Vertex Standard

VHF Low-Band FM Transceiver

VX-5500L

Service Manual

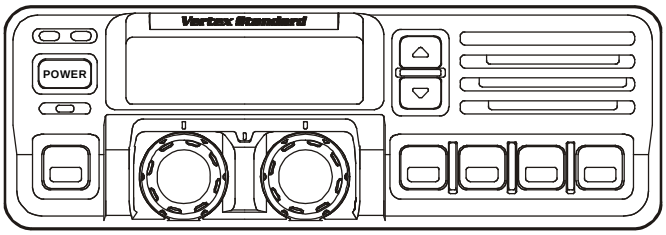
Vertex Standard LMR, Inc.

EC034L90K

Introduction

This manual provides technical information necessary for servicing the VX-5500L 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.

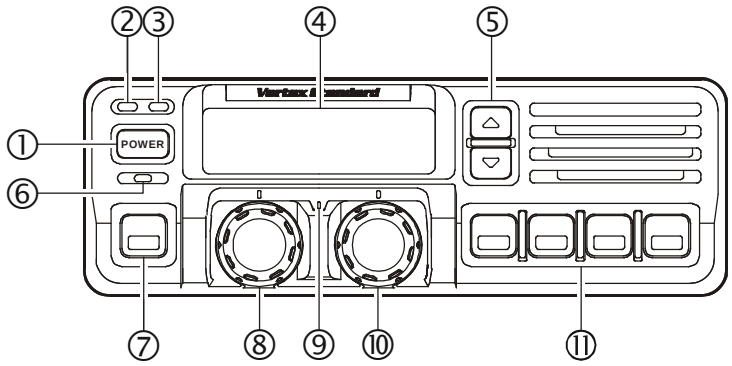
Important Note

After Lot. 8 of this transceiver was 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

CONTROLS & CONNECTORS

Front Panel

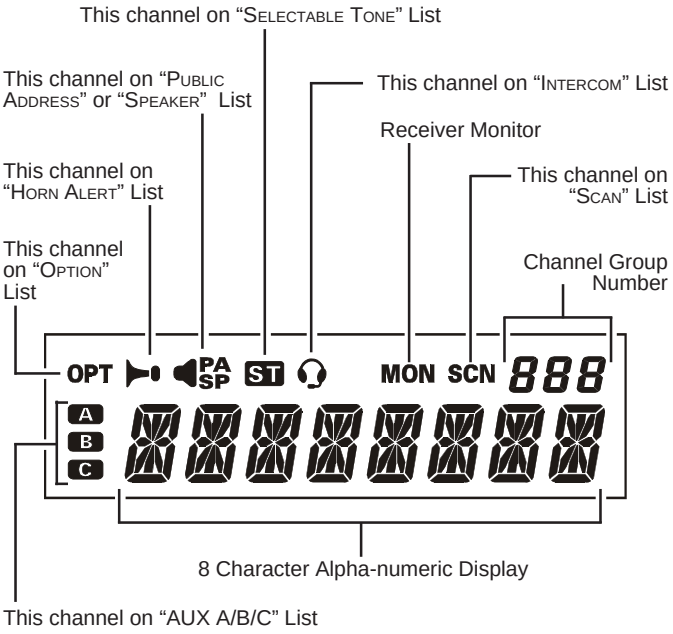


① POWER Button
Press the button to turn the transceiver ON and OFF.

② TX Indicator
This lamp glows red when the radio is transmitting.

③ BUSY Indicator
This lamp glows green when the channel is busy.

④ Liquid Crystal Display
The display include an 8-character alpha-numeric section showing channel and group names, status and identity information, and error messages. Additional indicators on the display show priority channel assignments and scan include / exclude selection.



⑤ ▲/▼ Button
Pressing these buttons changes the current group (and displayed group number or name). Holding this button for more than 1/2 second causes the function to repeat.

⑥ SQC Indicator
This lamp glows orange when incorrect position at the setting of CE49.

⑦ Programmable Function Button (PF button)
This button can be set up for special applications, such as high/low power selection, monitor, dimmer, talk-around, and call alert function, as determined by your network requirements and programmed by your VERTEX STANDARD dealer.

⑧ VOLUME Knob
This knob sets the volume of the receiver.

⑨ EMERGENCY Microphone
The emergency microphone is located behind this small slit. When the emergency feature is activated, this Microphone is enabled.

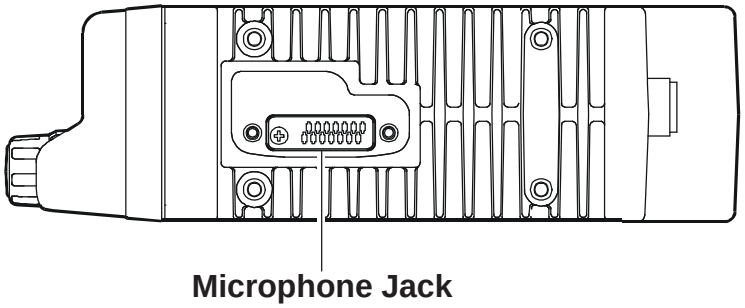
⑩ CHANNEL Selector Knob
This knob select the operating channel.

⑪ Programmable Function Button (PF button)
This button can be set up for special applications, such as high/low power selection, monitor, dimmer, talk-around, and call alert function, as determined by your network requirements and programmed by your VERTEX STANDARD dealer.

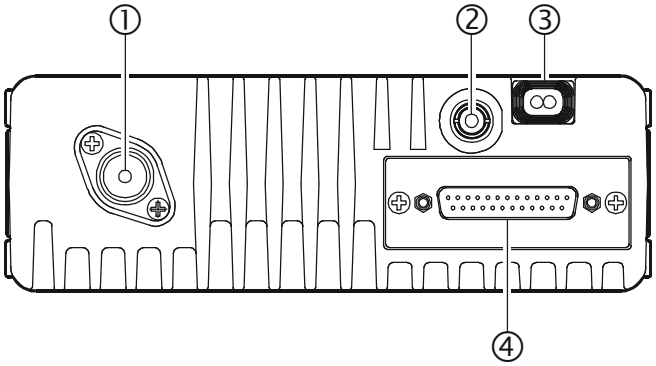
CONTROLS & CONNECTORS

Side Panel

Microphone Jack (It is on both sides.)
Connect the microphone plug to this jack.



***REAR** (Heatsink)*



① Antenna Socket
The 50-ohm coaxial feedline to the antenna must be connected here, using a type-M (PL-259) plug.

② External Speaker Jack
An external loudspeaker may be connected to this 2-contact, 3.5-mm mini-phone jack.
***Caution**: Do not connect this line to ground, and be certain that the speaker has adequate capability to handle the audio output from the VX-5500.*

③ 13.8-V DC Power Connector
The supplied DC power cable must be connected to this 4-pin connector. Use only the supplied fused cable, extended if necessary, for power connection.

④ DSUB 25-Pin Accessory Connector
External TX audio line input, PTT (Push To Talk), Squelch, and external RX audio line output signal may be obtained from this connector for use with accessories such as data transmission/reception modems, ets.

BASIC OPERATION OF THE TRANSCEIVER

***Important!** - Before turning on the radio the first time, confirm that the power connections have been made correctly and that a proper antenna is connected to the antenna jack.*

Switching Power ON/OFF

Push the **POWER** switch turn on the radio. The display will become illuminated. The radio will start up on the last channel used prior to shutdown during the previous operating session.

Turn the **CHANNEL** selector knob to choose the desired operating channel. A channel name will appear on the display. If you want to select the operating channel from a different Memory Channel Group, press the **UP** (▲) or **DOWN** (▼) button to select the Memory Channel Group you want before selecting the operating channel.

Setting the Volume

Turn the **VOLUME** knob clockwise to increase the volume, and counterclockwise to decrease it. If no signal is present, press and hold in the **MON** button more than 1/2 seconds; background noise will now be heard, and you may use this to set the **VOLUME** knob for the desired audio level. Press and hold the **MON** button more than 1/2 seconds to quiet the noise and resume normal (quiet) monitoring.

Transmitting

To transmit, wait until the "**BUSY**" indicator is off (the channel is not in use), and press the **PTT** (Push-To-Talk) switch on the side of the microphone (the "**TX**" indicator will appear or the "**TX**" indicator will glow red). While holding in the **PTT** switch, speak across the face of the microphone in a clear, normal voice level, and then release the **PTT** switch to receive.

Selecting Groups and Channels

- Press the **UP** (▲) or **DOWN** (▼) button (repeatedly, if necessary) to select a different group of channels.
- Turn the **CHANNEL** selector knob to select a different channel ***within the current group*.**

Automatic Time-Out Timer

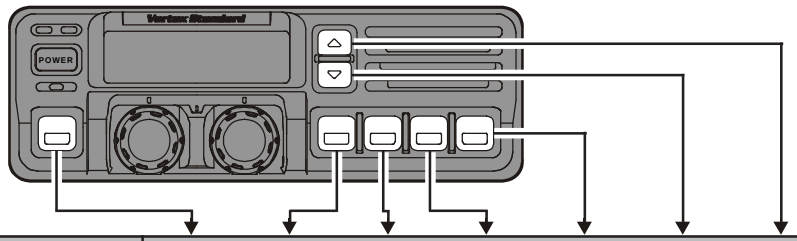
If the selected channel has been programmed for automatic time-out, you must limit the length of each transmission. While transmitting, a beep will sound five seconds before time-out. Another beep will sound just before the deadline; the "**TX**" indicator will disappear and transmission will cease soon thereafter. To resume transmitting, you must release the **PTT** and wait for the "penalty timer" to expire (if you press the **PTT** before this timer expires, the timer restarts, and you will have to wait another "penalty" period.)

ADVANCED OPERATION

Programmable Function Button (PF button)

The VX-5500 includes the seven **Programmable Function Buttons (PF button)**. The **PF** button functions can be customized, via programming by your VERTEX STANDARD dealer, to meet your communications/network requirements. Some features may require the purchase and installation of optional internal accessories. The possible **PF** button programming features are illustrated at the below, and their functions are explained on next page.

For further details, contact your VERTEX STANDARD dealer. For future reference, check the box next to each function that has been assigned to the **PF** button on your particular radio, and keep it handy.



Functions	Programmable Function Button (PF button)													
	<1.5 sec	>1.5 sec	<1.5 sec	>1.5 sec	<1.5 sec	>1.5 sec	<1.5 sec	>1.5 sec	<1.5 sec	>1.5 sec	<1.5 sec	>1.5 sec	<1.5 sec	>1.5 sec
None														
SCAN (SCN)														
Dual Watch														
Call/Reset														
Talk-Around (TA)														
Noise Blanker* (NB)														
Alpha Numeric (A/N)														
DIMMER (DIM)														
Emergency (EMG)														
Horn Alert (HA)														
Home Channel (HOM)														
Intercom (IC)														
Low Power (LOW)														
GRP UP														
GRP DWN														
CH UP														
CH DWN														
AUX A														
AUX B														
AUX C														
Public Address (PA)														
Monitor (MON)														
RCL														
Selectable Tone (ST)														
SP**														
Squelch Level (SQL)														
Compander														
Encryption*** (OPT)														

* for VX-5500L ** requires RMK-4000 *** requires Encryption Unit

ADVANCED OPERATION

Channel Scan

The Scanning feature is used to monitor multiple signals programmed into the transceiver. While scanning, the transceiver will check each channel for the presence of a signal, and will stop on a channel if a signal is present.

To activate scanning:

- ❍ Press the assigned **PF** button of the "**Scan**" momentarily to activate scanning.
- ❍ The scanner will search the channels, looking for active ones; it will pause each time it finds a channel on which someone is speaking.

To stop scanning

- ❍ Press the assigned **PF** button of the "**Scan**".
- ❍ Operation will revert to the channel to which the **CHANNEL** selector knob is set.

Note: Your dealer may have programmed your radio to stay on one of the following channels if you press the **PTT** switch during scanning pause:

- ❒ Current channel ("Talk Back")
- ❒ "Last Busy" channel
- ❒ "Priority" channel
- ❒ "Home" channel
- ❒ Scan Start" channel

Dual Watch

The Dual Watch feature is similar to the Scan feature, except that only two channels are monitored:

- ❒ The current operating channel; and
- ❒ The "Priority" channel.

To activate Dual Watch:

- ❍ Press the assigned **PF** button of the "**Dual Watch**".
- ❍ The scanner will search the two channels; it will pause each time it finds a channel on which someone is speaking.

To stop Dual Watch:

- ❍ Press the assigned **PF** button of the "**Dual Watch**".
- ❍ Operation will revert to the channel to which the **CHANNEL** selector knob is set.

ARTS (Auto Range Transpond System)

This system is designed to inform you when you and another ARTS-equipped station are within communication range.

During ARTS operation, your radio automatically transmits for about 1 second every 25 (or 55) seconds (the interval is programmed by Dealer) in an attempt to Shake hands with the other station. If you move out of range for more than one minutes, your radio senses that no signal has been received, a ringing beeper will sound. If you subsequently move back into range, as soon as the other station transmits, your beeper will sound.

The PF Button Function

The **PF** (Programmable Function) button can be programmed by the dealer to provide two of the other functions described below.

To activate the primary Accessory function, press the **PF** button momentarily. To access the secondary Accessory function (which may include the Alarm), press and hold the **PF** button for 1.5 seconds or longer.

Call/Reset

When this feature is programmed and a selective call has been received, momentarily press the assigned **PF** button of the "**Call/Reset**" to reset the flashing indicator and mute the receiver, otherwise press the assigned **PF** button of the "**Call/Reset**" to sent your radio's identification code (ANI) to the dispatcher.

Talk-Around

The feature causes the assigned **PF** button of the "**Talk-Around**" to select simplex operation on semi-duplex channels: the transmit frequency becomes the same as the receive frequency (regardless of any programmed offset for the channel).

Note: *This feature has no effect on simplex channels. After pressing the button,* "**-TAKARD-**" *is displayed on the LCD.*

Noise Blanker (for VX-5500L)

Because local noise can be particularly troublesome in the VHF Low-Band frequency spectrum, the Low-Band version of the VX-5500 includes a Noise Blanker feature, which may be toggled on and off by pressing the assigned **PF** button of the "**Noise Blanker**" for the appropriate lenght of time.

ADVANCED OPERATION

Alpha Numeric

Press the assigned **PF** button of the "**Alpha Numeric**" to switch the display between the Group/Channel number, and the Group/Channel name (alphanumeric). A tone will sound each time you switch between numerical and alphanumerical display.

DIM

Press the assigned **PF** button of the "**DIM**" to adjust the brightness of the display and key backright.

EMG (Emergency)

Press the assigned **PF** button of the "**EMG**" to initiate an emergency call (requires ANI board). When an emergency call is made, not tone is emitted and the display does not change. To end the emergency call, turn the transceiver power OFF.

HA (Horn Alert)

Press the assigned **PF** button of the "**HA**" to turn the Horn Alert function ON or OFF. If you receive a call from the base station with 2Tone or DTMF signaling, horn alert will activate.

When you turn Horn Alert ON, a tone will sound and " " appears on the display.

Home (Home Channel)

Press the assigned **PF** button of the "**Home**" to select the pre-programmed Home Channel. Press it again to return to the previous channel. If used while scanning, pressing this key a second time will change to the revert channel.

IC (Intercom)

This feature requires dual head configuration. Press the assigned **PF** button of the "**IC**" to turn the intercom feature ON or OFF. While ON, you can press the PTT switch to communicate to another control head operator without transmitting over the air. When you press this key, a tone sounds and "" appears on the display. The intercom can be used even while scanning and receiving a call.

Low Power

Press the assigned **PF** button of the "**Low Power**" to set the radio's transmitter to the "Low Power" mode.

Press this key again to return to "High Power" operation when in difficult terrain.

GRP UP/DWN

Press the assigned **PF** button of the "**GRP UP**" or "**GRP DWN**" to select a different group of channels.

CH UP/DWN

Press the assigned **PF** button of the "**CH UP**" or "**CH DWN**" to select a different channel within the current group.

AUX A/B/C

Press the assigned **PF** button of the "**AUX A**", "**AUX B**", or "**AUX C**" to turn the output port (respectively).

PA (Public Address)

Press the assigned **PF** button of the "**PA**" to use the transceiver as a PA amplifier. When you enable this function, a tone sounds and "PA" appears on the display. The public address can be used even while scanning and receiving a call.

MONI (Monitor)

Press the assigned **PF** button of the "**MONI**" momentarily to cancel CTCSS and DCS signaling squelch; the "**MON**" icon appears on the display. Press and hold this key for 1/2 seconds to hear background noise (unmute the audio); the **MON** icon blinks on the display.

RCL (Channel Recall)

During scan, you can press the assigned **PF** button of the "**RCL**" to select the last called channel.

ST (Selectable Tone)

Press the assigned **PF** button of the "**Selectable Tone**", then rotate the CHANNEL selector knob to select a 2-Tone.

SP

Press the assigned **PF** button of the "**SP**" to switch "Front panel", "Front panel & Body" and "Body" speaker. When "Body" is selected, a tone sounds and the "SP" icon appears on the display. You can use this function while scanning and receiving a call. However, all audio will be emitted from the PA speaker.

SQL (Squelch Level)

You can manually adjust the squelch level using this function:

1. Press the assigned **PF** button of the "**SQL**". A tone sounds and SQL appears on the display with the current squelch level.
2. Rotate the **CHANNEL** selector knob to select the desired level.
3. Press the this key. A tone sounds and the display returns to the normal channel.

COMP (Compander)

Press the **PF** button assigned to the "**COMP**" function to turn the "Compander" IC ON or OFF. This IC contains two variable gain circuits configured for compressing and expanding the dynamic range of the radio's transmitted audio signal.

When you enable this function, the signal-to-noise radio can be improved by reducing the transmitted audio dynamic range.

Encryption (Option)

When the Voice Scrambler feature is enabled, pressing the assigned **PF** button of the "**Encryption**" toggles the Scrambler on and off.

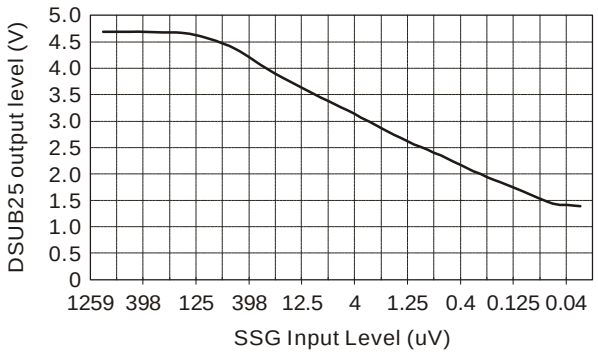
OPTIONAL ACCESSORIES

MH-53$_{C7A}$	Heavy Duty Microphone
MH-53$_{A7A}$	Heavy Duty Microphone w/Noise Canceler
MH-53$_{B7A}$	Heavy Duty DTMF Microphone w/Noise Canceler
CT-72	Radio to Radio Programming Cable
CT-93	Cable for RMK-4000 (33 ft,10 m)
CT-81	Cable for RMK-4000 (20 ft, 6 m)
CT-82	Cable for RMK-4000 (8 ft, 2.5 m)
CT-83	Cable for RMK-4000 (2 ft, 0.6 m)
CNT-6000	Control Head
RF DECK	RF Deck w/MMB-75 (for Dual Band Installations)
RMK-4000H	Remote Kit (for Head)
RMK-4000B	Remote Kit (for RF Deck)
BSC-5000	Base Station Console
VCS-5000	Channel Selector
F2D-8	2-Tone Decode Unit (Requires FIF-7A)
F5D-14	5-Tone ENC-DEC Unit (Requires FIF-7A)
FVP-25	Band inversion scrambler/DTMF paging Unit (Requires FIF-7A)
FVP-35	Encryption Unit (Rolling code voice scrambler; Requires FIF-7A)
FVP-36	Encryption Unit (Voice Inversion Type scrambler; Requires FIF-7A)
VME-100	MDC1200®/GE-STAR® ANI Encoder Unit (Requires FIF-7A)
FP-1023A	External 23A Power Supply
FP-1030A	External 25A Power Supply
MLS-200	Mobile Loud speaker (15 W Peak Power)
MLS-100	Mobile Loud speaker (12 W Peak Power)
MMB-75	Mobile Mounting Bracket
MMB-76	Locking Mobile Mounting Bracket
FIF-7A	Inter face Board (for F2D-8, F5D-14, FVP-25, FVP-36)
CN-6	Inter face Board (for Accessories)
LF-1	Line Filter
CE49	Programming Software
FIF-10A	USB Programming Interface
CT-105	Radio Programming Cable (for FIF-10A)
CT-29+CT-70	Radio Programming Cable (for VPL-1)

DSUB 25-PIN ACCESSORY CONNECTOR

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:

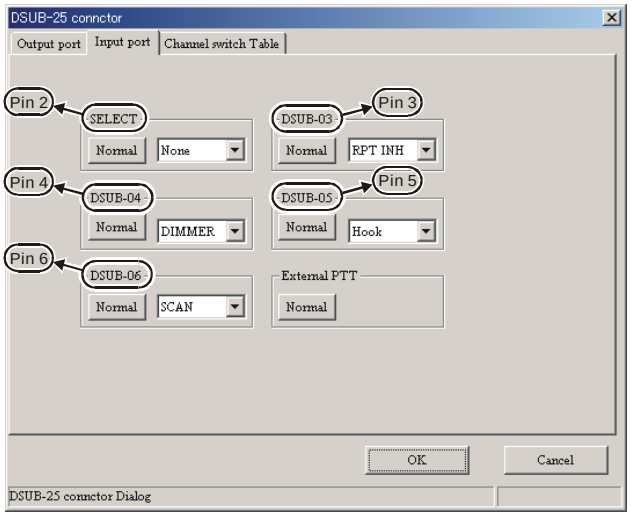


Pin 2, 3, 4, 5 & 6: SELECT, DSUB 03, DSUB 04, DSUB 05 & DSUB 06

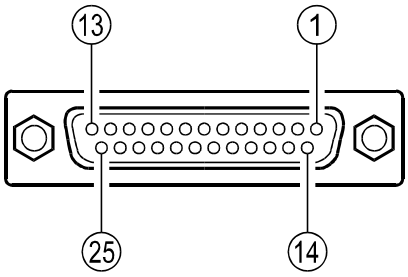
[Digital Input Port]

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)

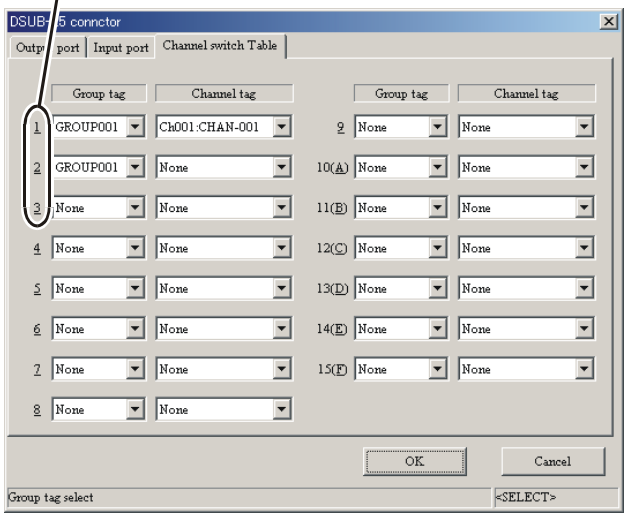
CH SW2 Memory channel recall (Channel Switch Table bit 2)

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



DSUB 25-PIN ACCESSORY CONNECTOR

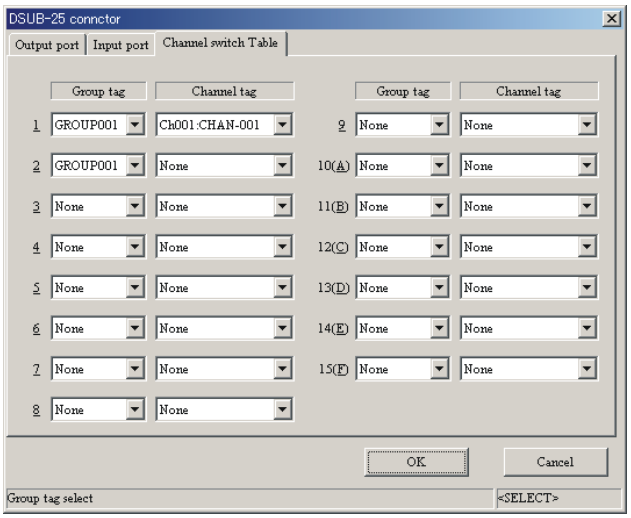
Similarly, if you assign "CH SW0," "CH SW1," and "CH SW2" to the Universal Input Port, you can recall Channels 1~7 as shown below:

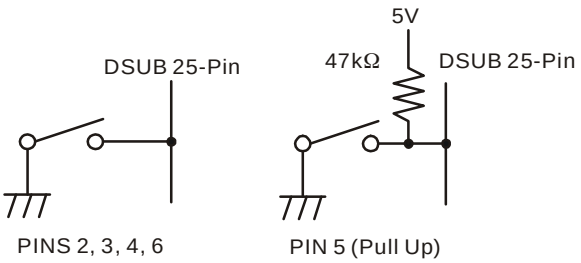
Channel	CH SW0	CH SW1	CH SW2
1	1	0	0
2	0	1	0
3	1	1	0
4	0	0	1
5	1	0	1
6	0	1	1
7	1	1	1

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."

