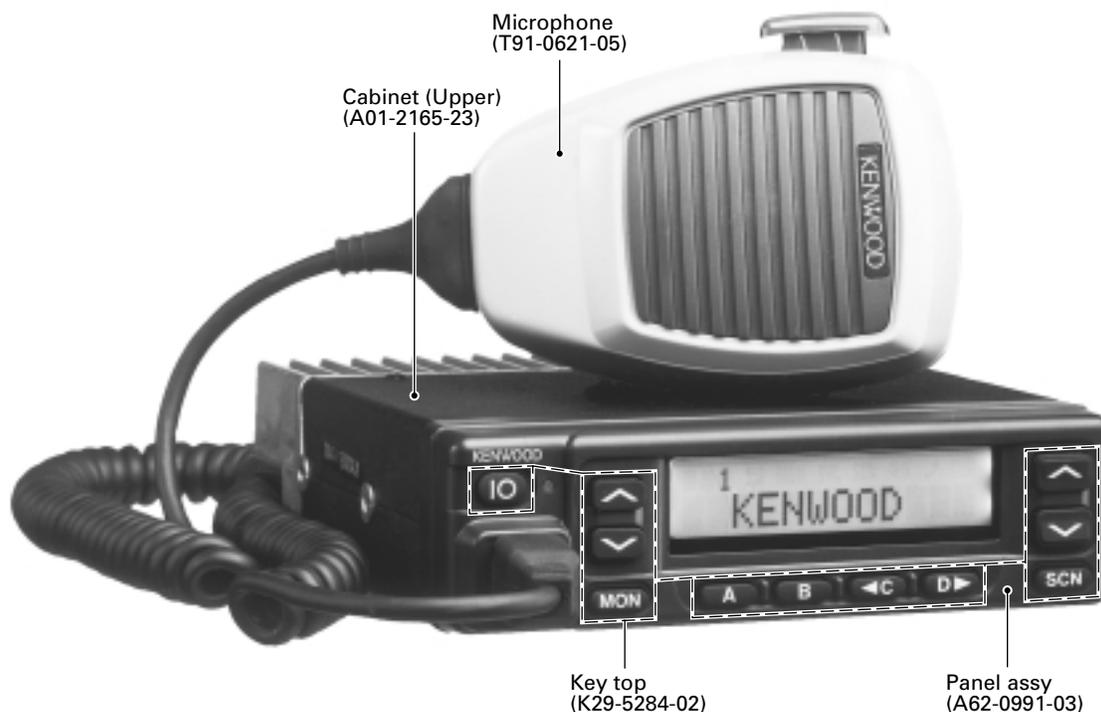


This service manual applied to products with 30600001 or subsequent serial numbers.
In terms of the products with the serial numbers earlier than 30600001, refer to the TK-980/981 service manual as per part No. B51-8478-10.



CONTENTS

GENERAL	2	ADJUSTMENT	43
OPERATING FEATURES	3	PC BOARD VIEWS	
REALIGNMENT	13	PLL/VCO (X58-4530-XX)	50
INSTALLATION	16	TX-RX UNIT (X57-6520-XX) (A/2)	51
CIRCUIT DESCRIPTION	25	TX-RX UNIT (X57-6520-XX) (B/2)	57
SEMICONDUCTOR DATA	29	SCHEMATIC DIAGRAM	61
DESCRIPTION OF COMPONENTS	30	BLOCK DIAGRAM	69
PARTS LIST	32	LEVEL DIAGRAM	72
EXPLODED VIEW	41	TERMINAL FUNCTION	74
PACKING	42	SPECIFICATIONS	75

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 date. Changes which may occur after publication are covered by either Service Bulletins or Manual Revisions, which 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, and 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 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 only qualified technicians.

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. LICENSING REQUIREMENTS

Federal regulations require a station license for each radio installation (mobile or base) be obtained by the equipment owner. The licensee is responsible for ensuring transmitter power, frequency, and deviation are within the limits permitted by the station license.

Transmitter adjustments may be performed only by a licensed technician holding an FCC first, second or general class commercial radiotelephone operator's license. There is no license required to install or operate the radio.

3. PRE-INSTALLATION CHECKOUT

3-1. 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.

3-2. 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.

4. PLANNING THE INSTALLATION

4-1. 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.

4-2. 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.

4-3. 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.

4-4. 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

5. INSTALLATION PLANNING – CONTROL STATIONS

5-1. 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.

5-2. 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.

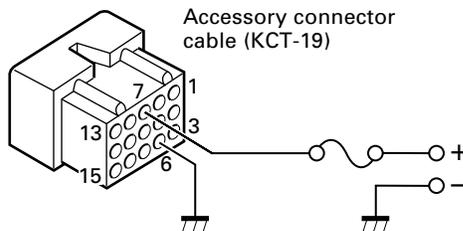
SERVICE

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

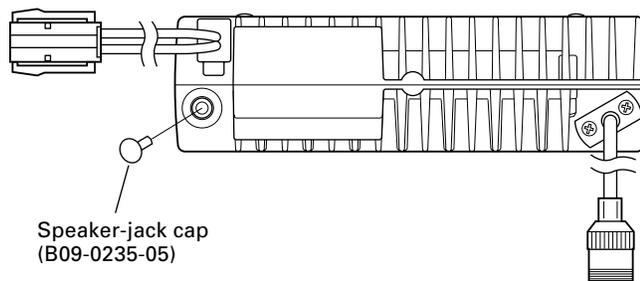
Note

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 13.6V (1A). 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-980/981 is an 800MHz/900MHz band EFJ LTR™ - compatible trunked radio designed to operate in both trunking and conventional modes. The programmable features are summarized.

This model can handle up to 32 systems with up to 250 groups in each system. The transceiver can be used in both trunked mode and conventional mode. Systems, groups, and their functions are programmed.

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 system and group are stored in memory. When the power is switched on again, the transceiver returns to the previous conditions.

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

- **SCAN key (Programmable)**

- **MONITOR 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 group is in use. The TX indicator (Red LED) shows that you are transmitting.

2-2. Programmable Keys

The FPU (KPG-49D) enables programmable keys to select the following functions.

Auto tel, AUX-A, AUX-B (Only when voice scrambler is not selected), DTMF ID (BOT), DTMF ID (EOT), Display character, Emergency (Only foot key), Function, Group down, Group up, Home group, Horn alert, Key lock, Memory (RCL/STO), Memory (RCL), Memory (STO), Message mode (Only A key), Monitor A, Monitor B, Monitor C, Monitor D, Public address, Redial, Scan, Scan del/add, Scan temporary delete, Scrambler (Only when voice scrambler is selected), Send GPS, System down, System up, TEL disconnect, Volume down, Volume up and None.

These functions the FPU programs to the function keys and described in the following sections.

- **Auto TEL**

Automatically connects available repeaters that are connected to telephone circuits when operating as LTR system. The time allocated to search for available repeaters is 60 seconds, after which connection failure occurs, a DTMF tone is output and the function terminates.

If connection to an available circuit is made, only ID 253, EOT or hang-up time-out can terminate the function.

OPERATING FEATURES

- **AUX-A**

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

- **DTMF ID (BOT)**

In conventional mode, if you press this key, a predetermined DTMF ID (Begin of TX) will be sent automatically.

- **DTMF ID (EOT)**

In conventional mode, if you press this key, a predetermined DTMF ID (End of TX) will be automatically sent.

- **Display character**

This key switches the LCD display between the system and group number and the system and group name.

- **Emergency**

Pressing this key for longer than the programmed "Emergency Key Delay Time" causes the transceiver to enter the emergency mode. The transceiver jumps to the programmed "Emergency system and group" and transmits for the programmed "Active Time".

The transceiver disables mic mute while transmitting. After finishing transmission, the transceiver receivers for the programmed "Interval Time". The transceiver mutes the speaker while receiving. Following the above sequence, the transceiver continues to transmit and receive.

- **Function**

Pressing this key causes the transceiver to display "FCN". Then, pressing a microphone DTMF key causes the corresponding programmed function to start. This key may be convenient when using many functions with the microphone 12-key keypad.

- **Group Up/Down**

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

- **Home Group**

Each pressing of the key selects a preset system/group.

- **Horn Alert**

If you are called from the base station using DTMF 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, and the display shows "HA" on the sub LCD.

If this key is pressed again, the horn alert function is turned off.

- **Key Lock**

Pressing this key causes the transceiver to accept entry of only the [Function], [Key lock], [PTT], [Monitor A], [Monitor B], [Monitor C], [Monitor D], and [Emergency] keys.

- **Message Mode**

Press this key to enter the message mode. (See "Alphanumeric Two-way Paging Function" for details)

- **Memory**

This key allows DTMF memory data to be recalled; up to 32 memories each with a memory dial of up to 16 digits and an A/N of up to 10 digits per memory.

- **Monitor**

Used to release signalling or squelch when operating as a conventional. It is also used to reset option signalling.

- **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 "PUBLIC ADRS". PA can be activated at anytime (scanning or non-scanning).

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

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

- **Redial**

If you press this key when the system/group is displayed, the last transmitted DTMF code will appear on the display. Pressing the PTT switch at this time will transmit the displayed DTMF code.

- **Scan**

Press this key starts scanning. Pressing this key stops scanning.

- **Scan Del/Add**

Used to select whether system scan routines are used during system scan. Each pressing of the key (to ON) toggles between lockout and lock. The scan routine is started when on lock. The DEL indicator flashes when the system is on lockout.

OPERATING FEATURES

- **Scan Temporary Delete**

This key is temporarily deleted a system being scanned. If you press this key when scan is stopped (when a call is being received from another station), the system is temporarily deleted and scanning restarts.

This key operates even when "Scan Type" is set to "List Type System Scan".

- **Scrambler**

If a scrambler code (1 to 16) has been set in the FPU, an underscore ("_") appears at the extreme right of the LCD display when scrambler is active. Pressing this key changes on/off of scramble operation. Press this key for 2 seconds to enter scrambler code selection mode.

- **Send GPS (Optional)**

Pressing this key causes the transceiver to send a single GPS data. (GPS receiver must be installed.)

- **System Up/Down**

When the key is pressed each time, the system number to be selected is incremented/decremented and repeats if held for one second or longer.

- **Telephone Disconnect**

Pressing this key ends an RIC connection (disconnects the telephone line).

- **Volume Up/Down**

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

- **None**

Sounds error operation beep, and no action will occur. Use this function when the transceiver is required to be more simple operated.

2-3. Front Panel Displays and Indicators

① Sub display

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

② P (Priority) indicator

The P indicator (P) appears when a selected group is programmed as priority, in conventional operation.

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

The handset indicator (H) appears when the selected group is programmed as telephone IDs.

⑧ MAIL indicator

Flashes when a status message (FleetSync™) 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 a delete indicator (▶) and the right is used for the selective call (*) or scrambler (⏏) function. The delete indicator shows the systems locked out of the scanning sequence. Selective call and scrambler are optional functions that can be programmed.

Displays received messages when using FleetSync™.

⑩ A,B,C,D key

These keys are programmable function (PF) keys.

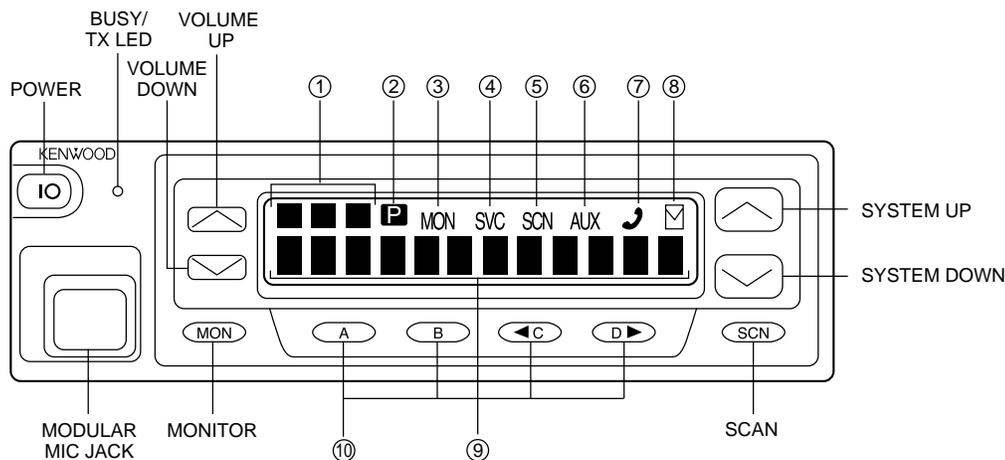


Fig. 1

OPERATING FEATURES

3. Scan Operating

■ System Scan

System scan can be selected with the "Scan" key by programming the scan feature. When the "Scan" key is pressed and the "SCN" mark appears, scan mode is entered. Scanning starts from the system following the currently displayed system. When a call is received, scanning stops, and the system and group are displayed.

When programming key is touched during scanning, the scan stops and the revert system or group can be changed. Scanning resumes one second after the key is released.

There are two types of system scan.

• Fix System Scan

All the set systems except locked-out ones are scanned. If the Del/Add feature is assigned to the programmable key, it can be controlled from the front panel.

• List Type System Scan

A scan list can be set for each system.

The list to be scanned can be changed by changing the display system.

If many systems have been set, the scan speed can be increased by narrowing the systems to be scanned with scan lists.

■ System Lockout

The system lockout feature is used to lock systems out of the scan sequence, and can be selected by programming in the following two ways;

• Fixed Lockout

The system to be locked out is selected by programming. When a locked system is selected, the Delete (▶) indicator appears on the left of the SYSTEM indicator. The revert system is scanned even if it is locked out. If there is a locked system, the Delete (▶) indicator flashes during fixed scanning.

• User Selectable Lockout

If the scan lockout feature is programmed to a key, the user can lock systems out of the scan sequence with the key. To lock a system out of the scan sequence, press the key when the system is displayed. The Delete (▶) indicator is displayed on the left of the SYSTEM indicator.

To unlock a system, select the system and press the key. The Delete (▶) indicator disappears to indicate that the system has returned to the scan sequence. The revert system is scanned even if it is locked out. If there a locked system, the Delete (▶) indicator flashes during fixed scanning. If all systems are locked out, the scan stops and only the revert system is received.

■ Drop-out Delay Time (Scan Resume Time)

If a call is received during scan, the scan stops. The scan resume time can be programmed as 0 to 300 seconds in one-second increments. The default value is 3 seconds.

■ Dwell Time

The dwell time is the time after transmission ends until the scan resumes in scan mode. It can be set 0 to 300 seconds by programming. The default value is 3 seconds.

■ System/Group Revert

System/group revert can be programmed for one of the following;

• Last Called Revert

The system or group changes to the revert system or group when a call is received with the system or group being scanned.

• Last Used Revert

If a system/group call is received during scanning and the PTT button is pressed for transmission and response within the drop out delay time, the system or group is assigned as the new revert system or group.

• Selected Revert

If the system/group was changed while scanning, the newly selected system/group.

• Selected + Talkback Revert

If the system/group was changed while scanning, the newly selected system/group. The transceiver "talks back" on the current receive group.

■ Scan Message Wait

The time for staying with the home repeater that receives a signal during system scan and monitoring data messages can be programmed. If there is no signal from the home repeater, the system is scanned for about 50ms. If there is a signal, three data messages are monitored. Normally, three data messages are monitored for each system, and it can be increased in multiples of three data messages per line to up to eight lines.

If the repeater data message indicates that there is no call, data monitoring is terminated and the home repeater of the next system is scanned.

■ Group Scan Operation

Group scan can be programmed for each group. In addition to the ID codes of the selected group, the ID codes of the other groups that are permitted for group scan are decoded. (The two fixed ID and block decode codes are always decoded.)

If, during group scanning, a call is received with one of the selectable group ID codes for which group scan is enabled, the group display indicates the group number that the call came in with. That group then becomes the new selected group. Group scan resumes after the specified drop-out delay time or dwell time shared by the system scan elapses.

OPERATING FEATURES

■ In Conventional System

If QT or DQT is set for the group, the groups, including signalling, are scanned.

In case of the priority group is set in conventional system, if a group scan (including group scan during a system scan) temporarily stops (receiving) in a group that does not have priority, a look back is performed to the priority group. Look back is performed according to the look back time A and B settings. If a call is received on the priority group, reception immediately switches to the priority group.

4. Details of Features

■ Time-out Timer

The time-out timer can be programmed in 15 seconds increments from 15 seconds to 10 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 system number or group number. It is useful when the main (12-digit) display indicates system, group 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 MSK (FleetSync™ : Fleet-ID) ANI to be sent with every time PTT (beginning of transmission, end of transmission, or both).

You can program PTT ID for each group. You can program PTT ID as "on" or "off" when "DTMF" is selected for the PTT ID type. You can program a PTT ID as "own", "sel" or "off" when "MSK" is selected for the PTT ID type. The contents of ID are programmed for each transceiver.

The timing that the transceiver sends ID is programmable.

BOT : DTMF ID (BOT)/MSK ID is sent on beginning of transmission.

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

Both : DTMF ID (BOT)/MSK ID is sent on beginning of transmission and DTMF ID (EOT)/MSK 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 "SCN" 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.

■ Horn Alert

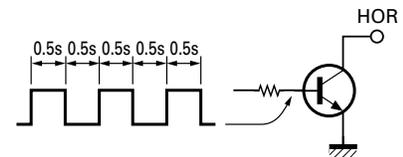
Horn alert can be set to on or off for each group. If horn alert has been set to YES for a group and DEC ID/QT/DQT/MSK matches, the horn alert, HOR. is turned on and off. The group for which the optional signalling is set works by ANDing the decode ID/QT/DQT/MSK with the optional signalling.

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

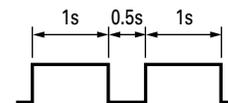
Off hook horn alert	Hook off	Hook on
Enable	Yes	Yes
Disable	No	Yes

■ Non-continuous

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



The timing when the fixed LTR ID matches is as follows;

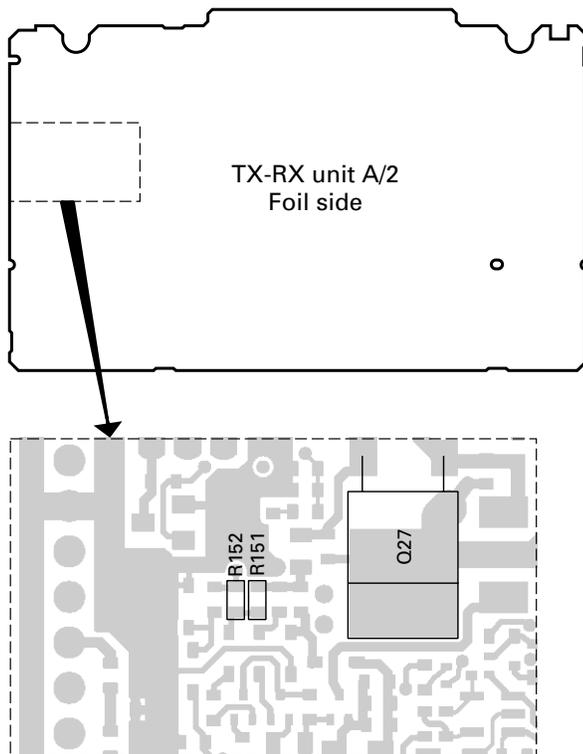


OPERATING FEATURES

■ Continuous

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

Operation when KCT-18 is connected	R151	R152
KCT-18 cannot be connected	Enable	Enable
Power on/off and Horn alert on/off	Disable	Enable
Horn alert on/off	Enable	Disable
Power cannot be turned on	Disable	Disable



■ Call Indicator

The call indicator can be programmed for each group. In trunked system, it can be set to respond to a selectable decode ID or one of two fixed IDs, except block IDs. When a call is received with a selectable decode ID, the call indicator flashes. When a call is received with a fixed ID, the call indicator lights continuously.

On a conventional system, the call indicator can be programmed to light for each QT or DQT code. It keeps flashing while a call is being received. It is turned off by pressing any front panel key.

■ Free System Ringback

This feature is available only when a telephone interconnected ID code is selected. If a busy tone sounds when the PTT button is pressed, the transceiver enters this mode automatically.

When the PTT button is released, a beep sounds for 400ms to indicate that the mode has been entered. If the scan is on, it is resumed (the "SCN" mark goes on). When any repeater becomes available, a ringing tone sounds and this mode ends.

The mode is terminated when the system, group, scan, PTT, key is changed.

■ System Search

This feature can be programmed to automatically access other programmed systems when the selected system cannot be accessed. If an intercept tone sounds when the PTT button is pressed after setting the mode, the transceiver has entered the mode.

If the group ID is a telephone interconnect ID, the transceiver then attempts to access, in succession, other systems that have a telephone interconnect ID in the revert group location. If the group ID is a dispatch ID, the transceiver attempts to access other systems that have a dispatch ID programmed in the revert group location.

If there is no system to be accessed, an intercept tone sounds, the mode is terminated, and the transceiver returns to the first system. If the access is successful, the mode is terminated, and the searched system becomes the new selected system (If during scanning, the scan stops).

■ Transpond

This feature can be programmed to turn on and off for each group. If the ID of the group for which transpond is enabled is received, two data messages (transmit ID and turn-off code) are automatically transmitted if the PTT button is not pressed as a response within the time set (0 to 300 seconds in 1-second increments). If the PTT button is pressed within the time, the transpond is not preformed.

■ 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.

■ Transmit Inhibit

The transceiver can be programmed with a transmit inhibit block of ID codes. If an ID code within this block is decoded the preset time before the PTT button is pressed, transmission is inhibited. The BUSY indicator lights and a busy tone sounds until the PTT button is released to indicate that transmission is not possible (except clear-to talk mode).

Transmission with the group for which the encode ID is not set is inhibited, and the busy tone is output while the PTT button is held down, regardless of the clear-to talk setting.

OPERATING FEATURES

■ Auto TEL

A telephone interconnect call can be made by simply pressing the key by assigning this feature to the key. This feature accesses the TEL channel of the available system automatically.

When the key is pressed, a queue tone is output, and the "AUTO TEL" appears on the alphanumeric display along with a flashing handset indicator (☎) to indicate that this mode has been entered. If the TEL ID is set for the revert system, the TEL channel of that system is accessed. If all TEL channels are busy, an attempt is made to access the TEL channels of another system in which the TEL ID code has been programmed. It is repeated for 60 seconds until the access succeeds. If the access succeeds, a dial tone returns from the repeater. If the key is pressed again when the queue tone is sounding, this mode is canceled.

If the access fails after 60 seconds, a deny tone is output and this mode is terminated. When the talk ends, the revert system/group returns. When the scan mode is effective, the scan resumes. The Auto TEL feature can be programmed to turn on or off for each system.

■ ARQ Mode

If affects Trunking mode only. Automatic Repeat reQuest (ARQ) mode is a manner to minimize the air traffic of data communication. Also, it enables to occupy the trunking repeater channel for the data communication period.

5. Option Signalling

5-1. DTMF

Built-in DTMF decoder is available for option signalling.

It is possible to use individual call, group call, D.B.D. (Dead Beat Disable). D.B.D. is used with DTMF only.

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

If option signalling matches on a group 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

You can select AND or OR for option signalling match conditions.

	Alert/Transpond
AND	QT/DQT/ID+DTMF; Option matches = Action
OR	QT/DQT/ID+DTMF; Option matches = Action
	AF mute open
AND	QT/DQT/ID+DTMF; Option matches = Action
OR	QT/DQT/ID; Signalling only matches = Action

With OR set up, alert/transpond will not function with only DTMF.

With OR set up, AF mute will not release when only DTMF matches.

With a conventional group not set up with QT or DQT, only the carrier is considered when signalling matches.

■ 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.

■ Dead Beat Disable

If the D.B.D. code matches, a predetermined action will occur. Whether option signalling is activated or not, when D.B.D. matches on any group, the transceiver will become TX inhibited or TX/RX inhibited. While D.B.D. is active, if the D.B.D. code + "#" code is received, D.B.D. will deactivate.

When D.B.D. matches, transpond will function. Alert will not be output, and option signalling match icon will not appear.

5-2. MSK

Built-in MSK (FleetSync™ : Fleet-ID) decoder is available for option signalling. When the group ID matches, squelch remains muted while the station waits for reception of proper MSK signal. When MSK signal matches, squelch unmutes.

■ AND/OR

AND : QT/DQT/ID + MSK to unmute. MSK matches = alert tone

OR : QT/DQT/ID to unmute. MSK matches = alert tone

6. Alphanumeric Two-way Paging Function (FleetSync™)

■ General

The Alphanumeric Two-way Paging Function (FleetSync™) 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 (own) can be sent at the beginning of transmission and/or the end of transmission to identify which radio unit is on air.

When selecting (sel) for MSK ID, the radio calls the specific Fleet user the same as selective call.

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 9 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;

80~87 : Reserved for future use.

88 : Terminates to emergency mode.

89 : Request for horn alert.

90 : Remote stun on. Disable the received radio unit's TX.

91 : Remote stun on. Disable the received radio unit's TX/RX.

92 : Cancel remote stun. Enable the received radio unit's TX/RX.

93 : Acknowledgement status sent when the radio unit is in stun mode (TX disabled).

94 : Acknowledgement status sent when the radio unit is in stun mode (TX/RX disabled).

95~97 : Reserved for future use.

98 : Man down emergency status (For portable).

99 : Emergency Status.

Note : Remote stun works with DTMF D.B.D. 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 Messase (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 4 received messages can be stored in the stack memory. In the Stack Mode, 3-digit LCD indicates the received Short Message as "M01"~"M04".

■ Long Message (Optional)

A maximum of 1024 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.)

