144/430 (440) MHz FM DUAL BANDER

TH-78A/E

SERVICE MANUAL

KENWOOD

B51-8167-00 (B) 1197

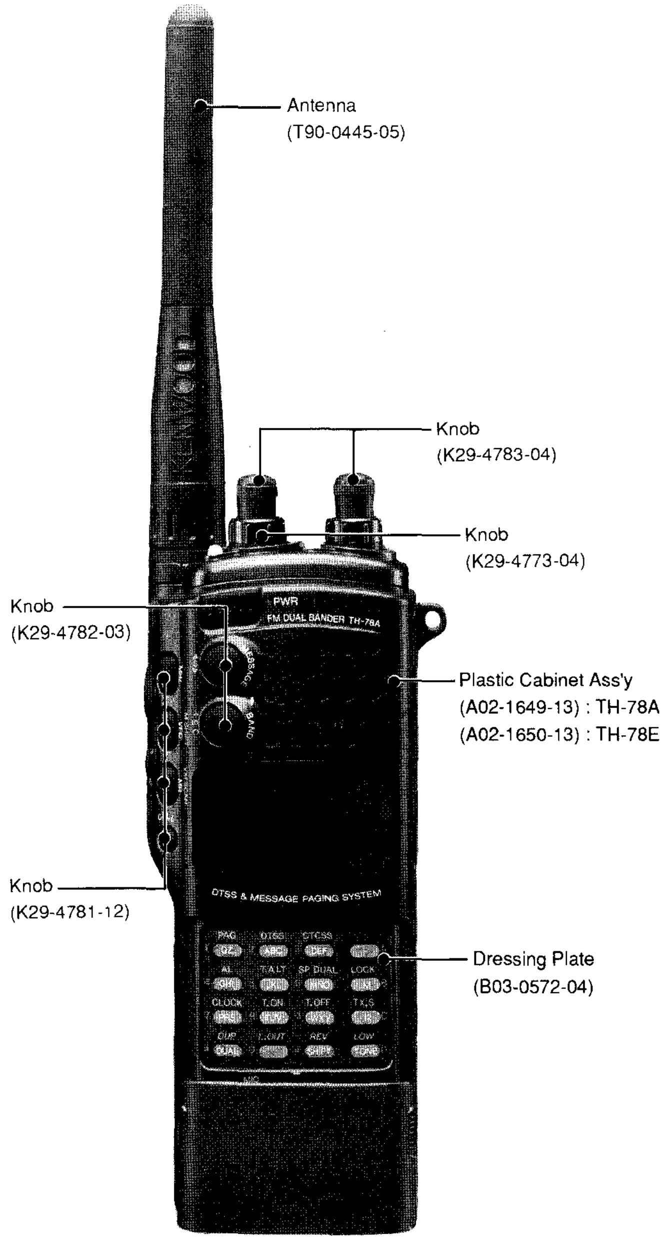


Photo is TH-78A.

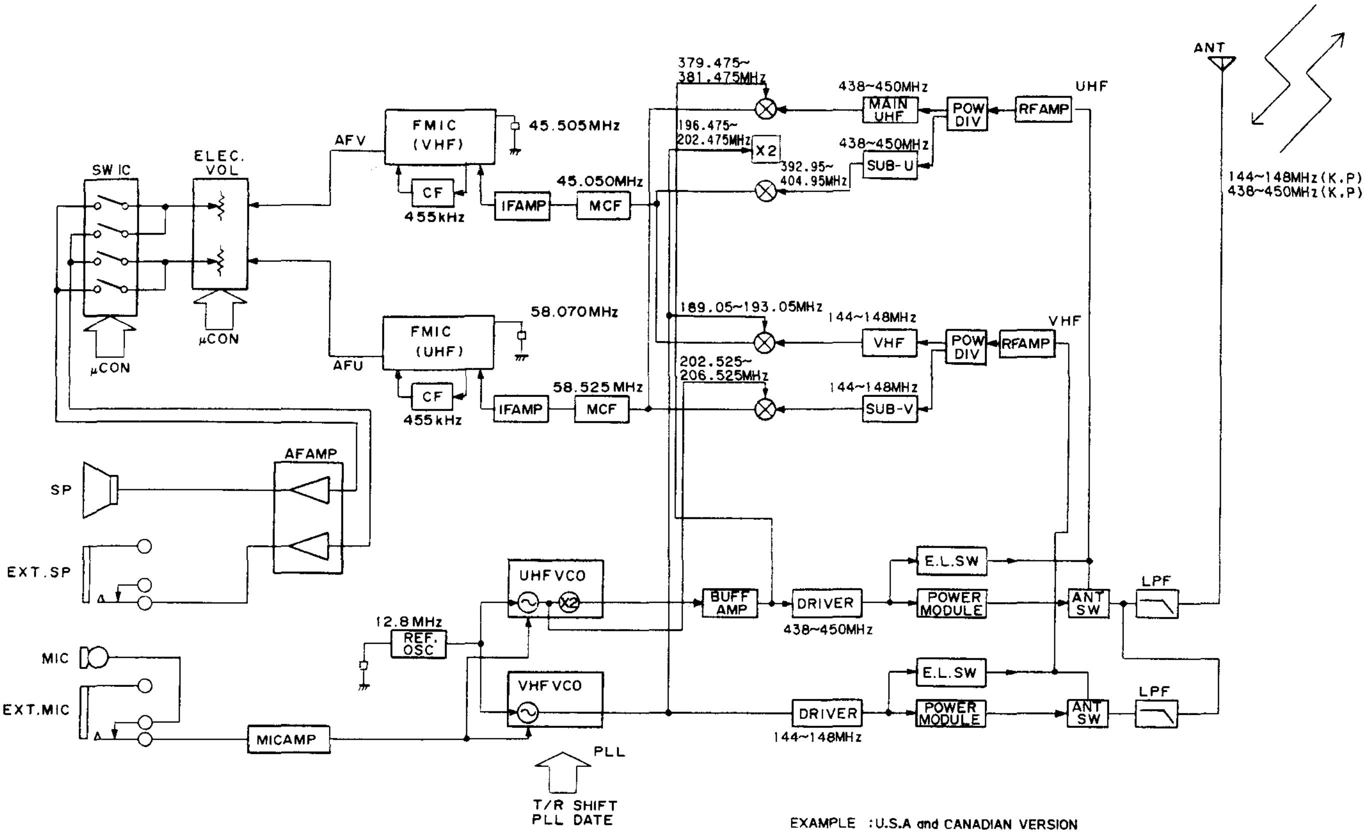
CONTENTS

PC BOARD VIEWS/CIRCUIT DIAGRAMS

CIRCUIT DESCRIPTION

1. Frequency configuration

- The TH-78 has separate PLL and IF units for the VHF and UHF bands, so it can receive signals in both bands at the same time.
- The UHF VCO signal is doubled, and the signal before doubling is used as a local oscillator signal, so signals can be received in the VHF band at the same time.
- The signals can be received in the UHF band by doubling the VHF local oscillator signal.
- The M-UHF receive signal becomes the 58.525 MHz first IF when mixed with the first local oscillator signal (lower hetero), and is then mixed with the 58.070-MHz second oscillator signal (upper hetero) to produce a 455 kHz signal.
- The M-VHF receive signal becomes the 45.050 MHz first IF when mixed with the first local oscillator signal (lower hetero), and is mixed with the 45.505 MHz second oscillator signal (upper hetero) to produce a 455 kHz signal.
- The SUB-U receive signal becomes the 45.050 MHz first IF by doubling the VHF local oscillator signal, which is used as the first local oscillator signal (lower hetero), and is processed by the M-VHF IF circuit.
- The SUB-V receive signal becomes the 58.525-MHz first IF by using the VHF signal before the UHF-VCO doubler as the first local oscillator signal (upper hetero), and is processed by the M-UHF IF circuit.
- The VHF transmitter system effects reactance modulation by directly driving the VCO, and amplifies the signal to the required level to produce a transmit signal.
- The UHF transmitter system applies reactance modulation to the oscillator that generates half the transmit frequency, doubles the signal, and amplifies it to the required level, to produce a transmit signal.



EXAMPLE :U.S.A and CANADIAN VERSION

Fig. 1 Circuit configration by frequency

CIRCUIT DESCRIPTION

2. Receiver system

The TH-78 uses an antenna shared by the VHF and UHF bands and contains a duplexer. It contains two audio amplifiers: one for the internal speaker and the other for the external speaker. (Fig. 2)

Item	Rating
Rated center frequency (fo)	45.050 MHz
Pass bandwidth	±7.5 kHz or more at 3 dB
Attenuation bandwidth	±22 kHz or less at 25 dB
Guaranteed attenuation	80 dB or more within +910 kHz (Spurious: ±1 MHz at 40 dB or more)
Ripple	1.0 dB or less
Insertion loss	4 dB or less
Terminating impedance	800Ω/2 pF

Table 1 MCF (L71-0409-05) characteristics (TX-RX UNIT XF302)

Item	Rating
Rated center frequency (fo)	58.525 MHz
Pass bandwidth	±8.5 kHz or more at 3 dB
Attenuation bandwidth	±25 kHz or less at 25 dB ±70 kHz or less at 60 dB
Guaranteed attenuation	±910 kHz or more at 80 dB
Ripple	1.0 dB or less
Insertion loss	4.0 dB or less
Terminating impedance	380Ω/3.5 pF

Table 2 MCF (L71-0410-05) characteristics (TX-RX UNIT XF301)

Item	Rating
Center frequency (fo) in 6 dB bandwidth	Within ±1.5 kHz of 455 kHz
6 dB bandwidth	±7.5 kHz or more
40 dB bandwidth	±15 kHz or less
Ripple in pass bandwidth	1.5 dB or less (Within ±5 kHz of 455 kHz)
Guaranteed attenuation (±100 kHz)	27 dB or more
Insertion loss	6 dB or less
I/O matching terminating impedance	1.5 kΩ

Table 3 Ceramic filter (L72-0362-05) characteristics (TX-RX UNIT CF301, CF302)

2-1. VHF Receiver

The signal from the antenna passes through the low-pass filter, duplexer, and antenna switch D21, D23 (MA77), is amplified by Q19 (2SC4226), and divided into the main VHF and sub VHF sections by the power divider. In the main VHF section, unwanted signal components are removed by a band-pass filter consisting of L36, L37, and L38. The signal is then mixed with the first local oscillator signal by first mixer Q18 (2SC4083) to generate the first IF. Unwanted components are removed from the first IF signal by a set of MCFs. The resulting signal is amplified by IF amplifier Q324 (2SC4619), and goes to IC304 (MC3372D). The signal is mixed with the second local oscillator signal by IC304 to generate the second IF. Unwanted signal components are removed by the ceramic filter, and the resulting signal is amplified and detected by the quadrature detector to generate the AF signal.

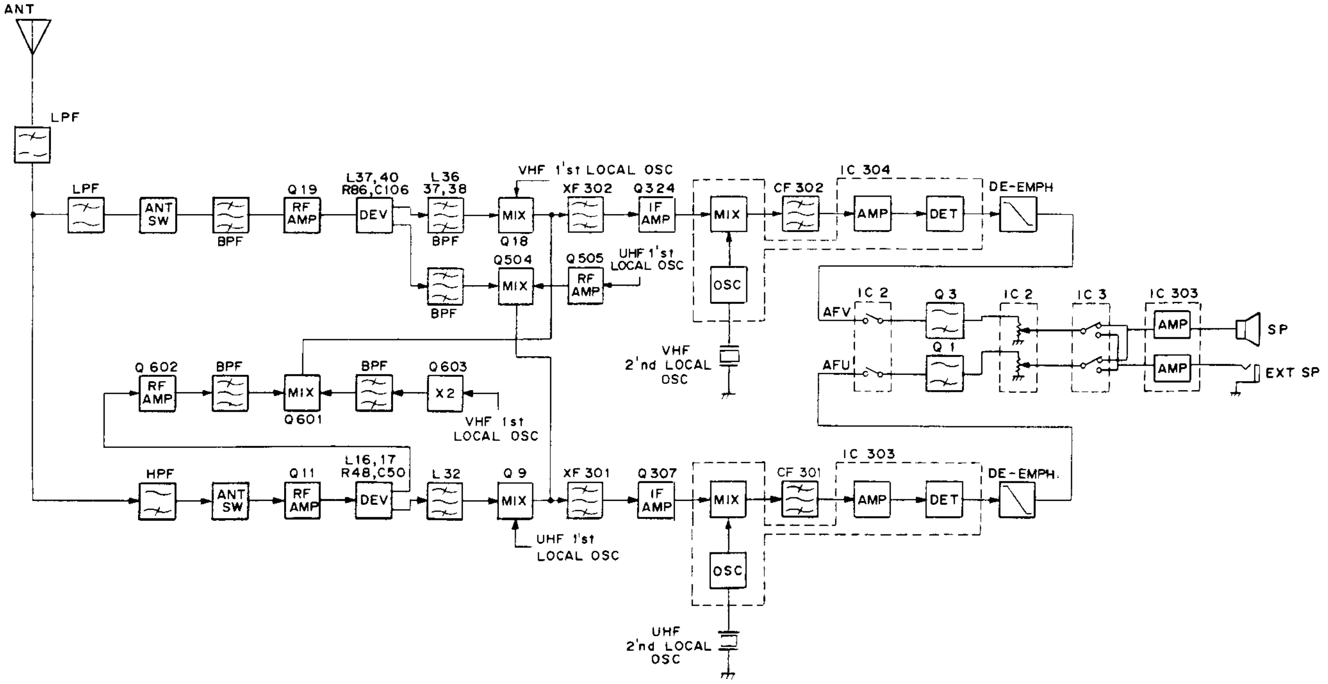


Fig. 2 RX selection block diagram

CIRCUIT DESCRIPTION

2-2. Sub VHF Receiver

The signal from the antenna enters the VHF receiver. It is amplified by Q19, divided by the power divider, and goes to the sub VHF section. Unwanted signal components are removed by a band-pass filter. The signal is then mixed with the original oscillator frequency of the UHF first local oscillator by first mixer Q505 (2SC4619) to generate the UHF first IF. The UHF receiver is used after the first IF. The sub VHF first mixer and main UHF first mixer are not affected by other bands because the collector is used and the bias is turned on and off.

2-3. UHF Receiver

The signal from the antenna passes through the low-pass filter, duplexer, and antenna switch (D11, D12 [MA77], and D14 [MA77]), is amplified by Q11 (3SK240), and divided into the main UHF and sub UHF sections by the power divider. In the main UHF section, unwanted components are removed by a helical filter. The resulting signal is then mixed with the first local oscillator signal by first mixer Q9 to generate the first IF. Unwanted components are removed from the first IF signal by a set of MCFs. The resulting signal is amplified by IF amplifier Q307 (2SC4215), and goes to IC303 (MC3372D). The signal is detected in the same way as in the VHF receiver to generate the AF signal.

2-4. Sub UHF Receiver

The signal from the antenna enters the UHF receiver. It is amplified by Q11, divided by the power divider, and goes to the sub UHF receiver. The signal is amplified by Q602 (2SC4839) and unwanted signal components are removed by a band-pass filter. The signal is then mixed by first mixer Q601 (2SC4839) to generate the UHF band first IF. The local oscillator signal is produced by doubling the VHF-VCO frequency by Q603. The VHF band receiver is used after the first IF.

The sub UHF first mixer and main VHF first mixer are not affected by other bands because the collector is used and the bias is turned on and off.

2-5. Audio Circuits

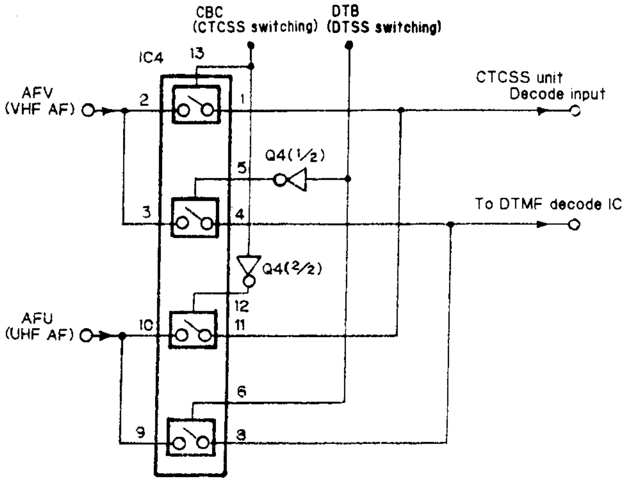
Outline

AF signals AFV and AFU, detected and de-emphasized by the IF unit, enter IC1 (TC4066BF) of the control unit, and SQL muting is controlled. AFV and AFU pass through a high-pass filter, and enter IC2 (DS1267S) of the electronic volume control, which containing two circuits. If the encoder/volume is in VOL mode, the pulse signal from the encoder is detected by IC5, and the IC2 resistor tap position is varied by serial data. IC3 controls the internal speaker, external speaker, V/U mix and separation.

2-5-1. CTCSS/DTSS switching

AFV and AFU are input to IC4 of the control unit, and switched to the input to the CTCSS unit and DTMF decode IC with the CBC and DTB signals.

If the CTCSS, DTSS, and paging functions are off, CBC and DTB are indefinite. The port states are shown in Fig. 3.



	CBC	DTB
VHF signal input	H	L
UHF signal input	L	H

Fig. 3 CTCSS, DTSS switching circuit

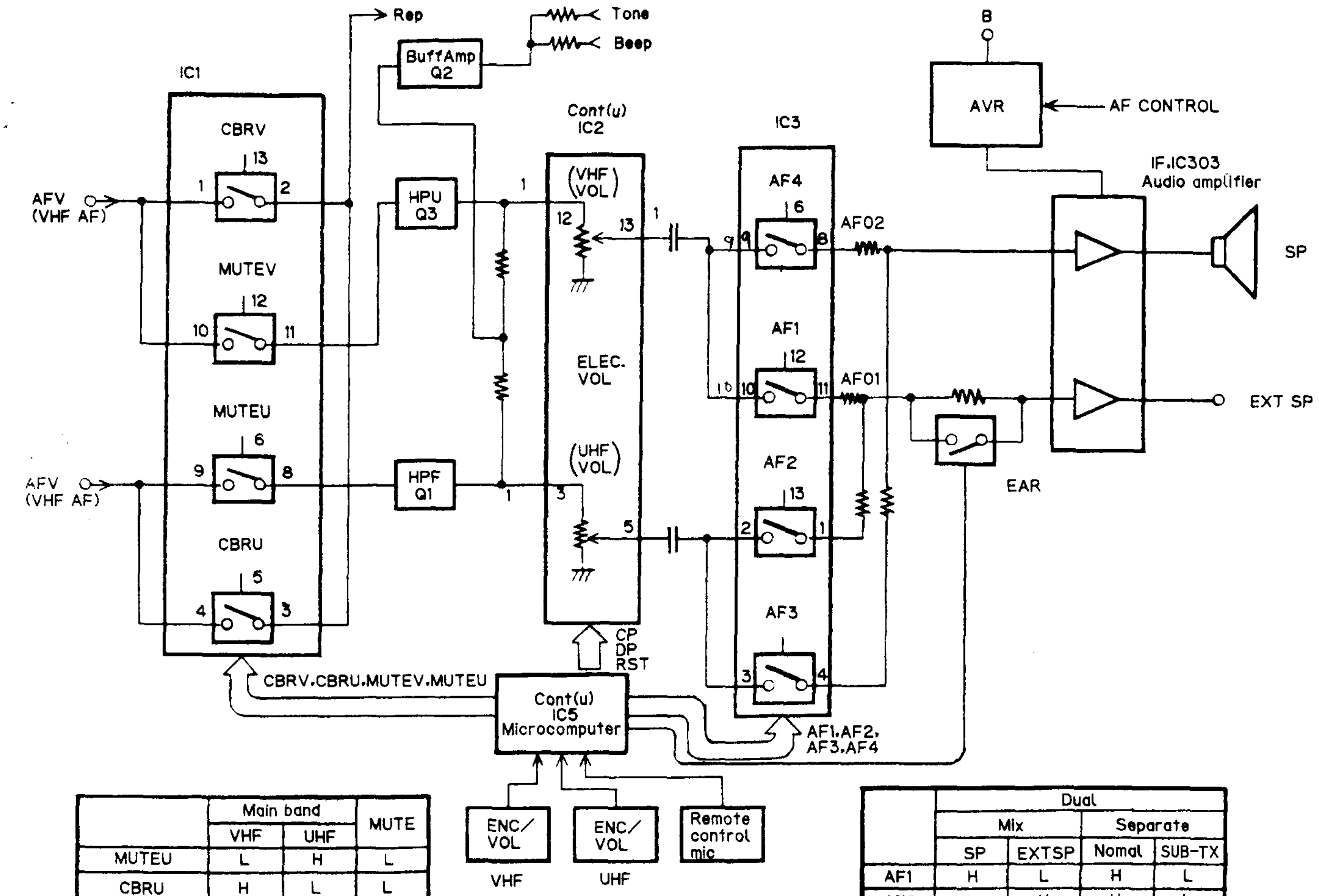
CIRCUIT DESCRIPTION

2-5-2. Receive audio signals switching

IC1 opens all switches to mute when it outputs a beep.

IC3 switches between speakers and between mixing and separation.

The port states are shown in Fig. 4.



	Main band		MUTE
	VHF	UHF	
MUTEU	L	H	L
CBRU	H	L	L
CBRV	L	H	L
MUTEV	H	L	L

	Dual			
	Mix		Separate	
	SP	EXTSP	Nomal	SUB-TX
AF1	H	L	H	L
AF2	L	H	H	L
AF3	L	H	L	H
AF4	H	L	L	H

Fig. 4 RX audio switching circuit

CIRCUIT DESCRIPTION

2-5-3. External speaker detection

The microcomputer detects that the speaker jack REM terminal becomes 0 or the remote switch voltage when the speaker plug is inserted, and the audio input is changed from IF unit IC302 AF02 to AF01 by IC3.

2-5-4. Audio amplifier

IC302 is an audio amplifier containing two circuits. AF02 is the input pin for the internal speaker, and AF01 is the input pin for the external speaker. The IC power is generated by Q304 (2SB1182) and Q305 (2SC4617). D312 (MA110) and Q306 (DTA144WE) comprises the power on/off control circuit.

2-5-5. Squelch circuit

The similar squelch circuit is used for the VHF and UHF bands. The squelch circuit for the VHF band is explained here. The IF IC304 detection output is filtered by the IC304 amplifier, noise components are amplified by Q326 and rectified by D306 to produce a squelch signal. It is turned on and off by changing the Q325 input pin voltage with a squelch VR, and the SCV signal and hysterisis switch operation is performed by Q327.

2-5-6. S meter circuit

The S meter circuit of IF unit IC303 and IC304 (MC3372D) is used. The input voltage to the microcomputer for the VHF band is adjusted by VR307 of the IF unit, and the input voltage to the microcomputer for the UHF band is adjusted by VR306.

Since the VHF and UHF signal strengths are displayed on the LCD at the same time, the S meter signal is applied to a different A/D converter input terminal. The signal strengths is displayed in five levels.

CIRCUIT DESCRIPTION

3. Transmitter system

The directly oscillated VCO is reactance-modulated in the VHF band. The 1/2 oscillated VCO is reactance-modulated in the UHF band and doubled. The microphone amplifier output level can be adjusted separately for the VHF and UHF bands (see Fig. 5).

3-1. Modulator Circuit

The audio signal from the microphone passes through a preemphasis, amplifier, limiter amplifier, and splatter filter in the IF unit IC301 (NJM4560E). The IF Q303 switches between the VHF and UHF. VR301 and VR302 adjust the frequency shift.

The modulation signal is applied to the varicap for VCO modulation for the VHF and UHF and reactance-modulated.

When the DTMF is used, the input terminal is shorted by Q302.

3-2. 88.5 Hz LPF

The 88.5 Hz internal tone is output from the ET port of the microcomputer as a square waveform, rectified by the Q1 active low-pass filter, amplified by Q2, and VCO is modulated directly.

3-3. Driver and Final Amplifier

The VCO output in the VHF and UHF bands is amplified by two amplifiers, and further amplified to the required level by the RF power-up module. The signal passes through the antenna switch in each band, duplexer, and low-pass filter, and goes to the antenna.

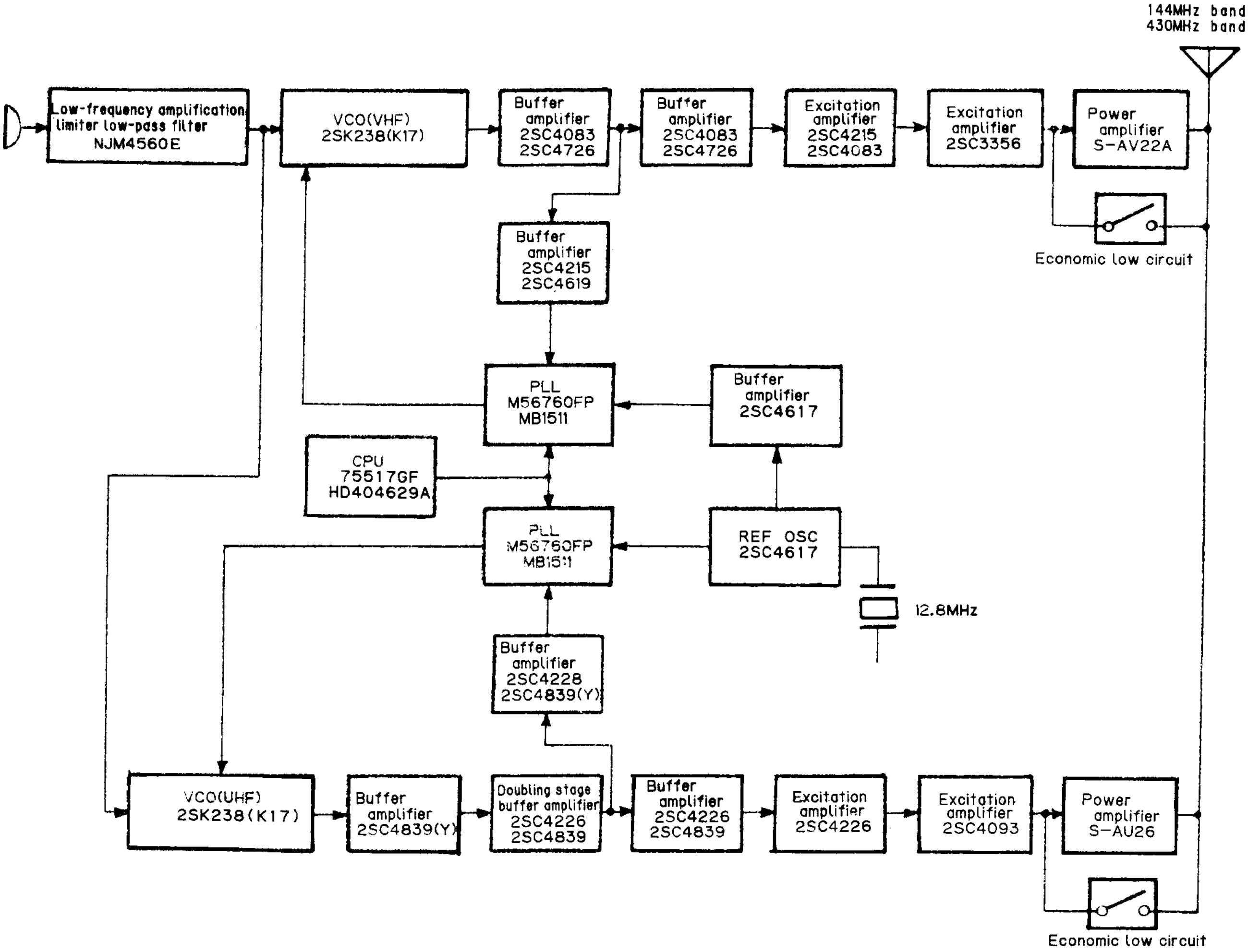
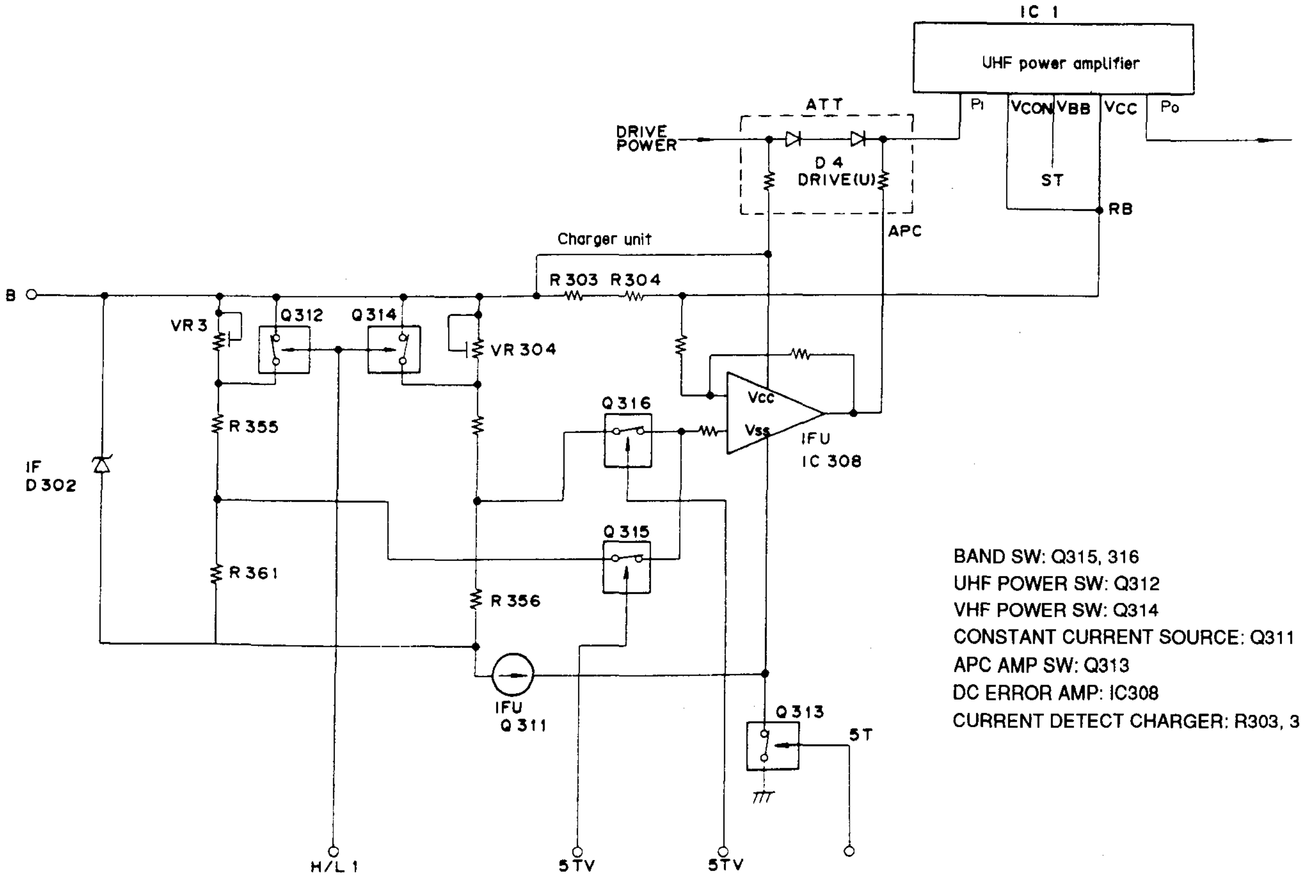


Fig. 5 Transmitter system

3-4. APC Circuit

The APC circuit detects the final amplifier current and controls the input power level to provide stable transmission output. The UHF band is explained below as an example (Fig. 6). Q313 is turned on by 5T during transmission, and IC308 operates. The IC1 output power is detected as a voltage drop of R303 and R304 of the charger unit. The voltage at both ends of the IF D302 stabilized by the IF Q311 is compared with the voltage divided by VR304, R356, and R365. The current flowing through D4 is controlled to eliminate the voltage difference. Therefore, the IC1 drive input power decreases as the power amplifier module current increases (the power increases). As the current decreases (the power decreases), the drive power increases.

To switch between two power levels, Q314 is turned on and off by controlling the H/L port, and the reference voltage to IC308 is switched (see Table 4).



BAND SW: Q315, 316
UHF POWER SW: Q312
VHF POWER SW: Q314
CONSTANT CURRENT SOURCE: Q311
APC AMP SW: Q313
DC ERROR AMP: IC308
CURRENT DETECT CHARGER: R303, 304

Fig. 6 APC operation

CIRCUIT DESCRIPTION

4. Power supply circuit

The external power supply is applied to the IF unit IC306 and control unit IC6. The IC306 output is always applied to control unit IC5 and IC7. If the battery is connected and the power is off, the current flows through IC306 and IC6 and the microcomputer backup current flows. When the power is switched on, the PS port of the control unit IC5 goes low, and control unit Q6 turns on. The reference voltage of each regulator is applied. The power is supplied to the CTCSS unit by the IF unit Q338 turns on (see Fig. 7).

5C and 5R are generated by the IF unit Q317 and Q319 (1/2), and 5T is generated by Q318 and Q320 (1/2) and distributed by each switch. The power to the PLL reference oscillator is supplied from 5C.

5R14, 5RVIC, and 5CV are turned on during VHF reception, and 5R43, 5RUIF, and 5CU are turned on during UHF reception. 5TV and 5TU are turned on during transmission.

5. Save circuit

The average current consumption is reduced by controlling Q321 by the SAVE pin of IC5 of the control unit and turning on and off the regulator for 5C and 5R of the IF unit Q317.

The APO (auto power off) stops the power to all circuits other than the power to the microcomputer by turning Q6 of the control unit off. Therefore, the current consumption when the APO is on is the same as when the power is off.

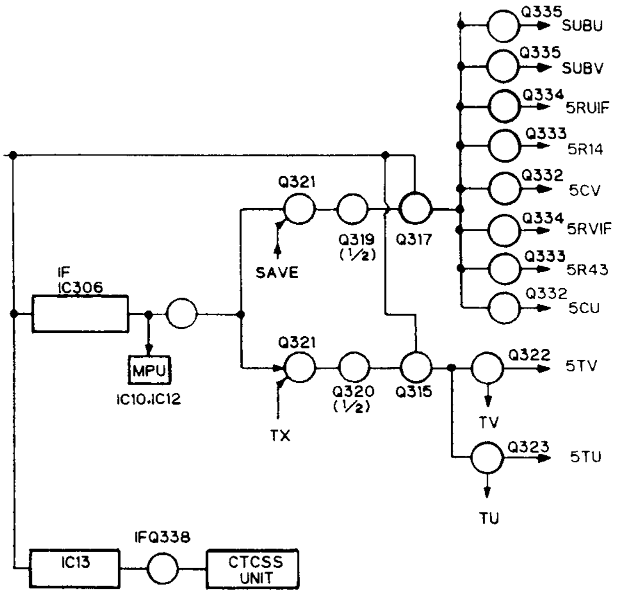


Fig. 7 Power supply circuit

6. PLL circuit

There are a PLL and a VCO for each of the VHF and UHF bands. The reference oscillator produces and outputs a signal to the V/U PLL IC.

6-1. PLL

X1: The 12.8 MHz crystal is oscillated by RF unit Q8, the output is divided to IC2 and Q7, and the Q7 output is applied to IC1. The reference oscillation frequency is divided by IC2 (VHF) and IC1 (UHF) to produce the 5 kHz or 6.25 kHz reference frequency.

The comparison frequency is obtained by amplifying the VCO output by Q16 (VHF) or Q4 (UHF) and dividing it to pulse-swallow PLL ICs (IC1 and IC2).

The PLL synthesizer with 5 kHz, 10 kHz, 12.5 kHz, 15 kHz, 20 kHz, and 25 kHz steps is configured by comparing the phases of the reference frequency obtained by dividing X1.

6-2-1. VCO-V

The Colpits oscillation circuit consisting of VCO-V (X58-3890-00) and FET: Q2 generates the desired frequency directly. The oscillation frequency is varied by applying the VCO control voltage to the varicap D1 and D2. The T/R pin is high during reception to turn Q1 and D4 on and change the oscillation frequency.

6-2-2. VCO-U

The Colpits oscillation circuit consisting of VCO-U (X58-3890-01) and FET: Q2 generates 1/2 the desired frequency. The oscillation frequency is varied by applying the VCO control voltage to the varicap D1 and D2. Q4 is a doubler that doubles the oscillation signal to obtain the desired frequency. The T/R pin is low during reception to turn Q1 and D4 off and change the oscillation frequency.

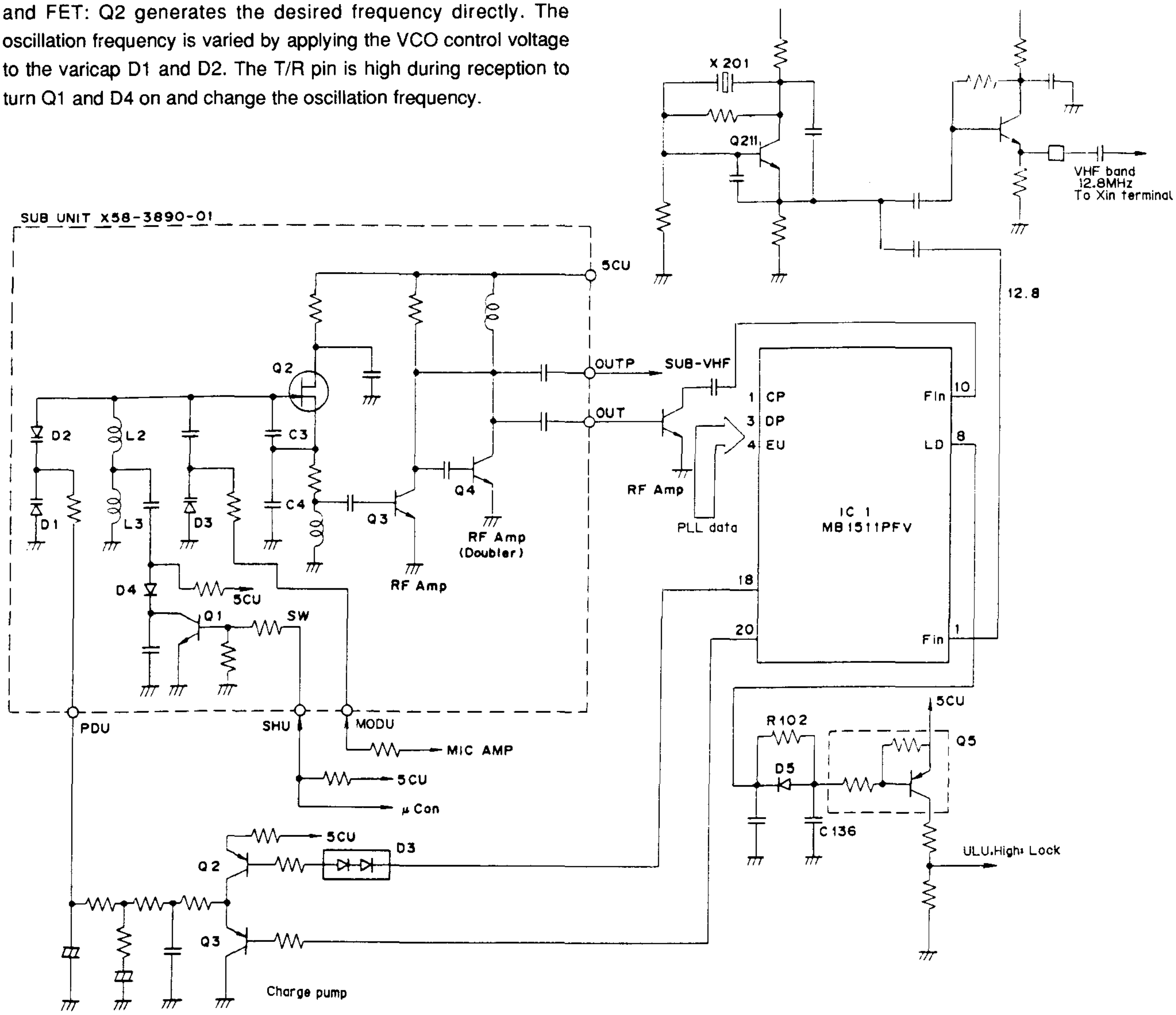


Fig. 8 PLL circuit (UHF)

7. Unlock detection circuit

When the PLL is unlocked, the pulse output to the IC1 LD pin (pin 8) is rectified by D5, R102, C136, and Q5, and the UL pint goes low. The UL pin voltage is detected by the microcomputer to control the transmission/reception switching timing.

LED drive circuit

For the LCD and key illumination, when the lamp switch is pressed, the IC5 LED and LAMP pins go high, the constant-voltage circuit consisting of Q101 and Q102 and Q8 S turn on, and the current flows.

When the green LED for reception lights and the squelch opens or the monitor switch is pressed, IC5 LED pin, SCV, or SCU pin goes high, and the constant-voltage circuit and Q9 or Q12 switch turn on, and the current flows.

When the red LED for transmission lights and the PTT switch is pressed, IC5 LED pin, TV, or TU pin goes high, and the constant-voltage circuit and Q10 or Q11 switch turn on, and the current flows.

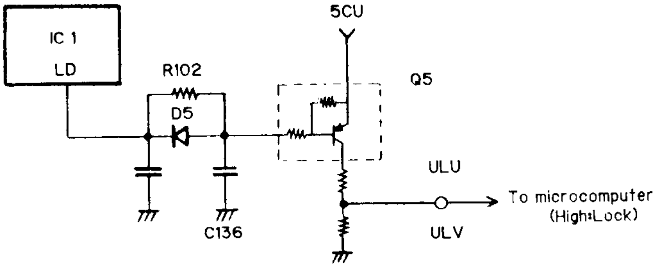


Fig. 9 Unlock detection circuit

Remote control microphone circuit

The voltage at the REM pin of the microcomputer (IC5) is A/D converted to perform remote operation according to the voltage.
The REM pin is normally about 4.5V by R5. When the remote control microphone switch is pressed, the voltage is divided by the resistor in series to the switch and R5, and the voltage indicates which switch is pressed.

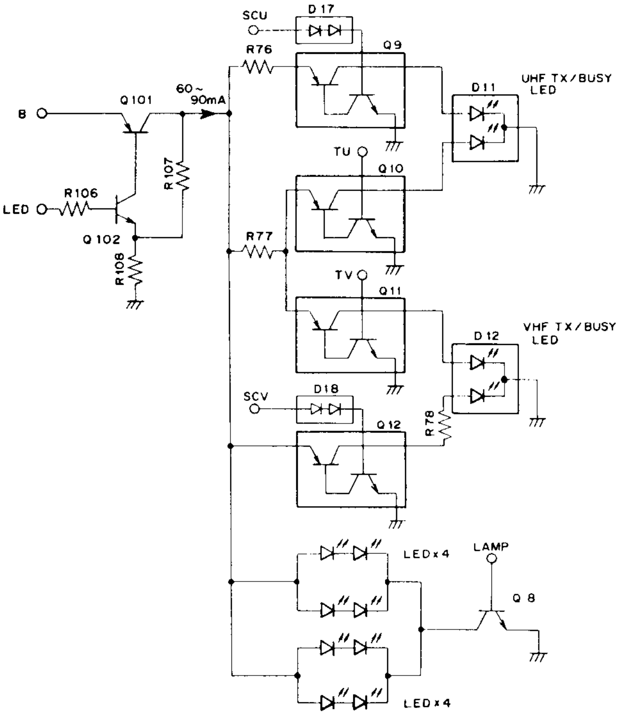


Fig. 10 LED drive amplifier circuit

CIRCUIT DESCRIPTION

8. Microcomputers and peripheral circuits

8-1. Reset and Backup Circuits

When power supply B is turned on, a low-level pulse of about 1 ms is output by the reset circuit consisting of C36 and Q7, and microcomputer IC5 is reset. When the power supply is turned off, the voltage detection IC IC6 detects the 5 V line voltage drop and changes the output from high to low.

If microcomputer port INT4 goes low, the microcomputer enters the backup mode. The microcomputer (IC7) is reset by the microcomputer (IC5).

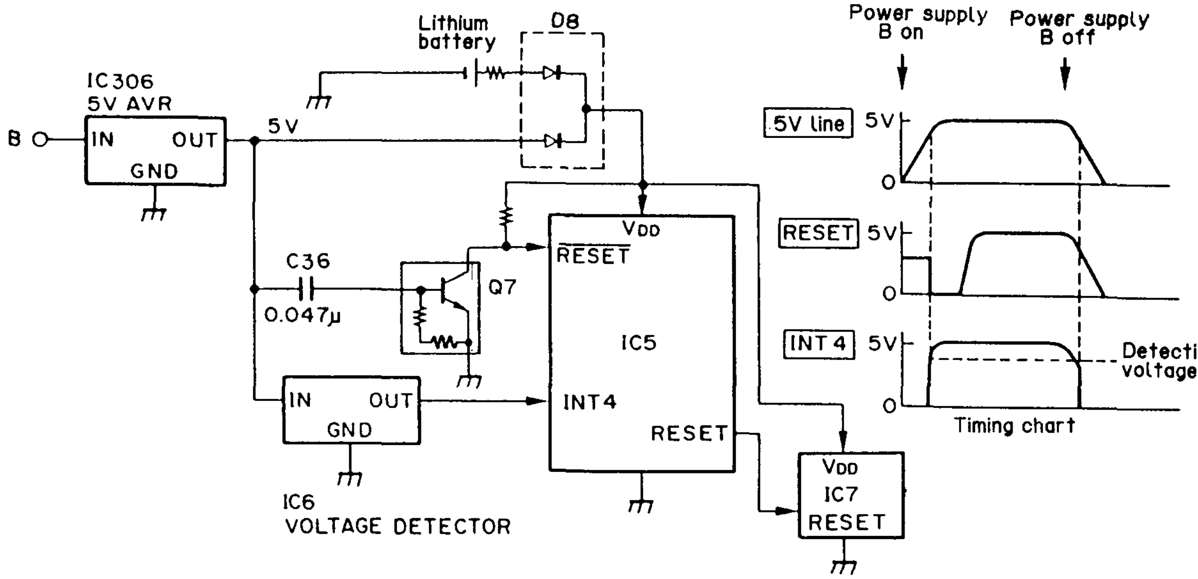


Fig. 11 Reset backup circuit

CIRCUIT DESCRIPTION

8-2. DTMF and DTSS/PAGING

8-2-1. DTMF encode

The DTMF signal is generated directly from TONE R and TONE C of IC7. Its characteristics are corrected by C318, R320, and VR303, the level is adjusted, and the resulting signal goes to pin 3 of IC1.

The DTMF monitor is applied to the input side of the main/sub HPF. AF is muted by IC1.

8-2-2. DTMF decode

AFV and AFU are divided to the CTCSS unit/DTMF decode and applied to IC101.

IC101 outputs the code corresponding to the DTMF signal to pins 11 to 14. The code is compared with the DTSS and paging codes by IC5 for matching.

8-2-3. DTMF decode timing

The DTMF decode IC operates the main and sub bands. If there is a single band, only the main band is checked. If there are two bands, the band in which a busy signal is present is checked. Therefore, if busy signals enter both the bands, one of them may not be checked.

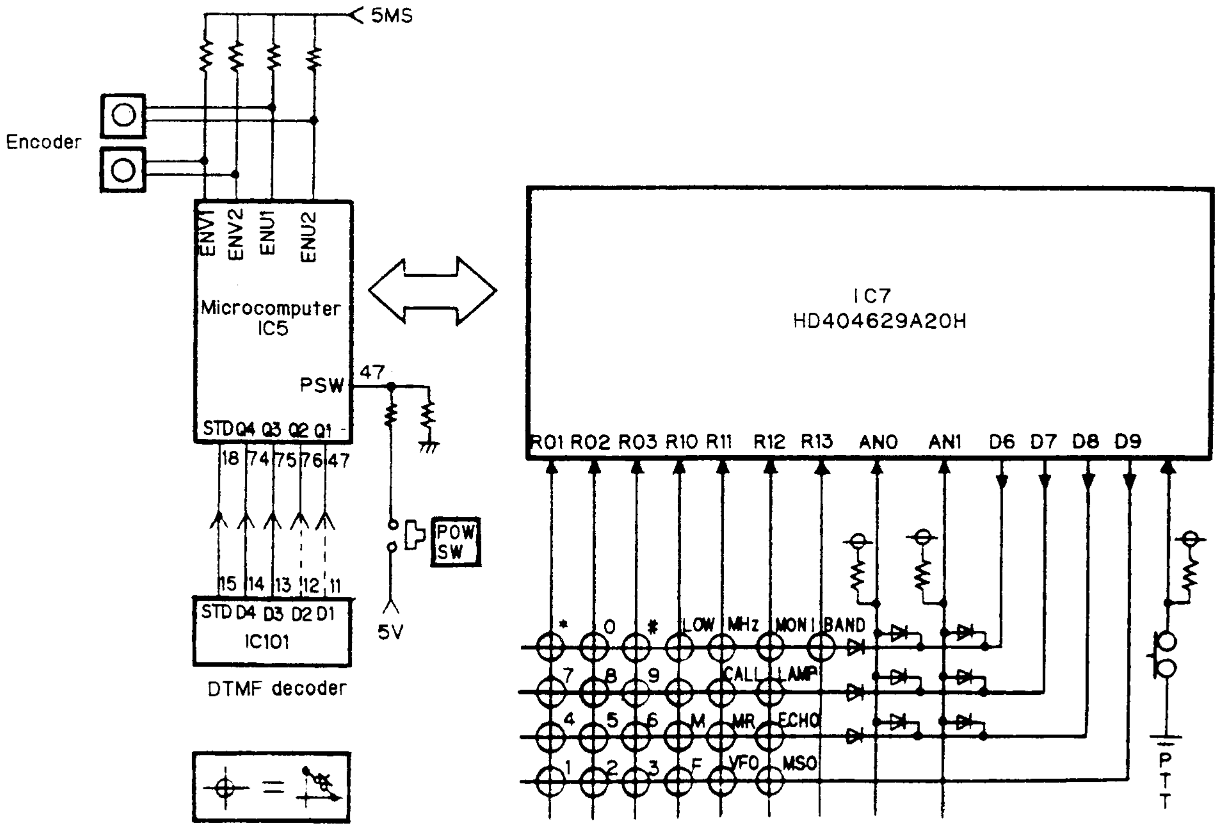
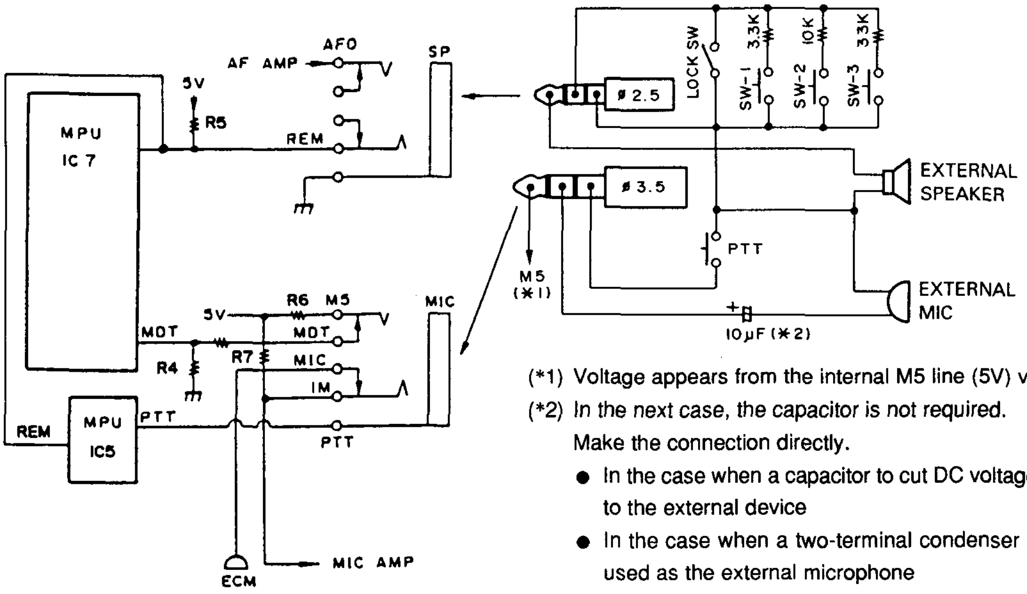


Fig. 12 Key encoder input circuit

CIRCUIT DESCRIPTION

8-3. Remote Control Microphone Circuit

The remote control microphone circuit has two internal audio aumplifiers. The external speaker is directly connected to IC5 via the AFO pin. The speaker microphone and speaker plug connections are detected using the REM and MDT signals. The REM and MDT signals are made high when the speaker microphone and speaker plug are not connected. The REM and MDT signals are then output from IC6 to the internal speaker. An audio signal is output to the external speaker when the MDT or REM signal is set low.



(*1) Voltage appears from the internal M5 line (5V) via R2.

(*2) In the next case, the capacitor is not required.
Make the connection directly.

- In the case when a capacitor to cut DC voltage is connected to the external device
- In the case when a two-terminal condenser microphone is used as the external microphone

Fig. 13 Speaker, Microphone, Remote circuit

8-4. CTCSS Operation

The CTCSS in the main band and sub-band is checked by the CTCSS timing unit. Only the main band is checked when a single band is used. The band carrying a BUSY signal is checked when a dual band is used with the main band and sub-band CTCSS set on. The main band and sub-band are checked every 500 ms when they carry a BUSY signal. During full-duplex operation, the CTCSS in the main band outputs a subtone when the TONE and CTCSS signals are on. Turns the CTCSS in the sub-band cannot be checked. In that case, the squelch in the sub-band is opened or closed using only the BUSY signal. For the band in which the CTCSS cannot be checked, the "CT" display disappears only during transmission.

