ICOM

SERVICE MANUAL

WIDEBAND RECEIVER

IC-R100

Icom Inc.

INTRODUCTION

This service manual describes the latest service information for the **IC-R100** WIDEBAND RECEIVER at the time of going to press.
5 versions of the **IC-R100** have been designed. This service manual covers each version.

VERSION NO.	VERSION	SYMBOL
#2	U.S.A.	USA
#3	Europe	EUR
#4	Australia	AUS
#5	Germany	FRG
#6	France	FRA

To upgrade quality, all electrical or mechanical parts, and internal circuits are subject to change without notice or obligation.

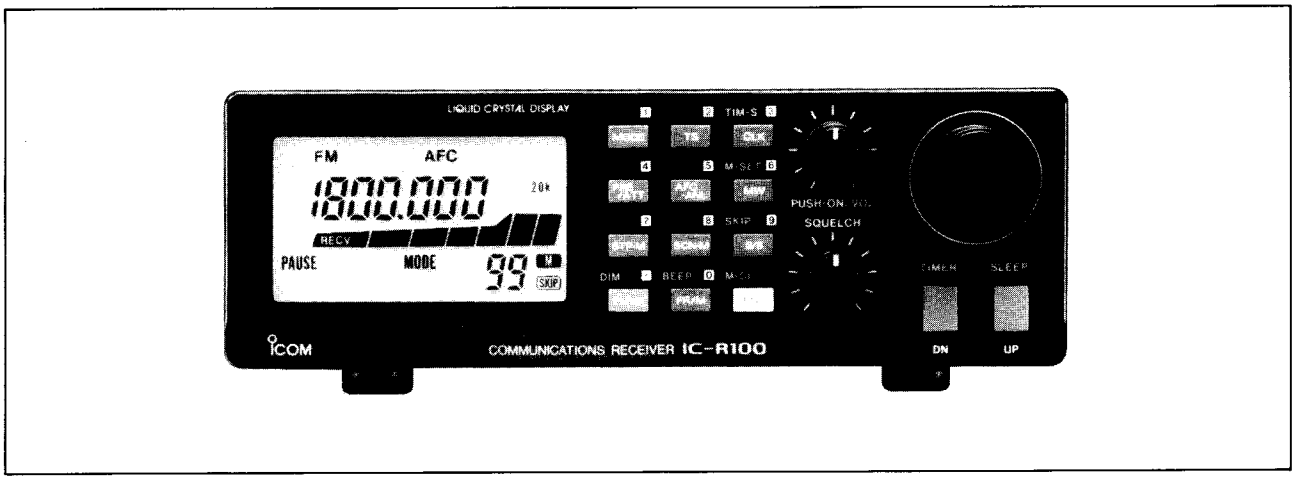
DANGER

NEVER connect the receiver to an AC outlet or to a DC power supply that uses more than 16 V. This will ruin the receiver.

DO NOT expose the receiver to rain, snow or any liquids.

DO NOT reverse the polarities of the power supply when connecting the receiver.

DO NOT apply an RF signal of more than 20 dBm (100 mW) to the antenna connector. This could damage the receiver's front end.



ORDERING PARTS

Be sure to include the following four points when ordering replacement parts:

1. 10-digit order numbers
2. Component part number and name
3. Equipment model name and unit name
4. Quantity required

<SAMPLE ORDER>

1130001000	IC	μPD4066BC	IC-R100 MAIN UNIT	5 pieces
8810006130	Screw	BiH M2.6×5	IC-R100 Top cover	10 pieces

Addresses are provided on the inside back cover for your convenience.

REPAIR NOTE

1. Make sure a problem is internal before disassembling the receiver.
2. **DO NOT** open the receiver until the receiver is disconnected from its power source.
3. **DO NOT** force any of the variable components.
   Turn them slowly and smoothly.
4. **DO NOT** short any circuits or electronic parts.
   An insulated tuning tool **MUST** be used for all adjustments.
5. **DO NOT** keep power ON for a long time when the receiver is defective.
6. **READ** the instructions of test equipment thoroughly before connecting equipment to the receiver.

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SECTION 1 SPECIFICATIONS

- Frequency coverage :

VERSION	FREQUENCY COVERAGE
U.S.A., Europe, Australia	0.1~1856 MHz*
Germany	13.95~ 14.5 MHz, 28.0~ 29.7 MHz, 144.0 ~ 146.0 MHz, 430.0~440.0 MHz, 1240.0 ~1300.0 MHz
France	0.1~87.5 MHz, 108.0~1856 MHz*

*Specifications guaranteed for 0.5~1800 MHz

- Mode : AM, FM, Wide FM (WFM)
- Tuning step increments : 1, 5, 8, 10, 12.5, 20 or 25 kHz (100~521.5 kHz and 1.630~904.9995 MHz)
  1, 5, 8, 9, 10, 12.5, 20 or 25 kHz (522~1629.5 kHz)
  12.5, 20 or 25 kHz (905~1856 MHz)
- Antenna impedance : 50 Ω (unbalanced)
- Power supply requirement : 13.8 V DC±15 % (negative ground)
- Current drain (at 13.8 V DC) : Less than 1.1 A
- Usable temperature range : −10 °C~+60 °C (+14 °F~+140 °F)
- Frequency stability (at 1800 MHz) : ±3.5 ppm (0 °C~+50 °C; +32 °F~+122 °F)
- Number of memory channels : Memory channels 100
  Priority channel 1
  Scan edge channels 20
  (for 10 scan ranges)
- Dimensions : 150 (W)×50 (H)×181 (D) mm
  5.9 (W)×2.0 (H)×7.1 (D) in
  (Projections not included)
- Weight : 1.4 kg (3.1 lb)
- Sensitivity :

Frequency	Sensitivity		
	FM	Wide FM	AM
0.5 ~ 1.6295 MHz	—	—	3.2 µV
1.63~ 49.9995 MHz	0.56 µV	—	1.6 µV
50.0 ~ 904.9995 MHz	0.2 µV	0.63 µV	0.56 µV
905.0 ~1380.4875 MHz	0.32 µV	0.79 µV	1.0 µV
1380.5 ~1800.0 MHz	0.45 µV	1.1 µV	1.4 µV

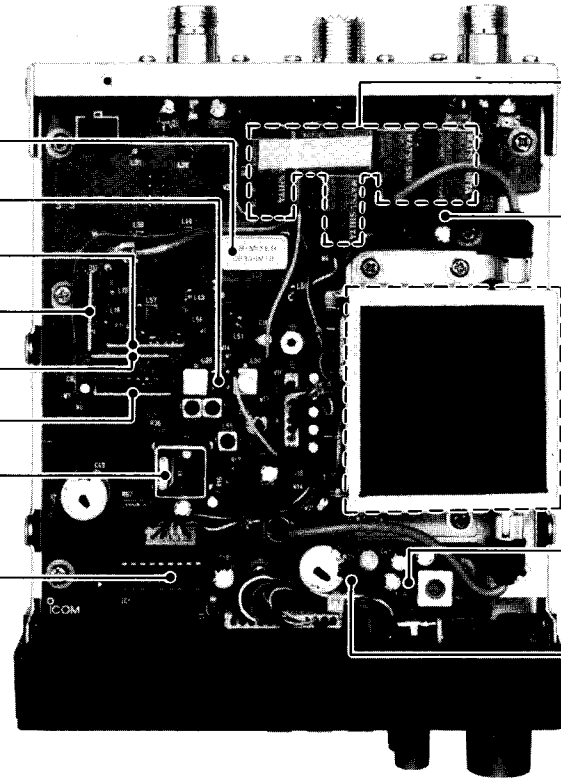
Measurement conditions:
Preamp is ON in the 50~904.9995 MHz frequency range.
FM 12 dB SINAD (1 kHz modulation with ±3.5 kHz deviation)
WFM 12 dB SINAD (1 kHz modulation with ±50 kHz deviation)
AM 10 dB S/N (1 kHz modulation with 30 % depth)

- Selectivity : FM More than 15 kHz/−6 dB
  WFM More than 180 kHz/−3 dB
  AM More than 6 kHz/−6 dB
- Audio output power : More than 2.5 W at 10 % distortion with an 8 Ω load.
- Audio output impedance : 4~8 Ω

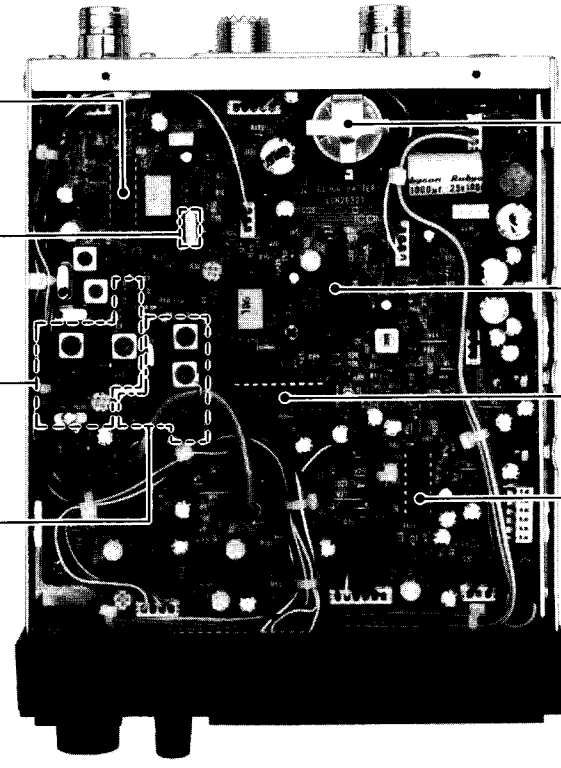
All stated specifications are subject to change without notice or obligation.

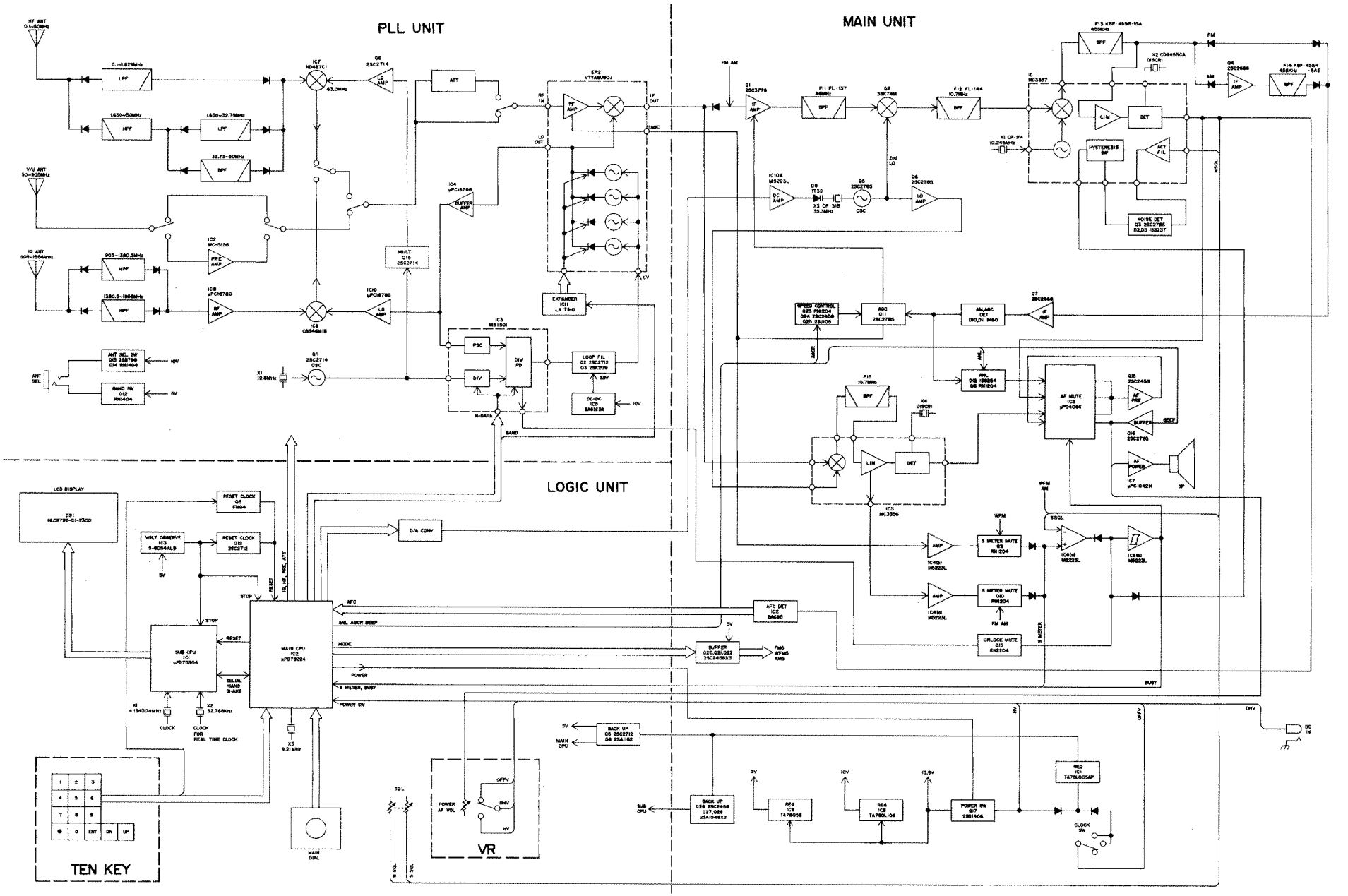
SECTION 2 INSIDE VIEWS

• TOP VIEW



• BOTTOM VIEW




PLL UNIT
MAIN UNIT
LOGIC UNIT
TEN KEY
VR

SECTION 4 CIRCUIT DESCRIPTION

4-1 RF CIRCUITS

4-1-1 FILTER CIRCUIT (PLL UNIT)

The IC-R100 has 3 antenna connectors (J7, J8, J9) for a super-wideband receiving range of 0.1 MHz to 1856.0 MHz. Received signals enter one of the 3 antenna connectors depending on the receive frequency range.

(1) 0.1~50.0 MHz FILTER

RF signals from an antenna connector (J8) are distributed to three separate filters through switching diodes (D10, D12) for filter selection.

• 0.1000~1.6290 MHz

After passing through a switching diode (D10), a 0.1000~1.6290 MHz signal is applied to an attenuator consisting of R64~R66. The attenuator prevents distortion of very strong signals from medium wave broadcasting stations. The signal is applied to FIL 1 (C1~C5, L1, L2) which forms a low-pass filter. The filter circuit cuts off frequencies of 1.6290 MHz or higher. The filtered signal passes through a switching diode (D11).

• 1.6295~32.7495 MHz

After passing through a switching diode (D12), a 1.6295~32.7495 MHz signal is applied to FIL 2 (C1~C7, L1, L2) which forms a high-pass filter. The filter circuit passes frequencies approx. 1.630 MHz or lower. The signal is applied to FIL 3 (C1~5, L1, L2) which forms a low-pass filter. The filter circuit cuts off approx. 32.75 MHz or higher. The filtered signal passes through a switching diode (D14).

• 32.7500~49.9995 MHz

A 32.7500 MHz~49.9995 MHz signal is applied to FIL 2 through the switching diode (D12). The signal is applied to FIL 4 (C1~C9, L1~L4) which forms a bandpass filter. The bandpass filter passes signal within the frequency range of 32.7500~50.0000 MHz. The filtered signal is applied to the switching diode (D14).

• RF CIRCUITS

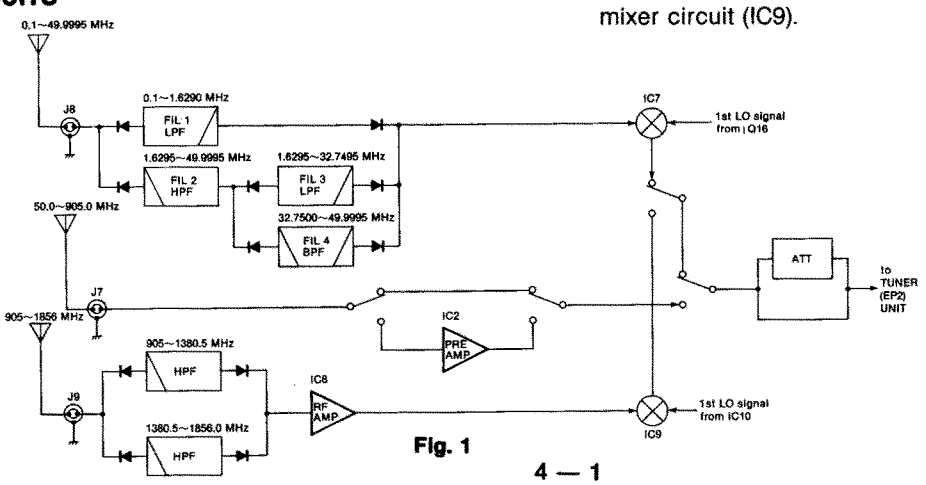


Fig. 1

(2) 50.0~905.0 MHz FILTER

No filter is installed in this frequency range. RF signals enter an antenna connector (J7) and then are applied to the RF relay circuit (RL2, RL3). The RF relay circuit switches the signals to bypass through a preamplifier (IC2) or be amplified at the preamplifier. The pre-amplifier (IC2) provides 15 dB gain to attenuate an IF signal level at an attenuator circuit (Q16) when the preamplifier circuit is turned ON.

(3) 905.0~1856.0 MHz FILTER

RF signals enter an antenna connector (J9) and then pass through a switching diode (D18). The signals are applied to two separate high-pass filters for frequencies lower than and higher than 1380.5 MHz. The filtered signals pass through a switching diode (D21).

4-1-2 HF BAND CONVERTER CIRCUIT (PLL UNIT)

The filtered signals entering at J8 are applied to a 1st mixer circuit consisting of IC7, L29, L30 and then are mixed with a 63.0 MHz 1st LO signal to produce a 63.1 ~112.9995 MHz 1st IF signal corresponding to the receive frequency range of 0.1~49.9995 MHz.

The 63.0 MHz 1st LO signal is generated by a local oscillator (X1, Q1). X1 produces a 12.6 MHz reference frequency. The reference frequency is multiplied by five at LO amplifiers (Q6, Q15) for producing the 63.0 MHz 1st LO signal.

4-1-3 1GHz BAND CONVERTER CIRCUIT (PLL UNIT)

The filtered signals entering at J9 are applied to a RF amplifier (IC8) corresponding to a UHF band and then applied to a 1st mixer circuit (IC9). IC9 is a DBM (Double Balanced Mixer). The signals are mixed with a 475.5 ~905.0 MHz 1st LO signal to produce a 429.5~905.0 MHz 1st IF signal corresponding to the receive frequency range of 905.0~1856.0 MHz. The 475.5~905.0 MHz 1st Lo signal is buffer-amplified at IC10 depending on the receive frequencies. The signal is applied to the 1st mixer circuit (IC9).

4-2 IF CIRCUITS

4-2-1 TUNER UNIT (PLL UNIT)

The TUNER UNIT (EP2) contains an RF amplifier controlled by the TAGC signal, mixer and 4 VCOs. The RF signals are applied to P2 on the TUNER UNIT (EP2) to be converted to a 46 MHz IF signal. The TUNER UNIT (EP2) outputs the signal from pin 8. IC2 on the LOGIC UNIT supplies 2-bit data to IC11 (pin 3, 4). IC11 is an expander for switching the operating band of TUNER UNIT (EP2). The following table (Fig 2) shows the relations between 2-bit data and the band signal.

FREQUENCY RANGE (MHz)	J1 (PLL UNIT) OUTPUT DATA						IC11 (PLL UNIT)			
	BS0	BS1	BS2	HF	1G	1GF	B1	B2	B3	B4
0.100 ~ 1.6290				H			H			
1.6295~ 32.7495				H						
32.750 ~ 49.9995		H		H				H		
50.000 ~ 95.7495							H			
95.750 ~ 221.7495		H						H		
221.750 ~ 475.7495			H						H	
475.750 ~ 904.9995		H	H							H
905.000 ~ 997.4875			H		H					
997.500 ~1380.4875		H	H		H					
1380.500 ~1856.0000		H	H		H	H				

H: High level No indication: Low level

Fig. 2

4-2-2 AM/FM IF AND 2ND MIXER CIRCUITS (MAIN UNIT)

The 46 MHz IF signal passes through a switching diode (D1) with AM 5 and FM 5 signals when AM or FM mode is selected. The signal is applied to an IF amplifier and then applied to a crystal filter (FI1) to improve the selectivity.

The filtered signal is applied to a 2nd mixer (Q2) and then mixed with the 35.3 MHz 2nd LO signal to produce a 10.7 MHz 2nd IF signal.

A 35.3 MHz 2nd LO signal is generated by a 2nd local oscillator circuit consisting of D8, X3, Q5, and other components. The 2nd LO oscillator circuit produces a frequency step less than the PLL reference frequency.

The LOGIC UNIT supplies D/A converted signals to IC10 (pin 3) which correspond to each tuning step. The signals are amplified at IC10 and then applied to a varactor diode (D8) which shifts the oscillation frequency.

• AM/FM IF AND 2ND MIXER CIRCUITS

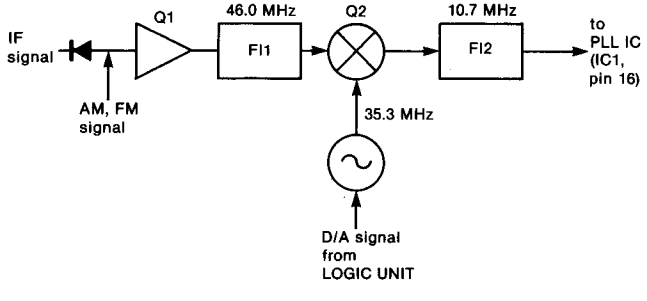


Fig. 3

4-2-3 2ND IF AND FM DEMODULATOR CIRCUITS (MAIN UNIT)

The 10.7 MHz 2nd IF signal is applied to FI2. FI2 is a MCF (Monolithic Crystal Filter) which suppresses out-of-band signals.

The 2nd IF signal is applied to a 3rd mixer section of IC1 and is mixed with a 3rd LO signal to be converted to a 455 kHz 3rd IF signal.

IC1 is designed for use in FM dual conversion communications equipment. IC1 contains the 3rd mixer, local oscillator circuit, limiter amplifier, quadrature detector circuit, and active filter circuit. The local oscillator section and X1 generate 10.245 MHz for a 3rd LO signal.

The 3rd IF signal from the 3rd mixer (IC1, pin 3) passes through a ceramic filter (FI3) where unwanted signals are suppressed. It is then amplified at the limiter amplifier section (IC1, pin 5) and applied to the quadrature detector section (IC1, pin 8 and ceramic discriminator X2) to demodulate the 3rd IF signal into an AF signal. The AF signal is output from IC1 (pin 9).

4-2-4 AM DEMODULATOR CIRCUIT (MAIN UNIT)

A portion of the 455 kHz 3rd IF signal is applied to an IF amplifier (Q4) after passing through the ceramic filter (FI3) when AM mode is selected by switching diodes (D5, D7). When the switching diodes are turned ON, AM 5 signal line obtains 5 V. The amplified signal passes through a ceramic filter (FI4) to improve selectivity. The filtered signal is re-amplified at an IF amplifier (Q7) and then rectified by the AM detector circuit (D10, D11). The detected signal is demodulated into an AM signal.

• **2ND IF AND FM/AM DEMODULATOR CIRCUITS**

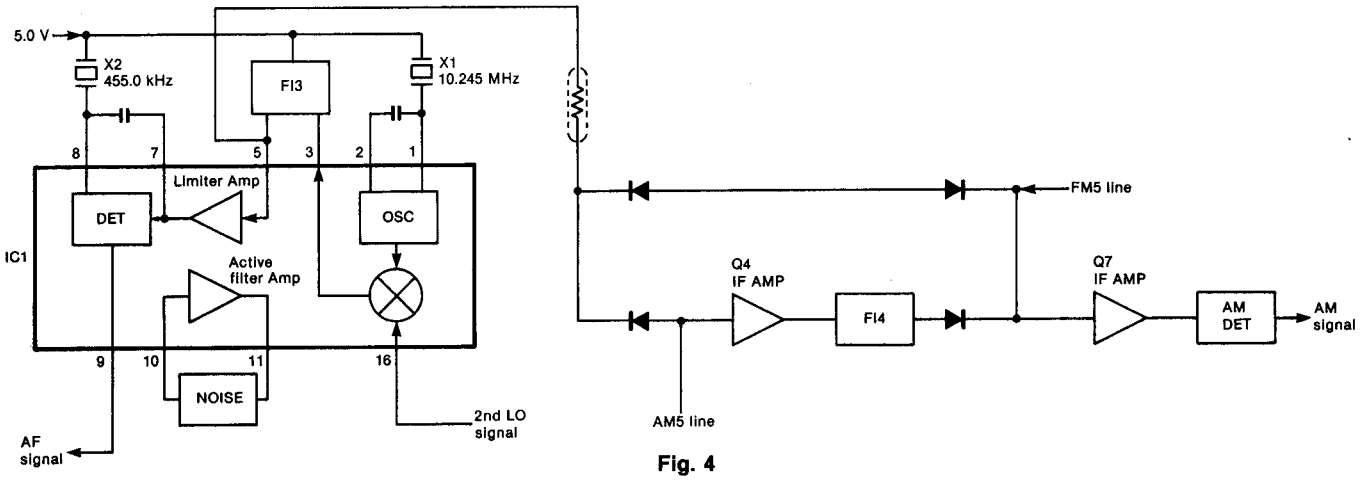


Fig. 4

4-2-5 WFM DEMODULATOR CIRCUIT (MAIN UNIT)

The 46 MHz IF signal is applied to a 2nd mixer section of IC3 and then mixed with the 35.3 MHz 2nd LO signal to produce a 10.7 MHz 2nd IF signal.

The 35.3 MHz 2nd LO signal is amplified at an LO amplifier (Q6) and is then applied to the 2nd mixer section through IC3 (pin 3).

IC3 is designed for use in digital data communications equipment. IC3 contains the 2nd mixer, local oscillator circuit, limiter amplifier and quadrature detector circuit.

The 2nd IF signal from the 2nd mixer (IC3, pin 5) passes through a ceramic filter (FI5) where unwanted signals are suppressed. It is then amplified at the limiter amplifier section (IC3, pin 7) and applied to the quadrature detector section (IC3, pin 11 and ceramic discriminator X4) to demodulate the 2nd IF signal into an AF signal. The AF signal is output from IC 3 (pin 13).

4-2-6 S-METER CIRCUIT (MAIN UNIT)

In WFM mode, the S-meter signal is output from IC3 (pin 14) and then applied to IC4(a) (pin 3). The amplified signal is applied to a main CPU (IC2, pin 93).

When the "WFM 5" line becomes "HIGH", the S-meter switch (Q9) is turned ON to cut off the FM or AM signal.

In FM or AM mode, the S-meter signal is applied to IC4(b) (pin 6) through the TAGC signal line. The inverted and amplified signal is applied to the main CPU (IC2, pin 93).

When the "FM 5" or "AM 5" line becomes "HIGH", the S-meter switch (Q10) is turned ON to cut off the WFM S-meter signal.

4-2-7 AGC CIRCUIT (MAIN UNIT)

In FM or AM mode, the signal is detected to obtain AGC voltage at D10 and D11 and is then amplified at an AGC amplifier (Q11). The amplified signal is distributed to a base of the IF amplifier (Q1) on the MAIN UNIT and the RF amplifier on the TUNER UNIT (EP2) through the TAGC line.

