



RadioShack®

Service Manual

HTX-400

MINI HANDHELD 70cm FM

AMATEUR TRANSCEIVER

Catalog Number : 19-1104

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SPECIFICATIONS

1. GENERAL

FREQUENCY :

RX ----- 420-470 MHz

TX ----- 430-470 MHz

FREQUENCY GENERATION ----- PLL SYNTHESIZER

FREQUENCY STABILITY ----- ± 5 PPM

OPERATING TEMPERATURE ----- 14°C TO 131°F (-10; ÉTO 55; É

POWER SOURCE ----- DC 3.0V TO 9V

MODULATION ----- F3E

IMPEDANCE ----- 50 ohm

DIMENSIONS (HWD) ----- $2\frac{1}{4}$; $3\frac{3}{8}$; $1\frac{1}{16}$ inches

85; 58; 26.5 mm

WEIGHT (without batteries) ----- 4.2 oz (120g)

2. RECEIVER SECTION

CIRCUIT TYPE ----- DUAL CONVERSION, SUPERHETERODYNE

IF FREQUENCY :

1st IF ----- 30.85 MHz

2nd IF ----- 450 KHz

SENSITIVITY ----- 0.22 μ V for 12dB SINAD

SELECTIVITY ----- 50 dB Min.

SPURIOUS & IMAGE REJECTION ----- 40 dB Min.

INTERMODULATION ----- 50 dB Min.

DISTORTION ----- 10 % Max.

S/N RATIO ----- 40 dB Min.

AUDIO OUTPUT @10%THD ----- 80 mW 16 Ohm, BTL

3. TRANSMITTER SECTION

POWER OUTPUT ----- 300 mW

DISTORTION ----- 10 %

DEVIATION ----- ± 5.2 KHz

S/N RATIO ----- 35 dB

CURRENT DRAIN ----- 600 mA

THEORY OF OPERATION

1. SEMICONDUCTORS AND FUNCTION

1.1 IC COMPLEMENT

REF.NO	TYPE	MANUFACTURER	FUNCTION
IC601	TK11230AM	TOKO	IC-REGULATOR
IC801	TMP87PP21DF	THOSHIBA	CPU IC
IC802	24LC16B	PRO-CHIPS	EEPROM
IC806	NJM2902V	JRC	MIC AMP
IC501	LV2105V	SANYO	PLL IC
IC3	NJM2073M	JRC	AUDIO POWER AMP
IC805	FX465DF	MX-COM	CTCSS ENCODER
IC401	TA31136FN	TOSHIBA	IC-IF
IC803	TK11230AM	TOKO	IC-REGULATOR
IC807	NJM2904V	JRC	TONE AMP
IC804	XC6371A350PR	TORREX	D/D CONVERTOR
IC808	AS2801M	ALPHA	IC-REGULATOR

1.2 TRANSISTOR COMPLEMENT

REF.NO	TYPE	MANUFACTURER	FUNCTION
Q101	MRF9242T1	MOTOROLA	FINNAL RF AMP
Q102	MMBR951LT1	MOTOROLA	DRIVER AMP
Q103	MMBR951LT1	MOTOROLA	PREDRIVER AMP
Q104	2SC3356	NEC	BUFFER
Q105	2SC3356	NEC	BUFFER
Q106	KTA1001S	KEC	TX S/W
Q201	2SC4226	NEC	1'ST AMP
Q202	2SC4226	NEC	1'ST MIXER
Q203	KTC4081	KEC	IF AMP
Q305	KRC104S	KEC	VCO R/TX S/W
Q304	2SC3356	NEC	VCO OSC
Q302	MMBR951	MOTOROLA	VCO BUFFER
Q303	MMBR951	MOTOROLA	VCO BUFFER
Q301	KTC3875	KEC	VCO REG
Q501	KRC410	KEC	PLL LOCK S/W
Q601	KRA310	KEC	RX B+ S/W
Q602	KRA310	KEC	SAVE B+ S/W
Q603	KRA310	NEC	TX EN1 B+ S/W
Q604	KRA310	KEC	TX EN2 B+ S/W
Q606	KRC404	KEC	AUDIO MUTE S/W
Q607	KTA2015	KEC	AUDIO B+ S/W
Q801	KTC3875	KEC	LAMP S/W
Q805	KRC104	KEC	RESET S/W
Q804	KRA110	KEC	PTT S/W
Q810	2SJ144	NEC	RX MUTE S/W
Q107	KRC401	KEC	TX S/W

1.3 DIODE COMPLEMENT

REF.NO	TYPE	MANUFACTURER	FUNCTION
D804-805	1N4001(M2)	ROHM	REVERSE B+ PROTECT
D807	1N4001(M2)	ROHM	REG REVERSE PROTECT
D806	RB471E	ROHM	D/D CON S/W
D804A	KDS187	KEC	CTCSS COMPARATOR
D830	MA77	PANASONIC	CLOCK SHIFT S/W
D802	KDS187	KEC	MODEL SELECTOR
ZD803	ZD7.5Y	KEC	PTT S/W
LED801-802	LED	EVERLIGHT	BACKLIGHT LED
D201-202	MA77	PANASONIC	RX LPF S/W
D101	MA77	PANASONIC	TX LPF S/W
D102	MA862	PANASONIC	R/TX LOCAL S/W
D303	KDS114	KEC	R/TX VCO S/W
D302	KV1832	TOKO	VCO OSC
D601	KDS181	KEC	RX B+ S/W
D401	MMBD101	MOTOROLA	SQ DET
D301	1SV229	NEC	DEV. VARICAP

∅ REMARKS.

KEC : KOREA ELECTRONICS CO., LTD.

ROHM : ROHM KOREA CORP.

TOSHIBA : TOSHIBA CO. LTD

MOTOROLA : MOTOROLA CO. LTD

JRC : NEW JAPAN RADIO CO. LTD

SANYO : SANYO ELECTRIC CO., LTD.

TOKO : JAPAN TOKO CO., LTD

PRO-CHIPS : JAPAN MICROCHIP CO., LTD

TORREX : JAPAN TORREX CO., LTD

EVERLIGHT : TAIWAN EVERLIGHT CO., LTD

PHILLIPS : TAIWAN PHILLIPS CO., LTD

ALPHA : ALPHA SEMICONDUCTOR CO., LTD

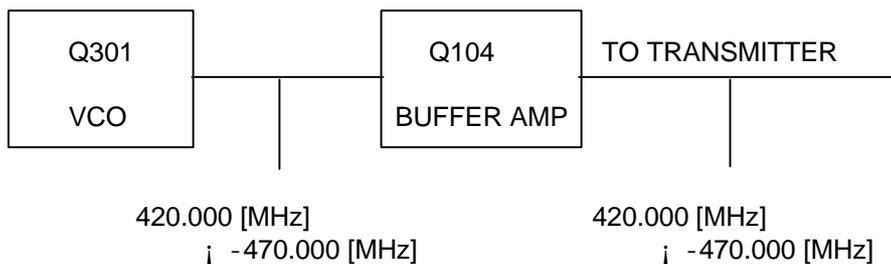
MX-COM : MX ∩COM, INC.

PANASONIC : MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD

2. DESCRIPTION OF FREQUENCY DETERMINING AND STABILIZING CIRCUIT

2.1 INTRODUCTION

THE FREQUENCIES FOR TRANSMITTER AND RECEIVER LOCAL FREQUENCIES ARE ALL DRIVED FROM A SINGLE 15.2 [MHz] VCTCXO BY MEANS OF A PHASE LOCKED LOOP. THE FIRST LOCAL OSCILLATOR FREQUENCIES ARE 389.15 [MHz] TO 439.15 [MHz]. THE SECOND LOCAL FREQUENCY IS FIXED AT 30.4 [MHz] TO GENERATE SECOND IF 450[KHz]. DURING TRANSMISSION, THE VCO OF THE PLL OPERATES 420.000 [MHz] TO 470.000[MHz].



THE VCO OPERATING FREQUENCY FOR THE RECEIVER IS 389.15 [MHz] TO 439.15 [MHz]. IT IS INJECTED THROUGH THE BUFFER AMP Q302 INTO THE FIRST TR MIXER Q202

2.2 DESCRIPTIONS OF EACH BLOCK

(1) INTRODUCTION

THE SYNTHESIZER CONSISTS OF THE FOLLOWING COMPONENTS : PLL IC (IC501), VCTCXO (MODULE1), VCO, VARICAP DIODE (D302)

IC501 IS A CMOS LSI THAT INCLUDES PRESCALLER. Q304, L303, L302, D302, D301, C322, C319, C316, C315 ARE CLAPP OSCILLATOR CIRCUIT TO OPERATE AS A VCO OF IC501.

Q301 IS A SWITCHING TRANSISTOR TO CONNECT OR DISCONNECT THE TUNING CAPACITOR IN THE VCO OSCILLATOR TANK CIRCUIT FOR TRANSMITTER OR RECEIVER.

Q104 AND Q105 WORK AS A BUFFER AMP FOR RX LOCAL FREQUENCIES AND TX CARRIER GENERATING FREQUENCIES.

(2) REFERENCE FREQUENCY

THE CRYSTAL, VCTCXO MODULE1(15.2 [MHz]) AND OTHER COMPONENTS AT PIN 1 AND 16 OF IC501 CAN MAKE A REFERENCE FREQUENCY OSCILLATOR WITH INTERNAL AMPLIFIER.

(3) VCO

Q302 AND SURROUNDING PARTS FORM A CLAPP OSCILLATOR WHICH WORKS AS A VCO OF IC501 WITH APPROPRIATE CONTROL VOLTAGE ON D302, THE VCO CAN OSCILLATE OVER THE REQUIRED RANGE OF 389.15 [MHz] TO 470.00 [MHz].

(4) PROGRAMMABLE DIVIDER AND ITS CONTROL

THE PROGRAMMABLE INPUTS FOR EACH CHANNEL ARE SET INSIDE IC801.

EACH INPUT SIGNAL TO CONTROL THE PLL IC501 IS DONE WITH THE PROVIDED (CPU IC 801) KEY MATRIX INPUT PINS - PIN25 TO PIN28 AND FOR EACH KEY MATRIX INPUT, AN INTERNAL CODE CONVERT EPROM PROVIDES THE APPROPRIATE BINARY CONTROL TO IC501 FOR THAT CHANNEL.

AN ADDITIONAL BIT IS REQUIRED AT PIN 42 OF IC801 TO ALLOW THE ROM TO RECOGNIZE WHETHER THE STATUS IS TX OR RX.

DURING TRANSMISSION, THE PUSH TO TALK SWITCH MAKES PIN 42 OF CPU IC HI.

THE OUTPUT OF IC501 IS FED TO THE PHASE DETECTOR TO COMPARE IT WITH THE 6.25 [KHz] REFERENCE FREQUENCY INSIDE.

(5) PHASE DETECTOR AND VCO CONTROL

THE PHASE DETECTOR IS A DIGITAL PHASE COMPARATOR WHICH COMPARES THE PHASE OF THE REFERENCE SIGNAL WITH PROGRAMMABLE DIVIDER OUTPUT SQUARE WAVES AND DEVELOPS A SERIES OF PULSES WHOSE DC LEVEL DEPENDS ON THE PHASE ERROR OF EACH SIGNAL.

THE PHASE DETECTOR PULSE OUTPUT IS FED TO AN ACTIVE LOW PASS FILTER, AND FED TO VARICAP D302 WHICH CONTROLS THE VCO FREQUENCY.

(6) TRANSMITTER / RECEIVER BUFFER AMP

OUTPUT SIGNAL OF Q302 IS FED INTO THE BUFFER AMP Q105, Q104 TO INCREASE THE STRENGTH OF TX CARRIER FREQUENCY AND 1st LOCAL FREQUENCIES.

(7) SWITCHING OF TUNING CAPACITOR IN VCO

THE VCO CIRCUIT MUST TUNE WITH A WIDE RANGE OF FREQUENCIES 420.000; 470.000 [MHz] FOR TRANSMITTER AND 389.150; 439.150 [MHz] FOR RECEIVER.

TO COMPLY ABOVE RANGE OF VCO, THE TUNING CAPACITANCE SHOULD BE SWITCHED FOR TRANSMISSION OR RECEPTION.

THE TUNING CIRCUIT CONSISTS OF Q304, L303, L302, D302, D301, C322, C319, C316, C315 WHEN THE VCO IS WORKING AS A RX, Q305 BECOMES OFF.

SO, D303 AND C317 MAKE TUNING FUNCTION WHEN TX Q301 BECOMES ON.

SO, L302 AND THE PARALLEL CAPACITANCE OF D302, C322 AND C319 MAKE TUNING FUNCTION.

(8) RECEIVER LOCAL OSCILLATOR OUTPUTS

1st MIXER : THE OUTPUT SIGNALS OF Q104 IS INJECTED TO THE SOURCES OF 1st MIXER Q203 IN THE 1st IF MIXER SECTION.

2nd MIXER : THE OUTPUT OF 30.4 [MHz] OSCILLATOR CIRCUIT WITH X401 IS INJECTED INTO IC401. INCOMING IF SIGNAL AND 30.85 [MHz] SIGNAL ARE MIXED INSIDE THE IF IC TO EXTRACT 2nd IF SIGNAL 450 [KHz].

FM SIGNALS ARE RECOVERED WITH ENVELOPE DETECTOR.

2.3 FREQUENCY STABILITY

LET : F_0 =CRYSTAL OSCILLATOR FREQUENCY

F_r =PHASE DETECTOR REFERENCE FREQUENCY

F_{vco} =VCO FREQUENCY

F_t =TRANSMIT FREQUENCY

THEN : $F_r = F_0 / 2048$

AND UNDER LOCKED CONDITIONS : $F_r = F_{vco} / N$

Where , "N" IS THE DIVIDE RATIO OF PROGRAMMABLE DIVIDER.

THEN : $F_{vco} = N \times F_r$

FROM WHICH IT CAN BE SEEN, THE PERCENTAGE ERROR IN F_t IS THE SAME AS THE PERCENTAGE ERROR IN F_0 .

