



# SERVICE MANUAL

VHF PRIVATE MOBILE RADIO

**IC-F1010**

VHF LAND MOBILE RADIO

**IC-F1020**

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## INTRODUCTION

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This service manual describes the latest service information for the **IC-F1010** VHF PRIVATE MOBILE RADIO and **IC-F1020** VHF LAND MOBILE RADIO at the time of publication.

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

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## DANGER

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

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

**DO NOT** reverse the polarities of the power supply when connecting the transceiver.

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



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## ORDERING PARTS

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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>**

1110003570 S.IC MC3372 IC-F1010 MAIN UNIT 5 pieces  
8810008660 Screw BT M3 x 8 NI-ZU IC-F1010 Bottom cover 10 pieces

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

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## REPAIR NOTES

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1. Make sure a problem is internal before disassembling the transceiver.
2. **DO NOT** open the transceiver until the transceiver 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 transceiver is defective.
6. **DO NOT** transmit power into a signal generator or a sweep generator.
7. **ALWAYS** connect a 40 dB to 50 dB attenuator between the transceiver and a deviation meter or spectrum analyzer when using such test equipment.
8. **READ** the instructions of test equipment thoroughly before connecting equipment to the transceiver.

# SECTION 1 SPECIFICATIONS

		IC-F1010	IC-F1020
GENERAL	Frequency coverage	136–155 MHz (L-band) 146–174 MHz (H-band)	136–155 MHz (L-band) 146–174 MHz (H-band)
	Mode	16K0F3E (Wide-type) 8K50F3E (Narrow-type)	16K0F3E
	Number of channels	32 (standard), 160 (with optional EX-1761)	32 (standard), 160 (with optional EX-1761)
	Channel spacing	25 kHz (Wide-type), 12.5 kHz (Narrow-type) (PLL step: 5 kHz and 6.25 kHz)	30 kHz, 25 kHz (PLL step: 5 kHz and 6.25 kHz)
	Antenna impedance	50 Ω (nominal)	50 Ω (nominal)
	Usable temperature range	-25 °C to +55 °C	-30 °C to +60 °C (-22 °F to +140 °F)
	Power supply requirement	13.2 V DC (negative ground)	13.6 V DC (negative ground)
	Current drain	Receive standby: 700 mA max. audio: 1.2 A Transmit high 7.0 A	Receive standby: 700 mA max. audio: 1.2 A Transmit high 15.0 A
	Dimensions	150(W) × 50(H) × 180(D) mm; 5 <sup>29</sup> / <sub>32</sub> (W) × 1 <sup>31</sup> / <sub>32</sub> (H) × 7 <sup>3</sup> / <sub>32</sub> (D) in	
	Weight	1.5 kg	1.5 kg; (3 lb 5 oz)
RECEIVER	Measurement method	ETS 300 086 or CEPT T/R24	EIA/TIA-204D
	Sensitivity	-2 dB μ (emf) for 20 dB SINAD	0.20 μV (pd) typ. for 12 dB SINAD
	Receive system	Double conversion superheterodyne	Double conversion superheterodyne
	Intermediate frequencies	1st: 21.8 MHz      2nd: 455 kHz	1st: 21.8 MHz      2nd: 455 kHz
	Adjacent channel selectivity	70 dB (Wide-type) 60 dB (Narrow-type)	75 dB
	Spurious response rejection	70 dB	80 dB
	Intermodulation rejection	65 dB	70 dB
	Audio frequency response	-3 dB to +1 dB in a 6 dB/octave range with 300 Hz to 3000 Hz modulation (wide) 300 Hz to 2550 Hz modulation (narrow)	-3 dB to +1 dB in a 6 dB/octave range with 300 Hz to 3000 Hz modulation
	Ham and noise	40 dB	45 dB
	Modulation acceptance	---	±7 kHz
	Audio output power	4 W typ. at 5 % distortion with a 4 Ω load.	4 W typ. at 5 % distortion with a 4 Ω load.
	Squelch threshold sensitivity	-6 dB μ (emf)	0.21 μV (pd)
TRANSMITTER	Measurement method	ETS 300 086 or CEPT T/R24	EIA/TIA-152C
	RF output power	25 W (#01–#04), 10 W (#05, #06) and 2 programmable low power levels	45 W and 2 programmable low power levels
	Modulation system	Variable reactance frequency modulation	Variable reactance frequency modulation
	Max. frequency deviation	±5 kHz (Wide-type), ±2.5 kHz (Narrow-type)	±5 kHz
	Spurious emissions	0.25 μW	-80 dB
	Frequency tolerance	±1.5 kHz	±0.0005%
	Adjacent channel power	-70 dB (Wide-type), -60 dB (Narrow-type)	---
	Audio frequency response	-3 dB to +1 dB in a 6 dB/octave range with 300 Hz to 3000 Hz input (wide) 300 Hz to 2550 Hz input (narrow)	-3 dB to +1 dB in a 6 dB/octave range with 300 Hz to 3000 Hz input
	Ham and noise	40 dB	45 dB
	Audio harmonic distortion	5%	5%
Limiting of modulator	70 % to 100 % deviaton	70 % to 100 % deviaton	

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

## EXPLICIT DEFINITIONS

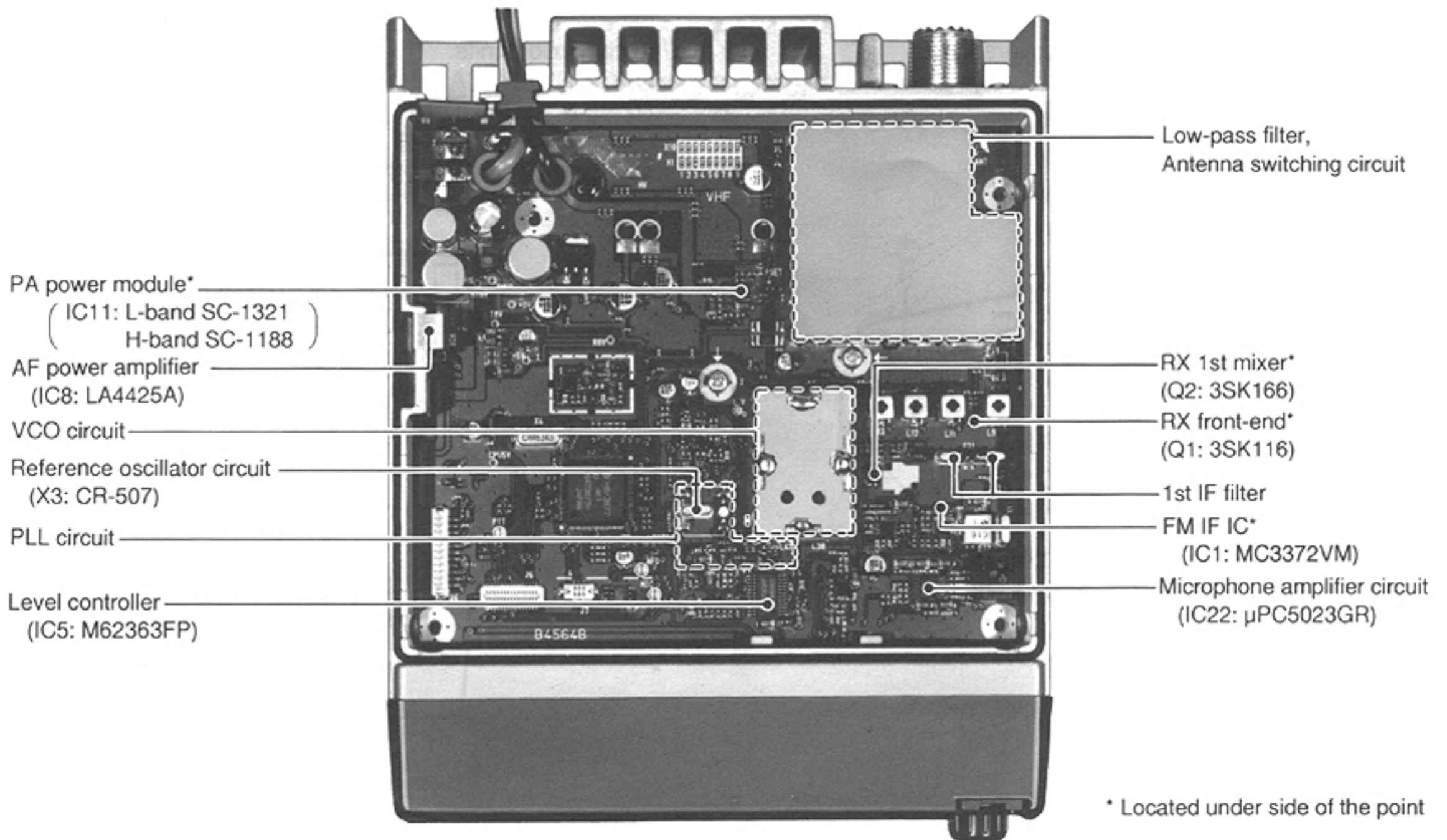
Model	Version number	Frequency coverage	Channel spacing	Power
IC-F1010 [PMR]	#01	L-band, 136 –155 MHz	12.5 kHz	25 W
	#02	L-band, 136 –155 MHz	25 kHz	25 W
	#03	H-band, 146 –174 MHz	12.5 kHz	25 W
	#04	H-band, 146 –174 MHz	25 kHz	25 W
	#05	H-band, 146 –174 MHz	12.5 kHz	10 W
	#06	H-band, 146 –174 MHz	25 kHz	10 W
IC-F1020 [LMR]	#01	L-band, 136 –155 MHz	30 kHz	45 W
	#02	H-band, 146 –174 MHz	30 kHz	45 W

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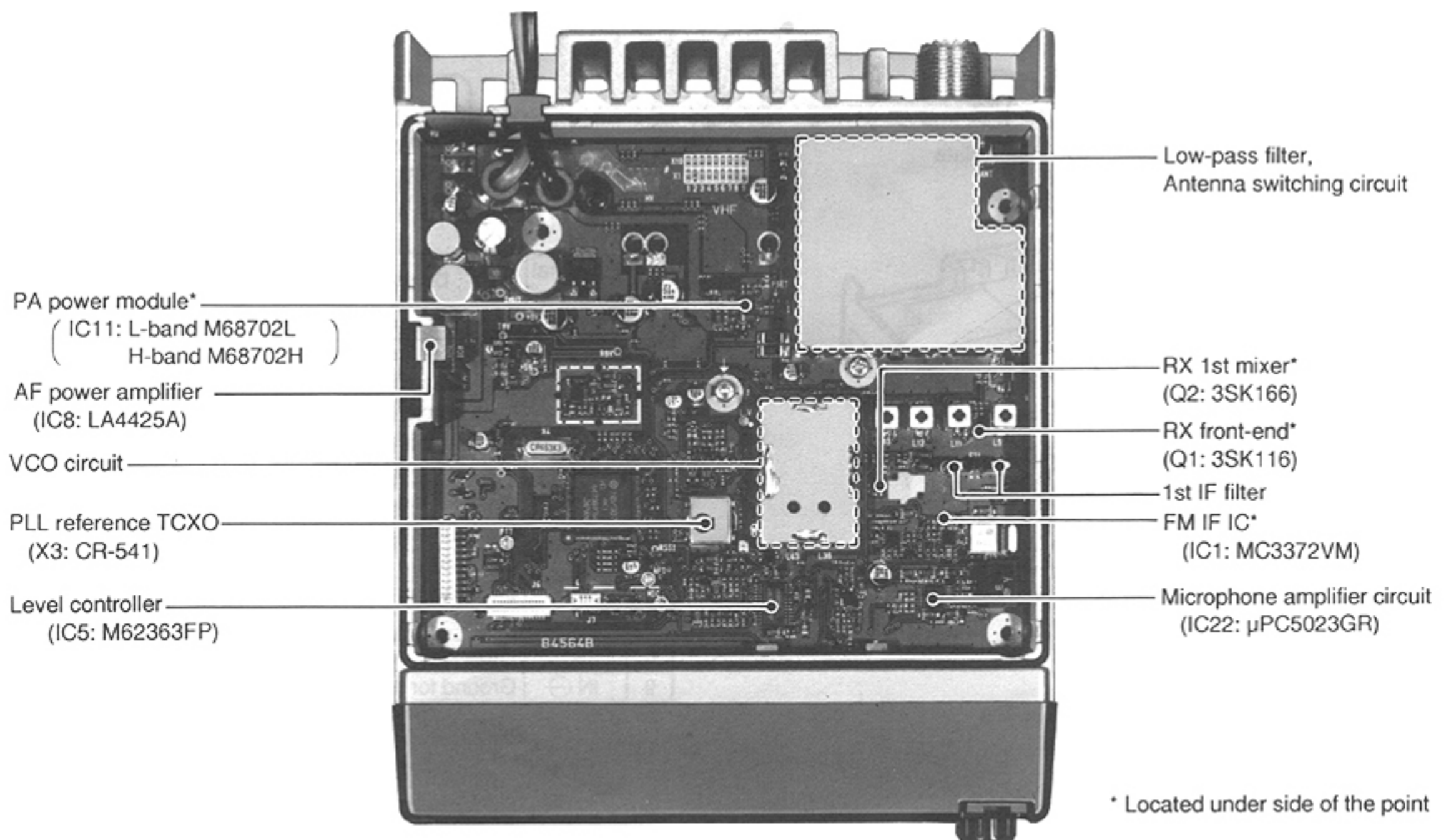
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## SECTION 2 INSIDE VIEWS

### ● IC-F1010



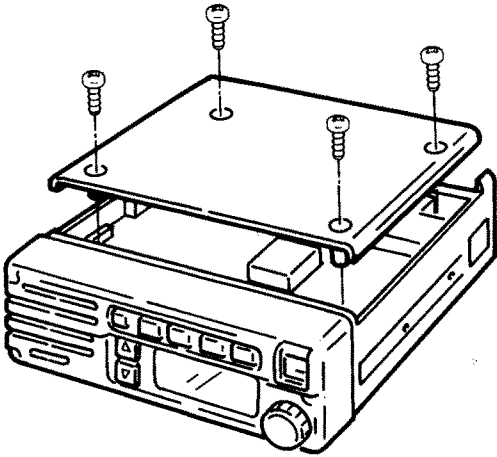
### ● IC-F1020



# SECTION 3 OPTION INSTALLATIONS

## • Opening covers

Remove 4 screws from bottom covers.



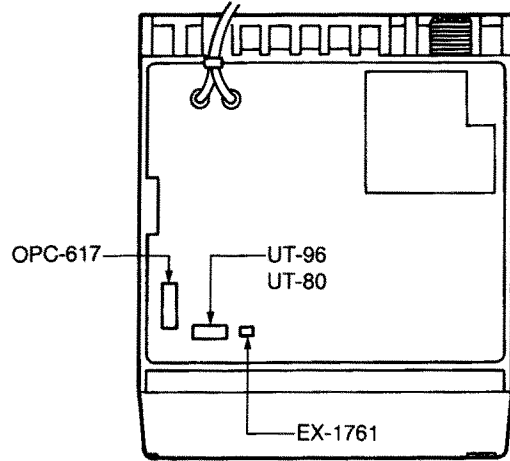
## • Installation location

Install option units.

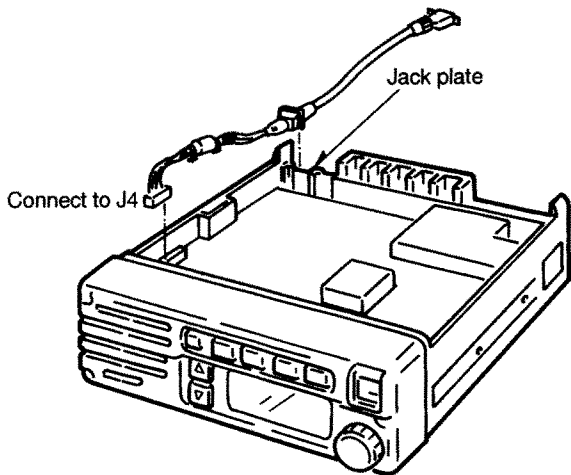
OPC-617 ACC CABLE: J4

UT-96 5-TONE UNIT  
or UT-80 2-TONE UNIT } J6

EX-1761 MEMORY EXPANSION UNIT: J7

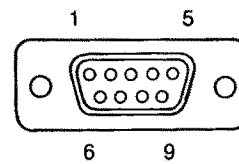


## • OPC-617 connection



Break the jack plate using cutting pliers to connect the OPC-617.

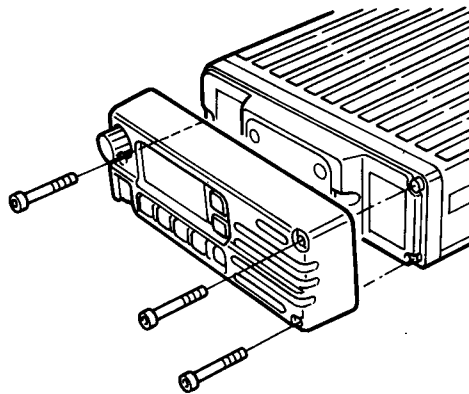
## PIN ASSIGNMENT



Pin No.	Terminal name	Description	Specification
1	DIM	Backlight control input	+5 to +30 V for dark
2	PAAF	AF output for public address and Ext SP functions	0 to 330 mV rms/ 47 kΩ
3	DISC	AF output for a terminal unit	330 mV rms/100 kΩ
4	IN	AF input for a terminal unit	330 mV rms/1200 bps
5	PTT	PTT control input	0 V for transmit
6	HORN	Grounded when receiving the specified call	Less than 50 mA when grounded
7	PAAF ⊖	Ground for PAAF	—
8	DISC ⊖	Ground for terminal output	—
9	IN ⊖	Ground for terminal input	—

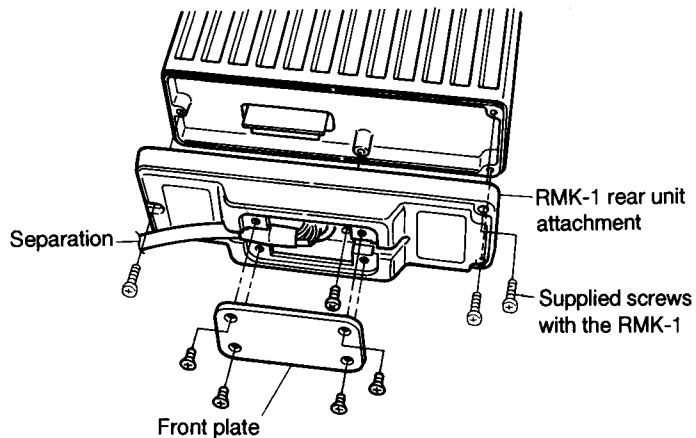
● **RMK-1 connection**

- ① Remove 3 allen-socket bolts from the front plate using an allen-wrench (1/32 in).
- ② Separate the front unit from the transceiver main unit.



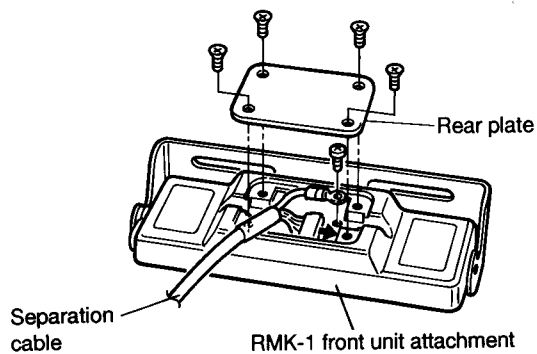
- ③ Attach the 'RMK-1 rear unit attachment' to the transceiver main unit using the supplied screws.
- ④ Remove 4 screws from the attachment to open the rear plate.
- ⑤ Connect one of three following optional separation cables to the inside of the rear plate and tighten the cable lug using the screw.
 

OPC-607 (3 m)	} Not permitted for European countries
OPC-608 (8 m)	
OPC-609 (1.9 m)	

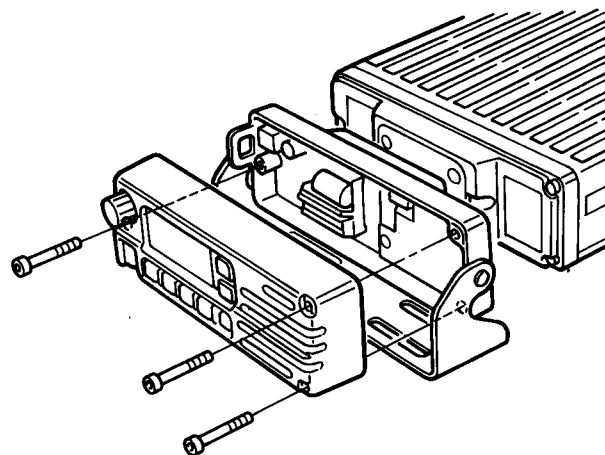


- ⑥ Re-attach the rear plate.

- ⑦ Remove 4 screws from the 'RMK-1 front unit attachment' to open the rear plate.
- ⑧ Connect the other end of the optional separation cable to the attachment and tighten the cable lug using the screw.
- ⑨ Re-attach the rear plate.



- ⑩ Attach the front unit and attachment with the 3 removed allen-socket bolts.



## SECTION 4 CIRCUIT DESCRIPTION

### 4-1 RECEIVER CIRCUITS

#### 4-1-1 ANTENNA SWITCHING CIRCUIT

The antenna switching circuit functions as a low-pass filter while receiving and a resonator circuit while transmitting. The circuit does not allow transmit signals to enter receiver circuits.

Received signals enter the antenna connector (J1) and pass through the low-pass filter. The filtered signals are passed through the  $\lambda/4$  type antenna switching circuit (D4–D6) and apply the RF circuit.