In WFM mode, the "WFM 5" line becomes "HIGH", turning ON Q12. The AGC voltage is cut off when Q12 is turned ON.

When the scan is in operation, the AGCR signal from the LOGIC UNIT turns OFF Q23. C132 is bypassed to reduce the AGC time constant.

• **WFM DEMODULATOR CIRCUIT**

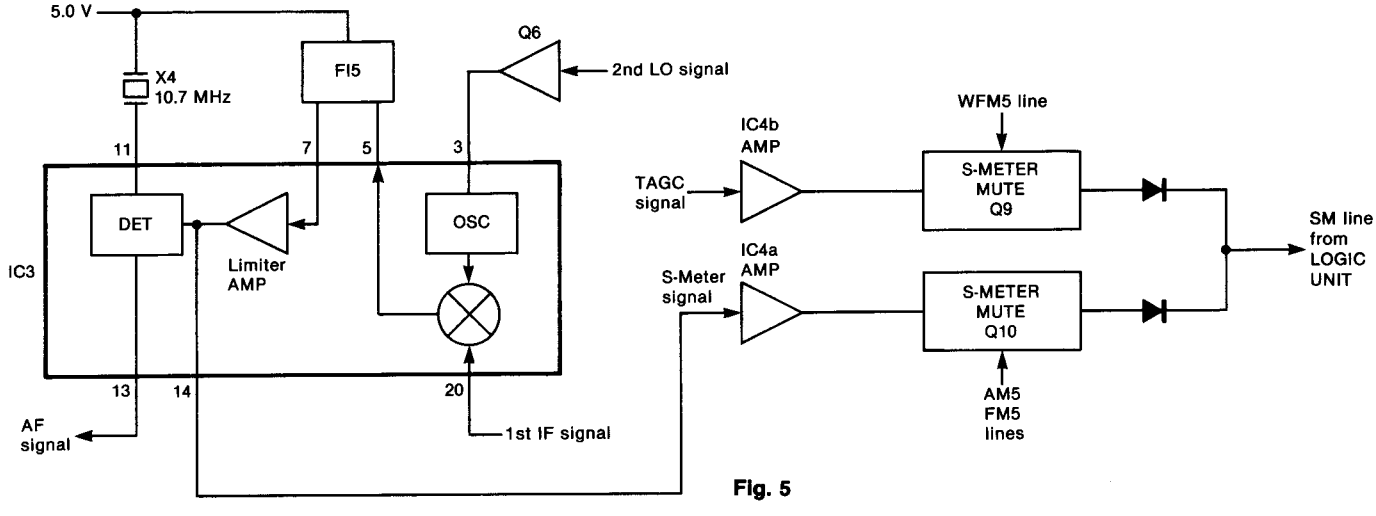


Fig. 5

4-2-8 SQUELCH CIRCUIT (MAIN UNIT)

The IC-R100 has 2 squelch systems, S-meter squelch and noise squelch.

The noise squelch functions in FM mode. Some of the noise components in the AF signal from IC1 are applied to IC1 (pin 10) via a de-emphasis circuit (R17, C28, C29). This de-emphasis circuit is an integrated circuit with frequency characteristics of −6 dB/octave.

The active filter section in IC1 amplifies noise components of frequencies of 20 kHz and above, and outputs the resulting signals from pin 11. Output signals are rectified by D2 and D3, and converted to DC voltage.

The rectified voltage triggers the squelch switch (Q3) and then is applied to a squelch trigger circuit (IC1, pin 12). The output level from IC1 (pin 14) becomes "LOW" and turns ON D29. The AF signal is muted when the output level from IC6(b) (pin 7) becomes "LOW."

The S-meter squelch functions in either AM or WFM mode. The S-meter squelch signal from IC1 (pin 11) is applied to IC6(a) through the squelch switch (Q3) to compare with a reference voltage controlled by R86 on the LOGIC UNIT. When this reference voltage level is higher than the S-meter squelch level from IC1 (pin 11), D28 is turned ON. The output level from IC6(b) (pin 7) becomes "LOW" to mute an AF signal line.

When the S-meter squelch is in operation, Q19 is turned ON to cut off the noise squelch.

4-2-9 AFC CIRCUIT (MAIN UNIT)

This circuit automatically controls the receive frequency to compensate for the frequency drift in FM or AM mode.

IC2 is a monolithic IC which lights up "AFC" on the function display when AFC function is in operation. A current regulator (IC8) supplies a 10 V reference voltage to IC2 (pin 1) for comparison with the DC component in the detected FM or AM signal.

The frequency drift selects an output signal to control the receive frequency. The signal is output from IC2 (pin 6~8) and applied to the LOGIC UNIT.

4-2-10 AF AMP CIRCUIT (MAIN UNIT)

The de-modulated signals are applied to an AF mute circuit consisting of IC5(b)~IC5(d) and then amplified at Q15. The amplified signals are applied to the [VOL] control (R1) on the VR UNIT. When the squelch is closed, IC5 cuts off the AF signals like an AF mute switch. The AF signals are power-amplified at an AF power amplifier (IC7) to drive a speaker.

4-2-11 ANL CIRCUIT (MAIN UNIT)

This circuit eliminates the noise components to obtain clear reception in AM mode.

The ANL circuit consists of R70~R73, D12, C69, and Q8. The detector output from D10 and D11 is applied to the anode of D12 through R72 and R73. The detector output is also applied to the cathode of D12, passing through R70 where it is divided by R70 and R71.

When the [AFC • ANL] switch is turned OFF, the anode voltage of D12 is higher than the cathode voltage. D12 is therefore activated. However, when the [AFC • ANL] switch is turned ON, the ANL signal line becomes "HIGH" to turn ON Q8. C69 and C117 are grounded. Therefore the detector output, including pulses, is only applied to the cathode of D12. The cathode voltage becomes higher than the anode voltage and D12 shuts OFF just at the moment when the pulses are received. The AF signal (excluding pulses) then passes through D12 and is applied to IC5(c).

• ANL CIRCUIT

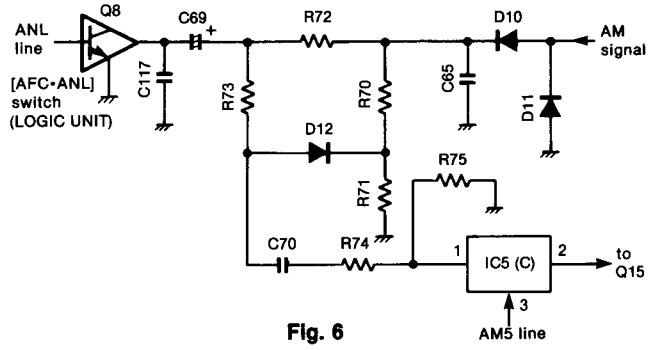


Fig. 6

4-3 PLL CIRCUITS

4-3-1 GENERAL (PLL UNIT)

The PLL circuit, using a one chip modulus prescaler (IC3), directly generates the 1st LO frequencies with 4 VCO's on the TUNER UNIT. The modulus prescaler (IC3) sets the dividing ratio based on serial data from the CPU, and compares the phases of VCO signals and the reference oscillator frequency. The PLL IC (IC3) detects the out-of-step phase and outputs it from IC3 (pin 5). A reference frequency is oscillated at X1.

4-3-2 REFERENCE OSCILLATOR CIRCUIT (PLL UNIT)

A 12.6 MHz reference frequency is produced by the local oscillator section of IC3 and X1. C14 provides frequency control.

4-3-3 LOOP FILTER CIRCUIT (PLL UNIT)

Phase-detected signals from IC3 (pin 5) are converted to DC voltage by a loop filter consisting of an active filter (Q2 and Q3).

The DC voltage (PLL lock voltage) is fed back to the TUNER UNIT (EP2) through an LV signal line to control the VCO oscillation frequency.

The unlock signal is output from IC3 (pin 7).

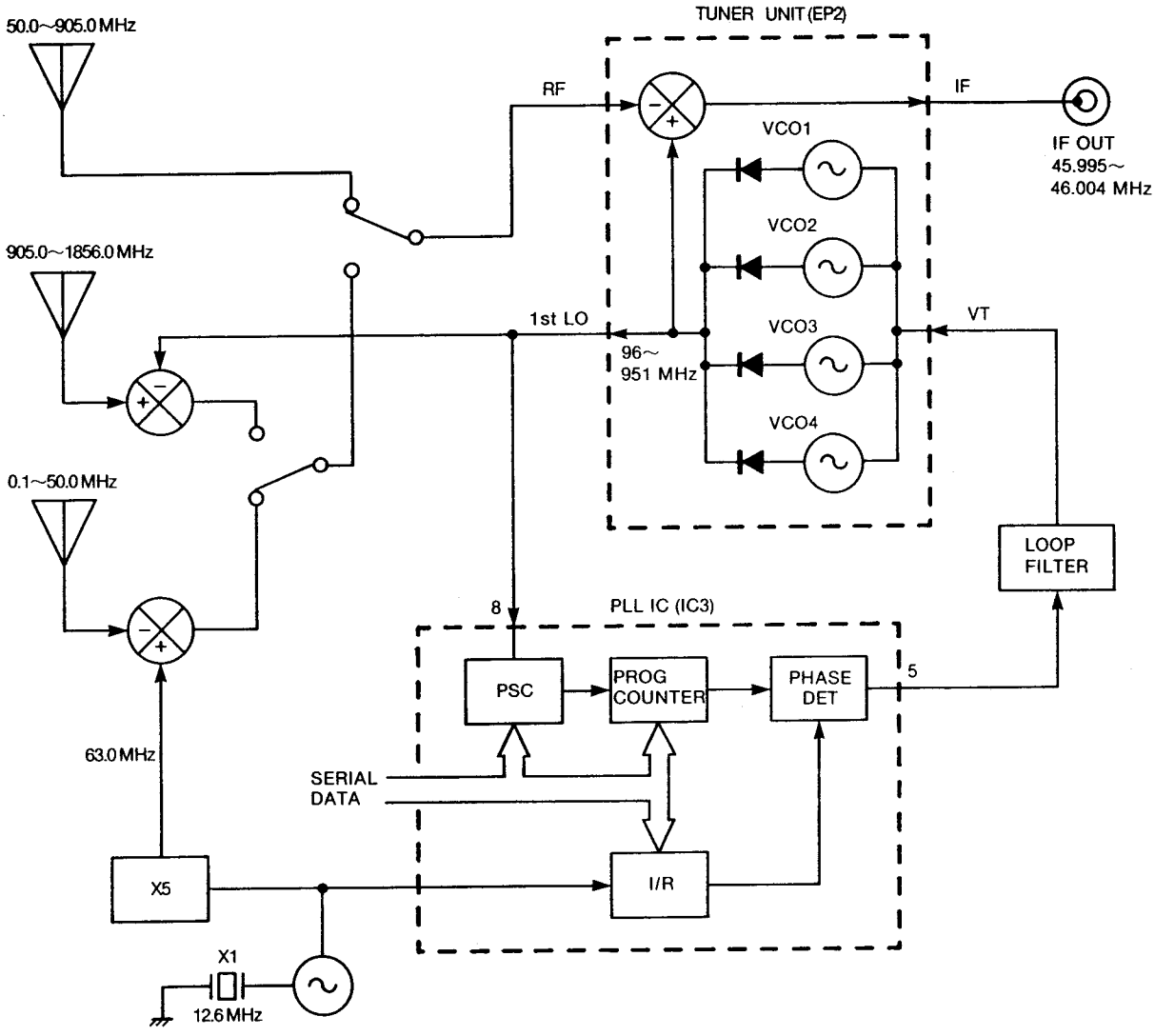


Fig. 7

4-3-4 VCO CIRCUIT (PLL UNIT)

Each of the 4 VCO's oscillates a different frequency on the TUNER UNIT (EP2). The Fig. 7, 8 shows the relations between VCO and oscillation frequency.

VCO	OSCILLATION FREQUENCY
VCO1	96.000~141.750 MHz
VCO2	141.750~267.750 MHz
VCO3	267.750~521.750 MHz
VCO4	521.750~951.000 MHz

Fig. 8

The signals are buffer-amplified at IC4 and then applied to IC3 (pin 8). The buffer amplifier (IC4) protects the PLL output signal against VCO oscillation.

4-3-5 DC-DC CONVERTER CIRCUIT (PLL UNIT)

IC5 is a DC-DC converter which creates approximately 30 V DC from 10 V DC to obtain wide range lock voltages for the PLL circuit.

4-4 POWER SUPPLY CIRCUITS

4-4-1 VOLTAGE LINES

LINE	DESCRIPTION
13.8 V	13.8 V DC controlled by the PWS signal line.
5 V	Common 5 V converted from the 13.8 V line at IC 9 on the MAIN UNIT.
10 V	10 V DC converted from the 13.8 V line. IC8 on the MAIN UNIT is a switching regulator IC and converts IC5 output into approx. 30 V DC.

4-4-1 SWITCHING CIRCUIT (MAIN UNIT)

This circuit consists of Q17, Q18 and Q30. The circuit corresponds to the high-rippled DC voltage which an AC adapter contains. When a ripple is present in DC voltage, a ripple filter (C129, R132) eliminates the ripple to obtain clear reception.

4-4-2 5 V AND 10 V REGULATOR CIRCUITS (MAIN UNIT)

The DC voltages are supplied from regulator circuits corresponding to the voltages. They are regulated at the following circuits using 13.8V DC.

(1) 5 V REGULATOR (MAIN UNIT)

5V DC is regulated by the three-terminal voltage regulator (IC9) and applied to the MAIN and PLL UNITS.

(2) 10 V REGULATOR (MAIN UNIT)

10V DC is regulated by the three-terminal voltage regulator (IC8) and applied to the MAIN and PLL UNITS.

• 5 V AND 10 V REGULATOR CIRCUITS

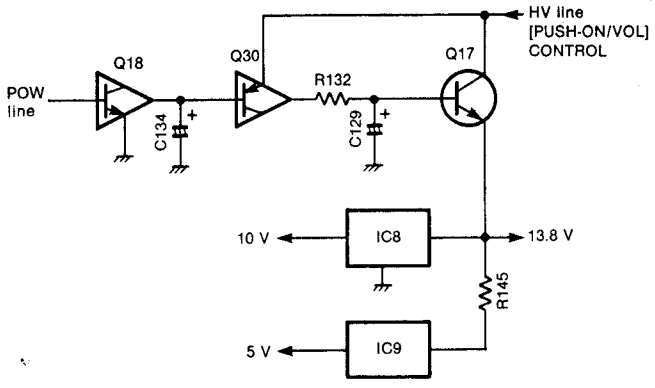


Fig. 9

4-4-3 CPU POWER SUPPLY CIRCUIT (LOGIC UNIT)

The DC voltage is applied to the main CPU (IC2, pin 8) via D2 from the lithium backup battery (BT1) to provide backup for the memory contents regardless of the power switch condition.

• CPU POWER SUPPLY AND CPU RESET CIRCUITS

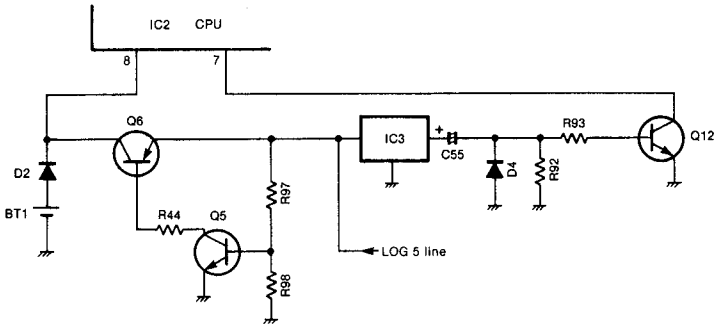


Fig. 10

4-4-4 SUB CPU POWER SUPPLY CIRCUIT (MAIN AND LOGIC UNITS)

The DC voltage is applied to the sub CPU (IC1, pin 54) from the lithium backup battery (BT1) to provide backup for the memory contents. This circuit is controlled by Q28.

• SUB CPU POWER SUPPLY

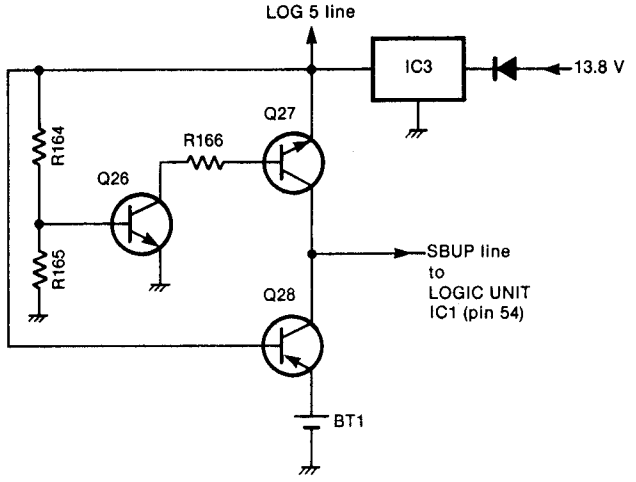


Fig. 11

4-5 OTHER CIRCUITS

4-5-1 DIMMER CIRCUIT (LOGIC UNIT)

The dimmer circuit consists of Q8, Q9 and other components and drives backlights (DS2), ensuring that brightness does not change even with a change of power supply.

When the main CPU (IC2, pin 28) changes its output level, Q8 and Q9 change the base voltage and collector current.

When the main CPU (IC2, pin 28) outputs "LOW", the base of Q9 obtains 5V through R89 to light up DS2.

When the main CPU (IC2, pin 28) outputs "HIGH" to turn ON, Q1, R89 and R90 divide 5 V into three voltages. The three voltage portions are applied to the base of Q9. Therefore, the collector voltage from Q8 decreases to dim the brightness of the lamp (DS2).

4-5-2 CPU RESET CIRCUIT (LOGIC UNIT)

When the power switch is turned OFF, the reset circuit functions as a three-terminal voltage regulator IC (IC3) which resets the main CPU (IC2). IC3 detects +5 V when the DC voltage is applied to the input terminal of IC3 and outputs 5 V. The voltage of the leading edge is applied to a time constant (C55, R93) to obtain sufficient reset time and inverted to supply a reset signal to the main CPU (IC2, pin 7) at Q12.

The differential circuit (C54, R84) functions while an AND circuit (D3 , D5) pushes and holds the [CLK], [FUNC], and [ENT] switches. When the power switch is turned ON, the differential circuit outputs a pulse to reset CPU.

4-5-3 REAL TIME CLOCK (LOGIC UNIT)

This receiver has a clock IC (IC1) with timer function. A 32.768 kHz is oscillated at X2 for clock reference. When the power switch is turned OFF, the DC voltage is applied to the sub CPU (IC1) from the lithium battery to provide backup for clock operation.

4-6 LOGIC CIRCUITS (LOGIC UNIT)

The LOGIC UNIT has two CPUs installed as main and sub CPUs for a variety of operating functions.

4-6-1 MAIN CPU (IC2) PORT ALLOCATIONS

(1) INPUT PORT

PORT NUMBER	PORT NAME	PIN NUMBER	DESCRIPTION
P10	K0	56	When the port becomes "LOW," the CPU detects that the [0] key has been pushed.
P11	K1	57	When the port becomes "LOW," the CPU detects that the [1] key has been pushed.
P12	K2	58	When the port becomes "LOW," the CPU detects that the [2] key has been pushed.
P13	K3	59	When the port becomes "LOW," the CPU detects that the [3] key has been pushed.
P14	K4	61	When the port becomes "LOW," the CPU detects that the [4] key has been pushed.
P15	K5	62	When the port becomes "LOW," the CPU detects that the [5] key has been pushed.
P16	K6	63	When the port becomes "LOW," the CPU detects that the [6] key has been pushed.
P17	K7	64	When the port becomes "LOW," the CPU detects that the [7] key has been pushed.
P20	—	—	Not used.
P21	STOP	76	When the port becomes "LOW," the CPU switches to the backup mode.
P22	DCK	77	Input port for the main dial clock pulses.
P23	ONEUP	79	Input port for control signals to communicate with the sub CPU. "HIGH" voltage is applied to the terminal every second.
P24	DDN	80	Input port for the DOWN signal of the main dial.
P25	DUP	81	Input port for the UP signal of the main dial.
P26	—	—	Not used.
P27	SIN	83	Input port for serial data.
P40	K8	49	When the port becomes "LOW," the CPU detects that the [8] key has been pushed.
P41	K9	48	When the port becomes "LOW," the CPU detects that the [9] key has been pushed.
P42	KDP	47	When the port becomes "LOW," the CPU detects that the [•] key has been pushed.
P43	KENT	46	When the port becomes "LOW," the CPU detects that the [ENT] key has been pushed.
P44	KUP	45	When the port becomes "LOW," the CPU detects that the [UP] key has been pushed.
P45	KDN	44	When the port becomes "LOW," the CPU detects that the [DOWN] key has been pushed.
P46	—	43	Not used.
P47	—	42	Not used.
P65	BUSY	25	When the port becomes "HIGH," the CPU detects that the receiver receives signals.
P66	PWS	24	When the port becomes "LOW," the CPU detects that the power switch has been turned ON.
P67	CLKS	23	When the port becomes "LOW," the CPU detects that the clock switch has been turned ON.
P70~ P72	VER1~ VER3	67~69	Used for selecting a version when only the CPU is reset.
P73	AUTO	71	When the port becomes "LOW," the 9 kHz step of the TS function is selected. This TS selection is only possibe after the CPU has been reset.
P74	FUP	72	AFC control signal input. When the port becomes "LOW," AFC controls the receive frequency for the higher frequency direction.
P75	FDN	73	AFC control signal input. When the port becomes "LOW," AFC controls the receive frequency for the lower fequency direction.
P76	FCNT	74	AFC control signal input. When the port becomes "LOW," the CPU detects that the displayed frequency (center frequency) has been received.
PT0	SM	93	A/D signal input. Used for indicating signal strength on the S-indicator.
PT1~ PT7	—	94, 1~6	Not used.

(2) OUTPUT PORT

PORT NUMBER	PORT NAME	PIN NUMBER	DESCRIPTION
P00~ P04	DA0~ DA4	14~18	Output D/A converted signals which control the frequency for lower 10 kHz unit.
P05	FM	19	The port becomes "HIGH" when FM mode is selected.
P06	WFM	20	The port becomes "HIGH" when WFM mode is selected.
P07	AM	21	The port becomes "HIGH" when AM mode is selected.
P30	ENA	85	Outputs a strobe signal for the PLL IC chip.
P31	SSTB	86	Outputs a strobe signal for the sub CPU.
P32	CK	87	Outputs serial clock signals.
P33	DATA	88	Outputs serial data.
P34	—	89	Not used.
P35	BEEP	90	Outputs 1 kHz or 500 Hz square waves used as a beep tone.
P36	SRST	91	Outputs a pulse of 15µsec. width when the CPU is reset.
P37	—	92	Not used.
P50	BS0	40	
P51	BS1	39	
P52	BS2	38	Output band control signals. See the table shown in the section.
P53	HF	37	PLL UNIT.
P54	1G	36	
P55	1GF	34	
P56	PRE	33	The port becomes "HIGH" when the [PRE/ATT] switch is pushed once.
P57	ATT	32	The port becomes "HIGH" when the [PRE/ATT] switch is pushed twice.
P60	POW	30	The port becomes "HIGH" when the [PUSH-ON/VOL] switch is ON.
P61	ANL	29	The port becomes "HIGH" when the [AFC • ANL] switch is ON.
P62	DIM	28	The port becomes "HIGH" when the [DIM] switch is ON.
P63	AGCR	27	The port becomes "LOW" when the AGC is set to FAST in scanning operation.
P64	—	26	Not used.

4-6-2 SUB CPU PORT ALLOCATIONS

PORT NUMBER	PORT NAME	PIN NUMBER	DESCRIPTION
P00	STOP	38	When the port becomes "LOW," the CPU enters the backup mode.
P01	CK	39	Input port for serial clock signals.
P02	S DATA	40	Outputs serial data.
P03	DATA	41	Input port for serial data.
P10	SSTB	42	Input port for a strobe signal.
P60	ONE UP	60	This port becomes "HIGH" every one second.

