FM TWO-WAY PORTABLE RADIO

TK-310

SERVICE MANUAL

Revised Edition

KENWOOD

KENWOOD CORPORATION

B51-3101-10 (O) 1994

CONTENTS

GENERAL

INTRODUCTION

SCOPE OF THIS MANUAL

This manual is intended for use by experienced technicians familiar with similar types of commercial grade communications equipment. It contains all required service information for the equipment and is current as of the publication date. 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.

SERVICE

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

NOTE.

WE CANNOT guarantee oscillator stability when using channel elements manufactured by other than KENWOOD or its authorized agents.

FCC COMPLIANCE AND TYPE ACCEPTANCE NUMBERS

Type acceptance number	Frequency range	Compliance
ALH9TKTK-310-1	450 ~ 470MHz	Part 15, 22, 74, 90 and 95
ALH9TKTK-310-2	470 ~ 490MHz	Part 15, 22 and 90
ALH9TKTK-310-3	490 ~ 512MHz	Part 15, 22 and 90

PERSONNEL SAFETY

The following precautions are recommended for personnel safety:

- 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.
- This equipment should be serviced by a qualified technician only.

SERVICE MANUAL QUESTIONNAIRE

Your Name _____ Dealer No. _____

Company Name _____

Company Address _____

_____ Zip _____

Today's Date _____

Service Manual Title _____

Printing Date (Bottom of Back cover)

USER FEEDBACK (Please print or write legibly)

As the user of this manual, we think you know what kind of information you need to service our equipment, We are willing to listen to your suggestions if we can get them.

1. Is the Installation information good? _____ If not, what do you need? _____

_____

_____

_____

2. Do you use the Circuit Description Section? _____ Is it too difficult, too simple, or OK? _____

_____

3. Do you use the suggested test procedures? _____ Do you have test setups or test procedures that you have found quicker or easier? _____

_____

4. Do you use the suggested alignment procedure? _____ If not, what procedure do you use? _____

_____

_____

5. Are the Parts Lists quick and easy to use? _____ If not, how would you like to see Parts Lists arranged?

_____

_____

6. What other information would you like to see? _____

_____

_____

7. General Comments _____

_____

_____

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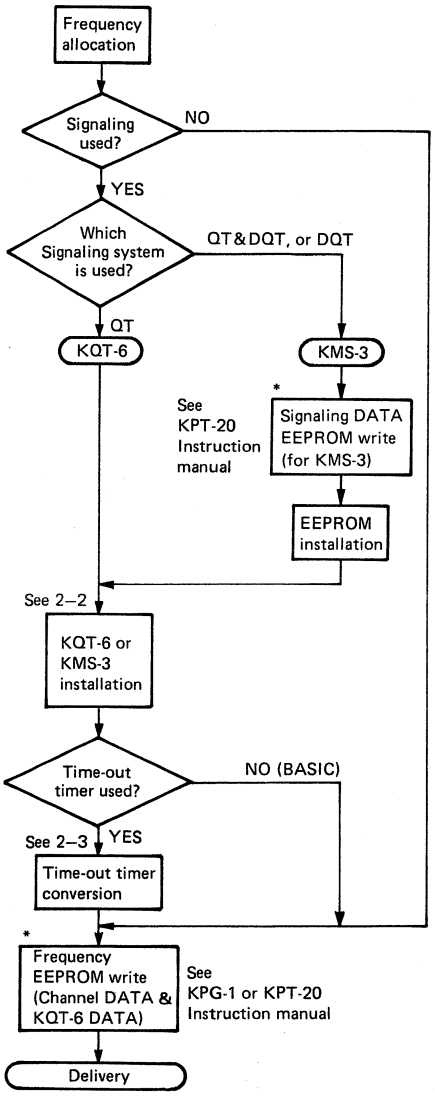
SYSTEM SET-UP/INSTALLATION AND CONVERSION

1. SYSTEM SET-UP

Preparation : Prepare an EEPROM writer (KPG-1 or KPT-20) when a KMS-3 is installed, use only KPT-20.



* The QT tone frequency recommended between 67.0 and 225.7Hz.
If over 225.7Hz, decoder operation may be affected by the received voice signal.

Fig. 1–1

2. INSTALLATION AND CONVERSION

2–1. Modification for temporary EEPROM writer

Modify the TK-310 as a temporary EEPROM writer.

1) Prepare a Front panel ass'y (KPG-1).

2) Modification :

1. Remove the front panel by loosening the 4 rear screws.

Caution :
Be careful not to break the speaker leads since the speaker is mounted on the cover.

2. As shown in the Fig. 2–1, disconnect the cable assembly from the main pc board, and keep it under the connector.

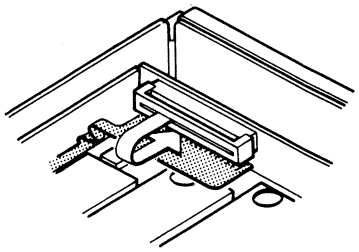


Fig. 2–1

3. As shown in the Fig. 2–2, desolder the jumper wire located on the speaker of KPG-1.

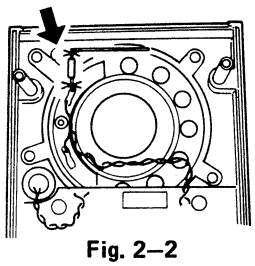


Fig. 2–2

4. As shown in the Fig. 2–3, connect terminals 4 (SWB) and NC on the small pc board with the jumper wire.
Use a low wattage pencil type iron.

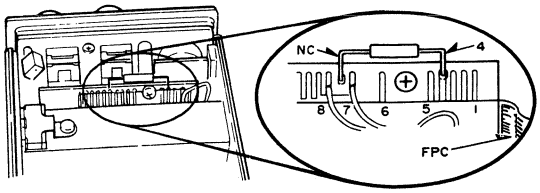


Fig. 2–3

5. Connect the cable assembly of the KPG-1 to the main board.
6. Tighten the 4 screws securing the KPG-1.

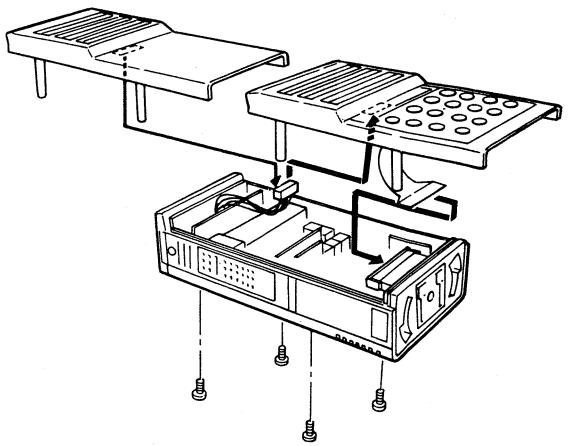


Fig. 2–4

3) Operation :
See the Instruction manual of the KPG-1.

INSTALLATION AND CONVERSION

2–2. Installation of KQT-6 or KMS-3

1. Remove the front panel by loosening 4 rear screws.

Caution :
Be careful not to break the speaker lead since the speaker is mounted on the cover.

2. Install the flexible pc (FPC) board plug Ⓐ into the connector Ⓑ on the KQT-6 and squeeze to tighten.

NOTE: Use the following procedure:

1) Position the end of pc board Ⓐ upward.
2) Slide the FPC connector housing on as shown, then release the lock.

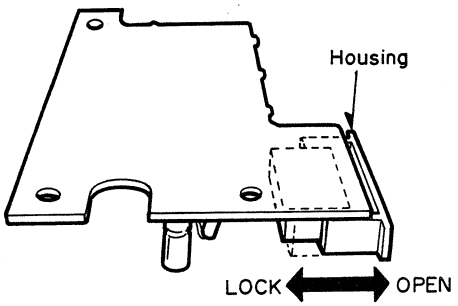


Fig. 2–5

3) Insert the end of the pc board into the FPC connector so it is seated securely.
4) Insert a small screwdriver as shown, and push the unit against the screwdriver.

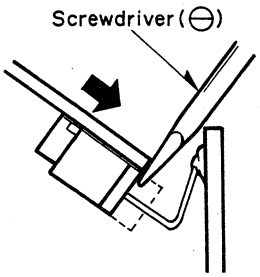


Fig. 2–6

5) Place the unit in the space provided.
6) Push the FPC connector housing with the screwdriver as shown, then lock the connector.

* Position the housing about 0.5mm away from the edge of the unit.

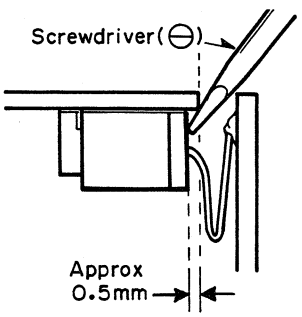


Fig. 2–7

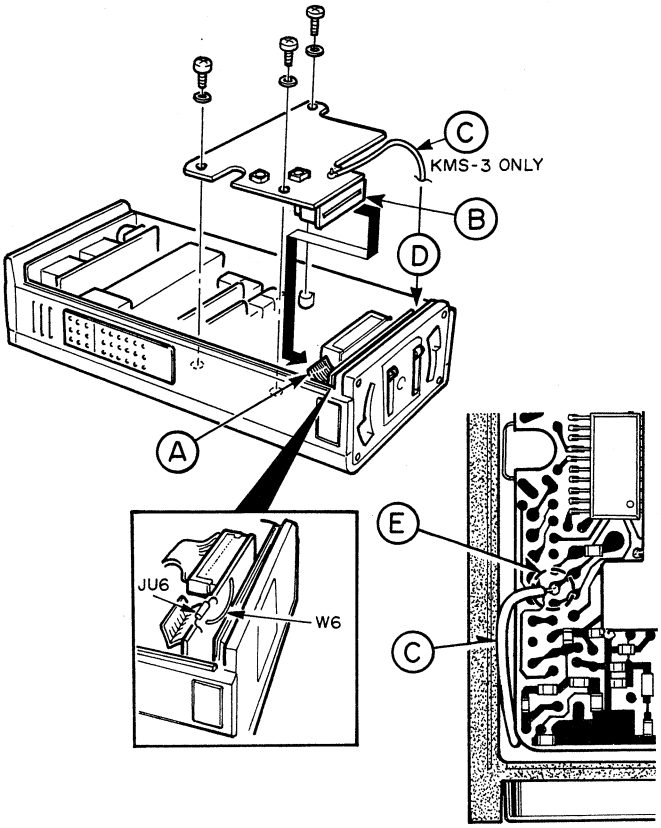


Fig. 2–8

3. Tighten the supplied 3 screws securing the KQT-6 or KMS-3.
4. Cut jumper wire JU6 on the Control unit.
5. KMS-3 ONLY (Perform step 1–4 first)

1) Cut jumper wire W6 on the Control unit.
2) Solder lead Ⓒ to the rear printed circuit Ⓔ through space Ⓓ .

2–3. Time-out timer conversion

	KQT-6		KMS-3	
Time (sec)	R25	R40	R2	R46
*OFF	O	O	O	O
30	O	X	O	X
60	X	O	X	O
120	X	X	X	X

O : Connect
X : Remove
* : BASIC

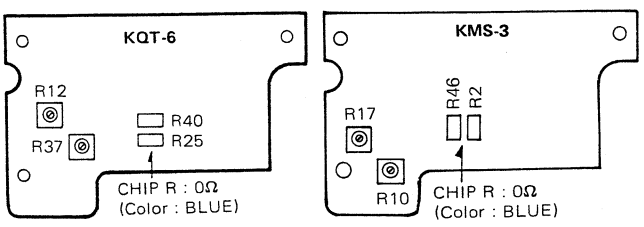
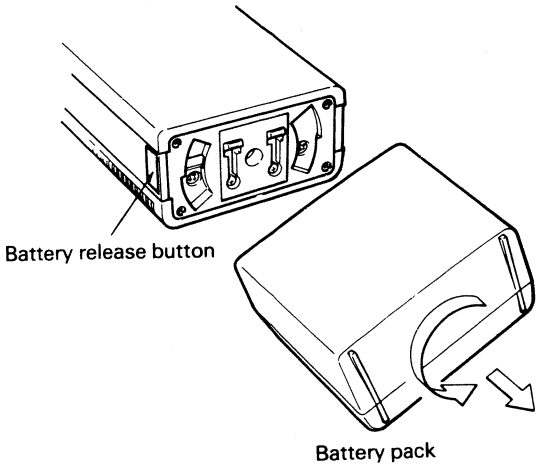


Fig. 2–9

DISASSEMBLY FOR REPAIR

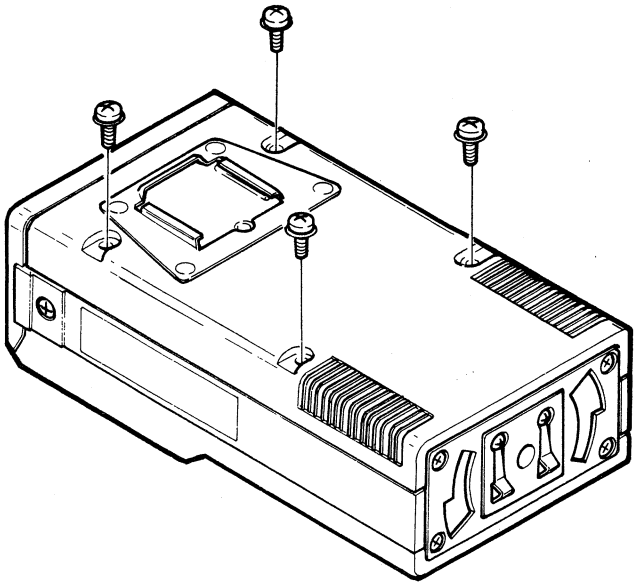
1. Battery release

Press the battery release button, turn the battery pack counterclockwise and pull the pack from the radio.



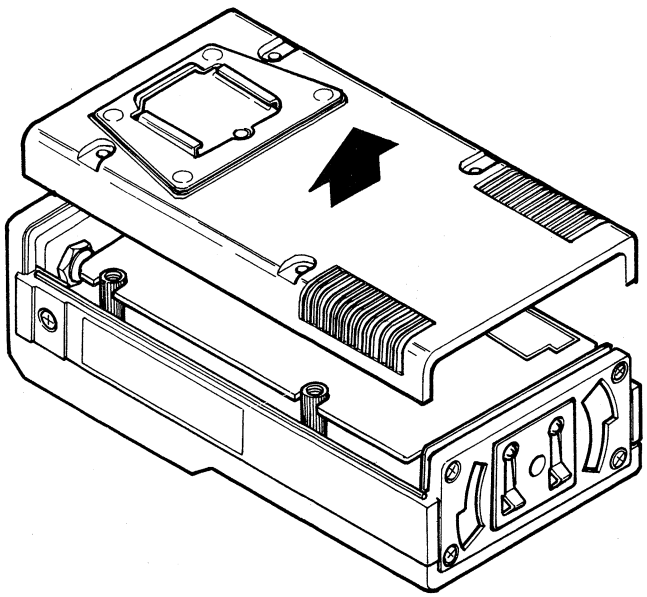
2. Case screw removal

Remove four screws securing the rear case.



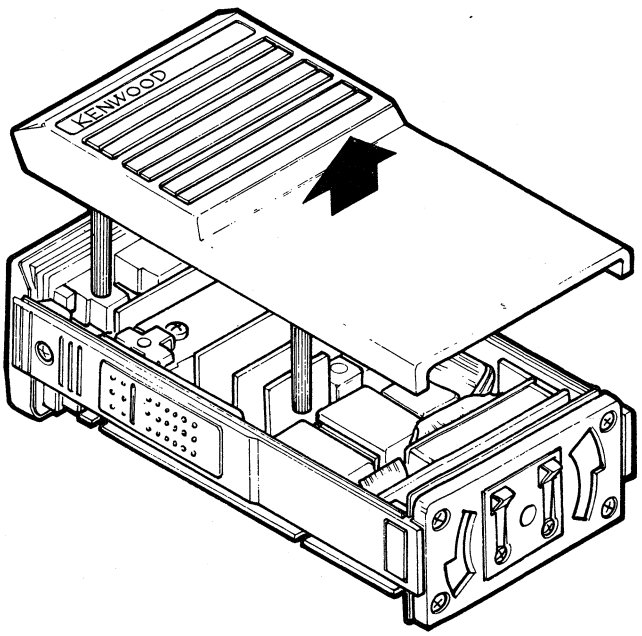
3. Rear case removal

With the rear facing up, carefully lift away the rear case.



4. Front case removal

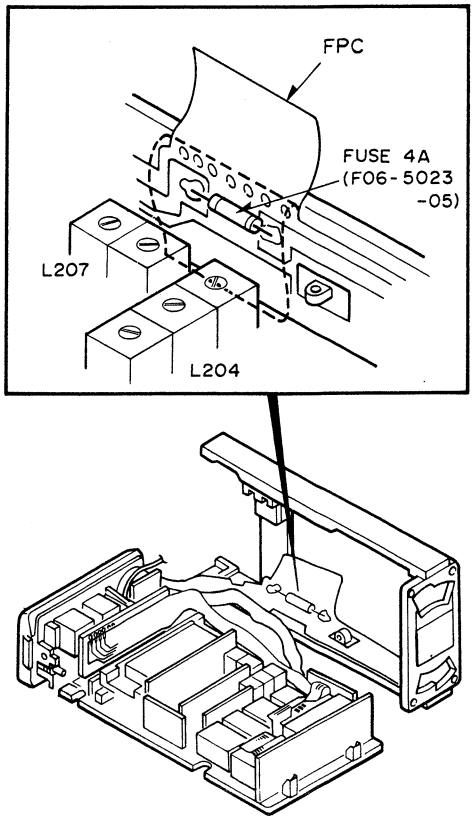
With the front facing up, carefully lift away the front case.



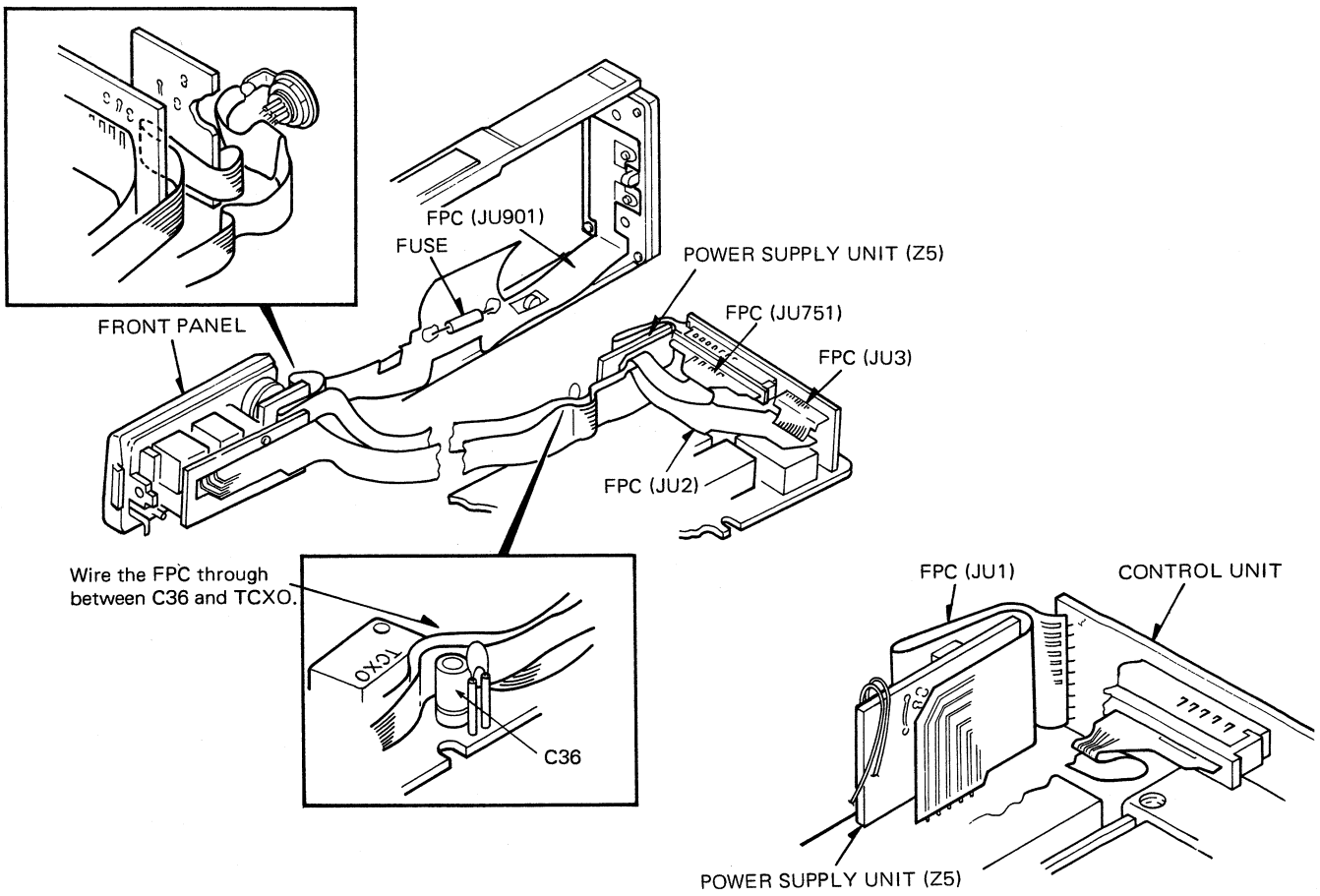
DISASSEMBLY FOR REPAIR

5. Fuse replacement

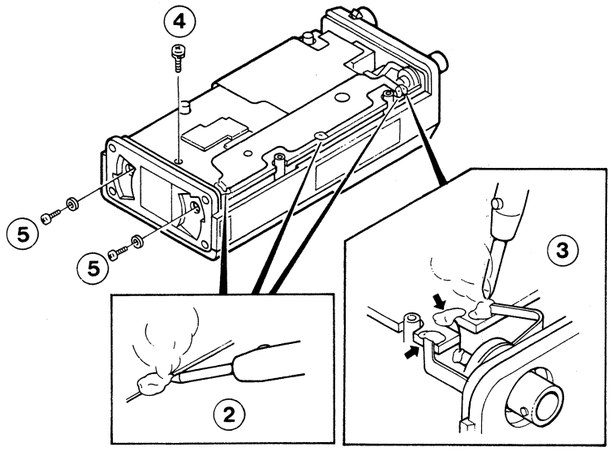
Remove the front case, and the fuse (4A) installed as shown in the figure can be seen.



6. Wiring of FPC

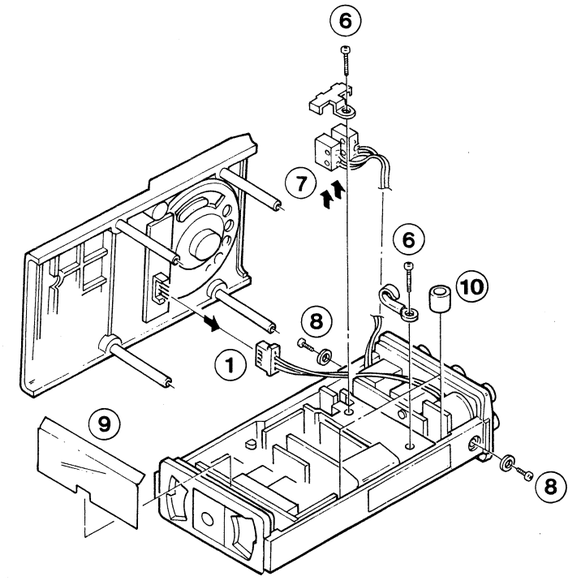


DISASSEMBLY FOR REPAIR



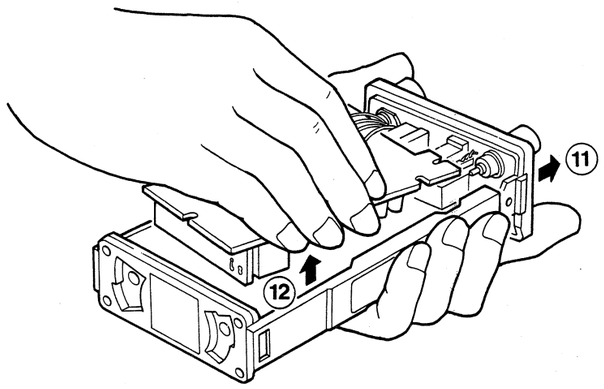
7. TX-RX unit conversion

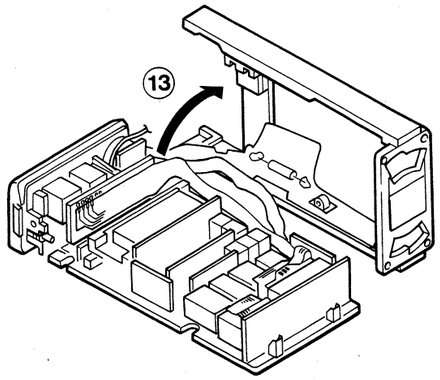
1. Disconnect the connector from the front case (①).
2. Remove the soldered parts (three places) from the shielding panel, then remove the shielding panel (②).
3. Remove the soldered parts of ANT terminal (three places) (③), then remove the one screws from the PC board (④).
4. Remove the two screws from the bottom plate (⑤), then remove the two screws from the parts side (⑥).



5. Remove PTT, MONI SW (⑦).
6. Remove the two screws from the side of frame (⑧), then remove the insulating sheet (⑨).
7. Remove the two silicon tubes (⑩).

8. Incline the panel in the direction of the arrow, and pull it out (⑪).
9. Lift the bottom side of TX-RX unit with the hand (⑫).
10. Move and set the panel and TX-RX unit together as shown below (⑬).

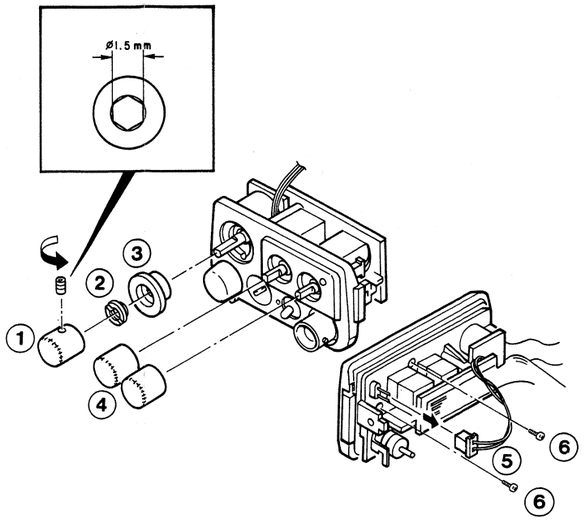




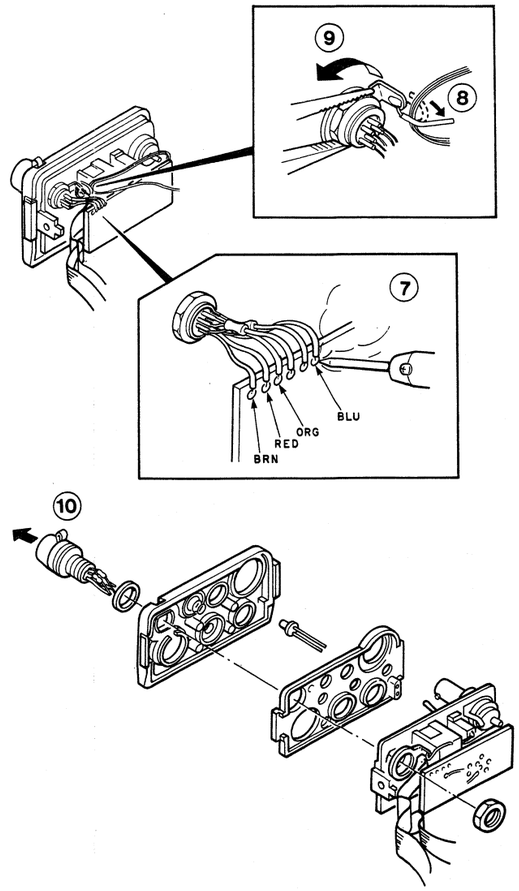
DISASSEMBLY FOR REPAIR

8. Front panel removal

1. Loosen the screw of CHANNEL knob with using a hexagon wrench, and remove the knob (①).
2. Remove the nut retaining the dial scale (②), then remove the dial scale (③).
3. Remove the AF VOL. and SQ VOL. knobs (④).
4. Disconnect the connector of TX LED (⑤), then remove the two screws retaining the front panel (⑥).

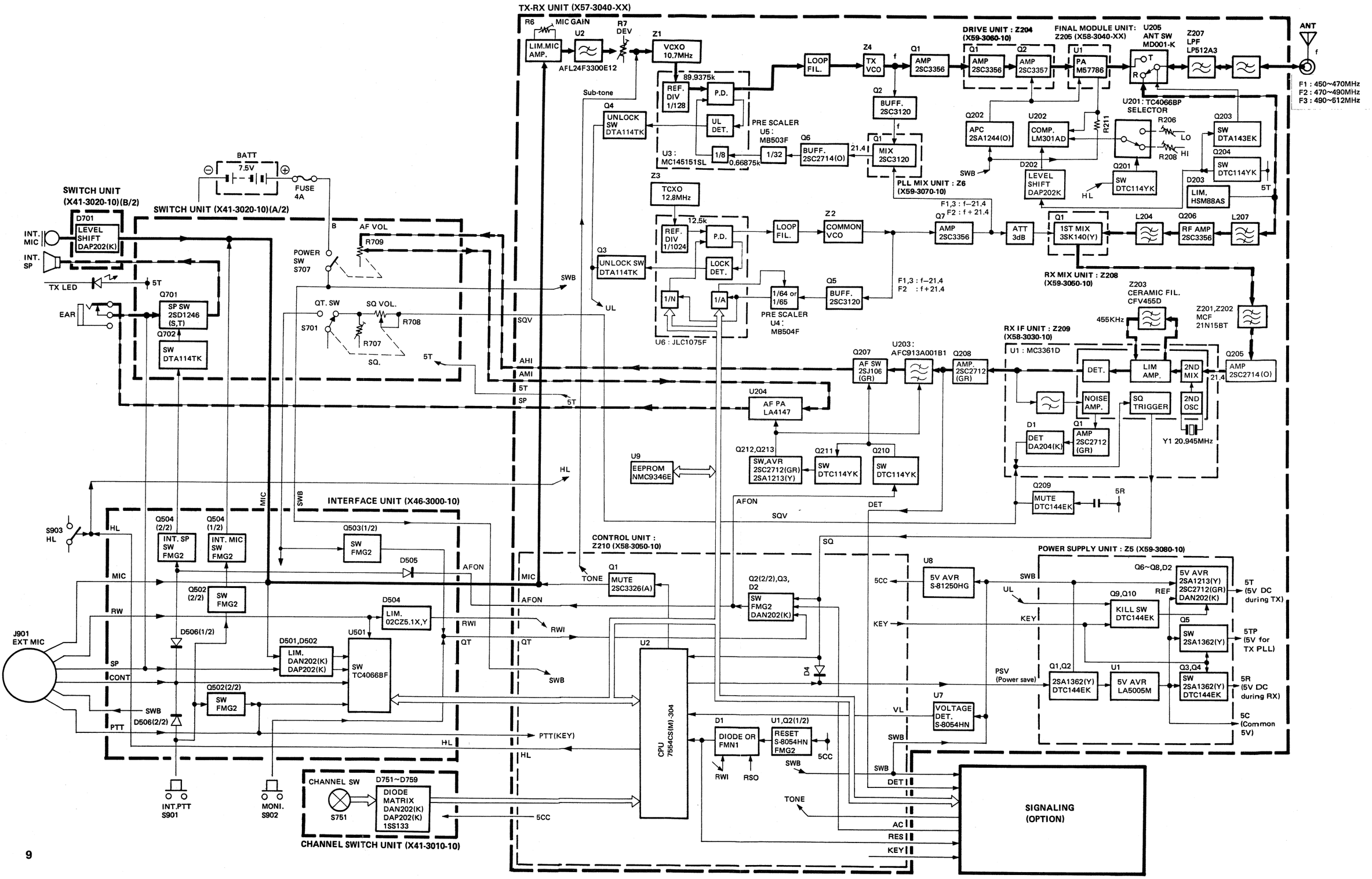


5. Resolder the EXT MIC wiring from the Interface unit side (⑦).
6. Remove the wiring (⑧), and remove the EXT MIC nut (⑨).
7. Remove the EXT MIC knob (⑩), then remove the front panel.



TK-310 TK-310

BLOCK DIAGRAM



CIRCUIT DESCRIPTION

The TK-310 consists of two switch units, an interface unit, and a transmitter-receiver unit. The TX-RX unit is divided into functional modules arranged as seven compact units that make effective use of internal space. The operation and functions of these units are described below.

The TK-310 is available in three frequency versions, one for each frequency band:

F1 version	450 to 470MHz
F2 version	470 to 490MHz
F3 version	490 to 512MHz

1. Phase-Locked Loop Circuit

1) Common phase-locked loop

The common PLL consists of a common voltage-controlled oscillator (Z2) that generates the RX first local signal (F1,3 : f–21.4MHz, F2 : f + 21.4MHz), a prescaler IC U4 : MB504F with a scaling factor of 1/64 or 1/65, the PLL IC U6 : JLC1075F, and a temperature-compensated crystal oscillator (Z3).

The common VCO consists of an oscillator and buffer amplifier. Its output is amplified by an RF amplifier Q7 : 2SC3356. The amplified output is fed to the RX mixing unit (Z208) as the first local signal, and to the TX PLL mixing unit as the TX PLL local signal.

Part of the output of the VCO (Z2) is rounted through an RF amplifier Q5 : 2SC3120 to the prescaler IC U4 : MB504F and divided by a factor of N0 in a pulse-swallow counter consisting of the prescaler and the N and A counters in the PLL IC U6 : JLC1075F. The resulting 12.5kHz signal is fed to a phase detector. N0, N, and A are related as follows :

$$N0 = 64N + A \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

N and A are provided as serial data from the microprocessor U2 : 7554CS(M)-304 in the Control unit. In response to a change in the channel data from the Channel switch unit, the microprocessor accesses the EEPROM U9 : NMC9346E to acquire the PLL divide data held by U6. Then the microprocessor accesses the PLL IC U6 : JLC1075F and writes new PLL data into U6.

The 12.5kHz signal provided to the phase detector is compared with a 12.5kHz reference signal. The reference signal originates in a temperature-compensated crystal oscillator (Z3) with a frequency stability of ±3ppm, the 12.8MHz output of which is divided by 1024 by a counter in U6 to generate the 12.5kHz frequency. The output of the phase detector is passed through a charge pump in U6 and a loop filter connected to U6 (R28 to R31, C43 to C45), then applied to a varicap diode in the VCO (Z2) to control its oscillation frequency.

2) TX phase-locked loop

The TX PLL consists of a TX voltage-controlled oscillator (Z4) and mixing module (PLL mixing unit : Z6) that generate the transmit frequency (450MHz to 512 MHz), a prescaler IC U5 : MB503F with a scaling factor of 1/32, the PLL IC U3 : MC145151SL, and a voltage-controlled crystal oscillator (Z1). The TX VCO (Z4) consists of an oscillator and a buffer. The output of this VCO (Z4) is amplified by an RF amplifier Q1 : 2SC3356, and the amplified output is fed to the Drive unit (Z204). The VCO output (f) is also amplified by another RF amplifier Q2 : 2SC3120 and fed to the PLL mixing unit (Z6), where it is mixed with the common VCO output (F1,3 : f–21.4MHz, F2 : f + 21.4MHz).

The 21.4MHz output of the PLL mixing unit is amplified by an RF amplifier Q6 : 2SC2714(O), then input to the prescaler IC U5 : MB503F. The output of U5 (21.4MHz/32 = 668.75kHz) is input to the PLL IC U3 : MC145151SL, where it is further divided by a factor of 8 and input (at 83.59375kHz) to the phase detector.

