hz |
| 13 | 5-tone DEC. (EIA #12345) | 5-tone ENC. (EIA #12345) |
| 14 | None | FFSK |
| 15 | FFSK code | FFSK code |

■ Preparations for Tuning the Transceiver

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

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

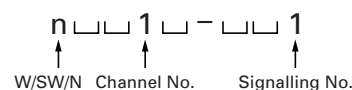
The speaker output connector must be terminated with a 4Ω dummy load and connected to an AC voltmeter and an audio distortion meter or a SINAD measurement meter at all times during tuning.

■ Transceiver Tuning

(To place transceiver in tuning mode)

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

LCD display (Test mode)



ADJUSTMENT

Press [A], now in tuning mode. Use [C] button to write tuning data through tuning modes, and [Channel Up/Down] to adjust tuning requirements (1 to 256 appears on LCD).

Use [D] button to select the adjustment item through tuning modes. Use [B] button to adjust 3 or 5-point tuning, and use [CALL] button to switch between wide/semi-wide/narrow.

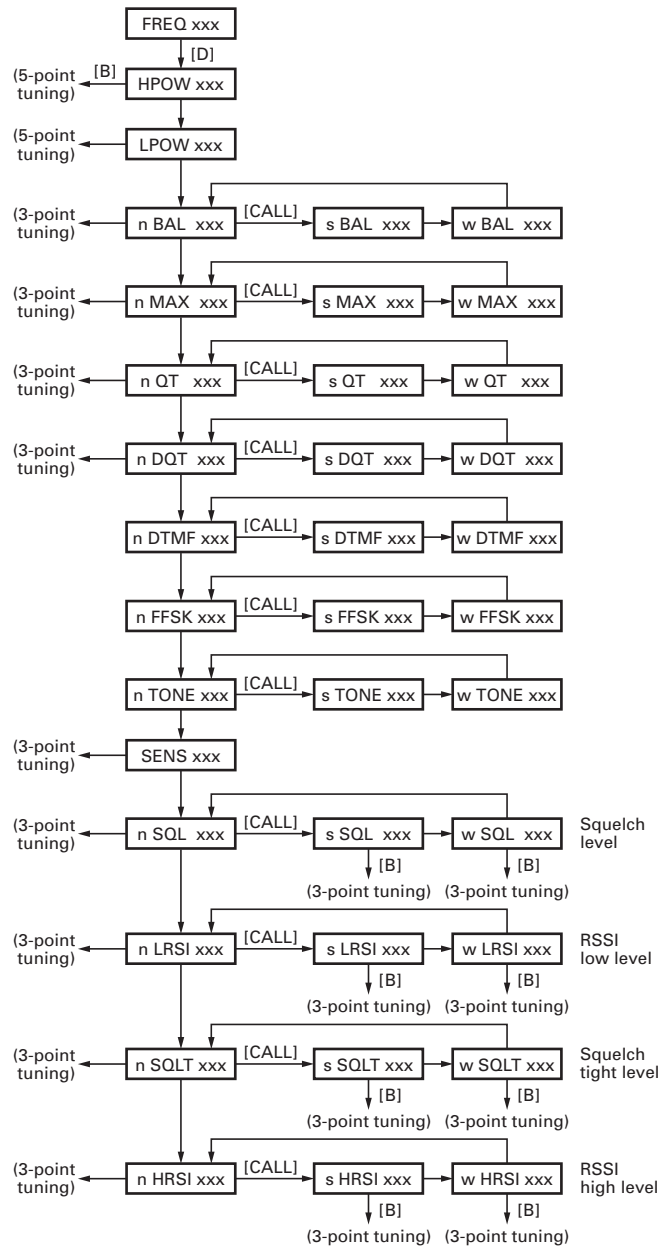
LCD display (Tuning mode)



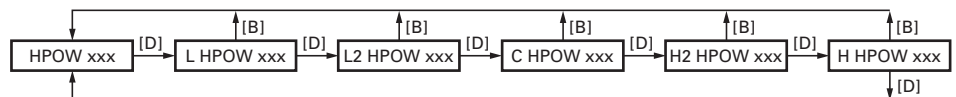
• Panel Tuning Mode (MHz)

| Test channel | RX frequency | TX frequency |
|--------------|--------------|--------------|
| L | 146.05000 | 146.10000 |
| L2 | 153.05000 | 153.10000 |
| C | 160.05000 | 160.10000 |
| H2 | 167.05000 | 167.10000 |
| H | 173.95000 | 173.90000 |

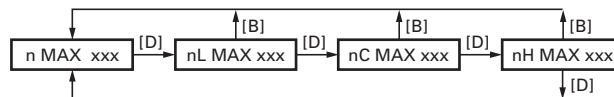
• Tuning flow



• 5-point tuning (ex. RF power high)



• 3-point tuning (ex. Maximum deviation (Narrow))



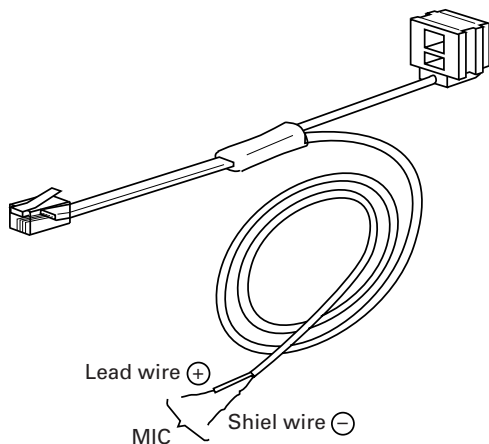
ADJUSTMENT

Test Equipment Required for Alignment

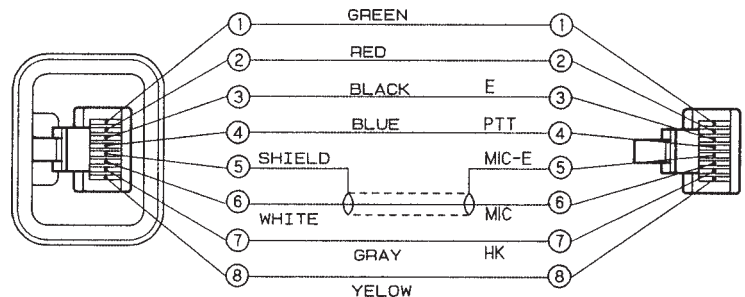
| Test Equipment | Major Specifications | |
|---------------------------------------|--|--|
| 1. Standard Signal Generator (SSG) | Frequency Range Modulation Output | 136 to 174MHz Frequency modulation and external modulation -127dBm/0.1μV to greater than -7dBm/100mV |
| 2. Power Meter | Input Impedance Operation Frequency Measurement Capability | 50Ω 136 to 174MHz or more Vicinity of 100W |
| 3. Deviation Meter | Frequency Range | 136 to 174MHz |
| 4. Digital Volt Meter (DVM) | Measuring Range Accuracy | 1 to 20V 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 | | 20A |
| 8. AF Volt Meter (AF VTVM) | Frequency Range Voltage Range | 50Hz to 10kHz 1mV to 10V |
| 9. Audio Generator (AG) | Frequency Range Output | 20Hz to 20kHz or more 0 to 1V |
| 10. Distortion Meter | Capability Input Level | 3% or less at 1kHz 50mV to 10Vrms |
| 11. 4Ω Dummy Load | | Approx. 4Ω, 10W or more |
| 12. Regulated Power Supply | | 13.2V, approx. 20A (adjustable from 9 to 20V) Useful if ammeter required |

Tuning cable (E30-3383-05)

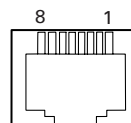
Adapter cable (E30-3383-05) is required for injecting an audio if PC tuning is used. See "PC Mode" section for the connection.