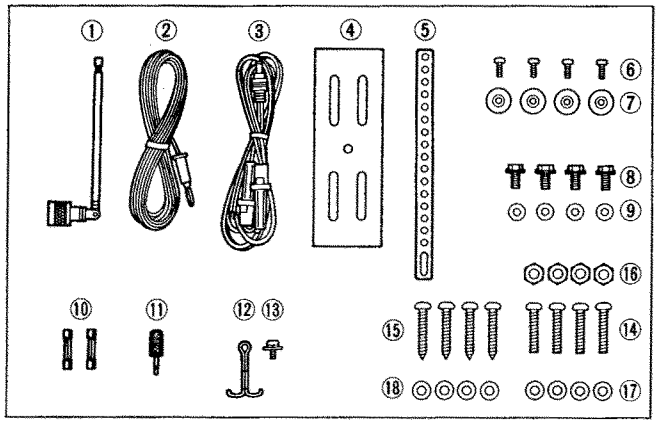
SECTION 5 MECHANICAL PARTS AND DISASSEMBLY

5-1 FRONT PARTS

LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.
①	8930013320	545 Rubber	1
②	8810006130	BiH M2.6 × 5 ZK	5
③	8930018550	Sponge (CG)	1
④	8110004010	Top cover	1
⑤	8210005530	Front panel (incl. window)	1
⑥	8830000550	VR nut (E)	1
⑦	8610006480	Knob N152 [PUSH-ON/VOL] [SQUELCH]	2
⑧	8610006470	Knob N151 [TUNING CONTROL]	1
⑨	8210005540	10 Key rubber	1
⑩	8930018320	Blind sheet	1
⑪	8810001720	PH B0 No.0-3 M1.4 × 4	5
⑫	7210001840	Variable resistor RV−168 [PUSH-ON/VOL]	1
⑬	8810003960	Setscrew (A) M2.6 × 5	5
⑭	2250000050	Encoder EVQ-WQGF15 24B [TUNING CONTROL]	1
⑮	8010009910	Sub chassis	1
⑯	8930018050	LCD cover	1
⑰	8930017850	LCD holder	1
⑱	5030000530	LCD HLC9792-01-2300	1
⑲	8930018360	LCD filter	1
⑳	8010009710	851 Reflector	1

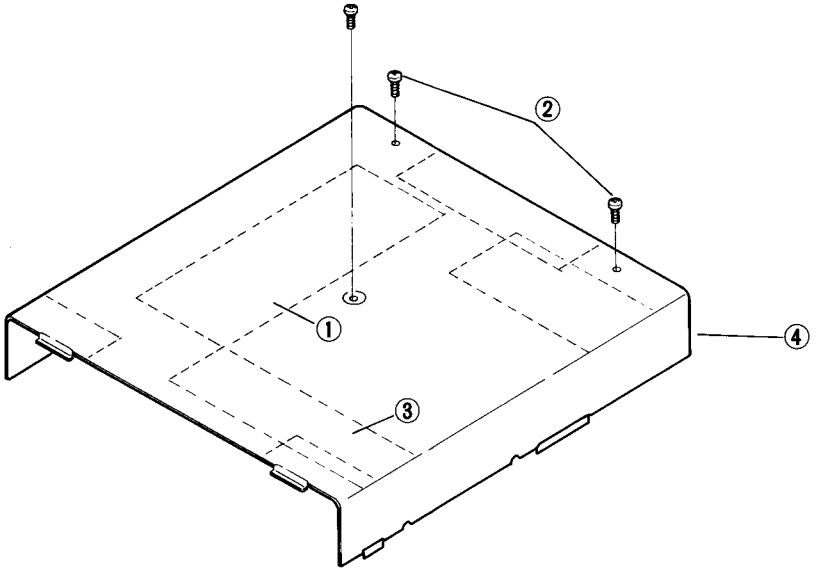
Screw abbreviations BiH: Binding head ZK: Black PH: Pan head B0: Self-tapping

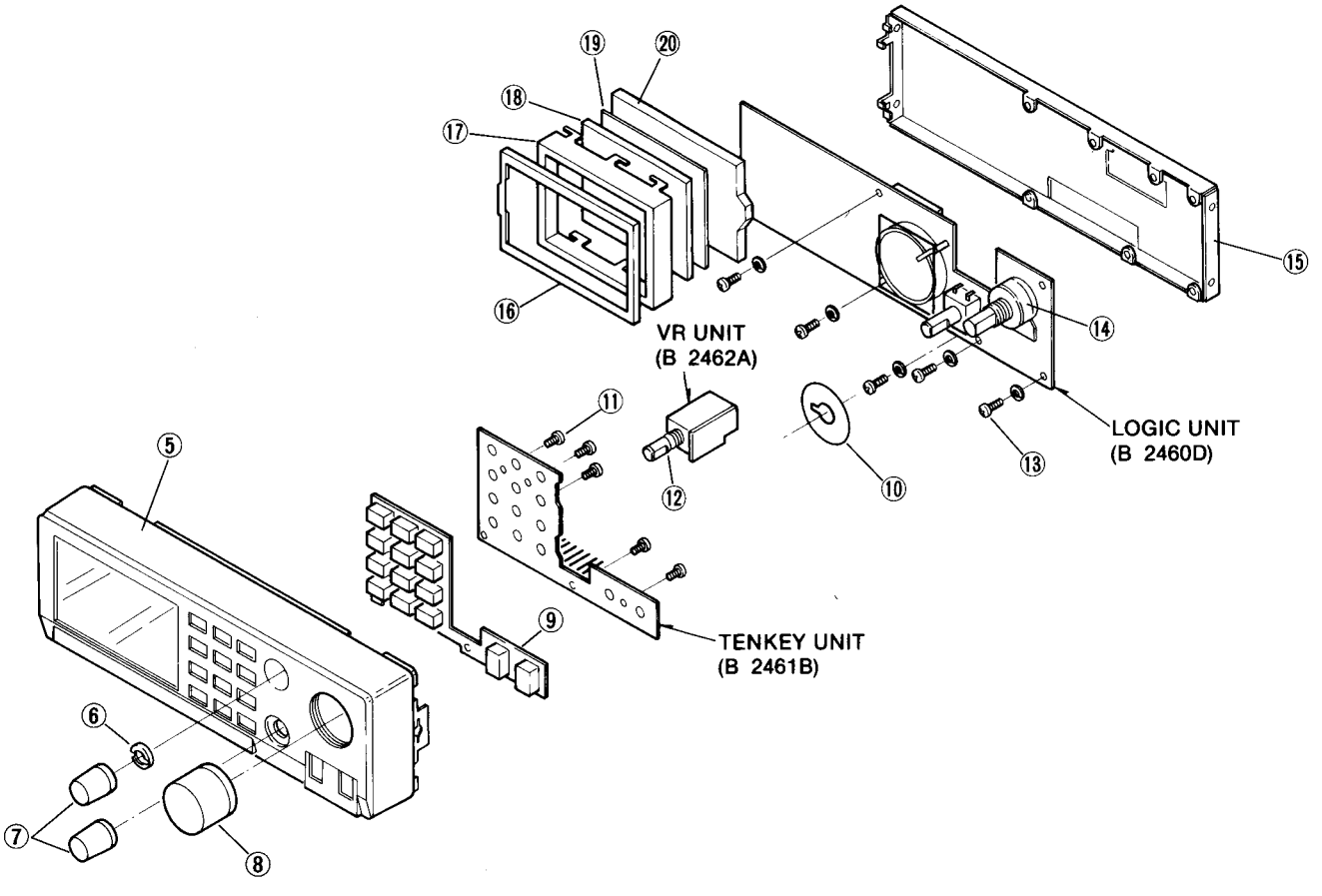
5-2 ACCESSORIES

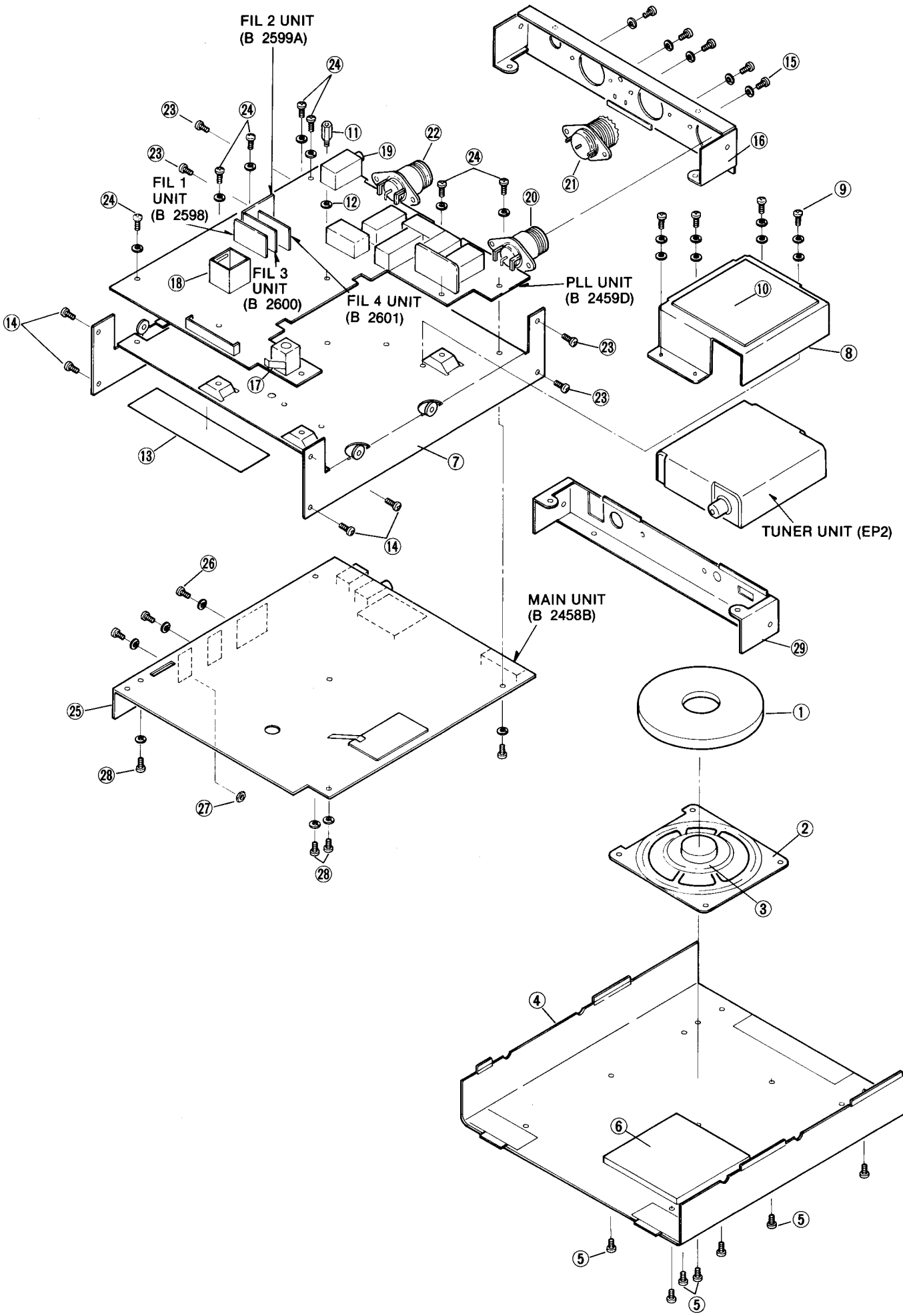


LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.
①	3310000540	VHF/UHF telescoping antenna FA-5N	1
②	8900000460	HF wire antenna OPC-069	1
③	Optional product	DC power cable OPC-131	1
④	8010004060	Mounting bracket	1
⑤	8010008710	150 Mounting support bracket	1
⑥	8810000150	PH M2.6 × 6	4
⑦	8930002820	Rubber feet (D)	4
⑧	8820000530	Mounting bolt	4
⑨	8850000140	Flat washer M4 NI BS	4
⑩	5210000040	Fuse FGB 2A	2
⑪	5610000020	AP313 3.5φ CS plug	1
⑫	8930018190	851 cable tie	1
⑬	8810003360	Setscrew M3 × 6	1
⑭	8810003870	PH M5 × 20	4
⑮	8810005840	PH (A) B0 M5 × 20	4
⑯	8830000120	Nut M5	4
⑰	8850000150	Flat washer M5 NI BS	4
⑱	8850000440	Spring washer M5 NI	4

Screw abbreviations PH: Pan head BS: Brass
NI: Nickel B0: Self-tapping


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VR UNIT
(B 2462A)
TENKEY UNIT
(B 2461B)
LOGIC UNIT
(B 2460D)


FIL 2 UNIT
(B 2599A)
FIL 1
UNIT
(B 2598)
FIL 3
UNIT
(B 2600)
FIL 4 UNIT
(B 2601)
PLL UNIT
(B 2459D)
TUNER UNIT (EP2)
MAIN UNIT
(B 2458B)

5-3 CHASSIS PARTS

LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.
①	8930005360	Sponge	1
②	8930017810	833 SP plate	1
③	2510000470	Speaker EAS-6P100SA	1
④	8110004020	Bottom cover	1
⑤	8810006130	BiH M2.6 × 5 ZK	4
⑥	8930001540	Sponge (Z)	1
⑦	8010009920	Chassis	1
⑧	8930018370	Tuner base cover	1
⑨	8810003350	Setscrew (C) M3 × 5	4
⑩	8930018570	Rubber sheet	1
⑪	8930018580	Standoff (BB)	1
⑫	8850000420	Spring washer M3 NI	1
⑬	8930007430	Shield plate	1
⑭	8810002110	FH M2.6 × 5	4
⑮	8810003150	Setscrew (A) M3 × 5	6
⑯	8010009870	Back panel (top)	1
⑰	8930001160	Ground spring	1
⑱	8510000020	194 shield case	1
⑲	6450000970	ANT connector HSJ0914-01-140 [ANT SEL]	1
⑳	6510000360	ANT connector NR-DS-E 02 [50MHz~905MHz]	1
㉑	6510000410	ANT connector MR-DS-E 02 [0.5MHz~50MHz]	1
㉒	6510000360	ANT connector NR-DS-E 02 [905MHz~1800MHz]	1
㉓	8810002160	FH M3 × 5	4
㉔	8810003150	Setscrew (A) M3 × 5	7
㉕	8410001500	MAIN heatsink	1
㉖	8810000240	PH M3 × 8	3
㉗	8830000100	Nuts M3	3
㉘	8810003150	Setscrew (A) M3 × 5	3
㉙	8010009880	Back panel (bottom)	1

Screw abbreviations BiH: Binding head ZK: Black PH: Pan head NI: Nickel FH: Flat head

SECTION 6 PARTS LIST

[VR UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R1	7210001840	Variable Resistor	RV-168 (RK0971112) [PUSH-ON/OFF]
EP1	0910025801	P.C. Board	B 2462A (VR)

[TENKEY UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
EP1	0910025912	P.C. Board	B 2461B (TENKEY)

[LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1140001260	IC	μPD75304GF-084-3B 9
IC2	1140001570	IC	μPD78224GJ-533-5B G
IC3	1110001550	IC	S-8054ALB-LM-T1
Q1	1590000420	Transistor	RN1404 (TE85R)
Q2	1590000420	Transistor	RN1404 (TE85R)
Q3	1590000450	Transistor	FMG4 T148
Q5	1530000160	Transistor	2SC2712-Y (TE85R)
Q6	1510000110	Transistor	2SA1162-Y (TE85R)
Q7	1590000420	Transistor	RN1404 (TE85R)
Q8	1510000110	Transistor	2SA1162-Y (TE85R)
Q9	1530000160	Transistor	2SC2712-Y (TE85R)
Q12	1530000160	Transistor	2SC2712-Y (TE85R)
D2	1750000030	Diode	1SS187 (TE85R)
D3	1750000020	Diode	1SS184 (TE85R)
D4	1750000040	Diode	1SS190 (TE85R)
D5	1750000020	Diode	1SS184 (TE85R)
X1	6050005090	Crystal	CR-245
X2	6050005800	Crystal	DT-26S 32.768KHZ
X3	6060000190	Crystal	CSA9.21MT2
R1	7030000300	Resistor	MCR10EZHJ 220 Ω (221)
R2	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R3	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R4	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R5	7030000620	Resistor	MCR10EZHJ 100 kΩ (104)
R7	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R8	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R9	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)

[LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R10	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R11	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R12	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R13	7030000970	Resistor	MCR10EZHJ 2.2 MΩ (225)
R14	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R15	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R16	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R17	7030000500	Resistor	MCR10EZHJ 10 kΩ (103)
R18	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R19	7030000620	Resistor	MCR10EZHJ 100 kΩ (104)
R20	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R21	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R22	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R23	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R24	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R25	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R26	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R27	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R28	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R29	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R30	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R31	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R32	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R33	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R34	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R35	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R36	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R37	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R38	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R39	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R41	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R42	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R43	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R44	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R45	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R46	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R47	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R48	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R49	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R50	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R51	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R52	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R53	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R54	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R55	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R56	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R57	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R58	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R59	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R60	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R61	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R62	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R63	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R64	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R65	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R66	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R67	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R68	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R69	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R70	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R71	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R72	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R73	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)

[LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R74	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R75	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R76	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R77	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R78	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R79	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R80	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R81	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R82	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R83	7410000520	Resistor Array	RKM7L 104J
R84	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R86	7210001830	Variable Resistor	RV-167 (RK09K)
R87	7030000410	Resistor	MCR10EZHJ 1.8 kΩ (182)
R88	7030000390	Resistor	MCR10EZHJ 1.2 kΩ (122)
R89	7030000550	Resistor	MCR10EZHJ 27 kΩ (273)
R90	7030000590	Resistor	MCR10EZHJ 56 kΩ (563)
R92	7030000660	Resistor	MCR10EZHJ 220 kΩ (224)
R93	7030000620	Resistor	MCR10EZHJ 100 kΩ (104)
R94	7030000580	Resistor	MCR10EZHJ 47 kΩ (473)
R95	7030000660	Resistor	MCR10EZHJ 220 kΩ (224)
R96	7030000660	Resistor	MCR10EZHJ 220 kΩ (224)
R97	7030000620	Resistor	MCR10EZHJ 100 kΩ (104)
R98	7030000550	Resistor	MCR10EZHJ 27 kΩ (273)
R99	7030000500	Resistor	MCR10EZHJ 10 kΩ (103)
C2	4030004520	Ceramic	C2012 SL 1H 220J- T-A
C3	4030004520	Ceramic	C2012 SL 1H 220J- T-A
C5	4030000920	Ceramic	GRM40 CH 150J 50P T
C6	4030000920	Ceramic	GRM40 CH 150J 50P T
C7	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C9	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C10	4030004610	Ceramic	C2012 SL 1H 101J- T-A
C11	4030004610	Ceramic	C2012 SL 1H 101J- T-A
C17	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C18	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C19	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C20	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C21	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C22	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C23	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C24	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C25	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C26	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C27	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C28	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C29	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C30	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C31	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C32	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C33	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C34	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C35	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C36	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C37	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C38	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C39	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C40	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C41	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C42	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C43	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C44	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C45	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C46	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C47	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C48	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C49	4030004740	Ceramic	C2012 JB 1H 472K- T-A

[LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C50	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C51	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C52	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C53	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C54	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C55	4510001150	Electrolytic	50 MS7 R47 µF
C56	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C57	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C58	4030004740	Ceramic	C2012 JB 1H 472K- T-A
DS1	5030000530	LCD	HLC9792-01-2300
DS2	5080000150	Lamp	HRS-7219A
S1	2250000050	Encoder	EVQ-WQGF15 24B [TUNING CONTROL]
BT1	3020000130	Lithium Battery	CR3032-1T2
EP1	0910025784	P.C. Board	B 2460D (LOGIC)
EP2	8930017610	LCD contact strip	SRCN-851

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1110000630	IC	MC3357P
IC2	1110001160	IC	BA695
IC3	1110002010	IC	MC3356P
IC4	1120001690	IC	M5223L
IC5	1130001000	IC	µPD4066BC
IC6	1120001690	IC	M5223L
IC7	1110001360	IC	µPC1242H
IC8	1180000590	IC	TA78DL10S
IC9	1110002020	IC	TA7805S
IC10	1120001690	IC	M5223L
IC11	1180000010	IC	TA78L005AP
Q1	1530002210	Transistor	2SC3776-D
Q2	1580000110	FET	3SK74 M
Q3	1530000591	Transistor	2SC2785 EL
Q4	1530000150	Transistor	2SC2668-O
Q5	1530000591	Transistor	2SC2785 EL
Q6	1530000591	Transistor	2SC2785 EL
Q7	1530000150	Transistor	2SC2668-O
Q8	1590000350	Transistor	RN1204
Q9	1590000350	Transistor	RN1204
Q10	1590000350	Transistor	RN1204
Q11	1530002710	Transistor	2SC2785 KL
Q12	1590000350	Transistor	RN1204
Q13	1590000370	Transistor	RN2204
Q15	1530000110	Transistor	2SC2458-GR
Q16	1530000591	Transistor	2SC2785 EL
Q17	1540000200	Transistor	2SD1406 Y
Q18	1590000350	Transistor	RN1204
Q19	1590000350	Transistor	RN1204

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
Q20	1530000110	Transistor	2SC2458-GR
Q21	1530000110	Transistor	2SC2458-GR
Q22	1530000110	Transistor	2SC2458-GR
Q23	1590000350	Transistor	RN1204
Q24	1530000110	Transistor	2SC2458-GR
Q25	1590000310	FET	2SJ105-GR
Q26	1530000100	Transistor	2SC2458-Y
Q27	1510000070	Transistor	2SA1048-Y
Q28	1510000070	Transistor	2SA1048-Y
Q29	1590000350	Transistor	RN1204
Q30	1590000370	Transistor	RN2204
Q31	1590000350	Transistor	RN1204
Q32	1530000110	Transistor	2SC2458-GR
D1	1710000050	Diode	1SS53
D2	1790000070	Diode	1SS237
D3	1790000070	Diode	1SS237
D4	1710000050	Diode	1SS53
D5	1710000050	Diode	1SS53
D6	1710000050	Diode	1SS53
D7	1710000050	Diode	1SS53
D8	1720000290	Varicap	1T32
D9	1730000120	Zener	RD6.2E B2
D10	1710000330	Diode	1K60
D11	1710000330	Diode	1K60
D12	1710000600	Diode	1SS254
D13	1710000160	Diode	1SS133
D14	1710000160	Diode	1SS133
D15	1710000160	Diode	1SS133
D17	1790000070	Diode	1SS237
D18	1790000070	Diode	1SS237
D19	1710000160	Diode	1SS133
D20	1710000160	Diode	1SS133
D21	1710000160	Diode	1SS133
D22	1710000160	Diode	1SS133
D25	1710000050	Diode	1SS53
D26	1710000050	Diode	1SS53
D27	1790000070	Diode	1SS237
D28	1710000160	Diode	1SS133
D29	1710000160	Diode	1SS133
D30	1710000350	Diode	1N4002
D31	1710000160	Diode	1SS133
D32	1710000140	Diode	U05G
D33	1710000160	Diode	1SS133
D34	1710000160	Diode	1SS133
D35	1710000160	Diode	1SS133
D36	1710000050	Diode	1SS53
D37	1710000050	Diode	1SS53
X1	6050002440	Crystal	CR-114
X2	6070000010	Discriminator	CDB455C7A
X3	6050006680	Crystal	CR-318
X4	6070000070	Discriminator	CDA10.7MC4A-A
FI1	2010001070	Filter	46M20AU
FI2	2010001160	Filter	10M15B7
FI3	2030000030	Ceramic Filter	KBF-455R-15A
FI4	2030000040	Ceramic Filter	KBF-455R-6AS
FI5	2020000670	Ceramic Filter	SFE10.7MS2-A
L1	6150000990	Coil	LS-114
L2	6150000990	Coil	LS-114
L3	6150001480	Coil	LS-164

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
L4	6150001480	Coil	LS-164
L5	6180000790	Coil	LAL 03NA 1R5M
L6	6180000880	Coil	LAL 03NA 100K
L7	6150002550	Coil	LS-284
L8	6150002550	Coil	LS-284
L9	6180000880	Coil	LAL 03NA 100K
L10	6150002290	Coil	LS-240
L11	6180002270	Coil	LAL 03NA 470K
L12	6170000140	Coil	LW-15
R1	7010003280	Resistor	ELR20J 100 Ω
R2	7010004230	Resistor	R20J 2.2 kΩ
R3	7010004230	Resistor	R20J 2.2 kΩ
R4	7510000260	Thermistor	ERT-D2ZGL102S
R5	7010004270	Resistor	R20J 4.7 kΩ
R6	7010003280	Resistor	ELR20J 100 Ω
R7	7010003280	Resistor	ELR20J 100 Ω
R8	7010003530	Resistor	ELR20J 10 kΩ
R9	7010004190	Resistor	R20J 1 kΩ
R10	7010003240	Resistor	ELR20J 47 Ω
R11	7010004070	Resistor	R20J 100 Ω
R12	7010003620	Resistor	ELR20J 47 kΩ
R13	7010003420	Resistor	ELR20J 1.5 kΩ
R14	7010003420	Resistor	ELR20J 1.5 kΩ
R15	7010003620	Resistor	ELR20J 47 kΩ
R16	7010003420	Resistor	ELR20J 1.5 kΩ
R17	7010004150	Resistor	R20J 470 Ω
R19	7010004190	Resistor	R20J 1 kΩ
R20	7010003720	Resistor	ELR20J 330 kΩ
R21	7010004280	Resistor	R20J 5.6 kΩ
R22	7010003580	Resistor	ELR20J 22 kΩ
R23	7010004410	Resistor	R20J 47 kΩ
R24	7010003480	Resistor	ELR20J 4.7 kΩ
R25	7010003440	Resistor	ELR20J 2.2 kΩ
R26	7010004110	Resistor	R20J 220 Ω
R27	7010003580	Resistor	ELR20J 22 kΩ
R28	7010003520	Resistor	ELR20J 8.2 kΩ
R29	7010003280	Resistor	ELR20J 100 Ω
R30	7010003240	Resistor	ELR20J 47 Ω
R31	7010003450	Resistor	ELR20J 2.7 kΩ
R32	7010003440	Resistor	ELR20J 2.2 kΩ
R33	7010003440	Resistor	ELR20J 2.2 kΩ
R34	7010004230	Resistor	R20J 2.2 kΩ
R35	7010003480	Resistor	ELR20J 4.7 kΩ
R36	7510000270	Thermistor	ERT-D2ZHL462S
R37	7010003560	Resistor	ELR20J 18 kΩ
R38	7310000750	Trimmer	RH0651C14J2WA (103)
R39	7010003620	Resistor	ELR20J 47 kΩ
R43	7010003550	Resistor	ELR20J 15 kΩ
R44	7010004400	Resistor	R20J 39 kΩ
R45	7010003360	Resistor	ELR20J 470 Ω
R46	7010004080	Resistor	R20J 120 Ω
R47	7010004070	Resistor	R20J 100 Ω
R48	7010000990	Resistor	R25XJ 47 Ω
R49	7010003280	Resistor	ELR20J 100 Ω
R50	7010003310	Resistor	ELR20J 180 Ω
R51	7010004320	Resistor	R20J 10 kΩ
R52	7010004270	Resistor	R20J 4.7 kΩ
R53	7010004450	Resistor	R20J 100 kΩ
R54	7010004410	Resistor	R20J 47 kΩ
R55	7310003210	Trimmer	EVN-2ACA00 B54 (503)
R56	7010004350	Resistor	R20J 18 kΩ
R57	7010004370	Resistor	R20J 22 kΩ
R58	7010003580	Resistor	ELR20J 22 kΩ
R59	7010004250	Resistor	R20J 3.3 kΩ
R60	7010004460	Resistor	R20J 120 kΩ

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R61	7010003600	Resistor	ELR20J 33 kΩ
R62	7010004330	Resistor	R20J 12 kΩ
R63	7010003510	Resistor	ELR20J 6.8 kΩ
R64	7010004450	Resistor	R20J 100 kΩ
R65	7010004320	Resistor	R20J 10 kΩ
R66	7010004110	Resistor	R20J 220 Ω
R67	7010003280	Resistor	ELR20J 100 Ω
R68	7010003560	Resistor	ELR20J 18 kΩ
R69	7010003580	Resistor	ELR20J 22 kΩ
R70	7010003620	Resistor	ELR20J 47 kΩ
R71	7010004320	Resistor	R20J 10 kΩ
R72	7010003720	Resistor	ELR20J 330 kΩ
R73	7010003660	Resistor	ELR20J 100 kΩ
R74	7010003710	Resistor	ELR20J 270 kΩ
R75	7010004370	Resistor	R20J 22 kΩ
R76	7010004410	Resistor	R20J 47 kΩ
R77	7010004410	Resistor	R20J 47 kΩ
R78	7010004410	Resistor	R20J 47 kΩ
R79	7010003700	Resistor	ELR20J 220 kΩ
R80	7010003460	Resistor	ELR20J 3.3 kΩ
R82	7010004450	Resistor	R20J 100 kΩ
R83	7010003510	Resistor	ELR20J 6.8 kΩ
R84	7010003340	Resistor	ELR20J 330 Ω
R85	7010003340	Resistor	ELR20J 330 Ω
R86	7010003530	Resistor	ELR20J 10 kΩ
R87	7010004280	Resistor	R20J 5.6 kΩ
R88	7010004350	Resistor	R20J 18 kΩ
R89	7010004200	Resistor	R20J 1.2 kΩ
R90	7010004350	Resistor	R20J 18 kΩ
R91	7310003230	Trimmer	EVN-2ACA00 B15 (104)
R92	7010003550	Resistor	ELR20J 15 kΩ
R93	7010004030	Resistor	R20J 47 Ω
R94	7010003620	Resistor	ELR20J 47 kΩ
R95	7310003230	Trimmer	EVN-2ACA00 B15 (104)
R96	7010001490	Resistor	R25XJ 470 kΩ
R97	7010004530	Resistor	R20J 470 kΩ
R98	7010004570	Resistor	R20J 1 MΩ
R99	7010004960	Resistor	ELR20J 1.5 MΩ
R100	7010003780	Resistor	ELR20J 1 MΩ
R101	7010003780	Resistor	ELR20J 1 MΩ
R102	7010003780	Resistor	ELR20J 1 MΩ
R105	7010003530	Resistor	ELR20J 10 kΩ
R106	7010004490	Resistor	R20J 220 kΩ
R107	7010003660	Resistor	ELR20J 100 kΩ
R108	7010005220	Resistor	ELR20J 10 MΩ
R109	7010003560	Resistor	ELR20J 18 kΩ
R110	7010004250	Resistor	R20J 3.3 kΩ
R111	7010004400	Resistor	R20J 39 kΩ
R112	7010003540	Resistor	ELR20J 12 kΩ
R113	7010004340	Resistor	R20J 15 kΩ
R114	7010003560	Resistor	ELR20J 18 kΩ
R115	7310003230	Trimmer	EVN-2ACA00 B15 (104)
R116	7010003470	Resistor	ELR20J 3.9 kΩ
R117	7010003780	Resistor	ELR20J 1 MΩ
R118	7010004450	Resistor	R20J 100 kΩ
R119	7010004450	Resistor	R20J 100 kΩ
R120	7010004150	Resistor	R20J 470 Ω
R121	7010003650	Resistor	ELR20J 82 kΩ
R122	7010003610	Resistor	ELR20J 39 kΩ
R123	7010004250	Resistor	R20J 3.3 kΩ
R124	7010003440	Resistor	ELR20J 2.2 kΩ
R125	7010003700	Resistor	ELR20J 220 kΩ
R126	7010003620	Resistor	ELR20J 47 kΩ
R127	7310003210	Trimmer	EVN-2ACA00 B54 (503)
R128	7010003620	Resistor	ELR20J 47 kΩ
R129	7010003100	Resistor	ELR20J 3.3 Ω
R130	7010004190	Resistor	R20J 1 kΩ

