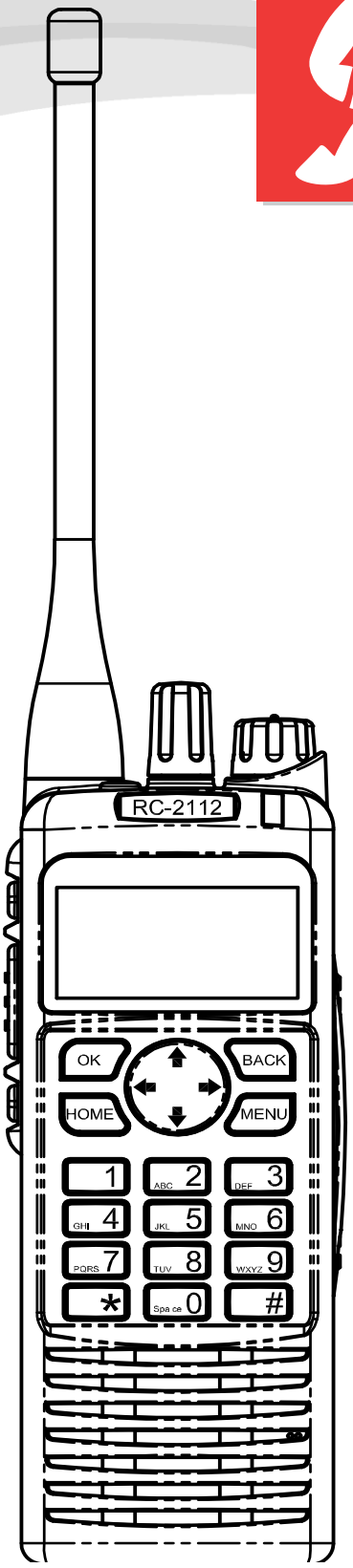
SmarTrunk Systems, Inc.



ST-2112D (450Mhz ~ 520Mhz)

UHF FM DIGITAL TRANSCEIVER

SERVICE MANUAL

SmarTrunk Systems, INC.

ST-2112D SM R1.2

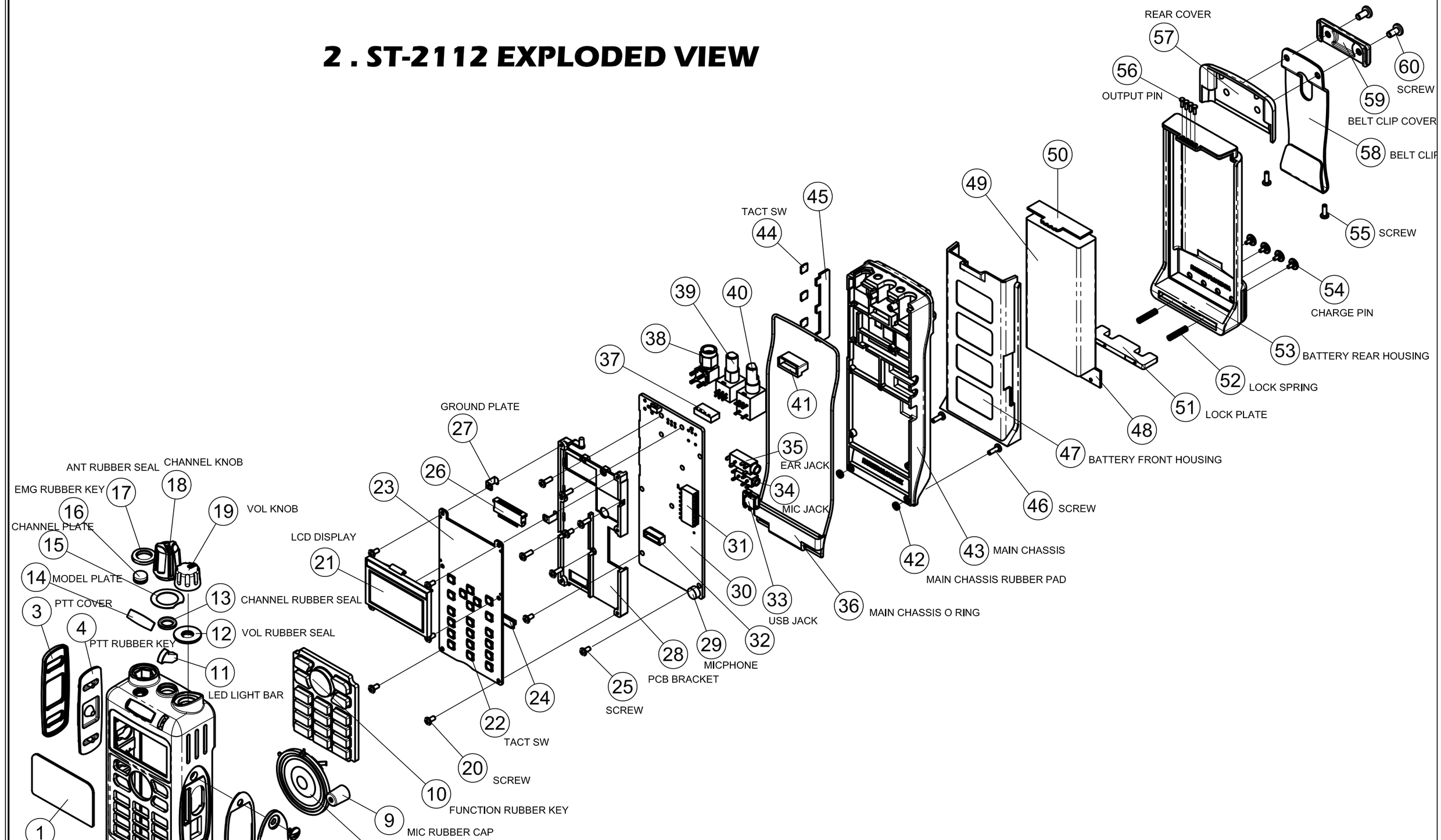
Table of Contents

1. Specifications:

	SPECIFICATION	ST-2112C
GENERAL	Frequency Range [Mhz]	450 TO 520
	Channels	512
	Groups/Banks	64
	Power [Vdc]	6.4 to 8.8
	Dimensions [mm]	130(H)x36(D)x52(W)
	Weight [gr] (oz)	320 - (11.3)
	Temperature range	- 30 °C ~ 60 °C (-22°F ~ +140°F)
	Signaling	51 CTCSS tones / 183 DCS tones / 65534 SDR IDs
	Reverse Burst	No
	Display	128x64 (supports international characters)
	Emergency call	Yes
	GPS	Option
	Channel Scan	Yes
	BCLO / BTLO	Yes
	Power Saver control	Yes
	TOT	Yes
	Radio Kill/Alive	Yes
	Adjustable Power Selection	Auto + H/M/L
	Key lock	Yes
	Adjustable Squelch Level	16 Step
	Password	Yes
	Key Function selection	Yes
TRANSMIT	MAX RF power	4 W
	Frequency Stability	>1PPM
	Bandwidth [Khz]	6.25/12.5/25
	Adjacent Channel Power	-65dBC (typ)
	SNR	45dB typ
	Analog harmonic distortion	3% typ (AF 1Khz, 60% deviation)
	Data transmit rate	2400/4800/9600 bps
	Max frequency deviation	2.5Khz@12.5Khz BW/5Khz@25Khz BW
	Analog Modulation type	11K0F3E, 25K0F3E
	TDMA Emissions	8K30F7E, 8K30F7D
	FDMA Digital emissions	6K25F1E, 6K25F1D, 8K30F1E, 8K30F1D, 8K30F1W
	Ext. Mic. Impedance	600 Ohms
RECEIVER	Analog Sensitivity	0.25uV (12dB Sinad)
	Digital Sensitivity	0.25uV (3% BER)
	Image rejection	60dB typ
	Adjacent Channel selectivity	65dB typ @25KHz BW
	HUM and NOISE ratio	45dB
	Speaker Audio Power	1W
	External audio power	1W

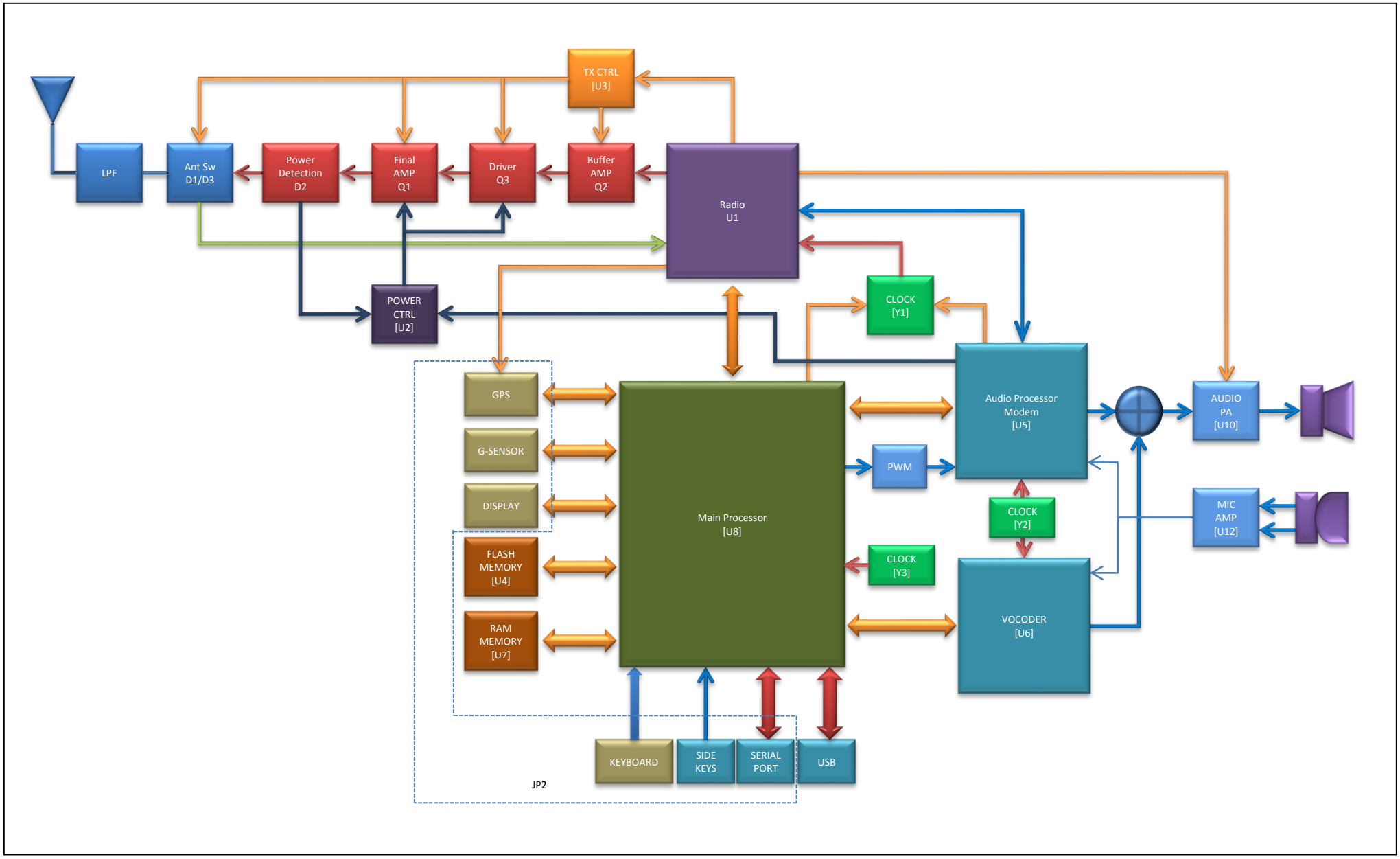
Specifications subject to change without notice or obligation

2 . ST-2112 EXPLODED VIEW



	REVISIONS	SIGN	DATE	SCALE	UNITS	MODEL		SmarTrunk Systems, Inc.
1						ST-2112V		
2				MATERIAL				
3				FINISH		APPROVED Daniel Martin	DATE M/D/Y	TITLE EXPLODE DRAWING
4				TOLERANCE UNLESS OTHERWISE STATED		CHECKED	DATE M/D/Y	PART NO.
5						DRAWN Jack Chang	DATE M/D/Y 04/05/2013	

3. ST-2112 SIMPLIFIED DIAGRAM



Notes:

4. - ST-2112 RF DESCRIPTION

4.1. Circuit Configuration

The receiver is a single receiver with built-in DSP fully integrated.

Incoming signals from the antenna, after passing through LPF filter, are fed direct to the DSP down converter to get the baseband voice from 0Hz to 3500Hz.

Demodulated signals are filtered and conditioned onto a second DSP based filter, which also includes a high efficiency 4FSK modem.

For digital demodulation, the recovered data is fed into a vocoder, which converts the data to voice.

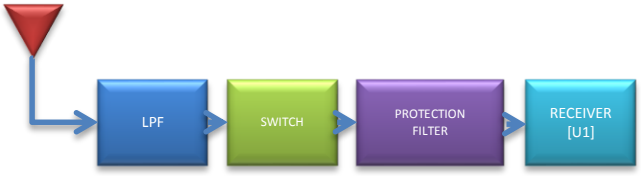
Analog voice from the analog path or the analog voice recovered from the vocoder, are fed into an audio power amplifier.

Transmit signal frequency is generated by integrated VCO and PLL. RF frequency generated by the integrated RF chip is amplified into a 3-step amplifier then filtered by a low pass filter to be applied to the antenna.

4.2. Receiver System

4.2.1. Front-end RF Receiver

Incoming RF signals from the antenna are delivered to the Receiver Unit and pass through a Low-pass filter, antenna switching



diode, and then fed to the receiver (U1) passing through a limiter BPF.

4.2.2. ANALOG Audio Processing

The RF signal is tuned by U1, which includes a base band DSP audio processing, recovering flat audio from DC up to 3500 hz.

The detected audio is amplified, filtered and conditioned inside of U5 which also includes a de-emphasize filtering shape for received audio signals

The output of the filtered and conditioned audio is delivered to an audio power amplifier (U10) then to the speaker passing through the external audio connector switch.

4.2.3. Virtual Squelch Circuit

S/N ratio is measured by the receiver (U1) as the result of the analysis of the signal and the noise of the carrier. The output is sent to the main processor as a digital frame, which is analyzed by radio firmware, removing noise then qualifying the signal level. If the signal level is higher than the

expected for the current programmed squelch threshold, then the processor analyzes the expected signaling programmed on the current channel table.
In case of not any signaling is required, or the signal has been detected, the processor ask to the audio processor (U5) to open the audio path, unmuting the audio amplifier (U10).

4.2.4. Virtual VOLUME CONTROL

The potentiometer position (RV1) is measured by one analog to digital converter on the audio processor (U5), and then the information is reported to the main processor. The firmware immediately adjusts the audio processor path gain to get the appropriate overall circuitry volume control.
Minimum volume, emergency and private audio level are controlled only by software overriding the information received from the DAC on U5.