THE STABILITY OF THE CRYSTAL OSCILLATOR IS DETERMINED PRIMARILY BY THE CRYSTAL ITSELF AND HAVING PASSIVE COMPONENTS OF THE OSCILLATOR.

THE CHOICE OF CRYSTAL AND COMPONENTS IS SUCH THAT THE REQUIRED FREQUENCY STABILITY IS MAINTAINED OVER THE REQUIRED VOLTAGE AND TEMPERATURE RANGE.

2.4 DESCRIPTION OF OTHER CIRCUITS

TRANSMITTER

(1) RF AMPLIFICATION

THE OUTPUT OF BUFFER AMP Q104 IS FED THROUGH TUNING C126 TO THE BASE OF PRE DRIVER AMP Q103.

THE OUTPUT IS THEN SUPPLIED THROUGH CAPACITOR C123 TO RF DRIVER AMP Q102.

THE OUTPUT OF Q102 IS SPLITTED WITH TUNING CIRCUIT L111, C119 AND GOES TO THE BASE OF FINAL RF AMP Q101.

THE OUTPUT OF Q101 IS SUPPLIED TO THE ANTENNA THROUGH L-C TUNING CIRCUIT.

(2) CIRCUIT FOR SUPPRESSION OF SPURIOUS RADIATION

THE TUNING CIRCUIT BETWEEN THE OUTPUT OF FINAL AMP Q101 AND ANTENNA, 4-STAGE "PHI TYPE" NETWORK L101, L102, L103, L104, L105, L106, L107, C101, C102, C103, C104, C105, C106 SERVES AS A SPURIOUS RADIATION SUPPRESSOR.

THIS NETWORK ALSO SERVES TO MATCH THE IMPEDANCE BETWEEN TX FINAL POWER AMP Q101 AND THE ANTENNA.

(3) MAXIMUM MODULATION CONTROL

MODULATION SIGNALS ARE FILTERED WITH RC NETWORK AND GO TO THE AUDIO AMP TO MAKE IT TO NOMINAL SIGNAL LEVEL TO ACHIEVE WANTED MODULATION.

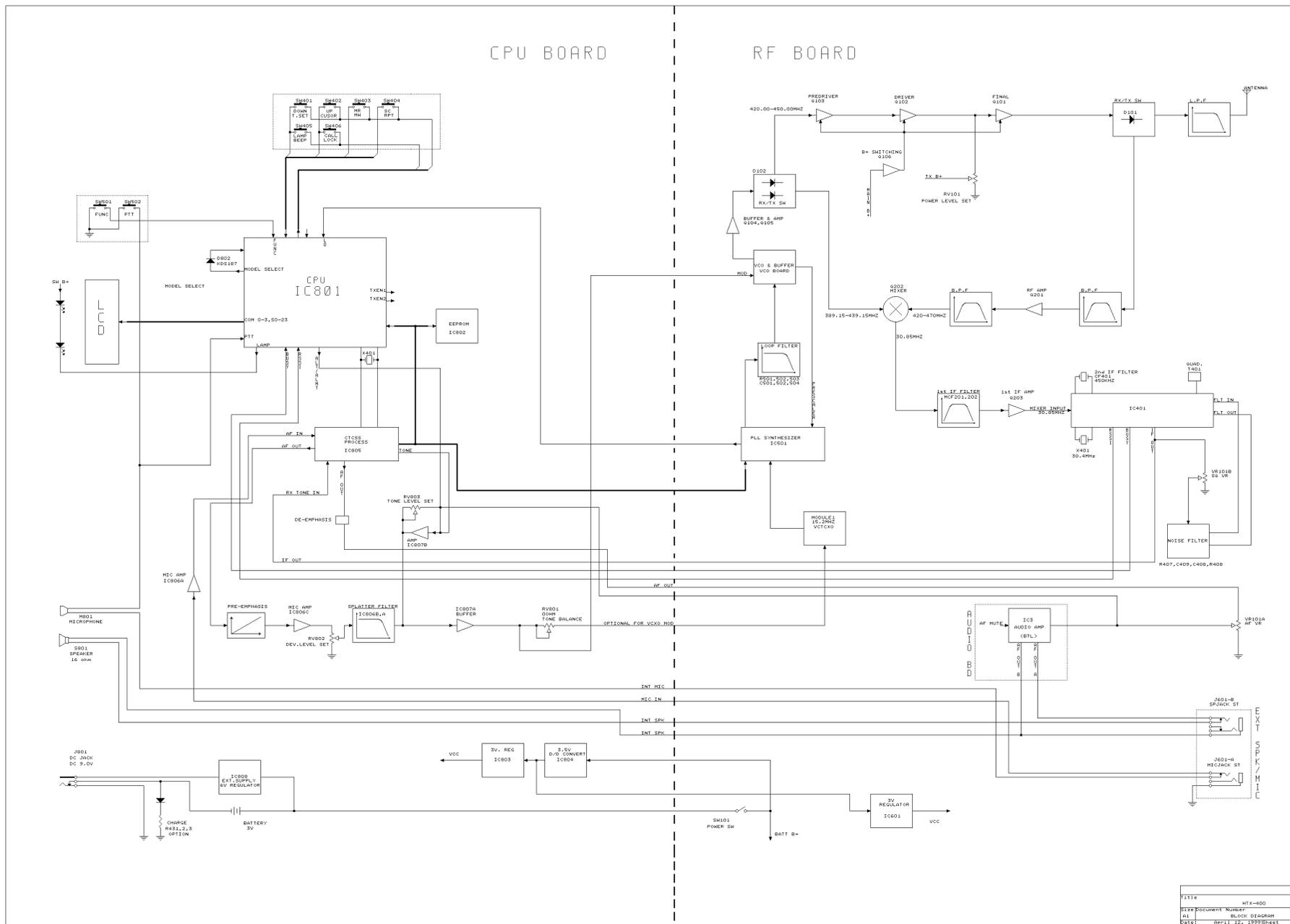
IC806 PIN13 AND CORRESPONDING LEVEL LIMITING CIRCUIT CONTROL INCOMING AUDIO SIGNAL WITH RV802.

ADJUSTING RV802 SHALL NOT EXCEED ± 5.0 KHz DEVIATION UNDER .1KHZ AF 20dB UP FROM 3KHZ DEVIATION LEVEL INPUT.

RECEIVER

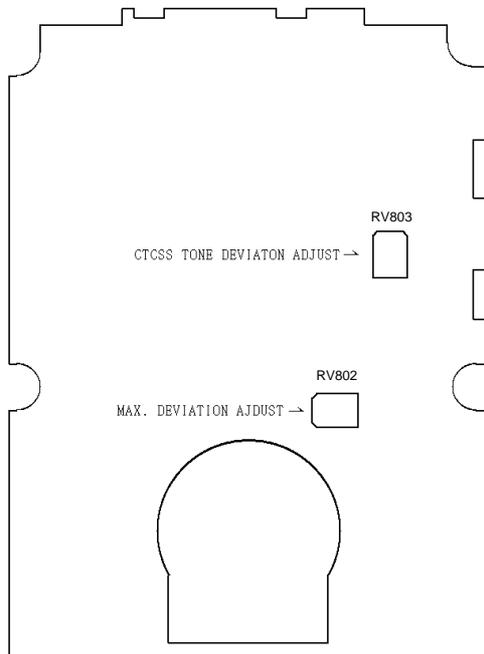
- (1) RF AMP Q201 AMPLIFY RF SIGNAL FROM ANTENNA. THE AMPLIFIED RF SIGNAL IS FED THROUGH TUNING BAND PASS FILTER SAW1, SAW2 TO THE BASE OF MIXER AMP Q202. ALSO VCO SOURCE'S FREQUENCY 30.85MHz LOW THAN THE FREQUENCY OF EACH CHANNEL IS SUPPLIED TO MIXER.
- (2) THE SOURCE OF 30.85MHz FREQUENCY PASSED TUNING COIL L209 AND C217 IS FED THROUGH MCF201/MCF202 TO IF AMP Q204.
- (3) THE 450KHz FREQUENCY SIGNAL IS PRODUCED FROM IC401 BY MIXING THE OUTPUT SOURCE OF MCF201/MCF202 30.85MHz FILTER AND THE SOURCE OF 30.4MHz FREQUENCY FROM CRYSTAL OSCILLATOR X401.
- (4) IC401 IS A FM DETECTOR WHICH PRODUCES AUDIO SIGNAL. THE AUDIO SIGNAL (IC401 PIN 9) IS FED THROUGH R412 AND C414 TO AUDIO POWER AMP (IC3).

BLOCK DIAGRAM

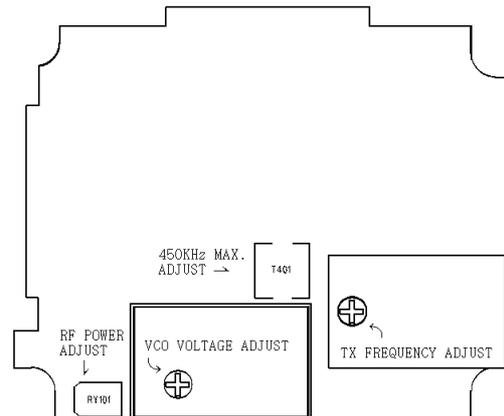


ALIGNMENT INSTRUCTIONS

1. ALIGNMENT LAYOUT



[CPU SECTION]



[RF SECTION]

2. TEST EQUIPMENT REQUIRED

1) CPU and Phase Locked Loop Section

- Frequency Counter
- DC Power Supply
- DC Volt Meter
- Oscilloscope

2) Transmitter Section

- RF Power Meter(RF SSVM)
- 50Ω Load(non-inductive)
- RF Attenuator
- Oscilloscope
- Audio Generator
- DC Power Supply
- Spectrum Analyzer
- Frequency Counter
- Modulation Meter

3) Receiver Section

- RF Signal Generator
- AF Level Meter
- Distortion Meter
- DC Power Supply
- Sine Wave Meter
- Oscilloscope
- 16 Ohm 1w Dummy Load

3. ALIGNMENT PROCEDURE

1) PHASE LOCKED LOOP AND CPU SECTION

STEP	SETTING	CONNECTION	ADJUST	ADJUST FOR
1	Frequency adjustment ; Mode : Receive Volume : Optional Squelch : Optional Frequency : 445.50MHz	Frequency counter To output pin 4 of Module 1 (Figure 1)	MODULE1	15.20MHz ; ± 100 Hz
2	CPU Voltage check ; Mode : Receive Volume : Optional Squelch : Optional Frequency : 445.50MHz	Connect DC Voltmeter. to P40 of IC801 on CPU Board. (Alignment Layout CPU Section)		Indication on DC Voltmeter must be 3 ; ± 0.5 V.

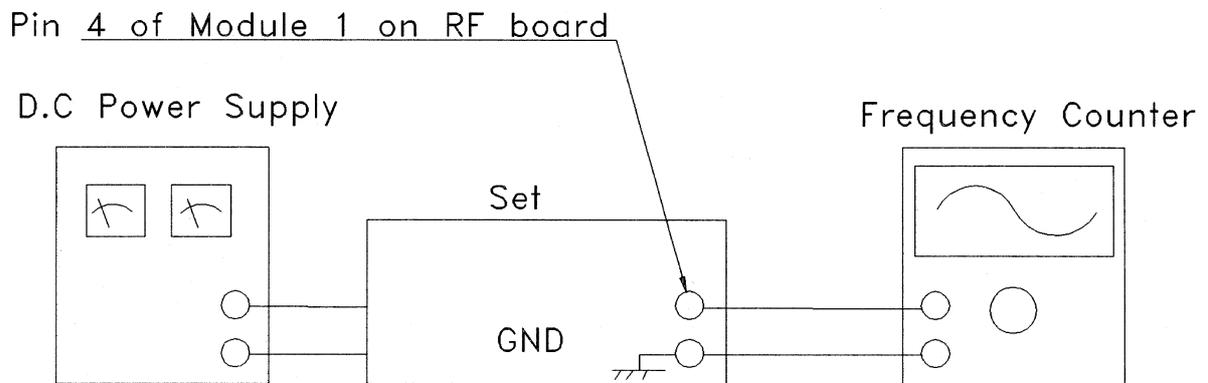
2) TRANSMITTER SECTION

STEP	SETTING	CONNECTION	ADJUST	ADJUST FOR
1	RF Power stage ; Mode : Transmit Volume : Optional Squelch : Optional Frequency : 445.50MHz	Connect dummy load and RF power meter to the external ANT-jack on the Set (Figure 2)	RV-101	Adjust for max. indication on the power meter (300mW; 50mW)
2	Second harmonic check ; Mode : Transmit Volume : Optional Squelch : Optional Frequency : 445.50MHz	Connect RF power meter with dummy load to spectrum analyzer through coupler/-40dB atten. to EXT-ANT. Jack on the set (Figure 3)		At no modulation, harmonic freq.-spectrum suppression of the 2nd harmonic freq. level must be lower than 45dBc. Check for the other Frequency
3	Frequency check ; Mode : Transmit Volume : Optional Squelch : Optional Frequency : 445.50MHz	Connect dummy load and frequency counter through coupler to RF power meter. Also connect power meter to EXT-ANT. jack on the set. (Figure 4)		Make sure that the indication of the transmitter freq. is 146.50MHz; 5 PPM on the frequency counter.
4	MAX deviation check ; Mode : Transmit Volume : Optional Squelch : Optional Frequency : 445.50MHz Modulation frequency : (300Hz-3KHz)	Connect dummy load and modulation meter through coupler to RF power meter. Also connect power meter to EXT-ANT. jack on the set. (Figure 6)	RV-802	When the deviation shows 3KHz, increase the input of audio generator up to 20dB. It is max deviation value, which is adjusted by 20KB Semi Volume at RV802. Swing the frequency of audio generator (300Hz-3KHz) and check if the Peak FM Deviation is within 5.8; 4 0KHz Spec.

