

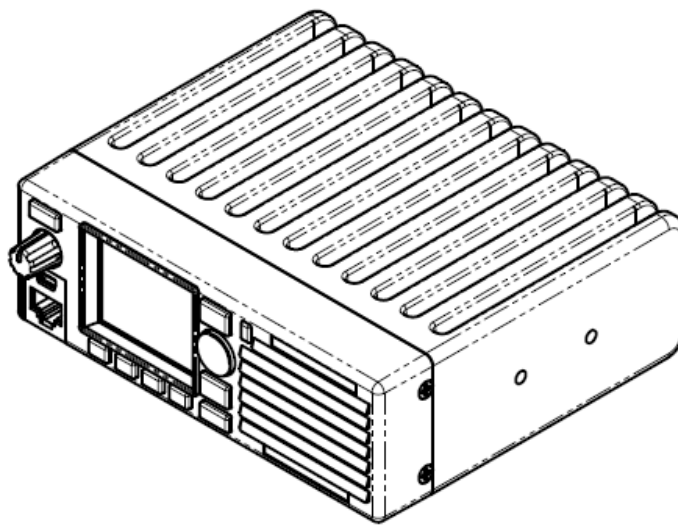


***SmarTrunk  
Systems, Inc.***

## **VHF FM DIGITAL TRANSCEIVER**

**ST-3118D** (450Mhz ~ 520Mhz)

### **SERVICE MANUAL**



**SmarTrunk Systems, INC.**

**ST-3118D SM R1.1**

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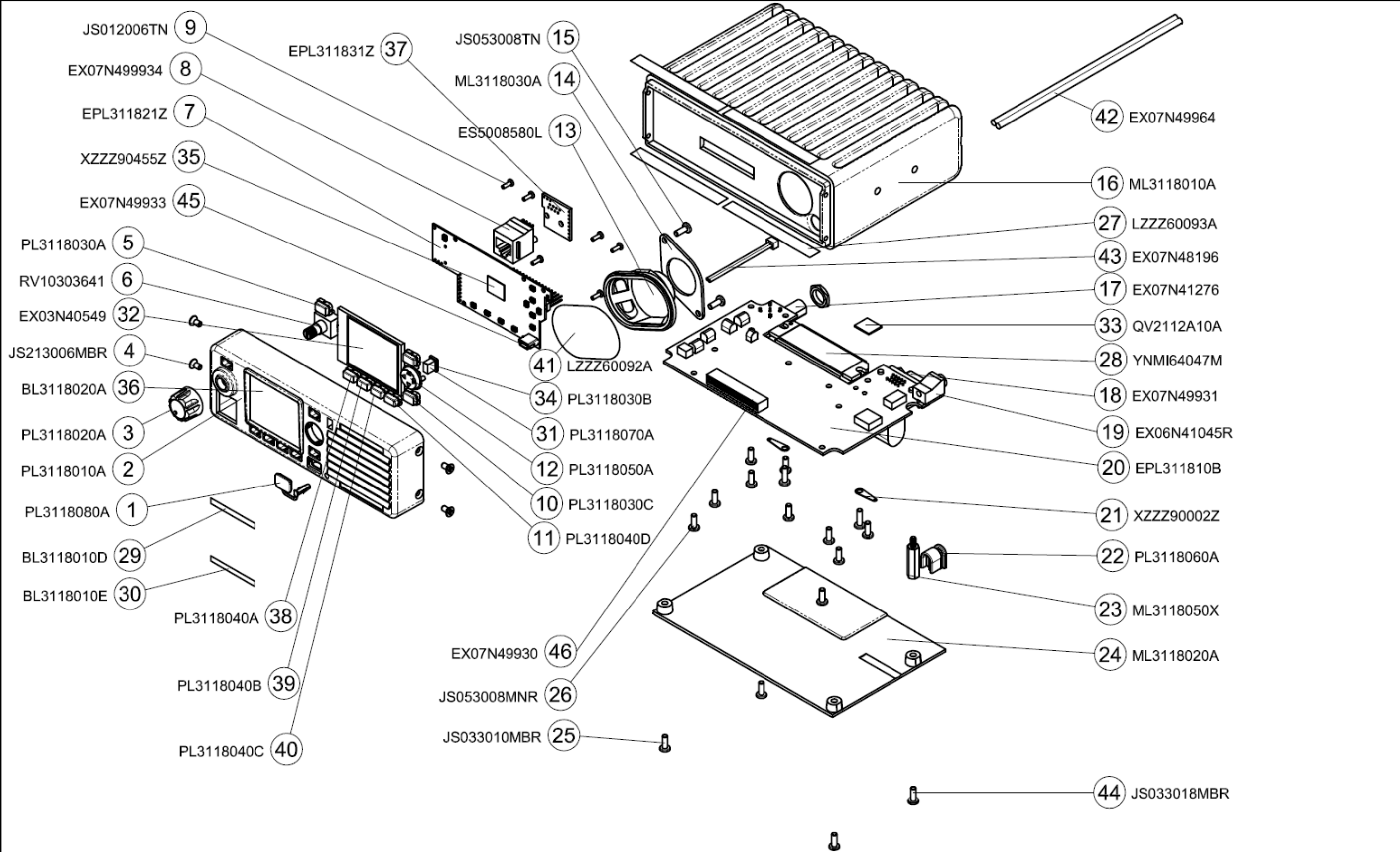
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## 1. Specifications:

|          | SPECIFICATION                | ST-3118D                                       |
|----------|------------------------------|------------------------------------------------|
| GENERAL  | Frequency Range [Mhz]        | 450 TO 520                                     |
|          | Channels                     | 512                                            |
|          | Groups/Banks                 | 64                                             |
|          | Power [Vdc]                  | 12 to 15                                       |
|          | Dimensions [mm]              | 50(H)x128(D)x150(W)                            |
|          | Weight [gr] (oz)             | 1.2Kg (2.6lbs)                                 |
|          | Temperature range            | - 30 °C ~ 60 °C (-22°F ~ +140°F)               |
|          | Signaling                    | 51 CTCSS tones / 183 DCS tones / 65534 SDR IDs |
|          | Display                      | 2" 176x220RGB dots (Multilanguage)             |
|          | 2/5 tone                     | Yes (EIA, EEA, CCIR, ZVEI 1 & ZVEI 2)          |
|          | GPS                          | Option                                         |
|          | Channel Scan                 | Yes                                            |
|          | BCLO / BTLO                  | Yes                                            |
|          | TOT                          | Yes                                            |
|          | Adjustable Power Selection   | Auto + H/M/L                                   |
|          | Password                     | Yes                                            |
|          | Key Function selection       | Yes                                            |
| TRANSMIT | MAX RF power                 | 40 W                                           |
|          | Frequency Stability          | +/- 1PPM                                       |
|          | Analog Bandwidth             | 12.5Khz/25Khz                                  |
|          | FDMA Bandwidth               | 12.5/6.25Khz                                   |
|          | TDMA Bandwidth               | 12.5Khz                                        |
|          | Adjacent Power Channel       | -65dBC (typ)                                   |
|          | SNR                          | 45dB typ                                       |
|          | Analog harmonic distortion   | <5% (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)                                |
|          | Squelch Sensitivity          | 0.25uV (Threshold)                             |
|          | Image rejection              | 60dB typ                                       |
|          | Adjacent Channel selectivity | 65dB typ @25KHz BW                             |
|          | HUM and NOISE ratio          | 45dB                                           |
|          | Speaker Audio Power          | 5W                                             |
|          | External audio power         | 5W                                             |

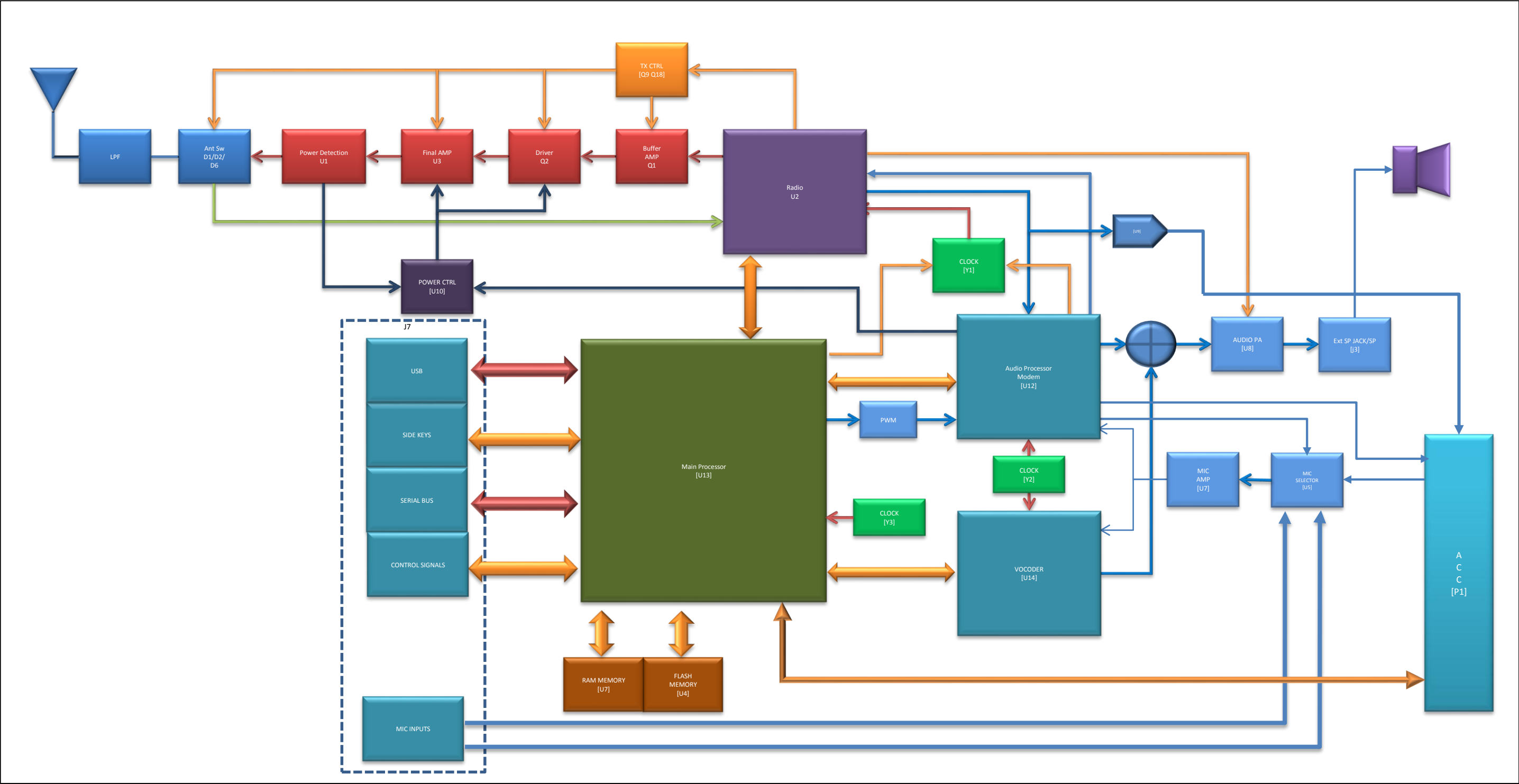
*Specifications subject to change without notice or obligation*

2. ST-3118 EXPLODED VIEW



| REVISIONS | SGH | DATE | SCALE                             | 1/1 | UNITS | MM | MODEL    | ST-3118    | SmarTrunk Systems, Inc.           |              |
|-----------|-----|------|-----------------------------------|-----|-------|----|----------|------------|-----------------------------------|--------------|
|           |     |      | MATERIAL                          |     |       |    |          |            | EXPLODE DRAWING                   |              |
|           |     |      | FINISH                            |     |       |    | APPROVED | DATE M/D/Y | TITLE                             |              |
|           |     |      | TOLERANCE UNLESS OTHERWISE STATED |     |       |    | CHECKED  | DATE M/D/Y | PART NO.                          |              |
|           |     |      |                                   |     |       |    | DRAWN    | DATE M/D/Y | FILE INFO.                        | 3RD. 1743832 |
|           |     |      |                                   |     |       |    |          | 01/08/2014 | SERVER 02\RNDEPT\PERSONAL FILE\PE | 2014/01/07   |

3. ST-3118D SIMPLIFIED DIAGRAM



## 4. - ST-3118 RF DESCRIPTION

### 4.1. Circuit Configuration

The receiver is a single receiver with built 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.

