Vertex Standard

VHF FM Transceiver

VX-6000V

Service Manual

Vertex Standard LMR, Inc.

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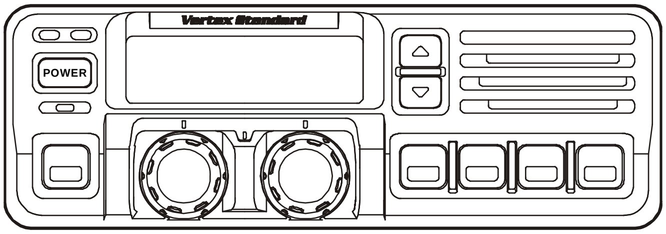
EC024N90J

Introduction



This manual provides technical information necessary for servicing the VX-6000V VHF FM Transceiver.

Servicing this equipment requires expertise in handling surface-mount chip components. Attempts by non-qualified persons to service this equipment may result in permanent damage not covered by the warranty, and may be illegal in some countries.

Two PCB layout diagrams are provided for each double-sided circuit board in the Transceiver. Each side of is referred to by the type of the majority of components installed on that side ("leaded" or "chip-only"). In most cases one side has only chip components, and the other has either a mixture of both chip and leaded components (trimmers, coils, electrolytic capacitors, ICs, etc.), or leaded components only.

While we believe the technical information in this manual to be correct, VERTEX STANDARD assumes no liability for damage that may occur as a result of typographical or other errors that may be present. Your cooperation in pointing out any inconsistencies in the technical information would be appreciated.

Important Note

After Lot. 22 of this transceiver is assembled using Pb (lead) free solder, based on the RoHS specification. Only lead-free solder (Alloy Composition: Sn-3.0Ag-0.5Cu) should be used for repairs performed on this apparatus. The solder stated above utilizes the alloy composition required for compliance with the lead-free specification, and any solder with the above alloy composition may be used.

Contents

General

Frequency Range:	148 - 174 MHz
Number of Channels:	250 channels
Channel Spacing:	12.5 / 25 kHz
Power Supply Voltage:	13.4V DC ±15 %
Current Consumption:	Standby: 600 mA
	Receive: 2.2 A
	Transmit: 28 A (High)
Ambient Temperature Range:	–22 °F to +140 °F (–30 °C to +60 °C)
Frequency Stability:	Better than ±2 ppm
RF Input-Output Impedance:	50 Ohms
Audio Output Impedance:	4 Ohms
Dimensions:	7" (w) x 2.4" (H)x 11.9" (D) (178 x 60 x 301 mm)
Weight (Approx.):	15.4 lbs. (7.0 kg)

Receiver (Measurements made per EIA standard TIA/EIA-603)

Circuit Type:	Double-conversion Super-heterodyne
Sensitivity (EIA 12 dB SINAD):	0.25 µV
Adjacent Channel Selectivity:	85/80 dB
Intermodulation:	80/75 dB
Spurious and Image Rejection:	90 dB
Audio Output:	5 W @ 4 Ohms w/3 % THD
	10 W @ 4 Ohms w/3 % THD (Optional MLS-100)

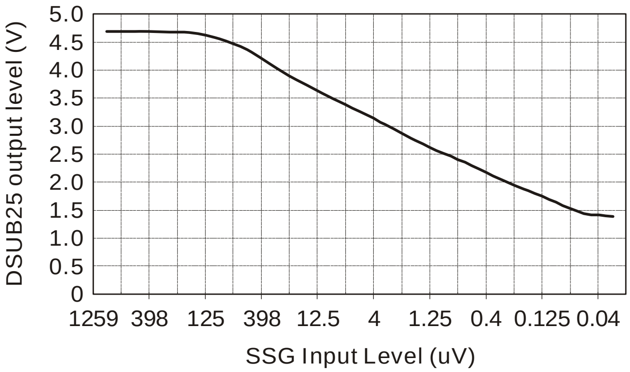
Transmitter (Measurements made per EIA standard TIA/EIA-603)

Power Output:	110 / 50 W
Modulation:	16K0F3E, 11K0F3E
Max Deviation:	5.0/2.5 kHz
Conducted Spurious Emissions:	80 dB Below Carrier
Audio Distortion (@ 1 kHz):	< 2 %

Measurements per EIA standards unless noted above.
Specifications subject to change without notice or obligation.

Pin 1: RSSI **[Analog Output]**

A DC voltage proportional to the strength of the signal currently being received (Receiver Signal Strength Indicator) is provided on this pin. This low impedance output is generated by the receiver IF sub-system and buffered by an internal op-amp. Typical voltages are graphed as follows:

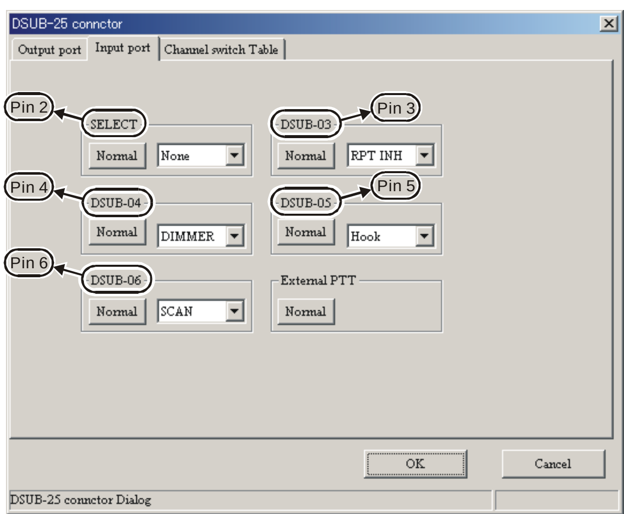


Pin 2, 3, 4, 5 & 6: SELECT, DSUB 03, DSUB 04, DSUB 05 & DSUB 06

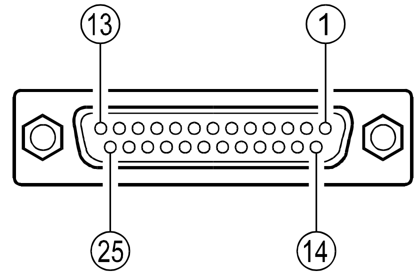
[Digital Input Port]

These input port features can be programmed via the CE49 programmer. The same item can not be chosen twice.

To select the "Input port" page, (Common ➠ DSUB-25 ➠ Input port).



LOGIC level (+5V / 0V) input (Low active).
High Impedance input.



DSUB 25-Pin Numbering

None

MON This feature is the same as pressing and holding in the Monitor key.

DIMMER LCD illumination dimmer "on."

Hook Activates the Hook1 feature.

SCAN Activates the scanner.

G-SCAN Activates the Group scanner.

RPT INH Disables the repeater feature during Multi Deck operation.

EMG Activates the Emergency feature.

Home Switches to the Home Channel.

CH SW0 Memory channel recall (Channel Switch Table bit 0)

CH SW1 Memory channel recall (Channel Switch Table bit 1)

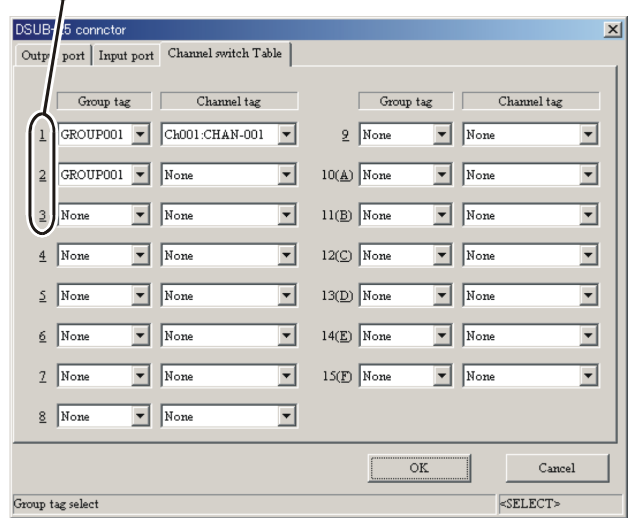
CH SW2 Memory channel recall (Channel Switch Table bit 2)

CH SW3 Memory channel recall (Channel Switch Table bit 3)

Example

If you assign "CH SW0" and "CH SW1" to the Universal Input Port, you can recall Channels 1~3 as shown below.

Channel	CH SW0	CH SW1
1	1	0
2	0	1
3	1	1



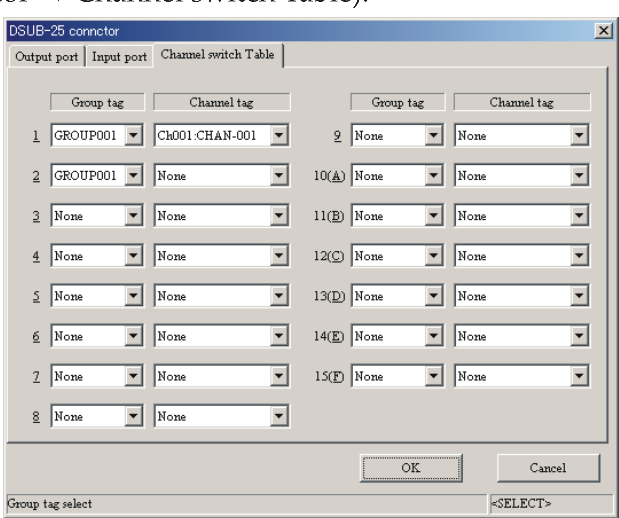
Similarly, if you assign "CH SW0," "CH SW1," and "CH SW2" to the Universal Input Port, you can recall Channels 1~7 as shown below:

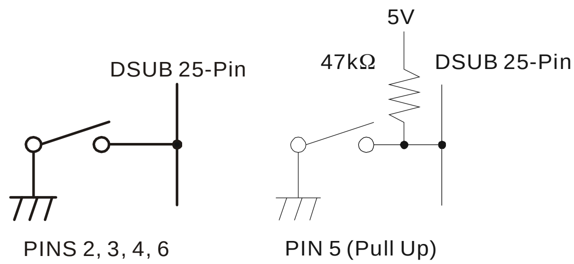
Channel	CH SW0	CH SW1	CH SW2
1	1	0	0
2	0	1	0
3	1	1	0
4	0	0	1
5	1	0	1
6	0	1	1
7	1	1	1

If you need to recall all memory channels (15 CH) from the External Controller via the Uni-versal Input Port, you should assign the "All Channel Recall" Command (CH SW 0 ~ CH SW 3) to the Universal Input Port.
In this case:

Channel	CH SW0	CH SW1	CH SW2	CH SW3
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1
10	0	1	0	1
11	1	1	0	1
12	0	0	1	1
13	1	0	1	1
14	0	1	1	1
15	1	1	1	1

The Memory Channel is determined via the CE49 Programmer. (Common ➠ DSUB-25pin connector ➠ Channel switch Table).





Sample Circuit

Pin 7: E [GND]

Ground for all logic levels and power supply return.

Pin 8: A KEY OUT [Universal Output Port]

Open collector output. Output voltage 0 ~ 5 V, Max. sink current 30 mA.
The possible programming features (use CE49) are illustrated below.

A PORT/B PORT/C PORT/D PORT/E PORT/ None

Refer to the "Pins 20, 21, & 22" section for details.

Pin 9: TXD [Digital Output for Alignment software]

Connect to the RS232C cable (requires FIF-8 and CT-88)

Pin 10: RXD [Digital Input for Alignment software]

Connect to the RS232C cable (requires FIF-8 and CT-88)

Pin 11: EXT PTT

Shorting this port to ground causes the transceiver to be placed in the Transmit mode, while opening the connection to this port returns the transceiver to the Receive mode.

Pin 12: MIC MUTE

MIC mute on: Level High (5V)
MIC mute off: Open
LOGIC level (+5V / 0V) output.
When the PTT/EXT PTT switch is pressed, this pin switches to "open."

Pin 13: TXDI [Digital Input for DATA Communications]

- ❍ TX Hi-speed Data Input Type (jumper JP2005). Input level 800 mV/600 Ohms, Max.input 1.2V
- ❍ Tx Low-speed Data input Type (Jumper JP2006). Input level 40 mV/600-Ohms

If the Jumper setting is "Low-speed Data" (JP2006 jumpered), this port is usable in the AUDIO (300~3000 Hz) range.
If the jumper setting is "HI-speed Data" (JP2005 jumpered), this port is usable for 9600 bps DATA communications, because the filter and limiter are not engaged in the Audio line.

Pin 14: DC OUT [13.4 V/5 V DC Output]

- ❍ Switched 13.8V output for supplying power to an accessory (jumper JP2008).
- ❍ Switched and regulated DC 5.0V output for supplying power to an accessory (jumper JP2007).
  Maximum output current is 200 mA

Pin 15: IGN [Ignition Sense feature]

Connecting this line to the ignition sense line of the vehicle will automatically turn the radio on when the vehicle's ignition key is turned on.

Pin 16: NC [NO connection]

Pin 17: RX DO [Digital Output for DATA Communications]

- ❍ RX Hi-speed Data Output Type (jumper JP2003). output level 600 mV/10k Ohms
- ❍ RX Low-speed Data Output Type (jumper JP2004). output level 200 mV/600 Ohms

If the Jumper setting is "Low-speed Data" (JP2004 jumpered), this port is usable in the AUDIO (300~3000 Hz) range.
If the jumper setting is "HI-speed Data" (JP2003 jumpered), this port is usable for 9600 bps DATA communications, because the filter and limiter are not engaged in the Audio line.

Pin 18: E [GND]

Ground for all logic levels and power supply return.

Pins 19, 20, 21, & 22: DSUB 19, DSUB 20, DSUB 21 and DSUB 22

[Universal Output Port]

LOGIC level (+5V / 0V) output.
The logic output appears at these pins when the front panel's PF key is turned on.
The possible programming features (use CE49) are illustrated below.
If the HA feature is assigned to these ports, a current amplifier must be connected between the Horn circuit and the port.

None/A PORT/B PORT/C PORT/D PORT/E PORT/HA PORT

Pin 23: EXT SQL [Squelch Signal Output]

Open collector output. Max. sink current 10 mA.
A Signal is present (Squelch is open): Level High
No Signal is present (Squelch is closed): Open
When you connect the solder jumper on J2002, this port changes to PULL UP (5 V) output.
This status can be changed by CE49 programmer.

Pin 24: SP MUTE [Speaker Mute Output]

Open collector output.
External Speaker mute on: Level High
External Speaker mute off: Open

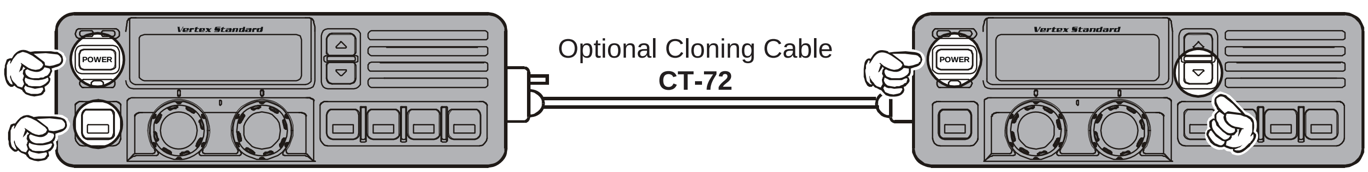
Pin 25: E [GND]

Chassis ground.

The **VX-6000** includes a convenient "Clone" feature, which allows the programming data from one transceiver to be transferred to another **VX-6000**. Here is the procedure for Cloning one radio's data to another.

Note: When a cloning isn't made, you correct the following part using "CE49."
When a "Radio to Radio Clone" which is in the "Miscellaneous" menu is "Disabled," change this menu to "Enabled."

1. Turn both transceivers off.
2. Remove the plastic cap and its two mounting screws from the **MIC/SP** jack on the transceiver. Do this for both transceivers.
3. Connect the optional **CT-72** cloning cable between the **MIC/SP** jacks of the two transceivers.
4. On the ***Destination*** transceiver, press and hold the **PF Button** (just below the **POWER Button**) while turning the transceiver on.
5. Now, on the ***Source*** transceiver, press and hold the ▼ **Button** while turning the transceiver on.Data will now be transferred to the ***Destination*** transceiver from the ***Source*** transceiver.
6. If there is a problem during the cloning process, sound an error beep from source the transceiver. Check your cable connections and battery voltage, and try again.
7. If cloning is a successful, turn the ***Destination*** transceiver off. Now turn the ***Source*** transceiver off.
8. Disconnect the **CT-72**. Replace the plastic cap and its two mounting screws.
9. You can then turn the transceivers back on, and begin normal operation.



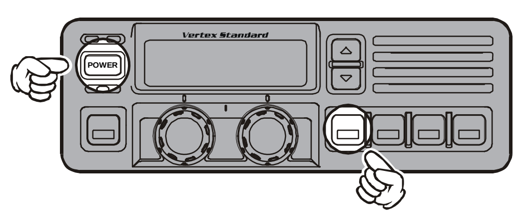
Destination ***Source***

Dealer Programming of VTP-50 and F5D-14

These procedures are designed to be used by the installing technician after the **VTP-50** and **F5D-14** has been installed in the transceiver. To program a **VX-6000**'s **VTP-50** and **F5D-14** board, you will need the **CT-71** programming interface cable, the **CE26** Programming diskette, and an IBM PC/AT or PS/2-compatible type computer.

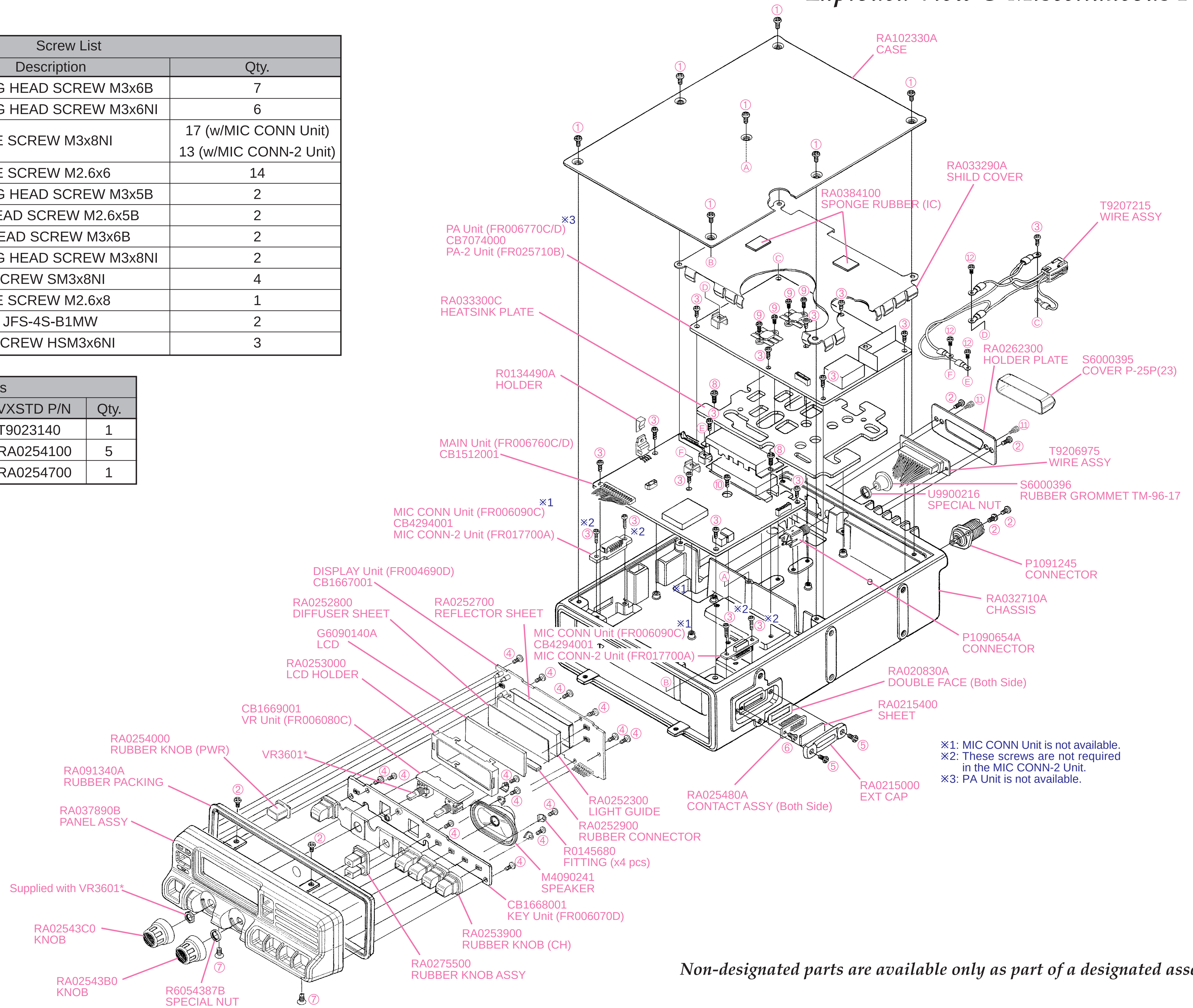
To enter the Programming mode, use the following procedure:

1. Turn the transceiver off.
2. Turn on the transceiver while holding in the **PF Button** (just below the ▼ **Button**).



Screw List			
REF.	VXSTD P/N	Description	Qty.
①	U20306007	BINDING HEAD SCREW M3x6B	7
②	U20306002	BINDING HEAD SCREW M3x6NI	6
③	U24308002	TAPTITE SCREW M3x8NI	17 (w/MIC CONN Unit) 13 (w/MIC CONN-2 Unit)
④	U23206001	TAPTITE SCREW M2.6x6	14
⑤	U20305007	BINDING HEAD SCREW M3x5B	2
⑥	U32450007	FLAT HEAD SCREW M2.6x5B	2
⑦	U31306007	OVAL HEAD SCREW M3x6B	2
⑧	U20308002	BINDING HEAD SCREW M3x8NI	2
⑨	U02308002	SEMS SCREW SM3x8NI	4
⑩	U24208001	TAPTITE SCREW M2.6x8	1
⑪	S5000182	SCREW JFS-4S-B1MW	2
⑫	U04306002	SEMS SCREW HSM3x6NI	3

Accessories		
Description	VXSTD P/N	Qty.
DC CABLE 04P 40AX2	T9023140	1
KNOB CAP	RA0254100	5
NAME PLATE	RA0254700	1

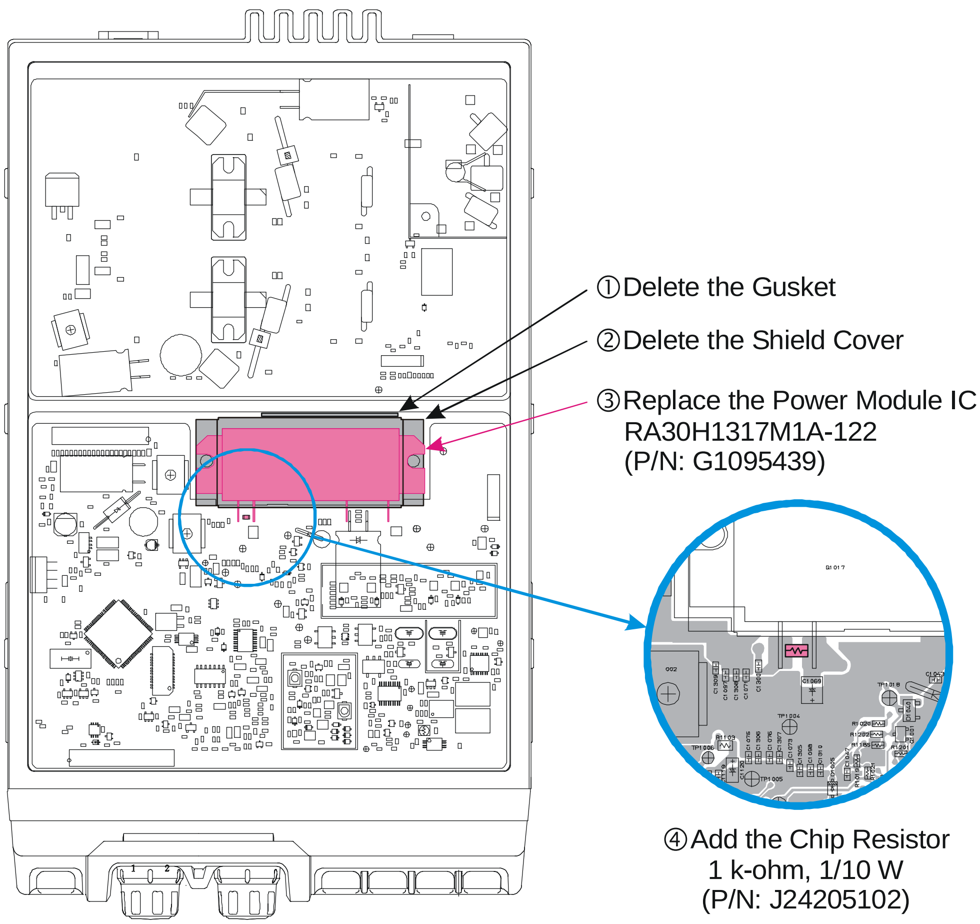


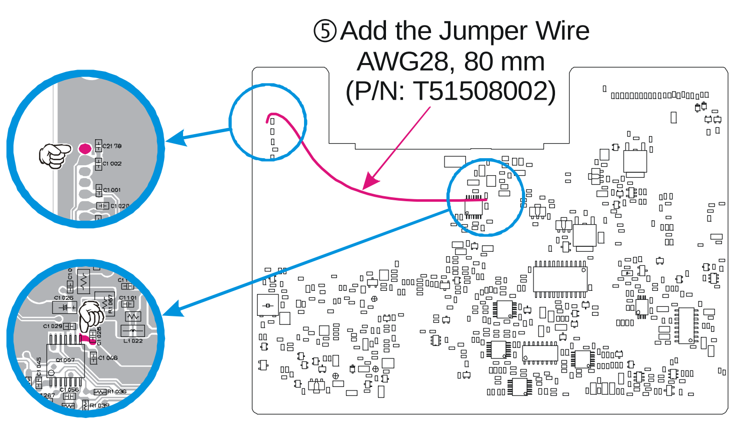
Non-designated parts are available only as part of a designated assembly.

