Vertex Standard

UHF FM Transceiver

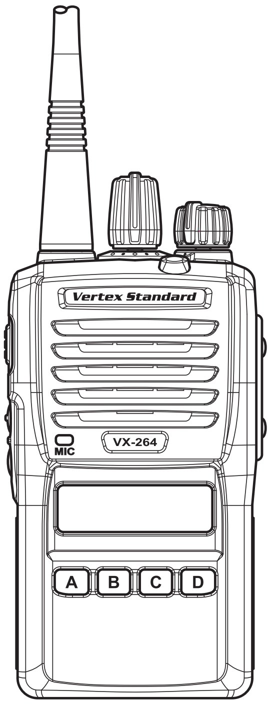
VX-264

Service Manual

Vertex Standard LMR, Inc.

EC127U90E

Introduction



This manual provides the technical information necessary for servicing the VX-264 UHF FM Transceiver.

Servicing this equipment requires expertise in handing 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 board in this transceiver. Each side of the board is referred to by the type of the majority of components installed on that side ("Side A" or "Side B"). In most cases one side has only chip components (surface-mount devices), and the other has either a mixture of both chip and leaded components (trimmers, coils, electrolytic capacitors, ICs, etc.), or leaded components only.

As described in the pages to follow, the advanced microprocessor design of the VX-264 Transceiver allows a complete alignment of this transceiver to be performed without opening the case of the radio; all adjustments can be performed from the front panel, using the "Alignment Mode" menu.

While we believe the 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

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

Specifications: USA (NA) & Except EIA (CE)

General

Frequency range:	403-470 MHz (Type "G6") 450-520 MHz (Type "G7") (USA Model: 450-512 MHz)
Channel / Group:	128 Channels / 8 Groups
Power Supply Voltage:	7.4 V DC ± 10%
Current Consumption:	<2.0 A (5 W TX)
Channel Spacing:	12.5 / 25 kHz (USA Model: 12.5 kHz)
PLL Steps:	5 / 6.25 kHz
IP Rating:	IP55
Operating Temperature Range:	–22 °F to +140 °F (–30 °C to +60 °C)
Charging Temperature Range:	+32 °F to +113 °F (0 °C to +45 °C)
Frequency Stability:	±2.5 ppm
RF Input-Output:	50 ohm (unbalanced)
Dimension (H x W x D):	2.3 x 4.3 x 1.3 inches (58.4 x 109 x 32.3 mm) (with FNB-V133LI-UNI) 2.3 x 4.3 x 1.6 inches (58.4 x 109 x 39.9 mm) (with FNB-V134LI-UNI)
Weight (Approx.):	10.4 oz (296 g) (with FNB-V133LI-UNI, Antenna, Belt Clip) 11.6 oz (330 g) (with FNB-V134LI-UNI, Antenna, Belt Clip)

Receiver (Measured by TIA/EIA-603)

Circuit Type:	Double Conversion Super-heterodyne
Sensitivity (12 dB SINAD):	0.25 µV
Adjacent Channel Selectivity:	65 / 60 dB (W/N)
Hum and Noise:	45 / 40 dB (W/N)
Intermodulation:	65 dB
Spurious Image Rejection:	70 dB
Conducted Spurious:	–57 dBm
Audio output:	700 mW (internal @16 ohm, 5 % THD) 500 mW (external @4 ohm, 5 % THD)

Transmitter (Measured by TIA/EIA-603)

Output Power:	5 / 1 W
Modulation:	16K0F3E / 11K0F3E
Maximum Deviation:	±5.0 kHz / ±2.5 kHz
Conducted Spurious Emissions:	70 dB below carrier
FM Hum & Noise:	45 / 40 dB (W/N)
Audio Distortion:	<5% @1 kHz

Specifications subject to change without notice or obligation.

General

Frequency range:	403-470 MHz (Type “G6”)
	450-520 MHz (Type “G7”)
Channel / Group:	128 Channels / 8 Groups
Power Supply Voltage:	7.4 V DC ± 10%
Current Consumption:	<2.0 A (5 W TX)
Channel Spacing:	12.5 / 20 / 25 kHz
PLL Steps:	5 / 6.25 kHz
IP Rating:	IP55
Operating Temperature Range:	–30 °C to +60 °C
Charging Temperature Range:	0 °C to +45 °C
Frequency Stability:	±2.5 ppm
RF Input-Output:	50 ohm (unbalanced)
Dimension (H x W x D):	58.4 x 109 x 32.3 mm (with FNB-V133LI-UNI)
	58.4 x 109 x 39.9 mm (with FNB-V134LI-UNI)
Weight (Approx.):	296 g (with FNB-V133LI-UNI, Antenna, Belt Clip)
	330 g (with FNB-V134LI-UNI, Antenna, Belt Clip)

Receiver (Measured by ETS 300 086)

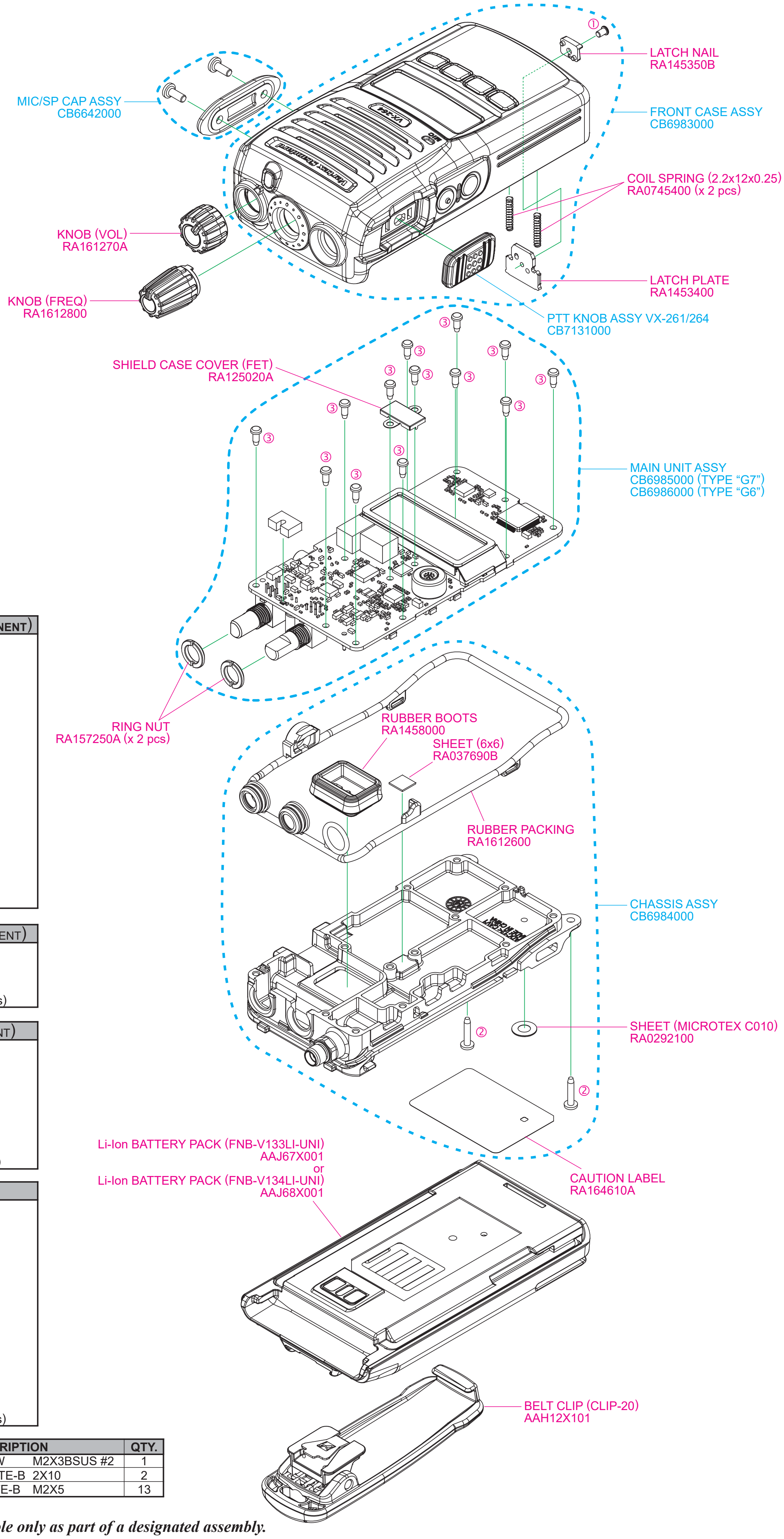
Circuit Type:	Double Conversion Super-heterodyne
Sensitivity (20 dB SINAD):	–2 dBμV
Adjacent Channel Selectivity:	65 / 60 dB (W/N)
Hum and Noise:	45 / 40 dB (W/N)
Intermodulation:	65 dB
Spurious Image Rejection:	70 dB
Conducted Spurious:	–57 dBm @≦ 1 GHz, –47 dBm @> 1 GHz
Audio output:	700 mW (internal @16 ohm, 5 % THD)
	500 mW (external @4 ohm, 5 % THD)

Transmitter (Measured by ETS 300 086)

Output Power:	5 / 1 W
Modulation:	16K0F3E / 14K0F3E / 11K0F3E
Maximum Deviation:	±5.0 kHz / ±4.0 kHz / ±2.5 kHz
Conducted Spurious Emissions:	–36 dBm @≦ 1 GHz, –30 dBm @> 1 GHz
FM Hum & Noise:	45 / 40 dB (W/N)
Audio Distortion:	<5% @1 kHz

Specifications subject to change without notice or obligation.