The transmit signal frequency is generated by the 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

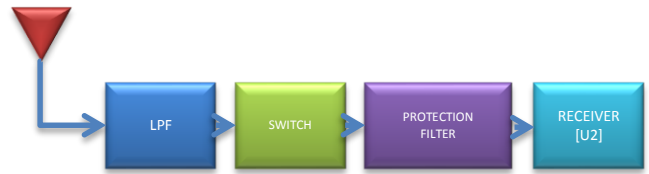


Figure 1: Receiver block Diagram

diodes, and then fed to the receiver (U2) passing through a limiter BPF.

### 4.2.2. ANALOG Audio Processing



Figure 2: Receiver Analog Audio Path Bloc Diagram

The RF signal is tuned by U2, 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 U12 which also includes a de-emphasize filtering shape for received audio signals

The output of the filtered and conditioned audio is delivered to a power amplifier (U8) then to the speaker passing through the external audio connector switch.

### 4.2.3. Virtual Squelch Circuit

RSSI is measured by the receiver (U2) as the result of the analysis of the signal and the noise of the carrier. The output is sent to the main processor (U13) as a digital frame, which is analyzed by radio firmware. If the signal quality 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 additional signaling must be decoded, or the signal has been detected, the main processor (U13) asks to the audio processor (U12) to open the audio path, unmuting the audio amplifier (U8).

#### 4.2.4. Virtual VOLUME CONTROL

The potentiometer position (R15 – front board) is measured by one analog to digital converter on the audio processor (U12), 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 U12.

#### 4.2.5. Sub audio signaling

Received sub audio signaling, as CTCSS and DCS, are received and processed by the receiver (U2) then detected on the audio processor (U12). Once decoded, the sub audio signaling is reported to the processor where the firmware compares it with the programmed into the current channel programming.

If the received signaling matches the channel programming, then the main processor (U13) requests the

audio processor (U12) 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 (U12). Decoded information or received tone is reported to the main processor (U13).

#### 4.2.7. DIGITAL AUDIO PROCESSING

Digital received information is

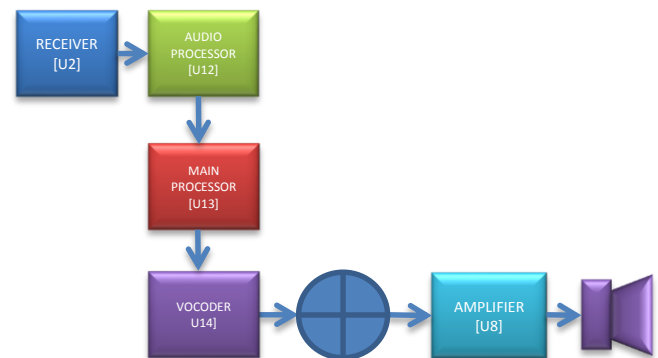


Figure 3: Digital Receiver Audio Path Block Diagram

processed by the receiver DSP (U2) then delivered to the audio processor (U12), which includes a high-speed modem.

Data decoded by the modem is transferred to the main processor (U13) which de-encrypts the information, checks the integrity, correct 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 (U14).

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

and fed it to the audio power amplifier (U8).

corresponding balance controlled by software.

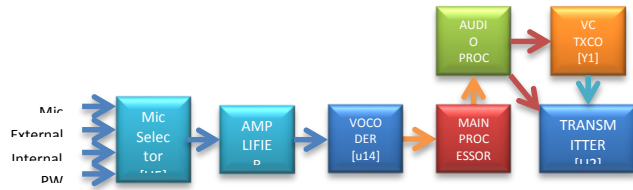


Figure 4: Digital Modulation path

## 4.3. Transmitter System

### 4.3.1. ANALOG TX SIGNAL

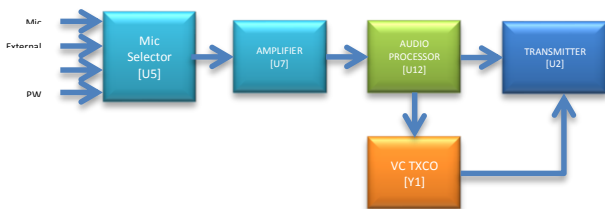


Figure 5: Analog Modulation path

The Mic signal coming from the front connector, the external Mic signal coming from the accessory connector or the output of the PWM filter and fed into an analog selector/switch (U5), then fed into the microphone pre-amplifier (U7).

The result of the conditioned and in band-filtered signal is fed to the Audio Processor (U12), 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 (U2), which performs a direct modulation of a generated carrier.

Low frequency signaling audio are fed directly to Y1 VC TXCO main clock generator and U2 with a

### 4.3.2. DIGITAL TX AUDIO:

The Mic signal coming from the front connector, the external Mic signal coming from the accessory connector or the output of the PWM filter and fed into an analog selector/switch (U5), then fed into the microphone pre-amplifier (U7).

After conditioning and band limiting, the signal is fed directly to the vocoder chip (U14) which perform the data codification, delivering the digitized and encoded audio as digital frames, which are processed by the Main Processor (U13), 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 (U12), which has a built in modem, which operates for FDMA or TDMA signals, controlling the modulation of the Transmitter (U2) through the VC TXCO for DC to low frequencies and the direct modulation for higher frequencies.

7141). The reference power level are

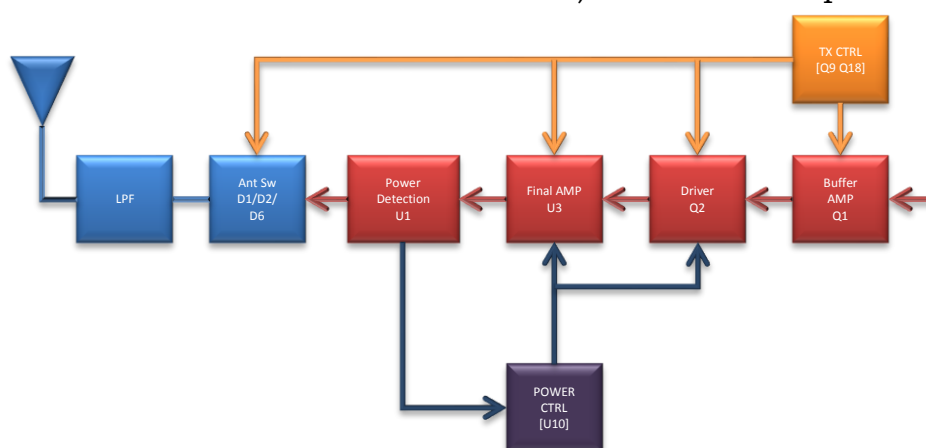


Figure 6: RF transmission path

### 4.3.3. Drive and Final Amplifier Stages

Final RF is amplified on Q1 (2SC5226) adjusting the impedance, then filtered to be fed to Q2 (2SC3357) then finally amplified by U3 (RA60H1317) up to 50 watts output power.

The transmit signal then passes through Forward and reflected power bridge (U1), then to the antenna switch D1/D2 (UM9401F) 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 (U1) detects transmitted feedback and reverse power feedback, then the detected signals are send to power control stage (U10) to be compared with the referenced power control coming from audio processor U12 (CMX-

set my the main processor (U13) to the audio processor (U12) in agree to the current channel information stored into the memory.

Power control stage (U10) also compares the reverse power feedback coming from power meter bridge (U1) to protect the power module in case of antenna mismatching.

The output of the power control stage (U10) is fed direct to the RF power Amplifier (U3) controlling the DC bias import for the hybrid module.

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 50Watts by the alignment software.

## 5. ST-3118 ALIGNMENT

### 5.1. Introduction

The ST-3118 series is carefully aligned at the 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.

In addition, 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 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 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.

### 5.3. 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 13.8 V DC, 15 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

### 5.4. 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 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°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. In addition, 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.

#### 5.4.1. 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.

## 5.5. MAIN RADIO ALIGNMENT

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

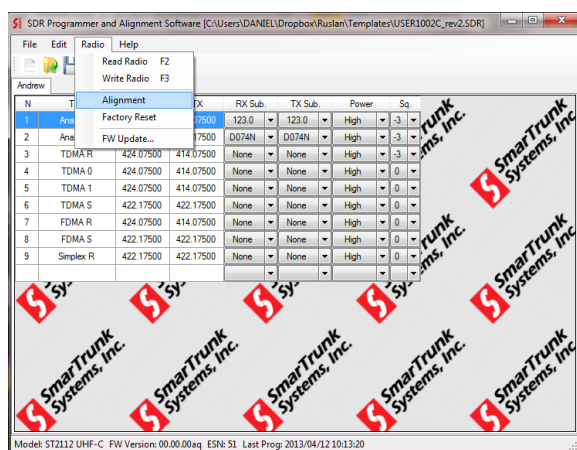


Figure 7: Accessing to the Alignment Menu

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

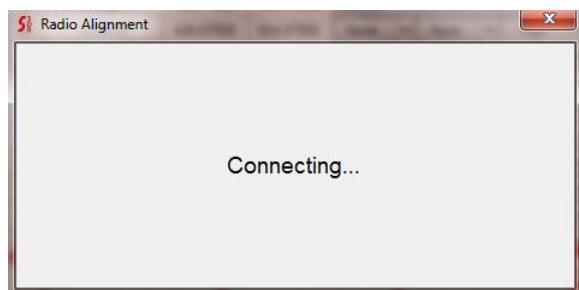


Figure 8: Connecting to the Alignment Mode

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 from 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.

## 5.6. TRANSMITTER ALIGNMENT:

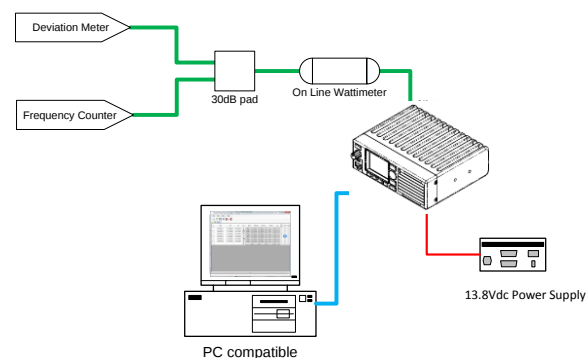


Figure 9s: Transmitter Alignment Instruments Connection

Setup the test equipment as shown for transceiver alignment, apply 13.8V 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.

### 5.6.1. Main Clock alignment:

To align the main clock for radio Tx and RX, please select:

**Main Clock Adjust**

option Alignment screen.

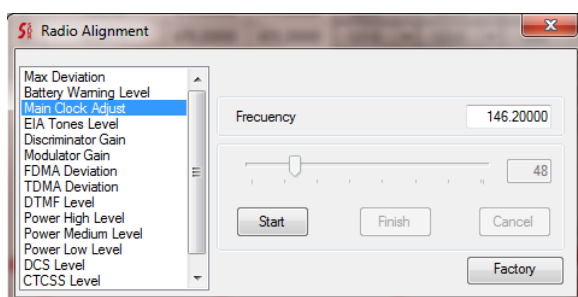


Figure 10: Main Clock Alignment

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.

Typical default alignment correspond to a max error of 60Hz on the alignment clock in factory when the radio was calibrated.

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.

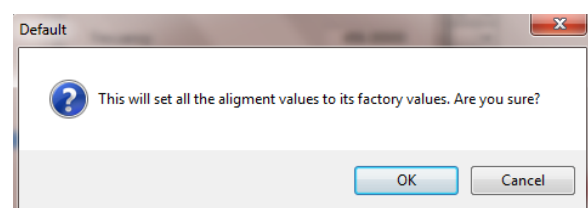


Figure 11: Default Alignment Values Retrieve

### 5.6.2. Transmit Power alignment:

ST-3118 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 dividing 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.

#### 5.6.2.1. High POWER LEVEL ALIGNMENT

To align the High Power level select

**Power High Level**

Software automatically retrieves actual level to the alignment slider.

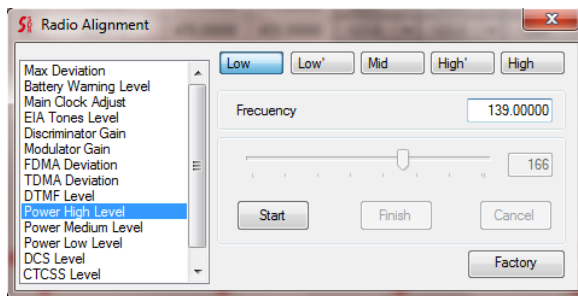


Figure 12: Power High Level Alignment

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.

