

KENWOOD TK-760/762/H SERVICE MANUAL

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VHF FM TRANSCEIVER

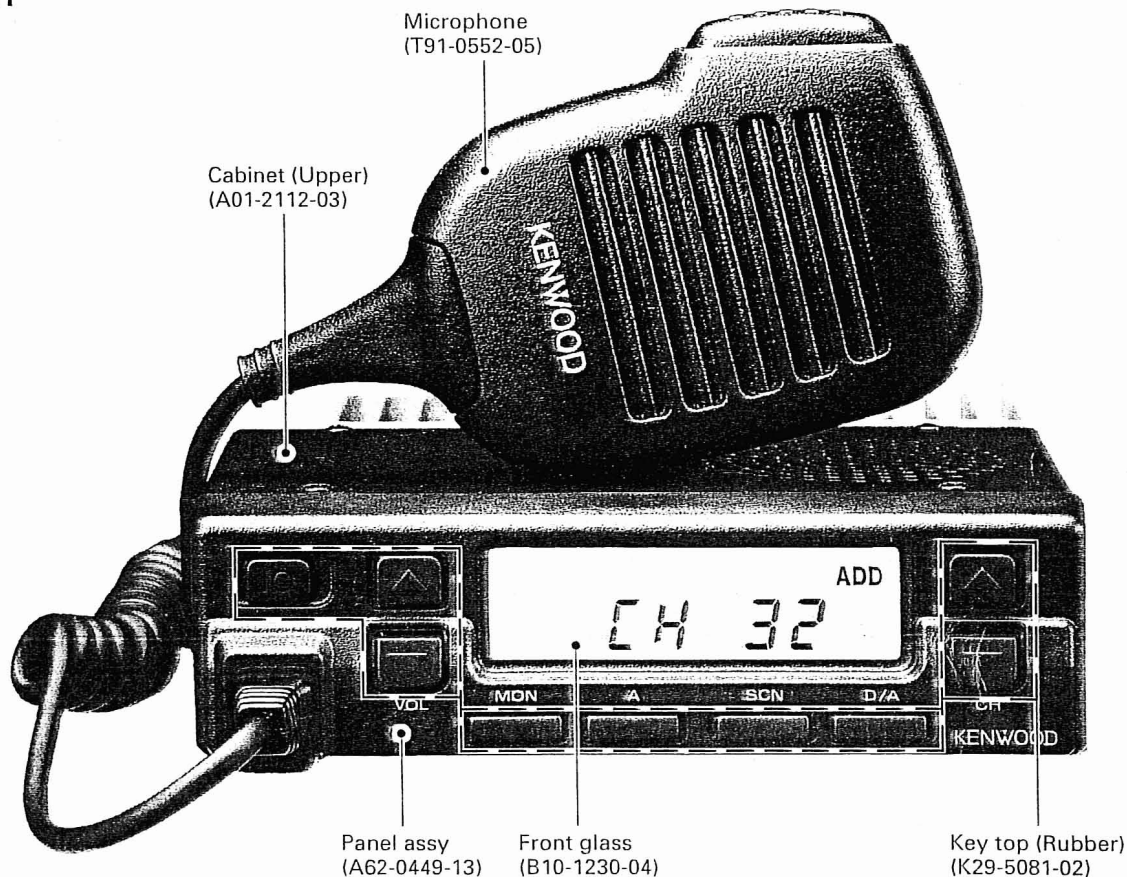
TK-760/762/H

SERVICE MANUAL

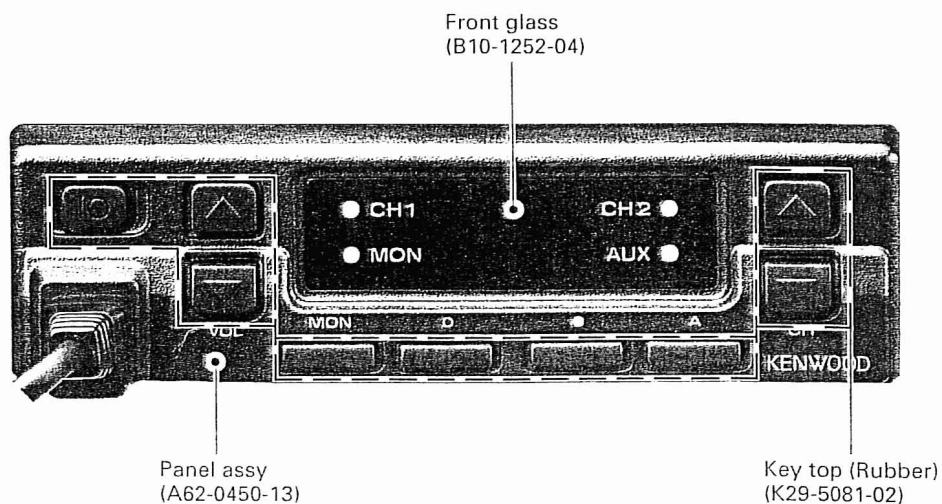
KENWOOD

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TK-760/H



TK-762/H



TK-760/762/H

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GENERAL

INTRODUCTION

SCOPE OF THIS MANUAL

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

ORDERING REPLACEMENT PARTS

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

PERSONNEL SAFETY

The following precautions are recommended for personnel safety :

- DO NOT transmit if someone is within two feet (0.6 meter) of the antenna.
- DO NOT transmit until all RF connectors are verified secure and any open connectors are properly terminated.
- SHUT OFF and DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere.
- All equipment should be properly grounded before power-up for safe operation.
- This equipment should be serviced by a qualified technician only.

FCC COMPLIANCE AND TYPE NUMBERS

| Model and destination | | Frequency range (MHz) | TX power (W) | Deviation (kHz) | Signaling | | | |
|-----------------------|----|-----------------------|--------------|-----------------|-----------|-----|------------|----------|
| | | | | | QT | DQT | 2-TONE DEC | DTMF ENC |
| TK-760 | K | 148~174 | 25 | 5/2.5 | ○ | ○ | ○ | ○ |
| TK-760 | K2 | 136~156 | 25 | 5/2.5 | ○ | ○ | ○ | ○ |
| TK-762 | K | 148~174 | 25 | 5/2.5 | ○ | ○ | ○ | ○ |
| TK-762 | K2 | 136~156 | 25 | 5/2.5 | ○ | ○ | ○ | ○ |
| TK-760H | K | 148~174 | 45 | 5/2.5 | ○ | ○ | ○ | ○ |
| TK-760H | K2 | 136~156 | 45 | 5/2.5 | ○ | ○ | ○ | ○ |
| TK-762H | K | 148~174 | 45 | 5/2.5 | ○ | ○ | ○ | ○ |
| TK-762H | K2 | 136~156 | 45 | 5/2.5 | ○ | ○ | ○ | ○ |

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. QT equipment operation should be verified.

GENERAL

4. PLANNING THE INSTALLATION

4-1. General

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

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

4-2. Antenna

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

4-3. Radio

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

4-4. DC Power and wiring

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

CAUTION

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

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

5. INSTALLATION PLANNING – CONTROL STATIONS

5-1. Antenna system

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

5-2. Radio location

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

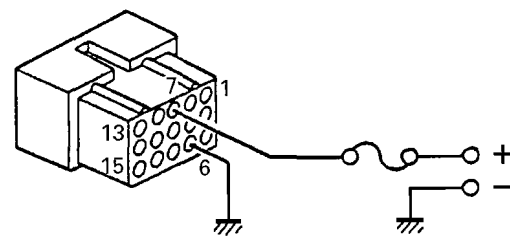
SERVICE

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

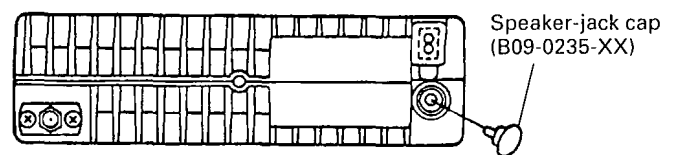
Note

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

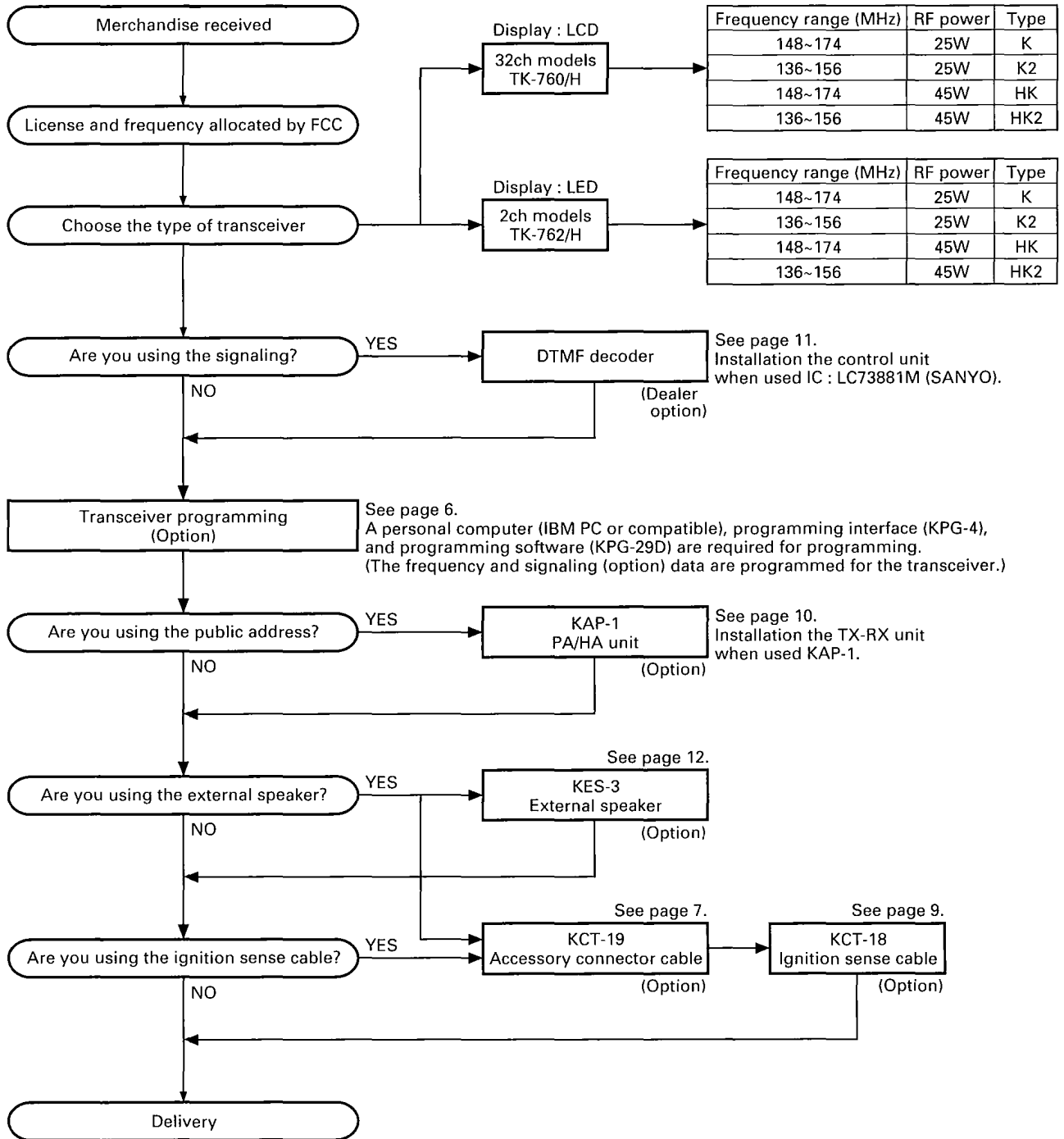
The rating of pin 7 (SB) of the accessory connector cable (KCT-19) on the rear of the radio is 13.6V (1A). Insert a 1A fuse if you use the SB pin for external equipment.



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



SYSTEM SET-UP



OPERATING FEATURES

1. Transceiver Programming

1-1. Introduction

The TK-760/762 transceiver is programmed using an IBM PC or compatible machine, a programming interface (KPG-4), and a programming disk (KPG-29D). Figure 1 shows the setup for an IBM PC.