The PA Unit have been discontinued. Therefore, the PA Unit is not possible to order as the repair parts, and replaced with the PA-2 Unit.

When replacing the PA Unit to PA-2 Unit, you must be modified the MAIN Unit as following.

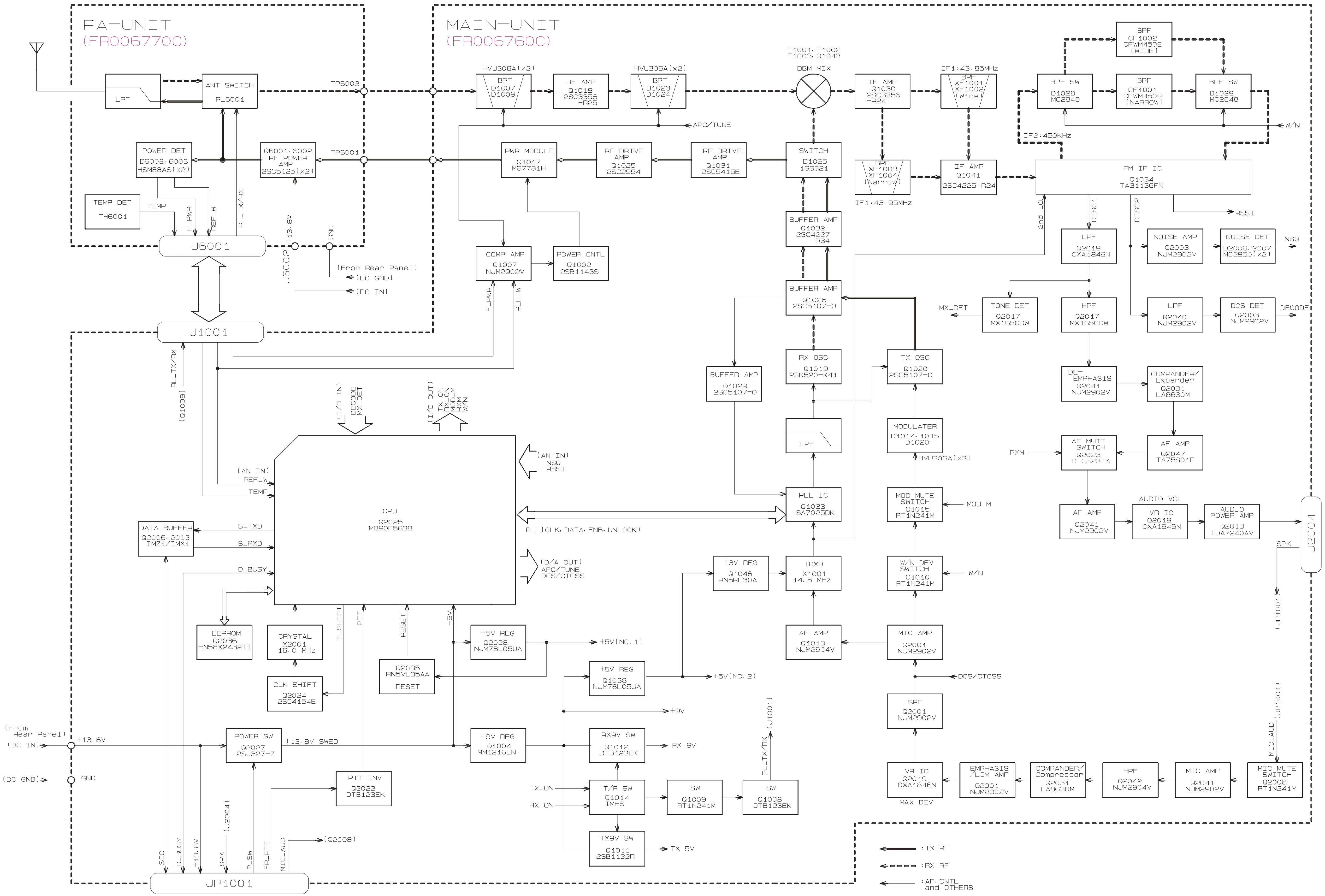
① Delete the Gusket (RA0530900). This part is no longer needed.
② Delete the Shield Cover (RA0124501). This part is no longer needed.
③ Replace the Power Module IC (G1094314 → G1095439: RA30H1317M1A-122).
④ Add the Chip Resistor (J24205102) between Pin 1 and Pin 2 of Q1017 (Power Module IC).
⑤ Add the Jumper wire (T51508002) between the Pin 8 of J1001 and Pin 8 of Q1007.

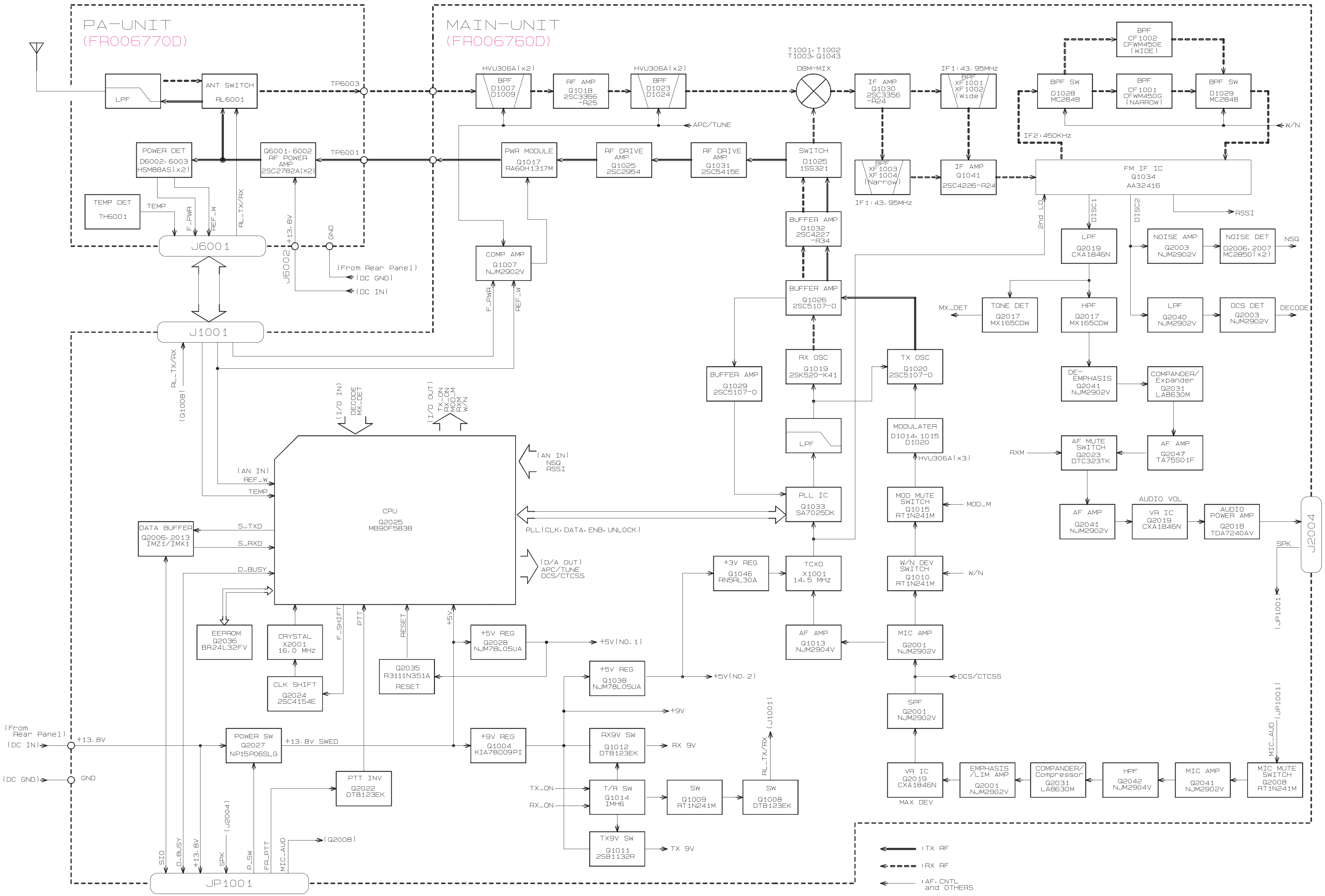


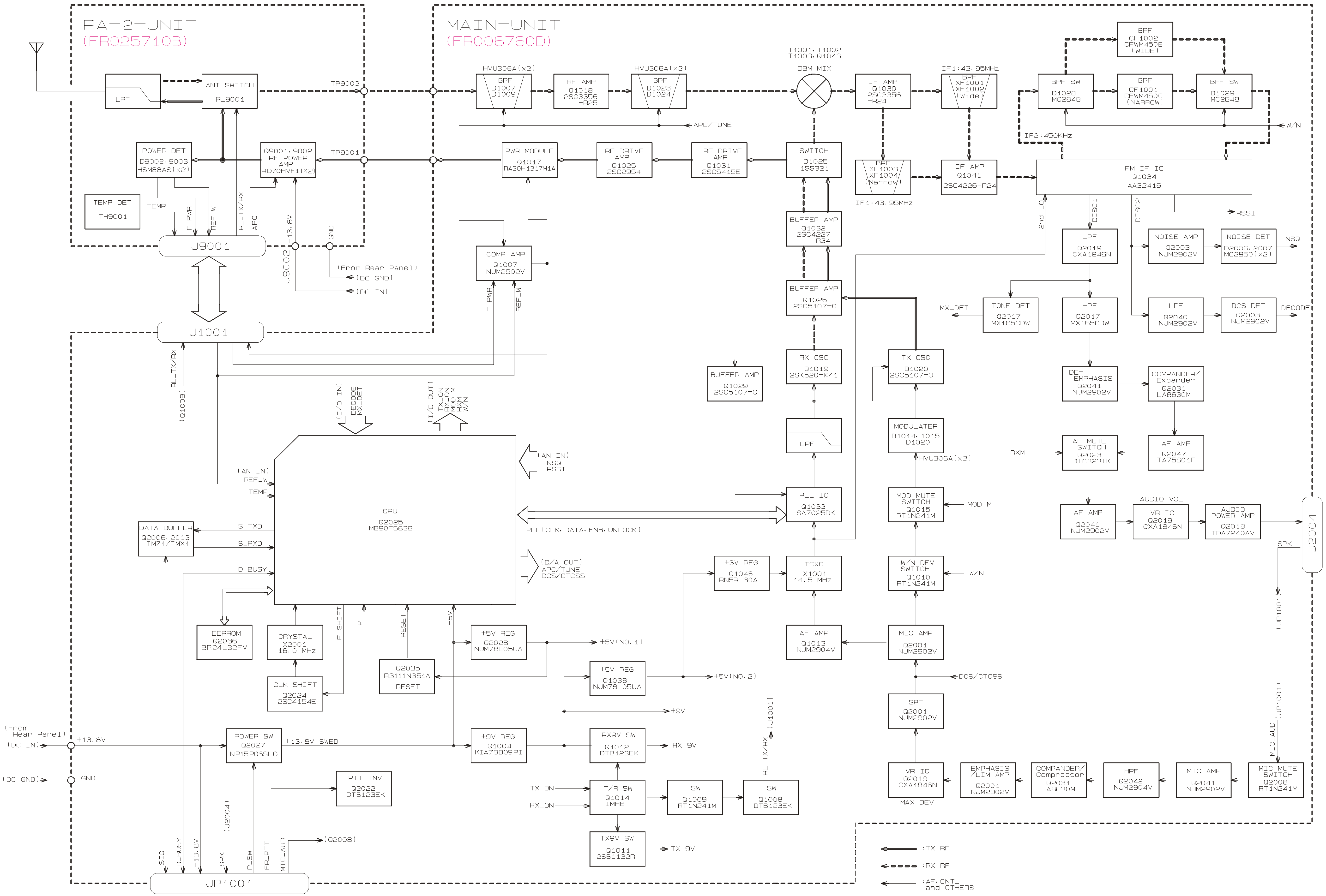


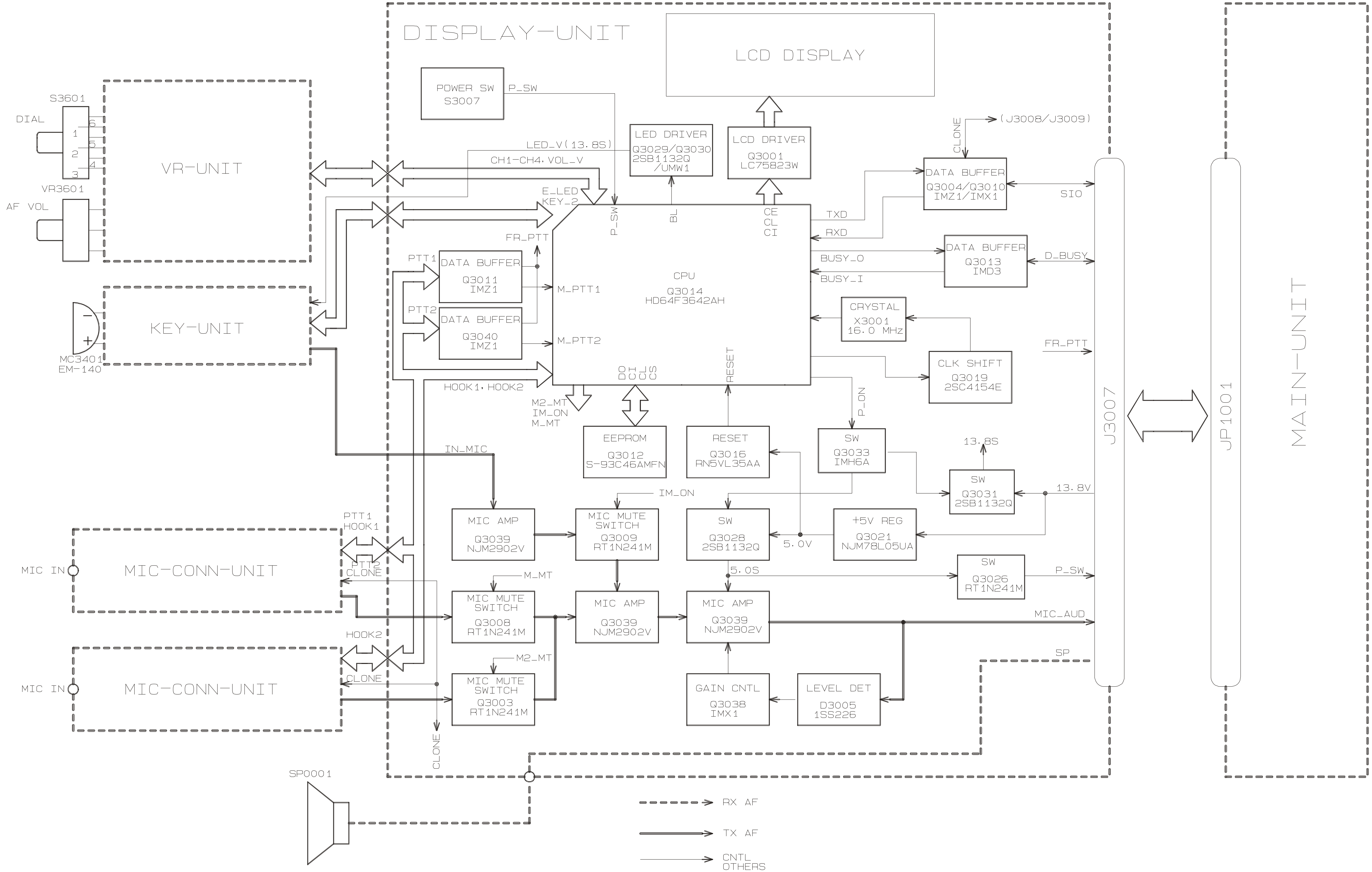
REF.	DESCRIPTION	VALUE	V/W	TOL.	MFR'S DESIG	VXSTD P/N	VERS.	LOT.	SIDE	LAY ADR
Printed Circuit Board with Components										
	MAIN Unit					CB1512001				
	DISPLAY Unit					CB1667001				
	KEY Unit					CB1668001				
	VR Unit					CB1669001				
	MIC CONN-2 Unit					CB4294001				
	PA-2 Unit					CB7074000				
Mechanical Parts										
	PANEL ASSY					RA037890B				
	CHASSIS					RA032710A				
	CASE					RA102330A				
	RUBBER PACKING					RA091340A				
	VOL KNOB					RA02543C0				
	CHANNEL KNOB					RA02543B0				
	RUBBER KNOB				(PWR)	RA0254000				
	RUBBER KNOB				(CH)	RA0253900				
	RUBBER KNOB ASSY					RA0275500				
	SPECIAL NUT				(CH)	R6054387B				
	LCD HOLDER					RA0253000				
	LIGHT GUIDE					RA0252300				
	REFLECTOR SHEET					RA0252700				
	RUBBER CONNECTOR					RA0252900				
	DIFFUSER SHEET					RA0252800				
	SEMS SCREW	3 pcs			HSM3x6NI	U04306002				
	BINDING HEAD SCREW	2 pcs			M3x5B	U20305007				
	BINDING HEAD SCREW	6 pcs			M3x6NI	U20306002				
	BINDING HEAD SCREW	7 pcs			M3x6B	U20306007				
	SEMS SCREW	4 pcs			SM3x8NI	U02308002				
	BINDING HEAD SCREW	2 pcs			SM3x8NI	U20308002				
	TAPTITE SCREW	14 pcs			M2.6x6	U23206001				
	TAPTITE SCREW	1 pc			M2.6x8	U24208001				
	TAPTITE SCREW	17 or 13 pcs			M3x8NI	U24308002				
	OVAL HEAD SCREW	2 pcs			M3x6B	U31306007				
	FLAT HEAD SCREW	2 pcs			M2.6x5B	U32450007				
	SCREW	2 pcs			JFS-4S-B1WM	S5000182				
Electrical Parts										
	SPEAKER	1.5 W/8 Ω			A-S0005030-002	M4090241				
	CONNECTOR				MR-S	P1091245				
MAIN Unit Electrical Parts										
CD1001	CERAMIC DISC				CDBCB450KCAY24-R0	H7901340		1-	B	a4
CF1001	CERAMIC FILTER				CFWLB450KGFA-B0	H3900435		1-	A	G5
CF1002	CERAMIC FILTER				CFWLB450KE2A-B0	H3900466		1-	A	G5
CO2001	CERAMIC OSC	1MHz			CSBFB1M00J2B021-R1	H7900950		1-	A	B3
F 2001	CHIP FUSE	0.25A			KAB2402-251NA31010	Q0000085		1-	A	B1
Q 1017	IC				RA60H1317M-124	G1094314	For PA Unit	1-	A	E1
Q 1017	IC				RA30H1317M1A-122	G1095439	For PA-2 Unit	1-	A	E1
Q 2018	TRANSISTOR				A7240L-TB7-T	G1095431		1-	A	A3
TC1001	TRIMMER CAP.	10pF			TZB4Z100AA10R00	K91000285		1-	A	E5
TC1002	TRIMMER CAP.	20pF			TZB4R200AA10R00	K91000217		1-	A	D4
TH1001	THERMISTOR				TBPS1R103K440H5Q	G9090067		1-	A	G4
TH1002	THERMISTOR				TBPS1R103K440H5Q	G9090067		1-	A	G4
VR1001	POT.				EVM3YSX50BC5	J51833154		1-	A	F5
X 1001	XTAL OSC	14.5MHz			TTS12V 14.5MHZ	H9500630		1-	A	F5
X 2001	XTAL 92SMX(CN)	16MHz			16.000MHZ	H0103322		1-	A	A4
XF1001	XTAL FILTER	43.95MHz			UM-5-3P 43Y12B5F	H1102425		1-	A	F4
XF1002	XTAL FILTER	43.95MHz			UM-5-3P 43Y12B5F	H1102425		1-	A	F4
XF1003	XTAL FILTER	43.95MHz			43Y07B5 UM-5-3P	H1102486		1-	A	F4
XF1004	XTAL FILTER	43.95MHz			43Y07B5 UM-5-3P	H1102486		1-	A	F4

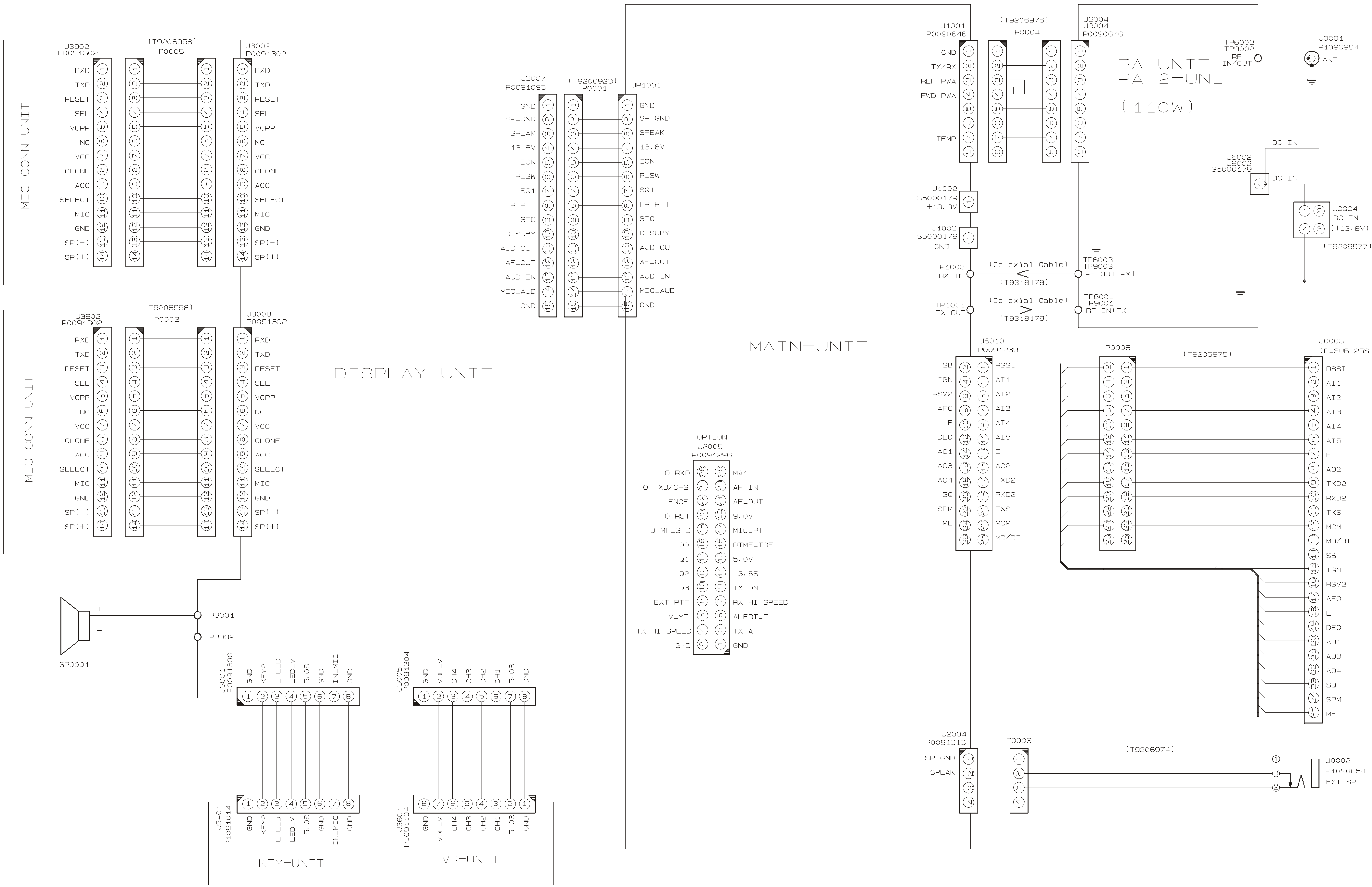
REF.	DESCRIPTION	VALUE	V/W	TOL.	MFR'S DESIG	VXSTD P/N	VERS.	LOT.	SIDE	LAY ADR
					DISPLAY Unit Electrical Parts					
DS3002	LCD				M762-1	G6090140A		1-	A	D1
S 3007	TACT SWITCH				SKQDAB	N5090058		1-	A	A1
S 3008	TACT SWITCH				SKQDAB	N5090058		1-	A	F1
S 3009	TACT SWITCH				SKQDAB	N5090058		1-	A	F1
X 3001	XTAL 92SMX(CN)	16MHz			16.000MHZ	H0103322		1-	B	a3
					KEY Unit Electrical Parts					
MC3401	MIC. ELEMENT				EM240T	M3290066		1-	A	
S 3401	TACT SWITCH				SKQDAB	N5090058		1-	A	
S 3402	TACT SWITCH				SKQDAB	N5090058		1-	A	
S 3403	TACT SWITCH				SKQDAB	N5090058		1-	A	
S 3404	TACT SWITCH				SKQDAB	N5090058		1-	A	
S 3405	TACT SWITCH				SKQDAB	N5090058		1-	A	
					VR Unit Electrical Parts					
S 3601	ROTARY SWITCH				SRZW0L010K	N0190177		1-	A	
VR3601	POT.				RK09L1120 L=15 10KC	J60800258		1-	A	
					PA-2 Unit Electrical Parts					
Q 9001	FET				RD70HVF1-101	G3090140		201-	A	C2
Q 9002	FET				RD70HVF1-101	G3090140		201-	A	C3
RL9001	RELAY		DC9V		G6Z-1PE-A DC9V	M1190220		201-	A	E3
TH9001	THERMISTOR				NTCG164LH104JT1	G9090192		201-	A	C3
TH9002	THERMISTOR				NTCG164BH102JT1	G9090188		201-	A	D4




