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# TK-931A(D)/931A(HD)

## 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

Type acceptance number	Frequency range	Compliance
ALHTK-931-1	896~941MHz	Parts 90
ALHTK-931H-1	896~941MHz	Parts 90

## GENERAL

### 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.

#### 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.

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#### 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.*

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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

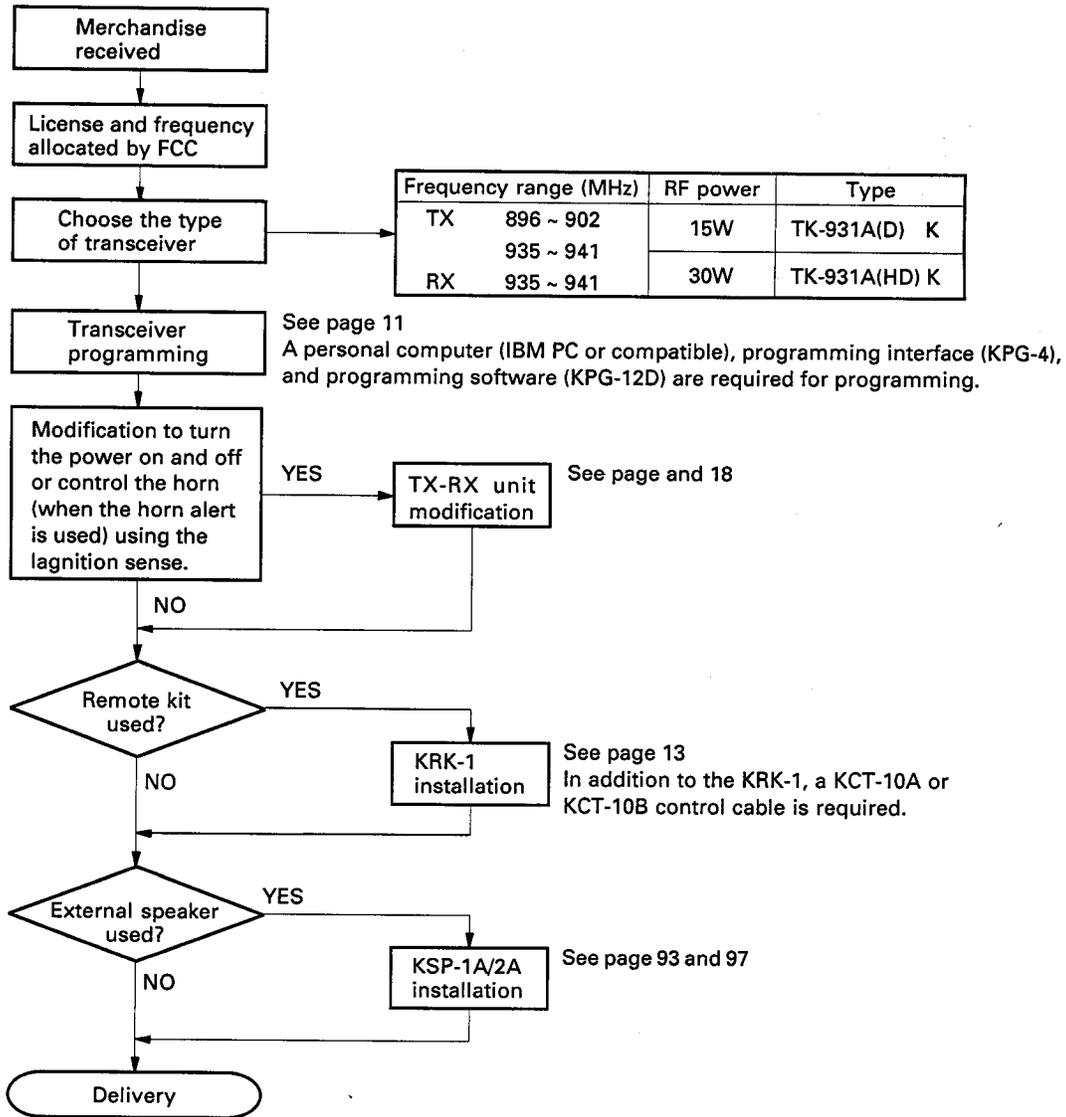
Select a convenient location for your control station radio which is as close as practical to the antenna cable entry point. Secondly, use your system's power supply (which supplies the voltage and current required for your system). Make sure sufficient air can flow around the radio and power supply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

# TK-931A(D)/931A(HD)

## SYSTEM SET-UP



## OPERATION FEATURES

### 1. Operating Features

#### 1-1. Transceiver features

The TK-931A(D) and TK-931A(HD) EFJ LTR™- and AmeriCom-compatible trunked radios, are designed to operate on both EFJ LTR™ and AmeriCom systems. The operating features common to both transceivers are summarized below.

- Any combination of ten LTR and AmeriCom systems programmable.
- Up to ten groups are programmable in each system.
- Eight-digit alphanumeric characters are programmable for each group.
- Programmable transmit inhibit.
- Programmable call indicator.
- Programmable horn alert.
- Programmable time-out timer.
- Programmable group scan.
- Convenient switchable test mode for TX/RX bench testing.

#### 1-2. LTR system features

The following features are available with systems programmed for LTR mode operation.

- System scan in LTR operation.
- LTR format talkaround (programmable).
- Free system ringback programmable with interconnect calls.
- Automatic system search programmable.
- Transpond programmable for each group.

#### 1-3. AmeriCom system features

The following features are available with systems programmed for AmeriCom mode operation.

- Over-the Air programming.
- Mobile-to mobile private call (Using Unique ID's).
- Pre-programmed telephone numbers.
- Automatic roaming.

### 2. Front Panel Controls and Indicators

#### 2-1. Front panel controls

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

- **POWER switch**

Transceiver POWER switch, when the power is switched off, all the parameters, such as the volume level, system, and group, are stored in the memory. When the power is switched on again, the system returns to the previous conditions.

- **VOLUME switch**

When the upper part of the VOLUME switch is pressed, the volume increases one level at a time. When the lower part of the VOLUME switch is pressed, the volume decreases one level at a time. When the switch is held down, the volume level changes continuously. When the switch is pressed while awaiting reception, a volume set tone automatically sounds. This tone stops about 0.5 second after the switch is released.

- **SYSTEM switch**

When the upper part of the SYSTEM switch is pressed, the system number to be selected is incremented by one. When the lower part of the SYSTEM switch is pressed, the system number is decremented by one. When the switch is held down, the system number changes continuously. When the system number reaches the highest (or lowest) system number, it changes to the lowest (or highest) system number. System numbers not set are skipped.

- **GROUP switch**

This switch is operated in the same way as the SYSTEM switch. When the system number is changed, the GROUP indicator shows the original group number (the last selected group number in each system). The group to be set may differ by system.

- **S (Scan/Select) switch**

The S switch functions differently for the LTR system than for the AmeriCom system. If the LTR system is selected, the switch toggles the system scan function on and off. If the AmeriCom system is selected, the switch displays the cell ID number of the selected system. The system being used is displayed or the system may be changed during roaming.

- **A (Auxiliary) switch**

This switch the auxiliary function, such as horn alert, on and off.

- **B and C switches**

These switches are normally ineffective. They are used only in test mode.

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## OPERATION FEATURES

### 2-2. Front panel displays and indicators

All the indicators on the front panel are shown in the LCD.

- **System display**

Shows the selected system number (0~9), 0 indicates system 10. Only the programmed systems are displayed. The system display is positioned above the SYSTEM switch.

- **Group display**

Shows the selected group number (0~9), 0 indicates group 10. Only the programmed groups are displayed. The group display is positioned above the GROUP switch.

- **SCAN/ROAM indicator**

If the LTR system is selected, the (S) mark on the left of the system display lights in system scan mode. If the AmeriCom system is selected, the (S) mark lights when the radio roams and enters another cell.

- **Delete (▶) indicator**

If the LTR system is selected, the ▶ mark on the left of the system display lights when the radio is locked out of the system scan sequence. If the AmeriCom system is selected, the mark lights when the roaming function of the system is disabled.

- **TX indicator**

The TX indicator goes on during transmission.

- **Busy indicator**

The BUSY indicator goes if the PTT switch is pressed when the trunked system is busy or while a TX inhibit ID is being received.

- **CALL indicator**

The CALL indicator can be programmed so that it goes on when a specified call is received.

- **A (Auxiliary) indicator**

This indicator lights when the A switch is pressed and the auxiliary function (for example, horn alert) is selected.

- **B and C indicators**

The B or C indicator lights when the B or C switch is pressed to select a function in test mode.

- **Alphanumeric display**

Up to 100 8-digit alphanumeric displays can be programmed (10 systems of 10 groups maximum).

### 3. Details of Features

#### 3-1. Audible user feedback tones

The radio outputs various combinations of tones to indicate the operating state of the radio. The main tones are listed below.

- **Busy tone**

This tone is output when the PTT is pressed but no repeater is available, so communication is not possible. The tone is output until communication is enabled while the PTT is being held down, or until the PTT is released.

- **Intercept tone**

This tone indicates that the radio is out of range. It indicates that the PTT is being pressed and the radio is transmitting, but the repeater cannot be connected, so communication is not possible. It is output until the PTT is released.

- **Delay tone**

This tone, output when the PTT is pressed and the repeater is accessed three times or more, indicates connection with the repeater is being delayed. The tone is the same as the Busy tone.

- **Proceed tone**

This tone, output when the PTT is pressed, transmission starts, and the repeater is connected, to indicate that the user can talk.

- **Queue tone**

This double beep tone is output until high-speed call connection is completed in AmeriCom mode.

- **Deny tone**

This tone is output if a call with a prestored number cannot be made in AmeriCom mode. It is similar to the intercept tone.

#### 3-2. Automatic volume setting

The volume can be adjusted in 32 steps using the volume up/down button. If the button is pressed when there is no signal, a busy tone is produced automatically. The minimum volume level when the power is buttoned on can be programmed. If the volume is reduced below this setting and the power switched off, the volume level is returned to the programmed setting when the power is switched on again. It is recommended that the volume level be set in the range six to nine. If the volume is increased above the programmed setting, the new setting becomes the programmed setting.

## OPERATION FEATURES

### 3-3. Alphanumeric display

Up to 100 eight-character alphanumeric strings can be programmed for each system or group (Fig. 1). These can be used to display the system or group name.

Display →	A	B	C	D	E	F	G	H	I
Key in →	A	B	C	D	E	F	G	H	I
	J	K	L	M	N	O	P	Q	R
	J	K	L	M	N	O	P	Q	R
	S	T	U	V	W	X	Y	Z	.
	S	T	U	V	W	X	Y	Z	.
	1	2	3	4	5	6	7	8	9
	1	2	3	4	5	6	7	8	9
	0	-	+	/	=	#	*	,	)
	0	-	+	/	=	#	*	,	)
	<	□	⊞	⋮	⊞ ← All on				
	(	@	\$	%					

Fig. 1

### 3-4. Call Indicator

The call indicator can be programmed to go on or off by setting the group flag for each group. When the call indicator is set to go on and a call with a receive ID set in that group is received, the call indicator goes on. The call indicator is reset by pressing any front-panel switch (except B or C), the PTT, or the microphone ON HOOK button.

In the AmeriCom system, the call indicator flashes when a call with a unique ID is received.

### 3-5. Horn alert

The horn alert can be programmed to turn on or off by setting the group flag (external alert) for each group. When the horn alert is set to go on and a call with the correct receive ID set in that group is received, the horn alert output pulses on for half a second and off for half a second for three cycles.

If the A (Auxiliary) switch on the front panel is turned off, horn alert pulses are not output.

### 3-6. Time-out timer

The time-out timer can be programmed in 15-second increments from 15 seconds to 10 minutes for dispatch and interconnect operation. If the PTT switch is held down so the transmitter operates continuously for longer than the programmed time, the transmitter is disabled and an alert tone is sounded. The tone stops when the PTT switch is released.

### 3-7. Transmit inhibit IDs

The transceiver can be programmed with four independent transmit inhibit IDs and an ID block (range ID) for each group. If a transmit inhibit ID is decoded up to five seconds before the PTT switch is pressed, transmission is inhibited. The BUSY indicator lights and a busy tone sounds to report that transmission is disabled. When the PTT switch is released, the busy tone stops and the BUSY indicator goes off.

### 3-8. Clear to talk

The clear to talk feature can be programmed to turn on or off by setting the radio type flag. (This feature uses the automatic retry setting of the radio type flag.)

If the clear to talk feature is set, the busy tone is not output. (The busy tone is output for the interconnect ID.) The delay tone is not output.

### 3-9. Interval scan

This feature is used to start group or system scanning even if the microphone is off hook. It can be programmed by setting the radio type flag. If this feature is enabled (the microphone and scan setting is for "Both on hook and off hook"), it restarts scanning automatically after the time set by the drop-out delay timer or dwell timer elapses, even if the microphone is off hook.

### 3-10. Drop-out delay timer

The drop-out delay timer can be set to 0 to 254 seconds in one-second increments. If a call is received during group or system scan, scanning stops. If the call ends and the preset time elapses, scanning resumes. The default value for this radio is 3 seconds.

### 3-11. Dwell timer

The dwell timer can be set to 0 to 254 seconds in one-second increments. If the interval scan is selected, the time after the end of transmission to the restart of scanning can be programmed. The default value for this radio is 15 seconds.

### 3-12. Off hook revert (Scan revert)

Either LAST CALL REVERT (floating revert) or LAST USE REVERT (fixed revert) can be programmed for the off hook revert system or group during scanning by setting the radio type flag. With LAST CALL REVERT, the system or group changes to the revert system or group when a call is received. With LAST USE REVERT, the system or group reverts to the last selected system or group.

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## OPERATION FEATURES

### 3-13. Group scan

Group scan can be programmed to turn on and off for each system by setting the group flag. The group scan occurs when the microphone is on hook (except for interval scan). A dash (-) appears for the group digit during group scan. The revert group IDs and all the IDs of the other groups permitted for group scan are decoded. If a call is received, the group indicator shows the set group number of the decoded ID.

### 3-14. Pre-empt

Whether to interrupt the call currently being received can be programmed for each group by setting the group flag.

If pre-empt is not permitted for the receiving group, the call from a group that permits another group scan is not interrupted until the drop-out delay or dwell timer expires.

If pre-empt is permitted, an interrupt occurs immediately after the call of the receiving group ends.

### 3-15. Priority ID codes

The priorities of the programmable decode ID codes are as follows:

1. Individual receive ID1
2. Individual receive ID2
3. Individual receive ID3
4. Individual receive ID4
5. Range IDs

If a call with a higher priority ID comes in, it is received immediately (unless the radio is trunked out). If a call with a lower priority ID comes in, it is decoded after the call with a higher priority ID has been received.

### 3-16. System scan

The system scan is available only in LTR mode, and is not available if the system is programmed for AmeriCom mode. System scan can be enabled with the front panel S switch. When the S switch is pressed, the (S) indicator lights.

Scanning occurs only if the microphone is on hook (except for interval scan). Scanning starts from the system following the currently displayed LTR system. When scanning, a dash (-) is indicated on both the SYSTEM and GROUP displays. All the groups in the systems that are not locked out of sequence are scanned. When a call is received, scanning stops, and the system and group are displayed. If no call is received within the time set with the drop-out delay timer after the call ends, scanning resumes.

The revert system or group can be changed while scanning simply by pressing the SYSTEM or GROUP switch. Scanning resumes one second after the switch is released.

The AmeriCom system cannot be selected in scan mode. To select the AmeriCom system, press the S switch on the front panel again to terminate the scan mode (the (S) indicator goes off), and select the system programmed for AmeriCom mode with the SYSTEM switch.

### 3-17. Scan lockout

The scan lockout feature is used to lock systems out of the system scan sequence, and can be selected by programming the system flag. When a locked system is selected, the Delete (▶) indicator lights on the left of the SYSTEM display.

### 3-18. Scan message wait

The time to stay with the home repeater when a signal comes in during system scan and to decode a message can be set to two values: 3 (for commercial systems) or 6 (for private systems). The system is used until the specified number of messages is decoded. If no call is received within the time set, the home repeater of the next system is scanned.

### 3-19. Free system ringback (Busy system quening)

This feature is available only when the selected system is in LTR mode. It can be selected by setting the group flag.

This feature is only when a telephone interconnect ID code is selected. If a busy tone sounds when the PTT button is pressed, the transceiver enters this mode automatically. When the PTT button is released, a beep sounds to indicate that the mode has been entered. When any repeater becomes available, a ringing tone sounds. System scan is automatically terminated when the mode is entered. The mode is terminated when the system, group, S (scan/select), A (AUX) button or PTT button is pressed.

### 3-20. System search

This feature is available only when the selected system is in LTR mode, and can be programmed to automatically access other programmed LTR systems when the selected system cannot be accessed. If an intercept tone sounds when the PTT switch is pressed, and the S switch is pressed while the PTT is being held down, the transceiver has entered the mode. If the PTT switch is released, a beep sounds to confirm this mode. System scan is automatically terminated at this point if it has been enabled.

## OPERATION FEATURES

If the group ID is a telephone interconnect ID, the transceiver then attempts to access, in succession, other systems that have a telephone interconnect ID in the revert group location. If the group ID is a dispatch ID, the transceiver attempts to access other systems that have a dispatch ID programmed in the revert group location. If there is no system to be accessed, an intercept tone sounds, the mode is terminated, and the transceiver returns to the first system. If the access is successful, the mode is terminated, and the searched system becomes the new selected system.

### 3-21. Transpond

This feature is available only when the selected system is in LTR mode. The feature can be programmed to turn on or off for each group by setting the group flag. If any receive ID, except range IDs set in the group for which transpond is enabled, is decoded, two data messages (transmit ID and turn-off code) are automatically transmitted if the PTT is not pressed as a response within the time set with the drop-out delay timer after the call ends.

### 3-22. Talk-around

This feature is available only when the selected system is in LTR mode. It can be selected for each group by setting the group flag.

### 3-23. Over-the-air programming initiated by the radio

Before over-the-air programming (OAP), the OAP frequency must be programmed in the radio to enable this feature. (For the programming method, see Section 4, Transceiver Programming.)

If the message "OAP" is displayed on the alphanumeric display and the call indicator flashes when the radio power is switched on, programming may start.

When the front panel S button or the PTT button is pressed, OAP starts. The call indicator goes off.

Transmission and reception are repeated several times (the TX indicator flashes). If the programming for the radio is completed successfully, the message "COMPLETE" appears on the alphanumeric display, and OAP ends.

When the power is switched off and on again, the radio can be used with the programmed settings.

If OAP fails due to some problem, the message "ERROR" appears on the alphanumeric display. OAP can be retried by switching the power off and on again. If the message "WAIT" appears on the alphanumeric display when the power is switched on, wait until it changes to the message "OAP".

### 3-24. OAP update initiated by the network manager

The program in the radio can be updated in the radio home cell by the OAP by changing them on the Network Manager.

When the radio receives an OAP update request from the AmeriCom switch, the message "UPDATE" appears on the alphanumeric display, and the radio transmits and receives several times repeatedly. If the programming for the radio ends normally, the radio outputs a proceed tone. The radio can be operated with the latest program contents.

If OAP fails due to some problem, the radio waits for the next OAP update request from the AmeriCom switch.

### 3-25. Pre-programmed telephone numbers

The radio can have numbers pre-stored by OAP. These numbers are assigned to system or group numbers, and can be selected with the System or Group button.

The numbers are used to make a telephone call or dispatch call using AmeriCom's high-speed protocol.

### 3-26. Placing an AmeriCom telephone call

An AmeriCom telephone call can be made by using the pre-stored number selected by the System and Group button. To place a call, select the party to be called with the System and Group buttons. Press the PTT button briefly. The radio transmits the data necessary to place a call to the AmeriCom switch.

The radio outputs a queue tone for several seconds. If communication is not possible for some reason or another, the radio outputs a deny tone and cancels the call.

When the queue tone stops, a ringing tone is heard from the telephone line. Subsequent operations can be performed in the usual way. To respond to an incoming call, press the PTT button to talk, and release it to listen.

To terminate the call, set the microphone on hook or press the System or Group button. If the optional DTMF microphone is used, press the # key to terminate the call.

### 3-27. Receiving an AmeriCom telephone call

An AmeriCom telephone call is received using the unique ID of the radio. So, in the AmeriCom network, the call is received regardless of the position of the System or Group switch of the radio. When a call is received, the call indicator flashes, and a ringing tone is heard from the telephone line. For response and termination, see Section 3-26.

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## OPERATION FEATURES

### 3-28. AmeriCom dispatch

If a unique mobile ID is set in the pre-stored number, a mobile-to-mobile private call can be placed. This call is placed in the same way as for placing an AmeriCom telephone call. See Sections 3-26 and 3-27.

If the radio does not have pre-stored numbers corresponding to the system and group, the procedure for the dispatch call is the same as that for the LTR ID dispatch call.

### 3-29. Automatic roaming

If the roaming function is enabled and the radio is out of range of the preferred system, the radio searches for programmed AmeriCom systems unless the roam lockout is programmed. The display shows that the radio is roaming. The message "ROAMING" appears on the alphanumeric display. A dash (-) appears on the system and group displays.

If the radio finds a system, it tries to check it in. The message "CHECKIN" appears on the alphanumeric display. If the check-in succeeds, the radio display shows the preferred system and group. The Roam (Ⓢ) indicator lights to show that the radio is roaming.

Pressing the PTT switch accesses the preferred system's group setting using the roamed system. Changing the group switch changes the preferred system's group setting.

Only pre-stored numbers are available to transmit. If an LTR ID was programmed on a preferred system's group setting, the radio sounds the intercept tone.

### 3-30. Roaming display

When the radio is roaming, the Roam (Ⓢ) indicator lights to show it. The system and group displays show the preferred system and group. When the S (Select) button is pressed momentarily, the radio system display shows the roaming system, and the group display shows a dash (-). The cell ID number appears on the alphanumeric display. This is useful to confirm the system being used.

If the S (Select) switch is held down for two seconds or more, the Roam (Ⓢ) indicator goes off, and the radio changes from the preferred system to the system roamed to. The group display indicates the revert group of that system. The cell ID number of the system appears on the alphanumeric display only when the S (Select) button is held down while the Roam (Ⓢ) indicator is off. Thus, you can confirm the cell ID number of the system being used.

### 3-31. Roam lock out

If the roaming feature is programmed as "NO" by the system flag setting, the system is not searched for during roaming.

If the radio goes out of range after this system is selected, the system remains valid.

If this system is selected, the ► mark on the system display lights.

If the radio cannot check into this system, the message "NO SERVC" appears on the alphanumeric display.

### 3-32. Test mode

The TK-931A(D) and TK-931A(HD) transceivers have a test mode.

To enter the test mode, set button SW100 on the TX-RX unit to the TEST position. When the power is buttoned on with the button set to this position, the test mode is entered. To exit the test mode, reset the button to the NORMAL position, and turn the power off and then back on again. The mode will not be changed merely by resetting the switch. The following functions are available in the test mode.

- **SYSTEM button**

The SYSTEM button is used to select up to ten pre-programmed test frequencies.

- **GROUP button**

The following modulation signals can be selected.

Group	Modulation
1	No modulation
2	LTR format data
3	ACLS format data
4	ACHS format data
5	100Hz square wave

- **A button**

When the A button is pressed in the test mode, the transmitter enters the talk-around mode to transmit with the receive frequency, and the Auxiliary indicator lights.

- **B button**

In test mode, the receiver operates with carrier squelch. When the B button is pressed, the data decode function set in groups 2 and 4 is added.

- **C button**

If the C button is pressed in the test mode, carrier squelch is turned off. If there is no signal noise is output by the speaker and the BUSY indicator lights.

## OPERATION FEATURES

- **S button**

When the S button is pressed in the test mode, scanning occurs. A dash (-) appears on the system and group displays, and all programmed test frequencies are scanned.

- **Alphanumeric display**

The alphanumeric display shows the frequency on which the radio operates in test mode.

- **Transmitter**

The transmitter is keyed using the microphone PTT button.

The modulation signal selected with the GROUP button is transmitted.

### 4. Transceiver Programming

#### 4-1. Preface

When a TK-931A(D) or TK-931A(HD) transceiver is used in the AmeriCom network, it can be programmed by OAP on the Network Manager. If only an LTR system is used, the service time and OAP frequency are programmed using a personal computer, programming interface (KPG-4), and programming software (KPG-12D).

The programming software can be used with an IBM PC or compatible. Figure 2 shows the setup of an IBM PC for programming.

#### 4-2. KPG-4 description

##### (P.C. programming interface cable : option)

The KPG-4 is required to interface the TK-931A(D) and TK-931A(HD) 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-4 connects the front panel modular microphone connector of the TK-931A(D) and TK-931A(HD) to the computers RS-232C serial port.

#### 4-3. Programming software description

The KPG-12D is the programming software for the TK-931A(D) and TK-931A(HD) supplied on a 5.25" floppy disk and a 3.5" floppy disk. This software runs under MS-DOS (version 3.1 or later) on an IBM-PC/XT, AT, or PS2, or compatible. Data can be input to or read from the TK-931A(D) and TK-931A(HD) and edited on the screen, and programmed data can be printed.

#### 4-4. Program mode

Data can be programmed into the EEPROM via the microphone connector. To set the transceiver in this mode, hold down the A (Auxiliary) switch, switch the power on, wait for at least 3 seconds, then release the A switch.

The system and group display show a dash (-) and indicates "PROGRAM" on the alphanumeric display.

In this mode, the microphone PTT and Hook lines operate as TXD and RXD data lines respectively.

If the program ends normally, the message "END" appears on the alphanumeric display. If an error occurs, the message "ERROR" is displayed. This mode is terminated by switching the power off.

#### 4-5. RCCB number

The TK-931A(D) and TK-931A(HD) have been programmed at the factory to have different RCCB numbers. When the transceiver is set to the Program mode, and the Group DOWN button is pressed, an eight-digit hexadecimal RCCB number appears on the alphanumeric display for confirmation. The RCCB numbers of the TK-931A(D) and TK-931A(HD) are in the range 135,266,304 (08100000 hex) to 136,314,879 (081FFFFF hex). This mode is terminated by switching the power off.

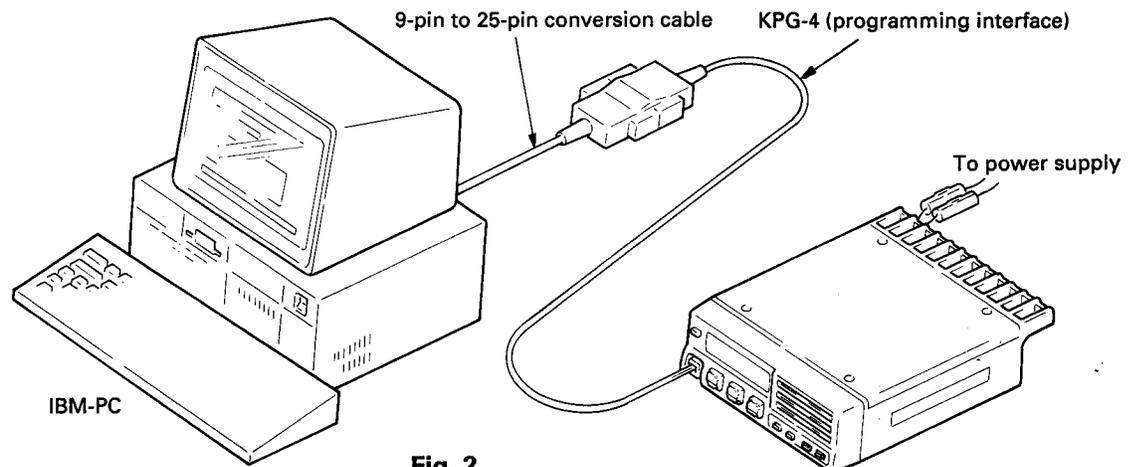


Fig. 2

# TK-931A(D)/931A(HD)

## OPERATION FEATURES

### 4-6. Minimum volume level

The TK-931A(D) and TK-931A(HD) have an automatic volume setting feature, but the maximum volume level when the power is switched on can be modified. To set this mode, set the transceiver to Program mode, and press the Volume Up/Down button. The message "VOL SET" appears on the alphanumeric display, and the preset number of steps (0~31) appears on the system and group displays. (The system display shows the high-order digit, and the group display shows the low-order digit.)

The low-order digit can be changed with the Group Up/Down button, and the high-order digit can be changed with the System Up/Down button. When the Volume Up/Down button is pressed, a busy tone sounds to confirm the volume level. The default value is step 6. This mode is terminated by switching the power off.

### 4-7. OAP frequency programming

The OAP frequency can be programmed by the transceiver itself. When the transceiver is set to program mode, and the system button is changed, the OAP frequency appears on the alphanumeric display. The digit that can be modified flashes. It can be changed by pressing the System Up/Down button. The digit that can be modified is changed by pressing the S (Select) button. The FCC channel number can be also set by pressing the A button. This mode is terminated by switching the power off. If the power is switched on again (without pressing the A button), OAP can start.

# TK-931A(D)/931A(HD)

## INSTALLATION

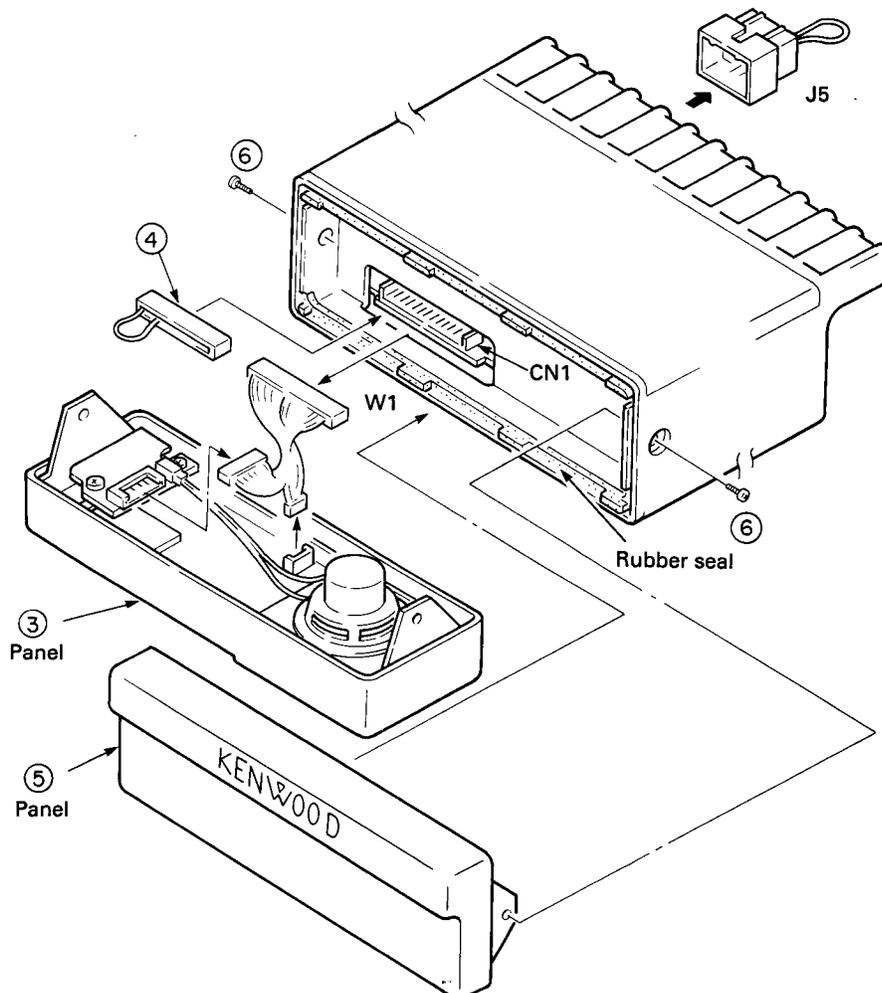
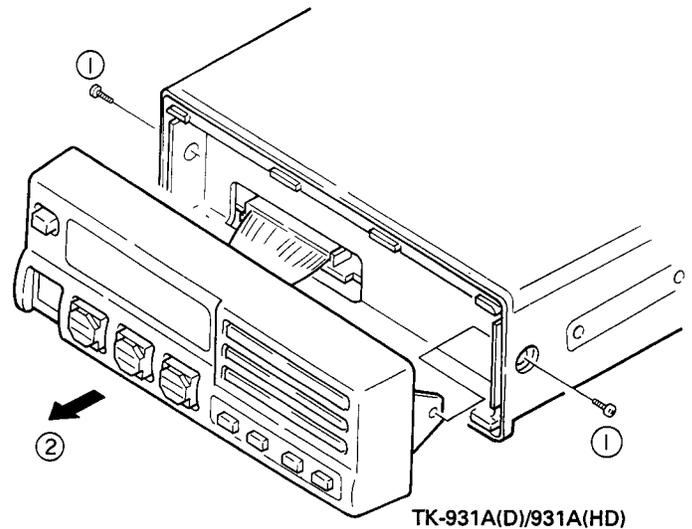
### 1. Installing the Remote Kit (KRK-1)

The KRK-1 is a kit for remote operation of the TK-931A(D)/931A(HD). The kit contains a control head, a control head bracket, and mounting screws. The panel unit can be separated from the main unit. The kit requires optional control cable (remote cable, external speaker cable) KCT-10A (length : 6m) or KCT-10B (length : 4m).

Both the TK-931A(D)/931A(HD) main unit and the control head (KRK-1) are required.

#### 1-1. TK-931A(D)/931A(HD) main unit

1. Remove the two screws ( ① ) securing the panel.
2. Pull the panel ( ② ) toward you.
3. Disconnect the the lead (W1) with connectors from the panel ( ③ ) and the main unit.
4. Disconnect the accessory connector (J5) from the rear panel.
5. Insert the jumper connector ( ④ ) supplied with the KCT-10A/10B into CN1 of the TX-RX unit.
6. Install the panel ( ⑤ ) removed from the KRK-1 on the main unit, and secure it with the two removed screws ( ⑥ ).

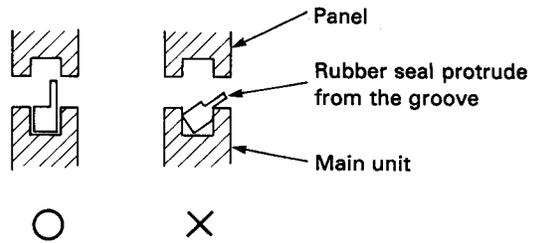


# TK-931A(D)/931A(HD)

## INSTALLATION

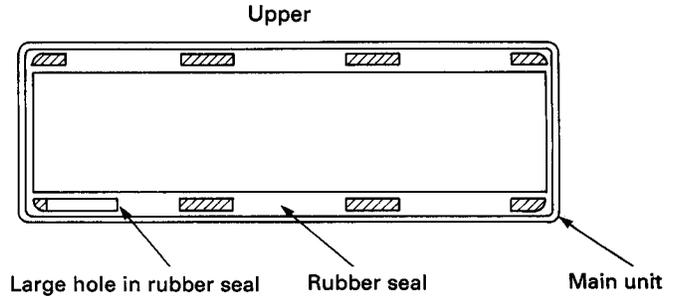
### Notes :

a. When installing the panel (5) on the main unit, fit the rubber seal into the groove so that it does not protrude from the groove.



b. When fitting the rubber seal into the groove, the large hole in the seal must be at the lower left corner of the main unit.

c. Keep the removed connector lead (W1) and accessory connector (J5). (They will be reused if the remote kit is removed to change back to the standard unit.)

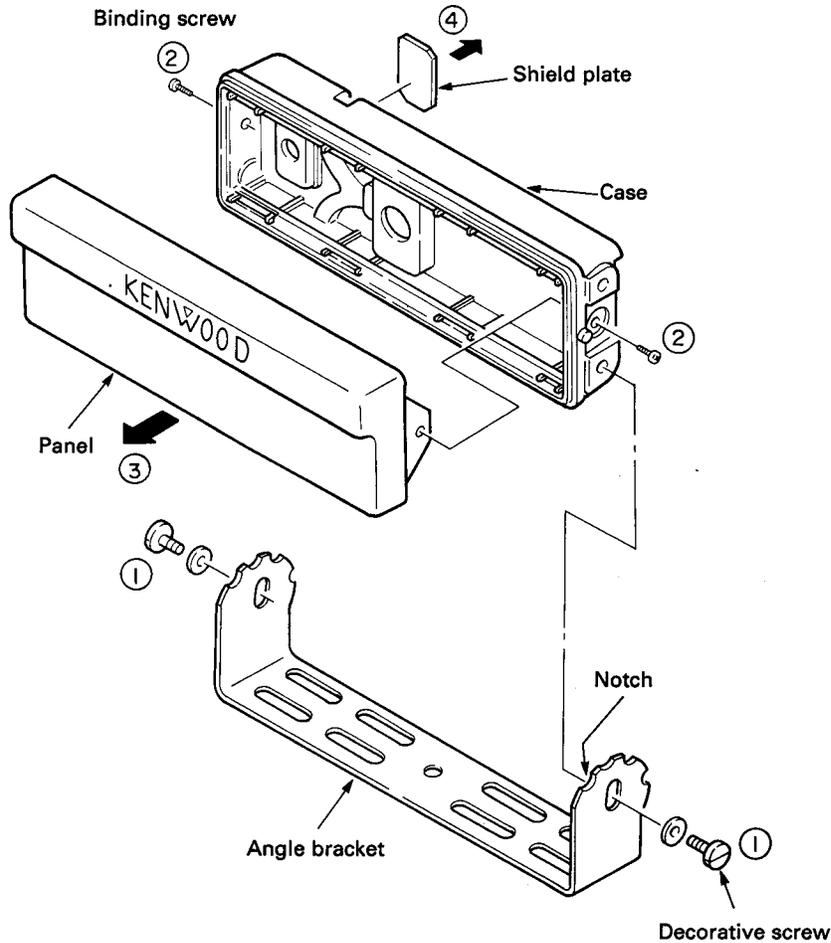


### 1-2. KRK-1

1. Remove the two decorative screws (1) holding the angle bracket, then remove the bracket.

2. Remove the two screws (2) holding the control head panel, then remove the panel (3).

3. When the external speaker and the cable for the microphone hook ground are used, remove the shielding plate fixed with double-sided adhesive tape by pushing it with a bar from the back of the case (4).

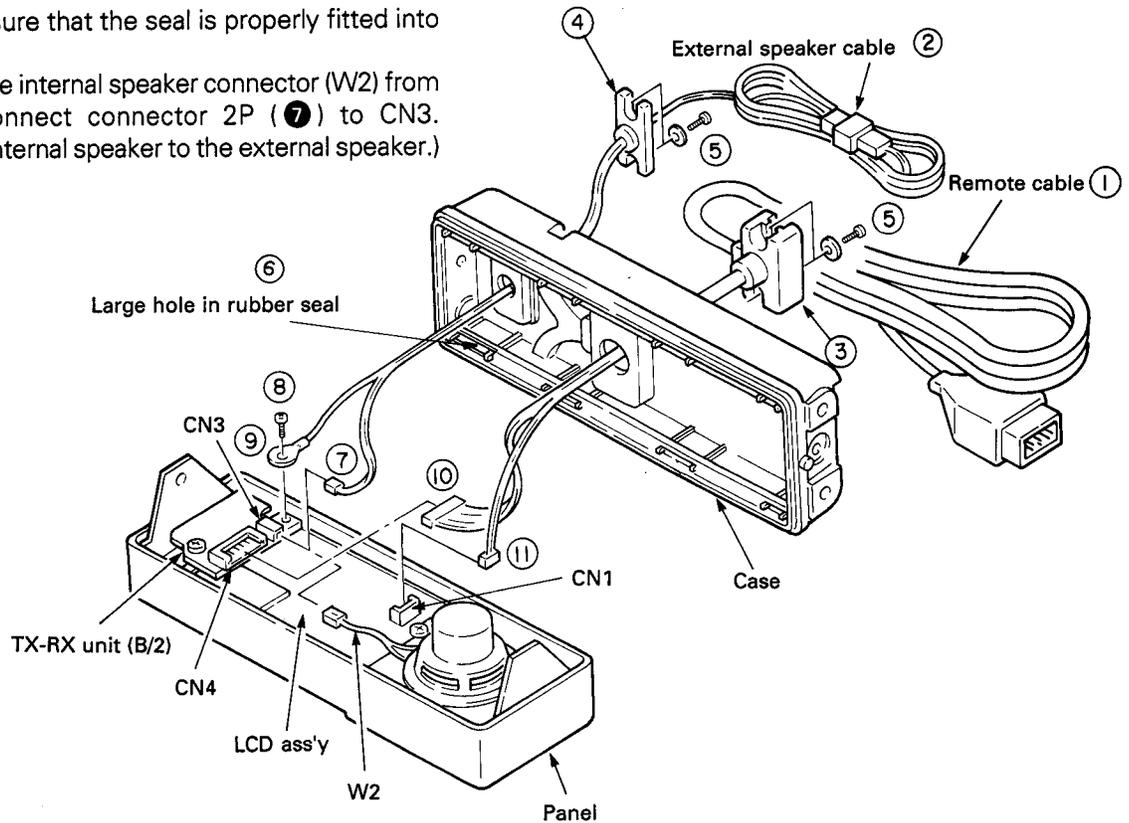


# TK-931A(D)/931A(HD)

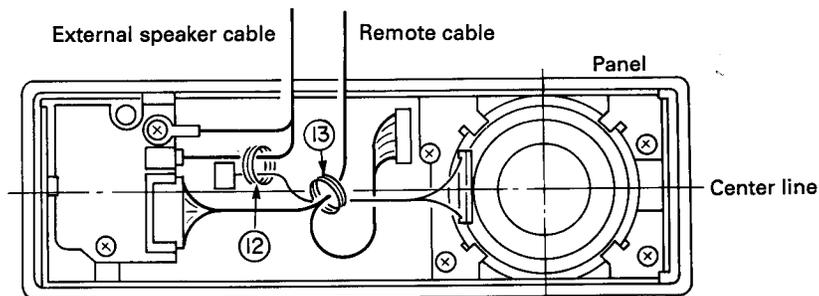
## INSTALLATION

4. Insert the remote cable (1) and external speaker cable (2) bushes (3 and 4) into the holes in the rear of the case, and secure them with the supplied screws and washers (5).  
(Example : When the external speaker cable is installed)
5. Fit the rubber seal (6) around the rim of the case with the large hole at the lower left corner of the case. Make sure that the seal is properly fitted into the groove.
6. Disconnect the internal speaker connector (W2) from CN3, and connect connector 2P (7) to CN3.  
(Change the internal speaker to the external speaker.)

7. Remove the one screw (8) holding TX-RX unit B/2, pass the screw through the round terminal (9 : microphone hook ground cable), and retighten the screw.
8. Insert remote cable connector 8P (10) into CN4 of TX-RX unit B/2, and insert remote cable connector 7P (11) into CN1 of the display unit.



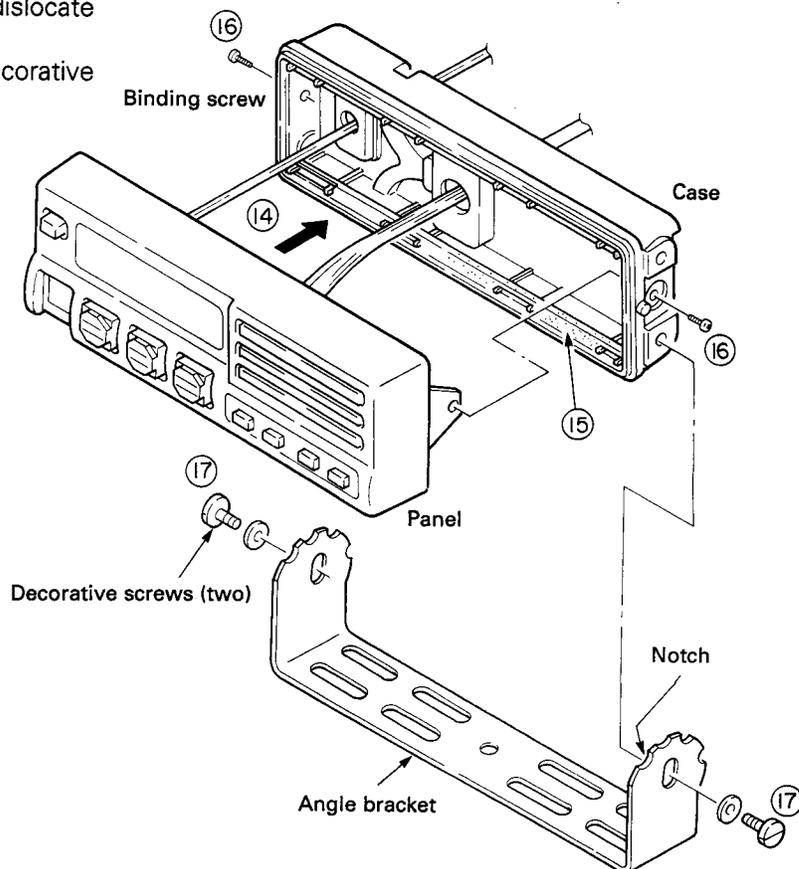
9. After inserting the connectors into the panel, secure the harness with the two supplied nylon bands (12 and 13) over the center line of the panel.



# TK-931A(D)/931A(HD)

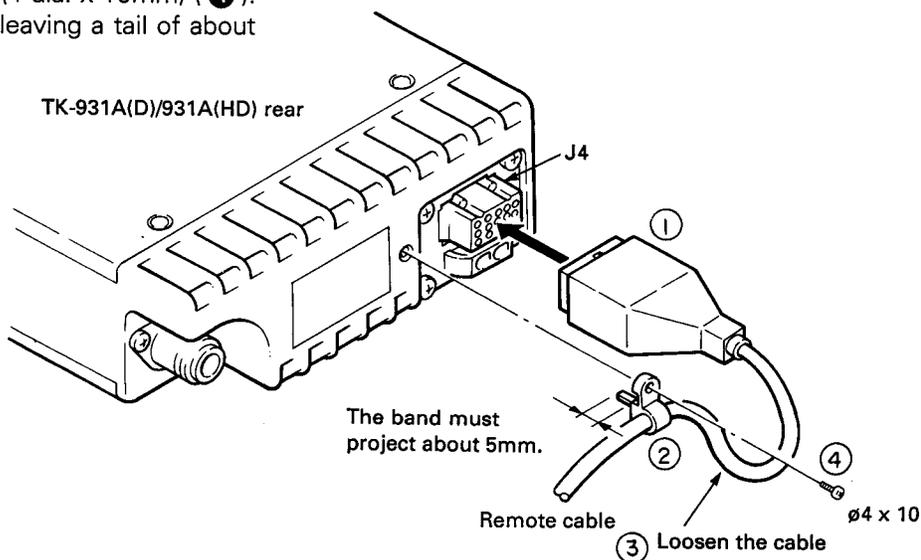
## INSTALLATION

10. Mount the panel on the case (14) and secure it with two screws (16). (Be careful not to dislocate the seal (15) when mounting the panel.)
11. Secure the angle bracket with the two decorative screws (17).