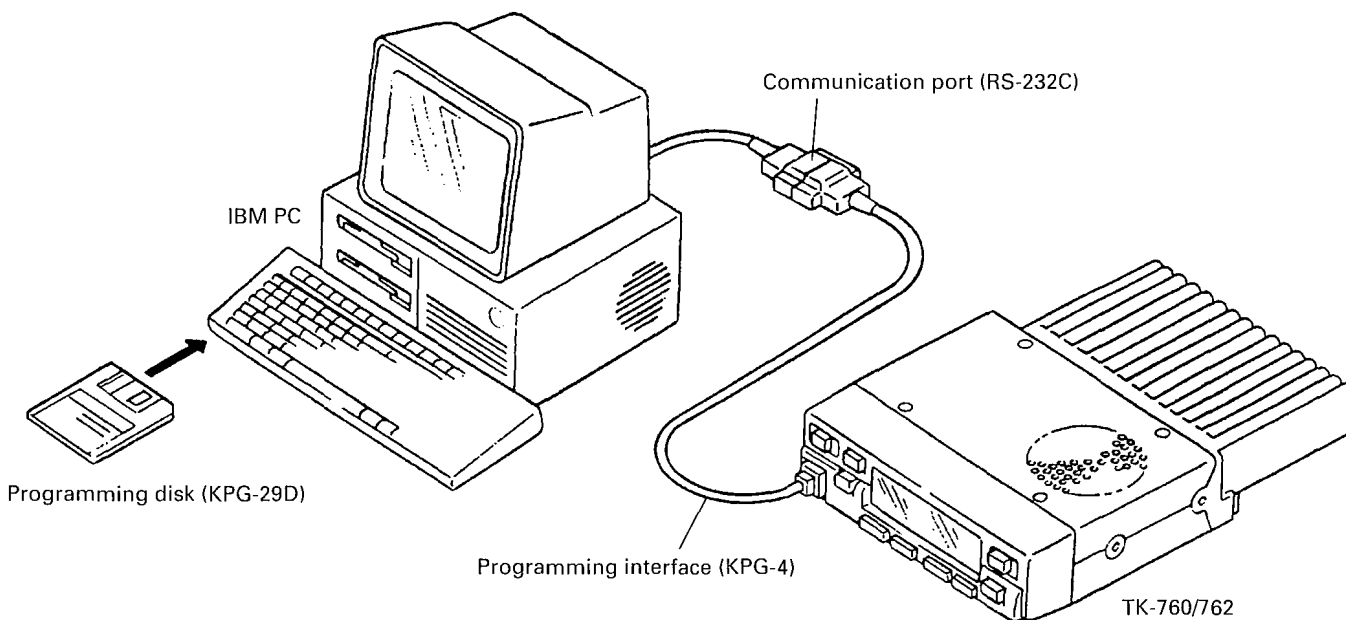


Fig. 1

1-2. KPG-4 Description

(Optional PC programming interface cable)

The KPG-4 is needed to connect the TK-760/762 to the computer. It has a circuit in the D-subconnector (25-pin) case that converts the RS-232C logic level to TTL level. The KPG-4 plug is connected to external socket of the TK-760/762 and to the computer by a conversion cable (option) with a 9-pin female connector and a 25-pin male connector.

1-3. Programming Software Description

KPG-29D is the programming software for the TK-760/762, supplied on a 3.5" or 5.25" floppy disk. This software runs under MS-DOS (version 3.3 or later) on an IBM-PC/XT, AT, or PS2, or on a compatible machine. Data can be input to or read from the TK-760/762, and edited on the screen. Programmed data can be printed.

1-4. Data Program Mode

In this mode, data is written into the flash memory in the transceiver. When the power is turned on, data program mode can be entered immediately. When the KPG-4 is connected and commands can be received, "PROGRAM" is displayed to indicate that data program mode has been entered.

Tuning can be done using an IBM PC and KPG-29D, in the same way as in panel tuning mode. You can carry out panel tuning by selecting test mode on the KPG-29D menu screen and following the instructions on the screen. See the KPG-29D instruction manual for details.

OPERATING FEATURES / INSTALLATION

1-5. Clone Mode (Figure 2)

Programmed data is transferred from one transceiver to another by using a microphone cable.

1. Connect the master set to the slave set with but the master set is TK-760 only.
2. Turn the slave set on.
3. Hold down the CH [▼] key, turn the master set on, and keep the CH [▼] key down for two more seconds. "-C-" appears on the display to indicate that clone mode has been entered.]

4. Press the MON key on the master set. The \Rightarrow mark appears and data is sent from the master set to the slave set. "-PC-" appears on the slave set to show that it is receiving data.
5. When cloning is complete, the \Rightarrow mark on the master set disappears and "-C-" changes to "END". The slave set is automatically reset and enters user mode.

If cloning fails, the master set shows "ErrOr". Repeat steps 4 and 5.

If you wish to clone several sets, switch each of them on and repeat 4 and 5.

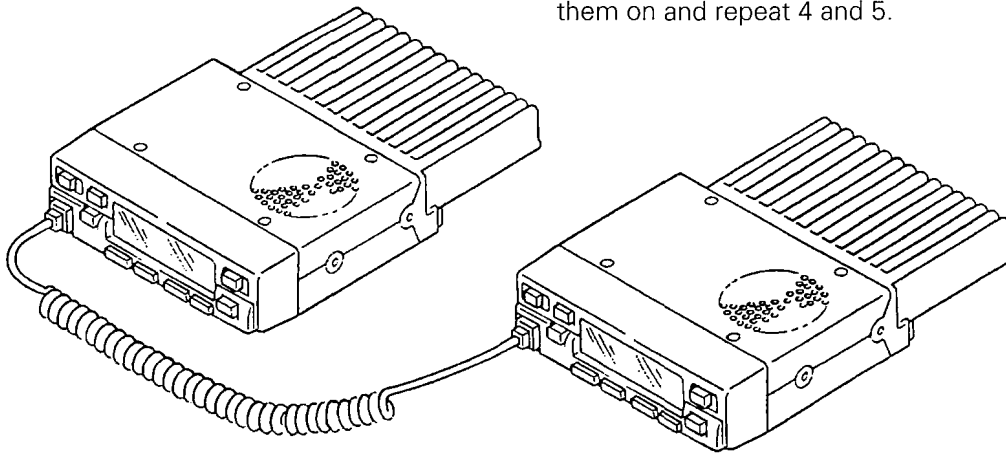


Fig. 2

INSTALLATION

1. Accessory Connection Cable

(KCT-19 : Option)

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

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

1. Remove the upper and lower halves of the transceiver case, and lift the DC cord bushing (1) from the chassis.
2. Remove the pad (2).

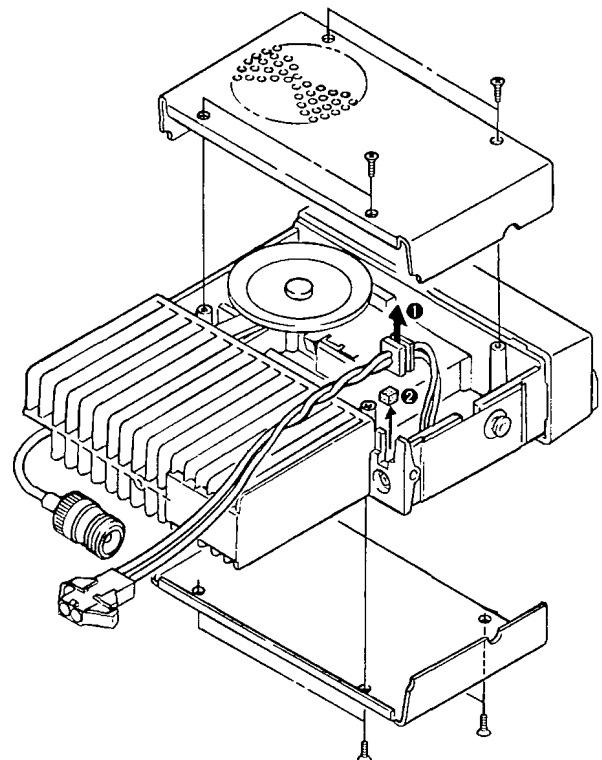


Fig. 1

INSTALLATION

3. Insert the KCT-19 cable (③) into the chassis (④).
The wire harness band (⑤) must be inside the chassis.
4. Relocate the DC cord bushing in the chassis (⑥).
5. Connect the KCT-19 to the TX-RX unit (A/2) as shown in Figure 2 (⑦).
6. Connect the KCT-19 to the external accessory by inserting the crimp terminal (⑧) into the square plug (⑨), both of which are supplied with the KCT-19.

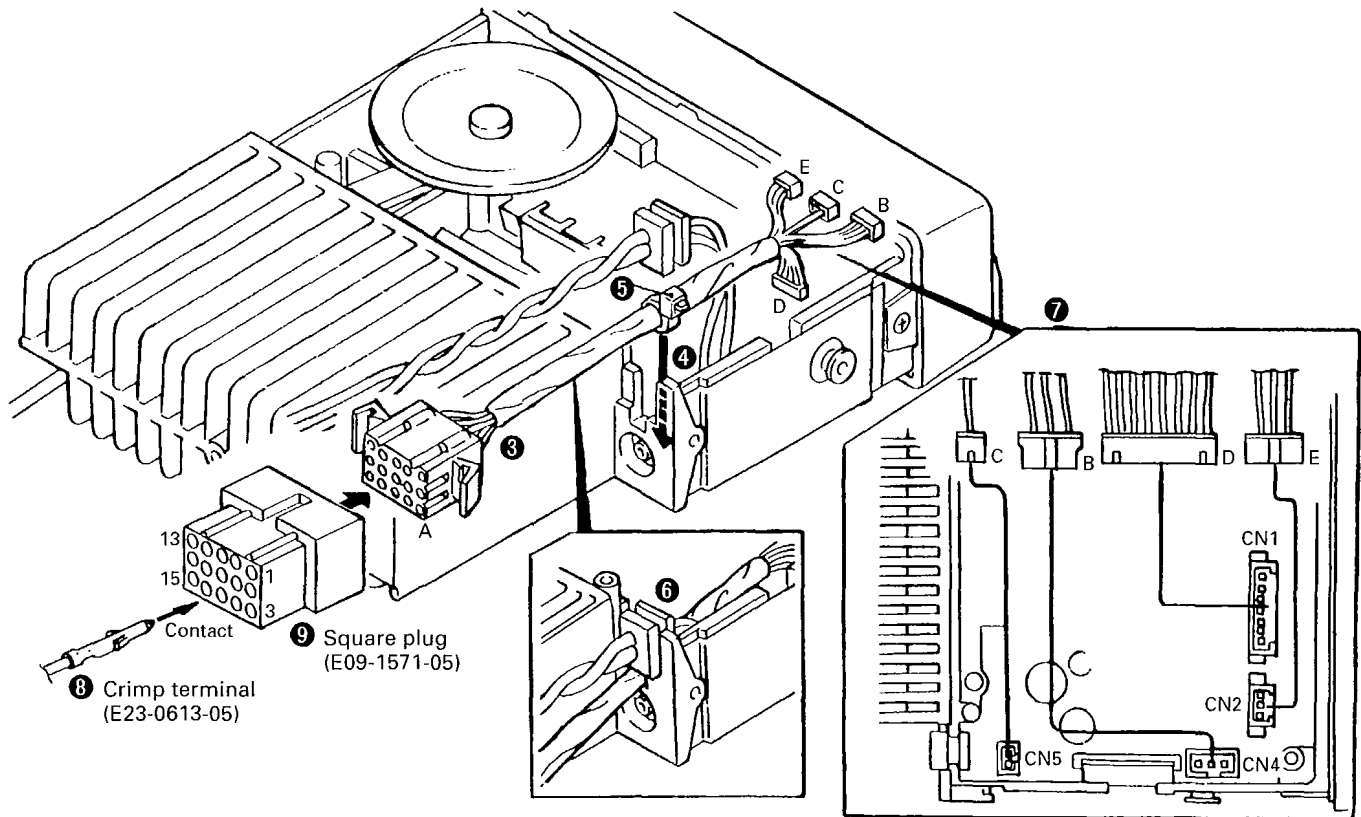


Fig. 2

1-2. Terminal function

| No. (A) | No. (B,C,D) | Name | Function | KAP-1 Installed |
|---------|-------------|--------|---|-----------------|
| A-1 | D-2 | HK/CHS | MIC hook input/Channel select | ← |
| A-2 | D-5 | ME | MIC GND | ← |
| A-3 | D-3 | IGN | Ignition input | ← |
| A-4 | D-1 | DEO | Detect output | ← |
| A-5 | D-6 | MI | MIC input | ← |
| A-6 | B-2 | E | GND | ← |
| A-7 | B-3 | SB | DC supply (1A) | ← |
| A-8 | D-7 | PTT | PTT input | ← |
| A-9 | D-4 | DI | Data mod input | ← |
| A-10 | B-1 | HOR | Horn Alert output | HR1 |
| A-11 | D-8 | SQ | Squelch output | ← |
| A-12 | C-1 | SP | Audio output | PA/HR2 |
| A-13 | E-1 | AM | Audio mute input | ← |
| A-14 | E-2 | MM | MIC mute input | ← |
| A-15 | E-3 | TXS | Signal indicating whether the transceiver is transmitting or not. | ← |

· Refer to Terminal function on page 49, if need description in detail.

