23-Channel Mobile Citizens Band 5 watt Transceiver

OWNER'S MANUAL

GENERAL INFORMATION

This unit is a transmitter and receiver designed for use in class "D" operation in the 27MHz Citizens Radio Service. Rules part 95 of FCC regulations defines operation in this service and the licensee is required to read and understand these regulations before operating this unit.

Part 95 regulations are available from the Superintendent of Documents, Government Printing Office, Washington D.C. 20402. You are also required to complete F.C.C. form 505 and submit it to the F.C.C. in order to obtain license to operate this unit. It is illegal to operate the transmitter section of this unit prior to receiving a valid station license.

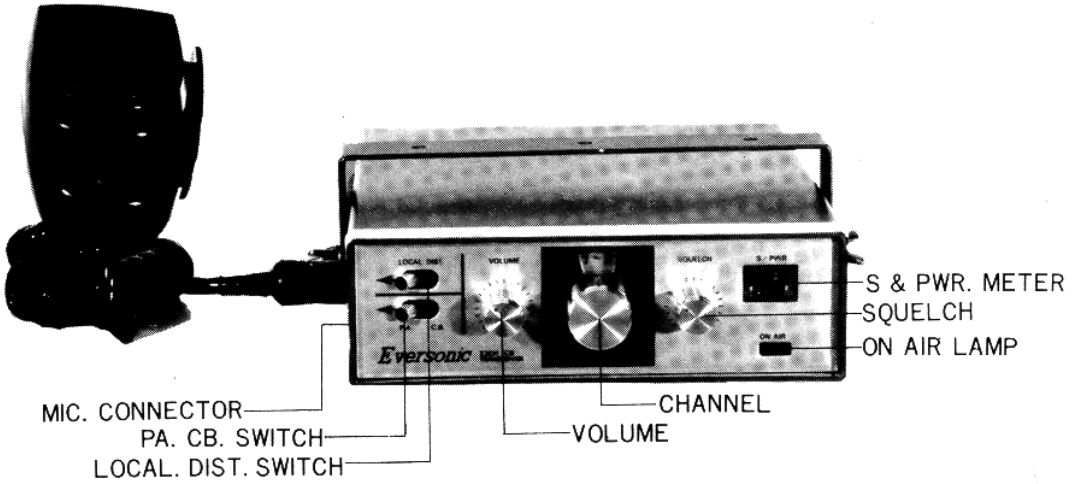
GENERAL DESCRIPTION

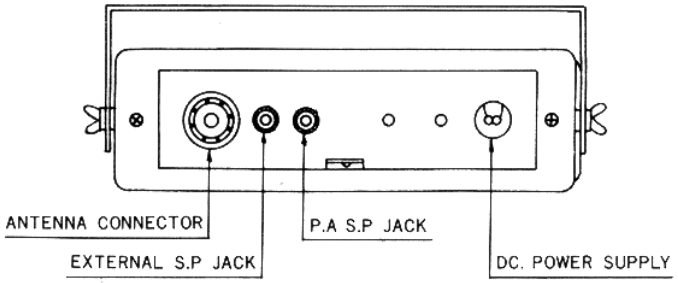
OUTLINE

This unit is an extremely compact all solid state 2-way radio providing 23 crystal-controlled transmit and receive channels in the 27MHz citizens band. Apart from communication use, this unit has an additional feature as a Public-Address Amplifier. Latest technique ensures reliable, trouble-free performance which will be found in the provisions follow and further technical instruction described in this operation manual.

EQUIPMENT LIST

This unit consists of the followings.
Unit, self-contained speaker and crystals.
Microphone, (curl cord with plug)
Mounting bracket.
Plug for external speaker: 2 pcs.
Fuse (2A) 2 pcs.
Instruction manual.


S & PWR. METER
SQUELCH
ON AIR LAMP
MIC. CONNECTOR
PA. CB. SWITCH
LOCAL. DIST. SWITCH
VOLUME
CHANNEL


ANTENNA CONNECTOR
EXTERNAL S.P JACK
P.A S.P JACK
DC. POWER SUPPLY

OPERATION

PRE-CAUTION

a) Polarity check
b) Never attempt to transmit without an antenna connection is properly made.
c) PA/CB switch: Make sure switch is placed on CB side.