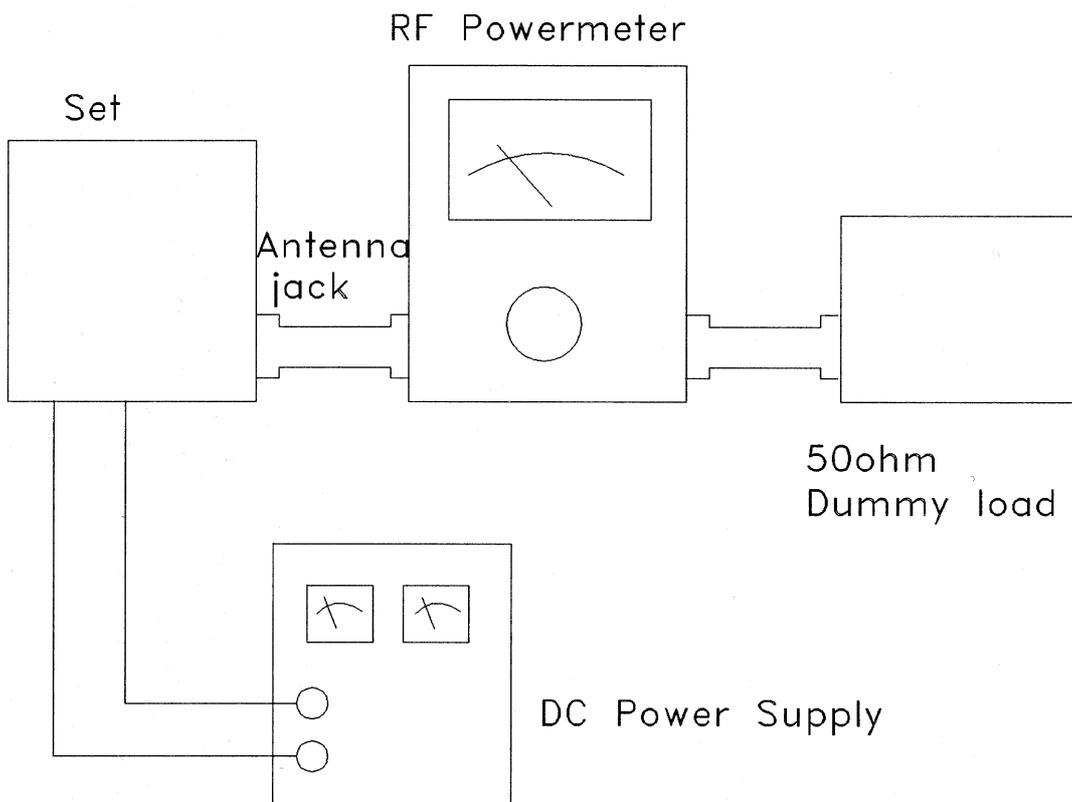
3) RECEIVER SECTION

STEP	SETTING	CONNECTION	ADJUST	ADJUST FOR
1	RX sensitivity ; Mode : Receiver Volume : Half clockwise Squelch : Turn to counterclockwise CH Selector : 1 SSG : 1KHZ AF 3KHZ DEV. 0.22V V Frequency : 445.50MHz	Connect RF signal Generator to external ANT. Jack. Connect SSVM, Sinadder and Distortion meter across EXT-Speaker out jack with 16V 0 dummy load (Figure 5)	T401	Adjust the parts of tuning circuitry for 12dB SINADDER

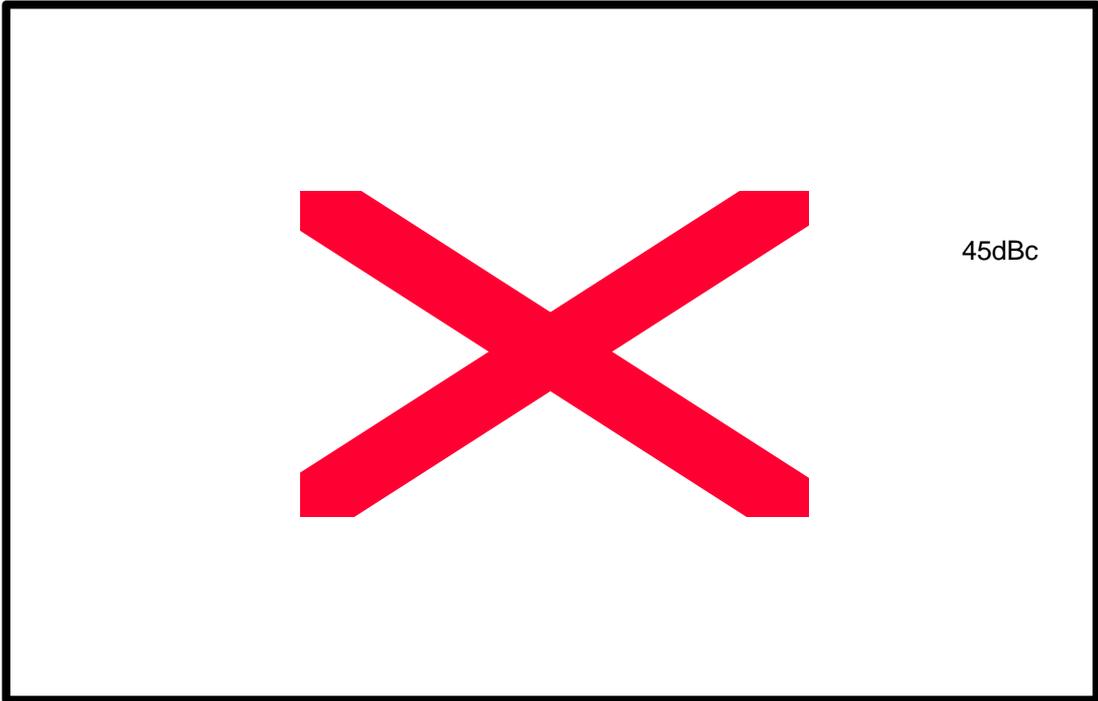
TEST EQUIPMENT SET-UP



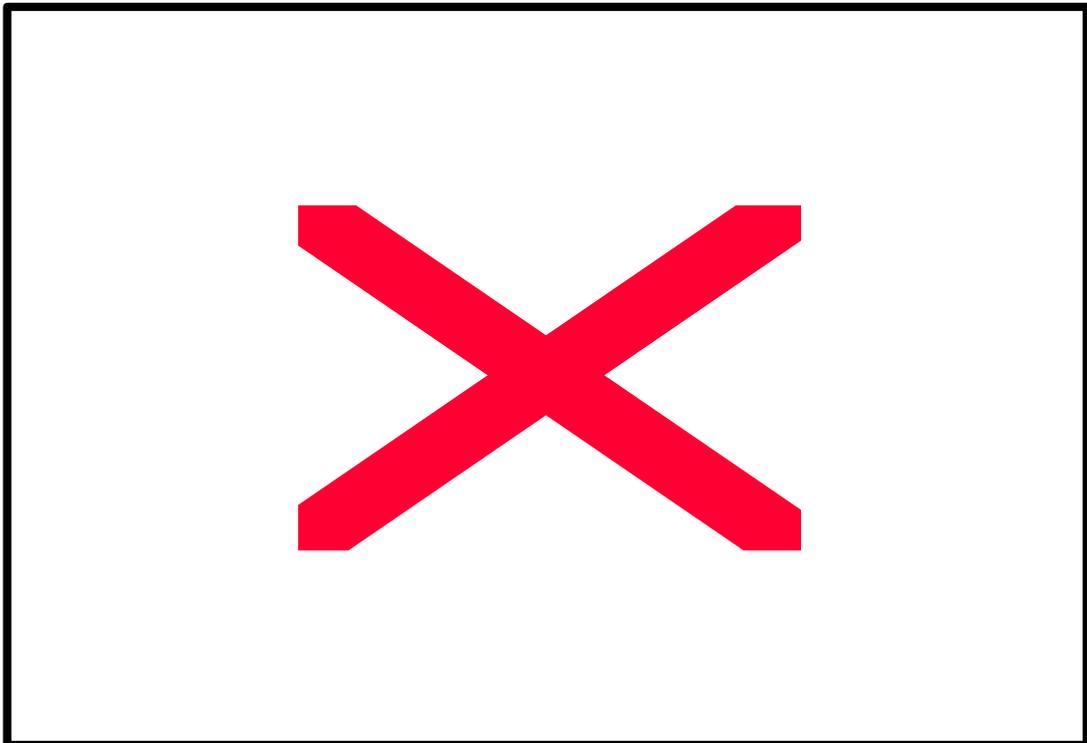
(FIGURE 1)



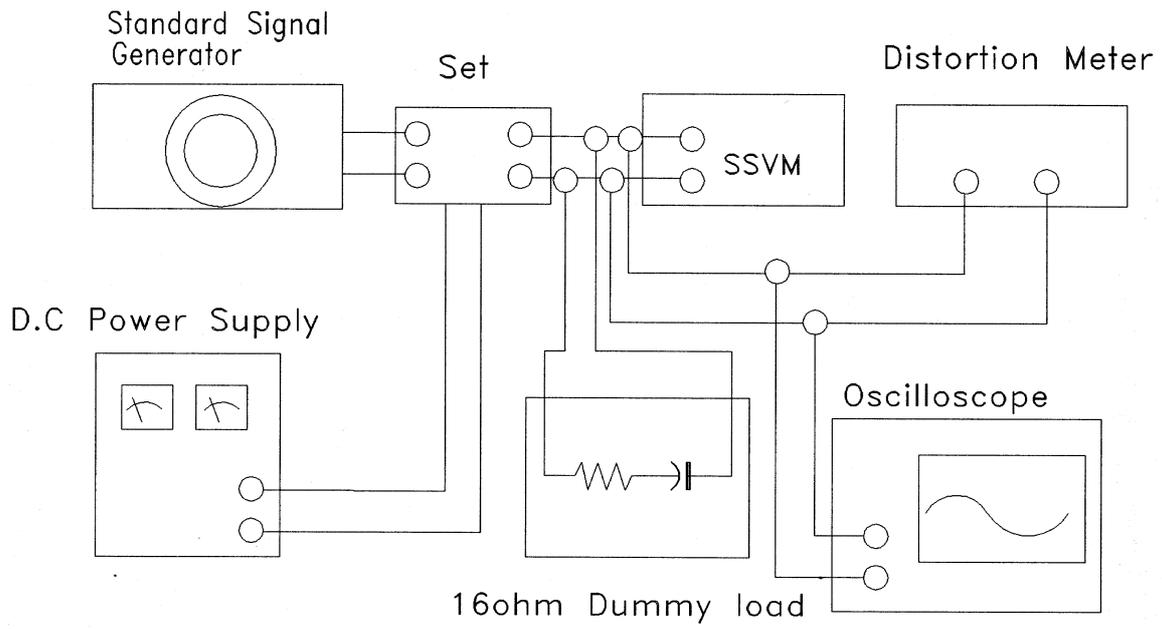
(FIGURE 2)



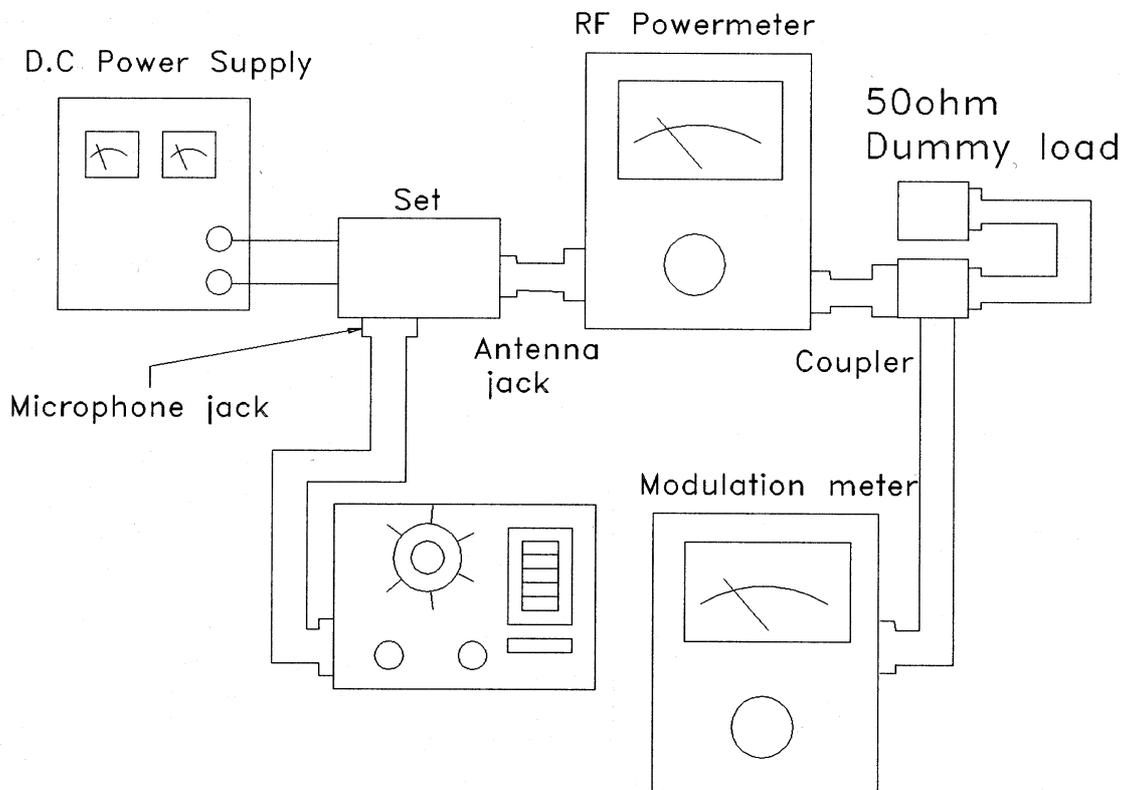
(FIGURE 3)



(FIGURE 4)



(FIGURE 5)



