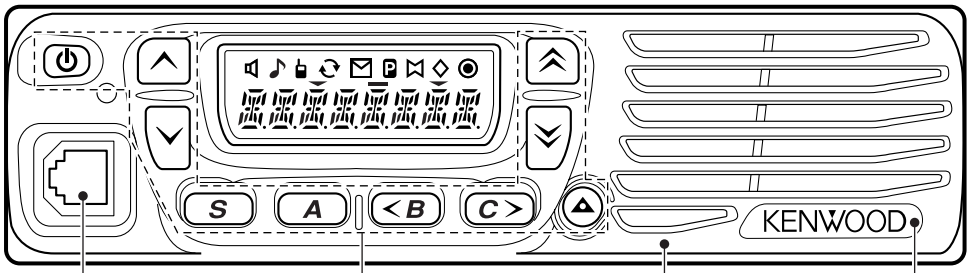
UHF FM TRANSCEIVER

TK-8160

SERVICE MANUAL

KENWOOD

B51-8707-00 (N) 1074

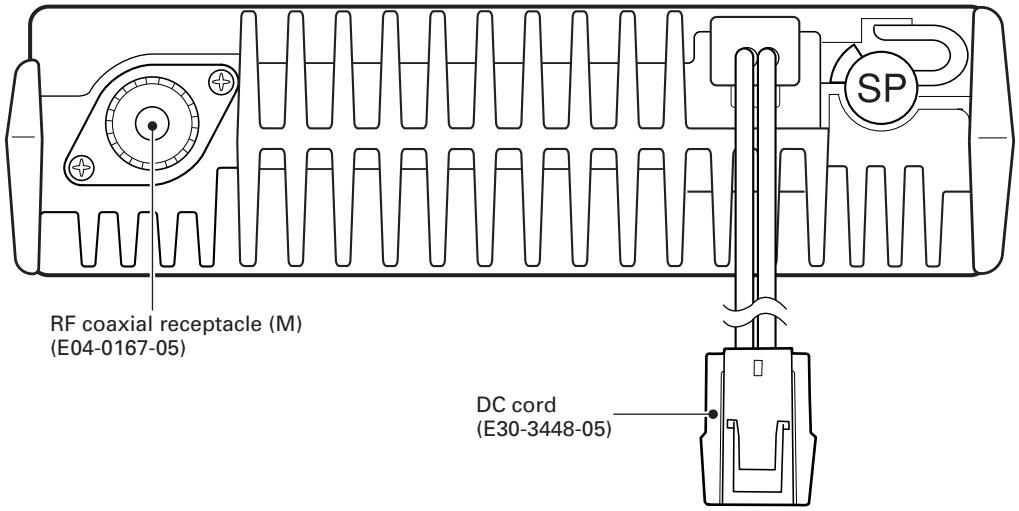


Modular jack
(E08-0877-05)

Key top
(K29-9342-01)

Panel assy
(A62-1107-13)

Badge
(B43-1179-04)



RF coaxial receptacle (M)
(E04-0167-05)

DC cord
(E30-3448-05)

CONTENTS

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 this 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.

PERSONAL SAFETY

The following precautions are recommended for personal 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 this equipment when near electrical blasting caps or while 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 CONSIDERATIONS

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. Signalling 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.
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 / SYSTEM SET-UP

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

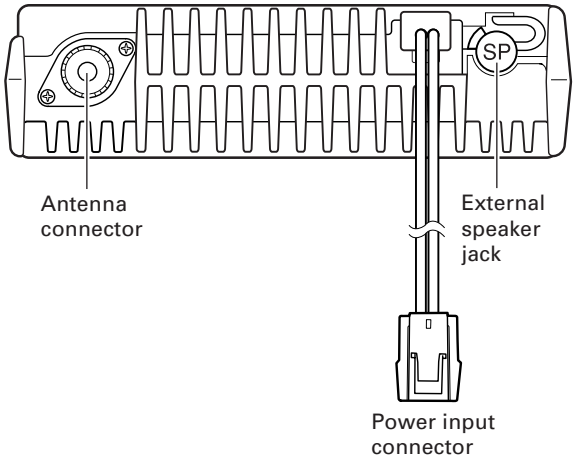
Select a convenient location for your control station radio which is as close as practical to the antenna cable entry point. Secondly, use your system's power supply (which supplies the voltage and current required for your system). Make sure sufficient air can flow around the radio and power supply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

SERVICE

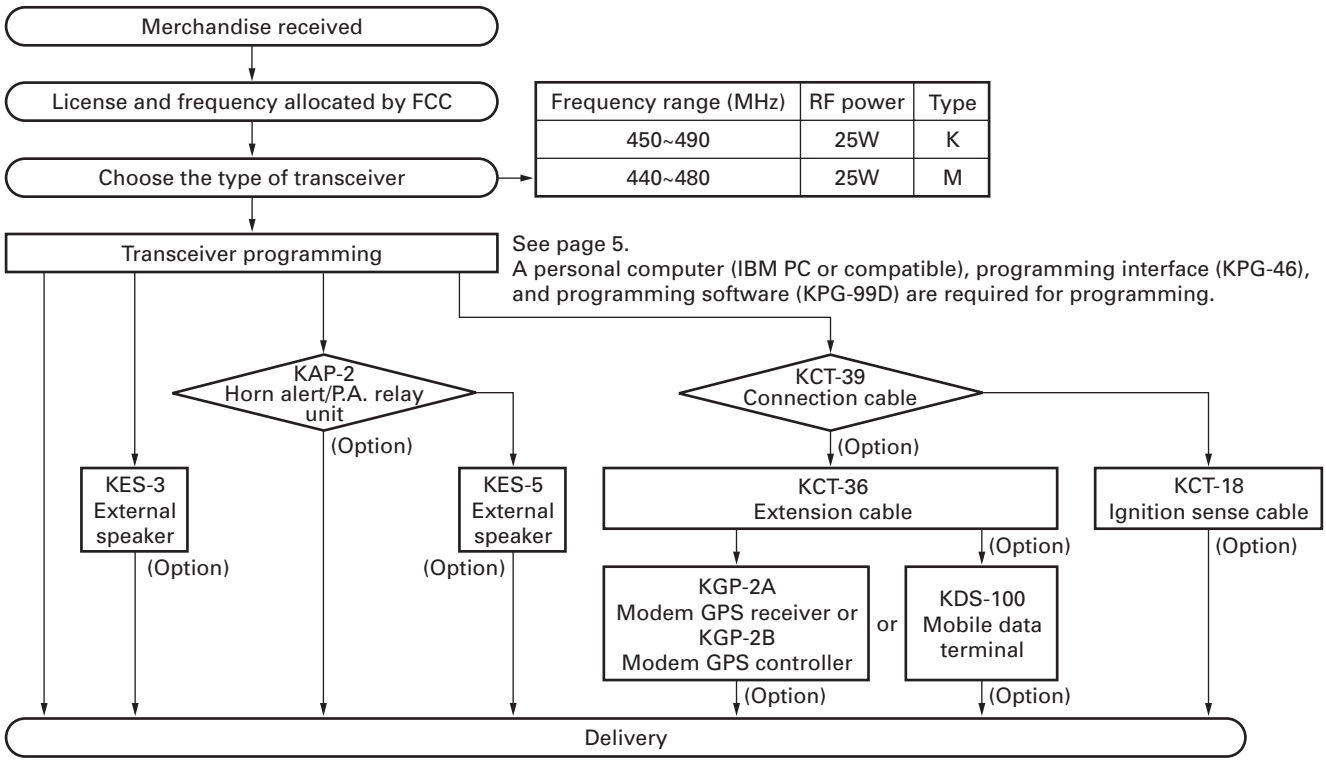
This radio is designed for easy servicing. Refer to the schematic diagrams, printed circuit board views, and alignment procedures contained in this manual.

NOTE

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



SYSTEM SET-UP

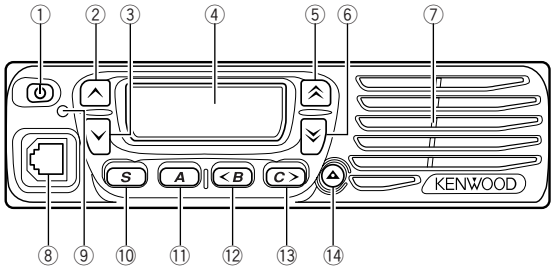


You can install either KAP-2 or KCT-39 to the transceiver.

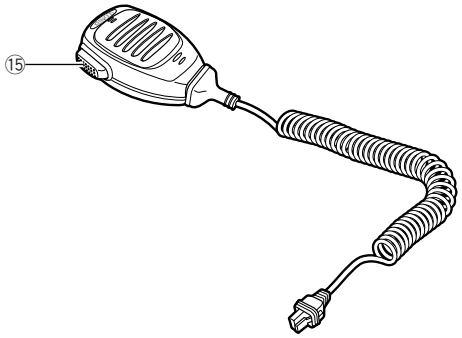
OPERATING FEATURES

1. Controls and Functions

1-1. Front Panel



1-2. Microphone



① ⏻ (Power) switch
Press to switch the transceiver ON or OFF.

② ∧ key
Press to activate its programmable function. The default setting is Volume Up.

③ ∨ key
Press to activate its programmable function. The default setting is Volume Down.

④ Display
Refer to right.

⑤ ⩓ key
Press to activate its programmable function. The default setting is Zone Up.

⑥ ⩔ key
Press to activate its programmable function. The default setting is Zone Down.

⑦ Speaker
Internal speaker.

⑧ Microphone jack
Insert the microphone plug into this jack.

⑨ TX/RX Indicator
Lights red while transmitting. Lights green while receiving a signal.

⑩ ***S*** key
Press to activate its programmable function. The default setting is Squelch Off Momentary.

⑪ ***A*** key
Press to activate its programmable function. The default setting is None (no function).

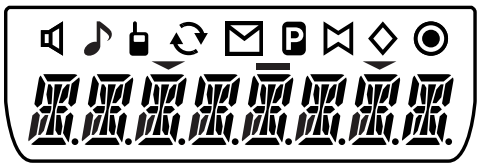
⑫ ***<B*** key
Press to activate its programmable function. The default setting is Channel Down.

⑬ ***C>*** key
Press to activate its programmable function. The default setting is Channel Up.

⑭ ▲ key
Press to activate its programmable function. The default setting is None (no function).

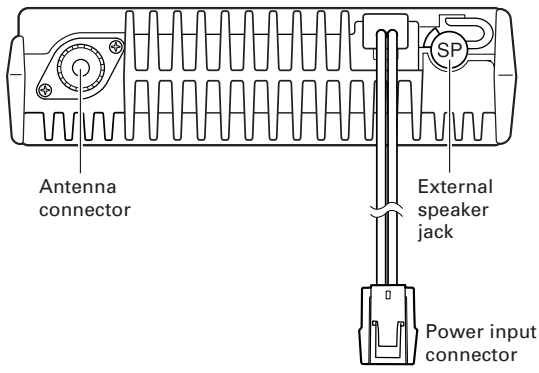
⑮ PTT switch
Press this switch, then speak into the microphone to call a station.

1-3. Display



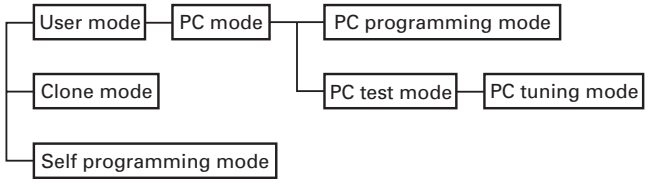
Indicator	Description
	Appears when the key programmed as Monitor or Squelch Off is pressed.
	Appears when the DTMF or 2-tone code of a call matches the code in your transceiver.
	Appears while using the Talk Around function.
	The selected zone is added to the scanning sequence.
	Appears while scanning.
	Appears when a message is stored in the transceiver stack memory. Appears and blinks when a new message has arrived.
	Appears when the AUX port has been activated.
	The selected channel is set as a Priority channel.
	Appears when the Horn Alert function has been activated.
	The selected channel is added to the scanning sequence.
	Appears when Scrambler function has been selected.
	Appears when the Public Address function has been activated.
	Displays the currently selected zone and channel number, or the channel name.

1-4. Rear Panel



REALIGNMENT

1. Modes



Mode	Function
User mode	For normal use.
PC mode	Used for communication between the radio and PC (IBM compatible).
PC 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.
PC tuning mode	Used to tune the radio using the PC.
Clone mode	Used to transfer programming data from one radio to another.
Self programming mode	You can program the frequency, signalling and other functions using only the radio.

2. How to Enter Each Mode

Mode	Operation
User mode	Power ON
PC mode	Received commands from PC
Clone mode	[⩔]+Power ON (Two seconds)
Self programming mode	[***S***]+Power ON (Two seconds)

3. PC Mode

3-1. Preface

The TK-8160 transceiver is programmed using a personal computer, a programming interface (KPG-46) and programming software (KPG-99D).

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

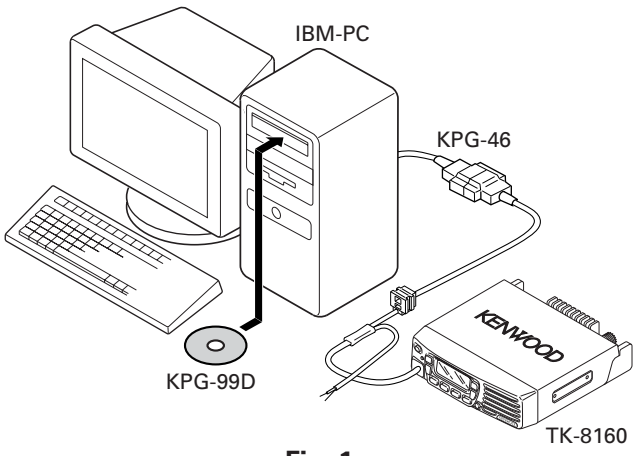


Fig. 1

3-2. Connection Procedure

1. Connect the TK-8160 to the personal computer with the interface cable.
2. When the Power is switched on, user mode can be entered immediately. When the PC sends a command, the radio enters PC mode.
   When data is transmitted from transceiver, the TX indicator blink.
   When data is received by the transceiver, the BUSY indicator blink.
   In the PC mode, "PROGRAM" is displayed on the LCD.

3-3. KPG-46 Description (PC programming interface cable : Option)

The KPG-46 is required to interface the TK-8160 to the computer. It has a circuit in its D-subconnector (25-pin) case that converts the RS-232C logic level to the TTL level.

The KPG-46 connects the modular microphone jack of the TK-8160 to the computers RS-232C serial port.

3-4. Programming Software Description

KPG-99D is the programming software for TK-8160 supplied on a CD-ROM. This software runs under Windows 98, ME, Windows 2000 or XP on an IBM-PC or compatible machine.

The data can be input to or read from TK-8160 and edited on the screen. The programmed or edited data can be printed out. It is also possible to tune the transceiver.

4. 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 the slave).

Note :

Clone mode should be enabled.

1. Turn the master TK-8160 power ON with the [⩔] key held down (2 seconds), " CLONE " is displayed on the LCD.
2. Power on the slave TK-8160.
3. Connect the cloning cable (No. E30-3382-05) to the modular microphone jacks on the master and slave.
4. Press the [***S***] key on the master TK-8160 transceiver. The data of the master is sent to the slave. While the master is sending data, red LED blinked. While the slave is receiving the data, " PC " is displayed and green LED blinked. When cloning of data is completed, the master displays "END", and the master red LED turned off, and the slave automatically operates in the User mode. The slave can then be operated by the same program as the master.
5. The other slave can be continuously cloned. Carry out the operation in step 2 to 4.

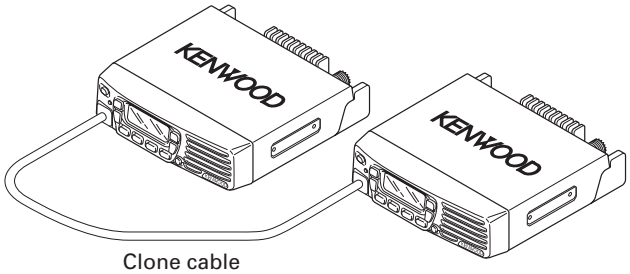
REALIGNMENT

4-1. Adding the data password.

If the data password is set in the optional feature menu, you must enter the password (Master transceiver) to activate a clone mode.

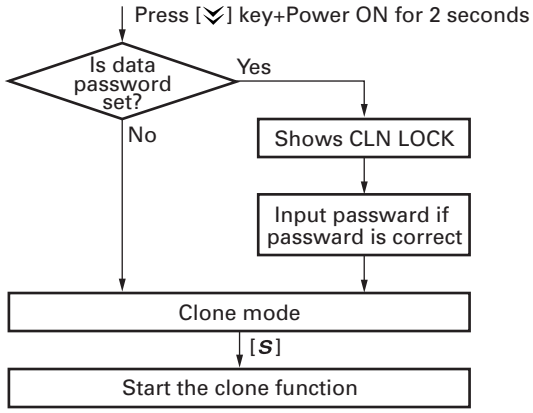
You can use 0~9 to configure the password. The maximum length of the password is 6 digits.

1. [⩔]+Power ON.
2. "CLN LOCK" is displayed on the LCD.
3. If the [⩓] and [⩔] keys is pressed while "CLN LOCK" is displayed, numbers (0 to 9) are displayed flashing. When you press the [***C*** >] key, the currently selected number is determined. If you press the [***S***] key after entering the password in this procedure, "CLONE" is displayed if the entered password is correct. If the password is incorrect, "CLN LOCK" is redisplayed.



Fig, 2

■ Flow Chart (Master radio)



5. Self Programming Mode

Write mode for frequency data and signaling, etc. To be used ONLY by the authorized service person maintaining the user's equipment. After programming, reset the FPU to the "Self- Programming" disabled mode. Radios CANNOT be delivered to the end-user in the self-programming mode.

5-1. Enter to the Self Programming Mode

Hold down the [***S***] key 2 seconds and turn the power switch on. When enter the self programming mode, "1- 1" is displayed 2 seconds after " SELF " is displayed.

5-2. Adding the Data Password

If the data password is set in the optional feature menu, you must enter the password to activate a self programming mode.

You can use 0~9 to configure the password. The maximum length of the password is 6 digits.

1. [***S***]+Power ON.
2. "SLF.LOCK.R"* is displayed on the LCD.
3. If the [⩓] and [⩔] keys is pressed while "SELFLOCK" is displayed, numbers (0 to 9) are displayed flashing. When you press the [***C*** >] key, the currently selected number is determined. If you press the [***S***] key after entering the password in this procedure, "SELF" is displayed if the entered password is correct. If the password is incorrect, "SLF.LOCK.R"* is redisplayed.

* Read authorization password → "SLF.LOCL.R"
Overwrite password → "SLF.LOCK.W"

Note :

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

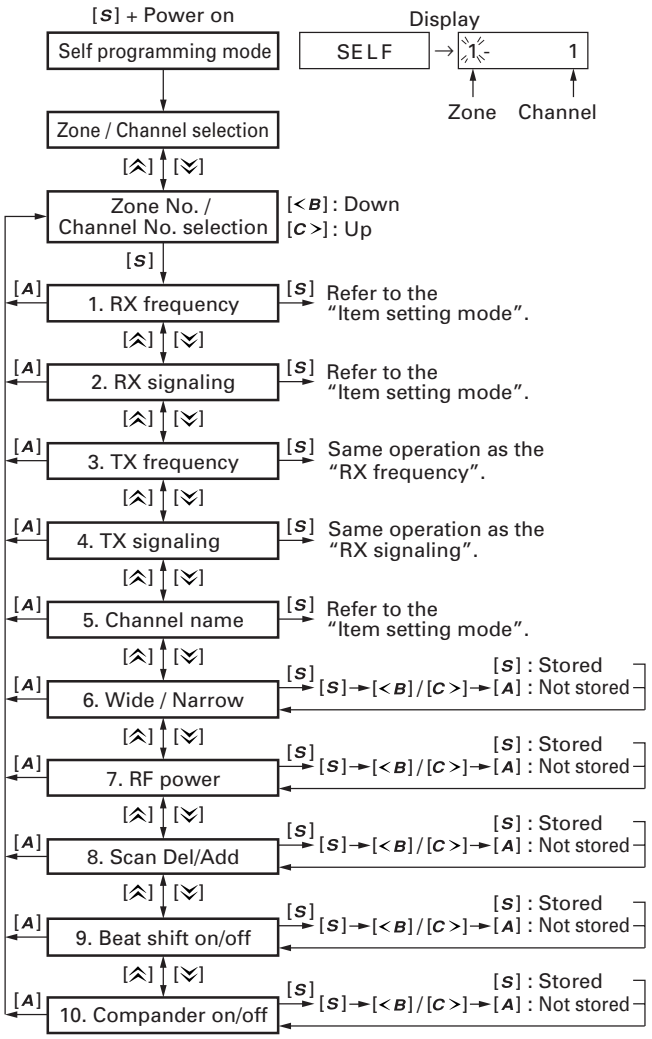
5-3. Channel Setting Mode

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

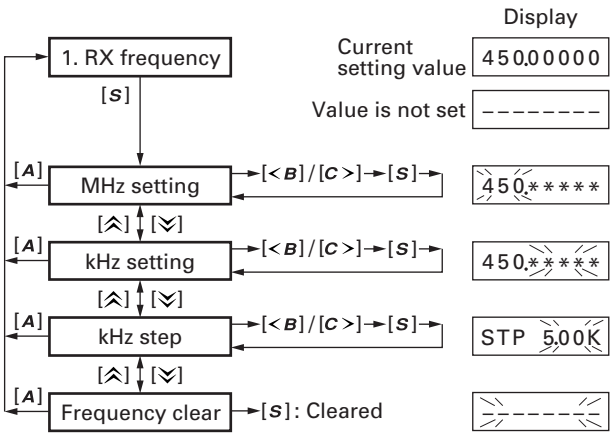
- Pressing [***S***] when "1- 1" is displayed, sets channel setting mode.
- Select an item set using [***S***] then change the selection with the [⩓] or [⩔].
- The data displayed using [***S***] is stored in the memory.
- Pressing [⩓] proceeds to the next item without storing it in the memory.
- Press [***A***] to set the display to " SELF " and return to reset (default) status.

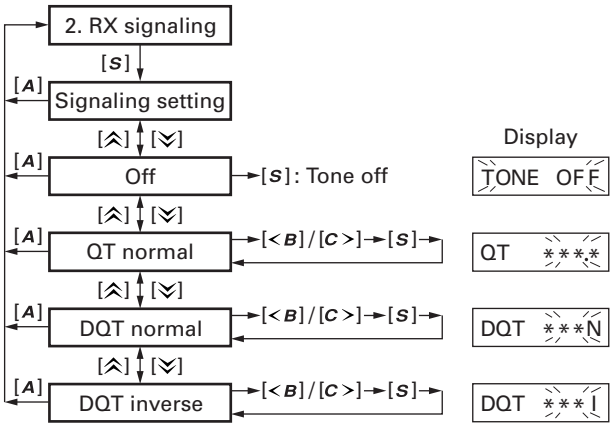
REALIGNMENT

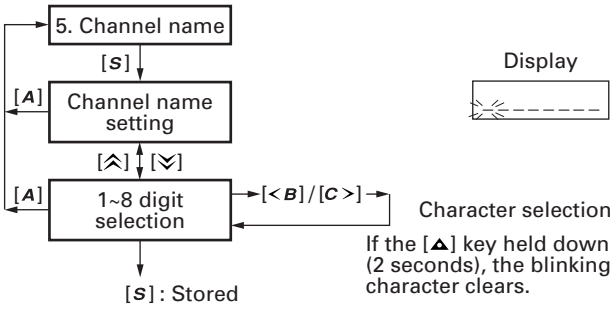
■ Item Selection Mode



■ Item Setting Mode







REALIGNMENT

6. Accessory Connection Cable (KCT-39)

The KCT-39 is an accessory connection cable for connecting external equipment. The connector has 15 pins and the necessary signal lines are selected for use.

6-1. Installing the KCT-39 in the Transceiver

1. Lift the DC cord bushing (❶) from the chassis. Peel the pad as shown in Figure 3 (❷).

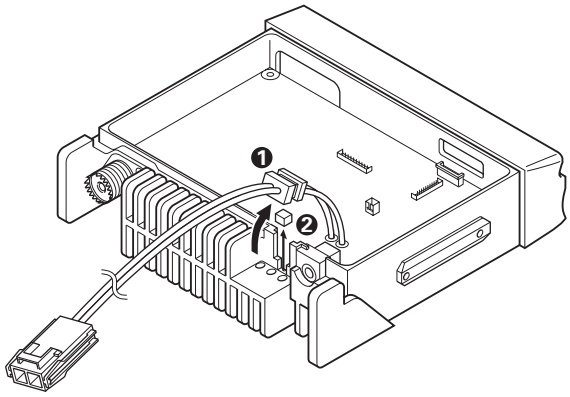


Fig. 3

2. Stick the pad to the DC cord (❸) and chassis (❹), both of which are supplied with the KCT-39.

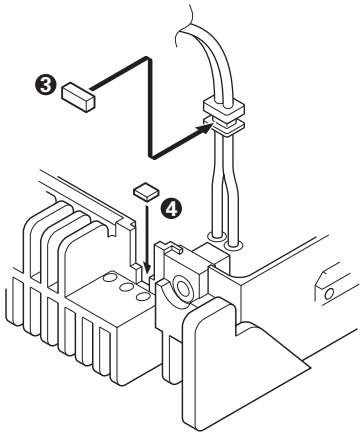


Fig. 4

3. Insert the KCT-39 cable (❺) into the chassis (❻). The wire harness band (❼) must be inside the chassis and face down.
4. Connect the KCT-39 to the TX-RX unit as shown in Figure 5 (❽).

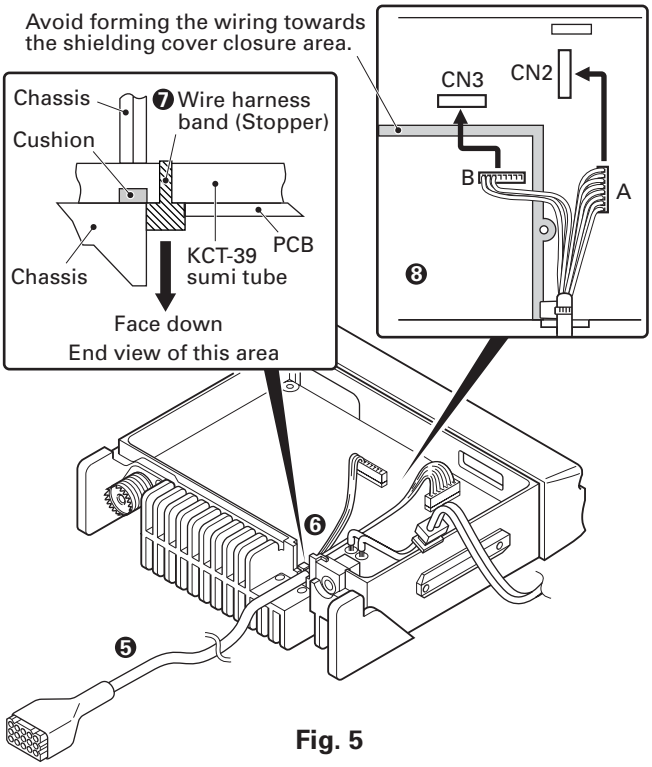


Fig. 5

5. Connect the KCT-39 to the external accessory by inserting the crimp terminal (❾) into the square plug (❿), both of which are supplied with the KCT-39.

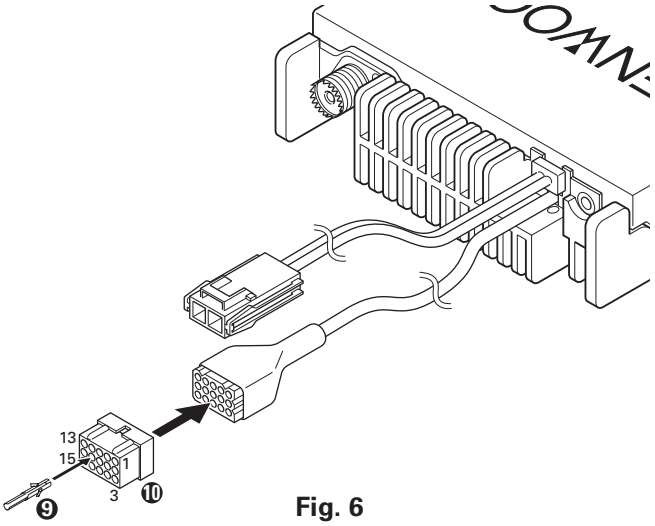
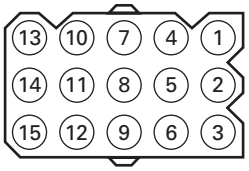


Fig. 6



■ Accessory Port Function

No.	Color	Internal connector	Name	No.	Color	Internal connector	Name
1	Red	CN2-1	SB	9	Purple	CN2-12	FNC8
2	Pink	CN3-1	IGN	10	Gray	CN2-10	FNC6
3	Black	CN2-3	GND	11	White	CN2-11	FNC7
4	Brown	CN3-3	DETO	12	NC	NC	
5	Orange	CN3-2	DATAI	13	NC	NC	
6	Yellow	CN2-8	FNC4	14	Sky blue	CN2-6	FNC2
7	Green	CN2-7	FNC3	15	Turquoise	CN2-5	FNC1
8	Blue	CN2-9	FNC5				

REALIGNMENT / INSTALLATION

7. Ignition Sense Cable (KCT-18)

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.