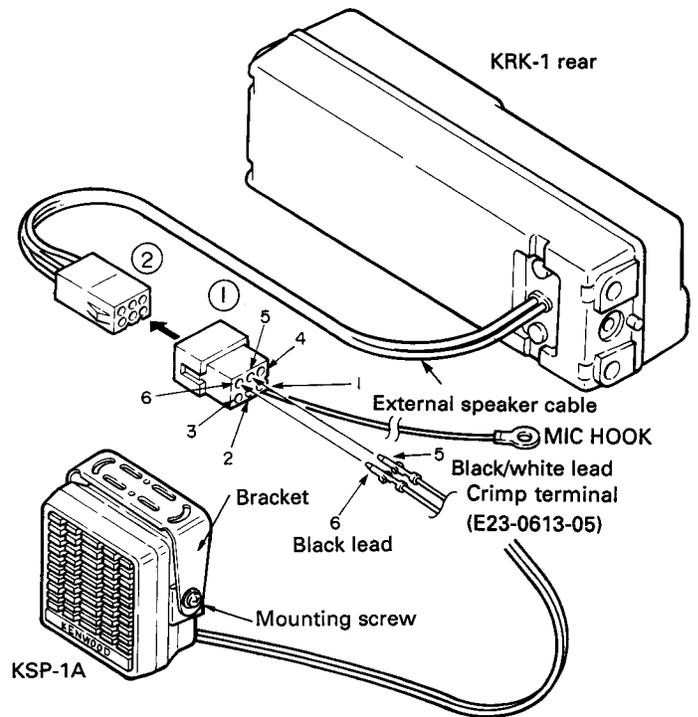
### 1-3. Connecting the TK-931A(D)/931A(HD), KRK-1, and options

1. Insert the remote cable connector (1) into the connector (J4) on the rear panel of the TK-931A(D)/931A(HD).
2. Pass the nylon band (2) around the cable. Tighten the band leaving enough room for the cable (3), and secure it with the screw (4 dia. x 10mm) (4). (Cut off the end of the band leaving a tail of about 5mm.)

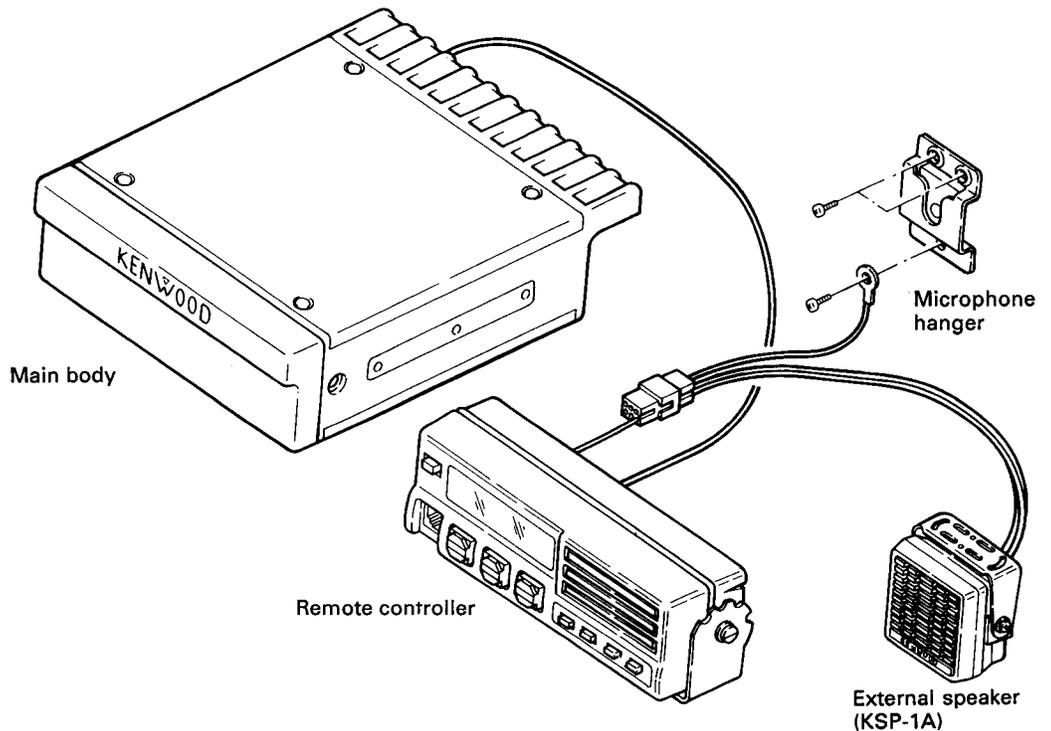


## INSTALLATION

3. Connecting the external speaker (KSP-1A : option)  
 Insert the KSP-1A leads into holes 6 and 5 of the external speaker plug ( ❶ ).  
 Hole 6 : Black lead  
 Hole 5 : Black/white lead  
 Insert the external speaker plug ( ❶ ) into the external speaker socket ( ❷ ).



4. Connection of TK-931A(D)/931A(HD) remote unit.



**Note :**

For details of the cabling to the power connector, see the TK-931A(D)/931A(HD) Instruction Manual.

# TK-931A(D)/931A(HD)

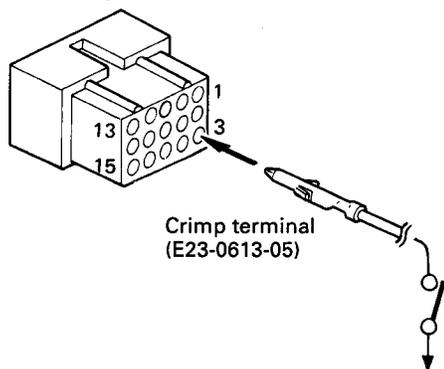
## MODIFICATION

### Modification to Turn the Power On and Off or Control the Horn (When the Horn Alert is Used) Using the Ignition Sense

#### 1. Modification method when horn honk is inhibited by ignition sense (IGS)

Connect the power supply (+B) controlled by the ignition switch to pin 3 of short plug J5 which is inserted into connector J4 on the rear of the radio.

Shot plug J5



Crimp terminal  
(E23-0613-05)

Battery (+B)  
(Power supply controlled by ignition switch)

#### • Modification method when the radio power is turned on and off by ignition sense

Remove R131 ( $0\Omega$ ) from the TX-RX unit, and add R130 ( $220k\Omega$ ). (R131 is installed at the factory.)

In this case, horn honk is always inhibited. To enable horn alert when the power is switched on, remove R125 ( $47k\Omega$ ) of the TX-RX unit.

#### 2. Modification method when horn honk is enabled when the microphone is off-hook

Remove R129 ( $22k\Omega$ ) of the TX-RX unit. (R129 is installed at the factory.)

Horn honk is usually disabled when the microphone is off-hook.

TX-RX unit (Foil side view)

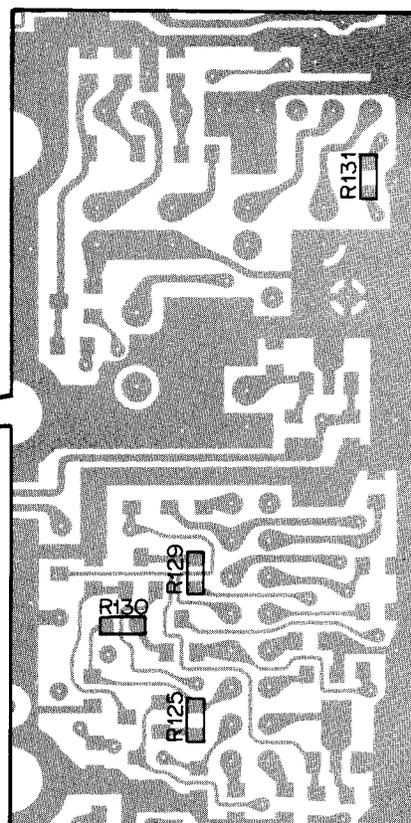
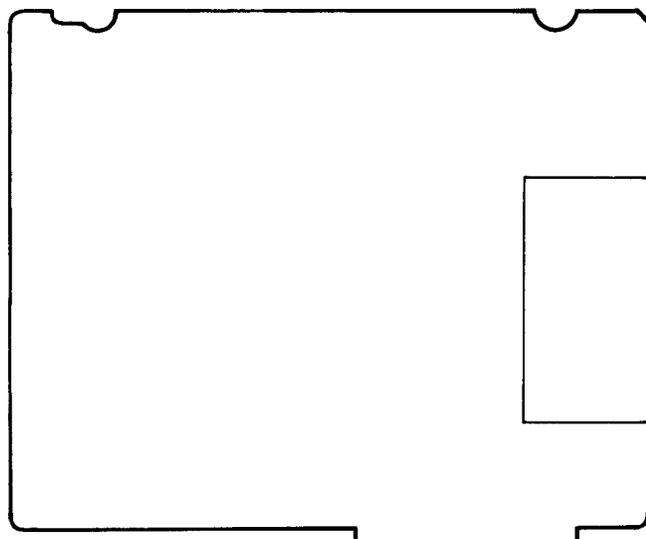


Fig. 1

## DISASSEMBLY FOR REPAIR

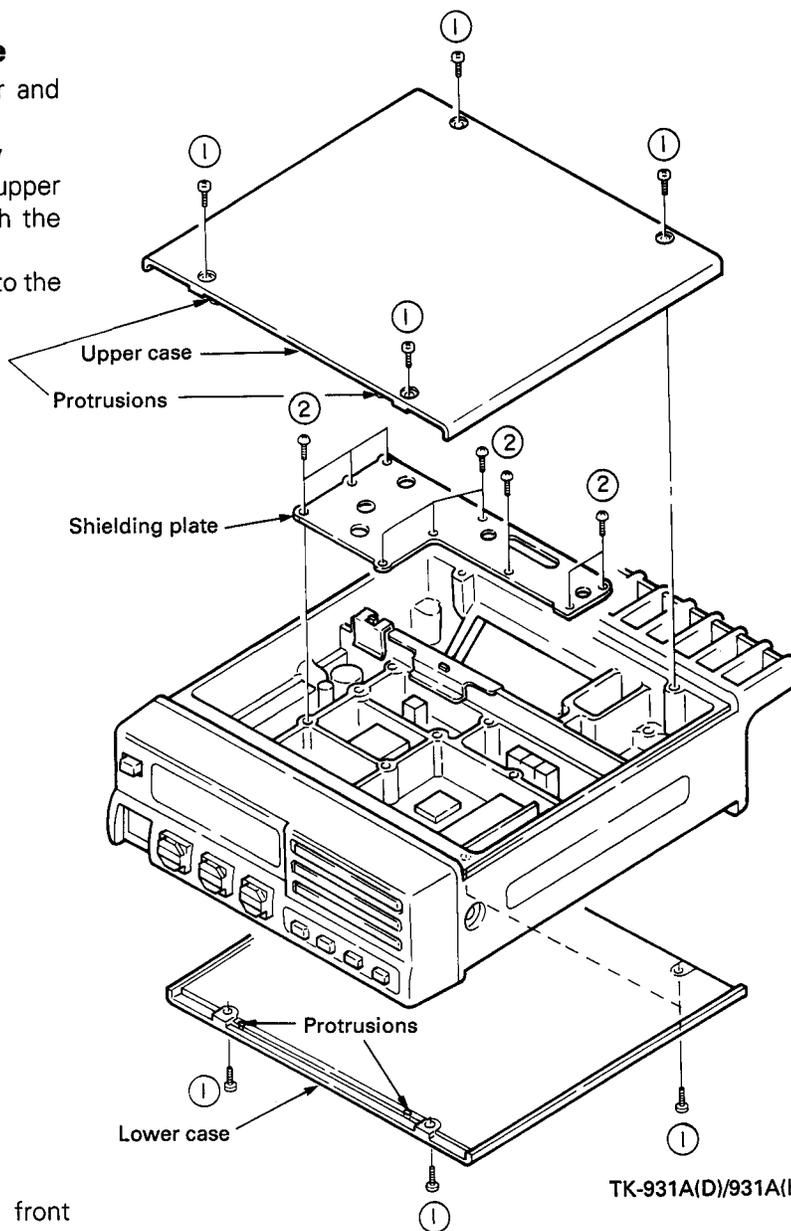
### 1. Removing the Case and Shield Plate

1. Remove the eight screws holding the upper and lower cases, then remove the cases ( ❶ ).

#### Caution on TK-931A(D)/931A(HD) assembly

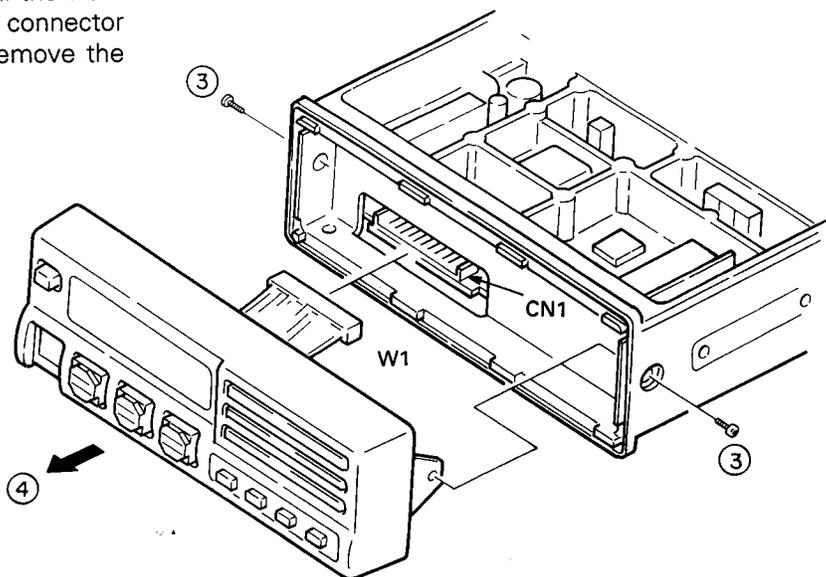
There are protrusions on the side of both the upper and lower halves of the case. Assemble with the protrusions on the front panel side.

2. Remove the 9 screws holding the shield plate to the frame, then remove the shield plate ( ❷ ).



### 2. Removing the Front Panel

1. Remove the two screws ( ❸ ) holding the front panel to the sides of the frame, and pull the front panel ( ❹ ) forward slightly. Remove the connector cable (W1) from the TX-RX unit, then remove the front panel ( ❹ ).

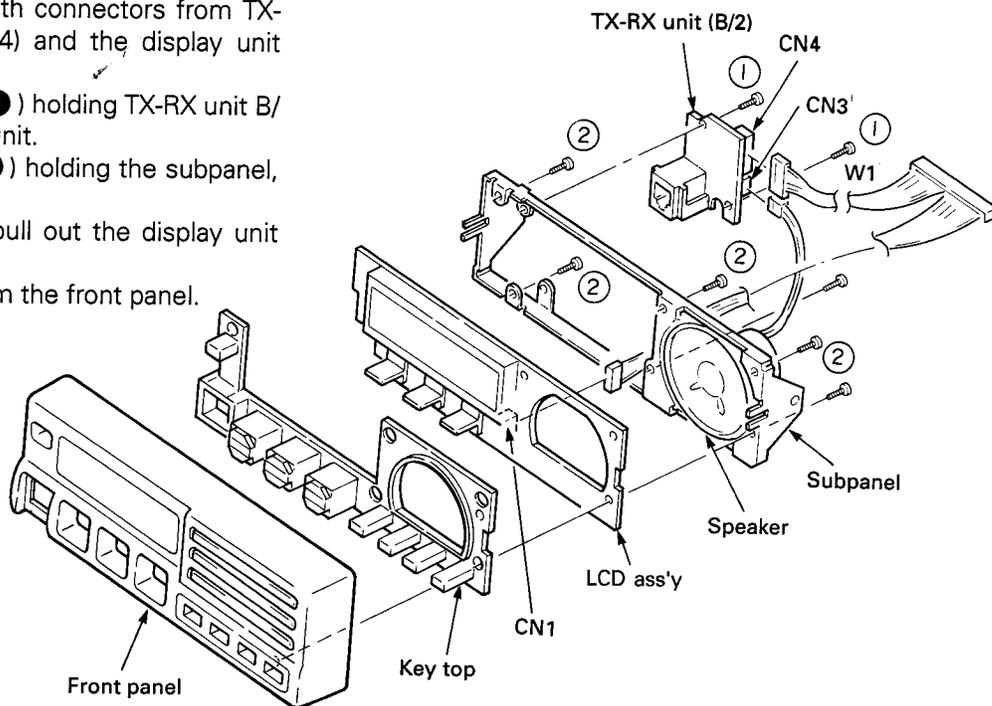


# TK-931A(D)/931A(HD)

## DISASSEMBLY FOR REPAIR

### 3. Disassembling the Front Panel

1. Remove the cable (W1) with connectors from TX-RX unit B/2 (CN3 and CN4) and the display unit (CN1).
2. Remove the two screws (1) holding TX-RX unit B/2, then remove the TX-RX unit.
3. Remove the six screws (2) holding the subpanel, then remove the subpanel.
4. Remove the speaker and pull out the display unit from the front panel.
5. Pull out the bottom tops from the front panel.



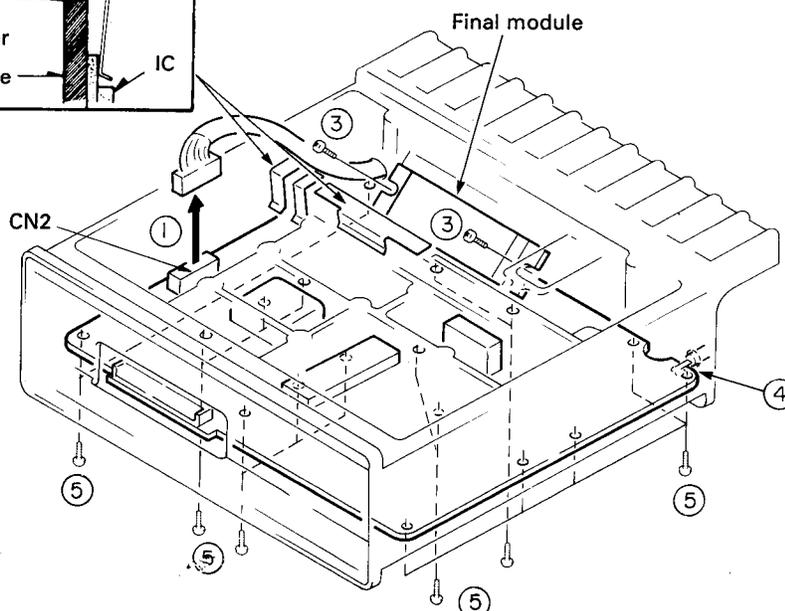
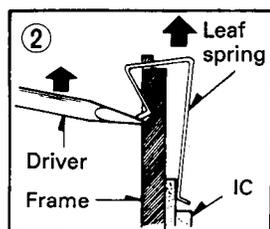
### 4. Removing the TX-RX Unit

1. Remove the cable connector (1) from CN2.
2. Remove the two leaf springs (2) holding the IC by pushing them up with a screwdriver.
3. Remove the two screws (3) holding the final module.

**Note :** To replace the final module, remove the lead soldered to the TX-RX unit.

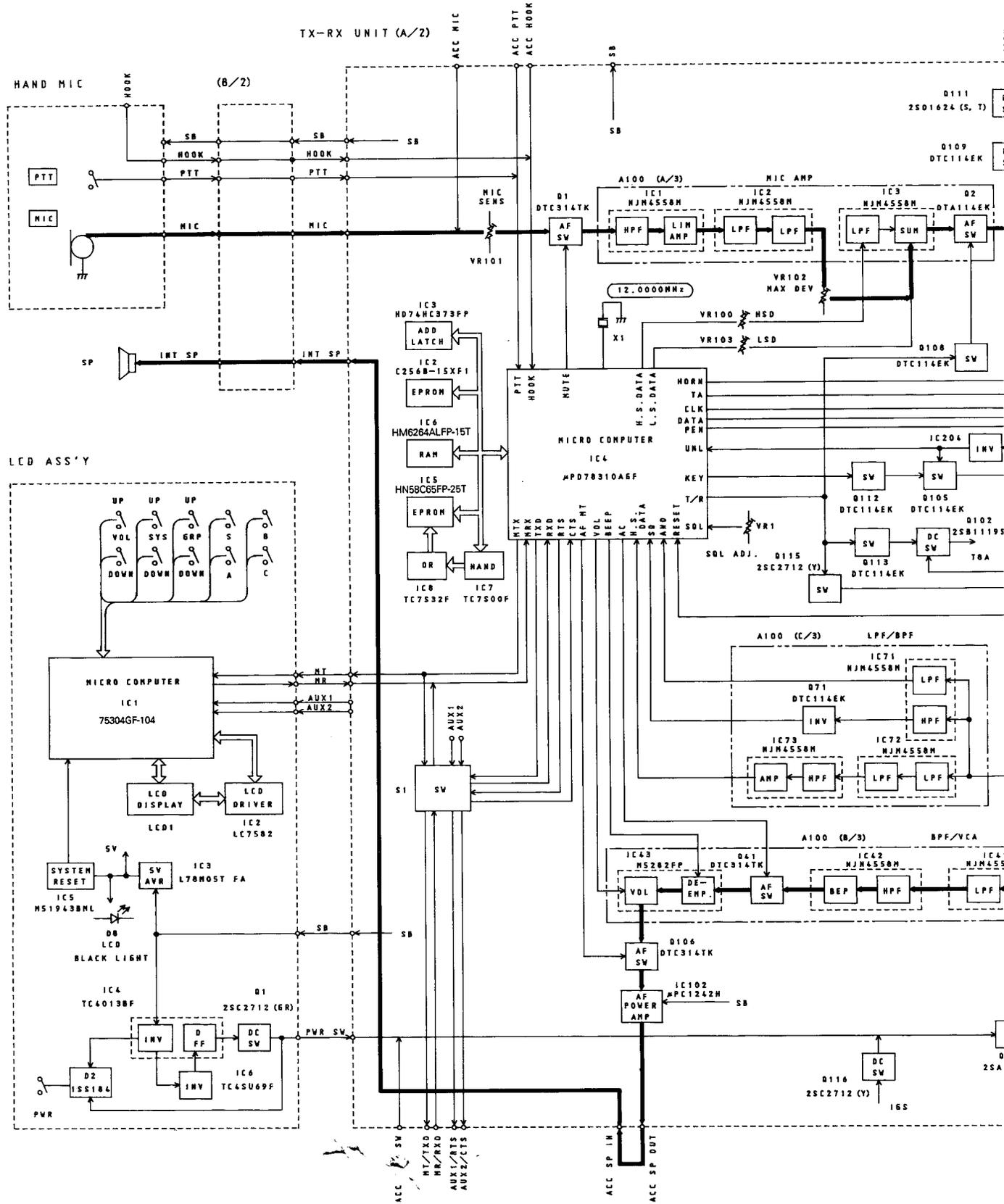
4. Remove the metal plate (4) to which the N type socket (J2) and TX-RX unit have been soldered.
5. Remove the 16 screws (5) holding the TX-RX unit, then remove the TX-RX unit.

**Notes :** For the high power model, remove the two screws holding the final transistor. To remove the TX-RX unit completely, desolder the two leads from the power connector.



# TK-931A(D)/931A(HD)

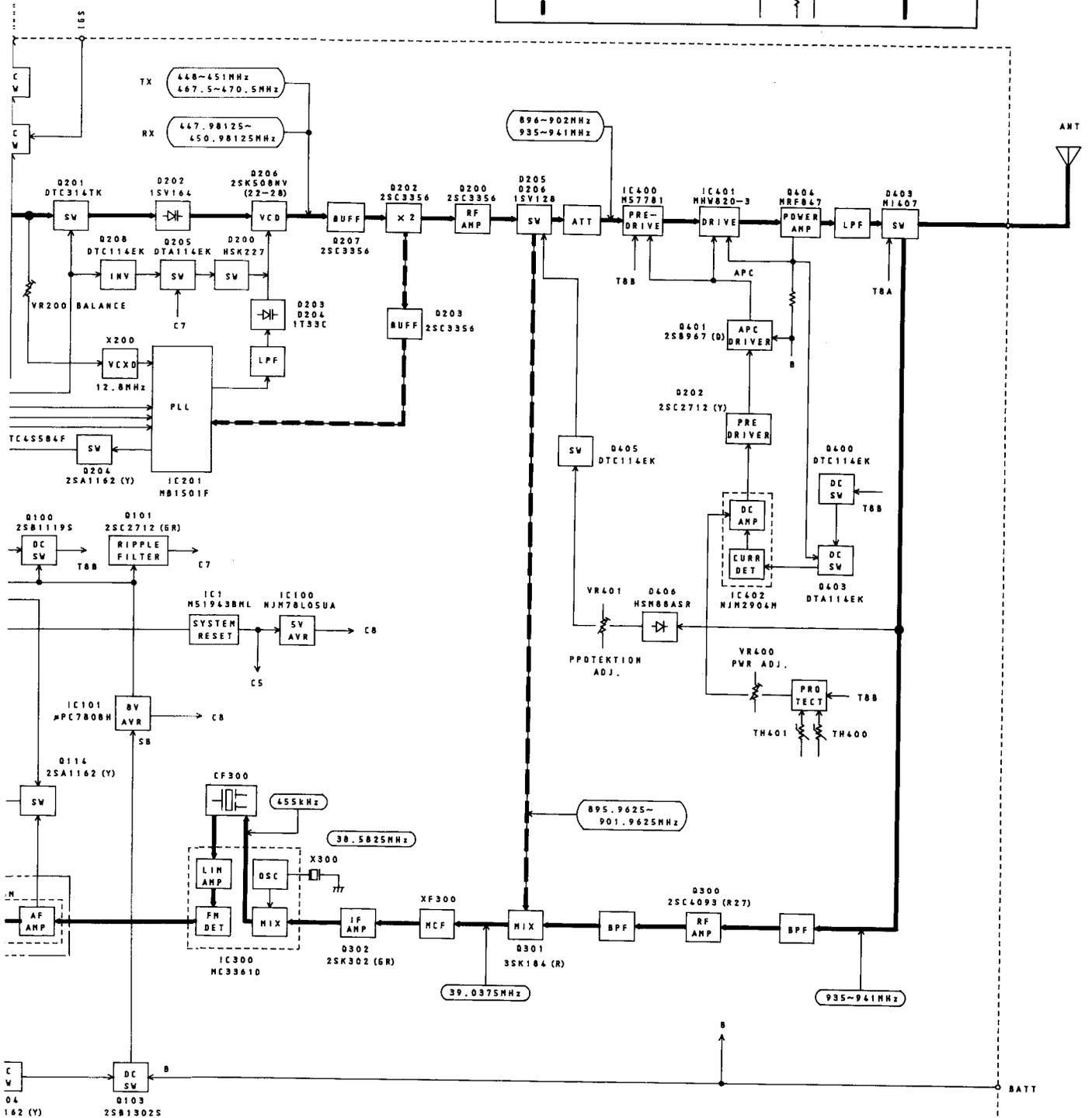
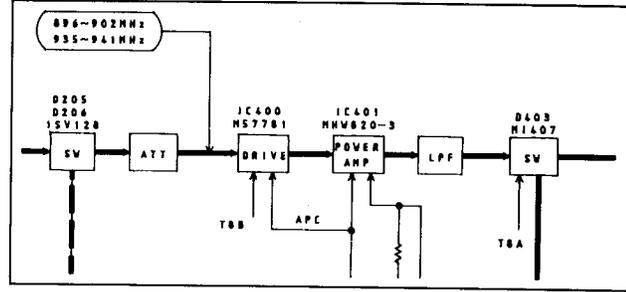
## BLOCK D



# TK-931A(D)/931A(HD)

## IAGRAM

USED TK-931A(D)

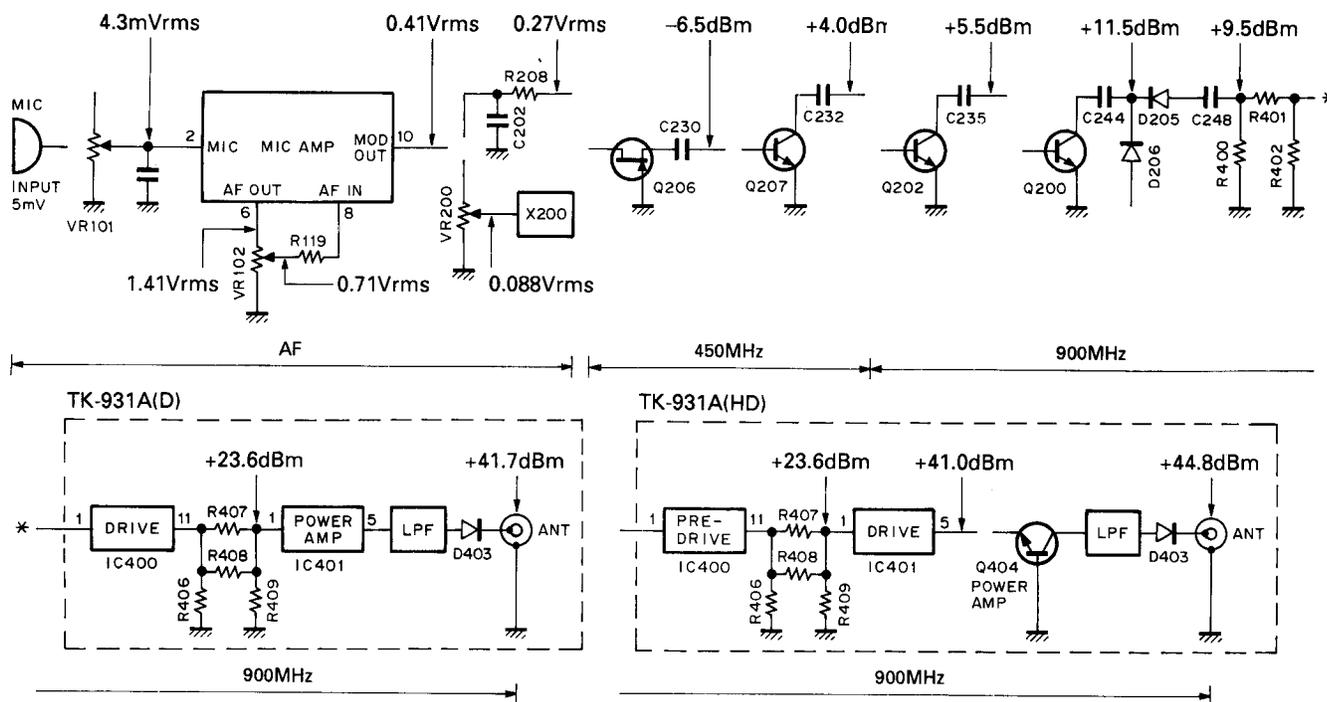


TK-931A(HD) / TK-931A(D)

# TK-931A(D)/931A(HD)

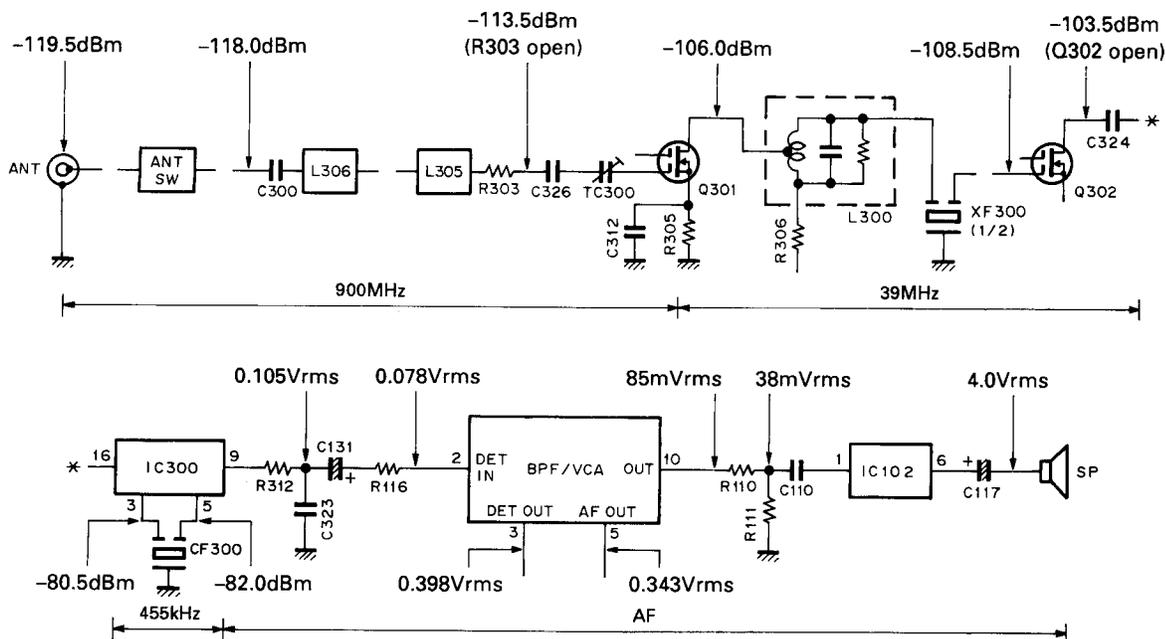
## LEVEL DIAGRAM

### TX Section



To make measurements in the AF section, connect the oscilloscope probes directly. In the RF section, use a 1000pF coupling capacitor.

### RX Section



To make measurements in the AF section, connect the oscilloscope probes directly. (ANT input : -47dBm, 1kHz FM, 1.5kHz dev.)

In the RF section, use a 1000pF coupling capacitor.

(The display shows the SSG input value required to obtain 12dB SINAD.)

# TK-931A(D)/931A(HD)

## CIRCUIT DESCRIPTION

### 1. Overview

This transceiver is an 900MHz band EFJ LTR™ - and AmeriCom- compatible FM transceiver for commercial use that can be programmed.

### 2. Circuit Configuration by Frequency

The TK-931A(D)/931A(HD) incorporates a PLL synthesizer that works with a digital VFO and allows a 12.5kHz channel step to be selected.

The receiver is a double-conversion superhetero-

dine one with a first intermediate frequency (IF) of 39.0375MHz and a second IF of 455kHz. Incoming signals from the antenna are mixed with the PLL output to produce the first IF, and this is mixed with the 38.5825MHz second local oscillator output to produce the second IF.

A transmit signal of 1/2 the desired frequency is generated by the PLL VCO, amplified, frequency doubled, and fed to the antenna.

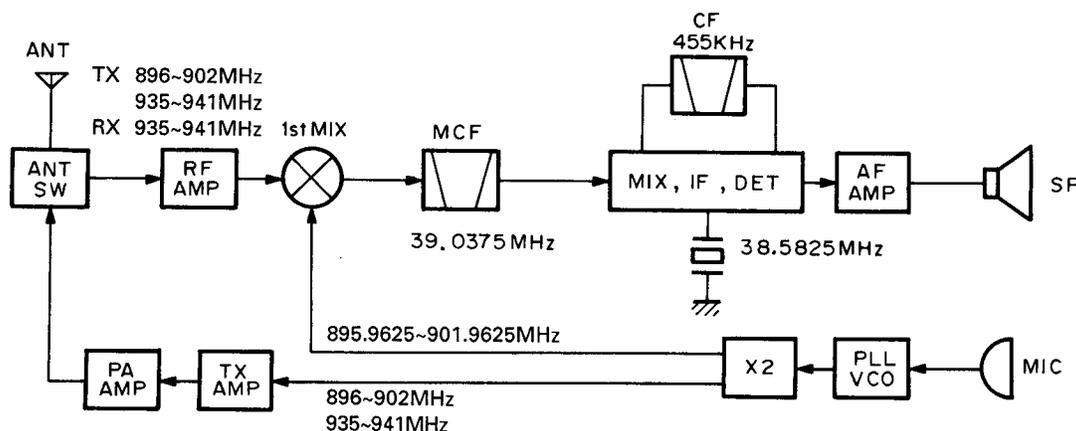


Fig. 1 Frequency configuration

### 3. Receiving System

#### 3-1. RF unit

An incoming RF signal from the antenna terminal is applied to bandpass filter (L306). Pin diode D403 is turned off. The signal is amplified by RF amplifier (Q300), and passes through the bandpass filter (L305) again. The resulting signal goes to the first mixer, Q301, where it is mixed with the first local oscillator output from the frequency synthesizer to produce the first IF (39.0375MHz).

#### 3-2. IF unit

The first IF signal then passes through a four-pole monolithic crystal filter (XF300) to limit its bandwidth. The signal is amplified by first IF amplifier Q302 and goes to the second IF unit. The second IF unit consists of IF system IC (IC300) and the second mixer, second local oscillator, IF filter, and FM detector. IC300 mixes the signal input to it with the second local oscillator

output of 39.0375MHz to produce the second IF of 455kHz. The 455kHz signal then goes through the 455kHz ceramic filter CF300, and is then amplified by the limiting amplifier, demodulated by the quadrature FM detector, and output to the receive audio amplifier.

#### 3-3. Audio amplifier unit

The demodulated signal enters the BPF/VCA (A100 (B/3)), is amplified by IC41 (1/2), and goes through a low-pass filter consisting of IC41 (2/2), which has a 3kHz cut-off frequency, a high-pass filter consisting of IC42 (1/2), which has a 300Hz cut-off frequency, and a BEP consisting of IC42 (2/2), which has a 200Hz cut-off frequency to produce an audio signal. The signal then goes through the de-emphasis and electronic volume control circuits in IC43, and on to power amplifier IC102, where it is amplified and output to the speaker.

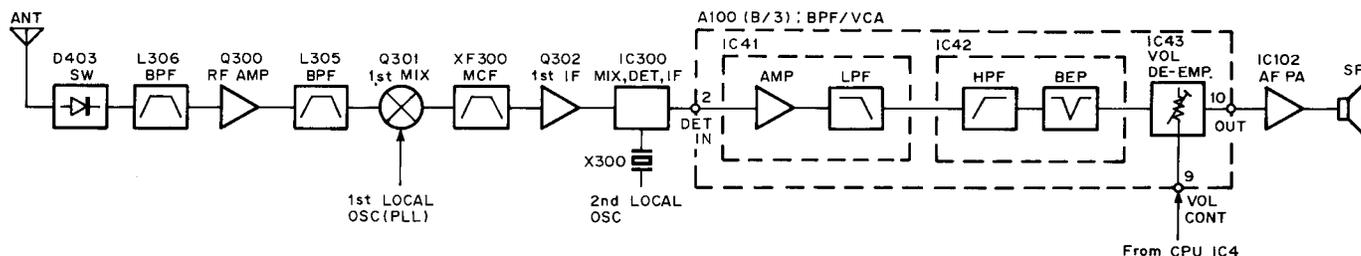


Fig. 2 Receiving system

## CIRCUIT DESCRIPTION

### 3-4. Squelch Circuit

The receive detector output is amplified by IC41 (1/2) in the BPF/VCA (A100 (B/3)), passes through Q114 (Q115, Q114 : on in receive mode), and goes to the LBF/BPF (A100 (C/3)). The signal passes through C74, and goes to the noise amplifier IC71 (2/2), which removes the noise component from the signal. Then, Q71 converts the level of the noise pulses and applies them to CPU (IC4) pin 20. IC4 counts the pulses, performs digital integration, reads the voltage across the preset squelch potentiometer (VR1) via IC4 pin 29, compares the voltage with the integration value, and turns the squelch on or off accordingly.

### 3-5. AF volume control circuit

The audio level is controlled by the DC voltage applied to pin 8 of the electronic volume IC (IC43). The voltage settings are stored in the memory of microprocessor IC4, and pulses of frequency about 23.8kHz with a duty ratio corresponding to one of the settings (32 steps) are output from the VRC pin and converted to a DC voltage by the low-pass filter consisting of R122, C161, R123, and C162.

The DC voltage is used to change the balance of the differential amplifier circuit in IC43 and change gm to attenuate.

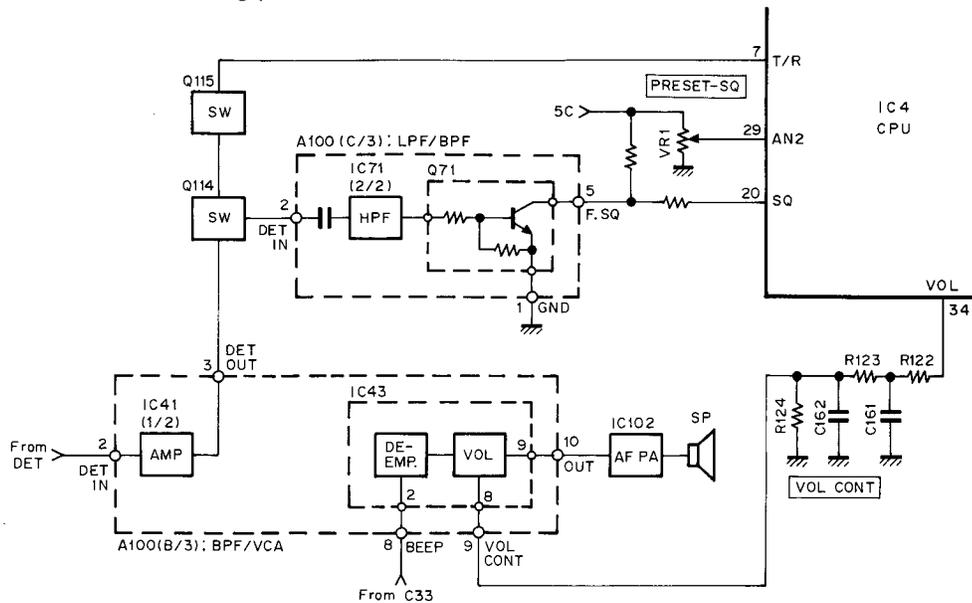


Fig. 3 Squelch and AF volume control

## 4. Transmitter System

### 4-1. Microphone amplifier

The signal from the microphone goes through the microphone gain potentiometer (VR101), enters the MIC AMP (A100 (A/3)), passes through a high-pass filter consisting of IC1 (2/2), which has a 230Hz cut-off frequency, and goes to the pre-emphasis/limiting circuit consisting of IC1 (2/2). The signal passes through a low-pass filter consisting of IC2, which has a 3.2kHz cut-off frequency, and unwanted harmonics are re-

moved. The resulting signal passes through the maximum deviation potentiometer (VR102) and is mixed with the low-speed data (LSD) encode output in the summing IC, IC3 (2/2). The output signal is switched by Q2 (Q2 on in transmit mode), and transmit mode, goes to the PLL modulator (D202) and VCXO (X200) modulation input.

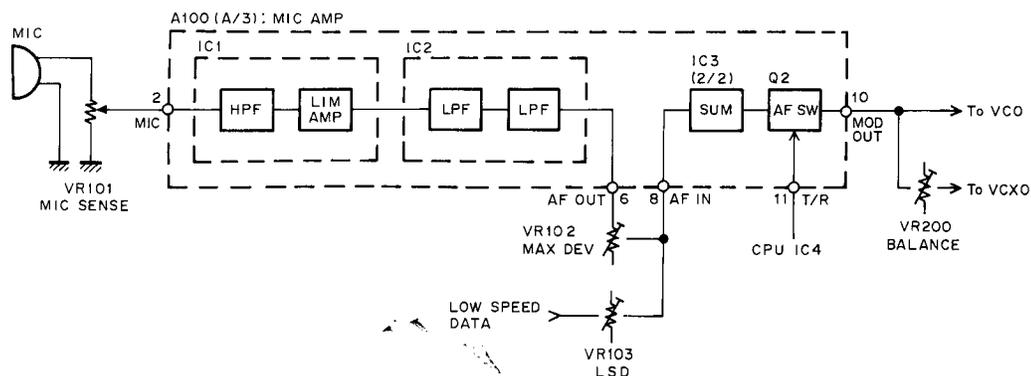


Fig. 4 Microphone amplification

# TK-931A(D)/931A(HD)

## CIRCUIT DESCRIPTION

### 4-2. Final amplifier

#### • TK-931A(D)

The signal from the PLL is amplified by the final module (IC400 and IC401) to an output level of 15W, and goes through the harmonic filter and antenna switch D403, and on to the antenna terminal.

#### • TK-931A(HD)

The signal from the PLL is amplified to an output level of 30W by the final module (IC400 and IC401) and the harmonic power amplification transistor (Q404), and goes through the harmonic filter and antenna switch D403, and on to the antenna terminal.

### 4-3. APC circuit

#### • TK-931A(D)

The direct current that flows through the final module (IC401) produces a voltage across resistors R429, R430, and R431. This voltage is applied to pin 2 of IC402 (2/2), and is input as the reference voltage difference of pin 3 and amplified.

IC402 (1/2) compares the DC input of pin 6 with the reference voltage input of pin 5, amplifies it, and controls the DC amplifier (Q402 and Q401) to keep the transmit final current constant, thus keeping the transmit output constant.

#### • TK-931A(HD)

The direct current that flows through the harmonic power transistor (Q404) and final module (IC401) produces a voltage across resistor R423. This voltage is applied to pin 2 of IC402 (2/2), and is input as the reference voltage difference of pin 3 and amplified.

IC402 (1/2) compares the DC input of pin 6 with the reference voltage input of pin 5, amplifies it, and controls the DC amplifier (Q402 and Q401) to keep the transmit final current constant, thus keeping the transmit output constant.

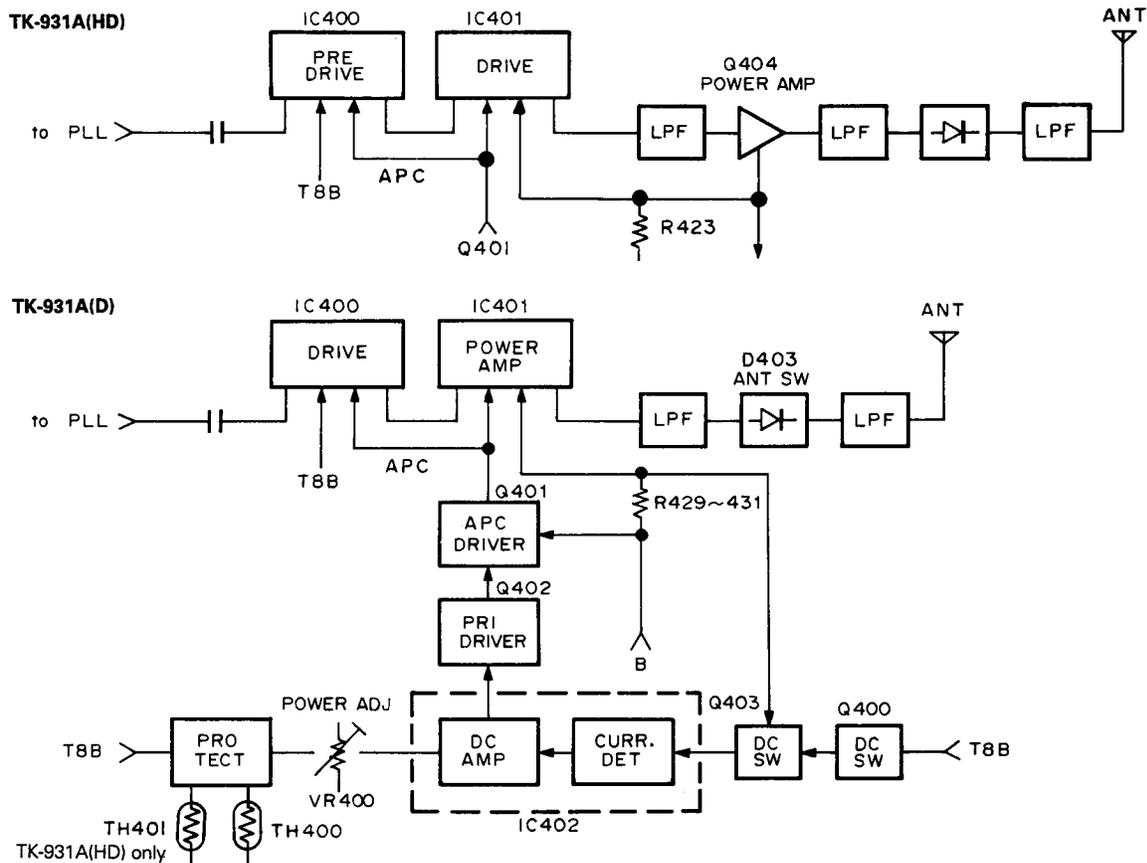


Fig. 5 Transmit power unit, APC circuit

## CIRCUIT DESCRIPTION

### 5. Frequency Synthesizer Unit

#### 5-1. PLL

The frequency synthesizer consists of VCXO (X200), and a VCO circuit, PLL circuit, and peripheral circuits.