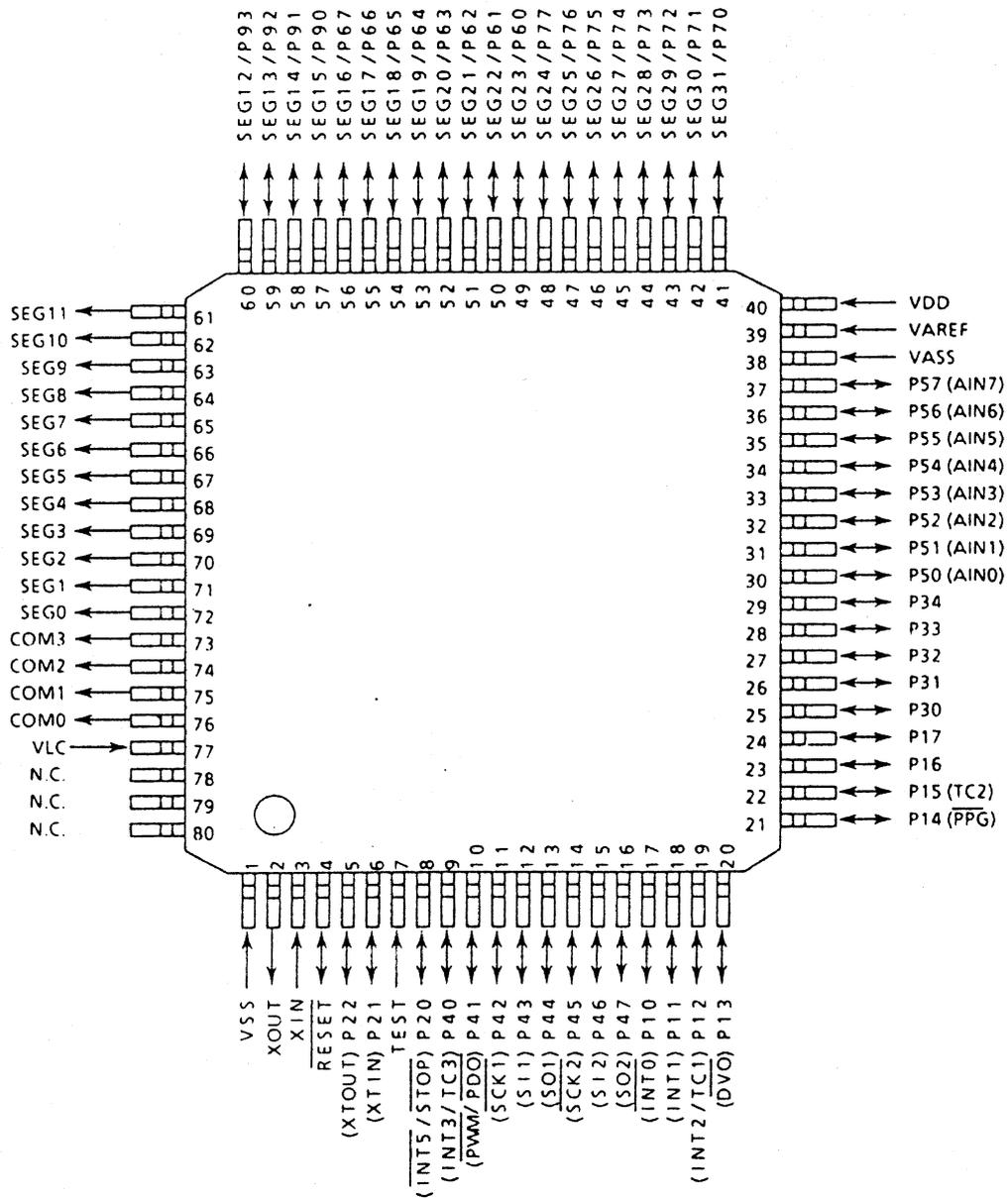
(FIGURE 6)

SEMICONDUCTOR LEAD IDENTIFICATION

AND IC INTERNAL DIAGRAM

1. INTERGRATED CIRCUITS

A. IC801 TMP87CH21DF

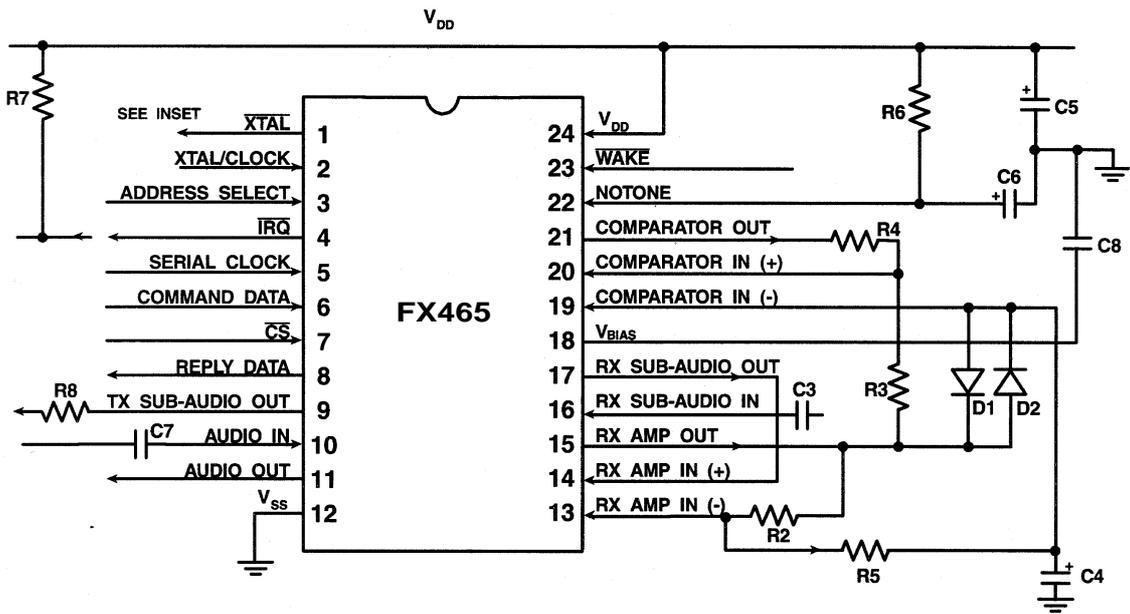


No.	PIN NAME	REMARKS	DESCRIPTION	ACTIVE
1	VSS		GROUND	
2	XOUT		HIGH FREQUENCY CLOCK OUT	
3	XIN		HIGH FREQUENCY CLOCK IN	
4	RESET		RESET input	
5	P22(XTOUT)	OPEN DRAIN	N.C	
6	P21(XTIN)	OPEN DRAIN	CTCSS DEFAULT OPTION	LOW:CTSS
7	TEST		Fixed to Low(GROUND)	
8	P20(INT5/STOP)	OPEN DRAIN	BUSY input (IN)	High:Busy
9	P40(INT3/TC3)	TRI STATE	PLL(LV2105) CLOCK (OUT)	
10	P41(PWM/PDO)	TRI STATE	ALERT TONE (PDO mode output) (OUT)	
11	P42(SCK1)	TRI STATE	PLL(LV2105) DATA (OUT)	
12	P43(SI1)	TRI STATE	PLL(LV2105) CE(CHIP ENABLE) (OUT)	
13	P44(SO1)	TRI STATE	ALIGNMENT MODE CONTROL	ACTIVE "H"
14	P45(SCK2)	TRI STATE	FX465 Serial Clock (OUT)	
15	P46(SI2)	TRI STATE	FX465 Serial Data (OUT)	
16	P47(SO2)	TRI STATE	FX465 Load Latch (OUT)	High pulse
17	P10(INT0)	TRI STATE	FX465 RX Tone Decode (IN)	OK:"L"
18	P11(INT1)	TRI STATE	TX Enable 1 (OUT)	ENABLE:"L"
19	P12(INT2/TC1)	TRI STATE	TX Enable 2 (OUT)	ENABLE:"L"
20	P13(DVO)	TRI STATE	EEPROM SERIAL DATA (IN/OUT)	
21	P14(PPG)	TRI STATE	EEPROM SERIAL CLOCK (OUT)	
22	P15(TC2)	TRI STATE	RX ENABLE (OUT)	ENBALE:"L"
23	P16	TRI STATE	LAMP CONTROL (OUT)	ON : "H"
24	P17	TRI STATE	AUDIO MUTE (OUT)	MUTE : "H"
25	P30	OPEN DRAIN	KEY IN 1 (IN)	ACTIVE:"H"
26	P31	OPEN DRAIN	KEY IN 2 (IN)	ACTIVE:"H"
27	P32	OPEN DRAIN	KEY IN 4 (IN)	ACTIVE:"H"
28	P33	OPEN DRAIN	KEY IN 8 (IN)	ACTIVE:"H"
29	P34	OPEN DRAIN	*Reserved (IN)	
30	P50(AIN0)	TRI STATE	SIGNAL LEVEL (A/D) (IN)	A/D
31	P51(AIN1)	TRI STATE	BATTERY LEVEL (A/D) (IN)	A/D
32	P52(AIN2)	TRI STATE	KEY OUTPUT 1 (OUT)	ACTIVE:"H"
33	P53(AIN3)	TRI STATE	KEY OUTPUT 2 (OUT)	ACTIVE:"H"
34	P54(AIN4)	TRI STATE	PLL LOCK DETECTOR (IN)	LOCK:"H"
35	P55(AIN5)	TRI STATE	MONITOR KEY (IN)	PUSH:"L"
36	P56(AIN6)	TRI STATE	FUNCTION KEY (IN)	PUSH:"L"
37	P57(AIN7)	TRI STATE	MODEL SELECTOR (OUT)	

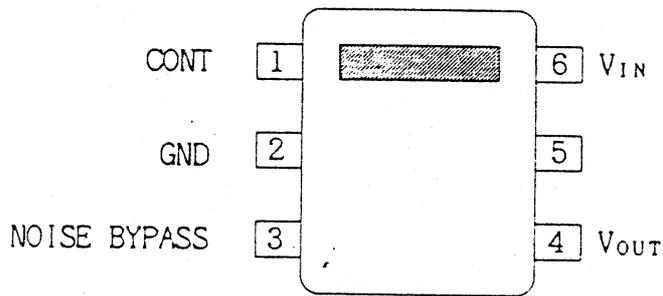
No.	PIN NAME	REMARKS	DESCRIPTION	ACTIVE
38	VASS		AD REFERENCE LOW VOLTAGE	
39	VAREF		AD REFERENCE HIGH VOLTAGE	
40	VDD		VDD	
41	P70(SEG31)	OPEN DRAIN	AUDIO PROTECT (IN)	
42	P71(SEG30)	OPEN DRAIN	PTT KEY (IN)	PUSH:"H"
43	P72(SEG29)	OPEN DRAIN	OPTION VIBRATOR (IN)	
44	P73(SEG28)	OPEN DRAIN	SIGNAL MUTE (OUT)	
45	P74(SEG27)	OPEN DRAIN	CLOCK SHIFT (IN)	
46	P75(SEG26)	OPEN DRAIN	MODEL SELECTOR (IN)	
47	P76(SEG25)	OPEN DRAIN	OPTION H/L (IN)	
48	P77(SEG24)	OPEN DRAIN	EEPROM CONTROL (OUT)	
49	SEG23(P60)		LCD SEGMENT OUTPUT	
50	SEG22(P61)		LCD SEGMENT OUTPUT	
51	SEG21(P62)		LCD SEGMENT OUTPUT	
52	SEG20(P63)		LCD SEGMENT OUTPUT	
53	SEG19(P64)		LCD SEGMENT OUTPUT	
54	SEG18(P65)		LCD SEGMENT OUTPUT	
55	SEG17(P66)		LCD SEGMENT OUTPUT	
56	SEG16(P67)		LCD SEGMENT OUTPUT	
57	SEG15(P90)		LCD SEGMENT OUTPUT	
58	SEG14(P91)		LCD SEGMENT OUTPUT	
59	SEG13(P92)		LCD SEGMENT OUTPUT	
60	SEG12(P93)		LCD SEGMENT OUTPUT	
61	SEG11		LCD SEGMENT OUTPUT	
62	SEG10		LCD SEGMENT OUTPUT	
63	SEG9		LCD SEGMENT OUTPUT	
64	SEG8		LCD SEGMENT OUTPUT	
65	SEG7		LCD SEGMENT OUTPUT	
66	SEG6		LCD SEGMENT OUTPUT	
67	SEG5		LCD SEGMENT OUTPUT	
68	SEG4		LCD SEGMENT OUTPUT	
69	SEG3		LCD SEGMENT OUTPUT	
70	SEG2		LCD SEGMENT OUTPUT	
71	SEG1		LCD SEGMENT OUTPUT	
72	SEG0		LCD SEGMENT OUTPUT	
73	COM3		LCD COMMON OUTPUT	
74	COM2		LCD COMMON OUTPUT	

No.	PIN NAME	REMARKS	DESCRIPTION	ACTIVE
75	COM1		LCD COMMON OUTPUT	
76	COM0		LCD COMMON OUTPUT	
77	VLC		LCD DRIVE VOLTAGE	
78	N.C			
79	N.C			
80	N.C			