7-2. Connecting the KCT-18 to the Transceiver

1. Install the KCT-39 in the transceiver. (See the KCT-39 section)
2. Insert the KCT-18 lead terminal (❶) into pin 2 of the KCT-39 (❷).

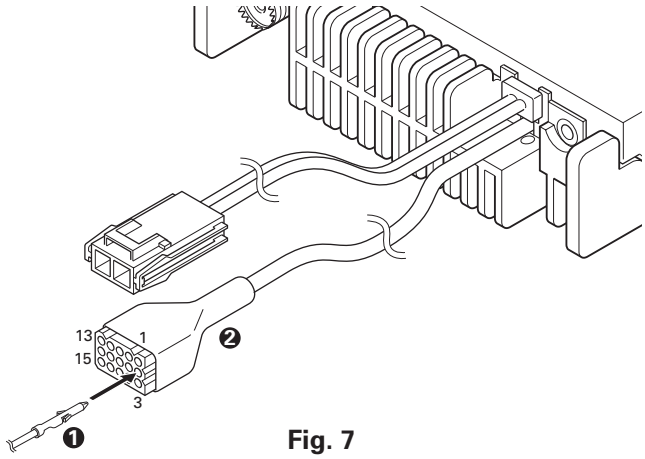


Fig. 7

7-3. Modifying the Transceiver

Modify the transceiver as follows to turn the power on and off with the ignition key.

1. Remove the jumper resistor (0Ω) R95 of the TX-RX unit.

■ Setting With the KPG-99D

Select "Function port" from the "Edit" menu and enable the "Ignition Sense".

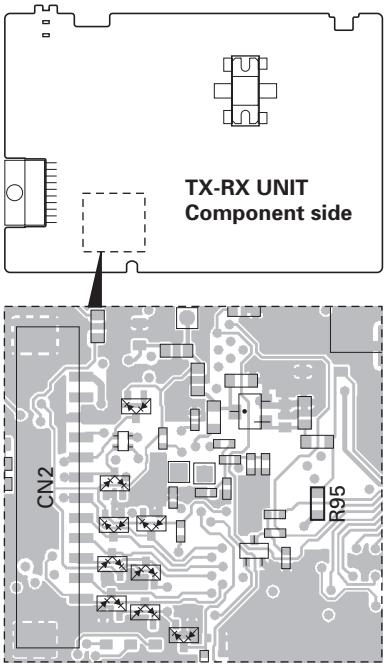


Fig. 8

1. PA/HA Unit (KAP-2 : Option)

1-1. Installing the KAP-2 in the Transceiver

The Horn Alert and Public Address functions are enabled by inserting the KAP-2 relay unit.

■ Installation Procedure

The accessories of KAP-2 use "KIT A" for this transceiver.

1. Open the case and shield cover of the transceiver.
2. Remove the jumper lead from CN6 connector on the TX-RX unit.
3. Lift the DC cord bushing (❶) from the chassis and remove the pad as shown in the Figure 1 (❷).

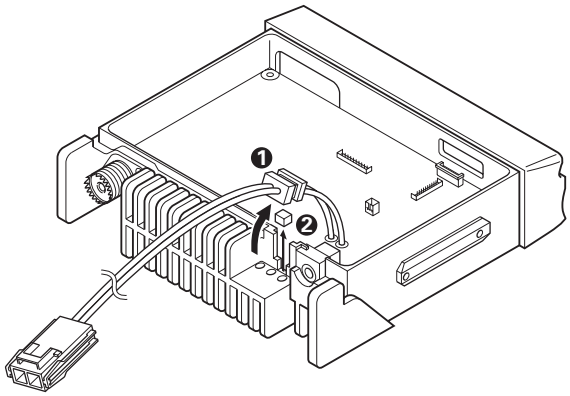


Fig. 1

4. Affix the new pads (supplied with the KAP-2) to the DC cord (❸) and chassis (❹).

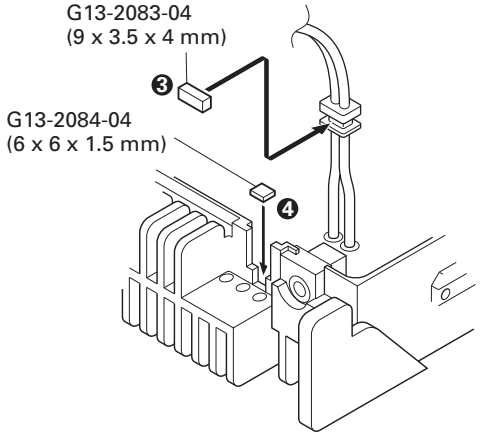


Fig. 2

INSTALLATION

5. Affix the 20 x 20 x 2.5 mm pad to the 40 x 33 mm transparent sheet, then attach it to the TX-RX unit printed area as shown in Figure 3.

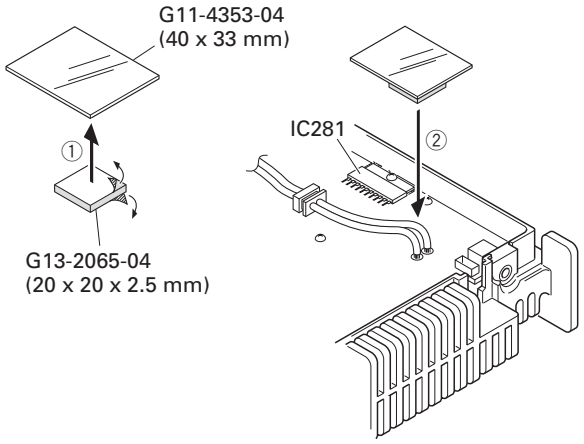


Fig. 3

6. Affix the 30 x 30 x 1 mm pad to the top of the KAP-2 relay unit.
7. Affix the KAP-2 relay unit to the transparent sheet.

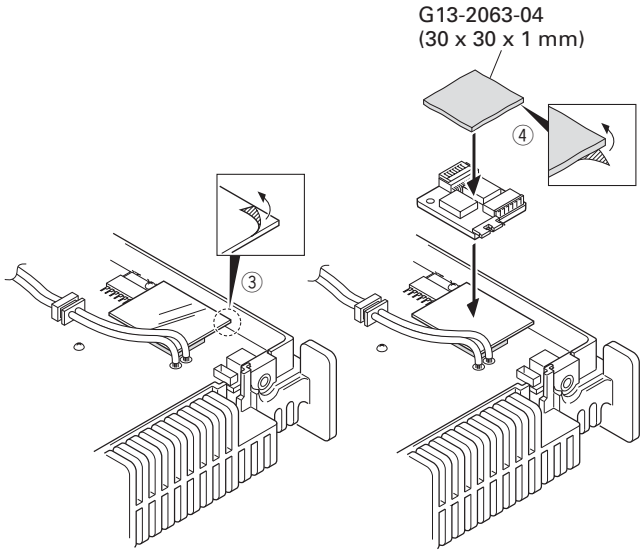


Fig. 4

8. Attach the supplied cable to the CN3 connector of the KAP-2 unit and the CN6 connector of the TX-RX unit.
9. Insert the extension cable connector into the CN2 connector of the KAP-2 unit.

Note : You must setup using the KPG-99D.

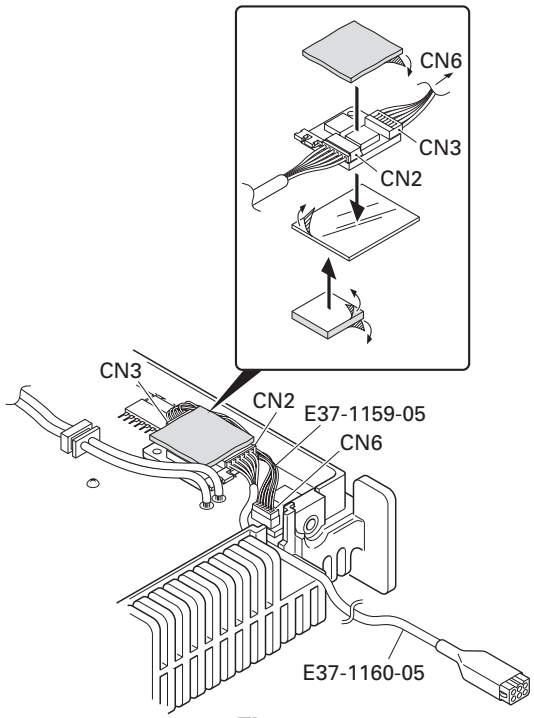


Fig. 5

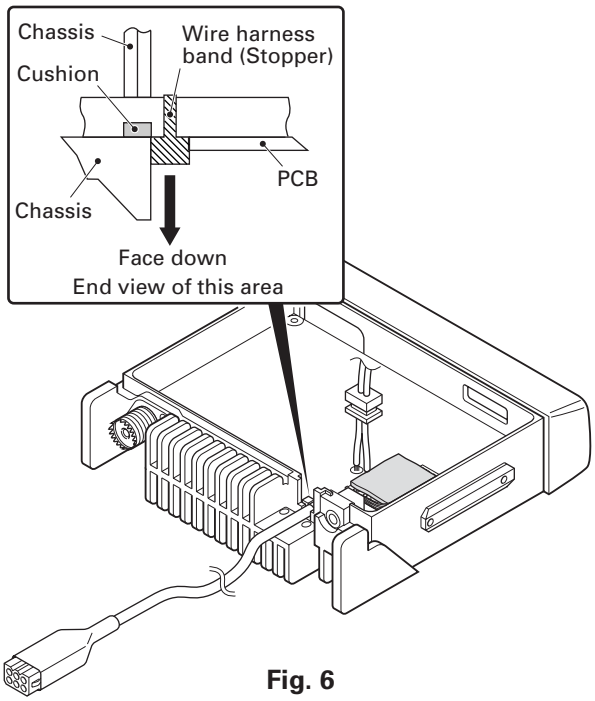
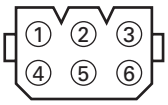


Fig. 6

■ **Cable (E37-1160-05)**
6-pin Connector

Pin No.	Color	Name
1	Red	HR2
2	Blue	GND
3	Yellow	OSP
4	Green	ESP
5	Brown	GND
6	Black	HR1



INSTALLATION / DISASSEMBLY FOR REPAIR

2. External Speaker (Option)

2-1. KES-3

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.

2-2. KES-5

External speaker KES-5 can be installed for KAP-2. If KES-5 is installed, it can be set by changing the CN1 short pin from pins 4 and 5 to pins 5 and 6 on the KAP-2.

CN1 Connect	Set Up
4-5	INT. SP or KES-3
5-6	KES-5

■ Connection Procedure

Insert the crimp terminal into the Square plug supplied with the KAP-2.

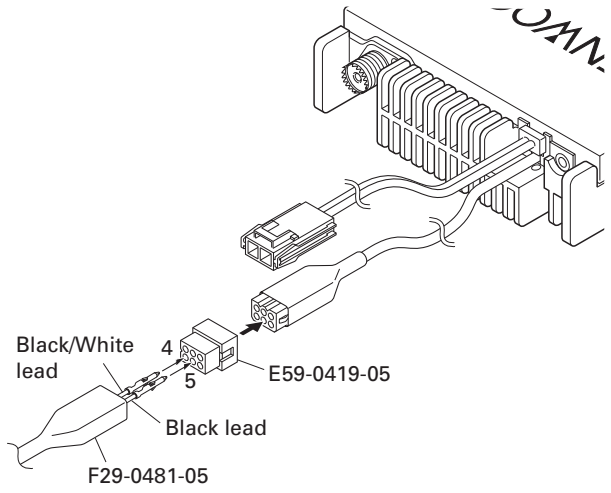


Fig. 7

1. When you remove the panel, turn the transceiver up side down. Detach the panel by lifting the tabs as shown below.

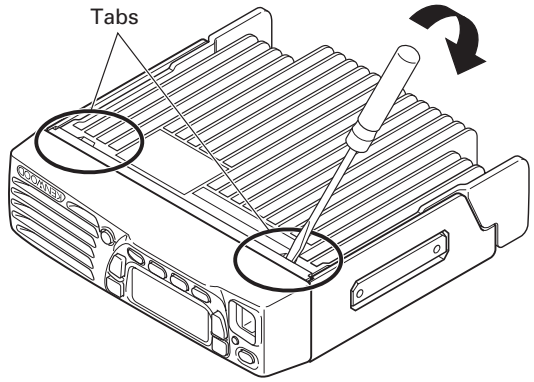


Fig. 1

2. To remove the cabinet, first turn the transceiver up side down. Detach the cabinet by prying the tabs as shown below.

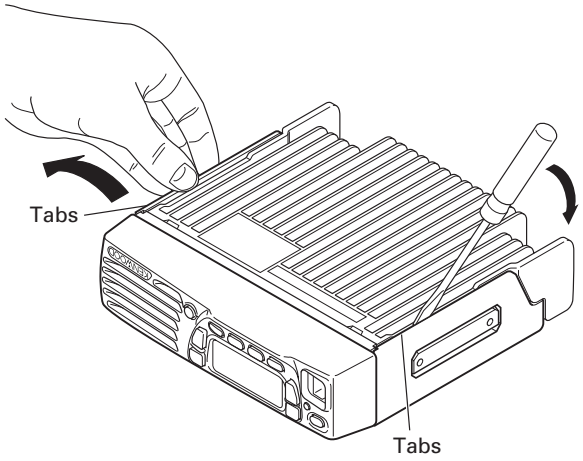


Fig. 2

3. When mounting the front panel, match the 4 tabs of the chassis with the panel, being sure they attach securely.

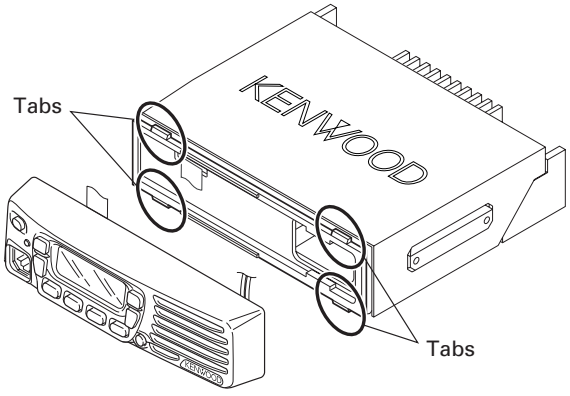


Fig. 3

CIRCUIT DESCRIPTION

Frequency Configuration

The receiver utilizes double conversion. The first IF is 49.95MHz and the second IF is 450kHz. The first local oscillator signal is supplied from the PLL circuit.

The PLL circuit in the transmitter generates the necessary frequencies. Figure 1 shows the frequencies.

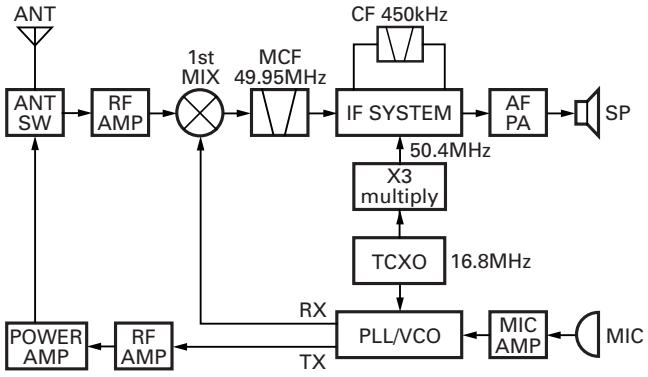


Fig. 1 Frequency configuration

Receiver System

The receiver is double conversion superheterodyne. The frequency configuration is shown in Figure 1.

■ Front-end RF Amplifier

An incoming signal from the antenna is applied to an RF amplifier (Q353) after passing through a transmit/receive switch circuit (D604 and D605 are off) and a BPF (L359, L358, L360, L361 and varactor diodes : D353, D354, D355). After the signal is amplified (Q353), the signal is filtered by a BPF (L354, L355 and varactor diodes : D351, D352) to eliminate unwanted signals before it is passed to the first mixer.

The voltage of these diodes are controlled by tracking the CPU (IC101) center frequency of the band pass filter. (See Fig. 2)

■ First Mixer

The signal from the RF amplifier is heterodyned with the first local oscillator signal from the PLL frequency synthesizer circuit at the first mixer (Q352) to create a 49.95MHz first intermediate frequency (1st IF) signal. The first IF signal is then fed through one pair of monolithic crystal filter (MCF : XF351) to further remove spurious signals.

■ IF Amplifier

The first IF signal is amplified by Q351, and the enters IC321 (FM processing IC). The signal is heterodyned again with a second local oscillator signal within IC321 to create a 450kHz second IF signal. The second IF signal is then fed through a 450kHz ceramic filter (Wide : CF301, Narrow : CF302) to further eliminate unwanted signals before it is amplified and FM detected in IC321.

Item	Rating
Nominal center frequency	49.95MHz
Pass bandwidth	±5.0kHz or more at 3dB
35dB stop bandwidth	±20.0kHz or less
Ripple	1.0dB or less
Insertion loss	5.0dB or less
Guaranteed attenMuation	80dB or more at fo±1MHz
	Spurious : 40dB or more within fo±1MHz
Terminal impedance	350Ω / 5.5pF

Table 1 Crystal filter (L71-0624-05) : XF351

Item	Rating
Nominal center frequency	450kHz
6dB bandwidth	±6.0kHz or more
50dB bandwidth	±12.5kHz or less
Ripple	2.0dB or less
Insertion loss	6.0dB or less
Guaranteed attenuation	35.0dB or more within fo±100kHz
Terminal impedance	2.0kΩ

Table 2 Ceramic filter (L72-0993-05) : CF301

Item	Rating
Nominal center frequency	450kHz
6dB bandwidth	±4.5kHz or more
50dB bandwidth	±10.0kHz or less
Ripple	2.0dB or less
Insertion loss	6.0dB or less
Guaranteed attenuation	60.0dB or more within fo±100kHz
Terminal impedance	2.0kΩ

Table 3 Ceramic filter (L72-0999-05) : CF302

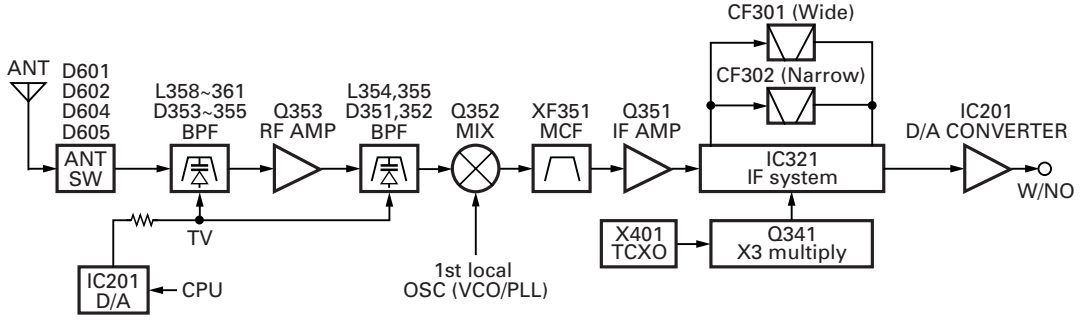


Fig. 2 Receiver system

CIRCUIT DESCRIPTION

■ Wide/Narrow Switching Circuit

The Wide port (pin 23) and Narrow port (pin 22) of the CPU is used to switch between ceramic filters. When the Wide port is high, the ceramic filter SW diodes (D332, D331) cause CF301 to turn on to receive a Wide signal.

When the Narrow port is high, the ceramic filter SW diodes (D332, D331) cause CF302 to turn on to receive a Narrow signal.

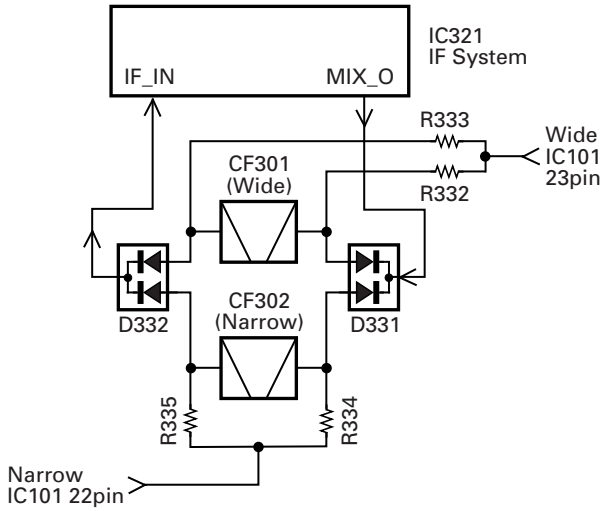


Fig. 3 Wide/Narrow switching circuit

■ AF Signal System

The detection signal from IF IC (IC321) goes to D/A converter (IC201) to adjust the gain and is output to AQUA IC (IC241) for characterizing the signal. The AF signal output from IC241 and the DTMF/MSK signal, BEEP signal are summed and the resulting signal goes to the D/A converter (IC201). The AFO output level is adjusted by the D/A converter. The signal output from the D/A converter is input to the audio power amplifier (IC281). The AF signal from IC281 switches between the internal speaker and speaker jack (J1) output.

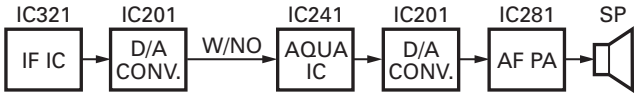


Fig. 4 AF signal system

■ Squelch Circuit

The detection output from the FM IF IC (IC321) passes through a noise amplifier (Q301) to detect noise. A voltage is applied to the CPU (IC101). The CPU controls squelch according to the voltage (SQIN) level. The signal from the RSSI pin of IC321 is monitored. The electric field strength of the receive signal can be known before the SQIN voltage is input to the CPU, and the scan stop speed is improved.

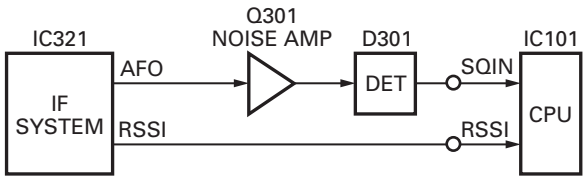


Fig. 5 Squelch circuit

PLL Frequency Synthesizer

The PLL circuit generates the first local oscillator signal for reception and the RF signal for transmission.

■ PLL

The frequency step of the PLL circuit is 5 or 6.25kHz. A 16.8MHz reference oscillator signal is divided at IC401 by a fixed counter to produce the 5 or 6.25kHz reference frequency. The voltage controlled oscillator (VCO) output signal is buffer amplified by Q446, then divided in IC401 by a dual-module programmable counter. The divided signal is compared in phase with the 5 or 6.25kHz reference signal in the phase comparator in IC401. The output signal from the phase comparator is filtered through a low-pass filter and passed to the VCO to control the oscillator frequency. (See Fig. 6)

■ VCO

The operating frequency is generated by Q406 in transmit mode and Q441 in receive mode. The oscillator frequency is controlled by applying the VCO control voltage, obtained from the phase comparator, to the varactor diodes (D443 and D444 in transmit mode and D441 and D442 in receive mode). The TX/RX pin is set low in receive mode causing Q443 and Q442 to turn Q406 off, and turn Q441 on. The TX/RX pin is set high in transmit mode. The outputs from Q441 and Q406 are amplified by Q446 and sent to the RF amplifiers.

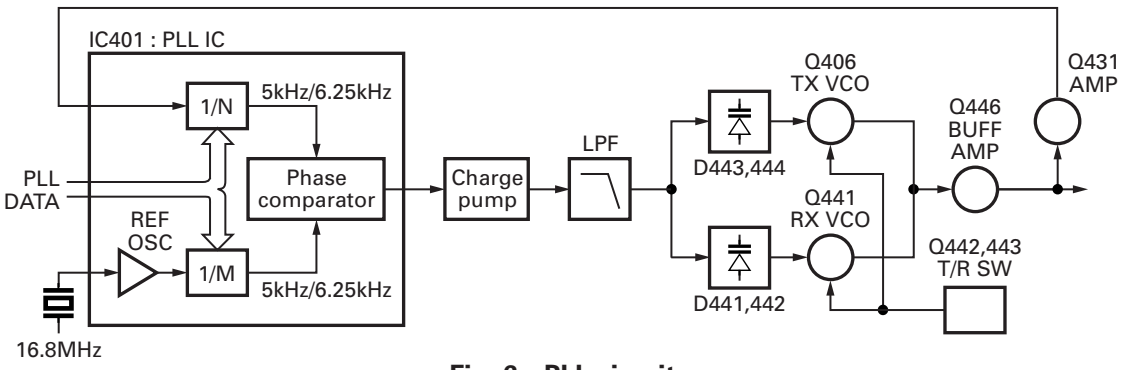


Fig. 6 PLL circuit

CIRCUIT DESCRIPTION

■ Unlock Circuit

During reception, the 8RC signal goes high, the 8TC signal goes low, and Q44 turns on. Q43 turns on and a voltage is applied to the collector (8R). During transmission, the 8RC signal goes low, the 8TC signal goes high and Q46 turns on. Q45 turns on and a voltage is applied to 8T.

The CPU in the control unit monitors the PLL (IC401) LD signal directly. When the PLL is unlocked during transmission, the PLL LD signal goes low. The CPU detects this signal and makes the 8TC signal low. When the 8TC signal goes low, no voltage is applied to 8T, and no signal is transmitted.

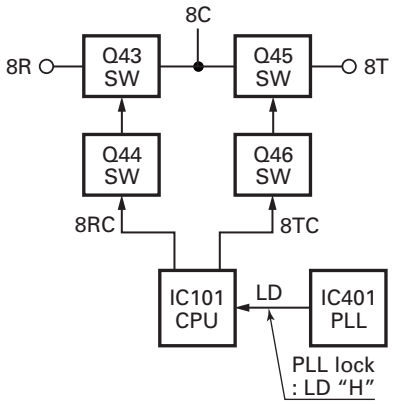


Fig. 7 Unlock circuit

Transmitter System

■ Outline

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

■ Power Amplifier Circuit

The transmit output signal from the VCO passes through the transmission/reception selection diode (D448) and amplified by Q501, Q502 and Q503. The amplified signal goes to the final amplifier (Q504) through a low-pass filter. The low-pass filter removes unwanted high-frequency harmonic components, and the resulting signal is goes the antenna terminal.

■ APC Circuit

The automatic transmission power control (APC) circuit detects part of a final amplifier output with a diode (D606, D607, D608 and D609) and applies a voltage to IC651. IC651 compares the APC control voltage (PC) generated by the D/A converter (IC201) and DC amplifier (IC214) with the detection output voltage. IC651 generates the voltage to control Q502, Q503 and Q504 and stabilizes transmission output.

The APC circuit is configured to protect over current of Q502, Q503 and Q504 due to fluctuations of the load at the antenna end and to stabilize transmission output at voltage and temperature variations.

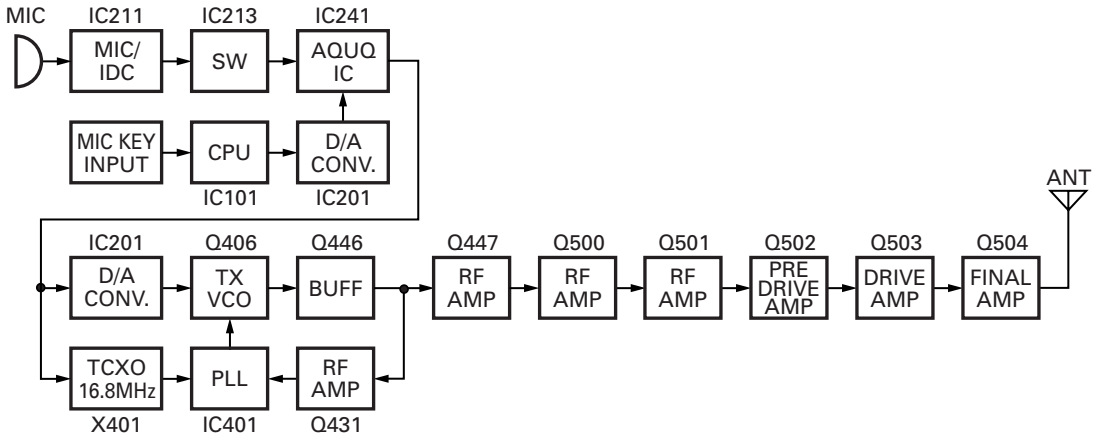


Fig. 8 Transmitter system

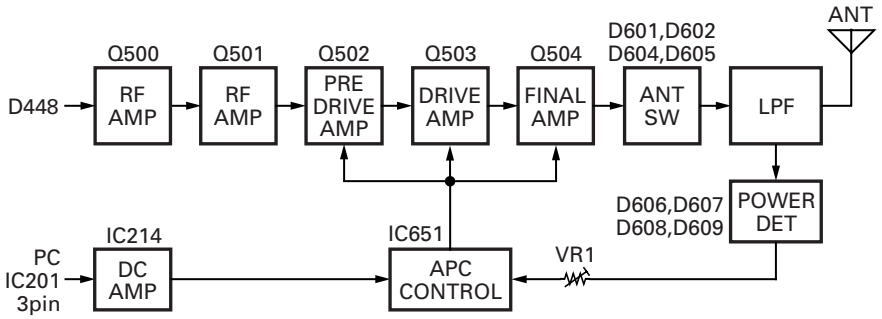


Fig. 9 APC circuit

CIRCUIT DESCRIPTION

Control Circuit

The CPU carries out the following tasks:

1) Controls the WIDE, NARROW, TX/RX outputs.
2) Controls the AQUA IC (IC241).
3) Controls the PLL (IC401).
4) Controls the D/A converter (IC201) and adjusts the volume, modulation and transmission power.