• FleetSync™ Baud Rate

MSK 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.

• Message Mode Timer

Message Mode Timer is a delay timer returning from message/stack mode to Normal mode.

• Status/Short/Long Message on Data Group

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

OPERATING FEATURES

- **Status/Short/Unit ID Message Serial Output (Option)**

Whether a received Status/Short message or PTT ID is output or not from serial port.

- **Caller ID Display**

PTT ID is displayed on LCD.

- **Call Alert (Continuous)**

The radio can provide the alert tone repeatedly until next operation.

- **PTT ID Sidetone**

This function allows a single beep sound after the PTT ID (MSK) for FleetSync™ signalling is encoded.

- **Caller ID Stack**

The radio stores the last 3 received caller IDs to volatile memory.

- **GPS Report (Optional)**

ANMEA-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**

GPS data transmission is made on the Data System/Group.

- **Received GPS Data Output**

Any selected sentence can be output through the radio serial port (COM0 or 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 System/ Group. If a radio unit receives a GTC message, it will move to the Data System/Group of the current system. Increase this item to make sure the called radio unit moves to the Data System/Group.

- **Random Access (Contention)**

When a channel (or all the repeater channels for Trunking mode) is busy, radio unit will not transmit (depending on its Busy Channel Lockout setting in conventional mode). 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 (or all the repeater channels for Trunking mode) 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.

OPERATING FEATURES

• **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. It must be set to more than 300ms if data communication is made in Trunking Mode.

7. 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.

The high tone is 1477Hz, the mid tone is 941Hz, and the low tone is 770Hz.

■ **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 and PLL unlocked. It is output until the PTT button is released. (The 697Hz tone is output.)

■ **DBD On Tone**

When a D.B.D. code is received, transpond tone sounds.

■ **DBD Off Tone**

When a D.B.D. release code is received, transpond tone sounds.

■ **Password Agreement Tone**

When the correct password is entered, the tone sounds. The optional feature's control tone can be set to yes or no.

■ **PTT Release Tone**

When you release the PTT switch, the PTT release tone sounds.

■ **Busy Tone**

Sounds in LTR mode, when you cannot use a repeater (system busy or TX inhibit). Sounds in conventional mode, when busy channel lockout is functioning. You can select yes or no for the optional feature's warning tone.

■ **Group Call Tone**

Sounds when a group call with the correct DTMF option signalling is received, repeats 7 times. You can select yes or no for the optional feature's warning tone.

■ **Individual Call Tone**

Sounds when an individual call with the correct DTMF option signalling is received. You can select yes or no for the optional feature's warning tone.

■ **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). You can select yes or no for the optional feature's control tone.

■ **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). You can select yes or no for the optional feature's control tone.

■ **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. You can select yes or no for the optional feature's control tone.

■ **Key Input Error Tone**

Sounds when a key is pressed but that key cannot be used. You can select yes or no for the optional feature's warning tone.

■ **Roll Over Tone**

Sounds at the smallest system/group. You can select yes or no for the optional feature's control tone.

■ **Transpond Tone**

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

■ **Intercept Tone**

This tone indicates that the transceiver is out of range. It indicates that the PTT button is pressed, and transmission has started, but the repeater cannot be connected and talking is not possible. It is output until the PTT button is released. (The mid tone and low tone are output alternately in 200ms intervals.)

■ **Delay Tone**

This tone is output when the PTT button is pressed and the repeater is accessed three times or more to indicate connection with the repeater is delayed. This tone is the same as the busy tone. (It is not output of clear to talk has been set to yes.)

OPERATING FEATURES / REALIGNMENT

■ Proceed Tone

This tone is output when the PTT button is pressed, transmission starts, and the repeater is connected to indicate that the user can talk if the clear to talk function has been set. (The high tone is output for 100ms.)

■ Queue Tone

This tone is output until the auto TEL function is set and the TEL channel is accepted successfully. (The mid tone on for 50ms, off for 50ms, and on for 50ms in 1 second intervals.)

■ Deny Tone

This tone is output if the auto TEL function is set, the queue tone is output, but the TEL channel cannot be accessed within 60 seconds. It is similar to the intercept tone. (The mid tone and low tone are output alternately in 150ms intervals.)

■ Free System Ringback Mode Tone, System Search Mode Tone

This tone indicates that the transceiver is free system ringback mode or system search mode. (The mid tone is output for 400ms.)

■ Ringing Tone

This tone indicates that the transceiver can use the repeater in free system ringback mode. (The mid tone and low tone are output eight cycles alternately in 50ms intervals.)

■ System Search Tone

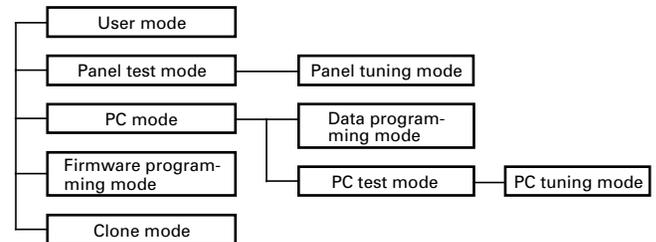
Sounds when the system changes during system search. You can select yes or no for the optional feature's warning tone.

■ System Search End Tone

Sounds when a possible connection to a repeater in system search is not made. You can select yes or no for the optional feature's warning tone.

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 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.

2. How to Enter Each Mode

Mode	Operation
User mode	Power ON
Panel test mode	[A]+Power ON (Two seconds)
PC mode	Received commands from PC
Panel tuning mode	[Panel test mode]+[SCN]
Firmware programming mode	[SCN]+Power ON (Two seconds)
Clone mode	[C]+Power ON (Two seconds)

3. Panel Test Mode

Setting method refer to ADJUSTMENT.

4. Panel Tuning Mode

Setting method refer to ADJUSTMENT.

REALIGNMENT

5. PC Mode

5-1. Preface

The transceiver is programmed by using a personal computer, programming interface (KPG-46) and programming software (KPG-49D).

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 transceiver to the personal computer with the interface cable.
2. When the Power switch on, user mode can be entered immediately. When PC sends command the 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 transceiver 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 transceiver to the computer. It has a circuit in its D-subconnector (25-pin) case that converts the RS-232C logic level to the TTL level.

The KPG-46 connects the modular microphone jack of the Transceiver to the computers RS-232C serial port.

5-4. Programming Software Description

The KPG-49D programming disk is supplied in 3-1/2" disk format. The software on this disk allows a user to program the transceiver radio via programming interface cable (KPG-46).

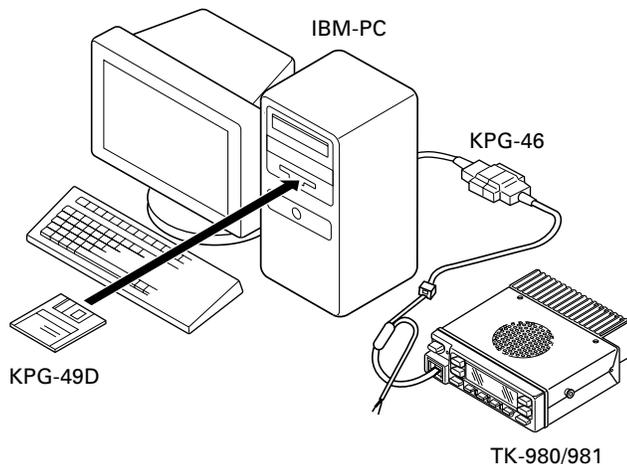


Fig. 1

5-5. Programming With IBM PC

If data is transferred to the transceiver from an IBM PC with the KPG-49D, 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-49D instruction manual parts No. : B62-1096-XX.

6. Firmware Programming Mode

6-1. Preface

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

6-2. Connection Procedure

Connect the transceiver to the personal computer (IBM PC or compatible) with the interface cable (KPG-46). (Connection is the same as in the PC Mode.)

6-3. Programming

1. Start up the programming software (KPG-49D), select "firmware program" in the "Program" item, and press the Return key on the personal computer. This starts up the firmware programmer.
2. The top screen is displayed. Press any key to advance to the next screen.
3. Set the communications speed (normally, 57600 bps) and communications port in the Setup item.
4. Set the firmware to be updated by File select (=F1).
5. Turn the transceiver Power ON with the [SCN] switch held down. Hold the switch down for two seconds until the display changes to "PROG 57600". When "PROG 57600" appears, release your finger from the switch.
6. Check the connection between the transceiver and the personal computer, and make sure that the transceiver is in the Program mode.
7. Press F10 on the personal computer. A window opens on the display to indicate progress of writing. When the transceiver starts to receive data, the [P] icon is blinking.
8. If writing ends successfully, the LED on the transceiver lights and the checksum is displayed.
9. If you want to continue programming other transceivers, repeat steps 5 to 8.

Notes :

- To start the Firmware Programmer from KPG-49D, the Fpro path must be set up by KPG-49D setup.
- This mode cannot be entered if the Firmware programming mode is set to Disable in the Programming software (KPG-49D).
- When programming the firmware, it is recommend to copy the data from the floppy disk to your hard disk before update the radio firmware.
Directly copying from the floppy disk to the radio may not work because the access speed is too slow.

REALIGNMENT

6-4. Function

1. If you press the [MON] switch while "PROG 57600" is displayed, the checksum is displayed. If you press the [MON] switch again while the checksum 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".

Note :

Normally, write in the high-speed mode.

7. Clone Mode

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

1. Turn the master radio power ON with the [C] key held down. If the password is set to the radio, the radio displays "CLONE LOCK". If the password is not set, the radio displays "CLONE MODE".
2. When "CLONE LOCK" is displayed, only the [System up/down] key and [SCN], and [0] to [9] keys can be accepted. When you enter the correct password, and "CLONE MODE" is displayed, the radio can be used as the cloning master. The following describes how to enter the password.
3. How to enter the password with the microphone keypad. If you press a key while "CLONE LOCK" is displayed, the number that was pressed is displayed on the radio. Each press of the key shifts the display in order to the left. When you enter the password and press the [SCN] key, "CLONE MODE" is displayed if the entered password is correct. If the password is incorrect, "CLONE LOCK" is redisplayed.
How to enter the password with the [System up/down] key;
If the [System up/down] key is pressed while "CLONE LOCK" is displayed, numbers (0 to 9) are displayed flashing. When you press the [SCN] key, the currently selected number is determined, and the display shifts to the left. If you press the [SCN] key after entering the password in this procedure, "CLONE MODE" is displayed if the entered password is correct. If the password is incorrect, "CLONE LOCK" is redisplayed.
4. Power on the slave radio.
5. Connect the cloning cable (No. E30-3382-05) to the modular microphone jacks on the master and slave.

6. Press the [SCN] key on the master while the master displays "CLONE MODE". The data of the master is sent to the slave. While the slave is receiving the data, "PROGRAM" is displayed. When cloning of data is completed, the mater displays "END", and the slave automatically operates in the User mode. The slave can then be operated by the same program as the master.
7. The other slave can be continuously cloned. When the [SCN] key on the master is pressed while the master displays "END", the master displays "CLONE MODE". Carry out the operation in step 4 to 6.

Note :

Only the same models can be cloned together.

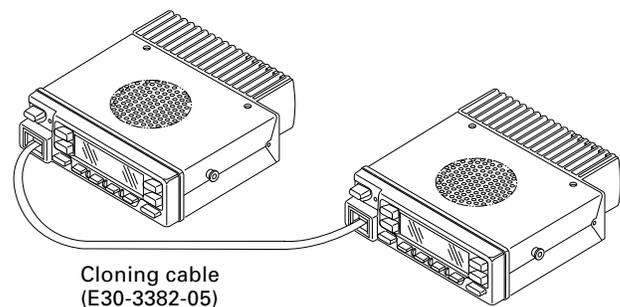


Fig. 2

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.

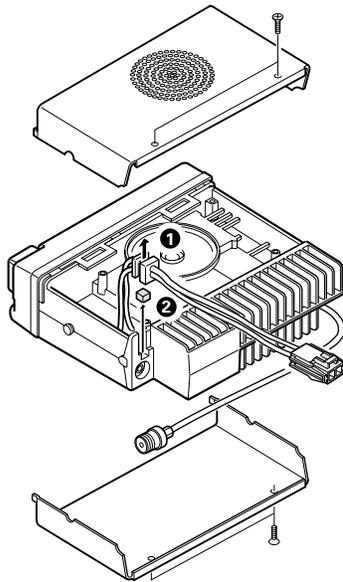


Fig. 1

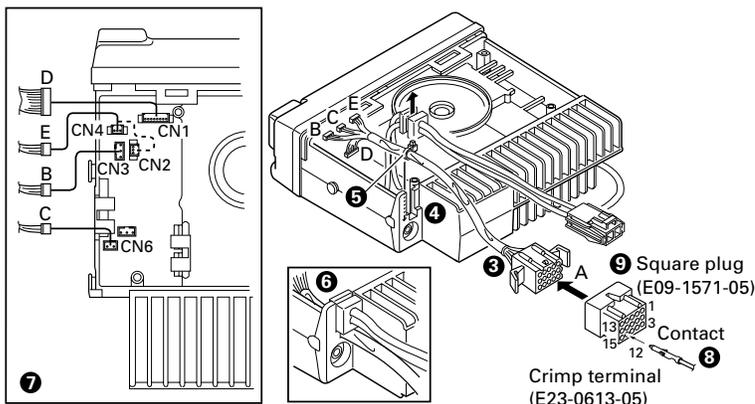


Fig. 2

1-2. Accessory Port Function

No. (A)	No. (B,C,D,E)	Name	Function	Note	
1	D-2	AHK	External hook input	*1	
		BUSY	System busy output		
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 13.6V output. Maximum 1A		
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 (Conventional)/ Logic squelch output (LTR), active low.		
12	C-1	SP	Speaker audio output.		
13	E-1	CN2 and CN4	LOK	*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	Link complete pulse output.		
		TXS	Transmitter sense output, Active high		
		FSW	Foot switch input, active low		

Note

*1 : The functions of A-1, A-2 and A-5 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.

AHK/BUSY

R64 (0Ω)	R18 (0Ω)	Function	
Yes	No	BUSY	System busy output indicates if no repeater channel is available in the currently selected LTR system when PTT is pressed, active low : Default
No	Yes	AHK	MIC hook input/RXD2 (com2).

ME/AM

R12 (0Ω)	R167 (0Ω)	Function	
Yes	No	AM	Speaker mute input, active high : Default
No	Yes	ME	MIC ground.

MI/TXS

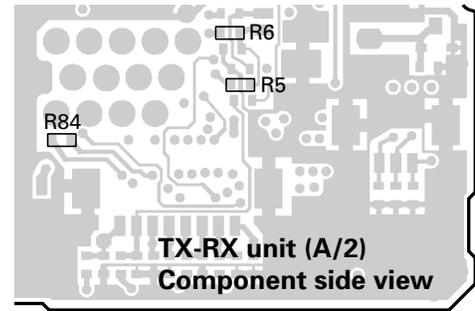
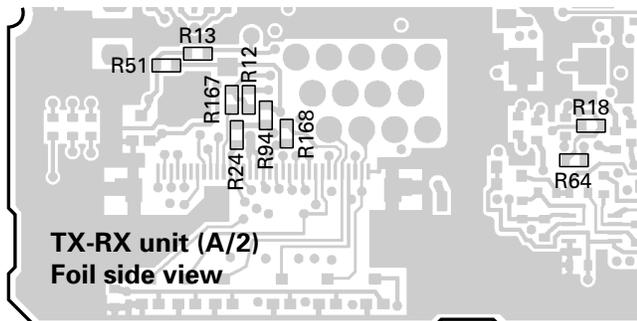
R94 (0Ω)	R24 (0Ω)	Function	
Yes	No	TXS	Transmitter sense output, active high : Default
No	Yes	MI	Internal MIC input.

LOK/AM

R5 (0Ω)	R6 (0Ω)	Function	
Yes	No	AM	Audio mute signal input.
No	Yes	LOK	Link complete pulse output : Default

DTC/LOK/TXS/FSW

R168 (0Ω)	R84 (0Ω)	R51 (0Ω)	R13 (0Ω)	Function	
No	No	No	Yes	LOK	Link complete pulse output.
Yes	No	No	No	DTC	Data control channel signal input, Data channel : low (Default)
No	No	Yes	No	TXS	Transmitter sense output, active high
No	Yes	No	No	FSW	Foot switch input, active low



Note : The following parts are not installed at the time of shipping; R5,R13,R18,R24,R51,R84,R167

2. Accessory Terminal (TX-RX Unit)

2-1. External Connector Accessory Terminal Method

Connector No.	Pin No.	Pin name	I/O	Function
CN1	1	DEO (DO)	O	Detect signal output. (Output level : 250mVrms; standard modulation)
	2	AHK (AH)	I	external hook signal input. "COM2" port must be select "AUX HOOK/PTT" / "DATA PTT" function in the KPG-49D. On hook : L, Off hook : H
		BUSY	O	System busy signal output for trunking system. No vacant repeater : L, Vacant repeater : H
3	RXD2		I	Serial data input 2. "COM2" port must be select "REM" / "DATA" / "DATA+GPS" function in the KPG-49D.
		IGN (IG)	I	Ignition input for KCT-18.
4	DI		I	External modulation signal input.
		ME	-	MIC earth.
5	AM		I	Audio mute signal input.
		MI	I	Internal MIC input.
6	TXS		O	Signal indicating whether the transceiver is transmitting or not. TX : H, Another : L
		PTT (PT)	I	External PTT signal input. "COM2" port must be select "AUX HOOK/PTT" / "DATA PTT" function in the KPG-49D. TX : L, Another : H
7	TXD2		O	Serial data output 2. "COM2" port must be select "REM" / "DATA" / "DATA+GPS" function in the KPG-49D.

INSTALLATION

Connector No.	Pin No.	Pin name	I/O	Function
	8	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-49D.
CN2	1	AM	I	Audio mute signal input.
		LOK	O	Access logic signal output. Active level or type can be selectable in the KPG-49D.
	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, Another : L
		FSW	I	Foot switch signal input. Foot sw on : L, Foot sw off : H
		LOK	O	Access logic signal output. Active level or type can be selectable in the KPG-49D.
CN3	1	HOR	O	Horn alert signal output. Signal output for horn relay drive (open collector). L level during horn drive : Max. sink current 100mA.
	2	E	-	Earth.
	3	SB	O	Power output after power switch (DC 13.6V±15%, 0.75A max.).
CN4	1	LOK	O	Access logic signal output. Active level or type can be selectable in the KPG-49D.
	2	RXD1	I	Serial data input 1. "COM1" port must be select "REM" / "DATA" / "GPS" / "DATA+GPS" function in the KPG-49D.
	3	TXD1	O	Serial data output 1. "COM1" port must be select "REM" / "DATA" / "GPS" / "DATA+GPS" function in the KPG-49D.
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.

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). 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	-	Switched B+, DC 13.6V output. Maximum 0.75A	SB	TX-RX (A/2)
5C	-	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	Access logic signal output. Active level or type can be selectable in the KPG-49D.	LOK	TX-RX (A/2)
OPT (EMG)	O	Option board select. Please select option board type in the KPG-49D.	OP	TX-RX (A/2)
OP1	O	Option code 1 (for voice scrambler code 1)	C1	TX-RX (A/2)
OP2	O	Option code 1 (for voice scrambler code 2)	C2	TX-RX (A/2)
OP3	O	Option code 1 (for voice scrambler code 3)	C3	TX-RX (A/2)
OP4	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-49D.	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)
ST	I	Side-tone input	ST	TX-RX (A/2)

INSTALLATION

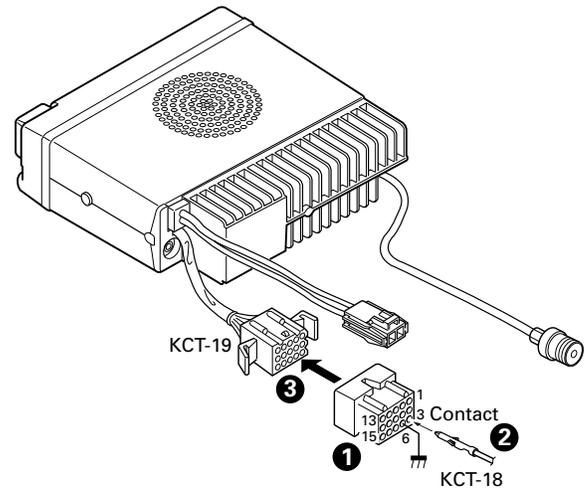
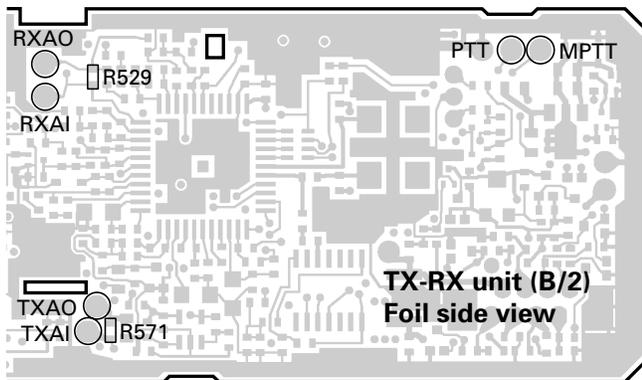
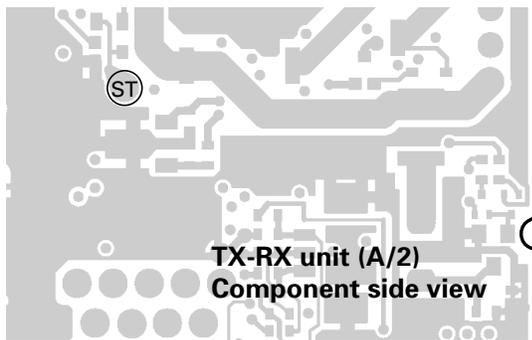
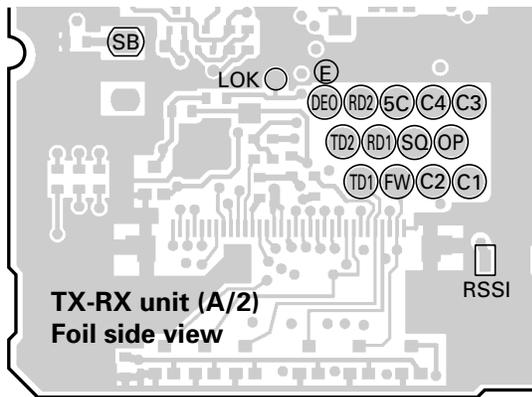


Fig. 3

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.

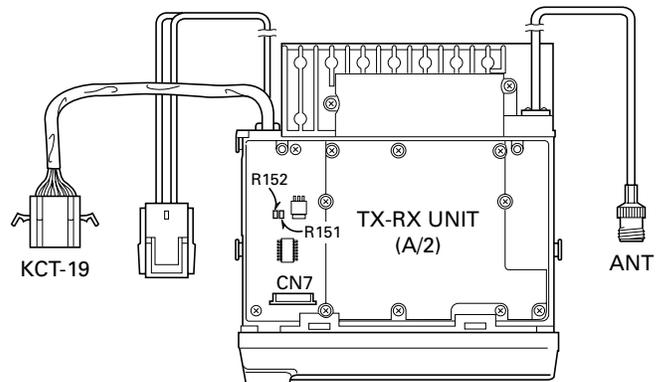


Fig. 4

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.

4-1. 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).

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

INSTALLATION

5. Connection Cable (KCT-29 : Option)

The KCT-29 connection cable kit is used to connect the TK-980/981 transceiver to the KPG-1A Modem GPS Receiver or the KPG-1B Modem GPS Controller.

5-1. Installing the KCT-29 in the transceiver

1. Remove the upper cover from the transceiver.
2. Lift the DC cord bushing (❶) from the chassis.
3. Remove the pad as shown in Figure 5 (❷).
4. Insert the KCT-29 cable (❸) into the chassis (❹). The wire harness band (❺) must be inside the chassis.
5. Replace the DC cord bushing (❻).
6. Connect the KCT-29 to the TX-RX unit (A/2) as shown in Figure 6 (❼).

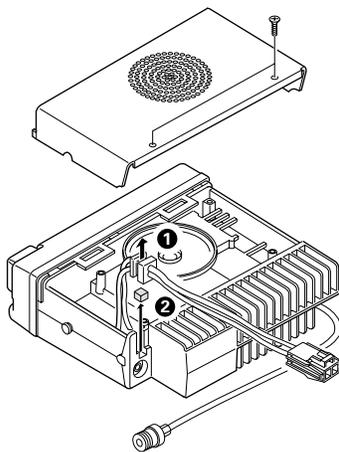


Fig. 5

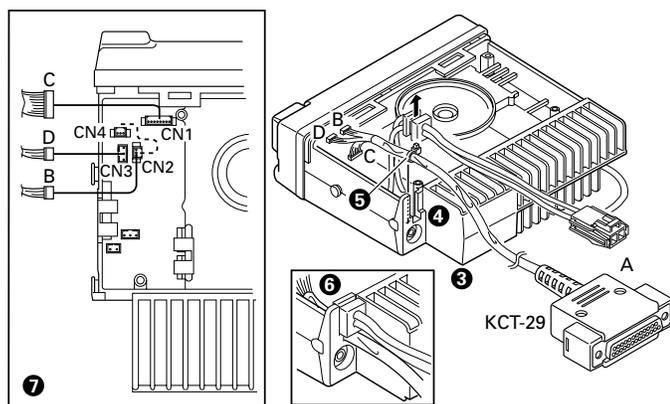


Fig. 6

6. Interface Cable (KCT-31 : Option)

The KCT-31 is a RS-232C interface cable for LMR mobile radios, TK-980/981.