4.2.5. Sub audio signaling

Received sub audio signaling like CTCSS and DCS are received and processed by the receiver (U1) then detected on the audio processor (U5). Once decoded, the sub audio signaling is reported to the processor where the firmware compares it with the value programmed into the current channel programming.

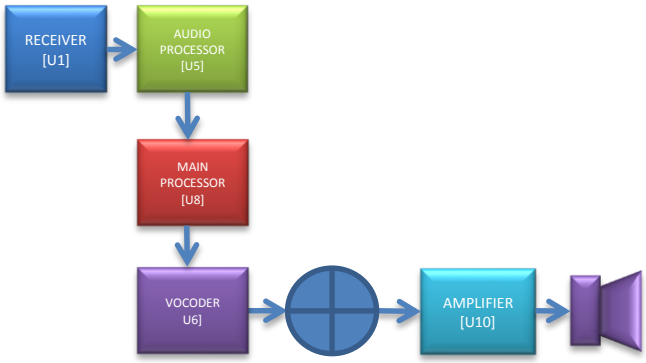
If the received signaling matches the channel programming, then the main processor (U8) requests the audio processor (U5) to open the audio patch.

4.2.6. ANALOG AUDIBLE SIGNALING

DTMF signals, MDC1200 and tone signals are processed and decoded by the audio processor (U5). Decoded information or received tone is reported to the main processor (U8).

4.2.7. DIGITAL AUDIO PROCESSING

Digital received information is processed by the receiver DSP (U1)



then delivered to the audio processor (U5), which includes a high speed (4FSK) modem.
Data decoded by the modem is transferred to the main processor (U8) which de-encrypts the information, checks the integrity, corrects the wrong bits and extract the audio information form the received frame.

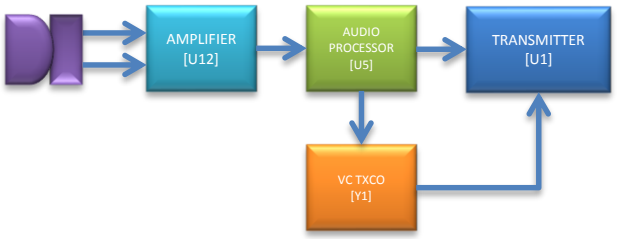
The portion of the data received, error free, is moved to the vocoder (U6).

The vocoder re-builds the audio from the compressed data then applies filter it, adjust the volume

and fed it to the audio power amplifier (U10).

4.3. Transmitter System

4.3.1. ANALOG TX SIGNAL



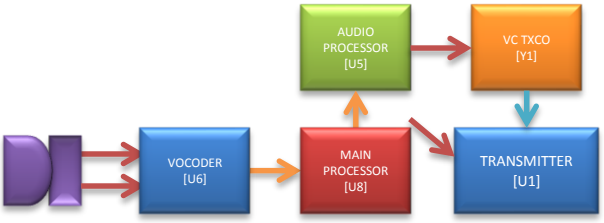
The AF signal from the internal microphone (MK1) or external microphone (J5) are processed as differential signal, then it is conditioned and transformed into common mode by the microphone pre-amplifier (U12).

The result of the conditioned in-band filtered signal is fed to the Audio Processor (U5), which provides audio compander, emphasize, limitation, encryption, etc.

The high audio band of the signal from 300 to 3500 Hz are directly fed to the transmitter (U1), which performs a direct modulation of a generated carrier.

Low frequency signaling audio are fed directly to Y1 VC TXCO main clock generator and U1 with a corresponding balance controlled by software.

4.3.2. DIGITAL TX AUDIO:



The AF signal from the internal microphone (MK1) or external microphone (J5) are fed directly to the vocoder chip (U6) which perform the data codification, delivering the digitized and encoded audio as digital frames which are processed by the Main Processor U8, which add a FEC (Frame Error Correction), encrypt the information and add the user related information as user ID, etc.

The final data frame is fed to the Audio Processor (U5) which has a built in modem, which operates for FDMA or TDMA signals, controlling the modulation of the Transmitter (U1) through the VC TXCO for DC to low frequencies and the direct modulation for higher frequencies.

4.3.3. Drive and Final Amplifier Stages

Final RF is amplified on Q2 (2SC3356) then filtered to be fed to Q3 (2SK3475) then finally amplified by Q1 (2SK3476) up to 5 watts output power.

The transmit signal then passes through the antenna switch D1 (BAR63) and is low-pass filtered to suppress harmonic spurious radiation before delivery to the antenna

4.3.4. Automatic Transmit Power Control

The RF power detector (RB705D) detects transmitted feedback then sends the readout to audio processor U5 (CMX-7141). Audio amplifier compares the transmitted power against the referred level stored on current channel memory adjusting the power control level generated as reference by one DAC output on the same Audio processor (U5) then amplified by U2 (MCP6241U) controlling the gate current on Q1 and Q17.

Evenly when power level is adjusted by software on three levels (Hi, Med, Lo) the power value can be adjusted to any desired value between zero and 5Watts by the alignment software.

Notes:

5. RC-2112 ALIGNMENT

5.1. Introduction

The ST-2112 series is carefully aligned in factory for the specified performance, across the frequency range depending 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 SmarTrunk 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 placed, 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 SmarTrunk service technicians who are experienced with the circuitry and fully equipped for repair and align. Therefore, if a fault is suspected, contact the dealer from whom the transceiver was purchased for instructions regarding repair. Authorized Smartrunk 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, SmarTrunk 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.

5.2. ALIGNMENT:

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 1 GHz
- ✓ Deviation Meter (linear detector)
- ✓ In-line Wattmeter with 5 % accuracy at 1 GHz
- ✓ 50 Ohm RF Dummy Load with power rating 10W at 1 GHz
- ✓ 8 Ohm AF Dummy Load (Attention: Audio output is BTL output)
- ✓ Regulated DC Power Supply (standard 7.5 V DC, 3 A)
- ✓ Frequency Counter with 0.2 ppm accuracy at 1GHz
- ✓ Audio Generator
- ✓ AC Voltmeter
- ✓ DC Voltmeter
- ✓ UHF Sampling Coupler
- ✓ IBM PC / compatible Computer with Microsoft® Windows® XP or later operating system
- ✓ SmarTrunk SDR Programming software (version 1.0.2 or later)
- ✓ USB A/B Programming Cable

5.3. Alignment Procedure

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 request for transmission, except where specified otherwise. Correct alignment is not possible with an antenna.

After completing one-step, read the following steps 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°F and 86 °F (20°C ~ 30 °C). When the transceiver is brought into the shop from hot or cold air, it should be required to wait few minutes 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 dBm EMF = 1 mV.

5.3.1. GENERAL ALIGNMENT CONSIDERATIONS:

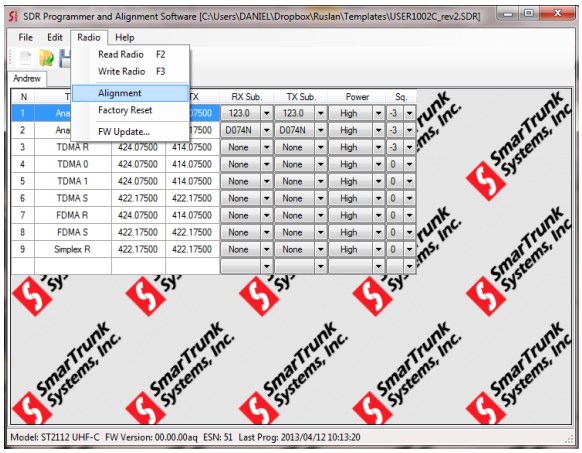
Evenly if the radio is powered off, the alignment software will detect it, but some of the test cannot be performed correctly.

Please be sure you turn the radio on before continue with this alignment procedure.

In case the battery has not enough charge, the test will be aborted by the software. Please ensure the battery has more than 50% of remaining charge to complete the test.

5.4. MAIN RADIO ALIGNMENT

Before setup any parameter, run SDR programming software then select Radio Alignment from top bar menu.



A complementary message will be displayed on the time the software detects the radio connected to USB port on the computer.

If the radio isn't connected, then the program will be timed out after 20 seconds.

As soon as the radio is detected, actual radio parameters are loaded.

Once the radio is connected, a new screen pops up showing all alignment parameters. The software downloads actual alignment parameters stored into radio memory, so the information displayed on each alignment step is the real value form the previous alignment.

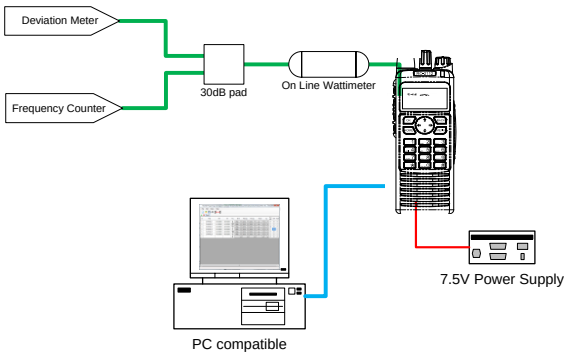
The radio also stores in a special memory area, original values assigned in factory. You can go back to those values anytime for any particular alignment step.

In case the radio is password protected, dealer password is required to access to this alignment menu.

At any time, press Finish to end the alignment procedure then the radio will returns to alignment menu.

For any transmit related alignment parameter, low power will be used.

5.5. TRANSMITTER ALIGNMENT:



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

The RF parameters are typed on the alignment software to facilitate the alignment within all radio band avoiding special programming of the radio before start alignment procedure.

All parameters can be aligned without relationship to any other, so there is no an order to align. On this way, you can adjust only the desired parameter, avoiding to waste time realigning other parameters than required.

Before proceed to align any parameter, a desired frequency must be loaded into both TX and RX. Evenly when the radio has stable characteristics for all bandwidth, it is recommendable to align on middle of the radio working band.

5.5.1. Main Clock alignment:

To align the main clock for radio Tx and RX, please select Main Clock Alignment option Alignment screen.

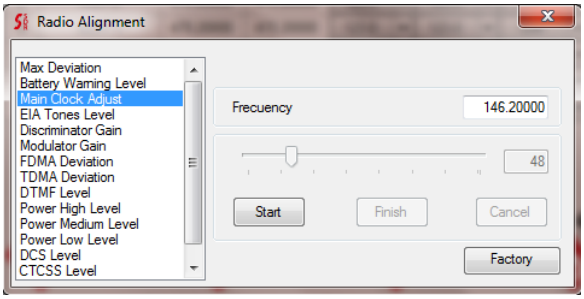


Fig 12: alignment menu

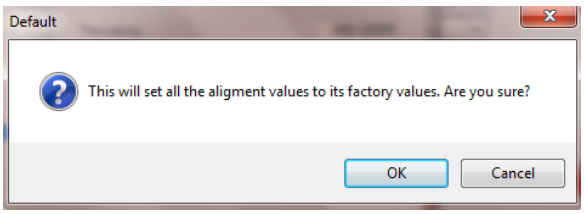
Actual alignment value will be displayed on alignment slider.

Press [Start] then move the slider to reach the desired value at the time you checks the Frequency Counter to reach the desired frequency as shown on Frequency field of the alignment screen.

As soon the desired value is reached, press [Finish] to store the value on radio memory.

If you want to retrieve factory default, press [Factory] instead of [Start]. You will be asked to confirm the factory default alignment, and then if you confirm it, original values from factory will be loaded into current alignment settings.

This confirmation screen will appears any time you want to realign any parameter to Factory Default.



5.5.2. Transmit Power alignment:

ST-2112 has three power levels to be selected for each channel. High, medium and low power level can be aligned as per radio usage requirement.

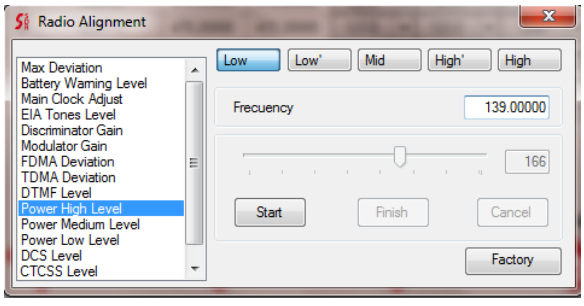
For power alignment, you can do a fine tuning as per your desire frequency sub-band. The software lets you linearize the complete band "cutting" the complete band into five steps to let you focus into your frequency bands.

Even when the software has already assigned the most convenient frequency points to consider the alignment, you still can enter exactly the frequency of your interest.

5.5.2.1. High POWER LEVEL ALIGNMENT

To align the High Power level select Power High Level.

Software automatically retrieves actual level to the alignment slider.



This level has been aligned in factory, but you still can adjust it as per your desires.

To realign, please select [Start] then move the slider or introduce the value manually at the time you check the real transmit power on the wattmeter connected to the radio as recommended on TX alignment diagram.

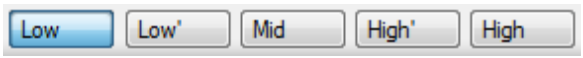
As soon as [Start] is pressed, the radio start to transmit a carrier, so please verify the antenna dummy load is properly connected to avoid any damage to the transmitter.

As soon the desired value is reached, press [Finish] to store the value into radio memory.

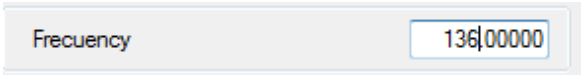
If you want to load default High power only, keeping any other value without any change, press [Factory] instead of [Start]. A pop up window will ask you to confirm the default parameters upload to the radio power.

Press [OK] to confirm.

As descripted previously, you can manually select the frequency range to align, divided into five different sub-ranges.



You can also define the right frequency of interest to align, typing the desired one into the frequency field:



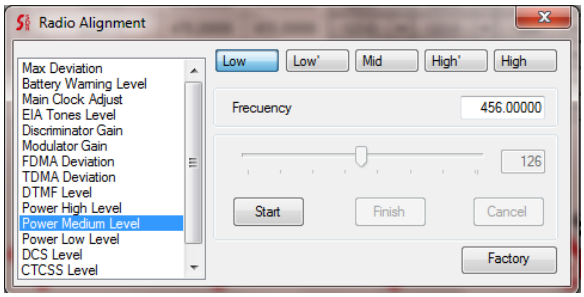
If selected frequency is not supported by radio hardware, the frequency field will be filled on red. In case the PLL is locked, then it becomes filled on green.

Please be sure that the PLL is locked as soon as you press [Start],

otherwise the alignment should be not correct.

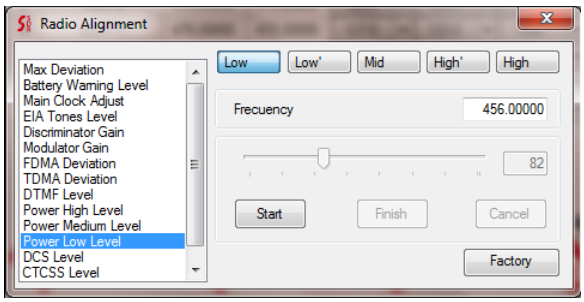
5.5.2.2. Mid POWER LEVEL ALIGNMENT

Repeat the same procedure to align High Power, but select Power Medium Level on the alignment menu.