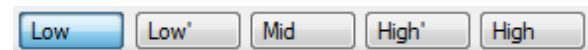
As soon as [Start] is pressed, the radio starts to transmit a carrier, so please verify the antenna dummy load is properly connected to avoid any damage to the transmitter.

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

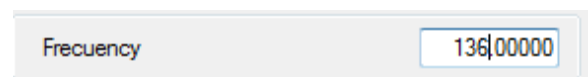
If you want to load default High power only, keeping any other value without any change, press [Factory] instead of [Start]. A pop up window will ask you to confirm the default parameters upload to the radio power.

Press [OK] to confirm.

As described 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.

### 5.6.2.2. Mid POWER LEVEL ALIGNMENT

Repeat the same procedure to align High Power, but select

**Power Medium Level**

on the alignment menu.

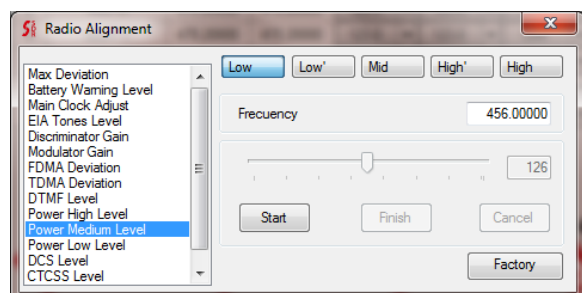


Figure 13: Medium Power Level Alignment

### 5.6.2.3. LOW POWER LEVEL ALIGNMENT

Repeat the same procedure to align High Power, but select

**Power Low Level**

on the alignment menu.

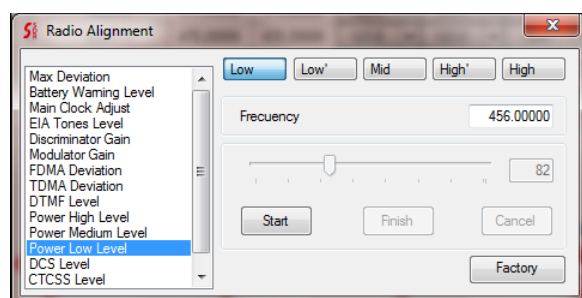


Figure 14: Low Power Level Alignment

## 5.6.3. ANALOG MAXIMUM DEVIATION

Maximum deviation for analog signals modulated from ST-3118 can be aligned by

**Max Deviation**

alignment option from the alignment menu.

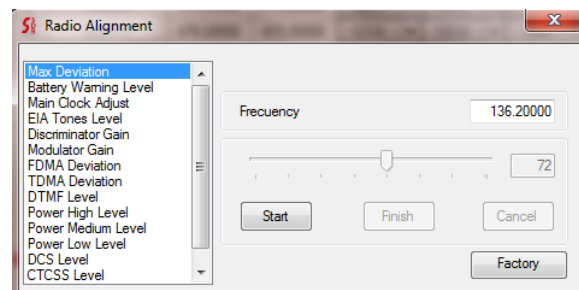


Figure 15: Analog Max Deviation Alignment

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.

Default value has been set to a right value, which correspond to 2.5 KHz Max deviation for Narrowband channels (12.5Khz channel bandwidth).

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

#### 5.6.4. 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.

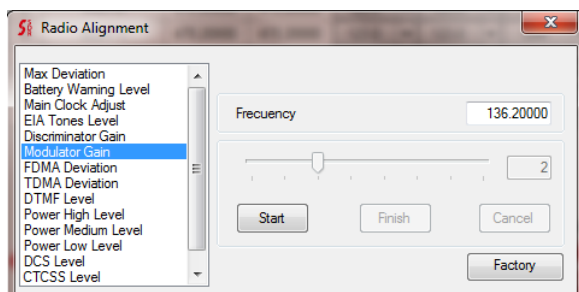


Figure 17: Modulator Gain Alignment

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.

#### 5.6.5. FDMA DATA MODULATION alignment:

To align 4FSK signaling deviation for FDMA mode, select

**FDMA Deviation**

on Alignment screen.

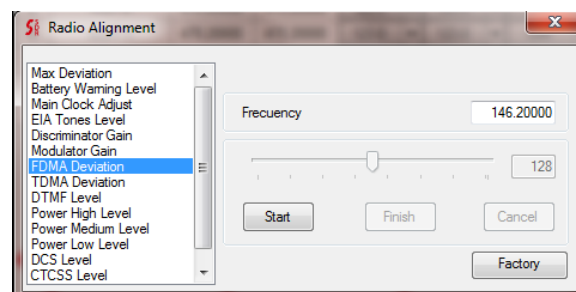


Figure 16: FDMA Deviation Alignment

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.

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.

### 5.6.6. TDMA DATA MODULATION alignment:

To align 4FSK signaling deviation for TDMA mode (12.5Khz channel bandwidth), select

**TDMA Deviation**

on Alignment screen.

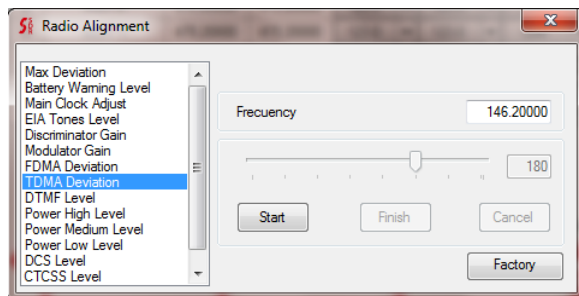


Figure 18: TDMA Deviation Alignment

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.

Default value corresponds to 2.2 KHz deviation for Narrowband channels (12.5Khz channel bandwidth).

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.

### 5.6.7. EIA tones Level Alignment:

EIA signaling generated by ST-3118 must be aligned by selecting

**EIA Tones Level**

alignment option form the alignment menu.

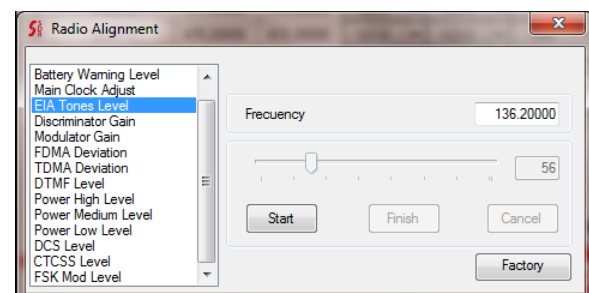


Figure 19: EIA Tones Level Alignment Screen

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 alignment

reference tone for alignment proposes.

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

Default value correspond to 1.8Khz deviation for narrow band channels.

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.

#### 5.6.8. DTMF signaling level alignment:

DTMF signaling generated by ST-3118 must be aligned by selecting

**DTMF Level**

alignment option form the alignment menu.

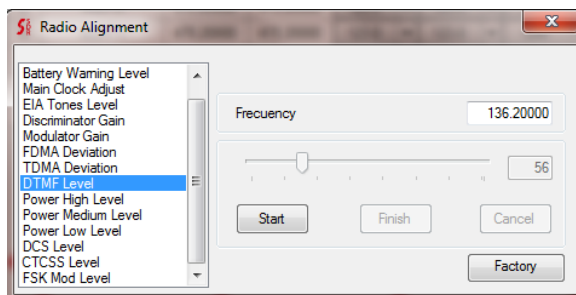


Figure 20: DTMF Level Alignment Screen

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 alignment reference tone for alignment proposes.

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

Default value corresponds to 1.8Khz deviation for Narrow band channels.

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.

#### 5.6.9. DCS signaling alignment:

DCS signaling encoded from ST-3118 must be aligned by selecting

**DCS Level**

alignment option form the alignment menu.

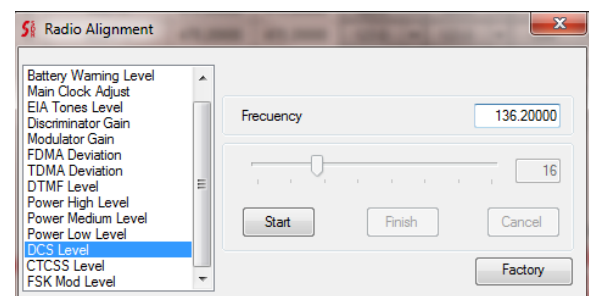


Figure 21 DCS Level Alignment Screen

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 134.4Hz audio tone for alignment proposes.

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

Default value corresponds to 300Hz deviation for narrow band channels.

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.

#### 5.6.10. CTCSS signaling alignment

CTCSS signaling encoded from ST-3118 can be aligned by selecting

**CTCSS Level**

alignment option form the alignment menu.

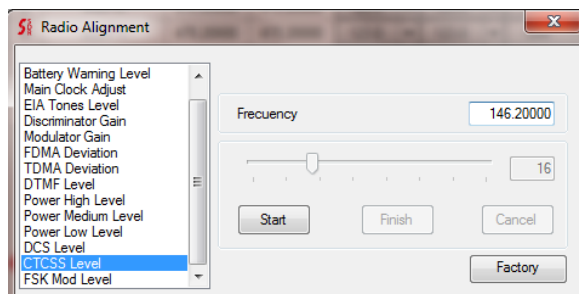


Figure 22: CTCSS Level Alignment Screen

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 123.0Hz audio tone for alignment proposes.

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

Default value corresponds to 300Hz deviation for narrow band channels.

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.

#### 5.6.11. FSK signaling alignment:

To align FSK/PSK signaling deviation, select

**FSK Mod Level**

on Alignment screen.

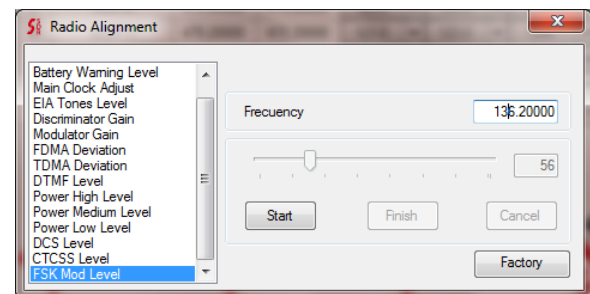


Figure 23: FSK Modulation Level Alignment Screen

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 alignment reference tone for alignment proposes.

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

Default value corresponds to 1.8 KHz deviation for narrow band channels (12.5Khz channel bandwidth).

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.

## 5.7. RECEIVER ALIGNMENT

Setup the test equipment as shown for Receiver alignment, apply 13.8 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.

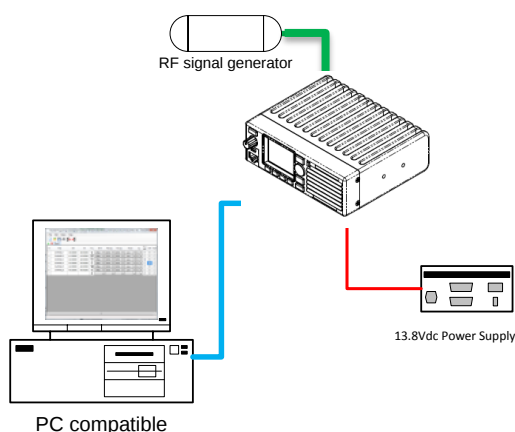


Figure 24: Receiver Alignment Setup

### 5.7.1. 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.

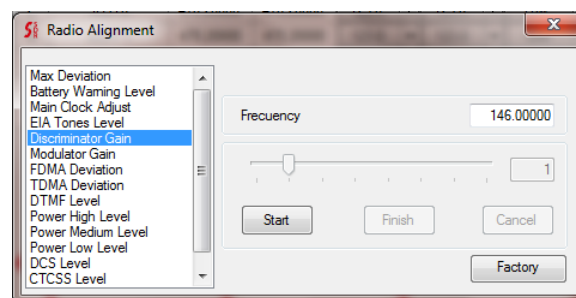


Figure 25: Discriminator Gain Alignment Screen

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.

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.

