



SERVICE MANUAL ADDENDUM

IC-F60V IC-F61V

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Model	Version		Band (High or Low)	Channel spacing (kHz)	Vibration	Voice storage
F60V	USA	USA	Low band (400–470 MHz)	12.5/25.0	N/A	N/A
		USA-01			Yes	N/A
		USA-02			Yes	Yes
		USA-03	High band (450–512 MHz)		N/A	N/A
		USA-04			Yes	N/A
	USA-05	Yes	Yes			
	Export	EXP	Low band (400–470 MHz)	12.5/25.0	N/A	N/A
		EXP-01			Yes	N/A
		EXP-02			Yes	Yes
		EXP-03	High band (450–520 MHz)		N/A	N/A
EXP-04		Yes			N/A	
EXP-05	Yes	Yes				
F61V	Europe	EUR	Low band (400–470 MHz)	12.5/20.0/ 25.0	N/A	N/A
		EUR-01			Yes	N/A
		EUR-02			Yes	Yes
	China	CHN		12.5/25.0	N/A	N/A
		CHN-01			Yes	N/A
		CHN-02			Yes	Yes

[FRONT UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
C417	4030017580	S.CER ECJ0EC1H060C [USA]	T	39.4/20.8
	4030017580	S.CER ECJ0EC1H060C [EUR]	T	
	4030017580	S.CER ECJ0EC1H060C [EXP]	T	
	4030017580	S.CER ECJ0EC1H060C [CHN]	T	
	4030017580	S.CER ECJ0EC1H060C [USA-01]	T	
	4030017580	S.CER ECJ0EC1H060C [EUR-01]	T	
	4030017580	S.CER ECJ0EC1H060C [EXP-01]	T	
	4030017580	S.CER ECJ0EC1H060C [CHN-01]	T	
	4030017580	S.CER ECJ0EC1H060C [USA-02]	T	
	4030017580	S.CER ECJ0EC1H060C [EUR-02]	T	
	4030017580	S.CER ECJ0EC1H060C [EXP-02]	T	
	4030017580	S.CER ECJ0EC1H060C [CHN-02]	T	
	4030017610	S.CER ECJ0EC1H090C [USA-03]	T	
	4030017610	S.CER ECJ0EC1H090C [USA-04]	T	
	4030017610	S.CER ECJ0EC1H090C [USA-05]	T	
	4030017610	S.CER ECJ0EC1H090C [EXP-03]	T	
	4030017610	S.CER ECJ0EC1H090C [EXP-04]	T	
	4030017610	S.CER ECJ0EC1H090C [EXP-05]	T	
C418	4030016930	S.CER ECJ0EB1A104K	T	39/24.6
C419	4550006050	S.TAN TEESVA OJ 106M8R	T	24.6/16.9
C420	4030016930	S.CER ECJ0EB1A104K	T	24.9/18.5
C421	4030016930	S.CER ECJ0EB1A104K	T	13.5/35.7
C423	4030018890	S.CER ECJ0EB0J224K	T	12.9/39.2
C425	4030017440	S.CER ECJ0EC1H221J	T	14.5/38.7
C426	4030017460	S.CER ECJ0EB1E102K	B	35.6/54.2
C427	4550007080	S.TAN TEESVA 1C 106M8R	T	40.6/44.3
C428	4030016930	S.CER ECJ0EB1A104K	T	37.6/47
C429	4030017460	S.CER ECJ0EB1E102K	T	36.7/47
C430	4030017460	S.CER ECJ0EB1E102K	T	34.7/36.8
C431	4030016790	S.CER ECJ0EB1C103K	T	32.9/39.3
C432	4030017460	S.CER ECJ0EB1E102K	T	38.9/42.7
C435	4550006760	S.TAN TEESVB21A336M8R	T	15.3/54.7
C437	4030018860	S.CER ECJ0EB0J105K	B	34.1/55.4
C441	4030016960	S.CER ECJ0EB1C183K	T	23.4/42.9
C442	4030016930	S.CER ECJ0EB1A104K	T	22.1/41.3
C443	4030017750	S.CER ECJ0EB1E122K	T	22.2/42.5
C444	4030016930	S.CER ECJ0EB1A104K	T	19.7/39.5
C445	4030017460	S.CER ECJ0EB1E102K	T	33.2/33.8
C446	4030017460	S.CER ECJ0EB1E102K	T	22.5/45.2
C447	4030017760	S.CER ECJ0EB1H222K	T	20.1/45.7
C448	4030017690	S.CER ECJ0EC1H121J	T	22.5/44.3
C449	4030017770	S.CER ECJ0EB1E332K	T	13.7/45.7
C450	4030017420	S.CER ECJ0EC1H470J	T	12.2/43.7
C461	4030017420	S.CER ECJ0EC1H470J	T	39/22.5
C462	4030017420	S.CER ECJ0EC1H470J	T	32/21
C463	4030017420	S.CER ECJ0EC1H470J	T	17.5/19.9
C464	4030017420	S.CER ECJ0EC1H470J	T	4.4/16.3
C465	4030017420	S.CER ECJ0EC1H470J	T	26.4/13.7
C466	4030017420	S.CER ECJ0EC1H470J	T	36.9/14.5
C467	4030017420	S.CER ECJ0EC1H470J	T	30.5/13.1
C468	4030017420	S.CER ECJ0EC1H470J	T	40.4/11.5
C473	4030016790	S.CER ECJ0EB1C103K	T	38.1/15.9
C474	4030018860	S.CER ECJ0EB0J105K	T	5/26.6
C475	4030017460	S.CER ECJ0EB1E102K	T	33/45.4
C476	4030017460	S.CER ECJ0EB1E102K	T	29.9/21.9
C477	4030017420	S.CER ECJ0EC1H470J	T	33.3/44.1
C478	4030017420	S.CER ECJ0EC1H470J	T	33.5/41.9
C479	4030017460	S.CER ECJ0EB1E102K	T	27.8/17.7
C481	4030017460	S.CER ECJ0EB1E102K	T	6.4/38.1
C482	4030017460	S.CER ECJ0EB1E102K	T	11.8/41.2
C483	4030017460	S.CER ECJ0EB1E102K	T	38.8/41.8
C485	4030017460	S.CER ECJ0EB1E102K	T	33.7/48
C486	4030017460	S.CER ECJ0EB1E102K	T	32.1/47.5
C487	4030017460	S.CER ECJ0EB1E102K	T	34.4/35.9
C488	4030017460	S.CER ECJ0EB1E102K	T	22.1/43.4
C489	4030017460	S.CER ECJ0EB1E102K	T	9.9/30.9
C490	4030017460	S.CER ECJ0EB1E102K	T	40.3/26.7
C491	4030017460	S.CER ECJ0EB1E102K	T	37.3/37.3
C492	4030017460	S.CER ECJ0EB1E102K	T	6.8/18.2
C493	4030016930	S.CER ECJ0EB1A104K	T	17.4/34.7
C494	4030017460	S.CER ECJ0EB1E102K	T	39.6/67.3
C495	4030017460	S.CER ECJ0EB1E102K	T	10/40.5
C496	4550006760	S.TAN TEESVB21A336M8R	T	12/54.7
C497	4030018390	S.CER ECJ0EB1A563K	T	8.1/37.9
C498	4030017430	S.CER ECJ0EC1H101J	T	10.5/33.2
C499	4030017420	S.CER ECJ0EC1H470J	T	15.4/36.9
C500	4030016930	S.CER ECJ0EB1A104K	T	9.3/37.9
C501	4030017730	S.CER ECJ0EB1E471K	T	35.1/13.2
C502	4030016930	S.CER ECJ0EB1A104K	T	31.9/49.6
C503	4030018860	S.CER ECJ0EB0J105K	T	32.3/48.7
C504	4550007080	S.TAN TEESVA 1C 106M8R	T	40.6/46.4
C505	4030016960	S.CER ECJ0EB1C183K	T	6.3/25.3
C506	4030016960	S.CER ECJ0EB1C183K	T	6.3/23.4
C507	4030017730	S.CER ECJ0EB1E471K	T	5/23
C508	4030017730	S.CER ECJ0EB1E471K	T	11.3/24.2
C510	4550000460	S.TAN TEESVA 1C 105M8R	T	23.5/48.5
C512	4030018860	S.CER ECJ0EB0J105K	B	22.3/49.4
C513	4030018860	S.CER ECJ0EB0J105K	B	25.9/51.5
J401	6510026130	S.CON IMSA-9681S-36Y900	T	30.9/6.2
J402	6510023831	S.CON (G)SM04B-SRSS-TB(LF)(SN)	T	34.9/52.5
J403	6510026140	S.CON 11FH-SM1-TB(LF)(SN)	T	29/43.5
DS401	5030002730	LCD L3-0048TAY-5		
DS402	5040002420	S.LED SML-310MT T86	B	13.5/16.1
DS403	5040002420	S.LED SML-310MT T86	B	32.7/15.3
DS404	5040002961	S.LED SML-A12MT T86J	B	6.2/38
DS405	5040002961	S.LED SML-A12MT T86J	B	42.8/38
DS406	5040002670	S.LED CL-165HR/YG	B	45.3/50.2
MC401	7700002760	MIC EM6027P-46C33-G-01 <HOR>		

[FRONT UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
S401	2260002840	SWI SKHLLFA010		
SP401	2510001330	SPE 036D0803 <FG>		
W401	8900016840	CAB OPC-1753 (P0.5,N36,L70) <TJM>		
W402	7120000470	JUM ERDS2T0		
W403	7120000470	JUM ERDS2T0		
W404	8900017120	CAB OPC-1754 (P0.5,N11,L35) <TJM>		
EP402	89300061530	LCD SRCN-2681-SP-N-W (SHJ)		

[VR UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
R601	7210003130	VAR TP76N97N-13F-10KA-2497		
W601	8900012340	CAB OPC-1260		

[CONNECT UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
D701	1790001810	S.VAR AVR-M1005C080MTABB	T	9.8/32.2
D702	1790001810	S.VAR AVR-M1005C080MTABB	T	8.9/32
D703	1790001810	S.VAR AVR-M1005C080MTABB	T	4.9/32.4
D704	1790001810	S.VAR AVR-M1005C080MTABB	T	3.4/32
D705	1790001810	S.VAR AVR-M1005C080MTABB	T	4.8/20.7
R701	7410001130	S.ARR EXB28V102JX	T	6.7/32.7
C701	4030017460	S.CER ECJ0EB1E102K	T	4.6/9.9
C702	4030017460	S.CER ECJ0EB1E102K	T	4.4/14.2
C704	4030017460	S.CER ECJ0EB1E102K	T	3.9/17.1
J1	6510026140	S.CON 11FH-SM1-TB(LF)(SN)	T	3.6/37.1
EP701	6910016330	S.BEA MMZ1005S 601CT-S	T	6.4/9.9
EP702	6910016330	S.BEA MMZ1005S 601CT-S	T	4.8/12.9
EP703	6910016330	S.BEA MMZ1005S 601CT-S	T	4.9/16.5
EP704	6910016330	S.BEA MMZ1005S 601CT-S	T	4.4/18.4
EP705	6910016330	S.BEA MMZ1005S 601CT-S	T	4.8/19.4
MP703	8510017840	S.PLA OG-321610G	T	7/27

M.=Mounted side (T: Mounted on the Top side, B: Mounted on the Bottom side)
S.=Surface mount

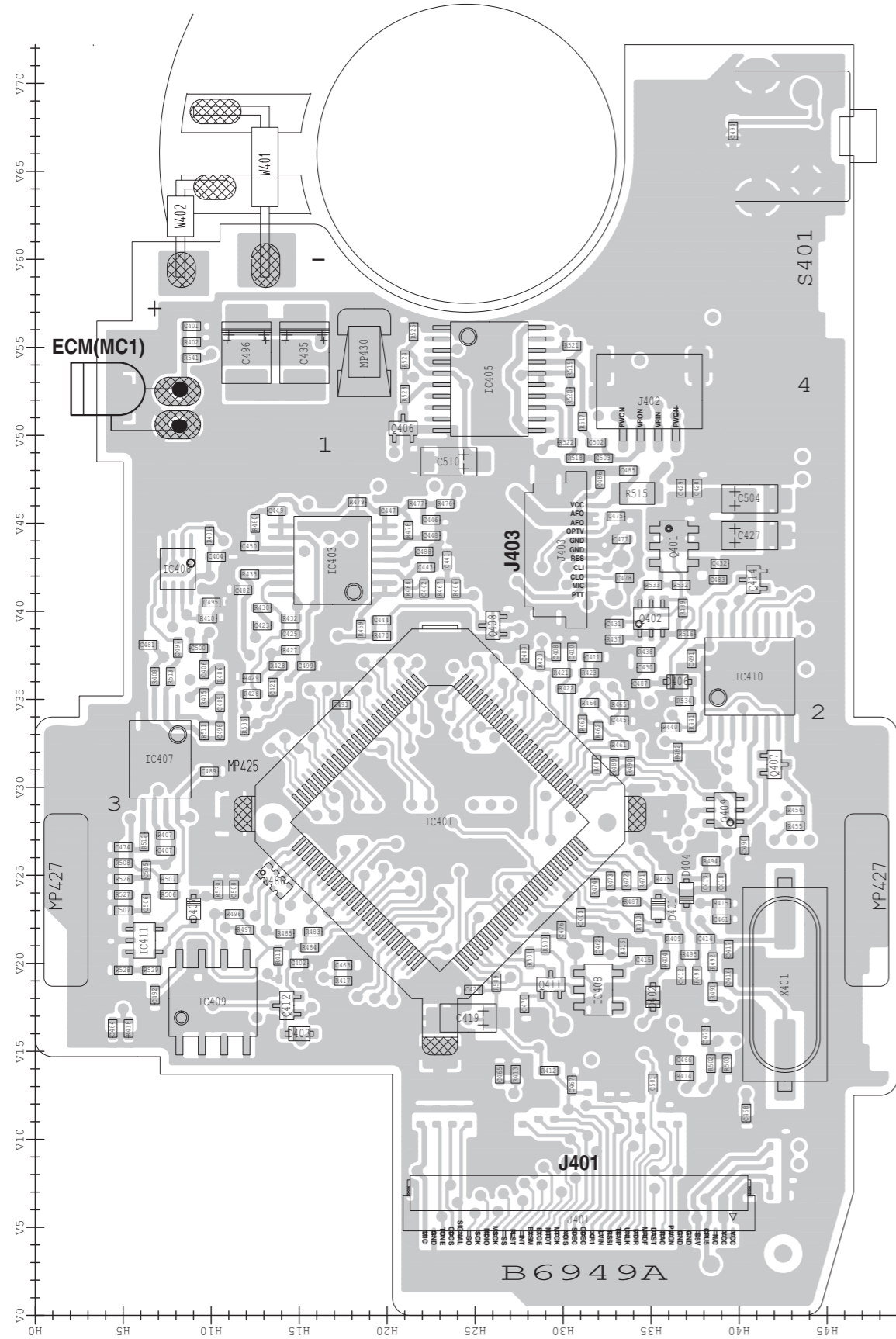
[MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION			
C374	4550007180	S.TAN F931C685MAABMA [USA]	B	52.6/15.7			
	4550007180	S.TAN F931C685MAABMA [EUR]					
	4550007180	S.TAN F931C685MAABMA [EXP]					
	4550007180	S.TAN F931C685MAABMA [CHN]					
	4550007180	S.TAN F931C685MAABMA [USA-01]					
	4550007180	S.TAN F931C685MAABMA [EUR-01]					
	4550007180	S.TAN F931C685MAABMA [EXP-01]					
	4550007180	S.TAN F931C685MAABMA [CHN-01]					
	4550007180	S.TAN F931C685MAABMA [USA-02]					
	4550007180	S.TAN F931C685MAABMA [EUR-02]					
	4550007180	S.TAN F931C685MAABMA [EXP-02]					
	4550007180	S.TAN F931C685MAABMA [CHN-02]					
	4550007080	S.TAN TEESVA 1C 106M8R [USA-03]					
	4550007080	S.TAN TEESVA 1C 106M8R [USA-04]					
	4550007080	S.TAN TEESVA 1C 106M8R [USA-05]					
	4550007080	S.TAN TEESVA 1C 106M8R [EXP-03]					
	4550007080	S.TAN TEESVA 1C 106M8R [EXP-04]					
	4550007080	S.TAN TEESVA 1C 106M8R [EXP-05]					
	C375	4550006250			S.TAN TEESVA 1A 106M8R	T	49.7/33.5
		C376			4550007410	S.TAN F931A157MNMBA [USA-02]	T
4550007410	S.TAN F931A157MNMBA [EUR-02]		T				
4550007410	S.TAN F931A157MNMBA [EXP-02]		T				
4550007410	S.TAN F931A157MNMBA [CHN-02]		T				
4550007410	S.TAN F931A157MNMBA [USA-05]		T				
J1	6510026130	S.CON IMSA-9681S-36Y900	T	7.6/30.7			
J2	6510021901	S.CON BM02B-ASRS-TF(LF)(SN)	T	2.5/33.2			
F1	5210000830	S.FUS ERBFE3R00U	T	76.1/27.9			
	F2	5210001100	S.FUS 0467.375NR [USA-01]	T	24.7/37.1		
		5210001100	S.FUS 0467.375NR [EUR-01]	T			
		5210001100	S.FUS 0467.375NR [EXP-01]	T			
		5210001100	S.FUS 0467.375NR [CHN-01]	T			
		5210001100	S.FUS 0467.375NR [USA-02]	T			
		5210001100	S.FUS 0467.375NR [EUR-02]	T			
		5210001100	S.FUS 0467.375NR [EXP-02]	T			
		5210001100	S.FUS 0467.375NR [CHN-02]	T			
		5210001100	S.FUS 0467.375NR [USA-04]	T			
		5210001100	S.FUS 0467.375NR [USA-05]	T			
		5210001100	S.FUS 0467.375NR [EXP-04]	T			
		5210001100	S.FUS 0467.375NR [EXP-05]	T			
		S1	2260002750	S.SWI EVQP7M01K		T	81.2/24
MF1	2710000850	MOT QX10A(R5.5X3)3.0V(WIRE30MM) [USA-01]	T				
	2710000850	MOT QX10A(R5.5X3)3.0V(WIRE30MM) [EUR-01]					
	2710000850	MOT QX10A(R5.5X3)3.0V(WIRE30MM) [EXP-01]					
	2710000850	MOT QX10A(R5.5X3)3.0V(WIRE30MM) [CHN-01]					
	2710000850	MOT QX10A(R5.5X3)3.0V(WIRE30MM) [USA-02]					
	2710000850	MOT QX10A(R5.5X3)3.0V(WIRE30MM) [EUR-02]					
	2710000850	MOT QX10A(R5.5X3)3.0V(WIRE30MM) [EXP-02]					
	2710000850	MOT QX10A(R5.5X3)3.0V(WIRE30MM) [CHN-02]					
	2710000850	MOT QX10A(R5.5X3)3.0V(WIRE30MM) [USA-04]					
	2710000850	MOT QX10A(R5.5X3)3.0V(WIRE30MM) [USA-05]					
	2710000850	MOT QX10A(R5.5X3)3.0V(WIRE30MM) [EXP-04]					
	2710000850	MOT QX10A(R5.5X3)3.0V(WIRE30MM) [EXP-05]					
	EP3	6910015370			S.BEA ACZ1005Y-102-T	B	25.4/35.1
	EP4	6910015600			S.BEA ACZ1005Y-241 (240)	T	23.9/21.7
EP5	6910015600	S.BEA ACZ1005Y-241 (240)	T	14/26.1			
EP8	6910014730	S.BEA MPZ2012S331A-T	B	76.7/18.7			
EP9	6910019100	S.BEA MPZ1608S101AT	T	76.1/25.3			
EP10	6910014730	S.BEA MPZ2012S331A-T	B	76.7/22.1			
MP1	8410002531	S.HEA 2681 PA HEATSINK-1	B	61/25.5			
MP7	6910014760	S.PLA OG-503040	B	42.3/39.2			

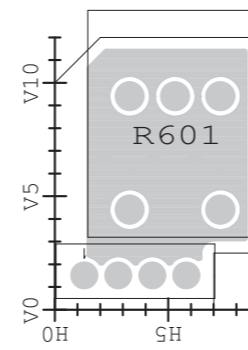
M.=Mounted side (T: Mounted on the Top side, B: Mounted on the Bottom side)
S.=Surface mount

BOARD LAYOUTS

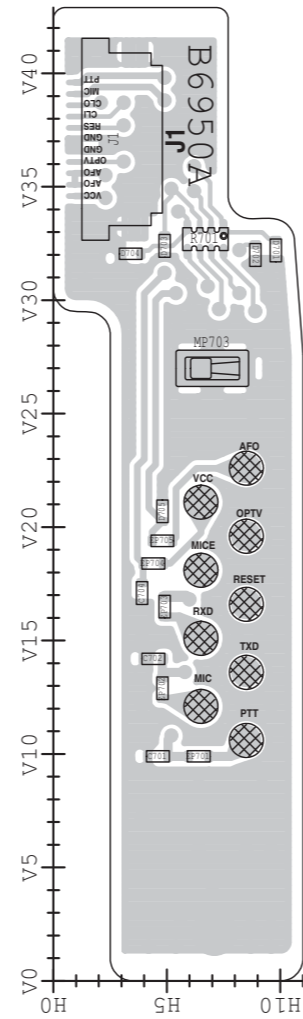
• FRONT UNIT (TOP VIEW)



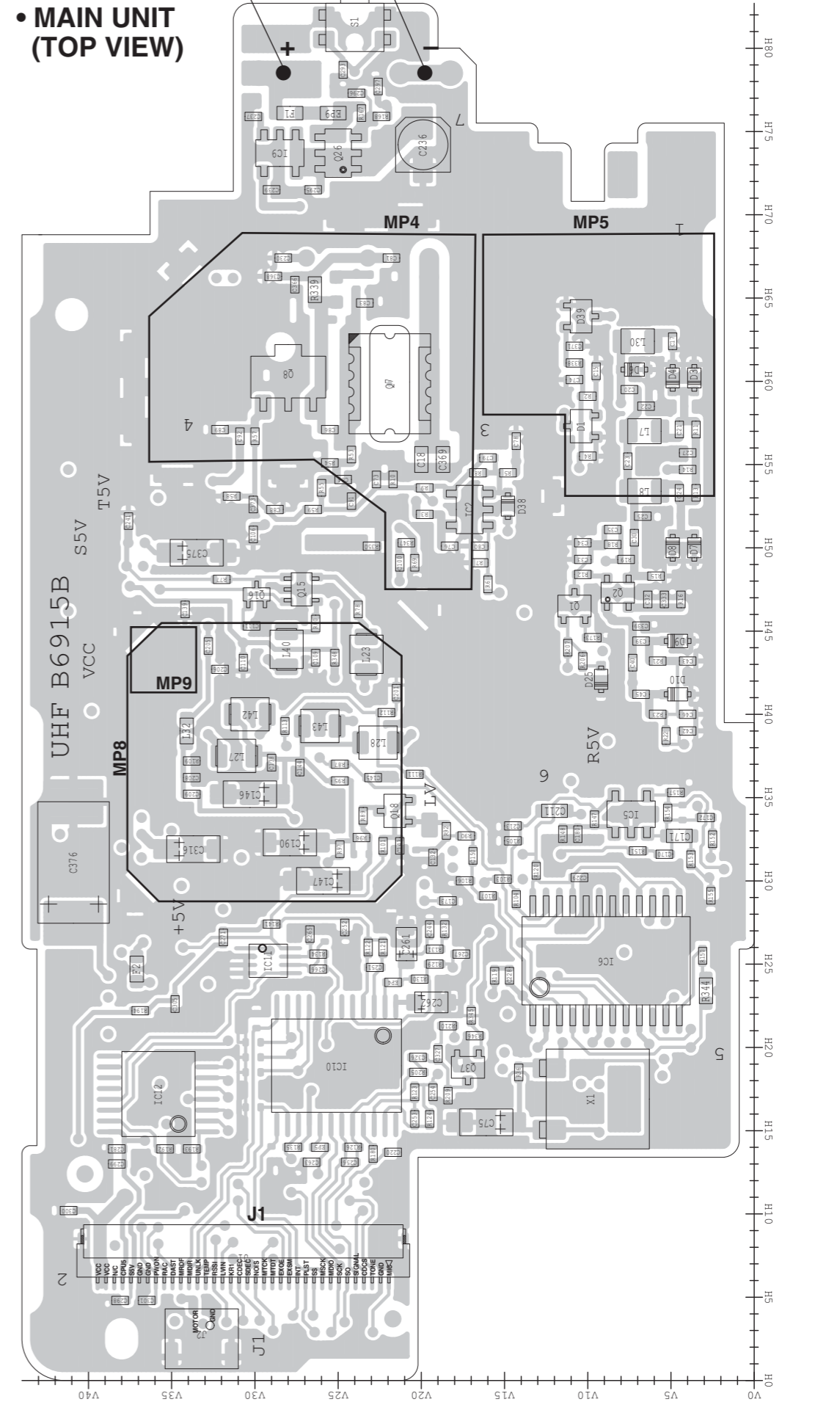
• VR UNIT (TOP VIEW)



