Pub NO. KT-53-002
September, 2003

FURUNO

TECHNICAL INFORMATION

TEST REPORT ON THE PERFORMANCE OF MARINE VHF RADIOTELEPHONE FOR SUBMISSION TO FCC

Trade Name: FURUNO

Model FM-3000

FURUNO ELECTRIC CO., LTD.
NISHINOMIYA CITY, JAPAN

******* CONTENTS******

1 GENERAL INFORMATION

Receivers

Frequency Range :	156.050 to 163.275 MHz
Number of Channels :	87CH + WX 10CH + free 70CH
Intermediate Frequency :	1st 21.7 MHz 2nd 450kHz
Input Impedance (RF) :	50 ohms
Output Impedance (SP) :	4 ohms
Audio Output Power (Resistive Load)	3.5W (4 ohms)

Transmitters

Frequency Range :	156.025 to 157.425 MHz
Maximum Power Rating:	25.0 / 1.0 W
Number of Channels :	55CH + free 70CH
Input Impedance (MIC) :	2000 ohms
Output Impedance (RF) :	50 ohms nominal
Voltage Requirements :	13.8 V DC nominal value
Model name :	FM-3000
Serial No. :	3542-0001
Manufacturer :	ICOM INC.

This Report was prepared by ICOM INCORPORATED.

Test performed by Y.Imamura

2 TRANSMITTER

PARAGRAPH : 2,985 DATE 2003/9/5

NAME OF TEST : CARRIER OUTPUT POWER

MANUFACTURERS RATING : HIGH 25.0W
LOW 1.0W

TEST RESULT : MEETS MINIMUM STANDARD

TEST CONDITIONS : AS SPECIFIED IN PARAGRAPH

TEST SETUP : SEE BLOCK DIAGRAM ON PAGE 27/29

MEASUREMENT DATA TEST FREQUENCY 156.025MHz

HIGH POWER (CH60)	25.0 WATTS NOMINAL TRANSMIT POWER
	23.5 WATTS ACTUAL TRANSMIT POWER
	63.5 WATTS INPUT POWER
	37.0 % EFFICIENCY
LOW POWER (CH60)	1.0 WATTS NOMINAL TRANSMIT POWER
	0.81 WATTS ACTUAL TRANSMIT POWER
	15.5 WATTS INPUT POWER
	5.2 % EFFICIENCY

PARAGRAPH : 2,985 DATE 2003/9/5

NAME OF TEST : CARRIER OUTPUT POWER

MANUFACTURERS RATING : HIGH 25.0W
LOW 1.0W

TEST RESULT : MEETS MINIMUM STANDARD

TEST CONDITIONS : AS SPECIFIED IN PARAGRAPH

TEST SETUP : SEE BLOCK DIAGRAM ON PAGE 27/29

MEASUREMENT DATA TEST FREQUENCY 156.800 MHz

HIGH POWER (CH16)

25.0 WATTS NOMINAL TRANSMIT POWER

23.4 WATTS ACTUAL TRANSMIT POWER

62.4 WATTS INPUT POWER

37.5 % EFFICIENCY

LOW POWER (CH16)

1.0 WATTS NOMINAL TRANSMIT POWER

0.81 WATTS ACTUAL TRANSMIT POWER

15.3 WATTS INPUT POWER

5.3 % EFFICIENCY

PARAGRAPH : 2,985 DATE 2003/9/5

NAME OF TEST : CARRIER OUTPUT POWER

MANUFACTURERS RATING : HIGH 25.0W
LOW 1.0W

TEST RESULT : MEETS MINIMUM STANDARD

TEST CONDITIONS : AS SPECIFIED IN PARAGRAPH

TEST SETUP : SEE BLOCK DIAGRAM ON PAGE 27/29

MEASUREMENT DATA TEST FREQUENCY 157.425 MHz

HIGH POWER (CH88A)

25.0 WATTS NOMINAL TRANSMIT POWER

23.4 WATTS ACTUAL TRANSMIT POWER

62.0 WATTS INPUT POWER

37.7 % EFFICIENCY

LOW POWER (CH88A)

1.0 WATTS NOMINAL TRANSMIT POWER

0.81 WATTS ACTUAL TRANSMIT POWER

15.3 WATTS INPUT POWER

5.3 % EFFICIENCY

PARAGRAPH : 2,987 DATE 2003/9/5

NAME OF TEST : MODULATION CHARACTERISTICS

MINIMUM STANDARD : AS SPECIFIED IN PARAGRAPH

TEST RESULT : MEETS MINIMUM STANDARD

TEST CONDITIONS : AS SPECIFIED IN PARAGRAPH

TEST SETUP : SEE BLOCK DIAGRAM ON PAGE 28/29

MEASUREMENT DATA

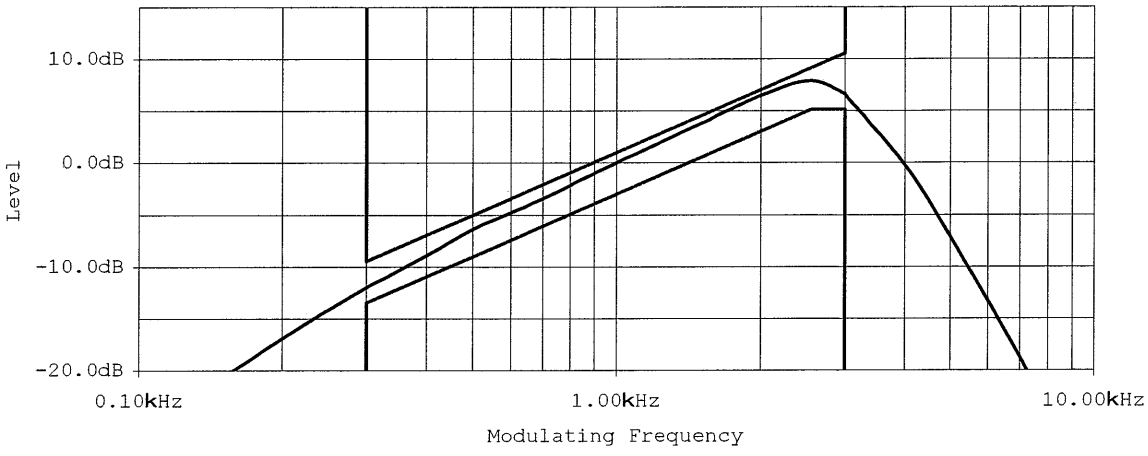
FREQUENCY RESPONSE OF AUDIO MODULATING CIRCUIT,ON PAGE 8/29

FREQUENCY RESPONSE OF LOW-PASS FILTER, ON PAGE 9/29

MODULATION CHARACTERISTICS, ON PAGE 10/29

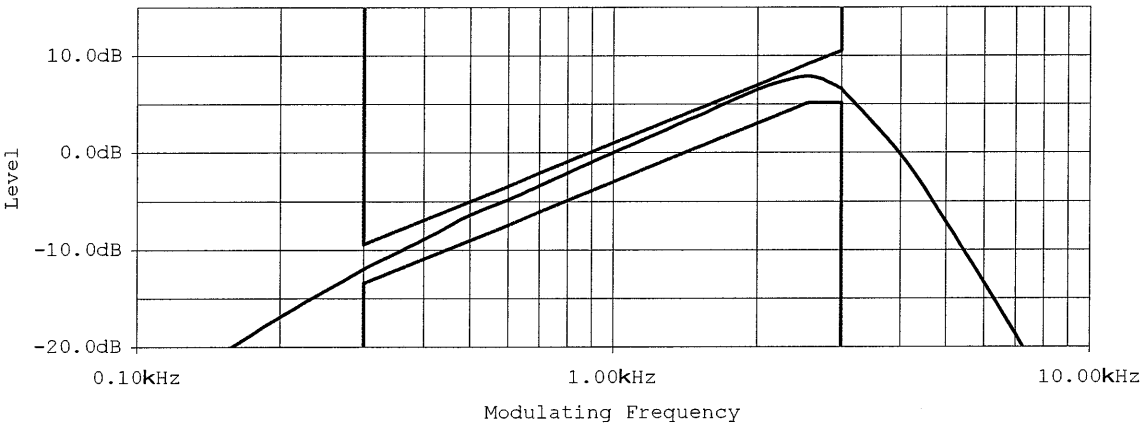
Frequency Response

Test Frequency 156.025MHz(CH60)



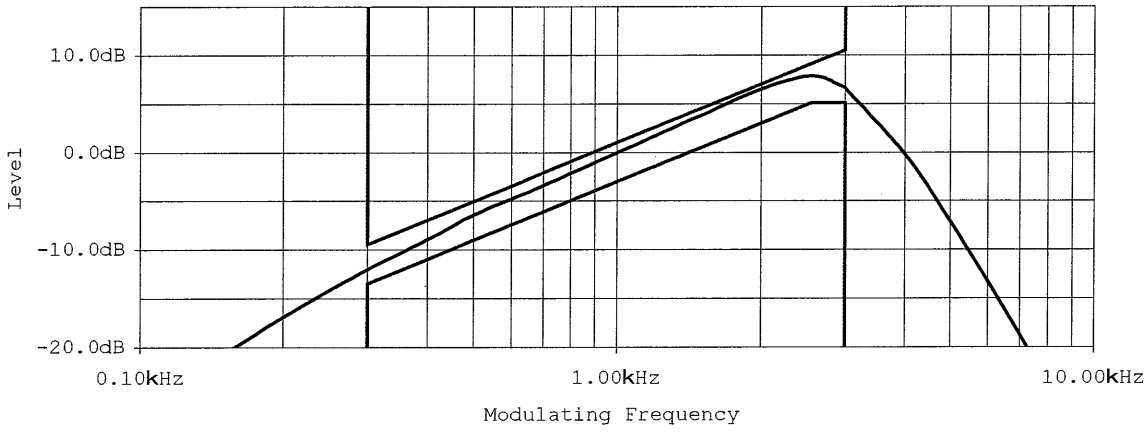
Frequency Response

Test Frequency 156.800MHz(ch16)

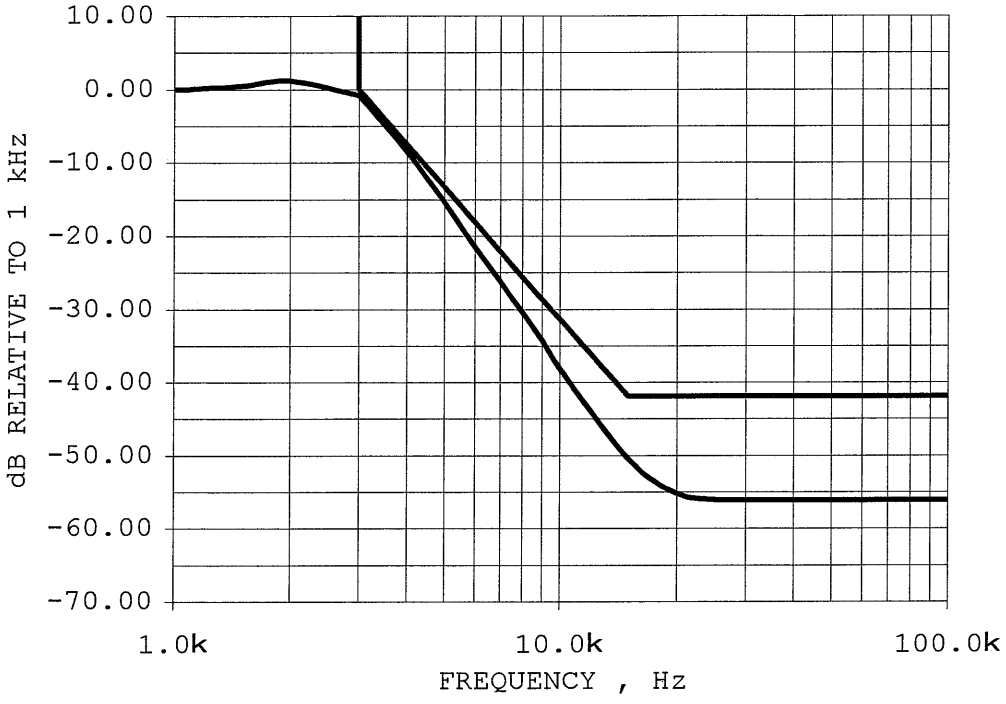


Frequency Response

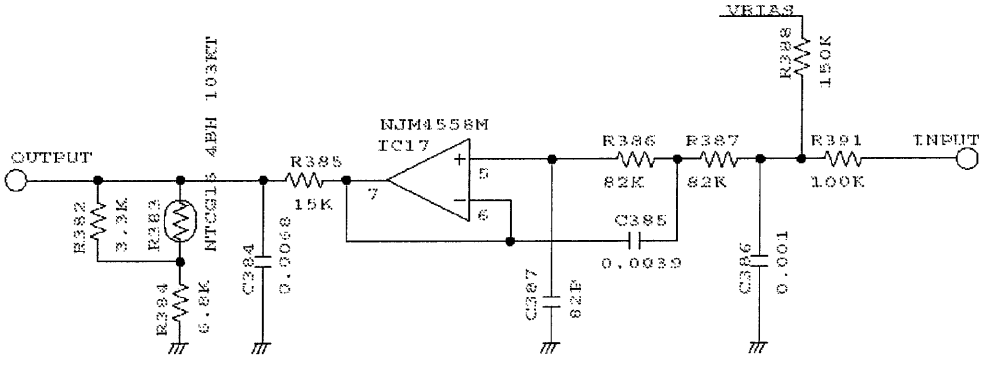
Test Frequency 157.425MHz(ch88A)



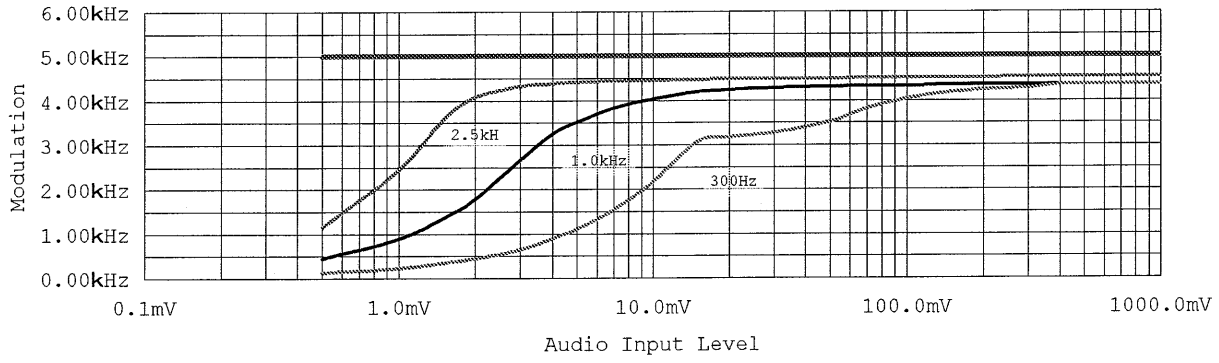
FREQUENCY RESPONSE OF AUDIO LOWPASS FILTER



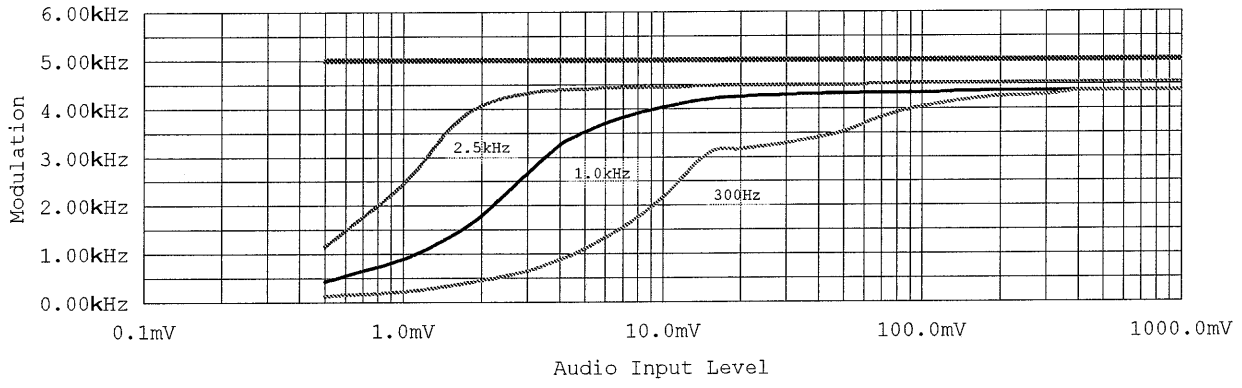
TEST FREQUENCY 156.800MHz (CH16)



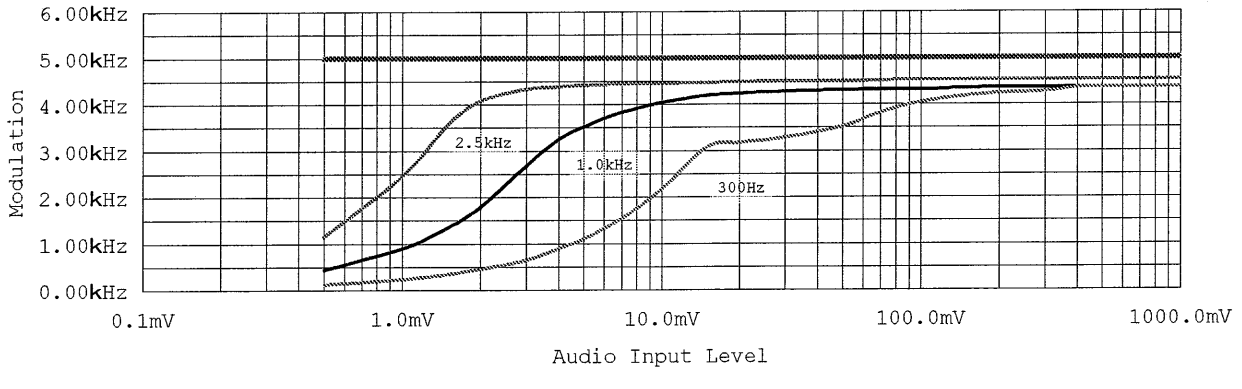
Modulation Limiting
Test Frequency 156.025MHz(ch60)



Modulation Limiting
Test Frequency 156.800MHz(ch16)



Modulation Limiting
Test Frequency 157.425MHz(ch88A)



PARAGRAPH : 2,989 DATE 2003/9/5

NAME OF TEST : OCCUPIED BANDWIDTH

MINIMUM STANDARD : AS SPECIFIED IN PARAGRAPH

TEST RESULT : MEETS MINIMUM STANDARD

TEST CONDITIONS : AS SPECIFIED IN PARAGRAPH

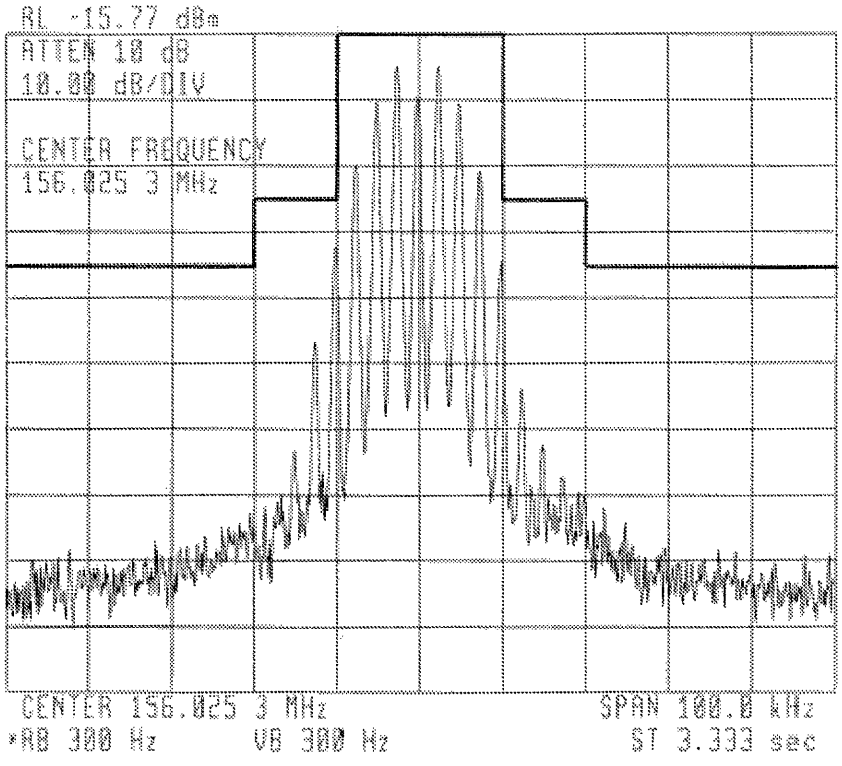
TEST SETUP : SEE BLOCK DIAGRAM ON PAGE 28/29

MEASUREMENT DATA

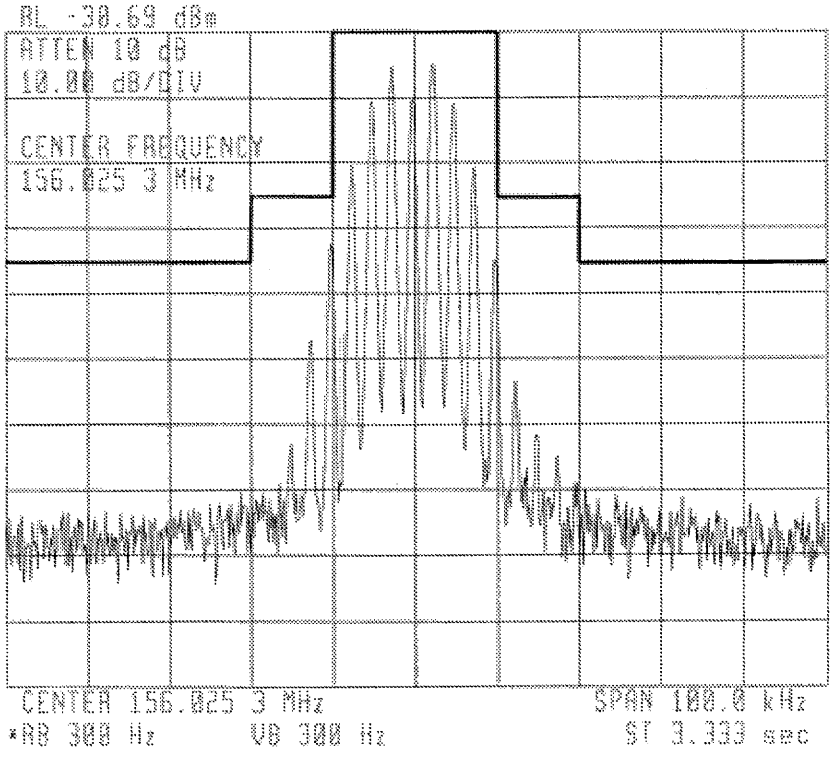
SEE DATA ON PAGE 12/29 ~ 19/29

NAME OF TEST: Emission Masks (Occupied Bandwidth) 2003/9/5

TEST FREQUENCY 156.025MHz(CH60)
Carrier output power 25W
MOD Frequency 2500Hz
0dB with reference to level of unmodulated carrier

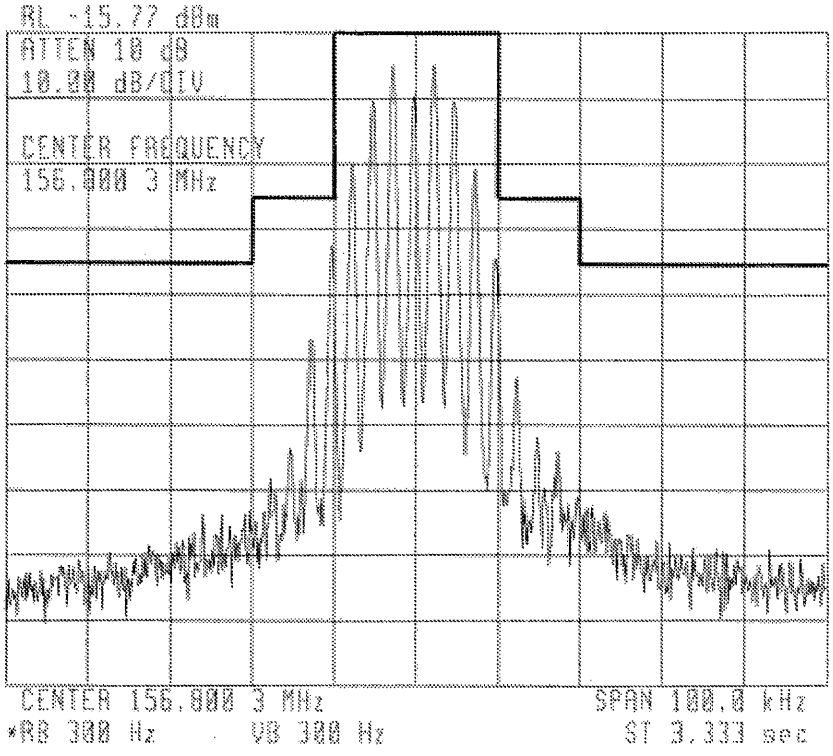


TEST FREQUENCY 156.025MHz(CH60)
Carrier output power 1W
MOD Frequency 2500Hz
0dB with reference to level of unmodulated carrier