· Connect CN5 of the radio to connector C of the KCT-19 instead of to the internal speaker connector, if use external speaker.

INSTALLATION

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

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

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

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

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

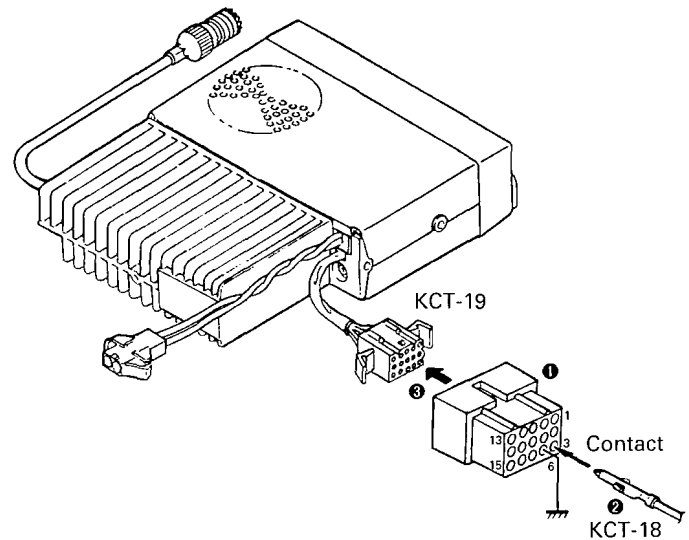


Fig. 3

2-2. Modifying the transceiver

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

1. Remove the lower half of the transceiver case.
2. Set jumper resistors (0Ω) R5 and R6 of the TX-RX unit (A/2) as shown in Table 1.

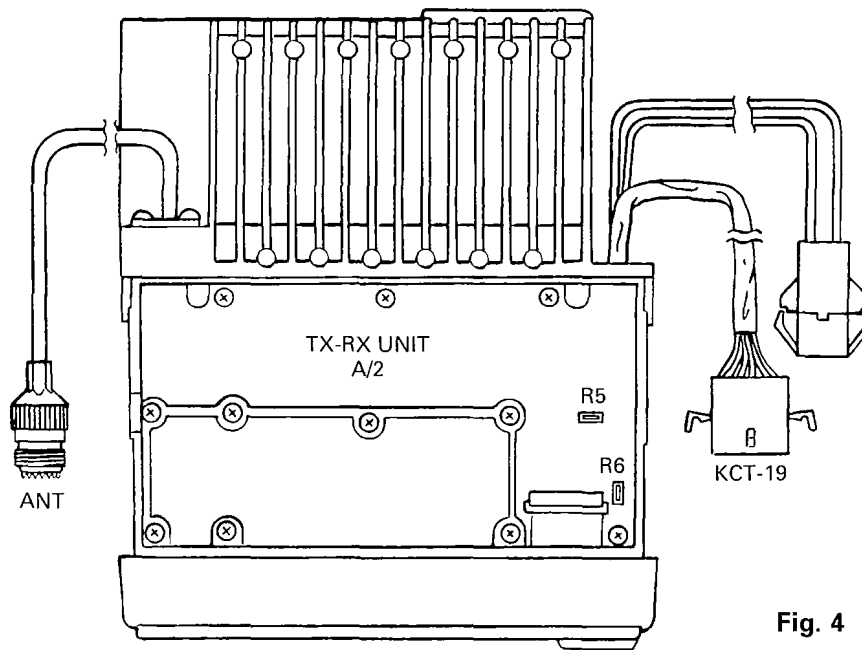


Fig. 4

| Operation when KCT-18 is connected | R5 | R6 | |
|---|---------|---------|------------------------------|
| | Enable | Enable | ← KCT-18 cannot be connected |
| Power on/off and Horn Alert on/off | Disable | Enable | |
| Horn Alert on/off | Enable | Disable | |
| | Disable | Disable | ← Power cannot be turned on |

Table 1 R5 and R6 setup chart

The Horn Alert function can be turned on and off only if the function has been assigned to the AUX key.

INSTALLATION

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

3-1. Installing the KAP-1 in the transceiver

The Horn Alert (max. 2A drive) and Public Address functions are enabled by inserting the KAP-1 W1 (3P; white/black/red) into CN4 on the TX/RX unit, inserting W2 (3P; green) into CN201 on the TX-RX unit, and connecting the KCT-19 (option) to CN2 and CN3 of the KAP-1.

• Installation procedure

1. Open the upper case of the transceiver.
2. Insert the two cables (1) with connectors from the KAP-1 switch unit into the connectors on the transceiver.
3. Secure the switch unit board on the chassis with two screws (3) with the notch (2) in the board placed at the front left side.

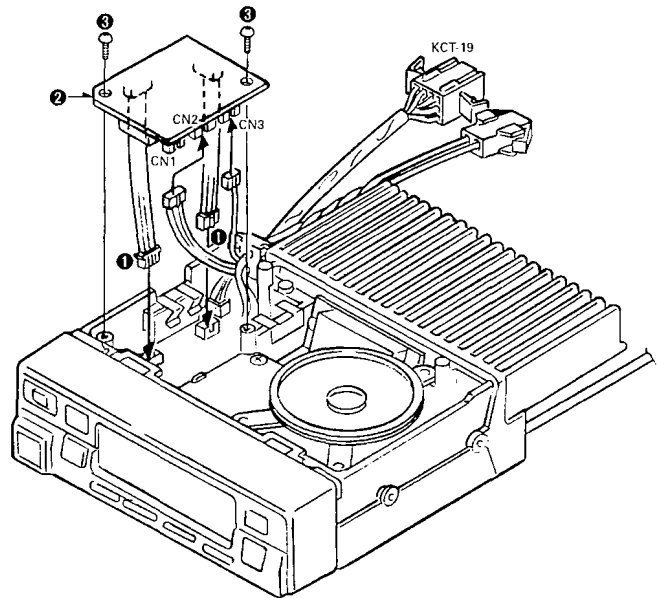


Fig. 5

3-2. Modifying the transceiver

• Horn Alert

The signal from pin 62 of IC409 (CPU) on the TX-RX unit turns Q13 and Q14 on and off and drives KAP-1 HA relay K2 to drive the horn with a maximum of 2A.

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

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

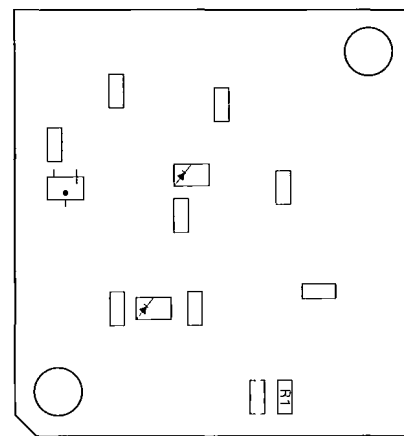


Fig. 6 KAP-1 foil side view

• Public Address

The signal from pin 14 of IC10 of the TX-RX unit drives PA relay K1 in the KAP-1 and switches the audio power amplifier output between the external PA system (through KCT-19) and internal and external speakers.

To use the PA function, R80 on the TX-RX unit must be removed. (See Fig. 7.)

| | R80 |
|----------------------------|---------|
| Use the PA function | Disable |
| Do not use the PA function | Enable |

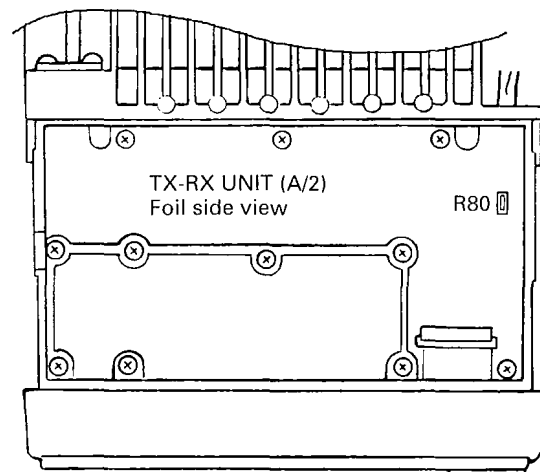


Fig. 7

INSTALLATION

3-3. Others

If the PA and HR2 are not necessary and the speaker output is output to an external unit through the KCT-19, connect the KCT-19 C connector to CN5 on the TX-RX unit.

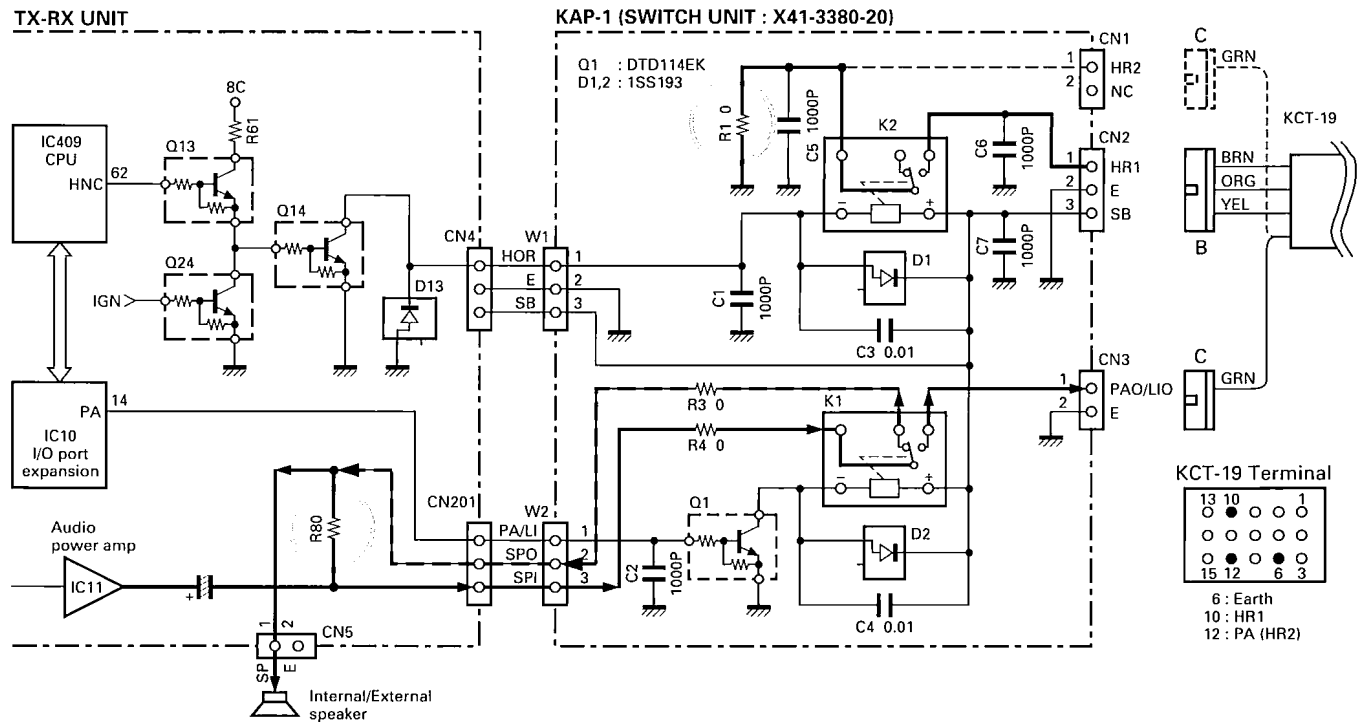


Fig. 8

4. DTMF Decode

If the DTMF decode function, such as code squelch, is necessary, the general-purpose decode IC (LC73881M: SANYO) must be installed.

