

KENWOOD SERVICE MANUAL

Model TS-670

FM-430, GC-10, VS-1
ALL MODE QUAD BANDER

MASTER COPY
Tel. 01243 2430 or 2817
Telex 377482 LOWIHC G
Maffia
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TS-670

SPECIFICATIONS

[General]

Transmit/receive frequency range:

40 m band: 7.0 — 7.1 MHz
15 m band: 21.0 — 21.45 MHz
10 m band: 28.0 — 29.7 MHz
6 m band: 50.0 — 54.0 MHz

Mode:

SSB (A3J), CW (A1), AM (A3) and FM (F3-option)
(50 MHz band only for AM transmission.)

Antenna impedance: 50 Ω

Supply voltage: 12 — 16 V DC

(Reference voltage: 13.8 V DC)

Power consumption:

Approx. 4 A at transmission
Approx. 1.1 A at reception with no signal

Dimensions: 270W(279) × 96H(108) × 260D(298) mm

Dimensions in () are the maximum, including projections.

Weight: 5.4 kg

[Transmitter]

Final power input: SSB, CW, FM 10 W
AM 4 W
(50 MHz band only)

Modulation :

SSB: Balanced modulation
FM : Variable reactance direct shift
AM : Low level modulation

Carrier suppression: Better than 40 dB

Unwanted sideband suppression: Better than 50 dB

Unwanted radiation intensity:

7, 21, 28 MHz bands : Less than -40 dB
50 MHz band : Less than -60 dB
21 MHz band 5th higher harmonic: Less than -70 dB
50 MHz band 2nd higher harmonic: Less than -70 dB

Transmission frequency response (SSB): 400 — 2600 Hz (better than -6 dB)

Maximum frequency deviation (FM): ± 5 kHz (FM-430 installed)

Microphone impedance: 500 Ω — 50 k Ω

[Receiver]

Circuitry: SSB, CW, AM : Single superheterodyne
: Double superheterodyne

Intermediate frequency: SSB, CW, AM: 8.83 MHz
FM: 1st IF 8.83 MHz
: 2nd IF 455 kHz

Sensitivity:

SSB, CW (10 dB S/N) : Less than -12 dB μ (0.25 μ V)
AM (10 dB S/N) : Less than 6 dB μ (2 μ V)
FM (30 dB S/N) : Less than 0 dB μ (1 μ V)
(12 dB SINAD) : Less than -8 dB μ (0.4 μ V)

With YK-88A inserted in AM mode.

With FM-430 inserted in FM mode.

Squelch sensitivity:

FM (28.50 MHz band) : Less than -10 dB μ (0.32 μ V)
SSB, CW, AM : Less than 10 dB μ (3.2 μ V)

Image ratio: More than 50 dB

IF reflection: More than 50 dB

Selectivity:

	-6	-60 dB
SSB, CW	2.5 kHz	6 kHz
AM*	6 kHz	11 kHz
FM**	12 kHz	22 kHz

* With YK-88A inserted.

** With FM-430 inserted.

RIT variable range: More than ± 1.2 kHz

Audio output power: More than 1.5 W

(with 8 Ω load, 10% distortion)

Audio output impedance: 8 — 16 Ω

[Frequency Controller]

Frequency accuracy:

Within $\pm 10 \times 10^{-6}$ at room temperature
Within $\pm 30 \times 10^{-6}$ at 0°C — +50°C

Frequency stability (at reception):

Within $\pm 30 \times 10^{-6}$ at 0°C — +50°C.
Within ± 300 Hz for up to 60 minutes after turn-on, and
within 30 Hz for any 30 minute period thereafter.

■ Circuitry and ratings are subject to change without notice
due to developments in technology.

■ GC-10, VS-1, VOX-4, FM-430, MB-430, SP-430 and
PS-20 are optionally available.

CIRCUIT DESCRIPTION

OUTLINE

The TS-670 is a single conversion 4-band transceiver having an intermediate frequency of 8.83 MHz. In the FM reception mode double conversion at 455 KHz is employed.

The Phase Locked Loop (PLL) uses a digital variable frequency oscillator (VFO) control system at a 10 and 100 Hz step switching rate in all modes but FM, in which 10 KHz and 100 KHz switching is automatically selected by the transceivers microprocessor. Excluding only the FM receiver second conversion oscillator, all oscillator frequencies generated in this device are including the carrier injection frequencies controlled by and synthesized from a single reference frequency source of 24 MHz.

The main auxiliary functions include two VFOs, 80-channel memory, frequency specify function, memory scan, program scan, IF shift, RIT, NB, power control and other useful functions.

RECEPTION CIRCUIT CONFIGURATION

The TS-670 reception system uses a single conversion at IF 8.83 MHz in SSB, CW and AM modes. In the FM mode, double conversion is used with a second IF at 455 kHz.

The RF stage is divided into 50 MHz, 7 MHz, 21 MHz and 28 MHz, while the stage following the mixer is common.

The signal received by the antenna is fed through the Low Pass Filter (LPF) (common for both transmission and reception), which is relay switched according to band, and antenna relay RL1 on the Filter unit before being input to the RF unit PA terminal.

The signal is fed through broad-band transformer T1, RF attenuating relay RL2, 8.83 MHz trap T2 and T3, IF traps L2 to L4, and for 50 MHz Band, the signal is stepped up by antenna coil T4 and T5. It is then amplified by RF amp Q1 (2SK74 (L)) and fed through Band Pass Filter (BPF) T6 to T8 before being output from buffer amp Q2. HF signals are stepped up by broadband transformer T9, and then fed through either a 7, 21, or 28 MHz BPF : 7 MHz; T12, T15 and T18. 21 MHz; T11, T14 and T17. 28 MHz; T10, T13 and T16. It is then amplified by RF amp Q3 (3SK74 (L)) before being output from buffer amp Q4.

Both 50 MHz and HF signals are converted a balanced signal by broad-band transformer T20, then mixed with the local oscillator by common mixers Q5 and Q6 (3SK122(L) x 2) to become an 8.83 MHz intermediate frequency signal T19 is an 8.83 MHz trap.

This signal is fed through ceramic filter CF1, then amplified by the first IF amp Q7 (3SK73 GR), and fed through Noise Blanker (NB) gate diode D17 through D20 before being output to the IF unit via the RIF terminal in the SSB, CW and AM modes. In the FM mode, the signal is first fed through buffer amp Q8, and is then output to the FM unit through the FMI terminal. The noise blanker samples from the output of ceramic filter CF1, feeds this through buffer amp Q11 (2SK192 (Y)), then amplifies this by Q12, Q13 and Q14 the noise component is detected by diodes D23 and D24 before

driving switching transistor Q15 to switch the NB gate.

The NB gate also serves as a blanking circuit to eliminate Phase Locked Loop (PLL) "click" noise when the Voltage Controlled Oscillator (VCO) resets (Q9 and Q10).

The signal from the RF unit RIF terminal is fed to the IF unit RIF terminal through matching transformer L1 and through mode-selected Monolithic Crystal Filters (MCFs), and is then amplified by IF amps Q1 and Q4 (3SK73).

The signal in SSB and CW modes is detected by product detector D26 through D29 (1N60), amplified by audio pre-amp Q7 which is common to each mode, and fed through squelch switching transistor Q8 before being output to the gain control.

In the FM mode, the signal is detected by diode D25, then passed through buffer amp Q6 before being fed to pre-amp Q7.

In FM mode, the signal is mixed, amplified and detected in the FM unit, then fed through the IF unit FAF terminal before being input to pre-amp Q7.

The audio input to this pre-amplifier is switched by either D30, for the SSB and CW modes, D32 for the AM mode or D31 for the FM mode.

TRANSMISSION CIRCUIT CONFIGURATION

Like the reception system, the transmission system uses single conversion in the SSB, CW and AM modes, and uses double conversion in the FM mode.

In the SSB, CW and AM modes, audio from the MIC input terminal is amplified by Q34 on the IF unit, then fed through the mic gain control, and further amplified by Q35 before being input to balanced modulator Q36 (AN612).

In the SSB mode, the output from this modulator is Double Side Band, and after passing through the Monolithic Crystal Filter (MCF) YK-88S3 becomes an SSB signal.

In the AM and CW modes, modulator balance is lost by applying the DC voltage to pin 1 of this modulator. At this time, the amount of carrier to be injected is determined by varying the DC bias current to pin diode D44 (MI204). In the AM mode, the output from Q36 is fed through R5 (680 ohm). (However, when AM filter YK-88A is mounted, the signal is also fed through this filter.) In the CW mode, the output is fed through SSB filter YK-88S3. Each mode signal fed through the filter is amplified by transmitter IF amp Q24, then output to the RF unit.

In the FM mode, the audio signal fed through mic amp Q34 which is commonly used is fed to the FM unit where the signal is FM-modulated using the 8831.5 kHz carrier frequency, the out-put of which is input to No. 1 transmitter balanced mixers Q24 and Q25 (3SK122 x 2) of the RF unit.

The switching between the SSB, CW, AM signals and the FM signal is performed by switching diodes D32 and D38.

The ALC (Automatic Level Control) is performed on transmitter IF amp Q42 of the IF unit.

The transmitter signal from the IF unit is mixed with band-wise VCO output at first transmitter balanced mixers Q24 and

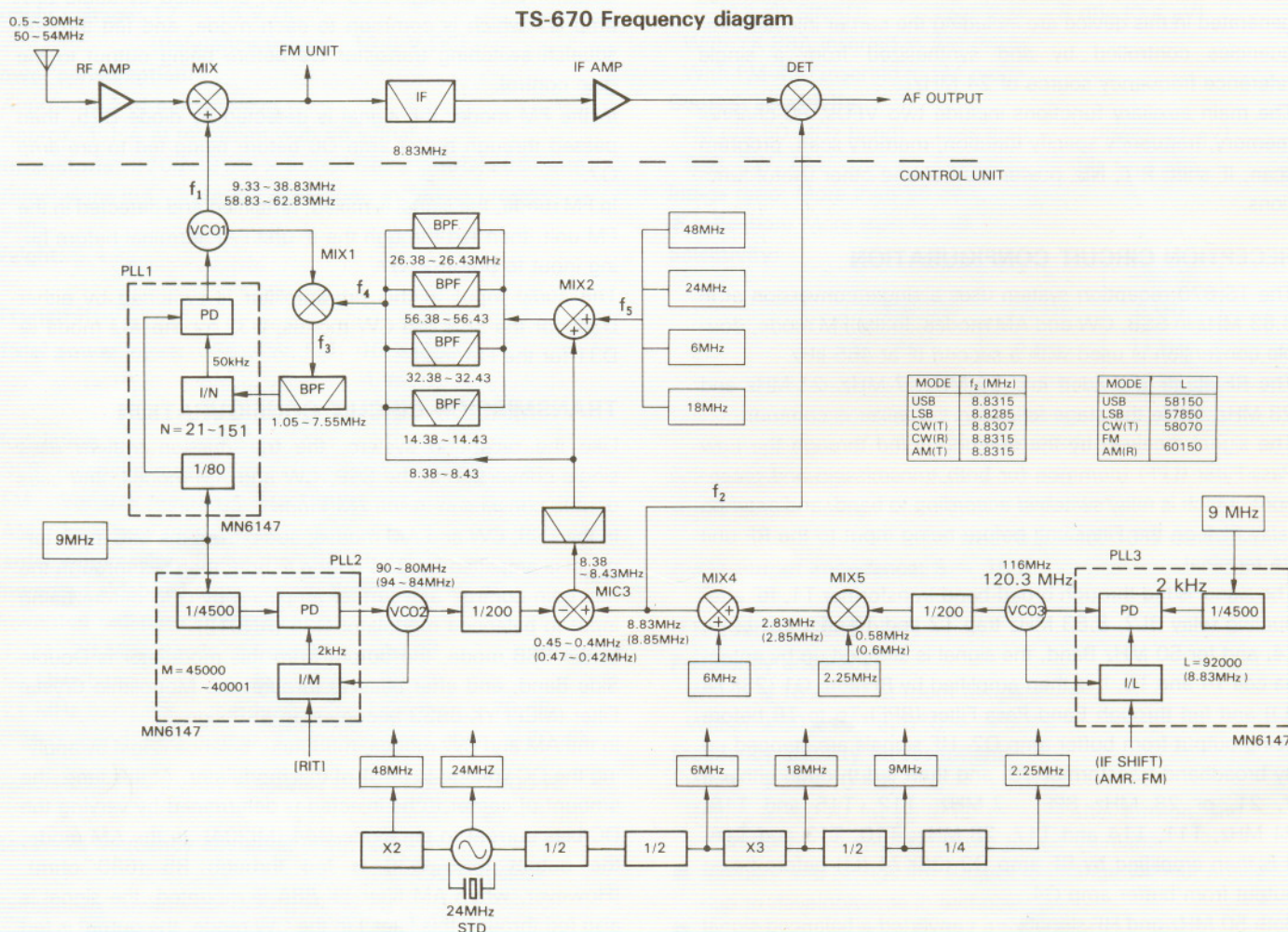
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CIRCUIT DESCRIPTION

Q25, then branched into two signals; 50 MHz and 7, 21, 28 MHz signals. The 50 MHz signal is fed through BPF (T37 to T40), then amplified by transmitter amp Q29 (3SK73) and broad-band amplifiers Q30 and Q31 (2SC2086 x 2), and output as a 50 MHz signal. The 7, 21 and 28 MHz signals are fed through each band-wise BPF (common as in reception), then amplified by broad-band amp Q26 (3SK73), buffer amp Q27 and broad-band amp Q28 (2SC2086). The amplified 50 MHz signal and 7, 21 and 28 MHz signals

are switched by relay RL1, then become a drive output to the final unit.