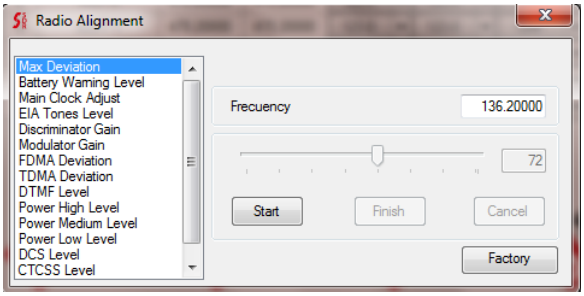
5.5.2.3. LOW POWER LEVEL ALIGNMENT

Repeat the same procedure to align High Power, but select Power Low Level on the alignment menu.



5.5.3. ANALOG MAXIMUM DEVIATION

Maximum deviation for analog signals modulated from ST-2112 can be aligned by Max Deviation alignment option from the alignment menu.



Actual alignment value will be displayed on alignment slider.

Press [Start] then move the slider to reach the desired value at the time you checks the deviation meter to reach the desired signaling level for narrow band operation. Radio will generate a 1000Hz alignment reference tone for alignment proposes.

As soon the desired value is reached, press [Finish] to store the value on radio memory.

Wide band channels uses the same limiter. No additional wide band max deviation alignment is required.

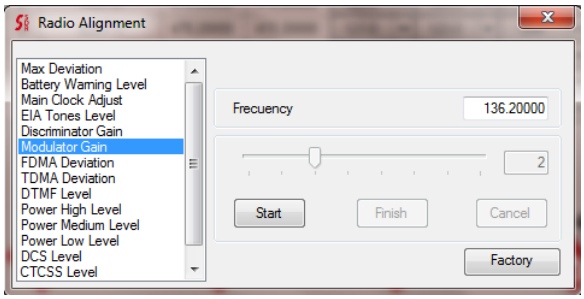
If you want to retrieve factory default, press [Factory] instead of [Start]. You will be asked to confirm the factory default alignment, and then if you confirm it, original values from factory will be loaded into current alignment settings

5.5.4. Modulation Gain alignment:

This is a critical parameter which may not be realigned to different values other than factory default.

Lower gain means a very high microphone gain must be assigned to get the proper radio voice deviation, and higher gain means a risk because the max deviation limit must be reached by any signal which makes the limiter to introduce distortion to avoid over deviation.

Under your risk, if you still prefer to realign the overall modulation gain, you must select Modulator Gain on Alignment screen.



Actual alignment value will be displayed on alignment slider.

Press [Start] then move the slider to reach the desired value at the time you checks the deviation meter to reach the desired signaling level for narrow band operation.

For this alignment step, the radio does not generate any signal. It only stores the new value of the overall modulation gain into the memory.

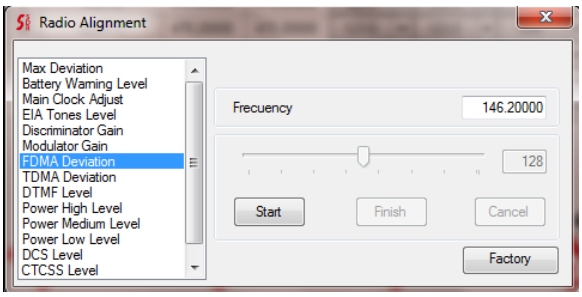
As soon the desired value is reached, press [Finish] to store the value on radio memory.

If you want to retrieve factory default, press [Factory] instead of [Start]. You will be asked to confirm the factory default alignment, and then if you confirm it, original values from factory will be loaded into current alignment settings.

5.5.5. FDMA DATA MODULATION alignment:

To align 4FSK signaling deviation for FDMA mode, select FDMA Deviation on Alignment screen.

Actual alignment value will be displayed on alignment slider.



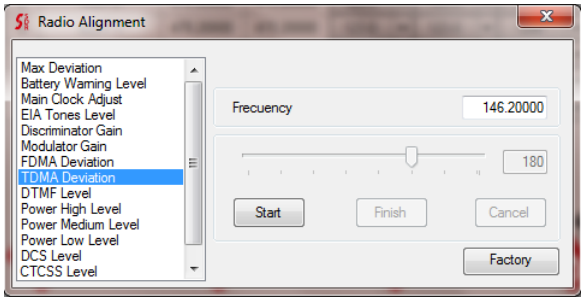
Press [Start] then move the slider to reach the desired value at the time you checks the deviation meter to reach the desired signaling level for narrow band operation. Radio will generate a 1000Hz reference tone for alignment proposes.

As soon the desired value is reached, press [Finish] to store the value on radio memory.

If you want to retrieve factory default, press [Factory] instead of [Start]. You will be asked to confirm the factory default alignment, and then if you confirm it, original values from factory will be loaded into current alignment settings.

5.5.6. TDMA DATA MODULATION alignment:

To align 4FSK signaling deviation for TDMA mode, select TDMA Deviation on Alignment screen.



Actual alignment value will be displayed on alignment slider.

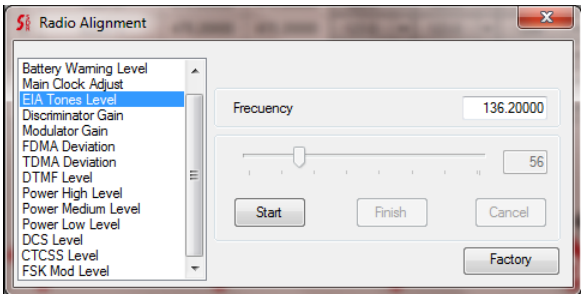
Press [Start] then move the slider to reach the desired value at the time you check the deviation meter to reach the desired signaling level for narrow band operation. Radio will generate a 1000Hz reference tone for alignment proposes.

As soon the desired value is reached, press [Finish] to store the value on radio memory.

If you want to retrieve factory default, press [Factory] instead of [Start]. You will be asked to confirm the factory default alignment, and then if you confirm it, original values from factory will be loaded into current alignment settings.

5.5.7. EIA tones Level Alignment:

EIA signaling generated by ST-2112 must be aligned by selecting EIA Tones Level alignment option from the alignment menu.



Actual alignment value will be displayed on alignment slider.

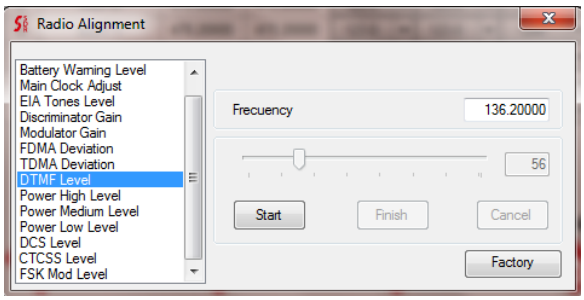
Press [Start] then move the slider to reach the desired value at the time you check the deviation meter to reach the desired signaling level for narrow band operation. Radio will generate a 1000Hz reference tone for alignment proposes.

As soon the desired value is reached, press [Finish] to store the value on radio memory.

If you want to retrieve factory default, press [Factory] instead of [Start]. You will be asked to confirm the factory default alignment, and then if you confirm it, original values from factory will be loaded into current alignment settings.

5.5.8. DTMF signaling level alignment:

DTMF signaling generated by ST-2112 must be aligned by selecting DTMF Level alignment option from the alignment menu.



Actual alignment value will be displayed on alignment slider.

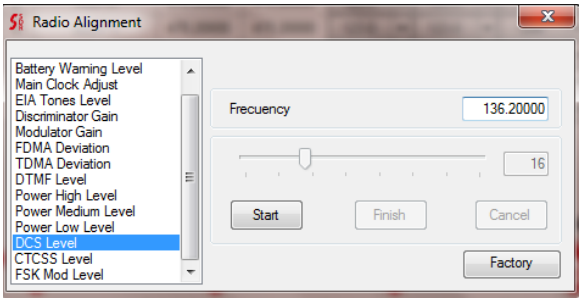
Press [Start] then move the slider to reach the desired value at the time you check the deviation meter to reach the desired signaling level for narrow band operation. Radio will generate a 1000Hz alignment reference tone for alignment proposes.

As soon the desired value is reached, press [Finish] to store the value on radio memory.

If you want to retrieve factory default, press [Factory] instead of [Start]. You will be asked to confirm the factory default alignment, and then if you confirm it, original values from factory will be loaded into current alignment settings.

5.5.9. DCS signaling alignment:

DCS signaling encoded from ST-2112 must be aligned by selecting DCS Level alignment option from the alignment menu.



Actual alignment value will be displayed on alignment slider.

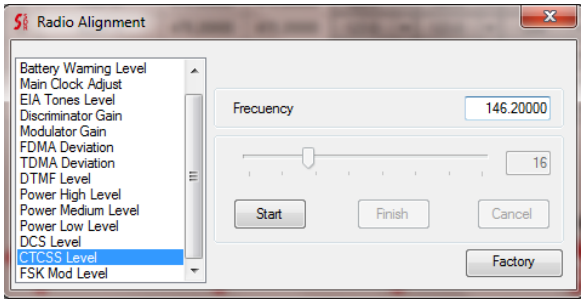
Press Start then move the slider to reach the desired value at the time you check the deviation meter to reach the desired signaling level for narrow band operation. Radio will generate 134.4Hz audio tone for alignment proposes.

As soon the desired value is reached, press [Finish] to store the value on radio memory.

If you want to retrieve factory default, press [Factory] instead of [Start]. You will be asked to confirm the factory default alignment, and then if you confirm it, original values from factory will be loaded into current alignment settings.

5.5.10. CTCSS signaling alignment

CTCSS signaling encoded from ST-2112 can be aligned by selecting CTCSS Level alignment option from the alignment menu.

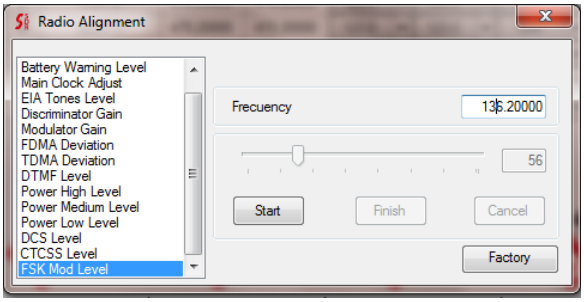


Actual alignment value will be displayed on alignment slider.

Press [Start] then move the slider to reach the desired value at the time you check the deviation meter to reach the desired signaling level for narrow band operation. Radio will generate 123.0Hz audio tone for alignment proposes.

As soon the desired value is reached, press [Finish] to store the value on radio memory.

If you want to retrieve factory default, press [Factory] instead of [Start]. You will be asked to confirm the factory default alignment, and then if you confirm it, original values from factory will be loaded into current alignment settings.



Actual alignment value will be displayed on alignment slider.

Press [Start] then move the slider to reach the desired value at the time you check the deviation meter to reach the desired signaling level for narrow band operation. Radio will generate a 1000Hz alignment reference tone for alignment proposes.

As soon the desired value is reached, press [Finish] to store the value on radio memory.

If you want to retrieve factory default, press [Factory] instead of [Start]. You will be asked to confirm the factory default alignment, and then if you confirm it, original values from factory will be loaded into current alignment settings.

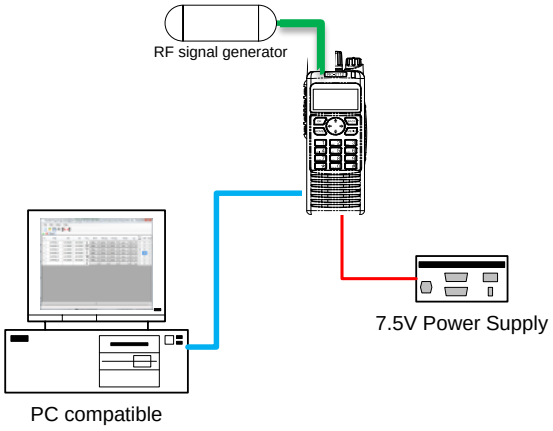
5.5.11. FSK signaling alignment:

To align FSK/PSK signaling deviation, select FSK Mod Level on Alignment screen.

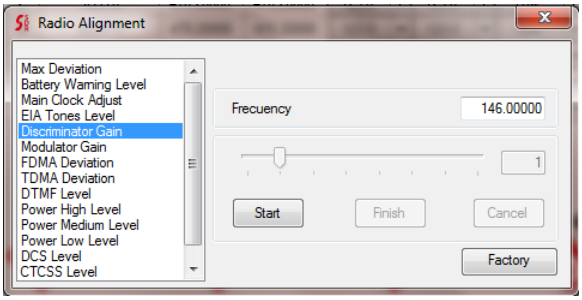
5.6. RECEIVER ALIGNMENT

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

The RF frequency must be loaded on Receiver Frequency of the alignment software to facilitate the alignment within all radio band avoiding special programming of the radio before start alignment procedure.



RECEIVER ALIGNMENT SETUP



Actual alignment value will be displayed on alignment slider.

Press [Start] then move the slider to reach the desired value.

As soon the desired value is reached, press [Finish] to store the value on radio memory.

Default value is 0.

If you want to retrieve factory default, press [Factory] instead of [Start]. You will be asked to confirm the factory default alignment, and then if you confirm it, original values from factory will be loaded into current alignment settings.

5.6.1. DISCRIMINATOR GAIN

This is a critical parameter which may not be realigned to different values other than factory default.

Under your risk, if you still prefer to realign the overall modulation gain, you must select Discriminator Gain on Alignment screen.

6. COMPLEMENTARY RADIO ALIGNMENT

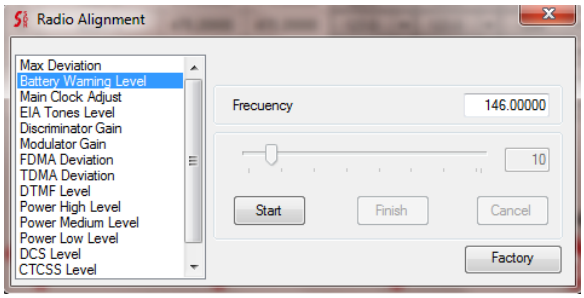
6.1. BATTERY WARNING LEVEL

ST-2112 generates acoustic and visual alerts when battery has reached a low voltage.

Visual information is displayed on battery icon which flashes with a cross on it when the minimum hardware value is reached.

Acoustic signaling is generated by the radio when the battery warning voltage is reached and this value can be adjusted by the dealer.

To align battery warning levels, select Battery Warning Level on Alignment screen.



Actual alignment value will be displayed on alignment slider.

Press [Start] then move the slider to reach the desired value.

This value means the percentage of charge when the radio starts the warning signals to the user (visual and acoustic).

As soon the desired value is reached, press [Finish] to store the value on radio memory.

Default value is 10 which correspond to 10% of residual charge to start the warning process.