PA-UNIT
(FR006770D)
MAIN-UNIT
(FR006760D)
LPF
ANT SWITCH
RL6001
TP6003
TP6001
POWER DET
D6002, 6003
HSM88AS(x2)
Q6001, 6002
RF POWER
AMP
2SC2782A(x2)
TEMP DET
TH6001
J6001
J6002
J1001
HVU306A(x2)
BPF
D1007
D1009
RF AMP
Q1018
2SC3356
-R25
BPF
D1023
D1024
APC/TUNE
T1001, T1002
T1003, Q1043
DBM-MIX
IF AMP
Q1030
2SC3356
-R24
IF1:43.95MHz
BPF
XF1001
XF1002
(Wide)
XF1003
XF1004
(Narrow)
IF AMP
Q1041
2SC4226-R24
BPF SW
D1028
MC2848
BPF
CF1002
CFWM450E
(WIDE)
CF1001
CFWM450G
(NARROW)
BPF SW
D1029
MC2848
W/N
IF2:450KHz
FM IF IC
Q1034
AA32416
RSSI
PWR MODULE
Q1017
RA60H1317M
RF DRIVE
AMP
Q1025
2SC2954
RF DRIVE
AMP
Q1031
2SC5415E
SWITCH
D1025
1SS321
BUFFER AMP
Q1032
2SC4227
-R34
BUFFER AMP
Q1026
2SC5107-O
COMP AMP
Q1007
NJM2902V
(From Rear Panel)
(DC GND)
(DC IN)
LPF
Q2019
CXA1846N
NOISE AMP
Q2003
NJM2902V
NOISE DET
D2006, 2007
MC2850(x2)
NSQ
TONE DET
Q2017
MX165CDW
HPF
Q2017
MX165CDW
LPF
Q2040
NJM2902V
DCS DET
Q2003
NJM2902V
DECODE
MX_DET
RX OSC
Q1019
2SK520-K41
TX OSC
Q1020
2SC5107-O
BUFFER AMP
Q1029
2SC5107-O
DE-EMPHASIS
Q2041
NJM2902V
COMPANDER/
Expander
Q2031
LA8630M
MODULATER
D1014, 1015
D1020
HVU306A(x3)
AF MUTE
SWITCH
Q2023
DTC323TK
AF AMP
Q2047
TA7501F
RXM
PLL IC
Q1033
SA7025DK
MOD MUTE
SWITCH
Q1015
RT1N241M
MOD_M
AF AMP
Q2041
NJM2902V
AUDIO VOL
VR IC
Q2019
CXA1846N
AUDIO
POWER AMP
Q2018
TDA7240AV
J2004
SPK
CPU
Q2025
MB90F583B
(I/O IN)
DECODE
MX_DET
(I/O OUT)
TX_ON
RX_ON
RXM
W/N
(AN IN)
NSQ
RSSI
(AN IN)
REF_W
TEMP
S_TXD
S_RXD
D_BUSY
PLL(CLK, DATA, ENB, UNLOCK)
(D/A OUT)
APC/TUNE
DCS/CTCSS
DATA BUFFER
Q2006, 2013
IMZ1/IMX1
+3V REG
Q1046
RN5RL30A
TCXO
X1001
14.5 MHz
W/N DEV
SWITCH
Q1010
RT1N241M
EEPROM
Q2036
BR24L32FV
CRYSTAL
X2001
16.0 MHz
F_SHIFT
PTT
RESET
+5V
+5V REG
Q2028
NJM78L05UA
+5V(NO.1)
Q2035
R3111N351A
RESET
+5V REG
Q1038
NJM78L05UA
+5V(NO.2)
CLK SHIFT
Q2024
2SC4154E
AF AMP
Q1013
NJM2904V
MIC AMP
Q2001
NJM2902V
DCS/CTCSS
SPF
Q2001
NJM2902V
+9V
(From
Rear Panel)
(DC IN)
+13.8V
(DC GND)
GND
POWER SW
Q2027
NP15P06SLG
+13.8V SWED
+9V REG
Q1004
KIA78009PI
RX9V SW
Q1012
DTB123EK
RX 9V
PTT INV
Q2022
DTB123EK
TX_ON
RX_ON
T/R SW
Q1014
IMH6
SW
Q1009
RT1N241M
SW
Q1008
DTB123EK
RL_TX/RX
(J1001)
TX9V SW
Q1011
2SB1132R
TX 9V
VR IC
Q2019
CXA1846N
MAX DEV
EMPHASIS
/LIM AMP
Q2001
NJM2902V
COMPANDER/
Compressor
Q2031
LA8630M
HPF
Q2042
NJM2904V
MIC AMP
Q2041
NJM2902V
MIC MUTE
SWITCH
Q2008
RT1N241M
MIC_AUD
(JP1001)
JP1001
SIO
D_BUSY
+13.8V
SPK
P_SW
FR_PTT
MIC_AUD
(J2004)
(Q2008)
(Q1008)
:TX RF
:RX RF
:AF, CNTL
and OTHERS


PA-2-UNIT
(FR025710B)
MAIN-UNIT
(FR006760D)
LPF
ANT SWITCH RL9001
TP9003
POWER DET D9002, 9003 HSM88AS(x2)
Q9001, 9002 RF POWER AMP RD70HVF1(X2)
TP9001
TEMP DET TH9001
TEMP
F_PWR
REF_W
RL_TX/RX
APC
+13.8V
GND
J9001
J9002
(From Rear Panel)
(DC GND)
(DC IN)
J1001
RL_TX/RX
(Q1008)
HVU306A(x2)
BPF D1007 D1009
RF AMP Q1018 2SC3356 -R25
BPF D1023 D1024
APC/TUNE
T1001, T1002 T1003, Q1043
DBM-MIX
IF AMP Q1030 2SC3356 -R24
IF1:43.95MHz
BPF XF1001 XF1002 (Wide)
BPF XF1003 XF1004 (Narrow)
IF1:43.95MHz
IF AMP Q1041 2SC4226-R24
BPF CF1002 CFWM450E (WIDE)
BPF SW D1028 MC2848
BPF CF1001 CFWM450G (NARROW)
BPF SW D1029 MC2848
W/N
IF2:450KHz
FM IF IC Q1034 AA32416
RSSI
2nd LO
DISC1
DISC2
PWR MODULE Q1017 RA30H1317M1A
RF DRIVE AMP Q1025 2SC2954
RF DRIVE AMP Q1031 2SC5415E
SWITCH D1025 1SS321
BUFFER AMP Q1032 2SC4227 -R34
BUFFER AMP Q1026 2SC5107-O
COMP AMP Q1007 NJM2902V
F_PWR
REF_W
LPF Q2019 CXA1846N
NOISE AMP Q2003 NJM2902V
NOISE DET D2006, 2007 MC2850(x2)
NSQ
MX_DET
TONE DET Q2017 MX165CDW
HPF Q2017 MX165CDW
LPF Q2040 NJM2902V
DCS DET Q2003 NJM2902V
DECODE
RX OSC Q1019 2SK520-K41
TX OSC Q1020 2SC5107-O
BUFFER AMP Q1029 2SC5107-O
DE-EMPHASIS Q2041 NJM2902V
COMPANDER/ Expander Q2031 LA8630M
LPF
MODULATER D1014, 1015 D1020
HVU306A(x3)
RXM
AF MUTE SWITCH Q2023 DTC323TK
AF AMP Q2047 TA75S01F
(I/O IN) DECODE MX-DET
(I/O OUT) TX_ON RX_ON MOD_M W/N
(AN IN) NSQ RSSI
(AN IN) REF_W
TEMP
CPU Q2025 M38F5838
PLL IC Q1033 SA7025DK
MOD MUTE SWITCH Q1015 RT1N241M
MOD_M
AF AMP Q2041 NJM2902V
AUDIO VOL
VR IC Q2019 CXA1846N
AUDIO POWER AMP Q2018 TDA7240AV
J2004
SPK
PLL(CLK, DATA, ENB, UNLOCK)
DATA BUFFER Q2006, 2013 IMZ1/IMX1
S_TXD
S_RXD
D_BUSY
(D/A OUT) APC/TUNE DCS/CTCSS
+3V REG Q1046 RN5RL30A
TCXO X1001 14.5 MHz
W/N DEV SWITCH Q1010 RT1N241M
W/N
(JP1001)
EEPROM Q2036 BR24L32FV
CRYSTAL X2001 16.0 MHz
F_SHIFT
PTT
RESET
+5V
+5V REG Q2028 NJM78L05UA
+5V(NO.1)
AF AMP Q1013 NJM2904V
MIC AMP Q2001 NJM2902V
CLK SHIFT Q2024 2SC4154E
Q2035 R3111N351A RESET
+5V REG Q1038 NJM78L05UA
+5V(NO.2)
DCS/CTCSS
SPF Q2001 NJM2902V
+9V
(From Rear Panel)
(DC IN)
+13.8V
POWER SW Q2027 NP15P06SLG
+13.8V SWED
+9V REG Q1004 KIA78009PI
RX9V SW Q1012 DTB123EK
RX 9V
RL_TX/RX
(J1001)
MIC_AUD
(JP1001)
(DC GND)
GND
PTT INV Q2022 DTB123EK
TX_ON
RX_ON
T/R SW Q1014 IMH6
SW Q1009 RT1N241M
SW Q1008 DTB123EK
VR IC Q2019 CXA1846N
MAX DEV
EMPHASIS /LIM AMP Q2001 NJM2902V
COMPANDER/ Compressor Q2031 LA8630M
HPF Q2042 NJM2904V
MIC AMP Q2041 NJM2902V
MIC MUTE SWITCH Q2008 RT1N241M
(J2004)
TX9V SW Q1011 2SB1132R
TX 9V
(Q2008)
SIO
D_BUSY
+13.8V
SPK
P_SW
FR_PTT
MIC_AUD
JP1001
:TX RF
:RX RF
:AF, CNTL and OTHERS


DISPLAY-UNIT
LCD DISPLAY
POWER SW
S3007
P_SW
LED DRIVER
Q3029/Q3030
2SB1132Q
/UMW1
LCD DRIVER
Q3001
LC75823W
CLONE
(J3008/J3009)
DATA BUFFER
Q3004/Q3010
IMZ1/IMX1
SIO
S3601
DIAL
VR-UNIT
VR3601
AF VOL
LED_V(13.8S)
CH1-CH4, VOL_V
E_LED
KEY_2
P_SW
BL
CE
CL
CI
TXD
RXD
FR_PTT
PTT1
DATA BUFFER
Q3011
IMZ1
M_PTT1
CPU
Q3014
HD64F3642AH
BUSY_O
BUSY_I
DATA BUFFER
Q3013
IMD3
D_BUSY
PTT2
DATA BUFFER
Q3040
IMZ1
M_PTT2
CRYSTAL
X3001
16.0 MHz
KEY-UNIT
MC3401
EM-140
CLK SHIFT
Q3019
2SC4154E
FR_PTT
HOOK1, HOOK2
DO
DI
CS
SK
RESET
P_ON
M2_MT
IM_ON
M_MT
J3007
JP1001
MAIN-UNIT
EEPROM
Q3012
S-93C46AMFN
RESET
Q3016
RN5VL35AA
SW
Q3033
IMH6A
13.8S
SW
Q3031
2SB1132Q
13.8V
IN_MIC
IM_ON
MIC AMP
Q3039
NJM2902V
MIC MUTE
SWITCH
Q3009
RT1N241M
SW
Q3028
2SB1132Q
5.0V
+5V REG
Q3021
NJM78L05UA
PTT1
HOOK1
PTT2
CLONE
MIC IN
MIC-CONN-UNIT
M_MT
5.0S
SW
Q3026
RT1N241M
P_SW
MIC MUTE
SWITCH
Q3008
RT1N241M
MIC AMP
Q3039
NJM2902V
MIC AMP
Q3039
NJM2902V
MIC_AUD
HOOK2
SP
M2_MT
CLONE
MIC IN
MIC-CONN-UNIT
MIC MUTE
SWITCH
Q3003
RT1N241M
GAIN CNTL
Q3038
IMX1
LEVEL DET
D3005
1SS226
CLONE
SP0001
RX AF
TX AF
CNTL
OTHERS


MIC-CONN-UNIT
J3902
P0091302
RXD
TXD
RESET
SEL
VCPP
NC
VCC
CLONE
ACC
SELECT
MIC
GND
SP(-)
SP(+)
(T9206958)
P0005
P0002
J3009
P0091302
J3008
DISPLAY-UNIT
J3007
P0091093
(T9206923)
P0001
JP1001
GND
SP_GND
SPEAK
13.8V
IGN
P_SW
SQ1
FR_PTT
SIO
D_SUBY
AUD_OUT
AF_OUT
AUD_IN
MIC_AUD
MAIN-UNIT
J1001
P0090646
TX/RX
REF PWA
FWD PWA
TEMP
(T9206976)
P0004
J6004
J9004
P0090646
PA-UNIT
PA-2-UNIT
(110W)
TP6002
TP9002
RF
IN/OUT
J0001
P1090984
ANT
DC IN
J6002
J9002
S5000179
J1002
S5000179
+13.8V
J1003
S5000179
J0004
DC IN
(+13.8V)
(T9206977)
TP1003
RX IN
(Co-axial Cable)
(T9318178)
TP6003
TP9003
RF OUT(RX)
TP1001
TX OUT
(T9318179)
TP6001
TP9001
RF IN(TX)
J6010
P0091239
P0006
(T9206975)
J0003
(D_SUB 25S)
SB
IGN
RSV2
AFO
E
DEO
AO1
AO3
AO4
SQ
SPM
ME
RSSI
AI1
AI2
AI3
AI4
AI5
AO2
TXD2
RXD2
TXS
MCM
MD/DI
OPTION
J2005
P0091296
O_RXD
O_TXD/CHS
ENCE
O_RST
DTMF_STD
Q0
Q1
Q2
Q3
EXT_PTT
V_MT
TX_HI_SPEED
MA1
AF_IN
9.0V
MIC_PTT
DTMF_TOE
5.0V
13.8S
TX_ON
RX_HI_SPEED
ALERT_T
TX_AF
SP0001
TP3001
TP3002
J3001
P0091300
KEY2
E_LED
LED_V
5.0S
IN_MIC
J3005
P0091304
VOL_V
CH4
CH3
CH2
CH1
J3401
P1091014
KEY-UNIT
J3601
P1091104
VR-UNIT
J2004
P0091313
P0003
(T9206974)
J0002
P1090654
EXT_SP

Transceiver functions, such as PLL synthesizer settings and channel programming, are controlled via the microprocessor unit (MPU). Reception and transmission are switched by "RX" and "TX" lines, also controlled from the MPU.

Main Receiver Signal Path

The receiver uses double-conversion superheterodyne circuitry, with a 43.95 MHz 1st IF and 450 kHz 2nd IF. The 1st LO, produced by a PLL synthesizer, yields the 43.95 MHz 1st IF. The 2nd LO uses a 43.5 MHz (43.95 MHz - 450 kHz) signal generated by a crystal oscillator. The 2nd mixer and other circuits use a custom IC to convert and amplify the 2nd IF, and detect FM to obtain demodulated signals.

Incoming RF signals from the antenna connector are delivered to the PA Unit or PA-2 Unit.

In the PA Unit, the RF signals pass through a low-pass filter (LPF) network consisting of coils L6009, L6008, and L6007, capacitors C6041, C6047, C6040, C6050, C6039, and C6027, and the antenna switching relay for delivery to the receiver front end in the Main Unit.

In the PA-2 Unit, the RF signals pass through a low-pass filter (LPF) network consisting of coils L9009, L9008, and L9007, capacitors C9041, C6047, C9040, C9050, C9039, and C9027, and the antenna switching relay for delivery to the receiver front end in the Main Unit.

Signals within the frequency range of the transceiver are then passed through a varactor-tuned band-pass filter consisting of L1007 and L1020 before RF amplification by Q1018 (**2SC3356**).

The amplified RF is then band-pass filtered again by varactor-tuned resonators L1009 and L1011 before and then to ensure pure in-band input to 1st mixer consisting of trances T1001, FET Q1043 (**SPM5001**).

Buffered output from the VCO Unit is amplified by Q1032 (**2SC4227**) and low-pass filtered by L1041, L1045 and C1153, C1154 and C1174 to provide a pure 1st local signal between 191.95 and 217.95 MHz for input to the 1st mixer.

The 43.95 MHz first mixer product then passes through second RF amplification by Q1030 (**2SC3356**) and dual monolithic crystal filters XF1001 and XF1002 (7.5 kHz BW) for wide band or XF1003 and XF1004 (3.75 kHz BW) for narrow band, and is amplified by Q1041 (**2SC4226**) and delivered to the input of the FM IF subsystem IC, Q1034 (**TA31136FN**). This IC contains the 2nd mixer, 2nd local oscillator, limiter amplifier, FM detector, noise amplifier, and squelch gate.

The 2nd LO in the IF-IC is produced from TCXO X1001 (14.500 MHz), and the 1st IF is converted to 450 kHz by the 2nd mixer and stripped of unwanted components by ceramic filter CF1001 or CF1002. After passing through a limiter amplifier, the signal is demodulated by the FM detector.

Demodulated receive audio from the IF-IC is amplified by Q1036 (**2SA1602A**), Q2019 (**CXA1846N**). After volume adjustment by the AF power amplifier Q2018 (**TDA7240AV**), the audio signal is passed to the speaker jack or the internal 4-Ohm loudspeaker.

PLL Synthesizer

The 1st LO maintains stability from the PLL synthesizer by using a 14.500 MHz reference signal from TCXO X1001. PLL synthesizer IC Q1033 (**SA7025DK**) consists of a prescaler, reference counter, swallow counter, programmable counter, a serial data input port to set these counters based on the external data, a phase comparator, and charge pump. The PLL-IC divides the 14.500 MHz reference signal by 725 using the reference counter (20.0 kHz comparison frequency). The phase detector comparison frequency is designed to be eight times the channel spacing (2.5 kHz). The VCO output is divided by the prescaler, swallow counter, and programmable counter. These two signals are compared by the phase comparator and sent to the charge pump. A voltage proportional to their phase difference is delivered to the low-pass filter circuit, then fed back to the VCO as a voltage with phase error, controlling and stabilizing the oscillating frequency. This synthesizer also operates as a modulator during transmit.

The RX-VCO is composed of Q1019 (**2SK520**) and D1010, D1011, D1016, D1018 (all **HVU306A**), and oscillates between 191.95 MHz and 217.95 MHz according to the programmed receiving frequency. And the TX-VCO is composed of Q1020 (**2SC5107**) and D1014 and D1015 (both**HVU306A**), and oscillates between 148.0 MHz and 174.0 MHz according to the programmed transmit frequency. The VCO output passes through buffer amplifier Q1026 (**2SC5107**), and a portion is fed to the buffer amplifier Q1029 (**2SC5107**) of the PLL IC, and at the same time amplified by Q1032 (**2SC4227**) to obtain stable output. The VCO DC supply is regulated by Q1006 (**2SC4154E**). Synthesizer output is fed to the 1st mixer by diode switch D1025 (**1SS321**) during receive, and to drive amplifier Q1031 (**2SC5415E**) and Q1025 (**2SC2954**) for transmit. The reference oscillator feeds the PLL synthesizer, and is composed of TCXO X1001 (14.500 MHz).

Transmitter

During transmit, the PLL synthesizer oscillates at the desired frequency directly, for amplification to obtain RF power output. During transmission, voice modulation and CTCSS (or DCS) modulation are applied to this synthesizer.

Voice audio from the microphone is amplified by the microphone amplifier Q3039 (**NJM2902V**) in the DISPLAY Unit, and then deliver to the MAIN Unit.

The amplified audio is supplied to Q2001 (**NJM2902V**) through the amplifier Q2041 (**NJM2902V**). Q2001consists of the pre-emphasis, limiter (IDC instantaneous deviation control), and low-pass filter; the signal is adjusted for optimum deviation level and delivered to the next stage.

Voice inputs from the microphone and CTCSS are FM-modulated at the VCO of the synthesizer, while DCS audio is modulated by the reference frequency oscillator of the synthesizer.

Synthesizer output, after passing through diode switch D1025 (**1SS321**), is amplified by drivers Q1031 (**2SC5415E**) and Q1025 (**2SC2954**) and power module Q1017 (early model: **M67781H**, current model: **RA60H1317M** for PA Unit or **RA30H1317M1A** for PA-2 Unit) to obtain the required RF drive prior to delivery to the PA Unit or PA-2 Unit.

In the PA Unit, the RF signal is amplified by parallel junction transistors Q6001/Q6002 (early model: both **2SC5125**, current model: both **2SC2782A**) and passes through antenna switching relay RL6001 and a low-pass filter circuit, and ultimately to the antenna connector.

RF output power from the final amplifier is sampled by a CM coupler and is rectified by D6002 and D6003 (both **HSM88AS**). The resulting DC is fed through Automatic Power Controller Q1007 (**NJM2902V**), Q1002 (**2SB1143S**: early model only) to control the gain of the transmitter RF amplifier and thus regulate the power output.

Generation of spurious products by the transmitter is minimized by the fundamental carrier frequency being equal to the final transmitting frequency, modulated directly in the transmit VCO. Additional harmonic suppression is provided by a low-pass filter consisting of L6007, L6008, L6009, and C6027, C6039, C6050, C6040, C6047 and C6041, resulting in more than 65 dB of harmonic suppression prior to delivery of the RF energy to the antenna.

In the PA-2 Unit, the RF signal is amplified by parallel junction transistors Q9001/Q9002 (both **RD70HVF1**) and passes through antenna switching relay RL9001 and a low-pass filter circuit, and ultimately to the antenna connector.

RF output power from the final amplifier is sampled by a CM coupler and is rectified by D9002 and D9003 (both **HSM88AS**). The resulting DC is fed through Automatic Power Controller Q1007 (**NJM2902V**) to control the gain of the transmitter RF amplifier and thus regulate the power output.

Generation of spurious products by the transmitter is minimized by the fundamental carrier frequency being equal to the final transmitting frequency, modulated directly in the transmit VCO. Additional harmonic suppression is provided by a low-pass filter consisting of L9007, L9008, L9009, and C9027, C9039, C9050, C9040, C9047 and C9041, resulting in more than 65 dB of harmonic suppression prior to delivery of the RF energy to the antenna.

DCS Demodulator

DCS signals are demodulated on the MAIN-UNIT, and are applied to low-pass filter Q2040 (**NJM2902V**), as well as the limiter comparator Q2040 (**NJM2902V**).

CTCSS Encoder/Decoder

The CTCSS code is generated and encoded by MPU IC Q2025 (**MB90F583B**). Demodulation and detection of the CTCSS tones are carried out by IC Q2017 (**MX165C**).

MPU

Operation is controlled by 16-bit MPU IC Q2025 (**MB90F583B**). The system clock uses a 16.000 MHz crystal for a time base. IC Q2035 (**RN5VL35AA**) resets the MPU when the power is on, and monitors the voltage of the regulated 5V power supply line.

EEPROM

The EEPROM retains Tx and Rx data for all memory channels, as well as CTCSS data, DCS data, prescaler dividing, and REF oscillator data (internal/external).

The VX-6000 has been carefully aligned at the factory for the specified performance across the frequency range specified for each version.

Realignment should therefore not be necessary except in the event of a component failure, or when altering the transceiver version. If a sudden problem occurs during normal operation, it is likely due to component failure; realignment should not be done until after the faulty component has been replaced. All component replacement and service should be performed only by an authorized **VERTEX STANDARD** representative, or the warranty policy may be voided. Therefore, if a fault is suspected, contact the dealer from whom the transceiver was purchased for instructions regarding repair.

Authorized **VERTEX STANDARD** service technicians realign all circuits and make complete performance checks to ensure compliance with factory specifications after replacing any faulty components. Those who do undertake any of the following alignments are cautioned to proceed at their own risk. Problems caused by unauthorized attempts at realignment are not covered by the warranty policy. Also, **VERTEX STANDARD** must reserve the right to change circuits and alignment procedures in the interest of improved performance, without notifying owners.

Under no circumstances should any alignment be attempted unless the normal function and operation of the transceiver are clearly understood, the cause of the malfunction has been clearly pinpointed and any faulty components replaced, and the need for realignment determined to be absolutely necessary.

Required Test Equipment

The following test equipment (and thorough familiarity with its correct use) is necessary for complete realignment. Correction of problems caused by misalignment resulting from use of improper test equipment is not covered under the warranty policy.

While most steps do not require all of the equipment listed, the interactions of some adjustments may require that more complex adjustments be performed afterwards. Do not attempt to perform only a single step unless it is clearly isolated electrically from all other steps. Have all test equipment ready before beginning, and follow all of the steps in a section in the order presented.

- ❒ RF signal generator: calibrated output level at 1000 MHz
- ❒ Deviation Meter (linear detector)
- ❒ AF Millivoltmeter
- ❒ SINAD Meter
- ❒ Inline Wattmeter with 5% accuracy at 1000 MHz
- ❒ Regulated DC Power Supply: adjustable from 10 to 17 VDC, 35A
- ❒ 50-ohm non-reactive Dummy Load: 200 W at 1000 MHz
- ❒ Frequency Counter: <0.1 ppm accuracy at 1000 MHz
- ❒ AF Signal Generator
- ❒ DC Voltmeter: high impedance
- ❒ RF Sampling Coupler (attenuation pad)
- ❒ Oscilloscope
- ❒ Spectrum Analyzer
- ❒ Vertex Standard SVC49 channel programming editor.
- ❒ IBM® PC/Compatible computer with Microsoft® Windows® 2000, XP, Vista or 7.
- ❒ Vertex Standard FIF-12 USB Programming Interface and T9101628 Connection Cable.
- ❒ Vertex Standard FRB-6 Tuning Interface Box and CT-161 Programming Cable.