The signal fed to the final unit is amplified by broad-band push-pull drive amps Q1 and Q2 (2SC1971 x 2), then further amplified by broad-band push-pull final amps Q3 and Q4 (2SC2509 x 2), and becomes a 10 W output. The RF output is fed through the band-wise LPFs in the filter unit, then fed to the antenna for output. The ALC and protection detection are performed at the antenna line after feeding through LPFs.



Item	Rating
Center frequency f_0	8830.7 kHz
Center frequency deviation	$f_0 \pm 150$ Hz at 6 dB
6 dB bandwidth	± 250 Hz or more
60 dB bandwidth	± 900 Hz or less
Ripple	2 dB or less
Loss	6 dB $\pm$ 2 dB
Guaranteed attenuation	80 dB or more within $f_0 \pm 2$ kHz to ± 1 MHz
Input and output impedance	600 Ω /15pF

Table 1 CW crystal filter YK-88C (L71-0211-05) Option

Item	Rating
Center frequency f_0	8830.7 kHz
Center frequency deviation	$f_0 \pm 50$ Hz at 6 dB
6 dB bandwidth	± 125 Hz or more
60 dB bandwidth	± 600 Hz or less
Ripple	2 dB or less
Loss	8 dB $\pm$ 2 dB
Guaranteed attenuation	80 dB or more within $f_0 \pm 2$ kHz to ± 1 MHz
Input and output impedance	600 Ω /15pF

Table 2 CW crystal filter YK-88CN (L71-0221-05) Option

CIRCUIT DESCRIPTION

PLL CIRCUIT

The PLL circuit of the TS-670 consists of 3 PLL circuits using a reference frequency of 24 MHz and all the frequencies are placed under the control of the 24 MHz reference oscillator. ICs 3, 4 and 13 are PLL ICs. A single package of these ICs (MN6147) contains the program divider, phase comparator, and frequency dividers for the reference signal.

The IC3 PLL has a reference comparison frequency of 2 kHz, and oscillates at 116 MHz (120 MHz during AM reception and FM reception). The 9 MHz signal obtained by dividing a 18 MHz signal by 2, the 3rd higher harmonic of 6 MHz which has been produced from a reference frequency of 24 MHz by dividing with 4, is further divided within the PLL to produce 2 kHz, which is in turn used as a reference comparison frequency. Frequency dividing ratios L are 58150 in USB, 57850 in LSB and 58070 in CW (during transmission) and 60150 during FM and AM (reception). The frequency dividing ratios are determined by the signals fed from data bus DB0 to DB3 of the CPU (IC19: TMP8049P-3034).

The 116 MHz (AM reception, FM 120 MHz) output is divided by a ratio $1/100 \times 1/2$ (IC5: M54459L, IC6-b: SN74LS112AN) to become 0.5815 MHz (0.6 MHz AM reception, FM) in USB mode, then mixed with a 2.5 MHz signal produced from the reference oscillator by MIX5 (IC7: SN161913P), fed through the BPF, and then mixed with the 6 MHz signal produced by the reference oscillator to obtain 8.8315 MHz in USB mode. This signal is fed through the buffer amp to become the CAR signal, and, on the other hand, it becomes a signal for other PLL. PLL IC4 has a reference comparison frequency of 2 kHz and oscillates at 90 to 80 MHz (AM reception, FM 94 to 84 MHz) in 2 kHz steps.

The 9 MHz signal obtained by the reference frequency is divided within the IC to produce a 2 kHz signal which is in turn used as a reference comparison frequency. The frequency dividing ratio M of the program divider is 45000 to 40001 and the frequency dividing setting signals for the IC are sent from data bus B0 to B3 of the CPU (IC19: TMP8049P-3034).

An output of 90 to 80 MHz (AM reception; FM 94 to 84 MHz) from VCO2 (Q24: 2SC1923) is divided by $1/100 \times 1/2$ (IC9: M54459L, IC6-a: SN74LS112AN) to become a 10 Hz step signal of 450 - 400 kHz (AM reception; FM 470 to 420 kHz). This signal is mixed with the 8.83 MHz PLL output of IC3 at MIX3 (IC10: SN16913P), then the resultant 8.38 to 8.43 MHz signal is fed through the ceramic filter and input to MIX2 (IC11: SN16913). This 8.38 to 8.43 MHz signal is either kept as it is or mixed with 48 MHz, 24 MHz, 6 MHz or 18 MHz signals generated by the reference oscillator, then input to the final PLL (IC13).

The final PLL IC13 oscillates at VCO frequencies (7, 21, 28 and 50 MHz amateur band frequencies plus 8.83 MHz) corresponding to respective amateur bands using a reference comparison frequency of 50 kHz. A reference comparison frequency of 50 kHz is obtained by dividing the 9 MHz signal generated from a reference frequency of 24 MHz within the PLL IC. Frequency dividing ratio N of the program divider is 31 to 151, and the frequency dividing ratio is given by data bus B0 to B3 of the CPU (IC19: TMP8049P-3034).

	BAND	Frequency range	VCO (f_1)	(f_2)	(f_4)	(f_5)
①	05A	0.5 ~ 1.8MHz	9.33 ~ 10.63MHz	5.05 ~ 3.8MHz	14.38 ~ 14.43MHz	6 MHz
②	2A	1.8 ~ 4 MHz	10.63 ~ 12.83MHz	2.25 ~ 4.4MHz	8.38 ~ 8.43MHz	—
③	4A	4 ~ 6.6MHz	12.83 ~ 15.43MHz	4.45 ~ 7 MHz	8.38 ~ 8.43MHz	—
* ④	7A	6.6 ~ 8 MHz	15.43 ~ 16.83MHz	1.05 ~ 2.4MHz	14.38 ~ 14.43MHz	6 MHz
⑤	8A	8 ~ 9.9MHz	16.83 ~ 18.73MHz	2.45 ~ 4.3MHz	14.38 ~ 14.43MHz	6 MHz
	10A	9.9 ~ 12 MHz	18.73 ~ 20.83MHz	4.35 ~ 6.4MHz	14.38 ~ 14.43MHz	6 MHz
⑥	12A	12 ~ 16 MHz	20.83 ~ 24.83MHz	5.55 ~ 1.6MHz	26.38 ~ 26.43MHz	18MHz
⑦	16A	16 ~ 21 MHz	24.83 ~ 29.83MHz	7.55 ~ 2.6MHz	32.38 ~ 32.43MHz	24MHz
* ⑧	21A	21 ~ 24.8MHz	29.83 ~ 33.63MHz	3.45 ~ 7.2MHz	26.38 ~ 26.43MHz	18MHz
* ⑨	28A	24.8 ~ 30 MHz	33.63 ~ 38.83MHz	1.25 ~ 6.4MHz	32.38 ~ 32.43MHz	24MHz
* ⑩	50A	50 ~ 54 MHz	58.83 ~ 62.83MHz	2.45 ~ 6.4MHz	56.38 ~ 56.43MHz	48MHz

Note 1: * Mark, original installed (without GC-10)

Note 2: ⑤ Band has change VCO (f_1) only and RF has 8 ~ 12 MHz BPF.

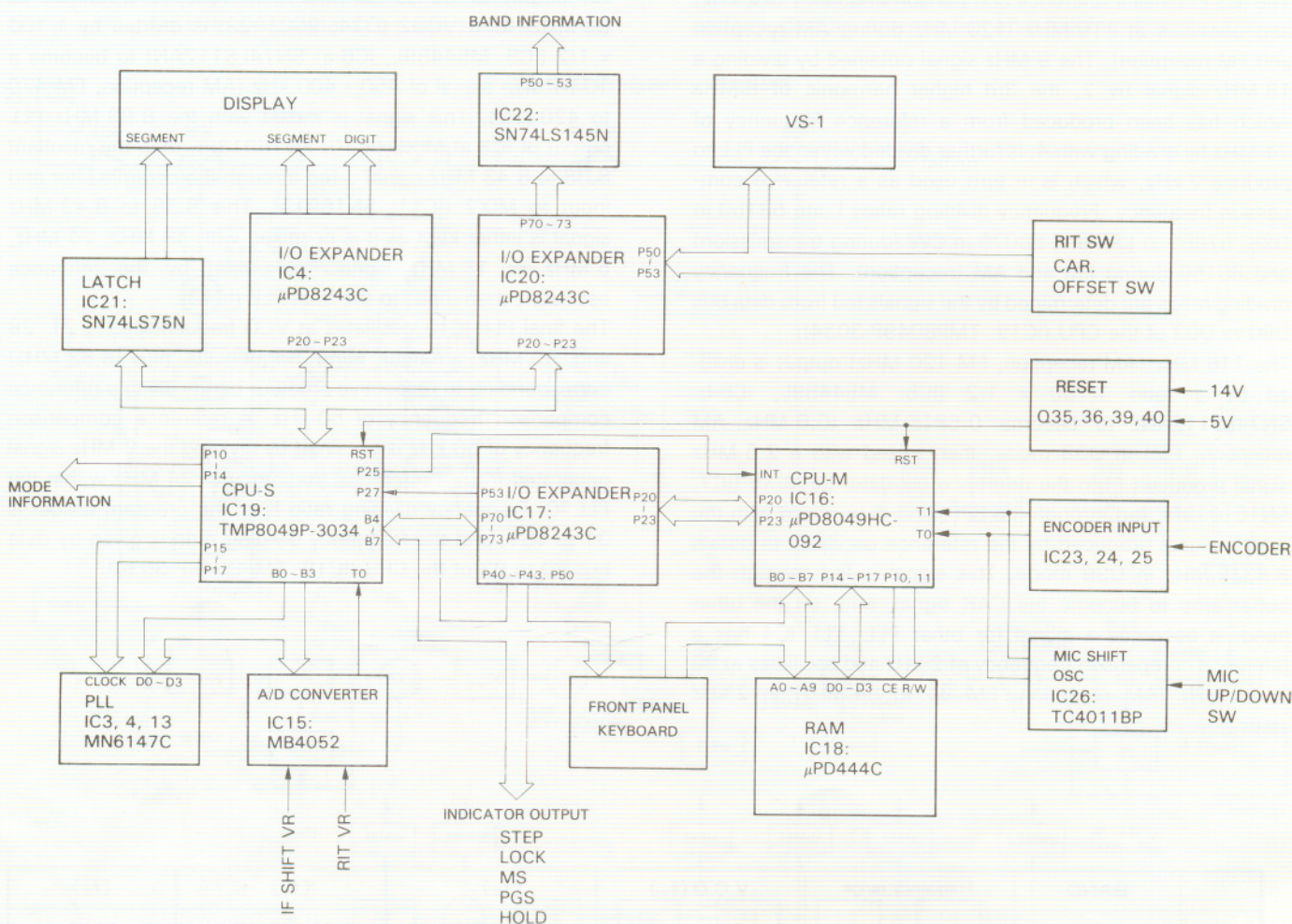
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CIRCUIT DESCRIPTION

The VCO consists of Q17, Q18, Q19 and Q20, and the VCO frequencies corresponding to 7, 21, 28 and 50 MHz are mixed with either one of the five corresponding frequencies 14.38 - 14.43 MHz, 32.38 - 32.43 MHz, 56.38 - 56.43 MHz, and 26.38 - 26.43 MHz (8.38 - 8.43 MHz is used when the general coverage unit is incorporated) generated by the previous MIX2, then fed through the BPF

and input to the PLL IC where phase is compared with the 50 kHz signal obtained by using dividing ratio N of 31 to 151.