If you want to retrieve factory default, press [Factory] instead of [Start]. You will be asked to confirm the factory default alignment, and then if you confirm it, original values from factory will be loaded into current alignment settings.

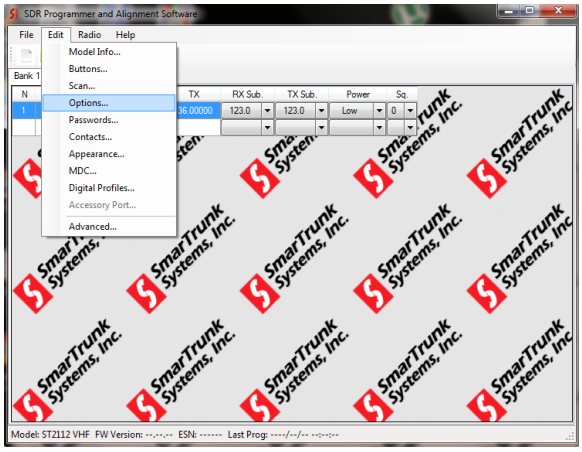
7. COMPLIMENTARY USER ALIGNMENT

The above parameters only can be aligned under dealer login and most of them should be critical for proper radio performance.

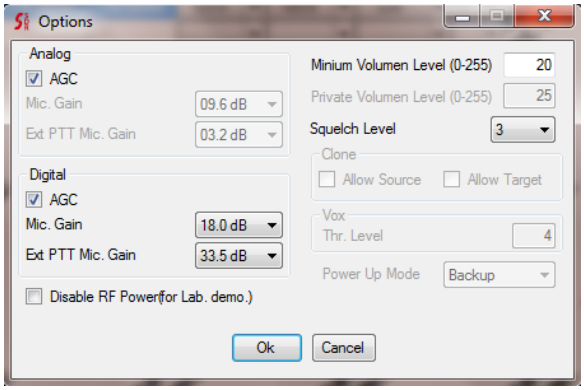
Additional complimentary parameters should be also aligned on user login mode; it means the user can align it as per the most convenient way for particular radio usage.

7.1. OPTION ALIGNMENT:

To access to the option alignment menu, select Edit then Option form the main software toolbar:



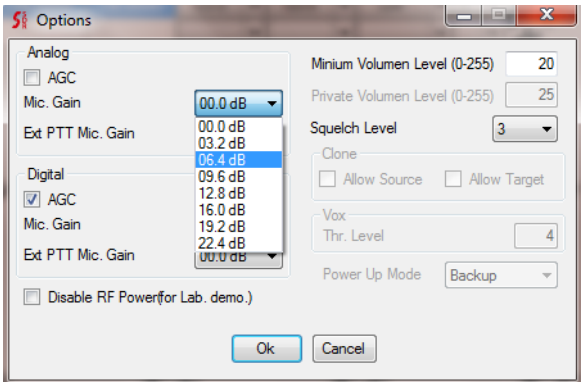
As soon as you click on Options… the Options screen is popped up:



From this screen the user can adjust:

7.1.1. ANALOG Microphone gain:

It aligns microphone sensitivity.



Alignment step is 3.2dB.

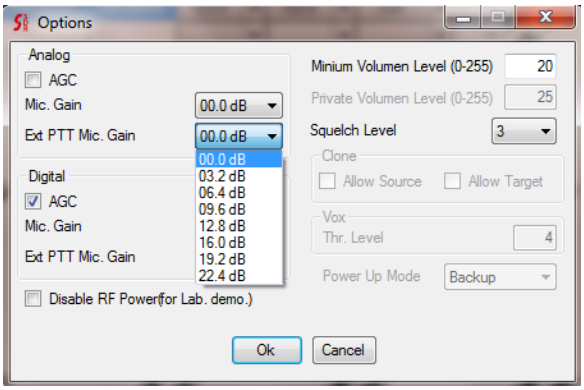
For noisy environments or when voice encryption is used, we recommend keeping it as low as possible.

Press [OK] to store it in the file.

The value will be updated after the file is transferred to the radio.

7.1.2. ANALOG External Mic Gain:

It aligns microphone sensitivity.



Alignment step is 3.2dB.

For noisy environments or when voice encryption is used, we recommend keeping it as low as possible.

Press [OK] to store it in the file.

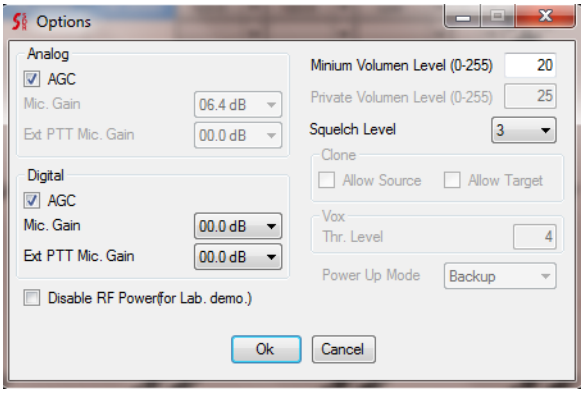
The value will be updated after the file is transferred to the radio.

7.1.3. ANALOG AGC

ST-2112 has an Automated Gain Control for analog microphone. This function adjusts the gain to reach a dynamic gain value which makes the analog voice deviation be equivalent to the right deviation produced by 50mV RMS on the microphone output, and the selected target gain.

If you want to use AGC, then you must select the target equivalent gain on the Mic Gain then check the ACG Check Box.

For example, if you want a dynamic gain which causes the same effect that a gain of 6.4dB when the voice on the microphone causes 50mV RMS in the microphone output (standard voice at 4 inches away from the microphone), or 0dB gain on the external microphone connection, then you must program the Analog Gain at 6.4dB and check AGC as bellow:



Press [OK] to store it in the file.

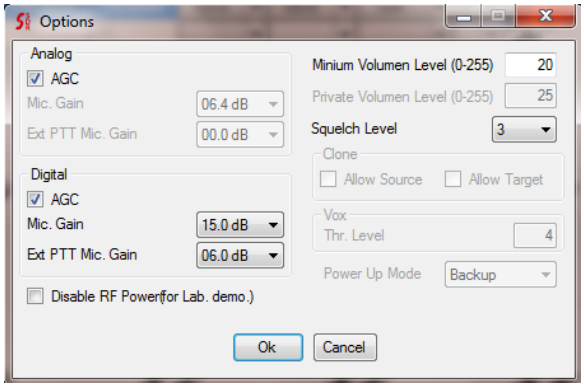
The value will be updated after the file is transferred to the radio.

7.1.4. DIGITAL AGC

ST-2112 has an Automated Gain Control for digital microphone. This function adjusts the gain to reach a dynamic gain value which makes the voice to be equivalent to the right voice digitally played back in the other end, produced by 50mV RMS on the microphone output, and the selected target gain.

If you want to use AGC, then you must select the target equivalent gain on the Mic Gain then check the Digital ACG Check Box.

For example, if you want a dynamic gain which causes the same effect that a gain of 15.0dB when the voice on the microphone causes 50mV RMS in the microphone output (standard voice at 4 inches away from the microphone), or 6.0dB gain on the external microphone connection, then you must program the Digital Gain at 15.0dB and the external gain on 6.0dB, then check Digital AGC as bellow:



Press [OK] to store it in the file.

The value will be updated after the file is transferred to the radio.

7.1.5. MINIMUM VOLUME LEVEL:

This alignment lets the user to ensure the speaker level should be audible, evenly when the volume control potentiometer is fully closed counter clockwise.

Minimum volume level can be aligned up to 250 (max) step 1.

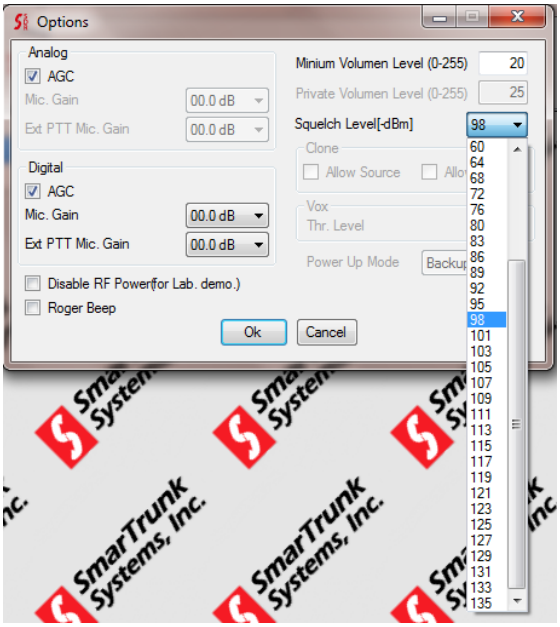
7.1.6. SQUELCH LEVEL:

ST-2112 supports individual squelch alignment for any channel to be programmed individually on each frequency defined into the frequency chart of each bank. On this way, the user can set a higher threshold level for noisy channels and lower for clear channels.

Once programmed, if due to the proximity of the radio to a noisy environment the squelch level is not high enough, the user can adjust a common reference for all the channels in the radio by adjusting the general squelch level.

Option screen on the edit menu, lets you to program the default squelch reference for all the channels. This value can be adjusted on the fly for the user if the dealer program on squelch control key or navigating through the radio menu.

To set a desired squelch reference, please select you desired squelch level form the list:



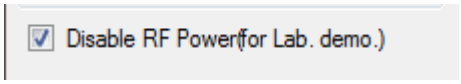
Press [OK] to store it in the file.

The value will be updated after the file is transferred to the radio.

7.1.7. DISABLE RF POWER

Use this box to check when you do not want to use the RF power amplifier. It is commonly used for dealers to make a demonstration of the radio features without interfering to any other existing user in the frequency or for operation without antenna connected to the radio.

To disable the RF power amplifier, check the box:



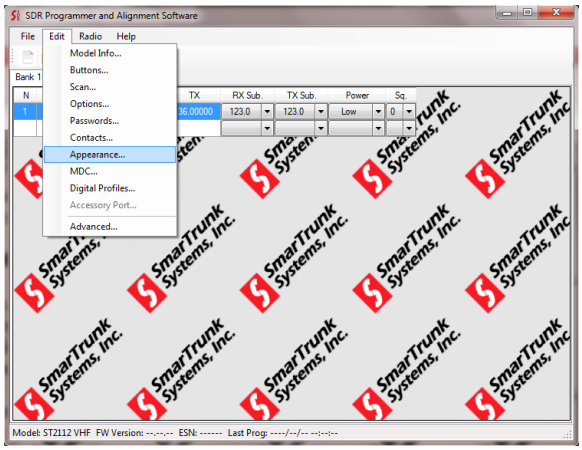
Press [OK] to store it in the file.

The value will be updated after the file is transferred to the radio.

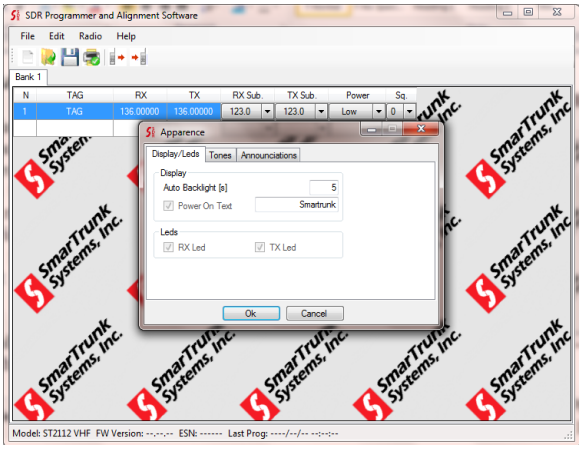
8. RADIO APPEARANCE ALIGNMENT

Radio appearance can be customized as per user requirement.

Select Edit then appearance from radio top toolbars to access to the appearance screen:



A soon as Appearance option is selected, a new window will pop up:



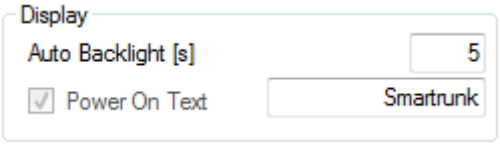
8.1. DISPLAYS AND LEDS:

This screen lets you adjust the behavior of the display and keyboard backlight.

8.1.1. Auto backlight delay alignment:

The auto backlight mode, automatically set on power off status to the backlight, after any event, to reduce the battery demand.

To change the value of the delay before the backlight is powered off; please enter the quantity of desired seconds for it.



8.1.2. Power on Text:

Type here the text to show on the display when the radio is powered on.

This string is very convenient for radio identification or dealer advertising at the time the radio is powered on.

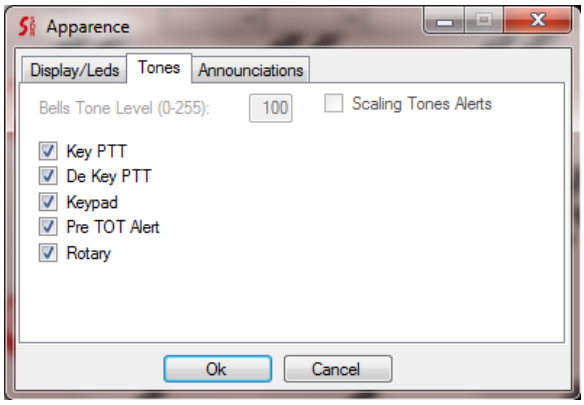
The option to activate or deactivate the power on text is disabled.

8.1.3. Leds:

Future version will allow the user to disable the function of Rx and TX led. Some application, as security, sometime demands no lights on the radio.

8.2. Tones

Second folder on appearance screen allows the user to adjust the tones which are played back in any event.



Tones can be changed by the dealer.

Check ***Key PTT*** if you want to play back a tone to acknowledge any time PTT key is pressed.

Check ***De-Key PTT*** if you want to play back a tone to acknowledges any time PTT is released.

Check ***Keypad*** if you want to play back a tone to acknowledge any time any keyboard key is pressed.

Check ***Pre TOT*** if you want to play back a tone to allert when time out timer is close to expire (5 seconds ahead).

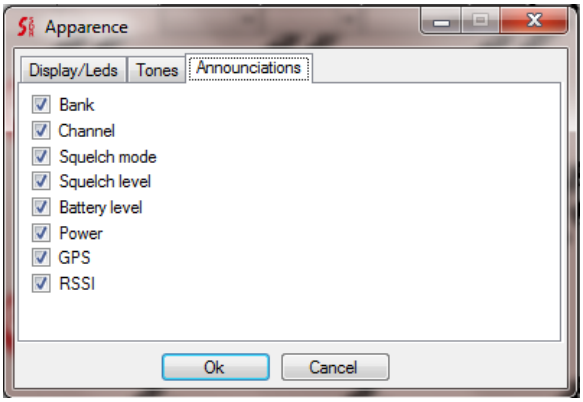
Check ***Rotary*** if you want to play back a tone to acknowledges any time the rotary switch changes its position.

8.3. ANNUNCIATION

Third folder on appearance screen, allows the user to define if the radio will play back any annunciation message for some important events, as per the associated check box.