DSUB 25-PIN ACCESSORY CONNECTOR

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 JP2002, 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.

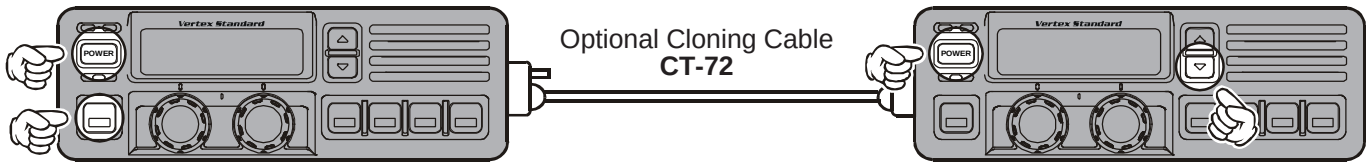
Operating Manual Reprint

Note:

The **VX-5500** includes a convenient "Clone" feature, which allows the programming data from one transceiver to be transferred to another **VX-5500**. 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 **Microphone** jack on the transceiver. Do this for both transceivers.
3. Connect the optional **CT-72** cloning cable between the **Microphone** 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.



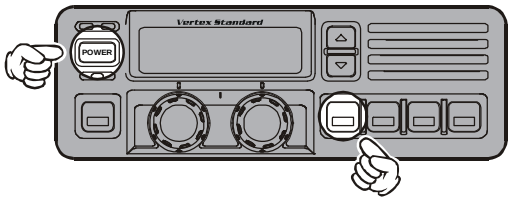
Destination *source*

DealerProgramming 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-5500**'s **VTP-50** and **F5D-14** board, you will need the **CT-71** programming interface cable, the **CE-26** 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**).



Specifications

GENERAL

Frequency Range:	29.7 - 37 MHz (Version A)
	37 - 50 MHz (Version B)
Number of Channels:	250 channels
Channel Spacing:	20 kHz
PLL Steps:	5 / 6.25 kHz
Power Supply Voltage:	13.6 VDC ±15 %
Current Consumption:	Standby: 600 mA
	Receive: 2.2 A
	Transmit: 15 A
Operating Temperature Range:	–22 °F to +140 °F (–30 °C to +60 °C)
Frequency Stability:	±5 ppm
RF Input-Output Impedance:	50 Ohms
Audio Output Impedance:	4 Ohms
Dimensions (W x H x D):	7″ x 2.4″ x 7.7″ (178 x 60 x 195 mm)
Weight (Approx.):	4.9 lbs. (2.2 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 dB
Intermodulation:	80 dB
Spurious and Image Rejection:	90 dB
Audio Output:	5 W @ 4 Ohms w/3 % THD (Internal)
	10 W @ 4 Ohms w/3 % THD (External)

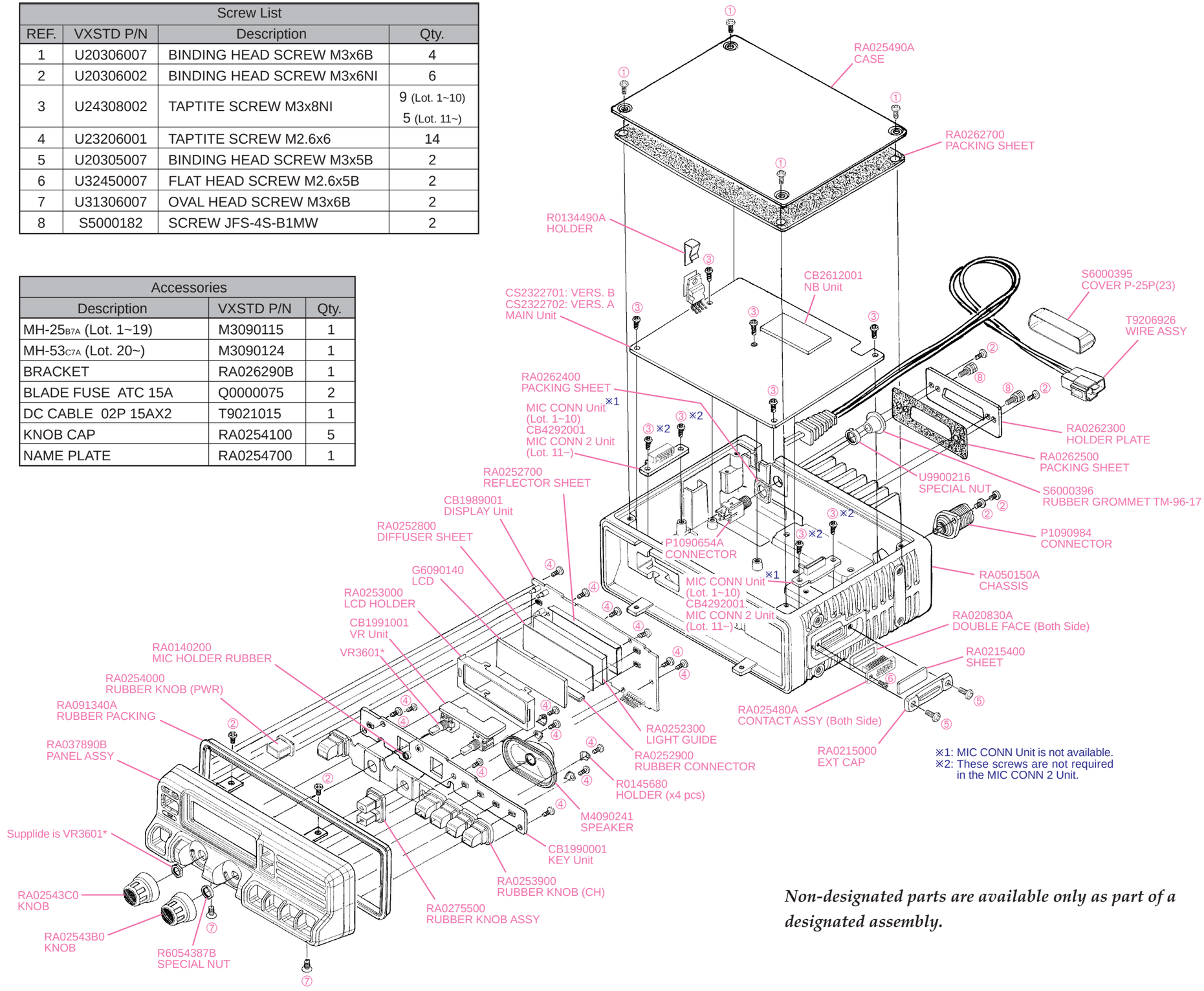
TRANSMITTER (Measurements made per EIA standard TIA/EIA-603)

Power Output:	70 W Adjustable to 30 W
Modulation:	16K0F3E
Maximum Deviation:	± 5 kHz
Conducted Spurious Emissions:	80 dB Below Carrier
Audio Distortion (@ 1 kHz):	< 2 %
Microphone impedance:	600 ohms

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

Screw List			
REF.	VXSTD P/N	Description	Qty.
1	U20306007	BINDING HEAD SCREW M3x6B	4
2	U20306002	BINDING HEAD SCREW M3x6NI	6
3	U24308002	TAPTITE SCREW M3x8NI	9 (Lot. 1~10) 5 (Lot. 11~)
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	S5000182	SCREW JFS-4S-B1MW	2

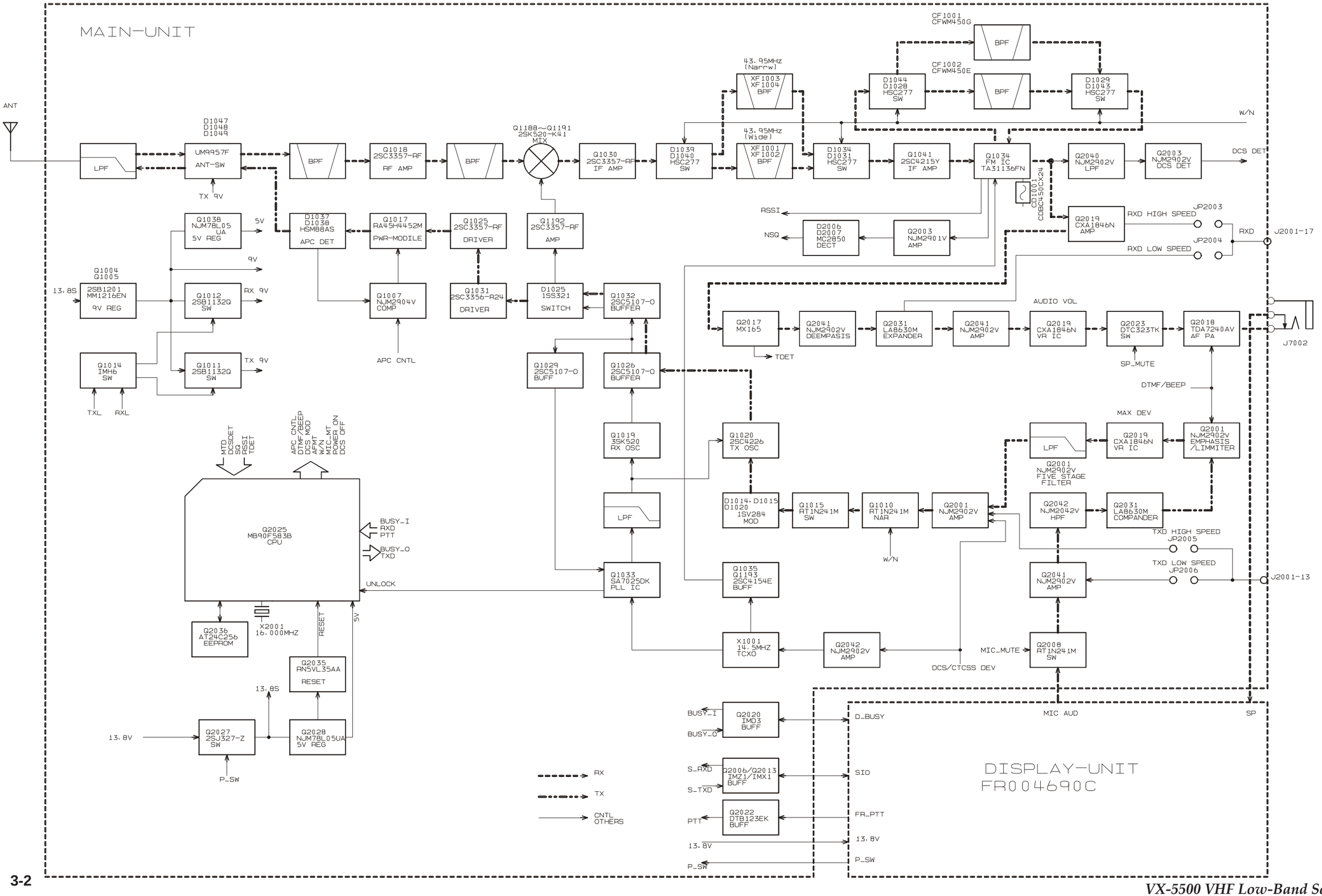
Accessories		
Description	VXSTD P/N	Qty.
MH-25$_{B7A}$ (Lot. 1~19)	M3090115	1
MH-53$_{C7A}$ (Lot. 20~)	M3090124	1
BRACKET	RA026290B	1
BLADE FUSE ATC 15A	Q0000075	2
DC CABLE 02P 15AX2	T9021015	1
KNOB CAP	RA0254100	5
NAME PLATE	RA0254700	1

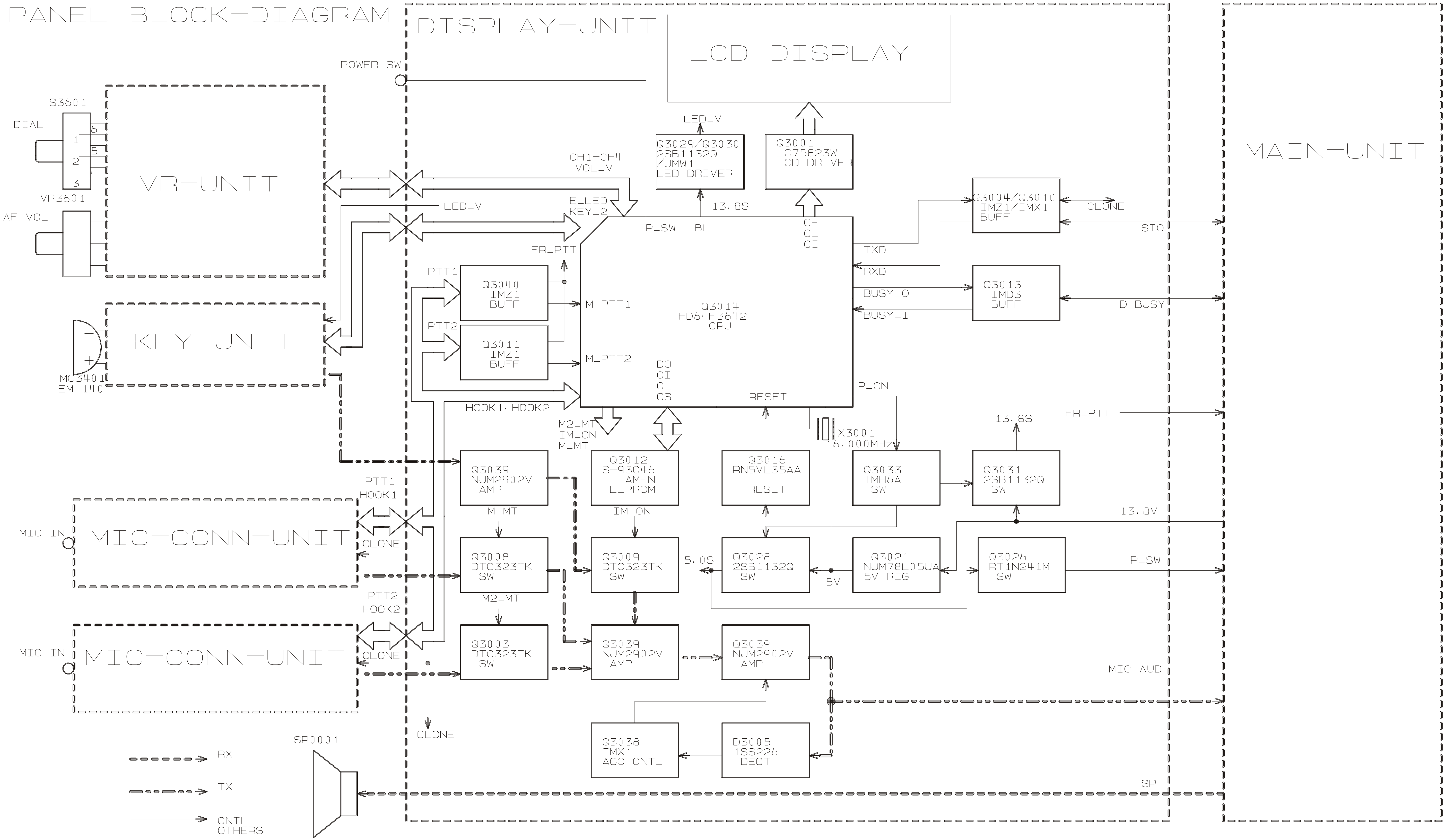


※1: MIC CONN Unit is not available.
※2: These screws are not required in the MIC CONN 2 Unit.

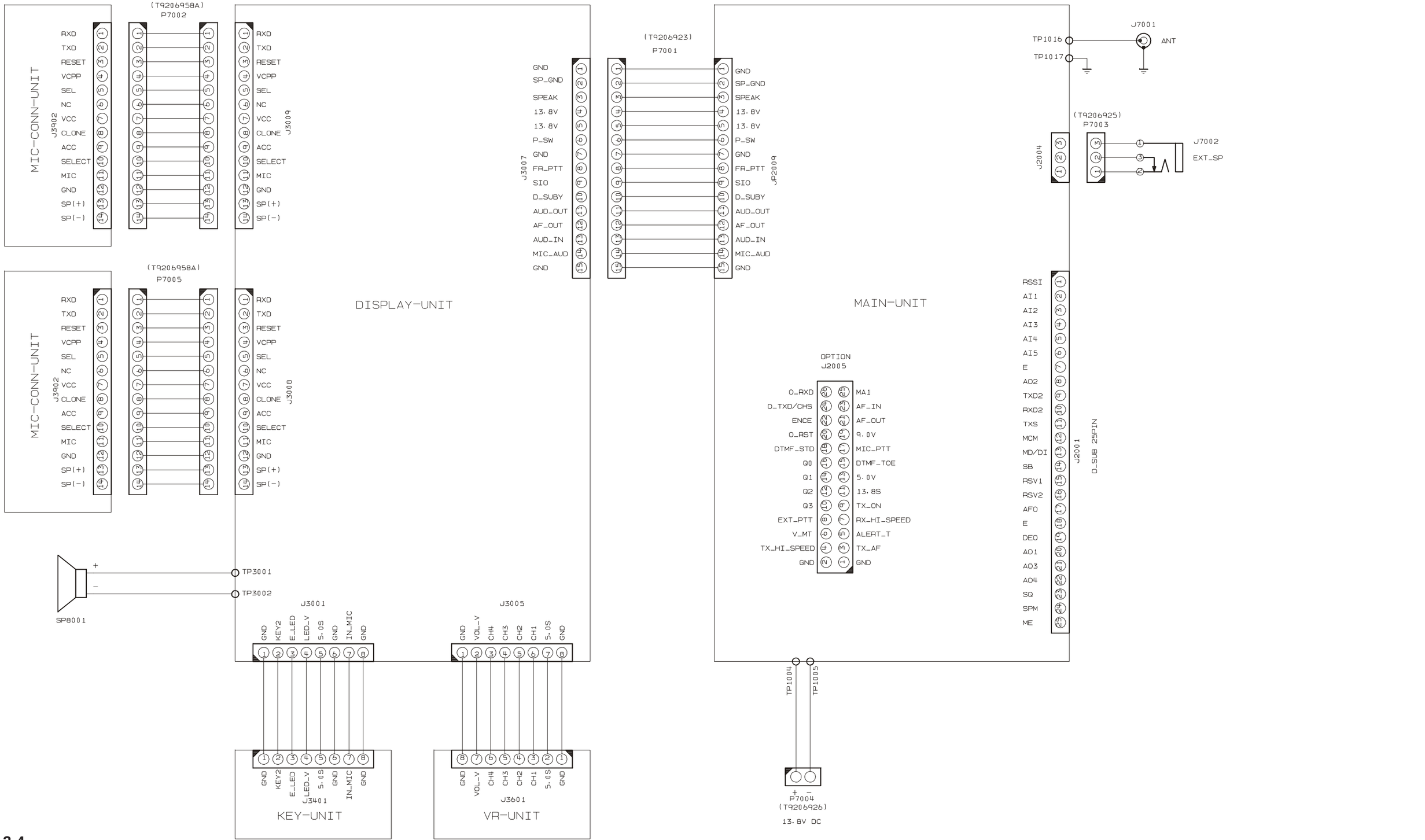
Non-designated parts are available only as part of a designated assembly.