Test cable for microphone input (E30-3360-08)



MIC connector (Front view)

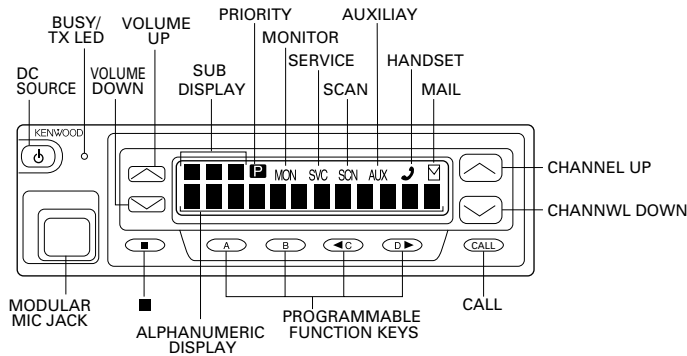


- 1 : BLC
- 2 : PSB
- 3 : E
- 4 : PTT
- 5 : ME
- 6 : MIC
- 7 : HOOK
- 8 : CM

ADJUSTMENT

Adjustment Location

■ Switch



■ Note

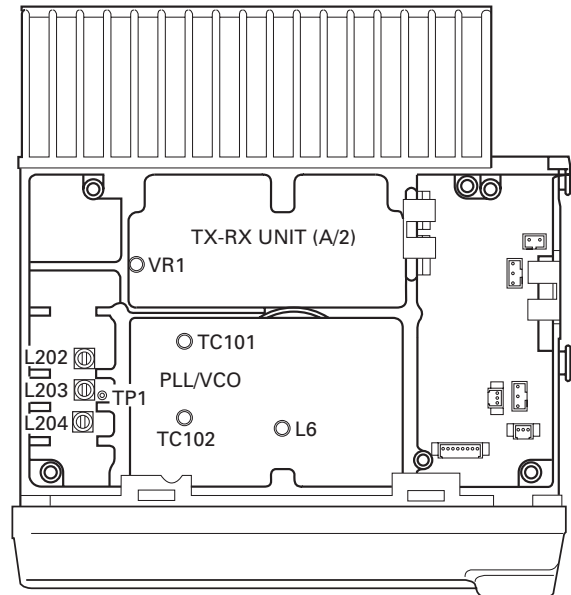
• Flash memory

The firmware program (User mode, Test mode, Tuning mode, etc.) and the data programmed by the FPU (KPG-60D) for the flash memory, is stored in memory. When parts are changed, program the data again.

• EEPROM

The tuning data (Deviation, Squelch, etc.) for the EEPROM, is stored in memory. When parts are changed, readjust the transceiver.

■ Adjustment Point



■ Repair Jig (Chassis)

Use jig (Part No. : A10-4010-02) for repairing the TK-780. The jig facilitates the voltage check when the voltage on the component side TX-RX unit (A/2) is checked during repairs.

Common Section

| Item | Condition | Measurement | | | Adjustment | | | Specifications/Remarks |
|---------------------|---|--------------------|----------------|----------|------------|-----------------|----------------|------------------------|
| | | Test-equipment | Unit | Terminal | Unit | Parts | Method | |
| 1. PLL lock voltage | 1) Set test mode CH : CH3 - Sig1 PTT : OFF (Receive) PTT : ON (Transmit) | DVM Power meter | TX-RX (A/2) | TP1 | PLL | TC101 | 1.5V (Receive) | ±0.1V |
| | TC102 | | | | | 1.5V (Transmit) | | |
| | 2) CH : CH2 - Sig1 PTT : OFF (Receive) PTT : ON (Transmit) | | | | | Check | 8.0V or less | |

ADJUSTMENT

Receiver Section


| Item | Condition | Measurement | | | Adjustment | | | Specifications/Remarks |
|------------------|---|--|------------|------------------------|----------------|-------|---|------------------------|
| | | Test-equipment | Unit | Terminal | Unit | Parts | Method | |
| 1. Discriminator | 1) Set test mode CH : CH1 - Sig1 SSG output : -53dBm AF : 1.4V/4Ω | SSG AF VTVM Oscilloscope | Rear panel | ANT ACC (EXT.SP) | TX-RX (A/2) | L6 | AF output voltage maximum. | |
| 2. Sensitivity | 1) Set test mode Select "SENS" in tuning mode. "L SENS" SSG freq' : 146.050MHz SSG output : -118dBm/0.31μV SSG MOD : 1.5kHz AF output : 1V/4Ω | SSG AF VTVM Distortion meter Oscilloscope AG | | ANT ACC (EXT.SP) | | | Adjust for maximum SINAD. | |
| | 2) "C SENS" SSG freq' : 160.050MHz | | | | | | Adjust for maximum SINAD. | |
| | 3) "H SENS" SSG freq' : 173.950MHz | | | | | | Adjust for maximum SINAD. | |
| 3. Squelch | 1) Set test mode Select "nL SQL" in tuning mode. SSG freq' : 146.050MHz SSG output : Sensitivity value of 12dB SINAD. SSG MOD : 1.5kHz (Narrow) | | | | | | Squelch must be closed once. Then adjust for squelch open point. | |
| | 2) "nC SQL" SSG freq' : 160.050MHz | | | | | | | |
| | 3) "nH SQL" SSG freq' : 173.950MHz | | | | | | | |
| | 4) "sL SQL", "sC SQL", "sH SQL" SSG freq' : Same as narrow adjustment. SSG output : Sensitivity value of 12dB SINAD. SSG MOD : 2.4kHz (Semi-wide) | | | | | | | |
| | 5) "wL SQL", "wC SQL", "wH SQL" SSG freq' : Same as narrow adjustment. SSG output : Sensitivity value of 12dB SINAD. SSG MOD : 3.0kHz (Wide) | | | | | | | |
| 4. RSSI (Low) | 1) Set test mode Select "nL LRSI" in tuning mode. SSG freq' : 146.050MHz SSG output : Sensitivity value of 12dB SINAD. SSG MOD : 1.5kHz (Narrow) | | | | | | Writing values only. | |
| | 2) "nC LRSI" SSG freq' : 160.050MHz | | | | | | | |
| | 3) "nH LRSI" SSG freq' : 173.950MHz | | | | | | | |
| | 4) "sL LRSI", "sC LRSI", "sH LRSI" SSG freq' : Same as narrow adjustment. SSG output : Sensitivity value of 12dB SINAD. SSG MOD : 2.4kHz (Semi-wide) | | | | | | | |
| | 5) "wL LRSI", "wC LRSI", "wH LRSI" SSG freq' : Same as narrow adjustment. SSG output : Sensitivity value of 12dB SINAD. SSG MOD : 3.0kHz (Wide) | | | | | | | |

ADJUSTMENT

| Item | Condition | Measurement | | | Adjustment | | | Specifications/Remarks |
|--------------------|---|-----------------------------|------------|--------------|------------|-------|---|------------------------|
| | | Test-equipment | Unit | Terminal | Unit | Parts | Method | |
| 5. Squelch (Tight) | 1) Set test mode Select "nL SQLT" in tuning mode. SSG freq' : 146.050MHz SSG output : -109dBm SSG MOD : 1.5kHz (Narrow) | SSG | Rear panel | ANT | | | Squelch must be closed once. Then adjust for squelch open point. | |
| | 2) "nC SQLT" SSG freq' : 160.050MHz | AF VTVM Distortion meter | | ACC (EXT.SP) | | | | |
| | 3) "nH SQLT" SSG freq' : 173.950MHz | Oscilloscope | | | | | | |
| | 4) "sL SQLT", "sC SQLT", "sH SQLT" SSG freq' : Same as narrow adjustment. SSG output : -109dBm SSG MOD : 2.4kHz (Semi-wide) | AG | | | | | | |
| | 5) "wL SQLT", "wC SQLT", "wH SQLT" SSG freq' : Same as narrow adjustment. SSG output : -109dBm SSG MOD : 3.0kHz (Wide) | | | | | | | |
| 6. RSSI (High) | 1) Set test mode Select "nL HRSI" in tuning mode. SSG freq' : 146.050MHz SSG output : -70dBm SSG MOD : 1.5kHz (Narrow) | | | | | | Writing values only. | |
| | 2) "nC HRSI" SSG freq' : 160.050MHz | | | | | | | |
| | 3) "nH HRSI" SSG freq' : 173.950MHz | | | | | | | |
| | 4) "sL HRSI", "sC HRSI", "sH HRSI" SSG freq' : -70dBm SSG output : Sensitivity value of 12dB SINAD. SSG MOD : 2.4kHz (Semi-wide) | | | | | | | |
| | 5) "wL HRSI", "wC HRSI", "wH HRSI" SSG freq' : -70dBm SSG output : Sensitivity value of 12dB SINAD. SSG MOD : 3.0kHz (Wide) | | | | | | | |
| 7. Squelch check | 1) Set test mode CH : CH1 - Sig1 SSG freq' : 160.050MHz SSG output : 15dB SINAD level | | | | | Check | Squelch must be opened. (Wide/Semi-wide/Narrow) | |
| | 2) SSG output : OFF | | | | | | Squelch must be closed. (Wide/Semi-wide/Narrow) | |
| 8. QT check | 1) Set test mode CH : CH1 - Sig5 SSG freq' : 160.050MHz SSG MOD INT : 1kHz EXT : 151.4Hz SSG system MOD DEV : ±3.75kHz SSG output : 12dB SINAD level | | | | | Check | Squelch must be opened. (Wide/Semi-wide/Narrow) | |
| | 2) CH : CH1 - Sig4 CH1 - Sig6 CH1 - Sig7 | | | | | | Squelch must be closed. | |