• Installation procedure

1. Remove the upper and lower case and the panel.
2. Solder the IC to the PCB land of the TX-RX unit (control section).

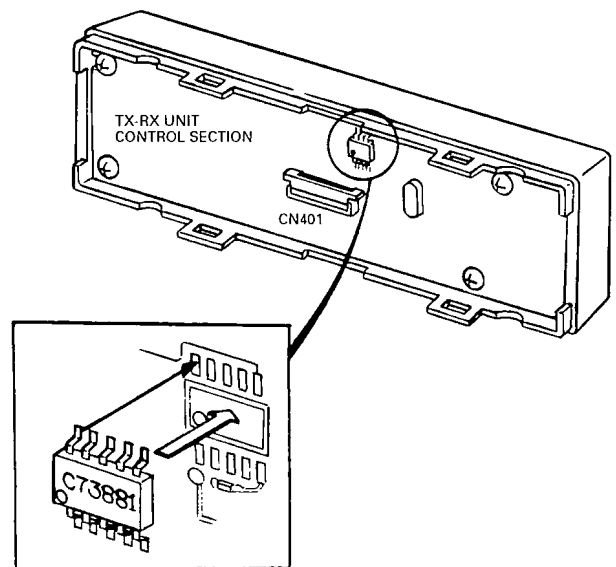


Fig. 9

INSTALLATION

5. External Speaker

5-1. KES-3 : Option

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

• Connection procedure

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

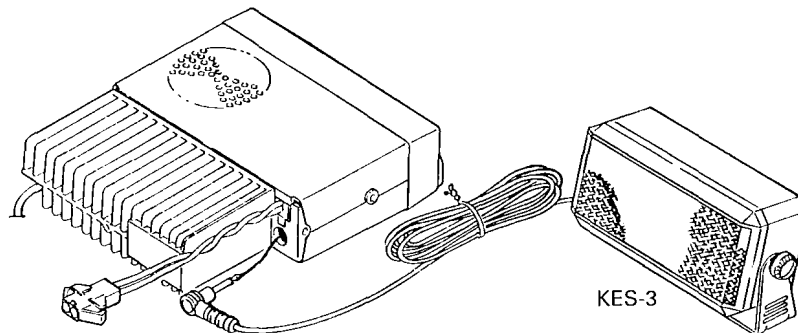


Fig. 10

6. Fitting the Control Panel Upside Down

The TK-760/762 control panel can be fitted upside down, so the transceiver can be mounted with its internal speaker (in the upper half of the case) facing down in your car.

1. Remove the upper and lower case of the transceiver and remove the panel from the main unit (❶).
2. Remove the flat cable (❷) and change the direction of bending the flat cable (❸).
3. Turn the panel over (❹), insert the flat cable into the main unit (❺). Attach the panel to the main unit, and reinstall the cases.

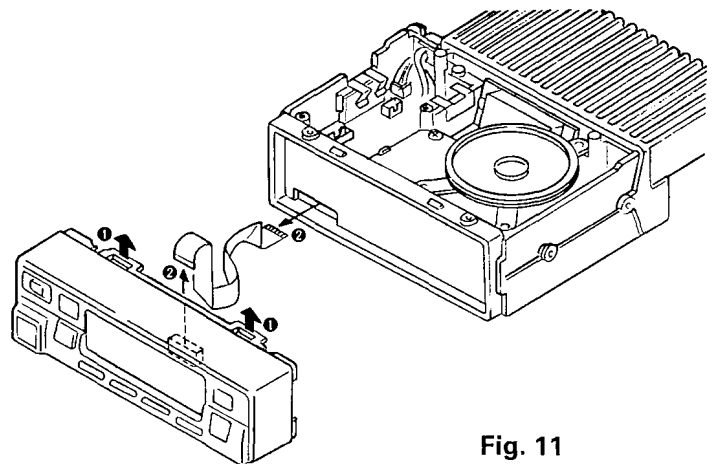


Fig. 11

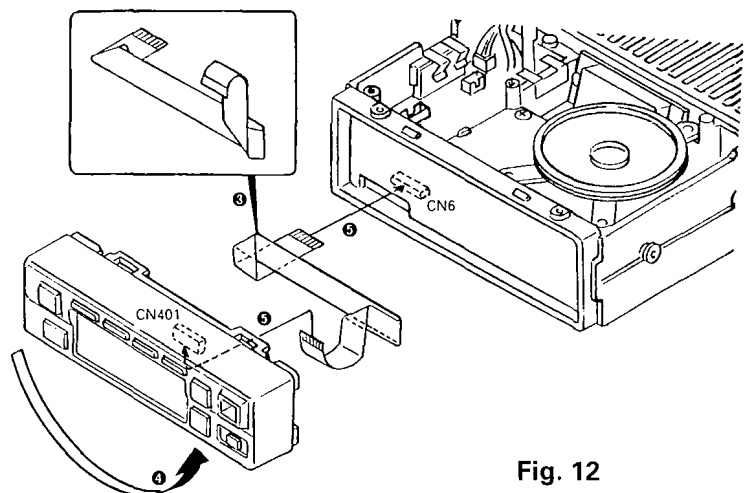
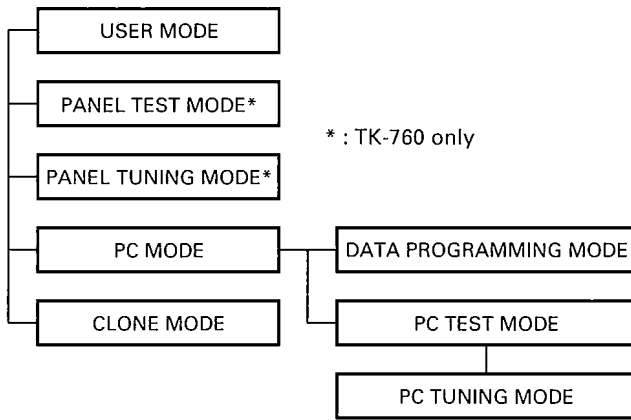


Fig. 12

REALIGNMENT

1. Modes



| Mode | Function |
|-----------------------|--|
| USER MODE | Customer use this mode. |
| PANEL TEST MODE | Dealer uses to check the fundamental characteristics. |
| PANEL TUNING MODE | Dealer uses to tune the radio. |
| PC MODE | This mode is communication the radio to PC (IBM compatible). It requires the KPG-29D. |
| DATA PROGRAMMING MODE | This mode is frequency data and features write to the radio and read from the radio. This feature is include the FPU. |
| PC TEST MODE | This mode can check the radio by PC control. This feature is include the FPU. This paragraph is as same as PANEL TUNING. |

2. How To Enter Each Mode

| Mode | Operation |
|-------------------|--|
| USER MODE | Usually Power ON then begin this mode. |
| PANEL TEST MODE | The D/A switch is held on with Power ON the radio. The D/A switch holding about 1 sec. after Power ON the radio. But, if this mode is disabled by FPU then begin the USER MODE. |
| PANEL TUNING MODE | The SCAN switch is held on with Power ON the radio. The SCAN switch holdings about 1 sec. after Power ON the radio. But, if this mode is disabled by FPU then begin the USER MODE. |
| PC MODE | The radio Power ON to begin the USER MODE when through to the microphone then begin this mode. Note : PANEL TEST MODE and PANEL TUNING MODE does not begin the PC MODE. |

3. Panel Test Mode (TK-760 Only)

When the test mode is entered, all LCD segments light, the beeper sounds for one second, and VERSION SELECT mode is entered.

Use the following keys to select a version:

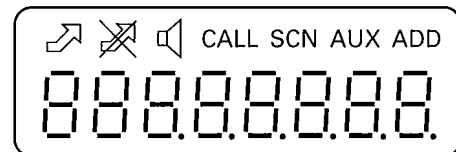
- D/A key UP
- SCN key DOWN

Table 1 lists the versions. The version is backed up when the CHANNEL DOWN key is pressed.

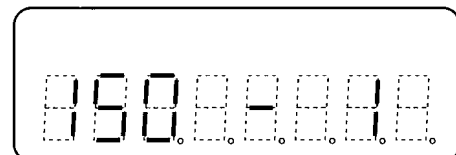
| Version | Display |
|---------|---------|
| VHF F1 | 150-1 |
| VHF F2 | 150-2 |

Table 1

All LCD segments appear



Version select mode



REALIGNMENT

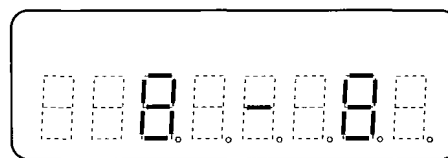
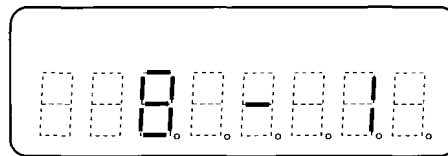
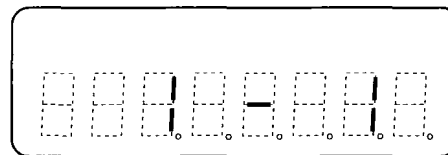
3-1. TEST MODE CHANNEL operation

When the CHANNEL DOWN key is pressed in the VERSION SELECT mode, the version is backed up and a channel operation begins.

The channel frequencies for each version are listed in Table 3, and key functions for channel operations are listed in Table 2.

| Key | Function |
|----------|----------|
| VOL UP | VOL UP |
| VOL DOWN | VOL DOWN |
| CH UP | MUTE OFF |
| CH DOWN | W/N |
| MON | CH DOWN |
| A | CH UP |
| SCN | SIG DOWN |
| D/A | SIG UP |
| PTT | TX |

Table 2



↑ RF channel ↑ Signaling

Frequency table for using on test mode

| CH | K | | K2 | |
|----|------------|------------|------------|------------|
| | RX F (MHz) | TX F (MHz) | RX F (MHz) | TX F (MHz) |
| 1 | 161.03000 | 161.00000 | 143.03000 | 143.00000 |
| 2 | 148.03000 | 148.00000 | 136.03000 | 136.00000 |
| 3 | 173.97000 | 174.00000 | 149.97000 | 150.00000 |
| 4 | 155.10000 | 155.10000 | 137.10000 | 137.10000 |
| 5 | 160.10000 | 160.10000 | 142.10000 | 142.10000 |
| 6 | 165.10000 | 165.10000 | 147.10000 | 147.10000 |
| 7 | 150.03000 | 150.00000 | 153.03000 | 153.00000 |
| 8 | 156.03000 | 156.00000 | 155.97000 | 156.00000 |

Signaling

| | DEC signaling | ENC signaling | Remarks |
|----|---------------|----------------------|---|
| 1 | No | No | |
| 2 | No | Rectangular wave | 100Hz |
| 3 | QT 67.0Hz | QT | 67.0Hz |
| 4 | QT 151.4Hz | QT | 151.4Hz |
| 5 | QT 210.7Hz | QT | 210.7Hz |
| 6 | DQT 023N | DQT 023N | |
| 7 | No | DTMF 1633Hz | Single tone |
| 8 | No | DTMF 852Hz 1209Hz | [7] key |
| 9 | 2-tone slow | No | 321.7Hz, 928.1Hz CALL flashes if the signal matches. |
| 10 | DTMF | No | [159D] CALL flashes if the signal matches. |

Table 3

REALIGNMENT

4. Panel Tuning Mode (TK-760 Only)

When the tuning mode is entered, the TUNING MODE START display appears for about one second, and the VERSION SELECT state becomes effective. This state is different from the VERSION SELECT state in the TEST MODE in that the dot at the lower right side of the display lights.

Use the following keys to select a version:

- D/A key UP
- SCN key DOWN

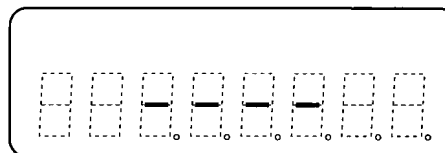
The version is backed up when the CH DOWN key is pressed as the version select key.

When the version is selected with the CH DOWN key, the CH SELECT state of the tuning mode becomes effective.