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R131	7010003080	Resistor	ELR20J 2.2 Ω
R132	7010003950	Resistor	R20J 10 Ω
R133	7010003400	Resistor	ELR20J 1 kΩ
R134	7010004650	Resistor	R50XJ 10 Ω
R135	7010003360	Resistor	ELR20J 470 Ω
R136	7010004320	Resistor	R20J 10 kΩ
R137	7010004340	Resistor	R20J 15 kΩ
R138	7010004450	Resistor	R20J 100 kΩ
R139	7010004450	Resistor	R20J 100 kΩ
R140	7010003700	Resistor	ELR20J 220 kΩ
R141	7010003690	Resistor	ELR20J 180 kΩ
R142	7310003220	Trimmer	EVN-2ACA00 B16 (105)
R143	7010003040	Resistor	ELR20J 1 Ω
R144	7010003780	Resistor	ELR20J 1 MΩ
R145	7070000610	Resistor	CRH100X R-02J 27 Ω (270)
R146	7010004410	Resistor	R20J 47 kΩ
R147	7010003620	Resistor	ELR20J 47 kΩ
R148	7010003460	Resistor	ELR20J 3.3 kΩ
R152	7010004110	Resistor	R20J 220 Ω
R153	7310000770	Trimmer	RH0651CN4J0TA (333)
R154	7010003520	Resistor	ELR20J 8.2 kΩ
R155	7010004450	Resistor	R20J 100 kΩ
R156	7010004270	Resistor	R20J 4.7 kΩ
R157	7010003630	Resistor	ELR20J 56 kΩ
R158	7510000330	Thermistor	ERT-D2ZIL154S
R159	7010004650	Resistor	R50XJ 10 Ω
R160	7070000270	Resistor	CRH100X R-02J 100 Ω (101)
R163	7010004030	Resistor	R20J 47 Ω
R164	7010003610	Resistor	ELR20J 39 kΩ
R165	7010003530	Resistor	ELR20J 10 kΩ
R166	7010003440	Resistor	ELR20J 2.2 kΩ
R167	7010004600	Resistor	R20J 2.2 MΩ
R168	4610001360	Trimmer	EVML1GA00B15 100KB
R169	7010003660	Resistor	ELR20J 100 kΩ
R170	7010004250	Resistor	R20J 3.3 kΩ
R171	7010004320	Resistor	R20J 10 kΩ
R172	7010004490	Resistor	R20J 220 kΩ
R173	7310000680	Trimmer	RH0651C12J04A (101)
C1	4010000500	Ceramic	DD104 B 102K 50V
C2	4040000250	Barrier Layer	UAT 08X 473M
C3	4010000650	Ceramic	DD104 CH 050C 50V
C4	4010000330	Ceramic	DD105 SL 101J 50V
C5	4010000510	Ceramic	DD106 B 222K 50V
C6	4010000510	Ceramic	DD106 B 222K 50V
C7	4010000510	Ceramic	DD106 B 222K 50V
C8	4010000170	Ceramic	DD104 SL 200J 50V
C9	4010000170	Ceramic	DD104 SL 200J 50V
C10	4010000180	Ceramic	DD104 SL 220J 50V
C11	4010000120	Ceramic	DD104 SL 100D 50V
C12	4010000520	Ceramic	DD108 B 472K 50V
C13	4040000150	Barrier Layer	UAT 05X 472K
C14	4010000340	Ceramic	DD105 SL 121J 50V
C15	4010000500	Ceramic	DD104 B 102K 50V
C16	4010000060	Ceramic	DD104 SL 040C 50V
C17	4010000330	Ceramic	DD105 SL 101J 50V
C18	4010000220	Ceramic	DD104 SL 330J 50V
C19	4010003460	Ceramic	DD104 UJ 330J 50V
C20	4010000800	Ceramic	DD105 CH 270J 50V
C21	4010000920	Ceramic	DD107 CH 820J 50V
C22	4010001020	Ceramic	DD111 CH 221J 50V
C23	4510001970	Electrolytic	50 MS7 0R1 µF
C24	4040000260	Barrier Layer	UZE 08X 104M
C25	4010000320	Ceramic	DD104 SL 820J 50V
C26	4010000520	Ceramic	DD108 B 472K 50V

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C27	4510002830	Electrolytic	25 SS 4R7 µF
C28	4010000530	Ceramic	DD112 B 103K 50V
C29	4010000460	Ceramic	DD104 B 471K 50V
C30	4040000090	Barrier Layer	UAT 04X 152K
C31	4010000220	Ceramic	DD104 SL 330J 50V
C32	4040000190	Barrier Layer	UAT 05X 103K
C33	4510002940	Electrolytic	50 SS 1 µF
C34	4040000250	Barrier Layer	UAT 08X 473M
C35	4010000500	Ceramic	DD104 B 102K 50V
C36	4010000500	Ceramic	DD104 B 102K 50V
C37	4040000250	Barrier Layer	UAT 08X 473M
C38	4040000260	Barrier Layer	UZE 08X 104M
C39	4040000260	Barrier Layer	UZE 08X 104M
C40	4040000250	Barrier Layer	UAT 08X 473M
C41	4010000320	Ceramic	DD104 SL 820J 50V
C42	4040000250	Barrier Layer	UAT 08X 473M
C43	4040000260	Barrier Layer	UZE 08X 104M
C44	4040000150	Barrier Layer	UAT 05X 472K
C45	4010000500	Ceramic	DD104 B 102K 50V
C46	4040000150	Barrier Layer	UAT 05X 472K
C47	4510002780	Electrolytic	16 SS 10 µF
C48	4010003580	Ceramic	DD106 UJ 101J 50V
C49	4010003580	Ceramic	DD106 UJ 101J 50V
C50	4040000150	Barrier Layer	UAT 05X 472K
C51	4010000820	Ceramic	DD105 CH 330J 50V
C52	4010000500	Ceramic	DD104 B 102K 50V
C53	4010000030	Ceramic	DD104 SL 1R5C 50V
C54	4010000820	Ceramic	DD105 CH 330J 50V
C55	4010000520	Ceramic	DD108 B 472K 50V
C56	4010000520	Ceramic	DD108 B 472K 50V
C57	4040000190	Barrier Layer	UAT 05X 103K
C58	4010000120	Ceramic	DD104 SL 100D 50V
C59	4510001970	Electrolytic	50 MS7 0R1 µF
C60	4010000500	Ceramic	DD104 B 102K 50V
C61	4040000260	Barrier Layer	UZE 08X 104M
C62	4310000050	Mylar	F2D 50V 222K
C63	4040000260	Barrier Layer	UZE 08X 104M
C64	4040000250	Barrier Layer	UAT 08X 473M
C65	4040000150	Barrier Layer	UAT 05X 472K
C66	4020000620	Cylinder	UP050 SL 220J
C67	4040000250	Barrier Layer	UAT 08X 473M
C68	4560000030	Ceramic	D55X5T 1H 473M
C69	4510001140	Electrolytic	50 MS7 R22 µF
C70	4310000050	Mylar	F2D 50V 222K
C71	4040000260	Barrier Layer	UZE 08X 104M
C72	4010000260	Ceramic	DD104 SL 470J 50V
C73	4040000190	Barrier Layer	UAT 05X 103K
C74	4040000190	Barrier Layer	UAT 05X 103K
C75	4040000190	Barrier Layer	UAT 05X 103K
C76	4510002830	Electrolytic	25 SS 4R7 µF
C77	4010000520	Ceramic	DD108 B 472K 50V
C78	4040000260	Barrier Layer	UZE 08X 104M
C79	4310000060	Mylar	F2D 50V 223K
C80	4010000460	Ceramic	DD104 B 471K 50V
C81	4040000190	Barrier Layer	UAT 05X 103K
C82	4510002780	Electrolytic	16 SS 10 µF
C83	4510002780	Electrolytic	16 SS 10 µF
C84	4010000520	Ceramic	DD108 B 472K 50V
C85	4040000190	Barrier Layer	UAT 05X 103K
C86	4510002830	Electrolytic	25 SS 4R7 µF
C87	4510002830	Electrolytic	25 SS 4R7 µF
C88	4510001150	Electrolytic	50 MS7 R47 µF
C89	4510002780	Electrolytic	16 SS 10 µF
C90	4010000520	Ceramic	DD108 B 472K 50V
C91	4510001740	Electrolytic	50 RBP 1 µF
C92	4510002730	Electrolytic	10 SS 100 µF
C93	4510002780	Electrolytic	16 SS 10 µF

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C94	4010000520	Ceramic	DD108 B 472K 50V
C95	4010000460	Ceramic	DD104 B 471K 50V
C96	4510002930	Electrolytic	50 SS R47 µF
C97	4510002940	Electrolytic	50 SS 1 µF
C98	4010000500	Ceramic	DD104 B 102K 50V
C99	4510002880	Electrolytic	25 SS 220 µF
C100	4510002640	Electrolytic	25 SS 47 µF
C101	4510002900	Electrolytic	25 SS 470 µF
C102	4510002640	Electrolytic	25 SS 47 µF
C103	4510002880	Electrolytic	25 SS 220 µF
C104	4040000260	Barrier Layer	UZE 08X 104M
C105	4510002830	Electrolytic	25 SS 4R7 µF
C106	4010000520	Ceramic	DD108 B 472K 50V
C107	4010000520	Ceramic	DD108 B 472K 50V
C108	4510002830	Electrolytic	25 SS 4R7 µF
C109	4510002830	Electrolytic	25 SS 4R7 µF
C110	4010000520	Ceramic	DD108 B 472K 50V
C111	4010000520	Ceramic	DD108 B 472K 50V
C113	4010000520	Ceramic	DD108 B 472K 50V
C115	4510002810	Electrolytic	16 SS 47 µF
C116	4040000260	Barrier Layer	UZE 08X 104M
C117	4010000500	Ceramic	DD104 B 102K 50V
C118	4510002830	Electrolytic	25 SS 4R7 µF
C119	4040000250	Barrier Layer	UAT 08X 473M
C120	4510002940	Electrolytic	50 SS 1 µF
C121	4040000150	Barrier Layer	UAT 05X 472K
C122	4510002900	Electrolytic	25 SS 470 µF
C123	4010000520	Ceramic	DD108 B 472K 50V
C124	4010000520	Ceramic	DD108 B 472K 50V
C125	4510002830	Electrolytic	25 SS 4R7 µF
C126	4040000260	Barrier Layer	UZE 08X 104M
C127	4040000260	Barrier Layer	UZE 08X 104M
C128	4040000260	Barrier Layer	UZE 08X 104M
C129	4510002910	Electrolytic	25 SS 1000 µF
C130	4610000800	Trimmer	CV38B 0601
C131	4040000190	Barrier Layer	UAT 05X 103K
C132	4510002850	Electrolytic	25 SS 22 µF
C133	4560000020	Ceramic	D33Y5V 1E 104Z21
C134	4510002830	Electrolytic	25 SS 4R7 µF
S1	2220000300	Switch	SSSU12209B
SO1	6510008370	Socket	BBH-1
BT1	3020000110	Lithium Battery	CR2032
EP1	0910025354	P.C. Board	B 2458D (MAIN)

[PLL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1120000970	IC	M54562P
IC2	1190000020	IC	MC-5156
IC3	1140001280	IC	MB1501PF-G-BND
IC4	1110001970	IC	µPC1676G-T2

[PLL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC5	1110001270	IC	BA6161M
IC7	1790000050	IC	ND487C1-3R
IC8	1110001890	IC	μPC1678G
IC9	6910004320	IC	CB346M1B
IC10	1110001890	IC	μPC1678G
IC11	1120001700	IC	LA7910
Q1	1530002360	Transistor	2SC2714-Y (TE85R)
Q2	1530001950	Transistor	2SC2712-GR (TE85R)
Q3	1560000360	FET	2SK209-Y (TE85R)
Q5	1590000420	Transistor	RN1404 (TE85R)
Q6	1530002360	Transistor	2SC2714-Y (TE85R)
Q7	1510000580	Transistor	2SA1362-GR (TE85R)
Q8	1510000580	Transistor	2SA1362-GR (TE85R)
Q9	1590000420	Transistor	RN1404 (TE85R)
Q10	1590000420	Transistor	RN1404 (TE85R)
Q11	1510000580	Transistor	2SA1362-GR (TE85R)
Q12	1590000420	Transistor	RN1404 (TE85R)
Q13	1520000180	Transistor	2SB798-T2 DL
Q14	1590000420	Transistor	RN1404 (TE85R)
Q15	1530002360	Transistor	2SC2714-Y (TE85R)
Q16	1530002030	Transistor	2SC3772-3-TA
Q17	1590000420	Transistor	RN1404 (TE85R)
D1	1730002160	Zener	02CZ5.1-Z (TE85R)
D2	1790000590	Diode	MA110 (TW)
D3	1790000590	Diode	MA110 (TW)
D4	1750000020	Diode	1SS184 (TE85R)
D5	1790000590	Diode	MA110 (TW)
D6	1790000590	Diode	MA110 (TW)
D7	1790000590	Diode	MA110 (TW)
D8	1790000590	Diode	MA110 (TW)
D9	1790000590	Diode	MA110 (TW)
D10	1710000270	Diode	MI204
D11	1710000270	Diode	MI204
D12	1710000270	Diode	MI204
D13	1790000450	Diode	MA862 (TX)
D14	1790000450	Diode	MA862 (TX)
D15	1750000020	Diode	1SS184 (TE85R)
D17	1750000020	Diode	1SS184 (TE85R)
D18	1750000210	Diode	1SV237 (TE85R)
D21	1750000210	Diode	1SV237 (TE85R)
D22	1710000040	Diode	1S953
D23	1750000020	Diode	1SS184 (TE85R)
D24	1750000070	Diode	1SS226 (TE85R)
X1	6050006670	Crystal	CR-316
L1	6180001220	Coil	LAL 04NA 100K
L2	6200000150	Coil	NL 322522T-1R0M
L3	6200000880	Coil	NL 322522T-4R7M
L4	6180002580	Coil	RCP095-472K-50
L5	6180000960	Coil	LAL 03NA 102K
L6	6200000970	Coil	NL 322522T-100K
L7	6200000970	Coil	NL 322522T-100K
L8	6200000970	Coil	NL 322522T-100K
L9	6200000970	Coil	NL 322522T-100K
L10	6200000970	Coil	NL 322522T-100K
L13	6180000960	Coil	LAL 03NA 102K
L14	6180000750	Coil	LAL 03NA R68M
L15	6180000960	Coil	LAL 03NA 102K
L16	6180000960	Coil	LAL 03NA 102K
L19	6180000960	Coil	LAL 03NA 102K

[PLL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
L22	6180000900	Coil	LAL 03NA 101K
L27	6180000900	Coil	LAL 03NA 101K
L28	6180000960	Coil	LAL 03NA 102K
L29	6140002060	Coil	LR-225
L30	6140002060	Coil	LR-225
L31	6200000260	Coil	LQN 2A R10K
L32	6200000260	Coil	LQN 2A R10K
L33	6150002750	Coil	LS-289
L34	6150003050	Coil	LS-286
L35	6200000150	Coil	NL 322522T-1R0M
L36	6200000150	Coil	NL 322522T-1R0M
L37	6110001530	Coil	LA-233
L38	6110001530	Coil	LA-233
L39	6110002140	Coil	LA-384
L40	6110002140	Coil	LA-384
L41	6200000150	Coil	NL 322522T-1R0M
L43	6110001990	Coil	LA-223
L44	6200000840	Coil	NL 322522T-R22M
L45	6200000840	Coil	NL 322522T-R22M
L46	6910000670	Coil	BT01RN1-A61-001
L47	6910000670	Coil	BT01RN1-A61-001
L48	6180000880	Coil	LAL 03NA 100K
L49	6110001980	Coil	LA-222
L50	6110001980	Coil	LA-222
L51	6110001980	Coil	LA-222
L52	6200000720	Coil	LQN 2A 10NM
L53	6110002010	Coil	LA-224
L54	6110002010	Coil	LA-224
L55	6150002750	Coil	LS-289
L56	6170000230	Coil	LW-25
L57	6110001640	Coil	LA-247
R1	7030000500	Resistor	MCR10EZHJ 10 kΩ (103)
R3	7030000300	Resistor	MCR10EZHJ 220 Ω (221)
R4	7030000340	Resistor	MCR10EZHJ 470 Ω (471)
R5	7030000460	Resistor	MCR10EZHJ 4.7 kΩ (472)
R6	7030000500	Resistor	MCR10EZHJ 10 kΩ (103)
R7	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R8	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R9	7030000220	Resistor	MCR10EZHJ 47 Ω (470)
R10	7030000220	Resistor	MCR10EZHJ 47 Ω (470)
R12	7030000310	Resistor	MCR10EZHJ 270 Ω (271)
R13	7030000160	Resistor	MCR10EZHJ 15 Ω (150)
R14	7030000310	Resistor	MCR10EZHJ 270 Ω (271)
R15	7030000500	Resistor	MCR10EZHJ 10 kΩ (103)
R16	7010004190	Resistor	R20J 1 kΩ
R17	7010004190	Resistor	R20J 1 kΩ
R18	7030000480	Resistor	MCR10EZHJ 6.8 kΩ (682)
R19	7030000390	Resistor	MCR10EZHJ 1.2 kΩ (122)
R20	7030000350	Resistor	MCR10EZHJ 560 Ω (561)
R21	7010001170	Resistor	R25XJ 1.5 kΩ
R22	7030000500	Resistor	MCR10EZHJ 10 kΩ (103)
R23	7030000260	Resistor	MCR10EZHJ 100 Ω (101)
R24	7030000390	Resistor	MCR10EZHJ 1.2 kΩ (122)
R25	7010004120	Resistor	R20J 270 Ω
R26	7030000340	Resistor	MCR10EZHJ 470 Ω (471)
R27	7030000230	Resistor	MCR10EZHJ 56 Ω (560)
R28	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R29	7030000260	Resistor	MCR10EZHJ 100 Ω (101)
R30	7030000260	Resistor	MCR10EZHJ 100 Ω (101)
R31	7030000260	Resistor	MCR10EZHJ 100 Ω (101)
R32	7030000340	Resistor	MCR10EZHJ 470 Ω (471)
R33	7030000310	Resistor	MCR10EZHJ 270 Ω (271)
R34	7030000160	Resistor	MCR10EZHJ 15 Ω (150)
R35	7030000310	Resistor	MCR10EZHJ 270 Ω (271)
R36	7010004070	Resistor	R20J 100 Ω

[PLL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R37	7030000540	Resistor	MCR10EZHJ 22 kΩ (223)
R38	7030000300	Resistor	MCR10EZHJ 220 Ω (221)
R39	7030000500	Resistor	MCR10EZHJ 10 kΩ (103)
R40	7030000500	Resistor	MCR10EZHJ 10 kΩ (103)
R41	7030000420	Resistor	MCR10EZHJ 2.2 kΩ (222)
R42	7030000500	Resistor	MCR10EZHJ 10 kΩ (103)
R43	7030000420	Resistor	MCR10EZHJ 2.2 kΩ (222)
R44	7030000260	Resistor	MCR10EZHJ 100 Ω (101)
R45	7030000310	Resistor	MCR10EZHJ 270 Ω (271)
R52	7030000310	Resistor	MCR10EZHJ 270 Ω (271)
R53	7030000260	Resistor	MCR10EZHJ 100 Ω (101)
R55	7030000280	Resistor	MCR10EZHJ 150 Ω (151)
R56	7030000210	Resistor	MCR10EZHJ 39 Ω (390)
R57	7030000280	Resistor	MCR10EZHJ 150 Ω (151)
R58	7030000500	Resistor	MCR10EZHJ 10 kΩ (103)
R59	7030000420	Resistor	MCR10EZHJ 2.2 kΩ (222)
R60	7030000420	Resistor	MCR10EZHJ 2.2 kΩ (222)
R61	7030000420	Resistor	MCR10EZHJ 2.2 kΩ (222)
R62	7010001280	Resistor	R25XJ 10 kΩ
R63	7030000260	Resistor	MCR10EZHJ 100 Ω (101)
R64	7030000320	Resistor	MCR10EZHJ 330 Ω (331)
R65	7030000230	Resistor	MCR10EZHJ 56 Ω (560)
R66	7030000320	Resistor	MCR10EZHJ 330 Ω (331)
R67	7030000260	Resistor	MCR10EZHJ 100 Ω (101)
R68	7030000300	Resistor	MCR10EZHJ 220 Ω (221)
R69	7030000540	Resistor	MCR10EZHJ 22 kΩ (223)
R70	7030000500	Resistor	MCR10EZHJ 10 kΩ (103)
R71	7030000460	Resistor	MCR10EZHJ 4.7 kΩ (472)
R72	7030000380	Resistor	MCR10EZHJ 1 kΩ (102)
R73	7310003210	Trimmer	EVN-2ACA00 B54 (503)
R74	7030000310	Resistor	MCR10EZHJ 270 Ω (271)
R75	7030000160	Resistor	MCR10EZHJ 15 Ω (150)
R76	7030000310	Resistor	MCR10EZHJ 270 Ω (271)
R77	7030000260	Resistor	MCR10EZHJ 100 Ω (101)
C1	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C2	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C3	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C4	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C5	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C6	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C7	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C8	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C9	4510002780	Electrolytic	16 SS 10 µF
C10	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C11	4030001030	Ceramic	GRM40 CH 151J 50P T
C12	4030001030	Ceramic	GRM40 CH 151J 50P T
C13	4030002180	Ceramic	GRM40 SH 270J 50P T
C14	4610000770	Trimmer	CV38D 1001
C15	4030004520	Ceramic	C2012 SL 1H 220J- T-A
C16	4030004610	Ceramic	C2012 SL 1H 101J- T-A
C17	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C18	4030004610	Ceramic	C2012 SL 1H 101J- T-A
C19	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C21	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C22	4510001100	Electrolytic	16 MS7 10 µF
C23	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C24	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C25	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C26	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C27	4560000110	Ceramic	D47X5T 1H 224M53
C28	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C29	4510002630	Electrolytic	50 SS 47 µF
C30	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C31	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C32	4030004720	Ceramic	C2012 JB 1H 102K- T-A

[PLL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C33	4510001100	Electrolytic	16 MS7 10 µF
C34	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C35	4510001100	Electrolytic	16 MS7 10 µF
C36	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C37	4510001100	Electrolytic	16 MS7 10 µF
C38	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C39	4510001100	Electrolytic	16 MS7 10 µF
C40	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C41	4510001100	Electrolytic	16 MS7 10 µF
C42	4510002970	Electrolytic	50 SS 4R7 µF
C43	4510002970	Electrolytic	50 SS 4R7 µF
C44	4510002800	Electrolytic	16 SS 33 µF
C45	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C48	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C49	4510000310	Electrolytic	16 MS16 1000 µF (12.5X16)
C50	4510000310	Electrolytic	16 MS16 1000 µF (12.5X16)
C52	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C53	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C55	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C57	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C58	4030003170	Ceramic	GRM40 SL 0R75C 50 PT
C59	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C60	4510002780	Electrolytic	16 SS 10 µF
C62	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C63	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C64	4510001100	Electrolytic	16 MS7 10 µF
C65	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C71	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C79	4030008700	Ceramic	GRM40 B 473K 50PT
C85	4030008700	Ceramic	GRM40 B 473K 50PT
C92	4030004420	Ceramic	C2012 SL 1H 050C- T-A
C93	4030004420	Ceramic	C2012 SL 1H 050C- T-A
C94	4030008700	Ceramic	GRM40 B 473K 50PT
C95	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C96	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C97	4030004560	Ceramic	C2012 SL 1H 390J- T-A
C98	4030004580	Ceramic	C2012 SL 1H 560J- T-A
C99	4030004670	Ceramic	C2012 SL 1H 271J- T-A
C100	4030004380	Ceramic	C2012 SL 1H 010C- T-A
C101	4030004470	Ceramic	C2012 SL 1H 100D- T-A
C102	4030004530	Ceramic	C2012 SL 1H 270J- T-A
C103	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C104	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C105	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C106	4030003170	Ceramic	GRM40 SL 0R75C 50 PT
C107	4030003170	Ceramic	GRM40 SL 0R75C 50 PT
C108	4030004710	Ceramic	C2012 JB 1H 471K- T-A
C109	4030004610	Ceramic	C2012 SL 1H 101J- T-A
C110	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C111	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C113	4030004400	Ceramic	C2012 SL 1H 030C- T-A
C114	4030004410	Ceramic	C2012 SL 1H 040C- T-A
C115	4030004390	Ceramic	C2012 SL 1H 020C- T-A
C116	4030004440	Ceramic	C2012 SL 1H 070D- T-A
C117	4030004390	Ceramic	C2012 SL 1H 020C- T-A
C118	4030004490	Ceramic	C2012 SL 1H 150J- T-A
C119	4030004400	Ceramic	C2012 SL 1H 030C- T-A
C120	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C121	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C125	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C126	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C127	4030004400	Ceramic	C2012 SL 1H 030C- T-A
C128	4030004380	Ceramic	C2012 SL 1H 010C- T-A
C129	4030004450	Ceramic	C2012 SL 1H 080D- T-A
C130	4030004380	Ceramic	C2012 SL 1H 010C- T-A