#### 4-1-2 RF AND 1ST MIXER CIRCUITS

The 1st mixer circuit converts the received signal to fixed frequency of the 1st IF signal with the PLL output frequency. By changing the PLL frequency, only the desired frequency will be passed through a pair of crystal filters at the next stage of the 1st mixer.

The signals from the antenna switching circuit are passed through the tunable bandpass filter (D8, L9) and amplified at the RF amplifier (Q1). The amplified signals are again passed through the tunable bandpass filter (D9, D11, L11, L13) and applied to the 1st mixer.

The filtered signals are mixed at the 1st mixer (Q2) with the 1st LO signal coming from the Rx VCO circuit to produce 1st IF signal. The 1st IF signal is passed through the matching circuit (L15, L52) and the pair of crystal filters (F11). The filtered signal is amplified at the 1st IF amplifier (Q4) and applied to the 2nd IF circuit.

#### 4-1-3 2ND IF AND DEMODULATOR CIRCUITS

The 2nd mixer circuit converts the 1st IF signal to a 2nd IF signal. A double-conversion superheterodyne system improves the image rejection ratio and obtains stable receiver gain.

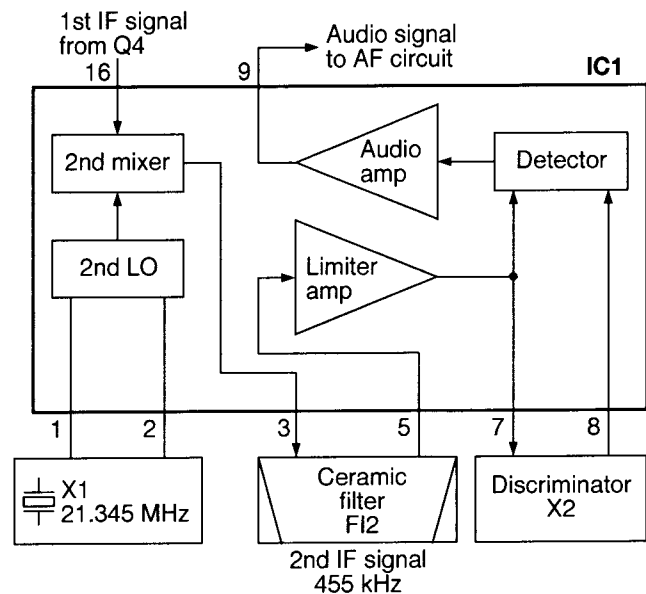
The 1st IF signal from Q4 is applied to the 2nd mixer section of IC1 (pin 16) and is then mixed with the 2nd LO signal for conversion to 455 kHz 2nd IF signal.

IC1 contains the 2nd mixer, 2nd local oscillator, limiter amplifier, quadrature detector and audio amplifier. The local oscillator section generates 21.345 MHz using X1.

The 2nd IF signal from the 2nd mixer (IC1 pin 3) passes through the ceramic filter (F12) to suppress unwanted heterodyned frequency signals. It is then amplified at the limiter amplifier section (IC1 pin 5) and applied to the quadrature detector section (IC1 pins 7, 8 and X2) to demodulate the 2nd IF signal into AF signals.

The AF signals are output from IC1 (pin 9) and are then applied to the AF circuit.

#### • 2ND IF AND DEMODULATOR CIRCUITS



#### 4-1-4 AF CIRCUIT

AF signals from IC1 (pin 9) are amplified at the AF amplifier (IC2) and are then applied to IC3. IC3a/b are high-pass filters whose characteristics are controlled by the "HFSW" line. When "HFSW" is "High," the cut off frequency is shifted higher to remove CTCSS or DTCS signals.

The filtered signals from IC3 (pin 1) are passed through the de-emphasis circuit (R68, C74) with frequency characteristics of  $-6$  dB/octave, and are then applied to the electronic volume controller (IC7) via the AF mute switch (Q6).

Output signals from IC7 (pin 9) are applied to the AF power amplifier (IC8) to drive the speaker.

#### 4-1-5 RECEIVE MUTE CIRCUITS

##### • NOISE SQUELCH

A squelch circuit cuts out AF signals when no RF signal is received. By detecting noise components in the AF signals, the squelch circuit switches the AF mute switch.

A portion of the AF signals from IC1 (pin 9) are applied to the active filter in IC1 (pin 10). Noise components about 10 kHz are amplified and output from pin 11.

The noise signals from IC1 (pin 11) are passed through a level controller (IC5 pins 21, 22), and are then converted to the pulse signal (NOIS) at Q9 and Q10.

The "NOIS" signal from Q10 is applied to the CPU (IC20 pin 19). Then the CPU analyzes the noise condition and controls the "AMUT" and "SP" ports to cut off the AF signal using AF switches (Q6, Q7).



• **CTCSS AND DTCS**

A portion of the AF signals from the AF amplifier (IC2) pass through the low-pass filters (IC4a/b) and are then amplified at the tone amplifier (IC28a). The signals are applied to the CTCSS decoder inside the CPU (IC20 pin 98) to control the "AMUT" and "SP" ports.

When the DTCS system is in use, the amplified signals are converted into digital signals at IC28b, then applied to the DTCS decoder inside the CPU (IC20 pin 23).

The "LFSW" port (IC20 pin 62) controls the LPF (IC4a) characteristics to shift the cut-off frequency for CTCSS and DTCS separately.

**4-2 TRANSMITTER CIRCUITS**

**4-2-1 MICROPHONE AMPLIFIER CIRCUIT**

The microphone amplifier circuit amplifies the audio signals with +6 dB/octave pre-emphasis characteristics from the microphone to a level needed for the modulation circuit.

AF signals (MIC) from the FRONT unit via J5 (pin 10) are applied to the audio switch (IC25). While transmitting, the MCON signal from the CPU is "High" and the AF signals pass to the microphone amplifier circuit.

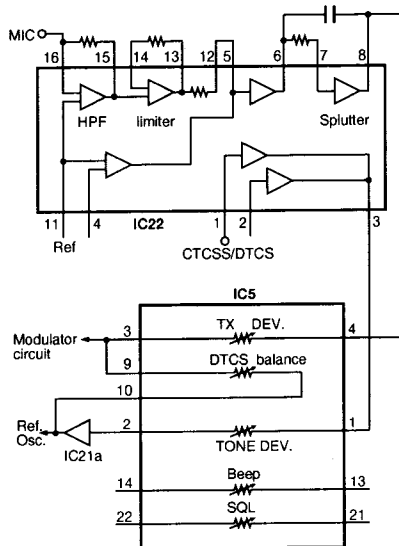
The AF signals from IC25 are applied to the microphone amplifier IC (IC22) via the preamplifier (IC21b). The amplified signals are applied to the limiter amplifier in IC22.

The entered signals (IC22 pin 16) are pre-emphasized with +6 dB/octave at a limiter amplifier, then passed through a splutter filter. The output signals from pin 8 pass through the level controller (IC5 pins 4, 3) and are then applied to the modulation circuit (D23, D46) via Q52.

**4-2-2 MODULATION CIRCUIT**

The modulation circuit modulates the VCO oscillating signal (RF signal) using the microphone AF signals.

• **MICROPHONE AMPLIFIER CIRCUIT**



The AF signals from Q52 change the reactance of D23 and D46 to modulate the oscillated signal at the Tx VCO circuit (Q23). The modulated signal is amplified at the buffer amplifiers (Q19, Q20) and is then applied to the drive amplifier circuit.

The CTCSS/DTCS signals from IC5 (pin 2) are amplified at IC21a, and are applied to the reference oscillator circuit (Q34, X3, D14 for IC-F1010 or X3; IC29 for IC-F1020) to modulate the oscillated signal.

**4-2-3 DRIVE/POWER AMPLIFIER CIRCUITS**

The signal from the buffer amplifier (Q20) is passed through the Tx/Rx switching circuit (D17), and amplified by the driver (Q15-Q17) and the power module (IC11) to obtain 25 W (IC-F1010) or 45 W (IC-F1020) of RF power.

The amplified signal is passed through the antenna switching circuit (D4), low-pass filter and APC detector, and is then applied to the antenna connector.

The collector voltages for drivers (Q15, Q16 for IC-F1010; Q16 only for IC-F1020) come from the MT8V regulator (Q38). The transmit mute switch (Q39) controls the regulator when transmit mute is necessary.

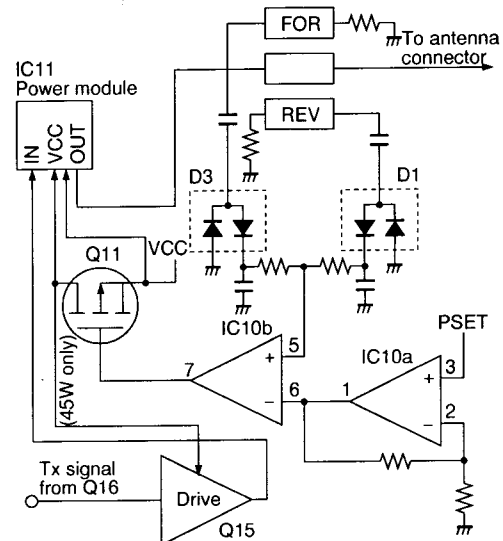
**4-2-4 APC CIRCUIT**

The APC circuit protects the power module (IC11) from a mismatched output load and stabilizes the output power.

The APC detector circuit detects forward signals and reflection signals at D3 and D1 respectively. The combined voltage is at a minimum level when the antenna impedance is matched at 50 Ω and is increased when it is mismatched.

The detected voltage is applied to the inverse amplifier (IC10b pin 5), and the power setting voltage (PSET) is applied to the other input (IC10b pin 6) via the amplifier (IC10a). When antenna impedance is mismatched, the detected voltage exceeds the power setting voltage. Then the output voltage of the inverse amplifier (IC10b pin 7) controls the input current of the power module (IC11) (and Q15 for IC-F1020) to decrease the output power.

• **APC CIRCUIT**



## 4-3 PLL CIRCUITS

### 4-3-1 PLL CIRCUIT

A PLL circuit provides stable oscillation of the transmit frequency and the receive 1st LO frequency. The PLL circuit consists of the PLL IC (IC12), charge pump and loop filter and employs a pulse swallow counter.

Signals from the VCO through buffer amplifiers (Q19, Q18) are prescaled in the PLL IC (IC12) based on the divided ratio (N-data). The PLL IC detects the out-of-step phase using the reference frequency and outputs it from pin 6. The output signal is passed through the charge pump (Q30–Q33) and loop filters (R154/C181, R153/C179), and is then applied to the VCO circuit as the lock voltage.

The accelerator switch (IC13a/b) selects the effective loop filter to accelerate the lock up speed.

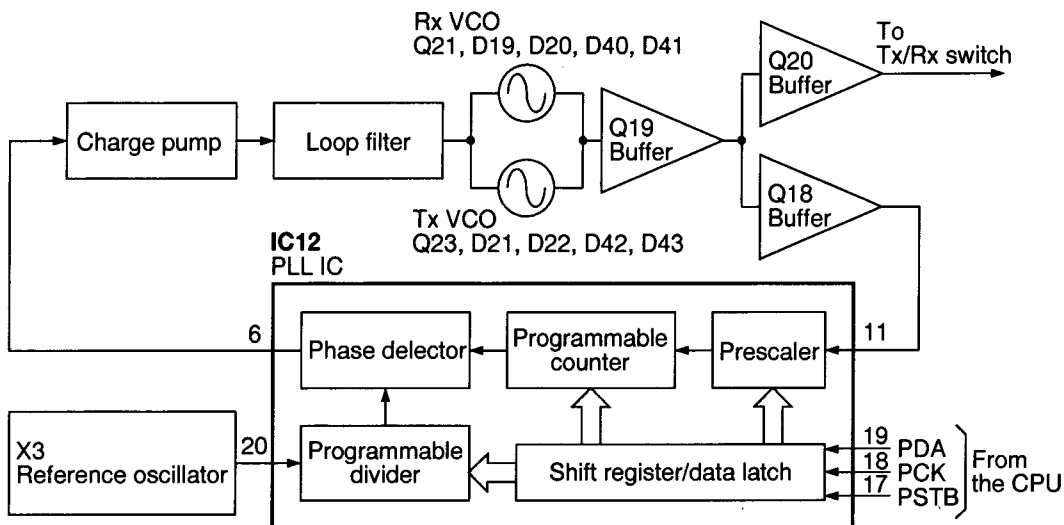
The lock voltage is also used for the receiver tunable bandpass filters to match the filter's center frequency to the desired receive frequency. The lock voltage is amplified at the buffer amplifier (Q29) and is then applied to the bandpass filters (D8–D11).

### 4-3-2 VCO CIRCUIT

The VCO circuit contains a separate Rx VCO (Q21, D19, D20, D40, D41) and Tx VCO (Q23, D21, D22, D42, D43). The oscillated signal is amplified at the buffer amplifiers (Q19, Q20) and is then applied to the Tx/Rx switching circuit (D17, D18). Then the Rx signal is applied to the 1st mixer (Q2) via the amplifier (Q3) and the Tx signal to the driver (Q17).

A portion of the signal from Q19 is amplified at the buffer amplifier (Q18) and is then fed back to the PLL IC (IC12 pin 11) as the comparison signal.

#### • PLL CIRCUIT BLOCK DIAGRAM



## 4-4 POWER SUPPLY CIRCUITS

### 4-4-1 VOLTAGE LINES

LINE	DESCRIPTION
HV	The voltage from the external power connector.
VCC	The same voltage as the HV line which is controlled by "PWON" signal from the CPU (IC20 pin 67) using a switching FET (Q12).
CPU5V	Common 5 V converted from the HV line at the 5 V regulator IC (IC17). This voltage is supplied to the CPU regardless of the power switch.
+5V	Common 5 V converted from the VCC line at Q42, Q43 and D30 using the CPU5V line as the reference voltage.
+8V	Common 8 V converted from the VCC line at IC16.
R8V	Receive 8 V controlled by "VRX" signal from the CPU (IC20 pin 66). This voltage is converted from the VCC line at Q36 and D27 using the +8V line as the reference voltage.
T8V	Transmit 8 V controlled by "VTX" signal from the CPU (IC20 pin 65). This voltage is converted from the VCC line at Q40 and D29 using the +8V line as the reference voltage.
MT8V	Transmit 8 V controlled by "TMUT" signal from the CPU (IC20 pin 60). This voltage is converted from the VCC line at Q38 and D28 using the +8V line as the reference voltage.

## 4-5 PORT ALLOCATIONS

### 4-5-1 CPU (IC20)

PIN No.	PORT NAME	DESCRIPTION
1	AFV	Input port for the volume control.
11	SHIFT	Output port for the CPU clock shift signal.
12	SCK	Used for C-bus line to an optional unit (J6).
13	SI	
14	SO	
16, 18	CLI	Input ports for the cloning data.
17	CLO	Output port for the cloning data.
19	NOIS	Noise pulse input port for the squelch control.
20	CIRQ	Used for C-bus line to an optional unit (J6).
21	POSW	Input port for the power switch. LOW: Power switch is pressed.
22	CCS	Used for C-bus line to an optional unit (J6).
23	DDEC	Input port for DTCS decoding.
32-35	CTN3-0	Output ports for CTCSS/DTCS encoder signals.
36	PTTO	Output port for the PTT control signal. LOW: Tx
38	DECO	Output port for CTCSS/DTCS tone matched signal.
39	PTTI	Input port for the PTT control signal from PTTO port.
40, 41	VER1, VER2	Reserved for initial settings.
42	ECK	Outputs clock signals to EEPROMs.
43	ESI	Serial data input port for EEPROMs.
44	ESO	Outputs serial data to EEPROMs.
45, 46	ECS1, ECS2	Output ports for chip select signals. ESC1: EEPROM (IC27), ESC2: Optional EEPROM (J7)
47	PDA	Outputs serial data to the PLL IC (IC12).
48	PCK	Outputs clock signals to the PLL IC (IC12).
49	UNLK	Input port for the PLL unlock signal. HIGH: PLL unlock
50	PSTB	Outputs a strobe signal to the PLL IC (IC12).
51	PLLT	Output port for a PLL acceleration signal.
53	DDA	Outputs serial data to the level controller (IC5).
54	DCK	Outputs clock signals to the level controller (IC5).
55	DSTB	Outputs a strobe signal to the level controller (IC5).
56	PASP	Output port for a "public-address" mute. HIGH: PA and Ext SP functions are not used.
57	SP	Output port for the audio mute signal (incl. beep). HIGH: Mute
58	HFSW	Outputs a selecting signal of RX HPF characteristics. HIGH: Filters out CTCSS freq.

PIN No.	PORT NAME	DESCRIPTION
59	PA	Outputs a mic audio selector signal. HIGH: "Public-address" function is ON.
60	TMUT	Outputs Tx mute signal. HIGH: Tx mute
61	HORN	Outputs an external device control signal. "HIGH" for the period of the EXO timer when receiving a matched 2- or 5-Tone code.
64	DIM	Input port for an external dimmer control signal. LOW: LCD backlight is dimmed.
65	VTX	Outputs Tx switching signal. During Tx: LOW
66	VRX	Outputs Rx switching signal. During Rx: LOW
67	PWON	Output port for the power control. HIGH to turn ON the power
79	MCON	Output port for MIC mute control. LOW: MIC mute
80	AMUT	Output port for Rx AF mute control. HIGH: Rx AF mute
81	MMUT	Input port for MIC mute signal from an optional unit (J6). LOW: MIC mute
82	RMUT	Input port for AF mute signal from the optional unit. LOW: AF mute
83	AUX	Reserved for input from an optional unit (J6).
84	BUSY	Output port for BUSY signal to an optional unit (J6).
85	AFON	Input port for the AF amplifier ON signal from an optional unit (J6).
86-88	OPT1-3	I/O port for an option unit (J6).
90	BEEP	Output port for the beep signal (sine wave).
91	DTMF	Output port for the DTMF signal (dual tone).
94-96	OPV3-1	Input ports for the option connector state (J6).
97	THRM	Input port for the transceiver's internal temperature.
99	RSSI	Input port for Rx signal strength level.

# SECTION 5 ADJUSTMENT PROCEDURES

## 5-1 INITIAL SET MODE

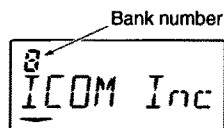
The following items can be adjusted via *Initial Set Mode* without opening the transceiver's case.

### ■ ENTERING INITIAL SET MODE

① Turn the transceiver power OFF.

② While pushing  $\triangle$  and  $\nabla$ , turn power ON

- Bank number appears regardless of the channel separation type, 'bank' or 'free.'



③ Push  $P_0$  to cycle through the initial set mode items.

**NOTE:** Initial Set Mode access can be inhibited through PC programming. In such cases,  $P_0$  cannot be used and only 'DISPLAY' setting can be done. Ask your Dealer or Icom Service Center for PC programming.