The 9-pin (D-sub) connector is connected to an external RS-232C terminal. The other end of the cable is connected to the internal connector of LMR mobile radio.

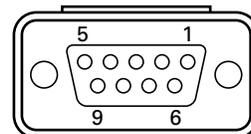
Note : You cannot write a firmware with the KCT-31.

6-1. Features

- This KCT-31 has a RS-232C-TTL level interface circuit.
- This KCT-31 does not require an external power supply.
- This KCT-31 can be used up to 9600 bps.
- Compatible with an ER terminal of DTE that has the voltage 6V or more.

6-2. Terminal function (D-sub connector)

Pin No.	I/O	Port name	Function
1	I	CD	Carrier detect
2	I	RD	Receive data
3	O	SD	Transmit data
4	O	ER	Data terminal ready
5	-	SG	Signal ground
6	I	DR	Data set ready
7	O	RS	Request to send
8	I	CS	Clear to send
9	-	CI	Ring indicator



INSTALLATION

6-3. Installing the KCT-31 in the transceiver

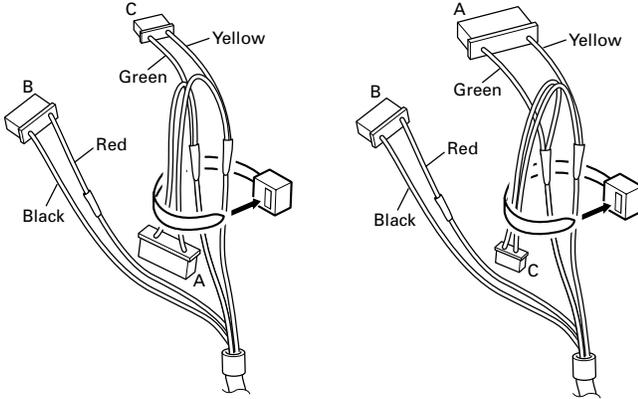
Note :

When the COM1 is used, A connector is unused.
When the COM2 is used, C connector is unused.

1. Bind the unused connector to the cable with a retaining band as shown.

When the COM1 is used.

When the COM2 is used.



	A	B	C
COM1	No	Yes	Yes
COM2	Yes	Yes	No

Fig. 7

2. Make sure the unit's power is turned off.
3. Remove the upper case of the transceiver and lift the DC cable bushing (①) from the chassis.
4. Remove the pad as shown in Figure 8 (②).

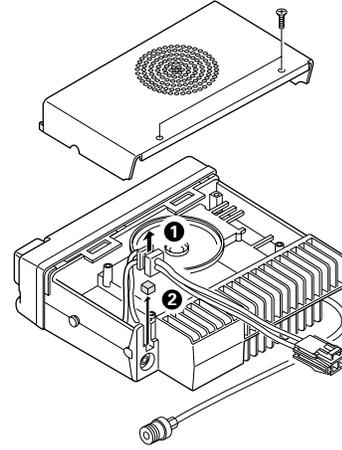


Fig. 8

5. Insert the KCT-31 cable (③) into the chassis (④).
The write retaining band (⑤) must be inside the chassis.
6. Replace the DC cable bushing (⑥).
7. Connect the KCT-31 to the TX-RX unit (A/2) as shown in Figure 9 (⑦).
8. Replace the upper case.

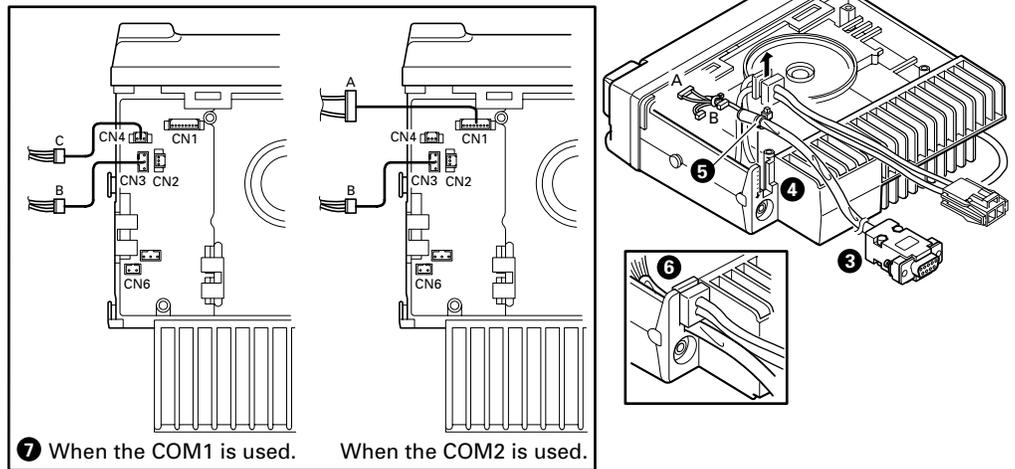


Fig. 9

Note :

- The modification must be applied to the TK-980/981 transceivers with a serial number of 30600000 or smaller when using a COM2 port. Replace the 47kΩ (R675) chip resistor on the TX-RX unit (B/2) with a 4.7kΩ resistor.

- Enable the serial port function on the terminal.
- Refer to the service manual of each radio or the help file that came with the FPU (Field Programming Unit) for details.

Original
47kΩ (RK73GB1J473J) → New
4.7kΩ (RK73GB1J472J)

INSTALLATION

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

7-1. 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 screws (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.

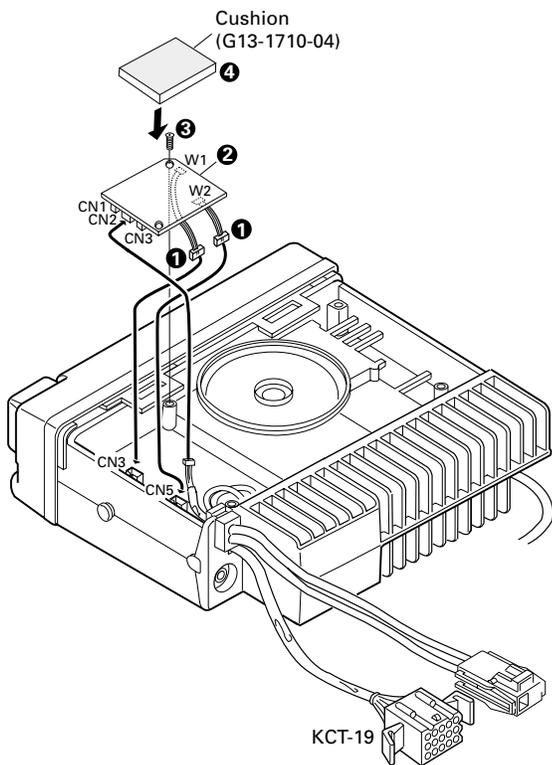


Fig. 10

7-2. 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)	Yes	
HR2	No	

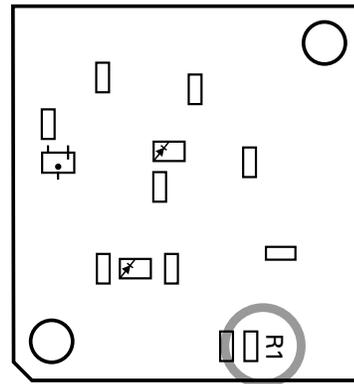


Fig. 11 KAP-1 foil side view

• 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

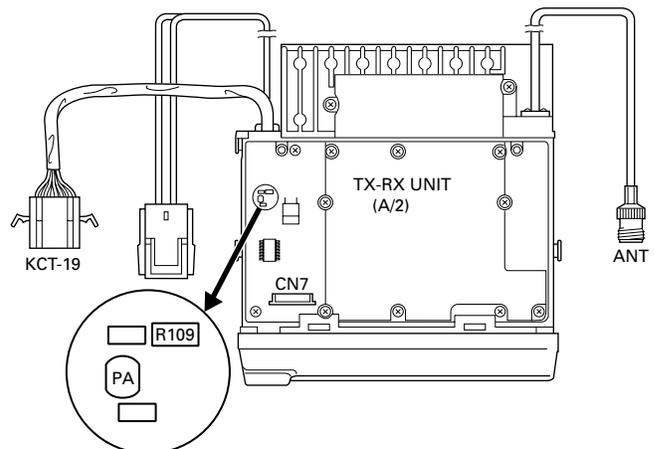


Fig. 12

INSTALLATION

• Others

If the PA and HR2 are not necessary and the speaker output is output to an external unit through the KCT-19, connect the KCT-19 C connector to CN6 on the TX-RX unit (A/2).

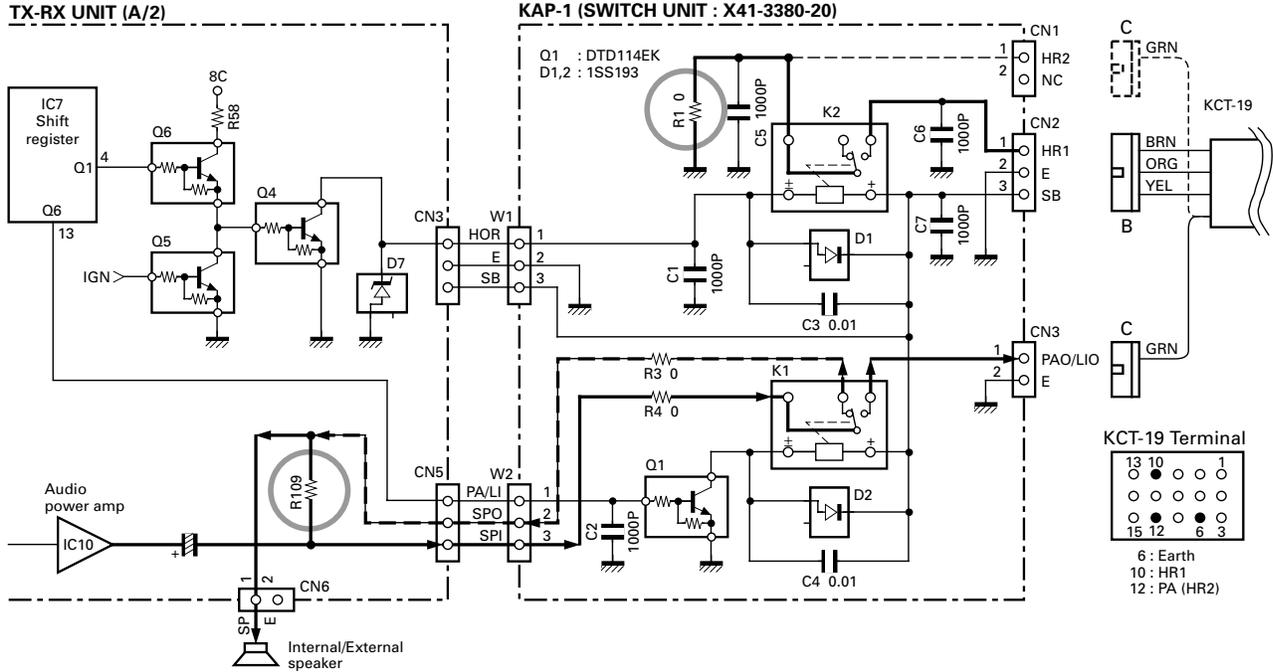


Fig. 13

8. Fitting the Control Panel Upside Down

The TK-980/981 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. 14)

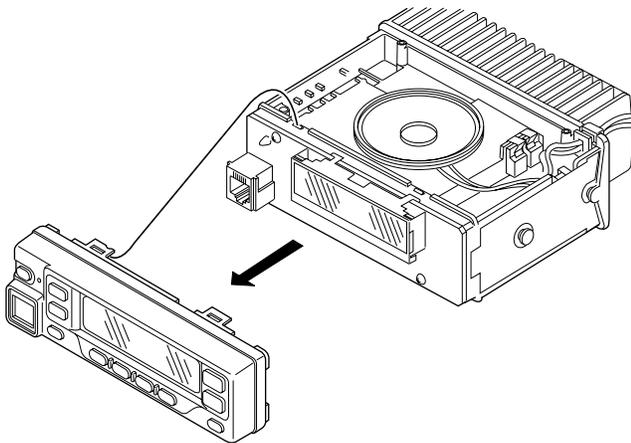


Fig. 14

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).

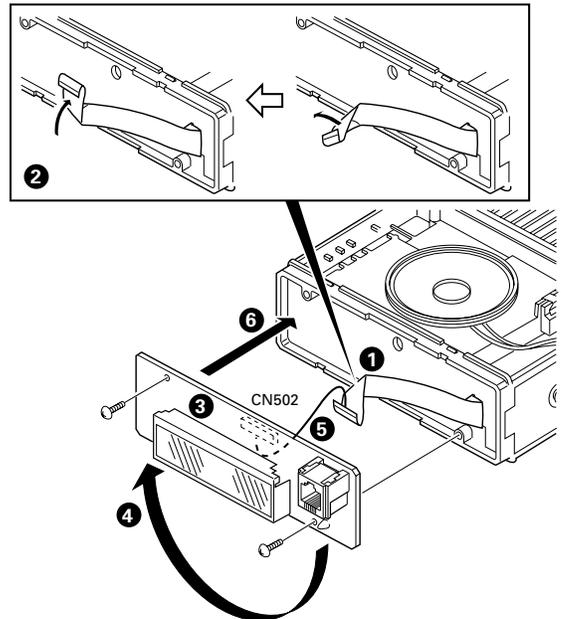


Fig. 15

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. 16)

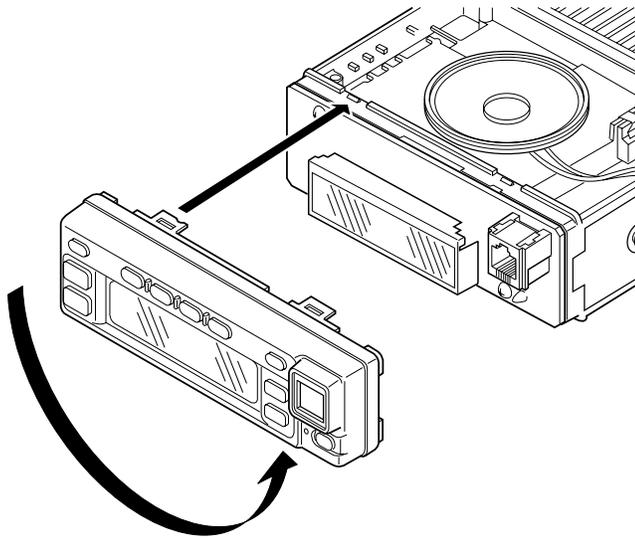


Fig. 16

9. External Speaker

9-1. 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.

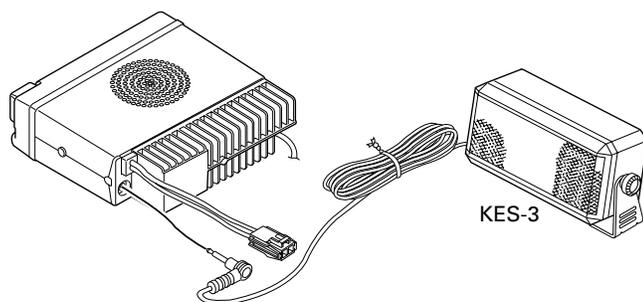


Fig. 17

9-2. 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.

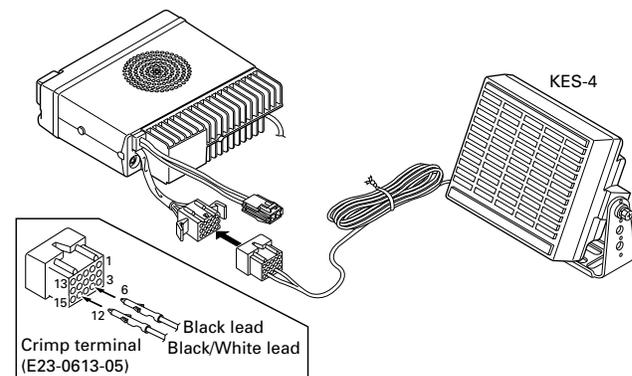


Fig. 18

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 12.5kHz 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 transmit signal frequency is generated by the PLL VCO, and modulated by the signal from the microphone. It is then amplified by TX amplifier and PA amplifier, and sent to the antenna.

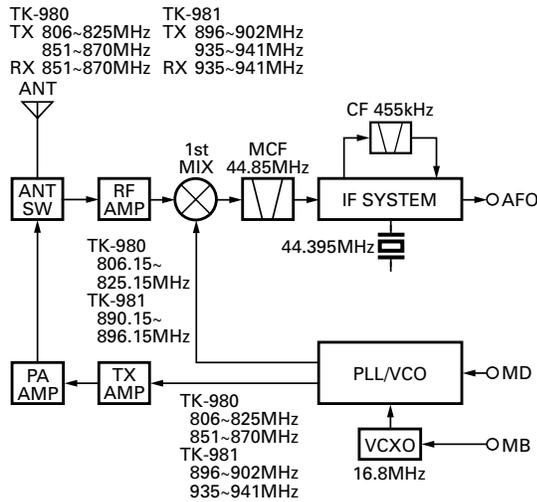


Fig. 1 Frequency configuration

Receiver System

Outline

An incoming RF signal from the antenna terminal passes through the antenna switch (D208, D209, and D210 are off) and then the bandpass filter (L203). The signal is amplified by RF amplifier Q201, and passes through the bandpass filter (L207) again. The resulting signal goes to the first mixer (Q203), where it is mixed with the first local oscillator signal output from the frequency synthesizer to produce the first IF 44.85MHz.

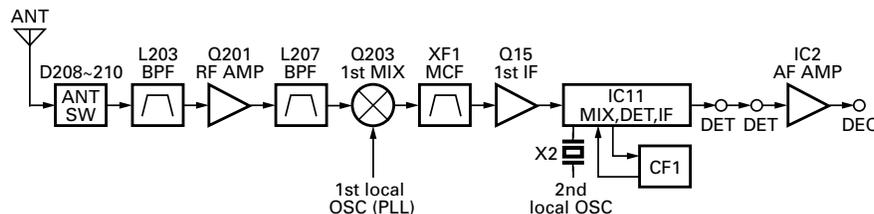


Fig. 2 Receiver system

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.

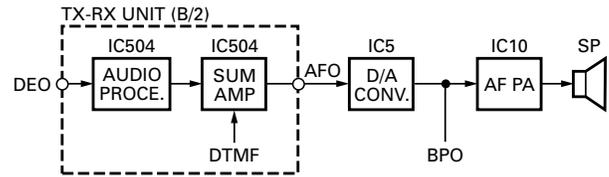


Fig. 3 AF signal system

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.

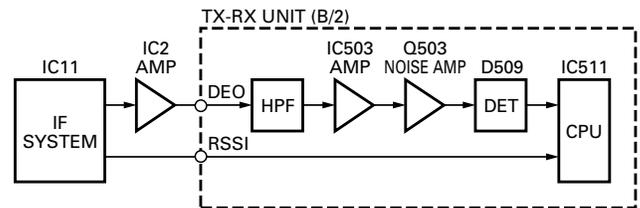


Fig. 4 Squelch circuit

CIRCUIT DESCRIPTION

Transmitter System

■ Outline

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

■ Younger-stage circuit

The signal output from the VCO is amplified by a buffer amplifier (Q7) and goes to the drive block. The younger-stage circuit provides a stable drive output without a need for adjustment. The APC circuit controls voltage in the younger final stage (Q204).

■ VCO/PLL Circuit

The TK-980/981 has a common VCO for the transmitter and the receiver in a sub-unit (A1). It is housed in a solid shielded case and connected to the TX-RX unit (A/2) through CN101. A filtered low-noise power supply is used for the VCO and varicap diodes.

The VCO is described below. It is designed so that Q101 turns on with a prescribed frequency when a reverse bias is applied to D100 and D101 by using the control voltage (CV) through CN101. The control voltage is changed by turning the trimmer capacitor (TC100). The output from Q103 is applied to the buffer amplifier (Q102) the output from Q102 is applied to the doubler (Q100) 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 Q100 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 D102 and passes through C106 and C107 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, 1.5ppm (-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.

■ Unlock Circuit

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

line goes low, the KEY line 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 line directly. When the PLL is unlocked during transmission, the PLL LD line goes low. The CPU detects this signal and makes the KEY line low. When the KEY line goes low, no voltage is applied to 8T, and no signal is transmitted.

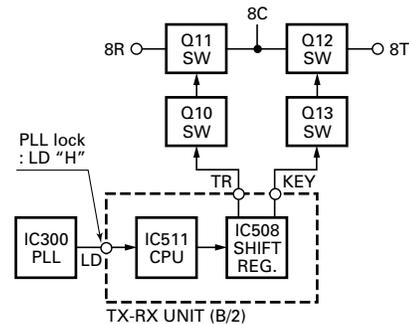


Fig. 6 Unlock circuit

■ Power Amplifier Circuit/Final

The transmit output signal from the VCO is amplified to a specified level of the power module (IC400) by the drive block (Q202, Q204). The amplified signal goes to a low-pass filter. The low-pass filter removes unwanted high-frequency harmonics. The resulting signal passes through the transmission/reception selection diode (D208), then goes to the antenna terminal.

■ APC Circuit

The direct current that flows through the final module (IC400) produces a voltage across resistors R127. This voltage is applied to pin 6 of IC13 (2/2), and is input as the reference voltage difference of pin 5 and amplified.

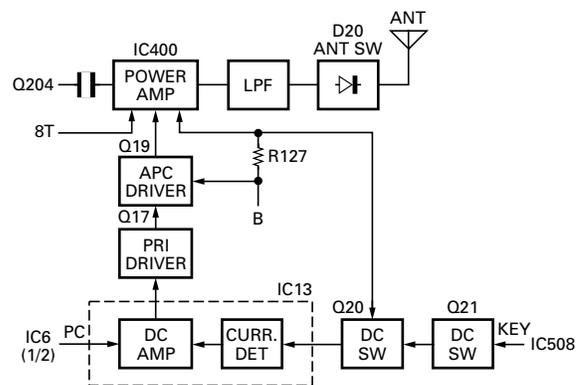


Fig. 7 APC circuit

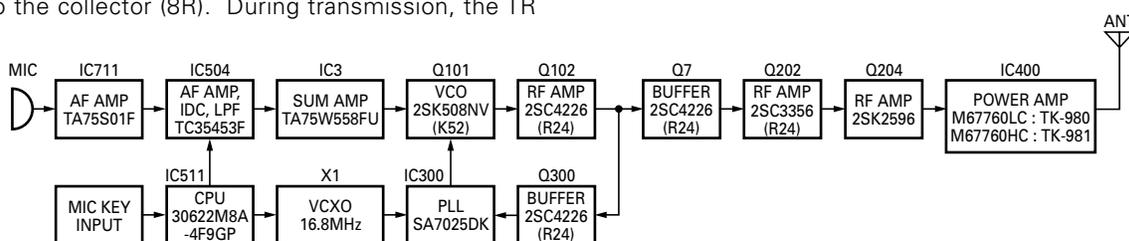


Fig. 5 Transmitter system

CIRCUIT DESCRIPTION

Control Circuit

The CPU carries out the following tasks:

- 1) Controls the shift register (IC7, IC8, IC508) AF MUTE, 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.

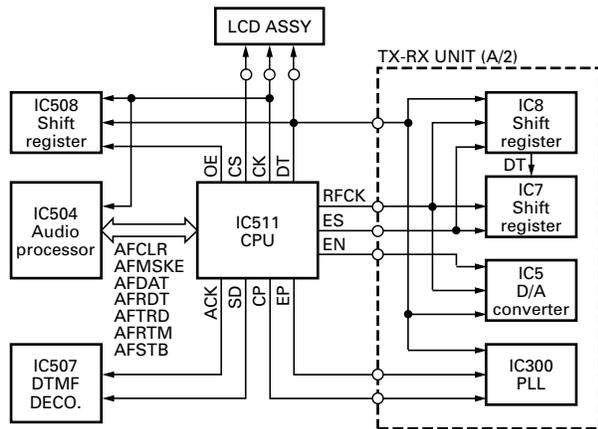


Fig. 8 Control circuit

Memory Circuit

The transceiver has a 2M-bit (256k x 8) flash ROM (IC510) and an 8k-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.

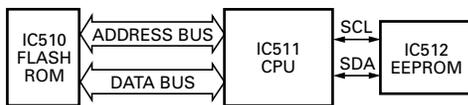


Fig. 9 Memory circuit

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 Q515 and Q513 turns on, and the key illumination LED lights. A voltage is applied to the LEDA line to turn on the LCD backlight.

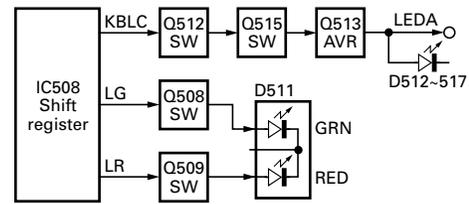


Fig. 10 Display circuit

Key Matrix Circuit

The TK-980/981 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.

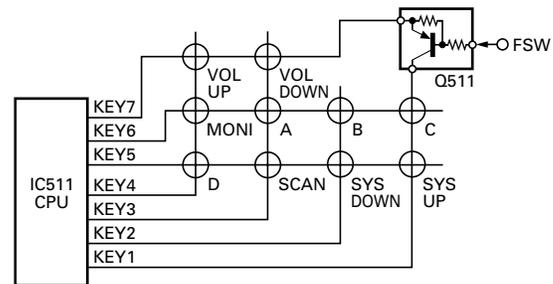


Fig. 11 Key matrix circuit

Encode

The QT, DQT, and LTR 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 signal is 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.