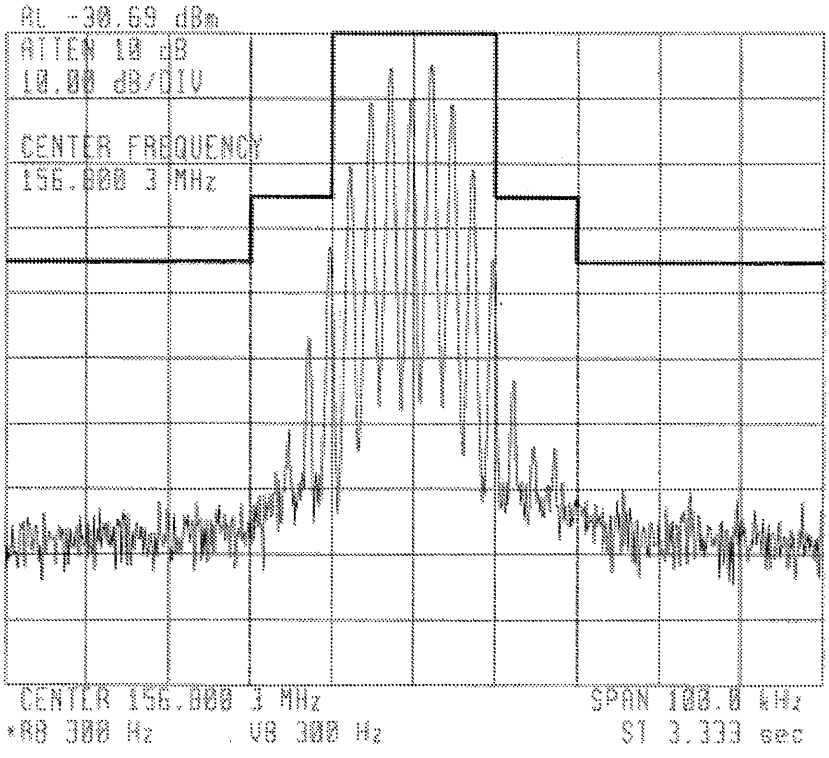


NAME OF TEST: Emission Masks (Occupied Bandwidth) 2003/9/5

TEST FREQUENCY 156.800MHz(CH16)
Carrier output power 25W
MOD Frequency 2500Hz
0dB with reference to level of unmodulated carrier

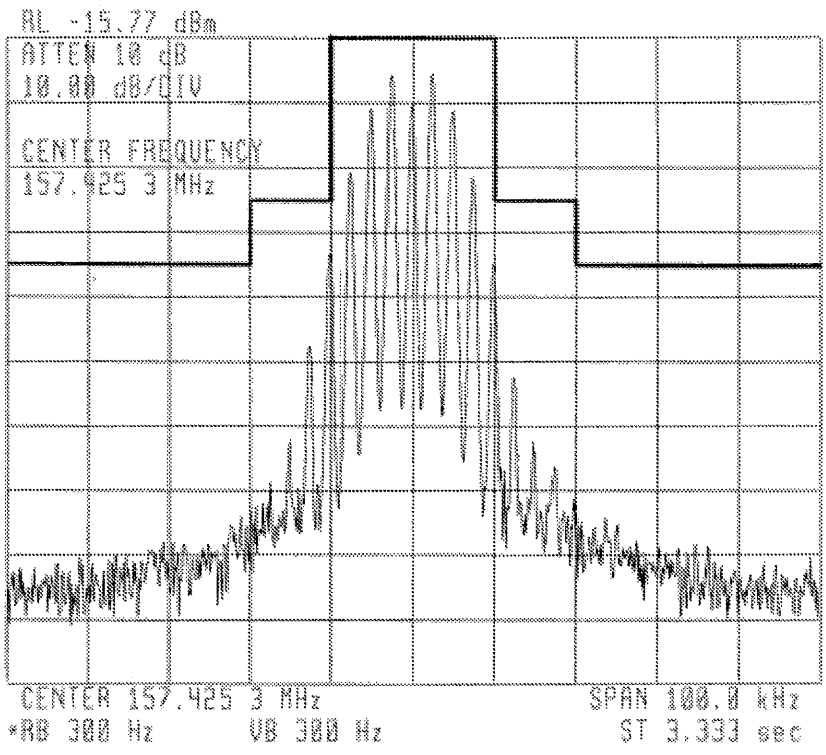


TEST FREQUENCY 156.800MHz(CH16)
Carrier output power 1W
MOD Frequency 2500Hz
0dB with reference to level of unmodulated carrier

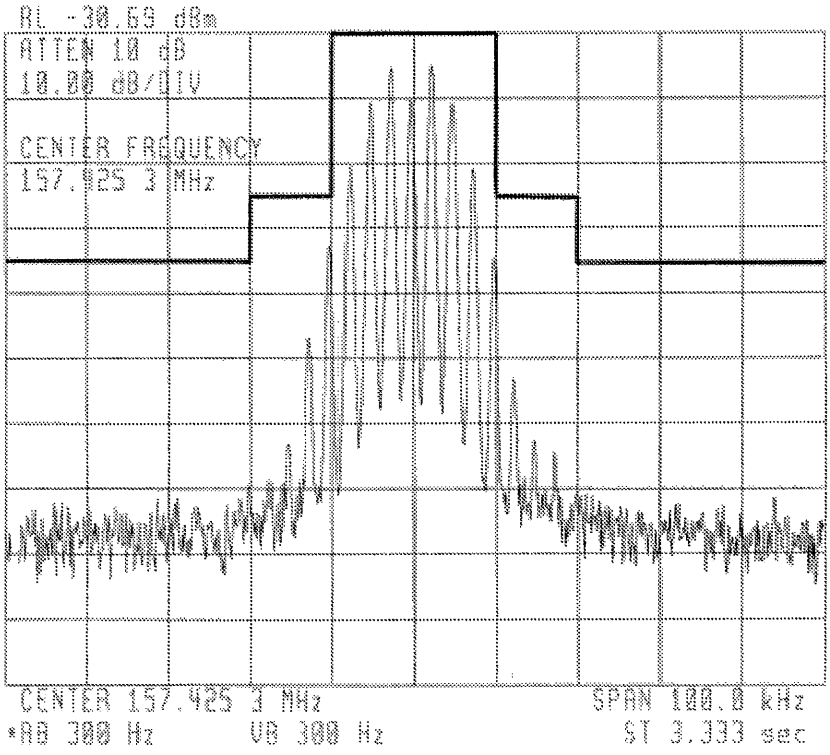


NAME OF TEST: Emission Masks (Occupied Bandwidth) 2003/9/5

TEST FREQUENCY 157.425MHz(CH88A)
Carrier output power 25W
MOD Frequency 2500Hz
0dB with reference to level of unmodulated carrier

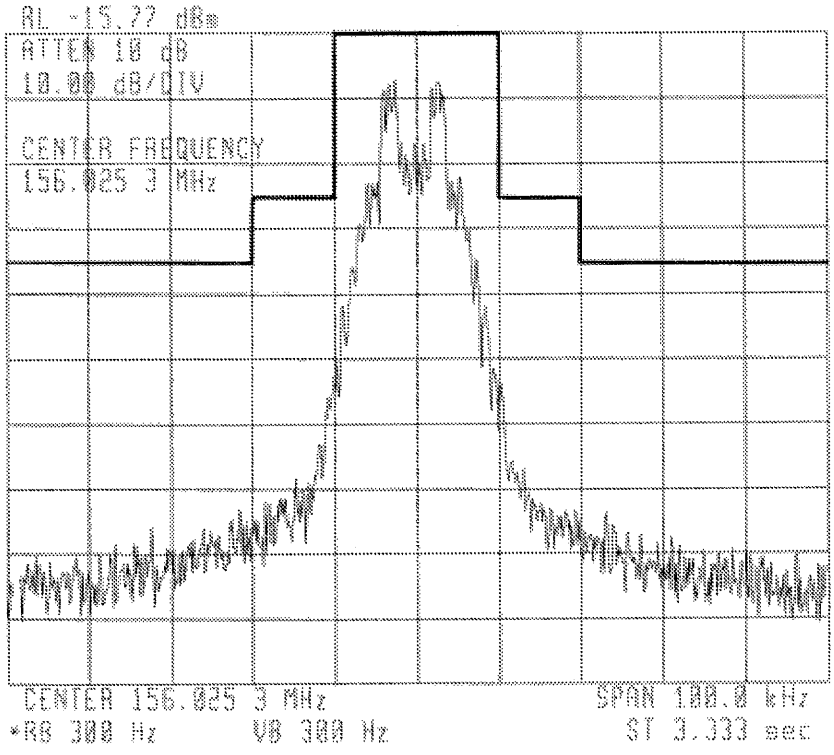


TEST FREQUENCY 157.425MHz(CH88A)
Carrier output power 1W
MOD Frequency 2500Hz
0dB with reference to level of unmodulated carrier

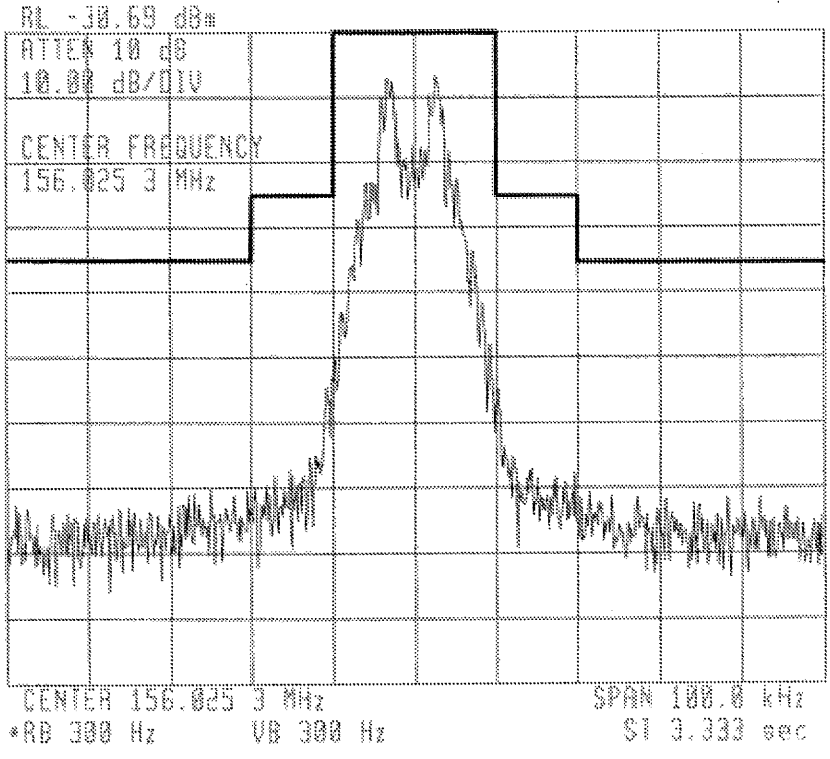


NAME OF TEST: Emission Masks (Occupied Bandwidth) 2003/9/5

TEST FREQUENCY 156.025MHz(CH60)
Carrier output power 25W
MOD Frequency 2500Hz including optional SCRAMBLER UNIT UT-112
0dB with reference to level of unmodulated carrier

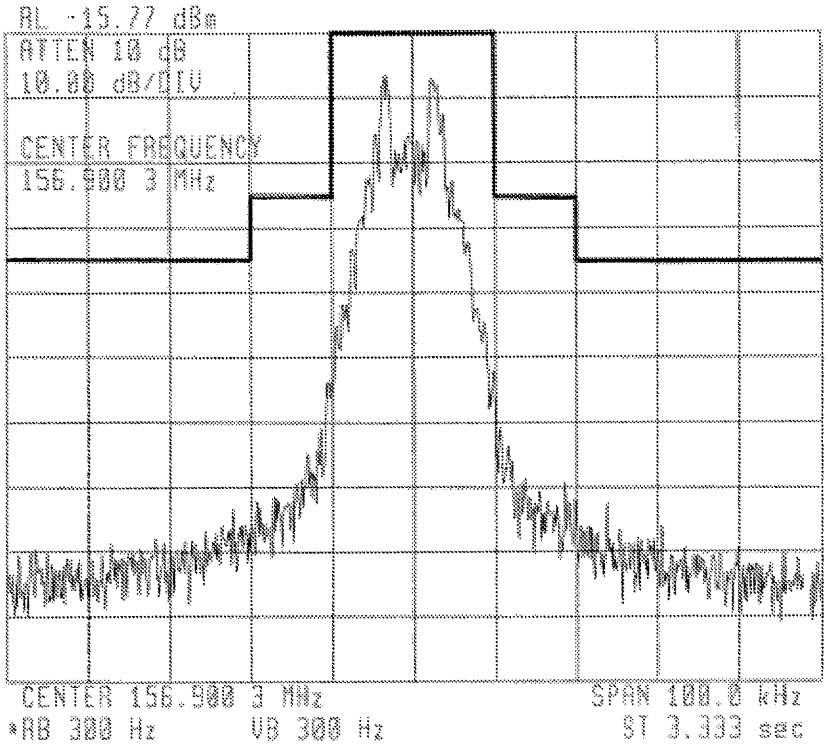


TEST FREQUENCY 156.025MHz(CH60)
Carrier output power 1W
MOD Frequency 2500Hz including optional SCRAMBLER UNIT UT-112
0dB with reference to level of unmodulated carrier

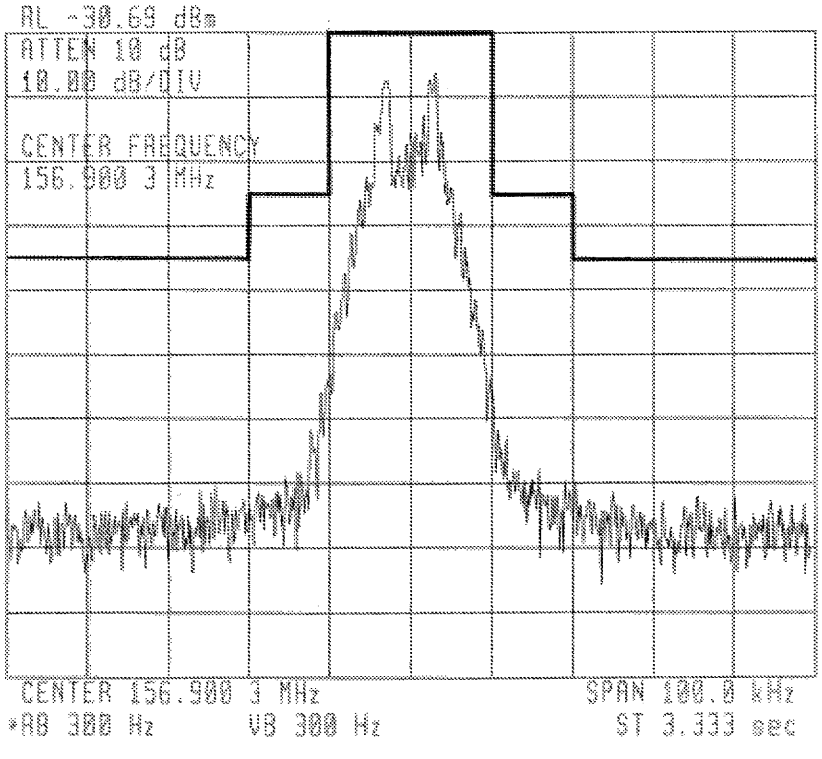


NAME OF TEST: Emission Masks (Occupied Bandwidth) 2003/9/5

TEST FREQUENCY 156.900MHz(CH18)
Carrier output power 25W
MOD Frequency 2500Hz including optional SCRAMBLER UNIT UT-112
0dB with reference to level of unmodulated carrier

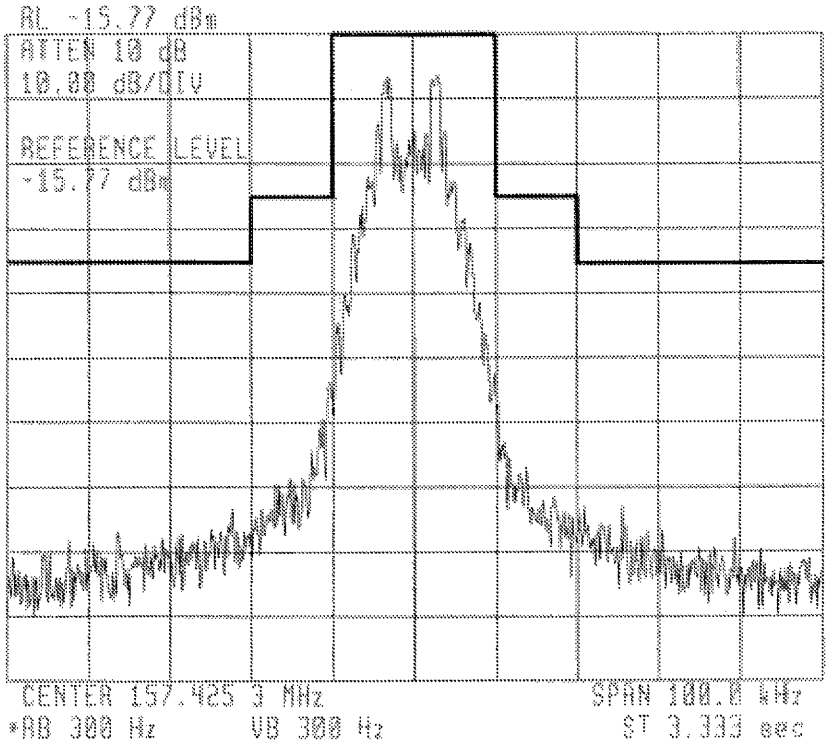


TEST FREQUENCY 156.900MHz(CH18)
Carrier output power 1W
MOD Frequency 2500Hz including optional SCRAMBLER UNIT UT-112
0dB with reference to level of unmodulated carrier

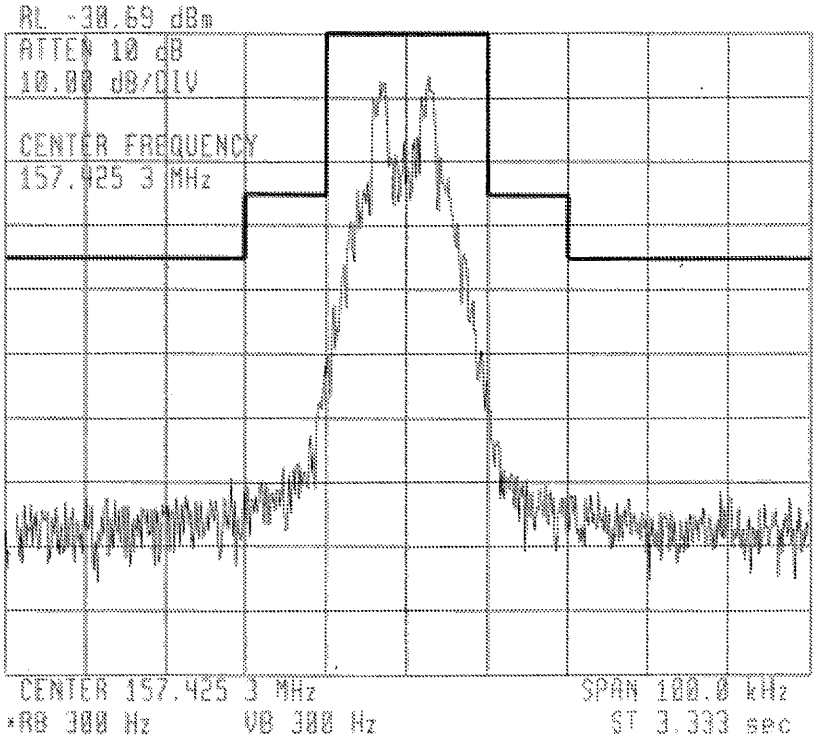


NAME OF TEST: Emission Masks (Occupied Bandwidth) 2003/9/5

TEST FREQUENCY 157.425MHz(CH88A)
Carrier output power 25W
MOD Frequency 2500Hz including optional SCRAMBLER UNIT UT-112
0dB with reference to level of unmodulated carrier

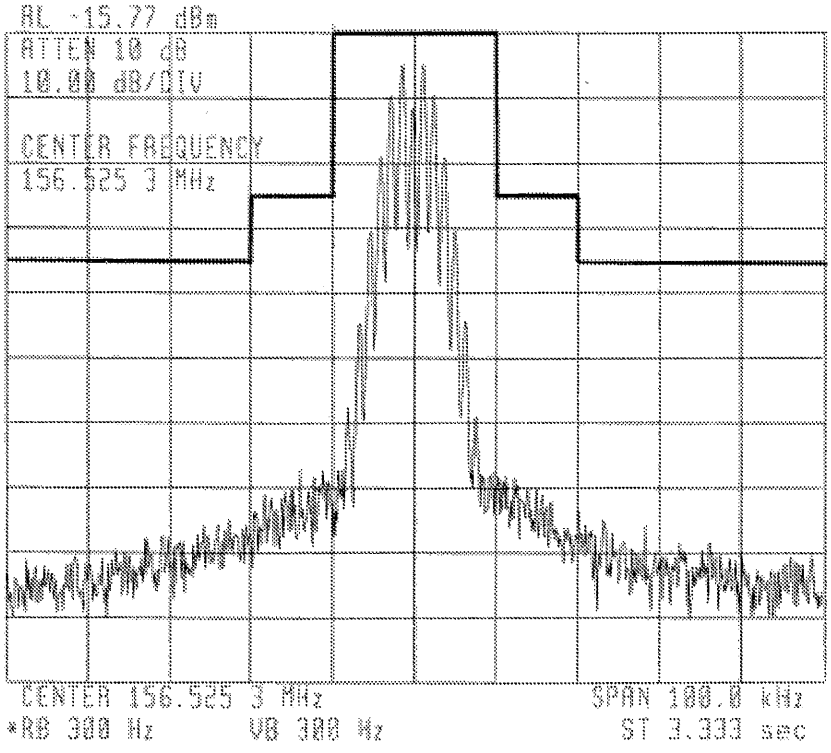


TEST FREQUENCY 157.425MHz(CH88A)
Carrier output power 1W
MOD Frequency 2500Hz including optional SCRAMBLER UNIT UT-112
0dB with reference to level of unmodulated carrier

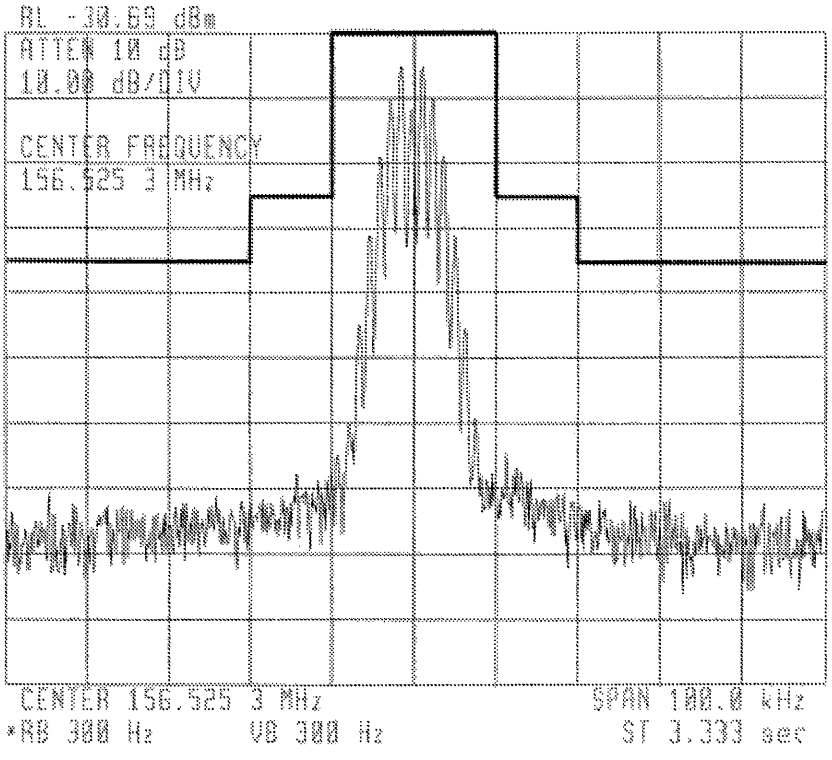


NAME OF TEST: Emission Masks (Occupied Bandwidth) 2003/9/5

TEST FREQUENCY 156.525MHz(CH70)
Carrier output power 25W
MOD Frequency DSC 1300Hz
0dB with reference to level of unmodulated carrier