The VCXO generates 12.8MHz. The frequency stability is within  $\pm 1.5$ ppm within the temperature range of  $-30^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ . This output enters the PLL IC (IC201), and is divided by 1024 to produce a 12.5kHz reference signal.

The VCO output from the buffer amplifier (Q207) is doubled by Q202, amplified by buffer amplifier Q203, and sent to the PLL IC (IC201). The phase of this signal is compared with the 12.5kHz reference signal in IC201. The output from the phase comparator goes

through the charge pump and low-pass filter in IC201, and on to the varactor diodes (D203 and D204) in the VCO unit, keeping the VCO frequency constant. The other output from Q202 is amplified by the RF amplifier (Q200), and output to the transmit or receive unit via the RF switch (D205 and D206).

The VCO frequency shift circuit, comprising Q205, D200, and their peripheral circuits, operates during transmission only, when the talk-around mode has been selected. The VCO frequency is doubled to 39MHz and then the transmission frequency is increased by this amount.

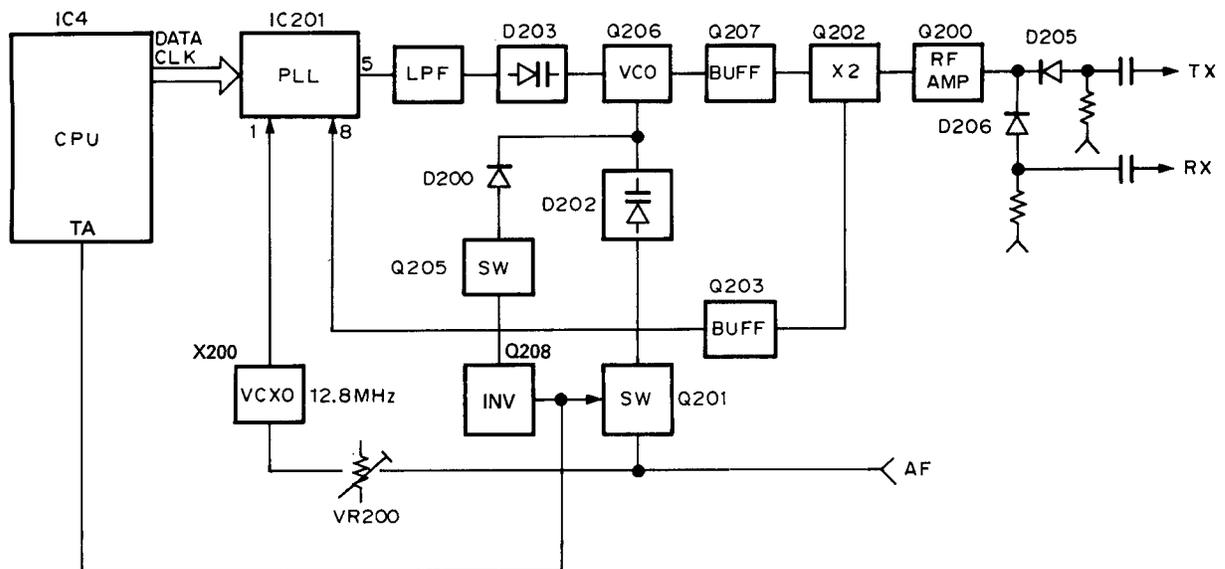


Fig. 6 PLL unit block diagram

#### 5-2. PLL unlock

When the PLL is unlocked, the lock detect signal (LD) of IC201 is converted to a DC signal by Q204 and IC204. This signal cuts off the power line (T8B) of the transmit stage with the DC switch (Q105, Q100), stopping transmission.

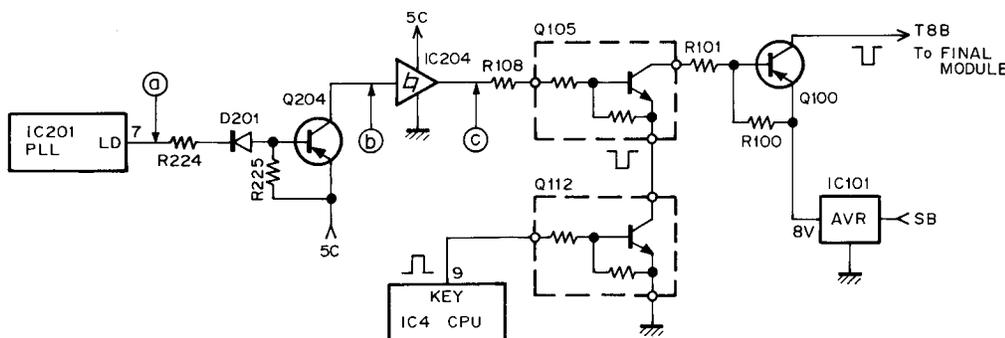
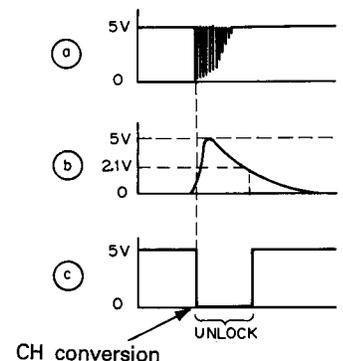


Fig. 7 PLL unlock circuit



# TK-931A(D)/931A(HD)

## CIRCUIT DESCRIPTION

### 6. Control Unit

The control unit consists of microprocessor IC4 and its peripheral circuits. It controls the TX and RX units and transfers data to and from the display assembly.

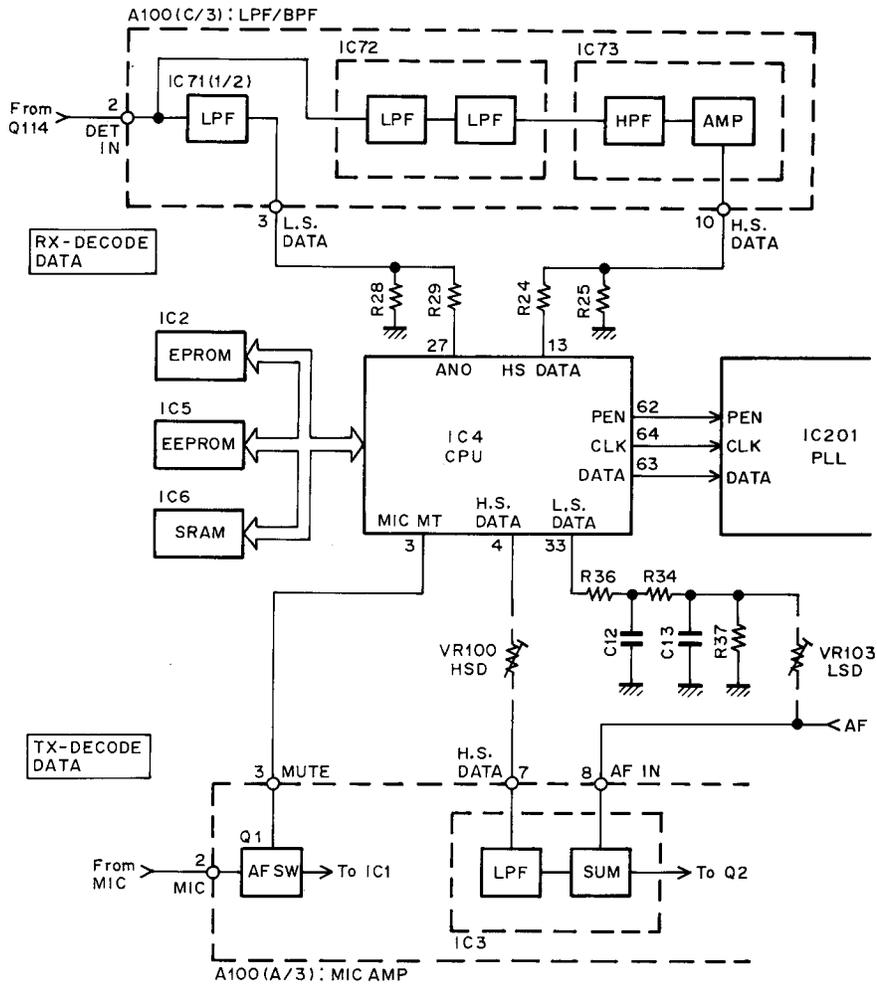


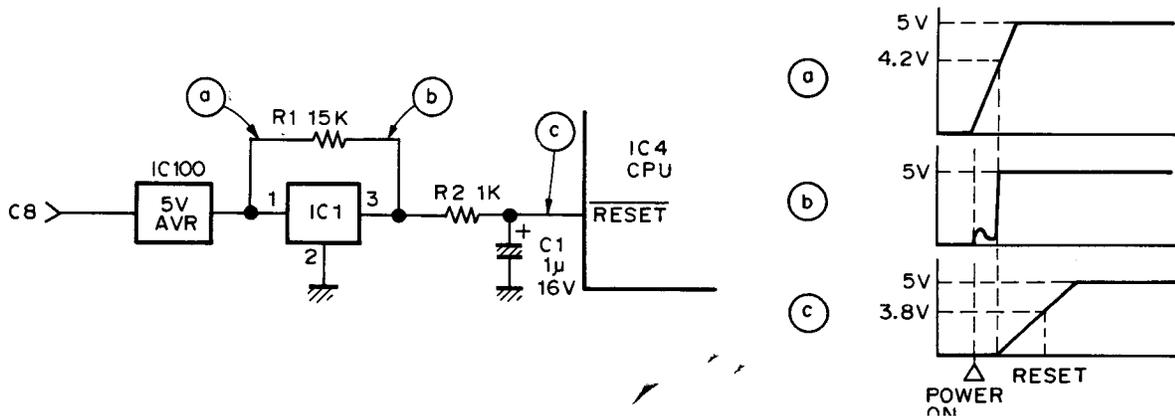
Fig. 8 Control unit block diagram

#### 6-1. Reset circuit

As the 5C line voltage (5V) rises when the power is turned on, the reset system IC (IC1) keeps the output (pin 3) at 0V until the input voltage exceeds 4.2V.

When the voltage exceeds 4.2V, the output goes

high, and the reset voltage is applied to the CPU (IC4) via the integrator consisting of R1, R2, and C1. When this voltage exceeds 3.8V, the CPU is initialized and starts up.



## CIRCUIT DESCRIPTION

### 6-2. Memory circuit

IC2 is an EPROM with a capacity of 32K x 8 bits, in which the transceiver control program is stored as part of the CPU (IC4). Data such as transceiver channels and operating features are programmed in the EEPROM, consisting of IC5. IC 6 is a static RAM used as a data buffer.

### 6-3. TX encode data

The microprocessor (IC4) transmits encode data selected by the program.

- **Low-speed data (LTR format)**

Low-speed data is output from IC4 pin 33. The signal passes through a low-pass filter consisting of R36, C12, R34, and C13, is mixed with the audio output in IC3 (2/2) in the microphone amplifier (A100 (A/3)), and transmit mode, goes to the PLL modulator (D202) and VCXO (X200) modulation input. The modulation level of the low speed data can be adjusted to an appropriate value with potentiometer VR103.

- **High speed data (AmeriCom format)**

High speed data is output from IC4 pin 4. The signal passes through a low-pass filter consisting of IC3 (1/2) in the microphone amplifier (A100 (A/3)), which has a 3.16kHz cut-off frequency, passes through IC3 (2/2), and goes to the PLL modulator (D202) and VCXO (X200) modulation input. The audio signal is switched by Q1 (Q1 : on) and muted, and only high-speed data is transmitted. The modulation level of the high-speed data can be adjusted to an appropriate value with potentiometer VR100.

### 6-4. RX decode data

- **Low-speed data (LTR format)**

The receive detection signal sent to the LPF/BPF (A100 (C/3)) goes through low-pass filter IC71 (1/2), which has a 200Hz cut-off frequency, where audio components are removed. This signal is divided by R28 and R29 and fed to CPU (IC4) pin 27. IC4 digitizes this signal, performs processing using low-pass filtering and DC restoration, and decodes the signal.

- **High-speed data (AmeriCom format)**

The receive detection signal sent to the LPF/BPF (A100 (C/3)) goes through low-pass filter IC72, which has a 3.2kHz cut-off frequency, and high-pass filter IC73 (1/2), which has a 200Hz cut-off frequency, and the waveform is rectified. This signal is divided by R24 and R25 and fed to CPU (IC4) pin 13. IC4 reads and decodes this signal.

### 6-5. PLL data output

PLL data is output from the DATA (P04), CLOCK (P05), and PLL ENABLE (P07) pins of the CPU (IC4) when the channel is changed or when transmission is changed to reception or vice versa. These signals are input to the PLL IC (IC201).

### 6-6. Tone generator

The beeps and tones used by the TK-931A(D)/931A(HD) are generated and mixed, and their frequencies (about 700Hz, 900Hz, and 1500Hz) are determined by the microprocessor (IC4). The 700Hz or 1500Hz square wave is output from the PIN33/ALT2 output pin, and the 900Hz square wave is output from the PIN35/ALT1 output pin. The signals are rectified by the network consisting of R31 to R33, C23, and C24, and fed to IC43 in BPF/VCA via C33.

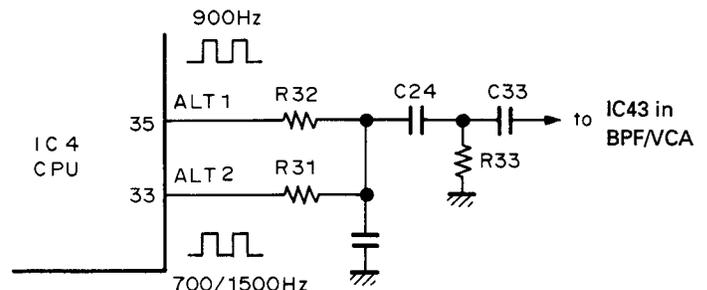


Fig. 10 Tone generator circuit

# TK-931A(D)/931A(HD)

## CIRCUIT DESCRIPTION

### 6-7. Horn control (Q109, Q111)

The horn switch, consisting of Q109 and Q111, controls the horn relay supplied by the dealer to provide the horn alert function. Normally, Q109 is on and the base of Q111 is about 0V, so Q111 is off.

If the horn alert is enabled when the ignition sense input (CN2 : IG) is off and microphone is on hook, CPU (IC4) pin 1 goes low, and Q109 turns off. As a result,

the base current flows to Q111 via R121, and Q111 turns on. The maximum sink current of Q111 is 800 mA.

**Note :** The horn relay can be controlled even if the ignition sense input (IG) is on and the microphone is off hook. (See page 18 Modification.)

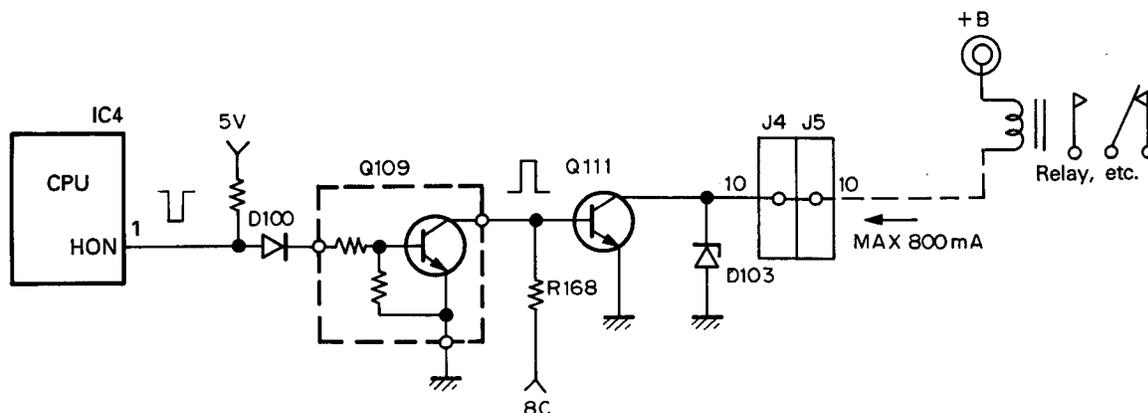


Fig. 11 Horn control circuit

### 6-8. Power switch circuit (semiconductor switch)

The power switch consists of Q103, Q104, and its peripheral circuits.

If pin 1 of CN1 connected to the LCD assembly goes low, Q104 and Q103 turn on and +B (13.6V) is supplied.

**Note :** Q104 and Q103 can be turned on by turning ignition sense input (CN2 : IG) on (Q116 : on). (See page 18 Modification.)

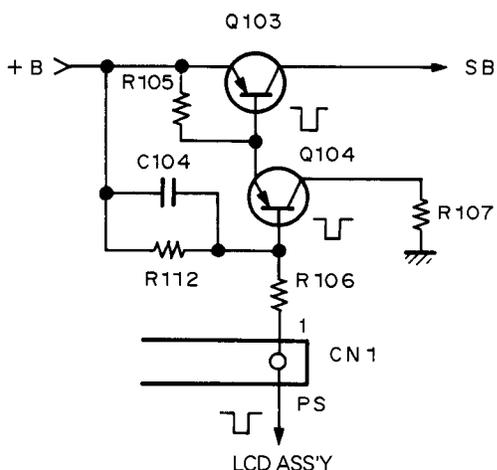


Fig. 12 Power switch circuit

### 6-9. Audio muting

Audio muting is controlled by making CPU (IC4) pin 2 and pin 59 high and turning Q106 BPF/VCA (A100 (B/3)) Q41 on. To output a beep or alert tone, Q106 turns off and Q41 turns on.

## 7. LCD assembly

The display assembly consists of the CPU, LCD, power switch circuit, and peripheral circuits.

### 7-1. CPU

The CPU (IC1) mainly does the following:

AF volume : Transmits on/off serial data from the AF volume UP/DOWN switch, system UP/DOWN switch, group UP/DOWN switch, SCAN switch, and A (AUX) switch to the TX/RX unit.

Receives serial data from the TX/RX unit and displays the data directly on the LCD. The LCD contains the system (7-segment), group (7-segment), transmission, BUSY, CALL, SCAN, and AUX indicators.

### 7-2. LCD drive

The LCD drive IC (IC2) drives the alphanumeric display, performing dynamic operation with a 1/2 duty ratio. Display data is received on PIN62/DATA, PIN61/CLK, and PIN60/CE of IC2.

### 7-3. Power switch circuit

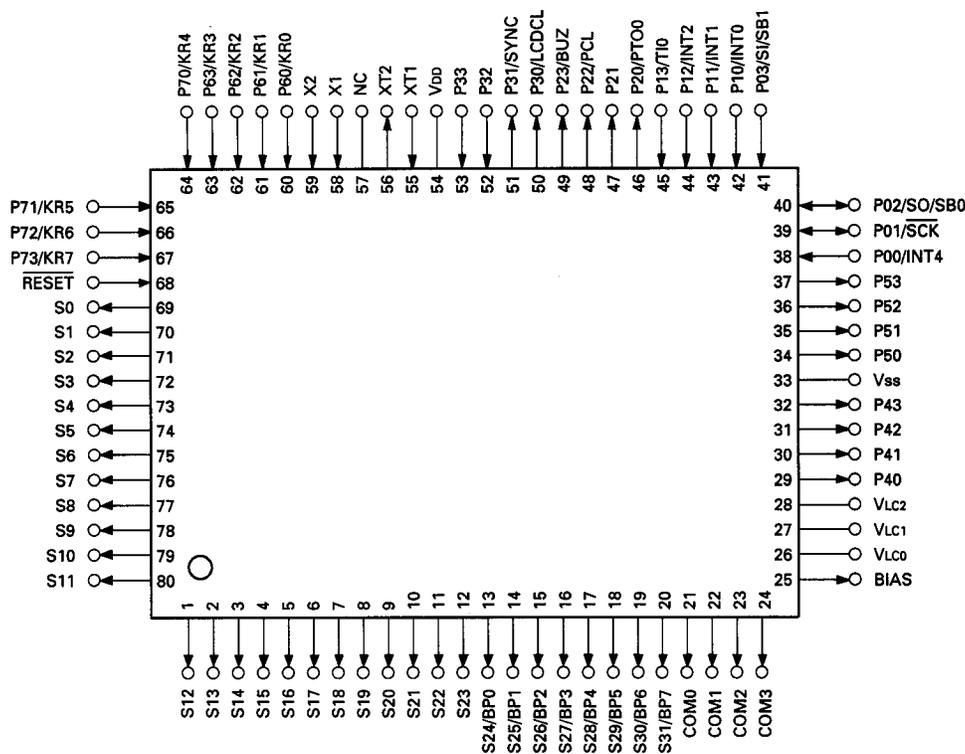
The power switch circuit consists of a D-type flip-flop (IC4), inverter (IC6), transistor (Q1), diode (D2), and peripheral circuits. It is toggled on and off by the momentary-touch power switch (SW1).

# TK-931A(D)/931A(HD)

## SEMICONDUCTOR DATA

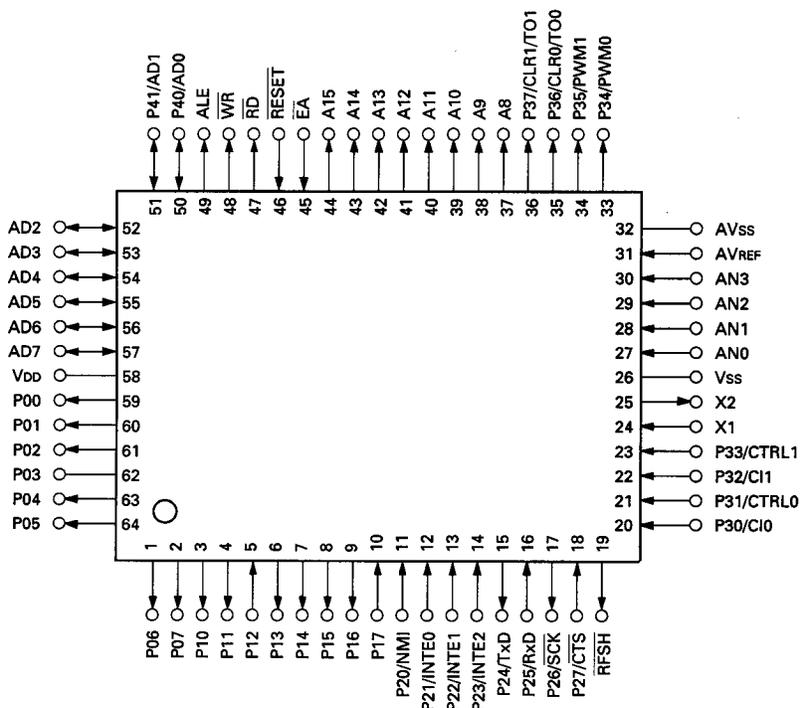
### Microprocessor : 75304GF-104 (LCD ass'y IC1)

• Terminal connection diagram



### Microprocessor : $\mu$ PD78310AGF (TX-RX unit IC4)

• Terminal connection diagram



# TK-931A(D)/931A(HD)

## SEMICONDUCTOR DATA

### • Terminal function (75304GF-104)

Terminal No.	Terminal Name	I/O	Function
1~20	S12~S31	O	Open (not use).
21	COM0	O	LCD COM2 output.
22	COM1	O	LCD COM1 output.
23	COM2	O	Open (not use).
24	COM3	O	Open (not use).
25	BIAS	O	LCD power supply voltage.
26	Vlc0	-	LCD voltage level generator.
27	Vlc1	-	LCD voltage level generator.
28	Vlc2	-	LCD voltage level generator.
29~32	P40~P43	O	Open (not use).
33	Vss	-	GND.
34~36	P50~P52	O	Open (not use).
37	P53	O	Serial data output ( $\mu$ PD78310AGF).
38	P00/INT4	I	GND.
39	P01/ $\overline{\text{SCK}}$	I/O	Open (not use).
40	P02/SO/SB0	I/O	Open (not use).
41	P03/SI/SB1	I	GND.
42	P10/INT0	I	Open (not use).
43	P11/INT1	I	Serial data input ( $\mu$ PD78310AGF).
44	P12/INT2	I	AUX1 input (Active "L").
45	P13/TI0	I	AUX2 input (Active "L").
46	P20/PTO0	O	Open (not use).
47	P21	O	Open (not use).
48	P22/PCL	O	LDC driver (LC7582) INHIBIT output (Active "L").
49	P23/BUZ	O	LCD driver (LC7582) CHIP ENABLE output (Active "H").
50	P30/LCDCL	O	LCD driver (LC7582) CLOCK output.
51	P31/SYNC	O	LCD driver (LC7582) DATA output.
52	P32	I	B SW input (Active "L").
53	P33	I	SCAN SW input (Active "L").
54	Vbd	-	+5V.
55	XT1	I	GND (not use).
56	XT2	O	Open (not use).
57	NC	-	Open.
58	X1	I	System clock input (Active "L").
59	X2	I	System clock input (Active "L").
60	P60/KR0	I	GROUP DOWN SW input (Active "L").
61	P61/KR1	I	SYSTEM DOWN SW input (Active "L").
62	P62/KR2	I	GROUP UP SW input (Active "L").
63	P63/KR3	I	A SW input (Active "L").
64	P70/KR4	I	C SW input (Active "L").
65	P71/KR5	I	VOLUME UP SW input (Active "L").
66	P72/KR6	I	SYSTEM UP SW input (Active "L").
67	P73/KR7	I	VOLUME DOWN SW input (Active "L").
68	RESET	I	System reset input.
69~79	S0~S10	O	LCD output (S1~S11).
80	S11	O	Open (not use).

## SEMICONDUCTOR DATA

• Terminal function ( $\mu$ PD78310AGF)

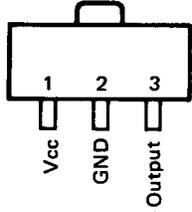
Terminal No.	Terminal Name	I/O	Function
1	P06	O	HORN control output (Active "L").
2	P07	O	AF mute output (Active "H").
3	P10	O	MIC mute output (Active "H").
4	P11	O	HIGH SPEED DATA output.
5	P12	I	EEPROM BUSY input.
6	P13	O	Talk-around control output (Active "L").
7	P14	O	T/R control output (Active "H").
8	P15	O	Open (not use).
9	P16	O	KEY control output (Active "H").
10	P17	I	PTT SW input (Active "L").
11	P20/NMI	I	GND (not use).
12	P21/INTE0	I	Serial data input (display).
13	P22/INTE1	I	HIGH SPEED DATA input.
14	P23/INTE2	I	HOOK SW input (Active "L").
15	P24/TXD	O	Serial data output (not use).
16	P25/RXD	I	Serial data input (not use).
17	P26/ $\overline{\text{SCK}}$	O	RTS output (not use).
18	P27/ $\overline{\text{CTS}}$	I	CTS input (not use).
19	RFSH	O	Open (not use).
20	P30/CI0	I	NOISE PULSE input.
21	P31/CTRL0	I	BAND SELECT input.
22	P32/CI1	I	Unlock signal input (Active "L").
23	P33/CTRL1	I	TEST MODE SELECT input (Active "L").
24	X1	I	System clock input.
25	X2	O	System clock output.
26	Vss	-	GND.
27	AN0	I	LOW SPEED DATA (signaling) input.
28	AN1	I	Open (not use).
29	AN2	I	NOISE SQ REFERENCE input.
30	AN3	I	Open (not use).
31	AVref	I	+5V.
32	AVss	-	GND.
33	P34/PWM0	O	LOW SPEED DATA output.
34	P35/PWM1	O	Volume control output.
35	P36/CTR0/TO0	O	LOW TONE output.
36	P37/CTR1/TO1	O	HIGH TONE output.
37~44	A8~A15	O	Address output (bit8~bit15).
45	$\overline{\text{EA}}$	I	EPROM access signal input (Active "L").
46	$\overline{\text{RESET}}$	I	System reset input.
47	$\overline{\text{RD}}$	O	EPROM read strobe output (Active "L").
48	$\overline{\text{WR}}$	O	SRAM write enable output (Active "L").
49	ALE	O	EPROM address latch enable output (Active "H").
50~57	AD0~AD7	I/O	Address output (bit0~bit7), data input (bit0~bit7).
58	Vdd	-	+5V.
59	P00	O	Audio mute control output (Active "H").
60	P01	O	Serial data output (display).
61	P02	O	Open (not use).
62	P03	O	PLL ENABLE output (Active "H").
63	P04	O	DATA output (PLL).
64	P05	O	CLOCK output (PLL).

# TK-931A(D)/931A(HD)

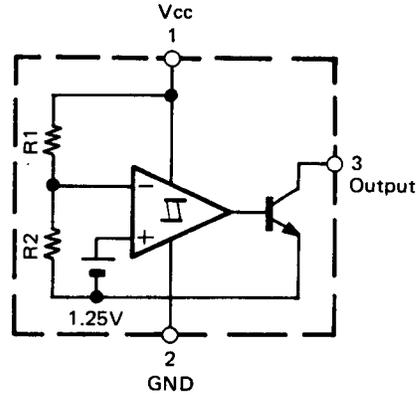
## SEMICONDUCTOR DATA

### Precision References : M51943BML (TX-RX unit IC1)

• Terminal connection diagram

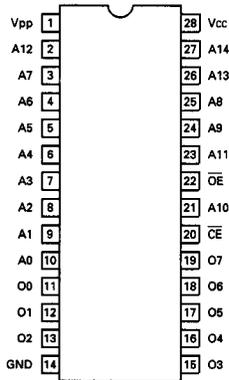


• Block diagram



### EPROM : C256B-15XF1JCL1 (TX-RX unit IC2)

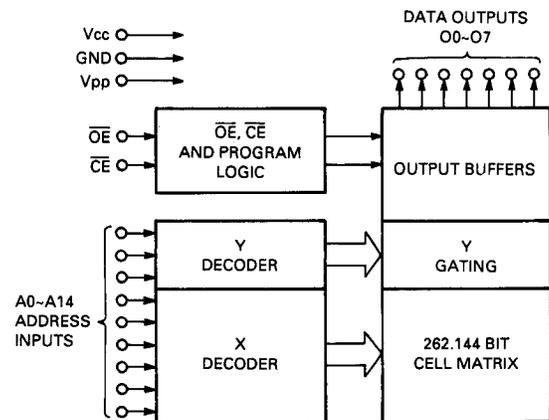
• Terminal connection diagram



• Pin functions

Pin name	Function
A0~A14	Address input
$\overline{CE}$	Chip enable input
$\overline{OE}$	Output enable
O0~O7	Data input/output

• Block diagram



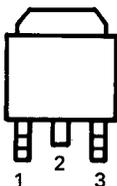
• Operation mode

MODE	PINS	$\overline{CE}$	$\overline{OE}$	A9	Vpp	OUTPUTS
READ		L	L	X	Vcc	Dout
OUTPUT DISABLE		L	H	X	Vcc	HIGH Z
STANDBY		H	X	X	Vcc	HIGH Z
PROGRAM		L	H	X	Vpp	Din
PROGRAM VERIFY		H	L	X	Vpp	Dout
PROGRAM INHIBIT		H	H	X	Vpp	HIGH Z
ELECTRONIC SIGNATURE		L	L	VH	Vcc	CODE

X: Don't care    VH: 12V±0.5V    H: High    L: Low

### DC Amplifier : 2SB967(Q) (TX-RX unit Q401)

• Terminal connection diagram



1 : Base  
2 : Collector  
3 : Emitter

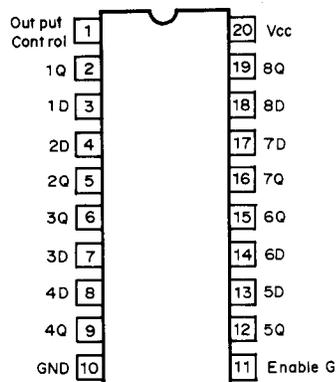
• Maximum ratings  $T_a = 25^\circ\text{C}$

Item	Symbol	Rating	Unit
Collector-base voltage	Vcbo	-27	V
Collector-emitter voltage	Vceo	-18	V
Emitter-base voltage	Vebo	-7	V
Applied collector current	Icp	-8	A
Collector current	Ic	-5	A
Collector power dissipation ( $T_c = 25^\circ\text{C}$ )	Pc	20	W
Junction temperature	Tj	150	$^\circ\text{C}$
Storage temperature range	Tstg	-55 ~ +150	$^\circ\text{C}$

## SEMICONDUCTOR DATA

### Octal Transparent Latch : HD74HC373FP (TX-RXunit IC3)

#### • Terminal connection diagram



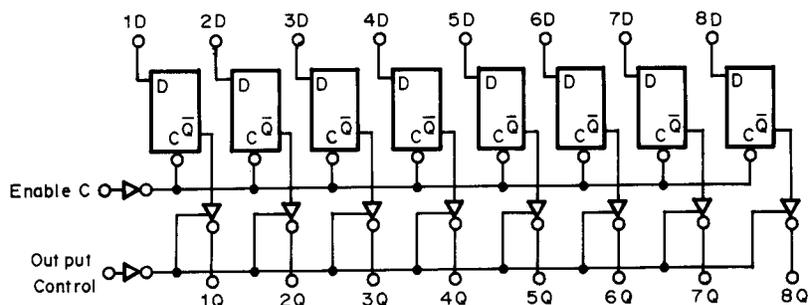
#### • Function table

Output Control	Enable G	D	Q
L	H	H	H
L	H	L	L
L	L	X	No change
H	X	X	Z

X : Don't care

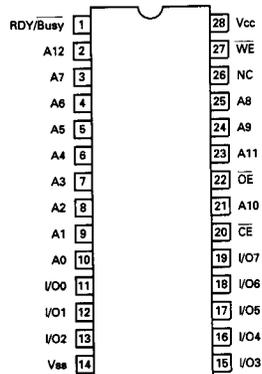
Z : High impedance

#### • Logic diagram



### EEPROM : HN58C65FP-25T (TX-RX unit IC5)

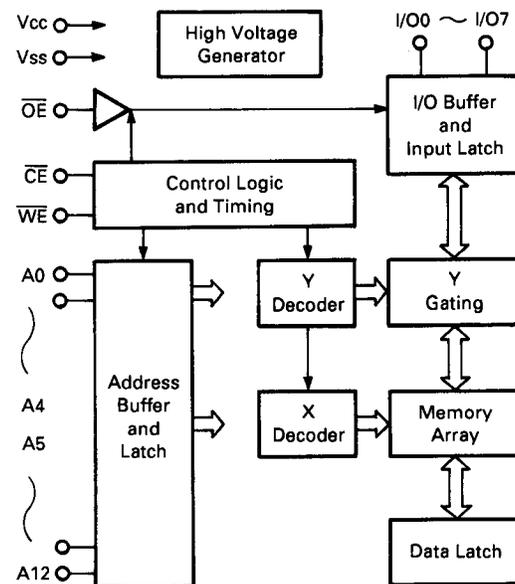
#### • Terminal connection diagram



#### • Pin functions

Pin name	Function
A0~A12	Address input
I/O0~I/O7	Data input/output
OE	Output enable
CE	Chip enable
WE	Write enable
Vcc	Power supply (+5V)
Vss	GND
NC	No connection
RDY/Busy	Ready/busy

#### • Block diagram



#### • Pin connection

Mode	Pin	CE (20)	OE (22)	WE (27)	RDY/Busy (1)	I/O (11~13, 15~19)
Read		V <sub>IL</sub>	V <sub>IL</sub>	V <sub>IH</sub>	High Z	Dout
Standby		V <sub>IH</sub>	X	X	High Z	High Z
Write		V <sub>IL</sub>	V <sub>IH</sub>	V <sub>IL</sub>	High Z → V <sub>OL</sub>	Din
Deselect		V <sub>IL</sub>	V <sub>IH</sub>	V <sub>IH</sub>	High Z	High Z
Write Inhibit		X	X	V <sub>IH</sub>	High Z	—
Write Inhibit		X	V <sub>IL</sub>	X	High Z	—
Data Polling		V <sub>IL</sub>	V <sub>IL</sub>	V <sub>IH</sub>	V <sub>OL</sub>	Data Out (I/O7)

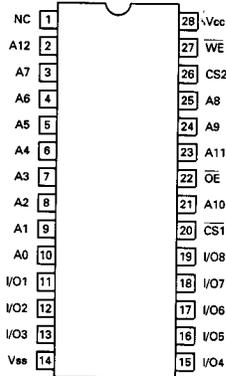
X : V<sub>IL</sub> or V<sub>IH</sub>

# TK-931A(D)/931A(HD)

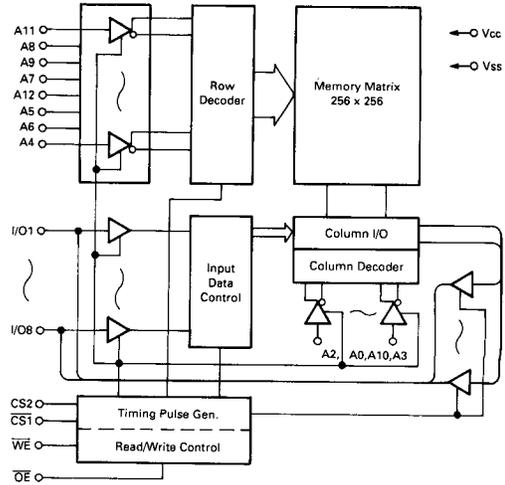
## SEMICONDUCTOR DATA

### SRAM : HM6264ALFP-15T (TX-RX unit IC6)

#### • Terminal connection diagram



#### • Block diagram



#### • Function table

WE	CS1	CS2	OE	Mode	Power current	I/O terminals	Reference cycle
X	H	X	X	Not selection (Power down)	ISB, ISB1	High impedance	
X	X	L	X		ISB, ISB1	High impedance	
H	L	H	H	Output disable	Icc	High impedance	
H	L	H	L	Read	Icc	Dout	Read cycle
L	L	H	H	Write	Icc	Din	Write cycle (1)
L	L	H	L		Icc	Din	Write cycle (2)

X : H or L

### TX Power Amplifier : MRF847 (TX-RX unit Q404) : TK-931A(HD)

#### • Maximum ratings

Item	Symbol	Rating	Unit
Collector-Emitter voltage	V <sub>CEO</sub>	16.5	V <sub>dc</sub>
Collector-Base voltage	V <sub>CB0</sub>	38	V <sub>dc</sub>
Emitter-Base voltage	V <sub>EBO</sub>	4	V <sub>dc</sub>
Collector-current - Continuous	I <sub>c</sub>	12	A <sub>dc</sub>
Total device dissipation @ Ta = 25°C	P <sub>D</sub>	150	Watts
Derate above 25°C		0.85	W/°C
Storage temperature range	T <sub>stg</sub>	-65 to +150	°C
Junction temperature	T <sub>J</sub>	200	°C
Thermal resistance, junction to case	R <sub>θJC</sub>	1.17	°C/W

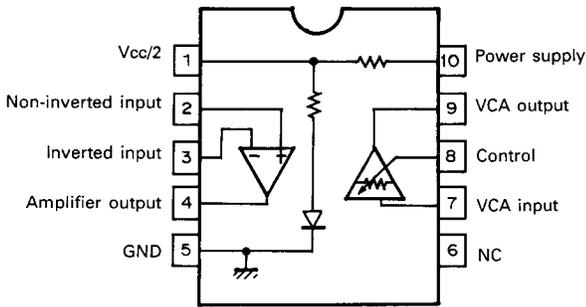
#### • Electrical characteristics T<sub>c</sub> = 25°C unless otherwise noted

Item	Symbol	Condition	Min	Typ	Max	Unit
<b>OFF characteristics</b>						
Emitter-Base breakdown voltage	V <sub>(BR)EBO</sub>	I <sub>E</sub> = 5mA <sub>dc</sub> , I <sub>C</sub> = 0	4	-	-	V <sub>dc</sub>
Collector-Emitter breakdown voltage	V <sub>(BR)CEO</sub>	I <sub>C</sub> = 50mA <sub>dc</sub> , I <sub>B</sub> = 0	16.5	-	-	V <sub>dc</sub>
Collector-Emitter breakdown voltage	V <sub>(BR)CES</sub>	I <sub>C</sub> = 50mA <sub>dc</sub> , V <sub>BE</sub> = 0	38	-	-	V <sub>dc</sub>
Collector cutoff current	I <sub>CES</sub>	V <sub>CE</sub> = 15V <sub>dc</sub> , V <sub>BE</sub> = 0	-	-	10	mA <sub>dc</sub>
<b>ON characteristics</b>						
DC current gain	h <sub>FE</sub>	I <sub>C</sub> = 2A <sub>dc</sub> , V <sub>CE</sub> = 5V <sub>dc</sub>	40	65	120	-
<b>Dynamic characteristics</b>						
Output capacitance	C <sub>ob</sub>	V <sub>CB</sub> = 12.5V <sub>dc</sub> , I <sub>E</sub> = 0, f = 1MHz	-	75	90	pF
<b>Functional tests</b>						
Common-base amplifier power gain	G <sub>PB</sub>	V <sub>cc</sub> = 12.5V <sub>dc</sub> , P <sub>out</sub> = 45W,	4.5	5.5	-	dB
Collector efficiency	η <sub>C</sub>	f = 870MHz	60	68	-	%
Load mismatch	ψ	V <sub>cc</sub> = 15.5V <sub>dc</sub> , P <sub>in</sub> = 16W, f = 870MHz VSWR = 10 : 1 all phase angles	No degradation in output power			

## SEMICONDUCTOR DATA

### Electronic Attenuator : M5282FP (BPF/VCA IC43)

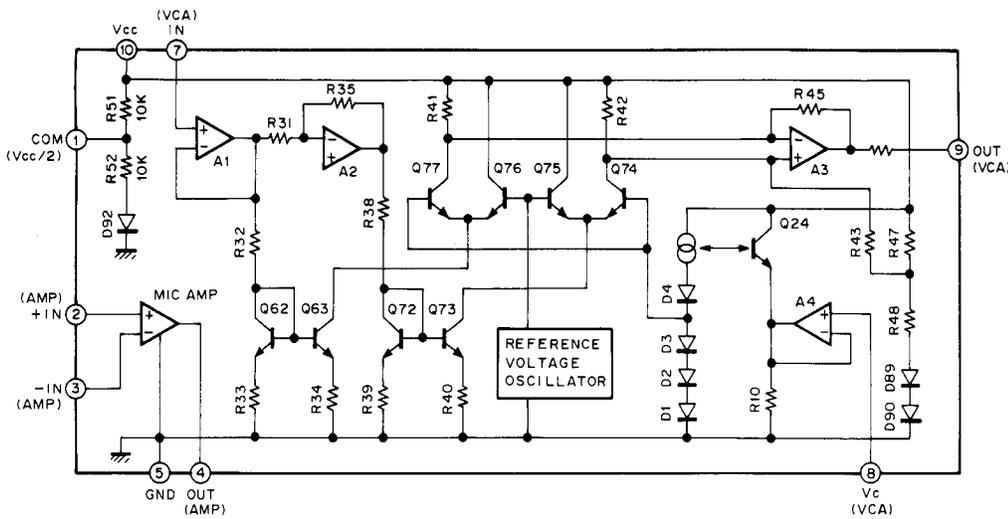
#### • Terminal connection diagram



#### • Maximum ratings

Item	Symbol	Condition	Rating	Unit
Power supply voltage	Vcc		15	V
	Pd		440	mW
	Kθ	Ta ≥ 25°C	4.40	mW/°C
Operating temperature range	Topr		-20 ~ +75	°C
Storage temperature range	Tstg		-40 ~ +125	°C

#### • Block diagram



#### • Electric volume (VCA) characteristics Vcc = 4.8V, Ta = 25°C

Item	Symbol	Condition	Rating			Unit
			MIN.	TYP.	MAX.	
Attenuation error	ATT	VC = 4.8V, VI = -10dBm, f = 1kHz	-2.0	-0.3	+2.0	dB
Maximum attenuation	ATTM	VC = 0V, VI = -10dBm, f = 1kHz	-77	-82	-	dB
Maximum input voltage	VIM	VC = 4.8V, f = 1kHz, THD = 0.2%	0.6	0.7	-	Vrms
Total harmonic distortion	THD	VC = 4.8V, VO = 0.5Vrms, f = 1kHz	-	0.06	0.20	%
Output noise voltage	VNO	VC = 4.8V, Rg = 0	-	19	50	μVrms

#### • Microphone amplifier characteristics Vcc = 4.8V, VC = 4.8V, Ta = 25°C, 40dB amp

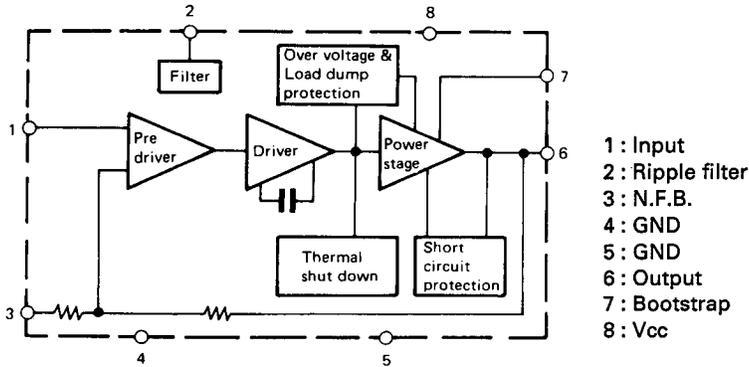
Item	Symbol	Condition	Rating			Unit
			Min	Typ	Max	
Maximum output voltage	VOM	THD = 0.2%	0.6	0.7	-	Vrms
Total harmonic distortion	THD	VO = 0.5Vrms, f = 1kHz	-	0.01	0.20	%
Input noise voltage	VIN	Rg = 1kΩ	-	0.5	1.0	μVrms