Alignment Preparation & Precautions

A dummy load and inline wattmeter must be connected to the main antenna jack in all procedures that call for transmission, except where specified otherwise. Correct alignment is not possible with an antenna. After completing one step, read the following step to determine whether the same test equipment will be required. If not, remove the test equipment (except dummy load and wattmeter, if connected) before proceeding.

Correct alignment requires that the ambient temperature be the same as that of the transceiver and test equipment, and that this temperature be held constant between 68° and 86°F (20° ~ 30°C). When the transceiver is brought into the shop from hot or cold air it should be allowed some time for thermal equalization with the environment before alignment. If possible, alignments should be made with oscillator shields and circuit boards firmly affixed in place. Also, the test equipment must be thoroughly warmed up before beginning.

Before beginning, connect the transceiver and PC using the FIF-12 USB Programming Interface and T9101628 Connection Cable, then download the EEPROM data from the transceiver to the computer.

Store this data in a disk file so that it can be saved and retrieved later. Using the table below, program the channel, CTCSS, and DCS alignment settings for your transceiver version. Upload this file to the transceiver.

Note: Signal levels in dB referred to in this procedure are based on 0 dBμ = 0.5 μV (closed circuit).

Alignment Channel Frequencies

Channel	Frequency (simplex)	CTCSS Encode	DCS Encode	Narrow/Wide
CH1	148.01 MHz	None	None	Wide
CH2	161.01 MHz	None	None	Wide
CH3	173.99 MHz	None	None	Wide
CH4	148.01 MHz	None	None	Narrow
CH5	161.01 MHz	None	None	Narrow
CH6	173.99 MHz	None	None	Narrow
CH7	161.01 MHz	151.4 Hz	None	Wide
CH8	161.01 MHz	None	023	Wide
CH9	161.01 MHz	151.4 Hz	None	Narrow
CH10	161.01 MHz	None	023	Narrow

PLL & Transmitter

Set up the test equipment as shown for transmitter alignment.

Maintain the supply voltage at 13.4 V DC for all steps.

PLL VCV

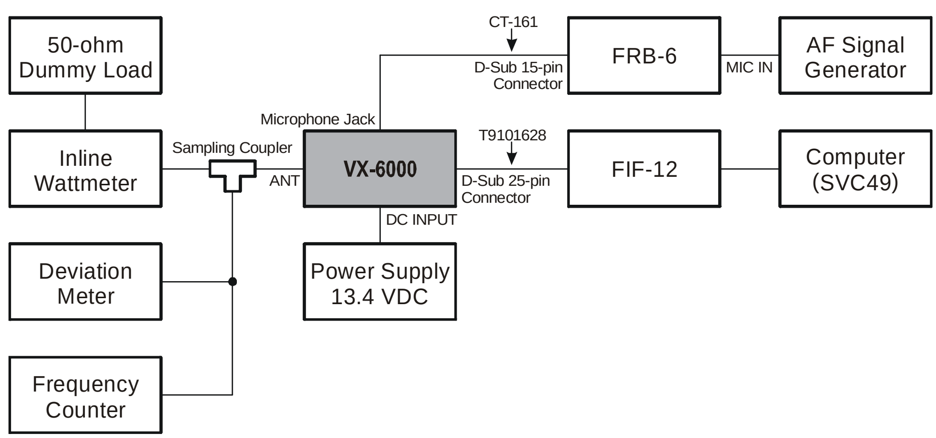
❒ Connect the positive lead of the DC voltmeter to test point **TP1008** (VCV) on the Main Unit, as indicated in the figure, and connect the negative lead to chassis ground.

❒ Set the transceiver to the low band edge frequency channel (CH1 or CH4), then adjust **TC1001** on the Main Unit for 1.6 V ± 0.1 V on the voltmeter.

❒ Key the transmitter, and adjust **TC1002** on the Main Unit for 1.85 V ±0.1 V on the voltmeter.

❒ Next select to the high edge frequency channel (CH3 or CH6) and confirm the VCV is less than 7.0 V on the voltmeter.

❒ Key the transmitter, and confirm the VCV is less than 7.0 V on the voltmeter.



TRANSMITTER ALIGNMENT SETUP

Transmitter Output Power

The following transmitter parameters can be adjusted from the computer by utilizing the Alignment Software. Refer to the onboard help of the Alignment Software Manual for details.

❒ Select the band center frequency channel (CH2 or CH5), and select the "high" power output level. Key the transmitter and adjust "TX PWR Hi" for a power output of 110 Watts (± 3.0 W) as indicated on the wattmeter.

❒ Stay on the band center frequency channel (CH2 or CH5), and select the "low" power output level. Key the transmitter and adjust "TX PWR L3" for a power level of 50 Watts (± 2.0 W) as indicated on the wattmeter.

Transmitter Deviation

The following modulation parameters can be adjusted from the computer by utilizing the Alignment Software. Refer to the onboard help of the Alignment Software Manual for details.

Microphone Audio Modulation Level

❒ Select the band center frequency channel (CH2), and select the "low" power output level.

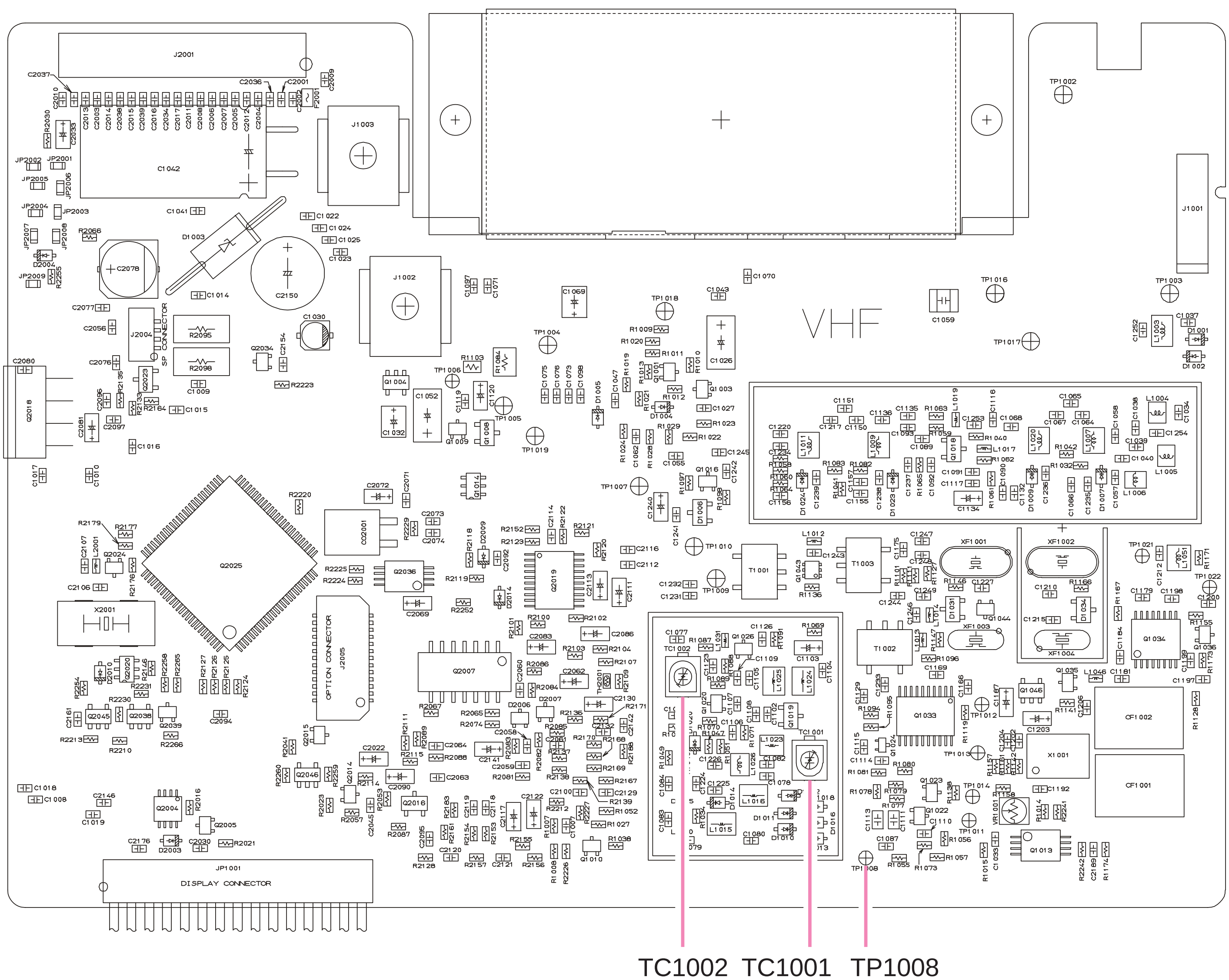
❒ Adjust the AF generator for 50mV (–30dBm) output at 1 kHz, as applied to the microphone jack.

❒ Key the transmitter and adjust "MAX Dev (wide)" for maxi-mum deviation of 4.2 kHz ± 0.2 kHz as indicated on the deviation meter.

❒ Select the band center frequency channel (CH5), and select the "low" power output level.

❒ Adjustdjust the AF generator for 50mV (–30dBm) output at 1 kHz, as applied to the microphone jack.

❒ Key the transmitter and adjust "MAX Dev (Narrow)" for maxi-mum deviation of 2.1 kHz ± 0.1 kHz as indicated on the deviation meter.



CTCSS Modulation Level

- ❒ Select the "low" power output level.
- ❒ Select the band center frequency channel (CH7), with 151.4 Hz CTCSS encode, and reduce the AF generator injection to zero.
- ❒ Key the transmitter and adjust "CTCSS Dev (wide)" for CTCSS deviation of 0.75 kHz ± 0.05 kHz as indicated on the deviation meter.
- ❒ Select the band center frequency channel (CH9), with 151.4 Hz CTCSS encode, and reduce the AF generator injection to zero.
- ❒ Key the transmitter and adjust "CTCSS Dev (Narrow)" for CTCSS deviation of ±0.36 kHz (± 0.05 kHz) as indicated on the deviation meter.

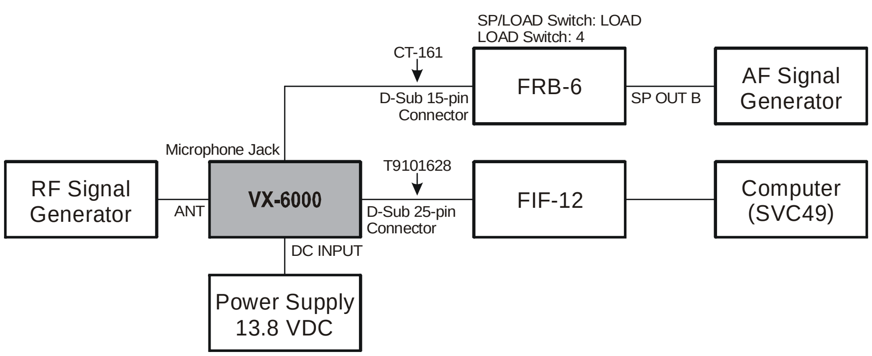
DCS Modulation Level

- ❒ Select the "low" power output level.
- ❒ Select the band center frequency channel (CH8), with 023 DCS code, and reduce the AF generator injection to zero.
- ❒ Key the transmitter and adjust "DCS Dev (wide)" for DCS deviation of ±0.75 kHz (± 0.05 kHz) as indicated on the deviation meter.
- ❒ Select the band center frequency channel (CH10), with 023 DCS code, and reduce the AF generator injection to zero.
- ❒ Key the transmitter and adjust "DCS Dev (Narrow)" for CTCSS deviation of ±0.36 kHz (± 0.05 kHz) as indicated on the deviation meter.

Receiver

The sensitivity parameters can be adjusted from the computer by utilizing the Alignment Software. Refer to the onboard help of the Alignment Software Manual for details.

- ❒ Set up the test equipment as shown for receiver alignment. Maintain the supply voltage at 13.8 V DC for all steps.
- ❒ With the transceiver set to the band center frequency channel (CH2), and with the RF signal generator tuned to the same frequency, set the generator for ±3.0 kHz deviation with 1 kHz tone modulation, and set the output level for –5.0 dBμ at the antenna jack.
- ❒ Adjust "Rx TUNE" the receiver front-end tuning for optimum SINAD, reducing signal generator output level as necessary for proper meter deflection.
- ❒ After the previous step, the final signal generator level should be less than –5.0 dBμ for 12dB SINAD.
- ❒ With the transceiver set to the band center frequency channel (CH5), and with the RF signal generator tuned to the same frequency, set the generator for ±1.5 kHz deviation with 1 kHz tone modulation, and set the output level for –4.0 dBμ at the antenna jack.
- ❒ After the previous step, and confirm the final signal generator level should be less than –4.0 dBμ for 12dB SINAD.



RECEIVER ALIGNMENT SETUP

Squelch Threshold

The squelch parameters can also be adjusted from the computer by utilizing the Alignment Software. Refer to the onboard help of the Alignment Software Manual for details.

Tight SQL RSSI LEVEL (Wide)

❒ Select the band center frequency channel (CH2), and with the RF signal generator turned to the same frequency, set the generator for ±3.0 kHz deviation with 1 kHz tone modulation, and set the output level for 1.0 dBµ at the antenna jack.

Threshold NSQ LEVEL (Wide)

❒ Select the band center frequency channel (CH2), and with the RF signal generator turned to the same frequency, set the generator for ±3.0 kHz deviation with 1 kHz tone modulation, and set the output level for –6.0 dBµ at the antenna jack.

Tight SQL NSQ LEVEL (Wide)

❒ Select the band center frequency channel (CH2), and with the RF signal generator turned to the same frequency, set the generator for ±3.0 kHz deviation with 1 kHz tone modulation, and set the output level for 1.0 dBµ at the antenna jack.

Tight SQL RSSI LEVEL (Narrow)

❒ Select the band center frequency channel (CH5), and with the RF signal generator turned to the same frequency, set the generator for ±1.5 kHz deviation with 1 kHz tone modulation, and set the output level for 1.0 dBµ at the antenna jack.

Threshold NSQ LEVEL (Narrow)

❒ Select the band center frequency channel (CH5), and with the RF signal generator turned to the same frequency, set the generator for ±1.5 kHz deviation with 1 kHz tone modulation, and set the output level for –6.0 dBµ at the antenna jack.

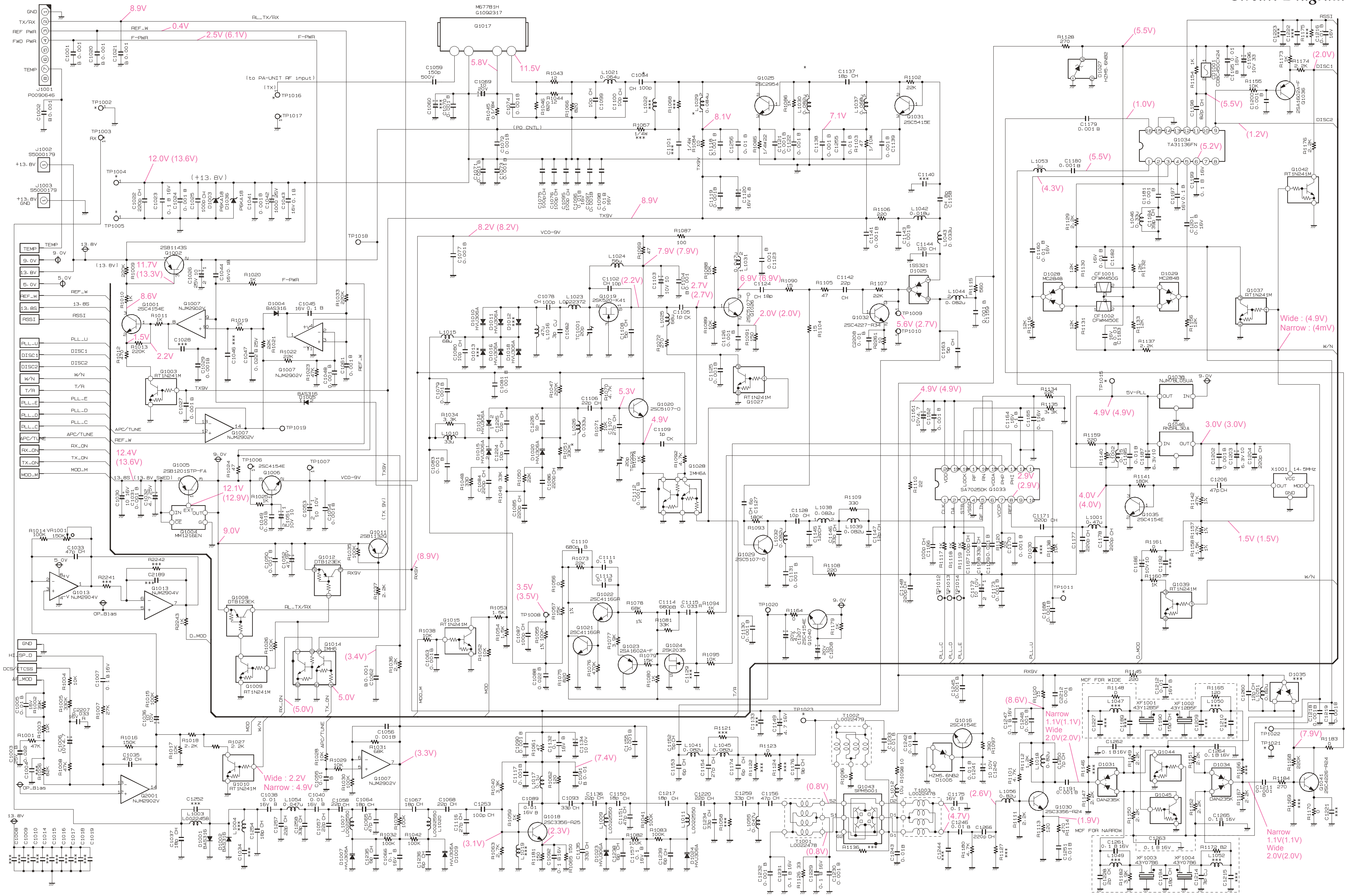
Tight SQL NSQ LEVEL (Narrow)

❒ Select the band center frequency channel (CH5), and with the RF signal generator turned to the same frequency, set the generator for ±1.5 kHz deviation with 1 kHz tone modulation, and set the output level for 1.0 dBµ at the antenna jack.

❒ Adjust the squelch threshold level "Tight SQL NSQ(Narrow)" such that the squelch just open at this signal input level (the BUSY LED will turn on).

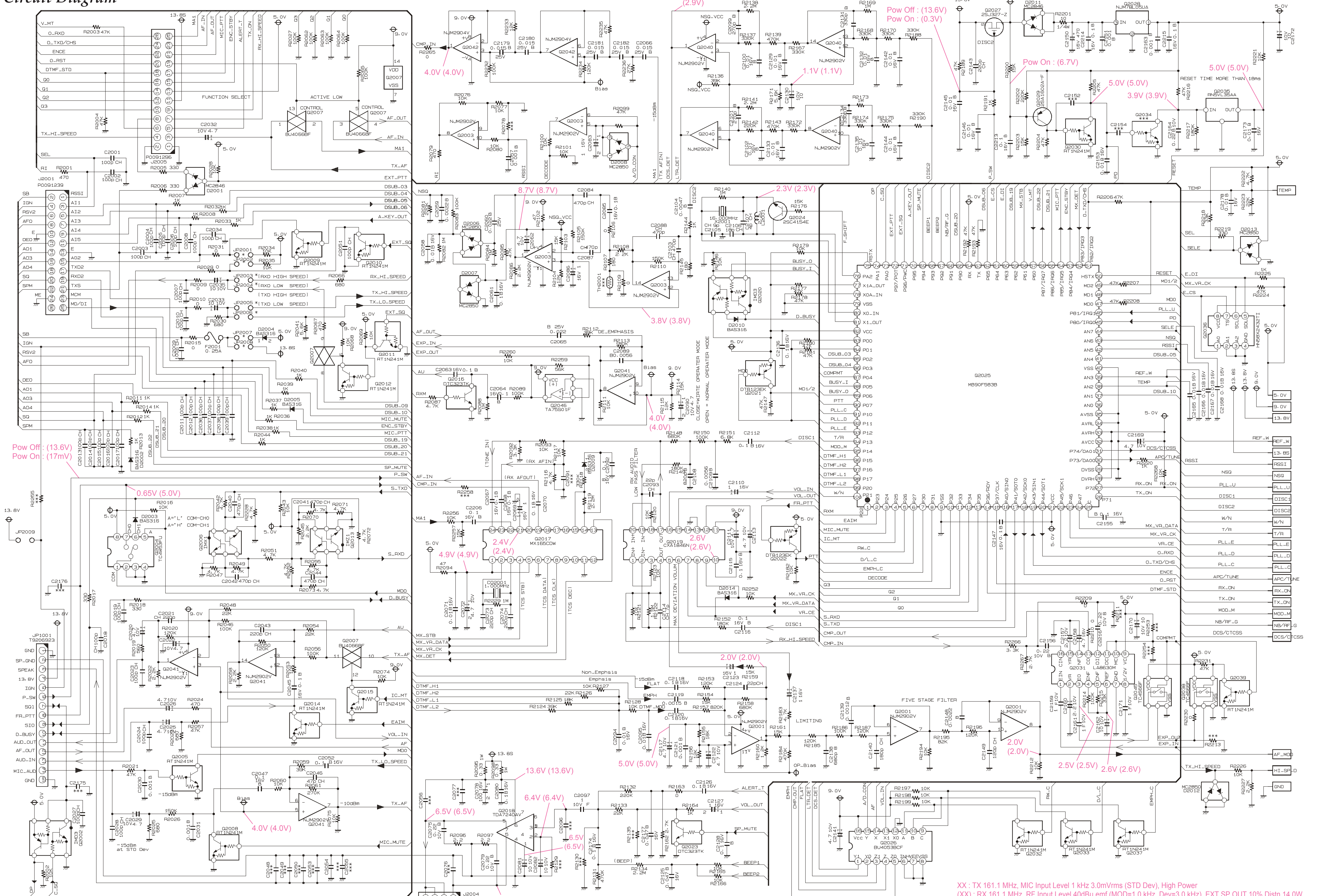
MAIN Unit (FR006760C)