[PLL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C131	4030004480	Ceramic	C2012 SL 1H 120J- T-A
C132	4030004400	Ceramic	C2012 SL 1H 030C- T-A
C134	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C135	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C137	4030004610	Ceramic	C2012 SL 1H 101J- T-A
C138	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C139	4030004710	Ceramic	C2012 JB 1H 471K- T-A
C140	4030004710	Ceramic	C2012 JB 1H 471K- T-A
C147	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C148	4030004400	Ceramic	C2012 SL 1H 030C- T-A
C149	4030004440	Ceramic	C2012 SL 1H 070D- T-A
C150	4030004430	Ceramic	C2012 SL 1H 060D- T-A
C154	4030004400	Ceramic	C2012 SL 1H 030C- T-A
C155	4030004370	Ceramic	C2012 SL 1H 0R5C- T-A
C156	4030004380	Ceramic	C2012 SL 1H 010C- T-A
C157	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C158	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C159	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C160	4510001190	Electrolytic	50 MS7 4R7 µF
C161	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C162	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C163	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C164	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C165	4510002720	Electrolytic	10 SS 47 µF
C166	4030004400	Ceramic	C2012 SL 1H 030C- T-A
C167	4030004400	Ceramic	C2012 SL 1H 030C- T-A
C168	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C169	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C170	4030003170	Ceramic	GRM40 SL 0R75C 50 PT
C171	4030003170	Ceramic	GRM40 SL 0R75C 50 PT
C172	4030004570	Ceramic	C2012 SL 1H 470J- T-A
C173	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C174	4030004470	Ceramic	C2012 SL 1H 100D- T-A
C175	4030004740	Ceramic	C2012 JB 1H 472K- T-A
C176	4030003170	Ceramic	GRM40 SL 0R75C 50 PT
C177	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C178	4030001030	Ceramic	GRM40 CH 151J 50P T
C179	4030004710	Ceramic	C2012 JB 1H 471K- T-A
C180	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C181	4510003040	Electrolytic	16 SS 100 µF
C182	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C184	4550000890	Tantalum	TESVC 1C 475M-12L
C185	4030004460	Ceramic	C2012 SL 1H 090D- T-A
RL1	6330000810	Relay	ARK115
RL2	6330000810	Relay	ARK115
RL3	6330000810	Relay	ARK115
RL4	6330000810	Relay	ARK115
RL5	6330000810	Relay	ARK115
EP1	0910025594	P.C. Board	B 2459D (PLL)
EP2	6910003430	Lead Frame	VTYA 6U80J
EP3	0910026610	P.C. Board	B 2695 (PLL)

[FIL 1 UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
L1	6200000880	Coil	NL 322522T-4R7M
L2	6200000880	Coil	NL 322522T-4R7M
C1	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C2	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C3	4030004710	Ceramic	C2012 JB 1H 471K- T-A
C4	4030004690	Ceramic	C2012 SL 1H 331J- T-A
C5	4030004710	Ceramic	C2012 JB 1H 471K- T-A
EP1	0910025500	P.C. Board	B 2598 (FIL 1)
EP2	6910002720	Lead Frame	HFB2.54-0.9-8 (N)

[FIL 2 UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
L1	6200000980	Coil	NL 322522T-8R2M
L2	6200000880	Coil	NL 322522T-4R7M
C1	4030004730	Ceramic	C2012 JB 1H 222K- T-A
C2	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C3	4030004730	Ceramic	C2012 JB 1H 222K- T-A
C4	4030004710	Ceramic	C2012 JB 1H 471K- T-A
C5	4030004710	Ceramic	C2012 JB 1H 471K- T-A
C6	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C7	4030004730	Ceramic	C2012 JB 1H 222K- T-A
C8	4030004720	Ceramic	C2012 JB 1H 102K- T-A
EP1	0910025511	P.C. Board	B 2599A (FIL 2)
EP2	6910002720	Lead Frame	HFB2.54-0.9-8 (N)

[FIL 3 UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
L1	6200000950	Coil	NL 322522T-R18M
L2	6200000940	Coil	NL 322522T-R27M
C1	4030004580	Ceramic	C2012 SL 1H 560J- T-A
C2	4030004610	Ceramic	C2012 SL 1H 101J- T-A
C3	4030004620	Ceramic	C2012 SL 1H 121J- T-A
C4	4030004520	Ceramic	C2012 SL 1H 220J- T-A
C5	4030004600	Ceramic	C2012 SL 1H 820J- T-A
EP1	0910025520	P.C. Board	B 2600 (FIL 3)
EP2	6910002720	Lead Frame	HFB2.54-0.9-8 (N)

[FIL 4 UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
L1	6200000950	Coil	NL 322522T-R18M
L2	6200000840	Coil	NL 322522T-R22M
L3	6200000960	Coil	NL 322522T-R33M
L4	6200000840	Coil	NL 322522T-R22M
C1	4030004600	Ceramic	C2012 SL 1H 820J- T-A
C2	4030004500	Ceramic	C2012 SL 1H 180J- T-A
C3	4030004580	Ceramic	C2012 SL 1H 560J- T-A
C4	4030004630	Ceramic	C2012 SL 1H 151J- T-A
C5	4030004670	Ceramic	C2012 SL 1H 271J- T-A
C6	4030004600	Ceramic	C2012 SL 1H 820J- T-A
C7	4030004710	Ceramic	C2012 JB 1H 471K- T-A
C8	4030004690	Ceramic	C2012 SL 1H 331J- T-A
C9	4030004630	Ceramic	C2012 SL 1H 151J- T-A
EP1	0910025530	P.C. Board	B 2601 (FIL 4)
EP2	6910002720	Lead Frame	HFB2.54-0.9-8 (N)

SECTION 7 ADJUSTMENT PROCEDURES

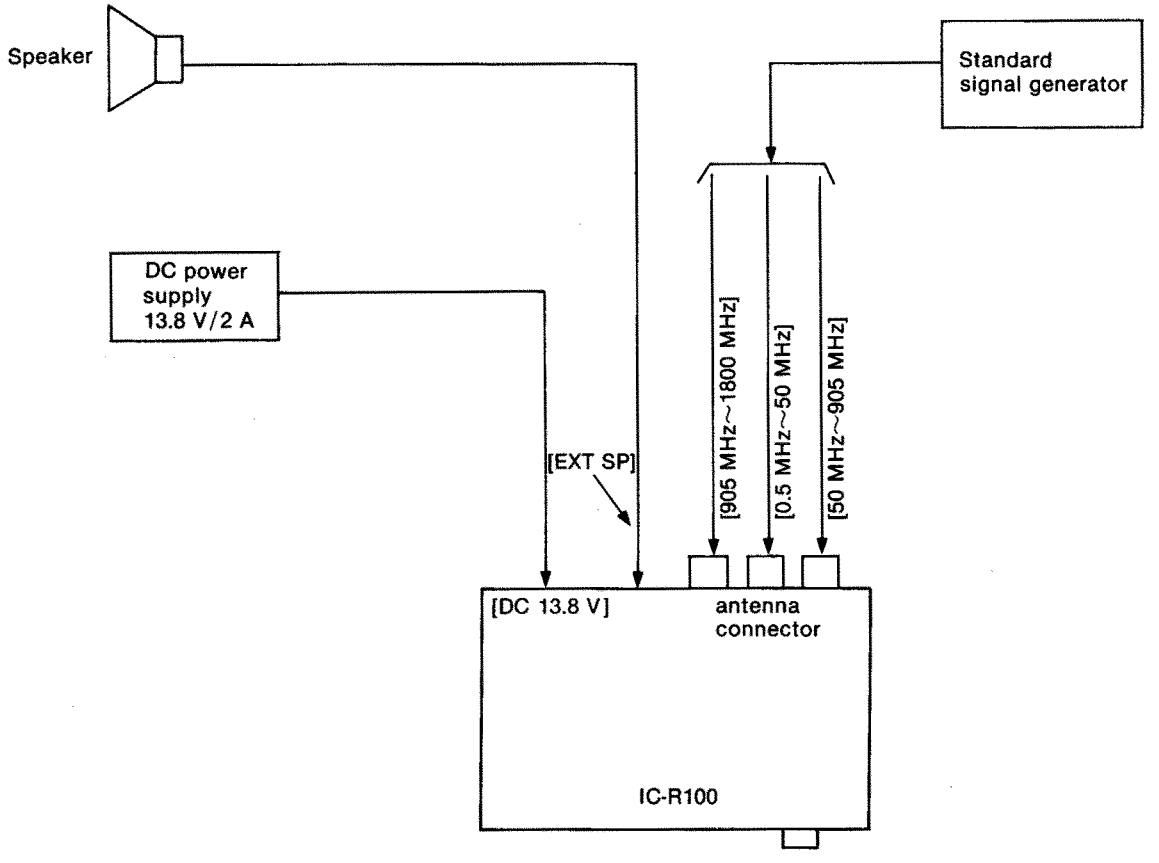
7-1 PREPARATION BEFORE SERVICING

■ REQUIRED TEST EQUIPMENT

EQUIPMENT	GRADE AND RANGE	EQUIPMENT	GRADE AND RANGE
DC power supply	Output voltage : 13.8 V DC Current capacity : 2 A or more	Oscilloscope	Frequency range : DC~50 MHz Measuring range : 0.01~10 V
Frequency counter	Frequency range : 0.1 MHz~1 GHz Frequency accuracy : ±1 ppm or better Sensitivity : 100 mV or better	Digital DC voltmeter	Input impedance : 10 MΩ/DC or better
RF voltmeter	Frequency range : 0.1~500 MHz Measuring range : 0.01~10 V	Standard signal generator (SSG)	Frequency range : 0.1 MHz~2 GHz Output level : −127~−17 dBm (0.1 μV~32 mV)

CW: Clockwise
CCW: Counterclockwise

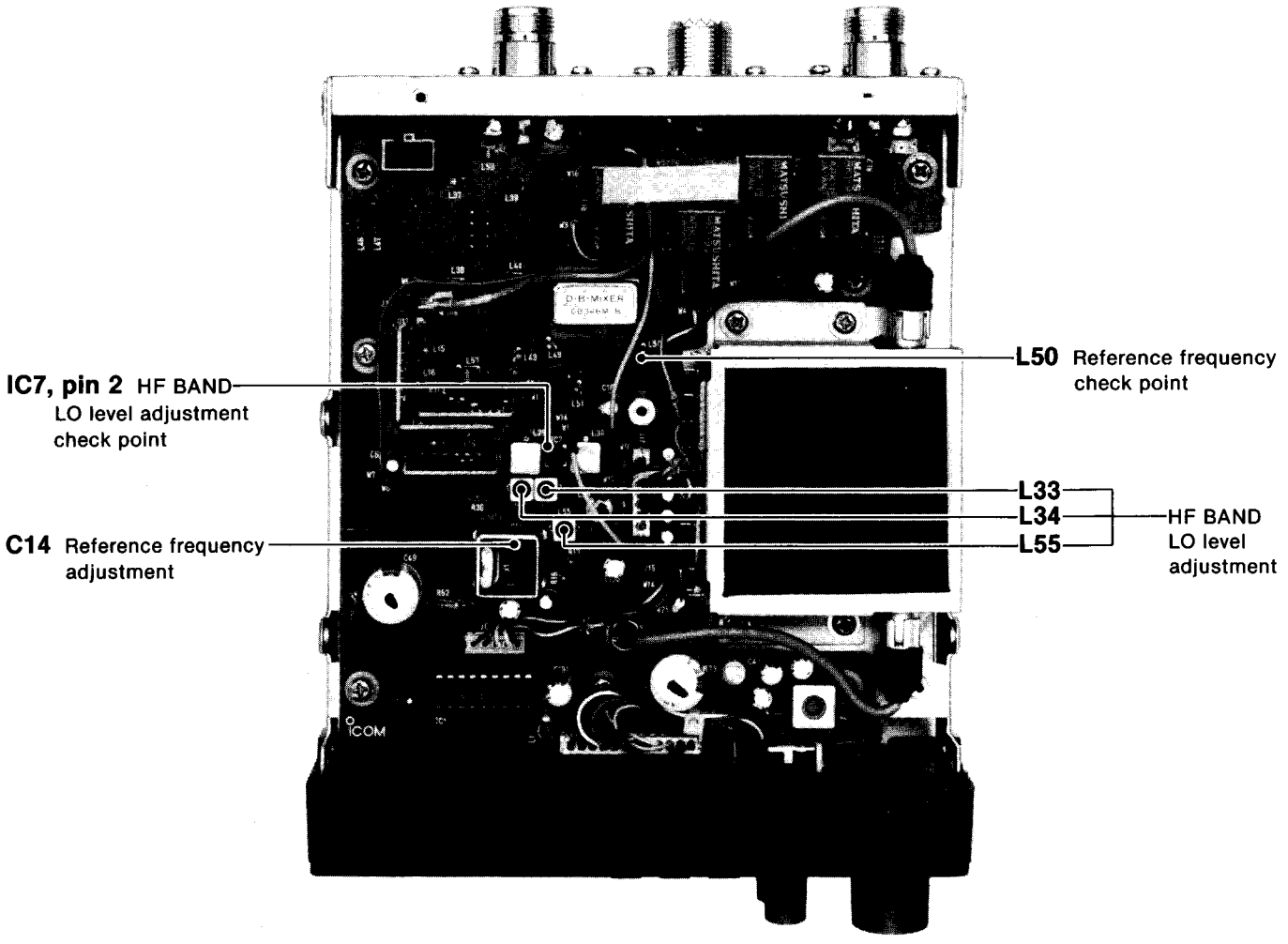
7-2 TEST EQUIPMENT CONNECTION



7-3 PLL ADJUSTMENT

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
REFERENCE FREQUENCY	1	• Displayed frequency: 1300.000 MHz (FRG version) 1856.000 MHz (All other versions) • Mode : FM	PLL	Connect the frequency counter to L50.	673.000 MHz (FRG) 951.000 MHz (All other versions)	PLL	C14
HF BAND LO LEVEL	1	• Displayed frequency: 28.000 MHz • Mode : FM	PLL	Connect the RF voltmeter to IC7, pin 2.	Maximum level (more than 170 mVrms)	PLL	Adjust in sequence L55, L34, L33

• PLL UNIT

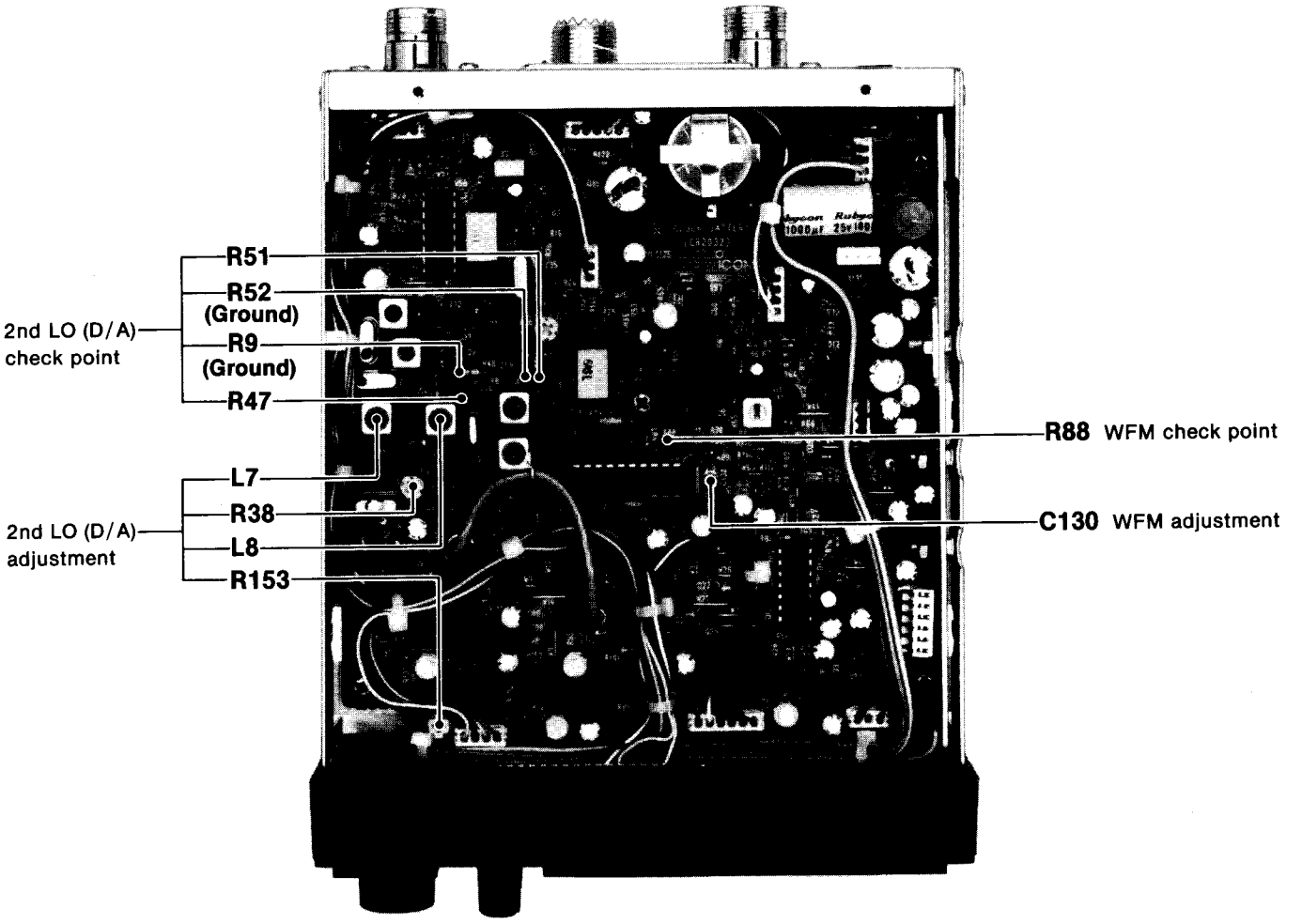


7-4 RECEIVER ADJUSTMENT

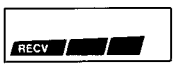
ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
2nd LO (D/A)	1	• Displayed frequency: 144.100 MHz (FRG version) 120.100 MHz (All other versions) • Mode : FM	MAIN	Connect the frequency counter to R51 and R52 (GND).	Preset to center.	MAIN	R38, R153
	2				35.3000 MHz		R38
	3			Connect the RF voltmeter to R47 and R9 (GND).	Maximum level (More than 300 mVrms)		L7, L8
	4	• Displayed frequency: 144.105 MHz (FRG version) 120.105 MHz (All other versions) • Mode : FM • Remove RF voltmeter.		Connect the frequency counter to R51 and R52 (GND).	35.2950 MHz		R153
	5	• Displayed frequency: 144.100 MHz (FRG version) 120.100 MHz (All other versions) • Mode : FM			35.3000 MHz		R38
	6	Repeat steps 4 and 5 several times.					
WFM	1	• Displayed frequency: 144.100 MHz (FRG version) 120.100 MHz (All other versions) • Mode : WFM • [PRE/ATT] switch : OFF • Set the signal generator; Level : 3.2 μV* (−97 dBm) Modulation: 1 kHz Deviation : 50 kHz	MAIN	Connect the digital DC voltmeter to R88.	2.5 V	MAIN	C130

*This output level of the standard signal generator (SSG) is indicated as SSG's open circuit.

• **MAIN UNIT**

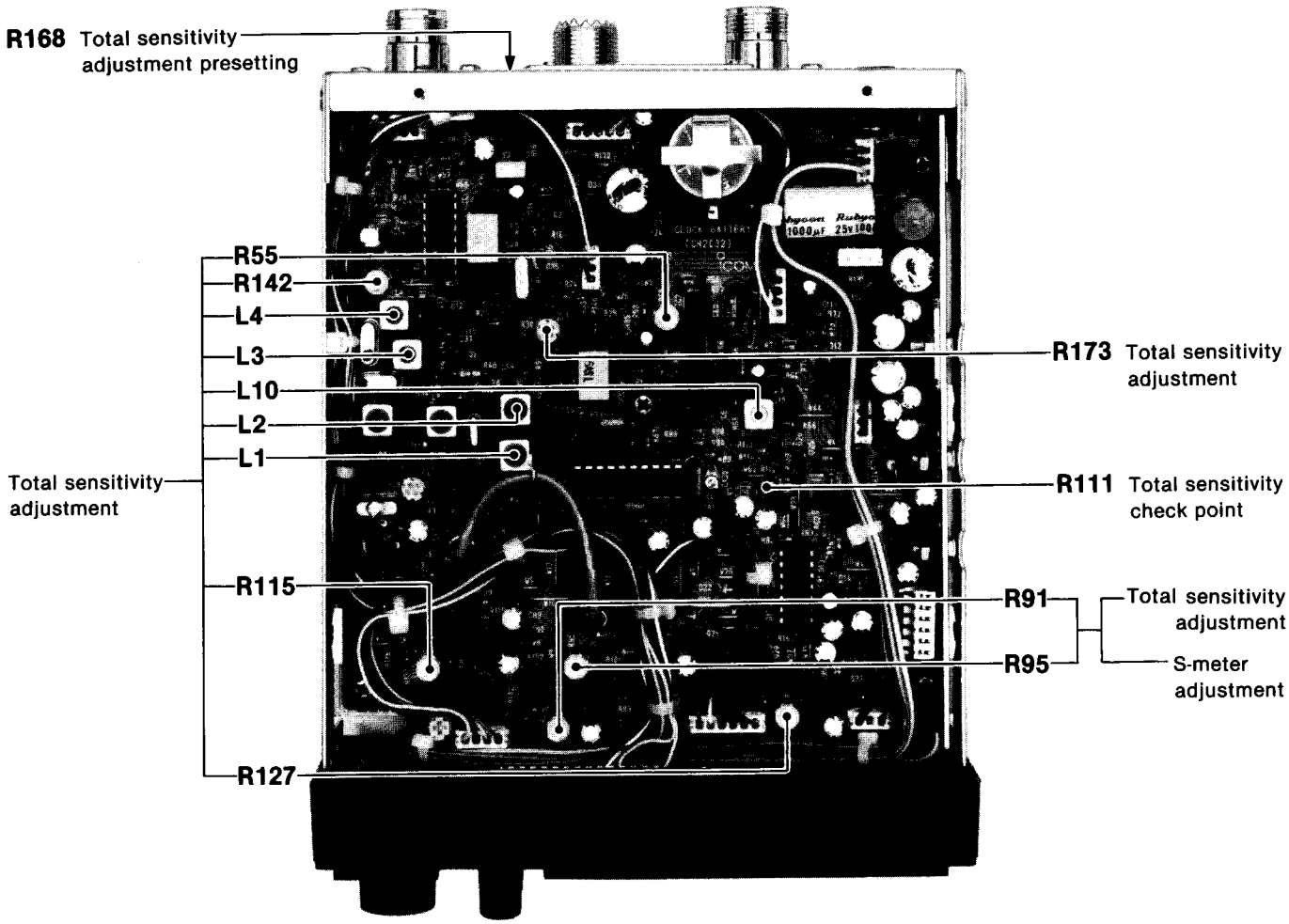

R51
R52
(Ground)
2nd LO (D/A)
check point
R9
(Ground)
R47
L7
R38
2nd LO (D/A)
adjustment
L8
R153
R88 WFM check point
C130 WFM adjustment

RECEIVER ADJUSTMENT (CONTINUED)

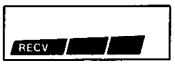
ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
TOTAL SENSITIVITY	1	• Displayed frequency: 144.100 MHz (FRG version) 120.100 MHz (All other versions) • Mode: FM • [PRE/ATT] switch : OFF • R168 (MAIN) : Max. CW	MAIN	Connect the digital DC voltmeter to R111.	Preset to center.	MAIN	R142, R95, R91, R55, R115, R127
	2	• Set the signal generator; Level : 10~320 μV* (−87~−57 dBm) Modulation: 1 kHz Deviation : 5.0 kHz			Minimum		Adjust in sequence L1~L4, L10
	3	• Set the signal generator; Level : 3.2~32 μV* (−97~−77 dBm) Modulation: 1 kHz Deviation : 10.0 kHz			Minimum		Adjust in sequence L1, L2
	4	• Set the signal generator; Level : 3.2 μV* (−97 dBm) Modulation: 1 kHz Deviation : 5.0 kHz					Adjust in sequence L3, L4, L10
	5	Repeat steps 3 and 4 several times.					
	6	• Set the signal generator; Level : 1 μV* (−107 dBm) Modulation: OFF			5.9 V		R142
	7	• Mode : AM					R173
S-METER	1	• Displayed frequency: 144.100 MHz (FRG version) 120.100 MHz (All other versions) • Mode : FM • [PRE/ATT] switch : OFF • Set the signal generator; Level : 3.2 μV* (−97 dBm) Modulation: OFF	Function display	S indicator	3 dots (S5) 	MAIN	R95
	2	• Mode : AM					Verify
	3	• Displayed frequency: 144.100 MHz (FRG version) 87.000 MHz (All other versions) • Mode : WFM • Set the signal generator; Level : 3.2 μV* (−97 dBm) Modulation: OFF			3 dots (S3) 		R91

*This output level of the standard signal generator (SSG) is indicated as SSG's open circuit.