### ■ SELECTABLE ITEMS

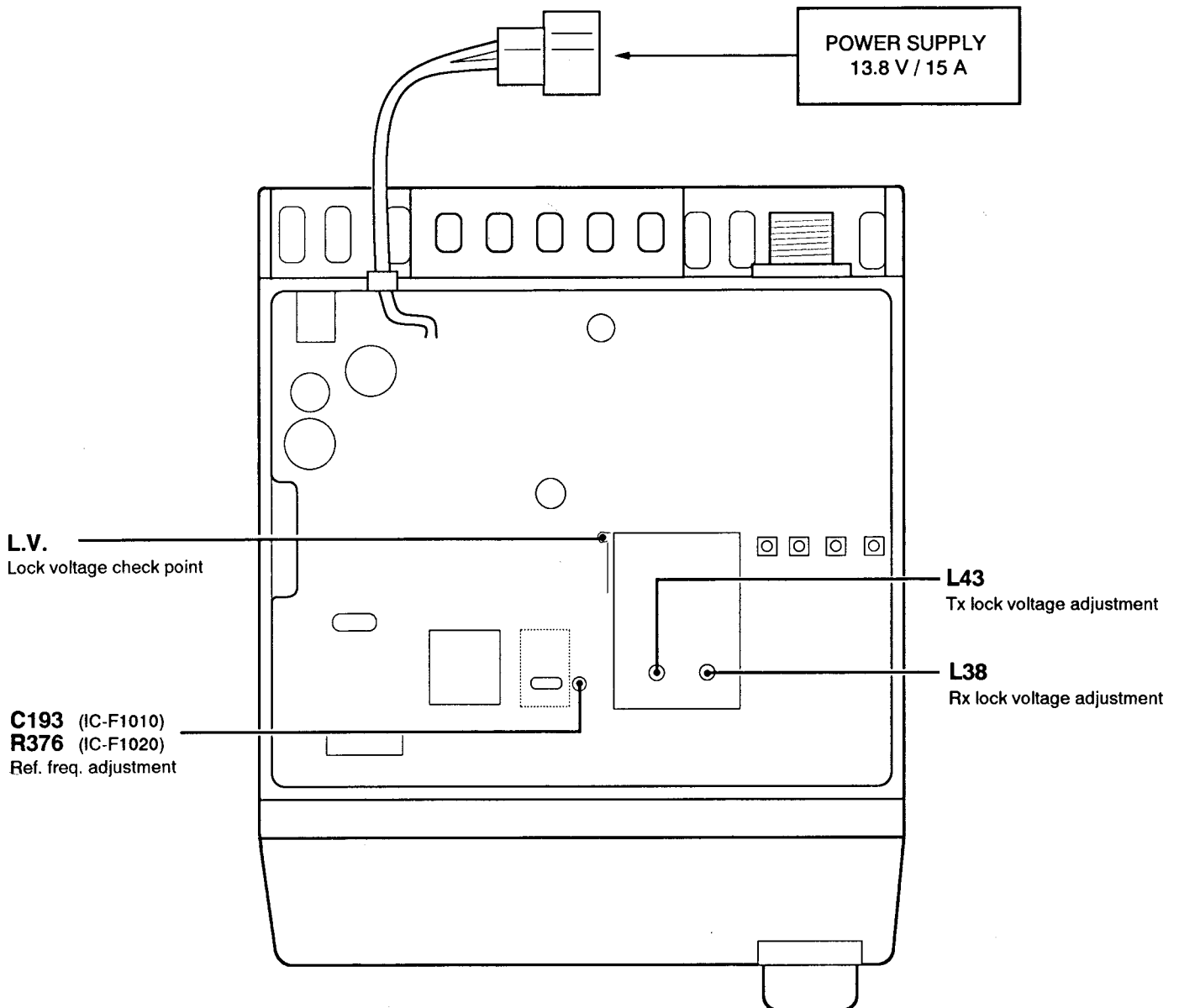
No.	ITEM	SELECTABLE CONDITIONS		
		$P_1$	$P_2$	$P_3$
1	DISPLAY	Backlight	—	Contrast
2	AF/SQUELCH	—	Squelch level	Minimum AF level
3	BEEP TONES	Link ON/OFF	Beep tones ON/OFF	Beep level
4	DEVIATION	DTCS balance	Tone deviation	Max. voice deviation
5	S-METER	Indicate the received signal level regardless of [P1] to [P3] keys		
6	TX POWER	Low 1	Low 2	High

### ■ SELECTION METHOD

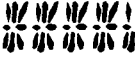
MODE No.	ITEM	METHOD	NOTE
1	Display backlight	Push $P_1$ to select 'dark' or 'bright.'	
	Display Contrast	Rotate the volume control while pushing $P_3$ .	
2	Squelch level	Rotate the volume control while pushing $P_2$ .	
	Minimum AF level	Rotate the volume control while pushing $P_3$ .	
3	Link/unlink beep tones with the volume control	Push $P_1$ to select 'link' or 'unlink.'	2 beeps: link; 1 beep: unlink
	Beep ON/OFF	Push $P_2$ to turn beep ON and OFF.	2 beeps: ON 1 beep: OFF Effective after exiting Initial Set Mode
	Maximum beep level	Rotate the volume control while pushing $P_3$ .	
4	DTCS balance	Rotate the volume control while pushing $P_1$ .	Automatic transmission while pushing the key.
	CTCSS/DTCS Tone deviation	Rotate the volume control while pushing $P_2$ .	Automatic transmission while pushing the key. Separate setting for CTCSS and DTCS depending on the programmed tone system.
	Maximum voice deviation	Rotate the volume control while pushing $P_3$ .	Automatic transmission while pushing the key.
5	S-meter level	—	Received signal level is shown in the display.
6	Transmit low power (L1)	Rotate the volume control while pushing $P_1$ .	Automatic transmission while pushing the key.
	Transmit low power (L2)	Rotate the volume control while pushing $P_2$ .	Same as above.
	Transmit high power (H)	Rotate the volume control while pushing $P_3$ .	Same as above.

## 5-2 PLL ADJUSTMENT

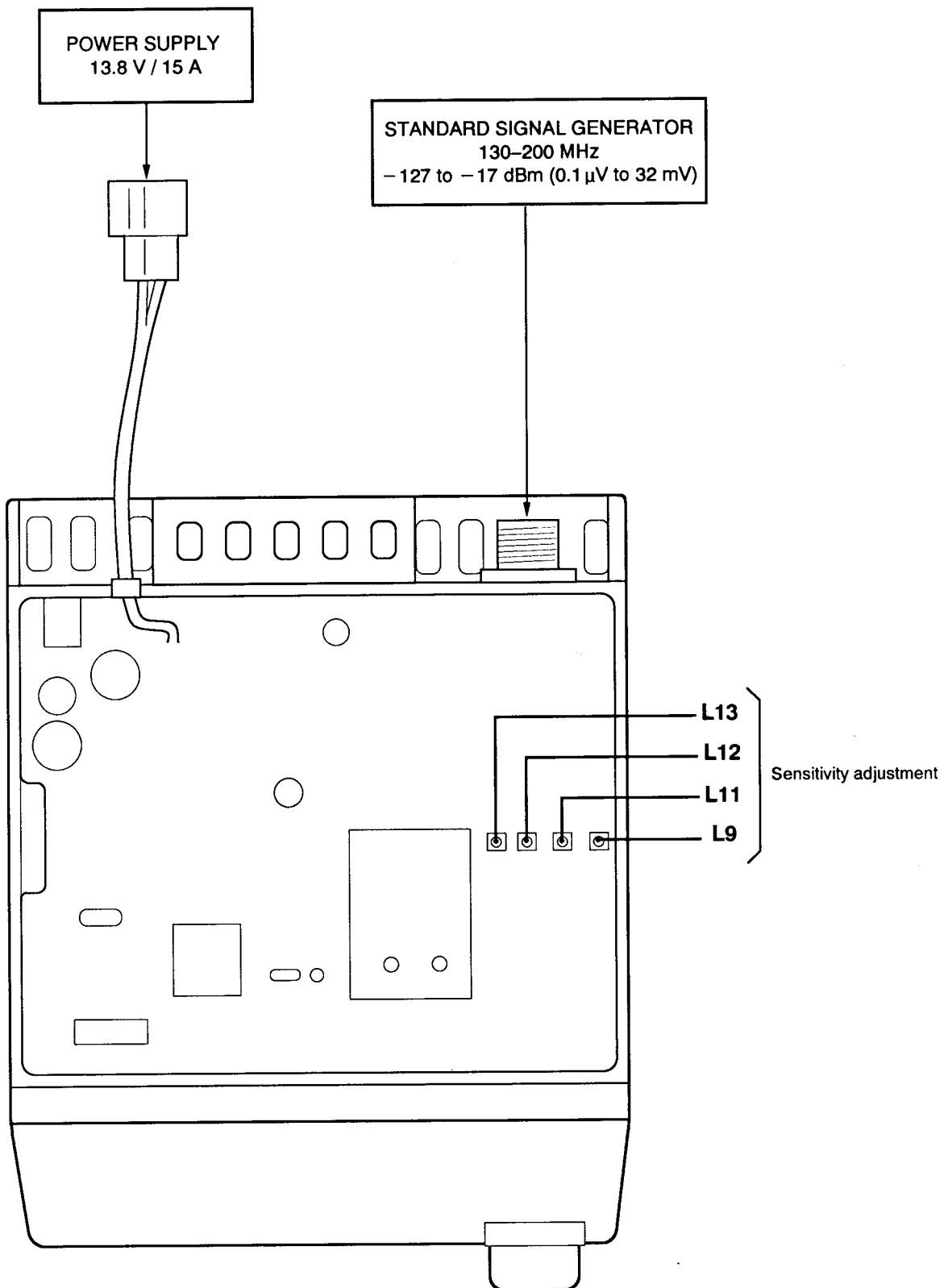
ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
PLL LOCK VOLTAGE	1 • Operating frequency : 136.000 MHz • Receiving	MAIN	Connect the digital multi-meter or oscilloscope to the check point "L.V."	3.0 V	MAIN	L38
	2 • Operating frequency : 174.000 MHz • Receiving			10-14 V		Verify
	3 • Operating frequency : 136.000 MHz • Transmitting			3.0 V		L43
	4 • Operating frequency : 174.000 MHz • Transmitting			10-14 V		Verify
PLL REFERENCE FREQUENCY	1 • Operating frequency : Any • Transmitting	MAIN	Loosely couple the frequency counter to the antenna connector.	The same frequency as programmed.	MAIN	C193 (IC-F1010) R376 (IC-F1020)



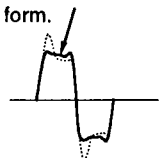
## 5-3 RECEIVER ADJUSTMENT

ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT METHOD	ADJUSTMENT	
			VALUE	METHOD
RECEIVER SENSITIVITY	1 <ul style="list-style-type: none"> <li>• Operating frequency : 136.000 MHz</li> <li>• Connect the SSG to the antenna connector and set as:                Level : 5.6 <math>\mu</math>V* ( - 92 dBm)                Modulation : OFF</li> <li>• Connect a 4 <math>\Omega</math> load to the external speaker jack.</li> <li>• Enter <i>Initial Set Mode No. 5</i>                Refer to p. 5-1 for details.</li> <li>• Receiving</li> </ul>	Number digits in the LCD 	Maximum indication	In sequence adjust L9, L11, L12, L13 on the MAIN unit
NOISE SQUELCH THRESHOLD POINT	1 <ul style="list-style-type: none"> <li>• Make sure no signal is being applied to the antenna connector.</li> <li>• Enter <i>Initial set mode No. 2</i>                Refer to p. 5-1 for details.</li> <li>• Operating frequency : Any</li> <li>• Receiving</li> </ul>	Speaker output	Audio noise just disappears.	Rotate volume control while pushing [P2].
	2 <ul style="list-style-type: none"> <li>• Connect the SSG to the antenna connector and set as:                Level : 0.25 <math>\mu</math>V* ( - 119 dBm)                Deviation : <math>\pm</math> 3.5 kHz (wide-type)  <math>\pm</math> 1.75 kHz (narrow-type)                Modulation: 1 kHz</li> </ul>		Squelch opens	Verify
BEEP LEVEL	1 <ul style="list-style-type: none"> <li>• Enter <i>Initial set mode No. 3</i>                Refer to p. 5-1 for details.</li> <li>• Operating frequency : Any</li> <li>• Receiving</li> </ul>	Speaker output	Desired level.	Rotate volume control while pushing [P3].

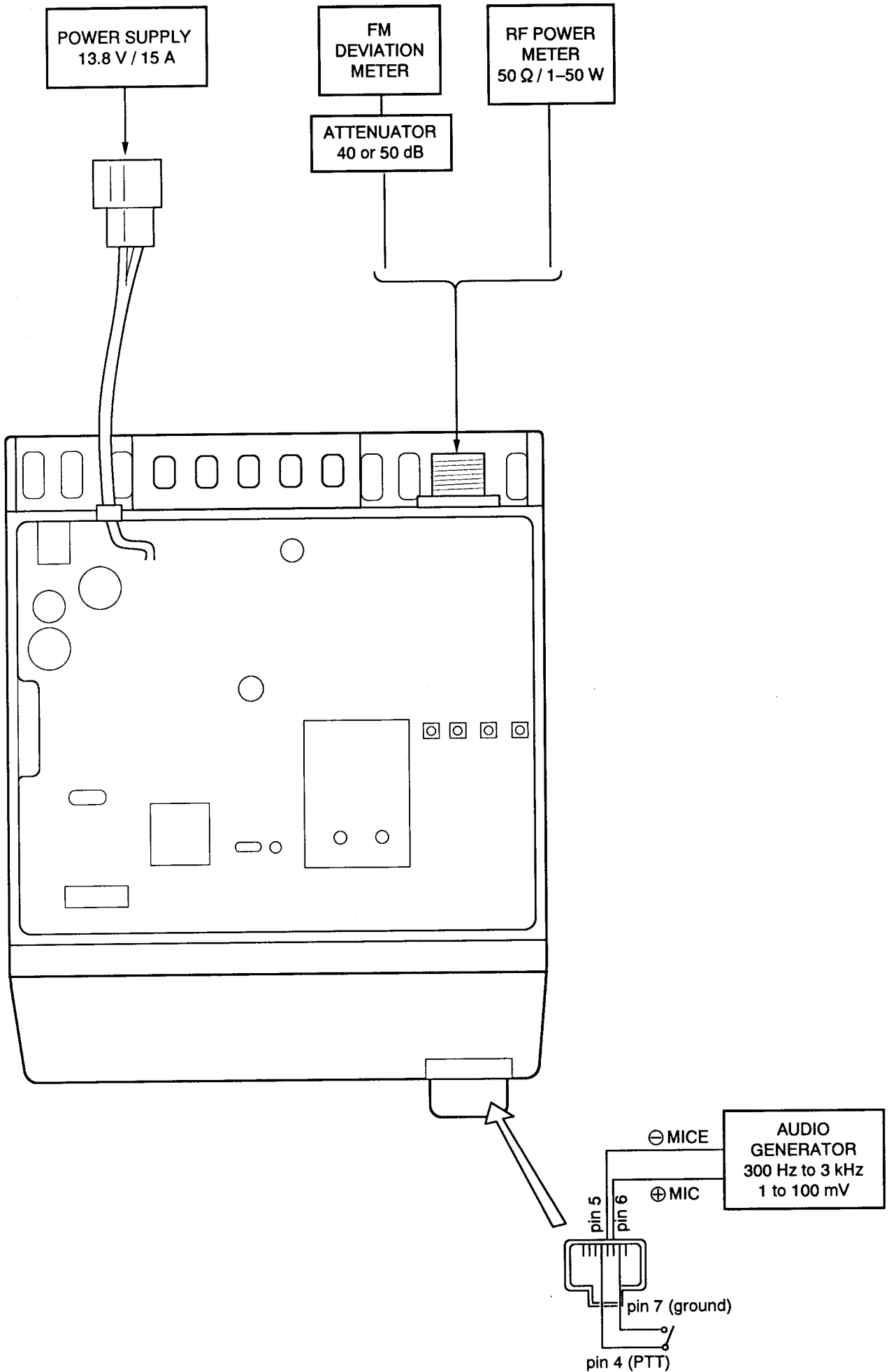
\* This output level of the standard signal generator (SSG) is indicated as SSG's open circuit.



## 5-4 TRANSMITTER ADJUSTMENT

ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT METHOD	ADJUSTMENT	
			VALUE	METHOD
OUTPUT POWER	<ul style="list-style-type: none"> <li>Operating frequency : 155.000 MHz (low-band type) 174.000 MHz (high-band type)</li> <li>Enter <i>Initial Set Mode</i> No. 6 Refer to p. 5 - 1 for details.</li> </ul>	Connect the RF power meter to the antenna connector.	23 W (IC-F1010) 45 W (IC-F1020)	Rotate volume control while pushing [P3].
			10 W (IC-F1010) 25 W (IC-F1020)	Rotate volume control while pushing [P2].
			2.5 W (IC-F1010) 4.5 W (IC-F1020)	Rotate volume control while pushing [P1].
<p><b>NOTE:</b> When the RF output power cannot be set with this procedure, cloning may be necessary to cancel the output power setting.</p>				
FM DEVIATION	<ul style="list-style-type: none"> <li>Operating frequency : 136.000 MHz (low-band type) 146.000 MHz (high-band type)</li> <li>Enter <i>Initial Set Mode</i> No. 4 Refer to p. 5 - 1 for details.</li> <li>Apply an AF signal to the [MIC] jack: 1 kHz / 35 mV (IC-F1010) 1 kHz / 50 mV (IC-F1020)</li> <li>Connect the FM deviation meter to the antenna connector and set as: HPF : OFF      LPF : 20 kHz De-emphasis: OFF Detector      : (P - P)/2</li> </ul>	Connect the FM deviation meter to the antenna connector through the attenuator.	<ul style="list-style-type: none"> <li>± 4.2 kHz (IC-F1010 wide-type)</li> <li>± 2.1 kHz (IC-F1010 narrow-type)</li> <li>± 4.1 kHz (IC-F1020 wide-type)</li> </ul>	Rotate volume control while pushing [P3].
DTCS TONE WAVE FORM AND DEVIATION	<ul style="list-style-type: none"> <li>Operating frequency : 136.000 MHz (low-band type) 146.000 MHz (high-band type)</li> <li>Enter <i>Initial Set Mode</i> No. 4 Refer to p. 5 - 1 for details.</li> <li>No signal applied to the [MIC] jack.</li> <li>DTCS code      : 007</li> </ul>	Connect the oscilloscope to the FM deviation meter.	Maximum wave form	Rotate volume control while pushing [P2].
			Set to flat wave form.	Rotate volume control while pushing [P1].
				<ul style="list-style-type: none"> <li>± 0.5 kHz (wide-type)</li> <li>± 0.3 kHz (narrow-type)</li> </ul>
Connect the FM deviation meter to the antenna connector through the attenuator.				
CTCSS TONE DEVIATION	<ul style="list-style-type: none"> <li>Operating frequency : 136.000 MHz (low-band type) 146.000 MHz (high-band type)</li> <li>Enter <i>Initial Set Mode</i> No. 4 Refer to p. 5 - 1 for details.</li> <li>No signal applied to the [MIC] jack.</li> <li>CTCSS tone frequency: 88.5 Hz</li> </ul>	Connect the FM deviation meter to the antenna connector through the attenuator.	<ul style="list-style-type: none"> <li>± 0.5 kHz (wide-type)</li> <li>± 0.3 kHz (narrow-type)</li> </ul>	Rotate volume control while pushing [P2].





# SECTION 6 PARTS LIST

[FRONT UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1140005590	S.IC	HD404812D89H
IC3	1110001550	S.IC	S-8054ALB-LM-T1
IC4	1110003390	S.IC	AN8005M-(E1)
Q1	1590001330	S.TRANSISTOR DTA114EU T107	
Q2	1590000680	S.TRANSISTOR DTC114EU T107	
Q3	1590000680	S.TRANSISTOR DTC114EU T107	
Q4	1590000680	S.TRANSISTOR DTC114EU T107	
Q5	1530002060	S.TRANSISTOR 2SC4081 T107 R	
Q6	1590001330	S.TRANSISTOR DTA114EU T107	
D1	1750000390	S.DIODE	1SS353 TE-17
D2	1750000390	S.DIODE	1SS353 TE-17
D3	1750000130	S.DIODE	DA204U T107
D4	1750000130	S.DIODE	DA204U T107
D5	1750000390	S.DIODE	1SS353 TE-17
X1	8060000600	S.CERAMIC	PBRC 3.68 AR
L1	6200003960	S.COIL	MLF1608A 1R0K-T
L3	6200003540	S.COIL	MLF1608D R22K-T
R1	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R3	7030003550	S.RESISTOR	ERJ3GEYJ 822 V (8.2 kΩ)
R4	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R5	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R6	7030003570	S.RESISTOR	ERJ3GEYJ 123 V (12 kΩ)
R7	7030003540	S.RESISTOR	ERJ3GEYJ 682 V (6.8 kΩ)
R10	7030003350	S.RESISTOR	ERJ3GEYJ 181 V (180 Ω)
R11	7030003350	S.RESISTOR	ERJ3GEYJ 181 V (180 Ω)
R13	7030003800	S.RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R14	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R15	7030003630	S.RESISTOR	ERJ3GEYJ 393 V (39 kΩ)
R16	7030003590	S.RESISTOR	ERJ3GEYJ 183 V (18 kΩ)
R17	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R18	7030003240	S.RESISTOR	ERJ3GEYJ 220 V (22 Ω)
R20	7210002830	VARIABLE	EVU-F2JFK4 B14
R21	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R22	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R26	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R27	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R28	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R29	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R30	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R31	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R32	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R40	7030000310	S.RESISTOR	MCR10EZHJ 270 Ω (271)
R41	7030003510	S.RESISTOR	ERJ3GEYJ 392 V (3.9 kΩ)
R42	7030003460	S.RESISTOR	ERJ3GEYJ 152 V (1.5 kΩ)
R43	7030003470	S.RESISTOR	ERJ3GEYJ 182 V (1.8 kΩ)
R44	7030003430	S.RESISTOR	ERJ3GEYJ 821 V (820 Ω)
R45	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R46	7030003660	S.RESISTOR	ERJ3GEYJ 683 V (68 kΩ)
R47	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R48	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R49	7030003610	S.RESISTOR	ERJ3GEYJ 273 V (27 kΩ)
R50	7510000200	S.THERMISTOR	TN20-3U473LT
R51	7030003660	S.RESISTOR	ERJ3GEYJ 683 V (68 kΩ)
R52	7030003500	S.RESISTOR	ERJ3GEYJ 332 V (3.3 kΩ)
R53	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
C3	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A
C4	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A
C5	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A

[FRONT UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C6	4030008560	S.CERAMIC	C1608 CH 1H 300J-T-A
C7	4030008560	S.CERAMIC	C1608 CH 1H 300J-T-A
C8	4550002890	S.TANTALUM	TESVA 1A 225M1-8L
C9	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A
C10	4510004440	S.Electrolitic	ECEV1HA010SR
C11	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A
C12	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A
C13	4550008250	S.TANTALUM	TEMSVA 1A 106M-8L
C15	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A
C16	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A
C18	4030010740	S.CERAMIC	C1608 JB 1A 104K-T-A
C19	4030006900	S.CERAMIC	C1608 JB 1E 103K-T-A
C20	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C21	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C22	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C23	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C24	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C25	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C26	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C27	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C28	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C30	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C31	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C32	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C33	4030006850	S.CERAMIC	C1608 JB 1H 471K-T-A
C34	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C35	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
DS1	5030001300	LCD	LD-BU4404E
DS2	5040002030	S.LED	CL-170Y-CD-T
DS3	5040002030	S.LED	CL-170Y-CD-T
DS4	5040002030	S.LED	CL-170Y-CD-T
DS5	5040002030	S.LED	CL-170Y-CD-T
DS6	5040002030	S.LED	CL-170Y-CD-T
DS7	5040002030	S.LED	CL-170Y-CD-T
J1	6510018030	S.CONNECTOR	53248-1217
J2	6450001470	CONNECTOR	95003-2881
W1	7120000380	JUMPER	JPW 01 R-01
W2	7120000380	JUMPER	JPW 01 R-01
W3	7030003860	S.JUMPER	ERJ3GE JPW V
SP1	2510000880	SPEAKER	SME-45W
EP1	0910045653	PCB	B 4565C
EP2	8930037960	LCD CONTACT	SRCN-1705 ZSS

Ⓟ: PMR only; Ⓛ: LMR only S.=Surface mount











[MAIN UNIT]

Table with columns: REF. NO., ORDER NO., DESCRIPTION. Contains parts list for MAIN UNIT on the left side of the page, including items like C130, C131, etc.