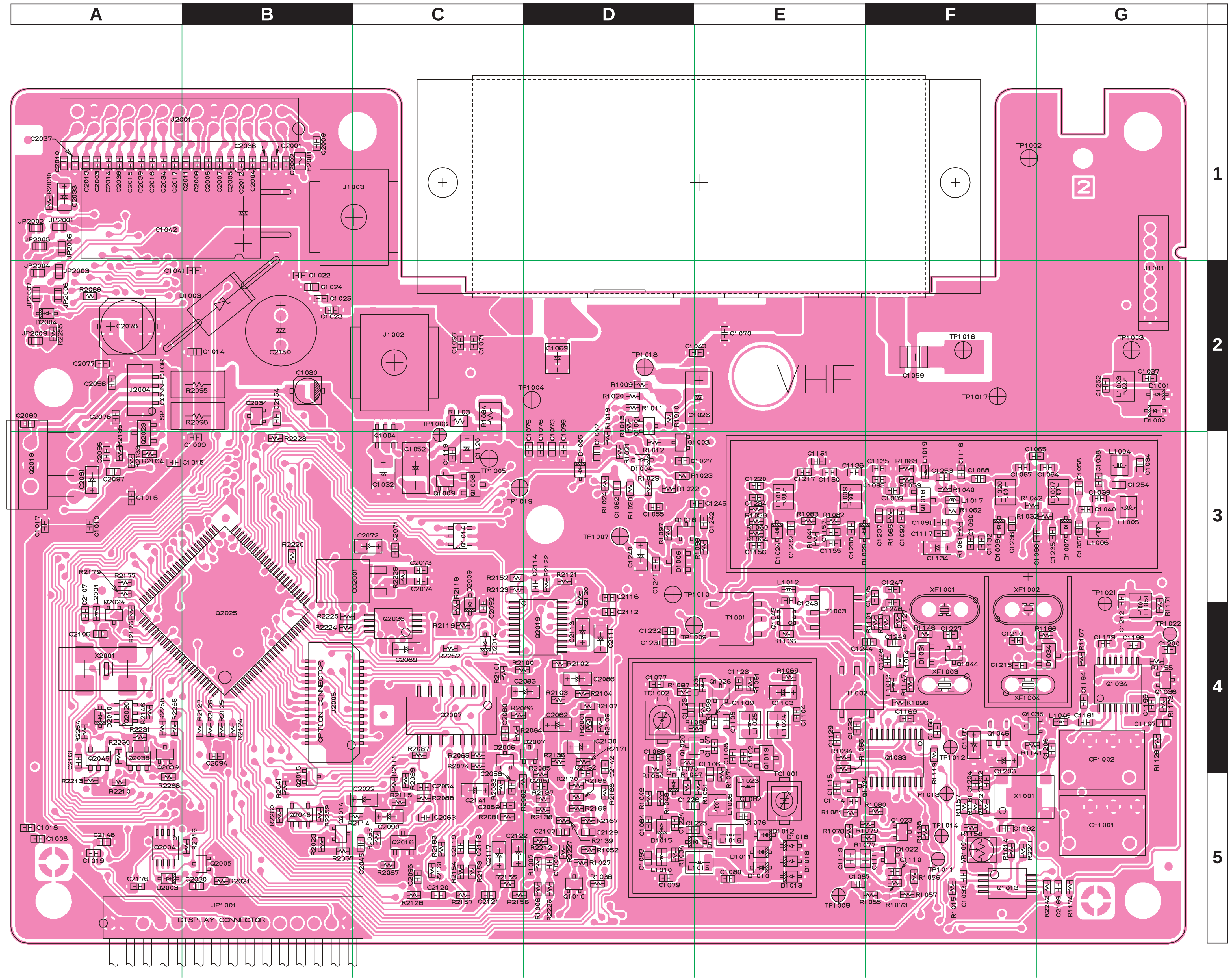
Circuit Diagram

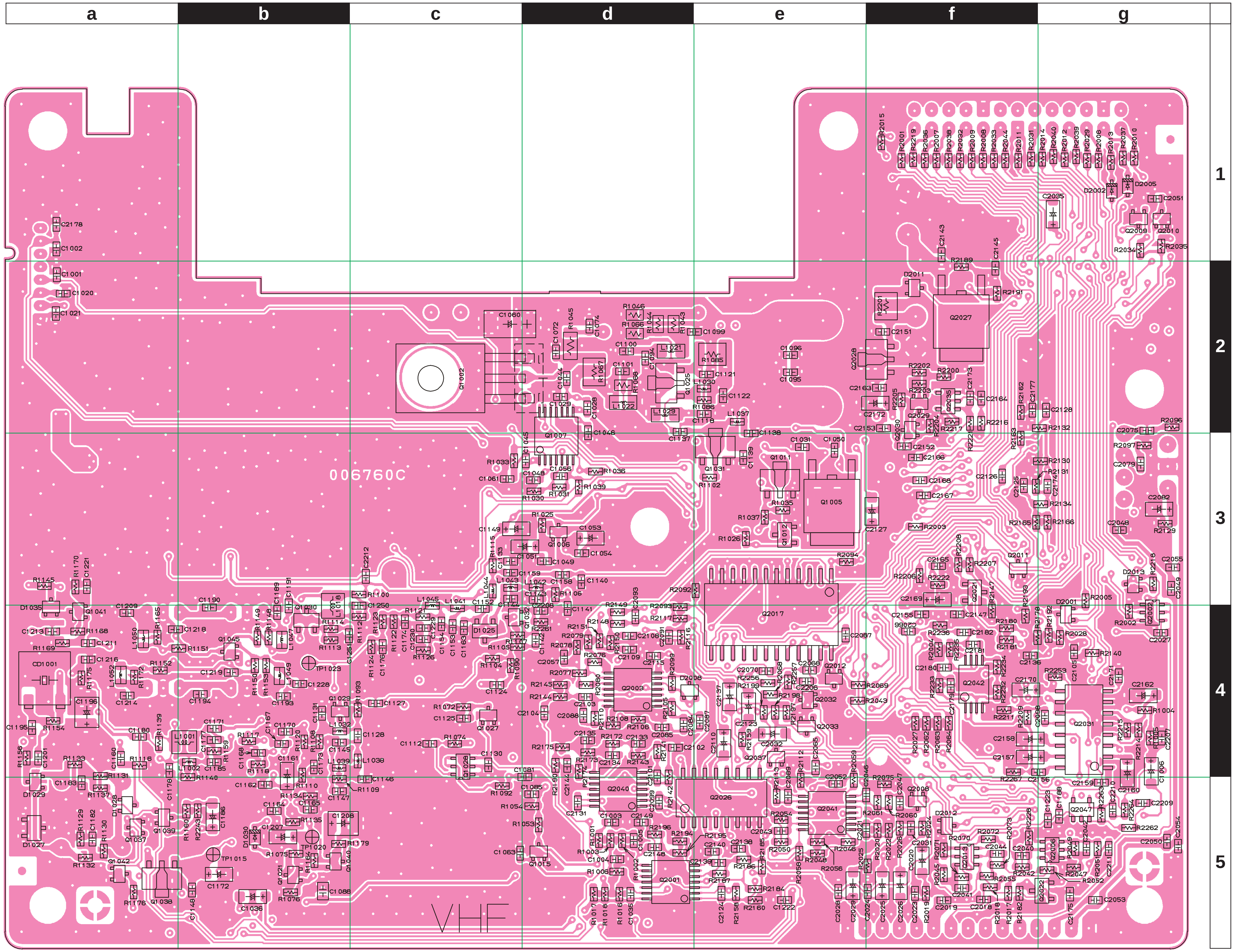


XX : TX 161.1 MHz, MIC Input Level 1 kHz 3.0mVrms (STD Dev), High Power
(XX) : RX 161.1 MHz, RF Input Level 40dBμ emf (MOD=1.0 kHz, Dev=3.0 kHz), EXT SP OUT 10% Distn 14.0W

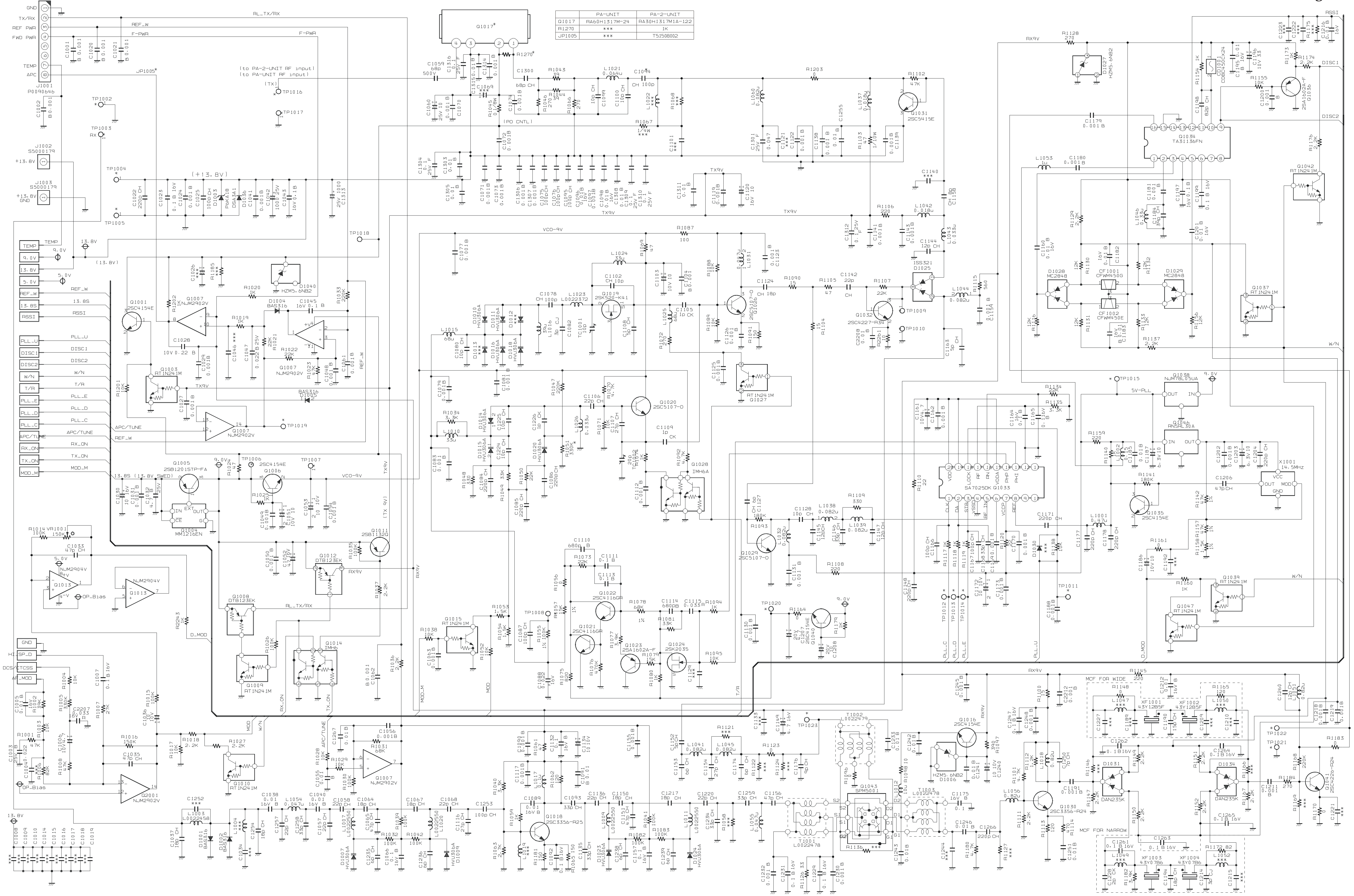
Circuit Diagram



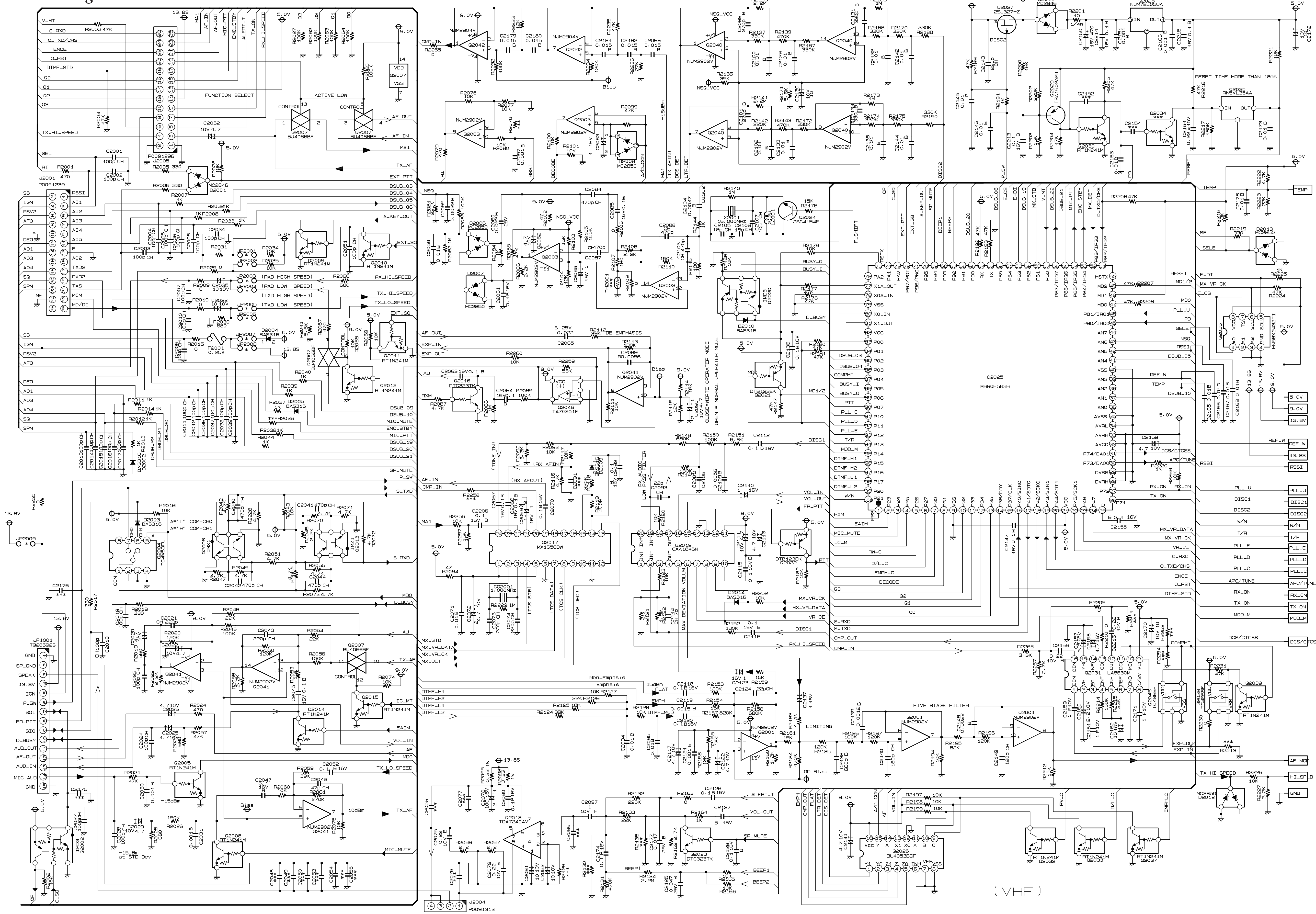


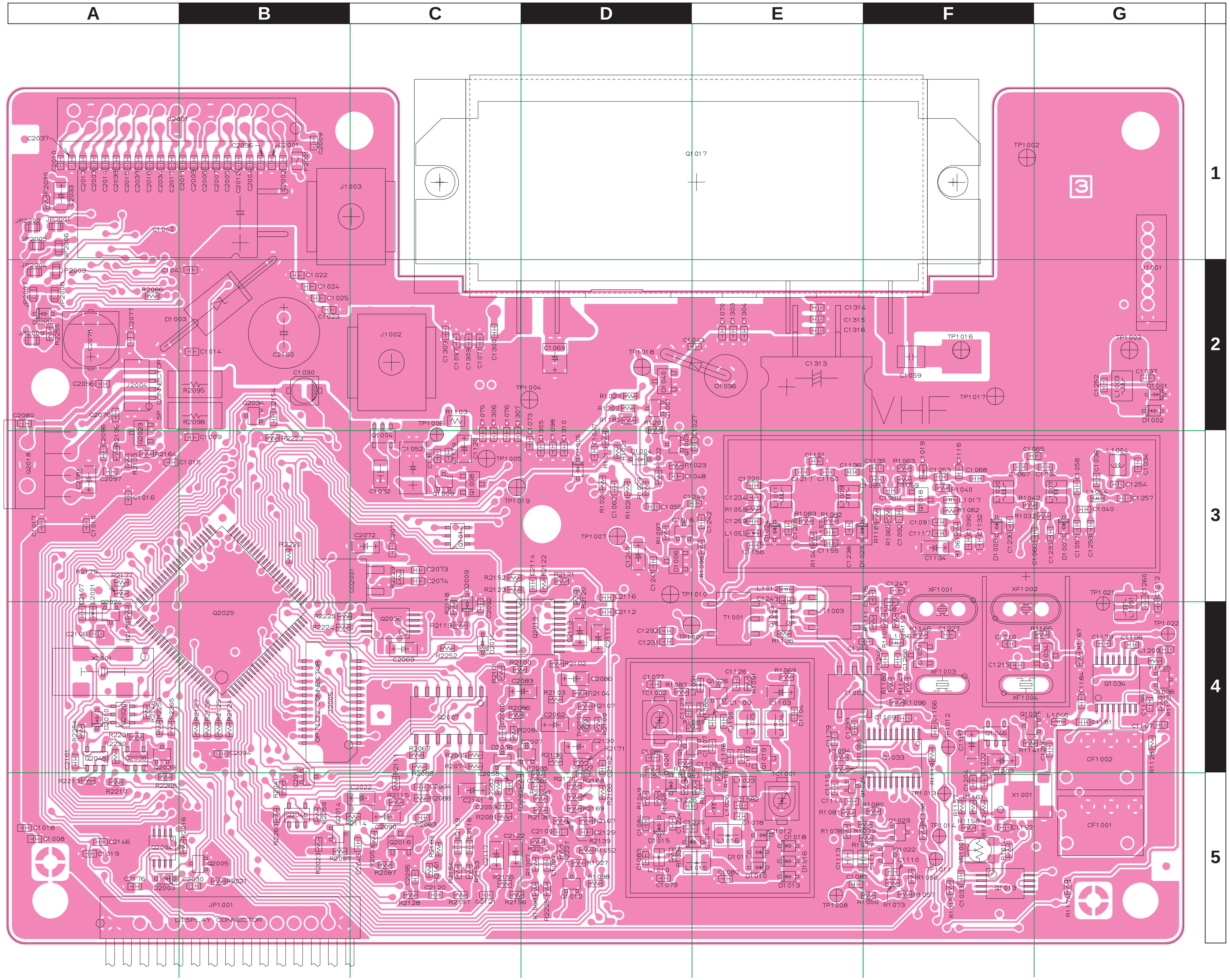

a
b
c
d
e
f
g
1
2
3
4
5
006760C
VHF

	PA-UNIT	PA-2-UNIT
Q1017	RA60H1317M-24	RA30H1317M1A-122
R1270	***	1K
JP1005	***	T51508002

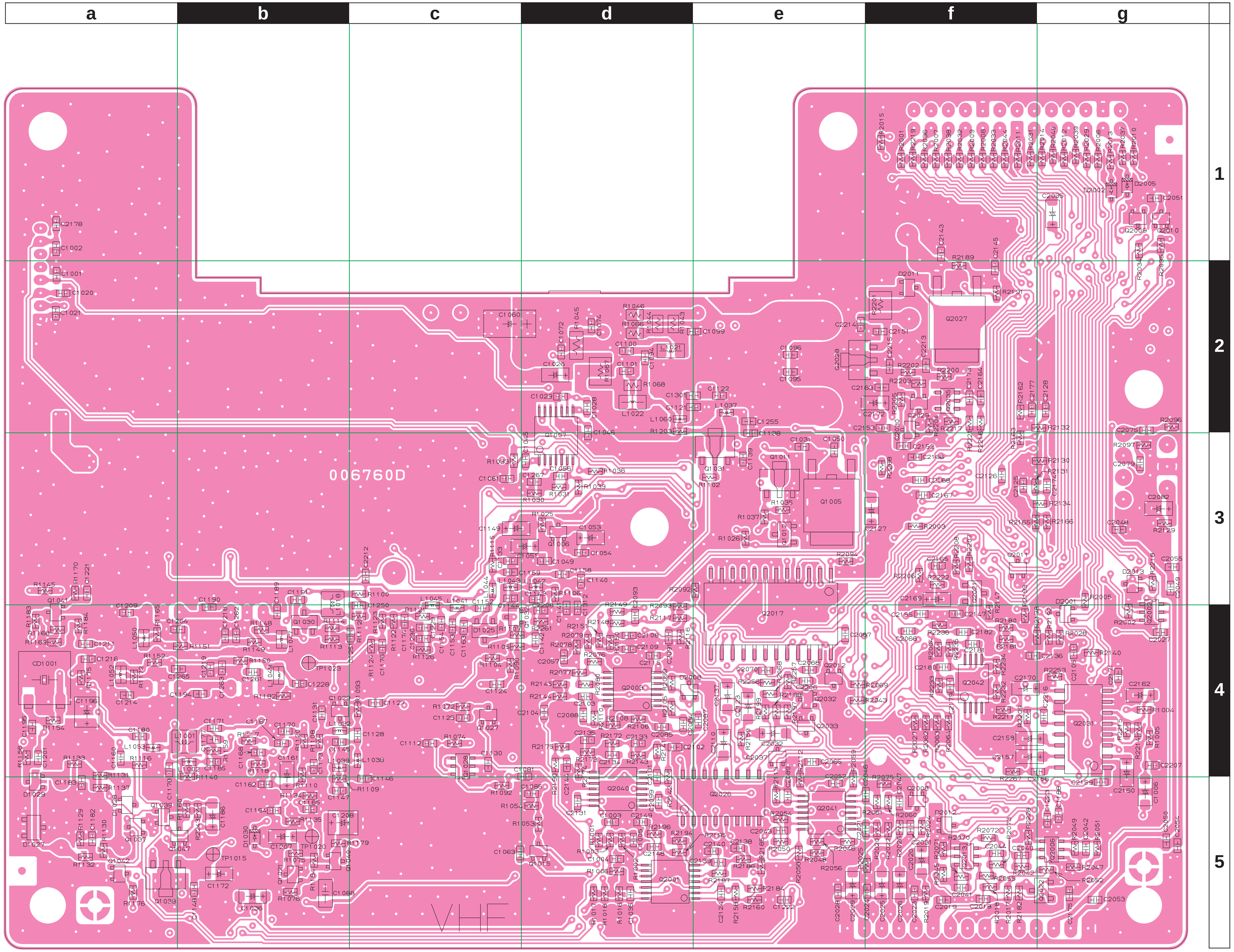


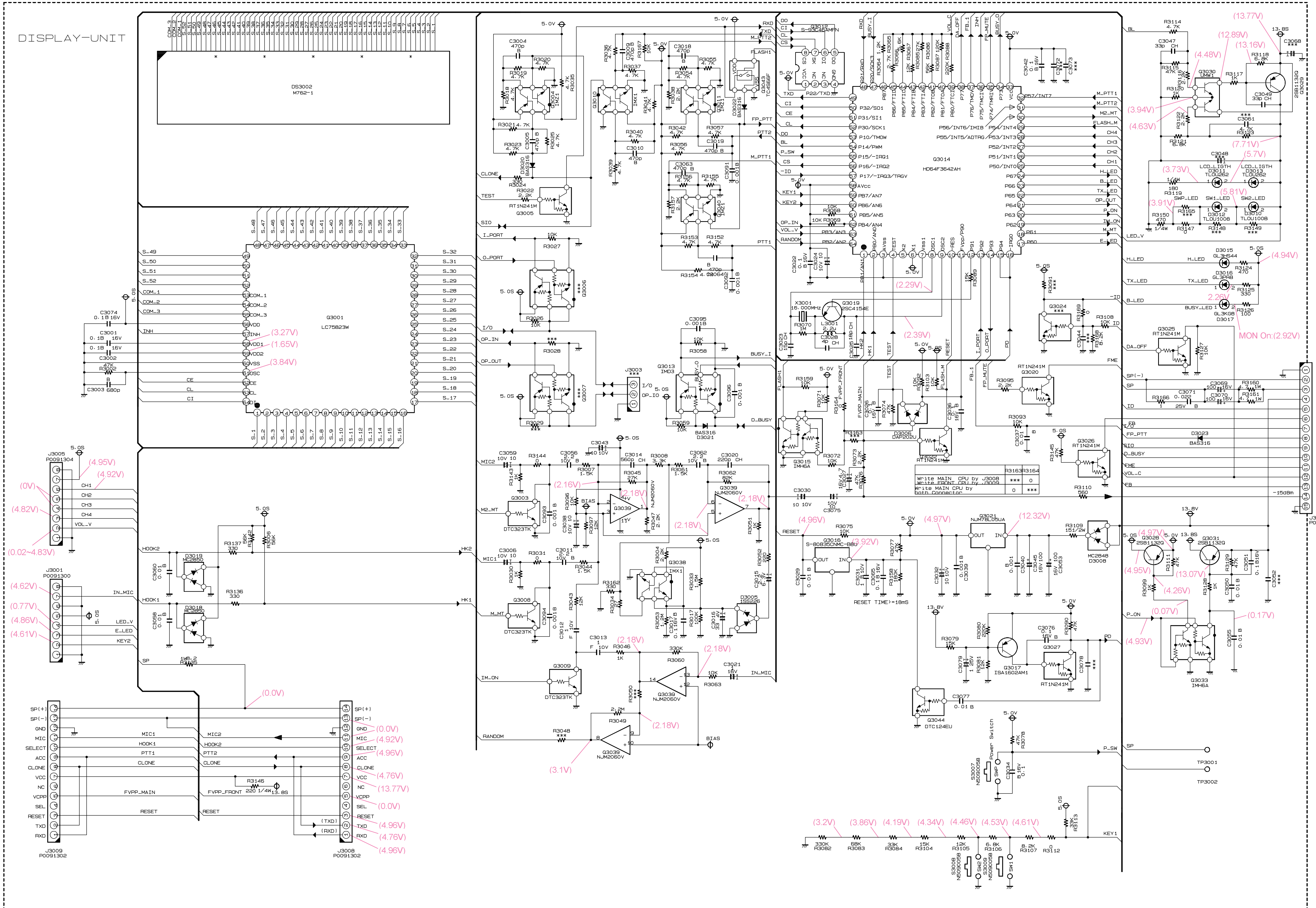
Circuit Diagram

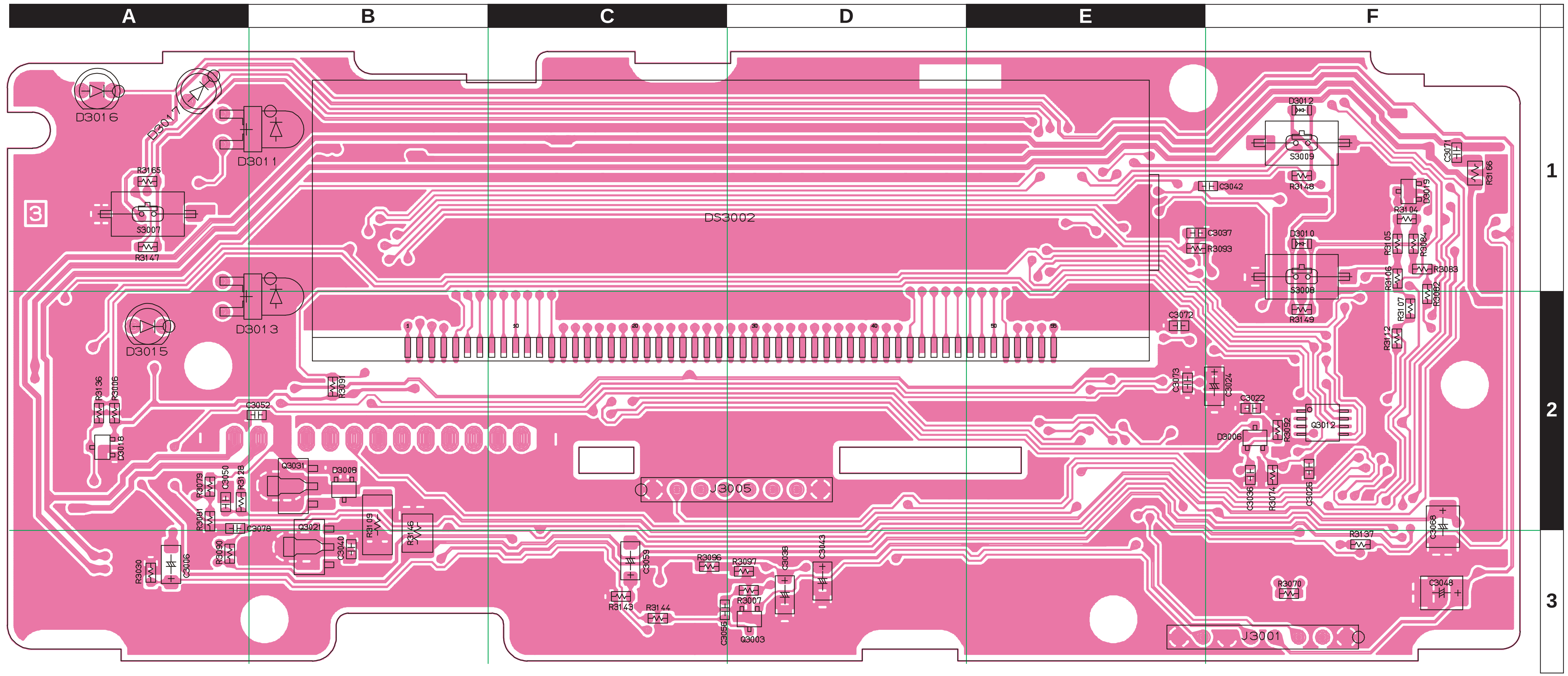




A
B
C
D
E
F
G
1
2
3
4
5
VHF
DISPLAY CONNECTOR




DISPLAY-UNIT
DS3002
M762-1
Q3001
LC75823W
Q3014
HD64F3642AH
J3005
P0091304
J3001
P0091300
J3009
P0091302
J3008
P0091302
J3007
P0091093
TO FRONT INTERFACE OR RF UNIT
Power Switch
RESET TIME>=10mS