CTCSS CHECK TIMING (MAIN, SUB CTCSS ON)

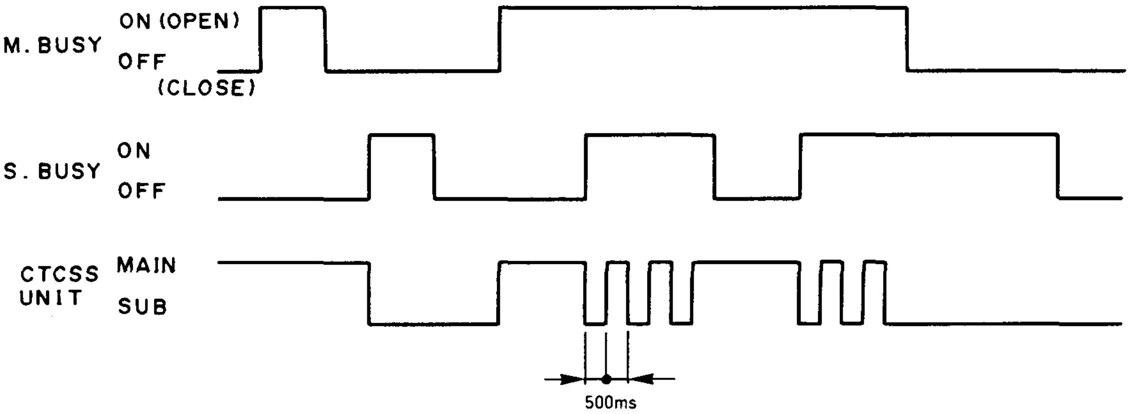


Fig. 14 CTCSS timing chart

DESCRIPTION OF COMPONENTS

1. Control Unit (X53-342X-XX) 0-11: K, P 0-21: M 0-22: M2 0-71: X 2-71: T, E, E3 2-72: E2

Reference No.	Function	Description
IC1	AF switch for cross band repeater	Non TX band AF output put into MIC amplifier
IC2	Electronic volume	
IC3	AF signal select to internal/external AF AMP	
IC4	DTMF/CTCSS decode select	
IC5	Microcomputer	Power supply, signaling control
IC6	Buck-up detect	
IC7	Microcomputer	Display, key input, clock, DTMF signal generate, memory
IC8	EEPROM for memory	
IC101	DTMF decoder	
Q1	HPF for VHF AF	
Q2	BUFF for BEEP TONE	
Q3	HPF for UHF AF	
Q4	CTCSS input, DTMF decoder input select control	
Q5	LPF for CTSS	
Q6	SW for 5M	IC5 PS: ON "L"→5MS
Q7	Microcomputer reset switch	During 1ms "L" when external power supply is connected.
Q8	Switch for LCD KEY LED	IC5 LAMP: ON "H"
Q9	Switch for UHF BUSY LED	IC5 SCU: ON "H"
Q10	Switch for UHF TX LED	IC5 TU: ON "H"
Q11	Switch for VHF TX LED	IC5 TV: ON "H"
Q12	Switch for VHF BUSY LED	IC5 SCV: ON "H"
Q13	Switch for earphone made	IC5 EAR: ON "L"
Q101	AVR for all LED	
Q102	Switch for Q101	IC5 LED: ON "H"
Q301	Current regulator of Ni-Cd charger	
D1	Channel display mode	
D2	Destination jumper	
D3	Destination jumper	
D4	Cross band repeater	
D5	Destination jumper	
D6	Destination jumper	
D7	Reverse current prevention	
D8	Reverse current prevention	
D9	For lithium battery charge	
D10	Reverse current prevention	
D11	UHF TX/BUSY LAMP	
D12	VHF TX/BUSY LAMP	
D13	LCD LAMP	
D14	LCD LAMP	
D15	LCD LAMP	
D16	LCD LAMP	
D17	BUSY LAMP error lights prevention	
D18	BUSY LAMP error lights prevention	
D301	Reverse connect prevention	
D302	Reverse connect prevention	
D303	Reverse current prevention	

DESCRIPTION OF COMPONENTS

Reference No.	Function	Description
D304	For voltage dropper	
D305	High level input protection	

2. TX-RX Unit (X57-409X-XX) 0-11: K, P 2-71: T, X, E, E2, E3, M, M2

Reference No.	Function	Description
IC1	UHF PLL IC	
IC2	VHF PLL IC	
IC301	MIC AMP/SPLATTER filter	
IC302	Audio amplifier	
IC303	UHF FM IF IC	
IC304	VHF FM IF IC	
IC305	VHF AM IC	
IC306	5M regulator	
IC307	Shift register	
Q1	UHF VCO lipple filter	
Q2, Q3	UHF PLL charge pump	
Q4	UHF PLL buffer amplifier	
Q5	UHF PLL UL switch	UHF PLL unlock detect
Q6	UHF RF amplifier	
Q7	UHF reference oscillator buffer amplifier	
Q8	Reference oscillator	12.8 MHz for PLL
Q9	UHF mixer amplifier	
Q10	UHF EL switch	
Q11	UHF receive RF amplifier	
Q12	UHF EL switch	
Q13	VHF VCO lipple filter	
Q14, Q15	VHF PLL charge pump	
Q16	VHF PLL buffer amplifier	
Q17	VHF PLL UL switch	VHF PLL unlock detect
Q18	VHF mixer amplifier	
Q19	VHF receive RF amplifier	
Q20	VHF EL switch	
Q21	VHF EL switch	
Q301	MIC input ATT switch	On when full-duplex
Q302	MIC input short switch	On when DTMF modulation
Q303	UHF/VHF MIC select switch	
Q304	AF AMP regulator	
Q305	AF AMP regulator	
Q306	AF AMP switch	On when AF output
Q307	UHF IF AMP	
Q308	UHF SQ switch	ON/OFF by noise detect output
Q309	UHF SQ SW, Hysteresis switch	ON/OFF by Q308 output
Q310	UHF noise amplifier	
Q311	Current regulator for APC	
Q312	UHF APC switch	On when LOW power
Q313	APC circuit switch	On when APC

DESCRIPTION OF COMPONENTS

Reference No.	Function	Description
Q314	VHF APC switch	On when LOW power
Q315	UHF APC switch	Band select
Q316	VHF APC switch	Band select
Q317	Regulator for 5C power supply	
Q318	Regulator for 5T power supply	
Q319	Error amplifier for 5C power supply	
Q320	Error amplifier for 5T power supply	
Q321	5C/5T power supply switch	ON/OFF of SAVE, TX
Q322	5TV switch	On when VHF transmit
Q323	5TU switch	On when UHF transmit
Q324	VHF IF AMP	
Q325	VHF SQ switch	ON/OFF by noise detect output
Q326	Noise amplifier	
Q327	VHF SQ SW, Hysteresis switch	ON/OFF by Q325 output
Q328	AGC level shift	
Q329	Air band AF amplifier	
Q330	FM discriminator short switch	On when AM mode
Q332	5CU, 5CV switch	
Q333	5R43, 5R14 switch	
Q334	5RVIF, 5RUIF switch	
Q335	SUBV, SUBU switch	
Q336	5R80, 5R36 switch	
Q338	5MT switch	
Q339	AIR switch	
Q501	Multi-plexer for 800 local oscillator	
Q502	800 RF AMP	
Q503	800 Mixer AMP	
Q504	SUB-V Mixer AMP	
Q505	Multi-plexer for SUB-V local oscillator	
Q601	SUB-U Mixer AMP	
Q602	SUB-U RF AMP	
Q603	Multi-plexer for SUB-U local oscillator	
D2	Lipple filter speed-up	
D3	PLL leakage current prevention	
D4	Reference oscillator power supply switch	
D5	UHF UL detect	
D6	UHF local oscillator switch	
D7	UHF local oscillator switch	
D8	LO80 switch	
D9	UHF RF amplifier switch	
D10	UHF RF high level input protection	
D11	UHF ANT switch	
D12	UHF ANT switch	
D13	UHF EL switch	
D14	UHF ANT switch	
D15	Lipple filter speed-up	
D16	PLL leakage current protection	

DESCRIPTION OF COMPONENTS

Reference No.	Function	Description
D17	VHF UL detect	
D18	VCO output select switch	On when VHF TX
D19	VCO output select switch	On when VHF, SUB-U receive
D20	Power supply switch	On when VHF, SUB-V receive
D21	VHF ANT switch	
D22	VHF EL switch	
D23	VHF ANT switch	
D24	Receive filter band-pass shift	
D25	Receive filter band-pass shift	
D26	Receive filter band-pass shift	
D27	VCO output switch	On when SUB-V receive
D28	VCO output select switch	
D301	UHF SQ noise detect	
D302	APC reference voltage occur	
D303	APC H/L select	Reverse current prevention of 5TV, 5TU
D305	Diode for AGC control (for air band)	IC304 input terminal voltage control
D306	VHF SQ noise detect	
D312	AF power supply speed-up	
D313	APC reverse current prevention	
D314	UHF SQ switch	
D315	VHF SQ switch	
D502	SUB-V ANT switch	On when SUB-V receive
D601	SUB-U select switch	
D602	SUB-U select switch	
D603	360 short switch	Off when 360 receive
D606	360 short switch	Off when 360 receive
D604	5R36/SUB-U power supply switch	
D605	SUB-U power supply reverse current prevention	

DESCRIPTION OF COMPONENTS

3. Module unit (PA+EL) (X58-3900-00) A/2

Reference No.	Function	Description
Q1	UHF RF amplifier	
Q2	UHF RF drive amplifier	
Q3	E-LOW select circuit	
Q4	E-LOW select circuit	
Q5	E-LOW select circuit	
Q6	E-LOW select circuit	
Q7	E-LOW select circuit	
Q8	E-LOW select circuit	
D1	Spacer	
D2	For Q2 bias	
D3	E-LOW select switch	
D4	PIN diode for APC ATT	
D5	ANT SW	
D6	For Q4 bias	

4. Module unit (PA+EL) (X58-3900-00) B/2

Reference No.	Function	Description
Q101	VHF RF amplifier	
Q102	VHF RF drive amplifier	
Q103	E-LOW select circuit	
Q104	E-LOW select circuit	
Q105	E-LOW select circuit	
Q106	E-LOW select circuit	
Q107	Spacer	
D103	E-LOW select switch	
D104	PIN diode for APC ATT	
D105	ANT SW	
D106	For Q104 bias	

5. VCO Unit (X58-3890-XX) -00: V.VCO -01: U.VCO

Reference No.	Function	Description
Q1	TX/RX select switch	
Q2	VCO oscillator	
Q3	VCO buffer amplifier	
Q4	VCO buffer amplifier	(001 destination: Multiplier)
D1	VCO frequency control	
D2	VCO frequency control	
D3	For VCO modulation	
D4	TX/RX select switch	

SEMICONDUCTOR DATA

PLL IC: MB1511PFV (TX-RX Unit IC1 and IC2)

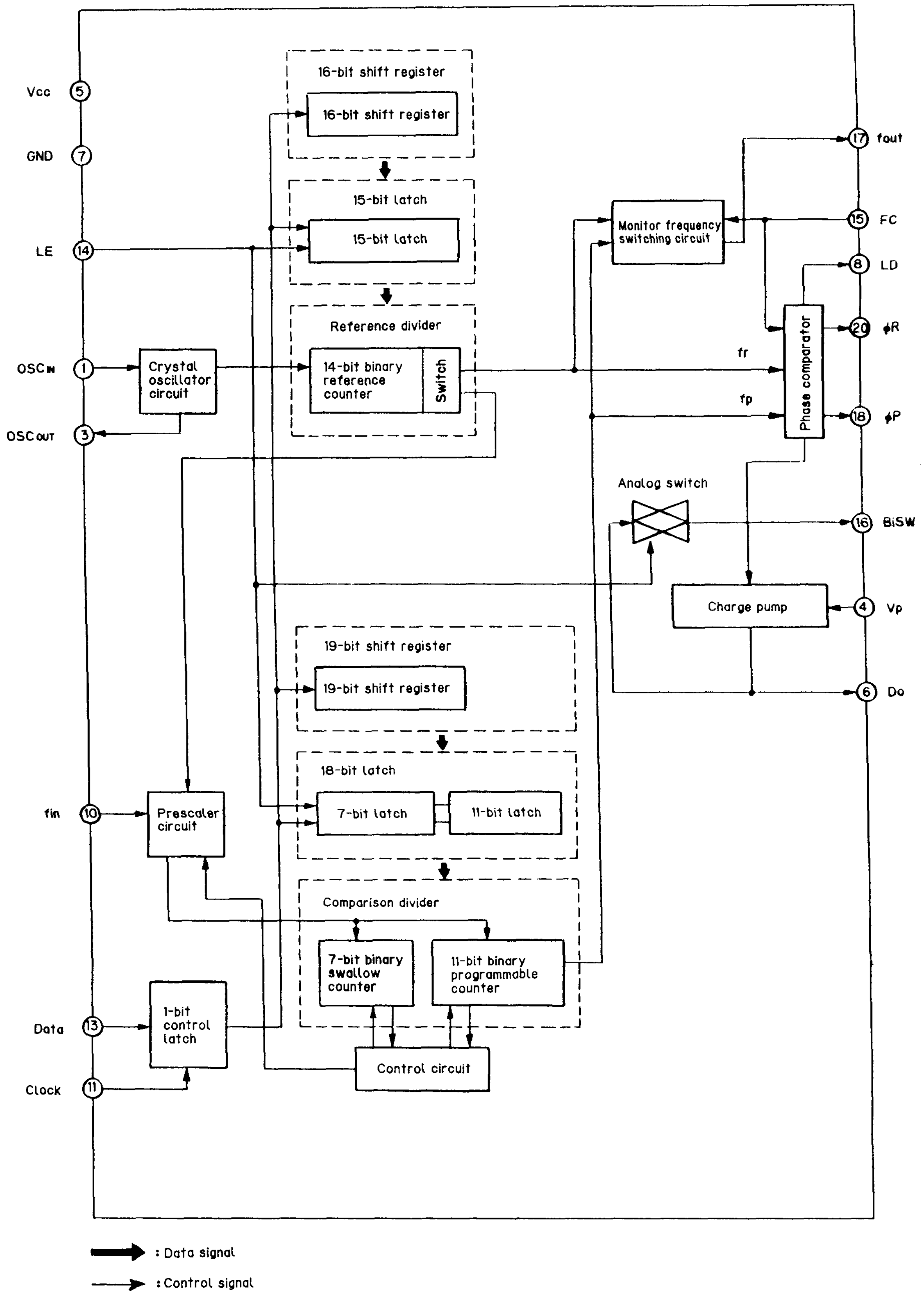
●Pin function

<table>
<tr><th>Pin No.</th><th>Name</th><th>I/O</th><th>Description</th></tr>
<tr><td>1</td><td>OSC/IN</td><td>I</td><td rowspan="2">Crystal oscillator connection pin and reference divider input pin
(OSCIN=Oscillator circuit input pin, OSCOUT=Oscillator circuit output pin)</td></tr>
<tr><td>3</td><td>OSC/OUT</td><td>O</td></tr>
<tr><td>4</td><td>Vr</td><td>–</td><td>Power supply pin for charge pump and analog switch output</td></tr>
<tr><td>5</td><td>Vcc</td><td>–</td><td>Power supply pin</td></tr>
<tr><td>6</td><td>Do</td><td>O</td><td>Built-in charge pump output pin
The phase characteristics are reversed by FC pin setting.</td></tr>
<tr><td>7</td><td>GND</td><td>–</td><td>GND pin</td></tr>
<tr><td>8</td><td>LD</td><td>O</td><td>Phase comparator output pin
Normally LD is high. LD is low in the period corresponding to the phase difference between fr and fp.</td></tr>
<tr><td>10</td><td>fin</td><td>I</td><td>Prescaler input pin. AC connection</td></tr>
<tr><td>11</td><td>Clock</td><td>I</td><td>Clock input pin for 19-bit and 16-bit shift registers
Data is read at a rising edge of the clock pulse.</td></tr>
<tr><td>13</td><td>Data</td><td>I</td><td>Binary code serial data input pin
The last data bit is a control bit.
<table>
<tr><th>Control data</th><th>Serial data destination</th></tr>
<tr><td>H</td><td>15-bit latch</td></tr>
<tr><td>L</td><td>18-bit latch</td></tr>
</table></td></tr>
<tr><td>14</td><td>LE</td><td>I</td><td>Load enable signal input pin (with pull-up resistor)
When LE is high or open, the shift register contents are sent to the latch together with the serial data control bit. The built-in analog switch turns on, and the output signal from the built-in charge pump is sent to the BiSW pin.</td></tr>
<tr><td>15</td><td>FC</td><td>I</td><td>Phase comparator phase switching pin (with pull-up resistor)
This reverses the polarity of the phase comparator output according to the polarity of the externally connected LPF and VCO.
When FC is low, the characteristics of the charge pump and phase comparator are reversed. It also switches between fout pin (test pin) outputs fr and fp.</td></tr>
<tr><td>16</td><td>BiSW</td><td>O</td><td>Analog switch output pin
Normally high impedance. Only when the switch is on (LE: high), the built-in charge pump state is output.</td></tr>
<tr><td>17</td><td>fout</td><td>O</td><td>Phase comparator input monitor pin
Either the reference divider output (fr) or comparison divider output (fp) signal is output according to the FC pin input level.
<table>
<tr><th>FC</th><th>Output signal</th></tr>
<tr><td>H</td><td>fr output</td></tr>
<tr><td>L</td><td>fp output</td></tr>
</table></td></tr>
<tr><td>18</td><td>øP</td><td>O</td><td rowspan="2">Phase comparator external charge pump output pin.
The phase characteristics are reversed by the FC pin setting.
The øP pin is Nch. open drain output.</td></tr>
<tr><td>20</td><td>øR</td><td>O</td></tr>
<tr><td>2, 9,
12, 19</td><td>NC</td><td>–</td><td>No connection</td></tr>
</table>

SEMICONDUCTOR DATA

PLL IC: MB1511PFV (TX-RX Units IC1 and IC2)

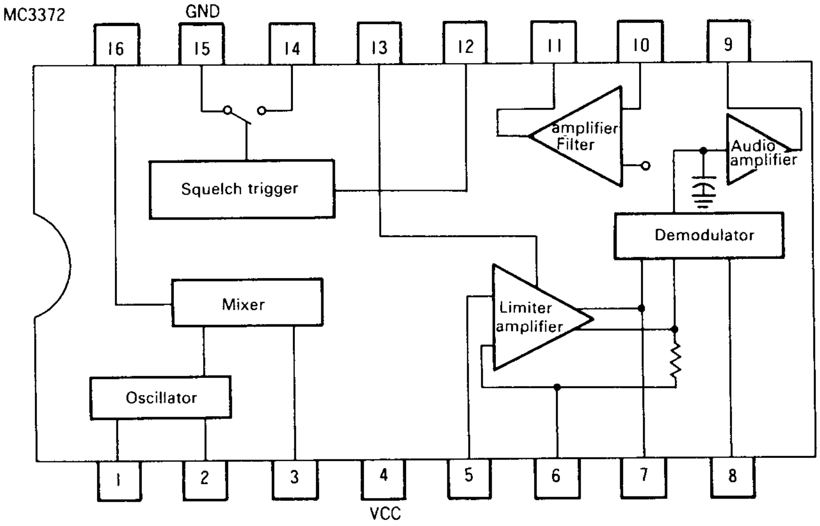
●Block Diagram



SEMICONDUCTOR DATA

FM Receive IC: MC3372D (TX-RX Units IC303 and IC304)

●Block Diagram



●Pin Functions

Pin No.	Name	Description
1	OSC In	A Colpitts oscillator circuit is set up by connecting a crystal oscillator. A signal is input to pin 1, and pin 2 is connected to Vcc when an external oscillator is used.
2	OSC Out	
3	MIX Out	Mixer output
4	Vcc	Power
5	LIM In	Limiter amplifier input and decoupling (or output). Pins 6 and 7 are AC-grounded (or a feedback resistor and phase meter capacitor are connected to pin 7).
6	DEC1	
7	DEC2 (LIM Out)	
8	QUAD In	Phase meter connection
9	AF Out	An FM detected signal is output.
10	FAmp. In	Operational amplifier inverting input
11	FAmp. Out	Operational amplifier output
12	SQSW In	Squelch switch input
13	Smeler Out	A current corresponding to the limiter amplifier input signal level is output.
14	SQSW Out	Squelch switch output
15	GND	Ground
16	MIX In	Mixer input

Note: The explanation in parentheses refers to FM receiver circuit MC3372.

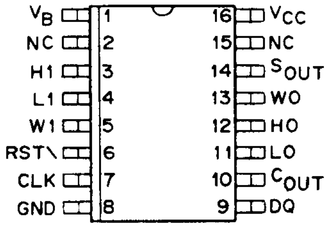
SEMICONDUCTOR DATA

Electronic Volume: DS1267S-10 (CONTROL UNIT IC2)

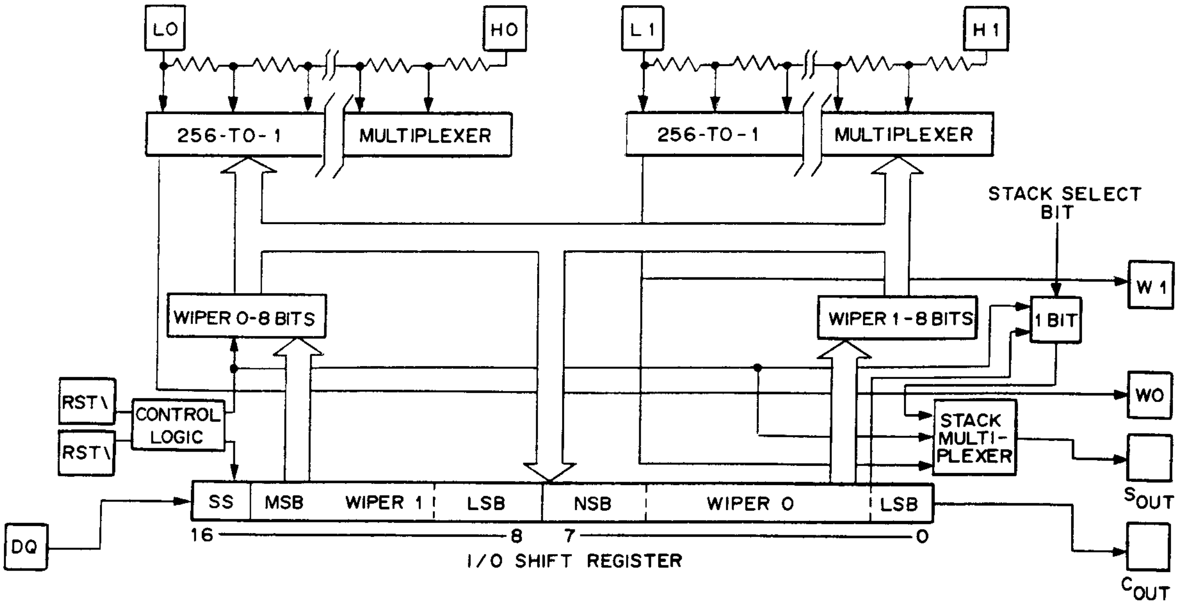
●Pin Functions

Pin names	Function
L0, L1	Low end of resistor
H0, H1	High end of resistor
W1, W2	Wiper end of resistor
VB	Substrate bias
SOUT	Wiper for stacked configuration
RST\	Serial port reset input
DQ	Serial port data input/output
CLK	Serial port clock input
COUT	Cascade serial port output
Vcc	+5 volt input
GND	Ground
NC	No connection

●Pin Layout (Top View)



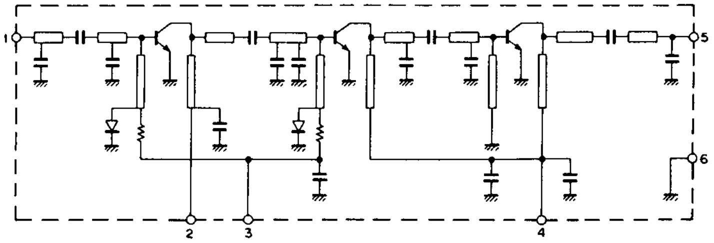
●Block Diagram



SEMICONDUCTOR DATA

UHF power module: S-AU26 (SUB unit IC1)

- **Equivalent circuit**



1 : High-frequency input (Pi)
2 : VCON pin (V1)
3 : VBB bias pin (V2)
4 : Vcc pin (V3)
5 : High-frequency output (Po)
6 : Ground (flange)

• Maximum rating (Tc = 25°C)

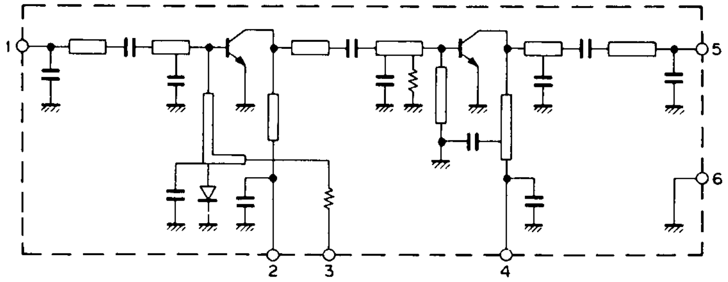
Item	Symbol	Condition	Rating	Unit
Power supply voltage	Vcc	Zg = Zl = 50Ω	15	V
Control voltage	VCON		15	V
Bias voltage	VBB		5.5	V
Input voltage	Pi		24	mW
Output voltage	Po		10	W
Total current	IT		4	A
Case temperature during operation	Tc(opr)	–	–30 ~ +100	°C
Storage temperature	Tstg	–	–40 ~ +110	°C

• Electrical characteristics

Item	Symbol	Measurement condition		Min	Typ	Max	Unit
Frequency range	frange	–		430	–	450	MHz
Output power	Po(1)	Pi = 12mW VBB = 5V Zg = Zl = 50Ω	Vcc = VCON = 12.5V	7	–	–	W
Total efficiency	ηT			36	–	–	%
Secondary harmonics	HRM(1)			–	–	–15	dBc
Tertiary harmonics	HRM(2)			–	–	–30	dBc
Output power at low voltage	Po(2)		Vcc = VCON = 8V	3	–	–	W
	Po(3)		Vcc = VCON = 6.4V	1.5	–	–	W

VHF power module: S-AV22A (SUB unit IC101)

- **Equivalent circuit**



1 : High-frequency input (Pi)
2 : VCON pin (V1)
3 : VBB bias pin (V2)
4 : Vcc pin (V3)
5 : High-frequency output (Po)
6 : Ground (flange)

• Maximum rating (Tc = 25°C)

Item	Symbol	Condition	Rating	Unit
Power supply voltage	Vcc	Zg = Zl = 50Ω	15	V
Control voltage	VCON		15	V
Bias voltage	VBB		5.5	V
Input voltage	Pi		30	mW
Output voltage	Po		10	W
Total current	IT		4	A
Case temperature during operation	Tc(opr)	–	–30 ~ +100	°C
Storage temperature	Tstg	–	–40 ~ +110	°C

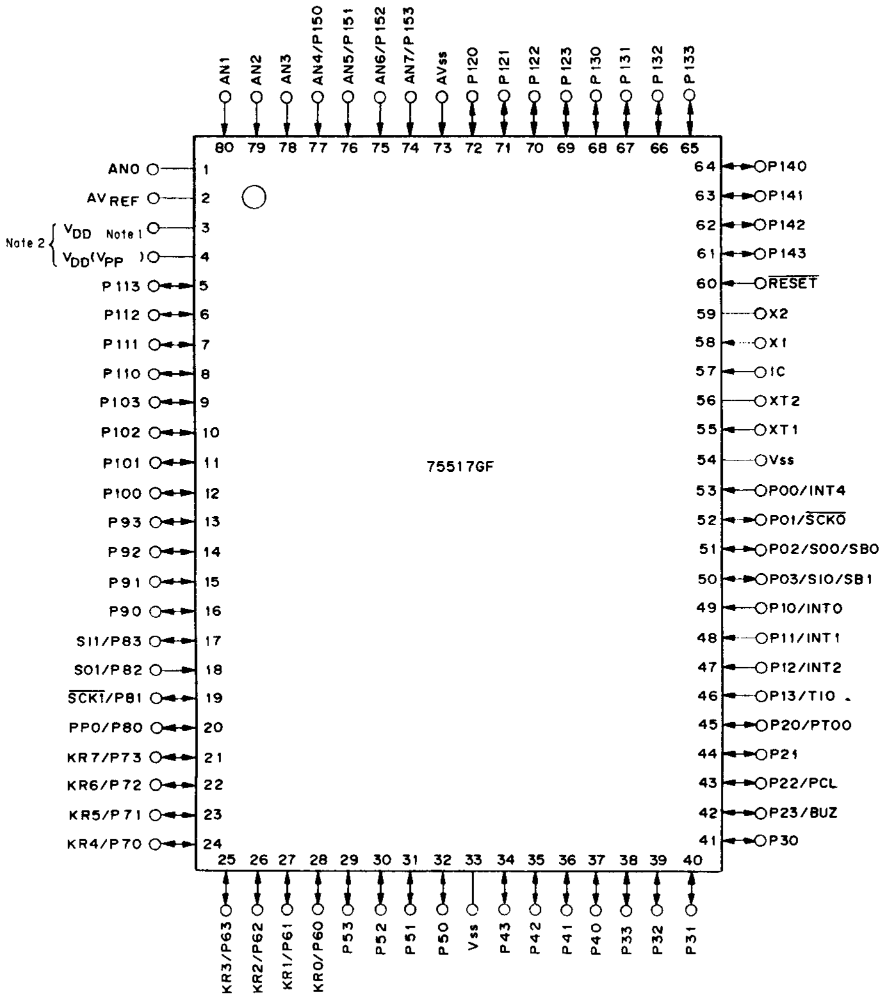
• Electrical characteristics

Item	Symbol	Measurement condition		Min	Typ	Max	Unit
Frequency range	frange	–		144	–	148	MHz
Output power	Po(1)	Pi = 15mW VBB = 5V Zg = Zl = 50Ω	Vcc = VCON = 12.5V	7	–	–	W
Total efficiency	ηT			40	–	–	%
Secondary harmonics	HRM(1)			–	–	–15	dBc
Tertiary harmonics	HRM(2)			–	–	–25	dBc
Output power at low voltage	Po(2)		Vcc = VCON = 8V	3.5	–	–	W
	Po(3)		Vcc = VCON = 6.4V	1.5	–	–	W

SEMICONDUCTOR DATA

Microcomputer: 75517GF-122-3B9 (CONTROL UNIT IC5)

Pin Connection (Top View)



IC: Internal connected (Connect to Vss)

Note 1. The pin name in parentheses is for the 75P518.
2. Supply power to both VDD pins.

SEMICONDUCTOR DATA

Microcomputer: 75517GF-122-3B9 (CONTROL UNIT IC5)

●I/O Port Specifications (1/3)

µCOM Port	Port Name	I/O	Pull Up	Back Up	Description	Circuit Pin Name
INT4 P00	P_INT4	I		I	Power detection High: On; Low: Off	BU
SCK0 P01		I		I	Serial interface clock	SCK
SO0/SB0 P02		O		I	Serial interface output	SO
SI0/SB1 P03		I		I	Serial interface input	SI
INT0 P10		I	△	I	Encoder clock UHF	ENU1
INT1 P11		I	△	I	Encoder clock VHF	ENV1
INT2 P12	P_POWSW	I		I	Power switch (Power on request from IC7) H: ACTIV	PSW
TI0 P13		I	△	I	Encoder data VHF	ENV2
PTO0 P20		O		I	Beep and 1750 Hz tone output	BEEP
P21	P_5M	O		I	5M power control (→ 5MS) Low: On	PS
PCL P22	P_EAR	O		I	Earphone mode switching output High: On	EAR
BUZ P23	P_HDINT1	O	△	I	IC7 INT1 (BACKUP) Low: ACTIVO	INT
P30	P_ENCDTU	I	△	I	Encoder data UHF	ENU2
P31	P_STXRQ	O	▼	I	TX request to IC7 High: ACTIVE	TX.RQ
P32	P_SBUSY	O	△	I	Busy to IC7 High: ACTIVE	BUSY
P33	P_HDRST	O	▼	I	IC7 reset High: ACTIVE	RESET
P40	P_AFC	O		I	AF AMP power supply Low: On	AFC
P41	P_ONAIRU	O	△	I	UHF transmission power supply (transmit LED) High: On	TU
P42	P_ONAIRV	O	△	I	VHF transmission power supply (transmit LED) High: On	TV
P43	P_PD	O		I	DTMF IC power save Low: Power on	PD
P50	P_SHIFTU	O	△	I	UHF VCO shift	SHU
P51	P_SHIFTV	O	△	I	VHF VCO shift	SHV
P52	P_TX	O		I	Transmission main power L: Power on	TX
P53	P_SAVE	O		I	Save H (OPEN): ON (L: Power on)	SAVE
KR1 P60	P_SCU	I/O		I	UHF band SQ High: Busy A high signal is output when MONITOR is ON.	SCU
KR0 P61	P_LAMP	O		I	Lamp on High: Lamp on	LAMP
KR2 P62	P_SCV	I/O		I	VHF band SQ High: Busy A high signal is output when MONITOR is ON.	SCV
KR3 P63	P_HDINT0	O	△	I	Power-on request to IC7 (INT0)	P.O.RQ

SEMICONDUCTOR DATA

Microcomputer: 75517GF-122-3B9 (CONTROL UNIT IC5)

● I/O Port Specifications (2/3)

µCOM Port	Port Name	I/O	Pull Up	Back Up	Description	Circuit Pin Name
KR4 P70	P_LED	O		I	LED power supply (Lamp main power supply) High: Power on	LED
KR5 P71	P_EVRST	O		I	Electronic volume RST	RST
KR6 P72	P_CTCE	O		I	TSU-7 enable	ET
KR7 P73	P_REGST	O		I	Shift register enable	ES
PPO P80	P_ULV	I		I	VHF band unlock Low: LOCK	ULV
SCK1 P81	P_ULU	I		I	UHF band unlock Low: LOCK	ULU
SO1 P82	P_STD	I		I	DTMF decode detection	STD
SI1 P83	P_CTCDET	O		I	TSU-7 tone match	SDO
P90	P_PLLEU	O		I	UHF PLL enable	EU
P91	P_PLLEV	O		I	VHF PLL enable	EV
P92	P_DT	O		I	Data	DP
P93	P_CK	O		I	Clock	CP
P100	P_CBRU	O		I	Cross band repeater UHF ON High: On	CBRU
P101	P_CBRV	O		I	Cross band repeater VHF ON High: On	CBRV
P102	P_CTAF	O		I	CTCSS AF line switching Low: VHF	CBC
P103	P_DTAF	O		I	DTMF AF line switching Low: VHF	DTB
P110	P_AF1	O		I	AF output switching	AF1
P111	P_AF2	O		I	AF output switching	AF2
P112	P_AF3	O		I	AF output switching	AF3
P113	P_AF4	O		I	AF output switching	AF4
P120	P_5CU	O		I	UHF PLL power supply Low: On	5CU
P121	P_5CV	O		I	VHF PLL power supply Low: On	5CV
P122	P_5RU	O		I	UHF AMR receive power supply Low: On	5R43
P123	P_5RV	O		I	VHF AMR receive power supply Low: On	5R14
P130	P_5RUC	O		I	UHF receive power supply Low: On	5RUIF
P131	P_5RVC	O		I	VHF receive power supply Low: On	5RVIF
P132	P_5RV1	O		I	UHF sub V receive power supply Low: On	SUBV
P133	P_5RV2	O		I	VHF sub U receive power supply Low: On	SUBU
P140	P_5RU1	O		I	UHF car telephone receive power supply Low: On	5R80
P141	P_5RU2	O		I	VHF ??? receive power supply Low: On	5R36
P142	P_MUTEU	O	△	I	UHF AF MUTE High: On	MUTU
P143	P_MUTEV	O	△	I	VHF AF MUTE High: On	MUTV
AN0	P_BATT	I		I	Battery voltage input	BC
AN1	P_REMT	I		I	Remote control analog input	REM
AN2	P_VHF SM	I		I	UHF S meter voltage input	SMU

SEMICONDUCTOR DATA

Microcomputer: 75517GF-122-3B9 (CONTROL UNIT IC5)

●I/O Port Specifications (3/3)

µCOM Port	Port Name	I/O	Pull Up	Back Up	Description	Circuit Pin Name
AN3	P_UHF SM	I		I	VHF S meter voltage input	SMV
AN4 P150	P_Q1	I		I	DTMF decode data input bit 0	Q1
AN5 P151	P_Q2	I		I	DTMF decode data input bit 1	Q2
AN6 P152	P_Q3	I		I	DTMF decode data input bit 2	Q3
AN7 P153	P_Q4	I		I	DTMF decode data input bit 3	Q4

○ : Always pulled up by software

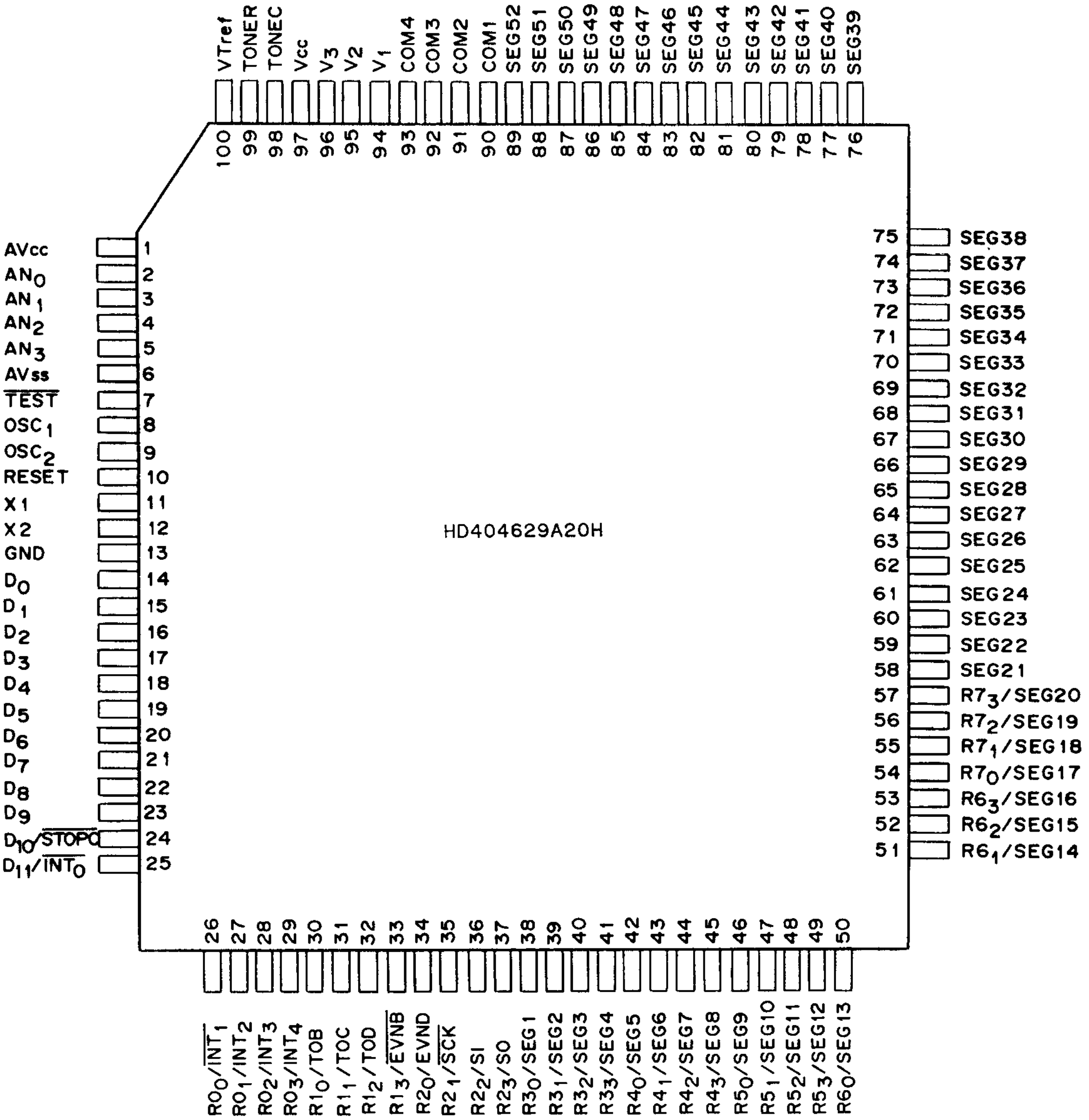
△ : Pulled up by hardware

▼ : Pulled down by hardware

SEMICONDUCTOR DATA

Microcomputer: HD404629A20H (CONTROL UNIT: IC7)

●Pin Layout (Top View)



●Pin Functions (1/2)

CPU Pin		Port Name	I/O	Back Up	Description	Circuit Pin Name
No.	Name					
2	AN0	P_TYPE0	I	–	Destination read	AN0
3	AN1	P_TYPE1	I	–	Destination read	AN1
4	AN2	P_PTT	I	–	PTT switch input	PTT
5	AN3	P_MICDET	I	–	Mic detect check input	AN3
14	D0	P_SCL	O	–	EEPROM clock output →X24LC161	D0
15	D1	P_DI	I	–	EEPROM data input →NM93C66E3	D1
16	D2	P_DO, P_SDA	I/O	–	EEPROM data output →NM93C66E3, ←→X24LC161	D2

SEMICONDUCTOR DATA

Microcomputer: HD404629A20H (CONTROL UNIT: IC7)

●Pin Functions (2/2)

CPU Pin		Port Name	I/O	Back Up	Description	Circuit Pin Name
No.	Name					
17	D3	P_SK	O	–	EEPROM chip select output →NM93C66E3	D3
18	D4	P_BATCHK	I	–	Battery connection check	D4
19	D5	P_CS	O	–	EEPROM chip select output →NM93C66E3	D5
20	D6	P_KEYO0	O	–	Key matrix output	D6
21	D7	P_KEYO1	O	–	Key matrix output	D7
22	D8	P_KEYO2	O	–	Key matrix output	D8
23	D9	P_KEYO3	O	–	Key matrix output	D9
24	D10/$\overline{\text{STOPC}}$	P_SRLTX	I	–	Transmission request input from IC5 ←IC5	TX.RQ
25	D11/$\overline{\text{INT0}}$	P_POWON	I	–	Power-on request from IC5 ←IC5	P.ON.RQ
26	R00/$\overline{\text{INT1}}$	P_BACKUP	I	–	Backup control input from IC5 ←IC5	INT
27	R01/INT2	P_KEYI0	I	–	Key matrix input	R01
28	R02/INT3	P_KEYI1	I	–	Key matrix input	R02
29	R03/INT4	P_KEYI2	I	–	Key matrix input	R03
30	R10/TOB	P_KEYI3	I	–	Key matrix input	R10
31	R11/TOC	P_KEYI4	I	–	Key matrix input	R11
32	R12/TOD	P_KEYI5	I	–	Key matrix input	R12
33	R13/$\overline{\text{EVNB}}$	P_KEYI6	I	–	Key matrix input	R13
34	R20/EVND	P_SRLBSY	I	–	Serial busy input from IC5 ←IC5	BUSY
35	R21/$\overline{\text{SCK}}$	P_SCK	O	–	Serial clock output to IC5 ←IC5	SCK
36	R22/SI	P_SI	I	–	Serial data input from IC5 ←IC5	SO
37	R23/SO	P_SO	O	–	Serial data output to IC5 ←IC5	SI
(10)	(RESET)		I	–	Reset signal input from IC5 ←IC5	
38	R30/SEG1	P_TIMEON	O	–	Power-on request to IC5 by on-timer ←IC5	R30
39	R31/SEG2		O		Used as LCD segment	
40	R32/SEG3		O		Used as LCD segment	
41	R33/SEG4		O		Used as LCD segment	
42	R40/SEG5		O		Used as LCD segment	
43	R41/SEG6		O		Used as LCD segment	
44	R42/SEG7		O		Used as LCD segment	
45	R43/SEG8		O		Used as LCD segment	
46	R50/SEG9		O		Used as LCD segment	
47	R51/SEG10		O		Used as LCD segment	
48	R52/SEG11		O		Used as LCD segment	
49	R53/SEG12		O		Used as LCD segment	
50	R60/SEG13		O		Used as LCD segment	
51	R61/SEG14		O		Used as LCD segment	
52	R62/SEG15		O		Used as LCD segment	
53	R63/SEG16		O		Used as LCD segment	
54	R70/SEG17		O		Used as LCD segment	
55	R71/SEG18		O		Used as LCD segment	
56	R72/SEG19		O		Used as LCD segment	
57	R73/SEG20		O		Used as LCD segment	

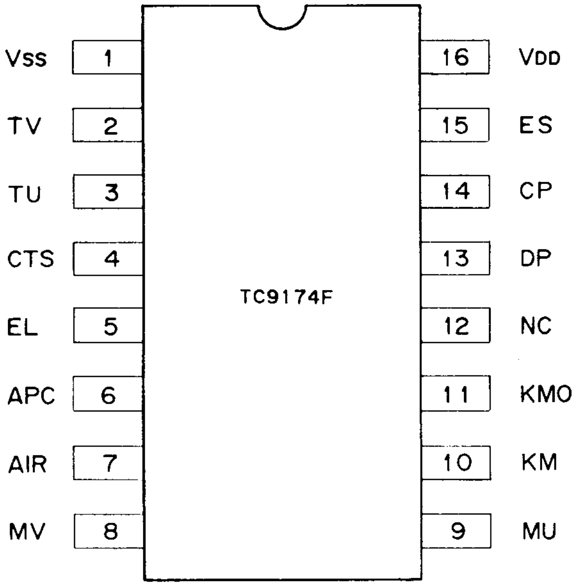
SEMICONDUCTOR DATA

Shift Register: TC9174F (TX-RX UNIT IC307)

●Pin Functions

Pin No.	Circuit Pin Name	Function
2	TV	VHF AM switching
3	TU	VHF AM switching
4	CTS	TSU-7 power on/off
5	EL	RF power switching
6	APC	RF power switching
7	AIR	VHF AM switching
8	MV	VHF modulation on/off
9	MU	VHF modulation on/off
10	KM	Microphone off
11	KM0	Reduces microphone sensitivity

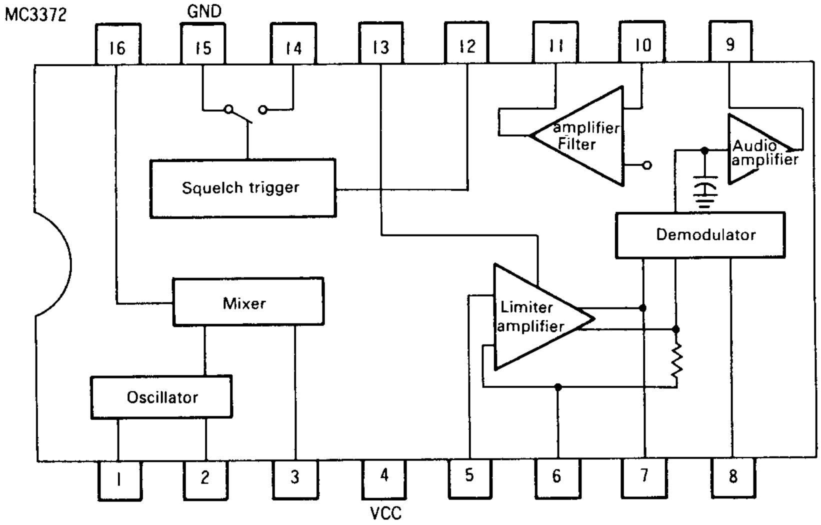
●Pin Layout (Top View)



SEMICONDUCTOR DATA

FM Receiver Circuit MC3372D (TX-RX UNIT IC303 and IC304)

●Block Diagram



●Pin Functions

Pin No.	Name	Description
1	OSC In	A Colpitts oscillator circuit is set up by connecting a crystal oscillator. A signal is input to pin 1, and pin 2 is connected to Vcc when an external oscillator is used.
2	OSC Out	
3	MIX Out	Mixer output
4	Vcc	Power
5	LIM In	Limiter amplifier input and decoupling (or output). Pins 6 and 7 are AC-grounded (or a feedback resistor and phase meter capacitor are connected to pin 7).
6	DEC1	
7	DEC2 (LIM Out)	
8	QUAD In	Phase meter connection
9	AF Out	An FM detected signal is output.
10	FAmp. In	Operational amplifier inverting input
11	FAmp. Out	Operational amplifier output
12	SQSW In	Squelch switch input
13	Smeler Out	A current corresponding to the limiter amplifier input signal level is output.
14	SQSW Out	Squelch switch output
15	GND	Ground
16	MIX In	Mixer input

Note: The explanation in parentheses refers to FM receiver circuit MC3372.