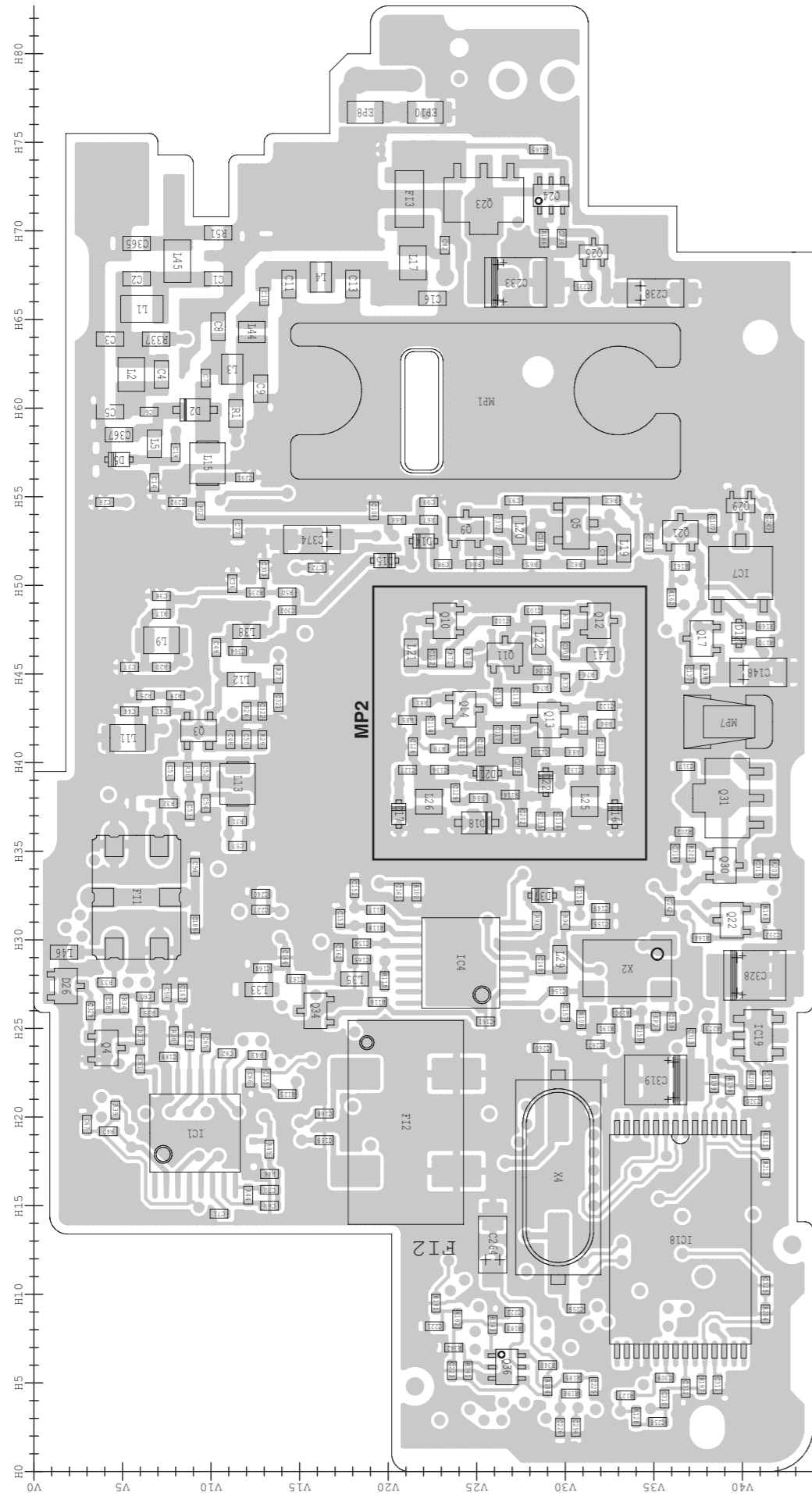
• CONNECT UNIT (TOP VIEW)



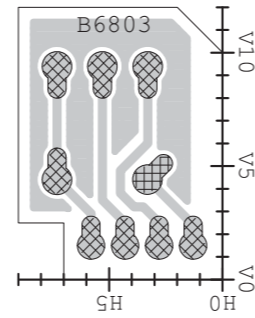
• MAIN UNIT (TOP VIEW)



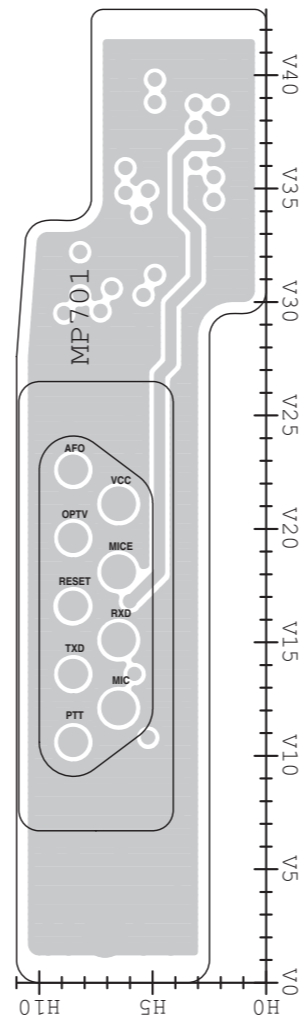
• **MAIN UNIT
(BOTTOM VIEW)**



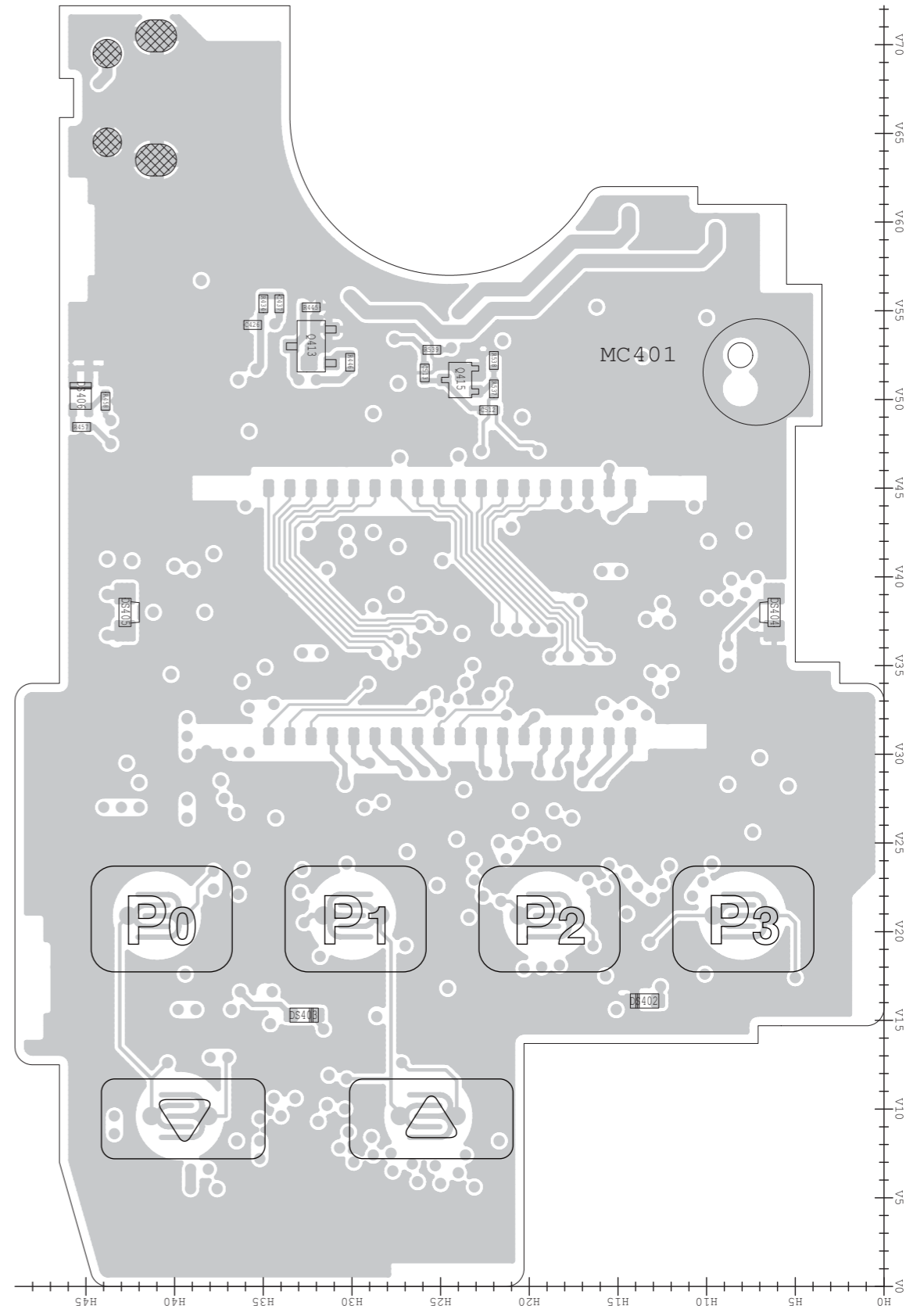
• **VR UNIT
(BOTTOM VIEW)**



• **CONNECT UNIT
(BOTTOM VIEW)**

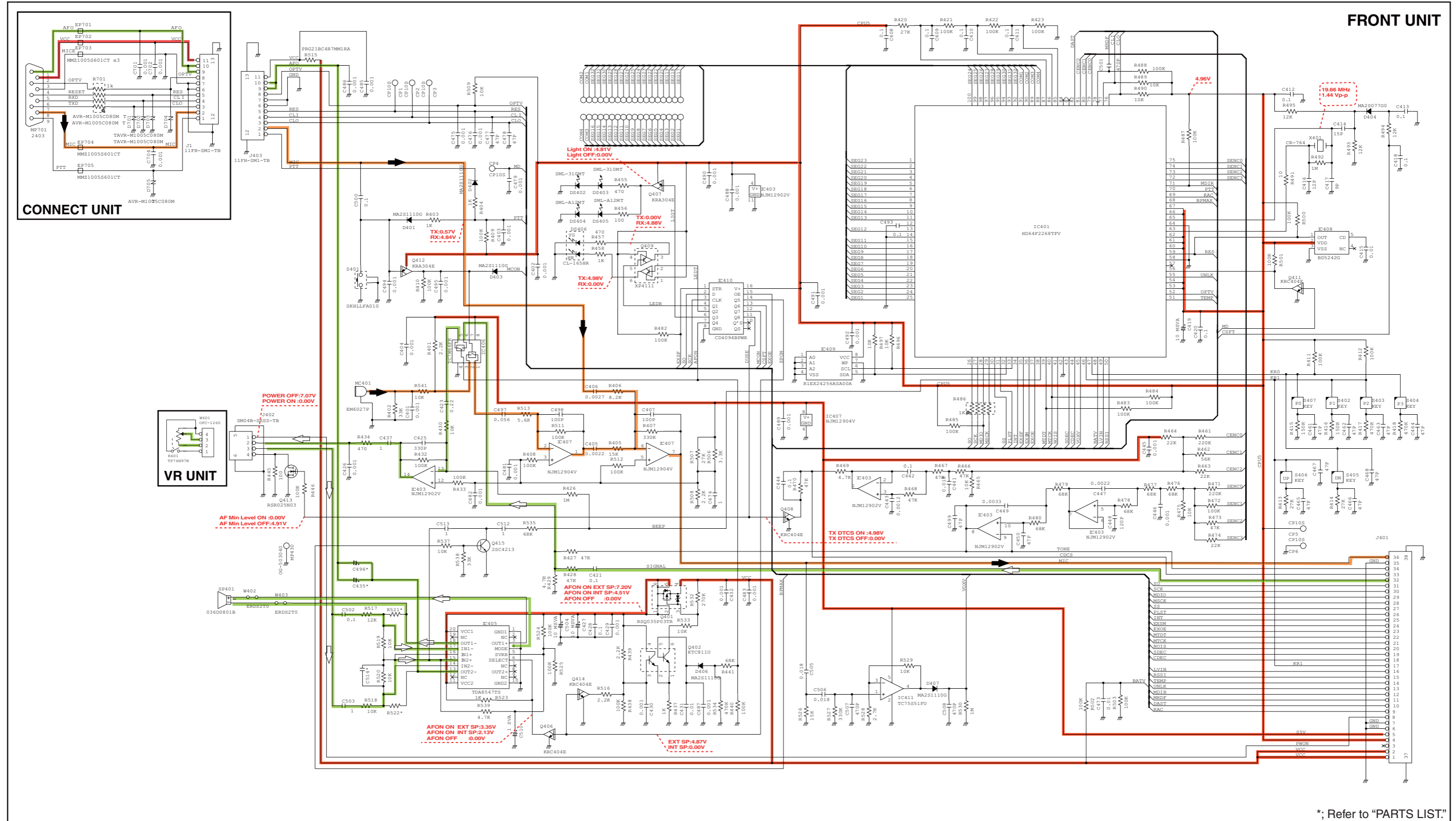


• **FRONT UNIT
(BOTTOM VIEW)**



The combination of this side and the bottom side shows the board layout in the same configuration as the actual P.C.Board.

VOLTAGE DIAGRAM



*; Refer to "PARTS LIST."

MAIN UNIT (Left side)

Vibration Motor (MF1)

Vibration ON -3.18V
 Vibration OFF -0.00V

Vibration ON -4.96V
 Vibration OFF -0.00V

Vibration ON -4.81V
 Vibration OFF -0.00V

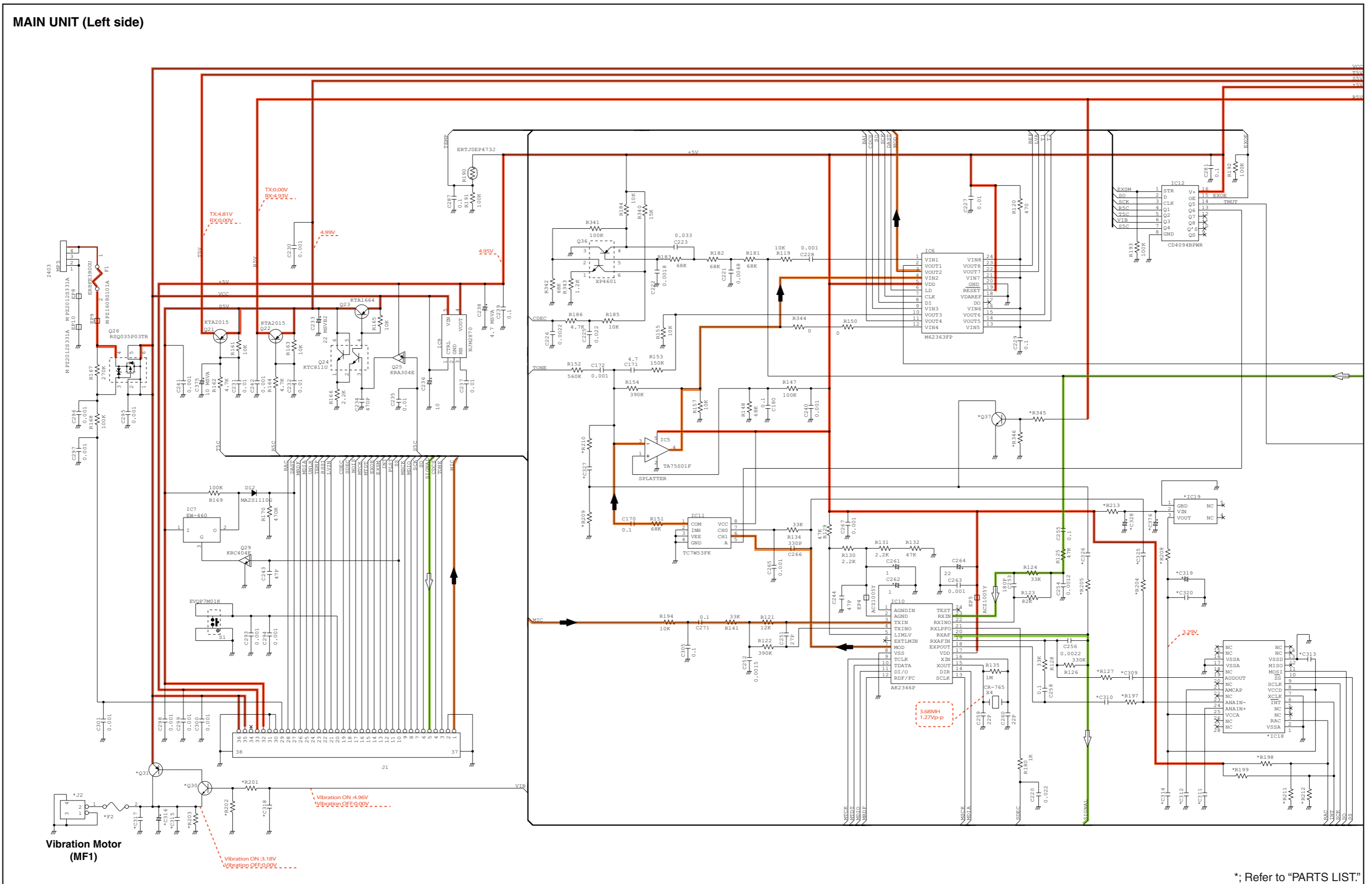
Vibration ON -4.93V
 Vibration OFF -0.00V

4.99V

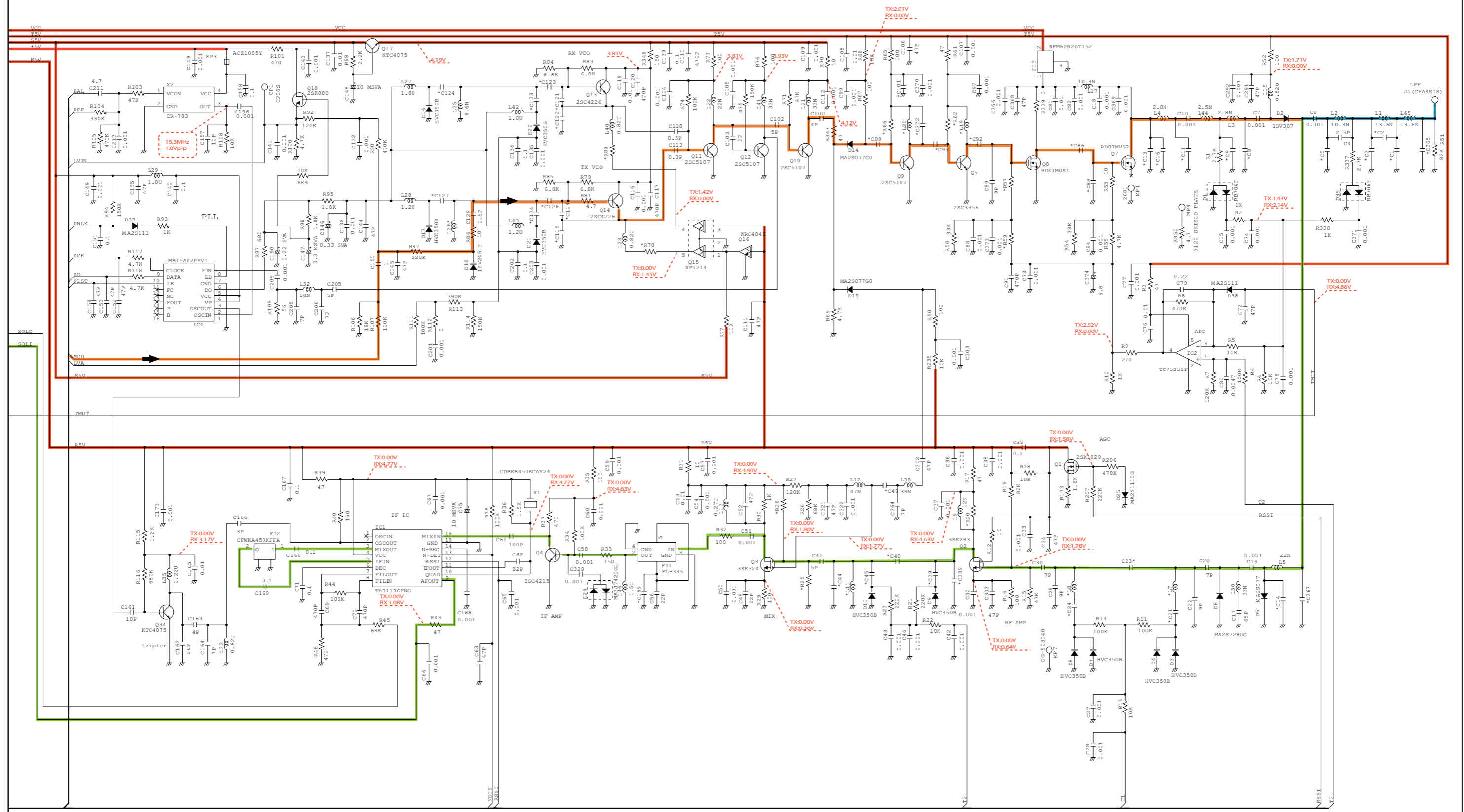
4.95V

3.29V

3.68MHz 1.27Vp-p



MAIN UNIT (Right side)



*; Refer to "PARTS LIST."



SERVICE MANUAL

UHF TRANSCEIVER

IC-F60V
IC-F61V

S-14424XZ-C1
Mar. 2008

Icom Inc.

INTRODUCTION

This service manual describes the latest service information for the **IC-F60V/F61V** UHF TRANSCEIVER at the time of publication.

Model	Version	Band Low/High	Channel spacing (kHz)	Vibration	Voice storage	
F60V	USA	USA	Low band (400–470 MHz)	12.5/25.0	N/A	N/A
		USA-01			Yes	N/A
		USA-02			Yes	Yes
		USA-03			N/A	N/A
		USA-04			Yes	N/A
	USA-05	Yes	Yes			
	Export	EXP	Low band (400–470 MHz)	12.5/25.0	N/A	N/A
		EXP-01			Yes	N/A
		EXP-02			Yes	Yes
		EXP-03			N/A	N/A
EXP-04		Yes			N/A	
F61V	Europe	EUR	Low band (400–470 MHz)	12.5/20.0/25.0	N/A	N/A
		EUR-01			Yes	N/A
		EUR-02			Yes	Yes
	China	CHN		12.5/25.0	N/A	N/A
		CHN-01			Yes	N/A
		CHN-02			Yes	Yes

UNIT ABBREVIATIONS:

F=FRONT UNIT
M=MAIN UNIT
V=VR UNIT
CO=CONNECT UNIT

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

CAUTION

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

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

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

ORDERING PARTS

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

1. 10-digit Icom parts numbers
2. Component name
3. Equipment model name and unit name
4. Quantity required

<ORDER EXAMPLE>

1110003491 S.IC TA31136FNG IC-F60V MAIN UNIT 5 pieces
8820001210 Screw 2438 screw IC-F61V Top cover 10 pieces

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

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REPAIR NOTES

1. Make sure the problem is internal before disassembling the transceiver.
2. **DO NOT** open the transceiver until the transceiver is disconnected from its power source.
3. **DO NOT** force any of the variable components. Turn them slowly and smoothly.
4. **DO NOT** short any circuits or electronic parts. An insulated tuning tool **MUST** be used for all adjustments.
5. **DO NOT** keep power ON for a long time when the transceiver is defective.
6. **DO NOT** transmit power into a Standard Signal Generator or a Sweep Generator.
7. **ALWAYS** connect a 50 dB to 60 dB attenuator between the transceiver and a Deviation Meter or Spectrum Analyzer when using such test equipment.
8. **READ** the instructions of test equipment thoroughly before connecting a test equipment to the transceiver.

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■ GENERAL

• Frequency coverage	: 400–470 MHz [Low band] 450–512 MHz [USA-03], [USA-04], [USA-05] 450–520 MHz [EXP-03], [EXP-04]
• Number of conventional channels	: 128 ch / 8 zones
• Type of emission	: Wide 16K0F3E (25.0 kHz) Middle 14K0F3E (20.0 kHz) [Europe] only Narrow 11K0F3E (12.5 kHz) [USA], [Export], [China] 8K50F3E (12.5 kHz) [Europe]
• Antenna impedance	: 50 Ω (Nominal)
• Operating temperature range	: –30°C to +60°C; –22°F to +140°F [USA], [Export], [China] –25°C to +55°C [Europe]
• Power supply requirement	: Specified Icom's battery packs only (7.2 V DC nominal; negative ground)
• Current drain (Approx.)	: Receiving 85 mA (stand-by) 500 mA (max. audio with internal speaker) 300 mA (max. audio with external speaker) Transmitting 1.8 A (at 4.0 W) 0.8 A (at 1.0 W)
• Dimensions (Projections not included)	: 56.0 (W)×97.0 (H)×36.4 (D) mm; 2 7/32 (W)×3 13/16 (H)×1 7/16 (D) in.
• Weight (Incl. BP-227)	: Approx. 284 g; 10 1/32 oz.