A
B
C
D
E
F
1
2
3
D3016
D3017
D3011
D3013
D3015
D3012
D3010
D3019
D3018
D3006
D3008
S3007
S3008
S3009
DS3002
J3005
J3001
Q3031
Q3021
Q3012
Q3003
R3165
R3147
R3148
R3149
R3093
R3083
R3104
R3105
R3106
R3107
R3112
R3136
R3137
R3143
R3144
R3096
R3097
R3070
R3030
R3007
C3042
C3037
C3071
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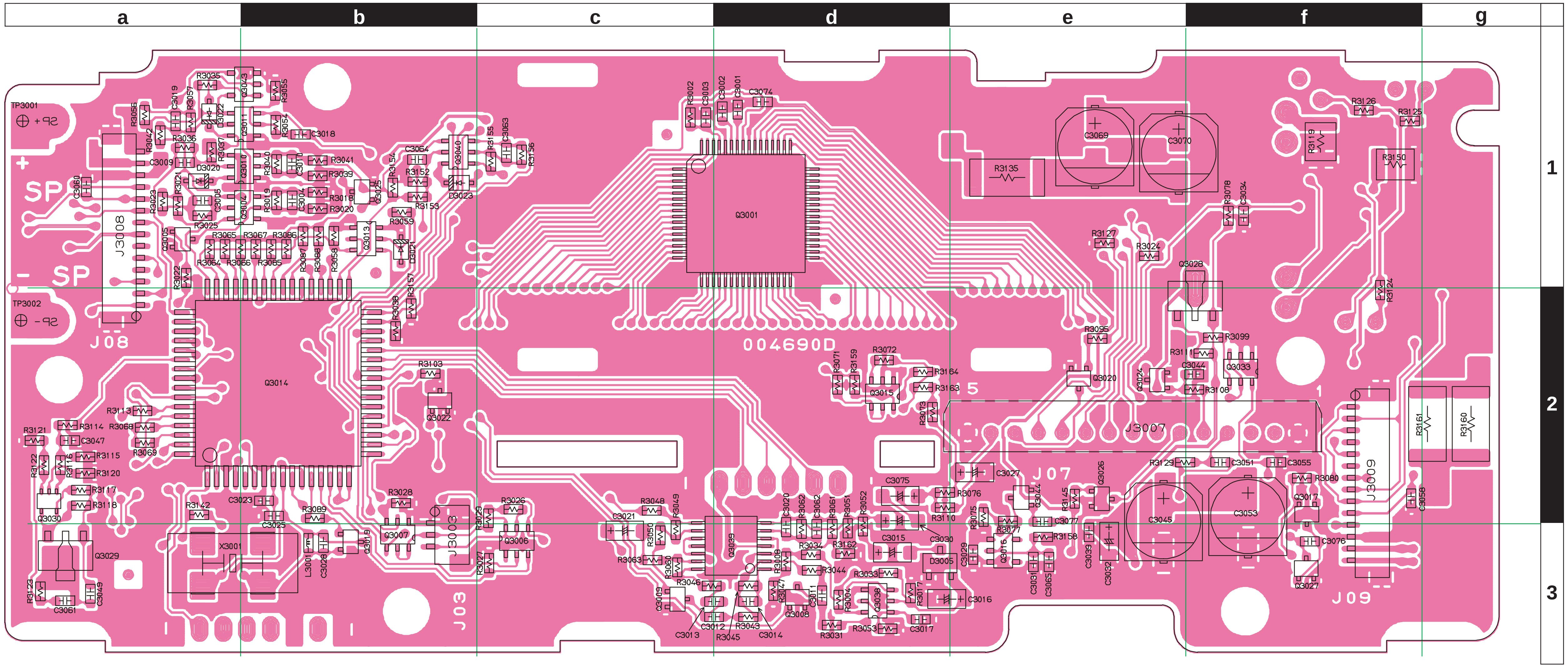
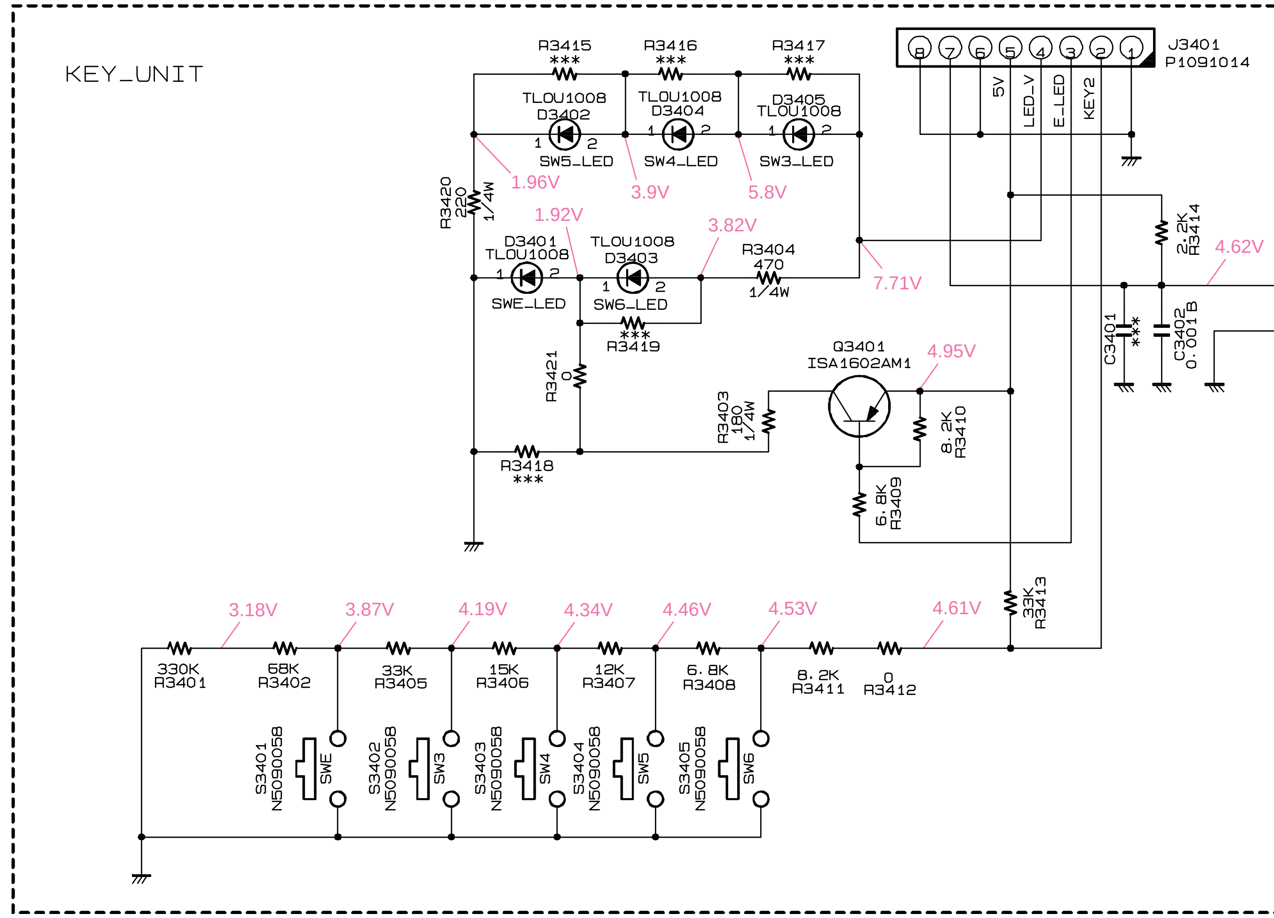
C3043
C3048
C3036