## 6. 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.

### 6.1. OPTION ALIGNMENT:

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

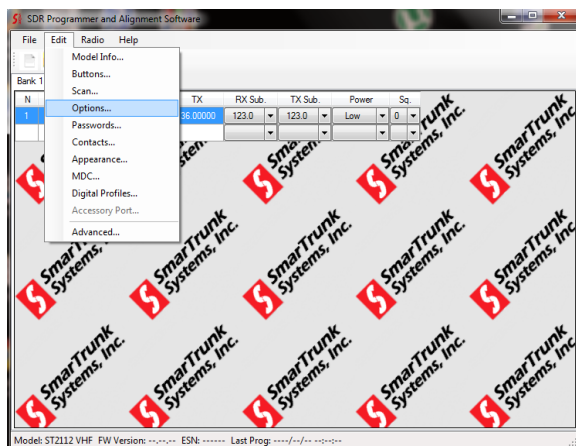


Figure 26: Optional Alignment Access

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

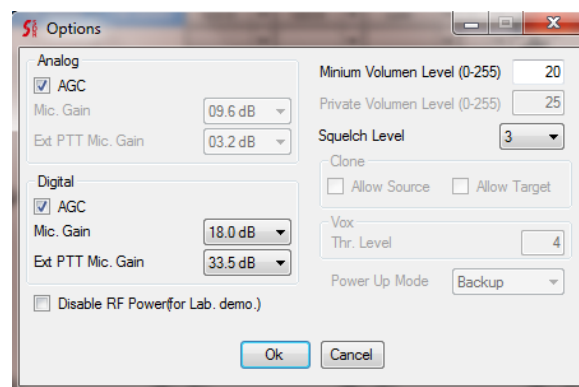


Figure 27: Option Alignment Screen

From this screen the user can adjust:

#### 6.1.1. ANALOG Microphone gain:

It aligns microphone sensitivity.

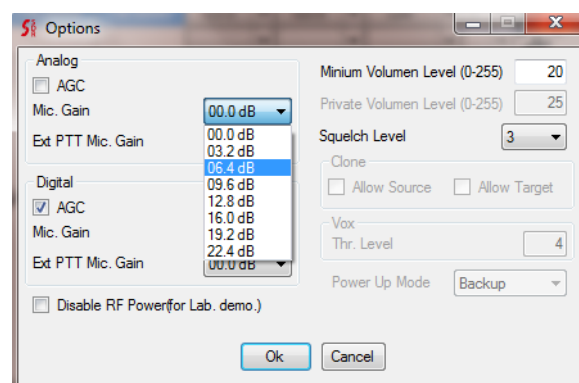


Figure 28: Analog Mic Gain Selection

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.

### 6.1.2. ANALOG External Mic Gain:

It aligns external microphone (Accessory Port) sensitivity. Default factory value is 0.0dB.

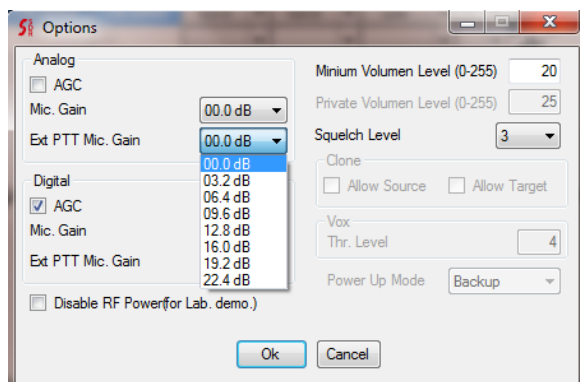


Figure 29: External Microphone Sensitivity Alignment

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.

### 6.1.3. Analog AGC

ST-3118 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 AGC 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 switch 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:

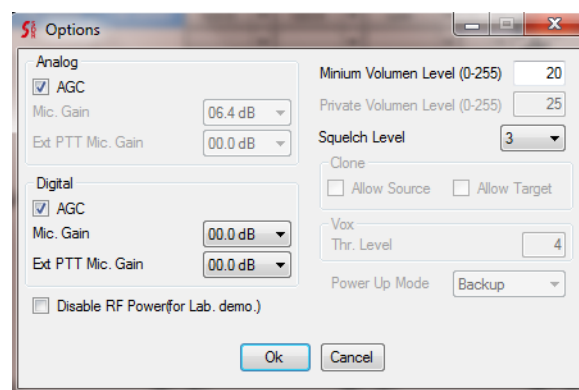


Figure 30: Analog Microphone AGC Control

Press [OK] to store it in the file.

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

### 6.1.4. DIGITAL AGC

ST-3118 has an Automated Gain Control for digital microphone path. 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 AGC 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 switch 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:

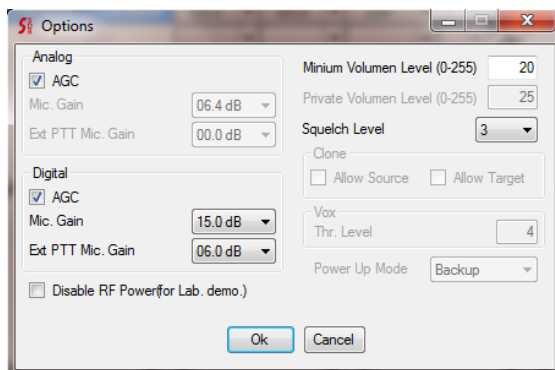


Figure 31: Digital Microphone Path AGC Control

Press [OK] to store it in the file.

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

### 6.1.5. 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.

It can be aligned up to 250 (max) step 1.

### 6.1.6. SQUELCH LEVEL:

ST-3118 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:

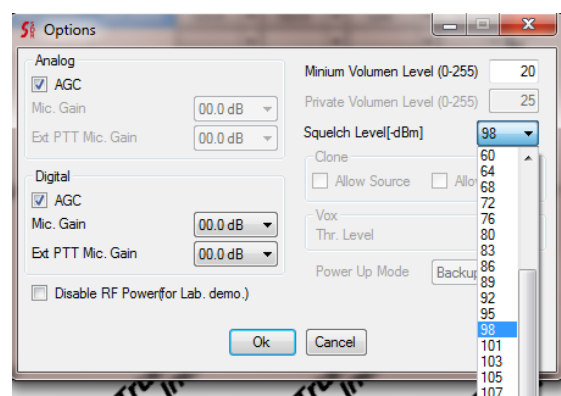


Figure 32: Squelch Level Setting Screen

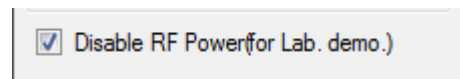
Press [OK] to store it in the file.

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

### 6.1.7. 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:

A screenshot of a software interface showing a checkbox that is checked. The text next to the checkbox is "Disable RF Power(for Lab. demo.)". The checkbox is a small square with a checkmark inside, and the text is in a standard sans-serif font.

Press [OK] to store it in the file.

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

## 7. RADIO APPEARANCE ALIGNMENT

Under user mode, login radio appearance can be aligned.

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

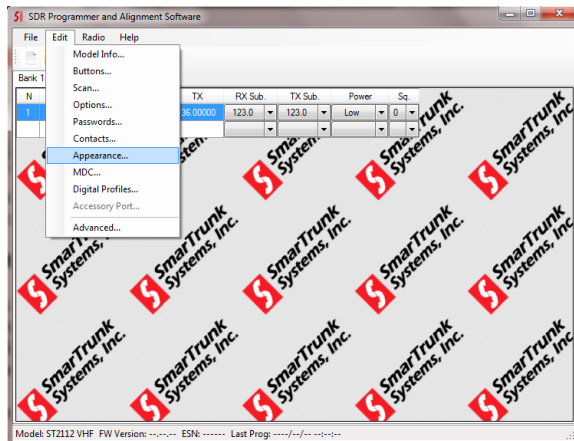


Figure 33: Access to the Appearance Menu

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

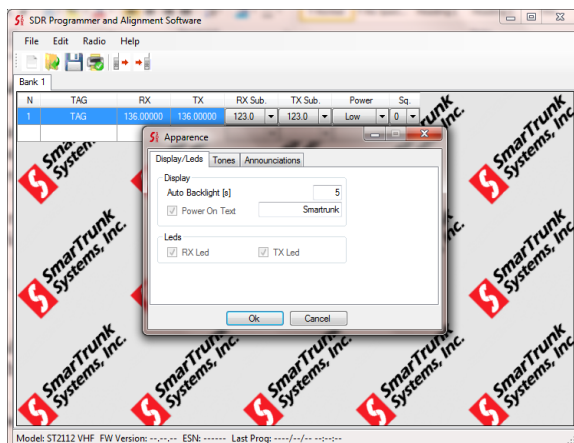


Figure 34: Display/Leds Appearance Screen

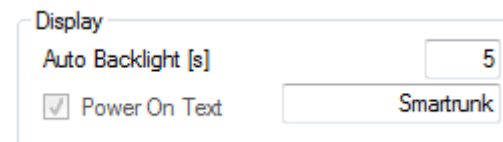
### 7.1. DISPLAYS AND LEDS:

This screen lets you adjust the behavior of the display backlight, Power On text and TX/RX LEDs.

#### 7.1.1. 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.



#### 7.1.2. 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.

#### 7.1.3. Leds:

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

### 7.2. Tones

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

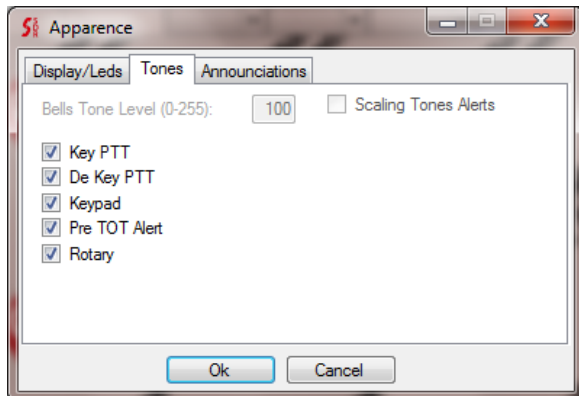


Figure 35: Courtesy Tones Programming Screen

Tones can be changed by the dealer. Please refer to appendix II to learn about it.

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

Check **DeKey PTT** if you want to play back a key tone acknowledges any time PTT is released.

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

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

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

### 7.3. 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.

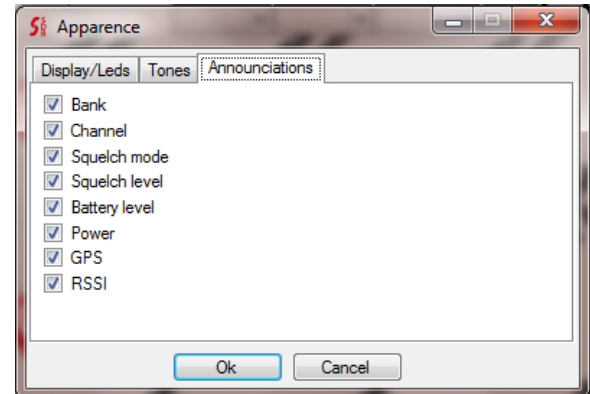


Figure 36: Annunciations Programming Screen

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.

**Battery level** announcement has no action into ST-3118

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.

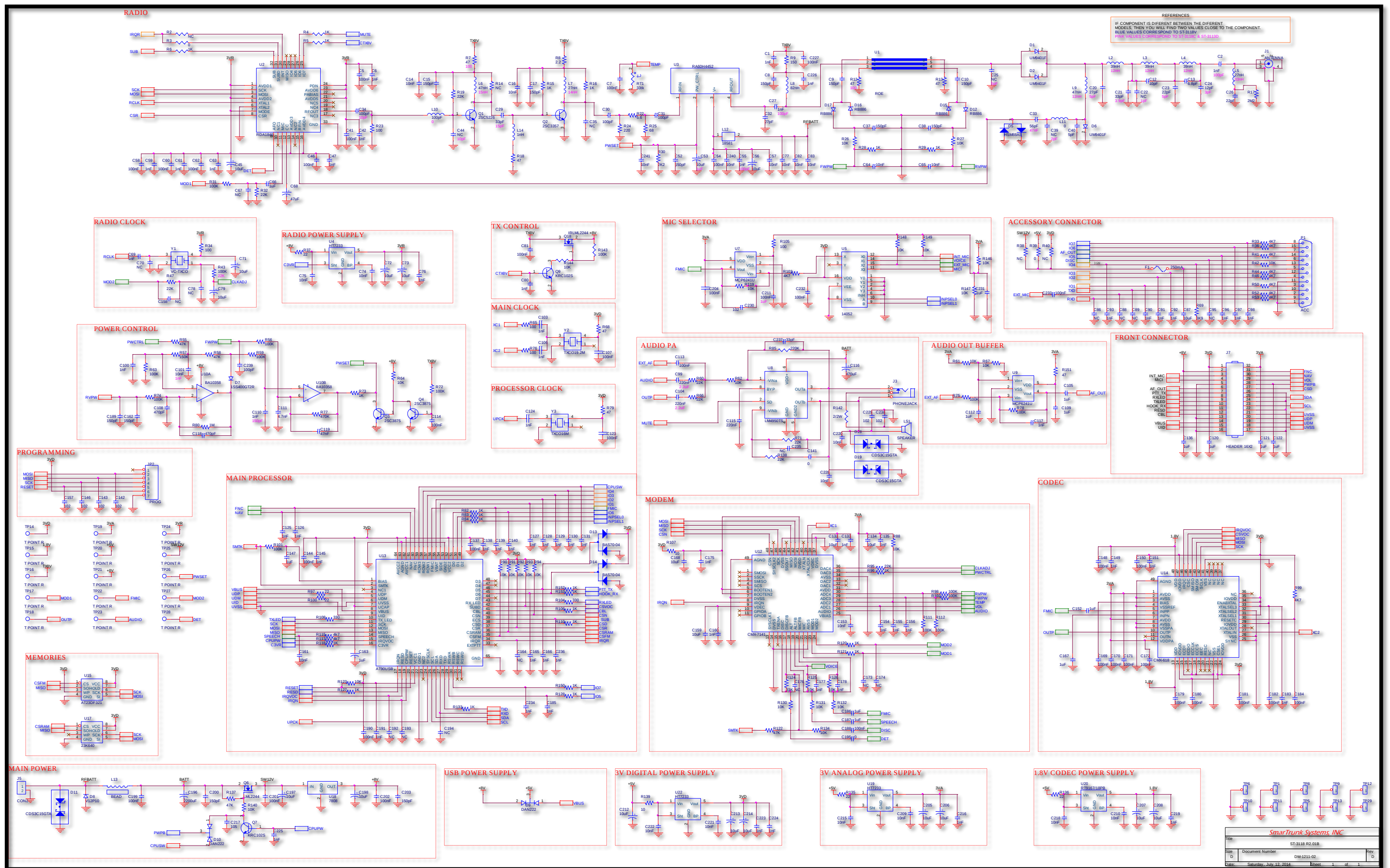
Check **RSSI** if you want the radio plays a concerning message back any time you ask for current RSSI.