Block Diagram




PANEL BLOCK-DIAGRAM
DISPLAY-UNIT
LCD DISPLAY
MAIN-UNIT
POWER SW
S3601
DIAL
VR3601
AF VOL
VR-UNIT
KEY-UNIT
MC3401
EM-140
MIC IN
MIC-CONN-UNIT
MIC IN
MIC-CONN-UNIT
PTT1
HOOK1
CLONE
PTT2
HOOK2
CLONE
CLONE
SP0001
RX
TX
CNTL
OTHERS
CH1-CH4
VOL_V
LED_V
E_LED
KEY_2
FR_PTT
PTT1
PTT2
Q3040
IMZ1
BUFF
Q3011
IMZ1
BUFF
HOOK1, HOOK2
M_PTT1
M_PTT2
LED_V
Q3029/Q3030
2SB1132Q
/UMW1
LED DRIVER
13.8S
Q3001
LC75823W
LCD DRIVER
P_SW
BL
CE
CL
CI
Q3014
HD64F3642
CPU
DO
CI
CL
CS
RESET
TXD
RXD
BUSY_O
BUSY_I
P_ON
Q3004/Q3010
IMZ1/IMX1
BUFF
CLONE
SIO
Q3013
IMD3
BUFF
D_BUSY
13.8S
FR_PTT
M2_MT
IM_ON
M_MT
X3001
16.000MHz
Q3039
NJM2902V
AMP
Q3012
S-93C46
AMFN
EEPROM
Q3016
RN5VL35AA
RESET
Q3033
IMH6A
SW
Q3031
2SB1132Q
SW
13.8V
M_MT
IM_ON
Q3008
DTC323TK
SW
Q3009
DTC323TK
SW
5.0S
Q3028
2SB1132Q
SW
5V
Q3021
NJM78L05UA
5V REG
Q3026
RT1N241M
SW
P_SW
M2_MT
Q3003
DTC323TK
SW
Q3039
NJM2902V
AMP
Q3039
NJM2902V
AMP
MIC_AUD
Q3038
IMX1
AGC CNTL
D3005
1SS226
DECT
SP

Interconnection Diagram



REF.	DESCRIPTION	VALUE	V/W	TOL.	MFR'S DESIG	VXSTD P/N	VERS.	LOT.	SIDE	LAY ADR
					Printed Circuit Board with Components					
	MAIN UNIT					CS2322701	Version B			
						CS2322702	Version A			
	DISPLAY UNIT					CB1989001				
	KEY UNIT					CB1990001				
	VR UNIT					CB1991001				
	NB UNIT					CB2612001				
	MIC CONN UNIT					Not available	(Lot. 1 ~ 10)			
	MIC CONN 2 UNIT					CB4292001	(Lot. 11 ~)			
					Mechanical Parts					
	PANEL ASSY					RA037890B				
	CHASSIS					RA050150A				
	CASE					RA025490A				
	RUBBER KNOB ASSY					RA0275500				
	RUBBER KNOB				CH	RA0253900				
	RUBBER KNOB				PWR	RA0254000				
	KNOB				CHANNEL	RA2543B0				
	KNOB				VOLUME	RA2543C0				
	COVER				P-25P(23)	S60000395				
	RUBBER GROMMET				TM-96-17	S60000396				
	RUBBER PACKING					RA091340A				
	HOLDER PLATE					RA0262300				
	PACKING SHEET					RA0262400				
	PACKING SHEET					RA0262500				
	PACKING SHEET					RA0262700				
	DOUBLE FACE	(x2 pcs)				RA020830A				
	HOLDER	(x4 pcs)				R0145680				
	SPECIAL NUT					R6054387B				
	SPECIAL NUT					U9900216				
					Electrical Parts					
	CONNECTOR				ANT	P1090984				
	CONNECTOR				EXT SP	P1090654A				
	SPEAKER	1.5 W, 8 Ω			A-S0005030-002	M4090241				
	WIRE ASSY				DC Cable	T9206926				
	CW ASSY				MAIN <---> DISPLAY	T9206923				
	CW ASSY	(x2 pcs)			DISPLAY <---> MIC CONN	T9206958A				
					Screws					
	BINDING HEAD SCREW	(x2 pcs)			M3x5B	U20305007				
	BINDING HEAD SCREW	(x6 pcs)			M3x6NI	U20306002				
	BINDING HEAD SCREW	(x4 pcs)			M3x6B	U20306007				
	TIPTITE SCREW	(x14 pcs)			M2.6x6	U23206001				
	TIPTITE SCREW	(x5 or x9 pcs)			M3x8NI	U24308002				
	OVAL HEAD SCREW	(x2 pcs)			M3x6B	U31306007				
	FLAT HEAD SCREW	(x2 pcs)			M2.6x5B	U32450007				
	SCREW	(x2 pcs)			JFS-4S-B1MW	S5000182				

Parts List

REF.	DESCRIPTION	VALUE	V/W	TOL.	MFR'S DESIG	VXSTD P/N	VERS.	LOT.	SIDE	LAY ADR
					MAIN UNIT					
CD1001	CERAMIC DISC				CDBCB450KCAY24-R0	H7901340		1-	A	E3
CF1001	CERAMIC FILTER				CFWLB450KE2A-B0	H3900466		1-	A	E3
CO2001	CERAMIC OSC	1MHz			CSBFB1M00J2B021-R1	H7900950		1-	A	C4
F 2001	CHIP FUSE	0.25A			KAB2402-251NA31010	Q0000085		1-	A	A2
J 1003	CONNECTOR				9210B-1-03Z172-T	P0091282		1-	A	D2
J 1004	CONNECTOR				9210B-1-04Z172-T	P0091283		1-	A	E2
J 2001	CONNECTOR				JBY-25S-1A3F(LF)(SN)	P1090815		1-	B	f1
J 2004	CONNECTOR				BM03B-SRSS-TBT(LF)(SN)	P0091301		1-	A	A2
J 2005	CONNECTOR				AXN426C530P	P0091296		1-	A	B4
Q 1001	TRANSISTOR				2SC2879A	G3328790A	A	1-	A	F3
Q 1001	TRANSISTOR				SD1487	G3090149	B	1-	A	F3
TC1001	TRIMMER CAP.	20pF			TZB4R200AA10R00	K91000217		1-	A	E4
TH1001	THERMISTOR				ERTJ1VR103J	G9090118		1-	A	E5
TH1002	THERMISTOR				ERTJ1VR103J	G9090118		1-	A	E5
TH2001	THERMISTOR				ERTJ1VV104J	G9090194		1-	B	b1
X 1001	XTAL UM-5	17.25MHz			17.25MHZ	H0103432		1-	A	F5
X 2001	XTAL 92SMX(CN)	16MHz			16.000MHZ	H0103322		1-	A	A4
XF1001	XTAL FILTER	17.7MHz			UM-5-3P 17T12B5(IM)	H1102422		1-	A	D3
XF1002	XTAL FILTER	17.7MHz			UM-5-3P 17T12B5(IM)	H1102422		1-	A	E3
	SHIELD CASE					RA0446100	B	1-		
	SHIELD CASE					RA0525600		1-		
	SHIELD PLATE					RA0373700		1-		
	LEAF SPRING	(x7 pcs)				R0140031		1-		
	LEAF SPRING					R0140031	A	1-		
					DISPLAY UNIT					
DS3002	LCD				M762-1	G6090140A		1-	A	D1
J 3001	CONNECTOR				9210B-1-08Z696-T	P0091300		1-	A	F3
J 3005	CONNECTOR				9210B-1-08Z707-T	P0091304		1-	A	C2
J 3007	CONNECTOR				SB20-15WS	P0091093		1-	B	f2
J 3008	CONNECTOR				BM14B-SRSS-TBT(LF)(SN)	P0091302		1-	B	a1
J 3009	CONNECTOR				BM14B-SRSS-TBT(LF)(SN)	P0091302		1-	B	f2
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
	LIGHT GUIDE					RA0252300		1-		
	REFLECTOR SHEET					RA0252700		1-		
	DIFFUSER SHEET					RA0252800		1-		
	RUBBER CONNECTOR					RA0252900		1-		
	LCD HOLDER					RA0253000		1-		
	LED SPACER				LH-5-6	S6000239		1-		
	LIGHT SHEET					RA0276500		1-		
					KEY UNIT					
J 3401	CONNECTOR				9110S-08	P1091014		1-		
MC3401	MIC. ELEMENT				EM240T	M3290066		1-		
S 3401	TACT SWITCH				SKQDAB	N5090058		1-		
S 3402	TACT SWITCH				SKQDAB	N5090058		1-		
S 3403	TACT SWITCH				SKQDAB	N5090058		1-		
S 3404	TACT SWITCH				SKQDAB	N5090058		1-		
S 3405	TACT SWITCH				SKQDAB	N5090058		1-		
					VR UNIT					
J 3601	CONNECTOR				9110S-08L	P1091104		1-		
S 3601	ROTARY SWITCH				SRZW0L010K	N0190177		1-		
VR3601	POT.				RK09L1120 L=15 10KC	J60800258		1-		
					MIC CONN 2 UNIT					
J 3952	CONNECTOR				SM14B-SRSS-TB(LF)(SN)	P0091497		11-		

Reception and transmission are switched by "RX" and "TX" lines from the microprocessor unit (MPU).

Signal Path Overview

The receiver uses double-conversion superheterodyne circuitry, with a 17.7 MHz 1st IF and 450 kHz 2nd IF. The 1st LO, produced by a PLL synthesizer, yields the 17.7 MHz 1st IF.

The 2nd LO uses a 17.25 MHz (17.7 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. During transmit, the PLL synthesizer oscillates at the desired frequency directly, for amplification to obtain RF power output. During transmit, voice modulation and CTCSS (or DCS) modulation are applied to this synthesizer. Transceiver functions, such as Tx/Rx control, PLL synthesizer settings, and channel programming, are controlled using the MPU.

Receiver

Incoming RF signals from the antenna connector are delivered to the MAIN Unit, and pass through a low-pass filter (LPF) antenna switching network consisting of coils L1011, L1012, L1014, and L1001, capacitors C1024, C1029, C1030, C1034, and C1002, and antenna switching diodes D1032, D1033, and D1034 for delivery to the receiver front end.

Signals within the frequency range of the transceiver are then passed through a varactor-tuned band-pass filter consisting of T1001 and T1002 before RF amplification by Q1006 (**GN010100R**).

The amplified RF is then band-pass filtered again by varactor-tuned resonators T1003 and T1004 to ensure pure in-band input to 1st mixer Q1040 (**SPM5001**).

Buffered output from the VCO Unit is amplified by Q1027 (**2SC5415E**) and low-pass filtered by L1020, L1023 and C1161, C1152, C1143, C1245, to provide a pure 1st local signal between 47.4 and 67.7 MHz to the 1st mixer.

The 17.7 MHz 1st mixer product then passes through dual monolithic crystal filters XF1001 and XF1002 (7.5 kHz BW), and is amplified by Q1035 (**2SC4215Y**) 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 gates.

The 2nd LO in the IF-IC is produced from crystal X1001 (17.25 MHz), and the 1st IF is converted to 450 kHz by the 2nd mixer and stripped of unwanted components by ceramic filter CF1001. After passing through a limiter amplifier, the signal is demodulated by the FM detector.

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

PLL Synthesizer

The 1st LO maintains stability from the PLL synthesizer by using a 17.250 MHz reference signal from crystal X1001. PLL synthesizer IC Q1029 1 (**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 17.250 MHz reference signal by 690 using the reference counter (25.0 kHz comparison frequency). The phase detector comparison frequency is configured to be eight times the channel spacing (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 input of 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 Q1015 (for RX High Band) or Q1042 (for RX Low Band) (**2SK508**) and D1016, D1017 (**HVU306A** x 2) (for RX High Band) or D1038, D1039 (**HVU306A** x 2) (for RX Low Band), and oscillates between 47.4 MHz and 67.7 MHz according to the programmed receiving frequency. And the TX-VCO is composed of Q1016 (**2SC4226-R24**) and D1012, D1013, D1014, D1015 (**HVU300A** x 4), and oscillates between 29.700 MHz and 50.000 MHz according to the programmed transmit frequency. The VCO output passes through buffer amplifier Q1021 (**2SC5107-O**), and a portion is fed to the buffer amplifier Q1023 (**2SC4081**: Type A, **2SC4215Y**: Type B) of the PLL IC, and at the same time amplified by Q1027 (**2SC5415E**) to obtain stable output. The VCO DC supply is regulated by Q1007 (**2SC4154E**). Synthesizer output is fed to the 1st mixer by diode switch D1022 (**1SS321**) during receive, and to drive amplifier Q1004 (**2SK3074**) for transmit. The reference oscillator feeds the PLL synthesizer, and is composed of crystal X1001 (17.25 MHz), the temperature compensation circuit which includes D1028 (**DAN217U**), thermostats TH1001 and TH1002, and transmit (DCS) modulation circuit D1025, D1029 (**HVU300A** x 2).

Circuit Description

Transmitter

Voice audio from the microphone is delivered via the Mic (Jack) Unit to the MAIN Unit, after passing through amplifier Q3039, Q2041 (**NJM2902V**), a pre-emphasis network, a limiter (IDC: instantaneous deviation control) , and LPF Q2001 (**NJM2902V**); it then is adjusted for optimum deviation level, and delivered to the next stage.

Voice input from the microphone (and CTCSS, if activated) are modulated in the VCO of the synthesizer, while DCS audio is modulated in the reference frequency oscillator of the synthesizer.

Synthesizer output, after passing through diode switch D1022 (**1SS321**), is amplified by drivers Q1004 (**2SK3074**), Q1002 (**RD16HHF1**) and final transistor Q1001 (**2SC2879**: Type A, **SD1405**: Type B) to obtain full RF output. The RF energy then passes through antenna switch D1033, D1034 and a low-pass filter circuit and finally to the antenna connector.

RF output power from the final amplifier is sampled by D1036 and D1037 (**MA729** x 2). The resulting DC is fed through Automatic Power Controller Q1038 (**NJM2902V**) to the transmitter RF amplifier, allowing control of the power output.

Generation of spurious products in 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 L1017, L1011, L1012 and C1102, C1088, C1034, C1030, C1029, and C1024, resulting in more than 60dB 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 Q2110.

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 (**MX165CDW**).

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 Q2036 (**AT24C256-10TI2.7**) retains TX and RX data for all memory channels and CTCSS data, DCS data, prescaler dividing, and REF oscillator data (internal/external).

The VX-5500L 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, 15A
- ❒ 50-ohm non-reactive Dummy Load: 100 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)
- ❒ AF Dummy Load: 4 ohms, 20W
- ❒ Oscilloscope
- ❒ Spectrum Analyzer
- ❒ IBM® PC-compatible computer
- ❒ VERTEX STANDARD SVC49 channel programming editor and CT-88 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.

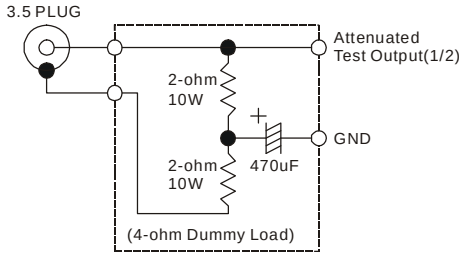
Alignment

Before beginning, connect the transceiver and PC using the CT-88 programming cable, and 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).

Caution: Do not connect the audio output line to ground, and be certain that the speaker has adequate capability to handle the audio output from the radio.
Because of the bridge audio amplifier circuit used in the radio, it is necessary to construct and use a simple audio load test adapter as shown in the schematic diagram below, when conducting receiver alignment steps.



AF Test Adapter Schematic

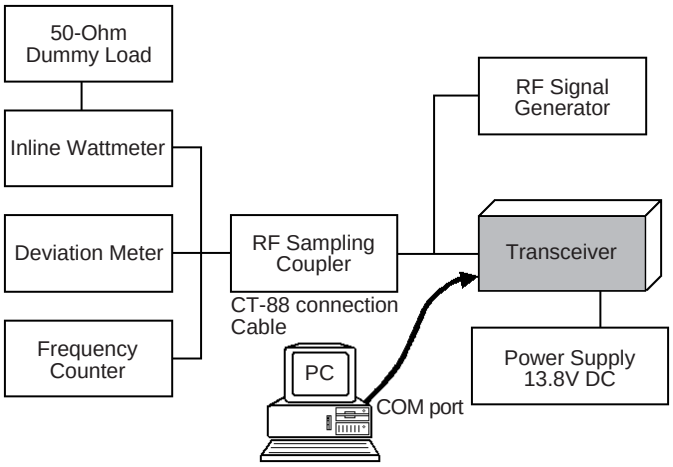
Alignment Channel Frequencies

Channel	Frequency (Simplex)		CTCSS Encode	DCS Encode
	Version "A"	Version "B"		
CH 1	29.70 MHz	37.00 MHz	None	None
CH 2	33.34 MHz	43.49 MHz	None	None
CH 3	33.35 MHz	43.50 MHz	None	None
CH 4	33.35 MHz	43.50 MHz	151.4 Hz	None
CH 5	33.35 MHz	43.50 MHz	None	023

PLL & Transmitter

Set up the test equipment as shown for transmitter alignment.

Maintain the supply voltage at 13.8 V DC for all steps.



PLL VCV

- ❒ Connect the positive lead of the DC voltmeter to test point **TP1010** (VCV) on the Main Unit, as indicated in the figure, and connect the negative lead to chassis ground.
- ❒ Set the transceiver to the high band edge frequency channel (CH4), then key the transmitter, and adjust **T1006** on the Main Unit for 7.0 V ±0.1 V on the voltmeter.
- ❒ Adjust **T1005** on the Main Unit for 7.0 V ±0.1 V on the voltmeter.
- ❒ Select the band center frequency channel (CH2) and Adjust **T1011** on the Main Unit for 7.0 V ±0.1 V on the voltmeter.
- ❒ Next select to the low band edge frequency channel (CH1) and confirm the VCV is 3.1 V ±0.3 V on the voltmeter.
- ❒ Select the band center frequency channel (CH3) and confirm the VCV is 3.75 V ±0.3 V on the voltmeter.
- ❒ Select the low band edge frequency channel (CH3), than Key the transmitter, and confirm the VCV is 1.7 V ±0.3 V on the voltmeter.

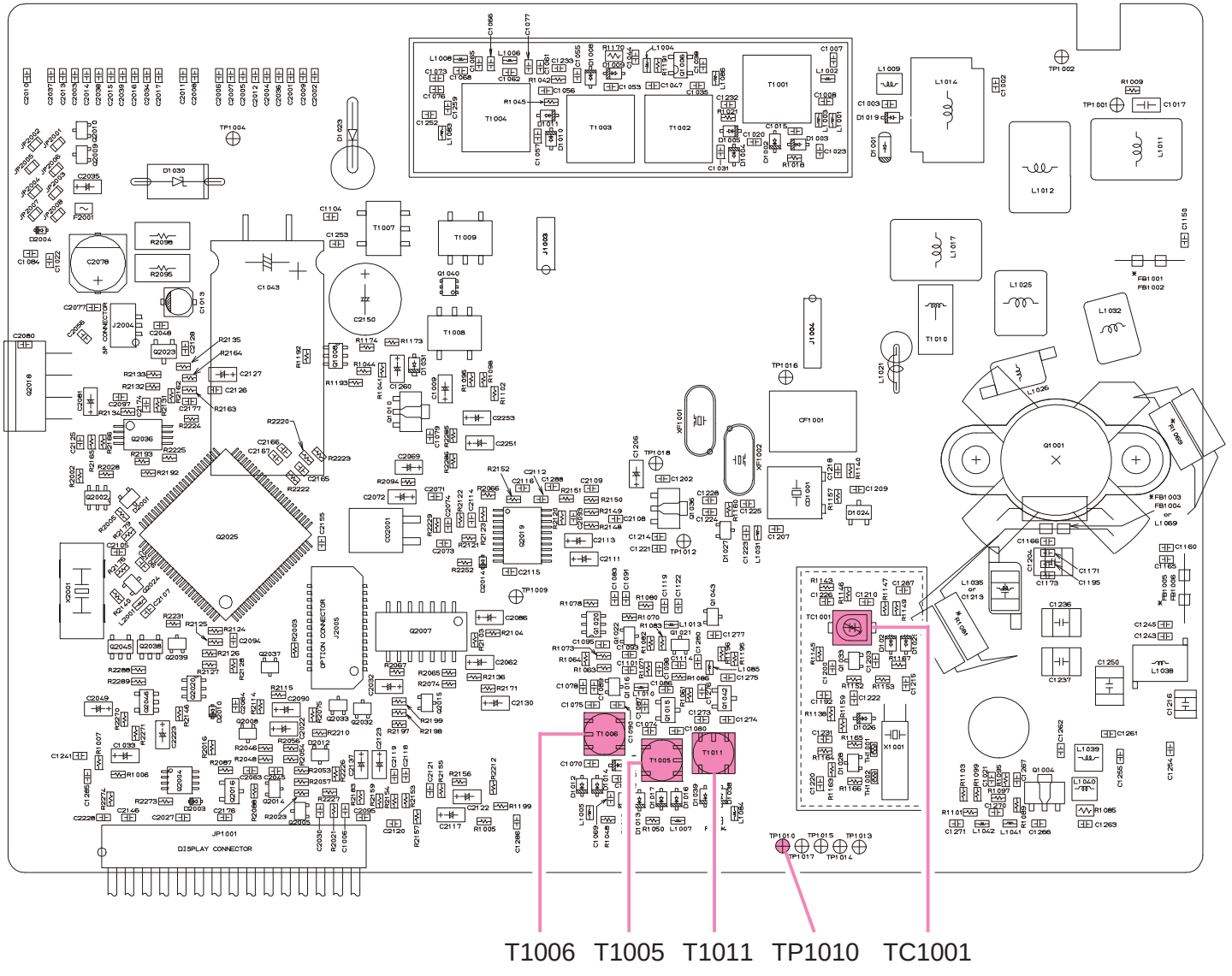
PLL Reference Frequency

- ❒ With the wattmeter, dummy load and frequency counter connected to the antenna jack.
- ❒ Select the high band edge frequency channel (CH4), and select the "low" power output level.
- ❒ key the transmitter and adjust **TC1001** on the Main Unit, if necessary, so the counter frequency is within 100 Hz of the channel center frequency for the transceiver version.

