

Jun. 2009



SERVICE MANUAL ADDENDUM

IC-M87 (ATEX version)

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[LOGIC UNIT]

REF NO.	PARTS NO.	DESCRIPTION	M.	H/V LOCATION
C557	4550007360	S.TAN F931A226MBABMA	B	22/29.4
C561	4030006900	S.CER C1608 JB 1H 103K-T	B	20.6/18.2
C571	4030006900	S.CER C1608 JB 1H 103K-T	B	21/33
C581	4030008890	S.CER C1608 JB 1H 273K-T	B	54.5/42
C582	4030007090	S.CER C1608 CH 1H 470J-T	T	52.9/18.9
C591	4030006900	S.CER C1608 JB 1H 103K-T	T	48.6/43.2
C601	4030007050	S.CER C1608 CH 1H 220J-T	B	41.8/38.8
C602	4030006980	S.CER C1608 CH 1H 070D-T	B	42.8/37.5
C603	4030007070	S.CER C1608 CH 1H 330J-T	B	44.1/36.1
C604	4030006900	S.CER C1608 JB 1H 103K-T	B	47/34.5
C605	4030007090	S.CER C1608 CH 1H 470J-T	B	47/33.2
C606	4030006900	S.CER C1608 JB 1H 103K-T	B	47/31.9
C611	4030006860	S.CER C1608 JB 1H 102K-T	B	2.6/20.3
C612	4030008880	S.CER C1608 JB 1H 223K-T	B	2.6/17.6
C621	4030006860	S.CER C1608 JB 1H 102K-T	B	33.3/44
C622	4030006860	S.CER C1608 JB 1H 102K-T	B	1.6/32.1
C623	4030006860	S.CER C1608 JB 1H 102K-T	B	37.6/5.9
C641	4550007360	S.TAN F931A226MBABMA	B	16.1/17.8
C642	4030006900	S.CER C1608 JB 1H 103K-T	B	25.6/30
C643	4030006900	S.CER C1608 JB 1H 103K-T	B	28.1/32.6
C661	4030008920	S.CER C1608 JB 1H 473K-T	B	48.9/31.1
C662	4030008920	S.CER C1608 JB 1H 473K-T	B	50.2/31.1
C663	4030008920	S.CER C1608 JB 1H 473K-T	B	48.5/28.2
C664	4030008920	S.CER C1608 JB 1H 473K-T	B	49.2/26.2
C665	4030008920	S.CER C1608 JB 1H 473K-T	B	52.9/22.3
C666	4030008900	S.CER C1608 JB 1H 333K-T	B	51/22.2
C667	4030008920	S.CER C1608 JB 1H 473K-T	B	52.9/21
C668	4030008920	S.CER C1608 JB 1H 473K-T	B	49.5/20.1
C669	4030008920	S.CER C1608 JB 1H 473K-T	B	51.3/17.8
C670	4030008920	S.CER C1608 JB 1H 473K-T	B	50/17.8
C671	4030011600	S.CER C1608 JB 1E 104K-T	B	53.2/18.6
C681	4030011600	S.CER C1608 JB 1E 104K-T	B	38.4/11.2
C682	4030017480	S.CER C1608 JB 1A 474K-T	B	47.5/17.9
C683	4030017480	S.CER C1608 JB 1A 474K-T	B	44.6/17.7
C684	4030017480	S.CER C1608 JB 1A 474K-T	B	46.1/16.4
C685	4030017480	S.CER C1608 JB 1A 474K-T	B	45.7/19.2
J401	6510023521	S.CON 54104-3696(3692)	B	5.8/30.8
J411	6510018351	S.CON S3B-ZR-SM4A-TF(LF)(SN)	B	65.5/37.9
DS651	5040002660	S.LED FY1101F-TR (LED)	T	47.8/32.7
DS652	5040002660	S.LED FY1101F-TR (LED)	T	47.8/16.7
DS653	5040002310	S.LED SML-311YTT86	T	11.2/32.8
DS654	5040002310	S.LED SML-311YTT86	T	11.2/16.6
DS681	5030002770	LCD L2-0390TAY-1		
MC461	7700002730	MIC AMB-622-462C33		
S461	2230001060	S.SWI EVQ-PUL 02K	B	67.6/44.8
S641	2230001060	S.SWI EVQ-PUL 02K	B	51.4/44.8
EP451	6910012350	S.BEA MMZ1608Y 102BT	T	67.8/10.3
EP452	6910012350	S.BEA MMZ1608Y 102BT	T	65.9/10.3
EP454	6910012350	S.BEA MMZ1608Y 102BT	B	64.7/10.4
EP458	6910012350	S.BEA MMZ1608Y 102BT	T	58.3/10.3
EP459	6910012350	S.BEA MMZ1608Y 102BT	T	57/10.3
EP681	8930059150	LCD SRCN-2600-SP-N-W (SHJ)		
MP441	6910014760	S.PLA OG-503040	B	52.4/26.7
MP451	6910014760	S.PLA OG-503040	B	65.7/13.6

[VR UNIT]

REF NO.	PARTS NO.	DESCRIPTION	M.	H/V LOCATION
R801	7210003130	VAR TP76N97N-13F-10KA-2497		
C801	4030006900	S.CER C1608 JB 1H 103K-T	B	6.9/2.6
C802	4030006860	S.CER C1608 JB 1H 102K-T	B	6.9/5.6
W801	8900011900	CAB OPC-1192		
W802	8900012031	CAB OPC-1231A		

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

[CONNECTOR UNIT]

REF NO.	PARTS NO.	DESCRIPTION	M.	H/V LOCATION
J851	6910015031	CON IMSA-9230B-1-09Z135-PT1		

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

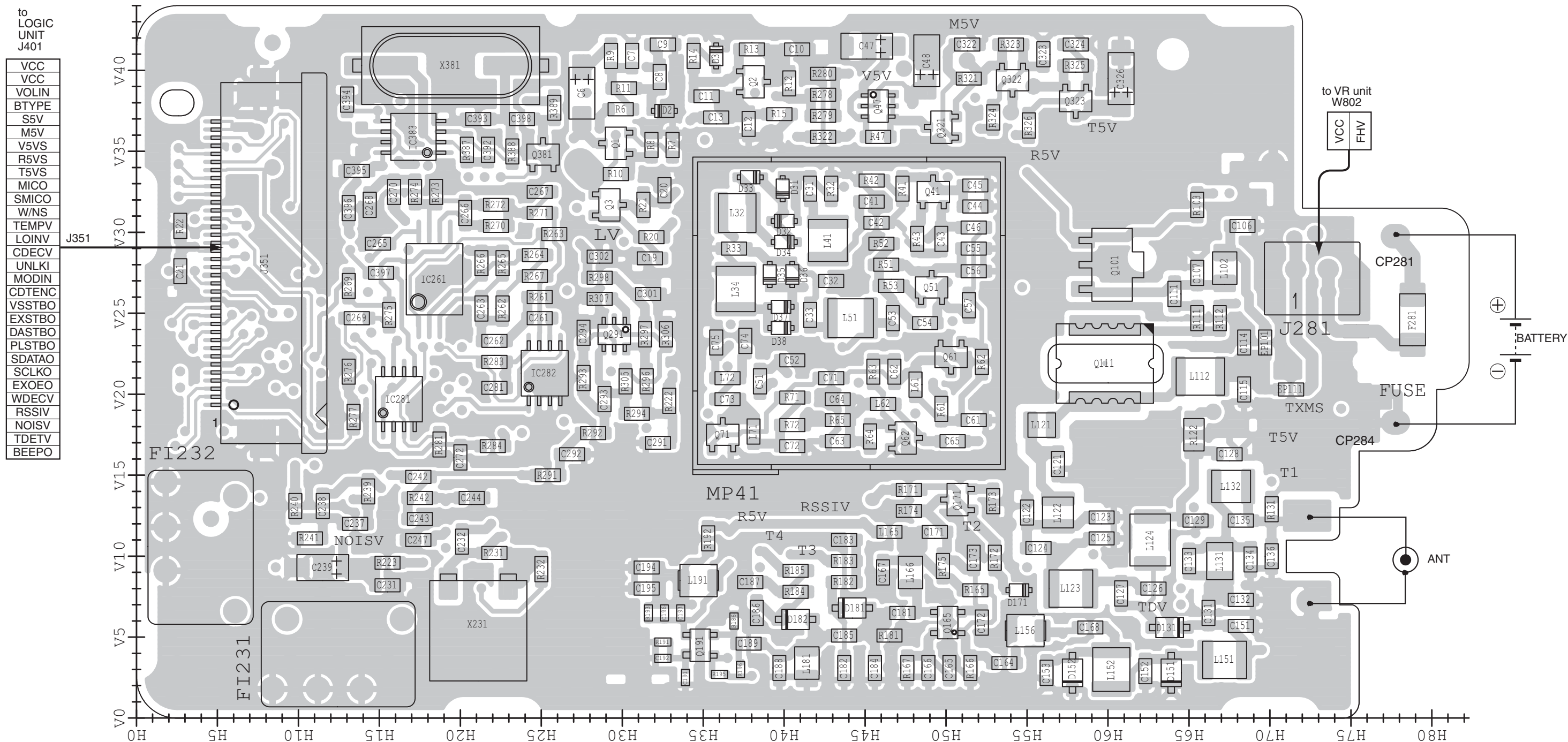
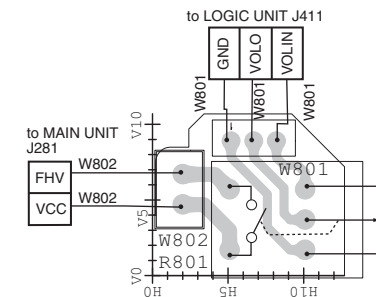
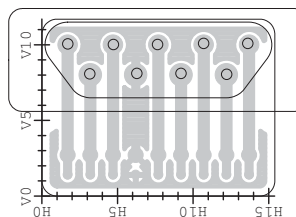
BOARD LAYOUTS

The combination of top side and bottom side of this page shows the actual configuration of P.C. board.

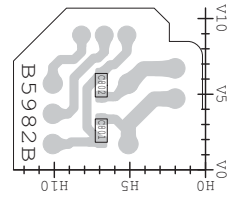
• MAIN UNIT (TOP VIEW)

• CONNECT UNIT (TOP VIEW)

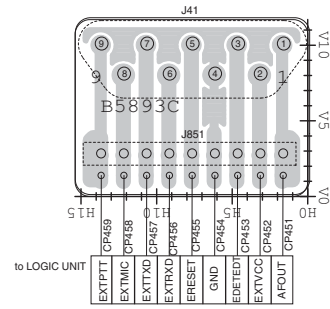
• VR UNIT (TOP VIEW)



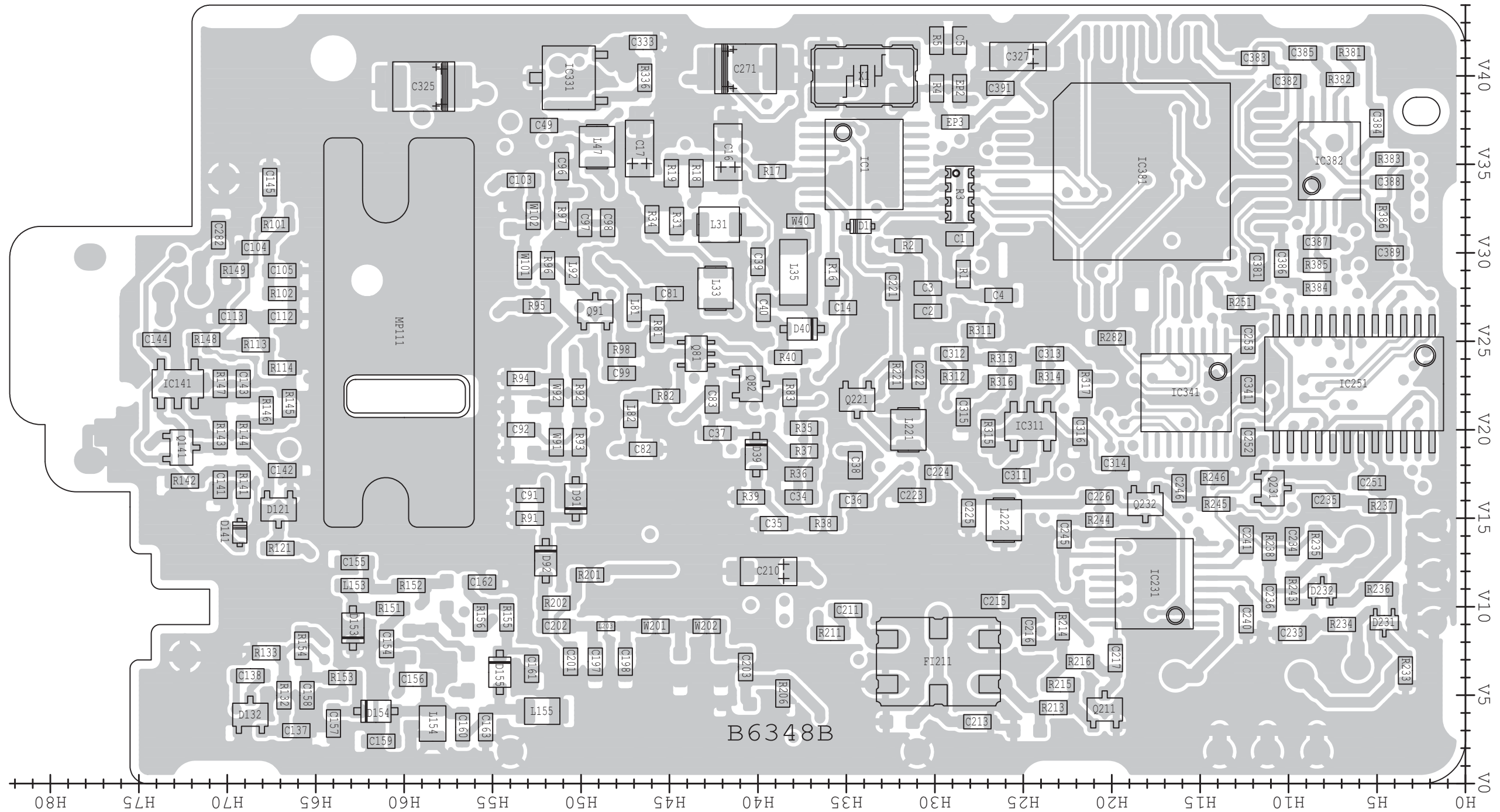
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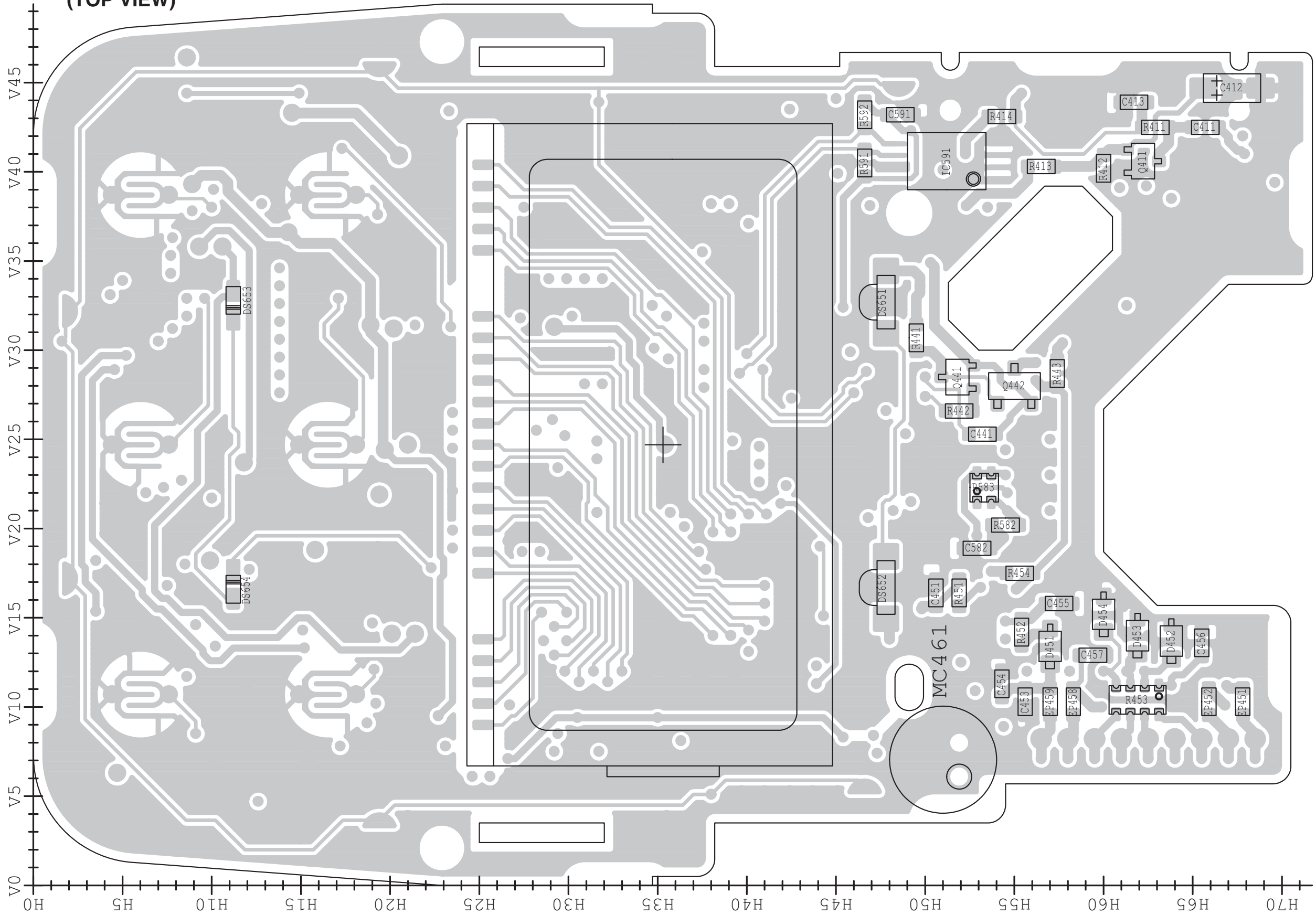
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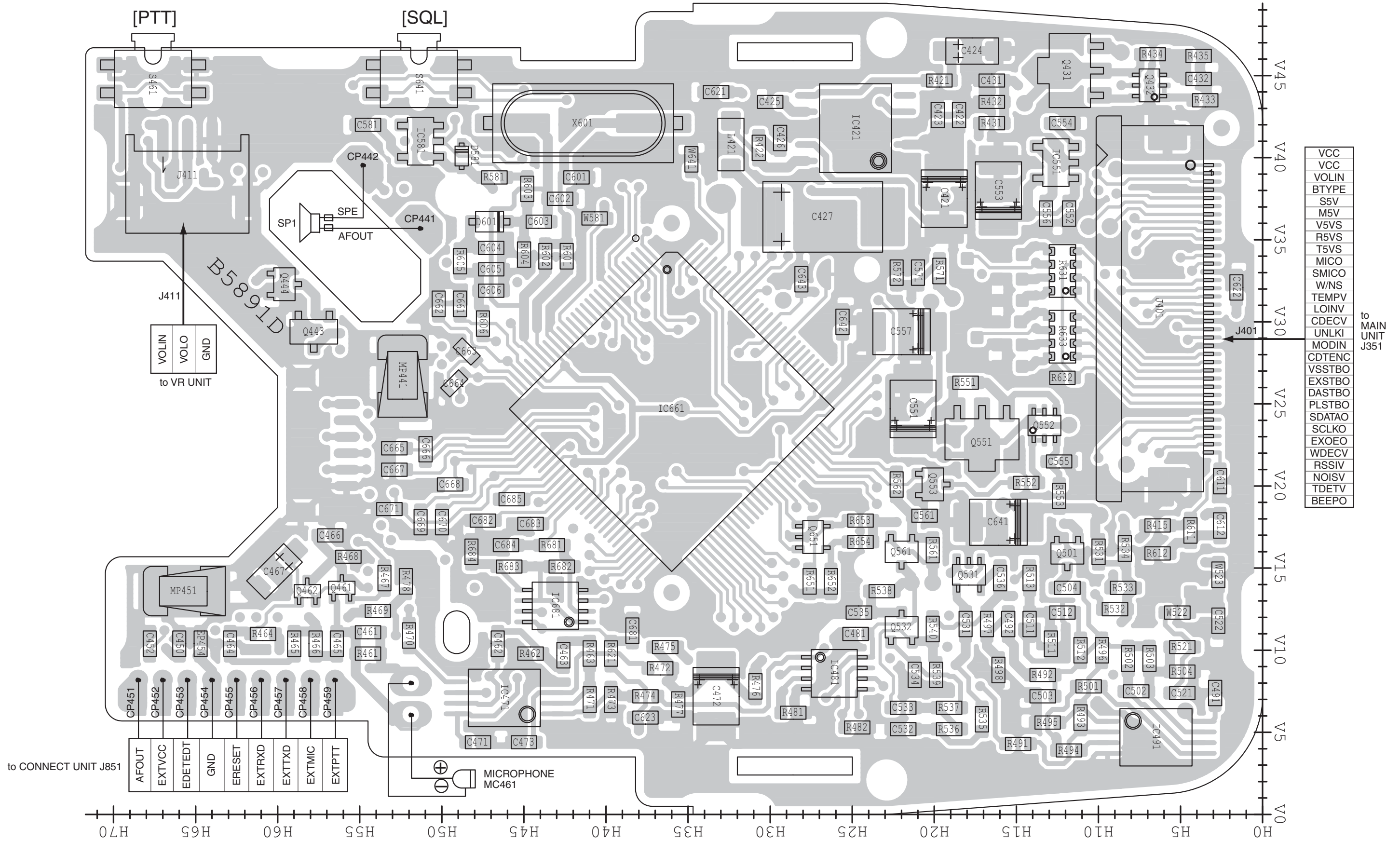
• VR UNIT (BOTTOM VIEW)



• LOGIC UNIT
(TOP VIEW)



• LOGIC UNIT
(BOTTOM VIEW)



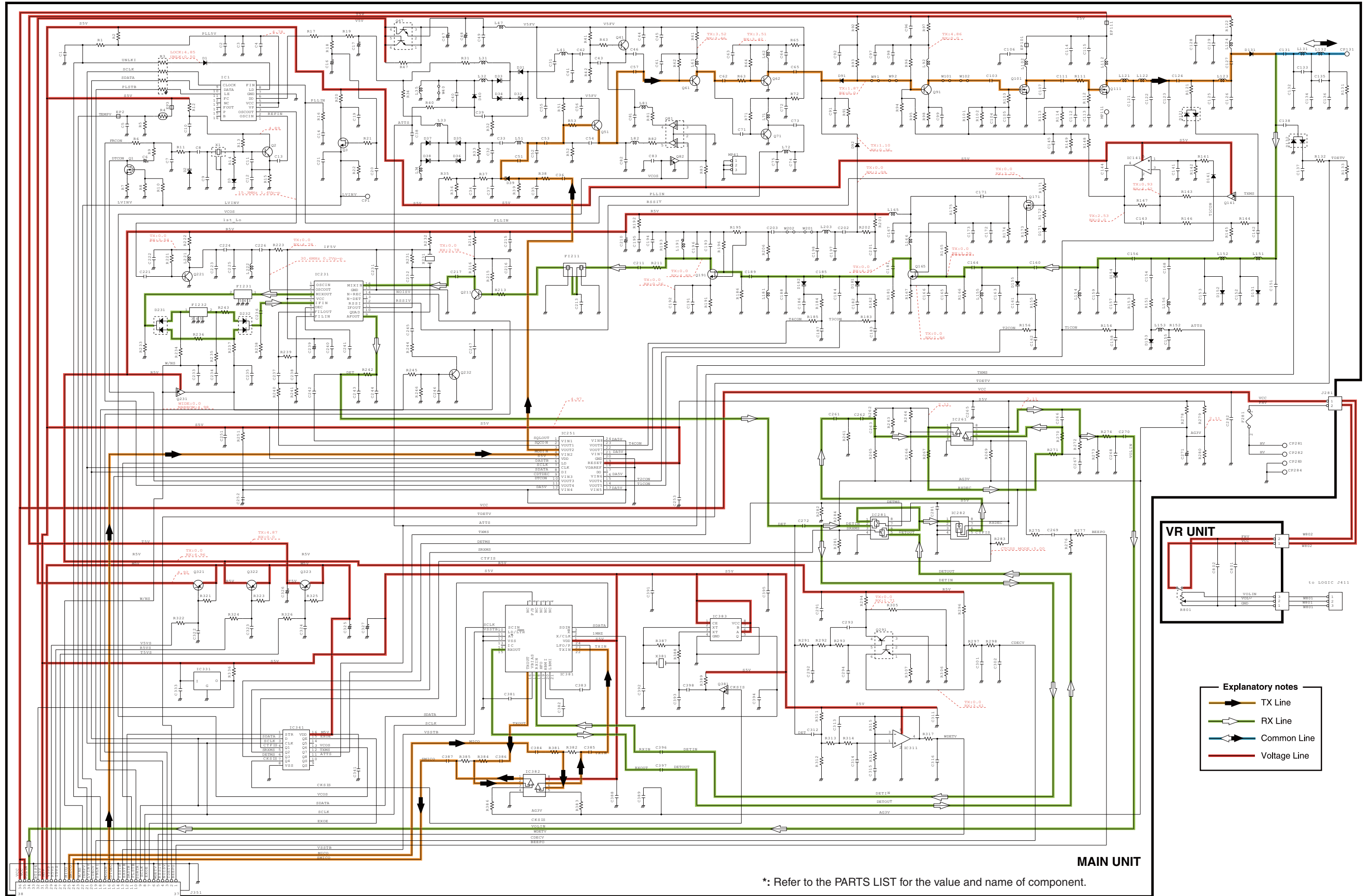
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V5VS
R5VS
T5VS
MICO
SMICO
W/NS
TEMPV
LOINV
CDECV
UNLKI
MODIN
CDTENC
VSSSTBO
EXSTBO
DASTBO
PLSTBO
SDATAO
SCLKO
EXOEO
WDECV
RSSIV
NOISV
TDETV
BEEPO

to MAIN UNIT J351

to VR UNIT

to CONNECT UNIT J851

VOLTAGE DIAGRAM



*: Refer to the PARTS LIST for the value and name of component.