# TK-931A(D)/931A(HD)

## SEMICONDUCTOR DATA

### AF Power Amplifier : $\mu$ PC1242H (TX-RX unit IC102)

#### • Block diagram

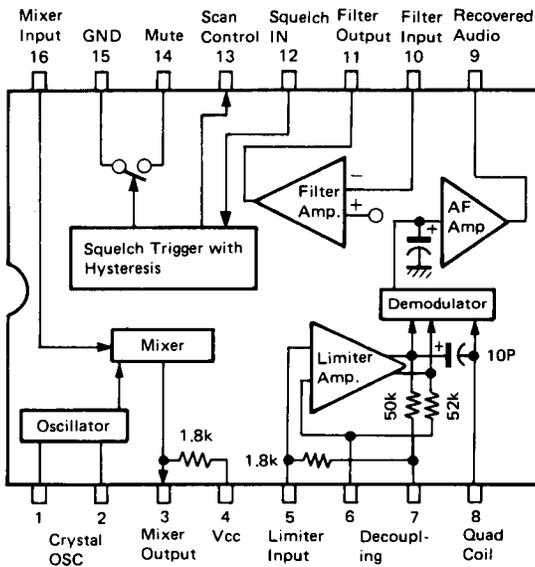


#### • Electrical characteristics $T_a = 25^\circ\text{C}$ , $V_{cc} = 13.2\text{V}$ , $f = 1\text{kHz}$ , $R_L = 4\Omega$

Item	Symbol	Condition	Rating			Unit
			Min	Typ	Max	
DC current	$I_{cc}$	$v_{in} = 0$	25	45	80	mA
Output power	$P_o$	T.H.D. = 10%	5.0	5.8	-	W
		$R_L = 2\Omega$ , T.H.D. = 10%	-	9.2	-	W
Distortion	T.H.D.	$P_o = 0.5\text{W}$	-	0.1	1.0	%
		$R_L = 2\Omega$ , $P_o = 1\text{W}$	-	0.4	-	%
Max. output power	$P_{OM}$		-	9.5	-	W
Voltage gain	$A_v$	$P_o = 0.5\text{W}$	49	51.5	54	dB
Noise output voltage	$v_n$	$R_G = 10\text{k}\Omega$	-	1.4	4.0	mVrms

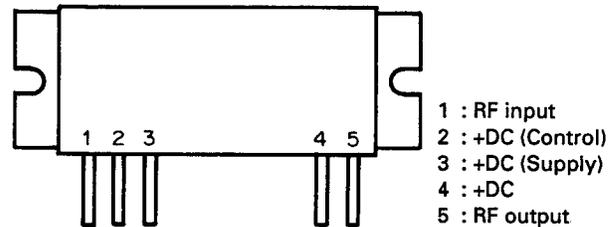
### IF System : MC3361D (TX-RX unit IC300)

#### • Block diagram



### TX Power Amplifier : MHW820-3 (TX-RX unit IC401)

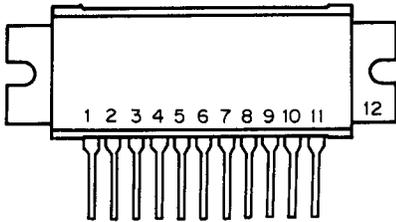
#### • Terminal connection diagram



## SEMICONDUCTOR DATA

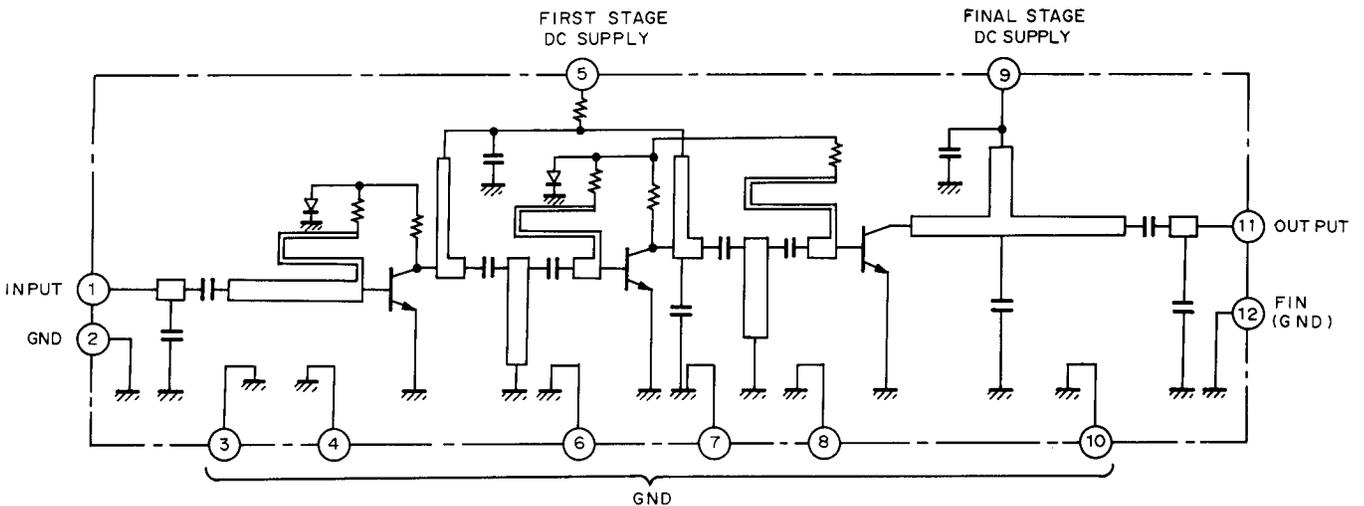
### TX Driver : M57781 (TX-RX unit IC400)

#### • Terminal connection diagram



- 1 : Input
- 2~4 : GND
- 5 : First DC supply voltage
- 6~8 : GND
- 9 : Final DC supply voltage
- 10 : GND
- 11 : Output
- 12 : Fin (GND)

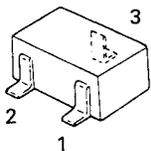
#### • Equivalent circuit



### Switching : DTC314TK

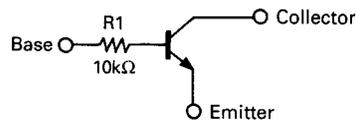
(TX-RX unit Q106, 201, MIC AMP Q1, BPF/VCA Q41)

#### • Terminal connection diagram



- 1 : Emitter
- 2 : Base
- 3 : Collector

#### • Circuit diagram



#### • Maximum ratings $T_a = 25^\circ\text{C}$

Item	Symbol	Rating	Unit
Collector-base voltage	VCBO	30	V
Collector-emitter voltage	VCEO	15	V
Emitter-base voltage	VEBO	5	V
Collector current	IC	600	mA
Collector power dissipation	Pc	200	mW
Junction temperature	Tj	125	°C
Storage temperature range	Tstg	-55 ~ +125	°C

# TK-931A(D)/931A(HD)

## DESCRIPTION OF COMPONENTS

### TX-RX UNIT (X57-3930-11) : TK-931A(D)

Ref No.	Parts No.	Use/Function	Operation/Condition/Compatibility
IC1	M51943BML	Precision references	
IC2	C256B-15XF1JCL1	EPROM	(M27)
IC3	HD74HC373FP	Octal transparent latch	
IC4	μPD78310AGF	Microprocessor	
IC5	HN58C65FP-25T	EEPROM	
IC6	HM6264ALFP-15T	SRAM	
IC7	TC7S00F	NAND	
IC8	TC7S32F	OR	
IC100	NJM78L05UA	Voltage regulator	5V
IC101	μPC7808H	Voltage regulator	8V
IC102	μPC1242H	AF power amplifier	
IC201	MB1501F	PLL system	
IC203	TC4S66F	Analog switch	
IC204	TC4S584F	Schmitt inverter	
IC300	MC3361D	IF system	
IC400	M57781	TX driver	
IC401	MHW820-3	TX power amplifier	
IC402	NJM2904M	DC amplifier	APC
Q100	2SB1119S	DC switch	T8B
Q101	2SC2712(GR)	Ripple filter	SC7
Q102	2SB1119S	DC switch	T8A
Q103	2SB1302S	DC switch	SB
Q104	2SA1162(Y)	DC switch	
Q105	DTC114EK	DC switch	
Q106	DTC314TK	Muting switch	
Q108,109	DTC114EK	DC switch	
Q111	2SD1624(S,T)	DC switch	
Q112,113	DTC114EK	DC switch	
Q114	2SA1162(Y)	Muting switch	
Q115,116	2SC2712(Y)	DC switch	
Q200	2SC3356	RF amplifier	
Q201	DTC314TK	AF switch	
Q202	2SC3356	Doubler	
Q203	2SC3356	RF amplifier	
Q204	2SA1162(Y)	DC amplifier	
Q205	DTA114EK	DC switch	
Q206	2SK508NV(52K)	Oscillator	
Q207	2SC3356	Buffer amplifier	
Q208	DTC114EK	DC switch	
Q300	2SC4093	RF amplifier	
Q301	3SK184(R)	Mixer	
Q302	2SK302(GR)	IF amplifier	
Q400	DTC114EK	DC switch	
Q401	2SB967(Q)	DC amplifier	APC
Q402	2SC2712(Y)	DC amplifier	
Q403	DTA114EK	DC switch	

# TK-931A(D)/931A(HD)

## DESCRIPTION OF COMPONENTS

Ref No.	Parts No.	Use/Function	Operation/Condition/Compatibility
D1~4	1SS226	Voltage clamp	
D5	RD5.1M-B1	Voltage clamp	
D6~9	1SS226	Voltage clamp	
D100,101	1SS184	Current steering	
D102	1SS226	Level shifter	
D103	RD20M-B1	Voltage clamp	
D104	1SS181	Current steering	
D200	HSK277	RF switch	
D201	1SS184	DC isolation	
D202	1SV164	Varactor	Modulator
D203,204	1T33C	Varactor	Tuning
D205	1SV128	RF switch	For TX
D206	1SV128	RF switch	For RX
D300	1SS184	Current steering	
D400	ERZ-M10DK220	Surge absorber	
D401	DSA3A1	Protection	Reverse polarity protection
D402	1SS184	Current steering	
D403	MI407	RF switch	
D404	MI308	RF switch	
D405	MI808	RF switch	

### TX-RX UNIT (X57-3940-11) : TK-931A(HD)

Ref No.	Parts No.	Use/Function	Operation/Condition/Compatibility
IC1	M51943BML	Precision references	
IC2	C256B-15XF1JCL1	EPROM	(M27)
IC3	HD74HC373FP	Octal transparent latch	
IC4	μPD78310AGF	Microprocessor	
IC5	HN58C65FP-25T	EEPROM	
IC6	HM6264ALFP-15T	SRAM	
IC7	TC7S00F	NAND	
IC8	TC7S32F	OR	
IC100	NJM78L05UA	Voltage regulator	5V
IC101	μPC7808H	Voltage regulator	8V
IC102	μPC1242H	AF power amplifier	
IC201	MB1501F	PLL system	
IC203	TC4S66F	Analog switch	
IC204	TC4S584F	Schmitt inverter	
IC300	MC3361D	IF system	
IC400	M57781	TX pre-driver	
IC401	MHW820-3	TX driver	
IC402	NJM2904M	DC amplifier	APC
Q100	2SB1119S	DC switch	T8B
Q101	2SC2712(GR)	Ripple filter	SC7
Q102	2SB1119S	DC switch	T8A
Q103	2SB1302S	DC switch	SB
Q104	2SA1162(Y)	DC switch	
Q105	DTC114EK	DC switch	
Q106	DTC314TK	Muting switch	
Q108,109	DTC114EK	DC switch	

# TK-931A(D)/931A(HD)

## DESCRIPTION OF COMPONENTS

Ref No.	Parts No.	Use/Function	Operation/Condition/Compatibility
Q111	2SD1624(S,T)	DC switch	
Q112,113	DTC114EK	DC switch	
Q114	2SA1162(Y)	Muting switch	
Q115,116	2SC2712(Y)	DC switch	
Q200	2SC3356	RF amplifier	
Q201	DTC314TK	AF switch	
Q202	2SC3356	Doubler	
Q203	2SC3356	RF amplifier	
Q204	2SA1162(Y)	DC amplifier	
Q205	DTA114EK	DC switch	
Q206	2SK508NV(52K)	Oscillator	
Q207	2SC3356	Buffer amplifier	
Q208	DTC114EK	DC switch	
Q300	2SC4093	RF amplifier	
Q301	3SK184(R)	Mixer	
Q302	2SK302(GR)	IF amplifier	
Q400	DTC114EK	DC switch	
Q401	2SB967(Q)	DC amplifier	APC
Q402	2SC2712(Y)	DC amplifier	
Q403	DTA114EK	DC switch	
Q404	MRF847	TX power amplifier	
Q405	DTC114EK	DC switch	
D1~4	1SS226	Voltage clamp	
D5	RD5.1M-B1	Voltage clamp	
D6~9	1SS226	Voltage clamp	
D100,101	1SS184	Current steering	
D102	1SS226	Level shifter	
D103	RD20M-B1	Voltage clamp	
D104	1SS181	Current steering	
D200	HSK277	RF switch	
D201	1SS184	DC isolation	
D202	1SV164	Varactor	Modulator
D203,204	1T33C	Varactor	Tuning
D205	1SV128	RF switch	For TX
D206	1SV128	RF switch	For RX
D300	1SS184	Current steering	
D301	HSM88ASR	Protection	
D400	ERZ-M10DK220	Surge absorber	
D401	DSA3A1	Protection	Reverse polarity protection
D402	1SS184	Current steering	
D403	UM9401	RF switch	
D404	MI308	RF switch	
D405	MI808	RF switch	
D406	HSM88ASR	Detector	
D407	1SS184	Current steering	

## DESCRIPTION OF COMPONENTS

## MIC AMP (X59-3950-10) (A/3) : TK-931A(D), TK-931A(HD)

Ref No.	Parts No.	Use/Function	Operation/Condition/Compatibility
IC1	NJM4558M	MIC amplifier/Limiter	IDC
IC2	NJM4558M	Active filter	
IC3	NJM4558M	Active filter/Summing amplifier	HS. data
Q1	DTC314TK	Muting switch	
Q2	DTA114EK	Muting switch	

## BPF/VCA (X59-3950-10) (B/3) : TK-931A(D), TK-931A(HD)

Ref No.	Parts No.	Use/Function	Operation/Condition/Compatibility
IC41	NJM4558M	Audio amplifier/Active filter	
IC42	NJM4558M	Active filter	
IC43	M5282FP	Electronic attenuator	
Q41	DTC314TK	Muting switch	

## LPF/BPF (X59-3950-10) (C/3) : TK-931A(D), TK-931A(HD)

Ref No.	Parts No.	Use/Function	Operation/Condition/Compatibility
IC71	NJM4558M	Active filter	LS. data/F. SQ
IC72,73	NJM4558M	Active filter	
Q71	DTC114EK	Noise amplifier	F. SQ

## LCD ASS'Y (B38-0332-15) : TK-931A(D), TK-931A(HD)

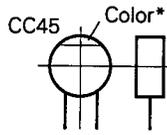
Ref No.	Parts No.	Use/Function	Operation/Condition/Compatibility
IC1	75304GF-104	Microprocessor	
IC2	LC7582	LCD driver	
IC3	L78M05T-FA	Voltage regulator	+5V
IC4	TC4013BF	D-type flip flop	
IC5	M51943BML	Precision references	
IC6	TC4SU69F	Inverter	
Q1	2SC2712(GR)	DC switch	
D1,2	1SS184	Current steering	
D3	1SS226	Voltage clamp	MRX
D4	1SS226	Voltage clamp	PTT (EXT)
D5	1SS226	Voltage clamp	MTX
D6	1SS226	Voltage clamp	HOOK (EXT)
D7	RD18M-B2	Voltage clamp	
D8	B38-0336-08	LED	Orange
LCD1	B38-0334-08	LCD	Indicator

## PARTS LIST

### CAPACITORS

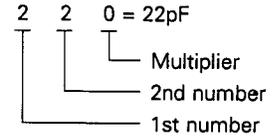
CC 45 TH 1H 220 J  
 1 2 3 4 5 6

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



#### • Capacitor value

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



#### • Temperature coefficient

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

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

Example : CC45TH = -470 ± 60ppm/°C

#### • Tolerance

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

Less than 10pF

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

#### • Voltage rating

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

#### • Chip capacitors

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

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

Refer to the table above.

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

(Chip) (B, F)

#### Dimension

Dimension code	L	W	T
Empty	5.6 ± 0.5	5.0 ± 0.5	Less than 2.0
E	3.2 ± 0.2	1.6 ± 0.2	Less than 1.25
F	2.0 ± 0.3	1.25 ± 0.2	Less than 1.25

#### Dimension

Dimension code	L	W	T	Wattage
E	3.2 ± 0.2	1.6 ± 0.2	0.57	2B
F	2.0 ± 0.3	1.25 ± 0.2	0.45	2A

### RESISTORS

#### • Chip resistor (Carbon)

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

(Chip) (B, F)

#### • Carbon resistor (Normal type)

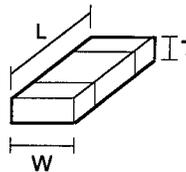
(EX) R D 1 4 B B 2 C 0 0 0 J  
 1 2 3 4 5 6 7

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

#### Rating wattage

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

#### Dimension



# TK-931A(D)/931A(HD)

## PARTS LIST

× New Parts

Parts without Parts No. are not supplied.

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

Teile ohne Parts No. werden nicht geliefert.

TK-931A(D)/931A(HD)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕 向	Re- marks 備考
<b>TK-931A(D)/931A(HD)</b>						
1	1B, 3B		A01-2003-22	METALLIC CABINET	HK K	
2	1A		A10-1313-01	FRAME		
2	2B		A10-1314-01	FRAME		
3	2A		A22-0771-02	SUB PANEL		
4	3A		A62-0014-03	PANEL ASSY		
5	3A	*	A62-0130-04	DRESSING PLATE		
7	3A		B38-0332-15	LCD ASSY (FULL FUNCTION)	K HK	
8	2B		B42-2455-04	LABEL (M4X8 MAX)		
9	2B		B42-3394-14	LABEL		
10			B46-0409-30	WARRANTY CARD		
11		*	B62-0192-00	INSTRUCTION MANUAL		
12	2B	*	B72-0310-04	MODEL NAME PLATE		
12	2B	*	B72-0311-04	MODEL NAME PLATE		
J2	2B		E04-0170-05	RF COAXIAL CABLE RECEPTACLE		
13			E30-2036-05	GROUND LEAD WIRE		
14			E30-2076-05	DC CORD		
J5	1B		E30-2089-08	CURL CORD (FOR MIC)		
			E31-3228-05	SHORT PLUG (ACCESSORY)		
16	2A		E37-0001-05	CONNECTING WIRE (DC CABLE:2P)	K HK	
17	2A		E37-0002-05	CONNECTING WIRE (ACCESSORY)		
			E37-0003-15	CONNECTING WIRE (TX-RX-DISPLAY)		
			E37-0004-05	CONNECTING WIRE (SPEAKER:2P)		
21	3B		F10-1440-33	SHIELDING COVER(LOWER)	K HK	
22	1B		F10-1441-14	SHIELDING COVER(UPPER)		
23	3B		F10-1476-04	SHIELDING PLATE(FINAL)		
24			F51-0016-05	FUSE (10A)		
24			F51-0017-05	FUSE (15A)		
25	2B		G02-0597-04	LEAF SPRING (MODULE)	K	
26	2B		G02-0711-04	LEAF SPRING		
27	1B, 3B		G53-0594-14	FELT (CASE)		
28	2B		G53-0595-13	RUBBER SEAL (FRONT-FRONT PANEL)		
29	2B		G53-0598-04	RUBBER SEAL (ACCESSORY)		
31			H10-2694-02	POLYTYRENE FOAMED FIXTURE	K	
32			H11-0838-04	PACKING FIXTURE		
33			H11-0839-04	BUFFER		
34			H25-0103-04	PROTECTION BAG		
35			H25-0747-04	PROTECTION BAG (RADIO)		
36		*	H52-0208-04	ITEM CARTON BOX		
40			J19-1376-15	MIC HANGER	K	
42	2A		J21-4305-04	MOUNTING HARDWARE (ACCESSORY)		
43			J29-0418-03	BRACKET		
44	2B		J69-0324-05	Ø RING (ANT)		
45	3A		J90-0406-04	KEY TOP GUIDE		
47	3A	*	K29-4732-03	KEY TOP		
A	2B		N09-0626-04	SCREW(Q404)	HK	
C	2A		N09-2077-05	SCREW(POWER MODULE)		
D	1B, 3B		N35-2606-46	BINDING HEAD MACHINE SCREW		
E	2B		N35-3008-45	BINDING HEAD MACHINE SCREW		
F	2A, 2B		N82-2610-46	SCREW (M2.6X10 SUB PANEL)		

L:Scandinavia

K:USA

P:Canada

Y:PX(Far East, Hawaii)

T:England

E:Europe

Y:AAFES(Europe)

X:Australia

M:Other Areas

K :TK-931A(D) K

HK :TK-931A(HD) K

 indicates safety critical components.

# TK-931A(D)/931A(HD)

## PARTS LIST

× New Parts

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TK-931A(D)/931A(HD)

TX-RX UNIT (X57-3930-11) : TK-931A(D)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
G	1B		N87-3005-46	BRAZIER HEAD TAPTITE SCREW		
H	3B		N87-3008-46	BRAZIER HEAD TAPTITE SCREW		
J	3B		N87-3010-46	BRAZIER HEAD TAPTITE SCREW		
K	1A, 3B		N89-3008-45	BINDING HEAD TAPTITE SCREW		
50			N99-0321-05	SCREW SET		
52	3A		T07-0265-05	SPEAKER (45W/8 OHM)		
53			T91-0362-15	MICROPHONE (WITH CORD)		
55	2A, 3B	*	X57-3930-11	TX·RX UNIT	K	
55	2A, 3B	*	X57-3940-11	TX·RX UNIT	HK	
<b>TX-RX UNIT (X57-3930-11) : TK-931A(D)</b>						
C1			C92-0004-05	ELECTRO	1.0UF	16WV
C2 -5			CK73FB1E103K	CHIP C	0.01UF	K
C6			CS15E1A470M	TANTAL	47UF	10WV
C7			CK73FB1E103K	CHIP C	0.01UF	K
C8 -11			CC73FSL1H101J	CHIP C	100PF	J
C12			CK73FB1H472K	CHIP C	4700PF	K
C13			CK73FB1E103K	CHIP C	0.01UF	K
C14			CC73FSL1H101J	CHIP C	100PF	J
C16			CE04EW1C470M	ELECTRO	47UF	16WV
C18			CC73FSL1H101J	CHIP C	100PF	J
C19 ,20			CC73FCH1H100D	CHIP C	10PF	D
C21			CC73FSL1H101J	CHIP C	100PF	J
C23 ,24			CK73FB1E223K	CHIP C	0.022UF	K
C25 -32			CC73FSL1H101J	CHIP C	100PF	J
C33			CK73FB1E103K	CHIP C	0.01UF	K
C34 -38			CC73FSL1H101J	CHIP C	100PF	J
C39			CC73FSL1H101J	CHIP C	100PF	J
C100			CE04EW1C470M	ELECTRO	47UF	16WV
C101-103			CK73FB1E103K	CHIP C	0.01UF	K
C104			CE04EW1C470M	ELECTRO	47UF	16WV
C105,106			CK73FB1E103K	CHIP C	0.01UF	K
C107,108			CE04EW1C470M	ELECTRO	47UF	16WV
C109			CK73EB1H104K	CHIP C	0.10UF	K
C110			CK73EF1C105Z	CHIP C	1.0UF	Z
C111			CK73FB1E103K	CHIP C	0.01UF	K
C112			CE04EW1C470M	ELECTRO	47UF	16WV
C113			CC73FSL1H101J	CHIP C	100PF	J
C114			CE04EW1C470M	ELECTRO	47UF	16WV
C115			CK73FB1E103K	CHIP C	0.01UF	K
C116			CE04EW1C470M	ELECTRO	47UF	16WV
C117			C90-2076-05	ELECTRO	560UF	10WV
C118			CE04EW1C470M	ELECTRO	47UF	16WV
C119			CQ92M1H104K	MYLAR	0.10UF	K
C121			CK73FB1H102K	CHIP C	1000PF	K
C122			CE04EW1C470M	ELECTRO	47UF	16WV
C124			CK73FB1H102K	CHIP C	1000PF	K
C125			CC73FSL1H101J	CHIP C	100PF	J
C126			CK73FB1H102K	CHIP C	1000PF	K
C127			CK73EF1C105Z	CHIP C	1.0UF	Z
C128			CE04EW1C470M	ELECTRO	47UF	16WV
C129			CK73FB1H472K	CHIP C	4700PF	K
C130,131			CE04EW1C470M	ELECTRO	47UF	16WV
C134			CK73FB1E103K	CHIP C	0.01UF	K
C140-143			CK73FB1H102K	CHIP C	1000PF	K

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Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
C144			CC73FSL1H101J	CHIP C 100PF J		
C145			CK73FB1H102K	CHIP C 1000PF K		
C161, 162			CK73FB1E104K	CHIP C 0.10UF K		
C163			CC73FSL1H101J	CHIP C 100PF J		
C165			CC73FSL1H101J	CHIP C 100PF J		
C171			CK73FB1E103K	CHIP C 0.01UF K		
C172-175			CC73FSL1H101J	CHIP C 100PF J		
C201			CK73FB1E103K	CHIP C 0.01UF K		
C202, 203			CC73FSL1H471J	CHIP C 47PF J		
C204			CK73EB1H473K	CHIP C 0.047UF K		
C205			CC73FCH1H0R5C	CHIP C 0.5PF C		
C206			C92-0004-05	ELECTRO 1.0UF 16WV		
C207			CK73EB1H473K	CHIP C 0.047UF K		
C208			CC73FSL1H101J	CHIP C 100PF J		
C209			CC73FSL1H471J	CHIP C 47PF J		
C210-212			CC73FSL1H101J	CHIP C 100PF J		
C213			CE04EW1C470M	ELECTRO 47UF 16WV		
C214			CK73FB1E103K	CHIP C 0.01UF K		
C215			CK73FB1H102K	CHIP C 1000PF K		
C216			C92-0004-05	ELECTRO 1.0UF 16WV		
C217			CK73FB1H102K	CHIP C 1000PF K		
C218, 219			CC73FSL1H471J	CHIP C 47PF J		
C220			CC73FCH1H020C	CHIP C 2.0PF C		
C221, 222			CC73FCH1H0R5C	CHIP C 0.5PF C		
C223			CK73FB1H102K	CHIP C 1000PF K		
C224			CC73FCH1H050C	CHIP C 5PF C		
C225			CC73FCH1H060D	CHIP C 6PF D		
C226			CC73FCH1H090D	CHIP C 9PF D		
C227			CK73FB1H102K	CHIP C 1000PF K		
C228, 229			CC73FCH1H070D	CHIP C 7PF D		
C230			CC73FCH1H010C	CHIP C 1PF C		
C232			CC73FCH1H030C	CHIP C 3PF C		
C234			CC73FCH1H470J	CHIP C 47PF J		
C235			CC73FCH1H030C	CHIP C 3PF C		
C237			CC73FCH1H470J	CHIP C 47PF J		
C238			CC73FCH1H010C	CHIP C 1PF C		
C239			CC73FCH1H020C	CHIP C 2.0PF C		
C240			CC73FCH1H470J	CHIP C 47PF J		
C241			CC73FCH1H020C	CHIP C 2.0PF C		
C242, 243			CC73FCH1H470J	CHIP C 47PF J		
C244			CC73FCH1H030C	CHIP C 3PF C		
C245			CC73FSL1H101J	CHIP C 100PF J		
C246-248			CC73FCH1H470J	CHIP C 47PF J		
C249, 250			CC73FSL1H471J	CHIP C 47PF J		
C251			CK73FB1H102K	CHIP C 1000PF K		
C252			C90-2041-05	ELECTRO 10UF 10WV		
C253-255			CC73FSL1H101J	CHIP C 100PF J		
C300			CC73FCH1H470J	CHIP C 47PF J		
C301			CC73FCH1H020C	CHIP C 2.0PF C		
C302-305			CC73FSL1H471J	CHIP C 47PF J		
C306			CC73FCH1H040C	CHIP C 4PF C		
C308			CC73FCH1H030C	CHIP C 3PF C		
C310			CC73FCH1H020C	CHIP C 2.0PF C		
C312, 313			CK73FB1H102K	CHIP C 1000PF K		
C314-315			CK73FB1E103K	CHIP C 0.01UF K		

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C316			CC73FCH1H100D	CHIP C 10PF D		
C317			CC73FCH1H120J	CHIP C 12PF J		
C318			CK73FB1H102K	CHIP C 1000PF K		
C319, 320			CK73EB1H104K	CHIP C 0.10UF K		
C321			C90-2041-05	ERECTRO 10UF 10WV		
C322			CK73EB1H104K	CHIP C 0.10UF K		
C323, 324			CK73FB1H102K	CHIP C 1000PF K		
C325			CC73FCH1H220J	CHIP C 22PF J		
C326			CC73FCH1H020C	CHIP C 2.0PF C		
C400			CK73FB1H102K	CHIP C 1000PF K		
C401, 402			CC73FCH1H470J	CHIP C 47PF J		
C403			CK73FB1H102K	CHIP C 1000PF K		
C404			CC73FSL1H471J	CHIP C 47PF J		
C405			CE04EW1C470M	ELECTRO 47UF 16WV		
C406			CC73FCH1H470J	CHIP C 47PF J		
C407, 408			CK73FB1H102K	CHIP C 1000PF K		
C409			CE04EW1C470M	ELECTRO 47UF 16WV		
C410			CC73FCH1H470J	CHIP C 47PF J		
C411			CK73FB1H102K	CHIP C 1000PF K		
C412			CC73FCH1H470J	CHIP C 47PF J		
C413			CE04EW1C470M	ELECTRO 47UF 16WV		
C414			CC73FCH1H470J	CHIP C 47PF J		
C415, 416			CK73FB1H102K	CHIP C 1000PF K		
C417, 418			CC73FSL1H471J	CHIP C 47PF J		
C419			CK73FB1H102K	CHIP C 1000PF K		
C420			CK73FB1E473K	CHIP C 0.047UF K		
C422			CK73EB1H104K	CHIP C 0.10UF K		
C424			CM73F2H040D	CHIP C 4.0PF D		
C425			CC73FSL1H471J	CHIP C 47PF J		
C427			CK73FB1H102K	CHIP C 1000PF K		
C428			CK73FB1E103K	CHIP C 0.01UF K		
C429			CK73FB1H102K	CHIP C 1000PF K		
C430			CC73FCH1H470J	CHIP C 47PF J		
C432			CM73F2H060D	CHIP C 6.0PF D		
C435			CM73F2H040D	CHIP C 4.0PF D		
C436			CM73F2H470J	CHIP C 47PF J		
C440			CC73FCH1H470J	CHIP C 47PF J		
C441			CM73F2H470J	CHIP C 47PF J		
C442			CC73FCH1H470J	CHIP C 47PF J		
C443			CK73FB1H102K	CHIP C 1000PF K		
C444			CC73FCH1H470J	CHIP C 47PF J		
C445			CK73FB1H102K	CHIP C 1000PF K		
C446			CM73F2H020C	CHIP C 2.0PF C		
C447			CC73FCH1H040C	CHIP C 4PF C		
C448			CC73FCH1H020C	CHIP C 2.0PF C		
C449			CK73FB1E103K	CHIP C 0.01UF K		
C450			CE04EW1C102M	ELECTRO 1000UF 16WV		
C454			C90-2041-05	ERECTRO 10UF 10WV		
C455			CC73FCH1H470J	CHIP C 47PF J		
C456			CK73FB1H102K	CHIP C 1000PF K		
C457			CK73FB1E103K	CHIP C 0.01UF K		
C460			CK73FB1E103K	CHIP C 0.01UF K		
C462			CK73FB1H102K	CHIP C 1000PF K		
C463			CC73FSL1H101J	CHIP C 100PF J		
TC300			C05-0369-05	TRIMMING CAP (6PF)		

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A1 CN1 CN2 CN3 CN4			E29-0468-14 E40-3312-05 E40-5428-05 E40-3260-05 E40-3266-05	TERMINAL (ANT-TX·RX) PIN CONNECTOR (15P) PIN CONNECTOR (16P) PIN CONNECTOR (2P) PIN CONNECTOR (8P)		
CN5 J1 TP200			E02-2015-05 E08-0673-05 E23-0464-05	IC SOCKET (28P) RECTANGULAR RECEPTACLE (MIC 6P) TERMINAL		
CF300 L200, 201 L202 L203, 204 L205			L72-0360-05 L40-1092-48 L34-4240-05 L40-1292-48 L40-1092-48	CERAMIC FILTER (CFV455G) SMALL FIXED INDUCTOR (1UH) COIL SMALL FIXED INDUCTOR (1.2UH) SMALL FIXED INDUCTOR (1UH)		
L206 L207 L208, 209 L300 L301			L40-3372-48 L40-2272-48 L40-1072-48 L34-4237-05 L34-4238-05	SMALL FIXED INDUCTOR (33NH) SMALL FIXED INDUCTOR (22NH) SMALL FIXED INDUCTOR (10UH) COIL COIL		
L302 L303 L304 L305 L306			L34-4239-05 L40-8282-48 L30-0503-05 L79-0898-05 L79-0897-05	COIL SMALL FIXED INDUCTOR (820NH) IFT FILTER FILTER		
L400-402 L405 L406 L407, 408 L412			L33-0697-05 L34-1309-15 L34-1305-15 L34-1313-05 L34-1309-15	CHOKE COIL COIL (2.5T) COIL (4.5T) COIL (2T) COIL (2.5T)		
X1 X200 X300 XF300			L77-1355-05 L77-1433-05 L77-1434-05 L71-0408-05	CRYSTAL RESONATOR (12MHZ) VCXO (12.8MHZ) CRYSTAL RESONATOR (38.5825MHZ) CRYSTAL FILTER (39.0375MHZ)		
R1 R2 -12 R13 ,14 R15 -18 R19 -22			RK73FB2A153J RK73FB2A102J RK73FB2A473J RK73FB2A102J RK73FB2A473J	CHIP R 15K J 1/10W CHIP R 1.0K J 1/10W CHIP R 47K J 1/10W CHIP R 1.0K J 1/10W CHIP R 47K J 1/10W		
R23 R24 R25 R26 R27			RK73FB2A223J RK73FB2A682J RK73FB2A222J RK73FB2A473J RK73FB2A102J	CHIP R 22K J 1/10W CHIP R 6.8K J 1/10W CHIP R 2.2K J 1/10W CHIP R 47K J 1/10W CHIP R 1.0K J 1/10W		
R28 R29 R30 R31 ,32 R33 ,34			RK73FB2A123J RK73FB2A153J RK73FB2A473J RK73FB2A223J RK73FB2A103J	CHIP R 12K J 1/10W CHIP R 15K J 1/10W CHIP R 47K J 1/10W CHIP R 22K J 1/10W CHIP R 10K J 1/10W		
R35 R36 R37 ,38 R39 R40			RK73FB2A102J RK73FB2A223J RK73FB2A473J RK73FB2A223J R92-0514-05	CHIP R 1.0K J 1/10W CHIP R 22K J 1/10W CHIP R 47K J 1/10W CHIP R 22K J 1/10W FUSE RESIST 4.7 J 1/4W		
R41 R42			RS14DB3D2R2J RK73FB2A102J	FL-PROOF RS 2.2 J 2W CHIP R 1.0K J 1/10W		

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R44			RK73FB2A103J	CHIP R 10K J 1/10W		
R45			RK73FB2A223J	CHIP R 22K J 1/10W		
R46 ,47			R92-0670-05	CHIP R 0 ΩHM		
R49			RK73FB2A473J	CHIP R 47K J 1/10W		
R100			RK73FB2A473J	CHIP R 47K J 1/10W		
R101,102			RK73FB2A152J	CHIP R 1.5K J 1/10W		
R103			RK73FB2A473J	CHIP R 47K J 1/10W		
R104			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R105,106			RK73FB2A473J	CHIP R 47K J 1/10W		
R107			R92-1215-05	CHIP R 470 J 1/2W		
R108			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R110,111			RK73FB2A103J	CHIP R 10K J 1/10W		
R112			RK73FB2A104J	CHIP R 100K J 1/10W		
R113			RK73FB2A221J	CHIP R 220 J 1/10W		
R115			RK73EB2B1R0K	CHIP R 1.0 K 1/8W		
R116			RK73FB2A103J	CHIP R 10K J 1/10W		
R118			RK73FB2A152J	CHIP R 1.5K J 1/10W		
R119			RK73FB2A023J	CHIP R 82K J 1/10W		
R120			RK73FB2A104J	CHIP R 100K J 1/10W		
R121			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R122,123			RK73FB2A103J	CHIP R 10K J 1/10W		
R124			RK73FB2A823J	CHIP R 82K J 1/10W		
R125			RK73FB2A473J	CHIP R 47K J 1/10W		
R126			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R127,128			RK73FB2A473J	CHIP R 47K J 1/10W		
R129			RK73FB2A223J	CHIP R 22K J 1/10W		
R130			RK73FB2A224J	CHIP R 220K J 1/10W		
R131			R92-0670-05	CHIP R 0 ΩHM		
R200			RK73FB2A332J	CHIP R 3.3K J 1/10W		
R201			RK73FB2A103J	CHIP R 10K J 1/10W		
R202			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R206			RK73FB2A154J	CHIP R 150K J 1/10W		
R208			RK73FB2A473J	CHIP R 47K J 1/10W		
R209			RK73FB2A223J	CHIP R 22K J 1/10W		
R211,212			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R213,214			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R221-223			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R224			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R225			RK73FB2A333J	CHIP R 33K J 1/10W		
R226			RK73FB2A101J	CHIP R 100 J 1/10W		
R227			RK73FB2A123J	CHIP R 12K J 1/10W		
R228			RK73FB2A104J	CHIP R 100K J 1/10W		
R229			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R230			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R231			RK73FB2A220J	CHIP R 22 J 1/10W		
R232			RK73FB2A181J	CHIP R 180 J 1/10W		
R233			RK73FB2A103J	CHIP R 10K J 1/10W		
R234			RK73FB2A223J	CHIP R 22K J 1/10W		
R235			RK73FB2A101J	CHIP R 100 J 1/10W		
R236			RK73FB2A470J	CHIP R 47 J 1/10W		
R237			RK73FB2A273J	CHIP R 27K J 1/10W		
R238			RK73FB2A220J	CHIP R 22 J 1/10W		
R239			RK73FB2A223J	CHIP R 22K J 1/10W		
R240			RK73FB2A103J	CHIP R 10K J 1/10W		
R241			RK73FB2A470J	CHIP R 47 J 1/10W		

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R242, 243			RK73FB2A101J	CHIP R 100 J 1/10W		
R244			RK73FB2A183J	CHIP R 18K J 1/10W		
R245			RK73FB2A682J	CHIP R 6.8K J 1/10W		
R246			RK73FB2A470J	CHIP R 47 J 1/10W		
R247			RK73FB2A101J	CHIP R 100 J 1/10W		
R248			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R249			RK73FB2A562J	CHIP R 5.6K J 1/10W		
R250, 251			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R252			RK73FB2A151J	CHIP R 150 J 1/10W		
R253			RK73FB2A390J	CHIP R 39 J 1/10W		
R254			RK73FB2A151J	CHIP R 150 J 1/10W		
R256			RK73FB2A471J	CHIP R 470 J 1/10W		
R258			RK73FB2A104J	CHIP R 100K J 1/10W		
R300			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R301			RK73FB2A473J	CHIP R 47K J 1/10W		
R302			R92-1261-05	FIXED RESISTOR (150/0.5W)		
R303			R92-0670-05	CHIP R 0 0HM		
R304			R92-0670-05	CHIP R 0 0HM		
R305, 306			RK73FB2A101J	CHIP R 100 J 1/10W		
R307			RK73FB2A332J	CHIP R 3.3K J 1/10W		
R308			RK73FB2A681J	CHIP R 680 J 1/10W		
R309			RK73FB2A220J	CHIP R 22 J 1/10W		
R310			RK73FB2A223J	CHIP R 22K J 1/10W		
R311			RK73FB2A220J	CHIP R 22 J 1/10W		
R312			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R313			RK73FB2A103J	CHIP R 10K J 1/10W		
R314			RK73FB2A223J	CHIP R 22K J 1/10W		
R400			RK73FB2A151J	CHIP R 150 J 1/10W		
R401			RK73FB2A390J	CHIP R 39 J 1/10W		
R402			RK73FB2A151J	CHIP R 150 J 1/10W		
R403, 404			R92-0699-05	SOLID 10 1/2W		
R406			RK73EB2B271J	CHIP R 270 J 1/8W		
R407, 408			RK73EB2B390J	CHIP R 39 J 1/8W		
R409			RK73EB2B271J	CHIP R 270 J 1/8W		
R410			RK73EB2B151J	CHIP R 150 J 1/8W		
R411			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R412, 413			RK73FB2A470J	CHIP R 47 J 1/10W		
R414			RK73FB2A164J	CHIP R 160K J 1/10W		
R415			RK73EB2B181J	CHIP R 180 J 1/8W		
R416			RK73FB2A223J	CHIP R 22K J 1/10W		
R417, 418			R92-1268-05	CHIP R 4.7K J 1/8W		
R419			RK73FB2A473J	CHIP R 47K J 1/10W		
R420			RK73EB2B272J	CHIP R 2.7K J 1/8W		
R421			R92-1268-05	CHIP R 4.7K J 1/8W		
R422			R92-1267-05	CHIP R 3.3K J 1/8W		
R424			RK73FB2A473J	CHIP R 47K J 1/10W		
R425			RK73FB2A153J	CHIP R 15K J 1/10W		
R426			RK73FB2A392J	CHIP R 3.9K J 1/10W		
R427			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R428			R92-1261-05	FIXED RESISTOR (150/0.5W)		
R429-431			R92-1203-05	CHIP R 0.22 J 1/2W		
R432			R92-1266-05	CHIP R 2.7K J 1/8W		
R433			R92-1265-05	CHIP R 390 J 1/8W		
VR1			R12-4414-05	TRIMMING POT. (50K)		
VR100			R12-6585-05	TRIMMING POT. (47K)		

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# TK-931A(D)/931A(HD)

## PARTS LIST

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TX-RX UNIT (X57-3930-11) : TK-931A(D)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕 向	Re- marks 備考
VR101 VR102, 103 VR200 VR400			R12-6575-05 R12-6585-05 R12-6585-05 R12-6583-05	TRIMMING POT.(1K) TRIMMING POT.(47K) TRIMMING POT.(47K) TRIMMING POT.(22K)		
S1 S100		*	S62-0415-05 S31-1411-05	SLIDE SWITCH SLIDE SWITCH		
D1 -4 D5 D6 -9 D100, 101 D102			1SS226 RD5.1M-B1 1SS226 1SS184 1SS226	DIODE ZENER DIODE DIODE DIODE DIODE		
D103 D104 D200 D201 D202			RD20M-B1 1SS181 HSK277 1SS184 1SV164	ZENER DIODE DIODE CHIP DIODE DIODE DIODE		
D203, 204 D205, 206 D300 D400 D401			1T33C 1SV128 1SS184 ERZ-M10DK220 DSA3A1	DIODE DIODE DIODE SERGE ABSORBER DIODE		
D402 D403 D404 D405 IC1			1SS184 MI407 MI308 MI808 M51943BML	DIODE DIODE DIODE DIODE IC(SYSTEM RESET))		
IC2 IC3 IC4 IC5 IC6		*	C256B-15XF1JCL1 HD74HC373FP UPD78310AGF HN58C65FP-25T HM6264ALFP-15T	IC (EPROM) IC (D TYPE LATCHES) IC (CPU) IC (EEPROM) IC (CMOS STATIC RAM)		
IC7 IC8 IC100 IC101 IC102			TC7S00F TC7S32F NJM78L05UA UPC7808H UPC1242H	IC(2CH NAND GATE) IC(2CH NAND GATE) IC(VOLTAGE REGULATOR/ +5V) IC(VOLTAGE REGULATOR/ +8V) IC(AF POWER AMP).)		
IC201 IC203 IC204 IC300 IC400			MB1501F TC4S66F TC4S584F MC3361D M57781	IC (PLL) IC(BILATERAL SWITCH)) IC(SCHMITT TRIGGER) IC(FM IF SYSTEM)) IC (POWER MODULE:DRIVE)		
IC401 IC402 Q100 Q101 Q102	2B		MHW820-3 NJM2904M 2SB1119S 2SC2712(GR) 2SB1119S	IC (POWER MODULE:FINAL) IC(OP AMP X2)) TRANSISTOR TRANSISTOR TRANSISTOR		
Q103 Q104 Q105 Q106 Q108, 109			2SB1302S 2SA1162(Y) DTC114EK DTC314TK DTC114EK	TRANSISTOR TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR		
Q111 Q112, 113 Q114			2SD1624(S, T) DTC114EK 2SA1162(Y)	TRANSISTOR DIGITAL TRANSISTOR TRANSISTOR		

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**TX-RX UNIT (X57-3930-11) : TK-931A(D)**

**TX-RX UNIT (X57-3940-11) : TK-931A(HD)**

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕 向	Re- marks 備考
Q115,116 Q200 Q201 Q202,203 Q204			2SC2712(Y) 2SC3356 DTC314TK 2SC3356 2SA1162(Y)	TRANSISTOR TRANSISTOR DIGITAL TRANSISTOR TRANSISTOR TRANSISTOR		
Q205 Q206 Q207 Q208 Q300			DTA114EK 2SK508NV(52K) 2SC3356 DTC114EK 2SC4093	DIGITAL TRANSISTOR FET TRANSISTOR DIGITAL TRANSISTOR TRANSISTOR		
Q301 Q302 Q400 Q401 Q402			3SK184(R) 2SK302(GR) DTC114EK 2SB967(Q) 2SC2712(Y)	FET FET DIGITAL TRANSISTOR TRANSISTOR TRANSISTOR		
Q403 TH400			DTA114EK 157-203-55009	DIGITAL TRANSISTOR THERMISTOR (20K)		
A100 A100 A100		*	X59-3950-10 X59-3950-10 X59-3950-10	MODULE UNIT A/3(MIC AMP.) MODULE UNIT B/3(BPF/VCA) MODULE UNIT C/3(LPF/BPF)		
<b>TX-RX UNIT (X57-3940-11) : TK-931A(HD)</b>						
C1 C2 -5 C6 C7 C8 -11			C92-0004-05 CK73FB1E103K CS15E1A470M CK73FB1E103K CC73FSL1H101J	ELECTRO CHIP C TANTAL CHIP C CHIP C 1.0UF 16WV 0.01UF K 47UF 10WV 0.01UF K 100PF J		
C12 C13 C14 C16 C18			CK73FB1H472K CK73FB1E103K CC73FSL1H101J CE04EW1C470M CC73FSL1H101J	CHIP C CHIP C CHIP C ELECTRO CHIP C 4700PF K 0.01UF K 100PF J 47UF 16WV 100PF J		
C19 ,20 C21 C23 ,24 C25 -32 C33			CC73FCH1H100D CC73FSL1H101J CK73FB1E223K CC73FSL1H101J CK73FB1E103K	CHIP C CHIP C CHIP C CHIP C CHIP C 10PF D 100PF J 0.022UF K 100PF J 0.01UF K		
C34 -38 C39 C100 C101-103 C104			CC73FSL1H101J CC73FSL1H101J CE04EW1C470M CK73FB1E103K CE04EW1C470M	CHIP C CHIP C ELECTRO CHIP C ELECTRO 100PF J 100PF J 47UF 16WV 0.01UF K 47UF 16WV		
C105,106 C107,108 C109 C110 C111			CK73FB1E103K CE04EW1C470M CK73EB1H104K CK73EF1C105Z CK73FB1E103K	CHIP C ELECTRO CHIP C CHIP C CHIP C 0.01UF K 47UF 16WV 0.10UF K 1.0UF Z 0.01UF K		
C112 C113 C114 C115 C116			CE04EW1C470M CC73FSL1H101J CE04EW1C470M CK73FB1E103K CE04EW1C470M	ELECTRO CHIP C ELECTRO CHIP C ELECTRO 47UF 16WV 100PF J 47UF 16WV 0.01UF K 47UF 16WV		
C117 C118 C119			C90-2076-05 CE04EW1C470M CQ92M1H104K	ELECTRO ELECTRO MYLAR 560UF 10WV 47UF 16WV 0.10UF K		