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 high band edge frequency channel (CH4), and select the "high" power output level. Key the transmitter and adjust "TX PWR Hi" for a power output of 70 Watts (± 2.0 W) as indicated on the wattmeter.
- ❒ Select the band center frequency channel (CH3), and select the "high" power output level. Key the transmitter and adjust "TX PWR Hi" for a power output of 70 Watts (± 2.0 W) as indicated on the wattmeter.
- ❒ Select the low band edge frequency channel (CH1), and select the "high" power output level. Key the transmitter and adjust "TX PWR Hi" for a power output of 70 Watts (± 2.0 W) as indicated on the wattmeter.
- ❒ Select the band center frequency channel (CH3), and select the "low" power output level. Key the transmitter and adjust "TX PWR L3" for a power level of 30 Watts (± 1.0 W) as indicated on the wattmeter.



Alignment

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 (CH4), and select the "low" power output level.
❒ Adjust the AF generator for 50 mV (–30 dBm) output at 1 kHz, as applied to the microphone jack.
❒ Key the transmitter and adjust "MAX Dev" for maximum deviation of 4.2 kHz ± 0.2 kHz as indicated on the deviation meter.

CTCSS Modulation Level

❒ Select the "low" power output level.
❒ Select the band center frequency channel (CH5), with 151.4 Hz CTCSS encode, and reduce the AF generator injection to zero.
❒ Key the transmitter and adjust "CTCSS Dev" for CTCSS deviation of 0.7 kHz ± 0.1 kHz as indicated on the deviation meter.

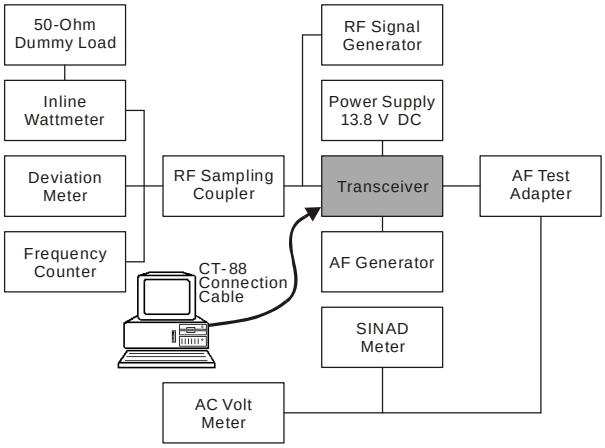
DCS Modulation Level

❒ Select the "low" power output level.
❒ Select the band center frequency channel (CH6), with 023 DCS code, and reduce the AF generator injection to zero.
❒ Key the transmitter and adjust "DCS Dev" for DCS deviation of 0.7 kHz ± 0.1 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, and install the audio test adapter.



❒ With the transceiver set to the low band edge frequency channel (CH1), and with the RF signal generator tuned to the same frequency, set the generator for ±3.0 kHz deviation with 1 kHz tone modulation at the antenna jack.
❒ Adjust T1001 ~ T1004 on the Main Unit for optimum SINAD, reducing signal generator output level as necessary for proper meter deflection.
❒ Select to the band center frequency channel (CH3), and the final signal generator level should be less than –6.0 dBµ for 12dB SINAD.
❒ Select to the high band edge frequency channel (CH4), and the final signal generator level should be less than –6.0 dBµ for 12dB SINAD.
❒ Select to the low band edge frequency channel (CH1), and the final signal generator level should be less than –5.0 dBµ for 12dB SINAD.

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

❒ Select the band center frequency channel (CH3), 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 12.0 dBμ at the antenna jack.

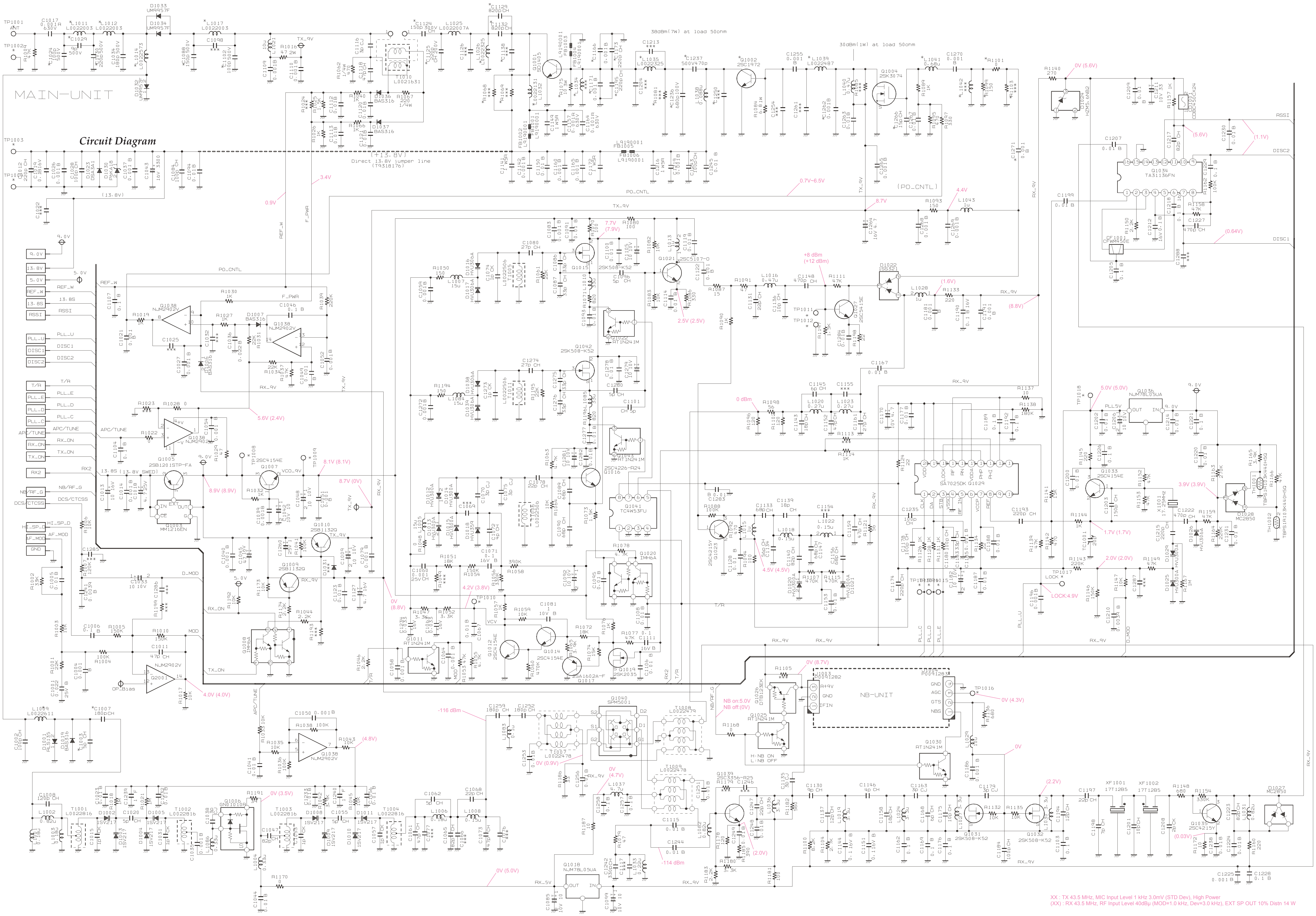
Threshold NSQ LEVEL

❒ Select the band center frequency channel (CH3), 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

❒ Select the band center frequency channel (CH3), 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 3 dBμ at the antenna jack.

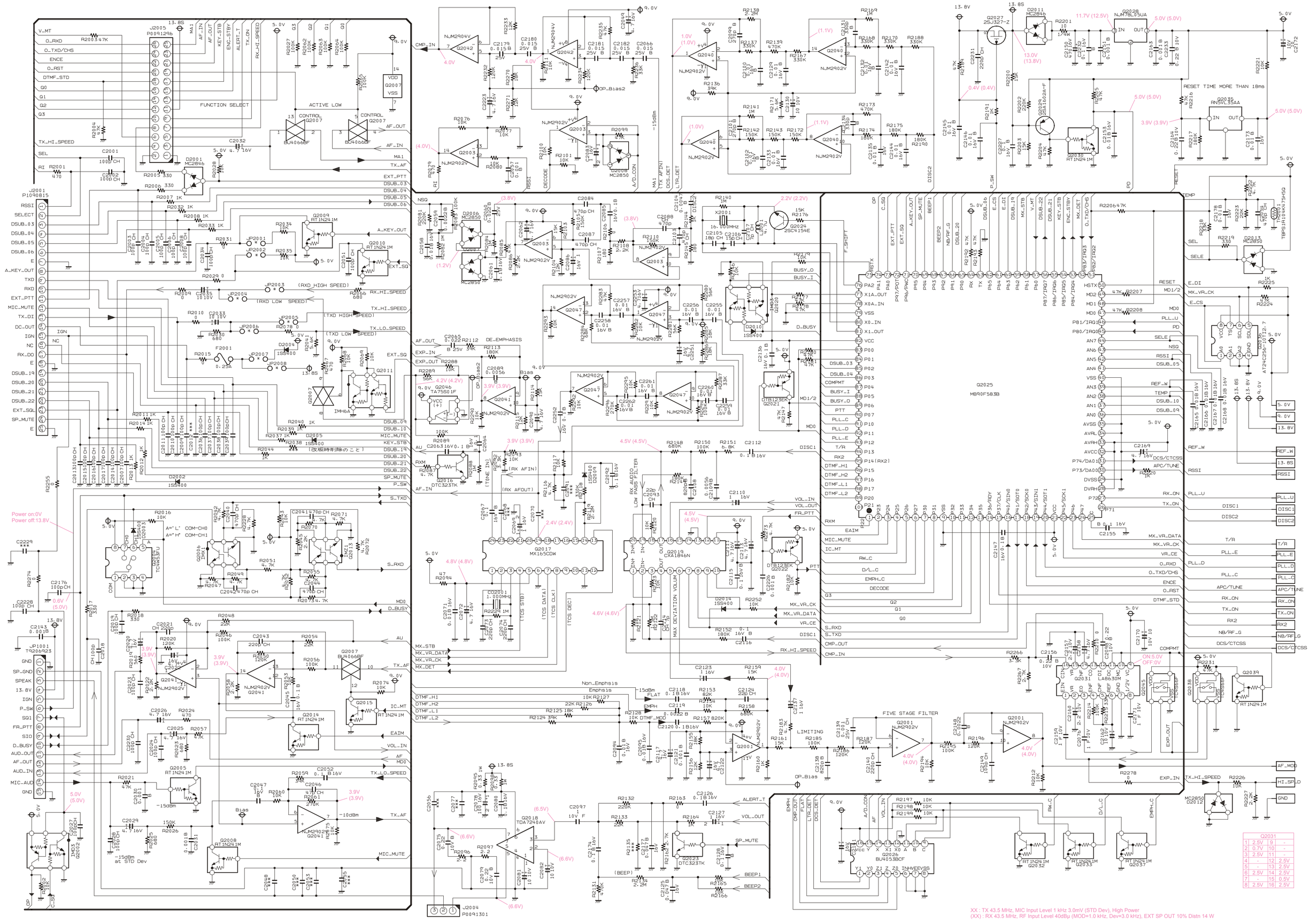
Note:



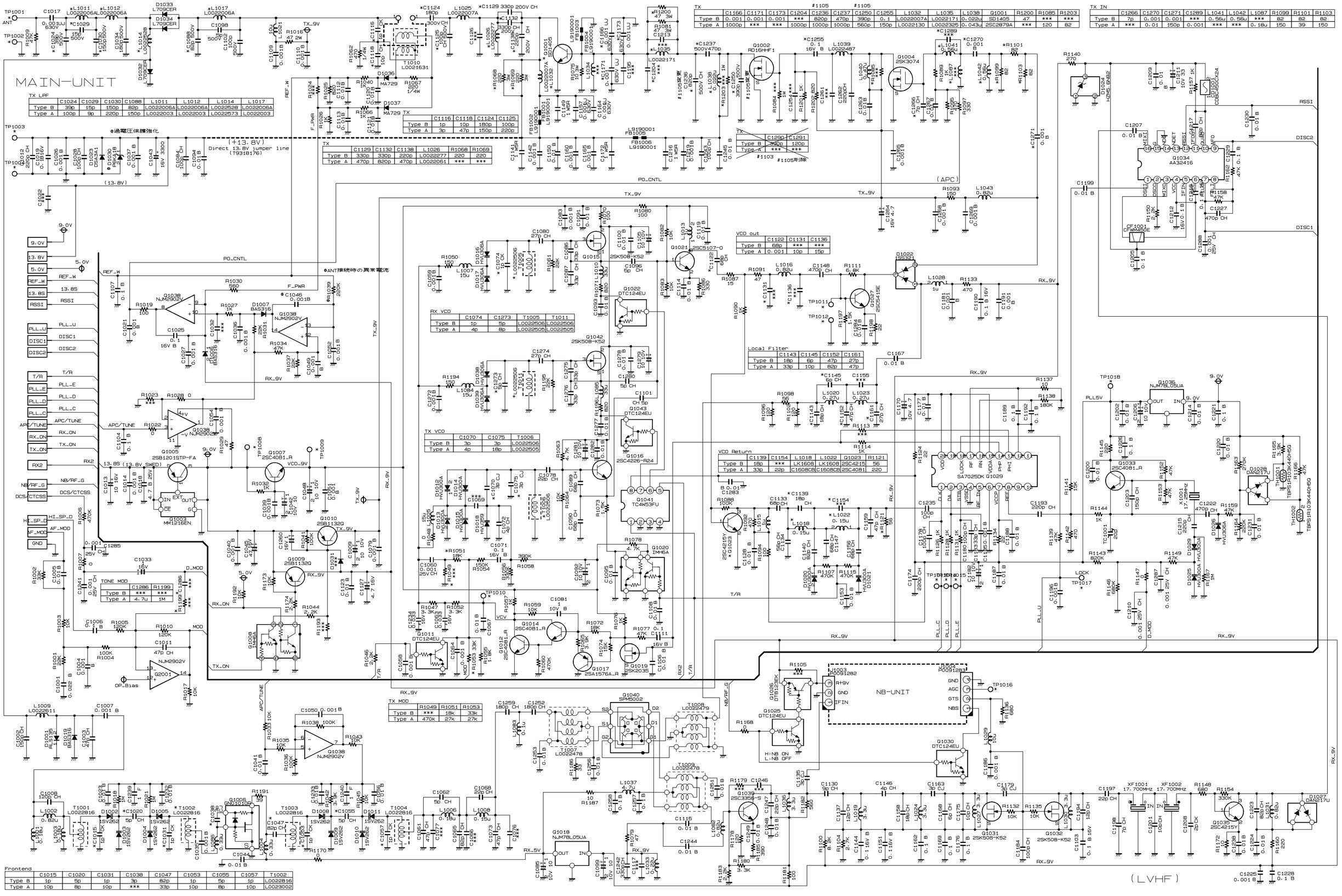
XX : TX 43.5 MHz, MIC Input Level 1 kHz 3.0mV (STD Dev), High Power
(XX) : RX 43.5 MHz, RF Input Level 40dBμ (MOD=1.0 kHz, Dev=3.0 kHz), EXT SP OUT 10% Distn 14 W

MAIN Unit (Lot. 1 ~ 25)

Circuit Diagram

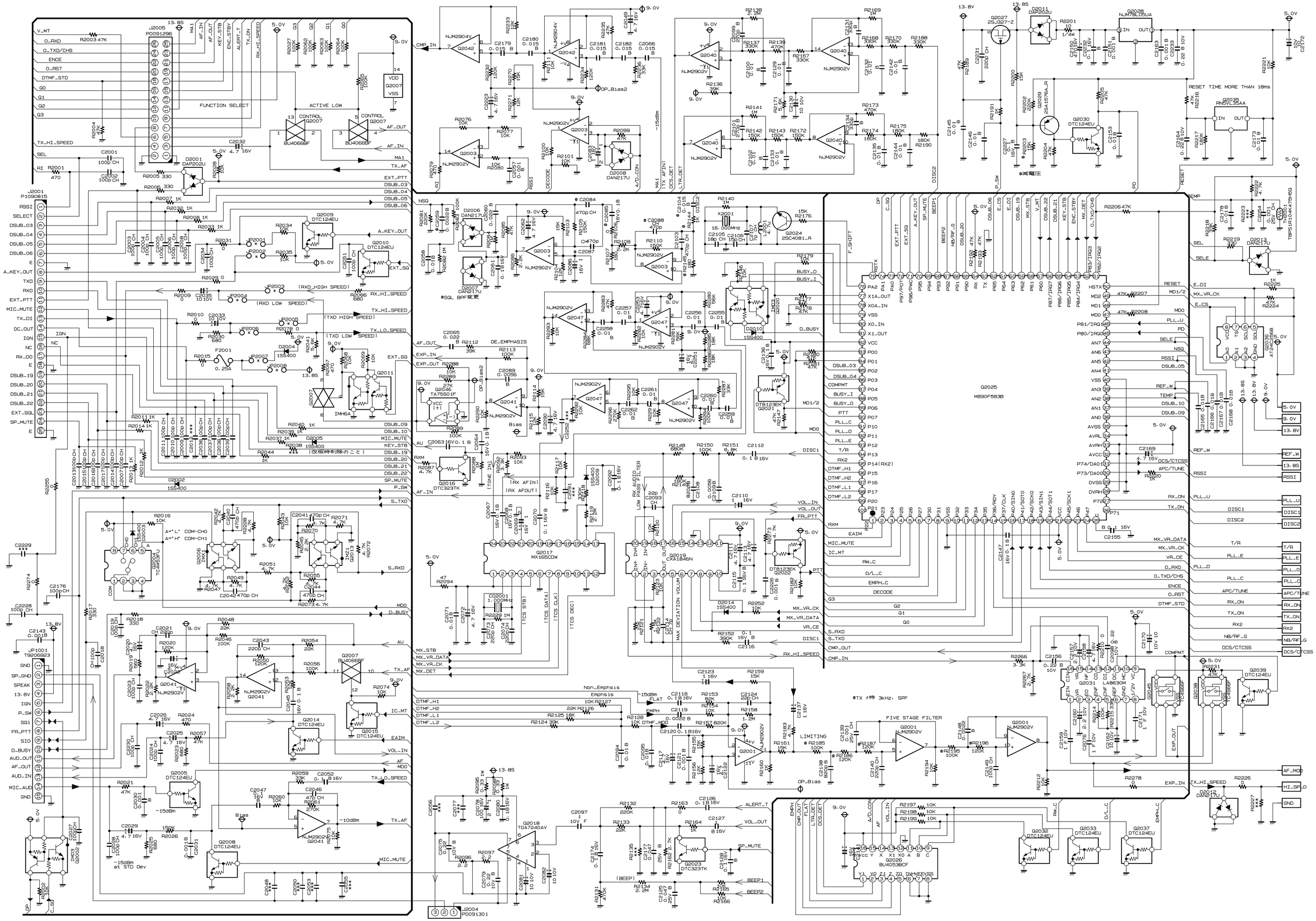


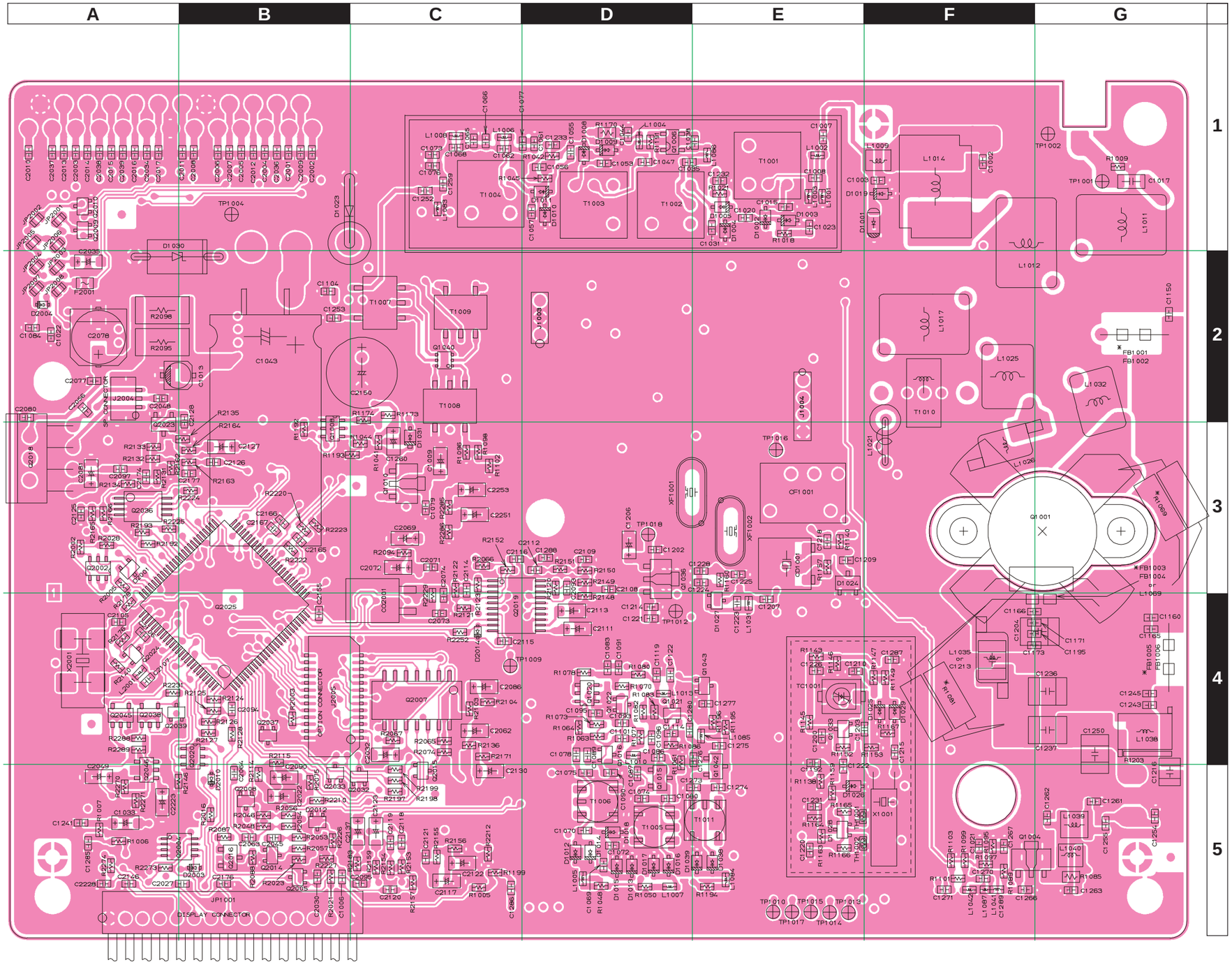
Q2031			
1	2.5V	9	-
2	0.7V	10	-
3	2.5V	11	-
4	-	12	2.5V
5	-	13	2.5V
6	2.5V	14	2.5V
7	-	15	0.5V
8	2.5V	16	2.5V


