

TH-315A

SERVICE MANUAL

KENWOOD

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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 16.9 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 16.9 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 16.445MHz 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) | 16.9MHz |
| 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 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 (L71-0276-05)(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)

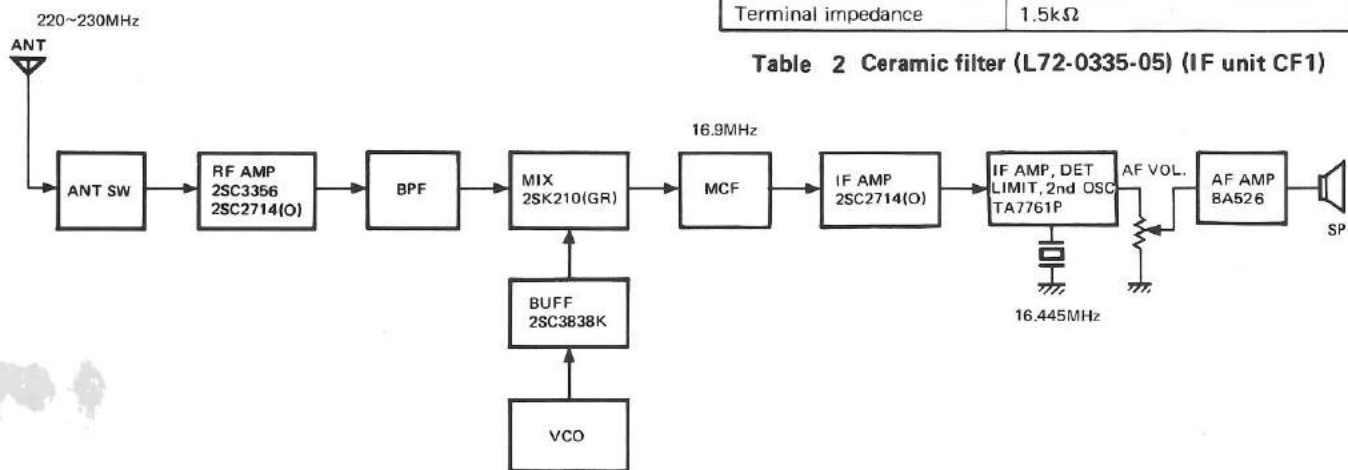


Fig. 1 RX section block diagram

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 (L78-0042-08) (VCO) of the RF unit in order to apply direct modulation to the VCO utilizing the capacitance between the electrodes of D1 : DAN235K.

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 : M67723.

The transmission output from IC1 is sent through low pass filter and transmission/reception switching diode D5 : MI303, 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

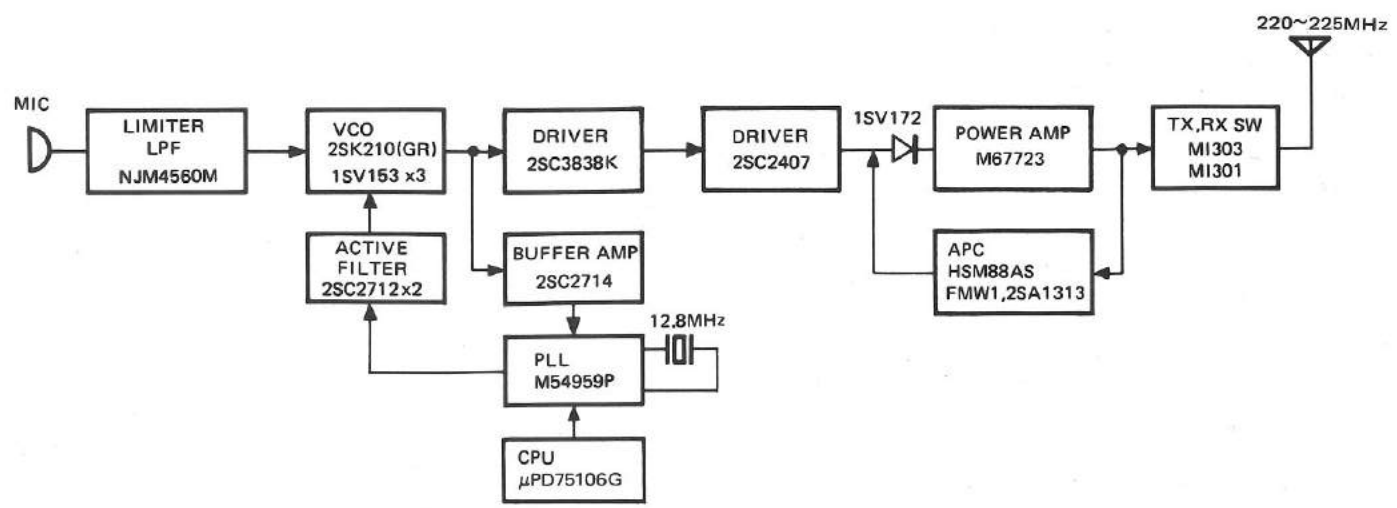


Fig. 2 TX section block diagram

PLL unit

The VCOs are provided independently for transmission and reception, and use Colpitts oscillator circuits of Q1 and Q2 : 2SK210(GR). The two VCOs are switched by switching Q14 : FMG4 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-315 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 : LP2950CZ, Q14 : 2SA1358Y 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 : DTA143ZK 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 : LP2950CZ 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.

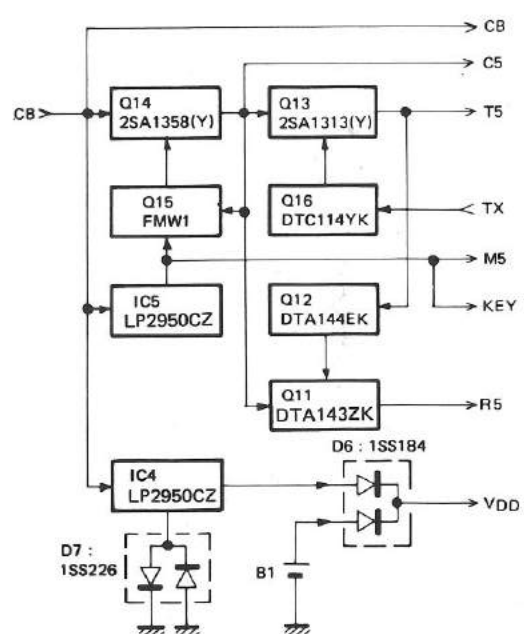


Fig. 3 Power supply circuit

CIRCUIT DESCRIPTION

Microprocessor and its peripheral circuits

The TH-315 is designed for multiple functions and has low power consumption, thanks to its 4 bit single-chip microprocessor (IC1 : μ PD75106G-524-1B in the control section) and LCD driver (IC2, a μ 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.

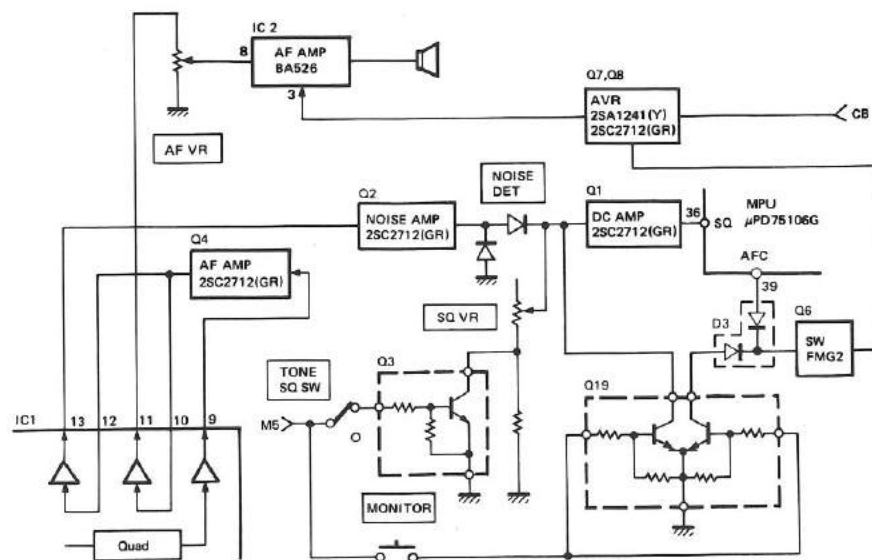


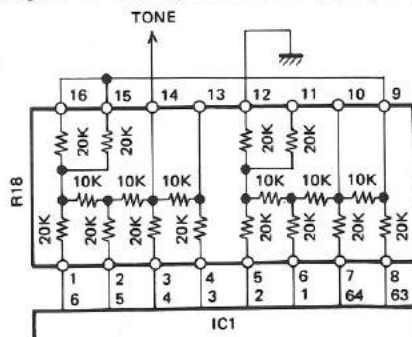
Fig. 4 Squelch circuit

• Sub-tone and touch tone signals.

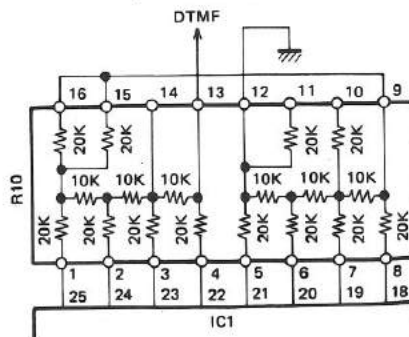
Sub audible tone frequencies and Touch Tone Pad frequencies are generated by the microprocessor in the TH-315. Since sub audible tones are a single tone the sine wave is produced from 7-bit digital data supplied by the microprocessor. Digital to analog conversion (D/A) is performed

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.



1) Sub-tone A/D conversion



2) Touch tone A/D conversion

Fig. 5 Sub-tone and touch-tone signals

CIRCUIT DESCRIPTION/SEMICONDUCTOR DATA

● Battery power save circuit

The TH-315 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-315 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.

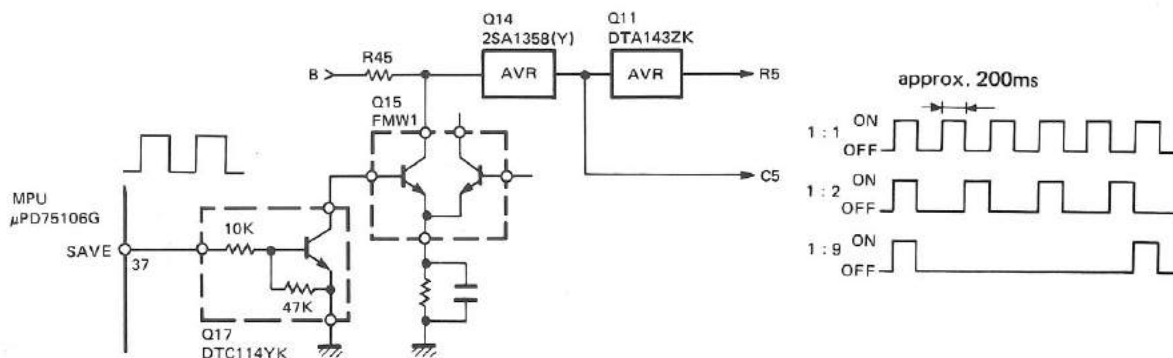
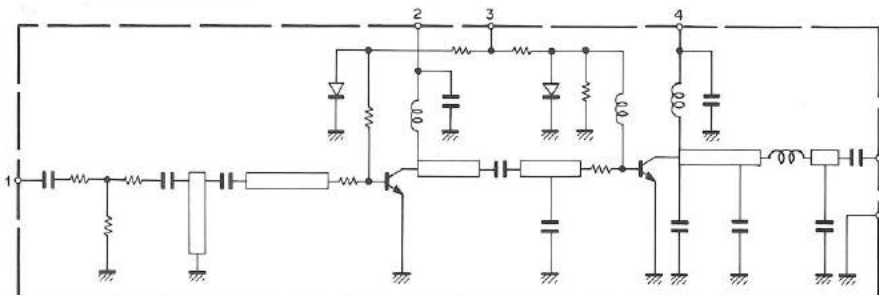


Fig. 6 Battery power save circuit

RF POWER AMP M67723(RF UNIT IC1)

● Equivalent circuit



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

● Electrical characteristic

| Item | Symbol | Rating | | | Unit |
|--------------------|------------------|--------|-----|-----|------|
| | | Min | Max | Typ | |
| Output power | P _o | 7 | 8 | — | W |
| Total efficiency | η _T | 45 | 50 | — | % |
| 2nd spurious | | — | — | -20 | dB |
| Spurious after 3rd | | — | — | -30 | dB |
| Input SWR | ρ _{in} | — | 2.0 | 2.5 | — |
| Output SWR | ρ _{out} | — | 1.5 | — | — |

T_a = 25°C, V_{cc} = 12.5V, V_{BB} = 5V, f = 220~225MHz,
P_{in} = 20mW, Z_G = Z_L = 50Ω

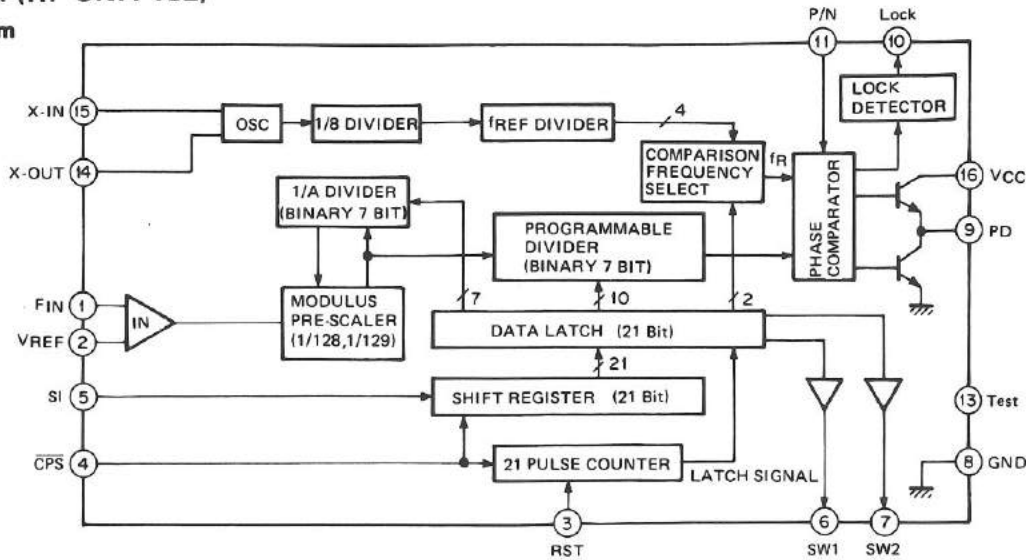
● Maximum rating

| Item | Symbol | T _c (°C) | Condition | Rating | Unit |
|----------------------------|---------------------|---------------------|--|------------|------|
| Operating voltage | V _{cc} | 25 | | 16 | V |
| Bias voltage | V _{BB} | 25 | | 6 | V |
| Current consumption | I _{cc} | 25 | | 4 | A |
| Input power | P _{in} | 25 | V _{cc1} ≤ 12.5V, Z _G = 50Ω | 40 | mW |
| Output power | P _o | 25 | Z _L = 50Ω | 10 | W |
| Operating case temperature | T _c (op) | | | -30 ~ +110 | °C |
| Storage temperature | T _{stg} | | | -40 ~ +110 | °C |

SEMICONDUCTOR DATA

PLL M54959P(RF UNIT IC2)

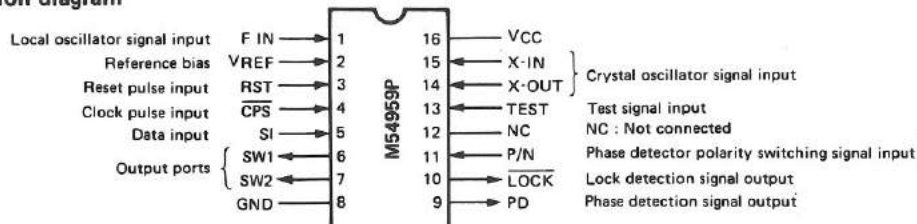
● Block diagram



● Description of terminals

| No. | Symbol | Pin name | Description |
|-----|--------|--|--|
| 1 | FIN | Local oscillator signal input | Local oscillator frequency (VCO input; $f_{MAX} = 500\text{MHz}$). |
| 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. 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", f_R (comparison frequency) and f_{IN}/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

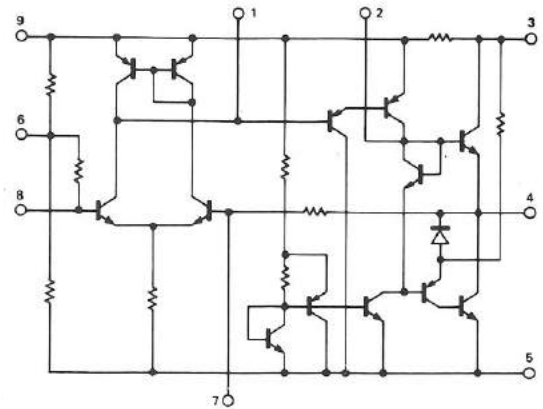
AF POWER AMP BA526(IF UNIT IC2)

● Electrical characteristic

| Item | Symbol | Rating | | | Unit | Condition |
|----------------------|-----------|--------|------|------|------------|-------------------------------------|
| | | Min. | Typ. | Max. | | |
| DC current | I_{CC} | — | 12 | 24 | mA | $V_{IN} = 0V$ |
| Voltage gain | G_{VC} | 48 | 52 | 54 | dB | $R_{NF} = 47\Omega, V_{IN} = 2.5mV$ |
| Max. output power | P_o MAX | 600 | 700 | — | mW | $V_{IN} = 25mV$ |
| Spec. output power | P_o | 350 | 430 | — | mW | T.H.D. = 10% |
| Noise output voltage | V_{NO} | — | 0.25 | 0.7 | mV | $R_g = 0\Omega$ |
| Distortion | T.H.D. | — | 0.4 | 2 | % | $P_o = 50mW$ |
| Input resistance | Z_{IN} | — | 22 | — | k Ω | 1kHz $P_o = 50mW$ |

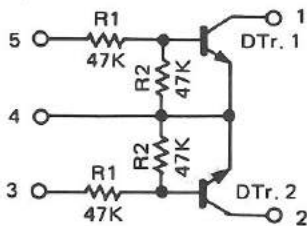
($T_a = 25^\circ C, V_{CC} = 6V, R_L = 8\Omega, f = 1kHz$)

● Equivalent circuit



FMG2 (IF UNIT Q6,10,19)

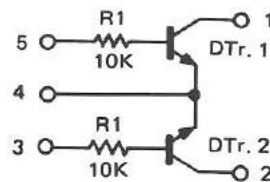
● Equivalent circuit



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

FMG4 (RF UNIT Q14)

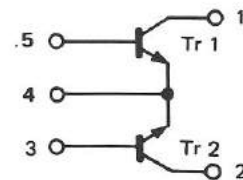
● Equivalent circuit



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

FMW1 (IF UNIT Q15, RF UNIT Q5)

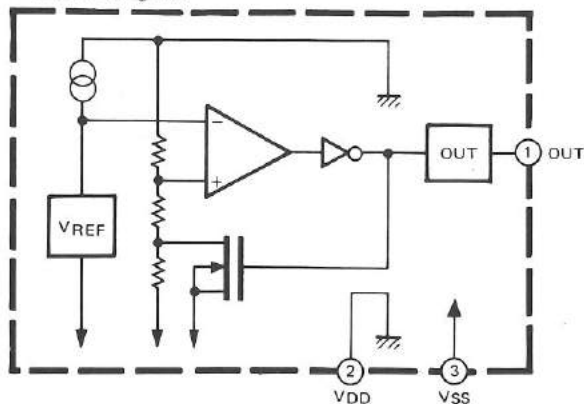
● Equivalent circuit



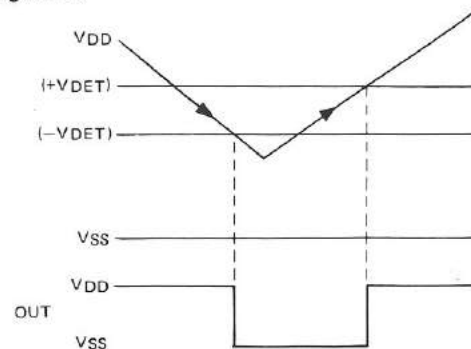
- 1: Tr1 Collector
- 2: Tr2 Collector
- 3: Tr2 Base
- 4: Tr1, 2 Emitter
- 5: Tr1 Base

BATTERY VOLTAGE DETECTOR S-8054HN (IF UNIT IC3)

● Block diagram



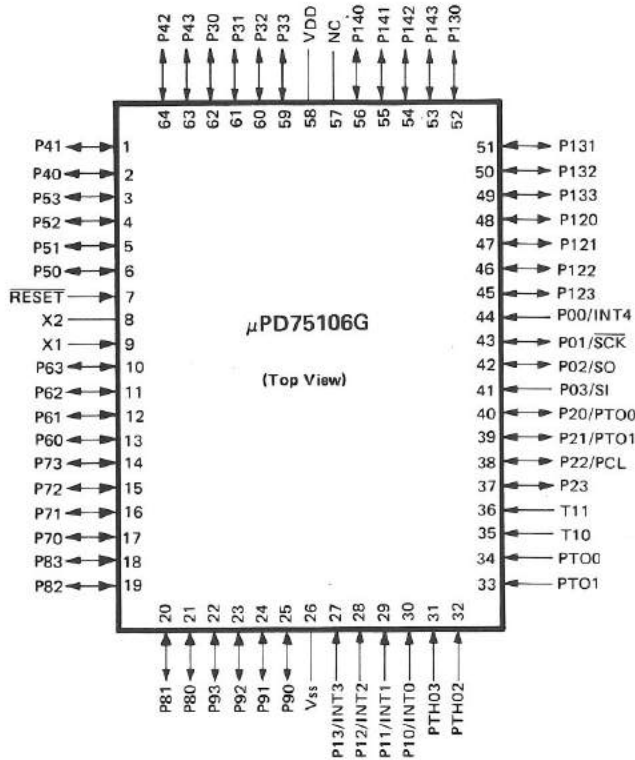
● Timing chart



SEMICONDUCTOR DATA

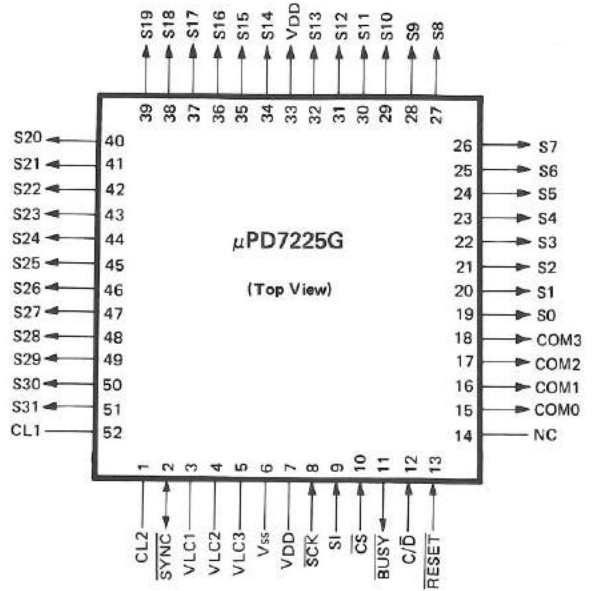
μPD75106G-524-1B (Case ass'y IC1)