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Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Desti-nation 仕向	Re-marks 備考
				TH-78		
1	3B	*	A01-2055-12	METALLIC CABINET(REAR)		
3	1A,1D	*	A02-1649-13	PLASTIC CABINET ASSY(TH-78A)	KMM2XP	
3	1A,1D	*	A02-1650-13	PLASTIC CABINET ASSY(TH-78E)	TEE2E3	
5	2A	*	A62-0179-04	PANEL		
7	1D	*	B03-0572-14	DRESSING PLATE(16 KEY)		
9	2E	*	B09-0330-03	CAP(SP,MIC,DC-IN)		
10	1C	*	B10-1182-04	FRONT GLASS		
-	-	*	B11-1055-03	FILTER(16 KEY)		
14	1B		B42-3343-04	LABEL(S/NO.)		
17	1B		B42-3394-14	LABEL(FCC)	K	
18	3F		B44-2163-04	UPC LABEL(ITEM CARTON BOX)		
-	-		B44-2165-04	UPC LABEL(OUTER PACKING CASE)		
20	1F		B46-0410-30	WARRNTY CARD	K	
20	1F		B46-0419-00	WARRNTY CARD	EE2E3	
20	1F		B46-0422-00	WARRNTY CARD	P	
24	1F	*	B62-0248-00	INSTRUCTION MANUAL		
24	1F	*	B62-0249-00	INSTRUCTION MANUAL	EE2	
24	1F	*	B62-0250-00	INSTRUCTION MANUAL	MM2PE3	
26	3A	*	B72-0396-04	MODEL NAME PLATE	KP	
26	3A	*	B72-0397-04	MODEL NAME PLATE	MM2X	
26	3A	*	B72-0398-04	MODEL NAME PLATE	TEE2E3	
26	3A	*	B72-0398-04	MODEL NAME PLATE	E3	
28	2B		D10-0610-03	LEVER(RELEASE)		
29	3A		E04-0184-05	RF COAXIAL CABLE RECEPTACLE		
30	2E		E19-0254-05	AC PLUG(ACSY)	MM2	
-	-		E23-0603-05	TERMINAL(ANT)		
37	2B		E23-0700-14	TERMINAL		
38	2B	*	E29-1104-04	TERMINAL(UHF MODULE)		
39	2A	*	E29-1105-04	TERMINAL(VHF MODULE)		
40	2C		E37-0031-15	SP WIRE		
-	-	*	E37-0278-05	CONNECTING WIRE(RF-IF)		
-	-	*	E37-0279-05	CONNECTING WIRE(CHARGE)		
-	-	*	E37-0285-05	CONNECTING WIRE(TSU-7)	MM2XT	
-	-	*	E37-0285-05	CONNECTING WIRE(TSU-7)	EE2E3	
44	1D	*	F07-1229-13	COVER(16 KEY)		
45	2A	*	F10-2035-02	SHIELDING COVER		
-	-	*	F20-1118-04	SHEET(SHIELDING COVER)		
47	3C		F20-1108-04	INSULATING BOARD(LITHUM BATT.)		
48	3B		F29-0435-05	INSULATOR		
49	2B		G01-0856-04	LEAF SPRING(RELEASE)		
50	1A		G10-0692-04	FORMED PLATE(CTCSS)	KP	
51	3D	*	G11-0677-14	FORMED PLATE(FPC)		
53	2A	*	G11-0678-14	FORMED PLATE(RF)		
56	2A		G13-1356-04	FORMED PLATE(VOL/ENC)		
57	2F	*	H10-2752-02	POLYSTYRENE FOAMED FIXTURE		
58	1E		H11-0842-04	POLYSTYRENE FOAMED BOARD	KMM2XP	
58	1E		H11-0842-04	POLYSTYRENE FOAMED BOARD	PEE2E3	
60	1F		H13-0823-04	CARTON BOARD	KTX	
61	1F		H13-0843-04	CARTON BOARD	EE2	
63	1F		H25-0085-04	PROTECTION BAG(100X200)		
65	3E	*	H52-0265-04	ITEM CARTON BOX(TH-78A)	KP	

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TH-78 (MAIN)

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65	3E	*	H52-0266-04	ITEM CARTON BOX(TH-78A)	MM2X	
65	3E	*	H52-0267-04	ITEM CARTON BOX(TH-78E)	TEE2E3	
-	-	*	H62-0236-04	OUTER PACKING CASE(TH-78A)	KMM2XP	
-	-	*	H62-0237-04	OUTER PACKING CASE(TH-78E)	TEE2E3	
70	2B		J19-1515-03	HOLDER(CHARGE UNIT)		
71	2D		J19-1516-03	HOLDER(16 KEY)		
72	2A	*	J21-4388-14	HARDWARE FIXTURE(VOL)		
73	2F		J29-0465-04	HOOK(ACSY)		
74	2C		J69-0313-05	STRING(LED)		
75	2E		J69-0327-04	HAND STRAP(ACSY)		
76	2A	*	J82-0018-05	FPC(RF-IF)		
-	-	*	J82-0019-15	FPC(PTT-CONTROL)		
79	3C	*	J82-0020-05	FPC(IF-CONTROL)		
80	2D	*	J82-0021-05	FPC(16 KYE)		
81	3C		J99-0325-04	HOLDER(LITHUM BATT.)		
-	-		J99-0326-14	HOLDER(VOL.)		
85	2A		K29-4773-04	KNOB(SQ)		
86	2C	*	K29-4781-12	KNOB(PTT)		
87	2C	*	K29-4782-03	KNOB(PWR)		
88	2A	*	K29-4783-04	KNOB(VOL)		
89	2D	*	K29-4785-03	KEY TOP(16 KEY)	KMM2XP	
89	2D	*	K29-4789-03	KEY TOP(16 KEY)	TEE2E3	
A	3B		N09-2028-05	SCREW (M3X4)		
B	3A		N14-0556-04	NUT (BNC)		
C	2A		N14-0557-04	NUT (VOL/ENC)		
D	2A,2B		N30-2610-46	PAN HEAD MACHIN SCREW(MODULE)		
E	1B		N35-2004-45	BINDING HEAD MACHINE SCREW		
F	-		N39-2045-45	PAN HEAD MACHINE SCREW		
H	2D		N79-2035-45	SCREW		
J	3C,3D		N79-2050-46	SCREW		
K	3A,3B		N80-2012-45	SCREW		
L	2B		N83-2004-46	SCREW		
M	2B	*	N83-2013-46	SCREW		
SP	2C		T07-0266-05	SPEAKER(DIA 28)		
100	2E		T90-0445-05	ANTENA(DUAL BAND)		
MIC 1	-		T91-0504-05	MICROPHONE(KEY FPC)		
D201-204	-		B30-2033-05	LED		
IC1	2B		S-AU26	IC(UHF POWER MODULE)		
IC101	2B		S-AV22A	IC(VHF POWER MODULE)		
103	1F		W09-0563-05	BATTERY ASSY(PB-13,ACSY)		
104	2E		W09-0565-05	BATTERY CHARGER(BC-14,ACSY)	KP	
104	2E		W09-0566-05	BATTERY CHARGER(120/240V,ACSY)	M1M2	
104	2E		W09-0567-05	BATTERY CHARGER(240V,ACSY)	X	
104	2E		W09-0568-05	BATTERY CHARGER(240V,ACSY)	T	
104	2E		W09-0569-15	BATTERY CHARGER(230V,ACSY)	EE2E3	
110	3C		W09-0570-05	LITHUM BATTERY		
115	1A		X52-3170-00	CTCSS UNIT(TSU-7)	KP	
116	2A,2D	*	X53-3420-11	CONTROL UNIT	KP	
116	2A,2D	*	X53-3420-21	CONTROL UNIT	M	
116	2A,2D	*	X53-3420-22	CONTROL UNIT	M2	
116	2A,2D	*	X53-3420-71	CONTROL UNIT	X	

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TH-78 (MAIN)
CONTROL UNIT (X53-342X-XX)

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116	2A,2D	⁎	X53-3422-71	CONTROL UNIT	TEE3	
116	2A,2D	⁎	X53-3422-72	CONTROL UNIT	E2	
118	3A,2B	⁎	X57-4090-11	TX-RX UNIT	KP	
118	3A,2B	⁎	X57-4092-71	TX-RX UNIT	MM2TX	
118	3A,2B	⁎	X57-4092-71	TX-RX UNIT	EE2E3	

CONTROL UNIT (X53-342X-XX)

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A1		⁎	F10-2044-04	SHIELDING PLATE		
A2			E29-1110-04	TERMINAL		
A3		⁎	B11-1059-04	FILTER		
A4		⁎	B11-1060-04	FILTER		
A5		⁎	B38-0376-05	LCD		
A6 ,7		⁎	E29-1107-04	CONNECTOR		
A8		⁎	J21-4390-04	HARDWARE FIXTURE(LCD)		
A9		⁎	G13-1379-04	FORMED PLATE(A8)		
C2 ,3			CK73FB1E473K	CHIP C 0.047UF K		
C4			CK73GB1H471K	CHIP C 470PF K		
C5			C92-0517-05	CHIP-TAN 2.2UF 4WV		
C6			CK73FB1E104K	CHIP C 0.10UF K		
C8			CK73FB1E104K	CHIP C 0.10UF K		
C9			CK73GR1C333K	CHIP C 0.033UFK		
C10			CK73FB1E104K	CHIP C 0.10UF K		
C11			CK73GB1H103K	CHIP C 0.01UF K		
C13 ,14			CK73FB1E473K	CHIP C 0.047UF K		
C15			CK73GB1H471K	CHIP C 470PF K		
C16			C92-0517-05	CHIP-TAN 2.2UF 4WV		
C17			CK73FB1E104K	CHIP C 0.10UF K		
C18 ,19			C92-0544-05	CHIP-TAN 10UF 4WV		
C20			CK73GR1C333K	CHIP C 0.033UFK		
C21			CK73GB1H102K	CHIP C 1000PF K		
C22 ,23			CK73FB1E104K	CHIP C 0.10UF K		
C24 -27			CK73GB1H103K	CHIP C 0.01UF K		
C28			CK73GB1H471K	CHIP C 470PF K		
C29 ,30			CK73FB1E473K	CHIP C 0.047UF K		
C31			CK73GB1H471K	CHIP C 470PF K		
C32			CK73FB1E104K	CHIP C 0.10UF K		
C33 -35			CK73GB1H471K	CHIP C 470PF K		
C36			CK73FB1E473K	CHIP C 0.047UF K		
C37 ,38			CC73GCH1H390J	CHIP C 39PF J		
C39 -41			CK73GB1H471K	CHIP C 470PF K		
C42 ,43			CC73GCH1H390J	CHIP C 39PF J		
C44 ,45			CC73GCH1H150J	CHIP C 15PF J		
C46			CK73GB1H471K	CHIP C 470PF K		
C47 ,48			CK73GB1E103K	CHIP C 0.010UF K		
C49			CK73GB1H103K	CHIP C 0.01UF K		
C50			CK73GR1C333K	CHIP C 0.033UFK		
C51			CE04NW0J101M	ELECTRO 100UF 6.3WV		
C54			CK73GB1H471K	CHIP C 470PF K		
C101			CK73FB1E104K	CHIP C 0.10UF K		
C102			CK73GB1H103K	CHIP C 0.01UF K		
C103			CK73FB1E104K	CHIP C 0.10UF K		
C104-108			CK73GB1H471K	CHIP C 470PF K		
CN1			E40-5572-05	PIN CONNECTOR FOR INSIDE(5P)		
CN301			E40-5181-05	PIN CONNECTOR FOR INSIDE(4P)		
L1			L33-0737-05	CHOKE COIL(1MH)		

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L2 -6			L92-0131-05	CORE		
L7			L33-0737-05	CHOKE COIL(1MH)		
L8 ,9			L92-0131-05	CORE		
X3			L77-1441-05	CRYSTAL RESONATOR(32KHZ)		
CP2 ,3			R90-0714-05	MULTI-COMP 10KX4		
CP4 -6			R90-0718-05	MULTI COMP 4.7X4		
R1			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R2			RK73GB1J182J	CHIP R 1.8K J 1/16W		
R3			RK73GB1J154J	CHIP R 150K J 1/16W		
R4 ,5			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R6			RK73GB1J331J	CHIP R 330 J 1/16W		
R7			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R8			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R9			RK73GB1J224J	CHIP R 220K J 1/16W		
R11 ,12			RK73GB1J822J	CHIP R 8.2K J 1/16W	EE2E3T	
R11 ,12			RK73GB1J153J	CHIP R 15K J 1/16W	KMM2XP	
R13			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R14			RK73GB1J182J	CHIP R 1.8K J 1/16W		
R15			RK73GB1J154J	CHIP R 150K J 1/16W		
R16			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R17			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R18			RK73GB1J331J	CHIP R 330 J 1/16W		
R19 ,20			RK73GB1J563J	CHIP R 56K J 1/16W		
R21			RK73GB1J104J	CHIP R 100K J 1/16W		
R22			RK73GB1J473J	CHIP R 47K J 1/16W		
R23			RK73GB1J104J	CHIP R 100K J 1/16W		
R24 -26			RK73GB1J473J	CHIP R 47K J 1/16W		
R27 -29			RK73GB1J103J	CHIP R 10K J 1/16W		
R30 ,31			RK73GB1J473J	CHIP R 47K J 1/16W		
R32			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R33			RK73GB1J153J	CHIP R 15K J 1/16W		
R34			RK73GB1J334J	CHIP R 330K J 1/16W		
R35			RK73GB1J562J	CHIP R 5.6K J 1/16W		
R36			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R37			RK73GB1J102J	CHIP R 1K J 1/16W		
R38			RK73GB1J100J	CHIP R 10 J 1/16W		
R39 ,40			RK73GB1J473J	CHIP R 47K J 1/16W		
R41			R92-1252-05	CHIP R 0 OHM		
R42			RK73GB1J124J	CHIP R 120K J 1/16W		
R43			RK73GB1J473J	CHIP R 47K J 1/16W		
R44			RK73GB1J182J	CHIP R 1.8K J 1/16W		
R45			RK73GB1J821J	CHIP R 820 J 1/16W		
R47			RK73GB1J100J	CHIP R 10 J 1/16W		
R48 -50			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R51			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R52			RK73GB1J474J	CHIP R 470K J 1/16W		
R53			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R54 -57			RK73GB1J473J	CHIP R 47K J 1/16W		
R59 ,60			RK73GB1J473J	CHIP R 47K J 1/16W		
R61			R92-1252-05	CHIP R 0 OHM		
R62			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R63			RK73GB1J105J	CHIP R 1.0M J 1/16W		
R64			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R65			RK73GB1J100J	CHIP R 10 J 1/16W		

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Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Desti-nation 仕向	Re-marks 備考
R68			RK73GB1J471J	CHIP R 470 J 1/16W		
R69 -71			RK73GB1J473J	CHIP R 47K J 1/16W		
R74			RK73FB2A820J	CHIP R 82 J 1/10W		
R75			RK73GB1J473J	CHIP R 47K J 1/16W		
R76 -78			RK73GB1J471J	CHIP R 470 J 1/16W		
R79			RK73FB2A820J	CHIP R 82 J 1/10W		
R80			RK73GB1J274J	CHIP R 270K J 1/16W		
R81			RK73GB1J104J	CHIP R 100K J 1/16W		
R83 ,84			RK73GB1J473J	CHIP R 47K J 1/16W		
R85			RK73GB1J562J	CHIP R 5.6K J 1/16W		
R86			RK73GB1J391J	CHIP R 390 J 1/16W		
R87 -90			RK73GB1J103J	CHIP R 10K J 1/16W		
R92 ,93			RK73GB1J104J	CHIP R 100K J 1/16W		
R94			RK73GB1J105J	CHIP R 1.0M J 1/16W		
R95 -98			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R99			RK73GB1J100J	CHIP R 10 J 1/16W		
R101			RK73GB1J473J	CHIP R 47K J 1/16W		
R102			RK73GB1J224J	CHIP R 220K J 1/16W		
R103			RK73GB1J103J	CHIP R 10K J 1/16W		
R104			RK73GB1J100J	CHIP R 10 J 1/16W		
R105			RK73GB1J334J	CHIP R 330K J 1/16W		
R106			RK73GB1J103J	CHIP R 10K J 1/16W		
R107			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R108			RK73GB1J122J	CHIP R 1.2K J 1/16W		
R301			RK73FB2A100J	CHIP R 10 J 1/10W		
R302			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R303,304			R92-1218-05	CHIP R 0.1 J 1/2W		
S1 -4			S70-0408-05	TACT SWITCH		
S5 -7			S70-0417-05	TACT SWITCH		
S101,102		⁎	R23-9408-05	POTENTIOMETER VOL/ENC		
D1			MA110	DIODE		
D2			MA110	DIODE	KPMM2	
D3			MA110	DIODE	KPXT	
D3			MA110	DIODE	EE2E3	
D4			MA110	DIODE		
D5			MA110	DIODE	KPMM2	
D5			MA110	DIODE	EE2E3T	
D6			MA110	DIODE	KPMEE2T	
D6			MA110	DIODE		
D7			IMN10	DIODE		
D8		⁎	MA741WK	DIODE		
D9			B30-0897-05	LED		
D10			MA110	DIODE		
D11 ,12		⁎	B30-2039-05	LED(TX/BUSY)		
D13 -16			B30-2033-05	LED(LCD)		
D17 ,18			DA221	DIODE		
D301,302			DE5SC4M	DIODE		
D301,302			EA40QC05F	DIODE		
D303			MA110	DIODE		
D304			1SS302	DIODE		
D305			RD22P	DIODE		
IC1			BU4066BF	IC(ANALOG SWITCH X4)		
IC2		⁎	DS1267S-10	IC(ELEC. VOL.)		
IC3 ,4			BU4066BF	IC(ANALOG SWITCH X4)		

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CONTROL UNIT (X53-342X-XX)
TX-RX UNIT (X57-409X-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
IC5		⁎	75517GF-122-3B9	IC		
IC6			S-8054ALR-LN	IC(VOLTAGE DETECTOR)		
IC7		⁎	HD404629A20H	IC		
IC8		⁎	NM93C66EM83	IC(EEPROM)		
IC101			CM8870CFI	IC(DTMF DEC.)		
IC101			LC7385M	IC(DTMF DEC.)		
Q1 -3			2SC4617(R)	TRANSISTOR		
Q4			UMG2	DIGITAL TRANSISTOR		
Q5			2SC4617(R)	TRANSISTOR		
Q6			DTA124EU	DIGITAL TRANSISTOR		
Q7			DTC144EE	DIGITAL TRANSISTOR		
Q8		⁎	2SK1824	FET		
Q9 -12		⁎	UMC4	DIGITAL TRANSISTOR		
Q13			2SJ144(GR)	FET		
Q101			2SB1182F5(Q)	TRANSISTOR		
Q102			2SC4617(R)	TRANSISTOR		
Q301			2SB798(DL,DK)	TRANSISTOR		
X1			L78-0301-05	RESONATOR(3.58MHZ)		
X1		⁎	L78-0302-05	RESONATOR(3.58MHZ)		
X2			L78-0096-05	RESONATOR(4MHZ)		
X2		⁎	L78-0097-05	RESONATOR(4MHZ)		
TX-RX UNIT (X57-409X-XX)						
A1		⁎	F10-2045-04	SHIELDING PLATE(RF UNIT)		
A2 ,3		⁎	E29-1109-04	TERMINAL		
A4 ,5		⁎	F20-1117-04	SHIELDING PLATE		
A6		⁎	G11-0682-04	FORMED PLATE(PLL IC(U))		
C1			CK73FB1H471K	CHIP C 470PF K		
C2			C92-0507-05	CHIP TAN 4.7UF 6.3WV		
C3			CK73FB1H103K	CHIP C 0.010UF K		
C4			CK73GB1H471K	CHIP C 470PF K		
C5			C92-0004-05	ELECTRO 1.0UF 16WV		
C6			C92-0507-05	CHIP TAN 4.7UF 6.3WV		
C7			CC73GCH1H070D	CHIP C 7PF D		
C8			CC73GCH1H060D	CHIP C 6PF D		
C9			CC73GCH1H330J	CHIP C 33PF J		
C10			CC73GCH1H080D	CHIP C 8PF D		
C11 ,12			CC73GCH1H100D	CHIP C 10PF D		
C13			CC73GCH1H030C	CHIP C 3PF C		
C14 ,15			CC73GCH1H100D	CHIP C 10PF D		
C17 ,18			CC73GCH1H100D	CHIP C 10PF D		
C19			CC73GCH1H070D	CHIP C 7PF D		
C20			CK73GB1H471K	CHIP C 470PF K		
C21			CK73FB1E104K	CHIP C 0.10UF K		
C22			C92-0002-05	CHIP TAN 0.22UF 35WV		
C23			C92-0507-05	CHIP TAN 4.7UF 6.3WV		
C24			C92-0001-05	CHIP TAN 0.1UF 35WV		
C25 ,26			CK73GB1H471K	CHIP C 470PF K		
C27			CK73FB1E104K	CHIP C 0.10UF K		
C28			CK73GB1H471K	CHIP C 470PF K		
C29			CK73GB1H102K	CHIP C 1000PF K		
C30			CC73GCH1H070D	CHIP C 7PF D		
C31			CK73GB1H471K	CHIP C 470PF K		
C32			CK73GB1E103K	CHIP C 0.010UF K		
C33			CK73GB1H102K	CHIP C 1000PF K		

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TX-RX UNIT (X57-409X-XX)

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
C34			CK73GB1E103K	CHIP C 0.010UF K		
C35			CC73GCH1H070D	CHIP C 7PF D		
C36			CC73GCH1H390J	CHIP C 39PF J		
C37 ,38			CK73GB1H102K	CHIP C 1000PF K		
C39			CC73GCH1H181J	CHIP C 180PF J		
C40			CC73GCH1H120J	CHIP C 12PF J		
C41			CK73GB1E103K	CHIP C 0.010UF K		
C43			CC73GCH1H030C	CHIP C 3PF C		
C44			CK73GB1E103K	CHIP C 0.010UF K		
C45			CK73GB1H471K	CHIP C 470PF K		
C46			CC73GCH1HR75C	CHIP C 0.75PF C		
C47			CC73GCH1H101J	CHIP C 100PF J		
C48 ,49			CC73GCH1H080D	CHIP C 8PF D	MM2TX	
C48 ,49			CC73GCH1H080D	CHIP C 8PF D	EE2E3	
C48 ,49			CC73GCH1H100D	CHIP C 10PF D	KP	
C50			CC73GCH1H060D	CHIP C 6PF D		
C51			CC73GCH1H030C	CHIP C 3PF C		
C52			CC73GCH1H080D	CHIP C 8PF D		
C53			CK73GB1E103K	CHIP C 0.010UF K		
C54			CK73GB1H471K	CHIP C 470PF K		
C56 ,57			CK73GB1H471K	CHIP C 470PF K		
C58			CC73GCH1H050C	CHIP C 5PF C		
C59			CK73GB1H471K	CHIP C 470PF K		
C60			CC73GCH1H060D	CHIP C 6PF D		
C61			CC73GCH1H030C	CHIP C 3PF C		
C62			CK73GB1H471K	CHIP C 470PF K		
C63			CC73GCH1H080D	CHIP C 8PF D		
C64			CC73GCH1H050C	CHIP C 5PF C		
C66			CC73GCH1H030C	CHIP C 3PF C		
C68			CC73GCH1H050C	CHIP C 5PF C		
C69			CC73GCH1H150J	CHIP C 15PF J		
C70			CC73GCH1H040C	CHIP C 4PF C		
C71			CC73GCH1H220J	CHIP C 22PF J		
C72			CC73GCH1H060D	CHIP C 6PF D		
C73			CC73GCH1H240J	CHIP C 24PF J		
C74			CC73GCH1H050C	CHIP C 5PF C		
C75			CC73GCH1H020C	CHIP C 2.0PF C		
C76			CC73GCH1H060D	CHIP C 6PF D		
C78			CC73GCH1H1R5C	CHIP C 1.5PF C		
C79			CC73GCH1H040C	CHIP C 4PF C		
C80			CC73GCH1H1R5C	CHIP C 1.5PF C		
C82 ,83			CC73GCH1H010C	CHIP C 1PF C		
C85			C92-0004-05	ELECTRO 1.0UF 16WV		
C86			C92-1016-05	CHIP-TAN 4.7UF 6.3WV		
C87			CK73FB1E104K	CHIP C 0.10UF K		
C88			CK73FB1E473K	CHIP C 0.047UF K		
C89			C92-1016-05	CHIP-TAN 4.7UF 6.3WV		
C90			C92-0001-05	CHIP TAN 0.1UF 35WV		
C91			CK73GB1H102K	CHIP C 1000PF K		
C92			CK73FB1E104K	CHIP C 0.10UF K		
C94 ,95			CK73GB1H102K	CHIP C 1000PF K		
C96			CK73GB1E103K	CHIP C 0.010UF K		
C97			CC73GCH1H060D	CHIP C 6PF D		
C98			CK73GB1E103K	CHIP C 0.010UF K		
C99			CK73GB1H102K	CHIP C 1000PF K		

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TX-RX UNIT (X57-409X-XX)

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
C100			CC73GCH1H010C	CHIP C 1PF C		
C101			CC73GCH1H560J	CHIP C 56PF J		
C102			CC73GCH1H120J	CHIP C 12PF J		
C103			CK73GB1H102K	CHIP C 1000PF K		
C104			CC73GCH1H120J	CHIP C 12PF J		
C105,106			CC73GCH1H180J	CHIP C 18PF J		
C107			CC73GCH1H090D	CHIP C 9PF D		
C108			CC73GCH1H180J	CHIP C 18PF J		
C109			CK73GB1E103K	CHIP C 0.010UF K		
C110			CK73GB1H102K	CHIP C 1000PF K		
C111			CK73GB1E103K	CHIP C 0.010UF K		
C112			CK73GB1H102K	CHIP C 1000PF K		
C113			CC73GCH1H151J	CHIP C 150PF J		
C114			CC73GCH1H070D	CHIP C 7PF D		
C115			CK73GB1H102K	CHIP C 1000PF K		
C116			CC73GCH1H330J	CHIP C 33PF J		
C117-120			CK73GB1H102K	CHIP C 1000PF K		
C121			CC73GCH1H120J	CHIP C 12PF J		
C122			CK73GB1H102K	CHIP C 1000PF K		
C123			CK73GB1H471K	CHIP C 470PF K		
C124			CK73GB1H102K	CHIP C 1000PF K		
C126			CK73GB1H471K	CHIP C 470PF K		
C128			CK73GB1E103K	CHIP C 0.010UF K		
C129			CK73GB1H471K	CHIP C 470PF K		
C130			CC73GCH1H020C	CHIP C 2.0PF C		
C131			C90-2073-05	ELECTRO 6.8UF 16WV		
C132			C92-0504-05	CHIP TAN 0.68UF 20WV		
C135			CK73GB1H471K	CHIP C 470PF K		
C136			CK73GB1E103K	CHIP C 0.010UF K		
C137-139			CK73GB1H471K	CHIP C 470PF K		
C140-143			CK73GB1H102K	CHIP C 1000PF K		
C144			C92-0002-05	CHIP TAN 0.22UF 35WV		
C145-147			CK73GB1H471K	CHIP C 470PF K		
C148			CC73GCH1H120J	CHIP C 12PF J		
C149			CK73GB1H471K	CHIP C 470PF K		
C150			CK73GB1H102K	CHIP C 1000PF K		
C152			CK73GB1H471K	CHIP C 470PF K		
C153			CC73GCH1H050C	CHIP C 5PF C		
C301,302			CK73GB1E103K	CHIP C 0.010UF K		
C303			C92-0002-05	CHIP-TAN 0.22UF 35WV		
C304			CK73GB1E223K	CHIP C 0.022UF K		
C305			CK73GB1H471K	CHIP C 470PF K		
C306,307			C92-0005-05	ELECTRO 2.2UF 6.3WV		
C308			CK73GB1H471K	CHIP C 470PF K		
C309			CK73GB1H182K	CHIP C 1800PF K		
C310			CC73GCH1H151J	CHIP C 150PF J		
C311			CK73GB1E103K	CHIP C 0.010UF K		
C312			C92-0507-05	CHIP TAN 4.7UF 6.3WV		
C313			C92-0005-05	ELECTRO 2.2UF 6.3WV		
C314,315			CK73GB1H471K	CHIP C 470PF K		
C318			CK73GB1E103K	CHIP C 0.010UF K		
C319		⁎	C90-2169-05	ELECTRO 68UF 10WV		
C320			CK73FB1E473K	CHIP C 0.047UF K		
C321		⁎	C90-2169-05	ELECTRO 68UF 10WV		
C322			CK73FB1E473K	CHIP C 0.047UF K		

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TX-RX UNIT (X57-409X-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
C323,324			C92-0517-05	CHIP-TAN 2.2UF 4WV		
C325,326			CK73GB1C273K	CHIP C 0.027UF K		
C327-332			CK73GB1H471K	CHIP C 470PF K		
C333			C92-0004-05	ELECTRO 1.0UF 16WV		
C334			CK73GB1H471K	CHIP C 470PF K		
C335			CK73GB1E103K	CHIP C 0.010UF K		
C336			CC73GCH1H090D	CHIP C 9PF D		
C337,338			CK73GB1E103K	CHIP C 0.010UF K		
C339,340			C92-0005-05	ELECTRO 2.2UF 6.3WV		
C341			CK73FB1E473K	CHIP C 0.047UF K		
C342			CK73GB1H102K	CHIP C 1000PF K		
C343,344			CK73FB1E104K	CHIP C 0.10UF K		
C345			C92-0045-05	ELECTRO 22UF 6.3WV		
C346			CK73GR1C333K	CHIP C 0.033UF K		
C347,348			CK73GB1H471K	CHIP C 470PF K		
C349			CK73GB1H102K	CHIP C 1000PF K		
C350			CK73GB1H471K	CHIP C 470PF K		
C351,352			CC73GCH1H220J	CHIP C 22PF J		
C353			CK73GB1E103K	CHIP C 0.010UF K		
C354,355			CK73FB1E104K	CHIP C 0.10UF K		
C356			CC73GCH1H270J	CHIP C 27PF J		
C357			CK73EB1H223K	CHIP C 0.022UF K		
C358			CC73GCH1H151J	CHIP C 150PF J		
C359			C92-0002-05	CHIP TAN 0.22UF 35WV		
C360-366			CK73GB1H471K	CHIP C 470PF K		
C367			C92-0047-05	ELECTRO 47UF 6.3WV		
C368-373			CK73GB1H471K	CHIP C 470PF K		
C374			C92-0519-05	CHIP-TAN 1UF 25WV		
C375-377			CK73GB1H471K	CHIP C 470PF K		
C378			C92-0519-05	CHIP-TAN 1UF 25WV		
C379-383			CK73GB1H471K	CHIP C 470PF K		
C384			C92-0047-05	ELECTRO 47UF 6.3WV		
C385-387			CK73GB1H471K	CHIP C 470PF K		
C388			C92-0038-05	ELECTRO 22UF 16WV		
C389,390			CK73GB1H471K	CHIP C 470PF K		
C391			CE04CW0J331M	ELECTRO 330UF 6.3WV		
C392			CK73GB1E103K	CHIP C 0.010UF K		
C393			CC73GCH1H050C	CHIP C 5PF C		
C394			CK73GB1H102K	CHIP C 1000PF K		
C395,396			CK73GB1E103K	CHIP C 0.010UF K		
C397			CC73GCH1H220J	CHIP C 22PF J		
C398,399			C92-0005-05	ELECTRO 2.2UF 6.3WV		
C400			CK73GR1C333K	CHIP C 0.033UF K		
C401			CK73GB1H152K	CHIP C 1500PF K		
C402			CK73GR1C333K	CHIP C 0.033UF K		
C403			CK73GB1H471K	CHIP C 470PF K		
C404,405			CK73FB1E104K	CHIP C 0.10UF K		
C406			C92-0045-05	ELECTRO 22UF 6.3WV		
C407			CK73GB1H102K	CHIP C 1000PF K		
C408,409			CK73GB1H471K	CHIP C 470PF K		
C410			CC73GCH1H270J	CHIP C 27PF J		
C411			CC73GCH1H150J	CHIP C 15PF J		
C412			CK73GB1E103K	CHIP C 0.010UF K		
C413,414			CK73FB1E104K	CHIP C 0.10UF K		
C415			CC73GCH1H270J	CHIP C 27PF J		

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TX-RX UNIT (X57-409X-XX)

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C416			CK73EB1H223K	CHIP C 0.022UF K		
C417			CK73FB1E104K	CHIP C 0.10UF K		
C418			CK73GB1E223K	CHIP C 0.022UF K		
C419			CK73GR1C333K	CHIP C 0.033UF K		
C420			C92-0045-05	ELECTRO 22UF 6.3WV		
C421			CK73GB1E103K	CHIP C 0.010UF K		
C422,423			CK73FB1E104K	CHIP C 0.10UF K		
C424			C92-0507-05	CHIP TAN 4.7UF 6.3WV		
C425			C92-0004-05	ELECTRO 1.0UF 16WV		
C426			C92-0005-05	ELECTRO 2.2UF 6.3WV		
C427-436			CK73GB1H471K	CHIP C 470PF K		
C437			C92-0044-05	ELECTRO 47UF 10WV		
C438,439			CK73GB1E103K	CHIP C 0.010UF K		
C440,441			C92-0005-05	ELECTRO 2.2UF 6.3WV		
C442-445			CK73GB1E103K	CHIP C 0.010UF K		
C446			CK73GB1H471K	CHIP C 470PF K		
C447			CK73GB1E103K	CHIP C 0.010UF K		
C448			CK73GB1H471K	CHIP C 470PF K		
C449			CC73GCH1H101J	CHIP C 100PF J		
C450			CK73GB1H471K	CHIP C 470PF K		
C451			CK73GB1E223K	CHIP C 0.022UF K		
C452,453			C92-0004-05	ELECTRO 1.0UF 16WV		
C454-468			CK73GB1H471K	CHIP C 470PF K		
C501,502			CK73GB1H471K	CHIP C 470PF K		
C503			CK73GB1H102K	CHIP C 1000PF K		
C504,505			CC73GCH1H1R5C	CHIP C 1.5PF C		
C506			CC73GCH1H020C	CHIP C 2.0PF C		
C507			CC73GCH1H1R5C	CHIP C 1.5PF C		
C508			CC73GCH1H020C	CHIP C 2.0PF C		
C509			CC73GCH1H010C	CHIP C 1PF C		
C510			CK73GB1H471K	CHIP C 470PF K		
C512,513			CK73GB1H471K	CHIP C 470PF K		
C514-516			CC73GCH1H030C	CHIP C 3PF C		
C517			CK73GB1E103K	CHIP C 0.010UF K		
C518			CK73GB1H471K	CHIP C 470PF K		
C519			CC73GCH1H020C	CHIP C 2.0PF C		
C520			CK73GB1H471K	CHIP C 470PF K		
C521			CK73GB1E103K	CHIP C 0.010UF K		
C522			CK73GB1H102K	CHIP C 1000PF K		
C523			CC73GCH1H0R5C	CHIP C 0.5PF C		
C524			CK73GB1H102K	CHIP C 1000PF K		
C528			CC73GCH1H270J	CHIP C 27PF J		
C529			CC73GCH1H150J	CHIP C 15PF J		
C530			CC73GCH1H270J	CHIP C 27PF J		
C531			CC73GCH1H820J	CHIP C 82PF J		
C532			CC73GCH1H151J	CHIP C 150PF J		
C533			CC73GCH1H820J	CHIP C 82PF J		
C534			CK73GB1H102K	CHIP C 1000PF K		
C535,536			CK73GB1E103K	CHIP C 0.010UF K		
C601			CK73GB1H471K	CHIP C 470PF K		
C602			CK73GB1E103K	CHIP C 0.010UF K		
C603			CC73GCH1H010C	CHIP C 1PF C		
C604			CK73GB1H471K	CHIP C 470PF K		
C605			CC73GCH1H070D	CHIP C 7PF D		
C606			CC73GCH1H330J	CHIP C 33PF J		

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C607			CC73GCH1H030C	CHIP C 3PF C		
C608			CC73GCH1H060D	CHIP C 6PF D		
C609			CC73GCH1H040C	CHIP C 4PF C		
C610,611			CC73GCH1H050C	CHIP C 5PF C		
C612			CK73GB1H471K	CHIP C 470PF K		
C614			CK73GB1H471K	CHIP C 470PF K		
C616-618			CK73GB1H471K	CHIP C 470PF K		
C619			CK73GB1H102K	CHIP C 1000PF K		
C620			CK73GB1H471K	CHIP C 470PF K		
C621			CC73GCH1H030C	CHIP C 3PF C		
C622			CC73GCH1H100D	CHIP C 10PF D		
C623			CC73GCH1H080D	CHIP C 8PF D		
C624			CC73GCH1H100D	CHIP C 10PF D		
C625			CC73GCH1H050C	CHIP C 5PF C		
C626			CC73GCH1H100D	CHIP C 10PF D		
C627			CK73GB1H471K	CHIP C 470PF K		
C628			CK73GB1E103K	CHIP C 0.010UF K		
CD301,302			L79-1013-05	FILTER		
CF301,302			L72-0362-05	CERAMIC FILTER		
CN301			E40-5167-05	PIN CONNECTOR FOR INSIDE		
CN303			E40-5343-05	PIN CONNECTOR FOR INSIDE		
CP301			R90-0720-05	MULTI COMP 100K		
J1			E11-0420-15	MIC JACK(EXT MIC)		
J2			E11-0439-05	PHONE JACK(EXT SP)		
J3			E03-0170-05	DC JACK(DC IN)		
L1			L33-0680-05	CHOKE COIL		
L2 -4			L92-0131-05	CORE		
L6			L92-0131-05	CORE		
L8			L40-2272-35	SMALL FIXED INDUCTOR(22NH)		
L9			L40-4772-35	SMALL FIXED INDUCTOR(47NH)		
L10			L40-1272-35	SMALL FIXED INDUCTOR(12NH)		
L11			L40-0672-35	SMALL FIXED INDUCTOR(6NH)		
L12			L40-2271-34	SMALL FIXED INDUCTOR(22NH)		
L13		*	L40-5685-34	SMALL FIXED INDUCTOR(0.56UH)		
L14			L40-1871-34	SMALL FIXED INDUCTOR(18NH)		
L15			L40-2271-34	SMALL FIXED INDUCTOR(22NH)		
L16 ,17			L40-1872-35	SMALL FIXED INDUCTOR(18NH)		
L18			L40-1571-34	SMALL FIXED INDUCTOR(15NH)		
L19			L40-5671-34	SMALL FIXED INDUCTOR(56NH)		
L20			L40-1271-34	SMALL FIXED INDUCTOR(12NH)		
L21 ,22			L34-1264-05	COIL(2.5T)		
L23 ,24			L34-1263-05	COIL(3.5T)		
L25		*	L34-1366-05	COIL(6.5T)		
L26 ,27			L34-1272-15	COIL(7.5TS)		
L28			L40-1092-19	SMALL FIXED INDUCTOR(1UH)		
L29 ,30			L34-1264-05	COIL(2.5T)		
L31		*	L34-1375-05	COIL(2.5TS)		
L32			L79-1011-05	FILTER	MM2TX	
L32			L79-1011-05	FILTER	EE2E3	
L32			L79-1012-05	FILTER	KP	
L33 ,34			L92-0131-05	CORE		
L36		*	L34-4306-05	COIL(3RD)		
L37			L40-6885-48	SMALL FIXED INDUCTOR(0.68UH)		
L38		*	L34-4305-05	COIL(2ND)		

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TX-RX UNIT (X57-409X-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
L39 ,40			L40-4772-35	SMALL FIXED INDUCTOR(47NH)		
L41			L40-6871-34	SMALL FIXED INDUCTOR(68NH)		
L42			L40-8271-34	SMALL FIXED INDUCTOR(82NH)		
L43		*	L34-4304-05	COIL(1ST)		
L44			L34-1271-15	COIL(8.5T)		
L45			L40-6871-34	SMALL FIXED INDUCTOR(68NH)		
L46			L92-0131-05	CORE		
L47			L40-2271-34	SMALL FIXED INDUCTOR(22NH)		
L48			L92-0131-05	CORE		
L50			L40-2271-34	SMALL FIXED INDUCTOR(22NH)		
L51 ,52			L34-1266-05	COIL(1.5T)		
L53			L92-0131-05	CORE		
L301		*	L40-4785-34	SMALL FIXED INDUCTOR(0.47UH)		
L302		*	L40-5685-34	SMALL FIXED INDUCTOR(0.56UH)		
L303,304			L40-1095-34	SMALL FIXED INDUCTOR(1UH)		
L305,306			L92-0131-05	CORE		
L311			L92-0131-05	CORE		
L502			L40-1072-35	SMALL FIXED INDUCTOR(10NH)		
L503			L40-0672-35	SMALL FIXED INDUCTOR(6NH)		
L504			L40-4772-35	SMALL FIXED INDUCTOR(47NH)		
L506			L40-8271-34	SMALL FIXED INDUCTOR(82NH)		
L507		*	L40-2771-34	SMALL FIXED INDUCTOR(27NH)		
L508			L40-4771-34	SMALL FIXED INDUCTOR(47NH)		
L601			L33-0750-05	CHOKE COIL(18NH)		
L602			L33-0745-05	CHOKE COIL(33NH)		
L603		*	L33-0751-05	CHOKE COIL(39NH)		
L604			L40-1872-35	SMALL FIXED INDUCTOR(18NH)		
L605			L40-2272-35	SMALL FIXED INDUCTOR(22NH)		
L606		*	L40-2771-34	SMALL FIXED INDUCTOR(27NH)		
L607			L40-1571-34	SMALL FIXED INDUCTOR(15NH)		
L608		*	L40-2772-35	SMALL FIXED INDUCTOR(27NH)		
R1			RK73FB2A101J	CHIP R 100 J 1/10W		
R2			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R3			RK73GB1J151J	CHIP R 150 J 1/16W		
R4			RK73GB1J473J	CHIP R 47K J 1/16W		
R5			RK73GB1J123J	CHIP R 12K J 1/16W		
R6			RK73GB1J182J	CHIP R 1.8K J 1/16W		
R7			RK73GB1J471J	CHIP R 470 J 1/16W		
R8			RK73GB1J103J	CHIP R 10K J 1/16W		
R9			RK73GB1J562J	CHIP R 5.6K J 1/16W		
R10			RK73GB1J473J	CHIP R 47K J 1/16W		
R11			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R12			RK73GB1J103J	CHIP R 10K J 1/16W		
R13			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R14			RK73GB1J333J	CHIP R 33K J 1/16W		
R15			RK73GB1J103J	CHIP R 10K J 1/16W		
R16 ,17			RK73GB1J561J	CHIP R 560 J 1/16W		
R18			RK73GB1J103J	CHIP R 10K J 1/16W		
R19 ,20			RK73GB1J333J	CHIP R 33K J 1/16W		
R21			RK73GB1J103J	CHIP R 10K J 1/16W		
R22 ,23			RK73GB1J182J	CHIP R 1.8K J 1/16W		
R24			RK73GB1J152J	CHIP R 1.5K J 1/16W		
R25 -27			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R28			RK73GB1J103J	CHIP R 10K J 1/16W		

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Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
R29			RK73GB1J473J	CHIP R 47K J 1/16W		
R30			RK73GB1J561J	CHIP R 560 J 1/16W		
R31			RK73GB1J333J	CHIP R 33K J 1/16W		
R32			RK73GB1J103J	CHIP R 10K J 1/16W		
R33			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R34			RK73GB1J564J	CHIP R 560K J 1/16W		
R35			RK73GB1J561J	CHIP R 560 J 1/16W		
R36			RK73GB1J332J	CHIP R 3.3K J 1/16W		
R37			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R38			RK73GB1J153J	CHIP R 15K J 1/16W		
R39			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R40			RK73GB1J153J	CHIP R 15K J 1/16W		
R41			RK73GB1J390J	CHIP R 39 J 1/16W		
R42			RK73GB1J152J	CHIP R 1.5K J 1/16W		
R43			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R44			RK73GB1J332J	CHIP R 3.3K J 1/16W		
R45			RK73GB1J681J	CHIP R 680 J 1/16W		
R46			RK73GB1J822J	CHIP R 8.2K J 1/16W		
R47			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R48			RK73GB1J101J	CHIP R 100 J 1/16W		
R49			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R50			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R51			RK73GB1J470J	CHIP R 47 J 1/16W		
R52			RK73GB1J151J	CHIP R 150 J 1/16W		
R53			R92-1252-05	CHIP R 0 OHM		
R54			RK73GB1J122J	CHIP R 1.2K J 1/16W		
R55			RK73GB1J473J	CHIP R 47K J 1/16W		
R56			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R57			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R58			RK73GB1J473J	CHIP R 47K J 1/16W		
R59			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R60			RK73GB1J103J	CHIP R 10K J 1/16W		
R61			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R62			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R63			RK73GB1J561J	CHIP R 560 J 1/16W		
R64			RK73GB1J103J	CHIP R 10K J 1/16W		
R65 ,66			RK73GB1J333J	CHIP R 33K J 1/16W		
R67			RK73GB1J103J	CHIP R 10K J 1/16W		
R68 -70			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R71 ,72			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R73			RK73GB1J122J	CHIP R 1.2K J 1/16W		
R74			RK73GB1J331J	CHIP R 330 J 1/16W		
R75			RK73GB1J473J	CHIP R 47K J 1/16W		
R76			RK73GB1J123J	CHIP R 12K J 1/16W		
R77			RK73GB1J390J	CHIP R 39 J 1/16W		
R79			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R80			RK73GB1J391J	CHIP R 390 J 1/16W		
R81			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R82			RK73GB1J123J	CHIP R 12K J 1/16W		
R83			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R84 ,85			RK73GB1J104J	CHIP R 100K J 1/16W		
R86			RK73GB1J101J	CHIP R 100 J 1/16W		
R87			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R88			RK73GB1J271J	CHIP R 270 J 1/16W		
R89			RK73GB1J472J	CHIP R 4.7K J 1/16W		

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Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
R90			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R91			RK73GB1J272J	CHIP R 2.7K J 1/16W		
R92			RK73GB1J104J	CHIP R 100K J 1/16W		
R94			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R95			R92-1252-05	CHIP R 0 OHM		
R96			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R97			RK73GB1J473J	CHIP R 47K J 1/16W		
R98			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R100			RK73GB1J152J	CHIP R 1.5K J 1/16W		
R101			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R102			RK73GB1J124J	CHIP R 120K J 1/16W		
R103			RK73GB1J332J	CHIP R 3.3K J 1/16W		
R104			RK73GB1J124J	CHIP R 120K J 1/16W		
R105			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R118			RK73GB1J332J	CHIP R 3.3K J 1/16W		
R301			R92-1252-05	CHIP R 0 OHM		
R302			RK73GB1J100J	CHIP R 10 J 1/16W		
R303			RK73GB1J272J	CHIP R 2.7K J 1/16W		
R304			RK73GB1J273J	CHIP R 27K J 1/16W		
R305			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R306			RK73GB1J103J	CHIP R 10K J 1/16W		
R307			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R308			RK73GB1J391J	CHIP R 390 J 1/16W		
R309			RK73GB1J223J	CHIP R 22K J 1/16W		
R310			RK73GB1J154J	CHIP R 150K J 1/16W		
R311,312			RK73GB1J104J	CHIP R 100K J 1/16W		
R313			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R314			RK73GB1J682J	CHIP R 6.8K J 1/16W		
R315			RK73GB1J183J	CHIP R 18K J 1/16W		
R316,317			RK73GB1J103J	CHIP R 10K J 1/16W		
R318,319			RK73GB1J470J	CHIP R 47 J 1/16W		
R320			RK73GB1J104J	CHIP R 100K J 1/16W		
R321			RK73GB1J394J	CHIP R 390K J 1/16W		
R322,323			RK73GB1J100J	CHIP R 10 J 1/16W		
R324,325			RK73GB1J470J	CHIP R 47 J 1/16W		
R326,327			RK73GB1J473J	CHIP R 47K J 1/16W		
R328			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R329			RK73GB1J152J	CHIP R 1.5K J 1/16W		
R330			RK73GB1J333J	CHIP R 33K J 1/16W		
R331			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R332			RK73GB1J470J	CHIP R 47 J 1/16W		
R333			RK73GB1J271J	CHIP R 270 J 1/16W		
R334			RK73GB1J334J	CHIP R 330K J 1/16W		
R335			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R336			RK73GB1J101J	CHIP R 100 J 1/16W		
R337			RK73GB1J103J	CHIP R 10K J 1/16W		
R338			RK73GB1J152J	CHIP R 1.5K J 1/16W		
R339			RK73GB1J183J	CHIP R 18K J 1/16W		
R340			RK73GB1J332J	CHIP R 3.3K J 1/16W		
R341			RK73GB1J561J	CHIP R 560 J 1/16W		
R342			RK73GB1J274J	CHIP R 270K J 1/16W		
R343			RK73GB1J681J	CHIP R 680 J 1/16W		
R344			RK73GB1J122J	CHIP R 1.2K J 1/16W		
R345			RK73GB1J104J	CHIP R 100K J 1/16W		
R346			RK73GB1J562J	CHIP R 5.6K J 1/16W		

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R347			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R349			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R350			RK73GB1J561J	CHIP R 560 J 1/16W		
R351			RK73GB1J473J	CHIP R 47K J 1/16W		
R352			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R353			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R354			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R355,356			RK73GB1J680J	CHIP R 68 J 1/16W		
R357			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R359			RK73GB1J564J	CHIP R 560K J 1/16W		
R360			RK73GB1J124J	CHIP R 120K J 1/16W		
R361			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R362			RK73GB1J124J	CHIP R 120K J 1/16W		
R365			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R366			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R367			RK73GB1J332J	CHIP R 3.3K J 1/16W		
R368			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R369			RK73GB1J332J	CHIP R 3.3K J 1/16W		
R370			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R371,372			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R373,374			RK73GB1J274J	CHIP R 270K J 1/16W		
R375			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R376,377			RK73GB1J272J	CHIP R 2.7K J 1/16W		
R378			RK73GB1J470J	CHIP R 47 J 1/16W		
R379			RK73GB1J561J	CHIP R 560 J 1/16W		
R380			RK73GB1J334J	CHIP R 330K J 1/16W		
R381			RK73GB1J103J	CHIP R 10K J 1/16W		
R382			RK73GB1J152J	CHIP R 1.5K J 1/16W		
R383			RK73GB1J101J	CHIP R 100 J 1/16W		
R384			RK73GB1J103J	CHIP R 10K J 1/16W		
R385			RK73GB1J152J	CHIP R 1.5K J 1/16W		
R386			RK73GB1J223J	CHIP R 22K J 1/16W		
R387			RK73GB1J332J	CHIP R 3.3K J 1/16W		
R388			RK73GB1J274J	CHIP R 270K J 1/16W		
R389			RK73GB1J561J	CHIP R 560 J 1/16W		
R390			RK73GB1J681J	CHIP R 680 J 1/16W		
R391			RK73GB1J152J	CHIP R 1.5K J 1/16W		
R392			RK73GB1J122J	CHIP R 1.2K J 1/16W		
R393			RK73GB1J562J	CHIP R 5.6K J 1/16W		
R394			RK73GB1J104J	CHIP R 100K J 1/16W		
R395			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R396			RK73GB1J182J	CHIP R 1.8K J 1/16W		
R397			RK73GB1J103J	CHIP R 10K J 1/16W		
R399			RK73GB1J561J	CHIP R 560 J 1/16W		
R400			RK73GB1J473J	CHIP R 47K J 1/16W		
R401			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R402			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R403			RK73GB1J274J	CHIP R 270K J 1/16W		
R404			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R405			RK73GB1J391J	CHIP R 390 J 1/16W		
R406			RK73GB1J220J	CHIP R 22 J 1/16W		
R407			RK73GB1J221J	CHIP R 220 J 1/16W		
R411,412			RK73GB1J223J	CHIP R 22K J 1/16W		
R413			R92-1252-05	CHIP R 0 OHM		
R415,416			RK73GB1J823J	CHIP R 82K J 1/16W		

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Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
R417,418			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R419,420			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R421,422			RK73GB1J100J	CHIP R 10 J 1/16W		
R423			RK73GB1J122J	CHIP R 1.2K J 1/16W		
R427			RK73GB1J473J	CHIP R 47K J 1/16W		
R428-430			RK73GB1J223J	CHIP R 22K J 1/16W		
R431-433			RK73GB1J103J	CHIP R 10K J 1/16W		
R434-436			RK73GB1J103J	CHIP R 10K J 1/16W		
R437,438			RK73GB1J273J	CHIP R 27K J 1/16W		
R439,440			RK73GB1J103J	CHIP R 10K J 1/16W		
R441			RK73FB2A2R2J	CHIP R 2.2 J 1/10W		
R443-445			R92-1252-05	CHIP R 0 OHM		
R446			RK73GB1J103J	CHIP R 10K J 1/16W		
R447			RK73GB1J473J	CHIP R 47K J 1/16W		
R501			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R502			RK73GB1J124J	CHIP R 120K J 1/16W		
R503			RK73GB1J681J	CHIP R 680 J 1/16W		
R504			RK73GB1J391J	CHIP R 390 J 1/16W		
R505			RK73GB1J100J	CHIP R 10 J 1/16W		
R506			RK73GB1J823J	CHIP R 82K J 1/16W		
R508			RK73GB1J681J	CHIP R 680 J 1/16W		
R509			RK73GB1J682J	CHIP R 6.8K J 1/16W		
R510			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R511			RK73GB1J391J	CHIP R 390 J 1/16W		
R512			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R513			RK73GB1J123J	CHIP R 12K J 1/16W		
R514,515			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R516			RK73GB1J391J	CHIP R 390 J 1/16W		
R517			RK73GB1J184J	CHIP R 180K J 1/16W		
R518			RK73GB1J100J	CHIP R 10 J 1/16W		
R519			R92-1252-05	CHIP R 0 OHM		
R601			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R602			RK73GB1J332J	CHIP R 3.3K J 1/16W		
R603			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R604			RK73GB1J391J	CHIP R 390 J 1/16W		
R605			RK73GB1J123J	CHIP R 12K J 1/16W		
R606			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R607			RK73GB1J103J	CHIP R 10K J 1/16W		
R608,609			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R610			RK73GB1J391J	CHIP R 390 J 1/16W		
R611			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R612			RK73GB1J103J	CHIP R 10K J 1/16W		
R613			RK73GB1J333J	CHIP R 33K J 1/16W		
R614			RK73GB1J561J	CHIP R 560 J 1/16W		
R615-619			R92-1252-05	CHIP R 0 OHM		
VR301-303			R12-6717-05	TRIM POT 47K		
VR304,305			R12-6705-05	TRIM POT 470		
VR306,307			R12-6708-05	TRIM POT 1.5K		
TC1			C05-0371-05	TRIM CAP 10PF		
D2			MA110	DIODE		
D3			DA221	DIODE		
D4 ,5			DAN222	DIODE		
D6 -8			MA77	DIODE		
D9			MA110	DIODE		

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TX-RX UNIT (X57-409X-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
D10			MA742	DIODE		
D11 -14			MA77	DIODE		
D15			MA110	DIODE		
D16			DA221	DIODE		
D17			DAN222	DIODE		
D18			MA77	DIODE		
D19 ,20			DAN222	DIODE		
D21 -23			MA77	DIODE		
D24 -26			MA360	DIODE		
D27 -29			MA77	DIODE		
D301			MA742	DIODE		
D302			MA8039	DIODE		
D303			DAN222	DIODE		
D305			MA728	DIODE		
D306			MA742	DIODE		
D312,313			MA110	DIODE		
D314,315			DA221	DIODE		
D501,502			MA77	DIODE		
D601,602			1SS312	DIODE		
D603,604			DAN222	DIODE		
D605			MA110	DIODE		
D606,607			MA77	DIODE		
IC1 ,2			MB1511PFV-G-BND	IC(PLL IC)		
IC301			NJM4560E	IC(MIC AMP)		
IC302		*	NJM2073S	IC(AUDIO AMP)		
IC302		*	RC2073S	IC(AUDIO AMP)		
IC303,304			MC3372D	IC(FM IC)		
IC305			TA7787AF	IC(FM/AM IF/3V)		
IC306			S-81250HG-RD	IC(VOLTAGE REGULATOR/ +5V)		
IC307			TC9174F	IC(CMOS I/O)		
IC308			LM301AD	IC(OP AMP)		
Q1		*	2SC4617(S)	TRANSISTOR		
Q2			2SA1832(GR)	TRANSISTOR		
Q3			2SC4738(GR)	TRANSISTOR		
Q4		*	2SC4839*J	TRANSISTOR		
Q5			DTA114YE	DIGITAL TRANSISTOR		
Q6		*	2SC4839*J	TRANSISTOR		
Q7 ,8			2SC4617(R)	TRANSISTOR		
Q9			2SC4226(R24)	TRANSISTOR		
Q10		*	2SK1824	FET		
Q11			3SK240	FET		
Q12		*	2SK1824	FET		
Q13		*	2SC4617(S)	TRANSISTOR		
Q14		*	2SA1832(GR)	TRANSISTOR		
Q15			2SC4738(GR)	TRANSISTOR		
Q16		*	2SC4726(P,Q)	TRANSISTOR		
Q17			DTA114YE	DIGITAL TRANSISTOR		
Q18			2SC4083(N,P)	TRANSISTOR		
Q19			2SC4226(R24)	TRANSISTOR		
Q20 ,21		*	2SK1824	FET		
Q301,302			DTC144EE	DIGITAL TRANSISTOR		
Q303			UMG1	DIGITAL TRANSISTOR		
Q304			2SB1182F5(Q)	TRANSISTOR		
Q305			2SC4617(R)	TRANSISTOR		
Q306			DTA144WE	DIGITAL TRANSISTOR		

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TX-RX UNIT (X57-409X-XX)
SUB UNIT (V, U, VCO) (X58-3890-XX)

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
Q307			2SC4215(Y)	TRANSISTOR		
Q308			DTC114YE	DIGITAL TRANSISTOR		
Q309			DTC144EE	DIGITAL TRANSISTOR		
Q310			2SC4617(R)	TRANSISTOR		
Q311			2SK879(Y)	FET		
Q312			FMC4	DISITAL TRANSISTOR		
Q313			DTC144EE	DIGITAL TRANSISTOR		
Q314-316			FMC4	DIGITAL TRANSISTOR		
Q317,318			2SB1182F5(Q)	TRANSISTOR		
Q319,320			FMW1	DIGITAL TRANGISTOR		
Q321			FMA1	DIGITAL TRANSISTOR		
Q322,323			DTB113ZK	DIGITAL TRANSISTOR		
Q324		*	2SC4619(P,Q)	TRANSISTOR		
Q325			DTC114YE	DIGITAL TRANSISTOR		
Q326			2SC4617(R)	TRANSISTOR		
Q327			DTC144EE	DIGITAL TRANSISTOR		
Q328,329			2SC4617(R)	TRANSISTOR		
Q330			DTC114EE	DIGITAL TRANSISTOR		
Q332			FMA7	DIGITAL TRANSISTOR		
Q333-336			UMA9	DIGITAL TRANSISTOR		
Q338			DTA114YE	DIGITAL TRANSISTOR		
Q339			DTA144WE	DIGITAL TRANSISTOR		
Q501-503		*	2SC4839*J	TRANSISTOR		
Q504		*	2SC4726(P,Q)	TRANSISTOR		
Q505		*	2SC4619(P,Q)	TRANSISTOR		
Q601-603		*	2SC4839*J	TRANSISTOR		
W301		*	E37-0285-05	CABLE	MM2TX	
W301		*	E37-0285-05	CABLE	EE2E3	
		*	X58-3890-00	SUB UNIT(V.VCO)		
		*	X58-3890-01	SUB UNIT(U.VCO)		
		*	X58-3900-00	MODULE UNIT(PA+EL)		
X1			L77-1440-05	CRYSTAL RESONATOR(12.8MHZ)		
X301			L77-1439-05	CRYSTAL RESONATOR(58.07MHZ)		
X302			L77-1438-05	CRYSTAL RESONATOR(45.505MHZ)		
XF301			L71-0410-05	CRYSTAL FILTER(58.525MHZ)		
XF302			L71-0409-05	CRYSTAL FILTER(45.05MHZ)		
SUB UNIT (V, U, VCO) (X58-3890-XX)						
C1			CC73GUJ1H0R5C	CHIP C 0.5PF C	U.VCO	
C1			CC73GUJ1H010C	CHIP C 1PF C	V.VCO	
C2			CK73GB1H102K	CHIP C 1000PF K		
C3			CC73GCH1H050C	CHIP C 5PF C	V.VCO	
C3			CC73GCH1H070C	CHIP C 7.0PF C	U.VCO	
C4			CC73GCH1H030C	CHIP C 3PF C	V.VCO	
C4			CC73GCH1H040C	CHIP C 4PF C	U.VCO	
C5			CC73GCH1H010C	CHIP C 1PF C		
C7			CK73GB1H102K	CHIP C 1000PF K		
C8			CC73GCH1H100D	CHIP C 10PF D		
C9			CC73GCH1H050C	CHIP C 5PF C	U.VCO	
C9			CC73GCH1H100D	CHIP C 10PF D	V.VCO	
C10			CC73GCH1H100D	CHIP C 10PF D	U.VCO	
C10			CK73GB1H102K	CHIP C 1000PF K	V.VCO	
C11		*	C91-1131-05	CERAMIC 0.001UF		
C12			CK73GB1H102K	CHIP C 1000PF K		

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SUB UNIT (V, U, VCO) (X58-3890-XX)
MODULE UNIT (PA + EL) (X58-3900-00)