The signal input by the phase detector is compared with a reference signal (83.59375kHz), which originates as the 10.7MHz output of the voltage-controlled crystal oscillator (Z1) and is divided by 128 by an internal counter in U3 to generate 83.59375kHz. The input to PLL IC (U3 : MC145151SL) and the division ratio of the divider in U3 depend on the frequency version **(Fig. 1)**. This is because the PLL mixer operates on the lower-heterodyne for F1 and F3, and on the upper-heterodyne for F2, so the PLL locking directions are different. The output of the phase detector passes through a loop filter and is applied to a varicap diode in the TX VCO (Z4) to control the frequency.

3) Modulator

The AF signal from the microphone is preemphasized and amplified by the microphone amplifier IC U1 : HFA101F001A2, which contains a built-in limiter. The amplitude-limited output is fed to an active low-pass filter U2 : AFL24F3300E12. The output of U2 passes through a potentiometer (R7) that adjusts the maximum frequency deviation, then is input to the 10.7MHz VCXO (Z1). This AF input to Z1 is applied to the internal varicap diode to achieve FM direct modulation.

CIRCUIT DESCRIPTION

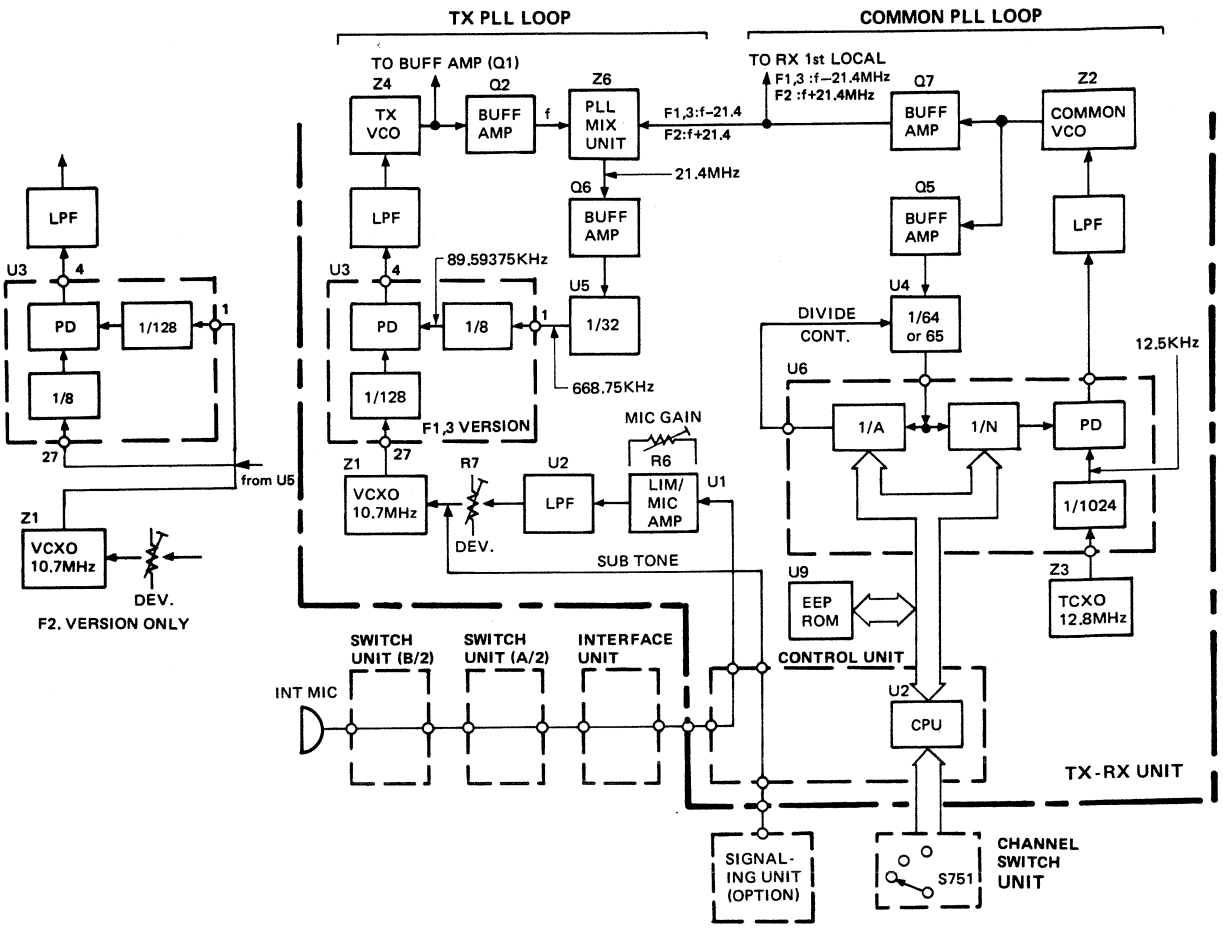


Fig. 1 PLL & Modulation Circuit Block Diagram

4) Unlock circuit

When the common PLL or TX PLL is in the unlocked state, the output of an unlock detector in the PLL IC (U6 or U3) goes low. When the common PLL is unlocked, the unlock switch Q3 : DTA114TK on and its output goes high. When the TX PLL is unlocked, the unlock switch Q4 turns on and its output goes high.

The output of the unlock switch (Q3 or Q4) is fed to the power supply unit (Z5) to halt operation of the 5T AVR circuit and stop transmitter radiation from the antenna.

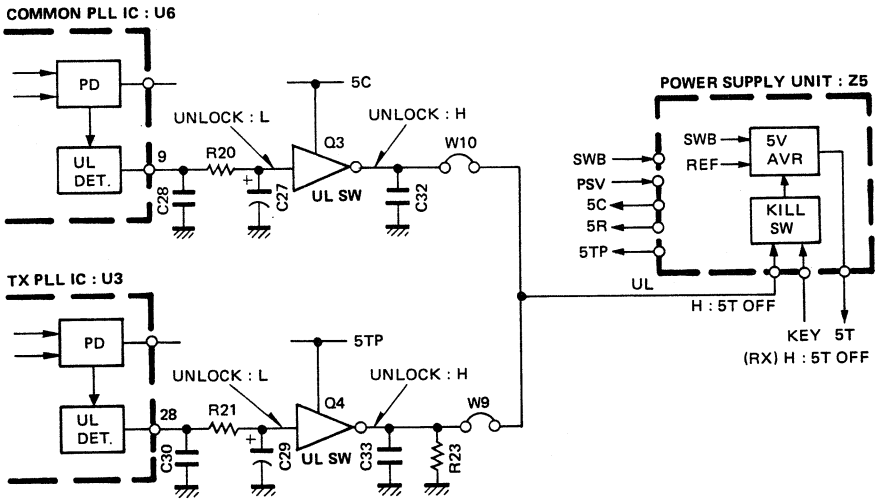


Fig. 2 Unlock Detection Circuit (TX-RX UNIT)

CIRCUIT DESCRIPTION

2. Receiver Circuit

The RF signal from the antenna passes through a low-pass filter (Z207) in the TX-RX unit and the antenna switch (U205) and is input to an RF amplifier Q206 : 2SC3356. The RF amplifier contains Q206, L207, and L204, and operates as a wide band amplifier. After selective amplification by the RF amplifier, the RF signal is mixed in the RX mixing unit (Z208) with the first local signal (F1,3 : f–21.4MHz, F2 : f + 21.4MHz) from the common PLL. The output of Z208 is band-limited by L203, an MCF consisting of Z201 and Z202, and L202 to produce the first IF signal (21.4MHz). The first IF signal is amplified by the IF amplifier Q205 : 2SC2714(O), then fed to the RX IF unit (Z209).

The RX IF unit is mounted on a small PC board containing the FM IF system IC, a noise amplifier, and a noise detector. The first IF signal input to Z209 is mixed internally with the 20.945MHz second local signal, converting it to the second IF signal (455kHz). The second IF signal is band-limited by a ceramic filter (Z203) external to Z209, then returned to Z209, where it is demodulated and output from Z209 as the AF signal.

The AF signal output from Z209 is amplified by an AF amplifier Q208 : 2SC2712(GR) and input to the RX AF filter U203 : AFC913A001B1. The AF signal is output from U203 via a jumper wire (W15) attached to the output pin (pin 7) of the bandpass filter, passed through the squelch switch Q207 : 2SJ106(GR) and input to the AF potentiometer (R709) of the Switch unit (A/2). The output of the AF potentiometer (R709) is returned to the TX-RX unit and amplified by the AF PA IC U204 : LA4147. The output of U204 reenters the Switch unit (A/2) via the external speaker jack (J902), and is routed via the speaker switch Q701 : 2SD1246(S,T) to the Switch unit (B/2) to drive the internal speaker.

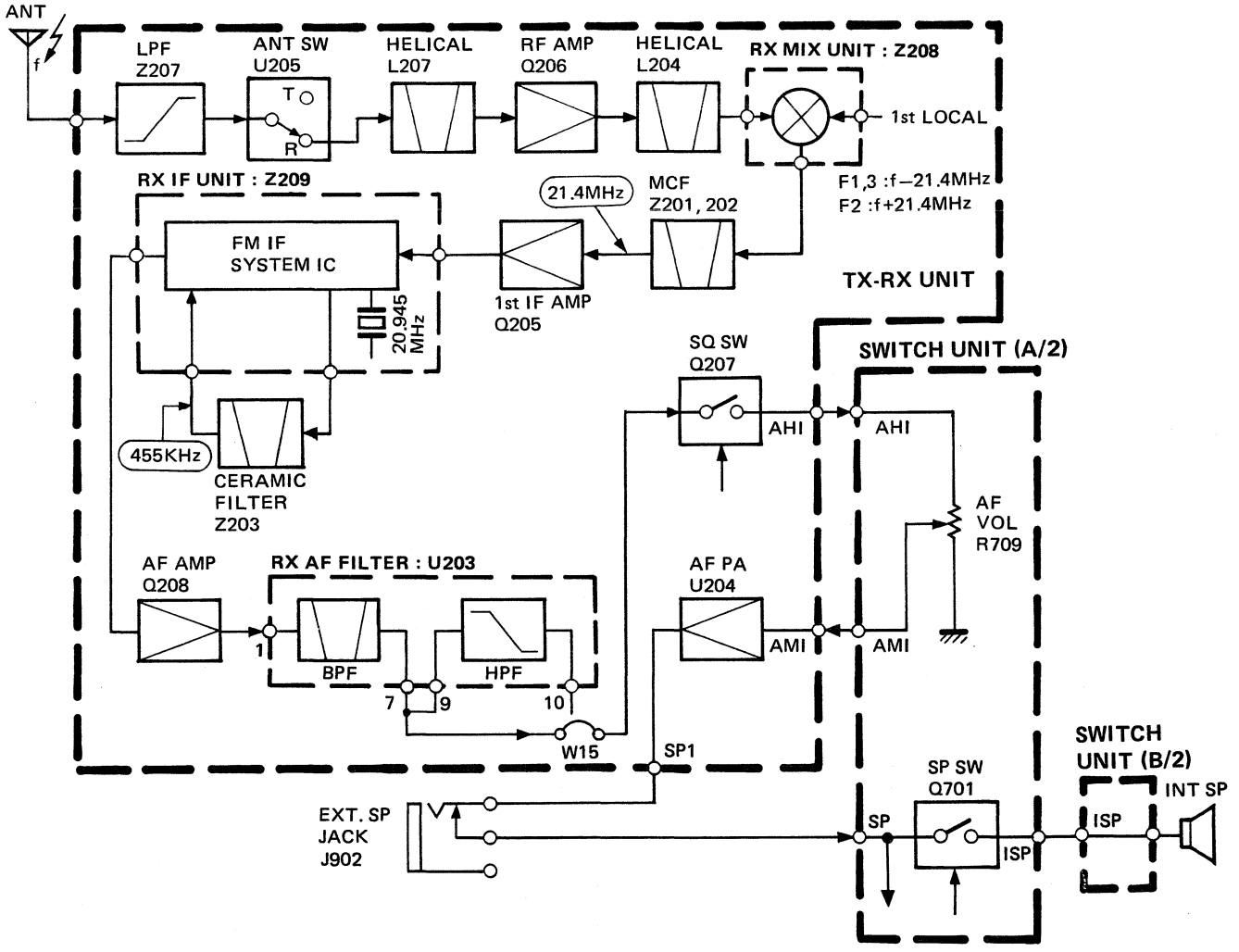


Fig. 3 Receiver Circuit Block Diagram

CIRCUIT DESCRIPTION

1) Noise squelch

The noise squelch components of the AF signal output from the FM system IC in the RX IF unit (Z209) are removed by an RC noise filter. After amplification by the noise amplifier, the noise signal is converted by the noise detector to a DC voltage signal. This DC voltage is level-adjusted by the squelch potentiometer (R708) in the Switch unit and a preset squelch resistance (R707), then applied to the squelch trigger circuit in Z209. When the input of the squelch trigger is high, the output is low. The squelch trigger output (SQ) turns Q3 (1/2) : FMG2 in the Control unit off, and turns Q2 (2/2) : FMG2 on. The output from Q2 (2/2) is fed to the TX-RX unit and the Interface unit.

When Q2 (2/2) is in the on state, Q210 : DTC114YK in the TX-RX unit is off. The output of Q210 controls the Power supply circuit (Q211 to Q213) of the squelch switch Q207 : 2SJ106(GR) and the AF PA.

When Q210 : DTC114YK turns off, the squelch switch Q207 : 2SJ106(GR) also turns off, cutting off the AF signal. Q211 : DTC114YK in the Power supply circuit (Q211 to Q213) of the AF PA turns on and Q212 : 2SC2712(GR) and Q213 : 2SA1213(Y) turn off, cutting off power to the AF PA. The output of Q213 is also fed to the RX AF filter U203 : AFC913A001B1, and also cuts off power to U203.

The output of Q2 (2/2) fed to the Interface unit turns off Q504 (2/2) : FMG2, causing Q701 : 2SD1246(S,T) and Q702 : DTA114TK in the Switch unit (A/2) also to turn off. Accordingly, when the squelch gate is closed, power to the other units is also cut off, thereby saving power.

2) Signaling squelch

When the QT unit (KQT-6) is installed, a signaling squelch operation is performed as follows. The signaling squelch gate opens after the noise squelch gate to permit the AF output to be heard through the speaker.

The SQL/QT switch should first be turned fully counter-clockwise to the QT position. In the QT position, the opening sensitivity of the noise squelch gate is the sensitivity set by the preset squelch trim pot. (R707), When the QT switch is in the on state, Q503 : FMG2 in the Interface unit turns off and Q3 (2/2) : FMG2 in the Control unit turns on. When Q3 (2/2) turns on, the AF ON pin remains low even when the noise squelch gate is open, preventing AF output through the speaker.

Next, part of the output from Q208 : 2SC2712(GR) in the TX-RX unit is fed to KQT-6 via the detector pin and the Control unit. When a signaling tone is received, the KQT-6 makes the AC pin low, causing Q3 (2/2) in the Control unit to turn off and the AF ON pin to go high. When AF ON goes high, Q207 : 2SJ106(GR) and Q213 : 2SA1213(Y) in the TX-RX unit turn on, Q701 : 2SD1246(S,T) in the Switch unit (A/2) turns on, and AF output is heard through the speaker.

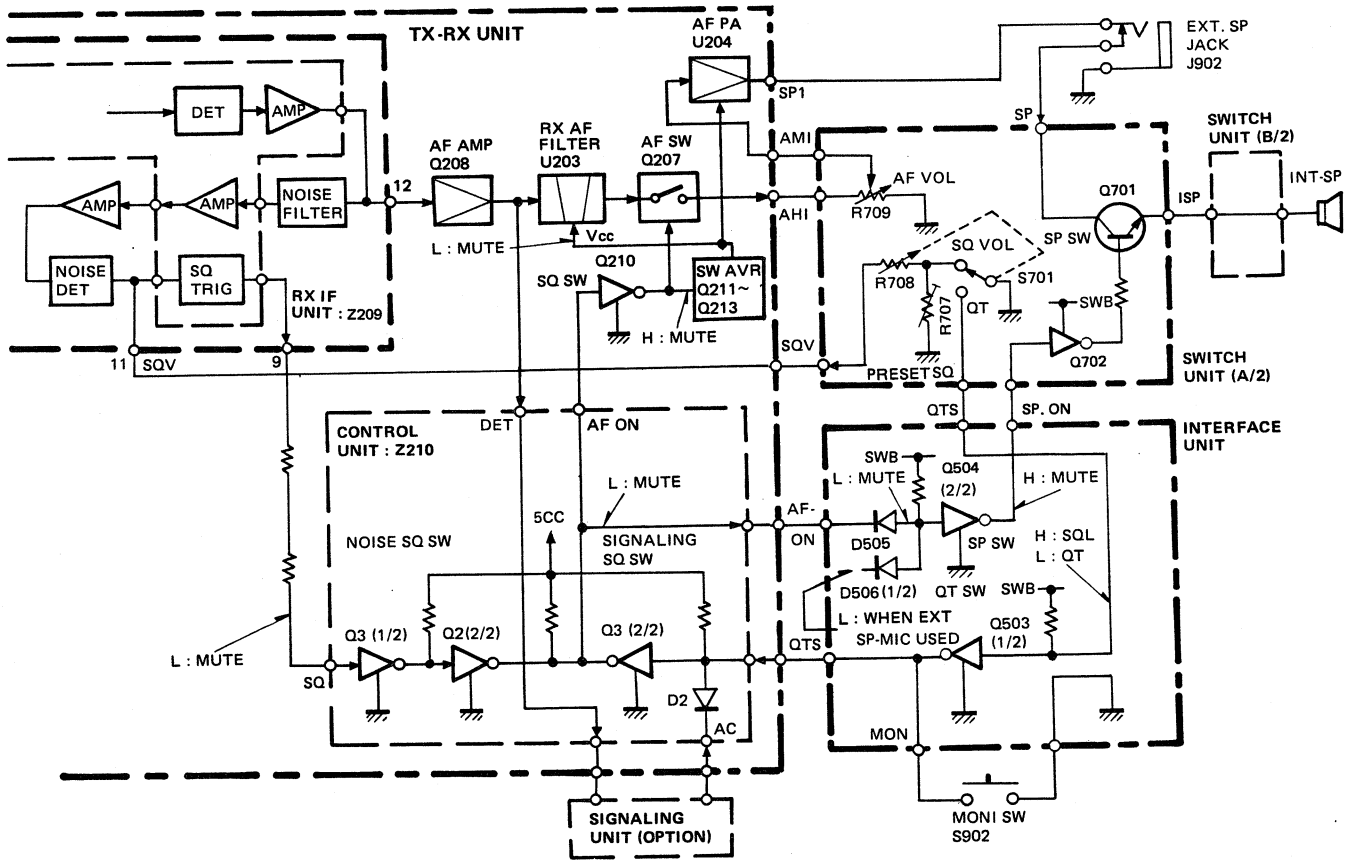


Fig. 4 Squelch Circuit Block Diagram

CIRCUIT DESCRIPTION

3. Transmitter Circuit

The output of the TX PLL circuit is amplified in the Drive unit (Z204) and power amplified in the Final module unit (Z205). The output from Z205 passes through the antenna switch U205 : MD001-K and a low-pass filter (Z207) and is fed to the antenna terminal. The spurious rejection characteristic of the transmitter is 70dB or better, spurious signals being rejected by the low-pass filter Z207 and another low-pass filter consisting of C201 and L201.

1) Automatic power control circuit

The APC circuit compares the collector current of the last-stage transistor in the Final module, detected as a voltage drop across R211, and the voltage resulting from division of the voltage generated by the zener diode D201 : 02CZ3.9Y,Z by the power-adjust potentiometer. The comparison is performed by a comparator U202 : LM301AD, the output of which controls the APC controller Q202 : 2SA1244(O) to vary the collector voltage of the Final module (Z205) and the last-stage transistor in the Drive unit (Z204). This stabilizes the input voltage of the last-stage transistor in the Final module for stable transmitter output.

2) High/low switching circuit

The TK-310 has a transmitter power switch that switches the transmitter power between 5W (high) and 2W (low). Information from this high/low switch (S903) controls the high/low switch Q201 : DTC114Y(K) in the TX-RX unit. When S903 is in the HIGH position, Q201 turns on, controlling the gate of the analog switch IC U201 : TC4066BP which switches the power, so that the output of the high-power adjustment potentiometer (R208) is supplied to the comparator U202 : LM301AD in the APC circuit. Similarly, when switch S903 is in the LOW position, Q201 turns off and the analog switch IC U201 : TC4066BP supplies the output of the low-power adjustment potentiometer (R206) to the comparator U202 : LM301AD in the APC circuit.

When the transmitter is operating on a channel that is set for low power, pin 12 of the micrprocessor U2 : 7554CS(M)-304 in the Control unit (Z210) goes low, acting via diode D3 to force the HL line low. This results in low power even when the high/low switch is set in the HIGH position.

3) Antenna switching circuit

The antenna switching circuit uses an antenna switching IC U205 : MD001-K containing an internal diode switch. The 5T input during transmission turns on Q204 : DTC114YK in the TX-RX unit, thereby turning on Q203 : DTA143EK and feeding switching current to the antenna switch U205 : MD001-K to establish the transmitting state.

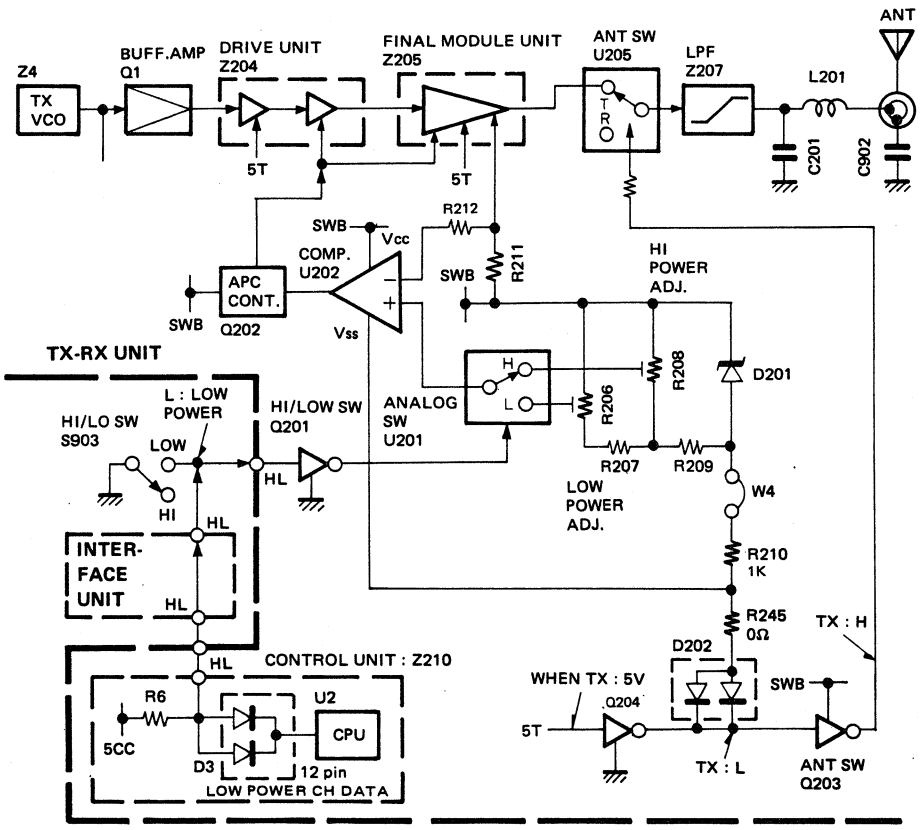


Fig. 5 Transmitter Circuit Block Diagram

CIRCUIT DESCRIPTION

4. Power Supply Circuit and Power Saver

When the power switch (S702) is switched on, 7.5V DC is supplied to the switched B lines (SWB). one of the two switched B lines is connected to the final, drive, and AF PA in the TX-RX unit, which require a large current flow. The other switched B line leads, via the Interface unit and Control unit (Z210), to the AVRs (Automatic Voltage Regulators) in the TX-RX unit.

The AVR configuration in the TX-RX unit consists of a 5V AVR that feeds 5V power (5CC) to the Control unit (Z210) and a power supply unit (Z5), that controls other circuit. Voltages with a PTT signal, PLL Unlock signal, and a Power Save (PSV) signal to reduce drain on the battery.

When the set is receiving, (when the KEY pin is high), the Power supply unit (Z5) outputs 5R. When the set is transmitting (when the KEY pin is low), the Power supply unit outputs 5TP (5V for the TX PLL) and 5T (5V for TX), except that 5T is not output when the Unlock signal is present. The 5C output is provided in both the receiving and transmitting states.

1) Power Saver

The power saver saves power by switching off the power supplies of unneeded circuits at regular intervals in the triggered reception mode. This power-saving operation requires that certain time values be written in the EEP-ROM in advance. These power saver time values can be set in the following four ways :

	Power-on time	Power-off time
1.	∞ (always)	0
2.	100ms	200ms
3.	100ms	400ms
4.	100ms	800ms

When the power saver operates, the PSV pin goes low and the 5C, 5R, 5T, and 5TP outputs are stopped. A voltage detector U7 : S-8054HN monitors the SWB voltage, and sends the microprocessor a low U7 signal when the SWB voltage falls below 5V.

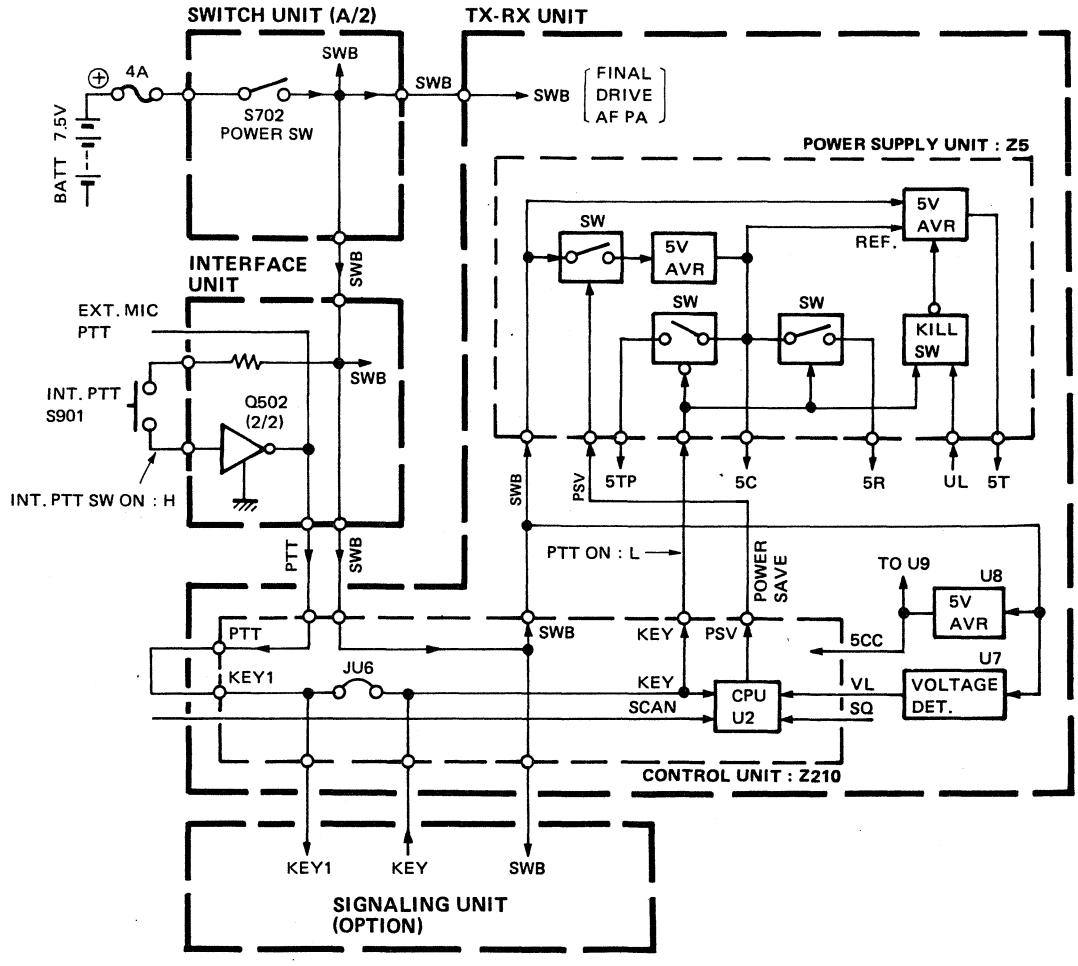


Fig. 6 Power supply Circuit Block Diagram

CIRCUIT DESCRIPTION

5. External Microphone Circuit

When pin 4 (CONT) of the external microphone jack (J901) is low, the other pins function as pins for the speaker-microphone unit (KMC-8). When pin 6 (RW) is high, they function as ROM writer pins.

1) Operation when the speaker-microphone unit is connected

When the speaker-microphone unit (KMC-8) is connected, pin 4 of the KMC-8 is grounded, causing pin 4 (CONT) of the external microphone jack (J901) to be low. When CONT is low, the internal speaker switch Q504 (2/2) : FMG2 is turned off via diode D506 (1/2) : DAN202(K) in the Interface unit to stop the Internal speaker from operating. As a result, the reception is heard only through the speaker of the speaker-microphone unit.

Similarly, the internal PTT switch Q502 (2/2) : FMG2 is turned off via D506 (1/2), disabling PTT control by the internal PTT switch (S901). The internal microphone switch Q502 (1/2) also turns off, disabling the internal microphone. As a result, only the PTT control signal and microphone signal from the speaker-microphone unit are enabled.

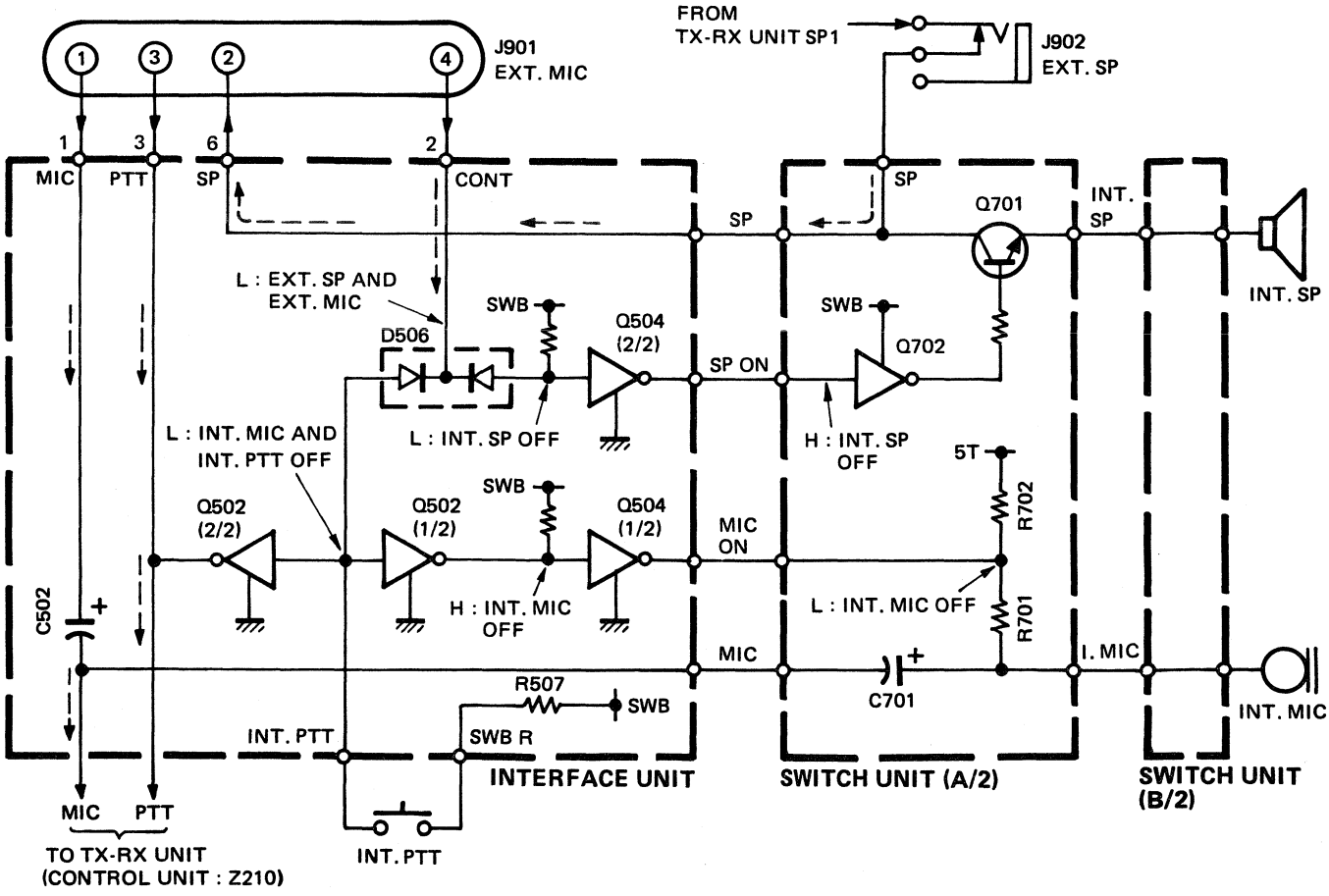


Fig. 7

CIRCUIT DESCRIPTION

2) Operation when the ROM writer is connected

The special ROM writer for the TK-310 connects by a cable to the external microphone jack. When the ROM writer is connected, the switched B line is connected to pin 6 (RW) of the microphone jack. The SWB input at the RW pin raises pins 5, 6, 12, and 13 of the analog switch U501 : TC4066BF to a high level, closing the analog switches and thereby connecting the ROM lines to the pins of the microphone jack. (The microphone jack and ROM pins are paired as shown below.)

External microphone jack		ROM pins
1. MIC	⟶	RCK (ROM Clock)
2. SP	⟶	ECS (ROM Chip Select, active high)
3. PTT	⟶	RDI (ROM Data Input)
4. CONT	⟵	RDO (ROM Data Output)
5. SWB		
6. RW (ROM Writer Information)		

The voltage applied to RW is also dropped by the zener diode D504 : 02CZ5.1X,Y to 5V and passed via the RWI (ROM Writer Information) pin to the Control unit (Z210). The high RWI signal input by the Control unit (Z210) passes through D1 to the Reset pin (pin 11) of the microprocessor U2 : 7554CS(M)-304. This high input at pin 11 sets the pins connected to the ROM in the high-impedance state, so they will not interfere with the exchange of data between the ROM writer and ROM.