● Terminal connection diagram



μPD7225G (Case ass'y IC2)

● Terminal connection diagram



μPD7225G (Case ass'y IC2)

● Terminal functions

| Pin No. | Pin name | Function |
|---------|----------|---|
| 1 | CL2 | R connection for CLOCK signal generation. |
| 2 | 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 | SCK | Serial clock input. |
| 9 | SI | Serial data output. |
| 10 | CS | Chip select input. |
| 11 | BUSY | BUSY output. |
| 12 | C/D | Command/Data select input. |
| 13 | 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. |

SEMICONDUCTOR DATA

 μ PD75106G-524-1B (Case ass'y IC1)

● Terminal functions

| Pin No. | Port name | I/O | Name | Function |
|---------|-----------|-----|------|--|
| 1 | P41 | O | | TONE bit 5. |
| 2 | P40 | O | | TONE bit 4. |
| 3 | P53 | O | | TONE bit 3. |
| 4 | P52 | O | | TONE bit 2. |
| 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 | | μ PD7225G RESET. |
| 13 | P60 | O | | μ PD7225G BUSY. |
| 14 | P73 | O | | μ PD7225G C/D. |
| 15 | P72 | O | | μ PD7225G CS. |
| 16 | P71 | O | | μ PD7225G SI. |
| 17 | P70 | O | | μ PD7225G 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 | T10 | I | UL | "H" : PLL Unlocked, "L" : PLL Locked. |
| 36 | T11 | 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. |
| 64 | P42 | O | | Tone bit 6. |

DESCRIPTION OF COMPONENTS

RF UNIT (W02-0812-08)

| Component | Name | Function |
|-----------|---------------|--|
| IC1 | M67723 | 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. |
| Q12,Q13 | 2SC2712(GR) | Active filter. |
| Q14 | FMG4 | VCO power supply switching for transmission and reception. |
| D1 | DAN235K | 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. |
| 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 (W02-0814-08)

| Component | Name | Function |
|-----------|-------------|---|
| IC1 | TA7761P | 1st IF amplifier receiver, 2nd OSC, 2nd MIX, 2nd IF amplifier, DISC. ⑦S meter output, ⑨Detection signal output, ⑩AF amplifier output, ⑬Noise amplifier output, ⑭IF signal input. |
| IC2 | BA526 | AF power amplifier ④output, ⑧input. |
| IC3 | S-8054HN | Backup reset ① output ("H" → "L" Backup). |
| IC4 | LP2950CZ | Microprocessor power supply ①input, ③output. |
| IC5 | LP2950CZ | KEY, 5V AVR for M5, ① input, ③output. |
| 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). 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. ② Turns the line for MOD pin "L" to cut the microprocessor noise while receiving. |
| Q11 | DTA143ZK | 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. |
| D1 | HSM88AS | SQL noise rectification. |
| D3 | 1SS184 | SW : Power supply for AF amplifier, AFC, OR circuit for SPO. |
| D4 | 02CZ7.5Y | 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

CC45



Capacitor value

1 0 3 = 0.01μF

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

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

- 0 1 0 = 1pF
- 1 0 0 = 10pF
- 1 0 1 = 100pF
- 1 0 2 = 1000pF = 0.001μF

Temperature Coefficient

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

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

Example CC45TH = -470±60 ppm/°C

Tolerance

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

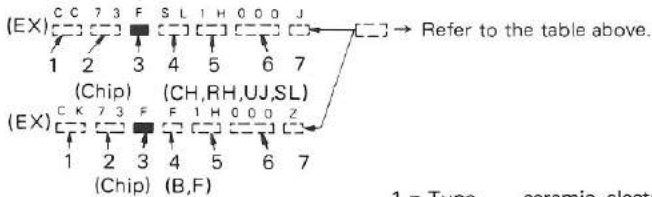
| Code | B | C | D | F | G |
|------|-------|--------|-------|-----|-----|
| (pF) | ± 0.1 | ± 0.25 | ± 0.5 | ± 1 | ± 2 |

Less than 10 pF

Rating voltage

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

Chip capacitors

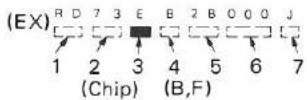


Dimension

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

RESISTORS

Chip resistor (Carbon)



Carbon resistor (Normal type)



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

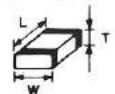
Dimension

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

Rating wattage

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

Dimension



PARTS LIST

SEMICONDUCTOR

N : New parts

| Item | Re- marks | Part No. |
|------------------|--------------|--|
| Diode | | 1SS277 |
| | | ERB83-004 |
| | | MI301 MI303 |
| Vari-cap diode | | 1SV153 |
| Chip diode | | 1SS184 1SS226 1SV172 |
| | | DA204K DAN235K |
| | | HSM88AS |
| Zener diode | | UZP-22B |
| Chip zener diode | | 02CZ7.5Y 02CZ8.2 |
| | | |
| Thermister | | 112-101-2 112-202-2 |
| Posistor | | PTH59T103M |
| LCD | | FTD8391 |
| FET | N | 2SK210(GR) |
| TR | | 2SA1241(Y) 2SA1358(Y) 2SB1182F5 2SC2407 |

| Item | Re- marks | Part No. | |
|--------------|--------------|---|--|
| Chip TR | | 2SA1313(Y) | |
| | | 2SC2412K 2SC2712(GR) 2SC2714(O) 2SC3356 2SC3838K(N,P) | |
| | | 2SJ106(GR) | |
| | Digital TR | | DTA114YK DTA143ZK DTA144EK DTC114YK DTC143XK DTC144EK |
| | | | FMG2 FMG4 FMW1 |
| Power module | | N M67723 | |
| IC | | | BA526 |
| | | | LP2950CZ |
| | | M54959P | |
| | | NJM4560M | |
| | | S-8054HN | |
| | TA7761P | | |
| | | μ PD7225G μ PD75106G-514-1B | |

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|------------------|---------------|----------------|-------------------|-------------------------------|------------------------|--------------------|
| TH-315A | | | | | | |
| 1 | 3B | | A01-1018-15 | METALLIC CABINET | | |
| 5 | 1A | | A02-0842-05 | PLASTIC CABINET | | |
| 7 | 3A | * | A20-2612-14 | PANEL ASSY | | |
| 10 | 3B | | A40-0620-23 | BOTTOM PLATE | | |
| 14 | 3C | | B09-0307-14 | CAP | | |
| 17 | 3A | * | B40-3794-04 | MODEL NAME PLATE | | |
| 18 | 1D | * | B50-8217-00 | INSTRUCTION MANUAL | | |
| 19 | 1D | | B46-0410-20 | WARRANTY CARD | | |
| 20 | 1D | | B58-0686-04 | CAUTION CARD | | |
| - | | | B42-2437-04 | SERIAL PLATE | | |
| - | | | B42-2454-04 | SERIAL PLATE | | |
| 21 | 3B | | D10-0602-04 | LEVER (RELEASE) | | |
| 22 | 2B | | E23-0474-14 | TERMINAL (BATT) | | |
| 23 | 3B | | E23-0432-04 | TERMINAL | | |
| 29 | 2A | | E31-3209-05 | CONNECTING LEAD WIRE(2P) | | |
| 40 | 2A | | E40-5089-05 | PIN CONNECTOR (24P) | | |
| - | | | E30-2078-25 | DC CORD | | |
| - | | | E31-3207-08 | FLAT CABLE (15P) | | |
| - | | | E31-3211-08 | FLAT CABLE (10P) | | |
| 32 | 2B | | F19-0646-04 | BLIND PLATE | | |
| 34 | 1A | | F20-0521-04 | INSULATING SHEET(BATT,-) | | |
| 35 | 3A | | F20-0574-04 | INSULATING BOARD | | |
| 36 | 1A | | F20-0520-04 | INSULATING SHEET(BATT,+) | | |
| - | | | F05-3022-05 | FUSE (3A) | | |
| 40 | 3B | | G01-0833-04 | COIL SPRING (LEVER) | | |
| 41 | 3A | | G01-0834-04 | COIL SPRING (PANEL) | | |
| 43 | 2A | | G10-0644-04 | NON-WOVEN FABRIC | | |
| 44 | 2B | | G11-0617-04 | CUSHION | | |
| 46 | 3A | | G13-0846-04 | CUSHION | | |
| 47 | 2A | | G13-0814-04 | CUSHION | | |
| - | | | G01-0837-05 | COIL SPRING (MONI) | | |
| 48 | 2C | * | H01-8163-02 | ITEM CARTON BOX | | |
| 49 | 1D | | H21-0713-04 | AIR PACKING | | |
| 50 | 1D | | H11-0808-14 | PACKING (BOARD) | | |
| 51 | 3D | | H11-0809-04 | PACKING (10X20X68) | | |
| 52 | 1C,3C | | H13-0801-04 | BUFFER | | |
| 53 | 2D | | H25-0103-04 | PROTECTION BAG | | |
| 54 | 3D | | H10-2618-12 | POLYSTYRENE FOAMED FIXTURE | | |
| 55 | 2D | | H25-0116-04 | PROTECTION BAG | | |
| 56 | 1C,2C | | H25-0120-04 | PROTECTION BAG | | |
| 57 | 3C | | H25-0076-03 | PROTECTION BAG | | |
| 58 | 2D | | J29-0417-04 | BELT HOOK | | |
| 59 | | | J39-0428-04 | SPACER | | |
| 63 | 2A | | K23-0787-04 | KNOB (VOL,SQL) | | |
| 64 | 3A | | K27-0494-04 | KNOB (LOW,TONE) | | |
| - | | | K29-3054-15 | KNOB (PTT) | | |
| - | | | K29-3055-15 | KNOB (MONI) | | |
| 76 | 3D | | N16-0030-41 | SPRING WASHER (FOR BELT HOOK) | | |
| 77 | 2D | | N35-3005-41 | BINDING HEAD MACHINE SCREW | | |
| 78 | 3A | | N19-0638-04 | FLAT WASHER | | |

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|---------------------------------|---------------|-------------------|-------------------|----------------------------|------------------------|--------------------|
| A | 3A, 3B | | N09-2002-05 | SCREW (2X20) | | |
| B | 2A | | N09-2008-05 | SCREW (2.6X8) | | |
| C | 3A, 3B | | N09-2009-15 | SCREW (2X4.5) | | |
| D | 2B | | N09-2010-15 | SCREW (2X6) | | |
| 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 | | |
| 92 | 3D | * | T90-0363-08 | ANTENNA | | |
| 95 | 2C | | W09-0315-25 | BATTERY CHARGER | | |
| 103 | 2D | | W09-0361-05 | BATTERY PACK | | |
| 106 | 2B | * | W02-0812-08 | RF UNIT | | |
| 107 | 2A | * | W02-0814-08 | IF UNIT | | |
| CASE ASS'Y (A02-0842-05) | | | | | | |
| 200 | 2B | | A02-0843-08 | CASE (FRONT) | | |
| 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 | | |
| 206 | 2B | | K29-3054-05 | KNOB (PTT) | | |
| 207 | 2B | | K29-3055-05 | KNOB (MONI) | | |
| R10 | | | KRR-C001 | H. IC | | |
| R18 | | | KRR-C001 | H. IC | | |
| 209 | 1B | | T07-0244-08 | SPEAKER (12 OHM) | | |
| 210 | 1B | | T91-0312-15 | MICROPHONE | | |
| 211 | | | FTD8391 | LCD | | |
| D1 | | | 02CZ8.2 | DIODE | | |
| D2 | | | DA204K | DIODE | | |
| IC1 | | | 75106G-524-1B | IC (MICROPROCESSOR) | | |
| IC2 | | | UPD7225G | IC | | |
| Q1 | | | 2SC2412K | TRANSISTOR | | |
| Q2 | | | 2SB1182 | TRANSISTOR | | |
| 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 | | |
| 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 | | |
| R6 | | | RK73FB2A823J | CHIP R 82K J 1/10W | | |

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|------------------------------|---------------|-------------------|------------------------------|--|------------------------|--------------------|
| R7 ,8 R9 | | | RK73FB2A104J RK73FB2A472J | CHIP R 100K J 1/10W CHIP R 4.7K J 1/10W | | |
| IC1 | | | NJM4560M | IC(OP AMP X2) | | |
| RF UNIT (W02-0812-08) | | | | | | |
| 108 | 2C | | A22-0749-13 | SUB PANEL | | |
| C1 ,2 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| C3 ,4 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C5 -7 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| C8 | | | CC73FCH1H030C | CHIP C 3.0PF C | | |
| C9 | | | CC73FCH1H060C | CHIP C 6.0PF C | | |
| C10 -12 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| C13 | | | CC73FCH1H060C | CHIP C 6.0PF C | | |
| 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 | | | CC73FCH1H220J | CHIP C 22PF J | | |
| C34 ,35 | | | CC73FCH1H010C | CHIP C 1.0PF C | | |
| C36 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C37 ,38 | | | CC73FCH1H010C | CHIP C 1.0PF C | | |
| C39 | | | CC73FCH1H220J | CHIP C 22PF J | | |
| C40 ,41 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| C42 | | | CC45CH1H120J | CERAMIC 12PF J | | |
| C43 | | | CC73FCH1H060C | CHIP C 6.0PF C | | |
| C44 | | | CC73FCH1H150J | CHIP C 15PF J | | |
| C45 | | | CC73FCH1H030C | CHIP C 3.0PF C | | |
| C48 | | | CC73FCH1H101J | CHIP C 100PF J | | |
| C49 ,50 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C52 | | | CC73FCH1H050C | CHIP C 5.0PF C | | |
| C53 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| C54 | | | CC73FCH1H0R5C | CHIP C 0.5PF C | | |
| C56 | | | CC73FCH1H060C | CHIP C 6.0PF C | | |
| C57 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| C58 | | | CC73FCH1H0R5C | CHIP C 0.5PF C | | |
| C59 | | | CC73FCH1H030C | CHIP C 3.0PF C | | |
| C61 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| C62 | | | CC73FCH1H150J | CHIP C 15PF J | | |
| C63 -65 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| C66 | | | CC73FCH1H070D | CHIP C 7.0PF D | | |
| C67 | | | CC73FCH1H330J | CHIP C 33PF J | | |
| C68 ,69 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| C70 | | | CC73FCH1H020C | CHIP C 2.0PF C | | |
| C71 | | | CC73FCH1H090D | CHIP C 9.0PF D | | |
| C72 | | | C90-2053-05 | ELECTR0 47UF 6.3WV | | |
| C73 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| C74 | | | CC73FCH1H560J | CHIP C 56PF J | | |
| C75 | | | CC73FCH1H150J | CHIP C 15PF J | | |

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|------------------|---------------|-------------------|-------------------|-----------------------------|------------------------|--------------------|
| C77 | | | C90-0478-05 | ELECTRO 10UF 16WV | | |
| C78 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C79 | | | CK73FB1E103K | CHIP C 0.010UF 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 | ELECTRO 220UF 6.3WV | | |
| C101 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C102 | | | CC73FCH1H090D | CHIP C 9.0PF D | | |
| C104 | | | CK45CH1H330J | CERAMIC 33PF J | | |
| C106,111,112 | | | CK45B1H102K | CERAMIC 1000PF K | | |
| C114-116 | | | CK45B1H102K | CERAMIC 1000PF K | | |
| TC1 | | | C05-0326-05 | TRIMMER (10PF) | | |
| - | | | E29-0472-04 | TERMINAL | | |
| CN1 | | | E40-5090-05 | PIN CONNECTOR | | |
| CN2 | | | E40-3237-05 | PIN CONNECTOR | | |
| J1 | 2A | | E11-0420-15 | PHONE JACK (MIC) | | |
| J2 | 2A | | E11-0421-15 | PHONE JACK (SP) | | |
| J3 | 2A | | E03-0165-05 | DC IN JACK | | |
| J4 | 2A | | E04-0160-05 | RF COAXIAL CABLE RECEPTACLE | | |
| TP1 ,2 | | | E23-0443-05 | TERMINAL | | |
| - | | | F02-0427-14 | HEAT SINK | | |
| - | | | F11-1038-24 | SHIELDING COVER(PLL) | | |
| - | | | J21-4217-04 | MOUNTING HARDWARE | | |
| - | | | J30-0545-05 | SPACER | | |
| - | | | J31-0503-05 | COLLAR | | |
| - | | | J39-0425-14 | SPACER | | |
| 110 | 2A | * | L78-0042-08 | VCO UNIT | | |
| L1 | | | L40-1581-80 | SMALL FIXED INDUCTOR | | |
| L2 | | | L40-3372-80 | SMALL FIXED INDUCTOR | | |
| L3 | | | L40-8272-80 | SMALL FIXED INDUCTOR | | |
| L4 | | | L40-5672-80 | SMALL FIXED INDUCTOR | | |
| L5 -7 | | | L33-0680-05 | CHOKO COIL | | |
| L9 | | | L40-1092-14 | SMALL FIXED INDUCTOR | | |
| L10 ,11 | | * | L34-1219-08 | COIL | | |
| L12 ,13 | | * | L34-1220-08 | COIL | | |
| L14 | | * | L34-4082-08 | COIL | | |
| L15 | | * | L34-4081-08 | COIL | | |
| L16 ,17 | | * | L34-4082-08 | COIL | | |
| L18 | | | L40-1001-14 | SMALL FIXED INDUCTOR | | |
| L19 | | * | L34-4083-08 | COIL | | |
| L20 ,21 | | | L40-1581-80 | SMALL FIXED INDUCTOR | | |
| L22 | | | L33-0680-05 | CHOKO COIL | | |
| L23 | | | L92-0110-05 | | | |
| L24 ,25 | | | L40-1021-14 | SMALL FIXED INDUCTOR | | |
| L26 | | | L40-1092-14 | SMALL FIXED INDUCTOR | | |
| L101 | | * | L34-1225-08 | COIL | | |
| L102 | | * | L34-1221-08 | COIL | | |

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|---------------------------|---------------|-------------------|---|--|------------------------|--------------------|
| L103, 104 X1 XF1 ,2 | | | L92-0110-05 L77-1325-05 L71-0276-05 | FERRITE BEAD CRYSTAL RESONATOR(12.8MHZ) CRYSTAL FILTER | | |
| - F | 2A | | N19-0638-04 N09-2016-05 | FLAT WASHER SCREW | | |
| 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 | | |
| 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 | | |
| 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 | | |
| R30 | | | RD14BB2C103J | RD 10K J 1/6W | | |
| R31 | | | RK73FB2A271J | CHIP R 270 J 1/10W | | |
| R32 | | | RD14BB2C103J | RD 10K J 1/6W | | |
| R33 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R36 | | | RD14BB2C470J | RD 47 J 1/6W | | |
| 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 | | |
| R44 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R45 | | | RD14BB2C471J | RD 470 J 1/6W | | |
| R46 | | | RD14BB2C470J | RD 47 J 1/6W | | |
| R46 | | | RD14BB2C823J | RD 82K J 1/6W | | |
| R47 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R48 | | | RD14BB2C101J | RD 100 J 1/6W | | |
| R49 | | | RK73FB2A334J | CHIP R 330K J 1/10W | | |
| R50 | | | RK73FB2A470J | CHIP R 47 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 | | |
| R58 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R59 | | | RK73FB2A272J | CHIP R 2.7K J 1/10W | | |
| R60 | | | RK73FB2A823J | CHIP R 82K J 1/10W | | |
| R61 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R62 | | | RK73FB2A332J | CHIP R 3.3K J 1/10W | | |
| R63 | | | RK73FB2A394J | CHIP R 390K J 1/10W | | |
| R64 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |

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| R65 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R101 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R102 | | | RK73FB2A394J | CHIP R 390K J 1/10W | | |
| R103 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R104 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | |
| R105-107 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| D1 | | * | DAN235K | DIODE | | |
| D2 | | | DA204K | DIODE | | |
| D3 | | | 1SV172 | DIODE | | |
| D4 | | | DA204K | DIODE | | |
| D5 | | | MI303 | DIODE | | |
| D6 | | | MI301 | DIODE | | |
| D7 | | | 1SS277 | DIODE | | |
| D8 ,9 | | | HSM88AS | DIODE | | |
| D14 | | | ERB83-004 | DIODE | | |
| D15 | | | UZP-22B | DIODE | | |
| D16 | | | ERB83-004 | DIODE | | |
| IC1 | | * | M67723 | IC(POWER MODULE) | | |
| IC2 | | | M54959P | IC(FREQ SYNTHESIZER PLL) | | |
| Q1 | | | 2SC2714(N) | TRANSISTOR | | |
| Q2 | | | 2SC3838K(N,P) | TRANSISTOR | | |
| Q3 | | | 2SC2407 | TRANSISTOR | | |
| Q4 | | | 2SA1313(Y) | TRANSISTOR | | |
| Q5 | | | FMW1 | TRANSISTOR | | |
| Q6 | | | 2SC3356 | TRANSISTOR | | |
| Q7 | | | 2SC2714(N) | TRANSISTOR | | |
| Q8 | | | 2SK210(GR) | FET | | |
| Q9 | | | 2SC2714(N) | TRANSISTOR | | |
| Q10 | | | 2SC3838K(N,P) | TRANSISTOR | | |
| Q12 ,13 | | | 2SC2712(GR) | TRANSISTOR | | |
| Q14 | | | FMG4 | TRANSISTOR | | |
| IF UNIT (W02-0814-08) | | | | | | |
| C1 | | | C90-1248-05 | ELECTRO 1UF 50WV | | |
| C2 | | | CK73FB1H471K | CHIP C 470PF K | | |
| C3 ,4 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C5 ,6 | | | C90-0890-05 | TANTAL 1UF 16WV | | |
| C7 | | | C91-0769-05 | CERAMIC 0.01UF M | | |
| C8 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| C9 | | | C90-0888-05 | TANTAL 0.1UF 16WV | | |
| C10 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C11 | | | CC73FCH1H390J | CHIP C 39PF J | | |
| C12 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C13 | | | CK73FB1H123K | CHIP C 0.012UF K | | |
| C14 | | | CK73FB1H122K | CHIP C 1200PF K | | |
| C15 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C16 | | | CK73FB1H123K | CHIP C 0.012UF K | | |
| C17 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| C19 | | | CK73FB1H223K | CHIP C 0.022UF K | | |
| C20 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C23 | | | CC73FCH1H820J | CHIP C 82PF J | | |
| C24 | | | CC73FCH1H330J | CHIP C 33PF J | | |
| C25 -27 | | | CK73EB1E104K | CHIP C 0.10UF K | | |
| C28 | | | C90-2050-05 | ELECTRO 33UF 6.3WV | | |
| C29 | | | CK73EB1E104K | CHIP C 0.10UF K | | |