Exploded View & Miscellaneous Parts



FRONT CASE ASSY (COMPONENT)
FRONT CASE (4KEY)
WINDOW
NAME PLATE
MODEL LABEL (VX-264)
KEYPAD
PTT KNOB ASSY VX-261/264
RUBBER (SIDE)
LATCH NAIL
LATCH PLATE
COIL SPRING (2.2x12x0.25) (x2 pcs)
INDICATOR
SPEAKER
SP NET
WIRE ASSY (BLK)
WIRE ASSY (YEL)
SHEET (MICROTEX 8x4)
PAN HEAD SCREW (M2x3BUS #2)

MIC/SP CAP ASSY (COMPONENT)
CAP (MIC/SP)
O RING (CAP)
O RING (0.8x2.2) (x2 pcs)
BIND HEAD SCREW (M2.6x6B) (x2 pcs)

CHASSIS ASSY (COMPONENT)
CHASSIS
CONNECTOR (5MAF11S-T02)
RUBBER PACKING
RUBBER BOOTS
SHEET (6x6)
SHEET (MICROTEX C010)
CAUTION LABEL
BIND HEAD TAPTITE-B (2x10) (x2 pcs)

MAIN UNIT (COMPONENT)
Printed Circuit Board with Components
LCD
LIGHT GUIDE (LCD)
LCD HOLDER
INTER CONNECTOR
REFLECTOR SHEET (C065)
SPONGE RUBBER (LCD)
DOUBLE FACE (LCD)
HOLDER RUBBER (MIC)
LIGHT GUIDE (LCD)
SPONGE RUBBER (LIGHT GUIDE)
SHIELD CASE COVER (FET)
RING NUT (x2 pcs)
PAN HEAD TAPTITE-B (M2x5) (x13 pcs)

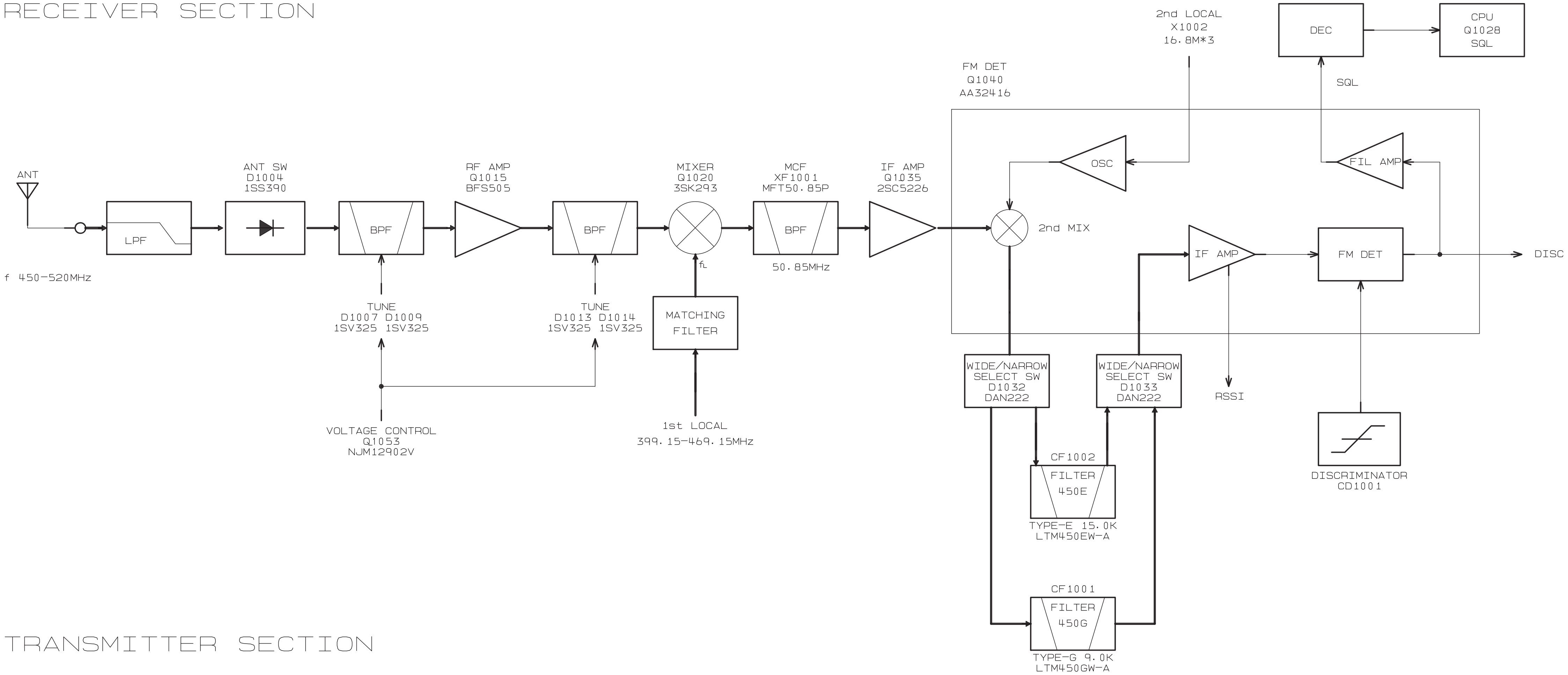
REF.	VXSTD P/N	DESCRIPTION	QTY.
①	U07230227	PAN HEAD SCREW M2X3BSUS #2	1
②	U24110001	BIND HEAD TAPTITE-B 2X10	2
③	U44105001	PAN HEAD TAPTITE-B M2X5	13

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

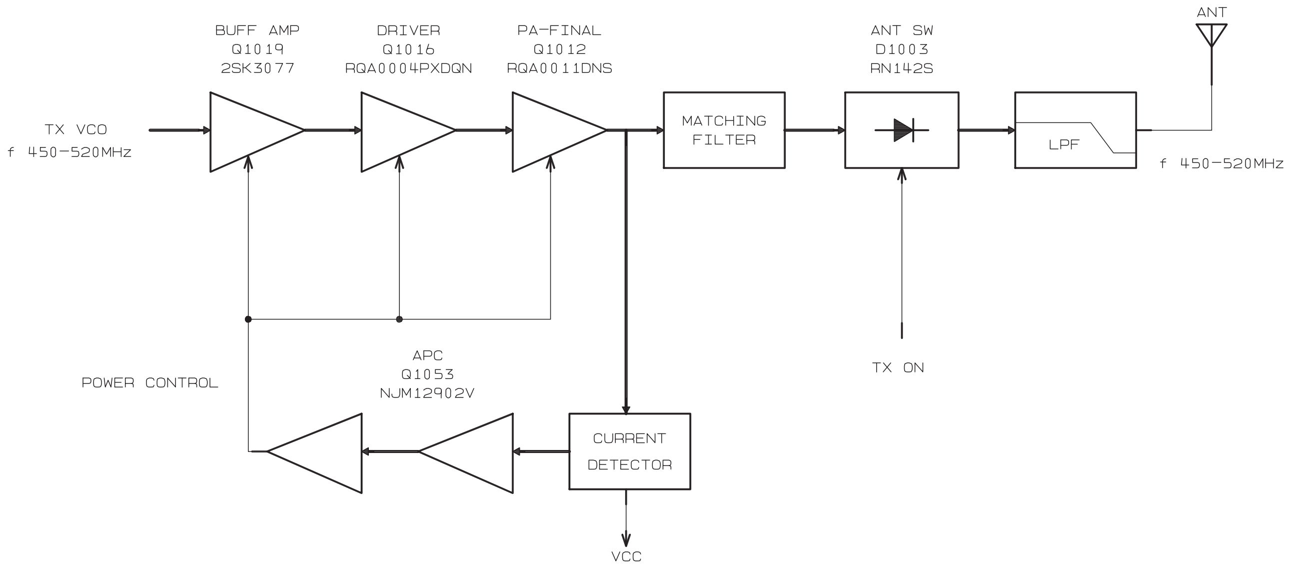
REF.	DESCRIPTION	VALUE	MFR's DESIG	VXSTD P/N
	FRONT CASE ASSY			CB6983000
	LATCH NAIL			RA145350B
	LATCH PLATE			RA1453400
	PTT KNOB ASSY VX-261/264			CB7131000
	COIL SPRING	(x2 pcs)	(2.2x12x0.25)	RA0745400
	PAN HEAD SCREW		(M2X3BSUS #2)	U07230227
	MIC/SP CAP ASSY			CB6642000
	CHASSIS ASSY			CB6984000
	RUBBER PACKING			RA1612600
	RUBBER BOOTS			RA1458000
	SHEET		(6x6)	RA037690B
	SHEET		(MICROTEX C010)	RA0292100
	CAUTION LABEL			RA164610A
	BIND HEAD TAPTITE-B	(x2 pcs)	(2x10)	U24110001
	MECHANICAL PARTS			
	KNOB		(VOL)	RA161270A
	KNOB		(FREQ)	RA1612800
	MAIN UNIT ASSY			CB6986000: TYPE "G6" CB6985000: TYPE "G7"
CD1001	CERAMIC DISC		JTBM450CX24-A	H7901530A
CF1001	CERAMIC FILTER		LTM450GW-A	H3900573A
CF1002	CERAMIC FILTER		LTM450EW-A	H3900574A
F 1001	CHIP FUSE ⚠	3.15A, 36 V	FHC16 322ADTP	Q0000118
MC1001	MIC. ELEMENT		PF0-1055P	M3290045
Q 1012	FET		RQA0011DNS#G0	G3070507
S 1001	TACT SWITCH		EVQPUB02K	N5090167
S 1002	TACT SWITCH		EVQPUB02K	N5090167
S 1003	TACT SWITCH		EVQPUB02K	N5090167
S 1004	ROTARY SWITCH		TP7LBJC16 RY-10488	N0190201
TH1001	THERMISTOR		TH05 4B473FR	G9090150
VR1001	POT.		TP7LBRN1 B503 RY-10489	J60800323
X 1001	XTAL	11.0592MHz	EXS00A-CG04670	H0103439
X 1002	XTAL OSC	16.8MHz	HKE3449A 16.8MHZ	H9501513
X 1003	XTAL	11.0592MHz	DSX321G 11.0592MHZ	H0103449
XF1001	XTAL FILTER		MFT50.85P 50.85MHZ	H1102361
	SHIELD CASE COVER		(FET)	RA125020A
	RING NUT	(x2 pcs)		RA157250A
	PAN HEAD TAPTITE-B	(x13 pcs)	(M2X5)	U44105001