INSTALLATION

As supplied with mounting bracket and other hard wares, installation is simply made however care must be taken as following procedure.

a) Select the place where front control panel facing you.
b) Position should not disturbe driver or operator.
c) Do not place nearer to heater ducts and or outlet of air conditioner.
d) Mounting place should not be effected by water and dust problems.
e) Prior cable connection, make sure to determine polarity of the cables Red(+) Black(−) and vehicle has a negative or positive ground electrical system.
   Wrong wiring will blow fuse (2A) placed in the cable for protection of internal damages.
   Do not attempt to insert the fuse more than 2A. Make sure to observe the input power voltage should be 12V DC.
f) Antenna must be of type accepted by FCC. Antenna installation is very important to obtain satisfactory communication.

STAND BY

a) Turn "Volume" knob on the front panel to the clock wise direction until click noise is heard with lit out of meter and channel indicator lamps.
b) Squelch control knob: Turn fully to the counter clockwise.
c) Turn volume control slowly to the clockwise until you will start to hear sound from speaker or you may hear others transmitting signals, then place volume control in most audible position.

d) Then turn squelch control slowly to the clockwise direction until you hear suddenly no sound, which is the position the squelch is set on. As further turning of squelch will not activate unless extremely large input power is received. Ideal position is where noise is suddenly disappeared.

TRANSMISSION

a) Connect the microphone to the input positioned at the left side of the unit.
b) Make sure to observe the antenna cable connection is firmly made to the jack "Ant".
c) To transmit, press the push-to-talk switch with approximately 5cm distance. For monitoring, confirm that the red indicator lamp "ON-Air" is lit also "S" meter should be on work.

CHANNEL SELECTOR

The number through the window on top of the channel switch, shows which channel is under operation. Reference for the channels and frequencies, refer attached chart. Desired channel can be selected by rotating the channel knob.

EXTERNAL SPEAKER

Due to the limited space, the unit incorporates smaller size speaker. However speaker will deliver sufficient power. It is suggested to use external speaker when communication take place where excessive back ground noise is arisen. For connection of the external speaker be sure to use the connecting plugs supplied with the unit and plug it to the position marked "EXT-SP" on the back panel.

PUBLIC ADDRESSOR (P.A.)

For operation as P.A., connect speaker to the JACK marked "PA-SP" on the back panel. Place the CB/PA switch on PA position, then the unit is ready for P.A. amplifier.

LOCAL-DISTANCE SWITCH

This switch is provided for emphasizing better receiving. It will effect on position "Local" when communicating with short distance where back ground noise is excessively high.

TECHNICAL PERFORMANCE

GENERAL

1)	Frequency range	: 23 channels, between 26.965MHz/27.255MHz
2)	Type of emission	: A3
3)	Microphone	: 600 ohm
4)	Power supply	: 12V DC, negative or positive ground, contained "Polarity protector"
5)	Power consumption	: Receive (Squelch ON) approx. 200mA Transmit (Max modulation) approx. 1,500mA
6)	Operating condition	:
	a) Ambient temperature	: $-10^{\circ}C - +50^{\circ}C$
	b) Relative humidity	: $+40^{\circ}C$ 95% or less
	c) Power variation	: 11V – 15V
7)	Dimensions and weight	
	a) Dimension	: 170W x 53H x 210D (m/m)
	b) Weight	: approx. 1.6Kg

TRANSMITTER

1)	Frequency stability	: 0.005% or less ($-30^{\circ}C - 50^{\circ}C$)
2)	RF output	: 4W max.
3)	Modulation	: 95%
4)	Harmonics and spurious emission	: 50db or more below carrier level
5)	Antenna terminal	: 50 ohm resistive