■ TRANSMITTER

• Output power	: 4 W (High)/2 W (Low2)/1 W (Low1)
• Modulation	: Variable reactance frequency modulation
• Maximum frequency deviation	: ±5.0 kHz (Wide) ±4.0 kHz (Middle) [Europe] only ±2.5 kHz (Narrow)
• Frequency stability	: ±2.5 ppm
• Spurious emissions	: 70 dB min. [USA], [Export], [China] 0.25 μW (≤1 GHz), 1.0 μW (>1 GHz) [Europe]
• Adjacent channel power	: 70 dB min. (Wide) 70 dB min. (Middle) [Europe] only 60 dB min. (Narrow)
• Audio harmonic distortion	: 3% (at AF 1 kHz 40% deviation)
• FM Hum and noise (without CCITT filter)	: 40 dB min., 46 dB typ. (Wide) [USA], [Export], [China] only 34 dB min., 40 dB typ. (Narrow)
• Residual modulation (with CCITT filter)	: 45 dB min., 55 dB typ. (Wide) [Europe] only 43 dB min., 53 dB typ. (Middle) 40 dB min., 50 dB typ. (Narrow)
• Limiting charact of modulator	: 60%–100% of max. deviation
• Microphone impedance	: 2.2 kΩ

■ RECEIVER

- Receive system : Double-conversion superheterodyne system
- Intermediate frequencies : 1st IF: 46.35 MHz, 2nd IF: 450 kHz
- Sensitivity : 0.25 μ V typ. at 12 dB SINAD [USA], [Export], [China]
-4 dB μ V (EMF) typ. at 20 dB SINAD [Europe]
- Squelch sensitivity (at threshold) : 0.25 μ V typ. [USA], [Export], [China]
-4 dB μ V (EMF) typ. [Europe]
- Adjacent channel selectivity : 70 dB min., 75 dB typ. (Wide)
70 dB min., 75 dB typ. (Middle) [Europe] only
60 dB min., 65 dB typ. (Narrow)
- Spurious response : 70 dB
- Intermodulation rejection ratio : 70 dB min., 74 dB typ. [USA], [Export], [China]
65 dB min., 67 dB typ. [Europe]
- Hum and noise (without CCITT filter) : 40 dB min., 45 dB typ. (Wide)
[USA], [Export], [China] only 34 dB min., 40 dB typ. (Narrow)
- Hum and noise (with CCITT filter) : 45 dB min., 55 dB typ. (Wide)
[Europe] only 43 dB min., 53 dB typ. (Middle)
40 dB min., 50 dB typ. (Narrow)
- Audio output power : 0.7 W typ. (at 5% distortion with the internal speaker)
(at 5% distortion with an 8 Ω load) 0.5 W typ. (at 5% distortion with an 8 Ω external speaker)
- Audio output impedance : 8 Ω

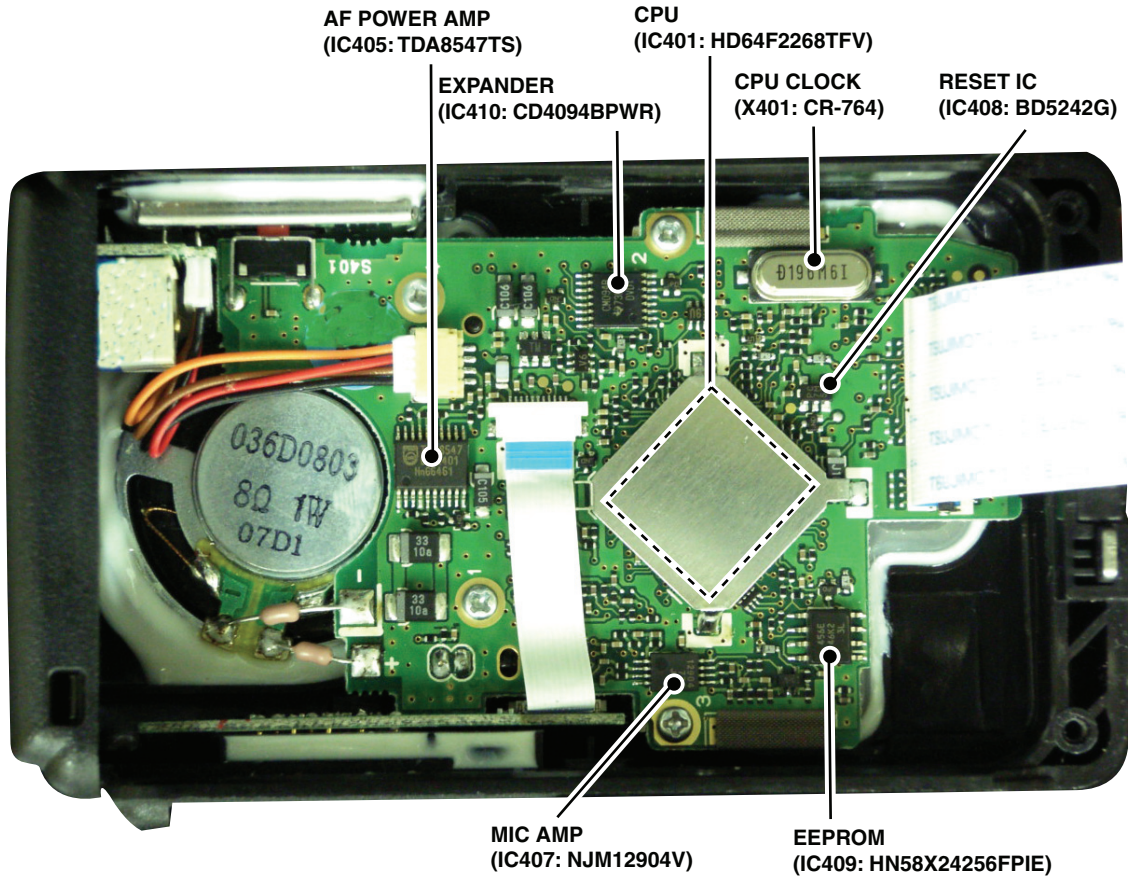
Specifications are measured in accordance with EIA-152-C/204D, TIA-603 (for [USA], [Export], [China]) or EN 300 086 (for [Europe]).

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

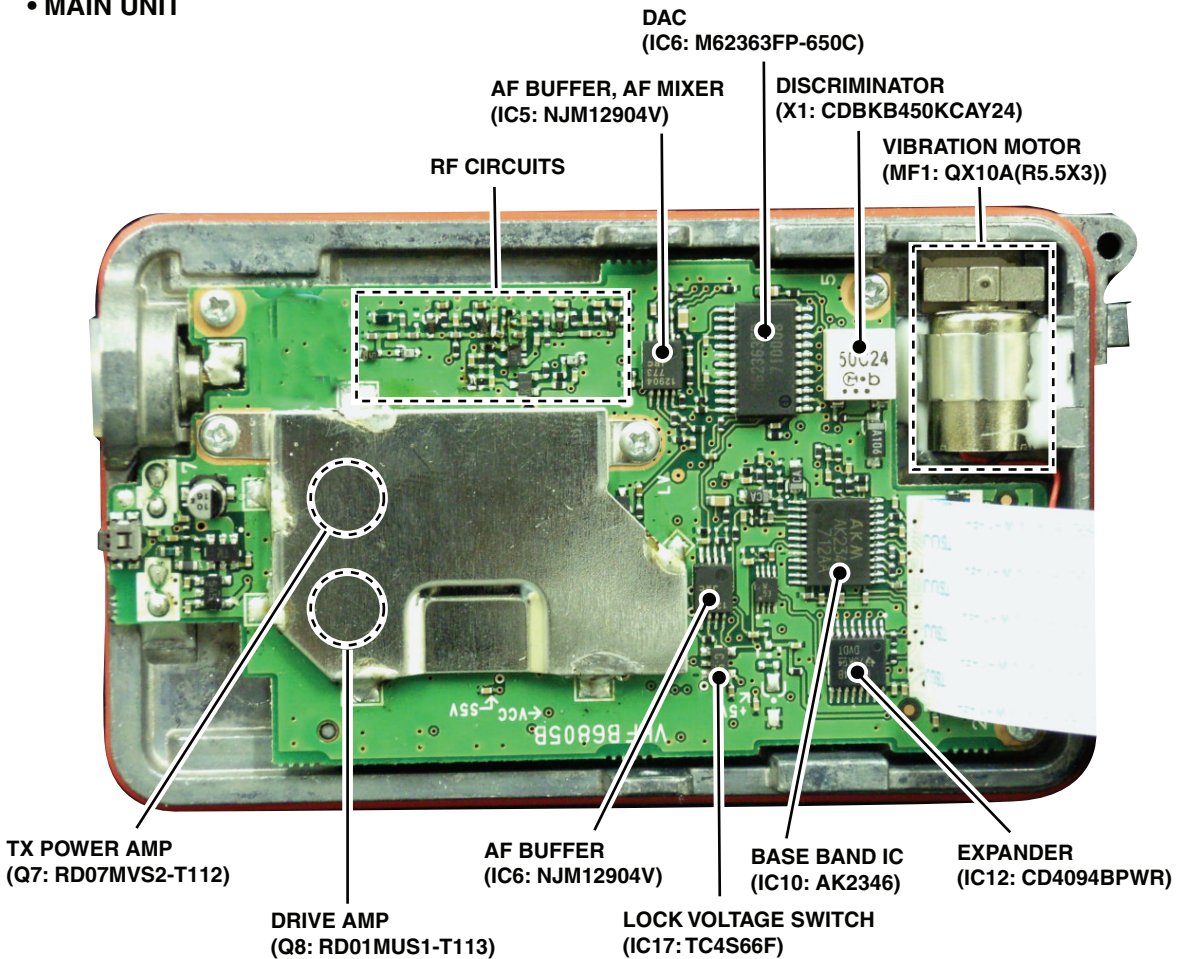
SECTION 2

INSIDE VIEWS

• FRONT UNIT



• MAIN UNIT

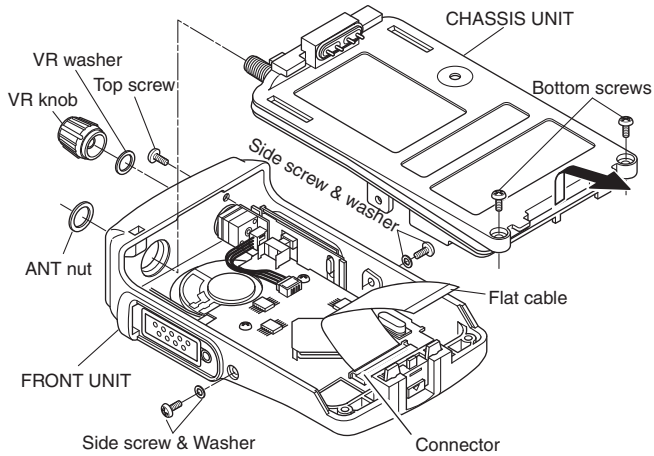


SECTION 3 DISASSEMBLY INSTRUCTION

1. REMOVING THE CHASSIS UNIT

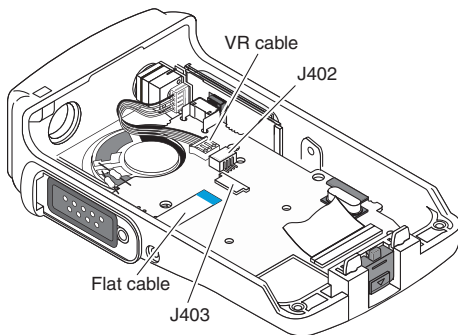
BE CAREFUL about the flat cable and connector when separating the CHASSIS UNIT from the FRONT UNIT.

- ① Unscrew the ANT nut, and remove the VR knob.
- ② Remove the VR washer, and unscrew the top screw.
- ③ Unscrew side screws and washers.
- ④ Unscrew bottom screws.
- ⑤ Take off the CHASSIS UNIT carefully in the direction of the arrow.
- ⑥ Disconnect the flat cable from the CHASSIS UNIT (MAIN UNIT).

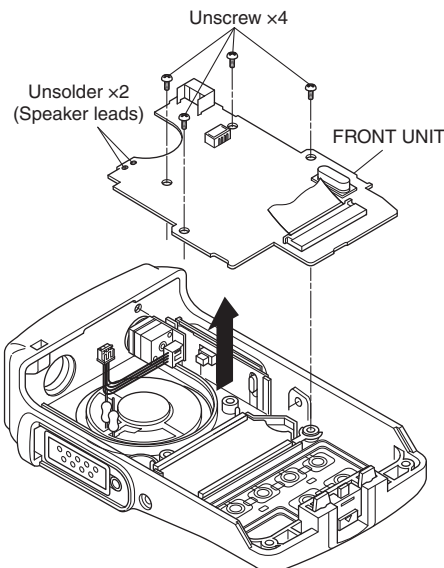


2. REMOVING THE FRONT UNIT

- ① Disconnect the VR cable from J402.
- ② Disconnect the flat cable from J403.

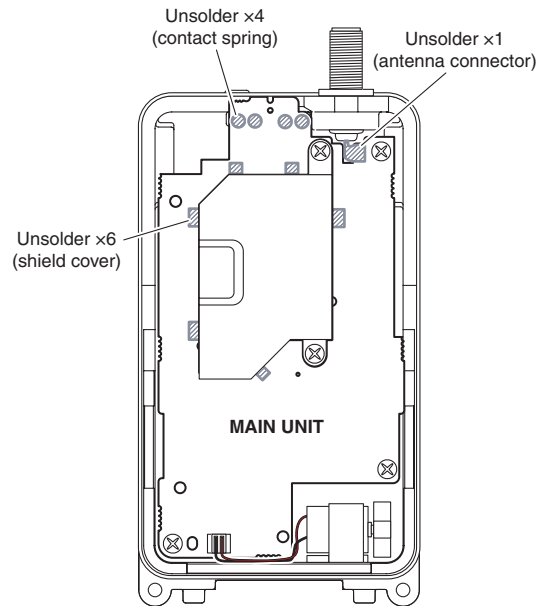


- ③ Unscrew 4 screws.
- ④ Unsolder 2 points (at the speaker leads).
- ⑤ Take off the FRONT UNIT in the direction of the arrow.

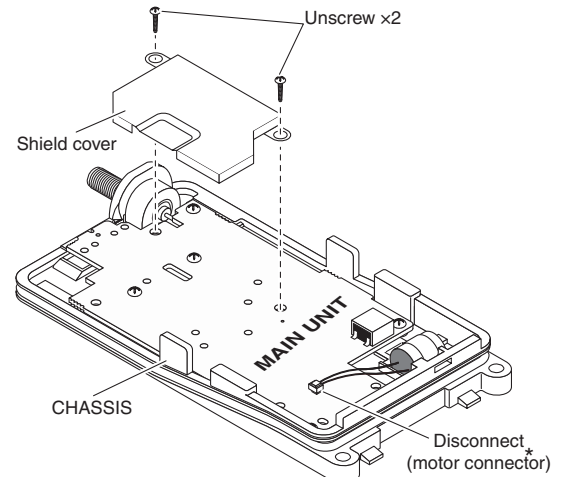


3. REMOVING THE MAIN UNIT

- ① Unsolder 6 points from the shield cover.
- ② Unsolder 4 points from the contact spring.
- ③ Unsolder 1 point from the antenna connector.

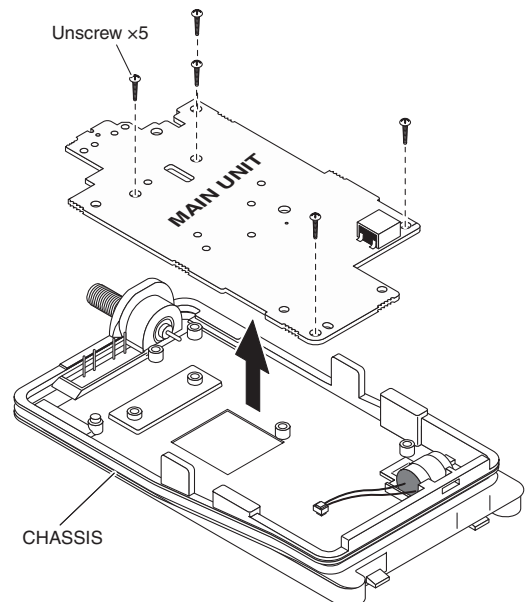


- ④ Unscrew 2 screws, and remove the shield cover.
- ⑤ Disconnect the motor connector* from the MAIN UNIT.



*: Except [USA], [EUR], [EXP], [CHN], [USA-03], [EXP-03]

- ⑥ Unscrew 5 screws, and take off the MAIN UNIT.



4-1 RECEIVER CIRCUITS

RF CIRCUITS

RF circuits consist of RF filters, antenna switch (ANT SW), RF amplifier (RF AMP), etc., and extracts and amplifies the signals of frequency which desired to receive.

The received signals (RX signals) from the antenna are passed through the 3-pole LPF, ANT SW (as an LPF in RX), BEF (Band Eliminate Filter; as a trap), limiter, and the two-staged tuned BPF. The filtered RX signals are amplified by the RF AMP, and passed through another two-staged tuned BPF. The filtered RX signals are then applied to the 1st IF circuits.

The ANT SW toggles RX line and TX line. While receiving, the TX line and the antenna is disconnected to prevent RX signals entering. The RX line is disconnected from the GND simultaneously, and an LPF which guides received signals to the RX circuits is composed.

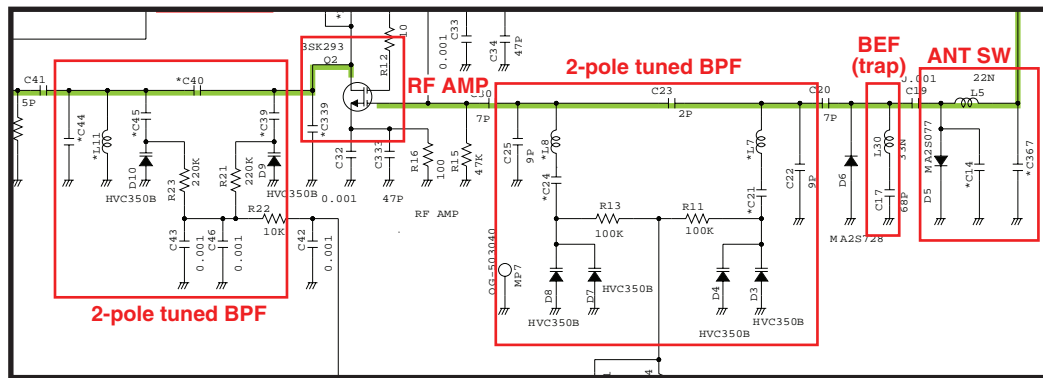
While transmitting, serial-connected PIN diodes are ON, thus the TX line is connected to the antenna, and the RX line is connected to the GND simultaneously to prevent TX signal entering.

The limiter protects RX line from over-level RF inputs, and the BEF (=trap) damps unwanted signals to GND.

The tuned-BPF is adjusted so that it responds to receiving frequency and rejects all others, by the variable capacitor whose capacitance is varied by added voltage "T1" and "T2."

The RF AMP amplifies RX signals to a level suited to the 1st mixer.

• RF CIRCUITS



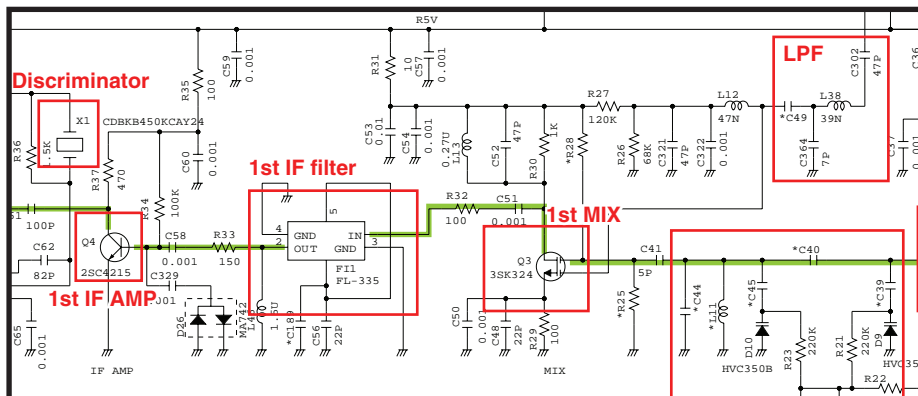
1ST IF CIRCUITS

The 1st IF circuits consist of 1st mixer, 1st IF filter and 1st IF amplifier (IF AMP). And it converts the RX signals into the 1st IF signal, then filters to remove unwanted signals and amplifies.

The converted 1st IF signal is passed through the 1st IF filter to be removed unwanted signals. The filtered 1st IF signal is applied to the 1st IF AMP via the limiter. The amplified 1st IF signal is then applied to the 2nd IF circuits.

The filtered RX signals are applied to the 1st mixer to be converted into the 46.35 MHz 1st IF signal, by being mixed with the 1st Local Oscillator (LO) signals from the RX VCO via the LPF.

• 1ST IF CIRCUITS



2ND IF AND FM DEMODULATOR CIRCUITS

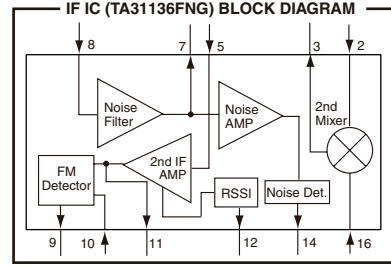
The 2nd IF circuits consist of 2nd mixer, 2nd IF filter, 2nd IF amplifier. And it converts the 1st IF signal into the 2nd IF signal, then filters to remove unwanted signals and amplifies. IF IC "TA31136FNG" contains whole of the 2nd IF circuits and FM demodulator circuit too.

The 1st IF signal is applied to the IF IC, and converted into the 2nd IF signal, by being mixed with the 15.3 MHz 2nd LO signal at internal 2nd mixer.

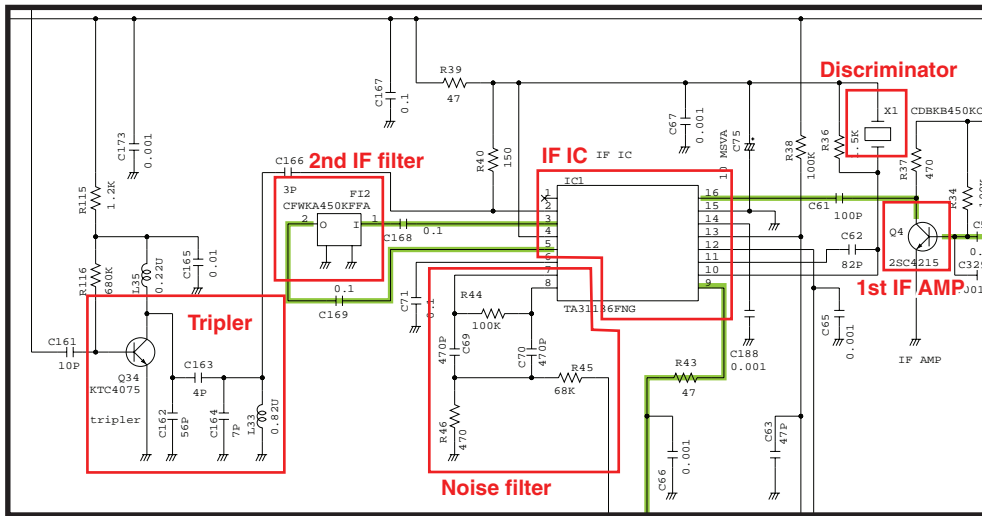
The 2nd LO signal is generated by reference frequency oscillator, buffered by the PLL IC and tripled by the tripler, then applied to the IF IC.

The converted 2nd IF signal is filtered by external 2nd IF filter (ceramic filter), and saturation-amplified by internal 2nd IF AMP. The amplified 2nd IF signal is FM-demodulated by the quadrature detector.

The demodulated AF signals "SQLI" are applied to the RX AF circuits.



• 2ND IF AND FM DEMODULATOR CIRCUITS



RX AF CIRCUITS

The RX AF circuits consist of AF filters, AF amplifier (AF AMP), AF power amplifier, etc., and amplify, filter the AF signals FM-demodulated by the IF IC.

This transceiver employs the base band IC for audio signal processing for both transmit and receive. The base band IC is an audio processor and composed of RF amplifier, compressor, expander, scrambler, etc. in its package.

The demodulated AF signals from the IF IC are applied to the base band IC (IC10, pin 23). The applied AF signals are amplified at the amplifier section and level adjusted at the volume controller section, then suppressed unwanted 3 kHz and higher audio signals at LPF. The filtered AF signals are applied (bypassed) the TX/RX HPF, scrambler, de-emphasis sections in sequence.