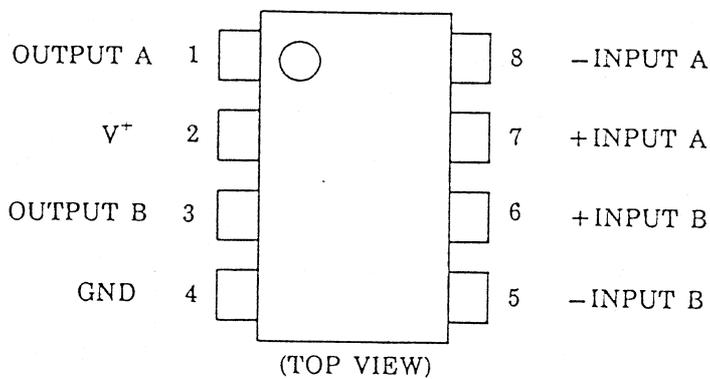
B. IC805 FX465



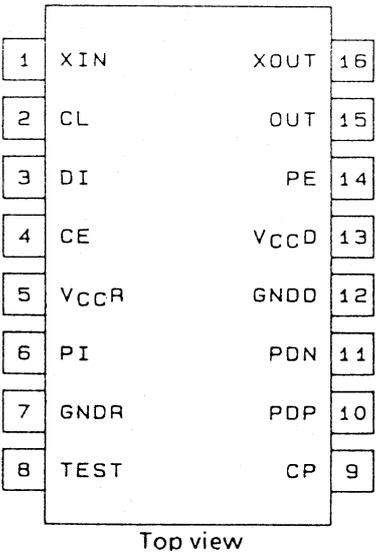
C. IC601 / IC803 TK11230



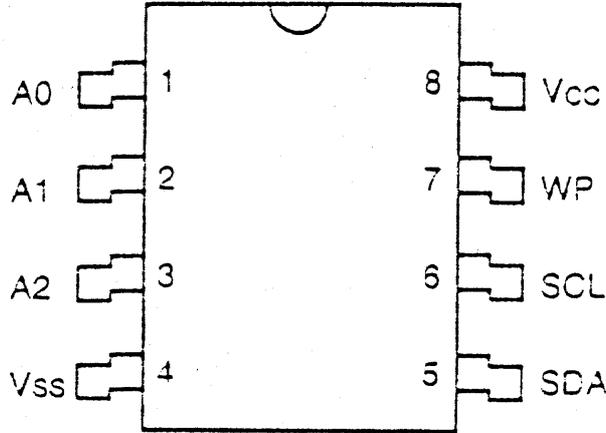
D. IC3 NJM 2073



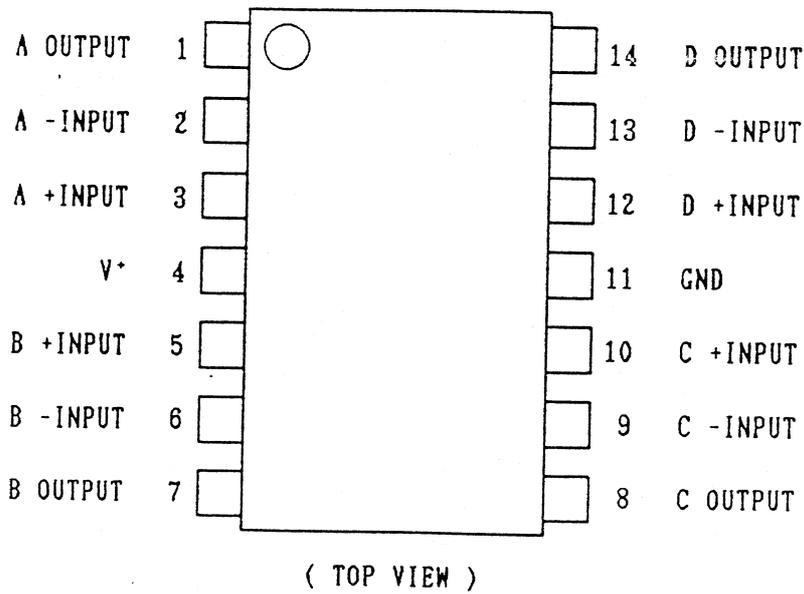
E. IC501 LV2105



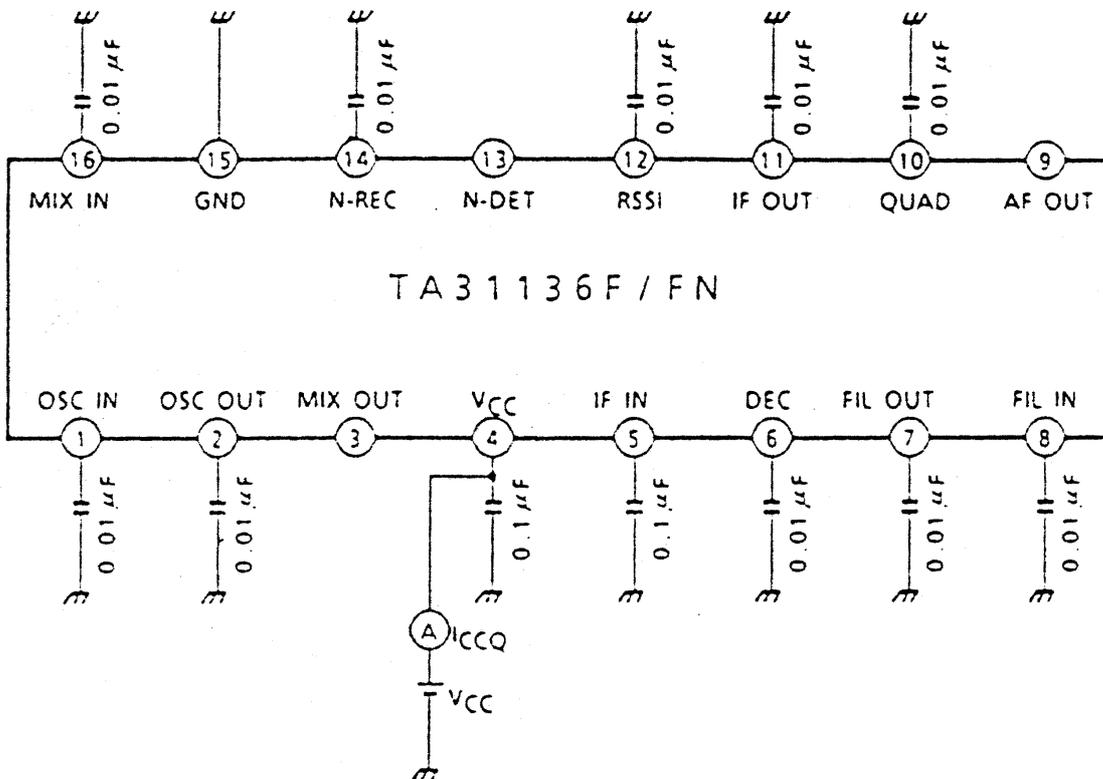
F. IC802 24LC16



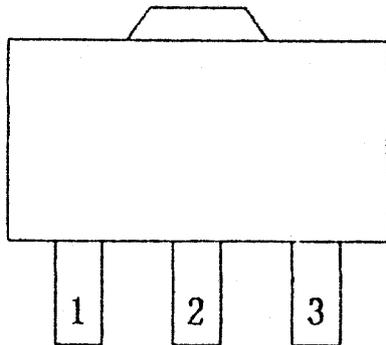
G. IC806 NJM2902V



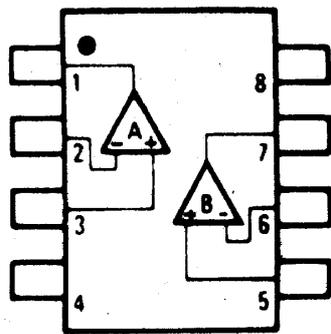
H. IC401 TA31136FN



I. IC804 XC6371



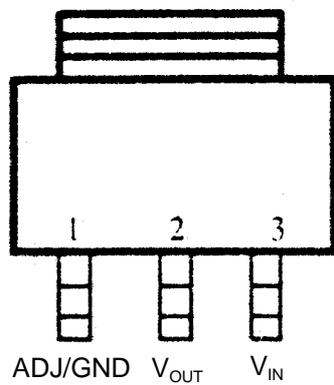
J. IC807 NJM2904



PIN FUNCTION

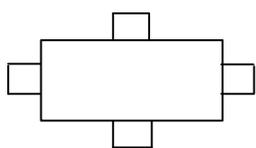
- 1. A OUTPUT
- 2. A-INPUT
- 3. A+INPUT
- 4. GND
- 5. B+INPUT
- 6. B-INPUT
- 7. B OUTPUT
- 8. V+

K. IC808 AS2810

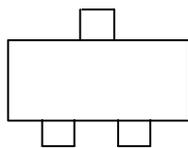


2. TRANSISTOR

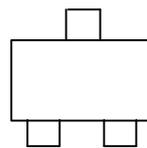
I.D. Number	DESCRIPTION	SPECIFICATION	MARKING	TYPE
Q101	FET	MRF9242T1	9242	A
Q102, Q103, Q302, Q303	TR	MMBR951LT1	7Z	B
Q104, Q105, Q304	TR	2SC3356	R24 OR R25	B
Q201, Q202, Q302, Q303, Q304	TR	2SC4226	R24 OR R25	C
Q203	TR	KTC4081	HH	C
Q301, Q606	TR	KRC404	ND	C
Q501	TR	KRC410	NK	C
Q601, Q602, Q603, Q604	TR	KRA310	PK	C
Q607	TR	KTA2015	ZO	B
Q801	TR	KTC3875	ALY	B
Q805	TR	KRC104	ND	B
Q804	TR	KRA110	PK	B
Q810	FET	2SJ144	VY	C
Q107	TR	KRC401	NA	C
Q106	TR	KRA1001	KY	D
Q301	TR	KRC104S	NP	B



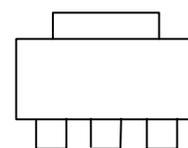
A TYPE
CASE 449-02 STYLE1(PLD-1)



B TYPE
(SOT-23)



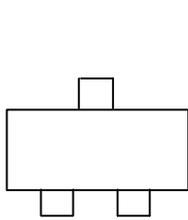
C TYPE
(USM)



D TYPE
(SOT-89)

3. DIODE

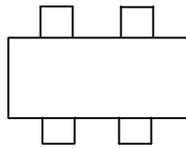
I.D. Number	DESCRIPTION	SPECIFICATION	MARKING	TYPE
D201, D202, D101, D301, D830	DIODE	MA77	4B	B
D102	DIODE	MA862	M11	C
D804, D805, D807	DIODE	1N4001	M2	B
D806	DIODE	RB471E	D3G	E
D804A, D802	DIODE	KDS187	D3	D
ZD803	ZENER-DIODE	ZD7.5Y	7.5Y	A
LED801, LED802	LED			