RECEIVER

1)	Sensitivity	: 0.5μV for 10db S/N (30% 1KHz mod.)
2)	Selectivity	: 6db bandwidth: 5.5KHz minimum Adjacent channel rejection: 50db minimum
3)	Spurious rejection	: 50db minimum
4)	AGC characteristics	: Within 10db AF variation for 2μV–0.1V RF input
5)	Squelch	: Minimum sensitivity: –0.3μV
6)	Audio output	: 3W
7)	Speaker	: 2" x 3" Oval dynamic 8 ohm

ADJUSTMENT AND CHECK OUT

PRE-CAUTION IN ADJUSTMENT

As mentioned, this unit is designed to complies with the rules part 95 of the FCC, it is important that servicing must be conducted by qualified servicemen with appropriate test equipments as it may not be only properly repaired but also cause to disturbe others operation by your transmitting with improperly aligned oscillator.

TUNE-UP PROCEDURE

Alignment procedures are as follows:

a) Transmitter alignment:
   Connect 50 ohm dummy load with antenna terminal.

b) Repeated test tune up is recommended as per instruction given in the Tune up procedure table.
   1) Pull-out the chassis toward the front panel after removing 2 screws on the back panel.
   2) Connect 50 ohm dummy load to the antenna terminal.

3) Power consumption under normal operation:
   Reception (Squelch on) . . . . . 200mA approx.
   Transmission (Non mod.) . . . . . 800mA approx.
   Transmission (Full mod.) . . . . . 1,300mA approx.
4) Maximum modulation degree is tuned at 90% and the level setting for the Over Modulation Protector should be performed by VR5.
5) Standard modulated input for the microphone (50% mod.) is 2mV/600 ohm at 1KHz.
6) Alignment of the squelch. Turn the squelch knob to max. position, set VR3 at the point when the squelch opens while tunning VR3 feeding 40db input from SSG which is connected to the antenna terminal. Then remove the input signal and turn the squelch knob full position toward counter-clockwise direction whereby you will hear noise from the speaker. Further, turn knob slowly toward clock-wise direction approximately 1/3 position whereby the squelch is ready to activates. Fix the squelch knob firmly at this point and check the squelch is properly working by feeding 0db input signal thru SSG.
7) Indicator setting
   i) RF output
      Set the meter reading shows on 2/3 position by VR6 when transmitting thru 50 ohm dummy load.
   ii) "S Meter"
      Set the meter reading shows on 3/4 position by VR1 feeding 90db SSG output when receiving.

ADJUSTMENT AND CHECK OUT OF TRANSMITTER SECTION

	Item	Adjusting Point	Measuring Point	Adjusting Measuring Value	Measuring Instrument
1	Oscillator (37MHz)	L6	TP-6	Set the channel on Ch.23. Align L6 until Freq. Counter accurately shows 37.850MHz when VTVM is in full scale reading and fix L6. Standard voltage of TP-6 is 0.8-0.9V.	Freq. counter RF VTVM
2	Mixer	L11 L12	TP-4	Set the channel on Ch.9. Align L11, L12 until the VTVM on TP-4 points full scale reading. Standard voltage of TP-4 is 0.35V.	RF VTVM
3	Exciter	L13 L14	TP-5	Set the channel on Ch.9. Align L13, L14 until obtain maximum current connecting DC current meter to TP-5. Standard current at TP-5 is 0.4 Amp.	DC current-meter
4	Power amp.	L15 L6	Ant. terminal	Align L15, L16 to obtain maximum reading of the dummy load which is connected to the antenna terminal. L13, L14 to be also aligned to obtain the above result. Standard out is 3-3.2W.	50 ohm dummy load

	Item	Adjusting Point	Measuring Point	Adjusting Measuring Value	Measuring Instrument
5	Modulation	VR5	Ant. terminal	Feed 2.5KHz AF Oscillator output to the microphone and tune up AF input level until 50% modulation wave is seen through oscilloscope. Increase AF input level 16db (6 times) at 50% modulation. Align VR5 and fix when modulation degree will not exceed 90%. Standard AF input level at 50% modulation is approx. 2mV/600 ohm.	AF oscillator oscilloscope AF VTVM

Note:

1. All tune-up are performed under channel 9 except 37MHz oscillator at 23 Ch.
2. The polarity of every measuring points are plus(+) except TP-5.
3. The polarity of TP5 is (−) at choke coil, CH3 and (+) at power source.
4. TP-7 is minus(−).