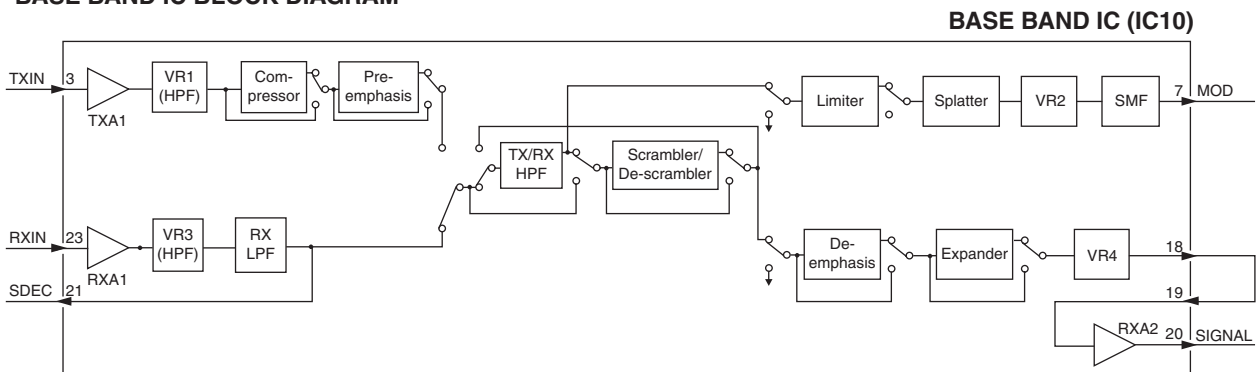
The TX/RX HPF filters out 250 Hz and lower audio signals, and the de-emphasis circuit obtains -6 dB/oct of audio characteristics. The expander expands the compressed audio signals and also noise reduction function is provided.

The AF signals are then level adjusted at the volume controller section and amplified at the amplifier section, then output from pin 20 (IC10).

The processed AF signals from the base band IC (IC10) are applied to the FRONT UNIT via J1 (MAIN) and J401 (FRONT).

The AF signals from the MAIN UNIT "SIGNAL" are passed through the AF mute SW, LPF and variable register (VR UNIT) for audio level adjustment, then applied to the AF power AMP. The amplified AF signals "AFO" are applied to the internal speaker, or external speaker via the [SP MIC] jack (MP701; CHASSIS).

• BASE BAND IC BLOCK DIAGRAM



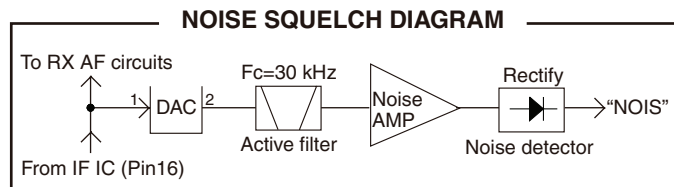
SQUELCH CIRCUITS

• NOISE SQUELCH

The noise squelch cuts off the AF output signals when no RF signals are received. Extracting noise components (approx. 30 kHz signals) in the demodulated AF signals, the squelch circuit turns the AF power amplifier and AF switches ON and OFF.

A portion of FM-demodulated AF signal from the IF IC is adjusted its level (=squelch threshold level) by DAC (D/A converter; IC6, pins 1, 2), then passed through the noise filter (M: IC1, pins 7, 8 and R44-46, C69, 70) to extract the noise components (approx. 30 kHz signals) only. The noise components are rectified to be converted into the pulse-type signal by noise detector to produce DC voltage corresponding to the noise level "NOIS". Then the DC voltage is applied to the CPU (IC401, pin 41) and compared with the reference level preset in the CPU.

If the CPU interpretes that the noise level is higher than preset one, the CPU sets the "AFON" signal to "High" to turn the AF power AMP controller OFF, and the AF mute SW is turned OFF simultaneously. Thus closing the squelch is accomplished.



4-2 TRANSMITTER CIRCUITS

TX AF CIRCUITS

The TX AF circuits consist of microphone amplifier (MIC AMP) and AF filters. The AF filter cuts off the signals except voice signals (300 Hz or lower and 3 kHz or higher).

The audio signals from the internal microphone (MIC signals) are passed through MIC mute SW and amplified by two MIC AMPs (#1 and #2).

• TONE SQUELCH

The tone squelch connects the RX AF line and activates the AF power amplifier to emit the AF signals only when receiving a signal which contains the tone frequency matched with preset in the CPU. Detecting signal in the demodulated AF signals, the tone squelch circuit turns the AF power amplifier and AF switches ON and OFF.

<CTCSS/DTCS>

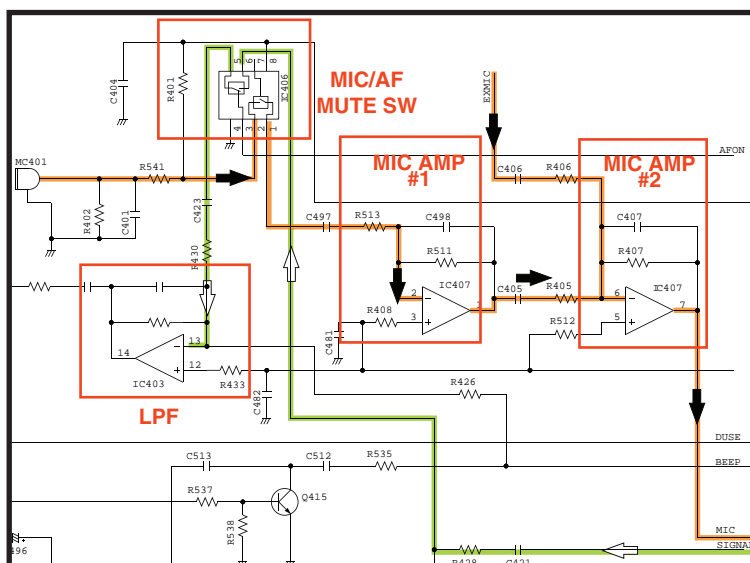
A portion of FM-demodulated AF signals from the IF IC are passed through the tone filter (M: Q36, pins 5, 6) to remove unwanted voice signals. The filtered tone signals are applied to the CPU (IC401, pin 44).

<2/5 TONE, DTMF>

A portion of FM-demodulated AF signals are output from the baseband IC (M: IC10, pin 21), and passed through the tone filter (M: R180, C220) to remove unwanted voice signals. The filtered tone signals are applied to the CPU (IC401, pin 43).

The CPU compares the tone frequency/code preset in the CPU, and if the applied tone frequency/code is matched to preset one, the CPU controls the AF power AMP and AF mute SW as same as "NOISE SQUELCH."

• TX AF CIRCUITS



The MIC signals from the external microphone "EXMIC" are applied to the FRONT UNIT via [SP MIC] jack, and amplified by MIC AMP (#2).

The amplified MIC signals "MIC" are applied to the MAIN UNIT via J401(FRONT UNIT) and J1 (MAIN UNIT).

The MIC signals from the FRONT UNIT are applied to the baseband IC (IC10, pin 3) and processed.

The applied MIC signals are amplified at the amplifier (TXA1), and level adjusted at the volume controller (VR1). The level adjusted MIC signals are applied (bypassed) the compressor section, pre-emphasis section, TX/RX HPF, de-scrambler, limiter, splatter, in sequence, then applied to another volume controller.

The compressor compresses the MIC signals to provide high S/N ratio for receive side, and the pre-emphasis obtains +6 dB/oct audio characteristics. The TX/RX HPF filters out 250 Hz and lower audio signals, the limiter limits its level and the splatter filters out 3 kHz and higher audio signals. The filtered MIC signals are level adjusted at another volume controller (VR2), and then output from pin 7 via smoothing filter (SMF).

The output MIC signals are passed through the FM/PM SW (IC11, pins 6, 1) and LPF (IC5, pins 2, 1) then applied to the DAC (D/A Converter; IC6, pin 4) and level-adjusted (deviation adjustment). The level-adjusted MIC signals are output from pin 3, then applied to the modulation circuit as the modulation signals "MOD" via buffer (IC5, pins 6, 7).

MODULATION CIRCUIT

The modulation circuit FM-modulates the VCO oscillating signal with the modulation signals from the TX AF circuits.

• VOICE SIGNAL

The buffer-amplified AF signals are applied to the variable capacitor (VD) to change its reactance for FM modulation.

• TONE SIGNALS

Tone signals are generated in the CPU and applied to the both of the VCO and reference frequency oscillator to be modulated.

• MODULATION CIRCUIT AND TX/RX VCOS

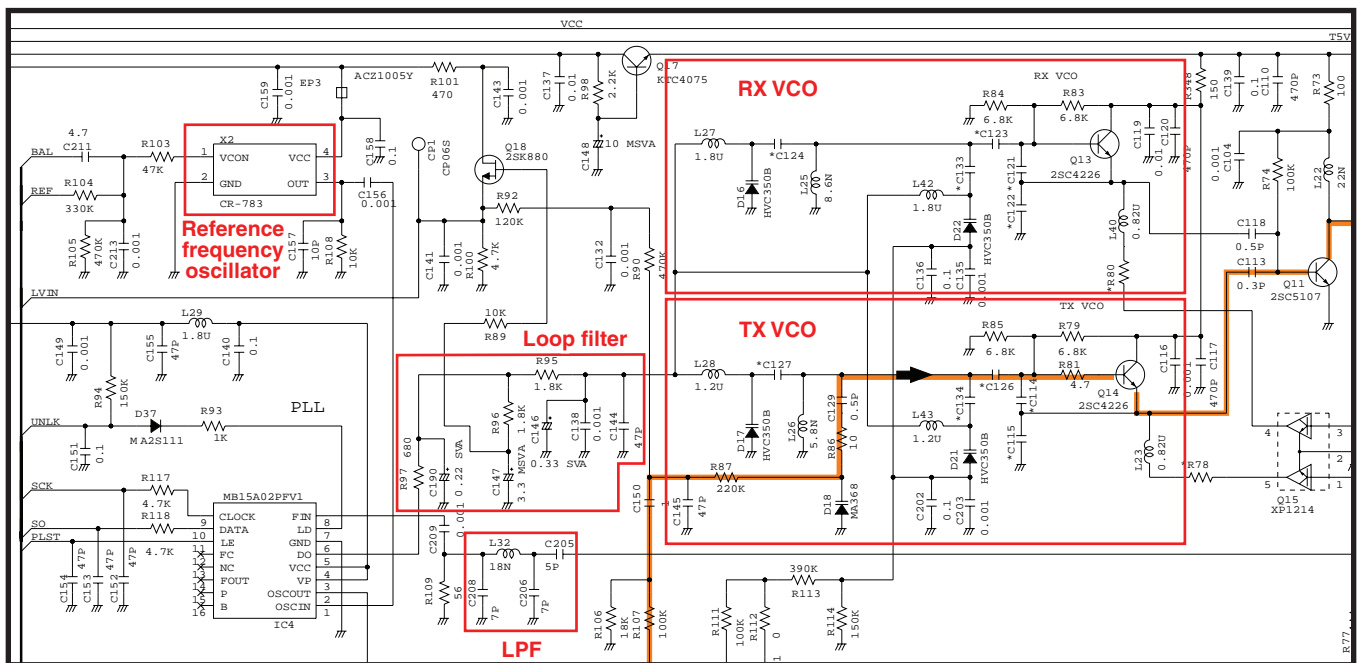
<CTCSS/DTCS>

CTCSS/DTCS signals ("CEN0"-"CEN2") are generated by the CPU (F: IC401, pins 79-81) and converted its wave form by R461-R463 (F), then passed through the LPF (F: IC403, pins 3, 1). The filtered CTCSS/DTCS signals are then level-adjusted by DAC (M: IC6, pins 9, 10) and applied to the AF mixer (M: IC5, pin 3) to be mixed with MIC signals, then applied to the TX VCO as the modulation signals. The CTCSS/DTCS signals are also applied to the reference signal oscillator (M; X2) too.

<2/5 TONE, DTMF>

2/5 tone and DTMF signals are ("SEN0"-"SEN3") are generated by the CPU (F: IC401, pins 72-75) and converted its wave form by R471-R474 (F), then passed through the two-staged LPF (F: IC403, pins 5, 7 and pins 10, 8). The filtered 2/5 tone and DTMF signals are applied to the AF mixer (M: IC5, pin 2) to be mixed with MIC signals. The mixed signals are then applied to the TX VCO as the modulation signals. The CTCSS/DTCS signals are also applied to the reference signal oscillator (M: X2, pin 1) too.

The modulated VCO output is buffer-amplified by two buffers (Q11, Q10), and applied to the pre-driver via TX/RX SW.



TRANSMIT AMPLIFIERS

The transmit amplifiers consist several RF amplifiers (pre-driver, driver and power), and amplify the TX VCO output to the transmit output level.

The TX VCO output is applied to the pre-drive amplifier via the LO SW. The amplified TX signal is amplified by YGR and drive amplifiers, then power-amplified by the power amplifier to obtain 4 W (max.) of TX output power.

The power-amplified TX signal is passed through the LPFs (as a harmonic filter), ANT SW (TX), and another LPF, then applied to the antenna.

APC CIRCUIT

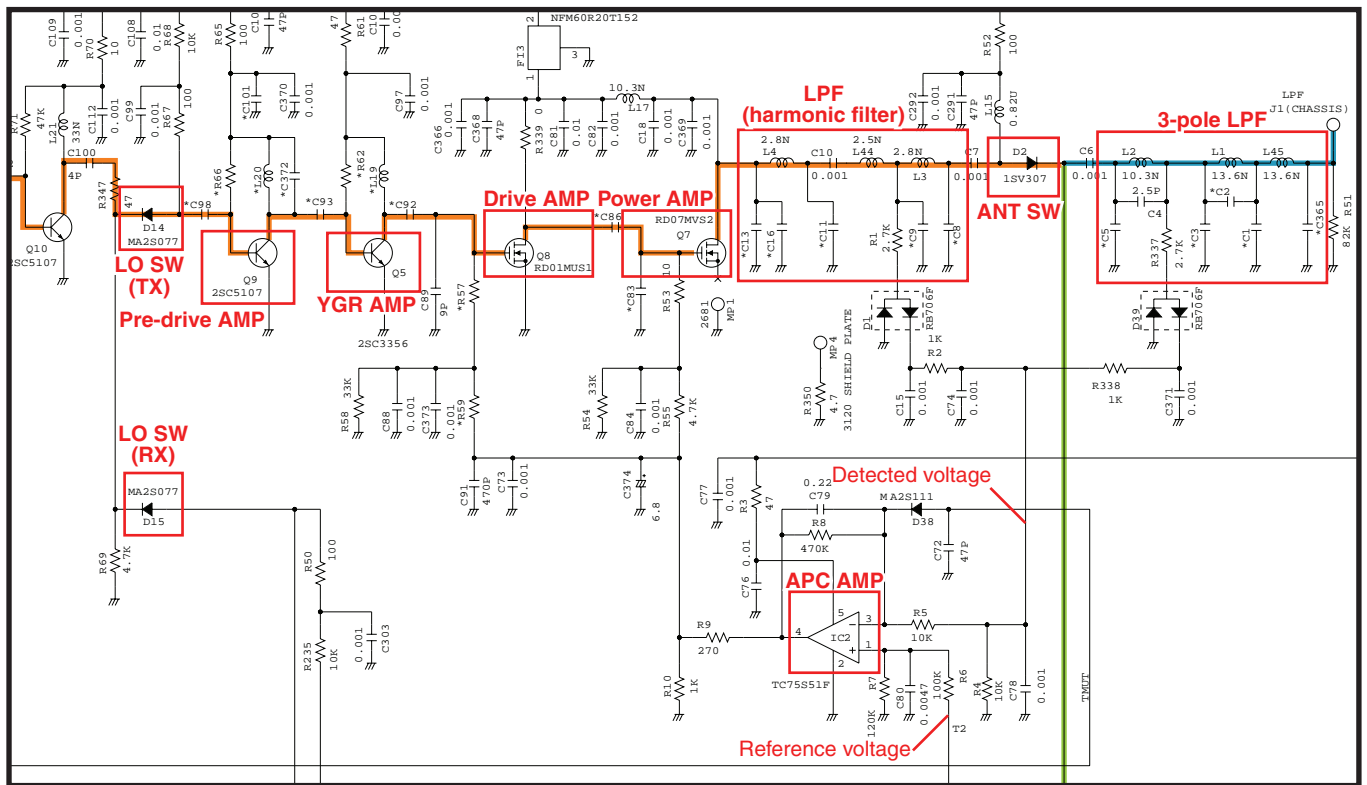
The APC (Automatic Power Control) circuit stabilizes transmit output power to prevent transmit output power level change which is caused by load mismatching or heat effect, etc. The APC circuit also selects transmit output power from high, middle and low power.

A portion of the TX signal is rectified by the power detector to be converted into DC voltage which is in proportion to the transmit output power level. The detected voltage is applied to the comparator. The transmit power setting voltage is applied to another input terminal as the reference voltage.

The APC compares the detected voltage and reference voltage, and the difference of voltage is output. The output voltage controls the bias of the TX amplifiers to reduce/increase the gain of these amplifiers for stable transmit output power.

The change of transmit power is carried out by changing reference voltage.

• TRANSMIT AMPLIFIERS AND APC CIRCUIT



4-3 FREQUENCY SYNTHESIZER CIRCUITS

VCOs

A VCO is an oscillator which its oscillation frequency is determined by the applied voltage. This transceiver has two VCOs; RX VCO and TX VCO. The RX VCO generates the 1st LO signals for the 1st IF produce, and TX VCO generates TX signal. The VCO SW toggles these VCOs.

• RX VCO

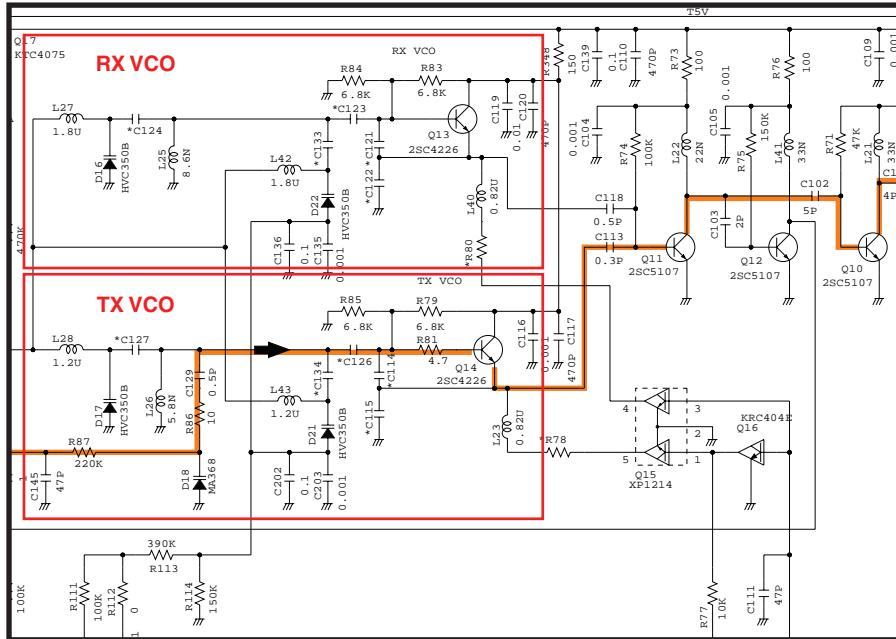
The generated 1st LO signals are applied to the 1st mixer (Q3) via two buffers (Q11 and Q10), LO SW and LPF.

• TX VCO

The generated TX signal is applied to the pre-drive AMP (one of TX AMPs) via the LO SW.

A portion of the VCO output is applied to the PLL IC via the buffers (Q11 and Q12).

• VCOs AND BUFFERS



PLL (Phase Locked Loop) CIRCUIT

The PLL circuit provides stable oscillation for both of the transmit and 1st LO frequencies (for receive). By comparing the feed backed VCO output and the reference frequency signal, the oscillating frequency is stabilized.

The PLL output frequency is controlled by the serial data including divide ratio from the CPU.

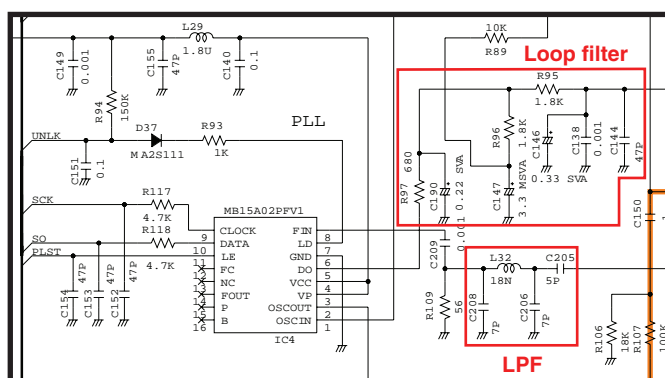
A portion of VCO output from the buffer (Q12) is applied to the PLL IC via LPF. The applied VCO output is divided according to the serial data including divide ratio from the CPU, at the prescaler and programmable divider. In the same way, the reference frequency signal from the reference frequency signal oscillator is applied to the PLL IC and divide so that these are the same frequency.

The frequency-matched signals are applied to the phase comparator and phase-compare. The resulted phase difference is detected as a phase-type signal, and level-adjusted at the charge pump then output. The output pulse type signal is passed through the loop filter to be converted into the DC voltage (=Lock Voltage).

Applying the lock voltage to the variable capacitors (VD) which composes a part of the resonator of VCO, the capacitance of VDs changes corresponding to the applied lock voltage. This causes the change of resonance frequency that determines the VCO oscillating frequency to keep the VCO frequency constant.

When the oscillation frequency drifts, its phase changes from that of the reference frequency, causing a lock voltage change to compensate for the drift in the VCO oscillating frequency.

• PLL CIRCUITS



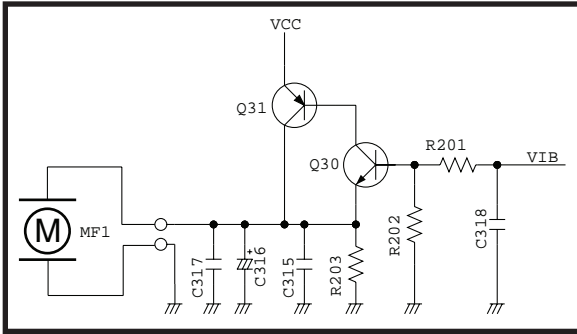
4-4 OTHER CIRCUITS

Vibration MOTOR CIRCUIT ([Vibration] only)

MF1 is a vibration motor. When the matched RX code signal is received, MF1 rotates to produce Vibration.

In vibration mode, and when the transceiver is called, "VIB" signal from the expander (IC12, pin 6) turns to "High(=VCC level)" and motor driver (Q30, Q31) is activated to rotate the vibration motor (MF1).

• MOTOR DRIVER

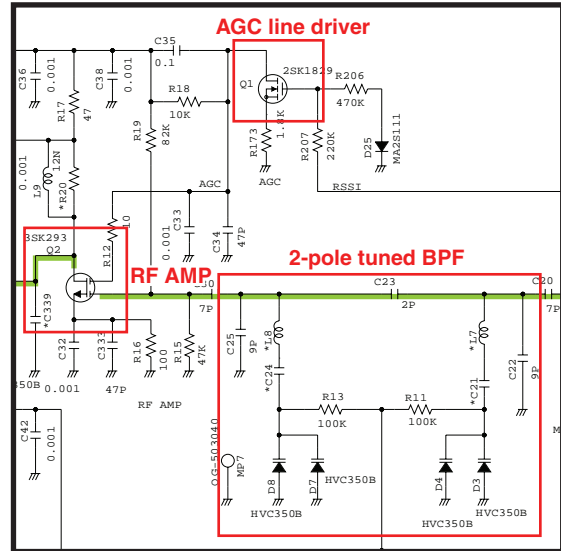


AGC (Automatic Gain Controller) CIRCUIT

The AGC circuit effectively reduces the RX signal level if the signal is strong, and raises it when it is weaker. The AGC circuit detects the overall strength of the signal and automatically adjusting the gain of the RF AMP to maintain an approximately constant average level of the received signals.

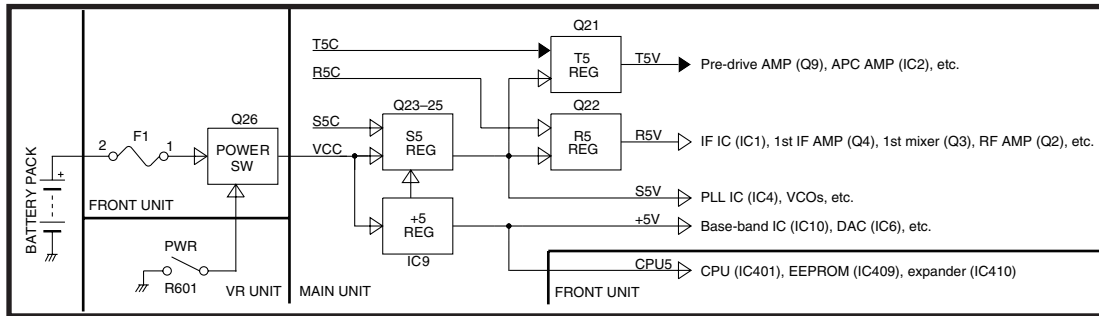
RSSI signal which is in proportion to the RX signal level is applied to the gate terminal of AGC line driver. The driver controls the voltage which supplied to the RF AMP to control the gain of RF AMP.