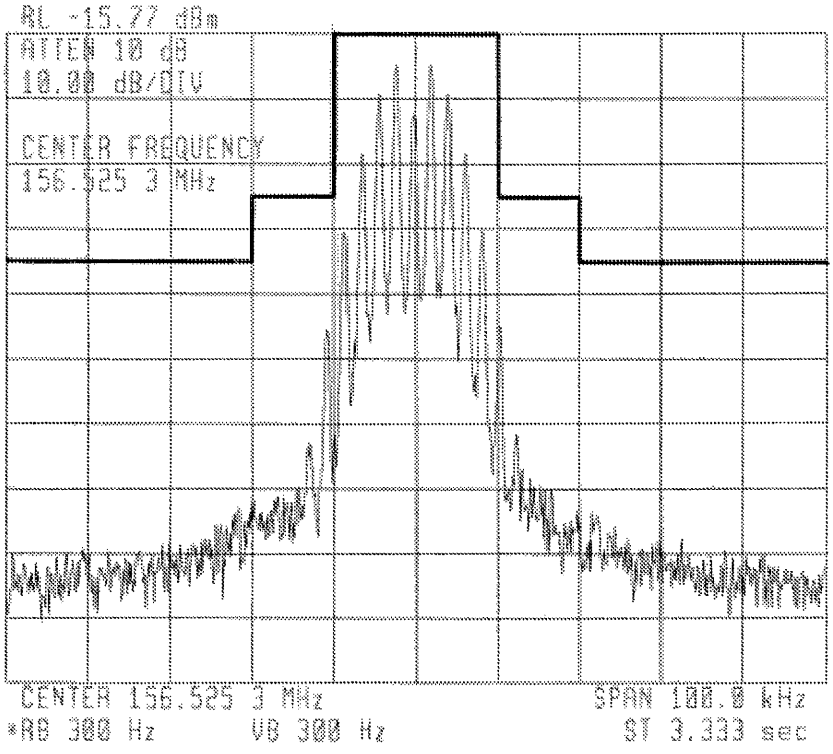


TEST FREQUENCY 156.525MHz(CH70)
Carrier output power 1W
MOD Frequency DSC 1300Hz
0dB with reference to level of unmodulated carrier

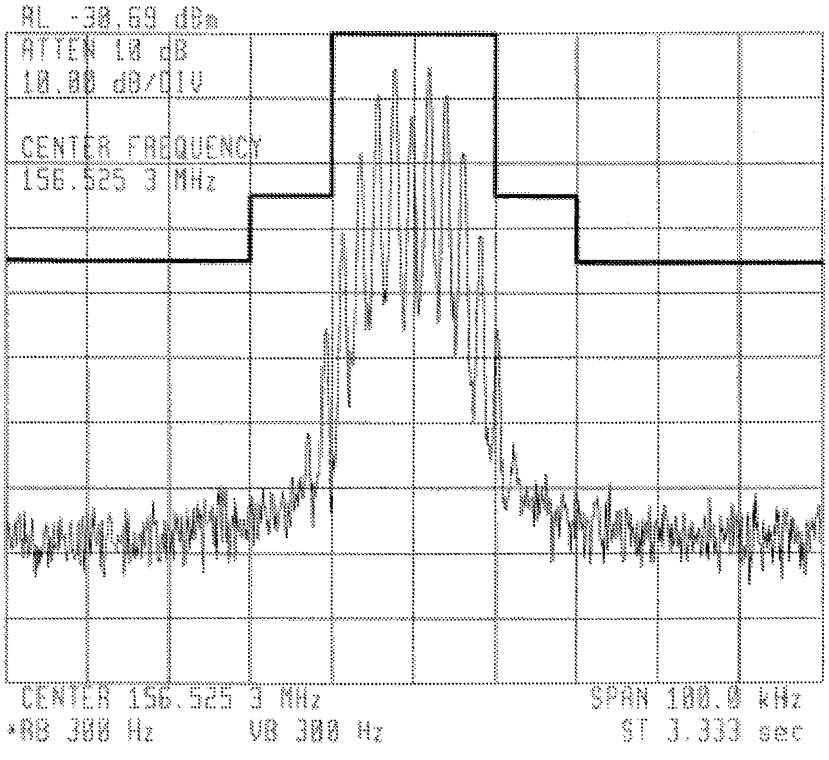


NAME OF TEST: Emission Masks (Occupied Bandwidth) 2003/9/5

TEST FREQUENCY 156.525MHz(CH70)
Carrier output power 25W
MOD Frequency DSC 2100Hz
0dB with reference to level of unmodulated carrier



TEST FREQUENCY 156.525MHz(CH70)
Carrier output power 1W
MOD Frequency DSC 2100Hz
0dB with reference to level of unmodulated carrier



PARAGRAPH : 2,991 DATE 2003/9/5

NAME OF TEST : SPURIOUS EMISSIONS AT ANTENNA TERMINALS

MINIMUM STANDARD : AS SPECIFIED IN PARAGRAPH

TEST RESULT : MEETS MINIMUM STANDARD

TEST CONDITIONS : AS SPECIFIED IN PARAGRAPH

TEST SETUP : SEE BLOCK DIAGRAM ON PAGE 28/29

MEASUREMENT DATA

Formula	Frequency	Below Carrier	RF output power
1Fo	156.050 MHz	0.0 dB	23.50 W (CH60)
2Fo	312.100 MHz	85.3 dB	
3Fo	468.150 MHz	-	
4Fo	624.200 MHz	-	
5Fo	780.250 MHz	-	
6Fo	936.300 MHz	-	
7Fo	1092.350 MHz	-	
8Fo	1248.400 MHz	-	
9Fo	1404.450 MHz	-	
10Fo	1560.500 MHz	-	
1Fo	156.050 MHz	0.0 dB	0.81 W (CH60)
2Fo	312.100 MHz	79.0 dB	
3Fo	468.150 MHz	-	
4Fo	624.200 MHz	-	
5Fo	780.250 MHz	-	
6Fo	936.300 MHz	-	
7Fo	1092.350 MHz	-	
8Fo	1248.400 MHz	-	
9Fo	1404.450 MHz	-	
10Fo	1560.500 MHz	-	

All other emissions less than 90 dB (HIGH POWER)
All other emissions less than 85 dB (LOW POWER)

PARAGRAPH : 2,991 DATE 2003/9/5

NAME OF TEST : SPURIOUS EMISSIONS AT ANTENNA TERMINALS

MINIMUM STANDARD : AS SPECIFIED IN PARAGRAPH

TEST RESULT : MEETS MINIMUM STANDARD

TEST CONDITIONS : AS SPECIFIED IN PARAGRAPH

TEST SETUP : SEE BLOCK DIAGRAM ON PAGE 28/29

MEASUREMENT DATA

Formula	Frequency	Below Carrier	RF output power
1Fo	156.800 MHz	0.0 dB	23.40 W (CH16)
2Fo	313.600 MHz	83.3 dB	
3Fo	470.400 MHz	-	
4Fo	627.200 MHz	-	
5Fo	784.000 MHz	-	
6Fo	940.800 MHz	-	
7Fo	1097.600 MHz	-	
8Fo	1254.400 MHz	-	
9Fo	1411.200 MHz	-	
10Fo	1568.000 MHz	-	
1Fo	156.800 MHz	0.0 dB	0.81 W (CH16)
2Fo	313.600 MHz	79.2 dB	
3Fo	470.400 MHz	-	
4Fo	627.200 MHz	-	
5Fo	784.000 MHz	-	
6Fo	940.800 MHz	-	
7Fo	1097.600 MHz	-	
8Fo	1254.400 MHz	-	
9Fo	1411.200 MHz	-	
10Fo	1568.000 MHz	-	

All other emissions less than 90 dB (HIGH POWER)
All other emissions less than 85 dB (LOW POWER)

PARAGRAPH : 2,991 DATE 2003/9/5

NAME OF TEST : SPURIOUS EMISSIONS AT ANTENNA TERMINALS

MINIMUM STANDARD : AS SPECIFIED IN PARAGRAPH

TEST RESULT : MEETS MINIMUM STANDARD

TEST CONDITIONS : AS SPECIFIED IN PARAGRAPH

TEST SETUP : SEE BLOCK DIAGRAM ON PAGE 28/29

MEASUREMENT DATA

Formula	Frequency	Below Carrier	RF output power
1Fo	157.425 MHz	0.0 dB	23.40 W (CH88A)
2Fo	314.850 MHz	83.0 dB	
3Fo	472.275 MHz	-	
4Fo	629.700 MHz	-	
5Fo	787.125 MHz	-	
6Fo	944.550 MHz	-	
7Fo	1101.975 MHz	-	
8Fo	1259.400 MHz	-	
9Fo	1416.825 MHz	-	
10Fo	1574.250 MHz	-	
1Fo	157.425 MHz	0.0 dB	0.81 W (CH88A)
2Fo	314.850 MHz	79.4 dB	
3Fo	472.275 MHz	-	
4Fo	629.700 MHz	-	
5Fo	787.125 MHz	-	
6Fo	944.550 MHz	-	
7Fo	1101.975 MHz	-	
8Fo	1259.400 MHz	-	
9Fo	1416.825 MHz	-	
10Fo	1574.250 MHz	-	

All other emissions less than 90 dB (HIGH POWER)
All other emissions less than 85 dB (LOW POWER)

PARAGRAPH : 2,995 DATE 2003/9/5

NAME OF TEST : OPERATION IN EXTREME TEMPERATURES

MINIMUM STANDARD : AS SPECIFIED IN PARAGRAPH

TEST RESULT : MEETS MINIMUM STANDARD

TEST CONDITIONS : AS SPECIFIED IN PARAGRAPH

TEST SETUP : SEE BLOCK DIAGRAM ON PAGE 27/29

MEASUREMENT DATA

SEE DATA ON PAGE 24/29 ~ 26/29

NAME OF TEST: OPERATION IN EXTREME TEMPERATURES

MEASUREMENT DATA
TEST FREQUENCY 156.025 MHz CH 60
Nominal Voltage 13.8V

TEMP.	Voltage	Hi Power	Low Power	Frequency error	
				Carrier Freq.	error
-20 deg.C	15.87 V	23.30 W	0.82 W	156.02459 MHz	-2.63ppm
	13.80 V	23.30 W	0.82 W	156.02448 MHz	-3.33ppm
	11.73 V	23.30 W	0.82 W	156.02471 MHz	-1.86ppm
0 deg.C	15.87 V	23.50 W	0.81 W	156.02537 MHz	2.37ppm
	13.80 V	23.50 W	0.81 W	156.02534 MHz	2.18ppm
	11.73 V	23.40 W	0.82 W	156.02539 MHz	2.50ppm
25 deg.C	15.87 V	23.50 W	0.81 W	156.02515 MHz	0.96ppm
	13.80 V	23.50 W	0.81 W	156.02519 MHz	1.22ppm
	11.73 V	23.40 W	0.81 W	156.02512 MHz	0.77ppm
50 deg.C	15.87 V	23.60 W	0.80 W	156.02477 MHz	-1.47ppm
	13.80 V	23.50 W	0.80 W	156.02477 MHz	-1.47ppm
	11.73 V	23.50 W	0.80 W	156.02477 MHz	-1.47ppm
60 deg.C	15.87 V	23.50 W	0.80 W	156.02489 MHz	-0.71ppm
	13.80 V	23.50 W	0.80 W	156.02486 MHz	-0.90ppm
	11.73 V	23.50 W	0.80 W	156.02492 MHz	-0.51ppm

NAME OF TEST: OPERATION IN EXTREME TEMPERATURES

MEASUREMENT DATA
TEST FREQUENCY 156.800 MHz CH 16
Nominal Voltage 13.8V

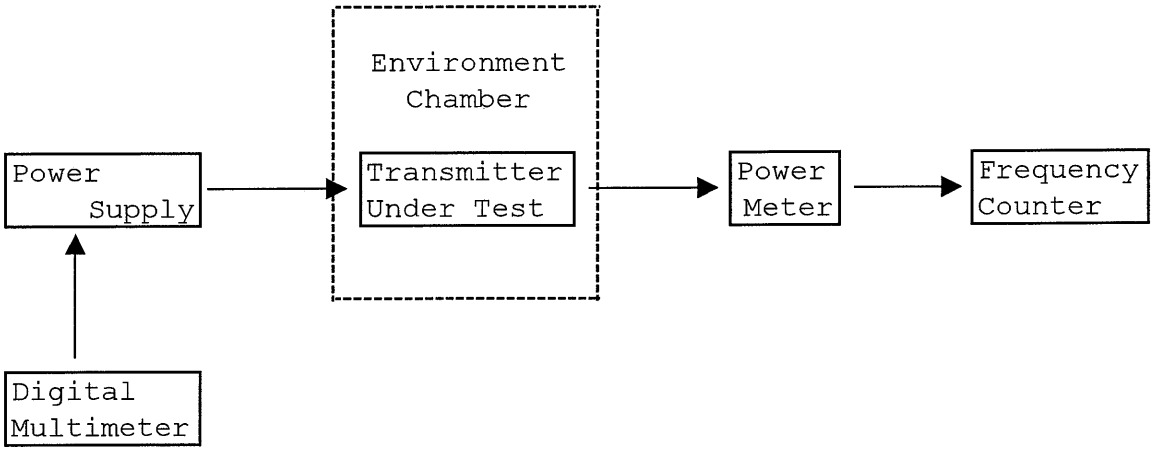
TEMP.	Voltage	Hi Power	Low Power	Frequency error	
				Carrier Freq.	error
-20 deg.C	15.87 V	23.30 W	0.83 W	156.79959 MHz	-2.61ppm
	13.80 V	23.30 W	0.83 W	156.79944 MHz	-3.57ppm
	11.73 V	23.30 W	0.83 W	156.79969 MHz	-1.98ppm
0 deg.C	15.87 V	23.40 W	0.82 W	156.80037 MHz	2.36ppm
	13.80 V	23.40 W	0.82 W	156.80034 MHz	2.17ppm
	11.73 V	23.30 W	0.82 W	156.80038 MHz	2.42ppm
25 deg.C	15.87 V	23.50 W	0.81 W	156.80016 MHz	1.02ppm
	13.80 V	23.40 W	0.81 W	156.80019 MHz	1.21ppm
	11.73 V	23.30 W	0.81 W	156.80013 MHz	0.83ppm
50 deg.C	15.87 V	23.50 W	0.81 W	156.79977 MHz	-1.47ppm
	13.80 V	23.50 W	0.81 W	156.79976 MHz	-1.53ppm
	11.73 V	23.50 W	0.81 W	156.79977 MHz	-1.47ppm
60 deg.C	15.87 V	23.50 W	0.80 W	156.79988 MHz	-0.77ppm
	13.80 V	23.50 W	0.80 W	156.79984 MHz	-1.02ppm
	11.73 V	23.40 W	0.80 W	156.79992 MHz	-0.51ppm

NAME OF TEST: OPERATION IN EXTREME TEMPERATURES

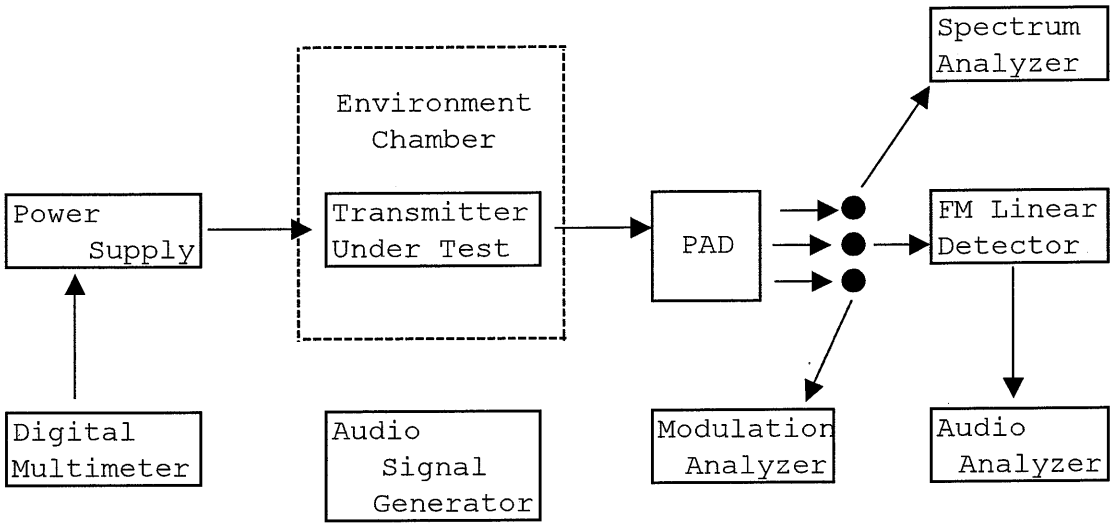
MEASUREMENT DATA
TEST FREQUENCY 157.425 MHz CH 88A
Nominal Voltage 13.8V

TEMP.	Voltage	Hi Power	Low Power	Frequency error	
				Carrier Freq.	error
-20 deg.C	15.87 V	23.30 W	0.83 W	157.42461 MHz	-2.48ppm
	13.80 V	23.30 W	0.83 W	157.42451 MHz	-3.11ppm
	11.73 V	23.20 W	0.83 W	157.42473 MHz	-1.72ppm
0 deg.C	15.87 V	23.30 W	0.82 W	157.42538 MHz	2.41ppm
	13.80 V	23.30 W	0.82 W	157.42536 MHz	2.29ppm
	11.73 V	23.30 W	0.82 W	157.42539 MHz	2.48ppm
25 deg.C	15.87 V	23.40 W	0.81 W	157.42515 MHz	0.95ppm
	13.80 V	23.40 W	0.81 W	157.42518 MHz	1.14ppm
	11.73 V	23.30 W	0.81 W	157.42512 MHz	0.76ppm
50 deg.C	15.87 V	23.50 W	0.81 W	157.42477 MHz	-1.46ppm
	13.80 V	23.40 W	0.81 W	157.42477 MHz	-1.46ppm
	11.73 V	23.30 W	0.81 W	157.42477 MHz	-1.46ppm
60 deg.C	15.87 V	23.40 W	0.80 W	157.42489 MHz	-0.70ppm
	13.80 V	23.40 W	0.80 W	157.42486 MHz	-0.89ppm
	11.73 V	23.30 W	0.81 W	157.42494 MHz	-0.38ppm

3 BLOCK DIAGRAM



BLOCK DIAGRAM



4 LIST OF TEST EQUIPMENT UTILIZED BY ICOM INCORPORATED

Equipment	Manufacturer	Model
Audio Analyzer	Hewlett Packard	8903B
Modulation Analyzer	Hewlett Packard	8901B
Power Meter	Hewlett Packard	437B
Spectrum Analyzer	Hewlett Packard	71100A
Frequency Counter	Hewlett Packard	5305B
Digital Multimeter	Hewlett Packard	3465A
PAD(attenuator)	Weinschel Engineering	45-30-45
DC Power Supply	Alinco	EP-3010
Environment Chamber	Tabai MFG.	PL-2G

5 Identification of equipment

6 FM-3000 CIRCUIT DESCRIPTION

1 RECEIVER CIRCUITS

1-1 ANTENNA SWITCHING CIRCUIT (MAIN UNIT)

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

Received signals enter the MAIN unit from the antenna connector and pass through the low-pass filter (L21, L22, C1, C127, C130). The signals are then applied to the RF circuit via the antenna switching circuit (D22, D23, R142, R144).

1-2 RF CIRCUIT (MAIN UNIT)

The RF circuit amplifies signals within the range of frequency coverage and filters out-of-band signals.

The signals from the antenna switching circuit pass through a tunable bandpass filter (D25, L35, C149–C152) where the object signals are led to the RF amplifier circuit (Q21).

The amplified signals at Q21 are applied to the other tunable bandpass filter (D26–D31, L36–L39, C161, C162, C164, C165, C173–C178, C182) to suppress unwanted signals and improve the selectivity. The signals are then applied to the 1st mixer circuit.

D25–D31 employ varactor diodes, that are controlled by the PLL lock voltage, to track the band pass filters.

1-3 1ST MIXER AND 1ST IF CIRCUITS (MAIN UNIT)

The 1st mixer circuit converts the received signal into a fixed frequency of the 1st IF signal with a 1st LO (VCO output) frequency. By changing the 1st LO frequency, only the desired frequency will pass through a pair of crystal filters at the next stage of the mixer.

The signals from the RF circuit are mixed with the VCO signals at the 1st mixer circuit (Q22) to produce a 21.7 MHz 1st IF signal.

The 1st IF signal is applied to a pair of crystal filters (FI1, FI2) to suppress out-of-band signals and is then amplified at the IF amplifier (Q23). The amplified signal is applied to the 2nd mixer circuit (IC5).

1-4 2ND IF AND DEMODULATOR CIRCUITS (MAIN UNIT)

The 2nd mixer circuit converts the 1st IF signal into a 2nd IF signal. A double superheterodyne system (which converts receive signals twice) improves the image rejection ratio and obtains stable receiver gain.

The FM IF IC (IC5) contains the 2nd local oscillator, 2nd mixer, limiter amplifier, quadrature detector, and noise detector circuits, etc.

The 1st IF signal from Q23 is applied to the 2nd mixer section of IC5 (pin 16), and is mixed with a 21.25 MHz 2nd LO signal generated at the PLL circuit using the reference frequency (21.25 MHz) to produce a 450 kHz 2nd IF signal.
The 2nd IF signal from IC5 (pin 3) is passed through the ceramic filter (FI3), where unwanted signals are suppressed, and is then applied to the 2nd IF (limiter) amplifier in IC5 (pin 5). The signal is applied to the FM detector section in IC5 for demodulation into AF signals.

The FM detector circuit employs a quadrature detection method (linear phase detection), which uses a ceramic discriminator (X2) for phase delay to obtain a non-adjusting circuit. The detected signal from IC5 (pin 9) is applied to the AF circuit.

1-5 AF AMPLIFIER CIRCUIT (MAIN AND FRONT UNITS, VOL BOARD)

The AF amplifier circuit amplifies the detected signals to drive a speaker. The AF circuit includes an AF mute circuit for the squelch.

AF signals from IC5 (pin 9) are passed through the analog switch (IC16, pins 10, 11), and are applied to the de-emphasis circuit (R291, C291). The de-emphasis circuit is an integrated circuit with frequency characteristic of –6 dB/octave.

The integrated signals are applied to the active filters (Q35, Q36). Q35 functions as a high-pass filter to suppress unwanted lower noise signals and Q36 functions as a low-pass filter to suppress higher noise signals.

The filtered signals are passed through the [VOLUME] control on the VOL board, and are then applied to the AF power amplifier (IC14, pin 1). The output signal from IC14 (pin 4) drives the internal (external) speaker (FRONT unit).

1-6 SQUELCH CIRCUIT (MAIN UNIT)

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

A portion of the AF signals from the FM IF IC (IC5, pin 9) pass through the squelch adjustment pot (R214), and are then applied to the active filter section (IC5, pin 8). The active filter section amplifies and filters noise components. The filtered signals are applied to the noise detector section and output from pin 14. The signal is amplified at the SQL amplifier (IC6) and applied to the CPU (IC19, pin 39) as the “SQL” signal. The CPU analyzes the noise condition and outputs the “RMUTM”, “RMUTS” signals to toggle the AF mute switches (Q37, Q38).

2 TRANSMITTER CIRCUITS

2-1 MICROPHONE AMPLIFIER CIRCUIT (MAIN UNIT)

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

The AF signals from the microphone are amplified at the microphone amplifier (IC15a, pin 2) via the analog switch (IC13, pins 11, 10). A capacitor (C367) and resistor (R369) are connected to the amplifier to obtain the pre-emphasis characteristics.

The amplified signals are applied to the IDC amplifier (IC17a, pin 2) via the analog switch (IC16, pins 9, 8 and pins 4, 3) and are passed through the splatter filter (IC17b) to suppress unwanted 3 kHz or higher signals. The filtered signals are then applied to the modulation circuit.

2-2 MODULATION CIRCUIT (MAIN UNIT)

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

Audio signals from the splatter filter (IC17b) pass through the frequency deviation adjustment pot (R381) and are then applied to the modulation circuit (D1–D3) to change the reactance of D3, and modulate the oscillated signal at the TX-VCO (Q4).

2-3 DRIVE AMPLIFIER CIRCUIT (MAIN UNIT)

The drive amplifier circuit amplifies the VCO oscillating signal to a level needed at the power amplifier.

The VCO output is buffer-amplified by Q6 and Q7, and is then applied to the Tx/Rx switch (D7, D8). The transmit signal from the Tx/Rx switch is amplified to the pre-drive (Q10) and YGR (Q12) amplifiers to obtain an approximate 50 mW signal level. The amplified signal is then applied to the RF power amplifier (IC3).

2-4 POWER AMPLIFIER CIRCUIT (MAIN UNIT)

The power amplifier circuit amplifies the driver signal to an output power level.

IC3 is a power module which has amplification output capabilities of about 35 W with 50 mW input. The output from IC3 (pin 4) is passed through the antenna switching circuit (D14) and is then applied to the antenna connector via the low-pass filter.

2-5 APC CIRCUIT (MAIN UNIT)

The APC circuit stabilizes transmit output power.

The RF output signal from the power amplifier (IC3) is detected at the power detector circuit (D12, D13). The detected signal is applied to the APC control circuit (Q13, Q16, D11) (one of the detected signal is applied to the CPU (IC19, pin 44) as comparison voltage via the "TXDET" signal). The signal from the APC control circuit is applied to the power amplifier's gate bias voltage (IC3). Thus, the APC circuit maintains a constant output power.