• MAIN UNIT

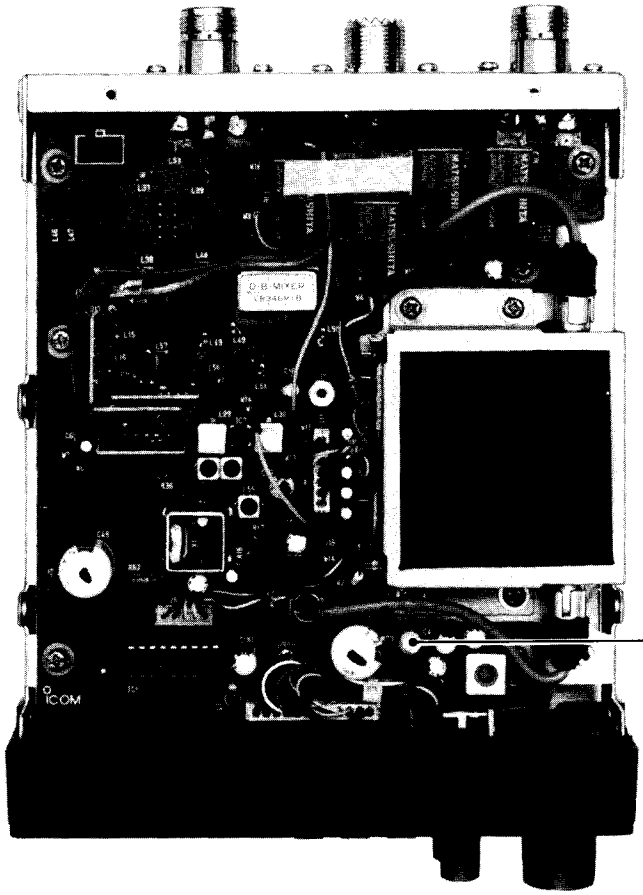

R168 Total sensitivity adjustment presetting
R55
R142
L4
L3
L10
L2
L1
Total sensitivity adjustment
R115
R127
R173 Total sensitivity adjustment
R111 Total sensitivity check point
R91
R95
Total sensitivity adjustment
S-meter adjustment

RECEIVER ADJUSTMENT (CONTINUED)

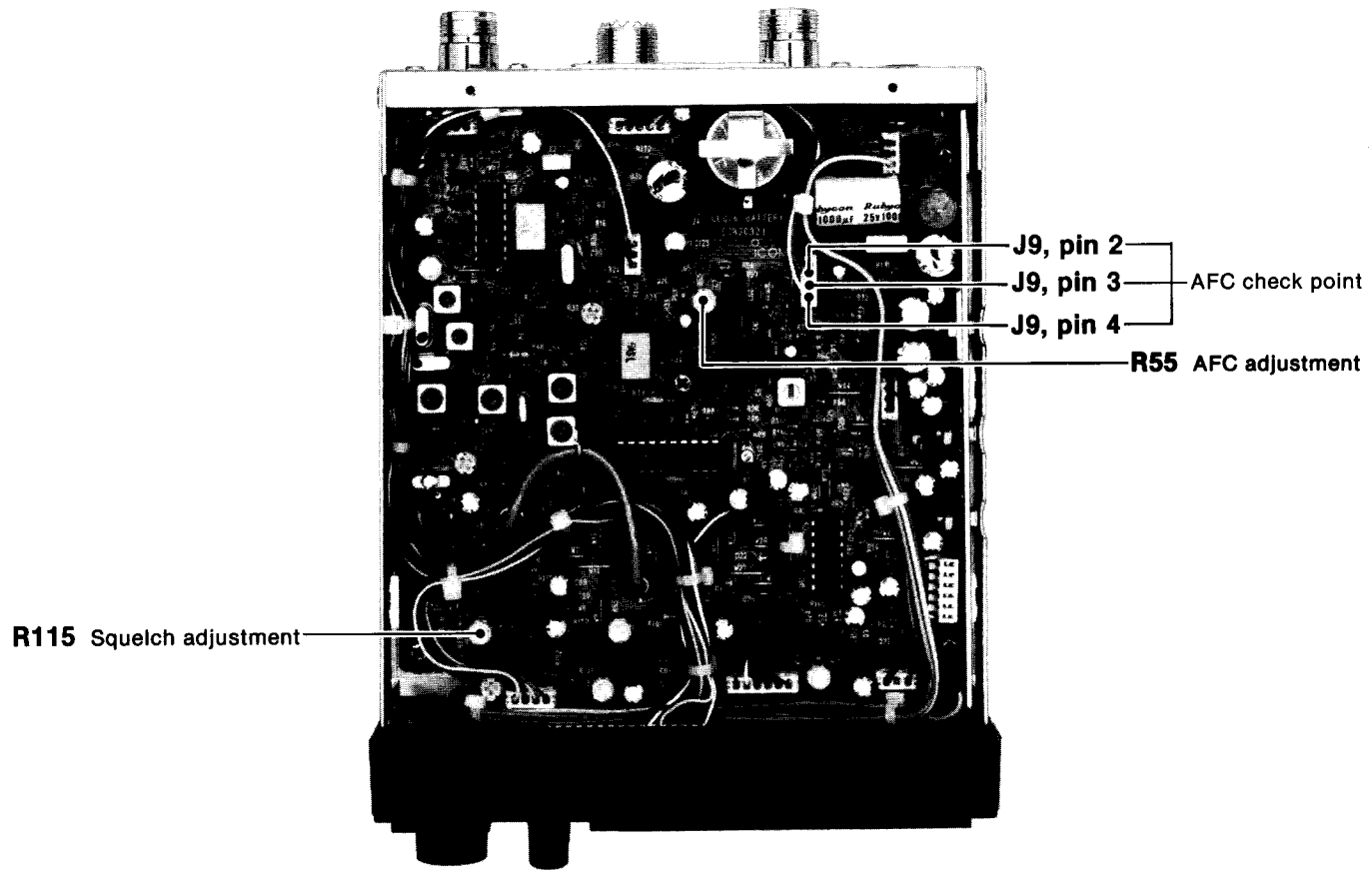
ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
PRE AMP	1	• Displayed frequency: 144.100 MHz (FRG version) 120.100 MHz (All other versions) • Mode : FM • [PRE/ATT] switch : ON • Set the signal generator; Level : 1.8 μV* (−102 dBm) Modulation: OFF	Function display	S indicator	3 dots (S5) 	PLL	R73
AFC	1	• Displayed frequency: 144.100 MHz (FRG version) 120.100 MHz (All other versions) • Mode : FM • [PRE/ATT] switch : OFF • Set the signal generator; Level : 3.2 μV* (−97 dBm) Modulation: OFF	MAIN	Connect the oscilloscope to J9, pin 3.	0 V	MAIN	R55
	2	Shift the signal generator frequency: ±2 kHz					
	3	Shift the signal generator frequency: +5 kHz		Connect the oscilloscope to J9, pin 4.			Verify
	4	Shift the signal generator frequency: −5 kHz		Connect the oscilloscope to J9, pin 2.			
SQUELCH	1	• Displayed frequency: 144.100 MHz (FRG version) 120.100 MHz (All other versions) • Mode : FM • [PRE/ATT] switch : OFF • Apply no signal to the antenna connector.	Bottom cover	Speaker	Squelch threshold point is between the 9 o'clock and 11 o'clock.	Front panel	[SQUELCH] control
	2	• Mode : AM			Same position as FM mode.	MAIN	R115
	3	• Mode : WFM					Verify

*This output level of the standard signal generator (SSG) is indicated as SSG's open circuit.

• **PLL UNIT**



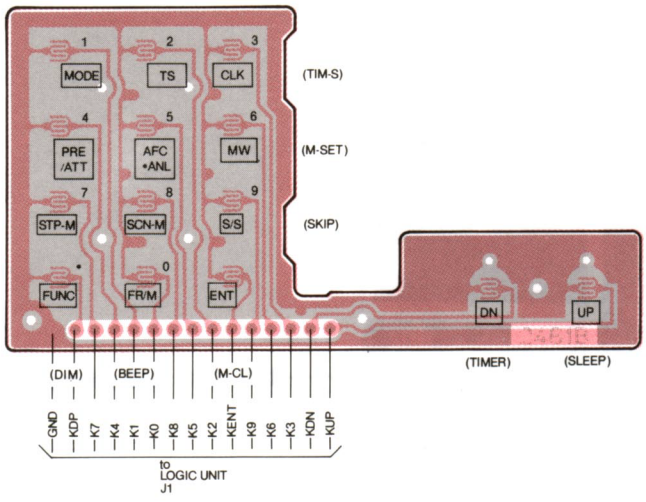
• **MAIN UNIT**



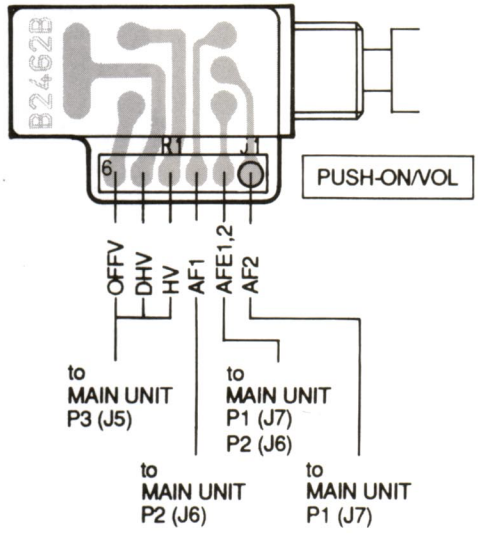
SECTION 8 BOARD LAYOUTS

8-1 SUBORDINATE LOGIC UNITS

• TENKEY UNIT



• VR UNIT



1SS184
(Symbol: B3)



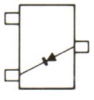
D3, D5

1SS187
(Symbol: D3)



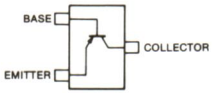
D2

1SS190
(Symbol: E3)



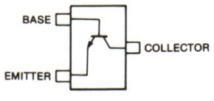
D4

2SA1162 Y
(Symbol: SY)



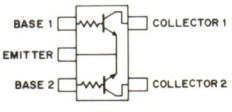
Q6, Q8

2SC2712 Y
(Symbol: LY)



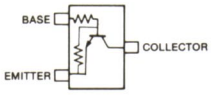
Q5, Q9, Q12

FMG4 T148
(Symbol: G4)



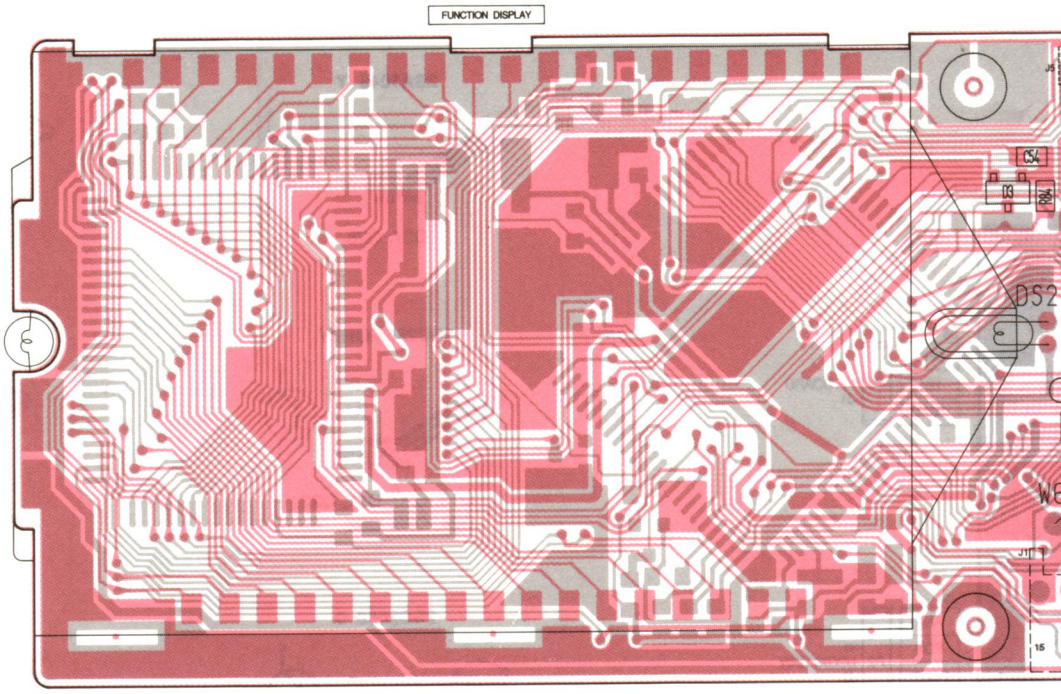
Q3

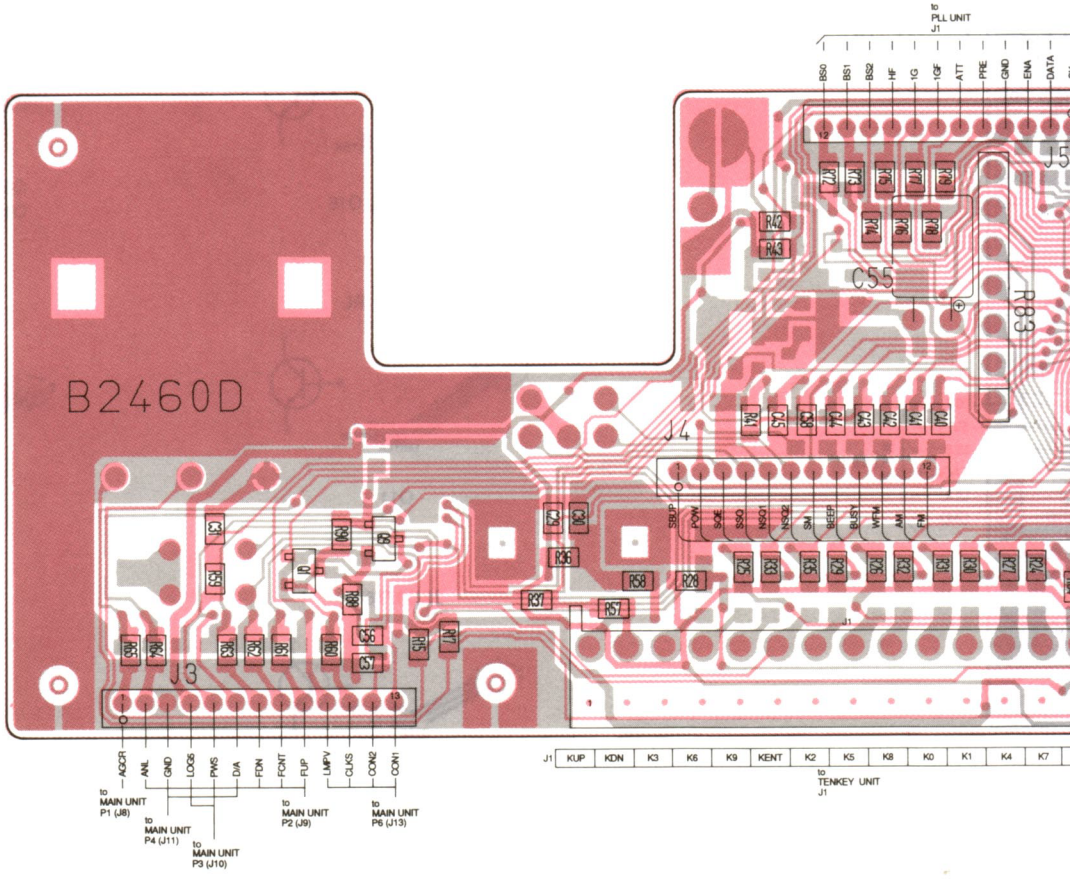
RN1404
(Symbol: XD)

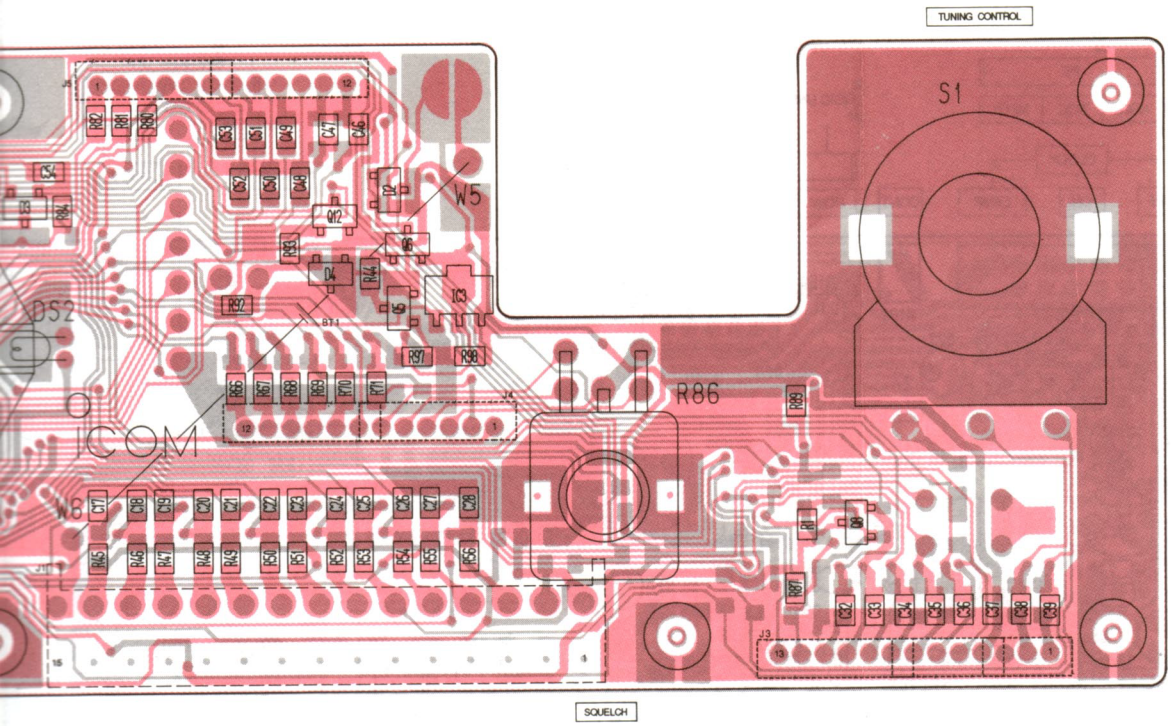


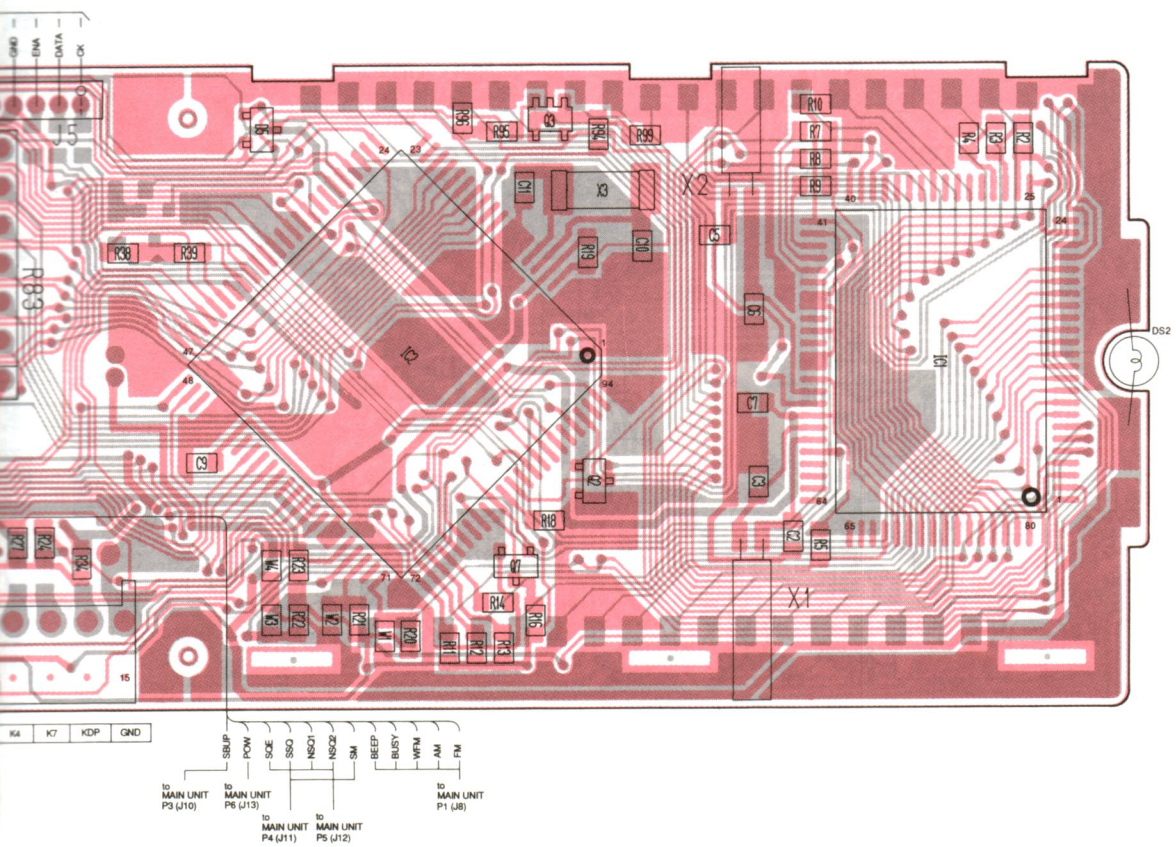
Q1, Q2, Q7

• LOGIC UNIT

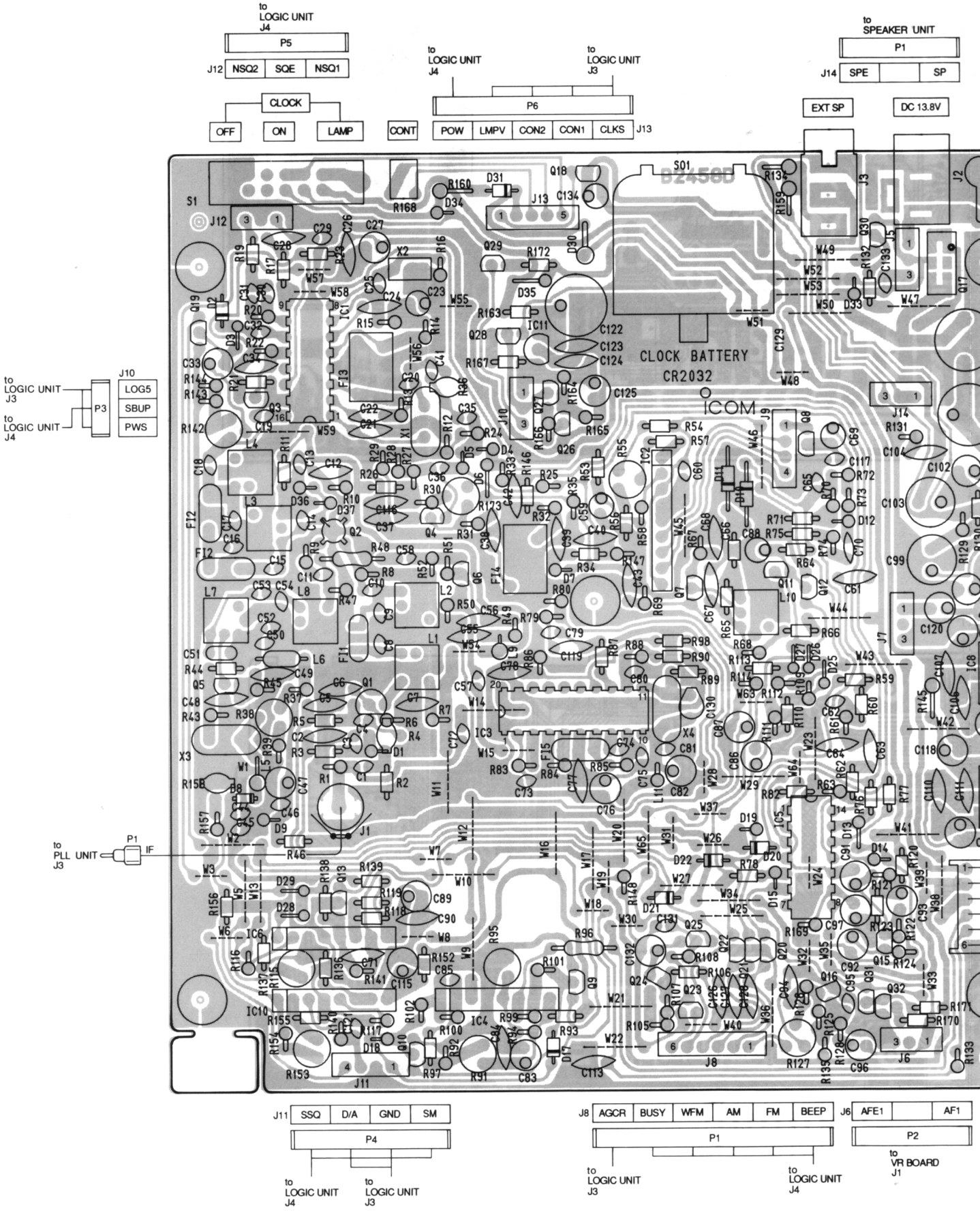

FUNCTION DISPLAY
DS2

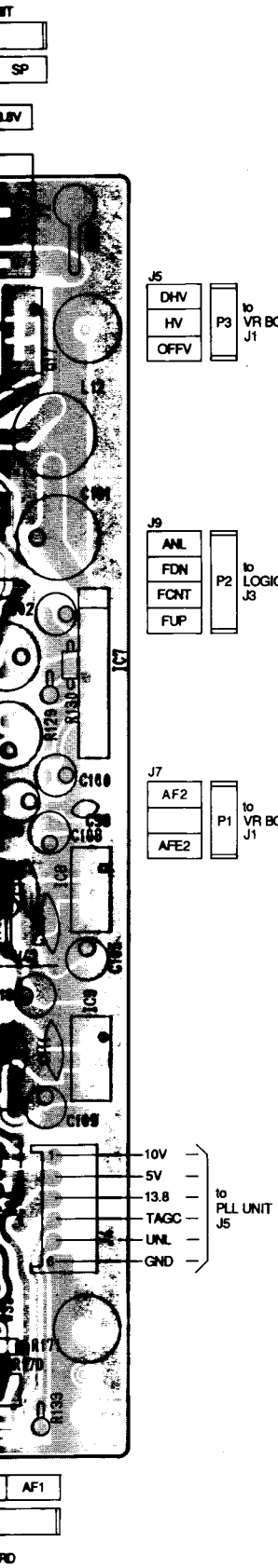

B2460D
to PLL UNIT J1
BS0
BS1
BS2
HF
IG
IGF
ATT
PRE
GND
ENA
DATA
J5
J4
J3
J1
C55
R89
SBEP
PCW
SAE
SSG
NSG1
NSG2
SM
BEEP
BUSY
WFM
AM
FM
ADCR
ANL
GND
LOGS
PWS
D/A
FDN
FCNT
FUP
LMPV
CLKS
CON2
CON1
to MAIN UNIT P1 (J8)
to MAIN UNIT P4 (J11)
to MAIN UNIT P3 (J10)
to MAIN UNIT P2 (J9)
to MAIN UNIT P6 (J13)
KUP
KDN
K3
K6
K9
KENT
K2
K5
K8
K0
K1
K4
K7
to TENKEY UNIT J1


TUNING CONTROL
S1
W5
DS2
R86
W8
SQUELCH

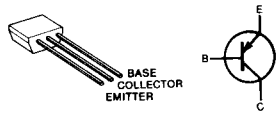

J5
GND
DNA
DATA
CK
R83
X3
X2
IC2
IC1
X1
DS2
K4
K7
KDP
GND
SBUP
POW
SQE
SSQ
NSQ1
NSQ2
SM
BEEP
BUSY
WFM
AM
FM
to MAIN UNIT P3 (J10)
to MAIN UNIT P6 (J13)
to MAIN UNIT P4 (J11)
to MAIN UNIT P5 (J12)
to MAIN UNIT P1 (J8)

8-2 MAIN UNIT


to LOGIC UNIT J4
P5
J12 NSQ2 SQE NSQ1
CLOCK
OFF ON LAMP
CONT
to LOGIC UNIT J4
to LOGIC UNIT J3
P6
POW LMPV CON2 CON1 CLKS J13
to SPEAKER UNIT
P1
J14 SPE SP
EXT SP
DC 13.8V
CLOCK BATTERY CR2032
ICOM
to LOGIC UNIT J3
to LOGIC UNIT J4
P3
J10 LOG5 SBUP PWS
to PLL UNIT J3
P1 IF
J11 SSQ D/A GND SM
P4
to LOGIC UNIT J4
to LOGIC UNIT J3
J8 AGCR BUSY WFM AM FM BEEP
P1
to LOGIC UNIT J3
to LOGIC UNIT J4
J6 AFE1 AF1
P2
to VR BOARD J1

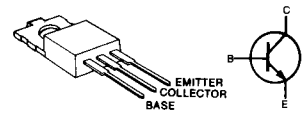


2SA1048 Y



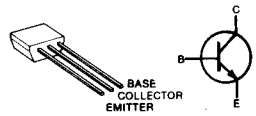
Q27, Q28

2SD1406 Y



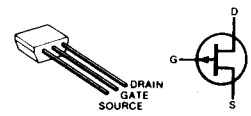
Q17

2SC2458-GR/Y



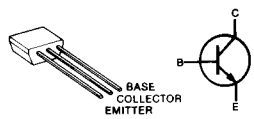
Q15, Q20, Q21, Q22,
Q24, Q26, Q32

2SJ105 GR



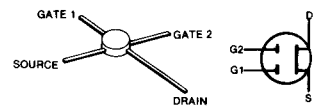
Q25

2SC2668 0



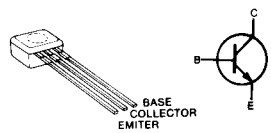
Q4, Q7

3SK74 M



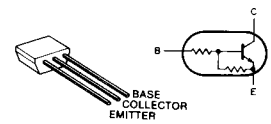
Q2

2SC2785 EL



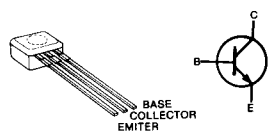
Q3, Q5, Q6, Q16

RN1204



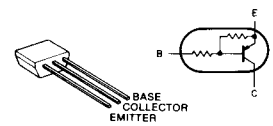
Q8, Q9, Q10, Q12, Q18,
Q19, Q23, Q29, Q31