Voice and language of the annunciation events can be adjusted as per user request.

Please refer to appendix III to learn about it.



Check ***Bank*** if you want the radio plays a concerning message back any time current bank has been changed.

Check ***Channel*** if you want the radio plays a concerning message back any time current channel has been changed.

Check ***Squelch mode*** if you want the radio plays a concerning

message back any time squelch function is changed.

Check ***Battery level*** if you want the radio plays a concerning message back any time battery level is below the value programmed as Battery Warning Level on alignment screen.

Check ***Power*** if you want the radio plays a concerning message back any time power level (high, med, low or auto) has been changed.

Check ***GPS*** if you want the radio plays a concerning message back any time the GPS changes the status: Powered on, Powered Off, Fix, etc. (only on those versions which includes GPS)

Check ***RSSI*** if you want the radio plays a concerning message back any time you ask for current RSSI.

Press OK once you finish the setting of all desired messages. This feature will be stored into the file then it will be transferred to the radio at the time the file is uploaded to the radio.

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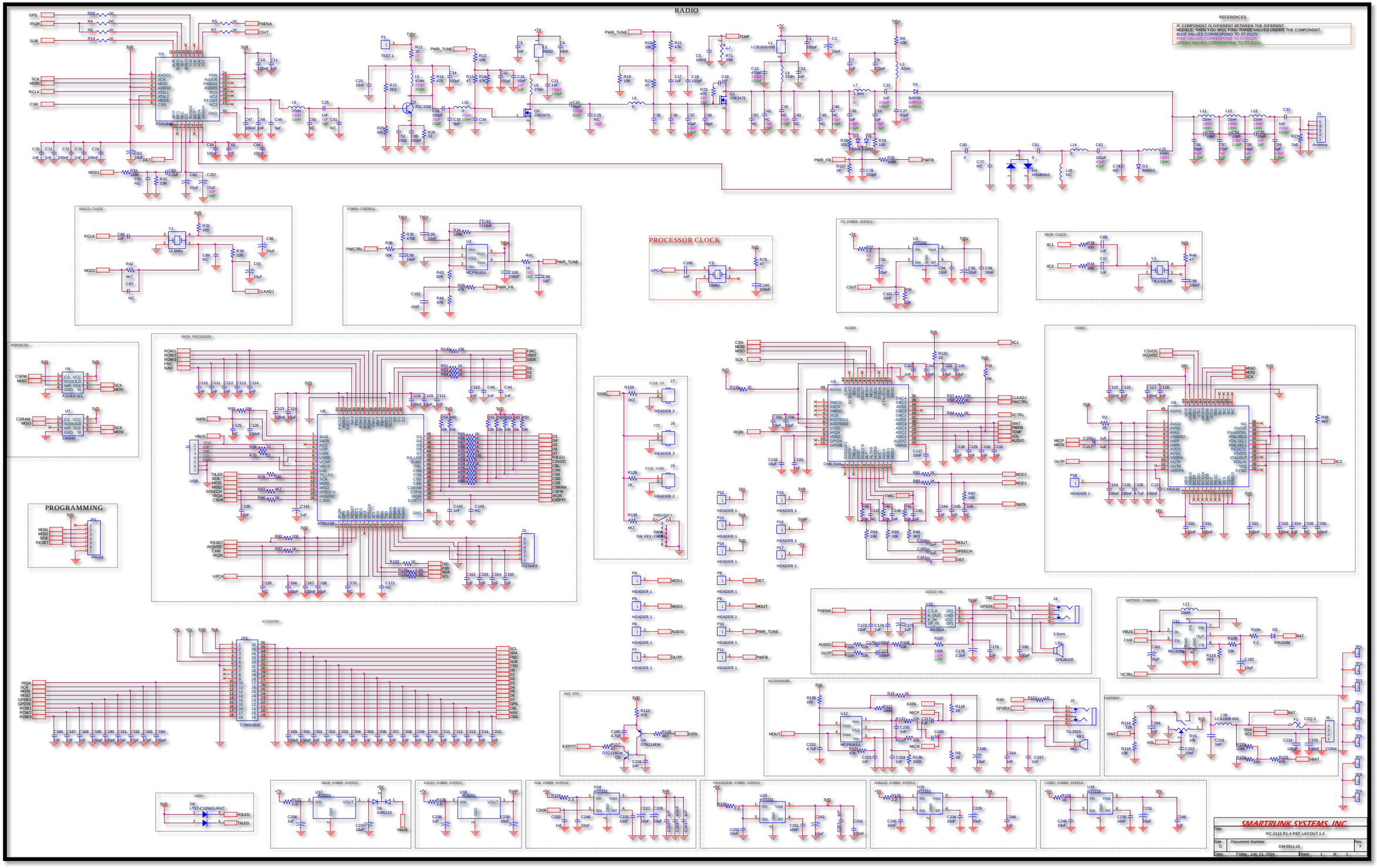
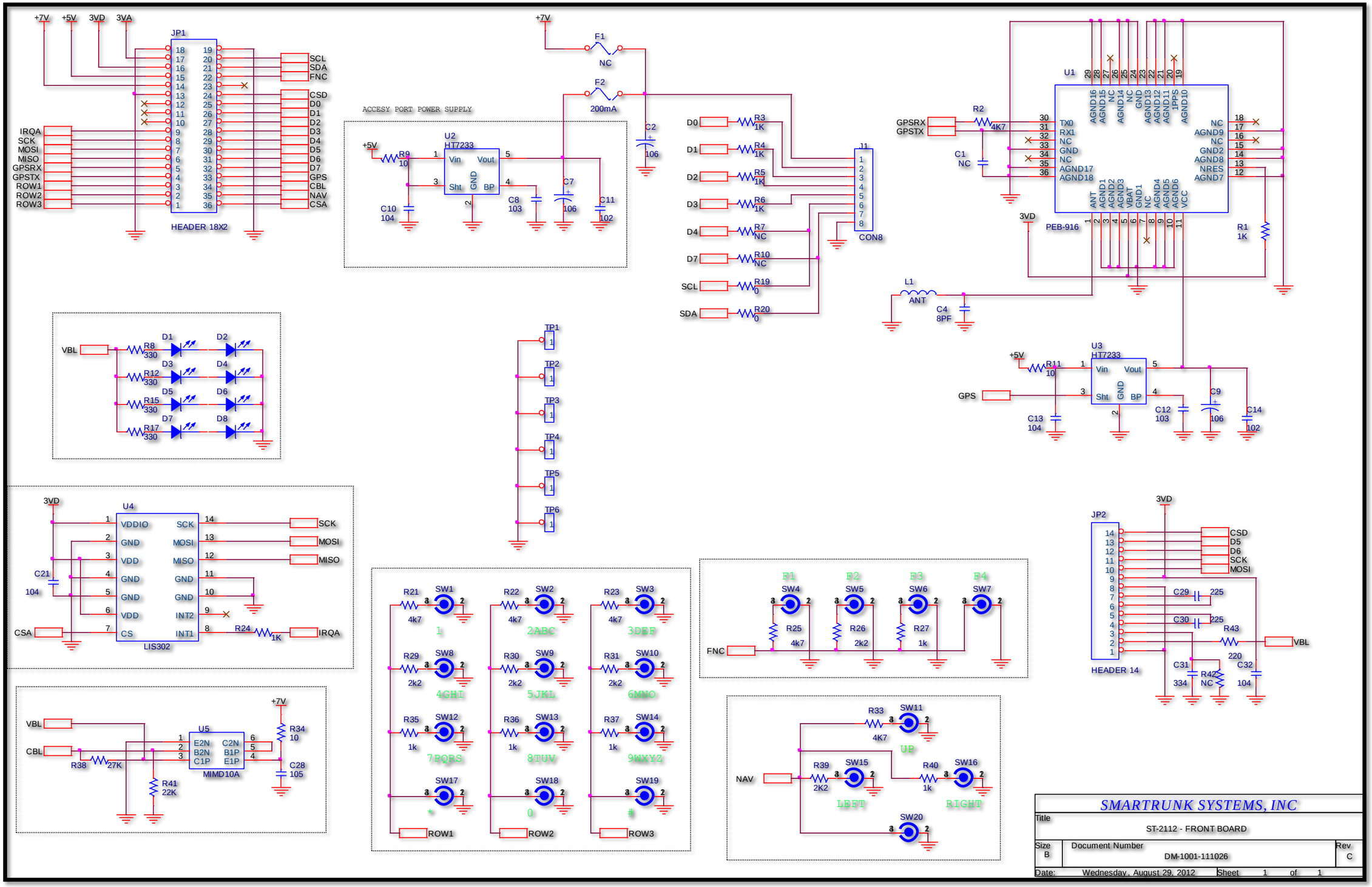
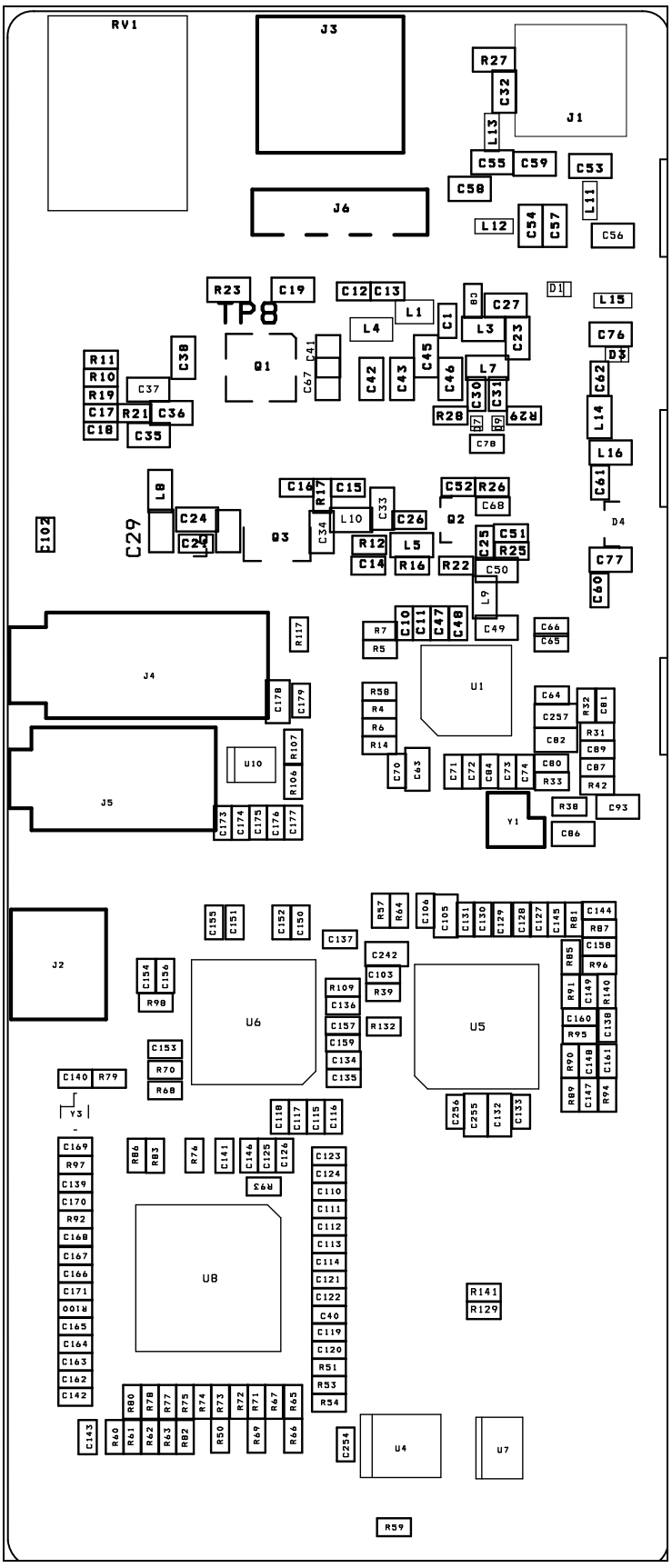
9. ST-2112 SCHEMATIC



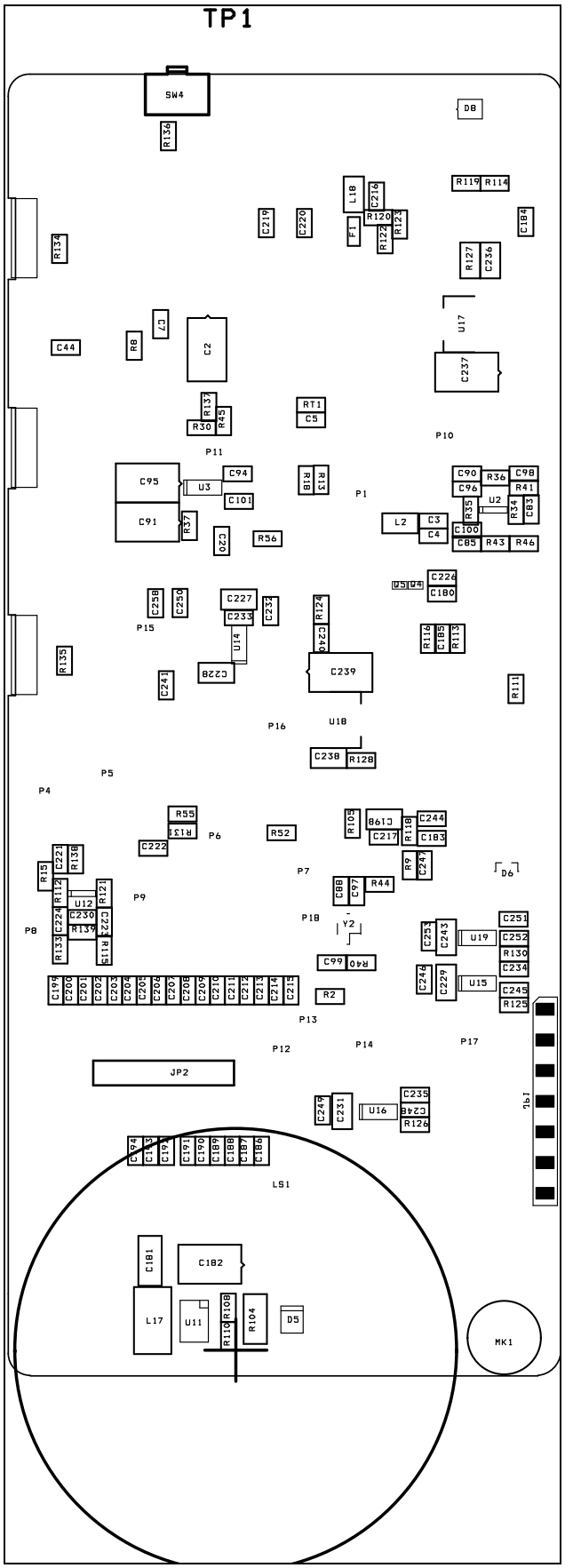
10. ST-2112 FROM BOARD SCHEMATIC



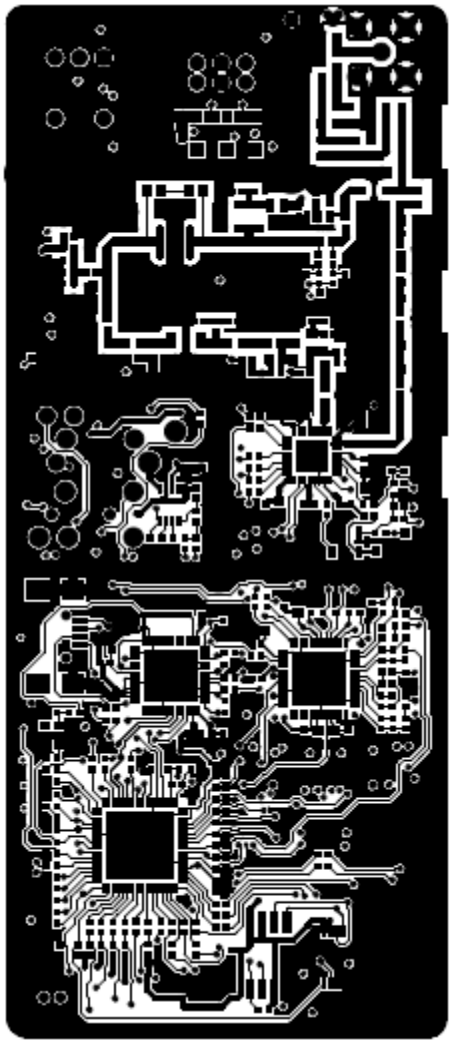
11 ST-2112 COMPONENT LOCATOR (TOP LAYER)