Press OK once you finish setting 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.

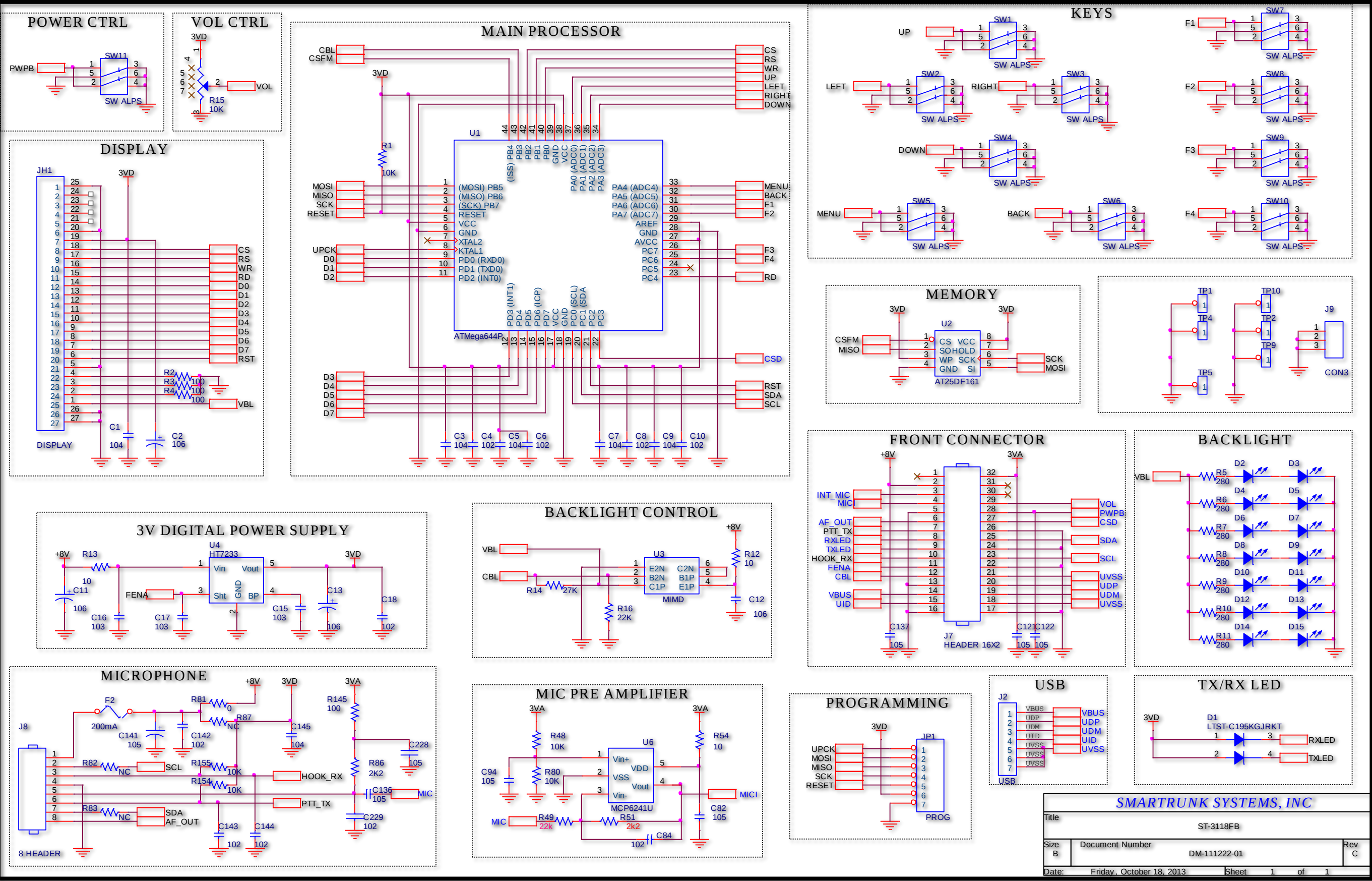


Notes:

## 8. ST-3118D MAIN BOARD SCHEMATIC

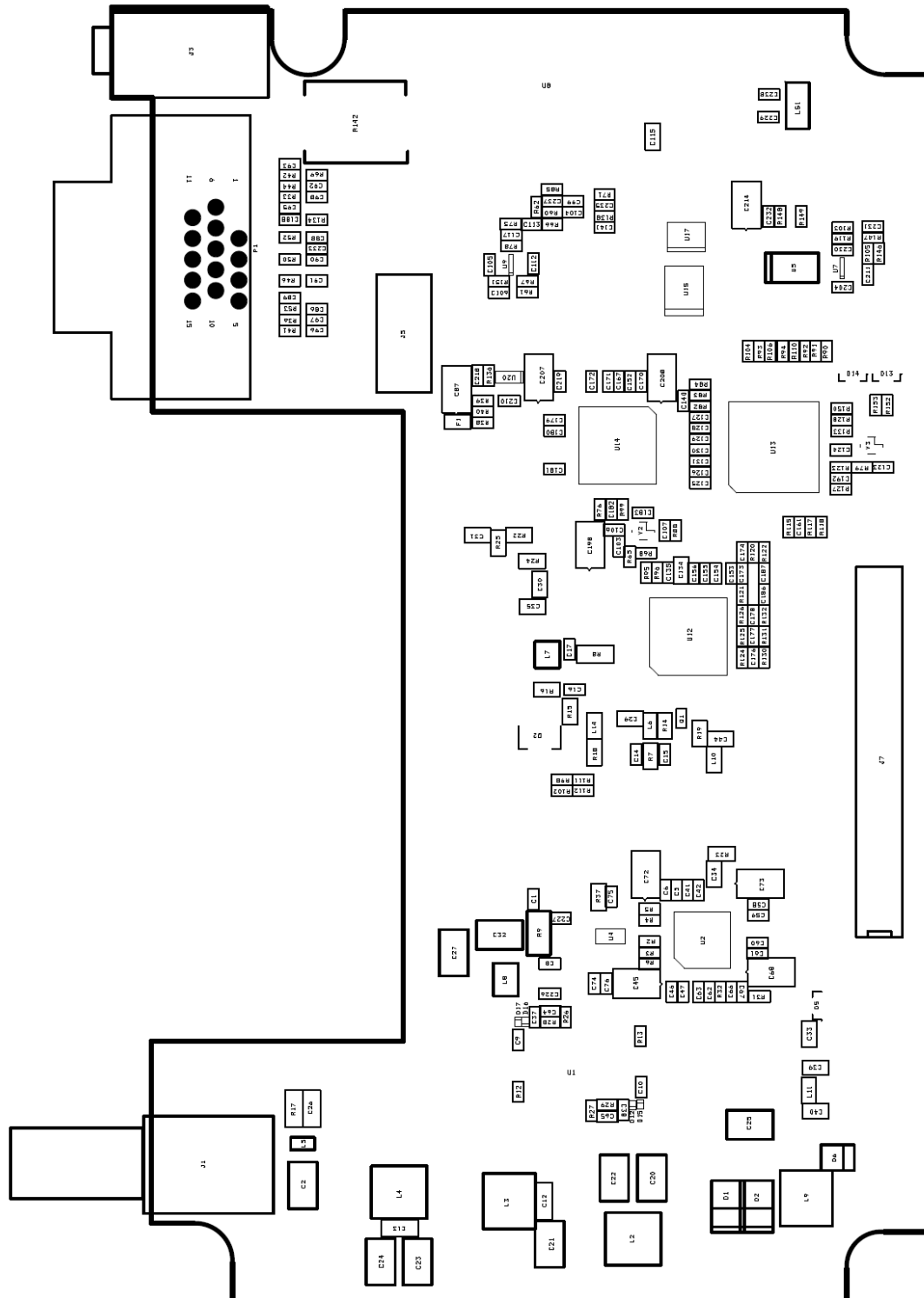


9. ST-3118 FRONT BOARD SCHEMATIC



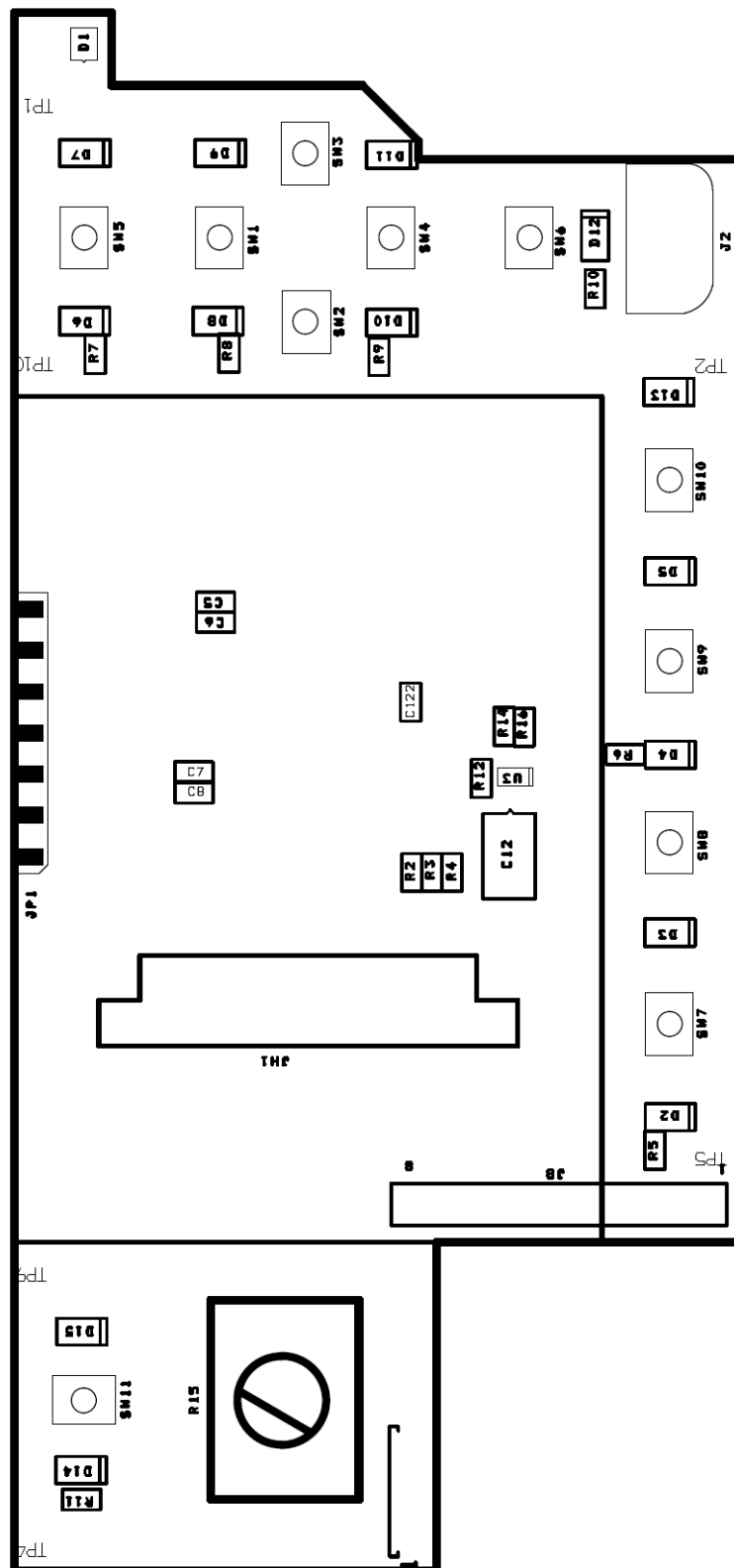
## 10.COMPONENT LOCATOR

### 10.1. ST-3118D COMPONENT LOCATOR (TOP LAYER)

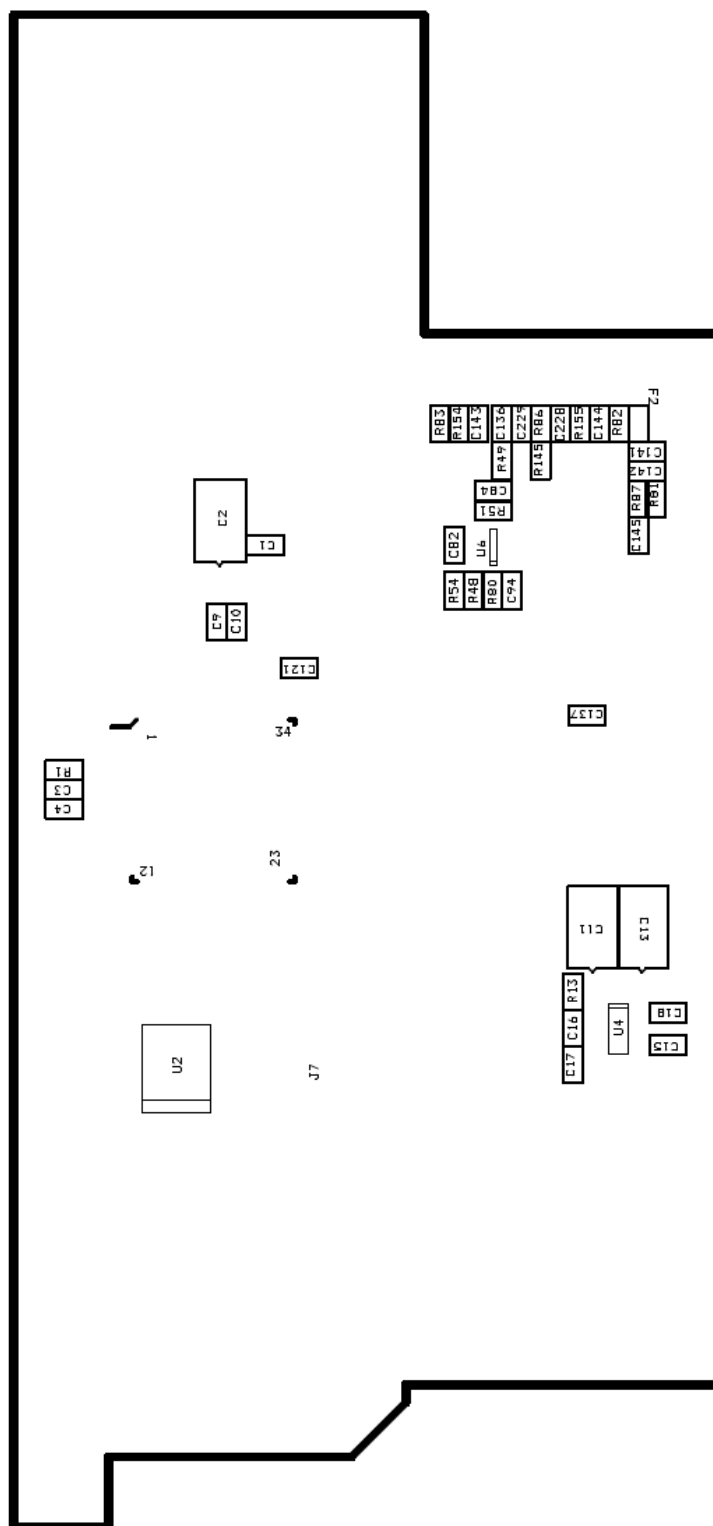




### 10.3. ST-3118D FRONT BOARD COMPONENT LOCATOR (TOP LAYER)

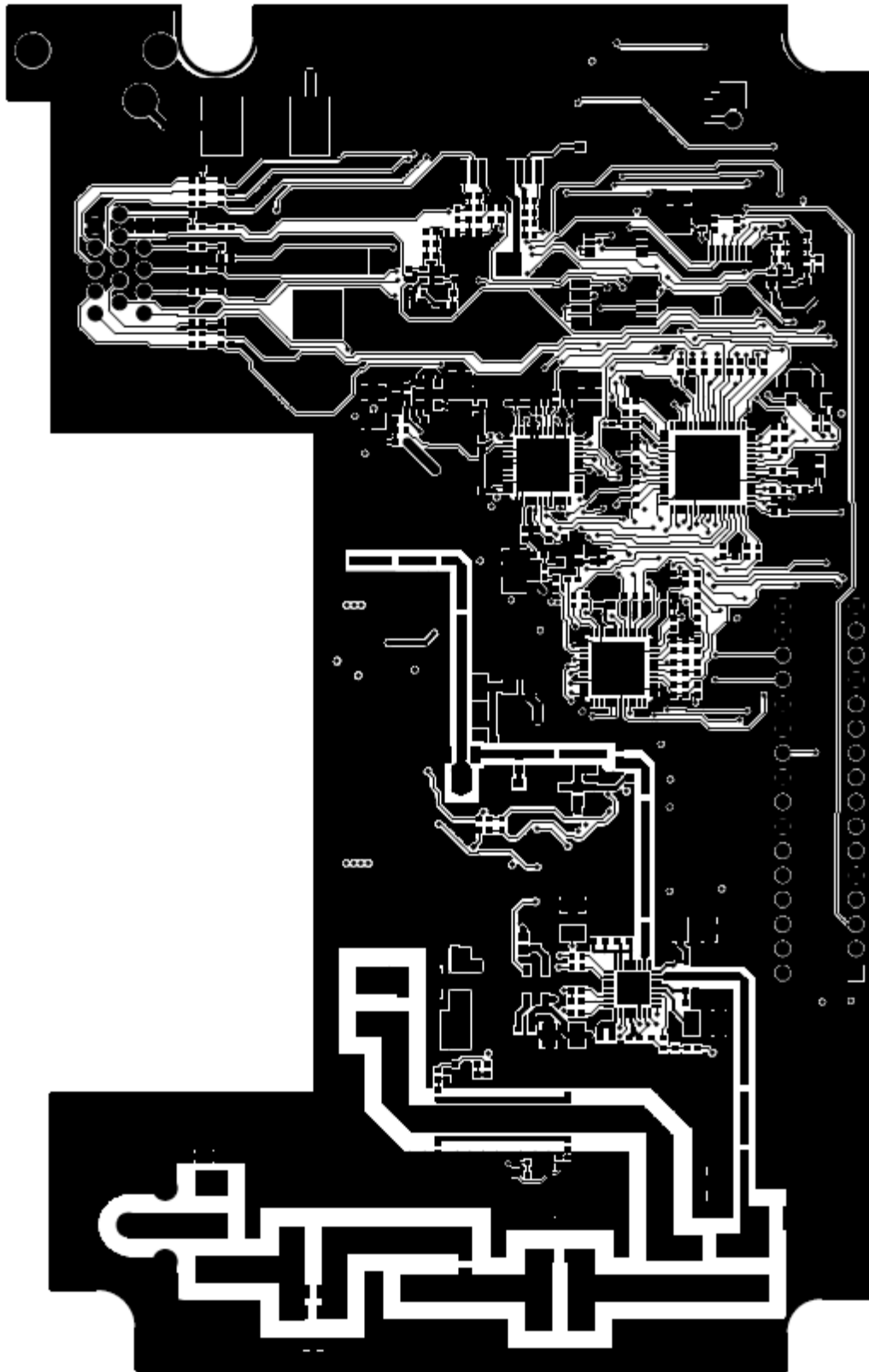