• AGC CIRCUIT



4-5 VOLTAGE BLOCK DIAGRAM

Voltage from the battery pack is routed to whole of the transceiver via switches and regulators.



4-6 CPU (F: IC401) PORT ALLOCATION

Pin No.	Line name	Description	I/O
1-11	SEG23-13	LCD segment ports.	O
13	SEG12		
15-25	SEG11-1		
26	SO	Serial data to DAC (M: IC6) and audio strage IC (M: IC18).	O
27	SCK	Serial clock to DAC (M: IC6) and audio strage IC (M: IC18).	O
28	MDIO	Data I/O for baseband IC (M: IC10).	I/O
29	MSCK	Clock to the baseband IC (M: IC10).	O
30	SS	Chip select signal to the Voice strage IC* (M: IC18).	O
31	PLST	Strobe signal to the PLL IC (M: IC4).	O
32	SDA	Serial data to DAC and voice strage IC* (M: IC18).	O
33	SCL	Serial clock to DAC (M: IC6) and voice strage IC* (M: IC18).	O
34	INT	Interupt signal to voice strage IC* (M: IC18).	O
35	EXSF	Strobe to the expander (F: IC410).	O
36	EXSM	Strobe to the expander (M: IC12)	O
37	EXOE	Output enable signal to the expander ICs (F: IC410 and M: IC12).	O
38	BEEP	Beep sounds.	O
39	MTDT	Data (MSK TX data) to the baseband IC (M: IC10).	O
40	MTCK	Clock (for MSK TX data) to baseband IC (M: IC10).	O
41	NOISE	Noise level from IF IC (M: IC1).	I
43	SDEC	Tone signals (DTMF, 2/5tone).	I
44	CDEC	CTCSS/DTCS signals.	I
45	VOXV	VOX detect. "High"=start to transmit.	I
46	KR1	Key input for [UP], [P0] and [P3] keys. (Pulled up)	I
47	KR0	Key input for [DOWN], [P1] and [P2] keys. (Pulled up)	I
48	BATV	Battery volatge for monitoring.	I
49	LVIN	Lock voltage for monitoring.	I
50	RSSI	RSSI voltage from IF IC (M: IC1).	I
51	TEMP	Voltage divided by thermal register (M: R190) and R191. (temperature monitor)	I
52	OPTV	Optional unit detect. "High"=An optional unit is connected.	I
55	UNLK	PLL unlock signal from IC4. "Low"=PLL is unlocked.	I
59	RES	Reset signal from the reset IC (F: IC408).	I
68	BPMAX	Beep sound level control signal to BEEP SW (F: Q415). "Low"=Maximum beep sound level.	O
69	RAC	Row address clock to the Voice strage IC* (M: IC18).	O

*: [Voice strage] only

Pin No.	Line name	Description	I/O
70	PTT	[PTT] key (F: S401). (Pulled up)	I
71	MDIR	Serial data I/O control signal to the baseband IC (M: IC10).	O
72-75	SENC3-SENC6	2/5 tone, DTMF signals.	O
78	MRDF	MSK data RX flag/flame detect signal to the baseband IC (M: IC6).	O
79-81	CENC0-CENC2	CTCSS/DTCS signals.	O
82	DAST	Strobe signal to the DAC (M: IC6).	O
88-91	COM4-COM1	LCD common terminals.	-
92-100	SEG32-24	LCD segment ports.	O

SECTION 5 ADJUSTMENT PROCEDURE

5-1 PREPARATION

■ REQUIRED EQUIPMENTS

EQUIPMENT	GRADE AND RANGE	EQUIPMENT	GRADE AND RANGE
Cloning software	CS-F50V CLONING SOFTWARE (Revision 1.0 or later)	JIG cable	Modified OPC-966C/UC (See the page 5-4)
RF power meter (terminated type)	Measuring range : 0.1–10 W Frequency range : 100–600 MHz Impedance : 50 Ω SWR : Less than 1.2 : 1	Standard signal generator (SSG)	Frequency range : 0.1–600 MHz Output level : 0.1 mV to 32 mV (–127 to –17 dBm)
Frequency counter	Frequency range : 0.1–600 MHz Frequency accuracy: ±1 ppm or better Input level : Less than 1 mW	Oscilloscope	Frequency range : DC–20 MHz Measuring range : 0.01–20 V
		AC millivoltmeter	Measuring range : 10 mV to 10 V
Modulation Analyzer	Frequency range : 30–600 MHz Measuring range : 0 to ±10 kHz	External speaker	Input impedance : 8 Ω Capacity : More than 1 W
Audio generator	Frequency range : 300–3000 Hz Output level : 1–500 mV	Attenuator	Power attenuation : 30 dB Capacity : More than 10 W

CAUTION! **BACK UP** the originally programmed memory data in the transceiver before programming the adjustment frequencies. When program the adjustment frequencies into the transceiver, the transceiver's memory data will be overwritten and lose original memory data at the same time.

■ CLONING ADJUSTMENT CHANNELS

Before starting adjustment, clone adjustment frequencies and other conditions (including Squelch Level) into the transceiver using CS-F50V CLONING SOFTWARE as below.

• ADJUSTMENT CHANNELS (for [Low band] version)

CH	Atr	Inh	Frequency (MHz)			W/N	SQL Tight	C.Tone		Text	Com-pander	TOT	RF PWR
			RX	TX	TX Inh			RX	TX				
1- 1	AB		400.100000	<-		W				LV ADJ			L1
1- 2			489.900000	<-		W				LV VERY			L1
1- 3			489.900000	<-		W				REF			L1
1- 4			400.100000	<-		W				TX HI			H
1- 5			400.100000	<-		W				TX L2			L2
1- 6			400.100000	<-		W				TX L1			L1
1- 7			435.000000	<-		N				Mod N			L1
1- 8			435.000000	<-		N				Mod M			L1
1- 9			435.000000	<-		W				Mod W			L1
1- 10			435.000000	<-		N		007N	<-	BAL N			L1
1- 11			435.000000	<-		N		007N	<-	BAL M			L1
1- 12			435.000000	<-		W		007N	<-	BAL W			L1
1- 13			435.000000	<-		W			151.4	CT/DT			L1
1- 14			435.000000	<-	i	W				RX SEN			L1
1- 15			400.100000	<-	i	W				S-MTR			L1
1- 16			489.900000	<-	i	W				SQL			L1

• ADJUSTMENT CHANNELS (for [High band] version)

CH	Atr	Inh	Frequency (MHz)			W/N	SQL Tight	C.Tone		Text	Com-pander	TOT	RF PWR
			RX	TX	TX Inh			RX	TX				
1- 1	AB		450.100000	<-		W				LV ADJ			L1
1- 2			511.900000	<-		W				LV VERY			L1
1- 3			511.900000	<-		W				REF			L1
1- 4			450.100000	<-		W				TX HI			H
1- 5			450.100000	<-		W				TX L2			L2
1- 6			450.100000	<-		W				TX L1			L1
1- 7			485.000000	<-		N				Mod N			L1
1- 8			485.000000	<-		N				Mod M			L1
1- 9			485.000000	<-		W				Mod W			L1
1- 10			485.000000	<-		N		007N	<-	BAL N			L1
1- 11			485.000000	<-		N		007N	<-	BAL M			L1
1- 12			485.000000	<-		W		007N	<-	BAL W			L1
1- 13			485.000000	<-		W			151.4	CT/DT			L1
1- 14			485.000000	<-	i	W				RX SEN			L1
1- 15			450.100000	<-	i	W				S-MTR			L1
1- 16			511.900000	<-	i	W				SQL			L1

• SQUELCH LEVEL SETTING

Set Mode		
	Value	Enable /Inhibit
Backlight	Auto	Enable
Beep	ON	Enable
Ringtone Level	Linked	Enable
SQL Level	2	Enable
AF Min Level	OFF	Enable

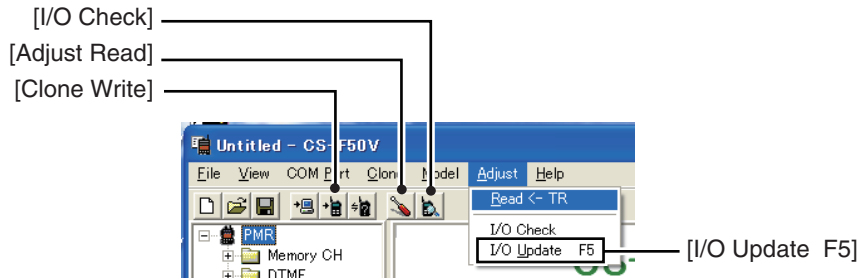
Set the SQL Level to "2"

NOTE: FOR [IC-F61V], when adjust "Devation" and "Modulation Balance" in the middle band, change the bandwidth to "Middle" as below.

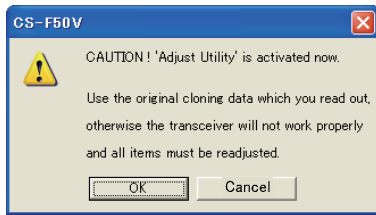
The screenshot shows a software interface with a sidebar on the left containing 'Set Mode', 'Common', and 'Character Editor'. The main window displays various settings: 'Preview Timer(Sec)' is 30.000, 'Max Alert Ringer' is selected, 'Invalid Timer(Sec)' is OFF, and 'TX End' is OFF. Under the 'Others' section, 'Beat Cancel' is Auto, 'Wide Band Width' is Wide, and 'SQL Tight Offset' is set to Middle. A red circle highlights the 'SQL Tight Offset' dropdown menu.

STARTING SOFTWARE ADJUSTMENT

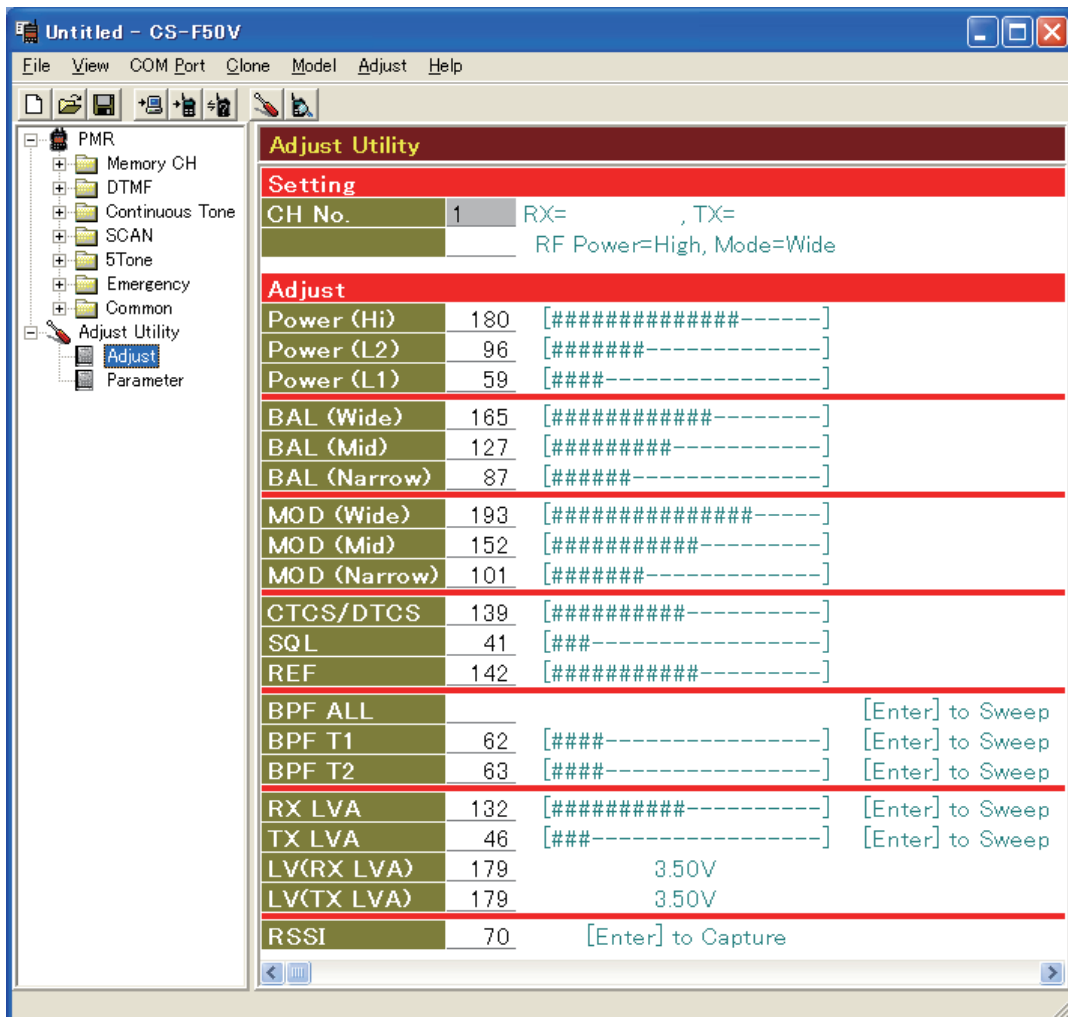
- ① Connect the transceiver and PC with OPC-966/U. (see the page 5-4)
- ② Turn the transceiver power ON.
- ③ Boot up Windows, and click the program group 'CS-F50V' in the 'Programs' folder of the [Start] menu, then CS-F50V's window appears. (Or click the shortcut 'CS-F50V' on the desktop.)
- ④ Click [Adjust Read] button.



- ⑤ The 'CAUTION' dialog appears. Click [OK].



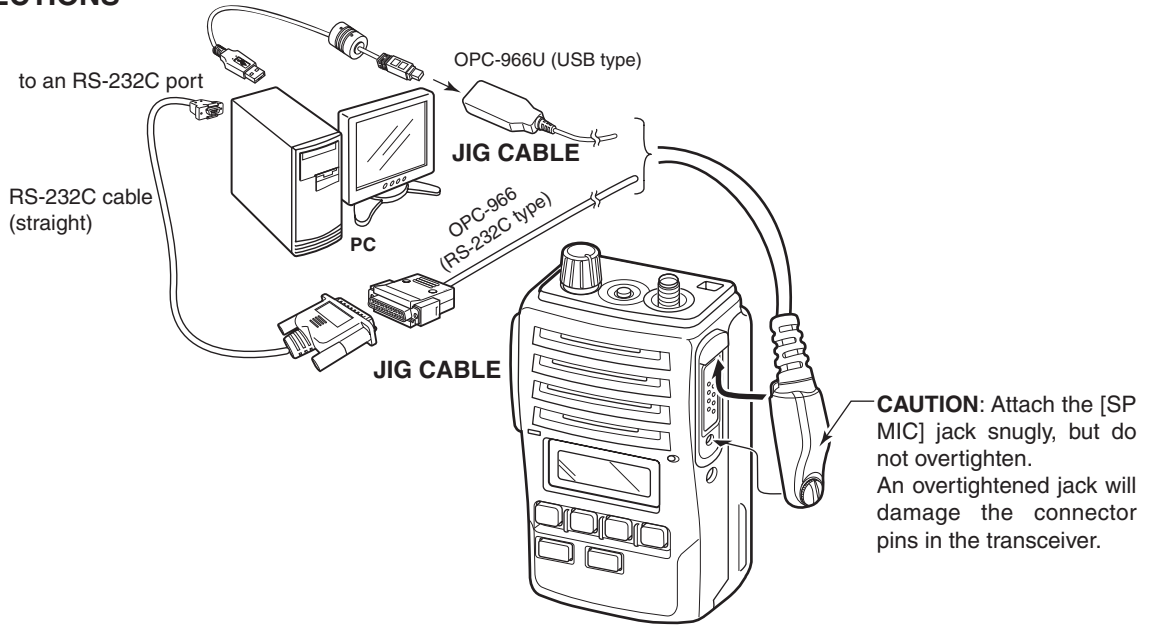
- ⑥ The adjustment window shows transceiver's condition and adjustment items as below.
- ⑦ Set or modify adjustment data as specified in the guidances (pages 5-4 to 5-12).



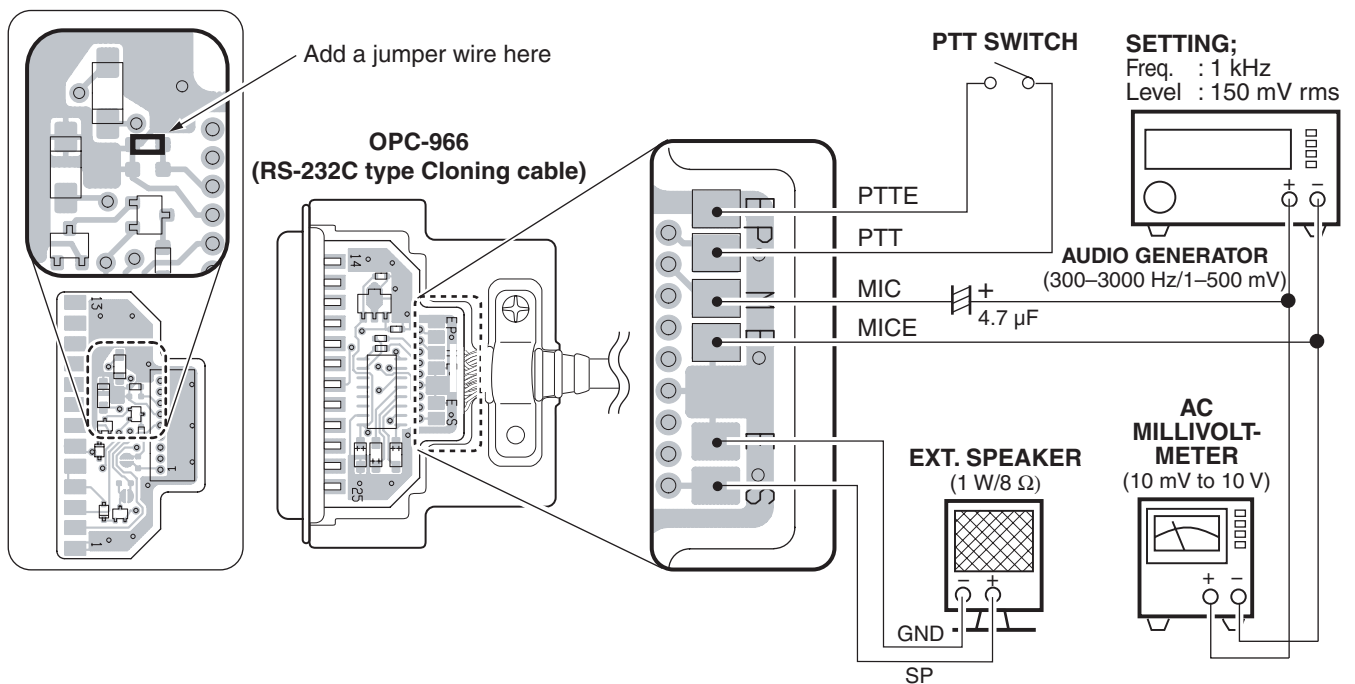
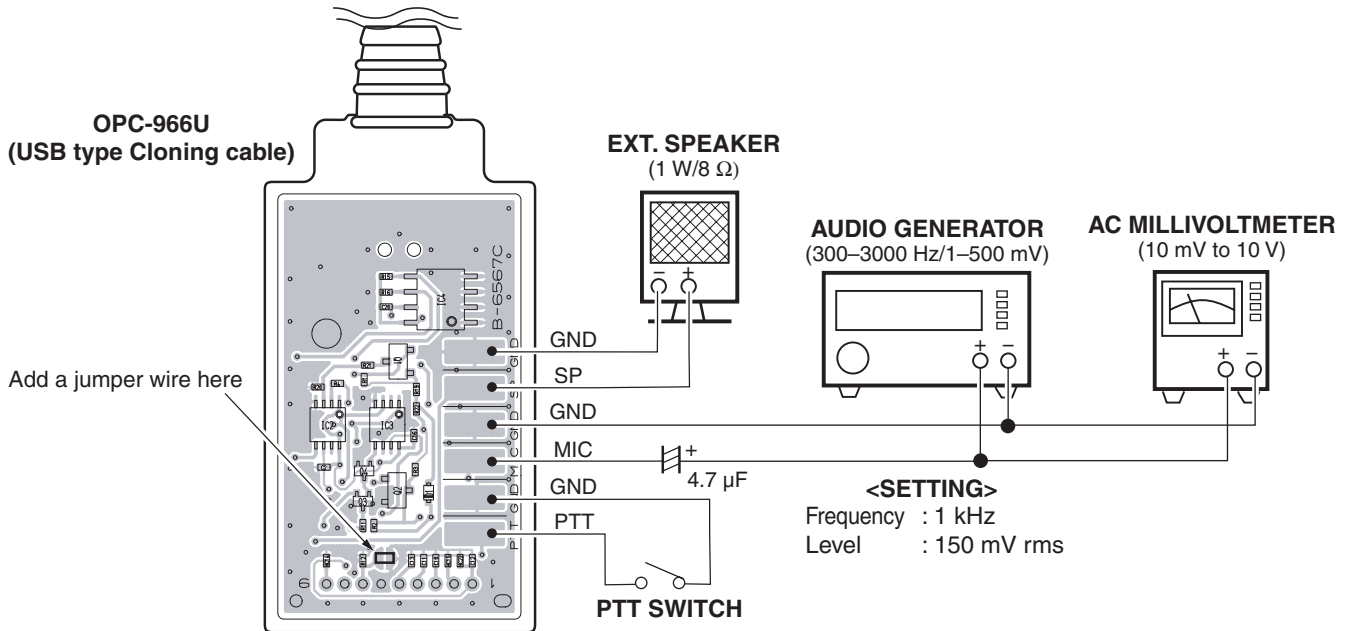
* This screen is an example only. Each transceiver has its own specific values for each setting.

- ⑧ When the adjustment is completed, click [Clone Write] button.

■ PC CONNECTIONS



■ JIG CABLES

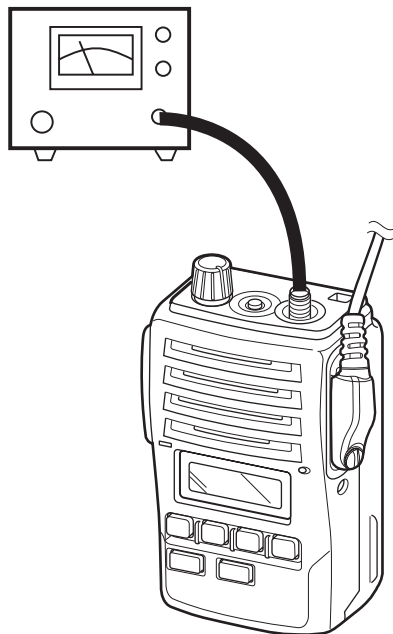


5-2 FREQUENCY ADJUSTMENT

Select an adjustment item using [↑] / [↓] keys, then set to the specified value using [←] / [→] keys on the connected PC's keyboard.