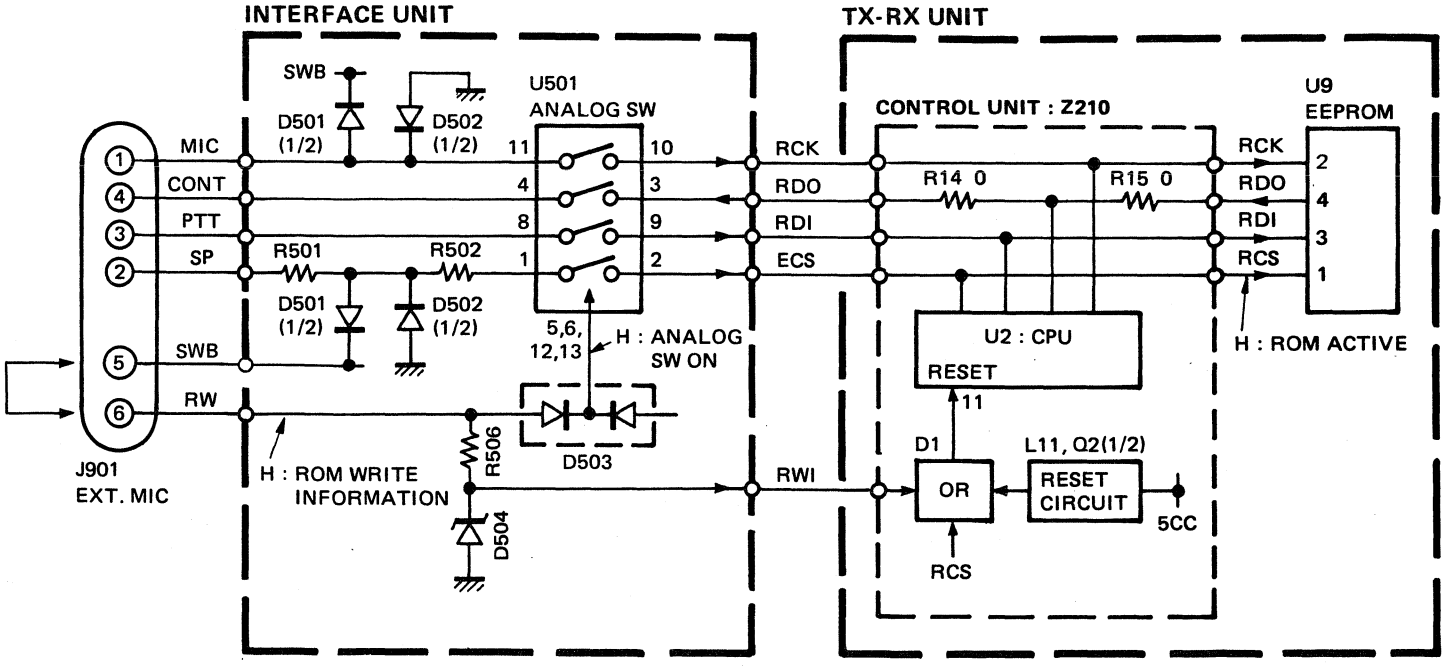


Fig. 8

CIRCUIT DESCRIPTION

6. Microprocessor (CPU) Circuit

- **Initialization (Operation when power is turned ON)**

1) Reset circuit

On the Control unit voltage detector U1 : S-8054HN, OUT terminal is low when the IN terminal is less than 4.5V, and goes high when Vcc becomes more than 4.5V. Therefore, Q2 (1/2) : FMG2 turns OFF when Vcc is less than 4.5V and turns ON when it is more than 4.5V.

When Q2 (1/2) is OFF, pin 11 of the CPU, U2 : 7554CS(M)-304 is high and maintains reset status. When Q2 (1/2) is turned ON, reset status is released and the CPU begins operation.

When the CPU starts operation, the initial operation will be performed in the following order :

1. Cancelling the RAM in the CPU.
2. Internal initializing of the CPU.
3. Reading out Power Save data from EEPROM.
4. Reading out of the inital channel data.
5. PLL data output.

The reset circuit in this unit has two external reset pins. When the ROM writer is connected, a high level signal is applied to RWI to make the CPU U2 reset. At this time, the CPU does not interfere with communication between the EEPROM and the ROM writer. When the KPG-1 is installed onto this unit, a high level signal is applied to RSO to make the CPU U2 reset, then, the TK-310 functions only as a ROM writer and does not function as a transceiver.

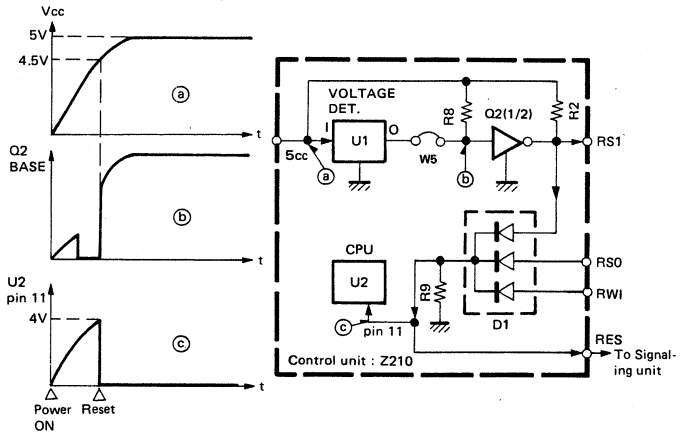


Fig. 9 Reset Circuit Block Diagram

- **Operation when the Channel SW is changed**

When the channel switch is changed, CPU U2 detects that the channel is switched, and U2 pin 18 (RCS) goes high. When the RCS (ROM Chip Selector) is inverted to high level, the EEPROM U9 is activated and outputs the channel data (PLL data, CTCSS tone data, and power control data) to RDO (ROM Data Output) in sequence while synchronized with the RCK (ROM Clock). These RDO data are read out by the CPU.

1) PLL Data

When the CPU has completed the data read out, CPU pin 18 (RCS) goes low and pin 19 (PLL EN) goes high. When the PLL EN (PLL enables) is inverted to high, the PLL IC U6 in the TX-RX unit is activated. Then the CPU outputs the PLL data synchronized with the RCK clock, and the data is written into the PLL IC.

When data transfer into the PLL IC is completed, PLL EN and RCS goes low.

2) Power Control Data

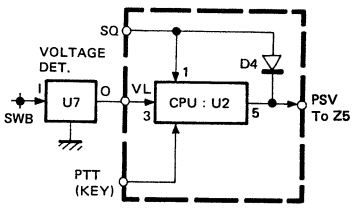
The power control data can be set for each channel, and is read out into the CPU from the EEPROM when the channel is switched. When the power data is set, CPU pin 17 is inverted to low. When CPU pin 17 is low, TX power is forced low (2W) regardless of the Hi/Low SW setting.

3) Power Save Operation

When the SQ, VL (voltage is low) and when not in the PTT mode, the power save data which is read out from the EEPROM at power-ON enables the power save operation.

The power save operation does not function when receiving a signal (SQ is high) or when in the transmission mode (PTT is low), as shown in **Fig. 10**.

However, when VL is low, that is, when the power voltage becomes less than 5V, the PSV is inverted to low level regardless of the power save data.



SQ
L : When no signal is received.
H : When the receiving signal is present.
VL
L : When SWB is less than 5V.
H : When SWB is more than 5V.
PTT
L : PTT is ON. H : PTT is OFF.
PSV to Z5
L : Power save operation
H : Normal operation

Fig. 10 Power Save Circuit Block Diagram

	SQ	PTT	VL	PSV
1	L	H	H	HI/LO*1
2	H	H	H	HI
3	L	L	H	HI
4	X	X	L	LO*2

X : Undefined

*1 : Changed over with the power save data.
*2 : Turns PSV low continuously when VL is low. When PTT is low and VL goes low, PSV maintains low status until PTT goes high.

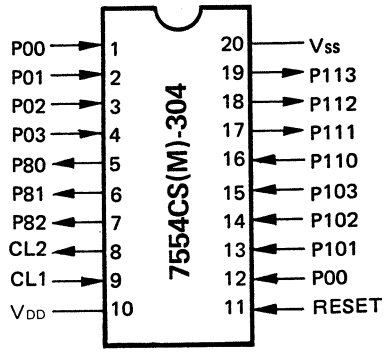
4) PLL data re-write

During the power save operation (PSV is low), power is supplied to the EEPROM and the Control unit and no power is supplied to any other sections. Therefore, since the data in the PLL IC U6 is last when the PSV operation is completed (PSV goes high), the PLL data will re-written into the PLL IC U6.

SEMICONDUCTOR

7554CS(M)-304 : PLL Control Microprocessor (Control unit U2)

- **Terminal connection diagram**



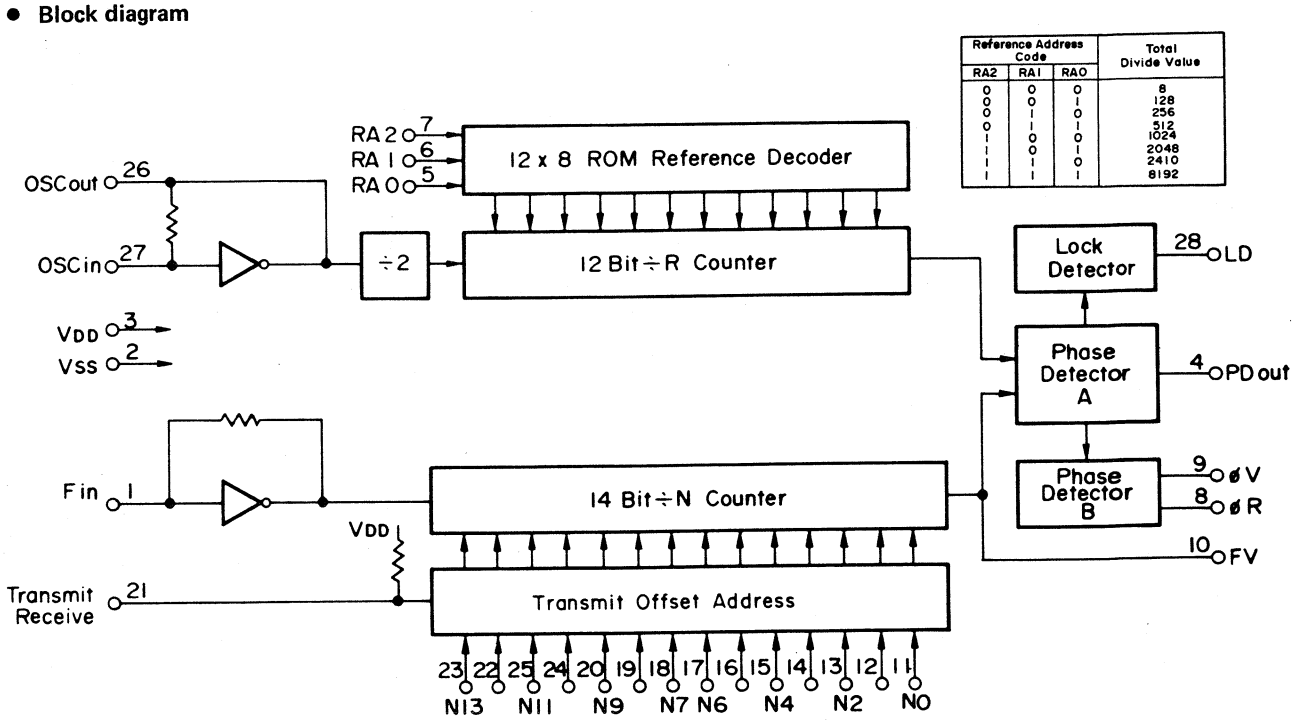
(Top View)

- **Terminal functions**

Pin No.	Port	I/O	Function	Pin No.	Port	I/O	Function
1	P00	I	Squelch	11	–	I	RESET
2	P01	I	Scan	12	P100	I	CH DATA (bit 0)
3	P02	I	Voltage low	13	P101	I	CH DATA (bit 1)
4	P03	I	PTT/KEY	14	P102	I	CH DATA (bit 2)
5	P80	O	Power save	15	P103	I	CH DATA (bit 3)
6	P81	O	CLOCK (EEPROM and PLL) = RCK	16	P110	I	READ (EEPROM) = RD0
7	P82	O	WRITE (EEPROM and PLL) = RDI	17	P111	O	Low power control
8	CL2	O	SYSTEM CLOCK	18	P112	O	EEPROM (chip enable)
9	CL1	I	SYSTEM CLOCK	19	P113	O	PLL (chip enable)
10	–	–	VDD	20	–	–	Vss

MC145151SL : Para-Input PLL Frequency Synthesizer (TX-RX unit U3)

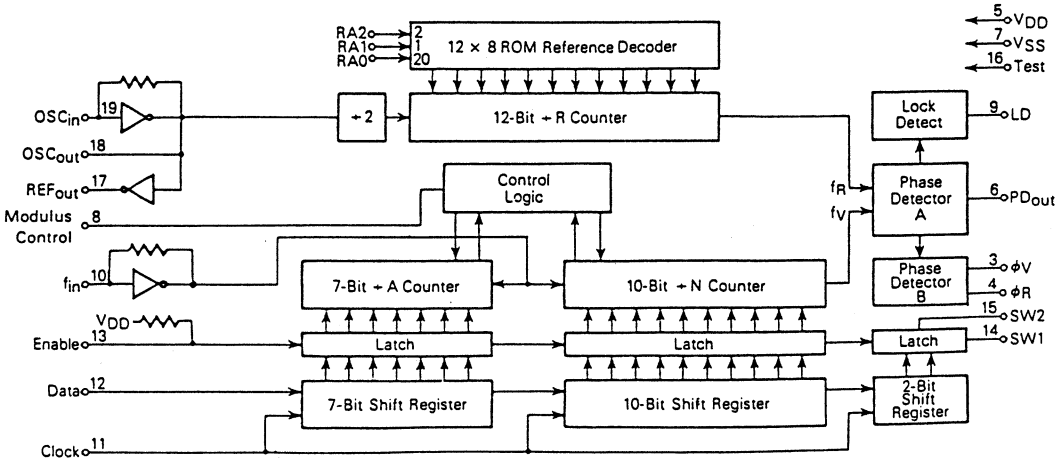
- **Block diagram**



SEMICONDUCTOR

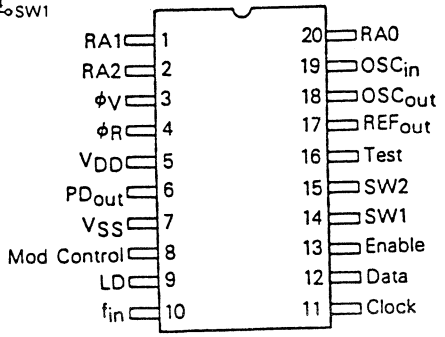
JLC1075F : PLL Frequency Synthesizer (TX-RX unit U6)

- **Block diagram**



Reference Address Code			Total Divide Value
RA2	RA1	RA0	
0	0	0	8
0	0	1	64
0	1	0	128
0	1	1	256
1	0	0	1160
1	0	1	2560
1	1	0	1024
1	1	1	2048

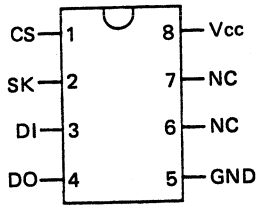
- **Terminal connection diagram**



(Top View)

NMC9346E : 1K EEPROM (TX-RX unit U9)

- **Terminal connection diagram**



CS	Chip Select
SK	Serial Data Clock
DI	Serial Data Input
DO	Serial Data Output
Vcc	Power Supply
GND	Ground
NC	Not Connected

(Top View)

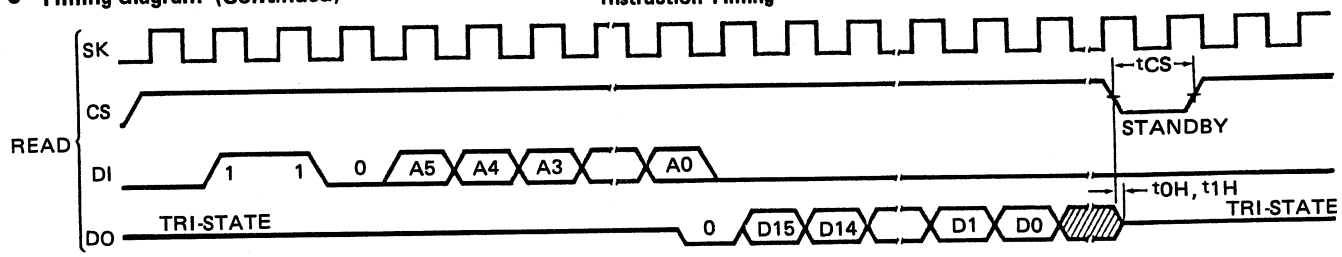
- **Instruction set for NMC9346E**

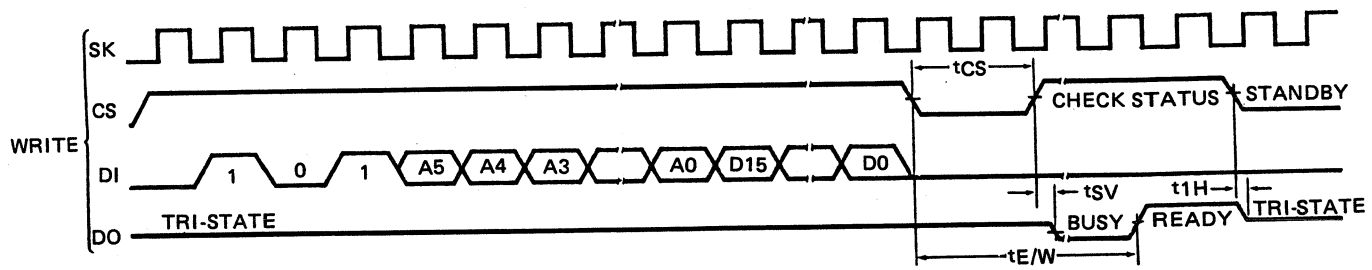
Instruction	SB	Op Code	Address	Data	Comments
READ	1	10	A5A4A3A2A1A0		Read Register A5A4A3A2A1A0
WRITE	1	01	A5A4A3A2A1A0	D15–D0	Write Register A5A4A3A2A1A0
ERASE	1	11	A5A4A3A2A1A0		Erase Register A5A4A3A2A1A0
EWEN	1	00	11XXXX		Erase/Write Enable
EWDS	1	00	00XXXX		Erase/Write Disable
ERAL	1	00	10XXXX		Erase All Registers

NMC9346E has 6 instructions as shown. Note that the MSB of any given instruction is a "1'L and is viewed as a start bit in the interface sequence. The next 8 bits carry the op code and the 6-bit address for 1 of 64, 16-bit registers.

- **Timing diagram (Continued)**

Instruction Timing

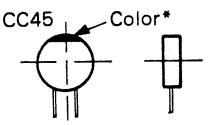




PARTS LIST

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

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



- **Capacitor value**

0 1 0 = 1pF
1 0 0 = 10pF
1 0 1 = 100pF
1 0 2 = 1000pF = 0.001μF
1 0 3 = 0.01μF

2 2 0 = 22pF
1st number | Multiplier
2nd number

- **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±60 ppm/°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

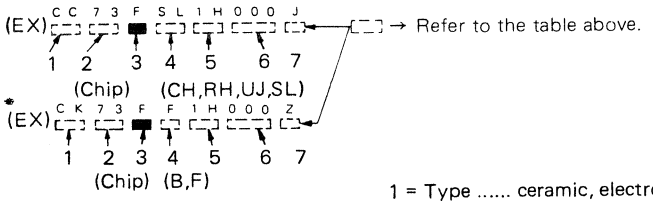
Code	B	C	D	F	G
(pF)	± 0.1	± 0.25	± 0.5	± 1	± 2

Less than 10 pF

- **Rating voltage**

1st word \ 2nd 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**

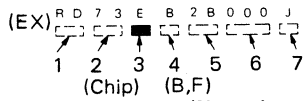


Dimension

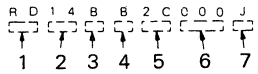
Dimension code	L	W	T
Empty	5.6 ± 0.5	5.0 ± 0.5	Less than 2.0
E	3.2 ± 0.2	1.6 ± 0.2	Less than 1.25
F	2.0 ± 0.3	1.25 ± 0.2	Less than 1.25

RESISTORS

- **Chip resistor (Carbon)**



- **Carbon resistor (Normal type)**



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

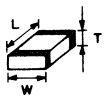
Dimension

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

Rating wattage

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

Dimension



PARTS LIST

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

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
			TK-310			
4	2D	*	A13-0674-15	FRAME		
5	2A	*	A22-0748-05	SUB PANEL		
6	1D	*	A40-0618-05	BOTTOM PLATE		
7	3G	*	A02-0723-02	CASE (FRONT)		
8	1G	*	A02-0736-03	CASE ASSY (REAR)		
-		*	A02-0735-03	CASE ASSY (FRONT)		
10	2C	*	B09-0306-04	CAP (EAR)		
11	1C	*	B09-0308-14	CAP (MIC)		
12	1C	*	B20-0826-04	DIAL SCALE		
13	1F	*	B40-3662-04	MODEL NAME PLATE	F1	
13	1F	*	B40-3736-04	MODEL NAME PLATE	F2	
13	1F	*	B40-3737-04	MODEL NAME PLATE	F3	
14	2F		B42-2437-04	SERIAL NO LABEL(TRANSCEIVER)		
15	3H	*	B43-1084-04	BADGE		
16	1H		B46-0409-10	WARRANTY CARD	K,K2,K3	
17	1H	*	B50-8057-40	INSTRUCTION MANUAL		
-			B42-2454-04	SERIAL NO LABEL(CARTON)		
D901	2B		B30-0852-05	LED (SLR-34VR3F)		
C901			CK73FB1H102K	CHIP C 1000PF K		
C902			CC45CH1H060D	CERAMIC 6.0PF D		
22	2D	*	D10-0601-05	RELEASE LEVER		
23	2D	*	D10-0603-04	PTT LEVER ASSY		
28	1B	*	E11-0427-05	PHONE JACK		
29	1B		E23-0468-04	TERMINAL (MIC)		
30	1D		E23-0474-14	TERMINAL		
31	2E	*	E23-0475-04	TERMINAL		
32	1A	*	E23-0489-04	TERMINAL (BNC)		
J901	1C		E06-0652-05	6P METAL SOCKET(MIC)		
J903	1A		E04-0160-05	BNC RECEPTACLE		
38	1E	*	F10-1350-03	SHIELDING PLATE(TX-RX UNIT)		
39	2G	*	F12-0408-04	COPPER TAPE (REAR CASE)		
40	2G		F19-0650-04	ISOLATION SHEET(FRONT CASE)		
41	1D	*	F20-0553-04	INSULATING SHEET(CONTROL UNIT)		
43	1F	*	F20-0564-04	INSULATING SHEET(TX-RX UNIT)		
44	1H	*	F20-0556-04	INSULATING SHEET(REAR CASE)		
45	1D,2E	*	F29-0430-05	INSULATING WASHER		
-			F06-4025-05	FUSE (4A)		
-			F07-0871-03	COVER (PTT LEVER)		
48	2D	*	G01-0835-04	COIL SPRING (RELEASE LEVER)		
49	2C	*	G01-0836-04	COIL SPRING (EAR)		
50	2B		G02-0505-05	D SPRING (KNOB)		
51	1D		G11-0617-04	CUSHION		
52	1E		G13-0816-04	CUSHION (CONTROL UNIT)		
53	1E	*	G53-0531-04	PACKING (BOTTOM PLATE)		
54	2B	*	G53-0532-13	PACKING (PANEL)		
57	3H	*	H01-8043-02	CARTON (INSIDE)		
61	2H	*	H10-2618-12	POLYSTYRENE FOAMED FIXTURE(LOW		
62	1H	*	H11-0808-14	POLYSTYRENE FOAMED FIXTURE(UP)		
63	1H	*	H13-0801-04	CUSHION		
64	2H		H25-0103-04	PROTECTION BAG		

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-		*	H03-2625-14	CARTON (OUTSIDE)		
67	2E	*	J21-4135-04	LEAD HOLDER		
68	1D	*	J21-4187-04	MOUNTING HARDWARE		
70	2E	*	J21-4189-04	MOUNTING HARDWARE(PTT SW)		
71	2G	*	J21-4188-04	MOUNTING HARDWARE(SPEAKER)		
72	2G		J39-0423-05	MIC SPACER		
JU901		*	J25-3476-05	FLEXIBLE PC BOARD		
75	2C	*	K21-0783-04	KNOB (CHANNEL)		
76	2C	*	K23-0786-04	KNOB (VOL,SQL)		
L901			L40-1092-14	SMALL FIXED INDUCTOR(1UH)		
L903			L40-1001-14	SMALL FIXED INDUCTOR(10UH)		
84	2C		N14-0523-04	NUT (CHANNEL SW)		
85	1D		N17-1021-41	TOOTHED WASHER		
A		*	N09-2019-05	BINDING SCREW (M2.6X10)		
B	2E	*	N09-2011-05	BINDING SCREW (M3X5)		
C	1D	*	N09-2014-05	BINDING SCREW (M2.6X6)		
D	1E	*	N09-2018-05	SEMUS SCREW (M2.6X6)		
E	1A		N35-2004-41	BINDING SCREW (M2X4)		
F	1D		N35-2008-41	BINDING SCREW (M2X8)		
G	2E		N35-2614-41	BINDING SCREW (M2.6X14)		
H			N89-2004-41	TAPPING SCREW (Ø2X4)		
J	1A		N89-2006-41	TAPPING SCREW (Ø2X6)		
-			R92-1061-05	JUMPER REST 0 OHM		
R901			RD14BB2C102J	RD 1.0K J 1/6W		
S901,902	2E		S50-1405-05	MICRO SWITCH (PTT,MON)		
S903	1B		S44-1412-05	TOGGLE SWITCH (HI/LOW)		
90	2H		T07-0239-05	LOUDSPEAKER (FULLRANGE)		
92	2H		T90-0335-25	FLEX ANTENNAS		
93	2G		T91-0312-15	CONDENSER MIC		
100	2H	*	W09-0360-05	BATTERY PACK (7.2V,800MAH)		
103	1A	*	X41-3010-10	CHANNEL SWITCH UNIT		
104	2G	*	X41-3020-10	SWITCH UNIT		
105	1A	*	X46-3000-10	INTERFACE UNIT		
106	1E	*	X57-3040-10	TX-RX UNIT (450-470MHZ)	F1	
106	1E	*	X57-3040-11	TX-RX UNIT (470-490MHZ)	F2	
106	1E	*	X57-3040-12	TX-RX UNIT (490-512MHZ)	F3	
107	2G	*	212-5801-05	INSULATING TUBE		
108	1G,3G		232-0032-05	SILICON TUBE		
CHANNEL SWITCH UNIT (X41-3010-10)						
JU751		*	J25-3472-05	FLEXIBLE PC BOARD		
S751		*	S29-1436-05	ROTARY SWITCH (CHANNEL)		
D751,752			DAP202(K)	DIODE		
D753			1SS133	DIODE		
D754			DAN202(K)	DIODE		
D755			DAP202(K)	DIODE		
D756			1SS133	DIODE		
D757			DAN202(K)	DIODE		

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D758			DAP202(K)	DIODE		
D759			DAN202(K)	DIODE		
SWITCH UNIT (X41-3020-10)						
C701			C92-0004-05	CHIP TAN 1UF 16WV		
C702			CK73FB1H102K	CHIP C 1000PF K		
J701			E40-3092-05	PIN CONNECTOR (4P)		
JU701		*	E31-3208-05	FLAT CABLE		
P701,702		*	E33-1766-00	CONNECTING WIRE(2P,4P)		
R701			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R702			RK73FB2A103J	CHIP R 10K J 1/10W		
R703			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R704,705			RK73FB2A122J	CHIP R 1.2K J 1/10W		
R706			RK73FB2A124J	CHIP R 120K J 1/10W		
R707			R12-3445-05	TRIMMING POT. (47K)		
R708		*	R05-4418-05	POTENTIOMETER(50KB)+SW,SQL/QT		
R709		*	R05-3439-05	POTENTIOMETER(10KA)+SW,VOL/OFF		
D701			DAP202(K)	DIODE		
Q701			2SD1246(S,T)	TRANSISTOR		
Q702			DTA114TK	DIGITAL TRANSISTOR		
INTERFACE UNIT (X46-3000-10)						
C501			CK73FB1H102K	CHIP C 1000PF K		
C502			C92-0004-05	CHIP TAN 1UF 16WV		
C503,504			CK73FB1H102K	CHIP C 1000PF K		
C505			C92-0004-05	CHIP TAN 1UF 16WV		
C506-510			CK73FB1H102K	CHIP C 1000PF K		
R501,502			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R503			RK73FB2A473J	CHIP R 47K J 1/10W		
R504			RK73FB2A222J	CHIP R 2.2K J 1/10W		
R505			RK73FB2A473J	CHIP R 47K J 1/10W		
R506			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R507			RK73FB2A103J	CHIP R 10K J 1/10W		
R508-512			RK73FB2A473J	CHIP R 47K J 1/10W		
D501			DAN202(K)	DIGITAL TRANSISTOR		
D502			DAP202(K)	DIGITAL TRANSISTOR		
D503			DAN202(K)	DIGITAL TRANSISTOR		
D504			02CZ5.1X,Y	ZENER DIODE (5.1V)		
D505,506			DAN202(K)	DIGITAL TRANSISTOR		
Q501			2SA1162(GR)	CHIP TRANSISTOR		
Q502-504			FMG2	DIGITAL TRANSISTOR		
Q505			2SC2712(GR)	CHIP TRANSISTOR		
U501			TC4066BF	CMOS IC(ANALOG/DIGITAL SW)		
TX-RX UNIT (X57-3040-10) : F1 (-11) : F2 (-12) : F3						
C1 ,2			CK73FB1H102K	CHIP C 1000PF K		
C3			CC73FSL1H271J	CHIP C 270PF J		
C4			C92-0005-05	CHIP-TAN 2.2UF 6.3WV		
C5			C90-0494-05	ELECTRO 22UF 6.3WV		
C6			CK73FB1H102K	CHIP C 1000PF K		
C7			C90-0868-05	ELECTRO 10UF 16WV		
C8			C92-0009-05	TANTAL 4.7UF 10WV		
C9			CK73FB1H102K	CHIP C 1000PF K		
C10			CK73FB1H103K	CHIP C 0.010UF K		
C11			CK73FB1H102K	CHIP C 1000PF K		

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C12			CQ92M1H123K	MYLAR	0.012UF	K		
C13			CQ92M1H332K	MYLAR	3300PF	K		
C14			C90-0890-05	TANTAL	1UF	16WV		
C15 -17			CK73FB1H102K	CHIP C	1000PF	K		
C18			C92-0009-05	TANTAL	4.7UF	10WV		
C19			CK73FB1H102K	CHIP C	1000PF	K		
C20 ,21			C90-0494-05	ELECTRO	22UF	6.3WV		
C22			CC73FCH1H0R5C	CHIP C	0.5PF	C	F3	
C22			CC73FCH1H010C	CHIP C	1.0PF	C	F1F2	
C23			CC73FCH1H080D	CHIP C	8.0PF	D		
C24			CK73FB1H102K	CHIP C	1000PF	K		
C25			CC73FCH1H030C	CHIP C	3.0PF	C	F3	
C25			CC73FCH1H050C	CHIP C	5.0PF	C	F1F2	
C26			CK73FB1H102K	CHIP C	1000PF	K		
C27			C90-0890-05	TANTAL	1UF	16WV		
C28			CC73FCH1H470J	CHIP C	47PF	J		
C29			C92-0004-05	CHIP TAN	1UF	16WV		
C30			CC73FCH1H470J	CHIP C	47PF	J		
C31 -34			CK73FB1H102K	CHIP C	1000PF	K		
C35			CC73FCH1H080D	CHIP C	8.0PF	D		
C36			C90-2048-05	ELECTRO	6.8UF	6.3WV		
C37 -40			CK73FB1H102K	CHIP C	1000PF	K		
C41			CC73FCH1H080D	CHIP C	8.0PF	D		
C42			CK73FB1H102K	CHIP C	1000PF	K		
C43			CQ92M1H223K	MYLAR	0.022UF	K		
C44			C90-0890-05	TANTAL	1UF	16WV		
C45			C90-0888-05	TANTAL	0.1UF	16WV		
C46			CK73FB1H102K	CHIP C	1000PF	K		
C47			C90-0494-05	ELECTRO	22UF	6.3WV		
C48			CC73FCH1H030C	CHIP C	3.0PF	C		
C49			CC73FCH1H080D	CHIP C	8.0PF	D		
C50			CK73FB1H102K	CHIP C	1000PF	K		
C51			CC73FCH1H030C	CHIP C	3.0PF	C		
C52 -57			CK73FB1H102K	CHIP C	1000PF	K		
C58			C90-0494-05	ELECTRO	22UF	6.3WV		
C59 ,60			CK73FB1H102K	CHIP C	1000PF	K		
C61			C90-0868-05	ELECTRO	10UF	16WV		
C62			CK73FB1H102K	CHIP C	1000PF	K		
C63			C92-0003-05	CHIP TAN	0.47UF	25WV		
C64			CK73EB1H223K	CHIP C	0.022UF	K		
C65			C90-0494-05	ELECTRO	22UF	6.3WV		
C66			CK73FB1H102K	CHIP C	1000PF	K		
C201			CC73FCH1H060D	CHIP C	6.0PF	D		
C202-205			CK73FB1H102K	CHIP C	1000PF	K		
C206			CC73FCH1H151J	CHIP C	150PF	J		
C207-209			CK73FB1H103K	CHIP C	0.010UF	K		
C210			CC73FCH1H070D	CHIP C	7.0PF	D		
C211			CK73FB1H103K	CHIP C	0.010UF	K		
C212			CC73FCH1H050C	CHIP C	5.0PF	C		
C213			CK73FB1H102K	CHIP C	1000PF	K		
C214			CC73FCH1H050C	CHIP C	5.0PF	C		
C215-217			CK73FB1H102K	CHIP C	1000PF	K		
C218			C92-0003-05	CHIP TAN	0.47UF	25WV		
C219			C92-0005-05	CHIP-TAN	2.2UF	6.3WV		
C220			C90-2046-05	ELECTRO	22UF	10WV		

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C221			C92-0004-05	CHIP TAN 1UF 16WV		
C222			C92-0005-05	CHIP-TAN 2.2UF 6.3WV		
C223			CK73FB1H103K	CHIP C 0.010UF K		
C224			CK73EB1E104K	CHIP C 0.10UF K		
C225		*	C92-0502-05	ELECTRO 0.33UF 35WV		
C226			CK73FB1H103K	CHIP C 0.010UF K		
C227			C92-0004-05	CHIP TAN 1UF 16WV		
C228			CK73FB1H103K	CHIP C 0.010UF K		
C229			CS15E1C4R7M	TANTAL 4.7UF 16WV		
C230,231		*	C90-2051-05	ELECTRO 33UF 10WV		
C232			C90-2012-05	ELECTRO 100UF 10WV		
C233			CK73EB1E104K	CHIP C 0.10UF K		
C234			CC73FCH1H470J	CHIP C 47PF J		
C235			CE04CW1C220M	ELECTRO 22UF 16WV		
C236			CK73FB1H102K	CHIP C 1000PF K		
C237			C90-2012-05	ELECTRO 100UF 10WV		
C238,239			CC73FCH1H050C	CHIP C 5.0PF C	F2	
C238,239			CC73FCH1H080D	CHIP C 8.0PF D	F1	
C240			CK73FB1H102K	CHIP C 1000PF K		
C241,242			CK73FB1H103K	CHIP C 0.010UF K		
C243			CK73FB1H102K	CHIP C 1000PF K		
C244			C91-0456-05	CERAMIC 0.047UF K		
C245			CK73EB1E104K	CHIP C 0.10UF K		
-		*	E23-0478-04	TERMINAL		
-		*	F10-1345-04	SHIELDING PLATE(COMMON VCO)		
-		*	F10-1346-04	SHIELDING PLATE(TX VCO)		
-		*	F20-0577-04	INSULATING SHEET		
-		*	J30-0545-05	SPACER (MCF)		
L1			L40-1021-14	SMALL FIXED INDUCTOR(1.0MH)		
L2 ,3			L40-4791-14	SMALL FIXED INDUCTOR(4.7UH)		
L4			L40-1872-80	CHIP INDUCTOR (18NH)		
L5 -7			L40-4791-14	SMALL FIXED INDUCTOR(4.7UH)		
L8			L40-2272-80	CHIP INDUCTOR (22NH)		
L201		*	L34-1183-05	COIL (2,3T)		
L202		*	L34-4011-05	COIL		
L203			L34-4012-05	COIL		
L204		*	L79-0699-05	HELICAL	F1	
L204		*	L79-0809-05	HELICAL	F2	
L204		*	L79-0811-05	HELICAL	F3	
L205			L40-1872-80	CHIP INDUCTOR (18NH)		
L206			L40-1072-80	CHIP INDUCTOR (10NH)		
L207		*	L79-0698-05	HELICAL	F1	
L207		*	L79-0808-05	HELICAL	F2	
L207		*	L79-0810-05	HELICAL	F3	
Z1		*	L77-1321-05	VCXO (10.7MHZ)		
Z2		*	L78-0021-05	VCO (440M)	F1	
Z2		*	L78-0027-05	VCO (480M)	F3	
Z2		*	L78-0028-05	VCO (500M)	F2	
Z3		*	L77-1322-05	TCXO (12.8MHZ)		
Z4		*	L78-0023-05	VCO (460M)	F1	
Z4		*	L78-0027-05	VCO (480M)	F2	
Z4		*	L78-0028-05	VCO (500M)	F3	
Z201,202			L71-0244-05	MCF (21N15BT)		