## 10.4. ST-3118D FRONT BOARD COMPONENT LOCATOR (BOTTOM LAYER)

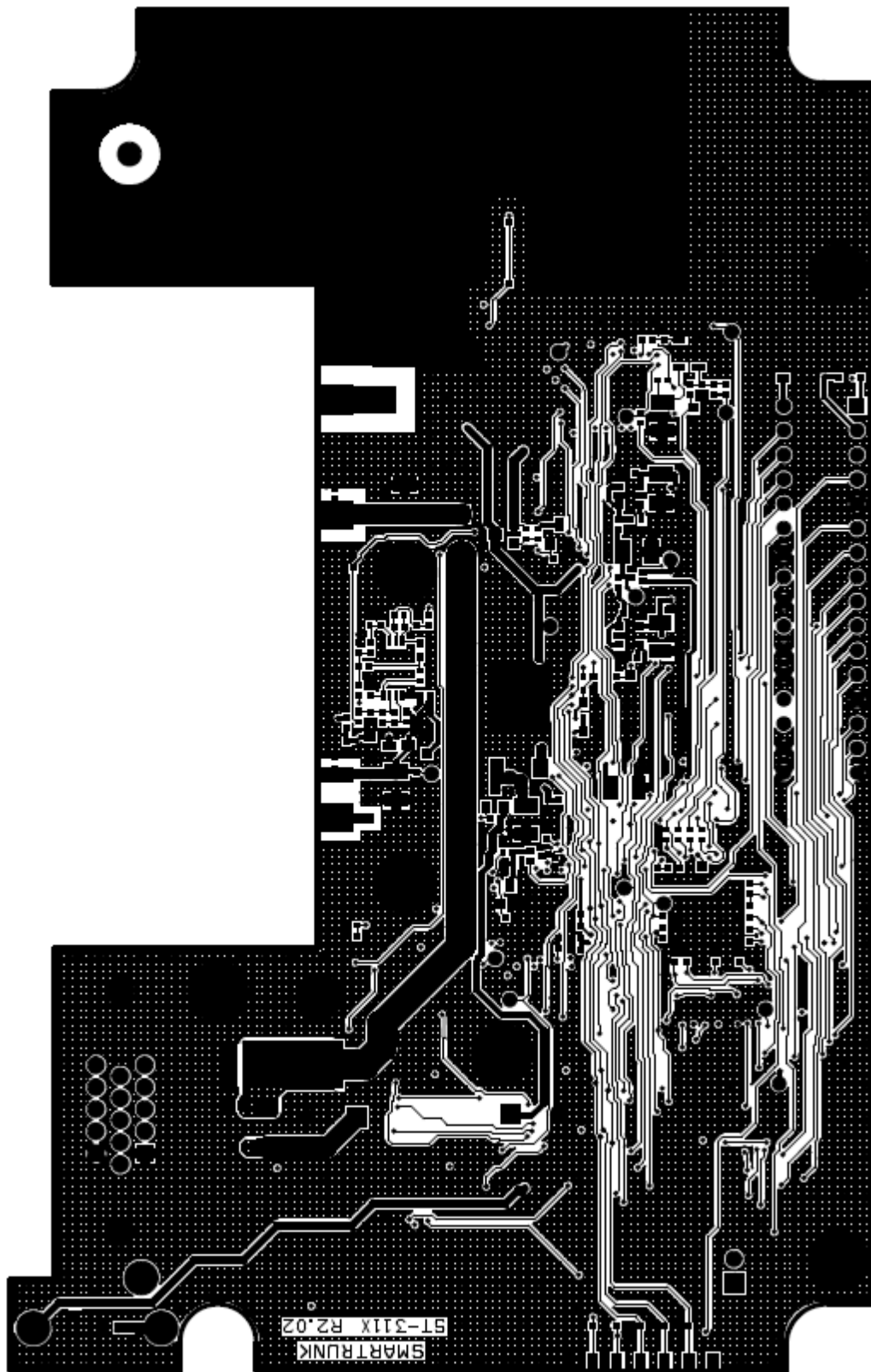


## 11.ST-3118D PCB LAYOUT

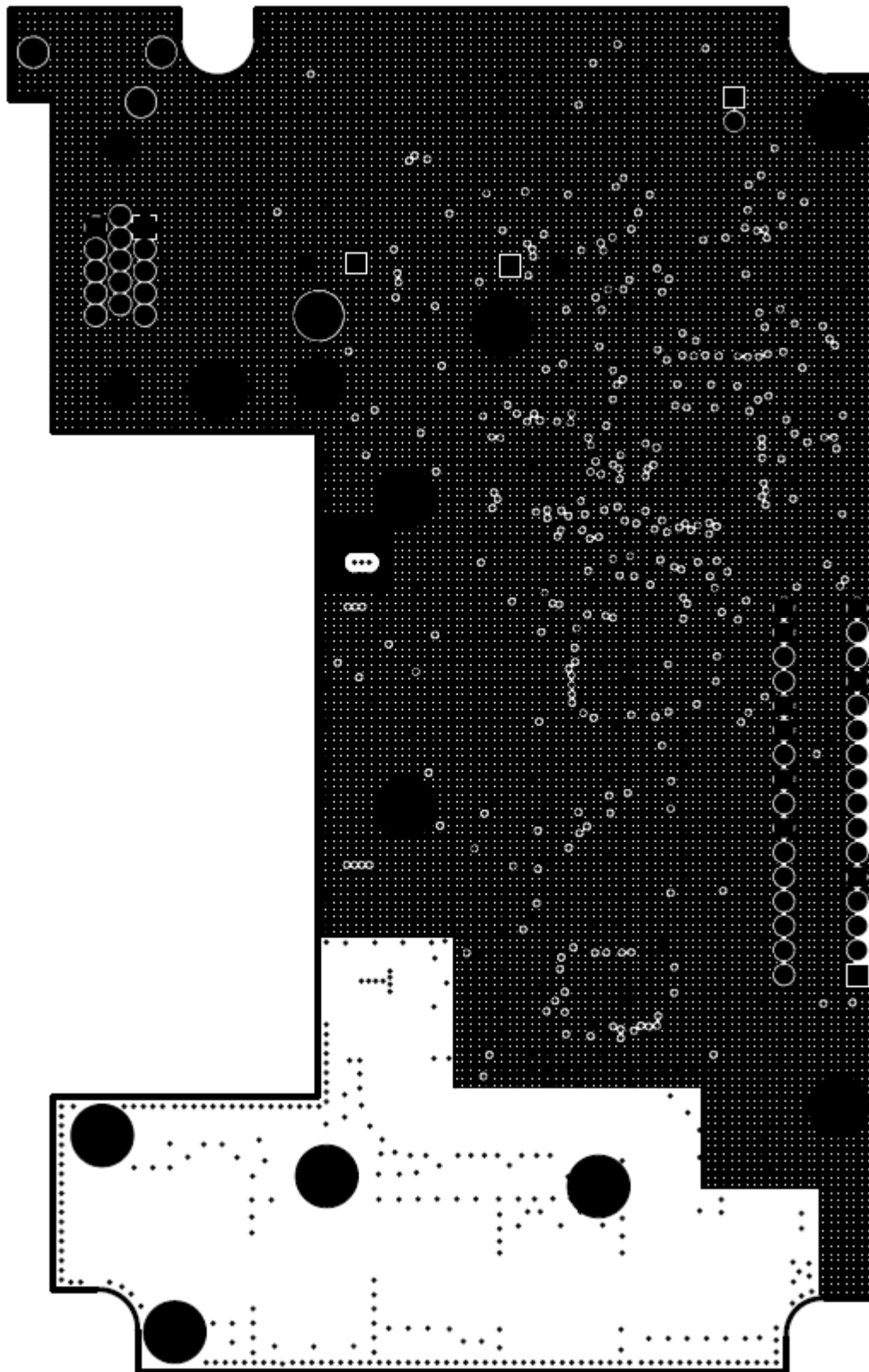
### 11.1. ST-3118D MAIN BOARD PCB TOP LAYER



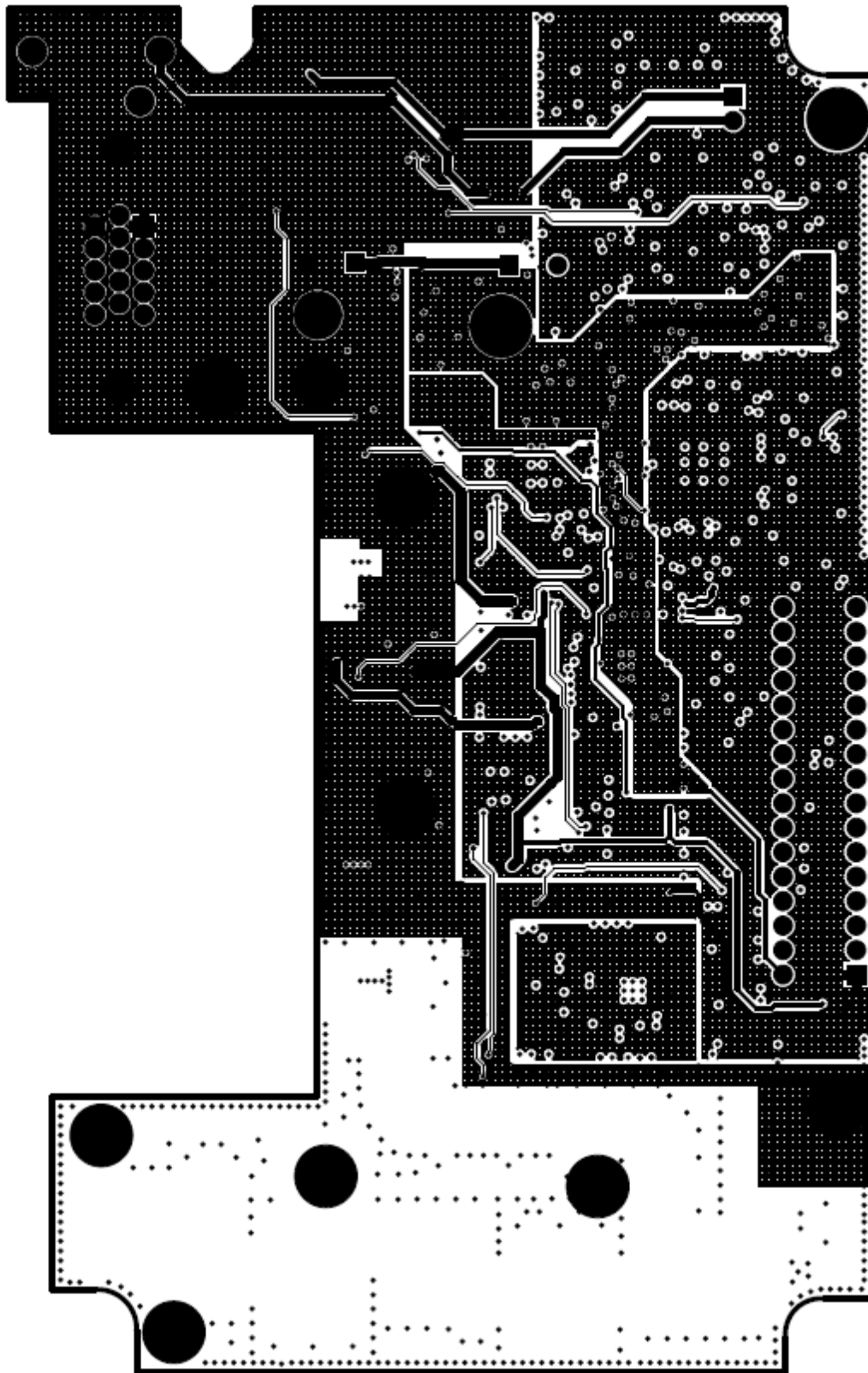
## 11.2. ST-3118D MAIN BOARD PCB BOTTOM LAYER



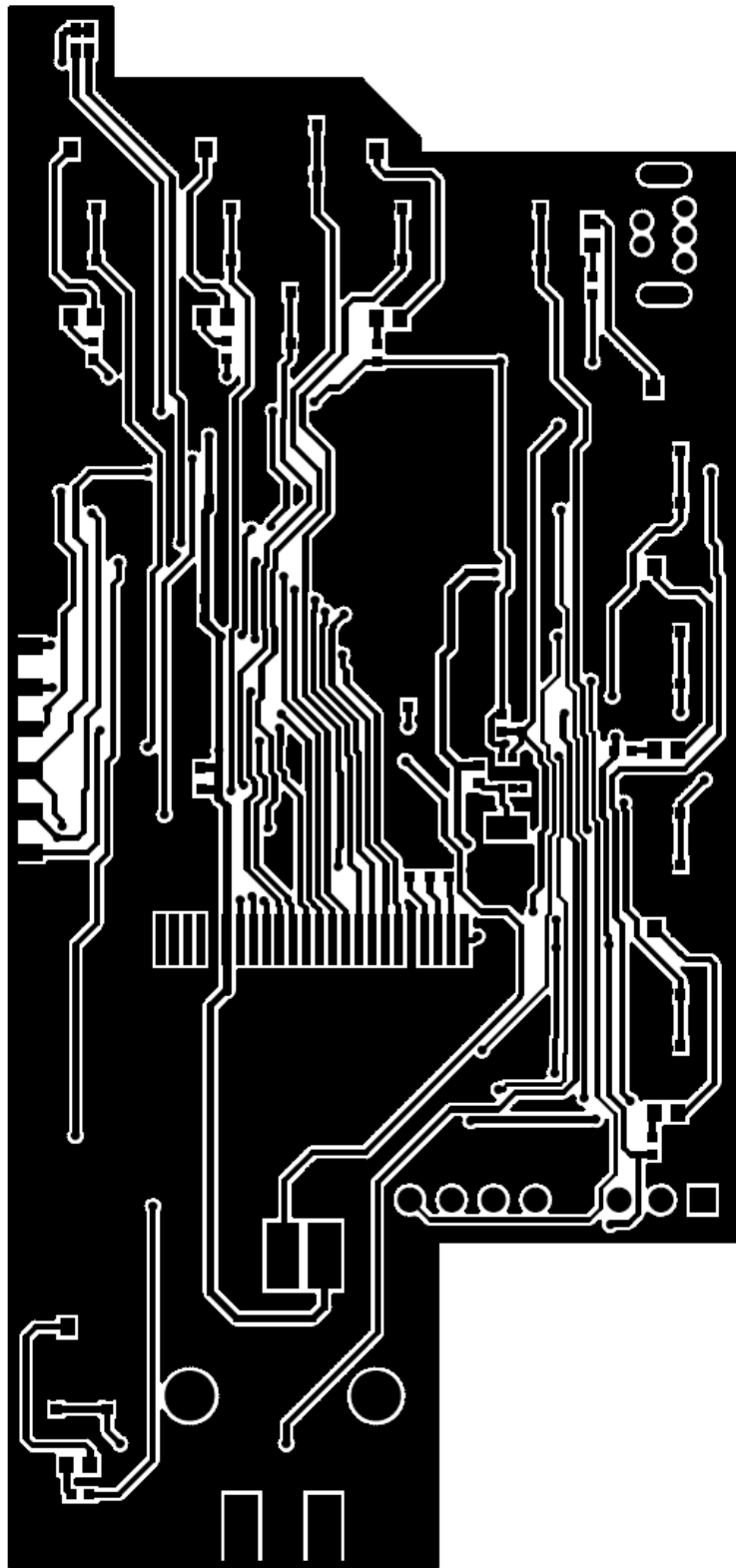
### 11.3. ST-3118D MAIN BOARD PCB GROUND LAYER