3 PLL CIRCUITS

3-1 GENERAL (MAIN UNIT)

The PLL circuit provides stable oscillation of the transmit frequency and receive 1st LO frequency. The PLL circuit compares the phase of the divided VCO frequency to the reference frequency. The PLL output frequency is controlled by a crystal oscillator and the divided ratio of the programmable divider.

IC1 is a dual PLL IC which controls both VCO circuits for Tx and Rx, and contains a prescaler, programmable counter, programmable divider phase detector, charge pomp and etc.

The PLL circuit, using a one chip PLL IC (IC1), directly generates the transmit frequency and receive 1st IF frequency with VCOs. The PLL sets the divided ratio based on serial data from the CPU and compares the phases of VCO signals with the reference oscillator frequency. The PLL IC detects the out-of-step phase and output from pins 8 and 13 for Tx and Rx, respectively. The reference frequency (21.25 MHz) is oscillated at X1.

3-2 TX LOOP (MAIN UNIT)

The generated signal at the TX-VCO (Q4, D1–D3) enters the PLL IC (IC1, pin 2) and is divided at the programmable divider section and is then applied to the phase detector section.

The phase detector compares the input signal with a reference frequency, and then outputs the out-of-phase signal (pulse-type signal) from IC1, pin 8.

The pulse-type signal is converted into DC voltage (lock voltage) at the loop filter (L3, C41, R5), and is then applied to varactor diodes (D1–D3) of the TX-VCO to stabilize the oscillated frequency.

3-3 RX LOOP (MAIN UNIT)

The generated signal at the RX-VCO (Q8, D4, D5) enters the PLL IC (IC1, pin 19) and is divided at the programmable divider section and is then applied to the phase detector section.

The phase detector compares the input signal with a reference frequency, and then outputs the out-of-phase signal (pulse-type signal) from IC1, pin 13.

The pulse-type signal is converted into DC voltage (lock voltage) at the loop filter (L8, R61, C61), and is then applied to varactor diodes (D4, D5) of the RX-VCO to stabilize the oscillated frequency. The lock voltage is also used for the receiver circuit for the bandpass filter center frequency. The lock voltage from the loop filter is amplified at the buffer-amplifier (Q6) and then applied to the RF circuit.

3-4 VCO CIRCUIT (MAIN UNIT)

The VCO outputs from TX-VCO (Q4) and RX-VCO (Q8) are amplified at the buffer amplifiers (Q6 and Q7), and are then sent to the Tx/Rx switch (D7, D8). The receive LO signal is applied to the 1st mixer circuit (Q22) through a low-pass filter, and the transmit signal is applied to the pre-drive amplifier (Q10). A portion of the VCO output is reapplied to the PLL IC (IC1, pin 2 or pin 19) via the buffer amplifier (Q3).

4 DSC CIRCUITS

4-1 DSC ENCODE CIRCUIT (MAIN UNIT)

The DSC signal is created at CPU (IC19, pin 30), is passed through the buffer amplifier (Q51) and applied to the analog switch (IC16, pin 1, 2). The analog switch (IC16) is a modulation switch that switches between the microphone audio signal and the DSC signal.

4-2 DSC DECODE CIRCUIT (MAIN UNIT)

The AF signals from FM IF IC (IC5, pin 9) are filtered at the bandpass filter (IC7) with +18 dB/octave characteristics. IC7b functions as a low-pass filter to suppress unwanted higher noise signals and IC7a functions as a high-pass filter to suppress lower noise signals. The filtered signals are converted analog signals into digital signals at DSC decoder IC (IC8), and are then applied to the CPU (IC19, pin 45) via the "DSDEC" signal after shaping waveform at IC9.

5 LOGIC CIRCUITS

5-1 LOGIC BOARD

• CPU

IC1 is an 8 bit single chip micro-computer and contains LCD driver, serial I/O, timer, A/D converter, programmable I/O, ROM and RAM. The CPU controls to display characters on the LCD too.

• SYSTEM CLOCK CIRCUIT

X1 is a ceramic oscillator and oscillates a 4.91 MHz system clock for the CPU (IC1).

• LCD DRIVER

IC2 is a LCD driver to control dot matrix part on the LCD (DS1).

• DIMMER CIRCUIT

CPU (IC1) and Q2, Q3, Q8 compose dimmer circuit. The circuit controls 8 steps the LCD backlight (DS2–DS17) brightness.

• CONTRAST CIRCUIT

CPU (IC1) and Q1, Q4 compose contrast circuit. The circuit controls 8 steps segment and dot LCD contrast.

7 Parts list

Ref	Description	Parts Name		Manufacturer	Qty
IC1	S.IC	UPD3140GS		NEC	1
IC2	S.IC	NJM2125F		JRC	1
IC3	IC	RA35H1516M		MITSUBISHI	1
IC5	S.IC	TA31136FN		TOSHIBA	1
IC6	S.IC	NJM2125F		JRC	1
IC7	S.IC	NJM4558M		JRC	1
IC8	S.IC	NJM2211M		JRC	1
IC9	S.IC	TC7W14FU		TOSHIBA	1
IC10	IC	TA7808S		TOSHIBA	1
IC12	S.IC	TA7805F		TOSHIBA	1
IC13	S.IC	BU4066BCF		ROHM	1
IC14	IC	LA4425A		SANYO	1
IC15	S.IC	NJM4558M		JRC	1
IC16	S.IC	BU4066BCF		ROHM	1
IC17	S.IC	NJM4558M		JRC	1
IC18	S.IC	HN58X2464TI		RENESAS	1
IC19	S.IC	MB90583CA		FUJITSU	1
IC20	S.IC	S-80928CNMC		SEIKO	1
IC21	S.IC	TC7W14FU		TOSHIBA	1
IC22	S.IC	PC357N6T		SHARP	1
IC24	S.IC	TC7S66FU		TOSHIBA	1
IC25	S.IC	TC7S66FU		TOSHIBA	1
Q1	S.FET	2SK880 Y		TOSHIBA	1
Q2	S.FET	2SK880 Y		TOSHIBA	1
Q3	S.TRANSISTOR	2SC4215 O		TOSHIBA	1
Q4	S.FET	2SK210 Y		TOSHIBA	1
Q5	S.TRANSISTOR	2SC4116 BL		TOSHIBA	1
Q6	S.TRANSISTOR	2SC4215 O		TOSHIBA	1
Q7	S.TRANSISTOR	2SC4215 O		TOSHIBA	1
Q8	S.FET	PMBFJ310		PHILIPS	1
Q9	S.TRANSISTOR	2SC4116 BL		TOSHIBA	1
Q10	S.TRANSISTOR	2SC4226 R25		NEC	1
Q12	S.TRANSISTOR	2SC3775 3		SANYO	1
Q13	S.TRANSISTOR	2SA1577 Q		ROHM	1
Q15	S.TRANSISTOR	DTC144EU		ROHM	1
Q16	S.TRANSISTOR	FMW1		ROHM	1
Q17	S.TRANSISTOR	DTC114EU		ROHM	1
Q18	S.TRANSISTOR	2SC4116 BL		TOSHIBA	1
Q21	S.FET	3SK292		TOSHIBA	1
Q22	S.FET	3SK206 U78	*	NEC	1
Q23	S.TRANSISTOR	2SC2714 Y		TOSHIBA	1
Q31	S.TRANSISTOR	2SB1132 R		ROHM	1
Q32	S.TRANSISTOR	DTC144EU		ROHM	1
Q33	S.TRANSISTOR	2SB1132 R		ROHM	1
Q34	S.TRANSISTOR	DTC144EU		ROHM	1
Q35	S.TRANSISTOR	2SC4116 BL		TOSHIBA	1
Q36	S.TRANSISTOR	2SC4116 BL		TOSHIBA	1
Q37	S.FET	2SJ144 Y		TOSHIBA	1
Q38	S.FET	2SJ144 Y		TOSHIBA	1
Q39	S.FET	2SK1069 4		SANYO	1
Q40	S.FET	2SJ144 Y		TOSHIBA	1
Q41	S.TRANSISTOR	2SC4116 BL		TOSHIBA	1
Q42	S.TRANSISTOR	2SC3326 B		TOSHIBA	1
Q43	S.TRANSISTOR	DTC144EU		ROHM	1
Q44	S.TRANSISTOR	DTC144EU		ROHM	1
Q46	S.TRANSISTOR	DTA144EU		ROHM	1
Q51	S.FET	2SK1069 4		SANYO	1

Ref	Description	Parts Name	Manufacturer	Qty
Q52	S.TRANSISTOR	DTA144EU	ROHM	1
Q53	S.TRANSISTOR	DTA144EU	ROHM	1
Q54	S.TRANSISTOR	DTA144EU	ROHM	1
Q55	S.FET	2SK1069 4	SANYO	1
Q56	S.TRANSISTOR	2SC4081 R	ROHM	1
Q57	S.TRANSISTOR	2SA1576 R	ROHM	1
Q58	S.TRANSISTOR	DTC144TU	ROHM	1
Q59	S.TRANSISTOR	2SC4081 S	ROHM	1
Q60	S.TRANSISTOR	DTC144EU	ROHM	1
Q61	S.TRANSISTOR	DTA144EU	ROHM	1
Q62	S.TRANSISTOR	DTC144TU	ROHM	1
D1	S.VARICAP	1SV278	TOSHIBA	1
D2	S.VARICAP	1SV278	TOSHIBA	1
D3	S.VARICAP	1SV284	TOSHIBA	1
D4	S.VARICAP	HVC358B	RENESAS	1
D5	S.VARICAP	HVC358B	RENESAS	1
D6	S.DIODE	1SS355	ROHM	1
D7	S.DIODE	MA77	MEC	1
D8	S.DIODE	MA77	MEC	1
D9	S.DIODE	1SS355	ROHM	1
D11	S.ZENER	MA8047 M	MEC	1
D12	S.DIODE	HSM88ASR	RENESAS	1
D13	S.DIODE	HSM88ASR	RENESAS	1
D14	DIODE	XB15A308	TOREX	1
D21	DIODE	XB15A308	TOREX	1
D22	S.DIODE	MA77	MEC	1
D23	S.DIODE	MA77	MEC	1
D24	S.DIODE	1SS375	SANYO	1
D25	S.VARICAP	1SV214	TOSHIBA	1
D26	S.VARICAP	1SV214	TOSHIBA	1
D27	S.VARICAP	1SV214	TOSHIBA	1
D28	S.VARICAP	1SV214	TOSHIBA	1
D29	S.VARICAP	1SV214	TOSHIBA	1
D30	S.VARICAP	1SV214	TOSHIBA	1
D31	S.VARICAP	1SV214	TOSHIBA	1
D32	S.ZENER	MA8036 L	MEC	1
D41	DIODE	DSA3A1	HITACHI	1
D42	S.DIODE	1SS355	ROHM	1
D43	S.DIODE	DA204U	ROHM	1
D44	S.DIODE	DA204U	ROHM	1
D45	S.DIODE	1SS355	ROHM	1
D46	S.DIODE	DAP202U	ROHM	1
D47	S.DIODE	DA204U	ROHM	1
D52	S.DIODE	DA204U	ROHM	1
D53	S.DIODE	DAP202U	ROHM	1
D54	S.ZENER	MA8062 M	MEC	1
D55	S.DIODE	DA204K	ROHM	1
D56	S.DIODE	1SS355	ROHM	1
FI1	MONOLITH	FL-368	HERTZ	1
FI2	MONOLITH	FL-363	HERTZ	1
FI3	CERAMIC	ALFY450E	TOKO	1
X1	S.XTAL	CR-766	TOKYO DENPA	1
X2	S.DISCRI	CDBC450CX24	MURATA	1
X4	S.XTAL	CR-769	HERTZ	1
L1	S.COIL	MLG1608B R10B 0.1U	TDK	1
L2	S.COIL	ELJRE 56NG 56N	MACO	1
L3	S.COIL	NL322522T 3R3J-3 3.3U	TDK	1

Ref	Description	Parts Name	Manufacturer	Qty
L4	S.COIL	LB-258	SUMIDA	1
L5	S.COIL	NL322522T 2R7J-3 2.7U	TDK	1
L6	S.COIL	MLG1608B R10B 0.1U	TDK	1
L7	S.COIL	MLG1608B R10B 0.1U	TDK	1
L8	S.COIL	NL322522T 3R9J-3 3.9U	TDK	1
L9	S.COIL	LB-258	SUMIDA	1
L10	S.COIL	NL322522T 3R9J-3 3.9U	TDK	1
L11	S.COIL	NL252018T 056J 56N	TDK	1
L13	S.COIL	ELJRE R15G 0.15U	MACO	1
L14	S.COIL	ELJRE 47NG 47N	MACO	1
L15	S.COIL	NL252018T 082J 82N	TDK	1
L16	S.COIL	NL252018T 082J 82N	TDK	1
L17	S.COIL	NL252018T 047J 47N	TDK	1
L18	S.COIL	NL252018T 047J 47N	TDK	1
L19	COIL	LA-243	ATLAS	1
L20	COIL	LW-25	ATLAS	1
L21	COIL	LA-243	ATLAS	1
L22	COIL	LA-262	ATLAS	1
L31	COIL	LA-243	ATLAS	1
L32	COIL	LA-238	ATLAS	1
L33	S.COIL	ELJND R47J 0.47U	MACO	1
L34	S.COIL	ELJND R47J 0.47U	MACO	1
L35	COIL	LS-440	TOKO	1
L36	COIL	LS-440	TOKO	1
L37	S.COIL	ELJND R47J 0.47U	MACO	1
L38	COIL	LS-440	TOKO	1
L39	COIL	LS-440	TOKO	1
L41	S.COIL	C2520C 1R0G 1U	SAGAMI	1
R1	S.RESISTOR	47 ERJ3GE	MACO	1
R2	S.RESISTOR	100K ERJ3GE	MACO	1
R3	S.ARRAY	EXB-V8V 1K	MACO	1
R4	S.RESISTOR	560 ERJ3GE	MACO	1
R5	S.RESISTOR	4.7K ERJ3GE	MACO	1
R6	S.RESISTOR	8.2K ERJ3GE	MACO	1
R8	S.RESISTOR	10K ERJ3GE	MACO	1
R9	S.RESISTOR	10 ERJ3GE	MACO	1
R10	S.RESISTOR	47K ERJ3GE	MACO	1
R11	S.RESISTOR	470 ERJ3GE	MACO	1
R12	S.RESISTOR	330 ERJ3GE	MACO	1
R13	S.RESISTOR	1K ERJ3GE	MACO	1
R14	S.RESISTOR	27K ERJ3GE	MACO	1
R15	S.RESISTOR	10K ERJ3GE	MACO	1
R16	S.RESISTOR	1K ERJ3GE	MACO	1
R17	S.RESISTOR	47K ERJ3GE	MACO	1
R22	S.RESISTOR	100K ERJ3GE	MACO	1
R23	S.RESISTOR	56K ERJ3GE	MACO	1
R24	S.RESISTOR	27K ERJ3GE	MACO	1
R26	S.RESISTOR	1K ERJ3GE	MACO	1
R27	S.RESISTOR	10K ERJ3GE	MACO	1
R31	S.RESISTOR	680 ERJ3GE	MACO	1
R32	S.RESISTOR	68K ERJ3GE	MACO	1
R33	S.RESISTOR	100 ERJ3GE	MACO	1
R34	S.RESISTOR	68 ERJ3GE	MACO	1
R35	S.RESISTOR	100 ERJ3GE	MACO	1
R41	S.RESISTOR	27K ERJ3GE	MACO	1
R42	S.RESISTOR	56K ERJ3GE	MACO	1
R43	S.RESISTOR	82 ERJ3GE	MACO	1

Ref	Description	Parts Name	Manufacturer	Qty
R51	S.RESISTOR	47 ERJ3GE	MACO	1
R52	S.RESISTOR	4.7K ERJ3GE	MACO	1
R53	S.RESISTOR	680 ERJ3GE	MACO	1
R54	S.RESISTOR	68K ERJ3GE	MACO	1
R55	S.RESISTOR	100 ERJ3GE	MACO	1
R56	S.RESISTOR	3.3K ERJ3GE	MACO	1
R57	S.RESISTOR	120 ERJ3GE	MACO	1
R58	S.RESISTOR	2.2K ERJ3GE	MACO	1
R59	S.RESISTOR	220 ERJ3GE	MACO	1
R61	S.RESISTOR	1K ERJ3GE	MACO	1
R62	S.RESISTOR	47 ERJ3GE	MACO	1
R63	S.RESISTOR	1.2K ERJ3GE	MACO	1
R71	S.RESISTOR	2.2K ERJ3GE	MACO	1
R72	S.RESISTOR	5.6K ERJ3GE	MACO	1
R73	S.RESISTOR	10 ERJ3GE	MACO	1
R74	S.RESISTOR	2.2K ERJ3GE	MACO	1
R75	S.RESISTOR	10K ERJ3GE	MACO	1
R81	S.RESISTOR	1K ERJ3GE	MACO	1
R82	S.RESISTOR	39 ERJ3GE	MACO	1
R83	S.RESISTOR	2.2K ERJ3GE	MACO	1
R84	S.RESISTOR	390 ERJ3GE	MACO	1
R85	S.RESISTOR	10 ERJ3GE	MACO	1
R86	S.RESISTOR	10K ERJ3GE	MACO	1
R87	S.RESISTOR	10K ERJ3GE	MACO	1
R88	S.RESISTOR	100 ERJ3GE	MACO	1
R91	S.RESISTOR	1K ERJ3GE	MACO	1
R92	S.RESISTOR	100 ERJ3GE	MACO	1
R93	S.RESISTOR	22 ERJ3GE	MACO	1
R94	S.RESISTOR	22 ERJ3GE	MACO	1
R95	S.RESISTOR	1K ERJ3GE	MACO	1
R96	S.RESISTOR	82 ERJ3GE	MACO	1
R103	S.RESISTOR	1M ERJ3GE	MACO	1
R104	S.RESISTOR	470 ERJ3GE	MACO	1
R107	S.RESISTOR	3.3K ERJ3GE	MACO	1
R110	S.RESISTOR	12K ERJ3GE	MACO	1
R111	S.RESISTOR	10K ERJ3GE	MACO	1
R112	S.RESISTOR	2.2K ERJ3GE	MACO	1
R113	S.RESISTOR	10K ERJ3GE	MACO	1
R114	S.TRIMMER	RV-143 (RH03A3AS2J 470)	ALPS	1
R115	S.RESISTOR	27K ERJ3GE	MACO	1
R116	S.RESISTOR	82 ERJ3GE	MACO	1
R121	S.RESISTOR	1.8K ERJ3GE	MACO	1
R122	S.RESISTOR	1.8K ERJ3GE	MACO	1
R123	S.RESISTOR	150 MCR50	ROHM	1
R125	S.RESISTOR	100K ERJ3GE	MACO	1
R126	S.RESISTOR	1.8K ERJ3GE	MACO	1
R127	S.RESISTOR	1.8K ERJ3GE	MACO	1
R142	S.RESISTOR	39 ERJ3GE	MACO	1
R143	S.RESISTOR	2.2K ERJ3GE	MACO	1
R144	S.RESISTOR	22 ERJ3GE	MACO	1
R145	S.RESISTOR	2.2K ERJ3GE	MACO	1
R146	S.RESISTOR	220K ERJ3GE	MACO	1
R147	S.RESISTOR	100 ERJ3GE	MACO	1
R148	S.RESISTOR	33K ERJ3GE	MACO	1
R149	S.RESISTOR	22K ERJ3GE	MACO	1
R150	S.RESISTOR	10K ERJ3GE	MACO	1
R151	S.RESISTOR	47K ERJ3GE	MACO	1

Ref	Description	Parts Name	Manufacturer	Qty
R152	S.RESISTOR	ERJ3GE-JPW	MACO	1
R153	S.RESISTOR	100 ERJ3GE	MACO	1
R154	S.RESISTOR	1 ERJ3GE	MACO	1
R155	S.RESISTOR	470 ERJ3GE	MACO	1
R157	S.RESISTOR	220K ERJ3GE	MACO	1
R171	S.RESISTOR	220K ERJ3GE	MACO	1
R172	S.RESISTOR	220K ERJ3GE	MACO	1
R173	S.RESISTOR	ERJ3GE-JPW	MACO	1
R174	S.RESISTOR	ERJ3GE-JPW	MACO	1
R181	S.RESISTOR	10K ERJ3GE	MACO	1
R182	S.RESISTOR	10 ERJ3GE	MACO	1
R183	S.RESISTOR	3.3K ERJ3GE	MACO	1
R184	S.RESISTOR	120 ERJ3GE	MACO	1
R185	S.RESISTOR	1.2K ERJ3GE	MACO	1
R201	S.RESISTOR	3.3K ERJ3GE	MACO	1
R202	S.RESISTOR	330 ERJ3GE	MACO	1
R203	S.RESISTOR	100K ERJ3GE	MACO	1
R204	S.RESISTOR	1.5K ERJ3GE	MACO	1
R205	S.RESISTOR	1K ERJ3GE	MACO	1
R206	S.RESISTOR	390 ERJ3GE	MACO	1
R207	S.RESISTOR	1.5K ERJ3GE	MACO	1
R208	S.RESISTOR	3.3K ERJ3GE	MACO	1
R211	S.RESISTOR	470K ERJ3GE	MACO	1
R212	S.RESISTOR	820 ERJ3GE	MACO	1
R213	S.RESISTOR	33K ERJ3GE	MACO	1
R214	S.TRIMMER	RV-152 (RH03A3AJ4X0HA 22K)	ALPS	1
R215	S.THRMISTOR	NTCG16 4LH 473KT	TDK	1
R216	S.RESISTOR	8.2K ERJ3GE	MACO	1
R218	S.RESISTOR	33K ERJ3GE	MACO	1
R219	S.RESISTOR	470 ERJ3GE	MACO	1
R221	S.RESISTOR	10K ERJ3GE	MACO	1
R222	S.RESISTOR	10K ERJ3GE	MACO	1
R223	S.RESISTOR	10K ERJ3GE	MACO	1
R224	S.RESISTOR	1K ERJ3GE	MACO	1
R225	S.RESISTOR	10K ERJ3GE	MACO	1
R226	S.RESISTOR	1K ERJ3GE	MACO	1
R227	S.THERMISTOR	NTCG16 3NH 471KT1	TDK	1
R231	S.RESISTOR	100K ERJ3GE	MACO	1
R232	S.RESISTOR	100K ERJ3GE	MACO	1
R233	S.RESISTOR	10K ERJ3GE	MACO	1
R234	S.RESISTOR	10K ERJ3GE	MACO	1
R235	S.RESISTOR	10K ERJ3GE	MACO	1
R236	S.RESISTOR	47 ERJ3GE	MACO	1
R237	S.RESISTOR	10K ERJ3GE	MACO	1
R238	S.RESISTOR	8.2K ERJ3GE	MACO	1
R239	S.RESISTOR	1.5K ERJ3GE	MACO	1
R240	S.RESISTOR	470K ERJ3GE	MACO	1
R241	S.RESISTOR	470K ERJ3GE	MACO	1
R242	S.RESISTOR	15K ERJ3GE	MACO	1
R243	S.RESISTOR	2.2K ERJ3GE	MACO	1
R244	S.RESISTOR	39K ERJ3GE	MACO	1
R245	S.RESISTOR	100K ERJ3GE	MACO	1
R246	S.RESISTOR	470K ERJ3GE	MACO	1
R251	S.RESISTOR	47K ERJ3GE	MACO	1
R252	S.RESISTOR	330 ERJ3GE	MACO	1
R261	S.RESISTOR	1 ERJ3GE	MACO	1
R262	S.RESISTOR	1 ERJ3GE	MACO	1