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Z203			L72-0339-05	CERAMIC FILTER (CFV455D)		
Z207			L79-0629-05	LPF (LP512A1)		
-			N35-2606-41	BIND SCREW (M2.6X6)		
JU212,213			R92-1061-05	JUMPER REST 0 OHM		
R1 ,2			RK73EB2B102J	CHIP R 1.0K J 1/8W		
R3			RK73FB2A103J	CHIP R 10K J 1/10W		
R4			R92-0670-05	CHIP R 0 OHM		
R5			RK73FB2A103J	CHIP R 10K J 1/10W		
R6			R12-3457-05	TRIMMING POT. (47K)		
R7		*	R12-3458-05	TRIMMING POT. (10K)		
R8 -11			RK73FB2A122J	CHIP R 1.2K J 1/10W		
R12			RK73FB2A100J	CHIP R 10 J 1/10W		
R13			RK73FB2A101J	CHIP R 100 J 1/10W		
R14			RK73FB2A123J	CHIP R 12K J 1/10W		
R15			RK73FB2A103J	CHIP R 10K J 1/10W		
R16			RK73FB2A681J	CHIP R 680 J 1/10W		
R17			RK73FB2A473J	CHIP R 47K J 1/10W		
R18			RK73EB2B102J	CHIP R 1.0K J 1/8W		
R19			RK73FB2A560J	CHIP R 56 J 1/10W		
R20 ,21			RK73FB2A473J	CHIP R 47K J 1/10W		
R22			RK73FB2A182J	CHIP R 1.8K J 1/10W		
R23			RK73FB2A473J	CHIP R 47K J 1/10W		
R24			RK73FB2A222J	CHIP R 2.2K J 1/10W		
R25			RK73FB2A224J	CHIP R 220K J 1/10W		
R26			RK73FB2A471J	CHIP R 470 J 1/10W		
R27			RK73FB2A473J	CHIP R 47K J 1/10W		
R28 ,29			RK73FB2A682J	CHIP R 6.8K J 1/10W		
R30			RK73FB2A103J	CHIP R 10K J 1/10W		
R31			RK73EB2B102J	CHIP R 1.0K J 1/8W		
R32			RK73FB2A563J	CHIP R 56K J 1/10W		
R33			RK73FB2A183J	CHIP R 18K J 1/10W		
R34 ,35			RK73FB2A101J	CHIP R 100 J 1/10W		
R36			RK73FB2A561J	CHIP R 560 J 1/10W		
R37			RK73FB2A271J	CHIP R 270 J 1/10W		
R38			RK73FB2A180J	CHIP R 18 J 1/10W		
R39			RK73FB2A271J	CHIP R 270 J 1/10W		
R40			RK73FB2A562J	CHIP R 5.6K J 1/10W		
R41			RK73FB2A223J	CHIP R 22K J 1/10W		
R42			RK73FB2A104J	CHIP R 100K J 1/10W		
R43			RK73FB2A182J	CHIP R 1.8K J 1/10W		
R44			RK73EB2B102J	CHIP R 1.0K J 1/8W		
R45			R92-0670-05	CHIP R 0 OHM	F1F3	
R46			RK73FB2A104J	CHIP R 100K J 1/10W		
R47			R92-0670-05	CHIP R 0 OHM		
R48 ,49			RK73FB2A473J	CHIP R 47K J 1/10W		
R201-203			RK73FB2A821J	CHIP R 820 J 1/10W		
R204,205			RK73FB2A473J	CHIP R 47K J 1/10W		
R206			R12-3444-05	TRIMMING POT. (10K)		
R207			RK73FB2A332J	CHIP R 3.3K J 1/10W		
R208			R12-3444-05	TRIMMING POT. (10K)		
R209			RK73FB2A683J	CHIP R 68K J 1/10W		
R210			RK73EB2B102J	CHIP R 1.0K J 1/8W		
R211			RD14DB2HR10J	SMALL-RD 0.10 J 1/2W		

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R212			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R213			RK73FB2A103J	CHIP R 10K J 1/10W		
R214			RK73EB2B102J	CHIP R 1.0K J 1/8W		
R215			RD14BB2C124J	RD 120K J 1/6W		
R216			RK73EB2B102J	CHIP R 1.0K J 1/8W		
R217			RK73FB2A121J	CHIP R 120 J 1/10W		
R218			RK73FB2A823J	CHIP R 82K J 1/10W		
R219			RK73FB2A391J	CHIP R 390 J 1/10W		
R220			RK73FB2A101J	CHIP R 100 J 1/10W		
R221			RK73FB2A220J	CHIP R 22 J 1/10W		
R222			RK73FB2A561J	CHIP R 560 J 1/10W	F2F3	
R222			RK73FB2A681J	CHIP R 680 J 1/10W	F1	
R223			RK73FB2A123J	CHIP R 12K J 1/10W		
R224			RK73FB2A103J	CHIP R 10K J 1/10W	F1	
R224			RK73FB2A153J	CHIP R 15K J 1/10W	F2F3	
R225			RK73FB2A103J	CHIP R 10K J 1/10W		
R226			RK73FB2A105J	CHIP R 1.0M J 1/10W		
R227			RK73FB2A103J	CHIP R 10K J 1/10W		
R228			RK73FB2A272J	CHIP R 2.7K J 1/10W		
R229			RK73FB2A101J	CHIP R 100 J 1/10W		
R230			RK73FB2A152J	CHIP R 1.5K J 1/10W		
R231			RK73FB2A682J	CHIP R 6.8K J 1/10W		
R232			RK73FB2A332J	CHIP R 3.3K J 1/10W		
R233			RK73EB2B102J	CHIP R 1.0K J 1/8W		
R234			RK73FB2A394J	CHIP R 390K J 1/10W		
R235			RK73FB2A332J	CHIP R 3.3K J 1/10W		
R236			RK73EB2B102J	CHIP R 1.0K J 1/8W		
R237			RK73FB2A103J	CHIP R 10K J 1/10W		
R239			RK73FB2A562J	CHIP R 5.6K J 1/10W		
R240			RK73FB2A272J	CHIP R 2.7K J 1/10W		
R241			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R242			RK73FB2A331J	CHIP R 330 J 1/10W		
R243			RK73FB2A471J	CHIP R 470 J 1/10W		
R244			RK73FB2A103J	CHIP R 10K J 1/10W		
R245-247			R92-0679-05	CHIP R 0 OHM		
R248,249			R92-0670-05	CHIP R 0 OHM		
D201			02CZ3.9Y,Z	ZENER DIODE (3.9V)		
D202			DAP202(K)	DIODE		
D203			HSM88AS	DIODE (5.1V)		
D204			MTZ5.1JA	ZENER DIODE		
Q1			2SC3356	CHIP TRANSISTOR		
Q2		*	2SC3120	CHIP TRANSISTOR		
Q3 ,4			DTA114TK	DIGITAL TRANSISTOR		
Q5		*	2SC3120	CHIP TRANSISTOR		
Q6			2SC2714(O)	CHIP TRANSISTOR		
Q7			2SC3356	CHIP TRANSISTOR		
Q201			DTC114YK	DIGITAL TRANSISTOR		
Q202		*	2SA1244(O)	TRANSISTOR		
Q203			DTA143EK	DIGITAL TRANSISTOR		
Q204			DTC114YK	DIGITAL TRANSISTOR		
Q205			2SC2714(O)	CHIP TRANSISTOR		
Q206			2SC3356	CHIP TRANSISTOR		
Q207			2SJ106(GR)	FET		
Q208			2SC2712(GR)	CHIP TRANSISTOR		

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Q209			DTC144EK	DIGITAL TRANSISTOR		
Q210,211			DTC114YK	DIGITAL TRANSISTOR		
Q212			2SC2712(GR)	CHIP TRANSISTOR		
Q213		*	2SA1213(Y)	CHIP TRANSISTOR		
U1		*	HFA101F001A2	IC(LIMITED AMP)		
U2		*	AFL24F3300E12	IC(ACTIVE L.P.F/FC3.6KHZ)		
U3			MC145151SL	IC(PARA INPUT PLL FREQ SYNTHE)		
U4		*	MB504F	IC(MODULUS PRE SCALER)		
U5		*	MB503F	IC(MODULUS PRE SCALER)		
U6		*	JLC1075F	IC(PLL FREQ SYNTHESIZER)		
U7			S-8054HN	IC(VOLTAGE DETECTOR)		
U8		*	S-81250HG	IC(VOLTAGE REGULATOR/ +5V))		
U9		*	NMC9346E	IC(1K EEP ROM)		
U201			TC4066BP	CMOS IC(ANALOG/DIGITAL SW)		
U202		*	LM301AD	IC(OP AMP)		
U203		*	AFC913A001B1	IC(ACTIVE B.P.F/ 0.4-1.6KHZ)		
U204		*	LA4147	IC(AF POWER AMP)		
U205		*	MD001-K	IC(ANT SW)		
Z5		*	X59-3080-10	POWER SUPPLY UNIT		
Z6		*	X59-3070-10	PLL MIX UNIT		
Z204		*	X59-3060-10	DRIVE UNIT		
Z205		*	X58-3040-10	FINAL MODULE UNIT(WITH M57786M	F1	
Z205		*	X58-3040-11	FINAL MODULE UNIT(WITH M57786H	F2F3	
Z208		*	X59-3050-10	RX MIX UNIT		
Z209		*	X58-3030-10	RX IF UNIT		
Z210		*	X58-3050-10	CONTROL UNIT		
RX IF UNIT (X58-3030-10)						
C1 ,2			CK73FB1H472K	CHIP C 4700PF K		
C3			C92-0003-05	CHIP TAN 0.47UF 25WV		
C4 ,5			CK73FB1H102K	CHIP C 1000PF K		
C6			CK73FB1H103K	CHIP C 0.010UF K		
C7			CK73FB1H102K	CHIP C 1000PF K		
C8			C92-0005-05	CHIP-TAN 2.2UF 6.3WV		
C9			CK73FB1H102K	CHIP C 1000PF K		
C10			CK73FB1H103K	CHIP C 0.010UF K		
C11			C92-0004-05	CHIP TAN 1UF 16WV		
C12 -14			C92-0005-05	CHIP-TAN 2.2UF 6.3WV		
C15			CC73FCH1H220J	CHIP C 22PF J		
C16			CC73FCH1H470J	CHIP C 47PF J		
C17 ,18			CK73EB1E104K	CHIP C 0.10UF K		
C19			C92-0010-05	TANTAL 6.8UF 6.3WV		
L1			L40-2701-81	CHIP INDUCTOR (27UH)		
L2		*	L34-4015-05	COIL (455KHZ)		
Y1		*	L77-1324-05	CRYSTAL (20.945MHZ)		
R1			RK73FB2A473J	CHIP R 47K J 1/10W		
R2			RK73FB2A332J	CHIP R 3.3K J 1/10W		
R3			RK73FB2A103J	CHIP R 10K J 1/10W		
R4			RK73FB2A332J	CHIP R 3.3K J 1/10W		
R5			RK73FB2A394J	CHIP R 390K J 1/10W		
R6			RK73FB2A103J	CHIP R 10K J 1/10W		
R7			RK73FB2A152J	CHIP R 1.5K J 1/10W		
R8			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R9			RK73FB2A332J	CHIP R 3.3K J 1/10W		
R10			RK73FB2A562J	CHIP R 5.6K J 1/10W		

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R11			RK73FB2A394J	CHIP R 390K J 1/10W		
R12			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R13			RK73FB2A332J	CHIP R 3.3K J 1/10W		
R14			RK73FB2A471J	CHIP R 470 J 1/10W		
R15			RK73FB2A103J	CHIP R 10K J 1/10W		
R16			RD14BB2C154J	RD 150K J 1/6W		
D1			DA204K	DIODE		
D2			DAP202(K)	DIODE		
Q1			2SC2712(GR)	CHIP TRANSISTOR		
U1		*	MC3361D	IC(FM IF SISTEM)IF)		
FINAL MODULE UNIT (X58-3040-10) : F1 (-11) : F2,F3						
C1			C90-2041-05	ELECTRO 10UF 10WV		
C2			CK73FB1H103K	CHIP C 0.010UF K		
C3			CK73FB1H102K	CHIP C 1000PF K		
C4			C90-2041-05	ELECTRO 10UF 10WV		
C5			CK73FB1H103K	CHIP C 0.010UF K		
C6 ,7			CK73FB1H102K	CHIP C 1000PF K		
C8			CK73FB1H103K	CHIP C 0.010UF K		
C9			CK73FF1E104Z	CHIP C 0.10UF Z		
C10			C90-2041-05	ELECTRO 10UF 10WV		
-		*	F11-1037-15	SHIELDING COVER		
L1			L33-0680-05	CHOKE COIL		
-			N35-2004-41	BINDING HEAD MACHINE SCREW		
U1		*	M57786H	IC(POWER MODULE/ 470-512MHZ)	F2F3	
U1		*	M57786M	IC(POWER MODULE)	F1	
CONTROL UNIT (X58-3050-10)						
C1 ,2			CK73FB1H102K	CHIP C 1000PF K		
C3			CK73FF1E104Z	CHIP C 0.10UF Z		
C4 -8			CK73FB1H102K	CHIP C 1000PF K		
J1		*	E40-5091-05	FPC CONNECTOR (22P)		
JU1 ,2		*	J25-3482-05	FLEXIBLE PC BOARD		
JU3		*	J25-3483-05	FLEXIBLE PC BOARD		
110 15			R92-0670-05	CHIP R 0 OHM		
JU6 ,7			R92-1061-05	JUMPER REST 0 OHM		
R1			RK73FB2A473J	CHIP R 47K J 1/10W		
R2 -5			RK73FB2A103J	CHIP R 10K J 1/10W		
R6 -8			RK73FB2A473J	CHIP R 47K J 1/10W		
R9 -13			RK73FB2A104J	CHIP R 100K J 1/10W		
D1		*	FMN1	DIDE		
D2 ,3			DAN202(K)	DIODE		
D4			DAP202(K)	DIODE		
Q1			2SC3326(A)	CHIP TRANSISTOR		
Q2 ,3			FMG2	DIGITAL TRANSISTOR		
U1			S-8054HN	IC(VOLTAGE DETECTOR)		
U2		*	7554CS(M)-304	IC(MICROPROCESSOR)		
RX MIX UNIT (X59-3050-10)						
C1			CK73FB1H102K	CHIP C 1000PF K		
C2			CK73FB1H103K	CHIP C 0.010UF K		
C3			CC73FRH1H330J	CHIP C 33PF J		

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L1			L40-1072-80	CHIP INDUCTOR (10NH)		
L2			L40-3972-80	CHIP INDUCTOR (39NH)		
L3			L40-4772-80	CHIP INDUCTOR (47NH)		
L4			L40-2272-80	CHIP INDUCTOR (22NH)		
R1 ,2			RK73FB2A333J	CHIP R 33K J 1/10W		
R3			RK73FB2A152J	CHIP R 1.5K J 1/10W		
Q1		*	3SK140(GR)	FET		
DRIVE UNIT (X59-3060-10)						
C1			CC73FCH1H030C	CHIP C 3.0PF C		
C2 -4			CK73FB1H102K	CHIP C 1000PF K		
C5			CC73FCH1H050C	CHIP C 5.0PF C		
C6 ,7			CK73FB1H102K	CHIP C 1000PF K		
C8			CC73FCH1H120J	CHIP C 12PF J		
C9 ,10			CK73FB1H102K	CHIP C 1000PF K		
L1			L40-1072-80	CHIP INDUCTOR (10NH)		
L2			L40-1872-80	CHIP INDUCTOR (18NH)		
L3			L40-1072-80	CHIP INDUCTOR (10NH)		
R1 ,2			RK73FB2A100J	CHIP R 10 J 1/10W		
R3			RK73FB2A151J	CHIP R 150 J 1/10W		
R4			RK73FB2A152J	CHIP R 1.5K J 1/10W		
R5			RK73FB2A332J	CHIP R 3.3K J 1/10W		
R6			RK73FB2A560J	CHIP R 56 J 1/10W		
R7			RK73FB2A152J	CHIP R 1.5K J 1/10W		
R8			RK73FB2A561J	CHIP R 560 J 1/10W		
R9 ,10			RK73FB2A220J	CHIP R 22 J 1/10W		
D1			DA204K	DIODE		
Q1			2SC3356	CHIP TRANSISTOR		
Q2			2SC3357	CHIP TRANSISTOR		
PLL MIX UNIT (X59-3070-10)						
C1			CK73FB1H102K	CHIP C 1000PF K		
C2 -4			CC73FCH1H100D	CHIP C 10PF D		
C5			CK73FB1H102K	CHIP C 1000PF K		
C6			CK73FB1H103K	CHIP C 0.010UF K		
C7			CK73FB1H102K	CHIP C 1000PF K		
L1			L40-2792-81	CHIP INDUCTOR (2.7U)		
R1			RK73FB2A473J	CHIP R 47K J 1/10W		
R2			RK73FB2A102J	CHIP R 1.0K J 1/10W		
Q1			2SC3120	CHIP TRANSISTOR		
POWER SUPPLY UNIT (X59-3080-10)						
C1			CK73FB1H102K	CHIP C 1000PF K		
C2 ,3			CK73FB1H103K	CHIP C 0.010UF K		
C4			CK73FB1H102K	CHIP C 1000PF K		
C5			CK73FB1H103K	CHIP C 0.010UF K		
C6 ,7			CK73FB1H102K	CHIP C 1000PF K		
C8 ,9			CK73FB1H103K	CHIP C 0.010UF K		
C10			C92-0005-05	CHIP-TAN 2.2UF 6.3WV		
C11 -13			CK73FB1H102K	CHIP C 1000PF K		
C14			CK73FB1H103K	CHIP C 0.010UF K		
C15			CK73FB1H102K	CHIP C 1000PF K		
C16			C92-0005-05	CHIP-TAN 2.2UF 6.3WV		

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R1			RK73FB2A473J	CHIP R 47K J 1/10W		
R2			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R3 ,4			RK73FB2A473J	CHIP R 47K J 1/10W		
R5 ,6			RK73FB2A103J	CHIP R 10K J 1/10W		
R7			RK73EB2B103J	CHIP R 10K J 1/8W		
R8			RK73FB2A473J	CHIP R 47K J 1/10W		
R9			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R10 ,11			RK73FB2A473J	CHIP R 47K J 1/10W		
R12 ,13			RK73FB2A100J	CHIP R 10 J 1/10W		
R14 ,15			R92-0670-05	CHIP R 0 OHM		
D1 ,2			DAN202(K)	DIODE		
Q1		*	2SA1362(Y)	CHIP TRANSISTOR		
Q2			DTC144EK	DIGITAL TRANSISTOR		
Q3		*	2SA1362(Y)	CHIP TRANSISTOR		
Q4			DTC144EK	DIGITAL TRANSISTOR		
Q5		*	2SA1362(Y)	CHIP TRANSISTOR		
Q6		*	2SA1213(Y)	CHIP TRANSISTOR		
Q7 ,8			2SC2712(GR)	CHIP TRANSISTOR		
Q9 ,10			DTC144EK	DIGITAL TRANSISTOR		
U1		*	LA5005M	IC(VOLTAGE REGULATOR/ +5V)		

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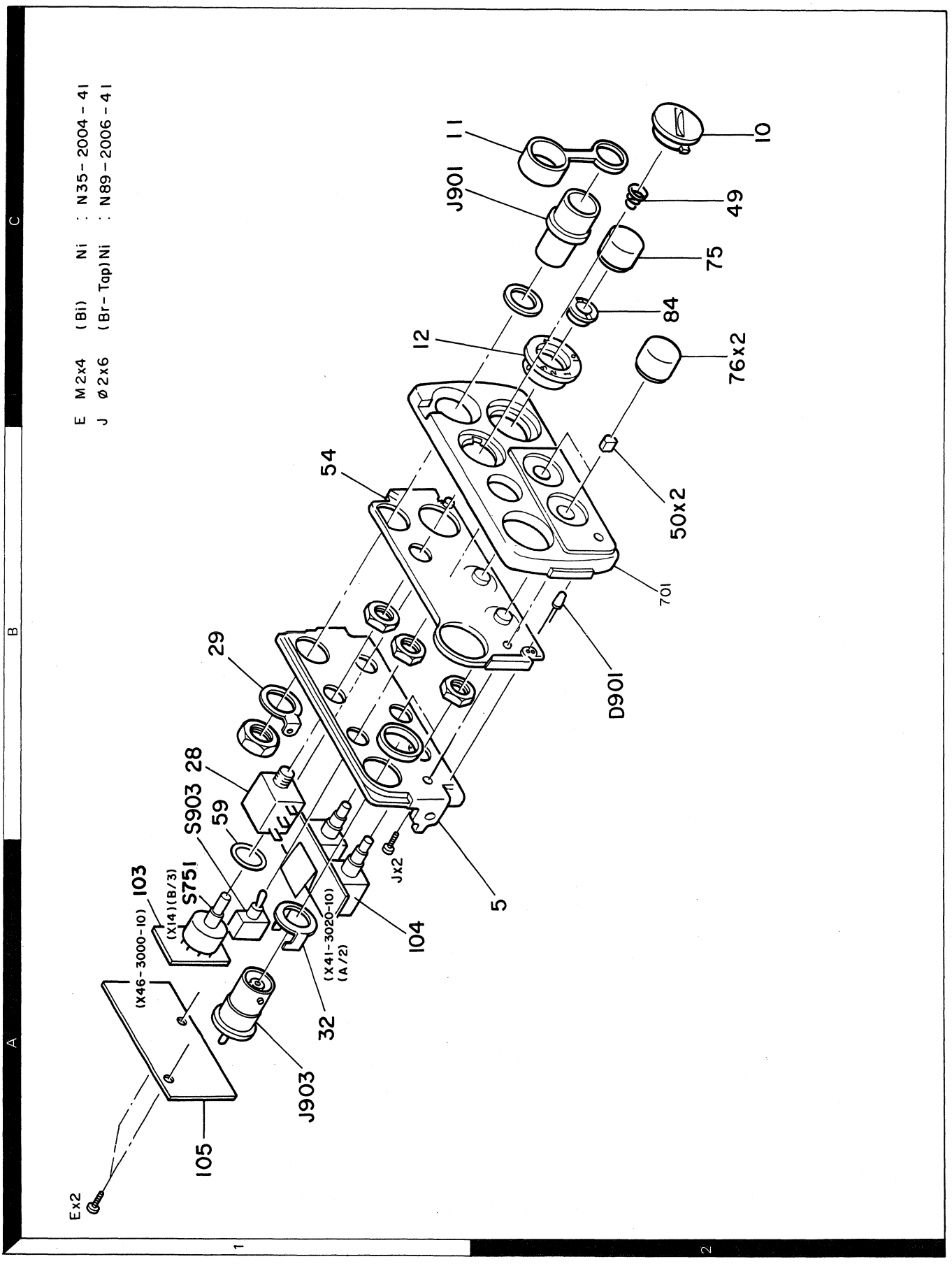
SEMICONDUCTOR

N : New parts

Item	Remarks	Part No.
Diode		1SS133
Chip Diode		DA204K
		DAN202(K)
		DPN202(K)
	N	FMN1
		HSM88AS
Zener Diode		02CZ3.9Y,Z
		02CZ5.1X,Y
		MTZ5.1JA
FET		2SJ106(GR)
	N	3SK140(GR)
TR	N	2SA1244(O)
		2SC3120
		2SD1246(S,T)
Chip TR		2SA1162(GR)
	N	2SA1213(Y)
	N	2SA1362(Y)
		2SC2712(GR)
		2SC2714(O)
	N	2SC3120
		2SC3326(A)
		2SC3356
		2SC3357

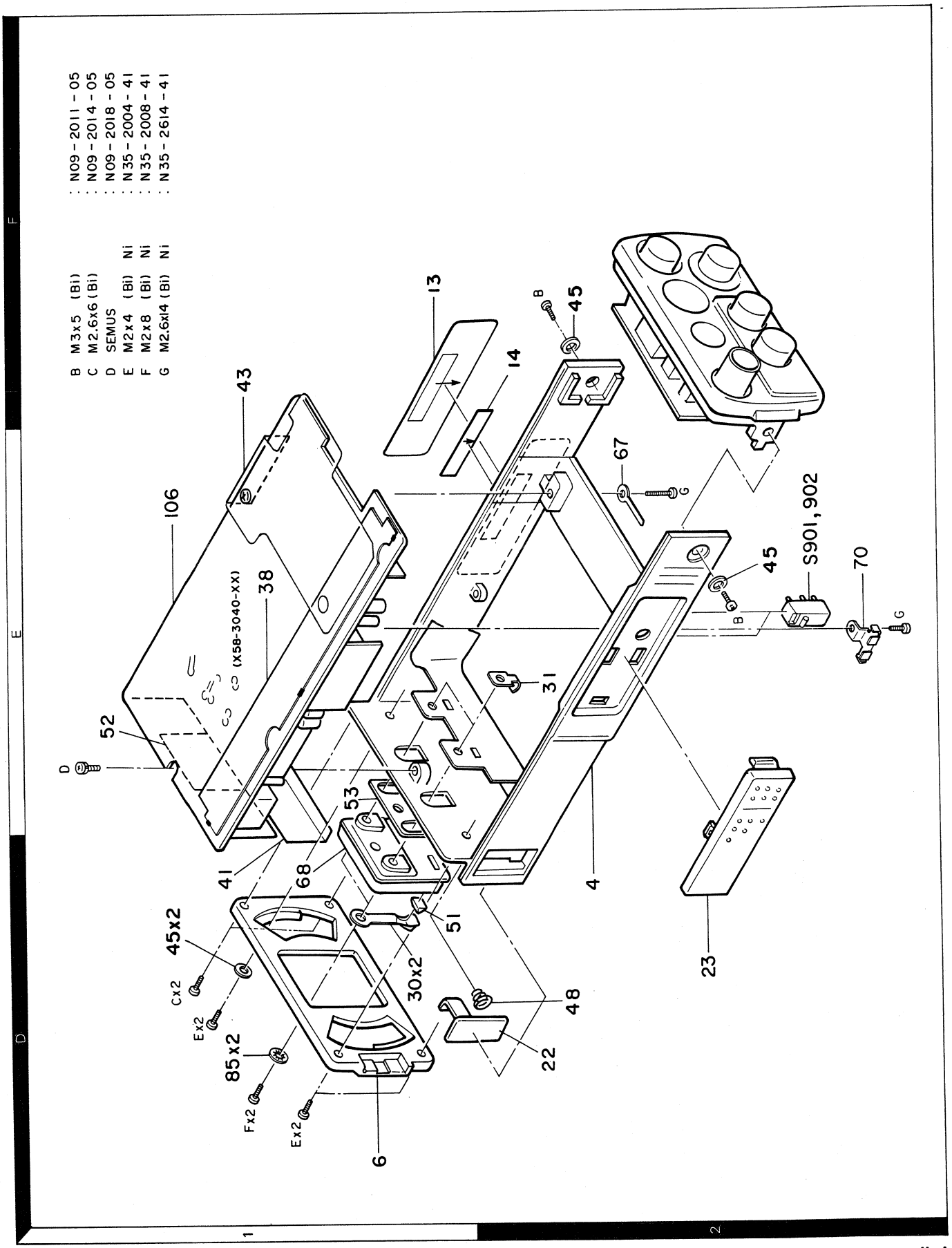
Item	Remarks	Part No.
Digital TR		DAN202(K)
		DAP202(K)
		DTA114TK
		DTA114YK
		DTC114EK
		DTC114YK
		DTC144EK
		FMG2
IC	N	7554CS(M)-304
	N	AFC913A001B1
	N	AFL24F3300E12
	N	HFA101F001A2
	N	JLC1057F
	N	LA4147
	N	LA5005M
	N	LM301AD
	N	M57786H
	N	M57786M
	N	MB503F
	N	MB504F
		MC3361D
		MC145151SL
	N	MD001-K
	N	NMC9346E
		S-8054HN
	N	S-81250HG
		TC4066BF
		TC4066BP

DISASSEMBLY



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

DISASSEMBLY



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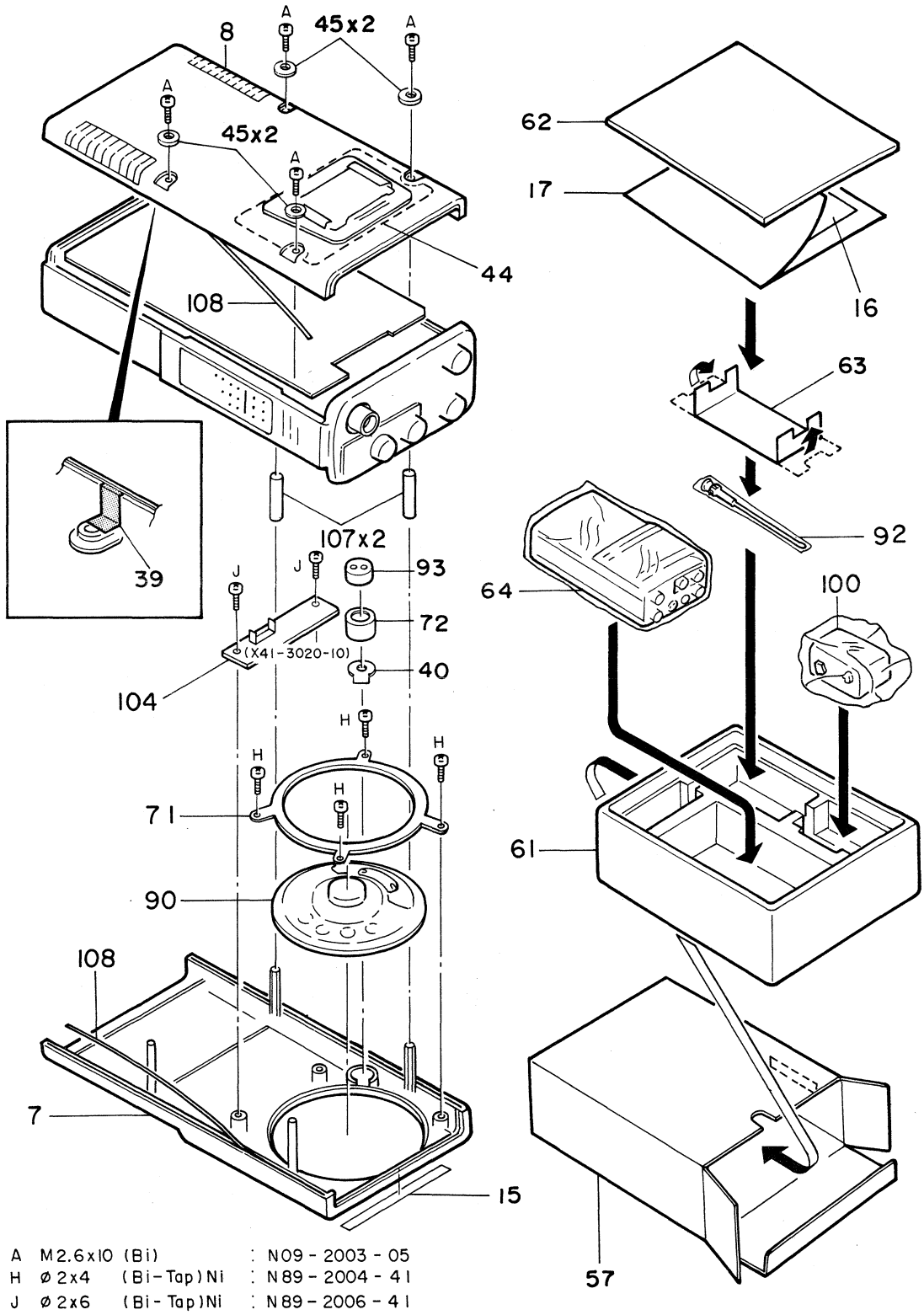
DISASSEMBLY/PACKING



A M2.6x10 (Bi) : N09-2003-05
H ø2x4 (Bi-Tap)Ni : N89-2004-41
J ø2x6 (Bi-Tap)Ni : N89-2006-41

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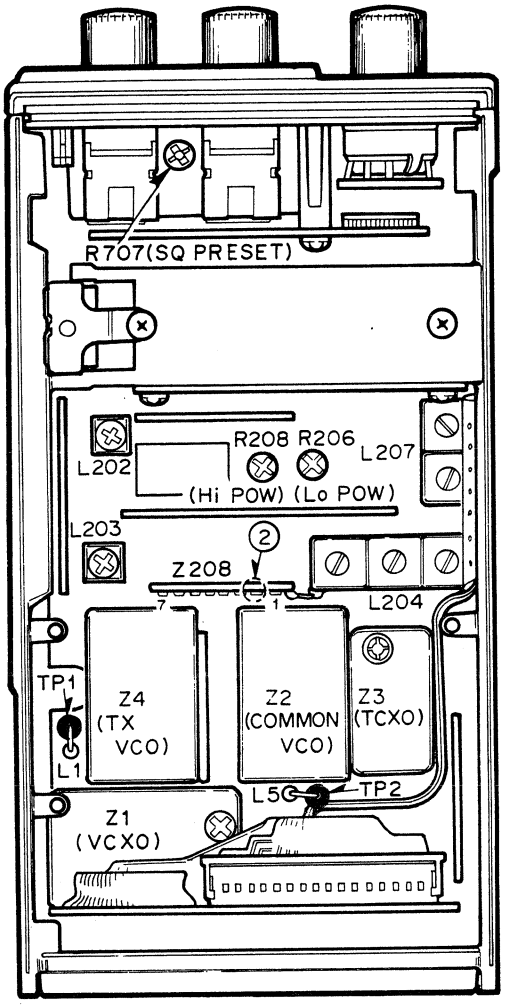
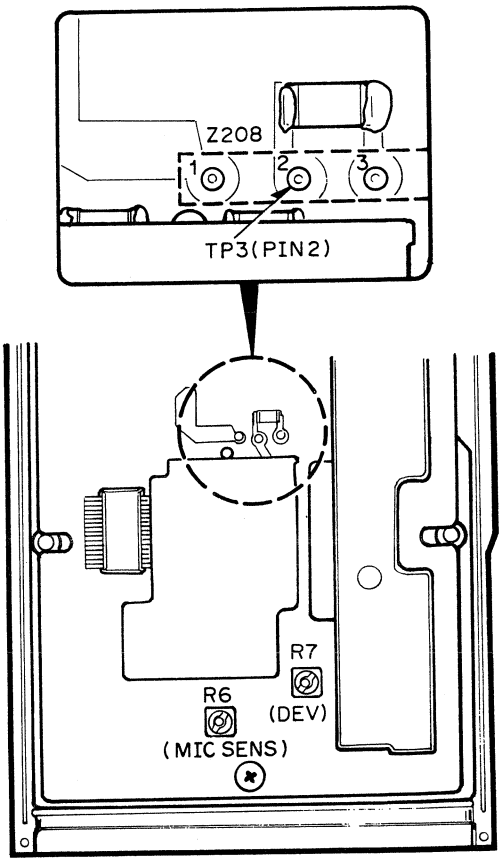
ADJUSTMENT

4. ADJUSTMENT

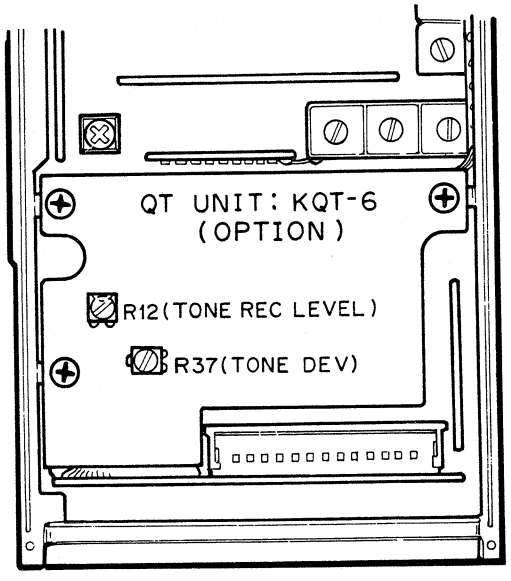
4–1. Adjustment location



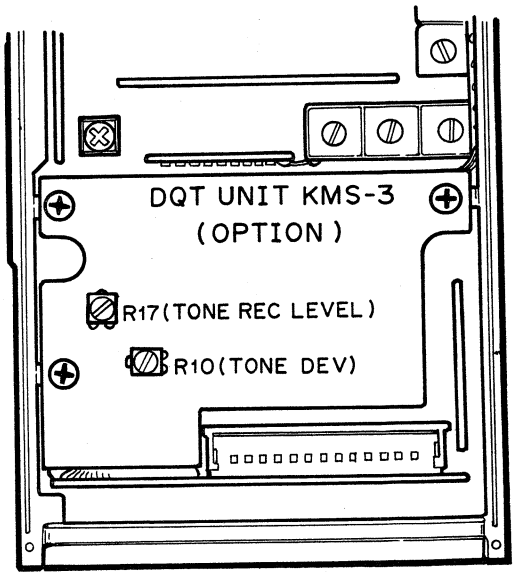
Component side view



Foil side view

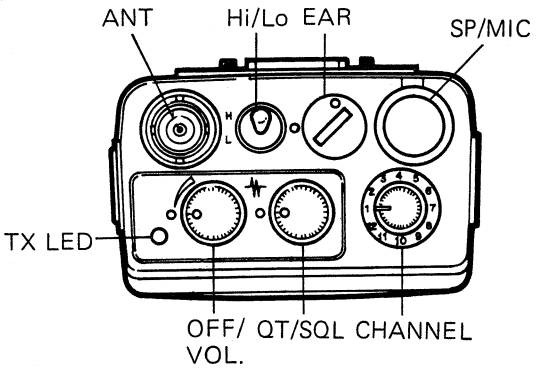


KQT-6 Install

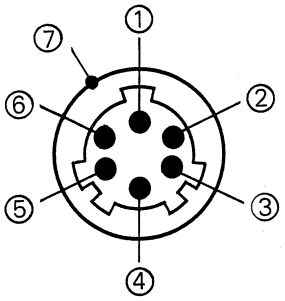


KMS-3 Install

ADJUSTMENT



Front panel view



① EXT MIC
② EXT SP
③ EXT PTT
④ CONT
⑤ SWB
⑥ RW
⑦ GND

SP/MIC Connector front view (J901)

4–2. Test equipment required for alignment

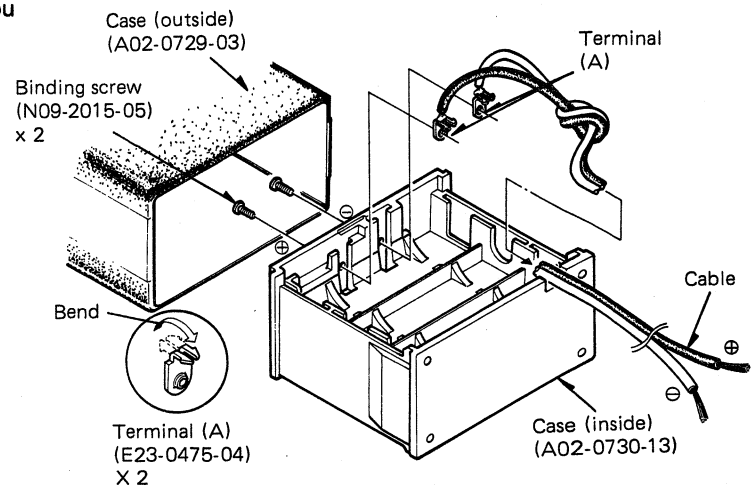
	Test Equipment	Major Specifications	
1.	Standard Signal Generator (SSG)	Frequency Range Modulation Output	450~512MHz Frequency modulation and external modulation. 0.1μV to greater than 1mV.
2.	Power meter	Input impedance Operation frequency Measurement capability	50 ohms 450 to 512MHz or more. Vicinity of 10W and 3W.
3.	Deviation meter	Frequency range	450~512MHz
4.	Digital Volt Meter (DVM)	Measuring range Accuracy	1~10V DC. High input impedance for minimum circuit loading.
5.	Oscilloscope		DC through 30MHz.
6.	High sensivity frequency counter	Frequency range Frequency stability	10Hz to 600MHz. 0.2 ppm or less.
7.	Ammeter		3A.
8.	AF Volt Meter (AFVTVM)	Frequency range Voltage range	50Hz to 10kHz. 3mV to 3V.
9.	Audio Generator (AG)	Frequency range Output	50Hz to 5kHz or more. 0 and 1V.
10.	Distortion meter	Capability Input level	3% or less at 1kHz. 50mV to 10Vrms.
11.	Voltmeter	Measuring range Input impedance	10~1.5V DC or less. 50kohms/V or greater.
12.	8 ohm dummy load		Approx. 8 ohm, 3W.
13.	Regulated power supply		7.5V, approx. 5A (adjustable from 6~16V) Useful if ammeter equipped.