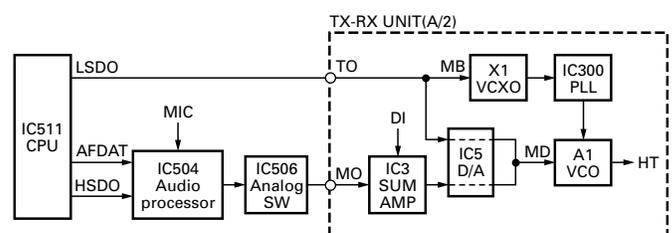


Fig. 12 Encode

CIRCUIT DESCRIPTION

■ 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, and LTR. The DTMF signal is decoded by a dedicated IC (IC507) and the resulting signal is sent to the CPU (IC511) as serial data (STD).

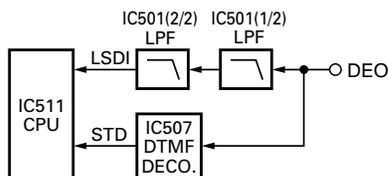


Fig. 13 Decode

■ 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)

■ 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.

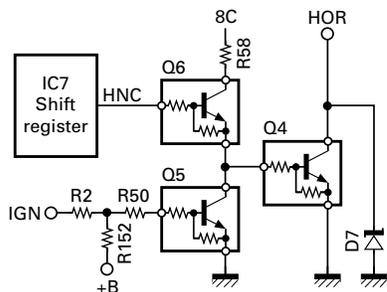


Fig. 14 Horn control

■ 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

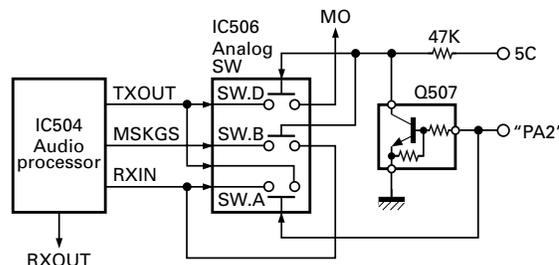


Fig. 15 PA switch

Power Supply Circuit

When the POWER switch on the TX-RX unit (B/2) 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.

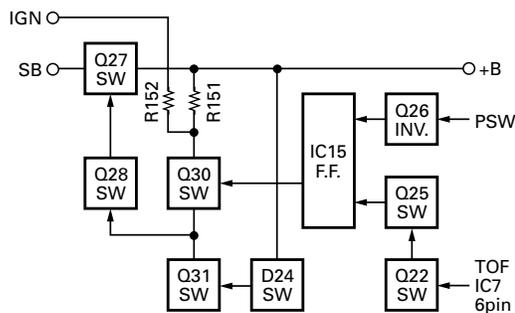


Fig. 16 Power supply circuit

SEMICONDUCTOR DATA

Microprocessor : 30622M8A-4F9GP (TX-RX Unit (B/2) IC511)

■ Terminal function

Pin No.	Name	I/O	Function	Pin No.	Name	I/O	Function
1	LSDOUT	O	Low speed data output.	36	RFCLK	O	Common clock output. (TX-RX unit A/2)
2	HSDOUT	O	High speed data output.	37	RDY	-	Not used.
3	HSDIN	I	High speed data input.	38	ALE	-	Not used.
4	DTMSTD	I	DTMF decode IC data detect input.	39	HOLD	-	Not used.
5	SELF	I	Not used.	40	HLDA	-	Not used.
6	BYTE	I	+5V.	41	BLCK	-	Not used.
7	CNVSS	I	GND.	42	RD	-	Flash memory RD bus.
8	SFTOE	O	Shift register output enable.	43	BHE	-	Not used.
9	LCDCS	O	LCD driver chip select output.	44	WR	-	Flash memory WR bus.
10	RESET	I	Microcomputer reset input.	45	DTMCLK	O	DTMF decode IC clock output.
11	XOUT	-	9.8304MHz (System clock).	46	CNTCLK	O	Common clock output. (TX-RX unit B/2)
12	VSS	-	GND.	47	EP	O	PLL IC data strobe output.
13	XIN	-	9.8304MHz (System clock).	48	CSO	O	Flash memory chip enable.
14	VCC	-	+5V.	49	A19	-	Not used.
15	IGN	I	Ignition input.	50~59	A18~A9	-	Flash memory address bus.
16	AFTRD	I	MSK modulation data output timing pulse input.	60	VCC	-	+5V.
17	AFRTM	I	MSK demodulation data input timing pulse input.	61	A8	-	Flash memory address bus.
18	MICDAT	O	MIC key data output.	62	VSS	-	GND.
19	CP	O	PLL IC clock output.	63~70	A7~A0	-	Flash memory address bus.
20	BEEP	O	Beep data output.	71~74	KEY1~KEY4	I/O	Key matrix data input/output 1~4.
21	AFRDT	I	MSK demodulation data input.	75	MINDAT	O	Common data output.
22	AFREG1	O	AF IC register switching data output 1.	76~78	KEY5~KEY7	I	Key matrix data input 5~7.
23	AFREG2	O	AF IC register switching data output 2.	79~86	D7~D0	-	Flash memory data bus.
24	EEPDAT	O	EEPROM data output.	87	DTMDAT	I	DTMF decode IC data input.
25	EN	O	D/A converter IC data strobe output.	88	AUXDTC	I	External DTC input.
26	AFCLR	O	MSK flame reset output.	89	MICBLC	O	MIC back light control output.
27	RXCOM2	I	External hook input / External serial interface input.	90	POWSW	I	Power switch input.
28	TXCOM2	I/O	External PTT input / External serial interface output.	91	ANLSQL	I	Squelch level input.
29	TXCOM1	O	External serial interface output.	92	PTT	I	PTT switch input.
30	RXCOM1	I	External serial interface input.	93	RSSI	I	Received signal strength indicator input (RSSI).
31	LD	I	PLL unlock detect input.	94	AVSS	-	GND.
32	AFMSKE	O	MSK modulation enable. (Enable active "H")	95	LSDIN	I	Low speed data input.
33	TXD	O	Serial interface output.	96	VREF	-	+5V.
34	HOOK	I	Hook input / Serial interface input.	97	AVCC	-	+5V.
35	AFDAT	O	MSK data output.	98	ES1	O	Shift register data strobe output. (TX-RX unit B/2)
				99	ES2	O	Shift register data strobe output. (TX-RX unit A/2)
				100	AFSTB	O	AF IC data strobe output.

SEMOCONDUCTOR DATA / DESCRIPTION OF COMPONENTS

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 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

■ 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	POR	Buffer amplifier and mixer switch. H : Normal, L : Power sw on (an instant)
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
5	Q2	H/L	NC
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. (Not used) H : Wide, L : Narrow
12	Q7	BUSY	Trunked system busy. H : Not busy, L : Busy
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 (X57-6520-XX) (A/2)

-10 : TK-980 -11 : TK-981

Ref. No.	Use / Function	Operation / Condition
IC1~3	Amplifier	
IC4	Switch	
IC5	D/A convert	
IC6	Amplifier	
IC7,8	Shift/store register	
IC9	5V AVR	
IC10	AF amplifier	
IC11	FM demodulation	
IC12	5V AVR	
IC13	DC amplifier	Current detect/PC
IC14	8V AVR	
IC15	Power supply logic circuit control	
IC16	9V AVR	8CL
IC300	PLL synthesizer	
IC400	Power module	RF power 15W
Q1	AF switch	
Q2	Ripple filter	

DESCRIPTION OF COMPONENTS

Ref. No.	Use / Function	Operation / Condition
Q4	DC switch	HOR
Q5	DC switch	IGN
Q6	DC switch	HOR CONT.
Q7	Buffer amplifier	
Q8,9	AF mute switch	
Q10,11	DC switch	8R
Q12,13	DC switch	8T
Q15	IF amplifier	
Q17	APC pre drive	APC
Q18	RX mute	
Q19	APC drive	APC
Q20	Current detector SW	TX on
Q21	Pre current detector SW	TX on
Q22	DC switch	TOF
Q25	DC switch	TOF
Q26	DC switch	PSW
Q27	SB switch	
Q28	DC switch	SB
Q30,31	DC switch	SB
Q32	AF switch	
Q33	DC switch	POR. Q7 SW
Q34	Thermal protection SW	
Q201	RF amplifier	Front amplifier
Q202	RF amplifier	Pre drive
Q203	Mixer	
Q204	RF amplifier	Drive
Q205	DC switch	POR. Q203 SW
Q300	RF amplifier	PLL input
Q301,302	CP	
D1~6	Surge absorption	
D7	Voltage reference	
D11	DC switch	
D16	Reverse current prevention	
D17	Surge absorption	
D18,19	RF switch	TX/RX
D20	Reverse current prevention	
D21	Voltage reference	
D24	Current protection	
D26	Reverse current prevention	
D28	Voltage reference	
D31	Reverse current prevention	
D32	Surge absorption	
D34	Voltage reference	
D35	Limiter	
D37	Reverse protection	

Ref. No.	Use / Function	Operation / Condition
D200	Limiter	Excessive input protection
D208~210	RF switch	TX/RX

TX-RX Unit (X57-6520-XX) (B/2)

-10 : TK-980 -11 : TK-981

Ref. No.	Use / Function	Operation / Condition
IC501~503	Amplifier	
IC504	Audio processor	
IC506	Analog switch	
IC507	DTMF decoder	
IC508	Shift/store register	
IC509	Reset IC	
IC510	Flash ROM	
IC511	CPU	
IC512	EEPROM	
IC513	8V AVR	
IC711	Amplifier	
Q501	MIC mute	
Q502	AF mute	
Q503	Amplifier	Noise
Q507	DC switch	PA
Q508,509	DC switch	LED
Q510	Clock shift	
Q511	DC switch	FSW
Q512	DC switch	BLC
Q513	AVR	
Q515	DC switch	Q513 SW
D501	Surge absorption	
D502	Current protection	
D503~505	Surge absorption	
D507	OR gate	MIC mute
D508,509	Limiter	
D510	Reverse current prevention	
D511~517	Light emission	
D518	Voltage reference back light	
D520	Discharge	Speed up

PLL/VCO (X58-4530-XX) -10 : TK-980 -11 : TK-981

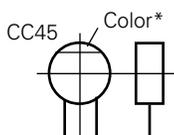
Ref. No.	Use / Function	Operation / Condition
Q100	Buffer amplifier	
Q101	VCO	
Q102	Doubler	
D100,101	VCO control	
D102	VCO modulation	

PARTS LIST

CAPACITORS

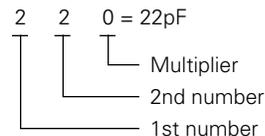
CC 45 TH 1H 220 J
 1 2 3 4 5 6

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



• Capacitor value

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



• Temperature coefficient

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

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

Example : CC45TH = -470 ± 60ppm/°C

• Tolerance (More than 10pF)

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

(Less than 10pF)

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

• Voltage rating

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

• Chip capacitors

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

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

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

(Chip) (B, F)

Refer to the table above.

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

Dimension (Chip capacitors)

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

RESISTORS

• Chip resistor (Carbon)

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

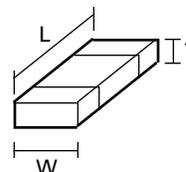
(Chip) (B,F)

• Carbon resistor (Normal type)

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

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

Dimension



Dimension (Chip resistor)

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

Rating wattage

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

PARTS LIST

* New Parts. Δ 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-980/981
TX-RX UNIT (X57-6520-XX)

Ref. No.	Address	New parts	Parts No.	Description	Desti- nation	Ref. No.	Address	New parts	Parts No.	Description	Desti- nation
TK-980/981											
1	1A		A01-2165-23	CABINET UPPER		C23			C92-0507-05	CHIP-TAN 4.7UF 6.3WV	
2	2A		A01-2166-23	CABINET LOWER		C24			CC73GCH1H101J	CHIP C 100PF J	
3	2A		A62-0991-03	PANEL ASSY		C25			C92-0507-05	CHIP-TAN 4.7UF 6.3WV	
5	1D		B09-0235-05	CAP ACC		C27			CK73GB1H102K	CHIP C 1000PF K	
6	2B		B38-0814-05	LCD ASSY		C28			CC73GCH1H220J	CHIP C 22PF J	
7	2D	*	B62-1549-00	INSTRUCTION MANUAL		C29			C92-0628-05	CHIP-TAN 10UF 10WV	
8	1C	*	B72-2047-04	MODEL NAME PLATE	TK-980	C30			CK73GB1H102K	CHIP C 1000PF K	
8	1C	*	B72-1488-24	MODEL NAME PLATE	TK-981	C31			C92-0628-05	CHIP-TAN 10UF 10WV	
10	2B	*	E23-1136-04	GROUND TERMINAL		C32			CC73GCH1H100D	CHIP C 10PF D	
11	1C		E30-3031-15	ANTENNA CABLE		C33			CK73GB1E103K	CHIP C 0.010UF K	
12	1D		E30-3339-05	DC CORD ACC		C34			C92-0568-05	CHIP-TAN 22UF 10WV	
13	1C		E30-3340-05	DC CORD		C35			CC73GCH1H101J	CHIP C 100PF J	
14	2B		E37-0789-05	FLAT CABLE CONT-TX-RX		C36			C92-0628-05	CHIP-TAN 10UF 10WV	
15	1B	*	E37-0790-25	LEAD WIRE WITH CONNECTOR SP		C37			C92-1341-05	ELECTRO 100UF 16WV	
17	2B		F20-1192-04	INSULATING SHEET		C38			C92-0507-05	CHIP-TAN 4.7UF 6.3WV	
18	1D		F51-0016-05	FUSE (6*30) 6A		C39			CK73GB1E103K	CHIP C 0.010UF K	
20	1B,1C		G02-0791-04	FLAT SPRING AF,APC,AVR		C40			CC73GCH1H101J	CHIP C 100PF J	
21	1B,1C		G10-1221-04	FIBROUS SHEET SIDE		C41			C92-0628-05	CHIP-TAN 10UF 10WV	
22	1B		G10-1222-14	FIBROUS SHEET UP,DOWN		C42			C92-0546-05	CHIP-TAN 68UF 6.3WV	
23	1A,2B		G10-1223-14	FIBROUS SHEET SHIELD CASE		C43,44			CC73GCH1H101J	CHIP C 100PF J	
24	1C		G13-1468-04	CUSHION DC CORD		C45			C92-0507-05	CHIP-TAN 4.7UF 6.3WV	
25	1B	*	G13-1873-04	CUSHION SP		C46			C92-0004-05	CHIP-TAN 1.0UF 16WV	
26	2C		G53-0796-04	PACKING PHONE JACK		C47			CC73GCH1H101J	CHIP C 100PF J	
28	3D		H10-6618-12	POLYSTYRENE FOAMED FIXTURE		C48			CK73FF1C105Z	CHIP C 1.0UF Z	
29	2E		H10-6619-12	POLYSTYRENE FOAMED FIXTURE		C49			CC73GCH1H101J	CHIP C 100PF J	
30	1D		H12-1391-03	INNER PACKING CASE ACC		C51			CC73GCH1H101J	CHIP C 100PF J	
31	1E		H25-0720-04	PROTECTION BAG (200X350)		C52			CC73GCH1H100D	CHIP C 10PF D	
32	3E		H52-1431-02	ITEM CARTON CASE	TK-980	C54			CK73GB1C104K	CHIP C 0.10UF K	
32	3E		H52-1432-02	ITEM CARTON CASE	TK-981	C55			CC73GCH1H030C	CHIP C 3.0PF C	
34	2D		J19-1584-05	HOLDER ACC		C56			CC73GCH1H101J	CHIP C 100PF J	
35	1D		J29-0627-23	BRACKET ACC		C57			CK73GB1E103K	CHIP C 0.010UF K	
37	2B		K29-5284-02	KEY TOP		C58			CC73GCH1H101J	CHIP C 100PF J	
A	1A,2A		N33-2606-45	OVAL HEAD MACHINE SCREW		C59			CC73GCH1H030C	CHIP C 3.0PF C	
B	2C		N67-3008-46	PAN HEAD SEMS SCREW W		C60			CC73GCH1H101J	CHIP C 100PF J	
C	1A,2B,1C		N87-2606-46	BRAZIER HEAD TAPTITE SCREW		C61			CK73GB1E103K	CHIP C 0.010UF K	
D	2B		N87-2612-46	BRAZIER HEAD TAPTITE SCREW		C62			CC73GCH1H030C	CHIP C 3.0PF C	
39	2D		N99-0395-05	SCREW SET ACC		C63			CK73FF1C105Z	CHIP C 1.0UF Z	
41	1B		T07-0246-05	SPEAKER		C64			CC73GCH1H101J	CHIP C 100PF J	
42	1D		T91-0621-05	MICROPHONE ACC		C65			CK73GB1C104K	CHIP C 0.10UF K	
TX-RX UNIT (X57-6520-XX) -10 : TK-980 -11 : TK-981											
D511			B30-2151-05	LED (RED/GRE)		C66			CK73GB1E103K	CHIP C 0.010UF K	
D512-517			B30-2171-05	LED (D)		C67			CC73GCH1H101J	CHIP C 100PF J	
C1-15			CC73GCH1H101J	CHIP C 100PF J		C68			CK73GB1C104K	CHIP C 0.10UF K	
C16			C92-0628-05	CHIP-TAN 10UF 10WV		C70			C92-0719-05	ELECTRO 47UF 25WV	
C18			C92-0507-05	CHIP-TAN 4.7UF 6.3WV		C71			CK73GB1C104K	CHIP C 0.10UF K	
C19			CC73GCH1H100D	CHIP C 10PF D		C72,73			CK73GB1H102K	CHIP C 1000PF K	
C20-22			CC73GCH1H101J	CHIP C 100PF J		C74			C92-0719-05	ELECTRO 47UF 25WV	
						C75			C92-0044-05	CHIP-ELE 47UF 10WV	
						C76			CK73GB1H102K	CHIP C 1000PF K	
						C77			C92-0719-05	ELECTRO 47UF 25WV	
						C78			CK73GB1E103K	CHIP C 0.010UF K	
						C79			C92-0722-05	ELECTRO 470UF 16WV	
						C80			CK73GB1C104K	CHIP C 0.10UF K	
						C83			CK73FB1H473K	CHIP C 0.047UF K	
						C84			CC73GCH1H120J	CHIP C 12PF J	TK-980
						C84			CC73GCH1H220J	CHIP C 22PF J	TK-981

PARTS LIST

TX-RX UNIT (X57-6520-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
C85			CK73GB1H102K	CHIP C 1000PF K		C173			CK73GB1E103K	CHIP C 0.010UF K	
C87			CC73GCH1H101J	CHIP C 100PF J		C174			C92-0585-05	CHIP-TAN 4.7UF 16WV	
C88			CK73GB1E103K	CHIP C 0.010UF K		C175			CC73GCH1H101J	CHIP C 100PF J	
C89			CK73GB1H471K	CHIP C 470PF K		C176			CC73GCH1H470J	CHIP C 47PF J	TK-980
C90			CK73GB1H102K	CHIP C 1000PF K		C176			CC73GCH1H101J	CHIP C 100PF J	TK-981
C91,92			CK73GB1E103K	CHIP C 0.010UF K		C177			C92-0519-05	CHIP-TAN 1.0UF 25WV	
C94			CK73GB1H471K	CHIP C 470PF K		C178			CC73GCH1H470J	CHIP C 47PF J	TK-980
C96			CC73GCH1H180J	CHIP C 18PF J		C179			CC73GCH1H101J	CHIP C 100PF J	TK-981
C97			CK73GB1H102K	CHIP C 1000PF K		C195-198			CK73GB1H102K	CHIP C 1000PF K	
C98			CC73GCH1H150J	CHIP C 15PF J		C207			CC73GCH1H101J	CHIP C 100PF J	
C99			CK73GB1H102K	CHIP C 1000PF K		C209			CC73GCH1H101J	CHIP C 100PF J	
C100			C92-0628-05	CHIP-TAN 10UF 10WV	TK-980	C210			CC73GCH1H030C	CHIP C 3.0PF C	
C102			CC73GCH1H270J	CHIP C 27PF J		C211			CC73GCH1H101J	CHIP C 100PF J	
C103			CK73GB1C104K	CHIP C 0.10UF K		C212			CC73GCH1H050C	CHIP C 5.0PF C	
C104			CK73GB1E103K	CHIP C 0.010UF K		C213			CC73GCH1H010B	CHIP C 1.0PF B	
C105			C92-0004-05	CHIP-TAN 1.0UF 16WV		C214,215			CC73GCH1H101J	CHIP C 100PF J	
C106			CK73GB1H102K	CHIP C 1000PF K		C216			CC73GCH1H010B	CHIP C 1.5PF B	TK-981
C107			C92-0628-05	CHIP-TAN 10UF 10WV		C216			CC73GCH1H1R5B	CHIP C 1.5PF B	TK-980
C108			CK73GB1C104K	CHIP C 0.10UF K		C217			CK73GB1H102K	CHIP C 1000PF K	
C109,110			CK73GB1H102K	CHIP C 1000PF K		C218			CC73GCH1H101J	CHIP C 100PF J	
C111			CC73GCH1H101J	CHIP C 100PF J		C219			CC73GCH1H110J	CHIP C 11PF J	TK-980
C112			CK73GB1H102K	CHIP C 1000PF K		C219			CC73GCH1H120J	CHIP C 12PF J	TK-981
C113			CK73GB1E103K	CHIP C 0.010UF K		C220			CC73GCH1H101J	CHIP C 100PF J	
C114			C92-0543-05	CHIP-TAN 3.3UF 10WV		C221			CK73GB1H102K	CHIP C 1000PF K	
C115			CK73GB1H102K	CHIP C 1000PF K		C222			CC73GCH1H101J	CHIP C 100PF J	
C116			C92-0507-05	CHIP-TAN 4.7UF 6.3WV		C224			CK73GB1H102K	CHIP C 1000PF K	
C117			CK73GB1E103K	CHIP C 0.010UF K		C227			CK73GB1H103K	CHIP C 0.010UF K	
C118			CK73GB1C104K	CHIP C 0.10UF K		C228			CK73GB1H102K	CHIP C 1000PF K	
C121			C92-0543-05	CHIP-TAN 3.3UF 10WV		C229			CK73GB1H103K	CHIP C 0.010UF K	
C123			CK73GB1C104K	CHIP C 0.10UF K		C234			CC73GCH1H101J	CHIP C 100PF J	
C124,125			CK73GB1H102K	CHIP C 1000PF K		C235			CC73GCH1H080D	CHIP C 8.0PF D	
C126			CK73GB1C104K	CHIP C 0.10UF K		C236			CC73GCH1H101J	CHIP C 100PF J	
C127			CK73GB1E103K	CHIP C 0.010UF K		C240			CK73GB1E103K	CHIP C 0.010UF K	
C128,129			CC73GCH1H470J	CHIP C 47PF J		C245			CC73GCH1H101J	CHIP C 100PF J	
C131			CC73GCH1H101J	CHIP C 100PF J		C246			C92-0001-05	CHIP C 0.1UF 35WV	
C132			CK73GB1C104K	CHIP C 0.10UF K		C247			CC73GCH1H101J	CHIP C 100PF J	
C134			CK73FB1C224K	CHIP C 0.22UF K		C249			CC73GCH1H100D	CHIP C 10PF D	
C136			CK73FB1C224K	CHIP C 0.22UF K		C251			CC73GCH1H050C	CHIP C 5.0PF C	TK-981
C137			CK73GB1H471K	CHIP C 470PF K		C251			CC73GCH1H060D	CHIP C 6.0PF D	TK-980
C142,143			CK73GB1H471K	CHIP C 470PF K		C252			CK73GB1H102K	CHIP C 1000PF K	
C144			CK73GB1H102K	CHIP C 1000PF K		C253			CC73FCH1H080D	CHIP C 8.0PF D	TK-981
C150			CC73GCH1H220J	CHIP C 22PF J		C253			CC73FCH1H100D	CHIP C 10PF D	TK-980
C151			CK73GB1H102K	CHIP C 1000PF K		C255			CC73FCH1H040C	CHIP C 4.0PF C	TK-981
C152			C92-0777-05	ELECTRO 1000UF 25WV		C255			CC73FCH1H060D	CHIP C 6.0PF D	TK-980
C153			CC73GCH1H100D	CHIP C 10PF D		C256			CK73GB1H102K	CHIP C 1000PF K	
C155			CK73GB1H102K	CHIP C 1000PF K		C257			C92-0719-05	ELECTRO 47UF 25WV	
C156			CK73GB1E103K	CHIP C 0.010UF K		C258			CK73GB1C104K	CHIP C 0.10UF K	
C157			CK73GB1C104K	CHIP C 0.10UF K		C259			C92-0719-05	ELECTRO 47UF 25WV	
C158,159			CC73GCH1H040C	CHIP C 4.0PF C		C260			CK73GB1H102K	CHIP C 1000PF K	
C160			CK73GB1C104K	CHIP C 0.10UF K		C261			CK73GB1C104K	CHIP C 0.10UF K	
C161			CC73GCH1H101J	CHIP C 100PF J		C262			C92-0719-05	ELECTRO 47UF 25WV	
C162			C92-0585-05	CHIP-TAN 4.7UF 16WV		C263			CK73GB1H102K	CHIP C 1000PF K	
C164			CK73GB1H471K	CHIP C 470PF K		C264			CK73GB1C104K	CHIP C 0.10UF K	
C166			CK73GB1C104K	CHIP C 0.10UF K		C265			C93-0550-05	CHIP C 1.0PF C	
C167			CC73GCH1H100D	CHIP C 10PF D		C266			C93-0552-05	CHIP C 2.0PF C	TK-981
C168			CC73GCH1H080D	CHIP C 8.0PF D		C266			C93-0553-05	CHIP C 3.0PF C	TK-980
C169			CK73GB1H102K	CHIP C 1000PF K		C267			C93-0568-05	CHIP C 47PF J	
C170			CC73GCH1H050C	CHIP C 5.0PF C		C268			CC73FCH1H010C	CHIP C 1.0PF C	TK-981
C171			CC73GCH1H101J	CHIP C 100PF J		C268			CC73FCH1H470J	CHIP C 47PF J	TK-980
C172			CK73GB1C104K	CHIP C 0.10UF K		C269			C93-0560-05	CHIP C 10PF D	