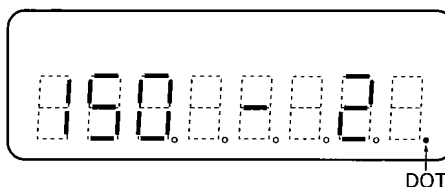
The channel and signaling can be selected in the same way as in the test mode.

The tuning items are listed in Tables 5 and 6, and key operations for tuning are listed in Table 4.

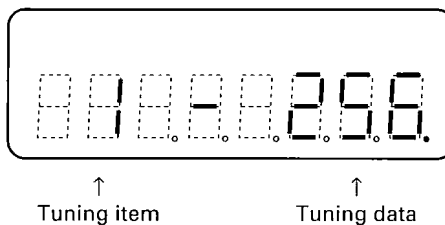
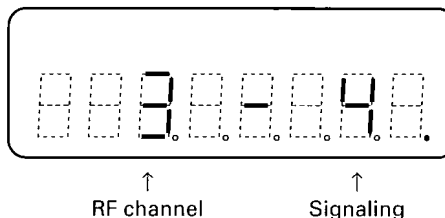
Tuning mode start display



Tuning mode version select state



Tuning mode channel select state



| Tuning mode channel select | | | Tuning mode tuning | | |
|----------------------------|-----------|--------------------|--------------------|-----------------------|-------------------|
| Key | Function | Remarks | Key | Function | Remarks |
| VOL UP | VOL up | | VOL UP | VOL up | |
| VOL DOWN | VOL down | | VOL DOWN | VOL down | |
| CH UP | To tuning | To the right state | CH UP | To CH SEL | To the left state |
| CH DOWN | N/A | | CH DOWN | Select | To the next item |
| MON | CH down | | MON | Item down | |
| AUX | CH up | | AUX | Item down | |
| SCN | SIG down | | SCN | Adjustment value down | |
| D/A | SIG up | | D/A | Adjustment value up | |
| PTT | TX | | PTT | TX | |

Table 4

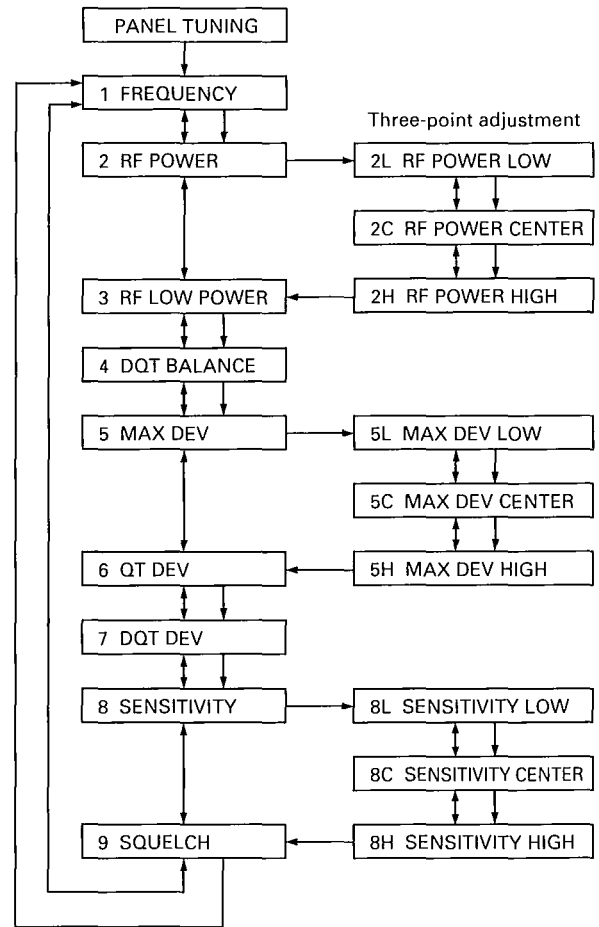
REALIGNMENT

Tuning item

| Item No. | Tuning description | Valid range | Remarks |
|----------|------------------------|-------------|------------------------|
| 1 | Frequency | 1~256 | |
| 2 | RF power | 1~256 | Three-point adjustment |
| 2L | RF power (Low) | 1~256 | Low |
| 2C | RF power (Center) | 1~256 | Center |
| 2H | RF power (High) | 1~256 | High |
| 3 | RF low power | 1~256 | KM UHF F1 |
| 4 | DQT balance | 1~256 | |
| 5 | Max deviation | 1~256 | Three-point adjustment |
| 5L | Max deviation (Low) | 1~256 | Low |
| 5C | Max deviation (Center) | 1~256 | Center |
| 5H | Max deviation (High) | 1~256 | High |
| 6 | QT deviation | 1~256 | |
| 7 | DQT deviation | 1~256 | |
| 8 | Sensitivity | 1~256 | Three-point adjustment |
| 8L | Sensitivity (Low) | 1~256 | Low |
| 8C | Sensitivity (Center) | 1~256 | Center |
| 8H | Sensitivity (High) | 1~256 | High |
| 9 | Squelch | | |

Table 5

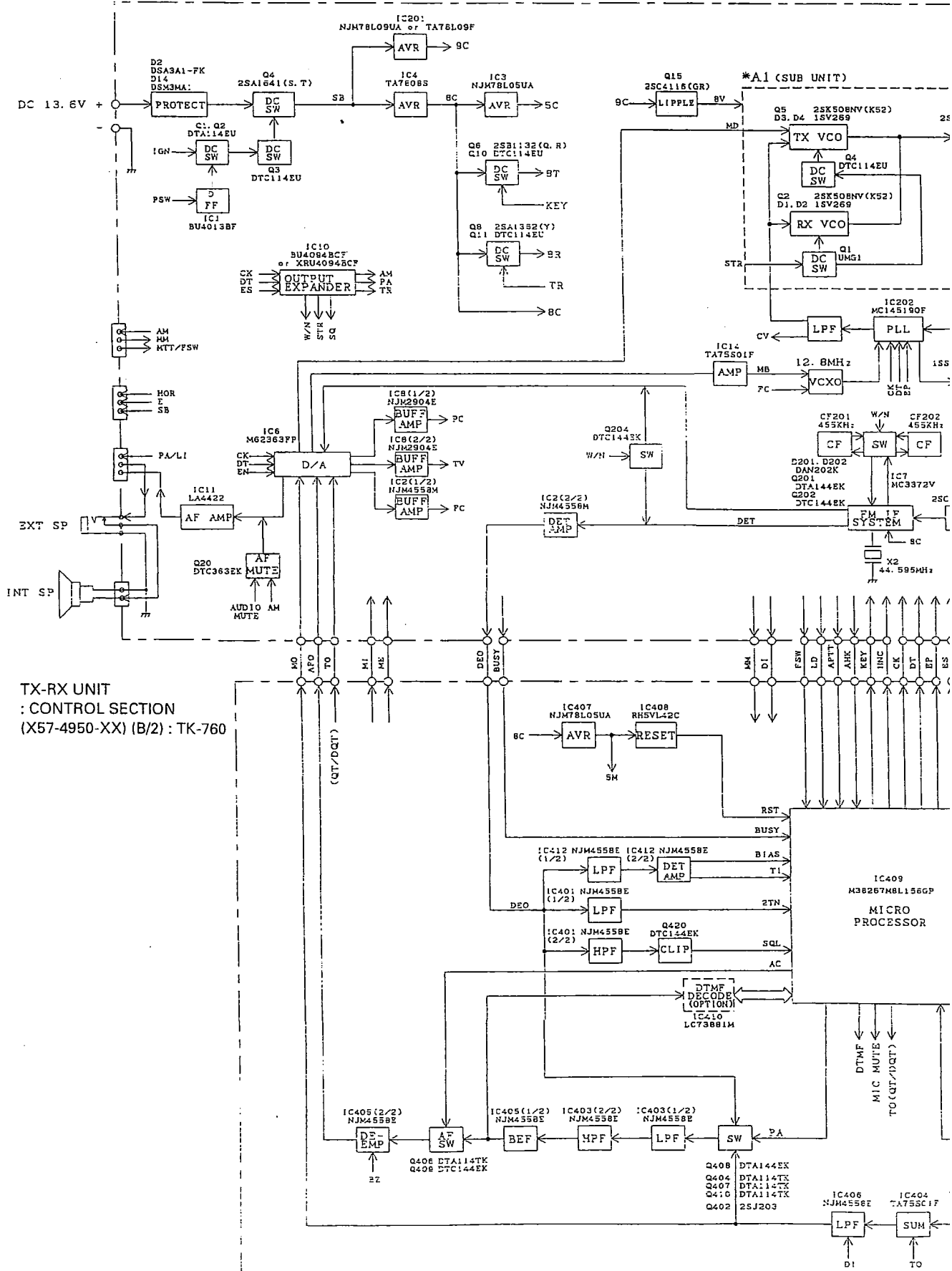
Panel tuning state transition



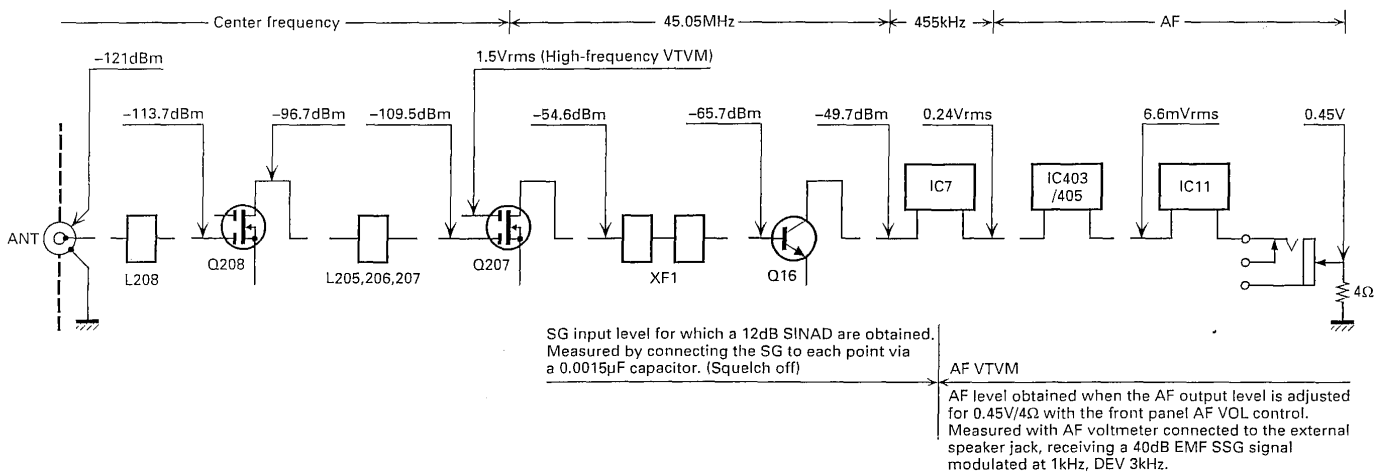
- Data save, next item
CH DOWN key
- ↔ Next item, previous item
MON key, A key

Table 6

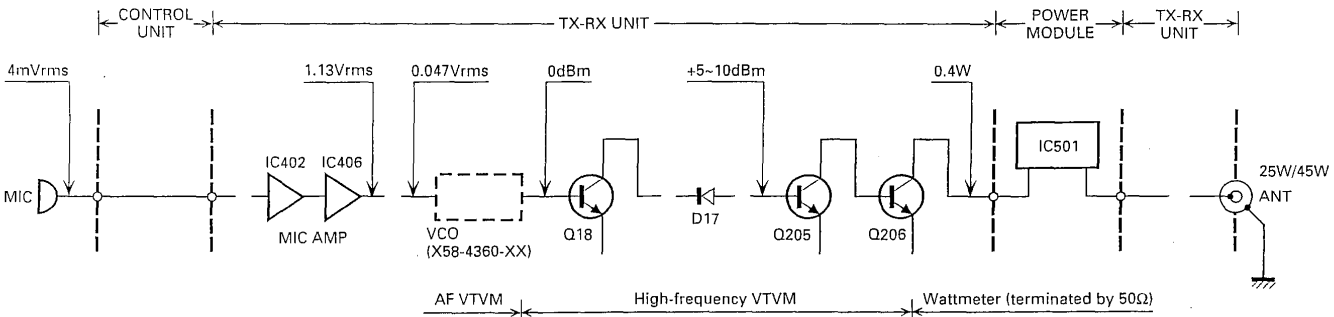
TX-RX UNIT : TX-RX SECTION (X57-4950-XX) (A/2) : TK-760 (X57-5100-XX) (A/2) : TK-762