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.

	RX freq' fR ( ) MHz			TX freq' fT ( ) MHz		
	L	M	H	L	M	H
K ,M	450.1	453.1	456.1	450.0	453.0	456.0
K2,M2	470.1	473.1	476.1	470.0	473.0	476.0
K3,M3	490.1	493.1	496.1	490.0	493.0	496.0

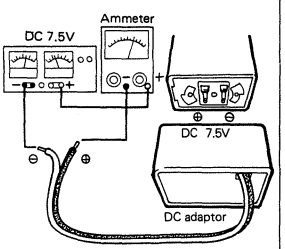
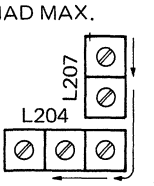
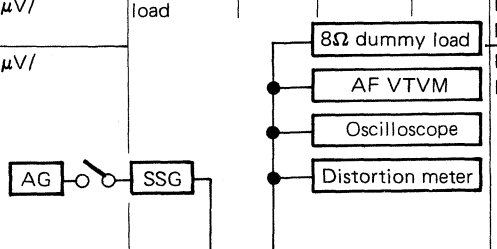
L : Low freq'
M : Mid freq'
H : Hi freq'

- The following adaptor is recommended in connecting of the Power supply.



ADJUSTMENT

4–3. Alignment

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Setting	1) Write in freq' designed with EEPROM writer.							
	2) Connect DC 7.5V to the battery terminal. **NOTE** 1. Measure voltage at bettery terminal. 2. Adjust voltage of power supply to be 7.5V in transmitting.	 Fig. 4–1						
2. Common PLL lock voltage check	1) CH : All channels	Volt-meter	TX-RX	TP2			Check	0.8~4.0V
3. TX PLL lock voltage check	1) CH : All channels			TP1			Check	0.8~4.0V
4. TCXO FREQ' ADJ.	1) CH : Channel in the vicinity of RX center freq' (f_{RM})	Freq' counter	TX-RX	TP3 (Z208–pin 2) * Foil side	TX-RX	Z3	Freq' ADJ. of F1,3 : (f–21.4)MHz + 500Hz F2 : (f+21.4)MHz –500Hz	±100Hz
5. Sensitivity	1) CH : Channel in the vicinity of RX center freq' (f_{RM}) QT/SQL : Open SSG freq' : channel freq' Output : 500μV/–53dBm Modulation : 1kHz/±3kHz Dev.	AF VTVM Oscillo-scope Distortion meter 8Ω dummy load	Panel	EAR	TX-RX	L202 L203	SINAD MAX.	
	2) SSG output : 1.7μV/ –103dBm					L207 L204	SINAD MAX.  Adjust in accordance with ← mark, and maximize SINAD.	
	3) SSG output : 0.5μV/ –117dBm					L207 L204		
	4) SSG output : 0.35μV/ –120dBm	 Fig. 4–2					Check	SINAD 12dB or more.
	5) CH : Channel with highest RX freq' (f_{RH}) and lowest RF freq' (f_{RL}) SSG freq' : CH (f_{RH}) or (f_{RL})						If out of spec, re-adjust.	
	6) SSG output : 500μV/ –53dBm CH : Channel with RX center freq' (f_{RM})				Panel	AF VOL. (R709)	2.0V/8Ω	
							Check	Distortion : 5% or less. S/N : 40dB or more.

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
6. Squelch preset	1) QT/SQL (R708) : CCW (OFF) Switch Unit (A/2) R707 : MAX. CW MONI SW (S902) : ON SSG : OFF	AF VTVM	Panel	EAR			Check	Squelch close.
	2) SSG output: *1.7μV/—103dBm						Check	Squelch open.
	*Squelch preset adjustment : Adjust SSG output level suitable for user's requirement.				Switch (A/2)	R707 (SQ preset)	Set to threshold point.	
	3) MONI SW (S902) : OFF						Check	Squelch close.
7. Power (APC) ADJ.	1) CH : Channel with lowest TX freq' (f_{TL}) ANT : Power meter TX-RX Unit R206, R208 : MAX CW Hi/Lo SW (S903) : Hi PTT : ON	TX LED	Panel	TX LED			Check	TX LED lights.
		Power meter Ammeter		ANT			Check	5.0W or more.
	2) CH : Channel with highest TX freq' (f_{TH}) PTT : ON						Check	5.0W or more.
	3) CH : Channel with TX center freq' (f_{TM}) PTT : ON				TX-RX	R208	4.7W	4.3W or more, 2.7A or less.
	4) CH : Channel with highest TX freq' and channel with lowest TX freq' PTT : ON						Check	
	5) CH : Channel with TX center freq' (f_{TM}) Hi/Lo SW (S903) : Lo PTT : ON				TX-RX	R206	2W	2W±0.5W 1.6A or less.
	6) CH : Channel with highest TX freq' and channel with lowest TX freq' PTT : ON						Check	
8. Transmit freq' ADJ.	1) CH : Channel vicinity of TX center freq' PTT : ON	Power meter Freq' counter	Panel	ANT	TX-RX	Z1	Freq' ADJ. of TX	±100Hz or less
	2) CH : Check other channel.						Verify TX freq'	±1.2kHz or less
9. Maximum deviation ADJ.	1) Connect audio generator to microphone terminal. CH : Channel with TX center Freq' AG : 1kHz/150mV Deviation meter filter : LPF20kHz, HPF OFF DE-EMPHASIS : OFF PTT : ON	Power meter AG Deviation meter AF VTVM	Panel	ANT	TX-RX	R7	±4.4kHz ADJ. Adjust one more than the other by switching between —P and + P.	±200Hz
10. Mic sensitivity	1) AG : 1kHz/15mV PTT : ON				TX-RX	R6	+ 3kHz ADJ. (+ P)	
11. KQT-6 or (KMS-3) **(Option)**	1) Setting PTT : OFF		KQT-6 (KMS-3)		KQT-6 (KMS-3)	R12 (R17)	Center	
	2) PTT : ON Deviation meter filter : LPF 3kHz, HPF 50Hz DE-EMPHASIS : OFF	Power meter Deviation meter	Panel	ANT		R37 (R10)	±0.75kHz re-adjust item 9), 10).	

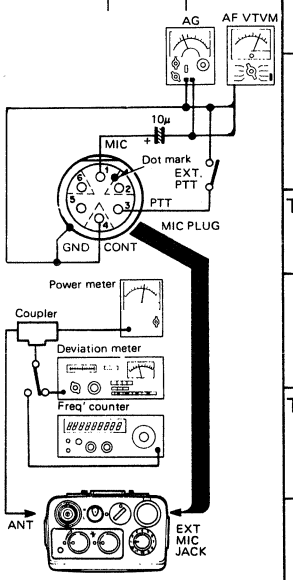
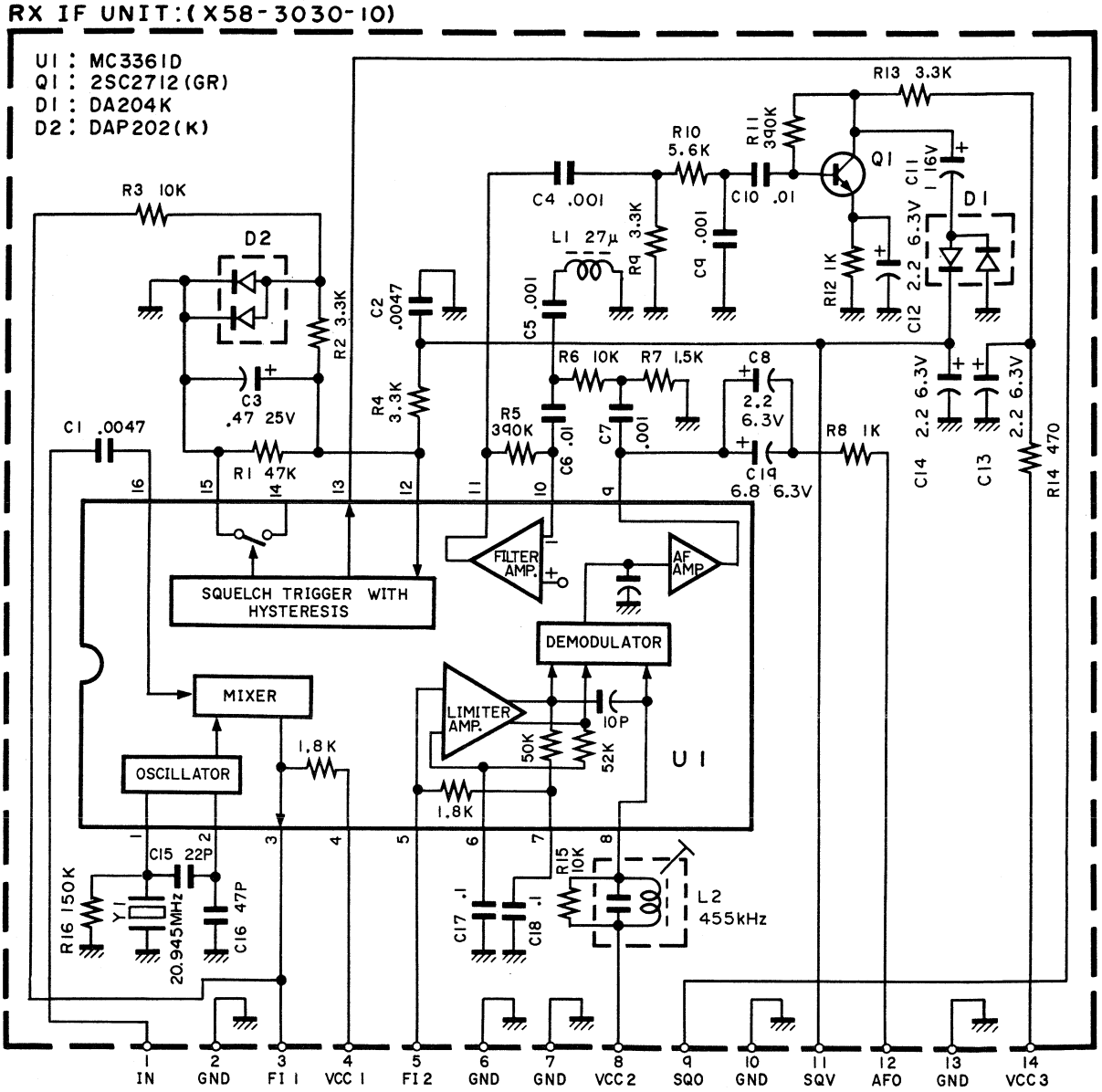


Fig. 4–3

CIRCUIT DIAGRAM/PC BOARD VIEWS TK-310

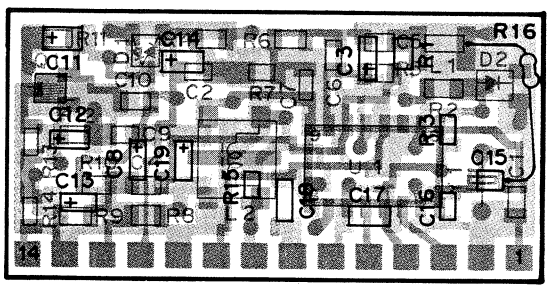
RX IF UNIT (X58-3030-10) CIRCUIT DIAGRAM

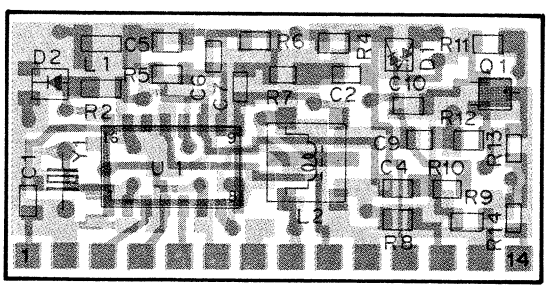
RX IF UNIT:(X58-3030-10)



RX IF UNIT (X58-3030-10) PC BOARD VIEWS

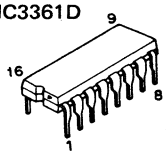
Foil side view





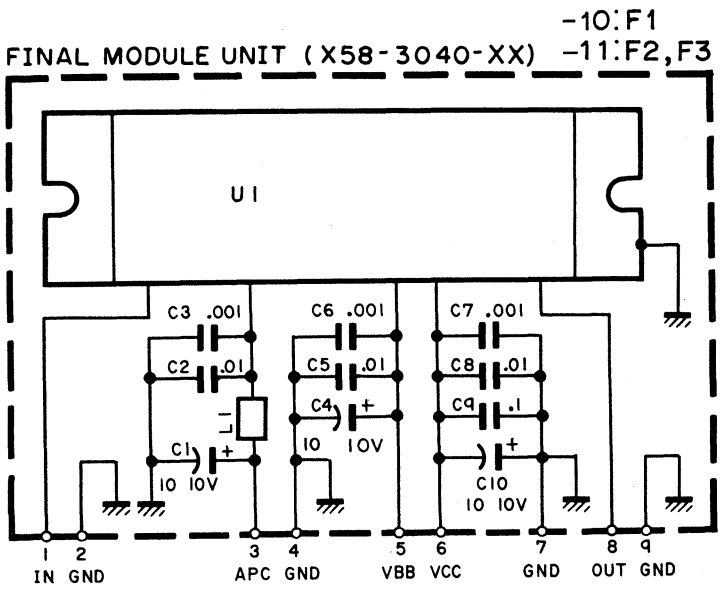
2SC2712

MC3361D



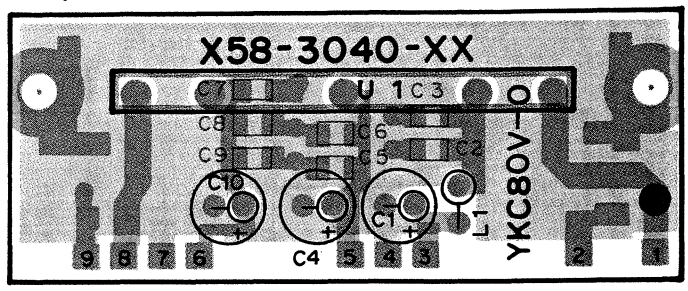
TK-310 CIRCUIT DIAGRAM/PC BOARD VIEWS

FINAL MODULE UNIT (X58-3040-XX)
CIRCUIT DIAGRAM

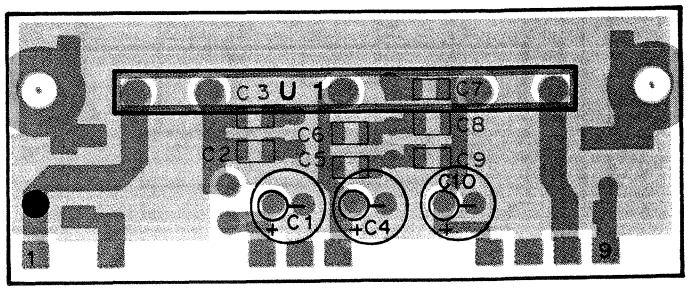


U1: M57786M: F1
M57786H: F2,F3

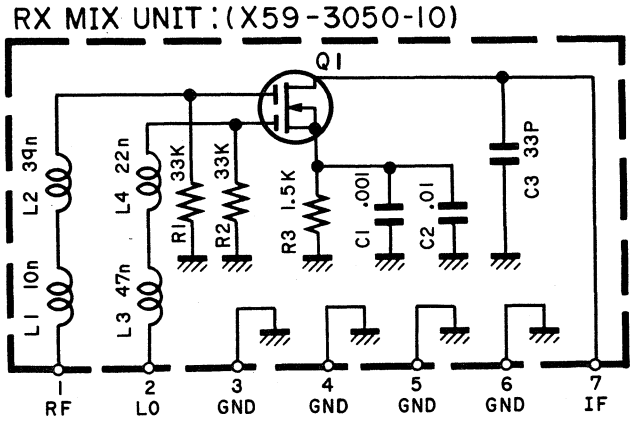
FINAL MODULE UNIT (X58-3040-XX)
-10 : F1, -11 : F2,F3
PC BOARD VIEWS
Component side view



Foil side view



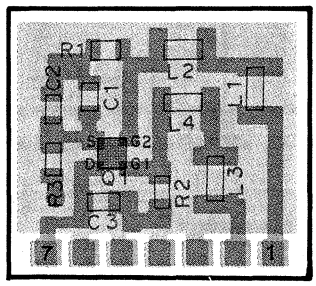
RX MIX UNIT (X59-3050-10)
CIRCUIT DIAGRAM



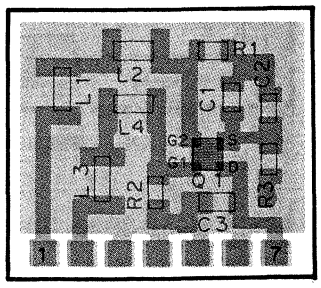
Q1 : 3SK140(GR)

RX MIX UNIT (X59-3050-10) PC BOARD VIEWS

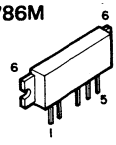
Component side view



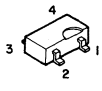
Foil side view



M57786M

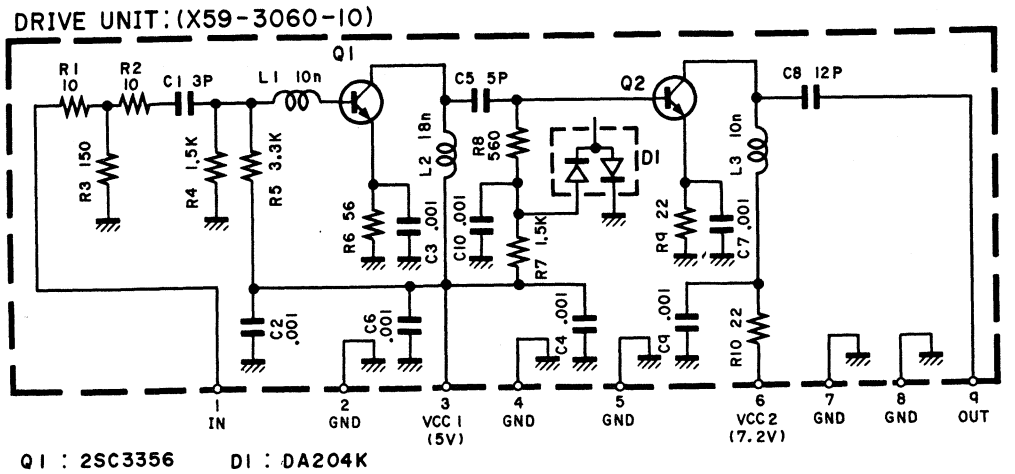


3SK140



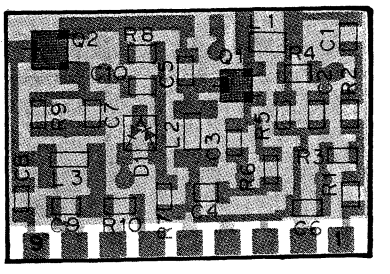
CIRCUIT DIAGRAM/PC BOARD VIEWS TK-310

DRIVE UNIT (X59-3060-10) CIRCUIT DIAGRAM

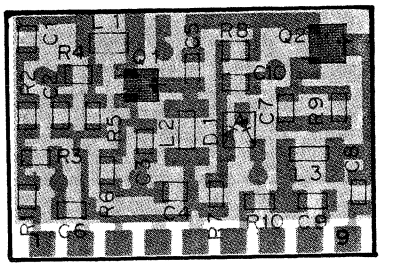


Q1 : 2SC3356 D1 : DA204K
Q2 : 2SC3357

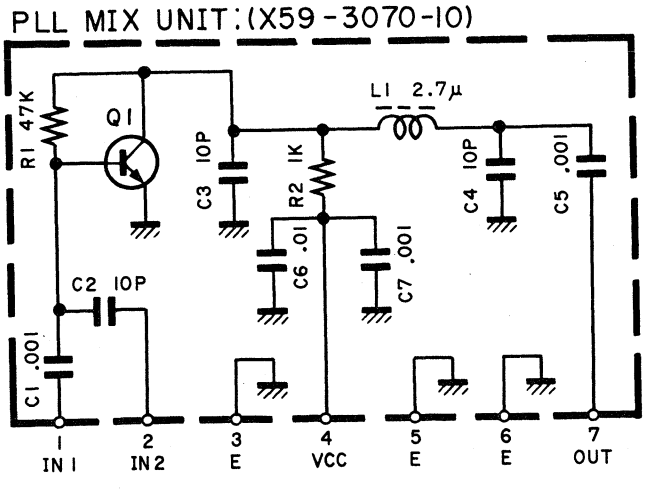
DRIVE UNIT (X59-3060-10)
PC BOARD VIEWS
Component side view



Foil side view

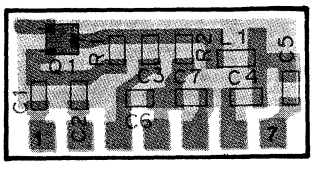


PLL MIX UNIT (X59-3070-10) CIRCUIT DIAGRAM

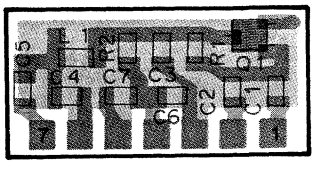


Q1 : 2SC3120

PLL MIX UNIT (X59-3070-10)
PC BOARD VIEWS
Component side view

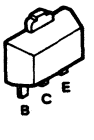


Foil side view



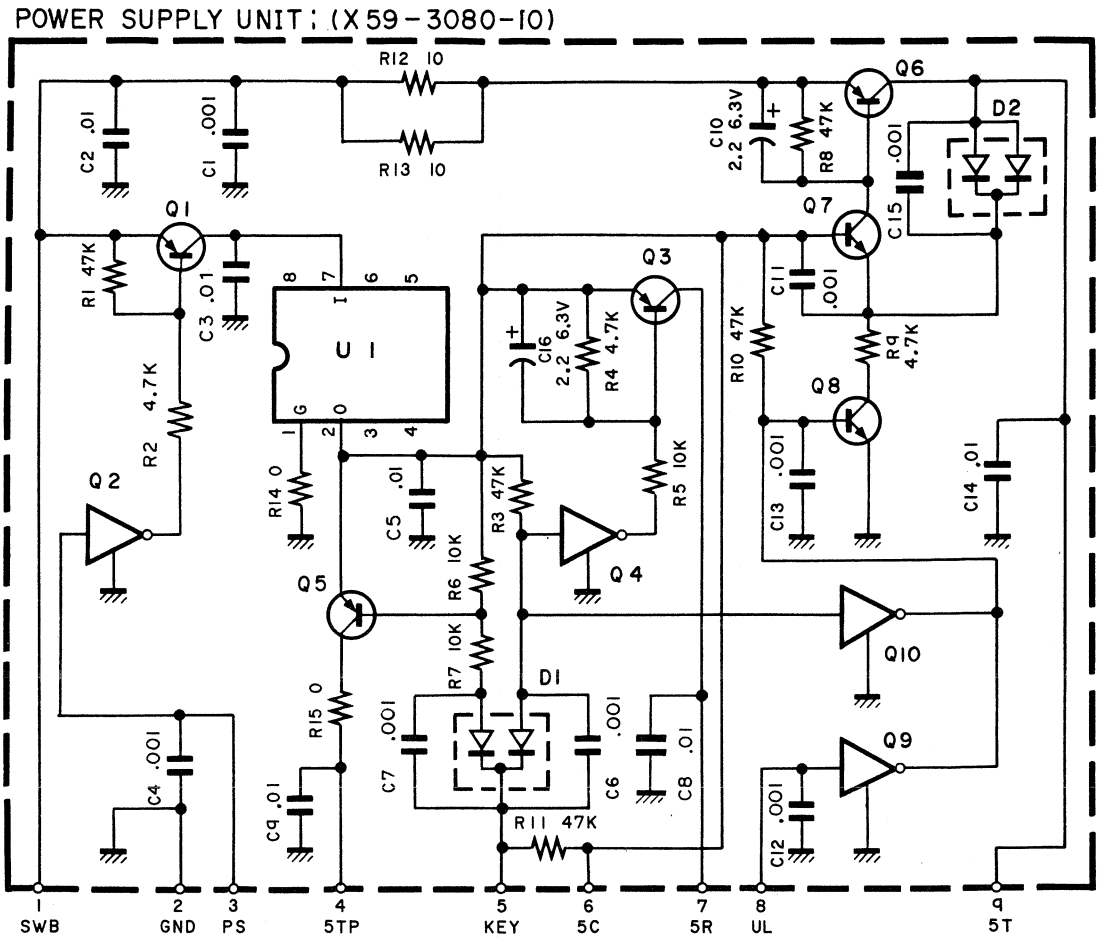
2SC3356
2SC3120

2SC3357



TK-310 CIRCUIT DIAGRAM/PC BOARD VIEWS

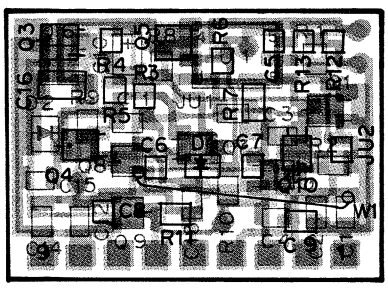
POWER SUPPLY UNIT (X59-3080-10) CIRCUIT DIAGRAM



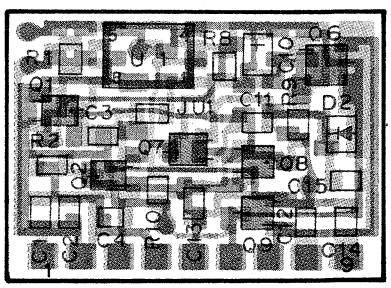
Q1,3,5 : 2SA1362(Y) Q7,8 : 2SC2712(GR) D1,2 : DAN202(K)
Q2,4,9,10: DTC144EK
Q6 : 2SA1213(Y) U1 : LA5005M

POWER SUPPLY UNIT (X59-3080-10) PC BOARD VIEWS

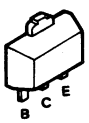
Component side view



Foil side view

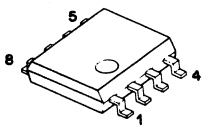


2SA1213

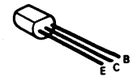


2SA1362
2SC2712
DTC114EK

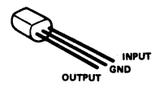
LA5055M



2SD1246

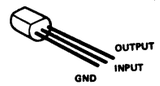


S-8054HN



DTA114YK 2SC2712
DTA143EK 2SC2714
DTC114YK 2SC3120
DTC144EK 2SC3326(A)
2SA1162 2SC3356

S-81250HG



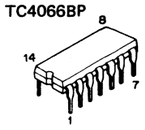
FMG2

HFA101F001A2

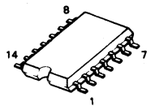
2SJ106

AFL24F3300E12

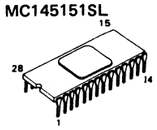
TC4066BP



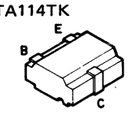
TC4066BF



MC145151SL



DTA114TK

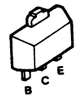


LA4147

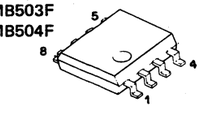
2SA1244

NMC9346E

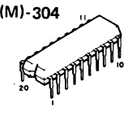
2SA1213



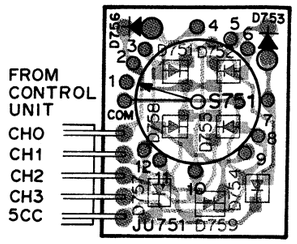
LM301AD
MB503F
MB504F



7554CS(M)-304

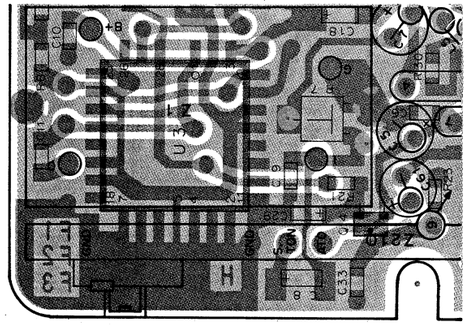


CHANNEL SWITCH UNIT (X41-3010-10) Component side view



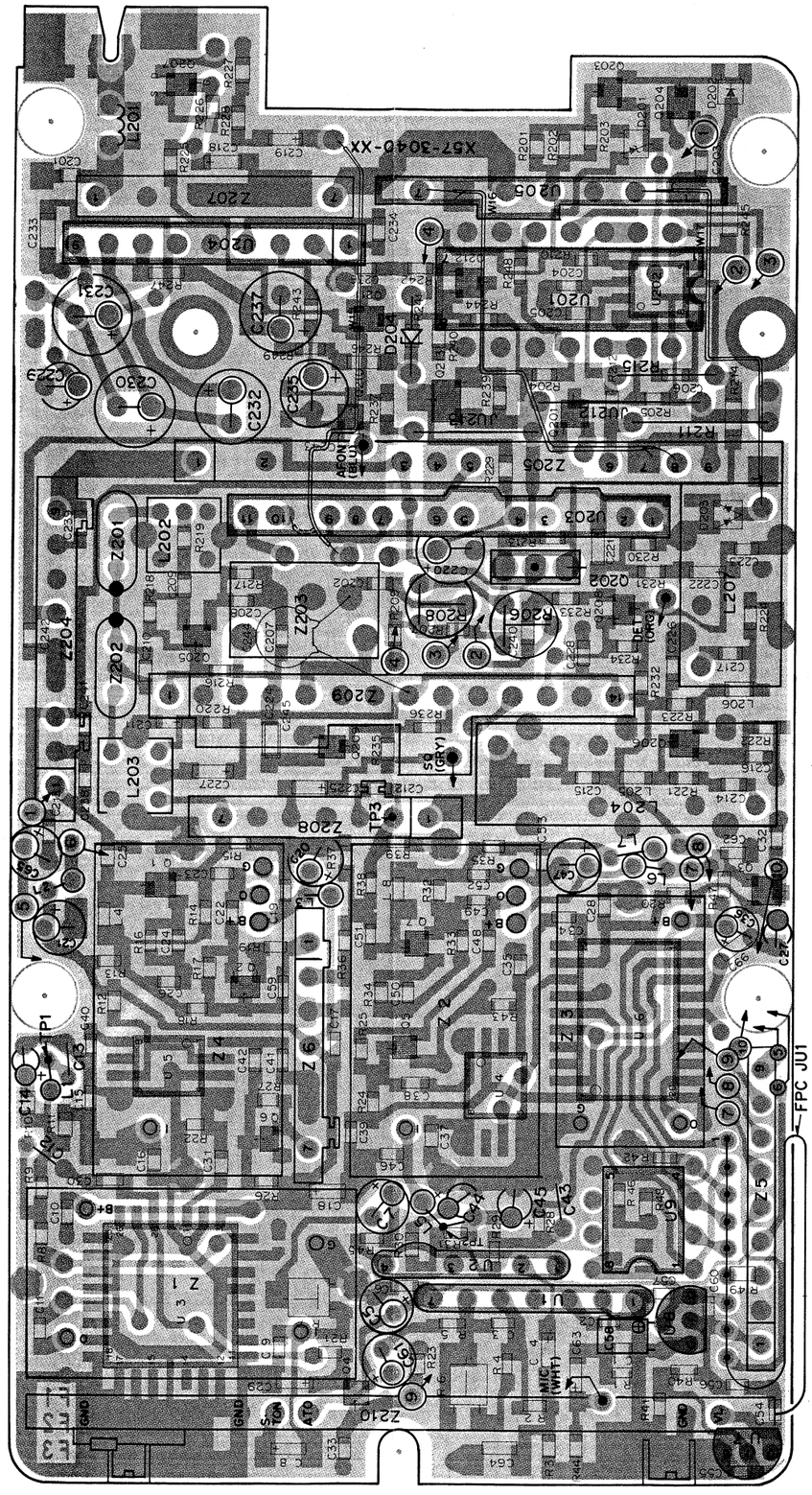
TX-RX UNIT (X57-3040-11 : F2)