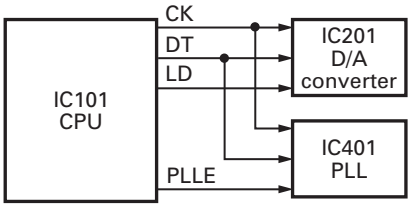


Fig. 10 Control circuit

■ Memory Circuit

The transceiver has an 64k-bit EEPROM (IC81). The EEPROM contains adjustment data. The CPU (IC101) controls the EEPROM through three serial data lines.

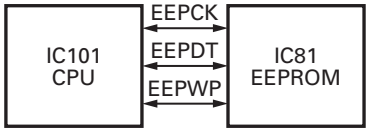


Fig. 11 Memory circuit

■ Display Circuit

The CPU (IC101) controls the display LCD and LEDs. When power is on, the CPU will use the MBL line to control the LCD illumination and key backlight LEDs.

The dimmer function is controlled by the switch Q1. The LCD controller (IC1) controls the functions of the LCD through the DO, CE, CL, DI lines from the CPU.

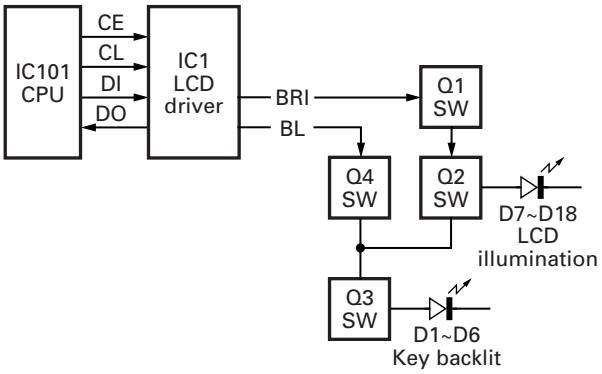


Fig. 12 Display circuit

■ Key Matrix Circuit

The TK-8160 front panel has function keys. Each of them is connected to a cross point of a matrix of the KMI1 to KMO3 ports of the IC1 LCD driver. The KMO1 to KMO3 ports are always high, while the KMI1 to KMI3 ports are always low.

The microprocessor monitors the status of the KMI1 to KMO3 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.

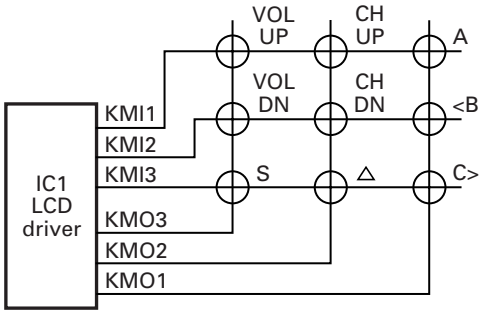


Fig. 13 Key matrix circuit

■ Encode

The QT and DQT signals are output from QT/DQT of the CPU (IC101) and summed with the external pin DI line by the AQUA IC (IC241) and the resulting signal goes to the D/A converter (IC201). The DTMF signal is output from DTMF of the CPU and goes to the D/A converter (IC201). The signal is summed with a MIC signal by the AQUA IC (IC241), and the resulting signal goes to the D/A converter (IC201).

The D/A converter (IC201) adjusts the MO level and the balance between the MO and QT/DQT levels. Part of a QT/DQT signal is summed with MO and the resulting signal goes to the VCOMOD pin of the VCO. This signal is applied to a varicap diode in the VCO for direct FM modulation.

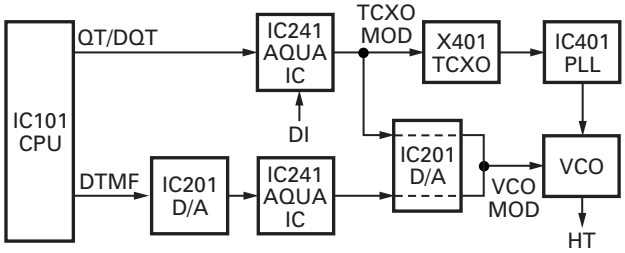


Fig. 14 Encode

CIRCUIT DESCRIPTION

■ Decode

The signal goes to EXTLIMIN (pin 5) of AQUA IC (IC241). The QT/DQT signal will pass through the low-pass filters in the AQUA IC (IC241) and be decoded within the AQUA IC (IC241). The DTMF signal will be decoded within the AQUA IC (IC241).

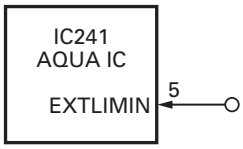


Fig. 15 Decode

■ D/A Converter

The D/A converter (IC201) is used to adjust MO modulation, 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 output = (Vin – VDAref) / 256 x n + VDAref

Vin: Analog input

VDAref: D/A reference voltage

n: Serial data value from the microprocessor (CPU)

Power Supply Circuit

When the power switch on the display unit is pressed, the power port on the display unit which is connected port 17 (POWER), goes low, then port 78 (SBC) goes high, Q42 turns on, SB SW (Q41) turns on and power (SB) is supplied to the radio.

When the DC power supplied to the radio, the voltage regulator IC (IC43) supply into the CPU VDD and reset voltage detect IC (IC44). IC44 will generate signal (RESET) in to the reset terminal on the CPU (IC101) to carry out a power ON reset. Also, CPU (IC101) is checking on port 91 (BATT). If DC power is less than about 9.5V, the radio is unable to power on.

When the DC power voltage deceases from normal voltage, the INT voltage detector IC (IC45) will set to high on CPU port 18 (INT) if B line will became less than about 9.5V. Then CPU send to EEPROM (IC81) the backup data and go into STOP mode.

This circuit has an overvoltage protection circuit. If a DC voltage of 16V or higher is applied to the base of Q81, this voltage turns Q81 on and sets port 18 (INT) to low. As a result port 78 (SBC) is low, and turns Q42 and Q41 (SB) off.

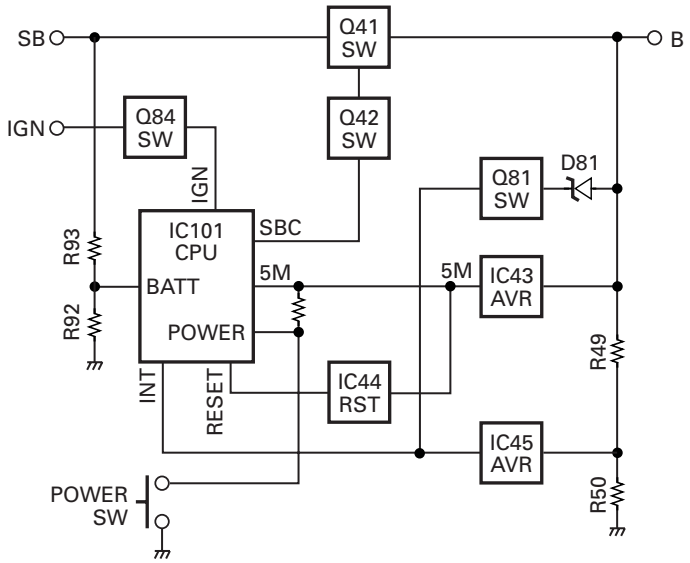


Fig. 16 Power supply circuit

SEMICONDUCTOR DATA

Microprocessor : 30622MEP-A01GP (TX-RX unit IC101)

■ Pin Function

Pin No.	Name	I/O	Function
1	QT/DQT	O	QT/DQT output
2	DTMF/MSK	O	HSD/MSK/BEEP output
3	PLLE	O	PLL IC chip select
4,5	NC	O	
6	GND	-	GND
7	CNVSS	-	CNVss for flash
8	EVLLD	O	E-Volume LD
9	BSHIFT	O	Beat shift
10	RESET	-	RESET
11	XOUT	-	X'TAL (12MHz)
12	VSS	-	GND
13	XIN	-	X'TAL (12 MHz)
14	VCC	-	+5V
15	GND	-	GND (Input only)
16	NC	I	
17	POWER	I	Power key input
18	INT	I	µCom stop
19	NC	I	
20	TX/RX	O	TX/RX H : RX, L : TX
21	UL	I	PLL unlock detect
22	NARROW	O	Wide/Narrow2 H : Narrow
23	WIDE	O	Wide/Narrow H : Wide
24	HOR	O	Horn alert
25	PA	O	Public address
26	EEPWP	O	EEPROM write protect
27	EEPCK	O	EEPROM clock (Nch open drain)
28	EEPDT	I/O	EEPROM Data (Nch open drain)
29	FNC1	I/O	Function P1/TxD for flash
30	FNC2	I/O	Function P2/RxD for flash
31	CLKFLS	I	SCLK for flash
32	BSYFLS	O	Busy for flash
33	TXD	O	To FPU
34	RXD	I	From FPU
35	PTT	I	PTT KEY
36	HOOK	I	Hook
37	ABS	I	AQUA clock beat shift
38	NC	I	
39	EMPFLS	I/O	EPM for flash
40	SCRSW	O	For Ext. scrambler H : No Board, L : Mounted
41	DETSW	O	For DET H : RX, L : TX
42	HSDSW	O	For High Speed Data H : HSD send, L : Others
43	FNC3	I/O	Function Port 3
44	CEFLS	I/O	CE for flash
45~49	FNC4~FNC8	I/O	Function Port 4~8
50	AFM	O	AF Mute H : Mute, L : Unmute
51	SPM	O	Speaker mute H : Mute, L : Unmute

Pin No.	Name	I/O	Function
52	AMPSW	O	AF AMP SW H : SW off, L : SW on
53	DT	O	Common data
54	CK	O	Common clock
55,56	NC	I	
57	DST1	I	Destination 1 H : 25W, L : 50W
58	DST2	I	Destination 2
59	DST3	I	Destination 3
60	VCC	-	+5V
61	NC	I	
62	VSS	-	GND
63,64	NC	I	
65	MBL	O	MIC backlight
66	DISPID	I	Display type information
67	CM	I/O	From MIC keypad
68	CL	O	Clock for LCD
69	DO	O	Transfer data to LCD
70	CE	O	Chip enable for LCD
71	DI	I	Transfer data from LCD
72	IGN	I	Ignition
73	MICMT	O	MIC 1 mute
74	MICEM	O	MIC 2 mute
75	MICMT2	I	
76	8RC	O	8R control
77	8TC	O	8T control
78	SBC	O	Battery switch
79	LIMSW	O	For limiter
80	DTRLOADN	O	
81	STD	I	
82	TCLK/DTRDO	I	
83	TDATA/DTRCLK	O	
84	DI/O	I/O	
85	RDF/FD	I	
86	DIR	O	
87	HSDI	I	HSD input
88	LSDI	I	LSD input
89	TEMP2	I	Temperature 2
90	TEMP1	I	Temperature 1
91	BATT	I	Battery voltage
92	RSSI	I	RSSI input
93	SQIN	I	Squelch input
94	AVSS	-	GND
95	NC	I	
96	VREF	-	+5V
97	AVCC	-	+5V
98	NC	O	
99	RXLED	O	For panel PCB
100	TXLED	O	For panel PCB

COMPONENTS DESCRIPTION

Display Unit (X54-3510-10)

Ref. No.	Parts name	Description
IC1	IC	LCD controller
Q1	Transistor	Dimmer function switch
Q2	Transistor	LCD backlit switch
Q3	Transistor	KEY backlit switch
Q4	Transistor	DC switch
Q7,8	Transistor	DC switch
D1~6	Diode	Key backlit
D7~18	Diode	LCD backlit
D20	Diode	Surge absorption
D21	Diode	DC controller
D22	Diode	TX/RX LED

TX-RX Unit (X57-7090-10)

Ref. No.	Parts name	Description
IC41	IC	Voltage Regulator / 8V
IC42,43	IC	Voltage Regulator / 5V
IC44	IC	Voltage detector / Reset
IC45	IC	Voltage detector / Int
IC81	IC	EEPROM
IC101	IC	Microprocessor
IC201	IC	Digital potentiometer
IC211	IC	MIC amplifier
IC213	IC	Quad analog switch
IC214,215	IC	Dual ground sense op-amplifier
IC241	IC	Audio processor
IC281	IC	Audio amplifier
IC321	IC	FM IF system
IC401	IC	PLL system
IC651	IC	Comparator (APC)
Q41	FET	DC switch (SB)
Q42	Transistor	DC switch (SB)
Q43,44	Transistor	DC switch (8R)
Q45,46	Transistor	DC switch (8T)
Q81	Transistor	Over voltage detection
Q82,83	Transistor	Beat shift
Q84	Transistor	Ignition
Q201	Transistor	TX AF (DETO)
Q211	Transistor	AGC/MIC mute
Q212	FET	Emergency MIC
Q213	FET	MIC mute
Q241	Transistor	W/N switch / TX
Q281	Digital transistor	AF mute
Q282	Transistor	AF mute
Q301	Transistor	SQL amplifier
Q341	Transistor	Buffer amplifier
Q351	Transistor	IF amplifier
Q352	FET	Mixer
Q353	FET	RF amplifier
Q406	FET	TX VCO
Q421,422	Transistor	Charge pump
Q431	Transistor	RF amplifier
Q441	FET	RX VCO
Q442	FET	T/R switch
Q443	Transistor	T/R switch
Q445	Transistor	Lipple filter
Q446	Transistor	Buffer amplifier
Q447	Transistor	RF amplifier
Q500,501	Transistor	RF amplifier
Q502	FET	Pre drive amplifier
Q503	FET	Drive amplifier
Q504	FET	Final amplifier
D1~11	Diode	Surge absorption
D41	Diode	Reverse connection protection
D42	Poly SW	Current protection
D81,82	Diode	Over voltage detection
D211	Diode	AGC
D212	Diode	OR gate
D301	Diode	Rectification
D331,332	Diode	IF switch (Wide/Narrow)
D351~355	Varicap	RF BPF tuning
D401	Diode	Lipple filter
D421	Diode	Voltage dropped
D441,442	Varicap	RX VCO
D443,444	Varicap	TX VCO
D445	Diode	Modulation
D446	Diode	Ripple filter
D447,448	Diode	RF switch (TX/RX)
D502	Diode	Temperature compensation
D503	Diode	Voltage protection
D601,602	Diode	ANT switch
D604,605	Diode	ANT switch
D606~609	Diode	APC voltage detect
D651	Diode	Temperature compensation

PARTS LIST

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

L : Scandinavia **K** : USA **P** : Canada
Y : PX (Far East, Hawaii) **T** : England **E** : Europe
Y : AAFES (Europe) **X** : Australia **M** : Other Areas

TK-8160 (Y51-5070-XX)
DISPLAY UNIT (X54-3510-10)
TX-RX UNIT (X57-7090-10)

Ref. No.	Address	New parts	Parts No.	Description	Destination
TK-8160					
1	1B	✻	A02-3899-01	PLASTIC CABINET	
2	3A	✻	A62-1107-13	PANEL ASSY	
4	3A	✻	B43-1179-04	BADGE	
5	1D	✻	B62-1829-00	INSTRUCTION MANUAL	
6	3B	✻	B72-2308-04	MODEL NAME-PLATE	
8	3B		E04-0167-05	RF COAXIAL PECEPTACLE (M)	
9	3C		E30-3339-05	DC CORD ACCESSORY	
10	2B		E30-3448-05	DC CORD	
11	3A		E37-1082-05	SPEAKER CABLE	
12	2A		E37-1097-05	FLAT CABLE (TX/RX-DISP)	
14	2B		F10-2449-11	SHIELDING COVER (UPPER)	
15	3C		F51-0016-15	FUSE (6X30) 10A ACCESSORY	
17	2B		G02-0894-04	EARTH SPRING (FINAL FET)	
18	2A		G10-1296-04	FIBROUS SHEET (FLAT CABLE)	
19	2A		G10-1324-04	FIBROUS SHEET (DISP)	
20	3B		G11-4127-14	RUBBER SHEET (CHASSIS)	
21	2B		G11-4240-04	RUBBER SHEET (DRIVE FET)	
23	3B		G13-1468-04	CUSHION	
24	2B		G53-1542-03	PACKING (PHONE JACK)	
25	1B		G53-1544-01	PACKING (CABINET)	
26	1A		G53-1548-02	GASKETTING	
27	3B	✻	G53-1664-03	PACKING (PANEL)	
29	2C,1D	✻	H12-3178-05	PACKING FIXTURE	
30	3D		H13-1190-02	CARTON BOARD	
31	1D		H25-2341-04	PROTECTION BAG	
32	2D	✻	H52-2089-02	ITEM CARTON CASE	
34	3C		J19-1584-05	MIC HOLDER ACCESSORY	K
35	3D		J29-0662-03	BRACKET ACCESSORY	
37	3A	✻	K29-9342-01	KEY TOP	
A	2B	✻	N67-2608-48	PAN HEAD SEMS SCREW	
B	2A	✻	N80-2008-48	PAN HEAD TAPTITE SCREW	
C	2B,3B		N87-2606-48	BRAZIER HEAD TAPTITE SCREW	
D	1B,2B	✻	N87-2614-48	BRAZIER HEAD TAPTITE SCREW	
39	3D		N99-0395-05	SCREW SET ACCESSORY	
41	3A		T07-0739-05	SPEAKER	
42	2C		T91-0639-05	MICROPHONE ACCESSORY	K
DISPLAY UNIT (X54-3510-10)					
101	2A	✻	B11-1829-03	ILLUMINATION GUIDE	
102	2A	✻	B38-0902-05	LCD	
D1-6			B30-2282-05	LED (Y)	
D7-18			B30-2281-05	LED (Y)	
D22			B30-2151-05	LED (R/G)	
C1			CK73GB1H103K	CHIP C 0.010UF K	
C6,7			CK73GB1H102K	CHIP C 1000PF K	
C9			CK73GB1H102K	CHIP C 1000PF K	
C10			CK73GB1H103K	CHIP C 0.010UF K	
C11-14			CK73GB1H102K	CHIP C 1000PF K	
C15			CK73GB1H471K	CHIP C 470PF K	
C16,17			CK73GB1A105K	CHIP C 1.0UF K	
C18			CK73GB1C104K	CHIP C 0.10UF K	
C19,20			CC73GCH1H101J	CHIP C 100PF J	
C21			CK73GB1H681K	CHIP C 680PF K	
C22,23			CK73GB1H102K	CHIP C 1000PF K	
C24			CK73GB1H103K	CHIP C 0.010UF K	
C25			CK73GB1H102K	CHIP C 1000PF K	
C27			CC73GCH1H101J	CHIP C 100PF J	
C30			CK73GB1H102K	CHIP C 1000PF K	
103	2A	✻	E29-1206-05	INTER CONNECTOR	
CN1			E40-6005-05	FLAT CABLE CONNECTOR	
J1			E08-0877-05	MODULAR JACK	
104	3A	✻	J21-8494-03	MOUNTING HARDWARE	
-		✻	J31-0553-05	COLLAR	
L1			L92-0138-05	CHIP FERRITE	
CP1			R90-0724-05	MULTI-COMP 1K X4	
R1			RK73GB1J101J	CHIP R 100 J 1/16W	
R2			RK73GB1J100J	CHIP R 10 J 1/16W	
R3-5			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R6-8			RK73GB1J103J	CHIP R 10K J 1/16W	
R9			RK73GB1J563J	CHIP R 56K J 1/16W	
R10,11			RK73FB2A331J	CHIP R 330 J 1/10W	
R14			RK73FB2A473J	CHIP R 47K J 1/10W	
R15,16			RK73FB2A330J	CHIP R 33 J 1/10W	
R17,18			RK73FB2A390J	CHIP R 39 J 1/10W	
R19			RK73GB1J392J	CHIP R 3.9K J 1/16W	
R20			R92-0670-05	CHIP R 0 OHM	
R21			R92-1252-05	CHIP R 0 OHM J 1/16W	
R22			RK73FB2A181J	CHIP R 180 J 1/10W	
R23			RK73FB2A820J	CHIP R 82 J 1/10W	
R24,25			RK73GB1J103J	CHIP R 10K J 1/16W	
R26,27			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R28-31			RK73GB1J390J	CHIP R 39 J 1/16W	
D20,21		✻	MC2850	DIODE	
IC1			LC75854W	MOS-IC	
IC1			PT6554LQ	MOS-IC	
Q1			RN47A4	TRANSISTOR	
Q2			2SB1132(Q,R)	TRANSISTOR	
Q3			KRA225S	DIGITAL TRANSISTOR	
Q4			KRC102S	DIGITAL TRANSISTOR	
Q7,8		✻	2SC3928A	TRANSISTOR	
TX-RX UNIT (X57-7090-10)					
C10			CK73HB1H102K	CHIP C 1000PF K	
C13-31			CK73HB1H471K	CHIP C 470PF K	
C41			CK73GB1H221K	CHIP C 220PF K	
C42			CK73GB1H471K	CHIP C 470PF K	
C43			CK73GB1H102K	CHIP C 1000PF K	

PARTS LIST

TX-RX UNIT (X57-7090-10)

Ref. No.	Address	New parts	Parts No.	Description			Destination
C46,47			CK73GB1H221K	CHIP C	220PF	K	
C48			CK73GB1H102K	CHIP C	1000PF	K	
C49			C92-0721-05	ELECTRO	330UF	25WV	
C50-53			CK73GB1H102K	CHIP C	1000PF	K	
C54,55			CK73GB1C104K	CHIP C	0.10UF	K	
C56			C92-0795-05	CHIP-TAN	22UF	10WV	
C57			CK73GB1H103K	CHIP C	0.010UF	K	
C58-60			C92-0795-05	CHIP-TAN	22UF	10WV	
C63			CK73GB1E103K	CHIP C	0.010UF	K	
C64,65			CK73GB1H103K	CHIP C	0.010UF	K	
C66			C92-0560-05	CHIP-TAN	10UF	6.3WV	
C67,68			CK73GB1H102K	CHIP C	1000PF	K	
C69,70			CK73GB1C104K	CHIP C	0.10UF	K	
C71			CK73GB1H102K	CHIP C	1000PF	K	
C81,82			CK73GB1H102K	CHIP C	1000PF	K	
C85			CK73HB1H102K	CHIP C	1000PF	K	
C86			CK73HB1A104K	CHIP C	0.10UF	K	
C88			CC73HCH1H180J	CHIP C	18PF	J	
C89,90			CC73HCH1H060B	CHIP C	6.0PF	B	
C91			CC73HCH1H180J	CHIP C	18PF	J	
C93,94			CK73GB1H102K	CHIP C	1000PF	K	
C96			CK73GB1H102K	CHIP C	1000PF	K	
C101			CK73GB1H102K	CHIP C	1000PF	K	
C102			CK73GB1C104K	CHIP C	0.10UF	K	
C106			CK73GB1C104K	CHIP C	0.10UF	K	
C110-117			CK73HB1C103K	CHIP C	0.010UF	K	
C201			CK73GB1C104K	CHIP C	0.10UF	K	
C202			C92-0507-05	CHIP-TAN	4.7UF	6.3WV	
C203			CK73GB1C333K	CHIP C	0.033UF	K	
C204			CK73GB1H102K	CHIP C	1000PF	K	
C205			CK73HB1H182K	CHIP C	1800PF	K	
C206			CK73GB1H102K	CHIP C	1000PF	K	
C211			CK73GB1H183K	CHIP C	0.018UF	K	
C212			CK73HB1H152K	CHIP C	1500PF	K	
C213			CK73GB1C104K	CHIP C	0.10UF	K	
C214			CC73HCH1H390J	CHIP C	39PF	J	
C215			CK73HB1A104K	CHIP C	0.10UF	K	
C216			C92-0514-05	CHIP-TAN	2.2UF	10WV	
C217			CK73HB1H471K	CHIP C	470PF	K	
C218-221			CK73GB1C104K	CHIP C	0.10UF	K	
C222,223			CK73HB1A104K	CHIP C	0.10UF	K	
C224			CK73GB1H103K	CHIP C	0.010UF	K	
C225			CK73GB1C104K	CHIP C	0.10UF	K	
C226			CK73HB1H471K	CHIP C	470PF	K	
C227			CK73HB1A104K	CHIP C	0.10UF	K	
C228			CK73GB0J475K	CHIP C	4.7UF	K	
C229			CK73GB1A105K	CHIP C	1.0UF	K	
C230			C92-0560-05	CHIP-TAN	10UF	6.3WV	
C231			C92-0662-05	CHIP-TAN	15UF	6.3WV	
C233			CK73GB1H471K	CHIP C	470PF	K	
C241-248			CK73HB1H471K	CHIP C	470PF	K	
C249,250			CC73HCH1H100D	CHIP C	10PF	D	
C251			CK73HB1A473K	CHIP C	0.047UF	K	
C252			CK73HB1A104K	CHIP C	0.10UF	K	
C253			CK73GB1H102K	CHIP C	1000PF	K	
C254			CK73GB1H332K	CHIP C	3300PF	K	
C255			CC73HCH1H560J	CHIP C	56PF	J	
C256			CK73GB1H331K	CHIP C	330PF	K	
C257			CC73HCH1H090B	CHIP C	9.0PF	B	
C259			CK73HB1H221K	CHIP C	220PF	K	

Ref. No.	Address	New parts	Parts No.	Description			Destination
C260			CK73GB1A474K	CHIP C	0.47UF	K	
C261			CK73HB1A104K	CHIP C	0.10UF	K	
C262			CK73GB1A105K	CHIP C	1.0UF	K	
C263			CK73GB1H103K	CHIP C	0.010UF	K	
C264			CC73HCH1H330J	CHIP C	33PF	J	
C265			CK73HB1H391K	CHIP C	390PF	K	
C266			CK73GB1C104K	CHIP C	0.10UF	K	
C267			CK73HB1A104K	CHIP C	0.10UF	K	
C268			CC73HCH1H181J	CHIP C	180PF	J	
C269,270			C92-0507-05	CHIP-TAN	4.7UF	6.3WV	
C271			CK73HB1A104K	CHIP C	0.10UF	K	
C272			C92-0507-05	CHIP-TAN	4.7UF	6.3WV	
C273,274		*	CK73HB1H681K	CHIP C	680PF	K	
C275,276			CK73HB1H102K	CHIP C	1000PF	K	
C281			CK73GB1H102K	CHIP C	1000PF	K	
C282			CK73GB1A105K	CHIP C	1.0UF	K	
C283			CK73FB1C224K	CHIP C	0.22UF	K	
C284			CK73GB1C104K	CHIP C	0.10UF	K	
C285			C92-0516-05	CHIP-TAN	4.7UF	16WV	
C286			C92-0040-05	CHIP-ELE	47UF	16WV	
C287			C92-0722-05	ELECTRO	470UF	16WV	
C288-290			CK73GB1H102K	CHIP C	1000PF	K	
C293			CK73GB1A105K	CHIP C	1.0UF	K	
C301			C92-0507-05	CHIP-TAN	4.7UF	6.3WV	
C302			CK73GB1H102K	CHIP C	1000PF	K	
C303			CK73GB1H472K	CHIP C	4700PF	K	
C304,305			CC73GCH1H331J	CHIP C	330PF	J	
C306			CK73GB1H102K	CHIP C	1000PF	K	
C307			CK73GB1E223K	CHIP C	0.022UF	K	
C308			CK73GB1H102K	CHIP C	1000PF	K	
C309			CK73GB1E223K	CHIP C	0.022UF	K	
C310		*	CK73FB1C104K	CHIP C	0.10UF	K	
C321			CK73GB1H103K	CHIP C	0.010UF	K	
C322-324			CK73GB1C104K	CHIP C	0.10UF	K	
C325			C92-0662-05	CHIP-TAN	15UF	6.3WV	
C326			CK73GB1H103K	CHIP C	0.010UF	K	
C331-333			CK73GB1C104K	CHIP C	0.10UF	K	
C341			CC73GCH1H101J	CHIP C	100PF	J	
C343			CC73GCH1H680J	CHIP C	68PF	J	
C344			CC73GCH1H560J	CHIP C	56PF	J	
C345			CC73GCH1H271J	CHIP C	270PF	J	
C346			CK73GB1H103K	CHIP C	0.010UF	K	
C349,350			CK73GB1E103K	CHIP C	0.010UF	K	
C351			CC73GCH1H330J	CHIP C	33PF	J	
C353			CK73GB1H103K	CHIP C	0.010UF	K	
C354			CC73GCH1H030B	CHIP C	3.0PF	B	
C355			CC73GCH1H180J	CHIP C	18PF	J	
C356			CC73GCH1H060B	CHIP C	6.0PF	B	
C357			CK73GB1H103K	CHIP C	0.010UF	K	
C358			CK73GB1H471K	CHIP C	470PF	K	
C359			CC73GCH1H120J	CHIP C	12PF	J	
C360			CC73GCH1H080B	CHIP C	8.0PF	B	
C361,362			CK73GB1H471K	CHIP C	470PF	K	
C363			CK73GB1H103K	CHIP C	0.010UF	K	
C364			CK73GB1H471K	CHIP C	470PF	K	
C366			CK73GB1C104K	CHIP C	0.10UF	K	
C367			CK73GB1H471K	CHIP C	470PF	K	
C368			CC73GCH1H080B	CHIP C	8.0PF	B	
C369			CC73GCH1H010B	CHIP C	1.0PF	B	
C370			CK73GB1H471K	CHIP C	470PF	K	