PARTS LIST

TX-RX UNIT (X57-6520-XX)

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation	Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
C271			C93-0550-05	CHIP C 1.0PF C		C531			CK73GB1H562K	CHIP C 5600PF K	
C272			CC73GCH1H010C	CHIP C 1.0PF C		C533			CK73GB1H562K	CHIP C 5600PF K	
C273			C93-0552-05	CHIP C 2.0PF C	TK-981	C535			CK73GB1H102K	CHIP C 1000PF K	
C273			C93-0553-05	CHIP C 3.0PF C	TK-980	C536			CC73GCH1H030C	CHIP C 3.0PF C	
C274			CC73GCH1H221J	CHIP C 220PF J		C537			CK73GB1H272K	CHIP C 2700PF K	
C275			C92-0002-05	CHIP-TAN 0.22UF 35WV		C539			CK73GB1H272K	CHIP C 2700PF K	
C276			C92-0657-05	CHIP-TAN 2.2UF 20WV	TK-981	C540			CC73GCH1H271J	CHIP C 270PF J	
C276			C92-0754-05	CHIP-TAN 4.7UF 20WV	TK-980	C541			CC73GCH1H151J	CHIP C 150PF J	
C284-286			CC73GCH1H470J	CHIP C 47PF J		C542			CC73GCH1H271J	CHIP C 270PF J	
C289			CK73GB1E103K	CHIP C 0.010UF K		C543			CK73GB1H272K	CHIP C 2700PF K	
C303			C92-0565-05	CHIP-TAN 6.8UF 10WV		C544			CC73GCH1H030C	CHIP C 3.0PF C	
C304			CC73GCH1H101J	CHIP C 100PF J		C545			CK73GB1H102K	CHIP C 1000PF K	
C306			CC73GCH1H101J	CHIP C 100PF J		C546			CK73GB1H122K	CHIP C 1200PF K	
C307			CK73GB1H103K	CHIP C 0.010UF K		C547			CK73GB1H102K	CHIP C 1000PF K	
C308			CC73GCH1H2R5B	CHIP C 2.5PF B		C548			C92-0712-05	CHIP-TAN 22UF 6.3WV	
C309			CC73GCH1H010B	CHIP C 1.0PF B		C549			CK73GB1C104K	CHIP C 0.10UF K	
C310			CC73GCH1H1R5B	CHIP C 1.5PF B	TK-981	C550			CC73GCH1H101J	CHIP C 100PF J	
C310			CC73GCH1H2R5B	CHIP C 2.5PF B	TK-980	C552			CK73GB1C333K	CHIP C 0.033UF K	
C313			CC73GCH1H101J	CHIP C 100PF J		C553			CK73GB1H472K	CHIP C 4700PF K	
C314			C92-0001-05	CHIP C 0.1UF 35WV	TK-980	C554-558			CK73GB1C104K	CHIP C 0.10UF K	
C314			C92-0503-05	CHIP C 0.068UF 35WV	TK-981	C559			CK73GB1H102K	CHIP C 1000PF K	
C315			CK73GB1C104K	CHIP C 0.10UF K		C560			C92-0507-05	CHIP-TAN 4.7UF 6.3WV	
C317			CC73GCH1H101J	CHIP C 100PF J		C561			CK73GB1H102K	CHIP C 1000PF K	
C318,319			CK73GB1C104K	CHIP C 0.10UF K		C562,563			CK73GB1H472K	CHIP C 4700PF K	
C320			C92-0003-05	CHIP-TAN 0.47UF 25WV	TK-981	C564			CK73GB1E223K	CHIP C 0.022UF K	
C320			C92-0519-05	CHIP-TAN 1.0UF 25WV	TK-980	C565			CK73GB1H102K	CHIP C 1000PF K	
C321			CC73GCH1H040C	CHIP C 4.0PF C		C566			CC73GCH1H101J	CHIP C 100PF J	
C322			C92-0003-05	CHIP-TAN 0.47UF 25WV	TK-981	C567			CK73GB1E223K	CHIP C 0.022UF K	
C322			C92-0519-05	CHIP-TAN 1.0UF 25WV	TK-980	C568			C92-0712-05	CHIP-TAN 22UF 6.3WV	
C325			C92-0003-05	CHIP-TAN 0.47UF 25WV	TK-981	C569			CC73GCH1H470J	CHIP C 47PF J	
C325			C92-0519-05	CHIP-TAN 1.0UF 25WV	TK-980	C570			CK73GB1C104K	CHIP C 0.10UF K	
C326			CK73FB1C154K	CHIP C 0.15UF K		C571			CK73GB1H102K	CHIP C 1000PF K	
C327			CC73GCH1H101J	CHIP C 100PF J		C572			CK73FB1H563K	CHIP C 0.056UF K	
C328			CK73GB1H471K	CHIP C 470PF K		C574			CK73GB1C104K	CHIP C 0.10UF K	
C330			CC73FCH1H101J	CHIP C 100PF J		C575			CK73FB1C334K	CHIP C 0.33UF K	
C437			CK73GB1H102K	CHIP C 1000PF K		C576			CK73GB1C473K	CHIP C 0.047UF K	
C438			CC73GCH1H220J	CHIP C 22PF J		C577			CK73GB1C104K	CHIP C 0.10UF K	
C501			CK73GB1H471K	CHIP C 470PF K		C578			CK73GB1H103K	CHIP C 0.010UF K	
C503,504			CK73GB1H471K	CHIP C 470PF K		C579			CK73GB1H472K	CHIP C 4700PF K	
C505			CK73GB1C683K	CHIP C 0.068UF K		C580			CK73GB1H102K	CHIP C 1000PF K	
C506			CK73GB1E123K	CHIP C 0.012UF 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	
C512			CK73GB1H471K	CHIP C 470PF K		C593			CK73GB1H103K	CHIP C 0.010UF K	
C513			CK73GB1H102K	CHIP C 1000PF K		C594,595			CC73GCH1H270J	CHIP C 27PF J	
C514			CK73GB1H152K	CHIP C 1500PF K		C596			CC73GCH1H680J	CHIP C 68PF J	
C515			CK73GB1C104K	CHIP C 0.10UF K		C597			CK73GB1H103K	CHIP C 0.010UF K	
C516,517			CK73GB1H103K	CHIP C 0.010UF K		C598,599			CC73GCH1H101J	CHIP C 100PF J	
C518			CK73GB1H102K	CHIP C 1000PF K		C600,601			CK73GB1H102K	CHIP C 1000PF K	
C519			C92-0507-05	CHIP-TAN 4.7UF 6.3WV		C602			CK73GB1H103K	CHIP C 0.010UF K	
C520			CC73GCH1H121J	CHIP C 120PF J		C603			CK73GB1C104K	CHIP C 0.10UF K	
C521,522			CK73GB1C104K	CHIP C 0.10UF K		C604			C92-0560-05	CHIP-TAN 10UF 6.3WV	
C523			CK73GB1H103K	CHIP C 0.010UF K		C605			CK73GB1H102K	CHIP C 1000PF K	
C524			CK73GB1C104K	CHIP C 0.10UF K		C606			CK73GB1H472K	CHIP C 4700PF K	
C525			CK73GB1H103K	CHIP C 0.010UF K		C607			CK73GB1C104K	CHIP C 0.10UF K	
C526			CK73GB1C104K	CHIP C 0.10UF K		C608			CK73GB1H392K	CHIP C 3900PF K	
C527			CK73GB1C333K	CHIP C 0.033UF K		C609,610			CK73GB1H103K	CHIP C 0.010UF K	
C528			CK73GB1H102K	CHIP C 1000PF K		C612			CK73GB1H103K	CHIP C 0.010UF K	
C529			CK73GB1H562K	CHIP C 5600PF K		C613			C92-0606-05	CHIP-TAN 4.7UF 10WV	

PARTS LIST

TX-RX UNIT (X57-6520-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
C614			CK73GB1H102K	CHIP C 1000PF K		L224			L34-1306-15	AIR-CORE COIL	
C616			CK73GB1H102K	CHIP C 1000PF K		L225			L92-0179-05	FERRITE CHIP	
C617			CC73GCH1H101J	CHIP C 100PF J		L226			L40-1078-94	SMALL FIXED INDUCTOR (10NH)	
C620			CC73GCH1H101J	CHIP C 100PF J		L229			L34-1308-15	AIR-CORE COIL	
C622,623			CK73GB1H102K	CHIP C 1000PF K		L300			L40-1563-92	SMALL FIXED INDUCTOR (1.5NH)	
C624			CC73GCH1H101J	CHIP C 100PF J		L301			L40-3963-92	SMALL FIXED INDUCTOR (3.9NH)	TK-981
C625			CK73GB1H102K	CHIP C 1000PF K		L301			L40-4763-92	SMALL FIXED INDUCTOR (4.7NH)	TK-980
C626			CC73GCH1H101J	CHIP C 100PF J		L303,304			L40-2763-92	SMALL FIXED INDUCTOR (2.7NH)	
C627			CK73GB1H102K	CHIP C 1000PF K		L305			L92-0179-05	FERRITE CHIP	
C628			CC73GCH1H101J	CHIP C 100PF J		L501-508			L92-0138-05	FERRITE CHIP	
C630			CK73GB1H102K	CHIP C 1000PF K		X1			L77-1882-05	VCXO (16.8MHZ)	
C631-634			CC73GCH1H101J	CHIP C 100PF J		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 (9.8304MHZ)	
C718			C92-0712-05	CHIP-TAN 22UF 6.3WV		XF1			L71-0525-05	MCF (5KHZ)	TK-980
C720			CC73GCH1H470J	CHIP C 47PF J		XF1			L71-0583-05	MCF (3.75KHZ)	TK-981
C722,723			CC73GCH1H221J	CHIP C 220PF J		CP501			R90-0724-05	MULTI-COMP 1K X4	
C726			CK73GB1C104K	CHIP C 0.10UF K		R1			RK73GB1J102J	CHIP R 1.0K J 1/16W	
C728			C92-0772-05	CHIP-TAN 10UF 6.3WV		R2			R92-1252-05	CHIP R 0 OHM J 1/16W	
CN1			E40-5737-05	PIN ASSY		R3			RK73GB1J101J	CHIP R 100 J 1/16W	
CN2			E40-5738-05	PIN ASSY		R4			RK73GB1J102J	CHIP R 1.0K J 1/16W	
CN3			E40-3247-05	PIN ASSY		R6,7			R92-1252-05	CHIP R 0 OHM J 1/16W	
CN4			E40-5738-05	PIN ASSY		R8			RK73GB1J102J	CHIP R 1.0K J 1/16W	
CN5			E40-3247-05	PIN ASSY		R9			R92-1252-05	CHIP R 0 OHM J 1/16W	
CN6			E40-3246-05	PIN ASSY		R10,11			RK73GB1J102J	CHIP R 1.0K J 1/16W	
CN7			E40-5982-05	FLAT CABLE CONNECTOR		R12			R92-1252-05	CHIP R 0 OHM J 1/16W	
CN501			E40-5823-05	FLAT CABLE CONNECTOR		R14			RK73GB1J473J	CHIP R 47K J 1/16W	
CN502			E40-5982-05	FLAT CABLE CONNECTOR		R15			RK73GB1J103J	CHIP R 10K J 1/16W	
J1	2C		E11-0442-05	3.5D PHONE JACK (3P)		R16			RK73GB1J274J	CHIP R 270K J 1/16W	
J501	1B		E08-0877-05	MODULAR JACK		R17			R92-1252-05	CHIP R 0 OHM J 1/16W	
-			J31-0543-05	COLLAR (LH-5-1.5)		R19			RK73GB1J153J	CHIP R 15K J 1/16W	
CF1			L72-0986-05	CERAMIC FILTER	TK-981	R20			RK73GB1J104J	CHIP R 100K J 1/16W	
CF1			L72-0998-05	CERAMIC FILTER	TK-980	R21			RK73GB1J563J	CHIP R 56K J 1/16W	
L1			L40-4795-34	SMALL FIXED INDUCTOR (4.7UH)		R22			RK73GB1J104J	CHIP R 100K J 1/16W	
L3,4			L40-1875-92	SMALL FIXED INDUCTOR (18NH)		R23			RK73GB1J224J	CHIP R 220K J 1/16W	
L5			L40-1092-34	SMALL FIXED INDUCTOR		R25			RK73GB1J394J	CHIP R 390K J 1/16W	
L6			L34-4459-05	COIL		R26			RK73GB1J104J	CHIP R 100K J 1/16W	
L8			L92-0138-05	FERRITE CHIP		R27			RK73GB1J473J	CHIP R 47K J 1/16W	
L9			L40-8265-92	SMALL FIXED INDUCTOR (8.2NH)		R28			R92-1252-05	CHIP R 0 OHM J 1/16W	
L10			L40-1092-34	SMALL FIXED INDUCTOR		R29			RK73GB1J220J	CHIP R 22 J 1/16W	
L11			L40-1091-37	SMALL FIXED INDUCTOR (1.000UH)		R30			RK73GB1J224J	CHIP R 220K J 1/16W	
L203			L79-1465-05	DIELECTRIC FILTER	TK-980	R31			RK73GB1J104J	CHIP R 100K J 1/16W	
L203			L79-1467-05	DIELECTRIC FILTER	TK-981	R32,33			RK73GB1J474J	CHIP R 470K J 1/16W	
L205			L40-1075-92	SMALL FIXED INDUCTOR (10NH)	TK-981	R34			R92-1252-05	CHIP R 0 OHM J 1/16W	
L205			L40-8265-92	SMALL FIXED INDUCTOR (8.2NH)	TK-980	R36			RK73GB1J103J	CHIP R 10K J 1/16W	
L206			L40-6865-92	SMALL FIXED INDUCTOR (6.8NH)	TK-981	R37			R92-1252-05	CHIP R 0 OHM J 1/16W	
L206			L40-8265-92	SMALL FIXED INDUCTOR (8.2NH)	TK-980	R39			RK73GB1J101J	CHIP R 100 J 1/16W	
L207			L79-1465-05	DIELECTRIC FILTER	TK-980	R40			RK73GB1J472J	CHIP R 4.7K J 1/16W	
L207			L79-1467-05	DIELECTRIC FILTER	TK-981	R41			RK73GB1J183J	CHIP R 18K J 1/16W	
L208			L40-4763-92	SMALL FIXED INDUCTOR (4.7NH)		R42			RK73GB1J333J	CHIP R 33K J 1/16W	
L209			L40-8265-92	SMALL FIXED INDUCTOR (8.2NH)		R44,45			RK73GB1J154J	CHIP R 150K J 1/16W	
L210			L40-3985-45	SMALL FIXED INDUCTOR (0.39UH)		R46			RK73GB1J104J	CHIP R 100K J 1/16W	
L211			L40-6885-45	SMALL FIXED INDUCTOR (0.68UH)		R47			RK73GB1J473J	CHIP R 47K J 1/16W	
L218			L40-1078-94	SMALL FIXED INDUCTOR (10NH)		R48			RK73GB1J122J	CHIP R 1.2K J 1/16W	
L220			L34-1306-15	AIR-CORE COIL		R49			RK73GB1J102J	CHIP R 1.0K J 1/16W	
L221			L34-1317-05	AIR-CORE COIL		R50			RK73GB1J103J	CHIP R 10K J 1/16W	
L222,223			L34-1307-05	AIR-CORE COIL	TK-980	R52			RK73GB1J104J	CHIP R 100K J 1/16W	
L222,223			L34-1313-05	AIR-CORE COIL	TK-981	R53			R92-1252-05	CHIP R 0 OHM J 1/16W	
						R54			RK73GB1J154J	CHIP R 150K J 1/16W	

PARTS LIST

TX-RX UNIT (X57-6520-XX)

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation	Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
R55			RK73GB1J104J	CHIP R 100K J 1/16W		R134			RK73GB1J473J	CHIP R 47K J 1/16W	
R56			RK73GB1J103J	CHIP R 10K J 1/16W		R135			R92-1261-05	CHIP R 150 J 1/2W	
R57			RK73GB1J473J	CHIP R 47K J 1/16W		R137			RK73GB1J473J	CHIP R 47K J 1/16W	
R58			RK73GB1J102J	CHIP R 1.0K J 1/16W		R139			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R60			RK73GB1J472J	CHIP R 4.7K J 1/16W		R140			R92-1252-05	CHIP R 0 OHM J 1/16W	
R61			RK73GB1J103J	CHIP R 10K J 1/16W		R141			RK73GB1J104J	CHIP R 100K J 1/16W	
R62			RK73GB1J101J	CHIP R 100 J 1/16W		R143			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R63-65			R92-1252-05	CHIP R 0 OHM J 1/16W		R144			RK73GB1J223J	CHIP R 22K J 1/16W	
R66			RK73GB1J682J	CHIP R 6.8K J 1/16W		R145			RK73GB1J104J	CHIP R 100K J 1/16W	
R67			RK73GB1J470J	CHIP R 47 J 1/16W		R146			R92-1215-05	CHIP R 470 J 1/2W	
R69			RK73GB1J102J	CHIP R 1.0K J 1/16W		R148			RK73FB2A472J	CHIP R 4.7K J 1/10W	
R70-73			R92-1252-05	CHIP R 0 OHM J 1/16W		R150			R92-0670-05	CHIP R 0 OHM	
R74			RK73GB1J473J	CHIP R 47K J 1/16W		R151-153			R92-1252-05	CHIP R 0 OHM J 1/16W	
R75			RK73GB1J102J	CHIP R 1.0K J 1/16W		R154			RK73GB1J103J	CHIP R 10K J 1/16W	
R76			RK73GB1J153J	CHIP R 15K J 1/16W		R155			RK73GB1J333J	CHIP R 33K J 1/16W	
R77			RK73GB1J333J	CHIP R 33K J 1/16W		R156			RK73GB1J471J	CHIP R 470 J 1/16W	
R78			RK73GB1J104J	CHIP R 100K J 1/16W		R157			RK73GB1J101J	CHIP R 100 J 1/16W	
R79			RK73GB1J180J	CHIP R 18 J 1/16W	TK-981	R158,159			R92-1252-05	CHIP R 0 OHM J 1/16W	
R79			RK73GB1J390J	CHIP R 39 J 1/16W	TK-980	R160			RK73GB1J184J	CHIP R 180K J 1/16W	
R80			RK73GB1J473J	CHIP R 47K J 1/16W		R163			RK73GB1J104J	CHIP R 100K J 1/16W	
R82,83			RK73GB1J151J	CHIP R 150 J 1/16W	TK-980	R166			R92-1252-05	CHIP R 0 OHM J 1/16W	
R82,83			RK73GB1J271J	CHIP R 270 J 1/16W	TK-981	R168			R92-1252-05	CHIP R 0 OHM J 1/16W	
R85			RK73GB1J122J	CHIP R 1.2K J 1/16W		R170,171			R92-1252-05	CHIP R 0 OHM J 1/16W	
R86,87			R92-1252-05	CHIP R 0 OHM J 1/16W		R172			RK73GB1J221J	CHIP R 220 J 1/16W	
R88			RK73EB2B181J	CHIP R 180 J 1/8W		R176			R92-0670-05	CHIP R 0 OHM	
R89			RK73EB2B151J	CHIP R 150 J 1/8W		R181,182			R92-0679-05	CHIP R 0 OHM	
R90			RK73GB1J2R2J	CHIP R 2.2 J 1/16W		R209			RK73GB1J103J	CHIP R 10K J 1/16W	
R91			RK73GB1J472J	CHIP R 4.7K J 1/16W		R210			RK73GB1J473J	CHIP R 47K J 1/16W	
R92			RK73FB2A472J	CHIP R 4.7K J 1/10W		R211			RK73GB1J101J	CHIP R 100 J 1/16W	
R93			RK73FB2A470J	CHIP R 47 J 1/10W		R212			RK73GB1J5R6J	CHIP R 5.6 J 1/16W	
R94			R92-1252-05	CHIP R 0 OHM J 1/16W		R214			RK73GB1J221J	CHIP R 220 J 1/16W	
R95			RK73FB2A154J	CHIP R 150K J 1/10W		R217			RK73GB1J101J	CHIP R 100 J 1/16W	
R96			RK73GB1J181J	CHIP R 180 J 1/16W	TK-981	R218			RK73GB1J473J	CHIP R 47K J 1/16W	
R96			RK73GB1J331J	CHIP R 330 J 1/16W	TK-980	R219			RK73GB1J273J	CHIP R 27K J 1/16W	
R97,98			RK73GB1J473J	CHIP R 47K J 1/16W		R220			RK73GB1J473J	CHIP R 47K J 1/16W	
R99			RK73GB1J152J	CHIP R 1.5K J 1/16W		R221			RK73GB1J153J	CHIP R 15K J 1/16W	
R100			RK73GB1J151J	CHIP R 150 J 1/16W	TK-981	R223			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R100			RK73GB1J331J	CHIP R 330 J 1/16W	TK-980	R226			RK73GB1J471J	CHIP R 470 J 1/16W	
R101			RK73FB2A470J	CHIP R 47 J 1/10W		R231			RK73GB1J100J	CHIP R 10 J 1/16W	
R102			RK73FB2A102J	CHIP R 1.0K J 1/10W		R235			RK73GB1J471J	CHIP R 470 J 1/16W	
R103			RK73FB2A223J	CHIP R 22K J 1/10W		R236			RK73GB1J470J	CHIP R 47 J 1/16W	
R104			RK73FB2A473J	CHIP R 47K J 1/10W		R237			RK73GB1J153J	CHIP R 15K J 1/16W	
R105			R92-2538-05	RN 3.9K B 1/8W		R239			RK73GB1J154J	CHIP R 150K J 1/16W	
R106			R92-1252-05	CHIP R 0 OHM J 1/16W		R240			RK73GB1J223J	CHIP R 22K J 1/16W	
R107			RK73GB1J473J	CHIP R 47K J 1/16W		R241			R92-1252-05	CHIP R 0 OHM J 1/16W	
R109			R92-0670-05	CHIP R 0 OHM		R243-245			R92-1252-05	CHIP R 0 OHM J 1/16W	
R110			RK73GB1J470J	CHIP R 47 J 1/16W		R247			R92-0699-05	CHIP R 10 J 1/2W	TK-981
R111			RK73GB1J472J	CHIP R 4.7K J 1/16W		R247			R92-1259-05	CHIP R 18 J 1/2W	TK-980
R112,113			R92-1268-05	RN 4.7K B 1/8W		R248,249			R92-1215-05	RESISTOR 470 1/2W	TK-981
R116			RK73GB1J473J	CHIP R 47K J 1/16W		R248,249			R92-2571-05	RESISTOR 270 1/2W	TK-980
R118			RK73GB1J392J	CHIP R 3.9K J 1/16W	TK-980	R250			RK73GB1J470J	CHIP R 47 J 1/16W	
R119			RK73GB1J103J	CHIP R 10K J 1/16W		R251			RK73GB1J474J	CHIP R 470K J 1/16W	
R120			R92-1268-05	RN 4.7K B 1/8W		R252			R92-1217-05	CHIP R 0 OHM	
R121			RK73GB1J472J	CHIP R 4.7K J 1/16W		R253,254			RK73GB1J821J	CHIP R 820 J 1/16W	
R122			RK73FB2A272J	CHIP R 2.7K J 1/10W		R255,256			R92-1308-05	CHIP R 22 J 1W	
R124			RK73GB1J223J	CHIP R 22K J 1/16W		R257,258			R92-0670-05	CHIP R 0 OHM	
R127			R92-2680-05	RESISTOR		R301-303			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R128			RK73GB1J223J	CHIP R 22K J 1/16W		R305			RK73GB1J103J	CHIP R 10K J 1/16W	
R129			RK73GB1J100J	CHIP R 10 J 1/16W		R306			RK73GB1J471J	CHIP R 470 J 1/16W	TK-981
R132			RK73GB1J104J	CHIP R 100K J 1/16W		R306			RK73GB1J102J	CHIP R 1.0K J 1/16W	TK-980