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|------------------|---------------|-------------------|-------------------|-------------------------|-------------------------|--------------------|
| C30 | | | C90-1248-05 | ELECTR0 1UF 50WV | | |
| C31 | | | C90-0890-05 | TANTAL 1UF 16WV | | |
| C32 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C33 | | | CK73FB1H222K | CHIP C 2200PF K | | |
| C34 ,35 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C35 | | | CK73FB1H681K | CHIP C 680PF K | | |
| C36 | | | CE04CW1A470M | ELECTR0 47UF 10WV | | |
| C37 ,38 | | | C90-2012-05 | ELECTR0 100UF 10WV | | |
| C39 | | | C91-1015-05 | FILM 0.18UF 63WV | | |
| C40 ,41 | | | C90-0885-05 | TANTAL 10UF 6.3WV | | |
| C42 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| C43 | | | CE04CW1A330M | ELECTR0 33UF 10WV | | |
| C44 | | | C90-1248-05 | ELECTR0 1UF 50WV | | |
| C45 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C46 | | | C90-1248-05 | ELECTR0 1UF 50WV | | |
| C47 | | | CE04CW1C220M | ELECTR0 22UF 16WV | | |
| C48 | | | CE04CW1C470M | ELECTR0 47UF 16WV | | |
| C49 | | | CK73FF1E104Z | CHIP C 0.10UF Z | | |
| C50 | | | CK73FB1H471K | CHIP C 470PF K | | |
| C51 | | | CE04CW1C4R7M | ELECTR0 4.7UF 16WV | | |
| C52 | | | CK73FB1H152K | CHIP C 1500PF K | | |
| C53 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| C54 | | | C90-0891-05 | TANTAL 4.7UF 16WV | | |
| C56 ,57 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| C58 | | | CE04CW1HR22M | ELECTR0 0.22UF 50WV | | |
| C59 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C60 | | | C90-0868-05 | ELECTR0 10UF 16WV | | |
| C61 ,62 | | | CK73FB1H471K | CHIP C 470PF K | | |
| C63 | | | C90-0868-05 | ELECTR0 10UF 16WV | | |
| C64 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C68 | | | C90-2011-05 | ELECTR0 4.7UF 25WV | | |
| C69 | | | C90-1248-05 | ELECTR0 1UF 50WV | | |
| C70 | | | CK73FB1H471K | CHIP C 470PF K | | |
| C71 | | | CE04CW0J220M | ELECTR0 22UF 6.3WV | | |
| C72 -74 | | | CK73FB1H471K | CHIP C 470PF K | | |
| C75 | | | C90-1248-05 | ELECTR0 1UF 50WV | | |
| C76 | | | C90-2048-05 | ELECTR0 6.8UF 6.3WV | | |
| C77 -79 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C83 | | | CE04CW1C470M | ELECTR0 47UF 16WV | | |
| C84 | | | CK73FB1H471K | CHIP C 470PF K | | |
| C85 | | | C90-2049-05 | ELECTR0 15UF 6.3WV | | |
| C86 | | | CK73FB1H471K | CHIP C 470PF K | | |
| C87 | | | C90-2048-05 | ELECTR0 6.8UF 6.3WV | | |
| C88 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C89 | | | CK73FB1H471K | CHIP C 470PF K | | |
| C90 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C91 | | | CK73FB1H471K | CHIP C 470PF K | | |
| C92 | | | C90-2073-05 | ELECTR0 6.8UF 16WV | | |
| C93 -96 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C97 | | | CK73FB1H471K | CHIP C 470PF K | | |
| C98 | | | C90-2049-05 | ELECTR0 15UF 6.3WV | | |
| C100 | | | CK73FB1H471K | CHIP C 470PF K | | |
| C102 | | | CE04CW1C220M | ELECTR0 22UF 16WV | | |
| C103 | | | CK73FB1H471K | CHIP C 470PF K | | |
| C105 | | | CK73FB1H471K | CHIP C 470PF K | | |

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|------------------|---------------|-------------------|-------------------|------------------------------|------------------------|--------------------|
| C107 | | | C91-0753-05 | CHIP C 470PF K | | |
| C108 | | | CK73FB1H471K | CHIP C 470PF K | | |
| C109 | | | C91-0757-05 | CERAMIC 0.001UF K | | |
| C111 | | | C90-1248-05 | ELECTRØ 1UF 50WV | | |
| C112 | | | CE04CWOJ220M | ELECTRØ 22UF 6.3WV | | |
| CN1 | | | E40-5089-05 | PIN CONNECTØR (24P) | | |
| CN2 | | | E40-5039-05 | PIN CONNECTØR (5P) | | |
| CN3 | | | E40-5021-05 | PIN CONNECTØR (7P) | | |
| CN4 | | | E23-0443-05 | TERMINAL (10P) | | |
| 112 | 1A | | K01-0414-04 | HANDLE | | |
| CF1 | | | L72-0335-05 | MCF (CFU455E2) | | |
| L2 ,3 | | | L30-0538-05 | IFT | | |
| L4 | | | L40-4791-14 | SMALL FIXED INDUCTØR | | |
| L5 -8 | | | L92-0122-05 | BEAD CORE | | |
| X1 | | * | L77-1372-08 | CRYSTAL RESONATOR(16.445MHZ) | | |
| CJ1 -3 | | | R92-0670-05 | CHIP R 0 ØHM | | |
| JP1 ,2 | | | R92-1061-05 | JUMPER REST 0 ØHM | | |
| R1 | | | RK73FB2A152J | CHIP R 1.5K J 1/10W | | |
| R2 | | | RK73FB2A271J | CHIP R 270 J 1/10W | | |
| R3 | | | RK73FB2A332J | CHIP R 3.3K J 1/10W | | |
| R4 | | | RK73FB2A271J | CHIP R 270 J 1/10W | | |
| R5 | | | RK73FB2A474J | CHIP R 470K J 1/10W | | |
| R6 | | | RK73FB2A105J | CHIP R 1.0M J 1/10W | | |
| R7 | | | RK73FB2A564J | CHIP R 560K J 1/10W | | |
| R8 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R9 | | | RK73FB2A153J | CHIP R 15K J 1/10W | | |
| R10 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R11 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R12 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R13 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R14 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R15 ,16 | | | RK73FB2A152J | CHIP R 1.5K J 1/10W | | |
| R17 | | | RK73FB2A823J | CHIP R 82K J 1/10W | | |
| R18 | | | RK73FB2A333J | CHIP R 33K J 1/10W | | |
| R19 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R20 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R20 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R21 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R23 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R24 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | |
| R25 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R26 | | | RD14BB2C123J | RD 12K J 1/6W | | |
| R27 | | | RD14BB2C394J | RD 390K J 1/6W | | |
| R28 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R29 ,30 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R31 | | | RK73FB2A333J | CHIP R 33K J 1/10W | | |
| R32 | | | RD14CB2C822J | RD 8.2K J 1/6W | | |
| R33 | | | RK73FB2A122J | CHIP R 1.2K J 1/10W | | |
| R34 | | | RK73FB2A333J | CHIP R 33K J 1/10W | | |
| R35 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R36 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R37 | | | RK73FB2A100J | CHIP R 10 J 1/10W | | |
| R38 | | | RD14CB2C222J | RD 2.2K J 1/6W | | |
| R39 | | | RK73FB2A273J | CHIP R 27K J 1/10W | | |

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| R40 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R41 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R42 | | | RK73FB2A151J | CHIP R 150 J 1/10W | | |
| R43 | | | RK73FB2A224J | CHIP R 220K J 1/10W | | |
| R44 | | | RK73FB2A474J | CHIP R 470K J 1/10W | | |
| R45 | | | RD14BB2C472J | RD 4.7K J 1/6W | | |
| R46 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R47 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R48 | | | RD14CB2C222J | RD 2.2K J 1/6W | | |
| R49 | | | RK73FB2A332J | CHIP R 3.3K J 1/10W | | |
| R50 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R51 | | | RK73FB2A272J | CHIP R 2.7K J 1/10W | | |
| R52 | | | RK73FB2A124J | CHIP R 120K J 1/10W | | |
| R53 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R54 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R55 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R56 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R57 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R58 | | | RK73FB2A822J | CHIP R 8.2K J 1/10W | | |
| R59 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| VR1 | | | R12-3447-05 | TRIMMING POT(10K) | | |
| VR2 | | | R12-1431-05 | TRIMMING POT(1K) | | |
| VR3 | 1A | | R05-4419-05 | POTENTIOMETER(50K)SQ | | |
| VR4 | 1A | | R05-3440-05 | POTENTIOMETER(10K)AF | | |
| VR5 | | | R12-6406-05 | TRIMMING POT(470K) | | |
| VR6 | | | R12-1437-05 | TRIMMING POT(3.3K) | | |
| VR7 | | | R12-1436-05 | TRIMMING POT(1K) | | |
| VR8 | | | R12-5422-05 | TRIMMING POT(100K) | | |
| S1 ,2 | 2B | | S40-1412-05 | TACT SWITCH (PTT,MONI) | | |
| S3 ,4 | 1A | | S40-1401-05 | PUSH SWITCH (TONE,HI/LOW) | | |
| D1 | | | HSM88AS | DIODE | | |
| D3 | | | 1SS184 | DIODE | | |
| D4 | | | 02CZ7.5Y | DIODE | | |
| D5 | | | 02CZ8.2 | DIODE | | |
| D6 | | | 1SS184 | DIODE | | |
| D7 | | | 1SS226 | DIODE | | |
| IC1 | | | TA7761P | IC(FM IF) | | |
| IC2 | | | BA526 | IC(AF POWER AMP/ 700MW) | | |
| IC3 | | | S-8054HN | IC(VOLTAGE DETECTOR) | | |
| IC4 ,5 | | | LP2950CZ | IC(VOLTAGE REGULATOR/ +5V) | | |
| Q1 ,2 | | | 2SC2712(GR) | TRANSISTOR | | |
| Q3 | | | DTC144EK | DIGITAL TRANSISTOR | | |
| Q4 | | | 2SC2712(GR) | TRANSISTOR | | |
| Q5 | | | 2SJ106(GR) | FET | | |
| Q6 | | | FMG2 | TRANSISTOR | | |
| Q7 | | | 2SC2712(GR) | TRANSISTOR | | |
| Q8 | | | 2SA1241(Y) | TRANSISTOR | | |
| Q9 | | | DTC143XK | DIGITAL TRANSISTOR | | |
| Q10 | | | FMG2 | TRANSISTOR | | |
| Q11 | | | DTA143ZK | DIGITAL TRANSISTOR | | |
| Q12 | | | DTA144EK | DIGITAL TRANSISTOR | | |
| Q13 | | | 2SA1313(Y) | TRANSISTOR | | |
| Q14 | | | 2SA1358(Y) | TRANSISTOR | | |
| Q15 | | | FMW1 | TRANSISTOR | | |

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

 indicates safety critical components.

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. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|---|---------------|-------------------|--|---|------------------------|--------------------|
| Q16 -18 Q19 Q20 TH1 TH2 TH3 | | | DTC114YK FMG2 DTC144EK PTH59T103M 112-202-2 112-101-2 | DIGITAL TRANSISTOR TRANSISTOR DIGITAL TRANSISTOR RESISTOR THERMISTOR THERMISTOR | | |
| B1 | 1B | | W09-0371-05 | LITHIUM BATTERY(CR2032-T12) | | |
| VCO (L78-0042-08) | | | | | | |
| C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 TC1 ,2 - 116 - L1 L2 L3 L4 R1 R2 R3 R4 R5 ,6 R7 R8 R9 D1 -3 Q1 ,2 | | | CC73FCH1H030C CC73FUJ1H330J CC73FCH1H030C CC73FCH1H080D CC73FUJ1H330J CK73FB1H103K CK73EB1E104K CS15E1C100M CC73FCH1H020C CK73FB1H102K CC73FUJ1H330J CC73FCH1H030C CC73FCH1H080D CC73FUJ1H330J CC73FCH1H020C CK73FB1H102K C05-0326-05 E23-0465-05 F20-0575-04 F11-1039-04 * L34-1223-08 L40-1892-81 * L34-1222-08 L40-1892-81 RK73FB2A104K RK73FB2A564K RK73FB2A104K RK73FB2A150K RK73FB2A333K RK73FB2A564K RK73FB2A104K RK73FB2A150K 15V153 25K210(GR) | CHIP C 3.0PF C CHIP C 33PF J CHIP C 3.0PF C CHIP C 8.0PF D CHIP C 33PF J CHIP C 0.010UF K CHIP C 0.10UF K TANTAL 10UF 16WV CHIP C 2.0PF C CHIP C 1000PF K CHIP C 33PF J CHIP C 3.0PF C CHIP C 8.0PF D CHIP C 33PF J CHIP C 2.0PF C CHIP C 1000PF K TRIMMER (10PF) TERMINAL INSULATING BOARD SHIELDING COVER COIL SMALL FIXED INDUCTOR COIL SMALL FIXED INDUCTOR CHIP R 100K K 1/10W CHIP R 560K K 1/10W CHIP R 100K K 1/10W CHIP R 15 K 1/10W CHIP R 33K K 1/10W CHIP R 560K K 1/10W CHIP R 100K K 1/10W CHIP R 15 K 1/10W DIODE FET | | |

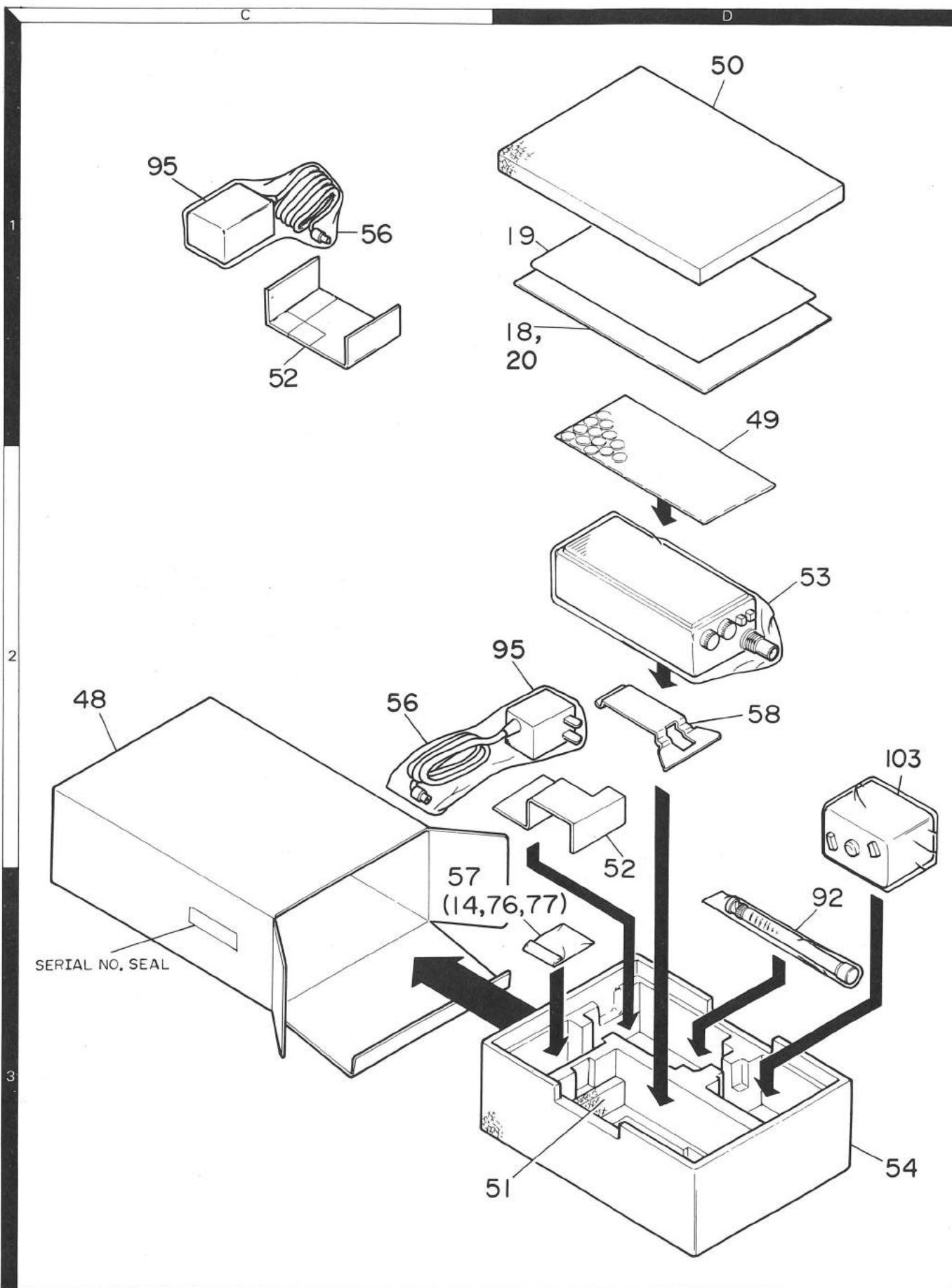
E: Scandinavia & Europe K: USA P: Canada

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

UE: AAFES(Europe) X: Australia

 indicates safety critical components.

PACKING



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 (10^{-7} or so).

4. Power Meter

- 1) Measurable frequency : Up to 500MHz
- 2) Impedance : 50Ω , 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 measurements 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 : 50Ω

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) 8Ω , 3W or more

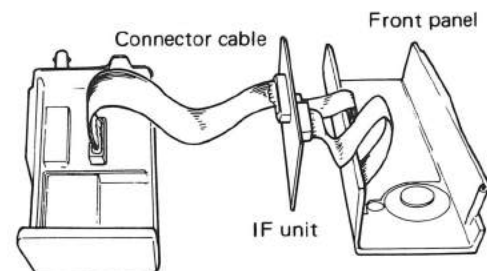
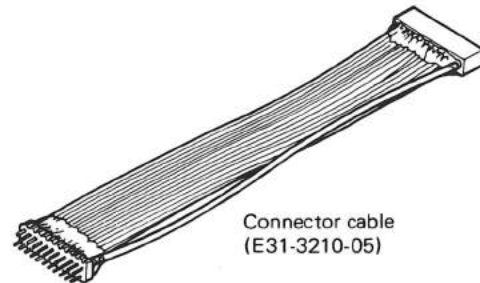
PREPARATION

- 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

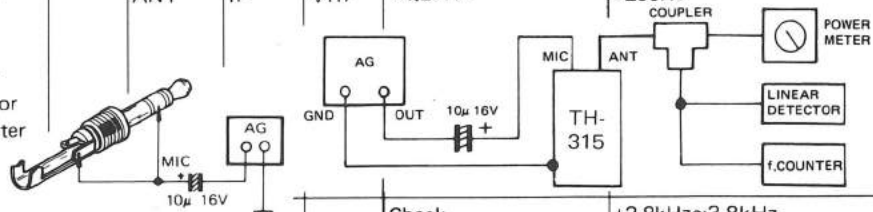
| Item | Condition | Measurement | | | Adjustment | | | Specification/Remarks |
|------------------|--|----------------|------|-------------|------------|------------|------------------------------|-----------------------|
| | | Test equipment | Unit | Terminal | Unit | Part | Method | |
| 1. Voltage check | 1) Power supply voltage : 13.8V (DC IN terminal) | DC V.M | IF | CN1-5 (CB) | IF UNIT | C37 C38 C2 | LITHIUM BATT MODULUS UNIT | 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 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. : 220.02MHz PTT : ON | f.counter Power meter | | ANT | RF | TC1 | 203.12MHz | ±100Hz |
| 2. VCV | RX | DC V.M | RF | TP2 | RF (VCO PCB) | TC2 | 3.2V | ±0.2V |
| | | | | | | | Check | 2.2V or more. |
| | TX | | | | | TC1 | 3.1V | ±0.2V |
| | | | | | | | Check | 2.0V or more. |

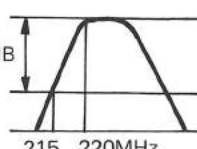
TX ADJUSTMENT

| Item | Condition | Measurement | | | Adjustment | | | Specification/Remarks |
|---------------|---|---|--------------|---------------------|------------|------|--------------|---|
| | | Test equipment | Unit | Terminal | Unit | Part | Method | |
| 1. Power ADJ. | HI | Power meter | ANT terminal | ANT | IF | VR2 | 5.5W | ±0.1W Power consumption : 1.5A or less. |
| | LOW | | | | | VR1 | 0.5W | ±0.1W Power consumption : 0.6A or less. |
| 2. DEV. | 1) Connect a power meter, linear detector, and f.counter to the ANT terminal FREQ. : 224.98MHz AG output : 1kHz, 80mV PTT : ON | Power meter AG Linear detector f.counter | | ANT | IF | VR7 | ±4.2kHz | ±200Hz |
| | 2) AG output : 1kHz, 8mV | | | | | | Check | ±2.8kHz~3.8kHz |
| 3. TONE | 1) FREQ. : 222.50MHz TONE : ON PTT : ON | Power meter Linear detector f.counter | | | IF | VR8 | ±0.8kHz | ±200Hz |
| 4. DTMF | 1) FREQ. : 222.50MHz keyboard : [SAVE] [] push PTT : ON | Power meter Linear detector f.counter | | | IF | VR6 | DEV. ±3.0kHz | ±400Hz |
| | | | | | | | Check | f : 1633±5Hz |
| | 2) Keyboard : [] push | f.counter | Check | DEV. ±0.7kHz~1.7kHz | | | | |