Ref	Description	Parts Name	Manufacturer	Qty
R263	S.RESISTOR	1 ERJ3GE	MACO	1
R271	S.RESISTOR	10K ERJ3GE	MACO	1
R272	S.RESISTOR	2.2K ERJ3GE	MACO	1
R273	S.RESISTOR	10K ERJ3GE	MACO	1
R274	S.RESISTOR	2.2K ERJ3GE	MACO	1
R281	S.RESISTOR	47 ERJ3GE	MACO	1
R282	S.RESISTOR	8.2K ERA3YE D	MACO	1
R284	S.RESISTOR	18K ERA3YE D	MACO	1
R285	S.RESISTOR	33K ERA3YE D	MACO	1
R291	S.RESISTOR	8.2K ERJ3GE	MACO	1
R292	S.RESISTOR	470K ERJ3GE	MACO	1
R293	S.RESISTOR	180K ERJ3GE	MACO	1
R294	S.RESISTOR	8.2K ERJ3GE	MACO	1
R295	S.RESISTOR	330 ERJ3GE	MACO	1
R296	S.RESISTOR	1.5K ERJ3GE	MACO	1
R297	S.RESISTOR	33K ERJ3GE	MACO	1
R298	S.RESISTOR	33K ERJ3GE	MACO	1
R299	S.RESISTOR	1K ERJ3GE	MACO	1
R300	S.RESISTOR	2.2K ERJ3GE	MACO	1
R301	S.RESISTOR	100K ERJ3GE	MACO	1
R302	S.RESISTOR	470K ERJ3GE	MACO	1
R303	S.RESISTOR	100K ERJ3GE	MACO	1
R304	S.RESISTOR	470K ERJ3GE	MACO	1
R305	S.RESISTOR	100K ERJ3GE	MACO	1
R310	S.RESISTOR	1M ERJ3GE	MACO	1
R311	S.RESISTOR	47 ERJ3GE	MACO	1
R312	S.RESISTOR	100K ERJ3GE	MACO	1
R314	S.RESISTOR	1K ERJ3GE	MACO	1
R315	S.RESISTOR	100K ERJ3GE	MACO	1
R316	S.RESISTOR	1M ERJ3GE	MACO	1
R317	S.RESISTOR	6.8K ERJ3GE	MACO	1
R318	S.RESISTOR	680 ERJ3GE	MACO	1
R319	S.RESISTOR	1M ERJ3GE	MACO	1
R320	S.RESISTOR	100K ERJ3GE	MACO	1
R321	S.RESISTOR	100K ERJ3GE	MACO	1
R322	S.RESISTOR	100K ERJ3GE	MACO	1
R323	S.RESISTOR	2.7K ERJ3GE	MACO	1
R331	S.RESISTOR	1K ERJ3GE	MACO	1
R332	S.RESISTOR	100 ERJ3GE	MACO	1
R333	S.RESISTOR	18K ERJ3GE	MACO	1
R334	S.RESISTOR	18K ERJ3GE	MACO	1
R341	S.RESISTOR	10K ERJ3GE	MACO	1
R342	S.RESISTOR	10K ERJ3GE	MACO	1
R343	S.RESISTOR	10K ERJ3GE	MACO	1
R344	S.RESISTOR	22K ERJ3GE	MACO	1
R351	S.RESISTOR	15K ERJ3GE	MACO	1
R352	S.RESISTOR	1.2K ERJ3GE	MACO	1
R353	S.RESISTOR	1M ERJ3GE	MACO	1
R354	S.RESISTOR	22K ERJ3GE	MACO	1
R355	S.RESISTOR	4.7 MCR10	ROHM	1
R356	S.RESISTOR	330 MCR10	ROHM	1
R357	S.RESISTOR	330 MCR10	ROHM	1
R358	S.RESISTOR	330 MCR10	ROHM	1
R359	S.RESISTOR	1.2K ERJ3GE	MACO	1
R360	S.RESISTOR	2.2K ERJ3GE	MACO	1
R361	S.RESISTOR	1M ERJ3GE	MACO	1
R362	S.RESISTOR	15K ERJ3GE	MACO	1

Ref	Description	Parts Name	Manufacturer	Qty
R363	S.RESISTOR	1.5M ERJ3GE	MACO	1
R367	S.RESISTOR	18K ERJ3GE	MACO	1
R368	S.RESISTOR	18K ERJ3GE	MACO	1
R369	S.RESISTOR	1.2K ERJ3GE	MACO	1
R370	S.RESISTOR	100K ERJ3GE	MACO	1
R371	S.RESISTOR	18K ERJ3GE	MACO	1
R372	S.RESISTOR	1M ERJ3GE	MACO	1
R373	S.RESISTOR	1M ERJ3GE	MACO	1
R374	S.RESISTOR	1M ERJ3GE	MACO	1
R375	S.RESISTOR	1M ERJ3GE	MACO	1
R376	S.RESISTOR	47K ERJ3GE	MACO	1
R377	S.RESISTOR	1M ERJ3GE	MACO	1
R381	S.TRIMMER	RV-110 (RH03A3AS4X0AA 47K)	ALPS	1
R382	S.RESISTOR	3.3K ERJ3GE	MACO	1
R383	S.THRMISTOR	NTCG16 4BH 103KT	TDK	1
R384	S.RESISTOR	6.8K ERJ3GE	MACO	1
R385	S.RESISTOR	15K ERJ3GE	MACO	1
R386	S.RESISTOR	82K ERJ3GE	MACO	1
R387	S.RESISTOR	82K ERJ3GE	MACO	1
R388	S.RESISTOR	150K ERJ3GE	MACO	1
R389	S.RESISTOR	100K ERJ3GE	MACO	1
R391	S.RESISTOR	100K ERJ3GE	MACO	1
R392	S.RESISTOR	1M ERJ3GE	MACO	1
R393	S.RESISTOR	12K ERJ3GE	MACO	1
R394	S.RESISTOR	1M ERJ3GE	MACO	1
R395	S.RESISTOR	82K ERJ3GE	MACO	1
R401	S.RESISTOR	1M ERJ3GE	MACO	1
R402	S.RESISTOR	20K ERJ3GE	MACO	1
R403	S.RESISTOR	2.7K ERJ3GE	MACO	1
R404	S.RESISTOR	150K ERJ3GE	MACO	1
R405	S.RESISTOR	47K ERJ3GE	MACO	1
R406	S.RESISTOR	100K ERJ3GE	MACO	1
R407	S.RESISTOR	100K ERJ3GE	MACO	1
R408	S.RESISTOR	100K ERJ3GE	MACO	1
R409	S.RESISTOR	100K ERJ3GE	MACO	1
R410	S.RESISTOR	1K ERJ3GE	MACO	1
R411	S.RESISTOR	47K ERJ3GE	MACO	1
R412	S.RESISTOR	47K ERJ3GE	MACO	1
R413	S.RESISTOR	100K ERJ3GE	MACO	1
R414	S.RESISTOR	100K ERJ3GE	MACO	1
R415	S.RESISTOR	100K ERJ3GE	MACO	1
R416	S.RESISTOR	100K ERJ3GE	MACO	1
R417	S.RESISTOR	100K ERJ3GE	MACO	1
R418	S.RESISTOR	100K ERJ3GE	MACO	1
R419	S.RESISTOR	100K ERJ3GE	MACO	1
R420	S.RESISTOR	100K ERJ3GE	MACO	1
R421	S.RESISTOR	100K ERJ3GE	MACO	1
R422	S.RESISTOR	47K ERJ3GE	MACO	1
R424	S.RESISTOR	47K ERJ3GE	MACO	1
R425	S.RESISTOR	10 ERJ3GE	MACO	1
R426	S.RESISTOR	1M ERJ3GE	MACO	1
R427	S.RESISTOR	100K ERJ3GE	MACO	1
R428	S.RESISTOR	27K ERJ3GE	MACO	1
R429	S.RESISTOR	2.7K ERJ3GE	MACO	1
R430	S.RESISTOR	4.7K ERJ3GE	MACO	1
R431	S.RESISTOR	100K ERJ3GE	MACO	1
R432	S.RESISTOR	10K ERJ3GE	MACO	1

Ref	Description	Parts Name	Manufacturer	Qty
R433	S.RESISTOR	39K ERJ3GE	MACO	1
R434	S.RESISTOR	39K ERJ3GE	MACO	1
R435	S.RESISTOR	100K ERJ3GE	MACO	1
R441	S.RESISTOR	100K ERJ3GE	MACO	1
R442	S.RESISTOR	1K ERJ3GE	MACO	1
R443	S.RESISTOR	1K ERJ3GE	MACO	1
R444	S.RESISTOR	47K ERJ3GE	MACO	1
R445	S.RESISTOR	4.7K ERJ3GE	MACO	1
R446	S.RESISTOR	47 ERJ3GE	MACO	1
R447	S.RESISTOR	1K ERJ3GE	MACO	1
R448	S.RESISTOR	1K ERJ3GE	MACO	1
R449	S.RESISTOR	15K ERJ3GE	MACO	1
R450	S.RESISTOR	100K ERJ3GE	MACO	1
R451	S.RESISTOR	100K ERJ3GE	MACO	1
R453	S.RESISTOR	4.7K ERJ3GE	MACO	1
R454	S.RESISTOR	12 ERJ3GE	MACO	1
R455	S.RESISTOR	100K ERJ3GE	MACO	1
R456	S.RESISTOR	6.8K ERJ3GE	MACO	1
R457	S.RESISTOR	470 ERJ3GE	MACO	1
R458	S.RESISTOR	100K ERJ3GE	MACO	1
R459	S.RESISTOR	100K ERJ3GE	MACO	1
C1	S.CERAMIC	0.022 C1608 16V B	TDK	1
C3	S.CERAMIC	0.01 C1608 25V B	TDK	1
C4	S.CERAMIC	0.1 C1608 16V B	TDK	1
C5	S.TANTALUM	2.2 16V ECST-Y	MACO	1
C7	S.CERAMIC	0.47 C1608 10V B	TDK	1
C8	S.CERAMIC	0.1 C1608 16V B	TDK	1
C9	S.CERAMIC	0.001 C1608 B	TDK	1
C11	S.CERAMIC	12P C1608 CH	TDK	1
C12	S.TRIMMER	TZC03R100A110 10P	MURATA	1
C13	S.CERAMIC	27P C1608 CH	TDK	1
C14	S.TANTALUM	0.047 35V SVA	NEC	1
C17	S.CERAMIC	0.001 C1608 B	TDK	1
C18	S.CERAMIC	0.001 C1608 B	TDK	1
C21	S.CERAMIC	0.01 C1608 25V B	TDK	1
C22	S.CERAMIC	0.01 C1608 25V B	TDK	1
C23	S.CERAMIC	0.001 C1608 B	TDK	1
C31	S.CERAMIC	0.001 C1608 B	TDK	1
C32	S.CERAMIC	5P C1608 CH B	TDK	1
C33	S.CERAMIC	20P C1608 CH	TDK	1
C34	S.CERAMIC	27P C1608 CH	TDK	1
C35	S.CERAMIC	27P C1608 CH	TDK	1
C36	S.CERAMIC	0.001 C1608 B	TDK	1
C37	S.CERAMIC	0.001 C1608 B	TDK	1
C41	S.TANTALUM	0.22 35V ECST-Y	MACO	1
C42	S.CERAMIC	1.5P C1608 CH B	TDK	1
C43	S.CERAMIC	2P C1608 CH B	TDK	1
C44	S.CERAMIC	0.001 C1608 B	TDK	1
C45	S.CERAMIC	0.001 C1608 B	TDK	1
C46	S.CERAMIC	0.1 C1608 16V B	TDK	1
C47	S.CERAMIC	7P C1608 UJ	TDK	1
C48	S.CERAMIC	4P C1608 CH B	TDK	1
C49	S.CERAMIC	3P C1608 CH B	TDK	1
C50	S.CERAMIC	0.22 C1608 10V B	TDK	1
C51	S.CERAMIC	3P C1608 CH B	TDK	1
C52	S.CERAMIC	0.5P C1608 CH B	TDK	1
C53	S.CERAMIC	0.001 C1608 B	TDK	1

Ref	Description	Parts Name	Manufacturer	Qty
C54	S.CERAMIC	0.001 C1608 B	TDK	1
C55	S.CERAMIC	0.01 C1608 25V B	TDK	1
C56	S.CERAMIC	12P C1608 CH	TDK	1
C57	S.CERAMIC	0.001 C1608 B	TDK	1
C58	S.CERAMIC	12P C1608 CH	TDK	1
C59	S.CERAMIC	0.001 C1608 B	TDK	1
C61	S.TANTALUM	0.047 35V SVA	NEC	1
C63	S.CERAMIC	15P C1608 UJ	TDK	1
C64	S.CERAMIC	15P C1608 UJ	TDK	1
C65	S.CERAMIC	15P C1608 CH	TDK	1
C66	S.CERAMIC	18P C1608 CH	TDK	1
C67	S.TANTALUM	10 10V ECST-Y	MACO	1
C68	S.CERAMIC	0.001 C1608 B	TDK	1
C69	S.CERAMIC	0.1 C1608 16V B	TDK	1
C70	S.CERAMIC	0.75P C1608 CH B	TDK	1
C71	S.CERAMIC	0.22 C1608 10V B	TDK	1
C72	S.TANTALUM	10 10V ECST-Y	MACO	1
C73	S.CERAMIC	0.001 C1608 B	TDK	1
C74	S.CERAMIC	0.001 C1608 B	TDK	1
C75	S.CERAMIC	0.001 C1608 B	TDK	1
C76	S.CERAMIC	39P C1608 CH	TDK	1
C77	S.CERAMIC	39P C1608 CH	TDK	1
C81	S.CERAMIC	0.001 C1608 B	TDK	1
C82	S.CERAMIC	0.001 C1608 B	TDK	1
C83	S.CERAMIC	47P C1608 CH	TDK	1
C84	S.CERAMIC	18P C1608 CH	TDK	1
C85	S.CERAMIC	18P C1608 CH	TDK	1
C86	S.CERAMIC	0.001 C1608 B	TDK	1
C87	S.CERAMIC	47P C1608 CH	TDK	1
C88	S.CERAMIC	0.001 C1608 B	TDK	1
C91	S.CERAMIC	18P C1608 CH	TDK	1
C92	S.CERAMIC	0.001 C1608 B	TDK	1
C93	S.CERAMIC	0.001 C1608 B	TDK	1
C94	S.CERAMIC	3P C1608 CH B	TDK	1
C95	S.CERAMIC	0.001 C1608 B	TDK	1
C96	S.CERAMIC	47P C1608 CH	TDK	1
C97	S.CERAMIC	470P C1608 CH	TDK	1
C101	S.CERAMIC	22P C1608 CH	TDK	1
C102	S.CERAMIC	18P C1608 CH	TDK	1
C103	S.CERAMIC	39P C1608 CH	TDK	1
C104	S.CERAMIC	18P C1608 CH	TDK	1
C105	S.TANTALUM	22 10V ECST-X	MACO	1
C106	S.CERAMIC	0.001 C1608 B	TDK	1
C107	S.CERAMIC	47P C1608 CH	TDK	1
C108	S.CERAMIC	470P C1608 CH	TDK	1
C109	S.CERAMIC	0.001 C1608 B	TDK	1
C110	S.ELECTROL	22 16V ECEV-S C	MACO	1
C112	S.CERAMIC	470P C1608 CH	TDK	1
C113	S.CERAMIC	0.1 C1608 16V B	TDK	1
C115	S.CERAMIC	0.001 C1608 B	TDK	1
C116	S.CERAMIC	470P C1608 CH	TDK	1
C117	S.CERAMIC	470P C1608 CH	TDK	1
C118	S.CERAMIC	0.001 C1608 B	TDK	1
C119	S.CERAMIC	0.001 C1608 B	TDK	1
C120	S.CERAMIC	0.001 C1608 B	TDK	1
C121	S.CERAMIC	18P GRM42-6 500V CH	MURATA	1
C122	S.CERAMIC	0.001 C1608 B	TDK	1

Ref	Description	Parts Name	Manufacturer	Qty
C123	S.CERAMIC	0.001 C1608 B	TDK	1
C124	S.CERAMIC	18P GRM42-6 500V CH	MURATA	1
C125	S.CERAMIC	0.001 C1608 B	TDK	1
C126	S.CERAMIC	0.001 GHM1030 630V R	MURATA	1
C127	S.CERAMIC	18P GRM42-6 500V CH	MURATA	1
C130	S.CERAMIC	27P GRM42-6 500V CH	MURATA	1
C135	S.CERAMIC	0.001 C1608 B	TDK	1
C141	S.CERAMIC	33P GRM42-6 500V CH	MURATA	1
C142	S.CERAMIC	27P GRM42-6 500V CH	MURATA	1
C143	S.CERAMIC	150P GRM31A 630V C0G	MURATA	1
C145	S.CERAMIC	0.001 C1608 B	TDK	1
C146	S.CERAMIC	0.001 C1608 B	TDK	1
C147	S.CERAMIC	0.001 C1608 B	TDK	1
C148	S.CERAMIC	0.001 C1608 B	TDK	1
C149	S.CERAMIC	1P C1608 CH B	TDK	1
C150	S.CERAMIC	10P C1608 CH	TDK	1
C151	S.CERAMIC	0.3P C1608 CH B	TDK	1
C152	S.CERAMIC	15P C1608 CH	TDK	1
C153	S.CERAMIC	0.001 C1608 B	TDK	1
C154	S.CERAMIC	1.5P C1608 CH B	TDK	1
C155	S.CERAMIC	0.001 C1608 B	TDK	1
C156	S.CERAMIC	0.001 C1608 B	TDK	1
C157	S.CERAMIC	0.001 C1608 B	TDK	1
C158	S.CERAMIC	470P C1608 CH	TDK	1
C159	S.CERAMIC	0.001 C1608 B	TDK	1
C160	S.CERAMIC	470P C1608 CH	TDK	1
C161	S.CERAMIC	1.5P C1608 CH B	TDK	1
C162	S.CERAMIC	15P C1608 CH	TDK	1
C163	S.CERAMIC	0.001 C1608 B	TDK	1
C164	S.CERAMIC	3P C1608 CH B	TDK	1
C165	S.CERAMIC	0.001 C1608 B	TDK	1
C171	S.CERAMIC	0.01 C1608 25V B	TDK	1
C172	S.CERAMIC	0.001 C1608 B	TDK	1
C173	S.CERAMIC	15P C1608 CH	TDK	1
C174	S.CERAMIC	2P C1608 CH B	TDK	1
C175	S.CERAMIC	0.5P C1608 CH B	TDK	1
C176	S.CERAMIC	2P C1608 CH B	TDK	1
C177	S.CERAMIC	2P C1608 CH B	TDK	1
C178	S.CERAMIC	15P C1608 CH	TDK	1
C179	S.CERAMIC	0.001 C1608 B	TDK	1
C180	S.CERAMIC	0.001 C1608 B	TDK	1
C181	S.CERAMIC	0.001 C1608 B	TDK	1
C182	S.CERAMIC	1P C1608 CH B	TDK	1
C183	S.CERAMIC	10P C1608 CH	TDK	1
C184	S.CERAMIC	0.001 C1608 B	TDK	1
C186	S.CERAMIC	47P CM105 CH G	KYOCERA	1
C187	S.CERAMIC	0.022 C1608 16V B	TDK	1
C188	S.CERAMIC	0.001 C1608 B	TDK	1
C189	S.CERAMIC	0.001 C1608 B	TDK	1
C190	S.CERAMIC	0.01 C1608 25V B	TDK	1
C191	S.CERAMIC	0.001 C1608 B	TDK	1
C193	S.CERAMIC	6P C1608 CH B	TDK	1
C195	S.CERAMIC	0.001 C1608 B	TDK	1
C197	S.CERAMIC	4P C1608 CH B	TDK	1
C201	S.CERAMIC	0.001 C1608 B	TDK	1
C202	S.CERAMIC	0.022 C1608 16V B	TDK	1
C203	S.CERAMIC	0.001 C1608 B	TDK	1

Ref	Description	Parts Name	Manufacturer	Qty
C204	S.CERAMIC	0.01 C1608 25V B	TDK	1
C205	S.CERAMIC	100P C1608 CH	TDK	1
C206	S.CERAMIC	47P C1608 CH	TDK	1
C207	S.CERAMIC	0.01 C1608 25V B	TDK	1
C208	S.ELECTROL	10 16V ECEV-S B	MACO	1
C209	S.CERAMIC	0.01 C1608 25V B	TDK	1
C210	S.CERAMIC	0.001 C1608 B	TDK	1
C211	S.CERAMIC	270P C1608 CH	TDK	1
C212	S.CERAMIC	270P C1608 CH	TDK	1
C213	S.CERAMIC	0.001 C1608 B	TDK	1
C215	S.CERAMIC	1 C1608 10V B	TDK	1
C216	S.CERAMIC	0.1 C1608 16V B	TDK	1
C217	S.CERAMIC	22P C1608 CH	TDK	1
C218	S.CERAMIC	0.1 C1608 16V B	TDK	1
C219	S.CERAMIC	0.001 C1608 B	TDK	1
C220	S.CERAMIC	0.001 C1608 B	TDK	1
C221	S.CERAMIC	0.1 C1608 16V B	TDK	1
C222	S.CERAMIC	0.22 C1608 10V B	TDK	1
C223	S.CERAMIC	0.22 C1608 10V B	TDK	1
C224	S.CERAMIC	0.1 C1608 16V B	TDK	1
C225	S.CERAMIC	0.22 C1608 10V B	TDK	1
C231	S.CERAMIC	0.1 C1608 16V B	TDK	1
C232	S.CERAMIC	0.012 C1608 16V B	TDK	1
C233	S.CERAMIC	0.033 C1608 16V B	TDK	1
C234	S.CERAMIC	0.033 C1608 16V B	TDK	1
C235	S.CERAMIC	470P C1608 CH	TDK	1
C236	S.CERAMIC	0.01 C1608 25V B	TDK	1
C237	S.CERAMIC	0.01 C1608 25V B	TDK	1
C238	S.CERAMIC	0.01 C1608 25V B	TDK	1
C239	S.CERAMIC	0.01 C1608 25V B	TDK	1
C240	S.CERAMIC	0.047 C1608 16V B	TDK	1
C241	S.TANTALUM	10 10V ECST-Y	MACO	1
C242	S.CERAMIC	0.1 C1608 16V B	TDK	1
C244	S.MYLAR	0.033 16V ECW-U	MACO	1
C245	S.CERAMIC	0.01 C1608 25V B	TDK	1
C246	S.CERAMIC	0.1 C1608 16V B	TDK	1
C247	S.CERAMIC	0.0022 C1608 B	TDK	1
C248	S.CERAMIC	0.22 C1608 10V B	TDK	1
C251	S.CERAMIC	0.1 C1608 16V B	TDK	1
C252	S.CERAMIC	470P C1608 CH	TDK	1
C261	ELECTROL	220 25V HC	SAN	1
C266	S.CERAMIC	0.001 C1608 B	TDK	1
C267	S.CERAMIC	0.01 C1608 25V B	TDK	1
C268	S.ELECTROL	10 16V ECEV-S B	MACO	1
C269	S.CERAMIC	0.1 C1608 16V B	TDK	1
C270	S.CERAMIC	0.1 C1608 16V B	TDK	1
C271	S.ELECTROL	10 16V ECEV-S B	MACO	1
C273	S.CERAMIC	0.01 C1608 25V B	TDK	1
C274	S.CERAMIC	0.1 C1608 16V B	TDK	1
C277	S.CERAMIC	0.1 C1608 16V B	TDK	1
C278	S.ELECTROL	10 16V ECEV-S B	MACO	1
C279	S.CERAMIC	0.001 C1608 B	TDK	1
C280	S.CERAMIC	0.001 C1608 B	TDK	1
C282	S.CERAMIC	0.1 C1608 16V B	TDK	1
C283	S.ELECTROL	10 16V ECEV-S B	MACO	1
C284	S.ELECTROL	10 16V ECEV-S B	MACO	1
C285	S.CERAMIC	0.1 C1608 16V B	TDK	1

Ref	Description	Parts Name	Manufacturer	Qty
C286	S.CERAMIC	0.01 C1608 25V B	TDK	1
C291	S.TANTALUM	0.1 35V SVA	NEC	1
C292	S.CERAMIC	0.027 C1608 16V B	TDK	1
C293	S.CERAMIC	0.027 C1608 16V B	TDK	1
C294	S.CERAMIC	0.0022 C1608 B	TDK	1
C295	S.CERAMIC	820P C1608 B	TDK	1
C296	S.ELECTROL	10 16V ECEV-S B	MACO	1
C297	S.CERAMIC	1 C1608 10V B	TDK	1
C301	S.CERAMIC	0.0039 C1608 B	TDK	1
C302	S.CERAMIC	1 C1608 10V B	TDK	1
C303	S.CERAMIC	1 C1608 10V B	TDK	1
C304	S.CERAMIC	0.0039 C1608 B	TDK	1
C305	S.CERAMIC	1 C1608 10V B	TDK	1
C311	S.CERAMIC	0.01 C1608 25V B	TDK	1
C312	S.CERAMIC	0.1 C1608 16V B	TDK	1
C313	S.CERAMIC	0.01 C1608 25V B	TDK	1
C314	S.CERAMIC	0.1 C1608 16V B	TDK	1
C315	S.CERAMIC	0.1 C1608 16V B	TDK	1
C316	S.CERAMIC	0.1 C1608 16V B	TDK	1
C322	S.CERAMIC	47P C1608 CH	TDK	1
C324	S.CERAMIC	0.1 C1608 16V B	TDK	1
C331	S.CERAMIC	470P C1608 CH	TDK	1
C332	S.CERAMIC	0.001 C1608 B	TDK	1
C333	S.CERAMIC	0.01 C1608 25V B	TDK	1
C334	S.CERAMIC	47P C1608 CH	TDK	1
C335	S.CERAMIC	470P C1608 CH	TDK	1
C336	S.CERAMIC	47P C1608 CH	TDK	1
C341	S.ELECTROL	10 16V ECEV-S B	MACO	1
C342	S.CERAMIC	1 C1608 10V B	TDK	1
C351	S.CERAMIC	0.01 C1608 25V B	TDK	1
C352	S.CERAMIC	1 C1608 10V B	TDK	1
C353	S.CERAMIC	0.001 C1608 B	TDK	1
C354	S.CERAMIC	0.1 C1608 16V B	TDK	1
C355	ELECTROL	470 16V HC	SAN	1
C356	ELECTROL	470 16V HC	SAN	1
C357	S.CERAMIC	0.1 C1608 16V B	TDK	1
C361	S.CERAMIC	0.22 C1608 10V B	TDK	1
C362	S.CERAMIC	18P C1608 CH	TDK	1
C363	S.CERAMIC	1 C1608 10V B	TDK	1
C365	S.CERAMIC	0.01 C1608 25V B	TDK	1
C367	S.CERAMIC	0.022 C1608 16V B	TDK	1
C368	S.CERAMIC	47P C1608 CH	TDK	1
C371	S.CERAMIC	0.22 C1608 10V B	TDK	1
C372	S.CERAMIC	0.1 C1608 16V B	TDK	1
C373	S.CERAMIC	0.1 C1608 16V B	TDK	1
C374	S.CERAMIC	0.1 C1608 16V B	TDK	1
C375	S.CERAMIC	0.1 C1608 16V B	TDK	1
C376	S.CERAMIC	0.1 C1608 16V B	TDK	1
C377	S.CERAMIC	0.1 C1608 16V B	TDK	1
C381	S.CERAMIC	0.47 C1608 10V B	TDK	1
C382	S.CERAMIC	0.001 C1608 B	TDK	1
C383	S.CERAMIC	47P C1608 CH	TDK	1
C384	S.CERAMIC	0.0068 C1608 B	TDK	1
C385	S.CERAMIC	0.0039 C1608 B	TDK	1
C386	S.CERAMIC	0.001 C1608 B	TDK	1
C387	S.CERAMIC	82P C1608 CH	TDK	1
C389	S.CERAMIC	0.01 C1608 25V B	TDK	1