PARTS LIST

TX-RX UNIT (X57-7090-10)

Ref. No.	Address	New parts	Parts No.	Description			Destination
C371			CC73GCH1HR75B	CHIP C	0.75PF	B	
C372			CC73GCH1H180G	CHIP C	18PF	G	
C373			CC73GCH1H080B	CHIP C	8.0PF	B	
C374			CC73GCH1H070B	CHIP C	7.0PF	B	
C375-380			CK73GB1H471K	CHIP C	470PF	K	
C381			CC73GCH1H050B	CHIP C	5.0PF	B	
C382			CK73GB1H471K	CHIP C	470PF	K	
C383			CC73GCH1HR75B	CHIP C	0.75PF	B	
C384			CC73GCH1H090B	CHIP C	9.0PF	B	
C385			CK73GB1H471K	CHIP C	470PF	K	
C386			CC73GCH1H010B	CHIP C	1.0PF	B	
C387			CC73GCH1H0R3B	CHIP C	0.3PF	B	
C388			CC73GCH1H2R5B	CHIP C	2.5PF	B	
C389			CK73GB1H103K	CHIP C	0.010UF	K	
C390			CC73FCH1H080D	CHIP C	8.0PF	D	
C391			CK73GB1H471K	CHIP C	470PF	K	
C392			CC73GCH1H4R5B	CHIP C	4.5PF	B	
C393			CC73GCH1HR75B	CHIP C	0.75PF	B	
C394			CC73GCH1H010B	CHIP C	1.0PF	B	
C395			CC73GCH1H060B	CHIP C	6.0PF	B	
C401,402			CK73GB1H102K	CHIP C	1000PF	K	
C403			CC73GCH1H101J	CHIP C	100PF	J	
C404,405			CC73HCH1H101J	CHIP C	100PF	J	
C406			CC73GCH1H020B	CHIP C	2.0PF	B	
C407			CK73GB1H102K	CHIP C	1000PF	K	
C409			CC73HCH1H220J	CHIP C	22PF	J	
C410,411			CK73GB1C104K	CHIP C	0.10UF	K	
C412			C92-0560-05	CHIP-TAN	10UF	6.3WV	
C413			CK73GB1C104K	CHIP C	0.10UF	K	
C414			C92-0560-05	CHIP-TAN	10UF	6.3WV	
C415			CK73HB1C103K	CHIP C	0.010UF	K	
C416			CK73GB1C104K	CHIP C	0.10UF	K	
C422,423			CK73HB1H471K	CHIP C	470PF	K	
C424			CK73GB1H471K	CHIP C	470PF	K	
C425			C92-0555-05	CHIP-TAN	0.047UF	35WV	
C426			C92-0004-05	CHIP-TAN	1.0UF	16WV	
C427			C92-0001-05	CHIP-TAN	0.1UF	35WV	
C431			CK73GB1H102K	CHIP C	1000PF	K	
C434			CK73GB1H471K	CHIP C	470PF	K	
C441			CC73GCH1H150J	CHIP C	15PF	J	
C442			CC73GCH1H120G	CHIP C	12PF	G	
C443			CK73GB1H471K	CHIP C	470PF	K	
C444			CC73GCH1H030B	CHIP C	3.0PF	B	
C445			CC73GCH1H040B	CHIP C	4.0PF	B	
C446			CC73GCH1H050B	CHIP C	5.0PF	B	
C447			CC73GCH1H0R5B	CHIP C	0.5PF	B	
C451,452			CK73GB1H471K	CHIP C	470PF	K	
C453			CC73GCH1H070B	CHIP C	7.0PF	B	
C454			CC73GCH1H060B	CHIP C	6.0PF	B	
C455			CC73GCH1H0R5B	CHIP C	0.5PF	B	
C456			CK73GB1H471K	CHIP C	470PF	K	
C457			CC73GCH1H1R5B	CHIP C	1.5PF	B	
C458,459			CC73GCH1H050B	CHIP C	5.0PF	B	
C460			CC73GCH1H0R3B	CHIP C	0.3PF	B	
C461			C92-0560-05	CHIP-TAN	10UF	6.3WV	
C463,464			CK73GB1H471K	CHIP C	470PF	K	
C465			C92-0795-05	CHIP-TAN	22UF	10WV	
C466,467			CK73GB1H471K	CHIP C	470PF	K	
C469			CC73GCH1H060B	CHIP C	6.0PF	B	
C470			CC73GCH1H040B	CHIP C	4.0PF	B	

Ref. No.	Address	New parts	Parts No.	Description			Destination
C471			CC73GCH1H020B	CHIP C	2.0PF	B	
C477			CK73GB1H471K	CHIP C	470PF	K	
C480			CC73GCH1H050B	CHIP C	5.0PF	B	
C481-483			CK73GB1H471K	CHIP C	470PF	K	
C501			CK73GB1H471K	CHIP C	470PF	K	
C502			CC73GCH1H030B	CHIP C	3.0PF	B	
C504,505			CK73GB1H471K	CHIP C	470PF	K	
C507			CK73GB1H471K	CHIP C	470PF	K	
C509			CC73GCH1H040B	CHIP C	4.0PF	B	
C510-515			CK73GB1H471K	CHIP C	470PF	K	
C516			CC73GCH1H040B	CHIP C	4.0PF	B	
C517			CK73GB1H471K	CHIP C	470PF	K	
C518			C92-0040-05	CHIP-ELE	47UF	16WV	
C520,521			CK73GB1H471K	CHIP C	470PF	K	
C522			CK73GB1C104K	CHIP C	0.10UF	K	
C523			CC73FCH1H470J	CHIP C	47PF	J	
C524			CC73FCH1H080D	CHIP C	8.0PF	D	
C526			CC73FCH1H090D	CHIP C	9.0PF	D	
C527			CC73FCH1H150J	CHIP C	15PF	J	
C528			CC73FCH1H470J	CHIP C	47PF	J	
C532			CK73GB1H471K	CHIP C	470PF	K	
C534		✻	CK73FB1H471K	CHIP C	470PF	K	
C535			CK73GB1H221K	CHIP C	220PF	K	
C536			CK73GB1H471K	CHIP C	470PF	K	
C537			C92-0719-05	ELECTRO	47UF	25WV	
C538			CK73FB1C474K	CHIP C	0.47UF	K	
C539		✻	CK73FB1H471K	CHIP C	470PF	K	
C540,541			C93-0567-05	CHIP C	39PF	J	
C543			C93-0599-05	CHIP C	470PF	K	
C545			C93-0560-05	CHIP C	10PF	D	
C548,549			C93-0566-05	CHIP C	33PF	J	
C550,551			CM73F2H300J	CHIP C	30PF	J	
C555			CK73FB1C474K	CHIP C	0.47UF	K	
C556			C93-0599-05	CHIP C	470PF	K	
C564			CM73F2H090D	CHIP C	9.0PF	D	
C565			CM73F2H010C	CHIP C	1.0PF	C	
C567			CM73F2H090D	CHIP C	9.0PF	D	
C570			C93-0599-05	CHIP C	470PF	K	
C571			CK73GB1H471K	CHIP C	470PF	K	
C572,573			CK73GB1H103K	CHIP C	0.010UF	K	
C574			CK73GB1H102K	CHIP C	1000PF	K	
C575			CK73GB1H471K	CHIP C	470PF	K	
C576			CK73GB1H221K	CHIP C	220PF	K	
C603			C93-0599-05	CHIP C	470PF	K	
C606			CC73GCH1H0R5B	CHIP C	0.5PF	B	
C607			CC73GCH1H010B	CHIP C	1.0PF	B	
C609			C93-0553-05	CHIP C	3.0PF	C	
C610			CC73GCH1H0R5B	CHIP C	0.5PF	B	
C611			CC73GCH1H030B	CHIP C	3.0PF	B	
C613			C93-0555-05	CHIP C	5.0PF	C	
C614			CC73GCH1H0R5B	CHIP C	0.5PF	B	
C615			CC73GCH1H020B	CHIP C	2.0PF	B	
C616			C93-0550-05	CHIP C	1.0PF	C	
C618,619			CK73GB1H471K	CHIP C	470PF	K	
C620			CK73GB1H102K	CHIP C	1000PF	K	
C624			CK73GB1H471K	CHIP C	470PF	K	
C625			CC73GCH1H020B	CHIP C	2.0PF	B	
C626			C93-0551-05	CHIP C	1.5PF	C	
C627			C93-0599-05	CHIP C	470PF	K	
C651			CK73GB1H103K	CHIP C	0.010UF	K	

PARTS LIST

TX-RX UNIT (X57-7090-10)

Ref. No.	Address	New parts	Parts No.	Description	Destination
C652			CK73GB1H471K	CHIP C 470PF K	
C672,673			CK73GB1H471K	CHIP C 470PF K	
TC441,442			C05-0245-05	CERAMIC TRIMMER (10PF)	
-		✻	E37-1161-05	SHORT PLUG (CN6)	
CN1			E40-6268-05	FLAT CABLE CONNECTOR	
CN2			E40-5702-05	PIN ASSY	
CN3			E40-6292-05	PIN ASSY	
CN5			E40-3246-05	PIN ASSY	
CN6		✻	E40-6433-05	PIN ASSY	
J1			E11-0425-05	3.5D PHONE JACK (3P)	
F41			F53-0246-05	FUSE	
CF301			L72-0993-05	CERAMIC FILTER	
CF302			L72-0999-05	CERAMIC FILTER	
L101			L92-0443-05	CHIP FERRITE	
L211			L92-0443-05	CHIP FERRITE	
L321			L34-4554-05	COIL	
L341			L41-3385-08	SMALL FIXED INDUCTOR	
L342,343			L40-3381-86	SMALL FIXED INDUCTOR (0.33UH)	
L351,352			L40-4785-85	SMALL FIXED INDUCTOR (0.47UH)	
L354,355			L34-4604-05	AIR-CORE COIL	
L356			L40-1875-92	SMALL FIXED INDUCTOR (18NH)	
L357			L40-3975-92	SMALL FIXED INDUCTOR (39NH)	
L358			L34-4605-05	AIR-CORE COIL	
L359-361			L34-4604-05	AIR-CORE COIL	
L402			L41-1005-08	SMALL FIXED INDUCTOR	
L404			L92-0442-05	CHIP FERRITE	
L421			L92-0443-05	CHIP FERRITE	
L441,442			L40-4791-86	SMALL FIXED INDUCTOR (4.7UH)	
L443			L41-2778-14	SMALL FIXED INDUCTOR	
L444,445			L40-4791-86	SMALL FIXED INDUCTOR (4.7UH)	
L446,447			L40-2702-86	SMALL FIXED INDUCTOR (27UH)	
L448			L41-2778-14	SMALL FIXED INDUCTOR	
L449,450			L40-4791-86	SMALL FIXED INDUCTOR (4.7UH)	
L451,452			L92-0443-05	CHIP FERRITE	
L454			L41-2775-06	SMALL FIXED INDUCTOR	
L456			L41-2775-06	SMALL FIXED INDUCTOR	
L501			L41-1575-06	SMALL FIXED INDUCTOR	
L502			L41-1875-08	SMALL FIXED INDUCTOR	
L503,504			L41-3363-08	SMALL FIXED INDUCTOR	
L505			L34-4603-05	AIR-CORE COIL	
L506			L34-4607-05	AIR-CORE COIL	
L507			L34-4602-05	AIR-CORE COIL	
L508		✻	L34-4754-05	AIR-CORE COIL	
L509		✻	L34-4753-05	AIR-CORE COIL	
L601		✻	L34-4757-05	AIR-CORE COIL	
L603,604		✻	L34-4754-05	AIR-CORE COIL	
L605		✻	L34-4753-05	AIR-CORE COIL	
X86			L77-1970-05	CRYSTAL RESONATOR (12.0MHZ)	
X241		✻	L77-1968-05	CRYSTAL RESONATOR (3.6864MHZ)	
X401		✻	L77-1944-05	TCXO (16.8MHZ)	
XF351		✻	L71-0624-05	MCF (49.95MHZ/5.0K)	
CP1-7			RK75HA1J102J	CHIP-COM 1.0K J 1/16W	
R1			R92-1252-05	CHIP R 0 OHM J 1/16W	
R2			RK73HB1J101J	CHIP R 100 J 1/16W	
R3			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R4			RK73HB1J332J	CHIP R 3.3K J 1/16W	
R5			RK73HB1J223J	CHIP R 22K J 1/16W	
R41			RK73GB1J473J	CHIP R 47K J 1/16W	

Ref. No.	Address	New parts	Parts No.	Description	Destination
R42			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R43			RK73GB1J473J	CHIP R 47K J 1/16W	
R44			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R45			RK73GB1J473J	CHIP R 47K J 1/16W	
R46			RK73GB1J152J	CHIP R 1.5K J 1/16W	
R47			RK73GB1J103J	CHIP R 10K J 1/16W	
R48			RK73HB1J334J	CHIP R 330K J 1/16W	
R49			RK73HB1J474J	CHIP R 470K J 1/16W	
R50			RK73HB1J394J	CHIP R 390K J 1/16W	
R51			RK73HB1J334J	CHIP R 330K J 1/16W	
R81,82			RK73GB1J103J	CHIP R 10K J 1/16W	
R83			R92-1252-05	CHIP R 0 OHM J 1/16W	
R84			R92-1368-05	CHIP R 0 OHM	
R85			RK73HB1J473J	CHIP R 47K J 1/16W	
R86			RK73GB1J471J	CHIP R 470 J 1/16W	
R87			R92-1252-05	CHIP R 0 OHM J 1/16W	
R88			RK73GB1J473J	CHIP R 47K J 1/16W	
R90			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R91			R92-1368-05	CHIP R 0 OHM	
R92			RK73GH1J183D	CHIP R 18K D 1/16W	
R93			RK73GH1J134D	CHIP R 130K D 1/16W	
R94			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R95			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R96			RK73GB1J105J	CHIP R 1.0M J 1/16W	
R97			RK73GB1J104J	CHIP R 100K J 1/16W	
R98			RK73GB1J473J	CHIP R 47K J 1/16W	
R99			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R100			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R101			RK73GB1J473J	CHIP R 47K J 1/16W	
R102			RK73HB1J473J	CHIP R 47K J 1/16W	
R103-105			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R108,109			RK73HB1J473J	CHIP R 47K J 1/16W	
R110			RK73GB1J152J	CHIP R 1.5K J 1/16W	
R111			RK73GB1J473J	CHIP R 47K J 1/16W	
R112			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R113			RK73HB1J473J	CHIP R 47K J 1/16W	
R115			RK73HB1J473J	CHIP R 47K J 1/16W	
R124			R92-1252-05	CHIP R 0 OHM J 1/16W	
R125			RK73GB1J473J	CHIP R 47K J 1/16W	
R126,127			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R128			RK73GB1J822J	CHIP R 8.2K J 1/16W	
R129			RK73GB1J123J	CHIP R 12K J 1/16W	
R130			R92-1252-05	CHIP R 0 OHM J 1/16W	
R131,132			RK73HB1J473J	CHIP R 47K J 1/16W	
R201			RK73GB1J124J	CHIP R 120K J 1/16W	
R202			RK73GB1J561J	CHIP R 560 J 1/16W	
R203			RK73GB1J913J	CHIP R 91K J 1/16W	
R204-206			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R207			RK73HB1J183J	CHIP R 18K J 1/16W	
R208			R92-1368-05	CHIP R 0 OHM	
R211		✻	RK73HH1J303D	CHIP R 30K D 1/16W	
R212,213		✻	RK73GB1J753J	CHIP R 75K J 1/16W	
R214			RK73HB1J334J	CHIP R 330K J 1/16W	
R215			RK73HB1J222J	CHIP R 2.2K J 1/16W	
R216			R92-1368-05	CHIP R 0 OHM	
R217			RK73HB1J101J	CHIP R 100 J 1/16W	
R218			RK73HB1J821J	CHIP R 820 J 1/16W	
R219			RK73GB1J223J	CHIP R 22K J 1/16W	
R220			RK73GB1J681J	CHIP R 680 J 1/16W	
R221			RK73GB1J472J	CHIP R 4.7K J 1/16W	

PARTS LIST

TX-RX UNIT (X57-7090-10)

Ref. No.	Address	New parts	Parts No.	Description				Destination
R222			RK73HB1J223J	CHIP R	22K	J	1/16W	
R223			RK73GB1J102J	CHIP R	1.0K	J	1/16W	
R224			RK73GB1J561J	CHIP R	560	J	1/16W	
R225-228			RK73GB1J223J	CHIP R	22K	J	1/16W	
R229			RK73HB1J104J	CHIP R	100K	J	1/16W	
R230			RK73HB1J393J	CHIP R	39K	J	1/16W	
R231			RK73GB1J683J	CHIP R	68K	J	1/16W	
R232,233			RK73HB1J683J	CHIP R	68K	J	1/16W	
R240-248			R92-1368-05	CHIP R	0 OHM			
R249			RK73HB1J562J	CHIP R	5.6K	J	1/16W	
R250			RK73HB1J105J	CHIP R	1.0M	J	1/16W	
R251			RK73HB1J473J	CHIP R	47K	J	1/16W	
R252			RK73HB1J104J	CHIP R	100K	J	1/16W	
R253			RK73GB1J562J	CHIP R	5.6K	J	1/16W	
R254			RK73HB1J474J	CHIP R	470K	J	1/16W	
R255			RK73HB1J154J	CHIP R	150K	J	1/16W	
R256			RK73HB1J473J	CHIP R	47K	J	1/16W	
R257			RK73HB1J104J	CHIP R	100K	J	1/16W	
R258		✻	RK73HH1J204D	CHIP R	200K	D	1/16W	
R259		✻	RK73HH1J394D	CHIP R	390K	D	1/16W	
R260			RK73GB1J683J	CHIP R	68K	J	1/16W	
R261			R92-1368-05	CHIP R	0 OHM			
R262			RK73HB1J563J	CHIP R	56K	J	1/16W	
R263			RK73HB1J104J	CHIP R	100K	J	1/16W	
R264,265			RK73HB1J473J	CHIP R	47K	J	1/16W	
R266			RK73HB1J332J	CHIP R	3.3K	J	1/16W	
R267			RK73HH1J683D	CHIP R	68K	D	1/16W	
R268			RK73HH1J154D	CHIP R	150K	D	1/1	
R269			RK73HH1J683D	CHIP R	68K	D	1/16W	
R270			RK73HB1J183J	CHIP R	18K	J	1/16W	
R271			RK73HB1J563J	CHIP R	56K	J	1/16W	
R272			RK73HH1J563D	CHIP R	56K	D	1/16W	
R273		✻	RK73HH1J184D	CHIP R	180K	D	1/16W	
R274			RK73HH1J332D	CHIP R	3.3K	D	1/16W	
R275			RK73HH1J563D	CHIP R	56K	D	1/16W	
R276,277			RK73HB1J223J	CHIP R	22K	J	1/16W	
R278,279			RK73HB1J823J	CHIP R	82K	J	1/16W	
R281			RK73GB1J472J	CHIP R	4.7K	J	1/16W	
R282			RK73GB1J473J	CHIP R	47K	J	1/16W	
R283			RK73GB1J683J	CHIP R	68K	J	1/16W	
R284			RK73GB1J222J	CHIP R	2.2K	J	1/16W	
R285			R92-0670-05	CHIP R	0 OHM			
R286			RK73GB1J391J	CHIP R	390	J	1/16W	
R301			RK73GB1J105J	CHIP R	1.0M	J	1/16W	
R302,303			RK73GB1J472J	CHIP R	4.7K	J	1/16W	
R304			RK73GB1J223J	CHIP R	22K	J	1/16W	
R305			RK73GB1J182J	CHIP R	1.8K	J	1/16W	
R306			RK73GB1J472J	CHIP R	4.7K	J	1/16W	
R307			RK73GB1J274J	CHIP R	270K	J	1/16W	
R309			RK73GB1J332J	CHIP R	3.3K	J	1/16W	
R310			RK73GB1J334J	CHIP R	330K	J	1/16W	
R311			RK73GB1J102J	CHIP R	1.0K	J	1/16W	
R312			RK73GB1J223J	CHIP R	22K	J	1/16W	
R313			RK73GB1J273J	CHIP R	27K	J	1/16W	
R314			RK73GB1J104J	CHIP R	100K	J	1/16W	
R321			RK73GB1J333J	CHIP R	33K	J	1/16W	
R322			RK73GB1J123J	CHIP R	12K	J	1/16W	
R323			RK73GB1J222J	CHIP R	2.2K	J	1/16W	
R324			R92-1252-05	CHIP R	0 OHM	J	1/16W	
R331-336			RK73GB1J103J	CHIP R	10K	J	1/16W	

Ref. No.	Address	New parts	Parts No.	Description				Destination
R341			RK73GB1J101J	CHIP R	100	J	1/16W	
R342			RK73GB1J224J	CHIP R	220K	J	1/16W	
R351			RK73GB1J471J	CHIP R	470	J	1/16W	
R352			RK73GB1J101J	CHIP R	100	J	1/16W	
R353			RK73GB1J104J	CHIP R	100K	J	1/16W	
R354			RK73GB1J471J	CHIP R	470	J	1/16W	
R355		✻	RK73GH1J331D	CHIP R	330	D	1/16W	
R358			RK73GB1J221J	CHIP R	220	J	1/16W	
R359			RK73GB1J224J	CHIP R	220K	J	1/16W	
R360			RK73GB1J824J	CHIP R	820K	J	1/16W	
R361			RK73GB1J181J	CHIP R	180	J	1/16W	
R362			RK73GB1J394J	CHIP R	390K	J	1/16W	
R363			RK73GB1J154J	CHIP R	150K	J	1/16W	
R364			R92-1252-05	CHIP R	0 OHM	J	1/16W	
R365,366			RK73GB1J105J	CHIP R	1.0M	J	1/16W	
R367			RK73GB1J101J	CHIP R	100	J	1/16W	
R369			RK73GB1J151J	CHIP R	150	J	1/16W	
R370			RK73GB1J473J	CHIP R	47K	J	1/16W	
R371			RK73GB1J393J	CHIP R	39K	J	1/16W	
R372			RK73GB1J683J	CHIP R	68K	J	1/16W	
R373			RK73GB1J223J	CHIP R	22K	J	1/16W	
R374			RK73GB1J105J	CHIP R	1.0M	J	1/16W	
R376			RK73GB1J105J	CHIP R	1.0M	J	1/16W	
R378			RK73GB1J105J	CHIP R	1.0M	J	1/16W	
R380			R92-1252-05	CHIP R	0 OHM	J	1/16W	
R381			RK73GB1J104J	CHIP R	100K	J	1/16W	
R392,393			R92-1252-05	CHIP R	0 OHM	J	1/16W	
R401-403			RK73HB1J102J	CHIP R	1.0K	J	1/16W	
R404			RK73GB1J222J	CHIP R	2.2K	J	1/16W	
R405			RK73GB1J103J	CHIP R	10K	J	1/16W	
R406			RK73GB1J152J	CHIP R	1.5K	J	1/16W	
R407			RK73HB1J100J	CHIP R	10	J	1/16W	
R408			RK73HB1J104J	CHIP R	100K	J	1/16W	
R409			RK73GB1J101J	CHIP R	100	J	1/16W	
R421			RK73GB1J103J	CHIP R	10K	J	1/16W	
R422			RK73GB1J123J	CHIP R	12K	J	1/16W	
R423			RK73GB1J103J	CHIP R	10K	J	1/16W	
R424			R92-1368-05	CHIP R	0 OHM			
R425			RK73GB1J103J	CHIP R	10K	J	1/16W	
R426,427			RK73GB1J102J	CHIP R	1.0K	J	1/16W	
R428			RK73GB1J222J	CHIP R	2.2K	J	1/16W	
R429			RK73GB1J152J	CHIP R	1.5K	J	1/16W	
R430			RK73GB1J103J	CHIP R	10K	J	1/16W	
R431			R92-1252-05	CHIP R	0 OHM	J	1/16W	
R432			RK73GB1J471J	CHIP R	470	J	1/16W	
R433			RK73GB1J224J	CHIP R	220K	J	1/16W	
R441			RK73GB1J221J	CHIP R	220	J	1/16W	
R442,443			RK73GB1J101J	CHIP R	100	J	1/16W	
R444			RK73GB1J104J	CHIP R	100K	J	1/16W	
R445			RK73GB1J102J	CHIP R	1.0K	J	1/16W	
R446			RK73GB1J151J	CHIP R	150	J	1/16W	
R447			RK73GB1J473J	CHIP R	47K	J	1/16W	
R448			RK73GB1J393J	CHIP R	39K	J	1/16W	
R449			RK73GB1J104J	CHIP R	100K	J	1/16W	
R450			RK73GB1J473J	CHIP R	47K	J	1/16W	
R451			RK73GB1J472J	CHIP R	4.7K	J	1/16W	
R452			RK73GB1J124J	CHIP R	120K	J	1/16W	
R453			RK73GB1J101J	CHIP R	100	J	1/16W	
R454			R92-1252-05	CHIP R	0 OHM	J	1/16W	
R457			RK73GB1J124J	CHIP R	120K	J	1/16W	

PARTS LIST

TX-RX UNIT (X57-7090-10)

Ref. No.	Address	New parts	Parts No.	Description	Destination
R458			RK73GB1J101J	CHIP R 100 J 1/16W	
R459			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R460			R92-1252-05	CHIP R 0 OHM J 1/16W	
R461			RK73GB1J101J	CHIP R 100 J 1/16W	
R462			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R463			R92-1252-05	CHIP R 0 OHM J 1/16W	
R464			RK73GB1J222J	CHIP R 2.2K J 1/16W	
R501			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R502			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R506			RK73GB1J103J	CHIP R 10K J 1/16W	
R507			RK73GB1J470J	CHIP R 47 J 1/16W	
R509			RK73GB1J100J	CHIP R 10 J 1/16W	
R511			RK73GB1J471J	CHIP R 470 J 1/16W	
R512			RK73GB1J332J	CHIP R 3.3K J 1/16W	
R513			RK73GB1J682J	CHIP R 6.8K J 1/16W	
R514			RK73FB2A470J	CHIP R 47 J 1/10W	
R515			RK73GB1J100J	CHIP R 10 J 1/16W	
R516			RK73GB1J332J	CHIP R 3.3K J 1/16W	
R517			RK73GB1J100J	CHIP R 10 J 1/16W	
R518			RK73GB1J223J	CHIP R 22K J 1/16W	
R519			RK73FB2A220J	CHIP R 22 J 1/10W	
R520			RK73GB1J822J	CHIP R 8.2K J 1/16W	
R521			RK73GB1J101J	CHIP R 100 J 1/16W	
R522			R92-1217-05	CHIP R 0 OHM	
R524			RK73FB2A821J	CHIP R 820 J 1/10W	
R525			RK73EB2B5R6J	CHIP R 5.6 J 1/8W	
R526			RK73FB2A821J	CHIP R 820 J 1/10W	
R534			RK73GB1J683J	CHIP R 68K J 1/16W	
R535			RK73GB1J563J	CHIP R 56K J 1/16W	
R536			RK73EB2B100J	CHIP R 10 J 1/8W	
R537			RK73GB1J823J	CHIP R 82K J 1/16W	
R538			RK73GB1J563J	CHIP R 56K J 1/16W	
R539			R92-1213-05	CHIP R 100 J 1/2W	
R601-603			RK73GB1J223J	CHIP R 22K J 1/16W	
R605			RK73GB1J473J	CHIP R 47K J 1/16W	
R606			RK73GB1J223J	CHIP R 22K J 1/16W	
R607			RK73GB1J221J	CHIP R 220 J 1/16W	
R651			RK73GB1J474J	CHIP R 470K J 1/16W	
R652			RK73GB1J473J	CHIP R 47K J 1/16W	
R653			R92-1252-05	CHIP R 0 OHM J 1/16W	
R654,655			RK73GB1J473J	CHIP R 47K J 1/16W	
R657			RK73GB1J473J	CHIP R 47K J 1/16W	
R658			R92-1252-05	CHIP R 0 OHM J 1/16W	
R659			RK73GB1J473J	CHIP R 47K J 1/16W	
R660			RK73GB1J104J	CHIP R 100K J 1/16W	
R661			RK73GB1J473J	CHIP R 47K J 1/16W	
R662			R92-1252-05	CHIP R 0 OHM J 1/16W	
R664			RK73GB1J473J	CHIP R 47K J 1/16W	
R800			R92-1061-05	JUMPER REST 0 OHM	
R822			R92-1215-05	CHIP R 470 J 1/2W	
R823			R92-0679-05	CHIP R 0 OHM DRIVE FET	
R824			RK73HB1J104J	CHIP R 100K J 1/16W	
VR1			R12-6427-05	TRIMMING POT. (47K/12)	
D1-11			DA221	DIODE	
D41			ZSH5MA27	SURGE ABSORBER	
D42			1812L110PR	VARISTOR	
D81			02DZ18(X,Y)	ZENER DIODE	
D82			1SS355	DIODE	
D211			1SS372	DIODE	