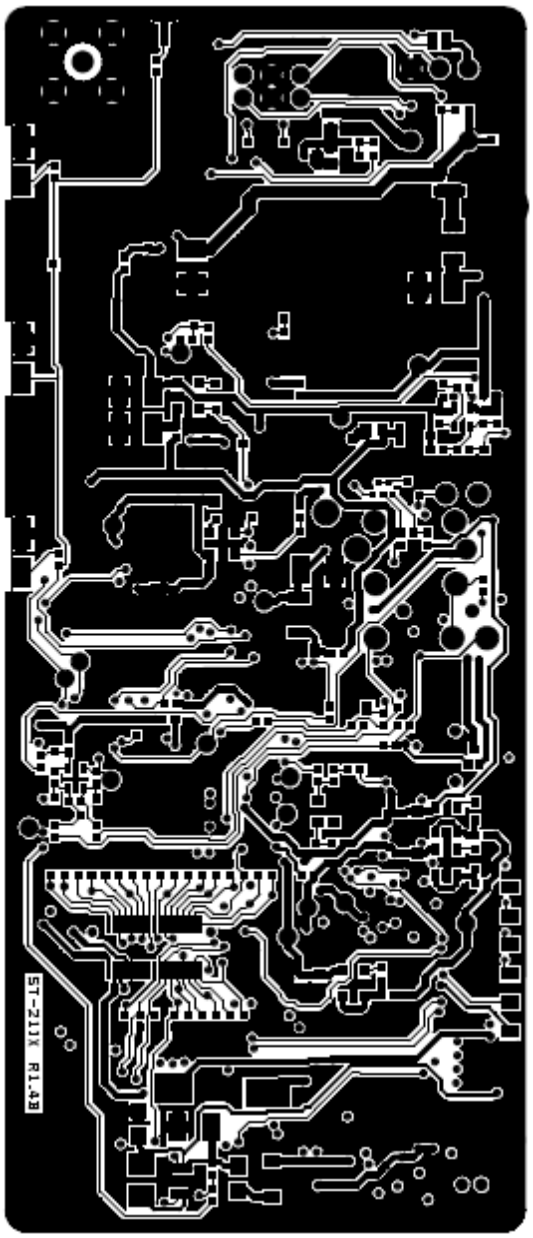
12 ST-2112 COMPONENT LOCATOR (BOTTOM LAYER)