PARTS LIST

TX-RX UNIT (X57-6520-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
R307			R92-1252-05	CHIP R 0 OHM J 1/16W		R551			RK73GB1J223J	CHIP R 22K J 1/16W	
R308			RK73GB1J101J	CHIP R 100 J 1/16W		R552			RK73GB1J334J	CHIP R 330K J 1/16W	
R309			RK73GB1J333J	CHIP R 33K J 1/16W	TK-980	R553			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R309			RK73GB1J154J	CHIP R 150K J 1/16W	TK-981	R554			RK73GB1J332J	CHIP R 3.3K J 1/16W	
R310			RK73GB1J103J	CHIP R 10K J 1/16W	TK-980	R555			RK73GB1J394J	CHIP R 390K J 1/16W	
R310			RK73GB1J473J	CHIP R 47K J 1/16W	TK-981	R556			RK73GB1J223J	CHIP R 22K J 1/16W	
R311			RK73GB1J561J	CHIP R 560 J 1/16W		R558			R92-1252-05	CHIP R 0 OHM J 1/16W	
R312			RK73GB1J472J	CHIP R 4.7K J 1/16W		R562			RK73GB1J273J	CHIP R 27K J 1/16W	
R313			RK73GB1J273J	CHIP R 27K J 1/16W		R564			R92-1252-05	CHIP R 0 OHM J 1/16W	
R314			RK73GB1J103J	CHIP R 10K J 1/16W	TK-981	R566			RK73GB1J470J	CHIP R 47 J 1/16W	
R314			RK73GB1J223J	CHIP R 22K J 1/16W	TK-980	R567			RK73GB1J220J	CHIP R 22 J 1/16W	
R315			RK73GB1J473J	CHIP R 47K J 1/16W		R568			RK73GB1J473J	CHIP R 47K J 1/16W	
R316,317			R92-1252-05	CHIP R 0 OHM J 1/16W		R569			RK73GB1J103J	CHIP R 10K J 1/16W	
R318			RK73GB1J391J	CHIP R 390 J 1/16W		R571,572			R92-1252-05	CHIP R 0 OHM J 1/16W	
R319			RK73GB1J102J	CHIP R 1.0K J 1/16W		R573			RK73GB1J104J	CHIP R 100K J 1/16W	
R320			R92-1252-05	CHIP R 0 OHM J 1/16W		R574			RK73GB1J473J	CHIP R 47K J 1/16W	
R321			RK73GB1J470J	CHIP R 47 J 1/16W		R575			RK73GB1J103J	CHIP R 10K J 1/16W	
R322			RK73GB1J100J	CHIP R 10 J 1/16W		R576			RK73GB1J473J	CHIP R 47K J 1/16W	
R323			R92-1252-05	CHIP R 0 OHM J 1/16W		R577			RK73GB1J153J	CHIP R 15K J 1/16W	
R408			R92-1252-05	CHIP R 0 OHM J 1/16W		R579			R92-1252-05	CHIP R 0 OHM J 1/16W	
R411			R92-1252-05	CHIP R 0 OHM J 1/16W		R580			RK73GB1J103J	CHIP R 10K J 1/16W	
R414			R92-1252-05	CHIP R 0 OHM J 1/16W		R581			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R502			RK73GB1J184J	CHIP R 180K J 1/16W		R582			R92-1252-05	CHIP R 0 OHM J 1/16W	
R503			RK73GB1J223J	CHIP R 22K J 1/16W		R584			R92-1252-05	CHIP R 0 OHM J 1/16W	
R504			RK73GB1J184J	CHIP R 180K J 1/16W		R585,586			RK73GB1J473J	CHIP R 47K J 1/16W	
R505			RK73GB1J102J	CHIP R 1.0K J 1/16W		R587			R92-1252-05	CHIP R 0 OHM J 1/16W	
R506			R92-1252-05	CHIP R 0 OHM J 1/16W		R588			RK73GB1J473J	CHIP R 47K J 1/16W	
R507,508			RK73GB1J154J	CHIP R 150K J 1/16W		R612			RK73GB1J224J	CHIP R 220K J 1/16W	
R512			RK73GB1J122J	CHIP R 1.2K J 1/16W		R614			R92-1252-05	CHIP R 0 OHM J 1/16W	
R513			R92-1252-05	CHIP R 0 OHM J 1/16W		R616			RK73GB1J473J	CHIP R 47K J 1/16W	
R515			RN73GH1J913D	CHIP R 91K D 1/16W		R624			R92-1252-05	CHIP R 0 OHM J 1/16W	
R516			RK73GB1J102J	CHIP R 1.0K J 1/16W		R633			R92-1252-05	CHIP R 0 OHM J 1/16W	
R518			RN73GH1J333D	CHIP R 33K D 1/16W		R645			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R519			RN73GH1J913D	CHIP R 91K D 1/16W		R658			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R520			RN73GH1J683D	CHIP R 68K D 1/16W		R667,668			RK73GB1J181J	CHIP R 180 J 1/16W	
R521			RK73GB1J105J	CHIP R 1.0M J 1/16W		R670			RK73GB1J473J	CHIP R 47K J 1/16W	
R522			RN73GH1J913D	CHIP R 91K D 1/16W		R672,673			RK73GB1J473J	CHIP R 47K J 1/16W	
R523			RK73GB1J154J	CHIP R 150K J 1/16W		R674			RK73FB2A222J	CHIP R 2.2K J 1/10W	
R524			RN73GH1J274D	CHIP R 270K D 1/16W		R675			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R525			RK73GB1J334J	CHIP R 330K J 1/16W		R676			RK73GB1J103J	CHIP R 10K J 1/16W	
R526			RK73GB1J154J	CHIP R 150K J 1/16W		R677			RK73GB1J223J	CHIP R 22K J 1/16W	
R527			RK73GB1J103J	CHIP R 10K J 1/16W		R678			RK73GB1J103J	CHIP R 10K J 1/16W	
R528			RK73GB1J153J	CHIP R 15K J 1/16W		R679			RK73FB2A390J	CHIP R 39 J 1/10W	
R529			R92-1252-05	CHIP R 0 OHM J 1/16W		R680			RK73FB2A222J	CHIP R 2.2K J 1/10W	
R530			RK73GB1J394J	CHIP R 390K J 1/16W		R681			RK73GB1J223J	CHIP R 22K J 1/16W	
R531			RK73GB1J473J	CHIP R 47K J 1/16W		R682			RK73GB1J473J	CHIP R 47K J 1/16W	
R532			RK73GB1J334J	CHIP R 330K J 1/16W		R683			RK73GB1J103J	CHIP R 10K J 1/16W	
R533			R92-1252-05	CHIP R 0 OHM J 1/16W		R701			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R535			RK73GB1J155J	CHIP R 1.5M J 1/16W		R702			RK73GB1J101J	CHIP R 100 J 1/16W	
R536			RN73GH1J682D	CHIP R 6.8K D 1/16W		R705,706			RK73GB1J473J	CHIP R 47K J 1/16W	
R537,538			RK73GB1J473J	CHIP R 47K J 1/16W		R716			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R540			RK73GB1J474J	CHIP R 470K J 1/16W		R718			RK73GB1J154J	CHIP R 150K J 1/16W	
R541			RK73GB1J274J	CHIP R 270K J 1/16W		R719			RK73GB1J103J	CHIP R 10K J 1/16W	
R542			RN73GH1J683D	CHIP R 68K D 1/16W		R720			RK73GB1J683J	CHIP R 68K J 1/16W	
R544			RK73GB1J101J	CHIP R 100 J 1/16W		R721			RK73GB1J334J	CHIP R 330K J 1/16W	
R545			RK73GB1J182J	CHIP R 1.8K J 1/16W		R722			RK73FB2A680J	CHIP R 68 J 1/10W	
R546			RK73GB1J224J	CHIP R 220K J 1/16W		R723			R92-1252-05	CHIP R 0 OHM J 1/16W	
R547			RK73GB1J103J	CHIP R 10K J 1/16W		R724			RK73GB1J392J	CHIP R 3.9K J 1/16W	
R548			RK73GB1J183J	CHIP R 18K J 1/16W		R725			RK73GB1J562J	CHIP R 5.6K J 1/16W	
R550			RN73GH1J682D	CHIP R 6.8K D 1/16W		R726,727			R92-1252-05	CHIP R 0 OHM J 1/16W	

PARTS LIST

TX-RX UNIT (X57-6520-XX)
PLL/VCO (X58-4530-XX)

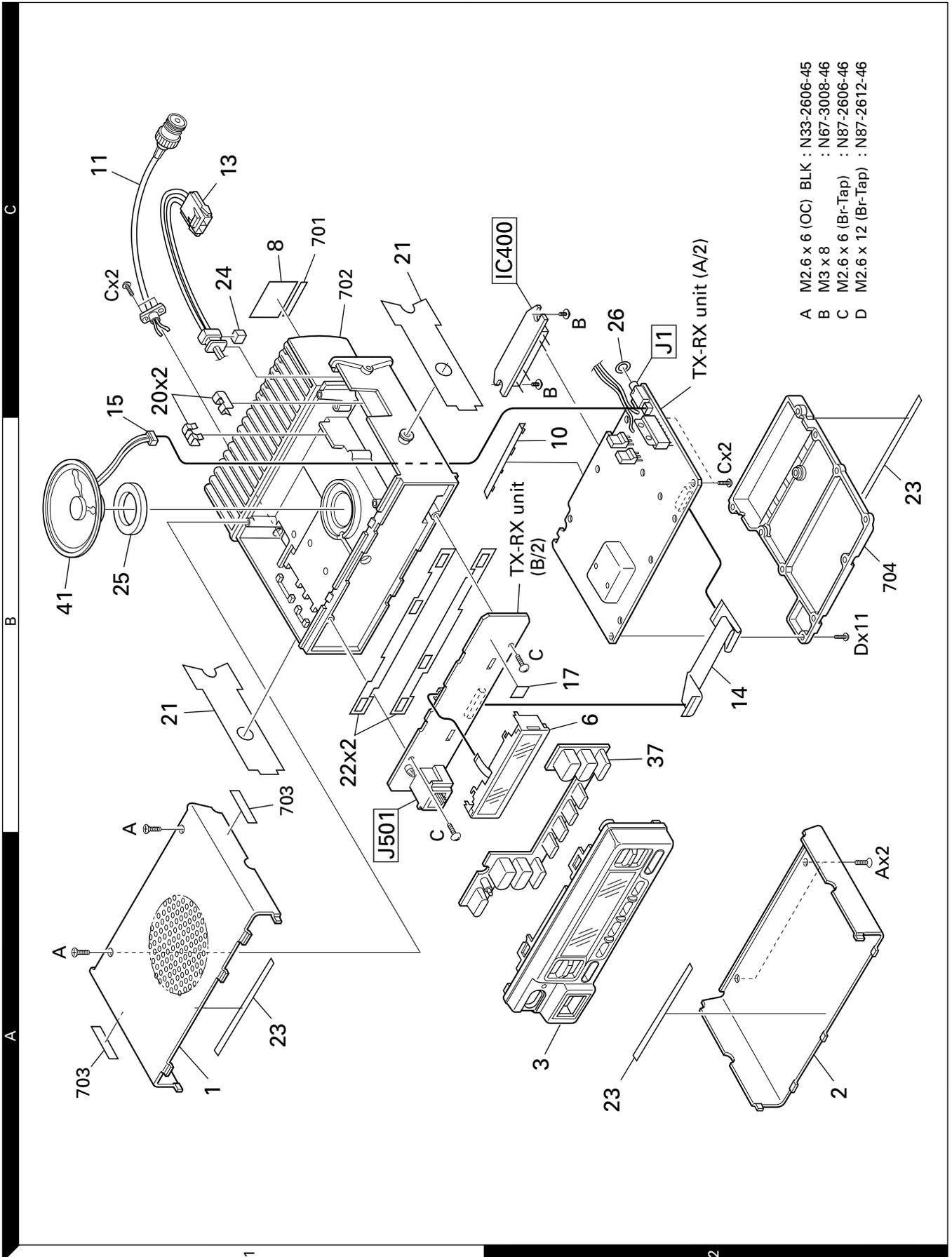
Ref. No.	Address	New parts	Parts No.	Description	Desti-nation	Ref. No.	Address	New parts	Parts No.	Description	Desti-nation		
D1-6			DA204U	DIODE		Q1			2SK1824	FET			
D7			02DZ20(Y,Z)	ZENER DIODE		Q2			2SC2412(K,S)	TRANSISTOR			
D11			DAN202U	DIODE		Q4			DTD114EK	DIGITAL TRANSISTOR			
D16			1SS355	DIODE		Q5,6			DTC114EE	DIGITAL TRANSISTOR			
D17			DA204U	DIODE		Q7			2SC4226(R24)	TRANSISTOR			
D18,19			HVC131	DIODE		Q8			DTC363EU	DIGITAL TRANSISTOR			
D20			1SS355	DIODE		Q9			DTA114YUA	DIGITAL TRANSISTOR			
D21			02DZ5.6(X,Y)	ZENER DIODE		Q10			DTC114EE	DIGITAL TRANSISTOR			
D24			MINISMDC075-02	VARISTOR		Q11			2SA1362(Y)	TRANSISTOR			
D26			1SS355	DIODE		Q12			2SB1132(Q,R)	TRANSISTOR			
D28			02DZ15(X,Y)	ZENER DIODE		Q13			DTC114EE	DIGITAL TRANSISTOR			
D31			1SS355	DIODE		Q15			2SC2059(K,P)	TRANSISTOR			
D32			22ZR-10D	SURGE ABSORBER		Q17			2SC4116(GR)	TRANSISTOR			
D34			02DZ18(X,Y)	ZENER DIODE		Q18			2SK1824	FET			
D35			MA742	DIODE		Q19			2SB1370(E,F)	TRANSISTOR			
D37			DSA3A1	DIODE		Q20			DTA144EUA	DIGITAL TRANSISTOR			
D200			HSM88AS	DIODE		Q21			DTC144EUA	DIGITAL TRANSISTOR			
D208			MA4PH633	DIODE		Q22			DTC114EE	DIGITAL TRANSISTOR			
D209,210			XB15A709	DIODE		Q25,26			DTA114EE	DIGITAL TRANSISTOR			
D501			DA204U	DIODE		Q27			2SA1641(S,T)	TRANSISTOR			
D502			MINISMDC075-02	VARISTOR		Q28			DTC114EE	DIGITAL TRANSISTOR			
D503-505			DA204U	DIODE		Q30			DTA114EE	DIGITAL TRANSISTOR			
D507			DAN202U	DIODE		Q31			DTC114EE	DIGITAL TRANSISTOR			
D508,509			MA742	DIODE		Q32			2SK1824	FET			
D510			HSC119	DIODE		Q33			DTC144EE	DIGITAL TRANSISTOR			
D518			02DZ9.1(X,Y)	ZENER DIODE		Q34			2SC2712(GR)	TRANSISTOR			
D520			MA2S111	DIODE		Q201			2SC4094(R37)	TRANSISTOR			
IC1			TA75W01FU	MOS IC		Q202			2SC3356(R24)	TRANSISTOR			
IC2			TC75W51FU	MOS IC		Q203			3SK255	FET			
IC3			TA75W558FU	MOS IC		Q204			2SK2596	FET			
IC4			TC4S66F	MOS IC		Q205			DTC144EE	DIGITAL TRANSISTOR			
IC5			M62363FP	MOS IC		Q300			2SC4226(R24)	TRANSISTOR			
IC6			TA75W558FU	MOS IC		Q301,302			2SC3722K(S)	TRANSISTOR			
IC7,8			BU4094BCFV	MOS IC		Q501			DTC314TU	DIGITAL TRANSISTOR			
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			NJM2904E	MOS IC		Q510			2SC4619	TRANSISTOR			
IC14			TA7808S	MOS IC		Q511			DTA144WE	DIGITAL TRANSISTOR			
IC15			TC4013BF(N)	MOS IC		Q512			DTC114EE	DIGITAL TRANSISTOR			
IC16			NJM78L08UA	BI-POLAR IC		Q513			2SC2873(Y)	TRANSISTOR			
IC300			SA7025DK	MOS IC		Q515			DTC114EE	DIGITAL TRANSISTOR			
IC400	2C		M67760HC	HYBRID IC	TK-981	TH1			157-104-55001	THERMISTOR			
IC400	2C		M67760LC	HYBRID IC	TK-980								
IC501			TA75W558FU	MOS IC		PLL/VCO (X58-4530-XX) -10 : TK-980 -11 : TK-981							
IC502			TC75W51FU	MOS IC		C100			CK73GB1H471K	CHIP C	470PF	K	
IC503			TA75W558FU	MOS IC		C101			CC73GCH1H4R5B	CHIP C	4.5PF	B	TK-981
IC504			TC35453F	MOS IC		C101			CC73GCH1H080B	CHIP C	8.0PF	B	TK-980
IC506			BU4066BCFV	MOS IC		C102			CC73GCH1HR75C	CHIP C	0.75PF	C	
IC507			LC73872M	MOS IC		C103			CK73GB1H471K	CHIP C	470PF	K	
IC508			BU4094BCFV	MOS IC		C104			CC73GCH1H1R5B	CHIP C	1.5PF	B	TK-980
IC509			RH5VL42C	MOS IC		C104			CC73GCH1H020B	CHIP C	2.0PF	B	TK-981
IC510			AT29C020-90TI	ROM IC		C105			CC73GCH1H040B	CHIP C	4.0PF	B	TK-981
IC510			W29C020C90	SRAM IC		C105			CC73GCH1H060B	CHIP C	6.0PF	B	TK-980
IC511			30622M8A-4F9GP	MPU		C106,107			CC73GCH1HR75B	CHIP C	0.75PF	B	
IC512			AT2408N10SI2.5	ROM IC		C108			CK73GB1H102K	CHIP C	1000PF	K	
IC512			24LC08BT-1SN	ROM IC		C109			CC73GCH1H030B	CHIP C	3.0PF	B	
IC513			TA78L05F	MOS IC		C110			CC73GCH1H050B	CHIP C	5.0PF	B	
IC711			TA75S01F	MOS IC									

PARTS LIST

PLL/VCO (X58-4530-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
C111			CC73GCH1H470J	CHIP C 47PF J							
C112			CK73GB1H471K	CHIP C 470PF K							
C113			CC73GCH1H040B	CHIP C 4.0PF B	TK-980						
C113			CC73GCH1H050B	CHIP C 5.0PF B	TK-981						
C114			CK73GB1H471K	CHIP C 470PF K	TK-981						
C114			CK73GB1H102K	CHIP C 1000PF K	TK-980						
C115			CC73GCH1H030B	CHIP C 3.0PF B							
C116			CC73GCH1H060B	CHIP C 6.0PF B							
C117			CK73GB1H102K	CHIP C 1000PF K							
C118			CC73GCH1HR75B	CHIP C 0.75PF B							
TC100			C05-0384-05	CERAMIC TRIMMER CAP (10P)							
CN100			E40-5699-05	PIN ASSY							
-			F10-2279-04	SHIELDING CASE							
L100,101			L40-1595-34	SMALL FIXED INDUCTOR (1.5UH)							
L102			L40-1071-35	SMALL FIXED INDUCTOR (10NH)	TK-981						
L102			L40-1271-35	SMALL FIXED INDUCTOR (12NH)	TK-980						
L103			L34-4518-05	AIR-CORE COIL							
L104			L40-1098-76	SMALL FIXED INDUCTOR (1UH)							
L105			L40-1571-35	SMALL FIXED INDUCTOR (15NH)	TK-981						
L105			L40-3971-35	SMALL FIXED INDUCTOR (39NH)	TK-980						
L106			L40-1571-35	SMALL FIXED INDUCTOR (15NH)	TK-981						
L106			L40-2771-35	SMALL FIXED INDUCTOR (27NH)	TK-980						
L107			L40-1595-34	SMALL FIXED INDUCTOR (1.5UH)							
R100,101			R92-1252-05	CHIP R 0 OHM J 1/16W							
R102			RK73GB1J102J	CHIP R 1.0K J 1/16W							
R103			R92-1252-05	CHIP R 0 OHM J 1/16W							
R104			RK73GB1J101J	CHIP R 100 J 1/16W							
R105			RK73GB1J823J	CHIP R 82K J 1/16W							
R106			RK73GB1J154J	CHIP R 150K J 1/16W							
R107			RK73GB1J270J	CHIP R 27 J 1/16W							
R108,109			RK73GB1J101J	CHIP R 100 J 1/16W							
R110			RK73GB1J181J	CHIP R 180 J 1/16W	TK-981						
R110			RK73GB1J221J	CHIP R 220 J 1/16W	TK-980						
R111			RK73GB1J223J	CHIP R 22K J 1/16W							
R112			RK73GB1J103J	CHIP R 10K J 1/16W							
R113			RK73GB1J470J	CHIP R 47 J 1/16W							
R114			R92-1252-05	CHIP R 0 OHM J 1/16W							
D100,101			1SV283	VARIABLE CAPACITANCE DIODE							
D102			1SV214	VARIABLE CAPACITANCE DIODE							
Q100			2SC4226(R24)	TRANSISTOR							
Q101			2SK508NV(K52)	FET							
Q102			2SC4226(R24)	TRANSISTOR							

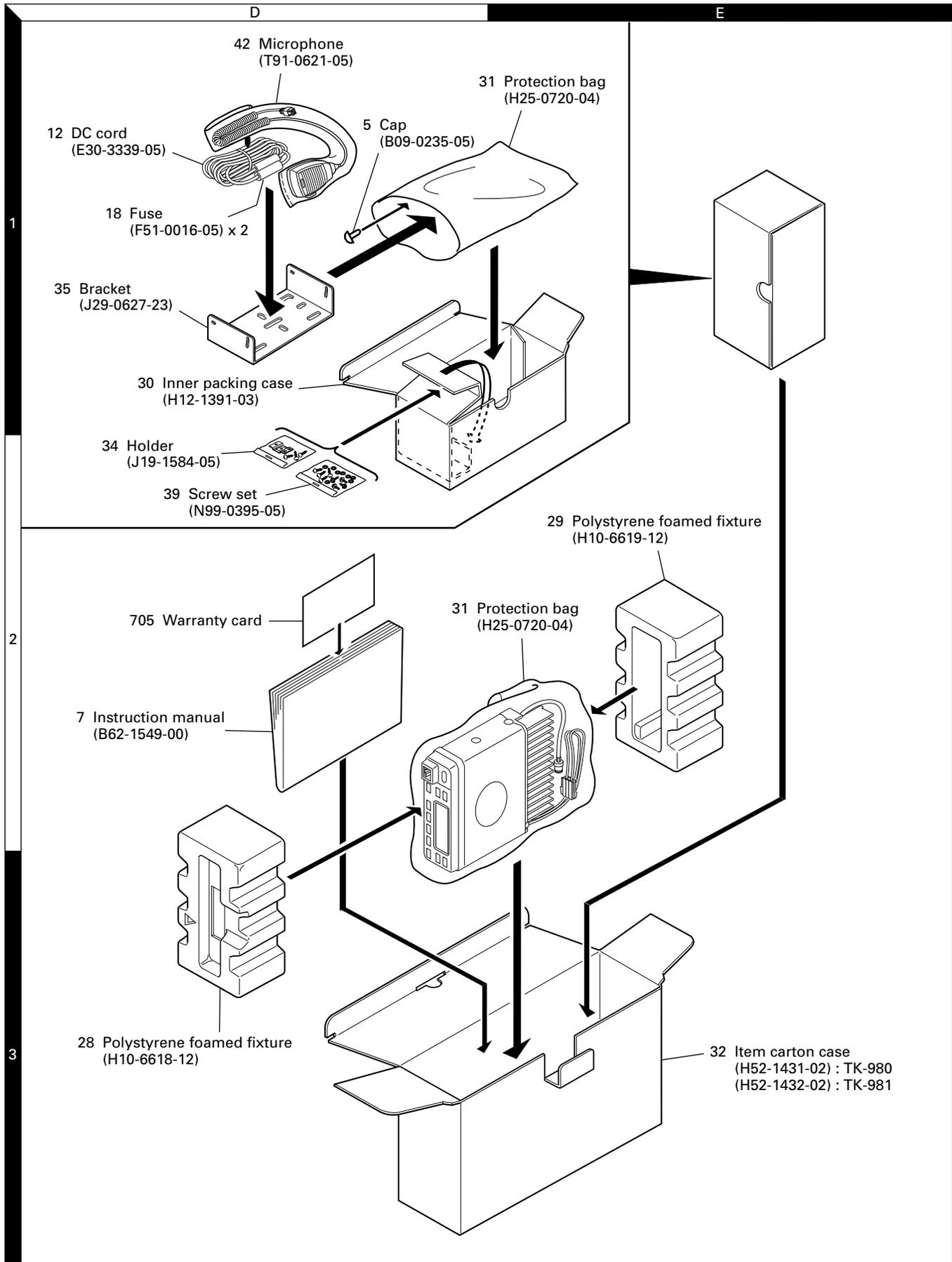
EXPLODED VIEW



- A M2.6 x 6 (OC) BLK : N33-2606-45
- B M3 x 8 : N67-3008-46
- C M2.6 x 6 (Br-Tap) : N87-2606-46
- D M2.6 x 12 (Br-Tap) : N87-2612-46

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

PACKING



ADJUSTMENT

Test Mode

■ Test Mode Operating Features

This transceiver has a test mode. **To enter test mode, press [A] key and turn power on. Hold [A] key until test channel No. and test signalling No. appears on LCD.**

Test mode can be inhibited by programming. To exit test mode, switch the power on again. The following functions are available in test mode.

• Controls ("FCN" appears)

[PTT]	Used when making a transmission.
[MON]	Monitor on and off.
[SCN]	MSK 1200bps and 2400bps.
[A]	Function off.
[B]	Compander function on and off.
[C]	Talk around on and off.
[D]	Function off.
[System Up/Down]	Changes channel
[Volume Up/Down]	Volume up/down.

• Controls ("FCN" not appears)

[PTT]	Used when making a transmission.
[MON]	Monitor on and off.
[SCN]	Sets to the tuning mode.
[A]	Function on.
[B]	None.
[C]	Changes signalling.
[D]	None.
[System Up/Down]	Changes channel
[Volume Up/Down]	Volume up/down.

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

• LCD indicator

"SCN"	Unused
" 	Lights at compander on.
"AUX"	Unused.
"P"	Unused.
"MON"	Lights at monitor on.
"SVC"	Unused.
" 	Lights at MSK 2400bps.