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
C13			CK73GB1E223K	CHIP C 0.022UF K		
C14			CC73GCH1H330J	CHIP C 33PF J	U.VCO	
C15			CC73GCH1H040C	CHIP C 4PF C	U.VCO	
C16		⁎	C91-1131-05	CERAMIC 0.001UF		
CN1 ,2		⁎	E40-5576-05	PIN CONNECTOR FOR INSIDE(3P)		
		⁎	F10-2036-04	SHIELDING PLATE(UHF)		
		⁎	F10-2037-04	SHIELDING PLATE(VHF)		
L1			L40-2272-35	SMALL FIXED INDUCTOR(22NH)	U.VCO	
L2			L34-1333-05	COIL(8.5T)	V.VCO	
L2		⁎	L34-1374-05	COIL(6.5T)	U.VCO	
L3			L34-1331-05	COIL(5.5T)	V.VCO	
L3		⁎	L34-1373-05	COIL(2.5T)	U.VCO	
L4		⁎	L40-1092-34	SMALL FIXED INDUCTOR(1UH)		
R1		⁎	R92-1300-05	FIXED RESISTOR 82K		
R2		⁎	R92-1299-05	FIXED RESISTOR 47K		
R3		⁎	R92-1298-05	FIXED RESISTOR 2.2K		
R4		⁎	R92-1296-05	FIXED RESISTOR 560		
R5		⁎	R92-1294-05	FIXED RESISTOR 47		
R6		⁎	R92-1293-05	FIXED RESISTOR 27		
R7		⁎	R92-1300-05	FIXED RESISTOR 82		
R8		⁎	R92-1297-05	FIXED RESISTOR 820		
R9		⁎	R92-1300-05	FIXED RESISTOR 82K		
R10		⁎	R92-1296-05	FIXED RESISTOR 560	U.VCO	
R10		⁎	R92-1297-05	FIXED RESISTOR 820	V.VCO	
R11		⁎	R92-1298-05	FIXED RESISTOR 2.2K		
R12		⁎	R92-1296-05	FIXED RESISTOR 560	U.VCO	
R13			R92-0670-05	CHIP R 0 OHM	V.VCO	
R14		⁎	R92-1299-05	FIXED RESISTOR 47K		
D1			MA333	DIODE	V.VCO	
D1			MA334B	DIODE	U.VCO	
D2			MA333	DIODE		
D3			MA360	DIODE		
D4			MA77	DIODE		
Q1			DTC114YE	DIGITAL TRANSISTOR		
Q2			2SK238(K17)	FET		
Q3 ,4		⁎	2SC4726(P,Q)	TRANSISTOR	V.VCO	
Q3 ,4		⁎	2SC4839	TRANSISTOR	U.VCO	
			MODULE UNIT (PA + EL) (X58-3900-00)			
C1 ,2			CK73GB1H471K	CHIP C 470PF K		
C3			CK73GB1E103K	CHIP C 0.010UF K		
C4			CK73GB1H471K	CHIP C 470PF K		
C5			CC73GCH1H030C	CHIP C 3PF C		
C6 ,7			CK73GB1H471K	CHIP C 470PF K		
C8			CC73GCH1H050C	CHIP C 5PF C		
C9			CK73GB1E103K	CHIP C 0.010UF K		
C10 -14			CK73GB1H471K	CHIP C 470PF K		
C15			CK73GB1E103K	CHIP C 0.010UF K		
C16			CK73GB1H471K	CHIP C 470PF K		
C17			CK73GB1E103K	CHIP C 0.010UF K		
C18			CK73GB1H471K	CHIP C 470PF K		
C19			CK73GB1E103K	CHIP C 0.010UF K		
C20 -24			CK73GB1H471K	CHIP C 470PF K		
C25			CC73GCH1H020C	CHIP C 2.0PF C		

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MODULE UNIT (PA + EL) (X58-3900-00)

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C26			CC73GCH1H040C	CHIP C 4PF C		
C27			CC73GCH1H020C	CHIP C 2.0PF C		
C28			CK73GB1E103K	CHIP C 0.010UF K		
C29 -31			CK73FB1E104K	CHIP C 0.10UF K		
C32			CK73GB1E103K	CHIP C 0.010UF K		
C101,102			CK73GB1H102K	CHIP C 1000PF K		
C103			CK73GB1E103K	CHIP C 0.010UF K		
C104			CK73GB1H102K	CHIP C 1000PF K		
C105			CC73GCH1H100D	CHIP C 10PF D		
C107			CK73GB1H102K	CHIP C 1000PF K		
C108			CC73GCH1H220J	CHIP C 22PF J		
C109			CK73GB1E103K	CHIP C 0.010UF K		
C110-113			CK73GB1H102K	CHIP C 1000PF K		
C114			CK73GB1E103K	CHIP C 0.010UF K		
C115			CK73GB1H102K	CHIP C 1000PF K		
C116			CK73GB1E103K	CHIP C 0.010UF K		
C117			CK73GB1H102K	CHIP C 1000PF K		
C118			CK73GB1E103K	CHIP C 0.010UF K		
C119,120			CK73GB1H102K	CHIP C 1000PF K		
C123			CK73GB1H102K	CHIP C 1000PF K		
C124-126			CK73FB1E104K	CHIP C 0.10UF K		
L1		⁎	L40-1572-34	SMALL FIXED INDUCTOR(15NH)		
L2		⁎	L40-1072-34	SMALL FIXED INDUCTOR(10NH)		
L3		⁎	L40-1872-34	SMALL FIXED INDUCTOR(18NH)		
L4			L40-1882-48	SMALL FIXED INDUCTOR(180NH)		
L5			L92-0132-05	CORE		
L6			L34-1266-05	COIL(1.5T)		
L7			L40-1872-35	SMALL FIXED INDUCTOR(18NH)		
L101			L40-1082-48	SMALL FIXED INDUCTOR(100NH)		
L102			L40-1282-48	SMALL FIXED INDUCTOR(120NH)		
L103			L92-0132-05	CORE		
L104		⁎	L40-1092-34	SMALL FIXED INDUCTOR(1UH)		
R1			RK73GB1J272J	CHIP R 2.7K J 1/16W		
R2			RK73GB1J820J	CHIP R 82 J 1/16W		
R3			RK73GB1J391J	CHIP R 390 J 1/16W		
R4			RK73GB1J390J	CHIP R 39 J 1/16W		
R5			RK73GB1J471J	CHIP R 470 J 1/16W		
R6			RK73GB1J182J	CHIP R 1.8K J 1/16W		
R7			RK73GB1J272J	CHIP R 2.7K J 1/16W		
R8			RK73GB1J330J	CHIP R 33 J 1/16W		
R9			RK73GB1J391J	CHIP R 390 J 1/16W		
R10			RK73GB1J180J	CHIP R 18 J 1/16W		
R11			RK73GB1J331J	CHIP R 330 J 1/16W		
R12			RK73GB1J271J	CHIP R 270 J 1/16W		
R13			RK73GB1J152J	CHIP R 1.5K J 1/16W		
R14			RK73GB1J821J	CHIP R 820 J 1/16W		
R15			RK73GB1J271J	CHIP R 270 J 1/16W		
R16 ,17			RK73FB2A680J	CHIP R 68 J 1/10W		
R19			RK73GB1J101J	CHIP R 100 J 1/16W		
R101			RK73GB1J272J	CHIP R 2.7K J 1/16W		
R102			RK73GB1J820J	CHIP R 82 J 1/16W		
R103			RK73GB1J471J	CHIP R 470 J 1/16W		
R104			RK73GB1J390J	CHIP R 39 J 1/16W		

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MODULE UNIT (PA + EL) (X58-3900-00)

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
R105			RK73GB1J821J	CHIP R 820 J 1/16W		
R106			RK73GB1J152J	CHIP R 1.5K J 1/16W		
R107			R92-1252-05	CHIP R 0 OHM		
R108			RK73GB1J330J	CHIP R 33 J 1/16W		
R109			RK73GB1J391J	CHIP R 390 J 1/16W		
R110			RK73GB1J220J	CHIP R 22 J 1/16W		
R111			RK73GB1J331J	CHIP R 330 J 1/16W		
R112			RK73GB1J271J	CHIP R 270 J 1/16W		
R113			RK73GB1J152J	CHIP R 1.5K J 1/16W		
R114			RK73GB1J821J	CHIP R 820 J 1/16W		
R115			RK73GB1J271J	CHIP R 270 J 1/16W		
R116,117			RK73FB2A101J	CHIP R 100 J 1/10W		
R118			RK73GB1J182J	CHIP R 1.8K J 1/16W		
D1 ,2			DA204U	DIODE		
D3			MA77	DIODE		
D4			1SV172	DIODE		
D5			MI809	DIODE		
D6			MA110	DIODE		
D103			MA77	DIODE		
D104			1SV172	DIODE		
D105			MI809	DIODE		
D106			MA110	DIODE		
Q1			2SC4226(R24)	TRANSISTOR		
IC1	2A		S-AU26	IC(UHF POUERMODULE)		
IC101	2A		S-AV22A	IC(UHF POUERMODULE)		
Q2			2SC3356	TRANSISTOR		
Q3 ,4		*	2SK1824	FET		
Q5			DTA143XE	DIGITAL TRANSISTOR		
Q6		*	2SK1824	FET		
Q7			DTB113ZK	DIGITAL TRANSISTOR		
Q8		*	2SK1824	FET		
Q101			2SC4083(N,P)	TRANSISTOR		
Q102			2SC3356	TRANSISTOR		
Q103-105		*	2SK1824	FET		
Q106			DTB113ZK	DIGITAL TRANSISTOR		
Q107			DTA143XE	DIGITAL TRANSISTOR		

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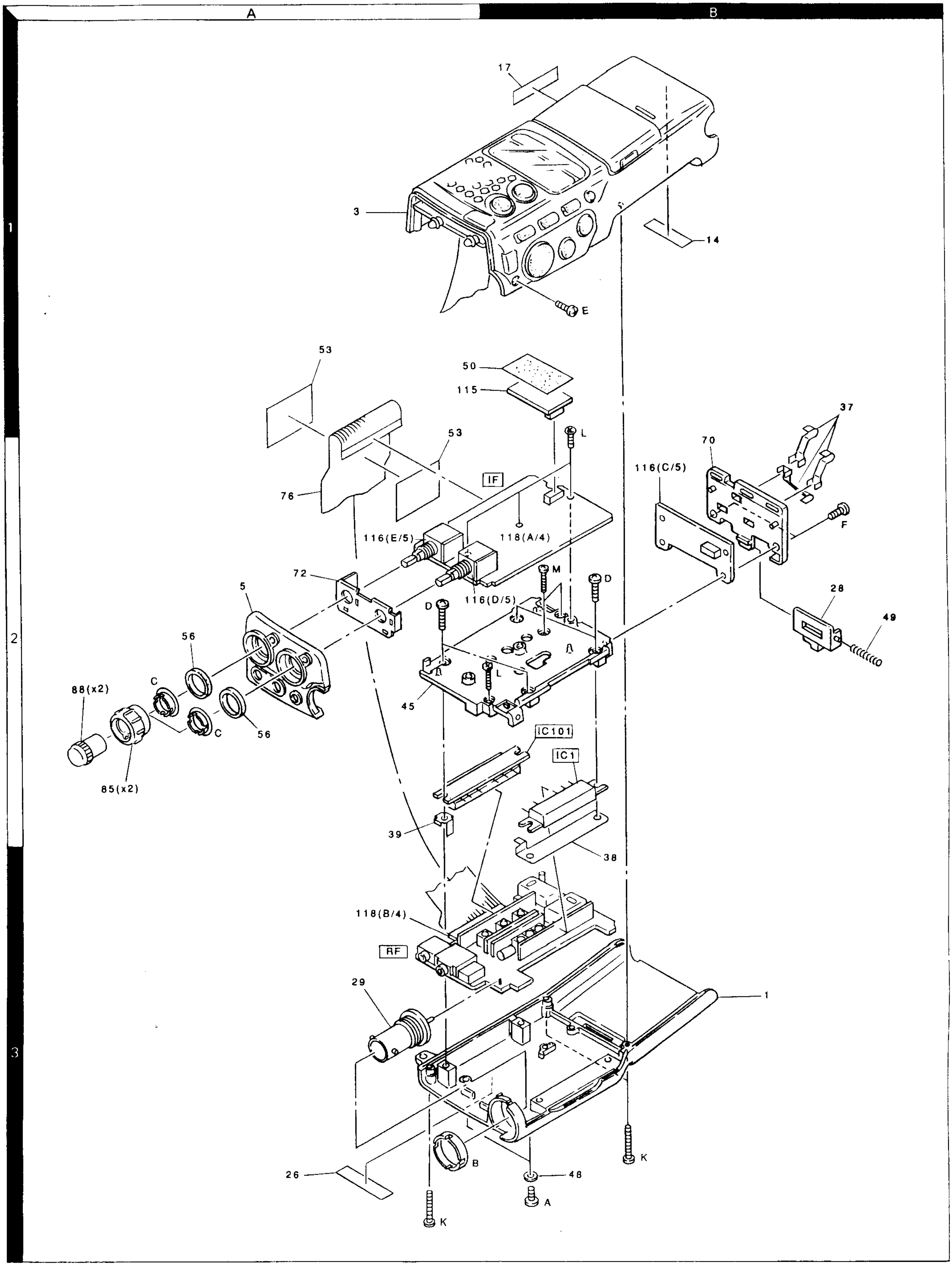
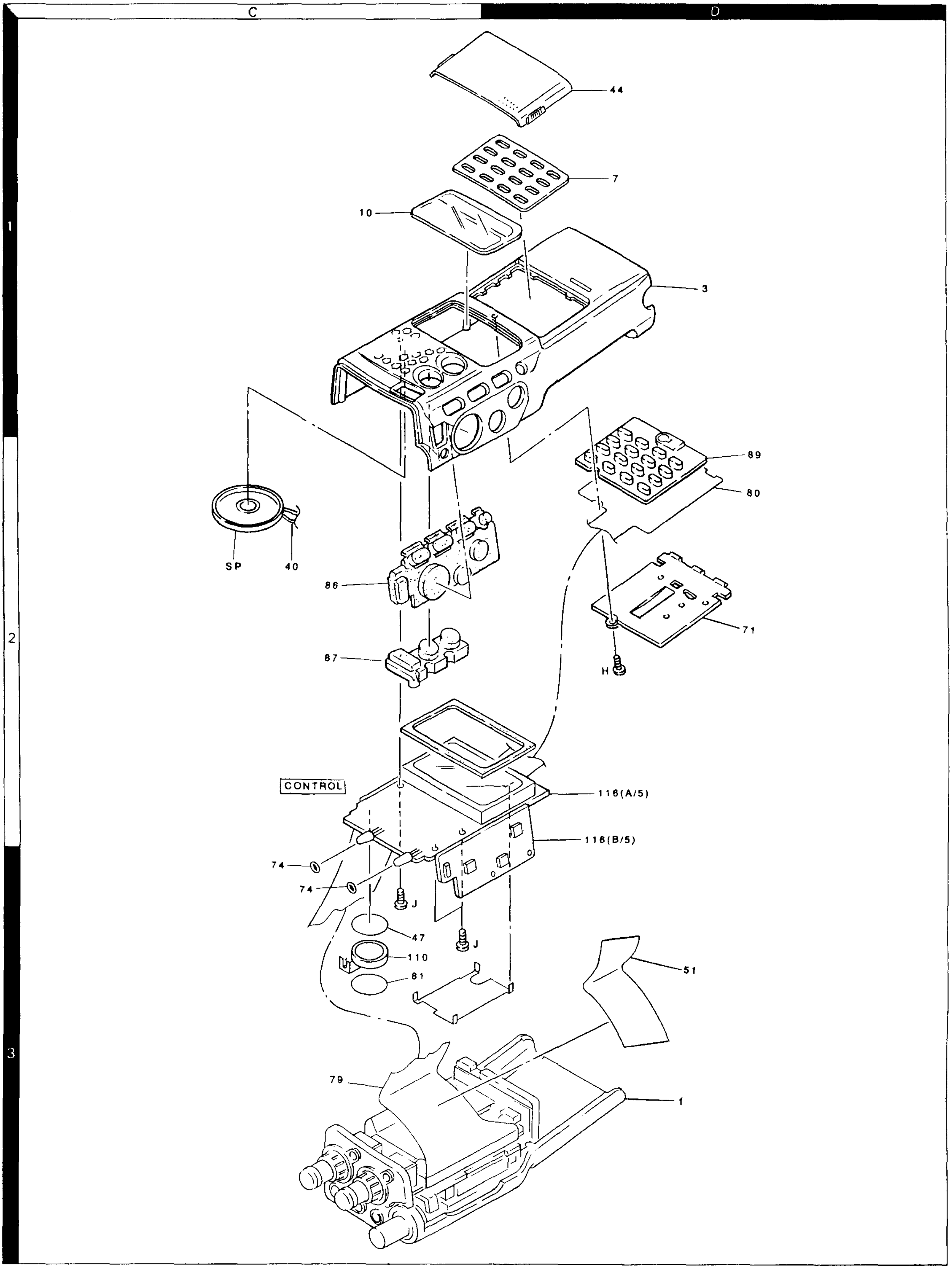
DISASSEMBLY



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

DISASSEMBLY



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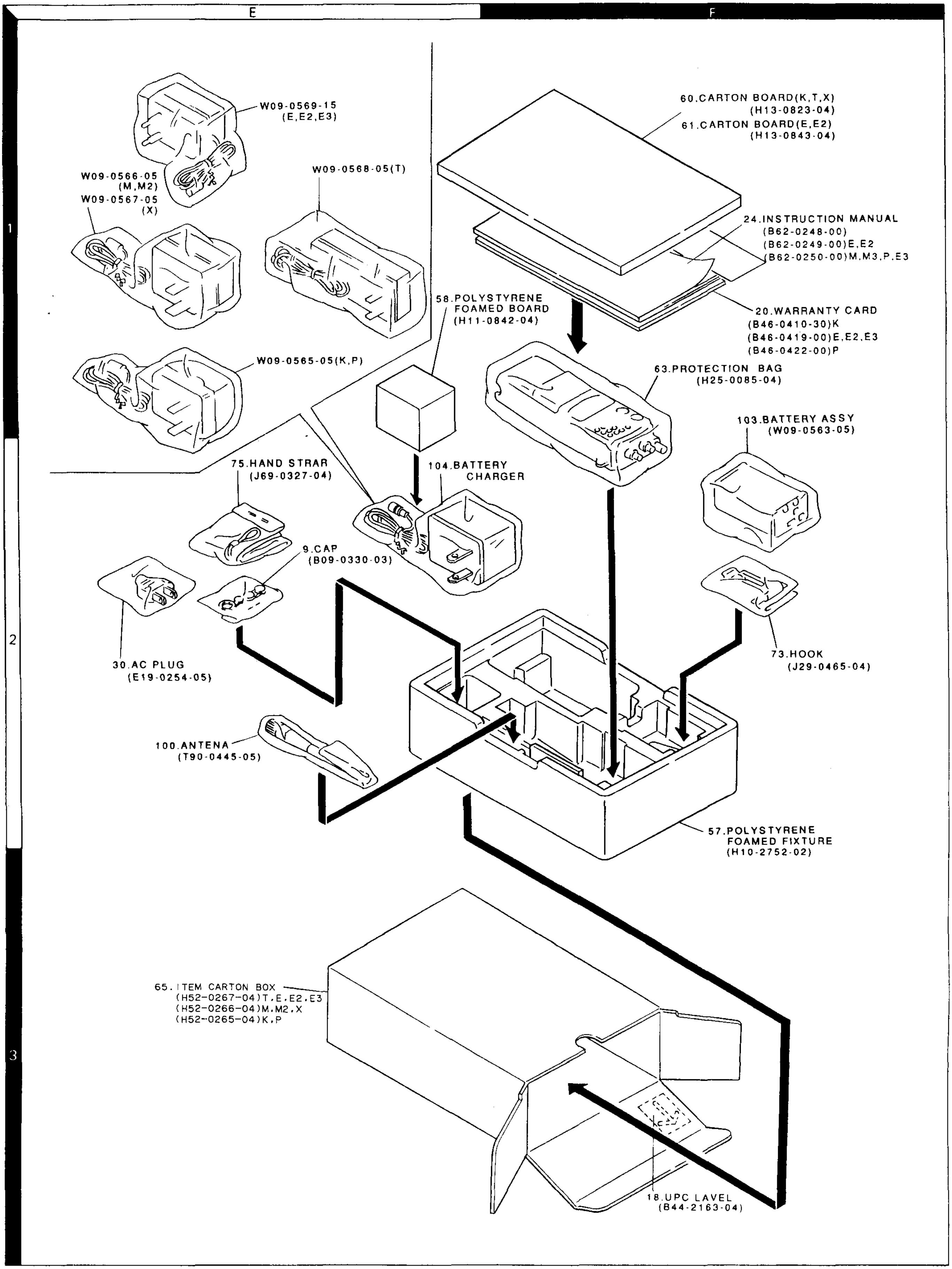
PACKING



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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 3A.
3) A cable of less internal loss must be used.

3. Frequency Counter (f. counter)

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

4. Power Meter

1) Measurable frequency : Up to 500MHz.
2) Impedance : 50Ω, unbalanced.
3) Measuring range : Full scale 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 : 1MΩ or more.

8. Oscilloscope

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

9. AF Voltmeter (AF V.M)

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 : –20dB/0.1μV to 120dB/1V.
3) Output impedance : 50Ω

12. Tracking Generator

1) Center frequency : 50kHz to 500MHz.
2) Frequency deviation : ±35MHz.
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 SW......................................ON
VHF SQL VR.................................. MIN
UHF SQL VR.................................. MIN
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 indicted SSG output levels are for maximum output.

Preference

Japanese "SG"	American "SG"
–6dB	0.25μV
0dB	0.5μV
6dB	1μV
12dB	2μV
24dB	8μV
30dB	15.8μV
40dB	50μV
50dB	158μV
60dB	500μV
70dB	1.58mV
80dB	5mV
90dB	15.8mV
100dB	50mV
120dB	0.5V

TH-78 ADJUSTMENT

TX-RX COMMON ADJUSTMENT

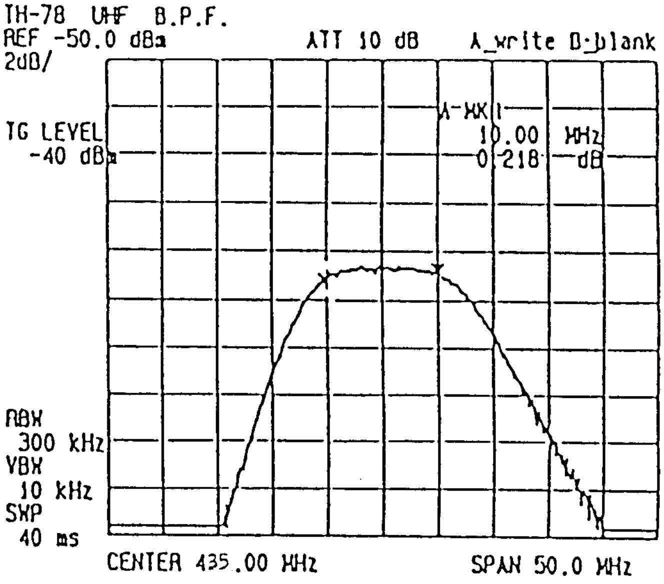
Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test Equipment	Unit	Terminal	Unit	Parts	Method	
1. Voltage confirmation	1) External power supply voltage: 9V	Digital voltmeter		DC IN			Check	
2. Reset	1) While holding the M key down, set the POWER switch to ON.						Display check	ALL segments ON

PLL ADJUSTMENT

Item	Condition	Test Equipment	Unit	Terminal	Unit	Parts	Method	Specifications/Remarks
1. Transmit frequency	1) FREQ: 439.975 MHz 449.975 MHz (K, P)	f.counter Power meter Directional coupler		ANT	TX-RX (RF)	TC1	439.980 MHz (Set the display to the display frequency.)	±100 Hz

UHF RX ADJUSTMENT

Item	Condition	Test Equipment	Unit	Terminal	Unit	Parts	Method	Specifications/Remarks
1. BPF	1) Tracking generator output: –40 dBm	Tracking generator Spectrum analyzer	TX-RX (RF)	ANT TP2	TX-RX (RF)	L32	Turn the L32 and adjust so that waveform of spectrum analyzer such as figure 1.	
2. Receive sensitivity	1) FREQ: F No.11 AF VR: about 0.63V/8Ω SSG ATT: 60 dBμ	SSG EXT.SP Oscilloscope AF VM Distortion meter		ANT SP			Large input S/N measurement AF VR: MAX	34 dB or more 1.3V or more
	2) SSG ATT: –8 dBμ						SINAD sensitivity measurement	SINAD 12 dB or more
	3) FREQ: F No.12							
	4) FREQ: F No.13							
3. Squelch	1) FREQ: F No.11 SSG RF: OFF U.SQL VR: At the point where noise disappears.	SSG EXT.SP Oscilloscope AF VM Distortion meter		ANT SP			U.SQL VR position Check current consumption	8:30 to 11:00 70 mA or less
	2) SSG ATT: –14 dBμ						Open sensitivity of threshold level	Squelch should open
	3) U.SQL VR: MAX						Tight squelch	Squelch should close
	4) SSG ATT: –5dBμ After check U.SQL VR: MIN						Tight squelch Open sensitivity	Squelch should open
4. S-meter	1) FREQ: F No.11 SSG ATT: –9 dBμ	SSG EXT.SP Oscilloscope AF VM Distortion meter		ANT SP	TX-RX (IF)	VR306	Set the S-meter from all segments in the all light on state to 1 segment lights.	
	2) SSG ATT: 30 dBμ						S-meter check	ALL segments ON
	3) SSG ATT: –14 dBμ						S-meter check	ALL segments OFF



<FREQUENCY TABLE FOR ADJUSTMENT>

F No. \ Destination	K, P	M, M2, X	E, E2, E3, T
01 (TX)	146.000 MHz	146.000 MHz	144.975 MHz
02 (TX)	144.000 MHz	144.000 MHz	144.000 MHz
03 (TX)	147.975 MHz	147.975 MHz	145.975 MHz
04 (RX)	146.050 MHz	146.050 MHz	145.050 MHz
05 (RX)	144.050 MHz	144.050 MHz	145.950 MHz
06 (RX)	147.950 MHz	147.950 MHz	144.050 MHz
08 (TX)	444.000 MHz	435.000 MHz	435.000 MHz
09 (TX)	438.000 MHz	430.000 MHz	430.000 MHz
10 (TX)	449.975 MHz	439.975 MHz	439.975 MHz
11 (RX)	444.050 MHz	435.050 MHz	435.050 MHz
12 (RX)	438.050 MHz	430.050 MHz	430.050 MHz
13 (RX)	449.950 MHz	439.950 MHz	439.950 MHz

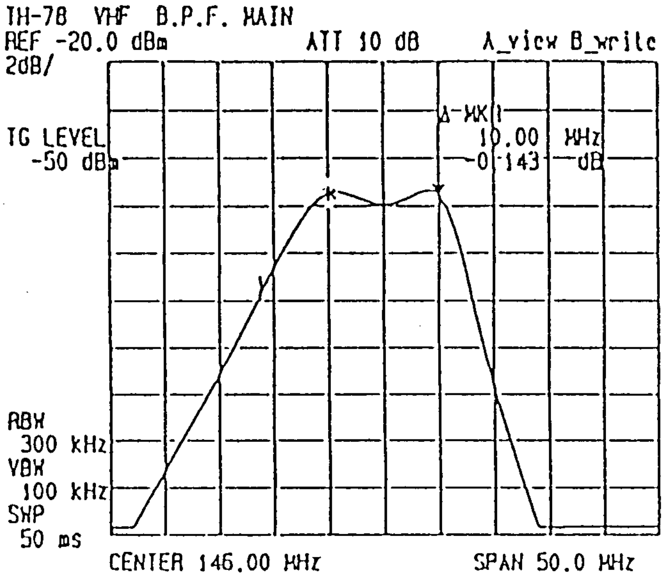
TH-78 ADJUSTMENT

S-VHF RX ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test Equipment	Unit	Terminal	Unit	Parts	Method	
1. Receive sensitivity	1) FREQ: F No.04 AF VR: 0.63V/8Ω SSG ATT: 60 dBμ						Large input S/N measurement	40 dB or more
	2) SSG ATT: –4 dBμ						SINAD sensitivity measurenent	SINAD 12 dB or less
	3) FREQ: F No.05							
	4) FREQ: F No.06							
2. Squelch	1) FREQ: F No.04 SSG RF: OFF U.SQL VR: At the point where noise disappears.						U.SQL VR position Check current consumption	8:00 to 11:00 70 mA or less
	2) SSG ATT: –6 dBμ						Open sensitivity of threshold level	Squelch should open
	3) U.SQL VR: MAX						Tight squelch	Squelch should close
	4) SSG ATT: 0 dBμ After check U.SQL VR: MIN						Tight squelch Open sensitivity	Squelch should open
3. S-meter	1) FREQ: F No.04 SSG ATT: 36 dBμ						S-meter check	ALL segments ON
	2) SSG ATT: –14 dBμ						S-meter check	ALL segments OFF

VHF RX ADJUSTMENT

1. BPF	1) Tracking generator output: –50 dBm	Tracking generator Spectrum analyzer	TX-RX (RF)	ANT TP3	TX-RX (RF)	L36 L38 L43	Adjust waveform of spectrum analyzer such as figure 2.	
2. Receive sensitivity	1) FREQ: F No.04 AF VR: 0.63V/8Ω SSG ATT: 60 dBμ	SSG EXT.SP Oscilloscope AF VM Distortion meter		ANT SP			Large input S/N measurement	40 dB or more
	2) SSG ATT: –9 dBμ						SINAD sensitivity measurement	SINAD 12 dB or more
	3) FREQ: F No.05							
	4) FREQ: F No.06							
3. Squelch	1) FREQ: F No.04 SSG RF: OFF V.SQL VR: At the point where noise disappears.			ANT SP			U.SQL VR position Check current consumption	8:30 to 11:00 65 mA or less
	2) SSG ATT: –14 dBμ						Open sensitivity of threshold level	Squelch should open
	3) V.SQL VR: MAX						Tight squelch	Squelch should close
	4) SSG ATT: –6dBμ After check V.SQL VR: MIN						Tight suelch Open sensitivity	Squelch should open
4. S-meter	1) FREQ: F No.04 SSG ATT: –8 dBμ			ANT SP	TX-RX (IF)	VR307	Set the S-meter from all segments in the all light on state to 1 segment lights.	
	2) SSG ATT: 22 dBμ						S-meter check	ALL segments ON
	3) SSG ATT: –14 dBμ						S-meter check	ALL segments OFF



TH-78 ADJUSTMENT

S-UHF RX ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test Equipment	Unit	Terminal	Unit	Parts	Method	
1. Receive sensitivity	1) FREQ: F No.11 AF VR: 0.63V/8Ω SSG ATT: 60 dBμ	SSG EXT.SP Oscilloscope AF VM Distortion meter		ANT SP			Large input S/N measurement	34 dB or more
	2) SSG ATT: –4 dBμ						SINAD sensitivity measurement	SINAD 12 dB or less
	3) FREQ: F No.12							
	4) FREQ: F No.13							
2. Squelch	1) FREQ: F No.11 SSG RF: OFF V.SQL VR: At the point where noise disappears.			ANT SP			U SQL VR position Check current consumption	8:00 to 11:00 75 mA or less
	2) SSG ATT: –14 dBμ						Open sensitivity of threshold level	Squelch should open
	3) U.SQL VR: MAX						Tight squelch	Squelch should close
	4) SSG ATT: 0 dBμ After check V.SQL VR: MIN						Tight squelch Open sensitivity	Squelch should open
3. S-meter	1) FREQ: F No.11 SSG ATT: 36 dBμ			ANT SP			S-meter check	ALL segments ON
	2) SSG ATT: –14 dBμ						S-meter check	ALL segments OFF

UHF TX ADJUSTMENT

Item	Condition	Test Equipment	Unit	Terminal	Unit	Parts	Method	Specifications/Remarks
1. Power (HI)	1) DC IN: 13.8V FREQ: F No.08 HI/LOW: HI PTT: ON	Power meter Ammeter		ANT	TX-RX (IF)	VR304	MAX power check	5.5W or more
							Set to 5.2W Check current comsumption	±0.1W 2.0A or less
	2) FREQ: F No.09					(VR304)	HI power check Check current comsumption	5.0 to 6.5W 2.0A or less
	3) FREQ: F No.10						In case of the frequency of 5.2W or less so that frequency adjust to 5.2W at this point.	
(LOW)	1) FREQ: F No.08 F No.09 F No.10 HI/LOW: LOW PTT: ON						LOW power check Check current consumption	0.2 to 1.0W 800 mA or less
(E-LOW)	1) FREQ: F No.08 HI/LOW: EL PTT: ON						E-LOW power check	5 mW or more
2. DEV	1) FREQ: F No.10 AG: 1 kHz/50 mV PTT: ON	Power meter Linear detector Oscilloscope f. counter AG AF MV		ANT MIC	TX-RX (IF)	VR302	Adjust at large value of ± so that 4.3 kHz.	±100 Hz
	2) AG: 20 dB down (1 kHz/5 mV) PTT: ON						MIC sensitivity check	±2.6 to 3.5 kHz
3. DTMF DEV	1) FREQ: F No.10 AG: OFF Press the TONE (CALL: E) key while transmit state.	Power meter Linear detector Oscilloscope f. counter		ANT	TX-RX (IF)	VR303	Adjust at large value of ± so that 3.5 kHz. Waveform check	±100 Hz It should dual tone.
4. TONE DEV	1) Press the TONE key and should display "T". PTT: ON				TSU-7	VR-1	Display check TONE DEV check	Display "T" light ±0.5 to 1.25 kHz
T, E, E2 E3	1) Press the TONE key.						Display check TONE DEV check	Display "T" light 2.5 to 4.5 kHz

TH-78 ADJUSTMENT

VHF TX ADJUSTMENT

1. Power (HI)	1) DC IN: 13.8V FREQ: F No.01 HI/LOW: HI PTT: ON	Power meter Ammeter		ANT	TX-RX (IF)	VR305	MAX power check	5.5W or more
							Set to 5.2W Check current comsumption	±0.1W 1.8A or less
	2) FREQ: F No.02					(VR305)	HI power check Check current comsumption	5.0 to 6.5W 1.8A or less
	3) FREQ: F No.03						In case of the frequency of 5.2W or less so that frequency adjust to 5.2W at this point.	
(LOW)	1) FREQ: F No.01 F No.02 F No.03 HI/LOW: LOW PTT: ON						LOW power check Check current consumption	0.2 to 1.0W 800 mA or less
(E-LOW)	1) FREQ: F No.01 HI/LOW: EL PTT: ON						E-LOW power check	5 mW or more
2. DEV	1) FREQ: F No.01 AG: 1 kHz/50 mV PTT: ON	Power meter Linear detector Oscilloscope f. counter AG AF MV		ANT MIC	TX-RX (IF)	VR301	Adjust at large value of ± so that 4.3 kHz.	±100 Hz
	2) AG: 20 dB down (1 kHz/5 mV) PTT: ON						MIC sensitivity check	±2.6 to 3.5 kHz
3. DTMF DEV	1) FREQ: F No.03 AG: OFF Press the TONE (CALL: E) key while transmit state.	Power meter Linear detector Oscilloscope f. counter		ANT	TX-RX (IF)	(VR303)	Adjust at large value of ± so that 3.5 kHz. Waveform check	±100 Hz It should dual tone
4. TONE DEV	1) Press the TONE key and should display "T". PTT: ON				TSU-7	VR-1	Display check TONE DEV check	Display "T" light ±0.5 to 1.25 kHz
T, E, E2 E3	1) Press the TONE key.						Display check TONE DEV check	Display "T" light ±5 to 4.5 kHz

<FREQUENCY TABLE FOR ADJUSTMENT>

F No. \ Destination		K, P	M, M2, X	E, E2, E3, T
01	(TX)	146.000 MHz	146.000 MHz	144.975 MHz
02	(TX)	144.000 MHz	144.000 MHz	144.000 MHz
03	(TX)	147.975 MHz	147.975 MHz	145.975 MHz
04	(RX)	146.050 MHz	146.050 MHz	145.050 MHz
05	(RX)	144.050 MHz	144.050 MHz	145.950 MHz
06	(RX)	147.950 MHz	147.950 MHz	144.050 MHz
08	(TX)	444.000 MHz	435.000 MHz	435.000 MHz
09	(TX)	438.000 MHz	430.000 MHz	430.000 MHz
10	(TX)	449.975 MHz	439.975 MHz	439.975 MHz
11	(RX)	444.050 MHz	435.050 MHz	435.050 MHz
12	(RX)	438.050 MHz	430.050 MHz	430.050 MHz
13	(RX)	449.950 MHz	439.950 MHz	439.950 MHz

ADJUSTMENT

Adjustment point

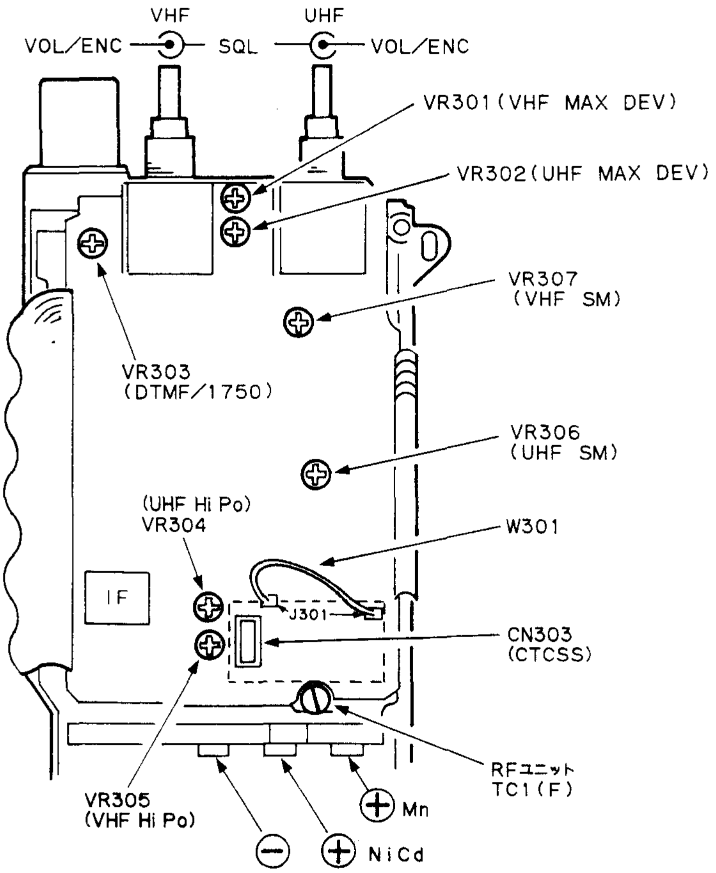


図 3 IF ユニット

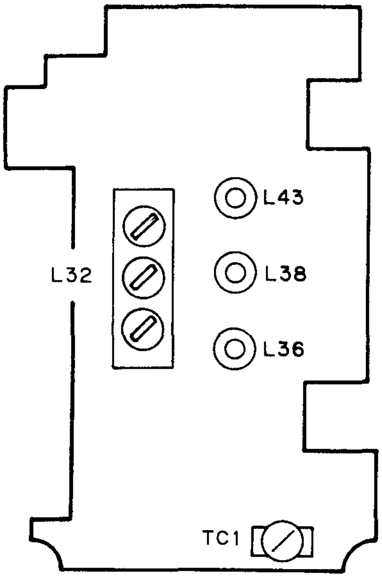


図 4 RF ユニット

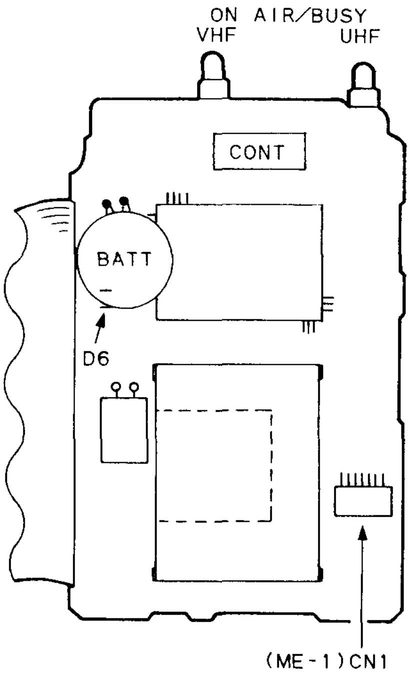
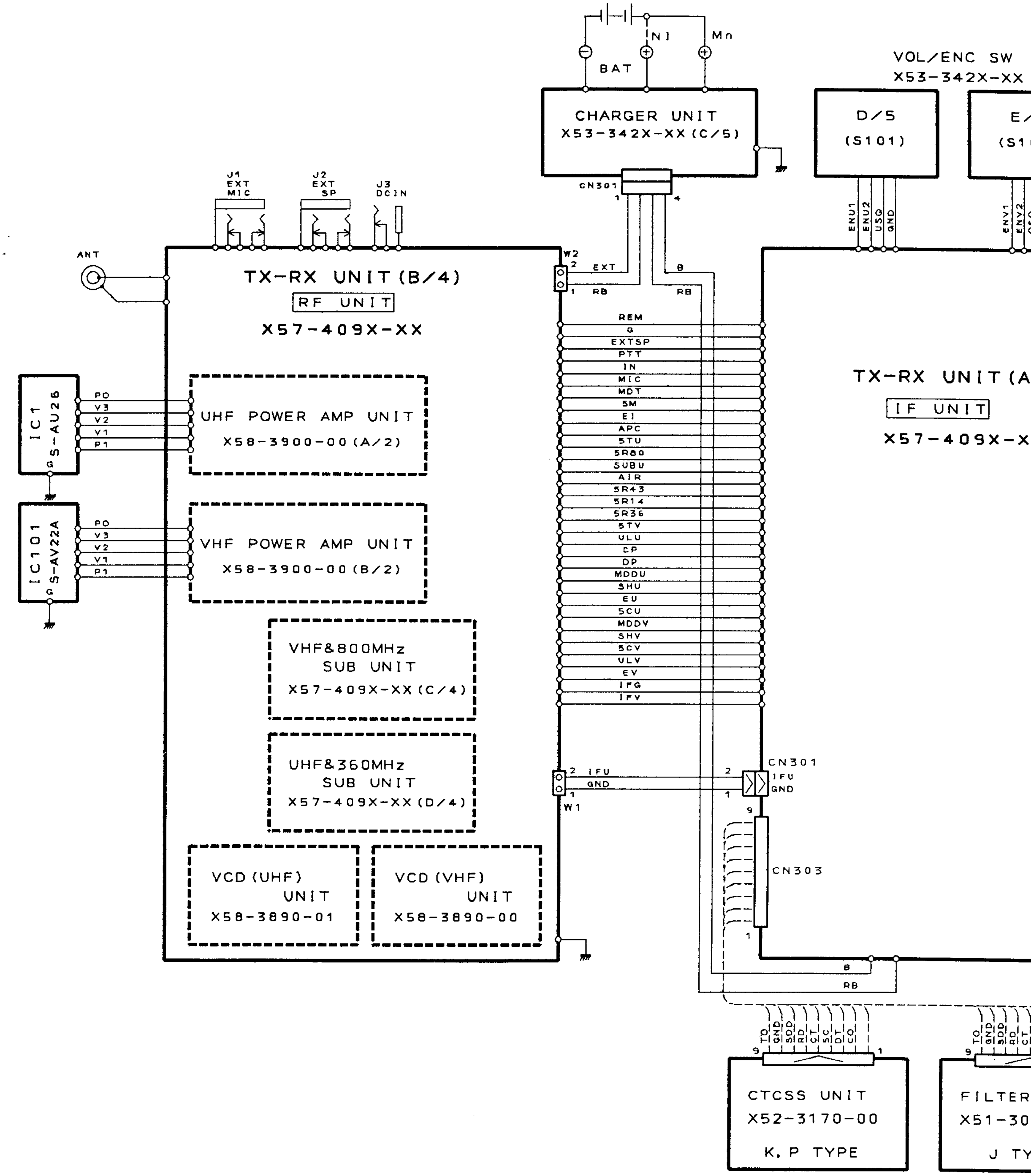


図 5 CONTROL ユニット

TH-78A/E TH-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NI
Mn
CHARGER UNIT
X53-342X-XX (C/5)
CN301
1
4
VOL/ENC SW
X53-342X-XX
D/S
(S101)
E/
(S1
ENU1
ENU2
USQ
GND
ENV1
ENV2
J1 EXT MIC
J2 EXT SP
J3 DC IN
ANT
TX-RX UNIT (B/4)
RF UNIT
X57-409X-XX
W2
2 EXT
1 RB
B
RB
REM
G
EXTSP
PTT
IN
MIC
MDT
5M
EI
APC
5TU
5R80
SUBU
AIR
5R43
5R14
5R36
5TV
ULU
CP
DP
MDDU
SHU
EU
5CU
MDDV
SHV
5CV
ULV
EV
IFG
IFV
TX-RX UNIT (A
IF UNIT
X57-409X-X
IC1
S-AU26
PO
V3
V2
V1
P1
G
UHF POWER AMP UNIT
X58-3900-00 (A/2)
IC101
S-AV22A
PO
V3
V2
V1
P1
G
VHF POWER AMP UNIT
X58-3900-00 (B/2)
VHF&800MHz SUB UNIT
X57-409X-XX (C/4)
UHF&360MHz SUB UNIT
X57-409X-XX (D/4)
W1
2 IFU
1 GND
2
1
CN301
IFU
GND
9
CN303
1
B
RB
VCD (UHF) UNIT
X58-3890-01
VCD (VHF) UNIT
X58-3890-00
TO
GND
SQD
RD
CT
SC
DT
CO
9
1
CTCSS UNIT
X52-3170-00
K, P TYPE
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GND
SQD
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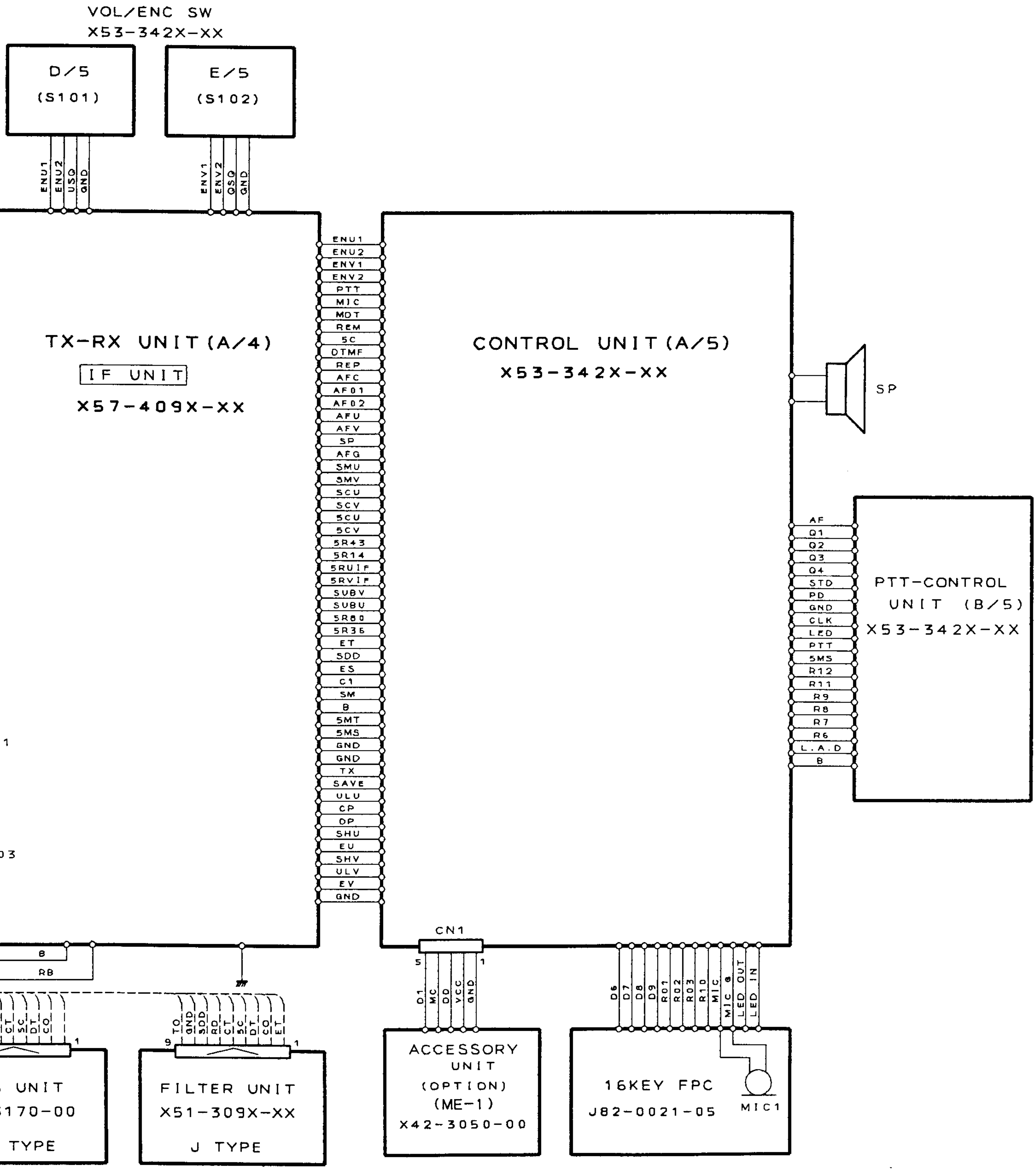
9
FILTER
X51-30
J TY

WIRING DIAGRAM

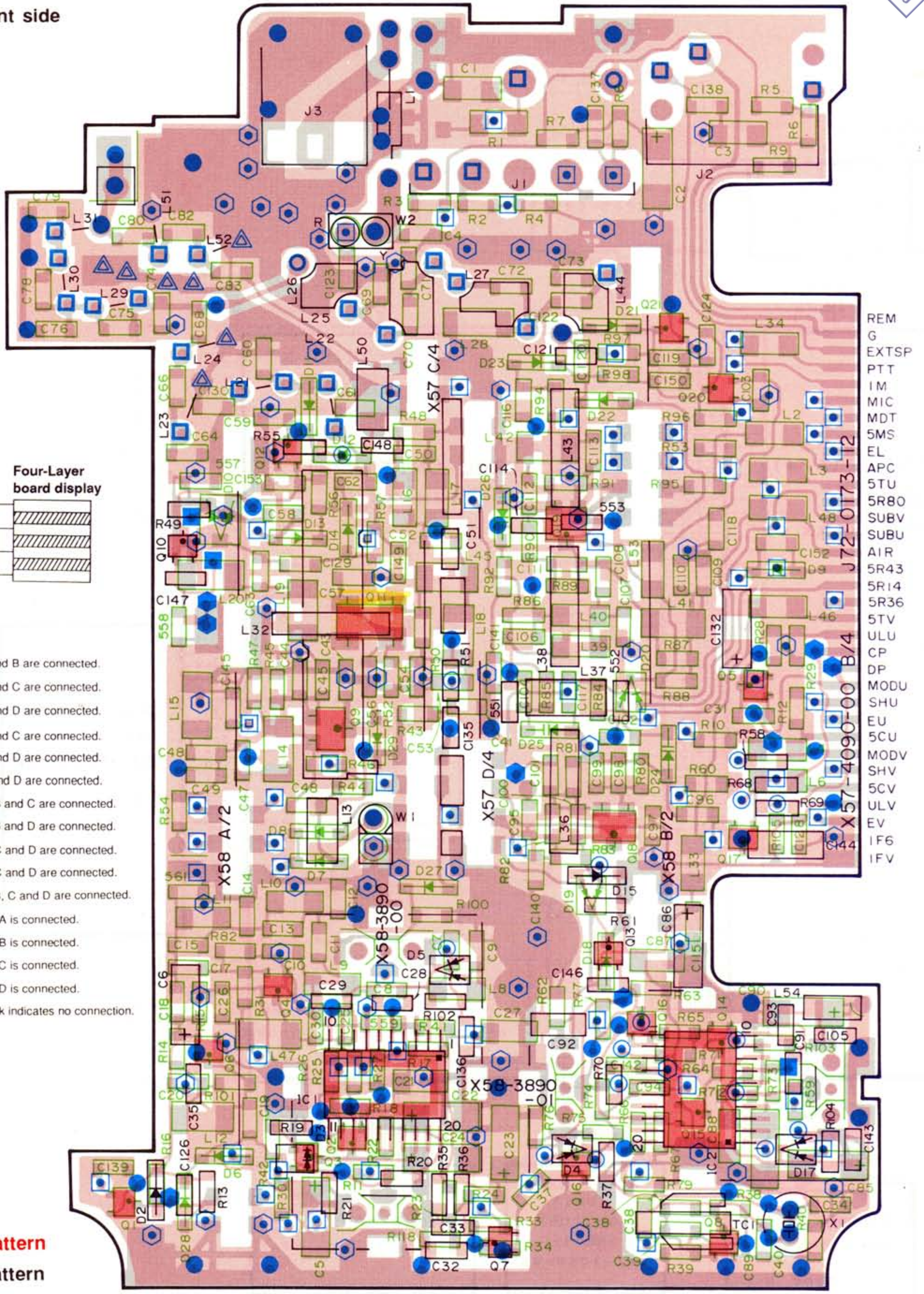


UNIT BOARDS

TH-78A/E

TX-RX UNIT•RF (X57-409X-XX) B/4 0-11: K, P 2-71: T, X, E, E2, E3, M, M2

Component side



Four-Layer board display

- Pattern A
- Pattern B
- Pattern C
- Pattern D

■ Patterns A and B are connected.

⊙ Patterns A and C are connected.

● Patterns A and D are connected.

△ Patterns B and C are connected.

▲ Patterns B and D are connected.

⊡ Patterns C and D are connected.

◎ Patterns A, B and C are connected.

⬡ Patterns A, B and D are connected.

⬢ Patterns A, C and D are connected.

▣ Patterns B, C and D are connected.

△ Patterns A, B, C and D are connected.

○ Only pattern A is connected.

⬡ Only pattern B is connected.

△ Only pattern C is connected.

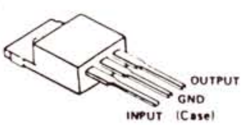
□ Only pattern D is connected.

The non-mark indicates no connection.