ADJUSTMENT

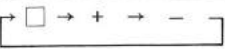
RX ADJUSTMENT

| 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. Connect a spectrum analyzer to the TP1 terminal of the RF unit. | Tracking generator Spectrum analyzer | RF | ANT TP1 | RF | L14 L15~ L17 | 220MHz MAX.  | The gain and band are MAX. |
| | 2) Connect a SSG to the ANT FREQ. : 221.05MHz SSG output : 70dBμ FREQ. : 187.25MHz MOD : OFF | SSG AF VTVM Oscilloscope | ANT terminal SP terminal | SP | RF | L102 | AF output : 1V | Adjust L102 till you get maximum noise output. |
| | 3) SSG output : -8dBμ | DC V.M Distortion meter Oscilloscope AF VTVM | ANT SP | IC7 7P SP | IF RF | L2 L19 | MIN. Check | SINAD 12dB or more. |
| 2. S meter | 1) FREQ. : 224.98MHz 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

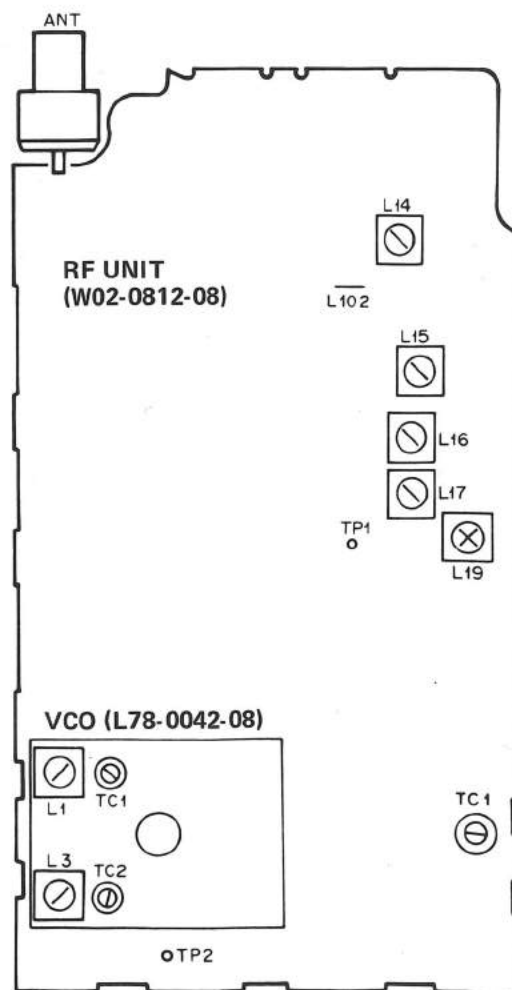
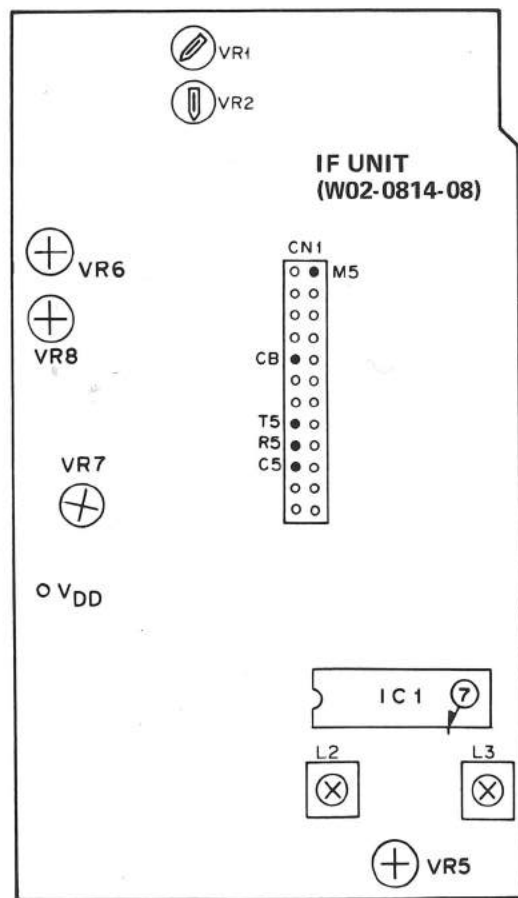
| Item | Condition | Operation check | Item | Condition | Operation check |
|---|---|--|---|---|---|
| 1. FREQ. setting | 1) ENTER push | 22□.□□□ FREQ. indication : 215.345 | 2. Function key operation (Pressing F key and numeral key activates the indicated function). | 2) F 2 /BEEP | BEEP ON (except LAMP), BEEP OFF |
| | 1 2 3 4 5 push | | | F 2 /BEEP | |
| | 2) ENTER push | 22□.□□□ FREQ. indication : 226.785 | | 3) F 3 /STEP | Switching of F.STEP. |
| | 6 7 8 9 0 push | | | 4) F 4 /BAND | BAND indicator turns on. Push SCAN key to start unit scanning on all receivable frequencies. |
| 3) ▼ push | 5kHz DOWN (when 5kHz steps) | | 5) F 5 /MEMORY | MEMO indicator turns on. Push SCAN key to start scan on only the memorized channel. | |
| 4) ▲ push | 5kHz UP (when 5kHz steps) | | 6) F 6 /PROGRAM | PROG indicator turns on. Push SCAN key to start scan between memory 8 and 9. | |
| 2. Function key operation (Pressing F key and numeral key activates the indicated function). | 1) F 1 /PRIORITY | PRI0 indicator turns on. Memory channel 1 is monitored every 5 seconds PRI0 indicator blinks if frequency is in use. PRI0 indicator turns off. | 7) F 7 /SEEK | SEEK indicator turns on. Push SCAN key to start scanning. If a signal is detected stops scanning and the scanning operation is released. | |
| | F 1 /PRIORITY | | 8) F 8 /TIME | TIME indicator turns on. Push SCAN key to start scanning. Scanning stops if signal detected, and scanning restarts after 5 seconds. | |

ADJUSTMENT

| Item | Condition | Operation check |
|---|--|---|
| 2. Function key operation (Pressing F key and numeral key activates the indicated function). | 9) F 9 /CARRIER | CAR indicator turns on. 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 F M /TX STOP | TX STOP indicator turns on. PTT and TONE key are disabled. TX STOP indicator turns off. |
| | 12) F ENTER /KEY LOCK F ENTER /KEY LOCK | KEY LOCK indicator turns on. Disables all keys except KEY LOCK and LAMP. KEY LOCK indicator turns off. |
| 3. OFFSET | 1) OFFSET/F |  |
| 4. Memory | 1) FREQ. indication : 220.02 M I push | M I indicator turns on. |
| | 2) FREQ. indication : Any value I push | I indicator turns on. FREQ. indication : 220.02 |

| 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 | R indicator turns on. |
| | push | 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 | Unit is reset. FREQ. indication : 220.000 |
| | 2) Hold down F ENTER POWER : ON | |

Adjusting points

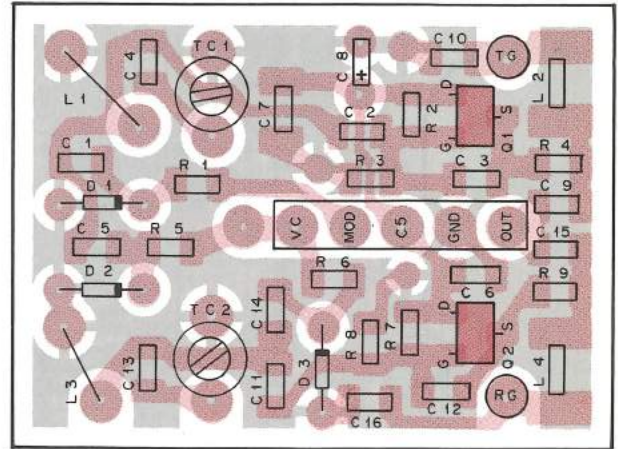


TERMINAL FUNCTIONS/PC BOARD VIEWS TH-315A

Terminal functions

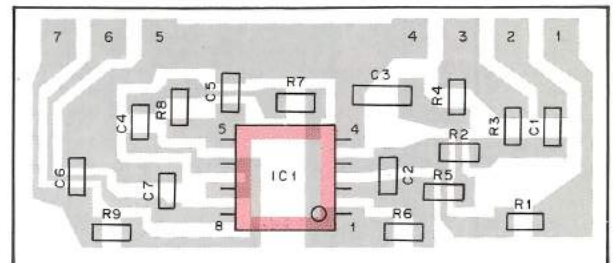
| Terminal | | Terminal function | |
|------------------------------|------|--|---------------------------------------|
| No. | Name | | |
| IF/RF UNIT COMMON | | | |
| 1 | B | Power supply before Power switch ON. | |
| 2 | B | Power supply before Power switch ON. | |
| 3 | GND | Ground | |
| 4 | CB | 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, "H" : transmission, "L" : reception | |
| 24 | M5 | 5V for Microphone | |
| RF UNIT (W02-0812-08) | | | |
| 1 | - | Battery (-) | |
| 2 | + | Battery (+) | |
| IF UNIT (W02-0814-08) | | | |
| 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 (L78-0042-08) Component side view



Q1,2 : 2SK210(GR) D1-3 : 1SV153

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

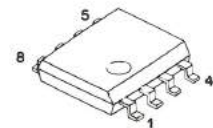


IC1 : NJM4560M

2SK210

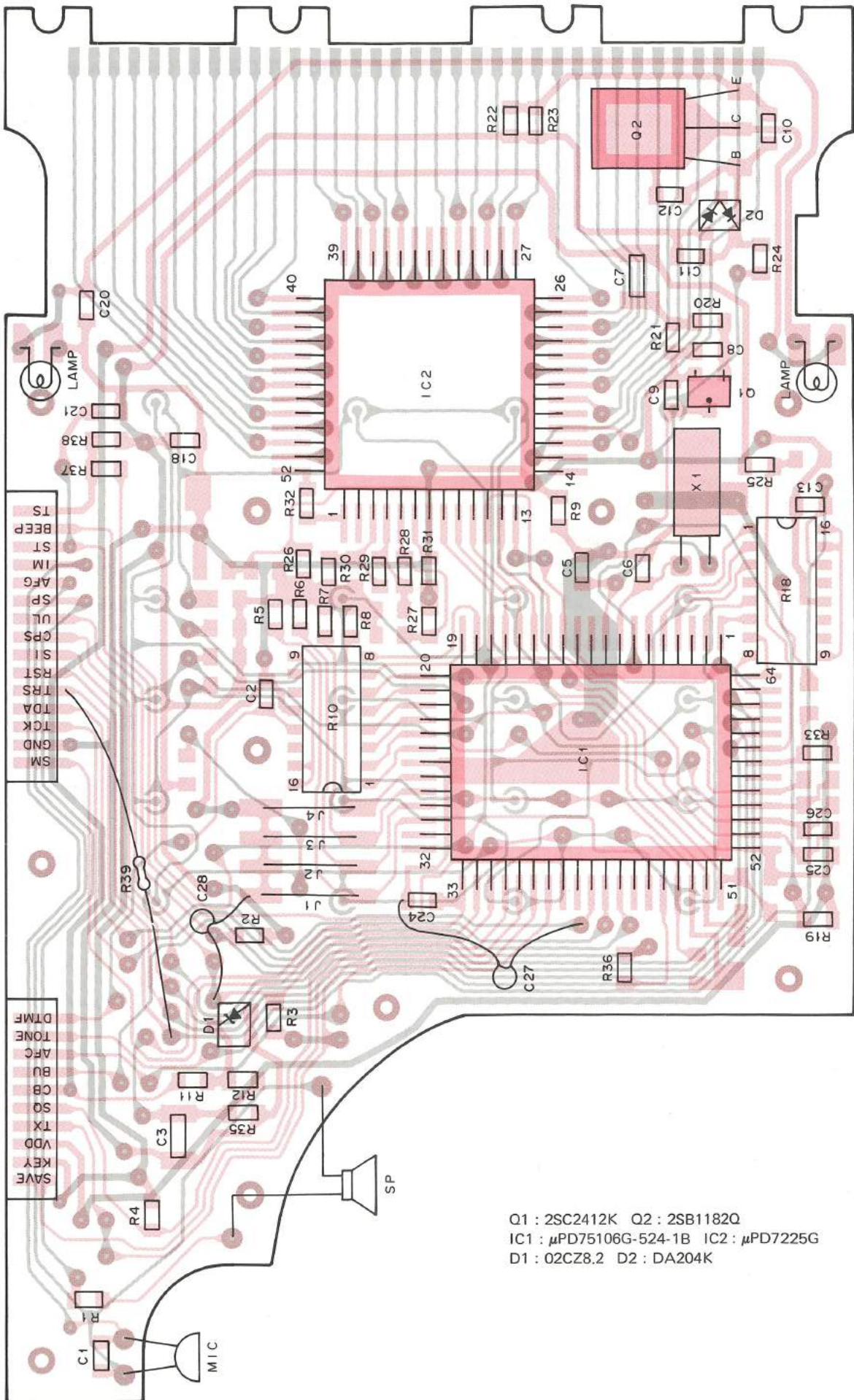


NJM4560M



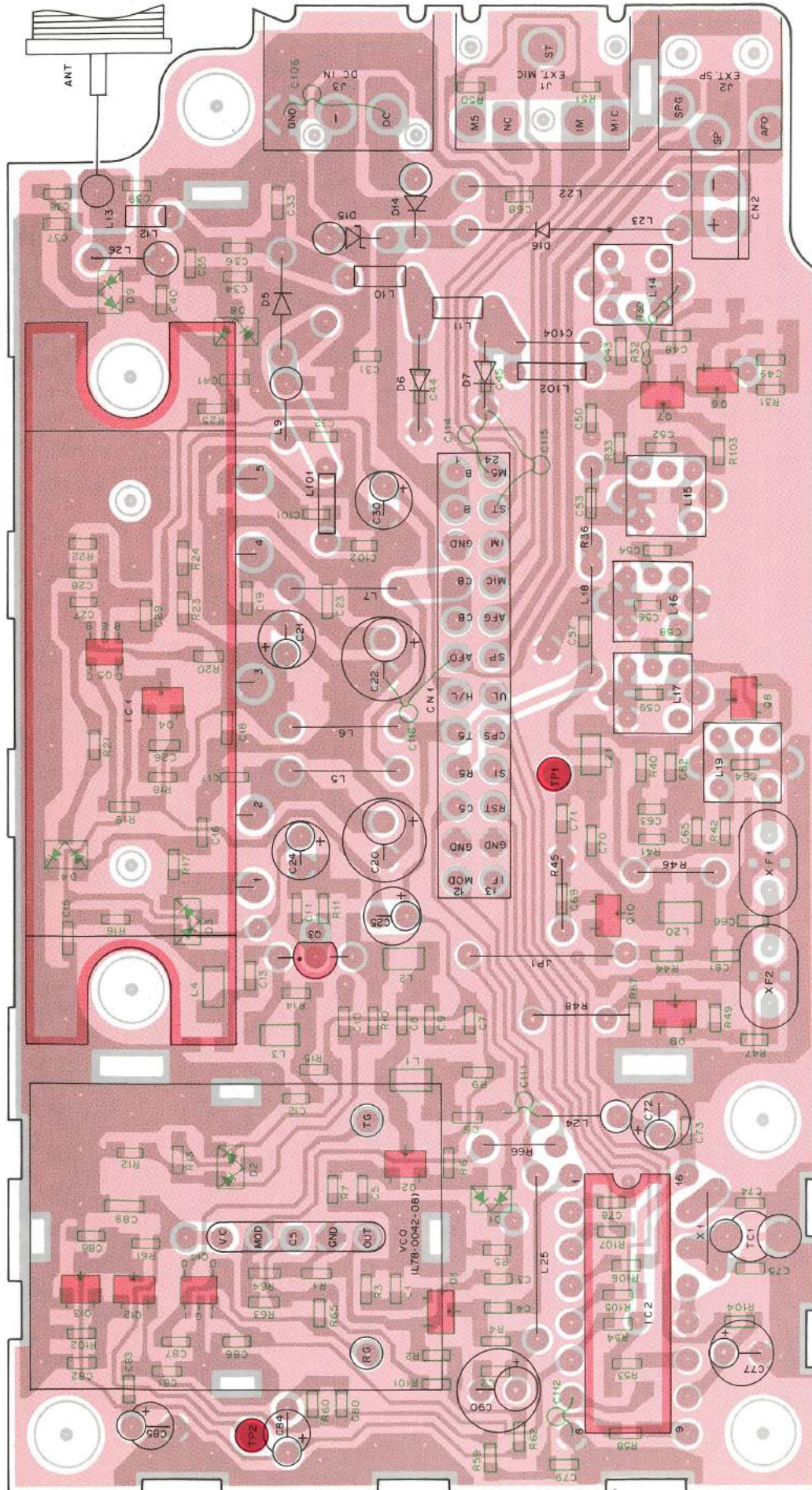
TH-315A PC BOARD VIEW

CASE ASS'Y (A02-0842-05) Component side view



Q1 : 2SC2412K Q2 : 2SB1182Q
 IC1 : μ PD75106G-524-1B IC2 : μ PD7225G
 D1 : 02CZ8.2 D2 : DA204K

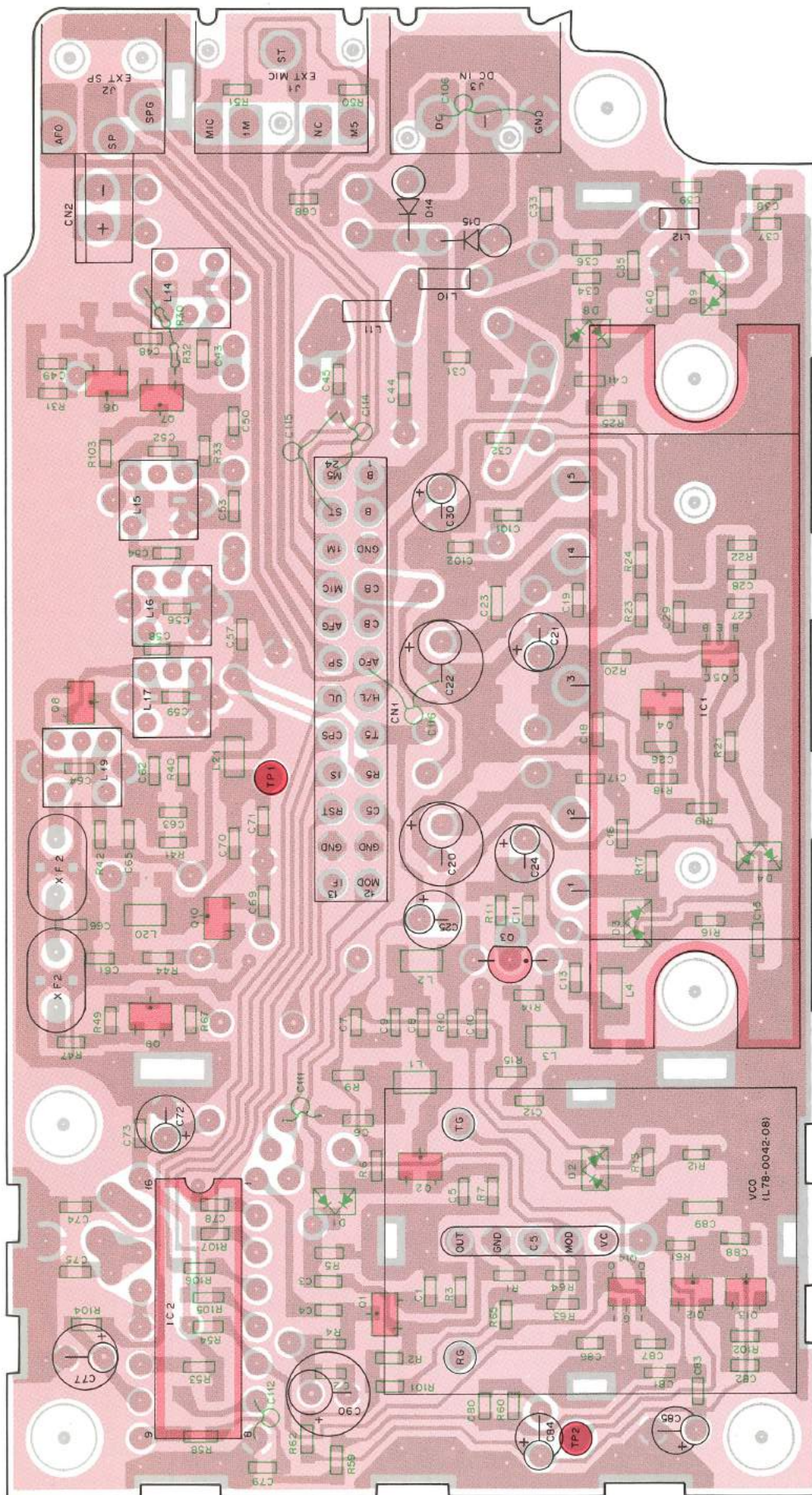
RF UNIT (W02-0812-08) Component side view



Q1,7,9 : 2SC2714(O) Q2,10 : 2SC338K(N,P) Q3 : 2SC2407 Q4 : 2SA1313(Y) Q5 : FMW1 Q6 : 2SC3356 Q8 : 2SK210(GR) Q12,13 : 2SC2712(GR) Q14 : FMG4
 IC1 : M67723 IC2 : M54959P
 D1 : DAN235K D2,4 : DA204K D3 : 1SV172 D5 : MI303 D6 : MI301 D7 : 1SS277 D8,9 : HSM88AS D14,16 : ERB83-004 D15 : UZP-22B