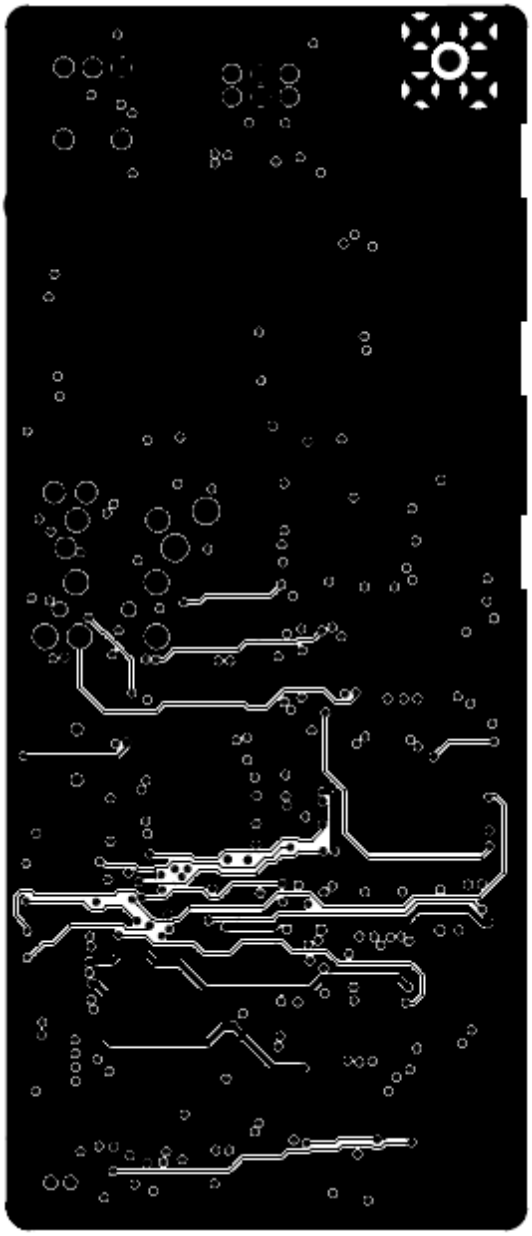
13 ST-2112 PCB TOP LAYER



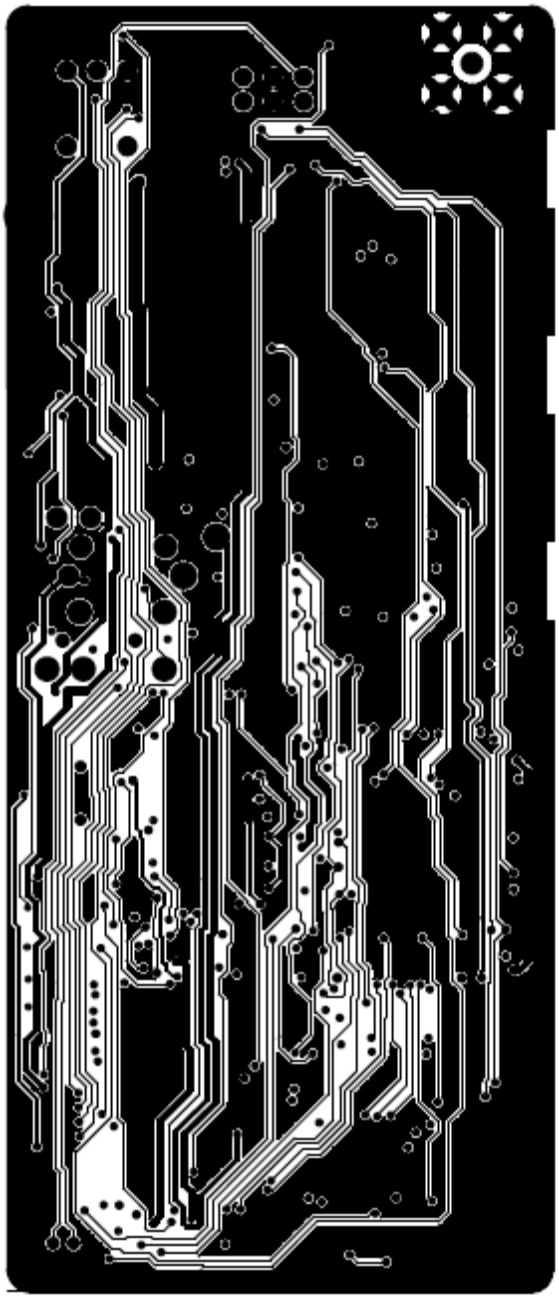
14 ST-2112 PCB BOTTOM LAYER



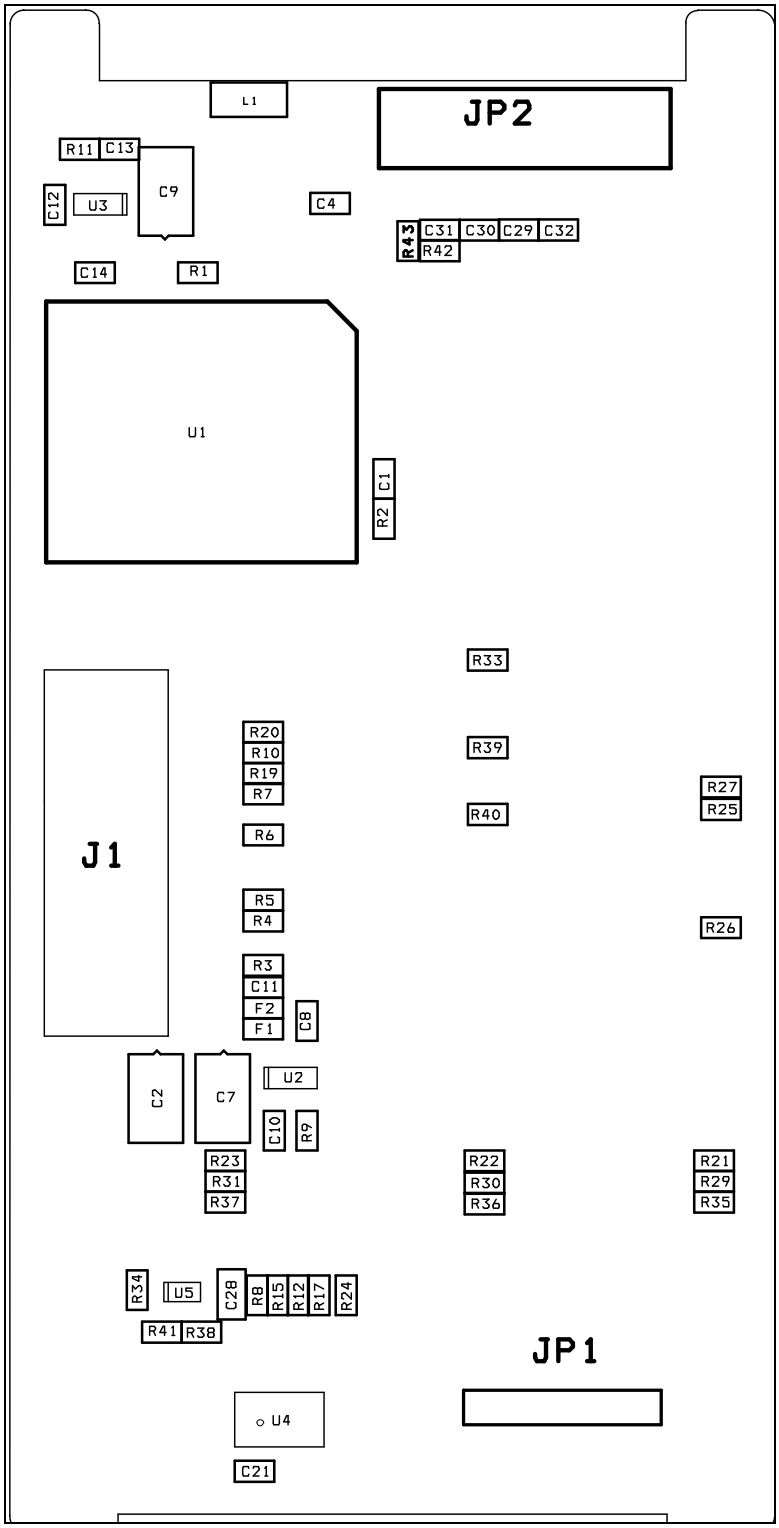
15 ST-2112 PCB GROUND LAYER



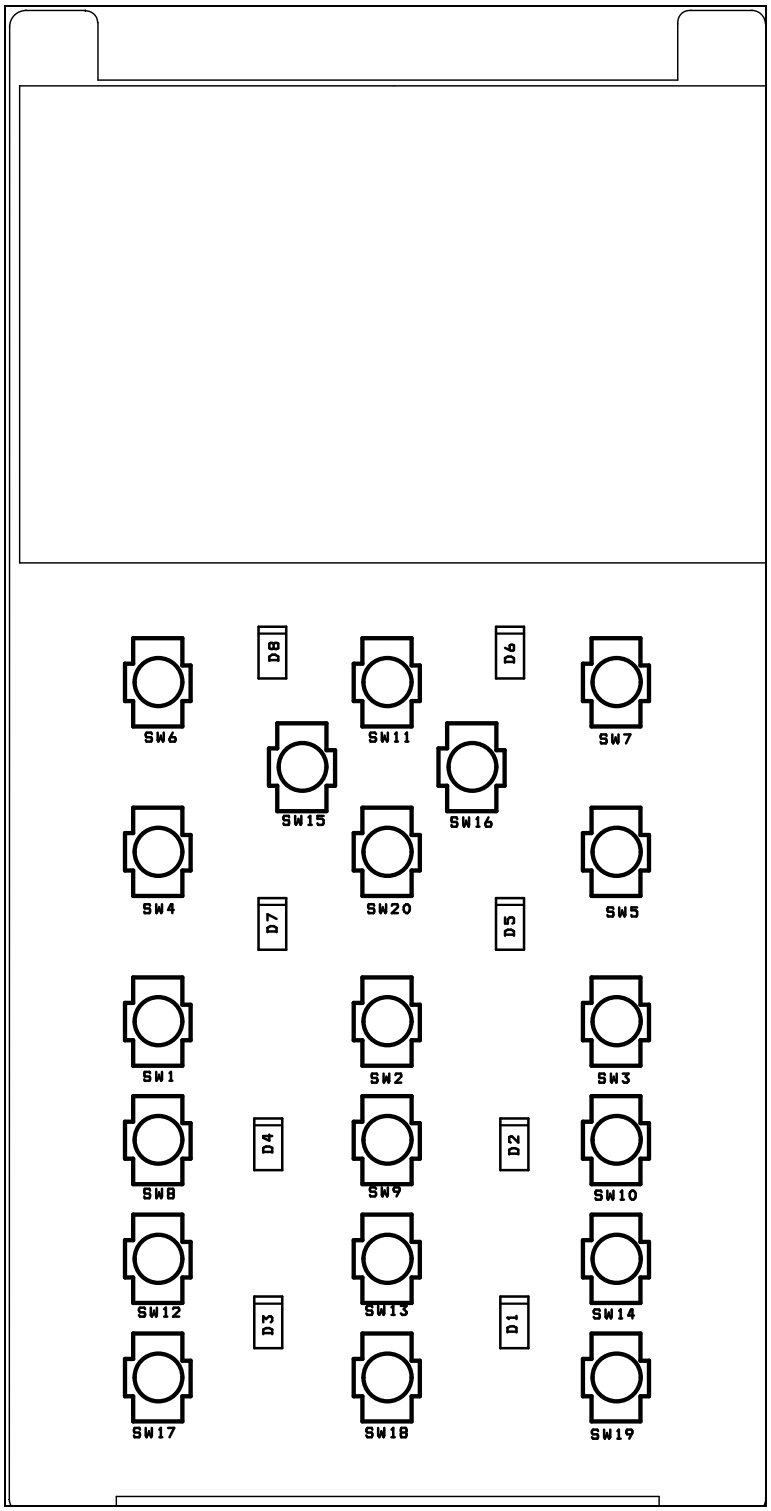
16 ST-2112 PCB POWER LAYER



17 ST-2112 FRONT BOARD COMPONENT LOCATOR (TOP LAYER)



18 ST-2112 FRONT BOARD COMPONENT LOCATOR (BOTTOM LAYER)



19 ST-2112D BOM

NAME	DESCRIPTION	VALUE	RANGER PN
	MAIN PCB		EPL211010D
C1	CAP CER 150PF 50V C0G 0402	150pF	CK1151AK5A
C14	CAP CER 150PF 50V C0G 0402	150pF	CK1151AK5A
C15	CAP CER 150PF 50V C0G 0402	150pF	CK1151AK5A
C18	CAP CER 150PF 50V C0G 0402	150pF	CK1151AK5A
C68	CAP CER 150PF 50V C0G 0402	150pF	CK1151AK5A
C78	CAP CER 150PF 50V C0G 0402	150pF	CK1151AK5A
C12	CAP CER 150PF 50V C0G 0402	150pF	CK1151AK5A
C21	CAP CER 150PF 50V C0G 0402	150pF	CK1151AK5A
C95	CAP TANT 10UF 10V 10% 1206	10uF	CTY101066ZR
C2	CAP TANT 10UF 10V 10% 1206	10uF	CTY101066ZR
C91	CAP TANT 10UF 10V 10% 1206	10uF	CTY101066ZR
C182	CAP TANT 10UF 10V 10% 1206	10uF	CTY101066ZR
C237	CAP TANT 10UF 10V 10% 1206	10uF	CTY101066ZR
C239	CAP TANT 10UF 10V 10% 1206	10uF	CTY101066ZR
C181	CAP CER 10UF 10V Y5V 0805	10uF	CK0106AB7R
C63	CAP CER 10UF 6.3V X5R 20% 0603	10uF	CK6106AD6T
C86	CAP CER 10UF 6.3V X5R 20% 0603	10uF	CK6106AD6T
C93	CAP CER 10UF 6.3V X5R 20% 0603	10uF	CK6106AD6T
C105	CAP CER 10UF 6.3V X5R 20% 0603	10uF	CK6106AD6T
C132	CAP CER 10UF 6.3V X5R 20% 0603	10uF	CK6106AD6T
C198	CAP CER 10UF 6.3V X5R 20% 0603	10uF	CK6106AD6T
C227	CAP CER 10UF 6.3V X5R 20% 0603	10uF	CK6106AD6T
C228	CAP CER 10UF 6.3V X5R 20% 0603	10uF	CK6106AD6T
C229	CAP CER 10UF 6.3V X5R 20% 0603	10uF	CK6106AD6T
C231	CAP CER 10UF 6.3V X5R 20% 0603	10uF	CK6106AD6T
C242	CAP CER 10UF 6.3V X5R 20% 0603	10uF	CK6106AD6T
C243	CAP CER 10UF 6.3V X5R 20% 0603	10uF	CK6106AD6T
C255	CAP CER 10UF 6.3V X5R 20% 0603	10uF	CK6106AD6T
C136	CAP CER 4.7UF 6.3V 20% X5R 0402	4.7uF	CK6475AK6T
C185	CAP CER 4.7UF 6.3V 20% X5R 0402	4.7uF	CK6475AK6T
C221	CAP CER 4.7UF 6.3V 20% X5R 0402	4.7uF	CK6475AK6T
C19	CAP CER 1000PF 50V 0603 LOW DIST	1nF	CK1102AD5XR
C3	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C7	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C11	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C13	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C40	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X

C48	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C65	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C70	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C71	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C73	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C84	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C88	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C97	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C103	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C110	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C111	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C112	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C113	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C114	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C116	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C118	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C121	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C122	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C128	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C129	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C130	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C131	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C133	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C142	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C144	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C145	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C148	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C149	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C154	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C162	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C163	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C164	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C165	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C169	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C179	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C184	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C186	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C187	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C188	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C201	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C202	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X

C203	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C204	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C205	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C206	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C207	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C208	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C209	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C210	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C211	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C212	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C213	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C214	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C215	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C216	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C223	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C224	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C226	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C230	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C232	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C241	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C244	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C246	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C247	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C249	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C253	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C44	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C250	CAP 1000PF 50V CERAMIC X7R 0402	1nF	CK1102AK5X
C166	CAP CERAMIC 100PF 50V NP0 0402	100pF	CK1101AK5A
C180	CAP CERAMIC 100PF 50V NP0 0402	100pF	CK1101AK5A
C189	CAP CERAMIC 100PF 50V NP0 0402	100pF	CK1101AK5A
C190	CAP CERAMIC 100PF 50V NP0 0402	100pF	CK1101AK5A
C194	CAP CERAMIC 100PF 50V NP0 0402	100pF	CK1101AK5A
C199	CAP CERAMIC 100PF 50V NP0 0402	100pF	CK1101AK5A
C200	CAP CERAMIC 100PF 50V NP0 0402	100pF	CK1101AK5A
C219	CAP CERAMIC 100PF 50V NP0 0402	100pF	CK1101AK5A
C220	CAP CERAMIC 100PF 50V NP0 0402	100pF	CK1101AK5A
C26	CAP CERAMIC 22PF 50V NP0 0402	22pF	CK1220AK4A
C23	CAP CER 100PF 100V 10% NP0 0603	100pF	CK4101AD5A
C32	CAP CER 150PF 100V 10% NP0 0603	150pF	CK4151AD4A
C8	CAP CERAMIC 47PF 50V NP0 0402	470pF	CK1471AK4A
C4	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X

C20	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C83	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C85	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C90	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C94	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C96	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C101	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C102	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C127	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C138	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C173	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C222	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C233	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C234	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C235	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C240	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C245	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C248	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C251	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C252	CAP CERAMIC .01UF 50V X7R 0402	10nF	CK5103AK5X
C5	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C10	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C47	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C64	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C66	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C72	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C74	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C99	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C115	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C117	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C119	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C123	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C126	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C134	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C135	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C137	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C140	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C150	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C151	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C152	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C153	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X

C156	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C167	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C176	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C177	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C100	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C258	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C254	CAP .10UF 16V CERAMIC Y5V 0402	100nF	CK5104AK5X
C16	CAP CER 1.0UF 6.3V X5R 20% 0402	1uF	CK6105AK6T
C17	CAP CER 1.0UF 6.3V X5R 20% 0402	1uF	CK6105AK6T
C98	CAP CER 1.0UF 6.3V X5R 20% 0402	1uF	CK6105AK6T
C141	CAP CER 1.0UF 6.3V X5R 20% 0402	1uF	CK6105AK6T
C157	CAP CER 1.0UF 6.3V X5R 20% 0402	1uF	CK6105AK6T
C158	CAP CER 1.0UF 6.3V X5R 20% 0402	1uF	CK6105AK6T
C159	CAP CER 1.0UF 6.3V X5R 20% 0402	1uF	CK6105AK6T
C160	CAP CER 1.0UF 6.3V X5R 20% 0402	1uF	CK6105AK6T
C174	CAP CER 1.0UF 6.3V X5R 20% 0402	1uF	CK6105AK6T
C175	CAP CER 1.0UF 6.3V X5R 20% 0402	1uF	CK6105AK6T
C236	CAP CERAMIC 1UF 16V Y5V 0603	1uF	CK5105AD7RR
C238	CAP CERAMIC 1UF 16V Y5V 0603	1uF	CK5105AD7RR
C24	CAP CER 82PF 50V 5% NP0 0603	82pF	CK1820AD4AR
C56	CAP CER 6.8PF 50V 5% NP0 0603	6.8pF	CK9689AD4A
C59	CAP CER 6.8PF 50V 5% NP0 0603	6.8pF	CK9689AD4A
C25	CAP CER 7PF 50V NP0 0402	7pF	CK1070AK2A
C33	CAP CER 8PF 50V NP0 0402	8pF	CK1080AK2A
C30	CAP CERAMIC 0.5PF 50V C0G 0402	.5pF	CK1059AK1A
C31	CAP CERAMIC 0.5PF 50V C0G 0402	.5pF	CK1059AK1A
C46	CAP CER 15PF 250V 10% SMD 0603	15pF	CK9150AD4A
C37	CAP CER 15PF 50V SMD 0603	15pF	CK1150AD4A
C55	CAP CERAMIC 2PF 100V NPO 0603	2pF	CK4020AD1A
C54	CAP CERAMIC 2.4PF 100V NPO 0603	2.4pF	CK4249AD1A
C58	CAP CER 5PF 250V C0G SMD	5pF	CK9050AD1A
C57	CAP CER 5PF 250V C0G SMD	5pF	CK9050AD1A
C42	CAP CER 27PF 250V SMD 0603	27pF	CK9270AD4A
C82	CAP CER 22UF 6.3V 20% X5R 0603	22uF	CK6226AD6T
C257	CAP CER 22UF 6.3V 20% X5R 0603	22uF	CK6226AD6T
C178	CAP CER 2.2UF 16V Y5V 0603	2.2uF	CK5225AD7R
C80	CAP CER 2.2UF 4.0V X5R 20% 0402	2.2uF	CK6225AK6T
C41	CAP CER 10PF 50V NPO SMD 0603	10pF	CK1100AD4A
C24	CAP CER 47PF 50V 1% NP0 0603	47pF	CK1470AD4A
C191	CAP CER 47PF 50V 1% NP0 0402	47pF	CK1470AK4A
C192	CAP CER 47PF 50V 1% NP0 0402	47pF	CK1470AK4A

C193	CAP CER 47PF 50V 1% NP0 0402	47pF	CK1470AK4A
C62	CAP CER 47PF 50V 1% NP0 0402	47pF	CK1470AK4A
C38	CAP CER 56PF 50V 1% NP0 0603	56pF	CK1560AD4A
C183	CAP CER 1UF 16V Z Y5V 0402	1uF	CK5105AK7R
C217	CAP CER 1UF 16V Z Y5V 0402	1uF	CK5105AK7R
C106	CAP CER 10UF 6.3V 20% X5R 0402	10uF	CKC106AK6T
C120	CAP CER 10UF 6.3V 20% X5R 0402	10uF	CKC106AK6T
C124	CAP CER 10UF 6.3V 20% X5R 0402	10uF	CKC106AK6T
C168	CAP CER 10UF 6.3V 20% X5R 0402	10uF	CKC106AK6T
C257	CAP CER 10UF 6.3V 20% X5R 0402	10uF	CKC106AK6T
D3	DIODE RF SGL 50V 100MA SOD-323	BAR63	EDBAR0063Y
D1	DIODE RF SGL 50V 100MA SOD-323	BAR63	EDBAR0063Y
D7	DIODE	RB886CS	EDRB886CSY
D9	DIODE	RB886CS	EDRB886CSY
D4	SILICON SCHOTTKY BARRIER DIODE	HSM88AS	EDHSM0088A
D5	DIODE 400V 0.7A SOD-123	RR264M	EDRR00264M
D6	DIODE SWITCH 80V 100MA EMD3	DAN222	EDDAN0222Y
D8	LED GREEN/RED BICOLOR 0606 SMD	LTST-C195KGJRKT	EX01Y40203
F1	FUSE 3A 32V 0603 FAST C2Q	C2Q 3	EX02Y40258
J2	CONN RCPT MINI USB2.0 5POS	USB	EX07N49886
J6	BATTERY CONNCETOR RIGHT ANGLE	CON4	EX07Y49885
L2	BEAD COIL	BEAD	YCBAD18592
L18	BEAD COIL	BEAD	YCBAD18592
L1	BEAD COIL	BEAD	YCBAD18592
L3	CHOKE COIL	.82uH	YCMCI8243D
L4	SPRING COIL	27nH	YCSPG18424
L9	CHOKE COIL	15nH	YCMCI1533D
L10	CHOKE COIL	15nH	YCMCI1533D
L6	CHOKE COIL	27nH	YCMCI2733D
L5	CHOKE COIL	27nH	YCMCI2733D
L8	RES 0.0 OHM 1/10W JUMP 0603	0	RCY060004ZR
L14	RES 0.0 OHM 1/10W JUMP 0603	0	RCY060004ZR
L7	RES 0.0 OHM 1/10W JUMP 0603	0	RCY060004ZR
L15	CHOKE COIL	47nH	YCWCI4733B
L11	Fixed Inductors Air Core RF Inductor 13.7 nH 5 % 2.7 A	13nH	YCSPG18426
L12	Fixed Inductors Air Core RF Inductor 13.7 nH 5 % 2.7 A	13nH	YCSPG18426
L13	Fixed Inductors Air Core RF Inductor 13.7 nH 5 % 2.7 A	13nH	YCSPG18426
L15	Fixed Inductors Air Core RF Inductor 13.7 nH 5 % 2.7 A	13nH	YCSPG18426
L17	INDUCTOR 10UH 500-MA 0603	10uH	YCTLI1064C
Q1	TR	2SK3476	TY2SK3476Z

Q2	TRANSISTOR NPN 1GHZ SOT-23	2SC3356	TY2SC3356Z
Q3	TR	2SK3475	TY2SK3475Z
Q4	TRANS PREBIAS PNP 150MW VMT3	DTA114EM	TYDTA114EM
RT1	THERMISTOR 33K OHM NTC 0402 SMD	33tk	RTU143334Y
R10	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R19	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R50	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R55	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R59	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R60	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R61	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R62	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R63	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R82	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R87	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R90	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R91	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R92	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R93	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R94	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R95	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R106	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R115	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R119	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R133	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R140	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R13	RES 10K OHM 1/16W 5% 0402 SMD	10K	RCY041034Z
R141	RES 6.8K OHM 1/16W 5% 0402 SMD	6.8K	RCY046824Z
R129	RES 6.8K OHM 1/16W 5% 0402 SMD	6.8K	RCY046824Z
R5	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R6	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R7	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R9	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R14	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R15	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R51	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R52	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R53	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R54	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R58	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R64	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z