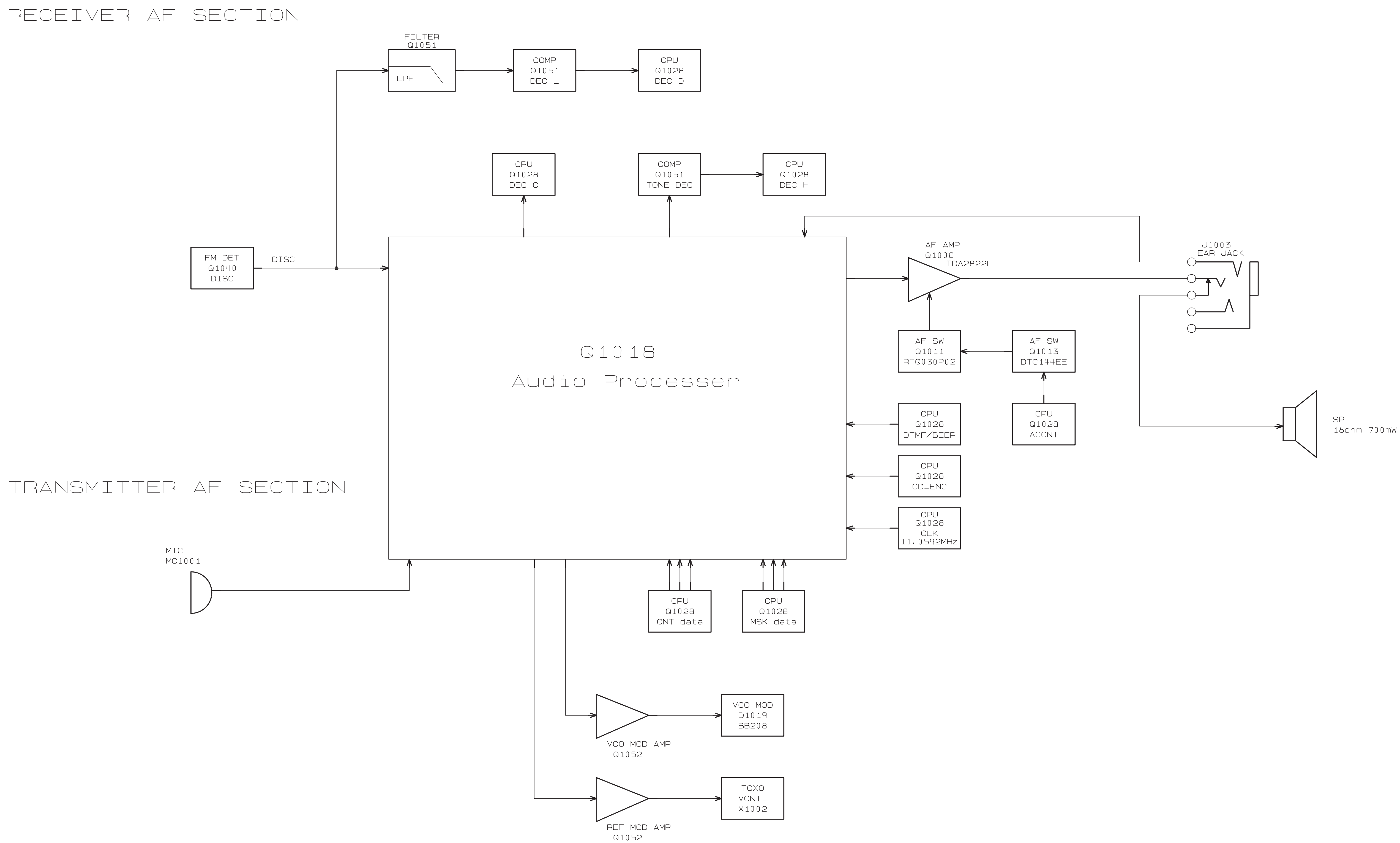
⚠ When replace a chip fuse, use the part of the same type and value.