When the optional general coverage unit (GC-10) is incorporated, the outputs from the six VCOs within the GC-10 are fed to MIX1 where phase is compared with the 50 kHz signal just as in amateur bands.



TS-670 CONTROL BLOCK diagram

Item	Rating
Center frequency (f_0)	8831.5 kHz $\pm$ 250 kHz
-6 dB bandwidth	6 kHz
Attenuation bandwidth	11 kHz
Guaranteed attenuation	80 dB or more
Ripple	2 dB or less
Loss	3 dB $\pm$ 2 dB
Input and output impedance	600 Ω /15pF
Temperature	-10°C ~ +50°C

Table 3 AM crystal filter YK-88A (L71-0223-05) Option

Item	Rating
Normal center frequency (f_0)	8.830 MHz
3 dB bandwidth	$f_0 \pm 5$ kHz or more, total 25 kHz or more
20 dB bandwidth	90 kHz or less
Ripple (Within 3 dB bandwidth)	1 dB or less
Spurious response	14 dB or more within $f_0 \pm 1.5$ MHz
Input and output impedance	330 Ω

Table 4 Ceramic filter (L72-0324-05) SFE8.83MF (RF unit, CF1)

CIRCUIT DESCRIPTION

DIGITAL CONTROL CIRCUIT

The controller of the TS-670 uses two 8-bit microprocessors (μ PD8049HC-092, and TMP8049P-3034), and its peripheral circuits consist of three I/O expander ICs (μ PD8243C), externally connected RAM (μ PD444C), etc.

The two CPUs are connected with each other via 4-bit data bus and 2-bit control bus for data interchange.

The microprocessor clock operates at 8.1 MHz, which is oscillated by CPU-S (IC19). The clock pulse is also fed to the other CPU-M (IC16).

The CPU-M (IC16) performs decision and arithmetic operations with which to select the operating state of the unit, using the data from various switches on the panel and encoders, etc., determining the operating frequencies and modes. The determined frequencies and mode data are stored in the externally connected RAM (IC18) and at the same time transferred to the CPU-S (IC19).

To the CPU-M, the I/O expander IC17 is connected, from which control signals for various indicators are output and to which data from the keyboard switches on the front panel is input in matrixed form.

The CPU-S provides the digital frequency display based on the input frequency and mode data, and calculates frequency dividing ratio for each PLL circuit, then set data at PLL ICs (IC3, IC4 and IC13). At the same time, in order to control the

external circuits, the CPU-S also outputs mode data and band data. The band data is output in 5-bit data consisting of 4-bit BCD and 1 bit. The 4-bit BCD data is fed through IC22 (SN74LS145N) where it is divided into 10 bands, and a total of 11-band data is output.

The encoder input circuit consists of the OR, exclusive NOR and NAND gates of IC23, IC24 and IC25; the input 250 pulses/revolution clock rate is multiplied by 4 to become 1000 pulses. The IC25 (TC4011BP) flip-flop circuit detects the direction of revolution of the rotary encoder.

The non-stable multivibrator IC26 (TC4011BP) is an oscillatory circuit for frequency shift by the mic UP/DOWN switch and operates at approx. 55 Hz; this oscillatory frequency determines the shift speed. However, a 1-step feed has nothing to do with this oscillator but is internally processed by the microprocessor.

The RIT and IF shift of the TS-670 are varied by using potentiometers; these can be varied digitally in 10 Hz steps. In RIT mode, the actual frequency is also displayed. The DC voltages preset by potentiometers are divided into approx. 0 to 2.5 V by voltage dividers, then input to the A/D converter (IC15: MB4052) where the signals are converted into the 8-bit (256 steps) data before being input to the CPU-S, varying the frequency dividing ratio of the PLL circuit for control.

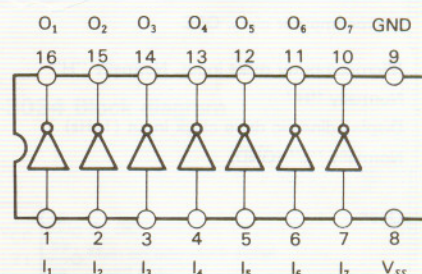
μ PA80C MAX Rating

Item	Symbol	Condition	Rating
Power voltage	V_{SS}	-60	V
Input voltage	V_I	-20	V
Output current	I_O	50	mA/unit
Ross	P_d	550	mW
Operating case temp.	T_{opt}	-25 ~ +75	°C
Storage temp.	T_{stg}	-40 ~ +125	°C

Item	Rating
Center frequency f_0	455 kHz
3 dB bandwidth	$f_0 \pm 4.2$ kHz or more
6 dB bandwidth	$f_0 \pm 6$ kHz or more
60 dB bandwidth	$f_0 \pm 12$ kHz or less
Ripple (With $f_0 \pm 4.2$ kHz)	3 dB or less
Loss	6 dB or less
Guaranteed attenuation	50 dB or more within $f_0 \pm 100$ kHz
Spurious	25 dB or more within 0.1 MHz to 1 MHz
Input and output impedance	1.5 k Ω

Table 5 FM crystal filter CFV455F (L72-0342-05)
(FM UNIT, CF1)

μ PA80C Block diagram



Item	Rating
Center frequency f_0	8830 kHz
Center frequency deviation	$f_0 \pm 150$ Hz at 6 dB
6 dB bandwidth	± 1.2 kHz or more
60 dB bandwidth	± 3.3 kHz or less
Ripple	2 dB or less
Loss	6 dB or less
Guaranteed attenuation	80 dB or more within $f_0 \pm 3$ kHz to ± 1 MHz
Input and output impedance	600 Ω /15pF

Table 6 CW crystal filter YK-88S3 (L71-0245-05)
(IF UNIT, XF1)

CIRCUIT DESCRIPTION

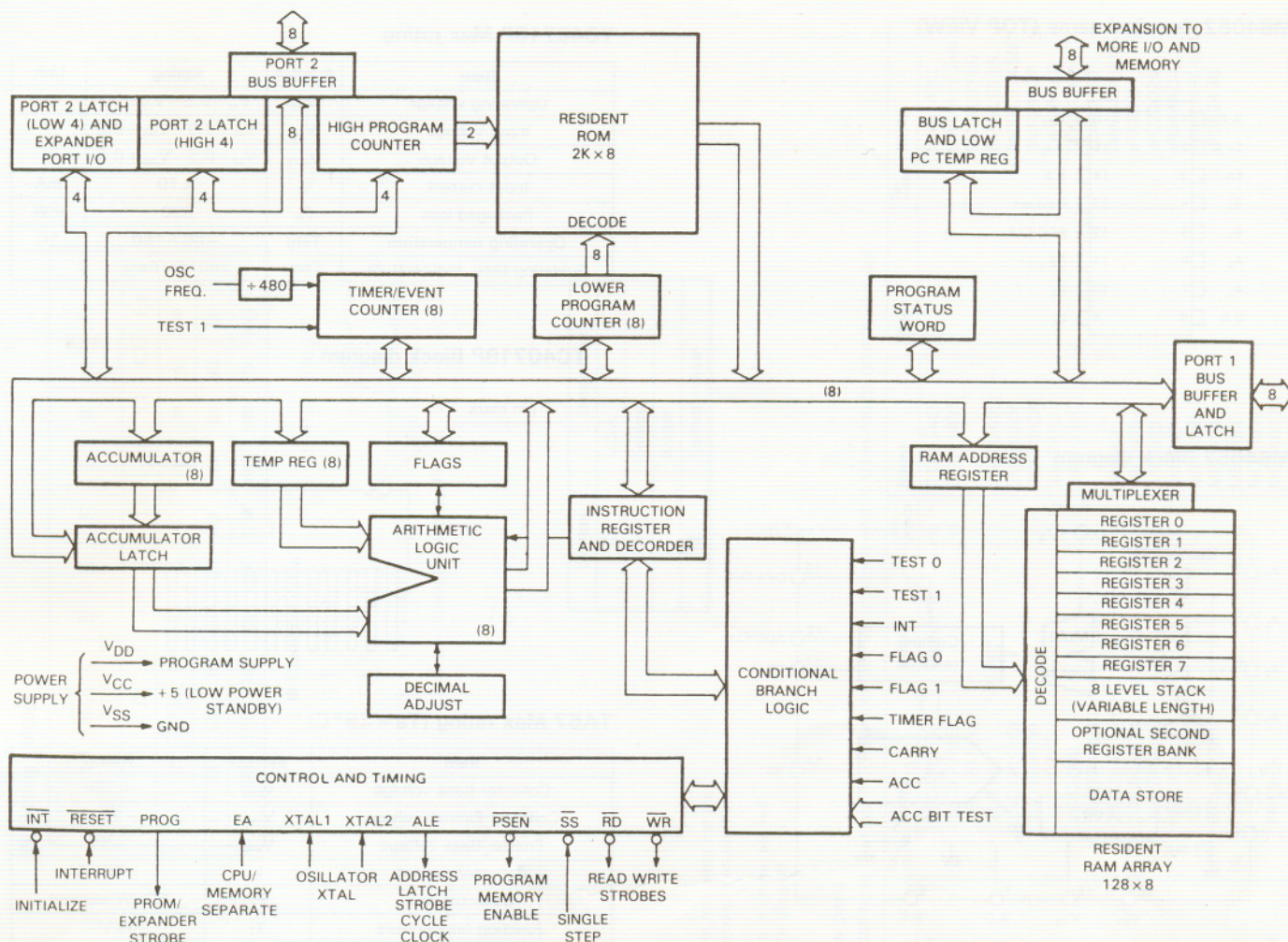
CPU-M IC6 (μ PD 8049HC-092) Terminal function

Terminal No.	Symbol	Explanation	Terminal No.	Symbol	Explanation
1	TO	Encoder UP/DOWN signal input	21	P20	I/O EXPANDER control output (IC17)
2	X'tal 1	Microcomputer clock input	22	P21	
3	X'tal 2		23	P22	
4	RESET	Microcomputer reset input. Normally "H"	24	P23	
5	SS	Normally "H"	25	PROG	
6	INT	CPU-S control input	26	V _{DD}	5V Power supply
7	EA	Normally "L"	27	P10	RAM CE output
8	RD	Open	28	P11	RAM R/W output READ: H WRITE: L
9	PSEN		29	P12	1MHz STEP SW input OFF: H ON: L
10	WR	Data input	30	P13	POWER DOWN input NORM: H
11	ALE		31	P14	RAM Data IN/OUTPUT
12	DB 0	RAM address output (A0 ~ 7)	32	P15	
13	DB 1		33	P16	
14	DB 2		34	P17	
15	DB 3		35	P24	RAM Address output (A8)
16	DB 4		36	P25	RAM Address output (A9)
17	DB 5		37	P26	Encoder F.F. Reset output
18	DB 6		38	P27	TX signal input TX: L RX: H
19	DB 7		39	T 1	Encoder clock output
20	GND	GND terminal	40	V _{CC}	5V Power supply

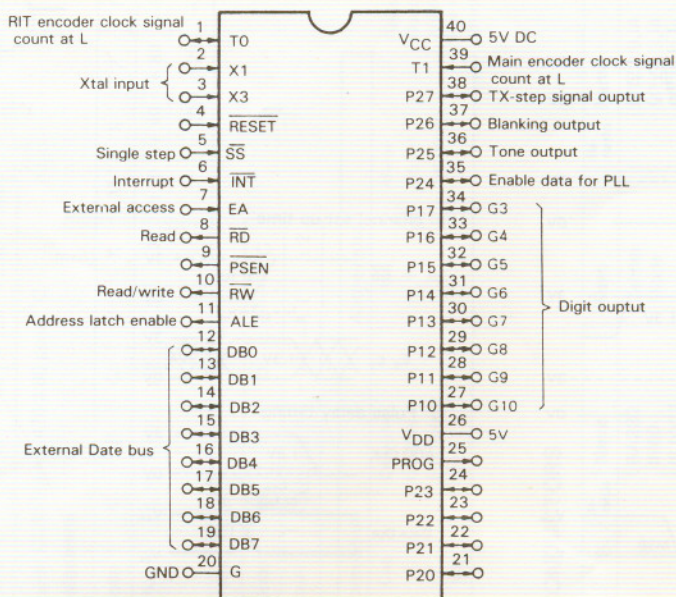
CPU-S IC19 (TMP8049P-3034) Terminal function