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TX-RX UNIT (X57-3940-11) : TK-931A(HD)

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C121			CK73FB1H102K	CHIP C 1000PF K		
C122			CE04EW1C470M	ELECTRO 47UF 16WV		
C124			CK73FB1H102K	CHIP C 1000PF K		
C125			CC73FSL1H101J	CHIP C 100PF J		
C126			CK73FB1H102K	CHIP C 1000PF K		
C127			CK73EF1C105Z	CHIP C 1.0UF Z		
C128			CE04EW1C470M	ELECTRO 47UF 16WV		
C129			CK73FB1H472K	CHIP C 4700PF K		
C130, 131			CE04EW1C470M	ELECTRO 47UF 16WV		
C134			CK73FB1E103K	CHIP C 0.01UF K		
C140-143			CK73FB1H102K	CHIP C 1000PF K		
C144			CC73FSL1H101J	CHIP C 100PF J		
C145			CK73FB1H102K	CHIP C 1000PF K		
C161, 162			CK73FB1E104K	CHIP C 0.10UF K		
C163			CC73FSL1H101J	CHIP C 100PF J		
C165			CC73FSL1H101J	CHIP C 100PF J		
C171			CK73FB1E103K	CHIP C 0.01UF K		
C172-175			CC73FSL1H101J	CHIP C 100PF J		
C201			CK73FB1E103K	CHIP C 0.01UF K		
C202, 203			CC73FSL1H471J	CHIP C 47PF J		
C204			CK73EB1H473K	CHIP C 0.047UF K		
C205			CC73FCH1H0R5C	CHIP C 0.5PF C		
C206			C92-0004-05	ELECTRO 1.0UF 16WV		
C207			CK73EB1H473K	CHIP C 0.047UF K		
C208			CC73FSL1H101J	CHIP C 100PF J		
C209			CC73FSL1H471J	CHIP C 47PF J		
C210-212			CC73FSL1H101J	CHIP C 100PF J		
C213			CE04EW1C470M	ELECTRO 47UF 16WV		
C214			CK73FB1E103K	CHIP C 0.01UF K		
C215			CK73FB1H102K	CHIP C 1000PF K		
C216			C92-0004-05	ELECTRO 1.0UF 16WV		
C217			CK73FB1H102K	CHIP C 1000PF K		
C218, 219			CC73FSL1H471J	CHIP C 47PF J		
C220			CC73FCH1H020C	CHIP C 2.0PF C		
C221, 222			CC73FCH1H0R5C	CHIP C 0.5PF C		
C223			CK73FB1H102K	CHIP C 1000PF K		
C224			CC73FCH1H050C	CHIP C 5PF C		
C225			CC73FCH1H060D	CHIP C 6PF D		
C226			CC73FCH1H090D	CHIP C 9PF D		
C227			CK73FB1H102K	CHIP C 1000PF K		
C228, 229			CC73FCH1H070D	CHIP C 7PF D		
C230			CC73FCH1H010C	CHIP C 1PF C		
C232			CC73FCH1H030C	CHIP C 3PF C		
C234			CC73FCH1H470J	CHIP C 47PF J		
C235			CC73FCH1H030C	CHIP C 3PF C		
C237			CC73FCH1H470J	CHIP C 47PF J		
C238			CC73FCH1H010C	CHIP C 1PF C		
C239			CC73FCH1H020C	CHIP C 2.0PF C		
C240			CC73FCH1H470J	CHIP C 47PF J		
C241			CC73FCH1H020C	CHIP C 2.0PF C		
C242, 243			CC73FCH1H470J	CHIP C 47PF J		
C244			CC73FCH1H030C	CHIP C 3PF C		
C245			CC73FSL1H101J	CHIP C 100PF J		
C246-248			CC73FCH1H470J	CHIP C 47PF J		
C249, 250			CC73FSL1H471J	CHIP C 47PF J		

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TX-RX UNIT (X57-3940-11) : TK-931A(HD)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕 向	Re- marks 備考
C251			CK73FB1H102K	CHIP C 1000PF K		
C252			C90-2041-05	ERECTRO 10UF 10WV		
C253-255			CC73FSL1H101J	CHIP C 100PF J		
C300			CC73FCH1H470J	CHIP C 47PF J		
C301			CC73FCH1H020C	CHIP C 2.0PF C		
C302-305			CC73FSL1H471J	CHIP C 47PF J		
C306			CC73FCH1H040C	CHIP C 4PF C		
C308			CC73FCH1H030C	CHIP C 3PF C		
C310			CC73FCH1H020C	CHIP C 2.0PF C		
C312, 313			CK73FB1H102K	CHIP C 1000PF K		
C314-315			CK73FB1E103K	CHIP C 0.01UF K		
C316			CC73FCH1H100D	CHIP C 10PF D		
C317			CC73FCH1H120J	CHIP C 12PF J		
C318			CK73FB1H102K	CHIP C 1000PF K		
C319, 320			CK73EB1H104K	CHIP C 0.10UF K		
C321			C90-2041-05	ERECTRO 10UF 10WV		
C322			CK73EB1H104K	CHIP C 0.10UF K		
C323, 324			CK73FB1H102K	CHIP C 1000PF K		
C325			CC73FCH1H220J	CHIP C 22PF J		
C326			CC73FCH1H020C	CHIP C 2.0PF C		
C327			CC73FSL1H101J	CHIP C 100PF J		
C400			CK73FB1H102K	CHIP C 1000PF K		
C401, 402			CC73FCH1H470J	CHIP C 47PF J		
C403			CK73FB1H102K	CHIP C 1000PF K		
C404			CC73FSL1H471J	CHIP C 47PF J		
C405			CE04EW1C470M	ELECTRO 47UF 16WV		
C406			CC73FCH1H470J	CHIP C 47PF J		
C407, 408			CK73FB1H102K	CHIP C 1000PF K		
C409			CE04EW1C470M	ELECTRO 47UF 16WV		
C410			CC73FCH1H470J	CHIP C 47PF J		
C411			CK73FB1H102K	CHIP C 1000PF K		
C412			CC73FCH1H470J	CHIP C 47PF J		
C413			CE04EW1C470M	ELECTRO 47UF 16WV		
C414			CC73FCH1H470J	CHIP C 47PF J		
C415, 416			CK73FB1H102K	CHIP C 1000PF K		
C417, 418			CC73FSL1H471J	CHIP C 47PF J		
C419			CK73FB1H102K	CHIP C 1000PF K		
C420			CK73FB1E473K	CHIP C 0.047UF K		
C421, 422			CK73EB1H104K	CHIP C 0.10UF K		
C423			CC73FCH1H010C	CHIP C 1PF C		
C425			CC73FSL1H471J	CHIP C 47PF J		
C427			CK73FB1H102K	CHIP C 1000PF K		
C428			CK73FB1E103K	CHIP C 0.01UF K		
C429			CK73FB1H102K	CHIP C 1000PF K		
C430			CC73FCH1H470J	CHIP C 47PF J		
C431			CM73F2H030D	CHIP C 3.00F D		
C433			CM73F2H120J	CHIP C 12PF J		
C434			CM73F2H060D	CHIP C 6.0PF D		
C435			CM73F2H030D	CHIP C 3.00F D		
C436			CM73F2H470J	CHIP C 47PF J		
C437			CM73F2H020C	CHIP C 2.0PF C		
C438			CM73F2H040D	CHIP C 4.0PF D		
C439			CM73F2H020C	CHIP C 2.0PF C		
C440			CC73ECH1H470J	CHIP C 47PF J		
C441			CM73F2H470J	CHIP C 47PF J		

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Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
C442			CC73FCH1H470J	CHIP C 47PF J		
C443			CK73FB1H102K	CHIP C 1000PF K		
C444			CC73ECH1H470J	CHIP C 47PF J		
C445			CK73EB1H102K	CHIP C 1000PF K		
C446			CM73F2H020C	CHIP C 2.0PF C		
C447			CC73FCH1H040C	CHIP C 4PF C		
C448			CC73ECH1H020C	CHIP C 2PF C		
C449			CK73FB1E103K	CHIP C 0.01UF K		
C450			CE04EW1C102M	ELECTRO 1000UF 16WV		
C451			CM73F2H120J	CHIP C 12PF J		
C452, 453			CM73F2H180J	CHIP C 18PF J		
C454			C90-2041-05	ERECTRO 10UF 10WV		
C455			CC73FCH1H470J	CHIP C 47PF J		
C456			CK73FB1H102K	CHIP C 1000PF K		
C457			CK73FB1E103K	CHIP C 0.01UF K		
C458			CM73F2H470J	CHIP C 47PF J		
C459			CK73EB1H102K	CHIP C 1000PF K		
C460			CK73FB1E103K	CHIP C 0.01UF K		
C461			CM73F2H030D	CHIP C 3.00F D		
C462			CK73FB1H102K	CHIP C 1000PF K		
C464			CC73FCH1H010C	CHIP C 1PF C		
C465-466			CC73FCH1H470J	CHIP C 47PF J		
C467			C92-0507-05	CHIP TAN 4.7UF 6.3WV		
C468			CC73FCH1H470J	CHIP C 47PF J		
C469			CC73FSL1H101J	CHIP C 100PF J		
C470, 471 TC300			CC73FCH1H470J C05-0369-05	CHIP C 47PF J TRIMMING CAP (6PF)		
A1		*	E29-0499-04	GND TERMINAL(Q404)		
CN1			E29-0468-14	TERMINAL (ANT-TX-RX)		
CN2			E40-3312-05	PIN CONNECTOR (15P)		
CN3			E40-5428-05	PIN CONNECTOR (16P)		
			E40-3260-05	PIN CONNECTOR (2P)		
CN4			E40-3266-05	PIN CONNECTOR (8P)		
CN5			E02-2015-05	IC SOCKET (28P)		
J1			E08-0673-05	RECTANGULAR RECEPTACLE(MIC 6P)		
TP200			E23-0464-05	TERMINAL		
CF300			L72-0360-05	CERAMIC FILTER (CFV455G)		
L200, 201			L40-1092-48	SMALL FIXED INDUCTOR(1UH)		
L202			L34-4240-05	COIL		
L203, 204			L40-1292-48	SMALL FIXED INDUCTOR(1.2UH)		
L205			L40-1092-48	SMALL FIXED INDUCTOR(1UH)		
L206			L40-3372-48	SMALL FIXED INDUCTOR(33NH)		
L207			L40-2272-48	SMALL FIXED INDUCTOR(22NH)		
L208, 209			L40-1072-48	SMALL FIXED INDUCTOR(10NH)		
L300			L34-4237-05	COIL		
L301			L34-4238-05	COIL		
L302			L34-4239-05	COIL		
L303			L40-8282-48	SMALL FIXED INDUCTOR(820NH)		
L304			L30-0503-05	IFT		
L305			L79-0898-05	FILTER		
L306			L79-0897-05	FILTER		
L400-402			L33-0697-05	CHOKE COIL		
L403			L34-1308-15	COIL (2T)		
L404			L34-1338-05	COIL (2T)		

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L405 L406 L407, 408 L409 L410			L34-1309-15 L34-1305-15 L34-1313-05 L34-1318-05 L34-1329-05	COIL (2.5T) COIL (4.5T) COIL (2T) COIL (5T) COIL (3T)		
L411 L412 L413 X1 X200			L33-0697-05 L34-1305-15 L40-3372-48 L77-1355-05 L77-1433-05	CHOKE COIL COIL (4.5T) SMALL FIXED INDUCTOR(33NH) CRYSTAL RESONATOR (12MHZ) CRYSTAL RESONATOR (12.8MHZ)		
X300 XF300			L77-1434-05 L71-0408-05	CRYSTAL RESONATOR (38.5625MHZ) CRYSTAL FILTER (39.0375MHZ)		
R1 R2 -12 R13 ,14 R15 -18 R19 -22			RK73FB2A153J RK73FB2A102J RK73FB2A473J RK73FB2A102J RK73FB2A473J	CHIP R 15K J 1/10W CHIP R 1.0K J 1/10W CHIP R 47K J 1/10W CHIP R 1.0K J 1/10W CHIP R 47K J 1/10W		
R23 R24 R25 R26 R27			RK73FB2A223J RK73FB2A682J RK73FB2A222J RK73FB2A473J RK73FB2A102J	CHIP R 22K J 1/10W CHIP R 6.8K J 1/10W CHIP R 2.2K J 1/10W CHIP R 47K J 1/10W CHIP R 1.0K J 1/10W		
R28 R29 R30 R31 ,32 R33 ,34			RK73FB2A123J RK73FB2A153J RK73FB2A473J RK73FB2A223J RK73FB2A103J	CHIP R 12K J 1/10W CHIP R 15K J 1/10W CHIP R 47K J 1/10W CHIP R 22K J 1/10W CHIP R 10K J 1/10W		
R35 R36 R37 ,38 R39 R40			RK73FB2A102J RK73FB2A223J RK73FB2A473J RK73FB2A223J R92-0514-05	CHIP R 1.0K J 1/10W CHIP R 22K J 1/10W CHIP R 47K J 1/10W CHIP R 22K J 1/10W FUSE RESIST 4.7 J 1/4W		
R41 R42 R44 R45 R46 ,47			RS14DB3D2R2J RK73FB2A102J RK73FB2A103J RK73FB2A223J R92-0670-05	FL-PROOF RS 2.2 J 2W CHIP R 1.0K J 1/10W CHIP R 10K J 1/10W CHIP R 22K J 1/10W CHIP R 0 OHM		
R49 R100 R101, 102 R103 R104			RK73FB2A473J RK73FB2A473J RK73FB2A152J RK73FB2A473J RK73FB2A472J	CHIP R 47K J 1/10W CHIP R 47K J 1/10W CHIP R 1.5K J 1/10W CHIP R 47K J 1/10W CHIP R 4.7K J 1/10W		
R105, 106 R107 R108 R110, 111 R112			RK73FB2A473J R92-1215-05 RK73FB2A472J RK73FB2A103J RK73FB2A104J	CHIP R 47K J 1/10W CHIP R 470 J 1/2W CHIP R 4.7K J 1/10W CHIP R 10K J 1/10W CHIP R 100K J 1/10W		
R113 R115 R116 R118 R119			RK73FB2A221J RK73EB2B1R0K RK73FB2A103J RK73FB2A152J RK73FB2A823J	CHIP R 220 J 1/10W CHIP R 1.0 K 1/8W CHIP R 10K J 1/10W CHIP R 1.5K J 1/10W CHIP R 82K J 1/10W		
R120 R121			RK73FB2A104J RK73FB2A102J	CHIP R 100K J 1/10W CHIP R 1.0K J 1/10W		

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K :TK-931A(D) K

HK :TK-931A(HD) K

△ indicates safety critical components.

# TK-931A(D)/931A(HD)

## PARTS LIST

× New Parts

Parts without Parts No. are not supplied.

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

Teile ohne Parts No. werden nicht geliefert.

TX-RX UNIT (X57-3940-11) : TK-931A(HD)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
R122, 123			RK73FB2A103J	CHIP R 10K J 1/10W		
R124			RK73FB2A823J	CHIP R 82K J 1/10W		
R125			RK73FB2A473J	CHIP R 47K J 1/10W		
R126			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R127, 128			RK73FB2A473J	CHIP R 47K J 1/10W		
R129			RK73FB2A223J	CHIP R 22K J 1/10W		
R130			RK73FB2A224J	CHIP R 220K J 1/10W		
R131			R92-0670-05	CHIP R 0 ΩHM		
R200			RK73FB2A332J	CHIP R 3.3K J 1/10W		
R201			RK73FB2A103J	CHIP R 10K J 1/10W		
R202			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R206			RK73FB2A154J	CHIP R 150K J 1/10W		
R208			RK73FB2A473J	CHIP R 47K J 1/10W		
R209			RK73FB2A223J	CHIP R 22K J 1/10W		
R210			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R211, 212			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R213, 214			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R221-223			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R224			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R225			RK73FB2A333J	CHIP R 33K J 1/10W		
R226			RK73FB2A101J	CHIP R 100 J 1/10W		
R227			RK73FB2A123J	CHIP R 12K J 1/10W		
R228			RK73FB2A104J	CHIP R 100K J 1/10W		
R229			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R230			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R231			RK73FB2A220J	CHIP R 22 J 1/10W		
R232			RK73FB2A181J	CHIP R 180 J 1/10W		
R233			RK73FB2A103J	CHIP R 10K J 1/10W		
R234			RK73FB2A223J	CHIP R 22K J 1/10W		
R235			RK73FB2A101J	CHIP R 100 J 1/10W		
R236			RK73FB2A470J	CHIP R 47 J 1/10W		
R237			RK73FB2A273J	CHIP R 27K J 1/10W		
R238			RK73FB2A220J	CHIP R 22 J 1/10W		
R239			RK73FB2A223J	CHIP R 22K J 1/10W		
R240			RK73FB2A103J	CHIP R 10K J 1/10W		
R241			RK73FB2A470J	CHIP R 47 J 1/10W		
R242, 243			RK73FB2A101J	CHIP R 100 J 1/10W		
R244			RK73FB2A183J	CHIP R 18K J 1/10W		
R245			RK73FB2A682J	CHIP R 6.8K J 1/10W		
R246			RK73FB2A470J	CHIP R 47 J 1/10W		
R247			RK73FB2A101J	CHIP R 100 J 1/10W		
R248			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R249			RK73FB2A562J	CHIP R 5.6K J 1/10W		
R250, 251			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R252			RK73FB2A151J	CHIP R 150 J 1/10W		
R253			RK73FB2A390J	CHIP R 39 J 1/10W		
R254			RK73FB2A151J	CHIP R 150 J 1/10W		
R256			RK73FB2A471J	CHIP R 470 J 1/10W		
R258			RK73FB2A104J	CHIP R 100K J 1/10W		
R300			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R301			RK73FB2A473J	CHIP R 47K J 1/10W		
R302			R92-1261-05	FIXED RESISTOR (150/0.5W)		
R303			R92-0670-05	CHIP R 0 ΩHM		
R304			R92-0670-05	CHIP R 0 ΩHM		
R305, 306			RK73FB2A101J	CHIP R 100 J 1/10W		

L:Scandinavia

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## PARTS LIST

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Teile ohne Parts No. werden nicht geliefert.

TX-RX UNIT (X57-3940-11) : TK-931A(HD)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕 向	Re- marks 備考
R307			RK73FB2A332J	CHIP R 3.3K J 1/10W		
R308			RK73FB2A681J	CHIP R 680 J 1/10W		
R309			RK73FB2A220J	CHIP R 22 J 1/10W		
R310			RK73FB2A223J	CHIP R 22K J 1/10W		
R311			RK73FB2A220J	CHIP R 22 J 1/10W		
R312			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R313			RK73FB2A103J	CHIP R 10K J 1/10W		
R314			RK73FB2A223J	CHIP R 22K J 1/10W		
R400			RK73FB2A121J	CHIP R 120 J 1/10W		
R401			RK73FB2A470J	CHIP R 47 J 1/10W		
R402			RK73FB2A121J	CHIP R 120 J 1/10W		
R403,404			R92-0699-05	SOLID 10 1/2W		
R406			RK73EB2B271J	CHIP R 270 J 1/8W		
R407,408			RK73EB2B390J	CHIP R 39 J 1/8W		
R409			RK73EB2B271J	CHIP R 270 J 1/8W		
R410			RK73EB2B151J	CHIP R 150 J 1/8W		
R411			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R412,413			RK73FB2A470J	CHIP R 47 J 1/10W		
R414			RK73FB2A164J	CHIP R 160K J 1/10W		
R415			RK73EB2B181J	CHIP R 180 J 1/8W		
R416			RK73FB2A223J	CHIP R 22K J 1/10W		
R417,418			R92-1268-05	CHIP R 4.7K J 1/8W		
R419			RK73FB2A513J	CHIP R 51K J 1/10W		
R420			RK73EB2B272J	CHIP R 2.7K J 1/8W		
R421			R92-1268-05	CHIP R 4.7K J 1/8W		
R422			R92-1267-05	CHIP R 3.3K J 1/8W		
R423			R92-1260-05	FIXED RESISTOR (0.033/3W)		
R424			RK73FB2A473J	CHIP R 47K J 1/10W		
R425			RK73FB2A153J	CHIP R 15K J 1/10W		
R426			RK73FB2A392J	CHIP R 3.9K J 1/10W		
R427			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R428			R92-1261-05	FIXED RESISTOR (150/0.3W)		
R432			R92-1269-05	CHIP R 2.2K J 1/8W		
R433			R92-0679-05	CHIP R 0 OHM		
R434			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R435,436			RK73FB2A471J	CHIP R 470 J 1/10W		
R437			RK73FB2A182J	CHIP R 1.8K J 1/10W		
VR1			R12-4414-05	TRIMMING POT.(50K)		
VR100			R12-6585-05	TRIMMING POT.(47K)		
VR101			R12-6575-05	TRIMMING POT.(1K)		
VR102,103			R12-6585-05	TRIMMING POT.(47K)		
VR200			R12-6585-05	TRIMMING POT.(47K)		
VR400,401			R12-6583-05	TRIMMING POT.(22K)		
S1		*	S62-0415-05	SLIDE SWITCH		
S100			S31-1411-05	SLIDE SWITCH		
D1 -4			1SS226	DIODE		
D5			RD5.1M-B1	ZENER DIODE		
D6 -9			1SS226	DIODE		
D100,101			1SS184	DIODE		
D102			1SS226	DIODE		
D103			RD20M-B1	ZENER DIODE		
D104			1SS181	DIODE		
D200			HSK277	CHIP DIODE		
D201			1SS184	DIODE		

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HK :TK-931A(HD) K

⚠ indicates safety critical components.

# TK-931A(D)/931A(HD)

## PARTS LIST

× New Parts

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TX-RX UNIT (X57-3940-11) : TK-931A(HD)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕 向	Re- marks 備考
D202			1SV164	DIODE		
D203, 204			1T33C	DIODE		
D205, 206			1SV128	DIODE		
D300			1SS184	DIODE		
D301			HSM88ASR	DIODE		
D400			ERZ-M10DK220	SERGE ABSORBER		
D401			DSA3A1	DIODE		
D402			1SS184	DIODE		
D403			UM9401	DIODE		
D404			MI308	DIODE		
D405			MI808	DIODE		
D406			HSM88ASR	DIODE		
D407			1SS184	DIODE		
IC1			M51943BML	IC(SYSTEM RESET))		
IC2		*	C256B-15XF1JCL1	IC (EPROM)		
IC3			HD74HC373FP	IC (D TYPE LATCHES)		
IC4			UPD78310AGF	IC (CPU)		
IC5		*	HN58C65FP-25T	IC (EEPROM)		
IC6		*	HM6264ALFP-15T	IC (CMOS STATIC RAM)		
IC7			TC7S00F	IC(2CH NAND GATE)		
IC8			TC7S32F	IC(2CH NAND GATE)		
IC100			NJM78L05UA	IC(VOLTAGE REGULATOR/ +5V)		
IC101			UPC7808H	IC(VOLTAGE REGULATOR/ +8V)		
IC102			UPC1242H	IC(AF POWER AMP.)		
IC201			MB1501F	IC (PLL)		
IC203			TC4S66F	IC(BILATERAL SWITCH))		
IC204			TC4S584F	IC(SCHMITT TRIGGER)		
IC300			MC3361D	IC(FM IF SYSTEM))		
IC400			M57781	IC (POWER MODULE:DRIVE)		
IC401	2B		MHW820-3	TRANSISTOR		
IC402			NJM2904M	IC(OP AMP X2))		
Q100			2SB1119S	TRANSISTOR		
Q101			2SC2712(GR)	TRANSISTOR		
Q102			2SB1119S	TRANSISTOR		
Q103			2SB1302S	TRANSISTOR		
Q104			2SA1162(Y)	TRANSISTOR		
Q105			DTC114EK	DIGITAL TRANSISTOR		
Q106			DTC314TK	DIGITAL TRANSISTOR		
Q108, 109			DTC114EK	DIGITAL TRANSISTOR		
Q111			2SD1624(S, T)	TRANSISTOR		
Q112, 113			DTC114EK	DIGITAL TRANSISTOR		
Q114			2SA1162(Y)	TRANSISTOR		
Q115, 116			2SC2712(Y)	TRANSISTOR		
Q200			2SC3356	TRANSISTOR		
Q201			DTC314TK	DIGITAL TRANSISTOR		
Q202, 203			2SC3356	TRANSISTOR		
Q204			2SA1162(Y)	TRANSISTOR		
Q205			DTA114EK	DIGITAL TRANSISTOR		
Q206			2SK508NV(52K)	FET		
Q207			2SC3356	TRANSISTOR		
Q208			DTC114EK	DIGITAL TRANSISTOR		
Q300			2SC4093	TRANSISTOR		
Q301			3SK184(R)	FET		
Q302			2SK302(GR)	FET		
Q400			DTC114EK	DIGITAL TRANSISTOR		

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## PARTS LIST

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**TX-RX UNIT (X57-3940-11) : TK-931A(HD)**  
**MODULE UNIT (X59-3950-10)**

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕 向	Re- marks 備考
Q401 Q402 Q403 Q404 Q405			2SB967(Q) 2SC2712(Y) DTA114EK MRF847 DTC114EK	TRANSISTOR TRANSISTOR DIGITAL TRANSISTOR TRANSISTOR DIGITAL TRANSISTOR		
TH400,401			157-203-55009	THERMISTOR(20K)		
A100 A100 A100		*	X59-3950-10 X59-3950-10 X59-3950-10	MODULE UNIT A/3 (MIC AMP.) MODULE UNIT B/3 (BPF/VCA) MODULE UNIT C/3 (LPF/BPF)		
<b>MODULE UNIT (X59-3950-10)</b>						
C1 C2 C3 C4 C5			CK73FB1E223K CC73FCH1H101J CK73FB1H102K CK73FB1H222K CK73FB1E223K	CHIP C CHIP C CHIP C CHIP C CHIP C	0.022UF K 100PF J 1000PF K 2200PF K 0.022UF K	
C6 C7 C8 C9 C10			C92-0004-05 CC73FCH1H101J CK73FB1E223K CC73FCH1H100D CK73EF1C105Z	ELECTRO CHIP C CHIP C CHIP C CHIP C	1.0UF 16WV 100PF J 0.022UF K 10PF D 1.0UF Z	
C11 C12 C13 C14 C15			CK73FB1H122K CC73FCH1H751J CK73FB1H332K CC73FCH1H181J CK73EF1C105Z	CHIP C CHIP C CHIP C CHIP C CHIP C	1200PF K 750PF J 3300PF K 180PF J 1.0UF Z	
C16 C17 C18 C19 C20			CK73FB1H152K CC73FCH1H751J CK73EF1C105Z CC73FCH1H271J C92-0004-05	CHIP C CHIP C CHIP C CHIP C ELECTRO	1500PF K 750PF J 1.0UF Z 270PF J 1.0UF 16WV	
C21 C41 C42 C43 -49 C50			CC73FCH1H101J CK73FB1H472K CK73FB1H102K CK73EB1E104K CK73FB1E103K	CHIP C CHIP C CHIP C CHIP C CHIP C	100PF J 4700PF K 1000PF K 0.10UF K 0.01UF K	
C51 C52 C53 C54 C55			CK73FB1E223K CK73EF1C105Z CK73FB1H102K CK73EF1C105Z C92-0004-05	CHIP C CHIP C CHIP C CHIP C ELECTRO	0.022UF K 1.0UF Z 1000PF K 1.0UF Z 1.0UF 16WV	
C71 -73 C74 C75 C76 C77			CK73FB1E303K CC73FCH1H101J CK73FB1E103K CK73FB1H822K CK73FB1E223K	CHIP C CHIP C CHIP C CHIP C CHIP C	0.030UF K 100PF J 0.01UF K 8200PF K 0.022UF K	
C78 C79 ,80 C81			CK73FB1H222K CK73FB1E473K C92-0004-05	CHIP C CHIP C ELECTRO	2200PF K 0.047UF K 1.0UF 16WV	
			E23-0471-05	TERMINAL		
R1 ,2 R3 R4 R5			RK73FB2A223J RK73FB2A474J RK73FB2A243J RK73FB2A273J	CHIP R CHIP R CHIP R CHIP R	22K J 1/10W 470K J 1/10W 24K J 1/10W 27K J 1/10W	

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**HK :TK-931A(HD) K**

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# TK-931A(D)/931A(HD)

## PARTS LIST

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MODULE UNIT (X59-3950-10)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
R6			RK73FB2A561J	CHIP R 560 J 1/10W		
R7			RK73FB2A474J	CHIP R 470K J 1/10W		
R8			RK73FB2A272J	CHIP R 2.7K J 1/10W		
R9			RK73FB2A153J	CHIP R 15K J 1/10W		
R10			RK73FB2A103J	CHIP R 10K J 1/10W		
R11			RK73FB2A104J	CHIP R 100K J 1/10W		
R12			RK73FB2A124J	CHIP R 120K J 1/10W		
R13 ,14			RK73FB2A923J	CHIP R 82K J 1/10W		
R15 ,16			RK73FB2A683J	CHIP R 68K J 1/10W		
R17			RK73FB2A104J	CHIP R 100K J 1/10W		
R18			RK73FB2A124J	CHIP R 120K J 1/10W		
R19 -21			RK73FB2A473J	CHIP R 47K J 1/10W		
R22			RK73FB2A103J	CHIP R 10K J 1/10W		
R23			RK73FB2A123J	CHIP R 12K J 1/10W		
R24			RK73FB2A473J	CHIP R 47K J 1/10W		
R25 ,26			RK73FB2A103J	CHIP R 10K J 1/10W		
R27			RK73FB2A123J	CHIP R 12K J 1/10W		
R41			RK73FB2A273J	CHIP R 27K J 1/10W		
R42			RK73FB2A184J	CHIP R 180K J 1/10W		
R43			RK73FB2A103J	CHIP R 10K J 1/10W		
R44 ,45			RK73FB2A223J	CHIP R 22K J 1/10W		
R46			RK73FB2A183J	CHIP R 18K J 1/10W		
R47			RK73FB2A562J	CHIP R 5.6K J 1/10W		
R48			RK73FB2A272J	CHIP R 2.7K J 1/10W		
R49			RK73FB2A223J	CHIP R 22K J 1/10W		
R50			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R51 ,52			RK73FB2A104J	CHIP R 100K J 1/10W		
R53			RK73FB2A681J	CHIP R 680 J 1/10W		
R54			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R55			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R56			RK73FB2A104J	CHIP R 100K J 1/10W		
R57			RK73FB2A103J	CHIP R 10K J 1/10W		
R58			RK73FB2A473J	CHIP R 47K J 1/10W		
R59			RK73FB2A103J	CHIP R 10K J 1/10W		
R60			RK73FB2A682J	CHIP R 6.8K J 1/10W		
R71			RK73FB2A104J	CHIP R 100K J 1/10W		
R72			RK73FB2A473J	CHIP R 47K J 1/10W		
R73			RK73FB2A563J	CHIP R 56K J 1/10W		
R74			RK73FB2A103J	CHIP R 10K J 1/10W		
R75 ,76			RK73FB2A224J	CHIP R 220K J 1/10W		
R77 ,78			RK73FB2A223J	CHIP R 22K J 1/10W		
R79			RK73FB2A684J	CHIP R 680K J 1/10W		
R80			RK73FB2A473J	CHIP R 47K J 1/10W		
R81			RK73FB2A103J	CHIP R 10K J 1/10W		
R82			RK73FB2A123J	CHIP R 12K J 1/10W		
R83 -86			RK73FB2A562J	CHIP R 5.6K J 1/10W		
R87			RK73FB2A123J	CHIP R 12K J 1/10W		
R88			RK73FB2A243J	CHIP R 24K J 1/10W		
R89			RK73FB2A103J	CHIP R 10K J 1/10W		
R90			RK73FB2A334J	CHIP R 330K J 1/10W		
R91			RK73FB2A103J	CHIP R 10K J 1/10W		
IC1 -3			NJM4558M	IC(OP AMP X2)		
IC41,42			NJM4558M	IC(OP AMP X2)		
IC43			M5282FP	IC (ELECTRONIC ATTENUATOR)		

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MODULE UNIT (X59-3950-10)

LCD ASSY (B38-0332-15)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名/規格	Desti- nation 仕向	Re- marks 備考
IC71-73 Q1 Q2 Q41 Q71			NJM4558M DTC314TK DTA114EK DTC314TK DTC114EK	IC(OP AMP X2)) DIGITAL TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR		
TH1			157-302-53008	THERMISTOR (3K)		
<b>LCD ASSY (B38-0332-15)</b>						
			B38-0336-05 B38-0334-08	LED ASSY LCD		
C2 -3 C4 C5 C6 C7 -8			CK73FB1H103K C92-0037-05 C92-0036-05 CK73FB1H103K CK73EB1H473K	CHIP C 0.010UF K ELECTRO 10UF 16WV ELECTRO 4.7UF 16WV CHIP C 0.010UF K CHIP C 0.047UF K		
C9 -10 C11 C12			CK73FB1H103K C92-0004-05 CC73FCH1H681J	CHIP C 0.010UF K ELECTRO 1.0UF 16WV CHIP C 680PF J		
CN1			E40-5184-05	PIN CONNECTOR(7P)		
XL1			L78-0043-05	CRYSTAL RESONATOR (4.194MHZ)		
R1 -2 R3 R4 -17 R18 R19 -20			RK73FB2A104J R92-0670-05 RK73FB2A473J RK73FB2A224J RK73FB2A473J	CHIP R 100K J 1/10W CHIP R 0 OHM CHIP R 47K J 1/10W CHIP R 220K J 1/10W CHIP R 47K J 1/10W		
R21 R22 -26 R27 R28 R29			RK73FB2A473J RK73FB2A102J RK73FB2A223J RK73FB2A4R7J RK73FB2A153J	CHIP R 47K J 1/10W CHIP R 1.0K J 1/10W CHIP R 22K J 1/10W CHIP R 4.7 J 1/10W CHIP R 15K J 1/10W		
R30 R31 -34 R35			RK73FB2A393J RK73FB2A470J RK73FB2A471J	CHIP R 39K J 1/10W CHIP R 47 J 1/10W CHIP R 470 J 1/10W		
D1 D2 D3 -6 D7 IC1			1SS184 1SS184 1SS226 RD18M-B2 75304GF-104	DIODE DIODE DIODE ZENER DIODE IC(MICROPROCESSOR)		
IC2 IC3 IC4 IC5 IC6			LC7582 L78M05T-FA TC4013BF M51943BML TC4SU69F	IC(LCD DRIVER) IC(VOLTAGE REGULATOR/+5V) IC(D FLIP-FLIP X2) IC(SYSTEM RESET) IC(INVERTER GATE)		
Q1			2SC2712(GR)	TRANSISTER		

L:Scandinavia

K:USA

P:Canada

Y:PX(Far East, Hawaii)

T:England

E:Europe

Y:AAFES(Europe)

X:Australia

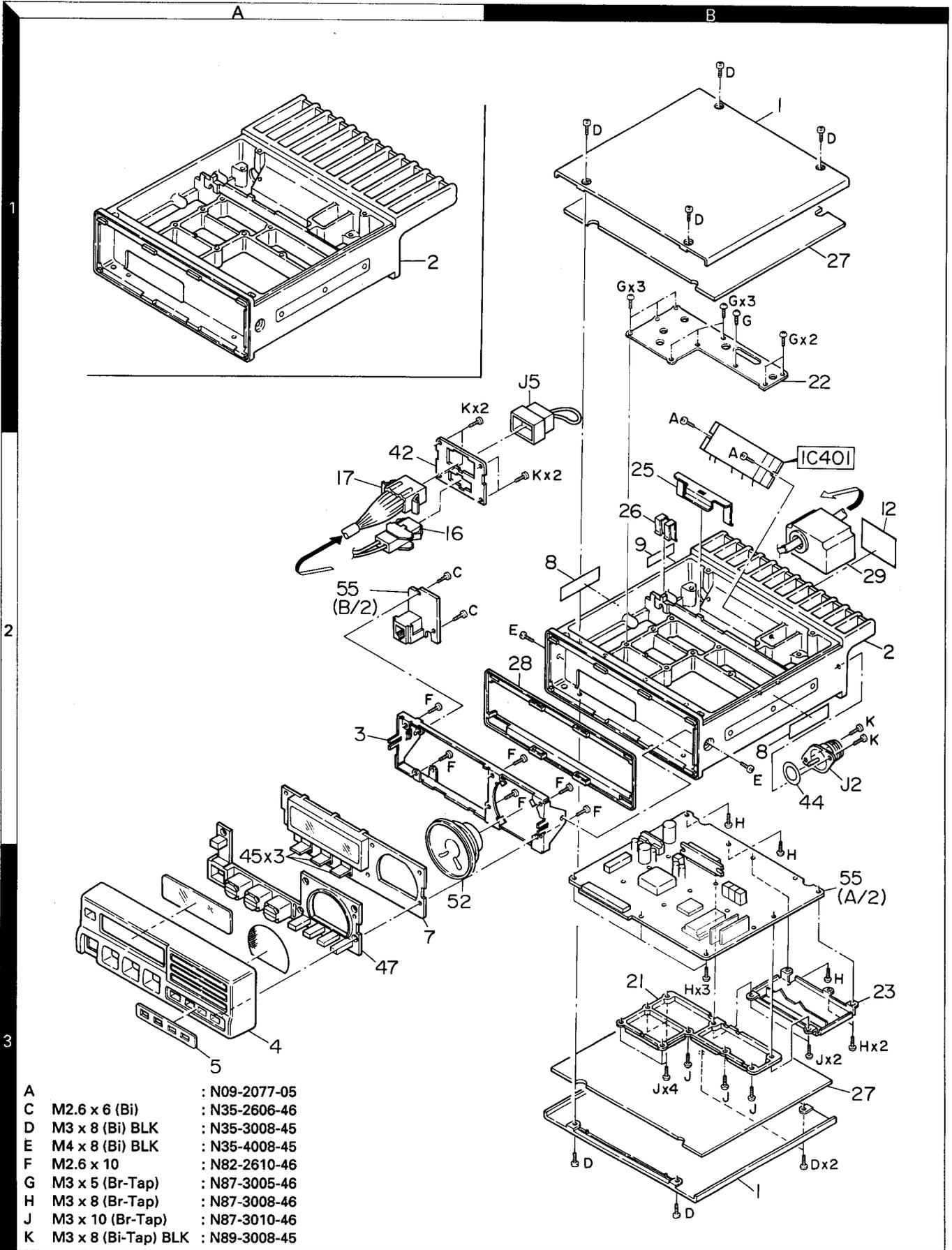
M:Other Areas

K :TK-931A(D) K  
HK :TK-931A(HD) K

▲ indicates safety critical components.

# TK-931A(D)/931A(HD)

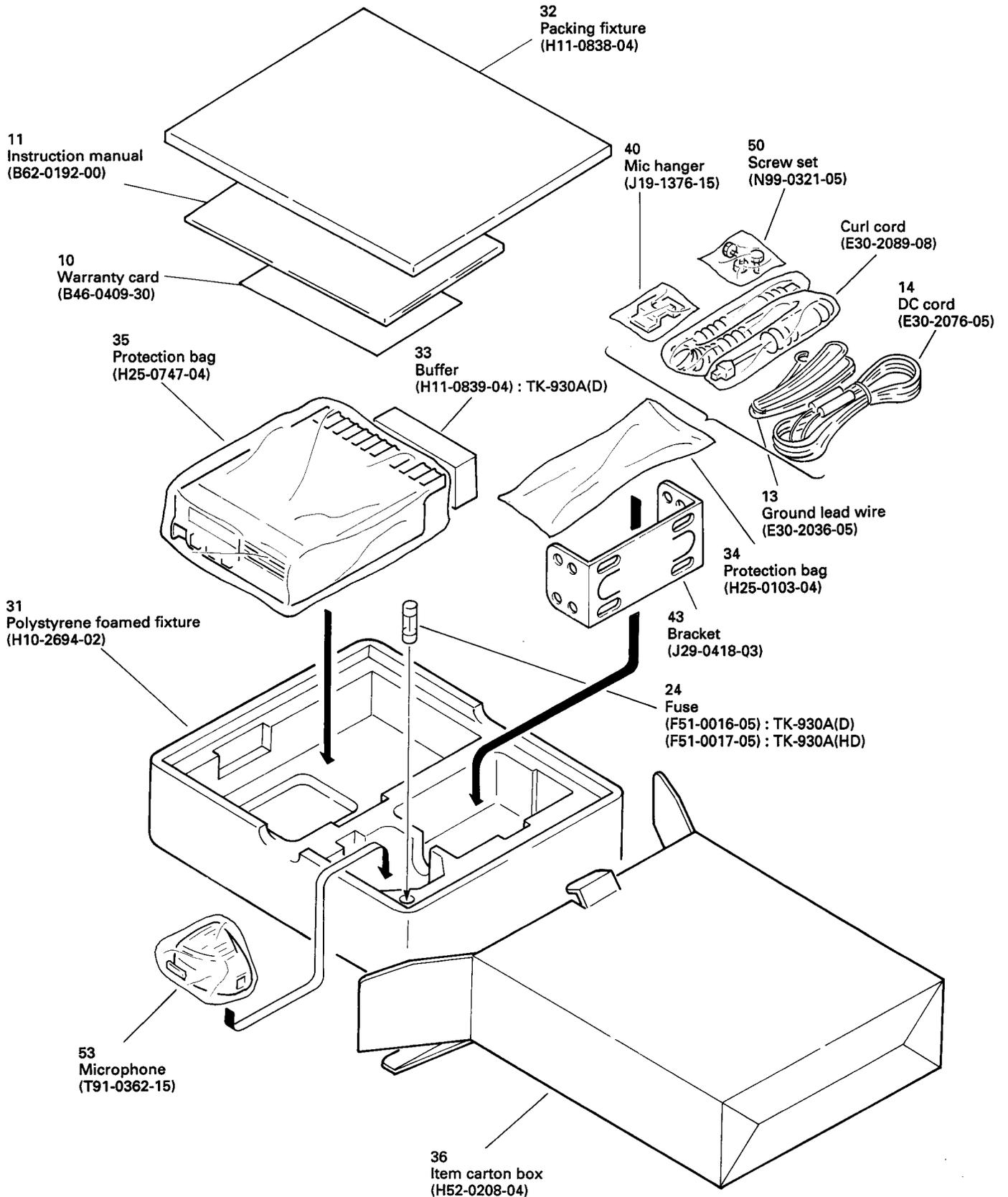
## EXPLODED VIEW



- |   |                     |               |
|---|---------------------|---------------|
| A | :                   | N09-2077-05   |
| C | M2.6 x 6 (Bi)       | : N35-2606-46 |
| D | M3 x 8 (Bi) BLK     | : N35-3008-45 |
| E | M4 x 8 (Bi) BLK     | : N35-4008-45 |
| F | M2.6 x 10           | : N82-2610-46 |
| G | M3 x 5 (Br-Tap)     | : N87-3005-46 |
| H | M3 x 8 (Br-Tap)     | : N87-3008-46 |
| J | M3 x 10 (Br-Tap)    | : N87-3010-46 |
| K | M3 x 8 (Bi-Tap) BLK | : N89-3008-45 |

# TK-931A(D)/931A(HD)

## PACKING



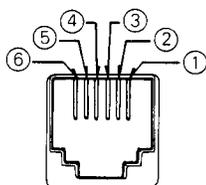
# TK-931A(D)/931A(HD)

## ADJUSTMENT

### Test Equipment Required for Alignment

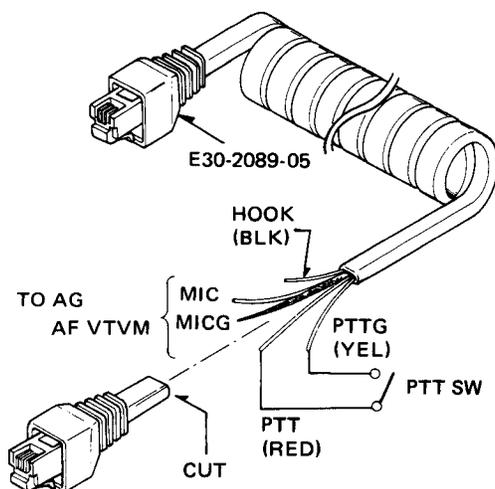
No.	Test Equipment	Major Specifications
1	Standard Signal Generator (SSG)	Frequency Range: 850 to 941MHz. Modulation: Frequency modulation and external modulation. Output: 0.1 $\mu$ V to greater than 1mV.
2	Power Meter	Input Impedance: 50 $\Omega$ . Operation Frequency: 800 to 950MHz or more. Measurement Capability: Vicinity of 100W.
3	Deviation Meter	Frequency Range: 800 to 950MHz.
4	Digital Volt Meter (DVM)	Measuring Range: 1 to 10V 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	30A.
8	AF Volt Meter (AFVTVM)	Frequency Range: 50Hz to 10kHz. Voltage Range: 3mV to 3V.
9	Audio Generator (AG)	Frequency Range: 50Hz to 5kHz or more. Output: 0 to 1V.
10	Distortion Meter	Capability: 3% or less at 1kHz. Input Level: 50mV to 10Vrms.
11	Voltmeter	Measuring Range: 10 to 1.5V DC or less. Input Impedance: 50k $\Omega$ or greater.
12	4 $\Omega$ Dummy Load	Approx. 4 $\Omega$ , 3W.
13	Regulated Power Supply	13.6V, approx. 30A (adjustable from 9 to 17 V). Useful if ammeter equipped.