Component side view

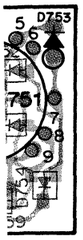


TX-RX UNIT (X57-3040-XX) Component side view

-10 : F1, -11 : F2, -12 : F3

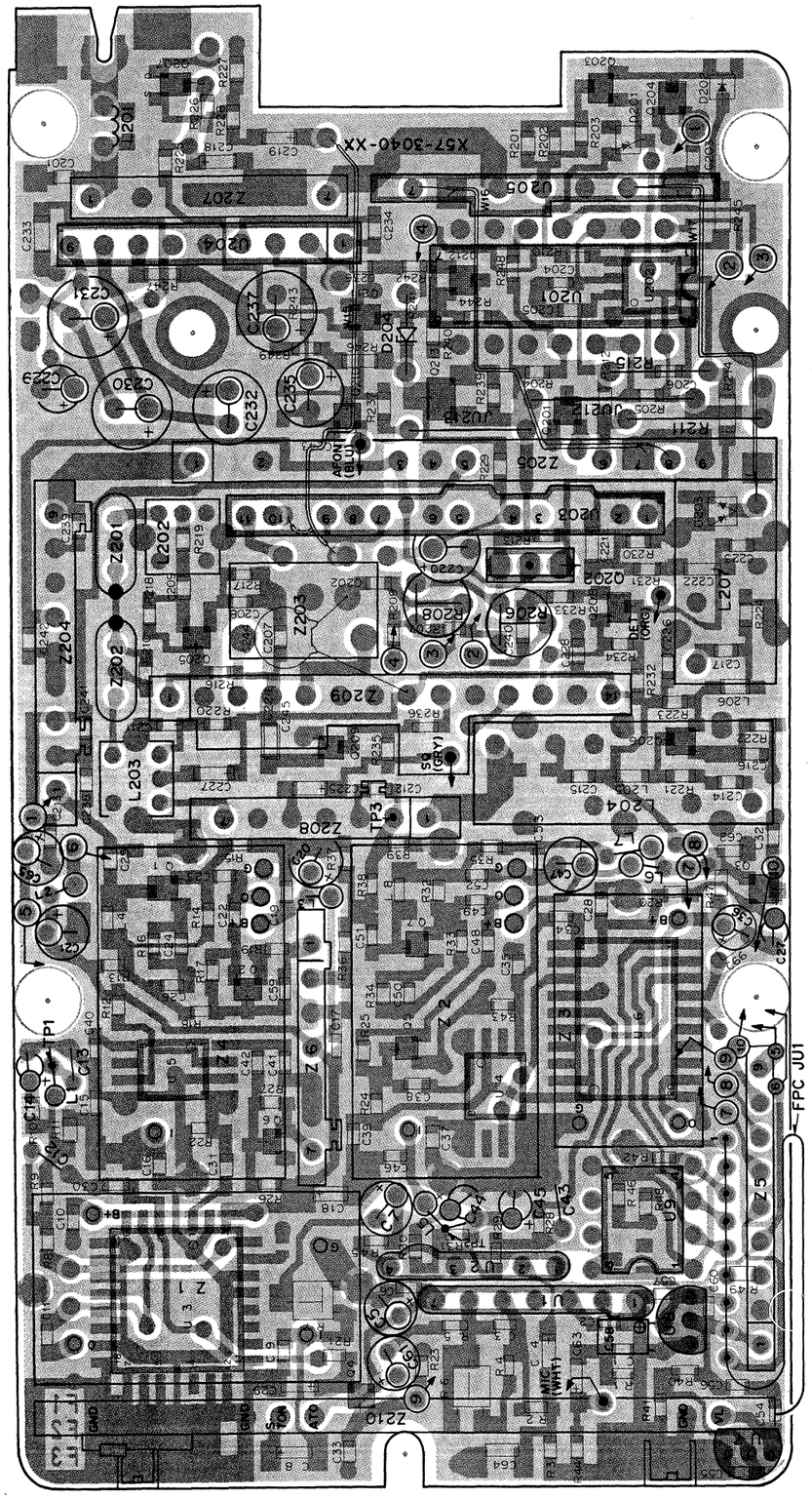


UNIT
onent side view

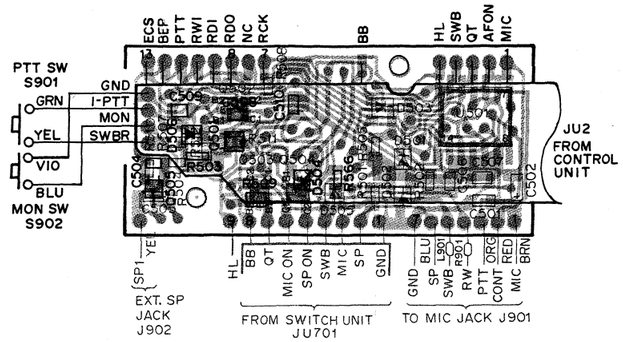


TX-RX UNIT (X57-3040-XX) Component side view

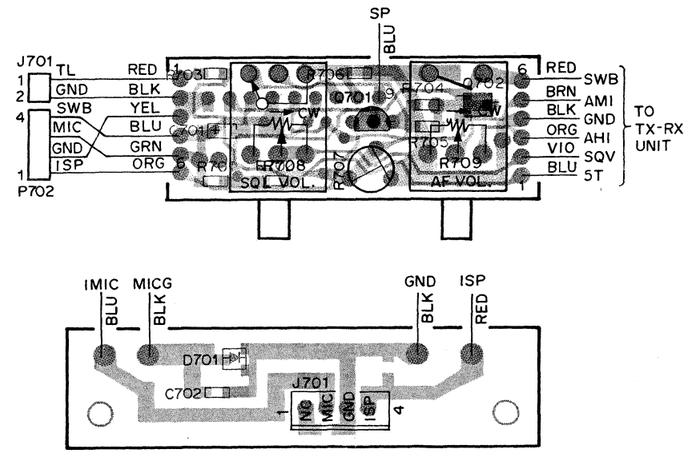
-10 : F1, -11 : F2, -12 : F3



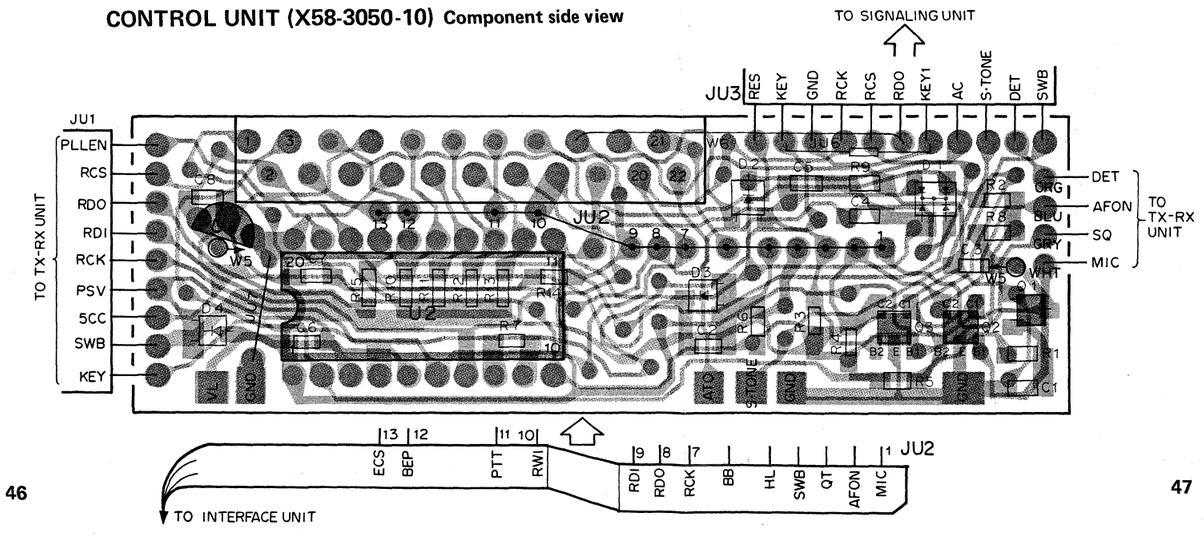
INTERFACE UNIT (X46-3000-10) Component side view



SWITCH UNIT (X41-3020-10) Component side view

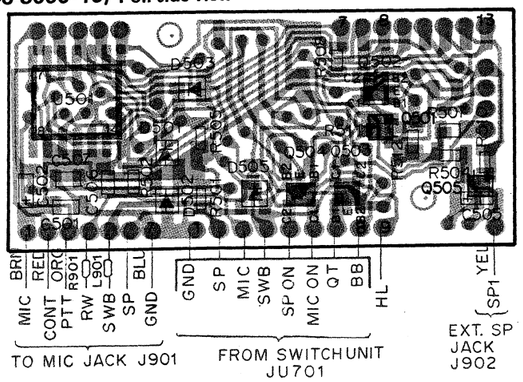


CONTROL UNIT (X58-3050-10) Component side view

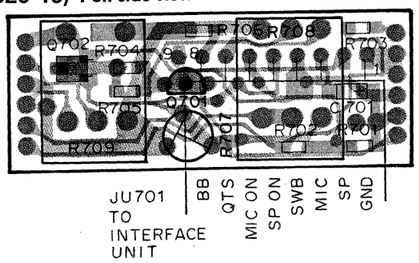


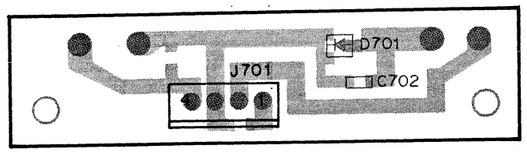
TK-310 PC BOARD VIEWS

INTERFACE UNIT (X46-3000-10) Foil side view

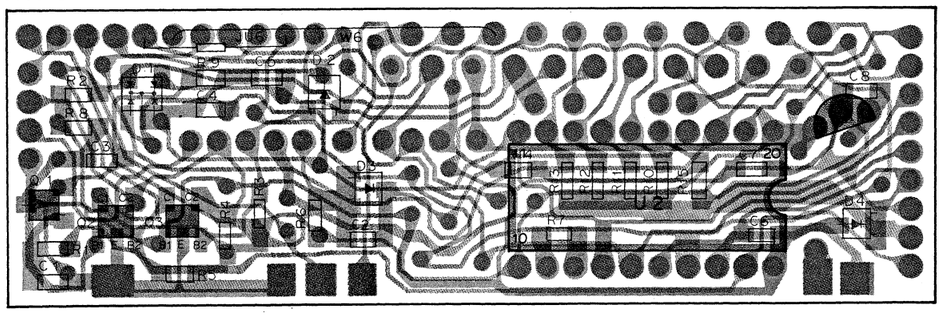


SWITCH UNIT (X41-3020-10) Foil side view



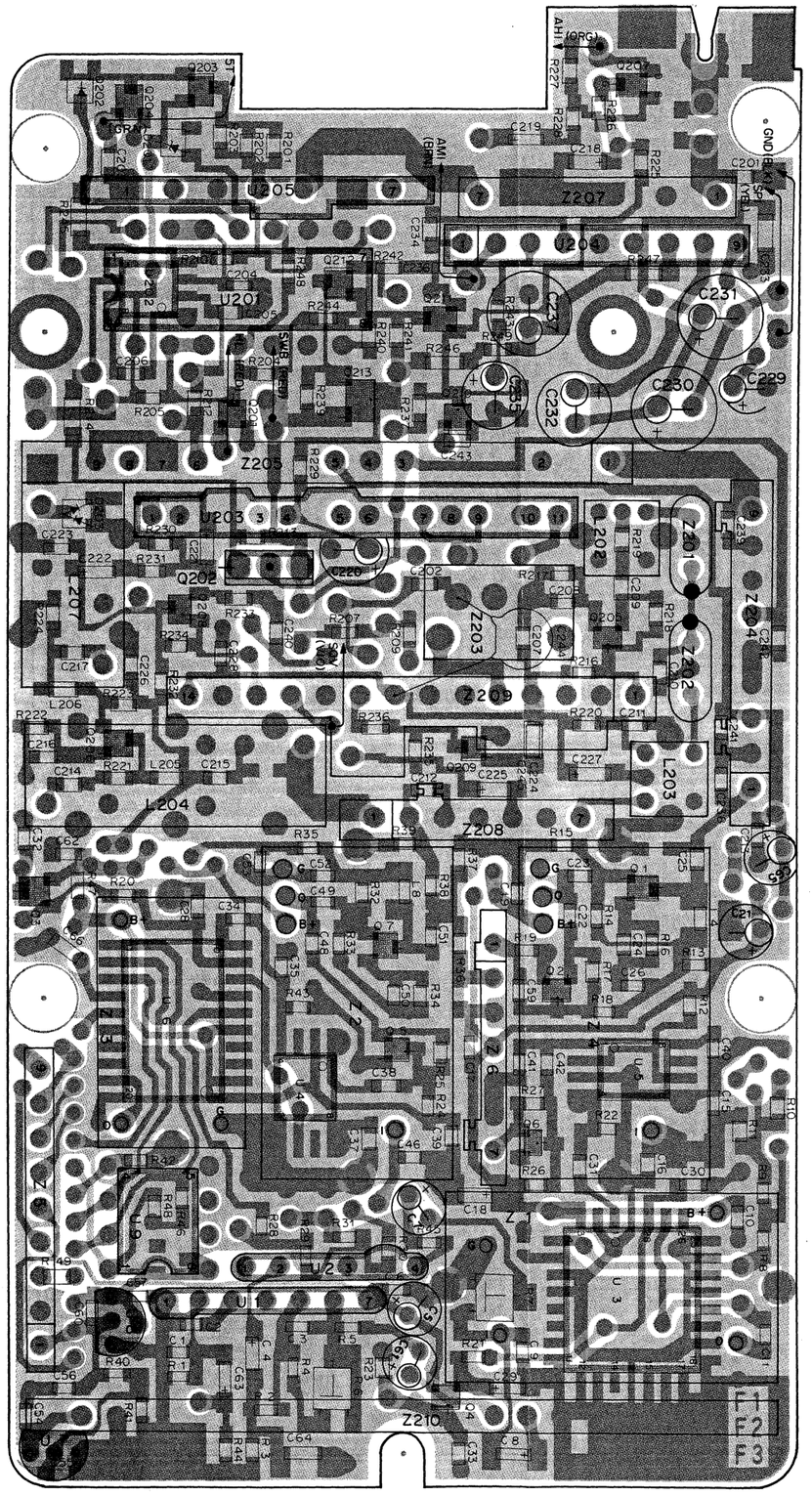


CONTROL UNIT (X58-3050-10) Foil side view



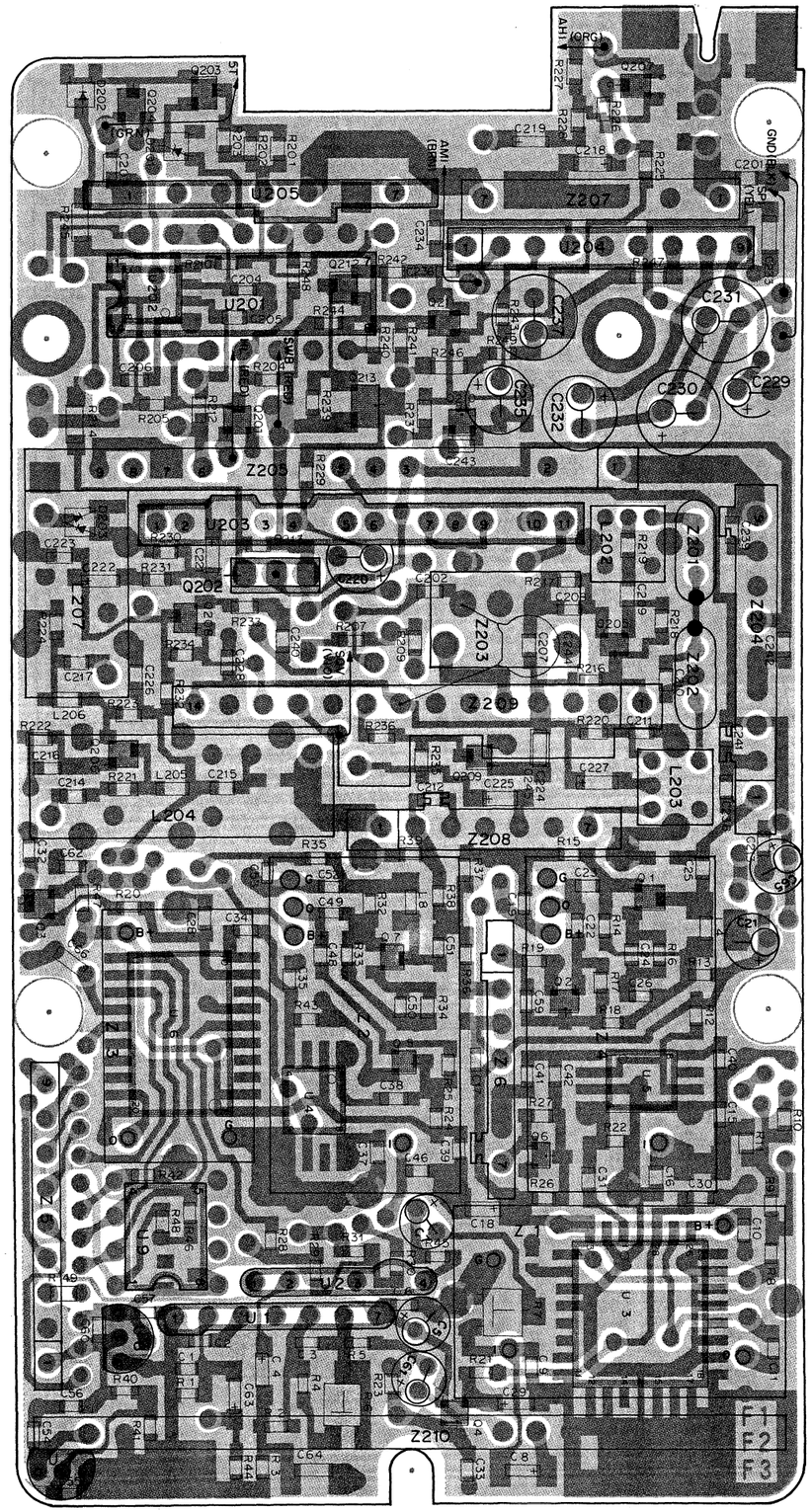
TX-RX UNIT (X57-3040-XX) Foil side view

-10 : F1, -11 : F2, -12 : F3

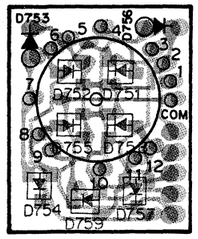


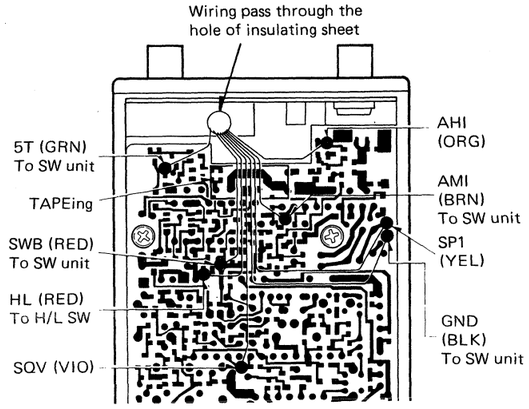
TX-RX UNIT (X57-3040-XX) Foil side view

-10 : F1, -11 : F2, -12 : F3



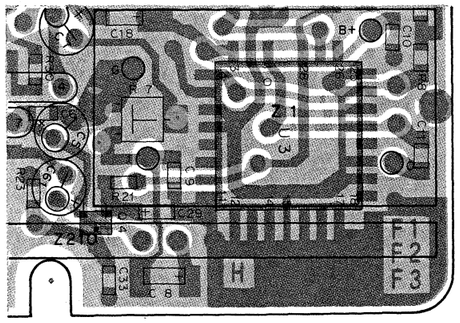
CHANNEL SWITCH UNIT (X41-3010-10) Foil side view



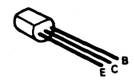


TX-RX UNIT (X57-3040-11 : F2)

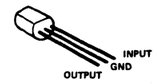
Foil side view



2SD1246

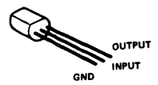


S-8054HN



DTA114YK 2SC2712
DTA143EK 2SC2714
DTC114YK 2SC3120
DTC144EK 2SC3326(A)
2SA1162 2SC3356

S-81250HG



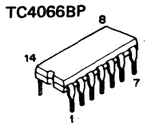
FMG2

AFL24F3300E12

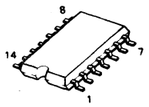
2SJ106

HFA101F001A2

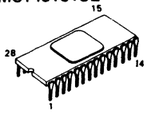
TC4066BP



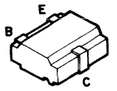
TC4066BF



MC145151SL



DTA114TK



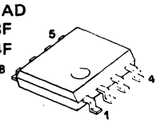
LA4147

2SA1244

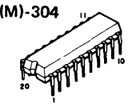
NMC9346E

2SA1213

LM301AD
MB503F
MB504F

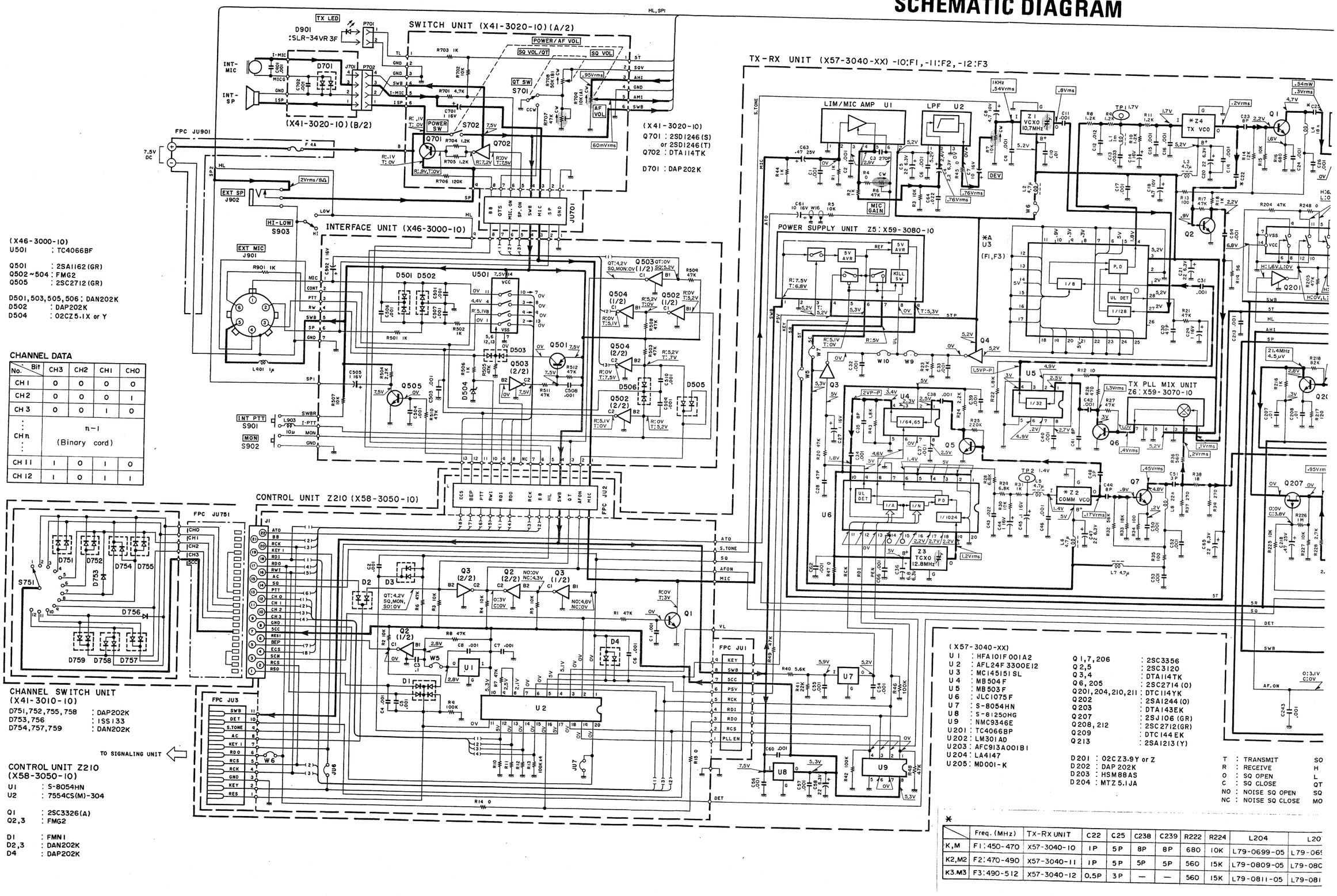


7554CS(M)-304



SCHEMATIC DIAGRAM

Signal line — — — Control line —— Common DC line ⬭ Adjusting points



*

	Freq. (MHz)	TX-RX UNIT	C22	C25	C238	C239	R222	R224	L204	L20
K,M	F1:450-470	X57-3040-10	1P	5P	8P	8P	680	10K	L79-0699-05	L79-069
K2,M2	F2:470-490	X57-3040-11	1P	5P	5P	5P	560	15K	L79-0809-05	L79-080
K3,M3	F3:490-512	X57-3040-12	0.5P	3P	—	—	560	15K	L79-0811-05	L79-081

SCHEMATIC DIAGRAM

TX-RX UNIT (X57-3040-XX) -10:F1, -11:F2, -12:F3

(X41-3020-10)
Q701 : 2SD1246(S) or 2SD1246(T)
Q702 : DTA114TK
D701 : DAP202K

LIM/MIC AMP U1 · LPF U2 · Z1 VCXO 10.7MHz · *Z4 TX VCO · Q1 · DRIVE UNIT Z204 : X59-3060-10 · FINAL MODULE UNIT *Z205 : X58-3040-XX · ANT SW U205 : MD001-K · LPF Z207 : LP512A1 · TX : 453.1 MHz POWER HI 5.4W LOW 2W · BNC CONNECTOR J903 · RX : 453.1MHz .25μV MOD : 1KHz DEV : 3KHz

POWER SUPPLY UNIT Z5 : X59-3080-10 · *A U3 (F1, F3) · Q2 · Q4 · U201 · Q201 · Q202 · LO PWR · HI PWR · D201 · D202 · D203 · Q203 · Q204

TX PLL MIX UNIT Z6 : X59-3070-10 · U5 · Q3 · U4 · Q5 · U6 · Z3 TCXO 12.8MHz · *Z2 COMM VCO · Q6 · Q7

RX MIX UNIT Z208 : X59-3050-10 · Q205 · Z201 · MCF 21N15B · Z202 · L202 · L203 · L204 · L207 · Q206

RX AF FILTER U203 · Q207 · Q208 · RX IF UNIT Z209 : X58-3030-10 · NOISE FILTER · SQ TRIG · OSC · Z203 CFV 455D · AF PA U204

Q209 · Q210 · Q211 · Q212 · Q213 · D204 · JU213 · JU212 · W1 · W2 · W3 · W4 · W5 · W6 · W7 · W9 · W10 · W15 · W16 · W17

FPC JU1 · FPC JU2 · KEY · SWB · SCC · PSV · RCK · RDI · RDO · RCS · PLL EN · ATO · S.TONE · SQ · AFON · MIC · DET

Q501 · Q502 (1/2) · Q502 (2/2) · Q503 · Q504 (1/2) · Q504 (2/2) · D505 · D506

U7 · U8 · U9

(X57-3040-XX)

U1	: HFA101F001A2	Q1,7,206	: 2SC3356
U2	: AFL24F3300E12	Q2,5	: 2SC3120
U3	: MC145151SL	Q3,4	: DTA114TK
U4	: MB504F	Q6,205	: 2SC2714(O)
U5	: MB503F	Q201,204,210,211	: DTC114YK
U6	: JLC1075F	Q202	: 2SA1244(O)
U7	: S-8054HN	Q203	: DTA143EK
U8	: S-81250HG	Q207	: 2SJ106(GR)
U9	: NMC9346E	Q208,212	: 2SC2712(GR)
U201	: TC4066BP	Q209	: DTC144EK
U202	: LM301AD	Q213	: 2SA1213(Y)
U203	: AFC913A001B1		
U204	: LA4147	D201	: 02CZ3.9Y or Z
U205	: MD001-K	D202	: DAP202K
		D203	: HSM88AS
		D204	: MTZ5.1JA

T	: TRANSMIT	SO	: SIGNALING SQ OPEN
R	: RECEIVE	H	: TRANSMIT HI POWER (5.4W)
O	: SQ OPEN	L	: TRANSMIT LOW POWER (2W)
C	: SQ CLOSE	QT	: SQL VOL QT POSITION
NO	: NOISE SQ OPEN	SQ	: SQL VOL EXCEPT ON QT POSITION
NC	: NOISE SQ CLOSE	MON	: MONITOR SW : ON

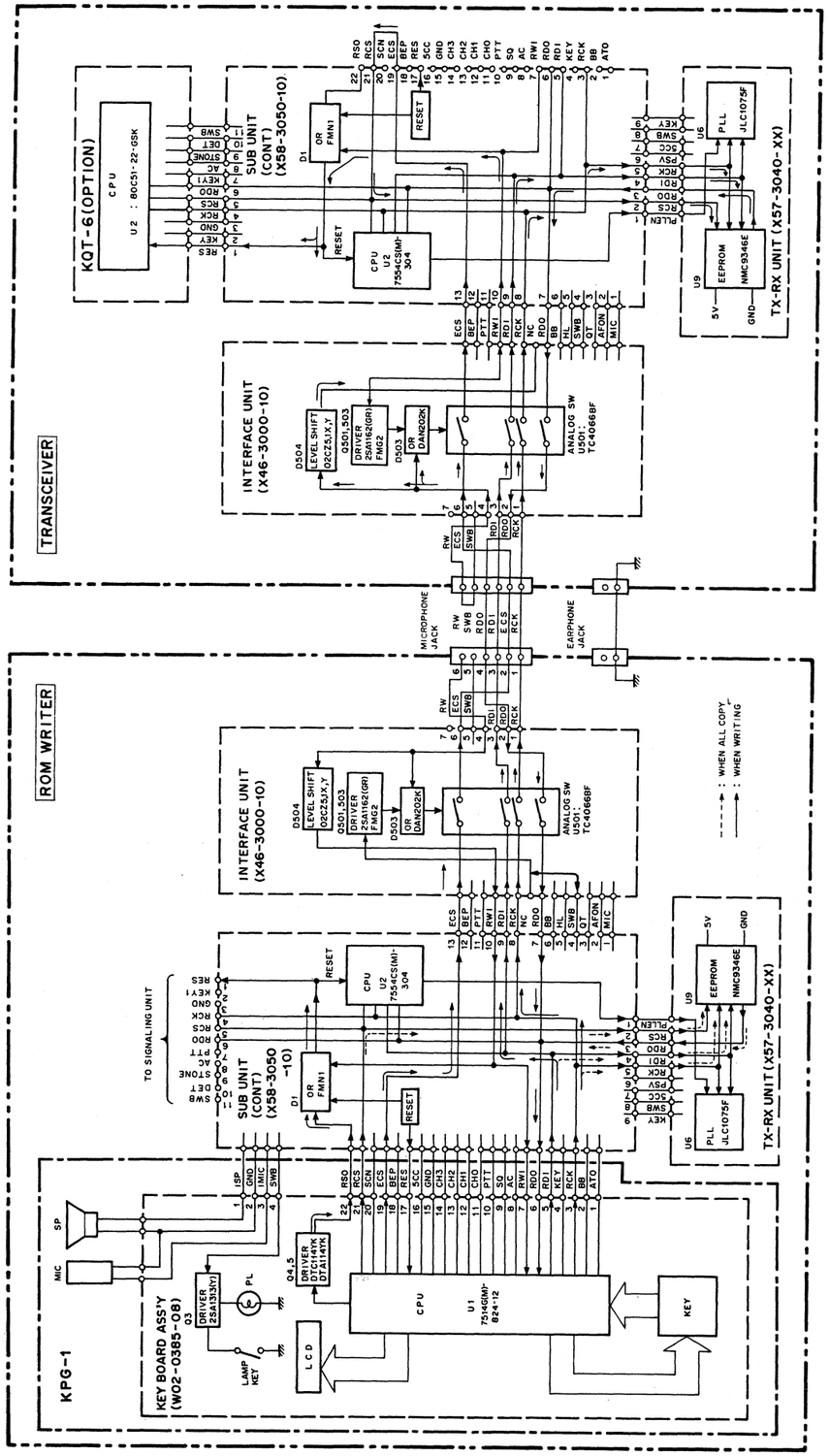
*

	Freq. (MHz)	TX-RX UNIT	C22	C25	C238	C239	R222	R224	L204	L207	Z2	Z4	Z205
K,M	F1 : 450-470	X57-3040-10	1P	5P	8P	8P	680	10K	L79-0699-05	L79-0698-05	L78-0021-05	L78-0023-05	X58-3040-10(U1 : M57786M)
K2,M2	F2 : 470-490	X57-3040-11	1P	5P	5P	5P	560	15K	L79-0809-05	L79-0808-05	L78-0028-05	L78-0027-05	X58-3040-11(U1 : M57786H)
K3,M3	F3 : 490-512	X57-3040-12	0.5P	3P	—	—	560	15K	L79-0811-05	L79-0810-05	L78-0027-05	L78-0028-05	X58-3040-11(U1 : M57786H)

*A (F2 ONLY : X57-3040-11)

KPG-1 (TEMPORARY EEPROM WRITER KIT)

BLOCK DIAGRAM



KPG-1 (TEMPORARY EEPROM WRITER KIT)

CIRCUIT DESCRIPTION

The KPG-1 is a case ass'y that changes the TK-210 and TK-310 into a simple ROM writer.

Note : When the KPG-1 is installed on to the transceiver, the transceiver functions as ROM writer and cannot be used as a transceiver.

The signal at each terminal of the KPG-1 and its use are described below.

The NC terminal is connected to the SWB terminal when a KPG-1 is installed.

The NC terminal goes high and this causes Interface unit Q503 (2/2) : FMG2 to turn on. Next, Q501 : 2SA1162(GR) turns on.

When Q501 conducts, analog/digital switch U501 : TC4066BF is on, which change is the microphone terminal into a data I/O terminal.

1) Reset

When the sub unit (CONT) receives a reset pulse at the RES terminal (pin 17), the microprocessor U1 : 7514G(M)-824-12 in the keyboard operates.

2) RSO terminal

The RSO (Reset Out) terminal provides the reset signal for the CPU in the EEPROM writer. The DATA lines (RCS, RCK, RDI, and RDO) are also used by the sub unit (CONT), CPU : 7554CS(M)-301, signaling CPU : 80C51-22-GSK and PLL IC : JLC1075F.

When the signal at the RESET terminal goes high (RSO terminal, pin 22), both CPU's stop, freeing the DATA lines; neither CPU can read data from the keyboard CPU. In addition, PLL is always in the input state (high impedance).

3) RCS and ECS Terminals

The RCS (ROM Chip Selector) terminal acts as the chip select for the ROM writer EEPROM. The RCS terminal is used (goes low) only in the All Copy mode. In All Copy mode, the signal at the ECS terminal goes high so data is read from the ROM writer EEPROM and written to the transceiver. As may be inferred, an All Copy operation requires data to be already written to the EEPROM.