RX Section



TX Section



1. AG is set so that MIC input becomes 3kHz DEV at 1kHz MOD.
2. Transmitting frequency : Center frequency

LEVEL DIAGRAM

TK-760/762

CIRCUIT DESCRIPTION

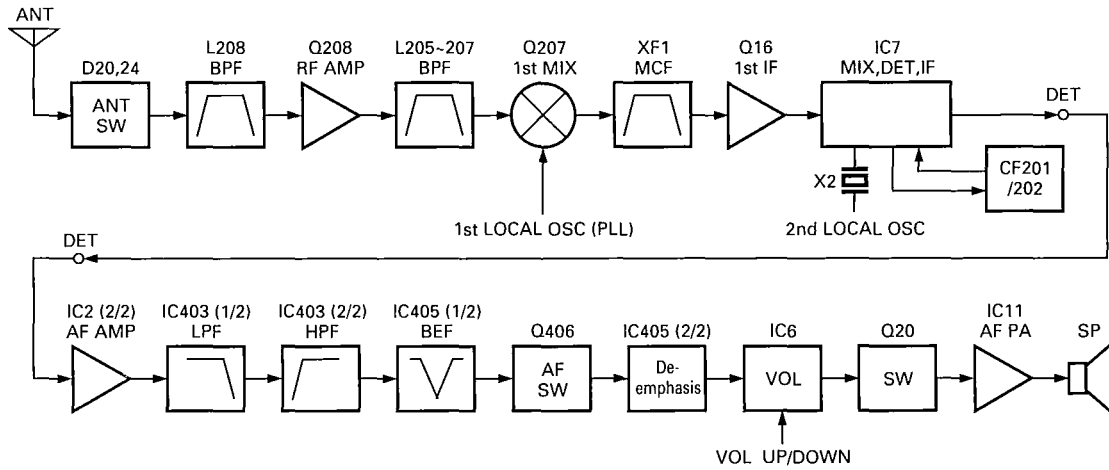


Fig. 2 Receiving system

2-5. Wide/Narrow switch

Each channel can be set as a wide or narrow channel by switching between CF201 : CFWM455F (Wide) and CF202 : CRWM455G (Narrow). The WIDE (high) signal and NARROW (low) signal are output from IC10 (I/O port expansion) pin 13. When the WIDE signal is output, Q201 turns off and Q202 turns on. When the NARROW signal is output, Q201 turns on and Q202 turns off.

A high or low signal is output to D201 and D202 to switch between CF201 and CF202. Q204 turns R221 on or off to change the IC7 (IF system) detection output level for WIDE/NARROW.

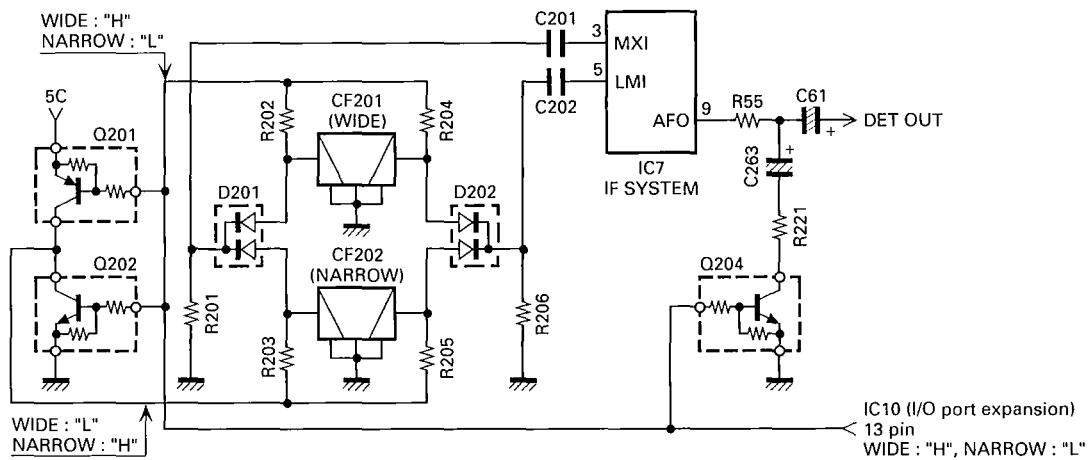


Fig. 3 Wide/Narrow switch

CIRCUIT DESCRIPTION

3. Transmitter System

3-1. Microphone amplifier

The signal from the microphone goes to the microphone mute switch (Q403 off). It then passes through the high-pass filter in IC402 (2/2) and the pre-emphasis/IDC circuit in IC402 (1/2).

The signal is applied to the IC404 summing amplifier and mixed with QT and DQT from the CPU (IC409). It then passes through the splatter filter (the fourth low-

pass filter) consisting of IC406 (1/2, 2/2), which removes unwanted harmonics.

The output from the low-pass filter is input to the D/A converter (IC6) to adjust the modulation. IC6 changes the deviations of the wide and narrow channels.

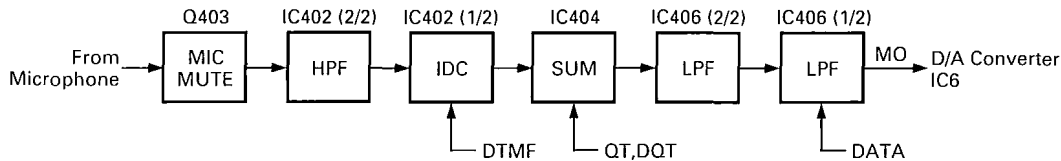


Fig. 4 Microphone amplification

3-2. Final amplifier

The signal from the PLL is amplified by drive amplifier (Q205, 206) and power module (IC501) to an output level of 25W/45W, and goes through the antenna switch D20 and harmonic filter, and on to the antenna terminal.

IC13 (1/2) compares the DC input to pin 2 with the reference voltage at pin 3 applied by IC8 (1/2), amplifies the result, and controls the DC amplifier (Q22 and Q23) to keep the transmit final current constant, thus keeping the transmit output constant.

3-3. APC circuit

The direct current that flows through the power module (IC501) produces a voltage across resistors R108. This voltage is applied to pin 6 of IC13 (2/2), and is input as the reference voltage difference of pin 5 and amplified.

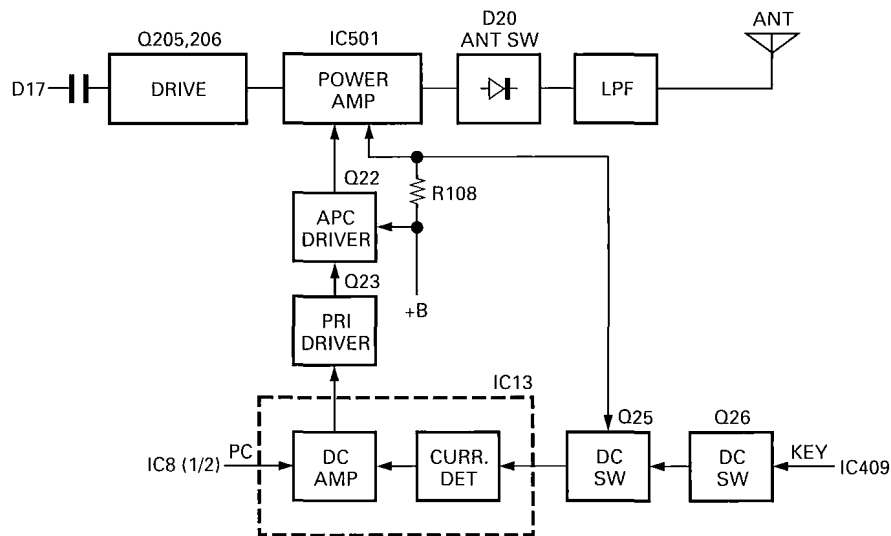


Fig. 5 Transmit power circuit and APC circuit

CIRCUIT DESCRIPTION

4. Frequency Synthesizer Unit

4-1. VCO/PLL

The PLL generates the transmit signal and the first local oscillator receive signal. The RF signal generated by Q5 (TX) or Q2 (RX) in the VCO unit is amplified by Q3, and the resulting signal is output to the TX-RX unit. TX and RX Q5 and Q2 are switched by turning the source line for Q5 and Q2 on and off. This is done by Q4 and Q1 using the control signal (STR) generated by the serial-to-parallel converter in the TX-RX unit. The RF signal passes through Q3 of the VCO unit and amplifier Q209 of the TX-RX unit, and is input to IC202 (PLL IC). The 12.8MHz PLL reference signal generated by the VCXO (X1) in the TX-RX unit is also input to IC202.

Both signals are divided according to the division data from the control unit to produce a 12.5kHz signal. The phases are compared, and a phase difference signal is output and passes through the charge pump (in IC202) and the low-pass filter of the lug lead to produce the control voltage for Q5/Q2 (VCO). This voltage is applied to D3 and D4 (TX) or D1 and D2 (RX) in the VCO unit to keep the VCO frequency constant. The other output from Q3 is amplified by the RF amplifier (Q18), and output to the transmit or receive unit via the RF switch (D17).

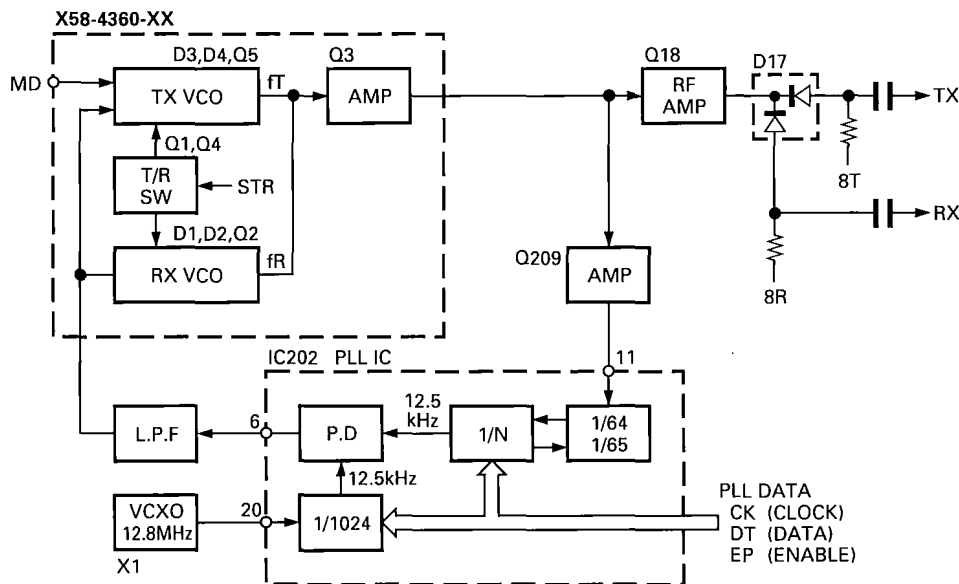


Fig. 6 PLL unit block diagram

4-2. PLL unlock

When the PLL is unlocked, the lock detect signal (LD) of the PLL IC (IC202) is rectified by D212, and converted to a DC signal. The CPU monitors this signal. When the PLL is unlocked, the CPU turns the key output signal off (low), then turns Q10, Q6, and 8T off to prevent unnecessary transmission.

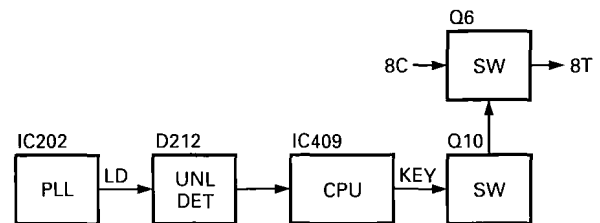


Fig. 7 PLL unlock circuit

CIRCUIT DESCRIPTION

5. Display Section

5-1. 32 channel (LCD) model

CPU (IC409) contains an LCD driver to drive the 7-segment, 8-digit LCD directly.

5-2. 2 channel (LED) model

This model turns LED drive switches Q412 to Q418 on or off in response to the signal from the CPU to light LEDs D412 to D415. To produce an orange light, the green and red LEDs are turned on at the same time.