RECEIVER SECTION

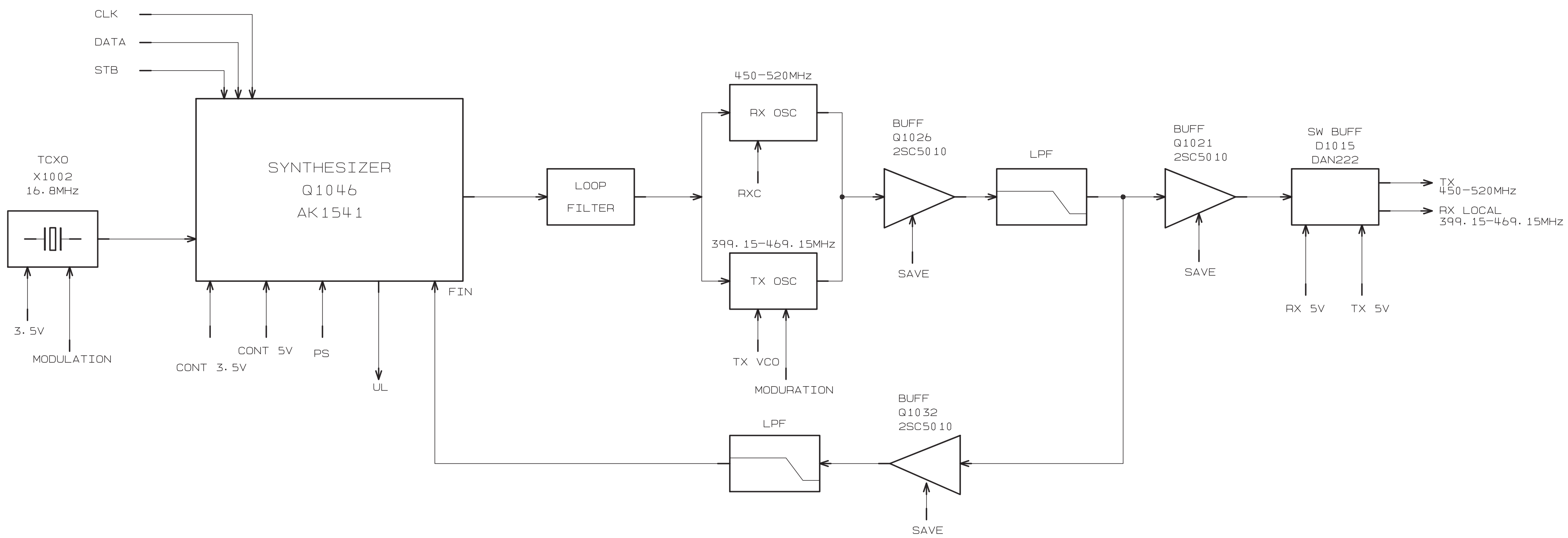


TRANSMITTER SECTION

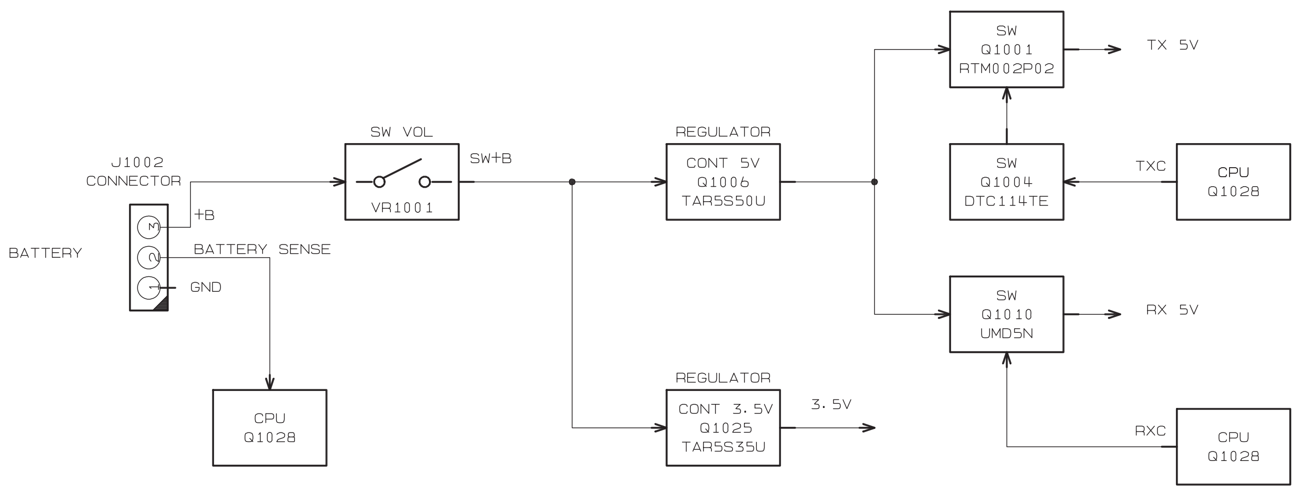


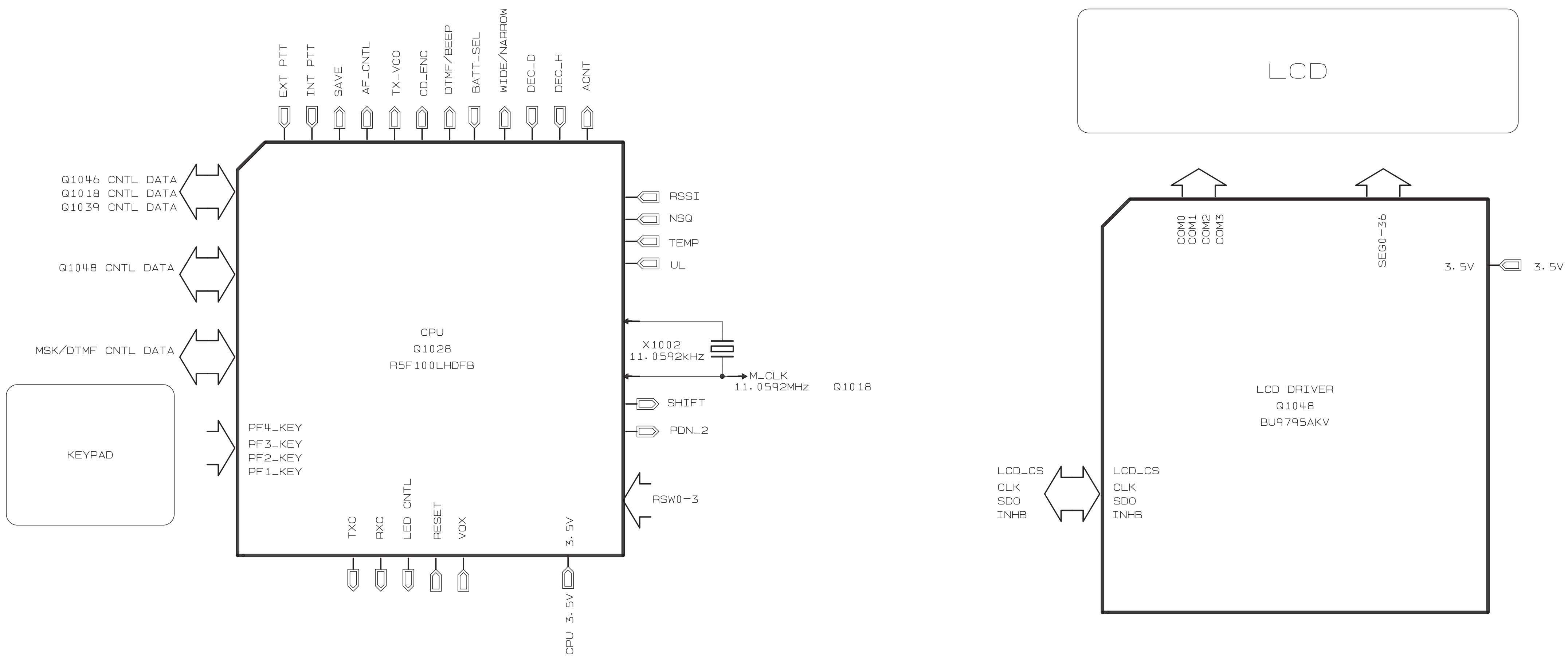

RECEIVER AF SECTION
FILTER Q1051
LPF
COMP Q1051 DEC_L
CPU Q1028 DEC_D
CPU Q1028 DEC_C
COMP Q1051 TONE DEC
CPU Q1028 DEC_H
FM DET Q1040 DISC
DISC
Q1018
Audio Processer
AF AMP Q1008
TDA2822L
J1003 EAR JACK
AF SW Q1011 RTQ030P02
AF SW Q1013 DTC144EE
CPU Q1028 ACONT
CPU Q1028 DTMF/BEEP
CPU Q1028 CD_ENC
CPU Q1028 CLK 11.0592MHz
SP 16ohm 700mW
TRANSMITTER AF SECTION
MIC MC1001
CPU Q1028 CNT data
CPU Q1028 MSK data
VCO MOD AMP Q1052
VCO MOD D1019 BB208
REF MOD AMP Q1052
TCXO VCNTL X1002

FREQUENCY GENERATION SECTION



REGURATION SECTION




EXT PTT
INT PTT
SAVE
AF_CNTL
TX_VCO
CD_ENC
DTMF/BEEP
BATT_SEL
WIDE/NARROW
DEC_D
DEC_H
ACNT
Q1046 CNTL DATA
Q1018 CNTL DATA
Q1039 CNTL DATA
Q1048 CNTL DATA
MSK/DTMF CNTL DATA
KEYPAD
PF4_KEY
PF3_KEY
PF2_KEY
PF1_KEY
CPU
Q1028
R5F100LHDFB
RSSI
NSQ
TEMP
UL
X1002
11.0592kHz
M_CLK
11.0592MHz
Q1018
SHIFT
PDN_2
RSW0-3
TXC
RXC
LED CNTL
RESET
VOX
3.5V
CPU 3.5V
LCD
COM0
COM1
COM2
COM3
SEG0-36
3.5V
3.5V
LCD DRIVER
Q1048
BU9795AKV
LCD_CS
CLK
SDO
INHB
LCD_CS
CLK
SDO
INHB

1. Receiver System

1-1. Front-end RF amplifier

Incoming RF signal from the antenna is delivered to the Main Unit and passes through low-pass filter, antenna switching diode **D1004** and **D1005** (both **1SS390**), high-pass filter and removed undesired frequencies by varactor tuned band-pass filter **D1007** and **D1009** (both **1SV305**).

The filtered RF signal is amplified by **Q1015** (**BFS505**) and then passes through another varactor tuned band-pass filter **D1013** and **D1014** (both **1SV305**) to remove the undesired frequencies, and then applied to the 1st mixer **Q1020** (**3SK293**).

1-2. First Mixer

The RF signal is mixed with the 1st local signal between 352.15 and 419.15 MHz (Type "G6") or 399.15 and 469.15 MHz (Type "G7") in the 1st mixer **Q1020** (**3SK293**), to produce 50.85 MHz 1st IF signal.

The 1st local signal is generated by the VCO, which consists of **Q1029** (**CPH3910**), varactor diodes **D1021** (**1SV323**), **D1022** (**1SV323**: Type "G6", **1SV325**: Type "G7"), **D1023** (**1SV323**: Type "G6", **1SV325**: Type "G7"), and **D1025** (**1SV323**). The 1st local signal is supplied to the 1st mixer **Q1020** (**3SK293**) through the buffer amplifier **Q1021** and **Q1026** (both **2SC5010**).

1-3. IF Amplifier & Demodulator

The 1st IF signal passes through monolithic crystal filters **XF1001** (±7.5 kHz BW) to strip away all but the desired signal, and then supplied the buffer amplifier **Q1035** (**2SC5226**).

The amplified 1st IF signal is applied to the FM IF subsystem IC **Q1040** (**AA32416**) which contains the 2nd mixer, 2nd local oscillator, limiter amplifier, noise amplifier, and RSSI amplifier.

The signal from reference oscillator **X1002** (16.8 MHz) becomes three times of frequencies in **Q1040** (**AA32416**), it is mixed with the 1st IF signal and becomes 450 kHz.

The 2nd IF signal passes through the ceramic filter **CF1001** (**LTM450GW**) or **CF1002** (**LTM450EW**) to strip away unwanted mixer products, and is supplied to the limiter amplifier in **Q1040** (**AA32416**), which removes amplitude variations in the 450 kHz IF, before detection of the speech by the ceramic discriminator **CD1001** (**JT-BM450CX24**).

1-4. Audio amplifier

The detected signal from **Q1040** (**AA32416**) is supplied to the receiver circuit section of the Baseband IC **Q1018** (**FQ0801**).

The processed audio signal from **Q1018** (**FQ0801**) is supplied to the AF volume (VR1001) through the audio amplifier **Q1008** (**TDA2822L**). As a result, the audio signal provides up to 700 mW (@16-ohm BTL) for internal speaker or up to 500 mW (@4-ohm OTL) for external speaker.

1-5. Squelch Circuit

There are 16 levels of squelch setting from "0" to "15". The level "0" means open the squelch. The level "1" means the threshold setting level and level "14" means tight squelch. From level "2" to level "13" is established in the middle of threshold and tight. The level "15" becomes setting of carrier squelch.

1-5-1. Noise Squelch

The noise squelch circuit is consisted of the band-path filter, noise amplifier **Q1047** (**2SC4617**), and noise detector **D1035** and **D1036** (both **DA221**).

When a carrier isn't received, the noise ingredient which goes out of the demodulator section of **Q1040** (**AA32416**) is amplified by noise amplifier **Q1047** (**2SC4617**) through the band-path filter, and then is detected to DC voltage by **D1035** and **D1036** (both **DA221**). The DC voltage is inputted to pin 54 (A/D port) of the CPU **Q1028** (**R5F100LHDFB**). When a carrier is received, the DC voltage becomes low because the noise is compressed.

When the detected voltage to CPU is "High", the CPU stops the AF output of **Q1013** (**DTC144EE**) by making to "low" of the pin 39 of CPU.

When the detection voltage to CPU is "low", the CPU allows the AF output of **Q1013** (**DTC144EE**) by making to "High" of the pin 39 of CPU.

1-5-2. Carrier Squelch

The detected RSSI voltage from pin 12 of **Q1040** (**AA32416**) supplied to pin 53 (A/D port) of **Q1028** (**R5F100LHDFB**). It is controls the AF output.

The RSSI output voltage changes according to the signal strength of carrier. The stronger signal makes the RSSI voltage to be higher voltage. The process of the AF signal control is same as Noise Squelch. The shipping data is adjusted 3 dBμ (EMF) higher than squelch tight sensitivity.

2. Transmitter System

2-1. MIC Amplifier

The speech signal from internal microphone **MC1001** or external microphone **J1003** is supplied to the transmitter circuit section of the Custom Baseband IC **Q1018** (**FQ0801**) which is consist of the microphone amplifier, compander, pre-emphasis, limiter and splatter filter.

The processed speech signal from pin 42 of **Q1018** (**FQ0801**) is amplified by **Q1052-2** (**NJM12904R**), and then is made FM modulation to transmit carrier by the modulator **D1019** (**BB208**) of VCO **Q1037** (**2SC4227**).

2-2. Drive and Final Amplifier Stages

The modulated signal from the VCO **Q1037** (**2SC4227**) is buffered by **Q1026** (**2SC5010**). Then the signal is buffered by **Q1021** (**2SC5010**) and **Q1019** (**2SK3077**) for the driver amplifier **Q1016** (**RQA0004PXDQS**). The low-level transmit signal is then applied to **Q1012** (**RQA-0011DNS**) for final amplification up to 5 watts output power.

The transmit signal then passes through the antenna switch **D1003** (**RN142S**) and is low-pass filtered to suppress away harmonic spurious radiation before delivery to the antenna.

2-3. Automatic Transmit Power Control

The current detector **Q1053-1** (**NJM12902V**) detects the current of the driver amplifier **Q1016** (**RQA0004PXDQS**) and final amplifier **Q1012** (**RQA0011DNS**), and converts the current difference to the voltage difference.

The output from the current detector **Q1053-1** (**NJM12902V**) is compared with the reference voltage by **Q1053-2** (**NJM12902V**). The output from **Q1053-2** (**NJM12902V**) controls the gate bias of the buffer amplifier **Q1019** (**2SK3077**), driver amplifier **Q1016** (**RQA0004PXDQS**) and final amplifier **Q1012** (**RQA-0011DNS**).

The reference voltage changes into two levels (Transmit Power "High" and "Low") controlled by Custom Baseband IC **Q1018** (**FQ0801**).

3. PLL Frequency Synthesizer

3-1. VCO (Voltage Controlled Oscillator)

While the radio is receiving, the RX VCO **Q1029** (**CPH3910**) generates a programmed frequency between 352.15 and 419.15 MHz (Type "G6") or 399.15 and 469.15 MHz (Type "G7") as 1st local signal.

While the radio is transmitting, the TX VCO **Q1037** (**2SC4227**) generates a frequency between 403 and 470 MHz (Type "G6") or 450 and 520 MHz (Type "G7").

The output from VCO is amplified by buffer amplifier **Q1026** and **Q1021** (both **2SC5010**). The buffered VCO is supplied to the 1st mixer **Q1020** (**3SK293**) in case of the reception. In the transmission, the buffered VCO is supplied to other buffer amplifier **Q1019** (**2SK3077**), and then amplified more by **Q1016** (**RQA0004PXDQS**) and it is put into the final amplifier **Q1012** (**RQA0011DNS**).

A portion of the buffered VCO is fed back to the PLL IC **Q1046** (**AK1541**) to control the VCV voltage.