• LED indicator

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

• Sub LCD indicator

"FCN"	Appears at function 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.	TK-980		TK-981	
	RX (TX : TA)	TX	RX (TX : TA)	TX
1	851.05000	806.05000	935.0250	896.0250
2	851.55000	806.55000	935.0500	896.0500
3	860.00000	815.00000	938.0000	899.0000
4	860.50000	815.50000	938.0250	899.0250
5	865.98750	820.98750	939.9875	900.9875
6	869.40000	824.40000	940.4000	901.4000
7	869.90000	824.90000	940.9000	901.9000
8	855.40000	810.40000	936.2500	897.2500
9	865.60000	820.60000	939.3000	900.3000
10	867.50000	822.50000	936.7500	897.7500
11~16	-	-	-	-

• Signalling

Signalling No.	RX	TX
1	None	None
2	None	100Hz square
3	LTR data	LTR data
4	QT 67.0Hz	QT 67.0Hz
5	QT 151.4Hz	QT 151.4Hz
6	QT 210.7Hz	QT 210.7Hz
7	QT 250.3Hz	QT 250.3Hz
8	DQT D023N	DQT D023N
9	DQT D754I	DQT D754I
10	DTMF DEC, (159D)	DTMF ENC, (159D)
11	None	DTMF tone
12	None	None
13	None	Single tone 1200Hz
14	None	MSK
15	MSK code	MSK code

Note : In test mode, if the operation frequency is in NPSPAC band (e.g. SYS 10), all deviations are automatically changed as the system deviation becomes ± 4 kHz.

• 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).

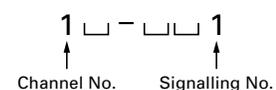
The speaker output connector must be terminated with a 4 Ω dummy load and connected to an AC voltmeter and an audio distortion meter or a SINAD measurement meter at all times during tuning.

• Transceiver tuning

(To place transceiver in tuning mode)

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

LCD display (Test mode)



ADJUSTMENT

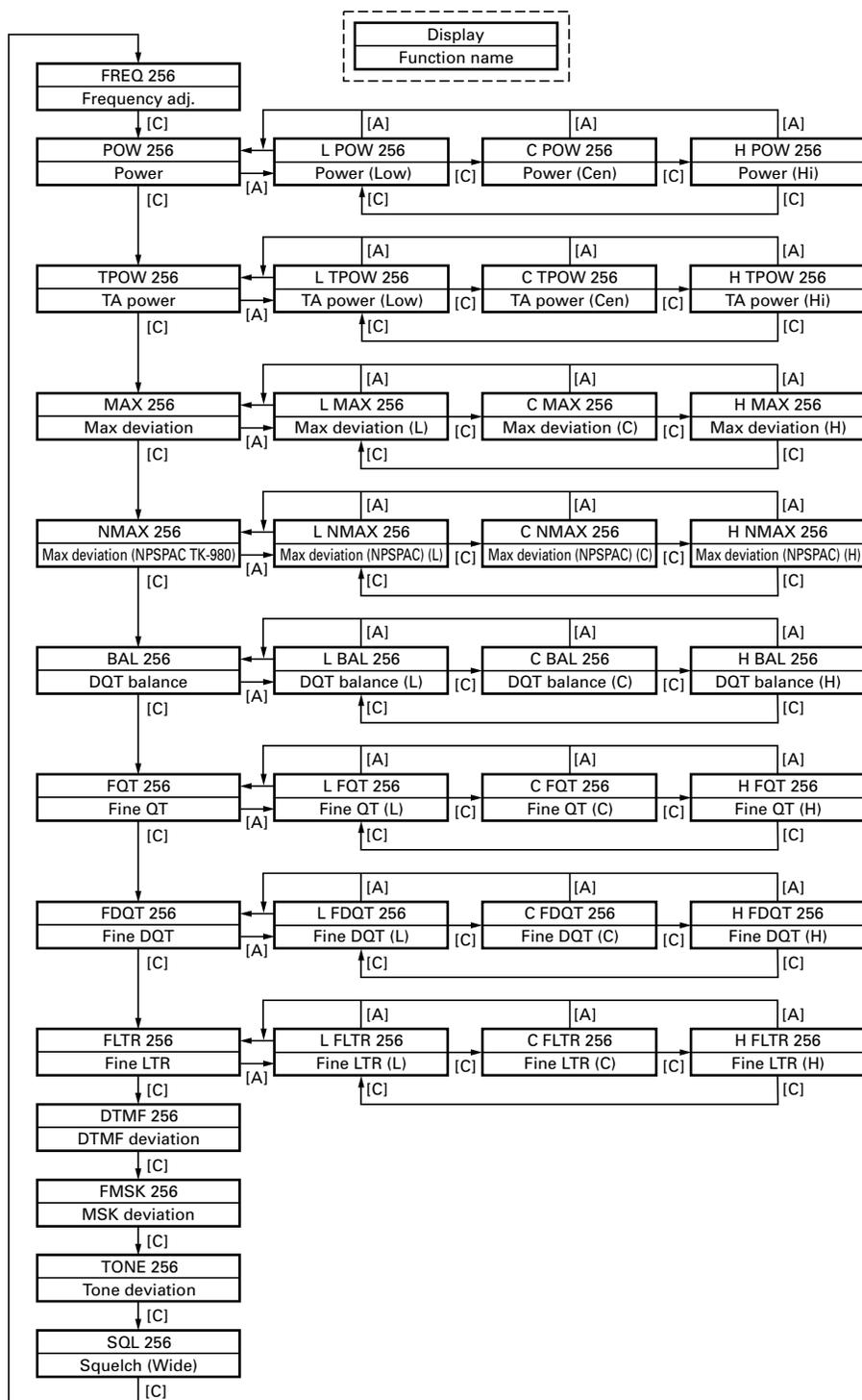
Press [SCN], now in tuning mode. Use [B] button to write tuning data through tuning modes, and [System Up/Down] : to adjust tuning requirements (1 to 256 appears on LCD).

Use [C] button to select the adjustment item through tuning modes. Use [A] button to adjust 3-point tuning.

LCD display (Tuning mode)



■ Tuning Mode



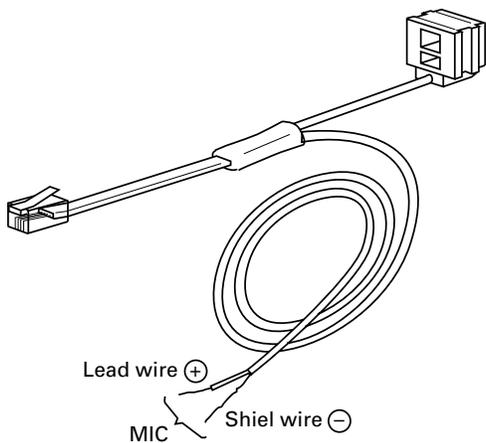
ADJUSTMENT

Test Equipment Required for Alignment

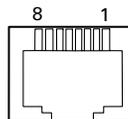
Test Equipment	Major Specifications	
1. Standard Signal Generator (SSG)	Frequency Range Modulation Output	806 to 870MHz (TK-980), 896 to 941MHz (TK-981) Frequency modulation and external modulation -127dBm/0.1μV to greater than -7dBm/100mV
2. Power Meter	Input Impedance Operation Frequency Measurement Capability	50Ω 806 to 870MHz or more (TK-980), 896 to 941MHz (TK-981) Vicinity of 30W
3. Deviation Meter	Frequency Range	806 to 870MHz (TK-980), 896 to 941MHz (TK-981)
4. Digital Volt Meter (DVM)	Measuring Range Accuracy	1 to 16V 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		10A
8. AF Volt Meter (AF VTVM)	Frequency Range Voltage Range	50Hz to 10kHz 3mV to 3V
9. Audio Generator (AG)	Frequency Range Output	50Hz to 5kHz or more 0 to 1V
10. Distortion Meter	Capability Input Level	3% or less at 1kHz 50mV to 10Vrms
11. Voltmeter	Measuring Range Input Impedance	1.5 to 30V DC or less 50kΩ/V or greater
12. 4Ω Dummy Load		Approx. 4Ω, 4W
13. Regulated Power Supply		13.6V, approx. 10A (adjustable from 9 to 17V) Useful if ammeter requipped

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.

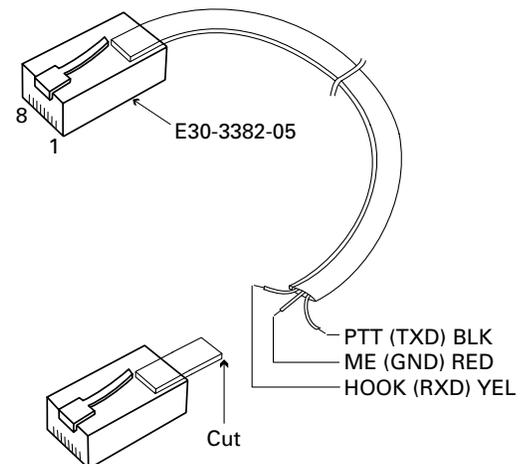


MIC connector (Front view)



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

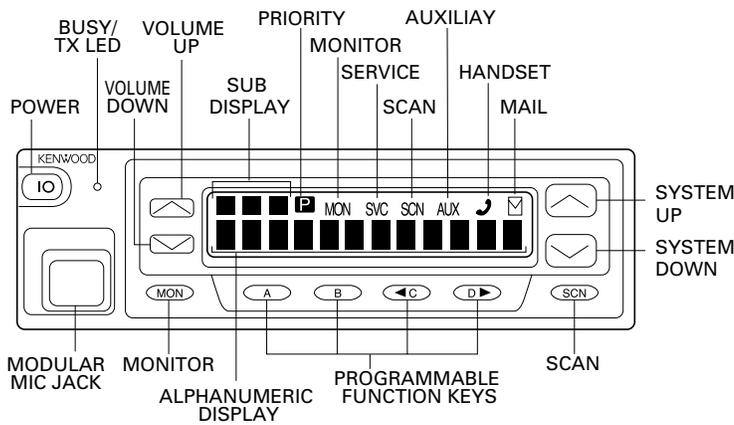
Test cable for microphone input



ADJUSTMENT

Adjustment Location

■ Switch



■ Note

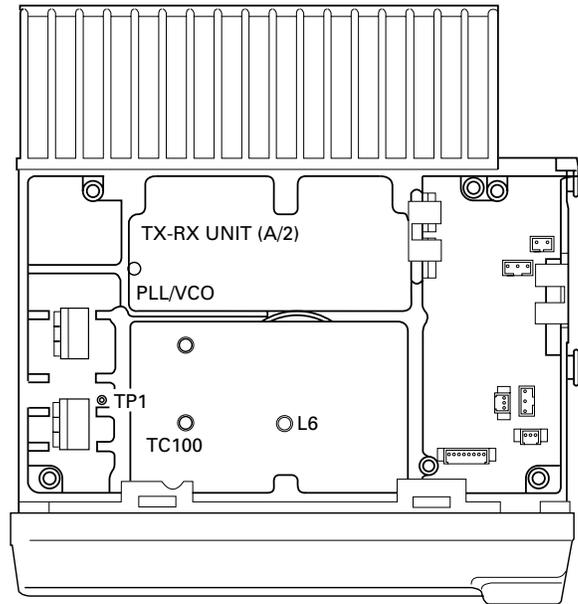
• Flash memory

The firmware program (User mode, Test mode, Tuning mode, etc.) and the data programmed by the FPU (KPG-49D) 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-980/981. 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 : (TA) CH7 - Sig1 PTT : ON (Transmit)	DVM Power meter F. conter	TX-RX (A/2)	TP1	PLL	TC100	1.5V	±0.1V
						Check	6.6V 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 : CH4 - 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 maximum.	
2. Sensitivity check	1) Set test mode CH : CH1 - Sig 1 SSG output : -116dBm SSG MOD : 3kHz AF output : 1V/4Ω	SSG AF VTVM Distortion meter Oscilloscope AG		ANT ACC (EXT.SP)			Check .	12dB SINAD or more.
3. Squelch	1) Set test mode CH : CH4 - Sig 1 Select "SQL" in tuning mode. SSG freq' : 860.5MHz (TK-980) : 938.025MHz (TK-981) SSG output : Value when 2dB is subtracted from the sensitivity value of 12dB SINAD. SSG MOD : 3kHz (TK-980) 1.5kHz (TK-981)						Squelch closed once. Then squelch must be opened.	
4. Squelch check	1) Set test mode CH : CH4 - Sig1 SSG output : 12dB SINAD level						Check	Squelch must be opened.
	2) SSG output : OFF							Squelch must be closed.
5. QT check	1) Set test mode CH : CH4 - Sig5 SSG MOD INT : 1kHz EXT : 151.4Hz SSG system MOD DEV : ±3.75kHz (TK-980) : ±1.85kHz (TK-981) SSG output : 10dB SINAD level							
	2) CH : CH1 - Sig4 CH1 - Sig6 CH1 - Sig7						Check	Squelch must be closed.

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	806.050MHz±100Hz (TK-980) 896.025MHz±100Hz (TK-981)
2. Maximum power check	1) Set test mode Select "H POW" in tuning mode. "POW 256" PTT : ON						Check	16.0W or more.

ADJUSTMENT

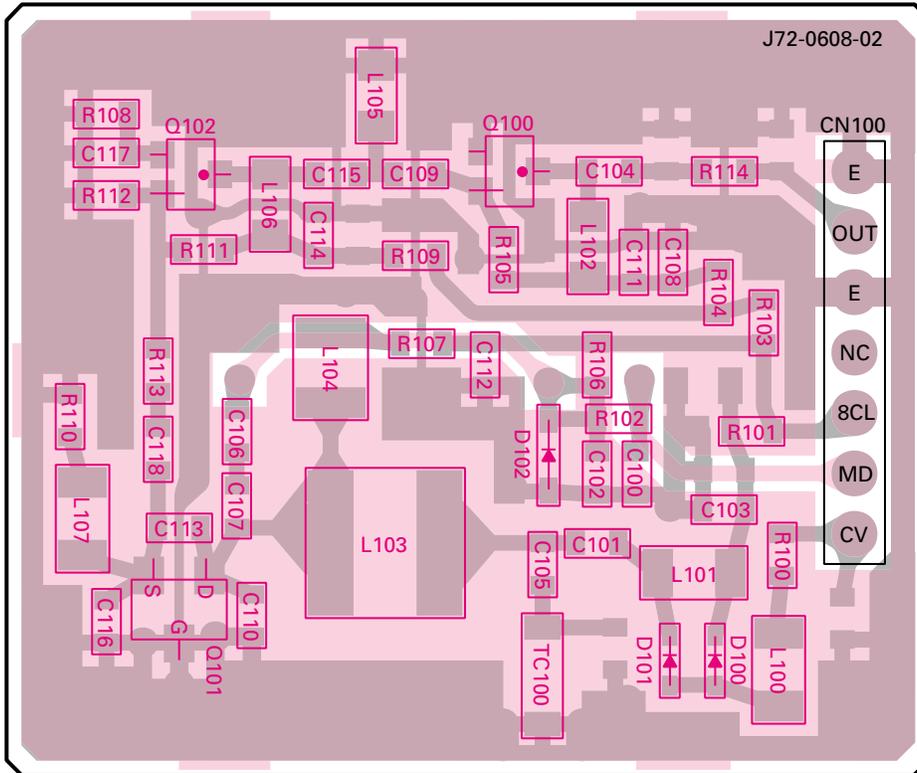
Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
3. High power	1) Set test mode Select "POW" in tuning mode. "L POW" PTT : ON	Power meter F. counter	Rear panel	ANT			15.0W	±1.0W
	2) "C POW" PTT : ON							
	3) "H POW" PTT : ON							
4. TA power	1) Set test mode Select "L POW" in tuning mode. "L TPOW" PTT : ON	Power meter					13.0W	±1.0W
	2) "C TPOW" PTT : ON							
	3) "H TPOW" PTT : ON							
5. Power check	1) Set test mode CH : CH1 - Sig1 CH4 - Sig1 CH7 - Sig1 PTT : ON	Power meter		ANT			Check	15W±1W 7A or less
		Ammeter		DC IN				
6. Modulation balanced	1) Set test mode MIC input : OFF Select "BAL" in tuning mode. "L BAL" Deviation meter filter LPF : 3kHz, HPF : OFF De-emphasis : OFF	Power meter Deviation meter Oscilloscope	Rear panel	ANT			Make the de- modulation waveform neat.	
	2) "C BAL" PTT : ON	AF VTVM AG	Front panel	MIC				
	3) "H BAL" PTT : ON							
7. Maximum deviation	1) Set test mode Connect AG to the MIC terminal. Select "MAX" in tuning mode. "L MAX" AG : 1kHz/50mV Deviation meter filter LPF : 15kHz, HPF : OFF De-emphasis : OFF PTT : ON						3.8kHz (TK-980) 1.75kHz (TK-981) (According to the larger +, -)	±50Hz
	2) "C MAX" PTT : ON							
	3) "H MAX" PTT : ON							
8. NPSPAC maximum deviation	1) Set test mode Connect AG to the MIC terminal. Select "NMAX" in tuning mode. "L NMAX" AG : 1kHz/50mV Deviation meter filter LPF : 15kHz, HPF : OFF De-emphasis : OFF PTT : ON						2.9kHz (TK-980) (According to the larger +, -)	±50Hz
	2) "C NMAX" PTT : ON							
	3) "H NMAX" PTT : ON							

ADJUSTMENT

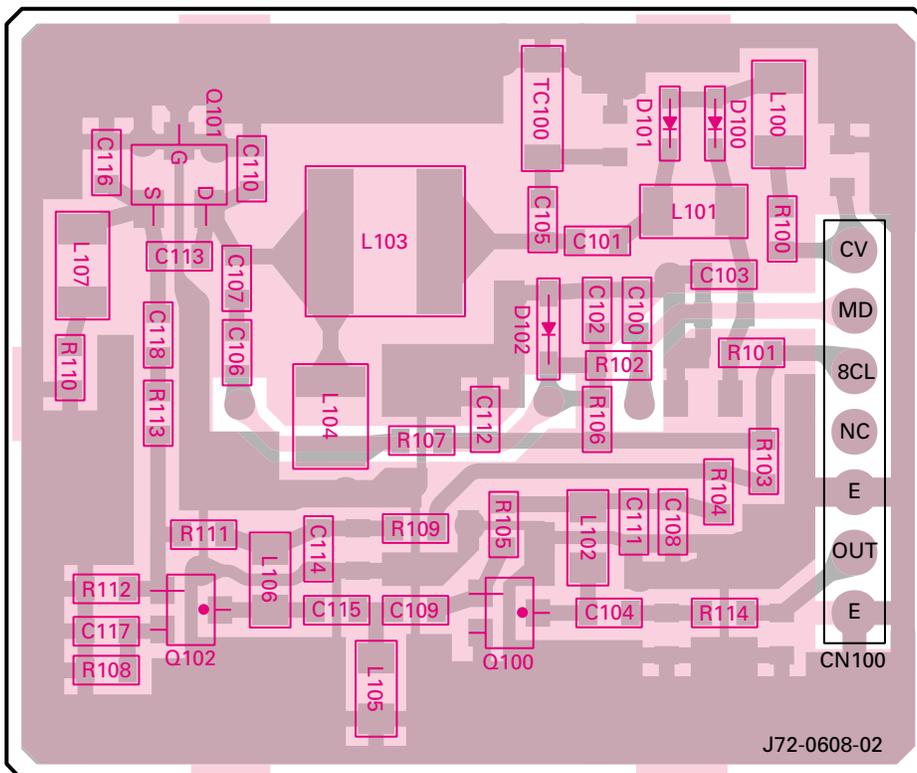
Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
9. MIC sensitivity check	1) Set test mode CH : CH4 - Sig1 AG : 1kHz/5mV PTT : ON	Power meter Deviation meter Oscilloscope	Rear panel	ANT			Check	2.2~3.8kHz (TK-980) 1.1~1.9kHz (TK-981)
10. QT deviation	1) Set test mode Select "FQT" in tuning mode. "L FQT" Deviation meter filter LPF : 3kHz HPF : OFF PTT : ON	AF VTVM AG	Front panel	MIC			0.75kHz (TK-980) 0.35kHz (TK-981)	±50Hz
	2) "C FQT" PTT : ON							
	3) "H FQT" PTT : ON							
11. DQT deviation	1) Set test mode Select "F DQT" in tuning mode. "L FDQT" Deviation meter filter LPF : 3kHz HPF : OFF PTT : ON						0.75kHz (TK-980) 0.35kHz (TK-981)	±50Hz
	2) "C FDQT" PTT : ON							
	3) "H FDQT" PTT : ON							
12. Fine LTR	1) Set test mode Select "FLTR" in tuning mode. "L FLTR" deviation meter filter LPF : 3kHz HPF : OFF PTT : ON						1.0kHz (TK-980) 0.75kHz (TK-981)	±50Hz
	2) "C FLTR" PTT : ON							
	3) "H FLTR" PTT : ON							
13. DTMF deviation	1) Set test mode Select "DTMF" in tuning mode. Deviation meter filter LPF : 15kHz HPF : OFF PTT : ON						3.0kHz (TK-980) 1.5kHz (TK-981)	±0.2kHz
14. MSK deviation	1) Set test mode Select "FMSK" in tuning mode. Deviation meter filter LPF : 15kHz HPF : OFF PTT : ON						3.0kHz (TK-980) 1.5kHz (TK-981)	±0.1kHz
15. TONE deviation	1) Set test mode Select "TONE" in tuning mode. Deviation meter filter LPF : 15kHz HPF : OFF PTT : ON						3.0kHz (TK-980) 1.5kHz (TK-981)	±0.1kHz

PC BOARD VIEWS Manual980.com TK-980/981

PLL/VCO (X58-4530-XX) -10 : TK-980 -11 : TK-981 Component side view



PLL/VCO (X58-4530-XX) -10 : TK-980 -11 : TK-981 Foil side view

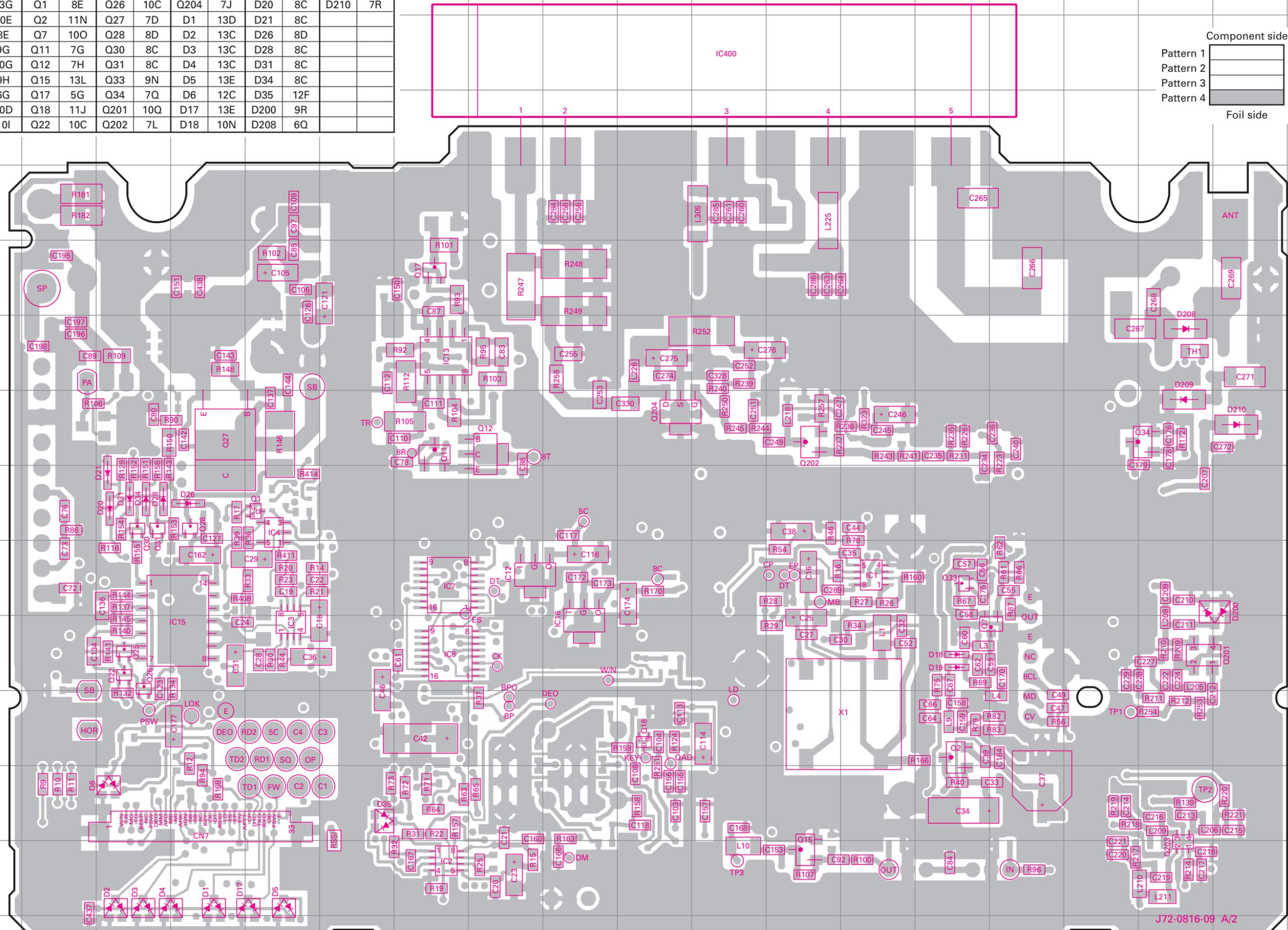
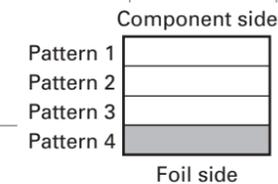