ADJUSTMENT [ADJUST ITEM]	ADJUSTMENT CONDITION	OPERATION	VALUE
PLL LOCK VOLTAGE [RX LVA]	1 •Channel : 1-1 •Receiving	Click [I/O Update (F5)] in the [Adjust] menu (see the page 5-3), then check the "LVIN" item on the I/O check window as below.	1.0 V
	[TX LVA]		2 •Channel : 1-1 •Connect an RF Power Meter to the antenna connector. •Transmitting
<p>CONVENIENT: The "PLL LOCK VOLTAGE" can be adjusted automatically.</p> <p>1: Set the Lock voltage preset; [RX LVA] to "51", [TX LVA] to "56"(for [High band]) or "51" (for [High band]).</p> <p>2: Push the [ENTER] key on the connected PC's keyboard.</p>			
PLL LOCK VOLTAGE (verify)	1 •Channel : 1-2 •Receiving	Click [I/O Update (F5)] in the [Adjust] menu (see the page 5-3), then check the "LVIN" item on the I/O check window as below.	2.7–4.0 V (Verify)
	2 •Channel : 1-2 •Transmitting		2.8–4.0 V (Verify)

RF POWER METER
(10 W/50 Ω)



• I/O CHECK WINDOW

I/O Check			
Input	Dec	Hex	Data
VIN	196	C4	7.69V
TEMPS	192	C0	23.2°C
LVIN	65	41	1.27V
SD	37	25	0.73V
S-MTR	-		
Output	Dec	Hex	Data
BPF T1	62	3E	1.22V
T2/POW	63	3F	1.24V
REF	142	8E	2.78V
MOD BAL	0	0	0.00%
Dev	0	0	0.00V
CTCSS	0	0	0.00V
SQL Lev	30	1E	0.59V

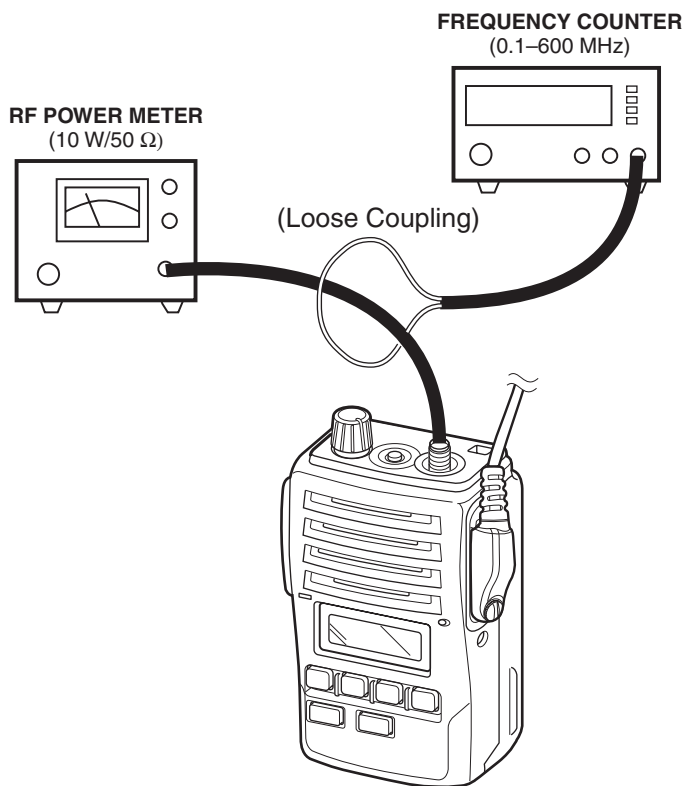
Lock Voltage Check

* This screen is an example only. Each transceiver has its own specific values for each setting.

5-2 FREQUENCY ADJUSTMENT (continued)

Select an adjustment item using [↑] / [↓] keys, then set to the specified value using [←] / [→] keys on the connected PC's keyboard.

ADJUSTMENT [ADJUST ITEM]	ADJUSTMENT CONDITION	OPERATION	VALUE
REFERENCE FREQUENCY [REF]	1 <ul style="list-style-type: none"> • Channel : 1-3 • Connect an RF Power Meter to the antenna connector. • Transmitting 	Loosely couple a Frequency Counter to the antenna connector.	469.9000 MHz [Low band] 511.9000 MHz [High band]

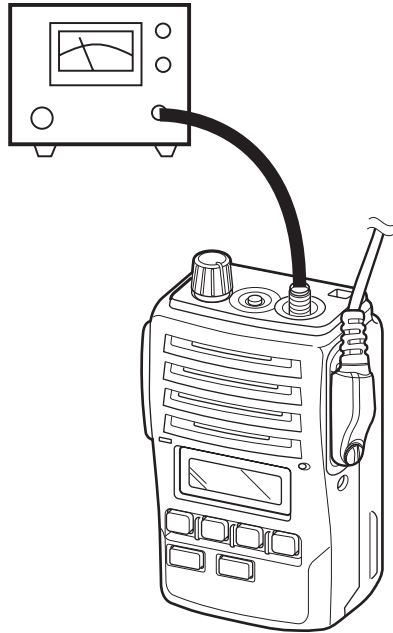


5-3 TRANSMIT ADJUSTMENT

Select an adjustment item using [↑] / [↓] keys, then set to the specified value using [←] / [→] keys on the connected PC's keyboard.

ADJUSTMENT [ADJUST ITEM]	ADJUSTMENT CONDITION	OPERATION	VALUE
TRANSMIT OUTPUT POWER (High) [Hi]	1 • Channel : 1-4 • Transmitting	Connect an RF power meter to the antenna connector.	4.0 W
(Low2) [L2]	2 • Channel : 1-5 • Transmitting		2.0 W
(Low1) [L1]	3 • Channel : 1-6 • Transmitting		1.0 W

RF POWER METER
(10 W/50 Ω)

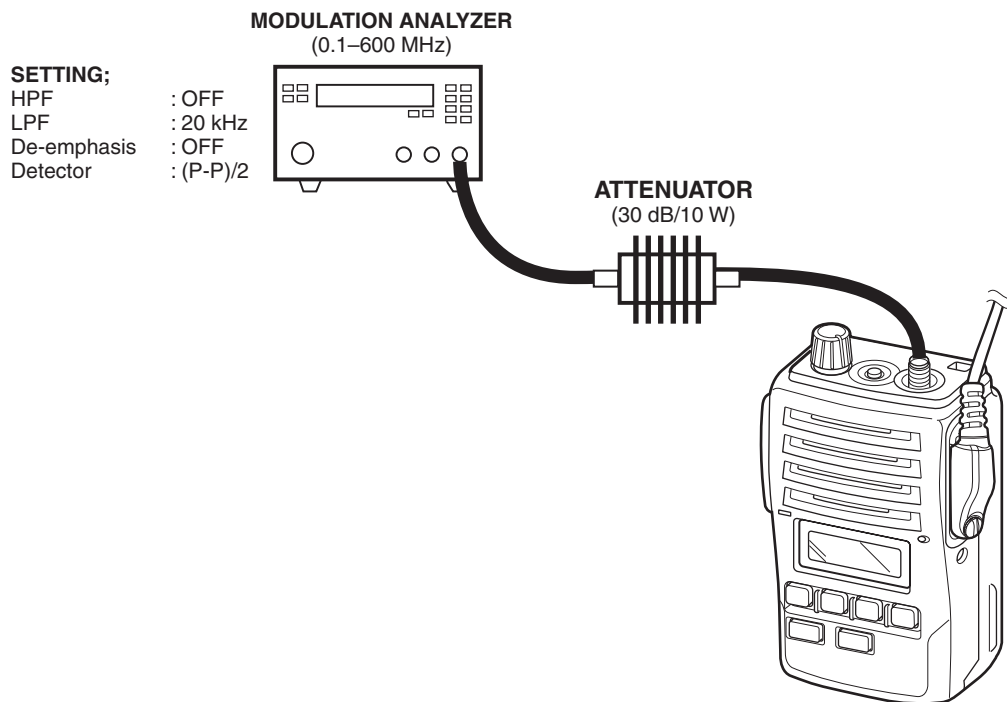


5-3 TRANSMIT ADJUSTMENT (continued)

Select an adjustment item using [↑] / [↓] keys, then set to the specified value using [←] / [→] keys on the connected PC's keyboard.

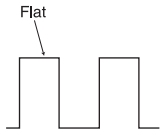
ADJUSTMENT [ADJUST ITEM]	ADJUSTMENT CONDITION	OPERATION	VALUE
FM DEVIATION (Narrow) [MOD(Narrow)]	1 <ul style="list-style-type: none"> • Channel : 1-7 • Connect an Audio Generator and an AC Millivoltmeter to the JIG cable (see the page 5-4). • Transmitting 	Connect an Modulation Analyzer to the antenna connector through an Attenuator.	±2.05 to 2.15 kHz
(Middle)* [MOD(Mid)]	2 <ul style="list-style-type: none"> • Channel : 1-8 • Transmitting 		±3.15 to 3.25 kHz
(Wide) [MOD(Wide)]	3 <ul style="list-style-type: none"> • Channel : 1-9 • Transmitting 		±4.05 to 4.15 kHz

*; IC-F61V only



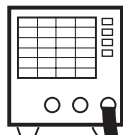
5-3 TRANSMIT ADJUSTMENT (continued)

Select an adjustment item using [↑]/[↓] keys, then set to the specified value using [←]/[→] keys on the connected PC's keyboard.

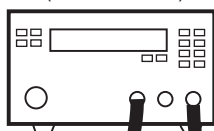
ADJUSTMENT [ADJUST ITEM]	ADJUSTMENT CONDITION	OPERATION	VALUE
MODULATION BALANCE (Narrow) [BAL(Narrow)]	1 • Channel : 1-10 • No audio signals are applied to the JIG cable. • Transmitting	Connect an Oscilloscope to the detect output terminal of the Modulation Analyzer.	Set to the square waveform Flat 
(Middle)* [BAL(Mid)]	2 • Channel : 1-11 • Transmitting		
(Wide) [BAL(Wide)]	3 • Channel : 1-12 • Transmitting		

*; IC-F61V only

OSCILLOSCOPE
(DC to 10 kHz)



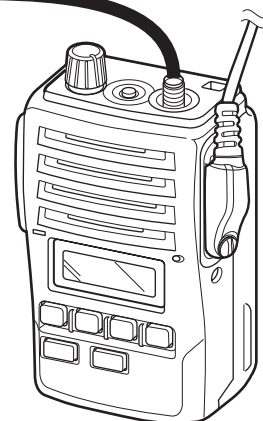
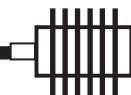
MODULATION ANALYZER
(0.1–600 MHz)



SETTING;

HPF : OFF
LPF : 20 kHz
De-emphasis : OFF
Detector : (P-P)/2

ATTENUATOR
(30 dB/10 W)

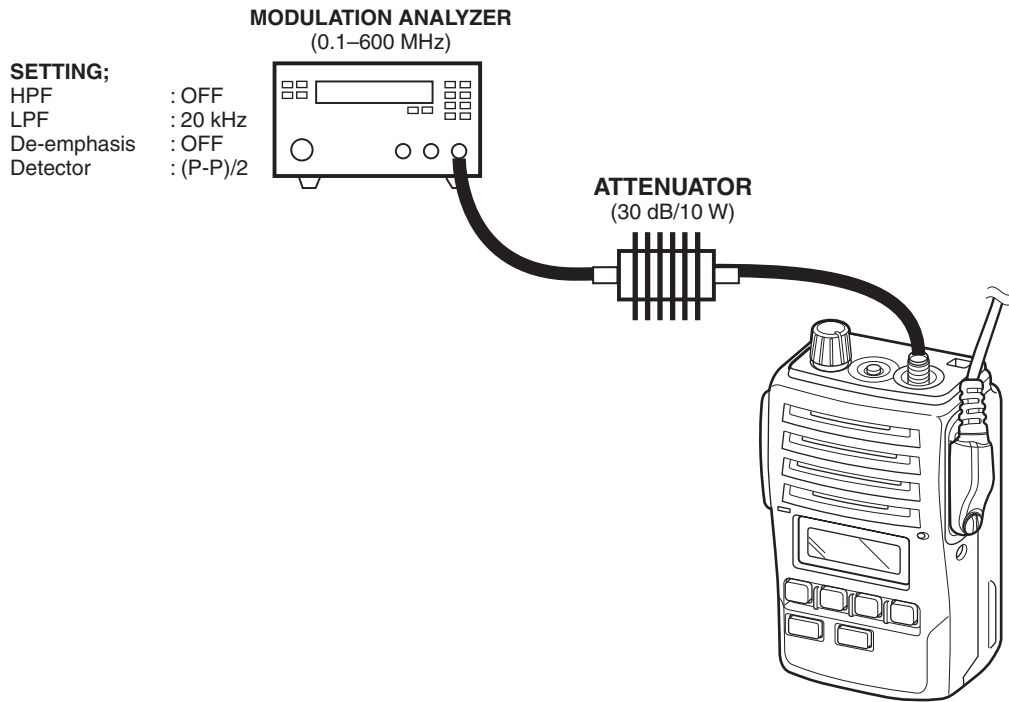


(Detect output)

5-3 TRANSMIT ADJUSTMENT (continued)

Select an adjustment item using [↑] / [↓] keys, then set to the specified value using [←] / [→] keys on the connected PC's keyboard.

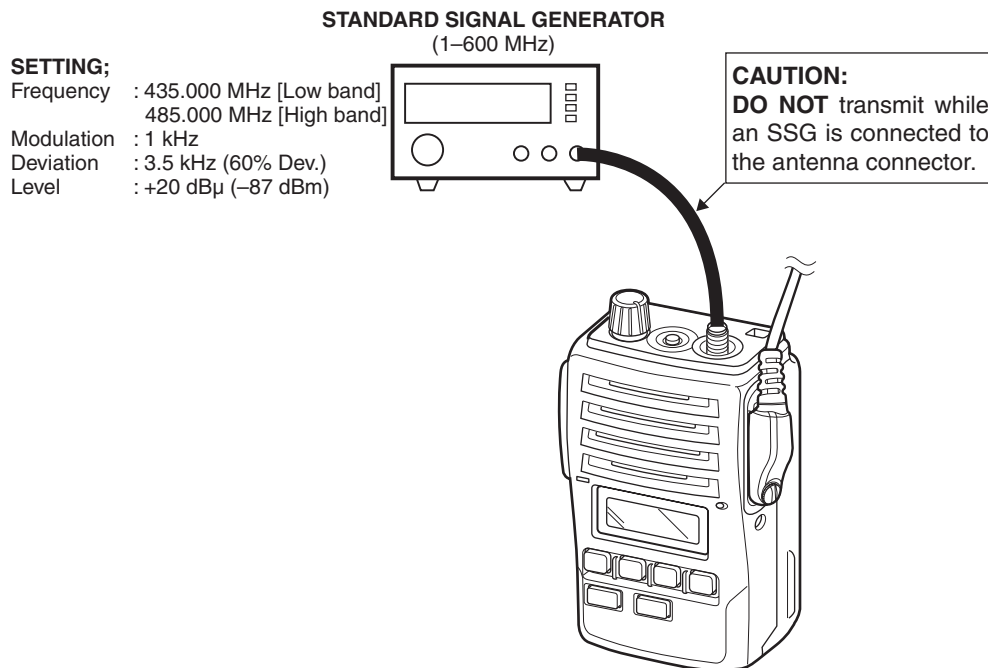
ADJUSTMENT [ADJUST ITEM]	ADJUSTMENT CONDITION	OPERATION	VALUE
CTCSS/DTCS DEVIATION [CTCSS/DTCS]	1 <ul style="list-style-type: none"> • Channel : 1-13 • No audio signals are applied to the JIG cable. • Transmitting 	Connect a Modulation Analyzer to the antenna connector through an Attenuator.	±0.66 to 0.70 kHz



5-4 RECEIVE ADJUSTMENT

Select an adjustment item using [\uparrow] / [\downarrow] keys, then set to the specified value using [\leftarrow] / [\rightarrow] keys on the connected PC's keyboard.

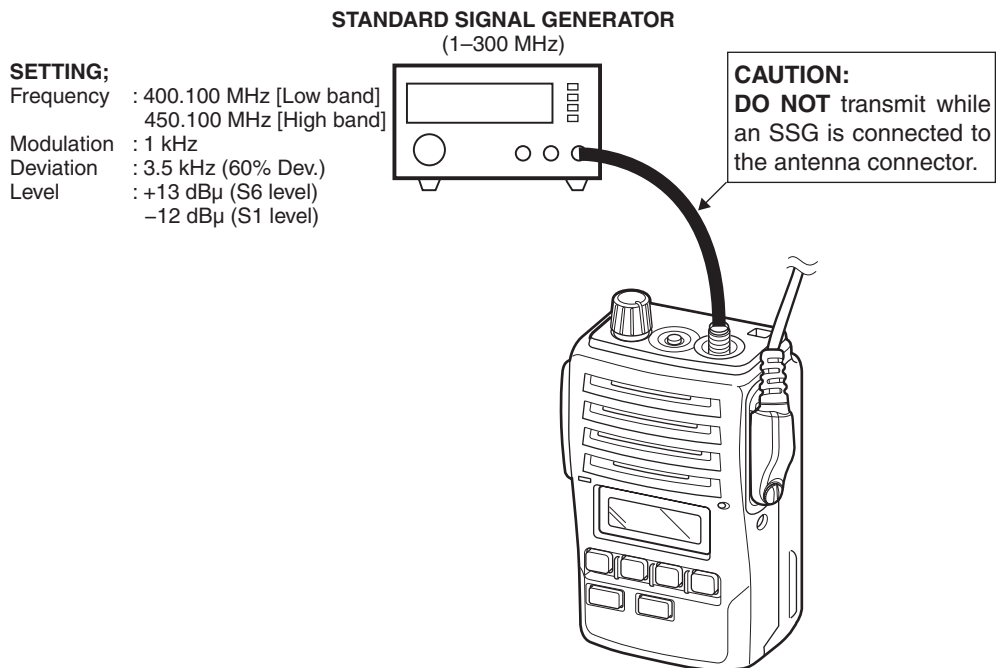
ADJUSTMENT [ADJUST ITEM]	ADJUSTMENT CONDITION	OPERATION	VALUE
RECEIVE SENSITIVITY [BPF T1]	1 <ul style="list-style-type: none"> •Channel : 1-14 •Connect a Standard Signal Generator to the antenna connector. •Receiving 	Put the cursor on the [BPF T1], and push the return key.	(Automatic adjustment)
[BPF T2]	2	Put the cursor on the [BPF T2], and push the return key.	
CONVENIENT: RECEIVE SENSITIVITY can be adjusted totally. Put the cursor on the [BPF ALL], and push the return key.			



5-4 RECEIVE ADJUSTMENT (continued)

Select an adjustment item using [↑] / [↓] keys, then set to the specified value using [←] / [→] keys on the connected PC's keyboard.

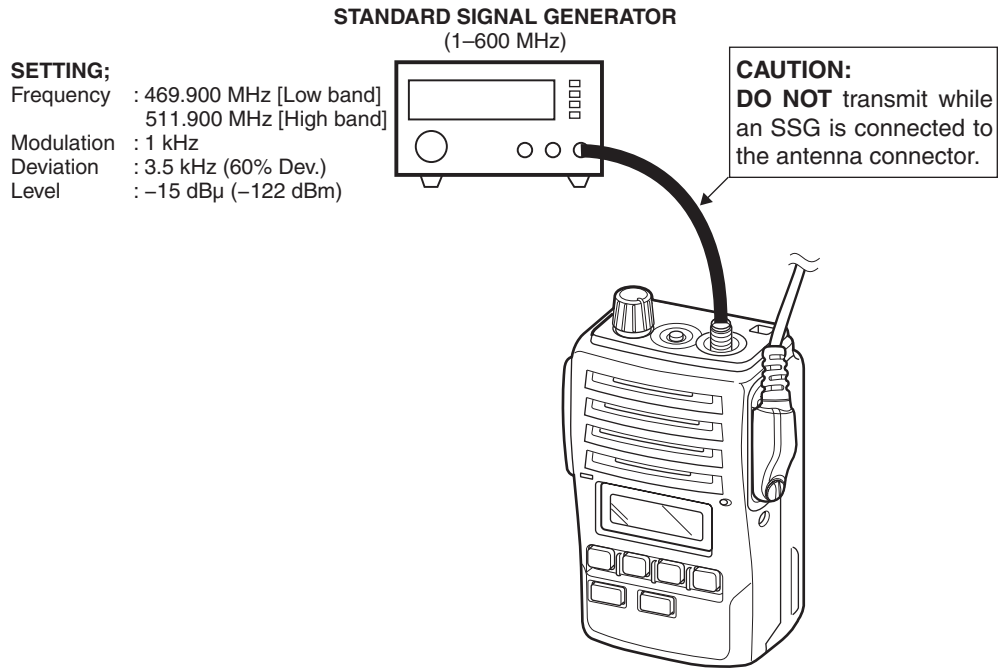
ADJUSTMENT [ADJUST ITEM]	ADJUSTMENT CONDITION	OPERATION	VALUE	
S-METER [S-METER] (S6 LEVEL)	NOTE: "RECEIVE SENSITIVITY" must be adjusted before "S-METER." Otherwise, "S-METER" will not be adjusted properly.			
	1	<ul style="list-style-type: none"> • Channel : 1-15 • Connect a Standard Signal Generator to the antenna connector. • Set the SSG output level to "+13 dBμ (-94 dBm)." • Receiving 	Push the return key to set the S6 level.	(Automatic adjustment)
[S-METER] (S1 LEVEL)	2	<ul style="list-style-type: none"> • Set the SSG output level to "-12 dBμ (-119 dBm)." • Receiving 	Push the return key to set the S1 level.	



5-4 RECEIVE ADJUSTMENT (continued)

Select an adjustment item using [↑] / [↓] keys, then set to the specified value using [←] / [→] keys on the connected PC's keyboard.

ADJUSTMENT [ADJUST ITEM]	ADJUSTMENT CONDITION	OPERATION	VALUE
SQUELCH [SQL]	1 <ul style="list-style-type: none"> • Channel : 1-16 • Connect a Standard Signal Generator to the antenna connector. • Receiving 	-	Set the [SQL] value to close squelch. Then set [SQL] value at the point where the audio signals just appear.



[FRONT UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
C466	4030017420	S.CER ECJ0EC1H470J	T	36.9/14.5
C467	4030017420	S.CER ECJ0EC1H470J	T	30.5/13.1
C468	4030017420	S.CER ECJ0EC1H470J	T	40.4/11.5
C473	4030016790	S.CER ECJ0EB1C103K	T	38.1/15.9
C474	4030018860	S.CER ECJ0EB0J105K	T	5/26.6
C475	4030017460	S.CER ECJ0EB1E102K	T	33/45.4
C476	4030017460	S.CER ECJ0EB1E102K	T	29.9/21.9
C477	4030017420	S.CER ECJ0EC1H470J	T	33.3/44.1
C478	4030017420	S.CER ECJ0EC1H470J	T	33.5/41.9
C479	4030017460	S.CER ECJ0EB1E102K	T	27.8/17.7
C481	4030017460	S.CER ECJ0EB1E102K	T	6.4/38.1
C482	4030017460	S.CER ECJ0EB1E102K	T	11.8/41.2
C483	4030017460	S.CER ECJ0EB1E102K	T	38.8/41.8
C485	4030017460	S.CER ECJ0EB1E102K	T	33.7/48
C486	4030017460	S.CER ECJ0EB1E102K	T	32.1/47.5
C487	4030017460	S.CER ECJ0EB1E102K	T	34.4/35.9
C488	4030017460	S.CER ECJ0EB1E102K	T	22.1/43.4
C489	4030017460	S.CER ECJ0EB1E102K	T	9.9/30.9
C490	4030017460	S.CER ECJ0EB1E102K	T	40.3/26.7
C491	4030017460	S.CER ECJ0EB1E102K	T	37.3/37.3
C492	4030017460	S.CER ECJ0EB1E102K	T	6.8/18.2
C493	4030016930	S.CER ECJ0EB1A104K	T	17.4/34.7
C494	4030017460	S.CER ECJ0EB1E102K	T	39.6/67.3
C495	4030017460	S.CER ECJ0EB1E102K	T	10/40.5
C496	4550006760	S.TAN TEESVB21A336M8R	T	12/54.7
C497	4030018390	S.CER ECJ0EB1A563K	T	8.1/37.9
C498	4030017430	S.CER ECJ0EC1H101J	T	10.5/33.2
C499	4030017420	S.CER ECJ0EC1H470J	T	15.4/36.9
C500	4030016930	S.CER ECJ0EB1A104K	T	9.3/37.9
C501	4030017730	S.CER ECJ0EB1E471K	T	35.1/13.2
C502	4030016930	S.CER ECJ0EB1A104K	T	31.9/49.6
C503	4030018860	S.CER ECJ0EB0J105K	T	32.3/48.7
C504	4550007080	S.TAN TEESVA 1C 106M8R	T	40.6/46.4
C505	4030016960	S.CER ECJ0EB1C183K	T	6.3/25.3
C506	4030016960	S.CER ECJ0EB1C183K	T	6.3/23.4
C507	4030017730	S.CER ECJ0EB1E471K	T	5/23
C508	4030017730	S.CER ECJ0EB1E471K	T	11.3/24.2
C510	4550000460	S.TAN TEESVA 1C 105M8R	T	23.5/48.5
C512	4030018860	S.CER ECJ0EB0J105K	B	22.3/49.4
C513	4030018860	S.CER ECJ0EB0J105K	B	25.9/51.5
J401	6510026130	S.CNR IMSA-9681S-36Y900	T	30.9/6.2
J402	6510023831	S.CNR (G) SM04B-SRSS-TB(LF)(SN)	T	34.9/52.5
J403	6510026140	S.CNR 11FH-SM1-TB (LF) (SN)	T	29/43.5
DS401	5030002730	LCD L3-0048TAY-5	B	13.5/16.1
DS402	5040002420	S.LED SML-310MT T86	B	32.7/15.3
DS403	5040002420	S.LED SML-310MT T86	B	6.2/38
DS404	5040002961	S.LED SML-A12MT T86J	B	42.8/38
DS405	5040002961	S.LED SML-A12MT T86J	B	45.3/50.2
DS406	5040002670	S.LED CL-165HR/YG	B	
MC401	7700002760	MIC EM6027P-46C33-G-01 <HOR>		
S401	2260002840	SW SKHLLFA010		
SP401	2510001330	SP 036D0803 <FG>		
W401	8900016840	CBL OPC-1753 (P0.5,N36,L70) <TJM>		
W402	7120000470	JMP ERDS2T0		
W403	7120000470	JMP ERDS2T0		
W404	8900017120	CBL OPC-1754 (P0.5,N11,L35) <TJM>		
EP402	8930061530	LCT SRCN-2681-SP-N-W (SHJ)		