Ref	Description	Parts Name	Manufacturer	Qty
C391	S.CERAMIC	22P C1608 CH	TDK	1
C392	S.CERAMIC	0.1 C1608 16V B	TDK	1
C401	S.CERAMIC	0.01 C1608 25V B	TDK	1
C403	S.CERAMIC	0.1 C1608 16V B	TDK	1
C404	S.ELECTROL	10 16V ECEV-S B	MACO	1
C405	S.CERAMIC	0.1 C1608 16V B	TDK	1
C406	S.CERAMIC	0.1 C1608 16V B	TDK	1
C407	S.CERAMIC	0.1 C1608 16V B	TDK	1
C422	S.CERAMIC	24P C1608 CH	TDK	1
C423	S.CERAMIC	24P C1608 CH	TDK	1
C424	S.CERAMIC	0.1 C1608 16V B	TDK	1
C426	S.CERAMIC	0.027 C1608 16V B	TDK	1
C442	S.CERAMIC	0.1 C1608 16V B	TDK	1
C443	S.CERAMIC	0.1 C1608 16V B	TDK	1
C451	S.CERAMIC	0.01 C1608 25V B	TDK	1
C453	S.CERAMIC	0.0047 C1608 B	TDK	1
RL1	RELAY	FTR-P3CP012W1	TAKAMIZAWA	1
RL2	RELAY	FTR-F3AA012E	TAKAMIZAWA	1
J1	S.CONNECTOR	B8B-PH-SM3-TB	NICHIATSU	1
J2	S.CONNECTOR	B2B-PH-SM3-TB	NICHIATSU	1
J3	S.CONNECTOR	53307-1491	MOLEX	1
J5	S.CONNECTOR	B4B-PH-SM3-TB	NICHIATSU	1
J6	S.CONNECTOR	20FLT-SM1-TB	NICHIATSU	1
J7	S.CONNECTOR	14FLT-SM1-TB	NICHIATSU	1
W1	CABLE	OPC-969	HITACHI DENSEN	1
W2	CABLE	OPC-1026	KOUSHIN	1
EP1	PCB	B-6036B (#2697-1B)	SANWA	1
EP2	TUBE	IRRAX D=1.0 L=10MM		1

Ref	Description	Parts Name		Manufacturer	Qty
C1	CERAMIC	5P 500V HM CH		KCK	1
J1	CONNECTOR	MR-DSE-01		NISSHIN	1
W1	CABLE	OPC-1251	<AI>	CMI	1
W2	JUMPER	74/98/020/X98/X98			1

Ref	Description	Parts Name		Manufacturer	Qty
C1	S.CERAMIC	0.001 C1608 B		TDK	1
C8	S.CERAMIC	0.001 C1608 B		TDK	1
J1	CONNECTOR	SB4P-HVQ-22		NICHIATSU	1
W1	S.JUMPER	MJP-0.2-T		MAKKUEITO	1
EP1	PCB	B-6037A	(#2697-1B)	SANWA	1

Ref	Description	Parts Name		Manufacturer	Qty
IC1	S.IC	TC4W53F		TOSHIBA	1
D4	S.ZENER	MA8062 M		MEC	1
R1	S.RESISTOR	100K ERJ3GE		MACO	1
R2	S.RESISTOR	100K ERJ3GE		MACO	1
R3	S.RESISTOR	1M ERJ3GE		MACO	1
R4	S.RESISTOR	1M ERJ3GE		MACO	1
R5	S.RESISTOR	1M ERJ3GE		MACO	1
R6	S.RESISTOR	100K ERJ3GE		MACO	1
C7	S.CERAMIC	0.01 C1608 25V B		TDK	1
C9	S.CERAMIC	0.01 C1608 25V B		TDK	1
C10	S.ELECTROL	10 16V ECEV-S A		MACO	1
C11	S.CERAMIC	1 C1608 10V B		TDK	1
C12	S.CERAMIC	1 C1608 10V B		TDK	1
C13	S.CERAMIC	1 C1608 10V B		TDK	1
C14	S.CERAMIC	0.01 C1608 25V B		TDK	1
C15	S.CERAMIC	0.01 C1608 25V B		TDK	1
J1	CONNECTOR	LTW-8MP-C	<AI>		1
J2	S.CONNECTOR	20FLT-SM1-TB		NICHIATSU	1
W1	CABLE	OPC-1297		HITACHI DENSEN	1
EP1	PCB	B-6042A	(#2697-2A)	SANWA	1

CTRL board parts list

Ref	Description	Parts Name	Manufacturer	Qty
MC1	MICROPHONE	FM-3001	SKE	1
SP1	SPEAKER	045P0803	FUJI GIKEN	1
W1	JUMPER	ERDS2T0	MEC	1
W2	JUMPER	ERDS2T0	MEC	1

Ref	Description	Parts Name		Manufacturer	Qty
IC1	S.IC	UPD789405AGK		NEC	1
IC2	S.IC	HD66712SA03FS	*	RENESAS	1
Q1	S.FET	2SK1069 4		SANYO	1
Q2	S.TRANSISTOR	2SC4116 BL		TOSHIBA	1
Q3	S.TRANSISTOR	2SB1132 R		ROHM	1
Q4	S.FET	2SK1069 4		SANYO	1
Q5	S.TRANSISTOR	DTA144EU		ROHM	1
Q6	S.TRANSISTOR	DTC144EU		ROHM	1
Q8	S.TRANSISTOR	2SC4116 BL		TOSHIBA	1
D1	S.ZENER	MA8043 L		MEC	1
X1	S.CERAMIC	CSTCC4.91MG	*	MURATA	1
R1	S.RESISTOR	47K ERJ3GE		MACO	1
R2	S.RESISTOR	10K ERJ3GE		MACO	1
R3	S.RESISTOR	47K ERJ3GE		MACO	1
R4	S.RESISTOR	10K ERJ3GE		MACO	1
R5	S.RESISTOR	47K ERJ3GE		MACO	1
R6	S.RESISTOR	12K ERJ3GE		MACO	1
R7	S.RESISTOR	1.5K ERJ3GE		MACO	1
R8	S.RESISTOR	10K ERJ3GE		MACO	1
R9	S.THRMISTOR	NTCG16 4BH 103KT		TDK	1
R10	S.RESISTOR	10K ERJ3GE		MACO	1
R11	S.RESISTOR	20K ERJ3GE		MACO	1
R12	S.RESISTOR	10K ERJ3GE		MACO	1
R13	S.RESISTOR	18K ERJ3GE		MACO	1
R14	S.RESISTOR	10K ERJ3GE		MACO	1
R15	S.RESISTOR	20K ERJ3GE		MACO	1
R16	S.RESISTOR	10K ERJ3GE		MACO	1
R17	S.RESISTOR	1K ERJ3GE		MACO	1
R18	S.RESISTOR	100K ERJ3GE		MACO	1
R19	S.RESISTOR	47K ERJ3GE		MACO	1
R20	S.RESISTOR	22K ERJ3GE		MACO	1
R22	S.RESISTOR	10K ERJ3GE		MACO	1
R23	S.RESISTOR	1.5K ERJ3GE		MACO	1
R24	S.RESISTOR	10K ERJ3GE		MACO	1
R25	S.THRMISTOR	NTCG16 4BH 103KT		TDK	1
R26	S.RESISTOR	10K ERJ3GE		MACO	1
R27	S.RESISTOR	10K ERJ3GE		MACO	1
R28	S.RESISTOR	10K ERJ3GE		MACO	1
R29	S.RESISTOR	10K ERJ3GE		MACO	1
R30	S.RESISTOR	10K ERJ3GE		MACO	1
R31	S.RESISTOR	10K ERJ3GE		MACO	1
R32	S.RESISTOR	10K ERJ3GE		MACO	1
R33	S.RESISTOR	100K ERJ3GE		MACO	1
R34	S.RESISTOR	100K ERJ3GE		MACO	1
R35	S.RESISTOR	100K ERJ3GE		MACO	1
R36	S.RESISTOR	100K ERJ3GE		MACO	1
R37	S.RESISTOR	100K ERJ3GE		MACO	1
R38	S.RESISTOR	220 ERJ3GE		MACO	1
R41	S.RESISTOR	220 ERJ3GE		MACO	1
R42	S.RESISTOR	220 ERJ3GE		MACO	1
R43	S.RESISTOR	220 ERJ3GE		MACO	1
R44	S.RESISTOR	10K ERJ3GE		MACO	1
R45	S.RESISTOR	10K ERJ3GE		MACO	1
R46	S.RESISTOR	27K ERJ3GE		MACO	1
R47	S.RESISTOR	10K ERJ3GE		MACO	1
R48	S.RESISTOR	10K ERJ3GE		MACO	1
R49	S.RESISTOR	100K ERJ3GE		MACO	1

Ref	Description	Parts Name	Manufacturer	Qty
R50	S.RESISTOR	390K ERJ3GE	MACO	1
R51	S.RESISTOR	120K ERJ3GE	MACO	1
R52	S.RESISTOR	10K ERJ3GE	MACO	1
R53	S.RESISTOR	220 ERJ3GE	MACO	1
R54	S.RESISTOR	220 ERJ3GE	MACO	1
R55	S.RESISTOR	10K ERJ3GE	MACO	1
R56	S.RESISTOR	3.3K ERJ3GE	MACO	1
R64	S.RESISTOR	33K ERJ3GE	MACO	1
R65	S.RESISTOR	1M ERJ3GE	MACO	1
R66	S.RESISTOR	100K ERJ3GE	MACO	1
R67	S.RESISTOR	18K ERJ3GE	MACO	1
R68	S.RESISTOR	10K ERJ3GE	MACO	1
R69	S.RESISTOR	39K ERJ3GE	MACO	1
R70	S.RESISTOR	47K ERJ3GE	MACO	1
C1	S.CERAMIC	0.001 C1608 B	TDK	1
C2	S.CERAMIC	0.001 C1608 B	TDK	1
C3	S.CERAMIC	0.1 C1608 16V B	TDK	1
C4	S.CERAMIC	0.1 C1608 16V B	TDK	1
C5	S.CERAMIC	0.001 C1608 B	TDK	1
C6	S.CERAMIC	0.001 C1608 B	TDK	1
C7	S.CERAMIC	0.01 C1608 25V B	TDK	1
C8	S.CERAMIC	0.01 C1608 25V B	TDK	1
C9	S.CERAMIC	0.1 C1608 16V B	TDK	1
C11	S.ELECTROL	10 16V ECEV-S B	MACO	1
C12	S.CERAMIC	0.001 C1608 B	TDK	1
C13	S.CERAMIC	0.01 C1608 25V B	TDK	1
C14	S.CERAMIC	0.1 C1608 16V B	TDK	1
C15	S.CERAMIC	0.01 C1608 25V B	TDK	1
C16	S.CERAMIC	0.01 C1608 25V B	TDK	1
C17	S.ELECTROL	10 16V ECEV-S B	MACO	1
C18	S.CERAMIC	0.01 C1608 25V B	TDK	1
C19	S.CERAMIC	0.01 C1608 25V B	TDK	1
C20	S.CERAMIC	0.1 C1608 16V B	TDK	1
C21	S.ELECTROL	1 50V ECEV-S B	MACO	1
C22	S.ELECTROL	1 50V ECEV-S B	MACO	1
C23	S.CERAMIC	0.01 C1608 25V B	TDK	1
C24	S.CERAMIC	0.1 C1608 16V B	TDK	1
C25	S.CERAMIC	0.01 C1608 25V B	TDK	1
J1	S.CONNECTOR	S2B-PH-SM3-TB	NICHIATSU	1
J3	S.CONNECTOR	B6B-ZR-SM3-TF	NICHIATSU	1
J4	S.CONNECTOR	14FLT-SM1-TB	NICHIATSU	1
DS1	LCD	TSD0393		1
DS2	S.LED	SML-512UW	ROHM	1
DS3	S.LED	SML-512WW	ROHM	1
DS4	S.LED	SML-512WW	ROHM	1
DS5	S.LED	SML-512WW	ROHM	1
DS6	S.LED	SML-512WW	ROHM	1
DS7	S.LED	SML-512WW	ROHM	1
DS8	S.LED	SML-512WW	ROHM	1
DS9	S.LED	SML-512WW	ROHM	1
DS10	S.LED	SML-512WW	ROHM	1
DS11	S.LED	SML-512WW	ROHM	1
DS12	S.LED	SML-512WW	ROHM	1
DS13	S.LED	SML-512WW	ROHM	1
DS14	S.LED	SML-512WW	ROHM	1
DS15	S.LED	SML-512WW	ROHM	1
DS16	S.LED	SML-512WW	ROHM	1

Ref	Description	Parts Name	Manufacturer	Qty
DS17	S.LED	SML-512WW	ROHM	1
S1	SWITCH	SPPH22014A	ALPS	1
EP1	PCB	B-6041 (#2697-2A)	SANWA	1
EP2	LCD CONTACT	SRCN-2345-SP-N-W	SHINETSU	2

Ref	Description	Parts Name		Manufacturer	Qty
R1	VARIABLE	TP96N97-15F-10KA-2345		COSMOS	1
J1	CONNECTOR	S3B-ZR		NICHIATSU	1
EP1	PCB	B-6038	(#2697-1B)	SANWA	1

VOL board parts list

Ref	Description	Parts Name		Manufacturer	Qty
R1	VARIABLE	TP96N97 15F-10KB-1301		COSMOS	1
W1	CABLE	OPC-971		KOUSHIN	1
EP1	PCB	B-6039A	(#2697-1B)	SANWA	1

Ref	Description	Parts Name	Manufacturer	Qty
S1	ENCODER	TP90N937E20-15F-1540	COSMOS	1
EP1	PCB	B-6040A (#2697-1B)	SANWA	1

Ref	Description	Parts Name		Manufacturer	Qty
R1	RESISTOR	12K FRD25	<KN>	RIVER	1
R2	RESISTOR	6.8K FRD25	<KN>	RIVER	1
R3	RESISTOR	15K FRD25	<KN>	RIVER	1
R4	RESISTOR	33K FRD25	<KN>	RIVER	1
R5	RESISTOR	15 MOS2W J	<KN>	HOKURIKU	1
C1	S.CERAMIC	0.022 C1608 16V B	<KN>	TDK	1
C2	S.CERAMIC	470P C1608 CH	<KN>		1
J1	CONNECTOR	S07B-EH-S	<KN>	NICHIATSU	1
MC1	MICROPHONE	KUC3523-040245	<KN>	HOSIDEN	1
S1	SWITCH	SKHHLP014A	<KN>	ALPS	1
S2	SWITCH	SKHHAM024A	<KN>	ALPS	1
S3	SWITCH	SKHHAM024A	<KN>	ALPS	1
S4	SWITCH	SKHHAM024A	<KN>	ALPS	1
SP1	SPEAKER	036D0801B		FUJI(XIAMEN)	1
W1	WIRE	71/98/020/X98/X98			1
W2	WIRE	71/98/020/X98/X98			1
W3	WIRE	71/98/020/X98/X98			1
W4	WIRE	71/98/020/X98/X98			1
W1	CABLE	OPC-948	<KN>		1
EP1	PCB	B-5431C	<KN>	SKE	1

8 Block Diagrams and Schematic Diagrams

SQL BOARD
DIAL BOARD
VOL BOARD
D5V
UP
E
DN
LOGIC BOARD
IC1
UPD789405AGK
SUB CPU
KEYBOARD
X1:CSTCC4.91MG
4.91MHz
IC2:HD66712SA03FS
LCD
LCD DRIVER
DS1:TSD0393
Q1:2SK1069
LCD CONTRAST
Q4:2SK1069
LCD CONTRAST
Q5:DTA144EU
Q6:DTC144EU
BUFF
Q2,8:2SC4116
Q3:2SB1132
DS2-17
DIM CTRL
LED
S1
POWER-SW
HV
HVS
SQL
BPLVLM
SP
SPEAKER/
MICROPHONE
KEYBOARD
SP
MIC
FRONT UNIT
MAIN UNIT
Q40:2SJ144
MIC MUTE
IC14:LA4425A
Q43:DTC144EU
D47:DA204U
AF AMP
Q42:2SC3326
D46:DAP202U
AF MUTE
Q41:2SC4116
D45:1SS355
RL2:FTR-F3AA012E
AF MUTE
IC13:BU4066BCF
Q37:2SJ144
AF MUTE
Q38:2SJ144
AF MUTE
Q35,36:2SC4116
BRF
IC16:BU4066BCF
Q44:DTC144EU
MIC AMP
IC15b:NJM4558M
MIC AMP
IC15a:NJM4558M
Q39:2SK1069
BUFF
Q61:DTA144EU
Q62:DTC144TU
BUFF
IC20:S-80928CNMC
RESET
IC19:
MB90583CA
MAIN CPU
X4:CR-769
7.9872MHz
IC18:HN58X2464TI
EEPROM
Q58:DTC144TU
D52:DA204U
CI-V
I/F
ICF3
IC21ac:TC7W14FU
Q55:2SK1069
Q56:2SC4081
Q57:2SA1576
BUFF
IC22:PC357N6T
D56:1SS355
DATAS
BUFF
PHOTO COUPLE
NMEAI+
NMEAI-
IC21b:TC7W14FU
DATAM
BUFF
NMEAO
Q59:2SC4081
Q60:DTC144EU
D54:MA8062
D55:DA204K
RS422 Interface
(U-art data I/O)
Q51:2SK1069
BUFF
DSC
ICF3
DETI
OPTION
SCRMBLER
UNIT
MICI
DETO
MICO
IC24,25:TC7W66FU
Q46:DTA144EU
450KHz
X2:CDBC450CX24
FI3:ALFY450E
CERAMIC BPF
450KHz
D32:MA8036
IF3.6V
R8
IC7b:NJM4558M
LPF
FM DET
2NDIF AMP
2ND MIX
Q23:2SC2714
IF AMP
FI1:FL-368
FI2:FL-363
CERAMIC BPF
21.7MHz
Q22:3SK206
1ST MIX
D26-31:1SV214
BPF
RF AMP
Q21:3SK292
D25:1SV214
BPF
ATT1-2
ATT
Q52,53:DTA144EU
D22,23:MA77
D14:XB15A308
D21:XB15A308
D24:1SS375
ANT SW
LPF
ANT
WXDEC
DSDEC
IC8:NJM2211M
IC9:TC7W14FU
DSC DECODER
HPF
IC7a:NJM4558M
IC5:TA31136FN
IF IC
NOISE AMP
NOISE DET
2ND LO BUFF
LPF
VCC
IC3:
RA35H15116M
PWR AMP
Q12:2SC3775
D9:1SS355
YGR AMP
LPF
Q18:2SC4116
D12,13:HSM88ASR
RFOUT DET
TXDET
Q13:2SA1577
Q16:FMW1
D11:MA8047
APC CTRL
PWR CTRL
Q17:DTC114EU
HI/LO
IC6:NJM2125F
SQL AMP
21.25MHz
X1:CR-766
IC1:UPD3140GS
PLL IC
LPF
Q3:2SC4215
BUFF
Q7:2SC4215
BUFF
TX/RX SW
D7,8:MA77
LPF
Q10:2SC4226
PRE DRIVE
IC2:NJM2125F
Q2:2SK880
BUFF
Q15:DTC144EU
Q54:DTA144EU
TX MUTE CTRL
TMUT
Q8:PMBFJ310
D4,5:HCV358B
LOOP FIL
RX VCO
Q6:2SC4215
BUFF
Q5:2SC4116
D6:1SS355
R8
RIPPLE FIL
Q4:2SK210
D1,2:1SV278
D3:1SV284
Q1:2SK880
LOOP FIL
TX_VCO
T8
RIPPLE FIL
Q9:2SC4116
IC17b:NJM4558M
LPF
IC17a:NJM4558M
IDC
RCV
SEND
8V
VCC
HVS
HV
Q31:2SB1132
Q32:DTC144EU
Q33:2SB1132
Q34:DTC144EU
R8 CTRL
T8 CTRL
IC10:TA7808S
+8 REG
PWR CTRL
D42:1SS355
RL1:FTR-P3CP012W1
D41:DSA3A1
REVERSE CONNECT PROTECT
PWR-CORD BOARD
13.8V
CHASSIS UNIT
IC12:TA7805F
D5V
+5 REG
EXT SP
CTRL BOARD
ICF3
IC1:TC4W53F
OPTION
FM-3010
SP
MIC
MIC MPU
CLONE
VCC

REVISIONS			
1		7	
2		8	
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APPD.	CHKD.		DWN. BY:	DATE 2003.9.10	MODEL FM-3000
山下	喜多		今村	BLOCK DIAGRAM	DWN. NO.

FRONT UNIT

LOGIC BOARD

J3: 1 D5V, 2 SQLV, 3 SQLG, 4 DIALA, 5 GND, 6 DIALB

J4: 1 HV, 2 HVS, 3 LMDA, 4 MLDA, 5 VPP, 6 8V, 7 SRESET, 8 GND, 9 D5V, 10 GND, 11 SP+, 12 SP-, 13 SP+, 14 SP-

SP1: SP+, SP-, W1, W2

J1: KEYM, GND

SQL BOARD

J1: 1 GND, 2 SQLV, 3 D5V

W1 OPC-969

J7: 1 HV, 2 HVS, 3 LMDA, 4 MLDA, 5 VPP, 6 8V, 7 SRESET, 8 GND, 9 D5V, 10 GND, 11 SP+, 12 SP-, 13 SP+, 14 SP-

DIAL BOARD

W1 OPC-971

J1: 1 DIALB, 2 GND, 3 (X), 4 DIALA

FM-3001 SPEAKER-MICROPHONE

J2: 1 KEYM, 2 GND

J1: 1 PTT, 2 HANG, 3 MICE, 4 MIC, 5 GND, 6 (X), 7 (X), 8 SPMIC

MAIN UNIT

J1: 1 AF1, 2 PTT, 3 HANG, 4 MICE, 5 MIC, 6 GND, 7 AF2, 8 SPMIC

VOL BOARD

J1: VOL1, VOL2, GND

W2 OPC-1026

OPTION SCRAMBLER UNIT

J3: 5V, SCK, GND, SDATA, OPTIN, OPSTB, SCON, MICI, GND, DETI, GND, MICO, GND, DETO

PWR-CORD BOARD

J5: 1 NMEAI+, 2 NMEAI-, 3 NMEAO, 4 GND

J2: 1 AF, 2 AFG

W1: NMEAI+, NMEAI-, NMEAO, GND, AF, AFG

J1: 1 HV, 2 HV, 3 GND, 4 GND

CHASSIS UNIT

J6: 1 PTTS, 2 DSCMOD, 3 SAFO, 4 MICG, 5 SMIC, 6 VCC, 7 VCC, 8 VCC, 9 VCC, 10 VCC, 11 DMDA, 12 D5V, 13 GND, 14 MCDA, 15 GND, 16 MDDA, 17 GND, 18 ICF3, 19 GND, 20 CMDA

J1: 1 ANT, 2 GND

GND, GND

CTRL BOARD

W1 OPC-1297

J2: 1 CMDA, 2 GND, 3 ICF3, 4 GND, 5 MDDA, 6 GND, 7 MCDA, 8 GND, 9 D5V, 10 DMDA, 11 VCC, 12 VCC, 13 VCC, 14 VCC, 15 SMIC, 16 MICG, 17 SAFO, 18 MICG, 19 DSCMOD, 20 PTTS

to FM-3010 J1

VCC	1
EXTRXD	7
AF/MIC	2
ICF3	8
EXTTXD	6
MICG	3
GND	4
PTTC	5

REVISIONS			
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DATE 2003.9.10

MODEL FM-3000

GENERAL SCHEMATIC DIAGRAM

DWN.NO.

APPD.	CHKD.		DWN.BY:
山下	喜多		今村

APPD.	CHKD.		DWN. BY.	DATE 2003.9.10	MODEL FM-3000
山下	喜多		今村	MAIN SCHEMATIC DIAGRAM	DWN. NO.