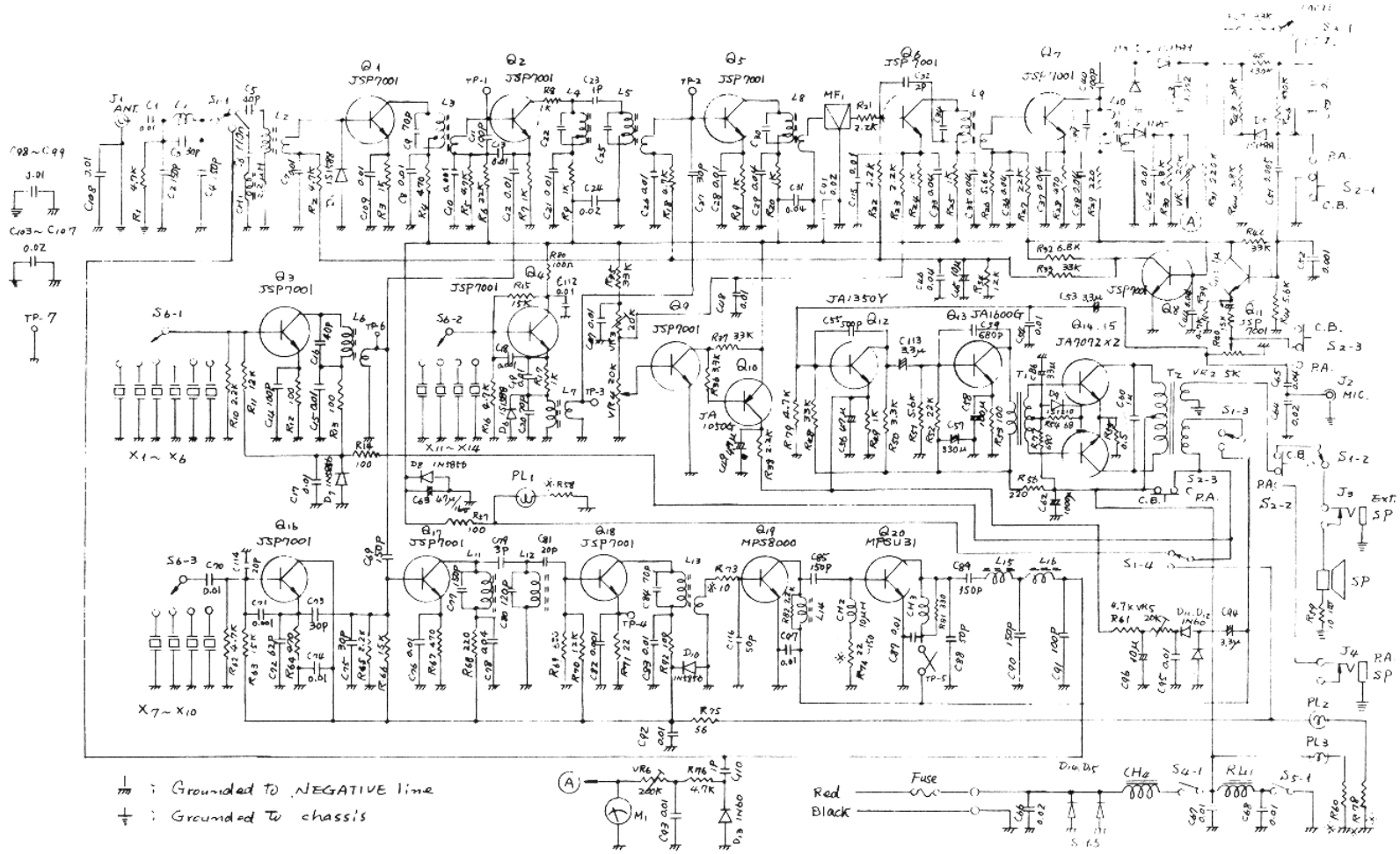
ADJUSTMENT AND CHECK OUT OF RECEIVER SECTION