Jan. 2009



SERVICE MANUAL ADDENDUM

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[MAIN UNIT]

Table with columns: REF NO., PARTS NO., DESCRIPTION, M., H/V LOCATION. Lists parts R145 to R326 with their descriptions and locations.

[MAIN UNIT]

Table with columns: REF NO., PARTS NO., DESCRIPTION, M., H/V LOCATION. Lists parts R336 to C131 with their descriptions and locations.

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

[LOGIC UNIT]

REF NO.	PARTS NO.	DESCRIPTION	M.	H/V LOCATION
C561	4030006900	S.CER C1608 JB 1H 103K-T	B	20.6/18.2
C571	4030006900	S.CER C1608 JB 1H 103K-T	B	21/33
C581	4030008890	S.CER C1608 JB 1H 273K-T	B	54.5/42
C582	4030007090	S.CER C1608 CH 1H 470J-T	T	52.9/18.9
C591	4030006900	S.CER C1608 JB 1H 103K-T	T	48.6/43.2
C601	4030007050	S.CER C1608 CH 1H 220J-T	B	41.8/38.8
C602	4030006980	S.CER C1608 CH 1H 070D-T	B	42.8/37.5
C603	4030007070	S.CER C1608 CH 1H 330J-T	B	44.1/36.1
C604	4030006900	S.CER C1608 JB 1H 103K-T	B	47/34.5
C605	4030007090	S.CER C1608 CH 1H 470J-T	B	47/33.2
C606	4030006900	S.CER C1608 JB 1H 103K-T	B	47/31.9
C611	4030006860	S.CER C1608 JB 1H 102K-T	B	2.6/20.3
C612	4030008880	S.CER C1608 JB 1H 223K-T	B	2.6/17.6
C621	4030006860	S.CER C1608 JB 1H 102K-T	B	33.3/44
C622	4030006860	S.CER C1608 JB 1H 102K-T	B	1.6/32.1
C623	4030006860	S.CER C1608 JB 1H 102K-T	B	37.6/5.9
C641	4550007360	S.TAN F931A226MBABMA	B	16.1/17.8
C642	4030006900	S.CER C1608 JB 1H 103K-T	B	25.6/30
C643	4030006900	S.CER C1608 JB 1H 103K-T	B	28.1/32.6
C661	4030008920	S.CER C1608 JB 1H 473K-T	B	48.9/31.1
C662	4030008920	S.CER C1608 JB 1H 473K-T	B	50.2/31.1
C663	4030008920	S.CER C1608 JB 1H 473K-T	B	48.5/28.2
C664	4030008920	S.CER C1608 JB 1H 473K-T	B	49.2/26.2
C665	4030008920	S.CER C1608 JB 1H 473K-T	B	52.9/22.3
C666	4030008900	S.CER C1608 JB 1H 333K-T	B	51/22.2
C667	4030008920	S.CER C1608 JB 1H 473K-T	B	52.9/21
C668	4030008920	S.CER C1608 JB 1H 473K-T	B	49.5/20.1
C669	4030008920	S.CER C1608 JB 1H 473K-T	B	51.3/17.8
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C683	4030017480	S.CER C1608 JB 1A 474K-T	B	44.6/17.7
C684	4030017480	S.CER C1608 JB 1A 474K-T	B	46.1/16.4
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DS681	5030002770	LCD L2-0390TAY-1		
MC461	7700002730	MIC AMB-622-462C33		
S461	2230001060	S.SWI EVQ-PUL 02K	B	67.6/44.8
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EP451	6910012350	S.BEA MMZ1608Y 102BT	T	67.8/10.3
EP452	6910012350	S.BEA MMZ1608Y 102BT	T	65.9/10.3
EP454	6910012350	S.BEA MMZ1608Y 102BT	B	64.7/10.4
EP458	6910012350	S.BEA MMZ1608Y 102BT	T	58.3/10.3
EP459	6910012350	S.BEA MMZ1608Y 102BT	T	57/10.3
EP681	8930059150	LCD SRCN-2600-SP-N-W (SHJ)		
MP441	6910014760	S.PLA OG-503040	B	52.4/26.7
MP451	6910014760	S.PLA OG-503040	B	65.7/13.6

[VR UNIT]

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C801	4030006900	S.CER C1608 JB 1H 103K-T	B	6.9/2.6
C802	4030006860	S.CER C1608 JB 1H 102K-T	B	6.9/5.6
W801	8900011900	CAB OPC-1192		
W802	8900012031	CAB OPC-1231A		

[CONNECTOR UNIT]

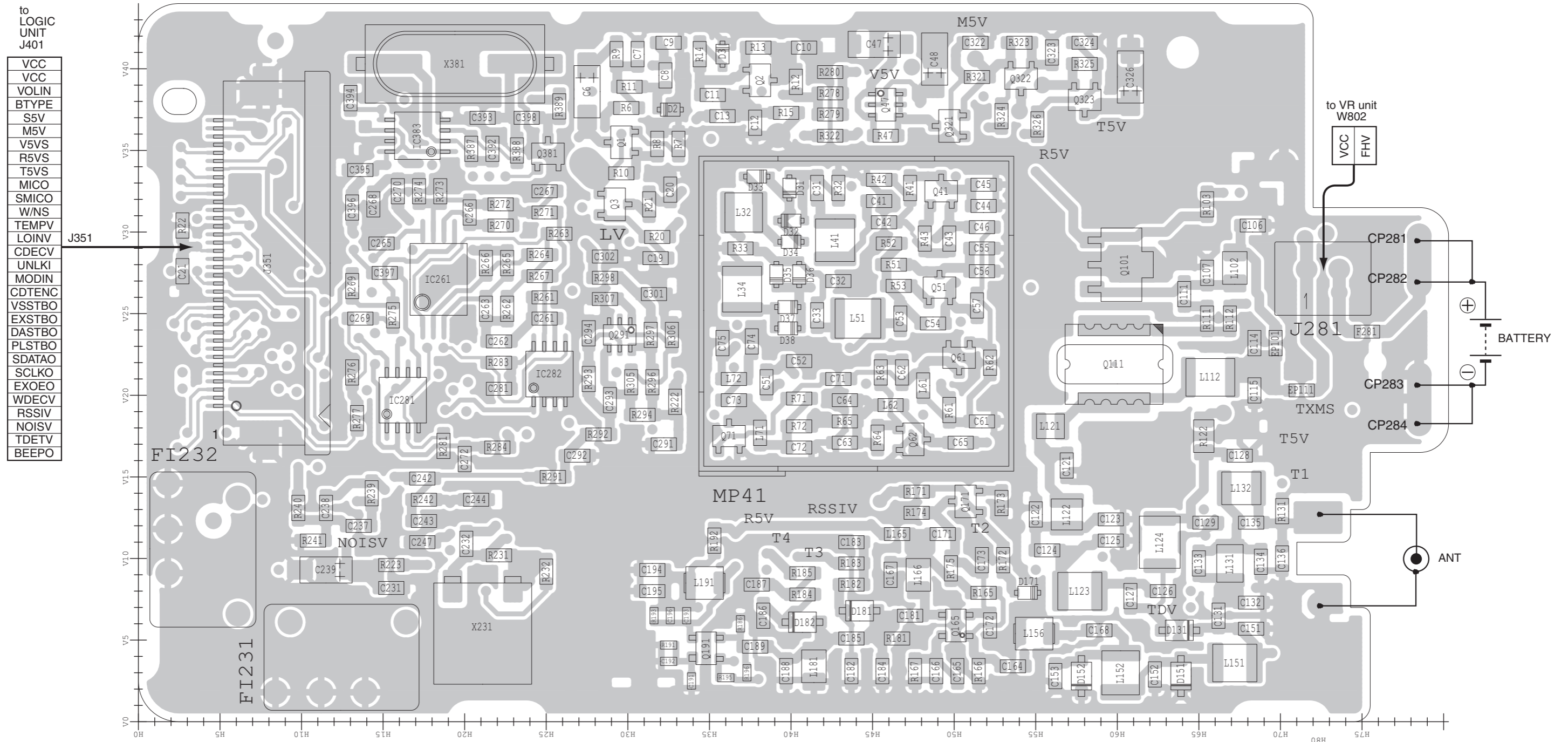
REF NO.	PARTS NO.	DESCRIPTION	M.	H/V LOCATION
J851	6910015031	CON IMSA-9230B-1-09Z135-PT1		

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

BOARD LAYOUT

The combination of top side and bottom side of this page shows the actual configuration of P.C. board.

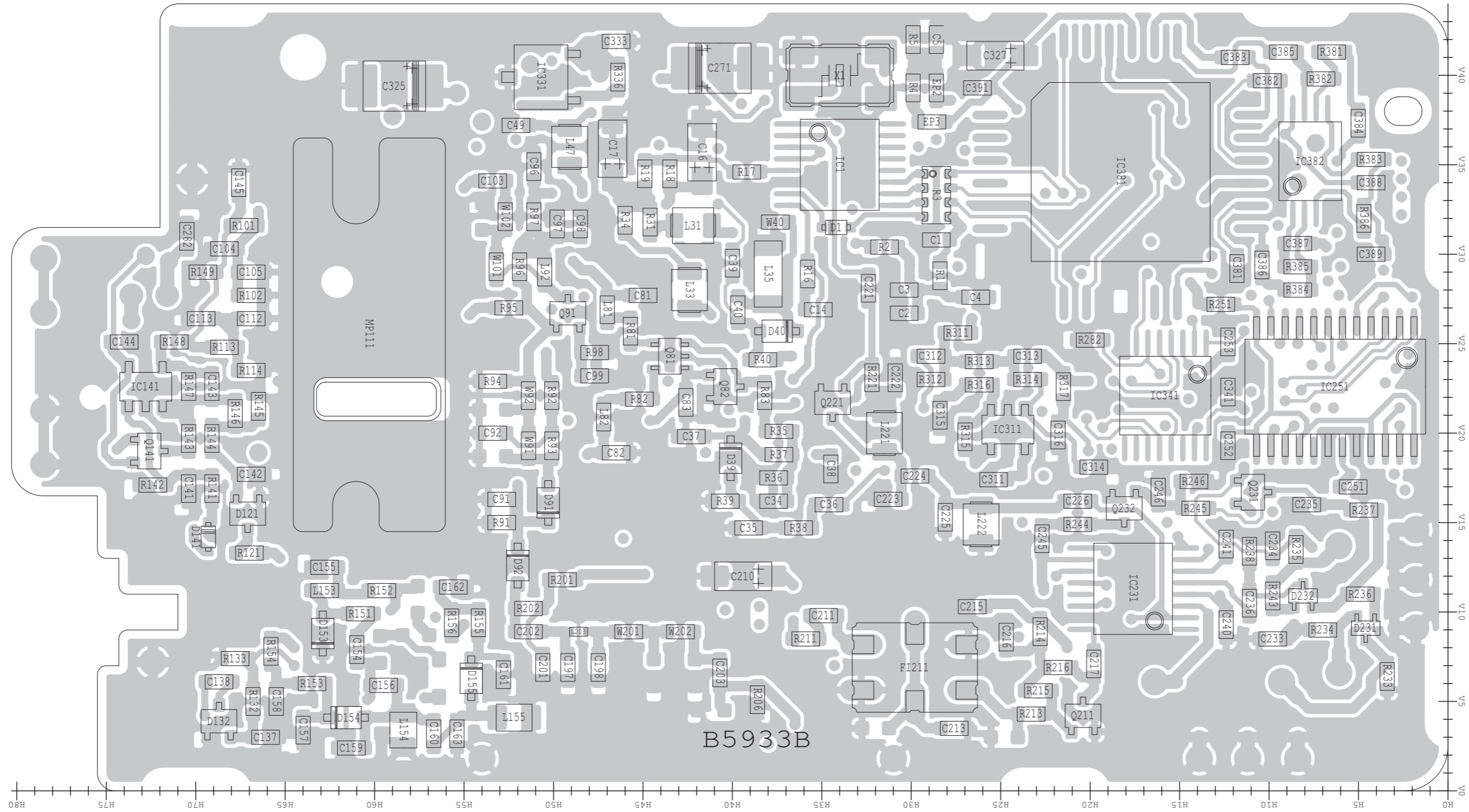
• MAIN UNIT (TOP VIEW)



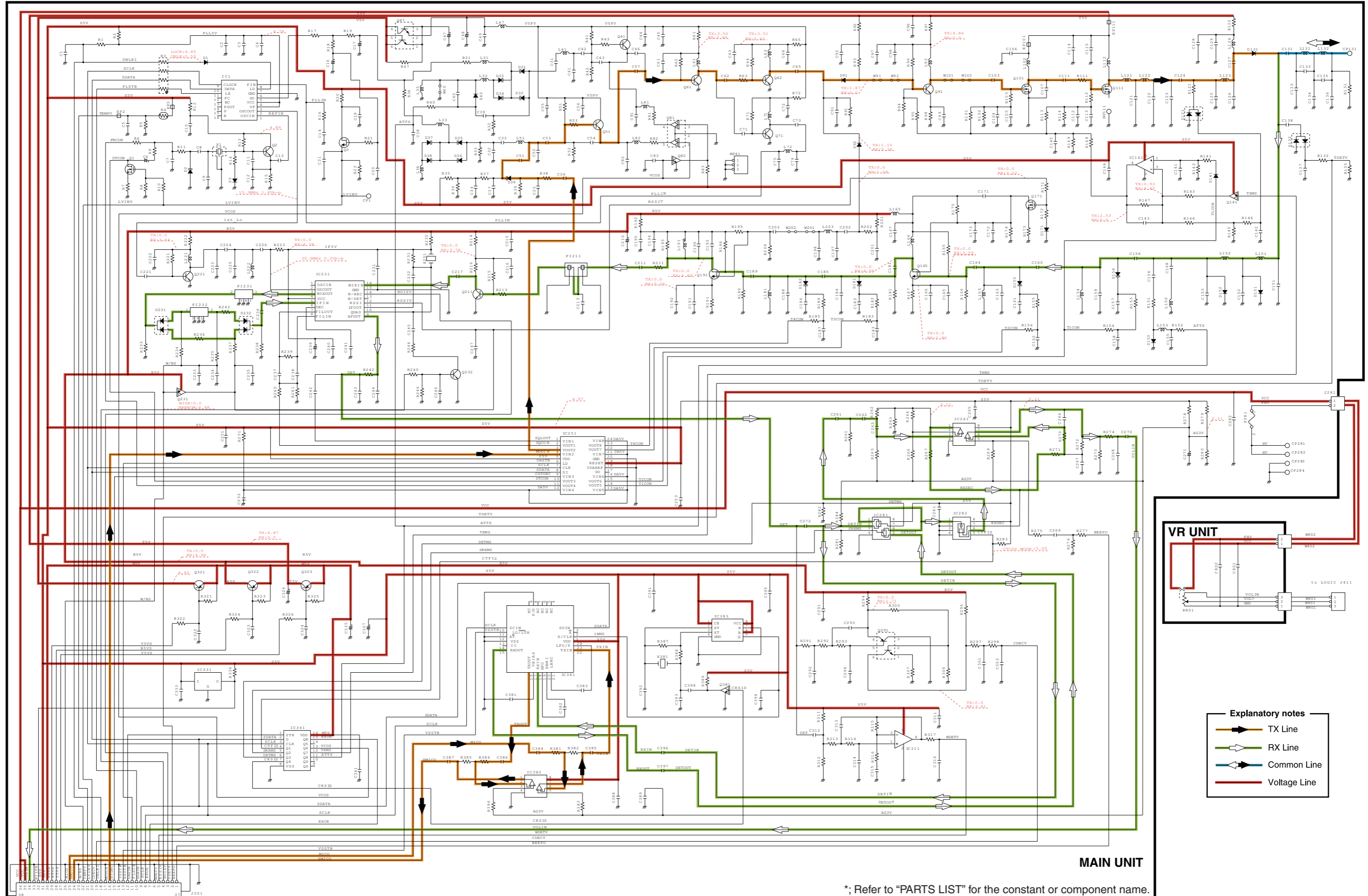
to LOGIC UNIT J401

VCC
VCC
VOLIN
BTYPE
S5V
M5V
V5VS
R5VS
T5VS
MICO
SMICO
W/NS
TEMPV
LOINV
CDECV
UNLKI
MODIN
CDTENC
VSSTBO
EXSTBO
DASTBO
PLSTBO
SDATAO
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EXOEO
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RSSIV
NOISV
TDETV
BEEPO

• MAIN UNIT
(BOTTOM VIEW)

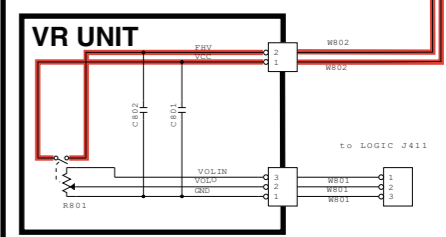


VOLTAGE DIAGRAM



- Explanatory notes**
- TX Line
 - RX Line
 - Common Line
 - Voltage Line

MAIN UNIT

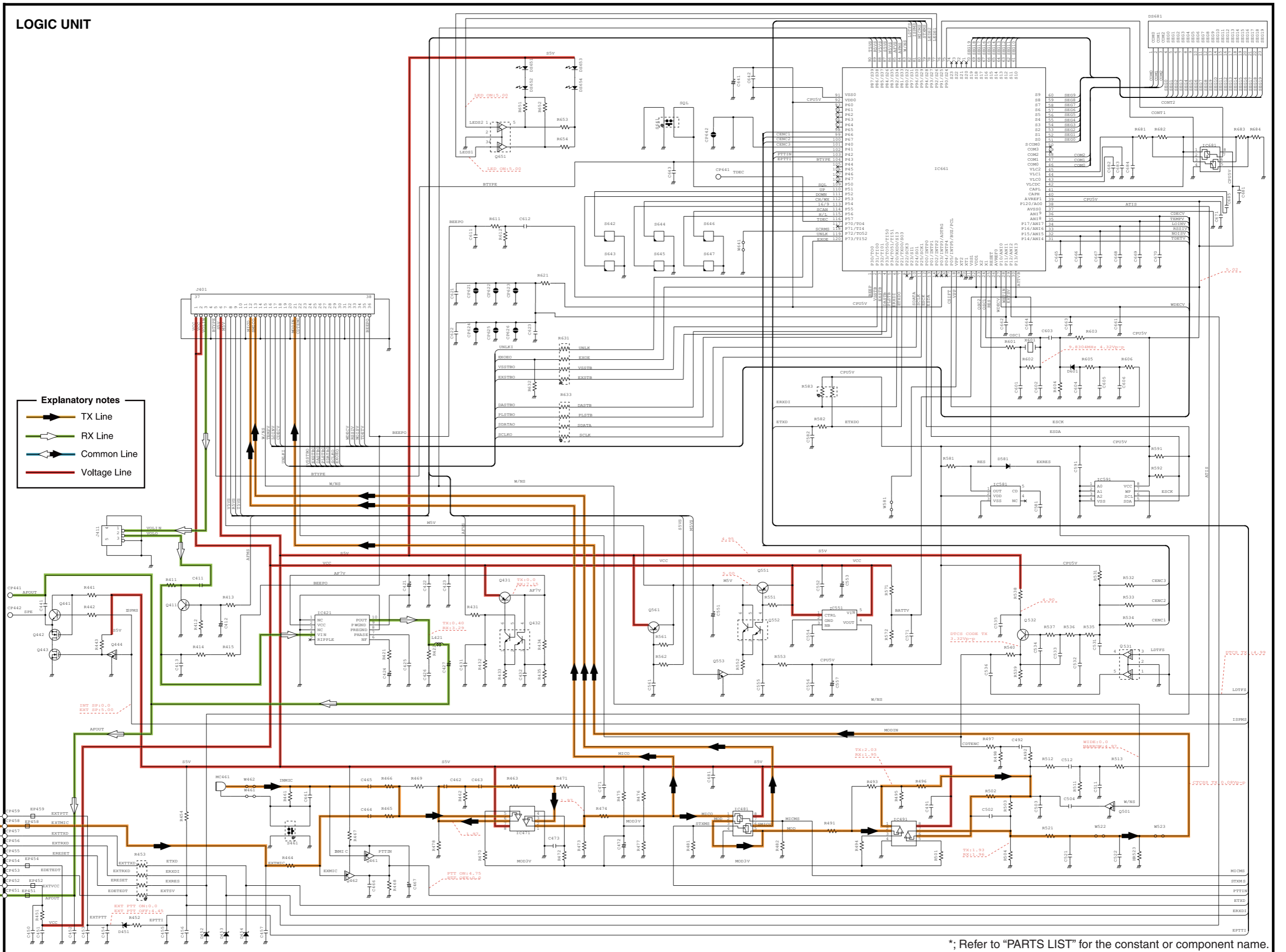
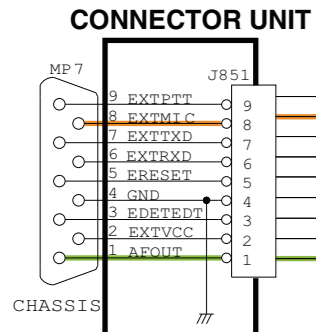


*; Refer to "PARTS LIST" for the constant or component name.

LOGIC UNIT

Explanatory notes

- TX Line
- RX Line
- Common Line
- Voltage Line



*; Refer to "PARTS LIST" for the constant or component name.



SERVICE MANUAL

VHF MARINE TRANSCEIVER

IC-M87

(ATEX VERSION)

S-14220MZ-C1

Feb. 2006

Icom Inc.

CAUTION

The repair and maintenance of an ATEX approved transceiver can only be performed in an ATEX approved repair facility. The ATEX approval will be canceled if ATEX intrinsically saferadios are repaired anywhere else except in an approved facility.

INTRODUCTION

This service manual describes the latest service information for the **IC-M87** VHF MARINE TRANSCEIVER at the time of publication.