PC BOARD VIEWS TH-315A

RF UNIT (W02-0812-08) Foil side view



M54959P



2SA1313 2SC3356
2SC2412K 2SC3838K
2SC2712
2SC2714



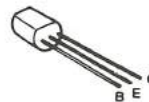
FMW1
FMG4



2SJ106

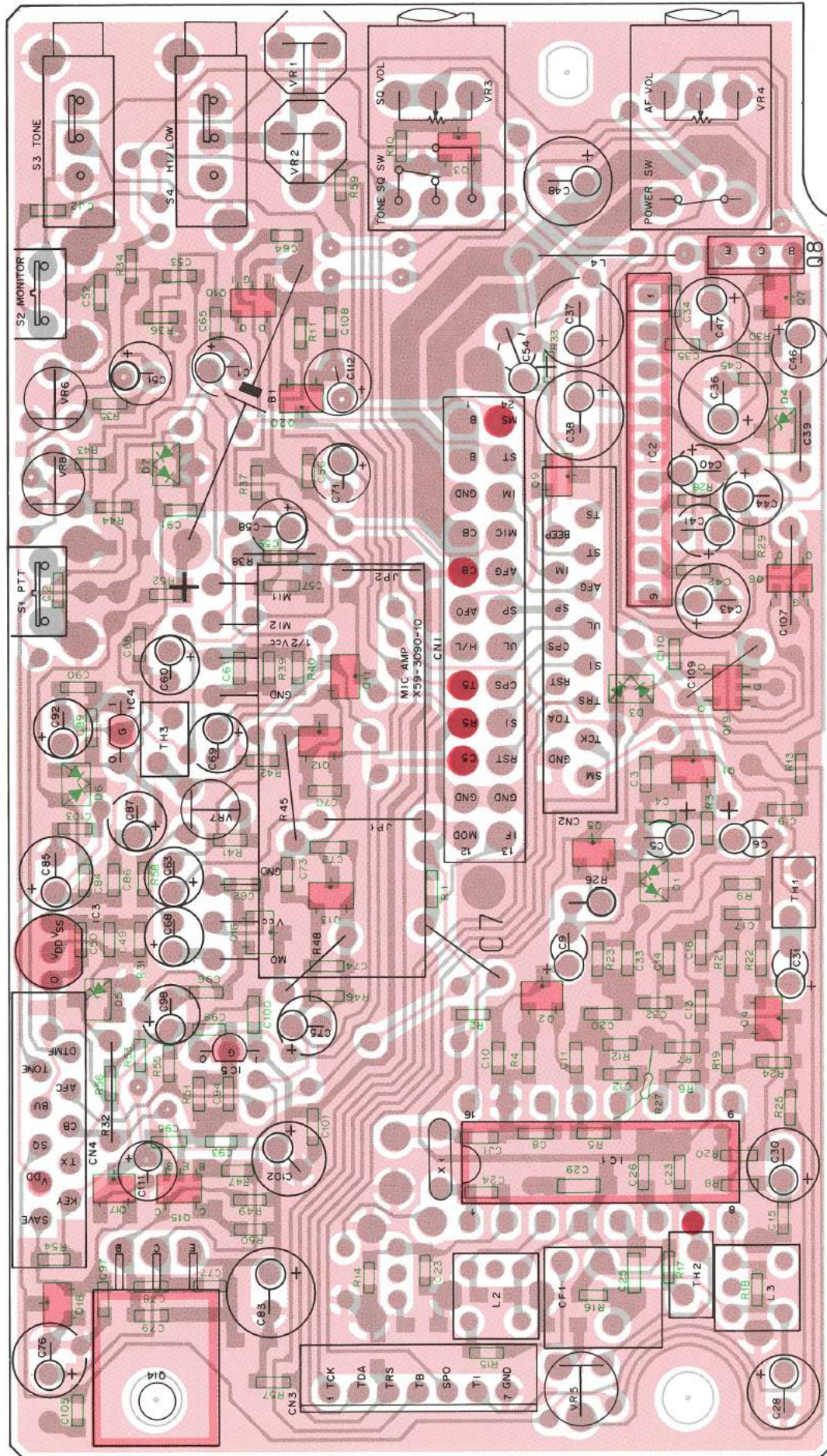


2SC2407



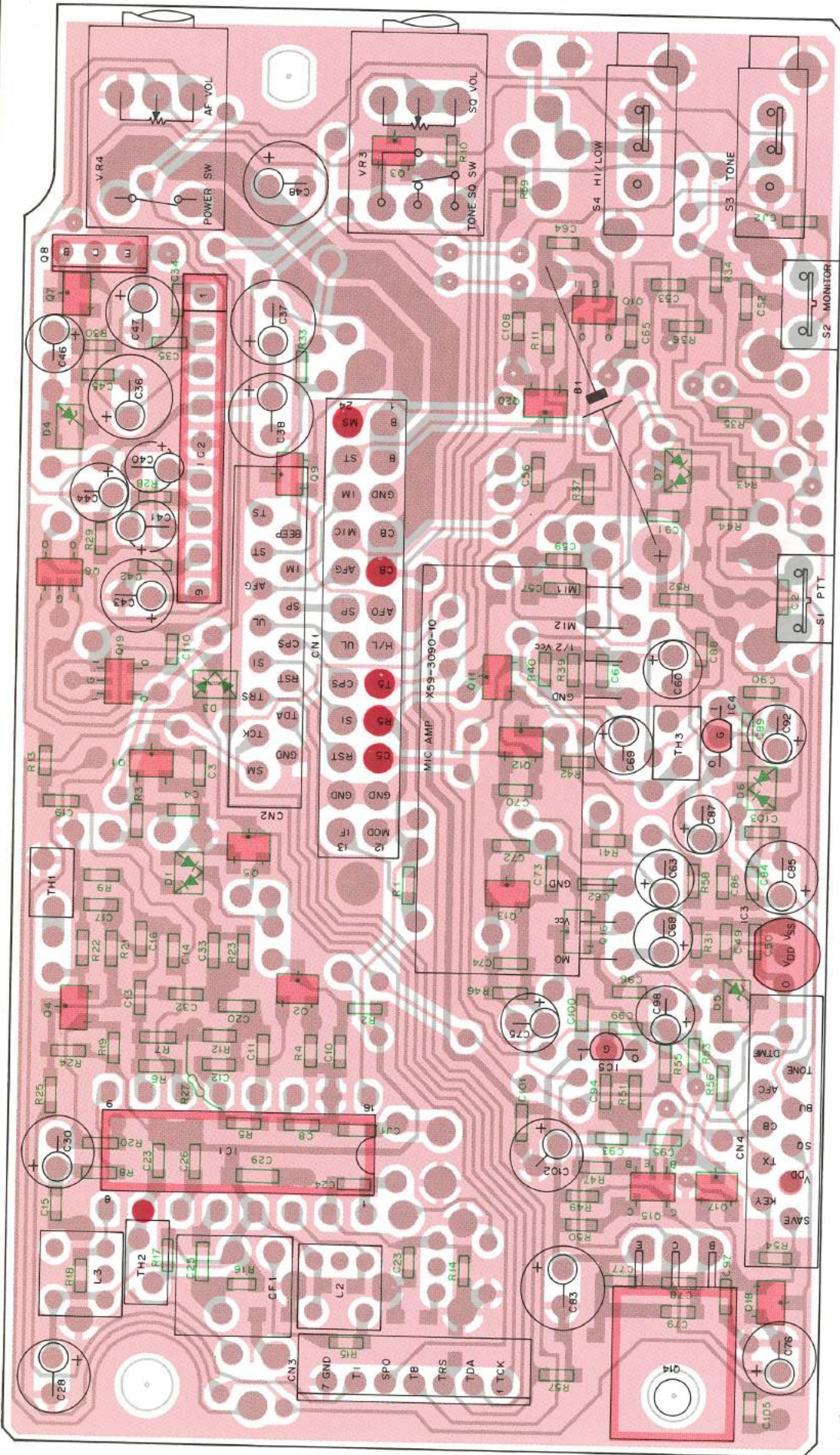
TH-315A PC BOARD VIEWS

IF UNIT (W02-0814-08) Component side view

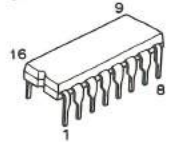


Q1,2,4,7 : 2SC2712(Y) Q3,20 : DTC144EK Q5 : 2SJ106(GR) Q6,10,19 : FMG2 Q8 : 2SA1241(Y) Q9 : DTC143XK Q11 : DTA143ZK
 Q12 : DTA144EK Q13 : 2SA1313(Y) Q14 : 2SA1358(Y) Q15 : FMW1 Q16-18 : DTC114YK
 IC1 : TA7761P IC2 : BA526 IC3 : S-8054HN IC4,5 : LP2950CZ
 D1 : HSM88AS D3,6 : 1SS184 D4 : 02CZ7.5Y D5 : 02CZ8.2 D7 : 1SS226
 TH1 : PTH59T103M TH2 : 112-202-2 YH3 : 112-101-2

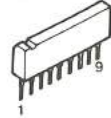
IF UNIT (W02-0814-08) Foil side view



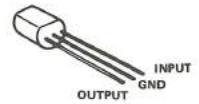
TA7761P



BA526



LP2950CZ
S-8054HN



2SJ106



2SA1313
2SC2712



2SA1241



DTC114YK
DTC143XK
DTC144EK



DTA143ZK
DTA144EK



2SA1358



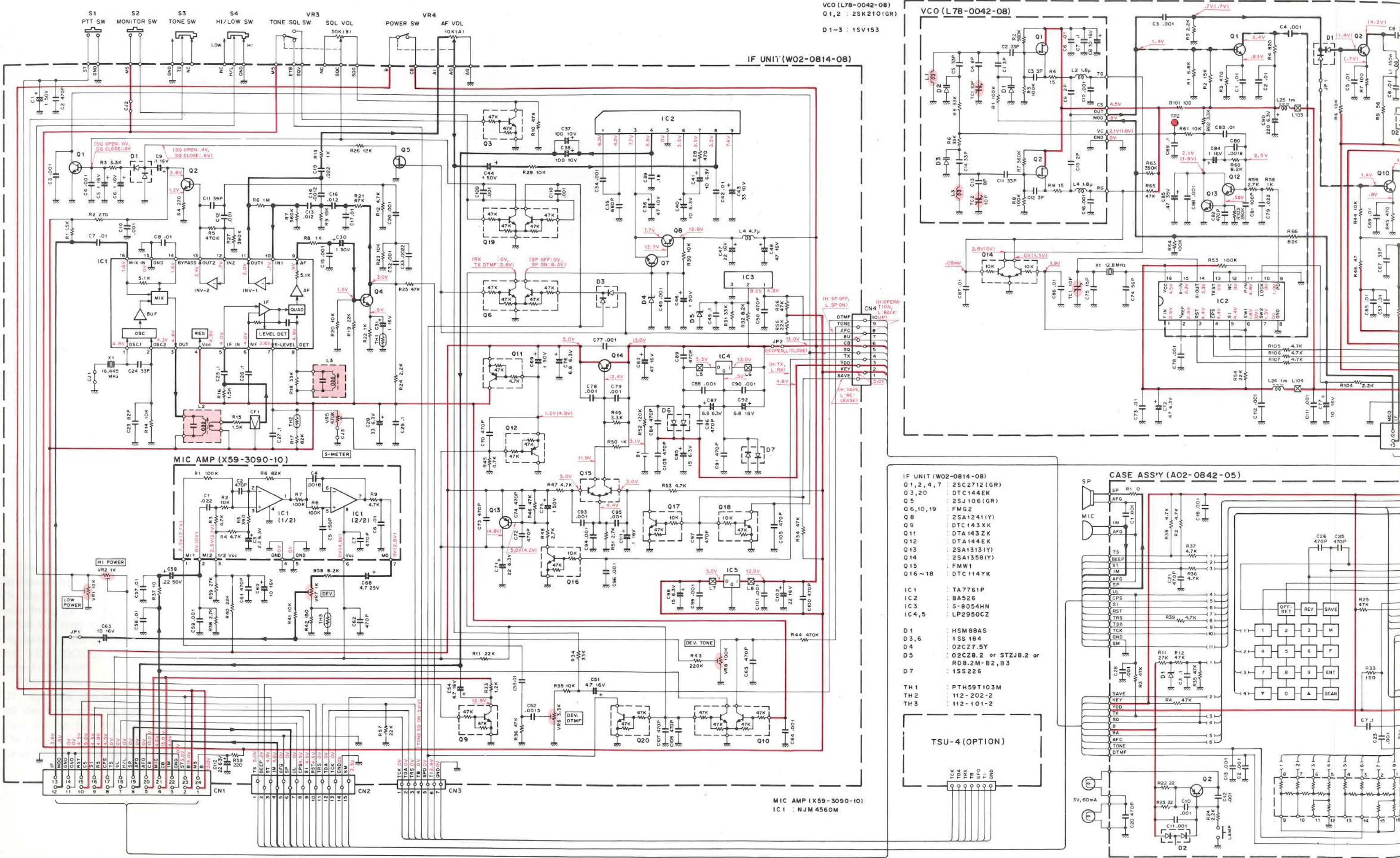
FMG2
FMW1



Signal line — Control line — Common DC line

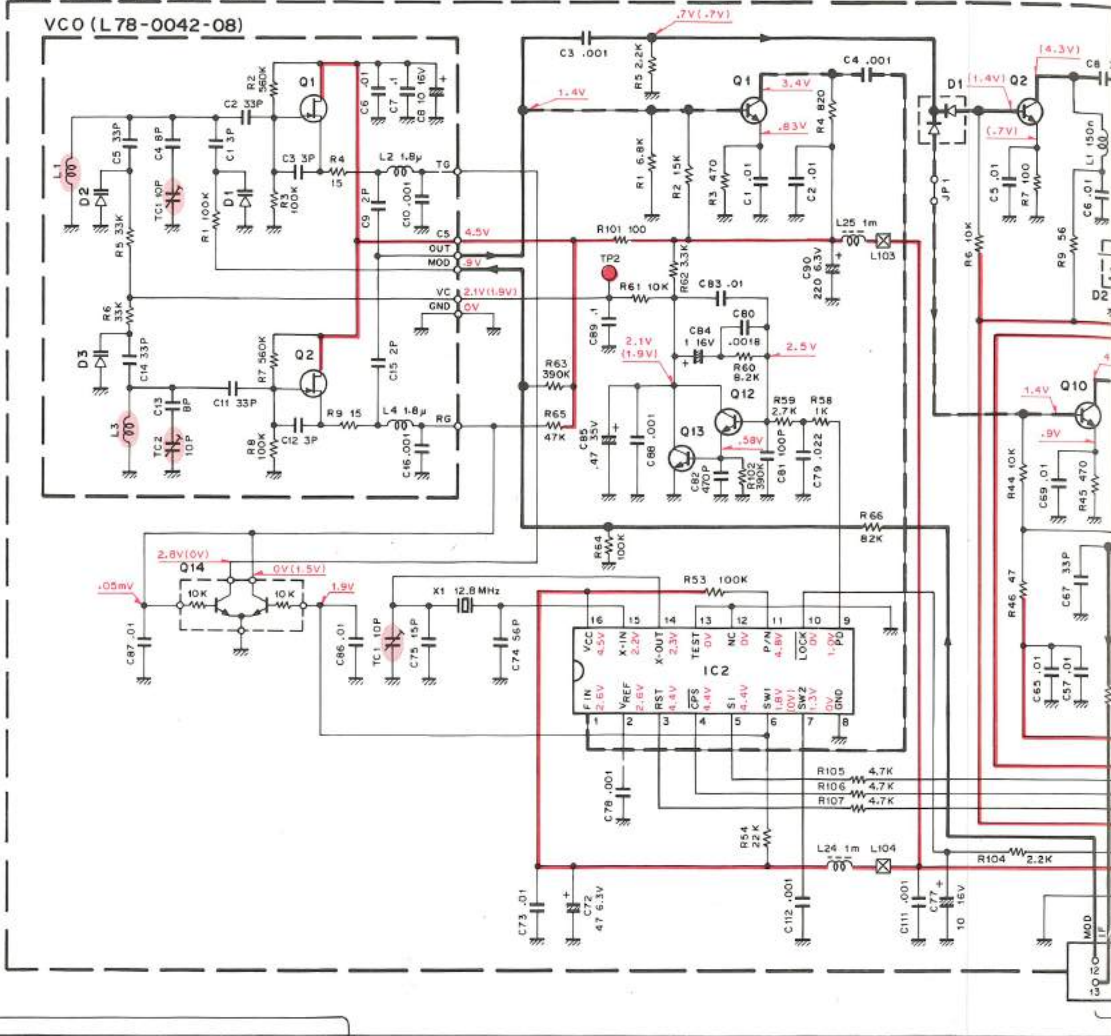
SCHEMATIC DIAGRAM

Voltage mea

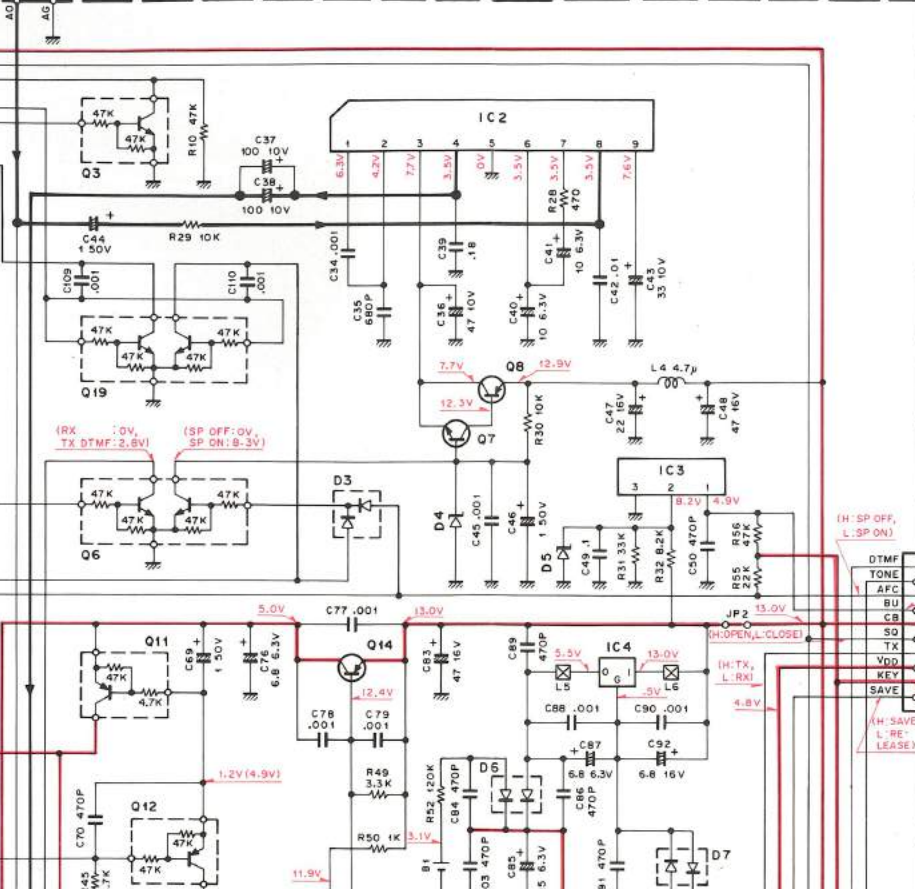


VCO (L78-0042-08)
 Q1,2 : 2SK210(GR)
 D1-3 : 1SV153

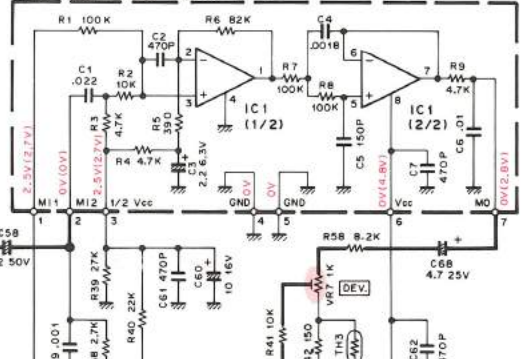
RF UNIT (W02-0812-08)



IF UNIT (W02-0814-08)



MIC AMP (X59-3090-10)



IF UNIT (W02-0814-08)

- Q1,2,4,7 : 2SC2712(GR)
- Q3,20 : DTC144EK
- Q5 : 2SJ106(GR)
- Q6,10,19 : FMG2
- Q8 : 2SA1241(Y)
- Q9 : DTC143XK
- Q11 : DTA143ZK
- Q12 : DTA144EK
- Q13 : 2SA1313(Y)
- Q14 : 2SA1358(Y)
- Q15 : FMW1
- Q16~18 : DTC114YK

IC1 : TA7761P

IC2 : BA526

IC3 : S-8054HN

IC4,5 : LP2950CZ

D1 : HSM88AS

D3,6 : 1SS184

D4 : 02CZ7.5Y

D5 : 02CZ8.2 or STZJ8.2 or RDB.2M-B2,B3

D7 : 1SS226

TH1 : PTH59T103M

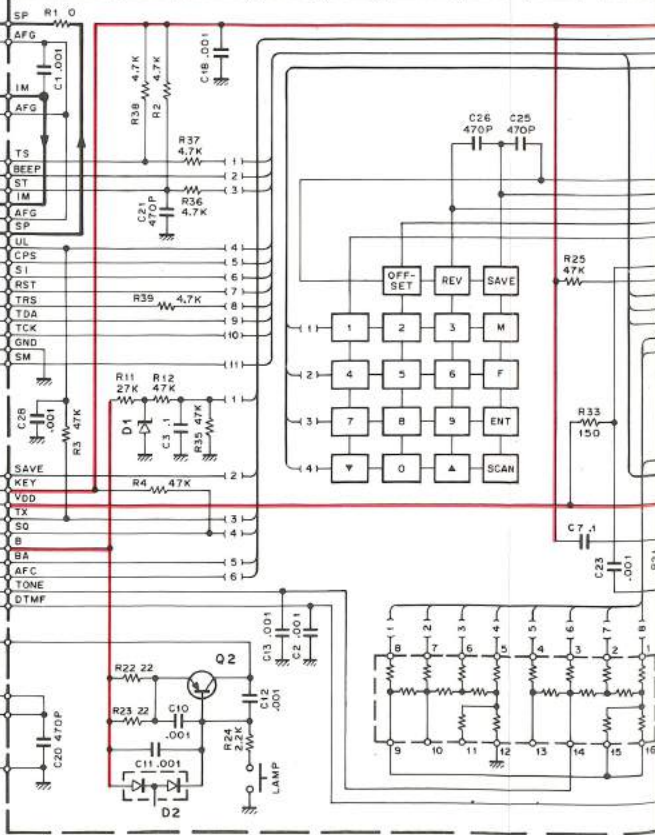
TH2 : 112-202-2

TH3 : 112-101-2

TSU-4 (OPTION)