Ref. No.	Address	New parts	Parts No.	Description	Destination
D212		✻	MC2858	DIODE	
D301			MA742	DIODE	
D331,332		✻	MC2858	DIODE	
D351-355			HVC350B	VARIABLE CAPACITANCE DIODE	
D401			1SS355	DIODE	
D421			HZU5ALL	DIODE	
D441-444			MA2S304	VARIABLE CAPACITANCE DIODE	
D445			1SV278	VARIABLE CAPACITANCE DIODE	
D446			1SS355	DIODE	
D447,448			HSC277	DIODE	
D502			MC2850	DIODE	
D503			02DZ5.1(Y)	ZENER DIODE	
D601,602			MA4PH633	DIODE	
D604,605			XB15A709	DIODE	
D606-609			MA742	DIODE	
D651			1SS355	DIODE	
IC41			KIA7808AF	ANALOGUE IC	
IC42,43			NJM78L05UA	BI-POLAR IC	
IC44,45			BD4740G	MOS-IC	
IC81		✻	AT24C12810SU18	ROM IC	
IC101		✻	30622MEP-A01GP	MICROPROCESSOR IC	
IC201			M62364FP	MOS-IC	
IC211			NJM2100V	MOS-IC	
IC213			BU4066BCFV	MOS-IC	
IC214,215			BA10358FV	MOS-IC	
IC241			AQUA-L	MOS-IC	
IC281	2B		LA4600	BI-POLAR IC	
IC321			TK14489V	BI-POLAR IC	
IC401			MB15A02	MOS-IC	
IC651			TA75W01FU	MOS-IC	
Q41			2SJ645	FET	
Q42			KRC102S	DIGITAL TRANSISTOR	
Q43			12A02CH	TRANSISTOR	
Q44			KRC102S	DIGITAL TRANSISTOR	
Q45			12A02CH	TRANSISTOR	
Q46			KRC102S	DIGITAL TRANSISTOR	
Q81			RT1N441U	TRANSISTOR	
Q82,83			2SK1830	FET	
Q84			KRC414RTK	DIGITAL TRANSISTOR	
Q201		✻	2SC3928A	TRANSISTOR	
Q211			2SC4919	TRANSISTOR	
Q212,213			2SK1830	FET	
Q241			RT1P141U	TRANSISTOR	
Q281			DTC363EU	DIGITAL TRANSISTOR	
Q282			KRC102S	DIGITAL TRANSISTOR	
Q301		✻	2SC3928A	TRANSISTOR	
Q341		✻	2SC3928A	TRANSISTOR	
Q351		✻	2SC5636	TRANSISTOR	
Q352			3SK318	FET	
Q353			3SK255	FET	
Q406			2SK508NV(K52)	FET	
Q421			2SA1832(GR)	TRANSISTOR	
Q422			2SC4738(GR)	TRANSISTOR	
Q431			2SC4649(N,P)	TRANSISTOR	
Q441			2SK508NV(K52)	FET	
Q442			2SJ347	FET	
Q443			KRX102U	TRANSISTOR	
Q445		✻	2SC3928A	TRANSISTOR	
Q446,447		✻	2SC5636	TRANSISTOR	
Q500			2SC5110(O)	TRANSISTOR	

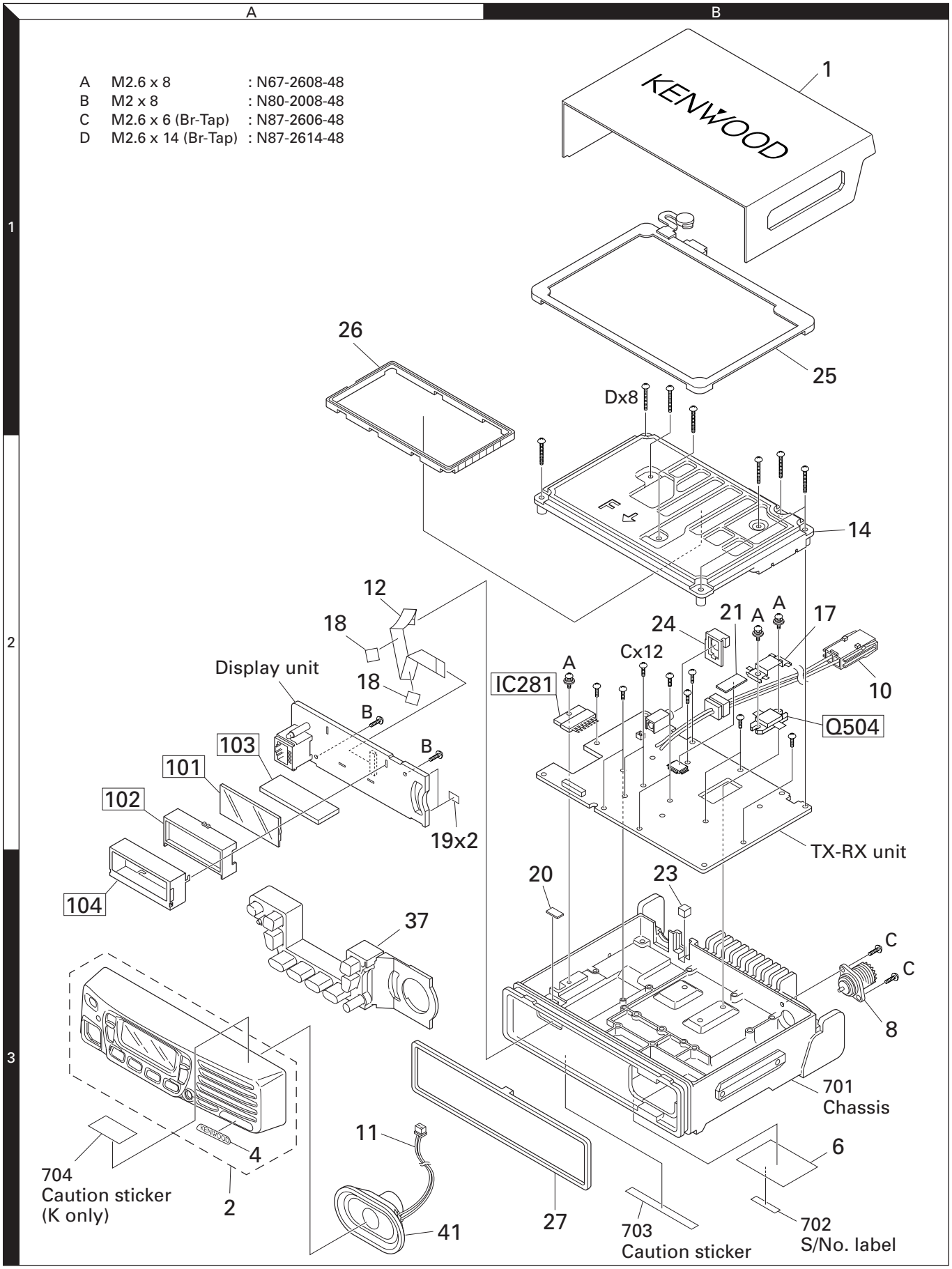
PARTS LIST

TX-RX UNIT (X57-7090-10)

Ref. No.	Address	New parts	Parts No.	Description	Destination
Q501			2SC3356(R24)	TRANSISTOR	
Q502			RD00HVS1	PREDRIVE FET	
Q503			PD55008TR	DRIVE FET	
Q504	2B		RD60HUF1-01	FINAL FET	
TH301			B57331V2104J	THERMISTOR	
TH351			NCP18XW332J03	THERMISTOR	
TH441			NCP18XH103K03	THERMISTOR	
TH672,673			B57331V2104J	THERMISTOR	

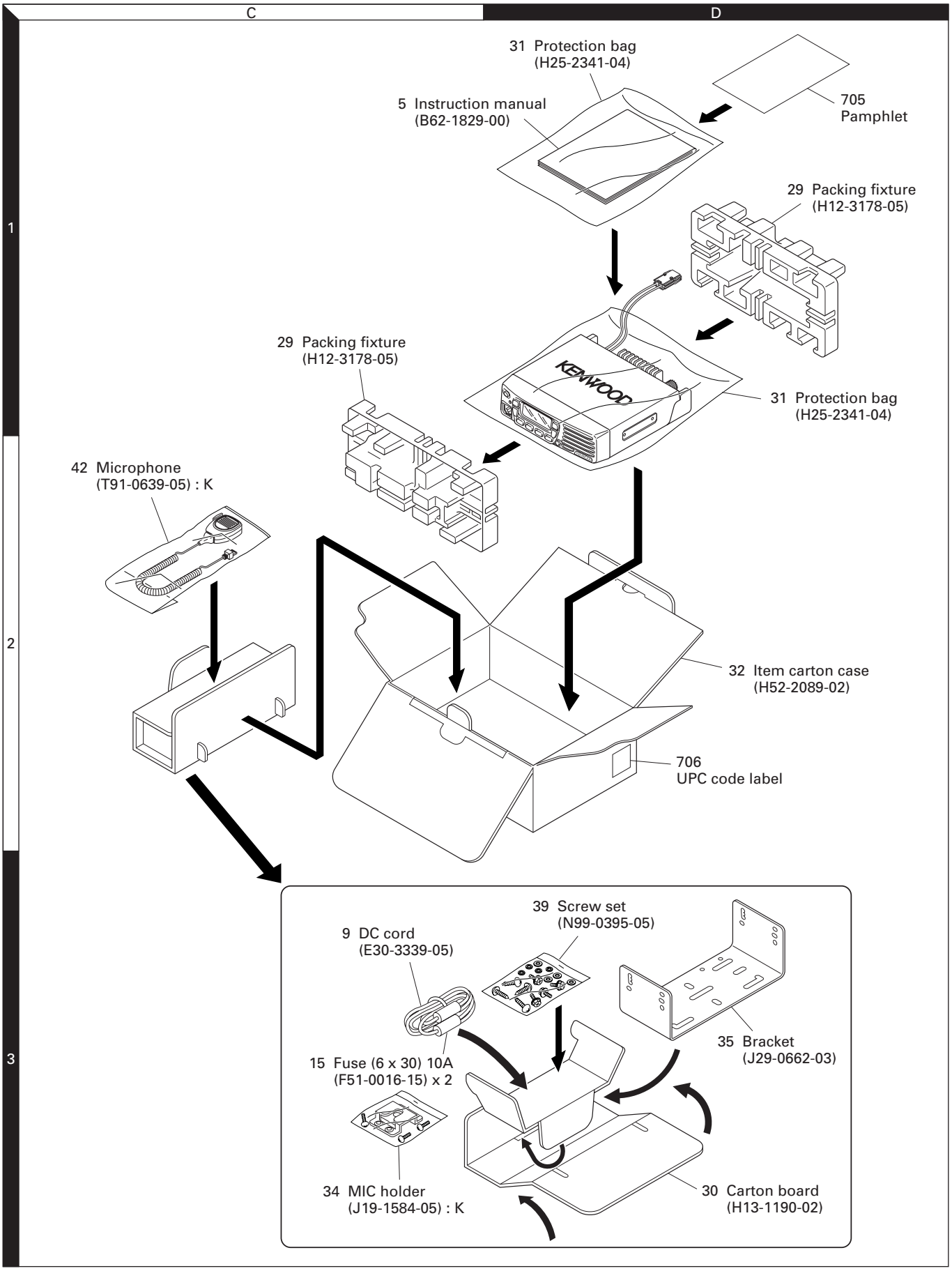
Ref. No.	Address	New parts	Parts No.	Description	Destination

EXPLODED VIEW



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

PACKING



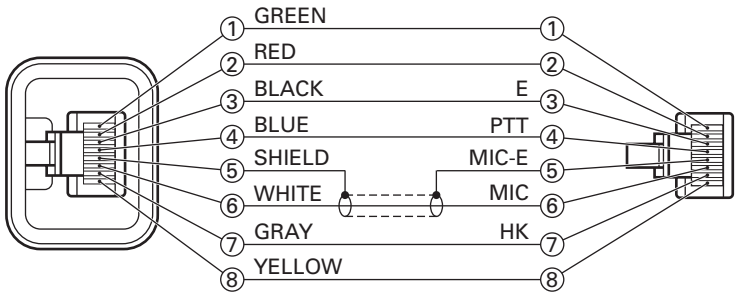
Parts with the exploded numbers larger than 700 are not supplied.

ADJUSTMENT

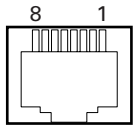
Test Equipment Required for Alignment

Test Equipment	Major Specifications	
1. Standard Signal Generator (SSG)	Frequency Range	400 to 520MHz
	Modulation	Frequency modulation and external modulation
	Output	–127dBm/0.1μV to greater than –7dBm/100mV
2. Power Meter	Input Impedance	50Ω
	Operation Frequency	400 to 520MHz or more
	Measurement Capability	Vicinity of 100W
3. Deviation Meter	Frequency Range	400 to 520MHz
4. Digital Volt Meter (DVM)	Measuring Range	1 to 20V DC
	Accuracy	High input impedance for minimum circuit loading
5. Oscilloscope		DC through 30MHz
6. High Sensitivity Frequency Counter	Frequency Range	10Hz to 1000MHz
	Frequency Stability	0.2ppm or less
7. Ammeter		20A
8. AF Volt Meter (AF VTVM)	Frequency Range	50Hz to 10kHz
	Voltage Range	1mV to 3V
9. Audio Generator (AG)	Frequency Range	20Hz to 20kHz or more
	Output	0 to 1V
10. Distortion Meter	Capability	3% or less at 1kHz
	Input Level	50mV to 10Vrms
11. 4Ω Dummy Load		Approx. 4Ω, 10W or more
12. Regulated Power Supply		13.6V, approx. 20A (adjustable from 9 to 17V)
		Useful if ammeter requipped
13. Spectrum Analyzer	Center frequency	50KHz to 600MHz
14. Tracking Generator	Output Voltage	100mV or more

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



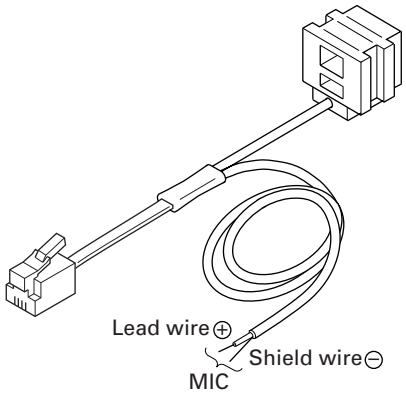
MIC connector (Front view)



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

Tuning cable (E30-3383-05)

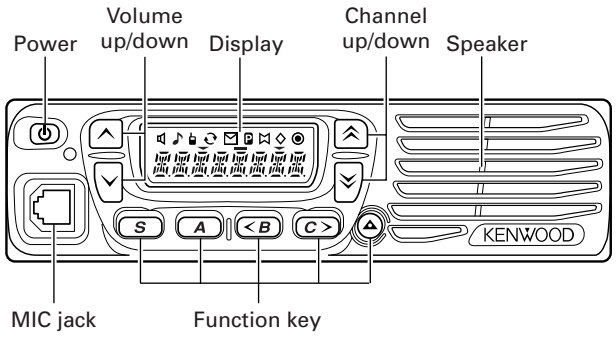
Adapter cable (E30-3383-05) is required for injecting an audio if PC tuning is used.
See "PC Mode" section for the connection.



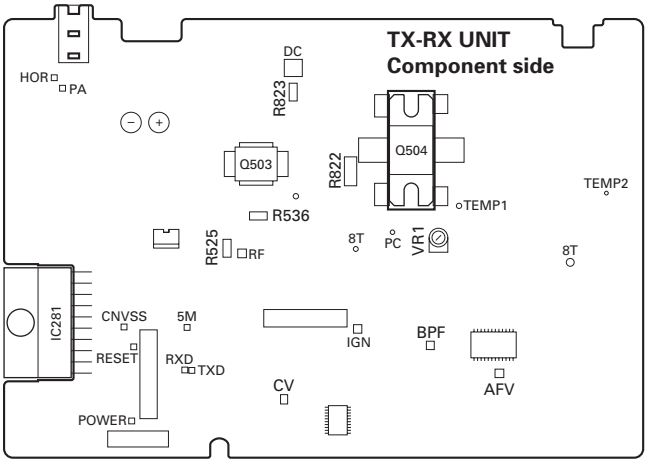
ADJUSTMENT

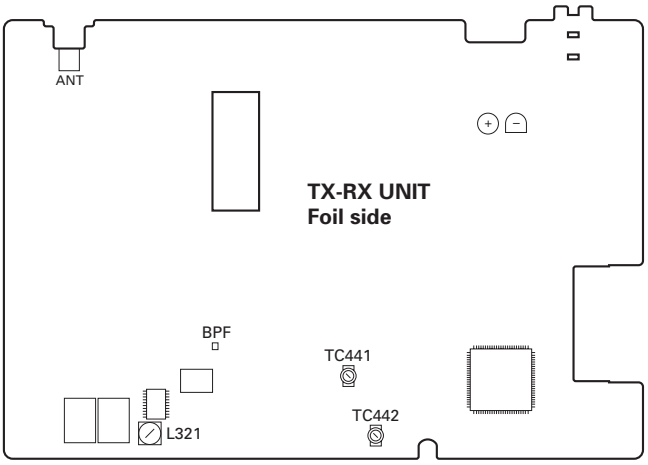
Adjustment Location

■ Switch



■ Adjustment Points





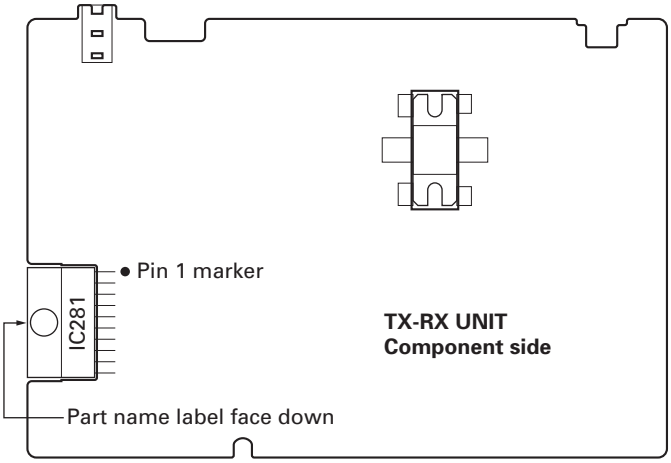
■ Notes

• EEPROM

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

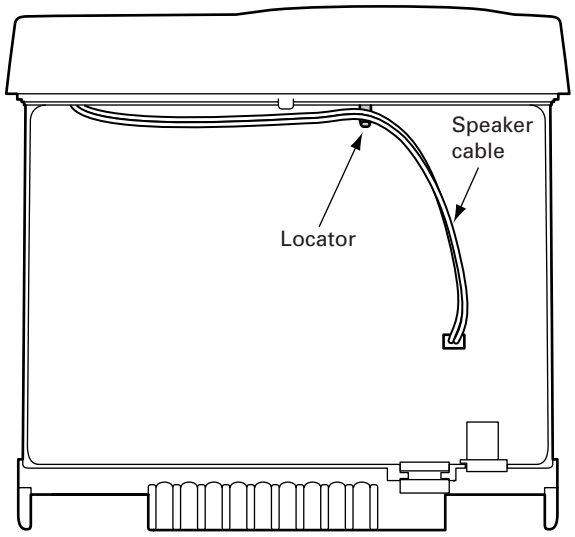
• AF PA IC (IC281)

How to mounting the IC281.



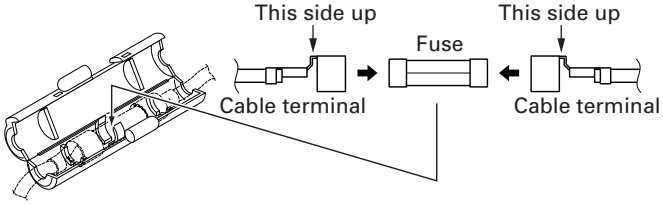
• Speaker Cable

The speaker cable should be formed before mounting the shield cover as below.



• Fuse

To mount the fuse, the cable terminal direction must be as follow.



ADJUSTMENT

Test Frequency

Channel	K		M	
	RX (MHz)	TX (MHz)	RX (MHz)	TX (MHz)
1	470.05	470.10	460.05	460.10
2	450.05	450.10	440.05	440.10
3	489.95	489.90	479.95	479.90
4	470.00	470.00	460.00	460.10
5	470.20	470.20	460.20	460.20
6	470.40	470.40	460.40	460.40

3 or 5 Reference Level Adjustment Frequency

Tuning point	K		M	
	RX (MHz)	TX (MHz)	RX (MHz)	TX (MHz)
Low	450.05	450.10	440.05	440.10
Low'	460.05	460.10	450.05	450.10
Center	470.05	470.10	460.05	460.10
High'	480.05	480.10	470.05	470.10
High	489.95	498.90	479.95	479.90

Test Signaling

	RX	TX
1	None	None
2	None	100Hz Square
3	QT : 67.0Hz	QT : 67.0Hz
4	QT : 151.4Hz	QT : 151.4Hz
5	QT : 210.7Hz	QT : 210.7Hz
6	QT : 254.1Hz	QT : 254.1Hz
7	DQT : 023N	DQT : 023N
8	DQT : 754I	DQT : 754I
9	DTMF : 159D	DTMF : 159D
10	None	DTMF Code 9
11	FleetSync 1200 bps : 100~1000	FleetSync 1200 bps : 100~1000
12	FleetSync 2400 bps : 100~1000	FleetSync 2400 bps : 100~1000
13	None	Single Tone : 1000Hz
14	2-Tone A : 304.7Hz, B : 3106.0Hz	2-Tone A : 304.7Hz, B : 3106.0Hz
15	Signle Tone : 979.9Hz	Signle Tone : 979.9Hz

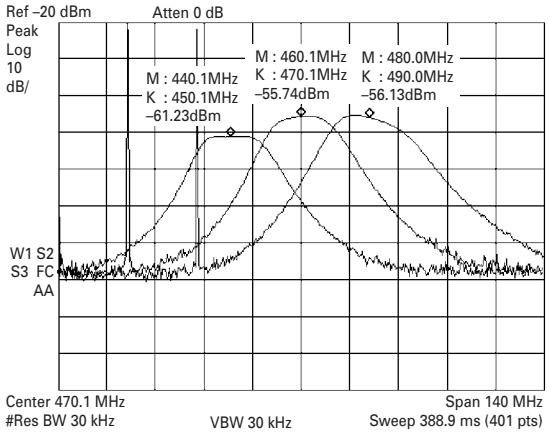


Fig. 1

PCB Section

Item	Condition	Measurement		Adjustment		Specifications/ Remarks
		Test equipment	Terminal	Parts	Method	
1. Setting	1) Power supply voltage DC Power supply terminal : 13.6V					
2. VCO lock voltage*	1) CH : TX high	Digital voltmeter	CV	TC442	5.5V	±0.1V
	2) CH : RX high			TC441	5.5V	±0.1V
	3) CH : TX low				Check	0.7V or more
	4) CH : RX low					
3. IF coil	1) CH : RX center (Wide) 2) SSG output : –53dBm (501μV) Mod : 1kHz, Dev : 3kHz	SSG Digital voltmeter	AFV	L321	3.25~3.35V (DC)	

ADJUSTMENT

Item	Condition	Measurement		Adjustment		Specifications/ Remarks
		Test equipment	Terminal	Parts	Method	
4. RF bandpass filter	1) CH : RX center (Wide) CH : RX low (Wide) CH : RX high (Wide) 2) Tra generator output : –30dBm Connect the spectrum analyzer to BPF terminal	Tra generator Spectrum analyzer	ANT BPF	PC key	Adjust the BPF waveform to Fig. 1	

*** Adjustment of TX VCO lock voltage**

1. Remove R525, R823, R536 and R822 (all on component side).
2. Remove PCB from chassis.
3. Transmit and check voltage at [CV] point.

Warning : Do not transmit if step "1." is not complete.

4. Adjust of voltage can be done by tuning TC442.

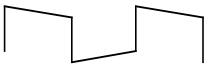
Receiver Section

Item	Condition	Measurement		Adjustment		Specifications/ Remarks
		Test equipment	Terminal	Parts	Method	
1. Seisitivity	1) CH : RX low (Wide/Narrow) CH : RX center (Wide/Narrow) CH : RX high (Wide/Narrow) 2) SSG output : –118dBm (0.28µV) (Wide) : –116dBm (0.35µV) (Narrow) Mod : 1kHz Dev : ±3.0kHz (Wide) Dev : ±1.5kHz (Narrow)	SSG Oscilloscope AF V.M Distortion meter	ANT EXT. SP		Check	SINAD : 12dB or higher
2. Squelch 9	1) CH : RX low (Wide) CH : RX center (Wide/Narrow) CH : RX high (Wide) 2) SSG output : 12dB SINAD+7dB Mod : 1kHz Dev : ±3.0kHz (Wide) Dev : ±1.5kHz (Narrow)			PC key	Adjust to open the squelch	
3. Squelch 1	1) CH : RX low (Wide) CH : RX center (Wide/Narrow) CH : RX high (Wide) 2) SSG output : 12dB SINAD+2dB Mod : 1kHz Dev : ±3.0kHz (Wide) Dev : ±1.5kHz (Narrow)					

Transmitter Section

Item	Condition	Measurement		Adjustment		Specifications/ Remarks
		Test equipment	Terminal	Parts	Method	
1. Frequency	1) CH : TX center 2) Transmit	Frequency counter	ANT	PC key	Adjust to center frequency	Within ±100Hz
2. Maximum power limitting	1) CH : TX high 2) Transmit	Power meter		VR1	28W	±1W

ADJUSTMENT

Item	Condition	Measurement		Adjustment		Specifications/ Remarks
		Test equipment	Terminal	Parts	Method	
3. High power	1) CH : TX low CH : TX low' CH : TX center CH : TX high' CH : TX high 2) Transmit	Power meter	ANT	PC key	25W	±1.0W
4. Low power	1) CH : TX low CH : TX low' CH : TX center CH : TX high' CH : TX high 2) Transmit				5W	±1.0W
5. DQT balance	1) CH : TX low (Wide) CH : TC center (Wide/Narrow) CH : TX high (Wide) 2) Transmit	Modulation analyzer or Linear detector (LPF : 3kHz) Oscilloscope			Adjust the waveform as below 	
6. MAX balance	1) CH : TX low (Wide) CH : TC center (Wide/Narrow) CH : TX high (Wide) 2) AG : 1kHz/50mV 3) Transmit	Modulation analyzer or Linear detector (LPF : 15kHz) Oscilloscope AG AF V.M	ANT MIC	PC key	±4.0kHz (Wide) ±2.0kHz (Narrow) According to the large +, –	±50Hz
7. MIC sensitivity	1) CH : TX center (Wide/Narrow) 2) AG : 1kHz/5mV 3) Transmit				Check	±3kHz±0.2kHz (Wide) ±1.5kHz±0.1kHz (Narrow)
8. DQT deviation	1) CH : TX center (Wide/Narrow) 2) Transmit	Modulation analyzer or Linear detector (LPF : 3kHz) Oscilloscope			±0.75kHz (Wide) ±0.35kHz (Narrow)	±0.05kHz
9. QT deviation	1) CH : TX center (Wide/Narrow) 2) Transmit				±0.75kHz (Wide) ±0.35kHz (Narrow)	±0.05kHz
10. DTMF/MSK deviation	1) CH : TX center (Wide/Narrow) 2) Transmit	LPF : 15kHz			±3.0kHz (Wide) ±1.5kHz (Narrow)	±0.2kHz
11. Single tone deviation	1) CH : TX center (Wide/Narrow) 2) Transmit					

If normal power is not obtained, please follow the step below

Open the shielding cover (upper), and screw 3 locations around ANT pin.

1. Switch off the transceiver.
   Impedance of Final FET (Q504) and Drive FET (Q503) can be measured easily using DVM Ω mode.
   Normal condition – Gate : 20kΩ~50kΩ, Drain : 1MΩ~2MΩ
   The above impedance values are rough estimations.
2. Switch on the transceiver. Check the voltage at R823 output point.
   The voltage is around 13.6V in receiving condition. The voltage will be 12.6V~ in transmitting condition. If found 0V at this point then R823 is broken.
3. Remove R525.
4. Connect 50Ω load at the ANT location.
   Transmit and check current drain at High power mode.
   If the current drain is less than 1A, then Final FET is broken.
   If the current drain is less than 5.0A, short the Drive FET gate to ground, and check the current drain.
   If the current drain is not 0.1A less than the original value, then the Drive FET is broken.
5. Check input power level at Drive FET gate location.
   Connect the wire to [RF] location.
   Transmit and check for power to be within the range of 0.7W~1W.
   If power found is less than 0.3W, check the circuit before the Drive FET.