Model	Version	Symbol	I/S	Power
IC-M87	Europe	EUR	ATEX	1 W
	U. K.	UK	ATEX	1 W
	Germany	FRG	ATEX	1 W

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

DANGER

NEVER connect the transceiver to an AC outlet or to a DC power supply that uses more than 8.3 V. 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 order numbers
2. Component part number and name
3. Equipment model name and unit name
4. Quantity required

<SAMPLE ORDER>

1110002750 S.IC TA7S01F IC-M87 MAIN UNIT 1 piece
8210019100 2600 Front panel IC-M87 CHASSIS 5 pieces

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



REPAIR NOTES

1. Make sure a problem is internal before disassembling the transceiver.
2. **DO NOT** open the transceiver until the transceiver is disconnected from its power source.
3. **DO NOT** force any of the variable components. Turn them slowly and smoothly.
4. **DO NOT** short any circuits or electronic parts. An insulated tuning tool **MUST** be used for all adjustments.
5. **DO NOT** keep power ON for a long time when the transceiver is defective.
6. **DO NOT** transmit power into a signal generator or a sweep generator.
7. **ALWAYS** connect a 40 dB or 50 dB attenuator between the transceiver and a deviation meter or spectrum analyser when using such test equipment.
8. **READ** the instructions of test equipment thoroughly before connecting equipment to the transceiver.


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SECTION 1 SPECIFICATIONS

GENERAL

• Frequency coverage	: TX: 156.000–161.450 MHz, RX: 156.000–163.425 MHz TX/RX: 146.000–174.000 MHz	[MARINE] [PMR]
• Number of free channels	: 22 channels	
• Type of emission	: 16K0G3E (Wide; 25 kHz) 16K0F3E (Wide; 25 kHz), 8K50F3E (Narrow; 12.5 kHz) 14K0F3E (Wide; 20 kHz), 8K50F3E (Narrow; 12.5 kHz)	[MARINE] for ATIS [PMR] ^{*1} [PMR] ^{*2}
• Antenna connector	: SMA / 50 Ω	
• Power supply requirement	: BP-227AX (7.2 V DC, negative ground)	
• Current drain (approx.)	: Transmit at High (1.0 W) 0.7 A at Low (0.5 W) 0.6 A Receive at maximum audio 200 mA	
• Frequency stability	: ±1.5 kHz	
• Usable temperature range	: –15°C to +55°C [MARINE]; –25°C to +55°C [PMR]	
• Dimensions (projections not included)	: 62(W) × 97(H) × 39(D) mm	
• Weight (with antenna, BP-227AX)	: 280 g (approx.)	

TRANSMITTER

• RF output power (with BP-227AX)	: 1 W 1 W / 0.5 W (High / Low)	[PMR] [MARINE]
• Modulation system	: Variable reactance frequency modulation	
• Maximum frequency deviation	: ±5.0 kHz (Wide; 25 kHz) ±5.0 kHz (Wide; 25 kHz), ±2.5 kHz (Narrow; 12.5 kHz) ±4.0 kHz (Wide; 20 kHz), ±2.5 kHz (Narrow; 12.5 kHz)	[MARINE] [PMR] ^{*1} [PMR] ^{*2}
• Spurious emissions	: 0.25 μW < 2 GHz, 1.0 μW > 2 GHz	
• Adjacent channel power	: 70 dB [MARINE], 70 dB (Wide) / 60 dB (Narrow) [PMR]	
• Residual modulation	: 40 dB [MARINE], 40 dB (Wide) / 34 dB (Narrow) [PMR]	
• Audio harmonic distortion	: 10% at 60% deviation	
• Audio frequency response	: +1 dB to –3 dB of 6 dB octave from 300 Hz to 3000 Hz	[MARINE] only
• Limiting charact modulation	: 60–100% of maximum deviation	
• Ext. microphone connector	: 9-pin multi connector/2 kΩ	

RECEIVER

• Receive system	: Double conversion superheterodyne system	
• Intermediate frequencies	: 1st 31.05 MHz 2nd 450 kHz	
• Sensitivity	: –2 dBμ [MARINE] (–4 dBμ [PMR]) emf typical at 20 dB SINAD	
• Squelch sensitivity	: +0 dBμ emf typical	
• Adjacent channel selectivity	: 70 dB [MARINE], 70 dB (Wide) / 60 dB (Narrow) [PMR]	
• Spurious response rejection	: 70 dB	
• Intermodulation rejection ratio	: 68 dB [MARINE], 65 dB [PMR]	
• Hum and noise	: 40 dB [MARINE], 40 dB (Wide) / 34 dB (Narrow) [PMR]	
• Audio output power	: 200 mW [MARINE] (350 mW [PMR]) at 10% distortion with an 8 Ω load	
• Audio frequency response	: +1 dB to –3 dB of –6 dB octave from 300 Hz to 3000 Hz	[MARINE] only
• Ext. speaker connector	: 9-pin multi connector/8 Ω	

Specifications are measured in accordance with EN301-178-2/EN300-086.

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

NOTE: ^{*1}[EUR], [UK] only, ^{*2}[FRG] only

■ VHF MARINE CHANNEL LIST

Channel No.		Frequency (MHz)		Channel No.		Frequency (MHz)		Channel No.		Frequency (MHz)	
USA	INT	Transmit	Receive	USA	INT	Transmit	Receive	USA	INT	Transmit	Receive
	01	156.050	160.650		22	157.100	161.700	74	74	156.725	156.725
01A		156.050	156.050	22A		157.100	157.100		75	156.775	156.775
	02	156.100	160.700		23	157.150	161.750		76	156.825	156.825
	03	156.150	160.750	23A		157.150	157.150	77	77	156.875	156.875
03A		156.150	156.150	24	24	157.200	161.800		78	156.925	161.525
	04	156.200	160.800	25	25	157.250	161.850	78A		156.925	156.925
	05	156.250	160.850	26	26	157.300	161.900		79	156.975	161.575
05A		156.250	156.250	27	27	157.350	161.950	79A		156.975	156.975
06	06	156.300	156.300	28	28	157.400	162.000		80	157.025	161.625
	07	156.350	160.950	37A*2	37A*2	157.850	157.850	80A		157.025	157.025
07A		156.350	156.350		60	156.025	160.625		81	157.075	161.675
08	08	156.400	156.400		61	156.075	160.675	81A		157.075	157.075
09	09	156.450	156.450	61A		156.075	156.075		82	157.125	161.725
10	10	156.500	156.500		62	156.125	160.725	82A		157.125	157.125
11	11	156.550	156.550		63	156.175	160.775		83	157.175	161.775
12	12	156.600	156.600	63A		156.175	156.175	83A		157.175	157.175
13	13	156.650	156.650		64	156.225	160.825	84	84	157.225	161.825
14	14	156.700	156.700	64A		156.225	156.225	84A		157.225	157.225
15	15	156.750	156.750		65	157.275	160.875	85	85	157.275	161.875
16	16	156.800	156.800	65A		157.275	156.275	85A		157.275	157.275
17	17	156.850	156.850		66	156.325	160.925	86	86	157.325	161.925
	18	156.900	161.500	66A		156.325	156.325	86A		157.325	157.325
18A		156.900	156.900	67	67	156.375	156.375	87		157.375	161.975
	19	156.950	161.550	68	68	156.425	156.425	87A	87	157.375	157.375
19A		156.950	156.950	69	69	156.475	156.475	88		157.425	162.025
20	20	157.000	161.600	70*1	70*1	156.525	156.525	88A	88	157.425	157.425
20A		157.000	157.000	71	71	156.575	156.575	P4*2	P4*2	161.425	161.425
	21	157.050	161.650	72	72	156.625	156.625				
21A		157.050	157.050	73	73	156.675	156.675				

*1 Receive only

*2 UK Marine Channels: M1=37A (157.850 MHz), M2=P4 (161.425 MHz) for [UK] only.

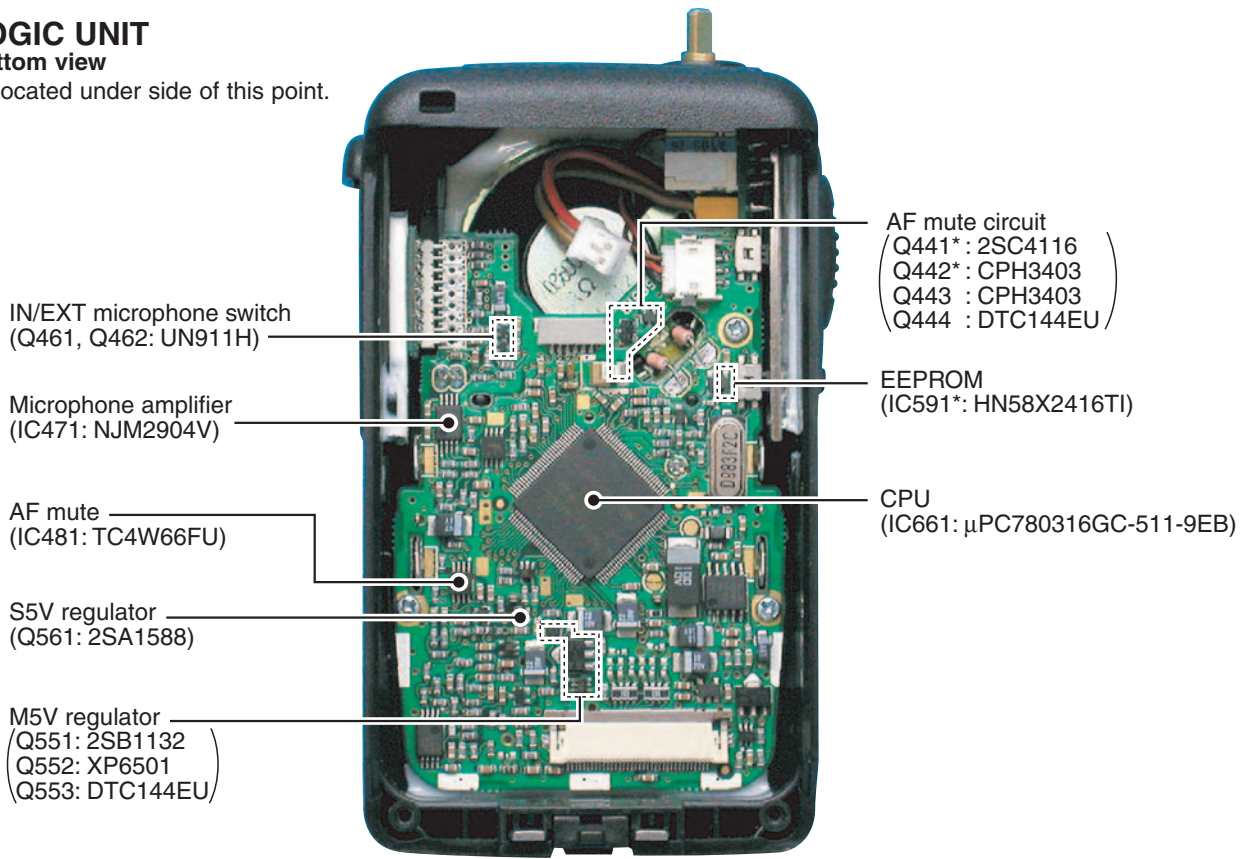
NOTE: USA channels for [UK] only.

SECTION 2 INSIDE VIEWS

• LOGIC UNIT

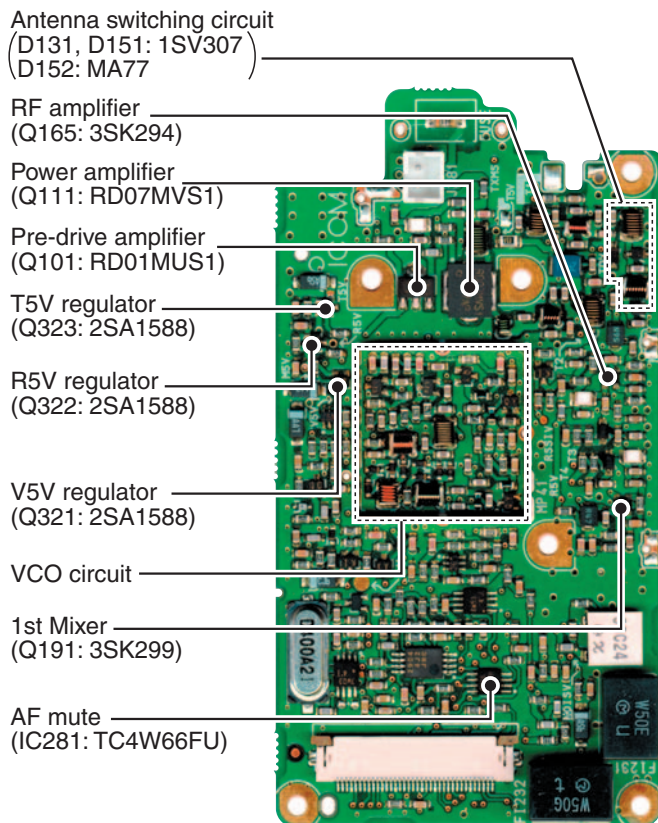
Bottom view

*: Located under side of this point.

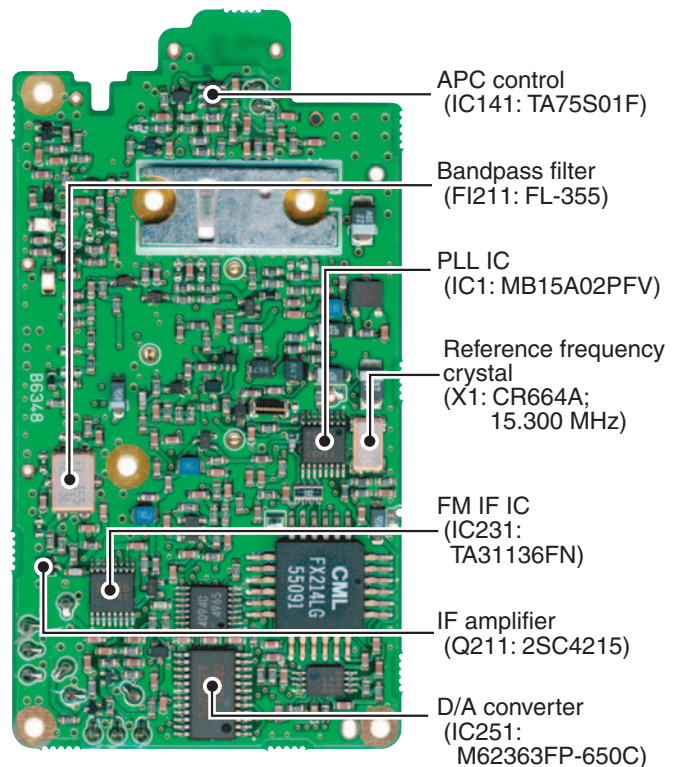


• MAIN UNIT

Top view



Bottom view

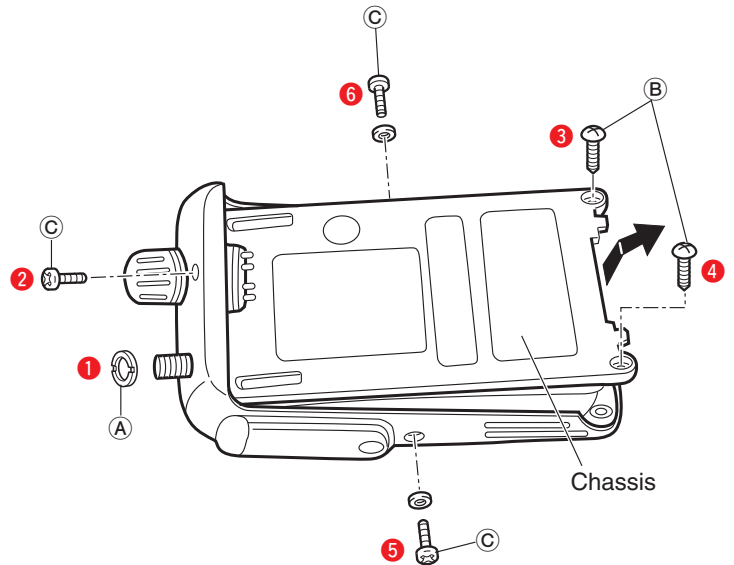


SECTION 3 DISASSEMBLY INSTRUCTIONS

1. Removing the chassis panel

- ① Remove a nut (A).
- ② Unscrew 2 screws (B) (2 × 8 mm, black) and 3 screws (C) (2 × 4 mm, black) from the chassis.
- ③ Take off the chassis in the direction of the arrow.

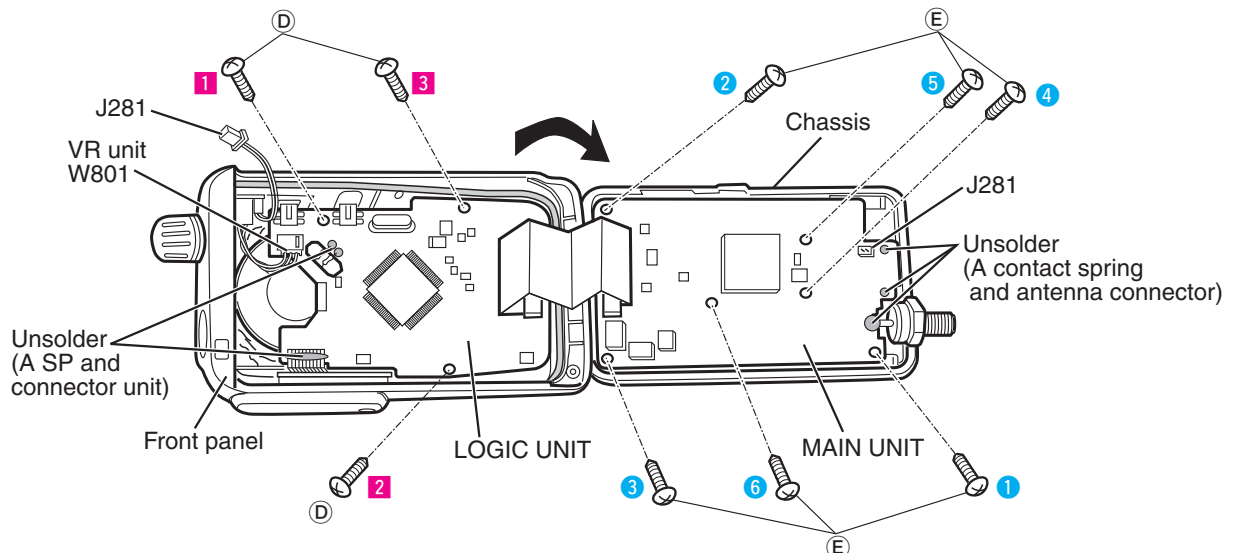
NOTE: * Tighten the screws in order of a number (1-6) when assembling.



2. Removing the LOGIC unit.

- ① Unplug the cable from J281 on the MAIN unit to separate the LOGIC unit
- ② Separate the front panel from the chassis in the direction of the arrow.
- ③ Unsolder the leads of speaker (11 points) and connector unit (9 points).
- ④ Unscrew 3 screws (D) (2 × 4 mm, silver) to separate the front panel.

NOTE: * Tighten the screws in order of a number (1-3) when assembling.



3. Removing the MAIN unit

- ① Unsolder the leads of contact spring (3 points) and antenna connector (1 point).
- ② Unscrew 6 screws (E) (2 × 4 mm, silver) to separate the chassis.

NOTE: * Tighten the screws in order of a number (1-6) when assembling.

SECTION 4 CIRCUIT DESCRIPTION

4-1 RECEIVER CIRCUITS

4-1-1 ANTENNA SWITCHING CIRCUIT (MAIN UNIT)

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

Received signals enter the antenna connector (CHASSIS; J1) and pass through the low-pass filter (L131, L132, C132 –C136). The filtered signals are passed through the ¼ type antenna switching circuit (D151, D152) and then applied to the RF circuit.

While receiving, no voltage is applied to the D151, D152. Thus, the receive line and the ground are disconnected and L151, L152, C152, C153 function as low-pass filter which leads received signals to the RF circuit.

4-1-2 RF CIRCUIT (MAIN UNIT)

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

The signals from the antenna switching circuit pass through the two-stage tunable bandpass filters (D154, D155, L154, L155). The filtered signals are amplified at the RF amplifier (Q165) and then passed through another two-stage tunable bandpass filters (D181, D182, L181) to suppress unwanted signals.

The filtered signals are applied to the 1st mixer circuit.

The tunable bandpass filters (D154, D155, D181, D182) employ varactor diodes to tune the center frequency of the RF passband for wide bandwidth receiving and good image response rejection. These diodes are controlled by the CPU (LOGIC unit; IC661) via the D/A converter (IC251, pins 14, 15, 22, 23).

4-1-3 1ST MIXER AND 1ST IF CIRCUITS (MAIN UNIT)

The 1st mixer circuit converts the received signal into the fixed frequency of the 1st IF signal with the PLL output frequencies. By changing the PLL frequency, only the desired frequency passes through a monolithic filter at the next stage of the 1st mixer.

The filtered signals from the bandpass filter are applied to the 1st mixer circuit (Q199). The applied signals are mixed with the 1st LO signals coming from the RX VCO circuit (Q41) to produce a 31.05 MHz 1st IF signal. The 1st IF signal is passed through the monolithic filter (F1211) to suppress out-of-band signals.

The filtered signal is amplified at the 1st IF amplifier (Q211) and is then applied to the 2nd IF circuit.

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

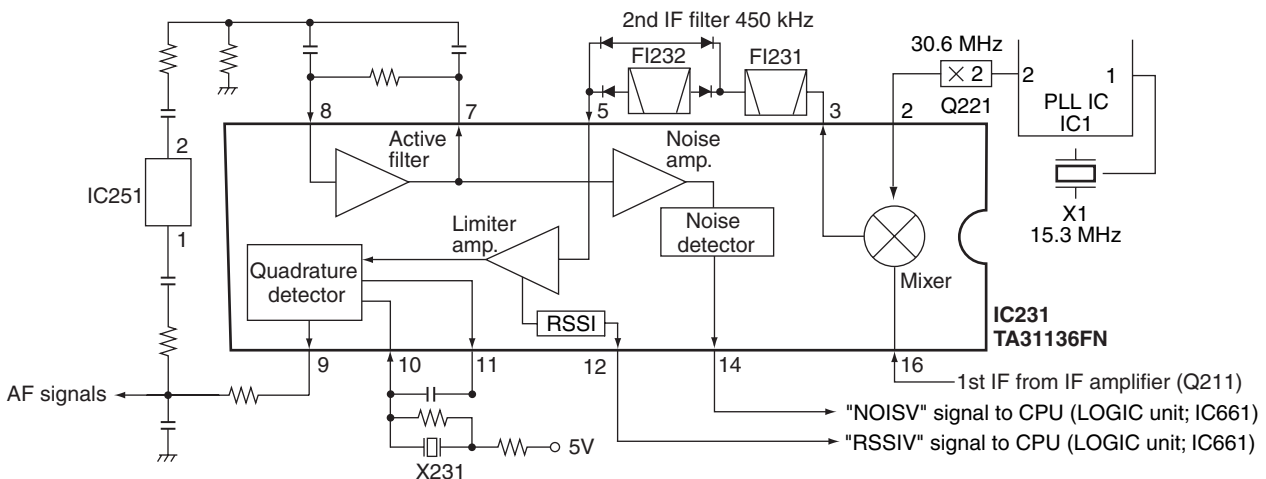
The 2nd mixer circuit converts the 1st IF signal into the 2nd IF signal. The double-conversion superheterodyne system (which convert receive signals twice) improves the image rejection ratio and obtains stable receiver gain.

The amplified 1st IF signal from the 1st IF amplifier (Q211) is applied to the 2nd mixer section of the FM IF IC (IC231, pin 16), and is mixed with the 2nd LO signal to be converted into a 450 kHz 2nd IF signal.

The FM IF IC (IC231) contains the 2nd mixer, limiter amplifier, quadrature detector, active filter and noise amplifier, etc.

The 2nd LO signal (30.6 MHz) is produced at the PLL circuit by doubling its reference frequency (X1: 15.3 MHz) at doubler circuit (Q221).

• 2ND IF AND DEMODULATOR CIRCUITS



The 2nd IF signal from the 2nd mixer section (IC231, pin 3) passes through the ceramic filter (Wide: FI231 only, Narrow: both FI231 and FI232) to remove unwanted heterodyned frequencies. The filtered signal is amplified at the limiter amplifier section (IC231, pin 5) and then applied to the quadrature detector section (IC231, pins 10, 11) to demodulate the 2nd IF signal into AF signals.

The demodulated AF signals are output from pin 9 (IC231) and then applied to the AF circuit.