#### MIC connector front view

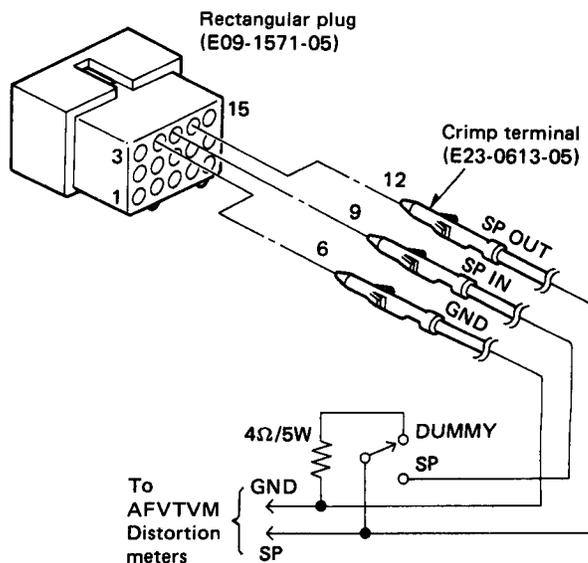


- ① SB
- ② PTTG
- ③ PTT
- ④ MICG
- ⑤ MIC
- ⑥ HOOK

• The following test cables are recommended.



Test cable for Microphone input



Test cable for Speaker output

## ADJUSTMENT

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

### SW100 test mode

		GRP 1	GRP 2	GRP 3	GRP 4	GRP 5
SYS 1	TX(MHz)	896.0000	896.0000	896.0000	896.0000	896.0000
	RX (MHz)	935.0000	935.0000	935.0000	935.0000	935.0000
	TONE	-	LTR	ACLS	ACHS	100Hz square wave
SYS 2	TX (MHz)	896.0250	896.0250	896.0250	896.0250	896.0250
	RX (MHz)	935.0250	935.0250	935.0250	935.0250	935.0250
	TONE	-	LTR	ACLS	ACHS	100Hz square wave
SYS 3	TX (MHz)	899.0000	899.0000	899.0000	899.0000	899.0000
	RX (MHz)	938.0000	938.0000	938.0000	938.0000	938.0000
	TONE	-	LTR	ACLS	ACHS	100Hz square wave
SYS 4	TX (MHz)	899.0250	899.0250	899.0250	899.0250	899.0250
	RX (MHz)	938.0250	938.0250	938.0250	938.0250	938.0250
	TONE	-	LTR	ACLS	ACHS	100Hz square wave
SYS 5	TX (MHz)	900.9875	900.9875	900.9875	900.9875	900.9875
	RX (MHz)	939.9875	939.9875	939.9875	939.9875	939.9875
	TONE	-	LTR	ACLS	ACHS	100Hz square wave
SYS 6	TX (MHz)	901.4000	901.4000	901.4000	901.4000	901.4000
	RX (MHz)	940.4000	940.4000	940.4000	940.4000	940.4000
	TONE	-	LTR	ACLS	ACHS	100Hz square wave
SYS 7	TX (MHz)	901.9000	901.9000	901.9000	901.9000	901.9000
	RX (MHz)	940.9000	940.9000	940.9000	940.9000	940.9000
	TONE	-	LTR	ACLS	ACHS	100Hz square wave
SYS 8	TX (MHz)	897.2500	897.2500	897.2500	897.2500	897.2500
	RX (MHz)	936.2500	936.2500	936.2500	936.2500	936.2500
	TONE	-	LTR	ACLS	ACHS	100Hz square wave
SYS 9	TX (MHz)	900.3000	900.3000	900.3000	900.3000	900.3000
	RX (MHz)	939.3000	939.3000	939.3000	939.3000	939.3000
	TONE	-	LTR	ACLS	ACHS	100Hz square wave
SYS 0	TX (MHz)	936.7500	936.7500	936.7500	936.7500	936.7500
	RX (MHz)	975.7500	975.7500	975.7500	975.7500	975.7500
	TONE	-	LTR	ACLS	ACHS	100Hz square wave

# TK-931A(D)/931A(HD)

## ADJUSTMENT

### Test Mode

The TK-931A(D) and TK-931A(HD) transceivers have a test mode.

To enter the test mode, set button SW100 on the TX-RX unit to the TEST position. When the power is buttoned on with the button set to this position, the test mode is entered. To exit the test mode, reset the button to the NORMAL position, and turn the power off and then back on again. The mode will not be changed merely by resetting the switch. The following functions are available in the test mode.

- **SYSTEM button**

The SYSTEM button is used to select up to ten preprogrammed test frequencies.

- **GROUP button**

The following modulation signals can be selected.

Group	Modulation
1	No modulation
2	LTR format data
3	ACLS format data
4	ACHS format data
5	100Hz square wave

- **A button**

When the A button is pressed in the test mode, the transmitter enters the talk-around mode to transmit with the receive frequency, and the Auxiliary indicator lights.

- **B button**

In test mode, the receiver operates with carrier squelch. When the B button is pressed, the data decode function set in groups 2 and 4 is added.

- **C button**

If the C button is pressed in the test mode, carrier squelch is turned off. If there is no signal noise is output by the speaker and the BUSY indicator lights.

- **S button**

When the S button is pressed in the test mode, scanning occurs. A dash (–) appears on the system and group displays, and all programmed test frequencies are scanned.

- **Alphanumeric display**

The alphanumeric display shows the frequency on which the radio operates in test mode.

- **Transmitter**

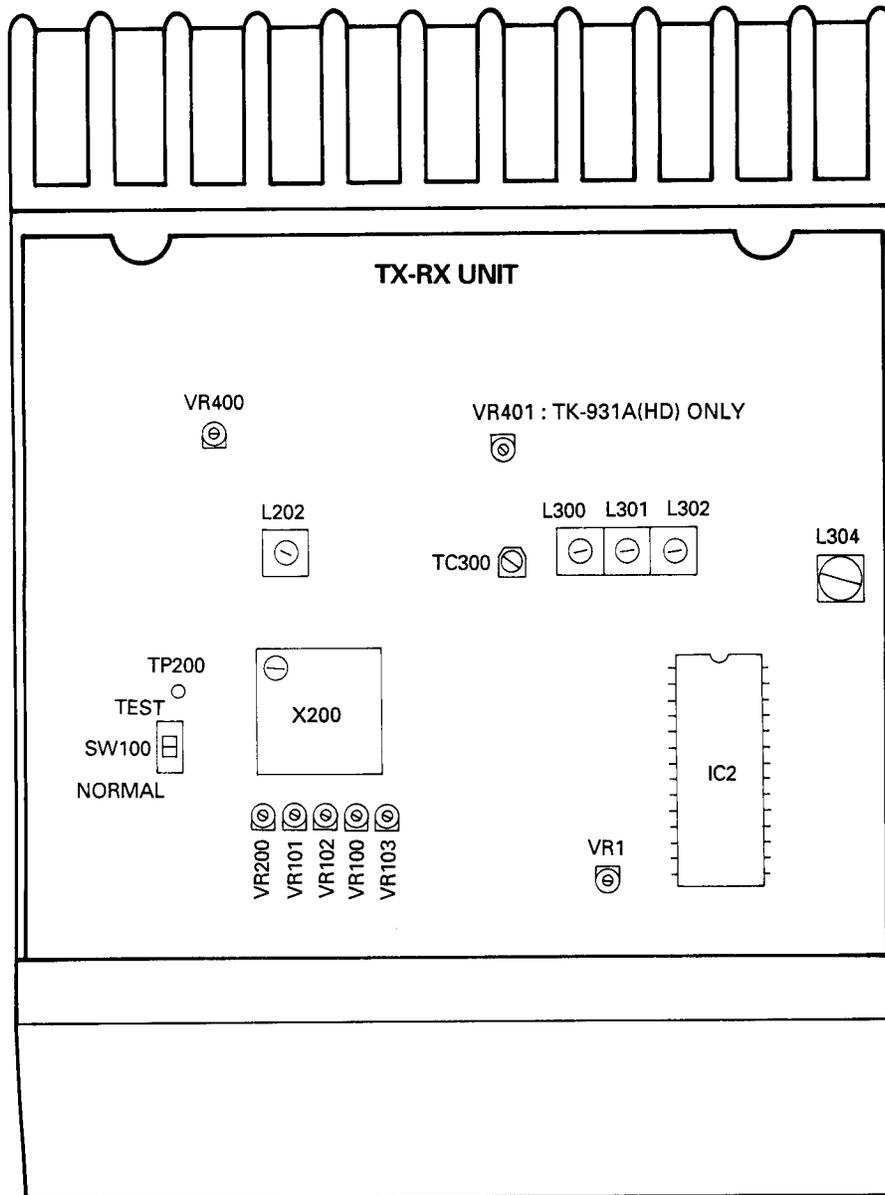
The transmitter is keyed using the microphone PTT button.

The modulation signal selected with the GROUP button is transmitted.

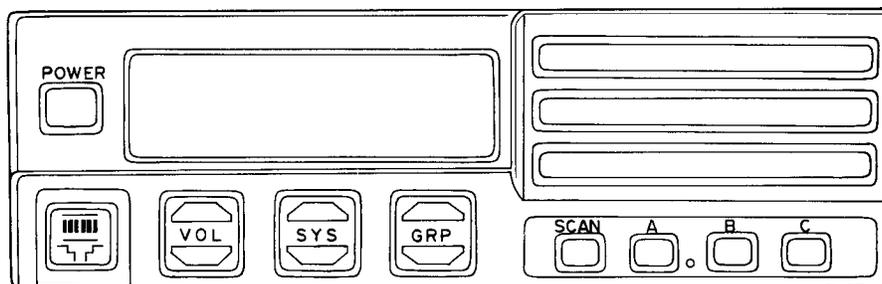
## ADJUSTMENT

### Adjustment Location

Top view



### Front panel view



# TK-931A(D)/931A(HD)

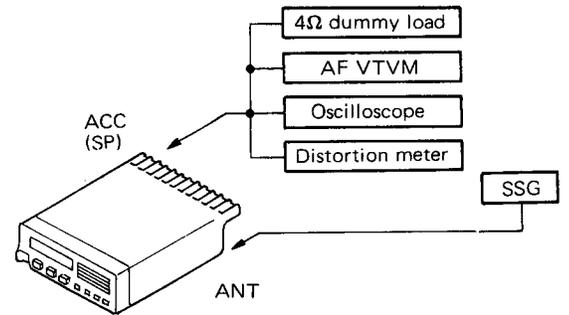
## ADJUSTMENT

### Alignment

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Setting	1) Connect the power cable to the rear panel. TX-RX unit SW100 : TEST MODE Power SW : ON							
2. PLL lock voltage	1) CH : SYS 3 (938MHz) GRP 1	DVM	TX-RX	TP200	TX-RX	L202	4V	±0.1V
	2) CH : SYS 1 (935MHz) GRP 1	Power meter					Check	1.0V or more.
	3) CH : SYS 7 (940.9MHz) GRP 1							7.0V or less.
	4) CH : SYS 1, GRP 1 A SW : ON PTT : ON							1.0V or more.
	5) CH : SYS 7, GRP 1 PTT : ON							7.0V or less.
	6) A SW : OFF							
3. Frequency adjustment (TCXO)	1) CH : Channel with TX freq . PTT : ON <b>Note</b> : TCXO is adjusted precisely at 25°C. If it is readjusted, the frequency stability is changed. Do not touch it normally.	Power meter f. counter	Rear panel	ANT	TX-RX	X200	Freq' adj. of TX.	±50Hz
	2) CH : Check other channel PTT : ON						Check	
4. Power adjustment	1) CH : SYS 4, GRP 1 (Channel with TX center freq') PTT : ON	Power meter Ammeter	Rear panel	ANT	TX-RX	VR400	MAX CW.	16.5W or more : TK-931A(D) 33W or more : TK-931A(HD)
							MAX CCW.	4W or less : TK-931A(D) 12W or less : TK-931A(HD)
							16W : TK-931A(D) 31W : TK-931A(HD)	±1W 6.5A or less : TK-931A(D) 12A or less : TK-931A(HD)
	2) PTT : ON ANT : Short					VR401	Adjust for minimum current : TK-931A(HD) only	8A or less
	3) CH : SYS 1, 7 GRP 1 (Channel with lowest TX freq', and channel with highest TX freq') PTT : ON						Check	12~18W less than : TK-931A(D) 24~36W less than : TK-931A(HD) 6.5A or less : TK-931A(D) 12A or less : TK-931A(HD)
4) A SW : ON								

## ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
	5) CH : SYS 1, 4, 7 GRP 1 PTT : ON	Power meter Ammeter	Rear panel	ANT			Check.	10~18W less than : TK-931A(D) 20~36W less than : TK-931A(HD)
	6) A SW : OFF							
5. Modulation balanced	1) MIC input : OFF Deviation meter filter LPF : 3kHz HPF : OFF De-emphasis : OFF CH : SYS 4, GRP 5 PTT : ON	Power meter Deviation meter AF VTVM AG Oscilloscope	Rear panel	ANT	TX-RX	VR200	Make the de-modulation waveform neat.	
6. LTR maximum deviation	1) MIC input : OFF Deviation meter filter LPF : 3kHz HPF : OFF De-emphasis : 750μs (P-P)/2 CH : SYS 4, GRP 2 PTT : ON					VR103	1.0kHz	±100Hz
7. AmeriCom Hi-speed	1) MIC input : OFF CH : SYS 4, GRP 4 PTT : ON Deviation meter filter LPF : 15kHz HPF : OFF De-emphasis : OFF	Power meter Deviation meter	Rear panel	ANT	TX-RX	VR100	1.75kHz	±0.1kHz
8. Maximum deviation adjustment	1) Connect AG to the MIC terminal. AG : 1kHz/50mV Deviation meter filter LPF : 15kHz HPF : OFF De-emphasis : OFF CH : SYS 4, GRP 1 PTT : ON	Power meter Deviation meter AF VTVM AG Oscilloscope	Rear panel	ANT	TX-RX	VR102	1.7kHz Adjust one more than the other by switching between -P and +P.	±100Hz
9. MIC sensitivity adjustment	1) AG : 1kHz/2.5mV Deviation meter filter LPF : 15kHz HPF : OFF De-emphasis : 750μs (P-P)/2 PTT : ON					VR101	0.75kHz	±100Hz
10. Sensitivity adjustment	1) CH : SYS 4, GRP 1 (Channel with RX center freq' (fRM)) SCAN SW : ON (BUSY)	SSG AF VTVM Distortion meter Oscilloscope	Rear panel	ACC (EXT.SP)				
	2) SSG freq' : fRM Output : -10dBμ/0.32μV/-117dBm MOD : 1kHz DEV : ±2.5kHz				TX-RX	L304 L302	Adjust for maximum AF output.	



# TK-931A(D)/931A(HD)

## ADJUSTMENT

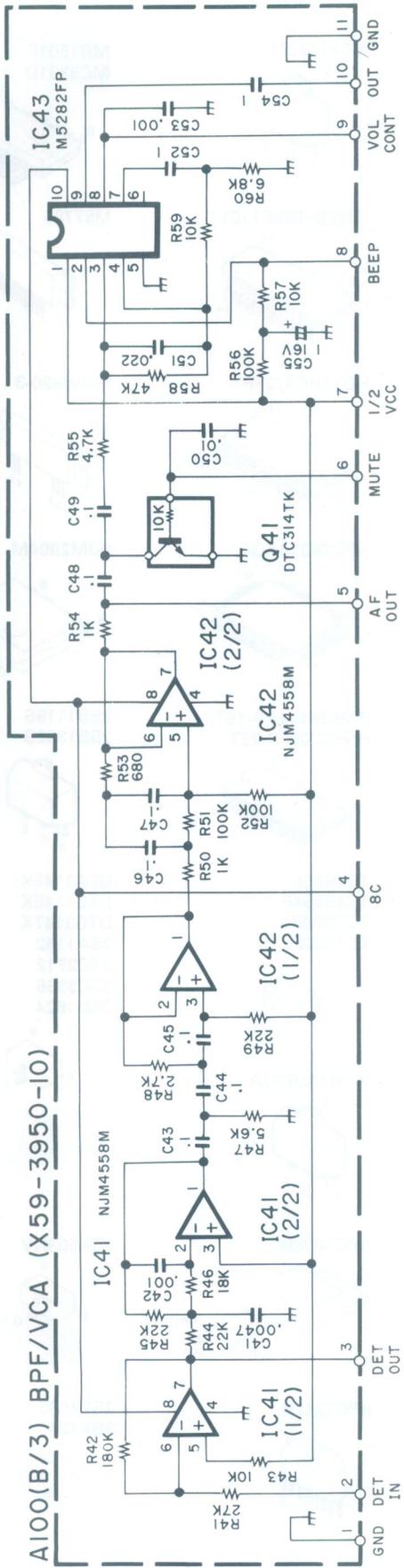
Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
	3) SSG output : -6dBμ/0.5μV/-113dBm MOD : 1kHz DEV : ±2.5kHz	SSG AF VTVM Distortion meter  Oscilloscope	Rear panel	ACC (EXT.SP)	TX-RX	L300 L301	Adjust for minimum distortion.	
						TC300	Adjust for minimum noise.	
	5) SSG output : -10dBμ/0.32μV/-117dBm MOD : 1kHz DEV : ±1.5kHz						Check	SINAD 12dB or more.
	6) CH : SYS 2, 6 GRP 1 (Channel with lowset RX freq' (fRL), and channel with highest RX freq' (fRH)) SSG freq' : fRL and fRH Output : -10dBμ/0.32μV/-117dBm MOD : 1kHz DEV : ±1.5kHz						Check	SINAD 12dB or more.
11. Squelch adjustment	1) CH : SYS 4, GRP 1 SSG freq' : fRM Output : Value when 3dB is subtracted from the sensitivity value of 12dB SINAD. MOD : 1kHz DEV : ±1.5kHz SCAN SW : OFF	SSG AF VTVM Oscilloscope	Rear panel	EXT.SP	TX-RX	VR1	Set to threshold point.	
	2) SSG output : -11dBμ/0.28μV/-118dBm						Check	Squelch must be opened.
	3) SSG output : Value when 3dB is subtracted from the sensi- tivity value of 12dB SINAD.							Squelch must be closed.

## TERMINAL FUNCTIONS

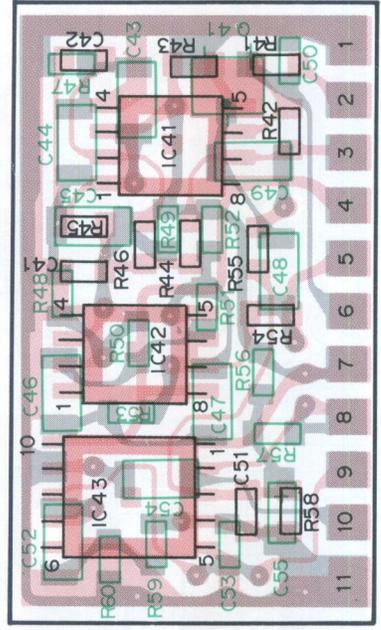
Connector No.	Terminal No.	Terminal Name	Terminal Function
<b>TX-RX UNIT (X57-3930-11/X57-3940-11)</b>			
CN1	1	PS	Power switch control signal input.
	2	SB	Power output after passing through the power switch.
	3	GN	GND.
	4	MT	Serial control signal output to the LCD ass'y.
	5	MR	Serial control signal input from the LCD ass'y.
	6	AUX2	Unused (normally shorted).
	7	AUX1	Unused.
	8	HK	HOOK (microphone hook) signal input.
	9	MC	MIC signal input.
	10	MG	MIC GND.
	11	PT	PTT signal input.
	12	GN	GND.
	13	SB	Power output after passing through the power switch.
	14	SG	GND for speaker.
	15	SO	Speaker output.
CN2	1A	HK	HOOK (microphone hook) signal input.
	2A	MG	MIC GND.
	3A	IG	Ignition sense input.
	4A	PS	Remote power switch control signal input.
	5A	MC	MIC signal input.
	6A	GN	GND.
	7A	SB	Power output after passing through the power switch.
	8A	PT	PTT signal input.
	1B	SI	Input for internal speaker.
	2B	HN	Horn relay drive signal output.
	3B	AUX1	Unused.
	4B	SO	Output for external speaker.
	5B	AUX2	Unused.
6B	MR	Remote serial control signal input.	
7B	MT	Remote serial control signal output.	
8B	NC	No connection.	
CN3	1	SPO	Output for internal speaker.
	2	SPG	GND for internal speaker.
CN4	1	HK	HOOK (microphone hook) signal output.
	2	MC	MIC signal output.
	3	MG	MIC GND.
	4	PT	PTT signal output.
	5	GN	GND.
	6	SB	Power input after passing through the power switch.
	7	SG	GND for speaker.
	8	SO	Input for internal speaker.
J1	1	SB	Power output after passing through the power switch.
	2	PTT-GND	PTT GND.
	3	PTT	PTT signal input.
	4	MIC-GND	MIC GND.
	5	MIC	MIC signal input.
	6	HOOK	HOOK (microphone hook) signal input.

Connector No.	Terminal No.	Terminal Name	Terminal Function
<b>LCD ASS'Y (B38-0332-15)</b>			
CN1	1	POWER SW	Power switch control signal output.
	2	SB	Power input after passing through the power switch.
	3	GND	GND.
	4	MTX	Serial control signal input from TX-RX unit.
	5	MRX	Serial control signal output to TX-RX unit.
	6	AUX2	Unused.
	7	AUX1	Unused.
<b>EXTERNAL CONNECTION</b>			
J2	-	ANT	N-type coaxial connector for antenna connection.
J3	1	+B	13.6V power supply input.
	2	GND	GND.
J4 (Accessory connector)	1	HOOK	HOOK (microphone hook) signal input.
	2	MIC-GND	MIC GND.
	3	IGS	Ignition sense input. 3.6V→ON, 0V→OFF
	4	POWER SW	Remote power switch control signal input. GND→POWER ON, OPEN→POWER OFF
	5	MIC	MIC signal input. Standard modulation with 600Ω, 5mV.
	6	GND	GND (for DC and speaker output).
	7	SB	Power output after passing through the power switch. +13.6V, 1A max.
	8	PTT	PTT signal input. GND→TX, OPEN→RX
	9	SP-IN	Input for internal speaker. Normally connected to No.12 (SP-OUT) with J5.
	10	HORN	Horn relay drive signal output (open collector). Low level when horn is driven. Maximum sink current : 800mA.
	11	AUX1	Reserved for remote operation.
	12	SP-OUT	Output for external speaker.
	13	AUX2	Reserved for remote operation. (Normally shorted)
	14	MRX	Remote serial control signal input.
	15	MTX	Remote serial control signal output.

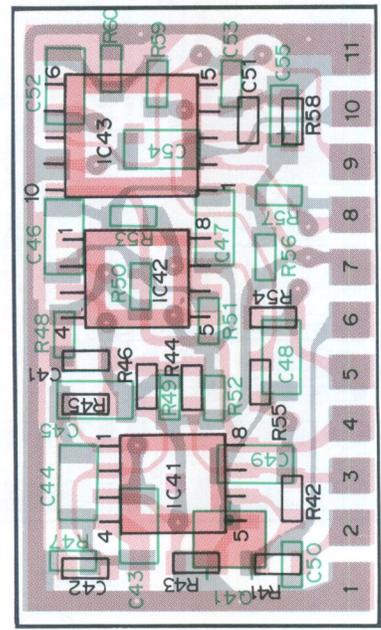




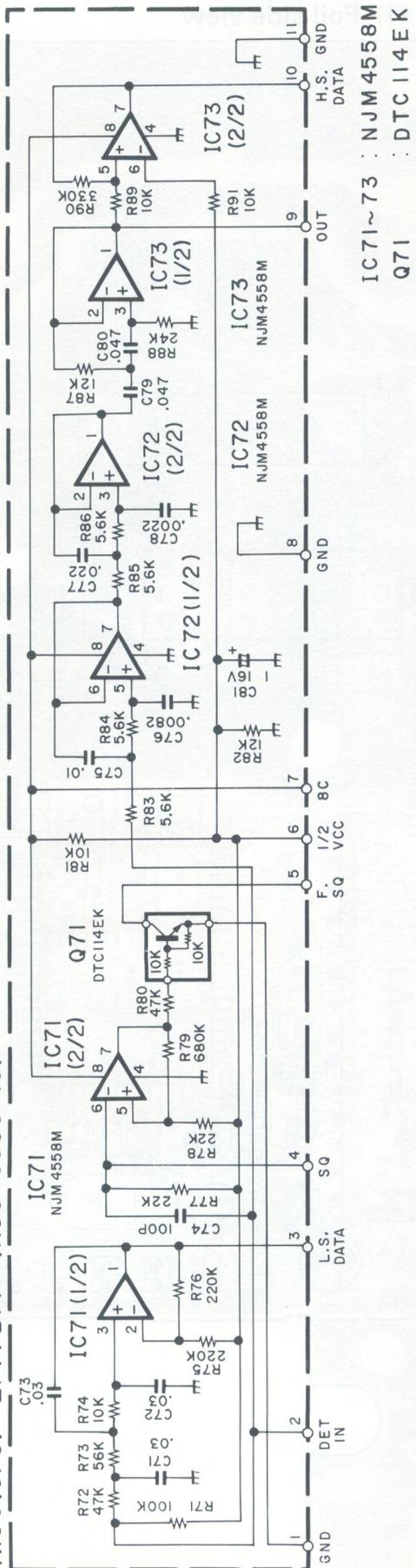
**BPF/VCA (X59-3950-10) (B/3)  
 Foil side view**



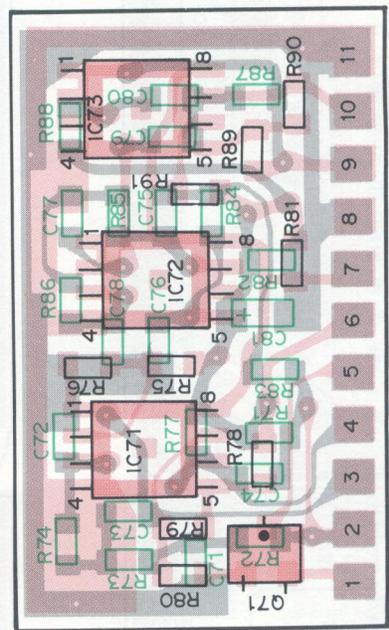
**BPF/VCA (X59-3950-10) (B/3)  
 Component side view**



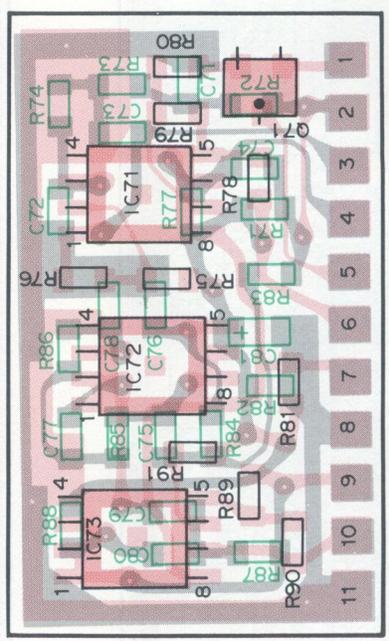
**A100(C/3) LPF/BPF (X59-3950-10)**



**LPF/BPF (X59-3950-10) (C/3)  
Component side view**



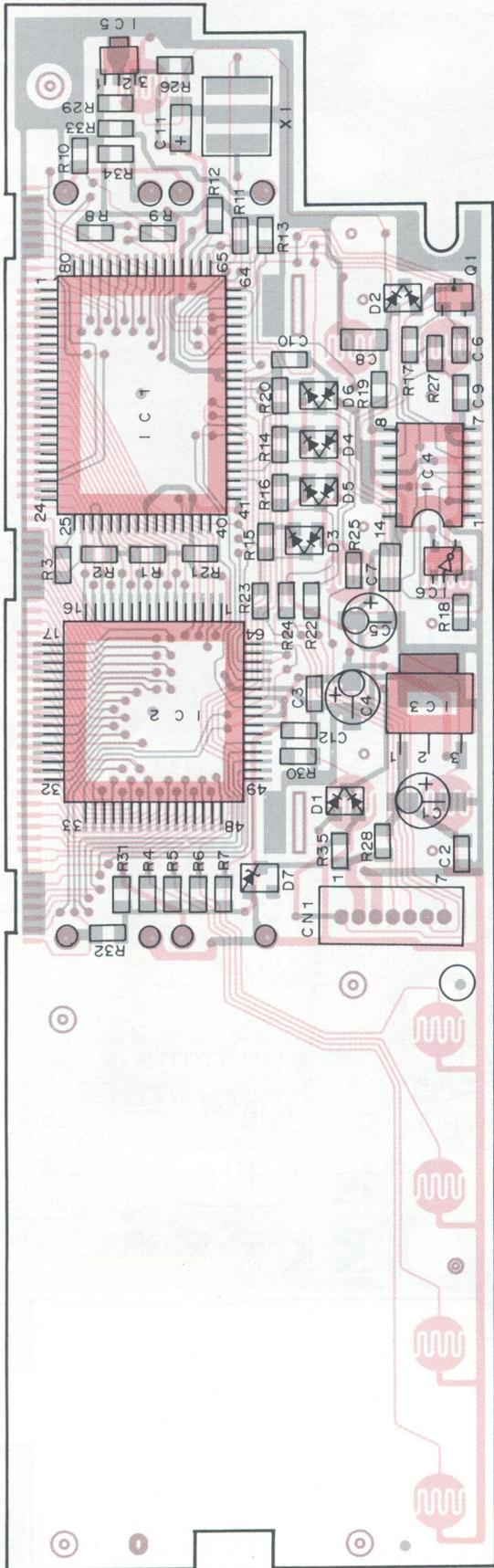
**LPF/BPF (X59-3950-10) (C/3)  
Foil side view**



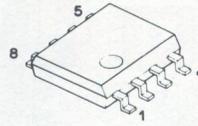
# PC BOARD VIEWS TK-931A(D)/931A(HD)

## LCD ASS'Y (B38-0332-15)

### Foil side view



NJM4558M



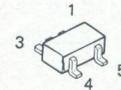
M51943BML



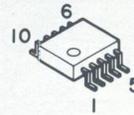
DTA114EK  
DTC114EK  
DTC314TK  
2SC2712



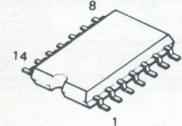
TC4SU69F



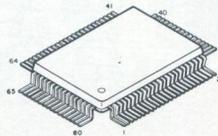
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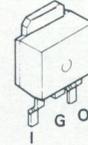
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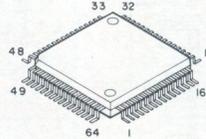
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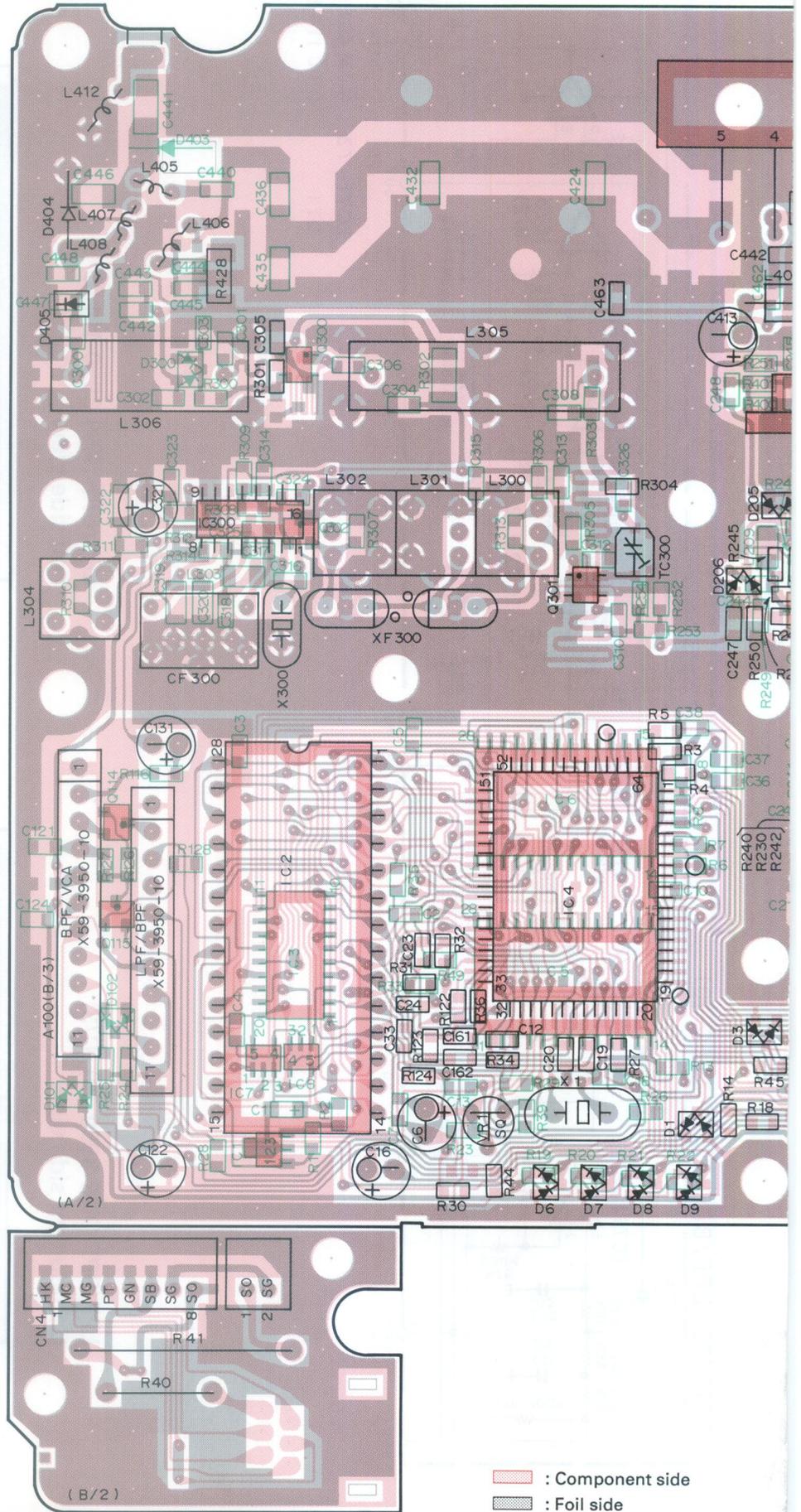
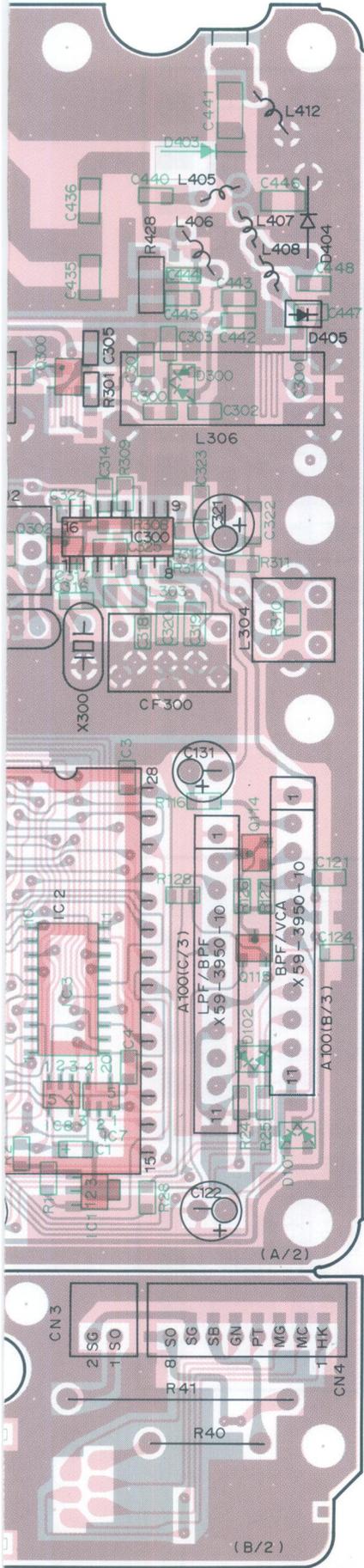
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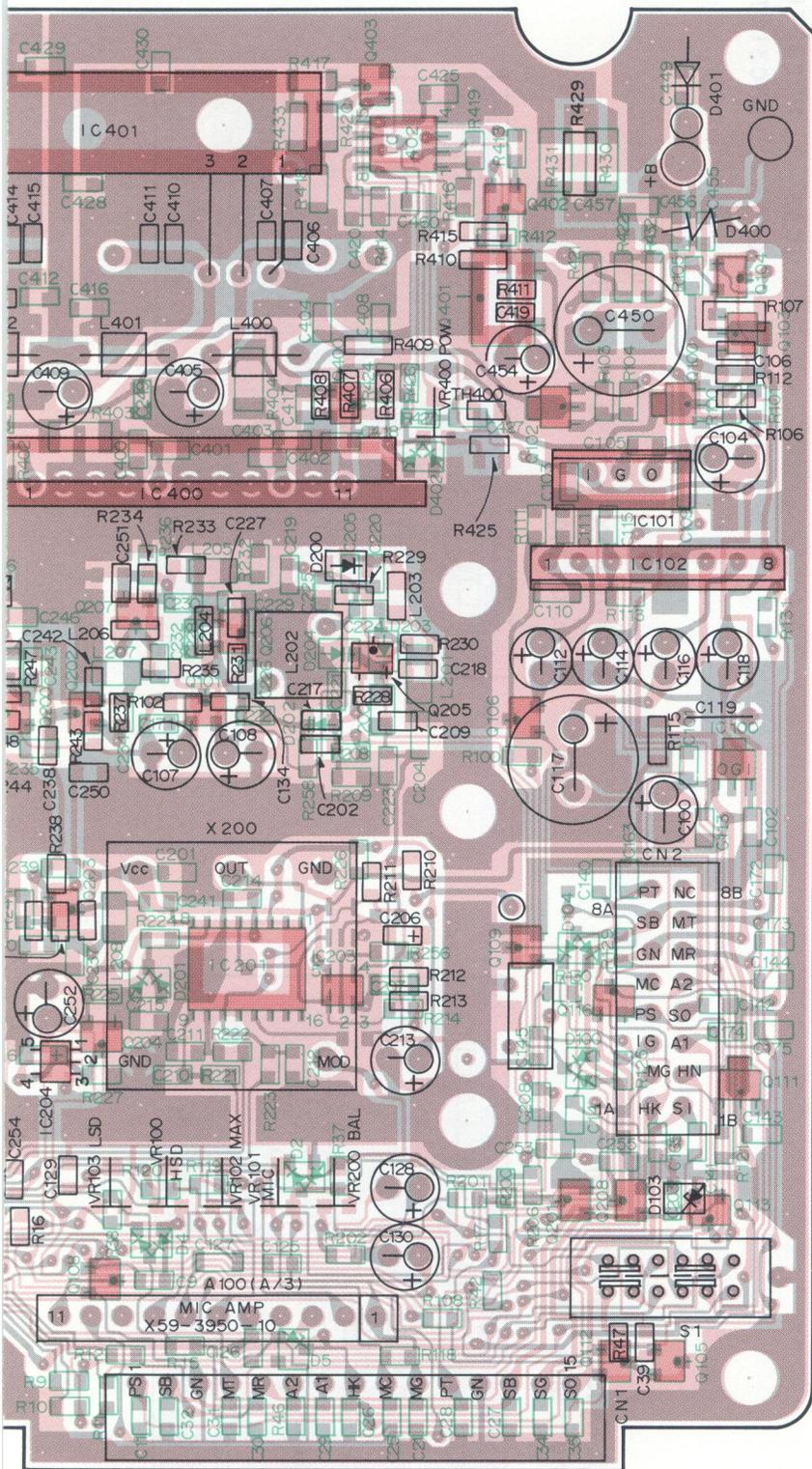
: Component side  
 : Foil side



### TX-RX UNIT (X57-3930-11) Foil side view



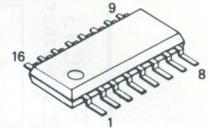
: Component side  
 : Foil side



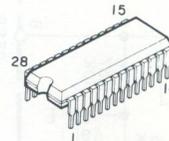
M51943BML



MB1501F  
MC3361D



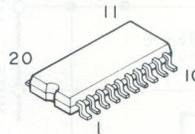
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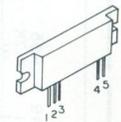
M57781



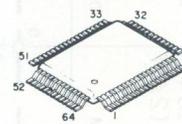
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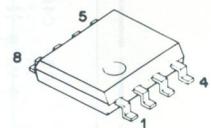
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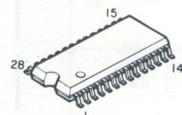
μPD78310AGF



NJM2904M



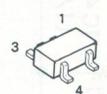
HM6264ALFP-15T  
HN58C65FP-25T



2SB1119S  
2SB1302S



TC4S66F  
TC4S584F  
TC7S00F  
TC7S32F



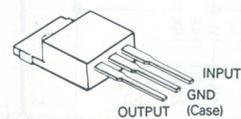
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DTC114EK  
DTC314TK  
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2SC2712  
2SC3356  
2SD1624



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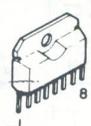
μPC7808H



2SK508NV



μPC1242H



2SC4093  
3SK184



2SB967

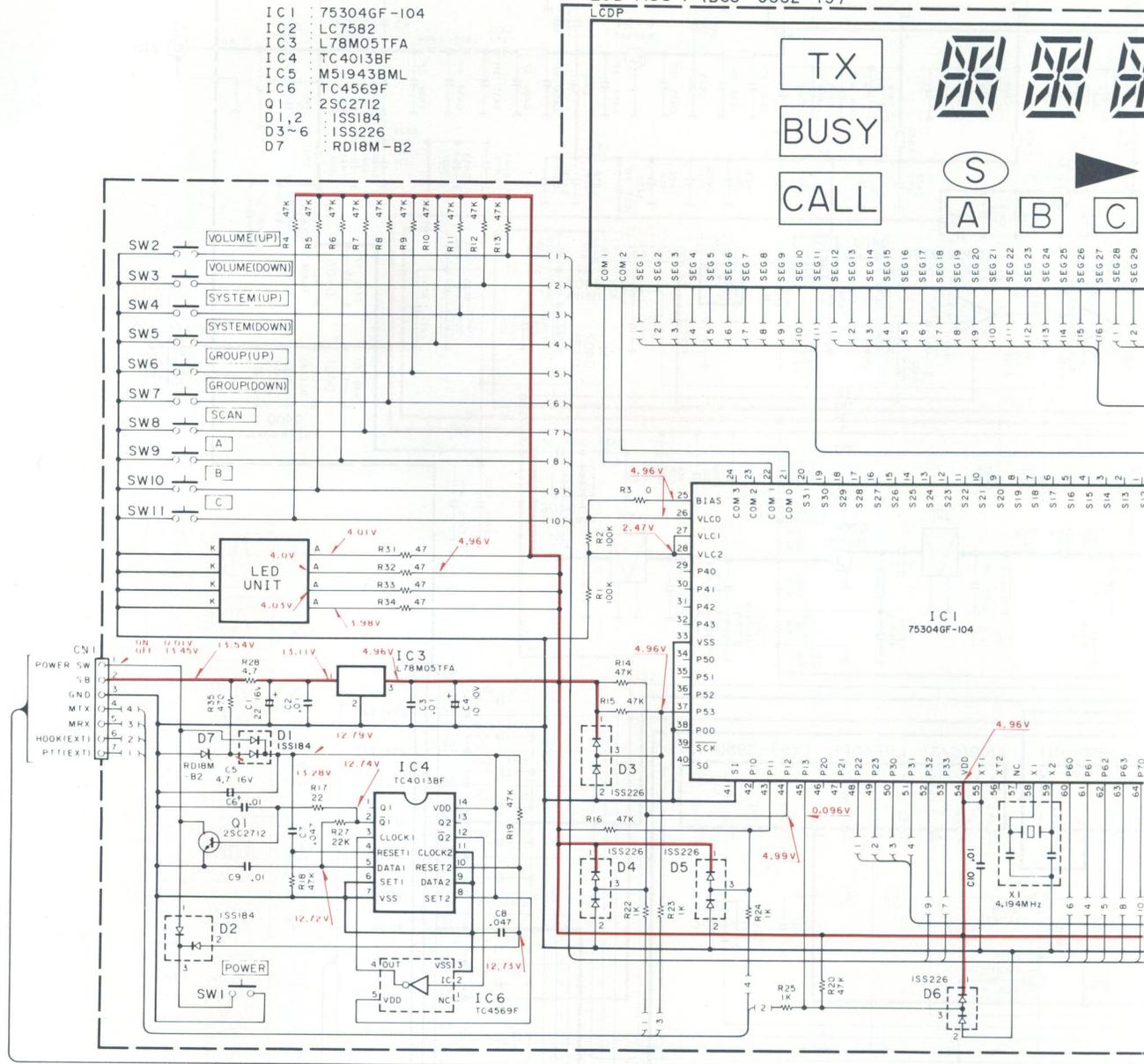


2SK302



- IC1 : 753046F-104
- IC2 : LC7582
- IC3 : L78M05TFA
- IC4 : TC4013BF
- IC5 : M51943BML
- IC6 : TC4569F
- Q1,2 : 2SC2712
- D1,2,6 : ISS184
- D3,7 : ISS226
- D7 : RD18M-B2

LCD ASS'Y (B38-0332-15)