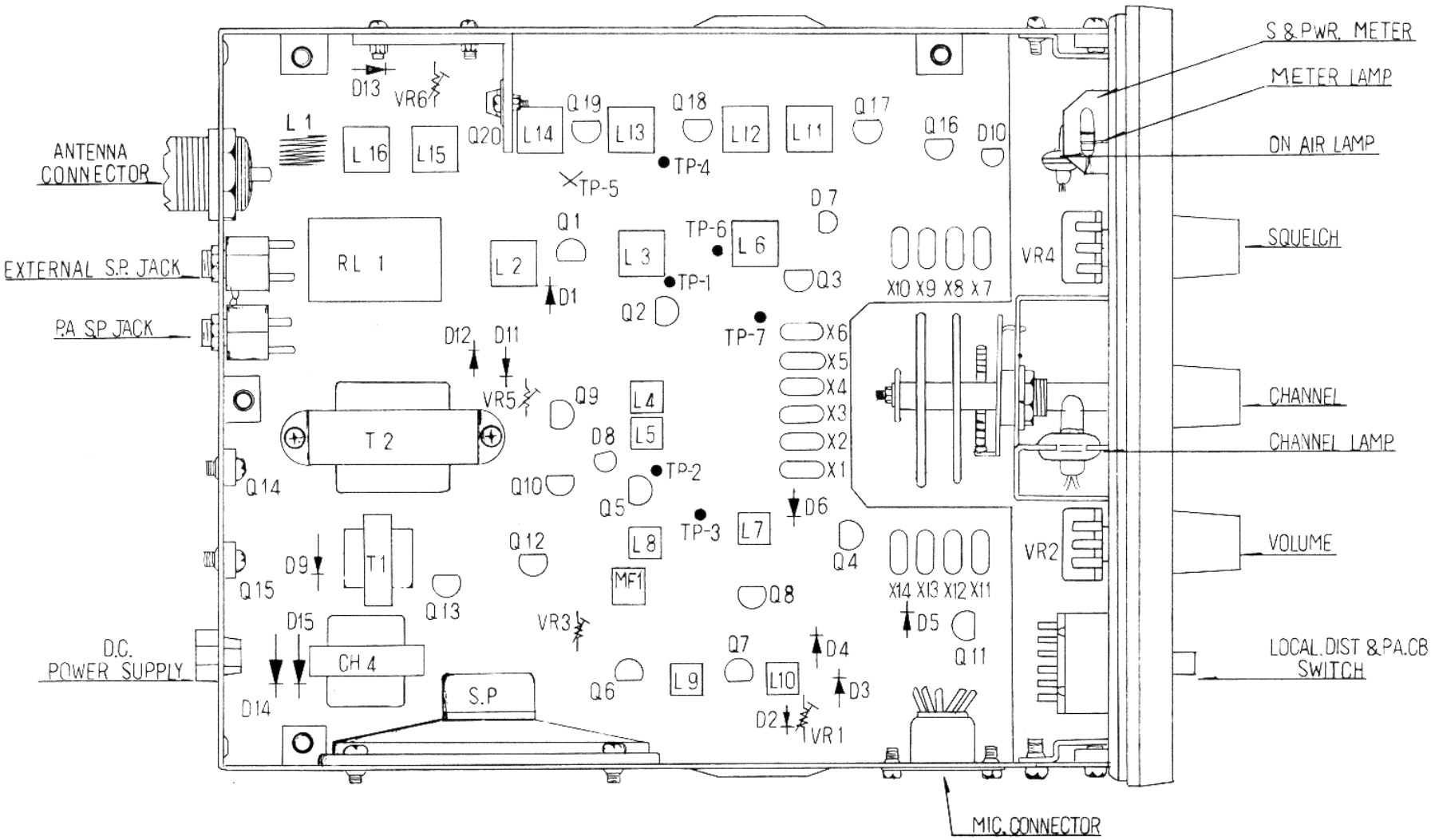
	Item	Adjusting Point	Measuring Point	Adjusting Measuring Value	Measuring Instrument
1	AF Amplifier	None	Speaker terminal (J3)	Check the wave and output voltage of the speaker terminals feeding with approx. 10mV signal to the both inputs of VR2. The output voltage is approx. 3V. It is satisfactory if no remarkable destorted wave is found. Speaker (8 ohm)	AF oscillator VTVM oscilloscope
2	2nd IF	L8 L9 L10	J3	Accurately align SSG freq. to 455KHz and feed 20db output power, at 30% modulation from TP-2. Align L8 - L10 until obtain maximum AF output. It is normal, circuits thereafter the 2nd IF, if AF output at J3 reads 3V/8 ohm when the input at TP-2 lowered to 15db.	SSG, VTVM, oscilloscope
3	2nd Local oscillator (10MHz)	L7	TP-3	Set the channel on Ch.9. Connect Freq. Counter and VTVM to TP-3. Align L7 and after VTVM indicates max. position and Freq. Counter accurately points 10.180MHz. Standard voltage at TP-3 is 0.4-0.6V.	Freq. Counter VTVM