Terminal No.	Symbol	Explanation	Terminal No.	Symbol	Explanation
1	TO	A/D converter input	21	P20	I/O EXPANDER control output (IC20)
2	X'tal 1	Microcomputer clock OSC	22	P21	
3	X'tal 2		23	P22	
4	RESET	Microcomputer reset input. Normally "H"	24	P23	
5	SS	Normally "H"	25	PROG	
6	INT	Display dynamic drive clock input (1kHz)	26	V _{DD}	5V Power supply
7	EA	Normally "L" (GND)	27	P10	LSB
8	RD	Open	28	P11	USB
9	PSEN		29	P12	CW
10	WR	PLL dividing ratio output	30	P13	AM
11	ALE		31	P14	FM
12	DB 0	A/D control output	32	P15	PLL 1 clock output (IC13)
13	DB 1		33	P16	PLL 2 clock output (IC4)
14	DB 2	Data input	34	P17	PLL 3 clock output (IC3)
15	DB 3		35	P24	LATCH output
16	DB 4	CPU-M control bus (input)	36	P25	CPU-M control output
17	DB 5		37	P26	EXPANDER CHIP SELECT output
18	DB 6		38	P27	CPU-M control input
19	DB 7		39	T 1	PLL UNLOCK input NOR: H UNLOCK: L
20	GND	GND terminal	40	V _{CC}	5V Power supply

CIRCUIT DESCRIPTION



μPD8049HC-092/TM8049P-3034 Block diagram



μPD8049HC-092/TMP8049P-3034 Terminal name

CAPACITORS

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

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

Temperature coefficient

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

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

Example CC45TH = -470 ± 60 ppm/°C

Tolerance

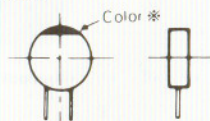
Code	C	D	G	J	K	M	X	Z	P	No code
(%)	± 0.25	± 0.5	± 2	± 5	± 10	± 20	+ 40 - 20	+ 80 - 20	+ 100 - 0	More than 10 μF - 10 ~ + 50 Less than 4.7 μF - 10 ~ + 75

Less than 10 pF

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

Abbreviation		Abbreviation	
Cap	Capacitor	ML	Mylar
C	Ceramic	S	Styren
E	Electrolytic	T	Tantalum
MC	Mica		

CC45



Rating voltage

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

Capacitor value

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

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

Symbol	Destination
K	U.S.A.
W	Europe
T	Britain
M	General market

Resistors not listed in this parts list are standard, fixed carbon composition, 1/4W or 1/8W. The resistance values, in ohms, are indicated on the schematic diagram.

N : New parts

* : Please note that parts are sometimes not in stock and it takes much time to deliver.

SEMICONDUCTORS

Item	Re- marks	Name	Item	Re- marks	Name	Item	Re- marks	Name	Item	Re- marks	Name	Item	Re- marks	Name
Diode	N	BA282	Zener Diode	N	MTZ3.9JA	N	N	2SC496(Y)	Digital-TR	N	DTA114ES			MN6147C
		IN60			MTZ4.3JA			2SC1775(E)			DTC114YS			SN74LS11.2AN
		IS1007			MTZ6.2JA			2SC1815(Y)						SN74LS75N
		IS1587			MTZ7.3JC			2SC1907						SN74LS93N
		IS2208			MTZ7.5JA			2SC1923(O)						SN74LS145N
		IS2588			MTZ8.2JB			2SC1959(Y)						SN16913P
		ISS101			MTZ9.1JB			2SC1971						TA1061AP
		ISS133			MTZ10JA			2SC2086						TC4011BP
		ISS1555			MTZ12JB			2SC2240(GR)						TC4071BP
		1TT310TE			WZ071			2SC2347		IC				TMP8049P-3034
		MC921						2SC2458(Y)			AN612			μPA80C
		M1204						2SC2459(BL)			AN7805			μPC2002V
		MV13						2SC2509			AN7808			μPD444C-0
		MV203						2SC2703(O,Y)			LM358P			μPD8049HC-092
		V06B						2SC2787(L)			M54459L			μPD8243C
								TA57			MB3614			
											MB4052			
											MC3357P			
											MC14077B			
Vari-cap Diode		1SV53A												

PARTS LIST

TS-670

Parts No.	Re- marks	Description	Q'ty	Ref No.
TS-670				
A01-0974-02		CASE (A)	1	
A01-0975-02		CASE (B)	1	
A20-2506-03	N	PANEL	1	
B05-0708-04		SP GRILE	1	
B10-0664-04	N	FRONT GLASS	1	
B30-0817-15		LAMP	1	
B31-0653-05	N	METER	1	
B39-0407-04		SPACER FOOT	2	
B40-3501-04	N	NAME PLATE KENWOOD	1	
B42-2378-04	N	FCC PLATE	1	K type only
B43-1007-04	N	BADGE KENWOOD	1	
B50-4115-00		INSTRUCTION MANUAL KENWOOD	1	
CE04W1A470M		ELECTRO 47 10V	1	
CK45F1H103Z		CERAMIC 0.01 50V	2	
CK45F1H473Z		CERAMIC 0.047 50V	1	
D09-0306-04			1	M type only
D09-0307-04			1	M type only
D40-0626-15		MECHANISM ASS'Y	1	
ERZD03DK331		SERGE ABSORB	2	
E04-0152-05		RF COAXIAL CABLE RECEPTACLE	2	
E06-0751-05		CYLINDRICAL RECEPTACLE REMOTE	1	
E07-0852-05		VOLTAGE SELECTOR PLUG	1	M type only
E08-0203-25		VOLTAGE SELECTOR SOCKET	1	
E30-1648-05		DC CABLE ASS'Y	1	
E31-0431-05		SPEAKER CABLE	1	
E31-2161-05		INSIDE CONNECTING WIRE	1	M type only
E40-0474-05		PIN ASS'Y	1	M type only
F05-4022-05		FUSE(4A)	1	
F05-4022-05		FUSE(4A)	1	
F10-1302-12	N*	SHIELDING PLATE	1	
F11-0858-03	N	SHIELDING CASE	1	
F15-0653-04	N	SHADE	1	
G02-0505-05		KNOB FITTING HARDWARE SPRING	3	
G09-0405-05		SPRING	1	
G11-0613-04	N	SOFT TAPE VFO	1	
G11-0609-04		SOFT TAPE MIC	2	M type only
G13-0666-04		CUSHION PANEL	2	
G13-0649-04		MOUNTING HARDWARE METER	2	
G53-0511-04		PACKING	4	
H01-4547-04		CARTON CASE (OUT)	1	
H03-2177-04		CARTON CASE (IN)	1	
H10-2588-02	N	POLYSTYRENE FOAM (F)	1	
H10-2589-02	N	POLYSTYRENE FOAM (R)	1	
H12-1315-04			1	
H25-0079-04		BAG 200X200	1	M type only
J02-0323-05		FOOT BOTTOM CASE	4	
J02-0407-04		FOOT METAL	1	
J02-0403-04		FOOT RUBBER	4	
J30-0534-04		SPACER (PLATE TYPE)	2	
J31-0141-04		COLLAR MIC	1	
J32-0781-04	N	BOSS 11.5CM	4	
J32-0782-04	N	BOSS 11CM	2	
J32-0786-04	N	BOSS 8.5CM POWER SW	2	
J61-0019-05		VINYL TIE	5	
J61-0408-05		VINYL TIE	5	
K01-0410-05		HANDLE	1	
K21-0768-04		MAIN KNOB	1	
K23-0710-04		KNOB AF RIT MIC	3	
K23-0721-04		KNOB SQL	1	
K27-0467-04	N	KNOB BAND	2	
K29-0741-24		KNOB RF GAIN, IF SHIP	3	
K29-0758-04		KNOB POWER	1	
K29-3001-04	N	KNOB 1MHZ RIT SEND	5	

Parts No.	Re- marks	Description	Q'ty	Ref No.
K29-3002-04	N	KNOB VOICE NB ALC	3	
K29-0771-04		KNOB MAIN RING	1	
LM358P		IC	1	
LN01201C	N	DIODE RED	2	
LN01301C	N	DIODE GREEN	5	
LN01401C	N	DIODE UMBER	4	
LN66(R)		DIODE	2	
N09-0256-05		SCREW	4	
N09-0682-04	N	SCREW (ACS. MOUNTING BLACKET)	1	
N09-0646-04		SCREW M4X4	2	
N14-0509-05		NUT GND	1	
N14-0115-05		NUT GND	1	
N15-1040-46		FLAT WASHER GND	2	
N30-2004-46		PAN HD SCREW	2	
N30-2604-46		PAN HD SCREW	4	
N32-2604-46		FLAT HD SCREW	6	
N32-2606-46		FLAT HD SCREW	10	
N32-3006-46		FLAT HD SCREW	2	
N33-3006-41		ROUND FLAT SCREW	4	
N33-3006-45		ROUND FLAT SCREW	4	
N35-3004-41		BIND SCREW	16	
N35-3006-46		BIND SCREW	2	
N87-2608-46		TAPPING SCREW	2	
N87-3006-41		TAPPING SCREW	6	
N87-3006-46		TAPPING SCREW	16	
N87-3012-46		TAPPING SCREW	29	
N88-2605-46			2	
N88-3006-46		FLAT TAPPING SCREW	12	
PN126S		PHOTO TRANSISTOR	2	
RS14AB3A100J		METAL FILM 10 OHM 1W	1	
R12-2411-05		SEMI FIXED	2	
S31-2045-05			1	
S40-2437-05		PUSH SW POWER	1	
S50-1406-05		TACT SWITCH(UP,DOWN)	2	
S59-0421-05	N	KEYBOARD SWITCH	1	M type only
T03-0027-15		SPEAKER	1	
T91-0316-15		MIC	1	M type only
W02-0328-10		ENCODER ASS'Y	1	
W09-0323-05		LITHUM BATTERY CR2032	1	
X41-1550-00	N	SWITCH UNIT	1	
X44-1580-00	N	RF UNIT	1	
X45-1350-00	N	PA UNIT	1	
X48-1390-00	N	IF UNIT	1	
X51-1320-00	N	FILTER UNIT	1	
X53-1370-00	N	CONT UNIT	1	
X54-1800-00	N	DISP UNIT	1	
2SA1015(Y)		TR	1	
2SD29		DIODE	1	M type only
490-0067-05		TAPE 3 MM	4	
SWITCH UNIT (X41-1550-00)				
CK45F1H103Z		CERAMIC 0.01 50V	3	C , 7, 8, 9
CK45F1H473Z		CERAMIC 0.047 50V	4	C , 3, 4, 5, 6
C90-0817-05		FIXED ELECTRO	2	C , 1, 2
E06-0858-05		CYLINDRICAL RECEPTACLE 8P	1	
E08-0272-05		VOLTAGE SELECTOR SOCKET 2P	1	
E08-0373-05		VOLTAGE SELECTOR SOCKET 3P	1	
E11-0401-05		EARPHONE JACK EXT.SP	1	
E11-0413-05		PHONE JACK PHONES	1	
E11-0418-05		PHONE JACK 3P KEY JACK	1	
E23-0401-05		TERMINAL (INSIDE)	1	

