

2-m FM HANDHELD TRANSCEIVER

# TH-215A/E

## SERVICE MANUAL

# KENWOOD

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Photo is TH-215A.

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## CIRCUIT DESCRIPTION

### Receiver section

The basic construction of the receiver section is of the double-superheterodyne system using the first IF of 16.3 MHz and second IF of 455kHz.

The signal input to the antenna is HF amplified by Q6 : 2SC3356 and Q7 : 2SC2714 which are connected in cascade, and supplied to the BPF of L15 to L17. The output from the BPF is supplied to first mixer Q8 : 2SK210(GR) to be mixed with the first local oscillator (PLL) output signal. The first mixer output is supplied through a 16.3 MHz MCF, amplified by Q9 : 2SC2714(O), and input to IC1 : TA7761P of the IF unit as the first IF signal. The first IF signal is mixed with the 16.755MHz signal from the second local oscillator, and covered into the 455kHz second IF signal. The 455kHz second IF signal is supplied through ceramic filter CF1, amplified by an internal amp, and detected.

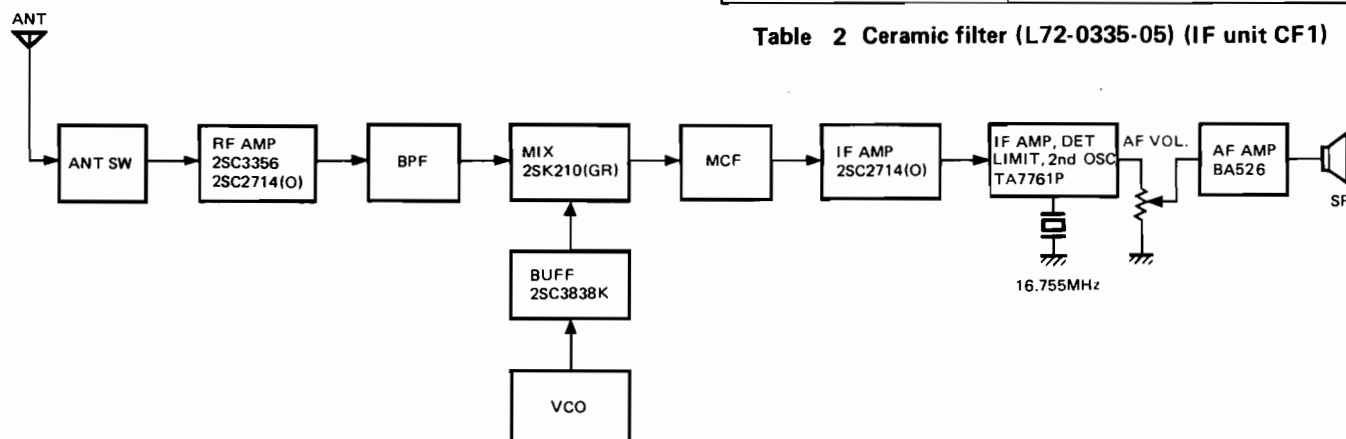
The detected signal is sent through the AF VOL, amplified by IC2 : BA526, and sent to the speaker.

| Item                          | Rating                                                                        |
|-------------------------------|-------------------------------------------------------------------------------|
| Noninal center frequency (fo) | 16.3MHz                                                                       |
| Pass bandwidth                | fo ± 7.5kHz or more at 3dB                                                    |
| Attenuation bandwidth         | fo ± 25kHz or more at 40dB                                                    |
| Guaranteed attenuation        | 70dB or more within fo ± 1MHz<br>Spurious : 40dB or more at fo ~ fo + 500kHz. |
| Ripple                        | 1dB or less                                                                   |
| Insertion loss                | 2dB or less                                                                   |
| Terminal impedance            | 1.8kΩ//0pF                                                                    |

**Table 1 MCF (L71-0265-05) (RF unit XF1,2)**

| Item                                   | Rating                          |
|----------------------------------------|---------------------------------|
| Center frequency of 6dB bandwidth (fo) | 455kHz ± 1.5kHz                 |
| 6dB bandwidth                          | ± 7.5kHz or more                |
| 40dB bandwidth                         | ± 15kHz or less                 |
| Ripple                                 | 1.5dB or less (455 ± 5kHz)      |
| Guaranteed attenuation                 | 27dB or more within fo ± 100kHz |
| Insertion loss                         | 6dB or less at 455kHz           |
| Terminal impedance                     | 1.5kΩ                           |

**Table 2 Ceramic filter (L72-0335-05) (IF unit CF1)**



**Fig. 1 RX section block diagram**

### Transmitter section

The audio signal from the MIC is amplified at sub-unit (X59-3090-10) (microphone amp) of the IF unit, then sent to sub-unit (X59-3010-10) (VCO) of the RF unit in order to apply direct modulation to the VCO utilizing the capacitance between the electrodes of D1 : 1SV153.

The VCO output is amplified by Q2 : 2SC3838K(N,P) and Q3 : 2SC2407, supplied through power-controller pin diode D3 : 1SV172, and power-amplified by final IC1 : M57732L.

The transmission output from IC1 is sent through low pass filter L8 and transmission/reception switching diode D5 : M1303, and supplied to the ANT terminal.

A part of the output is detected by D8 and D9 : HSM88AS. It is used by Q4 : 2SA1313(Y) and Q5 : FMW1 to control the current flowing to D3 and to apply APC by varying the power driving IC1. The power adjustment is performed by VR1 and VR2 on the IF unit.

## CIRCUIT DESCRIPTION

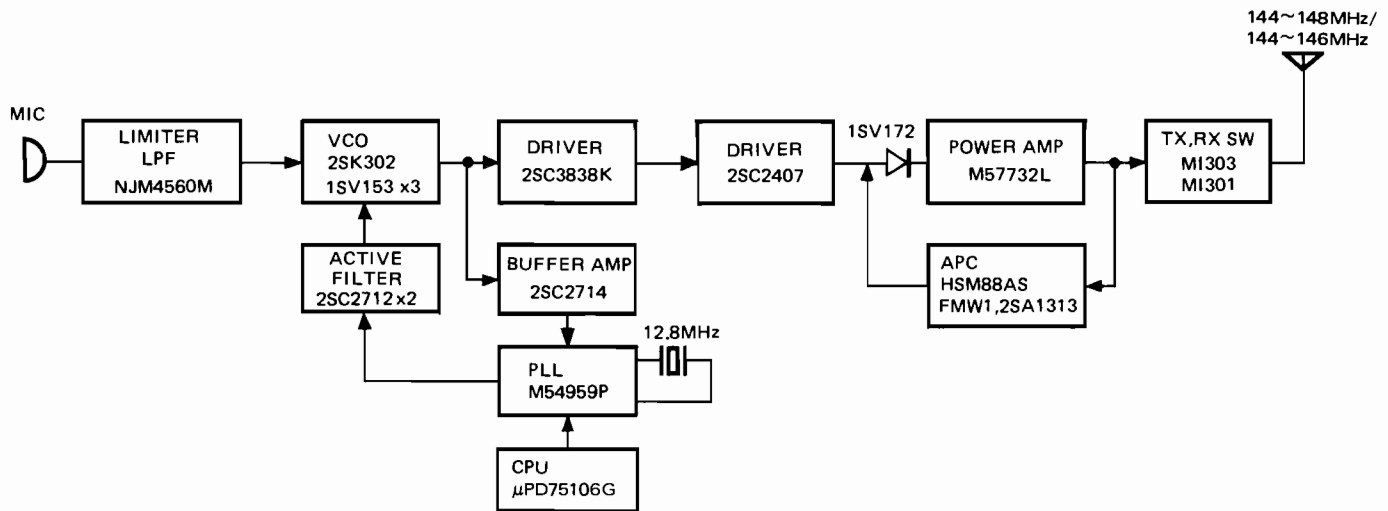


Fig. 2 TX section block diagram

## PLL unit

The VCOs are provided independently for transmission and reception, and use Colpitts oscillator circuits of Q1 and Q2 : 2SK302(GR). The two VCOs are switched by switching Q11 using the serial data sent from the microprocessor PLL control IC2 : M54959P.

The VCO output is distributed to the transmitter, receiver and PLL. The signal supplied to the PLL circuit is input to IC2 via the buffer circuit of Q1 : 2SC2714(O). The VCO output, which is input to IC2, is divided with the dividing ratio set by the serial data from the microprocessor. On the other hand, its phase is compared with that of a 5kHz signal obtained by dividing X1 : 12.8MHz, and the result is output from pin 9 of IC2. The phase comparison output passes through the active filter of Q12 of Q13 : 2SC2712(GR) and controls the VCO.

If the PLL is unlocked during transmission and the UL line from the RF unit goes high (HI), the microprocessor turns the TX line to low (LO) and returns to the transmission mode preventing abnormal reception.

## Power supply circuit

The TH-215 provides the following regulated/unregulated voltages;

- T5 . . . . . 5V DC in transmit
- R5 . . . . . 5V DC in receive
- C5 . . . . . 5V DC constant
- M5 . . . . . 5V DC for the microphone
- VDD . . . . . 5V DC for microprocessor bias
- KEY . . . . . Key matrix voltage
- CB . . . . . Battery voltage

The C5 constant voltage circuit utilizes three-pin regulators IC5 : LVC550C, Q14 : 2SA1358(Y) and Q15 : FMW1.

The T5 circuit consisting of Q13 : 2SA1313(Y) and Q16 : DTC114YK is controlled by the TX line from the microprocessor.

The R5 circuit, Q11 : DTA114YK and Q12 : DTA144EK is controlled by the output of the T5 circuit.

The M5 and KEY lines are directly controlled by three-pin regulator IC5.

VDD utilizes the output of the three-pin regulator IC4 : LVC550C to provide microprocessor power. When IC4 is OFF, D6 : 1SS184 causes the microprocessor to be powered from the backup battery, B1.

Since the microprocessor must synthesize TTP information and sub audible tone information the clock frequency is higher than the clock in the TH-205. Therefore, 5V is about 0.7V DC higher in the TH-215, by putting the GND terminal of IC4 higher at D7 : 1SS226.

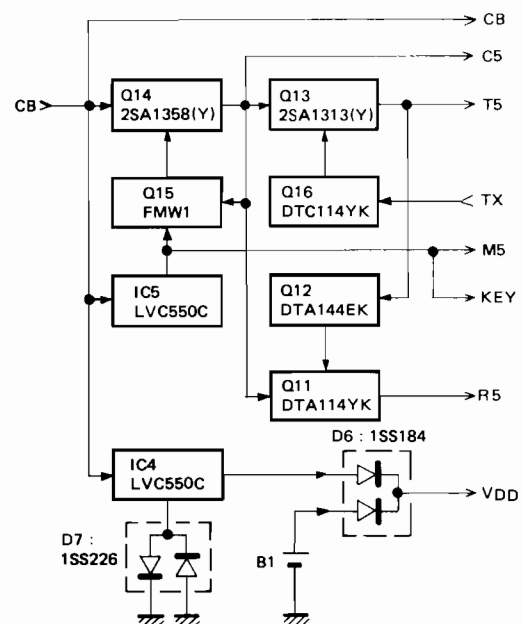


Fig. 3 Power supply circuit

## CIRCUIT DESCRIPTION

### Microprocessor and its peripheral circuits

The TH-215 is designed for multiple functions and has low power consumption, thanks to its 4 bit single-chip microprocessor (IC1 :  $\mu$ PD75106G-514-1B in the control section) and LCD driver (IC2, a  $\mu$ PD7225G in the Case ass'y).

#### • Backup circuits

If the CB voltage drops to approximately 5V, pin 1 of IC3 : S-8045HN in the IF unit goes "L" and pin 44 of the microprocessor goes "L". This places the microprocessor in the backup mode. If the CB voltage returns to normal, pin 44 of the microprocessor goes "H" and places the microprocessor back in the normal operating mode. This causes a differencing circuit to apply a reset pulse to pin 7 of the microprocessor.

Normally, the microprocessor can be reset by grounding pin 7 or pin 44. However, when the microprocessor lithium backup battery fails or when a new battery is installed the microprocessor must be reset by applying a pulse to pin 7.

Pin 44 is used to reset the microprocessor when normal

reset is impossible, due to low input voltage or a short power outage. If this happens the microprocessors RAM contents will be maintained by the lithium battery.

#### • Squelch circuit

Incoming signals are detected by IC1 : TA7761P (in the IF section) then amplified, rectified, and smoothed by the filter formed by IC1 and Q2 : 2SC2712(GR). The squelch control (SQL VOL.) sets the control voltage on Q1 : 2SC2712(GR). When Q1 is ON, the incoming receive signal is applied to the SQ port (pin 36) of the microprocessor.

When a signal is received, port SQ goes "H" and the BUSY indicator turns ON, in the LCD. At the same time, port AFC (pin 39 of the microprocessor) become "L" and Q6 thru Q8 (Q6 : FMG2, Q7 : 2SC2712(GR), Q8 : 2SA1241Y) of the IF unit, apply power to IC2 and Q6. When power is supplied to IC2, squelch is disabled. Pushing the MONITOR button places the SQ line "H" and the AFC line "L", this also opens squelch.

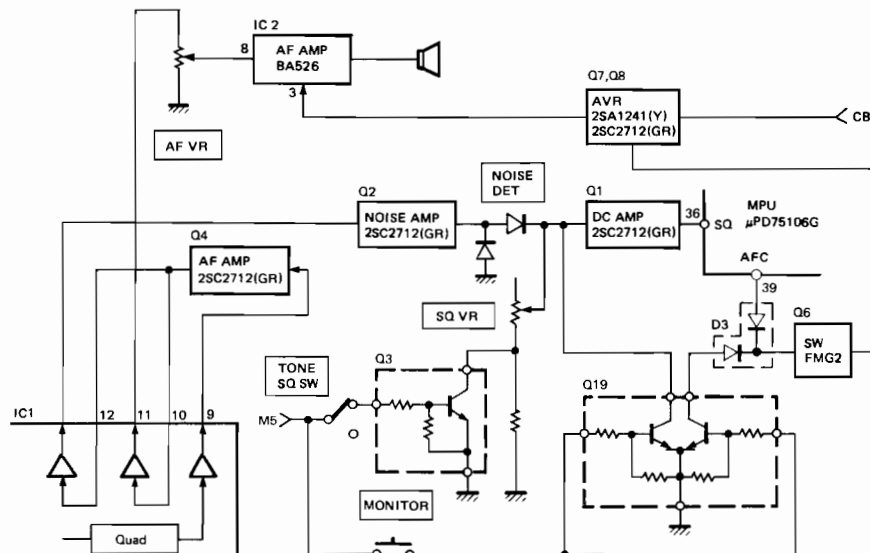


Fig. 4 Squelch circuit

#### • Sub-tone and touch tone signals.

Sub audible tone frequencies and Touch Tone Pad frequencies are generated by the microprocessor in the TH-215. Since sub audible tones are a single tone the sine wave is produced from 7-bit digital data supplied by the microprocessor. Digital to analog conversion (D/A) is performed

by weighted resistor array R18.

Touch tone signals are a two frequency signal produced by combining two 7-bit sine waves to an 8-bit signal. Digital to analog conversion is performed by weighted resistor array R10 for this function.

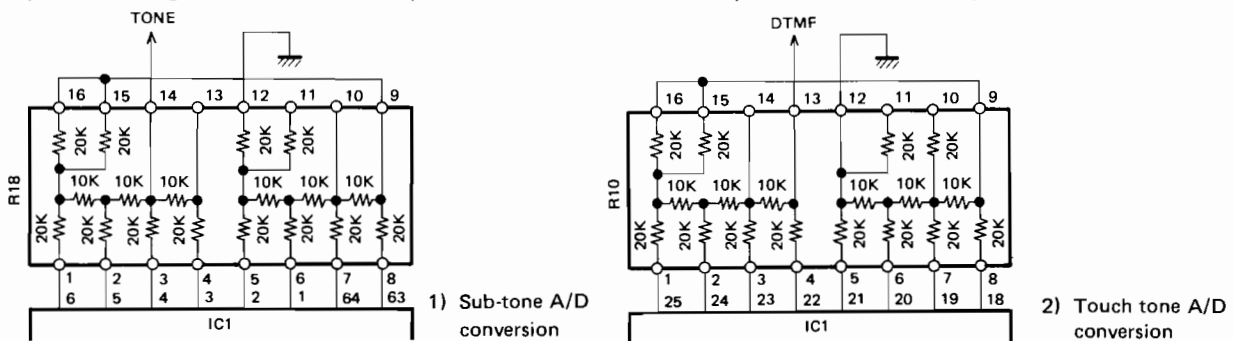


Fig. 5 Sub-tone and touch-tone signals

## CIRCUIT DESCRIPTION/SEMICONDUCTOR DATA

### ● Battery power save circuit

The TH-215 provides several battery saver modes to conserve on battery power. These modes function during the receive mode and not the transmit mode.

#### 1) Save mode

In this mode the radio will activate the battery power save circuit 2 seconds after the squelch closes.

#### 2) Auto save mode

In this mode the radio will activate the battery power save circuit 1 minute after the last key operation during the receive mode.

To select the desired battery saver mode press the **[SAVE]** key. Each time the key is depressed you will step thru the various modes, i.e. for SAVE to AUTO SAVE to OFF and back to SAVE etc. The appropriate indicator will light in the display to remind you which circuit is

active. When no indicator is on the battery power save circuit is OFF.

#### 3) Power save ratio selection

In addition to the two different activation modes the TH-215 allows you to specify the actual length of time the receiver section shuts down. To alter this rate press the **[F]** and then the **[SAVE]** key. The display will show the time the radio will be operating at reduced power levels.

During battery saver operation the SAVE line (pin 37) of the microprocessor repeatedly cycles between a logic "H" : High and "L" : Low which turns C5 and R5 ON and OFF. The VDD, KEY and M5 lines are not affected by these circuits and remain active. The ON/OFF interval is adjustable between 1 and 9 units, with each unit equalling about 200msec.

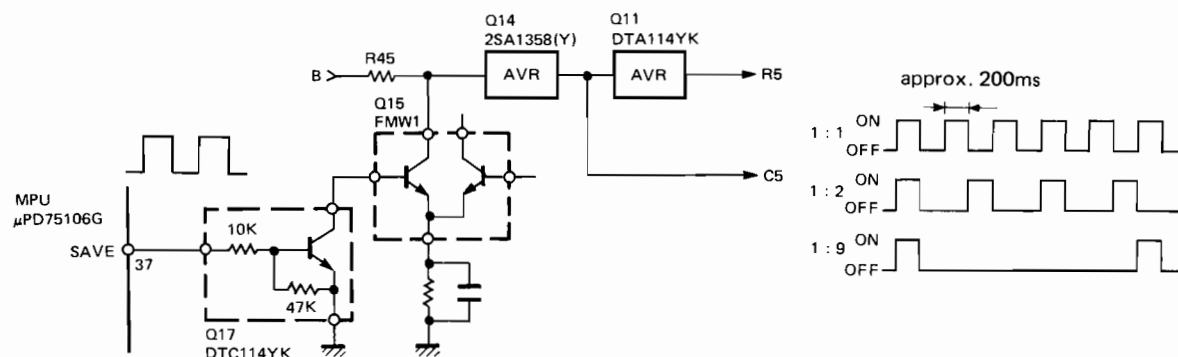
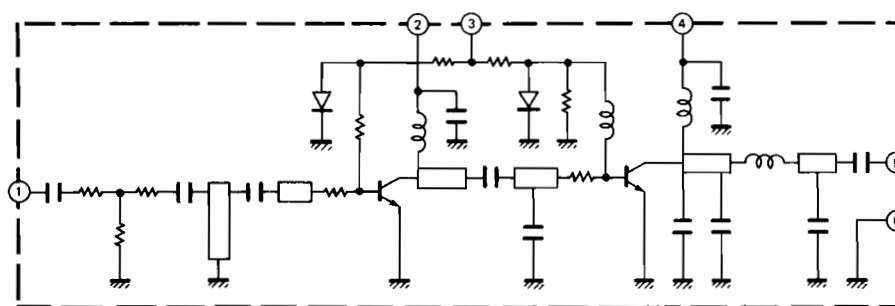


Fig. 6 Battery power save circuit

### RF POWER AMP M57732L(RF UNIT IC1)

#### ● Equivalent circuit



#### ● Electrical characteristic

| Item               | Symbol         | Rating |     |     | Unit | Condition        |
|--------------------|----------------|--------|-----|-----|------|------------------|
|                    |                | Min    | Max | Typ |      |                  |
| Output power       | $P_{01}$       | 7      | 8   | —   | W    | $V_{cc} = 12.5V$ |
| Total efficiency   | $\eta_T$       | 40     | 45  | —   | %    | $V_{cc} = 12.5V$ |
| 2nd spurious       |                | —      | —   | -20 | dB   | $V_{cc} = 12.5V$ |
| Spurious after 3rd |                | —      | —   | -30 | dB   | $V_{cc} = 12.5V$ |
| Input SWR          | $\delta_{in}$  | —      | 1.5 | 2.5 | —    | $V_{cc} = 12.5V$ |
| Output SWR         | $\delta_{out}$ | —      | 1.5 | —   | —    | $V_{cc} = 12.5V$ |
| Output power       | $P_{02}$       | 5      | 6   | —   | W    | $V_{cc} = 10.8V$ |
| Output power       | $P_{03}$       | 3.5    | 4   | —   | W    | $V_{cc} = 8.4V$  |
| Output power       | $P_{04}$       | 1.5    | 2   | —   | W    | $V_{cc} = 7.2V$  |

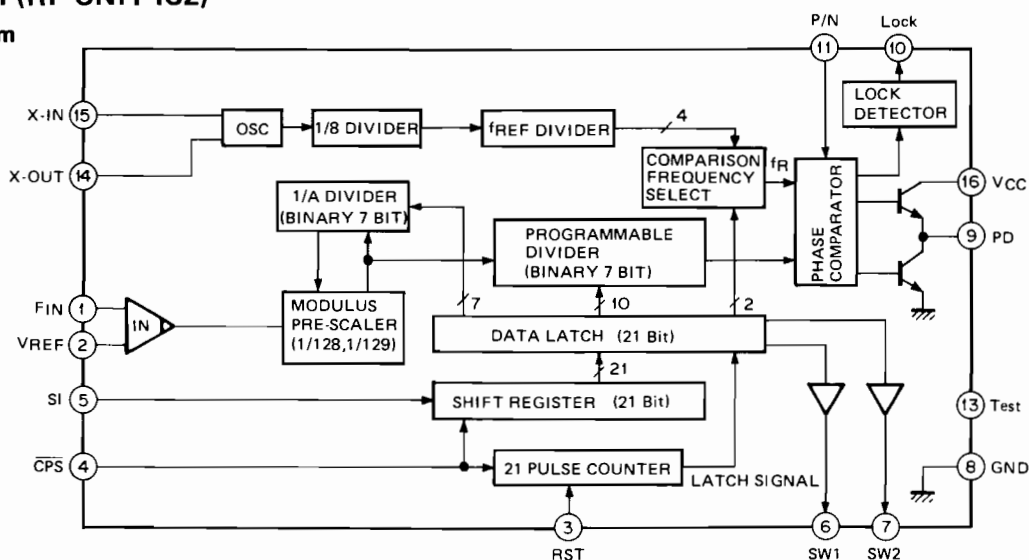
1:INPUT  
2:PRE-DRIVE+B  
3:BIAS+B  
4:FINAL+B  
5:OUTPUT  
6:GND

( $T_a = 25^\circ C$ ,  $V_{BB} = 5V$ ,  $f = 135 \sim 160MHz$ ,  $P_{in} = 20mW$ ,  $Z_G = Z_L = 50\Omega$ )

## SEMICONDUCTOR DATA

## PLL M54959P(RF UNIT IC2)

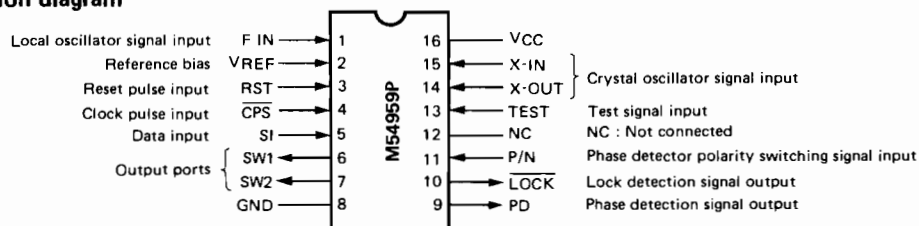
- **Block diagram**



### ● Description of terminals

| No. | Symbol | Pin name                               | Description                                                                                                                                                        |
|-----|--------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | FIN    | Local oscillator signal input          | Local oscillator frequency (VCO input; fMAX = 500MHz).                                                                                                             |
| 2   | VREF   | Reference bias                         | Grounded by a 1000pF capacitor.                                                                                                                                    |
| 3   | RST    | Reset pulse input                      | Reset pulse input for 21-pulse counter.                                                                                                                            |
| 4   | CPS    | Clock pulse input                      | Clock pulse input for shift register.                                                                                                                              |
| 5   | SI     | Data input                             | Data input for shift register.                                                                                                                                     |
| 6   | SW1    | Output ports                           | Output ports whose status is determined by the data sent from the controller.                                                                                      |
| 7   | SW2    |                                        | Open collector.                                                                                                                                                    |
| 8   | GND    | Ground                                 | 0V.                                                                                                                                                                |
| 9   | PD     | Phase detection signal output          | Tristate.                                                                                                                                                          |
| 10  | LOCK   | Lock detection signal output           | “L” when the PLL unit is locked; “H” when it is unlocked. Open collector.                                                                                          |
| 11  | P/N    | Phase detector polarity switching      | When this pin is “H”, the PD pin is “H” for phase lead and “L” for phase delay.<br>When this pin is “L”, the PD pin is “L” for phase lead and “H” for phase delay. |
| 12  | NC     | Not connected                          | Used open or as ground.                                                                                                                                            |
| 13  | Test   | Test signal input                      | Usually “L”. When this pin is “H”, fR (comparison frequency) and fIN/N (programmable divider) are output from SW1 (pin 6) and SW2 (pin 7), respectively.           |
| 14  | X-OUT  | Liquid crystal oscillator signal input | Inputs signals sent from the 12.8MHz basic oscillator to X-IN.                                                                                                     |
| 15  | X-IN   |                                        | Oscillation is possible even when an external crystal resonator is used.                                                                                           |
| 16  | Vcc    | Power supply                           | 4.5~5.5V.                                                                                                                                                          |