MAIN-UNIT
NB-UNIT
(LVHF)
TX_9V
RX_9V
PO_CNTL
REF_W
F_PWR
APC/TUNE
TX_ON
RX_ON
T/R
RX2
MOD
VCO
RSSI
DISC1
DISC2
PLL_U
PLL_D
PLL_E
PLL_C
NB/RF_G
DCS/CTCSS
HI_SP_D
AF_MOD
GND
TX LPF
TX
TX IN
RX VCO
TX VCO
VCO out
VCO Return
Local Filter
TONE MOD
Frontend
Direct 13.8V jumper line (T9318176)
過電圧保護強化
ANT接続時の異常電流
(APC)
#1103
#1105削除

MAIN Unit (Lot. 26 ~)

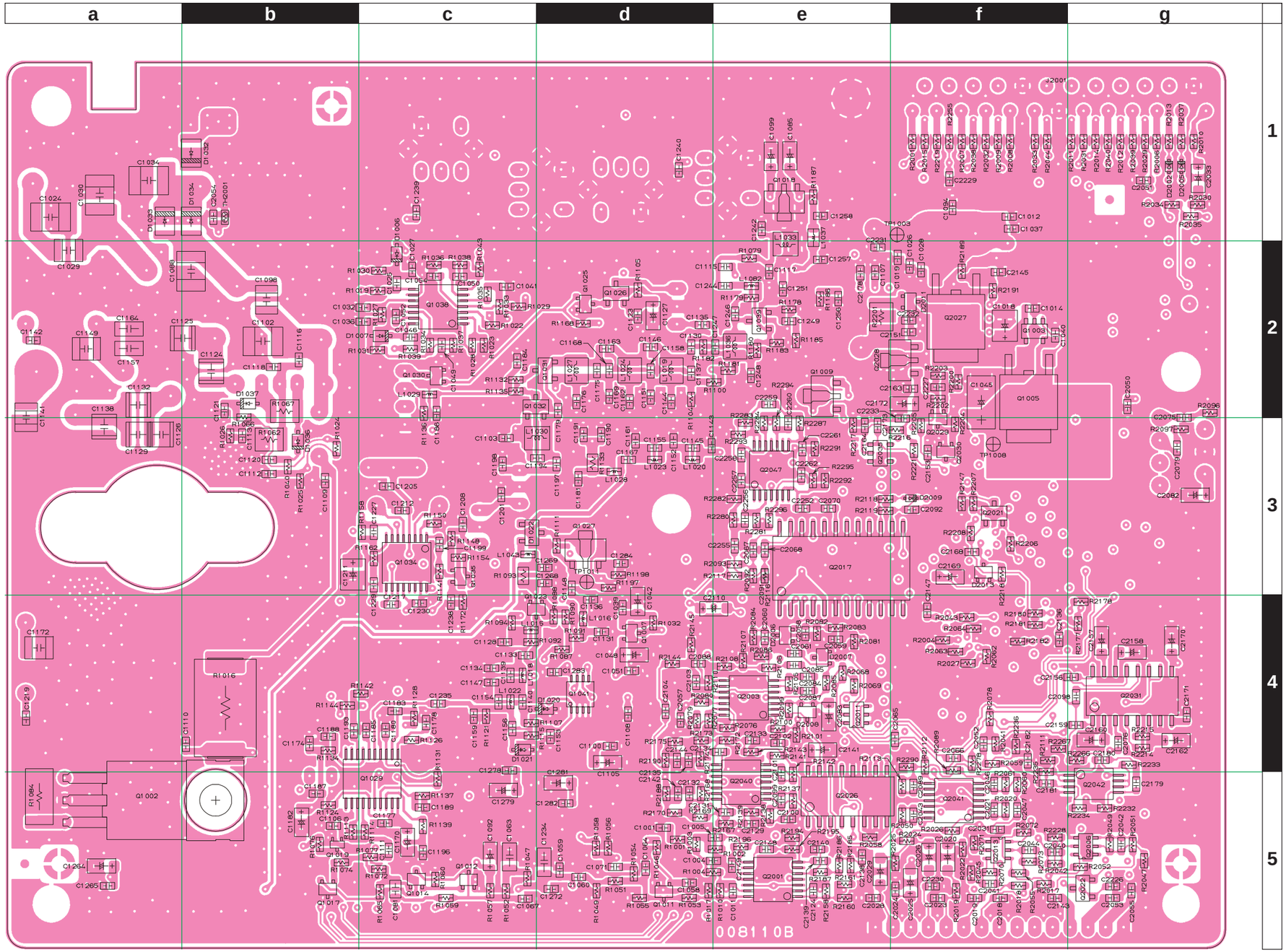
Circuit Diagram

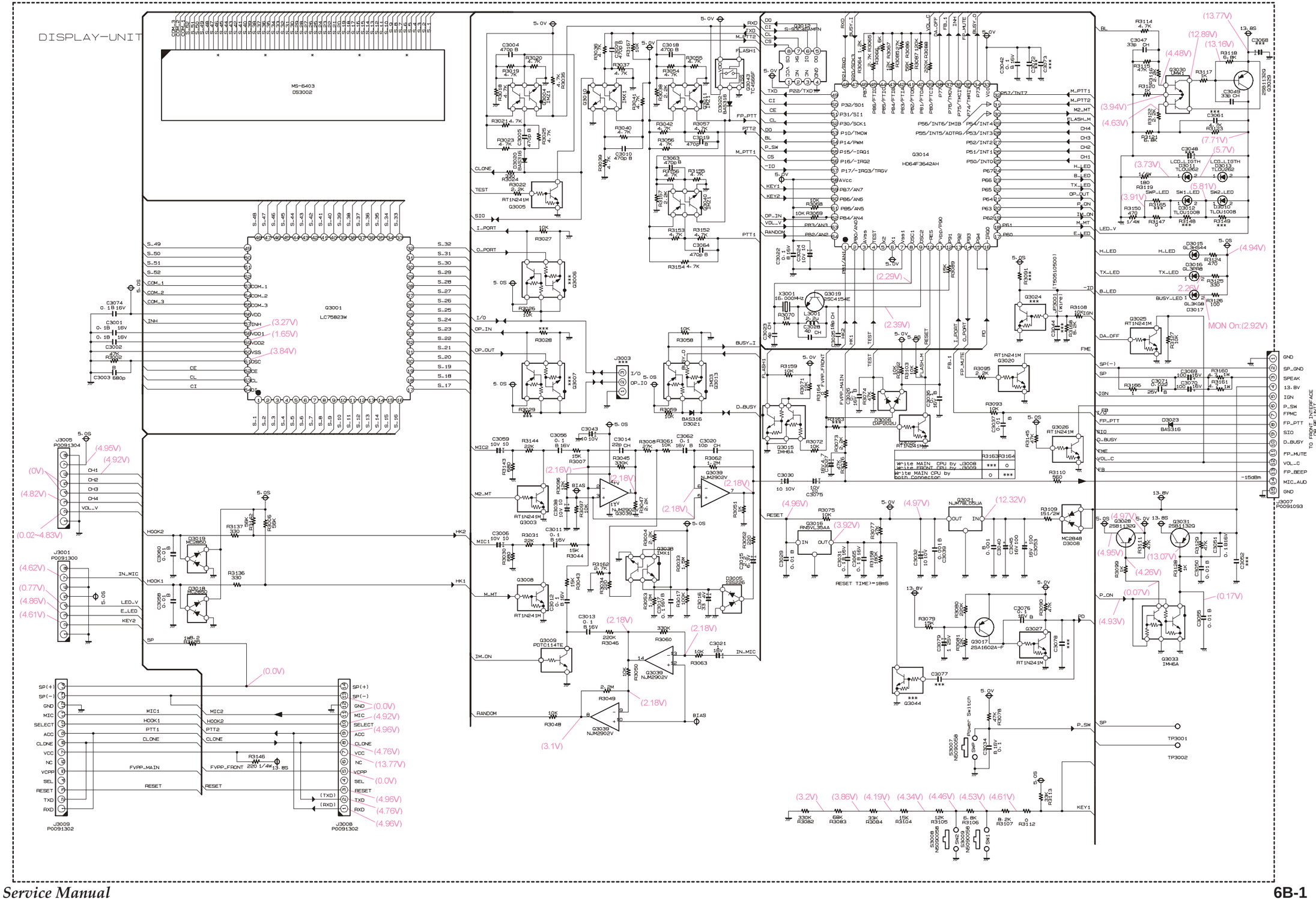



A
B
C
D
E
F
G
1
2
3
4
5
DISPLAY CONNECTOR
KEY CON CONNECTOR
SP CONNECTOR

MAIN Unit

Parts Layout (Side B)

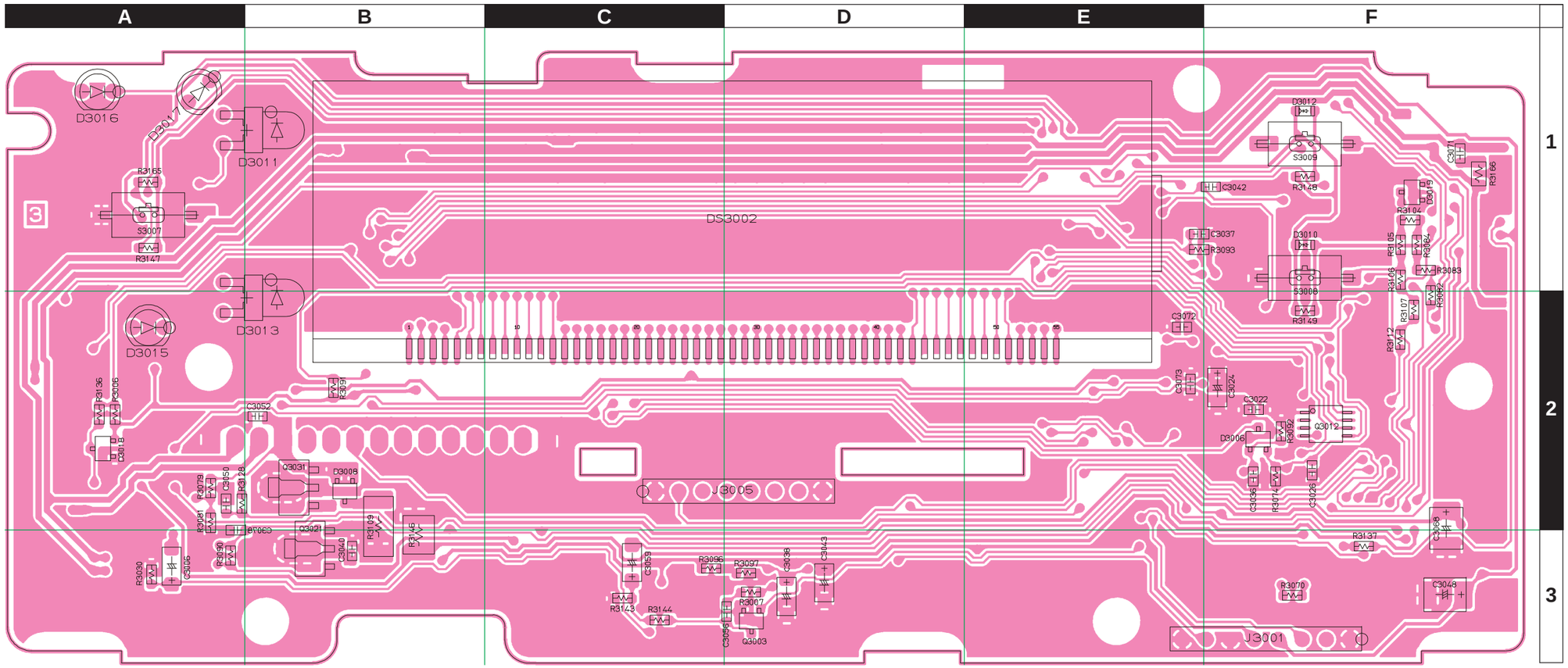



DISPLAY-UNIT
MS-6403
DS3002
Q3001
LC75823W
Q3014
HD64F3642AH
J3005
P0091304
J3001
P0091300
J3009
P0091302
J3008
P0091302
J3007
P0091093
Write MAIN CPU by J3008
Write FRONT CPU by J3009
Write MAIN CPU by both connector
R3163 R3164
*** 0
0 ***
TO FRONT INTERFACE OR RF UNIT

DISPLAY Unit (Lot. 1 ~ 7)

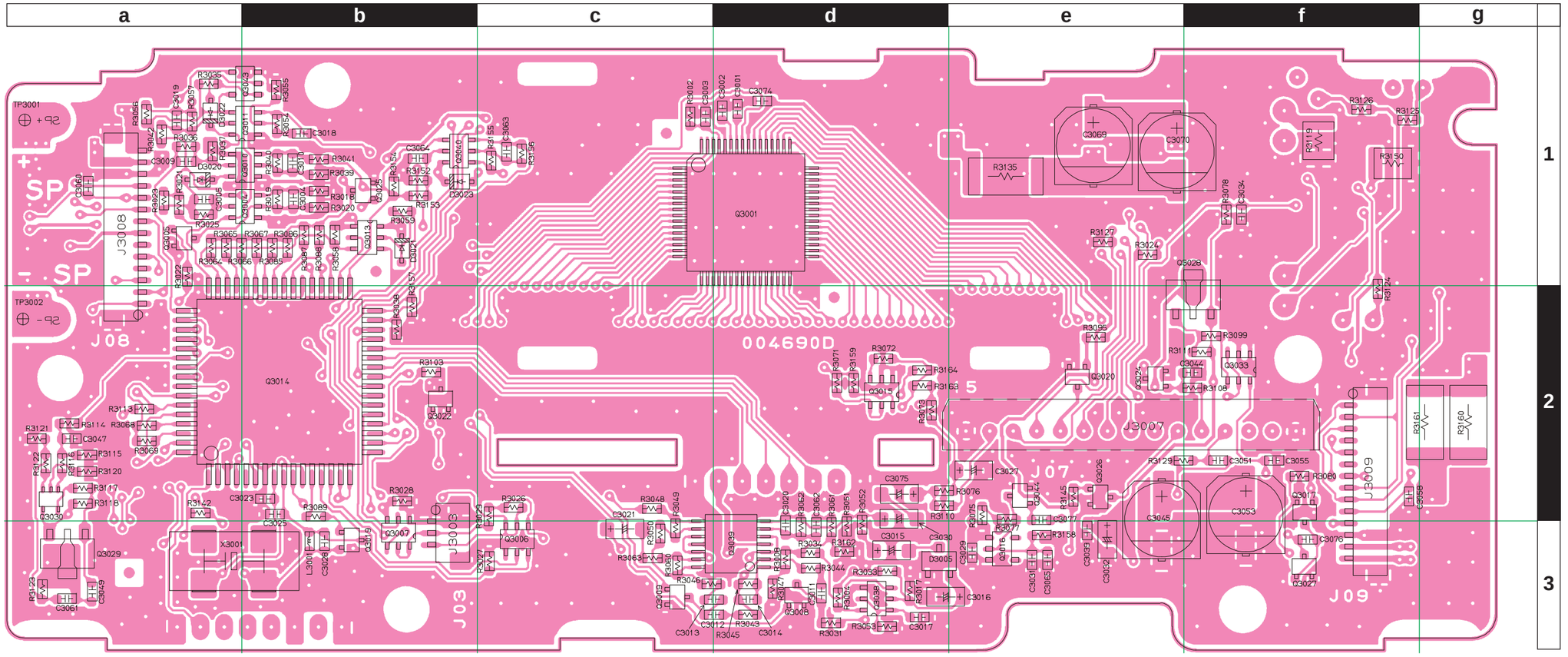
Note:

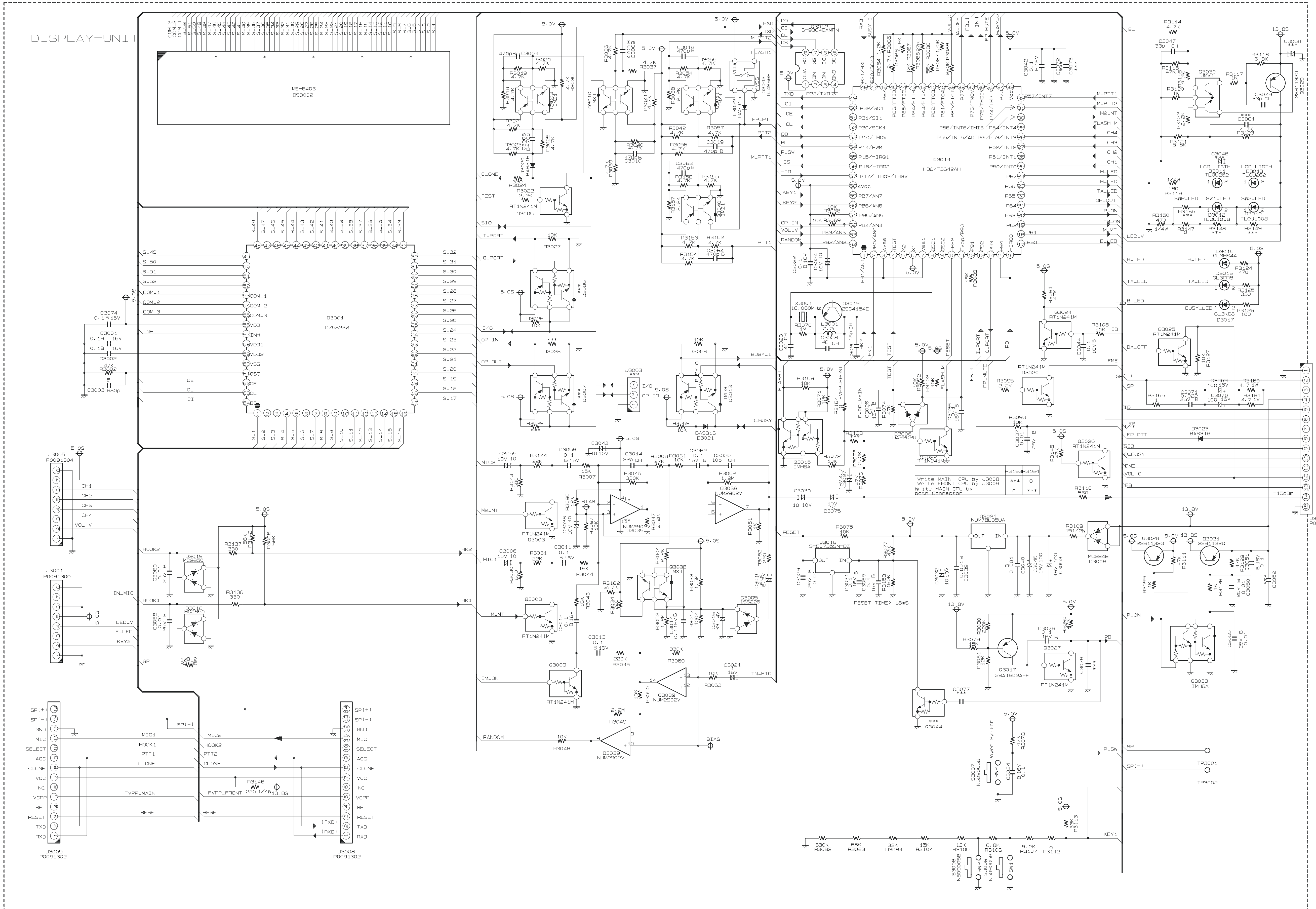
Parts Layout (Side A)



DISPLAY Unit (Lot. 1 ~ 7)

Parts Layout (Side B)