ADJUSTMENT

Transmitter Section

| Item | Condition | Measurement | | | Adjustment | | | Specifications/Remarks |
|-----------------------|--|--|-------------|----------|----------------|-------|---------------------------------------|--|
| | | Test-equipment | Unit | Terminal | Unit | Parts | Method | |
| 1. Frequency | 1) Set test mode Select "FREQ" in tuning mode. PTT : ON | Power meter F. counter | Rear panel | ANT | | | Check | 160.100MHz±100Hz |
| 2. Power output | 1) Maximum power Set test mode Select "HPOW" in tuning mode. "L HPOW 256" E "L HPOW 250" E3 PTT : ON | | | | TX-RX (A/2) | VR1 | 27.0W E 5.0W E3 | ±0.5W E ±0.2W E3 |
| 3. High power | 1) Set test mode Select "HPOW" in tuning mode. "L HPOW" PTT : ON | | | | | | 25.0W E 5.0W E3 | ±1.0W E ±0.2W E3 |
| | 2) "L2 HPOW" PTT : ON | | | | | | | |
| | 3) "C HPOW" PTT : ON | | | | | | | |
| | 4) "H2 HPOW" PTT : ON | | | | | | | |
| | 5) "H HPOW" PTT : ON | | | | | | | |
| 4. Low power | 1) Set test mode Select "LPOW" in tuning mode. "L LPOW" PTT : ON | Power meter | | | | | 6.0W E 1.0W E3 | ±0.5W E ±0.1W E3 |
| | 2) "L2 LPOW" PTT : ON | | | | | | | |
| | 3) "C LPOW" PTT : ON | | | | | | | |
| | 4) "H2 LPOW" PTT : ON | | | | | | | |
| | 5) "H LPOW" PTT : ON | | | | | | | |
| 5. Power check | 1) Set test mode CH : CH1 - Sig1 CH2 - Sig1 CH3 - Sig1 PTT : ON | Power meter | | ANT | | | Check | 25W±1W, 8A or less E 5W±0.2W, 5A or less E3 |
| | | Ammeter | | DC IN | | | | |
| 6. Modulation balance | 1) Set test mode MIC input : OFF Select "BAL" in tuning mode. "nL BAL" Deviation meter filter LPF : 15kHz HPF : OFF De-emphasis : OFF | Power meter Deviation meter Oscilloscope | Rear panel | ANT | | | Make the de-modulation waveform near. | (Wide/Semi-wide/Narrow)  |
| | 2) "nC BAL" PTT : ON | AF VTVM AG | Front panel | MIC | | | | |
| | 3) "nH BAL" PTT : ON | | | | | | | |
| | 4) "s BAL" PTT : ON | | | | | | | |
| | 5) "w BAL" PTT : ON | | | | | | | |

ADJUSTMENT

| Item | Condition | Measurement | | | Adjustment | | | Specifications/Remarks |
|--------------------------|--|--|-------------|----------|------------|-------|---|--|
| | | Test-equipment | Unit | Terminal | Unit | Parts | Method | |
| 7. Maximum deviation | 1) Set test mode Connect AG to the MIC terminal. Select "MAX" in tuning mode. "nL MAX" AG : 1kHz/40mV Deviation meter filter LPF : 15kHz HPF : OFF De-emphasis : OFF PTT : ON | Power meter Deviation meter Oscilloscope | Rear panel | ANT | | | 4.1kHz (Wide) 3.3kHz (Semi-wide) 2.05kHz (Narrow) (According to the larger +, -) | +0Hz/-50Hz (Wide/Semi-wide/Narrow) |
| | 2) "nC MAX" PTT : ON | AF VTVM | Front panel | MIC | | | | |
| | 3) "nH MAX" PTT : ON | | | | | | | |
| | 4) "s MAX" PTT : ON | | | | | | | |
| | 5) "w MAX" PTT : ON | | | | | | | |
| 8. MIC sensitivity check | 1) Set test mode CH : CH1 - Sig1 AG : 1kHz/4mV PTT : ON | | | | | | Check | $\pm 3\text{kHz} \pm 0.2\text{kHz}$ (Wide) $\pm 2.4\text{kHz} \pm 0.1\text{kHz}$ (Semi-wide) $\pm 1.5\text{kHz} \pm 0.05\text{kHz}$ (Narrow) |
| 9. QT deviation | 1) Set test mode Select "QT" in tuning mode. "nL QT" Deviation meter filter LPF : 3kHz HPF : OFF PTT : ON | | | | | | 0.75kHz (Wide) 0.60kHz (Semi-wide) 0.35kHz (Narrow) | $\pm 50\text{Hz}$ (Wide/Semi-wide/Narrow) |
| | 2) "nC QT" PTT : ON | | | | | | | |
| | 3) "nH QT" PTT : ON | | | | | | | |
| | 4) "s QT" PTT : ON | | | | | | | |
| | 5) "w QT" PTT : ON | | | | | | | |
| 10. DQT deviation | 1) Set test mode Select "DQT" in tuning mode. "nL DQT" Deviation meter filter LPF : 3kHz HPF : OFF PTT : ON | | | | | | 0.75kHz (Wide) 0.60kHz (Semi-wide) 0.35kHz (Narrow) | $\pm 50\text{Hz}$ (Wide/Semi-wide/Narrow) |
| | 2) "nC DQT" PTT : ON | | | | | | | |
| | 3) "nH DQT" PTT : ON | | | | | | | |
| | 4) "s DQT" PTT : ON | | | | | | | |
| | 5) "w DQT" PTT : ON | | | | | | | |