3-2. Varactor Control Voltage Control

The tuning voltage (VCV) of VCO is established the lock range of VCO by controlling the cathode of varactor diodes **D1021** (**1SV323**), **D1022** (**1SV323**: Type "G6", **1SV325**: Type "G7"), **D1023** (**1SV323**: Type "G6", **1SV325**: Type "G7"), and **D1025** (**1SV323**) for receiving and **D1026** (**1SV303**), **D1027** (**1SV323**: Type "G6", **1SV305**: Type "G7"), **D1028** (**1SV323**: Type "G6", **1SV305**: Type "G7"), and **D1029** (all **1SV305**) for transmitting.

3-3. PLL

The PLL IC **Q1046** (**AK1541**) is consists of reference divider, main divider, phase detector, charge pumps, and pulse swallow operation.

The reference frequency from TCXO **X1002** (16.8 MHz) is inputted to pin 10 of PLL IC **Q1046** (**AK1541**) and is divided by reference divider. On the other hand, the feedback signal of the VCO inputted to 17 pin of PLL IC **Q1046** (**AK1541**), and is divided with the dividing ratio which becomes same frequency as the output of reference divider.

These two signals are compared by phase detector, and then phase difference pulse is generated. The phase difference pulse is becomes a DC voltage through the charge pumps and LPF, and it controls the VCO.

The PLL serial data from CPU **Q1028** (**R5F100LHDFB**) is sent with three lines of SDO (pin 34), SCK (pin 32) and PSTB (pin 20).

The lock condition of PLL is output from the UL (pin 7) terminal of the PLL IC **Q1046** (**AK1541**). The UL terminal becomes "Low" at the lock condition, and becomes "High" at the unlock condition. The CPU **Q1028** (**R5F100LHDFB**) is always watching over the UL condition, and when it becomes "Low" unlocked condition, the CPU prohibits transmitting and receiving.

Introduction

The VX-264 is 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 altering version type. All component replacement and service should be performed only by an authorized Vertex Standard representative, or the warranty policy may be void.

The following procedures cover the sometimes critical and tedious adjustments that are not normally required once the transceiver has left the factory. However, if damage occurs and some parts subsequently are replaced, realignment may be required. 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.

We recommend that servicing be performed only by authorized Vertex Standard service technicians who are experienced with the circuitry and fully equipped for repair and alignment. 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 reserves 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 realignment determined to be absolutely necessary.

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.

Required Test Equipment

❒ RF Signal Generator with calibrated output level at 600 MHz
❒ Oscilloscope
❒ Deviation Meter (linear detector)
❒ In-line Wattmeter with 5 % accuracy at 600 MHz
❒ 50 Ohm RF Dummy Load with power rating 10 W at 600 MHz
❒ Regulated DC Power Supply (standard 7.5 V DC, 3 A)
❒ Frequency Counter with 0.2 ppm accuracy at 600 MHz
❒ Audio Signal Generator
❒ AC Voltmeter
❒ DC Voltmeter
❒ UHF Sampling Coupler
❒ IBM® PC/compatible Computer with Microsoft® Windows® 2000, XP, Vista or Windows7
❒ Vertex Standard CE150 PC Programming Software
❒ Vertex Standard FIF-12 USB Programming Interface and CT-104A, CT-106, or CT-171 PC Programming Cable.
❒ Vertex Standard FRB-6 Tuning Interface Box and CT-160 Connection Cable.
❒ Vertex Standard CN-3 (P/N: A08760001) Antenna Connector

Alignment Preparation & Precautions

A 50-Ohm RF Dummy Load and in-line 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.

Because of the BTL (Bridged Trans Less) Amplifier circuit used in the VX-264, do not connect earth side of the speaker leads to chassis “ground”.

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 time to come to room temperature before alignment.

Whenever 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.

Note: Signal levels in dB referred to in the alignment procedure are based on 0 dBμ EMF = 1 μV.

Test Setup

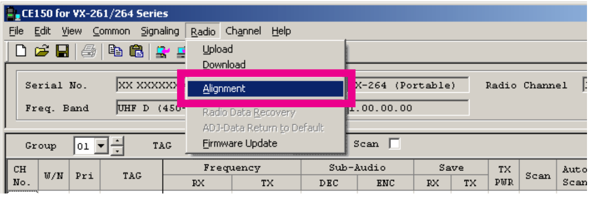
Setup the test equipment as shown below for transceiver alignment, then apply 7.5 V DC power to the transceiver.

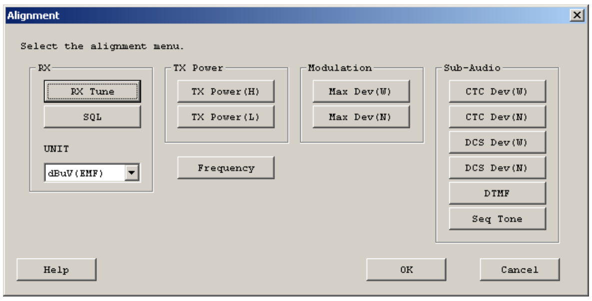
The Alignment Tool Outline

Installation of the alignment tool

❐ Install the CE150 (PC Programming Software) to your PC.

❐ “Alignment“ function in the “Radio“ menu tab of CE150.





Action of the switches

When the transceiver is in the “Alignment mode,“ the action of the [A], [B], [C], [D], SIDE-1, SIDE-2, and PTT keys are ignored. All of the action is controlled by the PC.

> **Caution**
> Please never turn off the power supply during alignment. If the power supply is turned off during alignment, the alignment data will be corrupted.

Alignment Mode

In the “Alignment Mode”, the aligned data written in the radio will be able to re-align its alignment data. The value of each parameter can be changed to desired position by “←”/“→” arrow key for data up/down, “↑”/“↓” arrow key for channel up/down, direct number input, and drag the mouse.

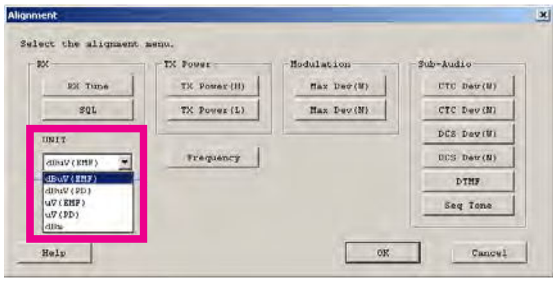
Note: when all items are aligned, it is strongly recommended to align according to following order. The detail information is written in the help document of CE150 PC Programming Software.

1. PLL Reference Frequency (Frequency)
2. RX Sensitivity (RX Tune)
3. Squelch (SQL/RSSI)
4. TX Power <High/Low>
5. Maximum Deviation <Wide/Narrow>

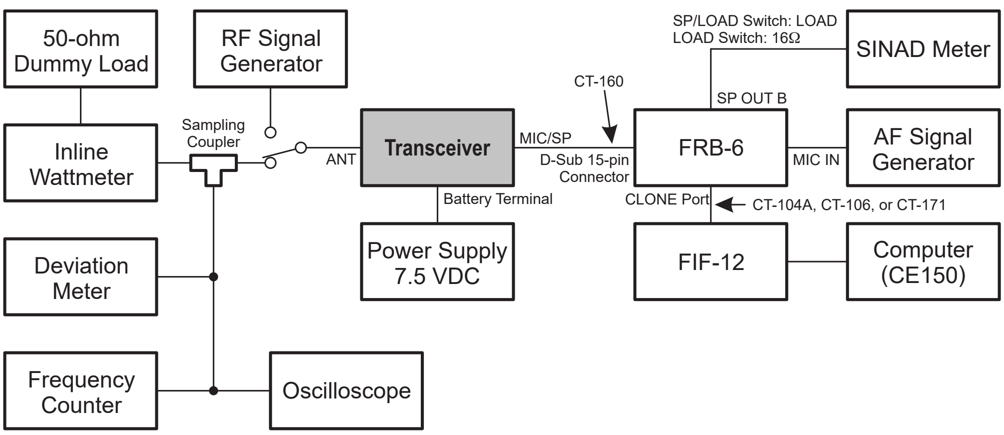
Please adjust the following items when needed.

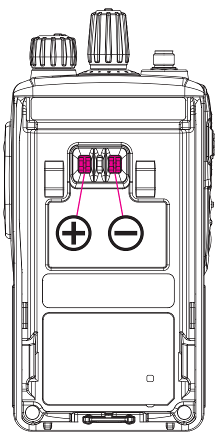
❍ CTCSS Deviation <Wide/Narrow>
❍ DCS Deviation <Wide/Narrow>
❍ DTMF Alignment
❍ Sequential Tone

> **Unit**
> During alignment, you may select the value among dBμV, μV (EMF or PD), or dBm by the “UNIT” box.



> When perform the RX Tune and SQL alignment, the RF level shows this unit according to this setting.

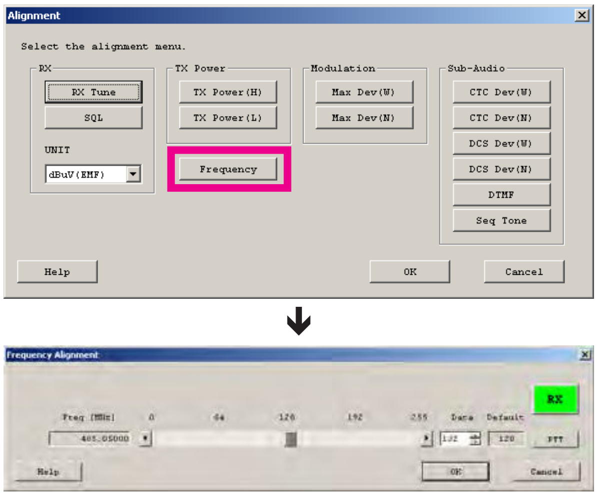




1. PLL Reference Frequency (Frequency)

This parameter align the reference frequency for PLL.

1. Press the “Frequency” button to open the “Frequency Alignment” window.
2. Click the “PTT” button to transmit the radio on the center frequency channel.
3. Set the value to get the desired frequency according to the following ways:
   - Dragging the slide bar
   - Clicking the arrow buttons
   - Pressing the left/right arrow key of the computer’s keyboard
   - Entering the value (“0” - “255”) in the “Data” box from the computer’s keyboard
4. After getting the desired frequency, click the “PTT” button to stop transmitting.
5. Click the “OK” button to finish the frequency alignment and save the data.