[MAIN UNIT]

Table with columns: REF. NO., ORDER NO., DESCRIPTION. Contains parts list for MAIN UNIT on the right side of the page, including items like C208, C209, etc.

Ⓢ: PMR only; Ⓛ: LMR only S.=Surface mount



[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C316	4030010740	S.CERAMIC	C1608 JB 1A 104K-T-A
C318	4030008900	S.CERAMIC	C1608 JB 1E 103K-T-A
C319	4030008880	S.CERAMIC	C1608 JB 1H 102K-T-A
C320	4030008920	S.CERAMIC	C1608 JB 1C 473K-T-A
C321	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C322	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C323	4030008880	S.CERAMIC	C1608 JB 1H 102K-T-A
C324	4030007060	S.CERAMIC	C1608 CH 1H 270J-T-A [PMR]
	4030007050	S.CERAMIC	C1608 CH 1H 220J-T-A [LMR]
C326	4030008850	S.CERAMIC	C1608 JB 1H 471K-T-A
C327	4030008880	S.CERAMIC	C1608 JB 1H 102K-T-A
C328	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C329	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C330	4030010740	S.CERAMIC	C1608 JB 1A 104K-T-A
C331	4550000480	S.TANTALUM	TESVA 1C 105M1-8L
C332	4550002890	S.TANTALUM	TESVA 1A 225M1-8L
C333	4550002890	S.TANTALUM	TESVA 1A 225M1-8L
C334	4550002890	S.TANTALUM	TESVA 1A 225M1-8L
C335	4030008870	S.CERAMIC	C1608 JB 1H 222K-T-A
C336	4550002890	S.CERAMIC	TESVA 1A 225M1-8L
C337	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C338	4030007080	S.CERAMIC	C1608 CH 1H 390J-T-A
C339	4550003220	S.TANTALUM	TEMSVA 1E 105M-8L
C340	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C341	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C343	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C344	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C348	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C349	4030010740	S.CERAMIC	C1608 JB 1A 104K-T-A
C350	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C351	4030010740	S.CERAMIC	C1608 JB 1A 104K-T-A
C352	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C353	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C354	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C355	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C356	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C357	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C358	4030010740	S.CERAMIC	C1608 JB 1A 104K-T-A
C359	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C360	4030010210	S.CERAMIC	C3216 JB 1C 105M-T-A
C361	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C362	4030010740	S.CERAMIC	C1608 JB 1A 104K-T-A
C363	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C364	4550008250	S.TANTALUM	TEMSVA 1A 106M-8L
C365	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C366	4550002890	S.TANTALUM	TESVA 1A 225M1-8L
C368	4510008090	S.Electrolitic	ECEVOGA470SR
C369	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C370	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C371	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C376	4030008850	S.CERAMIC	C1608 JB 1H 471K-T-A
C377	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C378	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C379	4030008850	S.CERAMIC	C1608 JB 1H 471K-T-A
C380	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C381	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C382	4030008850	S.CERAMIC	C1608 JB 1H 471K-T-A
C383	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C384	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C385	4030008850	S.CERAMIC	C1608 JB 1H 471K-T-A
C386	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C387	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C388	4030008850	S.CERAMIC	C1608 JB 1H 471K-T-A
C389	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C390	4030008850	S.CERAMIC	C1608 JB 1H 471K-T-A
C391	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C392	4030008850	S.CERAMIC	C1608 JB 1H 471K-T-A
C393	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C394	4030008850	S.CERAMIC	C1608 JB 1H 471K-T-A
C395	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C396	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C397	4030008850	S.CERAMIC	C1608 JB 1H 471K-T-A
C398	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C399	4030008850	S.CERAMIC	C1608 JB 1H 471K-T-A
C400	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C401	4030008850	S.CERAMIC	C1608 JB 1H 471K-T-A

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C402	4030008850	S.CERAMIC	C1608 JB 1H 471K-T-A
C403	4030008850	S.CERAMIC	C1608 JB 1H 471K-T-A
C404	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C405	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C406	4030008850	S.CERAMIC	C1608 JB 1H 471K-T-A
C407	4030008850	S.CERAMIC	C1608 JB 1H 471K-T-A
C408	4030008850	S.CERAMIC	C1608 JB 1H 471K-T-A
C409	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C410	4510005750	S.Electrolitic	ECEV1EA220SP
C411	4510005750	S.Electrolitic	ECEV1EA220SP
C412	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C413	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C414	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C415	4030011160	S.CERAMIC	GRM42-6 CH 150J 500PT [H-band]
	4030011170	S.CERAMIC	GRM42-6 CH 180J 500PT [L-band]
C416	4030000810	S.CERAMIC	GRM40 CK 0R5C 50PT
C417	4030011170	S.CERAMIC	GRM42-6 CH 180J 500PT
C418	4030011220	S.CERAMIC	GRM42-6 CH 380J 500PT
C419	4030008860	S.CERAMIC	C1608 JB 1H 102K-T-A
C420	4030009000	S.CERAMIC	C2012 JB 1C 224K-T-A
C421	4550008250	S.TANTALUM	TEMSVA 1A 106M-8L
J2	6450000140	CONNECTOR	HSJ0807-01-010
J4	6510019250	S.CONNECTOR	B11B-ZR-SM3-TF
J5	6510018040	CONNECTOR	52330-1217
J6	6510018430	S.CONNECTOR	AXN330C038P
J7	6510019270	S.CONNECTOR	52365-0691
W1	7030003860	S.JUMPER	ERJ3GE JPW V
W3	7030003860	S.JUMPER	ERJ3GE JPW V
W4	8900004540	CABLE	OPC-453
W6	7120000380	JUMPER	JPW 01 R-01
W7	7030003860	S.JUMPER	ERJ3GE JPW V
W8	7030003860	S.JUMPER	ERJ3GE JPW V
W9	7030003860	S.JUMPER	ERJ3GE JPW V
W10	7030003860	S.JUMPER	ERJ3GE JPW V
W11	7030003860	S.JUMPER	ERJ3GE JPW V [#01]
W12	7030003860	S.JUMPER	ERJ3GE JPW V [#02]
W13	7030003860	S.JUMPER	ERJ3GE JPW V [#03]
W14	7030003860	S.JUMPER	ERJ3GE JPW V [#04]
W15	7030003860	S.JUMPER	ERJ3GE JPW V [#05]
W16	7030003860	S.JUMPER	ERJ3GE JPW V [#06]
EP1	0910045643	PCB	B 4564C
EP2	6910010220	BEAD	HF70BB3.5X5X1.3
EP3	6910010280	BEAD	HF70BB9.5X10.4X4.9

Ⓣ: PMR only; Ⓛ: LMR only S.=Surface mount

# SECTION 7 MECHANICAL PARTS AND DISASSEMBLY

## [CHASSIS PARTS]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
J1	6510004880	Connector MR-DS-E 01	1
MP1	8010016320	1705 chassis	1
MP2	8810008660	Screw PH BT M3 x 8 NI-ZU	4
MP3	8810008660	Screw PH BT M3 x 8 NI-ZU	2
MP4	8810008660	Screw PH BT M3 x 8 NI-ZU	2
MP5	8810008660	Screw PH BT M3 x 8 NI-ZU	4
MP6	8930027480	1126 TR-A clip	1
MP7	8820000870	1705 cap screw	3
MP8	8110005570	1705 cover	1
MP11	8930032000	Thermal sheet (A)	1
MP12	8930036800	1705 M-holder	1
MP14	8310036980	Serial No. label (BE)	1
MP15	8930037651	1705 jack sheet -1	1
MP16	8930036770	1705 main seal	1

## [UNPACKING]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
F1	5210000080	Fuse FGB 20A	2
W1	8900003760	DC power cable OPC-346	1
W2	8900000730	Microphone (HANG) cable OPC-049	1
MC1	7700001990	Microphone EM-99	1
MP1	8010008710	150 mounting bracket	1
MP2	8930008050	Felt (A)	2
MP3	8820000530	Flange bolt M4 x 8 NI	4
MP4	8810000470	Screw PH M5 x 12 (+/-)	4
MP5	8810005840	Screw PH A M5 x 20	4
MP6	8850000150	Flat washer M5 NI BS	4
MP7	8850000390	Spring washer M5	4
MP8	8830000120	Nut M5	4
MP9	6910004210	731 microphone hanger set	1
MP10	8310037280	1705 LCD seal	1

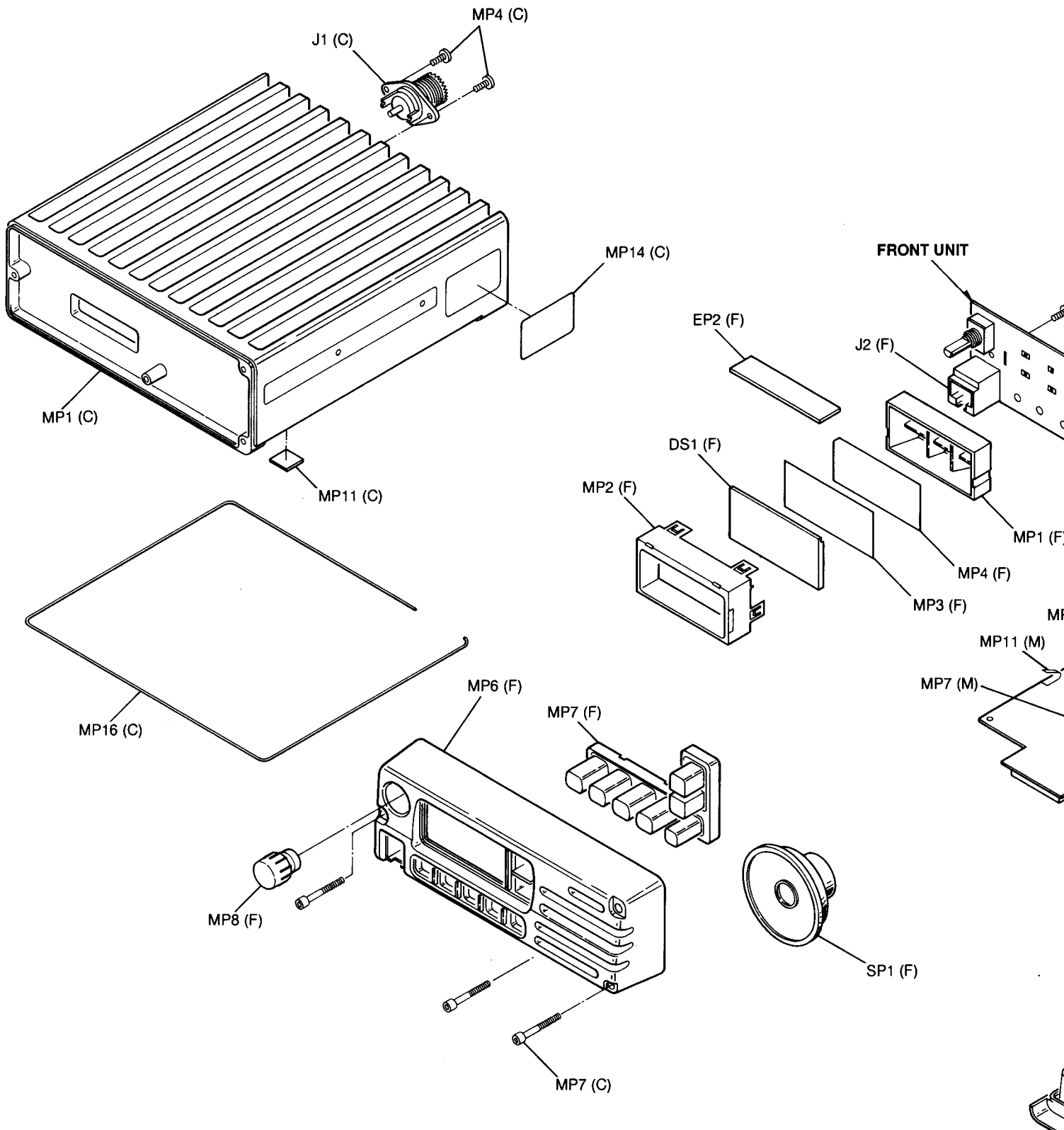
## [FRONT UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
J2	6450001470	Connector 95003-2881	1
DS1	5030001300	LCD LD-BU4404E	1
EP2	8930037960	LCD contact SRCN-1705 ZSS	1
MP1	8210012610	1705 reflector	1
MP2	8930036830	1705 LCD holder	1
MP3	8930036820	1705 LCD filter	1
MP4	8930037660	1705 LCD sheet	1
MP6	8210013310	1705 front panel (complete)	1
MP7	8930036810	1705 front key	1
MP8	8610009840	Knob N234	1
MP10	8810009130	Screw PH BT M3 x 12 NI-ZU	3
SP1	2510000880	Speaker SME-45W	1

**Screw abbreviations** BT: Self-tapping PH: Pan head  
 NI: Nickel NI-ZU: Nickel-Zinc  
 BS: Brass

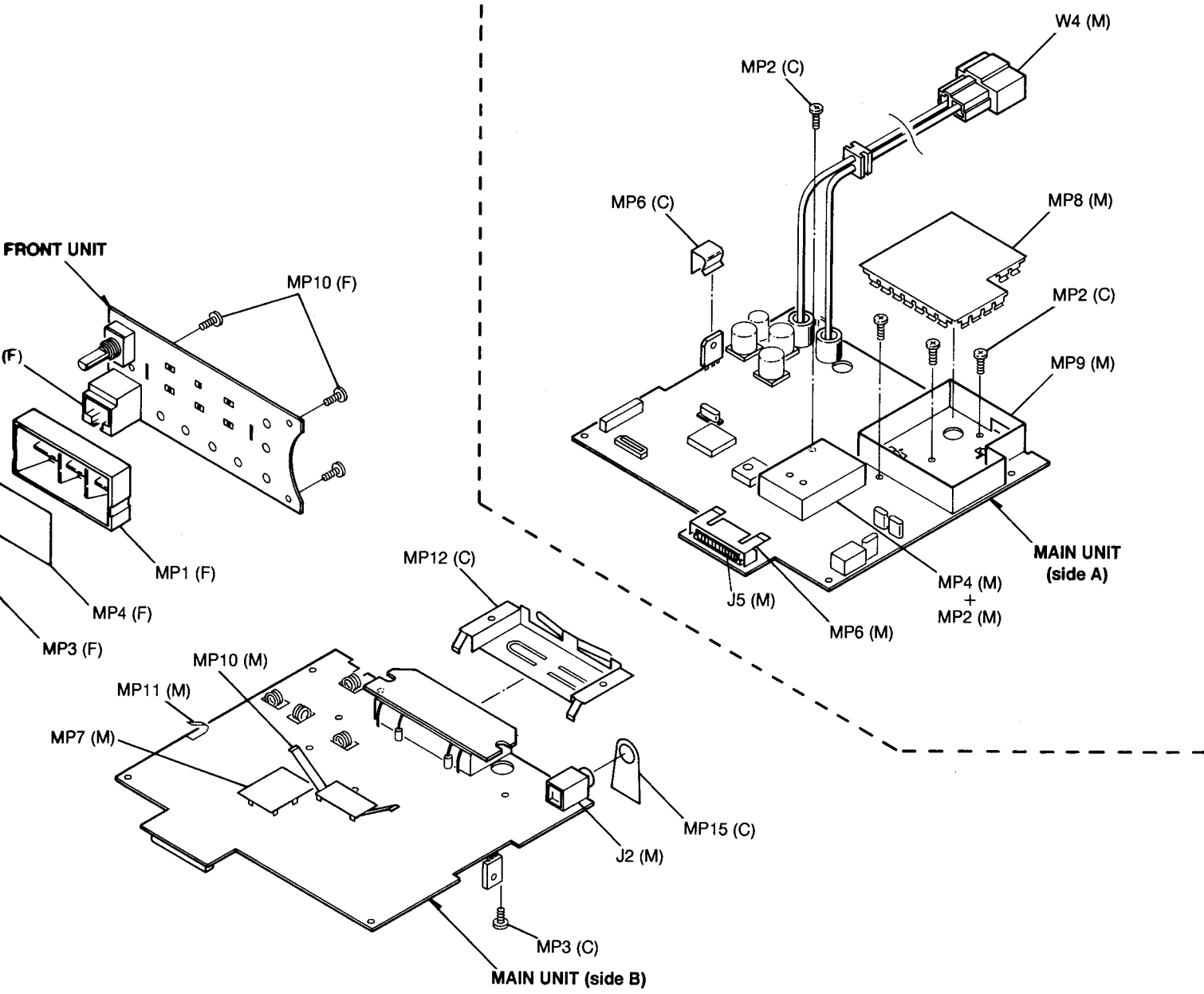
## [MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
J2	6450000140	Connector HSJ0807-01-010	1
W4	8900004540	Cable OPC-453	1
MP2	8510009980	1705 VCO case	1
MP4	8510010080	1705 VCO cover	1
MP6	8930037840	1705 connector spring	1
MP7	8510005070	599 shield plate	1
MP8	8510010240	1705 LPF cover	1
MP9	8510010230	1705 LPF case	1
MP10	8510010250	1705 shield plate	1
MP11	8930029511	1327 ANT plate -1	1

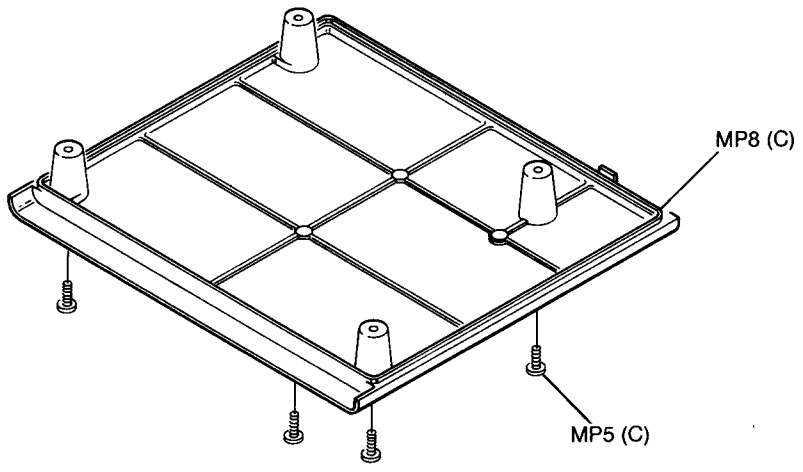


**Unit abbreviations** (F): FRONT UNIT (M): MAIN UNIT (C): CHASSIS PARTS

**OPPOSITE DIRECTION TO THE MAIN UNIT**










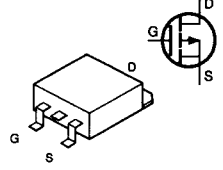
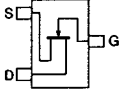
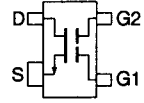







P1 (F)










# SECTION 8 SEMI-CONDUCTOR INFORMATION

## • TRANSISTORS AND FET'S

<b>2SA1576 R</b> (Symbol: FR) 	<b>2SB1123T</b> (Symbol: BF) 	<b>2SC4081 R</b> (Symbol: BR) 	<b>2SC4215 O</b> (Symbol: QO) 	<b>2SC4226 R25</b> (Symbol: R25) 
<b>2SC4703 SE</b> (Symbol: SE) 	<b>2SC5110 O</b> (Symbol: MGO) 	<b>2SD1664</b> (Symbol: DA) 	<b>2SJ144 Y</b> (Symbol: VY) 	<b>2SJ377</b> (Symbol: 4L) 
<b>2SK1069</b> (Symbol: FJ) 	<b>3SK166</b> (Symbol: K) 	<b>DTA114EU</b> (Symbol: 14) 	<b>DTC114EU</b> (Symbol: 24) 	<b>DTC363EK</b> (Symbol: H27) 
<b>FMS2A</b> (Symbol: S2) 	<b>FMW2</b> (Symbol: W2) 			