Parts No.	Re- marks	Description	Q'ty	Ref No.
E40-0273-05		MINI CONNECTOR 2P	5	
E40-0373-05		MINI CONNECTOR 3P	2	
E40-0473-05		MINI CONNECTOR 4P	1	
E40-0673-05		MINI CONNECTOR 6P	1	
E40-0873-05		MINI CONNECTOR 8P	1	
E40-0973-05		PIN ASS'Y 9P	1	
L15-0016-05		LOW-FREQUENCY COIL	1	CH , 1
R06-9407-05	N	POTENTIOMETER SQ	1	VR , 1
R12-1428-05	N	TRIM.POT. RVF6P01 1K	3	VR , 5, 7, 10
R12-3443-05	N	TRIM.POT. 10K	1	VR , 9
R12-4413-05	N	TRIM.POT. 50K	1	VR , 6
R12-1430-05	N	TRIM.POT. 3K	1	VR , 8
R19-3418-05	N	POTENTIOMETER	1	VR , 3
R19-3419-05	N	POTENTIOMETER	1	VR , 2
R19-3420-05	N	POTENTIOMETER	1	VR , 4
S40-2440-15		PUSH SW 2-2	7	S , 3, 4, 5, 6, 7, 8, 9
S40-2441-15		PUSH SW NON LOCK	1	S , 10
S50-2402-05	N	TACT SWITCH	2	S , 1, 2
U05B		DIODE	1	D , 1

RF UNIT (X44-1580-00)

BA282		DIODE	5	D , 3, 32, 34, 35, 36
CC45UJ1H030C		CERAMIC 3P 50V	1	C , 101
CC45UJ1H120J		CERAMIC 12P 50V	1	C , 96
CC45SL1H0R5C		CERAMIC 0.5P 50V	1	C , 7
CC45SL1H121J		CERAMIC 120P 50V	1	C , 136
CC45CH1H040C		CERAMIC 4P 50V	2	C , 6, 159
CC45SL1H010C		CERAMIC 1P 50V	1	C , 152
CC45CH1H050C		CERAMIC 5P 50V	3	C , 106, 113, 114
CC45UJ1H150J		CERAMIC 15P 50V	2	C , 99, 100
CC45SL1H030C		CERAMIC 3P 50V	1	C , 71
CC45UJ1H180J		CERAMIC 18P 50V	5	C , 84, 85, 86, 90, 102
CC45CH1H090D		CERAMIC 9P 50V	2	C , 105, 150
CC45UJ1H220J		CERAMIC 22P 50V	1	C , 102
CC45SL1H331J		CERAMIC 330P 50V	1	C , 75
CC45SL1H470J		CERAMIC 47P 50V	2	C , 51, 52
CC45UJ1H270J		CERAMIC 27P 50V	2	C , 83, 91
CC45UJ1H300J		CERAMIC 30P 50V	1	C , 89
CC45RH1H120J		CERAMIC 12P 50V	2	C , 37, 148
CC45UJ1H330J		CERAMIC 33P 50V	1	C , 94
CC45RH1H150J		CERAMIC 15P 50V	1	C , 175
CC45SL1H101J		CERAMIC 100P 50V	2	C , 139, 160
CC45SL1H100D		CERAMIC 10P 50V	2	C , 57, 65
CC45SL1H151J		CERAMIC 150P 50V	2	C , 109, 110
CC45UJ1H100D		CERAMIC 10P 50V	1	C , 95
CC45SL1H221J		CERAMIC 220P 50V	1	C , 111
CC45SL1H220J		CERAMIC 22P 50V	1	C , 38
CC45RH1H180J		CERAMIC 18P 50V	2	C , 176, 177
CC45RH1H050C		CERAMIC 5P 50V	3	C , 153, 173, 174
CC45SL1H330J		CERAMIC 33P 50V	3	C , 8, 117, 119
CC45CH1H080D		CERAMIC 8P 50V	1	C , 14
CC45CH1H150J		CERAMIC 15P 50V	1	C , 13
CC45RH1H100D		CERAMIC 10P 50V	1	C , 15
CC45SL1H680J		CERAMIC 68P 50V	2	C , 118, 166
CC45SL1H820J		CERAMIC 82P 50V	1	C , 145
CC45CH1H220J		CERAMIC 22P 50V	1	C , 149
CC45CH1H240J		CERAMIC 24P 50V	1	C , 151
CE04W1A470M		ELECTRO 47 10V	4	C , 88, 93, 98, 104
CE04W1C100M		ELECTRO 10 16V	1	C , 55
CE04W1HR33M		ELECTRO 0.33 50V	1	C , 169
CE04W1H010M		ELECTRO 1 50V	1	C , 79
CE04W1H3R3M		ELECTRO 3.3 50V	1	C , 170
CK45F1H103Z		CERAMIC 0.01 50V	30	C , 5, 12, 20, 27, 31, 41, 48, 53, 56, 63, 68, 76, 81, 112, 115, 121, 124, 125, 128, 130, 133, 146, 156, 157, 158, 162, 164, 168, 178, 179

CK45F1H223Z		CERAMIC 0.022 50V	15	C , 19, 21, 22, 23, 29, 36, 45, 50, 73, 107, 123, 129, 138, 140
CK45F1H223Z		CERAMIC 0.022 50V		C , 165
CK45B1H471K		CERAMIC 470P 50V	2	C , 120, 161
CK45B1H102K		CERAMIC 1000P 50V	4	C , 46, 67, 74, 134
CK45F1H473Z		CERAMIC 0.047 50V	1	C , 35
CQ92M1H122K		MYLAR 1200P 50V	1	C , 2
CQ92M1H272K		MYLAR 2700P 50V	1	C , 3
CQ92M1H472K		MYLAR 4700P 50V	1	C , 4
C05-0030-15		TRIMMER 20PF	1	TC , 4
C05-0309-05		TRIMMER 40P	3	TC , 1, 2, 3
C90-0838-05		ELECTRO 1 50V	1	C , 60
C91-0117-05		CERAMIC CAP 0.01	30	C , 1, 10, 11, 16, 32, 34, 40, 44, 47, 54, 58, 59, 62, 66, 70, 78, 87, 92, 97, 103, 116, 122, 132, 135, 141, 142, 147, 155, 163, 171
C91-0117-05		CERAMIC CAP 0.01		C , 30
C91-1031-05	N	FIXED 1200P 50V	1	C , 17, 18, 24, 25, 26, 28, 39
C91-1008-05		CERAMIC 0.022	18	C , 42, 43, 49, 69, 72, 77, 82
C91-1008-05		CERAMIC 0.022		C , 108, 126, 127, 143
C91-0119-05		CERAMIC 0.047 25V	4	C , 9, 33, 61, 80
DTA114E(S)	N	DIGITAL TR	6	Q , 33, 35, 36, 37, 38, 44
DTC114E(S)		DIGITAL TR	1	Q , 43
E23-0443-05		TERMINAL (INSIDE) TP	5	TP , 1, 2, 3, 4, 5
E31-2170-05		JUMPER WIRE	55	
E40-0273-05		MINI CONNECTOR 2P	11	
E40-0373-05		MINI CONNECTOR 3P	2	
E40-0473-05		MINI CONNECTOR 4P	1	
E40-0573-05		MINI CONNECTOR 5P	2	
E40-0673-05		MINI CONNECTOR 6P	1	
ITT310TE		VARI-CAP DIODE	4	D , 27, 29, 31, 33
J31-0503-05		BEADS	2	
J31-0502-04		COLLAR	8	
J42-0428-05		BUSHING	8	
J61-0408-05		VINYL TIE	1	
L19-0324-05		TRANSFORMER	2	T , 20, 32
L19-0328-05		TRANSFORMER	1	T , 36
L19-0344-05		TRANSFORMER	1	T , 1
L30-0506-05		IFT	1	T , 21
L30-0511-05		IFT	1	T , 25
L30-0512-05		IFT	1	T , 22
L32-0193-05		OSCILLATING COIL 7MHZ	1	T , 31
L32-0197-05		OSCILLATING COIL 21,28MHZ	2	T , 29, 30
L32-0639-05		OSCILLATING COIL 50MHZ	1	T , 28
L33-0222-05		CHOKO COIL	2	L , 39, 44
L34-0535-05		TUNING COIL	1	T , 26
L34-0536-05		TUNING COIL	2	T , 23, 27
L34-0558-05		TRAP COIL	1	T , 3
L34-0696-35		IN PUT COIL	1	T , 9
L34-0697-05		OUTPUT COIL	1	T , 33
L34-0908-05		TUNING COIL	2	L , 26, 27
L34-0942-05		TUNING COIL	1	T , 24
L34-0966-05		TRAP COIL	2	T , 2, 19
L34-1021-05		INPUT COIL	1	L , 41
L34-1022-05		OUTPUT COIL	1	L , 45
L34-2054-05		TUNING COIL 52MHZ	8	T , 4, 5, 6, 7, 8, 38, 39
L34-2055-05		TUNING COIL 52MHZ	2	T , 40
L34-2205-05	N	TUNING COIL 52MHZ	1	T , 41, 42
L34-2206-05	N	TRAP COIL 8.83MHZ	2	T , 37
L34-3093-05	N	BPF COIL 28MHZ	2	T , 34, 35
L34-3094-05	N	BPF COIL 28MHZ	2	T , 10, 16
L34-3095-05	N	BPF COIL 21MHZ	1	T , 13
L34-3096-05	N	BPF COIL 21MHZ	2	T , 11, 17
L34-3097-05	N	BPF COIL 7MHZ	1	T , 12
L34-3098-05	N	BPF COIL 7MHZ	1	T , 12
L34-3105-05	N	BPF COIL 7MHZ	1	T , 18
L40-1001-02		INDUCTOR 10 UH	3	L , 18
L40-1011-03		INDUCTOR 100 UH	1	L , 2, 3, 4

Parts No.	Re- marks	Description	Q'ty	Ref No.
L40-1511-03		INDUCTOR 150 UH	8	L , 6, 9, 14, 16, 17, 32, 33
L40-3391-13		INDUCTOR 3.3 UH	1	L , 34
L40-4791-13		INDUCTOR 4.7 UH	1	L , 38
L40-1001-13		INDUCTOR 10 UH	1	L , 43
L40-4701-13		INDUCTOR 47 UH	1	L , 42
L40-1011-17	N	INDUCTOR 100 UH	2	L , 47
L40-3982-14		INDUCTOR 0.39UH	2	L , 13, 29
L40-8282-14		INDUCTOR 0.82UH	2	L , 21, 22
L40-1092-14		INDUCTOR 1 UH	2	L , 20, 23
L40-1592-14		INDUCTOR 1.5 UH	1	L , 40
L40-4701-14		INDUCTOR 47 UH	1	L , 10
L40-1011-14		INDUCTOR 100 UH	2	L , 15, 37
L40-1011-14		INDUCTOR 100 UH	15	L , 1, 5, 7, 8, 11, 12, 19
L40-2211-14		INDUCTOR 220 UH	1	L , 24, 28, 30, 31, 35, 36, 46
L72-0324-05		CERAMIC FILTER 8.83MHZ	1	L , 48
MC921		DOUBLE DIODE	2	L , 25
MV13		VARISTOR	2	CF , 1
MV203		VARISTOR	1	D , 40, 50
R12-1429-05	N	TRIM.POT. 500	2	D , 22, 25
R12-1430-05	N	TRIM.POT. 3K	2	D , 48
R12-7403-05		SEMI FIXED RGS6-FAN 500K	1	
R92-0150-05		JUMPER WIRE	20	
S51-1422-05	N	RELAY	2	VR , 1, 2
1N60		DIODE	3	VR , 3, 4
1SS133		DIODE	8	VR , 5
1S1555		DIODE	9	RL , 1, 2
1S1587		DIODE	16	D , 21, 23, 24
1S1587		DIODE	7	D , 26, 37, 38, 41, 42, 43, 44
1S2588		DIODE	7	D , 46
2SA733(R)		TR	1	D , 51, 52, 53, 54, 55, 56, 57
2SA562(Y)	N	TR	4	D , 58, 59
2SA1115(E)		TR	1	D , 6, 8, 9, 11, 12, 13, 15
2SC2787(L)	N	TR	3	D , 16, 17, 18, 19, 20, 28, 30
2SC1923(O)		TR	1	D , 45, 47
2SC2086		TR	3	D , 1, 2, 4, 5, 7, 10, 14
2SC2347		TR	1	Q , 32
2SC2458(Y)		TR	4	Q , 39, 40, 41, 42
2SC460(B)		TR	1	Q , 34
2SC1907	N	TR	3	Q , 17, 18, 19
2SK192(Y)		FET	1	Q , 23
2SK192A(GR)*N		FET	1	Q , 28, 30, 31
3SK73(GR)		FET	2	Q , 21
3SK74(L)		FET	3	Q , 4, 8, 9, 10, 15, 16
3SK122(L)		FET	4	Q , 12, 13, 14
FINAL UNIT (X45-1350-00)				
CC45SL1H220J		CERAMIC 22P 50V	1	C , 1
CC45SL1H820J		CERAMIC 82P 50V	1	C , 6
CC45SL2H220J		CERAMIC 22P 500V	1	C , 30
CC45SL2H820J		CERAMIC 82P 500V	1	C , 11
CC45SL2H221J		CERAMIC 220P 500V	2	C , 27, 28
CC45SL2H331J		CERAMIC 330P 500V	1	C , 26
CC45SL2H151J		CERAMIC 150P 500V	1	C , 29
CE04W1C100M		ELECTRO 10 16V	2	C , 16, 20
CE04W1C221M		ELECTRO 220 16V	1	C , 9
CK45B1H102K		CERAMIC 1000P 50V	4	C , 12, 13, 14, 21
CK45F1H103Z		CERAMIC 0.01 50V	12	C , 2, 3, 4, 7, 8, 15, 17
CK45F1H103Z		CERAMIC 0.01 50V	1	C , 18, 19, 22, 24, 25
CK45F1H223Z		CERAMIC 0.022 50V	2	C , 5, 10
C05-0043-05		TRIMMER 20P	1	TC , 1