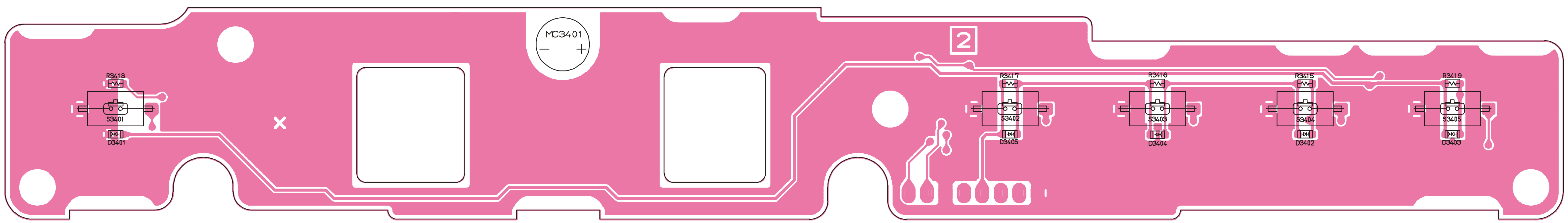


Circuit Diagram

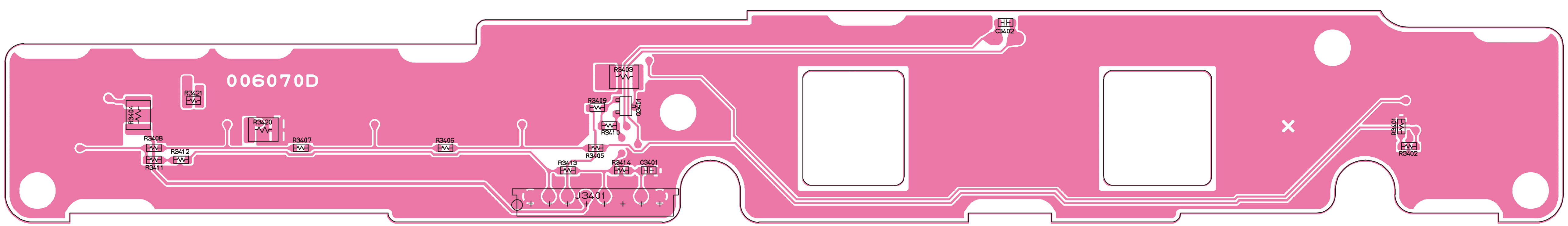


Parts Layout

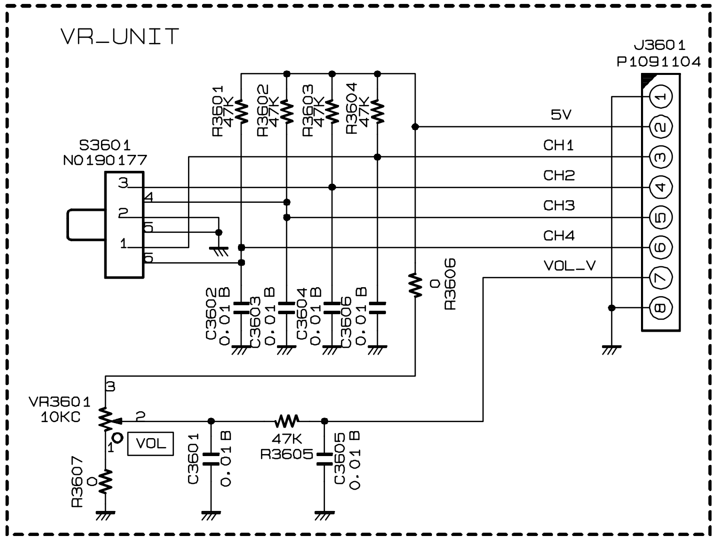
Side A



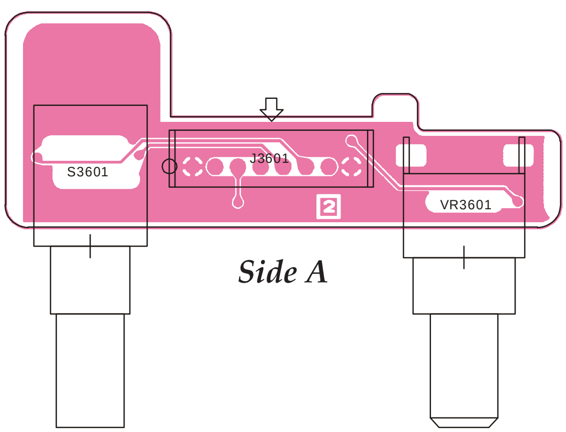
Side B



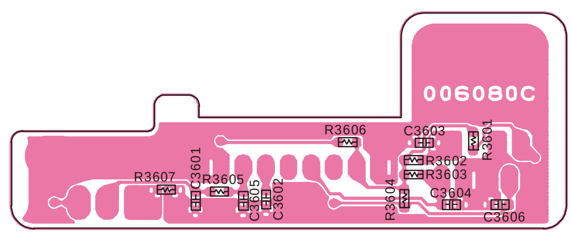
Circuit Diagram



Parts Layout

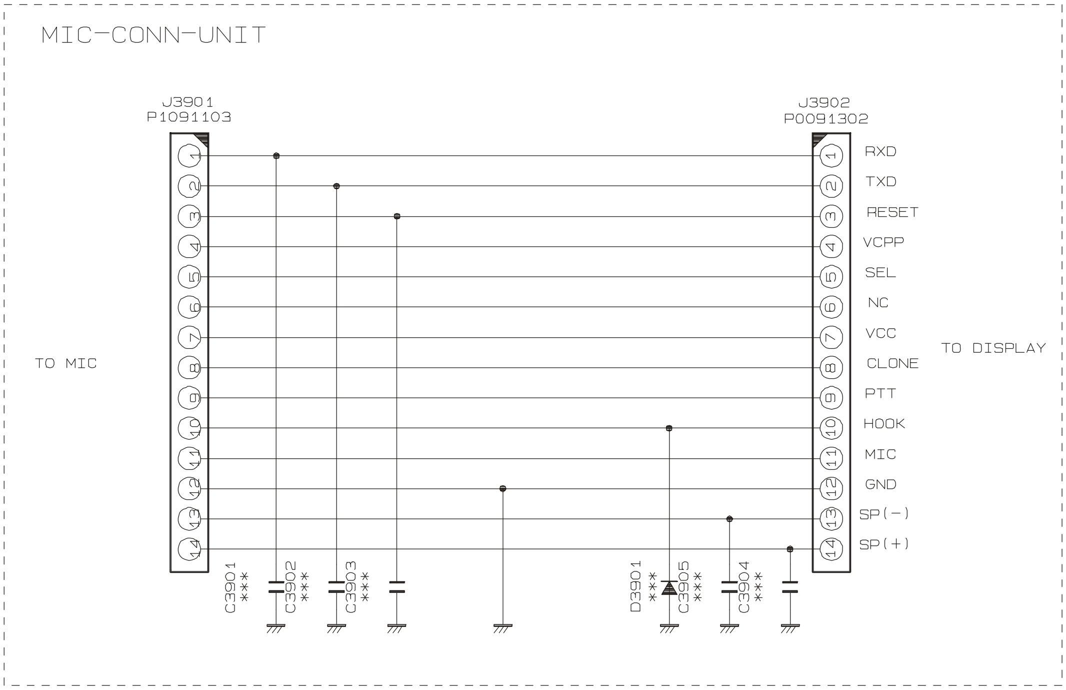


Side A

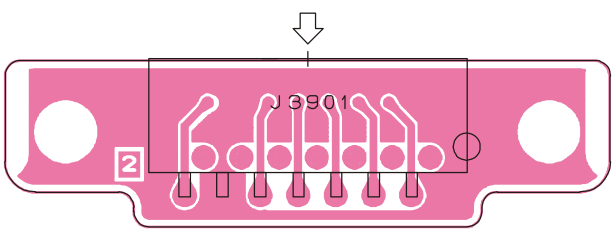


Side B

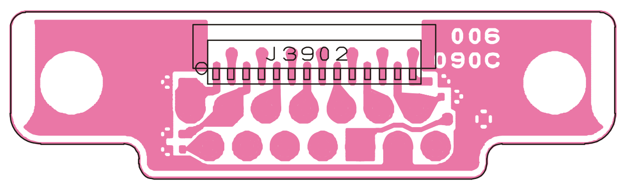
Circuit Diagram



Parts Layout

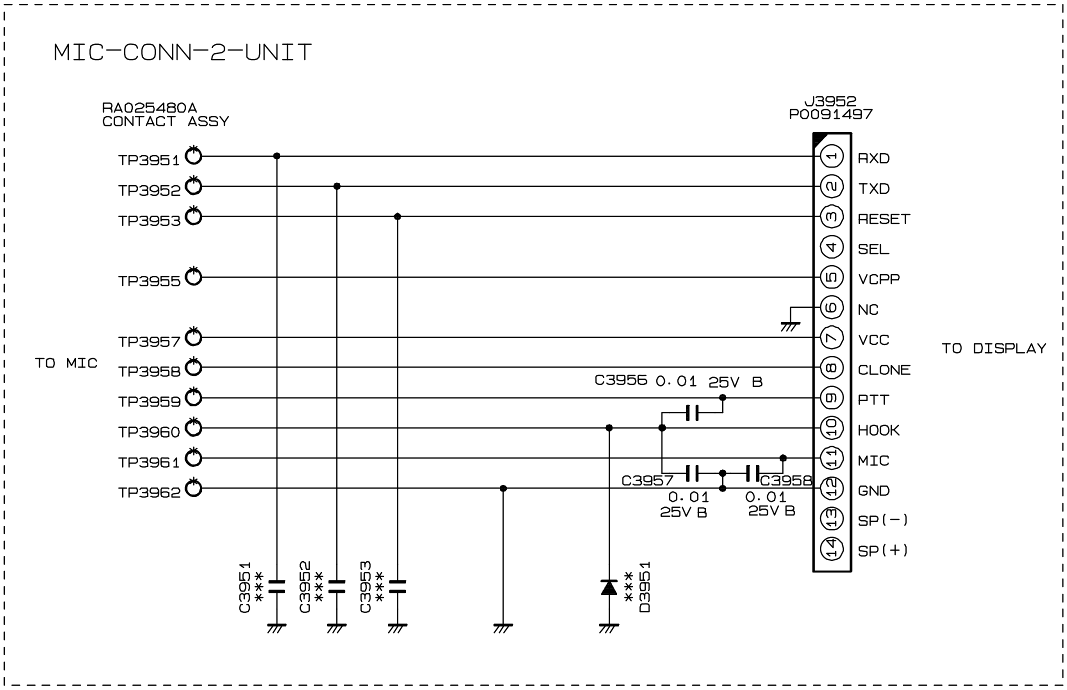


Side A

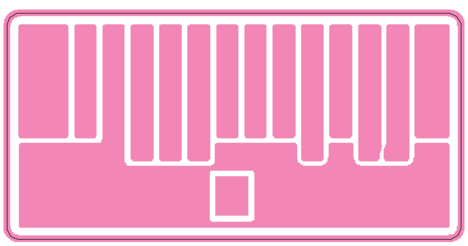


Side B

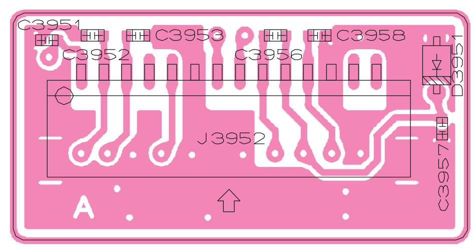
Circuit Diagram



Parts Layout

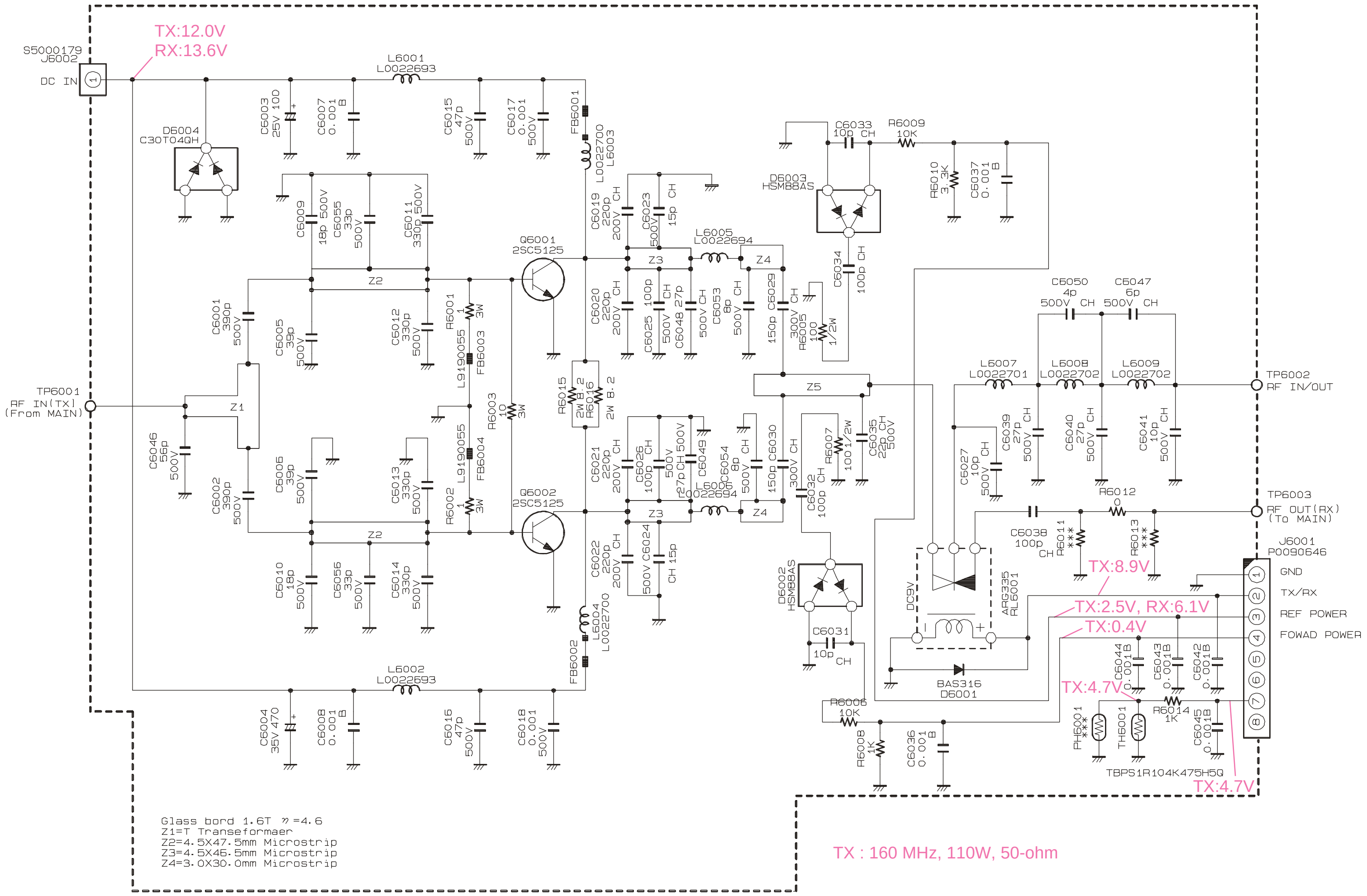


Side A

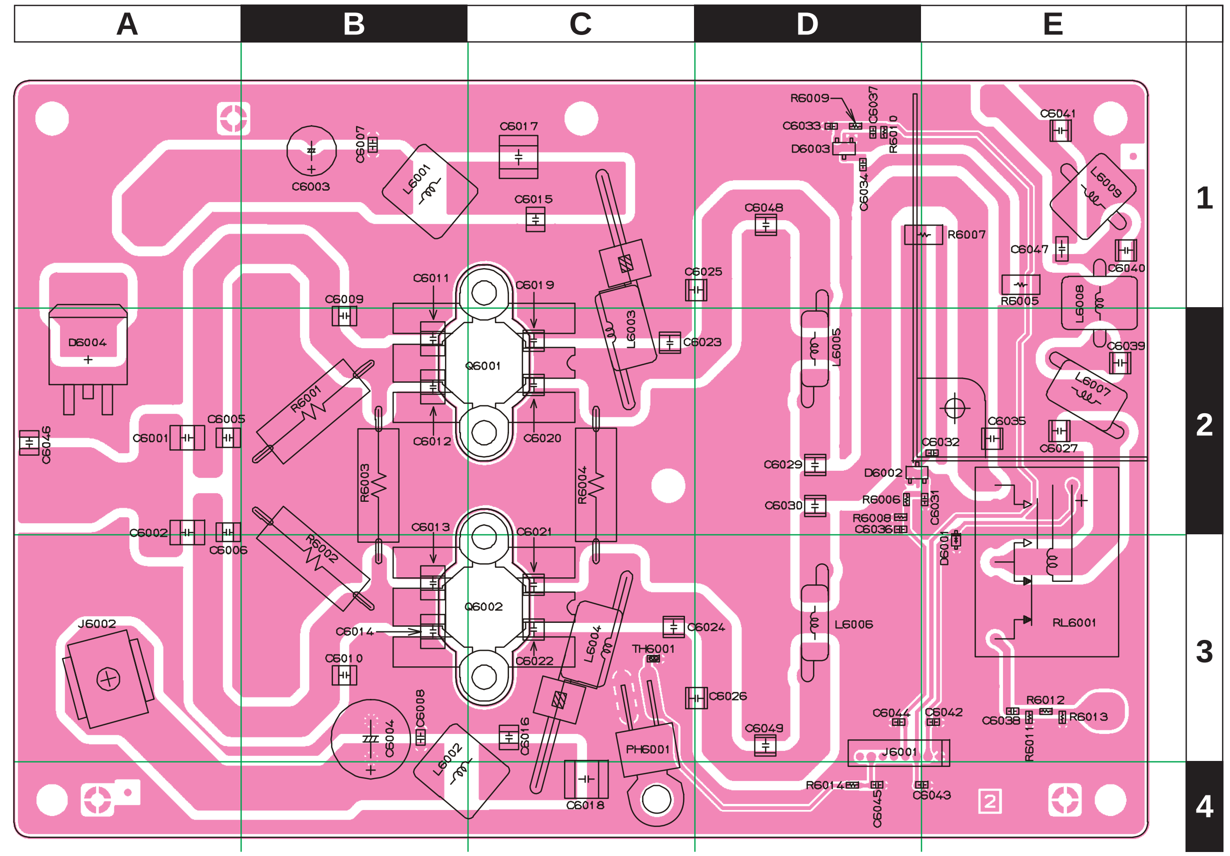


Side B

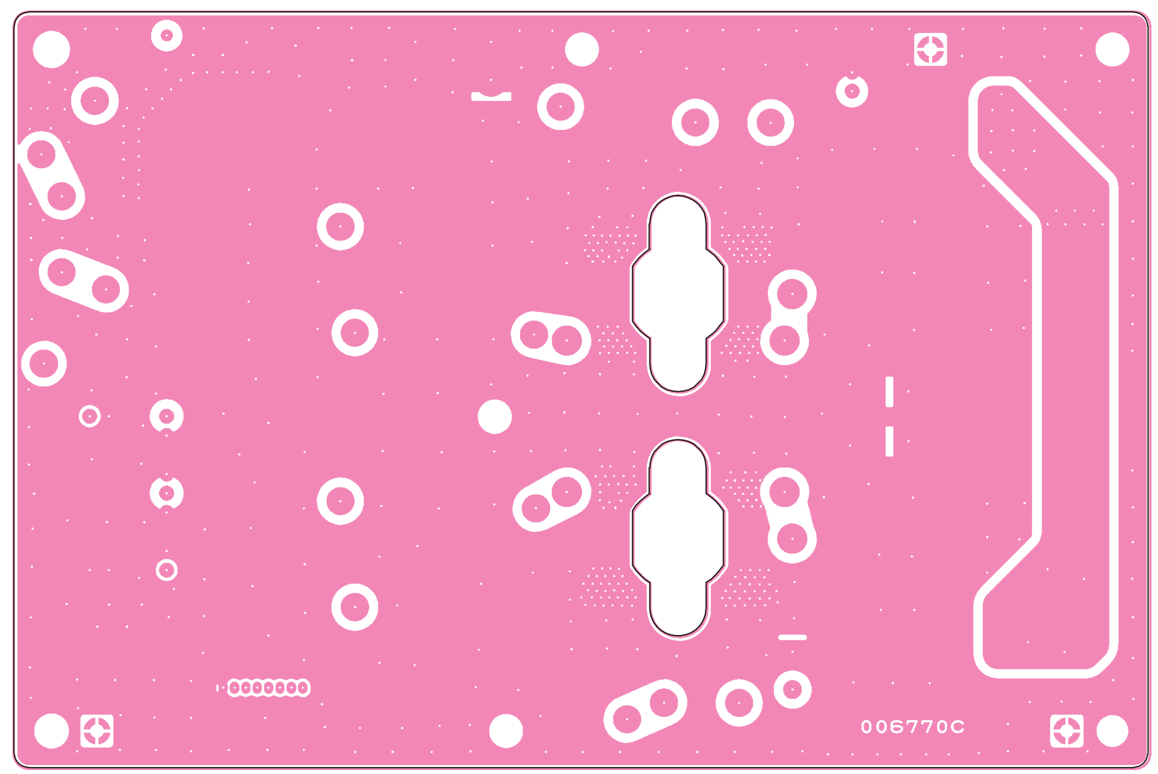
Circuit Diagram



Parts Layout



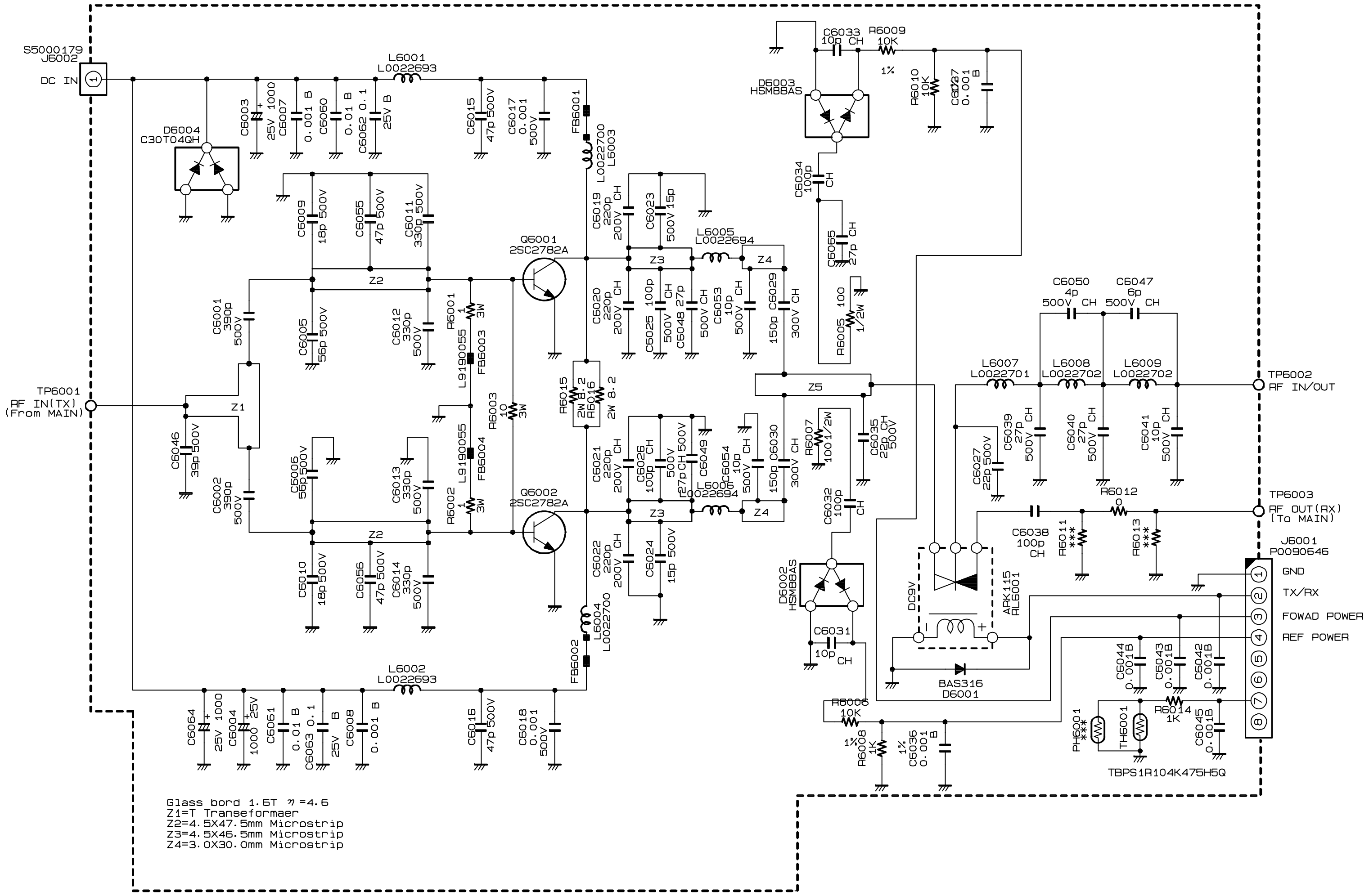
Side A



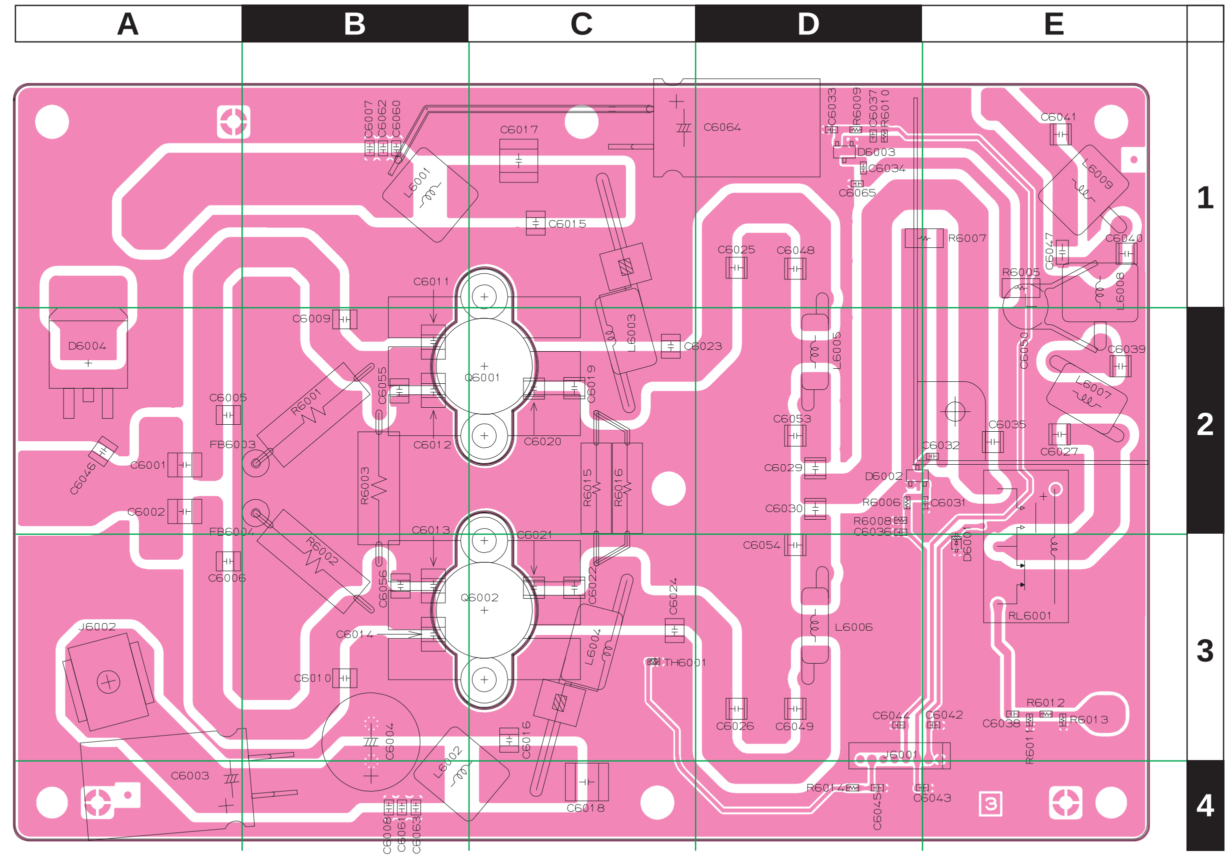
Side B

PA Unit (FR006770D)

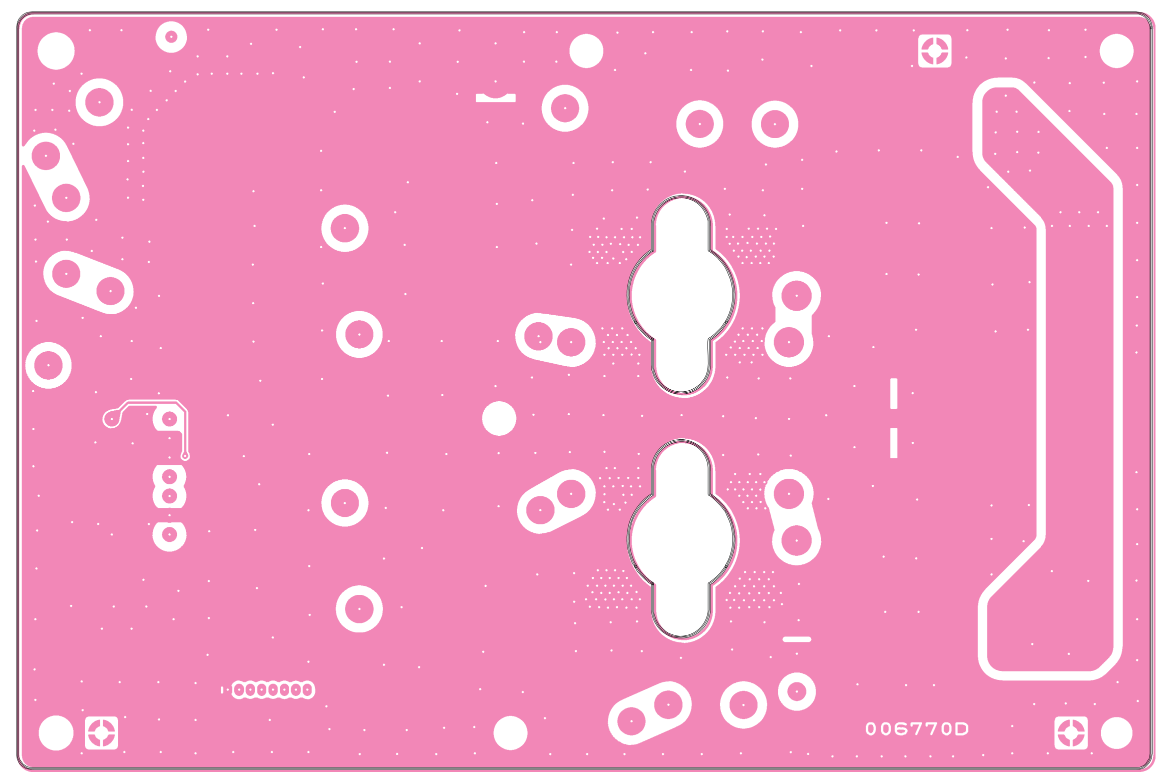
Circuit Diagram



Parts Layout

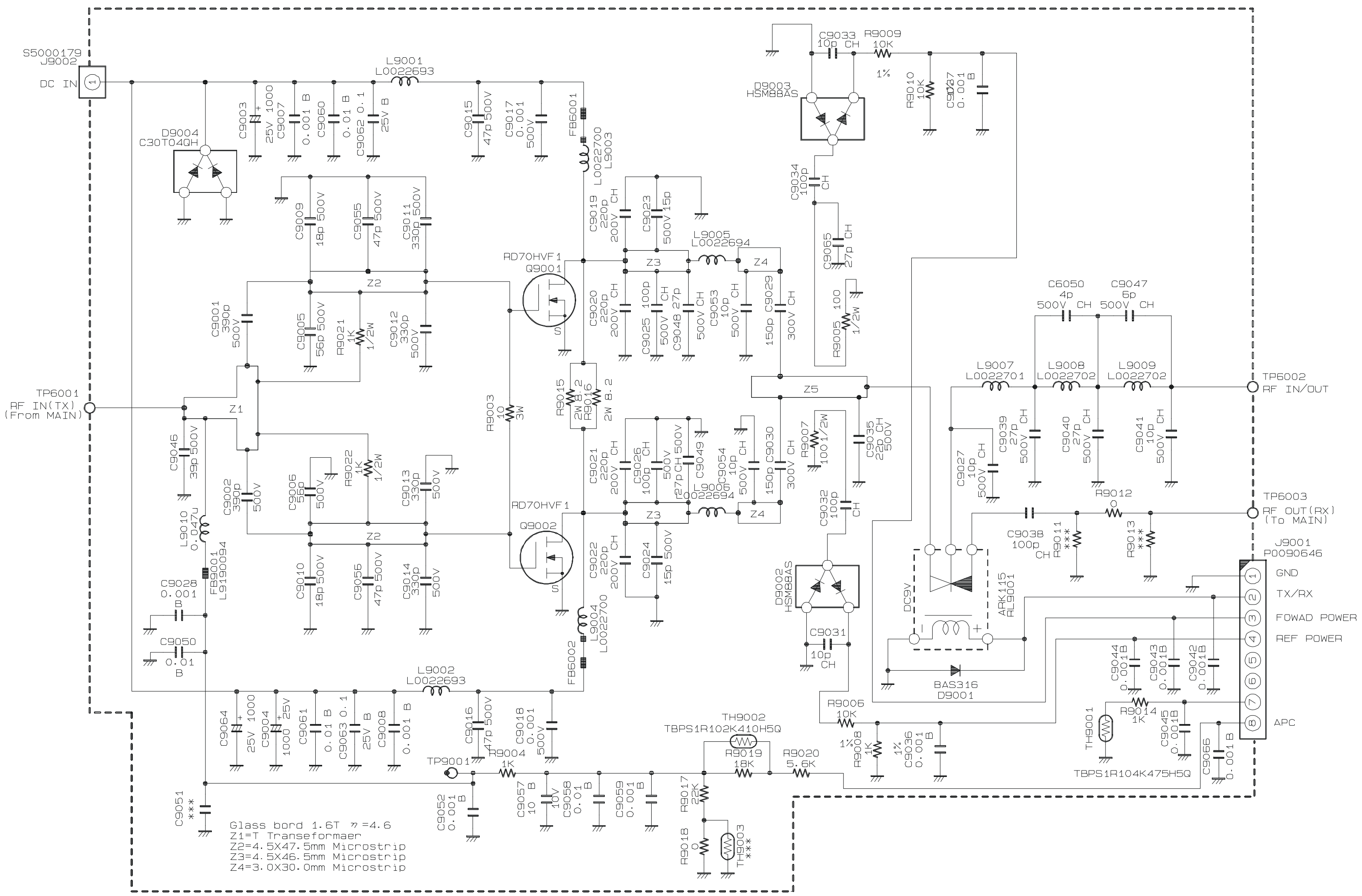


Side A

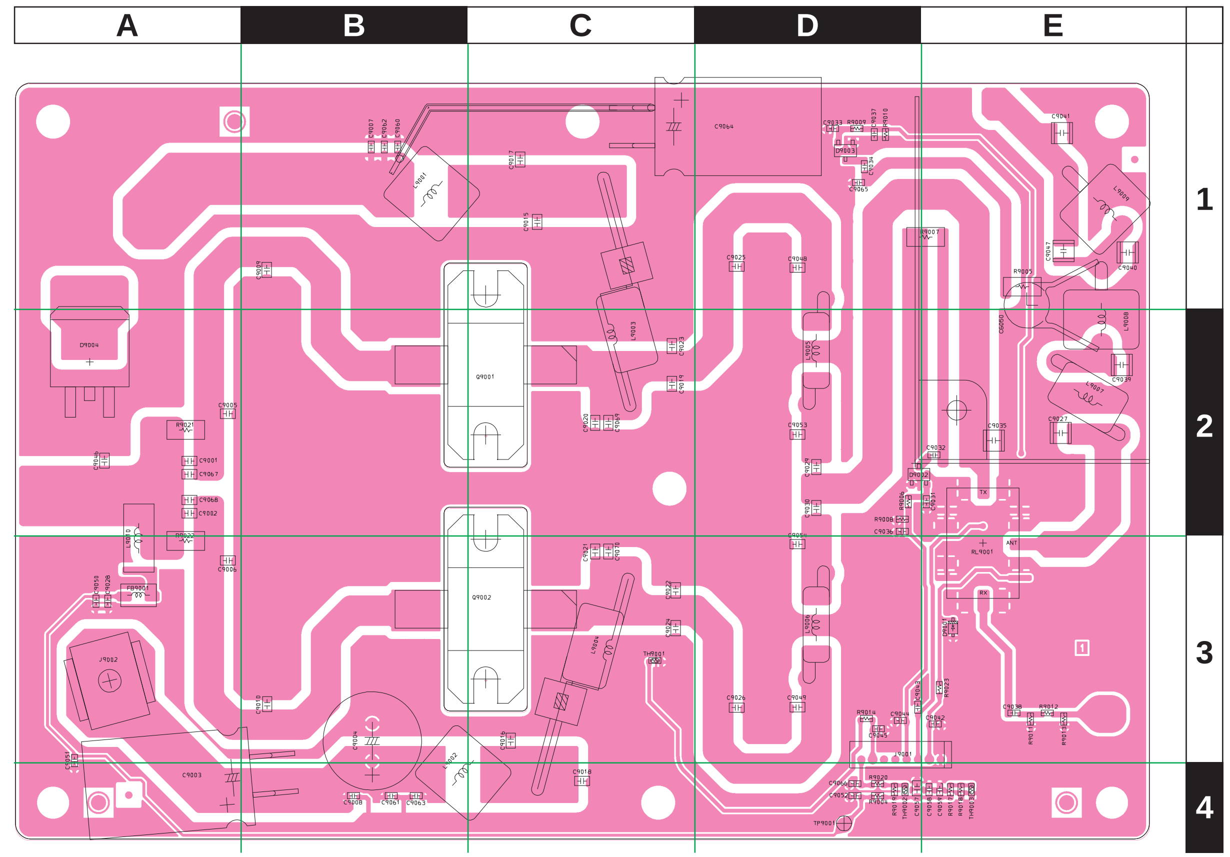


Side B

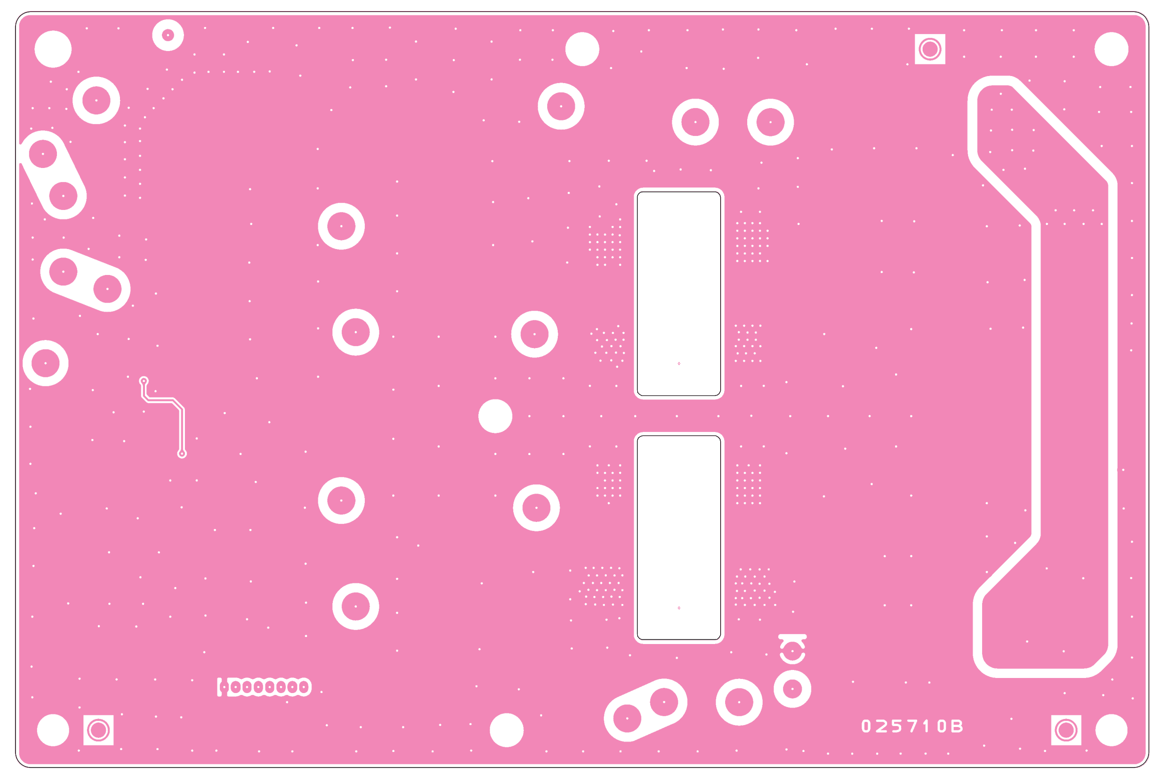
Circuit Diagram



Parts Layout



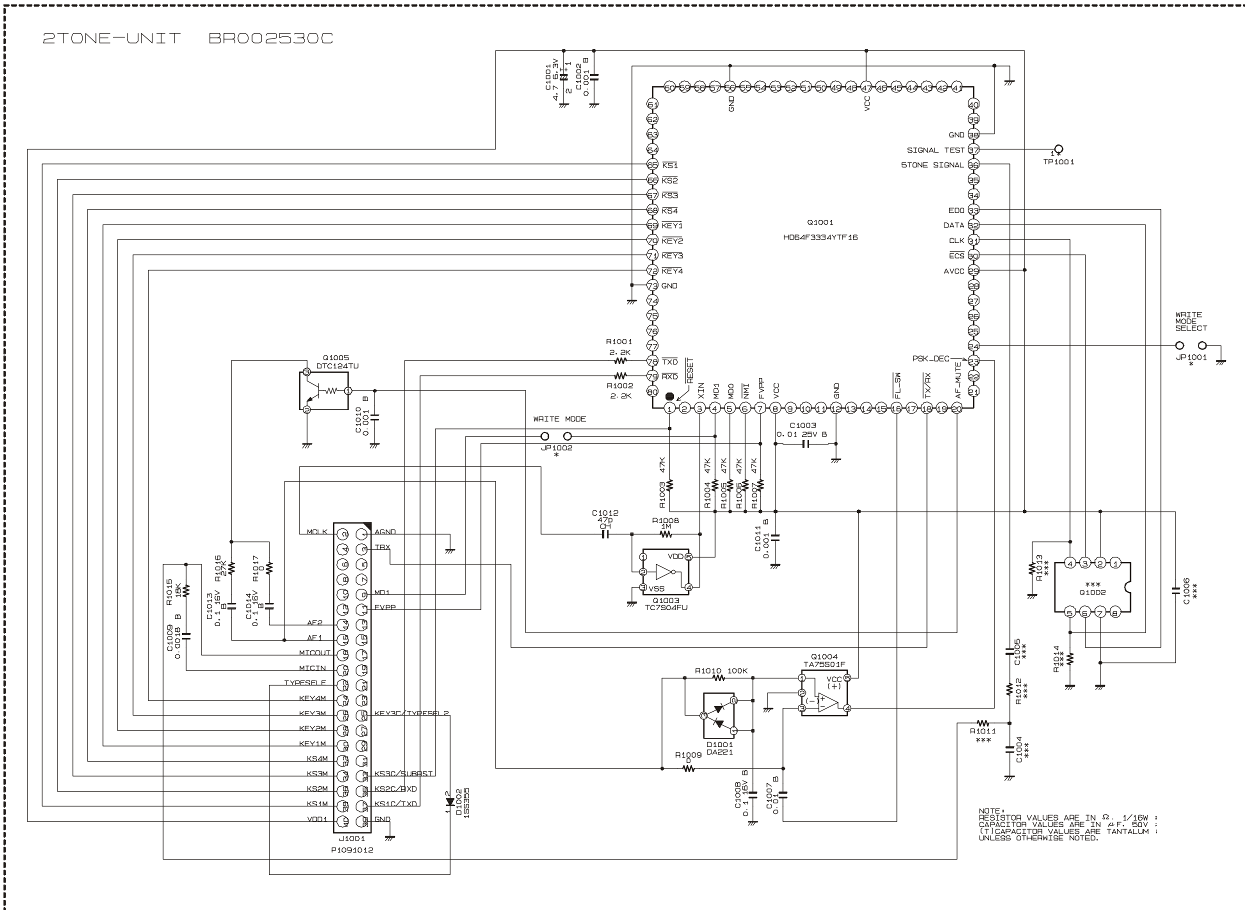
Side A



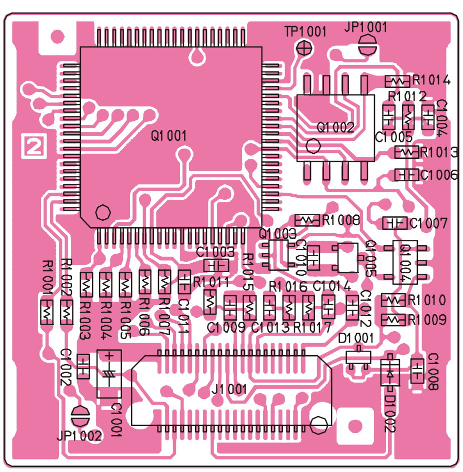
Side B

F2D-8 2-Tone Decode Unit (Option)