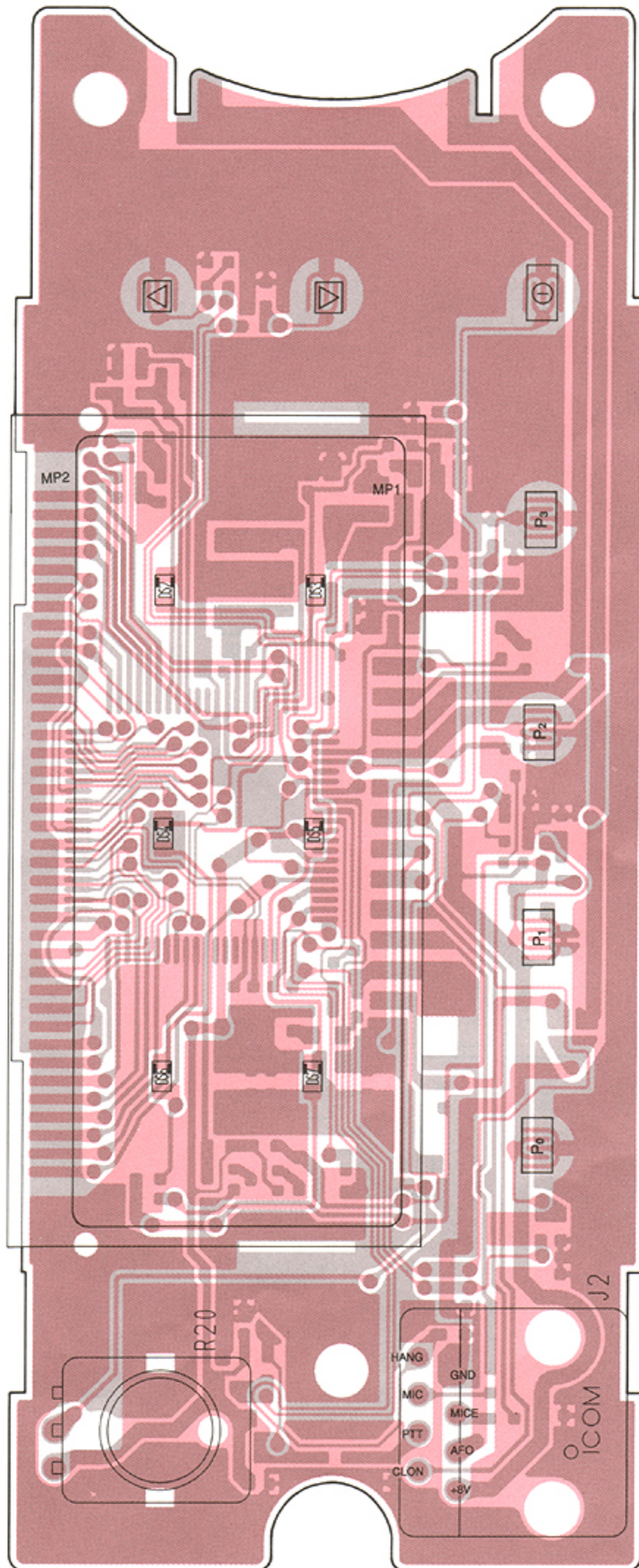
## • DIODES

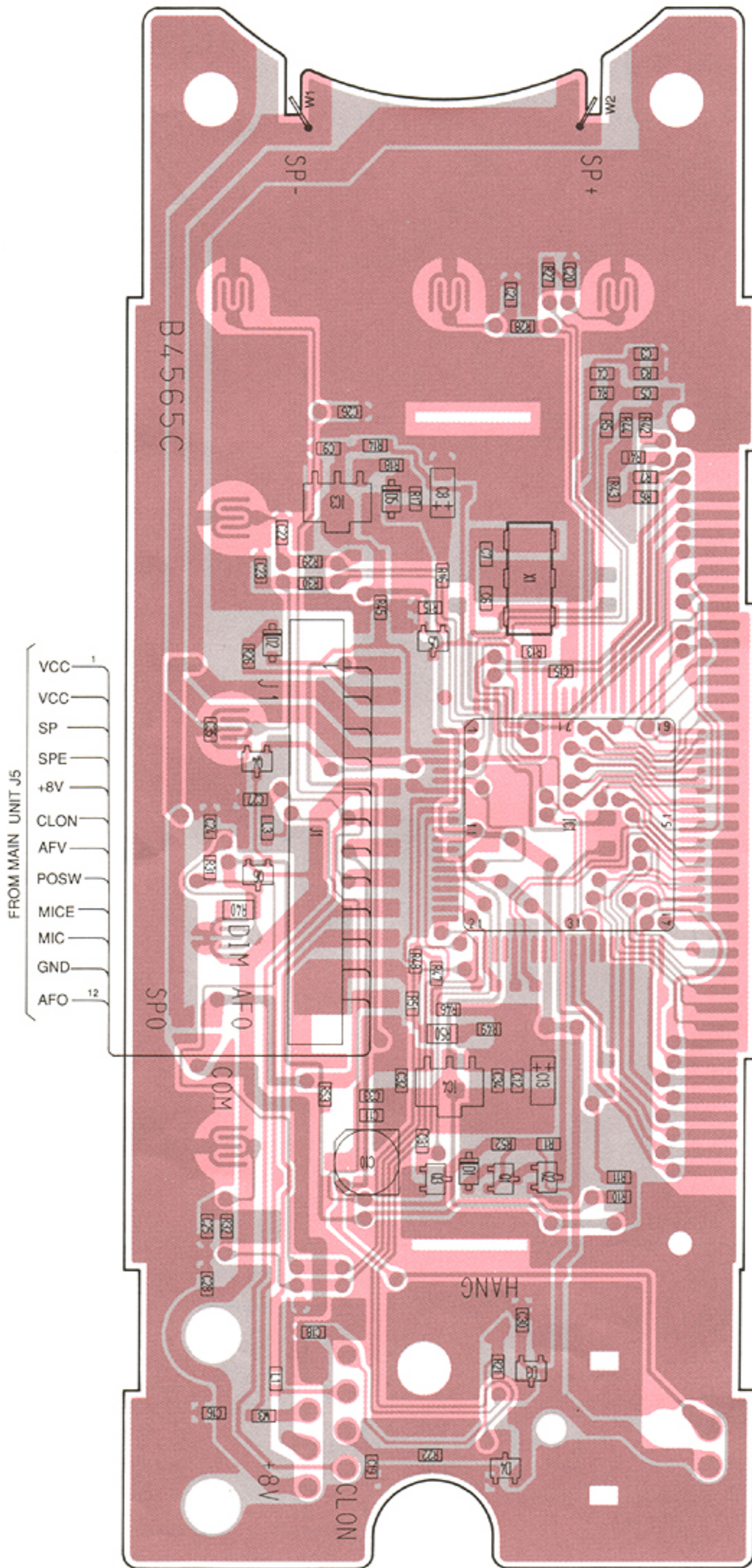
<b>1SS375</b> (Symbol: FH) 	<b>1SV164</b> (No symbol, orange line) 	<b>DA113W</b> (Symbol: AY) 	<b>DA204U</b> (Symbol: K) 	<b>DA221</b> (Symbol: K) 
<b>DAN202U</b> (Symbol: N) 	<b>HSU88TRF</b> (Symbol: 9) 			

# SECTION 9 BOARD LAYOUTS

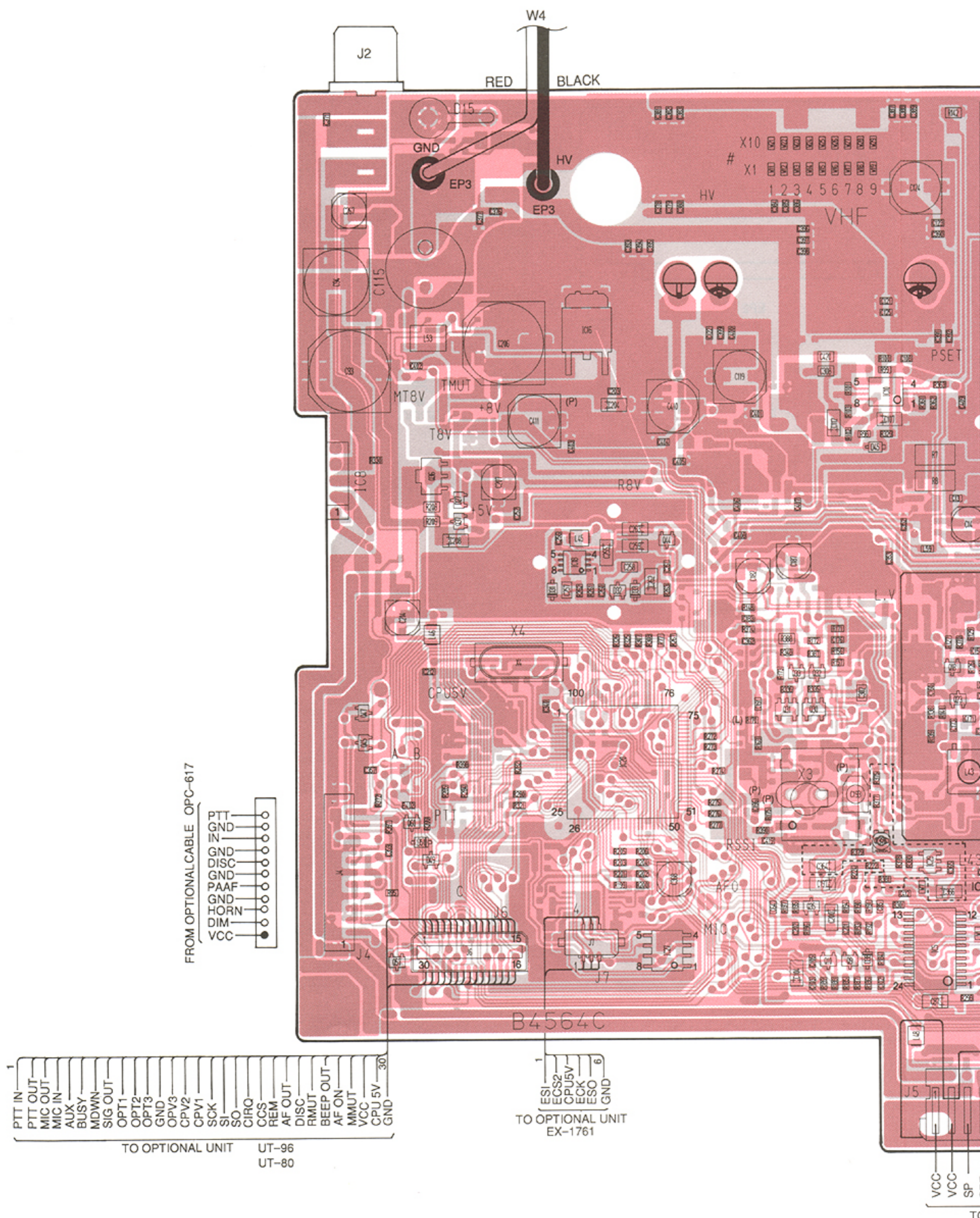
## 9-1 FRONT UNIT

The combination of this page and the next page show the unit layout in the same configuration as the actual P. C. Board.





# 9-2 MAIN UNIT



FROM OPTIONAL CABLE OPC-617

PTT	○
GND	○
IN	○
GND	○
DISC	○
GND	○
PAAF	○
GND	○
HORN	○
DIM	○
VCC	●

TO OPTIONAL UNIT

1	PTT IN
2	PTT OUT
3	MIC OUT
4	MIC IN
5	AUX
6	BUSY
7	MDWN
8	SIG OUT
9	OPT1
10	OPT2
11	OPT3
12	GND
13	OPV3
14	CPV2
15	CPV1
16	SCK
17	SI
18	SO
19	CIRQ
20	CCS
21	REM
22	AF OUT
23	DISC
24	RMUT
25	BEEP OUT
26	AF ON
27	MMUT
28	VCC
29	CPU 5V
30	GND

UT-96  
UT-80

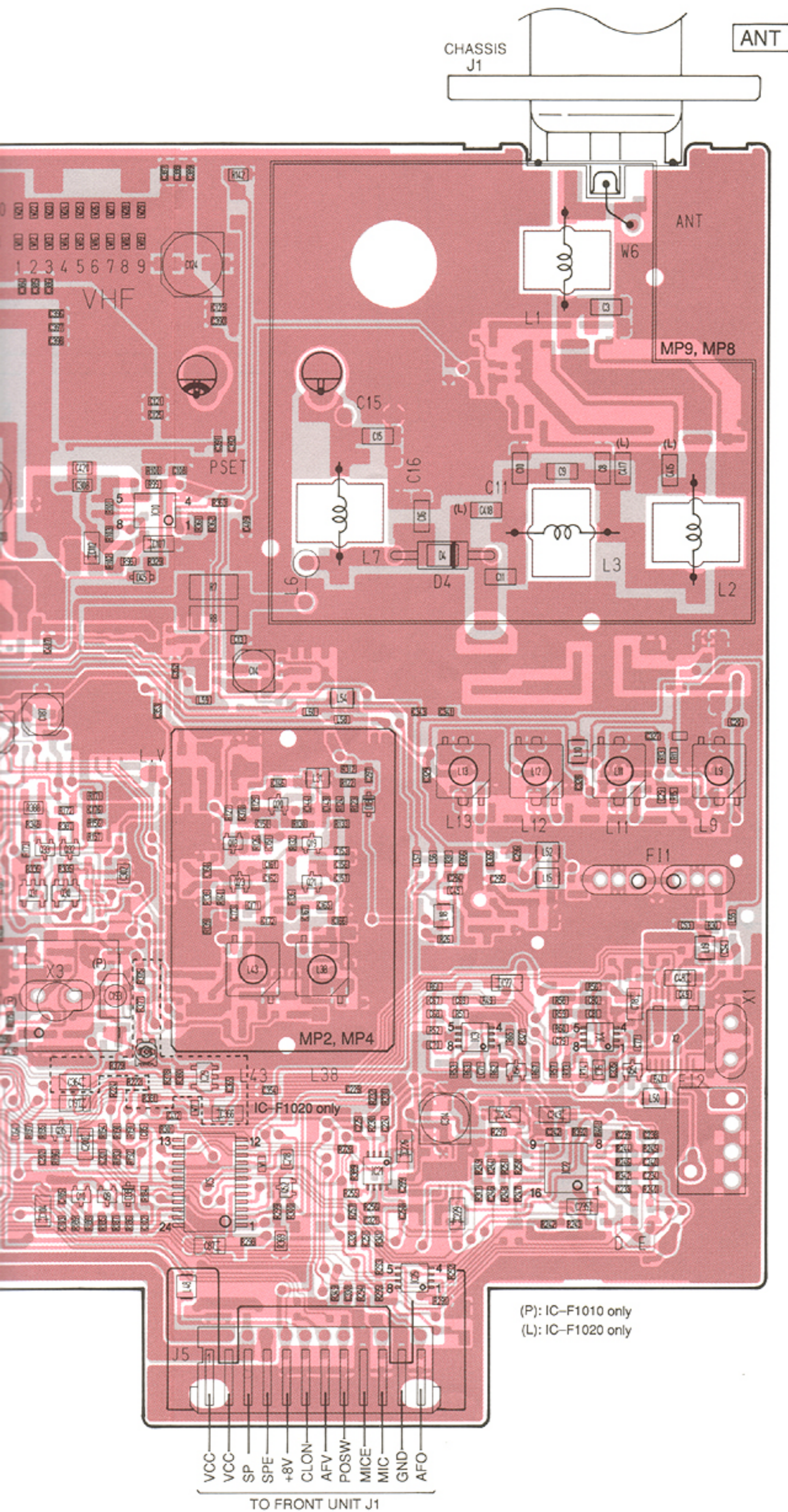
TO OPTIONAL UNIT EX-1761

1	ESI
2	ECS2
3	CPU5V
4	ECK
5	ESO
6	GND

VCC  
VCC  
SP  
SP

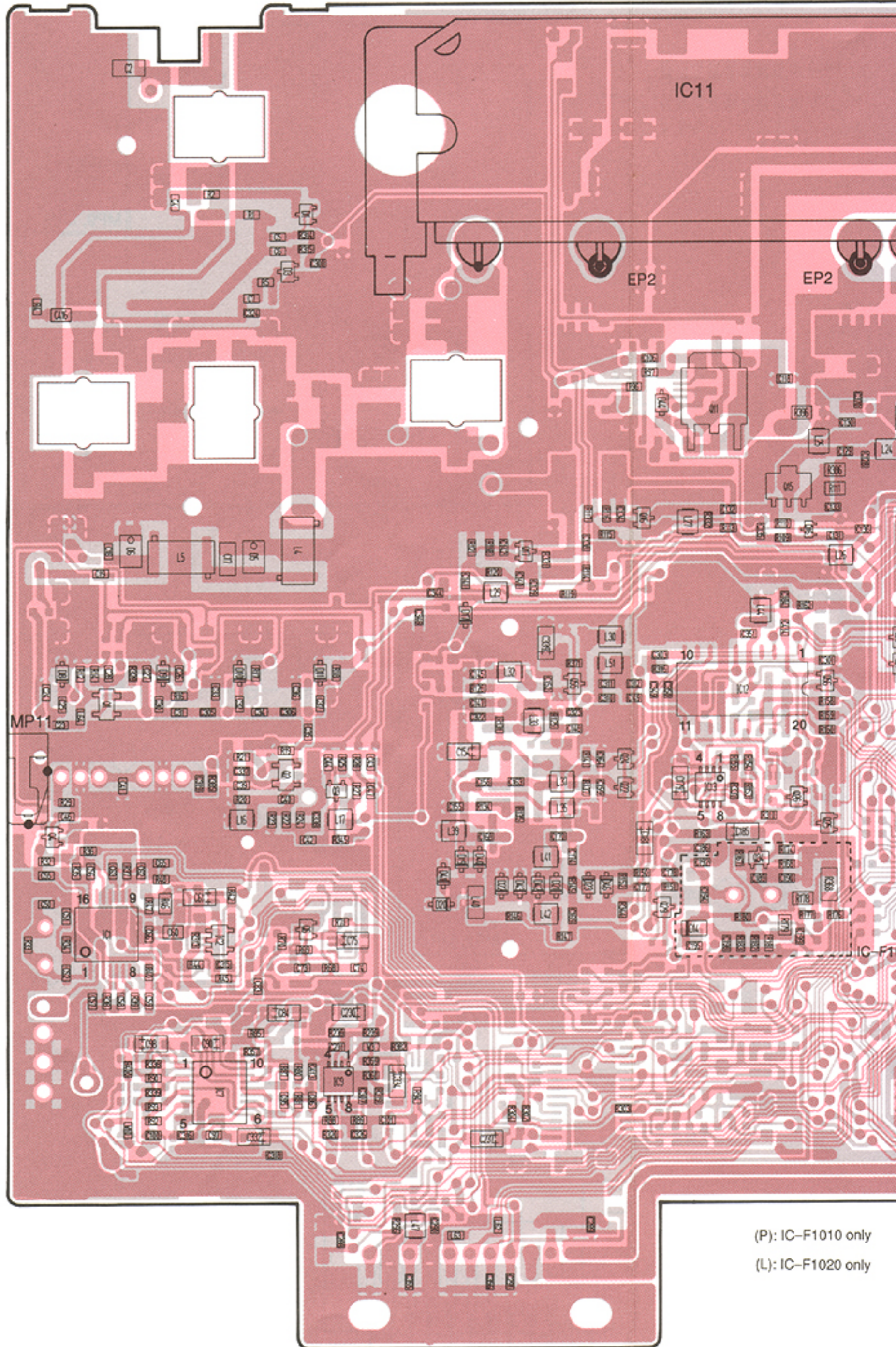


The combination of this page and the next page show the unit layout in the same configuration as the actual P. C. Board.