	Item	Adjusting Point	Measuring Point	Adjusting Measuring Value	Measuring Instrument
4	1st IF	L4 L5	J3	Set the channel on Ch.11. Adjust SSG Freq. sharply on 10.615MHz. Align thru L4, L5 until AF output of J3 outputs maximum power by feeding approx. 20db output at 30% modulation to TP-1. It is normal if AF output measured 3V/8 ohm against 10db input to TP-1.	SSG VTVM, oscilloscope
5	1st local oscillator (37MHz)	L6	TP-6	This stage is common use with the oscillator on transmitter section. For alignment, refer to the instruction given in transmitter section.	Freq. counter VTVM
6	RF amplifier	L2 L3	J3	Set the channel on Ch.9. Align SSG freq. to the 9 Ch. frequency. Align L2, L3 until AF output of J3 obtains max. output feeding from antenna terminal J1 with 10db output at 30% modulation. AF output of J3 is 3V/8 ohm against RF input of 2db-3db.	SSG VTVM, oscilloscope

Note:

1. Make certain that prior to check, the AF output terminal (J3) must be connected with either 8 ohm speaker or non-inductive resistor.
2. SSG connection to TP-1, TP-2 must be made thru 0.04-0.1uf capacitor.


Q1 JSP7001
Q2 JSP7001
Q5 JSP7001
Q6 JSP7001
Q7 JSP7001
Q3 JSP7001
Q4 JSP7001
Q9 JSP7001
Q10 JA1050G
Q12 JA1350Y
Q13 JA1600G
Q14, 15 JA7092XZ
Q8, Q11 2SP7001
Q16 JSP7001
Q17 JSP7001
Q18 JSP7001
Q19 MPS8000
Q20 MPSU31
MF1
PL1
M1
TP-1
TP-2
TP-3
TP-4
TP-5
TP-6
TP-7
S1-1
S1-2
S1-3
S1-4
S2-1
S2-2
S2-3
S3-1
S4-1
S5-1
S6-1
S6-2
S6-3
J1 ANT
J2 MIC.
J3 Ext. SP
J4 RA SP
SP
P.A.
C.B.
Fuse
Red
Black
X1 ~ X6
X7 ~ X10
X11 ~ X14
C98 ~ C99
C103 ~ C107
0.02
: Grounded to NEGATIVE line
: Grounded to chassis