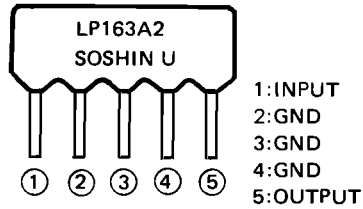
- **Terminal connection diagram**



## SEMICONDUCTOR DATA

## LPF LP163A2(RF UNIT L8)

## ● Outside view



## ● Electrical characteristic

| Item                       | Rating                    |
|----------------------------|---------------------------|
| Input and output impedance | 50Ω                       |
| Pass bandwidth             | 142–163MHz                |
| Loss                       | 0.7dB or less             |
| V.S.W.R.                   | 1.5 or less               |
| Attenuation                | 35dB or more (284–500MHz) |

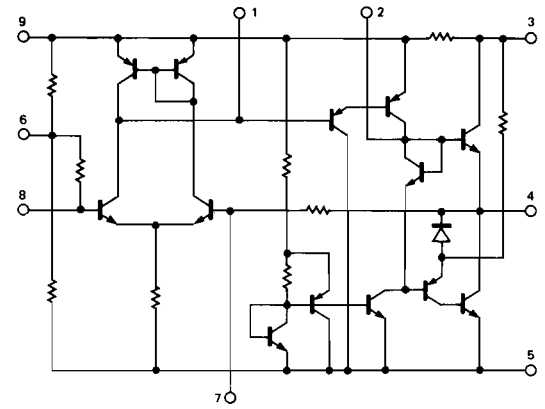
## AF POWER AMP BA526(IF UNIT IC2)

## ● Electrical characteristic

| Item                 | Symbol             | Rating |      |      | Unit | Condition                                      |
|----------------------|--------------------|--------|------|------|------|------------------------------------------------|
|                      |                    | Min.   | Typ. | Max. |      |                                                |
| DC current           | I <sub>cc</sub>    | —      | 12   | 24   | mA   | V <sub>IN</sub> = 0V                           |
| Voltage gain         | G <sub>vc</sub>    | 48     | 52   | 54   | dB   | R <sub>NF</sub> = 47Ω, V <sub>IN</sub> = 2.5mV |
| Max. output power    | P <sub>o</sub> MAX | 600    | 700  | —    | mW   | V <sub>IN</sub> = 25mV                         |
| Spec. output power   | P <sub>o</sub>     | 350    | 430  | —    | mW   | T.H.D. = 10%                                   |
| Noise output voltage | V <sub>NO</sub>    | —      | 0.25 | 0.7  | mV   | R <sub>g</sub> = 0Ω                            |
| Distortion           | T.H.D.             | —      | 0.4  | 2    | %    | P <sub>o</sub> = 50mW                          |
| Input resistance     | Z <sub>IN</sub>    | —      | 22   | —    | kΩ   | 1kHz P <sub>o</sub> = 50mW                     |

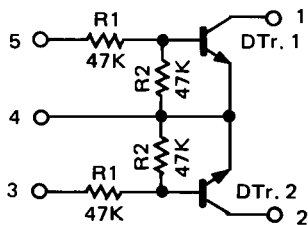
(T<sub>a</sub> = 25°C, V<sub>CC</sub> = 6V, R<sub>L</sub> = 8Ω, f = 1kHz)

## ● Equivalent circuit



## FMG2 (IF UNIT Q6,10,19)

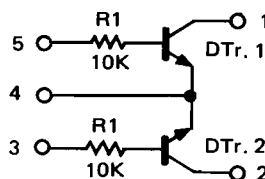
## ● Equivalent circuit



1: Tr1 OUT  
2: Tr2 OUT  
3: Tr2 IN  
4: GND  
5: Tr1 IN

## FMG4 (RF UNIT Q11,14)

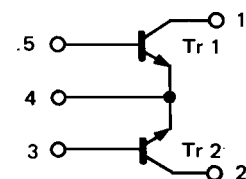
## ● Equivalent circuit



1: Tr1 OUT  
2: Tr2 OUT  
3: Tr2 IN  
4: GND  
5: Tr1 IN

## FMW1 (IF UNIT Q15, RF UNIT Q5)

## ● Equivalent circuit



1: Tr1 Collector  
2: Tr2 Collector  
3: Tr2 Base  
4: Tr1, 2 Emitter  
5: Tr1 Base

## SEMICONDUCTOR DATA

μPD75106G-514-1B (Case ass'y IC1)

## ● Terminal functions

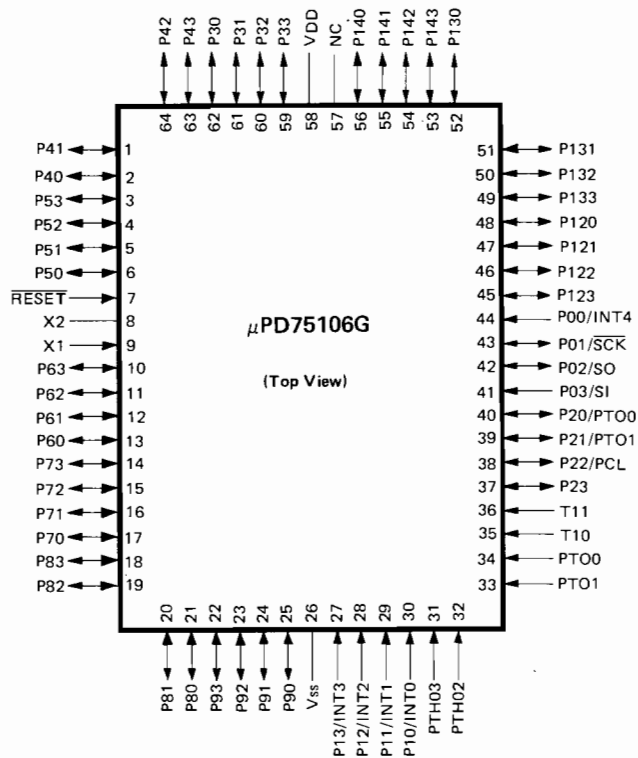
| Pin No. | Port name | I/O | Name | Function                                                         |
|---------|-----------|-----|------|------------------------------------------------------------------|
| 1       | P41       | O   |      | TONE bit 5, 1750 (T,W only)                                      |
| 2       | P40       | O   |      | TONE bit 4, 1750 (T,W only)                                      |
| 3       | P53       | O   |      | TONE bit 3, 1750 (T,W only)                                      |
| 4       | P52       | O   |      | TONE bit 2, 1750 (T,W only)                                      |
| 5       | P51       | O   |      | TONE bit 1.                                                      |
| 6       | P50       | O   |      | TONE bit 0.                                                      |
| 7       | RESET     | I   |      | Reset.                                                           |
| 8       | X2        | O   |      | X'tal oscillator.                                                |
| 9       | X1        | I   |      | X'tal oscillator.                                                |
| 10      | P63       | —   |      | Not used.                                                        |
| 11      | P62       | O   | TRS  | Power supply for TONE SQL unit, "H" : Power ON, "L" : Power OFF. |
| 12      | P61       | I   |      | μPD7225G RESET.                                                  |
| 13      | P60       | O   |      | μPD7225G BUSY.                                                   |
| 14      | P73       | O   |      | μPD7225G C/D.                                                    |
| 15      | P72       | O   |      | μPD7225G CS.                                                     |
| 16      | P71       | O   |      | μPD7225G SI.                                                     |
| 17      | P70       | O   |      | μPD7225G SCK.                                                    |
| 18      | P83       | O   |      | DTMF bit 7.                                                      |
| 19      | P82       | O   |      | DTMF bit 6.                                                      |
| 20      | P81       | O   |      | DTMF bit 5.                                                      |
| 21      | P80       | O   |      | DTMF bit 4.                                                      |
| 22      | P93       | O   |      | DTMF bit 3.                                                      |
| 23      | P92       | O   |      | DTMF bit 2.                                                      |
| 24      | P91       | O   |      | DTMF bit 1.                                                      |
| 25      | P90       | O   |      | DTMF bit 0.                                                      |
| 26      | Vss       | —   |      | GND.                                                             |
| 27      | P13/INT3  | I   | J4   | Customer's pin.                                                  |
| 28      | P12/INT2  | I   | J3   | Customer's pin.                                                  |
| 29      | P11/INT1  | I   | J2   | Customer's pin.                                                  |
| 30      | P10/INT0  | I   | J1   | Customer's pin.                                                  |
| 31      | PTH03     | —   |      | Not used.                                                        |
| 32      | PTH02     | —   |      | Not used.                                                        |
| 33      | PTH01     | I   |      | Battery warning, analog input.                                   |
| 34      | PTH00     | I   | SM   | S meter, analog input.                                           |
| 35      | TI0       | I   | UL   | "H" : PLL Unlocked, "L" : PLL Locked.                            |
| 36      | TI1       | I   | SQ   | "H" : SQ Close.                                                  |
| 37      | P23       | O   | SAVE | OPEN : Power Save operation, "L" : NORMAL operation.             |
| 38      | P22/PCL   | O   | TX   | "H" : TX, "L" : RX, OPEN Power Save operation.                   |
| 39      | P21/PT01  | O   | BEEP | BEEP sound output.                                               |
| 40      | P20/PT00  | O   | AFC  | "H" : SP OFF, "L" : SP ON, OPEN Power Save operation.            |
| 41      | P03/SI    | —   |      | Not used.                                                        |
| 42      | P02/SO    | O   | TD   | DATA for TONE SQL unit.                                          |
| 43      | P01/SCK   | O   | TCK  | CLOCK for TONE SQL unit.                                         |
| 44      | P00/INT4  | I   | BU   | "H" : Normal operation, "L" : Backup operation switching.        |
| 45      | P123      | —   |      | Not used.                                                        |
| 46      | P122      | I   | TS   | "H" : TONE OFF, "L" : TONE ON.                                   |
| 47      | P121      | I   | ST   | "H" : PTT OFF, "L" : PTT ON.                                     |
| 48      | P120      | I   |      | Key matrix (DOWN, 0, UP, SCAN).                                  |
| 49      | P133      | I   |      | Key matrix (7, 8, 9, ENTER).                                     |
| 50      | P132      | I   |      | Key matrix (4, 5, 6, M).                                         |
| 51      | P131      | I   |      | Key matrix (1, 2, 3, F).                                         |
| 52      | P130      | I   |      | Key matrix (OFFSET, REV, SAVE).                                  |
| 53      | P143      | O   |      | Key matrix (SAVE, M, F, ENTER, SCAN).                            |
| 54      | P142      | O   |      | Key matrix (REV, 3, 6, 9, UP).                                   |
| 55      | P141      | O   |      | Key matrix (OFFSET, 2, 5, 8, 0).                                 |
| 56      | P140      | O   |      | Key matrix (1, 4, 7, DOWN).                                      |
| 57      | NC        | —   |      | Not used.                                                        |
| 58      | VDD       | —   | VDD  | Power supply (+ 5V).                                             |
| 59      | P33       | —   |      | Not used.                                                        |
| 60      | P32       | O   | CPS  | CLOCK for PLL IC.                                                |
| 61      | P31       | O   | SI   | DATA for PLL IC.                                                 |
| 62      | P30       | O   | RST  | RESET for PLL IC.                                                |
| 63      | P43       | O   |      | Tone bit 7, 1750 (T,W only)                                      |
| 64      | P42       | O   |      | Tone bit 6, 1750 (T,W only)                                      |



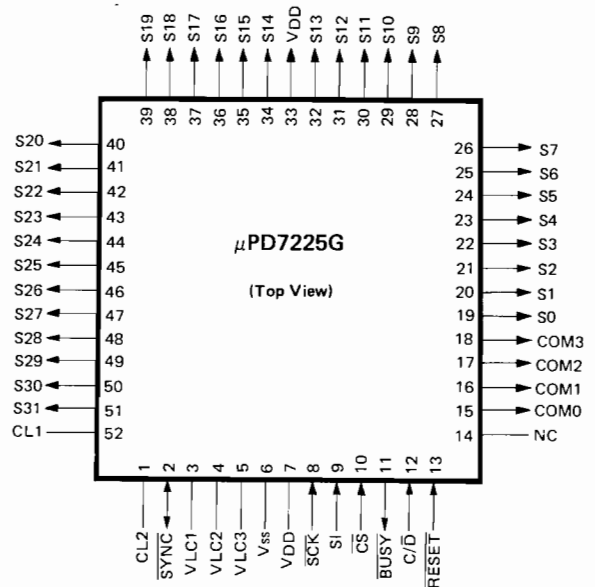
## SEMICONDUCTOR DATA

 $\mu$ PD75106G-514-1B (Case ass'y IC1)

## ● Terminal connection diagram

 $\mu$ PD7225G (Case ass'y IC2)

## ● Terminal connection diagram

 $\mu$ PD7225G (Case ass'y IC2)

## ● Terminal functions

| Pin No. | Pin name                       | Function                                  |
|---------|--------------------------------|-------------------------------------------|
| 1       | CL2                            | R connection for CLOCK signal generation. |
| 2       | $\overline{\text{SYNC}}$       | Not used.                                 |
| 3       | VLC1                           | LCD driver power supply.                  |
| 4       | VLC2                           | LCD driver power supply.                  |
| 5       | VLC3                           | LCD driver power supply.                  |
| 6       | Vss                            | GND.                                      |
| 7       | VDD                            | Power supply.                             |
| 8       | $\overline{\text{SCK}}$        | Serial clock input.                       |
| 9       | SI                             | Serial data output.                       |
| 10      | $\overline{\text{CS}}$         | Chip select input.                        |
| 11      | $\overline{\text{BUSY}}$       | BUSY output.                              |
| 12      | $\text{C}/\overline{\text{D}}$ | Command/Data select input.                |
| 13      | $\overline{\text{RESET}}$      | Reset input.                              |
| 14      | NC                             | Not used.                                 |
| 15      | COM0                           | Common signal output                      |
| 16      | COM1                           | Common signal output.                     |
| 17      | COM2                           | Common signal output.                     |
| 18      | COM3                           | Common signal output.                     |
| 19~32   | S0~S13                         | Segment signal output.                    |
| 33      | VDD                            | Not used.                                 |
| 34~51   | S14~S31                        | Segment signal output.                    |
| 52      | CL1                            | R connection for CLOCK signal generation. |

## DESCRIPTION OF COMPONENTS

## RF UNIT (X44-3000-10)

| Component | Name          | Function                                                       |
|-----------|---------------|----------------------------------------------------------------|
| IC1       | M57732L       | Transmission power amplification.                              |
| IC2       | M54959P       | PLL.                                                           |
| Q1        | 2SC2714(O)    | VCO output amplifier.                                          |
| Q2        | 2SC3838K(N,P) | Transmission amplifier.                                        |
| Q3        | 2SC2407       | Transmission amplifier.                                        |
| Q4        | 2SA1313(Y)    | Current control for D3.                                        |
| Q5        | FMW1          | APC.                                                           |
| Q6        | 2SC3356       | RF amplifier for reception.                                    |
| Q7        | 2SC2714(O)    | RF amplifier for reception.                                    |
| Q8        | 2SK210(GR)    | 1st mixer for reception.                                       |
| Q9        | 2SC2714(O)    | 1st IF amplifier for reception.                                |
| Q10       | 2SC3838K(N,P) | HFT (VCO) amplifier.                                           |
| Q11       | FMG4          | Varicap tuning voltage control.                                |
| Q12,Q13   | 2SC2712(GR)   | Active filter.                                                 |
| Q14       | FMG4          | VCO power supply switching for transmission and reception.     |
| D1        | HSM2693       | Transmission/reception switching.                              |
| D2        | DA204K        | Q3 bias setting.                                               |
| D3        | 1SV172        | Control on RF signal input to final module.                    |
| D4        | DA204K        | Q5 bias setting.                                               |
| D5        | MI303         | Transmission/reception switching (Transmission : ON).          |
| D6        | MI301         | Transmission/reception switching (Transmission : ON).          |
| D7        | 1SS277        | Protection of receiving unit against excessive input.          |
| D8,D9     | HSM88AS       | APC detection.                                                 |
| D10~D13   | 1SV153        | Varicap tuning.                                                |
| D14       | ERB83-004     | Protection against reverse connection.                         |
| D15       | UZP-22B       | Protection against over-voltage.                               |
| D16       | ERB83-004     | Battery protection for the external DC power supply operation. |

## IF UNIT (X48-3020-XX)

-10 : K,M1,M2,X (TH-215A), -51 : T,W (TH-215E)

| Component | Name        | Function                                                                                                                                                                            |
|-----------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IC1       | TA7761P     | 1st IF amplifier receiver, 2nd OSC, 2nd MIX, 2nd IF amplifier, DISC.<br>⑦S meter output, ⑨Detection signal output, ⑪AF amplifier output, ⑬Noise amplifier output, ⑮IF signal input. |
| IC2       | BA526       | AF power amplifier ④output, ⑧input.                                                                                                                                                 |
| IC3       | S-8054HN    | Backup reset ① output ("H" → "L" Backup).                                                                                                                                           |
| IC4       | LVC550C     | Microprocessor power supply ①input, ③output.                                                                                                                                        |
| IC5       | LVC550C     | KEY, 5V AVR for M5, ① input, ③ output.                                                                                                                                              |
| Q1        | 2SC2712(GR) | SQL SW, BUSY : OFF.                                                                                                                                                                 |
| Q2        | 2SC2712(GR) | SQL noise amplifier.                                                                                                                                                                |
| Q3        | DTC144EK    | SQL AUTO/MANUAL SW.                                                                                                                                                                 |
| Q4        | 2SC2712(GR) | AF amplifier.                                                                                                                                                                       |
| Q5        | 2SJ106(GR)  | Hysteresis characteristic switching for SQL circuit, BUSY : ON.                                                                                                                     |
| Q6        | FMG2        | SW : ① Turns OFF the MIC input when sound is generated from SP while transmitting (when DTMF, BEEP, etc., output).<br>② Turns OFF the AF amplifier power supply when AFC is "H".    |
| Q7        | 2SC2712(GR) | AF amplifier power supply.                                                                                                                                                          |
| Q8        | 2SA1241(Y)  | AF amplifier power supply.                                                                                                                                                          |
| Q9        | DTC143XK    | BEEP sound amplifier.                                                                                                                                                               |
| Q10       | FMG2        | SW : ① Turns SPL "L" when using DTMF while transmitting with TONE SQL unit.<br>② Turns the line for MOD pin "L" to cut the microprocessor noise while receiving.                    |
| Q11       | DTA114YK    | R5 power supply SW.                                                                                                                                                                 |
| Q12       | DTA144EK    | R5 power supply SW.                                                                                                                                                                 |
| Q13       | 2SA1313(Y)  | T5 power supply SW.                                                                                                                                                                 |
| Q14       | 2SA1358(Y)  | C5 power supply.                                                                                                                                                                    |
| Q15       | FMW1        | C5 power supply.                                                                                                                                                                    |
| Q16       | DTC114YK    | T5 power supply SW.                                                                                                                                                                 |
| Q17       | DTC114YK    | SW : Turns C5 ON/OFF in SAVE mode.                                                                                                                                                  |
| Q18       | DTC114YK    | SW : Turns SQ pin "L" in SAVE (C5 OFF) mode.                                                                                                                                        |
| Q19       | FMG2        | SW : Forces SQL open when monitoring.                                                                                                                                               |
| Q20       | DTC144EK    | SW : Turns MIC input OFF when transmitting DTMF. <b>K,M1,M2,X only</b>                                                                                                              |
| D1        | HSM88AS     | SQL noise rectification.                                                                                                                                                            |
| D3        | 1SS184      | SW : Power supply for AF amplifier, AFC, OR circuit for SPO.                                                                                                                        |
| D4        | 02CZ8.2     | AVR                                                                                                                                                                                 |
| D5        | 02CZ8.2     | AVR                                                                                                                                                                                 |
| D6        | 1SS184      | SW : Switching for microprocessor power supply.                                                                                                                                     |
| D7        | 1SS226      | AVR voltage shift (approx. 0.6V).                                                                                                                                                   |

## PARTS LIST

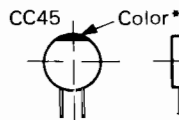
### CAPACITORS

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

#### • 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   |



#### • 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

| 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<br>- 20 | + 80<br>- 20 | + 100<br>- 0 | 10μF-10~+50<br>4.7μF-10~+75 |

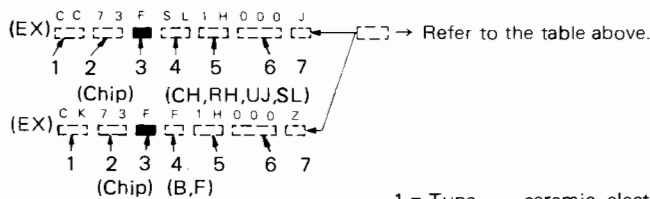
| Code | B     | C      | D     | F   | G   |
|------|-------|--------|-------|-----|-----|
| (pF) | ± 0.1 | ± 0.25 | ± 0.5 | ± 1 | ± 2 |

Less than 10 pF

#### • Rating voltage

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

#### • Chip capacitors



#### Dimension

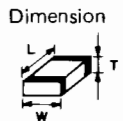
| Dimension code | L         | W          | T              |
|----------------|-----------|------------|----------------|
| Empty          | 5.6 ± 0.5 | 5.0 ± 0.5  | Less than 2.0  |
| E              | 3.2 ± 0.2 | 1.6 ± 0.2  | Less than 1.25 |
| F              | 2.0 ± 0.3 | 1.25 ± 0.2 | Less than 1.25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

#### Dimension

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

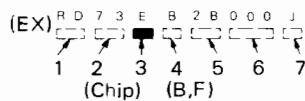
#### Rating wattage

| 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   |      |         |      |         |



### 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.

## PARTS LIST

### SEMICONDUCTOR

N : New parts

| Item                    | Re-<br>marks | Parts No.    |
|-------------------------|--------------|--------------|
| <b>Diode</b>            | N            | 1SS277       |
|                         |              | ERB83-004    |
|                         |              | MI301        |
|                         |              | MI303        |
| <b>Vari-cap</b>         |              | 1SV153       |
| <b>Chip Diode</b>       | N            | 1SS184       |
|                         |              | 1SS226       |
|                         |              | 1SV172       |
|                         |              | DA204K       |
| <b>Zener Diode</b>      | N            | HSM88AS      |
|                         |              | HSM2693      |
|                         |              | UZP-22B      |
| <b>Chip Zener Diode</b> | N            | 02CZ8.2      |
| <b>Thermister</b>       |              | 112-101-2    |
|                         |              | 112-202-2    |
| <b>Posistor</b>         |              | PTH59T103M   |
| <b>TR</b>               | N            | 2SA1241(Y)   |
|                         |              | 2SA1358(Y)   |
|                         |              | 2SB1182F5(Q) |
|                         |              | 2SC2407      |

| Item              | Re-<br>marks | Parts No.        |
|-------------------|--------------|------------------|
| <b>Chip TR</b>    | N            | 2SA1313(Y)       |
|                   |              | 2SC2412K         |
|                   |              | 2SC2712(GR)      |
|                   |              | 2SC2714(O)       |
| <b>Digital TR</b> | N            | 2SC3356          |
|                   |              | 2SC3838K(N,P)    |
|                   |              | DTA114YK         |
|                   |              | DTA144EK         |
| <b>Chip FET</b>   | N            | DTC114YK         |
|                   |              | DTC144EK         |
|                   |              | DTC143XK         |
|                   |              | FMG2             |
| <b>IC</b>         | N            | FMG4             |
|                   |              | FMW1             |
|                   |              | 2SK210(GR)       |
|                   |              | 2SK302(GR)       |
|                   |              | 2SJ106(GR)       |
|                   |              | BA526            |
|                   |              | LVC550C          |
|                   | N            | M54959P          |
|                   | N            | M57732L          |
|                   | N            | NJM4560M         |
|                   |              | S-8054HN         |
|                   |              | TA7761P          |
|                   |              | μPD75106G-514-1B |
|                   |              | μPD7225G         |

## PARTS LIST

\* New Parts

Parts without Parts No. are not supplied.