[VR UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
R601	7210003130	VAR TP76N97N-13F-10KA-2497		
W601	8900012340	CBL OPC-1260		

[CONNECT UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
D701	1790001810	S.VSR AVR-M1005C080MTABB	T	9.5/31.8
D702	1790001810	S.VSR AVR-M1005C080MTABB	T	9.2/32.8
D703	1790001810	S.VSR AVR-M1005C080MTABB	T	4.7/32.3
D704	1790001810	S.VSR AVR-M1005C080MTABB	T	3.4/32
D705	1790001810	S.VSR AVR-M1005C080MTABB	T	4.8/20.7
R701	7410001130	S.ARY EXB28V102JX	T	6.5/32.5
C701	4030017460	S.CER ECJ0EB1E102K	T	4.6/9.9
C702	4030017460	S.CER ECJ0EB1E102K	T	4.4/14.2
C704	4030017460	S.CER ECJ0EB1E102K	T	3.9/17.1
J1	6510026140	S.CNR 11FH-SM1-TB (LF) (SN)	T	3.6/37.1
EP701	6910016330	S.BEA MMZ1005S 601CT-S	T	6.4/9.9
EP702	6910016330	S.BEA MMZ1005S 601CT-S	T	4.8/12.9
EP703	6910016330	S.BEA MMZ1005S 601CT-S	T	4.9/16.5
EP704	6910016330	S.BEA MMZ1005S 601CT-S	T	4.4/18.4
EP705	6910016330	S.BEA MMZ1005S 601CT-S	T	4.8/19.4

M.=Mounted side (T: Mounted on the Top side, B: Mounted on the Bottom side)
S.=Surface mount

[MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
C339	4030017340	S.CER ECJ0EC1H010B [High band]	T	45.3/6.8
	4030017350	S.CER ECJ0EC1H020B [Low band]	T	45.3/6.8
C364	4030017590	S.CER ECJ0EC1H070C	B	46.3/11.5
C365	4030009350	S.CER C1608 CH 1H 3R5B-T [Low band]	B	69.3/5.8
	4030009520	S.CER C1608 CH 1H 020B-T [High band]	B	69.3/5.8
C366	4030017460	S.CER ECJ0EB1E102K	T	65.8/27.6
C367	4030009910	S.CER C1608 CH 1H 040B-T [High band]	B	58.5/4.8
	4030009920	S.CER C1608 CH 1H 050B-T [Low band]	B	58.5/4.8
C368	4030017420	S.CER ECJ0EC1H470J	T	66.3/28.9
C369	4030006860	S.CER C1608 JB 1H 102K-T	T	55.3/18.7
C370	4030017460	S.CER ECJ0EB1E102K	B	51.7/26.2
C371	4030017460	S.CER ECJ0EB1E102K	T	62.1/10.8
C372	4030017360	S.CER ECJ0EC1H030B [Low band]	B	53.5/26.2
	4030017590	S.CER ECJ0EC1H070C [High band]	B	53.5/26.2
C373	4030017460	S.CER ECJ0EB1E102K	T	52.6/30.1
C374	4550007180	S.TAN F931C685MAABMA	B	52.6/15.7
C375	4550006250	S.TAN TEESVA 1A 106M8R	T	49.7/33.5
C376	4550007410	S.TAN F931A157MNMBA [Voice strage] only	T	31.1/40.9
J1	6510026130	S.CNR IMSA-9681S-36Y900	T	7.6/30.7
J2	6510021901	S.CNR BM02B-ASRS-TF (LF) (SN) [Vibration]	T	2.5/33.2
F1	5210000830	S.FUS ERBFE3R00U	T	76.1/27.9
F2	5210001100	S.FUS 0467.375NR [Vibration] only	T	24.7/37.1
S1	2260002750	S.SW EVQP7M01K	T	81.2/24
MF1	2710000850	MTR QX10A (R5.5X3) 3.0V [Vibration] only		
EP3	6910015370	S.BEA ACZ1005Y-102-T	B	25.4/35.1
EP4	6910015600	S.BEA ACZ1005Y-241 (240)	T	23.9/21.7
EP5	6910015600	S.BEA ACZ1005Y-241 (240)	T	14/26.1
EP8	6910014730	S.BEA MPZ2012S331A-T	B	76.7/18.7
EP9	6910019100	S.BEA MPZ1608S101AT	T	76.1/25.3
EP10	6910014730	S.BEA MPZ2012S331A-T	B	76.7/22.1

M.=Mounted side (T: Mounted on the Top side, B: Mounted on the Bottom side)
S.=Surface mount

SECTION 7

MECHANICAL PARTS

[CHASSIS PARTS]

REF NO.	ORDER NO.	DESCRIPTION	QTY.
J1	6910015630	2682 ANT CONNECTOR	1
MP1	8010020920	3060 CHASSIS	1
MP2	8950005512	2403 CONTACT SPRING -2	1
MP3	8930058561	2403 A-MAIN SEAL-1	1
MP4	8930059800	2600 PET SHEET	1
MP5	8930059830	2600 SHEET	1
MP6	8930051500	O-RING (AB)	1
MP7	8930055870	O-RING (AO)	1
MP8	8930058550	O-RING (AS)	1
MP9	8830001600	NUT (L)	1
MP10	8830003140	VR NUT (Y)	1
MP11	8850001880	SEALING WASHER (W)	7
MP12	8810009511	SCREW BT B0 2X4 NI-ZC3 (BT)	2
MP13	8810007890	SCREW BT B0 2X4 SUS	1
MP14	8810010121	SCREWPH B0 2X8 SUS SSBC	2
MP15	8810010191	SCREW BIH M2X4 SUS SSBC	3
MP18	8930073030	3060 MOTOR PLATE	1
MP19	8930068750	SHIELD TAPE (R)	1
MP20	8310070300	3060 PLATE	1
MP21	8930073450	3060 VOL SEAL	1
MP22	8930076150	SHIELD SPONGE (CI)	1

[FRONT UNIT]

REF NO.	ORDER NO.	DESCRIPTION	QTY.
J401*	6510026130	IIMS-9681S-36A-TB	1
J402*	6510023831	SM04B-SRSS-TB (LF) (SN)	1
J403*	6510026140	11FH-SM1-TB (LF) (SN)	1
DS401	5030002730	L3-0048TAY-5	1
MC401	7700002760	EM6027P-46C33-G-01	1
S401*	2260002840	SKHLLFA010	1
SP401	2510001330	036D0803	1
W401	8900016840	OPC-1753	1
W402	7120000470	ERDS2T0	1
W403	7120000470	ERDS2T0	1
W404	8900017120	OPC-1754	1
EP402	8930061530	SRCN-2681-SP-N-W	2
MP401	8210024190	3060 FRONT PANEL (Incl. MP402, 403, 416, 420)	1
MP402	8210019870	2681 TOP PANEL	1
MP403	8930060530	2681 TOP KEY	1
MP404	8930060540	2681 4-2 KEY	1
MP405	8210019880	2681 PTT BUTTON	1
MP406	8930060550	2681 PTT PLATE	1
MP407	8930060711	2681 PTT RUBBER-1	1
MP408	8310059540	2681 LCD PLATE	1
MP409	8930060520	2681 LED LENS	1
MP410	8210019890	2681 REFLECTOR	1
MP411	8310069820	2681 WINDOW PLATE (A)	1
MP412	8930060860	2681 WINDOW SHEET	1
MP413	8930059360	2600 RELEASE BUTTON	1
MP414	8930063030	2721 RELEASE PLATE	1
MP415	8930056540	PUSH SPRING (AH)	2
MP416	8830001591	1362 INSERT NUT (A)-1	2
MP417	8930055730	2403 CONNECTOR SEAL	1
MP418	8930055890	2403 CONNECTOR SHEET	1
MP419	8930056430	2403 9-PIN SHEET	1
MP420	8930073610	SP NET (D)	1
MP421	8610011380	KNOB N-313 (Incl. MP422)	1
MP422	8610009240	KNOB SPRING NO.7800P	1
MP423	8930068980	2905 VENT SHEET	1
MP424	8810009511	SCREW BT B0 2X4 NI-ZC3 (BT)	4
MP425*	8510015660	2681 F-SHIELD PLATE	1
MP426	8930061200	2681 MIC RUBBER	1
MP427*	8930061120	SHIELD SPONGE (AA)	2
MP429	8930062240	SPONGE (HM)	1
MP430*	6910014760	OG-503040	1

*: Refer to "BOARD LAYOUTS."

†: Optional product.

[MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION	QTY.
J1*	6510026130	IIMS-9681S-36A-TB	1
J2*	6510021901	BM02B-ASRS-TF (LF) (SN)	1
S1*	2260002750	EVQP7M01K	1
F1*	5210000830	ERBFE3R00U	1
F2*	5210001100	0467.375NR	1
MF1	2710000850	QX10A (R5.5X3)3.0V (WIRE30MM)	1
MP1*	8410002531	2681 PA HEATSINK-1	1
MP2*	8510015520	2681 VCO CASE	1
MP3	8510015510	2681 VCO COVER	1
MP4*	8510018830	3120 A-SHIELD COVER	1
MP5*	8510018840	3120 B-SHIELD COVER	1
MP7*	6910014760	OG-503040	1
MP8*	8510015660	2681 F-SHIELD PLATE	1
MP9*	8930062230	SPONGE (HN)	1
MP10	8930062950	SHIELD SPONGE (AF)	1

[VR UNIT]

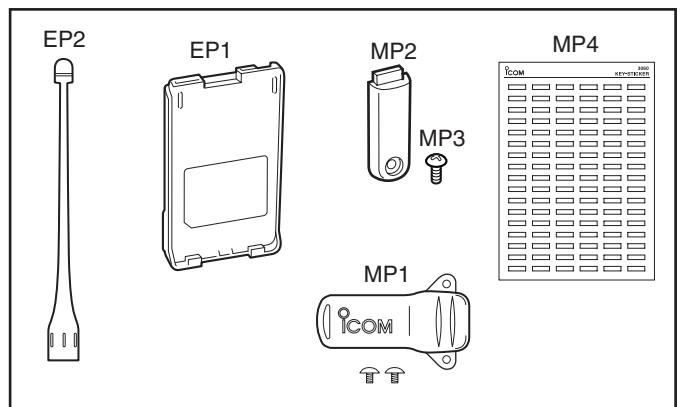
REF NO.	ORDER NO.	DESCRIPTION	QTY.
R601	7210003130	TP76N97N-13F-10KA-2497	1
W601	8900012340	OPC-1260	1

[CONNECTOR UNIT]

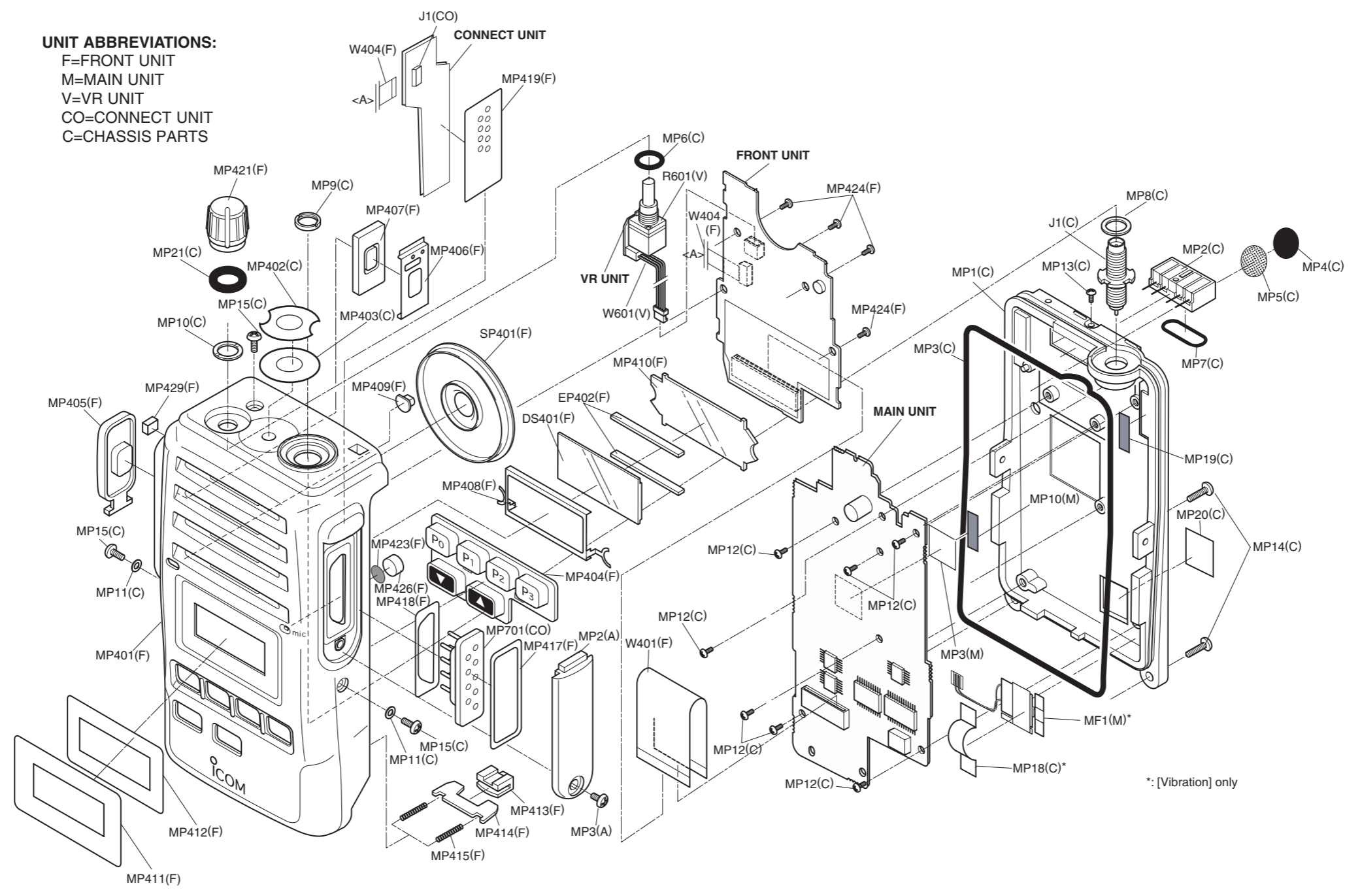
REF NO.	ORDER NO.	DESCRIPTION	QTY.
J1*	6510026140	11FH-SM1-TB (LF) (SN)	1
MP701	8950005520	2403 9-PIN CONNECTOR	1
MP702	8930062140	2682 EARTH SPRING	1
MP703*	8510017840	OG-321610G	1

[ACCESSORIES]

REF NO.	ORDER NO.	DESCRIPTION	QTY.
EP1†	-	BP-227	1
EP2†	-	FA-S27U	1
	-	FA-S56U	1
MP1†	-	MB-98	1
MP2	8210017071	2337 C-PANEL-1	1
MP3	8810010470	SCREW TRUSS M3X4 SUS SSBC	1
MP4	8310070780	3060 KEY-STICKER	1



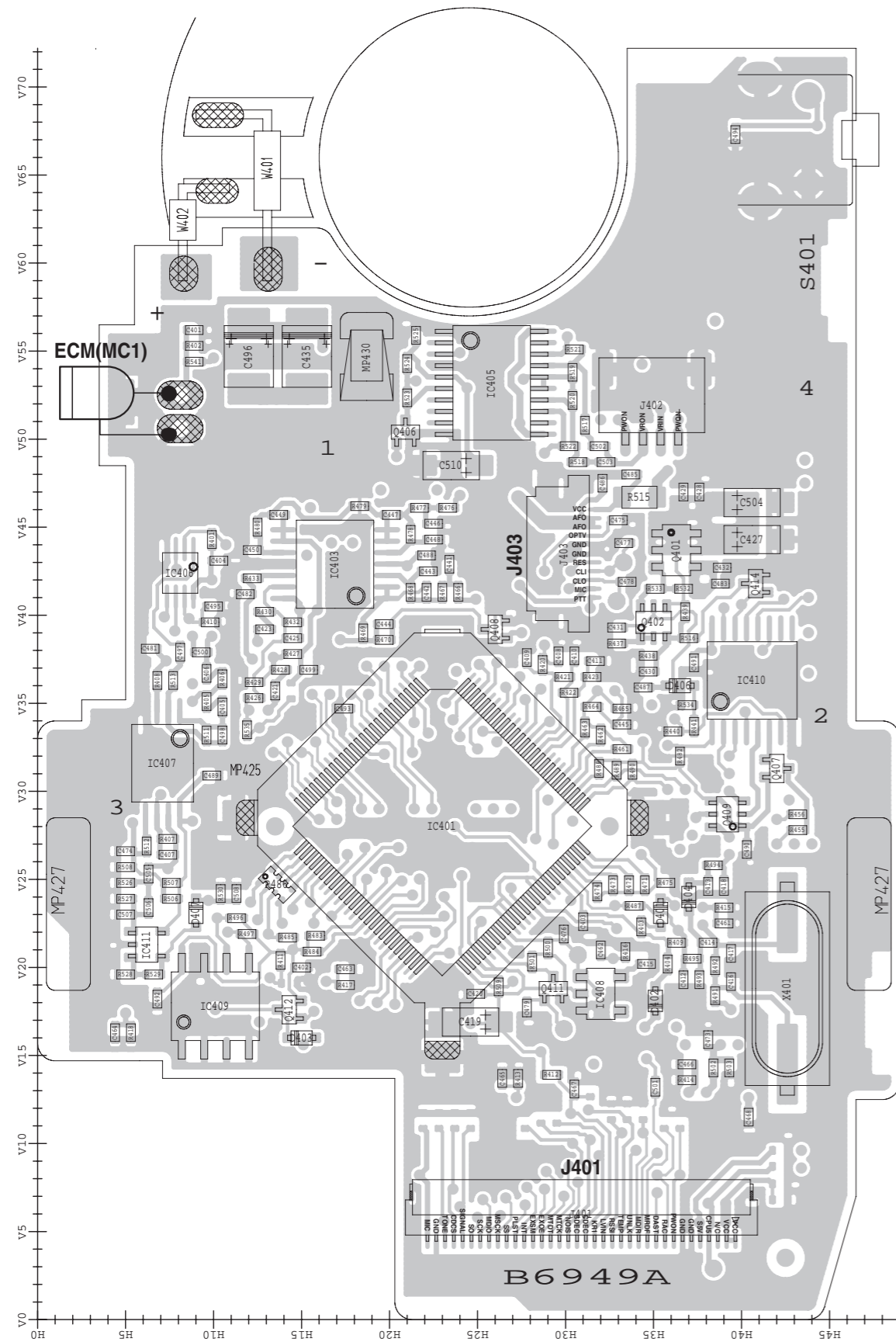
UNIT ABBREVIATIONS:
 F=FRONT UNIT
 M=MAIN UNIT
 V=VR UNIT
 CO=CONNECT UNIT
 C=CHASSIS PARTS



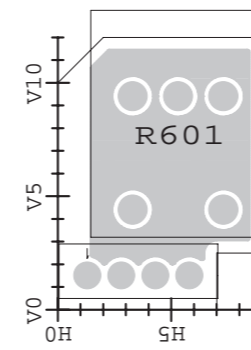
SECTION 8

BOARD LAYOUTS

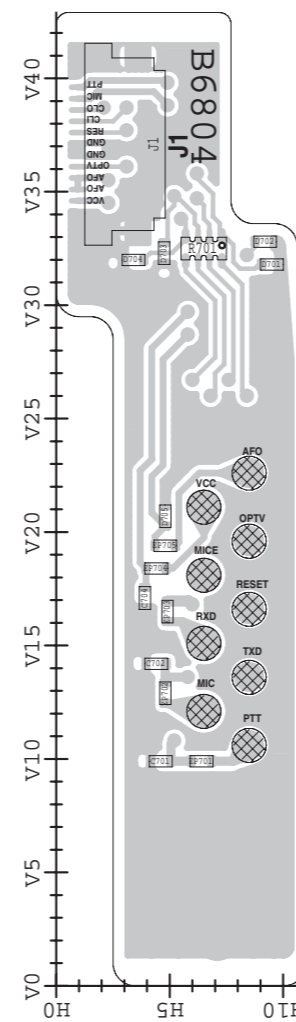
• FRONT UNIT
(TOP VIEW)



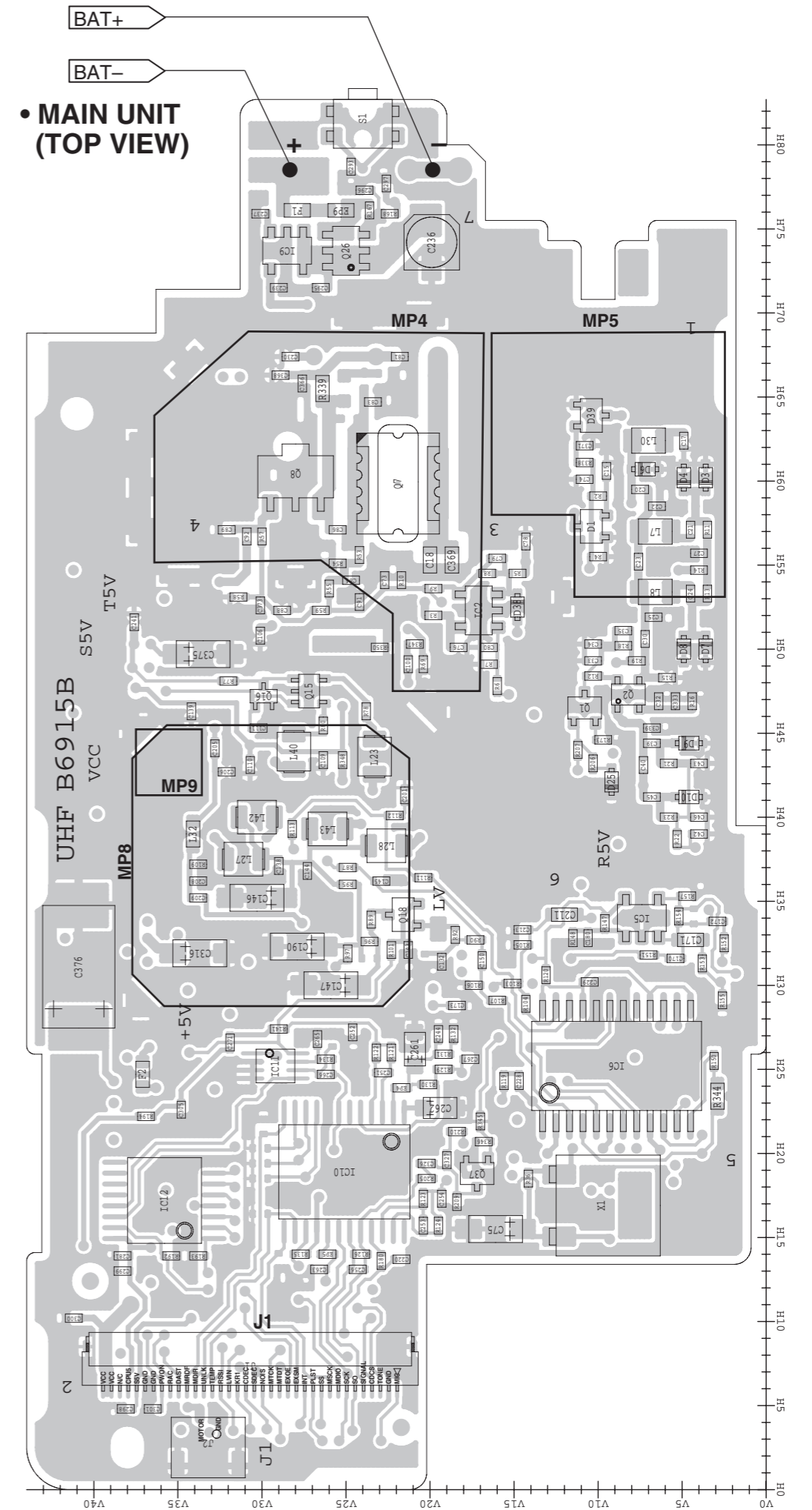
• VR UNIT
(TOP VIEW)



• CONNECT UNIT
(TOP VIEW)