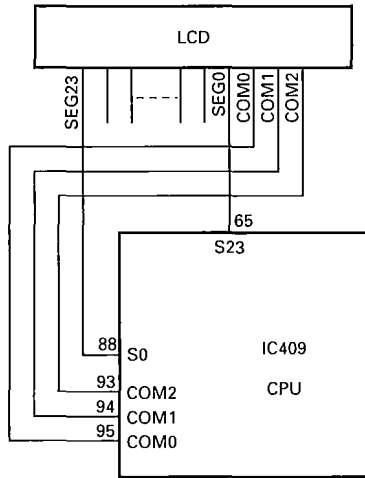


Fig. 8 32 channels model display section

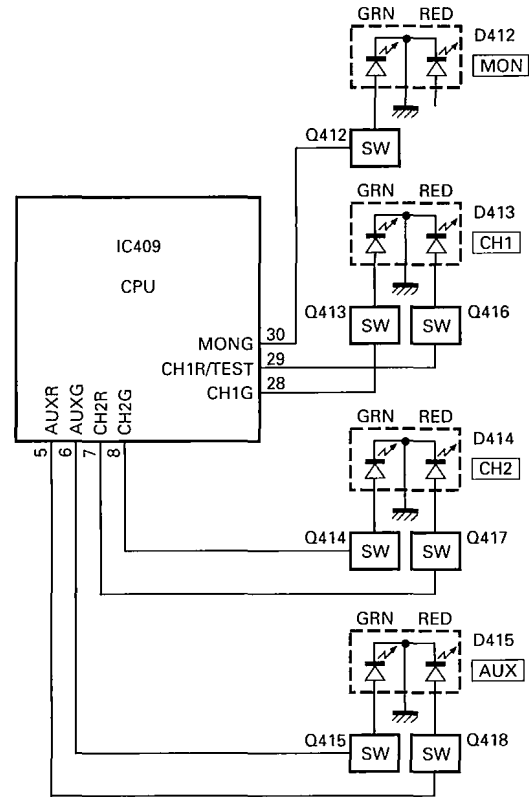


Fig. 9 2 channels model display section

6. Control Section

The control section consists of CPU (IC409) and its peripheral circuits. It controls the TX-RX unit. The CPU has the following main functions:

- 1) Switching between transmission and reception according to the PTT signal input.
- 2) Reading channel, frequency, and program data from the memory circuit.
- 3) Sending frequency data to the PLL.
- 4) Turning the squelch on and off according to the pulse signal input from the squelch circuit.
- 5) Controlling the audio mute circuit according to input decode data.
- 6) Sending encode data.
- 7) Sending data to the D/A converter.

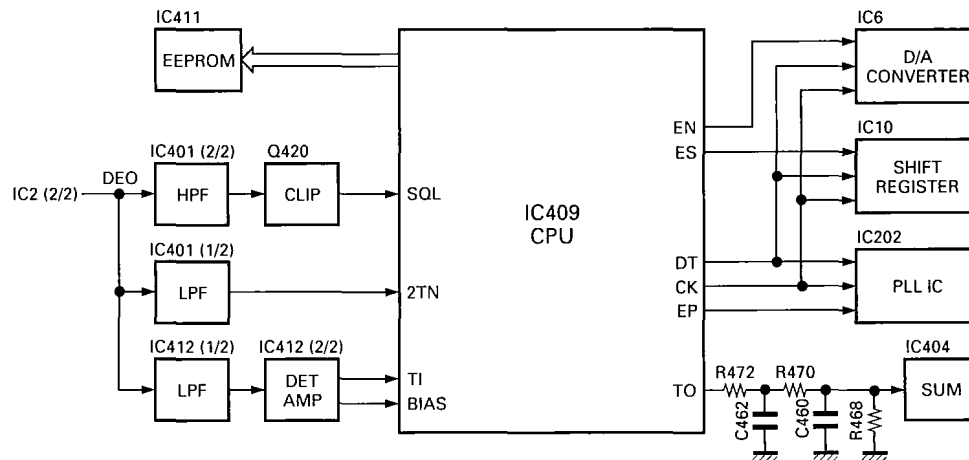


Fig. 10 Control section block diagram

CIRCUIT DESCRIPTION

6-1. Memory circuit

IC201 is a 8-Kbit EEPROM that stores adjustment and backup data.

- **Shift register**

IC10 is an interface IC for I/O port expansion. It is used to expand the CPU (IC409) output ports.

- **D/A converter**

IC6 is used as a conventional semi-fixed-resistor converter. It sets the following:

- 1) RX sensitivity
- 2) Transmission power
- 3) Modulation level
- 4) Audio power
- 5) Frequency

6-2. TX encode data

The CPU (IC409) transmits encode data.

- **QT, DQT, DTMF**

QT, DQT data items are output from CPU pin 16. The signal from this pin passes through the CR low-pass filter and goes to the summing amplifier (IC404) in the microphone amplifier. DTMF data is output from CPU pin 10. This signal passes through the CR low-pass filter and goes to IC402 in the IDC circuit of the microphone amplifier. These are mixed with the audio signal and output to the splatter filter. It then goes to the D/A converter (IC6) and on to the VCXO and VCO.

6-3. RX decode data

- **QT, DQT**

The receive detection signal passes through a low-pass filter IC412 (1/2) to remove audio components. This signal is input to pin 4 of the CPU.

The CPU digitizes this signal, and decodes the signal.

- **2-TONE**

The receive detection signal pass through a low-pass filter IC401 (1/2). This signal is input to pin 11 of the CPU.

- **DTMF**

DTMF decoding is made available by installing the DTMF decode IC (LC73881M : SANYO) on the control board.

6-4. PLL data output

PLL data is output from DATA (pin 60), ENABLE (pin 73), and CLOCK (pin 58) of the CPU (IC209). The signals are input to the PLL IC (IC202) when the channel is changed or when transmission is changed to reception and vice versa.

6-5. Horn control

The horn switch, consisting of Q13, Q14, and Q24, controls the horn relay. It is supplied by the dealer to provide the external horn alert function.

Q24 disables horn alert, turning on when its base is high, to inhibit the function. Normally, the output from IC10 is low, and Q13 is off; the base of Q14 is about 0V and Q14 is off. When horn alert is enabled, the output from IC10 goes high and Q13 turns on. The base current flows through R61 to Q14 to turn Q14 on. Q14 can sink a maximum of 100mA. If the optional KAP-1 is used, it can drive up to 2A.

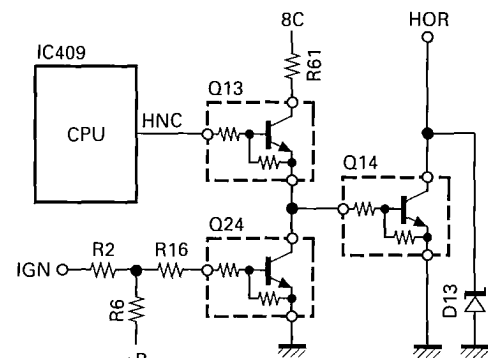


Fig. 11 Horn control circuit

6-6. PA switch

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

- **PA off**

For TX, Q410 turns on and Q407 turns off. The audio signal from the microphone passes through Q410 and IC6 and modulates the VCO.

For RX, the detected signal passes through Q404 which is on. It then passes through the audio filter, IC403, IC405, D/A IC (IC6), and is output to the speaker through the audio power amplifier IC11.

- **PA on**

Since Q410 is off, Q407 is on, and Q404 is off, the audio signal from the microphone goes to the audio filter IC403, passes through IC6, and goes to IC11. The signal is output to the external PA system through the PA relay in the KAP-1.

CIRCUIT DESCRIPTION

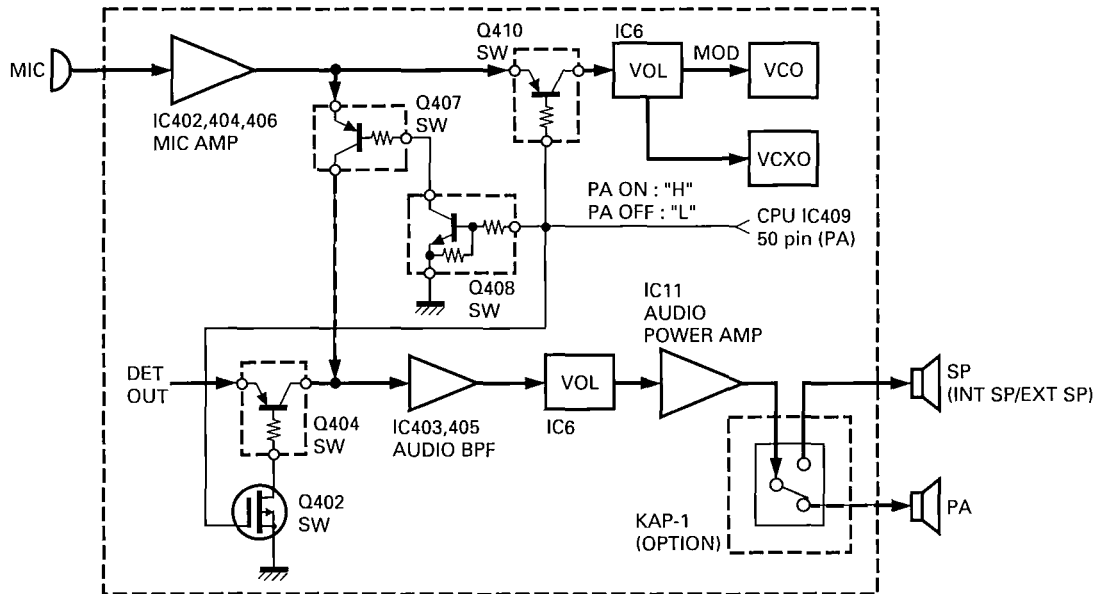


Fig. 12 PA switch circuit

6-7. Power supply circuit

D4 protects IC1 against overvoltage. Each time a pulse comes from the PSW terminal, the IC1 output is reversed. The reversed output signal passes through Q1 and Q3 and drives Q4. A voltage must be applied to the IGN terminal.

If 24V is supplied to the transceiver by mistake, Q2 turns on, and Q3 and Q4 are forced off, so the transceiver does not turn on.

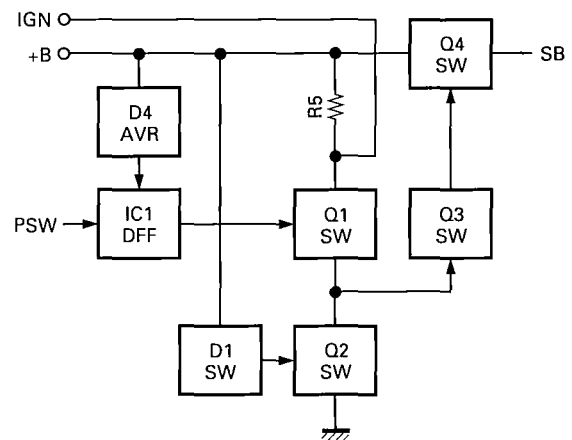
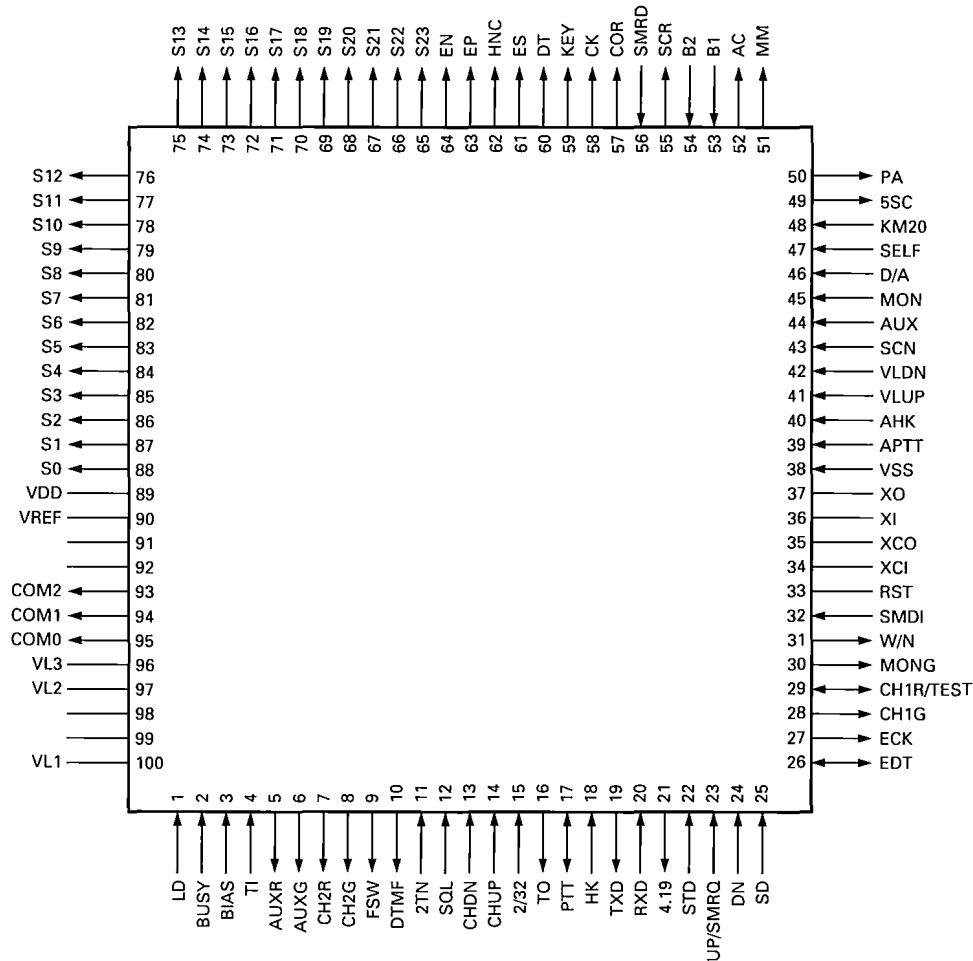