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

Teile ohne Parts No. werden nicht geliefert.

| Ref. No.<br>参照番号 | Address<br>位置 | New<br>Parts<br>新 | Parts No.<br>部品番号 | Description<br>部品名 / 規格      | Desti-<br>nation<br>仕向 | Re-<br>marks<br>備考 |
|------------------|---------------|-------------------|-------------------|------------------------------|------------------------|--------------------|
| TH-215A/E        |               |                   |                   |                              |                        |                    |
| 1                | 3B            | *                 | A01-1018-15       | CASE                         |                        |                    |
| 2                | 3D            |                   | A02-0728-13       | BATTERY CASE ASSY            | M1M2                   |                    |
| 5                | 1A            | *                 | A02-0761-05       | CASE ASSY                    | K                      |                    |
| 5                | 1A            | *                 | A02-0762-05       | CASE ASSY                    | M1X                    |                    |
| 5                | 1A            | *                 | A02-0763-05       | CASE ASSY                    | M2                     |                    |
| 5                | 1A            | *                 | A02-0765-05       | CASE ASSY                    | TW                     |                    |
| 7                | 3A            | *                 | A20-2612-14       | PANEL ASSY                   | KM1M2X                 |                    |
| 7                | 3A            | *                 | A20-2613-14       | PANEL ASSY                   | TW                     |                    |
| 8                | 2A            |                   | A22-0749-13       | SUB PANEL                    |                        |                    |
| 10               | 3B            |                   | A40-0620-13       | BOTTOM PLATE                 |                        |                    |
| 14               | 3C            |                   | B09-0307-14       | CAP (ACSY)                   |                        |                    |
| 17               | 3A            |                   | B40-3687-04       | MODEL NAME PLATE             | KM1M2X                 |                    |
| 17               | 3A            | *                 | B40-3689-04       | MODEL NAME PLATE             | TW                     |                    |
| 18               | 1D            | *                 | B50-8120-10       | INSTRUCTION MANUAL           |                        |                    |
| 19               | 1D            |                   | B46-0410-10       | WARRANTY CARD                | K                      |                    |
| 20               | 1D            |                   | B58-0682-04       | CAUTION CARD                 | M1M2                   |                    |
| -                |               | *                 | B42-2437-04       | LABEL                        |                        |                    |
| -                |               | *                 | B42-2454-04       | LABEL                        |                        |                    |
| C42              |               |                   | CC45SL1H180J      | CERAMIC 18PF J               |                        |                    |
| 20               | 3B            |                   | D10-0602-04       | LEVER (BATTERY RELEASE       |                        |                    |
| 22               | 2B            |                   | E23-0474-14       | TERMINAL (BATT)              |                        |                    |
| 23               | 3B            |                   | E23-0432-04       | TERMINAL                     |                        |                    |
| 29               | 2A            | *                 | E31-3209-05       | CONNECTING WIRE(DC LINE)     |                        |                    |
| 30               | 2A            |                   | E40-5089-05       | PIN CONNECTOR (24P)          |                        |                    |
| -                |               |                   | E31-3207-08       | FLAT CABLE (15P)             |                        |                    |
| -                |               | *                 | E31-3210-05       | CONNECTING WIRE(JIG FOR ADJ) |                        |                    |
| -                |               |                   | E31-3211-08       | FLAT CABLE (10P)             |                        |                    |
| J1               | 2A            |                   | E11-0420-15       | MIC JACK                     |                        |                    |
| J2               | 2A            |                   | E11-0421-05       | PHONE JACK                   |                        |                    |
| J3               | 2A            |                   | E03-0165-05       | DC IN JACK                   |                        |                    |
| J4               | 2A            |                   | E04-0160-05       | BNC RECEPTACLE               |                        |                    |
| 32               | 2B            |                   | F19-0646-04       | BLIND PLATE                  |                        |                    |
| 34               | 1A            |                   | F20-0521-04       | INSULATING SHEET(BATT,-)     |                        |                    |
| 35               | 3A            |                   | F20-0574-04       | INSULATING SHEET(CASE)       |                        |                    |
| 36               | 1A            |                   | F20-0520-04       | INSULATING BOARD(BATT,+)     |                        |                    |
| 37               | 2B            |                   | F20-0575-04       | INSULATING SHEET(VCO)        |                        |                    |
| 40               | 3B            |                   | G01-0833-04       | COIL SPRING                  |                        |                    |
| 41               | 3A            |                   | G01-0834-04       | COIL SPRING                  |                        |                    |
| 43               | 2A            |                   | G10-0644-04       | FELT (AF,SQL VR)             |                        |                    |
| 44               | 2B            |                   | G11-0617-04       | CUSHION (FOR BATT TERMINAL   |                        |                    |
| 46               | 3A            |                   | G13-0846-04       | CUSHION (FOR BLIND PLATE)    |                        |                    |
| 47               | 2A            |                   | G13-0814-04       | CUSHION                      |                        |                    |
| 48               | 2C            | *                 | H01-8051-02       | ITEM CARTON BOX(TH-215A)     | KM1M2X                 |                    |
| 48               | 2C            | *                 | H01-8053-02       | ITEM CARTON BOX(TH-215E)     | W                      |                    |
| 49               | 1D            |                   | H21-0713-04       | PROTECTION SHEET             |                        |                    |
| 50               | 1D            |                   | H11-0808-14       | BUFFER(TOP) 215X153X13       |                        |                    |
| 51               | 3D            |                   | H11-0809-04       | BUFFER (20X68X10)            |                        |                    |
| 52               | 1C,3C         |                   | H13-0801-04       | BUFFER                       |                        |                    |
| 53               | 2D            |                   | H25-0103-04       | BAG (125X250)                |                        |                    |
| 54               | 3D            |                   | H10-2618-02       | POLYSTYRENE FOAMED FIXTURE   |                        |                    |

E: Scandinavia &amp; Europe K: USA P: Canada W: Europe

U: PX(Far East, Hawaii) T: England M: Other Areas

UE: AAFES(Europe) X: Australia

⚠ indicates safety critical components.

## PARTS LIST

\* New Parts

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| Ref. No.<br>参照番号         | Address<br>位置 | New<br>Parts<br>新 | Parts No.<br>部品番号 | Description<br>部品名 / 規格       | Desti-<br>nation<br>仕 向 | Re-<br>marks<br>備考 |
|--------------------------|---------------|-------------------|-------------------|-------------------------------|-------------------------|--------------------|
| 55                       | 2D            |                   | H25-0116-04       | BAG (80X180)                  | K                       |                    |
| 56                       | 1C, 2C        |                   | H25-0120-04       | BAG (150X150)                 | KXTW                    |                    |
| 57                       | 3C            |                   | H25-0076-03       | BAG (60X50)                   |                         |                    |
| 58                       | 2D            |                   | J29-0417-14       | BELT HOOK                     | K                       |                    |
| -                        |               |                   | J21-4217-04       | MOUNTING HARDWARE             |                         |                    |
| 62                       | 1A            |                   | K01-0414-04       | HANDLE                        |                         |                    |
| 63                       | 2A            | *                 | K23-0787-04       | KNOB (AF VOL, SQL)            |                         |                    |
| 64                       | 3A            |                   | K27-0494-04       | KNOB (TONE, LOW)              |                         |                    |
| 76                       | 3D            |                   | N16-0030-41       | SPRING WASHER (FOR BELT HOOK) | K                       |                    |
| 77                       | 2D            |                   | N35-3005-41       | BINDING HEAD MACHINE SCREW    | K                       |                    |
| 78                       | 3A            |                   | N19-0638-04       | FLAT WASHER                   |                         |                    |
| -                        |               |                   | N09-2015-05       | SCREW (BATTERY CASE)          | M1M2                    |                    |
| A                        | 3A, 3B        |                   | N09-2002-05       | SCREW (2X20)                  |                         |                    |
| B                        | 2A            |                   | N09-2008-05       | SCREW (2.6X8)                 |                         |                    |
| C                        | 3A, 3B        |                   | N09-2009-05       | SCREW (2X4.5)                 |                         |                    |
| D                        | 2B            |                   | N09-2010-05       | SCREW (2X6)                   |                         |                    |
| F                        | 2A            |                   | N09-2016-05       | SCREW (2X4)                   |                         |                    |
| G                        | 2B            |                   | N35-2005-41       | BINDING HEAD MACHINE SCREW    |                         |                    |
| H                        | 1A, 1B        |                   | N35-2608-41       | BINDING HEAD MACHINE SCREW    |                         |                    |
| K                        | 2A            |                   | N87-2605-46       | BRAZIER HEAD TAPTITE SCREW    |                         |                    |
| VR3                      | 1A            |                   | R05-4419-05       | SQL VOL (50KB)                |                         |                    |
| VR4                      | 1A            |                   | R05-3440-05       | AF VOL (10KA)                 |                         |                    |
| S3                       | 1A            |                   | S40-1401-05       | PUSH SWITCH (SELF LOCK)       | KM1M2X                  |                    |
| S3                       | 1A            |                   | S40-1401-05       | PUSH SWITCH (SELF LOCK)       | T                       |                    |
| S3                       | 1A            |                   | S40-1402-05       | PUSH SWITCH (NON LOCK)        | W                       |                    |
| S4                       | 1A            |                   | S40-1401-05       | PUSH SWITCH (SELF LOCK)       |                         |                    |
| 92                       | 3D            | *                 | T90-0352-05       | ANTENNA                       |                         |                    |
| 95                       | 2C            |                   | W09-0315-15       | BATTERY CHARGER(120V)         | K                       |                    |
| 95                       | 1C            |                   | W09-0317-15       | BATTERY CHARGER(220V)         | W                       |                    |
| 95                       | 1C            |                   | W09-0318-15       | BATTERY CHARGER(240V)         | T                       |                    |
| 95                       | 1C            |                   | W09-0319-15       | BATTERY CHARGER(240V)         | X                       |                    |
| 103                      | 2D            |                   | W09-0361-05       | BATTERY PACK                  | KTW                     |                    |
| 103                      | 2D            |                   | W09-0361-05       | BATTERY PACK                  | X                       |                    |
| B1                       | 1B            |                   | W09-0326-05       | LITHIUM BATTERY               |                         |                    |
| 106                      | 2B            |                   | X44-3000-10       | RF PC BOARD ASSY              |                         |                    |
| 107                      | 2A            |                   | X48-3020-10       | IF PC BOARD ASSY              | KM1M2                   |                    |
| 107                      | 2A            |                   | X48-3020-10       | IF PC BOARD ASSY              | X                       |                    |
| 107                      | 2A            |                   | X48-3020-51       | IF PC BOARD ASSY              | TW                      |                    |
| CASE ASS'Y (A02-076X-05) |               |                   |                   |                               |                         |                    |
| 200                      | 2B            | *                 | A02-0767-08       | CASE                          | KM1M2X                  |                    |
| 200                      | 2B            | *                 | A02-0769-08       | CASE                          | TW                      |                    |
| 201                      | 1B            | *                 | A33-0407-08       | REFLECTOR                     |                         |                    |
| 202                      | 1B            | *                 | B10-0693-08       | FRONT GLASS                   |                         |                    |
| -                        |               | *                 | B03-0542-08       | DRESSING PLATE                |                         |                    |
| -                        |               |                   | B30-0849-05       | LAMP (3V, 60MA)               |                         |                    |
| 203                      | 1B            | *                 | E29-0476-08       | LCD CONNECTOR (15P)           |                         |                    |
| 204                      | 2B            |                   | G01-0837-05       | COMPRESSION SPRING            |                         |                    |
| 205                      | 2B            |                   | J31-0526-04       | MIC SPACER                    |                         |                    |

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|-----------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| 206                   | 2B            |                   | K29-3054-05       | KN0B (PTT)              |                        |                    |
| 207                   | 2B            |                   | K29-3055-05       | KN0B (MONITOR)          |                        |                    |
| 209                   | 1B            |                   | T07-0244-08       | SPEAKER                 |                        |                    |
| 210                   | 1B            |                   | T91-0312-15       | MICROPHONE              |                        |                    |
| 211                   |               | *                 | FTD8391           | LCD                     |                        |                    |
| D1                    |               |                   | 02CZ8.2           | CHIP ZENER DIODE        |                        |                    |
| D2                    |               |                   | DA204K            | CHIP DIODE              |                        |                    |
| IC1                   |               |                   | 75106G-514-1B     | MPU                     |                        |                    |
| IC2                   |               |                   | UPD7225G          | LCD DRIVER              |                        |                    |
| Q1                    |               |                   | 2SC2412K          | CHIP TRANSISTOR         |                        |                    |
| Q2                    |               |                   | 2SB1182           | TRANSISTOR              |                        |                    |
| R10 ,18               |               | *                 | KRR-C001          | HIC                     |                        |                    |
| RF UNIT (X44-3000-10) |               |                   |                   |                         |                        |                    |
| C1 ,2                 |               |                   | CK73FB1H103K      | CHIP C 0.010UF K        |                        |                    |
| C3 ,4                 |               |                   | CK73FB1H102K      | CHIP C 1000PF K         |                        |                    |
| C5 -7                 |               |                   | CK73FB1H103K      | CHIP C 0.010UF K        |                        |                    |
| C8                    |               |                   | CC73FCH1H070D     | CHIP C 7.0PF D          |                        |                    |
| C9                    |               |                   | CC73FCH1H220J     | CHIP C 22PF J           |                        |                    |
| C10 -12               |               |                   | CK73FB1H103K      | CHIP C 0.010UF K        |                        |                    |
| C13                   |               |                   | CC73FCH1H150J     | CHIP C 15PF J           |                        |                    |
| C14                   |               |                   | CC73FCH1H060D     | CHIP C 6.0PF D          |                        |                    |
| C15 -19               |               |                   | CK73FB1H103K      | CHIP C 0.010UF K        |                        |                    |
| C20                   |               |                   | C90-2039-05       | ELECTR0 15UF 16WV       |                        |                    |
| C21                   |               |                   | C90-2048-05       | ELECTR0 6.8UF 6.3WV     |                        |                    |
| C22                   |               |                   | C90-2039-05       | ELECTR0 15UF 16WV       |                        |                    |
| C23                   |               |                   | CK73EB1E104K      | CHIP C 0.10UF K         |                        |                    |
| C24                   |               |                   | C90-2053-05       | ELECTR0 47UF 6.3WV      |                        |                    |
| C25                   |               |                   | C90-0478-05       | ELECTR0 10UF 16WV       |                        |                    |
| C26 -29               |               |                   | CK73FB1H103K      | CHIP C 0.010UF K        |                        |                    |
| C30                   |               |                   | C90-0484-05       | ELECTR0 0.47UF 50WV     |                        |                    |
| C31 ,32               |               |                   | CK73FB1H103K      | CHIP C 0.010UF K        |                        |                    |
| C33                   |               |                   | CC73FCH1H390J     | CHIP C 39PF J           |                        |                    |
| C34 ,35               |               |                   | CC73FCH1H010C     | CHIP C 1.0PF C          |                        |                    |
| C36                   |               |                   | CK73FB1H102K      | CHIP C 1000PF K         |                        |                    |
| C37 ,38               |               |                   | CC73FCH1H010C     | CHIP C 1.0PF C          |                        |                    |
| C39                   |               |                   | CC73FCH1H390J     | CHIP C 39PF J           |                        |                    |
| C40 ,41               |               |                   | CK73FB1H103K      | CHIP C 0.010UF K        |                        |                    |
| C43                   |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C44                   |               |                   | CC73FCH1H270J     | CHIP C 27PF J           |                        |                    |
| C45 ,46               |               |                   | CC73FCH1H040C     | CHIP C 4.0PF C          |                        |                    |
| C47                   |               |                   | CC73FCH1H070D     | CHIP C 7.0PF D          |                        |                    |
| C48                   |               |                   | CC73FCH1H101J     | CHIP C 100PF J          |                        |                    |
| C49 ,50               |               |                   | CK73FB1H102K      | CHIP C 1000PF K         |                        |                    |
| C51                   |               |                   | CC73FCH1H070D     | CHIP C 7.0PF D          |                        |                    |
| C52                   |               |                   | CC73FCH1H020C     | CHIP C 2.0PF C          |                        |                    |
| C53                   |               |                   | CK73FB1H103K      | CHIP C 0.010UF K        |                        |                    |
| C54                   |               |                   | CC73FCH1H0R5C     | CHIP C 0.5PF C          |                        |                    |
| C55                   |               |                   | CC73FCH1H070D     | CHIP C 7.0PF D          |                        |                    |
| C56                   |               |                   | CC73FCH1H030C     | CHIP C 3.0PF C          |                        |                    |
| C57                   |               |                   | CK73FB1H103K      | CHIP C 0.010UF K        |                        |                    |
| C58                   |               |                   | CC73FCH1H0R5C     | CHIP C 0.5PF C          |                        |                    |
| C59                   |               |                   | CC73FCH1H070D     | CHIP C 7.0PF D          |                        |                    |
| C60 ,61               |               |                   | CK73FB1H103K      | CHIP C 0.010UF K        |                        |                    |

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|------------------|---------------|-------------------|-------------------|---------------------------------|------------------------|--------------------|
| C62              |               |                   | CC73FCH1H180J     | CHIP C 18PF J                   |                        |                    |
| C63 -65          |               |                   | CK73FB1H103K      | CHIP C 0.010UF K                |                        |                    |
| C66              |               |                   | CC73FCH1H080D     | CHIP C 8.0PF D                  |                        |                    |
| C67              |               |                   | CC73FCH1H330J     | CHIP C 33PF J                   |                        |                    |
| C68 ,69          |               |                   | CK73FB1H103K      | CHIP C 0.010UF K                |                        |                    |
| C70              |               |                   | CC73FCH1H070D     | CHIP C 7.0PF D                  |                        |                    |
| C71              |               |                   | CC73FCH1H180J     | CHIP C 18PF J                   |                        |                    |
| C72              |               |                   | C90-2053-05       | ELECTRØ 47UF 6.3WV              |                        |                    |
| C73              |               |                   | CK73FB1H103K      | CHIP C 0.010UF K                |                        |                    |
| C74              |               |                   | CC73FCH1H560J     | CHIP C 56PF J                   |                        |                    |
| C75              |               |                   | CC73FCH1H150J     | CHIP C 15PF J                   |                        |                    |
| C76              |               |                   | CK73FB1H103K      | CHIP C 0.010UF K                |                        |                    |
| C77              |               |                   | C90-0478-05       | ELECTRØ 10UF 16WV               |                        |                    |
| C78              |               |                   | CK73FB1H102K      | CHIP C 1000PF K                 |                        |                    |
| C79              |               |                   | CK73FB1E223K      | CHIP C 0.022UF K                |                        |                    |
| C80              |               |                   | CK73FB1H182K      | CHIP C 1800PF K                 |                        |                    |
| C81              |               |                   | CC73FCH1H101J     | CHIP C 100PF J                  |                        |                    |
| C82              |               |                   | CC73FSL1H471J     | CHIP C 470PF J                  |                        |                    |
| C83              |               |                   | CK73FB1H103K      | CHIP C 0.010UF K                |                        |                    |
| C84              |               |                   | CS15E1C010M       | TANTAL 1.0UF 16WV               |                        |                    |
| C85              |               |                   | CS15E1VR47M       | TANTAL 0.47UF 35WV              |                        |                    |
| C86 ,87          |               |                   | CK73FB1H103K      | CHIP C 0.010UF K                |                        |                    |
| C88              |               |                   | CK73FB1H102K      | CHIP C 1000PF K                 |                        |                    |
| C89              |               |                   | CK73EB1E104K      | CHIP C 0.10UF K                 |                        |                    |
| C90              |               |                   | C90-1408-05       | ELECTRØ 220UF 6.3WV             |                        |                    |
| TC1              |               |                   | C05-0326-05       | CERAMIC TRIMMER(10P)            |                        |                    |
| -                |               | *                 | E29-0472-04       | TERMINAL (GND)                  |                        |                    |
| CN1              |               | *                 | E40-5090-05       | PIN CONNECTOR                   |                        |                    |
| CN2              |               | *                 | E40-3237-05       | MINI CONNECTOR (2P)             |                        |                    |
| TP1 ,2           |               | *                 | E23-0443-05       | TERMINAL (TEST)                 |                        |                    |
| -                |               | *                 | F02-0427-14       | HEAT SINK(CAP/ADDITION TYPE)    |                        |                    |
| -                |               | *                 | F11-1038-14       | SHIELDING COVER                 |                        |                    |
| -                |               | *                 | J30-0545-05       | SPACER (FOR MCF)                |                        |                    |
| -                |               |                   | J31-0503-05       | BEAD                            |                        |                    |
| -                |               |                   | J39-0425-14       | SPACER                          |                        |                    |
| L1               |               | *                 | L40-1581-80       | SMALL FIXED INDUCTOR(CHIP,150N) |                        |                    |
| L2               |               | *                 | L40-3372-80       | SMALL FIXED INDUCTOR(CHIP,33N)  |                        |                    |
| L3               |               | *                 | L40-8272-80       | SMALL FIXED INDUCTOR(CHIP,82N)  |                        |                    |
| L4               |               | *                 | L40-5672-80       | SMALL FIXED INDUCTOR(CHIP,56N)  |                        |                    |
| L5 -7            |               | *                 | L33-0680-05       | CHØKE COIL                      |                        |                    |
| L8               |               | *                 | L79-0700-05       | FILTER MODULE (LP163A2)         |                        |                    |
| L9               |               |                   | L40-1092-14       | SMALL FIXED INDUCTOR(10H)       |                        |                    |
| L10 ,11          |               |                   | L34-0892-05       | COIL                            |                        |                    |
| L12              |               |                   | L34-0894-05       | COIL                            |                        |                    |
| L13              |               | *                 | L34-3159-05       | COIL                            |                        |                    |
| L14              |               | *                 | L34-4016-05       | COIL (RF)                       |                        |                    |
| L15 -17          |               | *                 | L34-2216-05       | COIL (RF)                       |                        |                    |
| L18              |               |                   | L40-1001-14       | SMALL FIXED INDUCTOR(10UH)      |                        |                    |
| L19              |               | *                 | L34-4017-05       | COIL (1ST IF)                   |                        |                    |
| L20              |               | *                 | L40-2281-80       | SMALL FIXED INDUCTOR(CHIP,220N) |                        |                    |
| L21              |               | *                 | L40-8272-80       | SMALL FIXED INDUCTOR(CHIP,82N)  |                        |                    |
| L22              |               |                   | L33-0680-05       | CHØKE COIL                      |                        |                    |
| L23              |               |                   | L92-0110-05       | BEAD CORE                       |                        |                    |

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|-----------------------------------------|---------------|-------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--------------------|
| C62<br>C63 -65<br>C66<br>C67<br>C68 ,69 |               |                   | CC73FCH1H180J<br>CK73FB1H103K<br>CC73FCH1H080D<br>CC73FCH1H330J<br>CK73FB1H103K | CHIP C 18PF J<br>CHIP C 0.010UF K<br>CHIP C 8.0PF D<br>CHIP C 33PF J<br>CHIP C 0.010UF K                                                            |                        |                    |
| C70<br>C71<br>C72<br>C73<br>C74         |               |                   | CC73FCH1H070D<br>CC73FCH1H180J<br>C90-2053-05<br>CK73FB1H103K<br>CC73FCH1H560J  | CHIP C 7.0PF D<br>CHIP C 18PF J<br>ELECTR 47UF 6.3WV<br>CHIP C 0.010UF K<br>CHIP C 56PF J                                                           |                        |                    |
| C75<br>C76<br>C77<br>C78<br>C79         |               |                   | CC73FCH1H150J<br>CK73FB1H103K<br>C90-0478-05<br>CK73FB1H102K<br>CK73FB1E223K    | CHIP C 15PF J<br>CHIP C 0.010UF K<br>ELECTR 10UF 16WV<br>CHIP C 1000PF K<br>CHIP C 0.022UF K                                                        |                        |                    |
| C80<br>C81<br>C82<br>C83<br>C84         |               |                   | CK73FB1H182K<br>CC73FCH1H101J<br>CC73FSL1H471J<br>CK73FB1H103K<br>CS15E1C010M   | CHIP C 1800PF K<br>CHIP C 100PF J<br>CHIP C 470PF J<br>CHIP C 0.010UF K<br>TANTAL 1.0UF 16WV                                                        |                        |                    |
| C85<br>C86 ,87<br>C88<br>C89<br>C90     |               |                   | CS15E1VR47M<br>CK73FB1H103K<br>CK73FB1H102K<br>CK73EB1E104K<br>C90-1408-05      | TANTAL 0.47UF 35WV<br>CHIP C 0.010UF K<br>CHIP C 1000PF K<br>CHIP C 0.10UF K<br>ELECTR 220UF 6.3WV                                                  |                        |                    |
| TC1                                     |               |                   | C05-0326-05                                                                     | CERAMIC TRIMMER(10P)                                                                                                                                |                        |                    |
| -<br>CN1<br>CN2<br>TP1 ,2               |               | *                 | E29-0472-04<br>E40-5090-05<br>E40-3237-05<br>E23-0443-05                        | TERMINAL (GND)<br>PIN CONNECTOR<br>MINI CONNECTOR (2P)<br>TERMINAL (TEST)                                                                           |                        |                    |
| -<br>-<br>-<br>-<br>-                   |               | *                 | F02-0427-14<br>F11-1038-14<br>J30-0545-05<br>J31-0503-05<br>J39-0425-14         | HEAT SINK(CAP/ADDITION TYPE)<br>SHIELDING COVER<br>SPACER (FOR MCF)<br>BEAD<br>SPACER                                                               |                        |                    |
| L1<br>L2<br>L3<br>L4<br>L5 -7           |               | *                 | L40-1581-80<br>L40-3372-80<br>L40-8272-80<br>L40-5672-80<br>L33-0680-05         | SMALL FIXED INDUCTOR(CHIP,150N)<br>SMALL FIXED INDUCTOR(CHIP,33N)<br>SMALL FIXED INDUCTOR(CHIP,82N)<br>SMALL FIXED INDUCTOR(CHIP,56N)<br>CHOKE COIL |                        |                    |
| L8<br>L9<br>L10 ,11<br>L12<br>L13       |               | *                 | L79-0700-05<br>L40-1092-14<br>L34-0892-05<br>L34-0894-05<br>L34-3159-05         | FILTER MODULE (LP163A2)<br>SMALL FIXED INDUCTOR(10H)<br>COIL<br>COIL<br>COIL                                                                        |                        |                    |
| L14<br>L15 -17<br>L18<br>L19<br>L20     |               | *                 | L34-4016-05<br>L34-2216-05<br>L40-1001-14<br>L34-4017-05<br>L40-2281-80         | COIL (RF)<br>COIL (RF)<br>SMALL FIXED INDUCTOR(10UH)<br>COIL (1ST IF)<br>SMALL FIXED INDUCTOR(CHIP,220N)                                            |                        |                    |
| L21<br>L22<br>L23                       |               | *                 | L40-8272-80<br>L33-0680-05<br>L92-0110-05                                       | SMALL FIXED INDUCTOR(CHIP,82N)<br>CHOKE COIL<br>BEAD CORE                                                                                           |                        |                    |