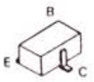
🟥 **A pattern**

⬜ **D pattern**

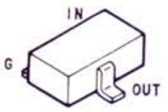
MA110
MA8039



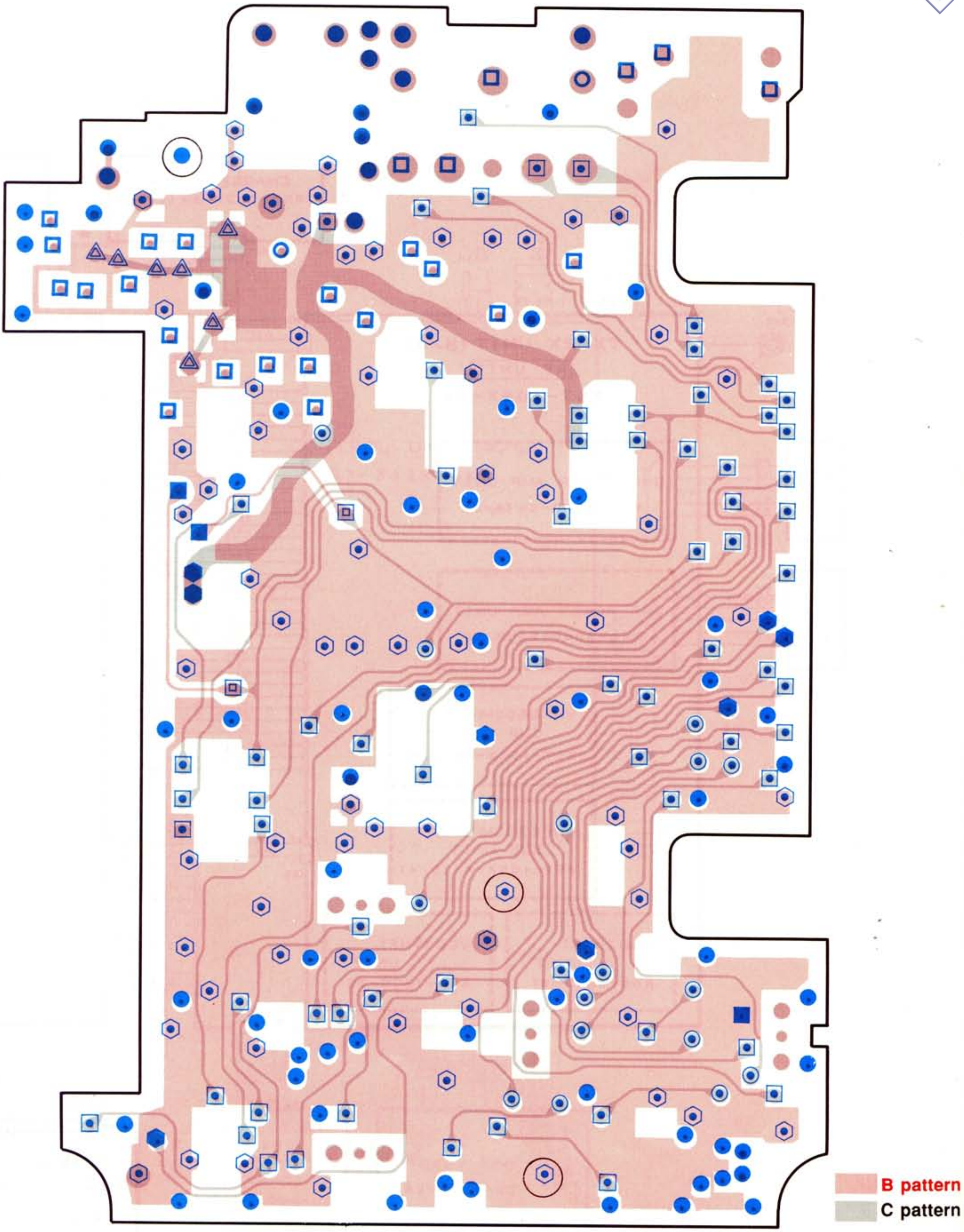
DTB113ZK
2SC4215
2SC4617
2SC4619

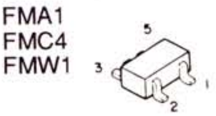


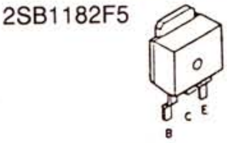
DTA114YE
DTA144WE
DTC114EE
DTC114YE
DTC144EE

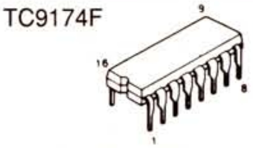


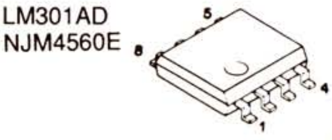
TH-78A/E


B pattern
C pattern


FMA1
FMC4
FMW1
5
3
1
2

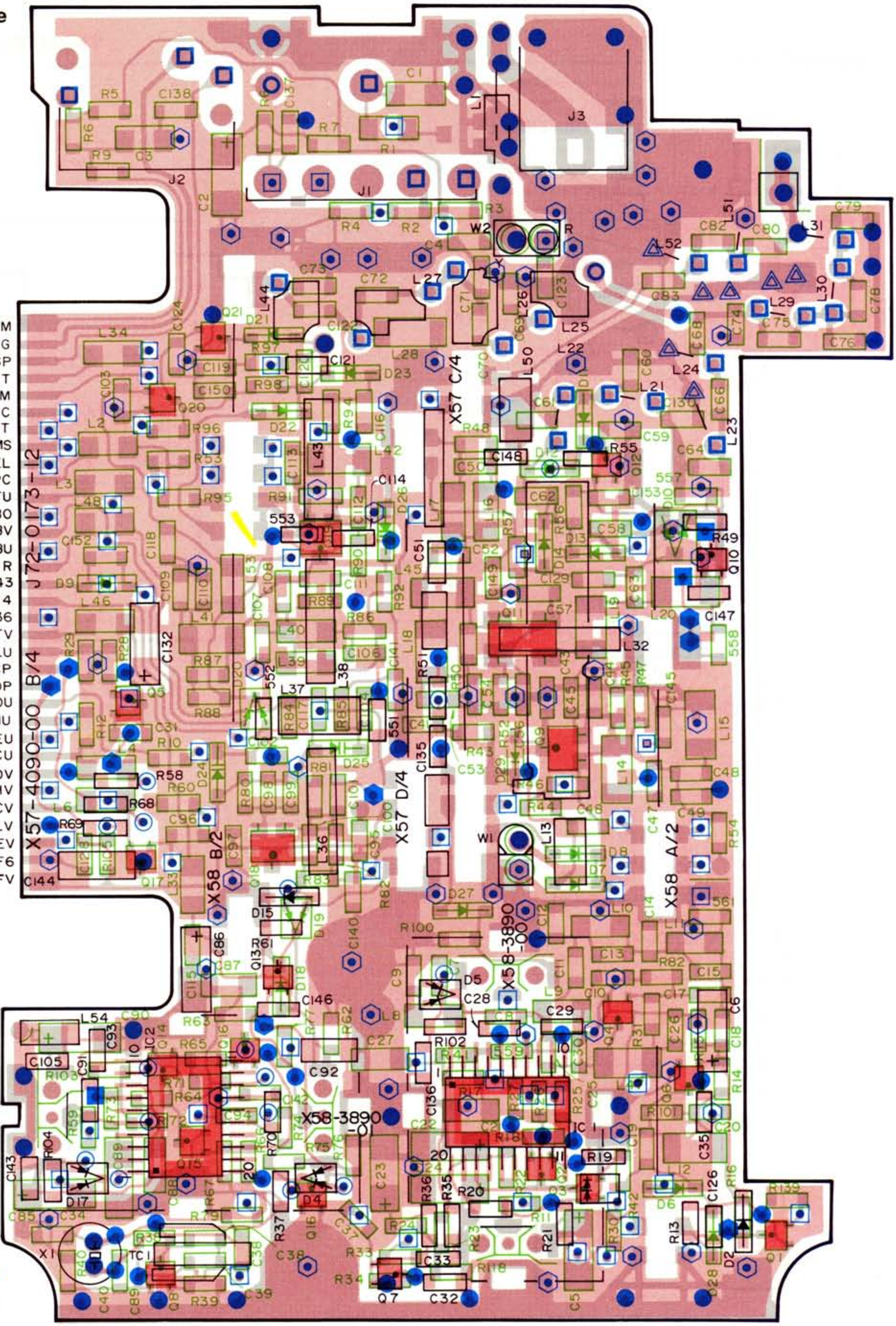

2SB1182F5
B
C
E


TC9174F
9
16
8
1


LM301AD
NJM4560E
5
8
4
1

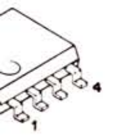
TX-RX UNIT•RF (X57-409X-XX) B/4 0-11: K, P 2-71: T, X, E, E2, E3, M, M2

Soldering side



B pattern 🟥 **A pattern**

C pattern ▨ **D pattern**



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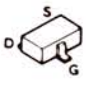
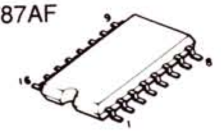
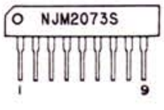


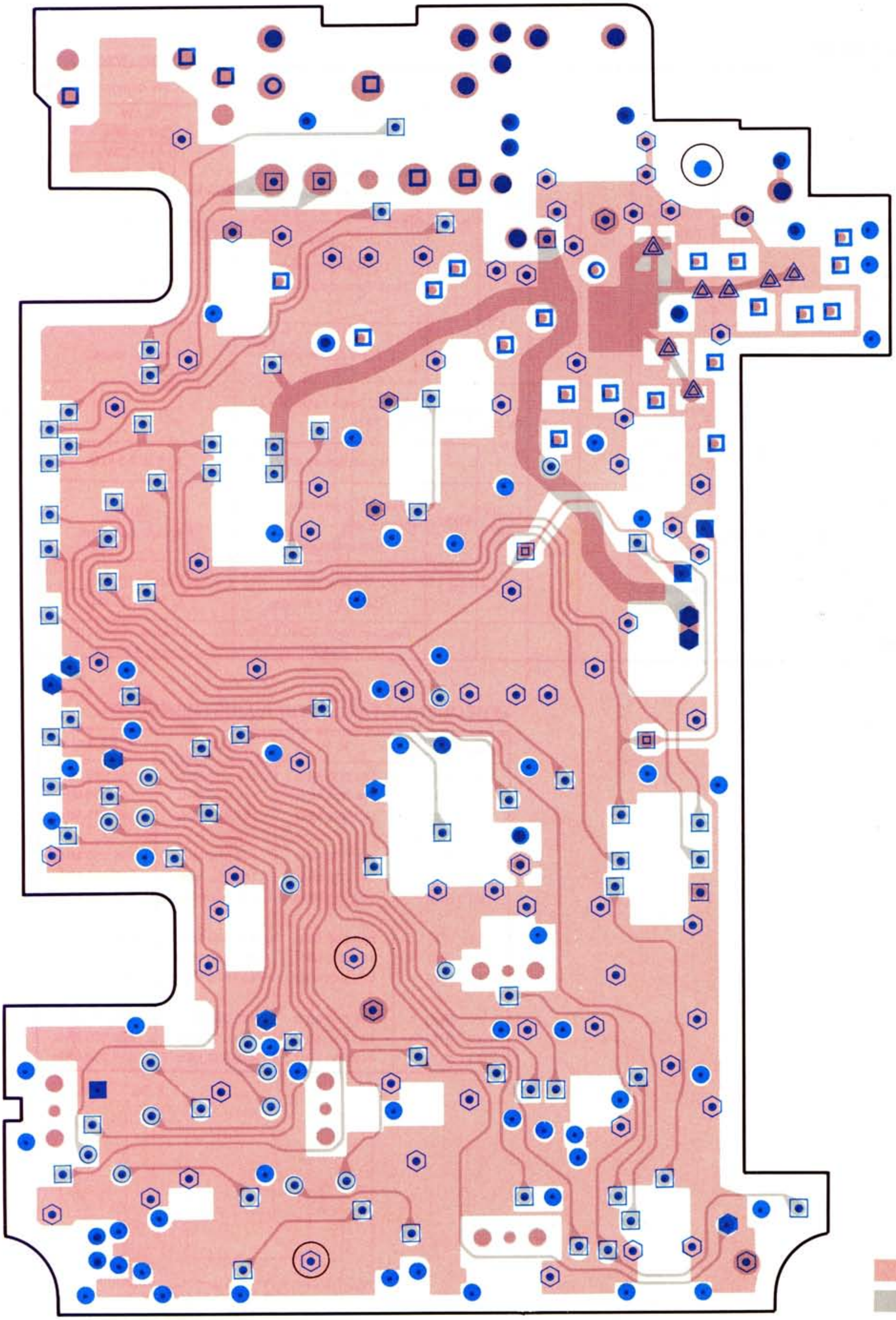
TA7787AF



NJM2073S



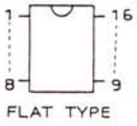
TH-78A/E



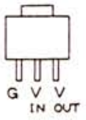
▨ **B pattern**

▨ **C pattern**

MC3372D



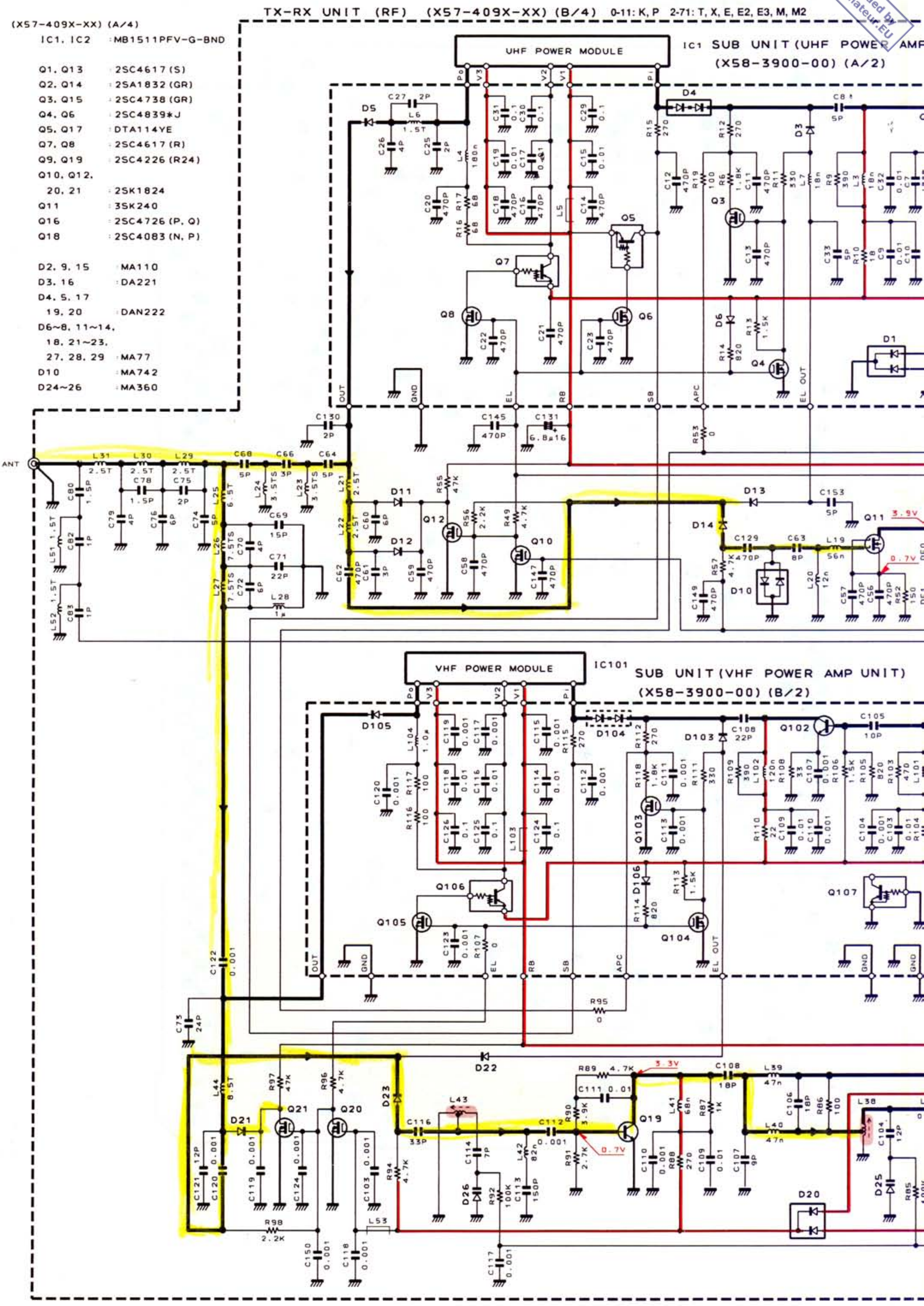
S-81250HG-RD

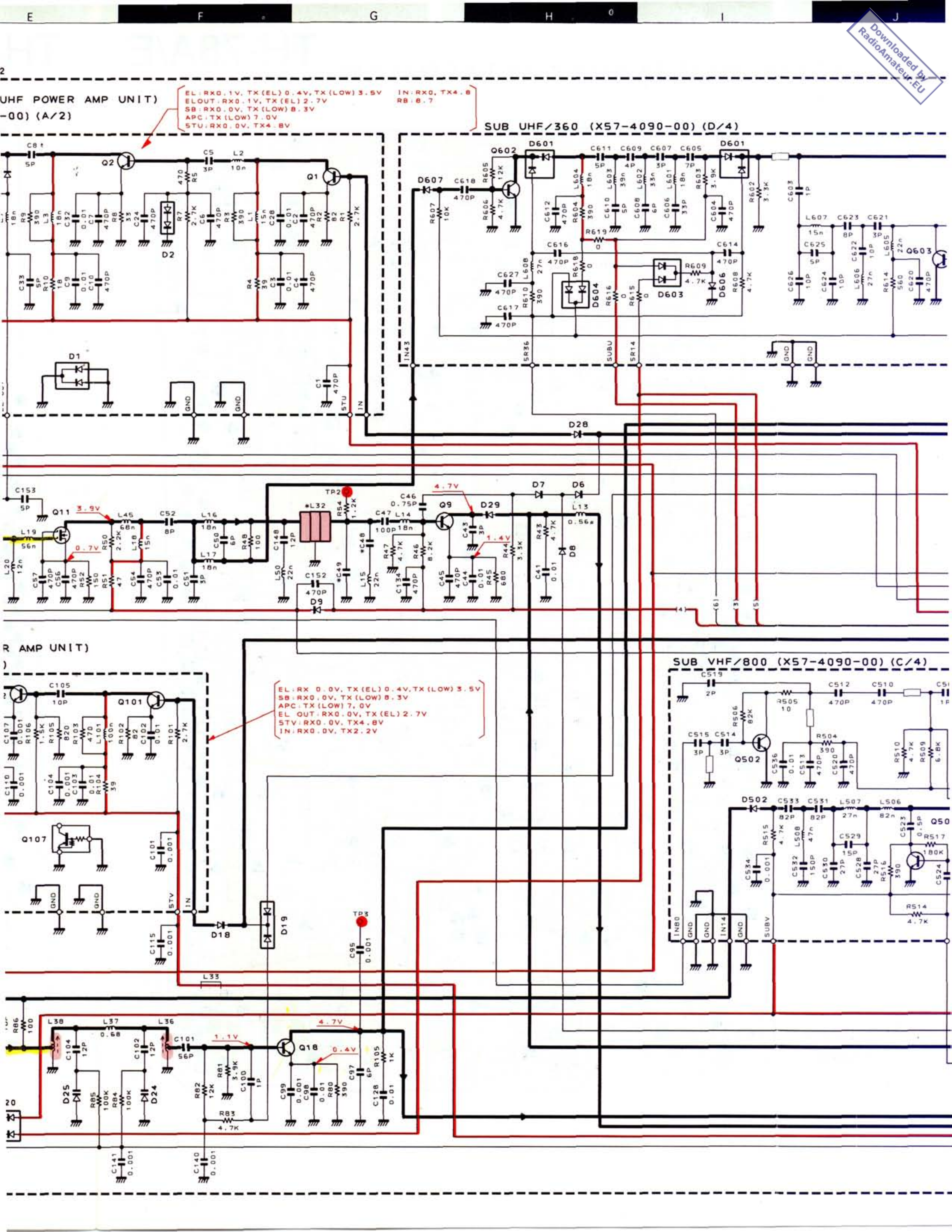


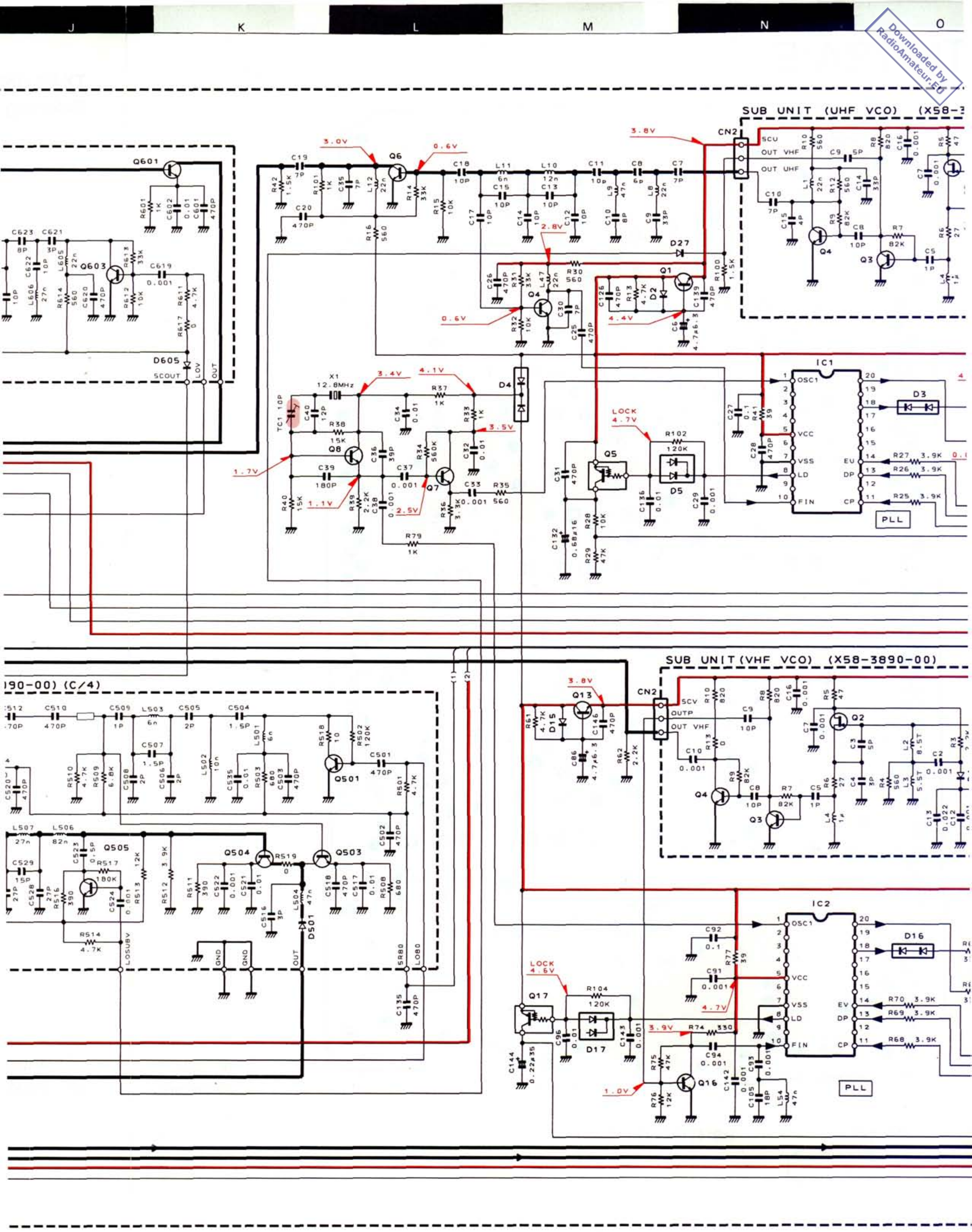
TX-RX UNIT (RF) (X57-409X-XX) (B/4) 0-11: K, P 2-71: T, X, E, E2, E3, M, M2

(X57-409X-XX) (A/4)

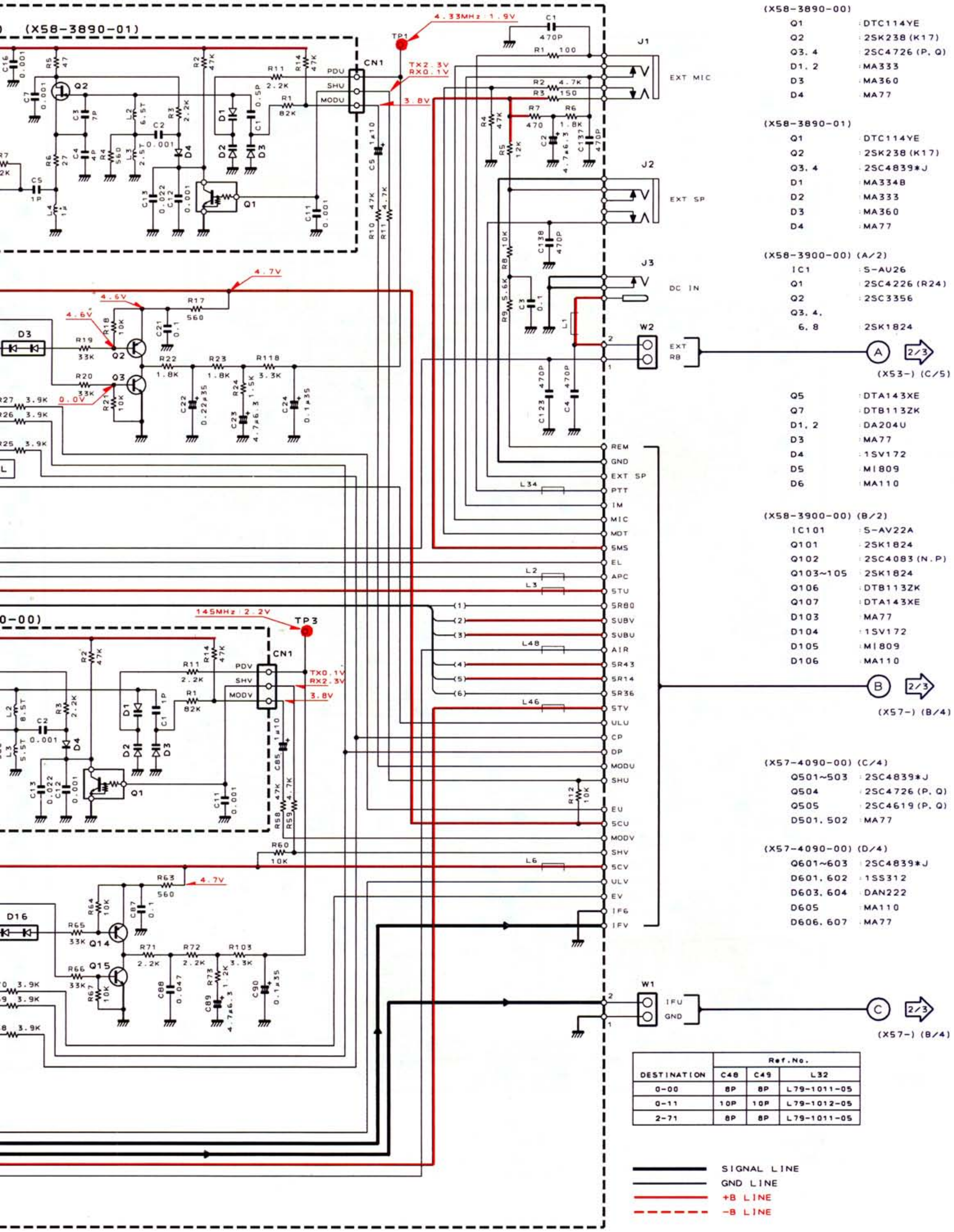
IC1, IC2	MB1511PFV-G-BND
Q1, Q13	2SC4617(S)
Q2, Q14	2SA1832(GR)
Q3, Q15	2SC4738(GR)
Q4, Q6	2SC4839*J
Q5, Q17	DTA114YE
Q7, Q8	2SC4617(R)
Q9, Q19	2SC4226(R24)
Q10, Q12, 20, 21	2SK1824
Q11	3SK240
Q16	2SC4726(P, Q)
Q18	2SC4083(N, P)
D2, 9, 15	MA110
D3, 16	DA221
D4, 5, 17 19, 20	DAN222
D6~8, 11~14, 18, 21~23, 27, 28, 29	MA77
D10	MA742
D24~26	MA360




E
F
G
H
I
J
UHF POWER AMP UNIT)
-00) (A/2)
EL:RX0.1V, TX(EL)0.4V, TX(LOW)3.5V
ELOUT:RX0.1V, TX(EL)2.7V
SB:RX0.0V, TX(LOW)8.3V
APC:TX(LOW)7.0V
STU:RX0.0V, TX4.8V
IN:RX0, TX4.8
RB:8.7
SUB UHF/360 (X57-4090-00) (D/4)
R AMP UNIT)
EL:RX 0.0V, TX(EL)0.4V, TX(LOW)3.5V
SB:RX0.0V, TX(LOW)8.3V
APC:TX(LOW)7.0V
EL OUT:RX0.0V, TX(EL)2.7V
STV:RX0.0V, TX4.8V
IN:RX0.0V, TX2.2V
SUB VHF/800 (X57-4090-00) (C/4)
Q1
Q2
Q9
Q11
Q18
Q101
Q107
Q502
Q602
Q603
D1
D2
D6
D7
D8
D9
D18
D19
D24
D25
D28
D29
D502
D601
D603
D604
D606
D607
TP2
TP3
3.9V
0.7V
4.7V
1.4V
1.1V
0.4V
*L32
L33
IN43
SR36
SUBU
SR14
IN80
IN14
SUBV
STU
STV
IN
GND
(4)
(6)
(3)
(5)


J
K
L
M
N
O
SUB UNIT (UHF VCO) (X58-3
SUB UNIT (VHF VCO) (X58-3890-00)
)90-00) (C/4)
CN2
SCU
OUT VHF
OUT UHF
SCV
OUTP
Q601
Q603
Q6
Q4
Q1
Q3
Q5
Q7
Q8
Q13
Q2
Q16
Q17
Q501
Q503
Q504
Q505
IC1
IC2
OSC1
VCC
VSS
LD
FIN
EU
EV
DP
CP
PLL
D3
D4
D5
D2
D15
D16
D17
D27
D501
D605
X1
12.8MHz
TC1 10P
SCOUT
LOV
OUT
LOSUBV
GND
SR80
LO80
3.0V
0.6V
3.8V
2.8V
4.4V
3.4V
4.1V
3.5V
1.7V
1.1V
2.5V
LOCK 4.7V
LOCK 4.6V
4.7V
3.9V
1.0V
R27 3.9K
R26 3.9K
R25 3.9K
R70 3.9K
R69 3.9K
R68 3.9K
R102 120K
R104 120K
R74 330
R37 1K
R38 15K
R35 560
R79 1K
R30 560
C33 0.001
C37 0.001
C39 180P
C94 0.001
C132 0.68/16
C144 0.22/35
C6 4.7/6.3
C86 4.7/6.3

TX-RX UNIT (RF)



(X58-3890-00)

Q1	:DTC114YE
Q2	:2SK238 (K17)
Q3, 4	:2SC4726 (P, Q)
D1, 2	:MA333
D3	:MA360
D4	:MA77

(X58-3890-01)

Q1	:DTC114YE
Q2	:2SK238 (K17)
Q3, 4	:2SC4839*J
D1	:MA334B
D2	:MA333
D3	:MA360
D4	:MA77

(X58-3900-00) (A/2)

IC1	:S-AU26
Q1	:2SC4226 (R24)
Q2	:2SC3356
Q3, 4, 6, 8	:2SK1824
Q5	:DTA143XE
Q7	:DTB113ZK
D1, 2	:DA204U
D3	:MA77
D4	:1SV172
D5	:MI809
D6	:MA110

(X58-3900-00) (B/2)

IC101	:S-AV22A
Q101	:2SK1824
Q102	:2SC4083 (N.P)
Q103~105	:2SK1824
Q106	:DTB113ZK
Q107	:DTA143XE
D103	:MA77
D104	:1SV172
D105	:MI809
D106	:MA110

(X57-4090-00) (C/4)

Q501~503	:2SC4839*J
Q504	:2SC4726 (P, Q)
Q505	:2SC4619 (P, Q)
D501, 502	:MA77

(X57-4090-00) (D/4)

Q601~603	:2SC4839*J
D601, 602	:1SS312
D603, 604	:DAN222
D605	:MA110
D606, 607	:MA77

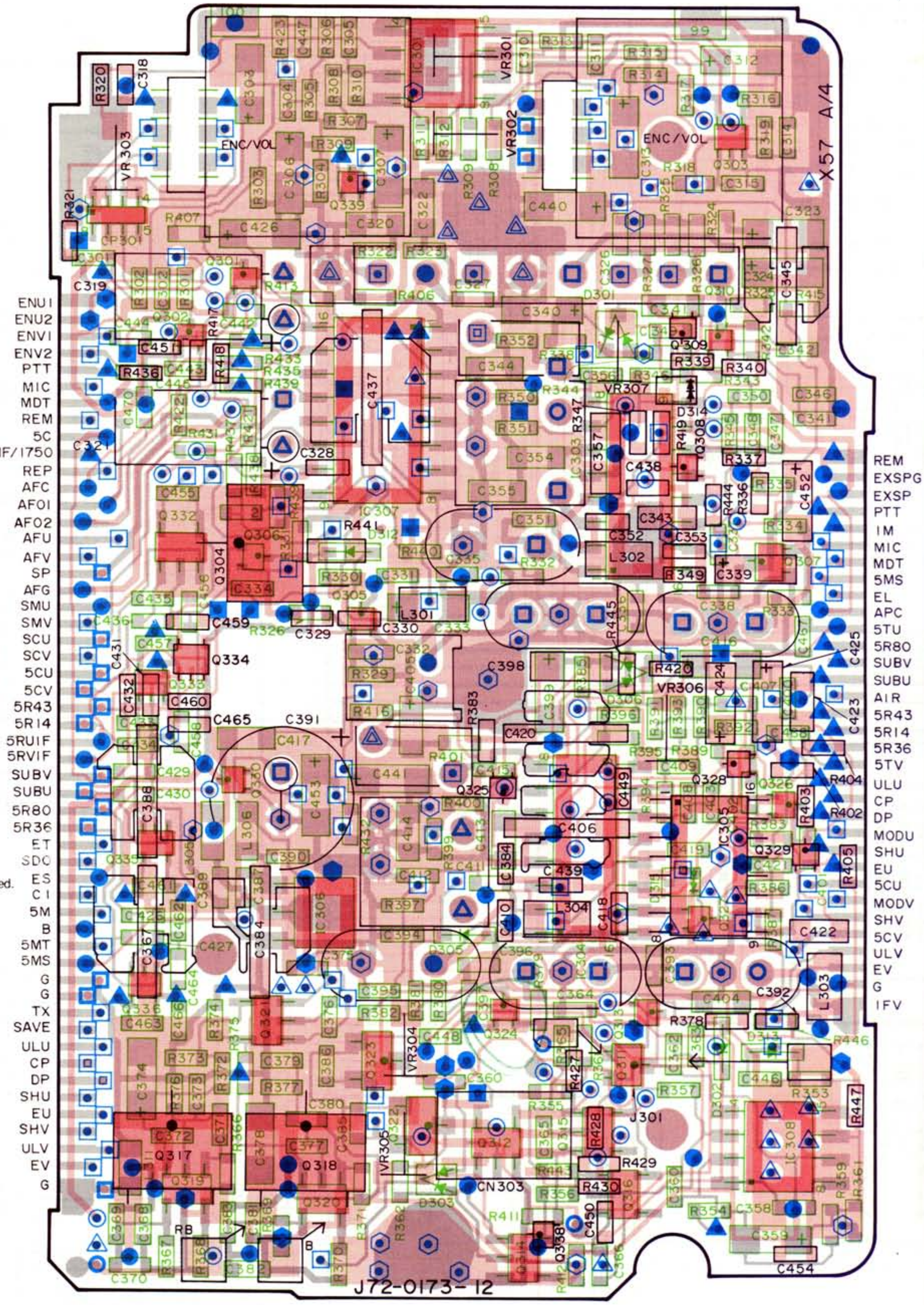
DESTINATION	Ref.No.		
	C48	C49	L32
0-00	8P	8P	L79-1011-05
0-11	10P	10P	L79-1012-05
2-71	8P	8P	L79-1011-05

UNIT BOARDS

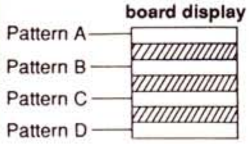
TH-78A/E

TX-RX UNIT·IF (X57-409X-XX) A/4 0-11: K, P 2-71: T, X, E, E2, E3, M, M2

Component side



Four-Layer board display



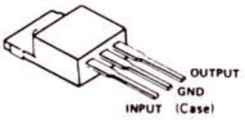
- ■ Patterns A and B are connected.
- ⊙ Patterns A and C are connected.
- ● Patterns A and D are connected.
- △ Patterns B and C are connected.
- ▲ Patterns B and D are connected.
- ▣ Patterns C and D are connected.
- ◎ Patterns A, B and C are connected.
- ⊙ Patterns A, B and D are connected.
- ⬢ Patterns A, C and D are connected.
- ▣ Patterns B, C and D are connected.
- △ Patterns A, B, C and D are connected.
- ○ Only pattern A is connected.
- ⬡ Only pattern B is connected.
- △ Only pattern C is connected.
- □ Only pattern D is connected.

The non-mark indicates no connection.

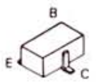
🟥 **A pattern**

▨ **D pattern**

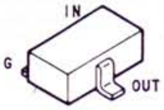
MA110
MA360
MA77



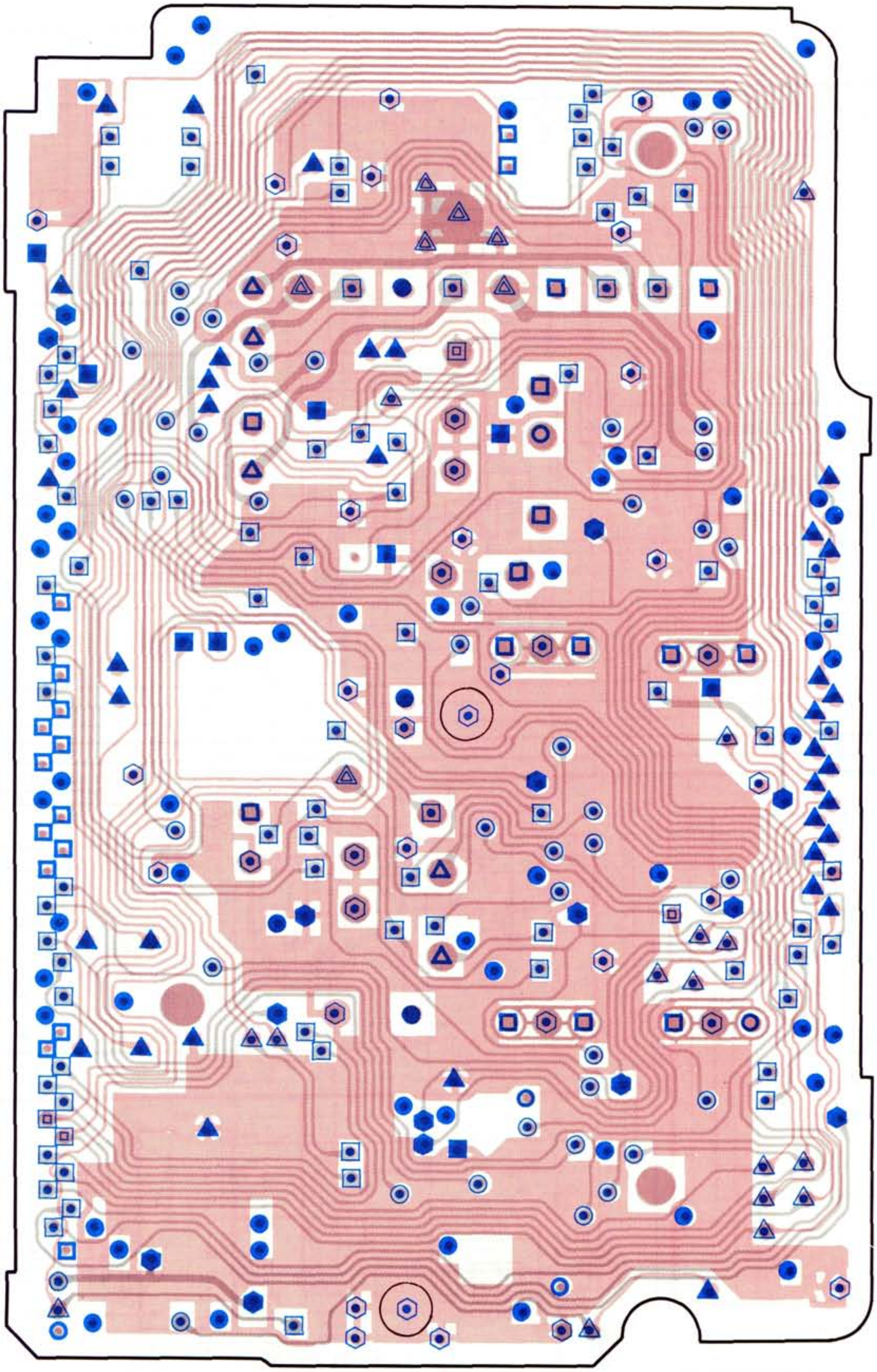
2SC4083
2SC4617
2SA1832
2SC4726
2SC4738
2SC4839-J
2SC4226