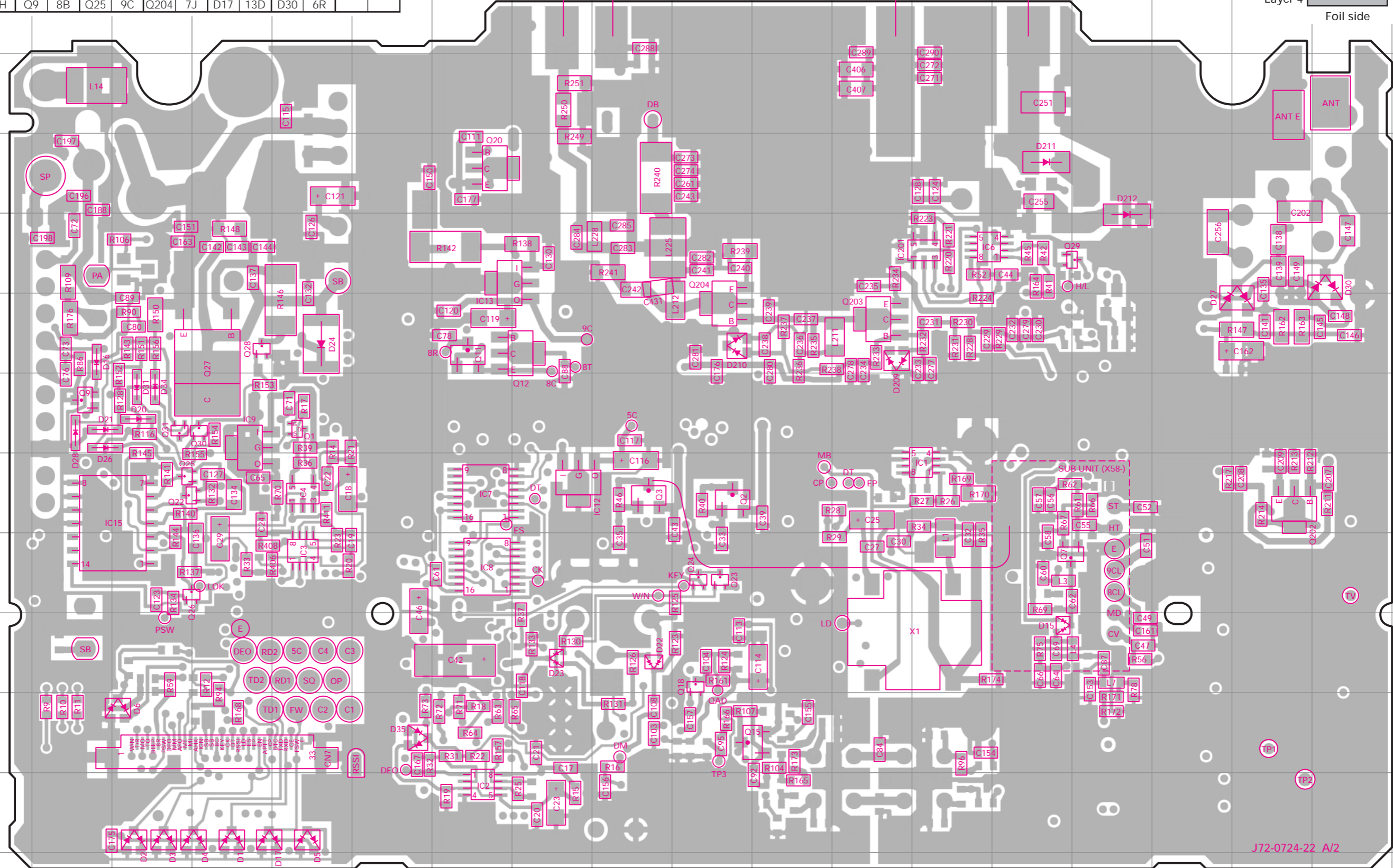
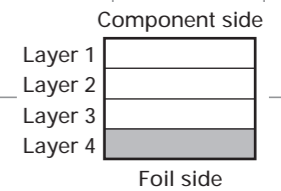
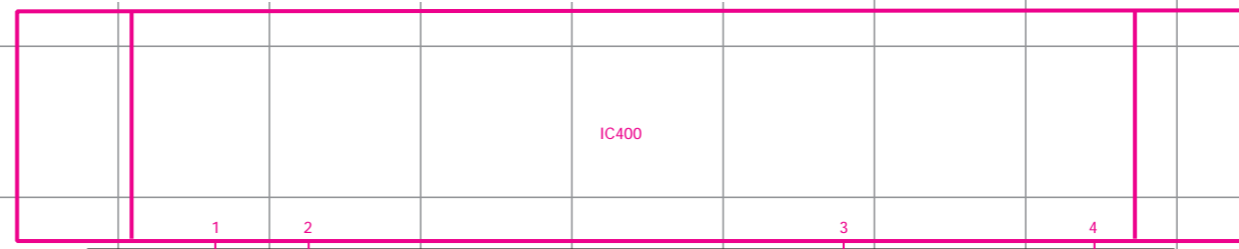
ADJUSTMENT

| Item | Condition | Measurement | | | Adjustment | | | Specifications/Remarks |
|--------------------|---|--|-------------|----------|------------|--|--|--|
| | | Test-equipment | Unit | Terminal | Unit | Parts | Method | |
| 11. DTMF deviation | 1) Set test mode Select "n DTMF" in tuning mode. Deviation meter filter LPF : 15kHz HPF : OFF PTT : ON | Power meter Deviation meter Oscilloscope | Rear panel | ANT | | | 3.0kHz (Wide) 2.4kHz (Semi-wide) 1.5kHz (Narrow) | ±0.2kHz (Wide/Semi-wide) ±0.1kHz (Narrow) |
| | 2) "s DTMF" PTT : ON | AF VTVM AG | Front panel | MIC | | | | |
| | 3) "w DTMF" PTT : ON | | | | | | | |
| 12. FFSK deviation | 1) Set test mode Select "n FFSK" in tuning mode. Deviation meter filter LPF : 15kHz HPF : OFF PTT : ON | | | | | | | |
| | 2) "s FFSK" PTT : ON | | | | | | | |
| | 3) "w FFSK" PTT : ON | | | | | | | |
| 13. TONE deviation | 1) Set test mode Select "n TONE" in tuning mode. Deviation meter filter LPF : 15kHz HPF : OFF PTT : ON | | | | | 3.0kHz (Wide) 2.4kHz (Semi-wide) 1.5kHz (Narrow) | ±0.1kHz (Wide/Semi-wide/Narrow) | |
| | 2) "s TONE" PTT : ON | | | | | | | |
| | 3) "w TONE" PTT : ON | | | | | | | |

| Ref. No. | Address | Ref. No. | Address | Ref. No. | Address | Ref. No. | Address | Ref. No. | Address | Ref. No. | Address | Ref. No. | Address |
|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|
| IC1 | 9M | IC13 | 6G | Q11 | 7G | Q26 | 10C | D1 | 13D | D20 | 8C | D31 | 8C |
| IC2 | 13G | IC15 | 9C | Q12 | 7H | Q27 | 7D | D2 | 13C | D21 | 8B | D34 | 8C |
| IC3 | 10E | IC201 | 6M | Q15 | 12K | Q28 | 7D | D3 | 13C | D22 | 11I | D35 | 12F |
| IC4 | 9E | IC400 | 2K | Q18 | 11J | Q29 | 6N | D4 | 13D | D23 | 11H | D209 | 7L |
| IC6 | 6M | Q1 | 8E | Q20 | 5G | Q30 | 8D | D5 | 13E | D24 | 7E | D210 | 7J |
| IC7 | 9G | Q2 | 9J | Q22 | 9C | Q31 | 8C | D6 | 12C | D26 | 9B | D211 | 5N |
| IC8 | 10G | Q3 | 9I | Q23 | 10J | Q202 | 9Q | D15 | 11N | D27 | 7Q | D212 | 6O |
| IC9 | 8D | Q7 | 10N | Q24 | 10J | Q203 | 7L | D16 | 7B | D28 | 8B | | |
| IC12 | 9H | Q9 | 8B | Q25 | 9C | Q204 | 7J | D17 | 13D | D30 | 6R | | |

TX-RX UNIT (X57-6142-XX) (A/2) -70 : E -72 : E3
Foil side view (J72-0724-22 A/2)