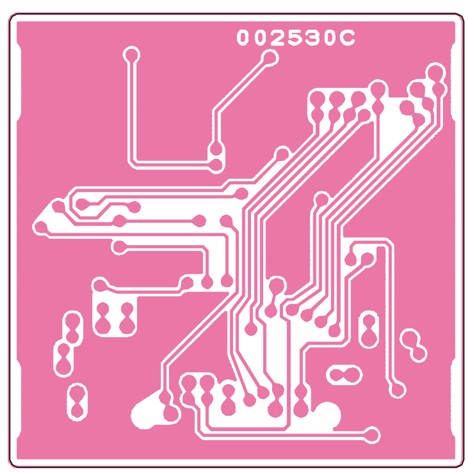
Circuit Diagram



Parts Layout

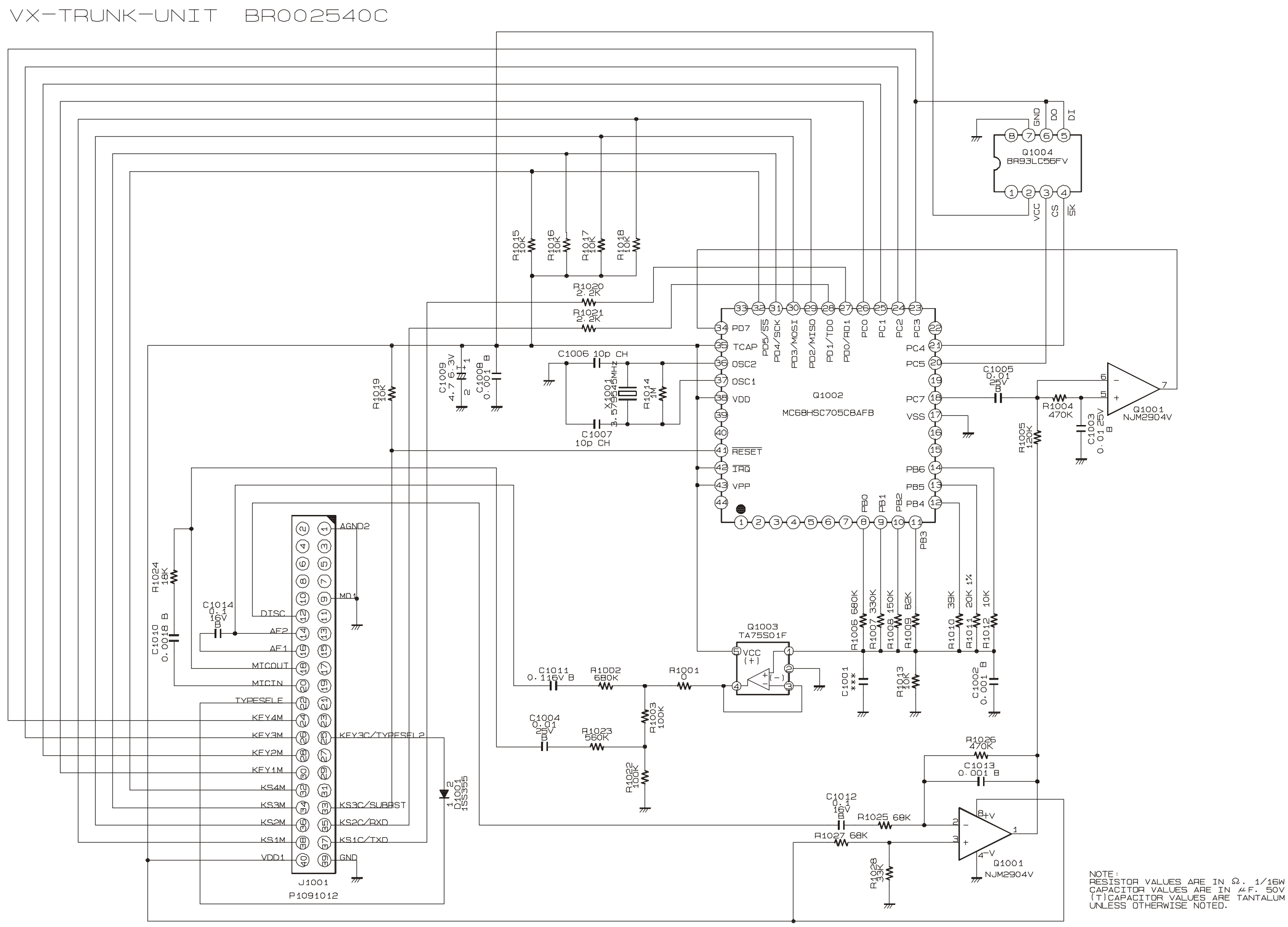


Side A

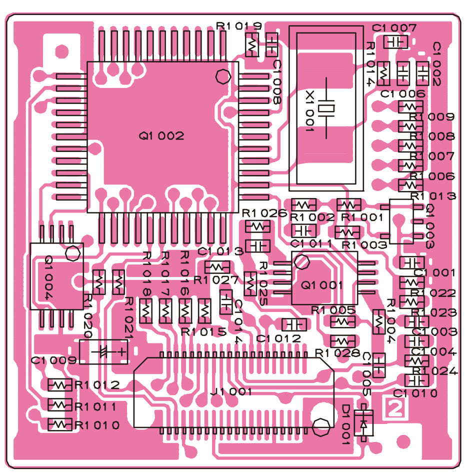


Side B

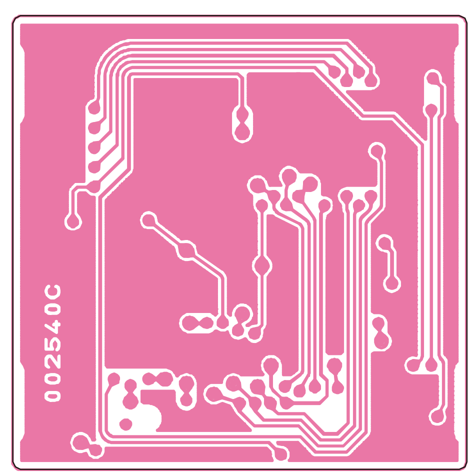
Circuit Diagram



Parts Layout

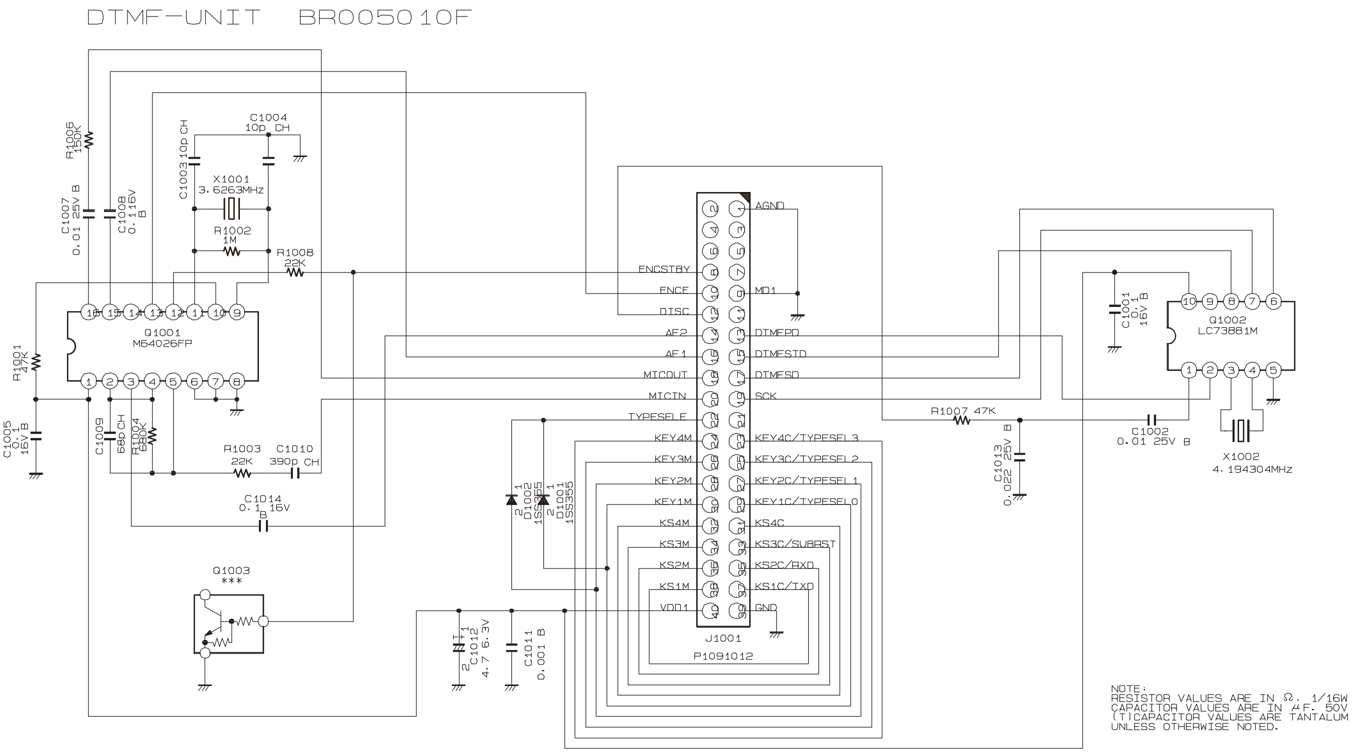


Side A

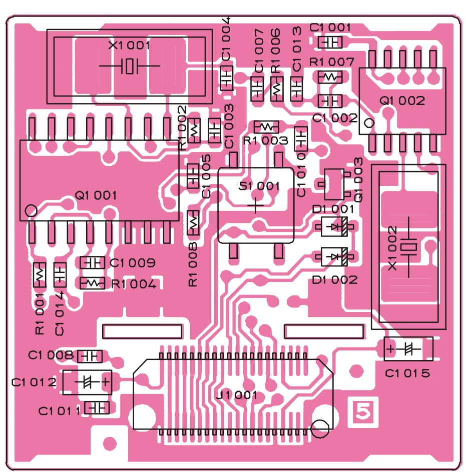


Side B

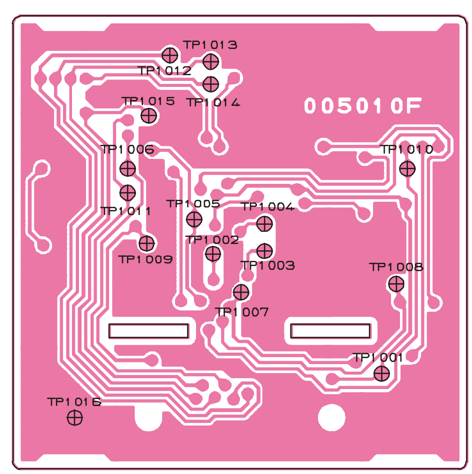
Circuit Diagram



Parts Layout



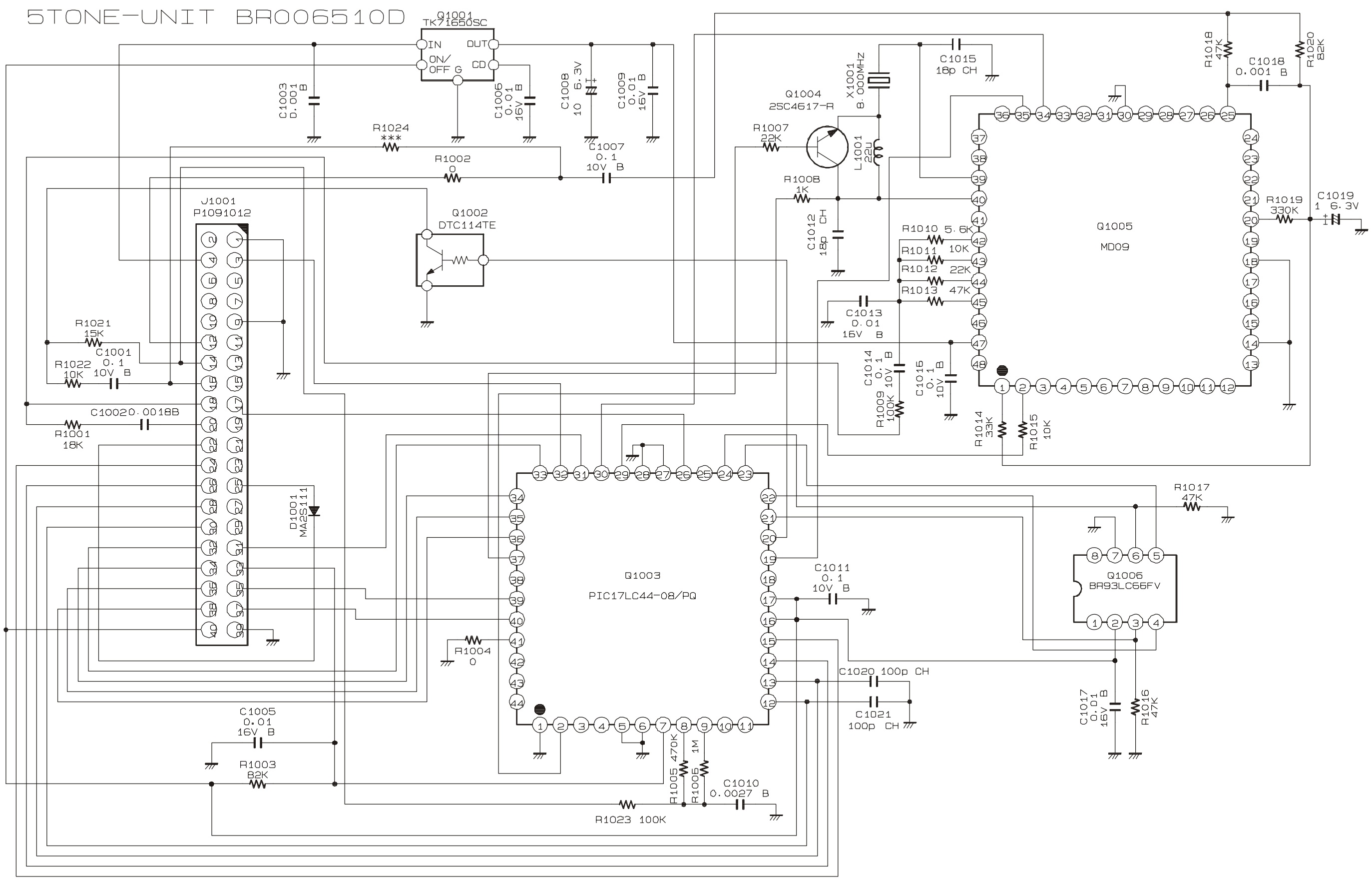
Side A



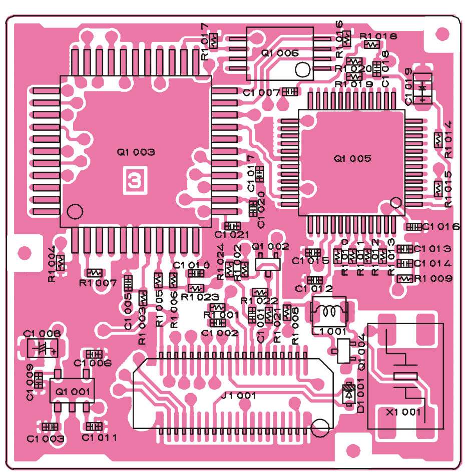
Side B

F5D-14 5-Tone Unit (Option)

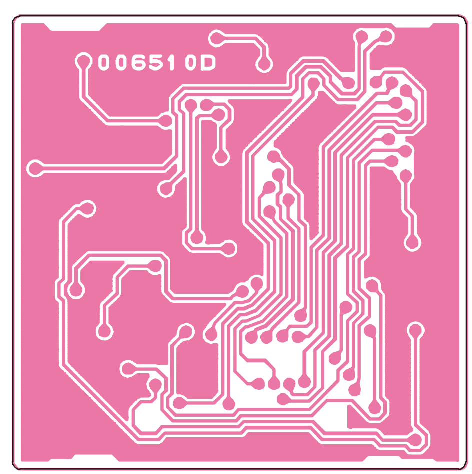
Circuit Diagram



Parts Layout



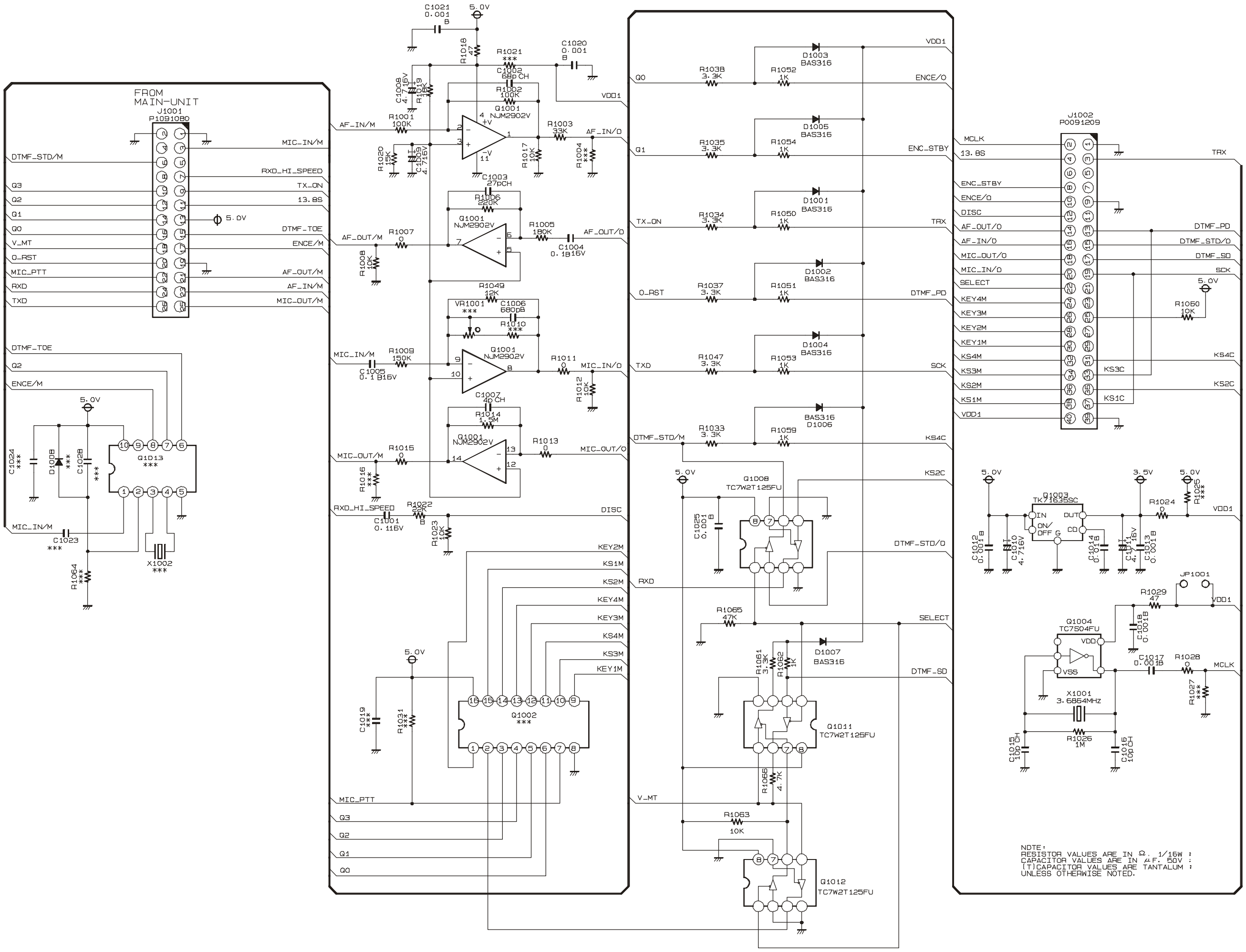
Side A



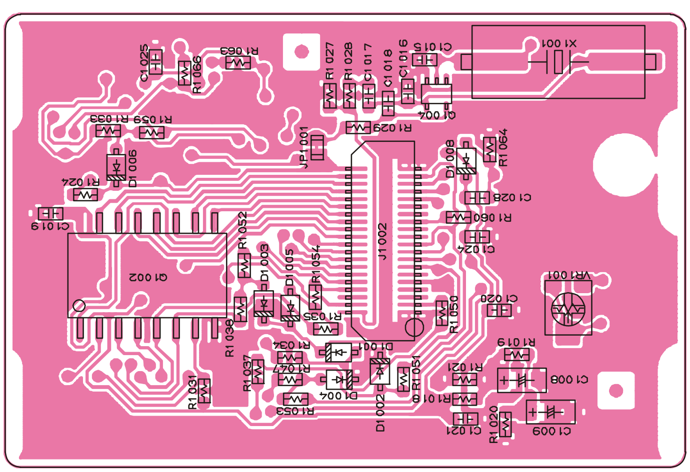
Side B

FIF-7 Connection Unit (Option)

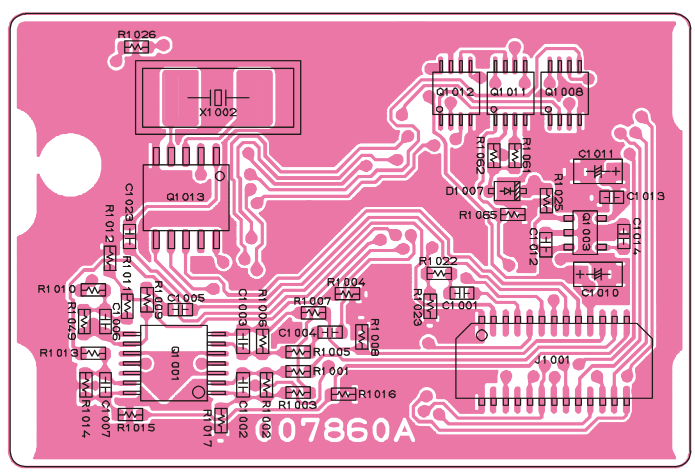
Circuit Diagram



Parts Layout



Side A



Side B

Vertex Standard

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