2. RX Sensitivity (RX Tune)

This parameter align the RX BPF (Band Pass Filter) for Receive (RX) sensitivity.

The PLL Reference Frequency (Frequency) alignment must be done before this alignment is performed.

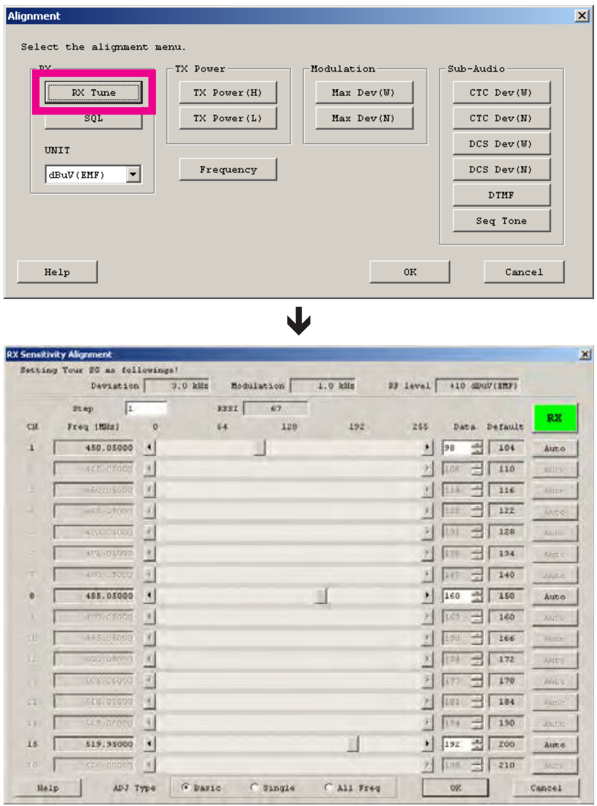
1. Press the “RX Tune” button to open the “RX Sensitivity Alignment” window will appear.
2. Click the slide bar of the desired channel. The radio switches to the selected channel.
3. Set the RF Signal Generator according to the indication at the top of the screen (Setting Your SG as followings).
4. Set the value to get the best RX sensitivity (Highest RSSI value) according to the following ways:
   - Dragging the slide bar
   - Clicking the arrow buttons
   - Pressing the left/right arrow key of the computer’s keyboard
   - Entering the value (“0” - “255”) in the “Data” box from the computer’s keyboard
5. Click the “OK” button to finish the RX Sensitivity alignment and save the data.

You may select the alignment type from the “Radio” button located at the button of the screen (**ADJ Type**), as needed.

Basic: “Low Edge / Band Center/ High Edge” and select the channel for alignment (Default).

Single: Alignment value changes only on the selected channel.

All Freq: Alignment value changes on all channels.



3. Squelch (SQL)

This parameter align the SQL (Squelch) Sensitivity. There are several alignments as follows in the Squelch Sensitivity.

Tight SQL Level (TI NSQ W/N)
The Alignment for the Noise SQL Tight level at Wide (5k/4k) or Narrow (2.5k).

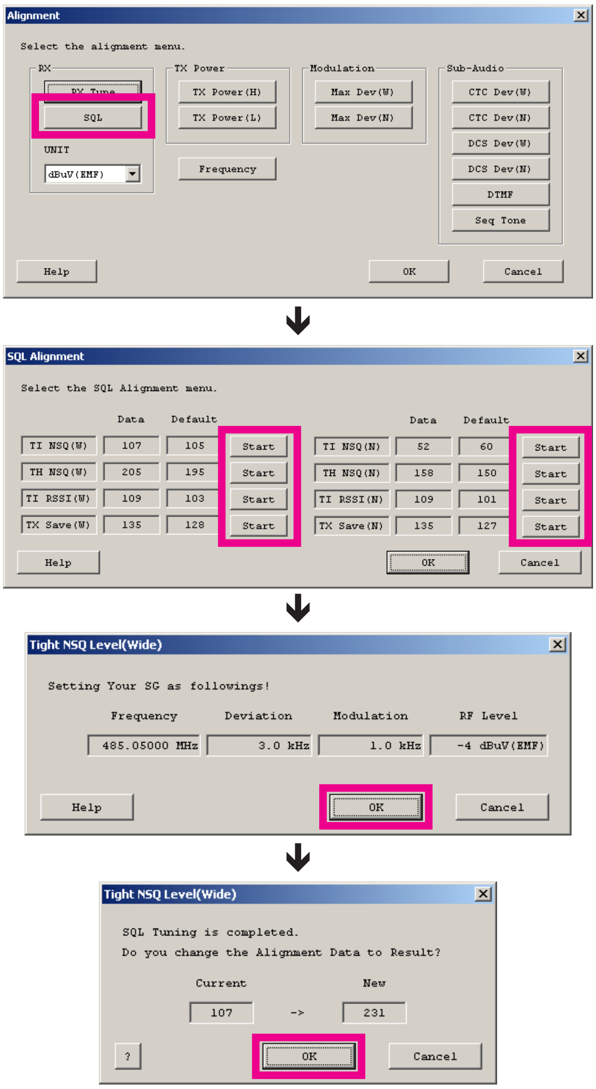
Threshold SQL Level (TH NSQ W/N)
The Alignment for the Noise SQL Threshold level at Wide (5k/4k) or Narrow (2.5k).

Tight SQL RSSI Level (TI RSSI W/N)
The Alignment for the “level 15” of the RSSI SQL level at Wide (5k/4k) or Narrow (2.5k).

TX Save RSSI Level (TX SAVE W/N)
The Alignment for the TX Save RSSI level at Wide (5k/4k) or Narrow (2.5k).

The procedure for all the alignments is as follows.

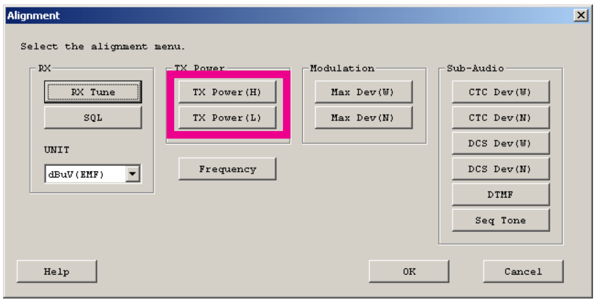
1. Click the “SQL” button to open the “SQL Alignment” menu.
2. Click the “Start” button on the desired alignment item to open other window.
3. Set the RF Signal Generator according to the indication of the window, then click the “OK” button.
4. The automatic alignment will start to get the optimum level.
5. The alignment result will appear in the “New” box.
   On the following alignment items, click the “OK” button and then repeat step 2-5 several times according to the indication of the window.
   Threshold SQL Level (Wide/Narrow)
   Normal RSSI Level (Wide/Narrow)
   Tight RSSI Level (Wide/Narrow)
   Other alignment items has not extra step; only one step procedure.
6. Click the “OK” button, then the data will be saved and the alignment is finished.

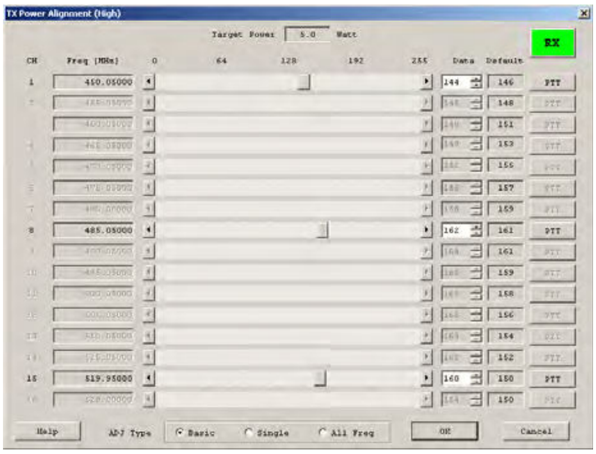


4. TX Power

This parameter align the Transmit Output “High” or “Low” Power for the selected channel.

1. Press the “TX Power (H / L)” button to open the “TX Power Alignment” window.
3. Click the “PTT” button on the desired channel. The radio starts to transmit on the selected channel.
4. Set the value to get desired output power (Normally: High: 5 W, Low: 1 W) on the Power Meter according to the following ways:
   - Dragging the slide bar
   - Clicking the arrow buttons
   - Pressing the left/right arrow key of the computer’s keyboard
   - Entering the value (“0” - “255”) in the “Data” box from the computer’s keyboard
5. After getting the desired output power, click the “PTT” button to stop transmitting.
6. Click the “OK” button to finish the TX Power alignment and save the data.





You may select the alignment type from the “Radio” button located at the button of the screen (**ADJ Type**), as needed.

Basic: “Low Edge / Band Center/ High Edge” and select the channel for alignment (Default).

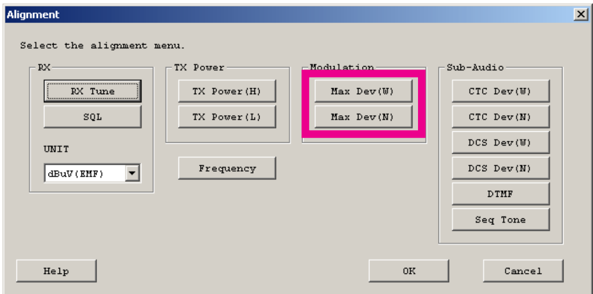
Single: Alignment value changes only on the selected channel.

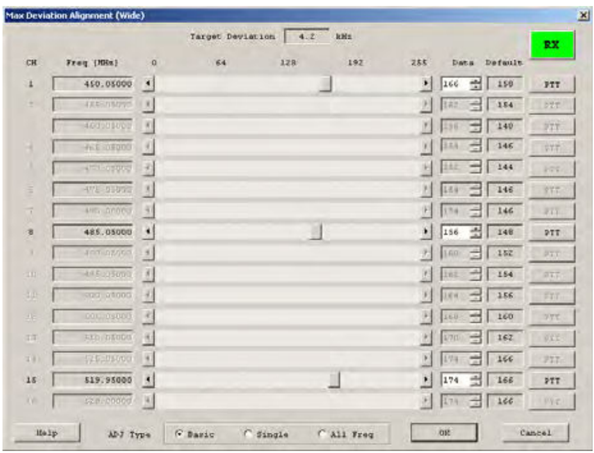
All Freq: Alignment value changes on all channels.

5. Maximum Deviation <Wide> / <Narrow>

This parameter align the Maximum Deviation (Wide/Narrow).