2SC2785 KL



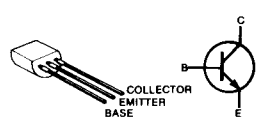
Q11

RN2204



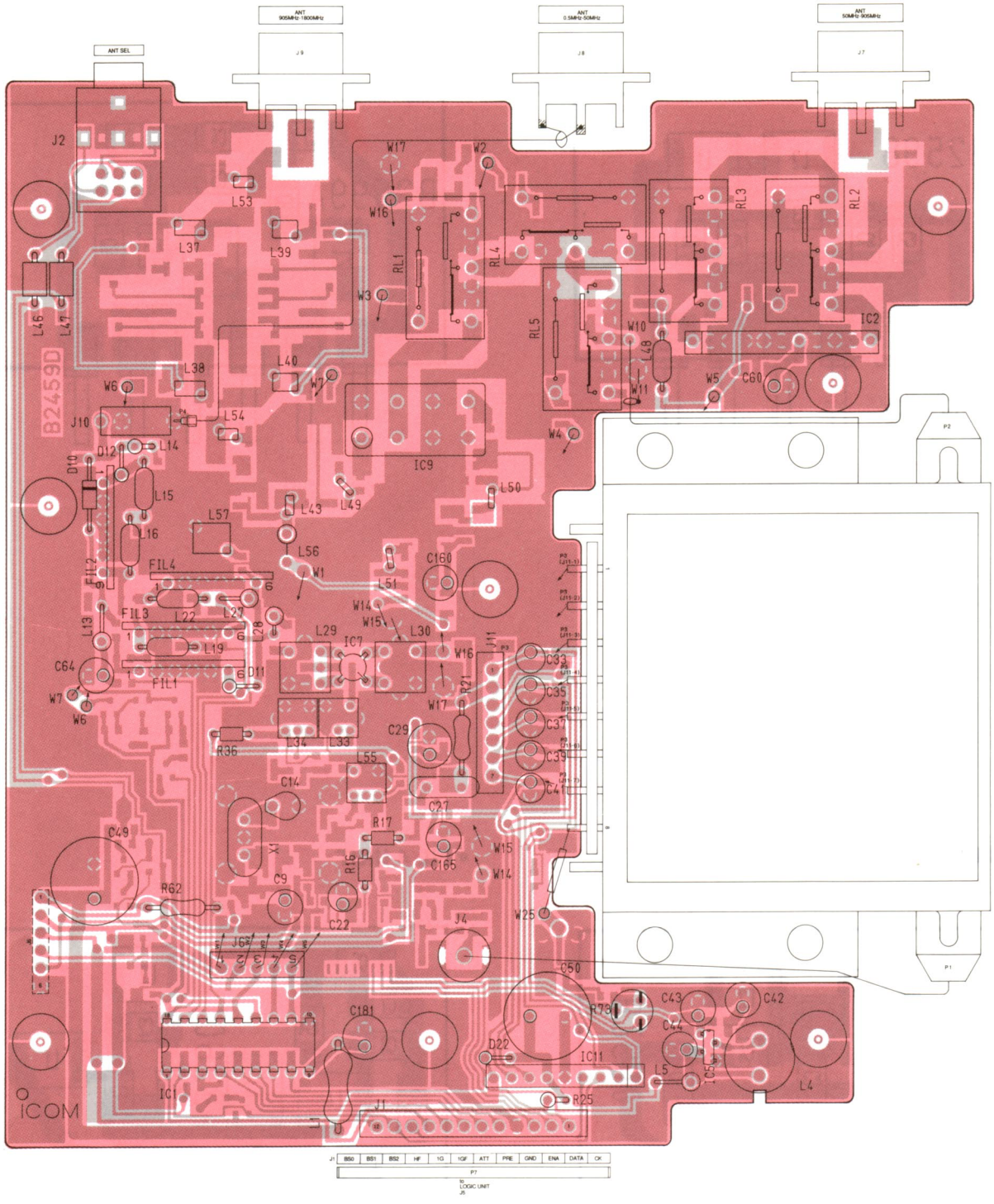
Q13, Q30

2SC3776-D

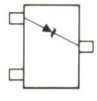


Q1

8-3 PLL UNIT

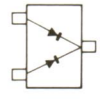


02CZ5.1 Z
(Symbol: 5.1Z)



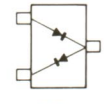
D1

1SS184
(Symbol: B3)



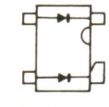
D4, D15, D17, D23

1SS226
(Symbol: C3)

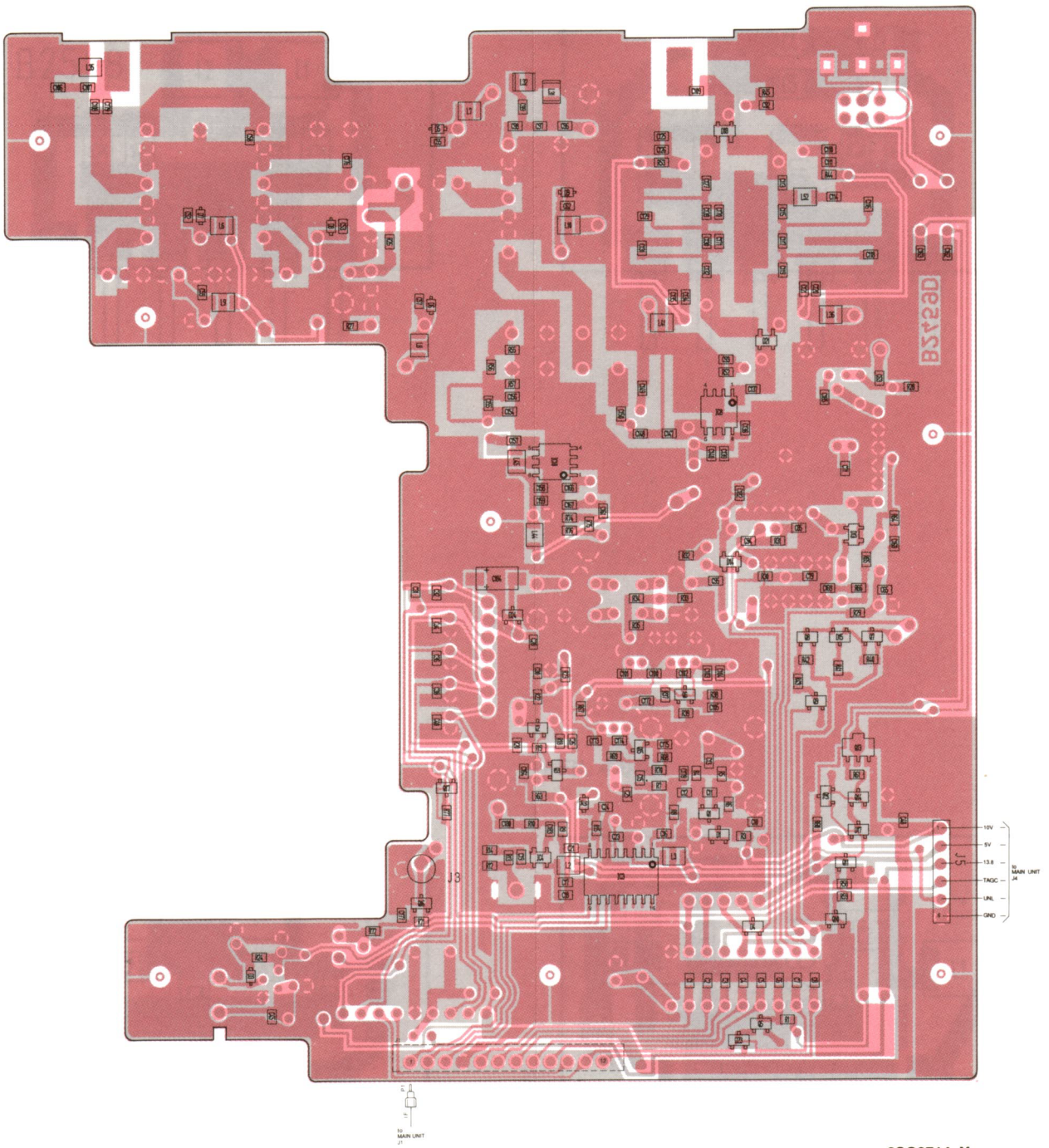


D24

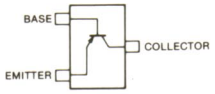
MA862
(Symbol: M1I)



D13, D14

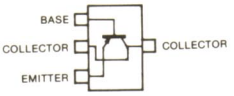


2SA1362 GR
(Symbol: AEG)



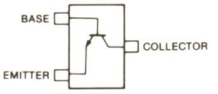
Q7, Q8, Q11

2SB798-T2 DL
(Symbol: DL)



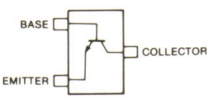
Q13

2SC2712 GR
(Symbol: LG)



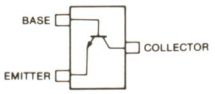
Q2

2SC2714 Y
(Symbol: QY)



Q1, Q6, Q15

2SC3772 3
(Symbol: LY3)



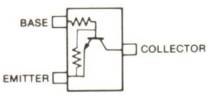
Q16

2SK209 Y
(Symbol: XY)



Q3

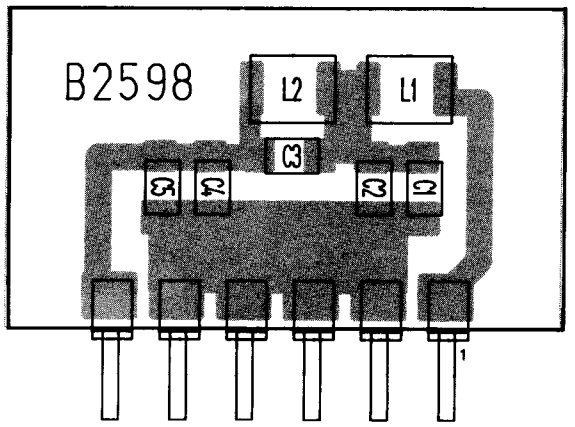
RN1404
(Symbol: XD)