TCK TDA TRS B SFO GND

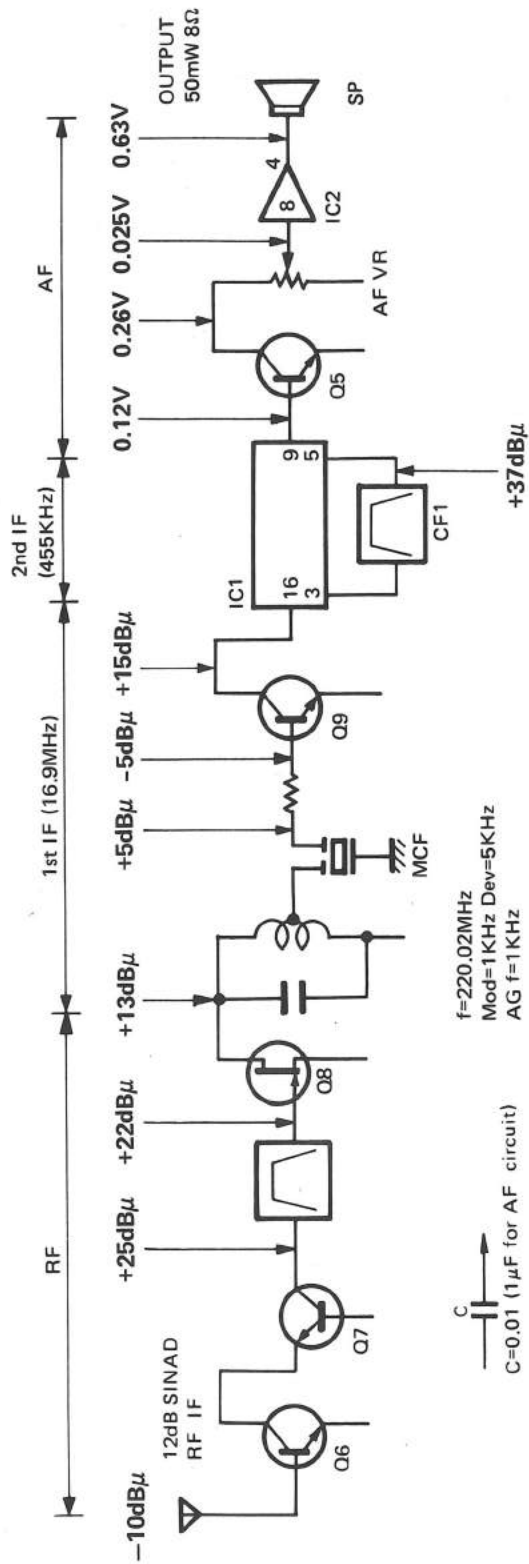
CASE ASS'Y (A02-0842-05)



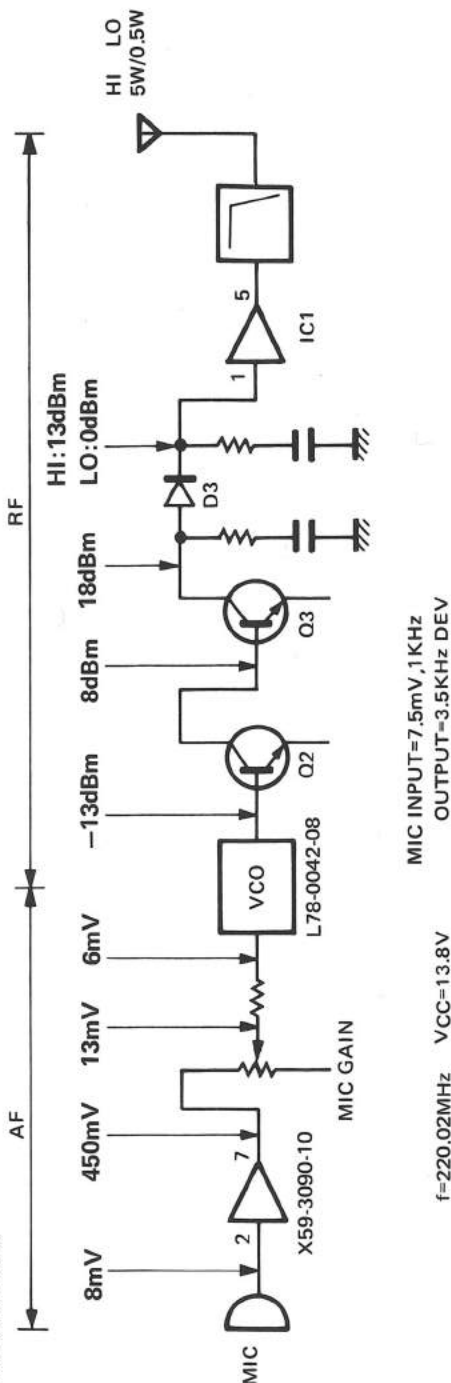
MIC AMP (X59-3090-10)
 IC1 : NJM4560M

LEVEL DIAGRAM

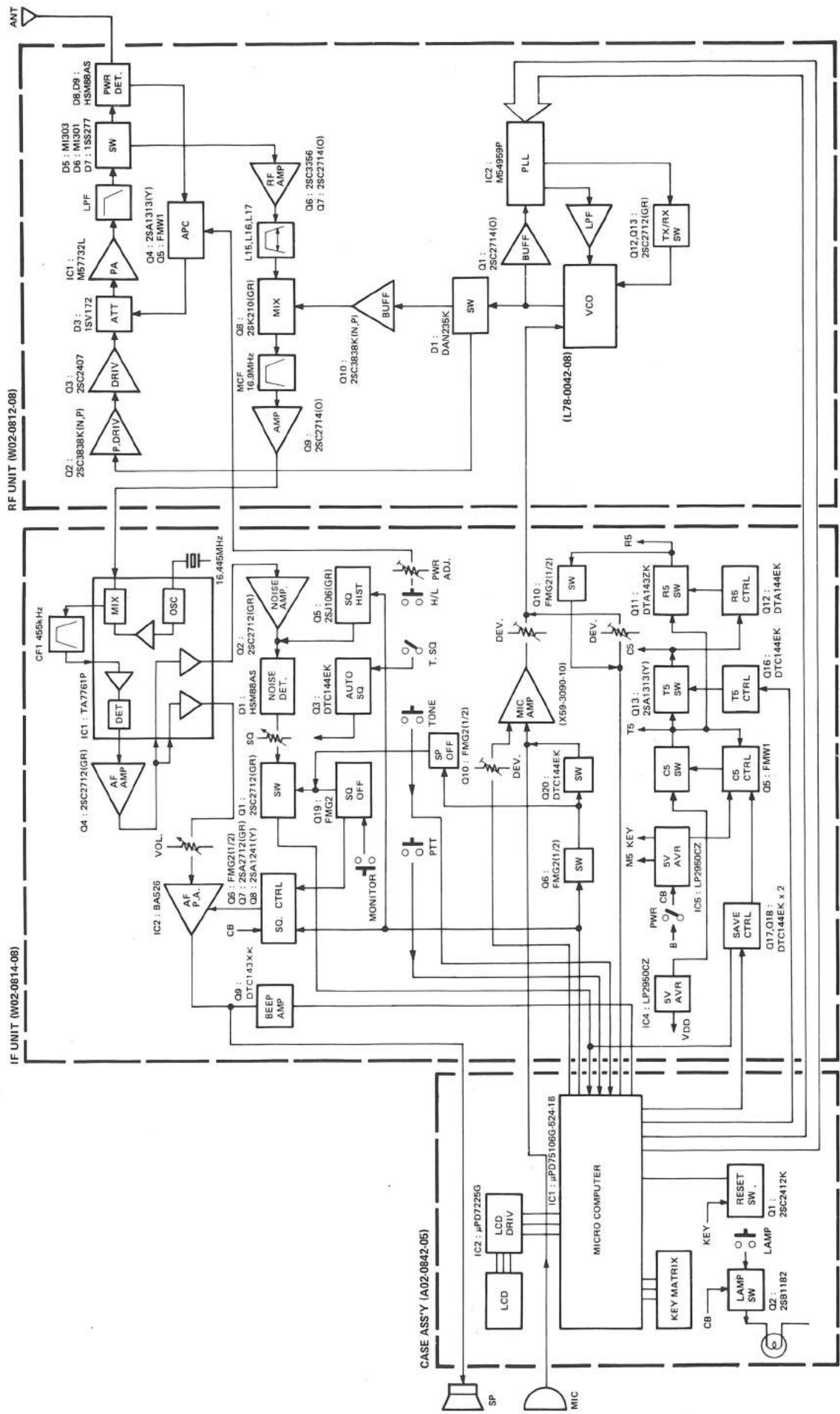
TX SECTION



RX SECTION



BLOCK DIAGRAM



BC-7 (RAPID CHARGER)

BC-7 External View



BC-7 Circuit Description

General

The BC-7 is a rapid charger for the PB-1 to PB-4 Ni-Cd batteries for the TH-205, TH-215, TH-405, TH-415 and TH-315.

2) Battery Pack Detect Circuit

This circuit detects whether a battery pack is inserted in the charger. Outputs from this circuit are routed to the reset circuit and the battery recognition circuit.

When a PB-3 or PB-4 is inserted in the charger, a small amount of current flows from Q2 : 2SA608E through R9 to the charging terminal B1 and Q2 turns on. As a result,

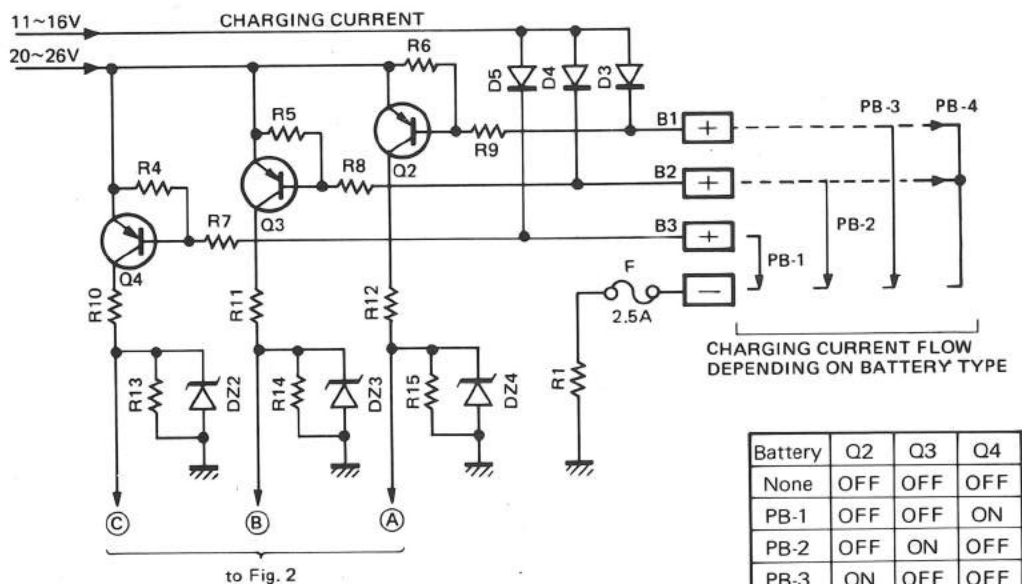
Theory of Operation

The operation of each block is explained below.

1) + 11V AVR Circuit

This AVR circuit, consisting of a 2SD600F transistor (Q1) and DZA11Y Zener diode (DZ1) provides an output of approximately +11V as the reference voltage for the charging circuit consisting of IC2 to IC5.

an output of approximately 11V appears at (A) in Figure 1. Similarly when a PB-2 or PB-4 is inserted Q3 : 2SA608E turns on and approximately 11V is provided at output (B). When a PB-1 is inserted Q4 : 2SA608E turns on and approximately 11V is provided at output (C).



| Battery | Q2 | Q3 | Q4 |
|---------|-----|-----|-----|
| None | OFF | OFF | OFF |
| PB-1 | OFF | OFF | ON |
| PB-2 | OFF | ON | OFF |
| PB-3 | ON | OFF | OFF |
| PB-4 | ON | ON | OFF |

Table 1

Fig. 1 Battery Pack Detect Circuit Block Diagram

BC-7 (RAPID CHARGER)

3) Reset Circuit/Charge Status Memory Circuit/ Display Circuit

The reset circuit initializes the charging status memory circuit.

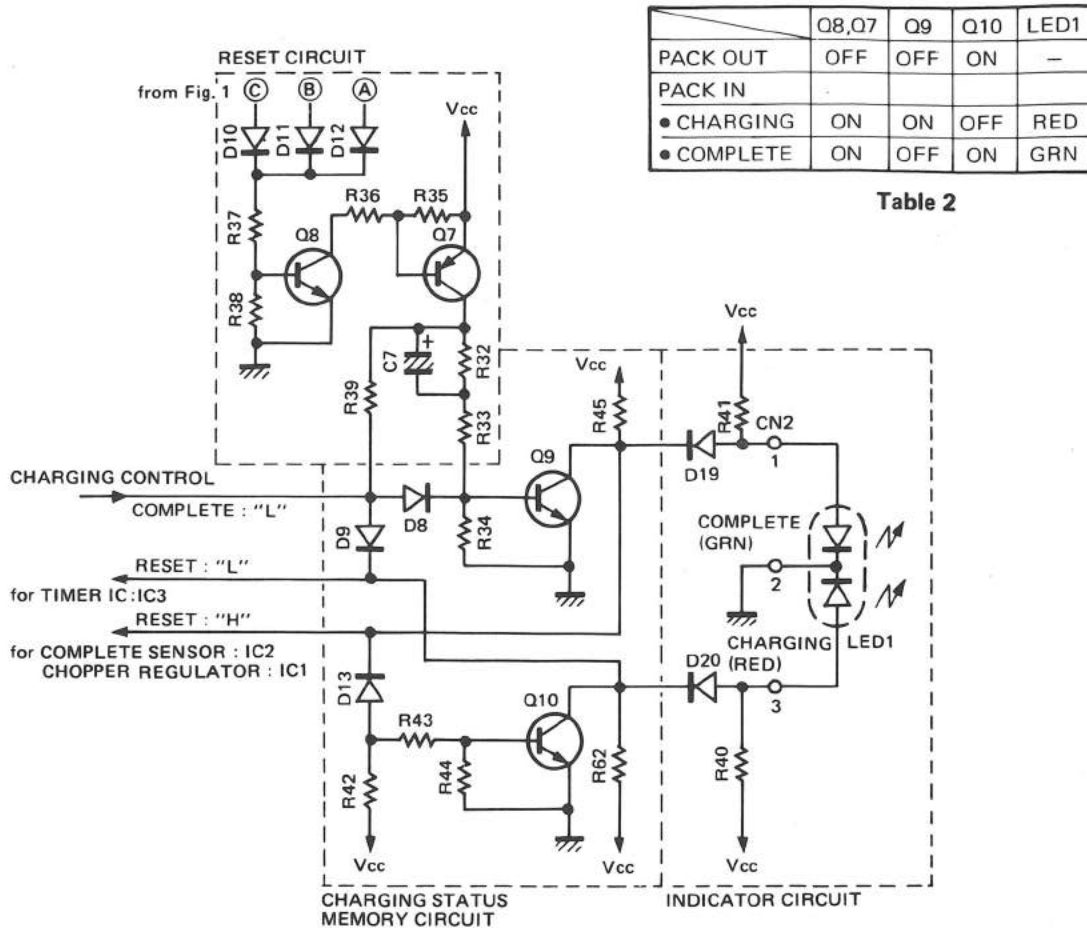


Fig. 2 Reset Circuit/Charge Status Memory Circuit/Display Circuit Block Diagram

The charge status memory circuit is an R-S flip-flop configured from transistors and resistors. The two states of the flip-flop are called COMPLETE and CHARGING. Outputs from the flip-flop drive the LED in the indicator circuit and reset the timer, complete sensor, and chopper regulator. In the COMPLETE state Q9 : 2SC536E is off and Q10 : 2SC536E is on. In the CHARGING state Q9 is on and Q10 is off.

When a battery pack is not inserted, Q8 : 2SC536E and Q7 : 2SC536E turn off. As there is no base voltage to Q9, Q9 also turns off. The base of Q10 receives enough bias from Vcc to turn on, resulting in 0V at the collector. The current flow through R41 to the COMPLETE indicator in LED1 which glows green, because of Q9 if off.

When the battery pack is inserted Q8 and Q7 turn on. As soon as Q7 turns on, charging current flows through R33, R34, and Q9 to C7 and Q9 turns on. The base voltage of Q10, which is connected to Q9 through diode D13, then drops and Q10 turns off. Since Q10 is off, current flows through R40 to the CHARGING indicator in LED1, which glows red to indicate that the battery is charging. When charging of C7 is completed, on-current continues to flow to the base of Q9 through R39 and D8.

When charging is completed the complete sensor (IC2) outputs a Low ("L") signal that ends the flow of current to the base of Q9, turning Q9 off. As a result current flows through R41 to the COMPLETE indicator in LED1, which glows green to indicate that charging is complete.

BC-7 (RAPID CHARGER)

4) Battery Recognition Circuit

The battery recognition circuit uses NAND logic to recognize the battery type from the outputs from the battery pack detect circuit. Outputs from this circuit are sent to the charging current limiting circuit and sensor level switching circuit.

| | INPUT | | | OUTPUT | | | |
|-------|-------|---|---|--------|---|---|---|
| BATT. | A | B | C | D | E | F | G |
| PB-1 | L | L | H | H | H | L | L |
| PB-2 | L | H | L | H | L | H | L |
| PB-3 | H | L | L | H | H | L | H |
| PB-4 | H | H | L | L | H | L | H |

Table 3

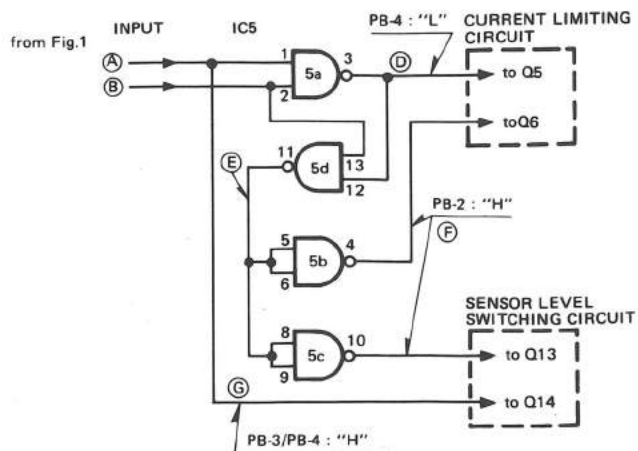


Fig. 3 Battery Recognition Circuit Block Diagram

5) Charging Current Limiting Circuit

This circuit receives the output of the battery recognition circuit and limits the charging current according to the type (current capacity) of battery. The charging current ICR is detected as a voltage drop across R1 (0.15Ω), which is provided to pin 3 of the operational amplifier IC4(1/2) : LA6393A. Pin 4 receives a reference voltage (VREF) used as a comparison standard for limiting the charging current. The VREF is changed by ON and OFF of Q5 and Q6 (See Table 4).

| BATT. | Q5 | Q6 | VREF | ICR MAX |
|-------|-----|-----|-------|---------|
| PB-1 | OFF | OFF | 0.28V | 1.8A |
| PB-2 | OFF | ON | 0.2V | 1.3A |
| PB-3 | OFF | OFF | 0.28V | 1.8A |
| PB-4 | ON | OFF | 0.36V | 2.4A |

Table 4

Pin 2 of IC4 : LA6393S provides "L" output when $V_{REF} < V_{CR}$, stopping the operation of the chopper regulator (IC1 : STK772B) and reducing the charging current. The charging current is limited by the formula :

$$I_{CR \text{ MAX}} (A) = V_{REF} (V) / 0.15(\Omega)$$

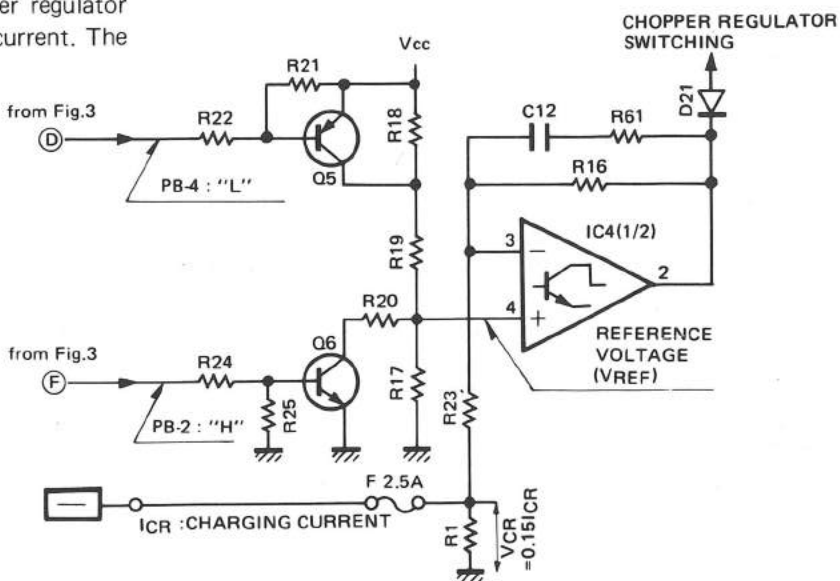


Fig. 4 Charging Current Limiting Circuit Block Diagram

BC-7 (RAPID CHARGER)

7) Charging Status Detect Circuit

This circuit detects the completion of charging and outputs a signal to stop charging. When no battery pack is inserted or charging is completed, a High ("H") Reset signal is applied to D15. When a battery is inserted the Reset signal applied to D15 is cleared. When the Reset signal is cleared, pin 4 of IC2 : KCH-1003 holds the reset state due to the charge in C8 for the duration of the R46-C8 time constant, then goes "L" to clear the reset state. Pins 8 and 9 of IC2 receive divided portions of the battery voltage. These inputs are tracked as the charging is performed in the long-term memory capacitor "MD". As the Ni-Cd battery charges, the battery voltage reaches a peak, then declines. (See Figure 6.) The MD stores the peak voltage, which is compared with the divided voltages at pins 8 and 9. When the difference ΔV is the same, a "L" signal is output from pin 11 to indicate that charging is complete. The signal indicating completion of charging is applied to the charging status memory circuit.