Parts No.	Re- marks	Description	Q'ty	Ref No.
E23-0401-05		TERMINAL (INSIDE)	1	
E23-0512-05		TERMINAL	1	
E31-2061-05		JUMPER WIRE	2	
F01-0761-03		HEAT SINK	1	
F20-0078-05		INSULATING PLATE	1	
J31-0505-04		COLLAR	6	
L19-0315-25		COIL	1	T , 1
L19-0325-05		COIL	1	T , 2
L19-0326-05		COIL	1	T , 3
L19-0327-05		COIL	1	T , 4
L33-0617-05		CHOKE COIL	1	L , 3
L33-0023-05		CHOKE COIL 1.3UH	3	L , 1, 2, 4
MV-5T		DIODE	1	D , 1
R12-0408-05		SEMI FIXED	1	VR , 2
R12-1422-05		SEMI FIXED	1	VR , 1
R92-0601-05		FIXED RESISTOR 0.22	1	R , 9
R92-0150-05		JUMPER WIRE	3	
SV03Y		DIODE	1	D , 2
2SC1971		TR	2	Q , 1, 2
2SC2509		TR	2	Q , 3, 4
2SC496(Y)		TR	1	Q , 5
IF UNIT (X48-1390-00)				
AN612		IC	1	Q , 36
AN7805		IC	1	Q , 26
AN7808		IC	1	Q , 27
CC45SL1H101J		CERAMIC 100P 50V	3	C , 44, 88, 89
CC45UJ1H150J		CERAMIC 15P 50V	1	C , 35
CC45SL1H221J		CERAMIC 220P 50V	1	C , 54
CC45SL1H050C		CERAMIC 5P 50V	1	C , 12
CC45SL1H100D		CERAMIC 10P 50V	1	C , 32
CC45SL1H150J		CERAMIC 15P 50V	2	C , 4, 13
CC45SL1H470J		CERAMIC 47P 50V	5	C , 53, 55, 107, 110, 121
CE04W1C470M		ELECTRO 47 16V	1	C , 75
CE04W1H0R1M		ELECTRO 0.1 50V	1	C , 50
CE04W1HR22M		ELECTRO 0.22 50V	2	C , 61, 81
CE04W1HR47M		ELECTRO 0.47 50V	4	C , 38, 46, 59, 140
CE04W1H010M		ELECTRO 1 50V	13	C , 44, 57, 72, 78, 80, 84, 86
CE04W1A470M		ELECTRO 47 10V	8	C , 92, 96, 98, 125, 126, 130
CE04W1A221M		ELECTRO 220 10V	1	C , 43, 48, 51, 70, 90, 97, 99
CE04W1H477M		ELECTRO 4.7 50V	3	C , 105
CE04BW1HR22M		ELECTRO 0.22 50V	1	C , 95
CE04W1C100M		ELECTRO 10 16V	4	C , 45, 58, 47
CE04W1C220M		ELECTRO 22 16V	1	C , 49
CK45B1H471K		CERAMIC 470P 50V	1	C , 64, 82, 94, 113
CK45B1H102K		CERAMIC 1000P 50V	5	C , 73
CK45F1H223Z		CERAMIC 0.022 50V	4	C , 111
CK45F1H103Z		CERAMIC 0.01 50V	2	C , 14, 26, 34, 100, 108
Q92M1H222K		MYLAR 2200P 50V	4	C , 18, 19, 30, 123
Q92M1H822K		MYLAR 8200P 50V	1	C , 69, 127
Q92M1H103K		MYLAR 0.01 50V	3	C , 41, 114, 135, 138
Q92M1H123K		MYLAR 0.012 50V	4	C , 60
Q92M1H153K		MYLAR 0.015 50V	1	C , 42, 136, 137
Q92M1H333K		MYLAR 0.033 50V	2	C , 115, 116, 117, 118
Q92M1H473K		MYLAR 0.047 50V	3	C , 91
Q92M1H104K		MYLAR 0.1 50V	1	C , 37, 62
CS15E1VR22M		TANTALUM 0.22 35V	1	C , 63, 93, 139
C05-0030-15		TRIMMER 20PF	1	C , 67
C90-0820-05		ELECTRO 470 16V	1	C , 31
C90-0864-05		FIXED ELECTRO 220 10V	1	TC , 1
C90-0866-05		FIXED ELECTRO 470 6.3V	1	C , 66
C91-0769-05		FIXED CAP 0.01	33	C , 68
				C , 65
				C , 1, 2, 3, 5, 6, 7, 8
				C , 9, 10, 11, 16, 17, 20, 29

Parts No.	Re- marks	Description	Q'ty	Ref No.
C91-0769-05		FIXED CAP 0.01	C	33, 36, 39, 56, 74, 77, 79
C91-0769-05		FIXED CAP 0.01	C	83, 87, 101, 102, 103, 106, 109
C91-0117-05			4 C	112, 119, 122, 124, 128
C91-0119-05		CERAMIC CAP 0.047	6 C	52, 71, 85, 132
			C	15, 28, 76, 104, 34, 0, 0
			C	0, 0, 0, 141
C91-1008-05		CERAMIC CAP 0.023	1 C	133
DTA114E(S)	N	DIGITAL TR	1 Q	52
DTC114E(S)	N	DIGITAL TR	8 Q	2, 21, 24, 29, 30, 31, 37
				38
E29-0413-05		TERMINAL 1P	1	
E31-2170-05		JUMPER WIRE	52	
E40-0273-05		MINI CONNECTOR 2P	21	
E40-0373-05		MINI CONNECTOR 3P	4	
E40-0473-05		MINI CONNECTOR 4P	4	
E40-0573-05		MINI CONNECTOR 5P	2	
E40-0673-05		MINI CONNECTOR 6P	1	
E40-0773-05		PIN ASS'Y 7P	1	
F01-0784-03		HEAT SINK	1	
F20-0078-05		INSULATING PLATE	1	
F29-0014-05		INSULATING WASHER	1	
J31-0502-04		COLLAR	7	
J42-0428-05		BUSHING	7	
L34-0535-05		TUNING COIL	1 L	10
L34-0536-05		TUNING COIL	1 L	4
L34-0708-05		TUNING COIL	1 L	1
L34-2077-05		TUNING COIL	1 L	2
L40-1011-14		INDUCTOR 100 UH	1 L	12
L40-3391-13		INDUCTOR 3.3 UH	1 L	8
L40-1021-03		INDUCTOR 1 MH	1 L	6
L40-1011-17		INDUCTOR 100 UH	2 L	9, 11
L40-1511-14		INDUCTOR 150 UH	3 L	5, 7, 14
L40-4711-14		INDUCTOR 470 UH	1 L	13
L71-0245-05	N	CRYSTAL FILTER YK-88S3	1 XF	1
MC921	N	DOUBLE DIODE	7 D	66, 67, 68, 69, 70, 71, 72
MI204		DIODE	1 D	44
MT24.3JA		ZENER DIODE 4.3V	1 D	73
MT26.2JA		ZENER DIODE 6.2V	1 D	40
MT29.1JB		ZENER DIODE 9.1V	1 D	60
MT210JA		ZENER DIODE 10V	1 D	38
MT212JB		ZENER DIODE 12V	1 D	63
R12-1414-05		TRIM.POT. 1K OHM	1 VR	1
R12-2409-05		SEMI FIXED 5k	1 VR	7
R12-3430-05		TRIM.POT. 10K OHM	3 VR	3, 5, 8
R12-4408-05		SEMI FIXED 50k	1 VR	10
R12-7403-05		SEMI FIXED RGS6-FAN 500K	1 VR	4
R12-2413-05		TRIM.POT. 5k	2 VR	2, 6
R12-3443-05		TRIM.POT. 10K	1 VR	9
R92-0150-05		JUMPER WIRE	18	
UPC2002V		IC	1 Q	25
V06B		DIODE	1 D	61
1N60		DIODE	7 D	25, 26, 27, 28, 29, 33, 34
1S5133		DIODE	8 D	11, 13, 19, 20, 35, 47, 48
				50
1S1555		DIODE	30 D	1, 2, 12, 14, 16, 17, 18
				21, 22, 23, 24, 30, 31, 32
1S1555		DIODE	D	36, 37, 39, 43, 49, 51, 52
				53, 54, 55, 56, 57, 58, 64
1S1555		DIODE	D	65, 74
1S1555		DIODE	8	2, 12, 14, 16, 17, 37, 52
				57
1S1587		DIODE	3 D	9, 10, 46
1S1007		DIODE	6 D	3, 4, 5, 6, 7, 8
1S2588		DIODE	1 D	45

Parts No.	Re- marks	Description	Q'ty	Ref No.
2SA1115(E)		TR	1 Q	23
2SA733(R)		TR	7 Q	9, 10, 11, 12, 13, 14, 18
2SC2458(Y)		TR	16 Q	5, 15, 16, 20, 33, 39, 40
		OR 2SC2603(E)		41, 43, 44, 45, 46, 47, 49
2SC2458(Y)		TR	Q	50, 51
2SC2459(BL)		TR	5 Q	6, 7, 8, 34, 35
2SC2703(O,Y)		TR	2 Q	28, 48
2SD880(Y)		TR	1 Q	32
2SK192A(GR)		FET	1 Q	22
2SK30A(O)		FET	2 Q	17, 19
3SK73(GR)		FET	3 Q	1, 4, 42
FILTER UNIT (X51-1320-00)				
CC45SL2H330J		CERAMIC 33P 500V	1 C	16
CC45SL2H470J		CERAMIC 47P 500V	1 C	14
CC45SL2H560J		CERAMIC 56P 500V	5 C	22, 26, 33, 36, 38
CC45SL2H020C		CERAMIC 2P 500V	1 C	46
CC45SL2H101J		CERAMIC 100P 500V	3 C	7, 13, 17
CC45SL2H121J		CERAMIC 120P 500V	1 C	5
CC45SL2H151J		CERAMIC 150P 500V	3 C	9, 24, 44
CC45SL2H100D		CERAMIC 10P 500V	3 C	18, 32, 41
CC45SL2H181J		CERAMIC 180P 500V	2 C	4, 8
CC45SL2H221J		CERAMIC 220P 500V	2 C	15, 47
CC45SL2H180J		CERAMIC 18P 500V	1 C	27
CC45SL2H220J		CERAMIC 22P 500V	3 C	34, 37, 39
CC45SL2H471J		CERAMIC 470P 500V	1 C	6
CC45SL2H270J		CERAMIC 27P 500V	2 C	31, 40
CE04W1HR47M		ELECTRO 0.47 50V	3 C	53, 55, 61
CE04W1H010M		ELECTRO 1 50V	1 C	56
CE04W1H3R3M		ELECTRO 3.3 50V	2 C	51, 57
CE04W1C220M		ELECTRO 22 16V	1 C	49
CK45B1H102K		CERAMIC 1000P 50V	5 C	48, 65, 66, 67, 68
CK45F1H103Z		CERAMIC 0.01 50V	24 C	1, 2, 3, 10, 11, 12, 19
				20, 21, 28, 29, 30, 42, 43
CK45F1H103Z		CERAMIC 0.01 50V	24 C	45, 50, 52, 54, 58, 59, 60
				62, 63, 64
C05-0043-05		TRIMMER 20P	1 TC	1
E04-0154-05		RF COAXIAL CABLE CONNECTOR RA	2	
E04-0157-05		RF COAXIAL CABLE RECEPTACLE	1	
E23-0430-05		TERMINAL (INSIDE)	1	
E40-0273-05		MINI CONNECTOR 2P	3	
E40-0673-05		MINI CONNECTOR 6P	1	
E40-0773-05		PIN ASS'Y 7P	1	
J31-0502-04		COLLAR	7	
J42-0428-05		BUSHING	7	
L34-3099-05	N	LPF COIL 7MHZ	2 L	5, 6
L34-3100-05	N	LPF COIL 21MHZ	2 L	9, 10
L34-3101-05	N	LPF COIL 28MHZ	2 L	13, 14
L34-3102-05	N	LPF COIL 50MHZ	1 L	18
L34-3103-05	N	LPF COIL 50MHZ	3 L	17, 19, 20
L39-0410-15		COIL	1 T	1
L40-1011-13		INDUCTOR 100 UH	4 L	1, 2, 24, 30
L40-1011-14		INDUCTOR 100 UH	14 L	3, 7, 11, 15, 21, 22, 23
				25, 26, 27, 28, 29, 32, 33
MB3614		IC	1 IC	1
MT26.2JB		ZENER DIODE	1 D	17
R12-1418-05		SEMI FIXED	2 VR	4, 5
R12-3434-05		TRIM.POT. 10K(B)3	1 VR	3
R12-4411-05		TRIM.POT. 50K	2 VR	1, 2
R92-0150-05		JUMPER WIRE	24	
S51-1420-05		RELAY DS-1 DC-12V	10 RL	1, 2, 3, 4, 5, 6, 7
				8, 9, 10
1N60		DIODE	2 D	6, 7