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|--------------------------------|---------------|-------------------|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------|------------------------|--------------------|
| L24 ,25<br>L26<br>X1<br>XF1 ,2 |               | *                 | L40-1021-14<br>L40-1092-14<br>L77-1325-05<br>L71-0265-05 | SMALL FIXED INDUCTOR(1MH)<br>SMALL FIXED INDUCTOR(1UH)<br>CRYSTAL RESONATOR (12.8MHZ)<br>MCF (16.3MHZ) |                        |                    |
| -                              |               | *                 | N09-2017-05                                              | TAPTYTE SCREW (Ø1.7X2.8)                                                                               |                        |                    |
| JP1                            |               |                   | R92-0150-05                                              | JUMPER REST 0 0HM                                                                                      |                        |                    |
| R1                             |               |                   | RK73FB2A682J                                             | CHIP R 6.8K J 1/10W                                                                                    |                        |                    |
| R2                             |               |                   | RK73FB2A153J                                             | CHIP R 15K J 1/10W                                                                                     |                        |                    |
| R3                             |               |                   | RK73FB2A471J                                             | CHIP R 470 J 1/10W                                                                                     |                        |                    |
| R4                             |               |                   | RK73FB2A821J                                             | CHIP R 820 J 1/10W                                                                                     |                        |                    |
| R5                             |               |                   | RK73FB2A222J                                             | CHIP R 2.2K J 1/10W                                                                                    |                        |                    |
| R6                             |               |                   | RK73FB2A103J                                             | CHIP R 10K J 1/10W                                                                                     |                        |                    |
| R7                             |               |                   | RK73FB2A101J                                             | CHIP R 100 J 1/10W                                                                                     |                        |                    |
| R8                             |               |                   | RK73FB2A331J                                             | CHIP R 330 J 1/10W                                                                                     |                        |                    |
| R9                             |               |                   | RK73FB2A560J                                             | CHIP R 56 J 1/10W                                                                                      |                        |                    |
| R10                            |               |                   | RK73FB2A470J                                             | CHIP R 47 J 1/10W                                                                                      |                        |                    |
| R11                            |               |                   | RK73FB2A220J                                             | CHIP R 22 J 1/10W                                                                                      |                        |                    |
| R12                            |               |                   | RK73FB2A103J                                             | CHIP R 10K J 1/10W                                                                                     |                        |                    |
| R13                            |               |                   | RK73FB2A222J                                             | CHIP R 2.2K J 1/10W                                                                                    |                        |                    |
| R14                            |               |                   | RK73FB2A681J                                             | CHIP R 680 J 1/10W                                                                                     |                        |                    |
| R15                            |               |                   | RK73FB2A120J                                             | CHIP R 12 J 1/10W                                                                                      |                        |                    |
| R16 ,17                        |               |                   | RK73FB2A331J                                             | CHIP R 330 J 1/10W                                                                                     |                        |                    |
| R18                            |               |                   | RK73FB2A221J                                             | CHIP R 220 J 1/10W                                                                                     |                        |                    |
| R19                            |               |                   | RK73FB2A682J                                             | CHIP R 6.8K J 1/10W                                                                                    |                        |                    |
| R20                            |               |                   | RK73FB2A333J                                             | CHIP R 33K J 1/10W                                                                                     |                        |                    |
| R21                            |               |                   | RK73FB2A103J                                             | CHIP R 10K J 1/10W                                                                                     |                        |                    |
| R22                            |               |                   | RK73FB2A221J                                             | CHIP R 220 J 1/10W                                                                                     |                        |                    |
| R23 ,24                        |               |                   | RK73FB2A820J                                             | CHIP R 82 J 1/10W                                                                                      |                        |                    |
| R25                            |               |                   | RK73FB2A222J                                             | CHIP R 2.2K J 1/10W                                                                                    |                        |                    |
| R29                            |               |                   | RK73FB2A104J                                             | CHIP R 100K J 1/10W                                                                                    |                        |                    |
| R30                            |               |                   | RD14BB2C103J                                             | RD 10K J 1/6W                                                                                          |                        |                    |
| R31                            |               |                   | RK73FB2A271J                                             | CHIP R 270 J 1/10W                                                                                     |                        |                    |
| R32 ,33                        |               |                   | RK73FB2A103J                                             | CHIP R 10K J 1/10W                                                                                     |                        |                    |
| R34                            |               |                   | RK73FB2A104J                                             | CHIP R 100K J 1/10W                                                                                    |                        |                    |
| R35                            |               |                   | RK73FB2A222J                                             | CHIP R 2.2K J 1/10W                                                                                    |                        |                    |
| R36                            |               |                   | RD14BB2C470J                                             | RD 47 J 1/6W                                                                                           |                        |                    |
| R37 -39                        |               |                   | RK73FB2A104J                                             | CHIP R 100K J 1/10W                                                                                    |                        |                    |
| R40                            |               |                   | RK73FB2A470J                                             | CHIP R 47 J 1/10W                                                                                      |                        |                    |
| R41                            |               |                   | RK73FB2A222J                                             | CHIP R 2.2K J 1/10W                                                                                    |                        |                    |
| R42                            |               |                   | RK73FB2A470J                                             | CHIP R 47 J 1/10W                                                                                      |                        |                    |
| R43                            |               |                   | RK73FB2A152J                                             | CHIP R 1.5K J 1/10W                                                                                    |                        |                    |
| R44                            |               |                   | RK73FB2A103J                                             | CHIP R 10K J 1/10W                                                                                     |                        |                    |
| R45                            |               |                   | RD14BB2C471J                                             | RD 470 J 1/6W                                                                                          |                        |                    |
| R46                            |               |                   | RD14BB2C470J                                             | RD 47 J 1/6W                                                                                           |                        |                    |
| R47                            |               |                   | RK73FB2A122J                                             | CHIP R 1.2K J 1/10W                                                                                    |                        |                    |
| R48                            |               |                   | RD14BB2C101J                                             | RD 100 J 1/6W                                                                                          |                        |                    |
| R49                            |               |                   | RD14BB2C334J                                             | RD 330K J 1/6W                                                                                         |                        |                    |
| R50                            |               |                   | RK73FB2A271J                                             | CHIP R 270 J 1/10W                                                                                     |                        |                    |
| R51                            |               |                   | RK73FB2A222J                                             | CHIP R 2.2K J 1/10W                                                                                    |                        |                    |
| R52                            |               |                   | RK73FB2A223J                                             | CHIP R 22K J 1/10W                                                                                     |                        |                    |
| R53                            |               |                   | RK73FB2A104J                                             | CHIP R 100K J 1/10W                                                                                    |                        |                    |
| R54                            |               |                   | RK73FB2A223J                                             | CHIP R 22K J 1/10W                                                                                     |                        |                    |
| R55 -57                        |               |                   | RK73FB2A104J                                             | CHIP R 100K J 1/10W                                                                                    |                        |                    |

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|----------------------------------------------------|---------------|-------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|------------------------|--------------------|
| R58 .59<br>R60<br>R61<br>R62<br>R63                |               |                   | RK73FB2A272J<br>RK73FB2A822J<br>RK73FB2A103J<br>RK73FB2A183J<br>RK73FB2A394J | CHIP R 2.7K J 1/10W<br>CHIP R 8.2K J 1/10W<br>CHIP R 10K J 1/10W<br>CHIP R 18K J 1/10W<br>CHIP R 390K J 1/10W |                        |                    |
| R64<br>R65<br>R66                                  |               |                   | RK73FB2A104J<br>RK73FB2A473J<br>RD14BB2C823J                                 | CHIP R 100K J 1/10W<br>CHIP R 47K J 1/10W<br>RD 82K J 1/6W                                                    |                        |                    |
| D1<br>D2<br>D3<br>D4<br>D5                         |               | *                 | HSM2693<br>DA204K<br>1SV172<br>DA204K<br>MI303                               | CHIP DIODE<br>CHIP DIODE<br>CHIP DIODE<br>CHIP DIODE<br>DIODE                                                 |                        |                    |
| D6<br>D7<br>D8 .9<br>D10 -13<br>D14                |               | *                 | MI301<br>1SS277<br>HSM88AS<br>1SV153<br>ERB83-004                            | DIODE<br>DIODE<br>VARICAP DIODE<br>DIODE<br>DIODE                                                             |                        |                    |
| D15<br>D16<br>IC1<br>IC2<br>Q1                     |               | *                 | UZF-22B<br>ERB83-004<br>M57732L<br>M54959P<br>2SC2714(0)                     | ZENER DIODE<br>DIODE<br>IC(POWER MODULE/ 135-160MHZ,5W<br>IC(FREQ SYNTHESIZER PLL)<br>CHIP TRANSISTOR         |                        |                    |
| Q2<br>Q3<br>Q4<br>Q5<br>Q6                         |               |                   | 2SC3838K(N,P)<br>2SC2407<br>2SA1313(Y)<br>FMW1<br>2SC3356                    | CHIP TRANSISTOR<br>TRANSISTOR<br>CHIP TRANSISTOR<br>DIGITAL TRANSISTOR<br>CHIP TRANSISTOR                     |                        |                    |
| Q7<br>Q8<br>Q9<br>Q10<br>Q11                       |               |                   | 2SC2714(0)<br>2SK210(GR)<br>2SC2714(0)<br>2SC3838K(N,P)<br>FMG4              | CHIP TRANSISTOR<br>CHIP FET<br>CHIP TRANSISTOR<br>CHIP<br>DIGITAL TRANSISTOR                                  |                        |                    |
| Q12 .13<br>Q14                                     |               | *                 | 2SC2712(GR)<br>FMG4                                                          | TRANSISTOR<br>DIGITAL TRANSISTOR                                                                              |                        |                    |
| 131                                                | 2B            |                   | X58-3010-10                                                                  | SUB UNIT (VCO)                                                                                                |                        |                    |
| IF UNIT (X48-3020-XX) -10 : TH-215A, -51 : TH-215E |               |                   |                                                                              |                                                                                                               |                        |                    |
| C1<br>C2<br>C3 .4<br>C5 .6<br>C7                   |               |                   | CE04CW1H010M<br>CK73FB1H471K<br>CK73FB1H102K<br>C90-0890-05<br>C91-0769-05   | ELECTRO 1.0UF 50WV<br>CHIP C 470PF K<br>CHIP C 1000PF K<br>CHIP TAN 1UF 16WV<br>CERAMIC 0.01UF M              |                        |                    |
| C8<br>C9<br>C10<br>C11<br>C12                      |               |                   | CK73FB1H103K<br>C90-0888-05<br>CK73FB1H102K<br>CC73FCH1H390J<br>CK73FB1H102K | CHIP C 0.010UF K<br>CHIP TAN 0.1UF 16WV<br>CHIP C 1000PF K<br>CHIP C 39PF J<br>CHIP C 1000PF K                |                        |                    |
| C13<br>C14<br>C15<br>C16<br>C17                    |               |                   | CK73FB1H123K<br>CK73FB1H122K<br>CK73FB1H102K<br>CK73FB1H123K<br>CK73FB1H103K | CHIP C 0.012UF K<br>CHIP C 1200PF K<br>CHIP C 1000PF K<br>CHIP C 0.012UF K<br>CHIP C 0.010UF K                |                        |                    |
| C19                                                |               |                   | CK73FB1E223K                                                                 | CHIP C 0.022UF K                                                                                              |                        |                    |

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| C20<br>C23<br>C24<br>C25 -27<br>C28 |               |                   | CK73FB1H102K<br>CC73FCH1H820J<br>CC73FCH1H330J<br>CK73EB1E104K<br>C90-2050-05 | CHIP C 1000PF K<br>CHIP C 82PF J<br>CHIP C 33PF J<br>CHIP C 0.10UF K<br>ELECTR0 33UF 6.3WV         |                        |                    |
| C29<br>C30<br>C31<br>C32<br>C33     |               |                   | CK73EB1E104K<br>C90-1248-05<br>C90-0890-05<br>CK73FB1H102K<br>CK73FB1H222K    | CHIP C 0.10UF K<br>ELECTR0 1UF 50WV<br>CHIP TAN 1UF 16WV<br>CHIP C 1000PF K<br>CHIP C 2200PF K     |                        |                    |
| C34<br>C35<br>C36<br>C37 ,38<br>C39 |               |                   | CK73FB1H102K<br>CK73FB1H681K<br>CE04CW1A470M<br>C90-2012-05<br>C91-1015-05    | CHIP C 1000PF K<br>CHIP C 680PF K<br>ELECTR0 47UF 10WV<br>ELECTR0 100UF 10WV<br>FILM 0.18UF        |                        |                    |
| C40 ,41<br>C42<br>C43<br>C44<br>C45 |               |                   | C90-0885-05<br>CK73FB1H103K<br>CE04CW1A330M<br>C90-1248-05<br>CK73FB1H102K    | TANTAL 10UF 6.3WV<br>CHIP C 0.010UF K<br>ELECTR0 33UF 10WV<br>ELECTR0 1UF 50WV<br>CHIP C 1000PF K  |                        |                    |
| C46<br>C47<br>C48<br>C49<br>C50     |               |                   | C90-1248-05<br>CE04CW1C220M<br>CE04CW1C470M<br>CK73FF1E104Z<br>CK73FB1H471K   | ELECTR0 1UF 50WV<br>ELECTR0 22UF 16WV<br>ELECTR0 47UF 16WV<br>CHIP C 0.10UF Z<br>CHIP C 470PF K    |                        |                    |
| C51<br>C52<br>C53<br>C54<br>C56 ,57 |               |                   | CE04CW1C4R7M<br>CK73FB1H152K<br>CK73FB1H103K<br>C90-0891-05<br>CK73FB1H103K   | ELECTR0 4.7UF 16WV<br>CHIP C 1500PF K<br>CHIP C 0.010UF K<br>TANTAL 4.7UF 16WV<br>CHIP C 0.010UF K |                        |                    |
| C58<br>C59<br>C60<br>C61 ,62<br>C63 |               |                   | CE04CW1HR22M<br>CK73FB1H102K<br>C90-0868-05<br>CK73FB1H471K<br>C90-0868-05    | ELECTR0 0.22UF 50WV<br>CHIP C 1000PF K<br>ELECTR0 10UF 16WV<br>CHIP C 470PF K<br>ELECTR0 10UF 16WV |                        |                    |
| C64<br>C65<br>C68<br>C69<br>C70     |               |                   | CK73FB1H102K<br>CK73FB1H471K<br>C90-2011-05<br>C90-1248-05<br>CK73FB1H471K    | CHIP C 1000PF K<br>CHIP C 470PF K<br>ELECTR0 4.7UF 25WV<br>ELECTR0 1UF 50WV<br>CHIP C 470PF K      | KM1M2X<br>KM1M2X       |                    |
| C70<br>C71<br>C72 -74<br>C75<br>C76 |               |                   | CK73FB1H471K<br>CE04CW0J220M<br>CK73FB1H471K<br>C90-1248-05<br>C90-2048-05    | CHIP C 470PF K<br>ELECTR0 22UF 6.3WV<br>CHIP C 470PF K<br>ELECTR0 1UF 50WV<br>ELECTR0 6.8UF 6.3WV  |                        |                    |
| C77 ,78<br>C83<br>C84<br>C85<br>C86 |               |                   | CK73FB1H102K<br>CE04CW1C470M<br>CK73FB1H471K<br>C90-2049-05<br>CK73FB1H471K   | CHIP C 1000PF K<br>ELECTR0 47UF 16WV<br>CHIP C 470PF K<br>ELECTR0 15UF 6.3WV<br>CHIP C 470PF K     |                        |                    |
| C87<br>C88<br>C89<br>C90<br>C91     |               |                   | C90-2048-05<br>CK73FB1H102K<br>CK73FB1H471K<br>CK73FB1H102K<br>CK73FB1H471K   | ELECTR0 6.8UF 6.3WV<br>CHIP C 1000PF K<br>CHIP C 470PF K<br>CHIP C 1000PF K<br>CHIP C 470PF K      |                        |                    |

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| C92<br>C93 -96<br>C97<br>C98<br>C99 |               |                   | C90-2073-05<br>CK73FB1H102K<br>CK73FB1H471K<br>C90-2049-05<br>CK73FB1H102K   | ELECTRO CAPACITOR(AL)<br>CHIP C 1000PF K<br>CHIP C 470PF K<br>ELECTRO 15UF 6.3WV<br>CHIP C 1000PF K           |                        |                    |
| C100<br>C101<br>C102<br>C103        |               |                   | CK73FB1H471K<br>CK73FB1H102K<br>CE04CW1C220M<br>CK73FB1H471K                 | CHIP C 470PF K<br>CHIP C 1000PF K<br>ELECTRO 22UF 16WV<br>CHIP C 470PF K                                      |                        |                    |
| CN2<br>CN3<br>CN4                   |               |                   | E40-5039-05<br>E40-5021-05<br>E40-5034-05                                    | PIN CONNECTOR (5597-15CPB)<br>PIN CONNECTOR (7P)<br>PIN CONNECTOR (5597-10CPB)                                | KM1M2X                 |                    |
| CF1<br>L2 ,3<br>L4<br>X1            |               |                   | L72-0335-05<br>L30-0538-05<br>L40-4791-14<br>L77-1323-05                     | CERAMIC FILTER (CFU45SE2)<br>IFT (455KHZ)<br>SMALL FIXED INDUCTOR(4.7KHZ)<br>CRYSTAL RESONATOR(16.722MHZ)     |                        |                    |
| Q13                                 |               |                   | 2SA1313(Y)                                                                   | CHIP TRANSISTOR                                                                                               |                        |                    |
| -<br>CJ1 ,2<br>CJ3<br>JP1 ,2<br>JP3 |               |                   | R92-0150-05<br>R92-0670-05<br>R92-0670-05<br>R92-1061-05<br>R92-1061-05      | JUMPER REST 0 OHM<br>CHIP R 0 OHM<br>CHIP R 0 OHM<br>JUMPER REST 0 OHM<br>JUMPER REST 0 OHM                   | KM1MX<br>TW<br>TW      |                    |
| R1<br>R2<br>R3<br>R4<br>R6          |               |                   | RK73FB2A152J<br>RK73FB2A271J<br>RK73FB2A332J<br>RK73FB2A271J<br>RK73FB2A105J | CHIP R 1.5K J 1/10W<br>CHIP R 270 J 1/10W<br>CHIP R 3.3K J 1/10W<br>CHIP R 270 J 1/10W<br>CHIP R 1.0M J 1/10W |                        |                    |
| R7<br>R9<br>R10<br>R11<br>R12       |               |                   | RK73FB2A564J<br>RK73FB2A153J<br>RK73FB2A333J<br>RK73FB2A223J<br>RK73FB2A472J | CHIP R 560K J 1/10W<br>CHIP R 15K J 1/10W<br>CHIP R 33K J 1/10W<br>CHIP R 22K J 1/10W<br>CHIP R 4.7K J 1/10W  |                        |                    |
| R14<br>R15 ,16<br>R17<br>R18<br>R19 |               |                   | RK73FB2A103J<br>RK73FB2A152J<br>RK73FB2A823J<br>RK73FB2A333J<br>RK73FB2A223J | CHIP R 10K J 1/10W<br>CHIP R 1.5K J 1/10W<br>CHIP R 82K J 1/10W<br>CHIP R 33K J 1/10W<br>CHIP R 22K J 1/10W   |                        |                    |
| R20<br>R21<br>R23<br>R24<br>R25     |               |                   | RK73FB2A103J<br>RK73FB2A473J<br>RK73FB2A103J<br>RK73FB2A222J<br>RK73FB2A473J | CHIP R 10K J 1/10W<br>CHIP R 47K J 1/10W<br>CHIP R 10K J 1/10W<br>CHIP R 2.2K J 1/10W<br>CHIP R 47K J 1/10W   |                        |                    |
| R26<br>R28<br>R29 ,30<br>R31<br>R32 |               |                   | RD14CB2C123J<br>RK73FB2A471J<br>RK73FB2A103J<br>RK73FB2A333J<br>RD14BB2C822J | RD 12K J 1/6W<br>CHIP R 470 J 1/10W<br>CHIP R 10K J 1/10W<br>CHIP R 33K J 1/10W<br>RD 8.2K J 1/6W             |                        |                    |
| R33<br>R34<br>R35<br>R36<br>R37     |               |                   | RK73FB2A122J<br>RK73FB2A333J<br>RK73FB2A103J<br>RK73FB2A473J<br>RK73FB2A100J | CHIP R 1.2K J 1/10W<br>CHIP R 33K J 1/10W<br>CHIP R 10K J 1/10W<br>CHIP R 47K J 1/10W<br>CHIP R 10 J 1/10W    |                        |                    |
| R38                                 |               |                   | RD14BB2C272J                                                                 | RD 2.7K J 1/6W                                                                                                |                        |                    |

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| R39<br>R40<br>R41<br>R42<br>R43      |               |                   | RK73FB2A273J<br>RK73FB2A223J<br>RK73FB2A103J<br>RK73FB2A151J<br>RK73FB2A224J | CHIP R 27K J 1/10W<br>CHIP R 22K J 1/10W<br>CHIP R 10K J 1/10W<br>CHIP R 150 J 1/10W<br>CHIP R 220K J 1/10W          | KM1M2X                  |                    |
| R44<br>R45<br>R46<br>R47<br>R48      |               |                   | RK73FB2A474J<br>RD14BB2C472J<br>RK73FB2A473J<br>RK73FB2A472J<br>RD14BB2C272J | CHIP R 470K J 1/10W<br>RD 4.7K J 1/6W<br>CHIP R 47K J 1/10W<br>CHIP R 4.7K J 1/10W<br>RD 2.7K J 1/6W                 | KM1M2X                  |                    |
| R49<br>R51<br>R52<br>R53<br>R54      |               |                   | RK73FB2A332J<br>RK73FB2A272J<br>RK73FB2A124J<br>RK73FB2A472J<br>RK73FB2A473J | CHIP R 3.3K J 1/10W<br>CHIP R 2.7K J 1/10W<br>CHIP R 120K J 1/10W<br>CHIP R 4.7K J 1/10W<br>CHIP R 47K J 1/10W       |                         |                    |
| R55<br>R56<br>R57<br>R58<br>VR1      |               |                   | RK73FB2A223J<br>RK73FB2A473J<br>RK73FB2A223J<br>RK73FB2A822J<br>R12-3447-05  | CHIP R 22K J 1/10W<br>CHIP R 47K J 1/10W<br>CHIP R 22K J 1/10W<br>CHIP R 8.2K J 1/10W<br>TRIMMING P8T. (10K)         |                         |                    |
| VR2<br>VR5<br>VR6<br>VR7<br>VR8      |               | *                 | R12-1431-05<br>R12-6406-05<br>R12-1437-05<br>R12-1436-05<br>R12-5422-05      | TRIMMING P8T. (1K)<br>TRIMMING P8T. (470K)<br>TRIMMING P8T. (3.3K)<br>TRIMMING P8T. (1K)<br>TRIMMING P8T. (100K)     | KM1M2X                  |                    |
| S1 ,2                                | 2B            |                   | S40-1412-05                                                                  | TACT SWITCH (EVQ-QSH03B)                                                                                             |                         |                    |
| D1<br>D3<br>D4 ,5<br>D6<br>D7        |               |                   | HSM88AS<br>1SS184<br>02C28.2<br>1SS184<br>1SS226                             | CHIP DIODE<br>CHIP DIODE<br>CHIP ZENER DIODE<br>CHIP DIODE<br>CHIP DIODE                                             |                         |                    |
| IC1<br>IC2<br>IC3<br>IC4 ,5<br>Q1 ,2 |               |                   | TA7761P<br>BA526<br>S-8054HN<br>LVC550C<br>2SC2712(GR)                       | IC(FM IF)<br>IC(AF POWER AMP/ 700MW)<br>IC(VOLTAGE DETECTOR)<br>IC(VOLTAGE REGULATOR/ +5V)<br>CHIP TRANSISTOR        |                         |                    |
| Q3<br>Q4<br>Q5<br>Q6<br>Q7           |               |                   | DTC144EK<br>2SC2712(GR)<br>2SJ106(GR)<br>FMG2<br>2SC2712(GR)                 | DIGITAL TRANSISTOR<br>CHIP TRANSISTOR<br>CHIP FET<br>DIGITAL TRANSISTOR<br>CHIP TRANSISTOR                           |                         |                    |
| Q8<br>Q9<br>Q10<br>Q11<br>Q12        |               |                   | 2SA1241(Y)<br>DTC143XK<br>FMG2<br>DTA114YK<br>DTA144EK                       | TRANSISTOR<br>DIGITAL TRANSISTOR<br>DIGITAL TRANSISTOR<br>DIGITAL TRANSISTOR(10K,47K)<br>DIGITAL TRANSISTOR(47K,47K) | KM1M2X                  |                    |
| Q14<br>Q15<br>Q16 -18<br>Q19<br>Q20  |               |                   | 2SA1358(Y)<br>FMW1<br>DTC114YK<br>FMG2<br>DTC144EK                           | TRANSISTOR<br>DIGITAL TRANSISTOR<br>DIGITAL TRANSISTOR(47K,47K)<br>DIGITAL TRANSISTOR<br>DIGITAL TRANSISTOR          | KM1M2X                  |                    |
| TH1<br>TH2<br>TH3                    |               |                   | PTH59T103M<br>112-202-2<br>112-101-2                                         | P8SISTOR<br>THERMISTOR<br>THERMISTOR                                                                                 |                         |                    |