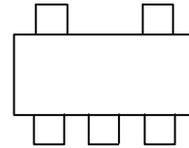
A TYPE



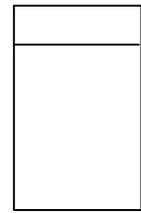
B TYPE



C TYPE



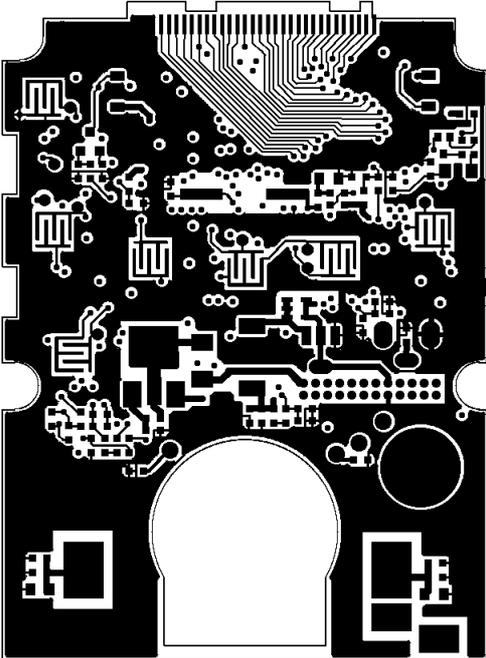
D TYPE



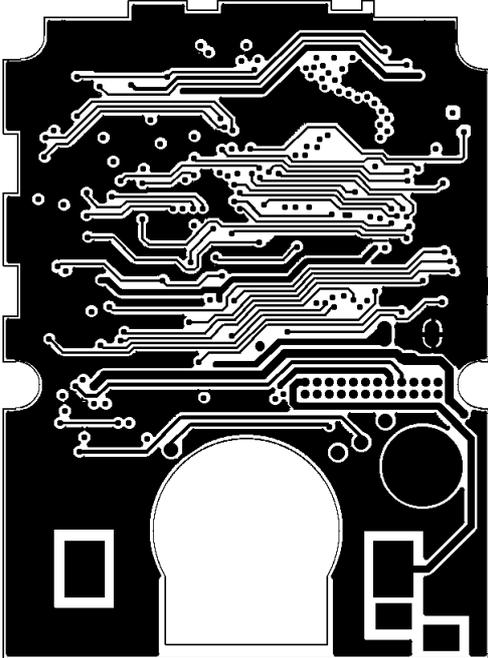
E TYPE

2. CPU, RF, VCO BOARD PATTERN

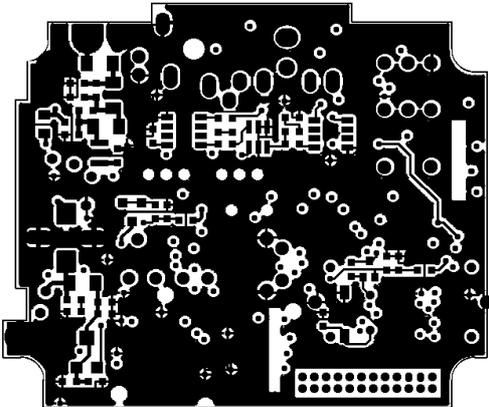
CPU TOP PATTERN



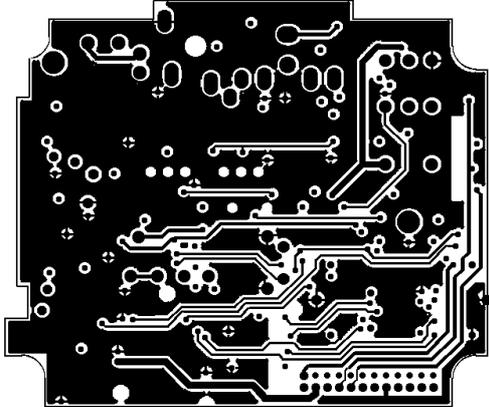
CPU 2LAYER PATTERN



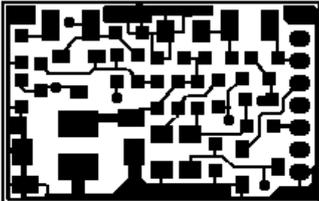
RF TOP PATTERN



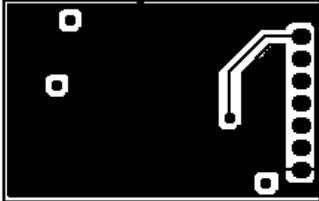
RF 2LAYER PATTERN



VCO TOP PATTERN

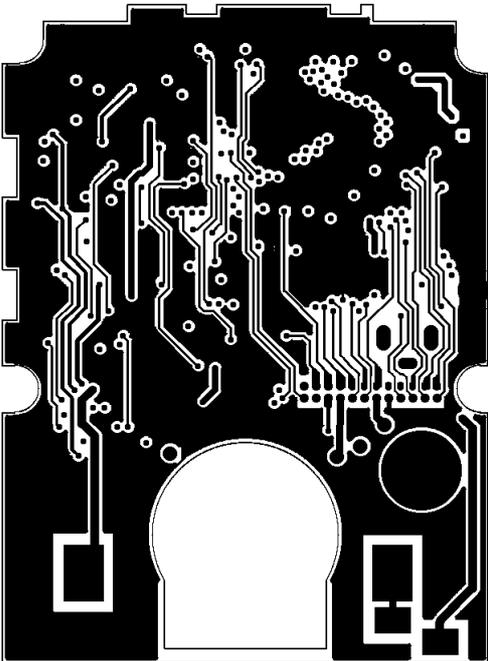


VCO 2LAYER PATTERN

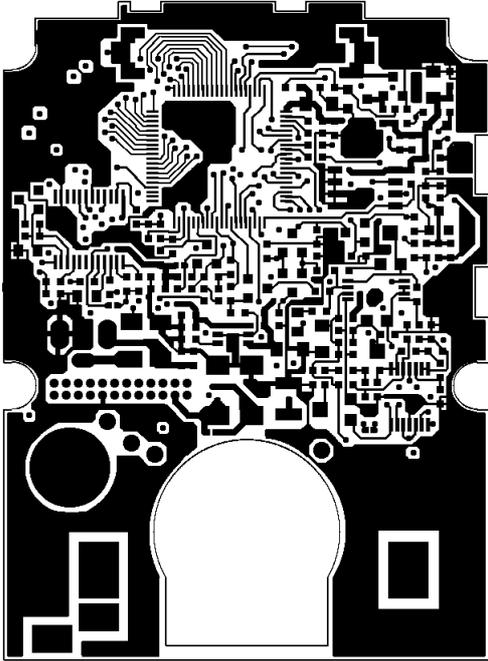


3. CPU, RF, VCO BOARD PATTERN

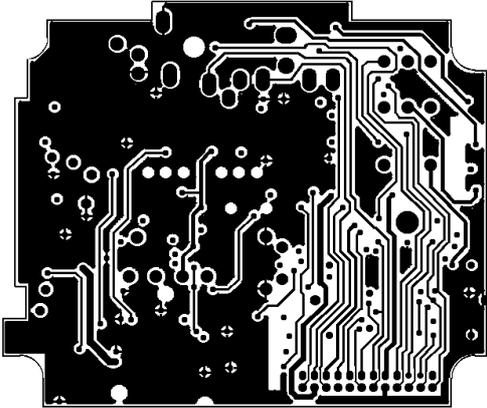
CPU 3LAYER PATTERN



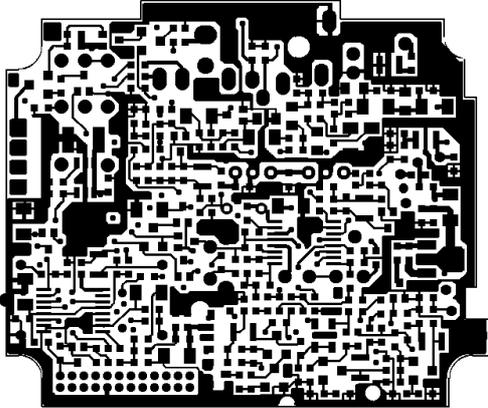
CPU BOTTOM PATTERN



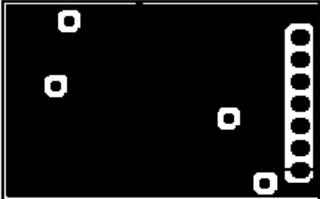
RF 3LAYER PATTERN



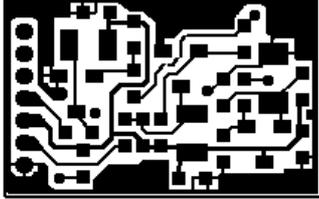
RF BOTTOM PATTERN



VCO 3LAYER PATTERN

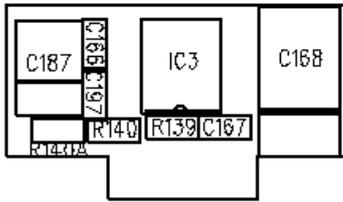


VCO BOTTOM PATTERN

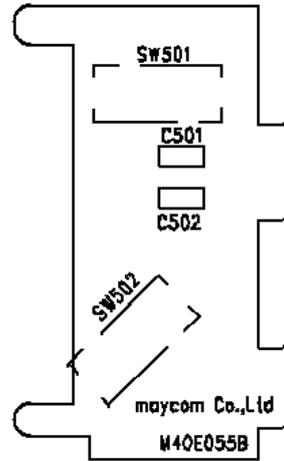


4. AUDIO, PTT BOARD LOCATION

AUDIO TOP LOCATION

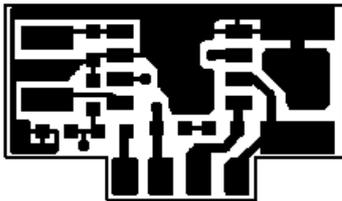


PTT TOP LOCATION



5. AUDIO, PTT BOARD PATTERN

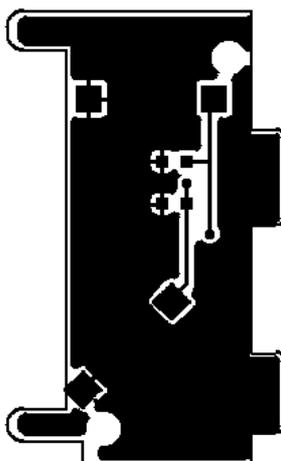
AUDIO TOP PATTERN



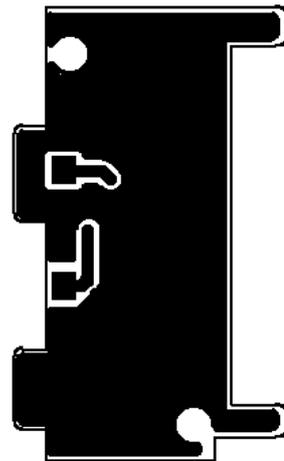
AUDIO BOTTOM PATTERN



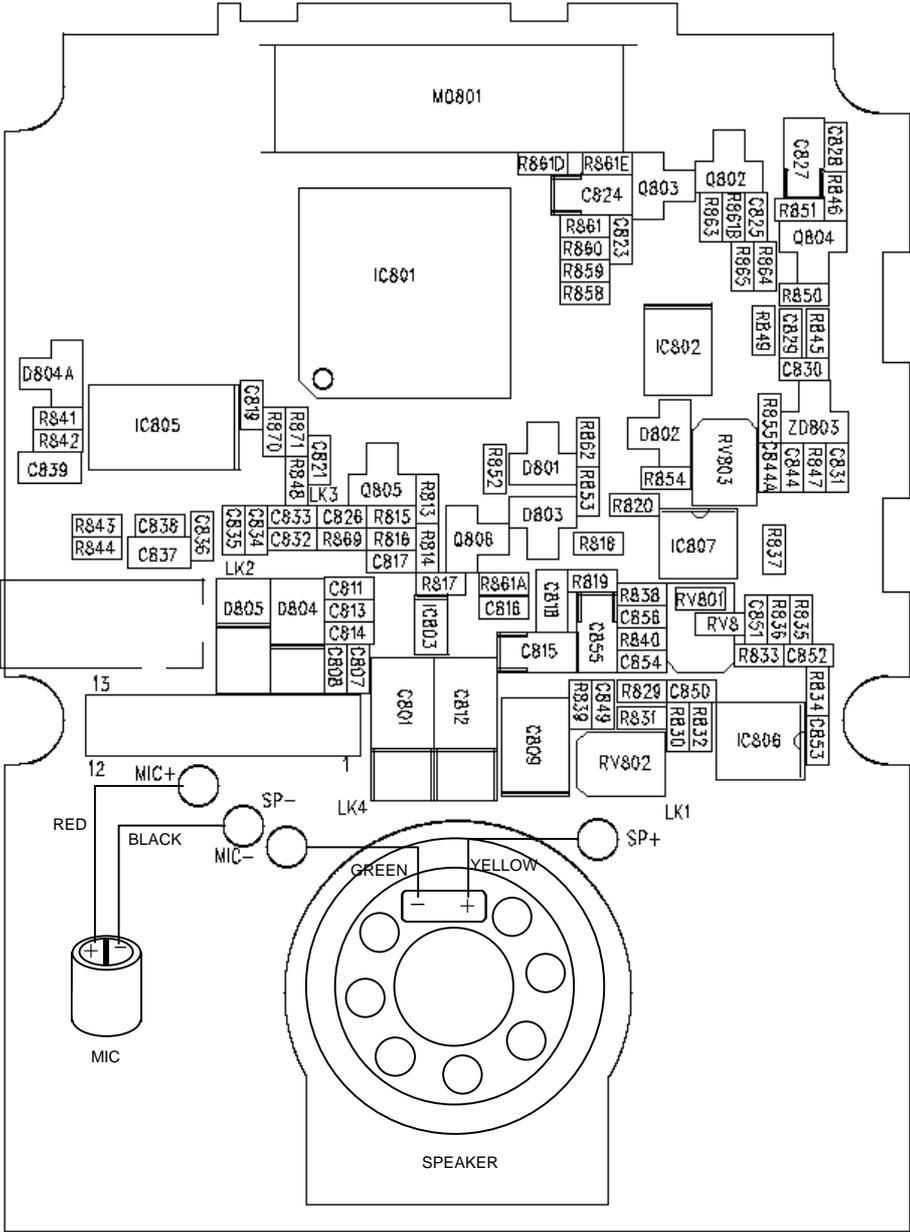
PTT TOP PATTERN



PTT BOTTOM PATTERN



WIRING DIAGRAM



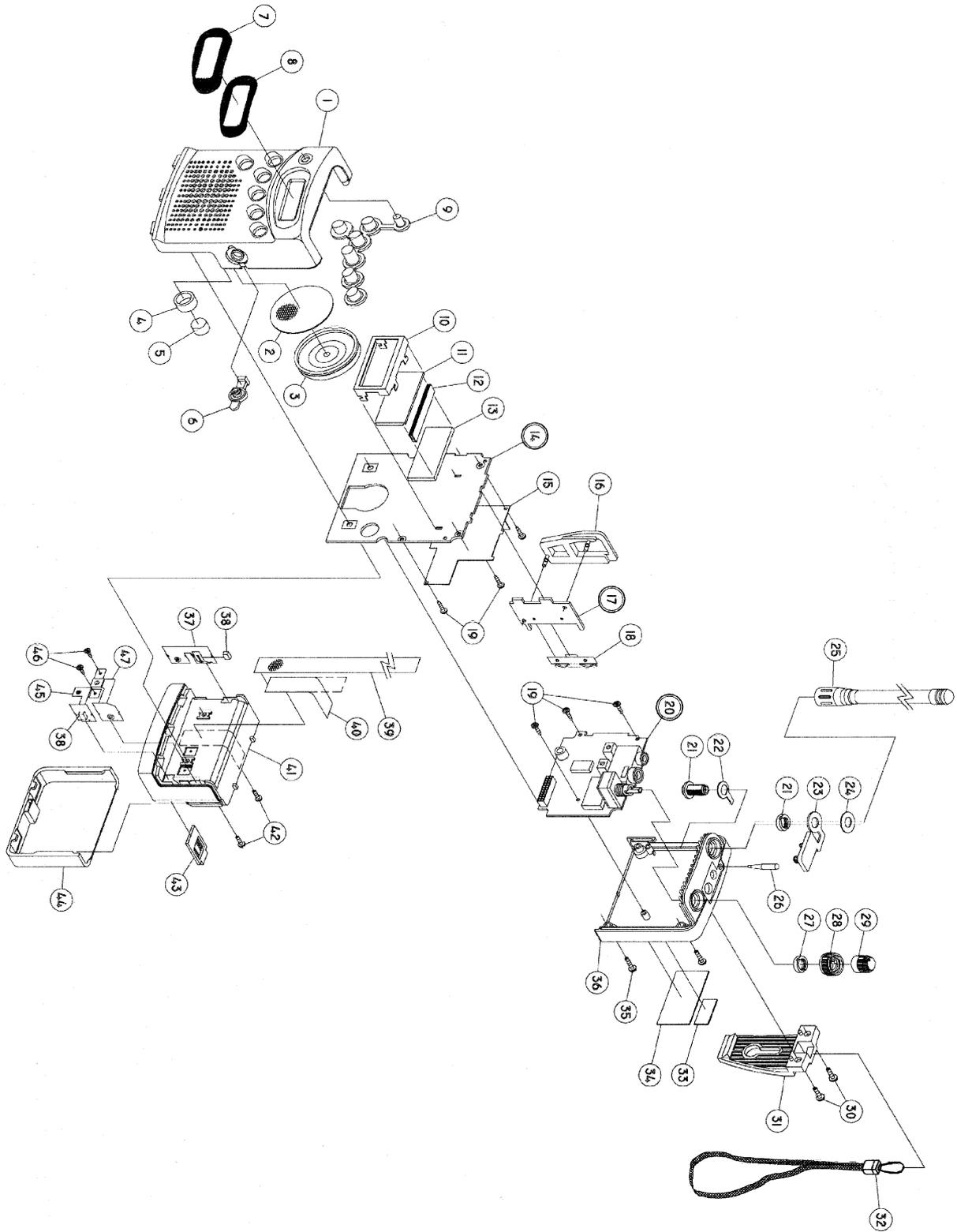
TROUBLESHOOTING CHART

SYMPTOM	PROBLEM	REMEDY
Unit does not work at all	1. Defective power switch VR101 2. Defective INPUT POWER LINE / REGULATOR	1.Replace 2.Replace
No output from speaker at all	1. Defective external speaker jack 2. Defective IC3,Q111,113,114 & Speaker	1.Replace or repair 2.Replace defective component
No noise on speaker	1. Measure all the voltage of IC601, IC401, VR101 2. Defective Squelch circuit components VR101	1.Replace 2.Replace
No modulation	1. Poor audio output and defective modulation Microphone amplifier components(IC806,807) 2. Defective RV802	1.Replace 2.Replace defective components
LCD display does not work	1.Defective X801, IC801	1.Replace
No TX output power	1. Defective Q101, Q102, Q103, D101, RV101, L108, L105	1.Replace

ERROR MESSAGES

PROBLEM	REASON	CHECK POINT	COUNTER MEASURE
EEP-ROM Error	No 3V input to the 8th pin of IC802	Check if 3V input is applied to the 8th pin of IC802	If this problem happens, 1. Turn the power off 2. Press "FUNC+MO" keys 3. Turn the power on 4. Release "FUNC+MO" keys
PLL Error	VCO unlock	1. When Q501 collector is locking, check the "LOW" 2. Check if the VCO locking voltage is normal or not 3. Check if the output voltage of Q604/Q603/Q602 is normal or not 4. Check if the output voltage of IC601 is 3V or not 5. Check if the output level of the 4th pin of VCO is normal or not	Check & Replacement
S-Short	Short of external speaker output terminal	Check the voltage of CPU Pin 41 Protect On : High Off : Low	Check

EXPLODED VIEW OF UNIT



WHOLE PARTS LIST

The numbers used on "Exploded View of Unit" correspond to Ref No. shown at the right side of the table below.