S & PWR. METER
METER LAMP
ON AIR LAMP
SQUELCH
CHANNEL
CHANNEL LAMP
VOLUME
LOCAL. DIST & P.A. CB SWITCH
MIC. CONNECTOR
ANTENNA CONNECTOR
EXTERNAL S.P. JACK
P.A. SP JACK
D.C. POWER SUPPLY
L 1
L 16
L 15
L 14
L 13
L 12
L 11
L 2
L 3
L 6
L4
L5
L7
L8
L9
L10
RL 1
T 2
T1
CH 4
S.P
MF1
VR1
VR2
VR3
VR4
VR5
VR6
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
D15
Q1
Q2
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Q4
Q5
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Q10
Q11
Q12
Q13
Q14
Q15
Q16
Q17
Q18
Q19
Q20
TP-1
TP-2
TP-3
TP-4
TP-5
TP-6
TP-7
X1
X2
X3
X4
X5
X6
X7
X8
X9
X10
X11
X12
X13
X14

PARTS LIST

Symbol No.	Name of Parts	Description	Symbol No.	Name of Parts	Description
	PC Board	HA-23C	X 2	Crystal	37.650
Q 1	Transistor	JSP-7001	3	Units	37.700
2		"	4	(HC-18U)	37.750
3		"	5		37.800
4		"	6		37.850
5		"	7		10.635
6		"	8		10.625
7		"	9		10.615
8		"	10		10.595
9		"	11		10.180
10		JA-1050G	12		10.170
11		JSP-7001	13		10.160
12		JA-1350Y	14		10.140
13		JA-1600G			
14		JA-7072	D 1	Diode	IS1588
15		"	2		IN60
16		MJE-9400	3		IS1588
17		"	4		"
18		"	5		"
19		MPS-8000	6		"
20		MPS-U31-1	7		IN5856B
			8		"
X 1	Quartz	37.600	9		IS1210

Symbol No.	Name of Parts	Description	Symbol No.	Name of Parts	Description
D 10	Diode	IN5856B	CH-2	Micro-Inductor	HC-10μH
11		IN60	3	RF Choke	
12		"	4	Choke Trans	E-24-001-1
13		"			
14		D-1.5-01	T 1	Input Trans	F-19-004
15		"	2	Output Trans	E-35
			RL-1	Relay	AE2341
L 1	Solenoide Coil				
2	RXANT Coil	HC-23C-100-1	VR-1	Semi-Fixed VR	20KB
3	RXRF Coil	100-2	2	VR (with S)	5KA
4	IFT	100-7301	3	Semi-Fixed VR	20KB
5	IFT	"	4	VR (without S)	20KB
6	OSC Coil	HC-23C-100-7	5	Semi-Fixed VR	20KB
7	IFT	100-7301	6	"	200KB
8	"	100-7103			
9	"	100-7101	R 1	Resistor	Carbon 4.7k
10	"	100-7102	2		Solidl/4W 4.7K
11	TXMIX Coil	HC-23C-100-6	3		Carbon 1K 14VJ
12	"	"	4		470Ω
13	TX Drive Coil	HC-23-100-3	5		4.7K
14	TXRX Coil-1	100-4	6		22K
15	"	"	7		1K
16	TXRF Coil-2	100-5	8		1K
			9		1K
CH-1	Micro-Inductor	2.2μH	10		2.2K

Symbol No.	Name of Parts	Description	Symbol No.	Name of Parts	Description
R 11	Resistor	Carbon 12K	R 36	Resistor	Carbon 1/4W 3.3K
12		100Ω	37		3.3K
13		100Ω	38		2.2K
14		100Ω	39		4.7K
15		15K	40		15K
16		4.7K	41		5.6K
17		1K	42		33K
18		Solidl/4W 4.7K	43		68K
19		Carbon 1/4W 1K	44		6.8K
20		1K	45		330K
21		2.2K	46		330K
22		2.2K	47		3.3K
23		2.2K	48		33K
24		1K	49		1K
25		1K	50		3.3K
26		5.6K	51		5.6K
27		22K	52		22K
28		470Ω	53		100Ω
29		220Ω	54		68Ω
30		6.8K	55		0.5Ω
31		220K	56		220Ω
32		6.8K	57		Solid 1/4W 100Ω
33		33K	58		Carbon 1/4W *(22Ω)
34		12K	59		10Ω
35		33K	60		*(22Ω)