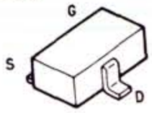
DTC114YE



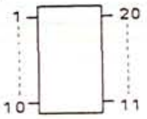
TH-78A/E



2SK1824

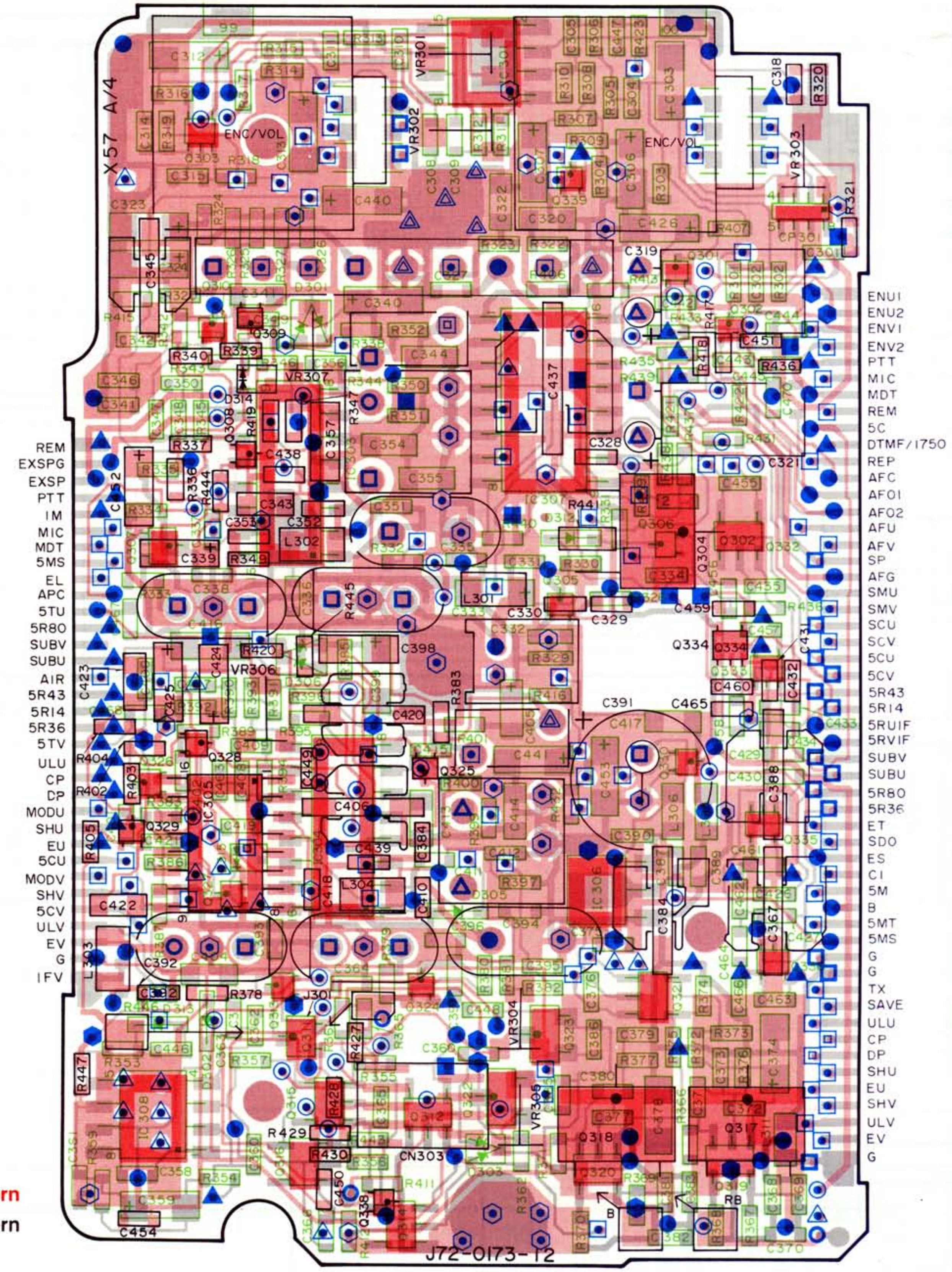


MB1511PFV-G-BND



TX RX UNIT•IF (X57-409X-XX) A/4 0-11: K, P 2-71: T, X, E, E2, E3, M, M2

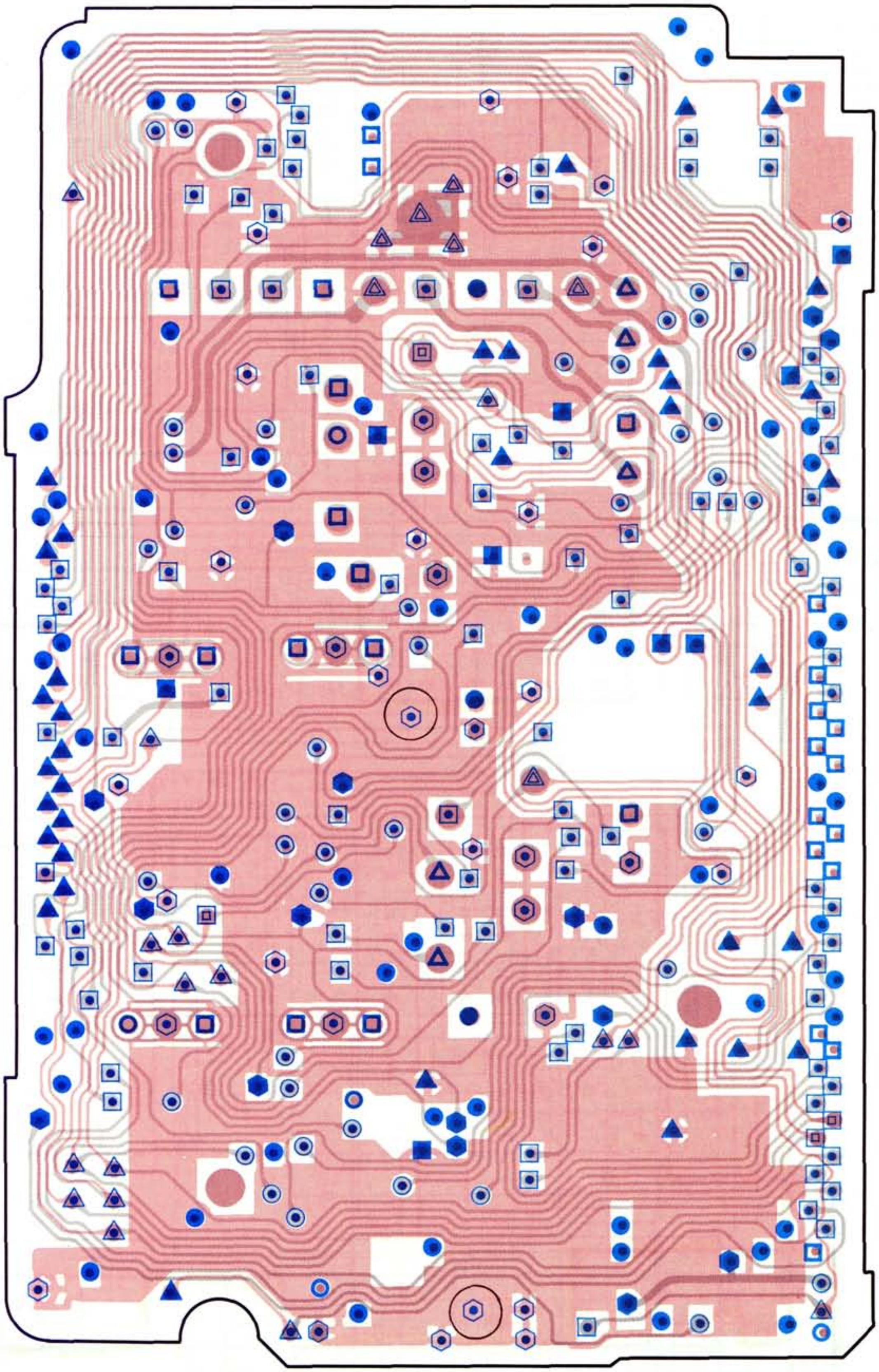
Soldering side



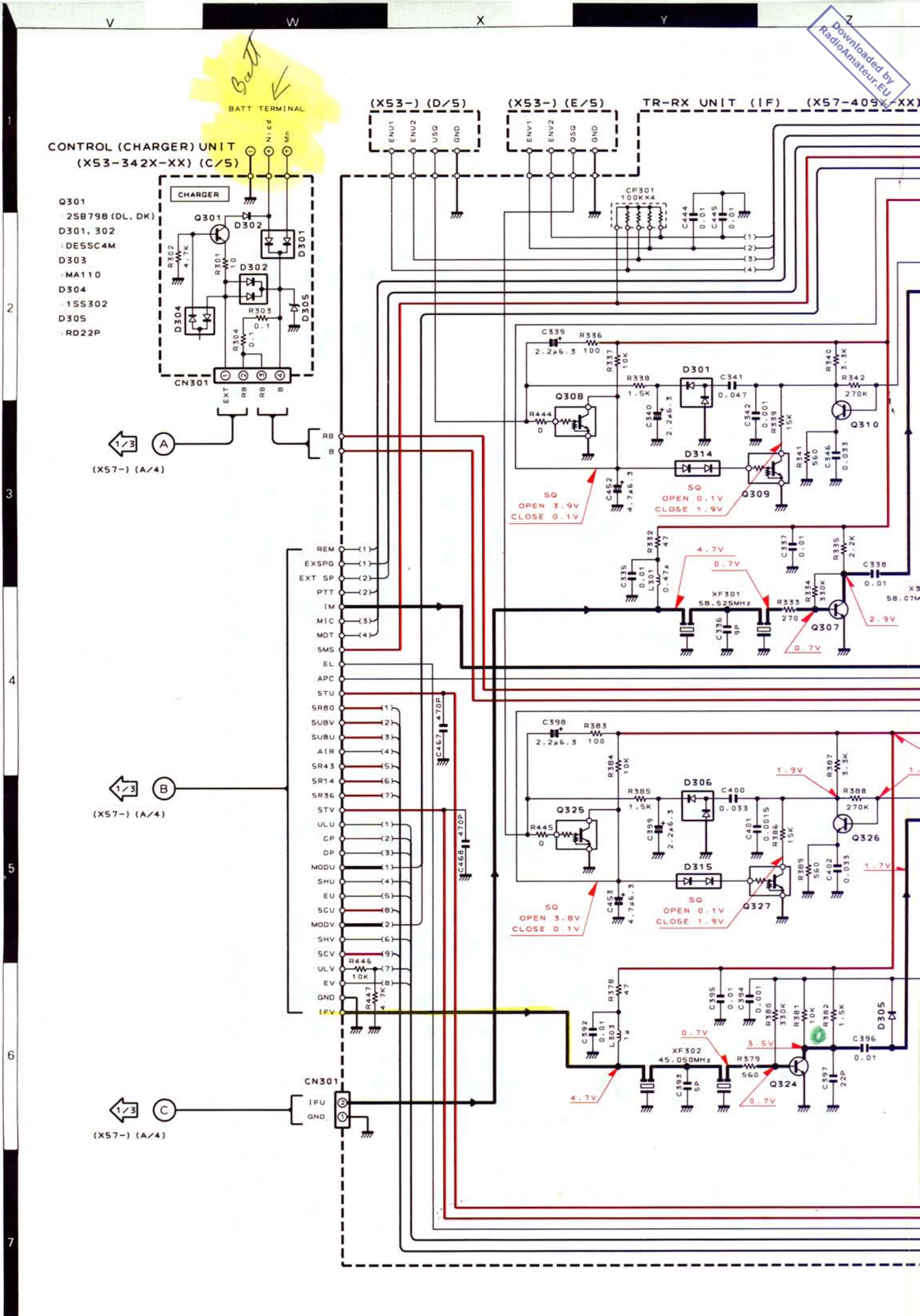
pattern
pattern

🟥 A pattern
▨ D pattern

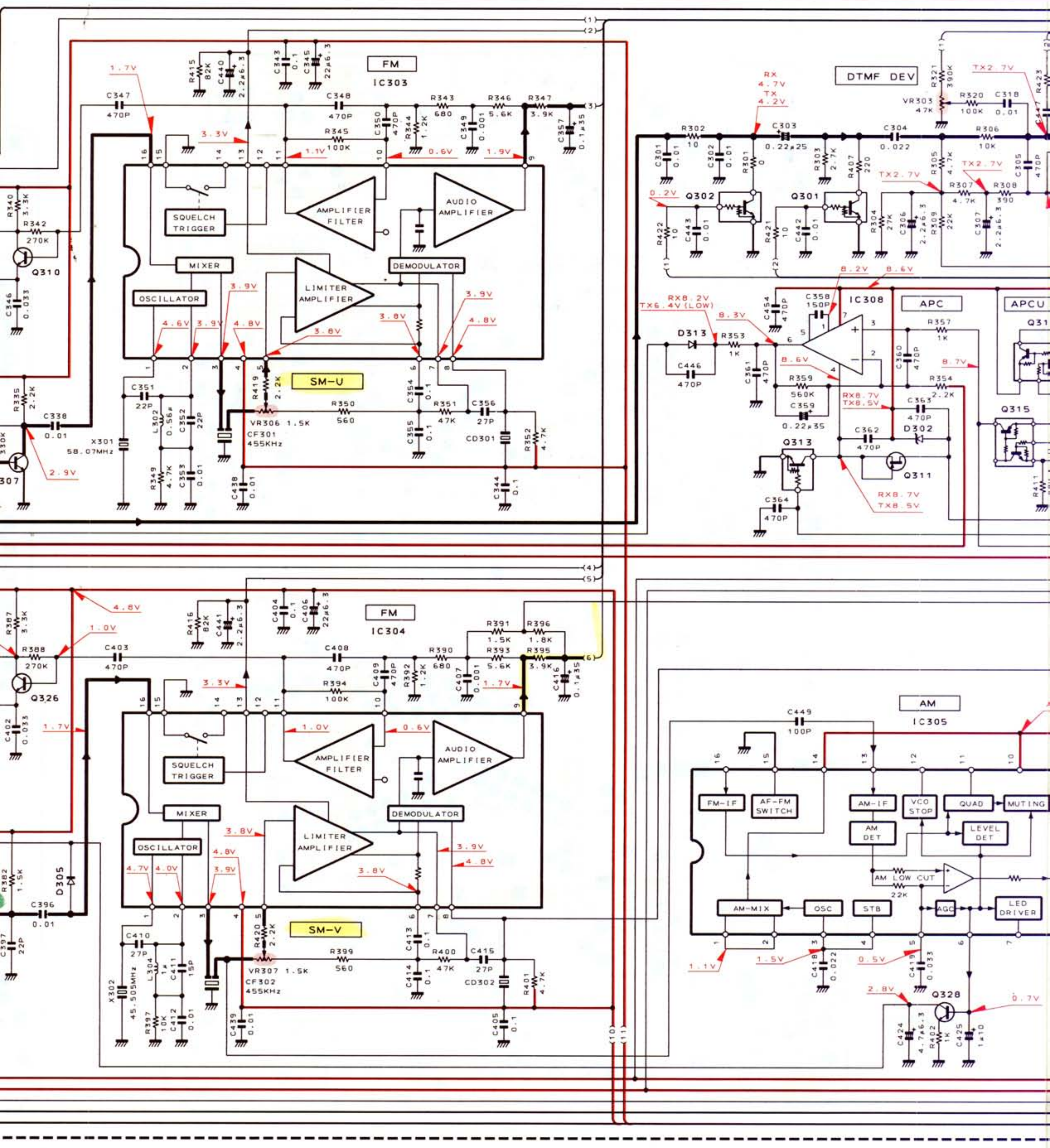
TH-78A/E

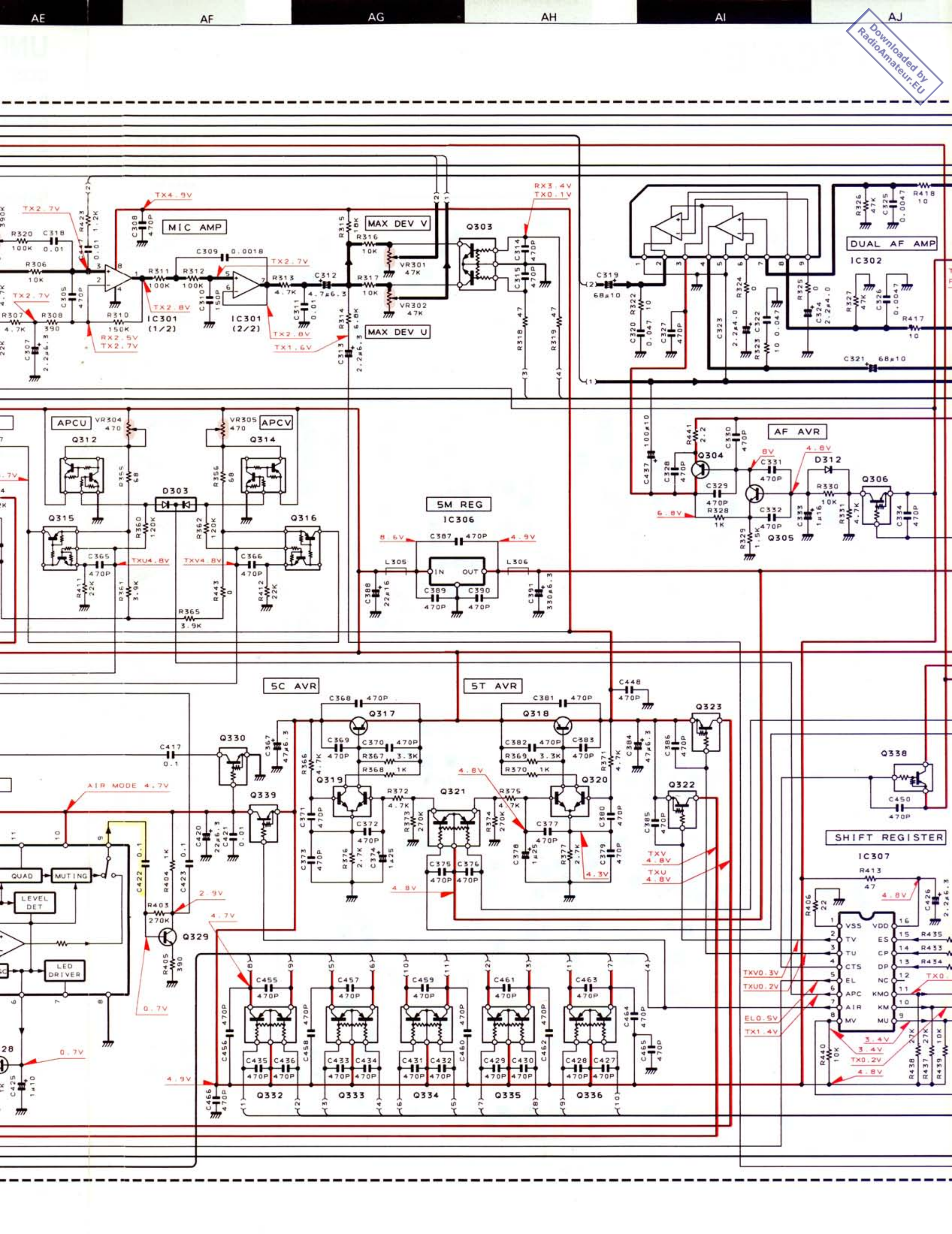


🟥 **B pattern**
▨ **C pattern**

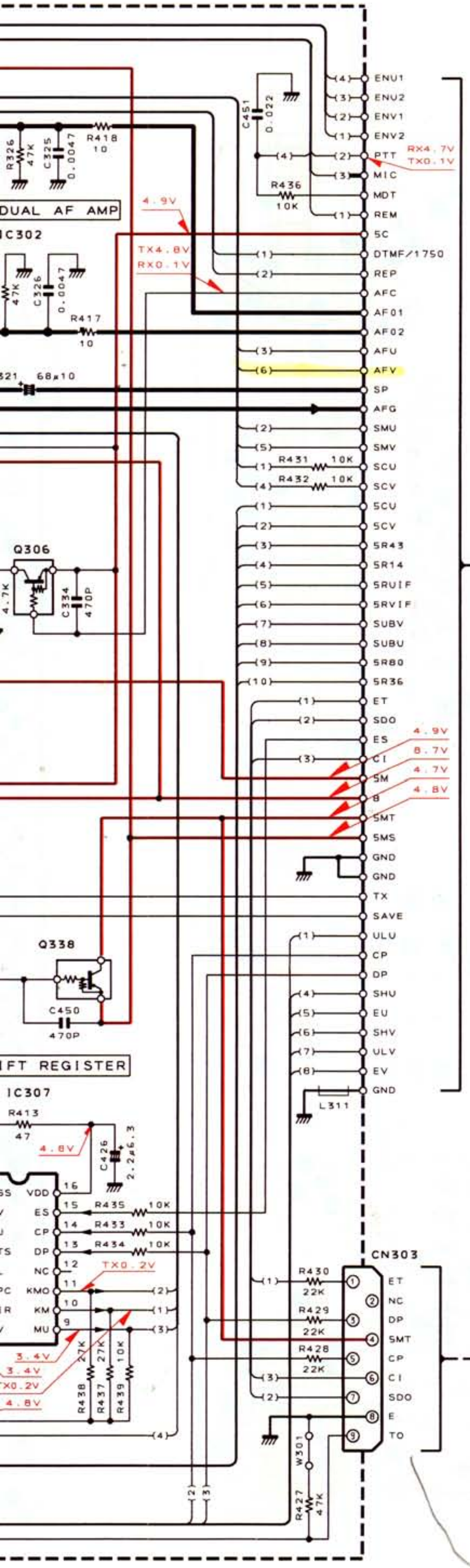

V
W
X
Y
Z
1
2
3
4
5
6
7
Batt
BATT TERMINAL
Nicd
Mn
CONTROL (CHARGER) UNIT
(X53-342X-XX) (C/5)
CHARGER
Q301
: 2SB798 (DL, DK)
D301, 302
: DE5SC4M
D303
: MA110
D304
: 1SS302
D305
: RD22P
Q301
D302
D301
R302 4.7K
R301 10
D302
D305
D304
R303 0.1
R304 0.1
CN301
EXT
RB
RB
B
(X53-) (D/5)
ENU1
ENU2
USQ
GND
(X53-) (E/5)
ENV1
ENV2
QSQ
GND
TR-RX UNIT (IF)
(X57-409X-XX)
CP301
100K×4
C444 0.01
C445 0.01
(1)
(2)
(3)
(4)
1/3
A
(X57-) (A/4)
RB
B
C339
2.2μ6.3
R336 100
R337 10K
R338 1.5K
D301
C341 0.047
R340 3.3K
R342 270K
Q308
R444 0
C340 2.2μ6.3
C342 0.001
R339 15K
Q310
R341 560
C346 0.033
D314
Q309
C452 4.7μ6.3
SQ
OPEN 3.9V
CLOSE 0.1V
SQ
OPEN 0.1V
CLOSE 1.9V
REM
EXSPG
EXT SP
PTT
IM
MIC
MDT
5MS
EL
APC
5TU
5R80
SUBV
SUBU
AIR
5R43
5R14
5R36
5TV
ULU
CP
DP
MODU
SHU
EU
SCU
MODV
SHV
SCV
ULV
EV
GND
IFV
R332 47
C335 0.01
L301 0.47μ
4.7V
0.7V
C337 0.01
R335 2.2K
C338 0.01
XF301
58.525MHz
C336 9P
R333 270
R334 330K
Q307
2.9V
0.7V
58.07M
C467 470P
C468 470P
1/3
B
(X57-) (A/4)
C398
2.2μ6.3
R383 100
R384 10K
R385 1.5K
D306
C400 0.033
R387 3.3K
R388 270K
1.9V
Q325
R445 0
C399 2.2μ6.3
C401 0.0015
R386 15K
Q326
R389 560
C402 0.033
1.7V
D315
Q327
C453 4.7μ6.3
SQ
OPEN 3.8V
CLOSE 0.1V
SQ
OPEN 0.1V
CLOSE 1.9V
R446 10K
R447 4.7K
R378 47
C392 0.01
L303 1μ
C395 0.01
C394 0.001
R380 330K
R381 10K
R382 1.5K
D305
C396 0.01
0.7V
3.5V
XF302
45.050MHz
C393 5P
R379 560
Q324
C397 22P
4.7V
0.7V
CN301
IFU
GND
1/3
C
(X57-) (A/4)

X57-409X-XX) (A/4) 0-11: K, P 2-71: T, X, E, E2, E3, M, M2




AE
AF
AG
AH
AI
AJ
MIC AMP
TX4.9V
TX2.7V
R320 100K
C318 0.01
R306 10K
R423 1.2K
C317 0.01
C308 470P
C305 470P
R307 4.7K
R308 390
C307 2.2μ6.3
R310 150K
RX2.5V
TX2.7V
TX2.8V
R311 100K
R312 100K
C309 0.0018
C310 150P
IC301 (1/2)
IC301 (2/2)
R313 4.7K
C311 0.01
C312 4.7μ6.3
TX2.8V
TX1.6V
MAX DEV V
MAX DEV U
R315 18K
R316 10K
R317 10K
VR301 47K
VR302 47K
R314 6.8K
C313 2.2μ6.3
Q303
RX3.4V
TX0.1V
C314 470P
C315 470P
R318 47
R319 47
C319 68μ10
R322 10
C320 0.047
C327 470P
C323 2.2μ4.0
R324 0
R323 10
C322 0.047
R325 0
C324 2.2μ4.0
R326 47K
C325 0.0047
R418 10
DUAL AF AMP
IC302
R327 47K
C326 0.0047
R417 10
C321 68μ10
APCU
VR304 470
Q312
R355 68
D303
VR305 470
APCV
Q314
R356 68
Q315
Q316
R360 120K
R362 120K
C365 470P
C366 470P
TXU4.8V
TXV4.8V
R411 22K
R361 3.9K
R443 0
R412 22K
R365 3.9K
5M REG
IC306
8.6V
4.9V
C387 470P
L305
L306
IN
OUT
C388 22μ16
C389 470P
C390 470P
C391 330μ6.3
AF AVR
C437 100μ10
R441 2.2
C330 470P
Q304
8V
C331 470P
4.8V
D312
C328 470P
C329 470P
R328 1K
Q305
C332 470P
R329 1.5K
6.8V
R330 10K
C333 1μ16
R331 4.7K
Q306
C334 470P
5C AVR
5T AVR
C368 470P
Q317
C369 470P
C370 470P
R367 3.3K
R368 1K
R366 4.7K
C367 47μ6.3
C417 0.1
Q330
Q339
AIR MODE 4.7V
Q319
R372 4.7K
C371 470P
C373 470P
R376 2.7K
C372 470P
C374 1μ25
R373 270K
Q321
C375 470P
C376 470P
4.8V
C381 470P
Q318
C382 470P
C383 470P
R369 3.3K
R370 1K
R375 4.7K
R374 270K
Q320
C377 470P
C378 1μ25
R377 2.7K
C379 470P
C380 470P
R371 4.7K
4.3V
C448 470P
C384 47μ6.3
C386 470P
Q323
Q322
C385 470P
TXV 4.8V
TXU 4.8V
Q338
C450 470P
SHIFT REGISTER
IC307
R413 47
R406 22
4.8V
C426 2.2μ6.3
VSS
TV
TU
CTS
EL
APC
AIR
MV
VDD
ES
CP
DP
NC
KMO
KM
MU
R435
R433
R434
TXV0.3V
TXU0.2V
EL0.5V
TX1.4V
TX0.
3.4V
3.4V
TX0.2V
4.8V
R440 10K
R438 27K
R437 27K
R439 10K
QUAD
MUTING
LEVEL DET
LED DRIVER
C422 0.1
R404 1K
C423 0.1
C420 22μ6.3
C421 0.01
2.9V
R403 270K
Q329
R405 390
4.7V
0.7V
0.7V
C425 1μ10
4.9V
C455 470P
C457 470P
C459 470P
C461 470P
C463 470P
C456 470P
C458 470P
C460 470P
C462 470P
C464 470P
C465 470P
C466 470P
C435 470P
C436 470P
C433 470P
C434 470P
C431 470P
C432 470P
C429 470P
C430 470P
C428 470P
C427 470P
Q332
Q333
Q334
Q335
Q336

TX-RX UNIT (IF)



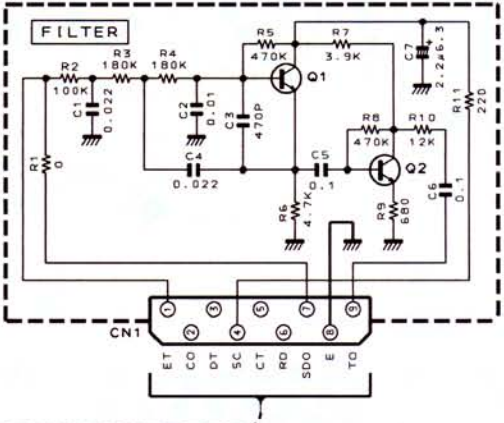
IC301	NJM4560E
IC302	NJM2073S
IC303, 304	MC3372D
IC305	TA7787AF
IC306	S-81250HG-RD
IC307	TC9174F
IC308	LM301AD
Q301, 302, 309, 313, 327, 330	DTC144EE
Q303	UMG1
Q304, 317, 318	2SB1182F5(Q)
Q305, 310, 326, 328, 329	2SC4617(R)
Q306, 339	DTA144WE
Q307	2SC4215(Y)
Q308, 325	DTC114YE
Q311	2SK879(Y)
Q312, 314, 315, 316	FMC4
Q319, 320	FMW1
Q321	FMA1
Q322, 323	DTB113ZK
Q324	2SC4619(P, Q)
Q332	FMA7
Q333~336	UMA9
Q338	DTA114YE

D301, 306	MA742
D302	MA8039
D303	DAN222
D305	MA728
D312, 313	MA110
D314, 315	DA221

D 3/3

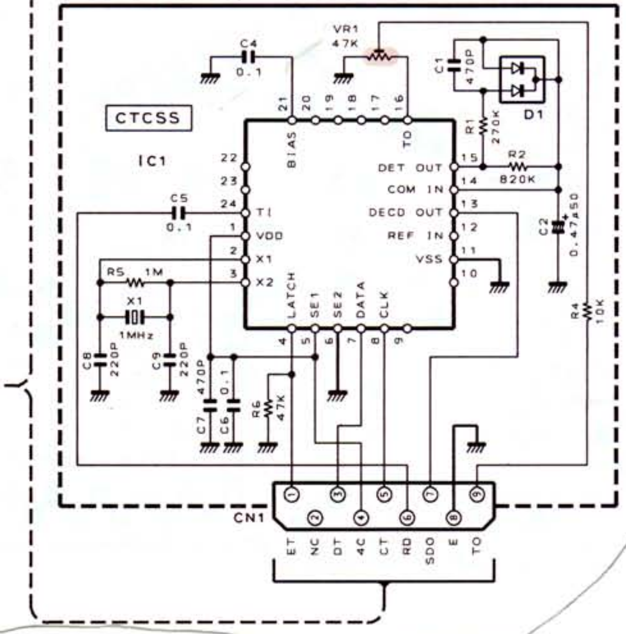
(X53-) (A/5)

(X51-3090-00) FILTER UNIT

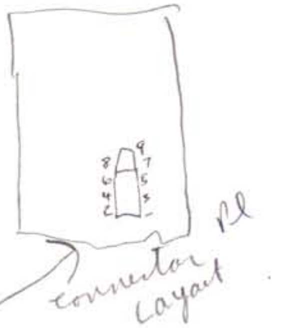


Q1	2SC4116(GR)
Q2	2SC4116(Y)

(X52-3170-00) CTCSS UNIT



IC1	FX365LS
D1	DAN202U



SIGNAL LINE
GND LINE
+B LINE
-B LINE

UNIT BOARDS

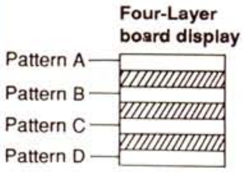
TH-78A/E

CONTROL UNIT (X53-342X-XX) A/5

0-11: K, P   0-21: M   0-22: M2   0-71: X

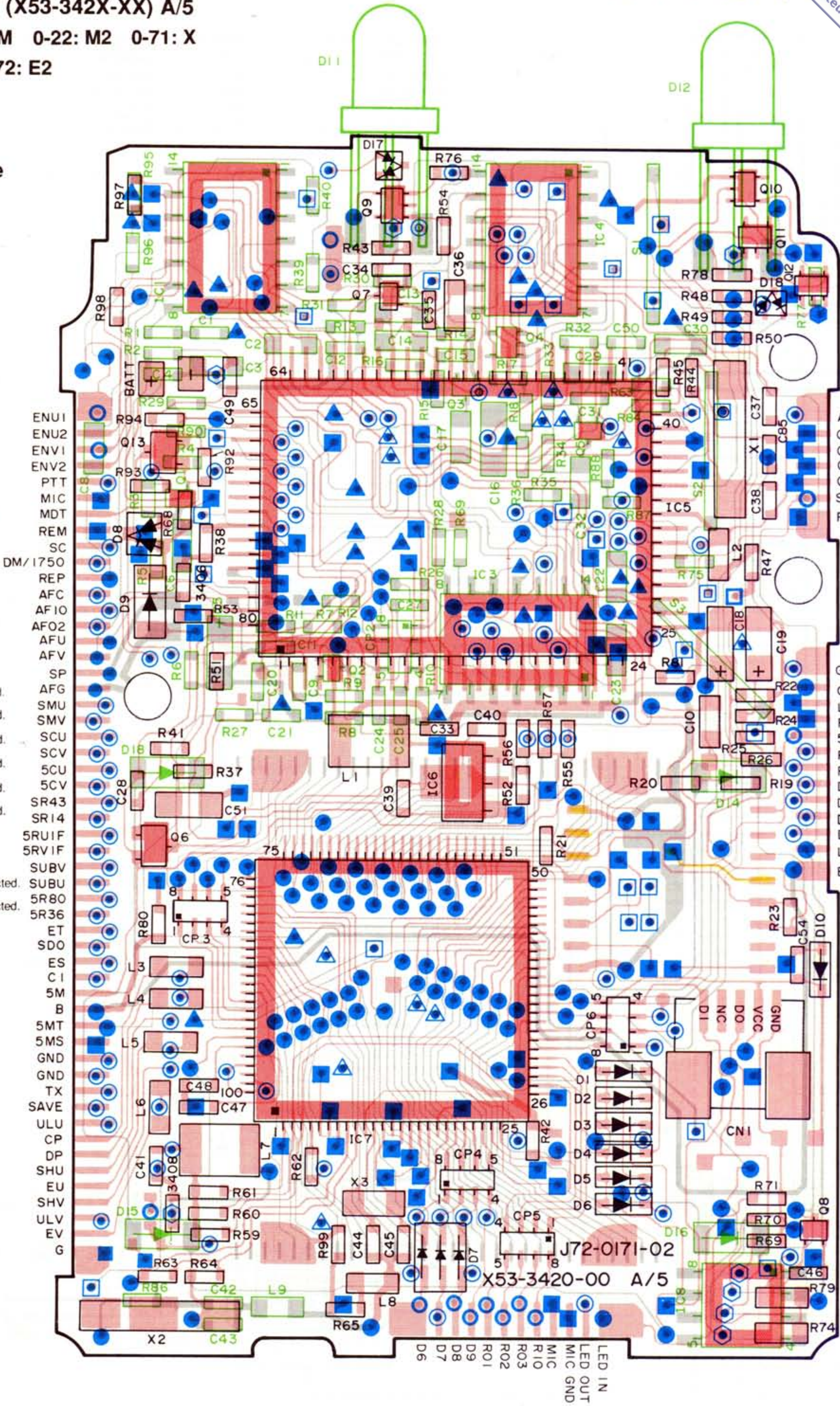
2-71: T, E, E3   2-72: E2

Component side

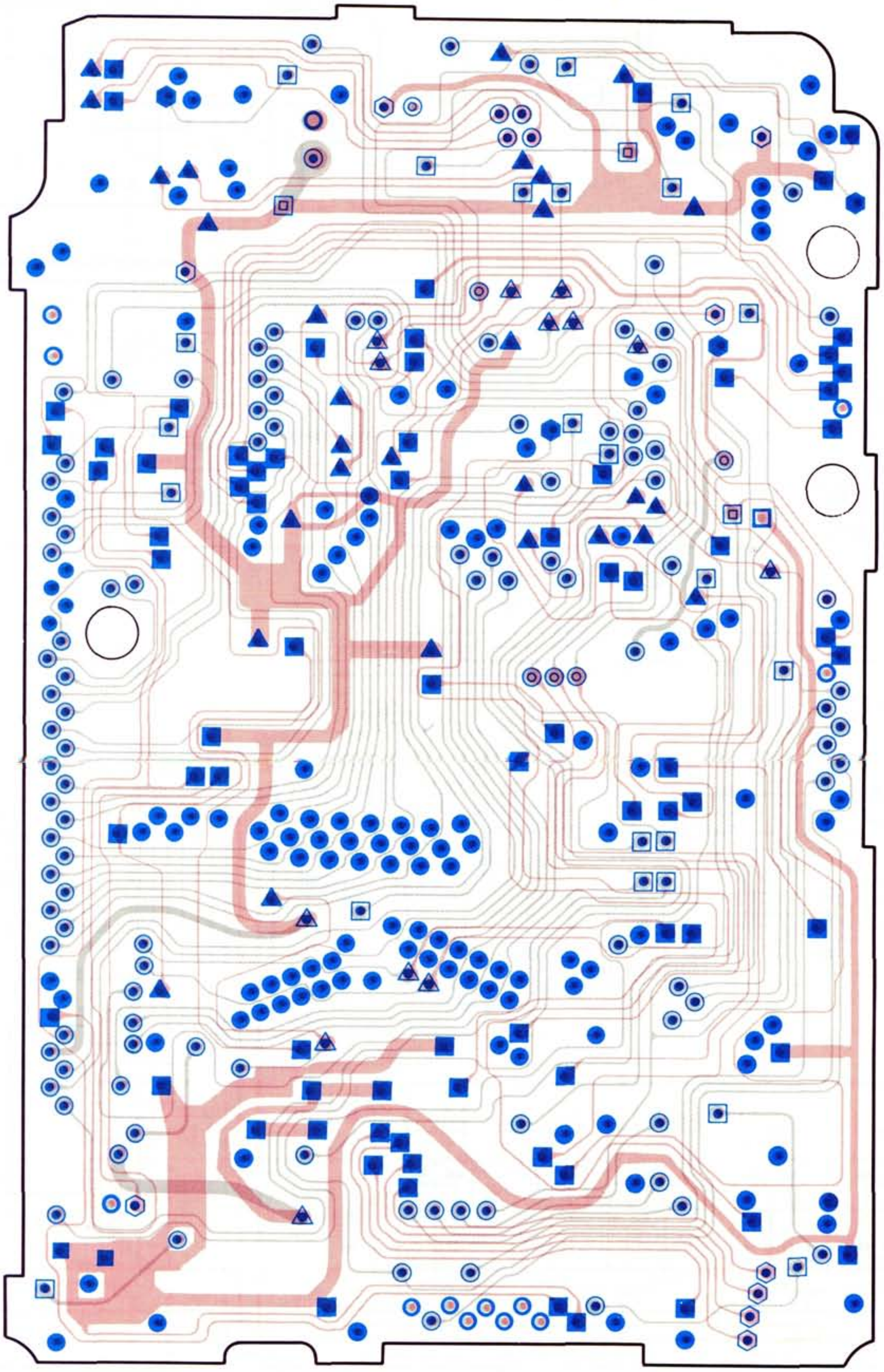


- □ Patterns A and B are connected.
- ▽ Patterns A and C are connected.
- ⬡ Patterns A and D are connected.
- ○ Patterns B and C are connected.
- ▽ Patterns B and D are connected.
- ⧈ Patterns C and D are connected.
- ⬢ Patterns A, B and C are connected.
- ⊙ Patterns A, B and D are connected.
- ◎ Patterns A, C and D are connected.
- ⊡ Patterns B, C and D are connected.
- ▼ Patterns A, B, C and D are connected.
- ▽ Only pattern A is connected.
- ● Only pattern B is connected.
- ⊙ Only pattern C is connected.
- ■ Only pattern D is connected.

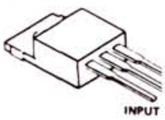
The non-mark indicates no connection.



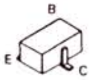
TH-78A/E



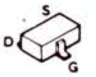
B30-0897-05
B30-2033-05
B30-2039-05
MA110



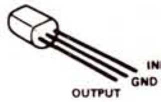
DTA143XE
2SC4617



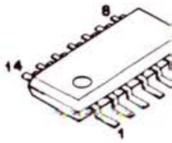
2SJ144



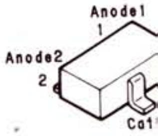
S-8054ALR-LN



BU4066BF



MA741WK



🟥 **B pattern**

▨ **C pattern**

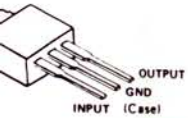
UNIT BOARDS

CONTROL UNIT (X53-342X-XX) A/5

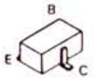
0-11: K, P 0-21: M
0-22: M2 0-71: X
2-71: T, E, E3 2-72: E2

Soldering side

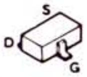
-0897-05
-2033-05
-2039-05
110



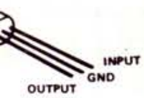
A143XE
C4617



144



054ALR-LN



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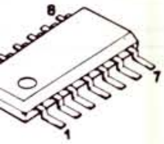

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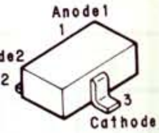
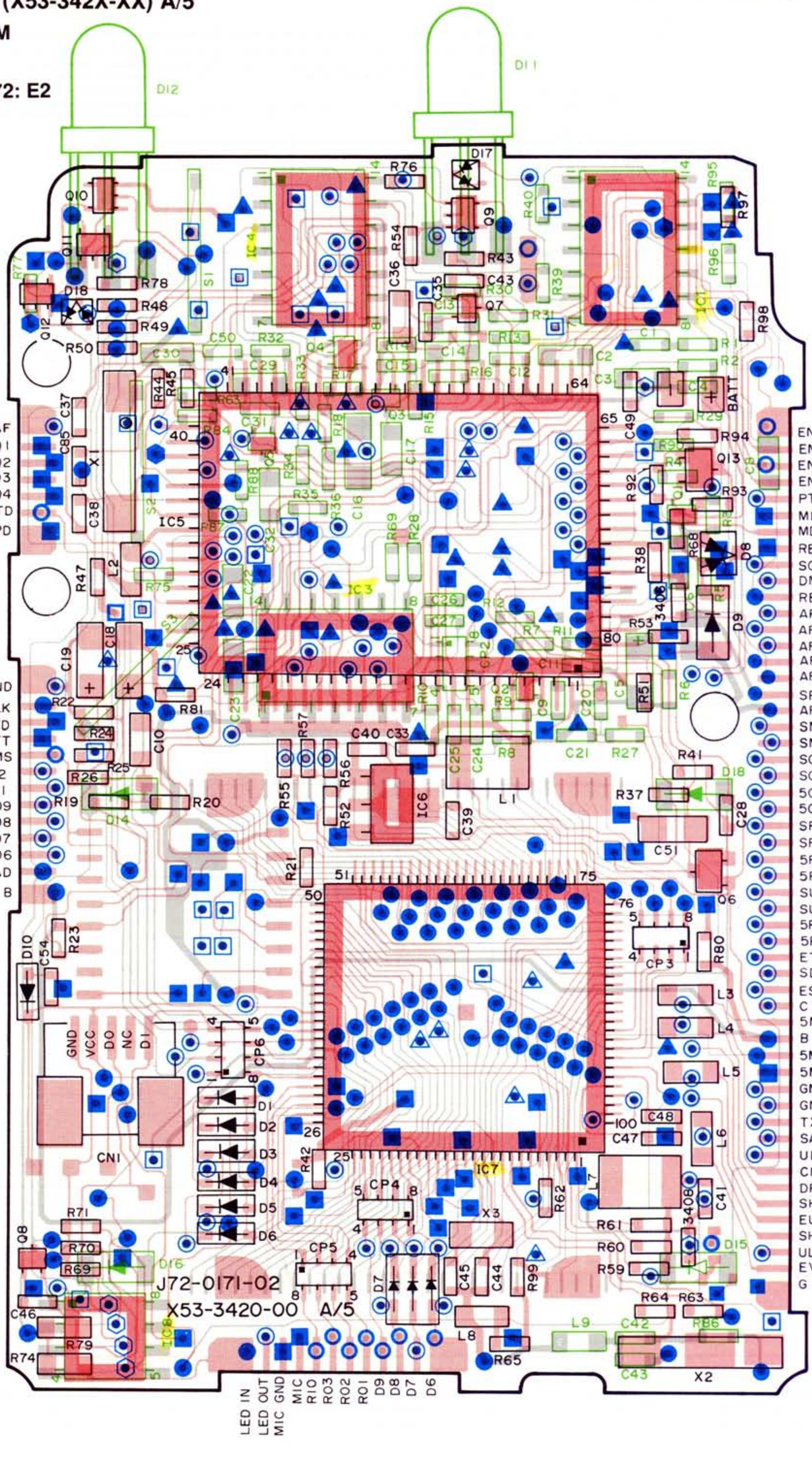
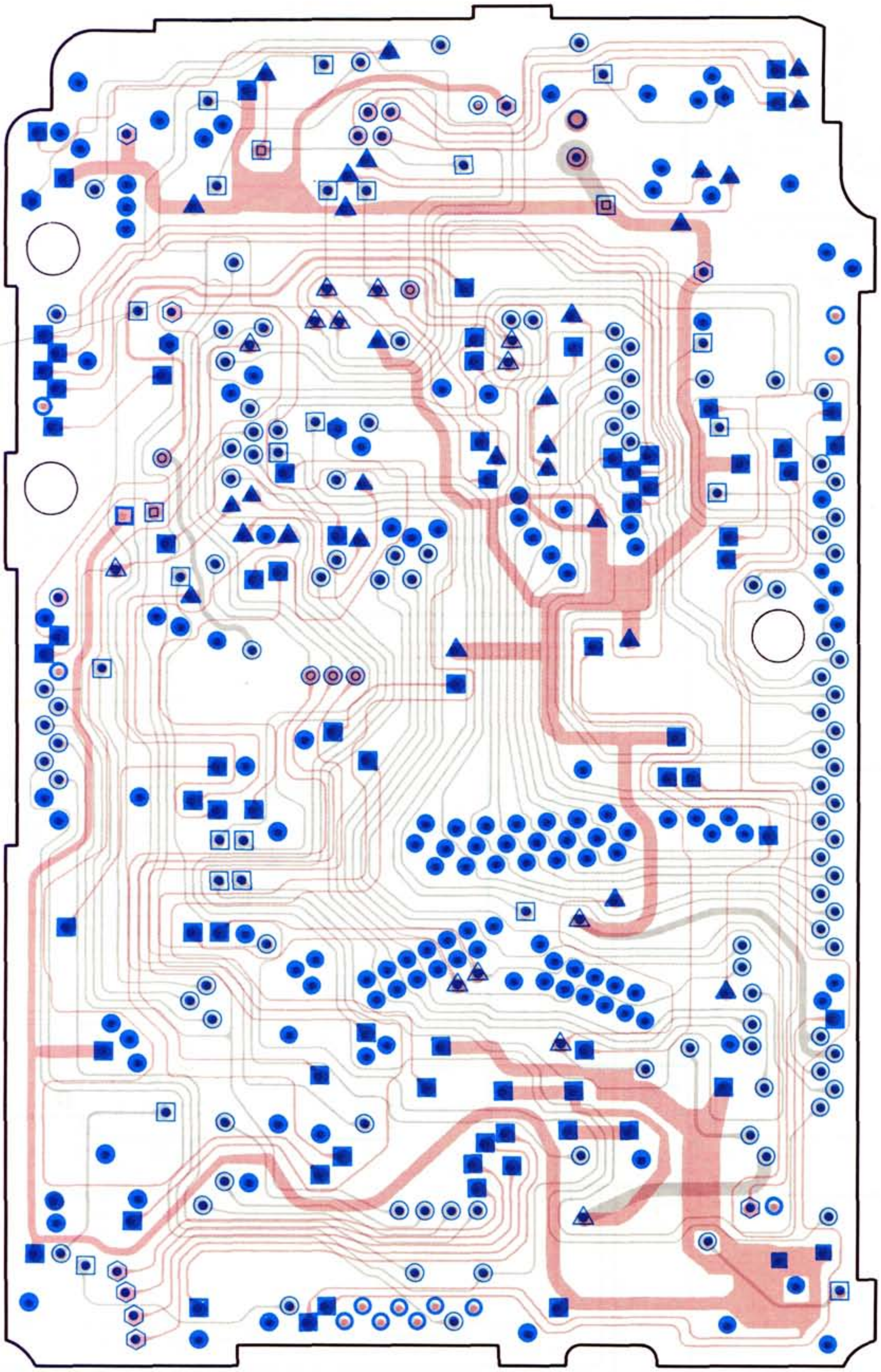




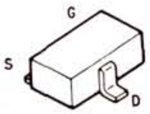
pattern
pattern

🟥 A pattern
▨ D pattern

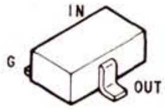
TH-78A/E



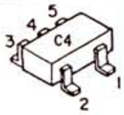
2SK1824



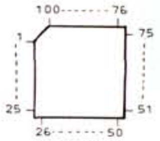
DTC114EE



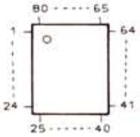
UMC4



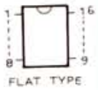
HD404629A20H



75517GF-122-3B9



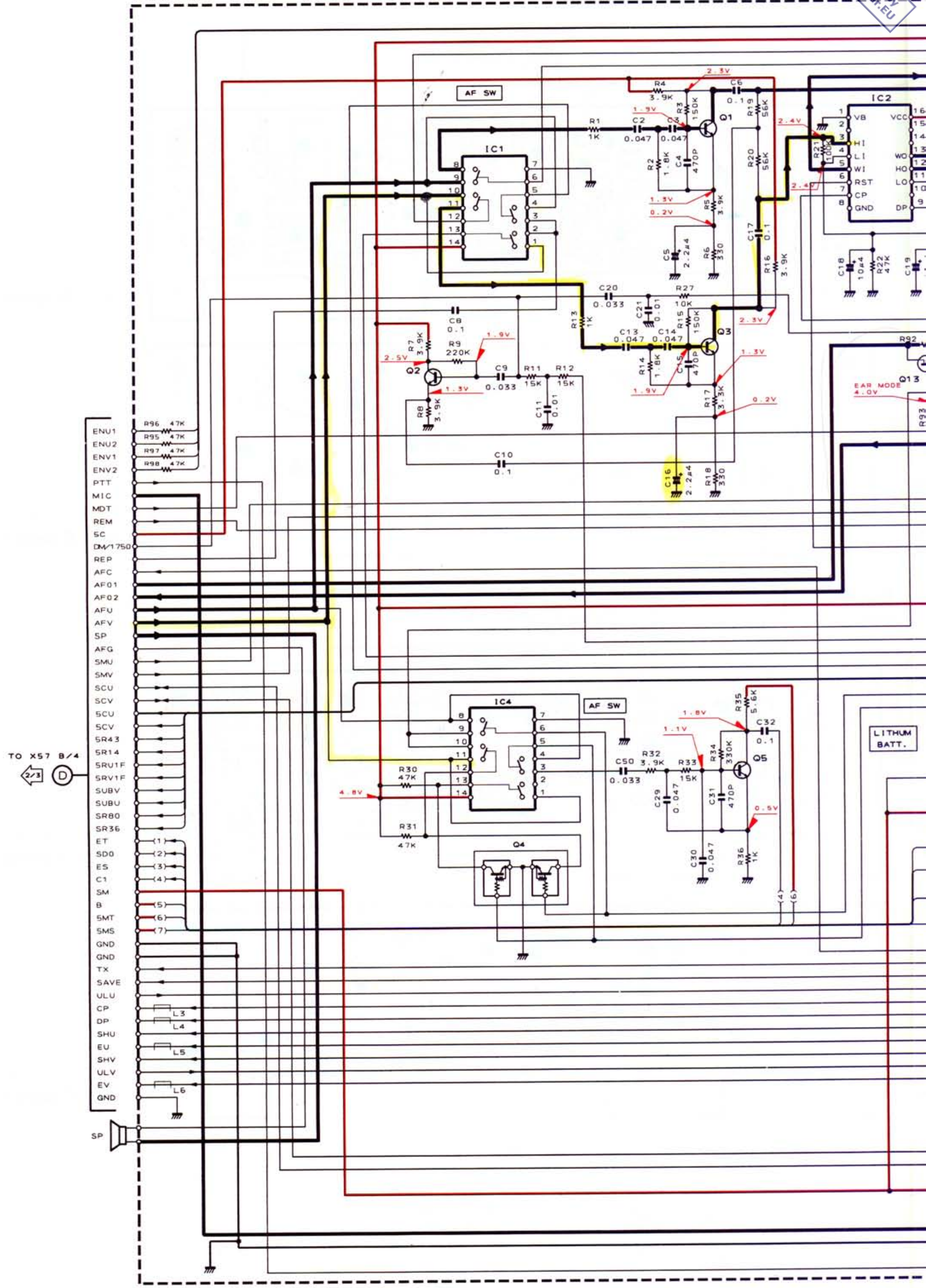
DS1267S-10

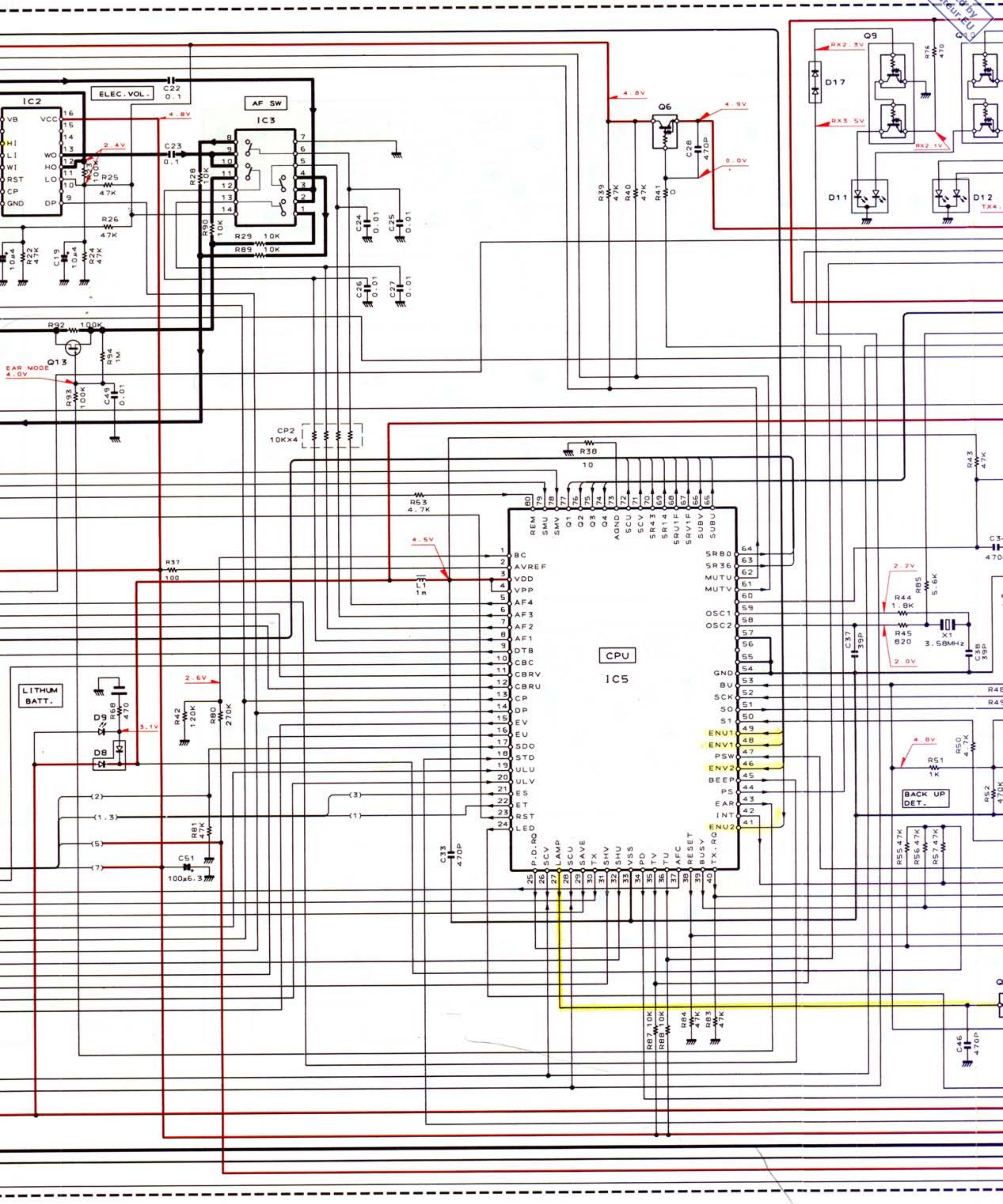


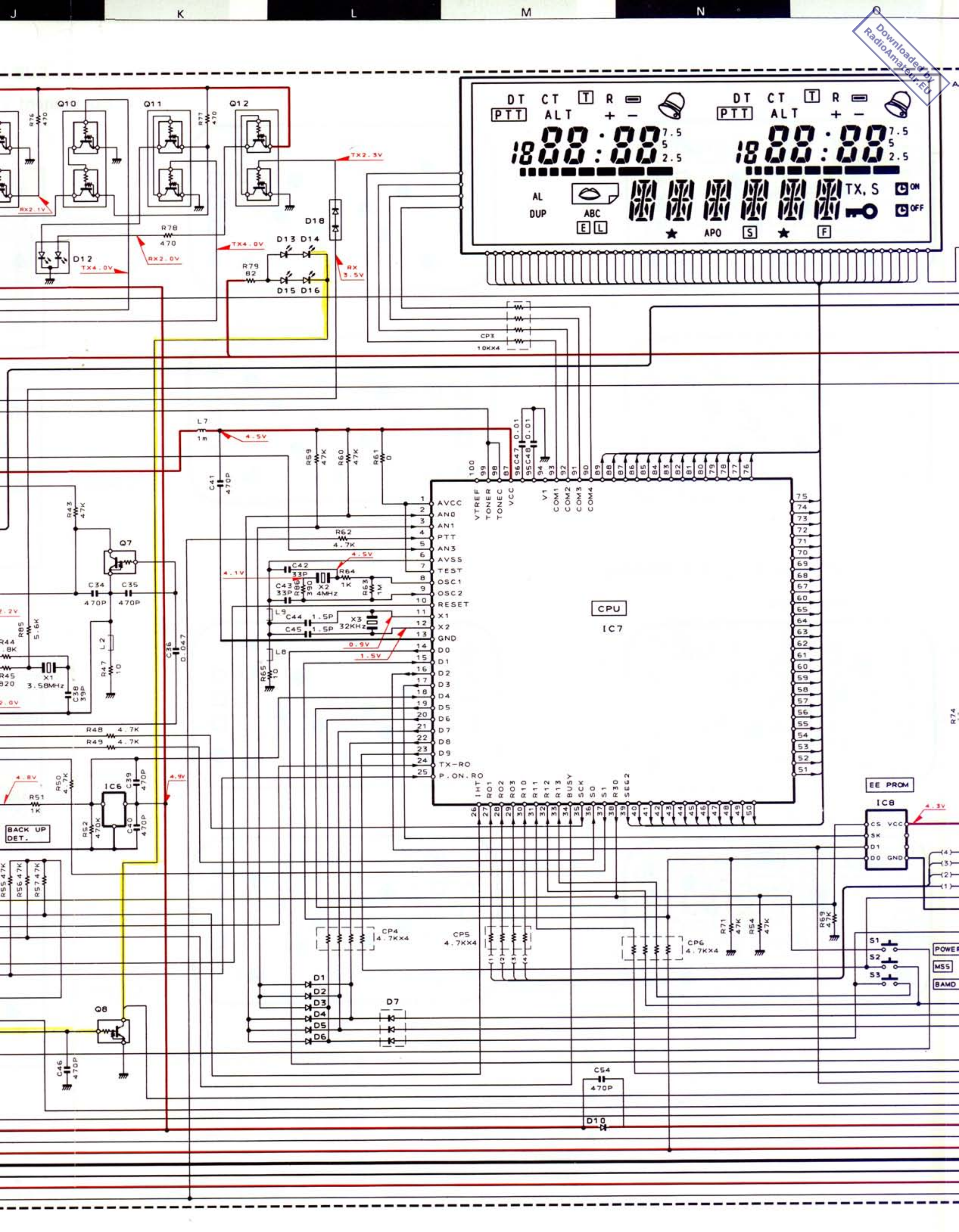
🟥 **B pattern**

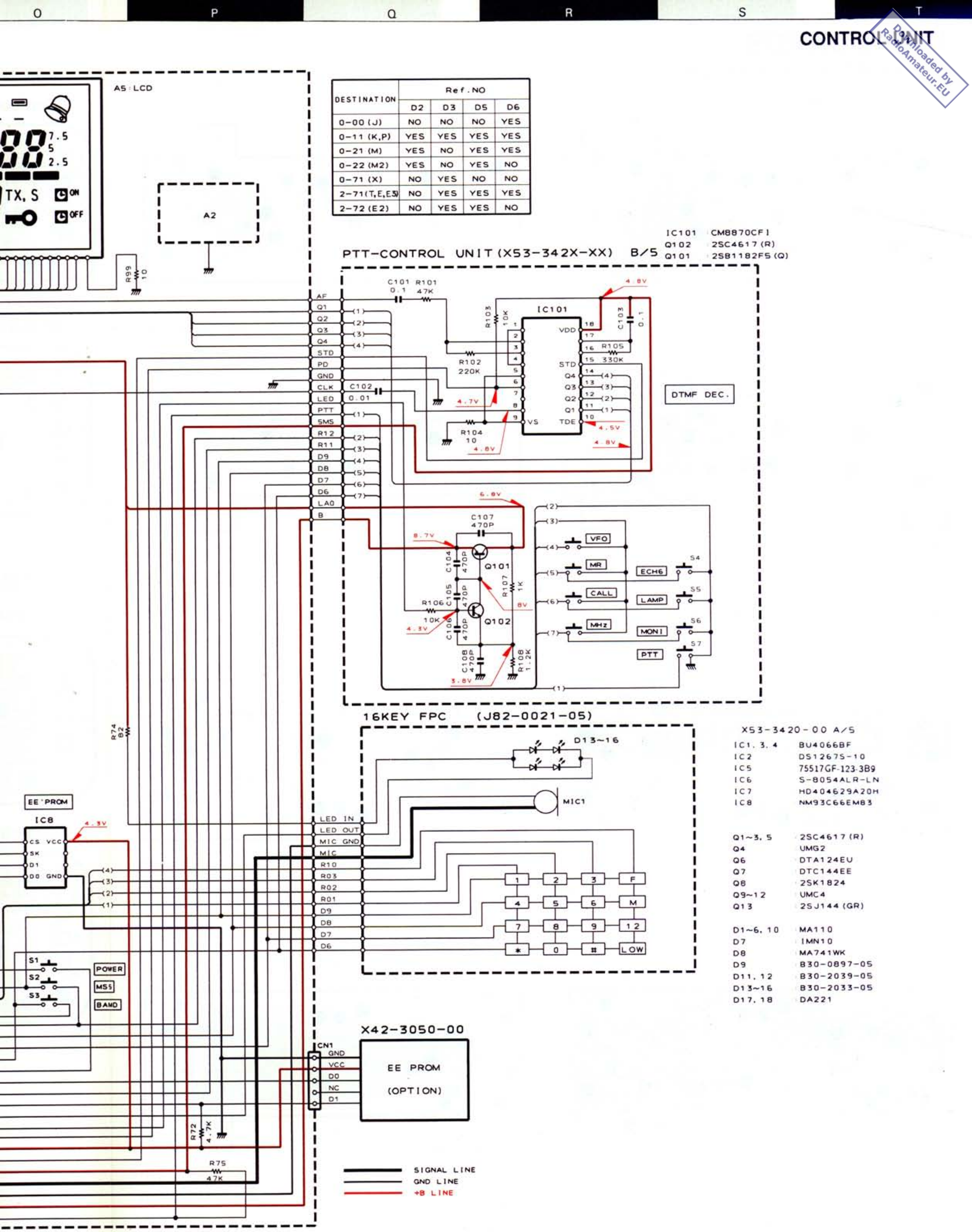
▨ **C pattern**

CONTROL UNIT (X53-342X-XX) A/5 0-11: K, P 0-21: M 0-22: M2 0-71: X 2-71: T, E, E3 2-72: E2




IC2
ELEC. VOL.
VB
HI
LI
WI
RST
CP
GND
VCC
WO
HO
LO
DP
C22 0.1
4.8V
2.4V
C23 0.1
R33 100K
R25 47K
R26 47K
R22 47K
C19 10µ4
R24 47K
AF SW
IC3
R28 10K
R90 10K
R29 10K
R89 10K
C24 0.01
C25 0.01
C26 0.01
C27 0.01
R92 100K
Q13
R94 1M
EAR MODE 4.0V
R93 100K
C49 0.01
CP2 10K×4
4.8V
Q6
4.9V
C28 470P
0.0V
R39 47K
R40
R41 0
47K
R38 10
R53 4.7K
R37 100
4.5V
L1 1m
LITHIUM BATT.
D9
R68 470
3.1V
D8
2.6V
R42 120K
R80 270K
R81 47K
C51 100µ6.3
C33 470P
CPU
IC5
REM SMU SMV Q1 Q2 Q3 Q4 AGND SCU SCV SR43 SR14 SRU1F SRV1F SUBV SUBU
BC AVREF VDD VPP AF4 AF3 AF2 AF1 DTB CBC CBRV CBRU CP DP EV EU SDO STD ULU ULV ES ET RST LED
SR80 SR36 MUTU MUTV OSC1 OSC2 GND BU SCK SO S1 ENU1 ENV1 PSW ENV2 BEEP PS EAR INT ENU2
P.D.RQ SCV LAMP SCU SAVE TX SHV SHU VSS PD TV TU AFC RESET BUSY TX.RQ
(2)
(1.3)
(5)
(7)
(3)
(1)
R87 10K
R88 10K
R84 47K
R83 47K
Q9
Q10
RX2.3V
D17
R76 470
RX3.5V
RX2.1V
D11
D12
TX4.
R43 47K
C3-
470
2.7V
R44 1.8K
R85 5.6K
R45 820
X1 3.58MHz
C37 39P
C38 39P
2.0V
R48
R49
4.8V
R50 4.7K
R51 1K
BACK UP DET.
R52 470K
R55 47K
R56 47K
R57 47K
C46 470P
Q


J
K
L
M
N
O
Q10
Q11
Q12
R76 470
R77 470
RX2.1V
TX2.3V
R78 470
D12
TX4.0V
RX2.0V
TX4.0V
D18
D13 D14
D15 D16
R79 82
RX 3.5V
DT CT T R
PTT ALT + −
18 88:88 7.5 5 2.5
AL
DUP
ABC
E L
TX, S
ON
OFF
APO
S
F
CP3 10K×4
L7 1m
4.5V
C41 470P
R59 47K
R60 47K
R61 0
C47 0.01
C48 0.01
R43 47K
Q7
R62 4.7K
4.5V
4.1V
C42 33P
R64 1K
C43 33P
R86 390
X2 4MHz
R63 1M
C34 470P
C35 470P
L2
L9
C44 1.5P
C45 1.5P
X3 32KHz
0.9V
1.5V
L8
R65 10
2.2V
R85 5.6K
R44 1.8K
R45 820
X1 3.58MHz
C38 39P
R47 10
C36 0.047
2.0V
R48 4.7K
R49 4.7K
4.8V
R50 4.7K
R51 1K
IC6
C39 470P
C40 470P
4.9V
R52 470K
BACK UP DET.
R55 47K
R56 47K
R57 47K
AVCC
AN0
AN1
PTT
AN3
AVSS
TEST
OSC1
OSC2
RESET
X1
X2
GND
D0
D1
D2
D3
D4
D5
D6
D7
D8
D9
TX-RO
P.ON.RO
VTREF
TONER
TONEC
VCC
V1
COM1
COM2
COM3
COM4
CPU
IC7
IHT
RO1
RO2
RO3
R10
R11
R12
R13
BUSY
SCK
S0
S1
R30
SE62
EE PROM
IC8
4.3V
CS VCC
SK
DI
DO GND
(4)
(3)
(2)
(1)
CP4 4.7K×4
CP5 4.7K×4
CP6 4.7K×4
R71 47K
R54 47K
R69 47K
R74
S1
S2
S3
POWER
MS5
BAND
D1
D2
D3
D4
D5
D6
D7
Q8
C46 470P
C54 470P
D10