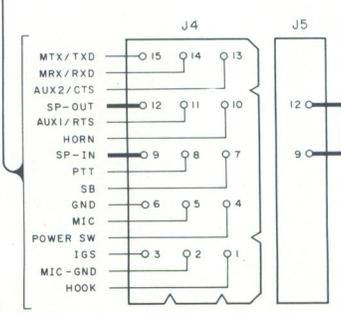
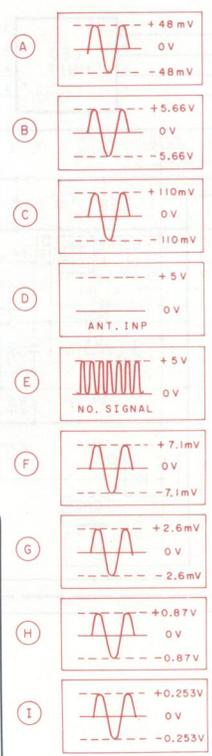
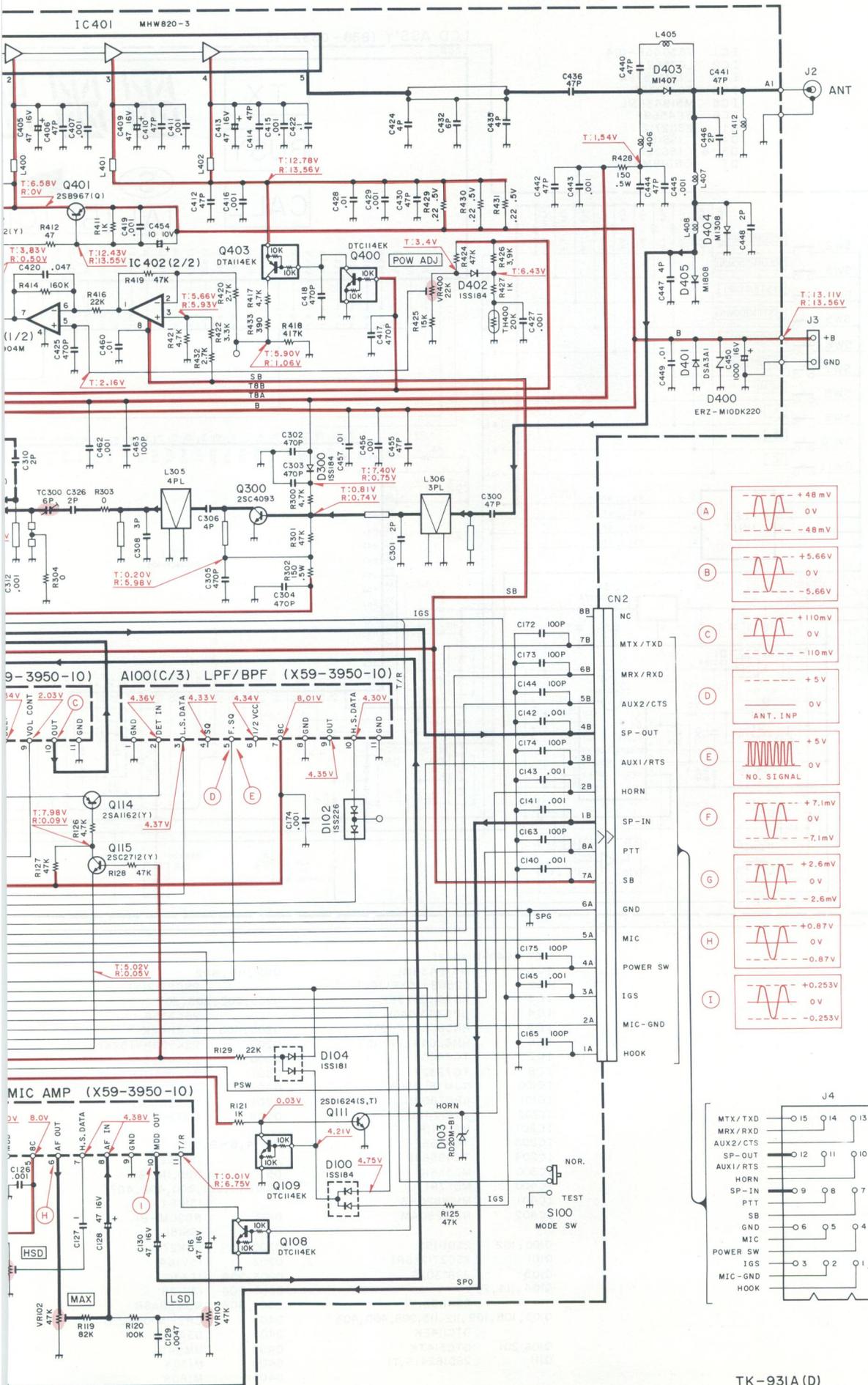


- (X57-3930-11) (A/2)
- |                                    |                 |                     |               |
|------------------------------------|-----------------|---------------------|---------------|
| IC1                                | M51943BML       | Q115, 116, 402      | 2SC2712(Y)    |
| IC2                                | C256B-15XF1JCLI | Q200, 202, 203, 207 | 2SC3356       |
| IC3                                | HD74HC373FP     | Q205, 403           | DTA114EK      |
| IC4                                | μPD78310AGF     | Q206                | 2SK508NV(52K) |
| IC5                                | HN58C65FP-25T   | Q300                | 2SC4093       |
| IC6                                | HM6264ALFP-15T  | Q301                | 3SK184(R)     |
| IC7                                | TC7S00F         | Q302                | 2SK302(GR)    |
| IC8                                | TC7S32F         | Q401                | 2SB967(Q)     |
| IC100                              | NJM78L05UA      |                     |               |
| IC101                              | μPC7808H        |                     |               |
| IC102                              | μPC1242H        |                     |               |
| IC201                              | MB1501F         |                     |               |
| IC203                              | TC4S66F         |                     |               |
| IC204                              | TC4S584F        |                     |               |
| IC300                              | MC3361D         |                     |               |
| IC400                              | M57781          |                     |               |
| IC401                              | MHW820-3        |                     |               |
| IC402                              | NJM2904M        |                     |               |
| Q100, 102                          | 2SB1119S        |                     |               |
| Q101                               | 2SC2712(GR)     |                     |               |
| Q103                               | 2SB1302S        |                     |               |
| Q104, 114, 204                     | 2SA1162(Y)      |                     |               |
| Q105, 108, 109, 112, 113, 208, 400 | 2SA1162(Y)      |                     |               |
| Q106, 201                          | DTC314TK        |                     |               |
| Q111                               | 2SD1624(S,T)    |                     |               |
| D1 ~ 4, 6 ~ 9, 102                 | ISS226          |                     |               |
| D5                                 | RD5.1M-BI       |                     |               |
| D100, 101, 201, 300, 402           | ISS184          |                     |               |
| D103                               | RD20M-BI        |                     |               |
| D104                               | ISS181          |                     |               |
| D200                               | HSK277          |                     |               |
| D202                               | ISVI64          |                     |               |
| D203, 204                          | IT33C           |                     |               |
| D205, 206                          | ISVI28          |                     |               |
| D400                               | ERZ-M10DK220    |                     |               |
| D401                               | DSA3A1          |                     |               |
| D403                               | UM9401          |                     |               |
| D404                               | M1308           |                     |               |
| D405                               | M1808           |                     |               |



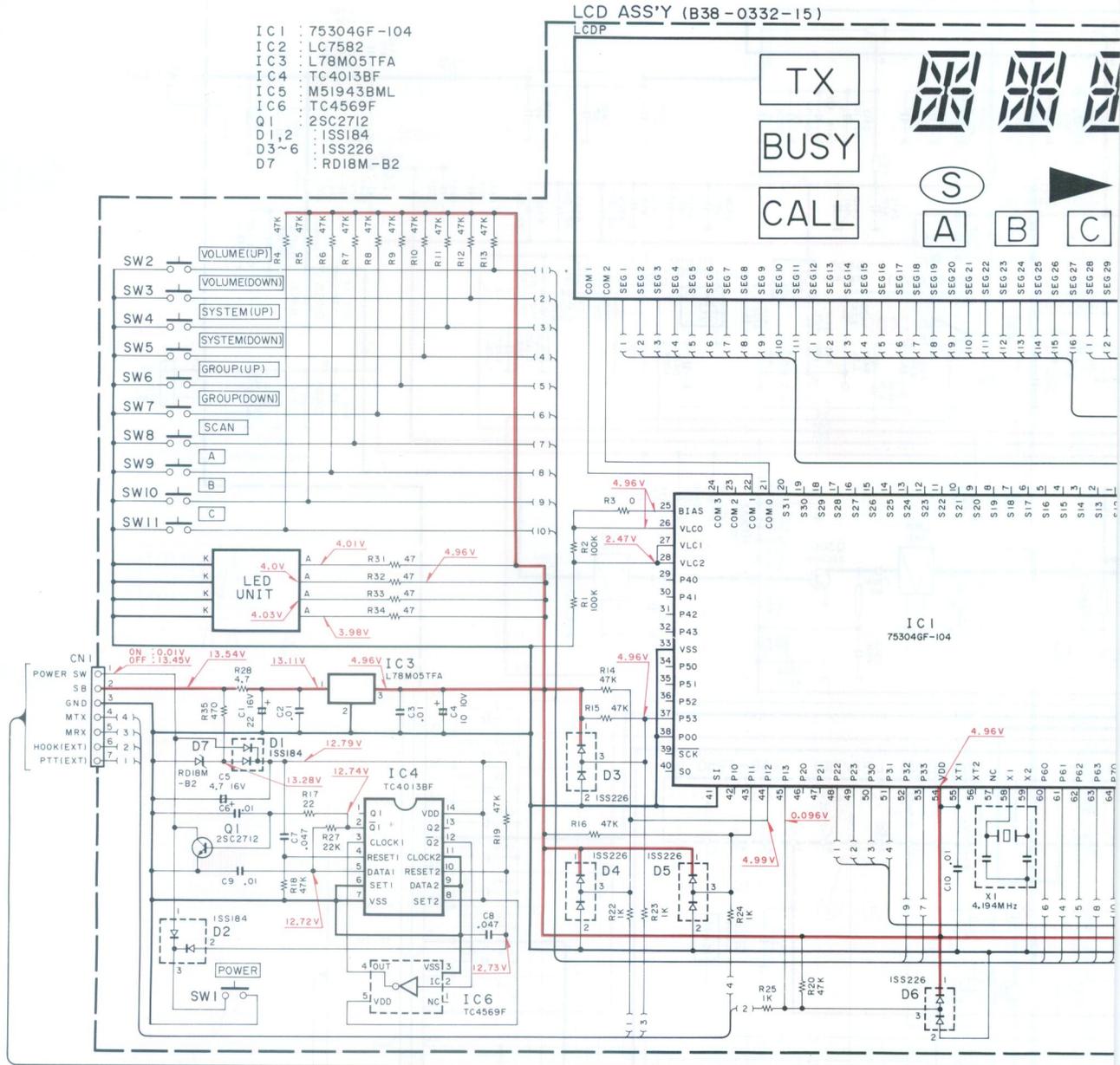


# SCHEMATIC DIAGRAM TK-931A(D)



# TK-931A(HD) SCHEMATIC DIAGRAM

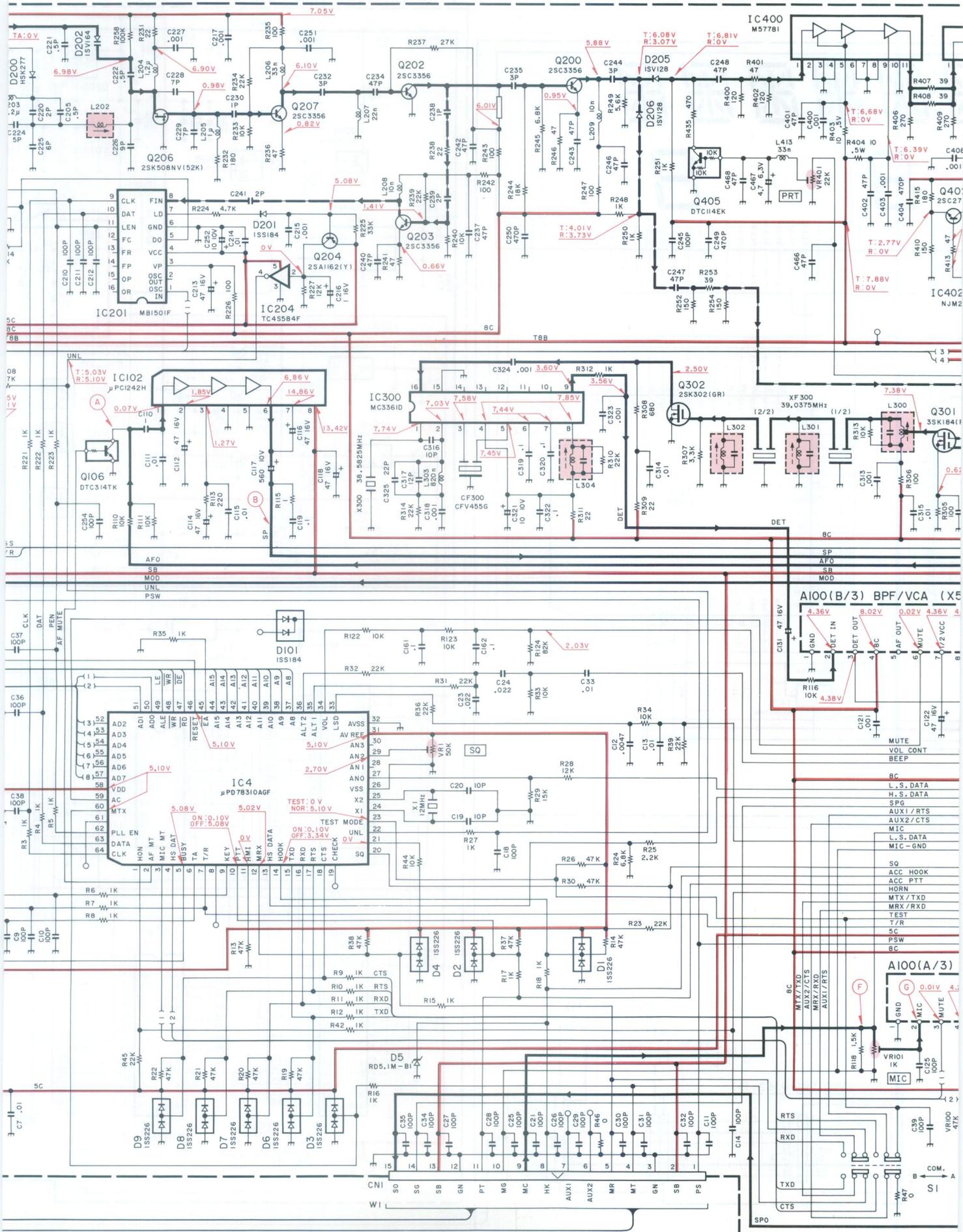
IC1 : 753046F-104  
 IC2 : LC7582  
 IC3 : L78M05TFA  
 IC4 : TC4013BF  
 IC5 : M51943BML  
 IC6 : TC4569F  
 Q1 : 2SC2712  
 D1,2 : ISS184  
 D3~6 : ISS226  
 D7 : RD18M-B2



(X57-3940-11) (A/2)

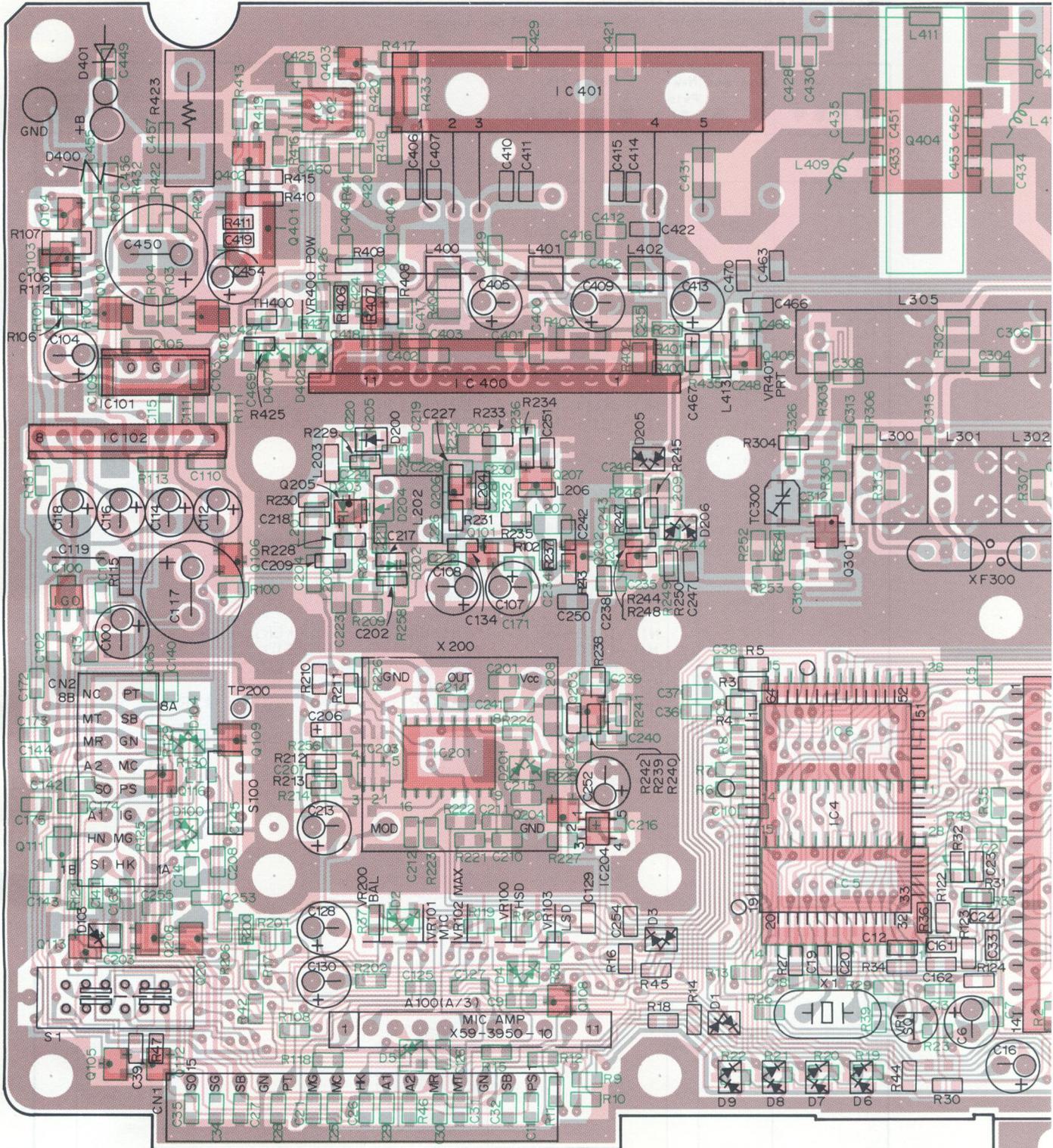
IC1	: M51943BML	Q115, 116, 402	
IC2	: C256B-15XF1JCLI		: 2SC2712(Y)
IC3	: HD74HC373FP	Q200, 202, 203, 207	
IC4	: μPD78310AGF		: 2SC3356
IC5	: HN58C65FP-25T	Q205, 403	: DTA114EK
IC6	: HM6264ALFP-15T	Q206	: 2SK508NV(52K)
IC7	: TC7S00F	Q300	: 2SC4093
IC8	: TC7S32F	Q301	: 3SK184(R)
IC100	: NJM7BL05UA	Q302	: 2SK302(GR)
IC101	: μPC7808H	Q401	: 2SB967(Q)
IC102	: μPC1242H	Q404	: MRF847
IC201	: MBI501F		
IC203	: TC4566F		
IC204	: TC45584F		
IC300	: MC3361D		
IC400	: M57781		
IC401	: MHW820-3		
IC402	: NJM2904M		
Q100, 102	: 2SB1119S		
Q101	: 2SC2712(GR)		
Q103	: 2SB1302S		
Q104, 114, 204			
	: 2SA1162(Y)		
Q105, 108, 109, 112, 113, 208, 400, 405			
	: DTC114EK		
Q106, 201	: DTC314TK		
Q111	: 2SD1624(S,T)		
		D1~4, 6~9, 102	
			: ISS226
		D5	: RD5.1M-B1
		D100, 101, 201, 300, 402, 407	
			: ISS184
		D103	: RD20M-B1
		D104	: ISS181
		D200	: HSK277
		D202	: ISV164
		D203, 204	: IT33C
		D205, 206	: ISV128
		D301, 406	: NSM8BASR
		D400	: ERZ-M10DK220
		D401	: DSA3A1
		D403	: UM9401
		D404	: M1308
		D405	: M1808



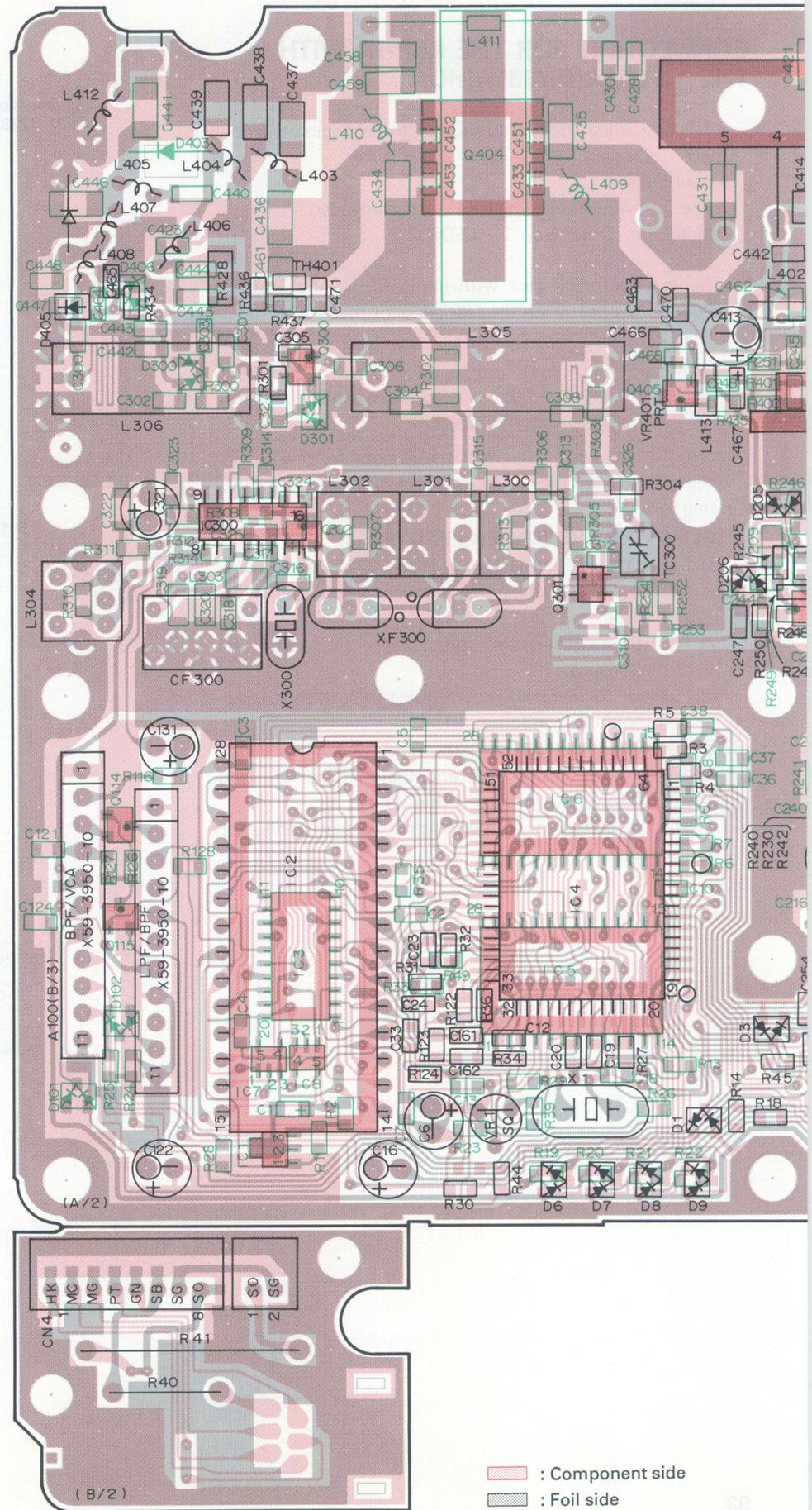
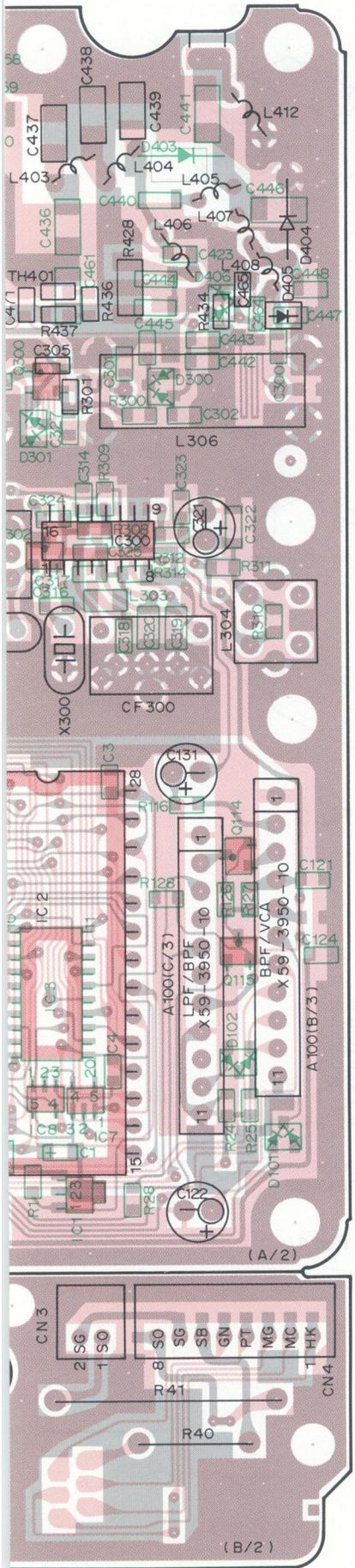




# TX-RX UNIT (X57-3940-11) Component side view

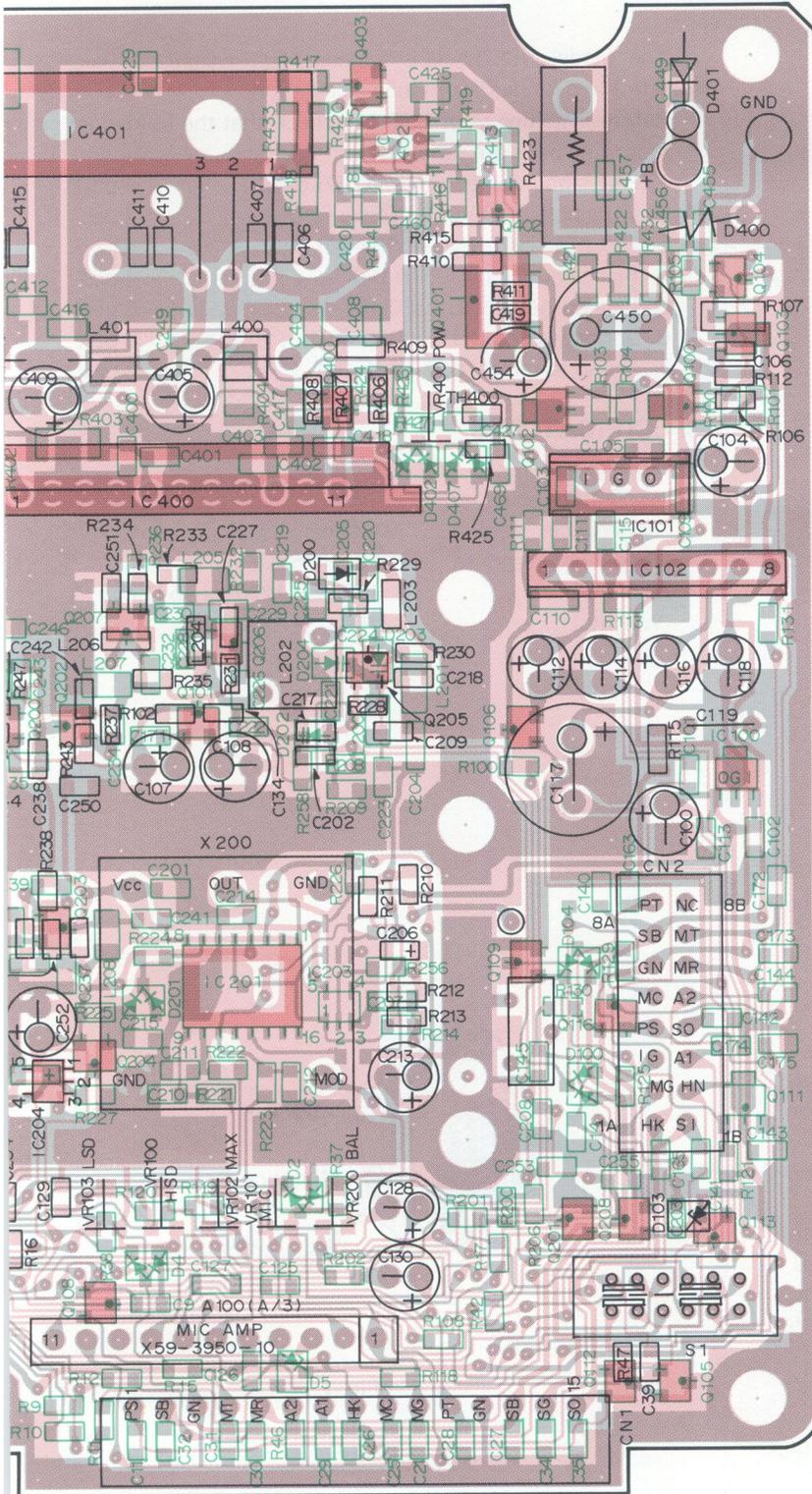


### TX-RX UNIT (X57-3940-11) Foil side view



: Component side  
 : Foil side

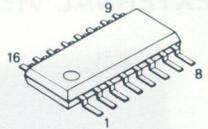
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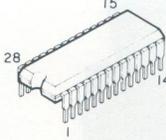
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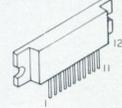
MB1501F  
MC3361D



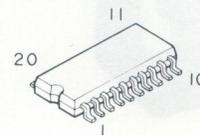
C256B-15XF1JCL1



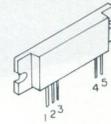
M57781



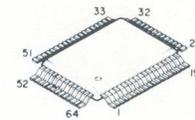
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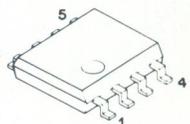
MHW820-3



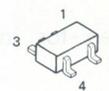
μPD78310AGF



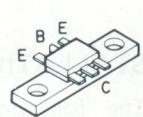
NJM2904M



TC4S66F  
TC4S584F  
TC7S00F  
TC7S32F



MRF847



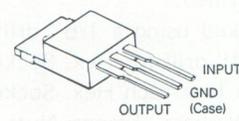
NJM78L05UA



2SB1119S  
2SB1302S



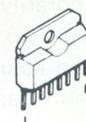
μPC7808H



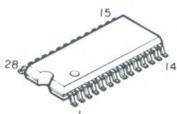
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DTC114EK  
DTC314TK  
2SA1162  
2SC2712  
2SC3356  
2SD1624



μPC1242H



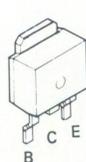
HM6264ALFP-15T  
HN58C65FP-25T



2SK302



2SB967



2SK508NV



2SC4093  
3SK184



# TK-931A(D)/931A(HD)

## KSP-1A (EXTERNAL SPEAKER)

### EXTERNAL VIEW



The Model KSP-1A is a compact, light-weight speaker specifically designed for mobile installation.

\* Before installing your KSP-1A, check that the following mounting parts are supplied:

1. Self tapping screws (N09-0655-05) . . . . . 4 pcs.
2. Wing bolts (N09-0662-05) . . . . . 2 pcs.
3. Hex-head bolts (N09-0008-04) . . . . . 4 pcs.
4. Flange nuts (N14-0510-04) . . . . . 4 pcs.
5. Flat washers (N15-1060-46) . . . . . 6 pcs.
6. Spring washers (N16-0060-46) . . . . . 6 pcs.
7. Crimp terminal (E23-0495-05) . . . . . 2 pcs.

### SPECIFICATIONS

Speaker size . . . . .	120mm
Maximum input . . . . .	10W
Impedance . . . . .	4 ohms
Frequency response . . . . .	165Hz~8kHz
Dimensions . . . . .	127 W x 127 H x 65 D mm
Weight . . . . .	750g

### INSTALLATION

The following tools are required for installing the External Speaker.

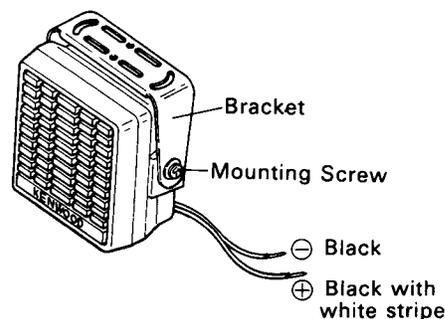
- 1/4" drill for Hex. Socket Screws.
- 1/6" drill for Self-tapping Screws.
- Screw Driver, Phillips No. 2.

1. Select a location in which to install the External Speaker.
2. Loosen the two Mounting Screws and remove the Bracket from the External Speaker (**Fig. 1**).
3. Use the Bracket as a template to locate the holes and mark four points to be drilled.
4. Drill four holes as marked using a 1/6" drill for Self-tapping Screws, or a 1/4" drill for Hex. Socket Screws.
5. Secure the Bracket with four each Hex. Socket Screws, Flat Washers, Spring Washers, Flange Nuts and Self-tapping Screws.
6. Attach the External Speaker temporarily to the Bracket using either two Mounting Screws or two Wing Screws.
7. The angle of the Bracket may be adjusted to any of seven possible angles. Select the desired angle.

**Note:** \_\_\_\_\_

The angle of the External Speaker can be adjusted 30-degree in seven steps.

8. Hold the External Speaker in place and tighten the two screws.



**Fig. 1**

# TK-931A(D)/931A(HD)

## KSP-1A (EXTERNAL SPEAKER)

### CONNECTION FOR THE KSP-1A WITH THE TK-931A(D)/931A(HD)

The following tools are required for changing the connector.

Extracting tool

The following extracting tool is recommended:  
Molex Inc. Order No.: 11-03-0002

1. Remove the connector with jumper from the External Speaker connector on the rear panel of the radio.

(Fig. 2)

**Note:**

Save the jumper, which is required when the radio is used without the External Speaker.

2. Remove the terminals with the jumper from the connector housing holes number 9 and 12 using the extracting tool.

#### REMOVING THE JUMPER LEAD (Fig. 3)

- 1) Insert the extracting tool (11-03-0002) into the connector while pushing the jumper lead in the direction of (a).
  - 2) Push the extracting tool into collapse the barbs of the crimp terminal.
  - 3) Pull out the lead while continuing to push the extracting tool in the direction (b).
3. Reinsert the terminal with the black and white stripe lead into hole number 12, and the terminal with the black lead into hole number 6 (Fig. 4).
  4. Attach the connector to the External Speaker connector on the radio.

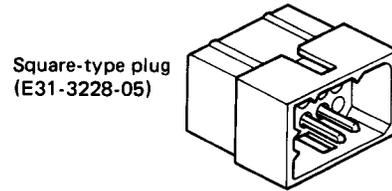


Fig. 2

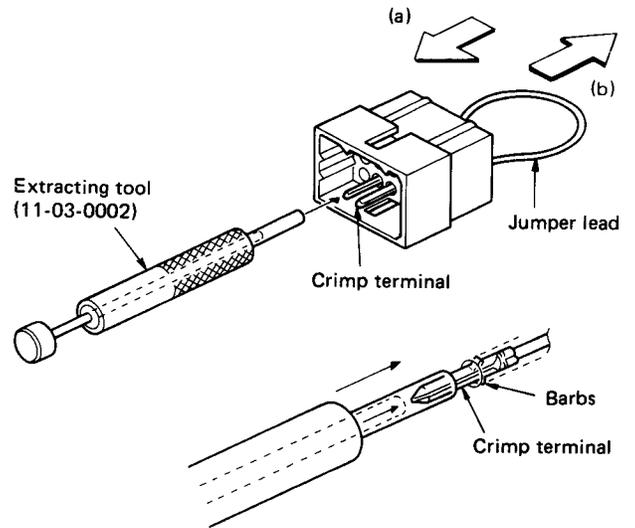


Fig. 3

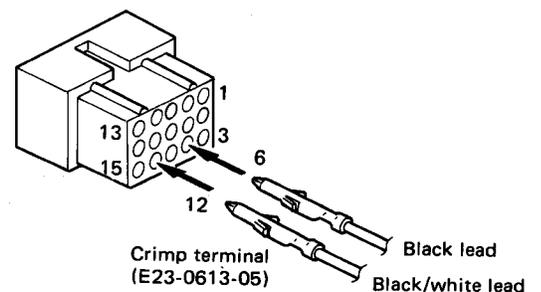


Fig. 4

# TK-931A(D)/931A(HD)

## KSP-1A (EXTERNAL SPEAKER)

× New Parts

Parts without Parts No. are not supplied.

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

Telle ohne Parts No. werden nicht geliefert.

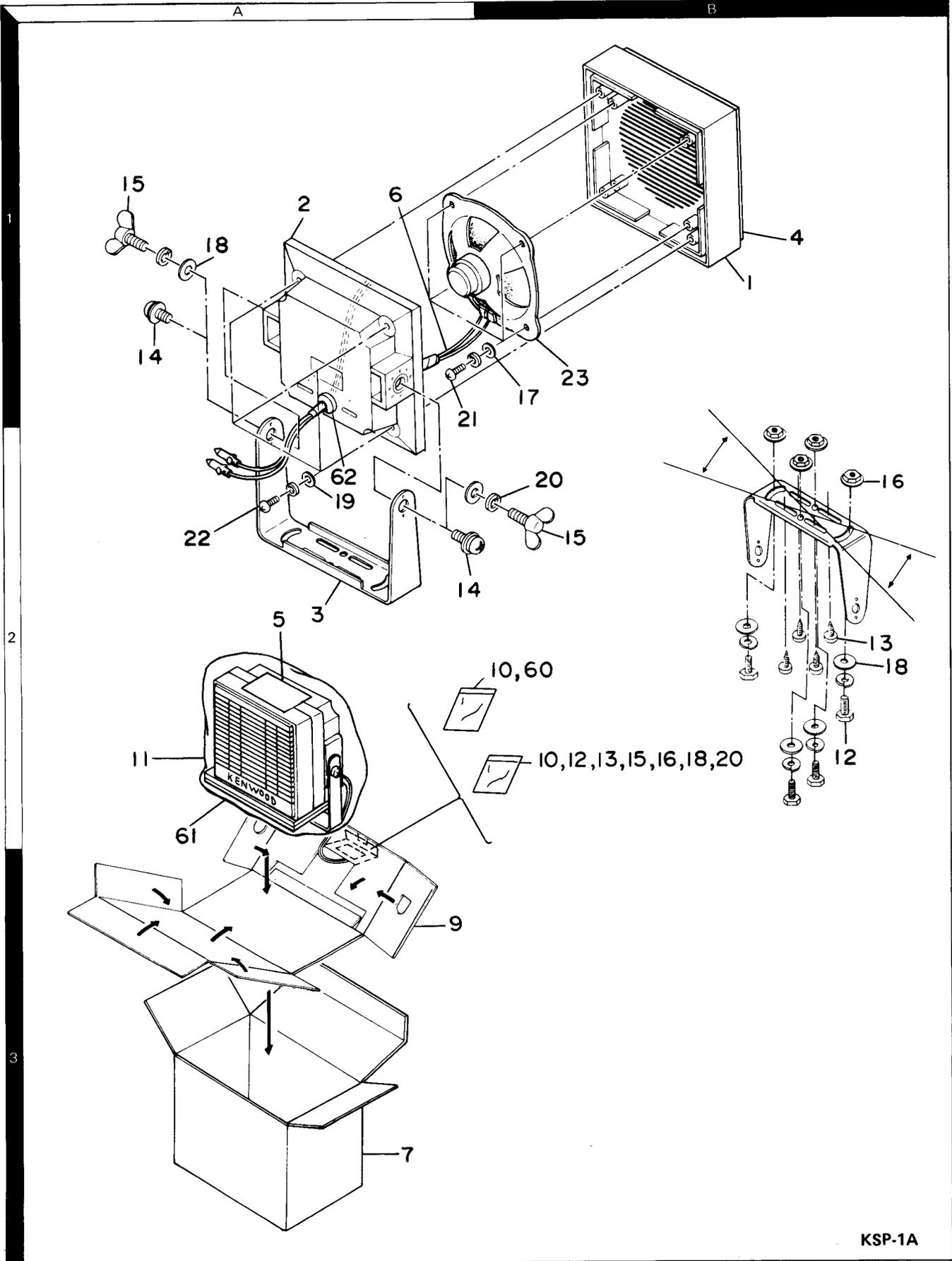
Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名/規格	Desti- nation 仕向	Re- marks 備考
<b>KSP-1A</b>						
1	1B		A01-1034-02	PLASTIC CABINET(FRONT)		
2	1A		A01-1035-02	PLASTIC CABINET(REAR)		
3	2A		A13-0678-03	ANGLE		
4	1B		B40-3739-04	MODEL NAME PLATE		
5	2A		B50-8165-00	INSTRUCTION MANUAL		
6	1A		E30-2083-05	CABLE ASSY WITH TERMINAL		
60	2B		E23-0495-05	CRIMP TERMINAL		
7	3A		H01-8106-03	ITEM CARTON CASE		
9	3A		H12-1335-03	PACKING FIXTURE		
10	2A		H25-0029-04	PROTECTION BAG (60X110)		
11	2A		H25-0106-04	PROTECTION BAG (250X350)		
61	2A		H12-1341-04	PACKING FIXTURE		
62	2A		J42-0443-05	CORD BUSHING		
12	2B		N09-0008-04	HEX BOLT 4 USED		
13	2B		N09-0655-05	TAPPING SCREW (4 USED)		
14	1A		N09-0656-05	SCREW WITH WASHERS, (ANGLE)		
15	2B		N09-0662-05	WING BOLT 2 USED		
16	2B		N14-0510-04	FLANGE NUT 4 USED		
17	1A		N15-1040-46	FLAT WASHER (SPEAKER,CABINET)		
18	1A, 1B		N15-1060-46	FLAT WASHER (6 USED)		
19	2A		N16-0040-46	SPRING WASHER(SPEAKER,CABINET)		
20	2B		N16-0060-46	SPRING WASHER(6 USED)		
21	1A		N87-4010-46	BRAZIER TAPTITE SCREW(SPEAKER)		
22	2A		N87-4020-46	BRAZIER TAPTITE SCREW(CABINET)		
23	1B		T07-0228-05	LOUDSPEAKER		

E: Scandinavia & Europe K: USA P: Canada  
 U: PX(Far East, Hawaii) T: England M: Other Areas  
 UE: AAFES(Europe) X: Australia

 indicates safety critical components.

## KSP-1A (EXTERNAL SPEAKER)

DISASSEMBLY



KSP-1A

# TK-931A(D)/931A(HD)

## KSP-2A (AMPLIFIED EXTERNAL SPEAKER)

### EXTERNAL VIEW



The Model KSP-2A is a compact, Built-in amp speaker specifically designed for mobile installation.

\* Before installation using your KSP-2A check that the following mounting parts are supplied :

1. Self tapping screws (N09-0655-05) . . . . . 4 pcs.
2. Wing bolts (N09-0662-05) . . . . . 2 pcs.
3. Hex-head bolts (N09-0008-04) . . . . . 4 pcs.
4. Flange nuts (N14-0510-04) . . . . . 4 pcs.
5. Flat washers (N15-1060-46) . . . . . 6 pcs.
6. Spring washers (N16-0060-46) . . . . . 6 pcs.
7. Fuse (F05-3022-05) . . . . . 1 pcs.

### FEATURES

1. This speaker is equipped with a large 10W output amplifier.
2. Specifically designed for mobile use to provide high sound quality.
3. Easy installation. The speaker can be mounted in almost any position by changing its angle in the bracket.
4. Perfectly matches the design of the transceiver.

### SPECIFICATIONS

Speaker Size . . . . .	120 mm
Maximum Output . . . . .	10W
Impedance . . . . .	8 ohms
Frequency Response . . . . .	165Hz–8kHz
Dimensions . . . . .	127W x 127H x 65D mm
Weight . . . . .	approx. 1kg
Max. Input . . . . .	3.4Vrms at 1kHz
Source Voltage . . . . .	13.8V ±15% DC

### INSTALLATION

1. Choose a location in which to install the speaker.
2. Remove the bracket from the speaker. (Two mounting screws)
3. Locate the bracket over the mounting space and mark 4 points to be drilled.
4. Drill 4 holes as marked. Use a 1/6" drill for self-tapping screws, or a 1/4" drill for machine screws.
5. Secure the bracket with the appropriate hardware.  
A : Securing with hex. bolts and nuts.  
B : Securing with 4 self tapping screws.
6. Reinstall the speaker to the bracket. Use either two mounting screws or two wing screws.

### CIRCUIT DESCRIPTION

The KSP-2A consists of the following circuits.

#### a) Attenuator

The high level signal of the speaker output is decreased by resistance dividing.

#### b) Amplifier IC $\mu$ PC1280V (U1)

Amplifier 1 does not reverse the phase whereas amplifier 2 does reverse the phase of the input signal. The outputs of amplifiers 1 and 2 have opposite phase and doubles output can be obtained (BTL connection).

#### c) Oscillation prevention

To prevent oscillation, R4–R5 and C8–C9 are used in the output stage.

## KSP-2A (AMPLIFIED EXTERNAL SPEAKER)

### CONNECTION FOR THE KSP-2A WITH THE TK-931A(D)/931A(HD)

The following tools are required for changing the connector.

Extracting tool

The following extracting tool is recommended:  
Molex Inc. Order No.: 11-03-0002

1. Remove the connector with jumper from the External Speaker connector on the rear panel of the radio.  
**(Fig. 2)**

**Note:**

Save the jumper, which is required when the radio is used without the External Speaker.

2. Remove the terminals with the jumper from the connector housing holes number 9 and 12 using the extracting tool.

**REMOVING THE JUMPER LEAD (Fig. 2)**

- 1) Insert the extracting tool (11-03-0002) into the connector while pushing the jumper lead in the direction of (a).
  - 2) Push the extracting tool into collapse the barbs of the crimp terminal.
  - 3) Pull out the lead while continuing to push the extracting tool in the direction (b).
3. Insert the terminal with the black lead into hole number 6, and the terminal with the black and white stripe lead into hole number 12, and the terminal with the red lead connected to the fuse holder into hole number 7.
  4. Attach the connector to the External Speaker connector on the radio.

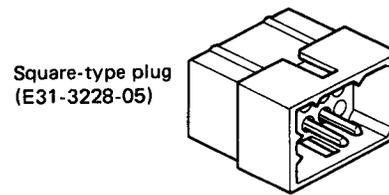


Fig. 1

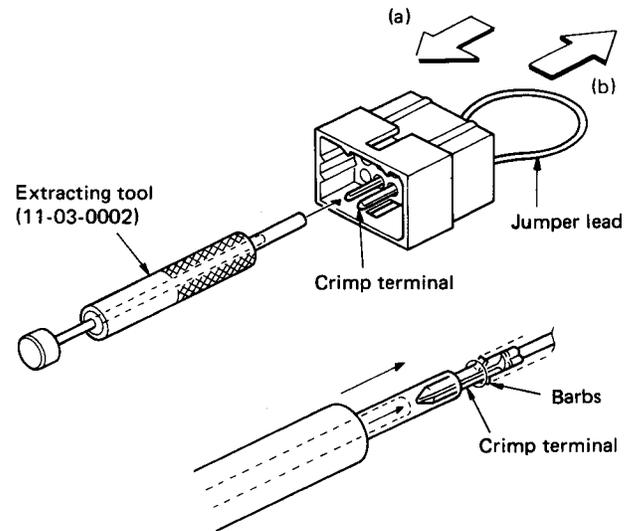


Fig. 2

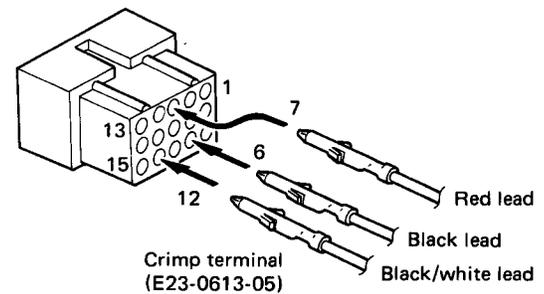


Fig. 3

# TK-931A(D)/931A(HD)

## KSP-2A (AMPLIFIED EXTERNAL SPEAKER)

× New Parts

Parts without Parts No. are not supplied.