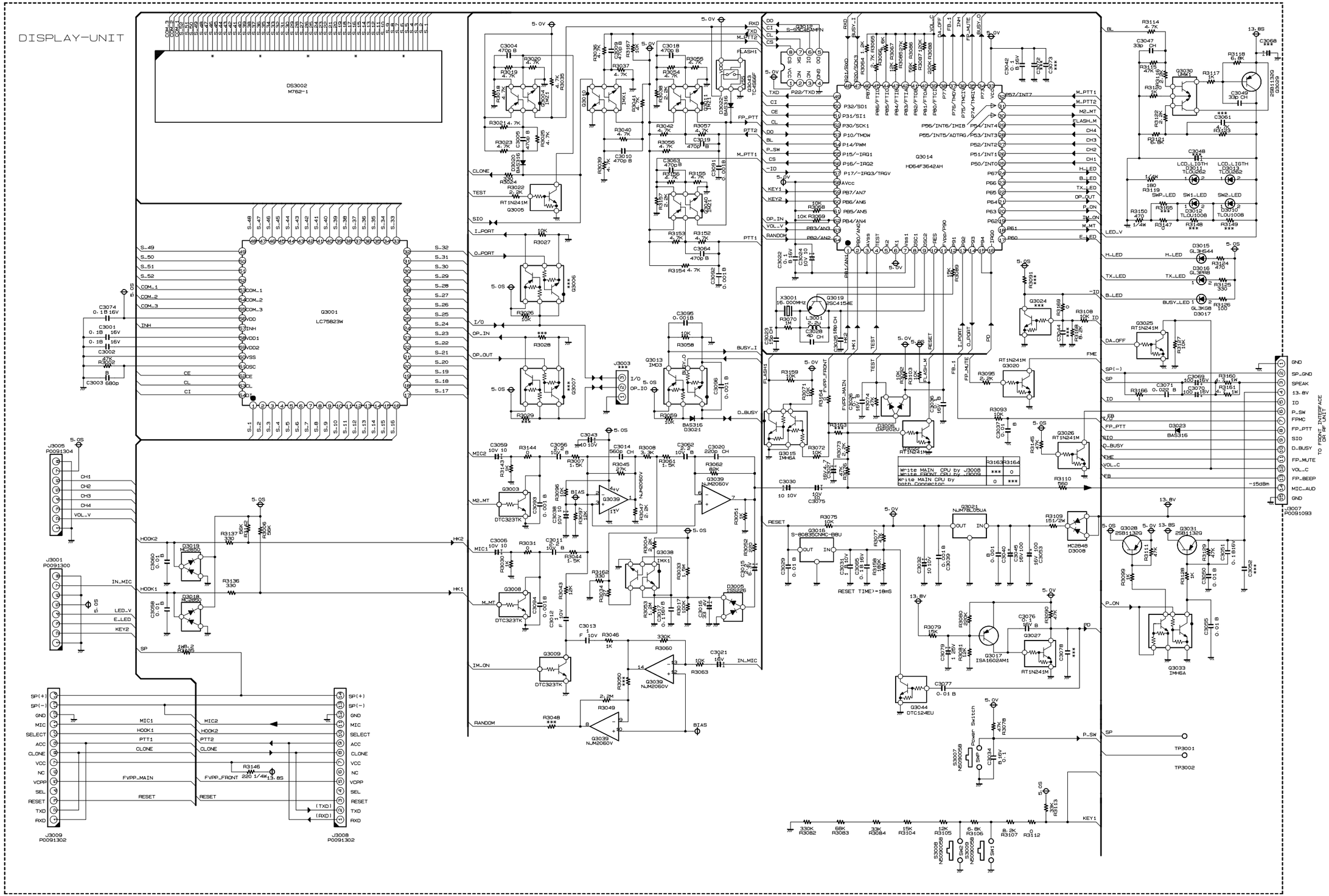




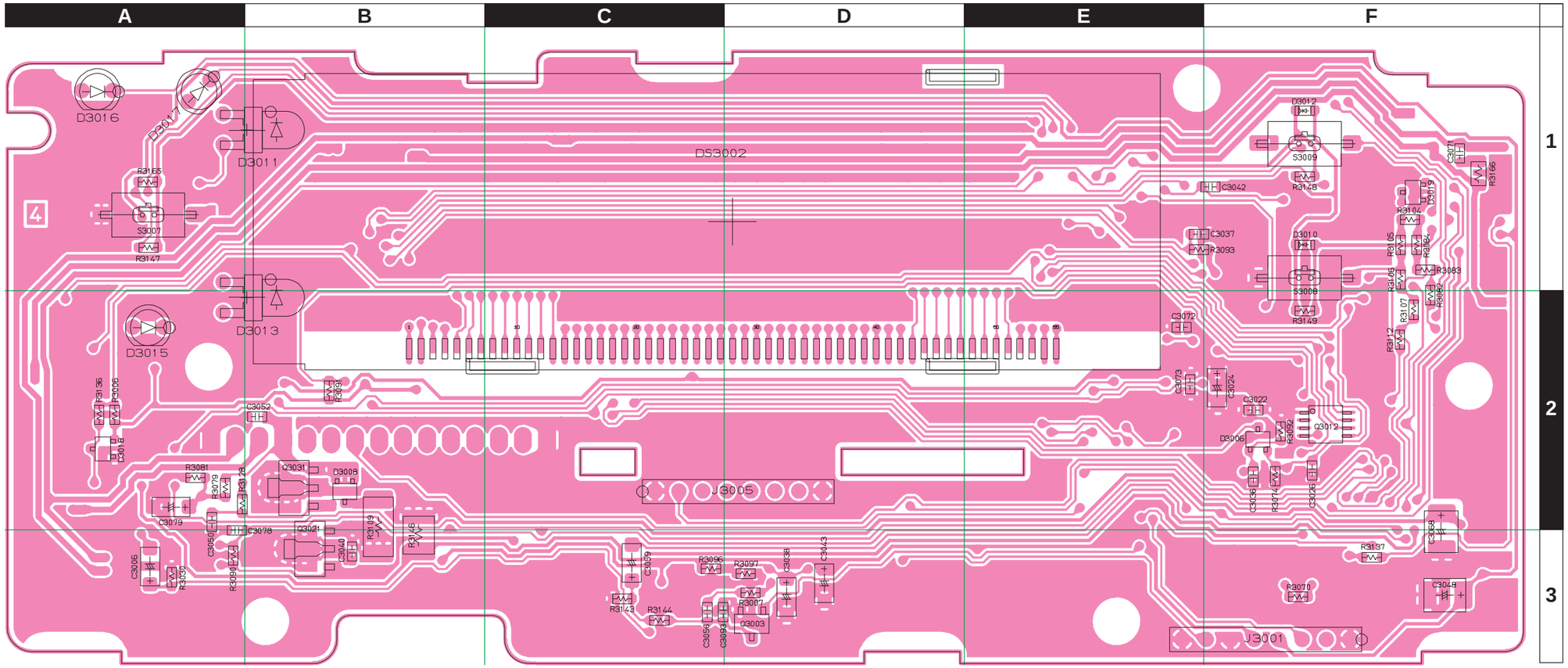
DISPLAY-UNIT
MS-6403
DS3002
Q3001
LC75823W
Q3014
HD64F3642AH
Q3012
S-93C46AMFN
X3001
16.000MHz
Q3019
2SC4154E
J3005
P0091304
J3001
P0091300
J3009
P0091302
J3008
P0091302
J3007
P0091093
TO FRONT INTERFACE OR RF UNIT
RESET TIME:=18mS
Write MAIN CPU by J3008
Write FRONT CPU by J3009
Write MAIN CPU by both Connector

DISPLAY Unit (Lot. 26 ~)

Circuit Diagram

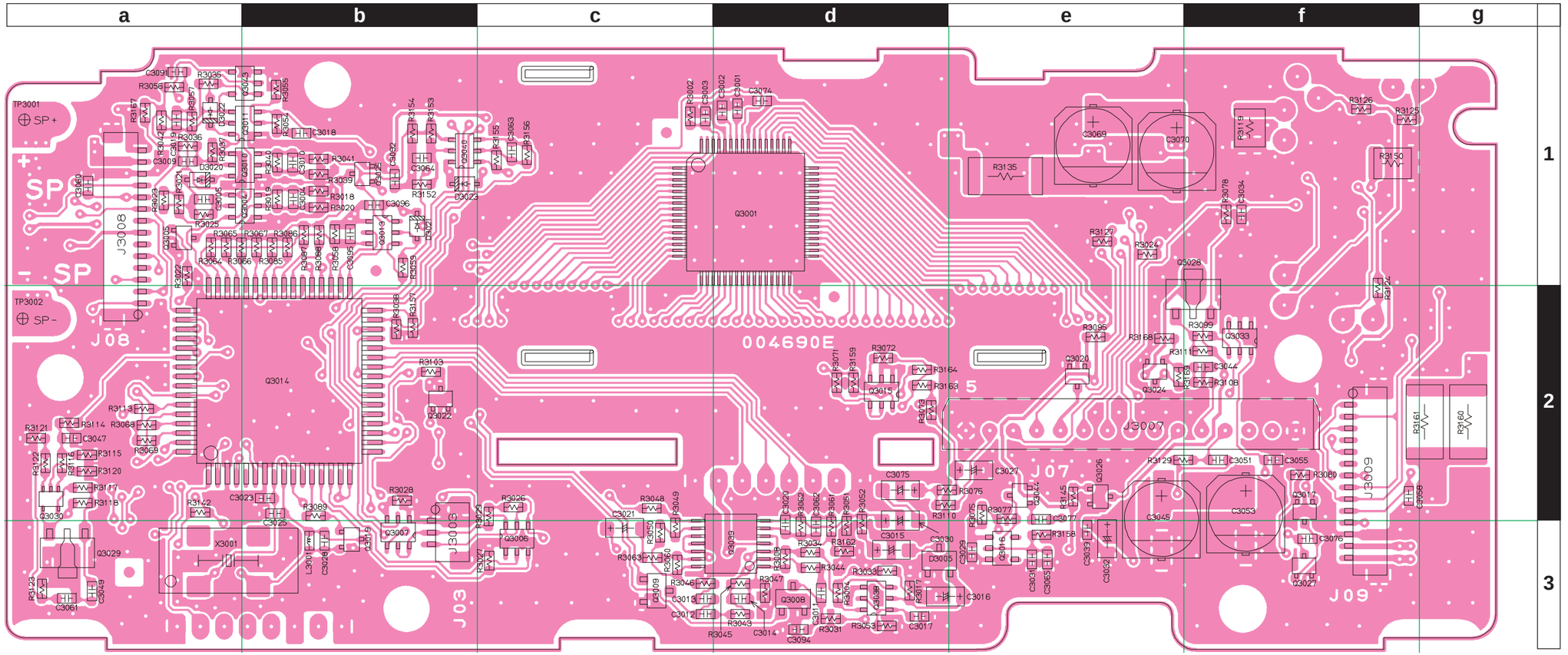


Parts Layout (Side A)



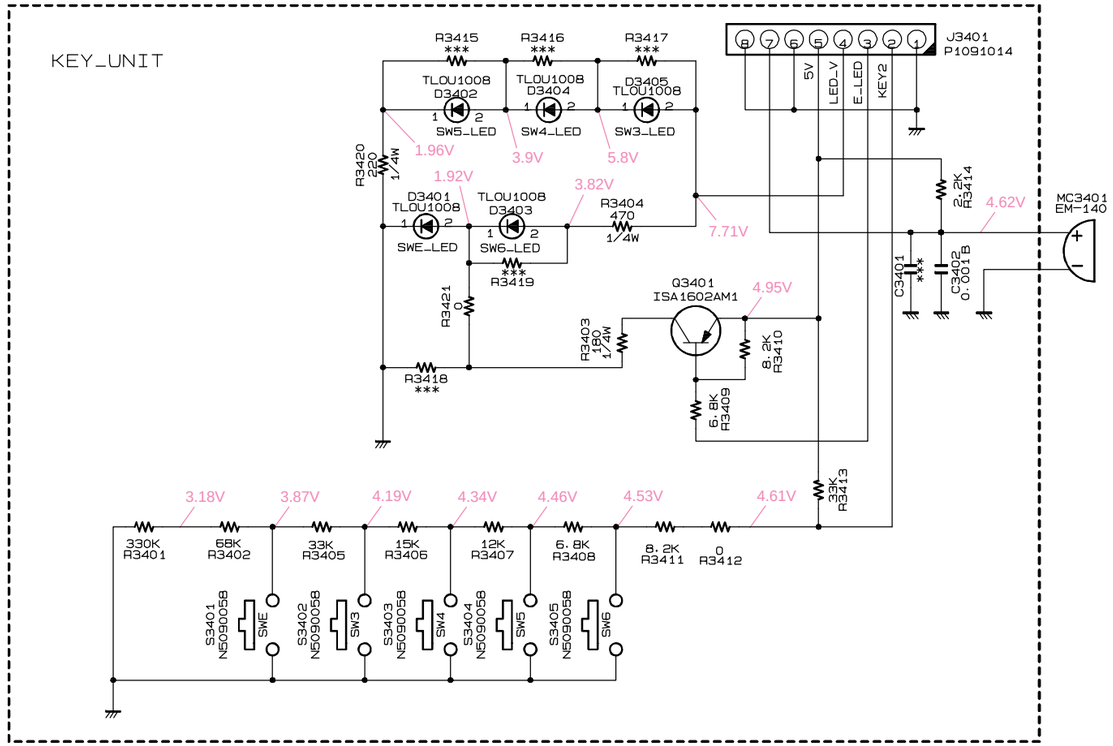
DISPLAY Unit (Lot. 8 ~)

Parts Layout (Side B)



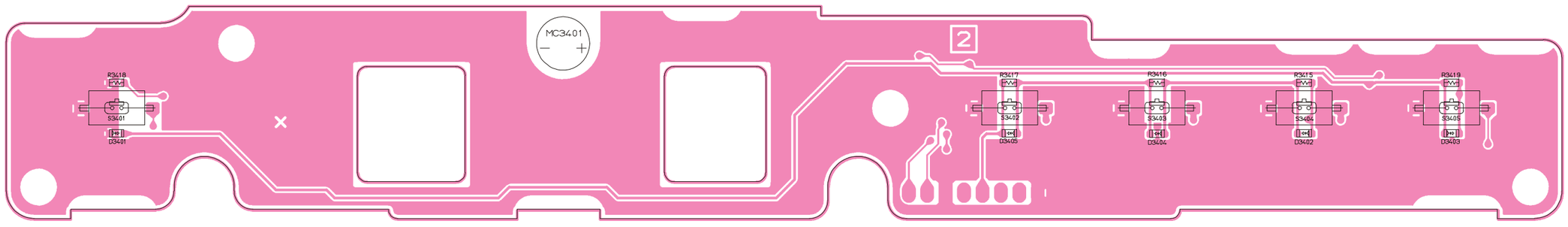
KEY Unit

Circuit Diagram

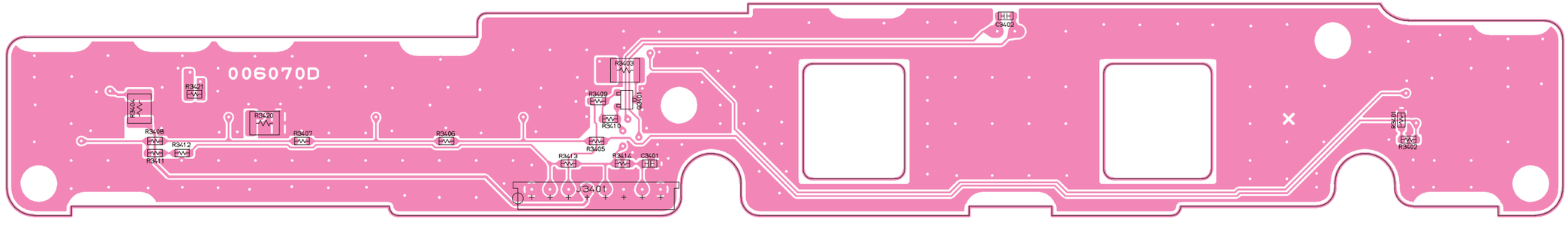


Parts Layout

Side A



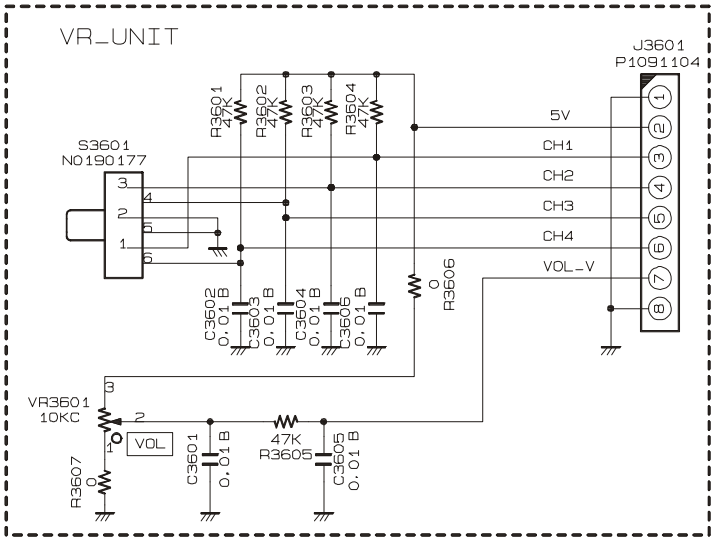
Side B



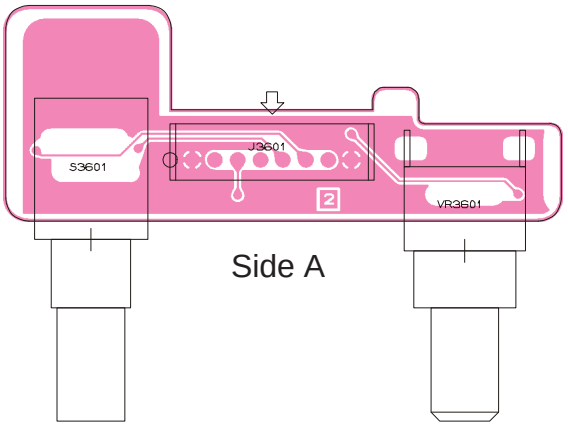
KEY Unit

Note:

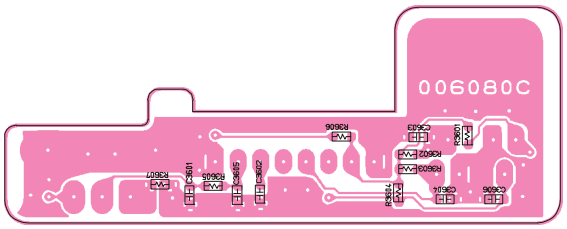
Circuit Diagram (Lot. 1 ~ 7)



Parts Layout (Lot. 1 ~ 7)

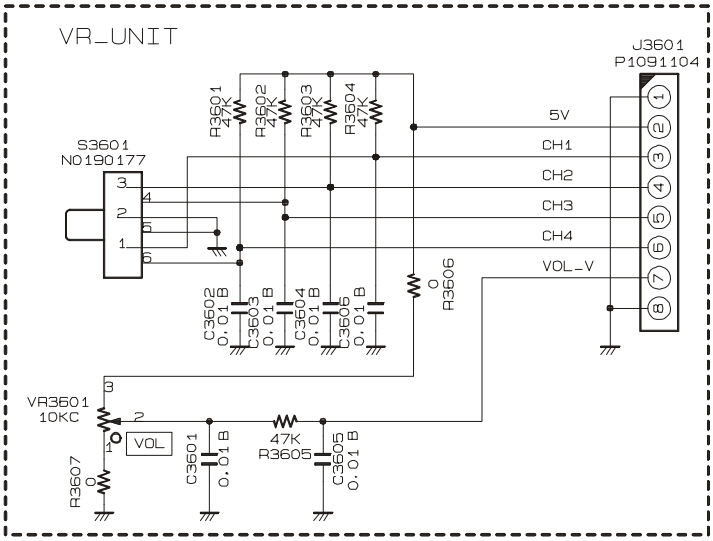


Side A

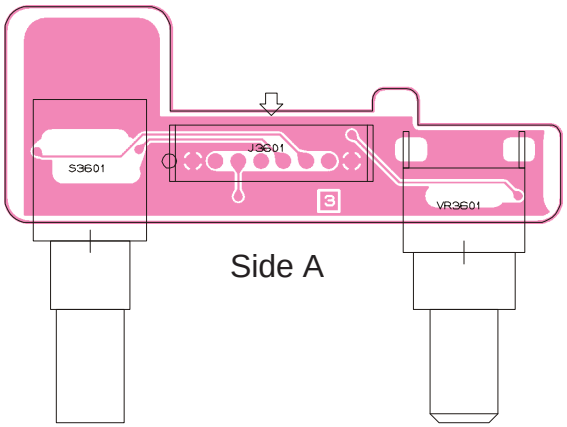


Side B

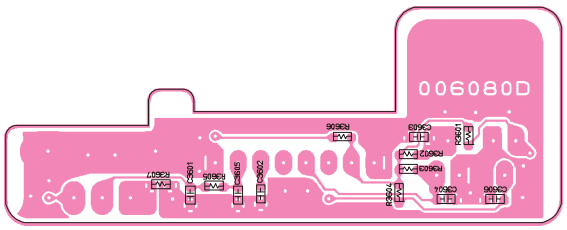
Circuit Diagram (Lot. 8 ~)



Parts Layout (Lot. 8 ~)



Side A



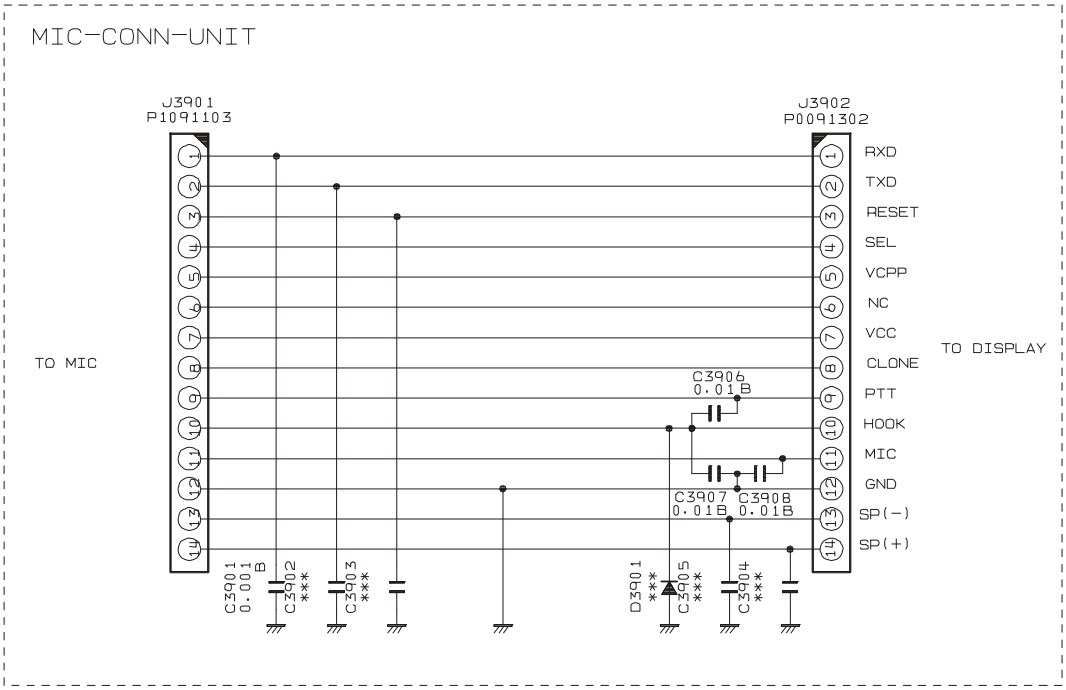
Side B

VR Unit

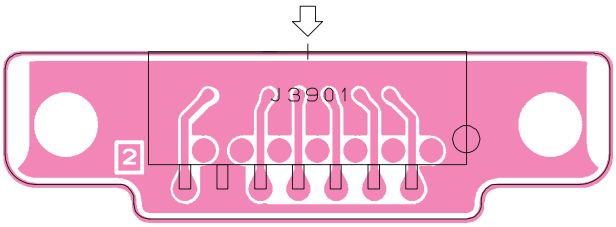
Note

MIC CONN Unit (Lot. 1 ~ 10)