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<tr><th>D2</th><th>D3</th><th>D5</th><th>D6</th></tr>
<tr><td>0-00 (J)</td><td>NO</td><td>NO</td><td>NO</td><td>YES</td></tr>
<tr><td>0-11 (K,P)</td><td>YES</td><td>YES</td><td>YES</td><td>YES</td></tr>
<tr><td>0-21 (M)</td><td>YES</td><td>NO</td><td>YES</td><td>YES</td></tr>
<tr><td>0-22 (M2)</td><td>YES</td><td>NO</td><td>YES</td><td>NO</td></tr>
<tr><td>0-71 (X)</td><td>NO</td><td>YES</td><td>NO</td><td>NO</td></tr>
<tr><td>2-71(T,E,E3)</td><td>NO</td><td>YES</td><td>YES</td><td>YES</td></tr>
<tr><td>2-72 (E2)</td><td>NO</td><td>YES</td><td>YES</td><td>NO</td></tr>
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IC101	CM8870CFI
Q102	2SC4617 (R)
Q101	2SB1182F5 (Q)

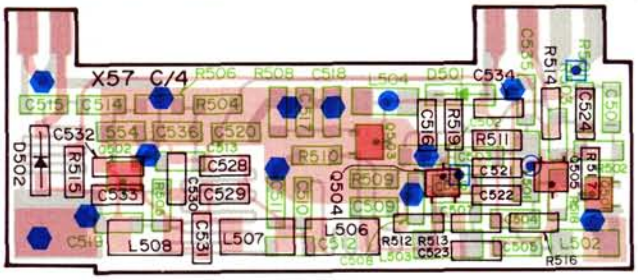
X53-3420-00 A/5

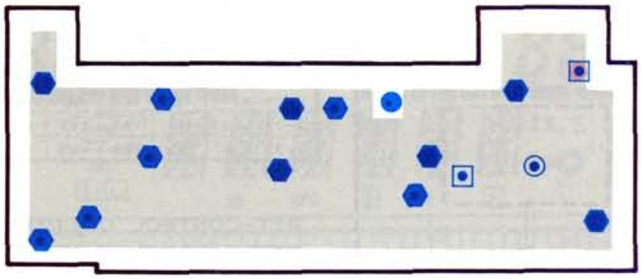
IC1, 3, 4	BU4066BF
IC2	DS1267S-10
IC5	75517GF-123-3B9
IC6	S-8054ALR-LN
IC7	HD404629A20H
IC8	NM93C66EM83
Q1~3, 5	2SC4617 (R)
Q4	UMG2
Q6	DTA124EU
Q7	DTC144EE
Q8	2SK1824
Q9~12	UMC4
Q13	2SJ144 (GR)
D1~6, 10	MA110
D7	IMN10
D8	MA741WK
D9	B30-0897-05
D11, 12	B30-2039-05
D13~16	B30-2033-05
D17, 18	DA221

UNIT BOARDS

TX-RX UNIT (X57-409X-XX) C/4

Component side

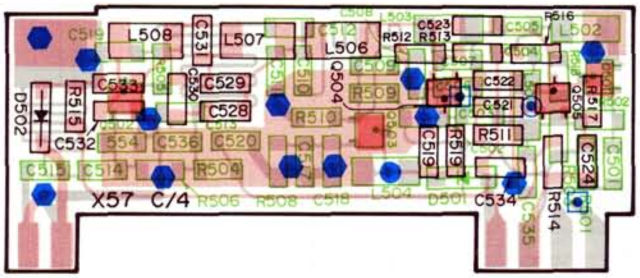


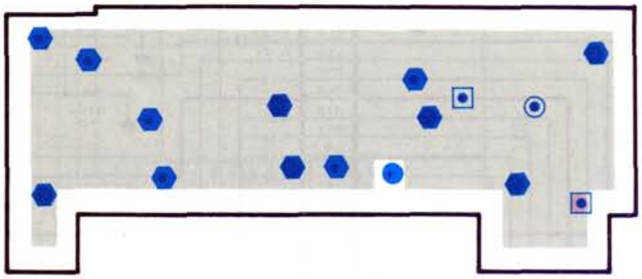


🟥 A pattern
▨ D pattern

🟥 B pattern
▨ C pattern

Soldering side



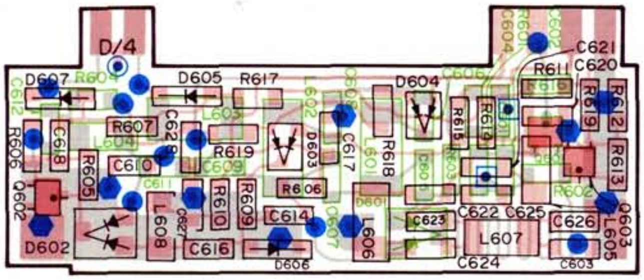


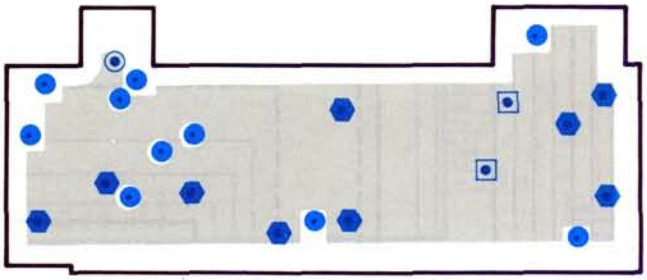
🟥 A pattern
▨ D pattern

🟥 B pattern
▨ C pattern

TX-RX UNIT (X57-409X-XX) D/4

Component side

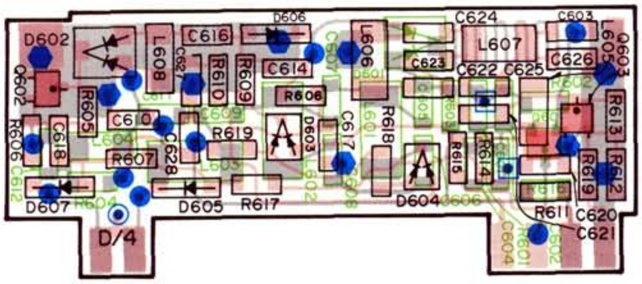


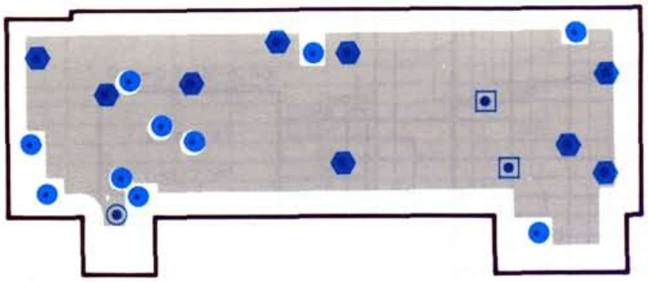


🟥 A pattern
▨ D pattern

🟥 B pattern
▨ C pattern

Soldering side



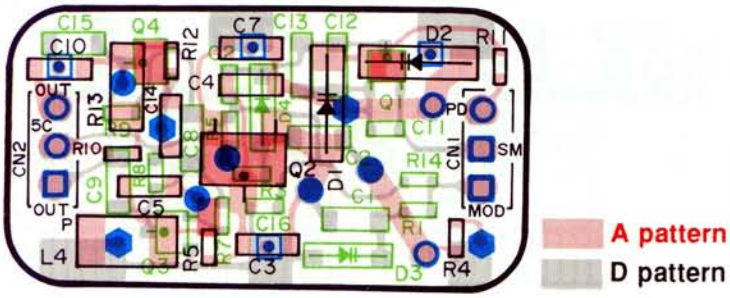


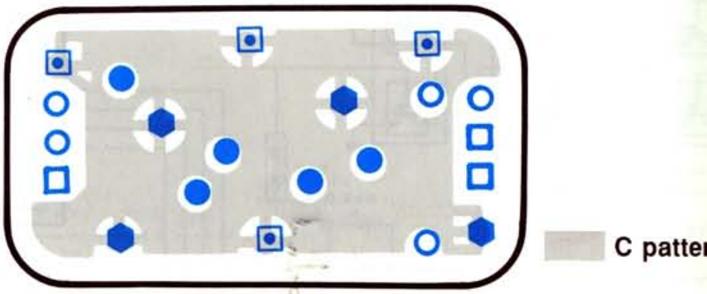
🟥 A pattern
▨ D pattern

🟥 B pattern
▨ C pattern

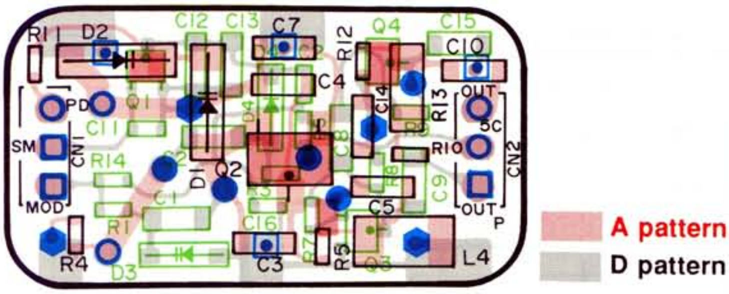
SUB UNIT (VHF VCO) (X58-3890-00)

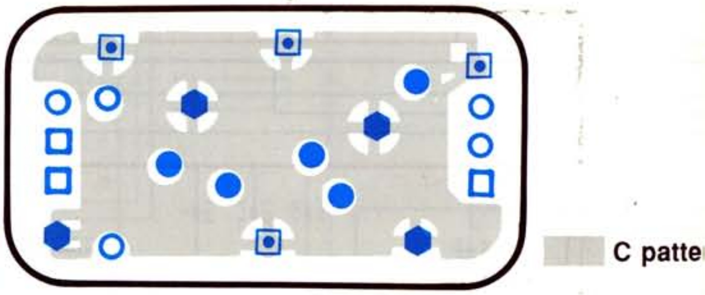
Component side





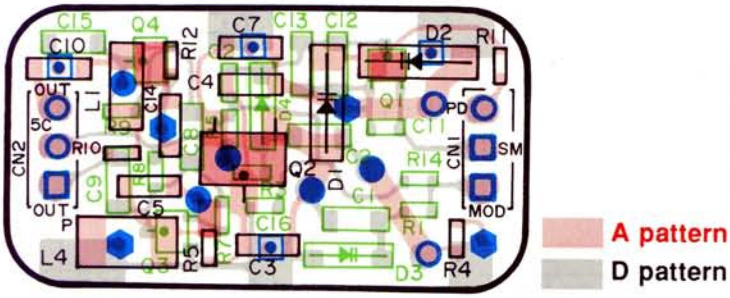
Soldering side

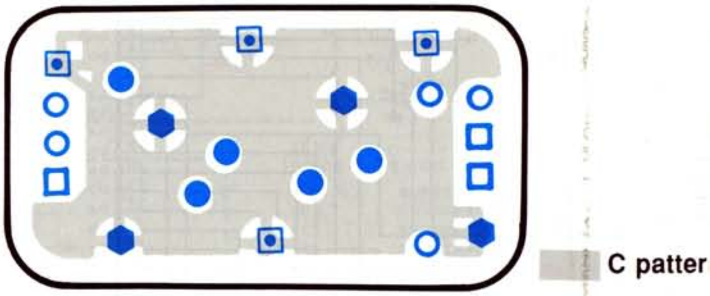




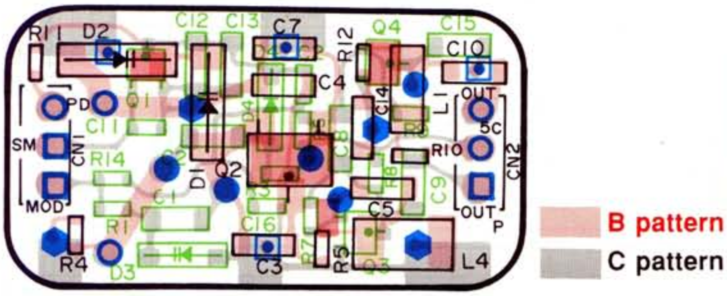
SUB UNIT (UHF VCO) (X58-3890-01)

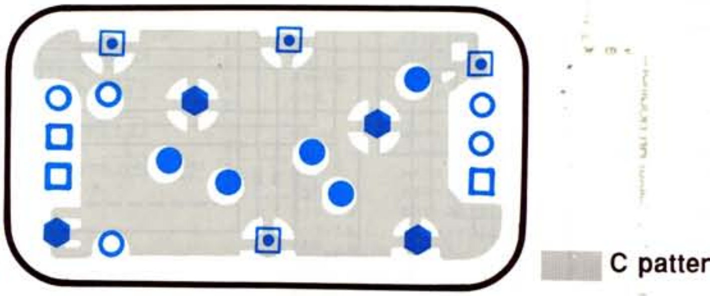
Component side

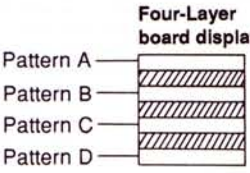




Soldering side





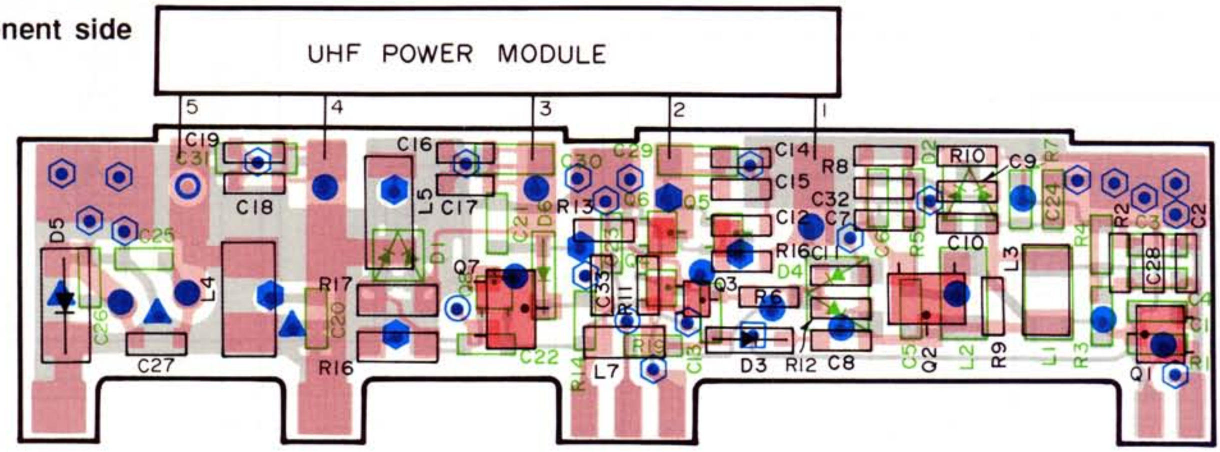


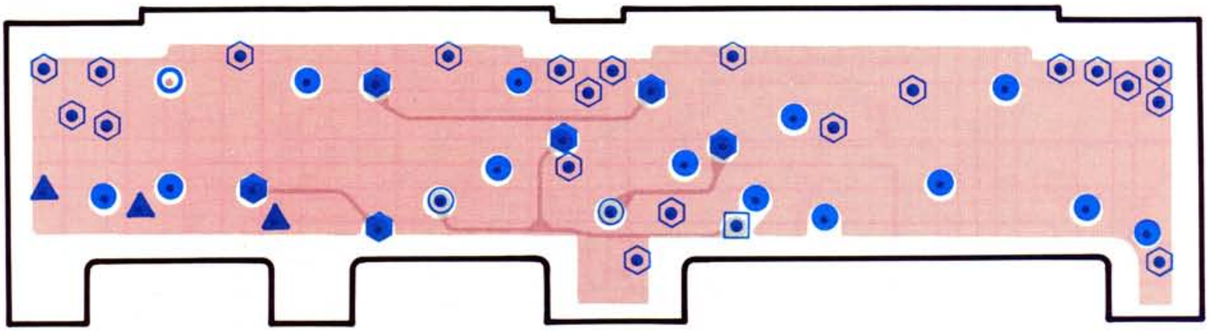
- ■ Patterns A and B are connected.
- ⊙ Patterns A and C are connected.
- ● Patterns A and D are connected.
- △ Patterns B and C are connected.
- ▲ Patterns B and D are connected.
- ⊡ Patterns C and D are connected.
- ◎ Patterns A, B and C are connected.
- ⬡ Patterns A, B and D are connected.
- ⬢ Patterns A, C and D are connected.
- ⊡ Patterns B, C and D are connected.
- △ Patterns A, B, C and D are connected.
- ○ Only pattern A is connected.
- ⬡ Only pattern B is connected.
- △ Only pattern C is connected.
- □ Only pattern D is connected.

The non-mark indicates no connection.

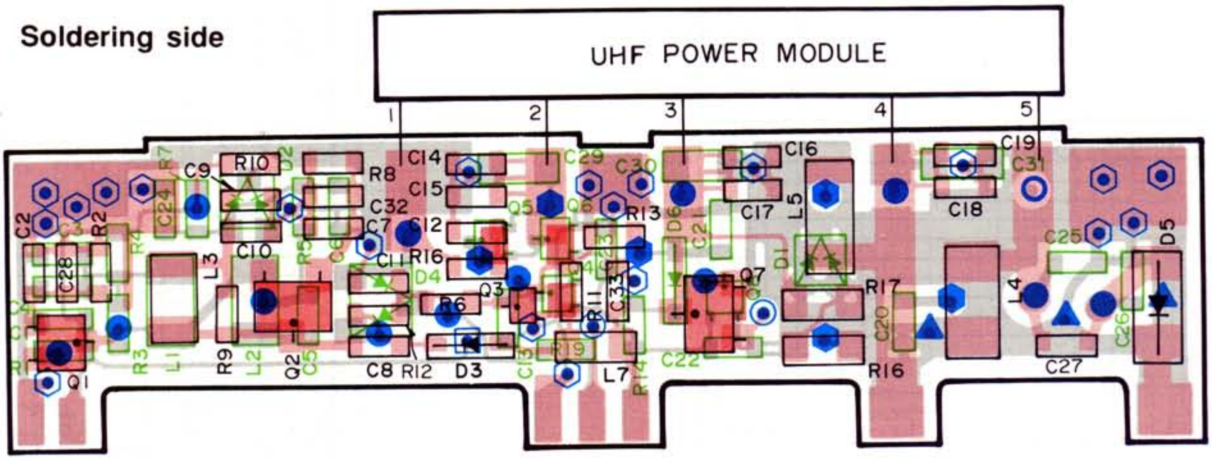
SUB UNIT (UHF POWER AMP) (X58-3900-00) A/2

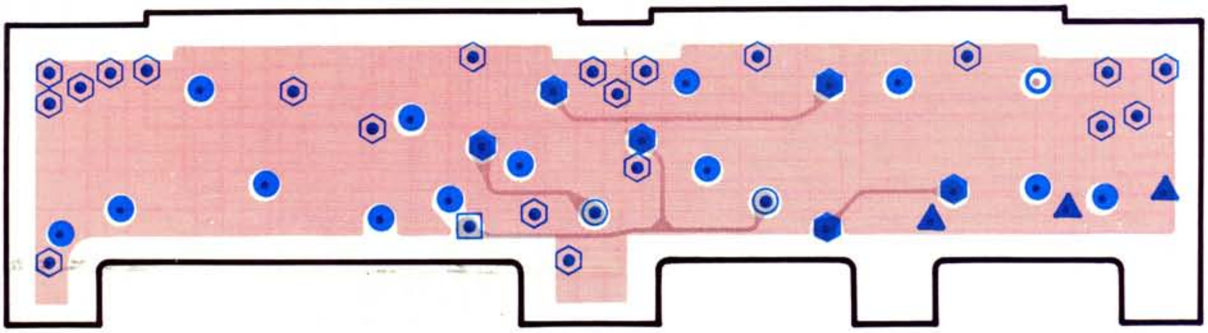
Component side



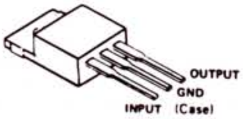


Soldering side

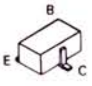




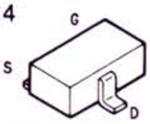
MA333
MA360
MA77
MA110
1SV172



DTB113ZK
2SC3356
2SC4083
DTA143XE
2SC4226
2SC4619
2SC4726
2SC4738

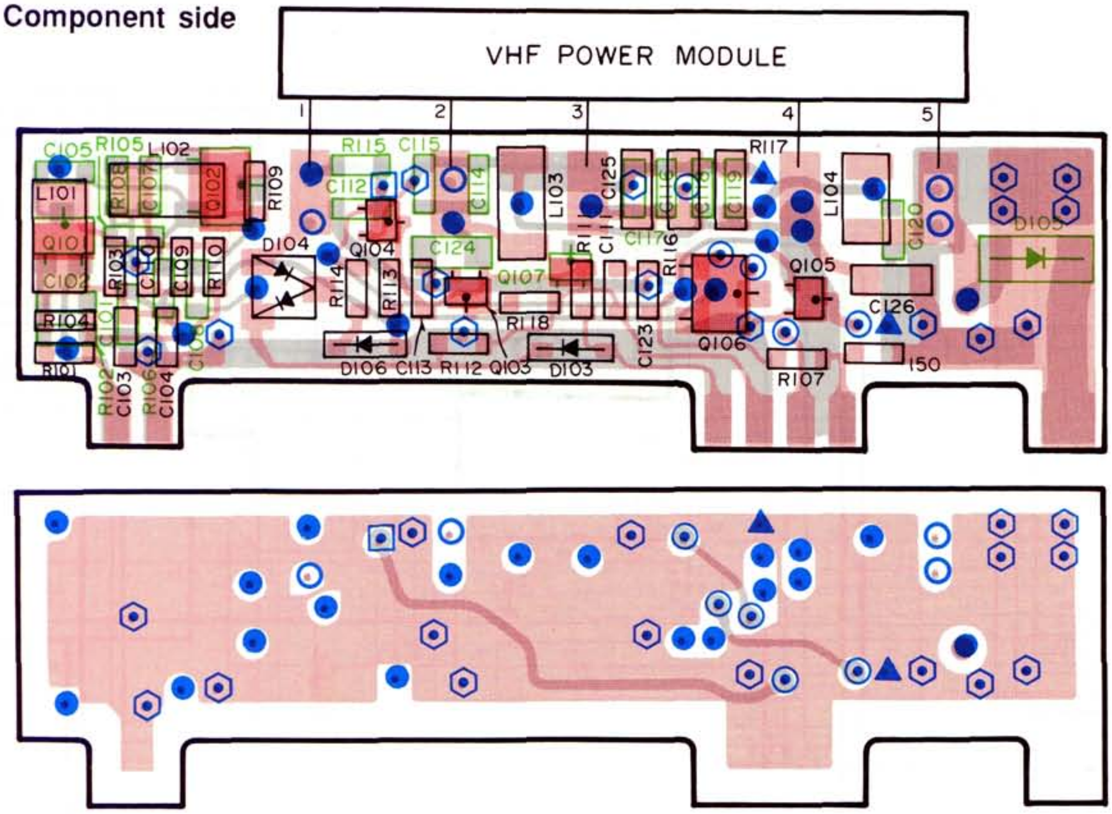


2SK1824



SUB UNIT (VHF POWER AMP) (X58-3900-00) B/2

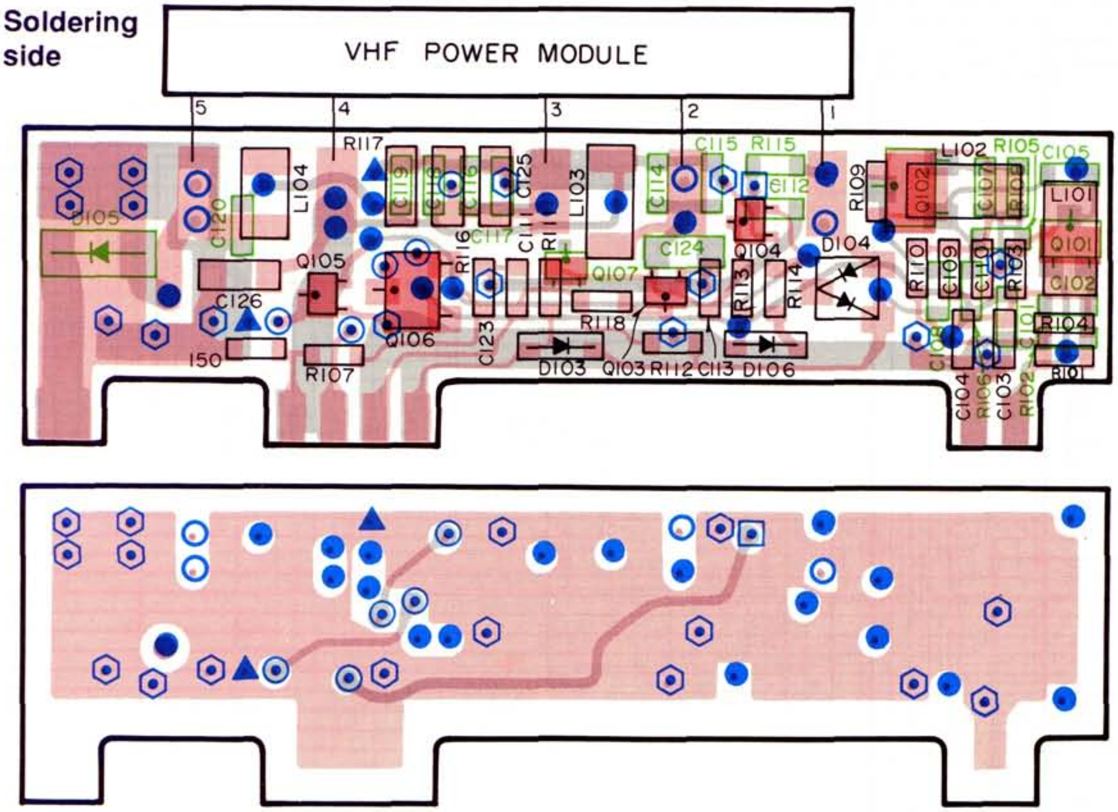
Component side



🟥 **A pattern**
▨ **D pattern**

🟥 **B pattern**
▨ **C pattern**

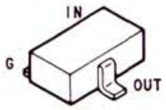
Soldering side



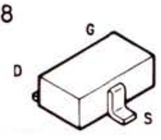
🟥 **A pattern**
▨ **D pattern**

🟥 **B pattern**
▨ **C pattern**

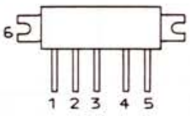
DTC114YE



2SK238



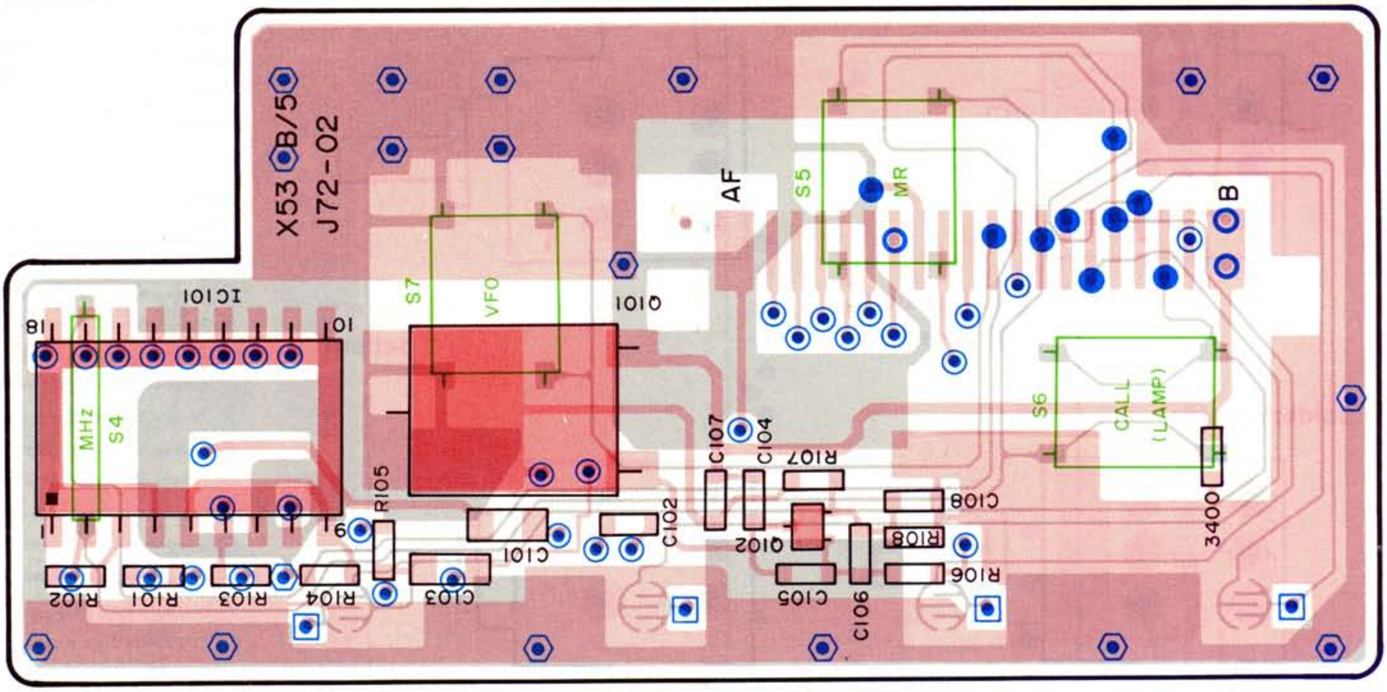
S-AV22A



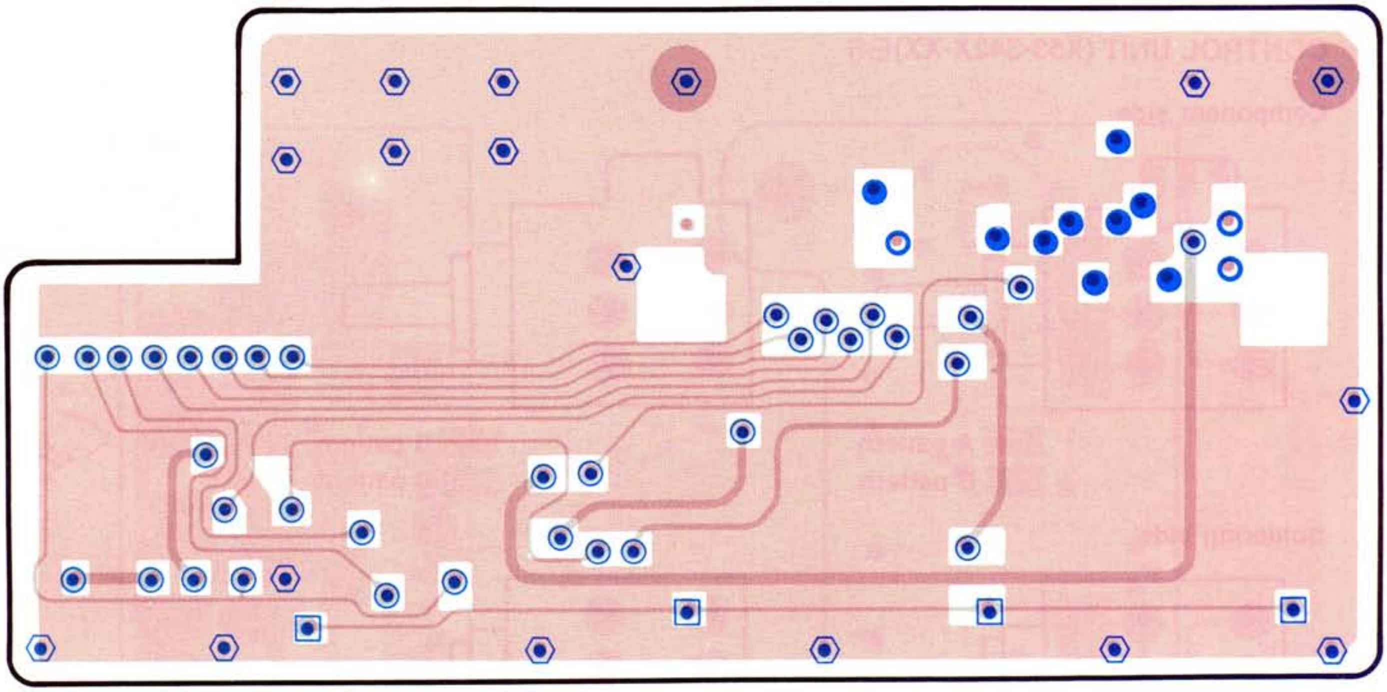
UNIT BOARDS

CONTROL UNIT (X53-342X-XX) B/5

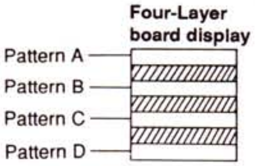
Component side



▨ **A pattern**
▨ **D pattern**



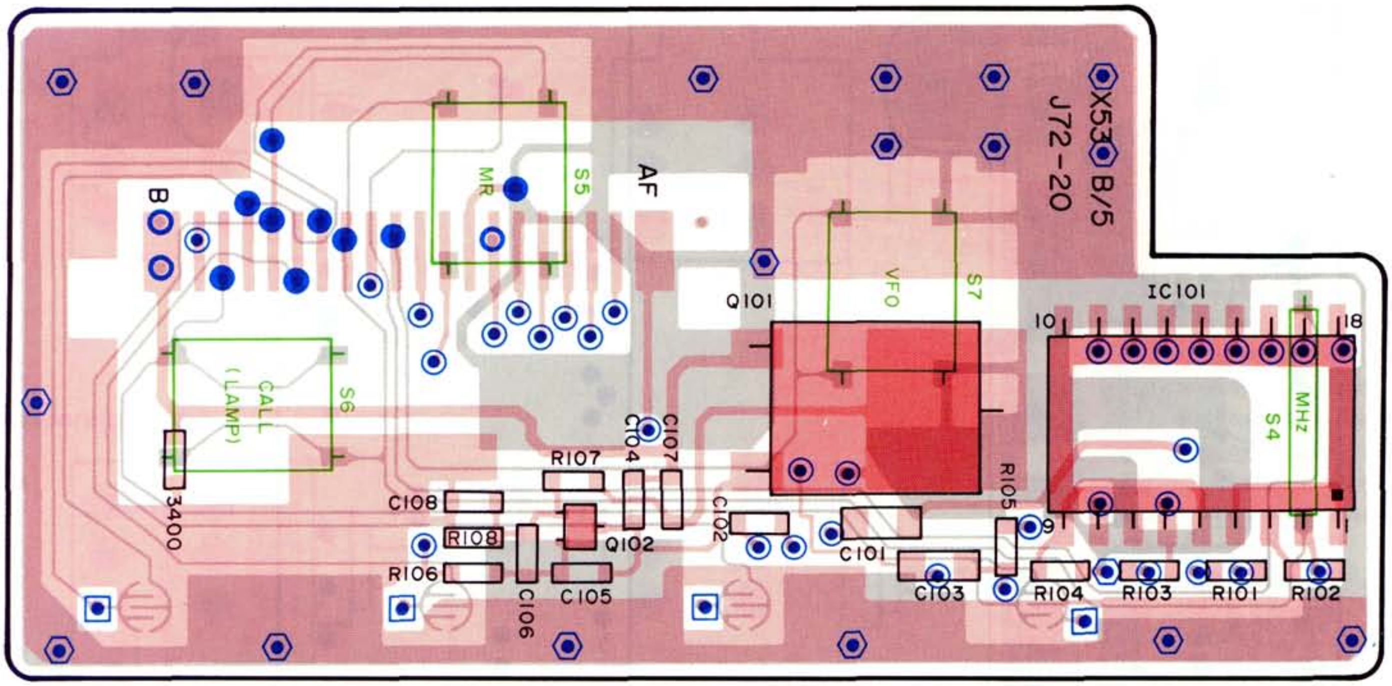
▨ **B pattern**
▨ **C pattern**



- ■ Patterns A and B are connected.
- ⊙ Patterns A and C are connected.
- ● Patterns A and D are connected.
- ◬ Patterns B and C are connected.
- ▲ Patterns B and D are connected.
- ⊡ Patterns C and D are connected.
- ◎ Patterns A, B and C are connected.
- ⬡ Patterns A, B and D are connected.
- ⬢ Patterns A, C and D are connected.
- ▣ Patterns B, C and D are connected.
- ◬ Patterns A, B, C and D are connected.
- ○ Only pattern A is connected.
- ⬡ Only pattern B is connected.
- △ Only pattern C is connected.
- □ Only pattern D is connected.

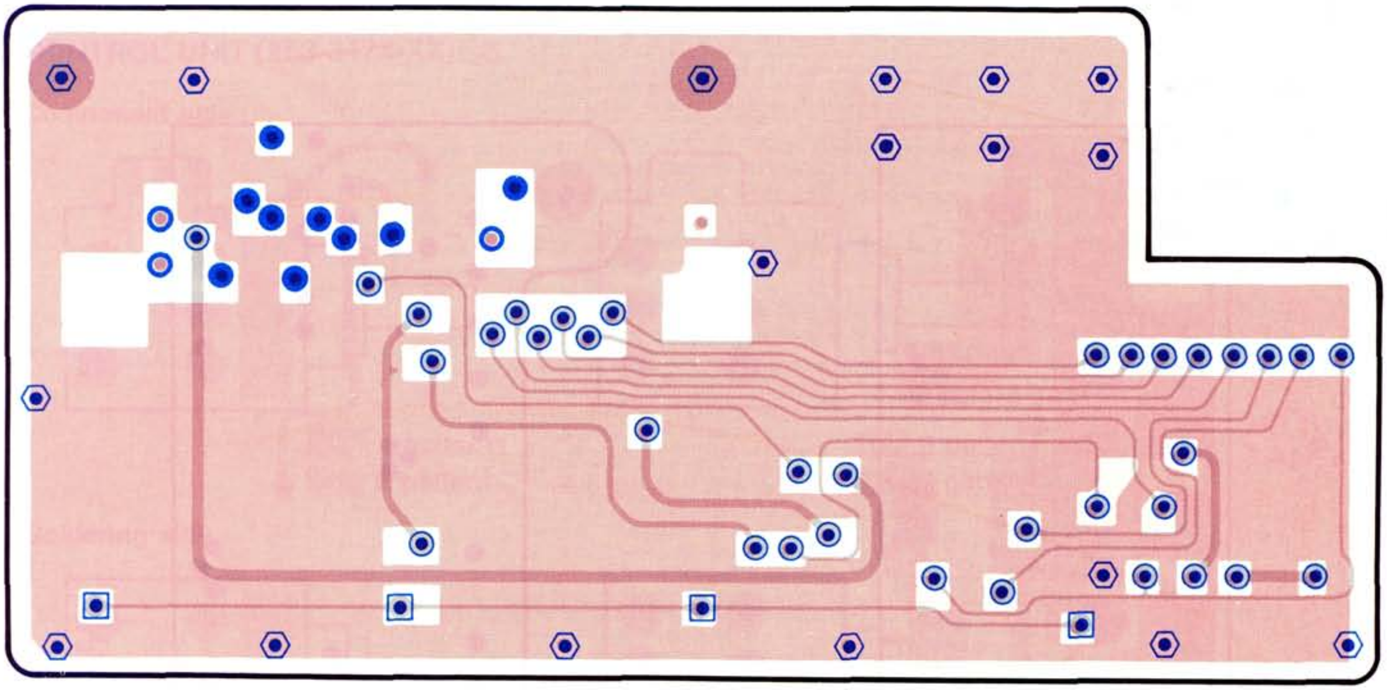
The non-mark indicates no connection.

Soldering side



🟥 **A pattern**

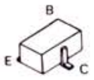
▨ **D pattern**



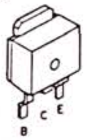
🟥 **B pattern**

▨ **C pattern**

2SC4617



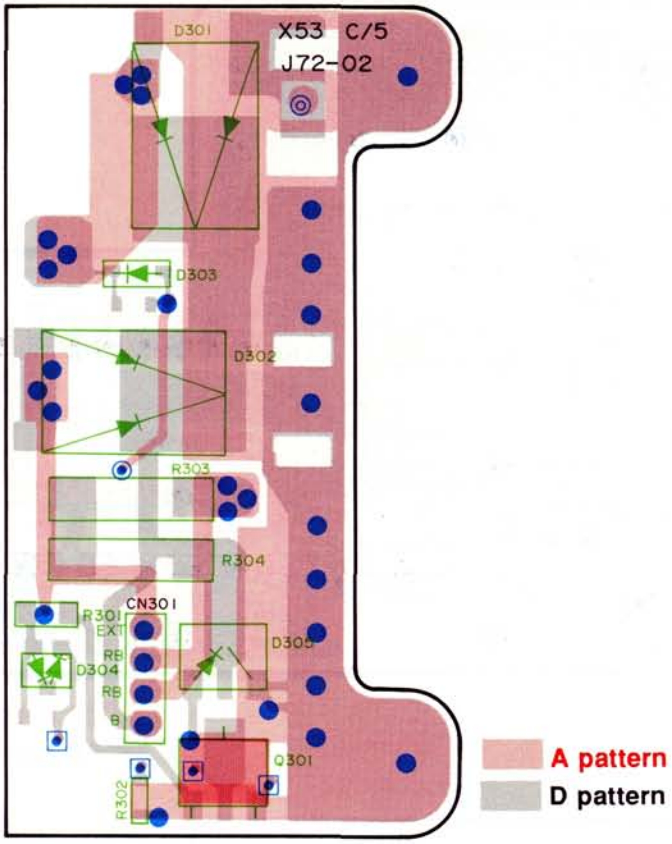
2SB1182F5

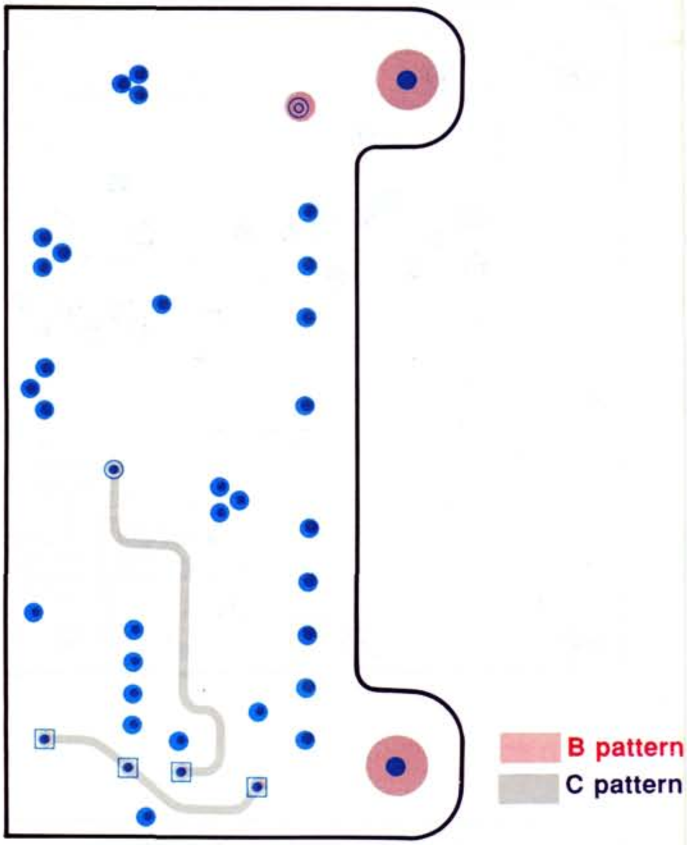


UNIT BOARDS

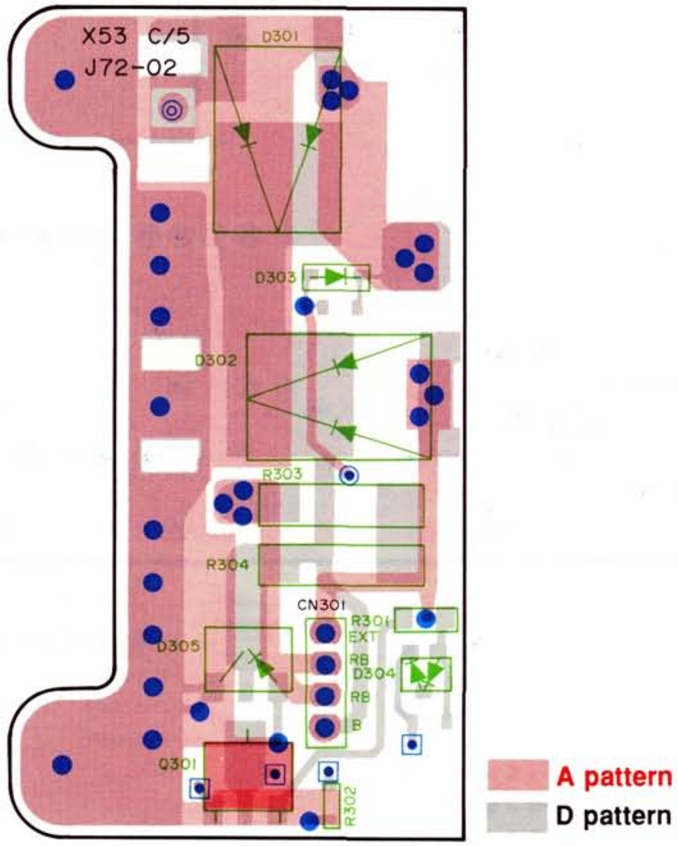
CONTROL UNIT (X53-342X-XX) C/5

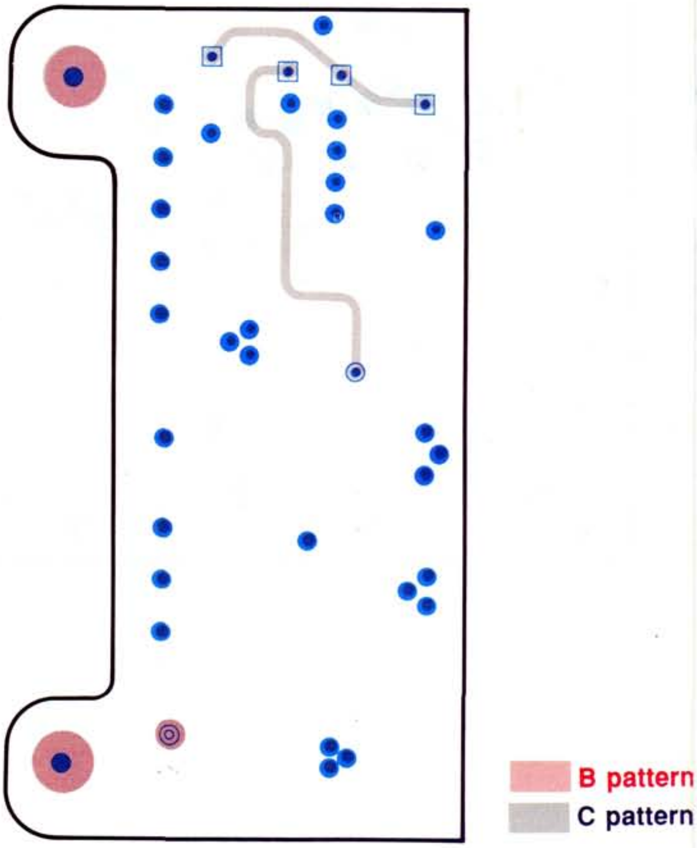
Component side





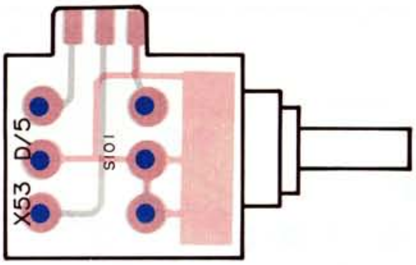
Soldering side



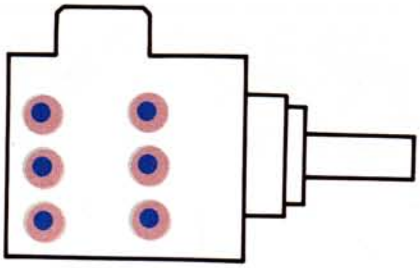


CONTROL UNIT (X53-342X-XX) C/5

Component side

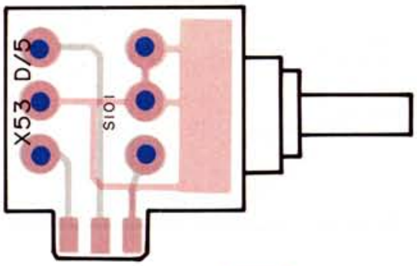


▨ A pattern
▨ D pattern

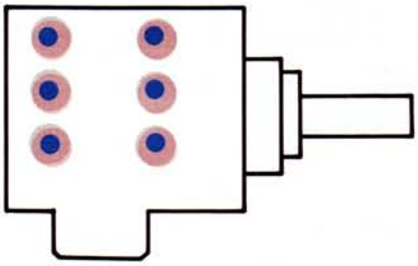


▨ B pattern
▨ C pattern

Soldering side

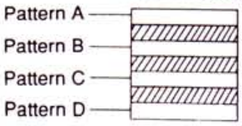


▨ A pattern
▨ D pattern



▨ B pattern
▨ C pattern

Four-Layer board display

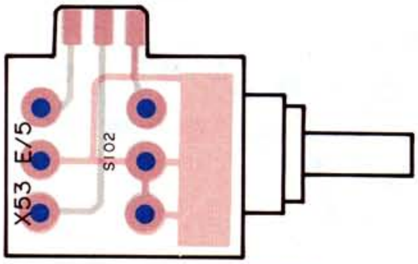


- ■ Patterns A and B are connected.
- ⊙ Patterns A and C are connected.
- ● Patterns A and D are connected.
- △ Patterns B and C are connected.
- ▲ Patterns B and D are connected.
- ⊡ Patterns C and D are connected.
- ◎ Patterns A, B and C are connected.
- ⬡ Patterns A, B and D are connected.
- ⬢ Patterns A, C and D are connected.
- ⧈ Patterns B, C and D are connected.
- △ Patterns A, B, C and D are connected.
- ○ Only pattern A is connected.
- ⬡ Only pattern B is connected.
- △ Only pattern C is connected.
- □ Only pattern D is connected.

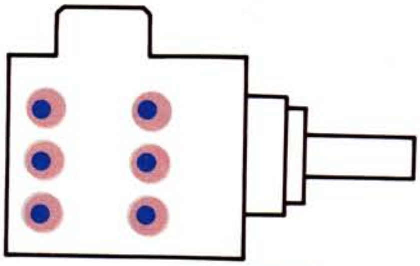
The non-mark indicates no connection.