REVISIONS

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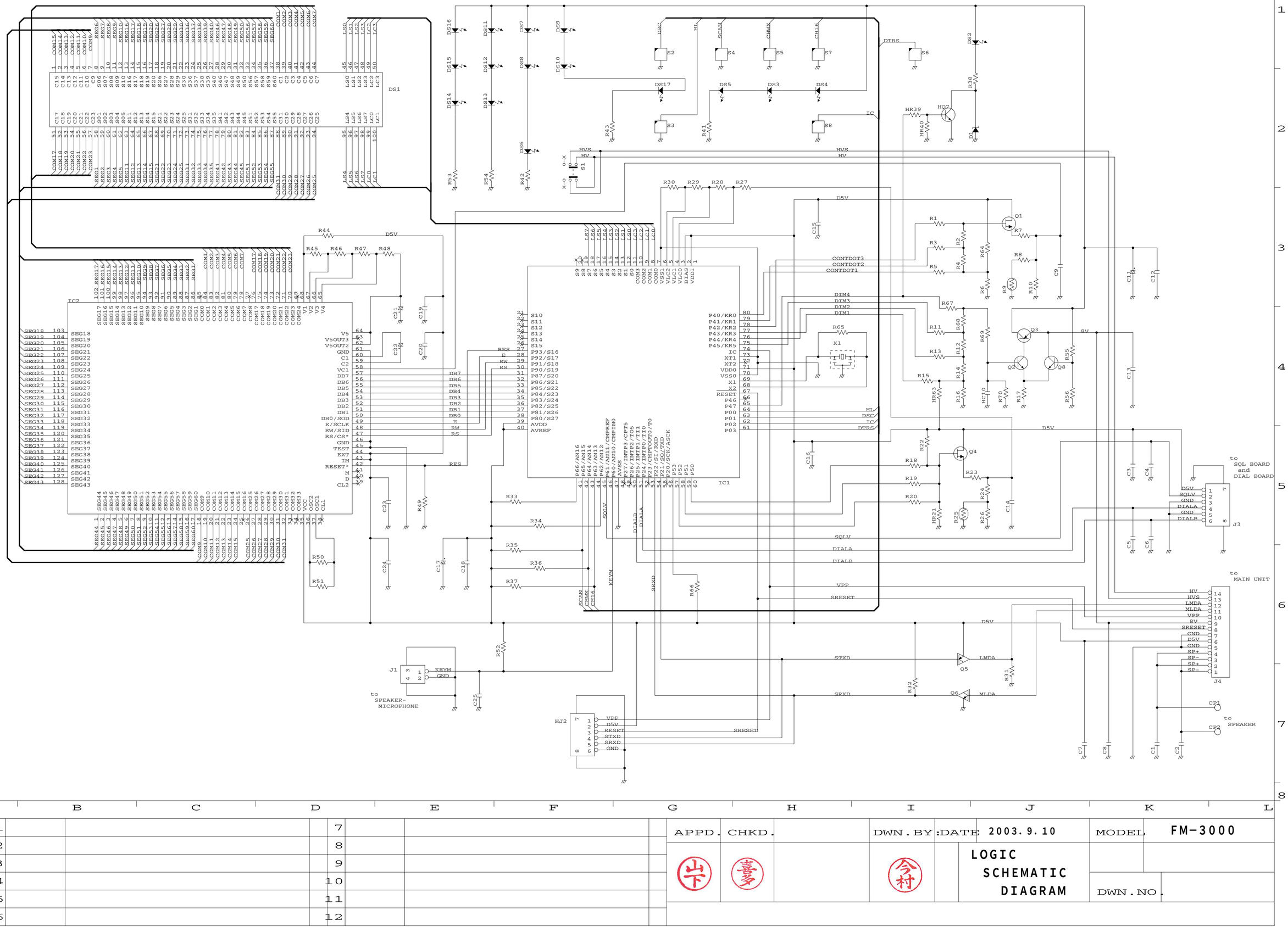
6		12	



A	B	C	D	E	F	G	H	I	J	K	L

REVISIONS					
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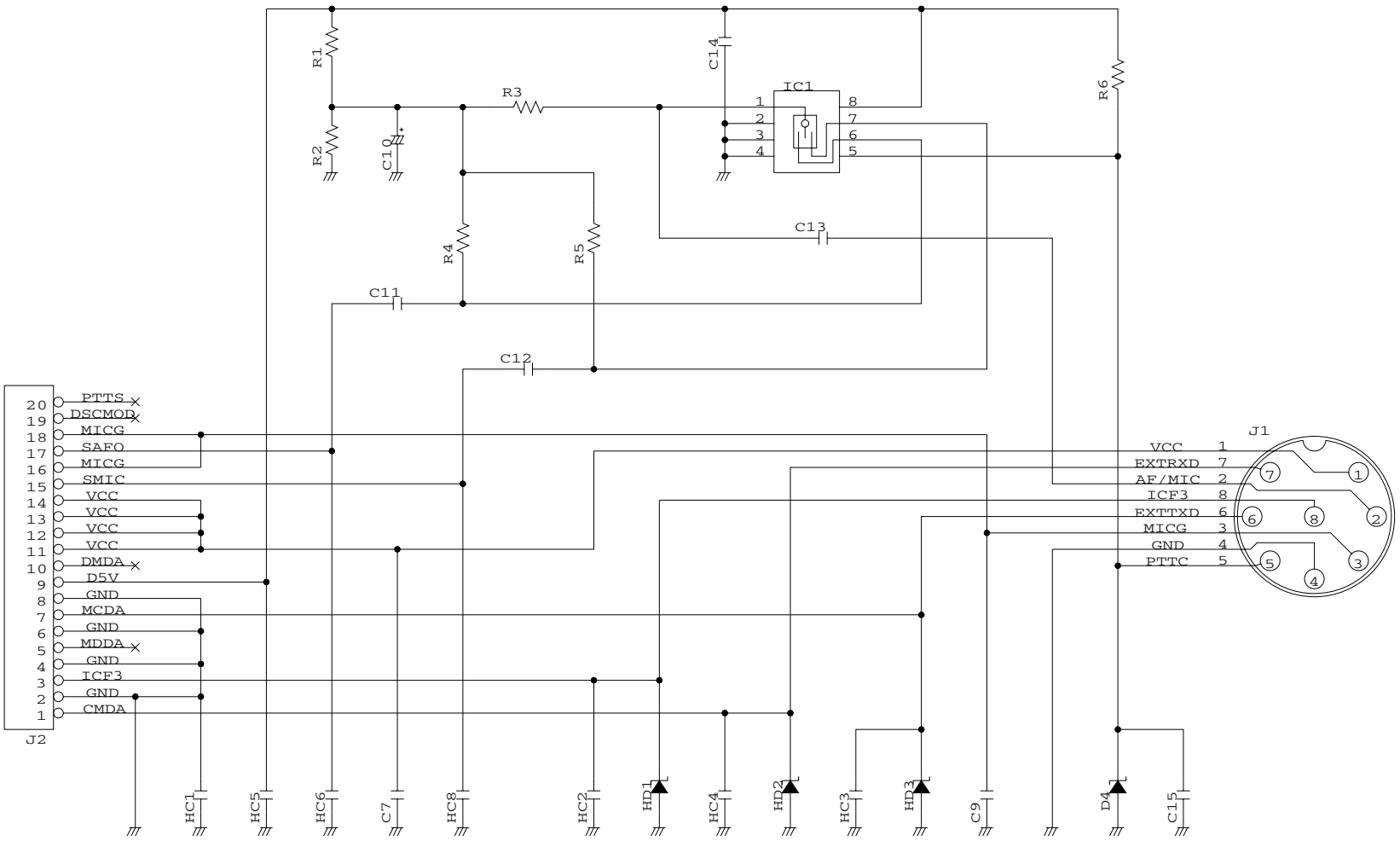
3		9			
4		10			
5		11			
6		12			

APPD.	CHKD.		DWN. BY	DATE 2003.9.10	MODEL FM-3000
山下	喜多		今村	LOGIC SCHEMATIC DIAGRAM	DWN. NO.



REVISIONS							
1				DATE	2003.9.10	MODEL	FM-3000
2				CTRL SCHEMATIC DIAGRAM			
3						DWN.NO.	
4				APPD.	CHKD.		DWN.BY:
5				山下	喜多		今村
6							
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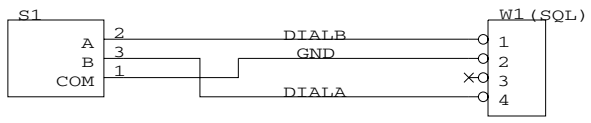

REVISIONS						
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2				DIAL SCHEMATIC DIAGRAM		
3					DWN.NO.	
4				APPD.	CHKD.	DWN.BY:
5				山下	喜多	今村
6						
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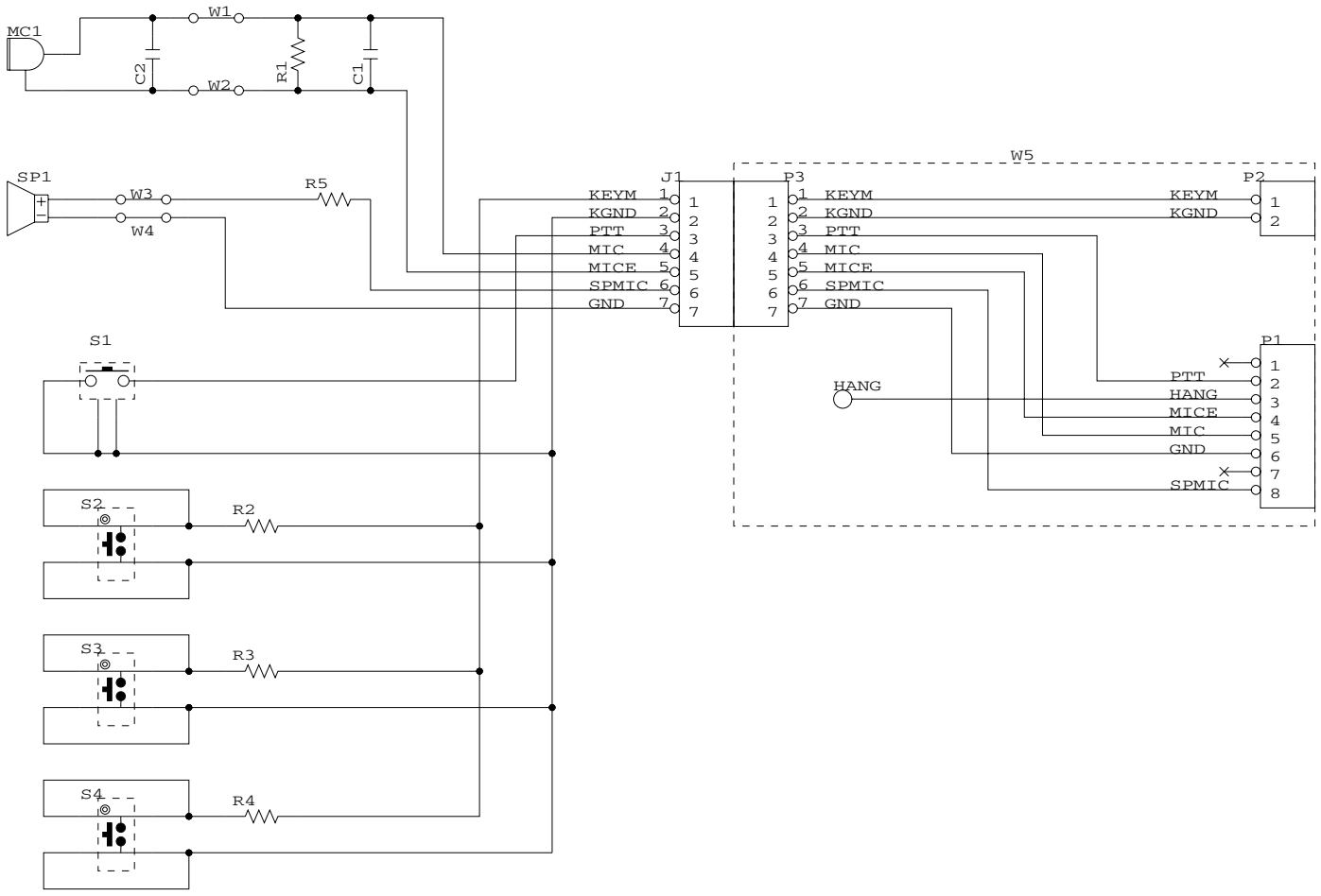
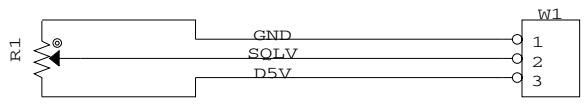


REVISIONS	1				DATE 2003.9.10	MODEL FM-3000
	2				FM-3001 MIC SCHEMATIC DIAGRAM	
	3					DWN.NO.
	4				APPD.	CHKD. DWN.BY:
	5				山下	喜多 今村
	6					
	7					
	8					



REVISIONS						
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2				SQL SCHEMATIC DIAGRAM		
3					DWN.NO.	
4				APPD.	CHKD.	DWN.BY:
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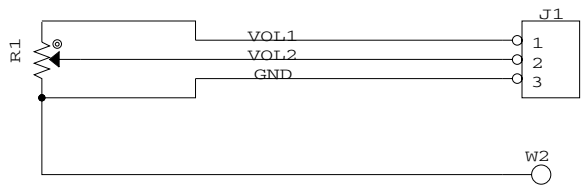
6						
7						
8						



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2				VOL SCHEMATIC DIAGRAM			
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5				山下	喜多		今村
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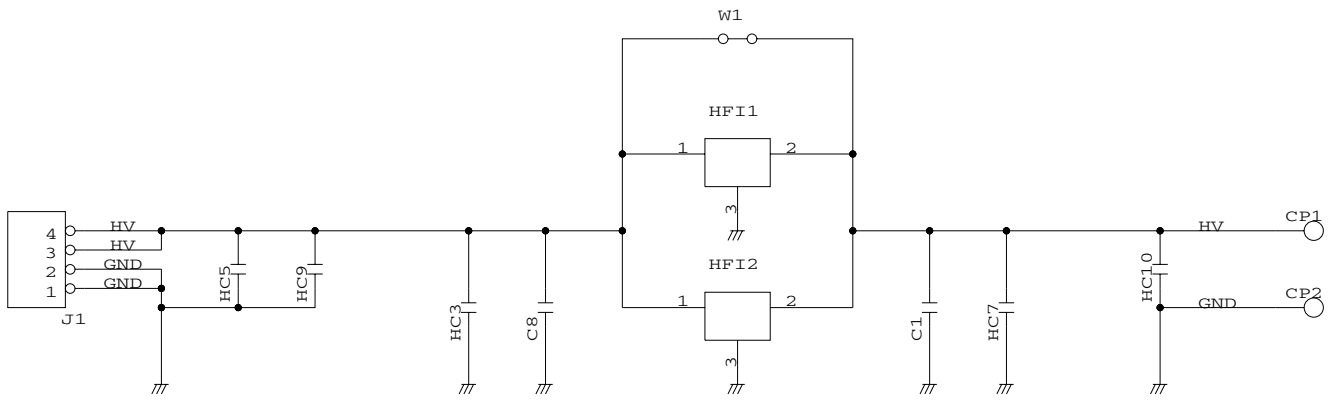

REVISIONS						
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2				PWR-CORD SCHEMATIC DIAGRAM		
3					DWN.NO.	
4				APPD.	CHKD.	DWN.BY:
5				山下	喜多	今村
6						
7						
8						