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|-----------------------|---------------|-------------------|-------------------|------------------------------|------------------------|--------------------|
| B1                    | 1B            | *                 | W09-0371-05       | LITHIUM BATTERY (CR2032-T12) |                        |                    |
| -                     |               |                   | X59-3090-10       | MODULE UNIT (MIC AMP)        |                        |                    |
| VCO (X58-3010-10)     |               |                   |                   |                              |                        |                    |
| C1                    |               |                   | CC73FCH1H030C     | CHIP C 3.0PF C               |                        |                    |
| C2                    |               |                   | CK73FF1E104Z      | CHIP C 0.10UF Z              |                        |                    |
| C3                    |               |                   | CC73FRH1H680J     | CHIP C 68PF J                |                        |                    |
| C4                    |               |                   | CC73FCH1H060D     | CHIP C 6.0PF D               |                        |                    |
| C5                    |               |                   | CK73EB1E104K      | CHIP C 0.10UF K              |                        |                    |
| C6                    |               |                   | CK73FB1H103K      | CHIP C 0.010UF K             |                        |                    |
| C7                    |               |                   | CC73FCH1H030C     | CHIP C 3.0PF C               |                        |                    |
| C8                    |               |                   | CK73FB1H102K      | CHIP C 1000PF K              |                        |                    |
| C9                    |               |                   | CC73FRH1H680J     | CHIP C 68PF J                |                        |                    |
| C10                   |               |                   | CC73FCH1H060D     | CHIP C 6.0PF D               |                        |                    |
| C11                   |               |                   | CC73FCH1H030C     | CHIP C 3.0PF C               |                        |                    |
| C12                   |               |                   | CK73FB1H102K      | CHIP C 1000PF K              |                        |                    |
| TC1 ,2                |               |                   | C05-0329-05       | TRIMMING CAP (6P)            |                        |                    |
| -                     |               |                   | E23-0465-05       | TEST PIN                     |                        |                    |
| -                     |               | *                 | E40-5092-05       | TERMINAL                     |                        |                    |
| -                     |               |                   | F11-1039-04       | SHIELDING CASE               |                        |                    |
| L1                    |               | *                 | L34-4013-05       | COIL                         |                        |                    |
| L2                    |               |                   | L40-1892-81       | SMALL FIXED INDUCTOR(1.8UH)  |                        |                    |
| L3                    |               | *                 | L34-4014-05       | COIL                         |                        |                    |
| L4                    |               |                   | L40-1892-81       | SMALL FIXED INDUCTOR(1.8UH)  |                        |                    |
| R1                    |               |                   | RK73FB2A104J      | CHIP R 100K J 1/10W          |                        |                    |
| R2                    |               |                   | RK73FB2A472J      | CHIP R 4.7K J 1/10W          |                        |                    |
| R3                    |               |                   | RK73FB2A104J      | CHIP R 100K J 1/10W          |                        |                    |
| R4                    |               |                   | RK73FB2A151J      | CHIP R 150 J 1/10W           |                        |                    |
| R5 ,6                 |               |                   | RK73FB2A103J      | CHIP R 10K J 1/10W           |                        |                    |
| R7                    |               |                   | RK73FB2A472J      | CHIP R 4.7K J 1/10W          |                        |                    |
| R8                    |               |                   | RK73FB2A104J      | CHIP R 100K J 1/10W          |                        |                    |
| R9                    |               |                   | RK73FB2A181J      | CHIP R 180 J 1/10W           |                        |                    |
| D1                    |               |                   | 1SV153            | VARI CAP                     |                        |                    |
| D2                    |               |                   | 1SS277            | DIODE                        |                        |                    |
| D3 ,4                 |               |                   | 1SV153            | VARI CAP                     |                        |                    |
| D5                    |               |                   | 1SS277            | DIODE                        |                        |                    |
| D6 ,7                 |               |                   | 1SV153            | VARI CAP                     |                        |                    |
| Q1 ,2                 |               |                   | 2SK302(GR)        | CHIP FET                     |                        |                    |
| MIC AMP (X59-3090-10) |               |                   |                   |                              |                        |                    |
| C1                    |               |                   | CK73FB1E223K      | CHIP C 0.022UF K             |                        |                    |
| C2                    |               |                   | CK73FB1H471K      | CHIP C 470PF K               |                        |                    |
| C3                    |               |                   | C92-0005-05       | CHIP TAN 2.2UF 6.3WV         |                        |                    |
| C4                    |               |                   | CK73FB1H182K      | CHIP C 1800PF K              |                        |                    |
| C5                    |               |                   | CC73FCH1H151J     | CHIP C 150PF J               |                        |                    |
| C6                    |               |                   | CK73FB1H103K      | CHIP C 0.010UF K             |                        |                    |
| C7                    |               |                   | CK73FB1H471K      | CHIP C 470PF K               |                        |                    |
| -                     |               |                   | E23-0471-05       | TERMINAL                     |                        |                    |
| R1                    |               |                   | RK73FB2A104J      | CHIP R 100K J 1/10W          |                        |                    |
| R2                    |               |                   | RK73FB2A103J      | CHIP R 10K J 1/10W           |                        |                    |
| R3 ,4                 |               |                   | RK73FB2A472J      | CHIP R 4.7K J 1/10W          |                        |                    |
| R5                    |               |                   | RK73FB2A391J      | CHIP R 390 J 1/10W           |                        |                    |

E: Scandinavia &amp; Europe K: USA P: Canada W: Europe

U: PX(Far East, Hawaii) T: England M: Other Areas

UE: AAFES(Europe) X: Australia

⚠ indicates safety critical components.

## PARTS LIST

✕ New Parts

Parts without Parts No. are not supplied.

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

Teile ohne Parts No. werden nicht geliefert.

| Ref. No.<br>参照番号  | Address<br>位置 | New<br>Parts<br>新 | Parts No.<br>部品番号                            | Description<br>部品名 / 規格                                          | Desti-<br>nation<br>仕向 | Re-<br>marks<br>備考 |
|-------------------|---------------|-------------------|----------------------------------------------|------------------------------------------------------------------|------------------------|--------------------|
| R6<br>R7 ,8<br>R9 |               |                   | RK73FB2A823J<br>RK73FB2A104J<br>RK73FB2A472J | CHIP R 82K J 1/10W<br>CHIP R 100K J 1/10W<br>CHIP R 4.7K J 1/10W |                        |                    |
| IC1               |               | *                 | NJM4560M                                     | IC(OP AMP X2)                                                    |                        |                    |

E: Scandinavia &amp; Europe K: USA P: Canada W: Europe

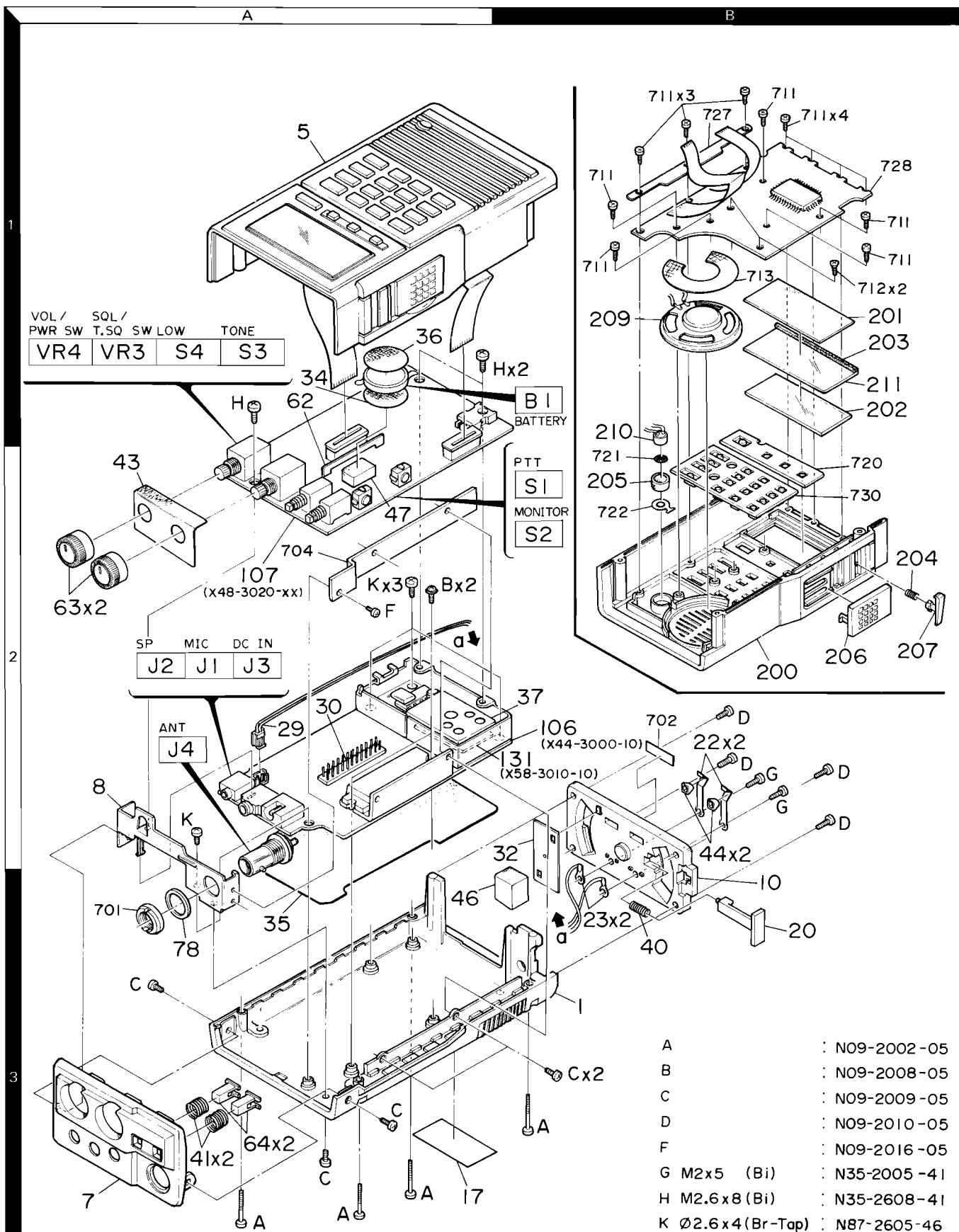
U: PX(Far East, Hawaii) T: England M: Other Areas

UE: AAFES(Europe) X: Australia

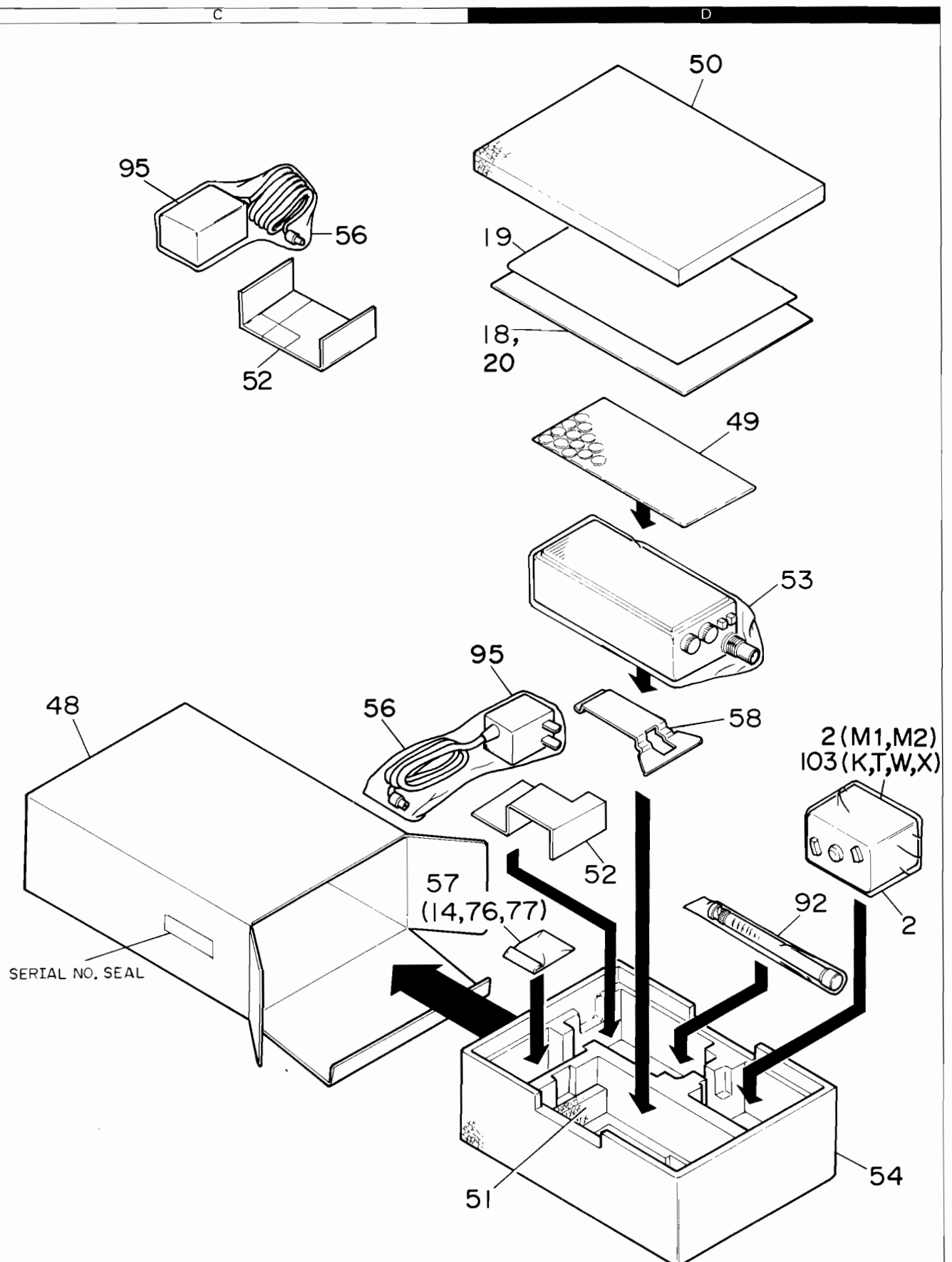
 indicates safety critical components.



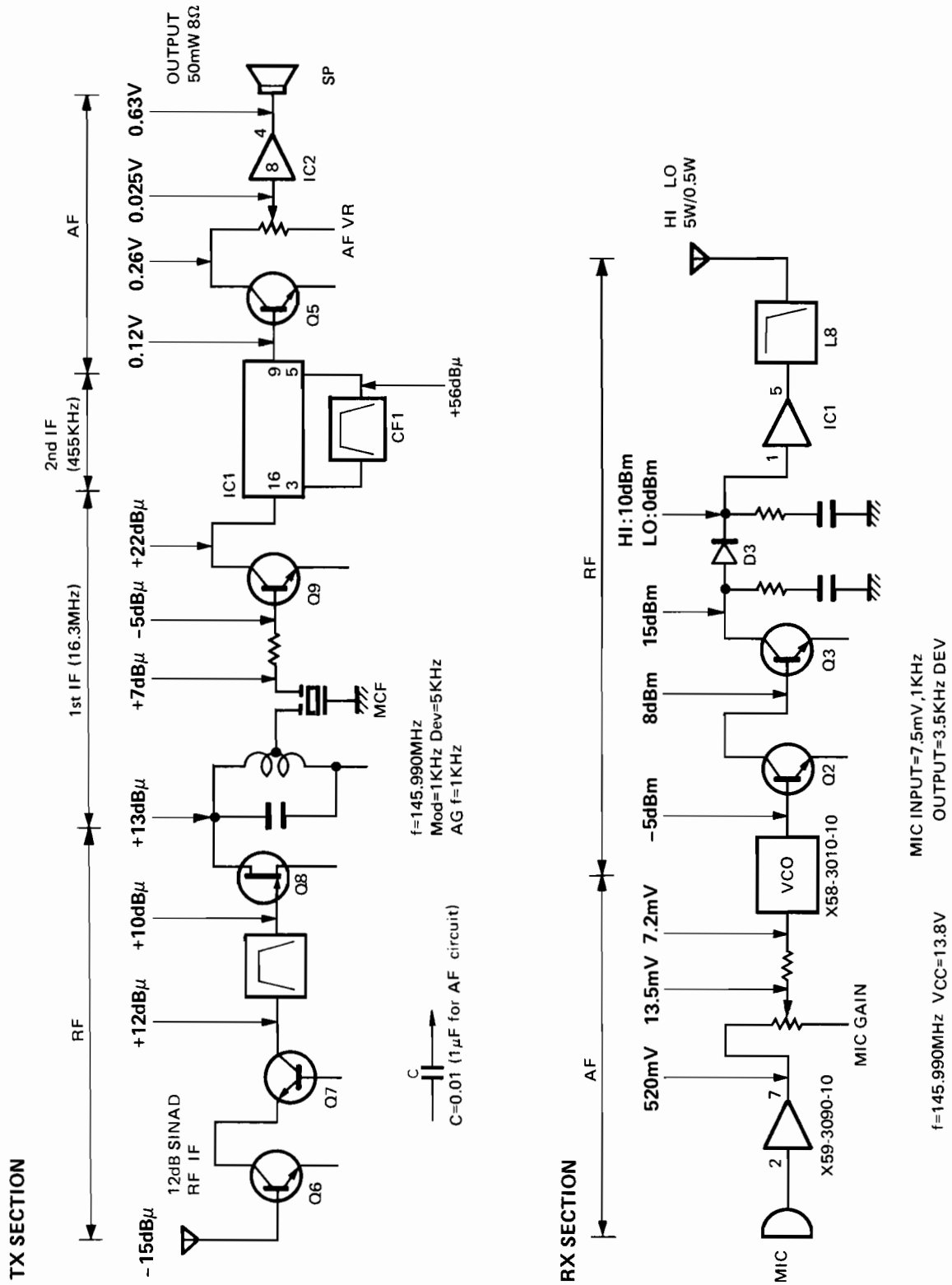
## EXPLODED VIEW



## PACKING



## LEVEL DIAGRAM



# ADJUSTMENT

## REQUIRED TEST EQUIPMENT

### 1. Stabilized Power Supply

- 1) The supply voltage can be changed between 5V and 18V, and the current is 3A or more.
- 2) The standard voltage is 13.8V.

### 2. DC Ammeter

- 1) Class 1 ammeter (17 ranges and other features)
- 2) The full scale can be set to either 300mA or 10A.
- 3) A cable of less internal loss must be used.

### 3. Frequency Counter (f. counter)

- 1) Frequencies of up to 1GHz or so can be measured.
- 2) The sensitivity can be changed to 250MHz or below, and measurements are highly stable and accurate (0.2 ppm or so).

### 4. Power Meter

- 1) Measurable frequency : Up to 500MHz
- 2) Impedance :  $50\Omega$ , unbalanced
- 3) Measuring range : Full scal of 10W or so
- 4) A standard cable (5D2W 1m) must be used.

### 5. RF VTVM (RF V.M)

- 1) Measurable frequency : Up to 500MHz or so

### 6. Linear Detector

- 1) Measurable frequency : Up to 500MHz
- 2) Characteristics are flat, and CN is 60dB or more.

### 7. Digital Voltmeter

- 1) Voltage range : FS = 18V or so
- 2) Input resistance :  $1M\Omega$  or more

### 8. Oscilloscope

- 1) Measuring range : DC to 30MHz
- 2) Provides highly accurate measurments for 5 to 25 MHz.

### 9. AF Voltmeter (AF VTVM)

- 1) Measurable frequency : 50Hz to 1MHz
- 2) Maximum sensitivity : 1mV or more

### 10. Spectrum Analyzer

- 1) Measuring range : DC to 1GHz or more

### 11. Standard Signal Generator (SSG)

- 1) Maximum frequency : 500MHz or more
- 2) Output :  $-20\text{dB}/0.1\mu\text{V}$  to  $120\text{dB}/1\text{V}$
- 3) Output impedance :  $50\Omega$

### 12. Tracking Generator

- 1) Center frequency : 50kHz to 200MHz
- 2) Frequency deviation :  $\pm 35\text{MHz}$
- 3) Output voltage : 100mV or more

### 13. Dummy Load

- 1)  $8\Omega$ , 3W or more

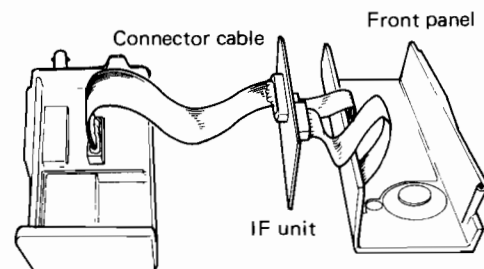
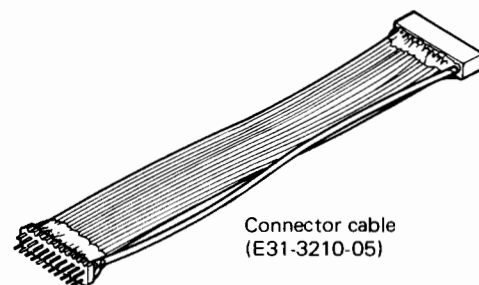
## PREPARATION

- Set the unit in the receiving mode and set the controls as follows, unless otherwise specified.

POWER/VOL ..... ON  
 SQL VR ..... MIN  
 F.LOCK ..... OFF  
 HI/LOW ..... HI

- Use a non-conductive rod such as a Bakelite rod for adjustment (especially of trimmers and coils).
- To protect the SSG, do not send out signals while adjusting the receiving unit.
- The indicated SSG output levels are for maximum output.

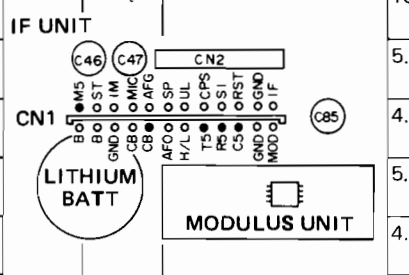
## Measuring Jigs



Be careful with the inserting direction when connecting the cables.