PC BOARD VIEW TK-780

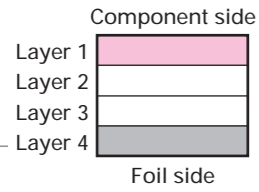


J72-0724-22 A/2

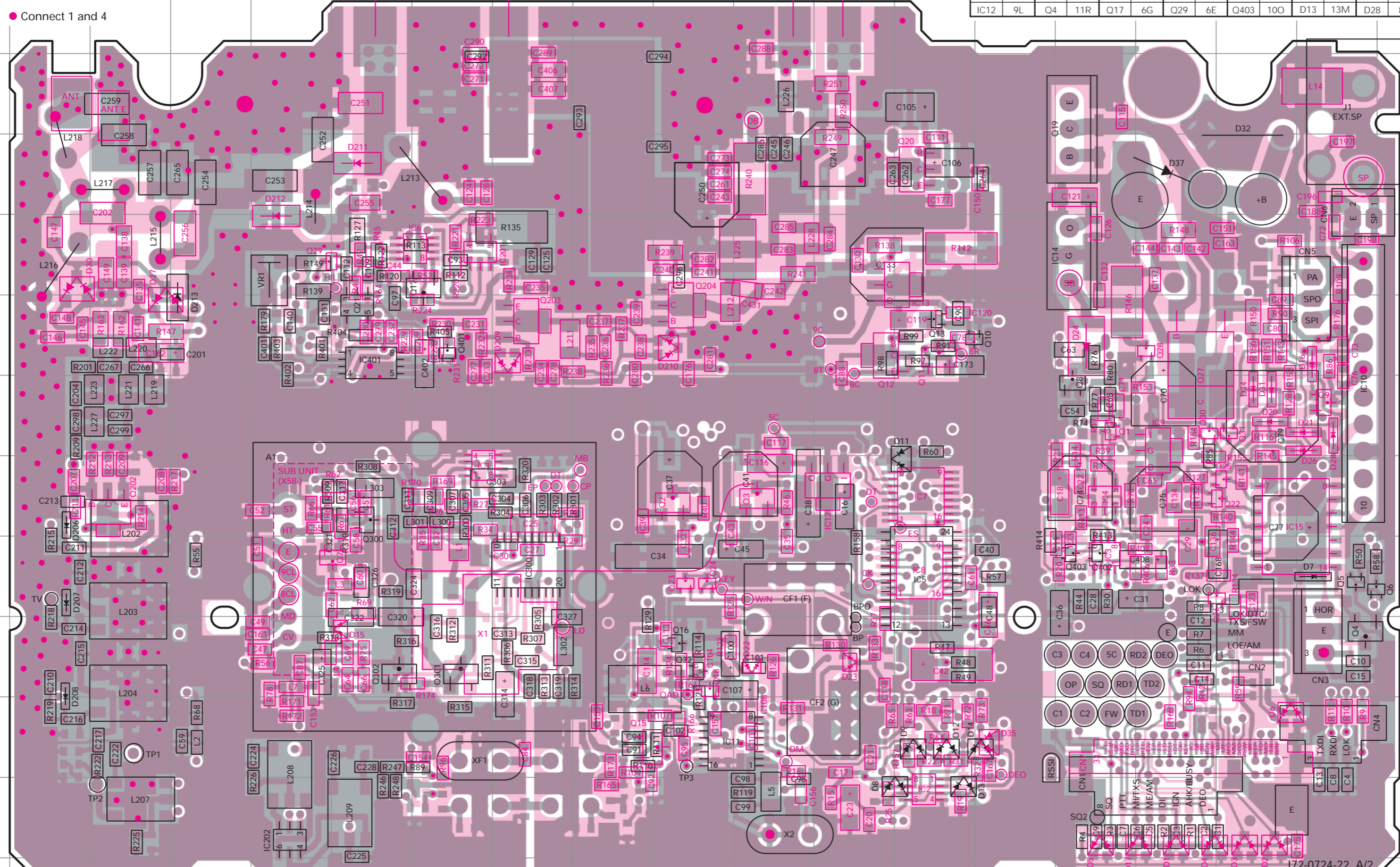
TK-780 PC BOARD VIEW

TX-RX UNIT (X57-6142-XX) (A/2) -70 : E -72 : E3 Component side view + Foil side (J72-0724-22 A/2)

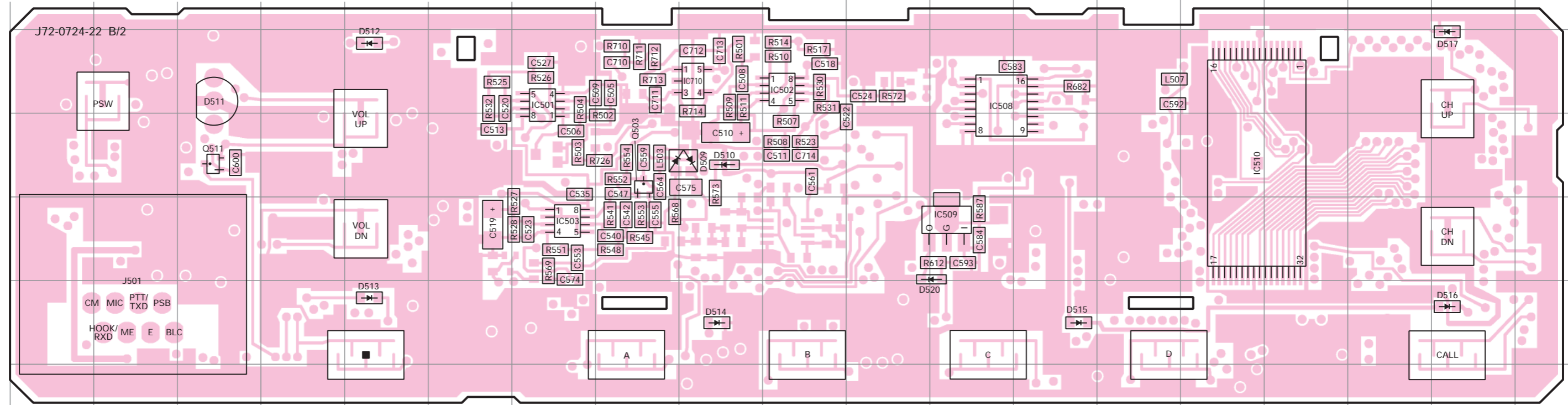
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|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|
| IC1 | 9G | IC13 | 6M | Q5 | 10R | Q18 | 11J | Q30 | 8P | D1 | 13P | D14 | 12N | D30 | 6B |
| IC2 | 13M | IC14 | 6O | Q6 | 10S | Q19 | 4O | Q31 | 8Q | D2 | 13Q | D15 | 11F | D31 | 8Q |
| IC3 | 10O | IC15 | 9Q | Q7 | 10F | Q20 | 5M | Q32 | 11J | D3 | 13Q | D16 | 7R | D32 | 4Q |
| IC4 | 9O | IC201 | 6G | Q8 | 8O | Q21 | 7F | Q202 | 9C | D4 | 13P | D17 | 13P | D34 | 8Q |
| IC5 | 10M | IC202 | 13E | Q9 | 8R | Q22 | 9Q | Q203 | 7H | D5 | 13O | D20 | 8Q | D35 | 12N |
| IC6 | 6G | IC300 | 10H | Q10 | 7N | Q23 | 10J | Q204 | 7J | D6 | 12Q | D21 | 8R | D37 | 5P |
| IC7 | 9M | IC400 | 2I | Q11 | 7M | Q24 | 10J | Q300 | 9F | D7 | 10R | D22 | 11K | D206 | 9B |
| IC8 | 10M | IC401 | 7F | Q12 | 7L | Q25 | 9Q | Q301 | 11G | D8 | 13L | D23 | 11L | D207 | 10B |
| IC9 | 8P | Q1 | 8O | Q13 | 7M | Q26 | 10Q | Q302 | 11F | D9 | 12M | D24 | 7O | D208 | 11B |
| IC10 | 8R | Q2 | 9J | Q15 | 12I | Q27 | 7P | Q401 | 7G | D11 | 9M | D26 | 8R | D209 | 7H |
| IC11 | 12J | Q3 | 9K | Q16 | 11J | Q28 | 7P | Q402 | 10O | D12 | 12M | D27 | 7C | D210 | 7J |
| IC12 | 9L | Q4 | 11R | Q17 | 6G | Q29 | 6E | Q403 | 10O | D13 | 13M | D28 | 8R | D211 | 5F |
| | | | | | | | | | | | | | | D212 | 6E |
| | | | | | | | | | | | | | | D213 | 7D |



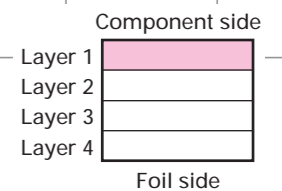
● Connect 1 and 4



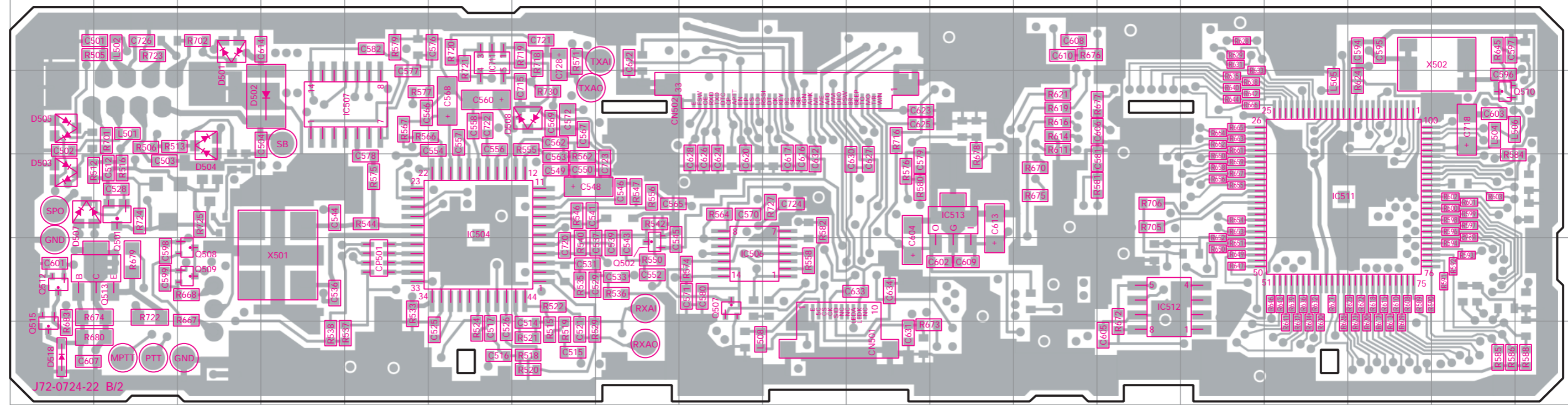
TX-RX UNIT (X57-6142-XX) (B/2) -70 : E -72 : E3 Component side view (J72-0724-22 B/2)