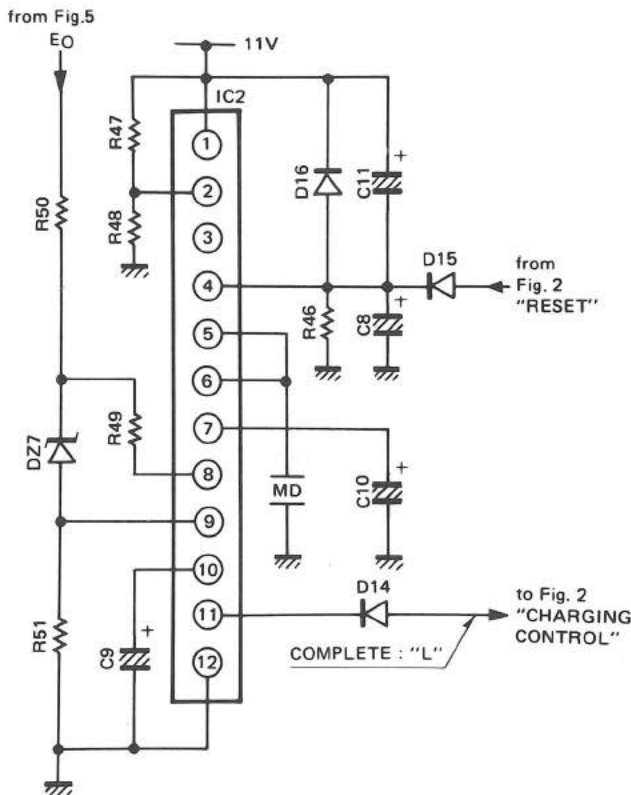


Fig. 7 Charging Status Detect Circuit Block Diagram

8) Timer Circuit

Battery defects may result in charging continuing indefinitely without completion, so this timer outputs a signal that stops charging approximately 1.7 hours after charging begins. When charging begins and the Reset signal is cleared at pin 3, IC3 : AN6780 begins counting. At the first count of 16384 pin 6 goes from "H" to "L". The output from pin 6 is connected to the Stop input (pin 2), so the output of IC3 is held in the "L" state until IC3 receives another Reset signal (for example, when the battery is removed).

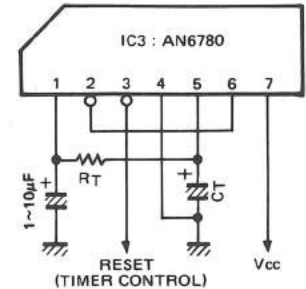


Fig. 8 Timer Circuit Block Diagram

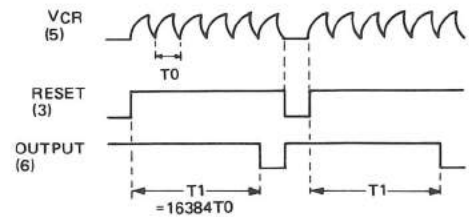


Fig. 9
 TIMER TIME $T_1 (s) \approx 11RT(K\Omega) \cdot C_T (\mu F)$
 TIMER TIME $T_1 (s) \approx 11 \times 56 (K\Omega) \cdot 10 (\mu F) = 6160 (s)$

9) Voltage Comparator Circuit

This circuit monitors the output (EO) of the sensor level switching circuit and indirectly detects abnormal conditions in the battery pack connected to the charging terminal. When the EO voltage falls to 5.2V or lower, the charging control line goes "L" to halt charging.

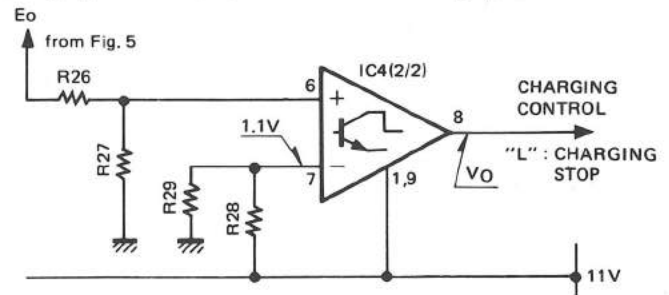


Fig. 10 Voltage Comparator Circuit Block Diagram

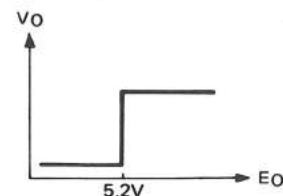


Fig. 11

BC-7 (RAPID CHARGER)

6) Sensor Level Switching Circuit

This circuit receives the output of the battery recognition circuit and aligns the voltages supplied to the charging status detect circuit according to the battery type (voltage) so that they are nearly equal at completion of charging.

| | Q11,Q13 | Q12,Q14 | EO (V) |
|------|---------|---------|--------|
| PB-1 | OFF | OFF | EI-7.6 |
| PB-2 | ON | OFF | EI-3.4 |
| PB-3 | OFF | ON | EI-2 |
| PB-4 | OFF | ON | EI-2 |

Table 5

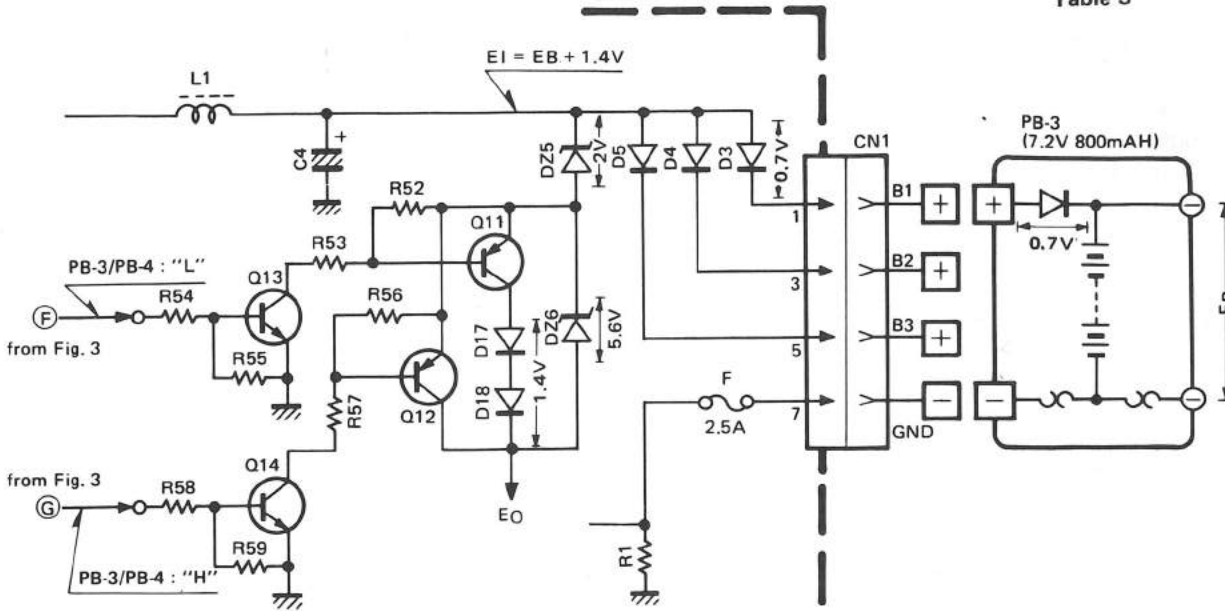


Fig. 5 Sensor Level Switching Circuit Block Diagram

The pin voltages while the Ni-Cd battery is charging are approximately 1.2 times the voltages at the completion of charging. (See **Figure 6**.)

The battery terminal voltage EB is as follows:

- Approximately 14.4V for the PB-1 (12V, 800mAh)
- Approximately 10.0V for the PB-2 (8.4V, 500mAh)
- Approximately 8.6V for the PB-3 (7.2V, 800mAh)
- Approximately 8.6V for the PB-4 (7.2V, 1600mAh)

The charging line voltage EI is the EB voltage plus a 1.4V voltage drop added by a diode.

$$EI = EB + 1.4V \dots \dots (1)$$

The EI voltage is output with a level shift as the voltage EO to the charging status detect circuit via Zener diode DZ6 and diodes D17 and D18. The amount of the shift is controlled by switching Q11 : 2SA608E and Q12 : 2SA608E on and off. (See **Table 5**.) If Eq. (1) is substituted into EO in **Table 5**, the results are:

- PB-1 : EO = EB-6.2V
- PB-2 : EO = EB-2V
- PB-3 or PB-4 : EO = EB-0.6V

At the completion of charging the value is approximately 8V.

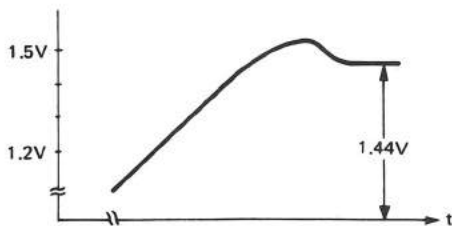


Fig. 6 The pin voltages while the Ni-CD Battery is charging

BC-7 (RAPID CHARGER)

× New Parts

Parts without Parts No. are not supplied.

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

Telle ohne Parts No. werden nicht geliefert.

BC-7 PARTS LIST

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕 向 | Re- marks 備考 |
|--|---------------|-------------------|---|--------------------------------|-------------------------|--------------------|
| BC-7 | | | | | | |
| 1 | 1A | * | A02-0776-08 | CASE | | |
| 2 | 1A,1B | * | A02-0778-05 | BATTERY POCKET | | |
| 3 | 1B | | B46-0411-00 | WARRANTY CARD | K | |
| 4 | 1B | * | B50-8134-08 | INSTRUCTION MANUAL | | |
| 5 | 1B | * | E23-0488-05 | TERMINAL | | |
| Δ 6 | 2A | * | E30-2038-08 | AC CORD | K,M,M2, P | |
| Δ 6 | 2A | * | E30-2072-08 | AC CORD | W | |
| Δ 6 | 2A | * | E30-2073-08 | AC CORD | T | |
| 8 | 2B | * | H01-8062-08 | ITEM CARTON CASE | | |
| 9 | 2B | | H10-2584-02 | POLYSTYRENE FOAMED FIXTURE (L) | | |
| 10 | 2B | | H10-2585-02 | POLYSTYRENE FOAMED FIXTURE (R) | | |
| 11 | 3A | | J02-0439-05 | FOOT | | |
| 12 | 3A | * | J39-0424-05 | SPACER | | |
| Δ T1 | 2A | * | L01-8081-08 | POWER TRANSFORMER (AC120V) | K,M2,P | |
| Δ T1 | 2A | * | L01-8112-08 | POWER TRANSFORMER (AC220V) | M,W | |
| Δ T1 | 2A | * | L01-8122-08 | POWER TRANSFORMER (AC240V) | T | |
| A | 3A | | N30-3006-41 | MACHINE SCREW (M3 X 6) | | |
| B | 2A,1B | | N34-4006-46 | MACHINE SCREW (M4 X 6 TR) | | |
| C | 2A,1B | | N35-4006-45 | MACHINE SCREW (M4 X 6 BI) BLK | | |
| D | 2A | | N87-3008-46 | TAPTITE SCREW (φ3 X 8 BR) | | |
| E | 1A | | N89-3008-45 | TAPTITE SCREW (φ3 X 8 BI) BLK | | |
| SW1 | 3A | | S36-1407-05 | POWER SW | | |
| 7 | 3B | * | W02-0389-05 | CHARGE CONTROL UNIT | | |
| | | | Resolder R64 (430Ω) and solder it to R41 printed on the PC board. | | | |
| CHARGE CONTROL UNIT (W02-0389-05) | | | | | | |
| C1 | | | CE04EW1V222M | ELECTRO 2200μF 35WV | | |
| C2 | | | CE04EW1C470M | ELECTRO 47μF 16WV | | |
| C3 | | | CE04EW1H010M | ELECTRO 1μF 50WV | | |
| C4 | | | CE04EW1E471M | ELECTRO 470μF 25WV | | |
| C5,6 | | | CE04EW1C100M | ELECTRO 10μF 16WV | | |
| C7 | | | CE04EW1A101M | ELECTRO 100μF 10WV | | |
| C8 | | | CE04EW1C100M | ELECTRO 10μF 16WV | | |
| C9,10 | | | CE04EW0J101M | ELECTRO 100μF 6.3WV | | |
| C11 | | | CE04EW1C330M | ELECTRO 33μF 16WV | | |
| C12 | | | CK45B1H102K | CERAMIC 0.001μF 50WV | | |
| C14 | | | CE04EW1H010M | ELECTRO 1μF 50WV | | |

E: Scandinavia & Europe H: Audio Club K: USA P: Canada

A: Saudi Arabia T: England U: PX(Far East, Hawaii)

UE: AAFES(Europe) X: Australia M: Other Areas

Δ indicates safety critical components.

BC-7 (RAPID CHARGER)

× New Parts

Parts without Parts No. are not supplied.

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

Teile ohne Parts No. werden nicht geliefert.

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------|---------------|-------------------|-------------------|--------------------------|------------------------|--------------------|
| MD | | | C91-1038-08 | ELECTRO | | |
| △ F1 | | | F05-2525-05 | FUSE (2.5A) | W | |
| △ F1 | | * | F06-2522-05 | FUSE (2.5A) | M,M2,T | |
| △ F1 | | * | F06-2523-05 | FUSE (2.5A) | K,P | |
| — | | | J13-0039-05 | FUSE HOLDER | W | |
| L1 | | * | L33-0694-08 | CHOKE COIL (470μH) | | |
| R1 | | * | R92-0683-08 | FL-PROOF 0.15Ω 4W | | |
| D1-5 | | | DSA26B | DIODE | | |
| D6-21 | | | DS442 | DIODE | | |
| DZ1 | | * | GZA11Y | ZENER DIODE (11V) | | |
| DZ2-4 | | * | GZA10Z | ZENER DIODE (10V) | | |
| DZ5 | | * | GZA2.0X | ZENER DIODE (2V) | | |
| DZ6 | | * | GZA5.6X | ZENER DIODE (5.6V) | | |
| DZ7 | | * | GZA7.5Y | ZENER DIODE (7.5V) | | |
| DZ8 | | | GZA3.0X | ZENER DIODE (3V) | | |
| IC1 | | * | STK772B | IC (CHOPPER REGULATOR) | | |
| IC2 | | * | KCH-1003 | IC (VOLTAGE SENSOR) | | |
| IC3 | | | AN6780 | IC (TIMER) | | |
| IC4 | | | LA6393S | IC (DUAL OP IC) | | |
| IC5 | | | LC4011B | IC (QUADRUPLE NAND GATE) | | |
| Q1 | | * | 2SD600F,KF | TRANSISTOR | | |
| Q2-5 | | * | 2SA608E,F | TRANSISTOR | | |
| Q6 | | * | 2SC536E,F | TRANSISTOR | | |
| Q7 | | * | 2SA608E,F | TRANSISTOR | | |
| Q8-10 | | | 2SC536E,F | TRANSISTOR | | |
| Q11,12 | | | 2SA608E,F | TRANSISTOR | | |
| Q13,14 | | | 2SC536E,F | TRANSISTOR | | |
| LED1 | 2A | | SLP-540D | LED (RED/GRN) | | |

E: Scandinavia & Europe H: Audio Club K: USA P: Canada

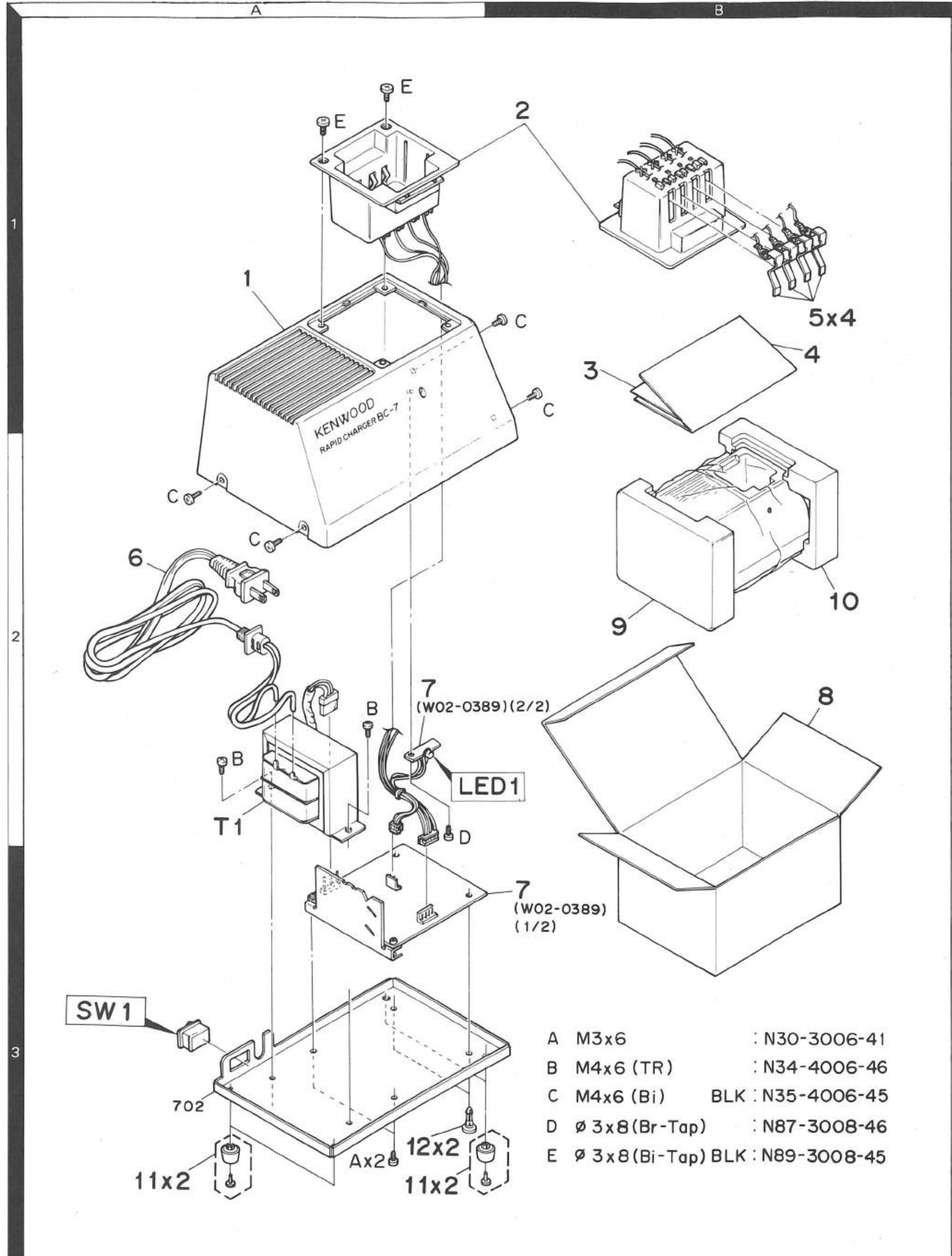
A: Saudi Arabia T: England U: PX (Far East, Hawaii)

UE: AAFES (Europe) X: Australia M: Other Areas

△ indicates safety critical components.