Component side
Foil side

Ref. No.	Address										
IC1	9M	IC400	2K	Q25	10C	Q203	13Q	D19	10N	D209	7Q
IC2	13G	Q1	8E	Q26	10C	Q204	7J	D20	8C	D210	7R
IC3	10E	Q2	11N	Q27	7D	D1	13D	D21	8C		
IC4	8E	Q7	10O	Q28	8D	D2	13C	D26	8D		
IC7	9G	Q11	7G	Q30	8C	D3	13C	D28	8C		
IC8	10G	Q12	7H	Q31	8C	D4	13C	D31	8C		
IC12	9H	Q15	13L	Q33	9N	D5	13E	D34	8C		
IC13	6G	Q17	5G	Q34	7Q	D6	12C	D35	12F		
IC15	10D	Q18	11J	Q201	10Q	D17	13E	D200	9R		
IC16	10I	Q22	10C	Q202	7L	D18	10N	D208	6Q		

TX-RX UNIT (X57-6520-XX) (A/2) -10 : TK-980 -11 : TK-981
Foil side view

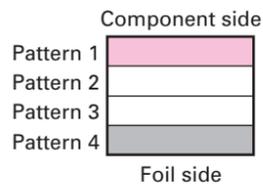
PC BOARD VIEW TK-980/981



TK-980/981 PC BOARD VIEW

TX-RX UNIT (X57-6520-XX) (A/2) -10 : TK-980 -11 : TK-981
Component side view + Foil side

Ref. No.	Address												
IC1	9G	IC13	6M	Q8	9O	Q22	10Q	Q203	13C	D7	11R	D32	5O
IC2	13M	IC14	6O	Q9	9Q	Q25	10Q	Q204	7J	D11	9M	D34	8Q
IC3	10O	IC15	10P	Q10	7M	Q26	10Q	Q205	13C	D16	9R	D35	12N
IC4	8O	IC16	10K	Q11	7M	Q27	7P	Q300	9F	D17	13O	D37	6P
IC5	10M	IC300	10H	Q12	7L	Q28	8P	Q301	11G	D18	10F	D200	9B
IC6	9K	IC400	2I	Q13	7M	Q30	8Q	Q302	11F	D19	10F	D208	6C
IC7	9M	Q1	8O	Q15	13H	Q31	8Q	D1	13P	D20	8Q	D209	7C
IC8	10M	Q2	11F	Q17	5M	Q32	12J	D2	13Q	D21	8Q	D210	7B
IC9	10O	Q4	11R	Q18	11J	Q33	9F	D3	13Q	D24	10R		
IC10	8R	Q5	10R	Q19	5O	Q34	7C	D4	13Q	D26	8P		
IC11	12J	Q6	10R	Q20	6L	Q201	10C	D5	13Q	D28	8Q		
IC12	9L	Q7	10E	Q21	6L	Q202	7H	D6	12Q	D31	8Q		

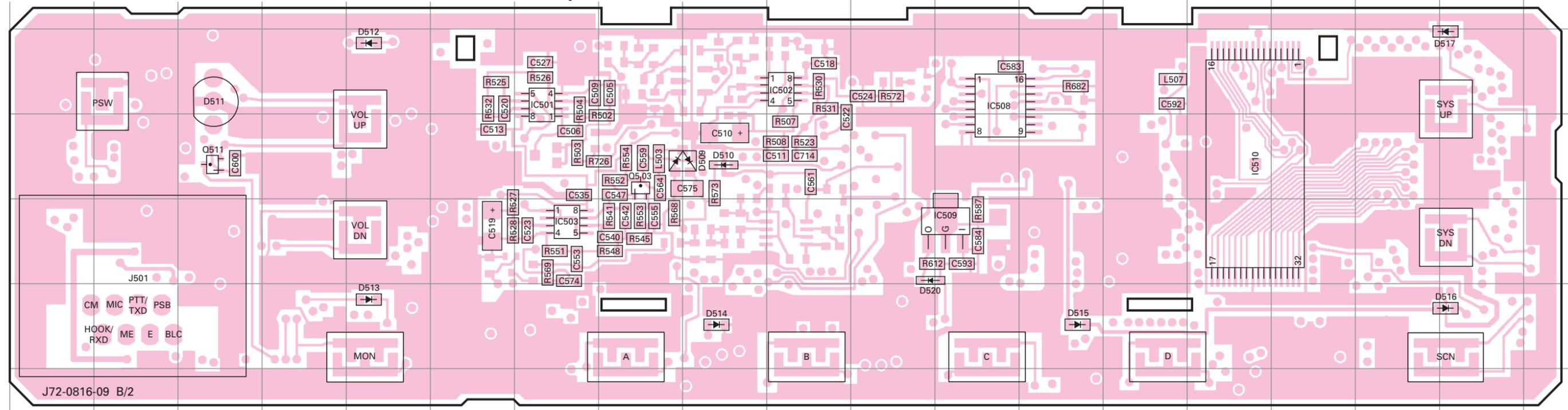


● Connect 1 and 4

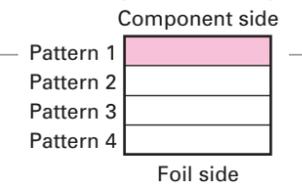


PC BOARD VIEWS TK-980/981

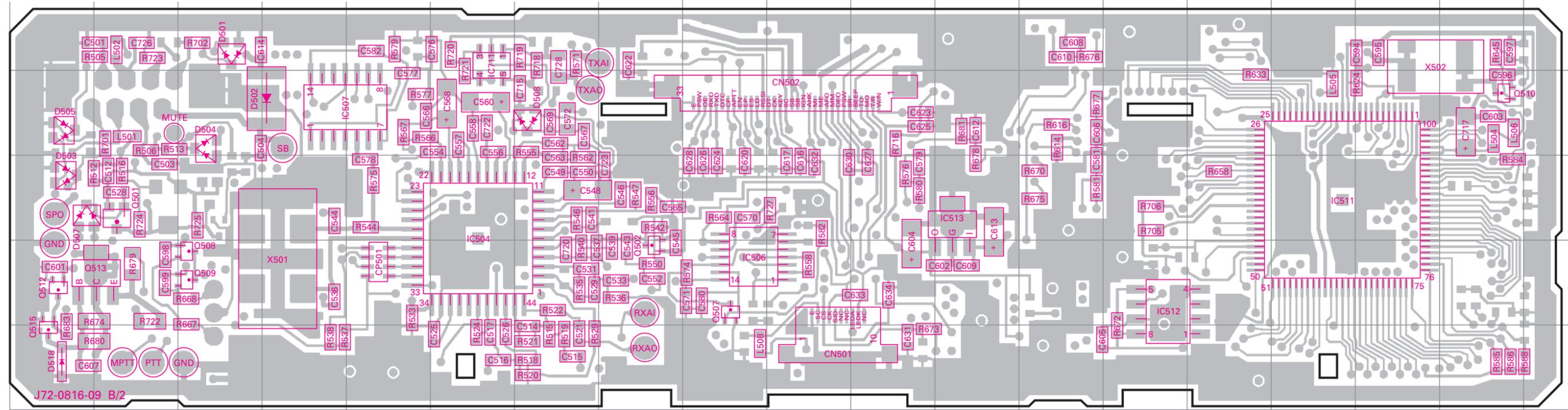
TX-RX UNIT (X57-6520-XX) (B/2) -10 : TK-980 -11 : TK-981 Component side view



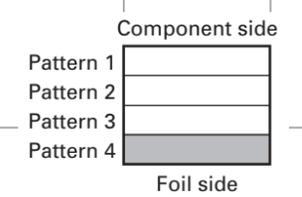
Ref No.	Address						
IC501	2G	IC510	3O	D511	2C	D516	5R
IC502	2J	Q503	3H	D512	2E	D517	2R
IC503	4G	Q511	3C	D513	5E	D520	4K
IC508	2L	D509	3I	D514	5I		
IC509	4L	D510	3I	D515	5M		



TX-RX UNIT (X57-6520-XX) (B/2) -10 : TK-980 -11 : TK-981 Foil side view

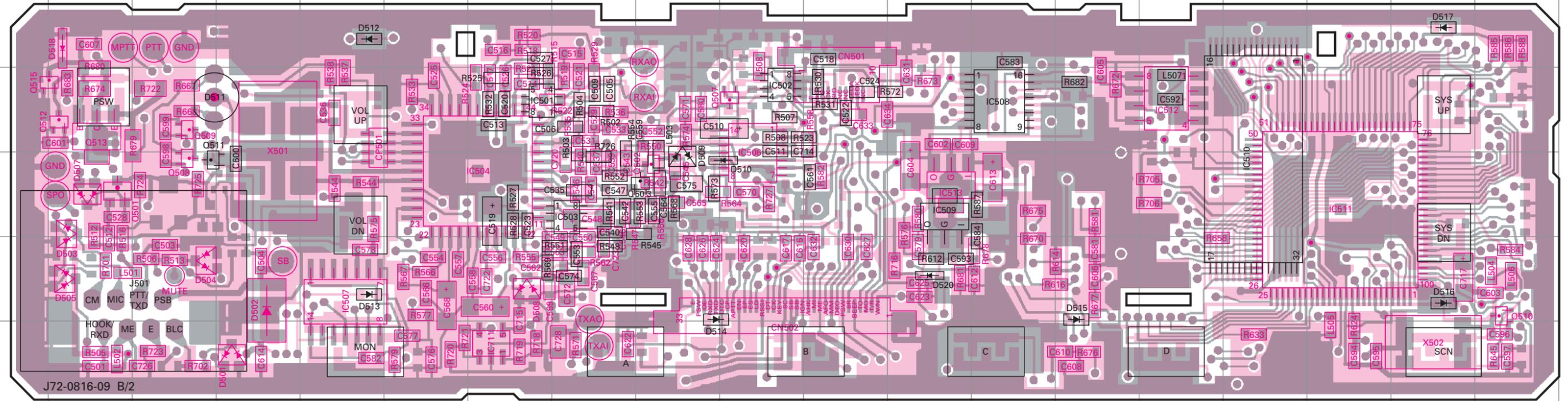


Ref No.	Address								
IC504	10F	IC513	10L	Q508	11C	Q515	12A	D505	9A
IC506	11I	IC711	8F	Q509	11C	D501	8C	D507	10A
IC507	9D	Q501	10B	Q510	9R	D502	9D	D508	9G
IC511	10P	Q502	11H	Q512	11A	D503	10A	D518	12A
IC512	11N	Q507	11I	Q513	11B	D504	9C		

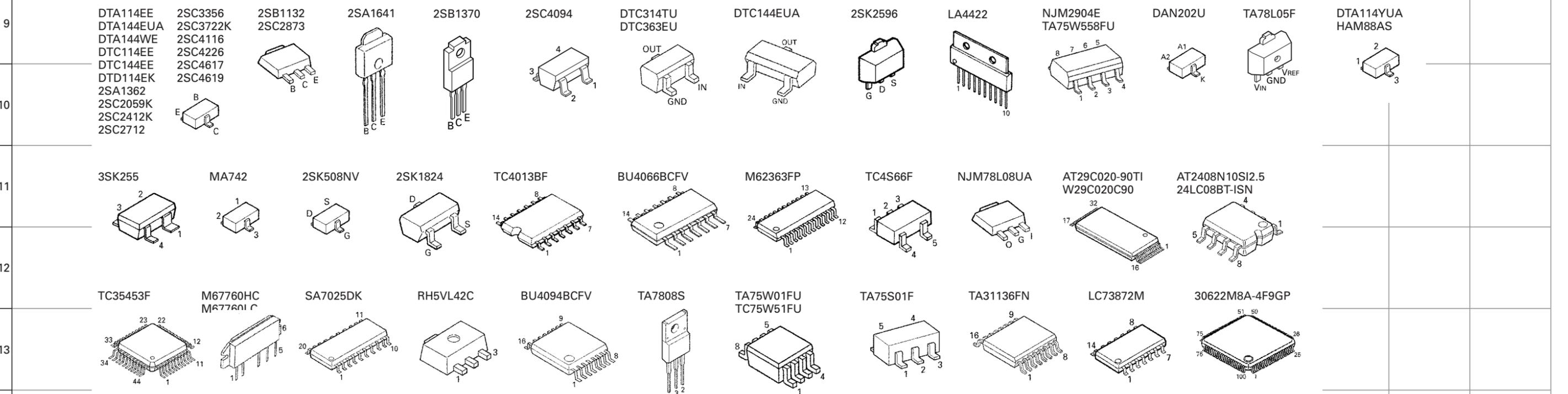
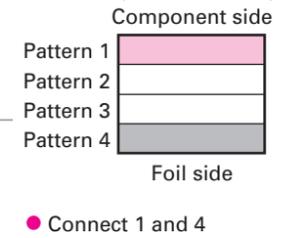


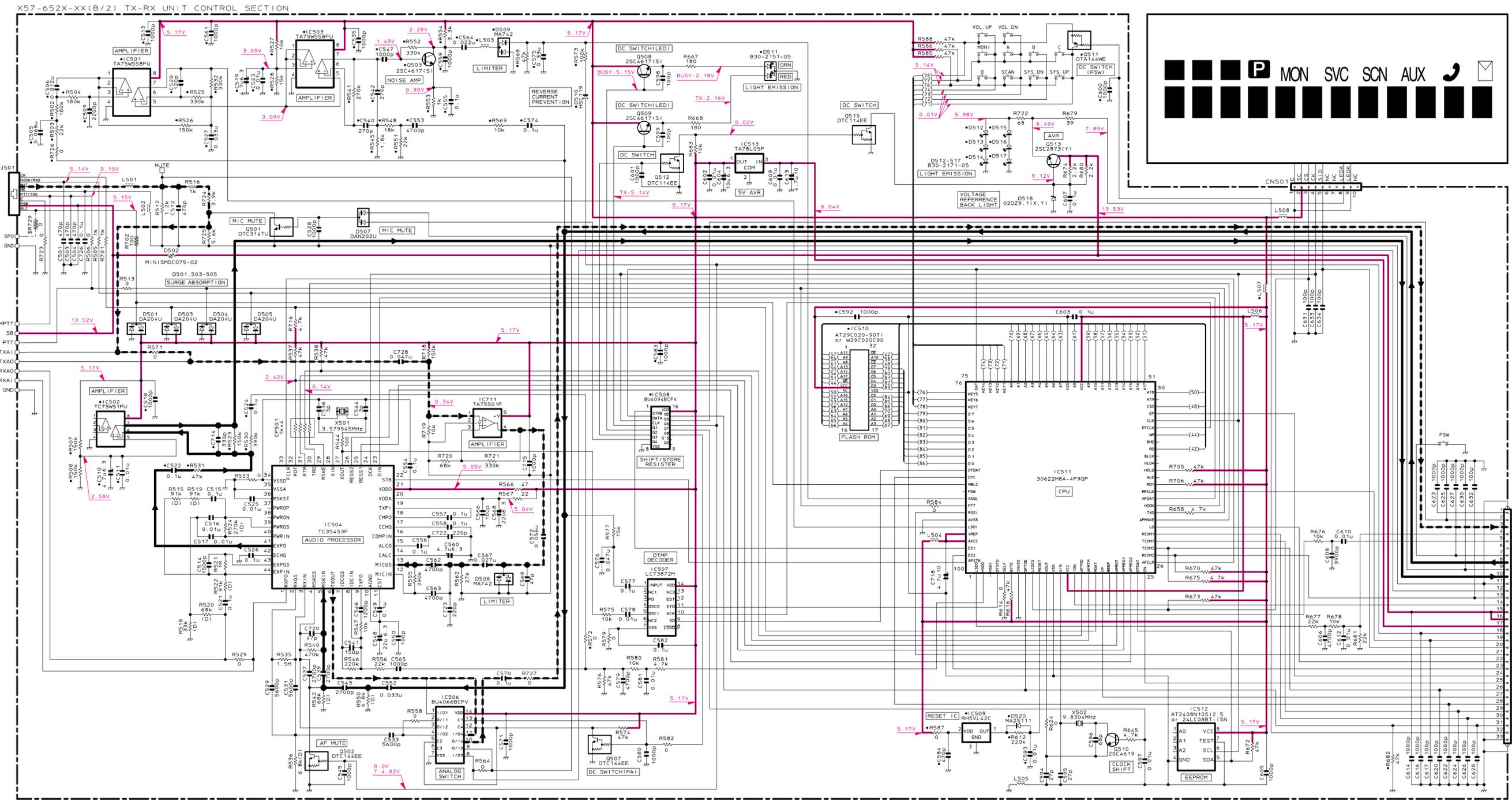
TK-980/981 PC BOARD VIEW

TX-RX UNIT (X57-6520-XX) (B/2) -10 : TK-980 -11 : TK-981 Component side view + Foil side



Ref No.	Address												
IC501	3G	IC508	3M	IC711	6G	Q509	3C	D501	6D	D508	5G	D514	5I
IC502	3J	IC509	4L	Q501	4B	Q510	5S	D502	5D	D509	4I	D515	5N
IC503	4H	IC510	4P	Q502	4I	Q511	4C	D503	4B	D510	4J	D516	5R
IC504	4G	IC511	4Q	Q503	4I	Q512	3B	D504	5C	D511	3C	D517	2R
IC506	4J	IC512	3O	Q507	3J	Q513	3B	D505	5B	D512	2E	D518	2B
IC507	5E	IC513	4L	Q508	4C	Q515	3B	D507	4B	D513	5E	D520	5L





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

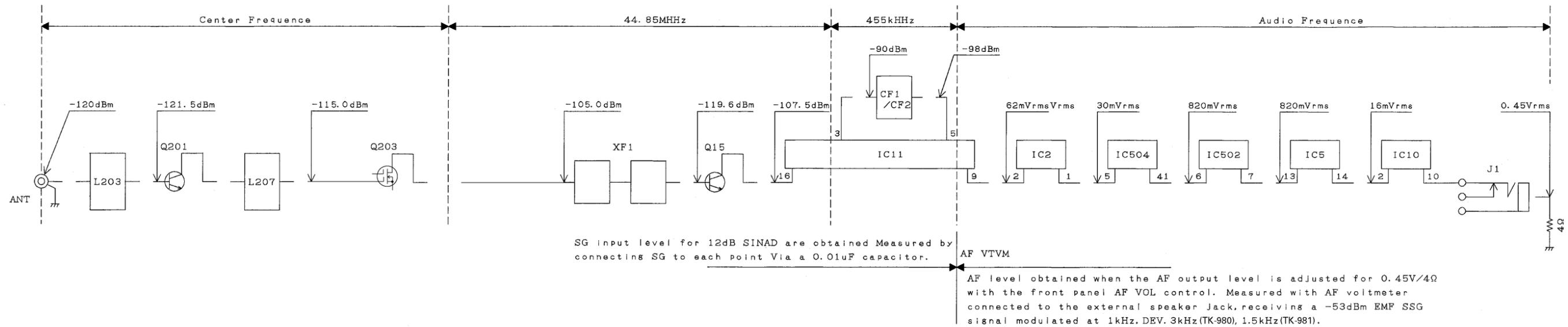
- | | |
|----------------|------------------|
| D501, 503-505 | :DA204U |
| D502 | :MINI SMD075-02 |
| D507 | :DAN202U |
| D508, 509 | :MA742 |
| D510 | :HSC119 |
| D511 | :B30-2151-05 |
| D512-517 | :B30-2171-05 |
| D518 | :02D29.1(X.Y) |
| D520 | :MA25111 |
| | |
| D501 | :DTC314TU |
| D502, 507 | :DTC144EE |
| D503, 508, 509 | :ZSC4617(S) |
| D510 | :ZSC4619 |
| D511 | :DTA144WE |
| D512, 515 | :DTC114EE |
| D513 | :ZSC2873(Y) |
| | |
| IC501, 503 | :TA75W58FU |
| IC502 | :TC75W51FU |
| IC504 | :TC35453F |
| IC506 | :BU4066BCFV |
| IC507 | :LC73872M |
| IC508 | :BU4094BCFV |
| IC509 | :RHSVL42C |
| IC510 | :AT29C020-90T1 |
| IC511 | :or W29C020C9D |
| IC512 | :30622M8A-4F9GP |
| IC512 | :AT2408N10S12.5 |
| IC512 | :or 24LC08BT-1SN |
| IC513 | :TA78L05F |
| IC711 | :TA75501F |

X57-652X-XX
TX-RX UNIT (A/2)

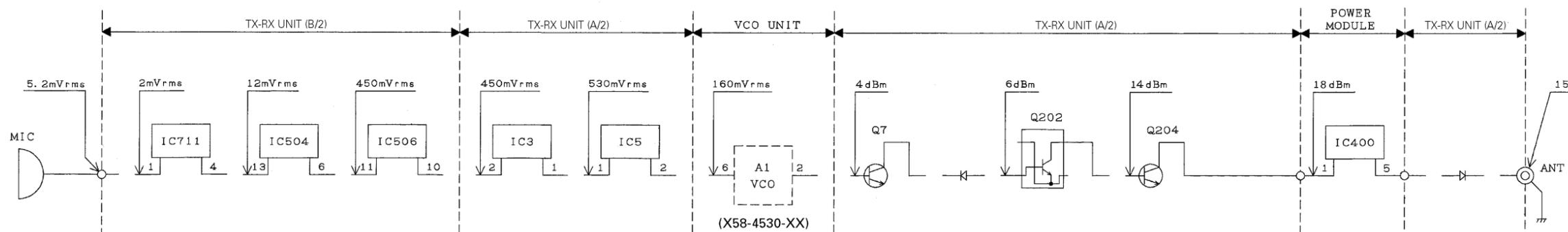
TK-980/981 TK-980/981

LEVEL DIAGRAM

Receiver Section



Transmitter Section



1. AG is set so that MIC input becomes 3kHz DEV. (TK-980), 1.5kHz DEV. (TK-981) at 1kHz mod.
2. Transmitting frequency: Center frequency.

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 switch input. H : Wide
2	T/R	TX/RX switch input. H : Receive
3	MO	Modulation signal input.
4	TO	Low speed data signal input.
5	BEEP	Beep input.
6	8R	NC (8V)
7	PSW	Power switch.
8	DEO	Recovery signal output.
9	MM	MIC mute. H : MIC mute
10	AFO	Recovery signal input.
11	ME	MIC ground.
12	MI	Internal MIC output.
13	AHK	Hook signal output. H : Off hook
14	IGN	Ignition output.
15	SB	13.6V output.
16	SB	13.6V output.
17	8C	8V output.
18	KEY	TX/Lock detection input.
19	CK	Shift register clock input.
20	DT	PLL/Shift register/DA converter input.
21	RSSI	RSSI signal output.
22	LD	PLL unlock detection output.
23	ES	Shift register enable input.
24	EP	PLL enable signal input.
25	EN	DA converter enable signal input.
26	APTT	PTT signal output.
27	CP	PLL clock.
28	DTC	Data control signal output.
29	TXD	Serial data
30	RXD	Serial data.
31	OE	Serial data.
32	FSW	Foot switch output.
33	E	Ground.

Pin No.	Name	Function
1	E	Ground.
2	HT	Signal output.
3	E	Ground.
4	NC	Unused terminal.
5	8CL	8V input.
6	MD	Modulation output.
7	CV	Control voltage input.

CN501 (TX-RX Unit B/2)

Pin No.	Name	Function
1	E	Ground (0V).
2	5C	Logic power.
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 backlight control.
2	PSB	13.6V.
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	TK-980	RX : 851~870MHz	TX : 806~825MHz, 851~870MHz
	TK-981	RX : 935~941MHz	TX : 896~902MHz, 935~941MHz
Number of Channels	Maximum 600 channels (LTR mode)		
	Maximum 250 channels (Conventional mode)		
Channel Spacing	TK-980	25kHz (PLL channel step 12.5kHz)	
	TK-981	12.5kHz (PLL channel step 12.5kHz)	
Input Voltage	13.6V DC negative ground		
Current Drain	0.4A on standby		
	1.0A on receive		
	7A on transmit		
Temperature Range	-30°C to +60°C (-22°F to +140°F)		
Dimensions & Weight	140 (5.51) W x 40 (1.58) H x 145 (5.73) D mm (inch), 0.94kg (2.07 lbs)		

RECEIVER (Measurements made per EIA standard EIA/TIA-603)

RF Input Impedance	50Ω		
Sensitivity (EIA 12dB SINAD)	0.25μV		
Selectivity	TK-980	: 75dB	TK-981 : 68dB
Intermodulation	TK-980	: 70dB	TK-981 : 65dB
Spurious and Image Rejection	80dB		
Audio Power Output	4W at 4Ω less than 5% distortion		
Frequency Stability	±1.5ppm from -30°C to +60°C		
Channel Frequency Spread	TK-980	: 19MHz	TK-981 : 6MHz

TRANSMITTER (Measurements made per EIA standard EIA/TIA-603)

RF Power Output	15W		
Spurious and Harmonics	-60dB		
Modulation	TK-980	: 16K0F3E	TK-981 : 11K0F3E
FM Noise	TK-980	: -45dB	TK-981 : -40dB
Microphone Impedance	Low impedance		
Audio Distortion	TK-980	: 3% or less at 1kHz	TK-981 : 5% or less at 1kHz
Frequency Stability	±1.5ppm from -30°C to +60°C		
Channel Frequency Spread	TK-980	: 64MHz	TK-981 : 45MHz

Specifications are for K (U.S.A) models only.

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