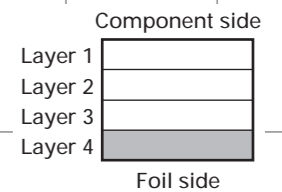
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|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|
| IC501 | 2G | IC508 | 2L | IC710 | 2I | D509 | 3I | D512 | 2E | D515 | 5M | D520 | 4L |
| IC502 | 2J | IC509 | 4L | Q503 | 3H | D510 | 3I | D513 | 5E | D516 | 5R | | |
| IC503 | 4G | IC510 | 3O | Q511 | 3C | D511 | 2C | D514 | 5I | D517 | 2R | | |



TX-RX UNIT (X57-6142-XX) (B/2) -70 : E -72 : E3 Foil side view (J72-0724-22 B/2)

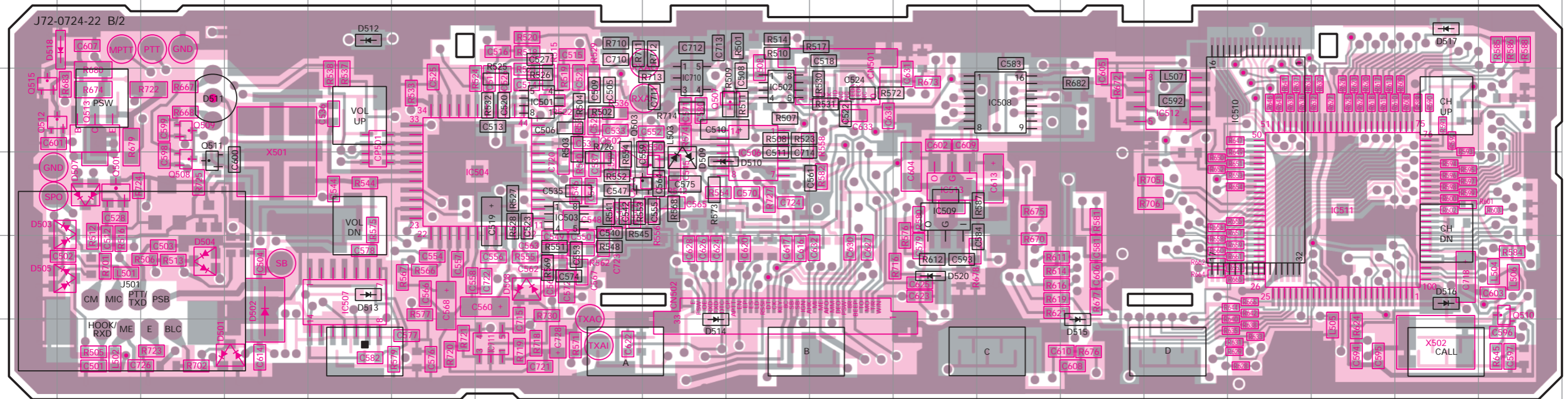


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|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|
| IC504 | 10F | IC511 | 10P | IC711 | 7F | Q507 | 11I | Q510 | 9R | Q515 | 12A | D503 | 10A |
| IC506 | 11I | IC512 | 11N | Q501 | 10B | Q508 | 11C | Q512 | 11A | D501 | 8C | D504 | 9C |
| IC507 | 9E | IC513 | 10L | Q502 | 11H | Q509 | 11C | Q513 | 11B | D502 | 9D | D505 | 9A |

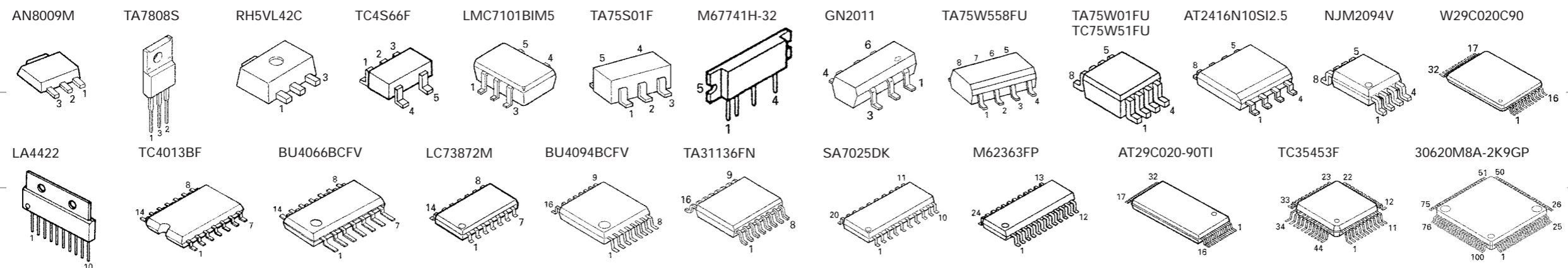
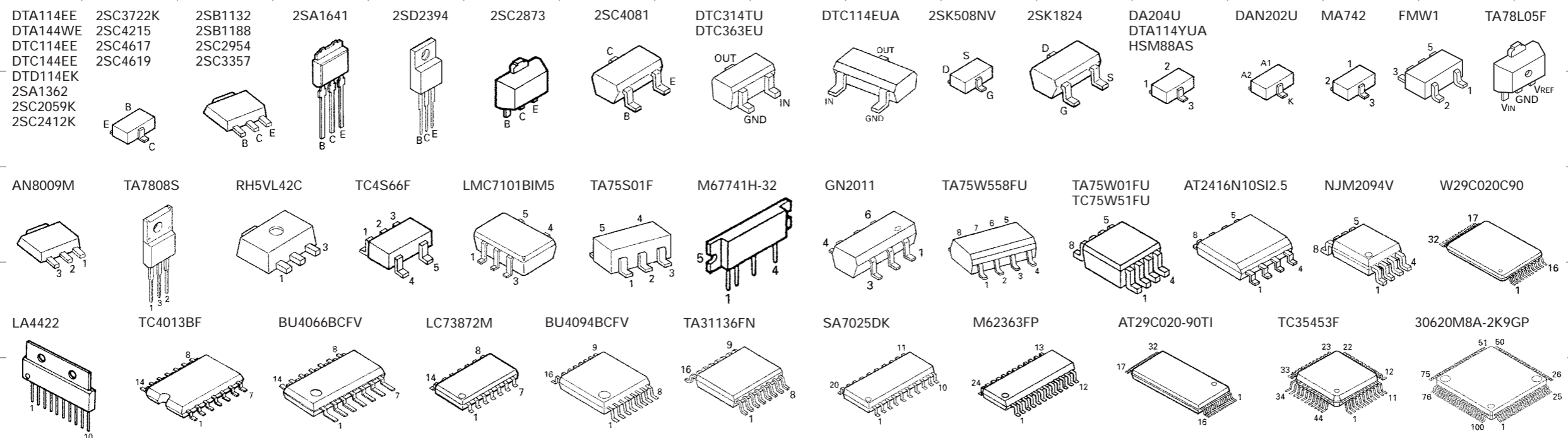
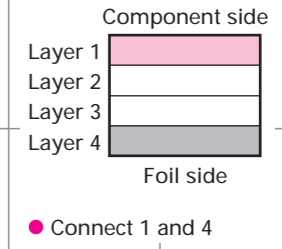


TK-780 PC BOARD VIEW

TX-RX UNIT (X57-6142-XX) (B/2) -70 : E -72 : E3 Component side view + Foil side (J72-0724-22 B/2)