R65	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R66	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R67	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R69	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R71	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R74	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R81	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R85	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R86	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R97	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R100	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R111	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R118	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R135	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R137	RES 1.0K OHM 1/16W 5% 0402 SMD	1K	RCY041024Z
R73	RES 0.0 OHM 1/16W 0402 SMD	0	RCY040004Z
R75	RES 0.0 OHM 1/16W 0402 SMD	0	RCY040004Z
R77	RES 0.0 OHM 1/16W 0402 SMD	0	RCY040004Z
R78	RES 0.0 OHM 1/16W 0402 SMD	0	RCY040004Z
R80	RES 0.0 OHM 1/16W 0402 SMD	0	RCY040004Z
C60	RES 0.0 OHM 1/16W 0402 SMD	0	RCY040004Z
C61	RES 0.0 OHM 1/16W 0402 SMD	0	RCY040004Z
C161	RES 0.0 OHM 1/16W 0402 SMD	0	RCY040004Z
R8	RES 100 OHM 1/16W 5% 0402 SMD	100	RCY041014Z
R28	RES 100 OHM 1/16W 5% 0402 SMD	100	RCY041014Z
R29	RES 100 OHM 1/16W 5% 0402 SMD	100	RCY041014Z
R33	RES 100 OHM 1/16W 5% 0402 SMD	100	RCY041014Z
R39	RES 100 OHM 1/16W 5% 0402 SMD	100	RCY041014Z
R44	RES 100 OHM 1/16W 5% 0402 SMD	100	RCY041014Z
R138	RES 100 OHM 1/16W 5% 0402 SMD	100	RCY041014Z
R11	RES 47K OHM 1/16W 5% 0402 SMD	47K	RCY044734Z
R18	RES 47K OHM 1/16W 5% 0402 SMD	47K	RCY044734Z
R45	RES 47K OHM 1/16W 5% 0402 SMD	47K	RCY044734Z
R46	RES 47K OHM 1/16W 5% 0402 SMD	47K	RCY044734Z
R121	RES 47K OHM 1/16W 5% 0402 SMD	47K	RCY044734Z
R123	RES 47K OHM 1/16W 5% 0402 SMD	47K	RCY044734Z
R12	RES 22 OHM 1/16W 5% 0402 SMD	22	RCY042204Z
R26	RES 22 OHM 1/16W 5% 0402 SMD	22	RCY042204Z
R68	RES 22 OHM 1/16W 5% 0402 SMD	22	RCY042204Z
R70	RES 22 OHM 1/16W 5% 0402 SMD	22	RCY042204Z
R32	RES 22K OHM 1/16W 5% 0402 SMD	22K	RCY042234Z

R38	RES 22K OHM 1/16W 5% 0402 SMD	22K	RCY042234Z
R57	RES 22K OHM 1/16W 5% 0402 SMD	22K	RCY042234Z
R105	RES 22K OHM 1/16W 5% 0402 SMD	22K	RCY042234Z
R109	RES 22K OHM 1/16W 5% 0402 SMD	22K	RCY042234Z
R114	RES 22K OHM 1/16W 5% 0402 SMD	22K	RCY042234Z
R16	RES 470 OHM 1/16W 5% 0402 SMD	470	RCY044714Z
R113	RES 470 OHM 1/16W 5% 0402 SMD	470	RCY044714Z
R17	RES 47 OHM 1/16W 5% 0402 SMD	47	RCY044704Z
R21	RES 47 OHM 1/16W 5% 0402 SMD	47	RCY044704Z
R40	RES 47 OHM 1/16W 5% 0402 SMD	47	RCY044704Z
R79	RES 47 OHM 1/16W 5% 0402 SMD	47	RCY044704Z
R117	RES 47 OHM 1/16W 5% 0402 SMD	47	RCY044704Z
R22	RES 2.2K OHM 1/16W 5% 0402 SMD	2K2	RCY042224Z
R41	RES 2.2K OHM 1/16W 5% 0402 SMD	2K2	RCY042224Z
R134	RES 2.2K OHM 1/16W 5% 0402 SMD	2K2	RCY042224Z
R23	RES 150 OHM 1/10W 5% 0603 SMD	150	RCY061514Z
R25	RES 560 OHM 1/16W 5% 0402 SMD	560	RCY045614Z
R27	RES 2.2M OHM 1/10W 5% 0603 SMD	2M2	RCY062254Z
R30	RES 100K OHM 1/16W 5% 0402 SMD	100K	RCY041044Z
R31	RES 100K OHM 1/16W 5% 0402 SMD	100K	RCY041044Z
R112	RES 100K OHM 1/16W 5% 0402 SMD	100K	RCY041044Z
R120	RES 100K OHM 1/16W 5% 0402 SMD	100K	RCY041044Z
R139	RES 100K OHM 1/16W 5% 0402 SMD	100K	RCY041044Z
R34	RES 120K OHM 1/16W 5% 0402 SMD	120K	RCY041244Z
R107	RES 220K OHM 1/16W 5% 0402 SMD	220K	RCY042244Z
R35	RES 470K OHM 1/16W 5% 0402 SMD	470K	RCY044744Z
R36	RES 56K OHM 1/16W 5% 0402 SMD	56K	RCY045634Z
R37	RES 10 OHM 1/16W 5% 0402 SMD	10	RCY041004Z
R2	RES 10 OHM 1/16W 5% 0402 SMD	10	RCY041004Z
R126	RES 10 OHM 1/16W 5% 0402 SMD	10	RCY041004Z
R131	RES 10 OHM 1/16W 5% 0402 SMD	10	RCY041004Z
R132	RES 10 OHM 1/16W 5% 0402 SMD	10	RCY041004Z
R127	RES 2.2 OHM 1/16W 5% 0603 SMD	2.2	RCY062294Z
R42	RES 4.7K OHM 1/16W 5% 0402 SMD	4K7	RCY044724Z
R83	RES 4.7K OHM 1/16W 5% 0402 SMD	4K7	RCY044724Z
R98	RES 4.7K OHM 1/16W 5% 0402 SMD	4K7	RCY044724Z
R116	RES 4.7K OHM 1/16W 5% 0402 SMD	4K7	RCY044724Z
R136	RES 4.7K OHM 1/16W 5% 0402 SMD	4K7	RCY044724Z
R43	RES 82K OHM 1/16W 5% 0402 SMD	82K	RCY048234Z
R76	RES 330 OHM 1/16W 5% 0402 SMD	330	RCY043314Z
R72	RES 330 OHM 1/16W 5% 0402 SMD	330	RCY043314Z

R104	RES .20 OHM 1/8W 5% 0805	0.2	RCY010294Z
R89	RES 33K OHM 1/16W 5% 0402 SMD	33K	RCY043334Z
R108	RES 33K OHM 1/16W 5% 0402 SMD	33K	RCY043334Z
R122	RES 33K OHM 1/16W 5% 0402 SMD	33K	RCY043334Z
R96	RES 3.3K OHM 1/16W 5% 0402 SMD	3K3	RCY043324Z
R110	RES 3.3K OHM 1/16W 5% 0402 SMD	3K3	RCY043324Z
R124	RES 2.2 OHM 1/16W 5% 0402 SMD	2.2	RCY042294Z
R125	RES 2.2 OHM 1/16W 5% 0402 SMD	2.2	RCY042294Z
R128	RES 2.2 OHM 1/16W 5% 0402 SMD	2.2	RCY042294Z
R130	RES 2.2 OHM 1/16W 5% 0402 SMD	2.2	RCY042294Z
SW4	PUSH SWITCH SMD	SW KEY-YM061	EWPS33083X
U1	SINGLE CHIP RADIO TRANSCEIVER	RDA1846	YNRD01846Z
U2	IC OPAMP SNGL 1.8V R-R SC70-5	MCP6241U	YNMR6241UT
U12	IC OPAMP SNGL 1.8V R-R SC70-5	MCP6241U	YNMR6241UT
U3	IC REG LDO 5.0V .3A SOT23-5	HT7250	YNHT07250Z
U5	dPMR MODEM IC	CMX-7141	YNCM07141Q
U6	VOCODER IC	CMX-618	YNCM00618Q
U7	IC SRL SRAM 64K 3.6V 8-TSSOP	23K640	YNMR23K640
U8	IC AVR MCU 64K 64QFN	AT90USB	YNAT1286MU
U10	IC AMP HDPH/SPEAKER UNBAL 8MSOP	BH7824	YNRO07824Z
U11	IC REG BOOST ADJ 0.5A 8MLF	MIC2290	YNML02290Z
U16	LDO LINEAR REGULATOR 1.8V 300mA	HT7218	YNHT07218Z
U18	IC REG LDO 5V 0.2A SOT89-3	XC6201	YNTX1P502P
U17	IC REG LDO 5V 0.2A SOT89-3	XC6201	YNTX1P502P
Y2	TCXO 19.2MHZ 3.3V TCXO/+-0.5PPM	TXCO19.2M	EFO192000Y
JP2	BOARD TO BOARD 18X2 CONN	CONN18X2	EX07Y49871
Q5	NPN PRE BIASED TRANSISTOR	DTC114EM	TYDTC114EM
U4	FLASH MEMORY 32MBIT	AT23DF321	YNAT25321A
Y1	VC-TXCO 12.8Mhz 3V +-12/2PPM	VC-TXCO	EFO128000Y
U14	LDO LINEAR REGULATOR 3.3V 300mA	HT7233	YNHT07233Z
U15	LDO LINEAR REGULATOR 3.3V 300mA	HT7233	YNHT07233Z
U19	LDO LINEAR REGULATOR 3.3V 300mA	HT7233	YNHT07233Z
Y3	TCXO 16MHZ 3.3V TCXO/+-0.5PPM	CRYSTRAL 16Mhz	EFO160000Y

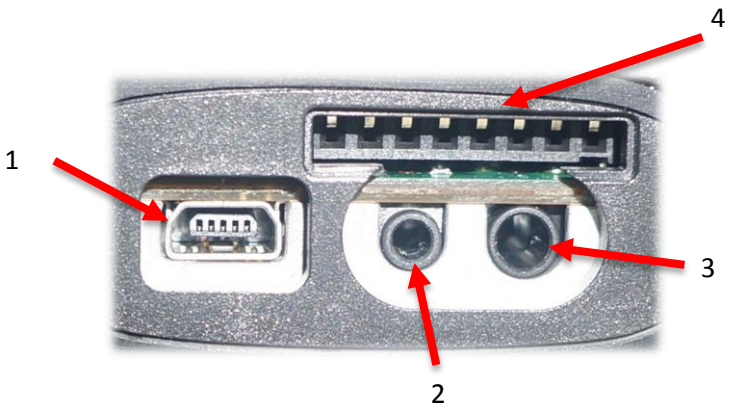
20 ST-2112 KEYBOARD & DISPLAY BOM

ITEM	QTY	DESCRIPTION	SMTK PN
1	1	KEY PCB	EPL211030Z

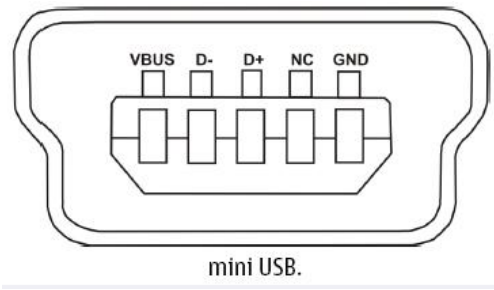
2	2	RESISTOR 0 ohm (0402)	RCY040004Z
3	1	RESISTOR 10 ohm (0402)	RCY041004Z
4	4	RESISTOR 330 ohm (0402)	RCY043314Z
5	1	RESISTOR 200 ohm (0402)	RCY042014Z
6	9	RESISTOR 1K (0402)	RCY041024Z
7	5	RESISTOR 2.2K (0402)	RCY042224Z
8	5	RESISTOR 4.7K (0402)	RCY044724Z
9	1	RESISTOR 22K (0402)	RCY042234Z
10	1	RESISTOR 27K (0402)	RCY042734Z
11	1	CAP. 0.1UF (0402)	CK5104AK5X
12	2	CAP. 2.2UF (0402)	CK6225AK6T
13	1	CAP. 0.33UF (0402)	CK0334AK5X
14	1	CAP. 4.7UF	CK0475AD7R
15	8	LED (0603)	EX01Y40205
16	0	FUSE 0.2A 32V (0402)	EX02Y40259
17	1	IC MIMD10A-7-F	YNDCOMD10A
18	20	TACTILE SW	EWPS33086X
19	1	PCB CONNECTOR 36P	EX07Y49872
20	1	PCB FHA8-M108000GA	EX07Y49911

21 ACCESSORY PORT:

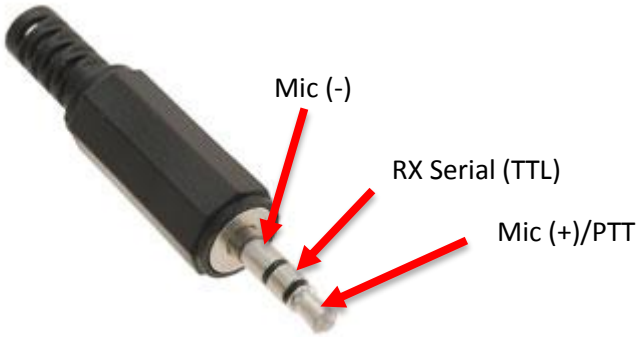
In the side of the radio, you will find four connectors:



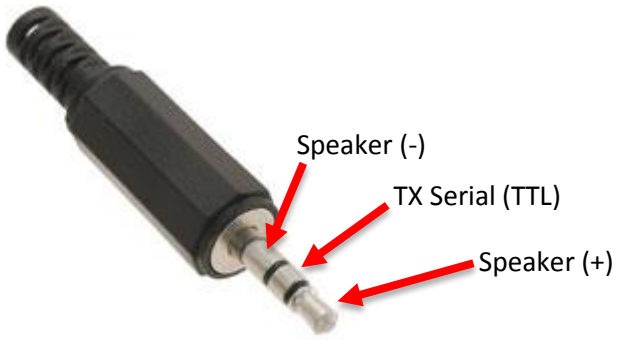
1 – USB: USB 2.0 compliance



2 – External mic, External PTT and RX serial data (2.5mm)



3 – External Speaker, TX serial data (3.5mm)



4 – Accessory port

Pin	Function	Comments
GND	Ground	Main radio GND
SDA	High Speed Serial data I/O	0-3V up to 400Khz
SCL	High Speed Serial Clock	0-3V up to 400Khz
I/O 3	Digital Input/Output	1K Ohm, 0-3.3V
I/O 2	Digital Input/Output	1K Ohm, 0-3.3V
I/O 1	Digital Input/Output	1K Ohm, 0-3.3V
I/O 0	Digital Input/Output	1K Ohm, 0-3.3V
+V	Accesory power	3.3Vdc @ 200 mA

22 ST-2112 SERVICE MANUAL REVISIONS

AUTHOR	RELEASE	DATE	REMARKS
DANIEL MARTIN	1.1	JUN-2013	INITIAL RELEASE VERSION
DANIEL MARTIN	1.2	JUN-2013	ADDED SOFTWARE ZONE SPECIFICATION

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