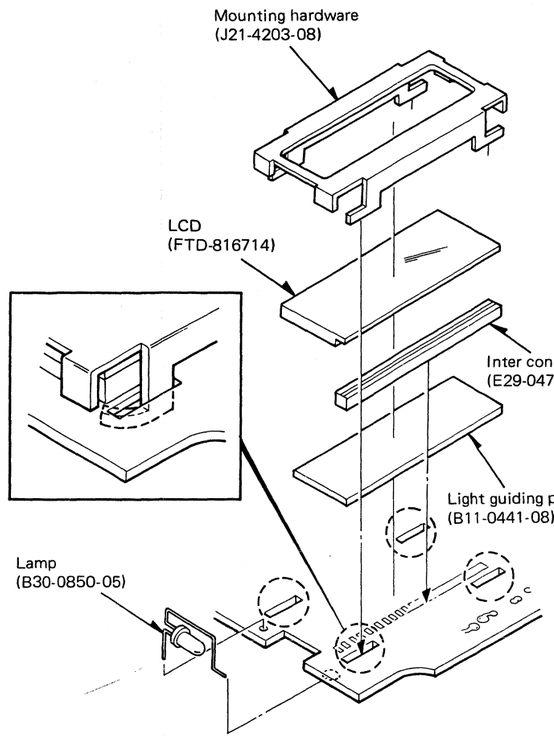
The ECS (Ext Chip Selector) terminal acts as the chip select for the transceiver EEPROM. The ECS terminal is high and sends a high signal to the EEPROM through analog switch U501 and the microphone terminal.

4) RWI (ROM Writer Information)

The signal at ROM writer RWI is always low. On the other hand, the transceiver signal level is high while the ROM writer cable is connected. When RWI goes high, it resets the transceiver CPU so the ROM writer does not write data to the EEPROM.

For transceiver operation, see the description for connecting the ROM writer in Section **6. EXT/MIC Circuit.**

LCD INSTALLATION



KPG-1 (TEMPORARY EEPROM WRITER KIT)

RCUIT DESCRIPTION

The KPG-1 is a case ass'y that changes the TK-210 and -310 into a simple ROM writer.

te : When the KPG-1 is installed on to the transceiver, transceiver functions as ROM writer and cannot be d as a transceiver.

The signal at each terminal of the KPG-1 and its use are cribed below.

The NC terminal is connected to the SWB terminal when PG-1 is installed.

The NC terminal goes high and this causes Interface t Q503 (2/2) : FMG2 to turn on. Next, Q501 : A1162(GR) turns on.

When Q501 conducts, analog/digital switch U501 : 4066BF is on, which change is the microphone terminal o a data I/O terminal.

Reset

When the sub unit (CONT) receives a reset pulse at the S terminal (pin 17), the microprocessor U1 : 7514G(M)--12 in the keyboard operates.

RSO terminal

The RSO (Reset Out) terminal provides the reset signal the CPU in the EEPROM writer. The DATA lines (RCS, K, RDI, and RDO) are also used by the sub unit NT), CPU : 7554CS(M)-301, signaling CPU : 80C51-GSK and PLL IC : JLC1075F.

When the signal at the RESET terminal goes high (RSO minal, pin 22), both CPU's stop, freeing the DATA s; neither CPU can read data from the keyboard CPU. ddition, PLL is always in the input state (high impe-ce).

RCS and ECS Terminals

The RCS (ROM Chip Selector) terminal acts as the chip ct for the ROM writer EEPROM. The RCS terminal sed (goes low) only in the All Copy mode. In All y mode, the signal at the ECS terminal goes high so is read from the ROM writer EEPROM and written he transceiver. As may be inferred, an All Copy ope-on requires data to be already written to the EEPROM.

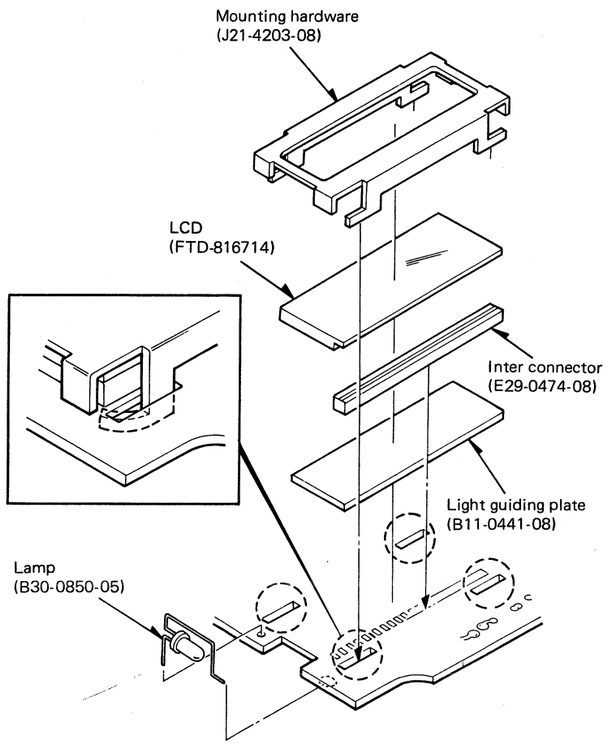
The ECS (Ext Chip Selector) terminal acts as the chip ct for the transceiver EEPROM. The ECS terminal igh and sends a high signal to the EEPROM through og switch U501 and the microphone terminal.

RWI (ROM Writer Information)

The signal at ROM writer RWI is always low. On the r hand, the transceiver signal level is high while the M writer cable is connected. When RWI goes high, esets the transceiver CPU so the ROM writer does write data to the EEPROM.

For transceiver operation, see the description for necting the ROM writer in Section **6. EXT/MIC Cir-**

LCD INSTALLATION



KPG-1 (TEMPORARY EEPROM WRITER KIT)

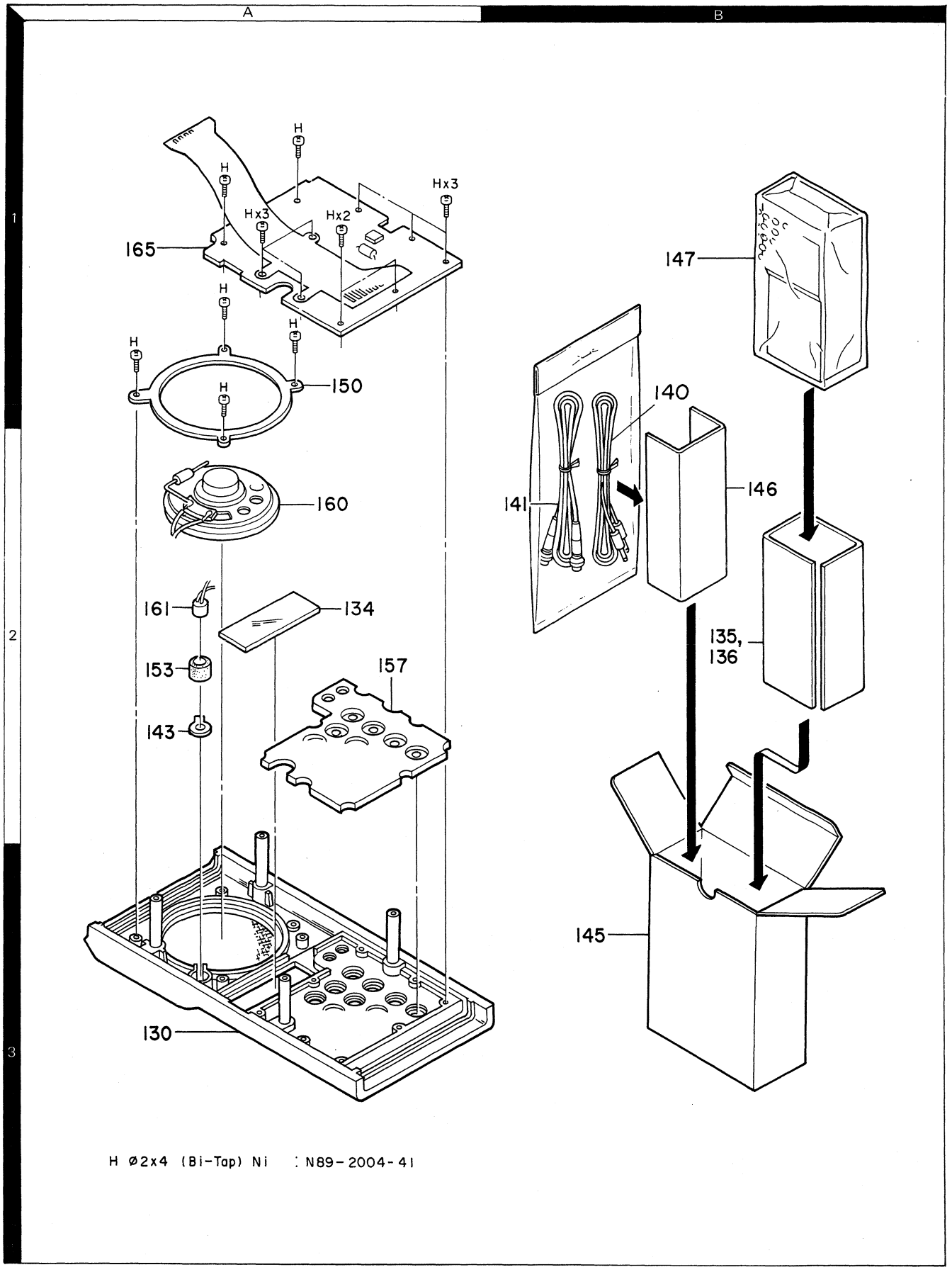
* New Parts
Parts without **Parts No.** are not supplied.
Les articles non mentionnes dans le **Parts No.** ne sont pas fournis.
Telle ohne **Parts No.** werden nicht gellefert.

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
			KPG-1			
130	3A	*	A02-0738-01	FRONT CASE		
-		*	A02-0737-03	FRONT CASE ASSY		
134	2A	*	B10-0684-04	FRONT GLASS		
135	2B		B46-0418-00	WARRANTY CARD	K,K2,K3	
136	2B	*	B50-8060-08	INSTRUCTION MANUAL		
-		*	B11-0441-08	LIGHT GUIDING PLATE		
-		*	B30-0850-05	LAMP		
-		*	B43-1089-04	BADGE		
140	1B	*	E30-0922-05	CABLE ASSY (EAR)		
141	2B	*	E30-2050-05	CABLE ASSY (6P-6P)		
143	2A		F19-0650-04	ISOLATION SHEET(FRONT CASE)		
-		*	E29-0474-08	INTER CONNECTOR		
145	3B	*	H01-8042-08	CARTON		
146	2B	*	H13-0813-08	CUSHION		
147	1B	*	H25-0717-08	PROTECTIVE BAG		
150	1A		J21-4188-04	MOUNTING HARDWARE(SP)		
153	2A		J39-0423-05	MIC SPACER		
-		*	J21-4203-08	MOUNTING HARDWARE(LCD)		
-		*	J25-3443-08	FLEXIBLE PC BOARD		
157	2A	*	K29-3053-08	KEY TOP		
H	1A		N89-2004-41	TAPPING SCREW (Ø2X4)		
160	2A		T07-0239-05	LOUDSPEAKER(FULLRANGE)		
161	2A		T91-0312-15	CONDENSOR MIC		
165	1A	*	W02-0385-08	KEY BOARD		
			KEYBOARD ASS'Y (W02-0385-08)			
-		*	FTD-8167H	LCD		
D1			1SS184	DIODE		
D2 -6			1SS181	DIODE		
D7 ,8			1SS184	DIODE		
D9 ,10			1SS181	DIODE		
Q1			2SC2714	CHIP TRANSISTOR		
Q2			DTC114YK	DIGITAL TRANSISTOR		
Q3			2SA1313(Y)	CHIP TRANSISTOR		
Q4			DTC114YK	DIGITAL TRANSISTOR		
Q5			DTA114YK	DIGITAL TRANSISTOR		
U1		*	7514G(M)-824-12	IC(MICROPROCESSOR)		
U2			LR40872	CMOS IC(DTMF ENCORDER)		
U3			TC4042BF	CMOS IC(QUAD D LATCH)		
X1			L77-1256-05	CRYSTAL (32.768KHZ)		
X2			L78-0010-05	CERAMIC OSC (3.58MHZ)		

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.

DISASSEMBLY KPG-1 (TEMPORARY EEPROM WRITER KIT)

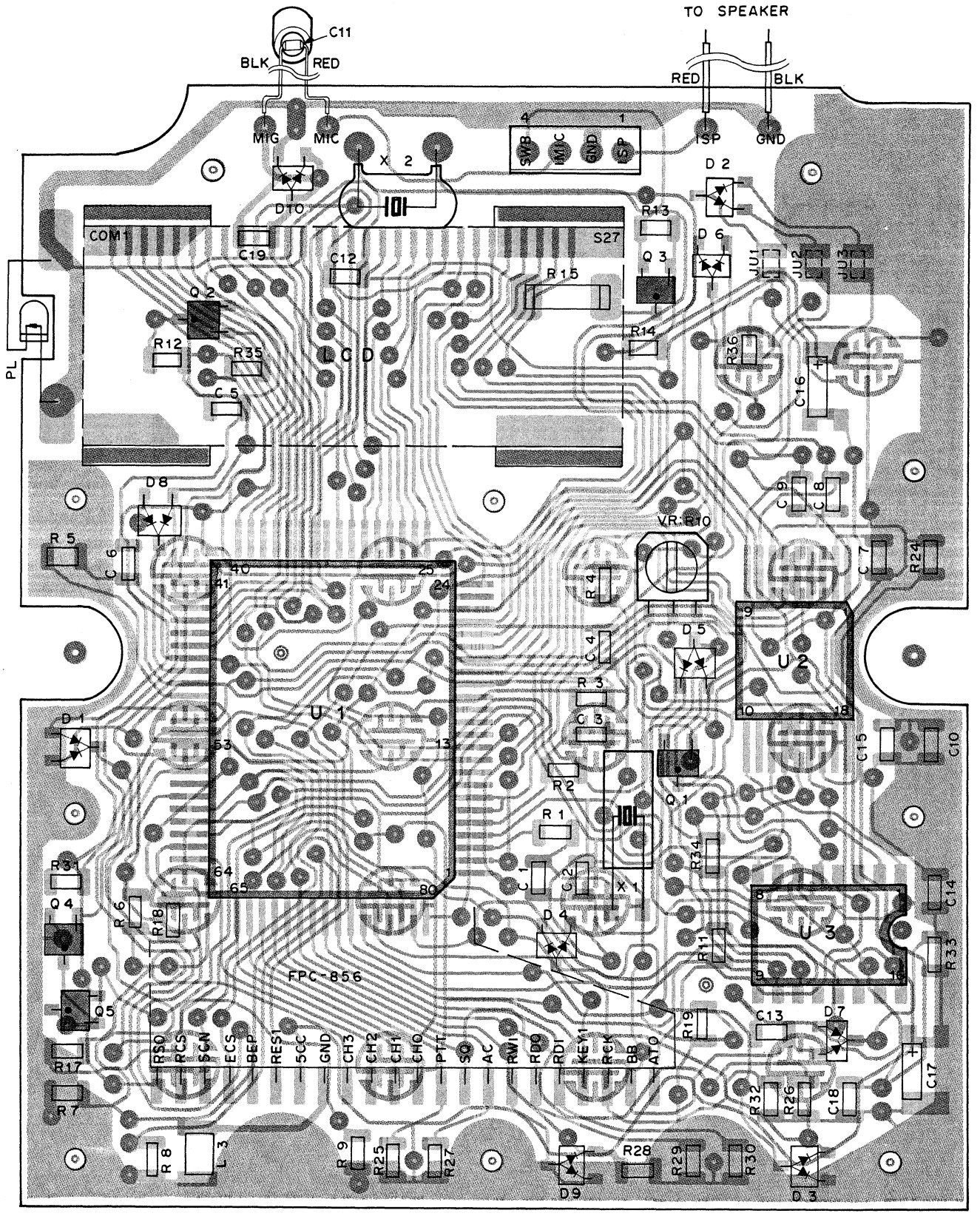


H Ø2x4 (Bi-Tap) Ni : N89-2004-41

TK-310 KPG-1 (TEMPORARY EEPROM WRITER KIT)

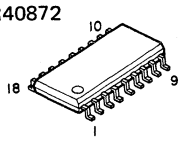
PC BOARD VIEW

KEYBOARD ASS'Y (W02-0385-08) Component side view

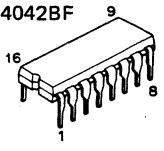


DTA114YK
DTC114YK
2SA1311
2SA1313
2SC2714

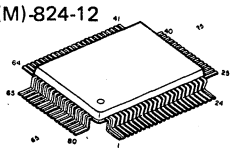
LR40872



TC4042BF

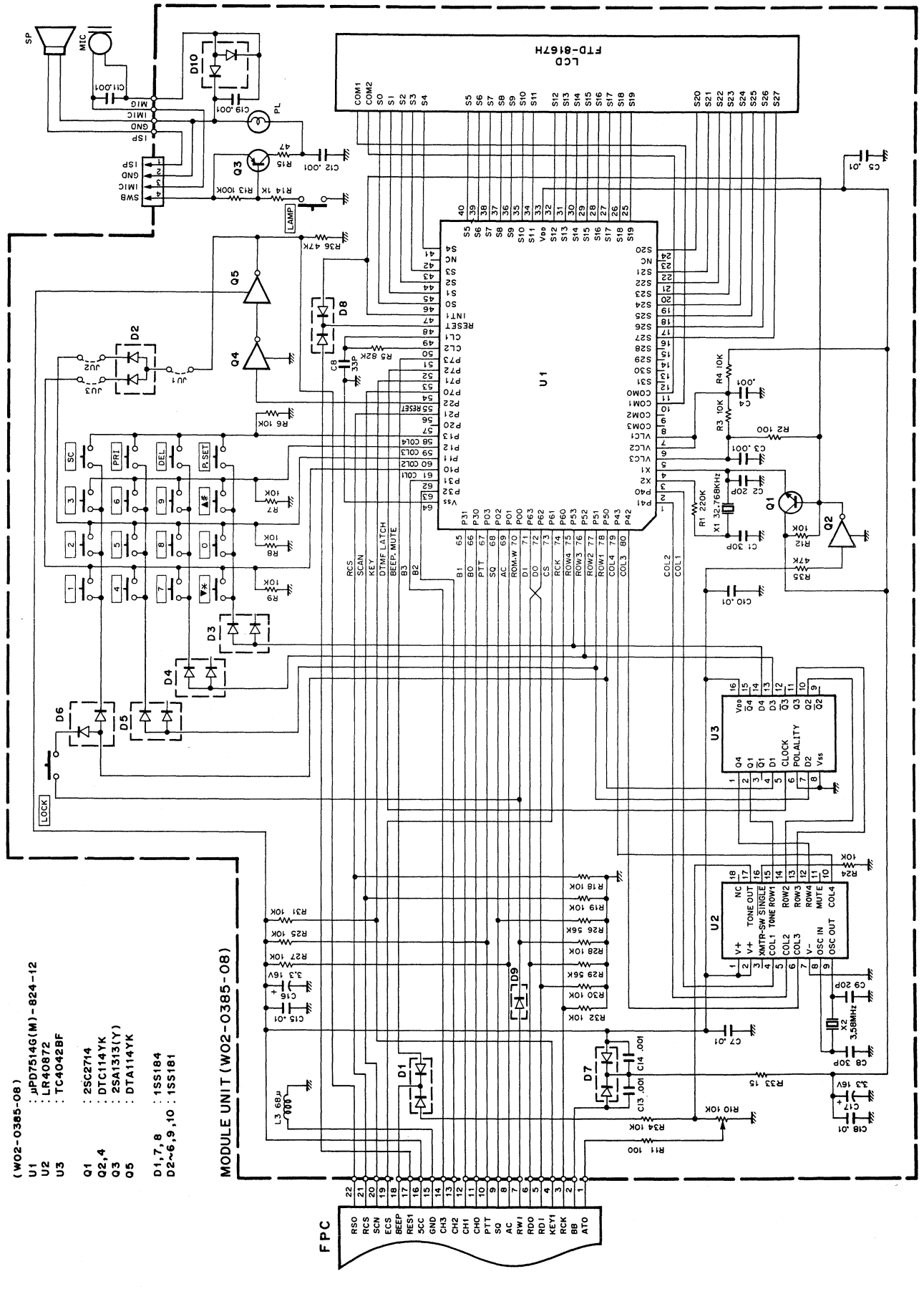


7514G(M)-824-12



KPG-1 (TEMPORARY EEPROM WRITER KIT) TK-310

CIRCUIT DIAGRAM



KQT-6 (QT, TIME-OUT TIMER)

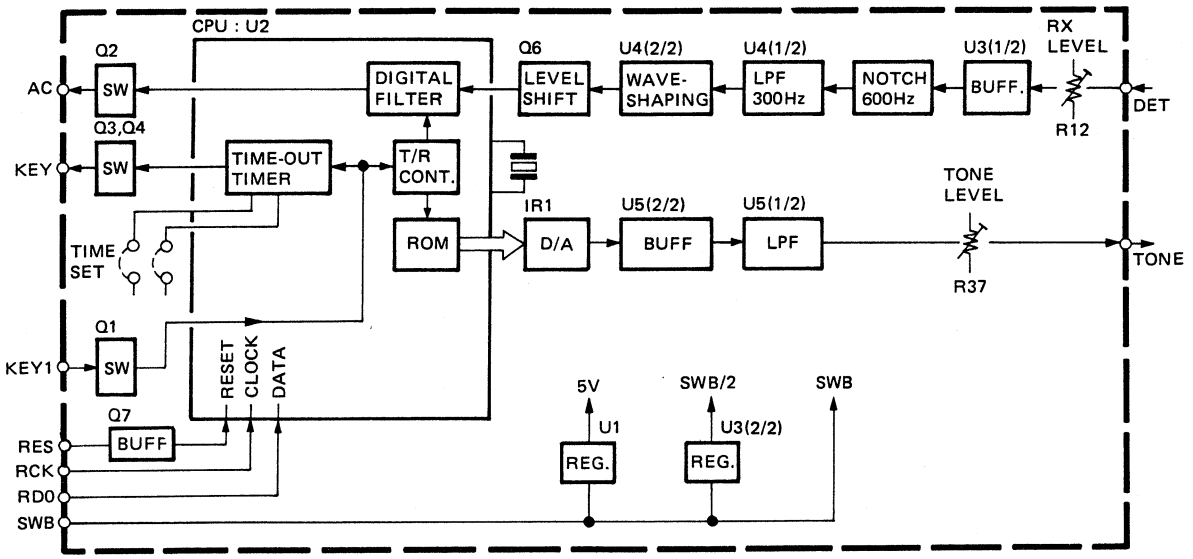


Fig. 1 KQT-6 Block diagram

CIRCUIT DESCRIPTION

1) Reading data

Turning the transceiver POWER switch on or changing the channel switch causes the microprocessor in the transceiver to read PLL and tone data from EEPROM. The KQT-6 acknowledges the tone data when they are received. Thus, KQT-6 monitors RCS (ROM Chip Selector) and RCK (ROM Clock), counts timing pulses, and reads tone data from RDO (ROM Data Output).

2) Decoder operation

The audio signal received by the transceiver is input to the decoder at the DET terminal. Next, RX LEVEL VOL (R12) adjusts the signal to the desired level. The attenuated signal then goes to buffer amplifier BUFF. U3 (1/2) : NJM2904M. The BUFF. output passes a notch filter (NOTCH), which is a capacitor-resistor circuit that filters out the voice frequencies and passes frequencies 300Hz or below. The low-pass filter (LPF) which follows sends the filtered signal to the wave-shaping and level-shifting circuits, then to the microprocessor.

The microprocessor compares the received signal with the internal tone data using a programmable digital filter. If the received tone signal matches the tone data, the microprocessor oututs a high level signal that causes the signal at the AC terminal (after the Q2 switch) to go low. When the AC terminal goes low, the transceiver releases the squelch circuit opens so the received signal can be heard.

3) Encoder operation

As shown in **Fig. 1**, when the PTT switch is turned on, the signal level at KEY1 goes low. Switch Q1 applies the low KEY1 signal to the microprocessor. When the microprocessor receives the PTT signal, it stops the decoder and starts the encoder. The encoder then reads ROM according to the tone data stored in the microprocessor. The digital signal from the ROM is converted into an analog signal by binary weighted resistors (IR1). This analog signal is applied to the TONE terminal through BUFF. U5 (2/2) : NJM2904M, LPF U5 (1/2), and the TONE LEVEL VOL. (R37).

4) Timeout timer operation

The state of the timeout timer depends on the connections of resistors R25 and R40, as shown in the table below.

Time (sec.)	R25	R40
*OFF	O	O
30	O	X
60	X	O
120	X	X

O : Connect
X : Remove
* : BASIC

When the transceiver PTT switch is turned on, the KEY1 terminal goes low, the timeout timer in the microprocessor starts operating, and the KEY terminal goes low (this causes the transceiver to enter the transmit mode). When the timeout timer reaches the set time, it stops operating, causes the KEY terminal to go high, and switches the transceiver to the receive mode.

KQT-6 (QT, TIME-OUT TIMER)

* New Parts
Parts without **Parts No.** are not supplied.
Les articles non mentionnes 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	Destination 仕向	Remarks 備考
KQT-6						
120		*	B58-0680-10	INSTALLATION MANUAL		
121		*	H01-8037-03	CARTON (INSIDE)		
122			H21-0704-04	PROTECTION SHEET		
123			H25-0076-03	PROTECTION BAG		
124			H25-0710-04	CONDUCTIVE BAG		
125			N89-2605-46	BINDING HEAD TAPTITE SCREW		
126		*	X52-3010-20	QT UNIT		
QT UNIT (X52-3010-20)						
C1			C90-0868-05	ELECTRO 10UF 16WV		
C2			CK73FB1H103K	CHIP C 0.010UF K		
C3			CS15E1C100M	TANTAL 10UF 16WV		
C4			C92-0009-05	TANTAL 4.7UF 10WV		
C5			C92-0003-05	CHIP TAN 0.47UF 25WV		
C6			CK73FB1H102K	CHIP C 1000PF K		
C7			CK73FB1H222K	CHIP C 2200PF K		
C8			CK73EB1H223K	CHIP C 0.022UF K		
C9 -11			CK73FB1H103K	CHIP C 0.010UF K		
C12			CK73EB1H222K	CHIP C 2200PF K		
C13			CK73FB1H103K	CHIP C 0.010UF K		
C14			CK73FB1E223K	CHIP C 0.022UF K		
C15 -18			CK73FB1H102K	CHIP C 1000PF K		
C19 ,20			CC73FCH1H100D	CHIP C 10PF D		
C21			CK73FB1H103K	CHIP C 0.010UF K		
C22			C92-0004-05	CHIP TAN 1UF 16WV		
C23			CK73FB1H103K	CHIP C 0.010UF K		
C25			CK73FB1H103K	CHIP C 0.010UF K		
C26			CK73FB1H102K	CHIP C 1000PF K		
C27			C92-0004-05	CHIP TAN 1UF 16WV		
C28			CK73FB1H102K	CHIP C 1000PF K		
C29			CK73EB1H102K	CHIP C 1000PF K		O
C29			CK73FB1H102K	CHIP C 1000PF K		N
C30			CK73FB1H102K	CHIP C 1000PF K		
C31 -33			CC73FSL1H471J	CHIP C 470PF J		
C34			CK73FB1H102K	CHIP C 1000PF K		
C35			CK73EB1H102K	CHIP C 1000PF K		O
C35			CK73FB1H102K	CHIP C 1000PF K		N
C36			C90-0890-05	TANTAL 1UF 16WV		O
J1			E40-5094-05	CONNECTOR (11P)		
L2			L40-4782-17	SMALL FIXED INDUCTOR(0.47UH)		
X1		*	L77-1334-15	CRYSTAL (12.0MHZ)		
IR1			R90-0598-05	RESISTOR (BLOCK)		
R1			RD14CB2C680J	RD 68 J 1/6W		O
R1		*	RK73FB2A680J	CHIP R 68 J 1/10W		N
R2 ,3			RK73FB2A153J	CHIP R 15K J 1/10W		
R4			RK73FB2A104J	CHIP R 100K J 1/10W		
R5 ,6			RK73FB2A473J	CHIP R 47K J 1/10W		
R7			RK73FB2A124J	CHIP R 120K J 1/10W		
R8 -11			RK73FB2A473J	CHIP R 47K J 1/10W		
R12			R12-3457-05	TRIMMING POT. (47K)		
R13			RK73FB2A823J	CHIP R 82K J 1/10W		

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

O : Original
N : New

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* New Parts
Parts without **Parts No.** are not supplied.
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Telle ohne **Parts No.** werden nicht geliefert.

KQT-6 (QT, TIME-OUT TIMER)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
R14			RK73FB2A104J	CHIP R 100K J 1/10W		
R15 ,16			RK73FB2A273J	CHIP R 27K J 1/10W		
R17 ,18			RK73FB2A563J	CHIP R 56K J 1/10W		
R19			RK73FB2A823J	CHIP R 82K J 1/10W		
R20			RK73FB2A124J	CHIP R 120K J 1/10W		
R21			RK73FB2A103J	CHIP R 10K J 1/10W		
R22			RK73FB2A684J	CHIP R 680K J 1/10W		
R23			RK73FB2A103J	CHIP R 10K J 1/10W		
R24			RK73FB2A473J	CHIP R 47K J 1/10W		
R25			R92-0670-05	CHIP R 0 OHM		
R26 -28			RK73FB2A473J	CHIP R 47K J 1/10W		
R29			RK73FB2A822J	CHIP R 8.2K J 1/10W		
R30			RK73FB2A333J	CHIP R 33K J 1/10W		
R31			RK73FB2A273J	CHIP R 27K J 1/10W		
R32 -34			RK73FB2A563J	CHIP R 56K J 1/10W		
R35			RK73FB2A333J	CHIP R 33K J 1/10W		
R36			RK73FB2A273J	CHIP R 27K J 1/10W		
R37			R12-3457-05	TRIMMING POT. (47K)		
R38			RK73FB2A123J	CHIP R 12K J 1/10W		
R39			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R40			R92-0670-05	CHIP R 0 OHM		
R41			RD14BB2B153J	RD 15K J 1/8W		O
R41			RK73FB2A153J	CHIP R 15K J 1/10W		N
R42			RK73FB2A101J	CHIP R 100 J 1/10W		
R43			R92-0670-05	CHIP R 0 OHM		
Q1			FMG2	DIGITAL TRANSISTOR		
Q2 -6			DTC144EK	DIGITAL TRANSISTOR		
Q7			2SK208(R)	CHIP FET		N
U1			S-8125OHG	IC(VOLTAGE REGULATOR/ +5V)		
U2			80C51-22-GSK	CPU		
U3 -5			NJM2904M	OP IC		

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

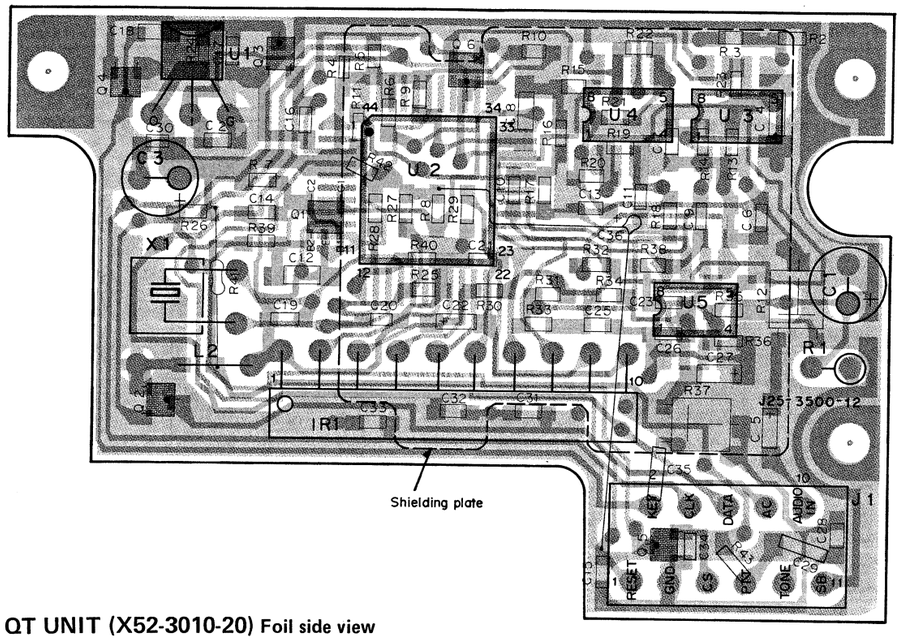
O : Original
N : New

⚠ indicates safety critical components.