4-1-5 AF AMPLIFIER CIRCUIT (LOGIC UNIT)

The AF signals (detected signals) passes through the scrambler switch (MAIN unit; IC281, pins 1, 2) and filter switch (MAIN unit; IC282, pins 1, 7) and then passed through the low-pass filter (MAIN unit; IC261, pins 6, 7). The filtered signal is applied to the AF volume (VR unit; R801) to adjust AF level and then amplified at the AF power amplifier (IC421, pins 4, 10) via the AF mute switch (Q411). The power amplified AF signals are applied to the internal speaker (CHASSIS; SP1) after being passed through the de-emphasis circuit (R411, C413) to obtain the -6 dB/octave frequency characteristics.

4-1-6 SQUELCH CIRCUITS (MAIN UNIT)

The noise squelch circuit mutes AF signals when no RF signals are received. By detecting noise components in the AF signals, the squelch circuit switches the AF amplifier controller.

Some noise components in the AF signals from the FM IF IC (IC231, pin 9) are applied to the D/A converter (IC251, pins 1, 2) to adjust the squelch level. The adjusted signals are applied to the active filter section in the FM IF IC (IC231, pins 7, 8). The active filter section filters and amplifies noise components only. The amplified signals are converted into the pulse-type signals at the noise detector section. The detected signals output from pin 14 (NOISV).

The "NOISV" signal from the FM IF IC (IC231 pin 14) is applied to the CPU (LOGIC unit; IC661, pin 32). Then the CPU analyzes the noise condition and outputs the AF mute signal as "AFMS" from the pin 84 to the AF mute switch (LOGIC unit; Q411).

4-2 TRANSMITTER CIRCUITS

4-2-1 MICROPHONE AMPLIFIER CIRCUIT (LOGIC UNIT)

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

• In case of the internal microphone

The AF signals from the internal microphone (MC461) are applied to the microphone amplifier (IC471, pins 6, 7) as the "INMIC" signal.

• In case of external microphone

The AF signals from the external microphone (CHASSIS unit; J41, pin 8) are applied to the microphone amplifier (IC471, pins 6, 7) as the "EXTMIC" signal.

The amplified signals are passed through the pre-emphasis circuit (R463, C463) and are then applied to the scrambler switch (IC481, pins 1, 2) after being passed through the another microphone amplifier (IC471, pins 1, 2).

The switched AF signals are amplified again at the limiter-amplifier (IC491, pins 1, 2) and then passed through the low-pass filter (IC491, pins 6, 7). The filtered AF signals are applied to the D/A converter (MAIN unit; IC251, pins 3, 4), and are then applied to the modulation circuit.

4-2-2 MODULATION CIRCUIT (MAIN UNIT)

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

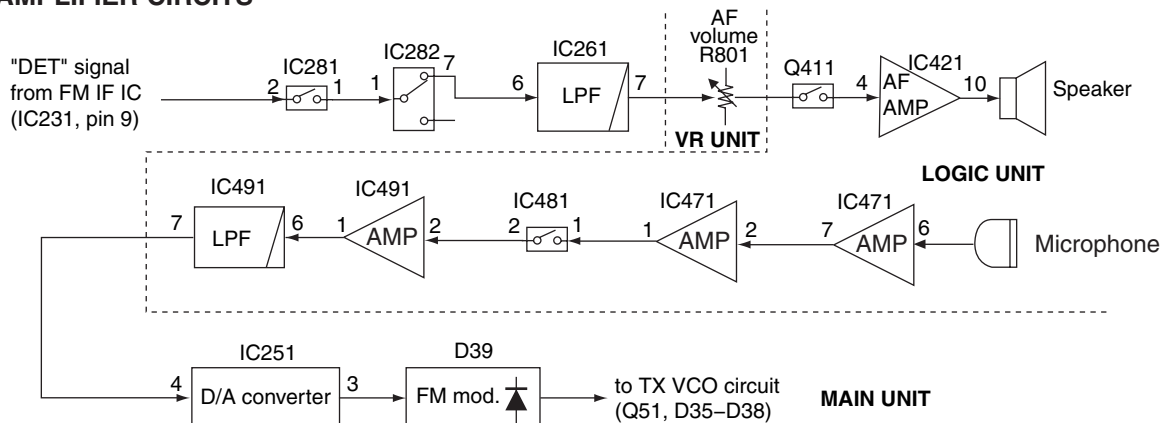
The AF signals from the D/A converter (IC251, pin 3) change the reactance of varactor diode (D39) to modulate the oscillating signal at the TX VCO circuit (Q51, D35-D38). The modulated signal is amplified at the buffer amplifiers (Q61, Q62) and is then applied to the drive amplifier circuit via the T/R switch (D91).

4-2-3 DRIVE/POWER AMPLIFIER CIRCUITS (MAIN UNIT)

The drive/power amplifier circuits amplify the VCO oscillating signal to the output power level.

The switched RF signal from the T/R switch (D91) is amplified at the buffer (Q91), drive (Q101) and power (Q111) amplifiers to obtain 1 W of RF power.

• AF AMPLIFIER CIRCUITS



The amplified signal is passed through the low-pass filter (L121, L122, C121, C122), power detector (D121), antenna switching circuit (D131) and another low-pass filter (L131, L132, C132-C136).

The filtered signal is applied to the antenna connector (CHASSIS unit; J1).

4-2-4 APC CIRCUIT (MAIN UNIT)

The APC circuit stabilizes transmit power and selects output power of HIGH or LOW.

The power detector circuit (D121) detects the transmit power output level and converts it into DC voltage.

The detected voltage is applied to the APC amplifier (IC141, pin 3) and is compared with the reference voltage that is supplied from the CPU (LOGIC unit: IC166) as "T1CON" signal via the D/A converter (IC251, pin 14).

The output voltage from the APC amplifier (IC141, pin 4) controls the bias voltage of the buffer (Q91), drive (Q101) and power (Q111) amplifiers to control the output power by comparing the detected voltage and reference voltage.

4-3 PLL CIRCUITS

4-3-1 PLL CIRCUIT (MAIN UNIT)

A PLL circuit provides stable oscillation of the transmit frequency and receive 1st LO frequency. The PLL output compares the phase of the divided VCO frequency to the reference frequency. The PLL output frequency is controlled by the divided ratio (N-data) of a programmable divider.

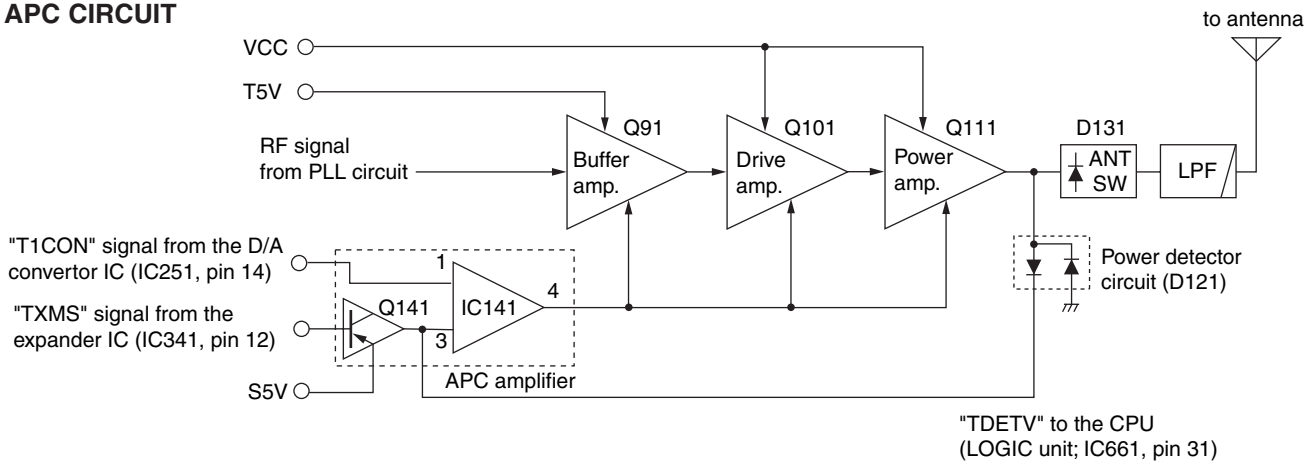
The PLL circuit contains the RX VCO (Q41, D31-D34) and TX VCO (Q51, D35-D38). The oscillated signal is amplified at the buffer amplifiers (Q61, Q71) and then applied to the PLL IC (IC1, pin 8) after being passed through the low-pass filter (L72, C74, C75).

The PLL IC contains a prescaler, programmable counter, programmable divider and phase detector, etc. The applied signal is divided at the prescaler and programmable counter section by the N-data ratio from the CPU (LOGIC unit; IC661).

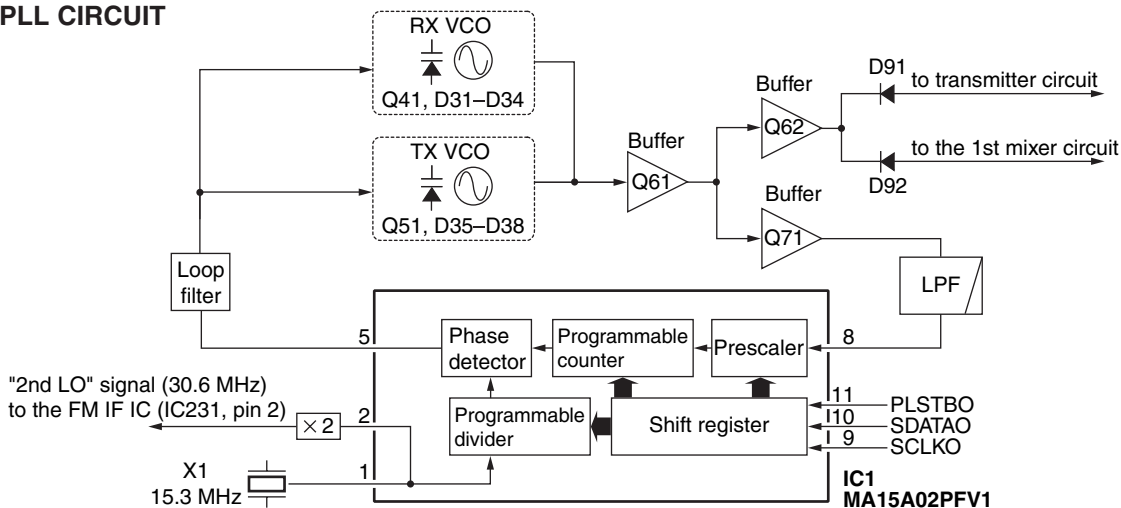
The reference signal is generated at the reference oscillator (X1) and is applied to the PLL IC (IC1). The PLL IC detects the out-of-step phase using the reference frequency and outputs it from pin 5 (IC1). The output signal is passed through the loop filter and is then applied to the VCO circuit as the lock voltage.

If the oscillated signal drifts, its phase changes from that of the reference frequency, causing a lock voltage change to compensate for the drift in the oscillated frequency.

• APC CIRCUIT



• PLL CIRCUIT



4-3-2 VCO CIRCUITS (MAIN UNIT)

The VCO circuits contain a separate RX VCO (Q41, D31–D34) and TX VCO (Q51, D35–D38). The oscillated signal is amplified at the buffer amplifiers (Q61, Q62) and is then applied to the T/R switches (D91, D92).

The receive 1st LO (RX) signal from the T/R switch (D92) is applied to the 1st mixer (Q191).

The transmit (TX) signal from the T/R switch (D91) is applied to the buffer amplifier (Q91).

4-4 POWER SUPPLY CIRCUITS

4-4-1 MAIN UNIT VOLTAGE LINE

Line	Description
HV	The voltage from the attached battery pack.
VCC	The same voltage as the HV line (battery voltage) which is controlled by the power switch (VR unit; R801). The output voltage is applied to the drive (Q101) and power amplifiers (Q111), etc.
R5V	Receive 5 V controlled by the R5V regulator circuit (Q322) using the "R5VS" signal from the CPU (IC661, pin 89). The output voltage is applied to the RF amplifier (Q165), 1st mixer (Q191), IF amplifier (Q211), etc.
T5V	Transmit 5 V controlled by the T5V regulator circuit (Q323) using the "T5VS" signal from the CPU (IC661, pin 90). The output voltage is applied to the buffer amplifier (Q91) and antenna switch (D131), etc.
V5V	Common 5 V converted from the M5V line at the V5V regulator circuit (Q321). The output voltage is applied to the VCO circuits (Q41, Q51), etc.

4-4-2 LOGIC UNIT VOLTAGE LINE

Line	Description
CPU5V	Common 5 V converted from the VCC line at the CPU5V regulator circuit (IC551). The output voltage is applied to the CPU (IC661), RESET IC (IC581), EEPROM (IC591), etc.
M5V	Common 5 V converted from the VCC line at the M5V regulator circuit (Q551–Q553). The output voltage is applied to V5V, R5V, T5V regulator circuits (MAIN unit; Q321–Q323), etc.
S5V	Common 5 V converted from the M5V line at the S5V regulator circuit (Q561). The output voltage is applied to the microphone amplifier (IC471), scrambler switch (IC481), etc.

4-5 PORT ALLOCATIONS

4-5-1 CPU (LOGIC UNIT; IC166)

Pin number	Port name	Description
1	BEEP	Output beep audio signals.
2	VSSTB	Outputs strobe signal for the scrambler IC (MAIN unit; IC381, pin 10).
3	EXSTB	Outputs strobe signal for the expander IC (MAIN unit; IC341, pin 1).
4	DASTB	Outputs strobe signal for the D/A converter (MAIN unit; IC251, pin 6).
5	PLSTB	Outputs strobe signal for the PLL IC (MAIN unit; IC1, pin 11).
10	SDATA	Outputs serial data for the PLL and scrambler ICs, etc.
11	SCLK	Outputs serial data for the PLL and scrambler ICs, etc.
12	ESCK	Outputs clock signal for the EEPROM (IC591).
13	ESDA	I/O port for the EEPROM data signal (IC591).
28	WETIN	Input port for the transceiver's internal inundation detection.
29	EXTSV	Input port for the external terminal connecting detection.
30	BATTV	Input port for the attached battery voltage detection.
31	TDETV	Input port for the transmit RF level detection.
32	NOISV	Input port for the noise level detection.
33	RSSIV	Input port for the RSSI voltage level detection.
34	LOINV	Input port for the VCO lock voltage level detection.
35	TEMPV	Input port for the transceiver's internal temperature detection.
36	CDECV	Input port for CTCSS/DTCS detection.
38	ATIS	Outputs ATIS wave form.
75, 76	CONT1, CONT2	Output LCD contrast control signals.
77, 78	LEDS1, LEDS2	Output LCD and key's backlight dimmer control signal.
79	STXMS	Outputs the scrambler switch (IC481, pin 3) control signal. Low : While the scrambler function OFF.
80	MICMS	Outputs the scrambler switch (IC481, pin 7) control signal. Low : While the scrambler function ON.

CPU (continued)

Pin number	Port name	Description
81	ISPMS	Outputs the internal speaker control signal. High : While connecting the external speaker.
82	LDTFS	Outputs DTCS's low-pass filter (Q532) cut-off frequency control signal.
83	W/NS	Outputs Wide/Narrow mode control signal. High : While narrow mode is selected.
84	AFMS	Outputs the AF mute circuit control signal. High : While the squelch is closed.
85	AFVS	Outputs AF amplifier's power supply control signal. High : While noise/tone squelches are opened or emitting a beep.
86	M5VS	Outputs M5V regulator circuit (Q551–Q553) control signal. Low : The common 5V is supplied.
87	S5VS	Outputs S5V regulator circuit (Q561) control signal. Low : The common 5V is supplied.
88	V5VS	Outputs V5V regulator circuit (MAIN unit; Q321) control signal. Low : The common 5V is supplied.
89	R5VS	Outputs R5V regulator circuit (MAIN unit; Q322) control signal. Low : While receiving.
90	T5VS	Outputs T5V regulator circuit (MAIN unit; Q323) control signal. Low : While transmitting.
98–100	CENC1–CENC3	Output DTCS/CTCSS wave form.
102	PTTIN	Input port for [PTT] switch detection. High : While [PTT] switch is pushed.
103	EPTTIN	Input port for HM-138 (optional speaker-microphone)'s [PTT] switch detection. Low : While HM-138's [PTT] switch is pushed.
109	SQL	Input port for [SQL]. Low : While [SQL] is pushed.
110	UP	Input port for [▲]. Low : While [▲] is pushed.
111	DOWN	Input port for [▼]. Low : While [▼] is pushed.
112	CH/WX	Input port for [DIAL]. Low : While [DIAL] is pushed
113	16/9	Input port for [16•C]. Low : While [16•C] is pushed.
114	SCAN	Input port for [SCN•DUAL]. Low : While [SCAN•DUAL] is pushed.
115	H/L	Input port for the [H/L•LOCK]. Low : While [H/L•LOCK] is pushed.
119	UNLCK	Input port for the PLL unlock signal. High : PLL circuit is unlocked.

4-5-2 EXPANDER (MAIN UNIT; IC341)

Pin number	Port name	Description
5	SRXMS	Outputs the scrambler switch (IC281, pin 3) control signal. Low : While the scrambler function OFF.
6	DETMS	Outputs the scrambler switch (IC281, pin 7) control signal. Low : While the scrambler function ON.
11	ATTS	Outputs the RF attenuator control signal. High : While attenuator is ON.
12	TXMS	Outputs the TX mute switch (Q141) control signal. Low : While receiving.
13	VCOS	Outputs the TX/RX VCO control signal.

4-5-3 D/A CONVERTER (MAIN UNIT; IC251)

Pin number	Port name	Description
2	SQCON	Output AF signals to the squelch circuit (IC231, pin 8).
3	MOCON	Output modulation signals to the VCO circuit.
10	DTCON	Output CTCSS/DTCS signals.
11	FRCON	Outputs reference oscillator (X1) control signal.
14	T1CON	• While receiving Outputs the bandpass filter (D154) tuning signal. • While transmitting Outputs TX power control signal.
15	T2CON	Outputs the bandpass filter (D155) tuning signal.
22	T3CON	Outputs the bandpass filter (D181) tuning signal.
23	T4CON	Outputs the bandpass filter (D182) tuning signal.

SECTION 5 ADJUSTMENT PROCEDURES

5-1 PREPARATION

When adjusting IC-M87, JIG cable (see illustration on page 5-2), RS-232C cable and optional CS-M88 ADJ ADJUSTMENT SOFTWARE (Rev. 1.0 or later) are required.

■ REQUIRED TEST EQUIPMENT

EQUIPMENT	GRADE AND RANGE	EQUIPMENT	GRADE AND RANGE
DC power supply	Output voltage : 7.2 V DC Current capacity : 3 A or more	Audio generator	Frequency range : 300–3000 Hz Measuring range : 1–500 mV
FM deviation meter	Frequency range : 30–300 MHz Measuring range : 0 to ±10 kHz	Attenuator	Power attenuation : 20 or 30 dB Capacity : 10 W
Frequency counter	Frequency range : 0.1–300 MHz Frequency accuracy : ±1 ppm or better Sensitivity : 100 mV or better	Standard signal generator (SSG)	Frequency range : 100–300 MHz Output level : 0.1 μV to 32 mV (–127 to –17 dBm)
Digital multimeter	Input impedance : 10 MΩ/V DC or more	AC millivoltmeter	Measuring range : 10 mV to 10 V
RF power meter (terminated type)	Measuring range : 0.1–5 W Frequency range : 100–300 MHz	Oscilloscope	Frequency rang : DC–20 MHz Measuring range : 0.01–20 V
	Impedance : 50 Ω SWR : Less than 1.2 : 1	External speaker	Input impedance : 8 Ω Capacity : 3 W or more

■ SYSTEM REQUIREMENTS

- Microsoft® Windows® 98/98SE/Me
- RS-232C serial port (D-sub 9 pin)

■ ADJUSTMENT SOFTWARE INSTALLATION

- ① Quit all applications when Windows is running.
- ② Insert the CD into the appropriate CD drive.
- ③ Double-click the “Setup.exe” contained in the adjustment software folder in the CD drive.
- ④ The “Welcome to the InstallShield Wizard for adjustment software will appear.
Click [Next>].
- ⑤ The “Choose Destination Location” will appears.
Click [Next>] to install the software into the specified folder.
- ⑥ After the installation is completed, the “InstallShield Wizard Complete” will appears.
Click [Finish].
- ⑦ Eject the CD.
- ⑧ The adjustment software icon appears on the desk top screen.

■ BEFORE STARTING SOFTWARE ADJUSTMENT

Program the adjustment frequencies (see adjustment frequency list) into the transceiver using with the cloning software before starting the software adjustment. Otherwise, the transceiver cannot be adjusted properly.

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.

■ STARTING SOFTWARE ADJUSTMENT

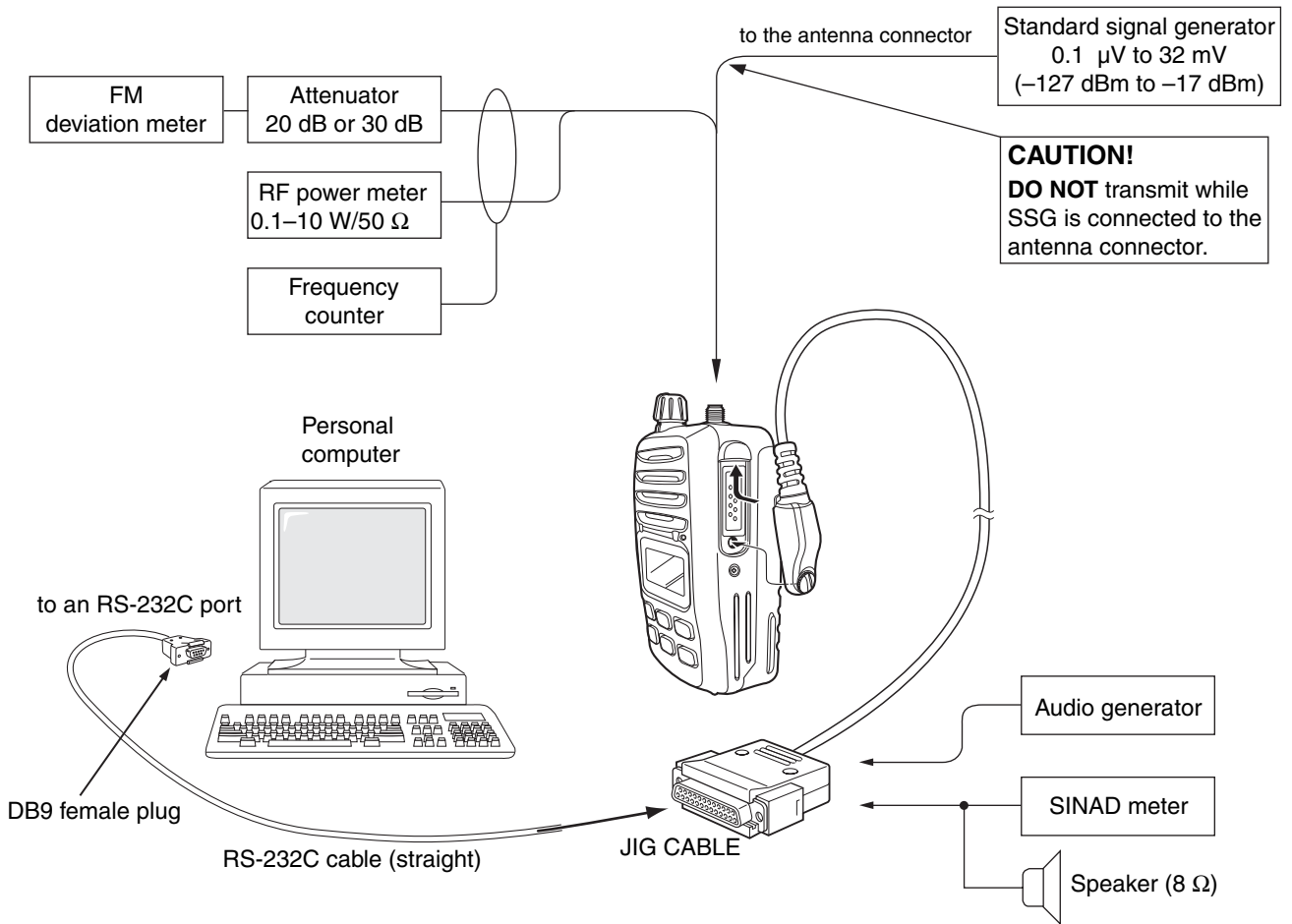
- ① Connect the transceiver and PC with the JIG CABLE.
- ② Turn the transceiver power ON.
- ③ Boot up Windows, and double-click the adjustment software icon on the desk top screen.
- ④ Click ‘Connect’ on the adjustment software screen, then appears the transceiver’s adjustment screen.
- ⑤ Set or modify adjustment data as desired.