Symbol No.	Name of Parts	Description	Symbol No.	Name of Parts	Description
R 61	Resistor	Carbon 1/4W 4.7K	C 3	Capacitor	(Ceramic) 30P(CH)
62		4.7K	4		" 150P(CH)
63		15K	5		" 40P(CH)
64		470Ω	6		" 110P(CH)
65		2.2K	7		" 0.01
66		15K	8		" 0.01
67		470Ω	9		" 70P(CH)
68		220Ω	10		(Mylor) 0.001
69		680Ω	11		(Ceramic) 100P
70		12K	12		(Mylor) 0.01
71		22Ω	13		" 0.01
72		100Ω	14		(Ceramic) 100P(UJ)
73		*10Ω	15		" 0.01
74		*68Ω	16		" 40P(SH)
75		56Ω	17		" 0.01
76		4.7K	18		" 0.001
77		680Ω	19		" 0.01
78		*(22Ω)	20		" 70P(CH)
79		4.7K	21		" 0.01
80		100Ω	22		
81		Solid 1/4W 330Ω	23		(Ceramic) 1P(CH)
82		2.2K	24		" 0.02
			25		
C 1	Capacitor	(Ceramic) 0.01	26		(Ceramic) 0.01
2		" 150P(CH)	27		" 30P(CH)

Symbol No.	Name of Parts	Description	Symbol No.	Name of Parts	Description
C 28	Capacitor	(Ceramic) 0.01	C 53	Capacitor	(Electro)3.3μF-16V
29		" 0.04	54		(Ceramic) 0.01
30			55		" 500P
31		(Ceramic) 0.04	56		(Electro)47μF-16V
32		" 2P	57		" 330μF-16V
33		" 0.04	58		" 100μF-16V
34			59		(Mylor) 680
35		(Ceramic) 0.04	60		(Electro)
36		" 0.04	61		
37		" 0.04	62		(Electro)1000μF-16V
38			63		" 47μF-16V
39			64		(Ceramic) 0.02
40		(Ceramic) 100P(CH)	65		" 0.04
41		" 0.02	66		" 0.02
42		" 0.01	67		" 0.01
43		(Mylor) 0.002	68		" 0.01
44		(Ceramic) 0.04	69		" 150P(CH)
45		(Electro)10μF-16V	70		" 0.01
46		(Ceramic) 0.04	71		" 0.001
47		" 0.01	72		" 62P(CH)
48		" 0.01	73		" 30P(CH)
49		(Electro)4.7μF-16V	74		" 0.01
50		(Ceramic) 0.1	75		" 30P(CH)
51		(Mylor) 0.005	76		" 0.01
52		" 0.001	77		" 150P(CH)

Symbol No.	Name of Parts	Description	Symbol No.	Name of Parts	Description
C 78	Capacitor	(Ceramic) 0.04	C103	Capacitor	(Ceramic) 0.02
79		" 3P(CH)	104		" 0.02
80		" 120P(CH)	105		" 0.02
81		" 20P(CH)	106		" 0.02
82		(Mylor) 0.001	107		" 0.02
83		(Ceramic) 0.01	108		" 0.01
84		" 70P(CH)	109		" 0.01
85		" 150P(CH)	110		" 1P(CH)
86		(Electro)33μF6.3V	111		(Electro)1μF-16V
87		(Ceramic) 0.01	112		(Ceramic) 0.01
88		" 50P(CH)	113		(Electro)3.3μF16V
89		" 150P(CH)	114		(Ceramic) 20P(CH)
90		" 150P(CH)	115		" 0.001
91		" 100P(CH)	116		" 50P(CH)
92		" 0.01	MF 1		(Ceramic filter)
93		" 0.01			CFU455H-2
94		(Electro)3.3μF16V			
95		(Ceramic) 0.01			
96		(Electro)10μF-16V			
97		(Ceramic) 0.01			
98		" 0.01			
99		" 0.01			
100					
101					
102					