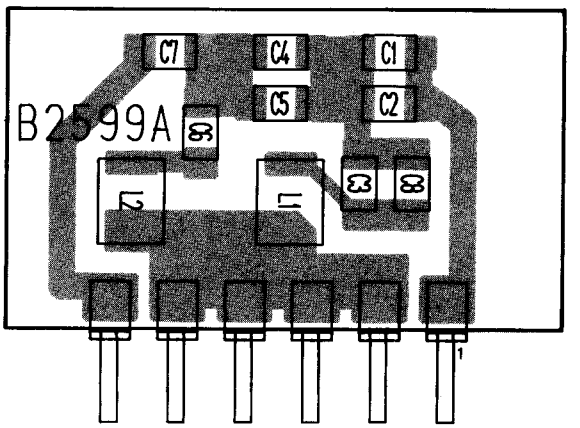
Q5, Q9, Q10, Q12,
Q14, Q17

8-4 SUBORDINATE PLL UNITS

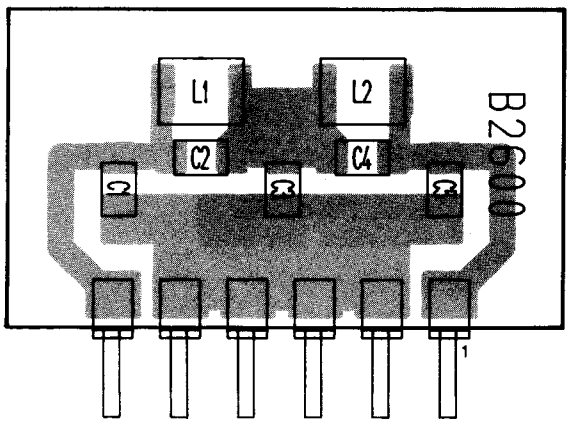
• **FIL 1 UNIT**



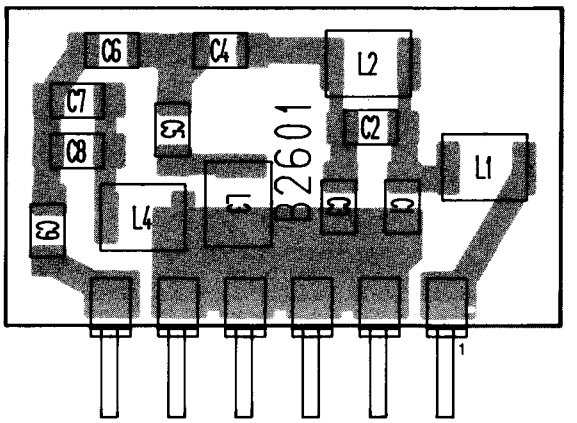
• **FIL 2 UNIT**



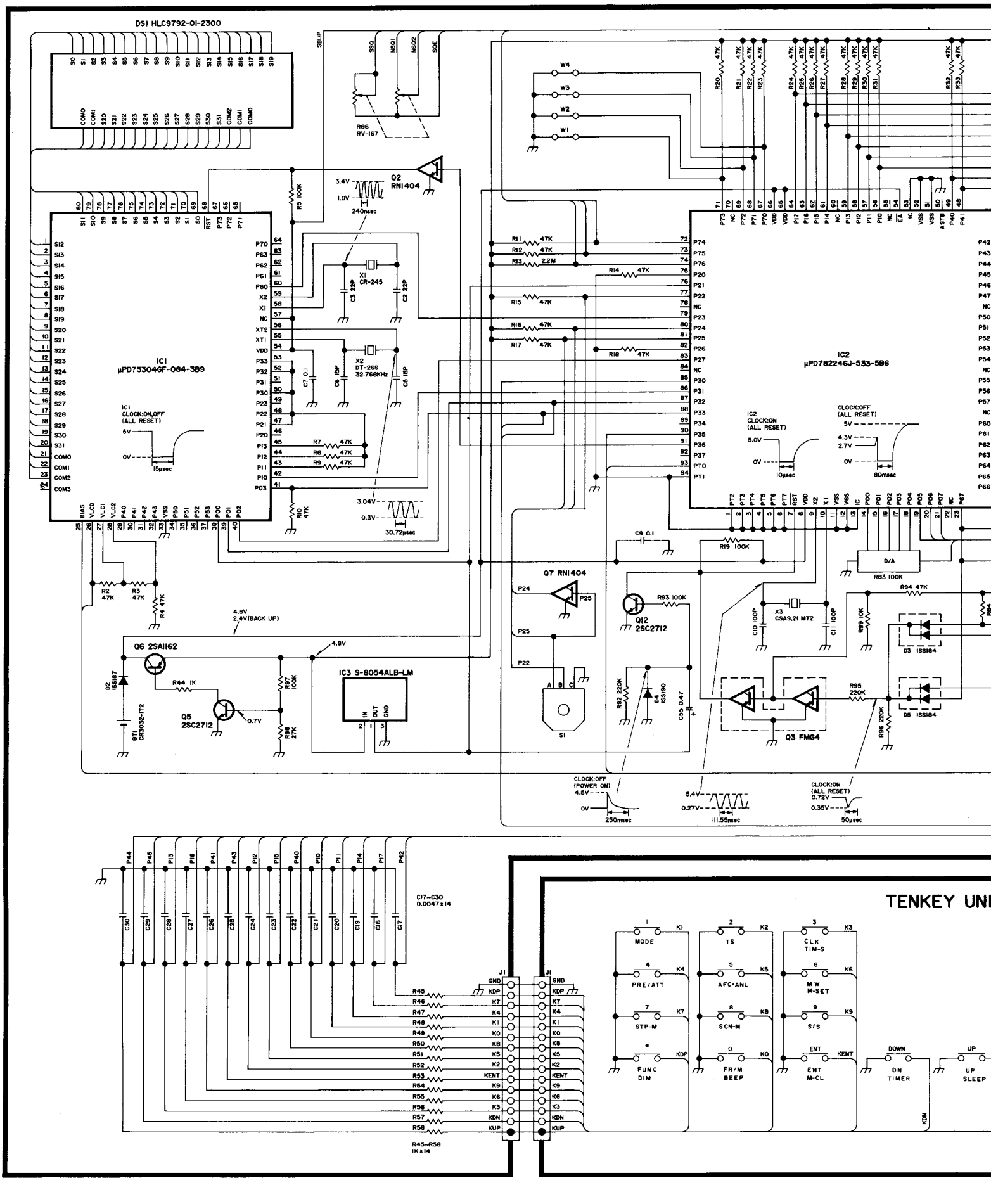
• **FIL 3 UNIT**

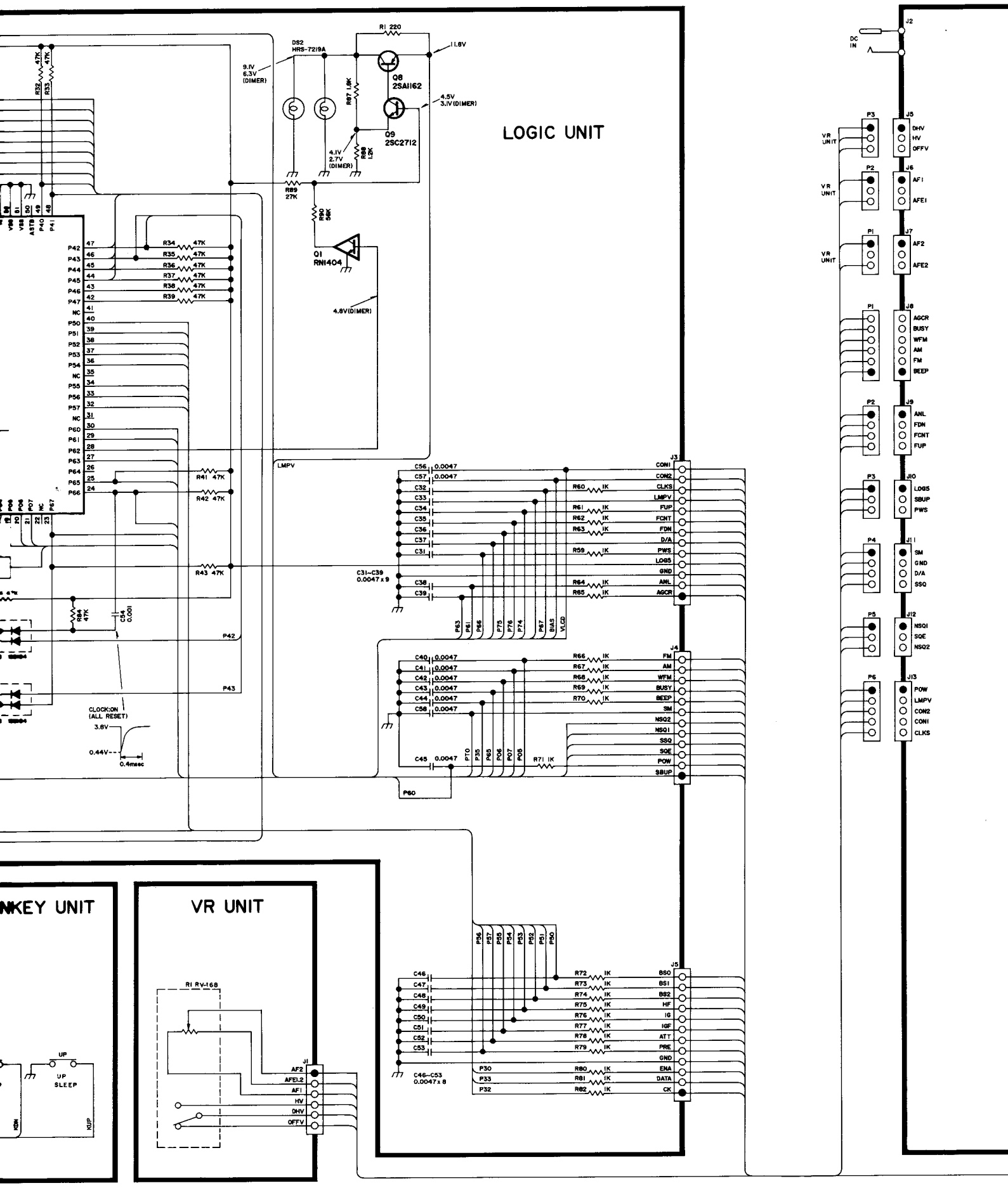


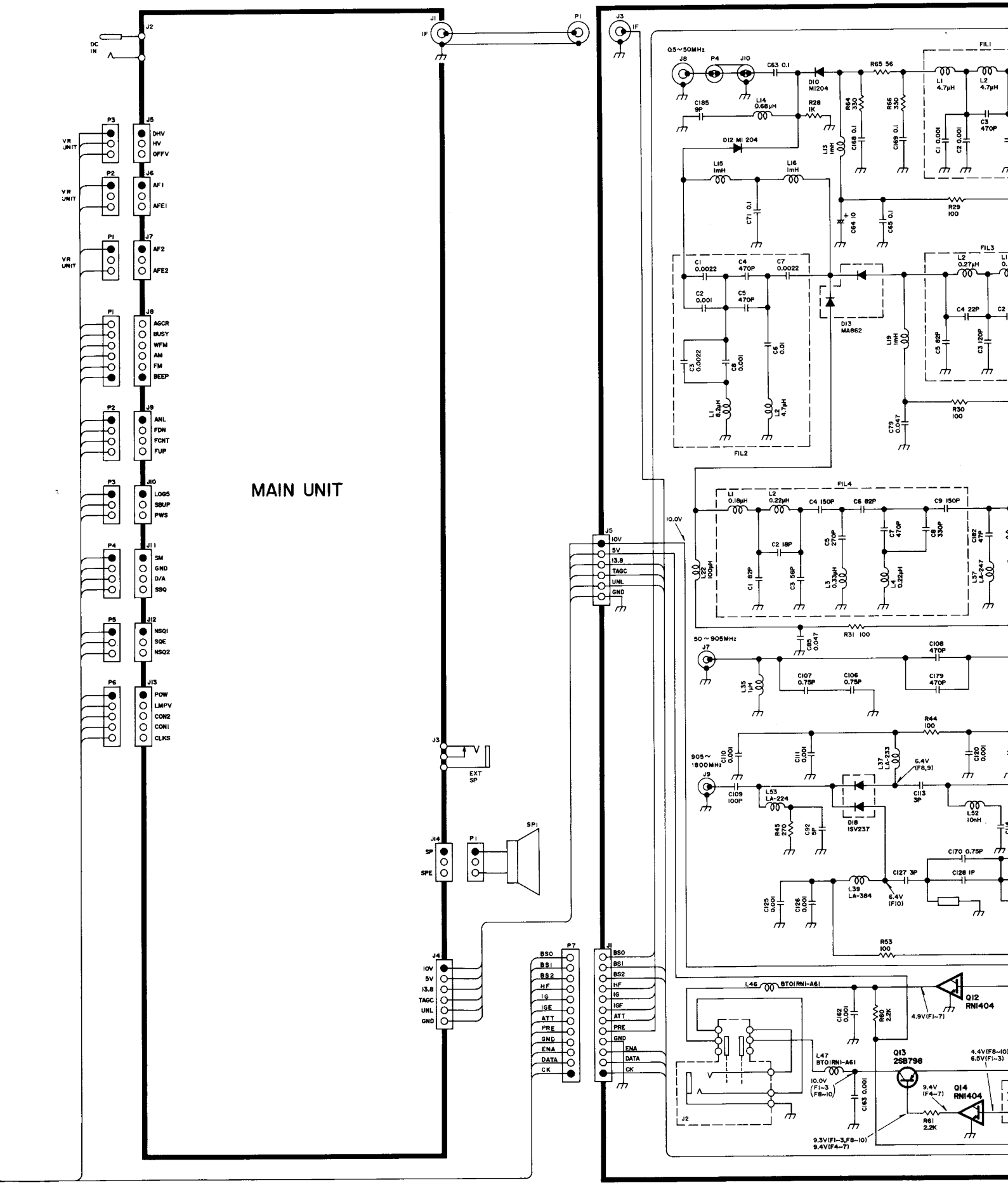
• **FIL 4 UNIT**

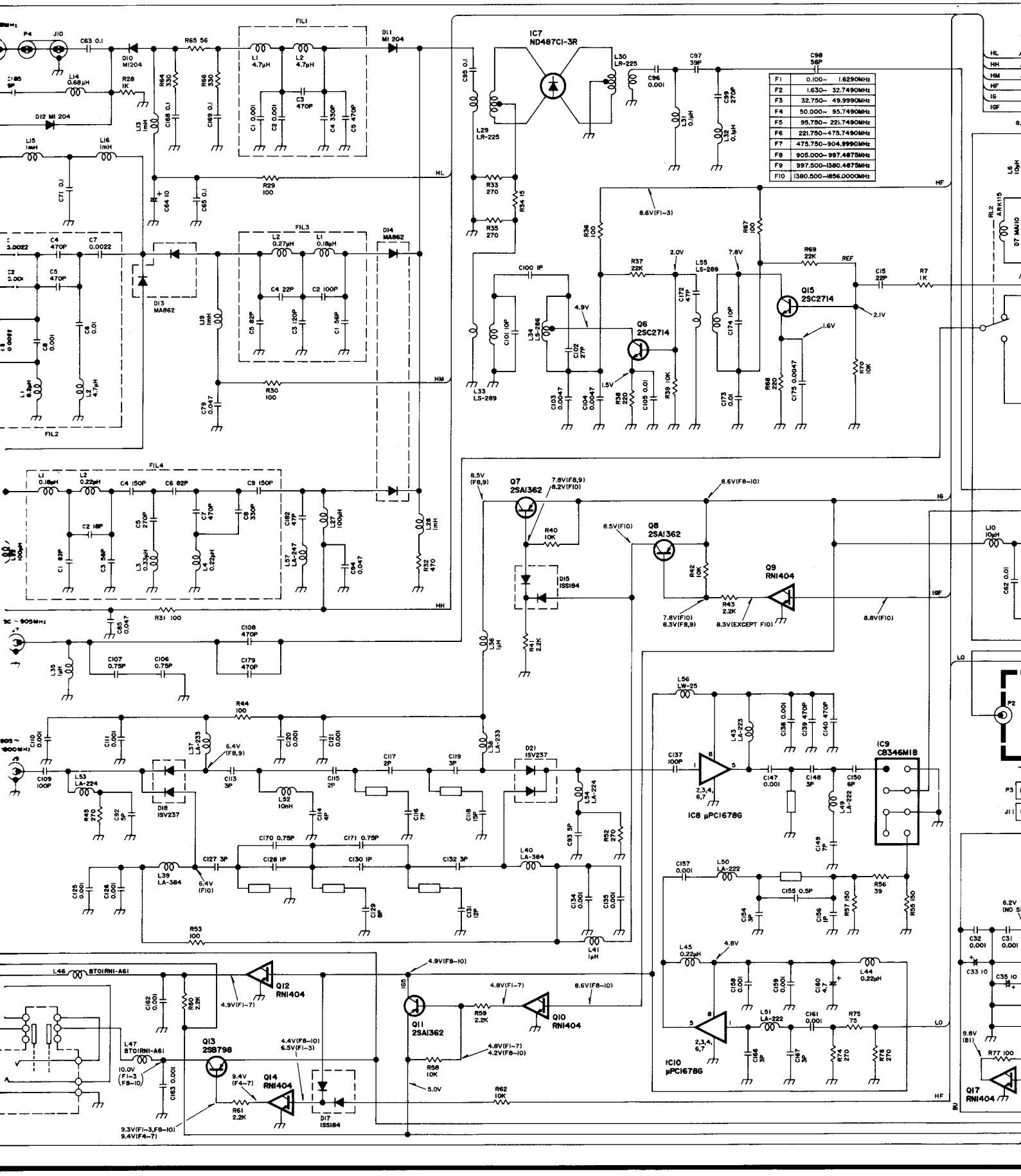


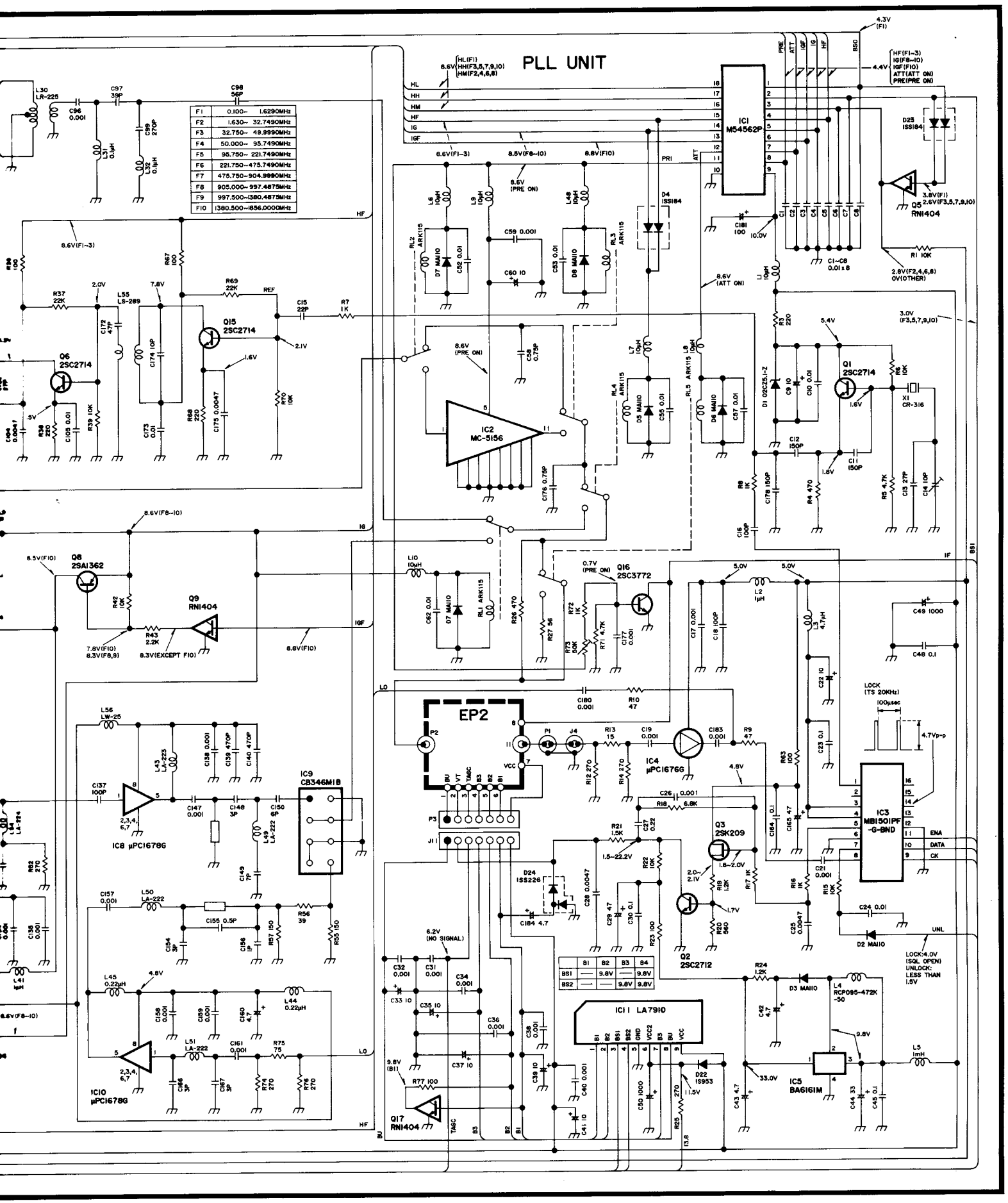
SECTION 9 VOLTAGE DIAGRAM

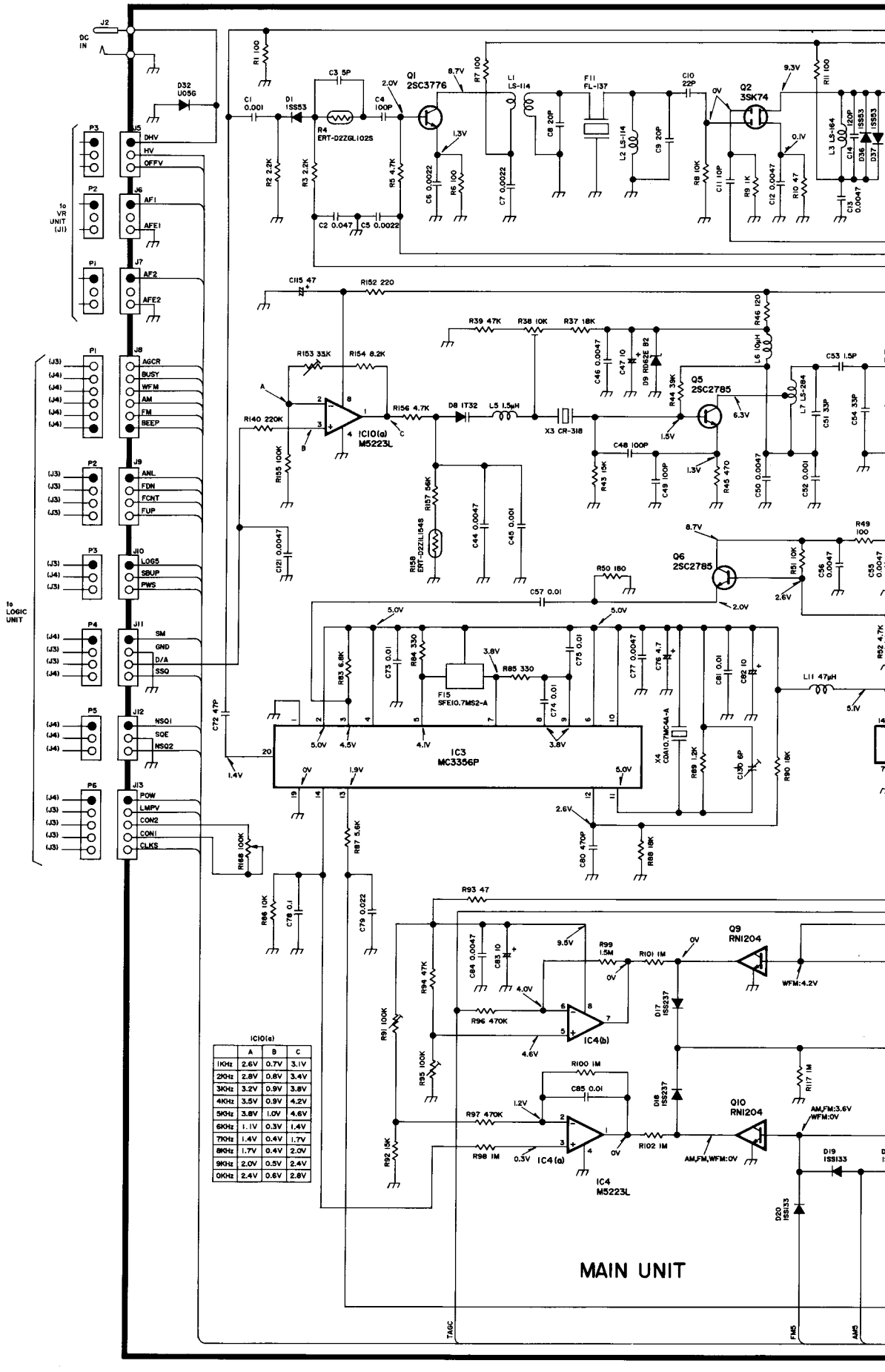



LOGIC UNIT
R1 220
DS2 HRS-7219A
11.8V
9.1V 6.3V (DIMER)
Q8 2SA1162
4.5V 3.1V(DIMER)
R87 1.8K
Q9 2SC2712
4.1V 2.7V (DIMER)
R88 1.2K
R89 27K
R90 56K
Q1 RN1404
4.8V(DIMER)
LMPV
R34 47K
R35 47K
R36 47K
R37 47K
R38 47K
R39 47K
R41 47K
R42 47K
R43 47K
R44 47K
C54 0.001
P42
P43
CLOCK:ON (ALL RESET)
3.8V
0.44V
0.4msec
C56 0.0047
C57 0.0047
C32
C33
C34
C35
C36
C37
C31
C31~C39 0.0047 x 9
C38
C39
R60 1K
R61 1K
R62 1K
R63 1K
R59 1K
R64 1K
R65 1K
J3
CON1
CON2
CLKS
LMPV
FUP
FCNT
FDN
D/A
PWS
LOGS
GND
ANL
AGCR
P63
P61
P66
P75
P76
P74
P67
BIAS
VLCD
C40 0.0047
C41 0.0047
C42 0.0047
C43 0.0047
C44 0.0047
C58 0.0047
C45 0.0047
P60
P70
P35
P65
P06
P07
P05
R66 1K
R67 1K
R68 1K
R69 1K
R70 1K
R71 1K
J4
FM
AM
WFM
BUSY
BEEP
SM
NSQ2
NSQ1
SSQ
SQE
POW
SBUP
C46
C47
C48
C49
C50
C51
C52
C53
C46~C53 0.0047 x 8
P56
P57
P55
P54
P53
P52
P51
P50
P30
P33
P32
R72 1K
R73 1K
R74 1K
R75 1K
R76 1K
R77 1K
R78 1K
R79 1K
R80 1K
R81 1K
R82 1K
J5
BSO
BS1
BS2
HF
IG
IGF
ATT
PRE
GND
ENA
DATA
CK
J2
DC IN
P3
VR UNIT
J5
DHV
HV
OFFV
P2
VR UNIT
J6
AF1
AFE1
P1
VR UNIT
J7
AF2
AFE2
P1
J8
AGCR
BUSY
WFM
AM
FM
BEEP
P2
J9
ANL
FDN
FCNT
FUP
P3
J10
LOGS
SBUP
PWS
P4
J11
SM
GND
D/A
SSQ
P5
J12
NSQ1
SQE
NSQ2
P6
J13
POW
LMPV
CON2
CON1
CLKS
NKEY UNIT
UP
UP SLEEP
VR UNIT
R1 RV-168
J1
AF2
AFE1,2
AF1
HV
DHV
OFFV


MAIN UNIT
J2
DC IN
J1
IF
P1
J3
IF
P3
VR UNIT
J5
DHV
HV
OFFV
P2
VR UNIT
J6
AF1
AFE1
P1
VR UNIT
J7
AF2
AFE2
P1
J8
AGCR
BUSY
WFM
AM
FM
BEEP
P2
J9
ANL
FDN
FCNT
FUP
P3
J10
LOG5
SBUP
PWS
P4
J11
SM
GND
D/A
SSQ
P5
J12
NSQ1
SQE
NSQ2
P6
J13
POW
LMPV
CON2
CON1
CLKS
0.5~50MHz
J8
P4
J10
C63 0.1
D10 MI204
R65 56
L1 4.7μH
L2 4.7μH
C185 9P
L14 0.68μH
R28 1K
R64 330
R66 330
C3 470P
C1 0.001
C2 0.001
D12 MI 204
L13 1mH
C168 0.1
C169 0.1
L15 1mH
L16 1mH
C71 0.1
C64 10
C65 0.1
R29 100
FIL1
FIL2
FIL3
C1 0.0022
C4 470P
C7 0.0022
C2 0.001
C5 470P
C3 0.0022
C8 0.001
C6 0.01
L1 6.2μH
L2 4.7μH
D13 MA862
L19 1mH
C4 22P
C5 82P
C3 120P
R30 100
C79 0.047
FIL4
L1 0.18μH
L2 0.22μH
C4 150P
C6 82P
C9 150P
C2 18P
C1 82P
C3 56P
L3 0.33μH
L4 0.22μH
C5 270P
C7 470P
C8 330P
C182 47P
L22 100μH
L57 LA-247 100μH
R31 100
C65 0.047
10.0V
J5
10V
5V
13.8
TAGC
UNL
GND
50~905MHz
J7
L35 1μH
C107 0.75P
C106 0.75P
C108 470P
C179 470P
R44 100
905~1800MHz
J9
C110 0.001
C111 0.001
C100 0.001
L37 LA-233
6.4V (F8,9)
C109 100P
L53 LA-224
C113 3P
L52 10nH
D18 1SV237
R45 270
C92 5P
C170 0.75P
C128 1P
C127 3P
L39 LA-384
6.4V (F10)
C125 0.001
C126 0.001
R53 100
J3
EXT SP
J14
SP
SPE
P1
SP1
J4
10V
5V
13.8
TAGC
UNL
GND
P7
BS0
BS1
BS2
HF
IG
IGE
ATT
PRE
GND
ENA
DATA
CK
J1
BS0
BS1
BS2
HF
IG
IGF
ATT
PRE
GND
ENA
DATA
CK
L46 BTO(RNI-A6)
Q12 RNI404
4.9V(F1-7)
C162 0.001
R60 2.2K
L47 BTO(RNI-A6)
Q13 2SB798
4.4V(F8~10) 6.5V(F1~3)
10.0V (F1~3 F8~10)
C163 0.001
9.4V (F4~7)
Q14 RNI404
R61 2.2K
9.3V(F1~3,F8~10) 9.4V(F4~7)
J2

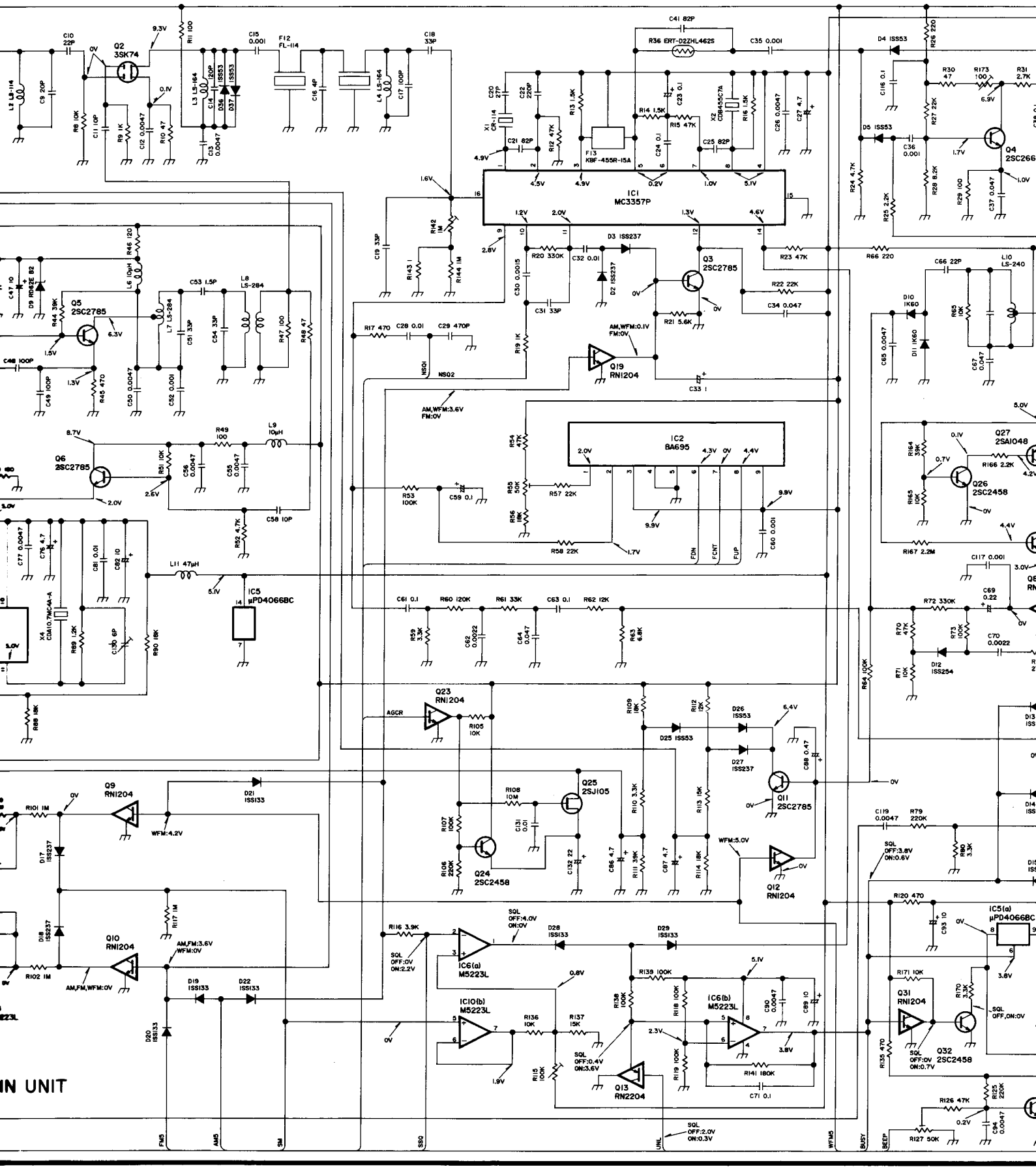

FIL1
FIL2
FIL3
FIL4
IC7 ND487CI-3R
IC8 μPC1678G
IC9 C8346M18
IC10 μPC1678G
Q6 2SC2714
Q7 2SA1362
Q8 2SA1362
Q9 RN1404
Q10 RN1404
Q11 2SA1362
Q12 RN1404
Q13 2SB798
Q14 RN1404
Q15 2SC2714
Q17 RN1404
D13 MA862
D14 MA862
D15 1SS184
D16 1SV237
D17 1SS184
D21 1SV237
F1 0.100~ 1.629MHz
F2 1.630~ 32.749MHz
F3 32.750~ 49.999MHz
F4 50.000~ 95.749MHz
F5 95.750~ 221.749MHz
F6 221.750~475.749MHz
F7 475.750~904.999MHz
F8 905.000~997.4875MHz
F9 997.500~1380.4875MHz
F10 1380.500~1856.0000MHz

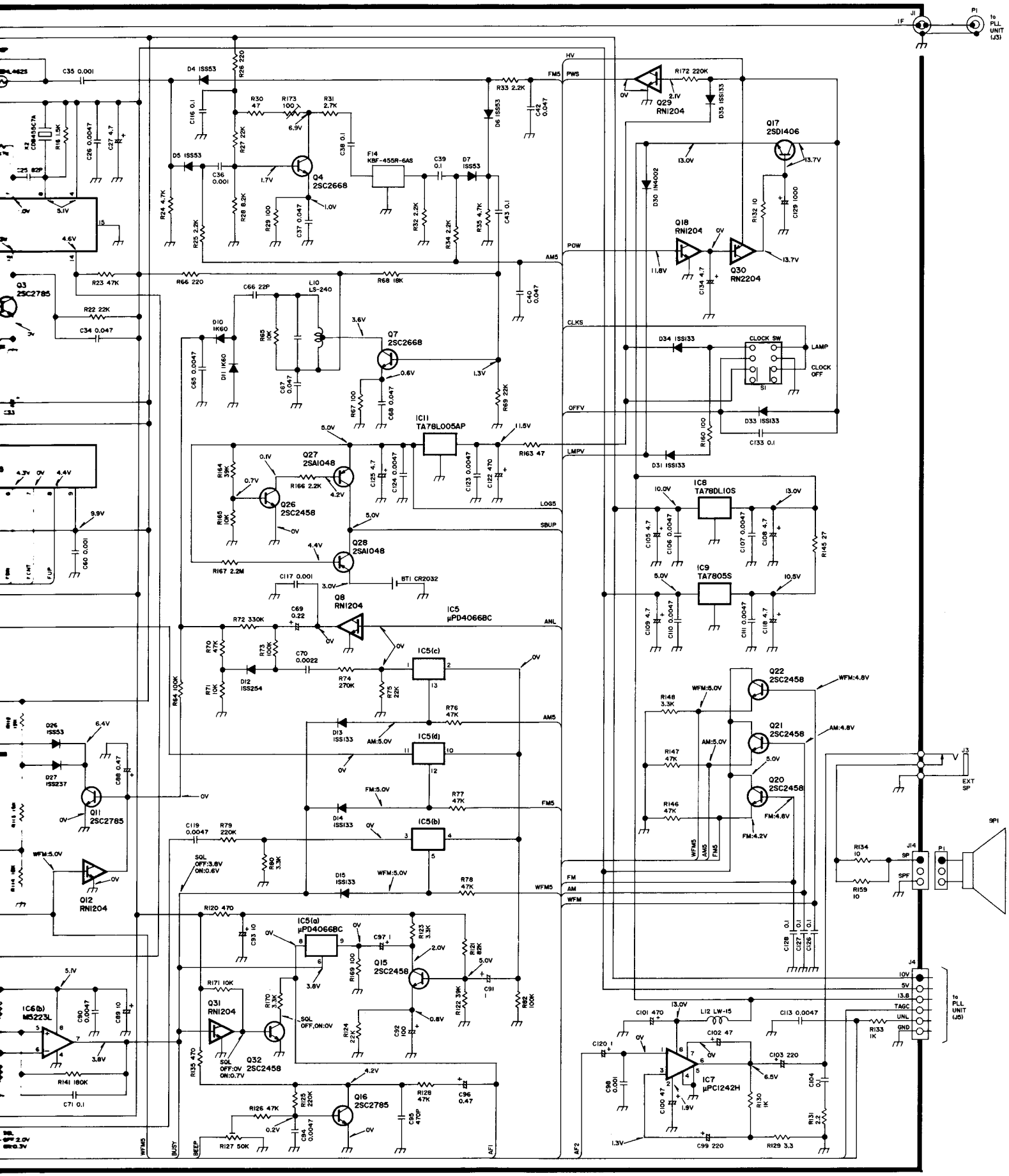

PLL UNIT
IC1 M54562P
IC2 MC-5156
IC3 MB1501PF -G-BND
IC4 μPC1676G
IC5 BA6161M
IC6 μPC1678G
IC8 μPC1678G
IC9 CB346M18
IC10 μPC1678G
IC11 LA7910
Q1 2SC2714
Q2 2SC2712
Q3 2SK209
Q5 RN1404
Q6 2SC2714
Q8 2SA1362
Q9 RN1404
Q15 2SC2714
Q16 2SC3772
Q17 RN1404
EP2
F1 0.100~ 1.6290MHz
F2 1.630~ 32.7490MHz
F3 32.750~ 49.9990MHz
F4 50.000~ 95.7490MHz
F5 95.750~ 221.7490MHz
F6 221.750~475.7490MHz
F7 475.750~904.9990MHz
F8 905.000~997.4875MHz
F9 997.500~1380.4875MHz
F10 1380.500~1656.0000MHz
LOCK (TS 20KHz)
100μsec
4.7Vp-p
LOCK:4.0V (SQL OPEN)
UNLOCK: LESS THAN 1.5V



IC10(a)

	A	B	C
1KHz	2.6V	0.7V	3.1V
2KHz	2.8V	0.8V	3.4V
3KHz	3.2V	0.9V	3.8V
4KHz	3.5V	0.9V	4.2V
5KHz	3.8V	1.0V	4.6V
6KHz	1.1V	0.3V	1.4V
7KHz	1.4V	0.4V	1.7V
8KHz	1.7V	0.4V	2.0V
9KHz	2.0V	0.5V	2.4V
0KHz	2.4V	0.6V	2.8V


Q2 3SK74
F12 FL-114
F13 KBF-455R-15A
IC1 MC3357P
IC2 BA695
IC5 μPD4066BC
IC6(a) M5223L
IC6(b) M5223L
IC10(b) M5223L
IC5(a) μPD4066BC
Q3 2SC2785
Q4 2SC2663
Q5 2SC2785
Q6 2SC2785
Q10 RN1204
Q11 2SC2785
Q12 RN1204
Q13 RN2204
Q19 RN1204
Q23 RN1204
Q24 2SC2458
Q25 2SJ105
Q26 2SC2458
Q27 2SA1048
Q31 RN1204
Q32 2SC2458
D3 ISS237
D4 ISS53
D5 ISS53
D10 1K60
D11 1K60
D12 ISS254
D17 ISS237
D18 ISS237
D20 ISS133
D21 ISS133
D22 ISS133
D25 ISS53
D26 ISS53
D27 ISS237
D28 ISS133
D29 ISS133
X1 CR-114
X2 CSB455C7A
X4 CDA10.7MC4A-A
AM,WFM:0.1V FM:0V
AM,WFM:3.6V FM:0V
AM,FM:3.6V WFM:0V
AM,FM,WFM:0V
WFM:4.2V
WFM:5.0V
SQL OFF:4.0V ON:0V
SQL OFF:0V ON:2.2V
SQL OFF:0.4V ON:3.6V
SQL OFF:3.8V ON:0.6V
SQL OFF:2.0V ON:0.3V
SQL OFF:0V ON:0.7V
SQL OFF,ON:0V
FDN
FCNT
FUP
FM5
AM5
SM
SSQ
UNL
WFM5
BUSY
BEEP
IN UNIT


J1
IF
P1
to PLL UNIT (J5)
HV
FM5
PWS
POW
AM5
CLKS
OFFV
LMPV
LOGS
SBUP
ANL
FM
AM
WFM
WFM5
BUSY
BEEP
AFI
AF2
IC11 TA78L005AP
IC8 TA78DL10S
IC9 TA7805S
IC5 μPD40668C
IC5(a) μPD40668C
IC5(b)
IC5(c)
IC5(d)
IC6(b) M5223L
IC7 μPC1242H
Q3 2SC2785
Q4 2SC2668
Q5 2SC2458
Q7 2SC2668
Q8 RN1204
Q11 2SC2785
Q12 RN1204
Q16 2SC2785
Q17 2SD1406
Q18 RN1204
Q20 2SC2458
Q21 2SC2458
Q22 2SC2458
Q26 2SC2458
Q27 2SA1048
Q28 2SA1048
Q29 RN1204
Q30 RN2204
Q31 RN1204
Q32 2SC2458
D4 ISS53
D5 ISS53
D6 ISS53
D7 ISS53
D10 1K60
D11 1K60
D12 ISS254
D13 ISS133
D14 ISS133
D15 ISS133
D26 ISS53
D27 ISS237
D30 IN4002
D31 ISS133
D33 ISS133
D34 ISS133
D35 ISS133
F14 KBF-455R-6AS
L10 LS-240
L12 LW-15
BT1 CR2032
CLOCK SW
CLOCK OFF
LAMP
S1
J3
EXT SP
J4
10V
5V
13.8
TAGC
UNL
GND
J14
SP
SPF
SP1

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