1. Press the “Max Dev (W /N)” button to open the “Max Deviation Alignment” window.
2. Set the Audio Signal Generator to 100 mV with a 1 kHz tone, Sine Wave.
3. Click the “PTT” button on the desired channel. The radio starts to transmit on the selected channel.
4. Set the value to get desired deviation (Wide: 4.2 kHz, Narrow: 2.1 kHz) on the deviation meter according to the following ways:
   - Dragging the slide bar
   - Clicking the arrow buttons
   - Pressing the left/right arrow key of the computer’s keyboard
   - Entering the value (“0” - “255”) in the “Data” box from the computer’s keyboard
5. After getting the desired deviation, click the “PTT” button to stop transmitting.
6. Click the “OK” button to finish the Max Deviation alignment and save the data.





You may select the alignment type from the “Radio” button located at the button of the screen (**ADJ Type**), as needed.

Basic: “Low Edge / Band Center/ High Edge” and select the channel for alignment (Default).

Single: Alignment value changes only on the selected channel.

All Freq: Alignment value changes on all channels.

Adjust the following items if needed.

CTCSS Deviation <Wide> / <Narrow>

This parameter align the CTCSS Deviation of the selected channel.

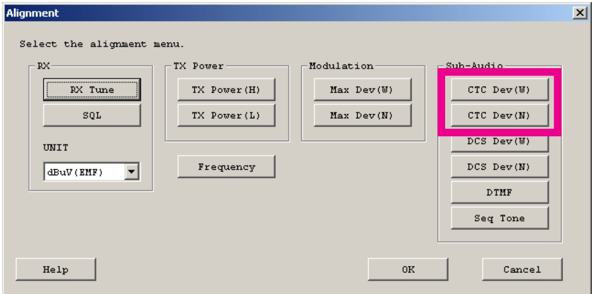
1. Press the "CTC Dev (W/N)" button to open the "CTCSS Deviation Alignment" window will appear.
2. Click the "PTT" button on the desired channel. The radio starts to transmit with the CTCSS tone on the selected channel.
3. Set the value to get desired deviation (Nominal: Wide: 0.55 kHz, Narrow: 0.35 kHz) on the deviation meter according to the following ways:
   - Dragging the slide bar
   - Clicking the arrow buttons
   - Pressing the left/right arrow key of the computer's keyboard
   - Entering the value ("0" - "31") in the "Data" box from the computer's keyboard
4. After getting the desired deviation, click the "PTT" button to stop transmitting.
5. Click the "OK" button to finish the CTCSS Deviation alignment and save the data.

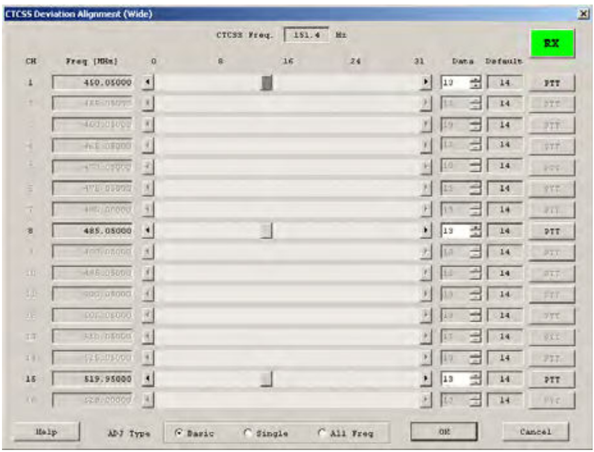
You may select the alignment type from the "Radio" button located at the button of the screen (**ADJ Type**), as needed.

Basic: "Low Edge / Band Center/ High Edge" and select the channel for alignment (Default).

Single: Alignment value changes only on the selected channel.

All Freq: Alignment value changes on all channels.





DCS Deviation <Wide> / <Narrow>

This parameter is to align the DCS Deviation of the selected channel.

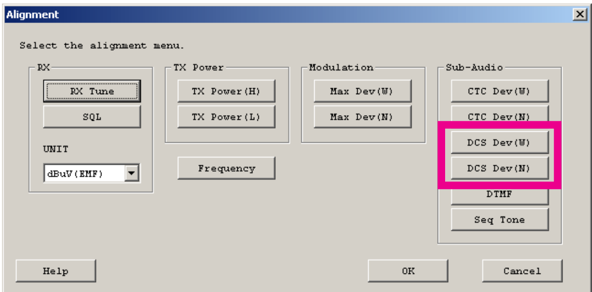
1. Press the "DCS Dev (W/N)" button to open the "DCS Deviation Alignment" window.
2. Click the "PTT" button on the desired channel. The radio starts to transmit with the DCS code on the selected channel.
3. Set the value to get desired deviation (Nominal: Wide: 0.55 kHz, Narrow: 0.35 kHz) on the deviation meter according to the following ways:
   - Dragging the slide bar
   - Clicking the arrow buttons
   - Pressing the left/right arrow key of the computer's keyboard
   - Entering the value ("0" - "31") in the "Data" box from the computer's keyboard
4. After getting the desired deviation, click "PTT" button to stop transmitting.
5. Click the "OK" button to finish the DCS Deviation alignment and save the data.

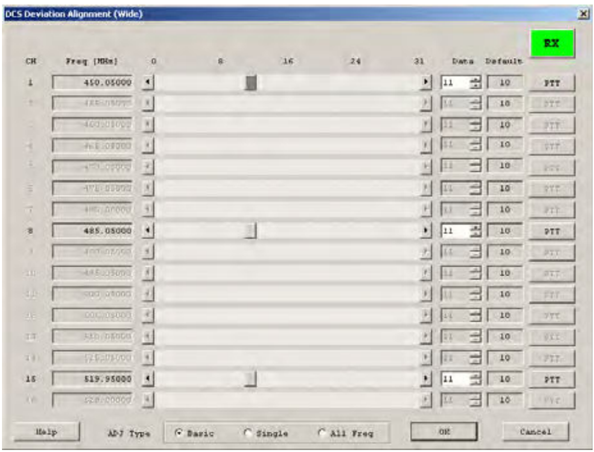
You may select the alignment type from the "Radio" button located at the button of the screen (**ADJ Type**), as needed.

Basic: "Low Edge / Band Center/ High Edge" and select the channel for alignment (Default).

Single: Alignment value changes only on the selected channel.

All Freq: Alignment value changes on all channels.

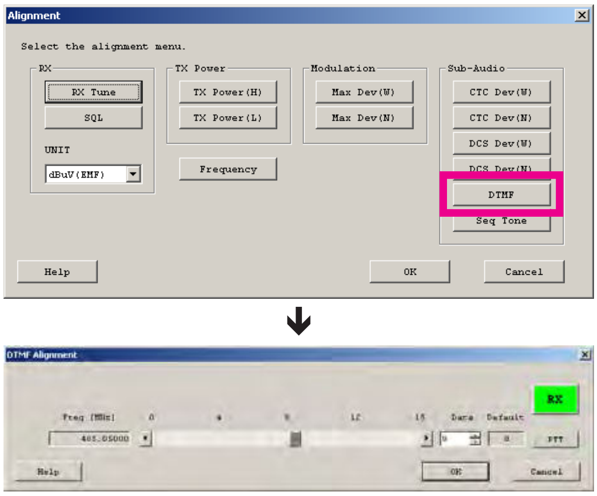




DTMF Deviation

This parameter align the DTMF Deviation.

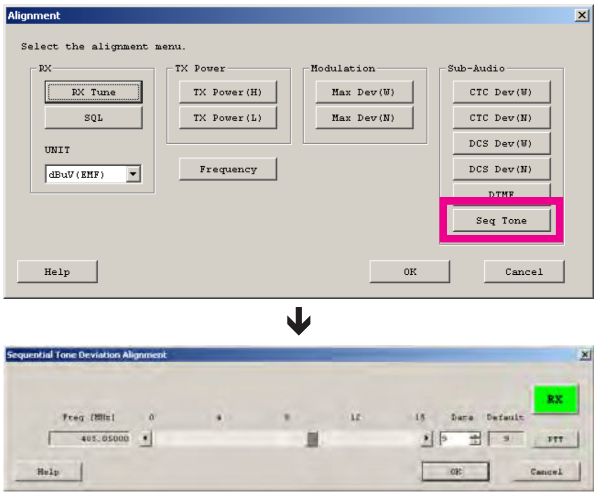
1. Press the "DTMF" button to open the "DTMF Alignment" window.
2. Click the "PTT" button to transmit the radio on the center frequency channel.
3. Set the value to get desired deviation (Nominal: 3.0 kHz) on the deviation meter according to the following ways:
   - Dragging the slide bar
   - Clicking the arrow buttons
   - Pressing the left/right arrow key of the computer's keyboard
   - Entering the value ("0" - "15") in the "Data" box from the computer's keyboard
4. After getting the desired deviation, click the "PTT" button to stop transmitting.
5. Click the "OK" button to finish the DTMF Deviation alignment and save the data.



Sequential Tone Deviation

This parameter align the Sequential Tone Deviation for the 2-Tone and 5-Tone Encoder.

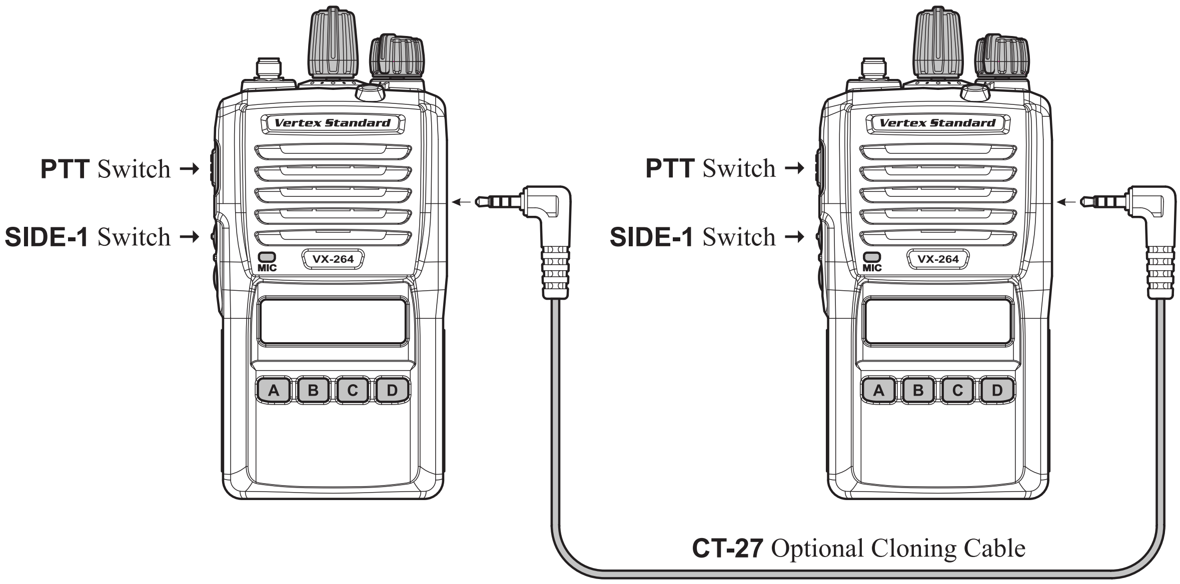
1. Press the "Seq Tone" button to open the "Sequential Tone Deviation Alignment" window will appear.
2. Click the "PTT" button to transmit the radio on the center frequency channel.
3. Set the value to get desired deviation (Nominal: 3.0 kHz) on the deviation meter according to the following ways:
   - Dragging the slide bar
   - Clicking the arrow buttons
   - Pressing the left/right arrow key of the computer's keyboard
   - Entering the value ("0" - "15") in the "Data" box from the computer's keyboard
4. After getting the desired deviation, click the "PTT" button to stop transmitting.
5. Click the "OK" button to finish the Sequential Tone Deviation alignment and save the data.