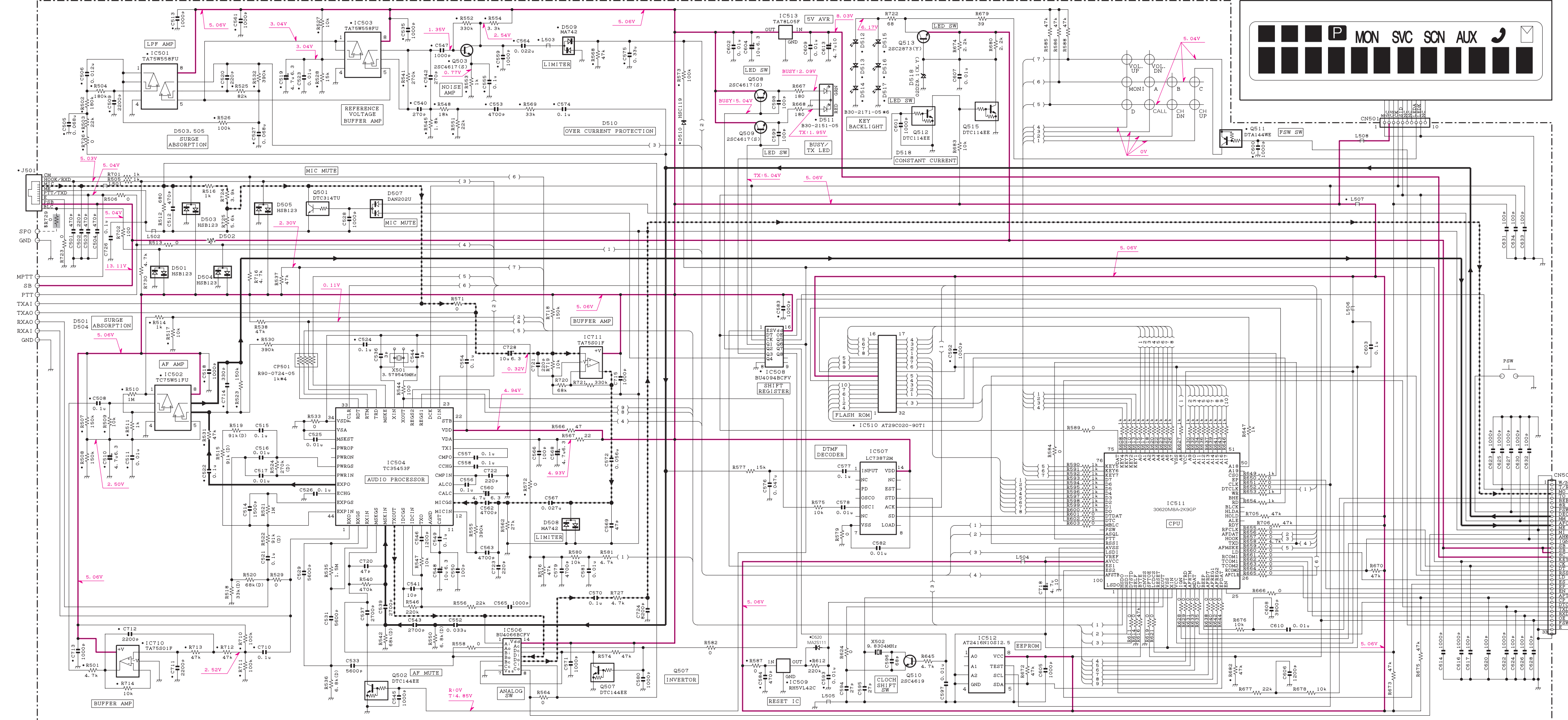
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|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|
| IC501 | 3G | IC509 | 4L | Q501 | 4B | Q511 | 4C | D504 | 5C | D512 | 2E | D520 | 5L |
| IC502 | 3J | IC510 | 3P | Q502 | 4I | Q512 | 3A | D505 | 5B | D513 | 5E | | |
| IC503 | 4H | IC511 | 4Q | Q503 | 4H | Q513 | 3B | D507 | 4B | D514 | 6I | | |
| IC504 | 4G | IC512 | 3O | Q507 | 3J | Q515 | 3A | D508 | 5G | D515 | 6N | | |
| IC506 | 4J | IC513 | 4L | Q508 | 4C | D501 | 6D | D509 | 4I | D516 | 5R | | |
| IC507 | 5E | IC710 | 3I | Q509 | 3C | D502 | 5D | D510 | 4J | D517 | 2R | | |
| IC508 | 3M | IC711 | 6G | Q510 | 5S | D503 | 4B | D511 | 3C | D518 | 2B | | |



TK-780 SCHEMATIC DIAGRAM

X57-6142-XX CONTROL SECTION

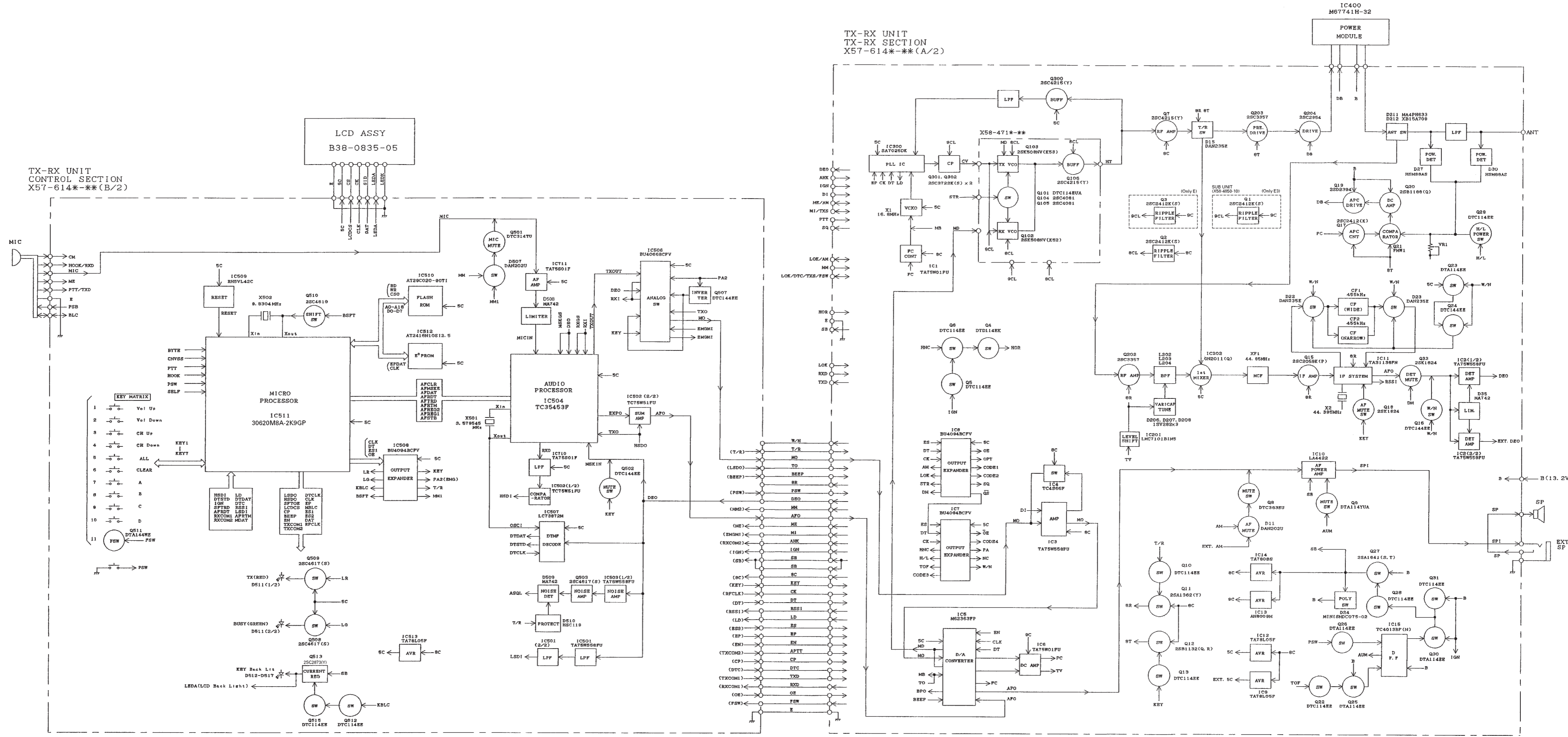
Note : Components marked with a dot (·) are parts of layer 1.