BC-7 (RAPID CHARGER)

BC-7 EXPLODED VIEW/PACKING

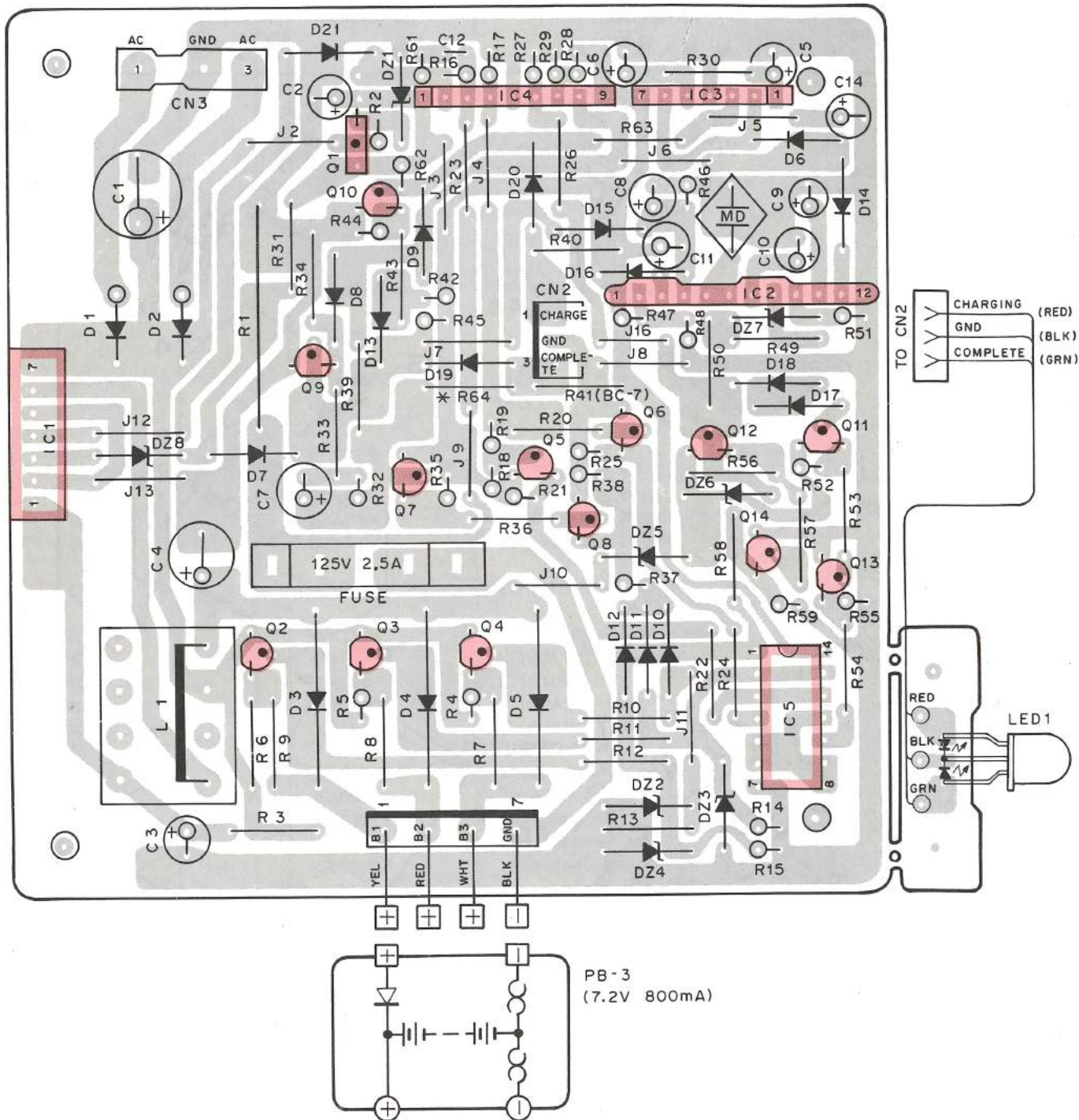


- | | | | |
|---|--------------------------------|-------|-------------|
| A | M3x6 | : | N30-3006-41 |
| B | M4x6 (TR) | : | N34-4006-46 |
| C | M4x6 (Bi) | BLK : | N35-4006-45 |
| D | \varnothing 3x8 (Br-Tap) | : | N87-3008-46 |
| E | \varnothing 3x8 (Bi-Tap) BLK | : | N89-3008-45 |

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

BC-7 (RAPID CHARGER)

BC-7 PC BOARD VIEW



Q1 : 2SD600F,KF Q2-5,7,11,12 : 2SA608E,F Q6,8-10,13,14 : 2SC536E,F
 IC1 : STK772B IC2 : KCH-1003 IC3 : AN6780 IC4 : LA6393S IC5 : LC4011B
 D1-5 : DSA26B D6-21 : DS442
 DZ1 : GZA11Y DZ2-4 : GZA10Z D5 : GZA2.0X DZ6 : GZA5.6X DZ7 : GZA7.5Y DZ8 : GZA3.0X

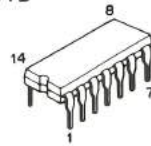
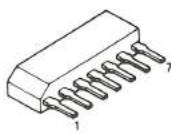
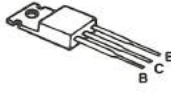
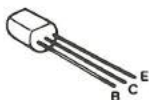
2SA608E
2SA608F

2SC536E 2SD600F
2SC536F 2SD600KF

AN6780

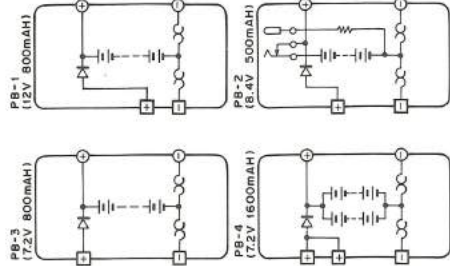
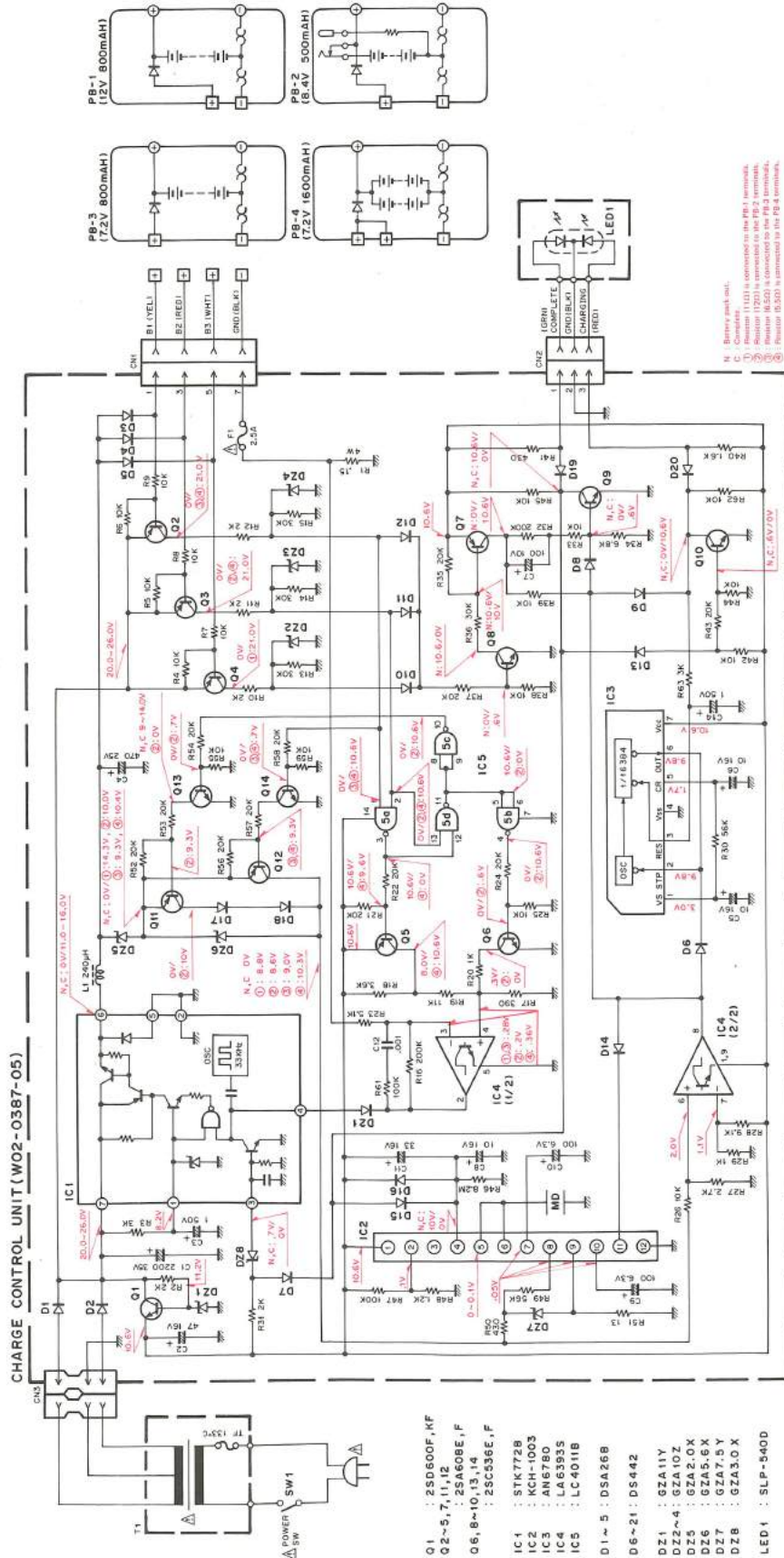
LC4011B

LA6393S



BC-7 (RAPID CHARGER)

BC-7 CIRCUIT DIAGRAM



BC-8 (COMPACT CHARGER)

BC-8 EXTERNAL VIEW

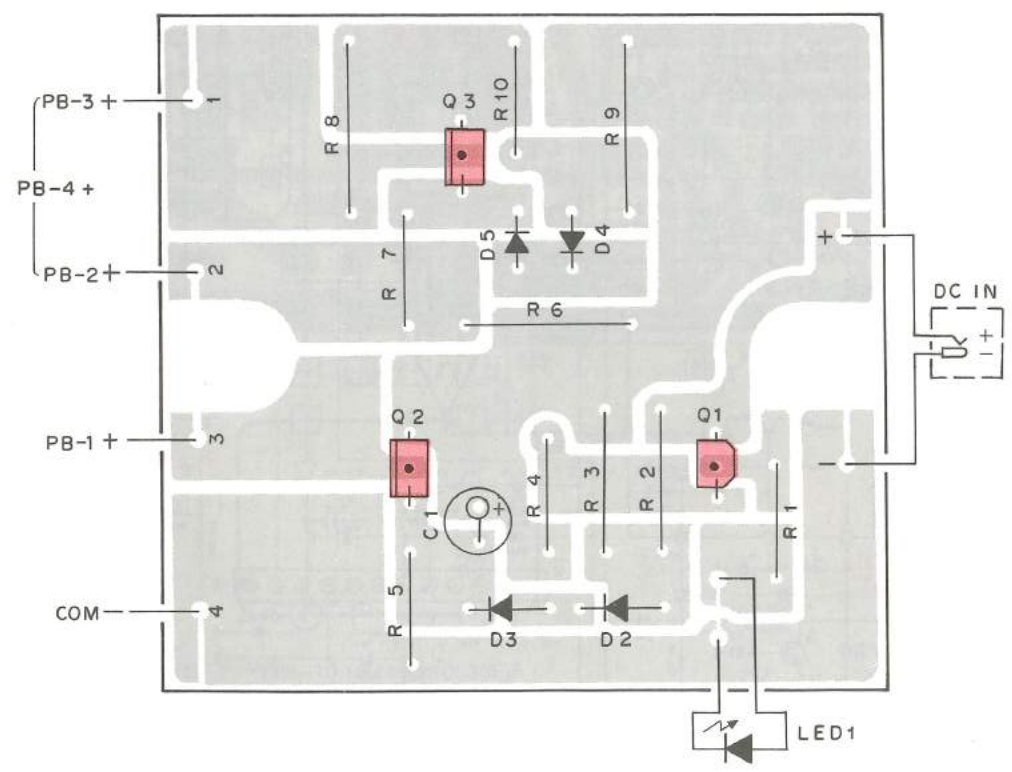


BC-8 PARTS LIST

N : New parts

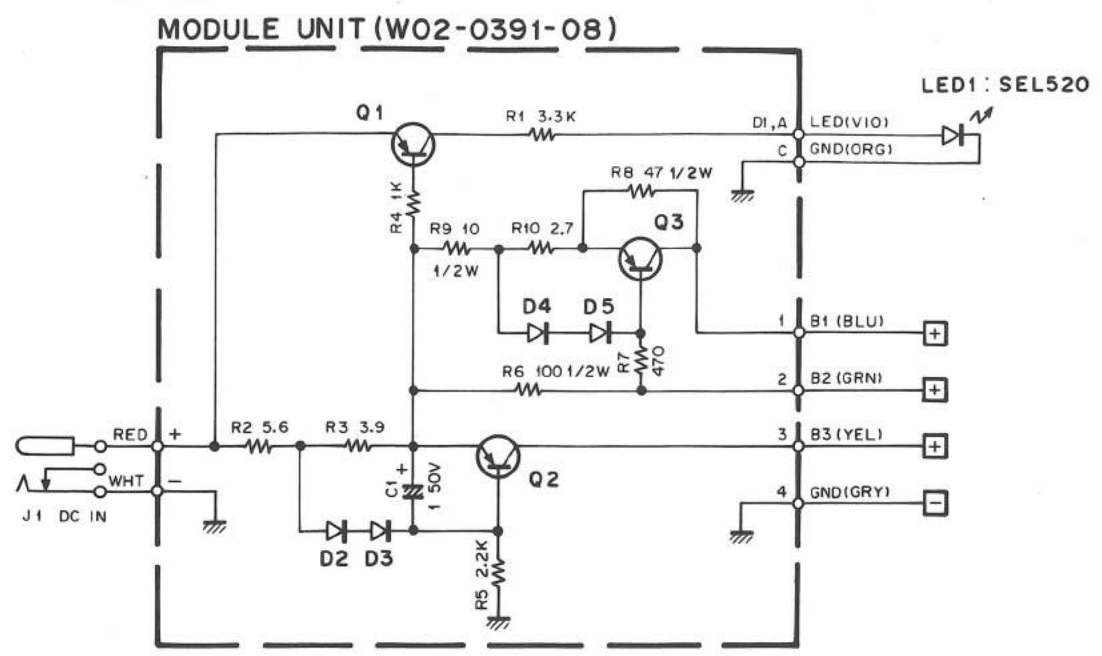
| Parts No. | Re- marks | Description | Ref.No. |
|---------------|--------------|------------------------------------|---------|
| A02-0778-05 | | Battery pocket | |
| B50-8137-18 | N | Instruction manual K,M1,M2, W,F | |
| B50-8138-18 | N | Instruction manual T | |
| E03-0168-05 | N | DC jack | |
| J19-1423-05 | N | LED holder | |
| W02-0391-08 | N | Module unit | |
| △ W09-0376-08 | N | AC adaptor AC 120V K | |
| △ W09-0377-08 | N | AC adaptor AC 220V M1 | |
| △ W09-0378-08 | N | AC adaptor AC 120V M2 | |
| △ W09-0379-08 | N | AC adaptor AC 220V W | |
| △ W09-0380-08 | N | AC adaptor AC 120V P | |
| △ W09-0381-08 | N | AC adaptor AC 240V T | |
| 2SA1115(E) | | TR | Q1 |
| 2SA1241Y | | TR | Q2,3 |
| 1SS133 | | Diode | D2~5 |
| SEL520 | N | LED | LED1 |

BC-8 PC BOARD VIEW

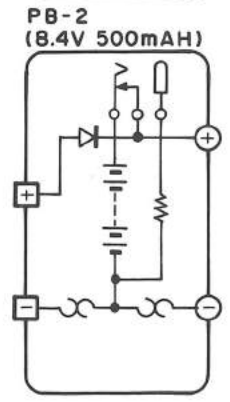
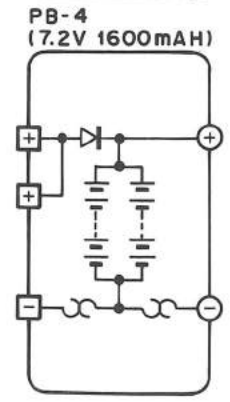
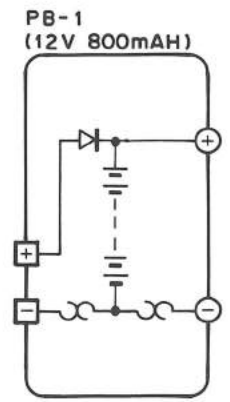
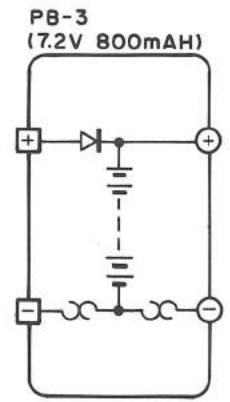
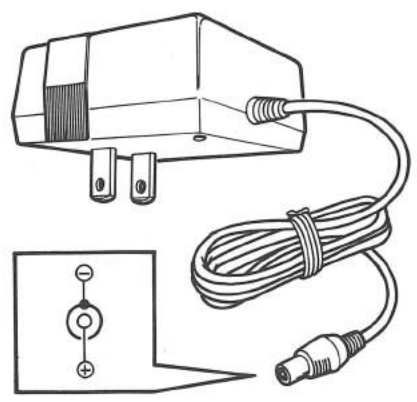


BC-8 (COMPACT CHARGER)

BC-8 CIRCUIT DIAGRAM

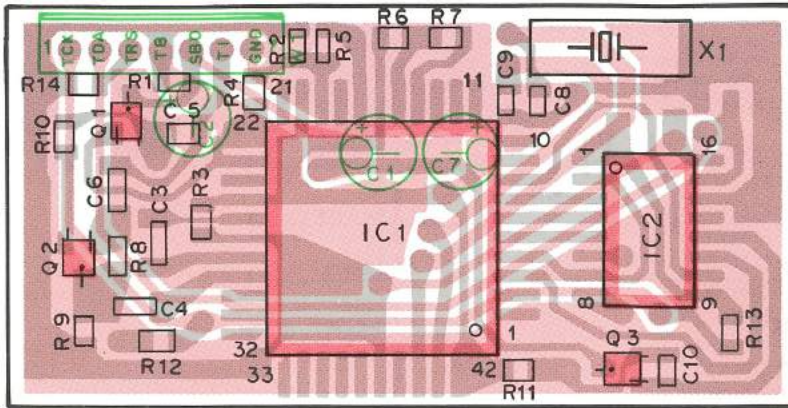


- Q1 : 2SA1115(E)
- Q2, 3 : 2SA1241Y
- D2~5 : 1SS133

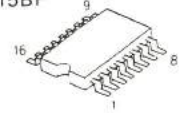


TSU-4 (TONE SQUELCH UNIT)

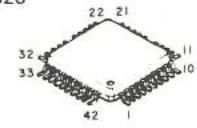
TSU-4 PC BOARD VIEW



TC4015BF



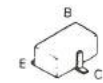
MN6520



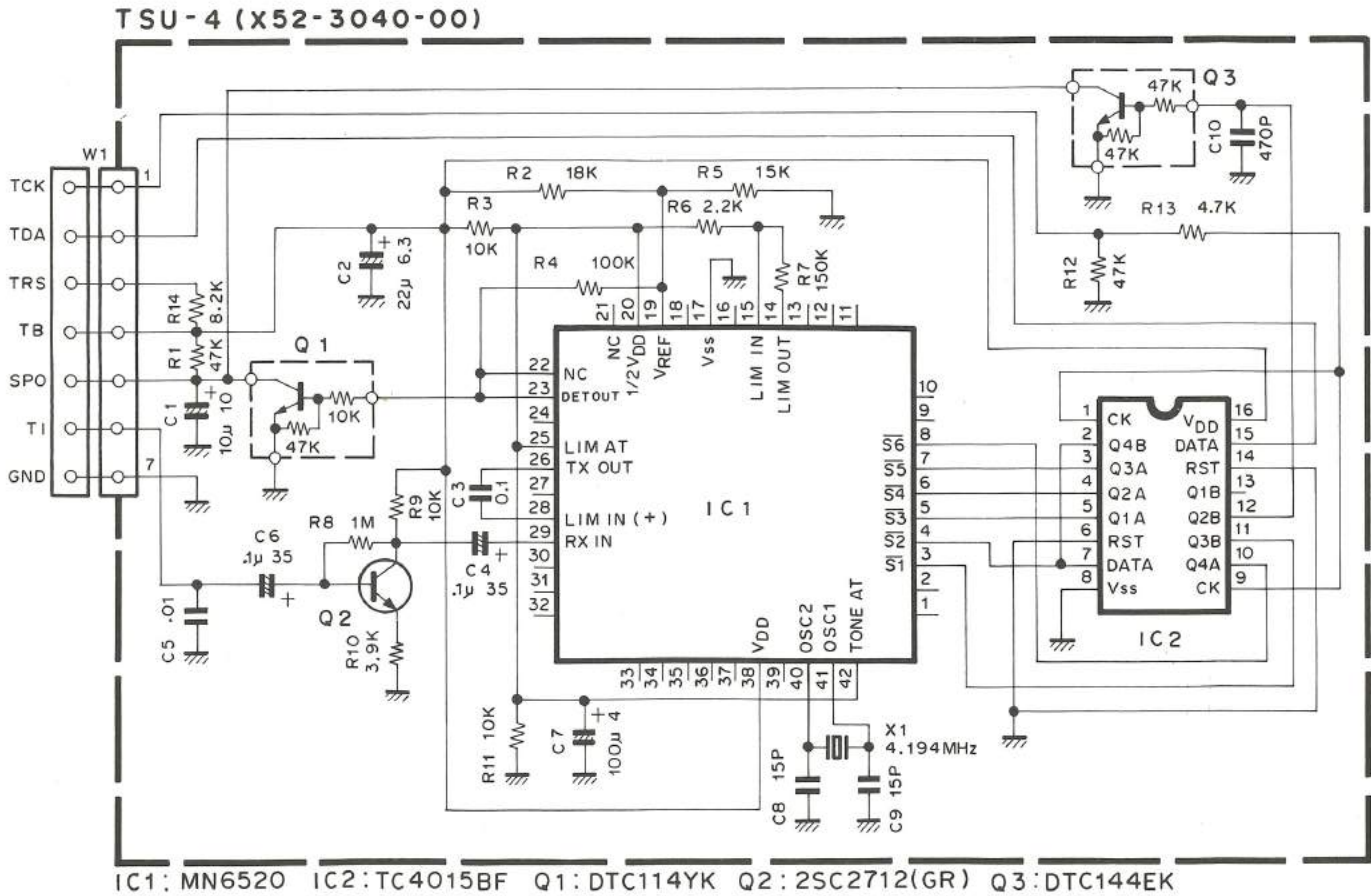
DTC114YK
DTC144EK



2SC2712



TSU-4 CIRCUIT DIAGRAM



TSU-4 (TONE SQUELCH UNIT)

× New Parts

Parts without Parts No. are not supplied.

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

Telle ohne Parts No. werden nicht geliefert.

TSU-4 PARTS LIST

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕 向 | Re- marks 備考 |
|--------------------------------------|---------------|-------------------|-------------------|---------------------------------|-------------------------|--------------------|
| TSU-4 | | | | | | |
| - | | * | B50-8130-00 | INSTRUCTION MANUAL | | |
| - | | | G13-0820-14 | CUSHION (ACSY) | | |
| - | | | J90-0402-04 | GUIDE | | |
| TSU-4 TONE UNIT (X52-3040-00) | | | | | | |
| C1 | | | CE04CW1A100M | ELECTRO 10UF 10WV | | |
| C2 | | | CE04CWOJ220M | ELECTRO 22UF 6.3WV | | |
| C3 | | | CK73EB1E104K | CHIP C 0.10UF 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 | | | CE04CWOJ101M | ELECTRO 100UF 4.0WV | | |
| C8 | .9 | | CC73FCH1H150J | CHIP C 15PF J | | |
| C10 | | | CK73FB1H471K | CHIP C 470PF K | | |
| W1 | | | E31-3223-15 | CONNECTING WIRE | | |
| X1 | | | L77-1313-05 | CRYSTAL RESONATOR(4.194304MHZ) | | |
| 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
 U: PX(Far East, Hawaii) T: England M: Other Areas
 UE: AAFES(Europe) X: Australia

 indicates safety critical components.

SPECIFICATIONS

General

| | |
|-----------------------|---|
| Frequency range | 220.000MHz – 224.995MHz |
| Signal type | F3 (F3E) |
| Power supply voltage | DC 6.3V – 15V (Battery terminal) DC 7.2V – 16V (DC IN jack) |
| Power consumption | At reception standby ; Approx. 55mA At battery power save ; Approx. 11mA At transmission (5W) ; Less than 1.7A 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 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 ; 16.9MHz 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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