TERMINAL FUNCTION

CN2

No.	Name	I/O	Function
1	SB	O	Battery voltage DC supply
2	NC	-	-
3	GND	O	Ground
4	DETO	O	FM detector output
5	FNC1	I/O	Programable I/O (programmed by FPU)
6	FNC2	I/O	Programable I/O (programmed by FPU)
7	FNC3	I/O	Programable I/O (programmed by FPU)
8	FNC4	I/O	Programable I/O (programmed by FPU)
9	FNC5	I/O	Programable I/O (programmed by FPU)
10	FNC6	I/O	Programable I/O (programmed by FPU)
11	FNC7	I/O	Programable I/O (programmed by FPU)
12	FNC8	I/O	Programable I/O (programmed by FPU)

CN3

No.	Name	I/O	Function
1	IGN	I	Ignition sens input
2	DATAI	I	External transmit signal input
3	DETO	O	FM detector output
4	TXAFI	I	TX audio input from scrambler board
5	TXAFO	O	TX audio output to scrambler board
6	EMGMIC	I	Emergency MIC input (1kHz/1.2mVrms)
7	RXAFO	O	RX audio output to scrambler board
8	ALTI	I	External alert tone signal input
9	RXAFI	I	RX audio input from scrambler board
10	5C	O	5V DC power supply (50mA MAX)
11	8C	O	8V DC power supply (50mA MAX)

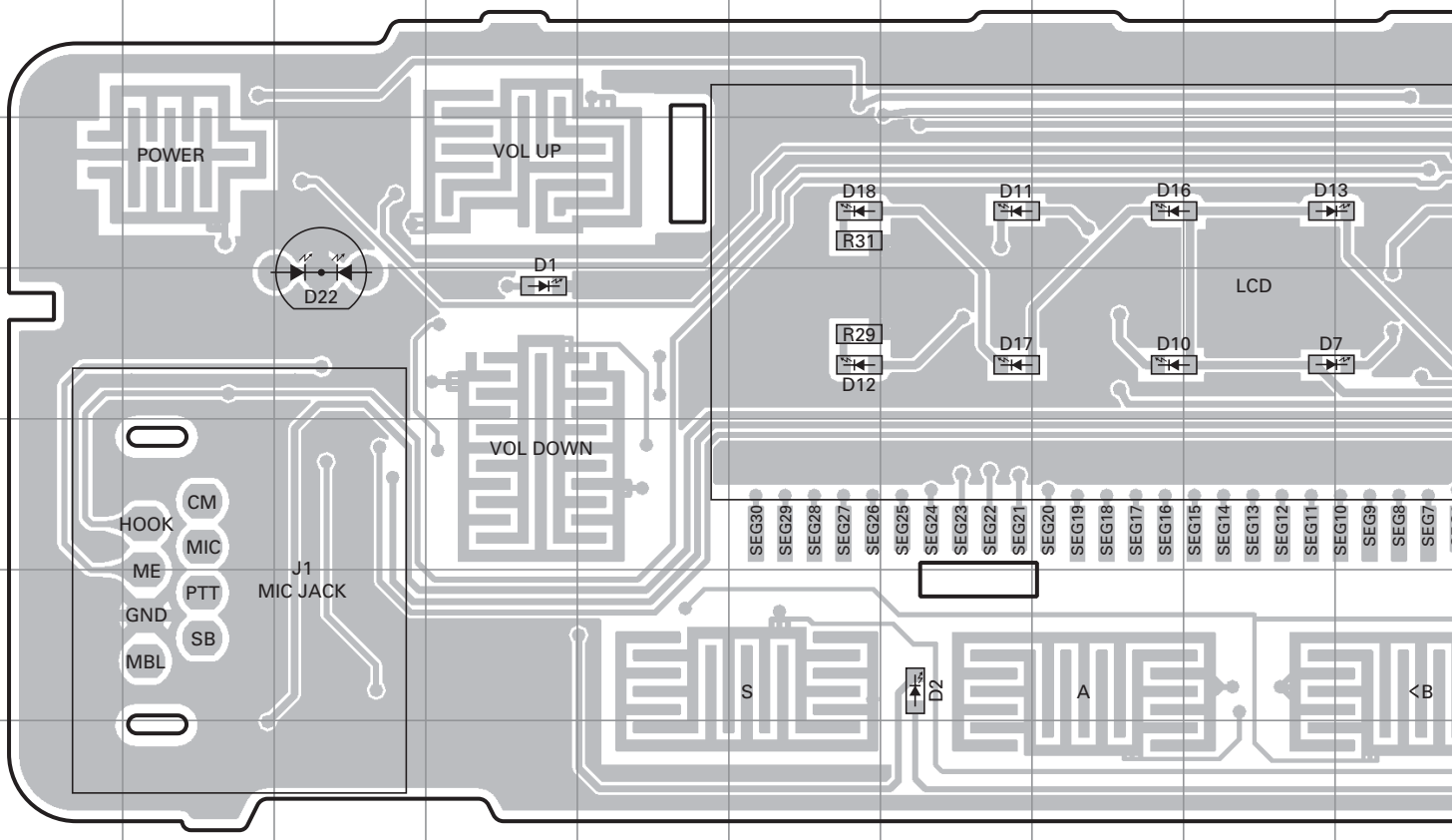
■ Function Port Assignment

	KDS-100, KGP-2A/2B	
	Name	I/O
FNC1	-	-
FNC2	-	-
FNC3	Data Channel	I
FNC4	PTT	I
FNC5	Carrier Operated Relay	O
FNC6	Audio Mute	I
FNC7	Mic Mute	I
FNC8	TX Relay	O
	Scrambler	
	Name	I/O
FNC1	-	-
FNC2	-	-
FNC3	TX Relay	O
FNC4	Scrambler	O
FNC5	Scrambler Code1 (1)	O
FNC6	Scrambler Code2 (2)	O
FNC7	Scrambler Code3 (4)	O
FNC8	Scrambler Code4 (8)	O

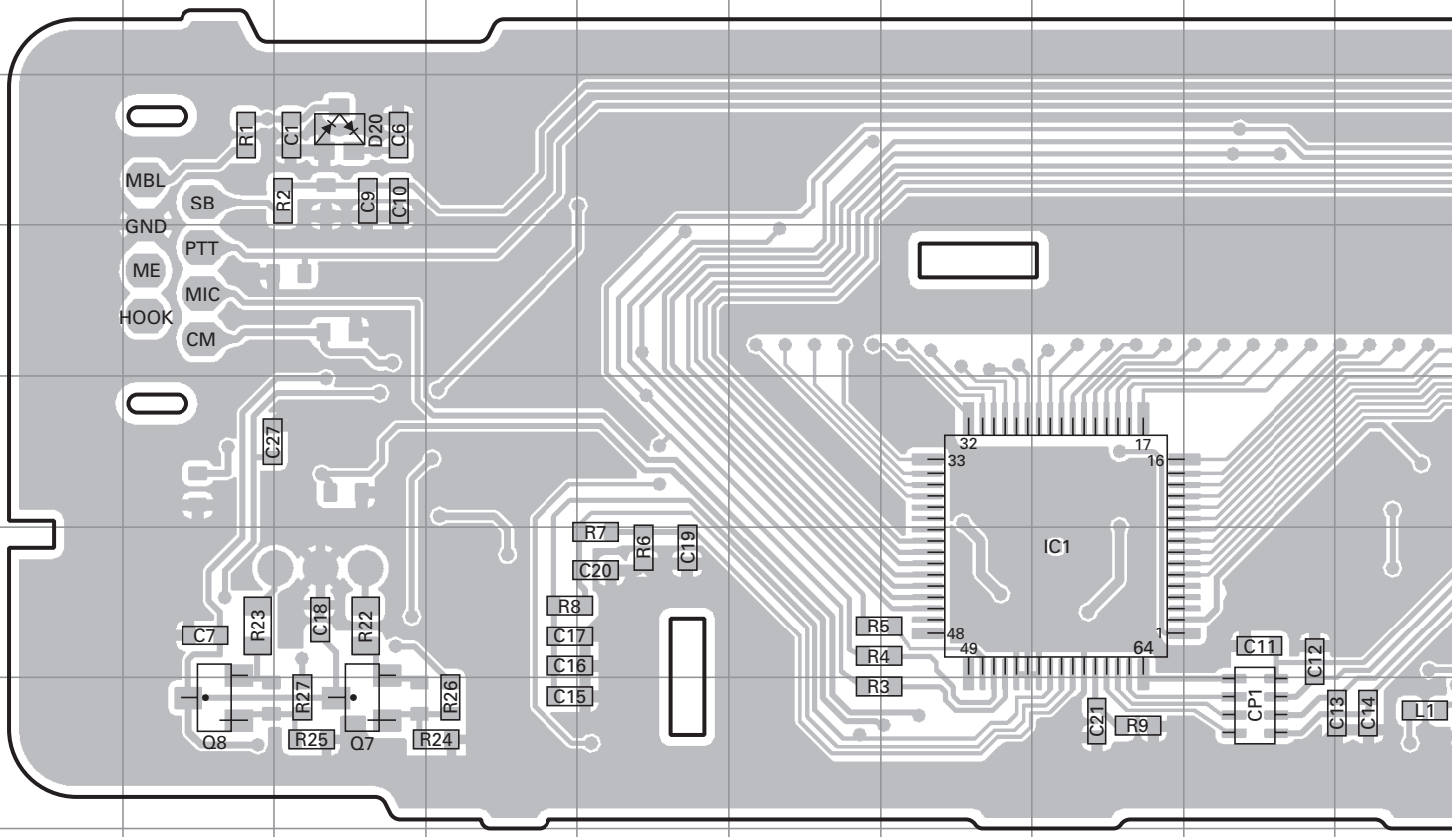
Port Function is Low Active. (Exclude : Scrambler Code)

TK-8160 PC BOARD

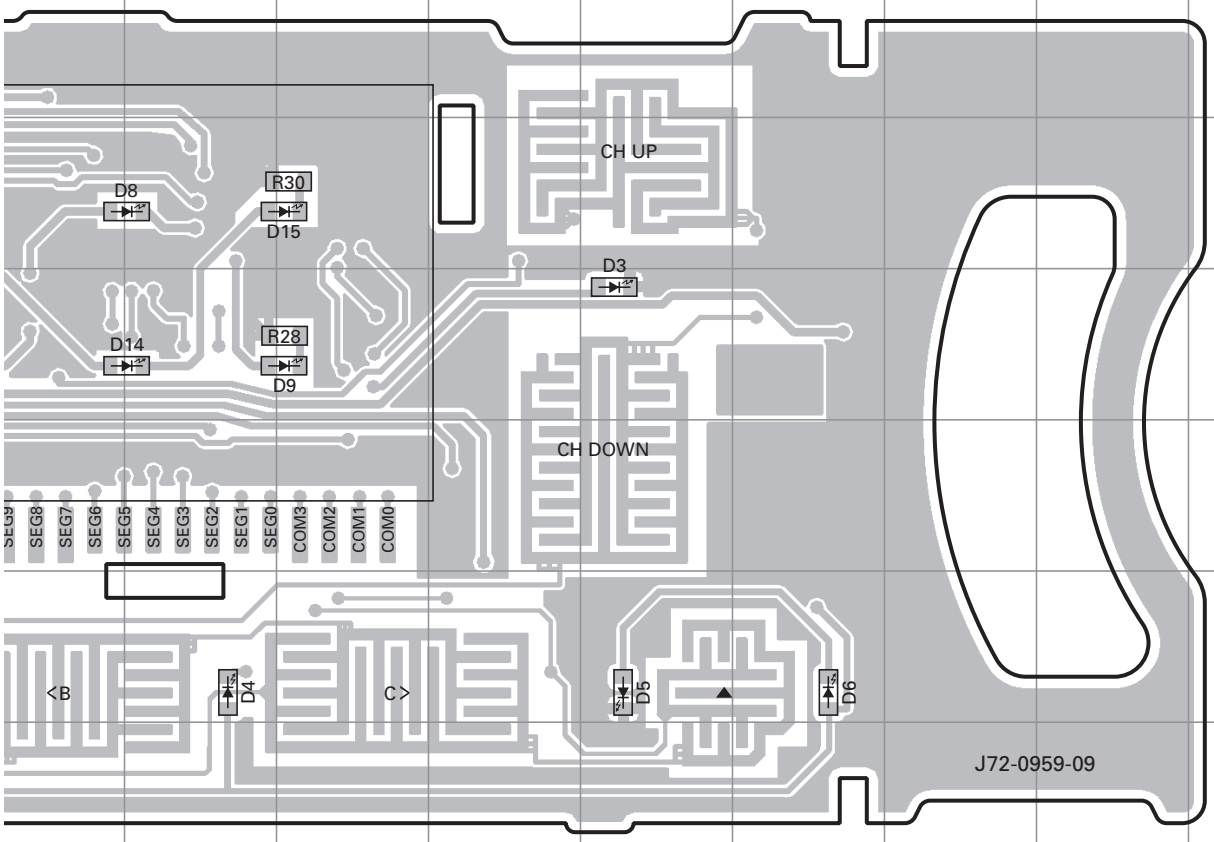
DISPLAY UNIT (X54-3510-10) Component side view (J72-0959-09)



DISPLAY UNIT (X54-3510-10) Foil side view (J72-0959-09)



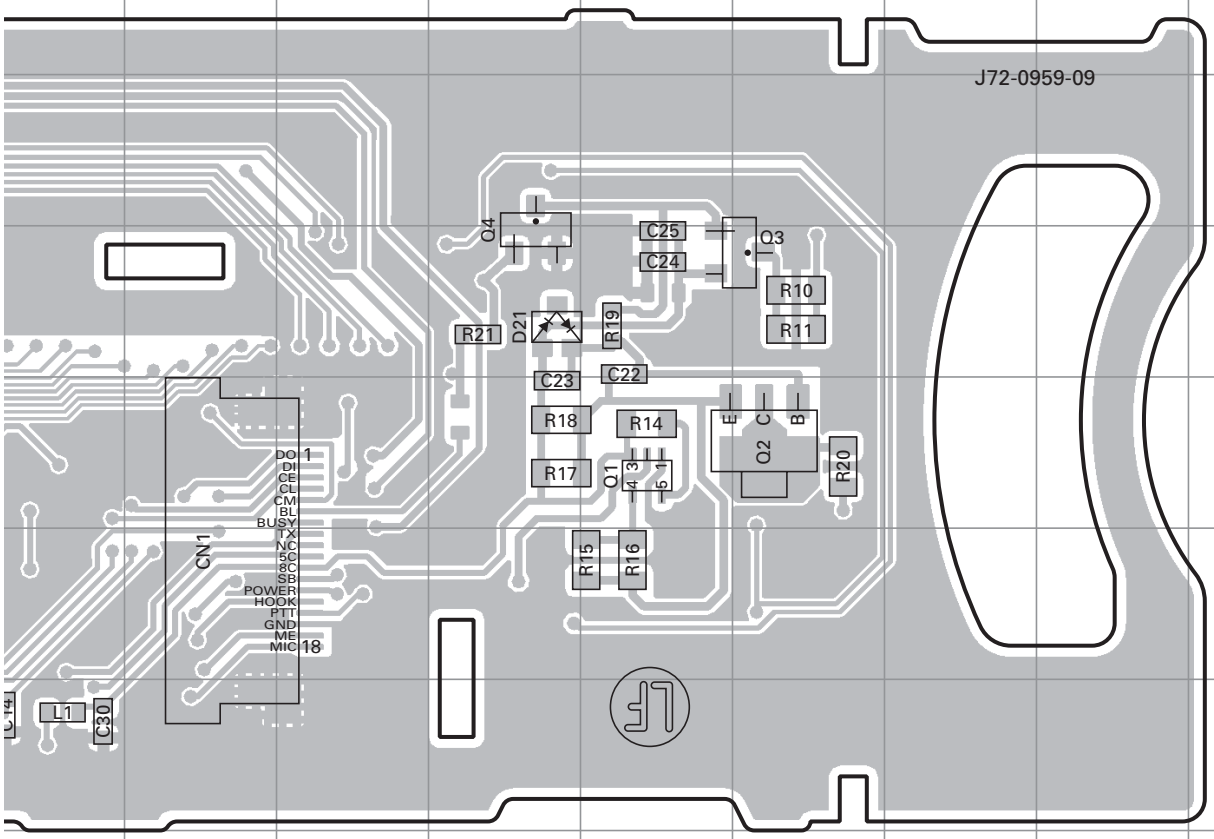
DISPLAY UNIT (X54-3510-10) Component side view (J72-0959-09)



Ref. No.	Address
D1	4D
D2	6G
D3	4N
D4	6K
D5	6N
D6	6O
D7	4I
D8	3K
D9	4L
D10	4H
D11	3G
D12	4F
D13	3I
D14	4K
D15	3L
D16	3H
D17	4G
D18	3F
D22	4C

Component side
Layer 1
Layer 2
Foil side

DISPLAY UNIT (X54-3510-10) Foil side view (J72-0959-09)



Ref. No.	Address
IC1	12H
Q1	11N
Q2	11O
Q3	10O
Q4	10M
Q7	13C
Q8	13B
D20	9C
D21	10M

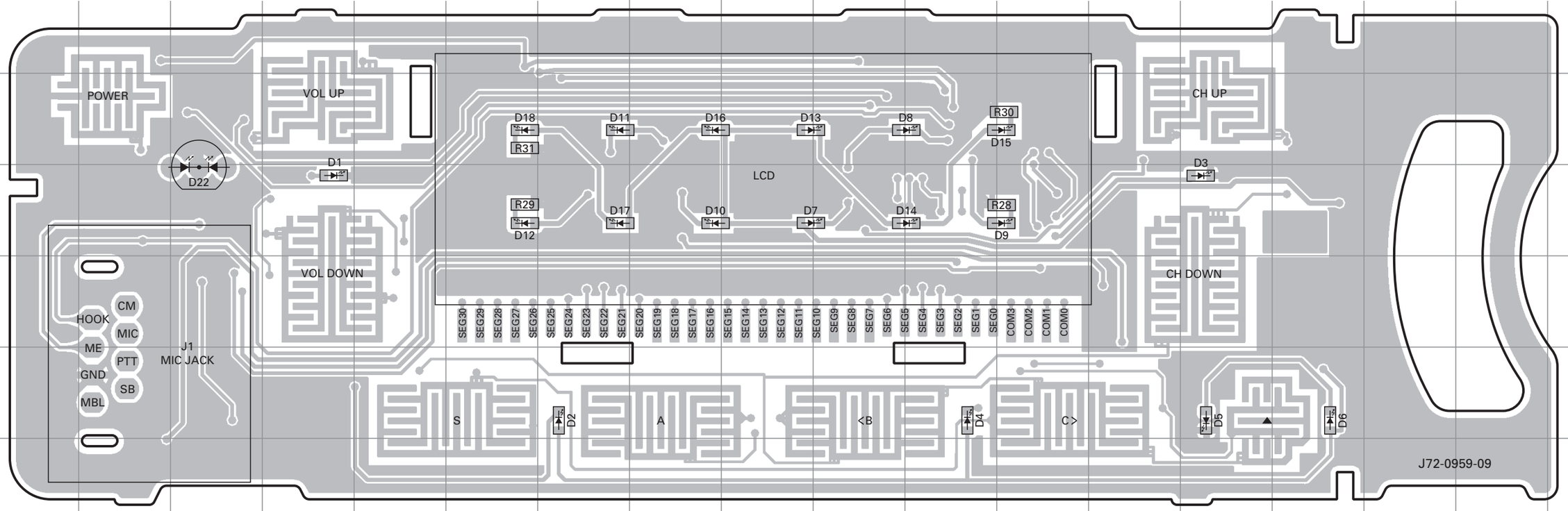
Component side
Layer 1
Layer 2
Foil side

TK-8160 PC BOARD

PC BOARD TK-8160

DISPLAY UNIT (X54-3510-10) Component side view (J72-0959-09)

DISPLAY UNIT (X54-3510-10) Component side view (J72-0959-09)

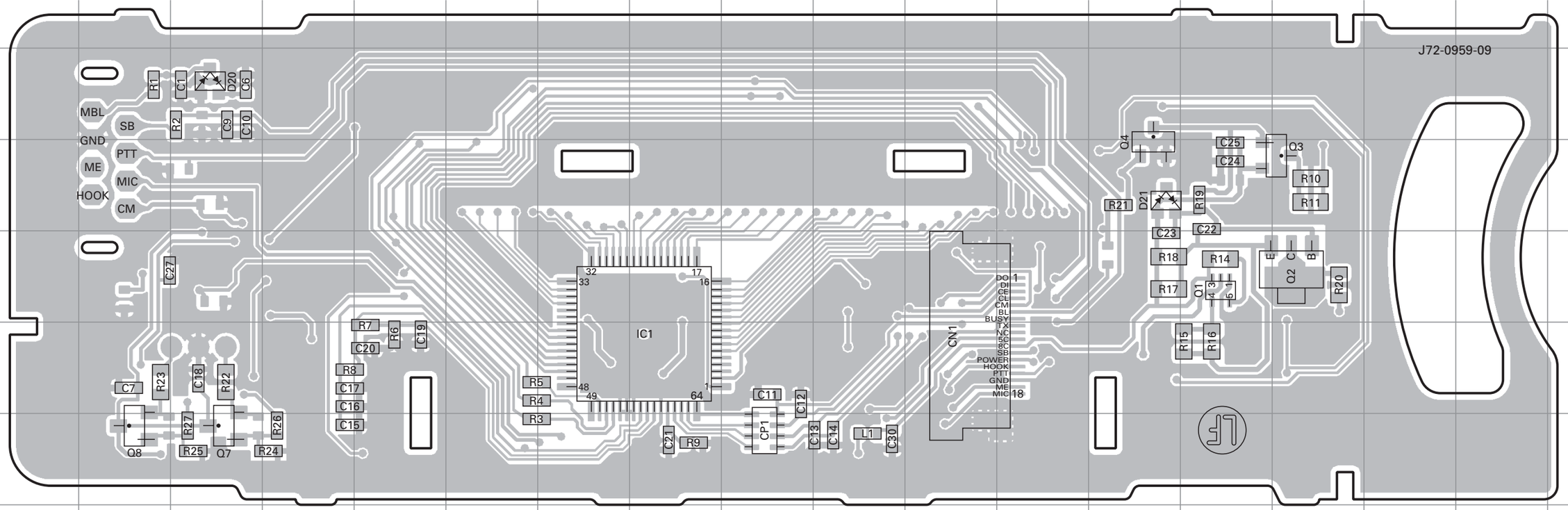


Ref. No.	Address
D1	4D
D2	6G
D3	4N
D4	6K
D5	6N
D6	6O
D7	4I
D8	3K
D9	4L
D10	4H
D11	3G
D12	4F
D13	3I
D14	4K
D15	3L
D16	3H
D17	4G
D18	3F
D22	4C

Component side
Layer 1
Layer 2
Foil side

DISPLAY UNIT (X54-3510-10) Foil side view (J72-0959-09)

DISPLAY UNIT (X54-3510-10) Foil side view (J72-0959-09)

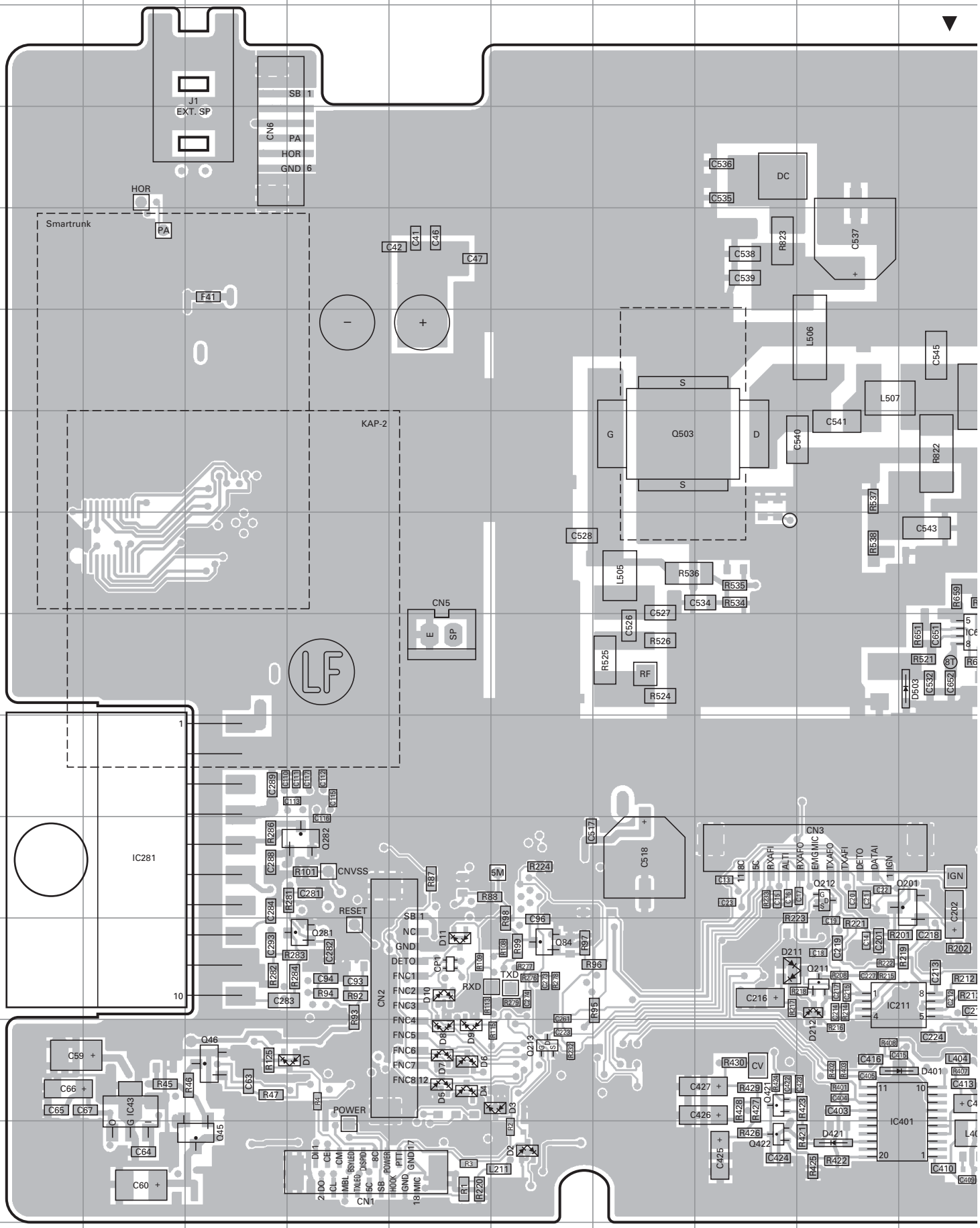


Ref. No.	Address
IC1	12H
Q1	11N
Q2	11O
Q3	10O
Q4	10M
Q7	13C
Q8	13B
D20	9C
D21	10M

Component side
Layer 1
Layer 2
Foil side

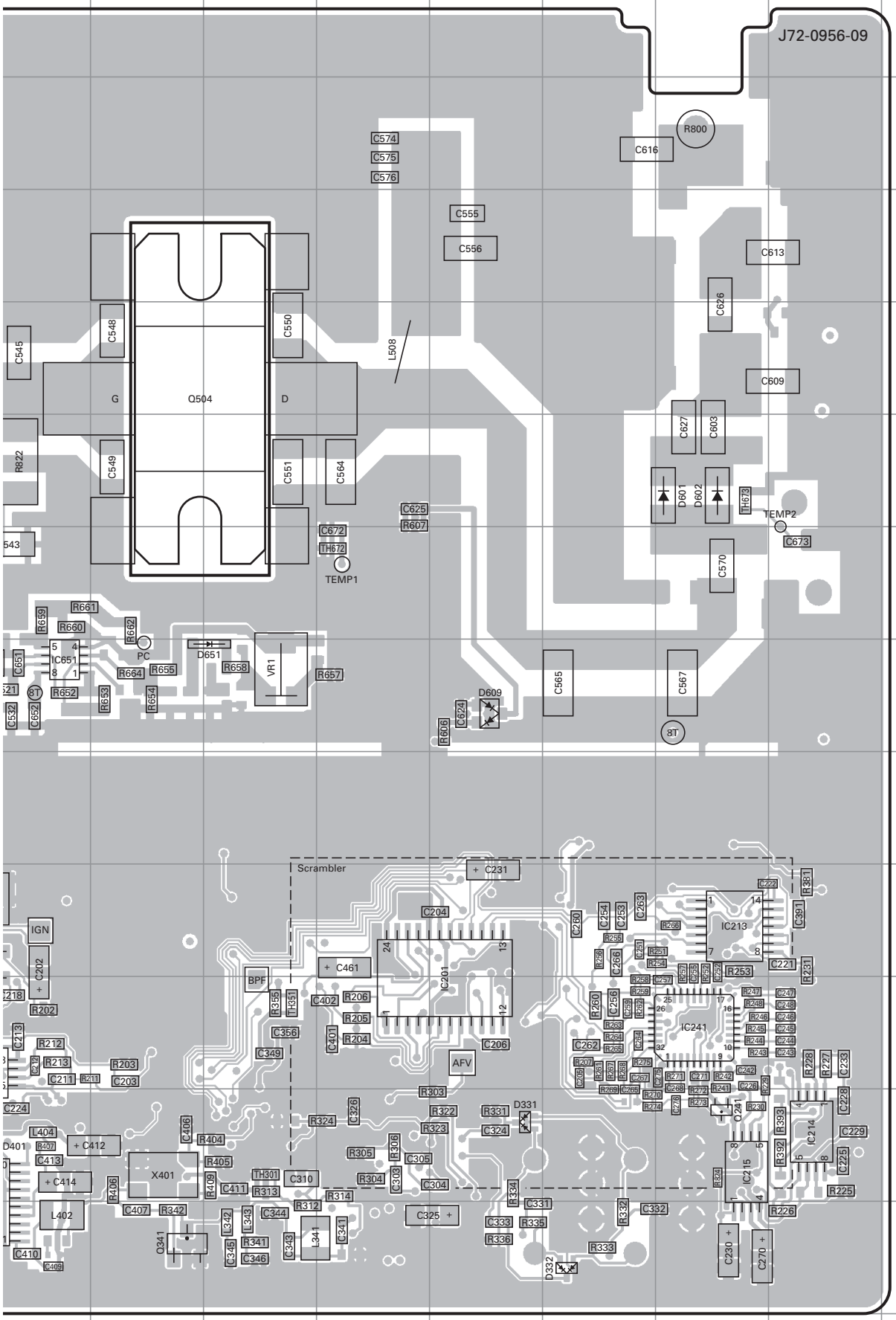
TK-8160 PC BOARD

TX-RX UNIT (X57-7090-10) Component side view (J72-0956-09)