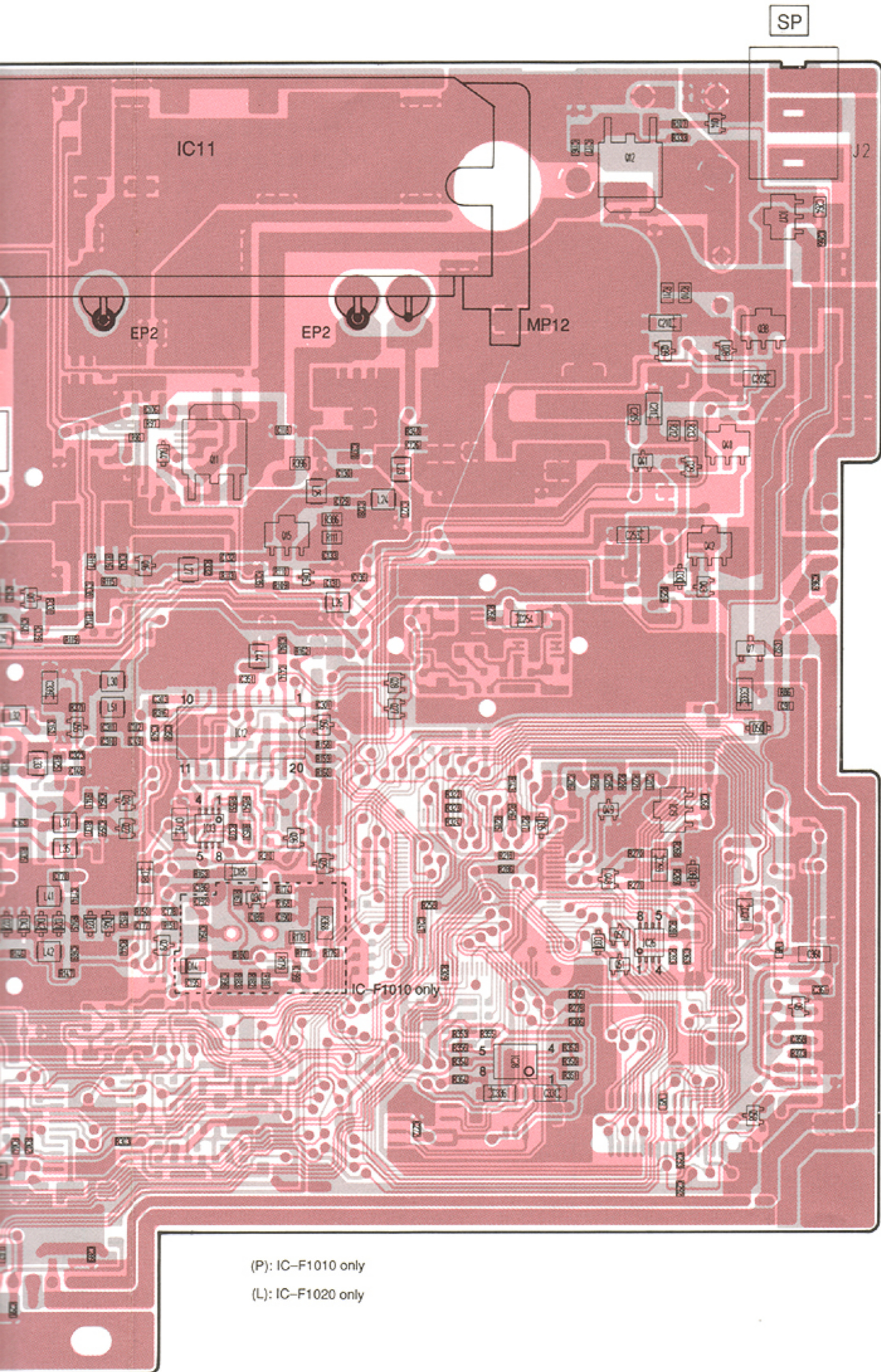


(P): IC-F1010 only  
 (L): IC-F1020 only

VCC  
 VCC  
 SP  
 SPE  
 +8V  
 CLON  
 AFV  
 POSW  
 MICE  
 MIC  
 GND  
 AFO  
 TO FRONT UNIT J1



(P): IC-F1010 only  
(L): IC-F1020 only

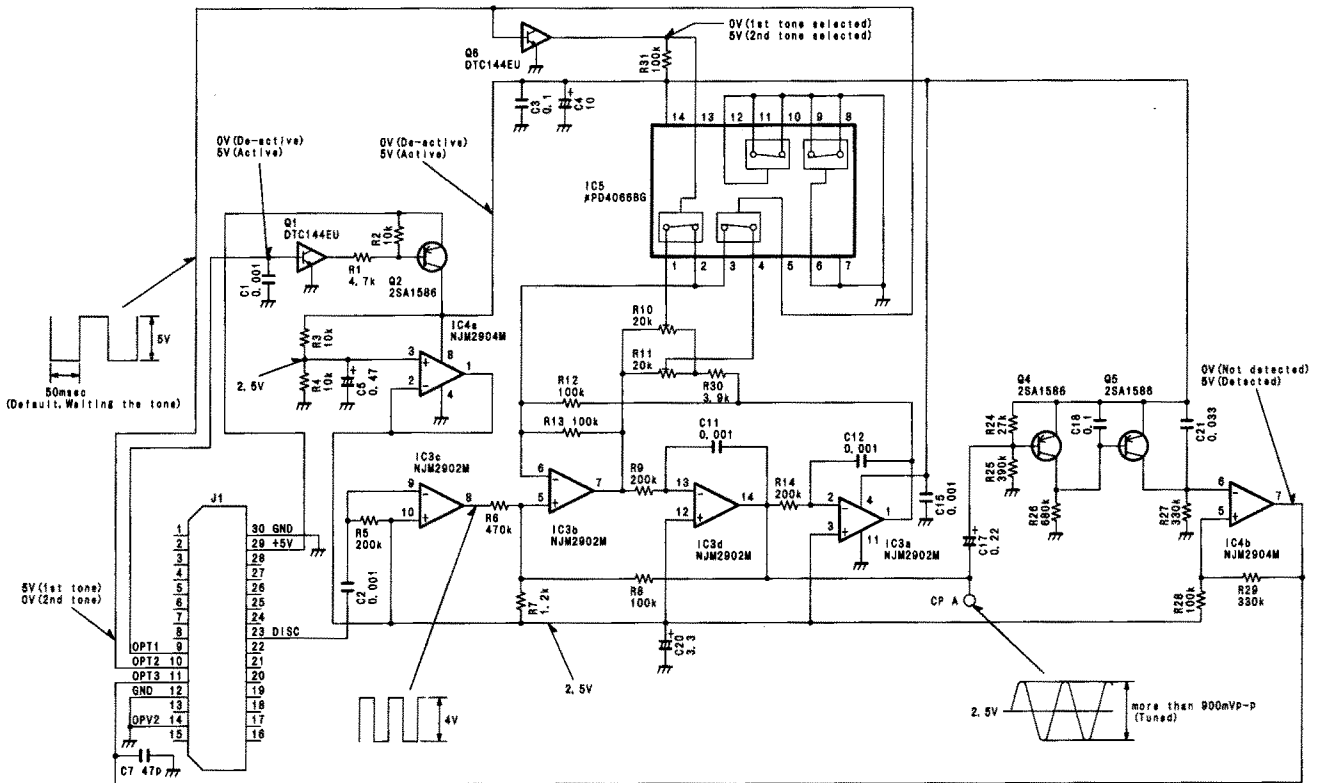


(P): IC-F1010 only

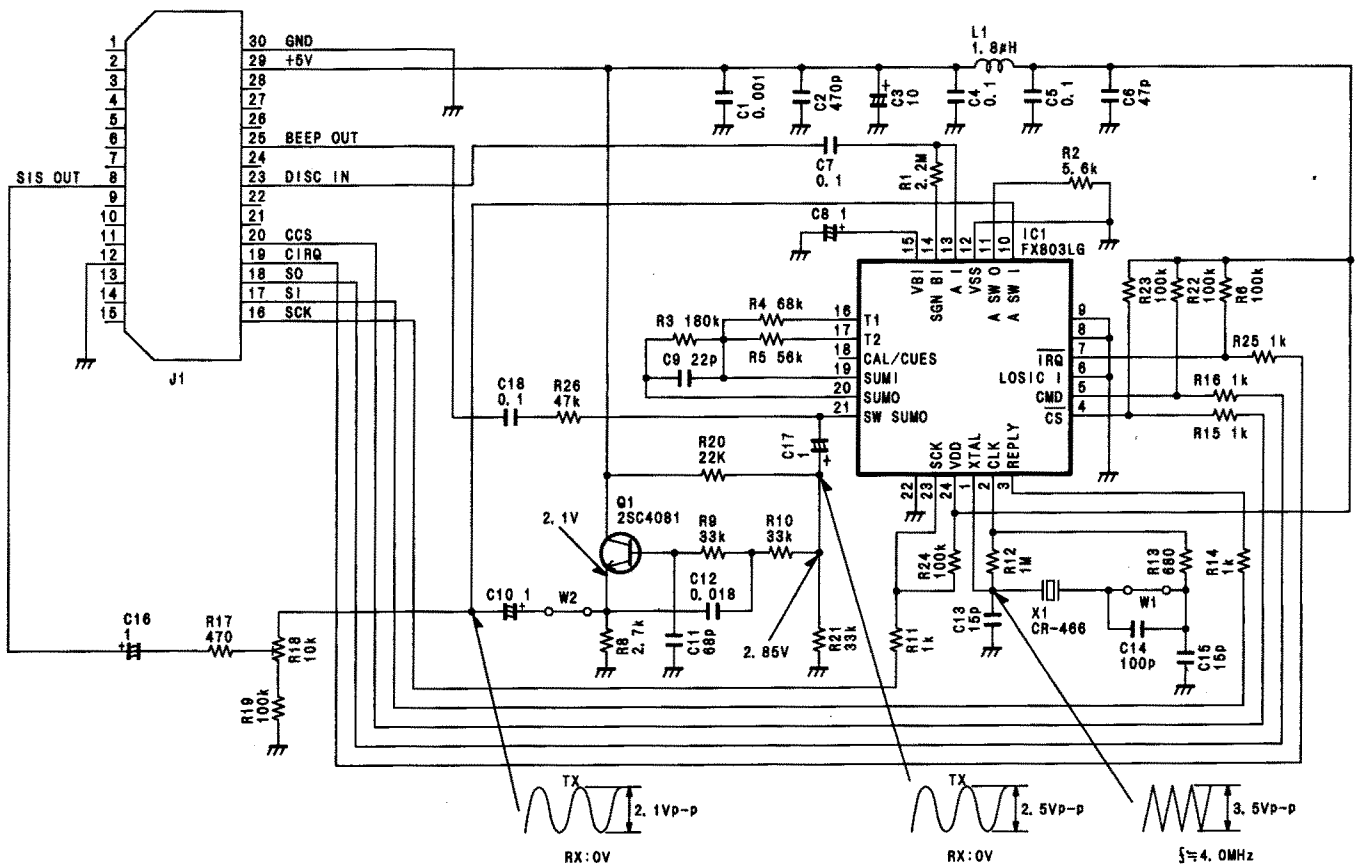
(L): IC-F1020 only

# SECTION 10 OPTIONAL UNITS

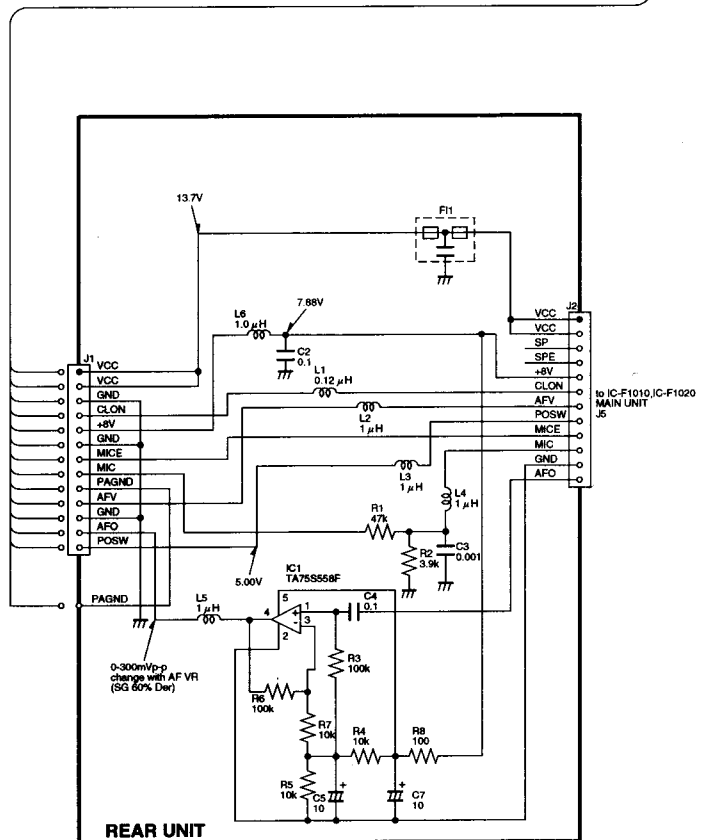
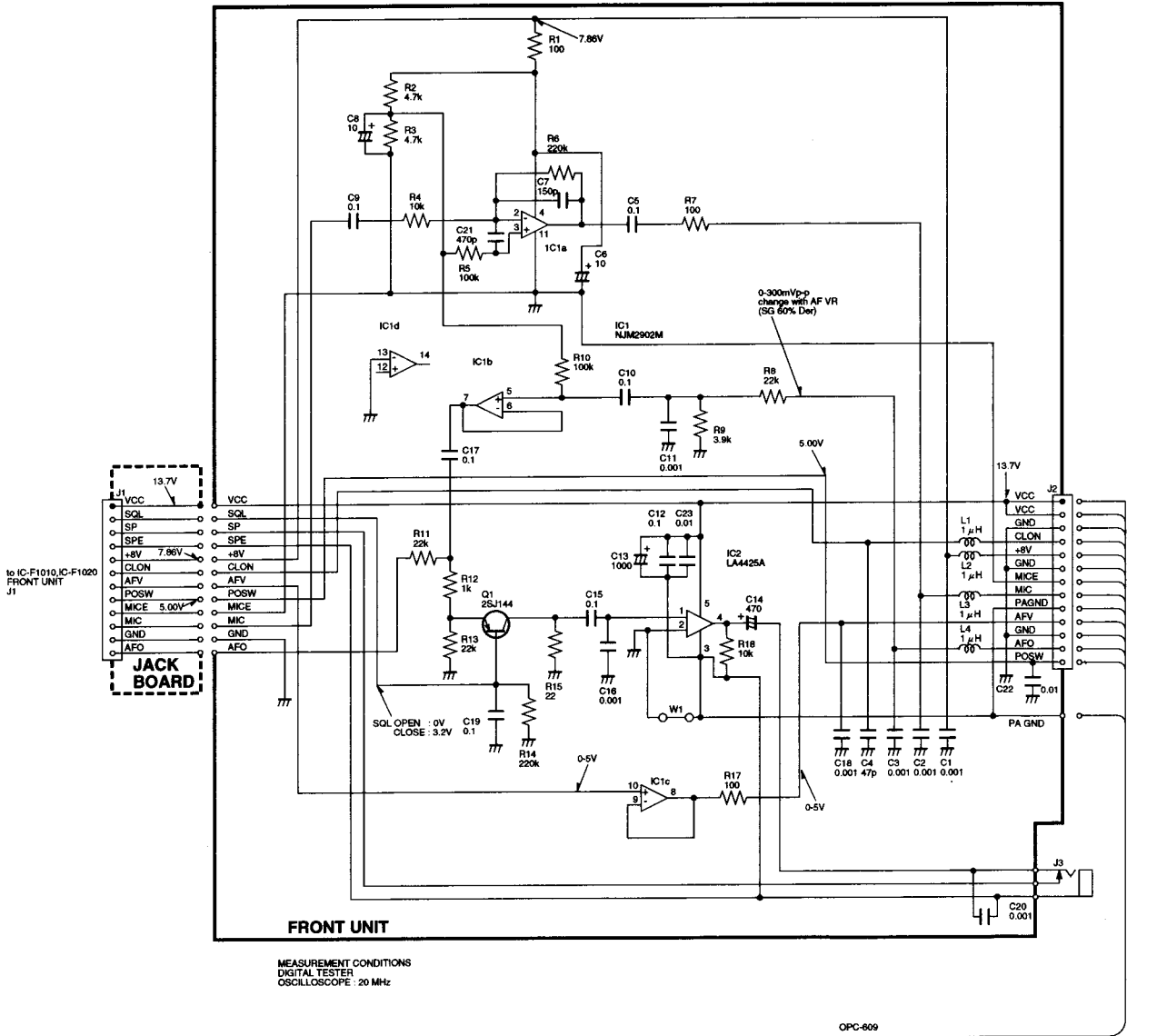
## 10-1 UT-80 2-TONE UNIT



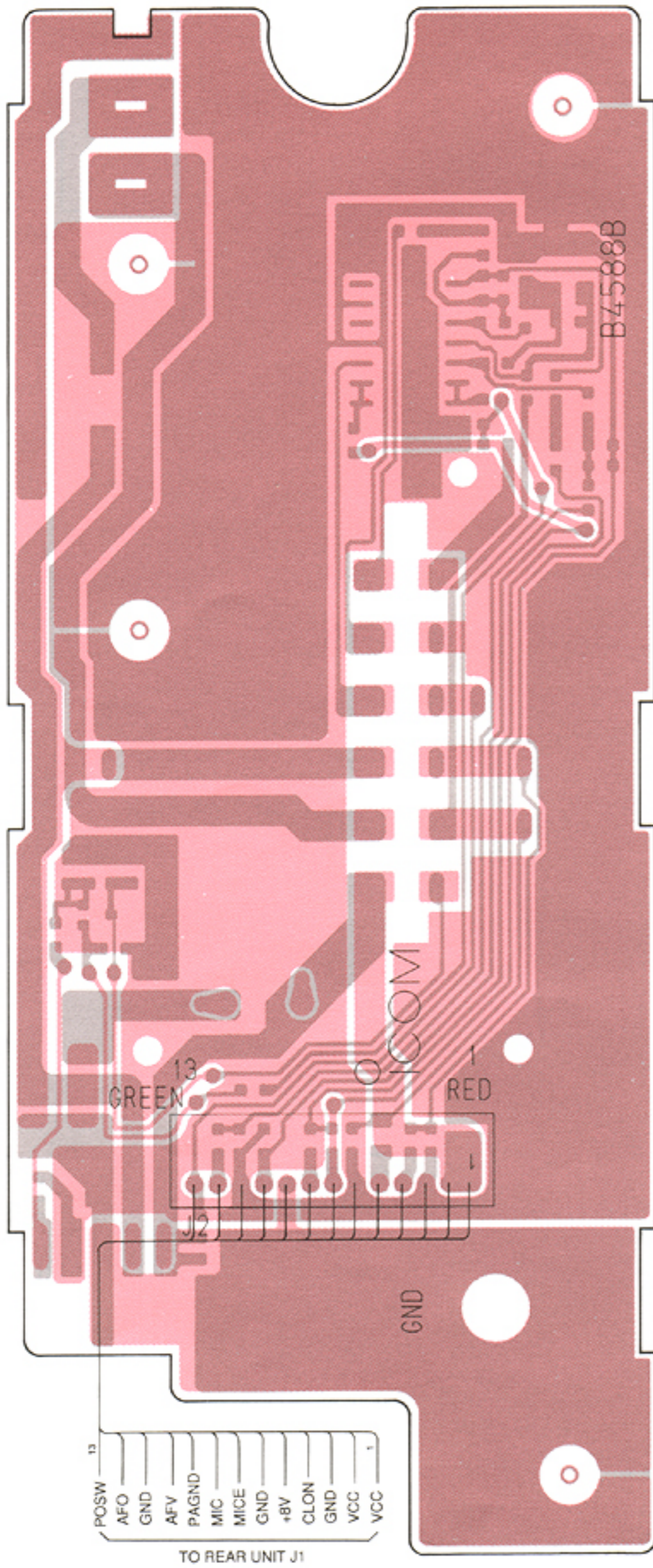
## 10-2 UT-96 5-TONE UNIT



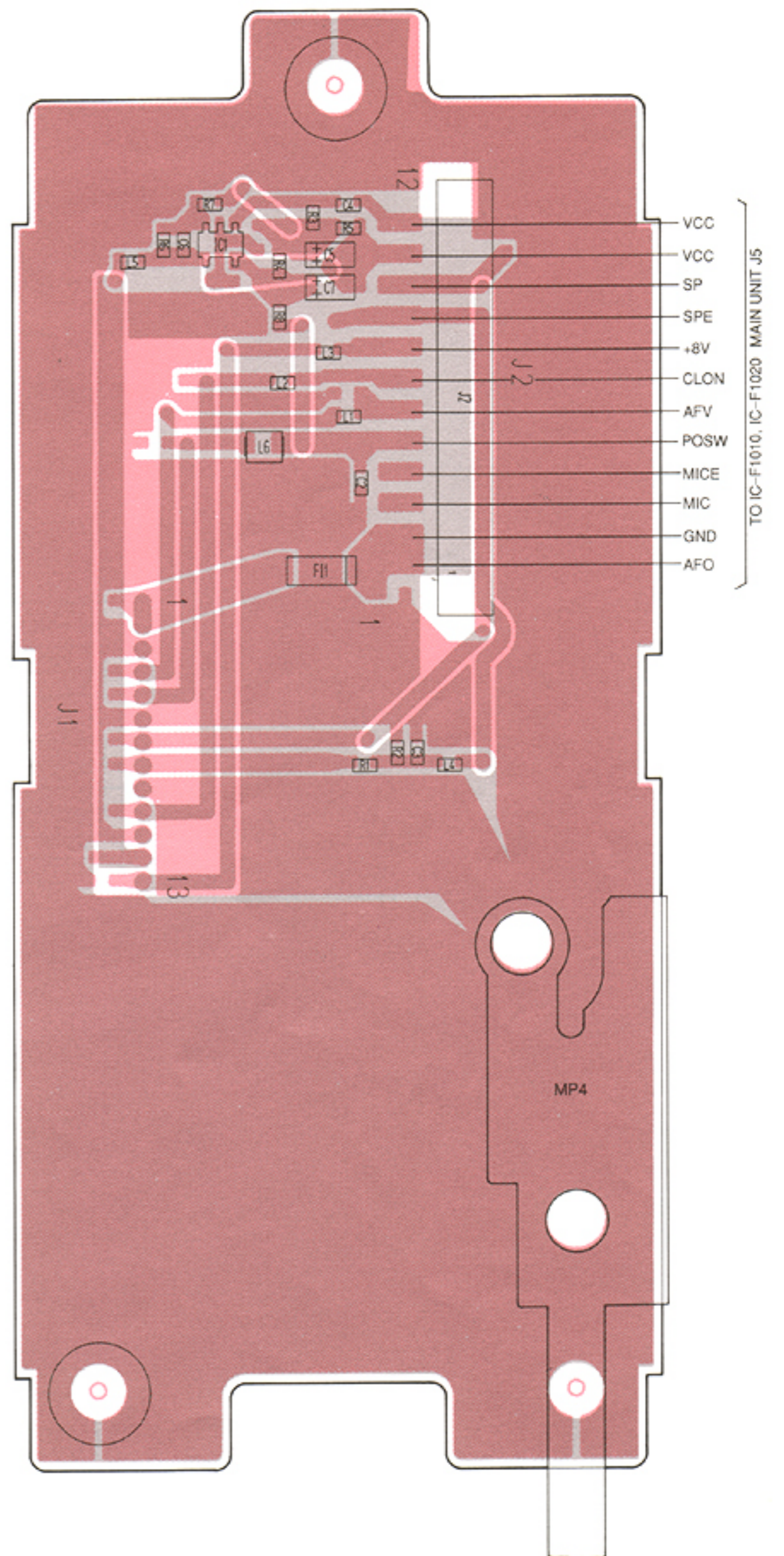
# 10-3 RMK-1 SEPARATION KIT



● FRONT UNIT

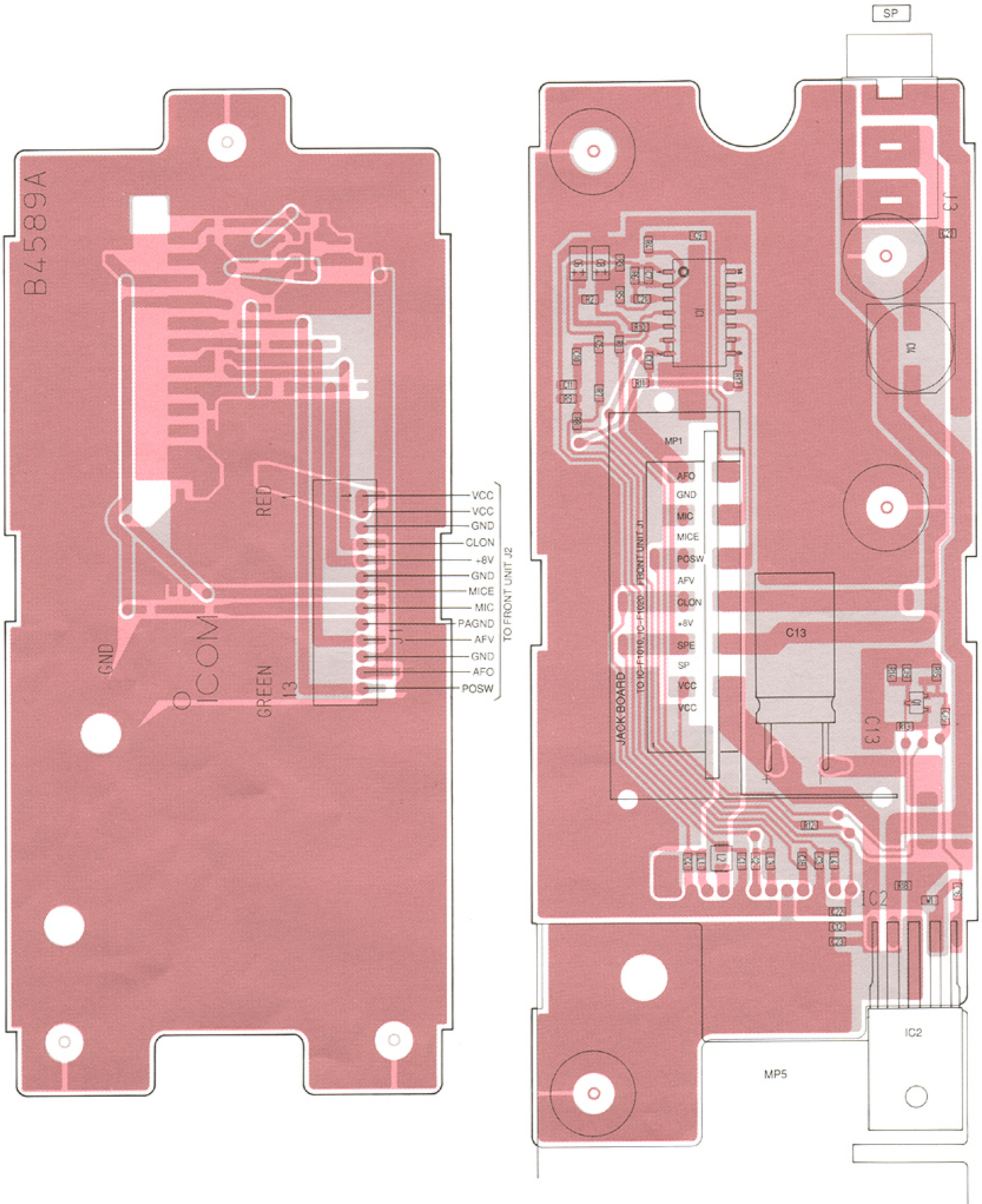


● REAR UNIT



● REAR UNIT

● FRONT UNIT



[FRONT UNIT]