CONTROL UNIT (X53-342X-XX) E/5

Component side

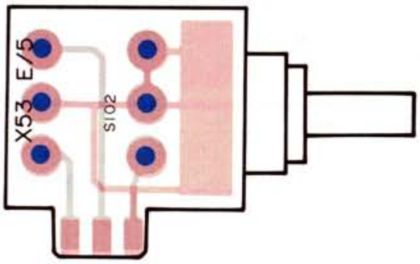


▨ A pattern
▨ D pattern

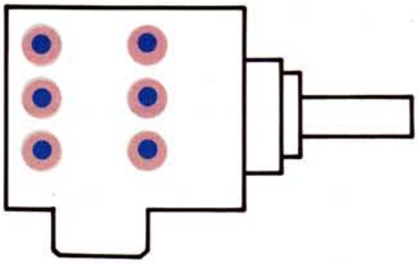


▨ B pattern
▨ C pattern

Soldering side

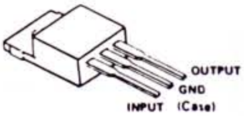


▨ A pattern
▨ D pattern

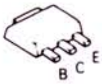


▨ B pattern
▨ C pattern

MA110

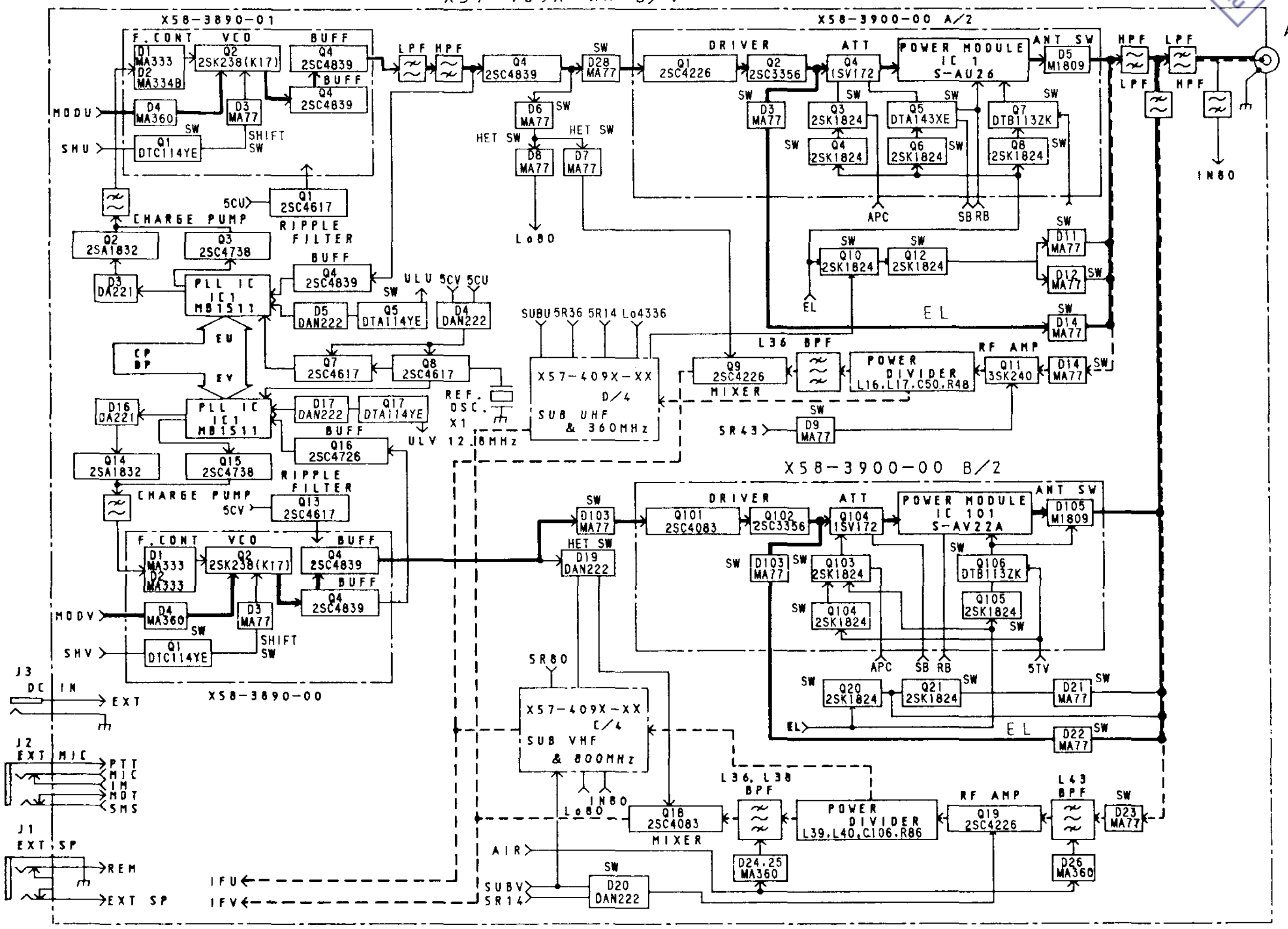


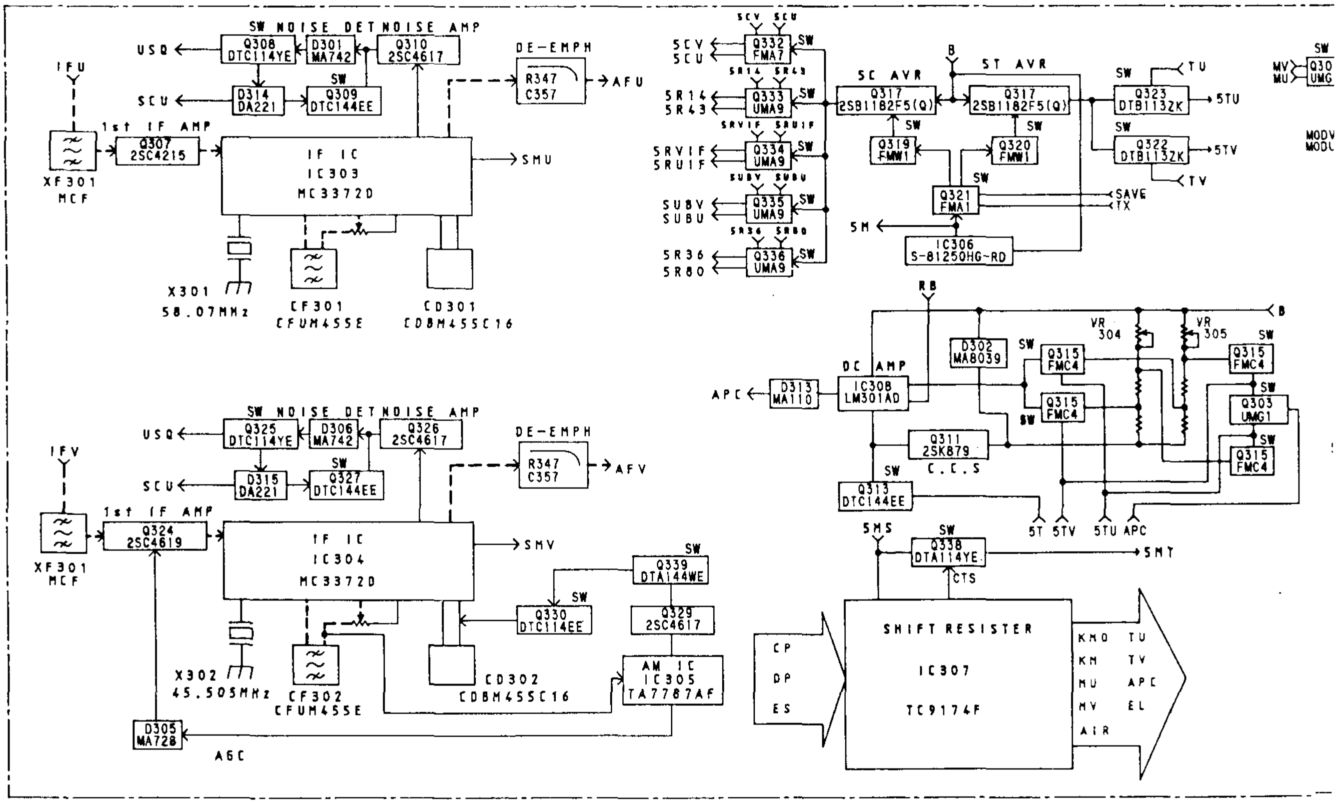
2SB798

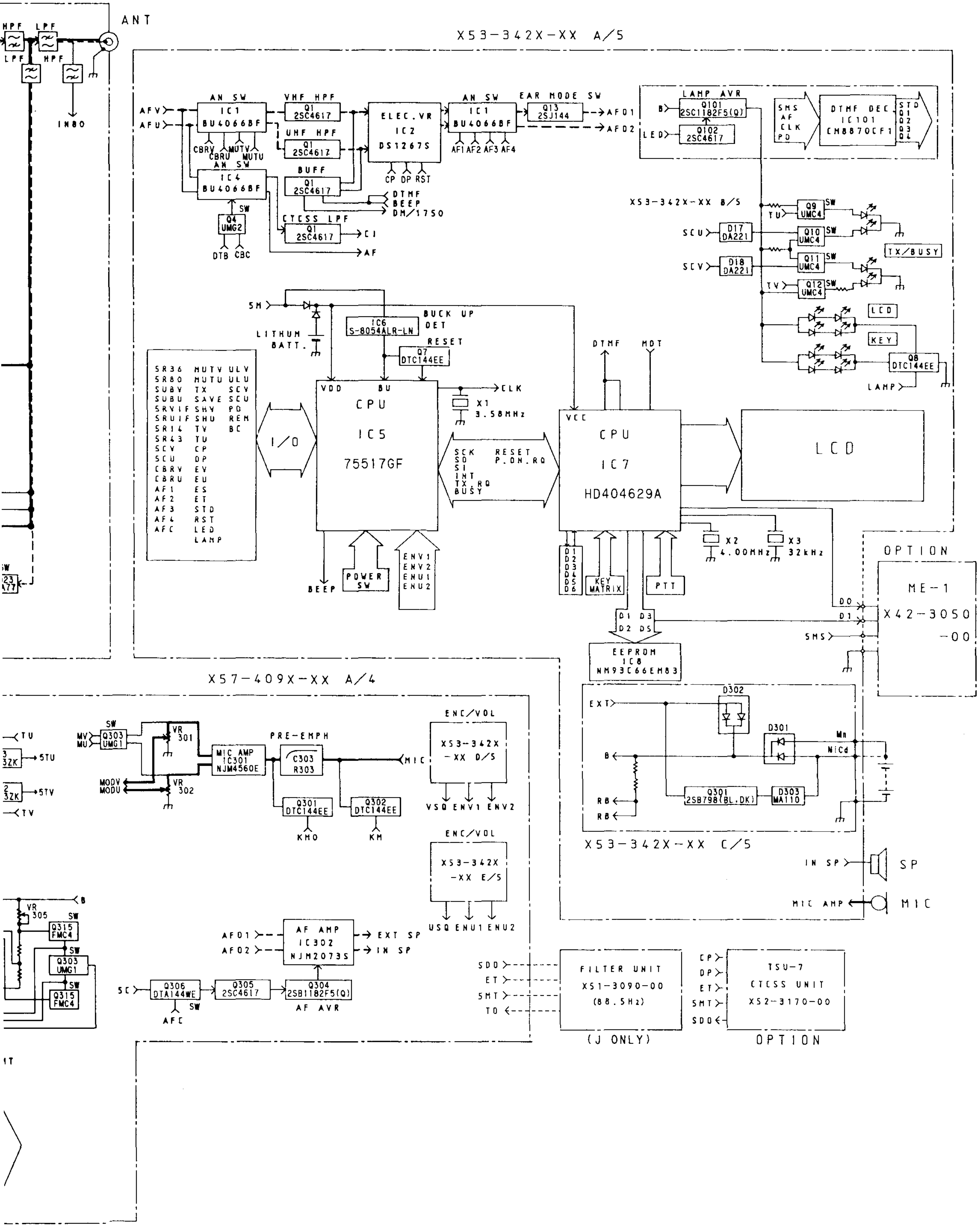


BLOCK DIAGRAM

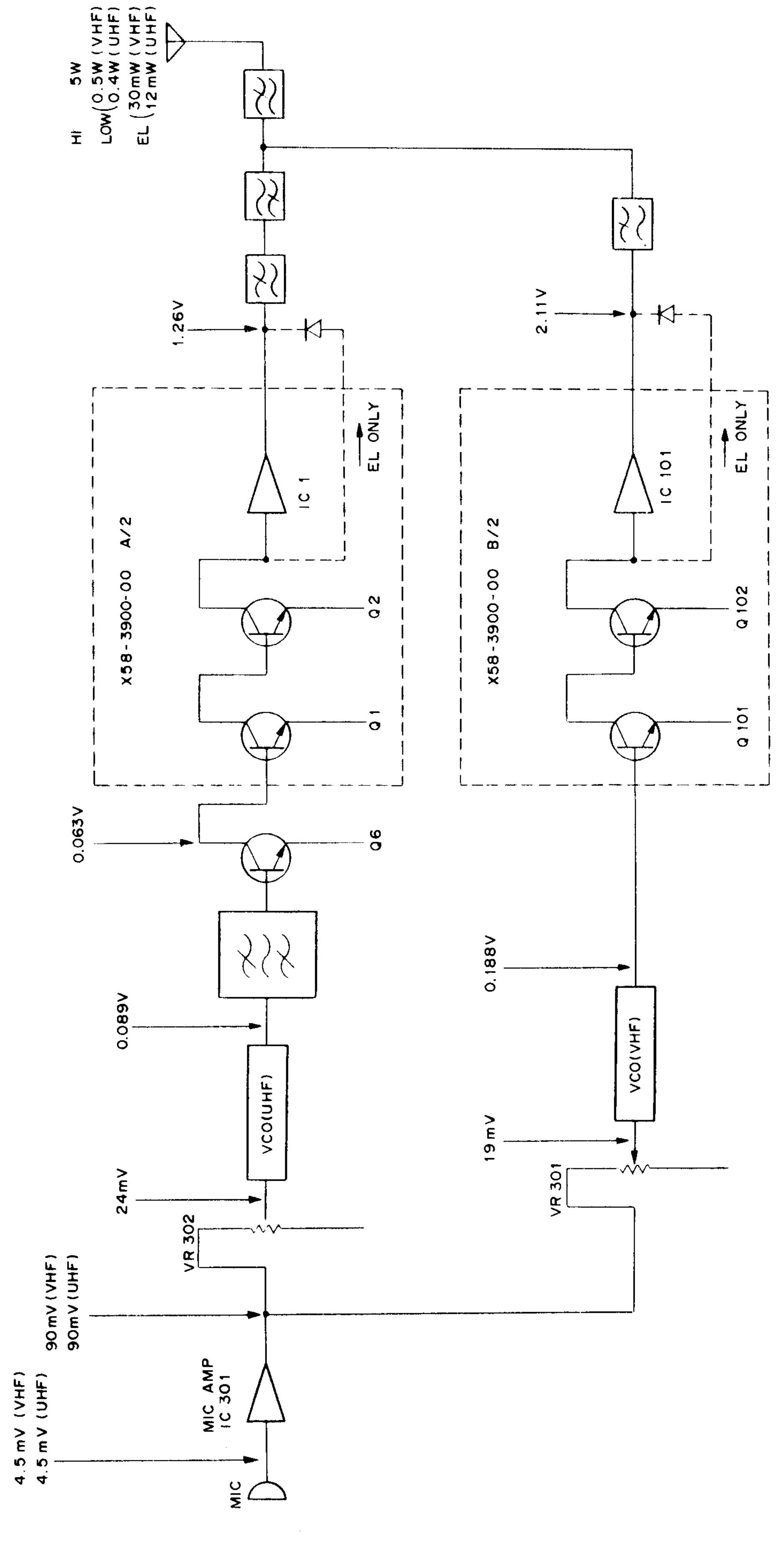
X57-409X-XX B/4





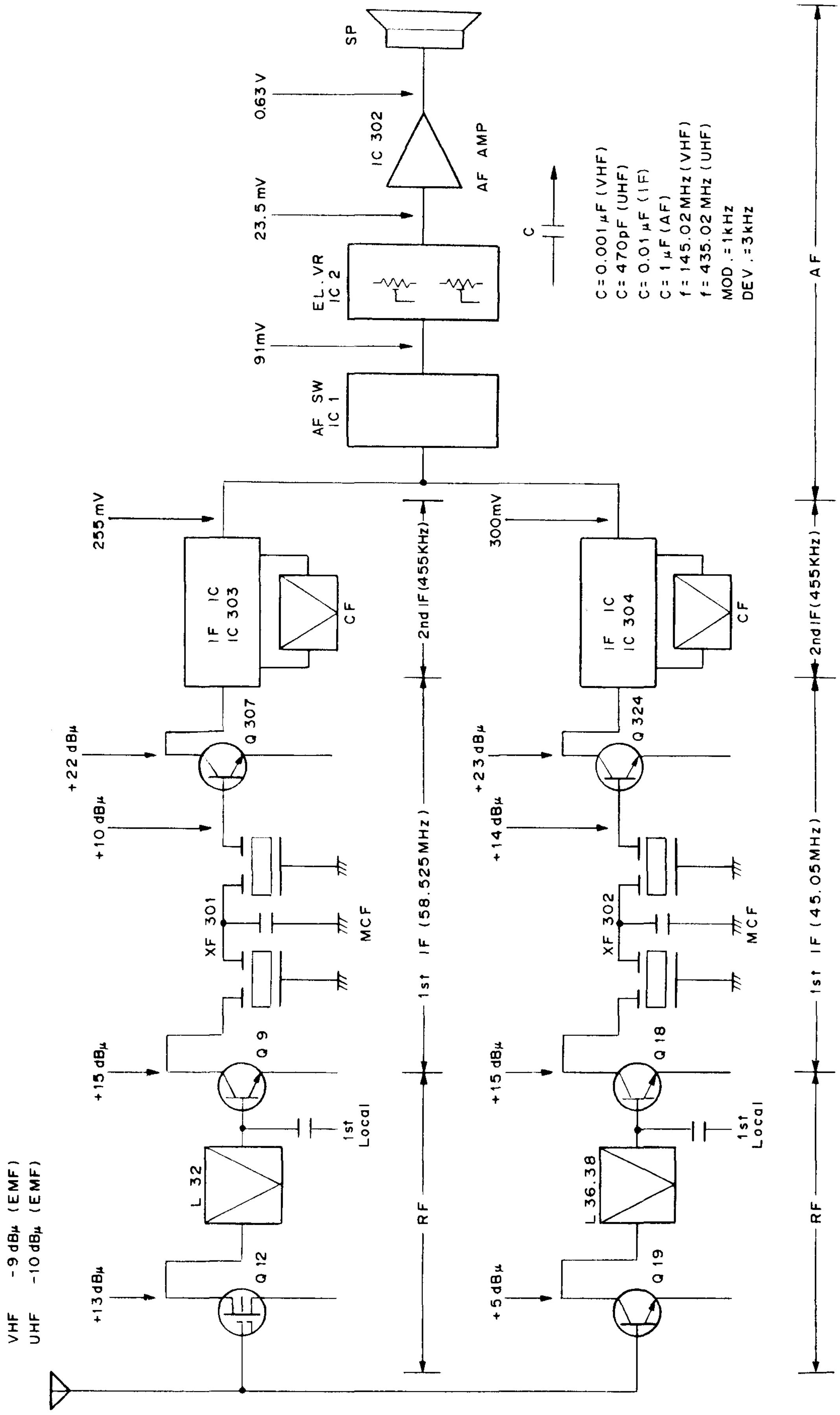

ANT
HPF LPF
LPF HPF
IN80
X53-342X-XX A/5
AFV
AFU
AN SW
IC1 BU4066BF
CBRV MUTV
CBRU MUTU
AN SW
IC4 BU4066BF
SW
Q4 UMG2
DTB CBC
VHF HPF
Q1 2SC4617
UHF HPF
Q1 2SC4617
BUFF
Q1 2SC4617
CTCSS LPF
Q1 2SC4617
CI
AF
ELEC.VR
IC2
DS1267S
CP DP RST
DTMF
BEEP
DM/1750
AN SW
IC1 BU4066BF
AF1 AF2 AF3 AF4
EAR MODE SW
Q13 2SJ144
AF01
AF02
LAMP AVR
B
Q101 2SC1182F5(Q)
LED
Q102 2SC4617
SMS AF CLK PD
DTMF DEC IC101 CM8870CF1
STD Q1 Q2 Q3 Q4
X53-342X-XX B/5
TU
Q9 UMC4
SW
SCU
D17 DA221
Q10 UMC4
SCV
D18 DA221
Q11 UMC4
TX/BUSY
TV
Q12 UMC4
LCD
KEY
Q8 DTC144EE
LAMP
5M
LITHUM BATT.
IC6 S-8054ALR-LN
BUCK UP DET
RESET
Q7 DTC144EE
SR36 MUTV ULV
SR80 MUTU ULU
SUBV TX SCV
SUBU SAVE SCU
SRVIF SHV PO
SRUIF SHU REM
SR14 TV BC
SR43 TU
SCV CP
SCU DP
CBRV EV
CBRU EU
AF1 ES
AF2 ET
AF3 STD
AF4 RST
AFC LED
LAMP
I/O
VDD BU
CPU
IC5
75517GF
CLK
X1 3.58MHz
SCK SO SI INT TX.RQ BUSY
RESET P.ON.RQ
BEEP
POWER SW
ENV1 ENV2 ENU1 ENU2
DTMF
MDT
VCC
CPU
IC7
HD404629A
LCD
X2 4.00MHz
X3 32kHz
D1 D2 D3 D4 D5 D6
KEY MATRIX
PTT
D1 D3
D2 D5
EEPROM IC8 NM93C66EM8
OPTION
ME-1
X42-3050 -00
D0
D1
SMS
EXT
D302
D301
Mn
NiCd
B
RB
RB
Q301 2SB798(BL.DK)
D303 MA110
X53-342X-XX C/5
IN SP
SP
MIC AMP
MIC
X57-409X-XX A/4
TU
3 3ZK
5TU
2 3ZK
5TV
TV
MV MU
SW
Q303 UMG1
VR 301
MODV MODU
VR 302
MIC AMP IC301 NJM4560E
PRE-EMPH
C303 R303
Q301 DTC144EE
Q302 DTC144EE
KMO
KM
MIC
ENC/VOL
X53-342X -XX D/5
VSQ ENV1 ENV2
ENC/VOL
X53-342X -XX E/5
USQ ENU1 ENU2
B
VR 305
SW
Q315 FMC4
SW
Q303 UMG1
SW
Q315 FMC4
AF01
AF02
AF AMP IC302 NJM2073S
EXT SP
IN SP
5C
Q306 DTA144WE
SW
AFC
Q305 2SC4617
Q304 2SB1182F5(Q)
AF AVR
SDO
ET
5MT
TO
FILTER UNIT X51-3090-00 (88.5Hz)
(J ONLY)
CP
DP
ET
5MT
SDO
TSU-7 CTCSS UNIT X52-3170-00
OPTION
IT

LEVEL DIAGRAM



✳ All sent in an EL level.

LEVEL DIAGRAM



TERMINAL FUNCTIONS

Pin No.	Name	Description
CONTROL UNIT (A/5)-CONTROL UNIT (B/5)		
1	AF	Audio signal line
2	Q1	DTMF decoder 0 bit line
3	Q2	DTMF decoder 1st bit line
4	Q3	DTMF decoder 2nd bit line
5	Q4	DTMF decoder 3rd bit line
6	STD	DTMF decode detect
7	PD	DTMF IC power save
8	GND	
9	CLK	DTMF IC clock line
10	LED	LAMP AVR SW line
11	PTT	PTT SW line
12	5MS	DTMF IC, AVR power supply line
13	R12	Key matrix microcomputer input line
14	R11	Key matrix microcomputer input line
15	R9	Key matrix microcomputer output line
16	R8	Key matrix microcomputer output line
17	R7	Key matrix microcomputer output line
18	R6	Key matrix microcomputer output line
19	LAO	AF AVR output line
20	B	AF AVR intput line
CONTROL UNIT (A/5)-16 KEY FPC		
1	D6	Key matrix microcomputer output line
2	D7	Key matrix microcomputer output line
3	D8	Key matrix microcomputer output line
4	D9	Key matrix microcomputer output line
5	R01	Key matrix microcomputer input line
6	R02	Key matrix microcomputer input line
7	R03	Key matrix microcomputer input line
8	R10	Key matrix microcomputer input line
9	MIC	MIC input line
10	MIC GND	MIC GMD
11	LED OUT	LED power supply input line
12	LED IN	LED power supply output line

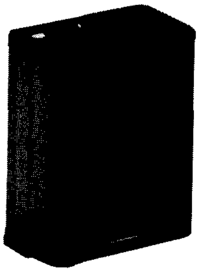
Pin No.	Name	Description
TX-RX UNIT (A/4)-TX-RX UNIT (B/4)		
1	REM	Remote line
2	EXSPG	External speaker GND
3	EXSP	External speaker line
4	PTT	PTT line
5	IM	MIC AMP input line
6	MIC	Internal MIC line
7	MDT	External MIC detect line
8	5C	5V power supply line
9	EL	E-LOW line
10	APC	APC line
11	5TU	UHF transmit 5V power supply line
12	5R80	800 MHz receive 5V power supply line
13	SUBV	SUB-V receive 5V power supply line
14	SUBU	SUB-U receive 5V power supply line
15	AIR	VHF BPF shift line for AIR band
16	5R43	UHF receive 5V power supply line
17	5R14	VHF receive 5V power supply line
18	5R36	360 MHz receive 5V power supply line
19	5TV	VHF transmit 5V power supply line
20	ULU	UHF PLL unlock detect line
21	CP	Clock signal line
22	DP	Serial data line
23	MODU	UHF modulation line
24	SHU	UHF VCO shift line
25	EU	UHF PLL enable line
26	5CU	UHF 5V power supply line
27	MODV	VHF modulation line
28	SHV	VHF VCO shift line
29	5CV	VHF 5V power supply line
30	ULV	VHF unlock detect line
31	EV	VHF PLL enable line
32	G	GND
33	IFV	VHF IF signal line

TERMINAL FUNCTIONS

Pin No.	Name	Description
CONTROL UNIT (A/5)-TX-RX UNIT (B/4)		
1	ENU1	UHF encoder line
2	ENU2	UHF encoder line
3	ENV1	VHF encoder line
4	ENV2	VHF encoder line
5	PTT	PTT line
6	MIC	Internal MIC line
7	MDT	External MIC detect line
8	REM	Remote line
9	5C	5V power supply line
10	DT/1750	DTMF, 1750 modulation line
11	REP	Modulation line for cross band repeater
12	AFC	Audio power supply switch line
13	AFO1	Audio AMP input for external speaker line
14	AFO2	Audio AMP input for internal speaker line
15	AFU	UHF audio line
16	AFV	VHF audio line
17	SP	Internal speaker line
18	AFG	Audio GND line
19	SMU	UHF S-meter line
20	SMV	VHF S-meter line
21	SCU	UHF SQ detect line
22	SCV	VHF SQ detect line
23	5CU	UHF 5V power supply switch line
24	5CV	VHF 5V power supply switch line
25	5R43	UHF receive 5V power supply switch line
26	5R14	VHF receive 5V power supply switch line
27	5RUIF	UHF IF 5V power supply switch line
28	5RVIF	VHF IF 5V power supply switch line
29	SUBV	SUB-V receive 5V power supply switch line
30	SUBU	SUB-U receive 5V power supply switch line
31	5R80	800 MHz receive 5V power supply switch line
32	5R36	360 MHz receive 5V power supply switch line
33	ET	Tone enable line
34	SD0	Tone detect line
35	ES	Shift register enable line
36	CI	Signaling AF output
37	5M	5V power supply switch line for microprocessor
38	B	B power supply
39	5MT	5V power supply for tone
40	5MS	Switched 5M power supply
41	G	GND
42	G	GND
43	TX	TX power supply switch line
44	SAVE	Save control line, Switching of 5C power supply
45	ULU	UHF PLL unlock detect line
46	CP	Clock signal line
47	DP	Serial data line
48	SHU	UHF VCO shift line
49	EU	UHF PLL enable line
50	SHV	VHF VCO shift line
51	ULV	VHF PLL unlock detect line
52	EV	VHF PLL enable line
53	G	GND

BT-8 (BATTERY CASE)

BT-8 External View



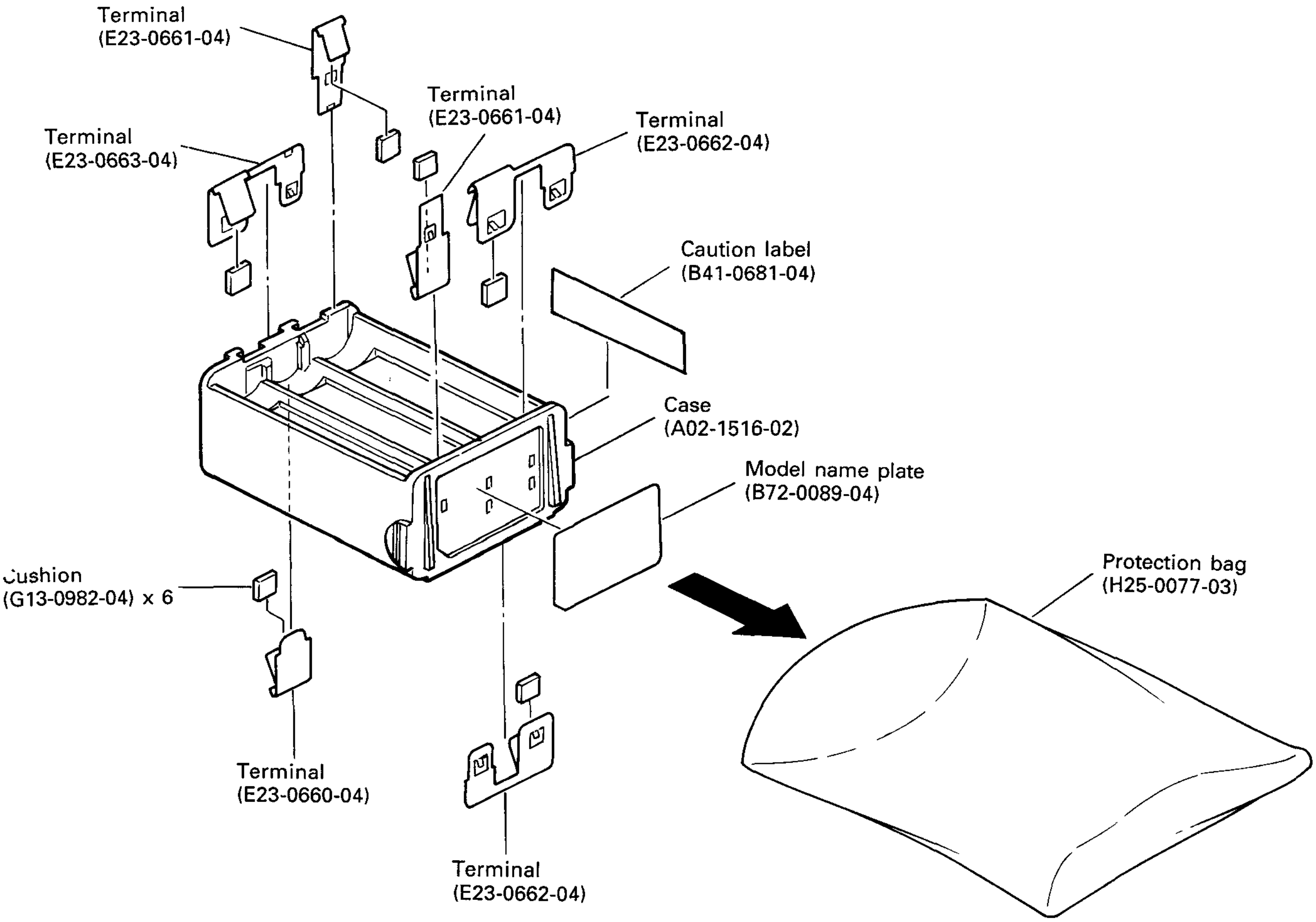
BT-8 Specifications

Dimensions .... 45.5 W x 56.23 H x 29.8 D (mm)
Weight .... 210g (Case only)

BT-8 Parts List

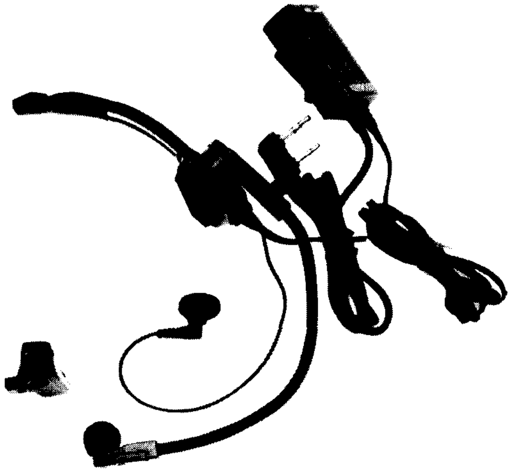
Ref. No.	New	Parts No.	Description
		A02-1516-02	Case
		B41-0681-04	Caution label
		B72-0089-04	Model name plate
		E23-0660-04	Terminal
		E23-0661-04	Terminal
		E23-0662-04	Terminal
		E23-0663-04	Terminal
		G13-0982-04	Cushion
		H25-0077-03	Protection bag

BT-8 Exploded View



HMC-2 (HEAD SET WITH VOX & PTT)

HMC-2 EXTERNAL VIEW



HMC-2 PARTS LIST

* : New Parts

Ref. No.	New Parts	Parts No.	Description
		A02-0840-08	Case (Front)
		A02-0841-08	Case (Rear)
		E30-2088-08	Cable with plug
		F09-0418-08	Microphone pad
		F09-0419-08	Ear pad
		J29-0427-08	Clip
VR1		R05-4422-08	Potentiometer 50kΩ
S1		S31-1416-08	Slide switch PTT/VOX
S2		S50-1413-05	Tact switch PTT
		T18-0056-08	Earphone with cable
		T91-0373-18	MIC ass'y
		W02-0806-18	VOX/PTT unit
Q1		FMG2	Digital transistor
Q2		FMW2	Digital transistor
Q3		2SC2712(GR)	Chip transistor
IC1		NJM2072M	IC
D1		1SS133	Diode

HMC-2 SPECIFICATIONS

Electrical characteristic

- **Earphone**

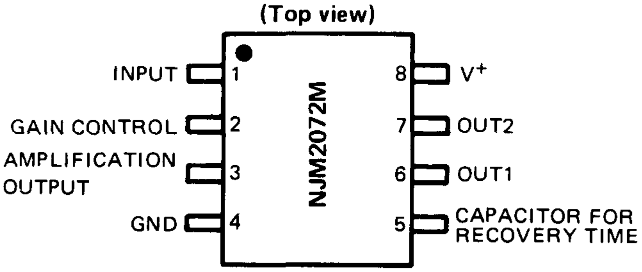
Diameter	ϕ19
Impedance	19Ω (1000Hz)
Max. input power	50mW

- **Microphone**

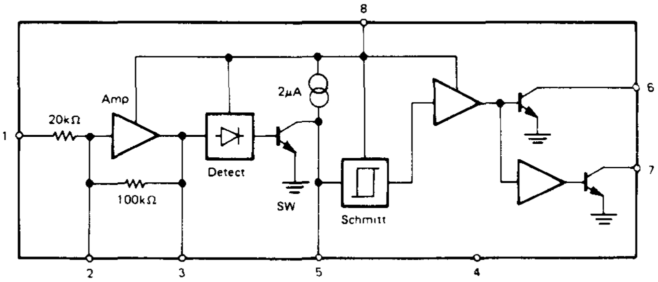
Output sensitivity	−67.5dB (0dB = 1V/µbar 1000Hz)
Output impedance	1.6kΩ (1000Hz)

HMC-2 SEMICONDUCTOR DATA

- **Terminal connection diagram**

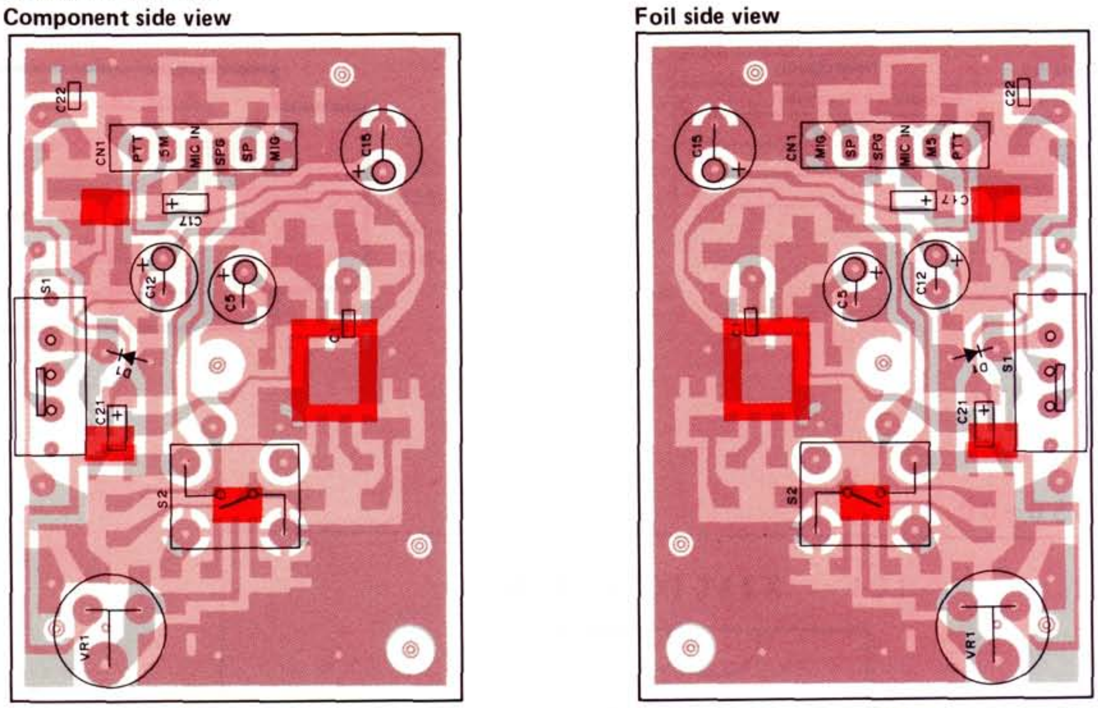


- **Block diagram**



HMC-2 (HEAD SET WITH VOX & PTT)

HMC-2 PC BOARD VIEWS

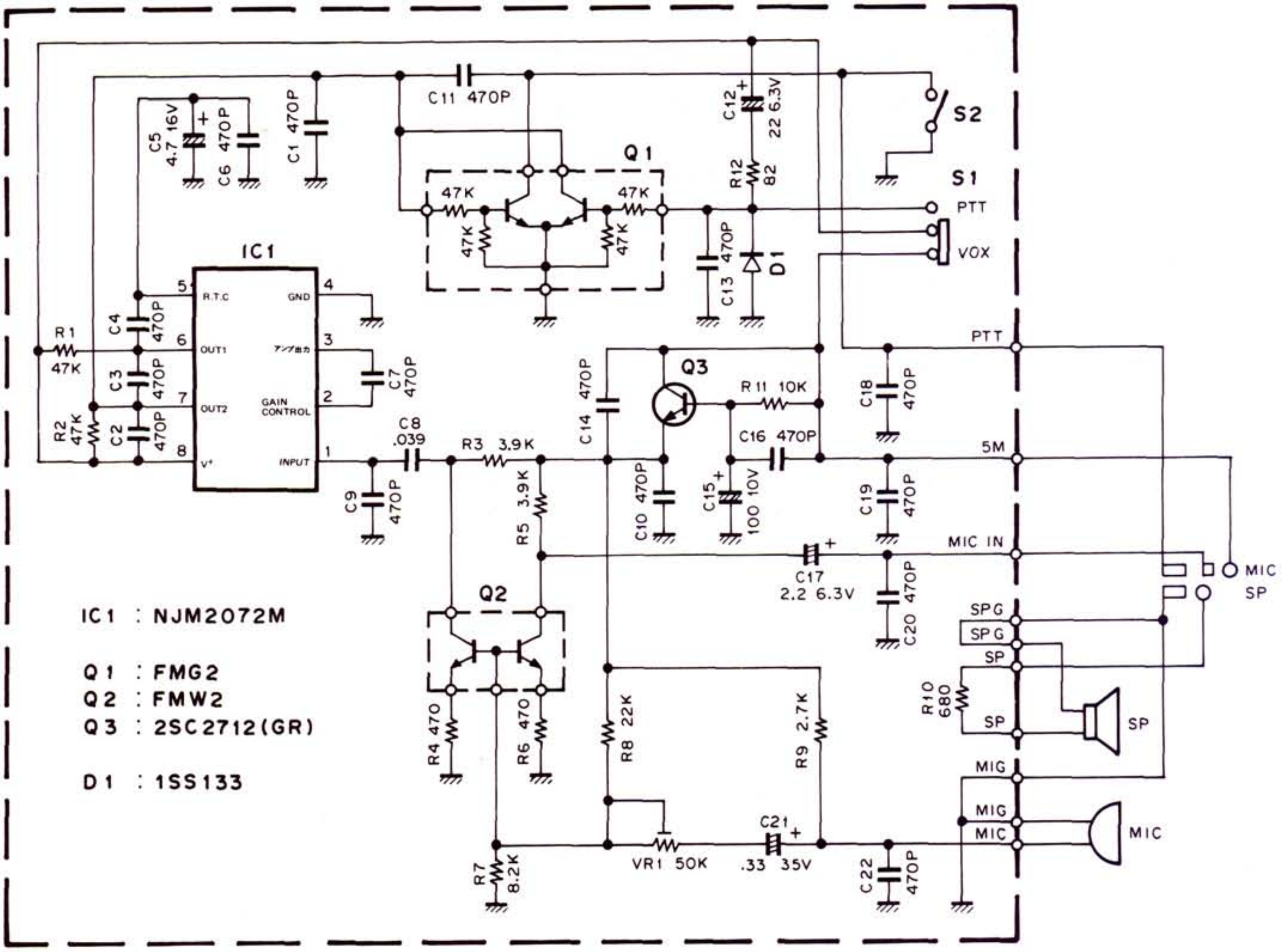

Component side view

Foil side view

🟥 : Component side

⬜ : Foil side

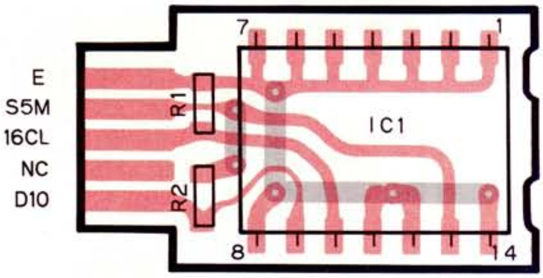
HMC-2 CIRCUIT DIAGRAM

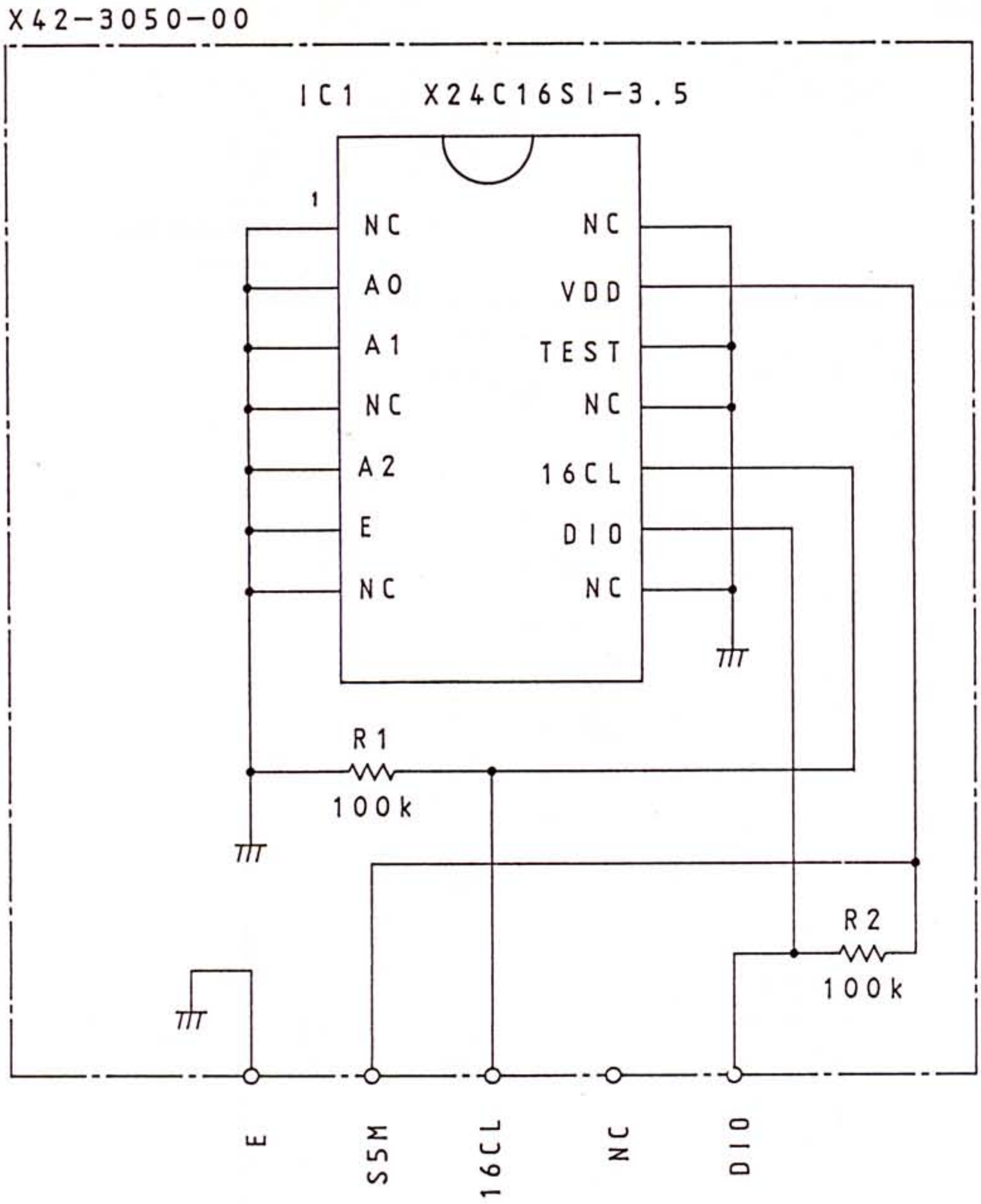


ME-1 (EXTENSION MEMORY UNIT)

ME-1 Parts List

Ref. No.	Parts No.	Description
	X42-3050-00	Extension memory unit
	B62-0255-00	Operating manual
R1, 2	RK73GB1J104J	Chip R 100K J
IC1	X24C16SI-3.5	IC



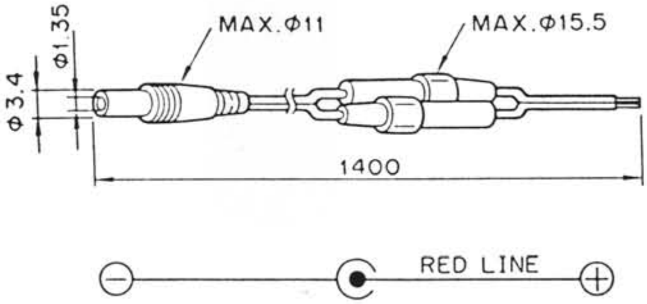


PG-2W (DC CORD) / PG-3F (PLUG WITH CORD)

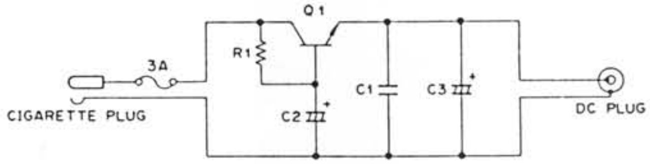
PG-2W EXTERNAL VIEW

PG-3F EXTERNAL VIEW

PG-2W MAIN EXTERNAL DIMENSIONS



PG-3F CIRCUIT DIAGRAM



Q1 : 2SD717 (O,Y)
R1 : 22Ω 1/4W

C1 : 0.001μF 50V
C2 : 2.200μF 16V
C3 : 100μF 16V

TH-78A/E

SC-35/36 (SOFT CASE) /MB-6 (MOBILE BRACKET) /WR-2 (WATERPROOF CASE)

SC-35 EXTERNAL VIEW
with PB-8, PB-13

SC-36 EXTERNAL VIEW
with PB-17, PB-18

MB-6 EXTERNAL VIEW

WR-2 EXTERNAL VIEW

MB-6 Parts List

Ref. No.	New	Parts No.	Description
		N99-0320-05	Screw set

SMC-31 / 32 (SPEAKER MICROPHONE)

SMC-31 EXTERNAL VIEW

SMC-32 EXTERNAL VIEW

SMC-31 SPECIFICATIONS

Electrical characteristic

- **Speaker**

Diameter	φ45 (mm)
Impedance	8Ω
Rated input power	0.15W
Max. input power	0.3W

- **Microphone**

Sensitivity	66dB ± 3dB at 1300Hz
Output impedance	2kΩ ± 30% at 1000Hz

SMC-32 SPECIFICATIONS

Electrical characteristic

- **Speaker**

Diameter	φ28 (mm)
Impedance	8Ω
Rated input power	0.5W
Max. input power	1W

- **Microphone**

Sensitivity	66dB ± 3dB at 1300Hz
Output impedance	2kΩ ± 30% at 1000Hz

SMC-31 PARTS LIST

• : New Parts

Ref. No.	New Parts	Parts No.	Description
		D10-0605-08	PTT lever
		E30-2110-05	Curl cord ass'y
		J19-1360-08	Clip
		T07-0219-08	Speaker
		T97-1024-08	Microphone

SMC-32 PARTS LIST

• : New Parts

Ref. No.	New Parts	Parts No.	Description
		E30-2127-08	Curl cord ass'y

SMC-33 (SPEAKER MICROPHONE) /HS-9 (EARPHONE)

SMC-33 SPECIFICATIONS

SMC-33 SPECIFICATIONS

Electrical chartacteristic

- **Speaker**

Diamater	ø28 (mm)
Impedance	8Ω
Rated input power	0.5W
Max. input power	1W

- **Microphone**

Sensivity	58dB±3dB (0dB = 1V/μbar) at 1300 Hz
Output impedance	2 kΩ ± 30% at 1000 Hz

SMC-33 Parts List

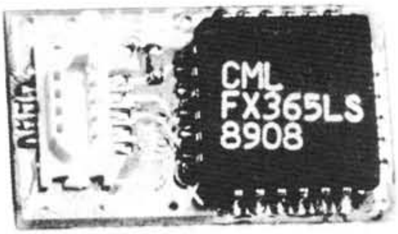
* : New Parts

Ref No.	New Parts	Parts No.	Deacription
		E30-2196-06	Microphone with Speaker
		T91-0392-05	Condenser MLC

HS-9 EXTERNAL VIEW

TSU-7(CTSS UNIT)

TSU-7 PC BOARD VIEW



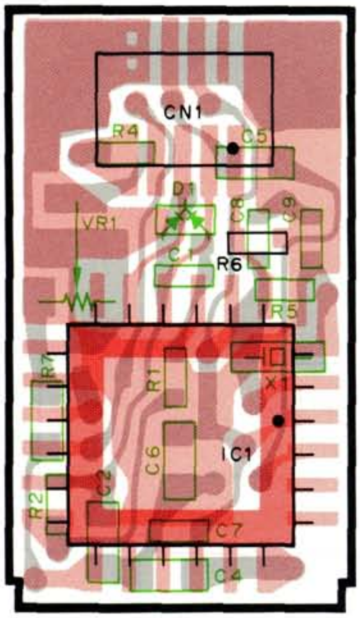
TSU-7 PARTS LIST

Ref. No	Address	Rart	Rarts No.	Description	Desti-nation	Re-marks
TSU-7 (X52-3170-00)						
			G10-0692-04	CUTTION		
			H21-0704-04	CUTTION		
X1			L78-0062-05	STAL (1MHz)		
IC1			FX365LS	IC		
D1			DAN202U	DIODE		
CN1			E40-5341-05			
VR1			R12-6526-05	TRIM. POT. (47K)		
R1			RK73BG1J274J	CHIP R J 270K		
R2			RK73BG1J824J	CHIP R J 820K		
R4			RK73BF1J103J	CHIP R J 10K		
R5			RK73BG1J105J	CHIP R J 1M		
R6			RK73BG1J473J	CHIP R J 47K		
C1			CK73GB1H471K	CHIP C K 470pF		
C2			C92-0521-05	CHIP TAN 20WV		
C4-6			CK73FB1E104K	CHIP C K 0.1UF		
C7			CK73GB1H471K	CHIP C K 470pF		
C8. 9			CC73GCH1H221J	CHIP C J 220pF		

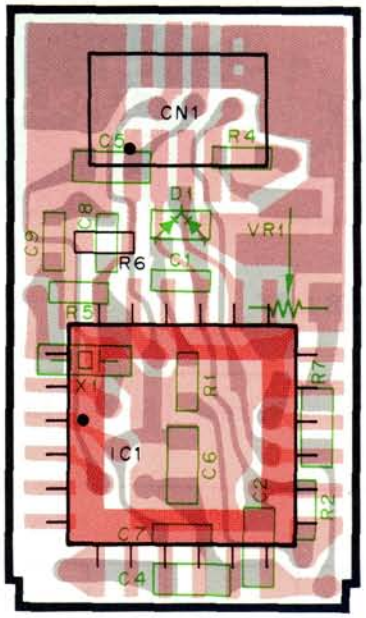
TSU-7(CTCSS UNIT)

PC BOARD VIEWS

(Component side view)

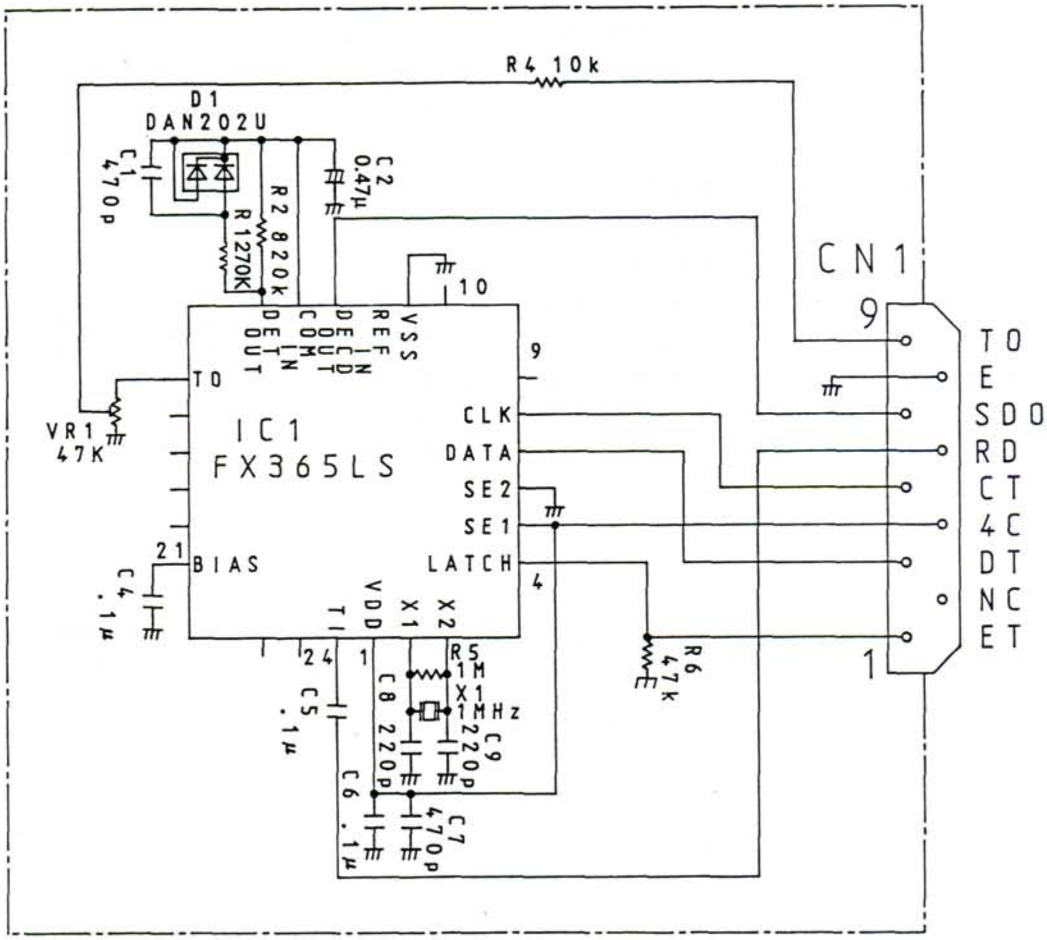


(Foil side view)



▨ : Component side pattern ▨ : Foil side pattern

CIRCUIT DIAGRAM



TH-78A/E

SPECIFICATIONS

GENERAL

		144MHz band	440/430MHz band
FREQUENCY RANGE (MHz)	U.S.A. Version	144 to 148	438 to 450
	U. K. and Europe	144 to 146	430 to 440
	Other market	144 to 148	430 to 440 or 438 to 450
MODE		F3E (FM)	
ANTENNA IMPEDANCE		50Ω	
OPERATING TEMPERATURE		–20℃ to +60℃ (–4°F to 140°F)	
POWER REQUIREMENTS	DC IN (normal)	6.3V to 16 VDC (13.8 VDC)	
	BATTERY PACK	6.3V to 16 VDC (7.2 VDC)	
CURRENT DRAIN		Approx.	Approx.
Transmit mode (13.8VDC)	H	1.4A	1.5A
Transmit mode (13.8VDC)	L	0.5A	0.6A
Transmit mode (13.8VDC)	EL	120 mA	150 mA
SIMPLEX Receive mode with no signal		60 mA	65 mA
SIMPLEX Battery Save mode		10 mA	12 mA
DUPLEX Receive mode with no signal		110 mA	110 mA
DUPLEX Battery Save mode		20 mA	20 mA
GROUND		Negative	
DIMENSION (WxHxD)		49.5x134x41 mm	
DIMENSION (Projection included)		61.4x149.5x41 mm	
WEIGHT (Transceiver only)		270g	
MICROPHONE IMPEDANCE		2kΩ	

TRANSMITTER

OUTPUT POWER	H (13.8VDC)	more than 5W	
	H (7.5VDC)	Approx. 2W	
	L	Approx. 0.5W	
	EL	Approx. 10W	Approx. 20W
MODULATION		Reactance	
MAX. FREQUENCY DEVIATION		±5 kHz	
SPURIOUS RADIATION		less than –60 dB	

RECEIVER

CIRCUTRY	double conversion superheterodyne	
INTERMEDIATE FREQUENCY 1ST IF	45.05 MHz	58.525 MHz
INTERMEDIATE FREQUENCY 2ND IF	455 kHz	
SENSITIVITY (12 SINAD)	less than 0.16 µV (MAIN) 0.32 µV (SUB)	less than 0.18 µV (MAIN) 0.32 µV (SUB)
SQUELCH SENSITIVITY	less than 0.16 µV	
SELECTIVITY –6dB	more than 12kHz	
SELECTIVITY –60B	less than 28 kHz	
AUDIO OUTPUT POWER (10% distortion)	More than 200 mW (across 8Ω load)	

NOTES: 1. Circuit and ratings are subject to change without notice, due to development in technology.

2. Recommended duty cycle: 1 minute Transmission, 3 minutes Reception.

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