• ADJUSTMENT FREQUENCY LIST

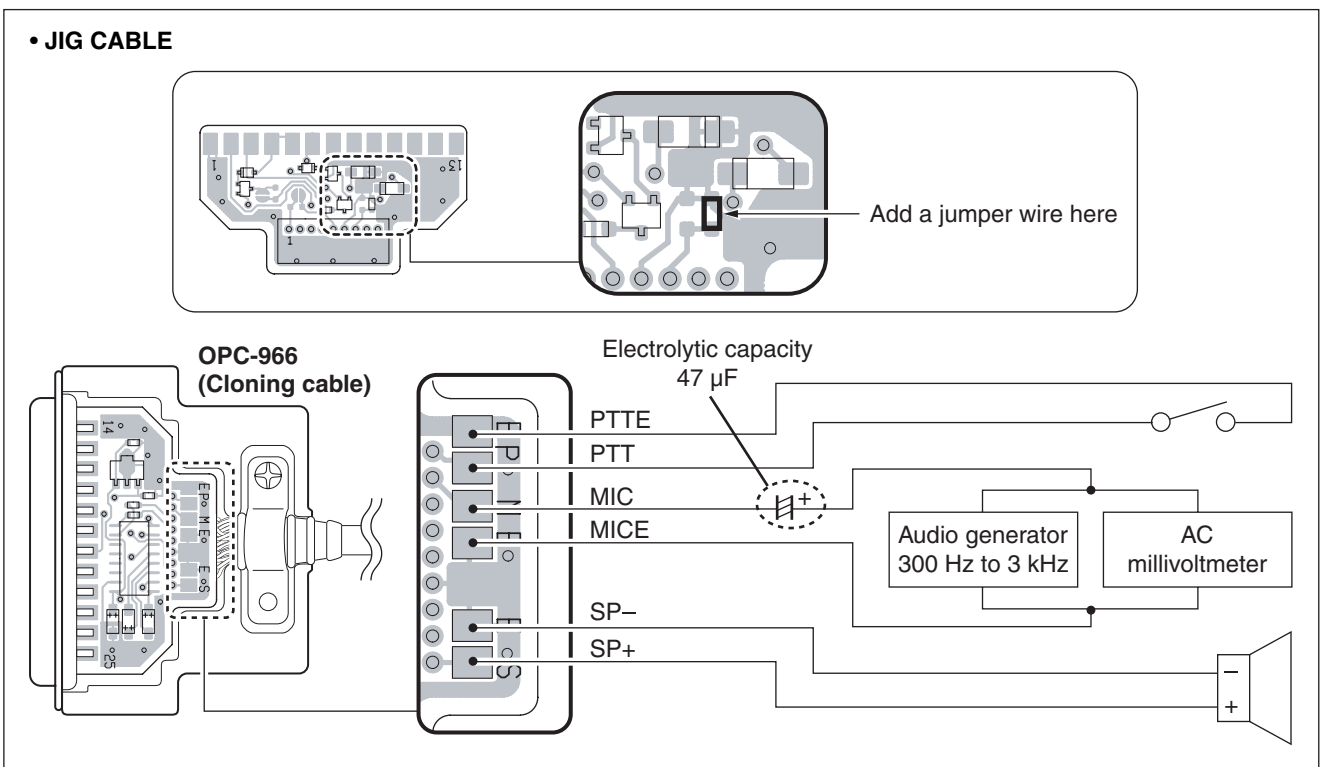
CH	CH GROUP	FREQUENCY	CONDITIONS
A1	MARINE	160.000 MHz	Mode : Wide
A2	MARINE	160.000 MHz	Mode : Narrow
A3	MARINE	160.000 MHz	Mode : Wide DTCS : 007
A4	MARINE	160.000 MHz	Mode : Narrow DTCS : 007
A5	LAND	160.000 MHz	Mode : Wide

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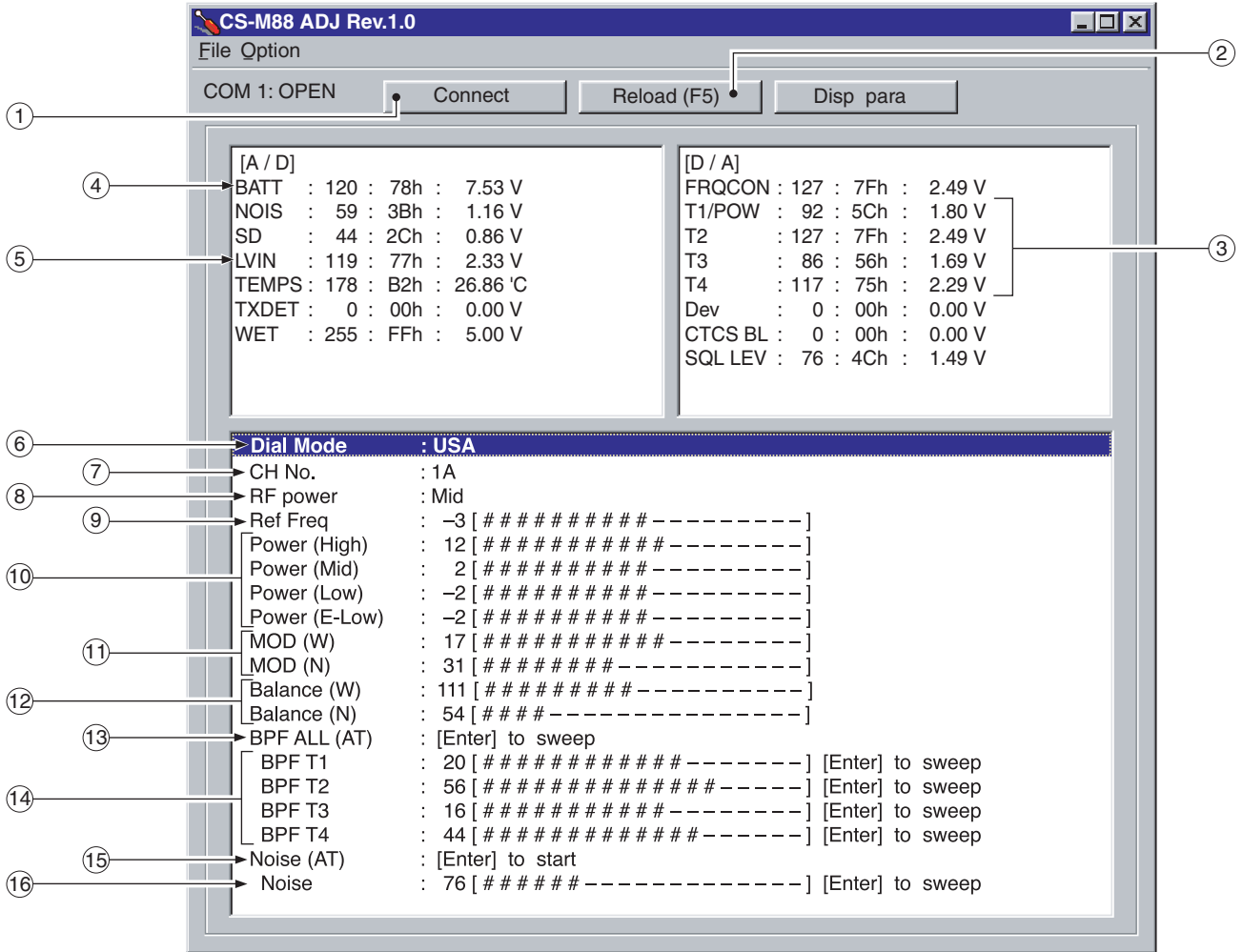
• CONNECTION



• JIG CABLE



• SCREEN DISPLAY EXAMPLE

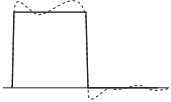


NOTE: The above values for settings are example only.
Each transceiver has its own specific values for each setting.

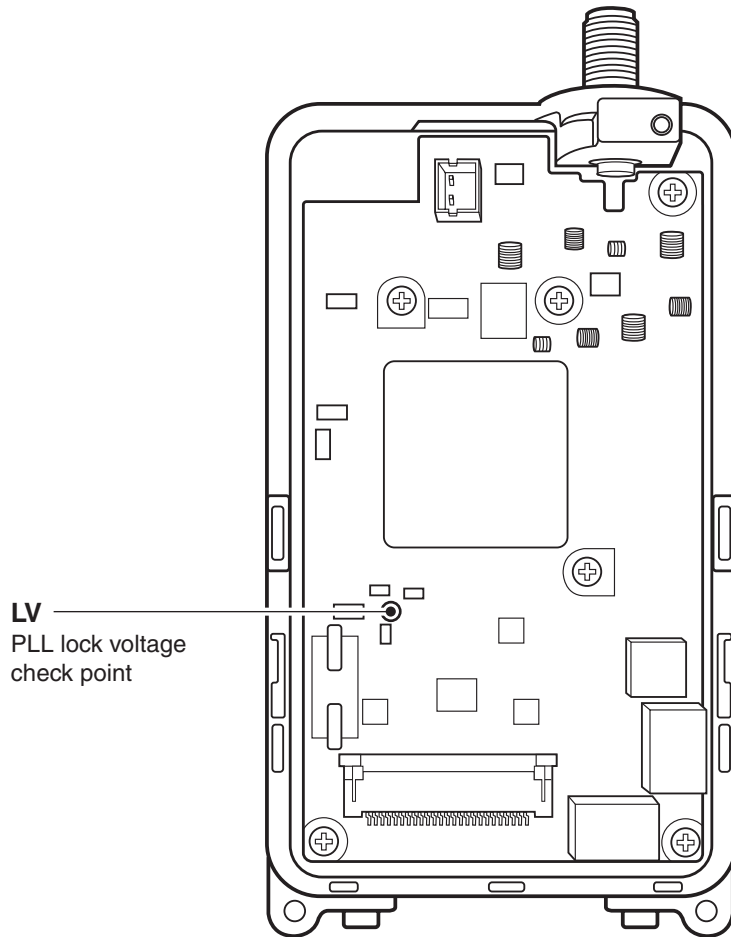
- | | |
|-------------------------------------|---|
| ① : Transceiver's connection state | ⑨ : Reference frequency |
| ② : Reload adjustment data | ⑩ : RF output power |
| ③ : Receive sensitivity measurement | ⑪ : FM deviation |
| ④ : Connected battery voltage | ⑫ : Modulation balance |
| ⑤ : PLL lock voltage | ⑬ : Receive sensitivity (automatically) |
| ⑥ : Dial mode select | ⑭ : Receive sensitivity (manually) |
| ⑦ : Operating channel select | ⑮ : Squelch level (automatically) |
| ⑧ : RF output power select | ⑯ : Squelch level (manually) |

5-2 SOFTWARE ADJUSTMENTS

- Select the adjustment item with [↑] / [↓] keys, then set specified value or condition with [←] / [→] keys on the connected computer keyboard.

ADJUSTMENT	ADJUSTMENT CONDITION	MEASUREMENT		VALUE	
		UNIT	LOCATION		
PLL LOCK VOLTAGE	1	<ul style="list-style-type: none"> Operating CH : A1 Receiving 	PC screen	Connect a digital multimeter to the check point LV.	1.85–3.35 V (Verify)
	2	<ul style="list-style-type: none"> Operating CH : A1 Transmitting 			1.8–3.3 V (Verify)
REFERENCE FREQUENCY [REF]	1	<ul style="list-style-type: none"> Operating CH : A1 Connect an RF power meter to the antenna connector. Transmitting 	Top panel	Loosely couple a frequency counter to the antenna connector.	160.0000 MHz
OUTPUT POWER [Power (High)]	1	<ul style="list-style-type: none"> Operating CH : A1 Transmitting 	Top panel	Connect an RF power meter to the antenna connector.	0.75 W
[Power (Mid)]	2	<ul style="list-style-type: none"> Operating CH : A1 Transmitting 			0.75 W
[Power (Low)]	3	<ul style="list-style-type: none"> Operating CH : A1 Transmitting 			0.75 W
[Power (E-Low)]	4	<ul style="list-style-type: none"> Operating CH : A1 Transmitting 			0.45 W
FM DEVIATION [MOD W]	1	<ul style="list-style-type: none"> Operating CH : A1 Connect an audio generator to the multi connector through the JIG cable and set as; : 1.0 kHz/200 mVrms Set an FM deviation meter as; HPF : OFF LPF : 20 kHz De-emphasis : OFF Detector : (P±P)/2 Transmitting 	Top panel	Connect an FM deviation meter to the antenna connector through an attenuator.	±4.15–4.25 kHz
	[MOD N]	2			<ul style="list-style-type: none"> Operating CH : A2 Transmitting
[Balance (W)]	1	<ul style="list-style-type: none"> Operating CH : A3 No audio is applied to the multi connector. Set an FM deviation meter as; HPF : OFF LPF : 20 kHz De-emphasis : OFF Detector : (P±P)/2 Transmitting. 	Top panel	Connect an FM deviation meter with an oscilloscope to the antenna connector through an attenuator.	Set to square wave form 
[Balance (N)]		<ul style="list-style-type: none"> Operating CH : A4 Transmitting. 			

• MAIN UNIT TOP VIEW



SOFTWARE ADJUSTMENTS (Continue)

• Select the adjustment item with [↑] / [↓] keys, then set specified value or condition with [←] / [→] keys on the connected computer keyboard.

ADJUSTMENT	ADJUSTMENT CONDITION	MEASUREMENT		VALUE	
		UNIT	LOCATION		
NOTE: Adjust all the adjustment items as follows throughly in sequence.					
RX SENSITIVITY [BPF T1]– [BPF T4]	1	<ul style="list-style-type: none"> Operating CH : A5 Connect an SSG to the antenna connector and set as; Frequency : 160.000 MHz Level : 10 μV* (–87 dBm) Modulation : 1 kHz Deviation : ±3.0 kHz Receiving 	Side panel	Connect a SINAD meter with an 8 Ω load to the multi connector through the JIG cable.	Minimum distortion level
	CONVENIENT: The BPF T1– BPF T4 can be adjusted automatically. ①-1: Set the cursor to "BPF ALL" and then push [ENTER] key. ①-2: The BPF T1–BPF T4 are tuned automatically. or ②-1: Set the cursor to one of BPF T1, T2, T3 or T4 as desired. ②-2: Push [ENTER] key to start tuning. ②-3: Repeat ②-1 and ②-2 to tune additional BPF.				
SQUELCH LEVEL [SQL]	1	<ul style="list-style-type: none"> Operating CH : A5 Connect an SSG to the antenna connector and set as; Frequency : 160.000 MHz Level : 0.5 μV* (–113 dBm) Modulation : 1 kHz Deviation : ±3.0 kHz Receiving 	Side panel	Connect a speaker to the multi connector through the JIG cable.	Close the squelch. Then set SQL level at the point where the audio signals just appears.

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

[MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
C231	4030006860	S.CER C1608 JB 1H 102K-T	T	15.5/8.2
C232	4030007130	S.CER C1608 CH 1H 101J-T	T	20.1/10.9
C233	4030011600	S.CER C1608 JB 1E 104K-T	B	9.8/8.5
C234	4030011600	S.CER C1608 JB 1E 104K-T	B	9.8/13.7
C235	4030011600	S.CER C1608 JB 1E 104K-T	B	7.9/16
C236	4030006900	S.CER C1608 JB 1H 103K-T	B	11.1/10.5
C237	4030010760	S.CER C1608 CH 1H 331J-T	T	13.5/12
C238	4030010760	S.CER C1608 CH 1H 331J-T	T	11.5/13.1
C239	4550007270	S.TAN F931A475MAABMA	T	11.5/9.3
C240	4030006860	S.CER C1608 JB 1H 102K-T	B	12.4/9.3
C241	4030011600	S.CER C1608 JB 1E 104K-T	B	12.4/13.8
C242	4030006860	S.CER C1608 JB 1H 102K-T	T	17.4/14.9
C243	4030006860	S.CER C1608 JB 1H 102K-T	T	17.5/12.3
C244	4030006860	S.CER C1608 JB 1H 102K-T	T	20.7/13.6
C245	4030006860	S.CER C1608 JB 1H 102K-T	B	22.7/14.1
C246	4030011340	S.CER C1608 CH 1H 471J-T	B	16.2/16.7
C247	4030006860	S.CER C1608 JB 1H 102K-T	T	17.4/11
C251	4030006900	S.CER C1608 JB 1H 103K-T	B	5.3/17
C252	4030006900	S.CER C1608 JB 1H 103K-T	B	12.3/19.3
C253	4030006900	S.CER C1608 JB 1H 103K-T	B	10.3/25.1
C261	4030008860	S.CER C1608 JB 1H 153K-T	T	24.9/24.7
C262	4030008900	S.CER C1608 JB 1H 333K-T	T	22.1/23.3
C263	4030008920	S.CER C1608 JB 1H 473K-T	T	21.3/25.3
C265	4030006860	S.CER C1608 JB 1H 102K-T	T	14.9/29.3
C266	4030007150	S.CER C1608 CH 1H 151J-T	T	20.3/31.2
C267	4030006880	S.CER C1608 JB 1H 472K-T	T	24.9/32.5
C268	4030008920	S.CER C1608 JB 1H 473K-T	T	14.4/31.7
C269	4030006900	S.CER C1608 JB 1H 103K-T	T	13.6/24.7
C270	4030017490	S.CER C1608 JB 1A 105K-T	T	15.9/32.5
C271	4550007200	S.TAN F930J476MBABMA	B	40.7/40.4
C272	4030017480	S.CER C1608 JB 1A 474K-T	T	20/16.1
C281	4030006900	S.CER C1608 JB 1H 103K-T	T	22.1/20.4
C282	4030006900	S.CER C1608 JB 1H 103K-T	B	70.5/31
C291	4030006900	S.CER C1608 JB 1H 103K-T	T	32.2/17
C292	4030009880	S.CER C1608 JB 1H 682K-T	T	26.9/16.3
C293	4030008900	S.CER C1608 JB 1H 333K-T	T	28.9/19.7
C294	4030009970	S.CER C1608 JB 1H 182K-T	T	27.6/23.8
C301	4030008880	S.CER C1608 JB 1H 223K-T	T	31.6/26.2
C302	4030006870	S.CER C1608 JB 1H 222K-T	T	28.6/28.5
C311	4030006860	S.CER C1608 JB 1H 102K-T	B	25.4/17.4
C312	4030008880	S.CER C1608 JB 1H 223K-T	B	28.9/24.3
C313	4030009490	S.CER C1608 JB 1H 821K-T	B	23.5/24.3
C314	4030009490	S.CER C1608 JB 1H 821K-T	B	19.8/18.1
C315	4030011600	S.CER C1608 JB 1E 104K-T	B	28.4/21
C316	4030008920	S.CER C1608 JB 1H 473K-T	B	21.8/19.9
C322	4030006900	S.CER C1608 JB 1H 103K-T	T	51.3/41.6
C323	4030006900	S.CER C1608 JB 1H 103K-T	T	56/41
C324	4030006900	S.CER C1608 JB 1H 103K-T	T	58/41.6
C325	4550007360	S.TAN F931A226MBABMA	B	58.9/39.4
C326	4550007270	S.TAN F931A475MAABMA	T	60.8/39.5
C327	4550007270	S.TAN F931A475MAABMA	B	25.3/41.1
C333	4030006860	S.CER C1608 JB 1H 102K-T	B	46.5/41.9
C341	4030006900	S.CER C1608 JB 1H 103K-T	B	12.3/22.3
C381	4030017490	S.CER C1608 JB 1A 105K-T	B	11.8/29.2
C382	4030017490	S.CER C1608 JB 1A 105K-T	B	10.1/39.7
C383	4030017490	S.CER C1608 JB 1A 105K-T	B	11.9/41
C384	4030011600	S.CER C1608 JB 1E 104K-T	B	5/37.3
C385	4030011600	S.CER C1608 JB 1E 104K-T	B	9.2/41.3
C386	4030017490	S.CER C1608 JB 1A 105K-T	B	10.4/29.4
C387	4030017490	S.CER C1608 JB 1A 105K-T	B	8.4/30.6
C388	4030006900	S.CER C1608 JB 1H 103K-T	B	4.3/34
C389	4030006900	S.CER C1608 JB 1H 103K-T	B	4.3/30
C391	4030011600	S.CER C1608 JB 1E 104K-T	B	26.3/39.3
C392	4030007060	S.CER C1608 CH 1H 270J-T	T	21.7/35.1
C393	4030007060	S.CER C1608 CH 1H 270J-T	T	21.1/37
C394	4030007140	S.CER C1608 CH 1H 121J-T	T	13/38.2
C395	4030011600	S.CER C1608 JB 1E 104K-T	T	13.6/33.8
C396	4030017490	S.CER C1608 JB 1A 105K-T	T	13.1/31.5
C397	4030017490	S.CER C1608 JB 1A 105K-T	T	15.1/27.5
C398	4030007020	S.CER C1608 CH 1H 120J-T	T	23.8/37
J281	6510023541	CNR B2B-PH-K-S(LF)		
J351	6510023520	S.CNR 54104-3692	T	7.4/28.1
F281	5210000951	S.FUS 0430001NR	T	78.8/24.6
W91	7030003860	S.RES ERJ3GE JPW V	B	51.4/19.3
W92	7030003860	S.RES ERJ3GE JPW V	B	51.4/22.1
W101	7030003860	S.RES ERJ3GE JPW V	B	53.2/29.3
W102	7030003860	S.RES ERJ3GE JPW V	B	52.7/32.1
W201	7030003860	S.RES ERJ3GE JPW V	B	45.8/8.9
W202	7030003860	S.RES ERJ3GE JPW V	B	42.9/8.9
EP2	6910012350	S.BEA MMZ1608Y 102BT	B	28.6/39.3
EP3	6910012350	S.BEA MMZ1608Y 102BT	B	28.8/37.3
EP101	6910013370	S.BEA BLM18BB221SN1D	T	69.7/23.2
EP111	6910014690	S.BEA MPZ1608S221A-T	T	71.3/20.3

[VR UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
R801	7210003130	VAR TP76N97N-13F-10KA-2497		
C801	4030006900	S.CER C1608 JB 1H 103K-T	B	6.9/2.6
C802	4030006860	S.CER C1608 JB 1H 102K-T	B	6.9/5.6
W801	8900011900	CBL OPC-1192		
W802	8900012031	CBL OPC-1231A		

[CONNECTOR UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
J851	6910015031	CNR IMSA-9230B-1-09Z135-PT1		

[CHASSIS UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
J41	6910014700	CNR 2600 ANT CONNECTOR		
SP1	2510001092	SP 036D0801B		
W1	7120000470	JMP ERDS2T0		
W2	7120000470	JMP ERDS2T0		
W3	7120000470	JMP ERDS2T0		
W41	8900011881	CBL OPC-1210A		