## ADJUSTMENT

### TX/RX COMMON ADJUSTMENT

| Item             | Condition                                        | Measurement    |      |             | Adjustment |      |                                                                                    | Specification/Remarks |
|------------------|--------------------------------------------------|----------------|------|-------------|------------|------|------------------------------------------------------------------------------------|-----------------------|
|                  |                                                  | Test equipment | Unit | Terminal    | Unit       | Part | Method                                                                             |                       |
| 1. Voltage check | 1) Power supply voltage : 13.8V (DC IN terminal) | DC V.M         | IF   | CN1-5 (CB)  | IF UNIT    | CN2  |  | 13.1V                 |
|                  | 2) C5                                            |                |      | CN1-10 (C5) |            |      |                                                                                    | 5.0V                  |
|                  | 3) R5                                            |                |      | CN1-9 (R5)  |            |      |                                                                                    | 4.9V                  |
|                  | 4) M5                                            |                |      | CN1-24 (M5) |            |      |                                                                                    | 5.0V                  |
|                  | 5) T5<br>PTT : ON                                |                |      | CN1-8 (T5)  |            |      |                                                                                    | 4.8V                  |
|                  | 6) PTT : OFF                                     |                |      |             |            |      |                                                                                    |                       |

### PLL ADJUSTMENT

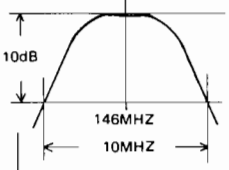
| Item               | Condition                        | Measurement              |      |          | Adjustment      |      |           | Specification/Remarks |
|--------------------|----------------------------------|--------------------------|------|----------|-----------------|------|-----------|-----------------------|
|                    |                                  | Test equipment           | Unit | Terminal | Unit            | Part | Method    |                       |
| 1. Reference FREQ. | 1) FREQ. : 145.00MHz<br>PTT : ON | f.counter<br>Power meter |      | ANT      | RF              | TC1  | 145.00MHz | ±100Hz                |
| 2. VCV             | RX 1) FREQ. : 145.99MHz          | DC V.M                   | RF   | TP2      | RF<br>(VCO PCB) | TC2  | 2.4V      | ±0.2V                 |
|                    | 2) FREQ. : 144.00MHz             |                          |      |          |                 |      | Check     | 2.0V or more.         |
|                    | TX 3) FREQ. : 145.99MHz          |                          |      |          |                 | TC1  | 2.2V      | ±0.2V                 |
|                    | 4) FREQ. : 144.00MHz             |                          |      |          |                 |      | Check     | 1.8V or more.         |

### TX ADJUSTMENT

| Item                    | Condition                                                                                                                               | Measurement                                       |              |          | Adjustment |      |                                | Specification/Remarks                             |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|--------------|----------|------------|------|--------------------------------|---------------------------------------------------|
|                         |                                                                                                                                         | Test equipment                                    | Unit         | Terminal | Unit       | Part | Method                         |                                                   |
| 1. Power ADJ.           | HI 1) FREQ. : 145.00MHz<br>PTT : ON                                                                                                     | Power meter                                       | ANT terminal | ANT      | IF         | VR2  | 5.3W                           | 5W or more.                                       |
|                         | LOW 2) FREQ. : 145.00MHz<br>PTT : ON                                                                                                    |                                                   |              |          |            | VR1  | 0.5W                           | 0.3W~0.7W<br>Power consumption :<br>0.7A or less. |
| 2. DEV.                 | 1) Connect a power meter, linear detector, and f.counter to the ANT terminal<br>FREQ. : 144.90MHz<br>AG output : 1kHz, 80mV<br>PTT : ON | Power meter<br>AG<br>Linear detector<br>f.counter |              | ANT      | IF         | VR7  | ±4.2kHz (K,M)<br>±4.4kHz (T,W) | ±200Hz                                            |
|                         | 2) AG output : 1kHz, 8mV                                                                                                                |                                                   |              |          |            |      | Check                          | ±2.8kHz~3.8kHz                                    |
| 3. TONE (K,M type only) | 1) FREQ. : 144.90MHz<br>TONE : ON<br>PTT : ON                                                                                           | Power meter<br>Linear detector<br>f.counter       |              |          | IF         | VR8  | ±0.8kHz                        | ±200Hz                                            |
| 3. TONE (W type only)   | 1) FREQ. : 144.90MHz<br>TONE : ON<br>PTT : ON                                                                                           |                                                   |              |          | IF         | VR6  | ±3kHz                          | ±400Hz                                            |
| 3. TONE (T type only)   | 1) FREQ. : 144.90MHz<br>PTT : ON                                                                                                        |                                                   |              |          |            |      | Check                          | TONE signal disappear with 0.4~0.8 sec.           |
| 4. DTMF (K,M type only) | 1) FREQ. : 144.90MHz<br>keyboard :<br>[SAVE] [Z] push<br>PTT : ON                                                                       | Power meter<br>Linear detector<br>f.counter       |              |          | Case ass'y | VR6  | DEV. ±3.0kHz                   | ±400Hz                                            |
|                         | 2) Keyboard :<br>[Q] push                                                                                                               |                                                   |              |          |            |      | Check                          | f : 1633±5Hz                                      |
|                         |                                                                                                                                         |                                                   |              |          |            |      | Check                          | DEV. ±1.2kHz±0.5kHz                               |

## ADJUSTMENT

## RX ADJUSTMENT

| Item                     | Condition                                                                                                               | Measurement                                 |                                   |            | Adjustment |                    |                                                                                                    | Specification/Remarks                                                                |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-----------------------------------|------------|------------|--------------------|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|                          |                                                                                                                         | Test equipment                              | Unit                              | Terminal   | Unit       | Part               | Method                                                                                             |                                                                                      |
| 1. Reception sensitivity | 1) Connect a tracking generator to the ANT terminal.<br>Connect a spectrum analyzer to the TP1 terminal of the RF unit. | Tracking generator<br>Spectrum analyzer     | RF                                | ANT<br>TP1 | RF         | L14<br>L15~<br>L17 | 146MHz MAX.<br> | The gain and band are MAX.<br>A gain of -10dB is obtained over at least 146MHz±5MHz. |
|                          | 2) Connect a SSG to the ANT<br>FREQ. : 144.90MHz<br>SSG output : 60dBμ<br>MOD : 1kHz<br>DEV. : ±3kHz                    | SSG<br>AF VTVM<br>Oscilloscope              | ANT<br>terminal<br>SP<br>terminal | SP         | IF         | L3                 | AF output : MAX                                                                                    |                                                                                      |
|                          | 3) SSG output : -8dBμ                                                                                                   | DC V.M                                      | ANT<br>SP                         | IC7<br>7P  | IF<br>RF   | L2<br>L19          | MIN.                                                                                               |                                                                                      |
|                          |                                                                                                                         | Distortion meter<br>Oscilloscope<br>AF VTVM |                                   | SP         |            |                    | Check                                                                                              | SINAD 12dB or more.                                                                  |
| 2. S meter               | 1) FREQ. : 145.98MHz<br>SSG output : -7dBμ                                                                              | S meter                                     |                                   |            | IF         | VR5                | Adjust VR5 to the "S-1" reading.                                                                   |                                                                                      |
|                          | 2) SSG output : -10dBμ                                                                                                  |                                             |                                   |            |            |                    | Check.                                                                                             | Lights OFF.                                                                          |
|                          | 3) SSG output : 23dBμ                                                                                                   |                                             |                                   |            |            |                    | Check.                                                                                             | All segments light ON.                                                               |

## Microprocessor operation check

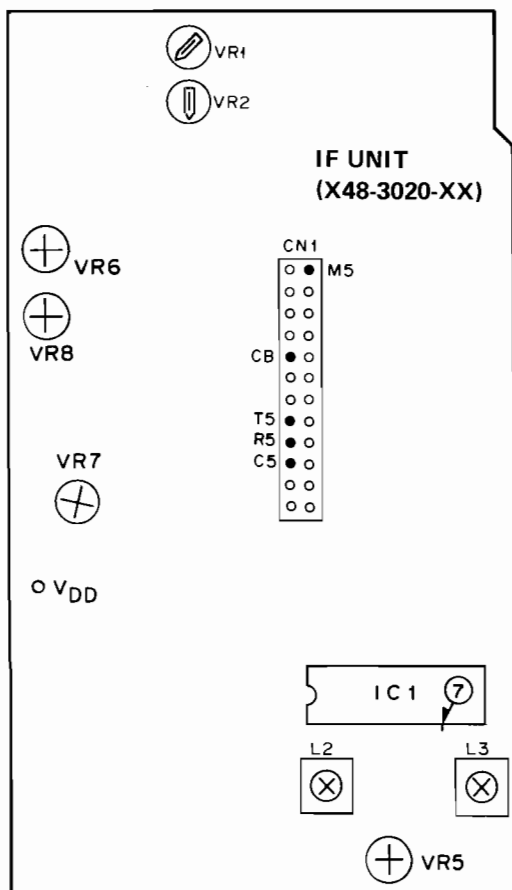
| Item                                                                                                     | Condition                                                   | Operation check                                                                                                                                                                              | Item                                                                                                     | Condition                                                     | Operation check                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. FREQ. setting                                                                                         | 1) <b>[ENTER]</b> push                                      | 14 <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/><br>FREQ. indication :<br>142.345 ( <b>K,M2</b> )<br>144.345 ( <b>T,M1,W,X</b> )                       | 2. Function key operation<br>(Pressing <b>[F]</b> key and numeral key activates the indicated function). | 2) <b>[F]</b> <b>[2]</b> /BEEP<br><b>[F]</b> <b>[2]</b> /BEEP | BEEP ON (except LAMP).<br>BEEP OFF                                                                                                                               |
|                                                                                                          | <b>[1]</b> <b>[2]</b> <b>[3]</b> <b>[4]</b> <b>[5]</b> push |                                                                                                                                                                                              |                                                                                                          | 3) <b>[F]</b> <b>[3]</b> /STEP                                | Switching of F.STEP.                                                                                                                                             |
|                                                                                                          | 2) <b>[ENTER]</b> push                                      | 14 <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/><br>FREQ. indication :<br>162.890 ( <b>K,M2</b> )<br>147.890 ( <b>M1,X</b> )<br>145.890 ( <b>T,W</b> ) |                                                                                                          | 4) <b>[F]</b> <b>[4]</b> /BAND                                | <b>[BAND]</b> indicator turns on.<br>Push <b>[SCAN]</b> key to start unit scanning on all receivable frequencies.                                                |
|                                                                                                          | <b>[6]</b> <b>[7]</b> <b>[8]</b> <b>[9]</b> <b>[0]</b> push |                                                                                                                                                                                              |                                                                                                          | 5) <b>[F]</b> <b>[5]</b> /MEMORY                              | <b>[MEMO]</b> indicator turns on.<br>Push <b>[SCAN]</b> key to start scan on only the memorized channel.                                                         |
| 2. Function key operation<br>(Pressing <b>[F]</b> key and numeral key activates the indicated function). | 3) <b>[▼]</b> push                                          | 5kHz DOWN (when 5kHz steps)                                                                                                                                                                  |                                                                                                          | 6) <b>[F]</b> <b>[6]</b> /PROGRAM                             | <b>[PROG]</b> indicator turns on.<br>Push <b>[SCAN]</b> key to start scan between memory 8 and 9.                                                                |
|                                                                                                          | 4) <b>[▲]</b> push                                          | 5kHz UP (when 5kHz steps)                                                                                                                                                                    |                                                                                                          | 7) <b>[F]</b> <b>[7]</b> /SEEK                                | <b>[SEEK]</b> indicator turns on.<br>Push <b>[SCAN]</b> key to start scanning.<br>If a signal is detected stops scanning and the scanning operation is released. |
|                                                                                                          | 1) <b>[F]</b> <b>[1]</b> /PRIORITY                          | <b>[PRIO]</b> indicator turns on.<br>Memory channel <b>[1]</b> is monitored every 5 seconds <b>[PRIO]</b> indicator blinks if frequency is in use.                                           |                                                                                                          | 8) <b>[F]</b> <b>[8]</b> /TIME                                | <b>[TIME]</b> indicator turns on.<br>Push <b>[SCAN]</b> key to start scanning.<br>Scanning stops if signal detected, and scanning restarts after 5 seconds.      |
|                                                                                                          | <b>[F]</b> <b>[1]</b> /PRIORITY                             | <b>[PRIO]</b> indicator turns off.                                                                                                                                                           |                                                                                                          |                                                               |                                                                                                                                                                  |

## ADJUSTMENT

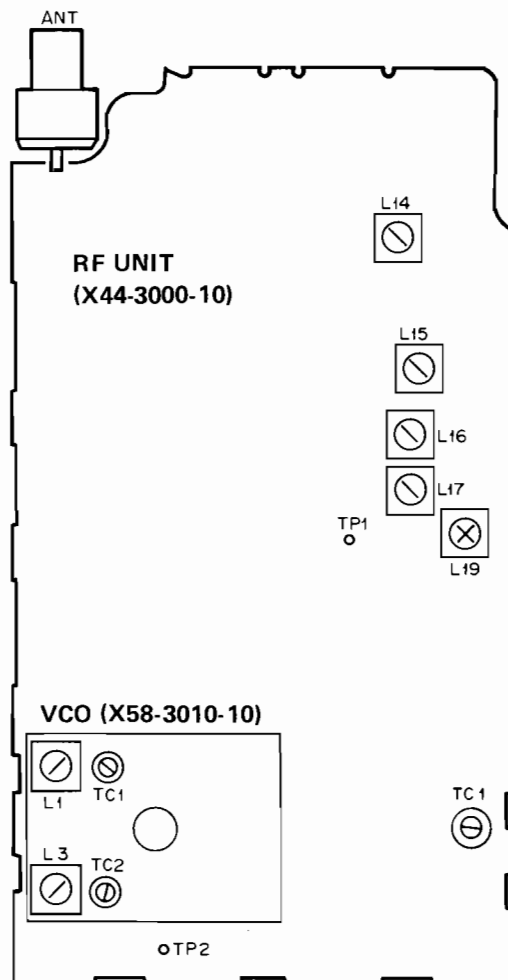
| Item                                                                                              | Condition                                        | Operation check                                                                                                                                           |
|---------------------------------------------------------------------------------------------------|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2. Function key operation<br>(Pressing [F] key and numeral key activates the indicated function). | 9) [F] [9]/CARRIER                               | [CAR] indicator turns on.<br>Push [SCAN] key to start scanning. Scanning stops if signal detected, and scanning restarts 2 seconds after the signal ends. |
|                                                                                                   | 10) [F] [▲] or [▼]                               | High speed operation of [▼] or [▲] mode.                                                                                                                  |
|                                                                                                   | 11) [F] [M]/TX STOP<br>[F] [M]/TX STOP           | [TX STOP] indicator turns on.<br>PTT and TONE key are disabled.<br>[TX STOP] indicator turns off.                                                         |
|                                                                                                   | 12) [F] [ENTER]/KEY LOCK<br>[F] [ENTER]/KEY LOCK | [KEY LOCK] indicator turns on.<br>Disables all keys except KEY LOCK and LAMP.<br>[KEY LOCK] indicator turns off.                                          |
| 3. OFFSET                                                                                         | 1) OFFSET/[F]                                    | → → + → - →                                                                                                                                               |
| 4. Memory                                                                                         | 1) FREQ. indication :<br>145.020<br>[M] [T] push | [M] [T] indicator turns on.                                                                                                                               |
|                                                                                                   | 2) FREQ. indication :<br>Any value<br>[L] push   | [L] indicator turns on.<br>FREQ. indication :<br>145.020                                                                                                  |

| Item            | Condition                              | Operation check                                          |
|-----------------|----------------------------------------|----------------------------------------------------------|
| 5. BATT SAVE    | 1) SQ : ON                             | The SAVE circuit begins operation after about 2 seconds. |
|                 | 2) [SAVE] push                         |                                                          |
|                 | 3) [F] [SAVE] [▲] or [▼] [ENTER]       | A rate from 1 to 9 can be selected.                      |
| 6. BATT Warning | 1) Unit monitors 7V from BATT pin.     | [BATT] indicator remains off.                            |
|                 | 2) Unit monitors 5.5V from BATT pin.   | [BATT] indicator turns on.                               |
| 7. R/ TONE.F    | 1) [R/TONE.F] push push                | R indicator turns on.<br>R indicator turns off.          |
|                 | 2) [F] [R/TONE.F]                      |                                                          |
|                 | 3) Set frequency with [▲] or [▼]       |                                                          |
|                 | 4) [ENTER] push                        | Complete TONE frequency setting.                         |
| 8. RESET        | 1) POWER : OFF                         |                                                          |
|                 | 2) Hold down [F] [ENTER]<br>POWER : ON | Unit is reset.<br>FREQ. indication :<br>144.000          |

### Adjusting points



(TOP SIDE VIEW)



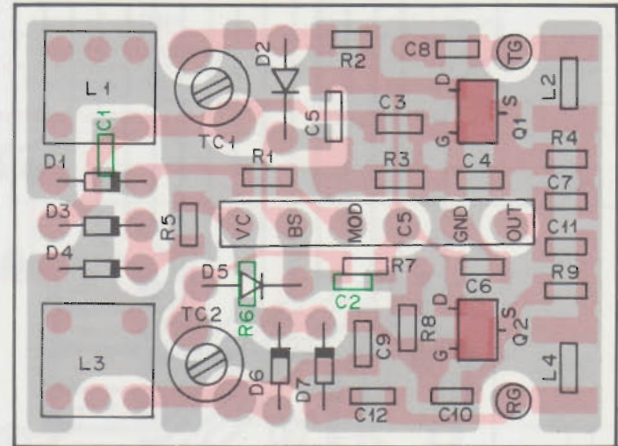
(BOTTOM SIDE VIEW)

# TERMINAL FUNCTIONS/PC BOARD VIEWS TH-215A/E

## Terminal functions

| Terminal              |      | Terminal function                                      |                                       |
|-----------------------|------|--------------------------------------------------------|---------------------------------------|
| No.                   | Name |                                                        |                                       |
| IF/RF UNIT COMMON     |      |                                                        |                                       |
| 1                     | B    | Power supply before Power switch ON.                   |                                       |
| 2                     | B    | Power supply before Power switch ON.                   |                                       |
| 3                     | GND  | Ground                                                 |                                       |
| 4                     | CB   | Power supply after Power switch ON.                    |                                       |
| 5                     | CB   | Power supply after Power switch ON.                    |                                       |
| 6                     | AFO  | AF output line                                         |                                       |
| 7                     | H/L  | transmission/reception output control line             |                                       |
| 8                     | T5   | 5V for transmission                                    |                                       |
| 9                     | R5   | 5V for reception                                       |                                       |
| 10                    | C5   | 5V for transmission/reception common                   |                                       |
| 11                    | GND  | Ground                                                 |                                       |
| 12                    | MOD  | Modulation signal line                                 |                                       |
| 13                    | IF   | Reception IF signal                                    |                                       |
| 14                    | GND  | Ground                                                 |                                       |
| 15                    | RST  | PLL IC reset pulse                                     |                                       |
| 16                    | SI   | PLL IC serial data pulse                               |                                       |
| 17                    | CPS  | PLL IC clock pulse                                     |                                       |
| 18                    | UL   | Unlock line, "L" : LOCK, "H" : UNLOCK                  |                                       |
| 19                    | SP   | Signal line to internal speaker                        |                                       |
| 20                    | AFG  | AF output line ground                                  |                                       |
| 21                    | MIC  | Signal line from Microphone                            |                                       |
| 22                    | IM   | Signal line from internal microphone                   |                                       |
| 23                    | ST   | Standby switch,<br>"H" : transmission, "L" : reception |                                       |
| 24                    | M5   | 5V for Microphone                                      |                                       |
| RF UNIT (X44-3000-10) |      |                                                        |                                       |
| 1                     | —    | Battery (—)                                            |                                       |
| 2                     | +    | Battery (+)                                            |                                       |
| IF UNIT (X48-3020-XX) |      |                                                        |                                       |
| CN2                   | 1    | TS                                                     | Tone SW ON "L"                        |
|                       | 2    | BEEP                                                   | BEEP input                            |
|                       | 3    | ST                                                     | Standby SW "L" : transmission         |
|                       | 4    | IM                                                     | Signal line from internal MIC         |
|                       | 5    | AFG                                                    | AF output GND                         |
|                       | 6    | SP                                                     | Signal line to internal SP            |
|                       | 7    | UL                                                     | Unlock line, "L" : LOCK, "H" : UNLOCK |
|                       | 8    | CPS                                                    | PLL IC clock pulse                    |
|                       | 9    | SI                                                     | PLL IC serial data pulse              |
|                       | 10   | RST                                                    | PLL IC reset pulse                    |
|                       | 11   | TRS                                                    | Tone IC clock pulse                   |
|                       | 12   | TDA                                                    | Tone IC data pulse                    |
|                       | 13   | TCK                                                    | Tone IC clock pulse                   |
|                       | 14   | GND                                                    | Ground                                |
|                       | 15   | SM                                                     | S meter data output                   |
| CN3                   | 1    | TCK                                                    | Tone IC clock pulse                   |
|                       | 2    | TDA                                                    | Tone IC data pulse                    |
|                       | 3    | TRS                                                    | Tone IC reset pulse                   |
|                       | 4    | TB                                                     | Power supply for external Tone unit   |
|                       | 5    | SPO                                                    | AF output control line                |
|                       | 6    | TI                                                     | Tone input line                       |
|                       | 7    | GND                                                    | Ground                                |
| CN4                   | 1    | SAVE                                                   | Battery save control line             |
|                       | 2    | KEY                                                    | Power supply for key matrix           |
|                       | 3    | VDD                                                    | Power supply for MPU                  |
|                       | 4    | TX                                                     | T5/R5 select line, "H" : transmission |
|                       | 5    | SQ                                                     | BUSY detect line, "H" : BUSY          |
|                       | 6    | CB                                                     | Power supply after Power SW ON        |
|                       | 7    | BU                                                     | Backup control line                   |
|                       | 8    | AFC                                                    | AF output control line "H" : BUSY     |
|                       | 9    | TONE                                                   | SUB Tone signal input line            |
|                       | 10   | DTMF                                                   | DTMF signal input line                |

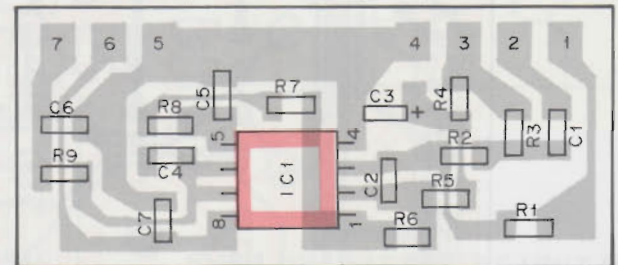
## ▼ VCO (X58-3010-10) Component side view



Q1,2 : 2SK302(GR)

D1,3,4,6,7 : 1SV153 D2,5 : 1SS277

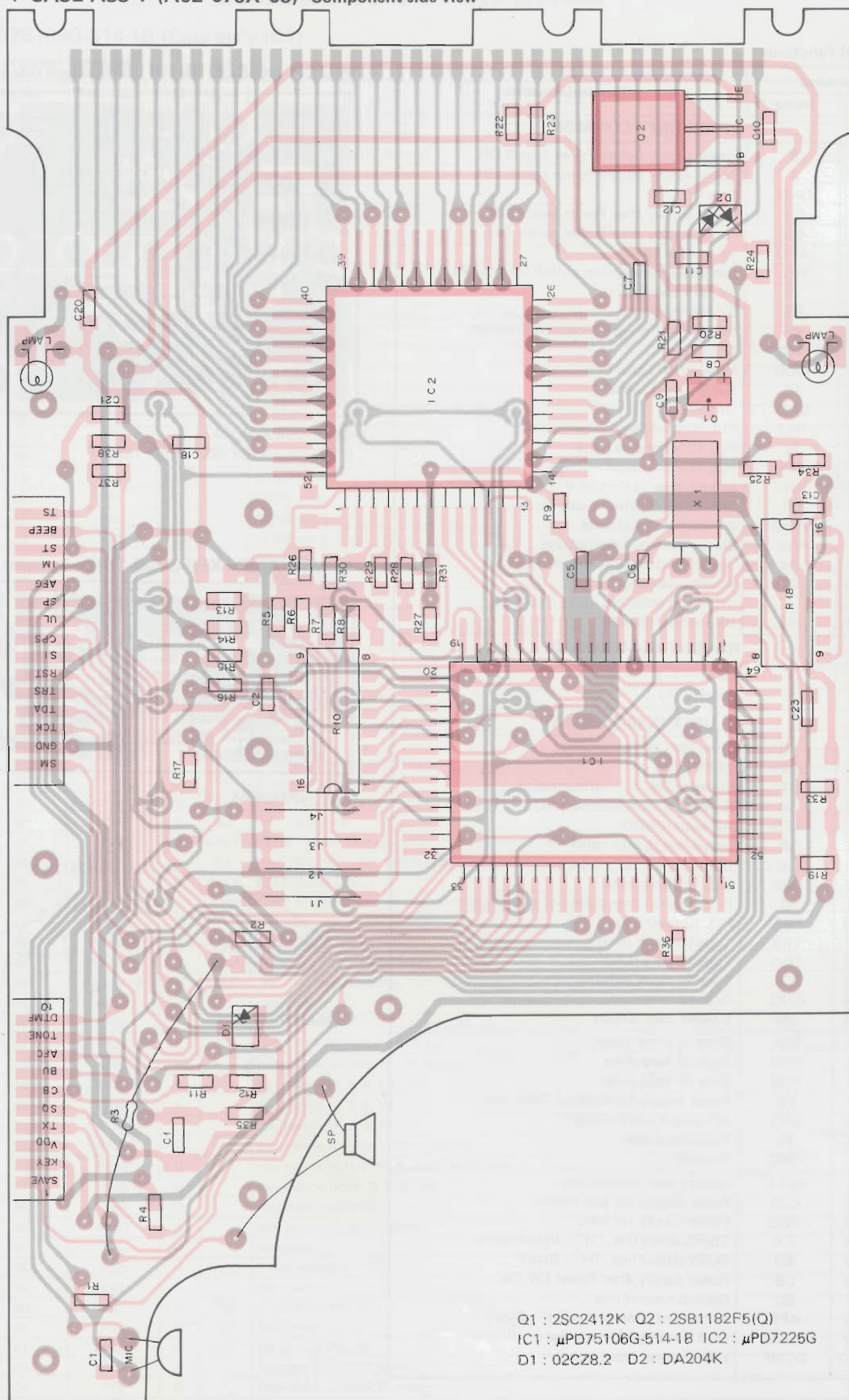
## ▼ MIC AMP (X59-3090-10) Component side view





# TH-215A/E PC BOARD VIEW

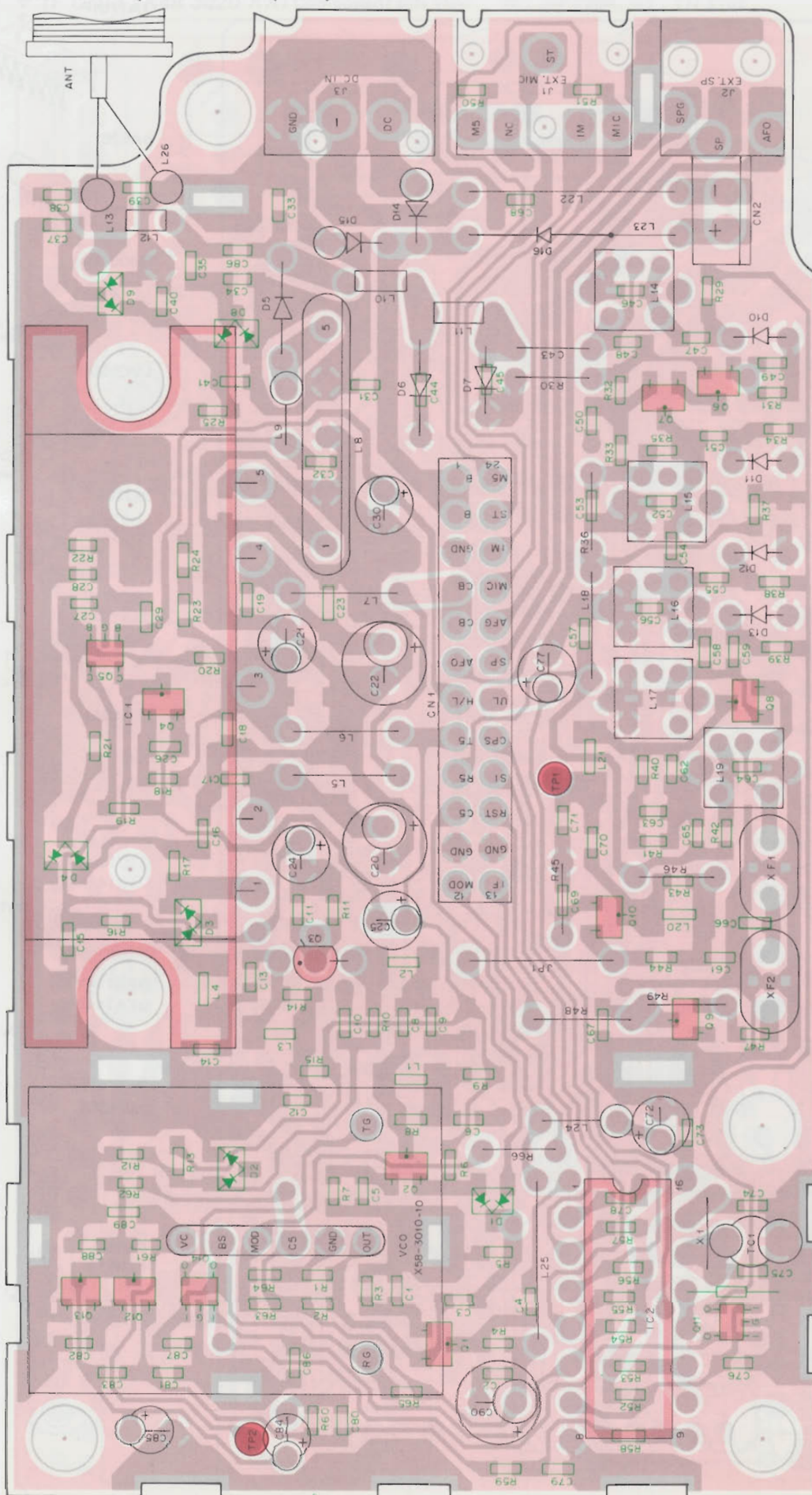
▼ CASE ASS'Y (A02-076X-05) Component side view