PC BOARD TK-8160

TX-RX UNIT (X57-7090-10) Component side view (J72-0956-09)



Ref. No.	Address
IC43	12B
IC201	11N
IC211	11J
IC213	10P
IC214	12Q
IC215	12P
IC241	11P
IC281	10B
IC401	10J
IC651	8J
Q45	13C
Q46	12C
Q84	11F
Q201	10J
Q211	11I
Q212	10I
Q213	12F
Q241	12P
Q281	11D
Q282	10D
Q341	13K
Q421	12H
Q422	13H
Q503	6G
Q504	5K
D1	12D
D2	13F
D3	12F
D4	12E
D5	12E
D6	12E
D7	12E
D8	12E
D9	12E
D10	11E
D11	11E
D211	11H
D212	11I
D331	12N
D332	13O
D401	12J
D421	13I
D503	8J
D601	6P
D602	6P
D609	8N
D651	8L

Component side

Layer 1	
Layer 2	
Layer 3	
Layer 4	

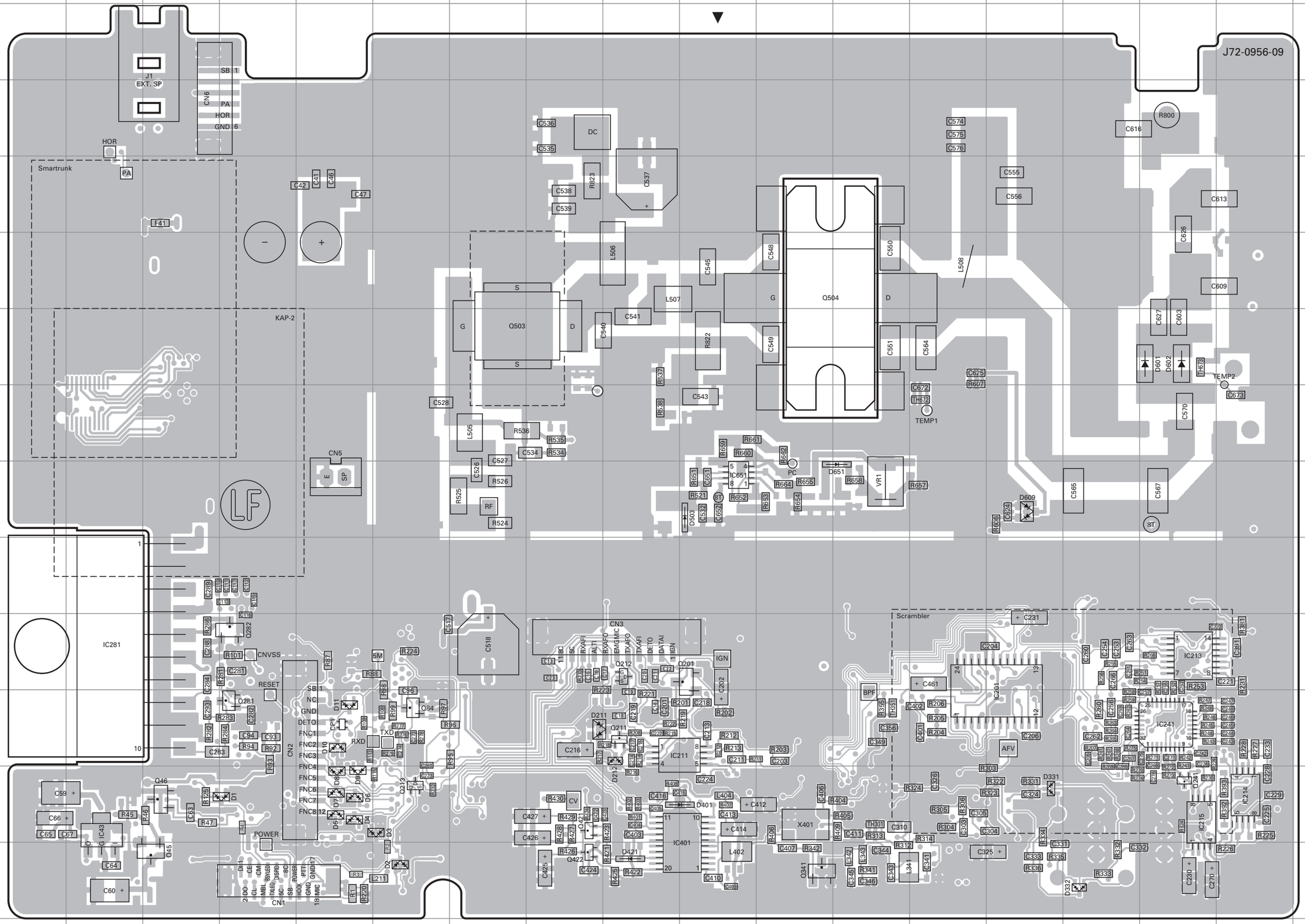
Foil side

TK-8160 PC BOARD

TX-RX UNIT (X57-7090-10) Component side view (J72-0956-09)

PC BOARD TK-8160

TX-RX UNIT (X57-7090-10) Component side view (J72-0956-09)



Ref. No.	Address
IC43	12B
IC201	11N
IC211	11J
IC213	10P
IC214	12Q
IC215	12P
IC241	11P
IC281	10B
IC401	10J
IC651	8J
Q45	13C
Q46	12C
Q84	11F
Q201	10J
Q211	11I
Q212	10I
Q213	12F
Q241	12P
Q281	11D
Q282	10D
Q341	13K
Q421	12H
Q422	13H
Q503	6G
Q504	5K
D1	12D
D2	13F
D3	12F
D4	12E
D5	12E
D6	12E
D7	12E
D8	12E
D9	12E
D10	11E
D11	11E
D211	11H
D212	11I
D331	12N
D332	13O
D401	12J
D421	13I
D503	8J
D601	6P
D602	6P
D609	8N
D651	8L

Component side

Layer 1

Layer 2

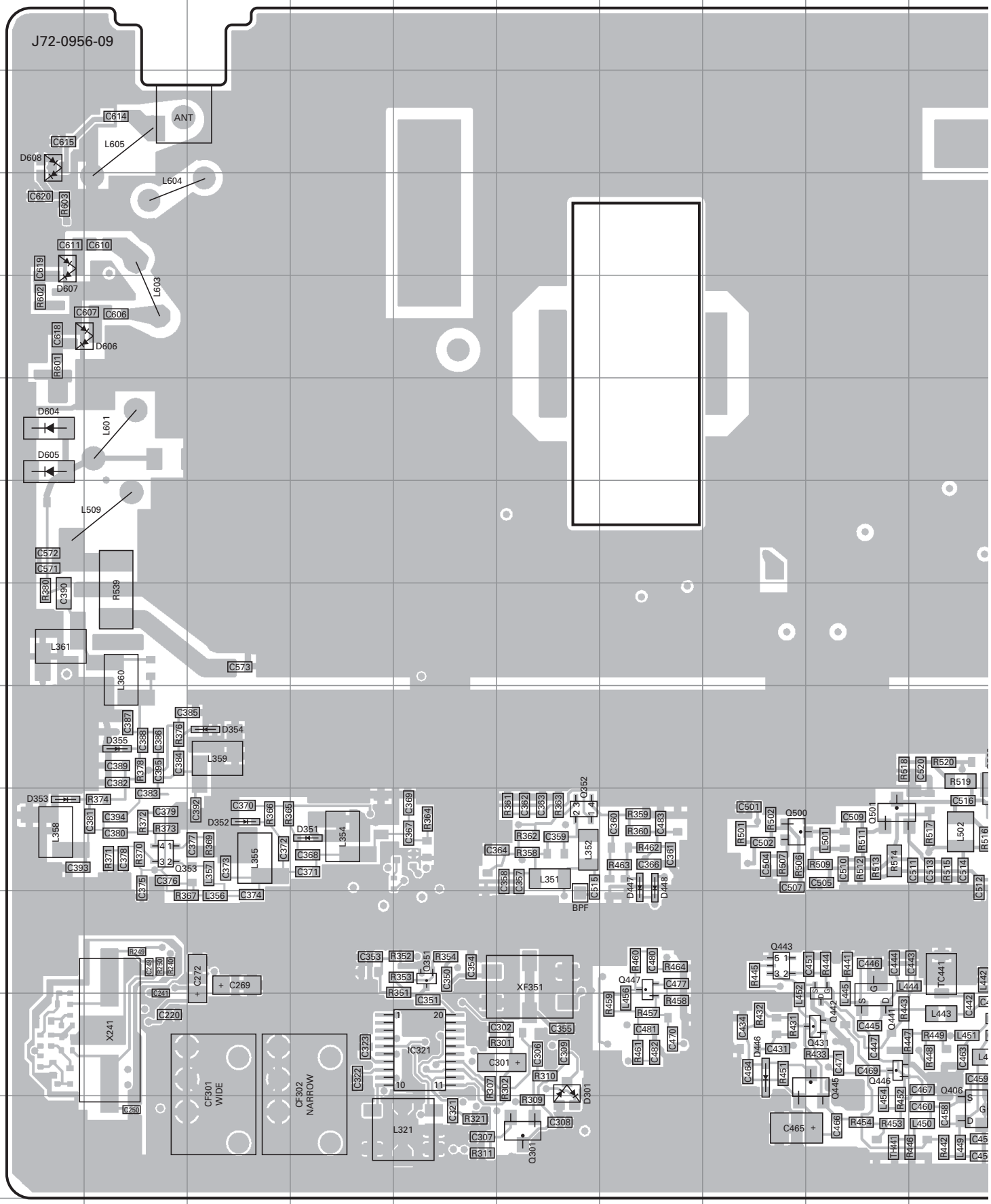
Layer 3

Layer 4

Foil side

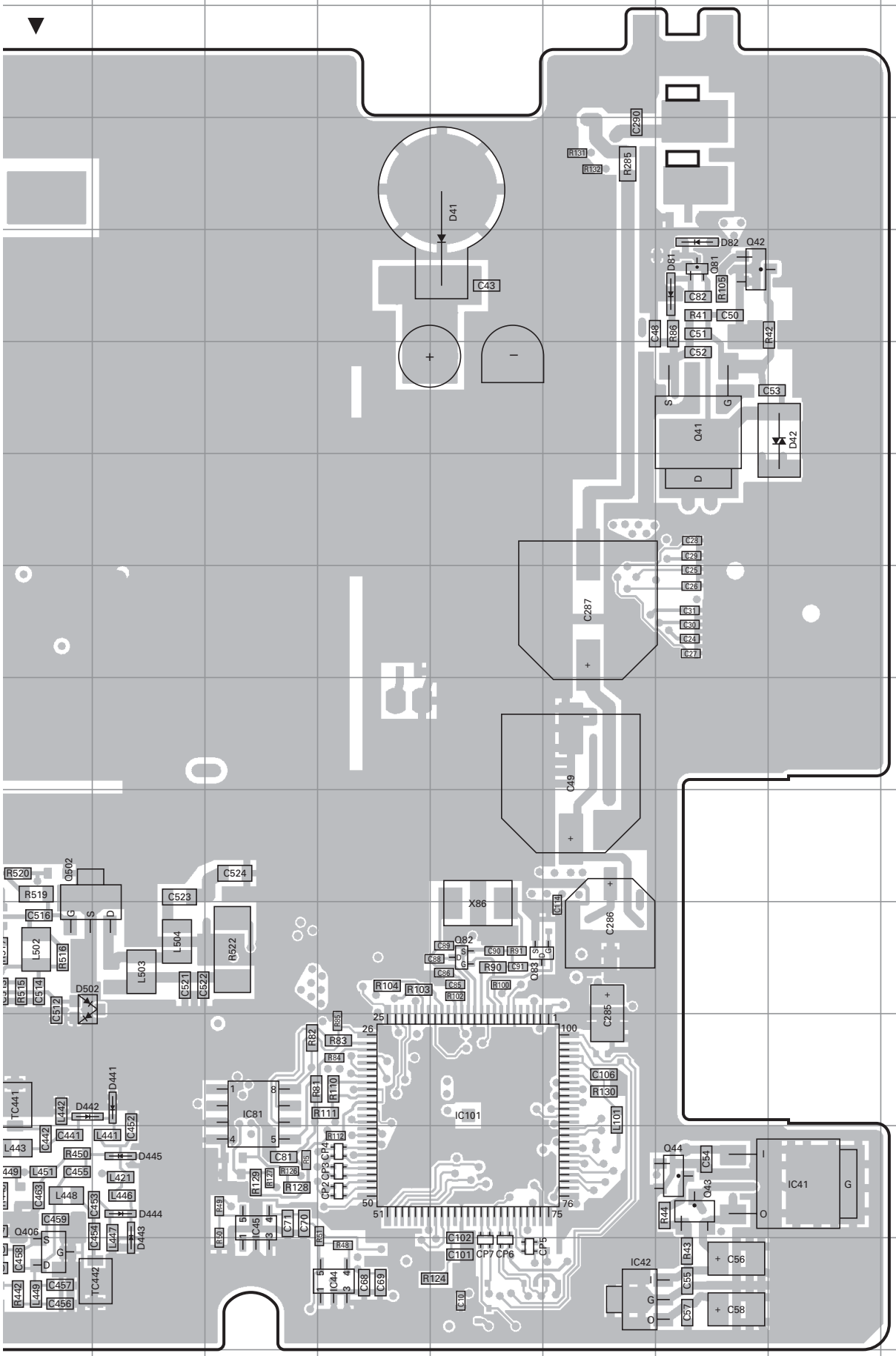
TK-8160 PC BOARD

TX-RX UNIT (X57-7090-10) Foil side view (J72-0956-09)



PC BOARD TK-8160

TX-RX UNIT (X57-7090-10) Foil side view (J72-0956-09)



Ref. No.	Address
IC41	12Q
IC42	13O
IC44	13M
IC45	12L
IC81	11L
IC101	11N
IC321	12E
Q41	5P
Q42	4P
Q43	12P
Q44	12P
Q81	4P
Q82	10N
Q83	10N
Q301	13F
Q351	11E
Q352	10F
Q353	10B
Q406	13J
Q431	12I
Q441	12I
Q442	12I
Q443	11H
Q445	12I
Q446	12I
Q447	11G
Q500	10H
Q501	10I
Q502	9J
D41	3N
D42	5Q
D81	4P
D82	4P
D301	12F
D351	10D
D352	10C
D353	10A
D354	9C
D355	9B
D441	11K
D442	11J
D443	12K
D444	12K
D445	12K
D446	12H
D447	10G
D448	10G
D502	10J
D604	6A
D605	6A
D606	5B
D607	4A
D608	3A

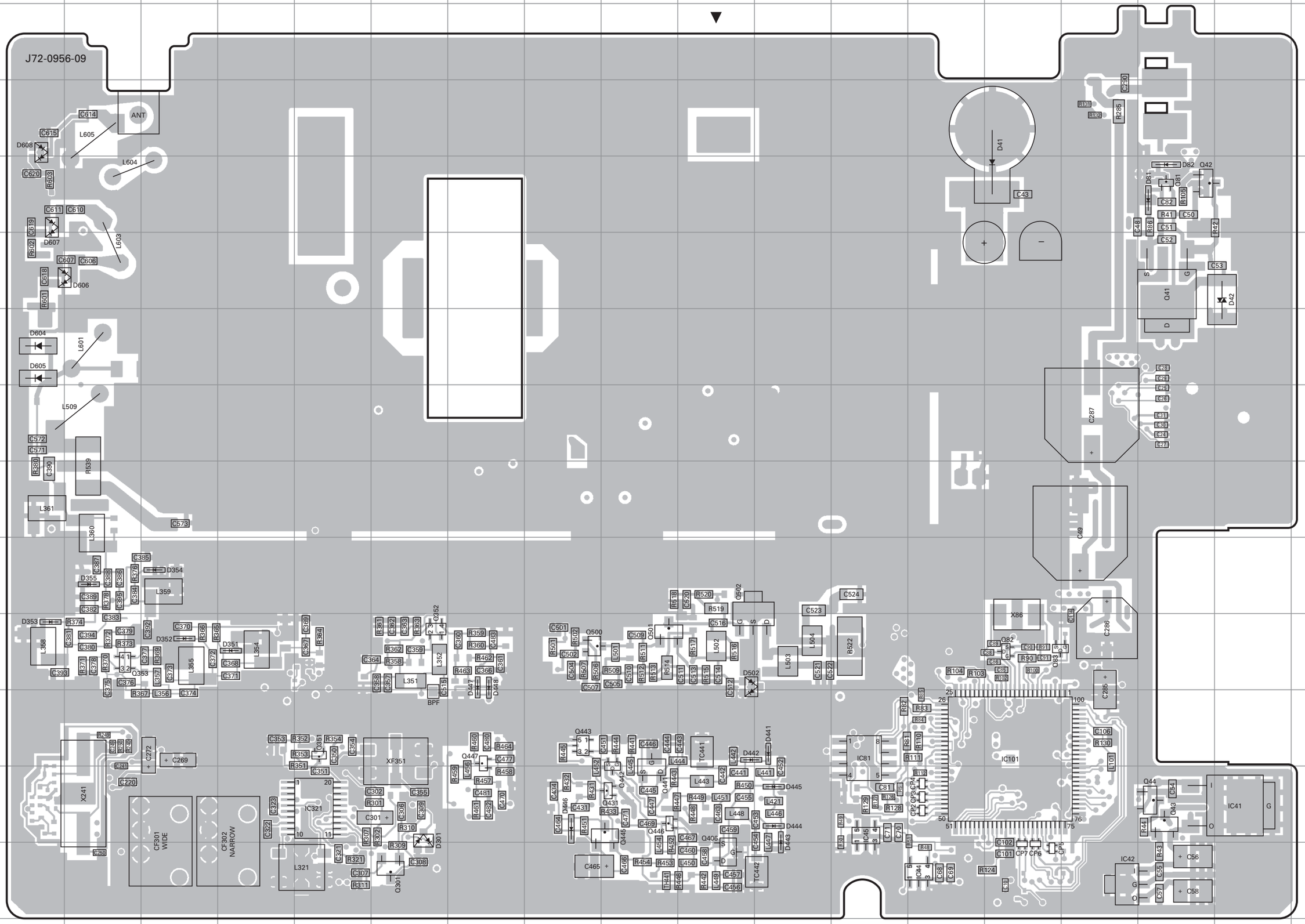
Component side
Layer 1
Layer 2
Layer 3
Layer 4
Foil side

TK-8160 PC BOARD

TX-RX UNIT (X57-7090-10) Foil side view (J72-0956-09)

PC BOARD TK-8160

TX-RX UNIT (X57-7090-10) Foil side view (J72-0956-09)



Ref. No.	Address
IC41	12Q
IC42	13O
IC44	13M
IC45	12L
IC81	11L
IC101	11N
IC321	12E
Q41	5P
Q42	4P
Q43	12P
Q44	12P
Q81	4P
Q82	10N
Q83	10N
Q301	13F
Q351	11E
Q352	10F
Q353	10B
Q406	13J
Q431	12I
Q441	12I
Q442	12I
Q443	11H
Q445	12I
Q446	12I
Q447	11G
Q500	10H
Q501	10I
Q502	9J
D41	3N
D42	5Q
D81	4P
D82	4P
D301	12F
D351	10D
D352	10C
D353	10A
D354	9C
D355	9B
D441	11K
D442	11J
D443	12K
D444	12K
D445	12K
D446	12H
D447	10G
D448	10G
D502	10J
D604	6A
D605	6A
D606	5B
D607	4A
D608	3A

Component side

Layer 1

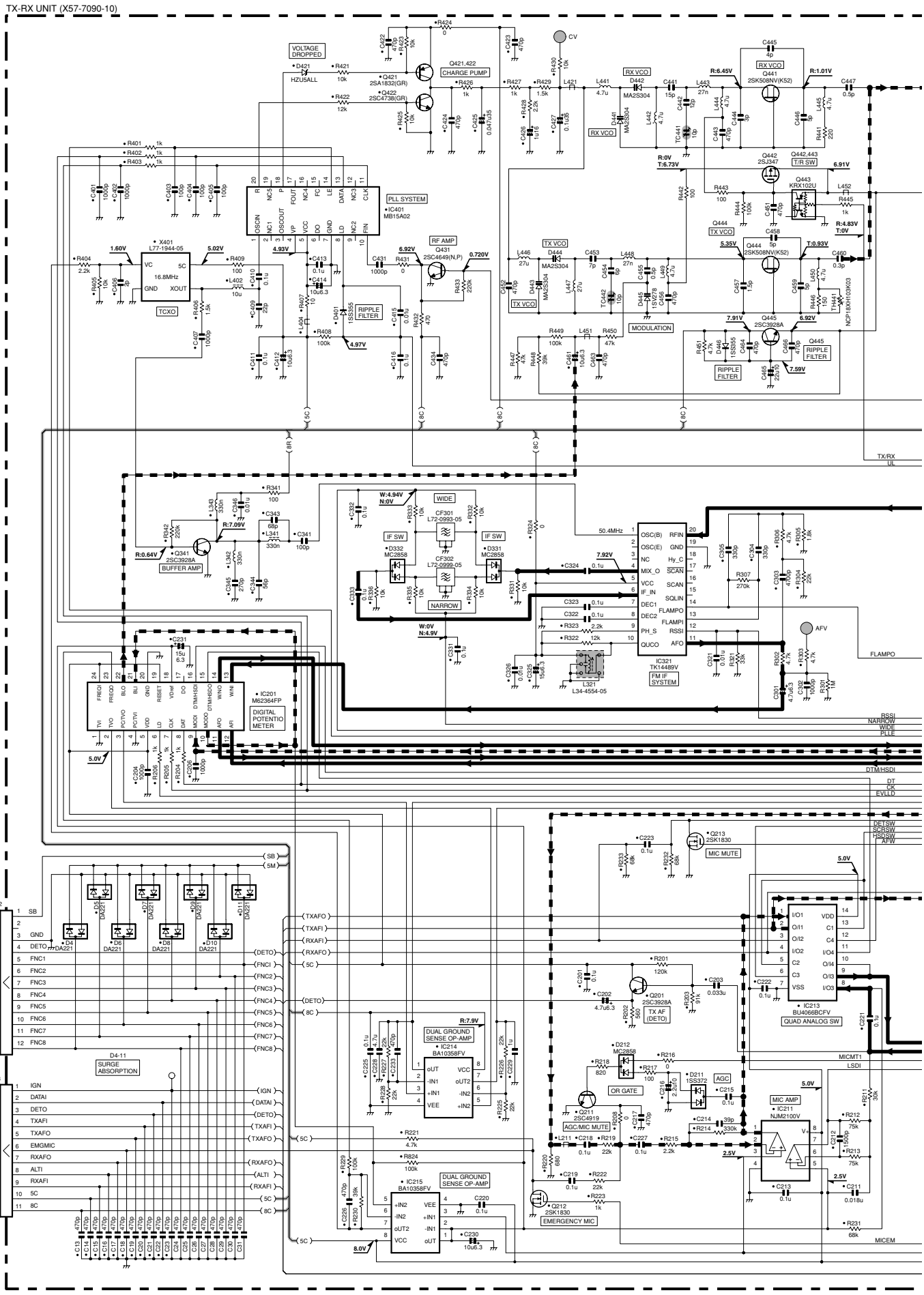
Layer 2

Layer 3

Layer 4

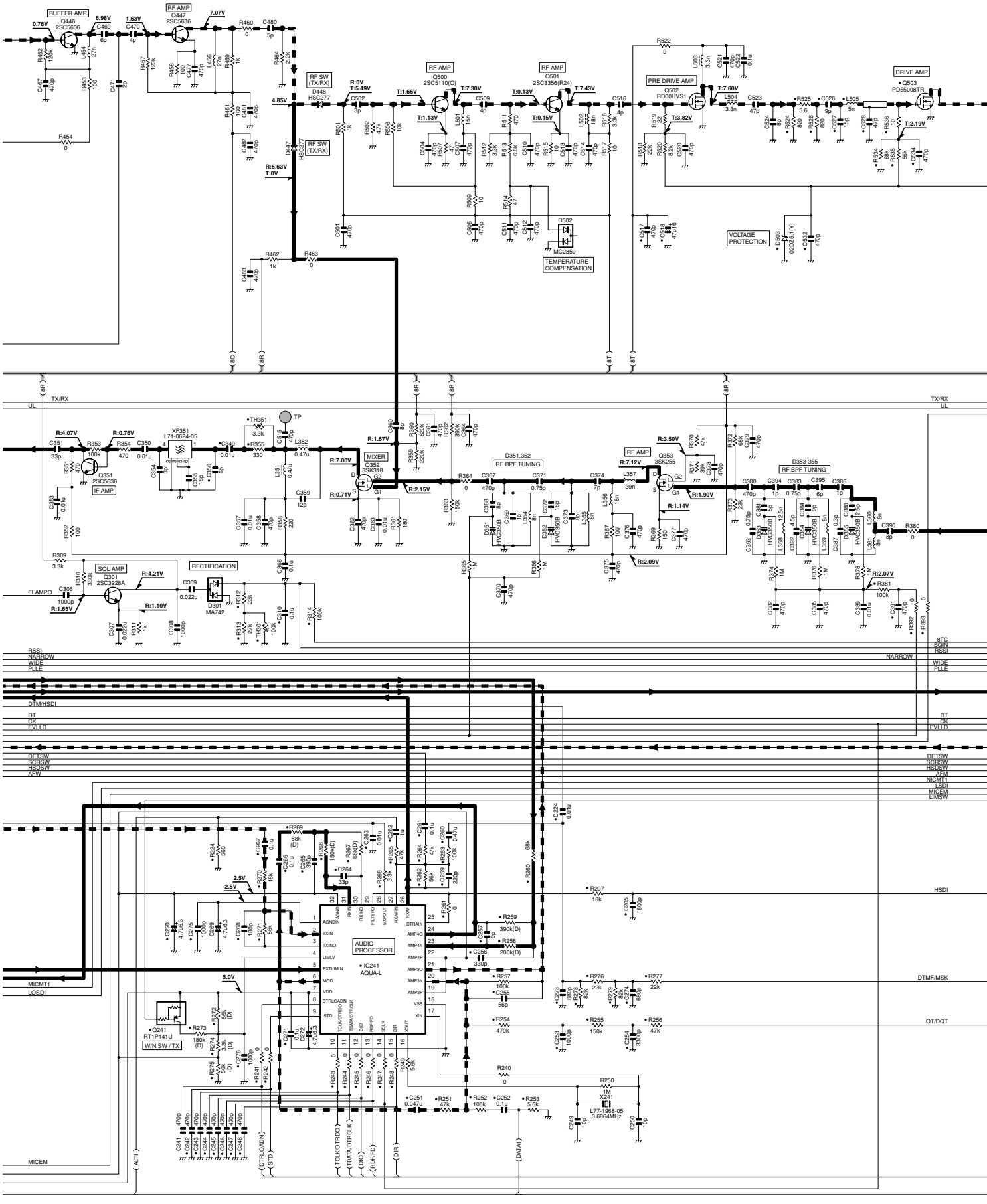
Foil side

TK-8160 SCHEMATIC DIAGRAM



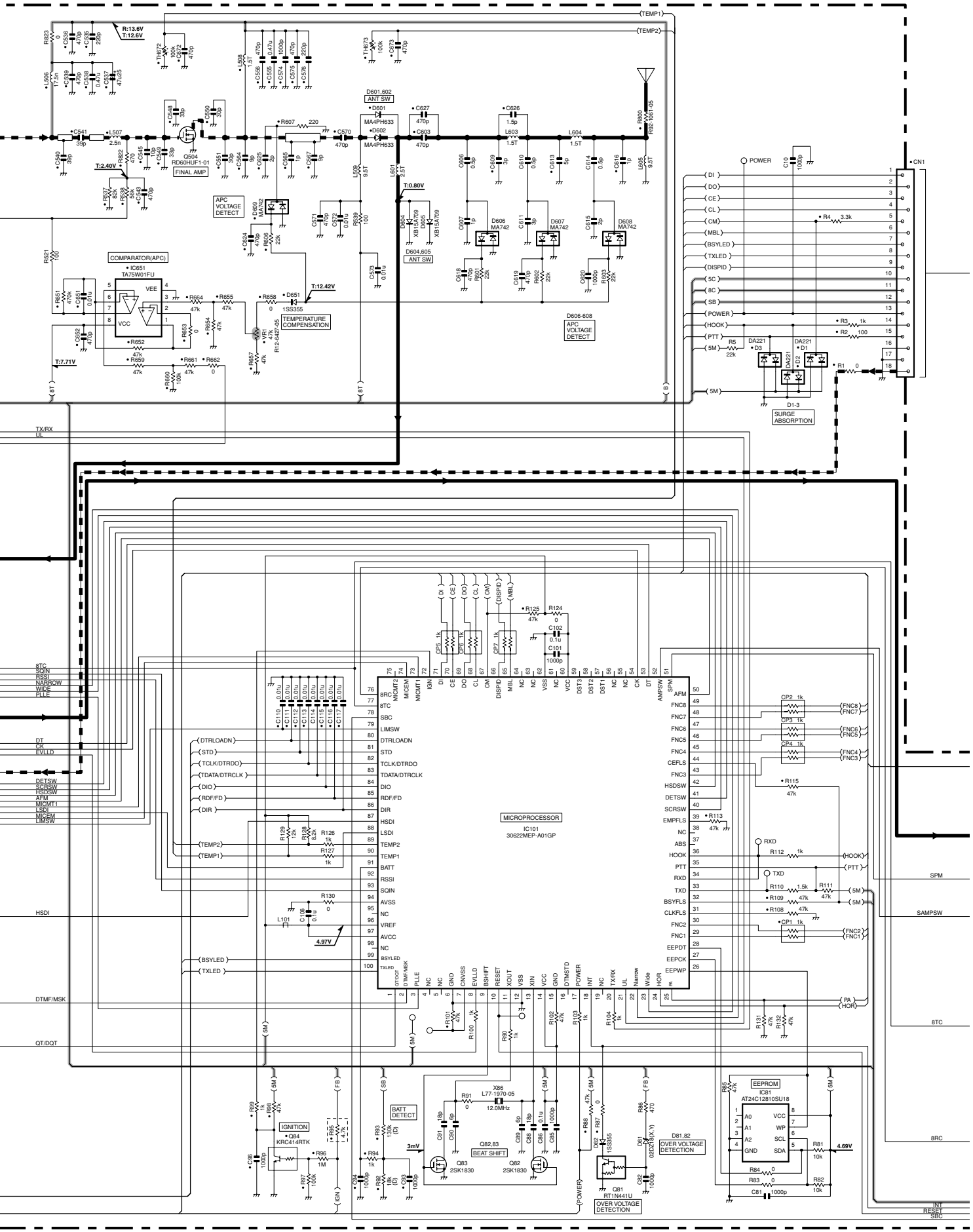
SCHEMATIC DIAGRAM TK-8160

TX-RX UNIT (X57-7090-10)