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

S.=Surface mount

SECTION 7 MECHANICAL PARTS AND DISASSEMBLY

[CHASSIS PARTS]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
J41	6910014700	2600 ANT connector	1
W1	7120000470	Jumper ERDS2T0	1
W2	7120000470	Jumper ERDS2T0	1
W3	7120000470	Jumper ERDS2T0 ATEX	1
W41	8900011881	Cable OPC-1210A (P=0.5 N=36 L=70)	1
MP1	8210019360	2600 front panel Ass'y (A)	1
MP4	8930058380	2600 PTT button	1
MP5	8930058430	2600 PTT plate	1
MP6	8930058360	2600 PTT holder	1
MP7	8950005520	2403 9-PIN connector	1
MP8	8930055890	2403 connector sheet	1
MP9	8930055730	2403 connector seal	1
MP10	8930058720	2600 9-PIN sheet	1
MP11	8930058830	2600 6-Key (A)	1
MP12	8310054570	2600 window plate (A)	1
MP13	8930058730	2600 window sheet	1
MP14	8930039000	1757 sheet	1
MP15	8930060160	2600 PTT TAPE	1
MP16	8930060020	2600 TAPE	1
MP21	8930059360	2600 release button	1
MP22	8930055761	2403 release plate-1	1
MP23	8930056540	Spring (AH)	2
MP31	8830001470	VR nut (N)	1
MP32	8930051500	O ring (AB)	1
MP33	8610011220	Knob N294	1
MP35	8810009510	Screw PH BT M2 × 4 NI-ZU	3
MP41	8010019081	2600 chassis-1	1
MP42	8950005512	2403 contact spring-2	1
MP43	8930055870	Seal O ring (AO)	1
MP44	8810007890	Screw PH B0 M2 × 4 SUS	1
MP45	8930058550	Seal O ring (AS)	1
MP46	8930058561	Seal 2403 A-main seal-1	1
MP47	8810009510	Screw PH BT M2 × 4 NI-ZU	6
MP51	8830001600	Nut (L)	1
MP52	8810010191	Bind M2 × 4 black SUS SSBC	2
MP53	8850001880	Sealing washer (W)	2
MP54	8810010190	Bind M2 × 4 black SUS SSBC	1
MP55	8810010120	Screw PH B0 M2 × 8 SUS SSBC	2
MP65	8930059830	2600 sheet	1
MP66	8930059800	2600 pet sheet	1
MP71	8210017071	2337 C-panel-1	1
MP72	8810009270	Screw truss M3 × 4 SUS ZK	1
MP74	8930066510	Insulation sheet (LD)	1
MP75	8930005490	Insulation sheet (J)	1
SP1	2510001092	Speaker 036D0801B <KS>	1

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
MP1	8510015340	2600 PLL plate	1
MP41	8510013000	2336 VCO case Y534	1
MP42	8510015430	1922 VCO cover (A)-1 Y340A	1
MP43	8930060000	2600 shield tape	1
MP101	8510015250	2600 shield case	1
MP111	8410002530	2337 PA heat sink (tip) Y539	1
MP151	8510014860	2600 shield plate	1
MP152	8930066530	Rubber sheet (BP)	1
MP153	8930064120	Insulation sheet	1

[LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
MC461	7700002630	Microphone SKB-2246T-C33	1
MP441	6910014760	S. plate OG-503040	1
MP451	6910014760	S. plate OG-503040	1
MP461	8930059810	Microphone rubber 2246	1
MP462	8930059990	2600 Mic sponge	1
MP681	8930058420	2600 LCD holder	1
MP682	8210019110	2600 reflector	1
MP683	8930059700	Himelon sheet (CH)	1
MP684	8930059850	Isolating sheet	1
MP685	8930059850	Isolating sheet	1
DS681	5030002770	LCD L2-0390TAY-1	1
EP681	8930059150	LCD contact SRCN-2600-SP-N-W	1

[VR UNIT]

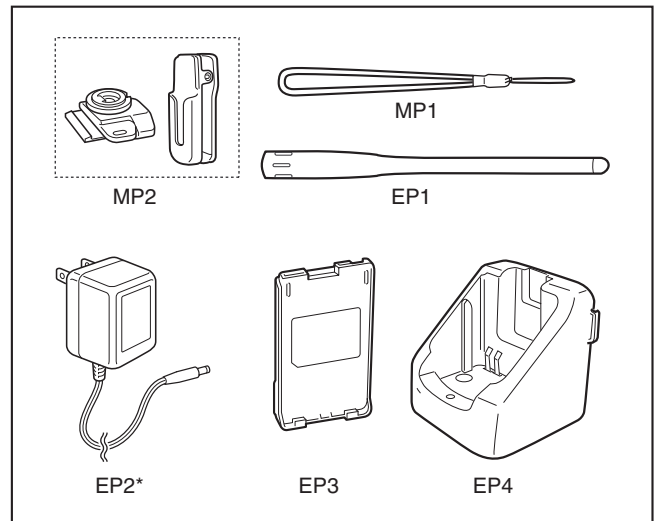
REF. NO.	ORDER NO.	DESCRIPTION	QTY.
R801	7210003130	TD76N-13F-10KA-2497	1
W801	8900011900	OPC-1192	1
W802	8900012030	OPC-1231	1

Screw abbreviations

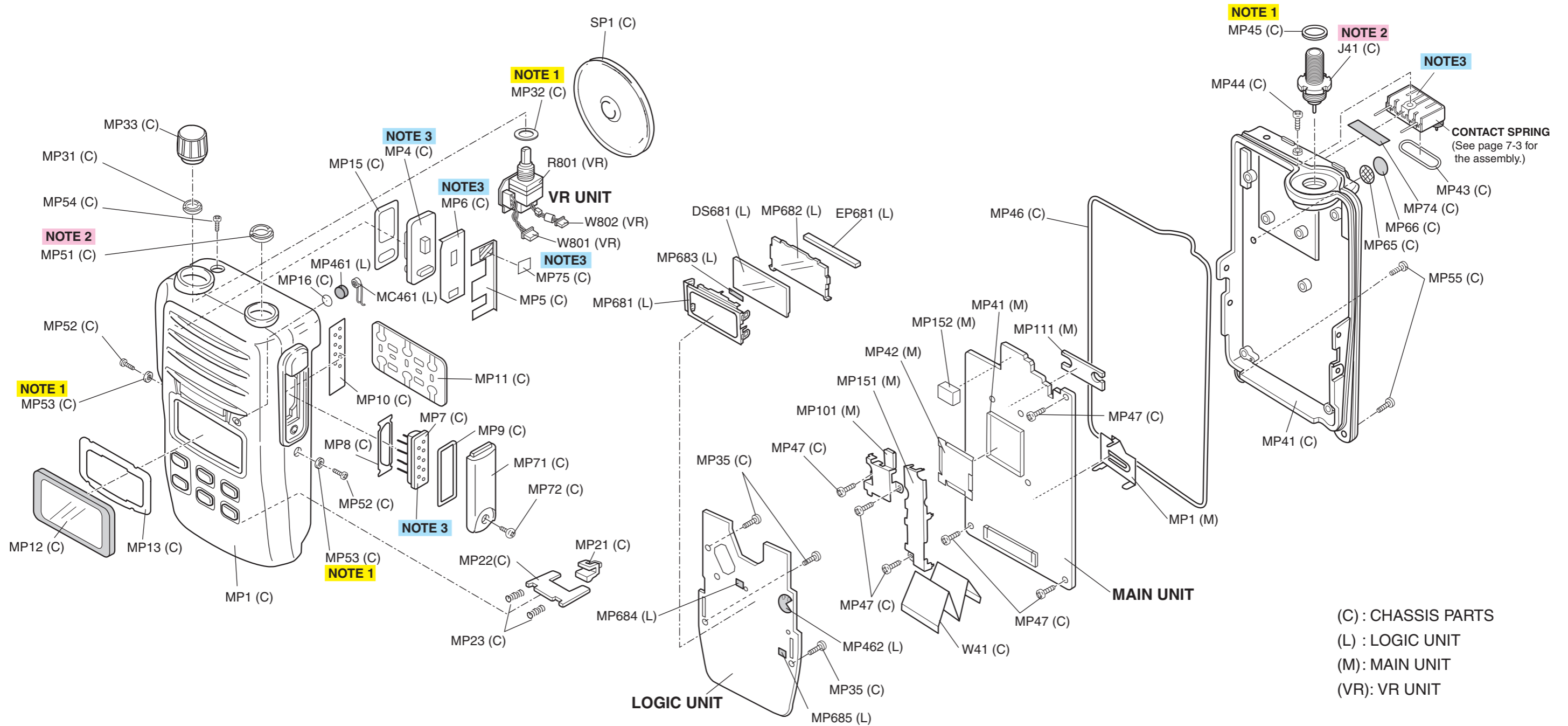
B0, BT: Self-tapping PH: Pan head
NI-ZU: Nickel-Zinc ZK: Black

[ACCESSORIES]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
EP1	Optional products	Antenna FA-S59V	1
EP2	Optional products	AC adaptor BC-147E [EUR], [FRG] only	1
EP3	Optional products	Battery BP-227AX	1
EP4	Optional products	Charger BC-152	1
MP1	8010018080	Hand strap HK-009	1
MP2	Optional products	Swivel belt clip MB-86	1



* Design is depended on versions.



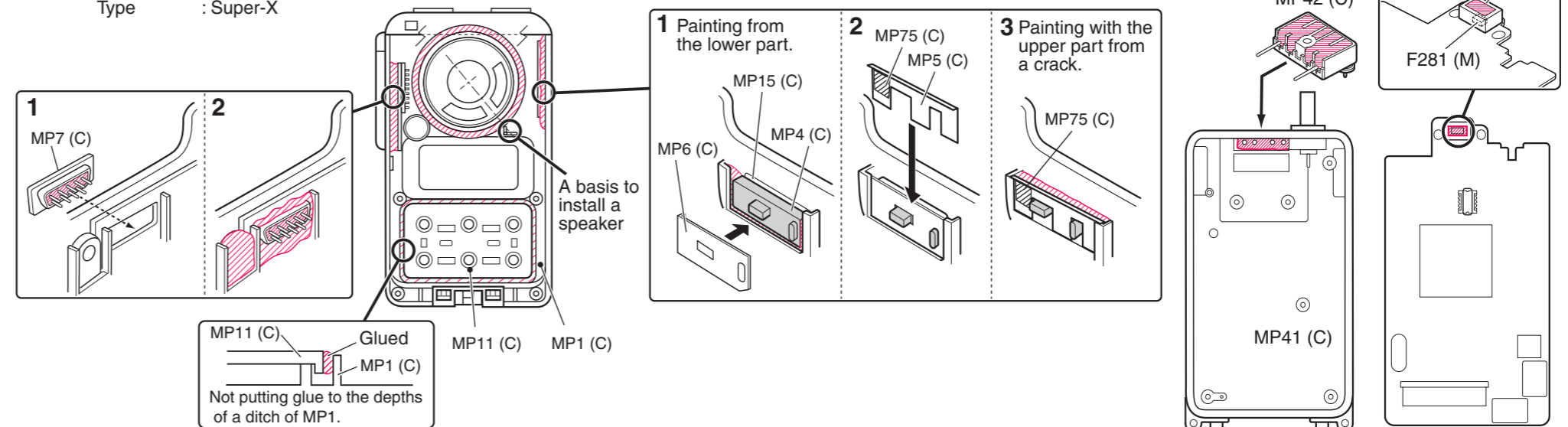
NOTE 1 : Once the following parts are removed, a O ring or sealing must be replaced with new one before reattachment.

REF. NO.	Mother parts	Daughter parts for relayed replacement
MP45 (C)	Antenna connector (J1)	O ring
MP53 (C)	MP39 (C) Screw	Shealing washer (W)
MP32 (C)	S1 (C) Encoder	O ring (AB)

NOTE 2
Apply a screw lock in the conclusion with J41 (C) and MP51 (C).
Reference No. : 89500001350
Reference Name : Screw lock 1401B

NOTE 3 The glue must be applied to the areas when the front panel is replaced with new one, to ensure water tightness.

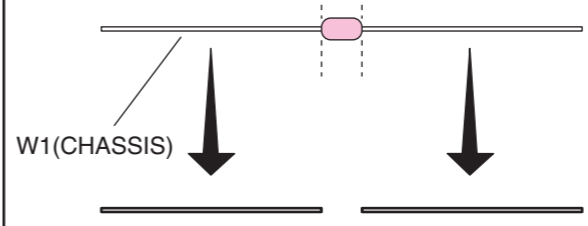
Manufacture : Cemedine Co.
Type : Super-X



CONTACT SPRING ASSEMBLY INSTRUCTION

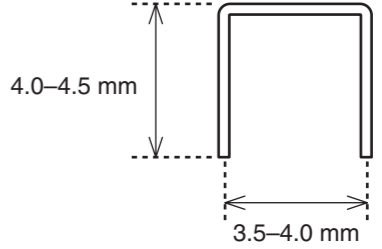
[1] PREPARING TWO SHORT LEADS

① Cut the W1 (CHASSIS).



W1(CHASSIS)


② Bend the leads according to the dimensions below.

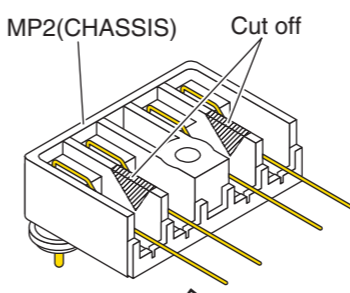


4.0-4.5 mm

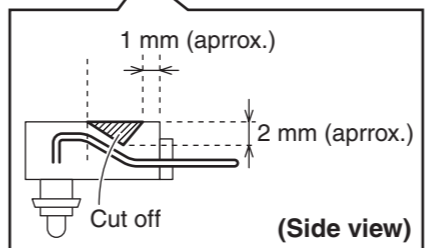
3.5-4.0 mm

[2] SOLDERING SHORT LEADS

① Cut off the  area as below.



MP2(CHASSIS) Cut off

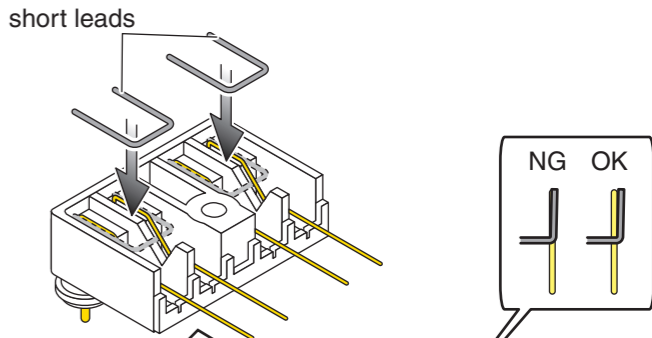


1 mm (approx.)

2 mm (approx.)

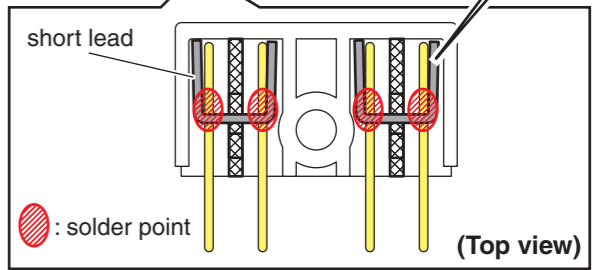
Cut off (Side view)

② Solder the short leads.



short leads

NG OK





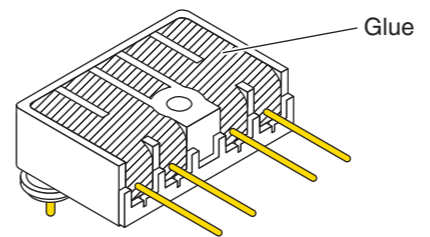
short lead

: solder point (Top view)

[3] ADDING THE GLUE AND CUTTING OFF EXTRA LEADS

① Fill up the MP2 with glue completely.

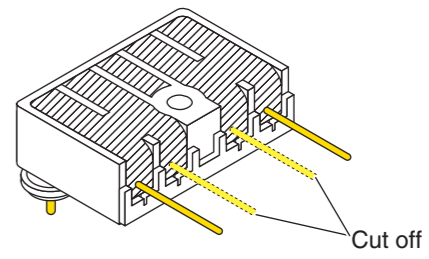
 DO NOT apply the glue to the area except . DO NOT overflow the glue.



Glue

- Glue Type-
Manufacture: Cemedine Co.
Type: Super-X

② Cut off two inner leads from the bottom.



Cut off

• BC-152 CHARGER PARTS LIST
ELECTRICAL PARTS

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
IC1	1180000970	S.IC AN78L05M-(E1)	B	48.2/58.9
IC2	1190001180	S.IC MM1332BFBE	B	23.7/24.6
IC3	1110005961	S.IC S-80833CNMC-B8S-T2G	B	48.2/33
IC4	1190001470	S.IC TB1009AF (EL)	B	18.8/57.4
IC5	1110002700	S.IC NJM2904M-TE1-#ZZZB	B	13/47.4
Q1	1540000550	S.TR 2SD1664 T100Q	B	63.4/40.2
Q2	1510000501	S.TR 2SA1162-GR (TE85R, F)	B	53.7/61.7
Q3	1590003620	S.FET 2SJ646-TL-E	B	35.8/38.7
Q4	1520000450	S.TR 2SB1132 T100 Q	B	48.8/22.8
Q5	1590000700	S.TR DTC144EKA T146	B	20.3/30.3
Q6	1590000930	S.TR DTA144EKA T146	B	24.2/54.8
D1	1790000671	S.DIO SB07-03C-TB-E	B	62.5/13.6
D2	1730002540	S.ZEN MA8130-L (TX)	B	66.4/33.6
D3	1750000150	S.DIO DA204K T146	B	37.5/9.1
D4	1730002460	S.ZEN MA8330-M (TX)	B	49.8/18.8
D5	1750000550	S.DIO 1SS355 TE-17	B	18.9/49.4
D6	1160000070	S.DIO DAN202K T146	B	24/46.5
D7	1730002320	S.ZEN MA8051-M (TX)	B	8/48.6
R1	7030000380	S.RES MCR10EZHZJ 1 kΩ	B	64.4/35.9
R2	7030000140	S.RES MCR10EZHZJ 10 Ω (100)	B	48.9/44.1
R3	7030000140	S.RES MCR10EZHZJ 10 Ω (100)	B	48.9/46.6
R4	7030000450	S.RES MCR10EZHZJ 3.9 kΩ	B	52.7/56.5
R5	7030000450	S.RES MCR10EZHZJ 3.9 kΩ	B	52.7/58.7
R6	7030000500	S.RES MCR10EZHZJ 10 kΩ	B	49.9/49.1
R7	7030002920	S.RES MCR10EZHFJX (39 kΩ)	B	48.3/29.9
R8	7030000580	S.RES MCR10EZHZJ 47 kΩ	B	48.3/27.7
R9	7030000420	S.RES MCR10EZHZJ 2.2 kΩ	B	51.4/30.8
R10	7030000260	S.RES MCR10EZHZJ 100 Ω (101)	B	52.7/54.2
R11	7030000500	S.RES MCR10EZHZJ 10 kΩ	B	24.2/50.9
R12	7030000530	S.RES MCR10EZHZJ 18 kΩ	B	39.6/14.4
R13	7030001780	S.RES MCR10EZHFJX (18 kΩ)	B	48.1/36
R14	7030000500	S.RES MCR10EZHZJ 10 kΩ	B	21.5/51.7
R15	7030000500	S.RES MCR10EZHZJ 10 kΩ	B	17.8/51.7
R16	7030000540	S.RES MCR10EZHZJ 22 kΩ	B	18.9/46.5
R17	7030010150	S.RES MCR10EZHF 2943 (294 kΩ)	B	17.8/62.7
R19	7030000530	S.RES MCR10EZHZJ 18 kΩ	B	24.2/57.8
R20	7030000300	S.RES MCR10EZHZJ 220 Ω (221)	B	10.4/13.3
R21	7030000500	S.RES MCR10EZHZJ 10 kΩ	B	8/50.8
R22	7030000540	S.RES MCR10EZHZJ 22 kΩ	B	8/55.2
R23	7030000550	S.RES MCR10EZHZJ 27 kΩ	B	8/53
R24	7030000020	S.RES MCR10EZHZJ 1 Ω (010)	B	13.1/5.8
R25	7030000020	S.RES MCR10EZHZJ 1 Ω (010)	B	15.4/5.8
R27	7030000580	S.RES MCR10EZHZJ 47 kΩ	B	8/43.9
R28	7030000500	S.RES MCR10EZHZJ 10 kΩ	B	8/46.1
R29	7030000680	S.RES MCR10EZHZJ 330 kΩ	B	12.6/53
R30	7030000510	S.RES MCR10EZHZJ 12 kΩ	B	8.4/58.5
C1	4030004750	S.CER C2012 JB 1H 103K-T	B	61.2/6.8
C2	4510005340	ELE 25 ME 47 HC	B	61.4/35
C3	4030008960	S.CER C2012 JB 1C 104K-T	B	40.7/40.1
C4	4030004720	S.CER C2012 JB 1H 102K-T	B	39.6/12.2
C5	4030004720	S.CER C2012 JB 1H 102K-T	B	39.6/12.2
C6	4510006160	ELE 25 ME 10 HC	B	49.3/63.3
C7	4030008960	S.CER C2012 JB 1C 104K-T	B	44.4/59.6
C8	4030008960	S.CER C2012 JB 1C 104K-T	B	23.5/61.4
C9	4030008960	S.CER C2012 JB 1H 333K-T	B	13.8/61.2
C10	4030008960	S.CER C2012 JB 1C 104K-T	B	13.6/55.2
C11	4510006160	ELE 25 ME 10 HC	B	67.3/37.4
C12	4030008960	S.CER C2012 JB 1C 104K-T	B	24.1/32.4
C13	4510006160	ELE 25 ME 10 HC	B	
C14	4030008960	S.CER C2012 JB 1C 104K-T	B	
C15	4030008960	S.CER C2012 JB 1C 104K-T	B	

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

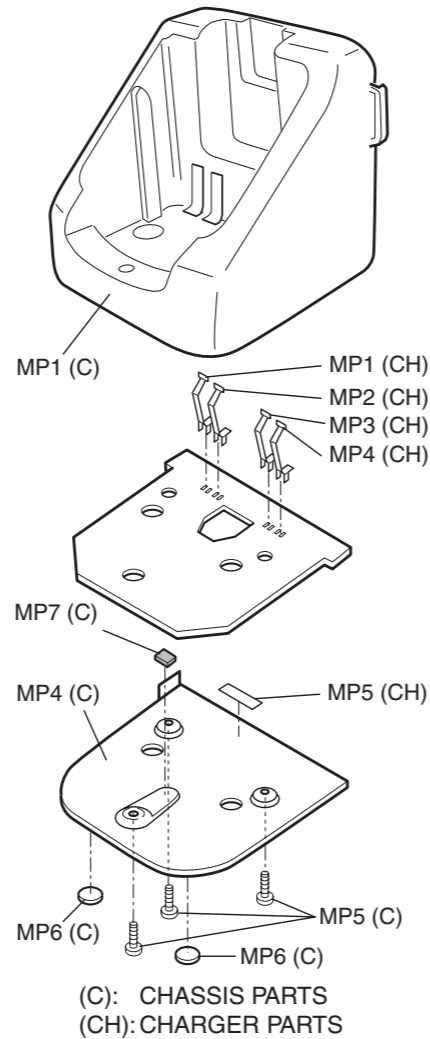
REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
J1	6510024940	CNR HEC2305-016250		
DS1	5040003020	LED SEL2410G		
W1	7030000010	S.RES MCR10EZHZJ JPW (000)	B	20.9/42.5
W2	7030000010	S.RES MCR10EZHZJ JPW (000)	B	20.9/46.5
W3	7030000010	S.RES MCR10EZHZJ JPW (000)	B	13.6/57.4
W4	7030000010	S.RES MCR10EZHZJ JPW (000)	B	10.6/58.5

MECHANICAL PARTS
CHASSIS PARTS (C)

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
MP1	8010019100	Case 2612	1
MP4	8110007810	Cover 2612	1
MP5	8810008660	Screw BT M3 x 8 NI-ZU	3
MP6	8930039620	LEG cushion (A)	2
MP7	8930056330	Summary sheet (Z) TC-100TK (7 x 7)	1

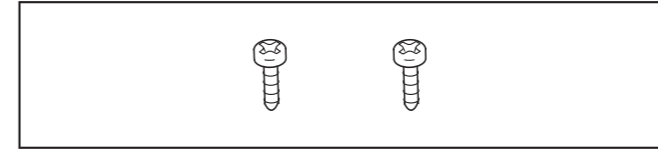
CHARGER PARTS (CH)

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
MP1	8930051341	2338 TERMINAL-1	1
MP2	8930051341	2338 TERMINAL-1	1
MP3	8930051341	2338 TERMINAL-1	1
MP4	8930051341	2338 TERMINAL-1	1