9 Photographs of equipment

Front view

Rear view

View from Left

View from right

View from top

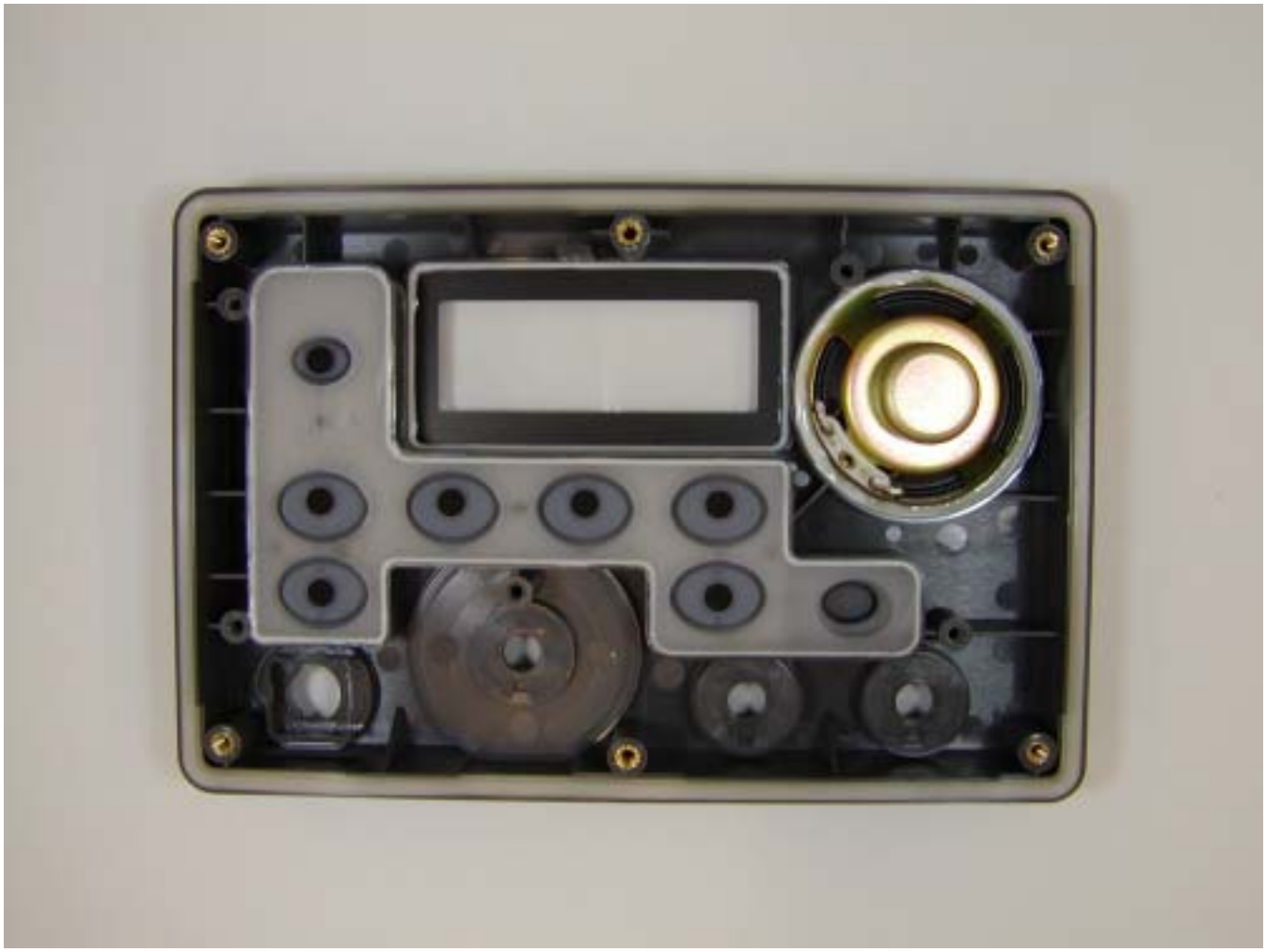
View from bottom

Microphone - front view

Microphone - rear view

Front panel -inside view

Front view with panel removed



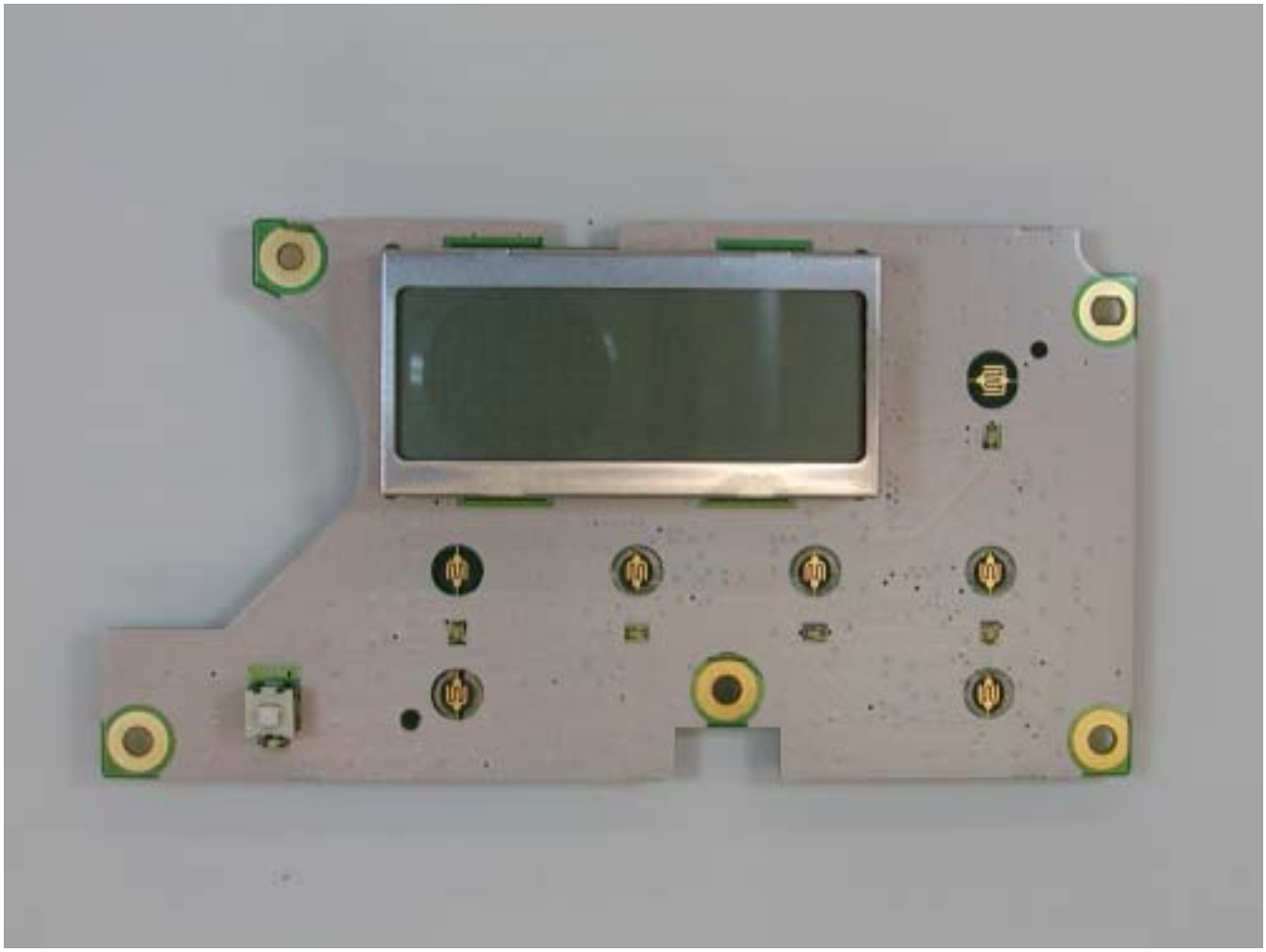
Rear view of the front panel

Rear chassis showing main PCB

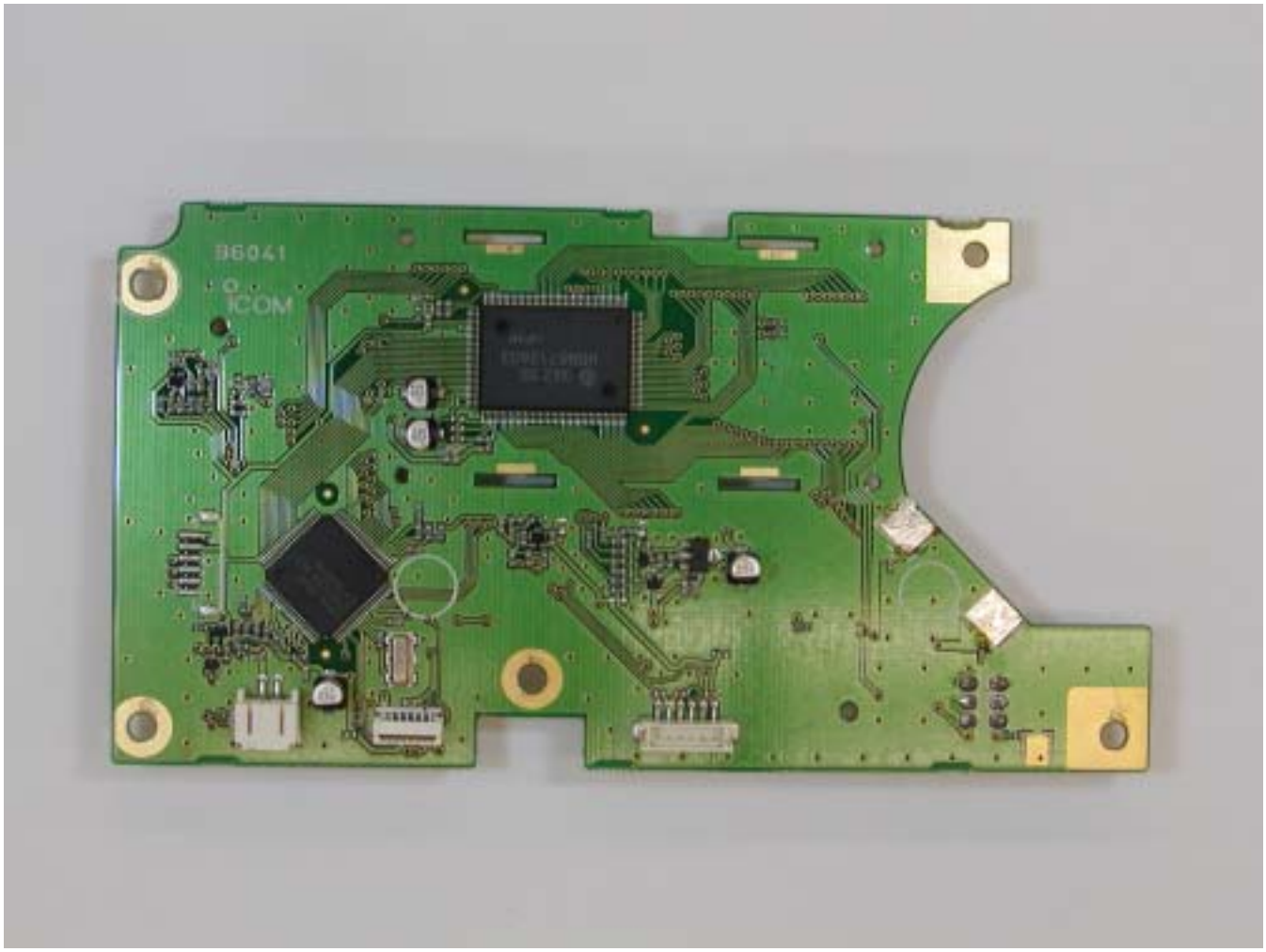
Rear chassis with main PCB removed

Rear chassis removing all PCBs

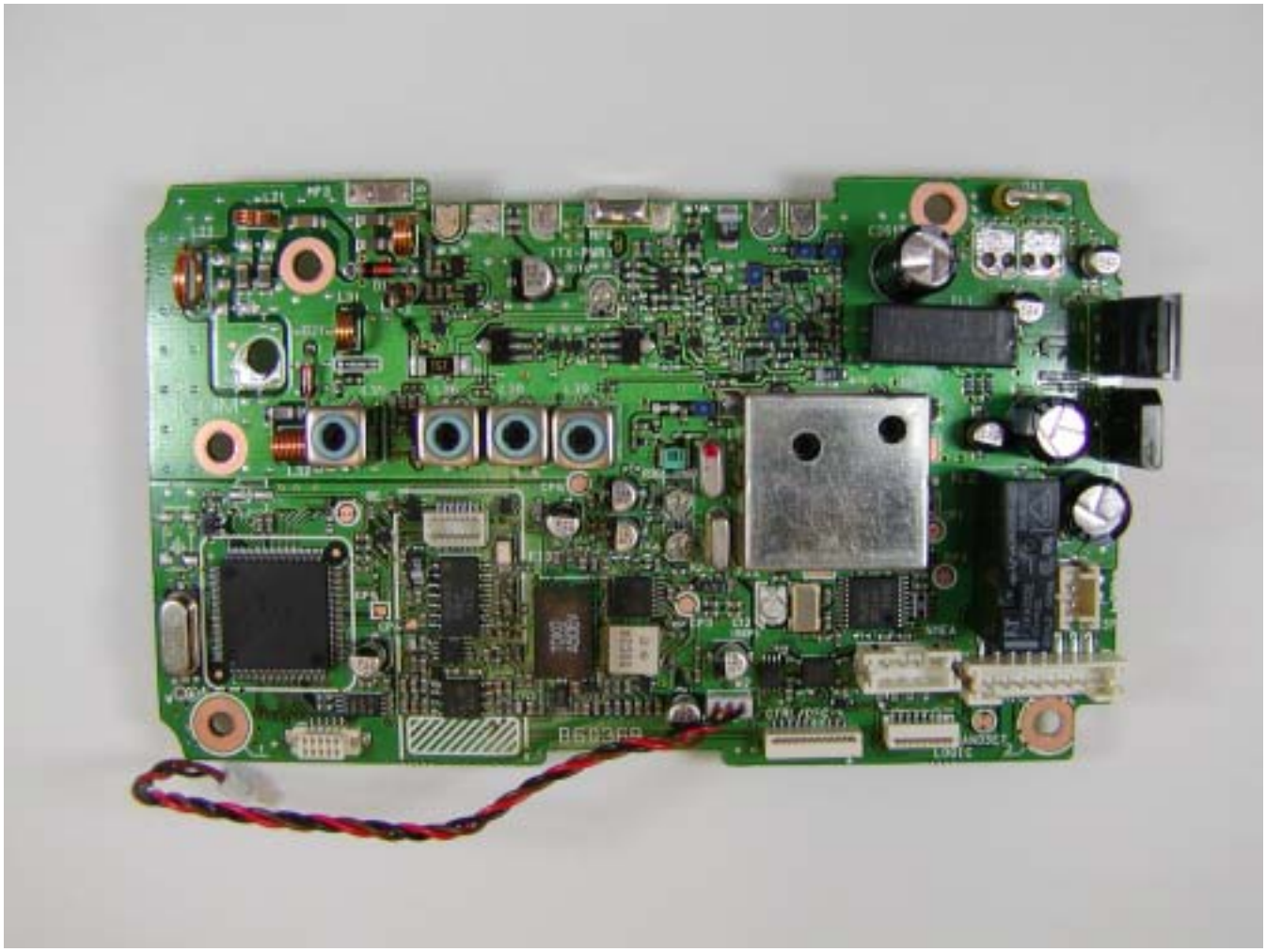
Logic PCB -front



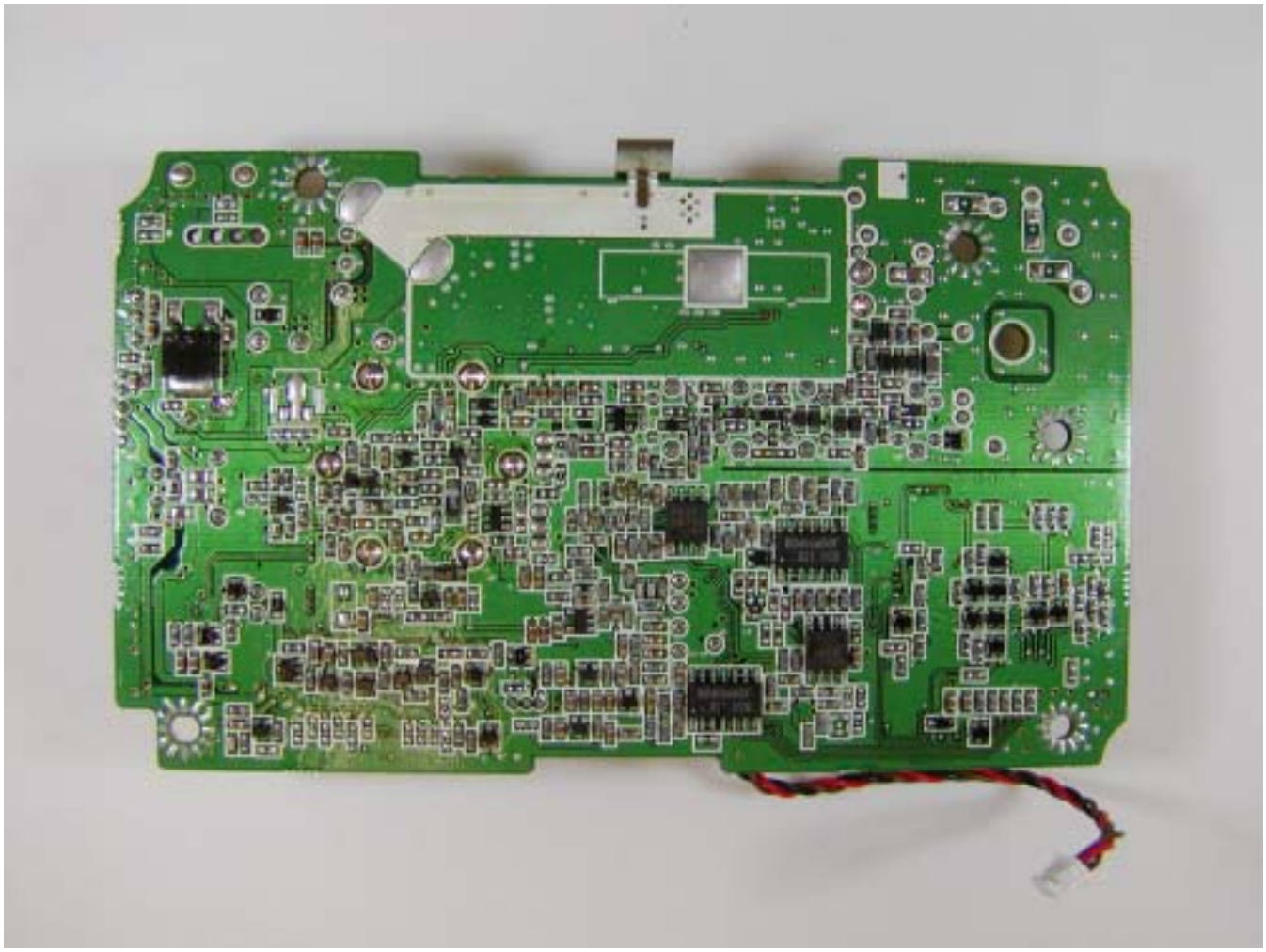
Logic PCB -rear



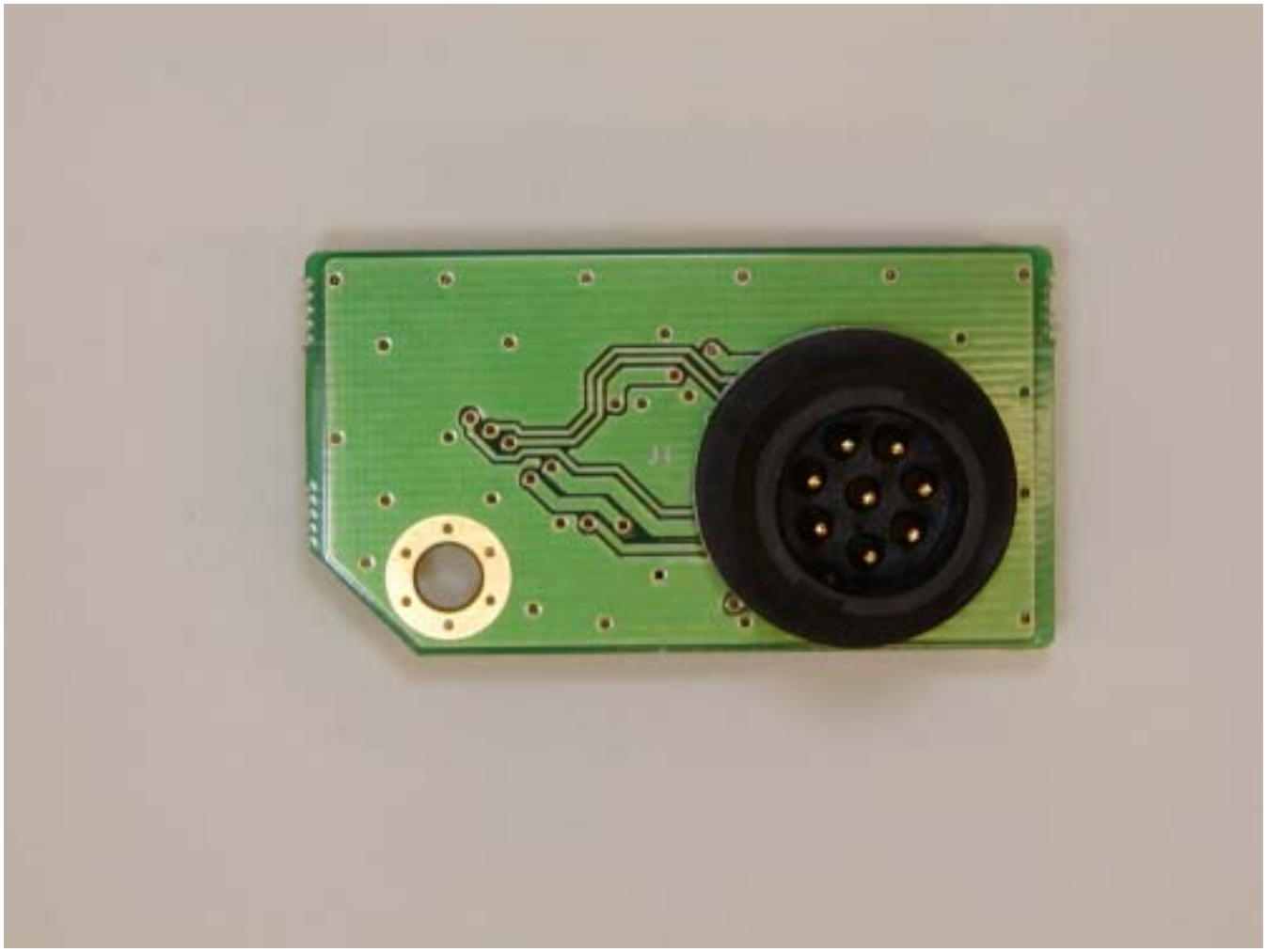
Main PCB - front view



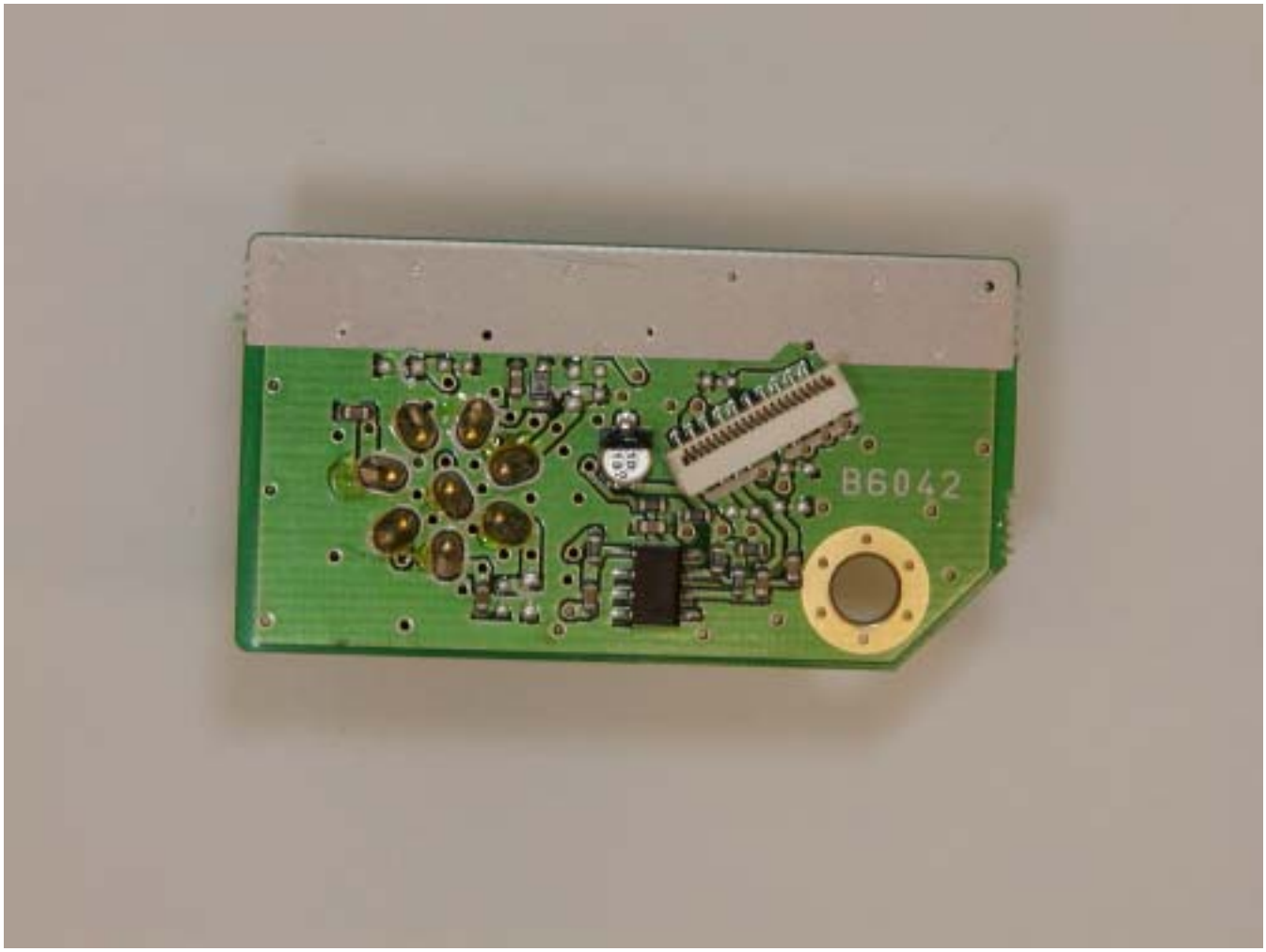
Rear view of main PCB



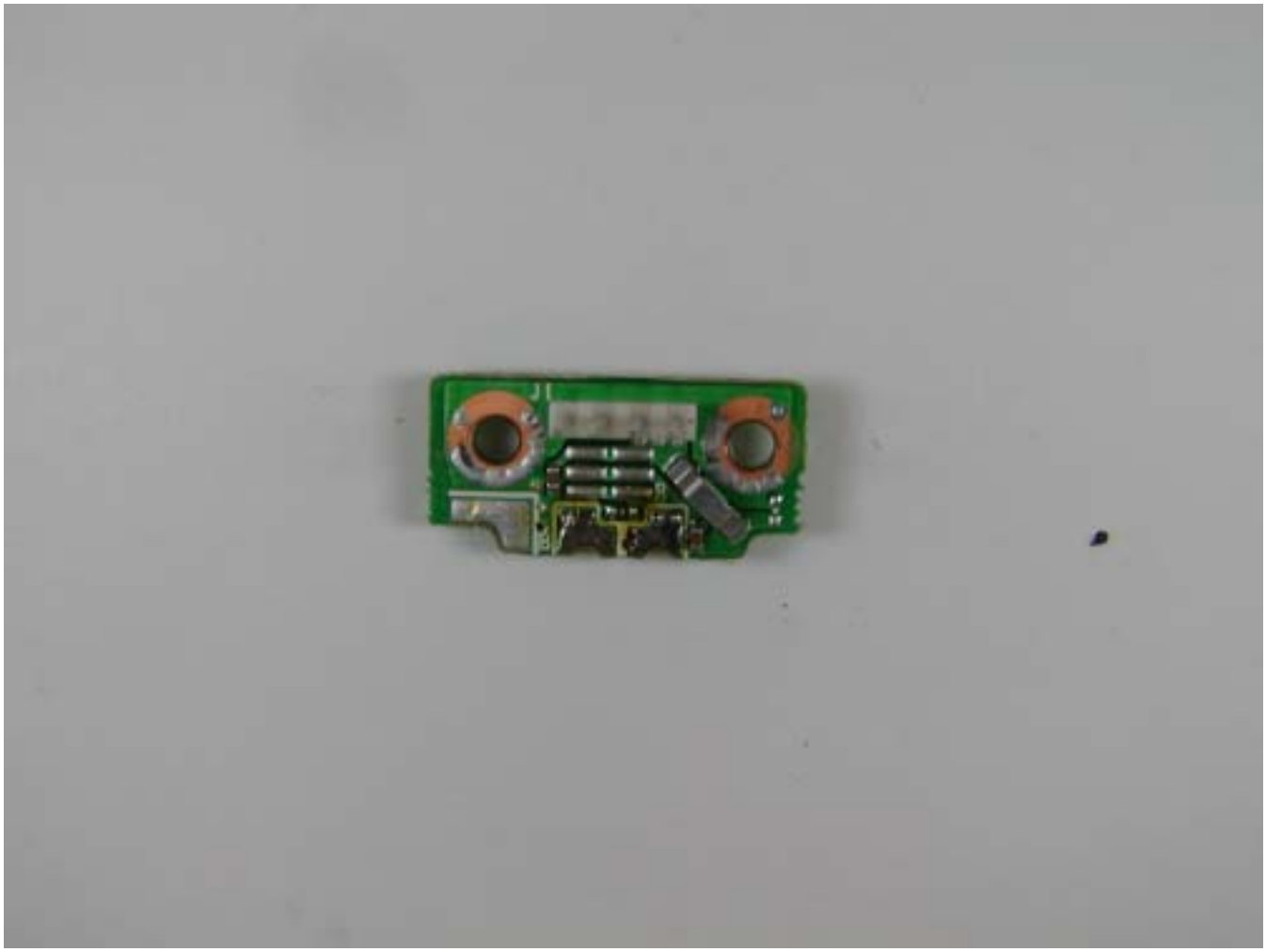
Control PCB - front view



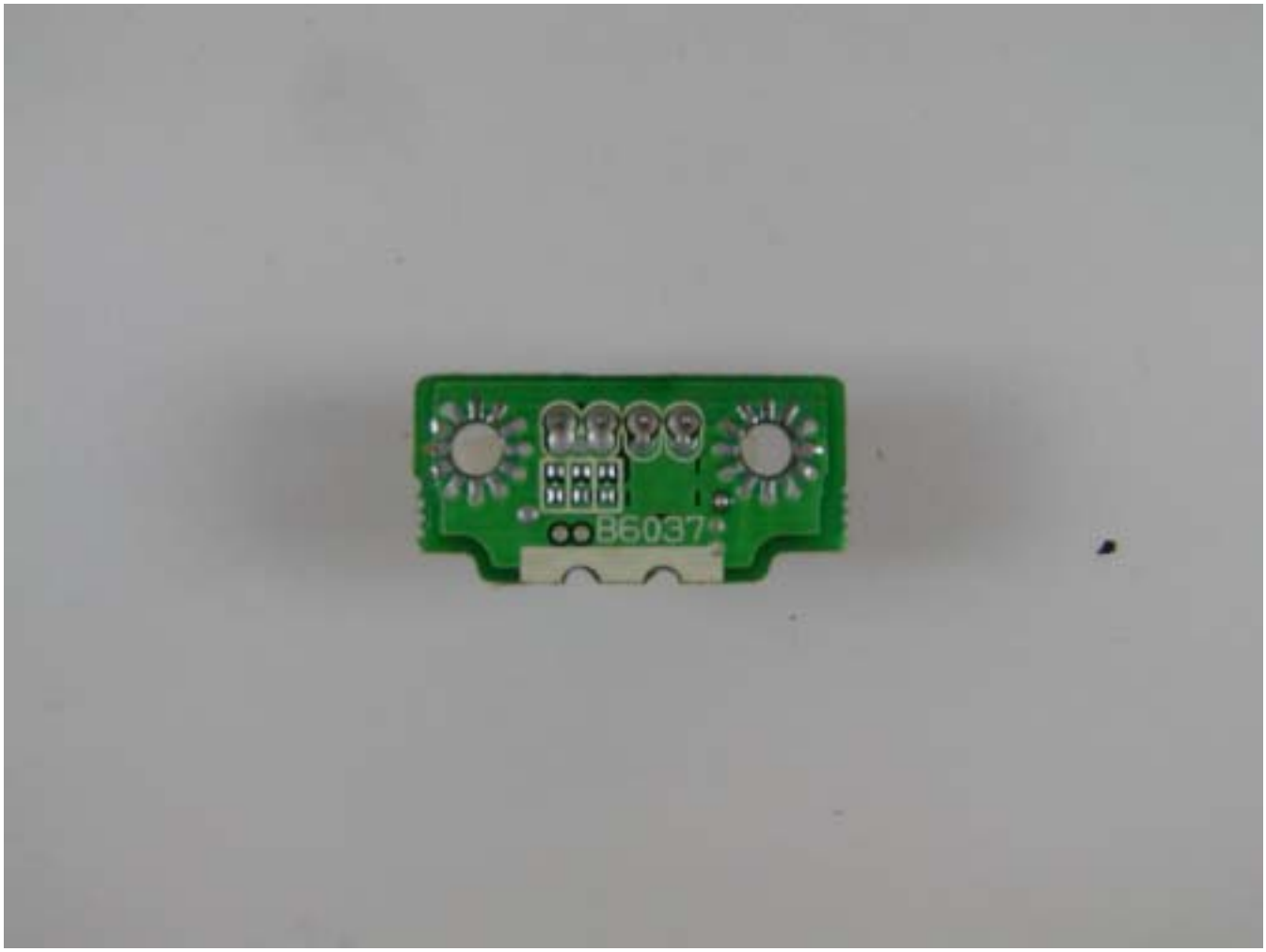
Control PCB - rear view



Power PCB - front view



Power PCB - rear view



Inside view of microphone

Microphone PCB - fron view

Microphone PCB - rear view