Parts No.	Re- marks	Description	Q'ty	Ref No.
1SS101		DIODE	3	D , 10, 15, 16
1S1555		DIODE	12	D , 1, 2, 3, 4, 5, 8, 9
1S1555		DIODE	12	D , 11, 12, 13, 14, 18
112-503-2		DIODE	1	TH , 1
2SA562(Y)	TR		4	Q , 1, 2, 3, 4
2SA1115(E)	TR		1	Q , 5
2SC1815(Y)	TR		2	Q , 6, 7

CONTROL UNIT (X53-1370-00)

CC45SL1H050C	CERAMIC	5P	50V	3	C , 7, 74, 135
CC45CH1H0R5C	CERAMIC	0.5P	50V	3	C , 46, 98, 112
CC45RH1H070D	CERAMIC	7P	50V	1	C , 71
CC45CH1H010C	CERAMIC	1P	50V	4	C , 20, 27, 51, 56
CC45RH1H120J	CERAMIC	12P	50V	1	C , 132
CC45SL1H100D	CERAMIC	10P	50V	5	C , 6, 9, 75, 136, 223
CC45CH1H020C	CERAMIC	2P	50V	3	C , 12, 33, 41
CC45RH1H150J	CERAMIC	15P	50V	3	C , 25, 26, 34
CC45RH1H180J	CERAMIC	18P	50V	1	C , 172
CC45SL1H150J	CERAMIC	15P	50V	1	C , 15
CC45RH1H220J	CERAMIC	22P	50V	5	C , 45, 47, 96, 97, 131
CC45UJ1H050C	CERAMIC	5P	50V	1	C , 3
CC45UJ1H100D	CERAMIC	10P	50V	1	C , 5
CC45RH1H270J	CERAMIC	27P	50V	2	C , 168, 174
CC45SL1H330J	CERAMIC	33P	50V	3	C , 31, 101, 103
CC45RH1H330J	CERAMIC	33P	50V	2	C , 50, 52
CC45CH1H150J	CERAMIC	15P	50V	2	C , 113, 218
CC45CH1H180J	CERAMIC	18P	50V	1	C , 217
CC45RH1H390J	CERAMIC	39P	50V	2	C , 169, 173
CC45SL1H470J	CERAMIC	47P	50V	2	C , 87, 89
CC45SL1H560J	CERAMIC	56P	50V	1	C , 102
CC45RH1H470J	CERAMIC	47P	50V	2	C , 170, 171
CC45RH1H560J	CERAMIC	56P	50V	2	C , 110, 111
CC45SL1H101J	CERAMIC	100P	50V	3	C , 24, 88, 175
CC45RH1H030C	CERAMIC	3P	50V	1	C , 84, 133
CC45SL1H151J	CERAMIC	150P	50V	6	C , 4, 17, 81, 83, 141, 143
CC45RH1H050C	CERAMIC	5P	50V	2	C , 73, 84
CC45TH1H100D	CERAMIC	10P	50V	1	C , 130
CC45TH1H120J	CERAMIC	12P	50V	1	C , 70
CC45TH1H390J	CERAMIC	39P	50V	1	C , 129
CE04W1C100M	ELECTRO	10	16V	1	C , 199
CE04W1A470M	ELECTRO	47	10V	7	C , 189, 194, 195, 196, 213, 215, 216
CE04W1A101M	ELECTRO	100	10V	5	C , 1, 68, 125, 185, 192
CE04W1HR47M	ELECTRO	0.47	50V	1	C , 120
CE04W1H010M	ELECTRO	1	50V	2	C , 118, 214
CE04W1H2R2M	ELECTRO	2.2	50V	1	C , 190
CE04W1H4R7M	ELECTRO	4.7	50V	1	C , 203
CK45B1H331K	CERAMIC	330P	50V	2	C , 82, 142
CK45B1H102K	CERAMIC	1000P	50V	8	C , 114, 115, 119, 151, 164, 179, 197, 198
CK45B1H222K	CERAMIC	2200P	50V	3	C , 69, 126, 187
CK45F1H103Z	CERAMIC	0.01	50V	30	C , 29, 36, 60, 61, 63, 76, 77, 80, 85, 86, 90, 95, 99, 100, 104, 109, 116, 121, 134, 137, 140, 144, 149, 155, 166, 167, 176, 205, 212, 219
CK45F1H103Z	CERAMIC	0.01	50V	C	C , 66
CK45F1H103Z	CERAMIC	0.01	50V	1	C , 123
CQ92M1H103K	MYLAR	0.01	50V	1	C , 182
CQ92M1H473K	MYLAR	0.047	50V	1	C , 122
CQ92M1H104K	MYLAR	0.1	50V	1	C , 65, 181
CQ92M1H102K	MYLAR	1000P	50V	1	C , 1
CQ92M1H152K	MYLAR	1500P	50V	2	C , 2
C05-0309-05	TRIMMER	40P		1	TC , 202
C05-0030-15	TRIMMER	20PF		1	TC , 2
C90-0838-05	ELECTRO	1	50V	1	C , 2
C91-0119-05	CERAMIC	0.047	25V	35	C , 2, 16, 21, 22, 28, 32, 64, 67, 72, 79, 91, 92, 93, 94, 117, 124, 127, 128, 139, 145, 146, 147, 148, 152, 160, 177, 180, 183, 184, 186, 188, 191, 193, 204, 211, 39, 201
C91-0119-05	CERAMIC	0.047	25V	C	C , 2, 16, 21, 22, 28, 32, 64, 67, 72, 79, 91, 92, 93, 94, 117, 124, 127, 128, 139, 145, 146, 147, 148, 152, 160, 177, 180, 183, 184, 186, 188, 191, 193, 204, 211, 39, 201
C91-0119-05	CERAMIC	0.047	25V	C	C , 2, 16, 21, 22, 28, 32, 64, 67, 72, 79, 91, 92, 93, 94, 117, 124, 127, 128, 139, 145, 146, 147, 148, 152, 160, 177, 180, 183, 184, 186, 188, 191, 193, 204, 211, 39, 201
C91-0498-05	FIXED CAP	0.35P		1	C , 39
C91-0457-05	FIXED CAP	0.022		1	C , 201

Parts No.	Re- marks	Description	Q'ty	Ref No.
C91-0769-05		FIXED CAP 0.01	38	C , 8, 10, 14, 23, 30, 35, 37, 43, 44, 48, 49, 53, 54, 58, 59, 62, 78, 105, 106, 107, 108, 138, 153, 156, 157, 158, 159, 161, 162, 163, 165, 178, 200, 206, 207, 208, 209, 210
C91-0769-05		FIXED CAPACITOR 0.01UF	C	C , 59, 62, 78, 105, 106, 107, 108, 138, 153, 156, 157, 158, 159, 161, 162, 163, 165, 178, 200, 206, 207, 208, 209, 210
C91-0769-05		FIXED CAPACITOR 0.01UF	C	C , 59, 62, 78, 105, 106, 107, 108, 138, 153, 156, 157, 158, 159, 161, 162, 163, 165, 178, 200, 206, 207, 208, 209, 210
E23-0443-05		TERMINAL (INSIDE) TP	3	
E31-2170-05		JUMPER WIRE	81	
E40-5023-05	N	LP CONNECTOR 2P	3	
E40-5024-05	N	LP CONNECTOR 3P	1	
E40-5025-05	N	LP CONNECTOR 5P	2	
E40-5026-05	N	LP CONNECTOR 6P	1	
E40-0273-05		MINI CONNECTOR 2P	14	
E40-0373-05		MINI CONNECTOR 3P	5	
E40-0473-05		MINI CONNECTOR 4P	3	
E40-0673-05		MINI CONNECTOR 6P	1	
E40-0773-05		PIN ASS'Y 7P	2	
ITT310TE		VARI-CAP DIODE	1	D , 21
J31-0502-04		COLLAR	8	
J42-0428-05		BUSHING	8	
J61-0408-05		VINYL TIE	3	
L32-0666-05	N	OSCILLATING COIL	2	L , 6, 20
L34-2207-05	N	TUNING COIL 48MHZ	1	T , 1
L34-2208-05	N	TUNING COIL 24MHZ	4	T , 2, 5, 6, 7
L34-2209-05	N	TUNING COIL 6MHZ	2	T , 3, 4
L34-2211-05	N	TUNING COIL 56MHZ	3	T , 8, 9, 10
L34-2212-05	N	TUNING COIL 14MHZ	2	T , 15, 16
L34-2213-05	N	TUNING COIL 2.8MHZ	2	T , 17, 18
L34-2214-05	N	TUNING COIL 8.4MHZ	2	T , 21, 22
L34-0781-05		TUNING COIL 9MHZ	2	T , 19, 20
L34-3064-05		TUNING COIL	4	T , 11, 12, 13, 14
L34-3104-05	N	LPF COIL	2	T , 23, 24
L40-2201-13		INDUCTOR 22 UH	1	L , 32
L40-1801-03		INDUCTOR 18 UH	2	L , 24, 25
L40-1011-13		INDUCTOR 100 UH	7	L , 33, 34, 36, 37, 38, 39, 40
L40-2201-03		INDUCTOR 22 UH	2	L , 12, 13
L40-8201-03		INDUCTOR 82 MH	2	L , 10, 11
L40-1001-14		INDUCTOR 10 UH	1	L , 41
L40-1011-03		INDUCTOR 100 UH	2	L , 4, 18
L40-2711-03		INDUCTOR 270 UH	2	L , 21, 22
L40-3311-03		INDUCTOR 330 UH	2	L , 8, 9
L40-4711-03		INDUCTOR 470 UH	2	L , 5, 17
L40-1011-14		INDUCTOR 100 UH	7	L , 1, 2, 15, 16, 23, 29, 31
L40-1511-14		INDUCTOR 150 UH	3	L , 14, 26, 27
L40-2211-14		INDUCTOR 220 UH	6	L , 3, 7, 19, 28, 30, 35
L72-0343-05	N	CERAMIC FILTER 8.4MHZ	1	CF , 1
L77-1226-05	N	CRYSTAL 24MHZ	1	X , 1
L77-1257-05	N	CRYSTAL 8.1MHZ	1	X , 2
MB4052	N	IC	1	IC , 15
MC14077B		IC	1	IC , 24
MC911		DIODE	1	D , 56
MN6147C		IC	3	IC , 3, 4, 13
MTZ7.5JC		DIODE	1	D , 25
MS4459L		IC	2	IC , 5, 9
R12-4411-05		TRIM.POT. 50K	1	VR , 1
R90-0511-05		RESISTOR BLOCK	2	RB , 1, 2
R90-0515-05		RESISTOR BLOCK 10K X 4	1	RB , 4
R90-0534-05		RESISTOR BLOCK 10K X 5	1	RB , 7
R90-0561-05		RESISTOR BLOCK 22K X 6	1	RB , 5
R90-0574-05	N	RESISTOR BLOCK 4.7K X 11	1	RB , 3
R90-0575-05	N	RESISTOR BLOCK 10K X 3	1	RB , 6
R92-0150-05		JUMPER WIRE	20	
SN16913P	IC		5	IC , 7, 8, 10, 11, 12
SN74LS75N	IC		1	IC , 21
SN74LS93N	IC	OR M74LS93P	1	IC , 2
SN74LS112AN	IC	OR M74LS112P	2	IC , 1, 6
SN74LS145N	IC	OR M74LS145P	1	IC , 22