CODE NO.	DESCRIPTION	SPECIFICATION	Q'TY	REF.NO.	LOCATION
80169001	ASS'Y SET		1		
61000328	COVER 1- BATTERY	ABS, BLK	1	44	
61000419	WINDOW- LCD	ACRYL, SILK	1	07	
64000065	CAP"C"- DC JACK	SILICONE, BLK	1	06	
68000032	SCREW- B.H,M/C,H/T	(+)M2*L6,FZB	4	35	
68000034	SCREW- C.H,M/C,H/T	(+)M1.7*L5,FNW	2	42	
80169003	ASS'Y MAIN		1		
80169004	ASS'Y FRONT		1		
64000054	BUTTON- PTT	SILICONE, BLK	1	16	
68000009	SCREW- P.H,T/P	(+)M1.7*L3.2,FZB	4	19	
80169006	ASS'Y CPU		1		
62000068	PLATE "F"- SHIELD	CUP 0.05T+INSU	1	15	
80169010	ASS'Y PTT B.D		1	17	
17010102	C- CERAMIC	GRM39 X7R 102K 50	2		C901,C902
35020003	TACT- SWITCH	KQD- 902	2		SW901,SW902
M40E055B	PCB- MH- PTT	17.2*28.5*0.8T	1		PCB
80169012	ASS'Y CPU B.D		1	14	
80133018	ASS'Y CPU INSERT		1		
28020015	LCD	KXN29740 AAP	1	11	LCD801
32020007	CONNECTOR	GDH7- 24DBCW	1		CON401
33020003	POWER JACK (1 PIE)	HEC1737- 01- 510	1		J801
37420003	ZEBRA- CONNECTOR	29(L)*1.5(W)*3.5(H)	1	12	
61000152	REFLECTOR	ACRYL,CLEARNESS	1	13	
62000046	HOUSING- LCD	SPTE 0.3T	1	10	
62000050	TERMINAL- GROUND	BECU 0.1T	1	18	
80169017	ASS'Y CPU SMD		1		
11010025	TOSHIBA OTP IC	TMP87PP21DF	1		IC801
11610008	IC- CTCSS ENCODER/D	FX- 465D5	1		IC805
11610014	IC	NJM2902V	1		IC806
11610021	IC	NJM2904V	1		IC807
11610026	IC	AS- 2810M	1		IC808
11610032	IC	XPC6371A350PR(50KHZ)	1		IC804
11620005	IC- EEPROM	X24C16F	1		IC802
11710003	IC- REGULATOR	TK11230AMTL	1		IC803
13010002	TR- PNP	KRA110S	1		Q804
13210003	TR- NPN	KRC104S	1		Q805
13210009	TR- NPN	KTC3875S	1		Q801
13410005	TR- FET	2SJ144	1		Q810
15210000	THICK FILM CHIP- R	0- J- 1/16W (0603)	4		R860,R867,RV801,R810A
15210100	THICK FILM CHIP- R	10- J- 1/16W (0603)	1		R874
15210101	THICK FILM CHIP- R	100- J- 1/16W (0603)	1		R870
15210103	THICK FILM CHIP- R	10K- J- 1/16W (0603)	7		R815,R832,R835,R836, R844,R846,R867A

CODE NO.	DESCRIPTION	SPECIFICATION	Q'TY	REF.NO.	LOCATION
15210104	THICK FILM CHIP- R	100K- J- 1/16W (0603)	12		R831,R845,R848,R849, R853,R854,R855,R862, R869,R852,R861B,R848A
15210105	THICK FILM CHIP- R	1M- J- 1/16W (0603)	1		R871
15210121	THICK FILM CHIP- R	120- J- 1/16W (0603)	1		R808
15210153	THICK FILM CHIP- R	15K- J- 1/16W (0603)	1		R839
15210182	THICK FILM CHIP- R	1.8K- J- 1/16W (0603)	2		R823,R827
15210222	THICK FILM CHIP- R	2.2K- J- 1/16W (0603)	3		R858,R859,R822
15210223	THICK FILM CHIP- R	22K- J- 1/16W (0603)	4		R811,R824,R861C,R861A
15210224	THICK FILM CHIP- R	220K- J- 1/16W (0603)	1		R816
15210274	THICK FILM CHIP- R	270K- J- 1/16W (0603)	1		R825
15210332	THICK FILM CHIP- R	3.3K- J- 1/16W (0603)	1		R840
15210333	THICK FILM CHIP- R	33K- J- 1/16W (0603)	2		R838,R813
15210392	THICK FILM CHIP- R	3.9K- J- 1/16W (0603)	1		R861
15210393	THICK FILM CHIP- R	39K- J- 1/16W (0603)	1		R810
15210472	THICK FILM CHIP- R	4.7K- J- 1/16W (0603)	3		R843,R847,R872
15210473	THICK FILM CHIP- R	47K- J- 1/16W (0603)	6		R821,R826,R837,R850, R851,R821A
15210561	THICK FILM CHIP- R	560- J- 1/16W (0603)	1		R809
15210564	THICK FILM CHIP- R	560K- J- 1/16W (0603)	1		R841
15210682	THICK FILM CHIP- R	6.8K- J- 1/16W (0603)	1		R820
15210822	THICK FILM CHIP- R	8.2K- J- 1/16W (0603)	4		R829,R830,R833,R834
15210823	THICK FILM CHIP- R	82K- J- 1/16W (0603)	2		R819,R828
15210824	THICK FILM CHIP- R	820K- J- 1/16W (0603)	1		R842
1652B203	RESISTOR- SEMI	EVN5ESX(W)50B24	1		RV802
1652B503	RESISTOR- SEMI	EVN5ESX(W)50B54	1		RV803
17010102	C- CERAMIC	GRM39 X7R 102K 50	8		C803,C808,C813,C825, C854,C856,C859,C860
17010103	C- CERAMIC	GRM39 X7R 103K 50	6		C814,C816,C817,C828, C829,C850
17010104	C- CERAMIC	GRM39 Y5V 104Z 25	9		C823,C826,C833,C834, C835,C836,C838,C842, C847
17010154	C- CERAMIC	GRM39 Y5V 154Z 50	1		C839
17010182	C- CERAMIC	GRM39 X7R 182K 50PT	1		C853
17010221	C- CERAMIC	GRM39 COG 221J 50	6		C802,C807,C811,C832, C858,C861
17010223	C- CERAMIC	GRM39 X7R 223K 25	2		C846,C852
17010300	C- CERAMIC	GRM39 COG 300J 50	2		C820,C821
17010333	C- CERAMIC	GRM39 X7R 333K 16	2		C844,C849
17010470	C- CERAMIC	GRM39 COG 470J 50	4		C819,C831,C845,C848
17010471	C- CERAMIC	GRM39 COG 471J 50S	1		C844A
17010472	C- CERAMIC	GRM39 X7R 472K 50S	1		C851
17010820	C- CERAMIC	GRM39 COG 820J 50	1		C821A
1701A474	C- CERAMIC	GRM42- 6X5R474K16	2		C818,C837
1821A001	C- CHIP- TANTALUM	1UF- M- 16V SIZE A	1		C843

CODE NO.	DESCRIPTION	SPECIFICATION	Q'TY	REF.NO.	LOCATION
1821A010	C- CHIP- TANTALUM	10UF- M- 6V SIZE A	6		C815, C824, C827, C855, C857, C862
1821B010	C- CHIP- TANTALUM	10UF- M- 16V SIZE B3	1		C809
1821C147	C- CHIP- TANTALUM	47UF- M- 10V SIZE C	2		C812, C801
19610004	DIODE- SWITCH	KDS187	1		D804A
19610013	DIODE	KDS190	1		D802
19810001	DIODE	M2	3		D804, D805, D807
19820006	DIODE- SCHOTTKY	RB471E	1		D806
20010003	DIODE- ZENER	ZO2W7.5V(Z)	1		ZD803
21210001	INDUCTOR	646CY- 101M(100UH)	1		CH801
22260001	DIODE CHIP	MA77	1		D830
23010001	X- TAL(MH- 150)	4.0000(SX- 3 TYPE)	1		X801
28410002	LED LAMP(GREEN) SM	12- 21VGC/TR8	2		LED801, LED802
M40E087D	PCB- MA- 144- CPU	51.0*69.75*0.8T, MLB	1		
80169007	ASS'Y F/COVER		1		
17010471	C- CERAMIC	GRM39 COG 471J 50S	1		C601
30020008	SPEAKER	U2816B05	1		03 S801
30620001	C- MIC	WM- 62AU	1		05 M801
37020025	WIRE	BL, AWG30, 1.7*1*12.9	1		
37020026	WIRE	RE, AWG30, 1.7*1*12.9	1		
37020027	WIRE	GR, AWG28, 1.7*1*22.3	1		
37020028	WIRE	YE, AWG28, 1.7*1*22.3	1		
61000420	COVER- FRONT	BLK, FULL- AL	1		01
67000009	NUT 5- INSERTING	MBSBD1, M1.7*L4	2		
67000010	NUT 3- INSERTING	MBSBD1, M2*L14.8	3		
67000011	NUT 4- INSERTING	MBSBD1, M2*L16.2	1		
64000006	HOLDER- MIC	NBR230, BLK	1		04
64000050	BUTTON- FUNCTION	SIL, L&BLK&BLUE	1		09
70000035	FELT- SPEAKER	FELT BLK, P25.5	1		02
70000036	TAPE- WINDOW	S/NO.T400B, 0.3T	1		08
80169005	ASS'Y BACK		1		
61000154	KNOB- VOL.INNER	ABS, BLK, P- FILL	1		29
61000374	KNOB- VOL.OUT	ABS, BLK	1		28
67000008	NUT 2- VOLUME	MBSBD1, M7*1.5H	1		27
68000009	SCREW- P. H, T/P	(+)M1.7*L3.2, FZB	3		19
70000082	FELT- KNOB	FELT 0.2T, BLK	1		
80133010	ASS'Y AUDIO B.D		1		
11610012	IC- AUDIO	NJM2073M	1		IC3
15210100	THICK FILM CHIP- R	10- J- 1/16W (0603)	1		R139
15210183	THICK FILM CHIP- R	18K- J- 1/16W (0603)	1		R140A
15210223	THICK FILM CHIP- R	22K- J- 1/16W (0603)	1		R140
17010103	C- CERAMIC	GRM39 X7R 103K 50	1		C166
17010104	C- CERAMIC	GRM39 Y5V 104Z 25	1		C167
17010682	C- CERAMIC	GRM39 X7R 682K 50	1		C197
1821B010	C- CHIP- TANTALUM	10UF- M- 16V SIZE B3	1		C165
1821D047	C- CHIP- TANTALUM	47UF- M- 16V SIZE D2	1		C168