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

Telle ohne Parts No. werden nicht geliefert.

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名/规格	Desti- nation 仕向	Re- marks 備考
<b>KSP-2A</b>						
1	1B		A01-1034-02	PLASTIC CABINET(FRONT)		
2	1A		A01-1035-02	PLASTIC CABINET(REAR)		
3	2A		A13-0678-03	ANGLE		
7	1B		B40-3740-04	MODEL NAME PLATE		
8	2A		B50-8165-00	INSTRUCTION MANUAL		
12	2A		E30-2083-05	CABLE ASSY WITH TERMINAL		
13	2A		E30-2084-05	DC POWER CORD		
17	1A		F01-0920-02	HEAT SINK		
18	3B		F05-3022-05	FUSE		
22	3A		H01-8107-03	ITEM CARTON BOX		
23	3A		H12-1335-03	PACKING FIXTURE		
24	3A		H12-1341-04	PACKING FIXTURE		
25	3B		H25-0029-04	PROTECTION BAG (60X110)		
26	3B		H25-0076-03	PROTECTION BAG (6X50)		
27	2A		H25-0106-04	PROTECTION BAG (250X350)		
31	2A		J41-0026-05	CORD BUSHING		
35	3B		N09-0008-04	HEX BOLT (4 USED)		
36	2B, 3B		N09-0655-05	TAPLING SCREW (4 USED)		
37	1A, 2A		N09-0656-05	SCREW WITH WASHERS(ANGLE)		
38	1A, 2A		N09-0662-05	WING BOLT (2 USED)		
39	1B		N10-2030-46	HEXAGON NUT (10)		
40	2B, 3B		N14-0510-04	FLANGE NUT (4 USED)		
41	2A, 1B		N15-1040-46	FLAT WASHER (SPEAKER, CABINET)		
42	1A, 2B		N15-1060-46	FLAT WASHER (6 USED)		
43	2A, 1B		N16-0040-46	SPRING WASHER(SPEAKER, CABINET)		
44	1A, 2B		N16-0060-46	SPRING WASHER (6 USED)		
45	1A		N35-3006-46	PAN HEAD MACHINE SCREW		
46	2B		N87-3006-46	BRAZIER HEAD TAPTITE SCREW(PCB)		
47	1A		N87-3010-46	BRAZIER HEAD TAPTITE SCREW		
48	1B		N87-4010-46	BRAZIER HEAD TAPTITE SCREW		
49	2A		N87-4020-46	BRAZIER HEAD TAPTITE SCREW		
50	1B		T07-0250-05	LOUDSPEAKER (8 OHM)		
52	2B		X63-1090-10	AMP UNIT		
<b>AMP UNIT (X63-1090-10)</b>						
C1			C092M1H102K	MYLAR	1000PF	K
C2			CE04W1C470M	ELECTRO	47UF	16WV
C3	,4		CE04W0J101M	ELECTRO	100UF	6.3WV
C5			C092M1H104K	MYLAR	0.10UF	K
C6			C90-2005-05	ELECTRO	1000UF	25WV
C7			CE04W1A101M	ELECTRO	100UF	10WV
C8	,9		C092M1H104K	MYLAR	0.10UF	K
C10			CE04W1A101M	ELECTRO	100UF	10WV
-			E31-3090-05	CONNECTOR WITH LEAD		
L1			L15-0307-05	HASH CHOKE (0.5MH)		
R1			RD14BB2E102J	RD	1.0K	J 1/4W
R2			RD14BB2E3R9J	RD	3.9	J 1/4W
R3			RD14BB2E102J	RD	1.0K	J 1/4W

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 indicates safety critical components.

## KSP-2A (AMPLIFIED EXTERNAL SPEAKER)

× New Parts

Parts without Parts No. are not supplied.

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

Telle ohne Parts No. werden nicht geliefert.

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
R4 ,5 D1 U1			RD14BB2E010J DSA3A1 UPC1280V	RD 1.0 J 1/4W DIODE IC (AF POWER AMP/ 20W X2)		

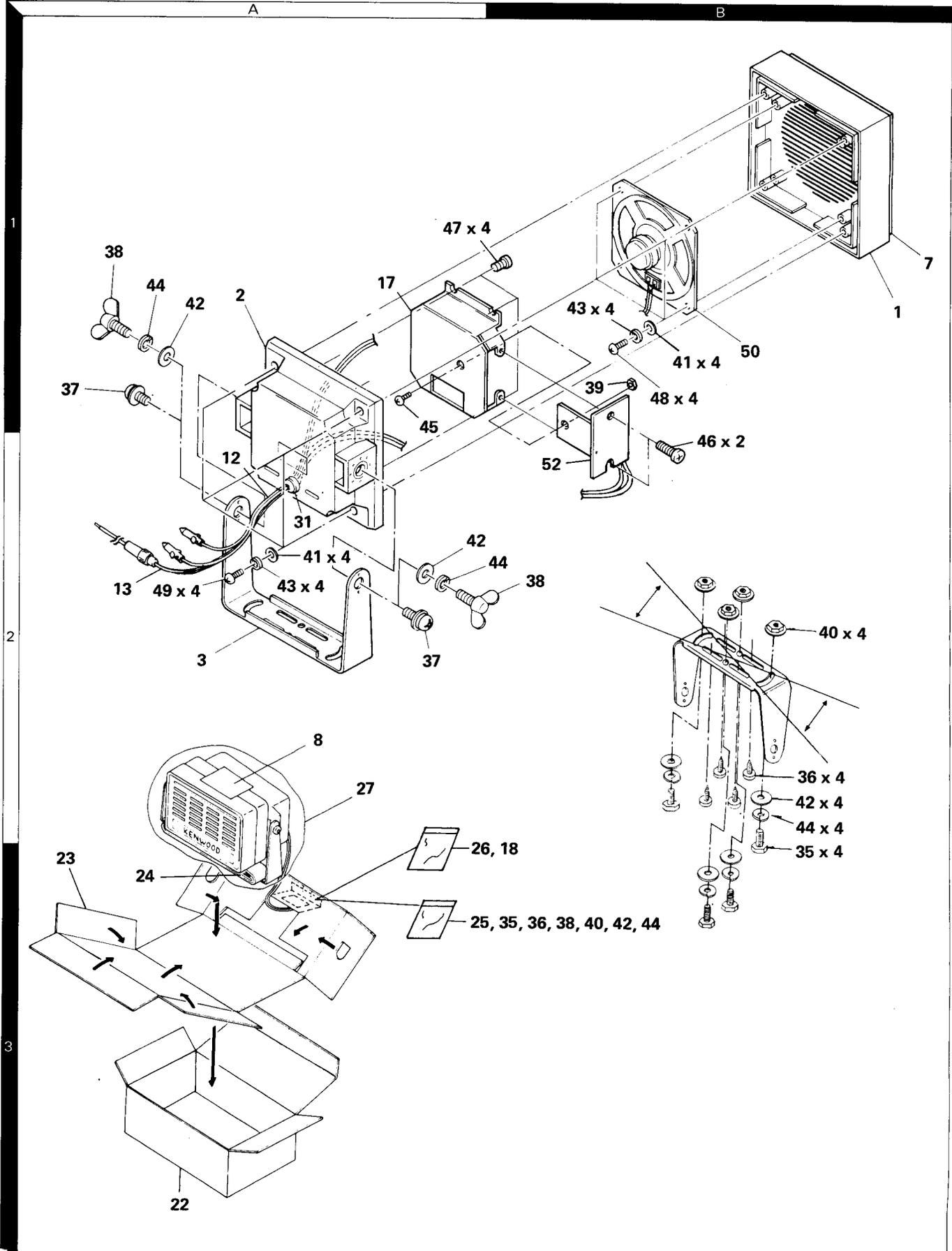
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# TK-931A(D)/931A(HD)

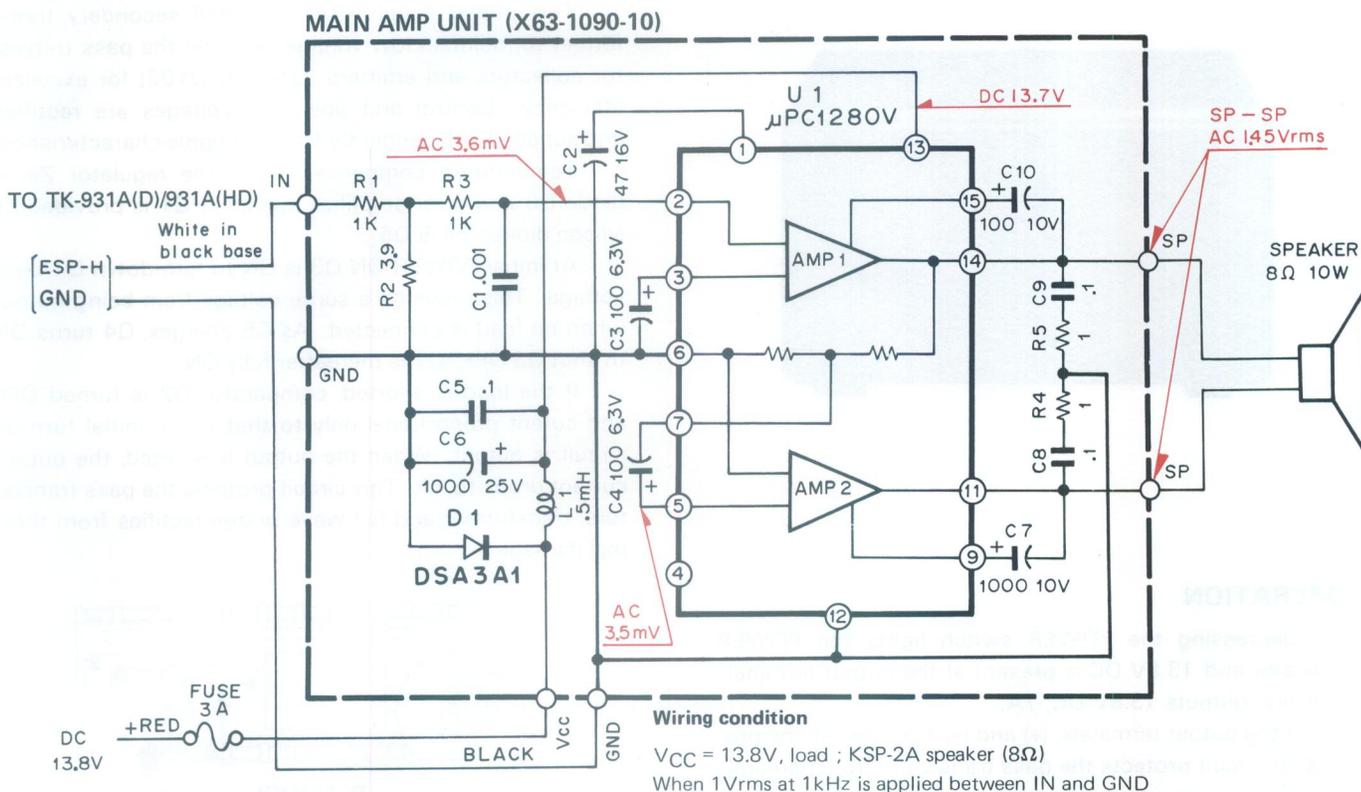
## KSP-2A (AMPLIFIED EXTERNAL SPEAKER)

DISASSEMBLY



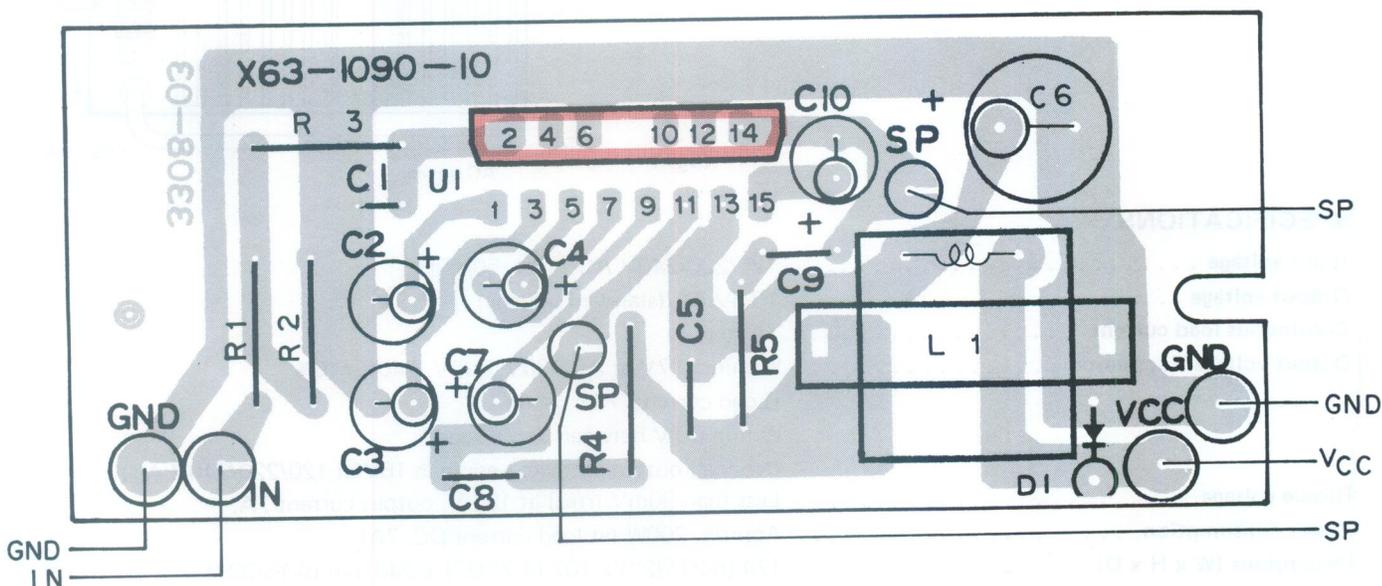
## KSP-2A (AMPLIFIED EXTERNAL SPEAKER)

### SCHEMATIC DIAGRAM



### PC BOARD

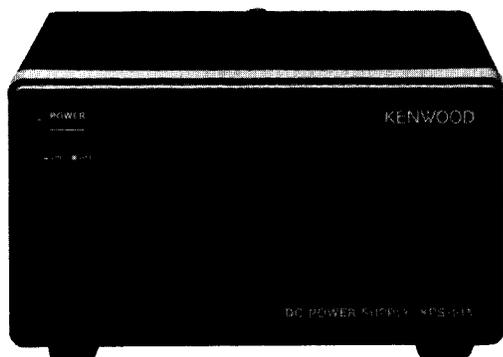
MAIN AMP UNIT (X63-1090-10) Component side view



# TK-931A(D)/931A(HD)

## KPS-10A (DC POWER SUPPLY)

### EXTERNAL VIEW



### CIRCUIT DESCRIPTION

This power supply uses a tapped secondary transformer to maintain low voltage between the pass transistor collectors and emitters (Q101 & Q102) for excellent efficiency. Control and operating voltages are rectified and supplied independently for good ripple characteristics.

Temperature compensation for the regulator Zener diode D6 and error amplifier transistor Q1 is provided by silicon diodes D4 & D5.

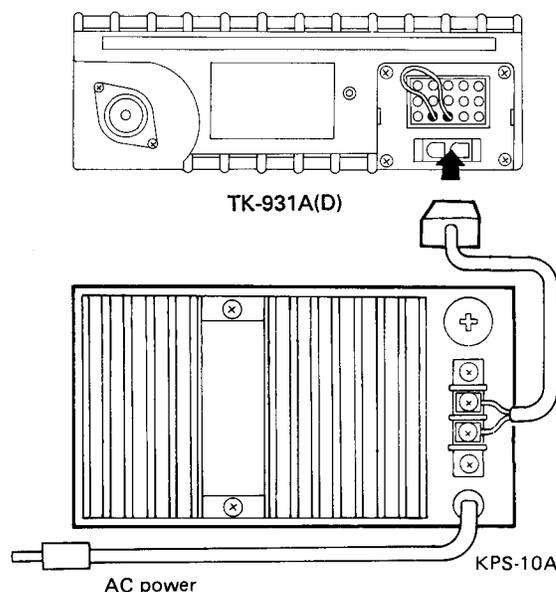
At initial POWER-ON Q3 is ON to turn-down Q1 base voltage. This prevents a surge voltage from being output when no load is connected. As C5 charges, Q4 turns ON to shut Q3 OFF. Q1 is thereafter fully ON.

If the load is shorted, comparator Q2 is turned OFF and current proportional only to that in the initial turn-on circuit is output. When the output is shorted, the output current drops to 1A. This circuit protects the pass transistors, transformer and full wave bridge rectifies from thermal damage.

### OPERATION

Depressing the POWER switch lights the POWER indicator and 13.8V DC is present at the output terminal. This unit outputs 13.8V DC, 7A.

If the output terminals, (+) and (-) are shorted, the protection circuit protects the pass transistors from damage. When the short circuit is removed, protection releases and normal output is automatically resumed.



### SPECIFICATIONS

Input voltage	120/220/240V AC $\pm 10\%$ , 50/60Hz
Output voltage	13.8V DC (standard voltage)
Continuous load current	7A max.
Output voltage fluctuation	Within $\pm 0.7V$ at AC 120V, 220V, 240V $\pm 10\%$ (Load current; 7A) Within 0.7V between 2~7A load. (No-load output voltage; Less than 16V at 120/220/240V AC)
Ripple voltage	Less than 30mV (rms) at 13.8V, output current 7A.
Power consumption	Approx. 200W (at load current DC, 7A)
Dimensions (W x H x D)	174 (6-27/32") x 107 (4-7/32") x 240 mm (9-15/32")
Weight	Approx. 6kg (13.2 lbs.)

\* Circuit design and ratings are subject to change for improvement without notice.

# TK-931A(D)/931A(HD)

## KPS-10A (DC POWER SUPPLY)

### BLOCK DIAGRAM

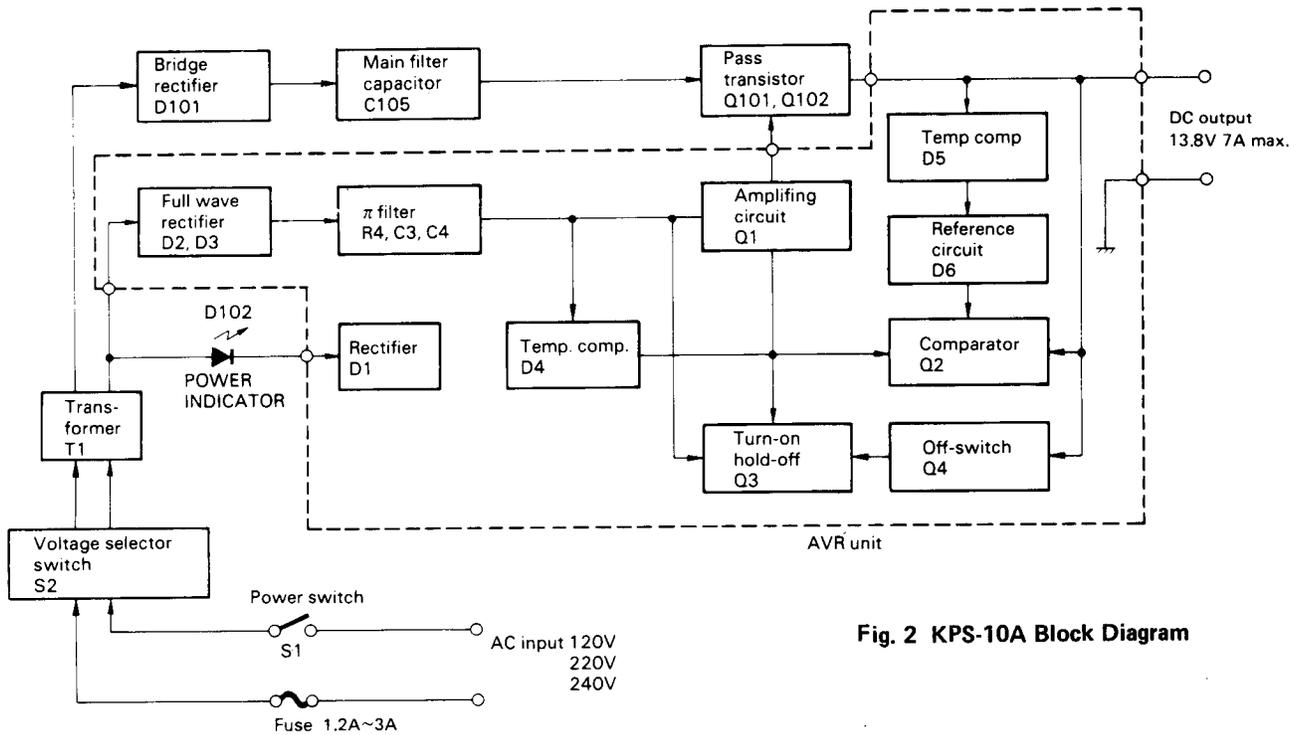


Fig. 2 KPS-10A Block Diagram

### ALIGNMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method	
1. Setting	AC voltage for destination (K) : 120V (W) : 220V (T,X) : 240V (M) : 120,220,240V Set the voltage selector switch for the local line voltage.							
2. Test equipment set-up	Function → 0.1Ω resistor Meter → 60A, 60V DC → ON Power → ON SW1 → OFF							
3. Voltage setting	Power switch : ON	DVM		Output	AVR	VR1	Adjust the load for 7A.	13.6V±0.4V (Verify Power indicator lights.)
	Vary the load for 2A-7A draw. (Set to 7A after check.)	DVM AF VTVM						13.6V±0.7V DC Less than 30mV AC
	Power SW : OFF							
4. Protection	1) SW1 : ON, VR2 : MAX CW							
	2) Power SW : ON	DVM		Output	AVR	VR2	0.2V	0.2V±0.1V
	3) SW1 : OFF						Check	13.6V±0.4V

# TK-931A(D)/931A(HD)

## KPS-10A (DC POWER SUPPLY)

× New Parts

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Telle ohne Parts No. werden nicht geliefert.

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕 向	Re- marks 備考
<b>KPS-10A</b>						
1			A01-1039-02	METALLIC CABINET (UPPER)		
2			A01-1040-02	METALLIC CABINET (LOWER)		
6			A20-2632-03	PANEL ASSY		
7			A23-1502-03	REAR PANEL		
3			B41-0659-14	CAUTION LABEL	K	
4			B41-0660-04	CAUTION LABEL (FUSE)	K	
5			B42-3311-04	LABEL (+,-)		
8			B40-3758-04	MODEL NAME PLATE	K	
8			B40-3760-04	MODEL NAME PLATE	M	
8			B40-3765-04	MODEL NAME PLATE	TXW	
10			B42-3309-04	LABEL (3A)	K	
10			B42-3310-04	LABEL (1.5A)	MTXW	
11			B46-0418-10	WARRANTY CARD	K	
12			B50-8193-00	INSTRUCTION MANUAL		
C101-104			CK45E2H103P	CERAMIC 0.010UF P		
C105			C90-0865-05	ELECTRO 47000UF 25WV		
C106			C91-1098-05	FIXED CAPACITOR (4700PF, AC400WV)		
C107, 108			C91-0496-05	CERAMIC 470PF K		
13			E20-0282-05	TERMINAL BOARD (2P)		
14			E30-0185-05	AC POWER CORD	X	
14			E30-0585-05	AC POWER CORD	W	
14			E30-0602-05	AC POWER CORD	T	
14			E30-0780-05	AC POWER CORD	KM	
15			E31-2188-05	CONNECTING WIRE (LED)		
-			E23-0022-04	TERMINAL		
16			F01-0795-13	HEAT SINK		
17			F05-1222-05	FUSE (1.25A)	TXW	
17			F05-1224-05	FUSE (1.2A)	M	
17			F05-3021-05	FUSE (3A)	KM	
18			F07-0849-04	COVER		
F1			F05-1222-05	FUSE (1.25A)	TXW	
F1			F05-1224-05	FUSE (1.2A)	M	
F1			F05-3021-05	FUSE (3A)	K	
19			H01-8132-04	ITEM CARTON BOX		
20			H10-2567-02	POLYSTYRENE FOAMED FIXTURE (F)		
21			H10-2576-02	POLYSTYRENE FOAMED FIXTURE (R)		
22			H12-1337-04	PACKING FIXTURE		
23			H20-1420-03	PROTECTION COVER		
24			H25-0029-04	PROTECTION BAG (FUSE)		
25			H25-0105-04	PROTECTION BAG (AC POWER CORD)		
27			J02-0323-05	FONT (REAR SIDE)		
28			J02-0429-05	FONT (FRONT SIDE)		
29			J13-0031-05	FUSE HOLDER (5X20)	TXW	
29			J13-0033-05	FUSE HOLDER (6X30)	KM	
30			J19-1325-04	RETAINER		
31			J21-4102-04	PCB BRACKET (A)		
32			J21-4103-04	PCB BRACKET (B)		
35			J32-0220-04	HEX BSS		
36			J41-0024-15	CORD BUSHING	TXW	
36			J41-0033-05	CORD BUSHING	KM	
37			K29-0758-14	PUSH KNØB		

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UE: AAFES(Europe) X: Australia

△ indicates safety critical components.

## KPS-10A (DC POWER SUPPLY)

× New Parts

Parts without Parts No. are not supplied.

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

Teile ohne Parts No. werden nicht geliefert.

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕 向	Re- marks 備考
T1			L01-8101-05	POWER TRANSFORMER	K TX W M	
T1			L01-8132-05	POWER TRANSFORMER		
T1			L01-8142-05	POWER TRANSFORMER		
T1			L01-8326-05	POWER TRANSFORMER		
39			N10-2030-46	HEXAGON NUT		
41			N15-1030-46	FLAT WASHER		
42			N30-3004-46	PAN HEAD MACHINE SCREW		
43			N30-3016-46	PAN HEAD MACHINE SCREW		
44			N30-3025-46	PAN HEAD MACHINE SCREW		
45			N35-3006-45	BINDING HEAD MACHINE SCREW		
46			N35-4008-45	BINDING HEAD MACHINE SCREW		
47			N87-3006-46	BRAZIER TAPTITE SCREW		
48			N89-3008-45	BINDING TAPTITE SCREW(PCB)		
49			N87-3010-46	BRAZIER TAPTITE SCREW(FOOT)		
50			N30-3010-46	PAN HEAD MACHINE SCREW		
51			N34-4008-45	TRUSS HEAD MACHINE SCREW(T1)		
52			N87-3012-46	BRAZIER TAPTITE SCREW(TERMINAL)		
S1			S40-1416-05	PUSH SWITCH (POWER)	M	
S2			S29-2406-05	VOLTAGE SELECT SWITCH		
D101			S25VB10	DIODE		
D102			SLP144B	LED (RED)		
Q101, 102			2N5885	TRANSISTOR		
53			X63-1030-10	AVR UNIT		
<b>AVR UNIT (X63-1030-10)</b>						
C1	.2		CK45F1H103Z	CERAMIC 0.010UF Z		
C3	.4		C90-0814-05	ELECTRO 4700UF 25WV		
C5			CE04W1A470M	ELECTRO 47UF 10WV		
C6	.7		CK45F1H103Z	CERAMIC 0.010UF Z		
C8			C90-0814-05	ELECTRO 4700UF 25WV		
C9	-11		CK73FB1H102K	CHIP C 1000PF K		
C12			CK45B1H102K	CERAMIC 1000PF K		
-			E23-0022-04	TERMINAL		
R1	.2		R92-0619-05	FIXED RESISTOR (0.05,5W)		
R3			RD14CB2E391J	RD 390 J 1/4W		
R4			RS14AB3A4R7J	FL-PROOF RS 4.7 J 1W		
R5			RD14CB2E822J	RD 8.2K J 1/4W		
R6			RD14CB2E273J	RD 27K J 1/4W		
R7			RD14BB2E273J	RD 27K J 1/4W		
R8			RD14CB2E273J	RD 27K J 1/4W		
R9			RD14CB2E683J	RD 68K J 1/4W		
R10			RD14CB2E121J	RD 120 J 1/4W		
R11			RD14CB2E821J	RD 820 J 1/4W		
R12			RD14BB2E122J	RD 1.2K J 1/4W		
VR1			R12-0427-05	TRIMMING PNT. (500)		
VR2			R12-8405-05	TRIMMING PNT. (1M)		
D1			1S1555	DIODE		
D2	.3		DSA3A1	DIODE		
D4	.5		1S1555	DIODE		
D6			RD7.5EB2	ZENER DIODE (7.5V)		
Q1			2SB512(P)	TRANSISTOR		
Q2	-4		2SC1815(Y)	TRANSISTOR		

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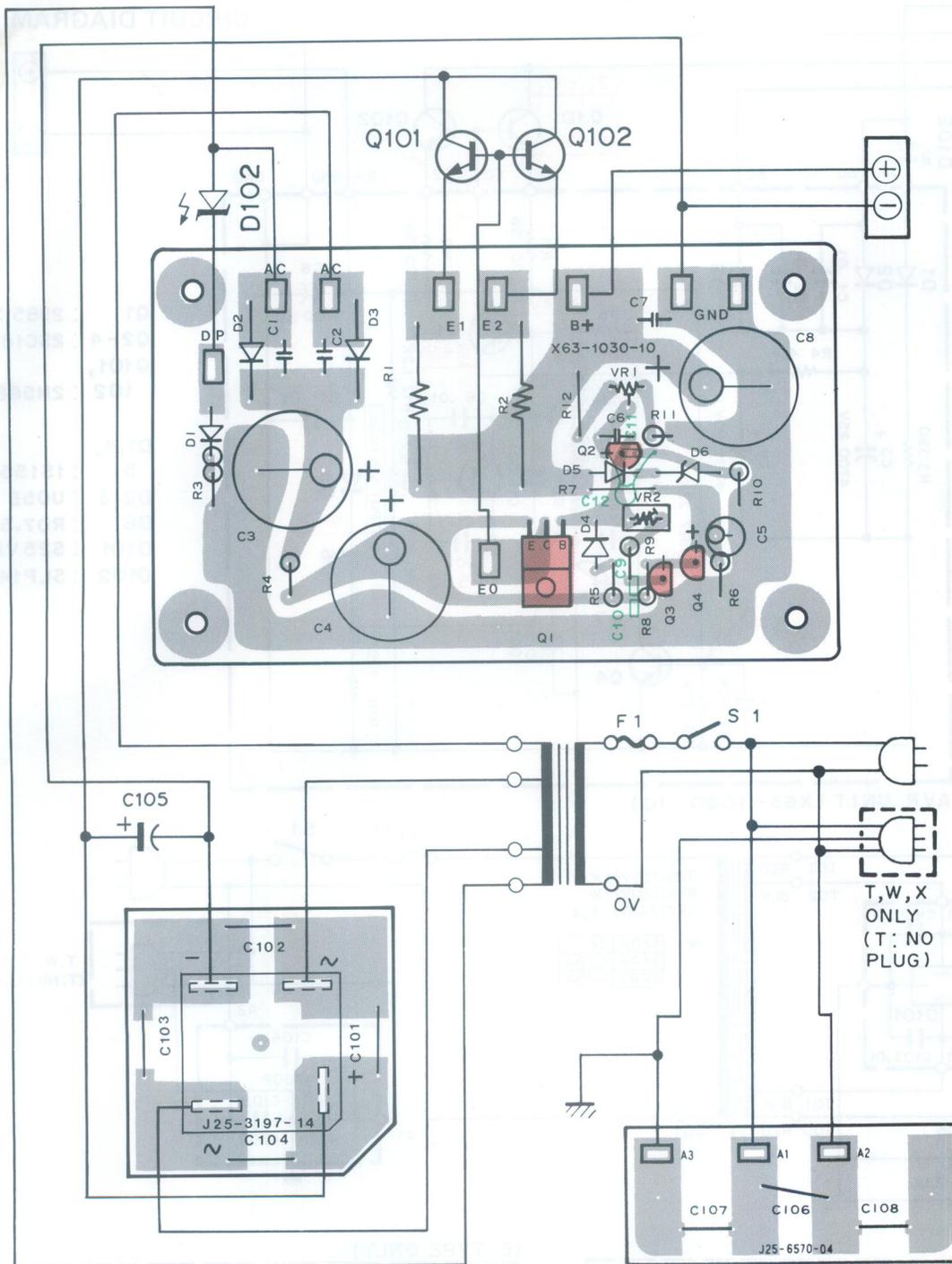
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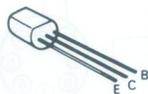
⚠ indicates safety critical components.



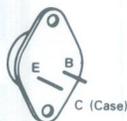
## KPS-10A (DC POWER SUPPLY)



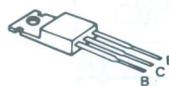
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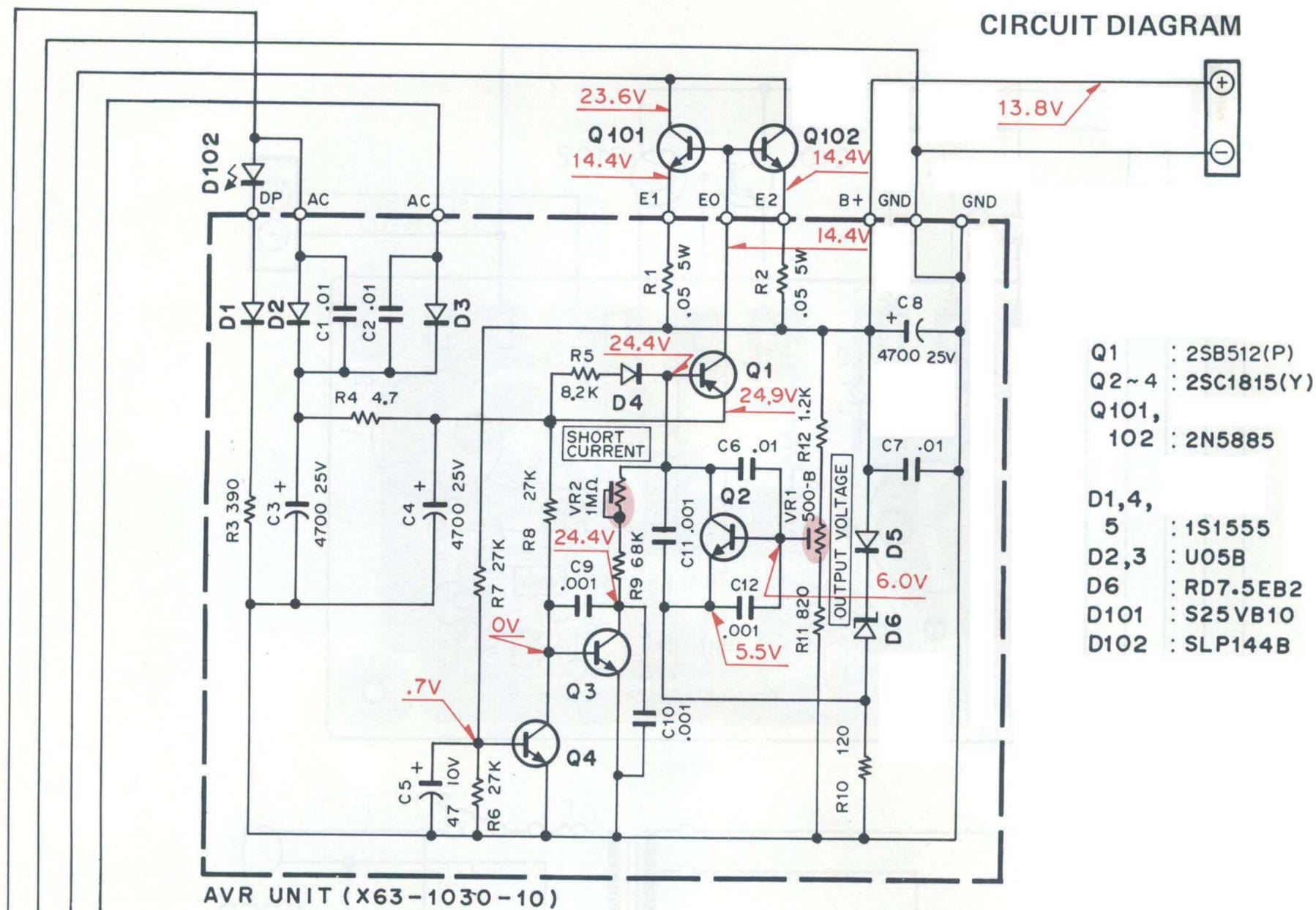
2SB512



# TK-931A(D)/931A(HD)

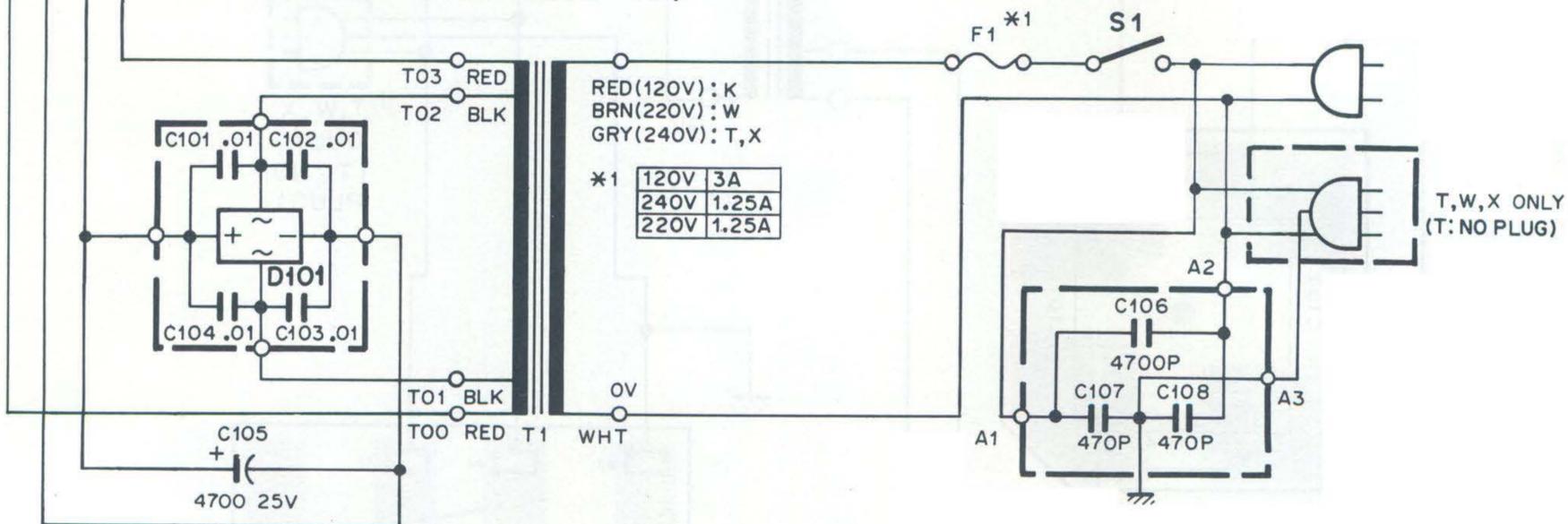
## KPS-10A (DC POWER SUPPLY)

CIRCUIT DIAGRAM

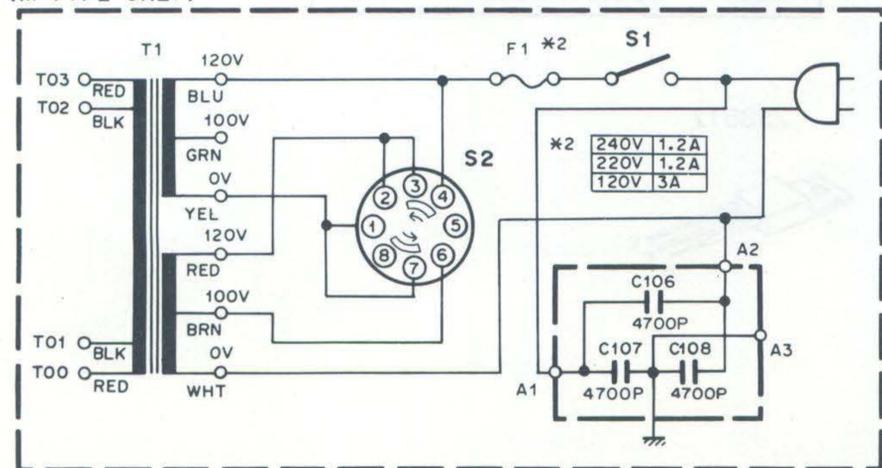


- Q1 : 2SB512(P)
- Q2~4 : 2SC1815(Y)
- Q101,  
102 : 2N5885
- D1,4,  
5 : 1S1555
- D2,3 : U05B
- D6 : RD7.5EB2
- D101 : S25VB10
- D102 : SLP144B

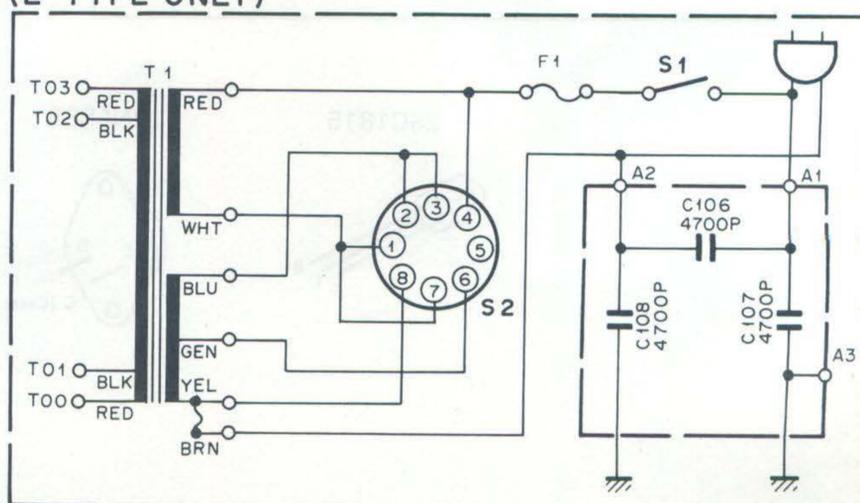
AVR UNIT (X63-1030-10)



(M TYPE ONLY)

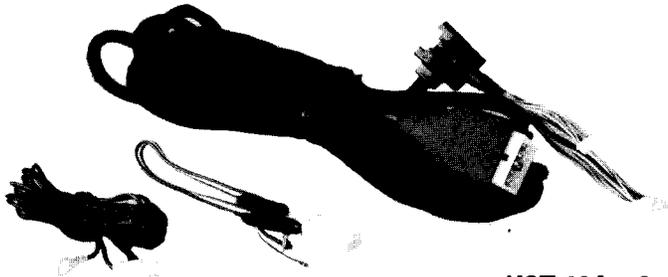


(E TYPE ONLY)



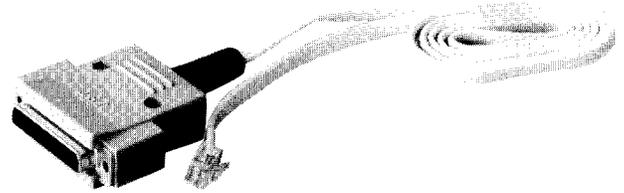
# KCT-10A/10B (CONTROL CABLE)/ TK-931A(D)/931A(HD) KPG-4 (PROGRAMMING INTERFACE)/KRK-1 (REMOTE KIT)

**KCT-10A/10B External View**

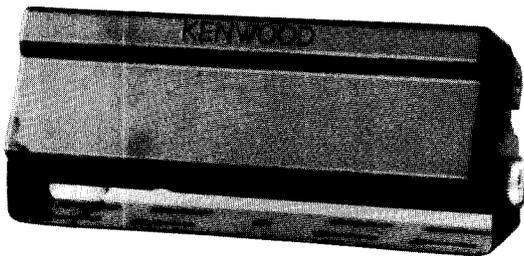


**KCT-10A : 6m  
KCT-10B : 4m**

**KPG-4 External View**



**KRK-1 External View**



**KRK-1 Parts List**

Ref. No.	New	Parts No.	Description
		A01-2012-03	Case
		A62-0032-02	Front panel
		B62-0029-00	Instruction manual
		G53-0595-03	Rubber seal
		J29-0455-03	Angle bracket
		N08-0514-14	Decorative screw
		N19-0648-05	Flat washer
		N35-4008-45	Binding head machine screw (M4 x 8)
		N87-3008-46	Second brazier tap tight screw (M3 x 8)
		N99-0348-05	Screw set

# TK-931A(D)/931A(HD)

## SPECIFICATIONS

### GENERAL

Frequency Range .....	RX : 935~941MHz TX : 896~902MHz, 935~941MHz
Systems/Channels .....	6 systems/120 channels : TK-931A(D), 10 systems/200 channels : TK-931A(HD)
Groups .....	4 groups per system : TK-931A(D), 10 groups per system : TK-931A(HD)
Conventional Channels .....	4 channels per system : TK-931A(D), 10 channels per system : TK-931A(HD)
Channel Spacing .....	12.5kHz
Input Voltage .....	13.6V DC negative ground
Current Drain .....	0.4A on standby 1.0A on receive 5.0A on transmit : TK-931A(D), 9.0A on transmit : TK-931A(HD)
Duty Cycle .....	Receiver 100%, Transmitter 20%
Temperature Range .....	-30°C to +60°C (-22°F to +140°F)
Dimensions and Weight .....	5.91" (150mm) W x 1.97" (50mm) H x 7.48" (190mm) D, 3.09 lbs (1.4kg) : TK-930A(D) 5.91" (150mm) W x 1.97" (50mm) H x 8.66" (220mm) D, 3.53 lbs (1.6kg) : TK-930A(HD)

### RECEIVER (Measurements made per EIA standard EIA-204-C)

RF Input Impedance .....	50Ω
Sensitivity (EIA 12dB SINAD) .....	0.35μV
Modulation Acceptance .....	±3.5kHz
Selectivity .....	-70dB
Intermodulation .....	-65dB
Spurious and Image Rejection .....	-75dB
Frequency Stability .....	±0.00015% from -30°C to +60°C
Channel Frequency Spread .....	6MHz
Audio Power Output .....	4W at less than 5% distortion

### TRANSMITTER (Measurements made per EIA standard EIA-152-B)

RF Power Output .....	15W adjustable to 5W : TK-931A(D) 30W adjustable to 15W (More than 20W for talk-around) : TK-931A(HD)
RF Output Impedance .....	50Ω
Spurious and Harmonics .....	-65dB
Modulation .....	F3E, F1D, F2D
FM Noise .....	-40dB
Microphone Impedance .....	Low impedance
Audio Distortion .....	Less than 3% at 1000Hz
Frequency Stability .....	±0.00015% from -30°C to +60°C
Channel Frequency Spread .....	45MHz

### APPLICABLE MIL STANDARD

MIL 810C Methods/Procedures .....	Rain : 506.1/2	Shock : 516.2/1,2,3,5	Vibration : 514.2/8
MIL 810D Methods/Procedures .....	Rain : 506.2/2	Shock : 516.3/1,4,5,6	Vibration : 514.3/1

### APPLICABLE ENVIRONMENTAL EIA STANDARDS

EIA 152C, 204C Shock, Vibration, Humidity

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