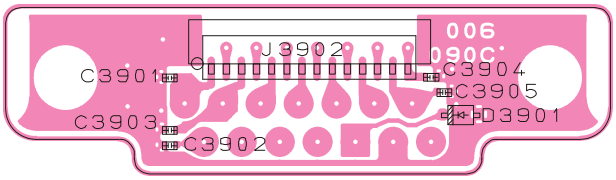
Circuit Diagram



Parts Layout



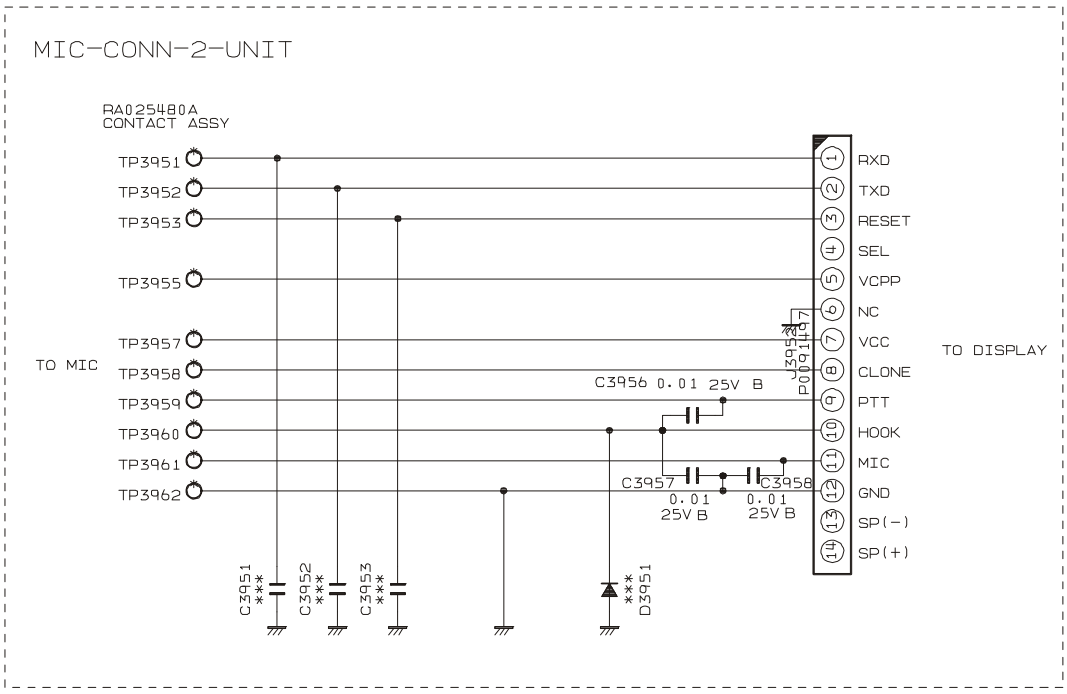
Side A



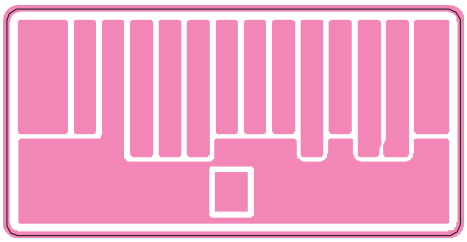
Side B

MIC CONN 2 Unit (Lot. 11 ~)

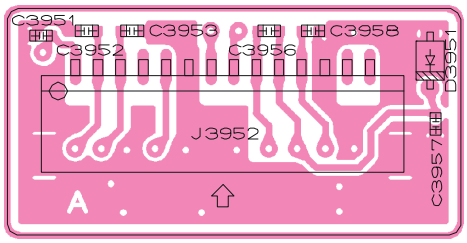
Circuit Diagram



Parts Layout



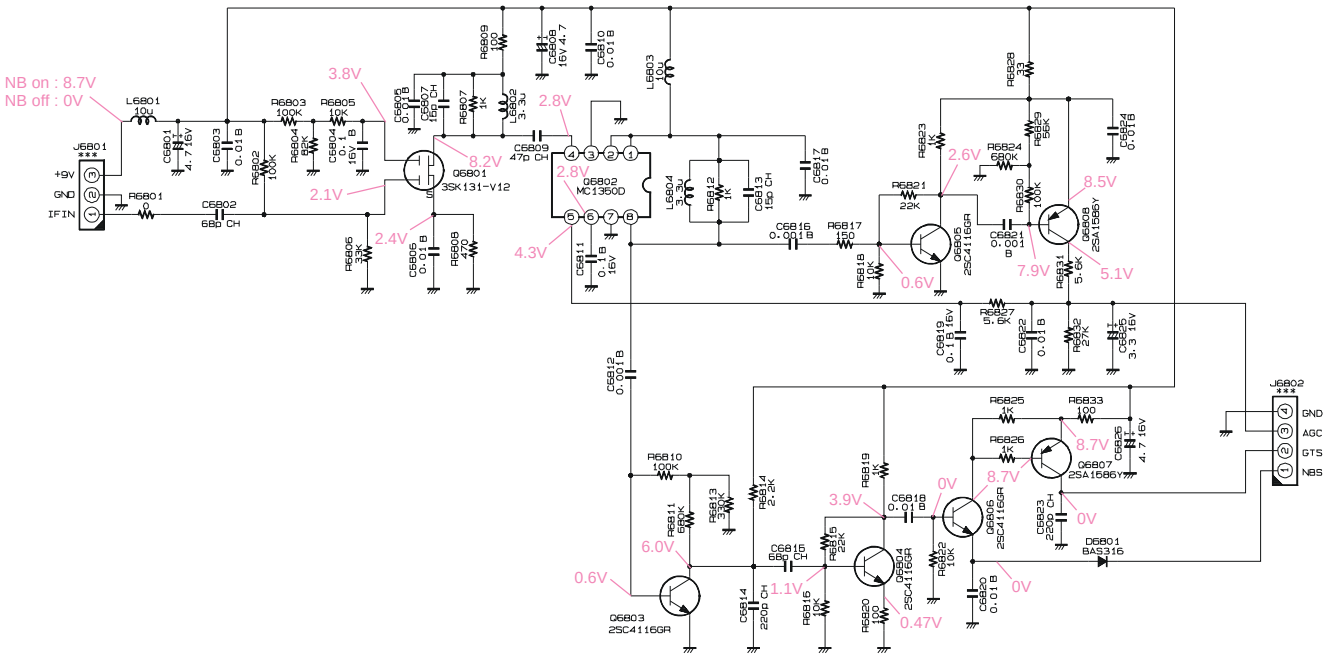
Side A



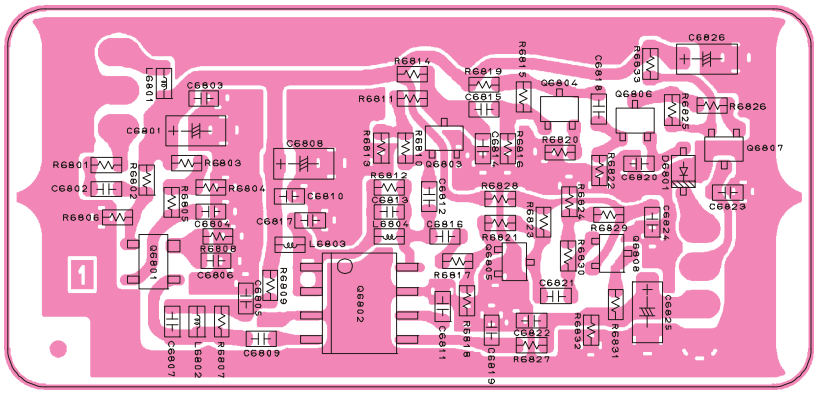
Side B

NB Unit (Lot. 1 ~ 7)

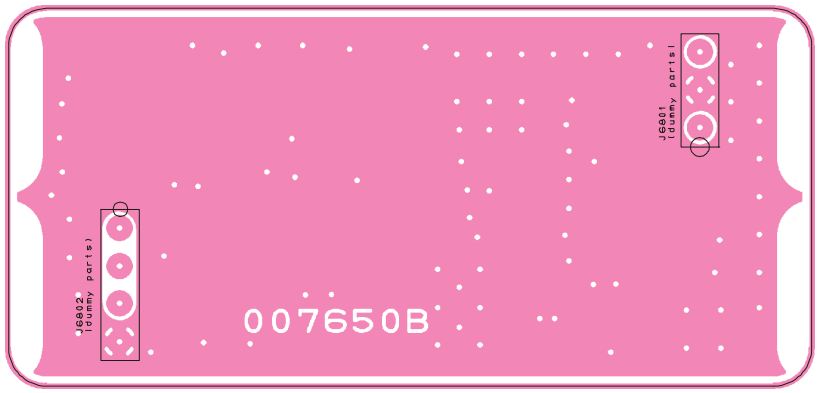
Circuit Diagram



Parts Layout



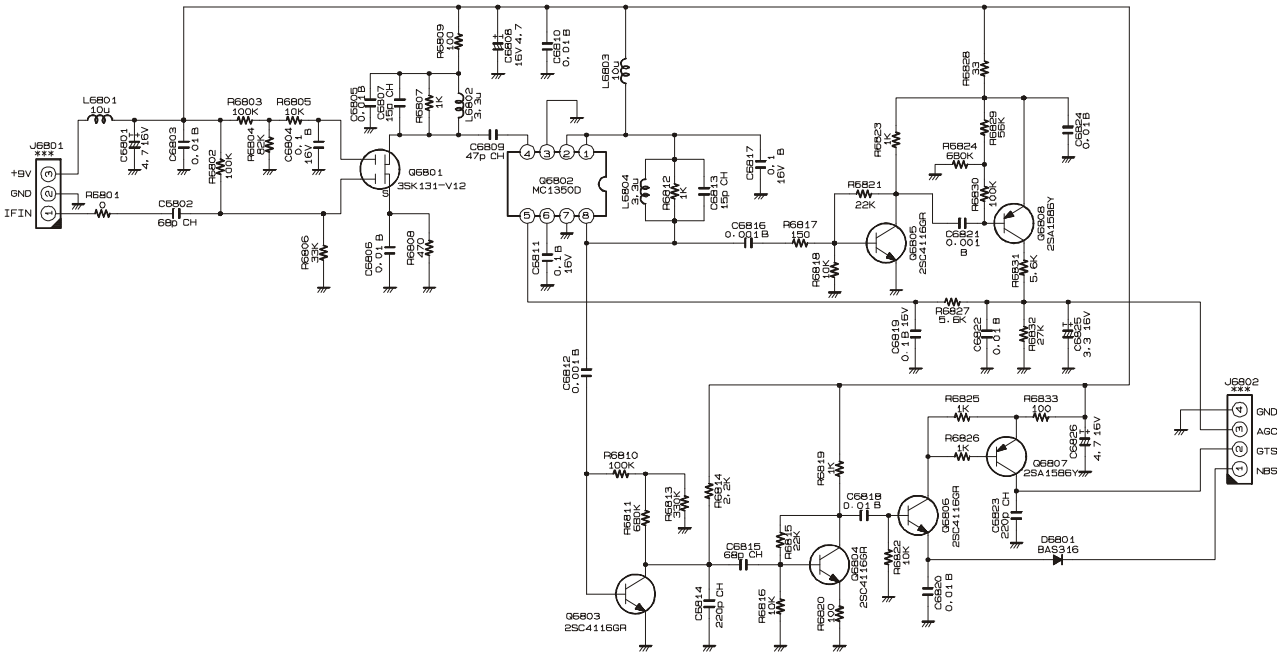
Side A



Side B

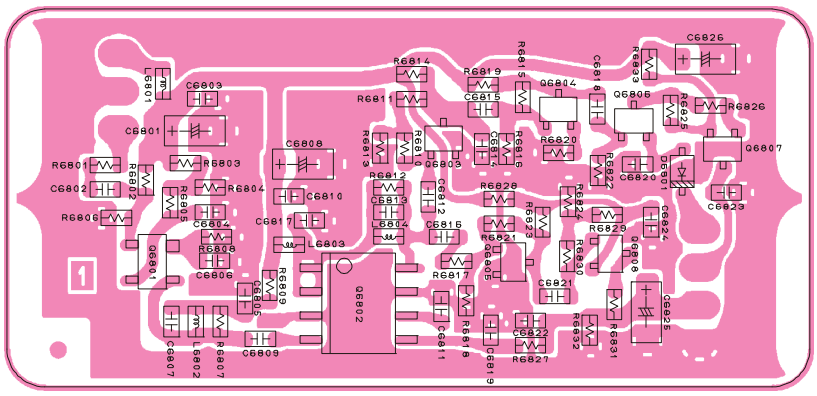
NB Unit (Lot. 8 ~)

Circuit Diagram

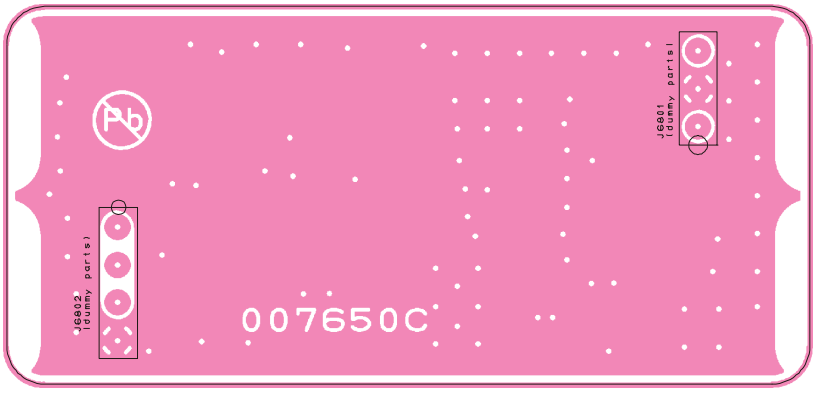


Parts Layout

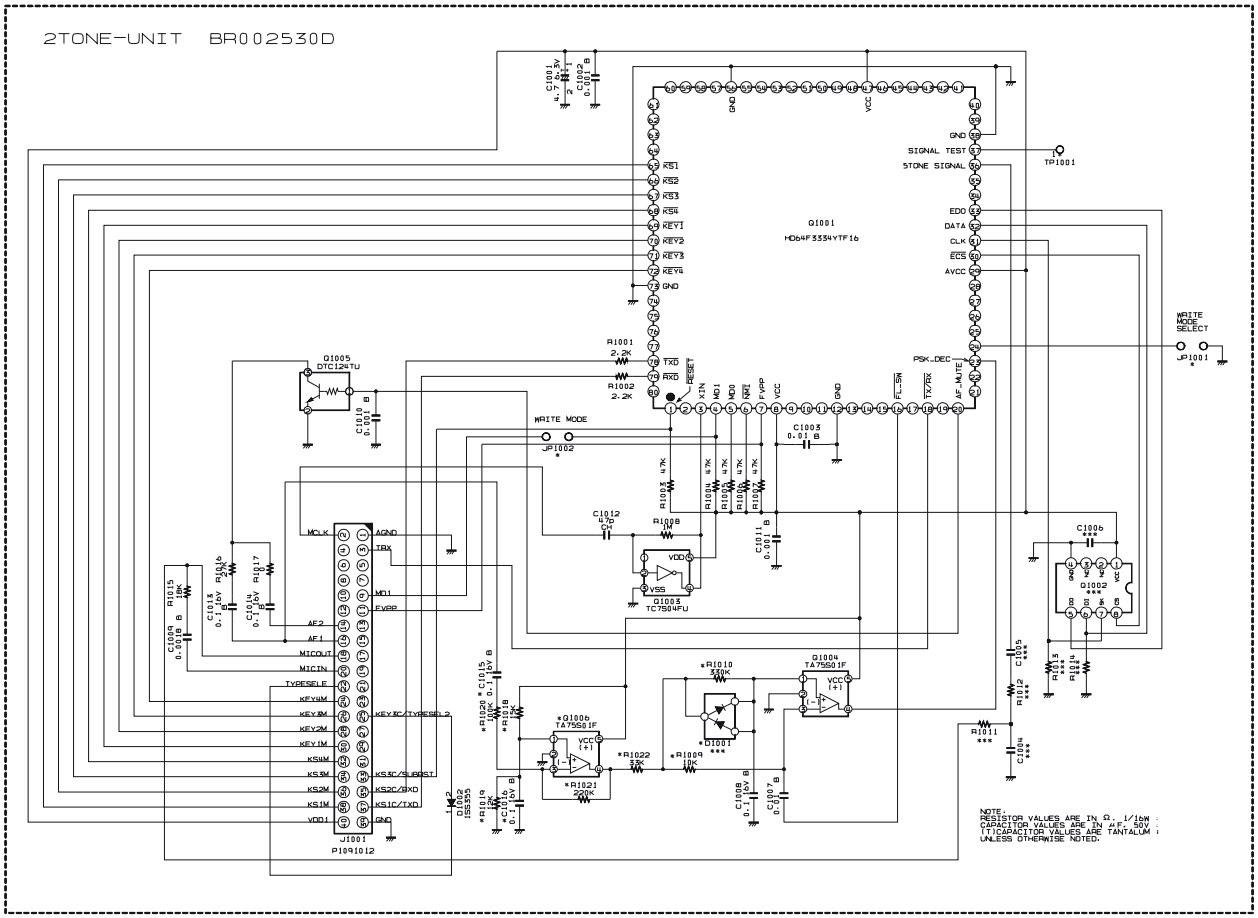
Side A



Side B



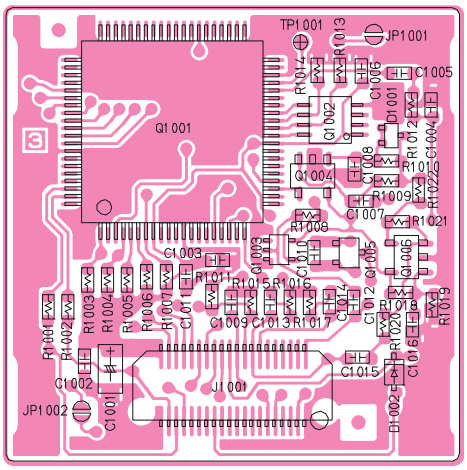
Circuit Diagram



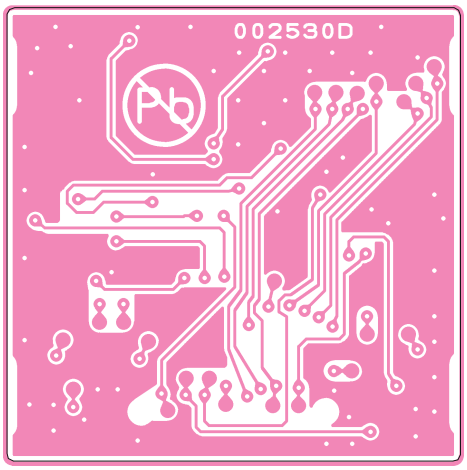
DST

	C1015	C1016	D1001	Q1006	R1009	R1010	R1018	R1019	R1020	R1021	R1022
VTX	0	***	NA221	***	0	100k	***	***	0	0	0
MIC	0.1u	0.1u	***	TA75S01	10k	550k	15k	12k	100k	220k	33k