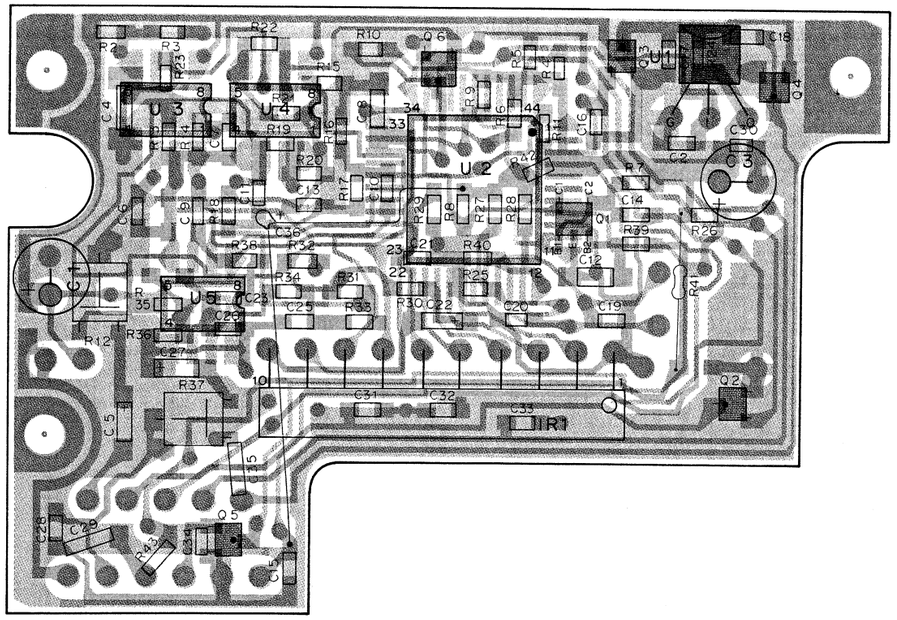
TK-310 KQT-6 (QT, TIME-OUT TIMER)

PC BOARD VIEWS (Original)

QT UNIT (X52-3010-20) Component side view



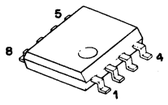
QT UNIT (X52-3010-20) Foil side view



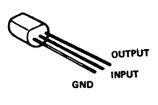
DTC114EK

FMG2

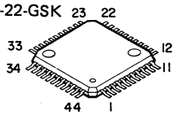
NJM2904M



S-81250HG

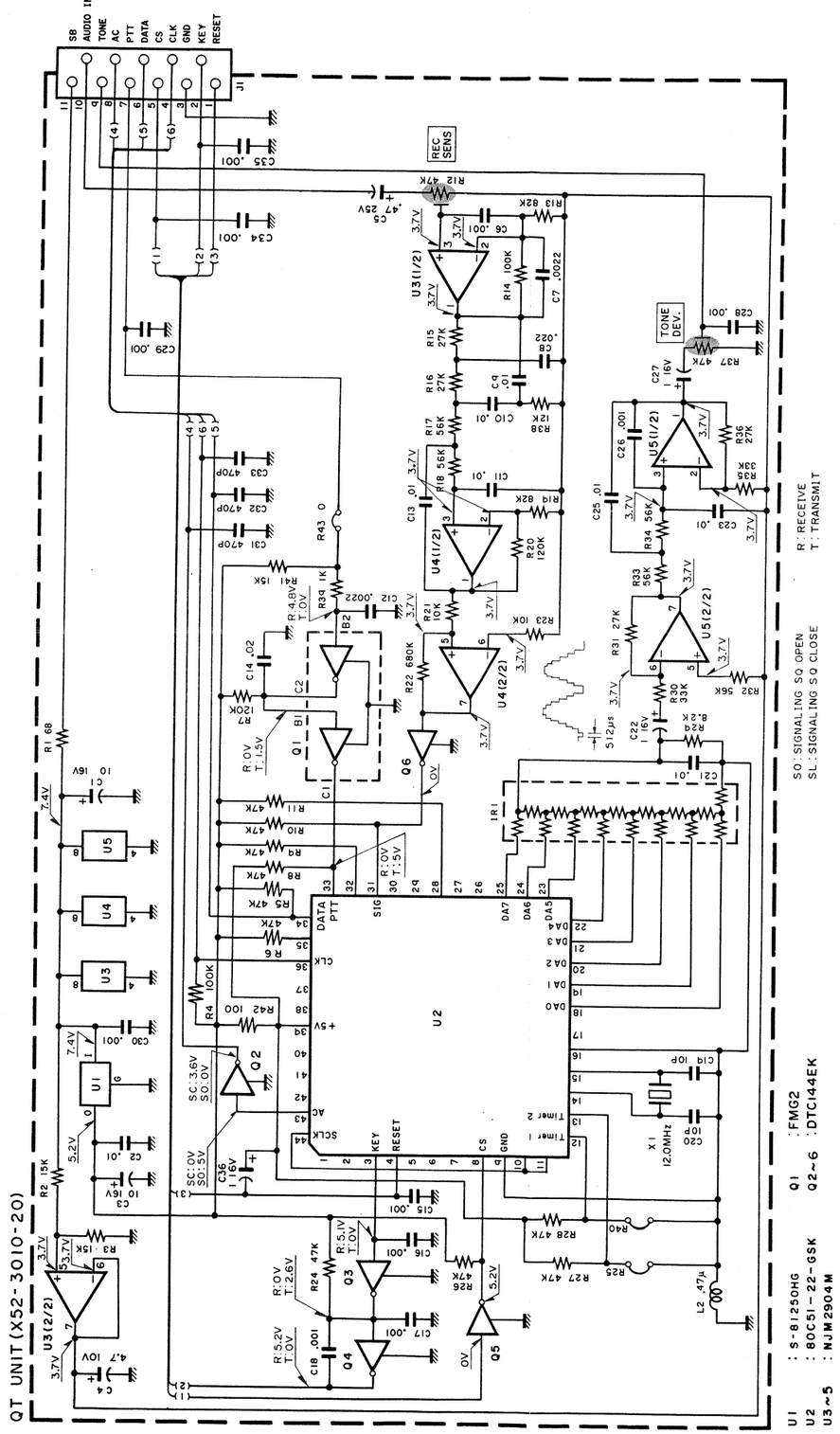


80C51-22-GSK



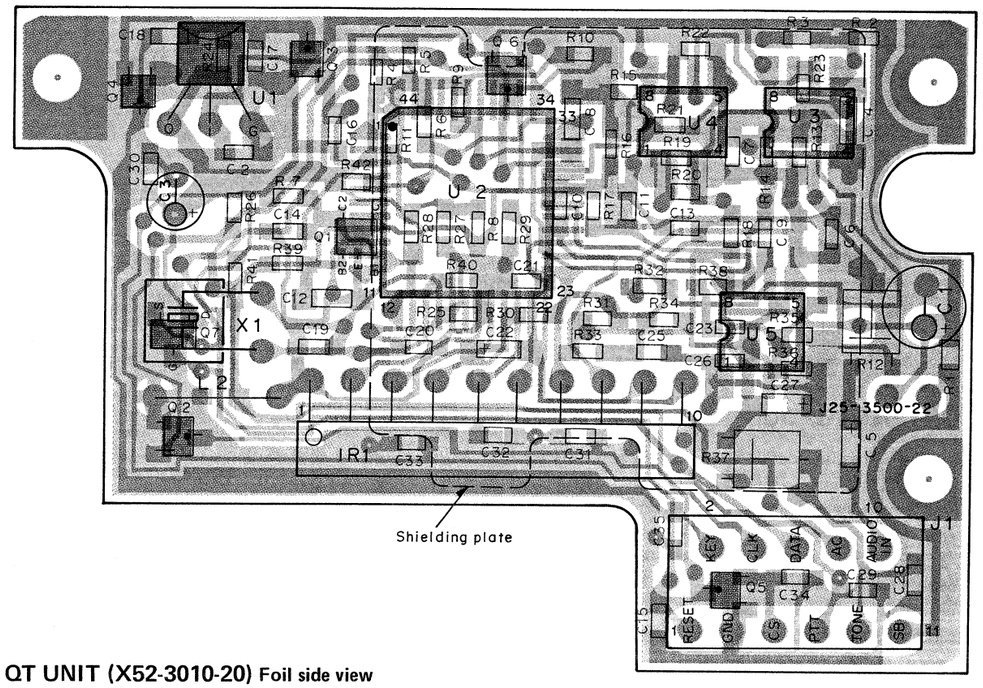
TK-310 KQT-6 (QT, TIME-OUT TIMER)

CIRCUIT DIAGRAM (Original)

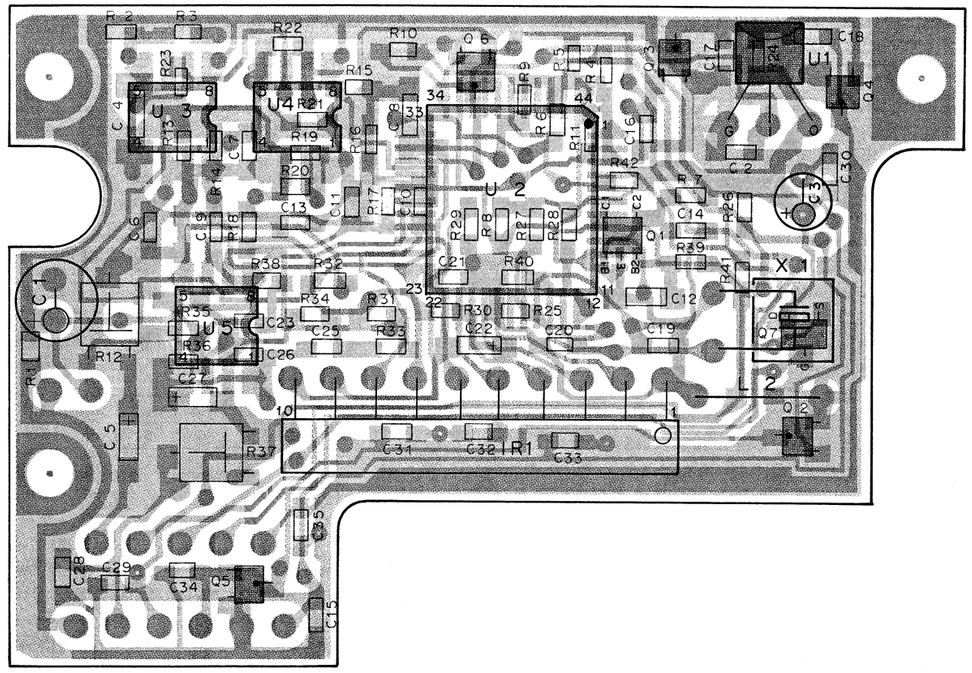


PC BOARD VIEW (New)

QT UNIT (X52-3010-20) Component side view



QT UNIT (X52-3010-20) Foil side view

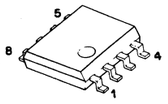


2SK208

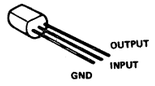
DTC114EK

FMG2

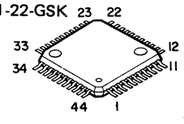
NJM2904M



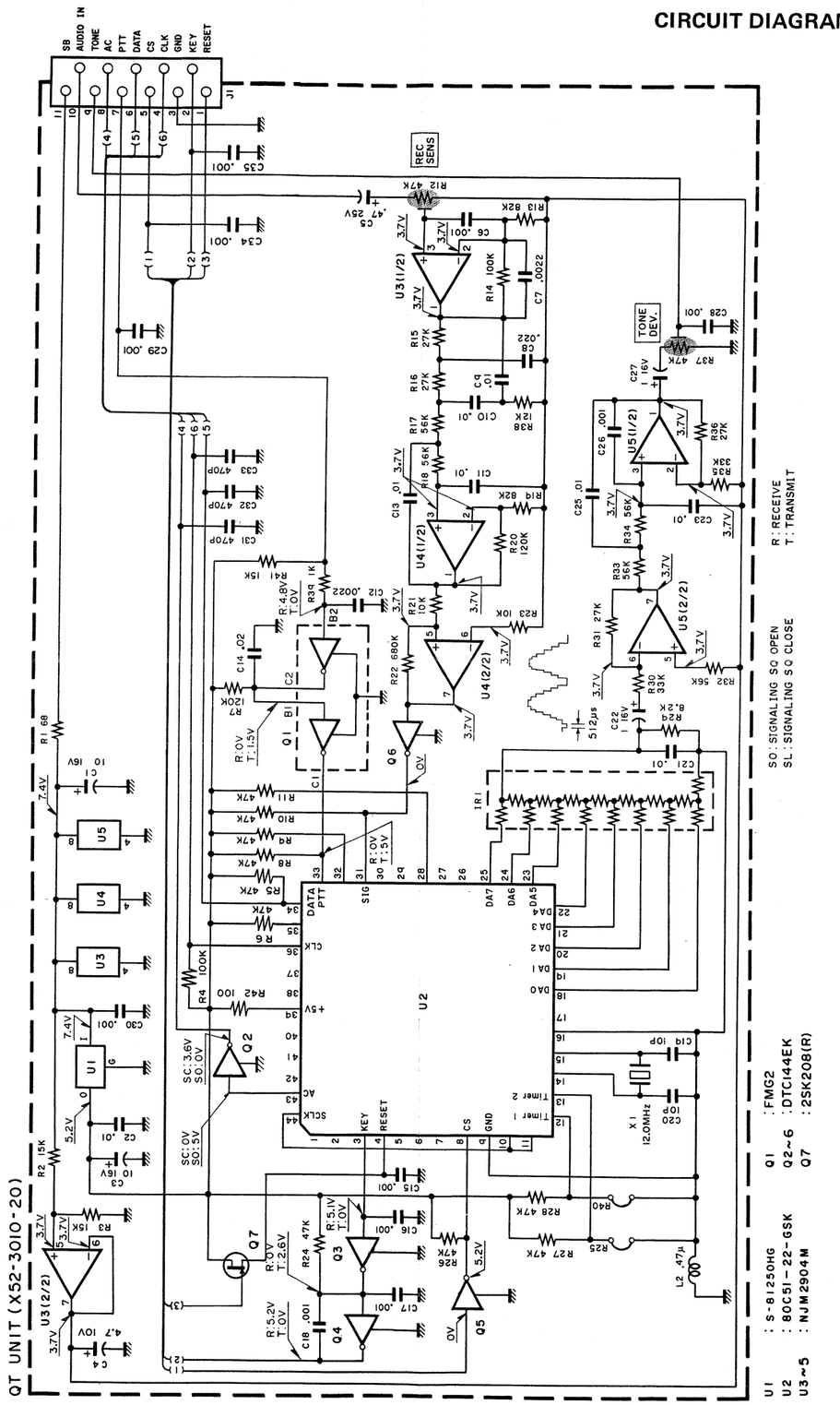
S-81250HG



80C51-22-GSK

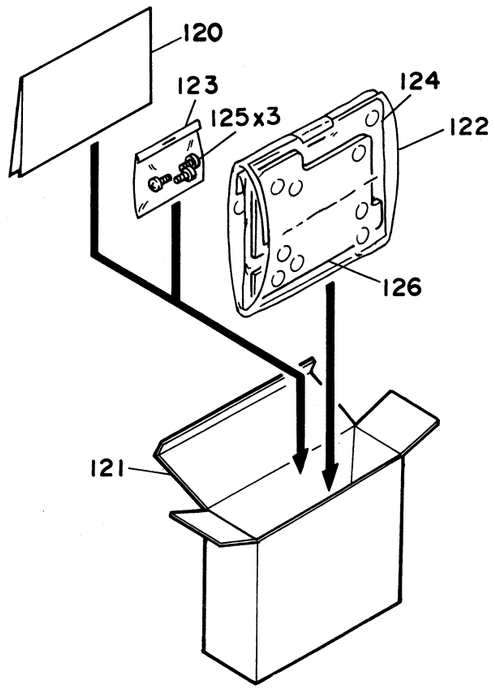


CIRCUIT DIAGRAM (New)



KQT-6 (QT, TIME-OUT TIMER)

PACKING



RATINGS

QT	
Encoder/Decoder tone frequency	67.0 to 225.7Hz EIA STD (RS-220A) tone frequencies and includes other Motorola tone frequencies.
Decoder response time: (T1)	T1 = 100/QT tone frequency x 250ms or less
Encoder response time: (T2)	T2 = 100/QT tone frequency x 75ms or less
Reverse burst time: (Tr)	Tr = 12/QT tone frequency x 100ms
Encoder frequency error	±0.5% or less
Squelch sensitivity	SINAD 10dB or less
Time-out timer	
Time	OFF, 30, 60, 120s (Presettable)

KMS-3 (QT, DQT UNIT)

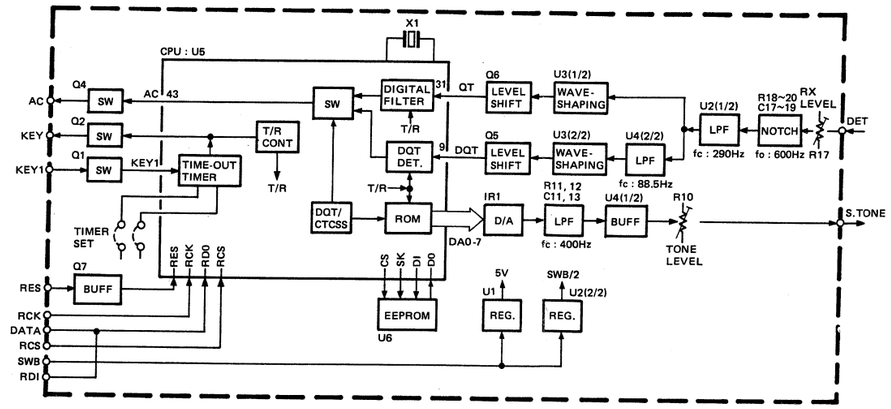


Fig. 1 KMS-3 Block diagram

CIRCUIT DESCRIPTION

The KMS-3 has an encoder and a decoder for QT (quiet talk) and DQT (Digital Quiet Talk), and a time-out timer. The user can select either QT or DQT for each channel. Before use, however, signal data must be written into the KMS-3 EEPROM using the KPT-20 ROM writer.

1) Channel address data read

When the transceiver POWER switch is turned on or when the channel is switched, the microprocessor in the transceiver outputs a channel address to the EEPROM and reads PLL data. The KMS-3 microprocessor U5 : MSM80C51F-120 monitors transceiver EEPROM data (RDI, RCS, and RCK), and reads the channel address data.

2) Signaling data read

The KMS-3 microprocessor U5 accesses the EEPROM U6 : NMC9346E and reads the signaling data corresponding to the read channel address data.

3) Decoder operation

The receive audio signal from the transceiver DET terminal is input to RX LEVEL VOL. (R17). The level of the audio signal is attenuated by R17, then the signal passes the 600Hz notch filter and a low-pass filter U2 (1/2) : NJM2904M, with fc of 290Hz. This removes audio frequencies from the signal, which leaves only the tone signal.

The LPF output signal goes to both the QT decoder and the DQT decoder. The QT tone signal passes through the wave-shaping U3 (1/2) : NJM2904M and level-shift Q6 : DTC144EK ICs, then is applied to pin 31 of the microprocessor U5.

The DQT signal passes through a low-pass filter U4 (1/2) : NJM2904M with fc of 88.5Hz, then enters a wave-shaping circuit U3 (2/2). The frequency of the DQT signal is normally about 67Hz but becomes 134Hz when a turn-off code is applied.

When a turn-off code is applied, the filter level goes by LPF U4 (1/2), a low-pass filter with fc of 88.5Hz. A wave-shaping circuit U3 (1/2) in the next stage provides sufficient gain so that the decoder function works normally. The output from the wave-shaping circuit goes to a level shifter Q5 : DTC144EK, then enters pin 9 of the microprocessor U5.

The QT or DQT signal applied to U5 is compared with the signal data read from the EEPROM (U6). If the signaling data matches, U5 pin 43 goes high, and SW Q1 : FMG2 turns on, which brings the AC terminal low. This tells the transceiver that the signaling data correct, and opens the squelch.

4) Encoder operation

As shown in Fig. 1, when the PTT switch is on, the signal level at KEY1 goes low. Switch Q1 applies the low KEY1 signal to the microprocessor. When the microprocessor receives the PTT signal, it stops the decoder and starts the encoder. The encoder then reads ROM data according to the QT or DQT data stored in the microprocessor. The digital signal from the ROM is converted into an analog signal by binary weighted resistors (IR1). This analog signal is applied to the TONE terminal through LPF, BUFF. U4 (1/2), and the TONE LEVEL VOL. (R10).

5) Time-out timer operation

The state of the time-out timer depends on the connections of resistors R2 and R46 as shown in the table below.

Time (sec.)	R2	R46
*OFF	O	O
30	O	X
60	X	O
120	X	X

O : Connect
X : Remove
* : BASIC

When the transceiver PTT switch is turned on, the KEY1 terminal goes low, the time-out timer in the microprocessor starts operating, and the KEY terminal goes low (this causes the transceiver to enter the transmit mode). When the timer reaches the set time, it stops operating, causes the KEY terminal to go high, and switches the transceiver to the receive mode.

KMS-3 (QT, DQT UNIT)

* New Parts
Parts without **Parts No.** are not supplied.
Les articles non mentionnes 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	Destination 仕向	Remarks 備考
KMS-3						
120		*	B58-0681-00	INSTALLATION MANUAL		
121		*	H01-8072-03	CARTON		
122			H21-0704-04	PROTECTION SHEET		
123			H25-0076-03	PROTECTION BAG		
124			H25-0710-04	PROTECTIVE BAG		
125			N89-2605-46	BINDING HEAD TAPTITE SCREW		
126		*	X52-3050-20	DQT UNIT		
DQT UNIT (X52-3050-20)						
C1			C90-0868-05	ELECTRO 10UF 16WV		
C2			CK73FB1H103K	CHIP C 0.010UF K		
C3			C92-0009-05	TANTAL 4.7UF 10WV		
C4			CK73FB1H103K	CHIP C 0.010UF K		
C5			CK73FB1H471K	CHIP C 470PF K		
C6			CK73FB1H102K	CHIP C 1000PF K		
C7			CK73FB1E223K	CHIP C 0.022UF K		
C8 ,9			CC73FCH1H100D	CHIP C 10PF D		
C10			CK73FB1E223K	CHIP C 0.022UF K		
C11 -13			CK73FB1H103K	CHIP C 0.010UF K		
C14			C92-0004-05	CHIP TAN 1UF 16WV		
C15			CK73FB1H103K	CHIP C 0.010UF K		
C16			C92-0004-05	CHIP TAN 1UF 16WV		
C17			CK73FB1H103K	CHIP C 0.010UF K		
C18			CK73FB1E223K	CHIP C 0.022UF K		
C19			CK73FB1H103K	CHIP C 0.010UF K		
C20			CK73FB1H123K	CHIP C 0.012UF K		
C21			CK73FB1H822K	CHIP C 8200PF K		
C22 ,23			CK73FB1H153K	CHIP C 0.015UF K		
C24			CK73FB1H103K	CHIP C 0.010UF K		
C25			CK73FB1H102K	CHIP C 1000PF K		
C26			CK73FB1H471K	CHIP C 470PF K		
C27			C92-0004-05	CHIP TAN 1UF 16WV		
-			E18-0151-05	PIN SOCKET		
J1			E40-5094-05	PIN CONNECTOR (11P)		
-			F10-1353-04	SHIELDING PLATE		
L1			L40-3982-81	SMALL FIXED INDUCTOR(0.39UH)		
L2 ,3			L40-1092-81	SMALL FIXED INDUCTOR(1UH)		
X1			L77-1334-15	CRYSTAL RESONATOR (12.0MHZ)		
IR1			R90-0598-05	RESISTOR BLOCK		
R1			RD14CB2C680J	RD 68 J 1/6W		
R2			R92-0670-05	CHIP R 0 OHM		
R3			RK73FB2A153J	CHIP R 15K J 1/10W		
R4			RK73FB2A473J	CHIP R 47K J 1/10W		
R5			RK73FB2A153J	CHIP R 15K J 1/10W		
R6			RK73FB2A124J	CHIP R 120K J 1/10W		
R7 -9			RK73FB2A473J	CHIP R 47K J 1/10W		
R10			R12-3457-05	TRIMMING POT. (47K)		
R11 ,12			RK73FB2A393J	CHIP R 39K J 1/10W		
R13			RK73FB2A683J	CHIP R 68K J 1/10W		
R14			RK73FB2A273J	CHIP R 27K J 1/10W		

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.

KMS-3 (QT, DQT UNIT)

* New Parts
Parts without **Parts No.** are not supplied.
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Telle ohne **Parts No.** werden nicht geliefert.

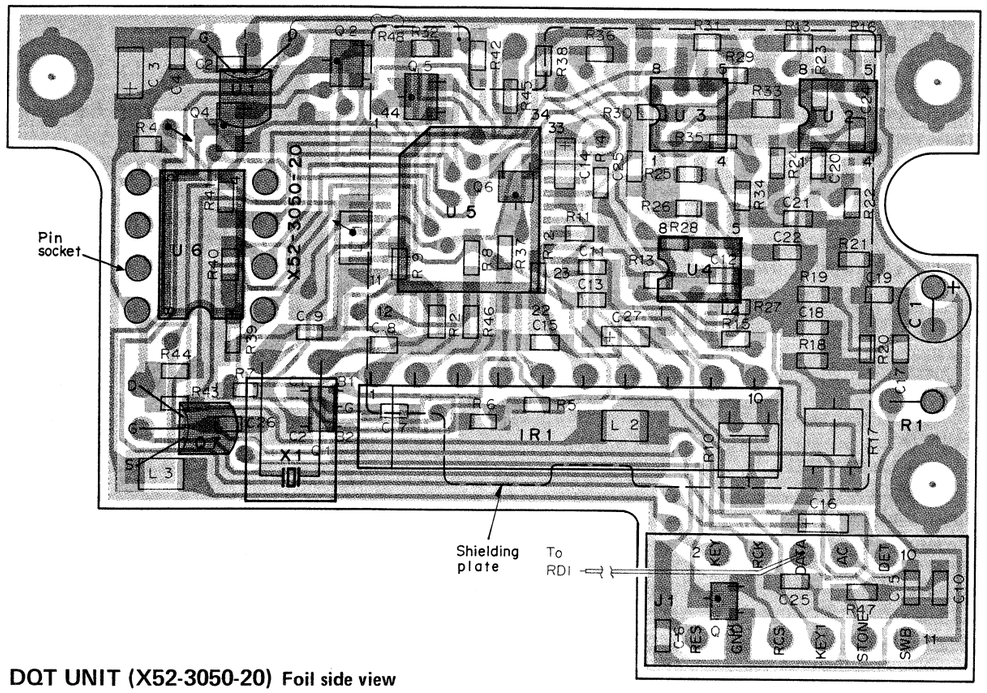
Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
R15			RK73FB2A563J	CHIP R 56K J 1/10W		
R16			RK73FB2A153J	CHIP R 15K J 1/10W		
R17			R12-3457-05	TRIMMING POT. (47K)		
R18			RK73FB2A273J	CHIP R 27K J 1/10W		
R19			RK73FB2A123J	CHIP R 12K J 1/10W		
R20			RK73FB2A273J	CHIP R 27K J 1/10W		
R21 ,22			RK73FB2A563J	CHIP R 56K J 1/10W		
R23			RK73FB2A333J	CHIP R 33K J 1/10W		
R24			RK73FB2A683J	CHIP R 68K J 1/10W		
R25 ,26			RK73FB2A124J	CHIP R 120K J 1/10W		
R27 ,28			RK73FB2A104J	CHIP R 100K J 1/10W		
R29 ,30			RK73FB2A103J	CHIP R 10K J 1/10W		
R31			RK73FB2A274J	CHIP R 270K J 1/10W		
R32			RK73FB2A473J	CHIP R 47K J 1/10W		
R33 ,34			RK73FB2A103J	CHIP R 10K J 1/10W		
R35			RK73FB2A684J	CHIP R 680K J 1/10W		
R36 -42			RK73FB2A473J	CHIP R 47K J 1/10W		
R43			RK73FB2A104J	CHIP R 100K J 1/10W		
R44 ,45			RK73FB2A473J	CHIP R 47K J 1/10W		
R46 ,47			R92-0670-05	CHIP R 0 OHM		
R48			RD14BB2C101J	RD 100 J 1/6W		
Q1			FMG2	DIGITAL TRANSISTOR		
Q2 -6			DTC144EK	DIGITAL TRANSISTOR		
Q7			2SK30A(O)	FET		
U1			S-81250HG	IC(VOLTAGE REGULATOR/ +5V)		
U2 -4			NJM2904M	IC(OP AMP X2)		
U5		*	MSM80C51F-120	IC		
U6			NMC9346E	IC(1K EEP ROM)		

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

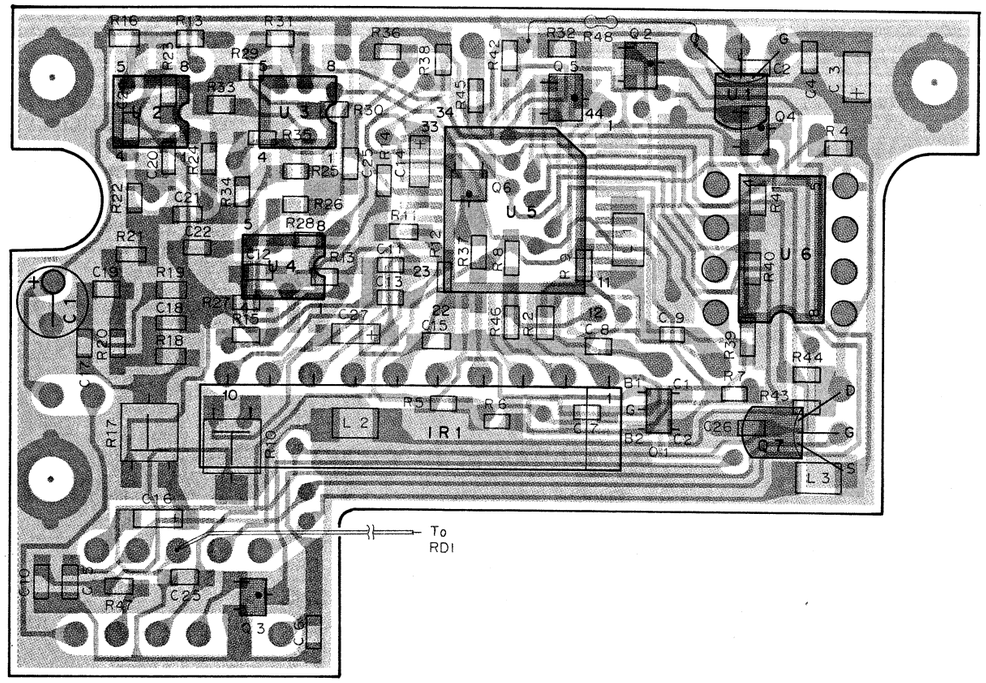
⚠ indicates safety critical components.

PC BOARD VIEWS

DQT UNIT (X52-3050-20) Component side view



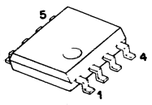
DQT UNIT (X52-3050-20) Foil side view



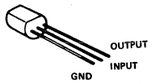
DTC114EK

FMG2

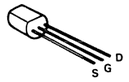
NJM2904M



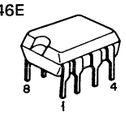
S-81250HG



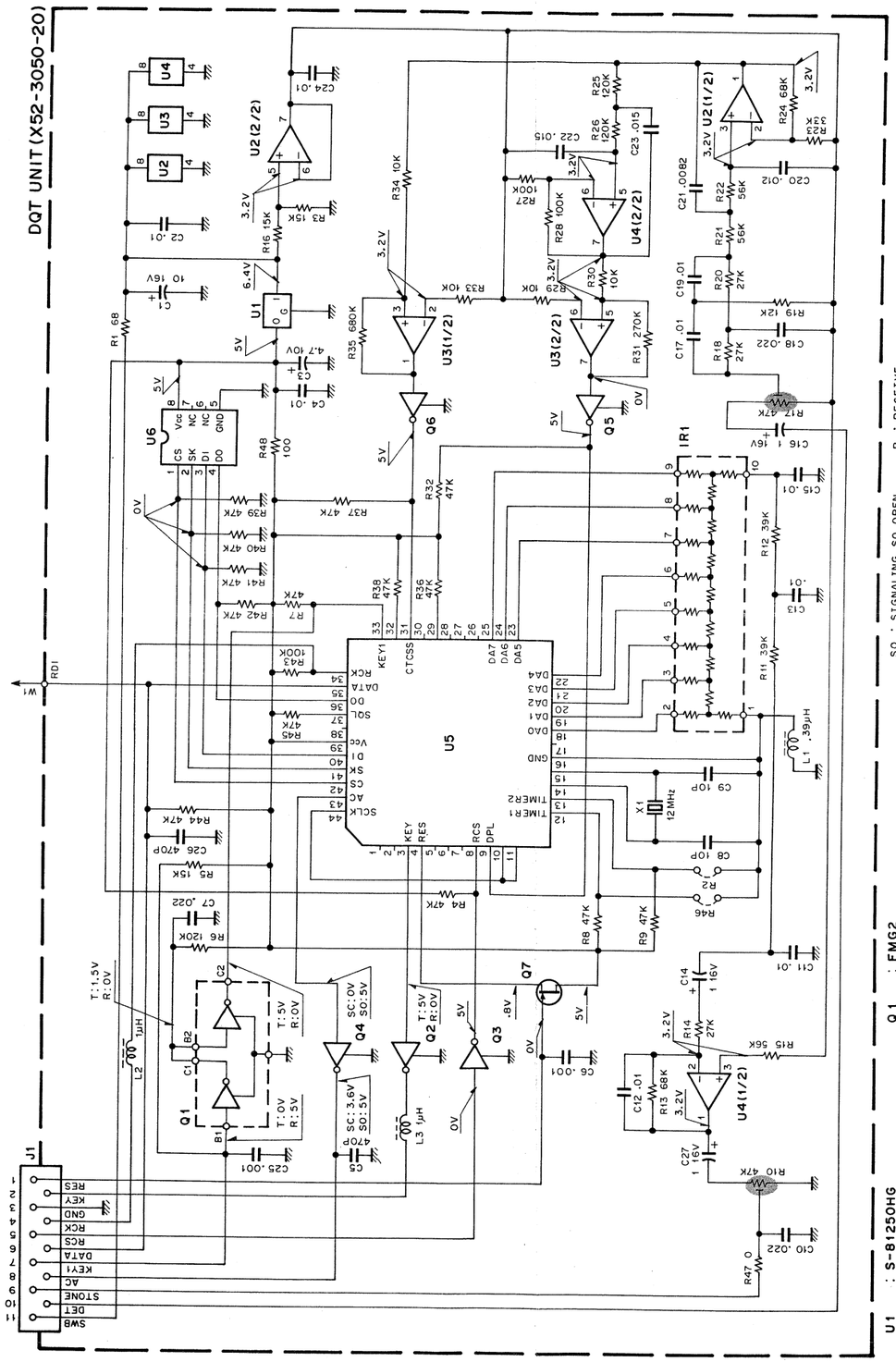
2SK30A



NMC9346E

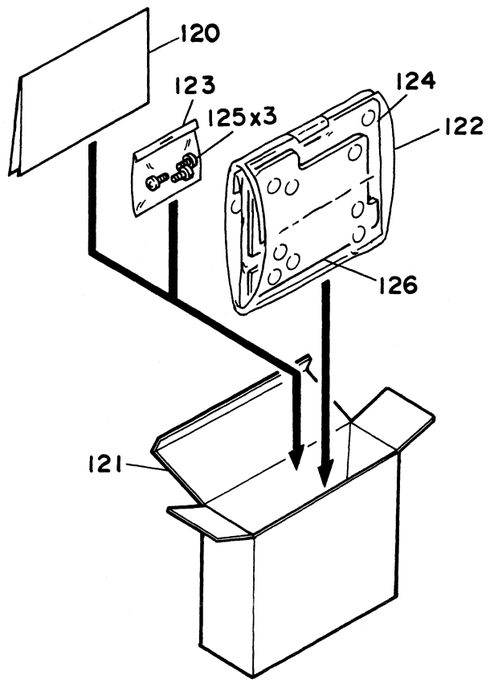


CIRCUIT DIAGRAM



KMS-3 (QT, DQT UNIT)

PACKING



RATINGS

QT	
Decoder tone frequency	67.0 to 225.7Hz EIA STD (RS-220A) tone frequencies and includes other Motorola tone frequencies.
Encoder tone frequency	67.0 to 225.7Hz (in 0.1Hz steps)
Decoder response time: (T1)	T1 = 100/QT tone frequency x 250ms or less
Encoder response time: (T2)	T2 = 100/QT tone frequency x 75ms or less
Reverse burst time: (Tr)	Tr* = 1000 + 160 x Reverse burst data (00H~1EH)/QT tone frequency (ms) * 100ms when reverse burst data is 1FH
Encoder frequency error	±0.5% or less
Squelch sensitivity	SINAD 10dB or less
DQT	
DQT code	23 bits total: a 3-digit octal number (0~7, 12 bits) with error correction (11 bits)
Decoder response time: (T3)	T3 = 270ms or less
Encoder response time: (T4)	T4 = 0
Turn-off code transmission time: (Toff)	Toff = 180ms
Encoder pulse width error	±0.7% or less
Squelch sensitivity	SINAD 10dB or less
Time-out timer	
Time	OFF, 30, 60, 120s (Presettable)

SPECIFICATIONS

(GENERAL)

Frequency Range	450~512MHz
Number of Channels	12
Channel Spacing	25kHz (PLL channel step 12.5kHz)
Battery Voltage	7.5V DC
Current Drain	Standby : 50mA : 17mA with battery saving mode Transmit 5 watts (HI) : 2.5A, 2 watts (LO) : 1.6A
Temperature Range	−30°C to + 60°C (−22°F to + 140°F)
Dimensions & Weight	With 800mAh battery (KNB-3) 7.13"(181mm)H x 2.64"(67mm)W x 1.46"(37mm)D, 1.54lbs. (700g) With 1600mAh battery (KNB-4) 8.86"(225mm)H x 2.64"(67mm)W x 1.46"(37mm)D, 2.0lbs. (910g)

(RECEIVER) **Measurements made per EIA Standard RS-316-B**

Sensitivity	
EIA 12dB SINAD	0.35μV
20dB Quieting	0.45μV
Squelch Sensitivity	0.25μV threshold
Modulation Acceptance	±7kHz
Adjacent Channel Selectivity	−60dB
Intermodulation	−60dB
Spurious & Image Rejection	−60dB
Audio Power Output	500mW at less than 5% distortion
Frequency Stability	±0.0005% from −30°C to + 60°C
Channel Frequency Spread	6MHz

(TRANSMITTER) **Measurement made per EIA Standard RS-316-B**

RF Power Output	HI : 5 watts typical, adjustable to 2 watts LO : 2 watts, adjustable to 0.3 watts
Spurious & Harmonics	−55dB
Modulation	16F3, ±5kHz for 100% at 1000Hz
FM Noise	−40dB
Audio Distortion	Less than 3% at 1000Hz
Frequency Stability	±0.0005% from −30°C to + 60°C
Microphone Impedance	600Ω
Channel Frequency Spread	6MHz (5W typical) 11MHz (4.5W)

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