CODE NO.	DESCRIPTION	SPECIFICATION	Q'TY	REF.NO.	LOCATION
M40E052C	PCB- MH- 430- AUDIO	18*10.4*0.8T,MLB	1		
80169008	ASS'Y RF B.D		1	20	
80169013	ASS'Y RF SMD		1		
11610011	IC- IF	TA31136FN	1		IC401
11610015	IC	LV2105V	1		IC501
11610034	IC	UPC2748T	1		IC201
11710003	IC- REGULATOR	TK11230AMTL	1		IC601
13010003	TR- PNP	KTA1001S	1		Q106
13210013	TR- PNP	KRA225S	1		Q607
13210015	TR	MMBR951LT1	2		Q102, Q103
13210018	TR	2SC3356(R24)	2		Q104, Q105
13210026	TR- NPN	KRC404	1		Q606
13210027	TR- NPN	2SC4226(R24)	2		Q201, Q202
13210028	TR- NPN	KTC4081	1		Q203
13210029	TR- NPN	KRC410	1		Q501
13210030	TR- PNP	KRA310	4		Q601, Q602, Q603, Q604
13210033	TR- NPN	KRC401	1		Q107
13410007	FET	MRF9242T1	1		Q101
15210000	THICK FILM CHIP- R	0- J- 1/16W (0603)	3		R208, R206, R501
15210100	THICK FILM CHIP- R	10- J- 1/16W (0603)	4		R102, R106, R511, R512
15210101	THICK FILM CHIP- R	100- J- 1/16W (0603)	5		R118, R210, R211, R601, R114
15210102	THICK FILM CHIP- R	1K- J- 1/16W (0603)	1		R602
15210103	THICK FILM CHIP- R	10K- J- 1/16W (0603)	5		R112, R113, R115, R509, R502
15210104	THICK FILM CHIP- R	100K- J- 1/16W (0603)	2		R212A, R403
15210121	THICK FILM CHIP- R	120- J- 1/16W (0603)	1		R207
15210122	THICK FILM CHIP- R	1.2K- J- 1/16W (0603)	2		R201, R212
15210181	THICK FILM CHIP- R	180- J- 1/16W (0603)	1		R205
15210221	THICK FILM CHIP- R	220- J- 1/16W (0603)	1		R503
15210222	THICK FILM CHIP- R	2.2K- J- 1/16W (0603)	4		R110, R111, R412, R508
15210223	THICK FILM CHIP- R	22K- J- 1/16W (0603)	2		R405, R510
15210224	THICK FILM CHIP- R	220K- J- 1/16W (0603)	1		R407
15210272	THICK FILM CHIP- R	2.7K- J- 1/16W (0603)	1		R408
15210331	THICK FILM CHIP- R	330- J- 1/16W (0603)	1		R410
15210332	THICK FILM CHIP- R	3.3K- J- 1/16W (0603)	4		R109, R105, R108, R104
15210334	THICK FILM CHIP- R	330K- J- 1/16W (0603)	1		R409
15210391	THICK FILM CHIP- R	390- J- 1/16W (0603)	2		R116, R117
152103R3	THICK FILM CHIP- R	3.3- J- 1/16W	2		R603, R604
15210470	THICK FILM CHIP- R	47- J- 1/16W (0603)	1		R107
15210471	THICK FILM CHIP- R	470- J- 1/16W (0603)	2		R216, R411
15210472	THICK FILM CHIP- R	4.7K- J- 1/16W (0603)	3		R606, R202, R203
15210473	THICK FILM CHIP- R	47K- J- 1/16W (0603)	2		R204, R215
15210560	THICK FILM CHIP- R	56- J- 1/16W (0603)	1		R101
152105R6	THICK FILM CHIP- R	5.6- J- 1/16W	1		R103
15210681	THICK FILM CHIP- R	680- J- 1/16W	2		R213, R504

CODE NO.	DESCRIPTION	SPECIFICATION	Q'TY	REF.NO.	LOCATION
15210683	THICK FILM CHIP- R	68K- J- 1/16W (0603)	1		R405A
15210821	THICK FILM CHIP- R	820- J- 1/16W (0603)	1		R214
15210823	THICK FILM CHIP- R	82K- J- 1/16W (0603)	1		R404
16510222	RESISTOR- SEMI	POZ3AN- 1- 222- N TOO	1		RV101
17010010	C- CERAMIC	GRM39 COG 010C 50	1		C104
17010030	C- CERAMIC	GRM39 COG 030C 50	2		C202,C219
17010040	C- CERAMIC	GRM39 COG 040C 50	1		C113
17010050	C- CERAMIC	GRM39 COG 050C 50	2		C102,C508
17010060	C- CERAMIC	GRM39 COG 060D 50	3		C209,C212,C220
17010070	C- CERAMIC	GRM39 COG 070D 50	5		C106,C126,C204A,C217, C122
17010080	C- CERAMIC	GRM39 COG 080D 50	1		C108
170100R3	C- CERAMIC	GRM39 COG 0R3C 50	1		C214
17010100	C- CERAMIC	GRM39 COG 100D 50	2		C110,C119
17010102	C- CERAMIC	GRM39 X7R 102K 50	27		C107,C127,C131,C213, C224,C408,C409,C410, C411,C413,C513,C608, C609,C610,C509,C111, C207,C208,C210,C211, C212A,C215,C216,C218, C221,C222,C502
17010103	C- CERAMIC	GRM39 X7R 103K 50	7		C132,C133,C134,C511, C601,C603,C605
17010104	C- CERAMIC	GRM39 Y5V 104Z 25	5		C402,C403,C405,C407, C412
17010120	C- CERAMIC	GRM39 COG 120J 50	2		C201,C223
17010150	C- CERAMIC	GRM39 COG 150J 50	1		C206
17010180	C- CERAMIC	GRM39 COG 180J 50	1		C204
17010182	C- CERAMIC	GRM39 X7R 182K 50PT	1		C101
17010183	C- CERAMIC	GRM39 X7R 183K 25	2		C115,C116
170101R5	C- CERAMIC	GRM39 COG 1R5C 50	1		C103
17010200	C- CERAMIC	GRM39 COG 200J 50	1		C404
17010220	C- CERAMIC	GRM39 COG 220J 50	1		C218
17010221	C- CERAMIC	GRM39 COG 221J 50	9		C109,C112,C114,C120, C121,C124,C125,C129, C130
17010223	C- CERAMIC	GRM39 X7R 223K 25	1		C414
17010240	C- CERAMIC	GRM39 COG 240J 50PT	2		C123,C203
17010333	C- CERAMIC	GRM39 X7R 333K 16	1		C510
17010390	C- CERAMIC	GRM39 COG 390J 50	1		C416
170105R6	C- CERAMIC	GRM39 COG 5R6C 50	1		C105
17010680	C- CERAMIC	GRM39 COG 680J 50	2		C417,C205
17010820	C- CERAMIC	GRM39 COG 820J 50	1		C117
1821A010	C- CHIP- TANTALUM	10UF- M- 6V SIZE A	5		C406,C504,C512,C604, C607
1821A0R1	C- CHIP- TANTALUM	0.1UF- M- 6V SIZE A	1		C391

CODE NO.	DESCRIPTION	SPECIFICATION	Q'TY	REF.NO.	LOCATION
1821B010	C- CHIP- TANTALUM	10UF- M- 16V SIZE B3	1		C602
19610001	DIODE- SWITCH	KDS181	1		D601
19610007	DIODE- SWITCH	KDS114	1		D204
19610010	DIODE	MMBD101LT1	1		D401
19610012	DIODE- SWITCH	MA- 862	1		D102
19610014	DIODE	MAS- 728	1		D205
22010100	COIL- CHIP	FSLU2520 R22K- P2	1		L106
22010105	COIL- CHIP	FSLU2520 27NK- P2	2		L113,L114
22010108	COIL- CHIP	LQN1A17NJ04	1		L109
22010113	COIL- CHIP	ELJFC8R2KF(8.2UH)	2		L101,L105
22010115	COIL- CHIP	ELJFC2R2KF(2.2UH)	1		L209
22010122	COIL- CHIP	LQN1A47NJ04	2		L110,L204
22010124	COIL- CHIP	ELJC1R8KF	1		L210
22010137	COIL- CHIP	LL2012- F8N2	1		L112
22010138	COIL- CHIP	LL1608- FH33NH	1		L207
22010139	COIL- CHIP	LQN1A15NJ04	3		L102,L201,L202
22010140	COIL- CHIP	LQN1A23NJ04	3		L103,L104,L206
22010141	COIL- CHIP	LQN1A27NJ04	1		L203
22010142	COIL- CHIP	LQN1A33NJ04	1		L205
22260001	DIODE CHIP	MA77	4		D101,D201,D202,D203
24610001	LC- FILTER	LFB30N12B0445B010	2		SAW1,SAW2
M40E119A	PCB- MA- 440- RF	52*44, 0.8T ,MLB	1		
80169014	ASS'Y RF INSERT		1		
16620203	RESISTOR- VARIABLE	V- 9M- COS2009- B20K	1		VR101
21420040	COIL- QUAD	455K QUAD COIL	1		T401
21820032	COIL- SPRING	0.5*2.5*1.5T(L)	1		L108
21820033	COIL- SPRING	0.5*1.8*1.5T(L)	2		L107,L111
23020023	CRYSTAL	30.4MHZ	1		X401
24020006	FILTER- CERAMIC	LTW33- 450E	1		CF401
24220007	FILTER- CRYSTAL	30.85A(UM- 1)	1		MCF201,202
24620003	VCTCXO	UX2- 2C/15.2M	1		MODULE1
32020008	CONNECTOR	TDH7- 24SG	1		CON1
32020023	CONNECTOR 2PIN	F200- M- 2SSG	1		JP1
33020007	MIC/SPK- JACK	HSJ1468- 01- 010	1		J601
80169009	ASS'Y VCO B.D		1		
80169015	ASS'Y VCO SMD		1		
13210003	TR- NPN	KRC104S	1		Q305
13210009	TR- NPN	KTC3875S	1		Q301
13210015	TR	MMBR951LT1	2		Q302,Q303
13210018	TR	2SC3356(R24)	1		Q304
15210103	THICK FILM CHIP- R	10K- J- 1/16W (0603)	2		R313,R308
15210221	THICK FILM CHIP- R	220- J- 1/16W (0603)	1		R307
15210222	THICK FILM CHIP- R	2.2K- J- 1/16W (0603)	1		R301
15210472	THICK FILM CHIP- R	4.7K- J- 1/16W (0603)	1		R311
15210473	THICK FILM CHIP- R	47K- J- 1/16W (0603)	3		R305,R309,R312
15210560	THICK FILM CHIP- R	56- J- 1/16W (0603)	1		R306

CODE NO.	DESCRIPTION	SPECIFICATION	Q'TY	REF.NO.	LOCATION
15210623	THICK FILM CHIP- R	62K- J- 1/16W (0603)	1		R302
17010010	C- CERAMIC	GRM39 COG 010C 50	1		C307
17010090	C- CERAMIC	GRM39 COG 090C 50	1		C315
170100R5	C- CERAMIC	GRM39 COG 0R5C 50	1		C321
17010102	C- CERAMIC	GRM39 X7R 102K 50	2		C303,C333
17010103	C- CERAMIC	GRM39 X7R 103K 50	1		C304
17010104	C- CERAMIC	GRM39 Y5V 104Z 25	1		C301
17010120	C- CERAMIC	GRM39 COG 120J 50	1		C316
17010200	C- CERAMIC	GRM39 COG 200J 50	2		C319,C322
17010221	C- CERAMIC	GRM39 COG 221J 50	5		C306,C312,C314,C334, C335
170102R2	C- CERAMIC	GRM39 COG 2R2 C50	1		C305
170103R3	C- CERAMIC	GRM39 COG 3R3C 50	2		C311,C313
170104R7	C- CERAMIC	GRM39 COG 4R7C 50PT	1		C317
1821A047	C- CHIP- TANTALUM	4.7uF- M- 6V, SIZE A	1		C302
19610007	DIODE- SWITCH	KDS114	1		D303
20210006	DIODE	1SV229	1		D301
20210008	DIODE- VAR	KV1832E	1		D302
21820044	COIL- SPRING	0.4*1.3*2T	1		L302
22010100	COIL- CHIP	FSLU2520 R22K- P2	2		L303,L305
22010105	COIL- CHIP	FSLU2520 27NK- P2	2		L301,L302
M40E120A	PCB- MA- 440- VCO	11.0*18.0,0.8T,MLB	1		
80169016	ASS'Y VCO INSERT		1		
32020006	CONNECTOR	F127- M- 7SSG	1		
62000048	CAN- VCO	SPTE 0.3T	1		
80169011	ASS'Y BACK COVER		1		
32020019	SMA CONNECTOR	SW- 2406	1	21	
61000421	COVER- BACK	BLK,FULL- AL	1	36	
67000002	NUT- INSERTING	M2.6*L3,MBSBD1	2		
62000057	LUG 1- ANT	SPTE 0.2T,SN	1	22	
62000059	WASHER- ANT	PVC 0.3T,BLK	1	24	
64000051	CAP"B"- SPK/MIC	SILIC+PVC,BLK	1	23	
64000052	CAP"A"- HOLE	SILICONE, BLK	1	26	
80169002	ASS'Y PACKING		1		
41030058	ANT	DS- C440- UA	1	25	
61000255	CLIP- BELT	PC+ABS,BLK	1	31	
66000100	STICKER- DATE CODE	TETRON 0.05T	2	33	
66000501	LABEL- SERIAL	TETRON 0.05T	1	34	
66000502	LABEL- CARTON	KRAFT PAPER	0.1		
66000503	MANUAL- USER	ART PAPER	1		
66000504	STICKER 2- BAR CODE	ART PAPER	0.05		
68000033	SCREW- P.H,M/C	(+)M2.6*L5,FZB	2	30	
69000006	STRAP- HAND	P.P+NYLON	1	32	
69000096	BOX- CARTON	DW- 2	0.05		
69000102	PAD- CARTON	DW- 2	0.1		
69000170	P.E FOAM- TOP	P.E FOAM, WHT	1		

CODE NO.	DESCRIPTION	SPECIFICATION	Q'TY	REF.NO.	LOCATION
69000202	P.E FOAM- BOTTOM	P.E FOAM, WHT	1		
69000263	BOX- GIFT(R/SHACK)	MANILAR 450G	1		
70000088	BAG- POLY(100*250)	LDPE 0.05T, CLR	1		
80200017	ASS'Y BATT. CASE		1		
61000242	BUTTON- LOCK	ACETAL, BLK	1	43	
61000256	CASE 1- BATTERY	PC+ABS, BLK	1	41	
62000033	TERMINAL A	SUS 0.2T, NI- PL	1	37	
62000034	TERMINAL B	SUS 0.2T, NI- PL	1	47	
62000035	TERMINAL C	SUS 0.2T, NI- PL	1	45	
68000031	SCREW- B.H,T/P2	(+)M1.7*L2, FZB	2	46	
70000037	RUB. 1- TERMINAL	NBR230, 3.5*3.5*1.8T	2	38	
70000053	TAPE 1- RIBBON	ADHESIVE, TAPE	1	39	
70000054	RIBBON 1- BATT.	RIBBON, BLK	1	40	