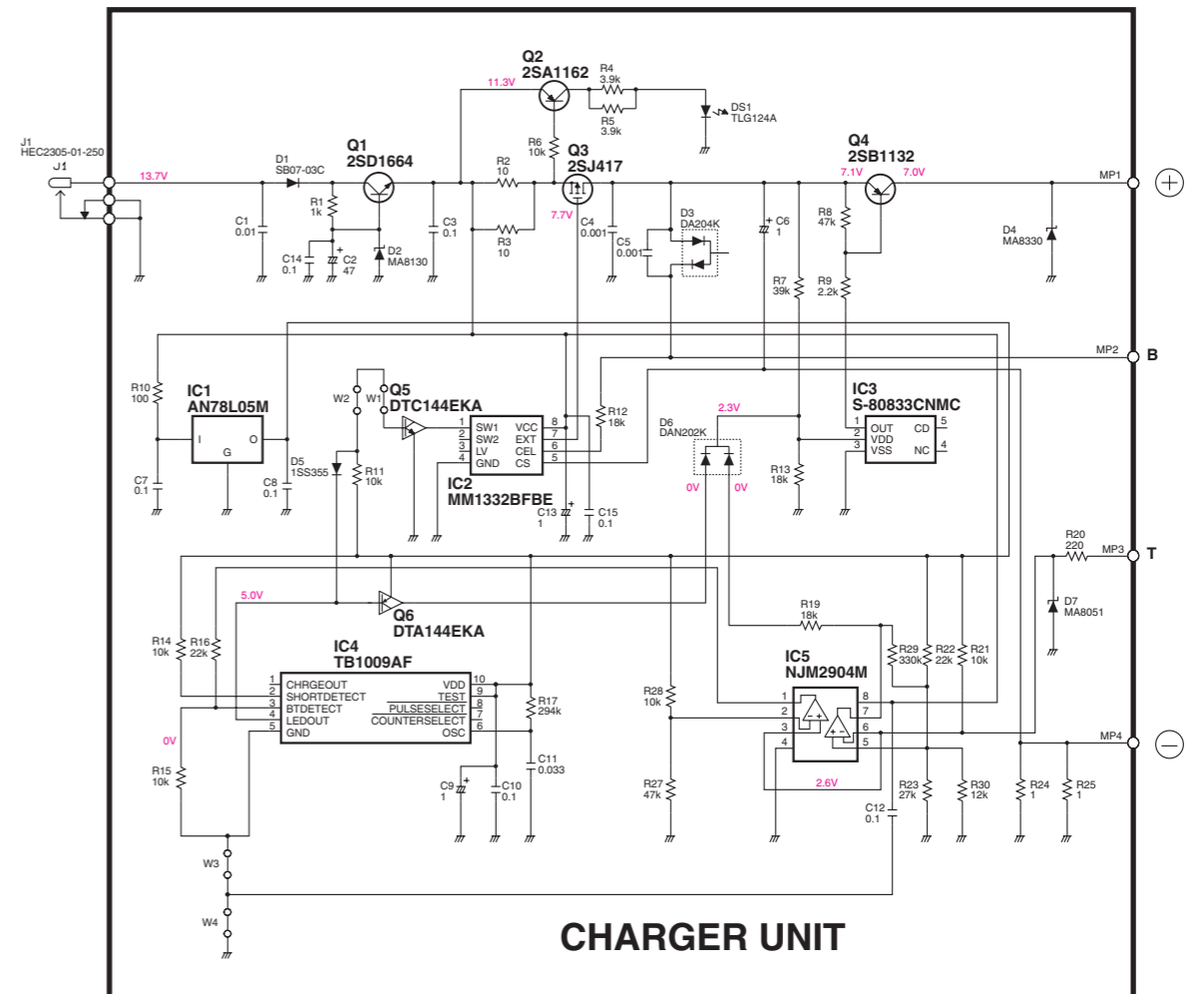


ACCESSORY PARTS

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
MP1	8810001470	Screw.5 x 30 SUS	2



• BC-152 VOLTAGE DIAGRAM



CHARGER UNIT

SECTION 8 SEMI-CONDUCTOR INFORMATION

8 - 1 TRANSISTORS AND FETS

• IC-M87

2SA1588-GR (Symbol: ZG) 	2SB1132 T100 Q (Symbol: BAQ) 	2SC4116 BL/GR (Symbol: LL/LG) 	2SC4213-B (Symbol: AB) 	2SC4215 O/Y (Symbol: QO/QY)
2SC4226-T1 R25 (Symbol: R25) 	2SC5107 O (Symbol: MFO) 	2SC5110-O (TE85R) (Symbol: MGO) 	2SK1829(TE85R) (Symbol: KI) 	2SK880Y (Symbol: XY)
3SK294 (Symbol: UV) 	3SK299-T1 U73 (Symbol: U73) 	CPH3403-TL (Symbol: KC) 	DTA144EUA T106 (Symbol: 16) 	DTC144EUA (Symbol: 26)
RD01MUS1 (Symbol: K2) 	RD07MVS1 (Symbol: RD07MVS1) 	UN911F/H (Symbol: 6O/6P) 	XP1213(TX) (Symbol: 9L) 	XP1214(TX) (Symbol: 9H)
XP4601(TX) (Symbol: 5C) 	XP6501 AB (Symbol: 5N) 			

• BC-152

2SA1162-GR (Symbol: SG) 	2SD1664 T100Q (Symbol: DAQ) 	2SJ417-TL (Symbol: J417) 	DTA144EKA T146 (Symbol: 16) 	DTC144EKA T146 (Symbol: 26)
--------------------------------	------------------------------------	---------------------------------	------------------------------------	------------------------------------

8 - 2 DIODES

• IC-M87

1SS375-TL (Symbol: FH) 	1SV245 (Symbol: T3) 	1SV307 (TPH3) (Symbol: TX) 	DAN222TL (Symbol: N-4) 	HVC350BTRF (Symbol: B0)
HVC362TRF (Symbol: V2) 	HVU350B TRF (Symbol: 4) 	MA2S111 (Symbol: A) 	MA2S728-(TX) (Symbol: B) 	MA77(TX) (Symbol: 4B)
MA8056-M (Symbol: 5-6) 	MA8062-M(TX) (Symbol: 6-2) 	RB706F-40T106 (Symbol: 3J) 		

• BC-152

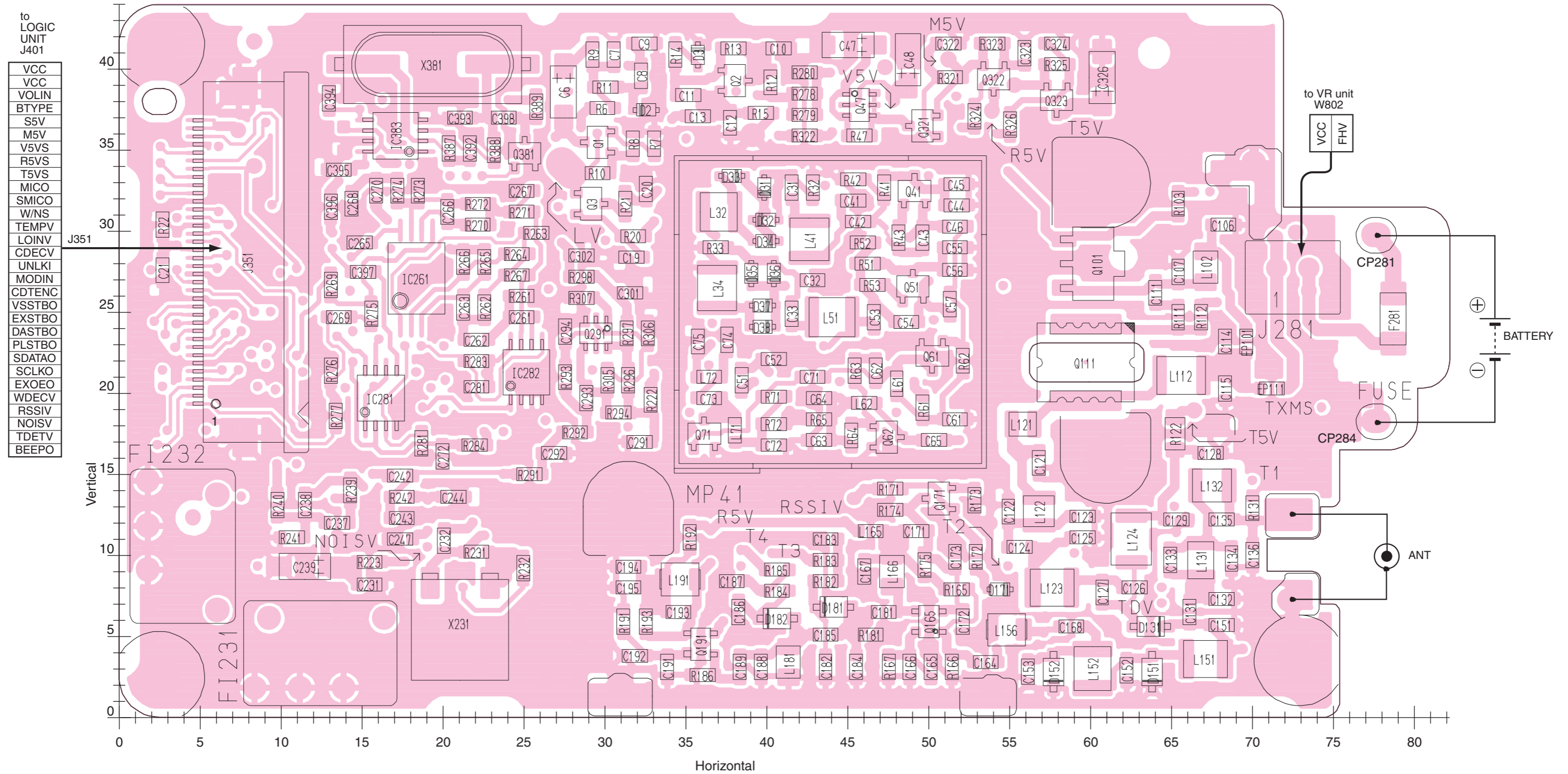
1SS355 TE-17 (Symbol: A) 	DA204K T146 (Symbol: K) 	DAN202K T146 (Symbol: N) 	MA8051-M (Symbol: 5-1) 	MA8130-L (Symbol: 13_)
MA8330-M (Symbol: 33-) 	SB07-03C-TB (Symbol: 12) 			

SECTION 9 BOARD LAYOUTS

9-1 MAIN UNIT

• TOP VIEW

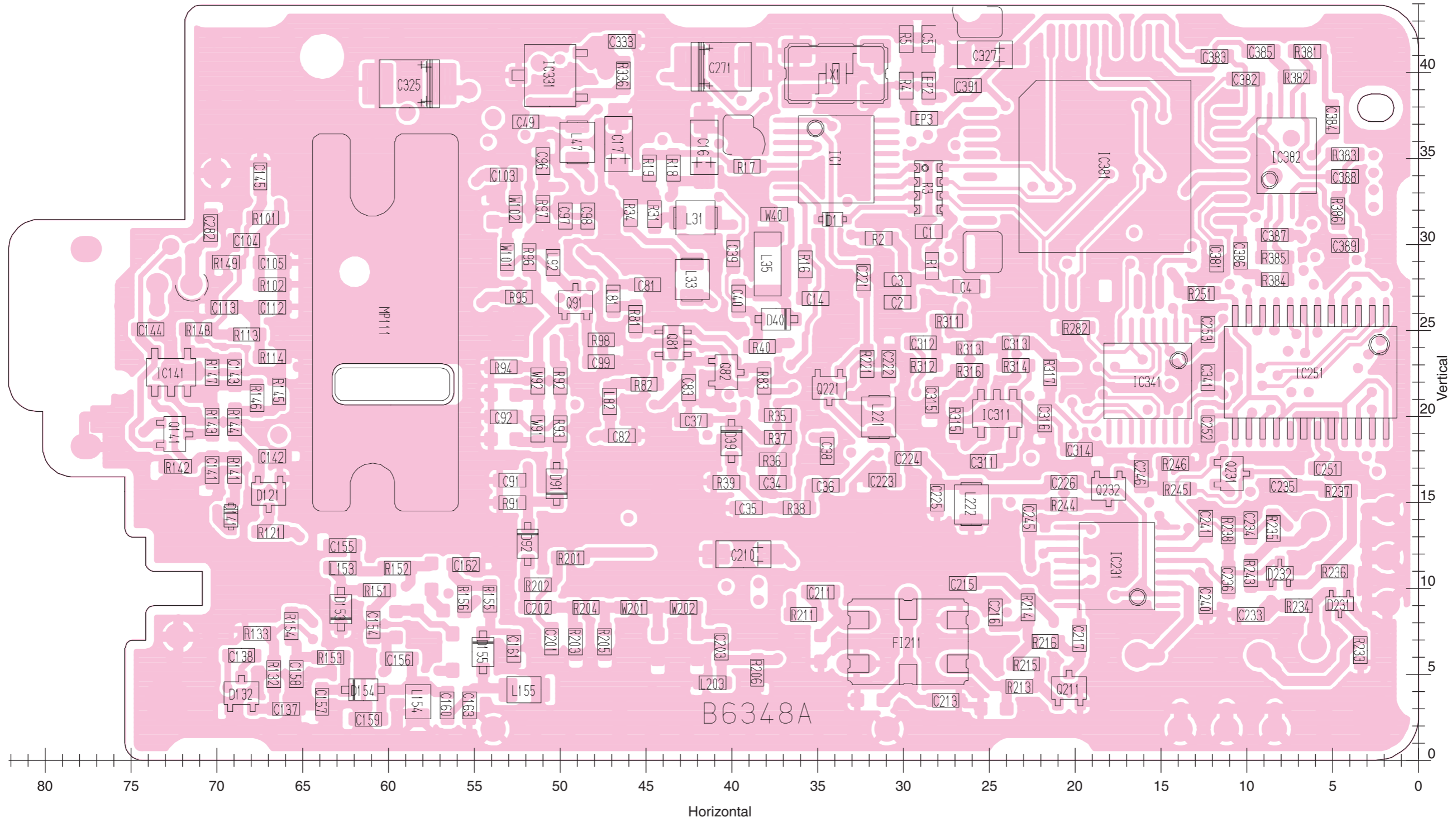
The combination of this page and the next page shows the unit layout in the same configuration as the actual P.C. Board.



MAIN UNIT

• BOTTOM VIEW

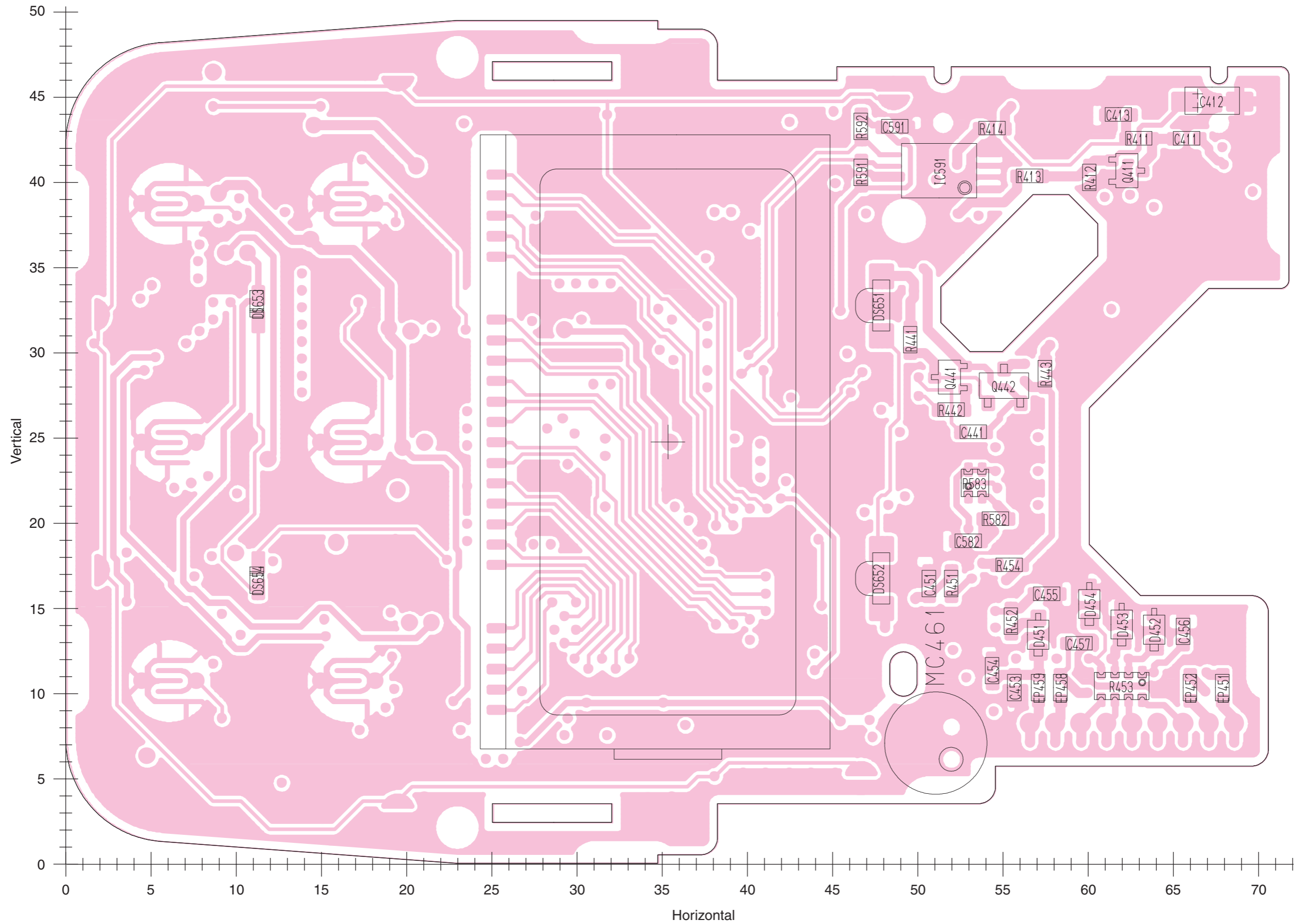
The combination of this page and the previous page shows the unit layout in the same configuration as the actual P.C. Board.



9-2 LOGIC UNIT

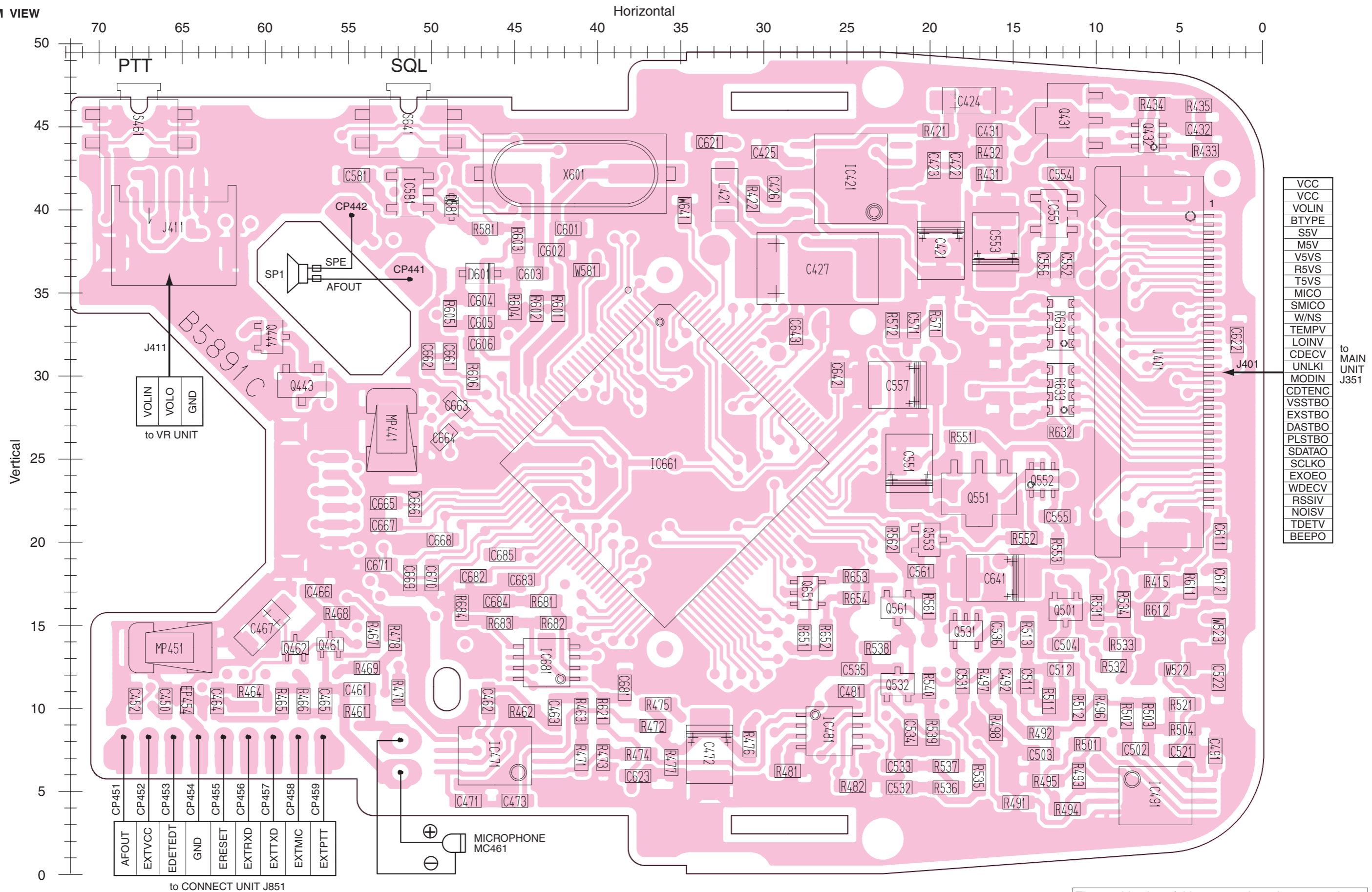
• TOP VIEW

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



LOGIC UNIT

• BOTTOM VIEW

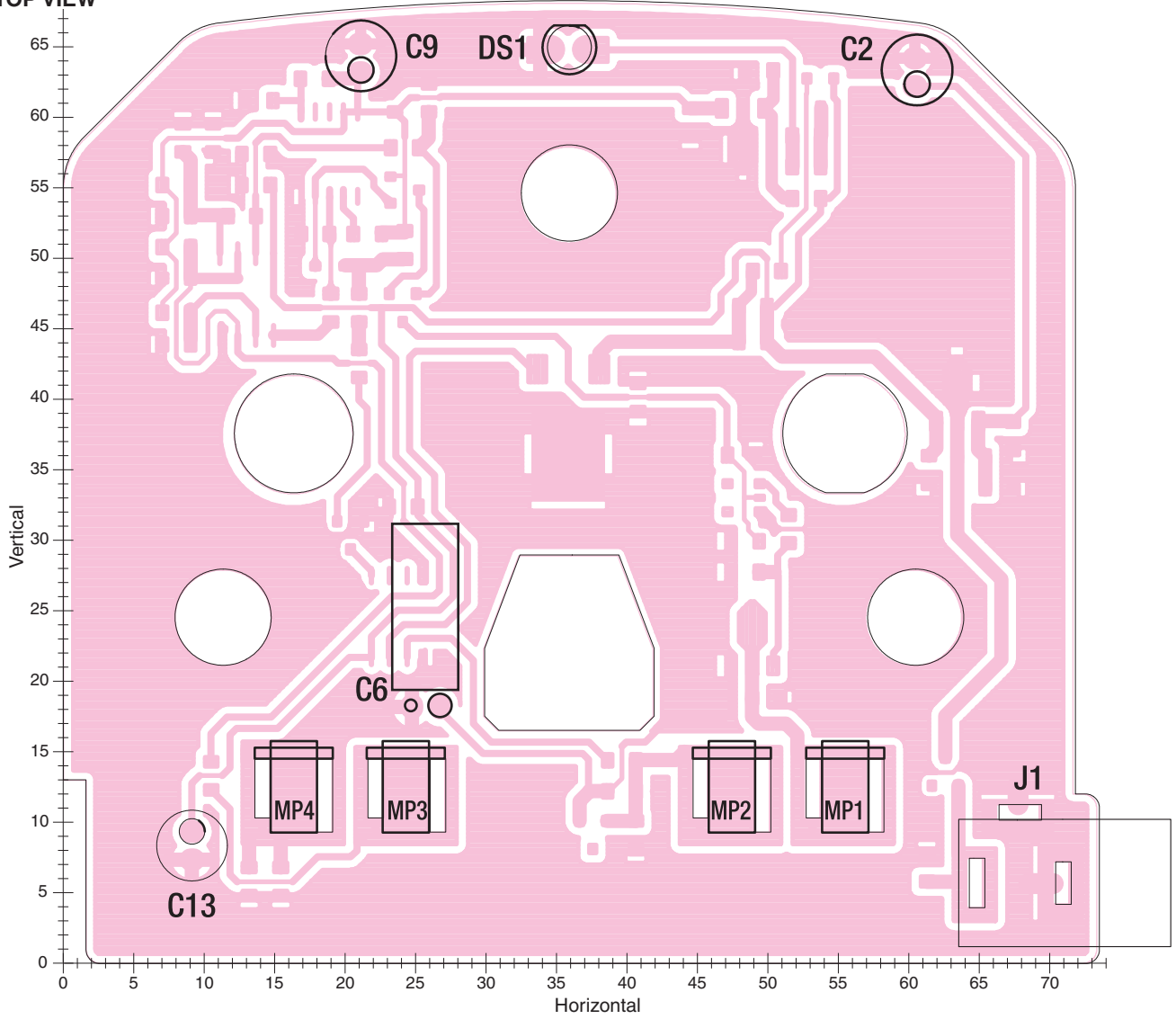


VCC
VCC
VOLIN
BTYPE
S5V
M5V
V5VS
R5VS
T5VS
MICO
SMICO
W/NS
TEMPV
LOINV
CDECV
UNLKI
MODIN
CDTENC
VSSTBO
EXSTBO
DASTBO
PLSTBO
SDATAO
SCLKO
EXOEO
WDECV
RSSIV
NOISV
TDETV
BEEPO