Fig. 13 Power supply circuit

SEMICONDUCTOR DATA

Microprocessor : M38267M8L156GP (TX-RX Unit IC409)

• Terminal connection diagram



• Terminal function

| Pin No. | Port Name | I/O | Function |
|---------|-----------|-----|--|
| 1 | LD | I | PLL lock detect. "L" : Unlock, "H" : Lock |
| 2 | BUSY | I | Nor used. |
| 3 | BIAS | I | QT/DQT center voltage input. |
| 4 | TI | I | QT/DQT signal input. |
| 5 | AUXR | O | AUX LED (red). "L" : On, "H" : Off (TK-762 only) |
| 6 | AUXG | O | AUX LED (Green). "L" : On, "H" : Off (TK-762 only) |
| 7 | CH2R | O | CH2 LED (red). "L" : On, "H" : Off (TK-762 only) |
| 8 | CH2G | O | CH2 LED (green). "L" : On, "H" : Off (TK-762 only) |
| 9 | FSW | O | TX sense. "L" : PTT off, "H" : PTT on |
| 10 | DTMF | O | DTMF output. |
| 11 | 2TN | I | 2-tone input. |
| 12 | SQL | I | Squelch noise pulse input. |
| 13 | CHDN | I | CH down. "L" : On, "H" : Off |
| 14 | CHUP | I | CH up. "L" : On, "H" : Off |
| 15 | 2/32 | I | CH version. "L" : 32ch, "H" : 2ch |
| 16 | TO | O | QT/DQT PWM output. |
| 17 | PTT | I/O | Normal microphone PTT. "L" : On, "H" : Off / DTMF microphone : serial interface. |
| 18 | HK | I | Microphone hook. "L" : On hook, "H" : Off hook |

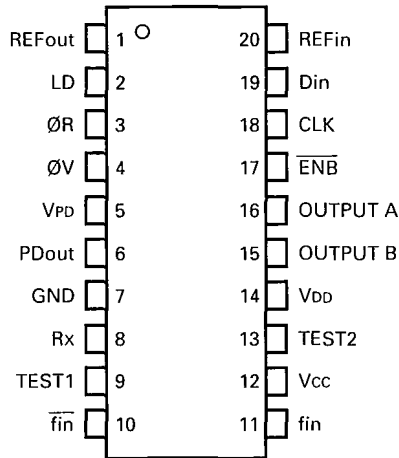
SEMICONDUCTOR DATA

| Pin No. | Port Name | I/O | Function |
|---------|-----------|-----|--|
| 19 | TXD | O | RS-232C data output. |
| 20 | RXD | I | RS-232C data input. |
| 21 | 4.19 | O | DTMF decoder system clock. |
| 22 | STD | I | DTMF decoder STD. "L" : DTMF signal absent, "H" : DTMF signal present |
| 23 | UP/SMRQ | I | E trunk step pulse / Smartrunk ACK/REQ. (TK-760 only) |
| 24 | DN | I | E trunk sync pulse. (TK-760 only) |
| 25 | SD | I | DTMF decoder data. |
| 26 | EDT | I/O | EEPROM serial data. |
| 27 | ECK | O | EEPROM serial clock. |
| 28 | CHIG | O | CH1 LED (green). "L" : On, "H" : Off (TK-762 only) |
| 29 | CHIR/TEST | O/I | CH1 LED (red). "L" : On, "H" : Off (TK-762 only) / LCD check mode. "L" : On, "H" : Off (TK-760 only) |
| 30 | MONG | O | MON LED (green). "L" : On, "H" : Off (TK-762 only) |
| 31 | W/N | O | Wide/Narrow. "L" : Narrow, "H" : Wide |
| 32 | SMDI | I | E trunk AUX mute, Smartrunk serial data. (TK-760 only) |
| 33 | RST | - | Reset. |
| 34 | XCI | - | Sub clock. |
| 35 | XCO | - | Sub clock. |
| 36 | XI | - | Clock. |
| 37 | XO | - | Clock. |
| 38 | VSS | - | GND. |
| 39 | APTT | I | External PTT. "L" : On, "H" : Off |
| 40 | AHK | I | MDT : DTC. "L" : Data CH, "H" : Normal CH. External hook. "L" : On hook, "H" : Off hook |
| 41 | VLUP | I | VOL up. "L" : On, "H" : Off |
| 42 | VLDN | I | VOL down. "L" : On, "H" : Off |
| 43 | SCN | I | SCN. "L" : On, "H" : Off |
| 44 | AUX | I | A. "L" : On, "H" : Off |
| 45 | MON | I | MON. "L" : On, "H" : Off |
| 46 | D/A | I | D/A. "L" : On, "H" : Off |
| 47 | SELF | I | Dealer/Test mode enter. "L" : NG, "H" : OK |
| 48 | KM20 | I | DTMF microphone PTT. "L" : Off, "H" : On |
| 49 | 5SC | O | Smartrunk power supply. "L" : Off, "H" : On (TK-760 only) |
| 50 | PA | O | Public address. "L" : Off, "H" : On (TK-760 only) |
| 51 | MM | O | Microphone mute. "L" : Unmute, "H" : Mute |
| 52 | AC | O | Audio control. "L" : Mute, "H" : Unmute |
| 53 | B1 | I | Scrambler binary data 1. |
| 54 | B2 | I | Scrambler binary data 2. |
| 55 | SCR | O | Scrambler. "L" : Off, "H" : On |
| 56 | SMRD | I | Smartrunk data ready. (TK-760 only) |
| 57 | COR | O | E trunk COR. (TK-760 only) |
| 58 | CK | O | Common clock. |
| 59 | KEY | O | TX key. "L" : TX off, "H" : TX on |
| 60 | DT | O | Common data. |
| 61 | ES | O | Shift register strobe. "L" : Load, "H" : Latch |
| 62 | HNC | O | Horn control. "L" : Off, "H" : On |
| 63 | EP | O | PLL chip select. "L" : Select, "H" : Not select |
| 64 | EN | O | D/A converter chip select. "L" : Select, "H" : Not select |
| 65~88 | S23~S0 | O | LCD segment 23~0. |
| 89 | VDD | - | +5V. |
| 90 | VREF | - | +5V. |
| 91, 92 | | | |
| 93~95 | COM2~COM0 | O | LCD common 2~0. |
| 96, 97 | VL3, VL2 | - | |
| 98, 99 | | | |
| 100 | VL1 | - | |

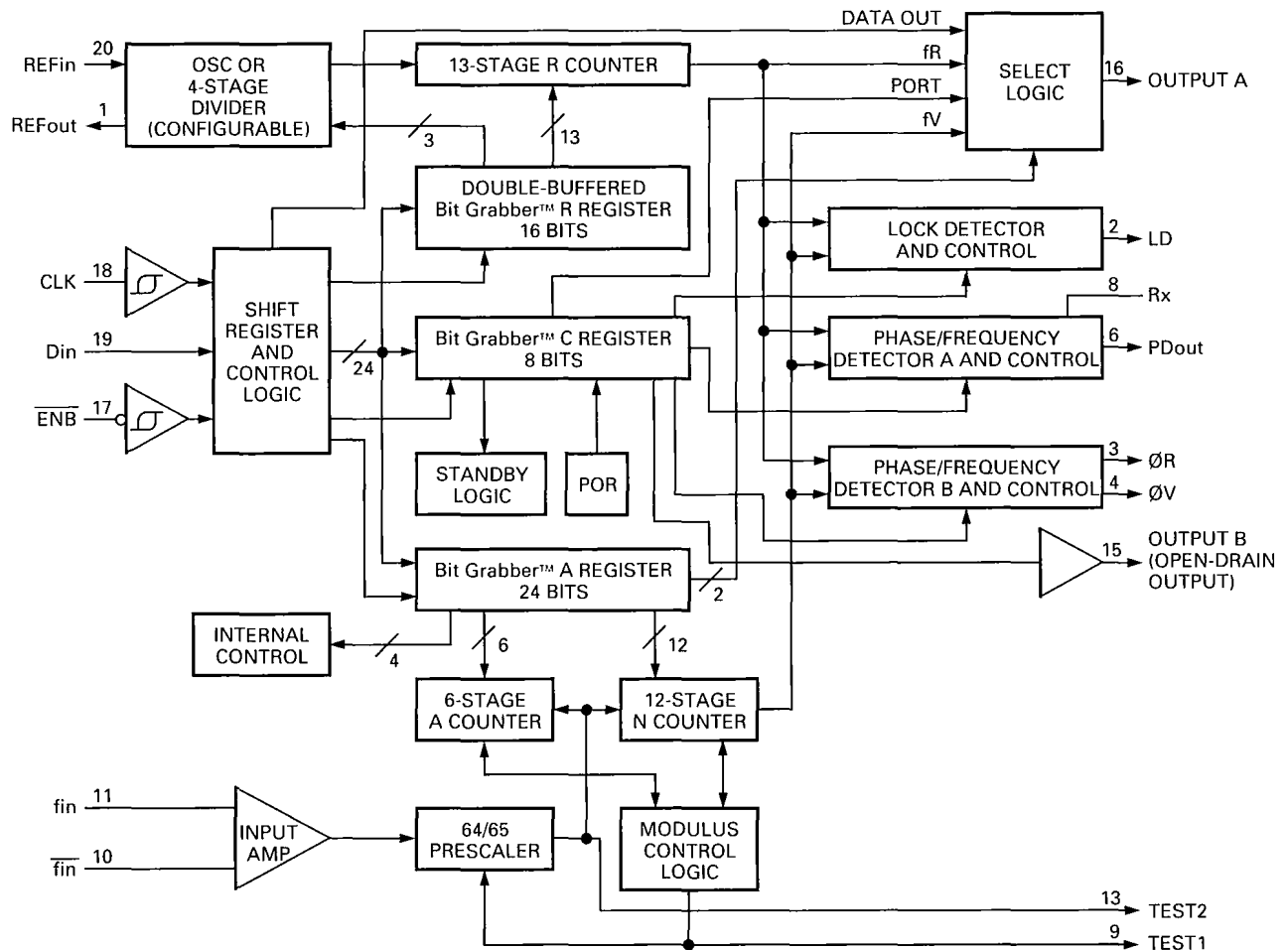
SEMICONDUCTOR DATA

PLL System : MC145190F (TX-RX UNit IC202)

• Terminal connection diagram



• Block diagram



SUPPLY CONNECTIONS :

- PIN12 = Vcc (V+ TO INPUT AMP AND 64/65 PRESCALER)
- PIN5 = VpD (V+ TO PHASE/FREQUENCY DETECTORS A AND B)
- PIN14 = VDD (V+ TO BALANCE OF CIRCUIT)
- PIN7 = GND (COMMON GROUND)