REF. NO.	ORDER NO.	DESCRIPTION		QTY.
IC1	1110002680	S.IC	NJM2902M-T1	1
IC2	1110003090	IC	LA4425A	1
Q1	1590001450	S.FET	2SJ144-GR (TE85R)	1
L1	6200003960	S.COIL	MLF1608A 1R0K-T	1
L2	6200001980	S.COIL	NL 252018T-1R0J	1
L3	6200003960	S.COIL	MLF1608A 1R0K-T	1
L4	6200003960	S.COIL	MLF1608A 1R0K-T	1
R1	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)	1
R2	7030003520	S.RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)	1
R3	7030003520	S.RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)	1
R4	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	1
R5	7030003680	S.RESISTOR (#01)	ERJ3GEYJ 104 V (100 kΩ)	1
	7030003320	S.RESISTOR (#02)	ERJ3GEYJ 101 V (100 Ω)	1
R6	7030003720	S.RESISTOR	ERJ3GEYJ 224 V (220 kΩ)	1
R7	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)	1
R8	7030003600	S.RESISTOR	ERJ3GEYJ 223 V (22 kΩ)	1
R9	7030003510	S.RESISTOR	ERJ3GEYJ 392 V (3.9 kΩ)	1
R10	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)	1
R11	7030003600	S.RESISTOR	ERJ3GEYJ 223 V (22 kΩ)	1
R12	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)	1
R13	7030003600	S.RESISTOR	ERJ3GEYJ 223 V (22 kΩ)	1
R14	7030003720	S.RESISTOR	ERJ3GEYJ 224 V (220 kΩ)	1
R15	7030003600	S.RESISTOR	ERJ3GEYJ 223 V (22 kΩ)	1
R17	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)	1
R18	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	1
C1	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A	1
C2	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A	1
C3	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A	1
C4	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A	1
C5	4030010740	S.CERAMIC	C1608 JB 1A 104K-T-A	1
C6	4550006250	S.TANTALUM	TEMSVA 1A 106M-8L	1
C7	4030007150	S.CERAMIC	C1608 CH 1H 151J-T-A	1
C8	4550006250	S.TANTALUM	TEMSVA 1A 106M-8L	1
C9	4030010740	S.CERAMIC	C1608 JB 1A 104K-T-A	1
C10	4030010740	S.CERAMIC	C1608 JB 1A 104K-T-A	1
C11	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A	1
C12	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A	1
C13	4510005040	ELECTROLYTIC	25 MV 1000 HC	1
C14	4510006260	S.ELECTROL	ECEV1AA471UP	1
C15	4030010740	S.CERAMIC	C1608 JB 1A 104K-T-A	1
C16	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A	1
C17	4030010740	S.CERAMIC	C1608 JB 1A 104K-T-A	1
C18	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A	1
C19	4030010740	S.CERAMIC	C1608 JB 1A 104K-T-A	1
C20	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A	1
C21	4030006850	S.CERAMIC	C1608 JB 1H 471K-T-A	1
C22	4030006900	S.CERAMIC	C1608 JB 1E 103K-T-A	1
C23	4030006900	S.CERAMIC	C1608 JB 1E 103K-T-A	1
J2	6510019090	CONNECTOR	S13B-ZR	1
J3	6450000140	CONNECTOR	HSJ0807-01-010	1
W1	7030003860	S.JUMPER	ERJ3GE JPW V	1
EP1	0910045692	PCB	B 4588B (FRONT)	1

[FRONT UNIT]

REF. NO.	ORDER NO.	DESCRIPTION		QTY.
MP1	8930038200	1765 jack plate		1
MP2	8210013160	1765 front panel		1
MP3	8930038230	1765 rear seal		1
MP5	8930038180	1765 IC plate		1
MP6	8930038210	1765 jack seal		1
MP7	8930038190	1765 jack bush		1
MP8	8810009130	Screw PH BT M3 x 12 NI-ZU		2
MP9	8810009060	Screw FH M3 x 6 ZK		4
MP10	8810009130	Screw PH BT M3 x 12 NI-ZU		1
MP11	8310037230	Serial No. label (BE) RMK-1		1

[JACK BOARD]

REF. NO.	ORDER NO.	DESCRIPTION		QTY.
J1	6510018040	CONNECTOR	52330-1217	1
EP1	0910045711	PCB	B 4590A (JACK)	1

[REAR UNIT]

REF. NO.	ORDER NO.	DESCRIPTION		QTY.
IC1	1130007370	S.IC	TA75S558F (TE85L)	1
FI1	2040000790	S.LC	EXCCET103U	1
L1	6200004470	S.COIL	MLF1608D R12K-T	1
L2	6200003960	S.COIL	MLF1608A 1R0K-T	1
L3	6200003960	S.COIL	MLF1608A 1R0K-T	1
L4	6200003960	S.COIL	MLF1608A 1R0K-T	1
L5	6200003960	S.COIL	MLF1608A 1R0K-T	1
L6	6200001980	S.COIL	NL 252018T-1R0J	1
R1	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)	1
R2	7030003510	S.RESISTOR	ERJ3GEYJ 392 V (3.9 kΩ)	1
R3	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)	1
R4	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	1
R5	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	1
R6	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)	1
R7	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	1
R8	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)	1
C2	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A	1
C3	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A	1
C4	4030010740	S.CERAMIC	C1608 JB 1A 104K-T-A	1
C5	4550006250	S.TANTALUM	TEMSVA 1A 106M-8L	1
C7	4550006250	S.TANTALUM	TEMSVA 1A 106M-8L	1
J1	6510019090	CONNECTOR	S13B-ZR	1
J2	6510018030	S.CONNECTOR	53248-1217	1
EP1	0910045701	PCB	B 4589A (REAR)	1
MP1	8210013150	1765 rear panel		1
MP2	8930038230	1765 rear seal		1
MP4	8930038240	1765 spring		1
MP6	8810009130	Screw PH BT M3 x 12 NI-ZU		1
MP7	8810004300	Screw PH M3 x 10 ZK		3
MP8	8810009060	Screw FH M3 x 6 ZK		4

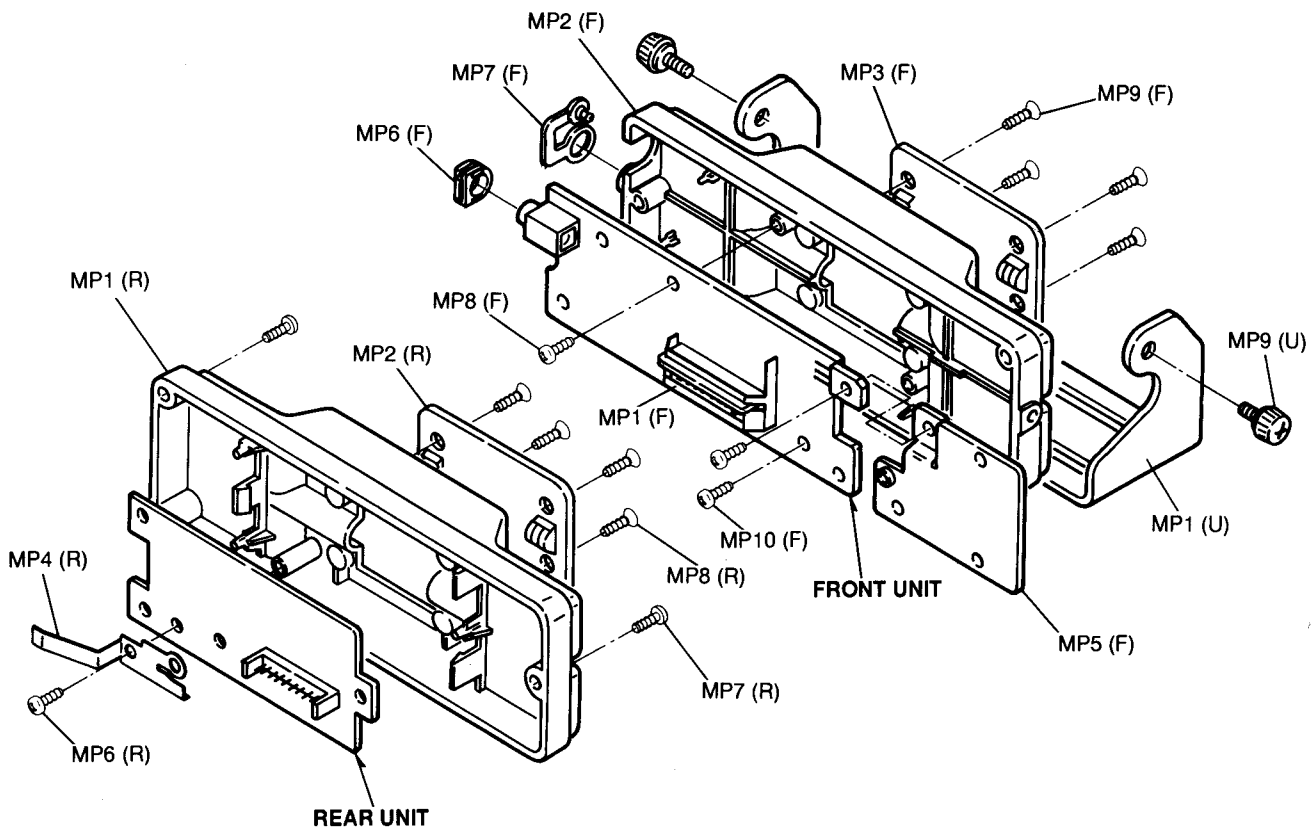
S.=Surface mount



**[UNPACKING]**

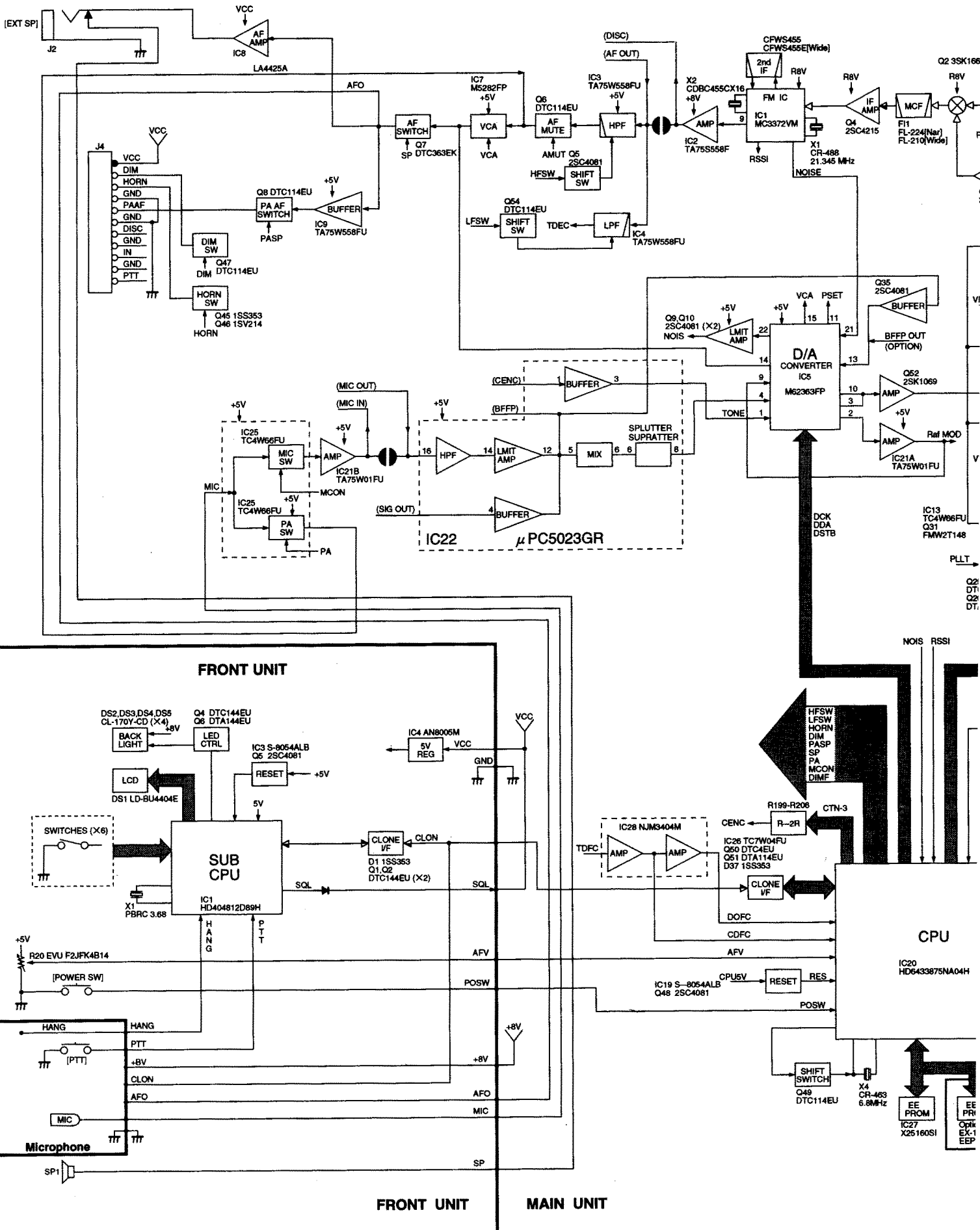
REF. NO.	ORDER NO.	DESCRIPTION	QTY.
MP1	8010016470	1765 mounting bracket	1
MP3	8810000470	Screw PH M5 x 12 (+/-)	4
MP4	8810000950	Screw PH A M5 x 16	4
MP5	8850000150	Flat washer M5 NI BS	4
MP6	8850000390	Spring washer M5	4
MP7	8830000120	Nut M5	4
MP8	8810004430	Screw PH M3 x 6 ZK	2
MP9	8820000910	1765 screw	2

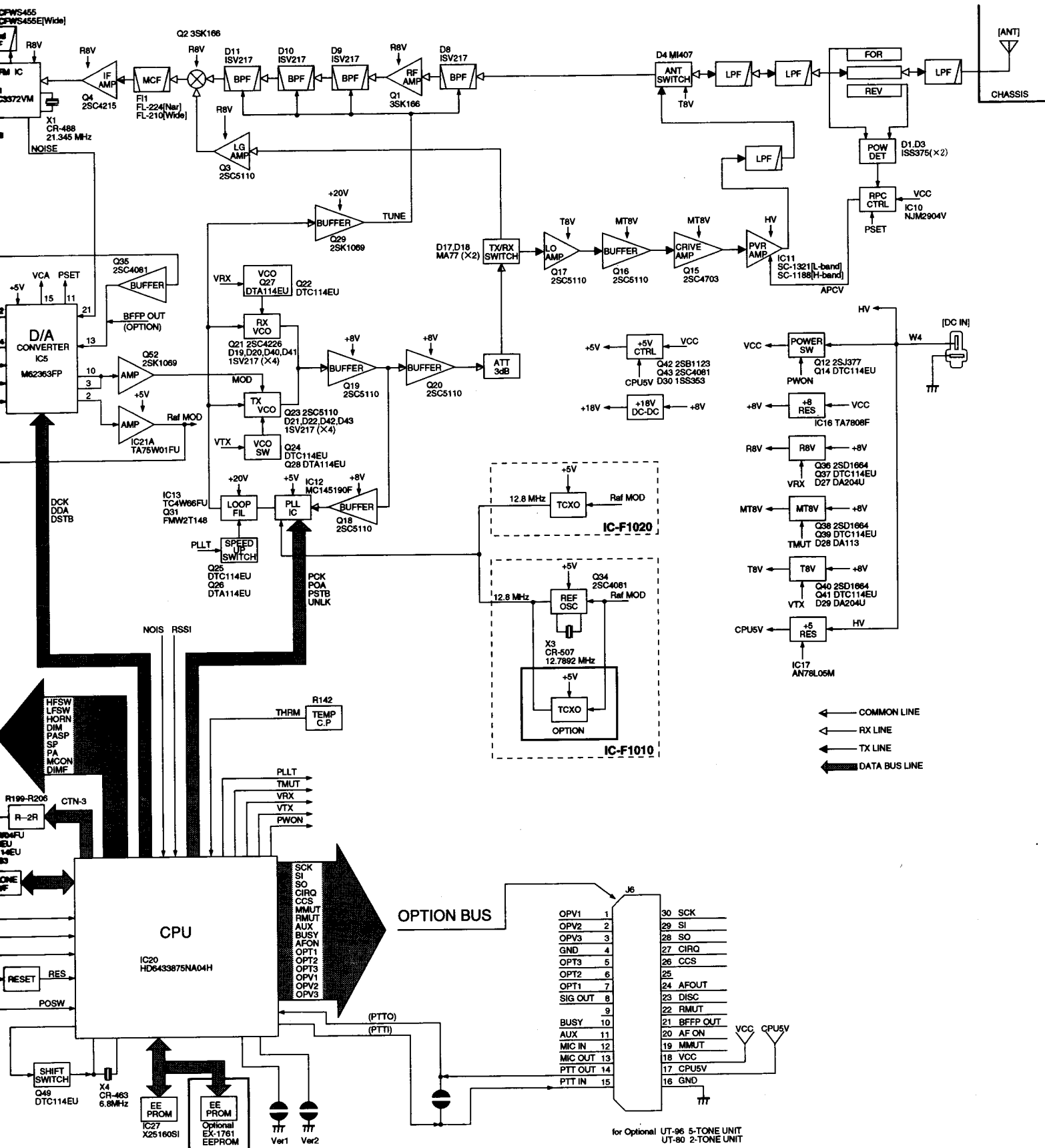
**Screw abbreviations** BT: Self-tapping PH: Pan head  
 FH: Flat head NI-ZU: Nickel-zinc  
 NI: Nickel BS: Brass ZK: Black