Parts Layout



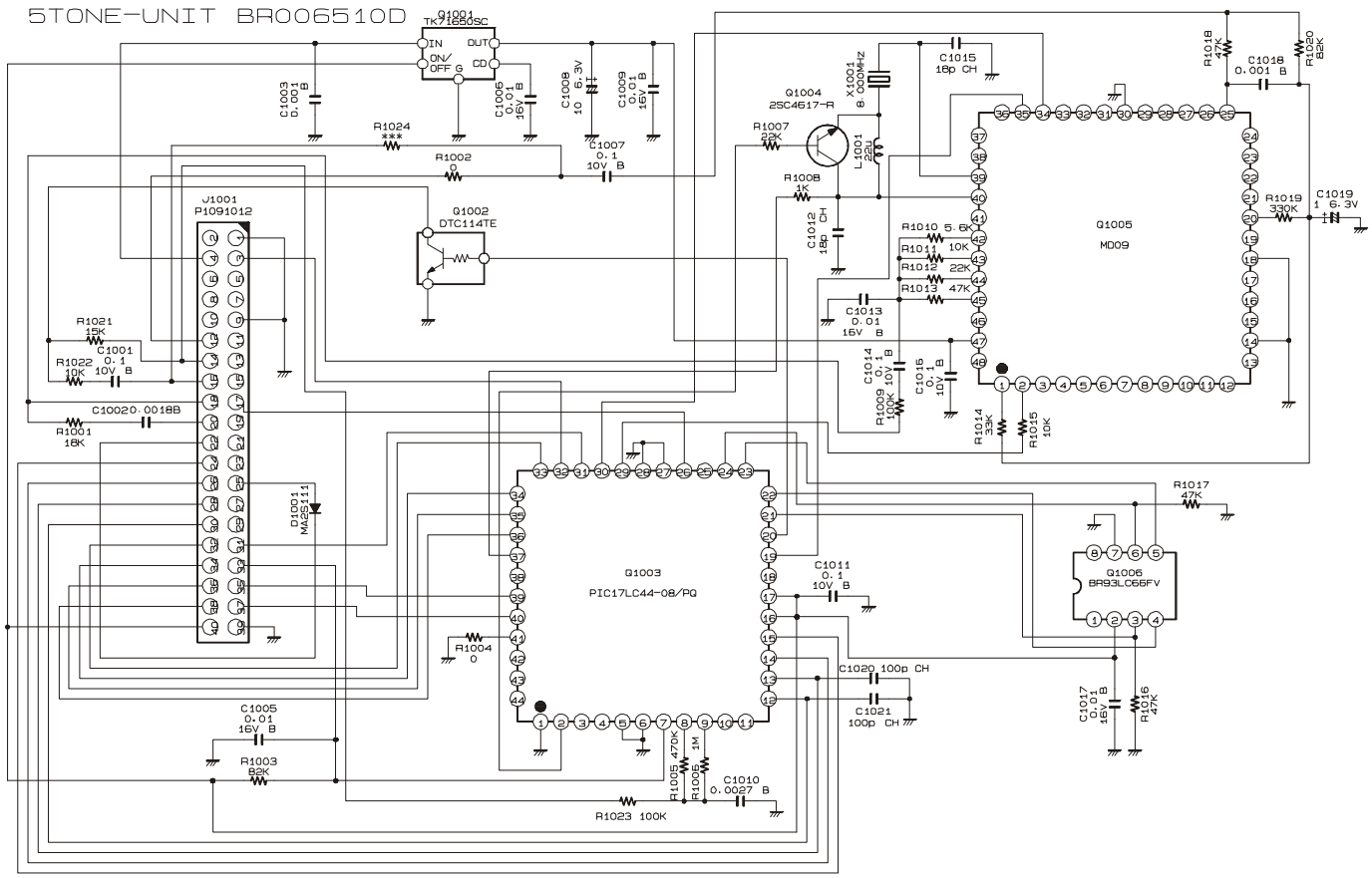
Side A



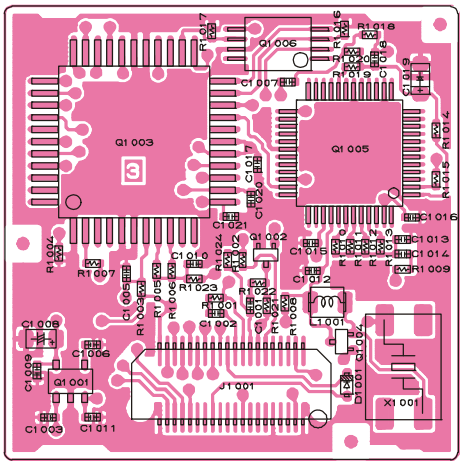
Side B

F5D-14 5-Tone Unit

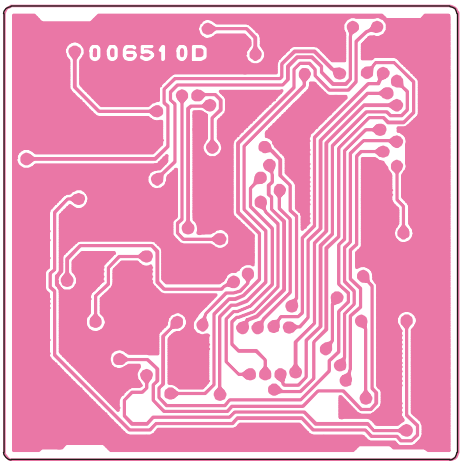
Circuit Diagram



Parts Layout

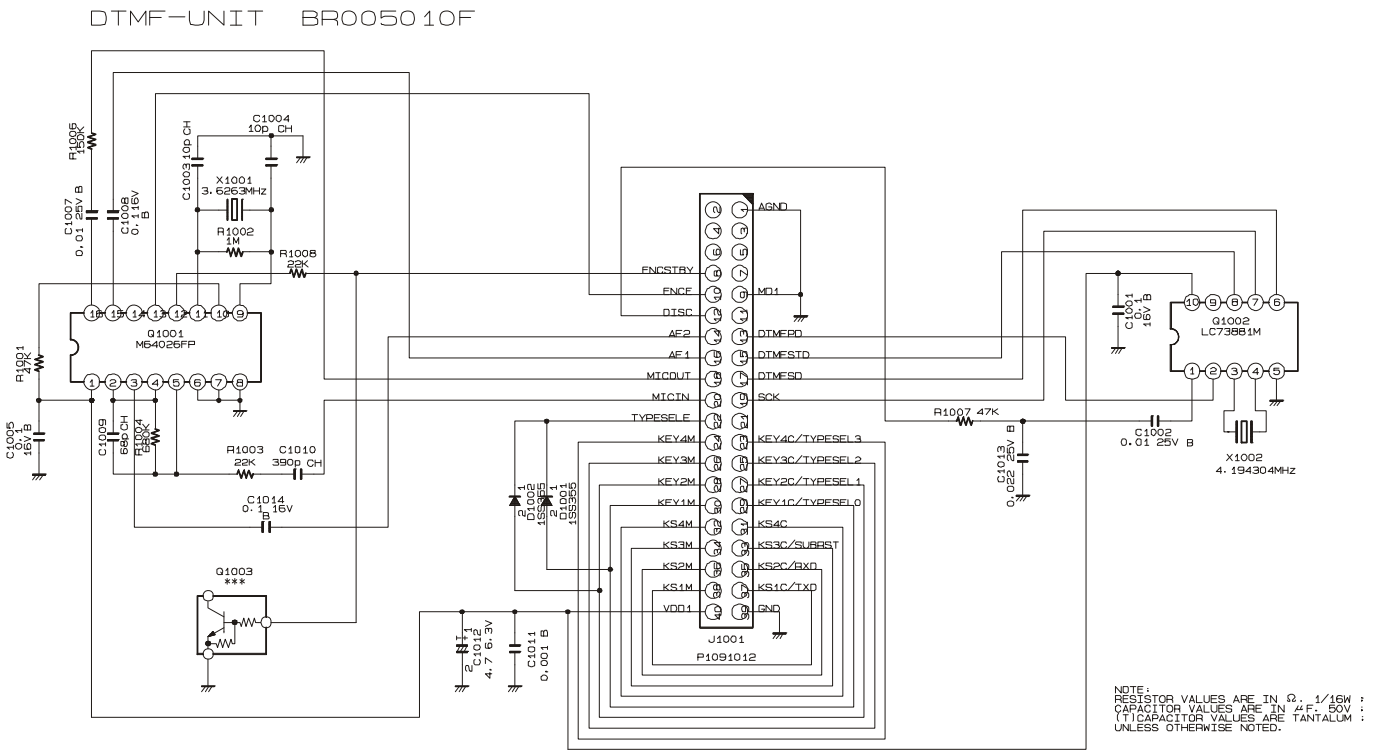


Side A

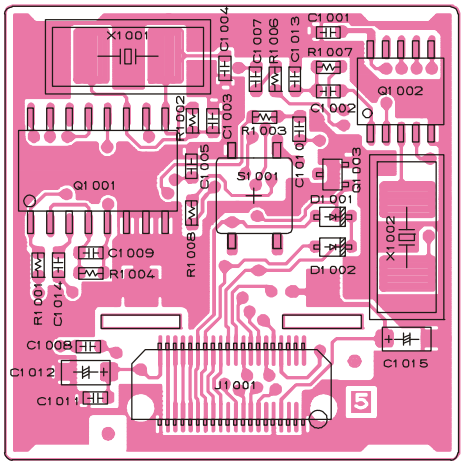


Side B

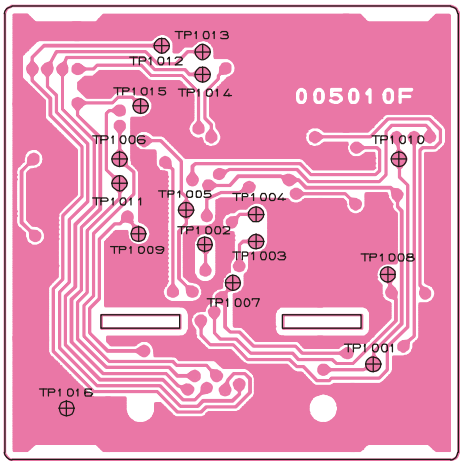
Circuit Diagram



Parts Layout



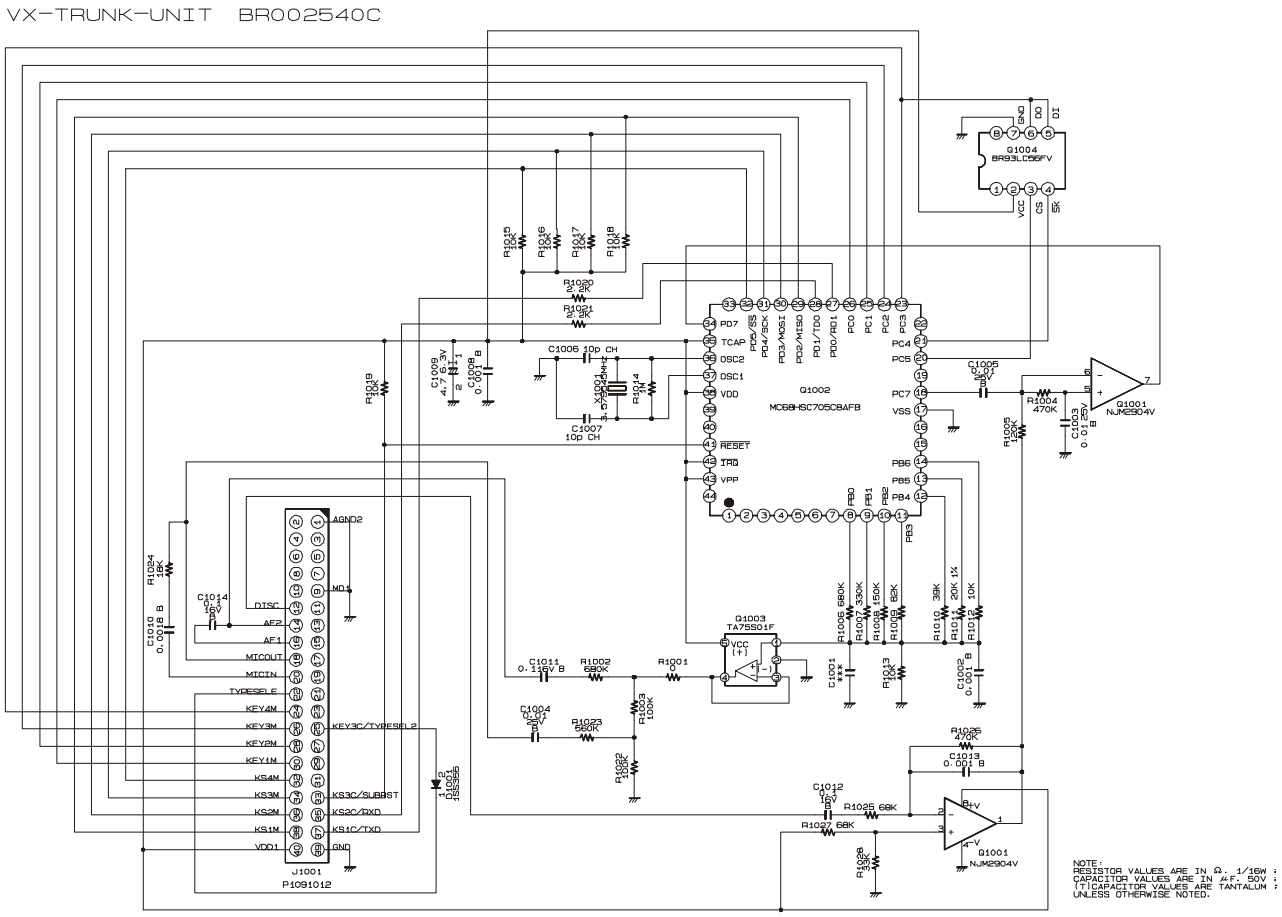
Side A



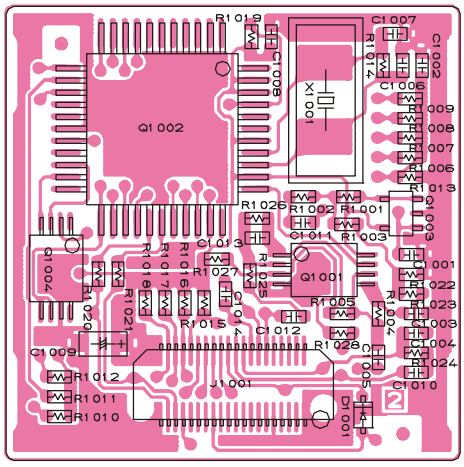
Side B

VTP-50 VX-Trunk Unit

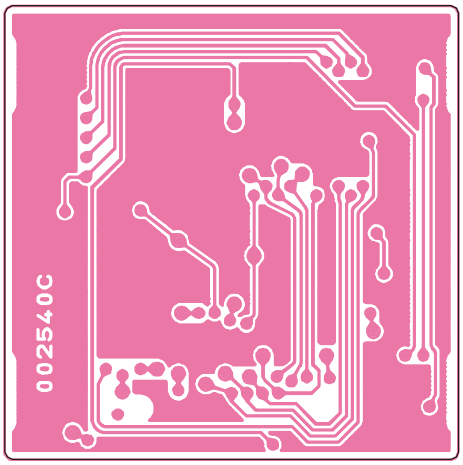
Circuit Diagram



Parts Layout

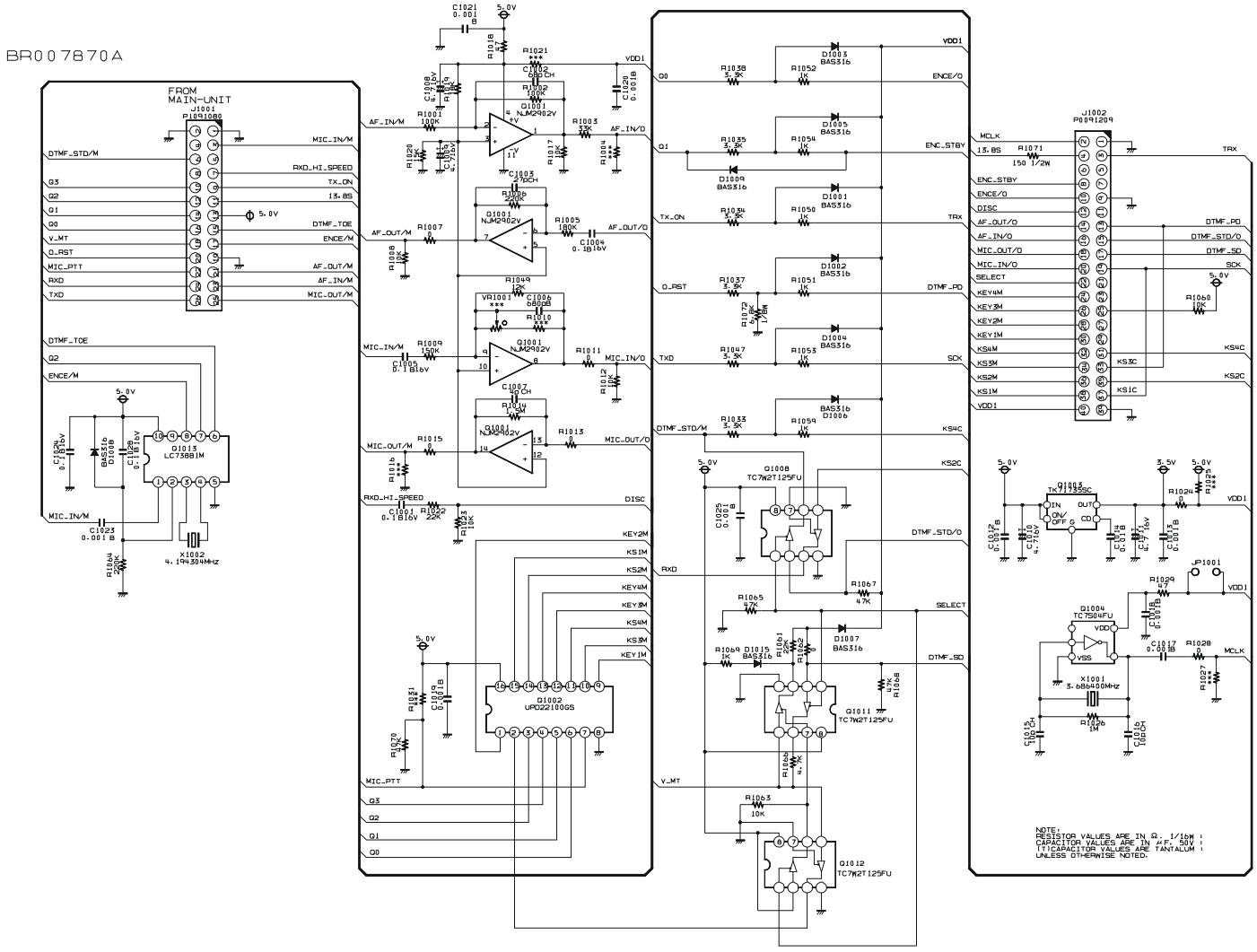


Side A

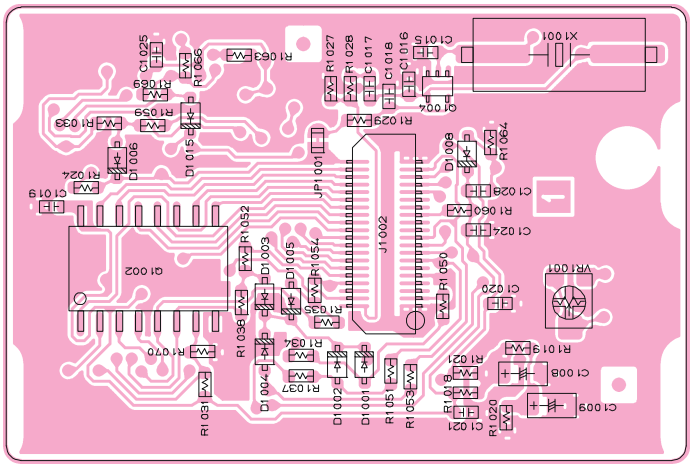


Side B

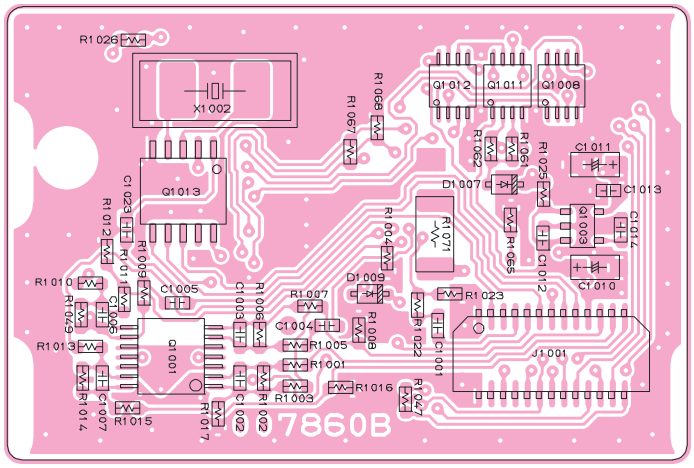
Circuit Diagram



Parts Layout



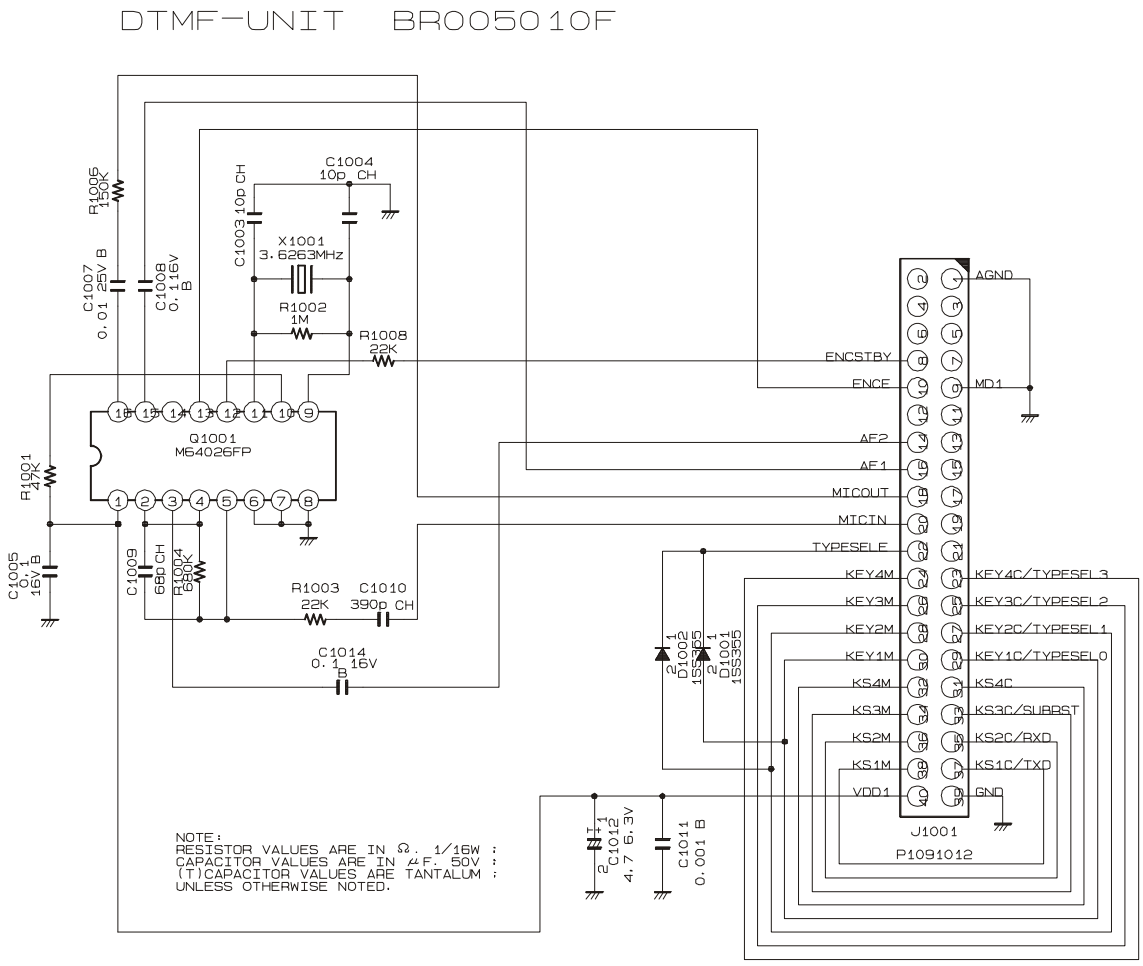
Side A



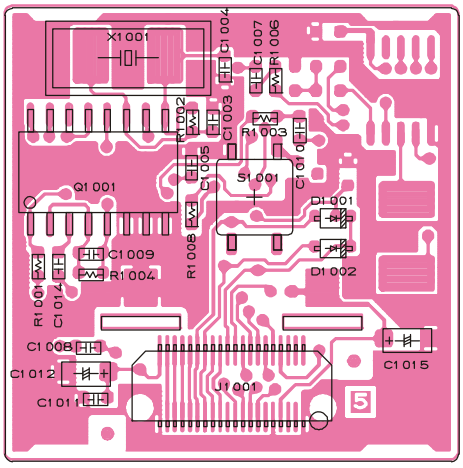
Side B

FVP-36 Voice Inversion Type Encryption Unit

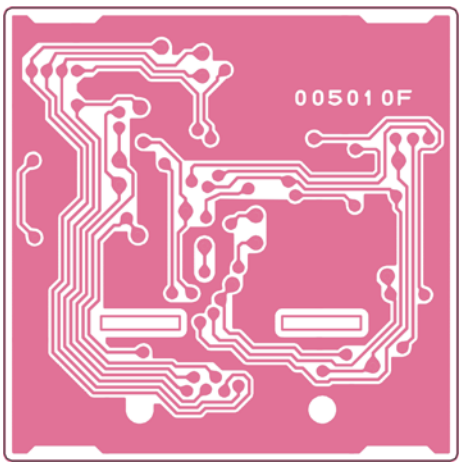
Circuit Diagram



Parts Layout



Side A



Side B