Q1 : 2SC2412K Q2 : 2SB1182F5(Q)  
 IC1 :  $\mu$ PD75106G-514-18 IC2 :  $\mu$ PD7225G  
 D1 : 02CZ8.2 D2 : DA204K



▼ RF UNIT (X44-3000-10) Component side view

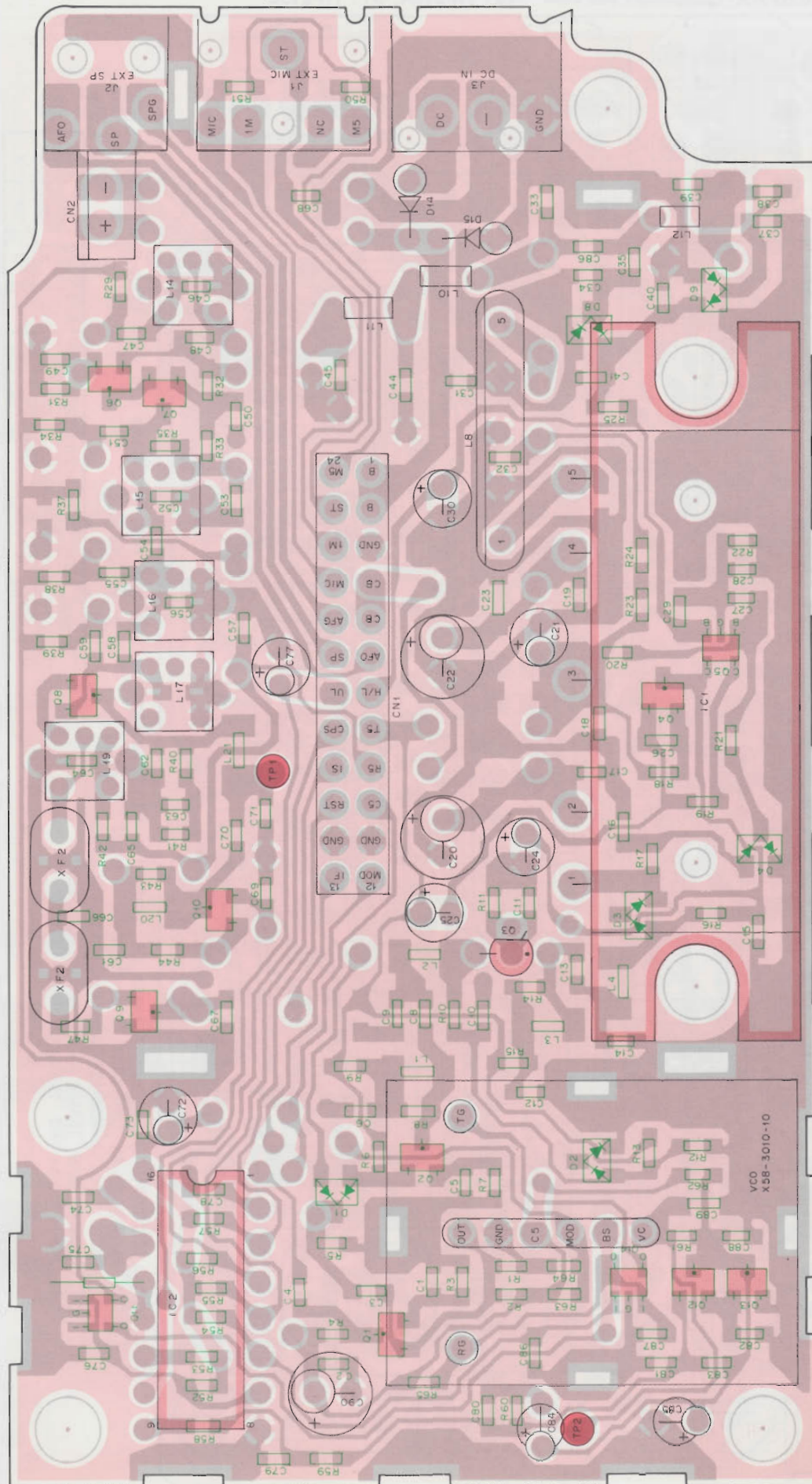


Q1,7,9 : 2SC2714(O) Q2,10 : 2SC3838K(N,P) Q3 : 2SC2407 Q4 : 2SA1313(Y) Q5 : FMW1 Q6 : 2SC3356 Q8 : 2SK210(GR) Q11,14 : FMG4 Q12,13 : 2SC2712(GR)  
 IC1 : M57732L IC2 : M54959P  
 D1 : HSM2693 D2,4 : DA204K D3 : 1SV172 D5 : MI303 D6 : MI301 D7 : 1SS277 D8,9 : HSM88AS D10-13 : 1SV153 D14,16 : ERB83-004 D15 : UZP-228



# PC BOARD VIEWS TH-215A/E

## ▼ RF UNIT (X44-3000-10) Foil side view



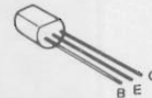
M54959P



2SA1313 2SC3356  
2SC2712 2SC3838K  
2SC2714



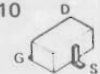
2SC2407



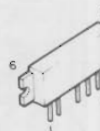
FMW1  
FMG4



2SK210



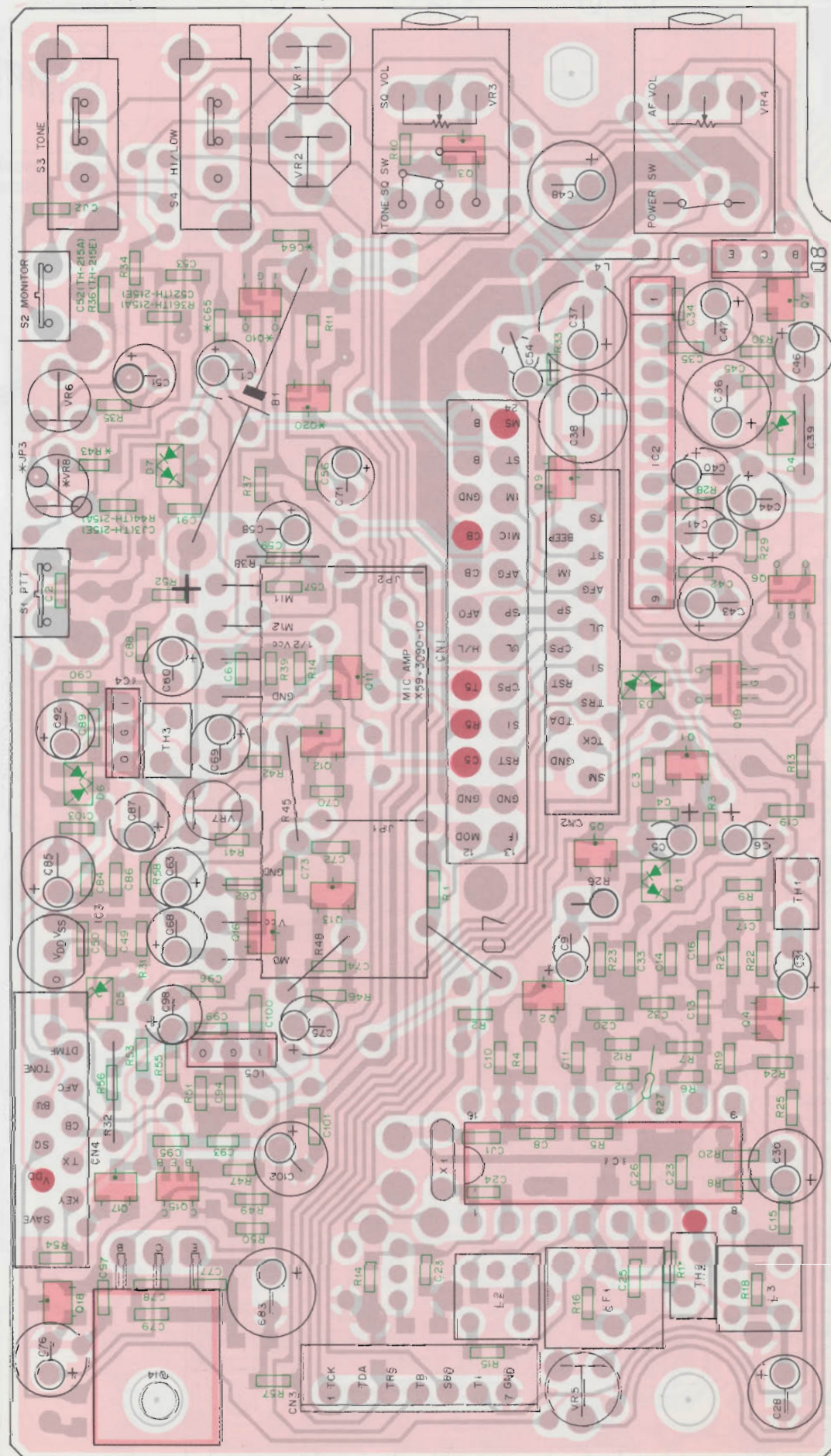
M57732L





# TH-215A/E PC BOARD VIEWS

▼ IF UNIT (X48-3020-XX) Component side view -10 : TH-215A, -51 : TH-215E



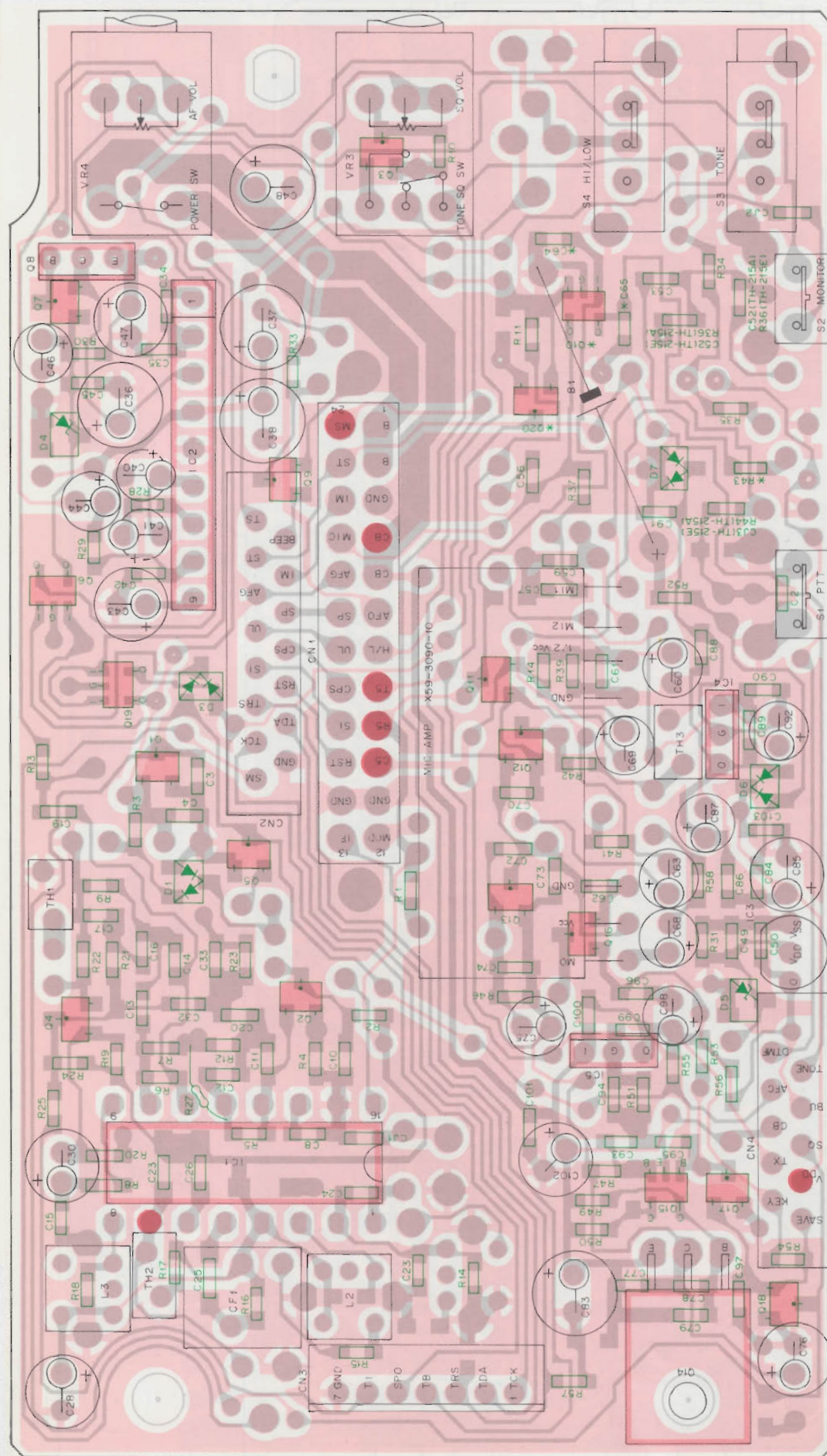
Q1,2,4,7 : 2SC2712(IGR) Q3,20 : DTC144EK Q5 : 2SJ106(IGR) Q6,10,19 : FMG2 Q8 : 2SA1241(Y) Q9 : DTC143XK Q11 : DTA114YK Q12 : DTA144EK  
Q15 : FMW1 Q16-18 : DTC114YK Q19 : FMG2  
IC1 : TA7761P IC2 : BA526 IC3 : S-8054HN IC4,5 : LVC550C  
D1 : HSM88A5 D3,6 : 1SS184 D4,5 : 02C28.2 D7 : 1SS226  
TH1 : PTH59T103M TH2 : 112-202-2 TH3 : 112-101-2

|               | Q10 | Q20 | Q64 | Q65 | R43 | R44 | JP3 | CJ3 | VR8 |
|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| TH-215A (-10) | ○   | ○   | ○   | ○   | ○   | ○   | ○   | ○   | ○   |
| TH-215E (-51) | ×   | ×   | ×   | ×   | ×   | ×   | ×   | ×   | ×   |

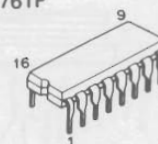
○ : Used, × : Not used.



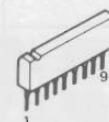
▼ IF UNIT (X48-3020-XX) Foil side view -10 : TH-215A, -51 : TH-215E



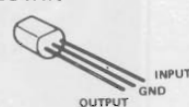
TA7761P



BA526



S-8054HN



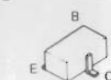
LVC550C



2SJ106



2SC2712  
2SA1313



2SA1241



DTC114YK  
DTC144EK  
DTC143XK



DTA114YK  
DTA144EK



2SA1358



FMG2  
FMW1









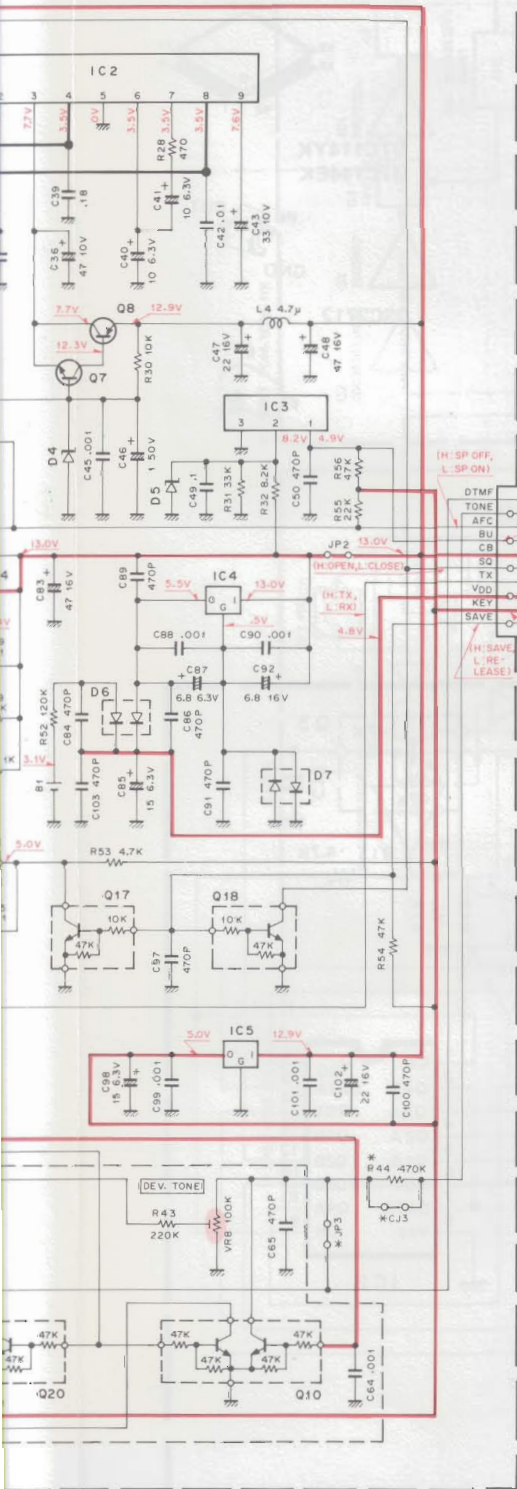
# SCHEMATIC DIAGRAM

VCO (X58-3010-10)  
Q1,2 : 2SK302(GR)  
D1,3,4,6,7 : 1SV153  
D2,5 : 1SS277

RF UNIT (X44-3000-10)

VCO (X58-3010-10)

3020-XX) -10 : TH-215A(K,M1,M2,X) -51 : TH-215E(T,W)



MIC AMP (X59-3090-10)  
IC1 : NJM 4560M

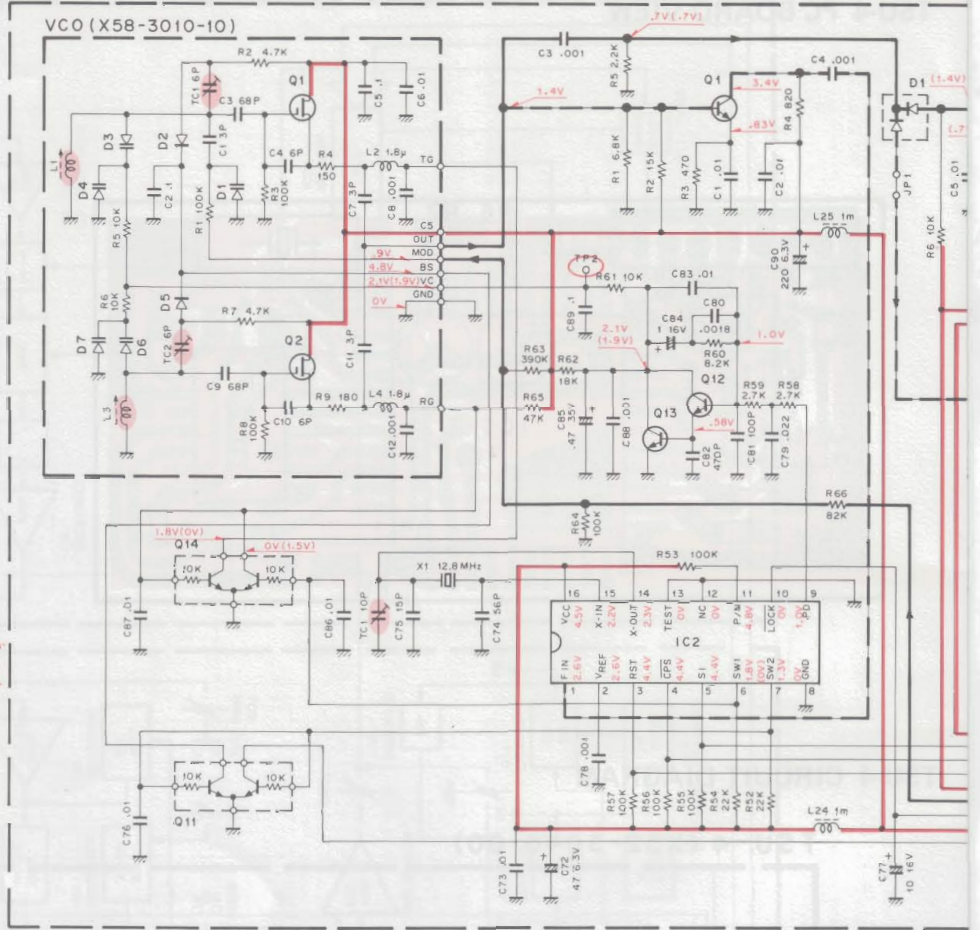
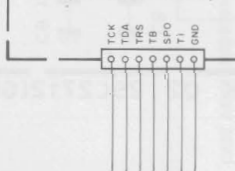
IF UNIT (X48-3020-XX)  
Q1,2,4,7 : 2SC2712 (GR)  
Q3,20 : DTC144EK  
Q5 : 2SJ106 (GR)  
Q6,10,19 : FMG2  
Q8 : 2SA1241(Y)  
Q9 : DTC143XK  
Q11 : DTA114YK  
Q12 : DTA144EK  
Q13 : 2SA1313(Y)  
Q14 : 2SA1358(Y)  
Q15 : FMW1  
Q16~18 : DTC114YK

IC1 : TA7761P  
IC2 : BA526  
IC3 : S-8054HN  
IC4,5 : LVC550C

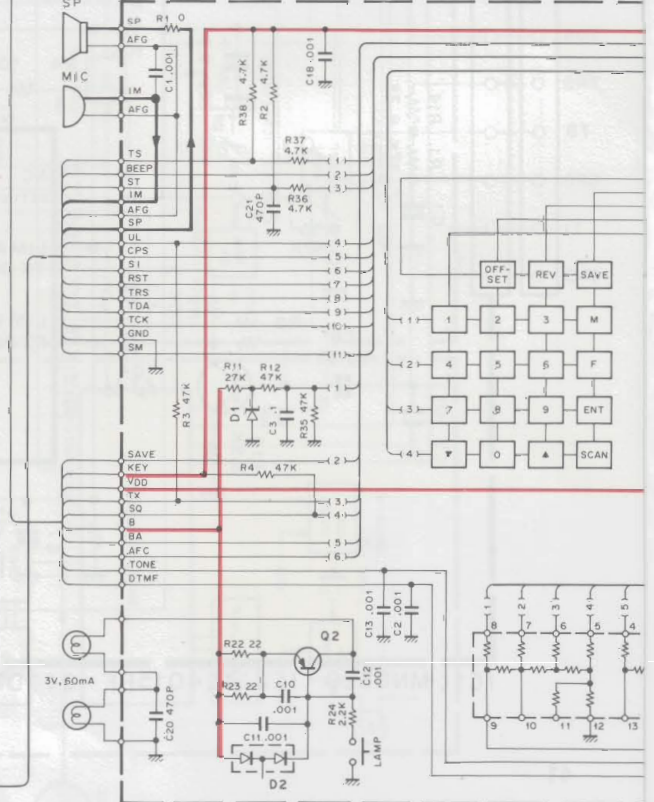
D1 : HSM88AS  
D3,6 : 1SS184  
D4,5 : 02C28.2 or STZJ8.2 or RD8.2M-B2,B3  
D7 : 1SS226

TH1 : PTH59T103M  
TH2 : 112-202-2  
TH3 : 112-101-2

TSU-4 (OPTION)  
(TH-215A ONLY)



CASE ASS'Y (A02-076X-05)