Cloning

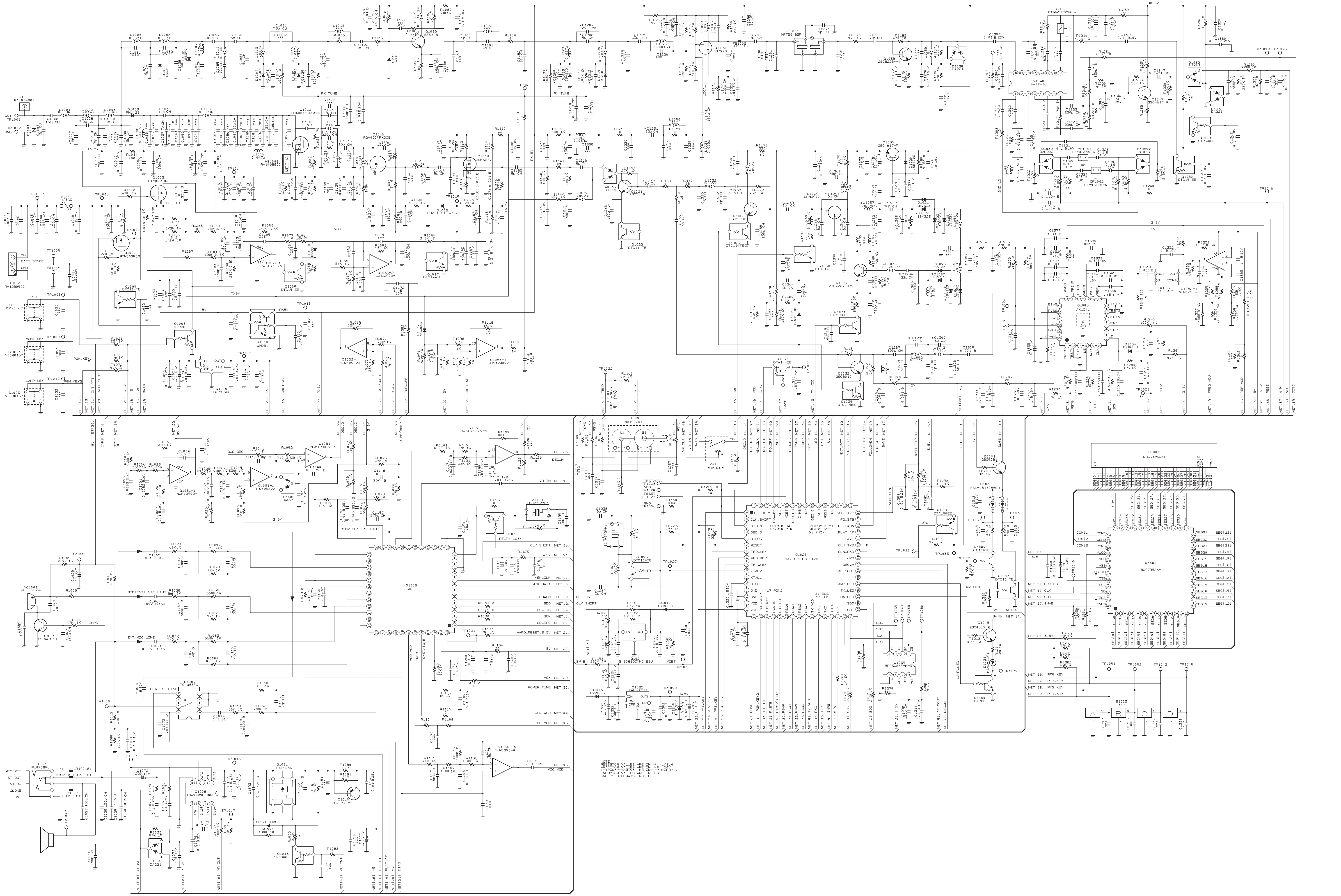
The **VX-264** transceiver includes a convenient "Cloning" feature, which allows the programming data from one transceiver to be transferred to another **VX-264**. Here is the procedure for Cloning one transceiver's data to another.

1. Turn both transceivers "off".
2. Remove the plastic cap and its two mounting screws from the **MIC/SP** jack on the right side of the transceiver. Do this for both transceivers.
3. Connect the optional **CT-27** cloning cable between the **MIC/SP** jacks of the two transceivers.
4. Press and hold in the **PTT** and **SIDE-1** switches (just below the **PTT** switch) while turning the transceiver "on". Do this for both transceivers (the order of the switch-on operation does not matter). When Clone mode is successfully activated in this step. "**CLONE**" will appear on the display of both transceivers.
5. On the **Destination** transceiver, press the **SIDE-1** switch. "**LOADING**" will appear on the display.
6. Press the **PTT** switch on the **Source** transceiver. "**SENDING**" will appear on the display, and the data will be transferred.
7. If there is a problem during the cloning process, "**ERROR**" will appear on the display; check your cable connections and battery voltage, and try again.
8. If the data transfer is successful, the display will return to "**CLONE**". Turn both transceivers "off" and disconnect the **CT-27** cable. You can then turn the transceivers back on, and begin normal operation.
9. Replace the plastic cap and its two mounting screws.



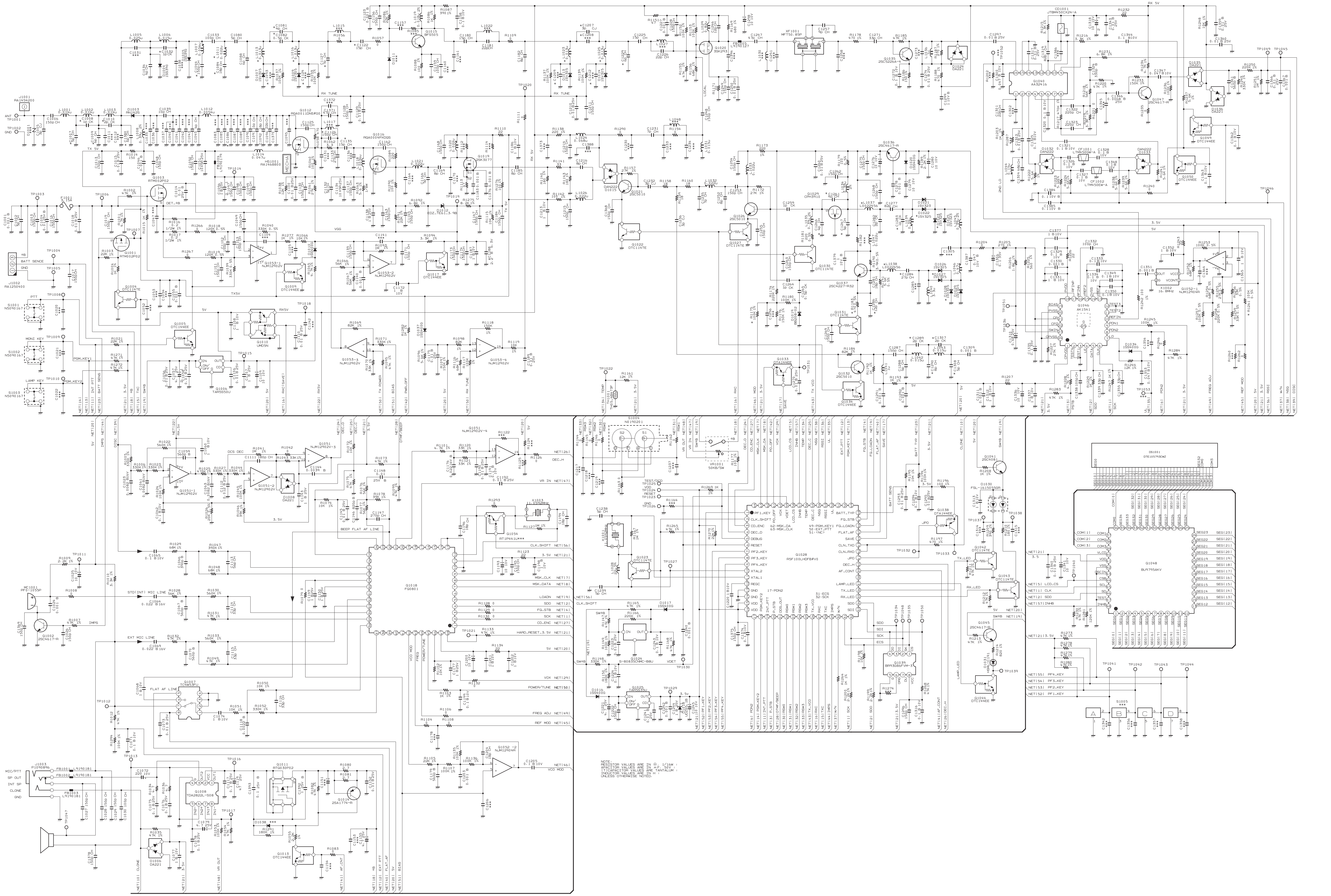
Main Unit

Circuit Diagram: Type "G6"



Main Unit

Circuit Diagram: Type “G7”



Vertex Standard