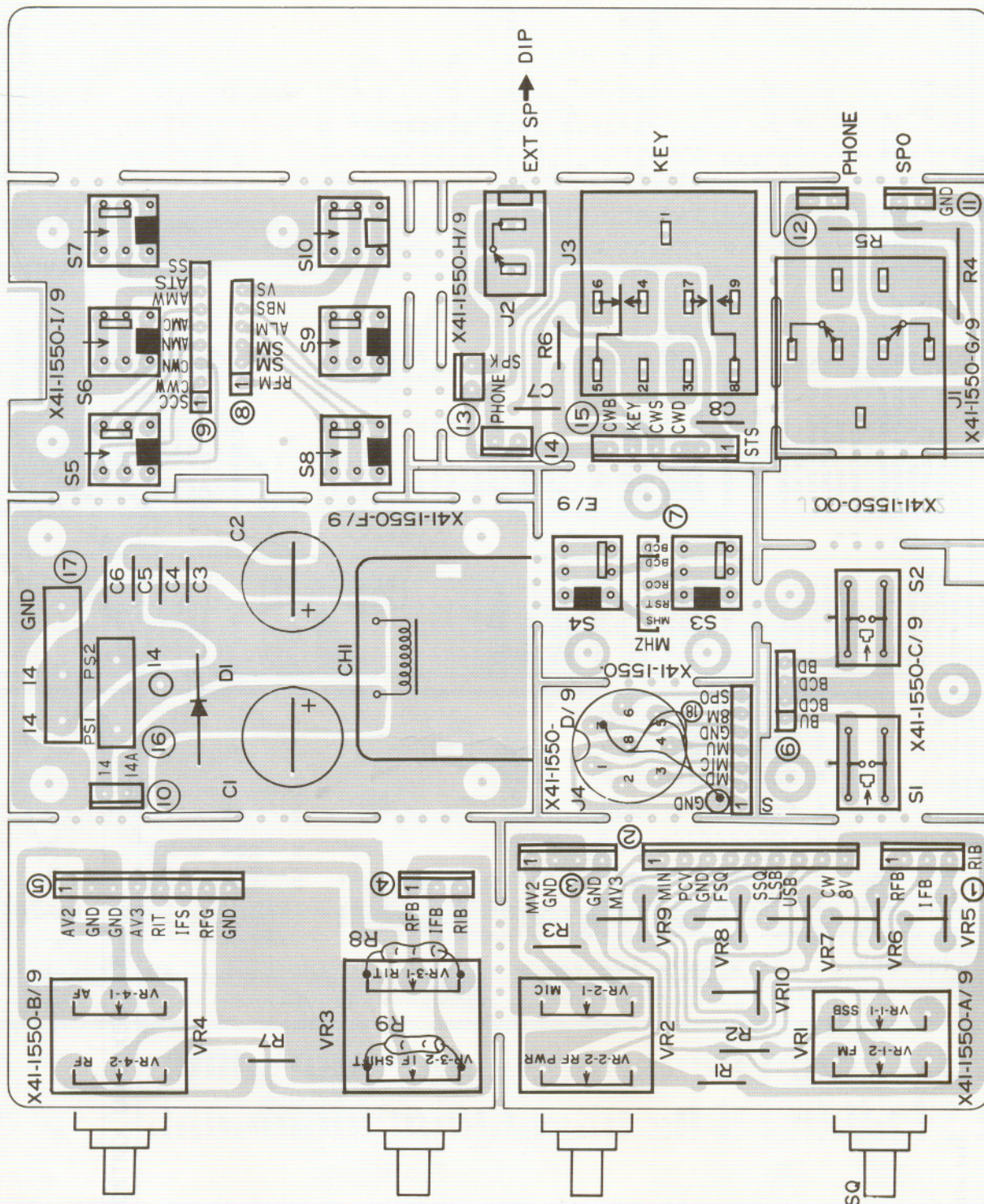
Parts No.	Re- marks	Description	Q'ty	Ref No.
S31-0401-05	N	DIP SWITCH 10P	1	
TA57	N	TRANSISTOR AREY	1	Q / 55
TC4011BP		IC	3	IC / 14, 25, 26
TC4071BP	N	IC	2	IC / 23, 27
TMP8049P-3034	N	IC	1	IC / 19
UPD8049HC-092	N	IC	1	IC / 16
UPD8243C		IC	2	IC / 17, 20
UPD444C-0		IC	1	IC / 18
1N60		DIODE	1	D / 38
1SS133		DIODE	6	D / 26, 27, 28, 29, 39, 40
1SV53A		DIODE	1	D / 20
1S1555		DIODE	48	D / 5, 6, 7, 8, 22, 23, 24, 30, 31, 32, 33, 34, 35, 36, 37, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75
1S1555		DIODE		D / 37, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53
1S1555		DIODE		D / 54, 55, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69
1S1555		DIODE		D / 70, 71, 72, 73, 74, 75
1S1587		DIODE	12	D / 2, 3, 4, 9, 10, 12, 13, 14, 16, 17, 18, 19
1S2588		DIODE	3	D / 1, 11, 15
2SA1015(Y)	TR		7	Q / 35, 43, 50, 51, 52, 53, 54
2SC1923(D)	TR		4	Q / 9, 13, 14, 24
2SC1775(E)	TR		9	Q / 10, 11, 12, 21, 22, 23, 32, 33, 34
2SC460(B)	TR		3	Q / 1, 16, 17
2SC1959(Y)	TR		1	Q / 19
2SC1815(Y)	TR		30	Q / 2, 3, 4, 5, 6, 7, 8, 15, 18, 20, 25, 26, 27, 28, 29, 30, 31, 36, 37, 38, 39, 40, 41, 42, 44, 45, 46, 47, 48, 49
2SC1815(Y)	TR			Q / 48, 49

Parts No.	Re- marks	Description	Q'ty	Ref No.
DISPLAY UNIT (X54-1800-00)				
CE04W1A470M		ELECTRO 47 10V	1	C / 1
CE04W1C101M		ELECTRO 100 16V	1	C / 2
CE04W1V100M		ELECTRO 10 35V	3	C / 3, 5, 6
CQ92M1H103K		MYLAR 0.01 50V	1	C / 4
C90-0840-05		ELECTRIC BLOCK CAPACITOR	1	C / 7
C91-0119-05		CERAMIC CAP 0.047	2	C / 8, 9
E31-3024-05	N	TAPE CABLE 2 WIRE	1	
E31-3025-05	N	TAPE CABLE 10 WIRE	2	
E40-0273-05		MINI CONNECTOR 2P	1	
E40-0373-05		MINI CONNECTOR 3P	1	
E40-0773-05		PIN ASS'Y 7P	1	
E40-3008-05		PIN CONNECTOR 3P	1	
FIP11FM7	N	DISPLY TUBE	1	
J21-4133-04	N	HARDWARE FIXTURE	1	
L19-0323-05		TRANSFORMER	1	T / 1
L40-1011-14		INDUCTOR 100 UH	1	L / 2
L40-1011-13		INDUCTOR 100 UH	1	L / 1
MTZ8.2JB		ZENER DIODE 8.2V	1	D / 5
MTZ6.2JA		ZENER DIODE 6.2V	1	D / 6
R92-0150-05		JUMPER WIRE	17	
UPA80C	N	IC	3	IC / 1, 2, 3
UPD8243C		IC	1	IC / 4
1S1555		DIODE	4	D / 1, 2, 3, 4
2SC1959(Y)	TR		2	Q / 1, 2

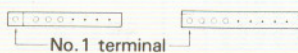
TS-670 PC BOARD VIEW

SWITCH UNIT (X41-1550-00)

Component side view



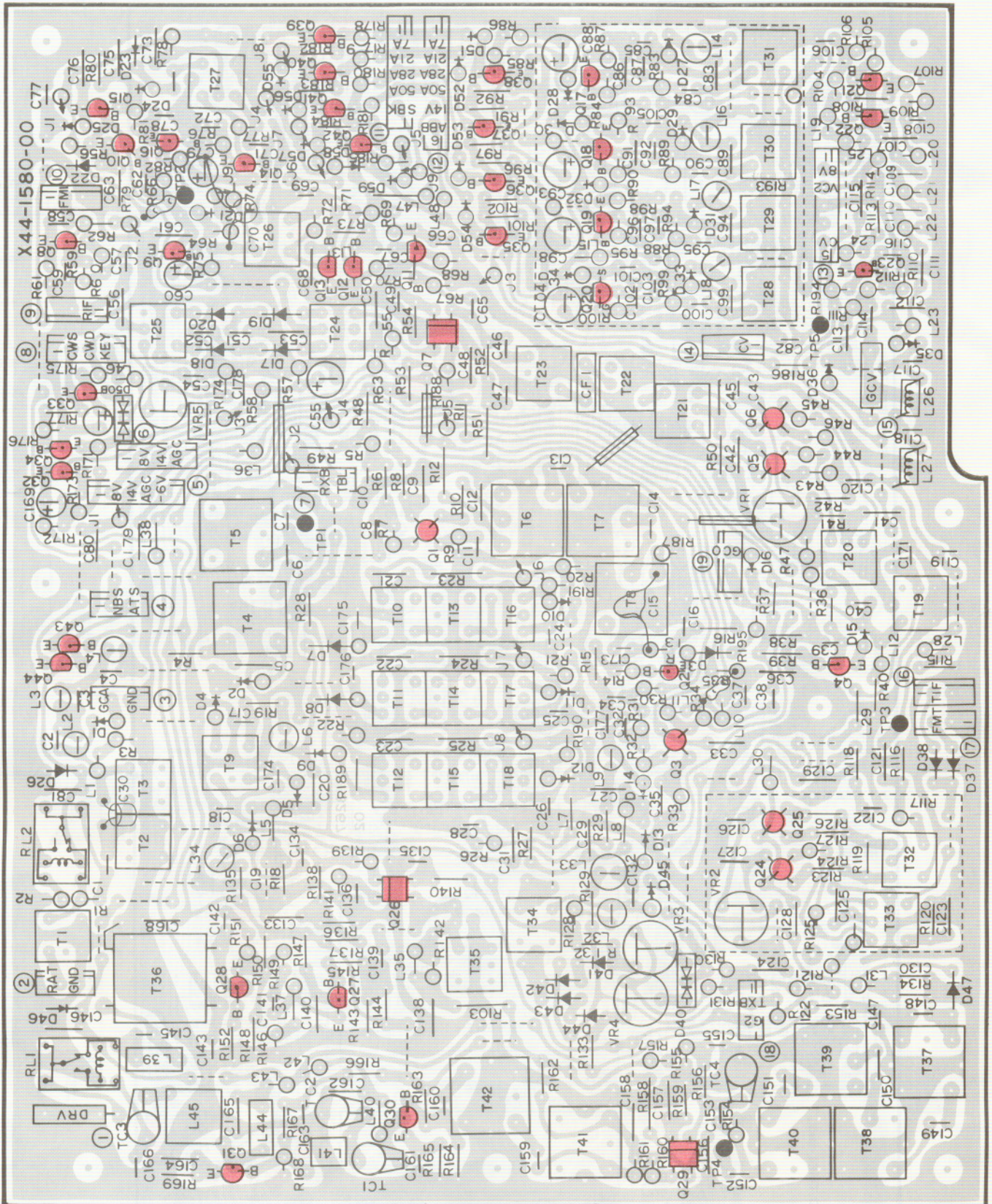
Terminal number



PC BOARD VIEW

RF UNIT (X44-1580-00)

Component side view



IF UNIT (X48-1390-00) **Component side view**

IF UNIT (X48-1390-00)

Component side view