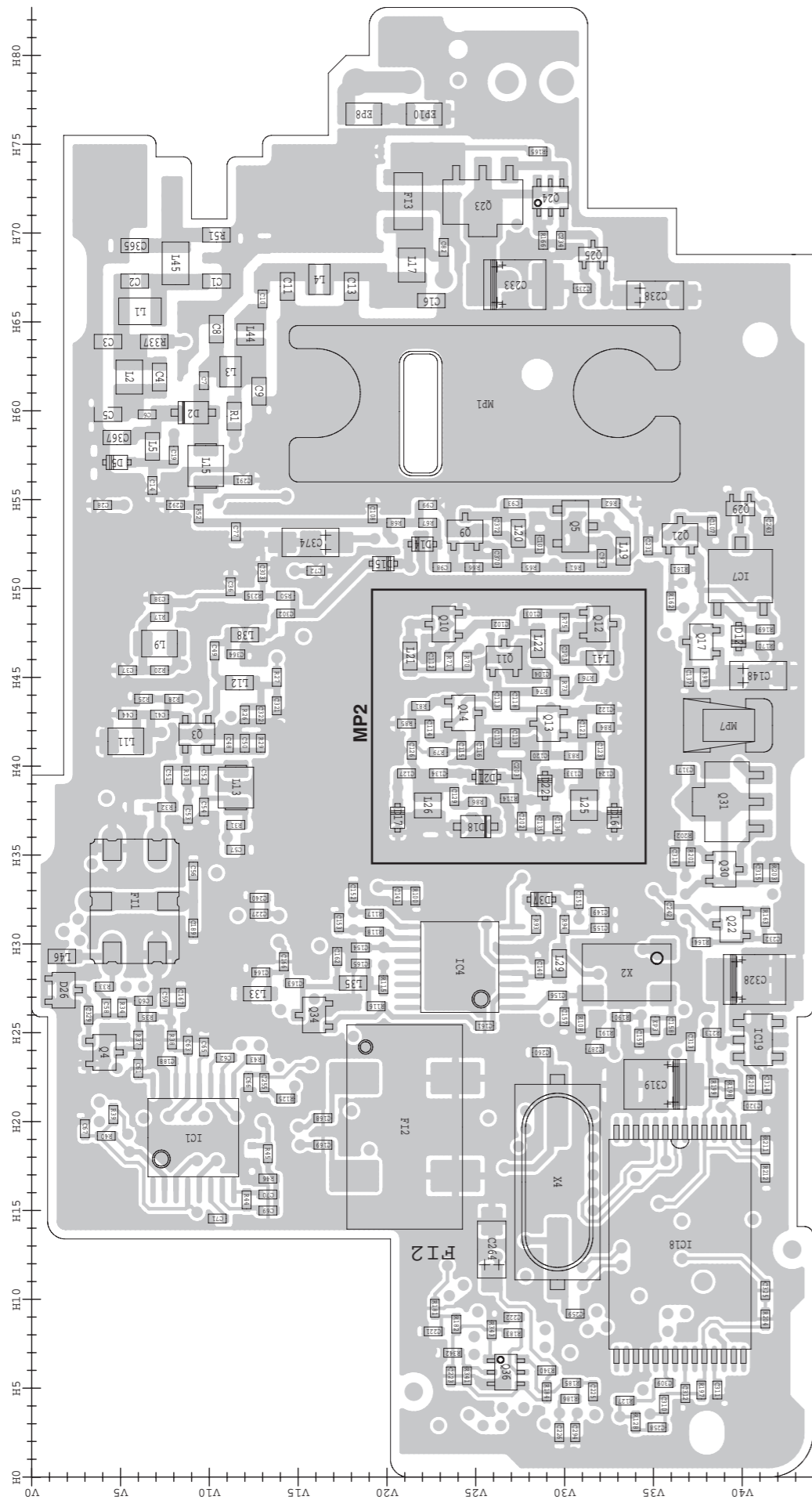


• MAIN UNIT
(TOP VIEW)

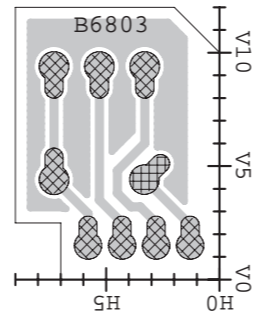


The combination of this side and the bottom side shows the board layout in the same configuration as the actual P.C.Board.

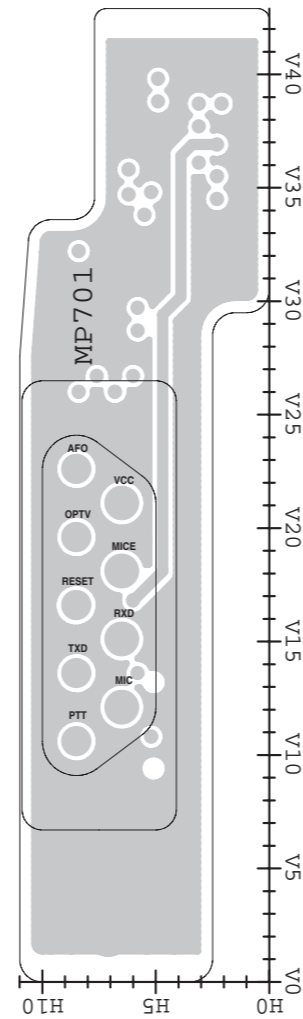
• **MAIN UNIT
(BOTTOM VIEW)**



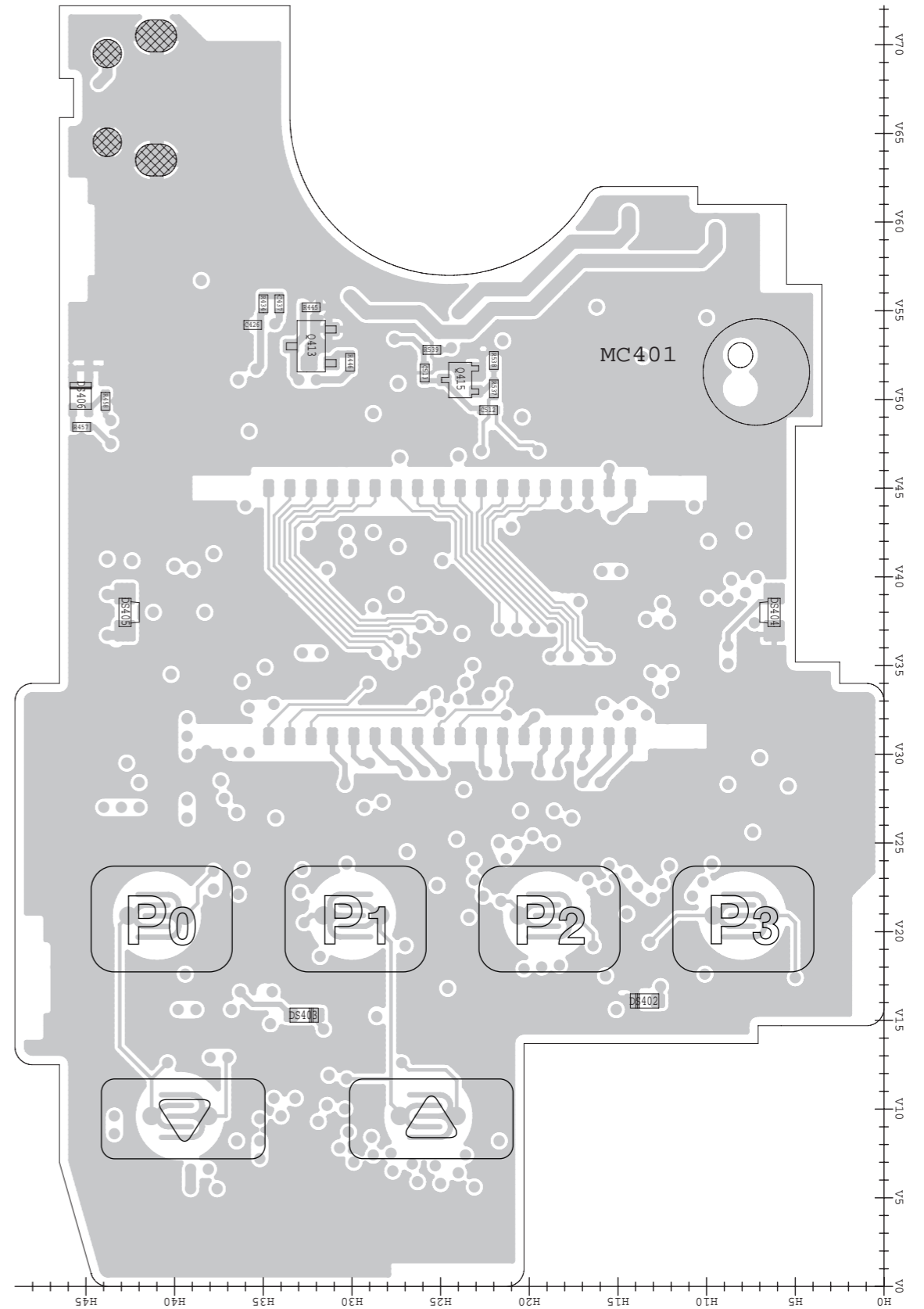
• **VR UNIT
(BOTTOM VIEW)**



• **CONNECT UNIT
(BOTTOM VIEW)**



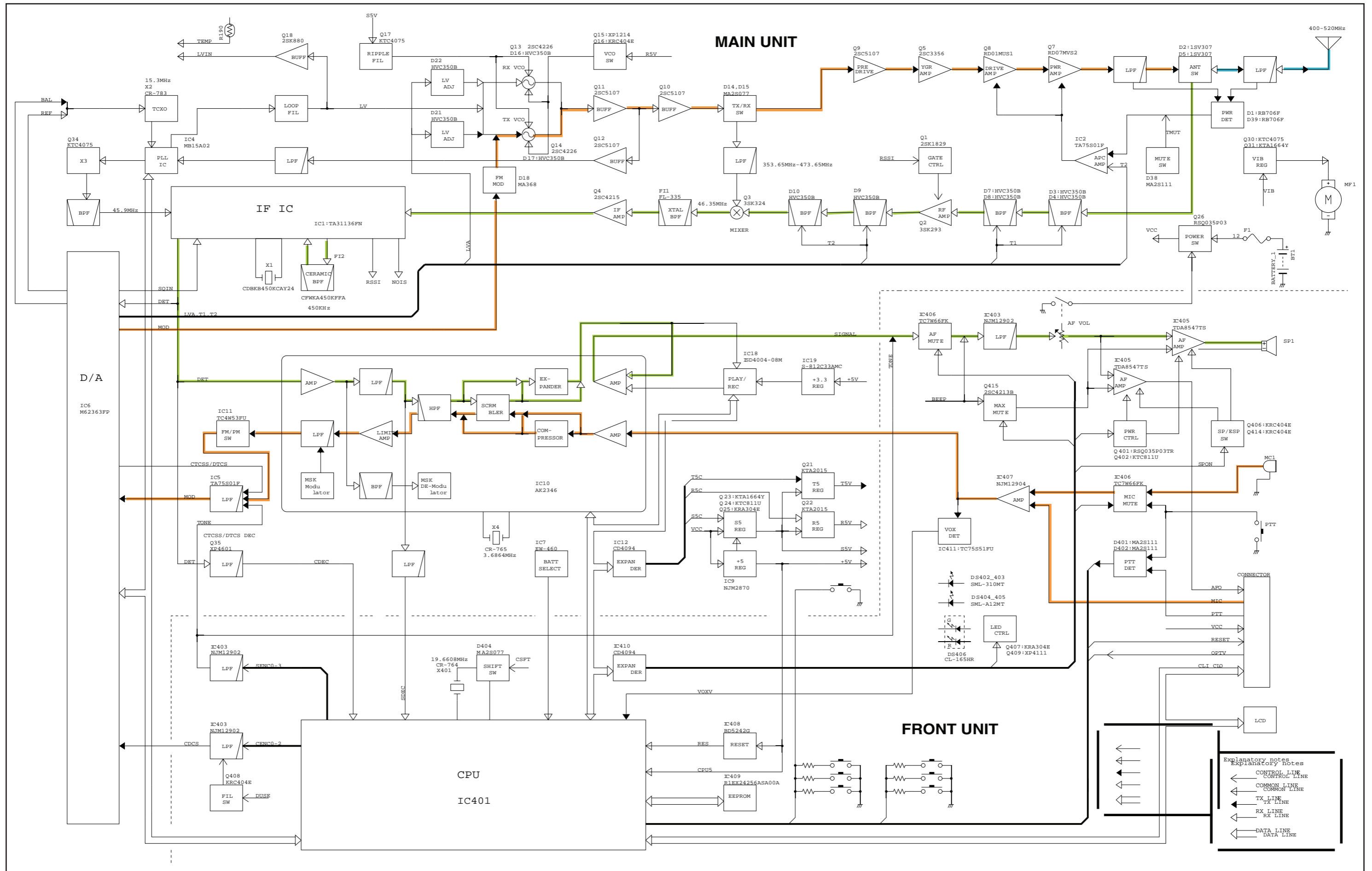
• **FRONT UNIT
(BOTTOM VIEW)**



The combination of this side and the bottom side shows the board layout in the same configuration as the actual P.C.Board.

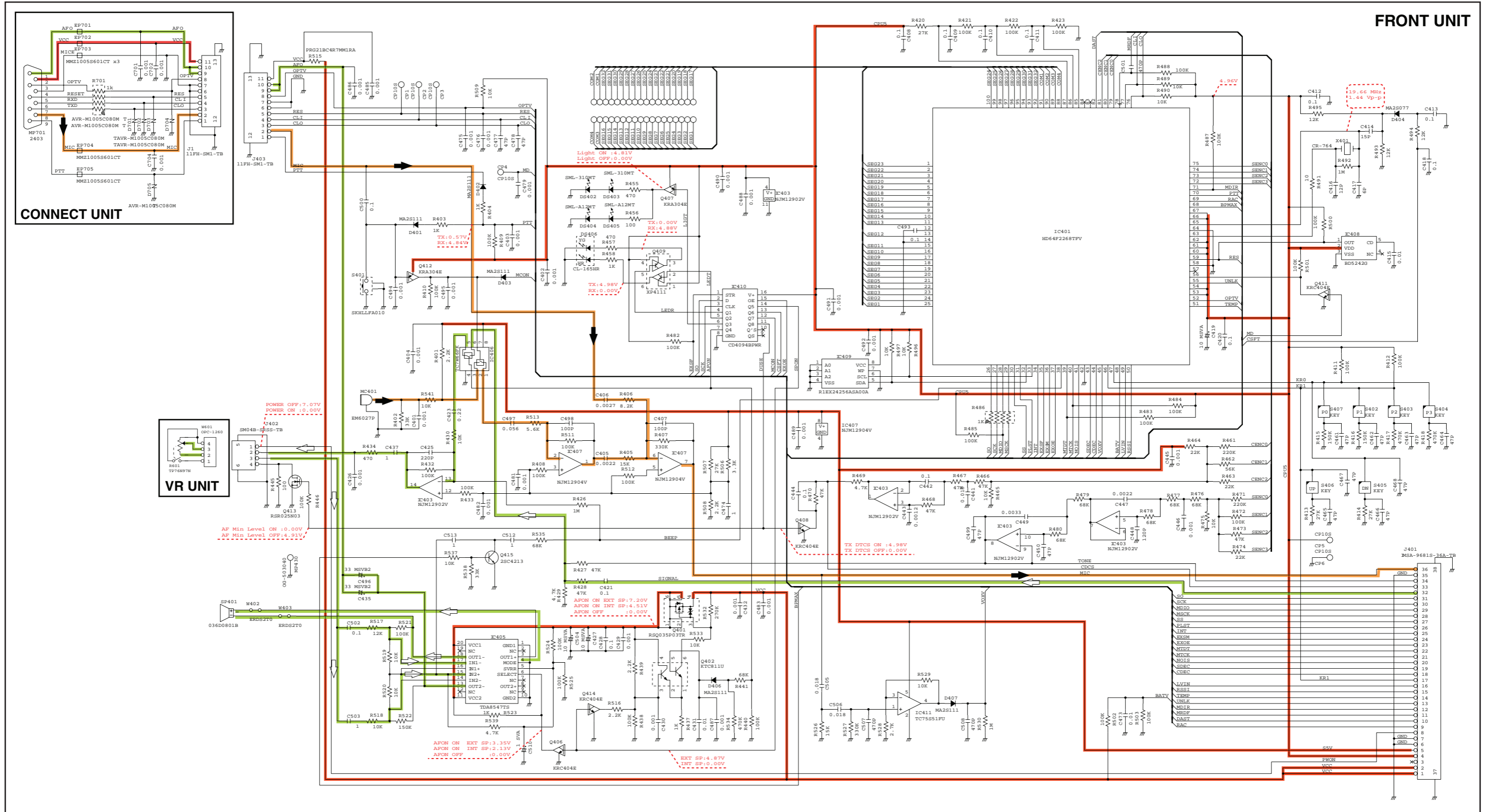
SECTION 9

BLOCK DIAGRAM



SECTION 10

VOLTAGE DIAGRAM



FRONT UNIT

CONNECT UNIT

VR UNIT

*; Refer to "PARTS LIST."

MAIN UNIT (Left side)

Vibration Motor (MF1)

Vibration ON : 3.18V
Vibration OFF : 0.00V

Vibration ON : 4.96V
Vibration OFF : 0.00V

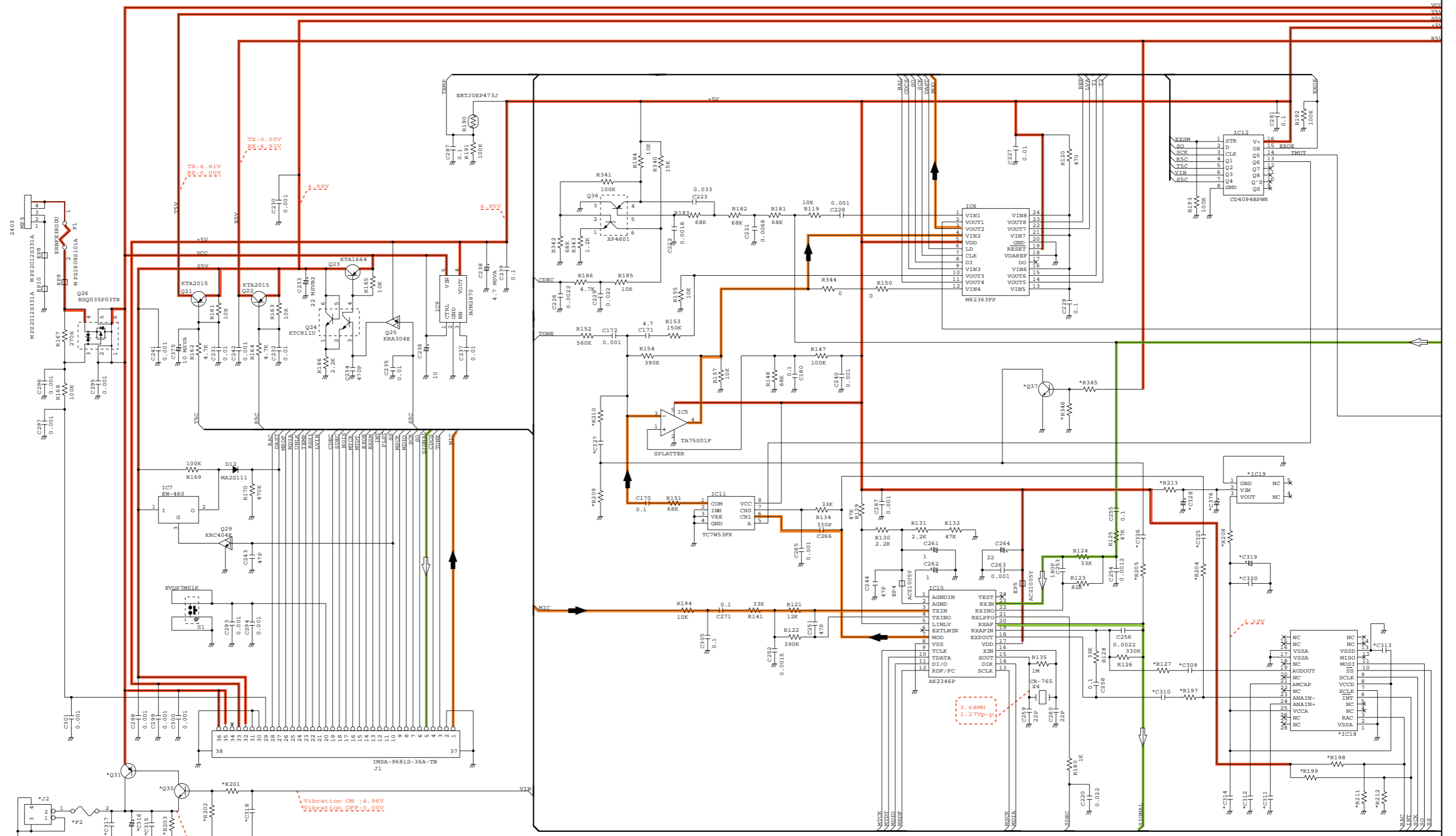
TX : 4.81V
RX : 0.00V

TX : 0.00V
RX : 4.81V

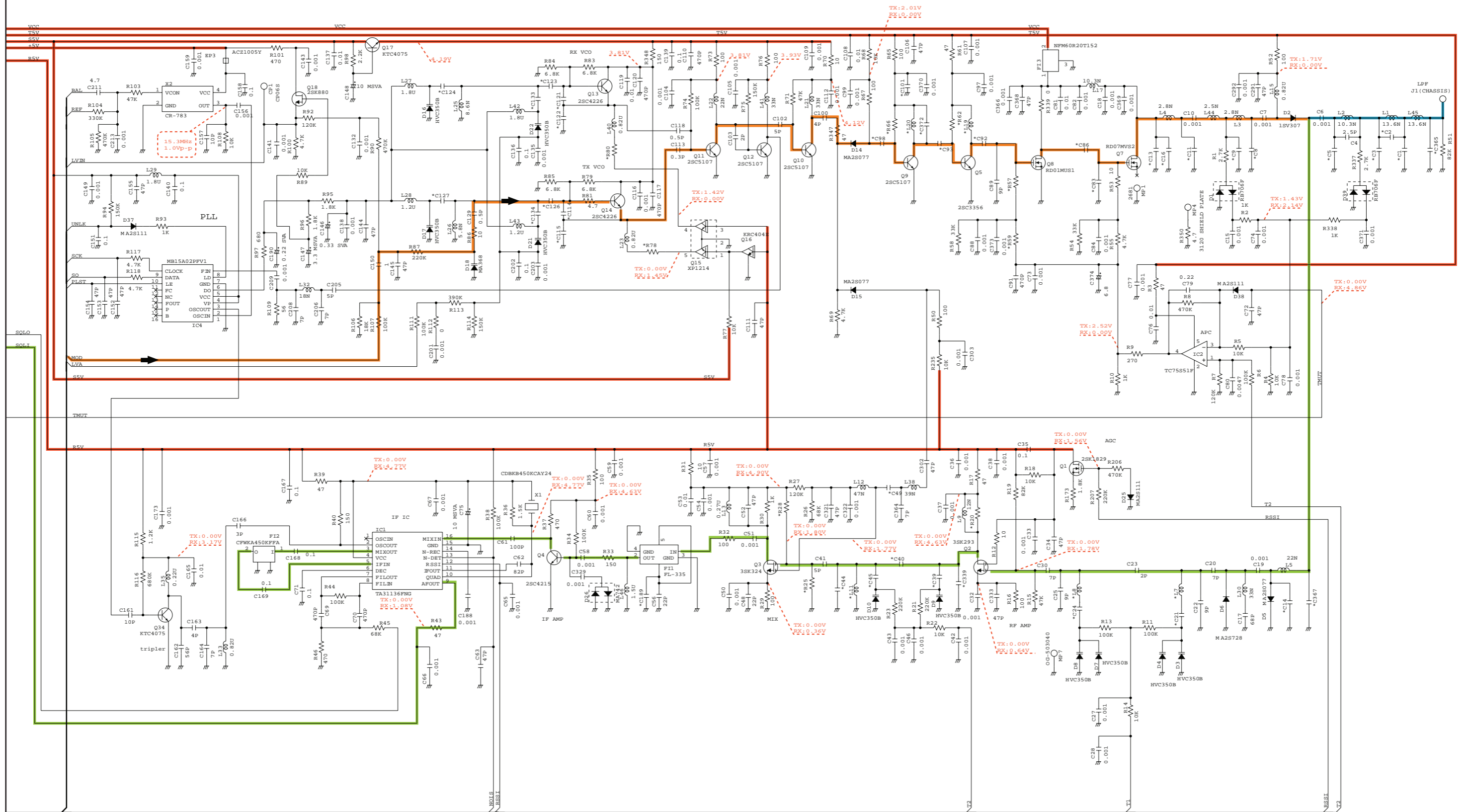
4.95V

3.68MHz
1.27Vp-p

*, Refer to "PARTS LIST."



MAIN UNIT (Right side)



*; Refer to "PARTS LIST."

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