$f = 144.000\text{MHz}$ ,  $V_{CC} = 8.4\text{V}$ , ( ) : TX

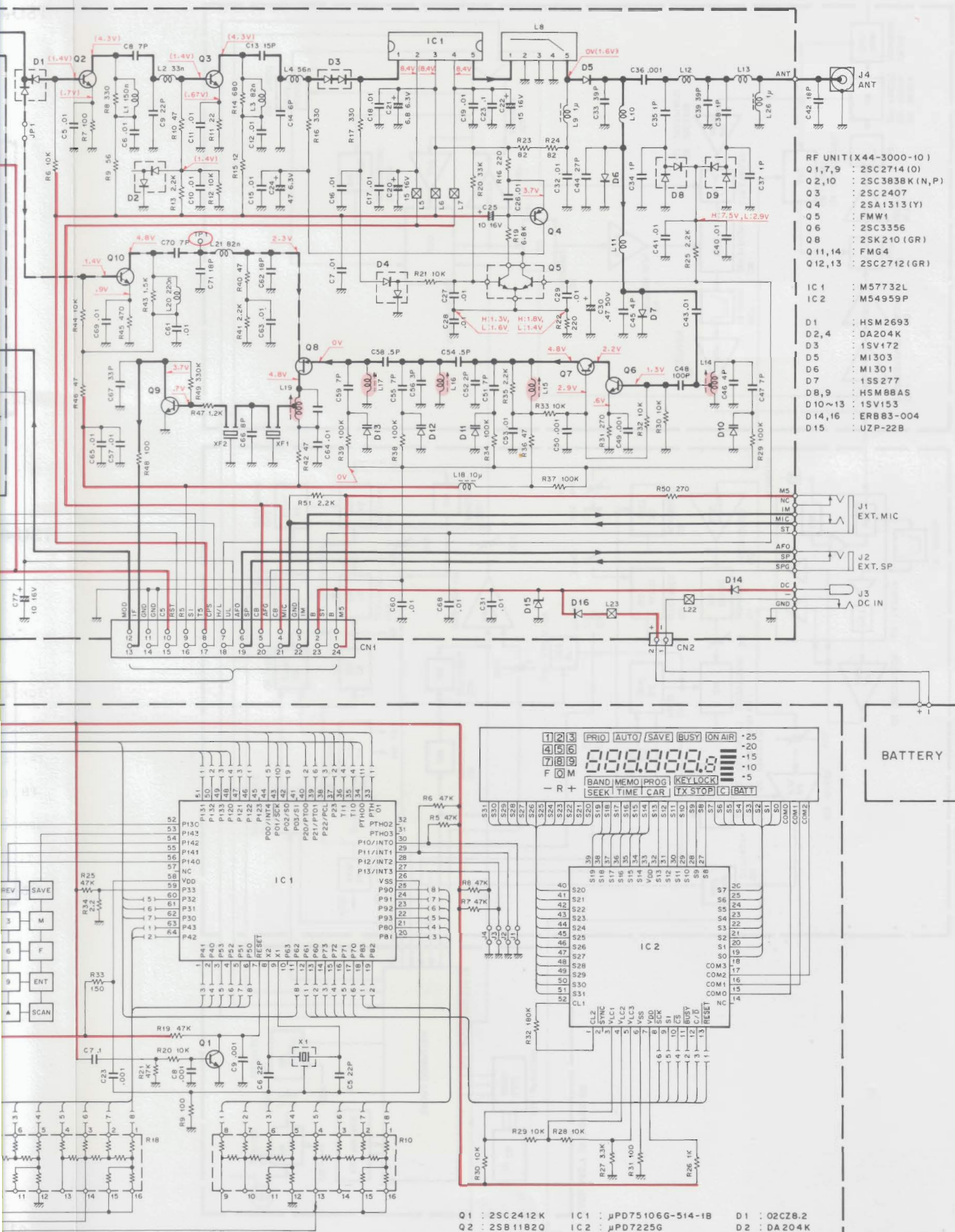
```

RF UNIT(X44-3000-10)
Q1,7,9 : 25C2714(O)
Q2,10 : 25C3838(N,P)
Q3 : 25C2407
Q4 : 25A1313(Y)
Q5 : FMW1
Q6 : 25C3356
Q8 : 25K210(GR)
Q11,14 : FMG4
Q12,13 : 25C2712(GR)

IC1 : M57732L
IC2 : M54959P

D1 : HSM2693
D2,4 : DA204K
D3 : 15V172
D5 : M1303
D6 : M1301
D7 : 15S277
D8,9 : HSM88AS
D10-13 : 15V153
D14,16 : ERB83-004
D15 : UZP-22B

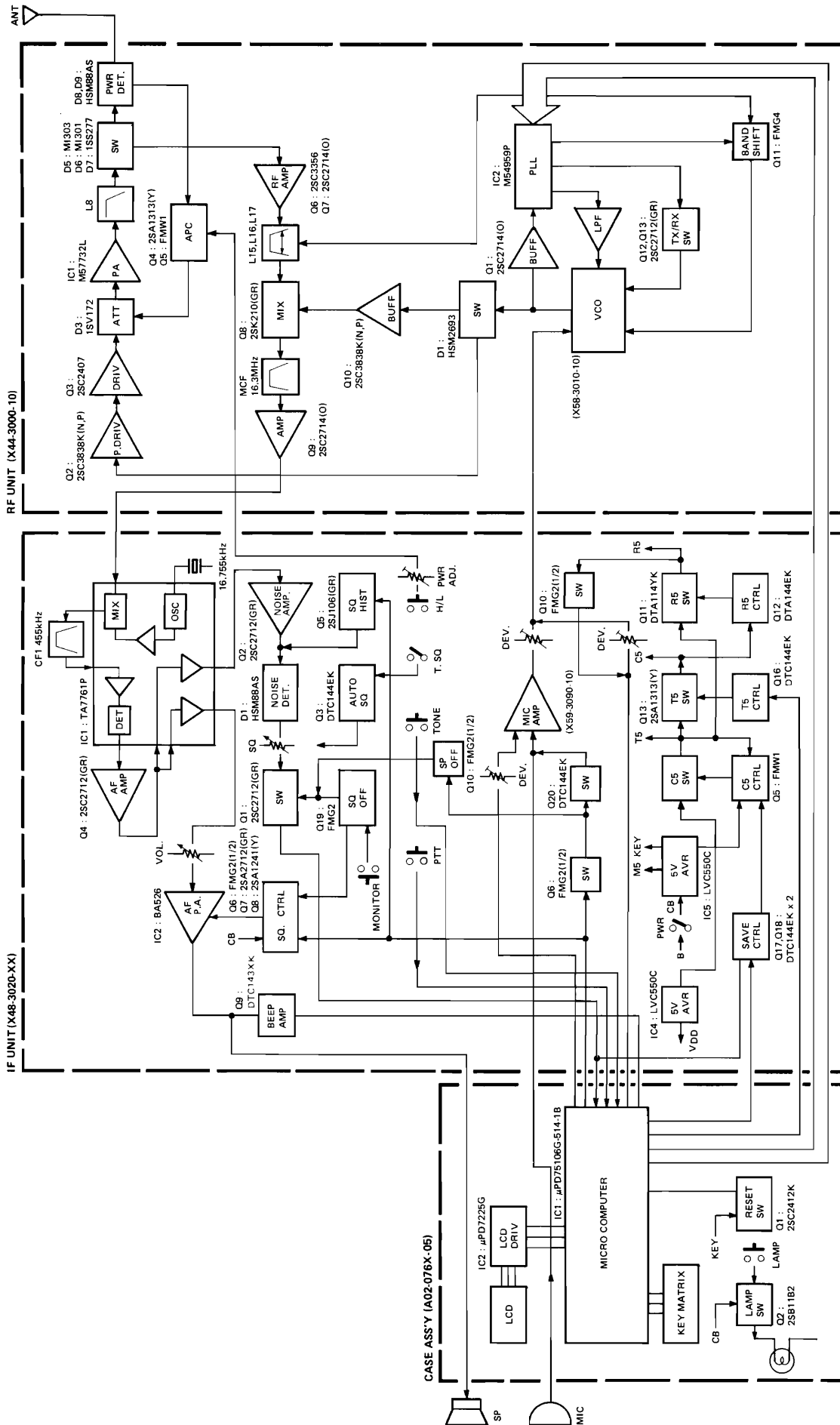
```



TH-215A/E

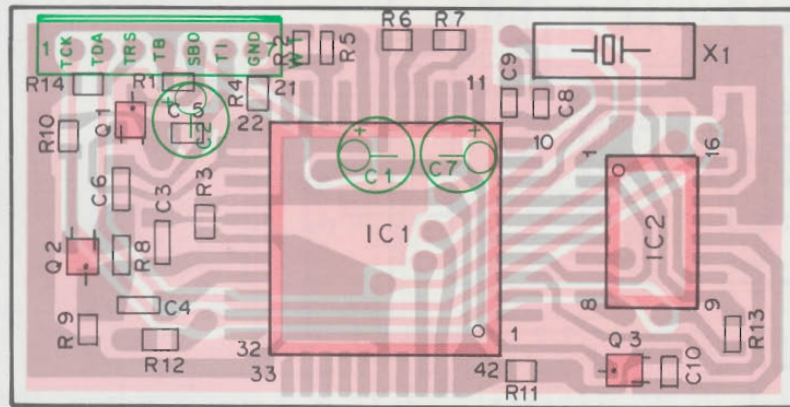


## BLOCK DIAGRAM

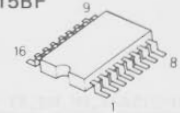


## TSU-4 (TONE SQUELCH : TH-215A ONLY)

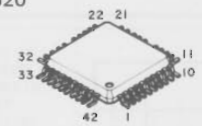
TSU-4 PC BOARD VIEW



TC4015BF



MN6520



DTC114YK  
DTC144EK

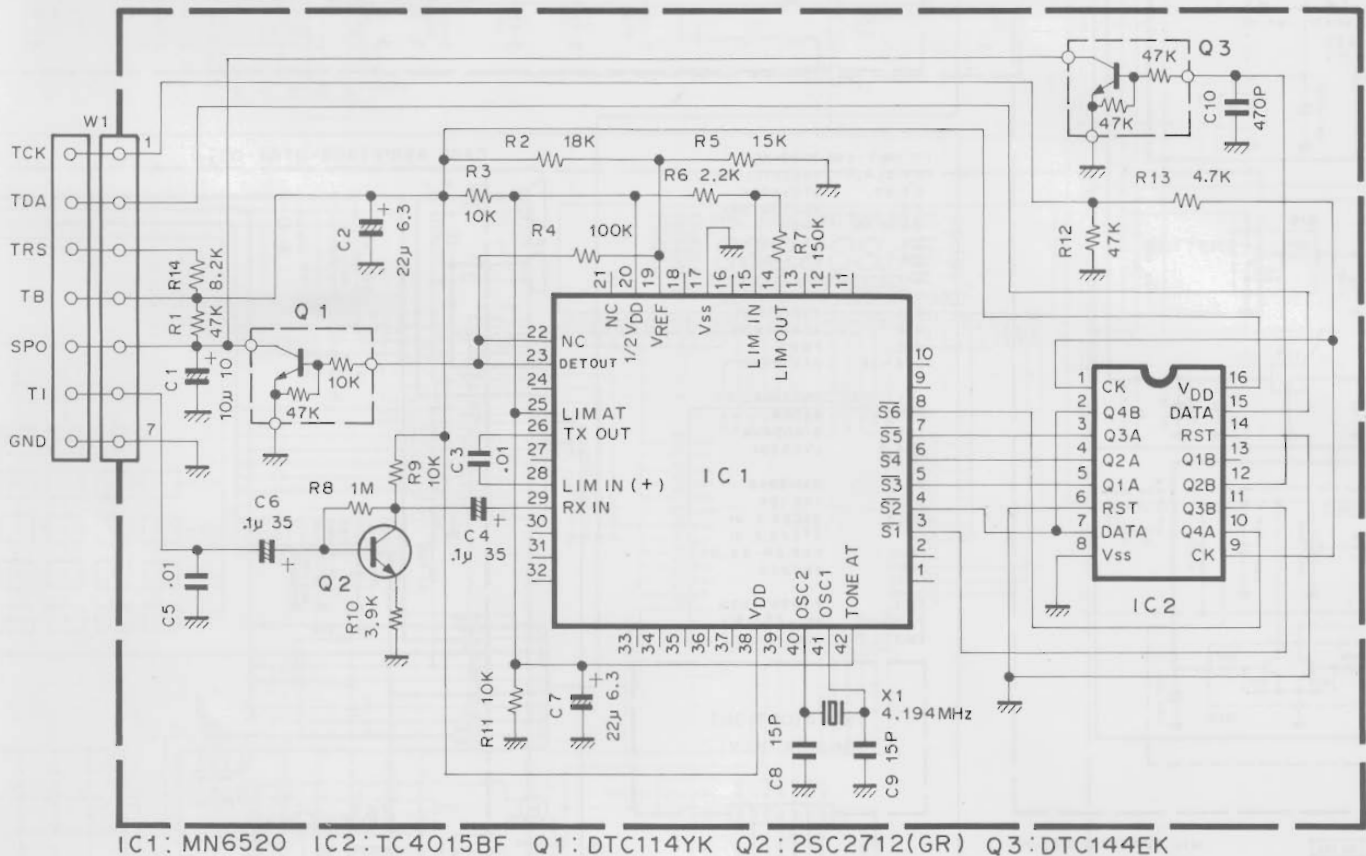


2SC2712



TSU-4 CIRCUIT DIAGRAM

TSU - 4 (X52-3040-00)



## TSU-4 (TONE SQUELCH : TH-215A ONLY)

※ New Parts

Parts without Parts No. are not supplied.

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

Teile ohne Parts No. werden nicht geliefert.

### TSU-4 PARTS LIST

| Ref. No.<br>参照番号        | Address<br>位置 | New<br>Parts<br>新 | Parts No.<br>部品番号 | Description<br>部品名 / 規格        | Desti-<br>nation<br>仕向 | Re-<br>marks<br>備考 |
|-------------------------|---------------|-------------------|-------------------|--------------------------------|------------------------|--------------------|
| TSU-4                   |               |                   |                   |                                |                        |                    |
| -                       |               | *                 | B50-8130-00       | INSTRUCTION MANUAL             |                        |                    |
| -                       |               |                   | G13-0820-14       | CUSHION (ACSY)                 |                        |                    |
| -                       |               |                   | J90-0402-04       | GUIDE                          |                        |                    |
| TONE UNIT (X52-3040-00) |               |                   |                   |                                |                        |                    |
| C1                      |               |                   | CE04CW1A100M      | ELECTR0 10UF 10WV              |                        |                    |
| C2                      |               |                   | CE04CW0J220M      | ELECTR0 22UF 6.3WV             |                        |                    |
| C3                      |               |                   | CK73EB1H103K      | CHIP C 0.010UF K               |                        |                    |
| C4                      |               |                   | C92-0001-05       | TANTAL 0.1UF 35WV              |                        |                    |
| C5                      |               |                   | CK73FB1H103K      | CHIP C 0.010UF K               |                        |                    |
| C6                      |               |                   | C92-0001-05       | TANTAL 0.1UF 35WV              |                        |                    |
| C7                      |               |                   | CE04CW0J220M      | ELECTR0 22UF 6.3WV             |                        |                    |
| C8 ,9                   |               |                   | CK73FB1H150J      | CHIP C 15PF J                  |                        |                    |
| C10                     |               |                   | CK73FB1H471K      | CHIP C 470PF K                 |                        |                    |
| W1                      |               |                   | E31-3223-15       | CONNECTING WIRE                |                        |                    |
| X1                      |               |                   | L77-1313-05       | CRYSTAL RESONATOR(4.194394MHZ) |                        |                    |
| R1                      |               |                   | RK73FB2A473J      | CHIP R 47K J 1/10W             |                        |                    |
| R2                      |               |                   | RK73FB2A183J      | CHIP R 18K J 1/10W             |                        |                    |
| R3                      |               |                   | RK73FB2A103J      | CHIP R 10K J 1/10W             |                        |                    |
| R4                      |               |                   | RK73FB2A104J      | CHIP R 100K J 1/10W            |                        |                    |
| R5                      |               |                   | RK73FB2A153J      | CHIP R 15K J 1/10W             |                        |                    |
| R6                      |               |                   | RK73FB2A222J      | CHIP R 2.2K J 1/10W            |                        |                    |
| R7                      |               |                   | RK73FB2A154J      | CHIP R 150K J 1/10W            |                        |                    |
| R8                      |               |                   | RK73FB2A105J      | CHIP R 1.0M J 1/10W            |                        |                    |
| R9                      |               |                   | RK73FB2A103J      | CHIP R 10K J 1/10W             |                        |                    |
| R10                     |               |                   | RK73FB2A392J      | CHIP R 3.9K J 1/10W            |                        |                    |
| R11                     |               |                   | RK73FB2A103J      | CHIP R 10K J 1/10W             |                        |                    |
| R12                     |               |                   | RK73FB2A473J      | CHIP R 47K J 1/10W             |                        |                    |
| R13                     |               |                   | RK73FB2A472J      | CHIP R 4.7K J 1/10W            |                        |                    |
| R14                     |               |                   | RK73FB2A822J      | CHIP R 8.2K J 1/10W            |                        |                    |
| IC1                     |               | *                 | MN6520            | IC(CTCSS SYSTEM)               |                        |                    |
| IC2                     |               |                   | TC4015BF          | IC(DUAL 4-STAGE SHIFT RESISTOR |                        |                    |
| Q1                      |               |                   | DTC114YK          | DIGITAL TRANSISTOR             |                        |                    |
| Q2                      |               |                   | 2SC2712(GR)       | TRANSISTOR                     |                        |                    |
| Q3                      |               |                   | DTC144EK          | DIGITAL TRANSISTOR             |                        |                    |

E: Scandinavia & Europe K: USA P: Canada W: Europe

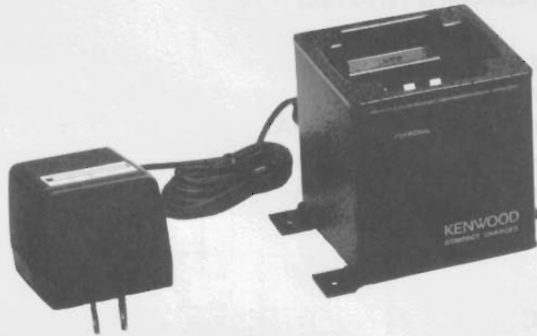
U: PX(Far East, Hawaii) T: England M: Other Areas

UE: AAFES(Europe) X: Australia

⚠ indicates safety critical components.

## BC-8 (COMPACT CHARGER)

### BC-8 EXTERNAL VIEW

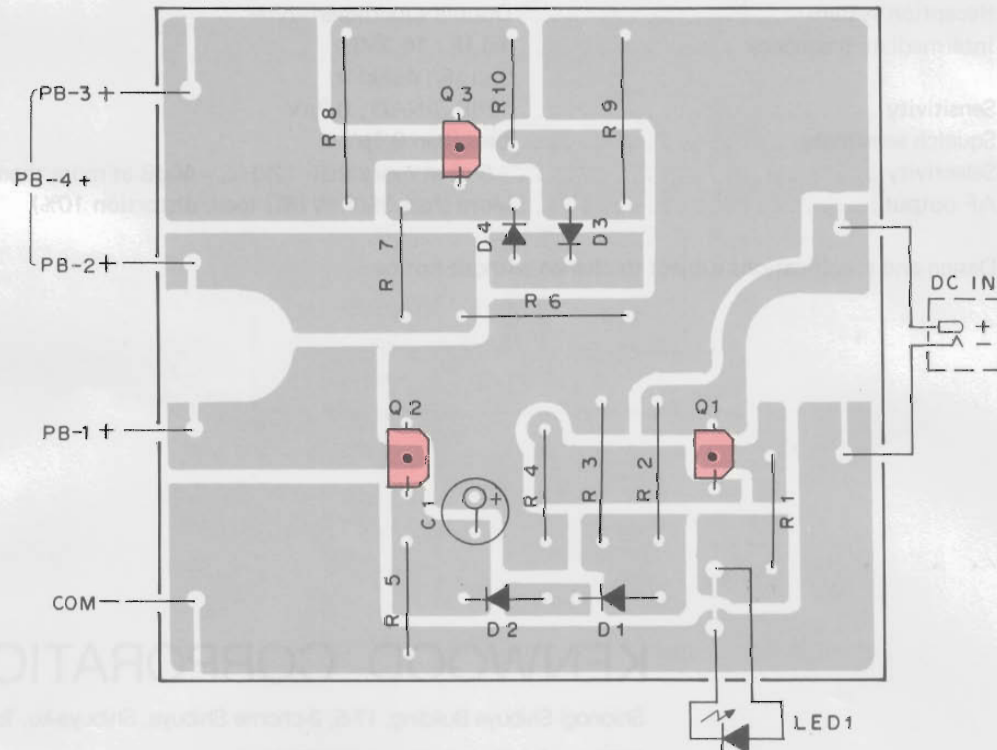


### BC-8 PARTS LIST

N : New parts

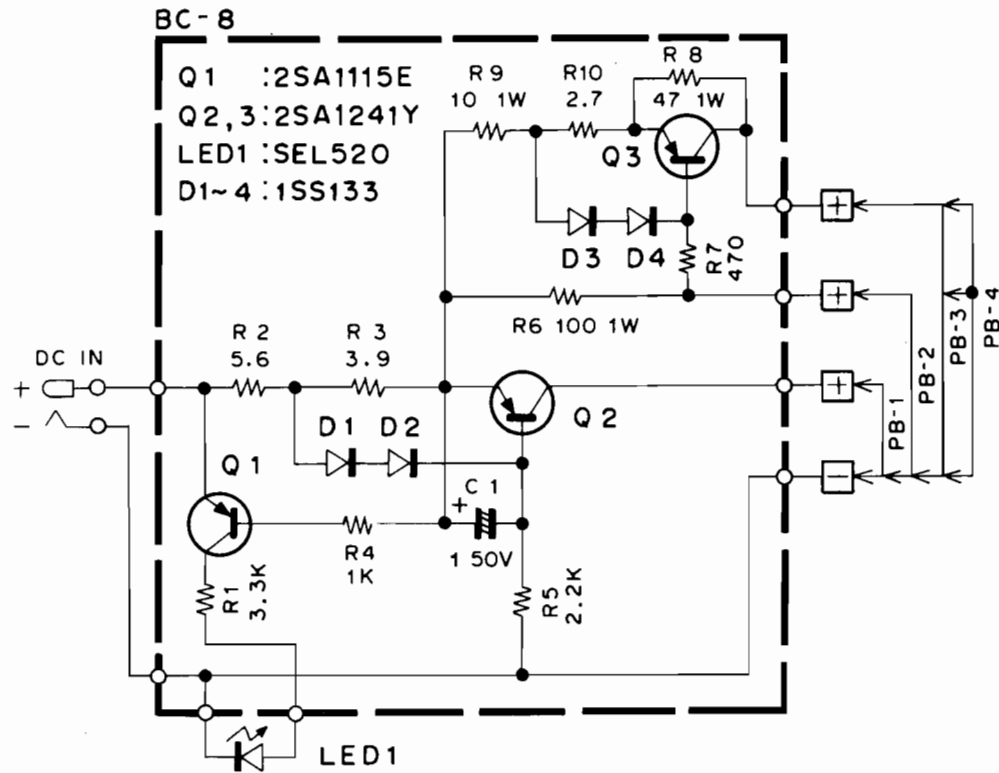
| Parts No.   | Re-<br>marks | Description        | Ref.No. |
|-------------|--------------|--------------------|---------|
| A02-0778-05 | N            | Case               |         |
| B50-8137-18 | N            | Instruction manual |         |
| W09-0391-08 | N            | PC board ass'y     |         |
| 2SA1115E    |              | TR                 | Q1      |
| 2SA1241Y    |              | TR                 | Q2,3    |
| 1SS133      |              | Diode              | D1~4    |
| SEL520      |              | LED                | LED1    |

### BC-8 PC BOARD VIEW

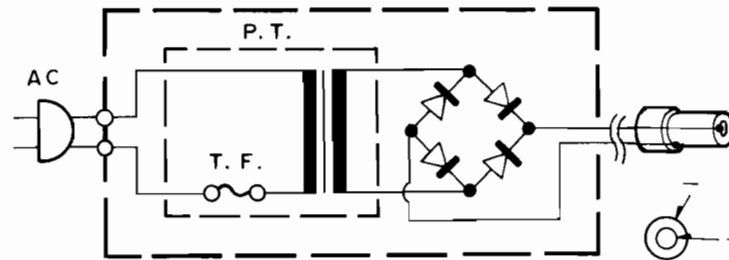


## BC-8 (COMPACT CHARGER)

BC-8 CIRCUIT DIAGRAM



The unspecified resistors have the value of 1/4W.





## SPECIFICATIONS

### General

|                       |                                                                                                                                                                 |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Frequency range       | 144.00MHz – 148.00MHz (TH-215A)<br>144.00MHz – 146.00MHz (TH-215E)                                                                                              |
| Signal type           | F3 (F3E)                                                                                                                                                        |
| Power supply voltage  | DC 6.3V – 15V (Battery terminal)<br>DC 7.2V – 16V (DC IN jack)                                                                                                  |
| Power consumption     | At reception standby ; Approx. 50mA<br>At battery power save ; Approx. 11mA<br>At transmission (5W) ; Less than 1.7A<br>At transmission (0.5W) ; Less than 0.7A |
| Antenna impedance     | 50Ω                                                                                                                                                             |
| EXT. MIC impedance    | 2kΩ                                                                                                                                                             |
| Operating temperature | –20°C – +50°C                                                                                                                                                   |
| Dimensions            | 67 (69.5) W x 173 (180.7) H x 37 (40) D mm<br>The numbers in the parenthesis include projections parts.                                                         |
| Weight                | 540g (including antenna and Ni-Cd batteries)                                                                                                                    |

### Transmitter section

|                          |                                                   |
|--------------------------|---------------------------------------------------|
| Output power             | Hi ; 5W, Low ; 0.5W                               |
| Modulation system        | Reactance modulation                              |
| Max. frequency deviation | ±5kHz                                             |
| Unwanted reflection      | Less than –60dB                                   |
| Frequency tolerance      | Less than $\pm 20 \times 10^{-6}$ (–10°C ~ +50°C) |

### Receiver section

|                        |                                                   |
|------------------------|---------------------------------------------------|
| Reception system       | Double superheterodyne                            |
| Intermediate frequency | 1st IF ; 16.3MHz<br>2nd IF ; 455kHz               |
| Sensitivity            | 12dB SINAD ; 0.2μV                                |
| Squelch sensitivity    | Less than 0.1μV                                   |
| Selectivity            | –6dB at more than 12kHz, –40dB at more than 24kHz |
| AF output              | More than 350mW (8Ω load, distortion 10%)         |

Design and specifications subject to change without notice.

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4E. Woodcock Place, Lane Cove, N.S.W. 2066, Australia