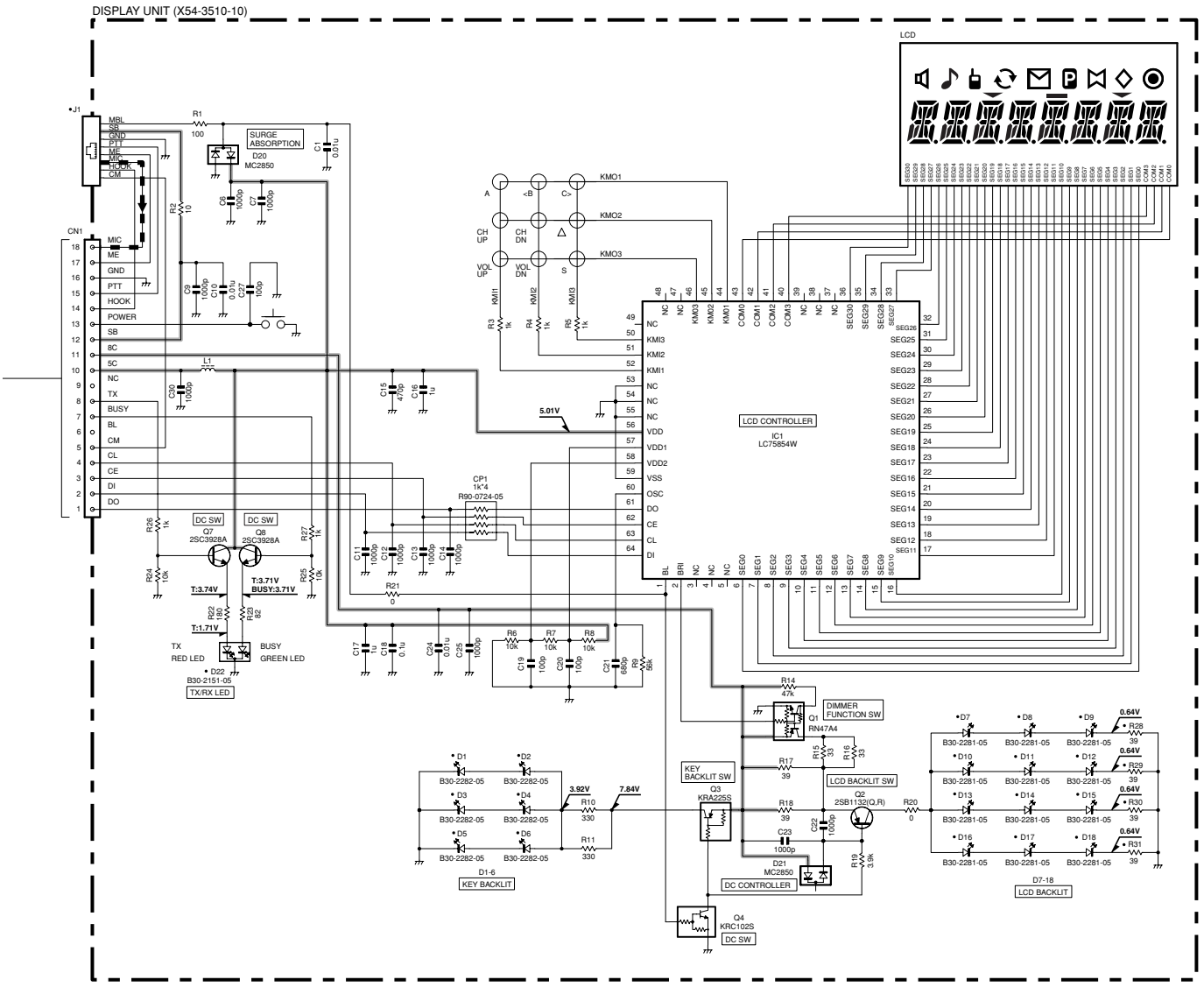


TK-8160 SCHEMATIC DIAGRAM

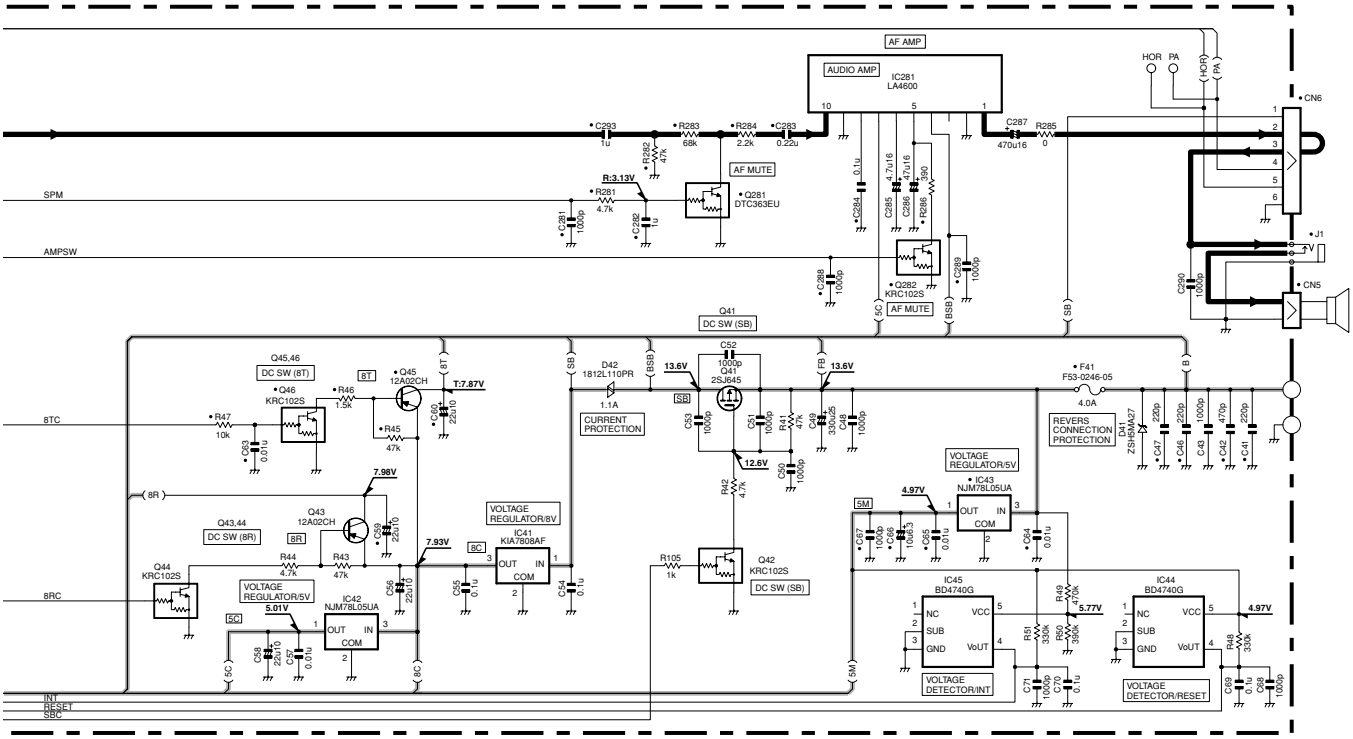
TX-RX UNIT (X57-7090-10)



SCHEMATIC DIAGRAM TK-8160



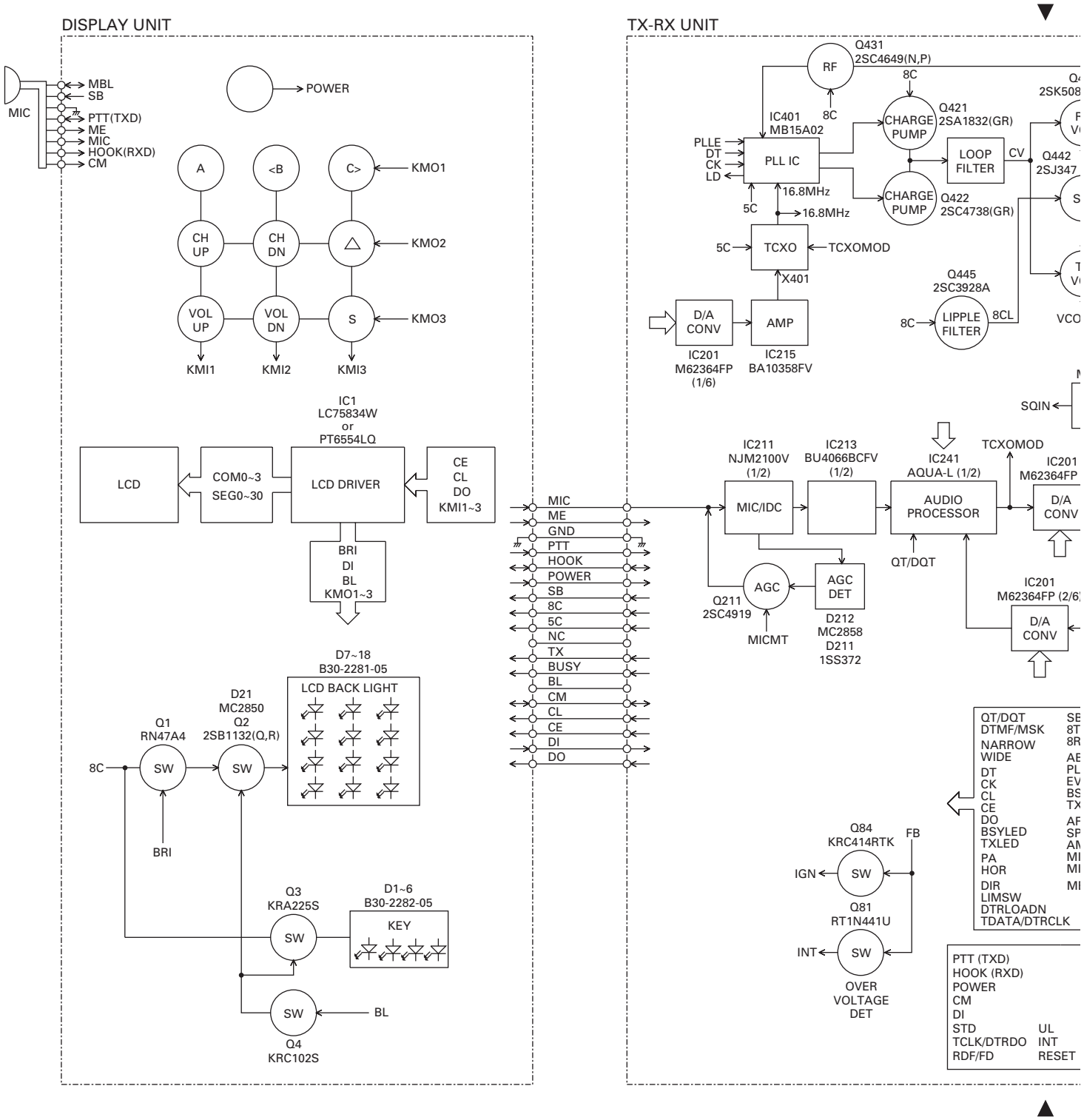
TX-RX UNIT (X57-7090-10)



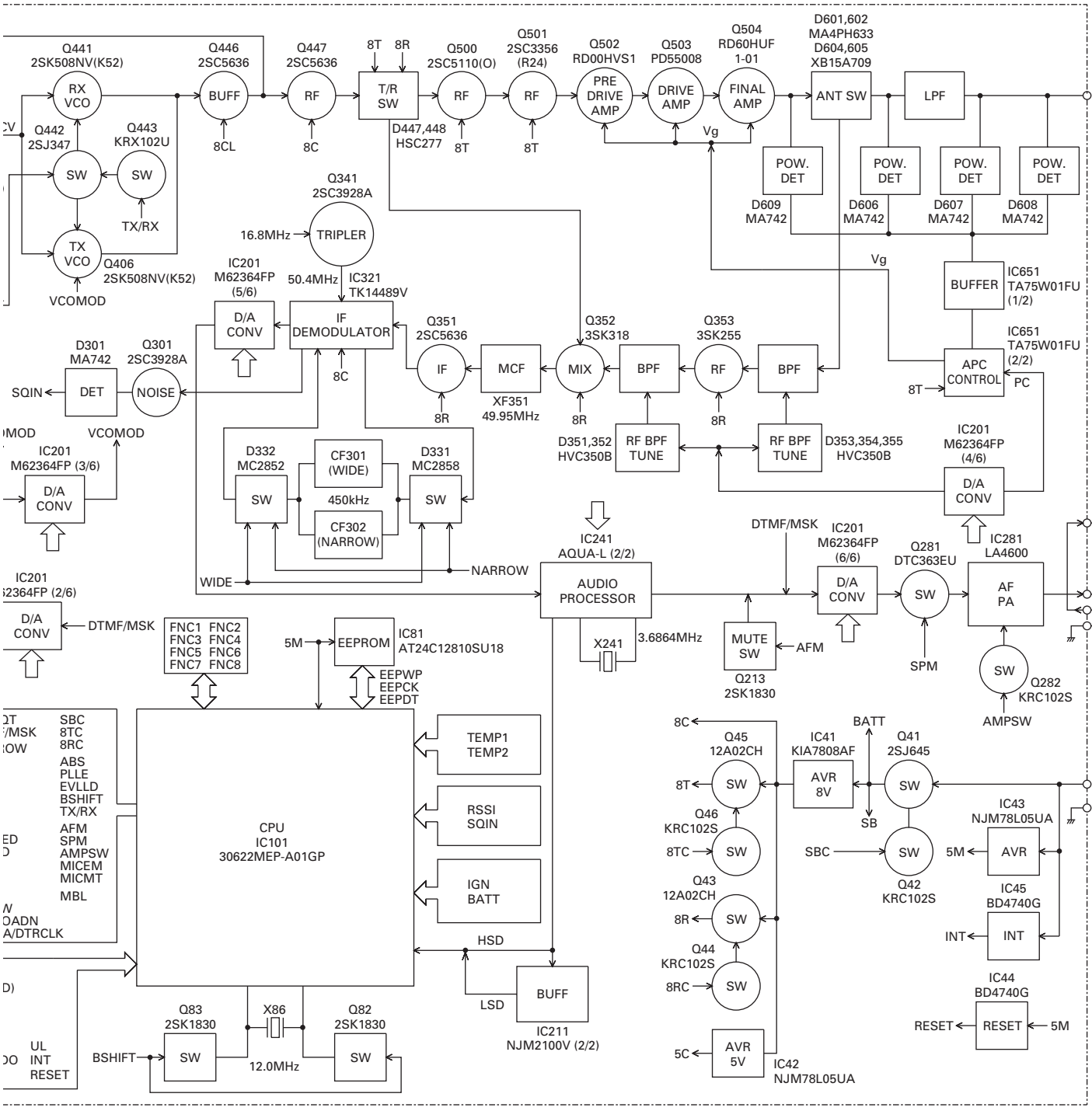
Note : The components marked with a dot (•) are parts of layer 1.


TX-RX UNIT (X57-7090-10)
DISPLAY UNIT (X54-3510-10)

BLOCK DIAGRAM

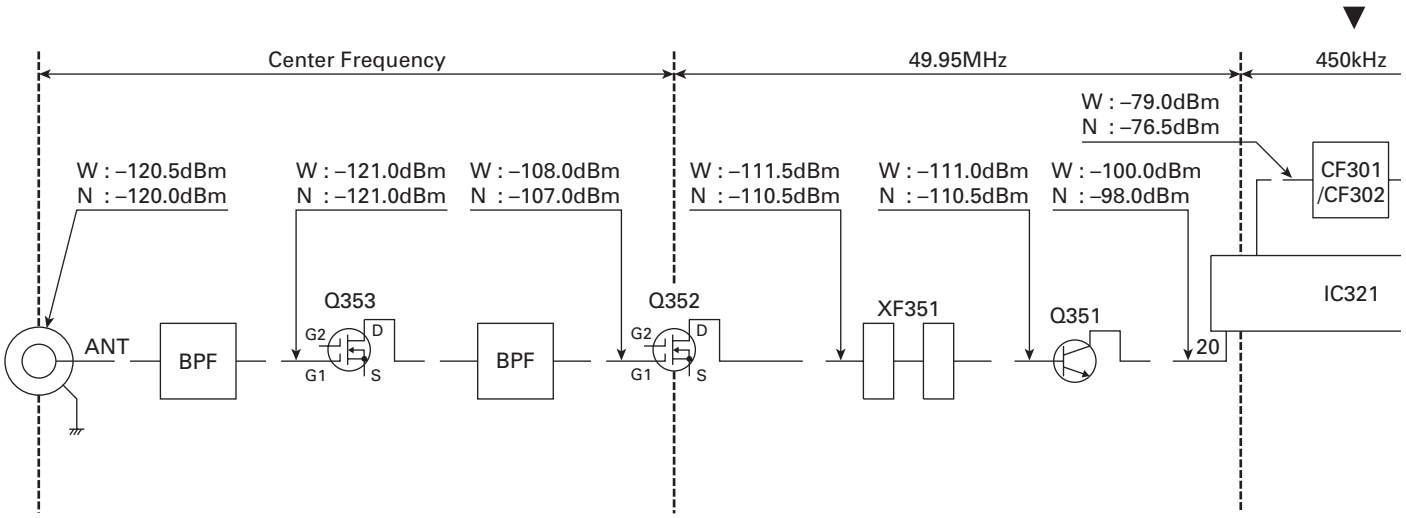


BLOCK DIAGRAM



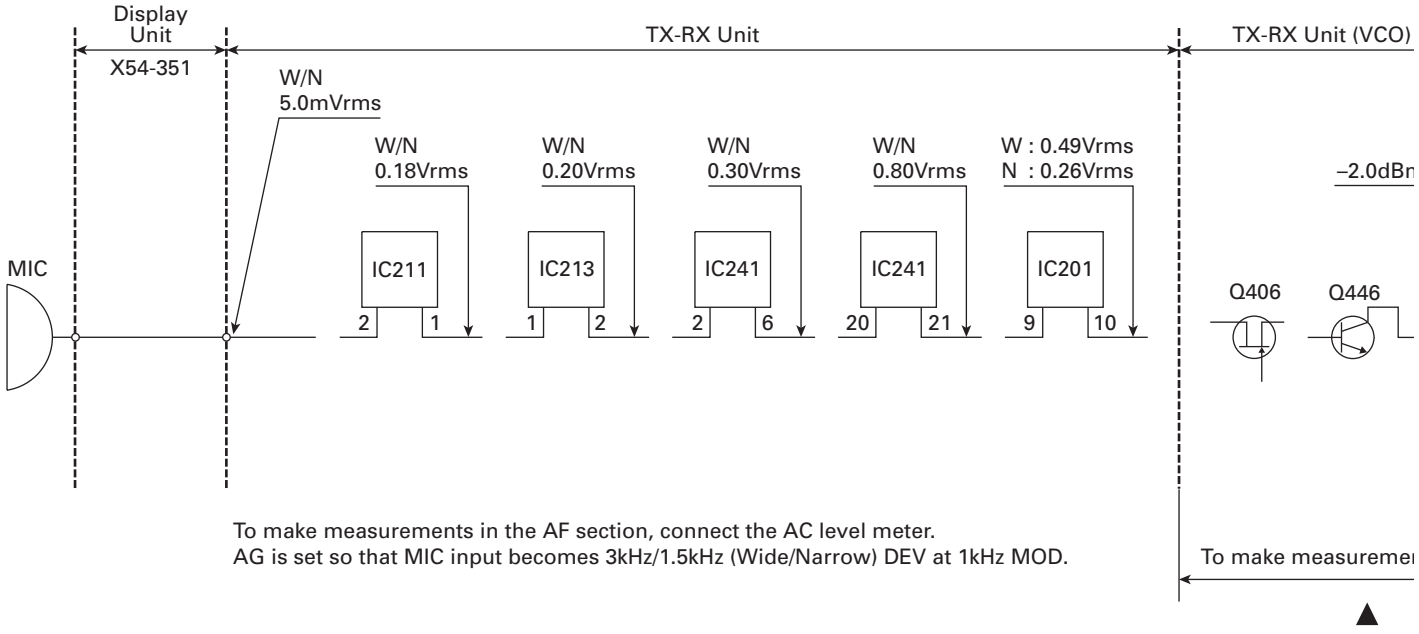
LEVEL DIAGRAM

Receiver Section



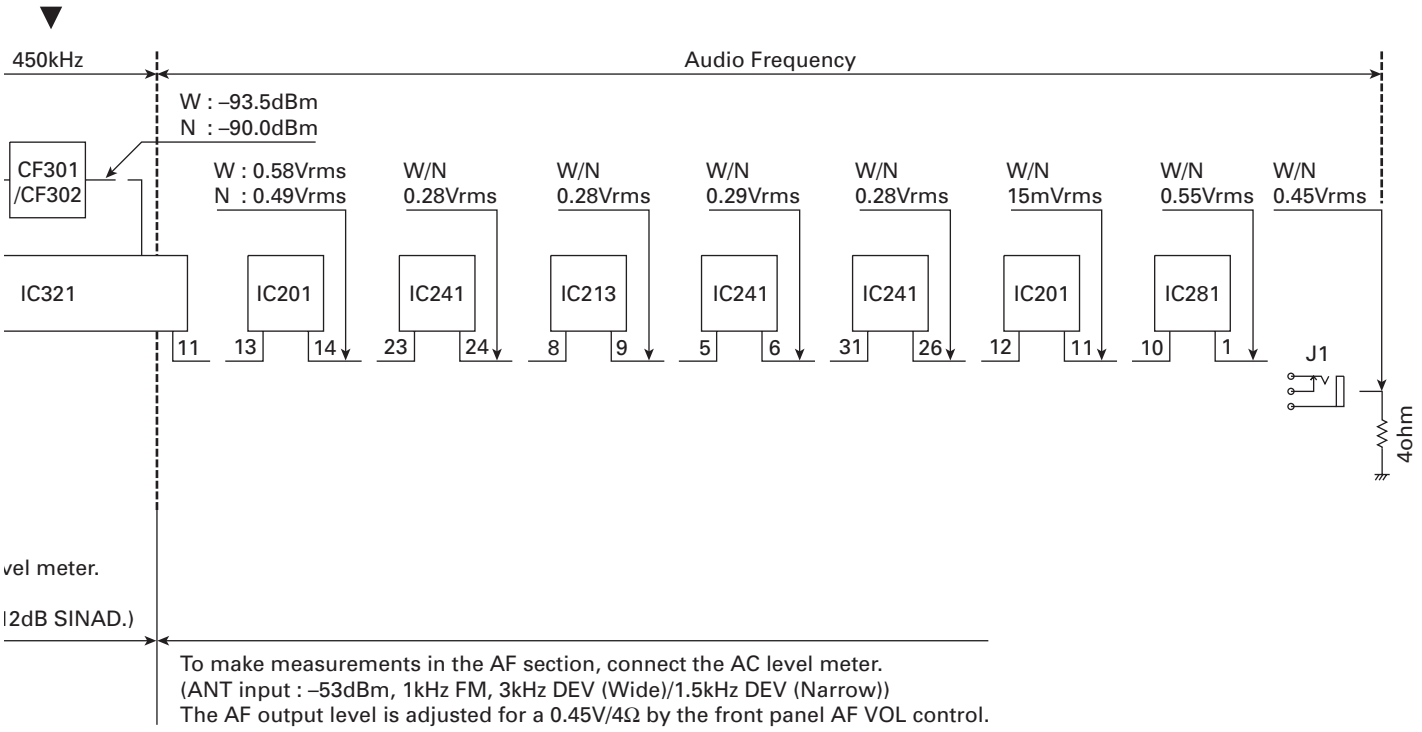
To make measurements in the RF section, connect the RF level meter.
In the RF section, use a 0.01µF coupling capacitor.
(The display shows the SSG input value required to obtain 12dB SIN

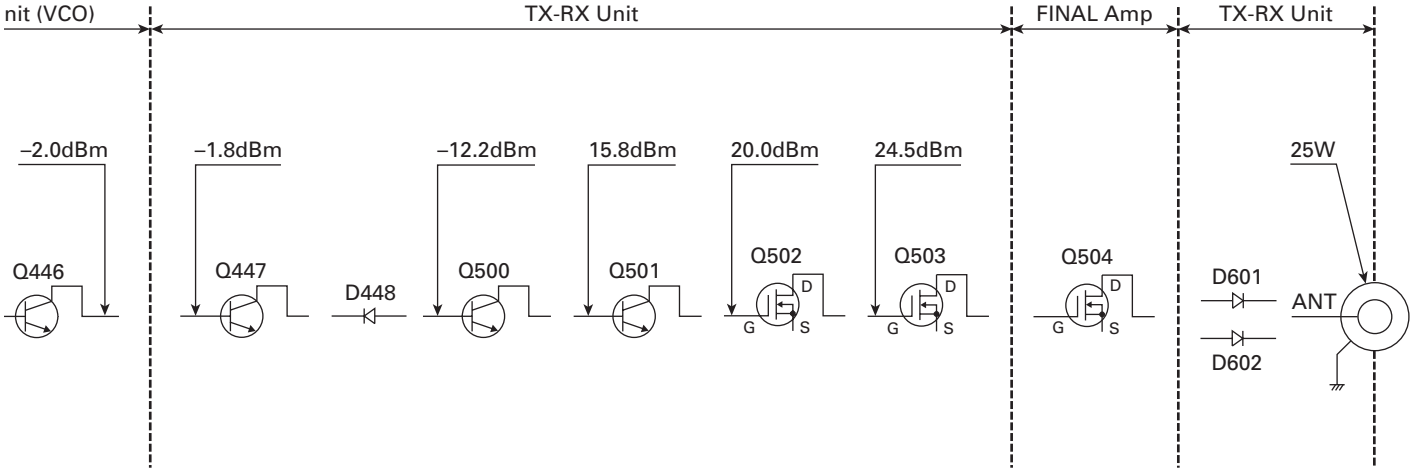
Transmitter Section



To make measurements in the AF section, connect the AC level meter.
AG is set so that MIC input becomes 3kHz/1.5kHz (Wide/Narrow) DEV at 1kHz MOD.

LEVEL DIAGRAM





asurements in the RF section, connect the RF Wattmeter (50Ω).

TK-8160

SPECIFICATIONS

GENERAL

Frequency Range	K : 450 to 490MHz M : 440 to 480MHz
Channels / Zone	Max 128 CH / Max 128 zone
Channel Spacing	Wide : 25kHz Narrow : 12.5kHz
Operating Voltage	13.6V DC ±15%
Current Drain	Less than 0.4A on standby
	Less than 1.0A on receive
	Less than 8.0A on transmit
Operating Temperature Range	–30°C to +60°C
Dimensions & Weight	6.30 (160) W x 1.70 (43) H x 5.40 (137) D inch (mm), 2.60 lbs (1.18kg)
Channel Frequency Spread	40MHz

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

Sensitivity (12dB SINAD)	Wide : 0.28µV Narrow : 0.35µV
Selectivity	Wide : 75dB Narrow : 65dB
Intermodulation	Wide : 70dB Narrow : 60dB
Spurious Response	75dB
Audio Power Output	4.0W
Frequency Stability	±2.5ppm

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

RF Power Output	High : 25W Low : 5W
Spurious and Harmonics	70dB
Modulation	Wide : 16K0F3E Narrow : 11K0F3E
FM Noise	Wide : 45dB Narrow : 40dB
Audio Distortion	Less than 3%
Frequency Stability	±2.5ppm

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