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

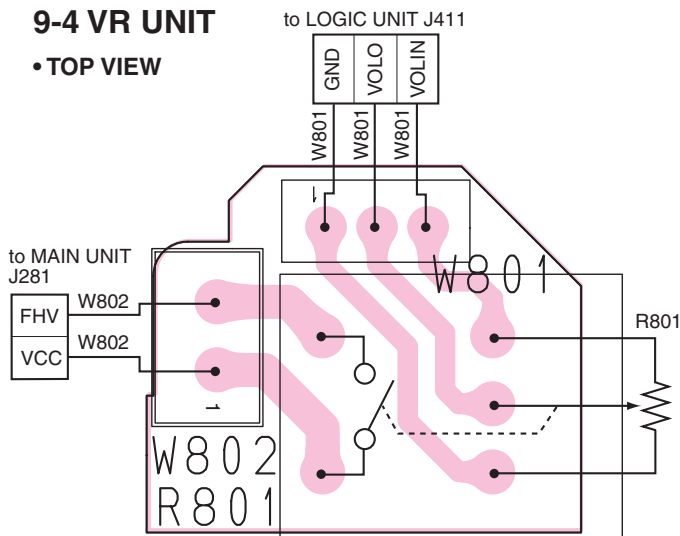
9-3 CHARGER UNIT (BC-152)

• TOP VIEW



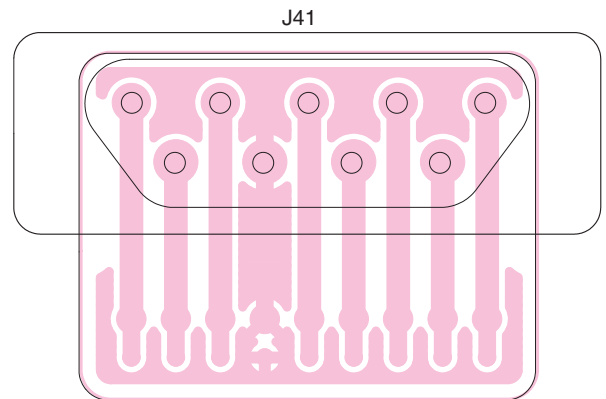
9-4 VR UNIT

• TOP VIEW



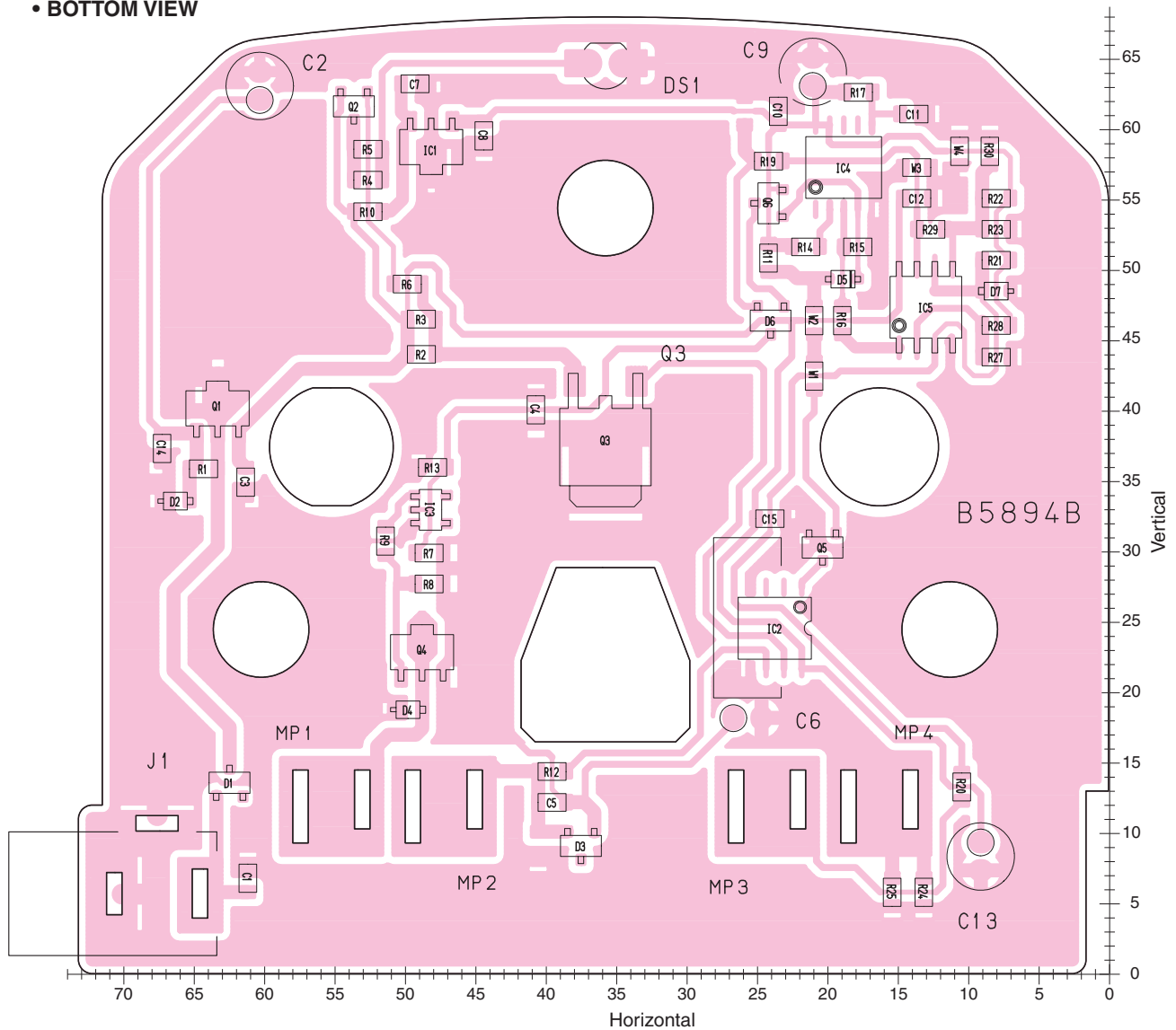
9-5 CONNECTOR UNIT

• TOP VIEW



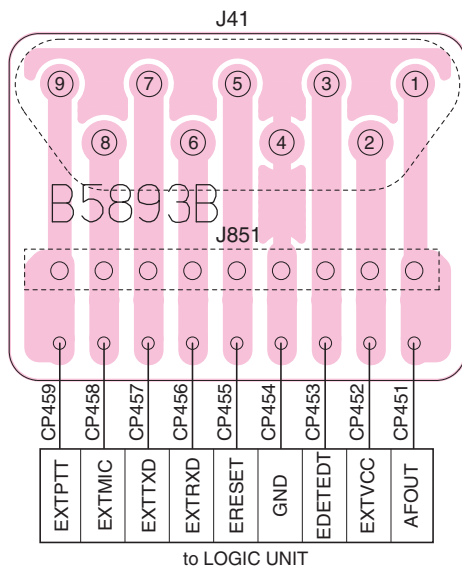
CHARGER UNIT (BC-152)

• BOTTOM VIEW



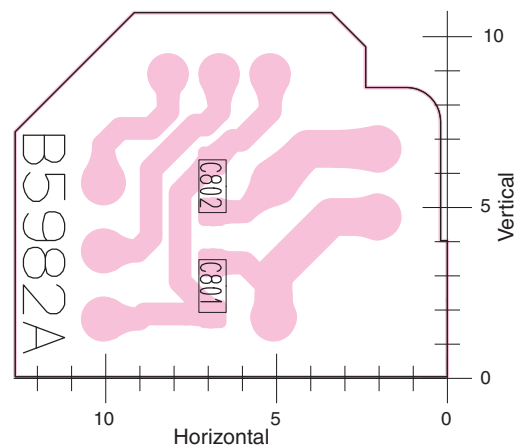
CONNECTOR UNIT

• BOTTOM VIEW

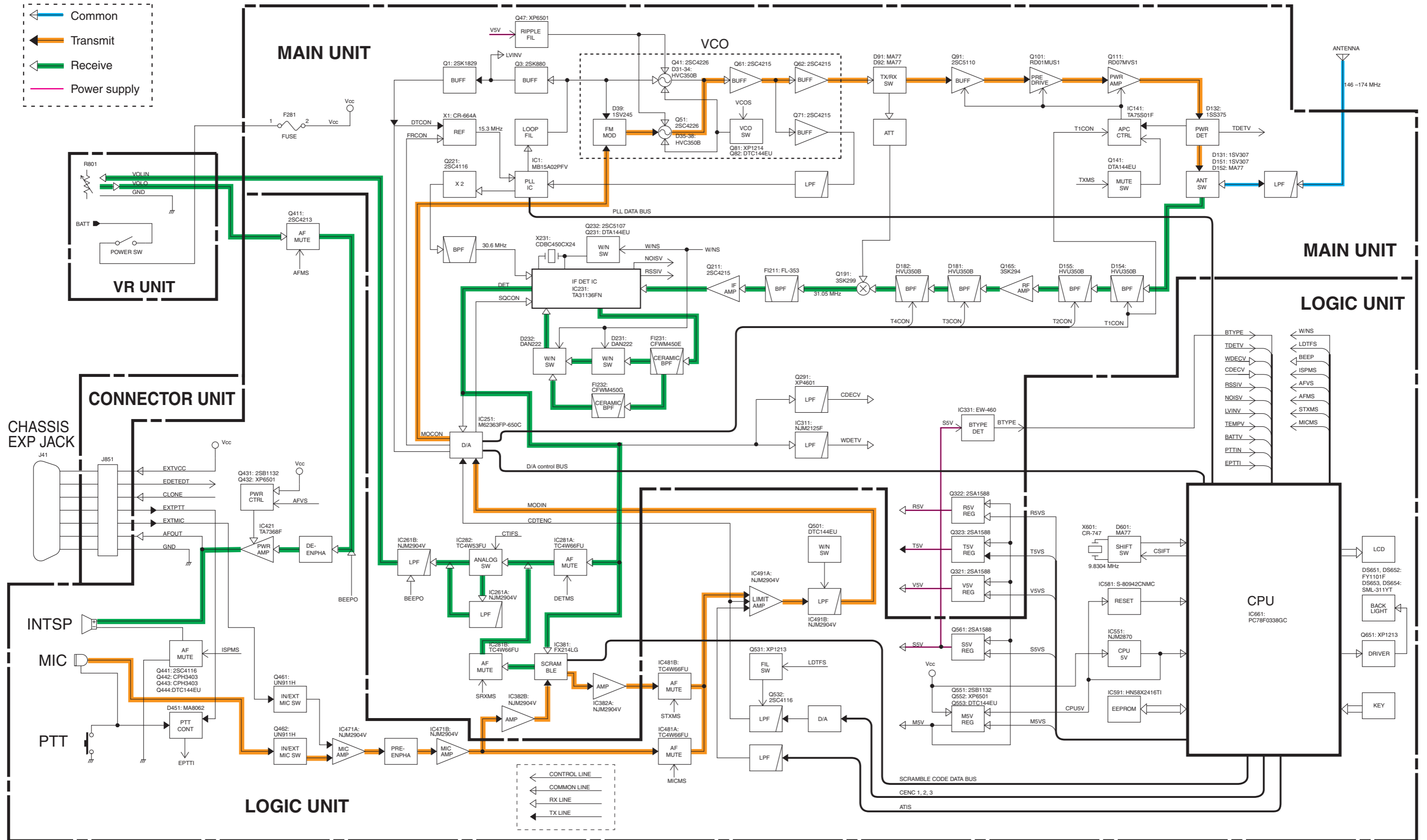


VR UNIT

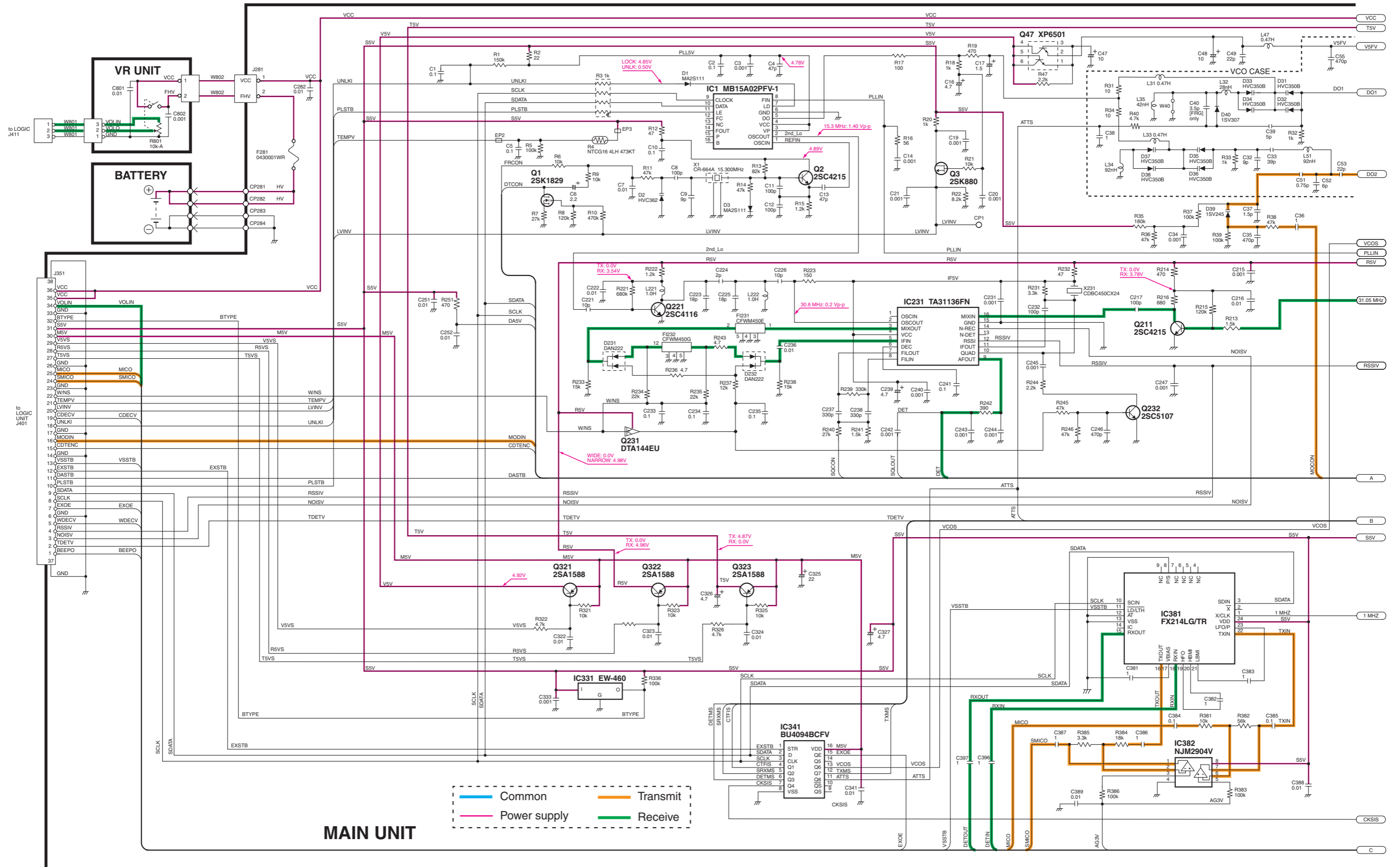
• BOTTOM VIEW

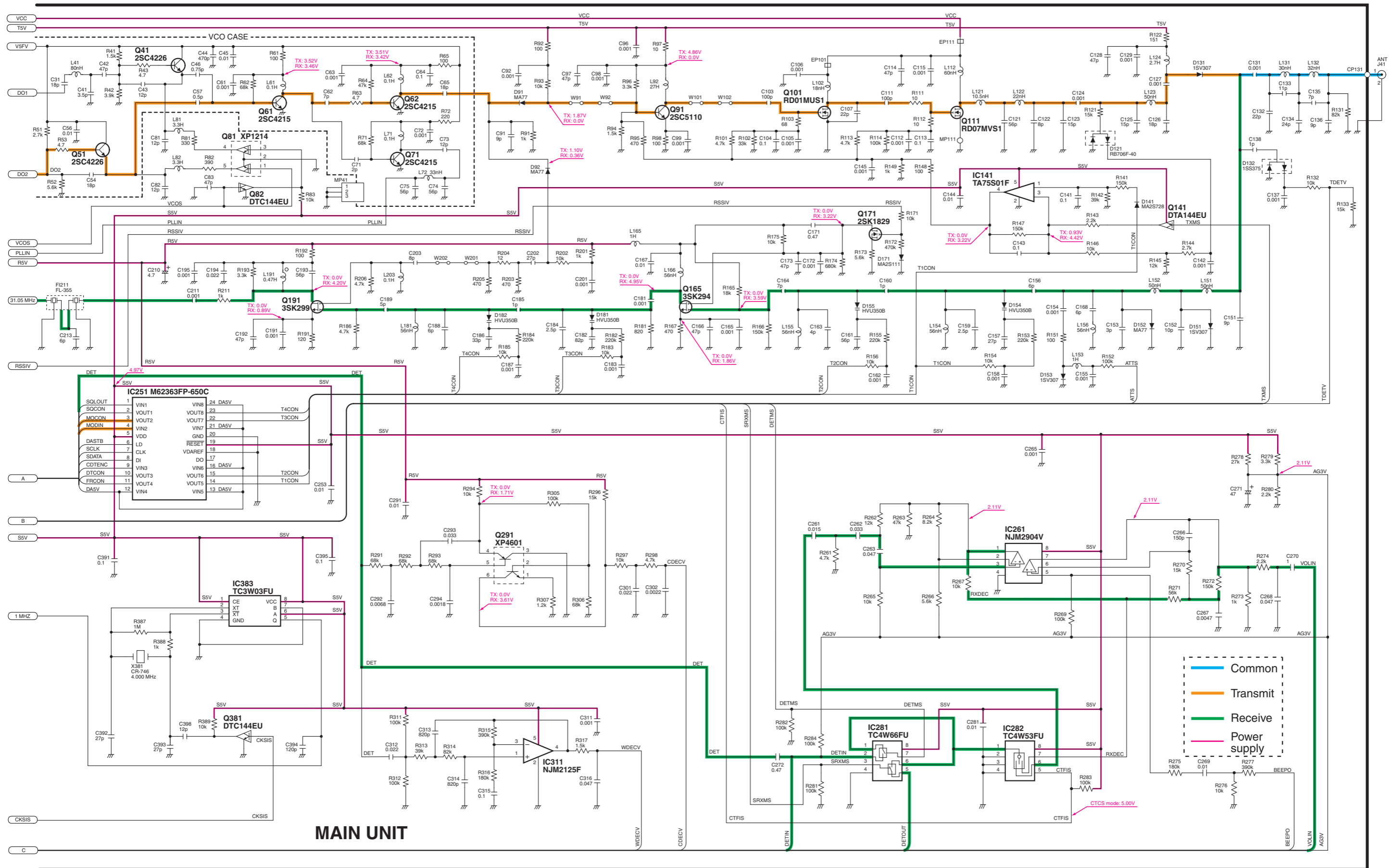


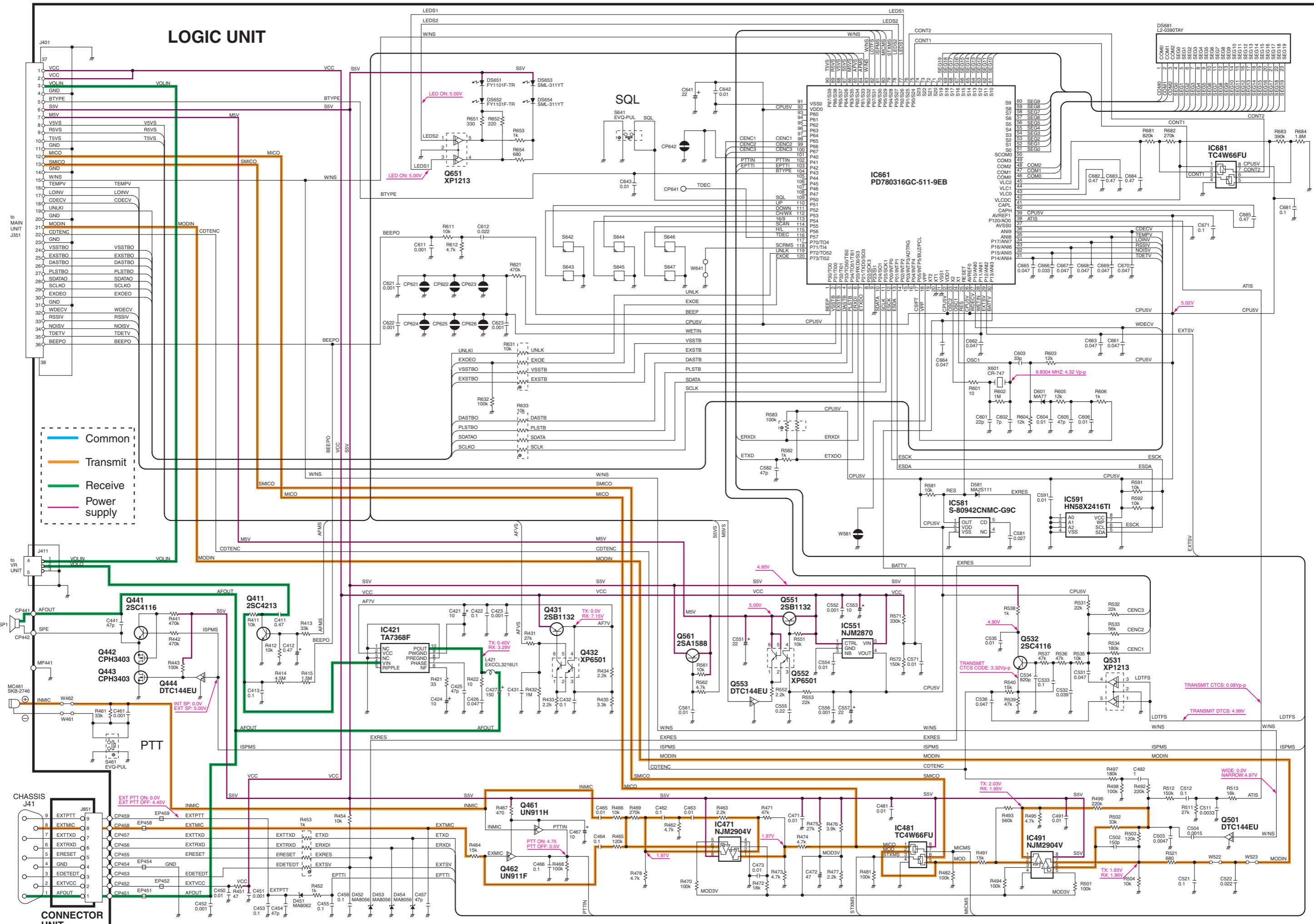
SECTION 10 BLOCK DIAGRAM



SECTION 11 VOLTAGE DIAGRAM







- Common
- Transmit
- Receive
- Power supply

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