- D501, 503-505 : HSB123 or DA204U
- D507 : DAN202U
- D510 : HSC119
- D512-517 : B30-2171-05
- D520 : MA251111
- Q501 : DTC314TU
- Q503, 508, 509 : 2SC4617(S)
- Q511 : DTA144WE
- Q513 : 2SC2873(Y)
- IC501, 503 : TA75W58FU
- IC504 : TC35453P
- IC507 : LC73872M
- IC509 : RH5V42C
- IC511 : 30620M8A-2K9GP
- IC513 : TA78L05F
- D502 : MINISMDC075-02
- D508, 509 : MAT742
- D511 : B30-2151-05
- D518 : 02DZ9.1(X,Y)
- Q502, 507 : DTC144EE
- Q510 : 2SC4619
- IC502 : TC75W51FU
- IC506 : BU4066BCFV
- IC508 : BU4094BCFV
- IC510 : AT29CC02-90TI
- IC512 : AT2416N10S12.5
- IC710, 711 : TA75S01F

X57-6142-XX
TX/RX UNIT

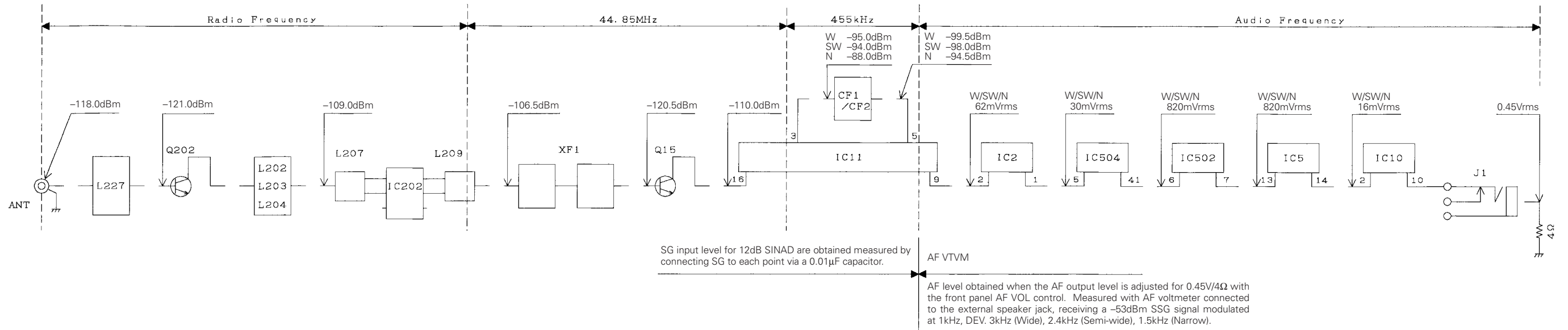
BLOCK DIAGRAM



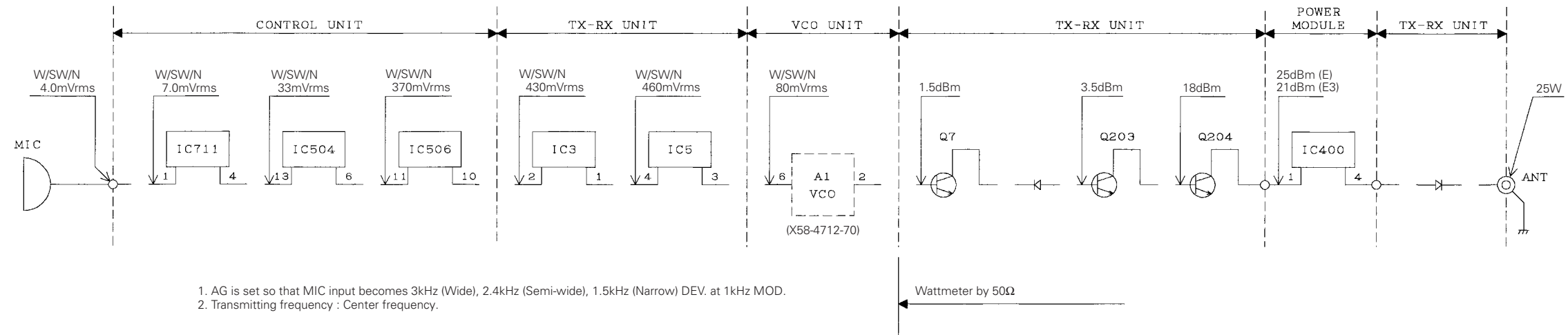
TK-780 TK-780

LEVEL DIAGRAM

Receiver Section



Transmitter Section



TERMINAL FUNCTION

CN7 (TX-RX Unit A/2) ↔ CN502 (TX-RX Unit B/2) CN101 (VCO) ↔ TX-RX Unit A/2

| Pin No. | Name | Function |
|---------|------|---------------------------------------|
| 1 | W/N | Wide/Narrow. H : Wide |
| 2 | T/R | TX/RX switch. H : Receive |
| 3 | MO | Modulation signal. |
| 4 | TO | Low speed data signal. |
| 5 | BEEP | Beep. |
| 6 | 8R | NC |
| 7 | PSW | Power switch. |
| 8 | DEO | Receive signal to control unit. |
| 9 | MM | MIC mute. H : MIC mute |
| 10 | AFO | Receive signal from control unit. |
| 11 | ME | MIC ground. |
| 12 | MI | External MIC. |
| 13 | AHK | Hook signal. H : Off hook |
| 14 | IGN | Ignition signal. |
| 15 | SB | 13.2V. |
| 16 | SB | 13.2V. |
| 17 | 8C | 8V. |
| 18 | KEY | TX signal. |
| 19 | CK | Shift register clock. |
| 20 | DT | PLL/Shift register/DA converter data. |
| 21 | RSSI | RSSI. |
| 22 | LD | PLL unlock detection. |
| 23 | ES | Shift register enable. |
| 24 | EP | PLL enable. |
| 25 | EN | DA converter enable. |
| 26 | APTT | External PTT. |
| 27 | CP | PLL clock. |
| 28 | DTC | Data control. |
| 29 | TXD | Serial data. |
| 30 | RXD | Serial data. |
| 31 | OE | Serial data. |
| 32 | FSW | Foot switch. |
| 33 | E | Ground. |

| Pin No. | Name | Function |
|---------|------|---------------------------------------|
| 1 | ST | Switched transmit input. H : Transmit |
| 2 | HT | RF output. |
| 3 | E | Ground. |
| 4 | 9CL | 9V input. |
| 5 | 8CL | 8V input. |
| 6 | MD | Modulation input. |
| 7 | CV | Control voltage input. |

CN501 (TX-RX Unit B/2)

| Pin No. | Name | Function |
|---------|--------|----------------------------------|
| 1 | E | Ground. |
| 2 | 5C | Logic power (5V). |
| 3 | CS | Chip selector signal. L : Option |
| 4 | CK | Serial clock signal. |
| 5 | SID | Serial data input. |
| 6 | (NC) | Unused terminal. |
| 7 | (NC) | Unused terminal. |
| 8 | LED(A) | LED anode terminal. |
| 9 | LED(K) | LED cathode terminal. |
| 10 | NC | Unused terminal. |

J501 (TX-RX Unit B/2)

| Pin No. | Name | Function |
|---------|----------|----------------------------|
| 1 | BLC | MIC key backlight control. |
| 2 | PSB | 13.2V. |
| 3 | E | Ground. |
| 4 | PTT/TXD | PTT. |
| 5 | ME | MIC ground. |
| 6 | MIC | MIC signal input. |
| 7 | HOOK/RXD | Hook detection |
| 8 | CM | MIC data detection. |

SPECIFICATIONS

GENERAL

| | |
|---------------------------|---|
| Frequency Range | 146 to 174MHz |
| Number of Channels | Maximum 250 channels |
| Channel Spacing | Narrow : 12.5kHz Wide 4k : 20kHz Wide 5k : 25kHz |
| Input Voltage | 13.2V DC negative ground |
| Current Drain | 0.4A on standby 1.0A on receive E : 8A on transmit E3 : 5A on transmit |
| Temperature Range | -30°C to +60°C |
| Frequency Stability | ±2.5ppm |
| Dimensions & Weight | 140 W x 40 H x 145 D mm, 0.94kg |

RECEIVER (Measurements made per ETS standard)

| | |
|------------------------------------|-----------------------------------|
| RF Input Impedance | 50Ω |
| Sensitivity (EIA 12dB SINAD) | 0.25μV |
| Selectivity | Wide : 80dB Narrow : 70dB |
| Intermodulation | 70dB |
| Spurious and Image Rejection | 80dB |
| Audio Power Output | 4W at 4Ω less than 10% distortion |
| Channel Frequency Spread | 28MHz |

TRANSMITTER (Measurements made per ETS standard)

| | |
|--------------------------------|--|
| RF Power Output | E : 5 to 25W E3 : 1 to 5W |
| Spurious Emission | ≤ 1GHz : Less than -36dBm > 1GHz : Less than -30dBm |
| Modulation Limiting | Narrow : ±2.5kHz Wide 4k : ±4kHz Wide 5k : ±5kHz |
| FM Noise (EIA) | Wide : 50dB Narrow : 45dB |
| Microphone Impedance | 600Ω |
| Audio Distortion | Less than 3% |
| Channel Frequency Spread | 28MHz |

TK-780

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