**Unit abbreviations** (F): FRONT UNIT (R): REAR UNIT (U): UNPACKING

# SECTION 11 BLOCK DIAGRAM





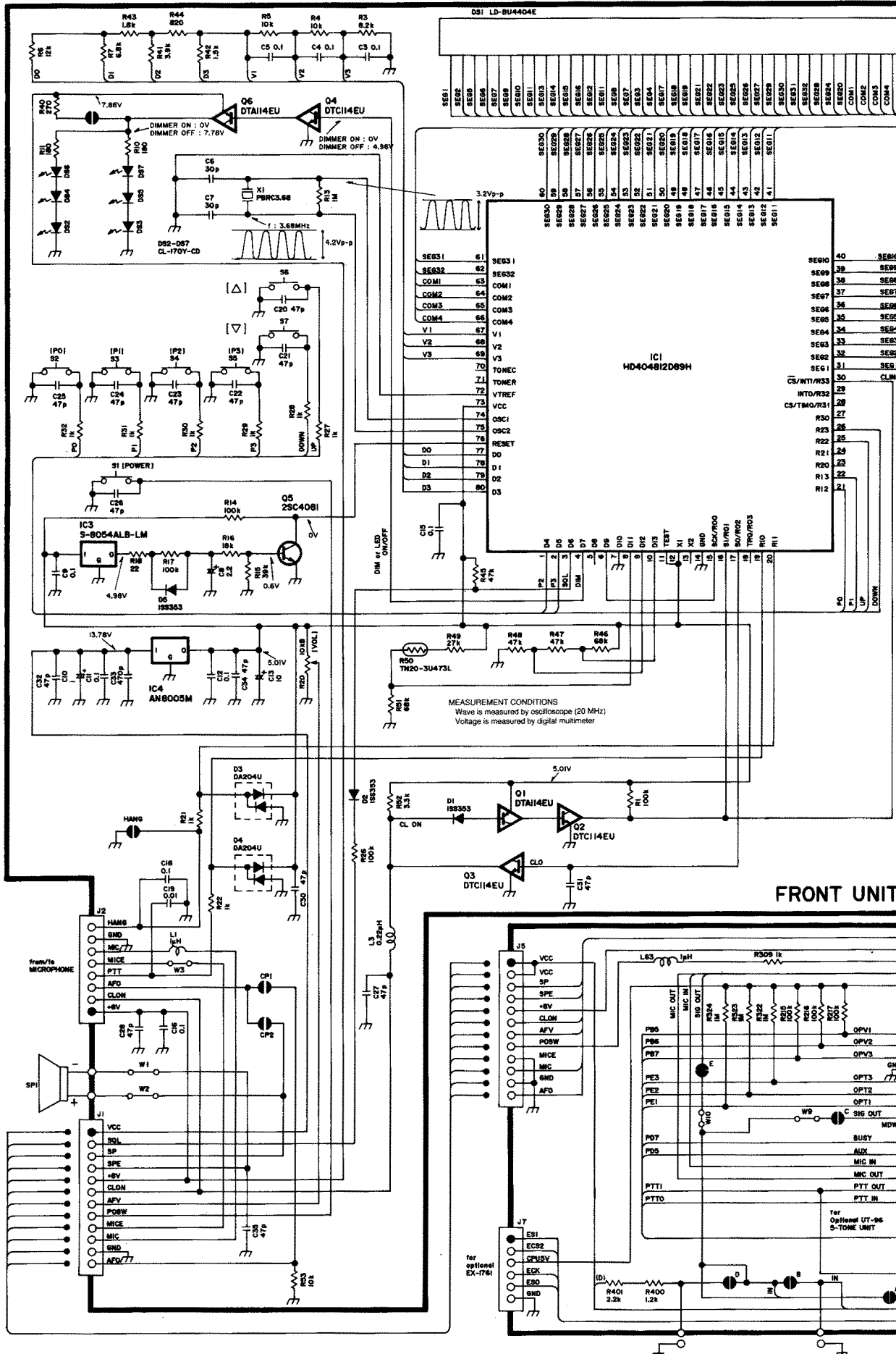
← COMMON LINE  
 ← RX LINE  
 ← TX LINE  
 ← DATA BUS LINE

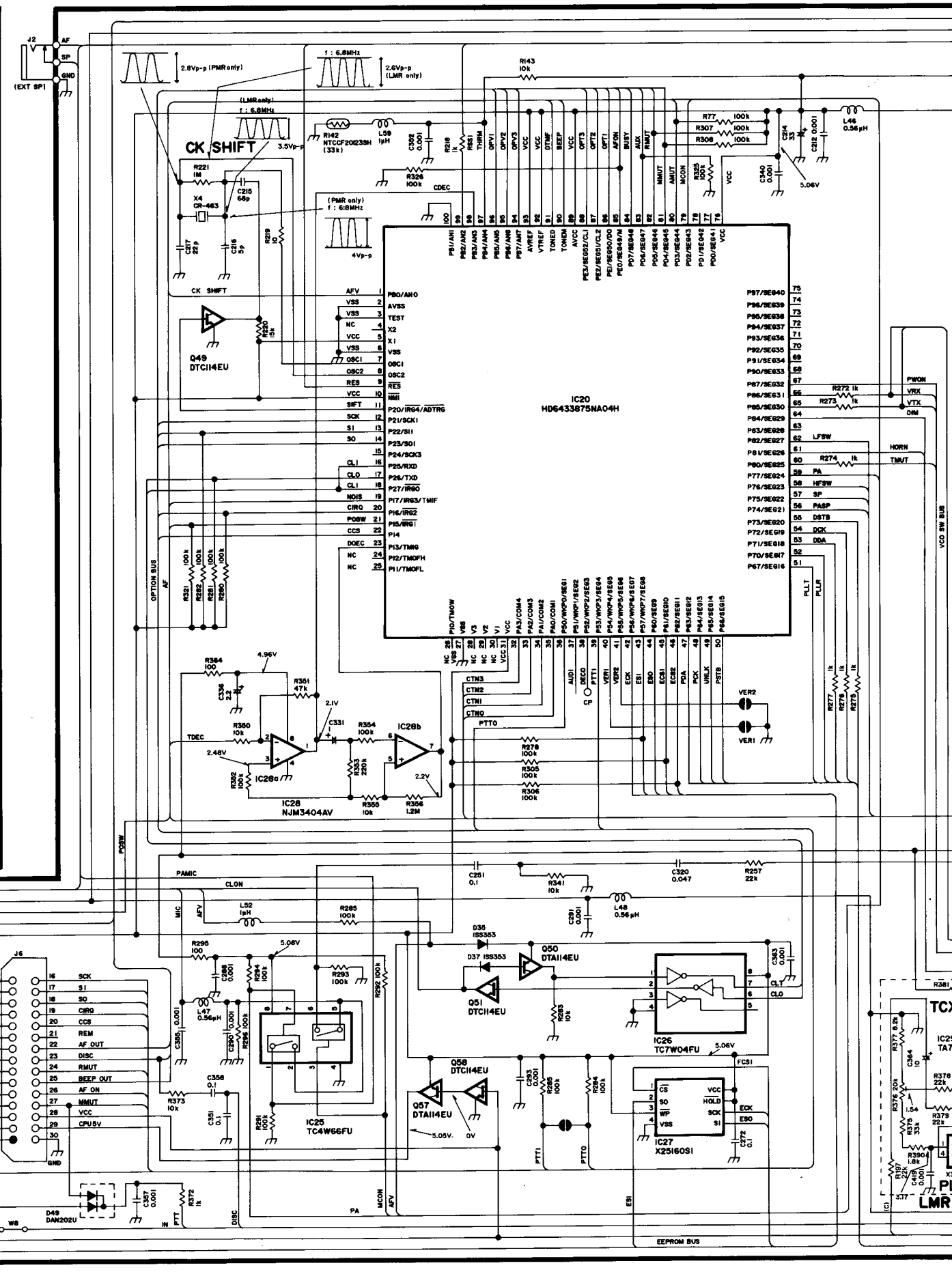
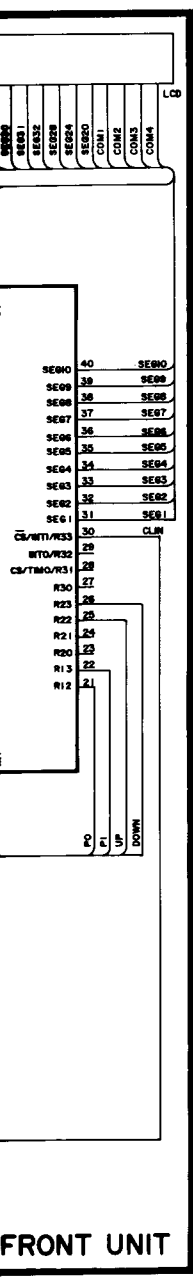
**OPTION BUS**

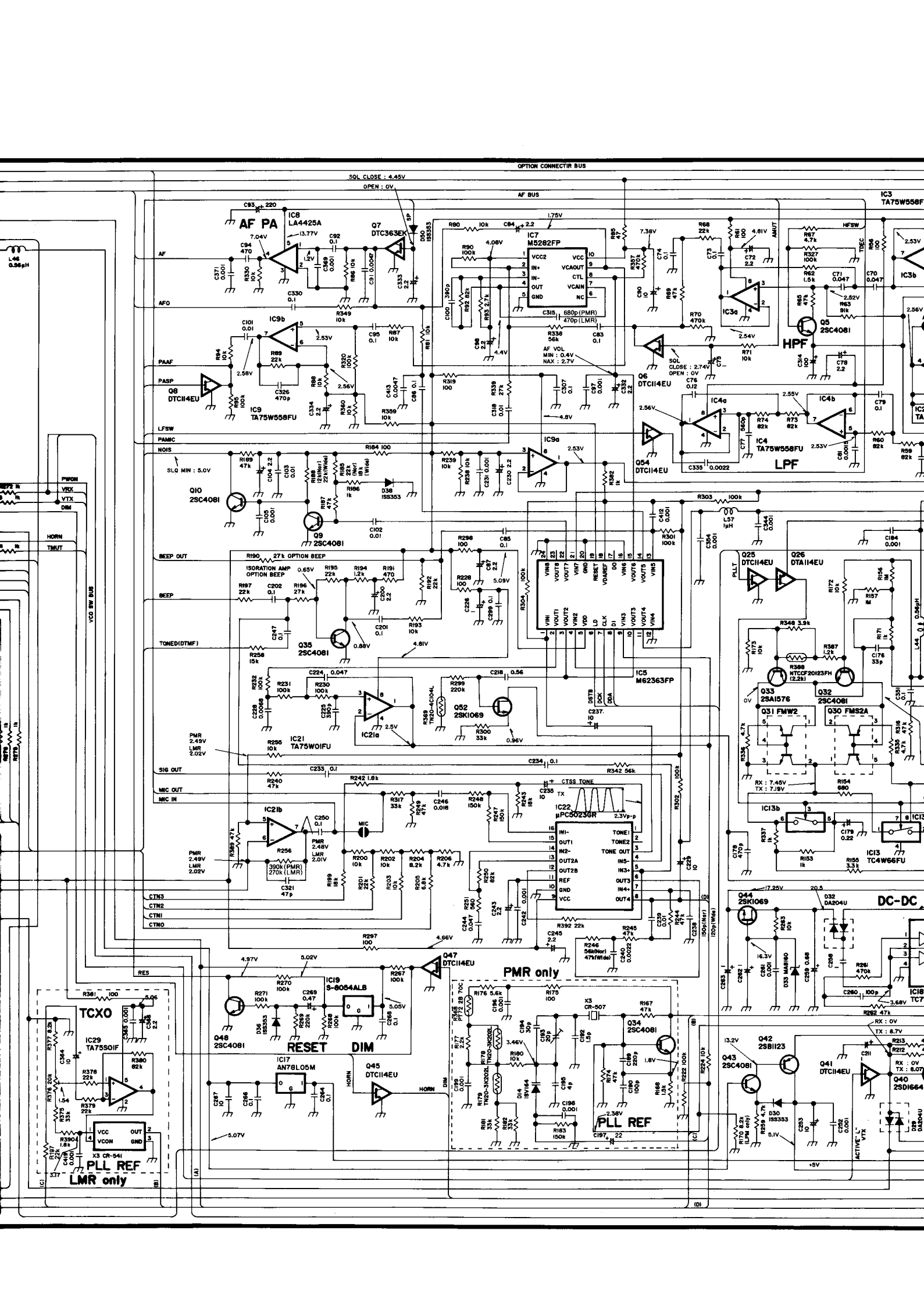
OPV1	1	30	SCK
OPV2	2	29	SI
OPV3	3	28	SO
GND	4	27	CHQ
OPT3	5	26	CCS
OPT2	6	25	
OPT1	7	24	AFOUT
SIG OUT	8	23	DISC
	9	22	RMUT
BUSY	10	21	BFFP OUT
AUX	11	20	AF ON
MIC IN	12	19	MMUT
MIC OUT	13	18	VCC
PTT OUT	14	17	CPU5V
PTT IN	15	16	GND

for Optional UT-96 5-TONE UNIT  
UT-80 2-TONE UNIT

# SECTION 12 VOLTAGE DIAGRAM







OPTION CONNECTOR BUS

SOL CLOSE : 4.45V  
OPEN : 0V

AF BUS

AF PA  
IC8 LA4425A  
7.04V  
13.77V

IC7 M5282FP  
VCC2  
VCAOUT  
CTL  
VCAIN  
NC

IC3 TA75W558FU

IC3b  
IC3c  
IC3d

IC9b  
IC9 TA75W558FU

Q7 DTC14EU

IC35 680p(PMR)  
470p(LMR)

Q6 DTC14EU

Q5 2SC4081

Q10 2SC4081

Q9 2SC4081

Q35 2SC4081

IC21b  
IC21 TA75W01FU

Q52 2SK1069

Q32 2SC4081

Q33 2SA1576

Q30 FMS2A

Q31 FMW2

Q47 DTC14EU

Q48 2SC4081

IC19 S-8054ALB

AN78L05M

Q45 DTC14EU

Q44 2SK1069

Q42 2SB1123

Q43 2SC4081

Q41 DTC14EU

Q40 2SD1664

IC29 TA75SOIF

IC22  $\mu$ PC5023GR

IC13b  
IC13c  
IC13d  
IC13 TA75W558FU

PLL REF  
LMR only

PMR only

PLL REF

DC-DC

TCXO

RES

RESET

DIM

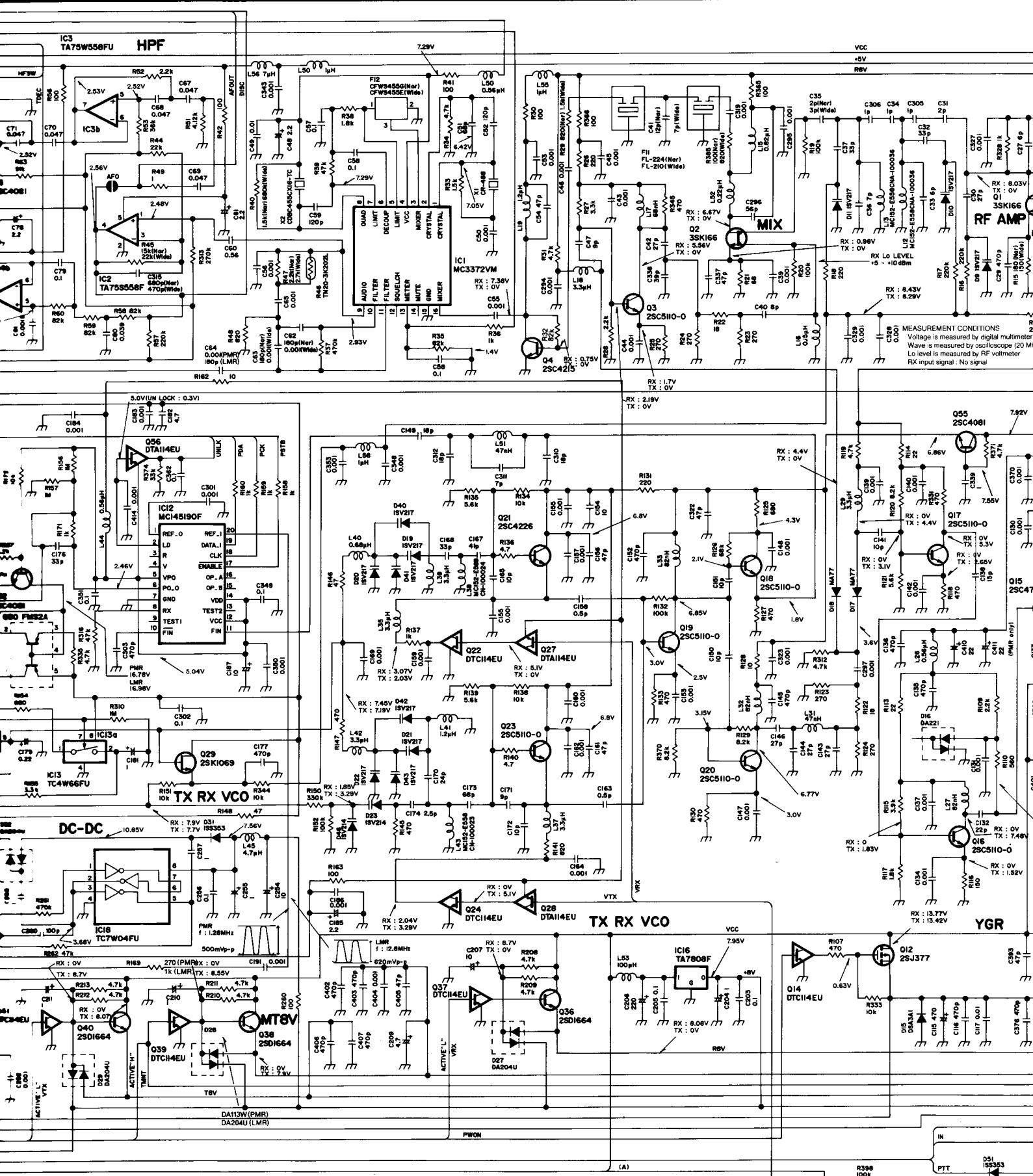
HORN

DIM

DIM

ACTIVE L VTX

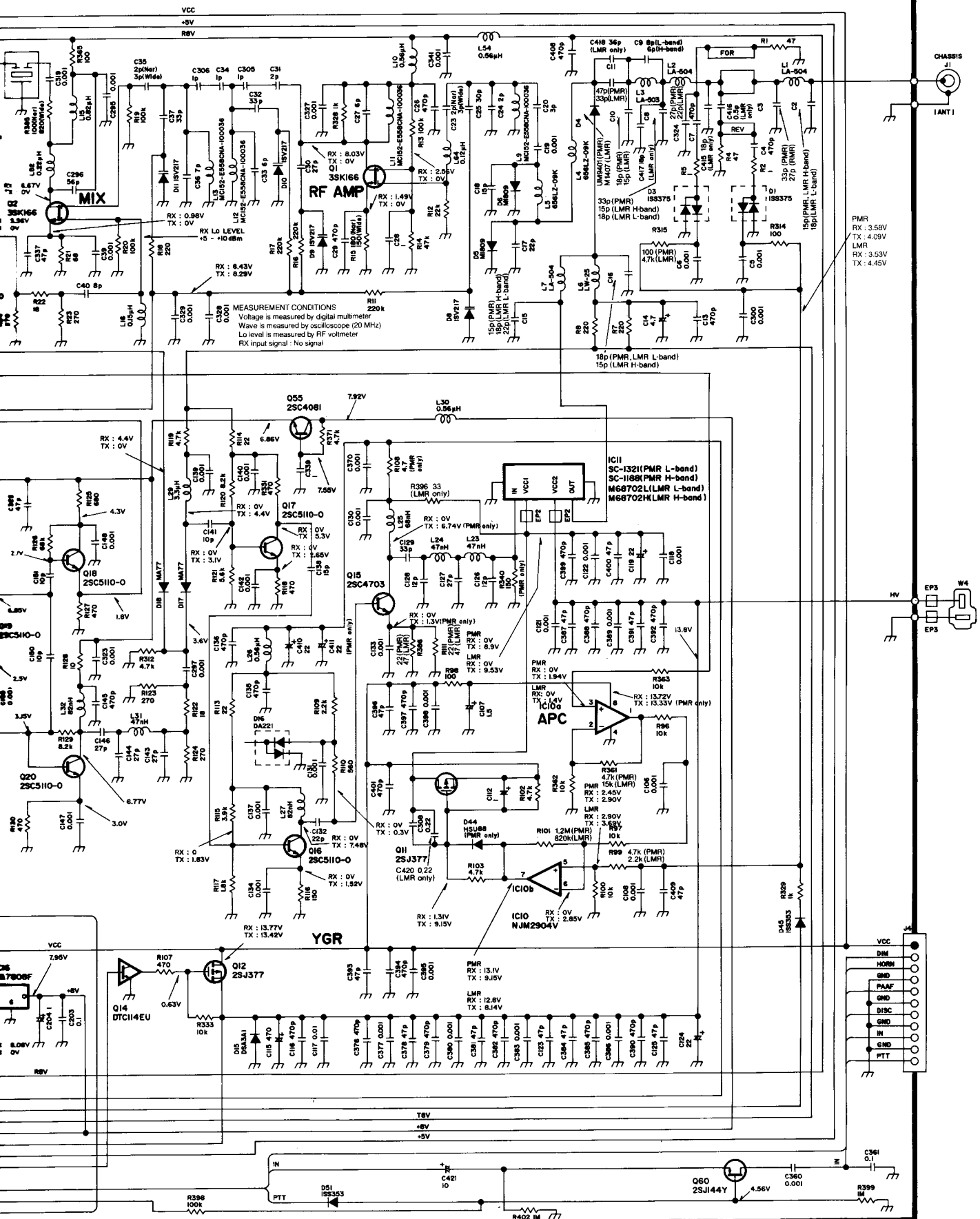
ACTIVE L VTX



MEASUREMENT CONDITIONS  
 Voltage is measured by digital multimeter  
 Wave is measured by oscilloscope (20 M $\Omega$ )  
 Lo level is measured by RF voltmeter  
 RX input signal: No signal

(A)

# MAIN UNIT



MEASUREMENT CONDITIONS  
 Voltage is measured by digital multimeter  
 Wave is measured by oscilloscope (20 MHz)  
 L<sub>o</sub> level is measured by RF voltmeter  
 RX input signal: No signal

PMR	RX: 3.50V
	TX: 4.09V
LMR	RX: 3.53V
	TX: 4.45V

060 2SJ144Y 4.56V  
 C360 0.001  
 R399 1M  
 R402 1M



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Count on us!

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