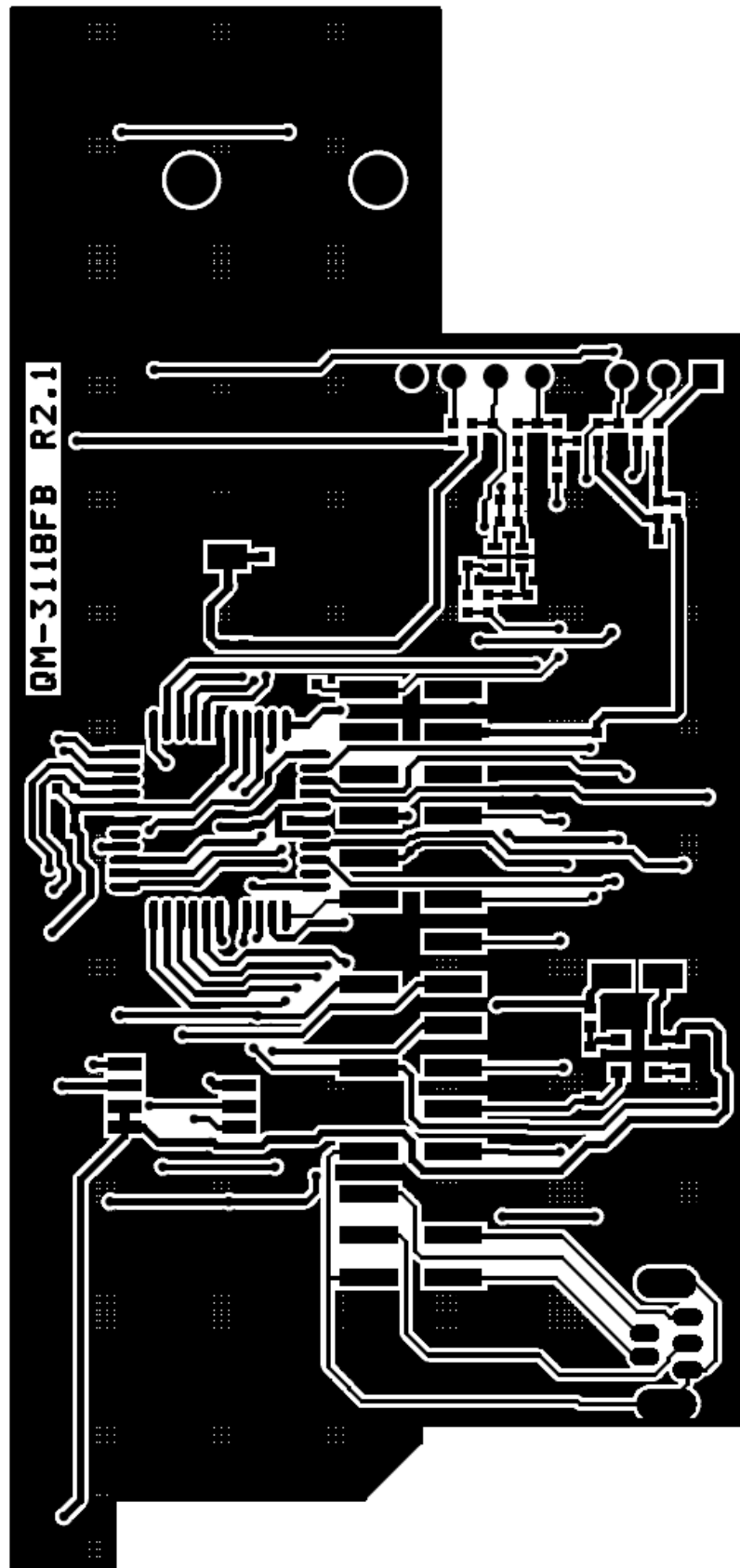
#### 11.4. ST-3118D MAIN BOARD PCB POWER LAYER



## 11.5. ST-3118D FRONT BOARD PCB TOP LAYER



## 11.6. ST-3118D FRONT BOARD PCB TOP LAYER



## 12.ST-3118D BOM

### 12.1. ST-3118D MAIN PCB BOM

| NAME | DESCRIPTION                     | VALUE | SMARTRUNK PN |
|------|---------------------------------|-------|--------------|
|      | Main PCB                        |       | EPL311810B   |
| C1   | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C6   | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C42  | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C47  | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C59  | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C61  | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C63  | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C69  | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C76  | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C80  | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C90  | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C91  | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C92  | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C93  | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C96  | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C97  | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C98  | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C100 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C101 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C103 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C106 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C117 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C124 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C125 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C126 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C127 | 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   |
| C135 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C138 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C139 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C140 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C145 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C149 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C151 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C154 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C155 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C156 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C160 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C165 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |
| C166 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X   |

|      |                                 |       |            |
|------|---------------------------------|-------|------------|
| C175 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X |
| C177 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X |
| C178 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X |
| C183 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X |
| C185 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X |
| C191 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X |
| C216 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X |
| C219 | 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 |
| C225 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X |
| C226 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X |
| C234 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X |
| C236 | CAP 1000PF 50V CERAMIC X7R 0402 | 1nF   | CK1102AK5X |
| C44  | CAP CER 10PF 250V 5% 0603 NPO   | 10pF  | CK9100AD2A |
| C29  | CAP CER 15PF 250V 0603 NPO      | 15pF  | CK9150AD4A |
| C8   | CAP CER 150PF 50V C0G 0402      | 150pF | CK1151AK5A |
| C9   | CAP CER 150PF 50V C0G 0402      | 150pF | CK1151AK5A |
| C10  | CAP CER 150PF 50V C0G 0402      | 150pF | CK1151AK5A |
| C15  | CAP CER 150PF 50V C0G 0402      | 150pF | CK1151AK5A |
| C17  | CAP CER 150PF 50V C0G 0402      | 150pF | CK1151AK5A |
| C37  | CAP CER 150PF 50V C0G 0402      | 150pF | CK1151AK5A |
| C38  | CAP CER 150PF 50V C0G 0402      | 150pF | CK1151AK5A |
| C52  | CAP CER 150PF 50V C0G 0402      | 150pF | CK1151AK5A |
| C110 | CAP CER 150PF 50V C0G 0402      | 150pF | CK1151AK5A |
| C162 | CAP CER 150PF 50V C0G 0402      | 150pF | CK1151AK5A |
| C189 | CAP CER 150PF 50V C0G 0402      | 150pF | CK1151AK5A |
| C200 | CAP CER 150PF 50V C0G 0402      | 150pF | CK1151AK5A |
| C203 | CAP CER 150PF 50V C0G 0402      | 150pF | CK1151AK5A |
| C5   | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C7   | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C41  | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C46  | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C54  | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C58  | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C60  | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C62  | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C81  | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C107 | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C113 | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C114 | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C123 | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C137 | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C144 | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C148 | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C150 | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C169 | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C170 | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C171 | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C172 | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C179 | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |
| C180 | CAP CER 0.1UF 16V 10% X7R 0402  | 100nF | CK5104AK5X |

|      |                                                     |       |            |
|------|-----------------------------------------------------|-------|------------|
| C181 | CAP CER 0.1UF 16V 10% X7R 0402                      | 100nF | CK5104AK5X |
| C182 | CAP CER 0.1UF 16V 10% X7R 0402                      | 100nF | CK5104AK5X |
| C184 | CAP CER 0.1UF 16V 10% X7R 0402                      | 100nF | CK5104AK5X |
| C188 | CAP CER 0.1UF 16V 10% X7R 0402                      | 100nF | CK5104AK5X |
| C190 | CAP CER 0.1UF 16V 10% X7R 0402                      | 100nF | CK5104AK5X |
| C199 | CAP CER 0.1UF 16V 10% X7R 0402                      | 100nF | CK5104AK5X |
| C201 | CAP CER 0.1UF 16V 10% X7R 0402                      | 100nF | CK5104AK5X |
| C202 | CAP CER 0.1UF 16V 10% X7R 0402                      | 100nF | CK5104AK5X |
| C204 | CAP CER 0.1UF 16V 10% X7R 0402                      | 100nF | CK5104AK5X |
| C227 | CAP CER 0.1UF 16V 10% X7R 0402                      | 100nF | CK5104AK5X |
| C232 | CAP CER 0.1UF 16V 10% X7R 0402                      | 100nF | CK5104AK5X |
| C233 | CAP CER 0.1UF 16V 10% X7R 0402                      | 100nF | CK5104AK5X |
| C30  | CAP CER 100PF 250V 5% 0603                          | 100pF | CK9101AD5A |
| C31  | CAP CER 100PF 250V 5% 0603                          | 100pF | CK9101AD5A |
| C14  | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C16  | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C57  | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C64  | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C65  | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C74  | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C75  | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C77  | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C82  | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C83  | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C153 | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C161 | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C209 | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C210 | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C215 | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C218 | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C220 | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C221 | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C222 | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C228 | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C240 | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C241 | CAP CER 10000PF 50V 10% X7R 0402                    | 10nF  | CK5103AK5X |
| C21  | CAP CERAMIC NPO, MULTILAYER, HI RF POWER 3.9PF 1206 | 3.9pF | CK3039DA4A |
| C24  | CAP CERAMIC NPO, MULTILAYER, HI RF POWER 3PF 1206   | 3pF   | CK3030DA6A |
| C20  | CAP CERAMIC NPO, MULTILAYER, HI RF POWER 5PF 1206   | 5pF   | CK3050DA4A |
| C23  | CAP CERAMIC NPO, MULTILAYER, HI RF POWER 5PF 1206   | 5pF   | CK3050DA4A |
| C25  | CAP CERAMIC NPO, MULTILAYER, HI RF POWER 5PF 1206   | 5pF   | CK3050DA4A |
| C2   | CAP CERAMIC NPO, MULTILAYER, HI RF POWER 100PF 1206 | 100pF | CK3101DA4A |
| C27  | CAP CERAMIC NPO, MULTILAYER, HI RF POWER 100PF 1206 | 100pF | CK3101DA4A |
| C79  | CAP CER 10UF 6.3V 10% X5R 0603                      | 10uF  | CK6106AD6T |
| C132 | CAP CER 10UF 6.3V 10% X5R 0603                      | 10uF  | CK6106AD6T |
| C134 | CAP CER 10UF 6.3V 10% X5R 0603                      | 10uF  | CK6106AD6T |
| C159 | CAP CER 10UF 6.3V 10% X5R 0603                      | 10uF  | CK6106AD6T |

|      |                                                   |         |             |
|------|---------------------------------------------------|---------|-------------|
| C168 | CAP CER 10UF 6.3V 10% X5R 0603                    | 10uF    | CK6106AD6T  |
| C121 | CAP CER 1UF 16V 10% X7R 0603                      | 1uF     | CK5105AD7RR |
| C163 | CAP CER 1UF 16V 10% X7R 0603                      | 1uF     | CK5105AD7RR |
| C66  | CAP CER 1UF 6.3V 10% X5R 0402                     | 1uF     | CK6105AK6T  |
| C105 | CAP CER 1UF 6.3V 10% X5R 0402                     | 1uF     | CK6105AK6T  |
| C109 | CAP CER 1UF 6.3V 10% X5R 0402                     | 1uF     | CK6105AK6T  |
| C211 | CAP CER 1UF 6.3V 10% X5R 0402                     | 1uF     | CK6105AK6T  |
| C112 | CAP CER 1UF 6.3V 10% X5R 0402                     | 1uF     | CK6105AK6T  |
| C120 | CAP CER 1UF 6.3V 10% X5R 0402                     | 1uF     | CK6105AK6T  |
| C147 | CAP CER 1UF 6.3V 10% X5R 0402                     | 1uF     | CK6105AK6T  |
| C152 | CAP CER 1UF 6.3V 10% X5R 0402                     | 1uF     | CK6105AK6T  |
| C167 | CAP CER 1UF 6.3V 10% X5R 0402                     | 1uF     | CK6105AK6T  |
| C186 | CAP CER 1UF 6.3V 10% X5R 0402                     | 1uF     | CK6105AK6T  |
| C187 | CAP CER 1UF 6.3V 10% X5R 0402                     | 1uF     | CK6105AK6T  |
| C231 | CAP CER 1UF 6.3V 10% X5R 0402                     | 1uF     | CK6105AK6T  |
| C122 | CAP CER 1UF 16V 10% X5R 0402                      | 1uF     | CK5105AK7R  |
| C136 | CAP CER 1UF 16V 10% X5R 0402                      | 1uF     | CK5105AK7R  |
| C99  | CAP CER 0.22UF 10V 10% X5R 0402                   | 2.2uF   | CK0224AK5T  |
| C104 | CAP CER 0.22UF 10V 10% X5R 0402                   | 2.2uF   | CK0224AK5T  |
| C108 | CAP 470PF 50V CERAMIC X7R 0402                    | 470pF   | CK1471AK4A  |
| C118 | CAP 470PF 50V CERAMIC X7R 0402                    | 470pF   | CK1471AK4A  |
| C111 | CAP CER 4700PF 50V 10% X7R 0402                   | 4.7nF   | CK1472AK5X  |
| C119 | CAP CER 0.047UF 16V 10% X7R 0402                  | 47nF    | CK5473AK5X  |
| C33  | CAP CER 47PF 50V NPO 0603                         | 47pF    | CK1470AD4A  |
| C115 | CAP CER 0.22UF 50V 0603                           | 220nF   | CK1224AD5R  |
| C39  | CAP CER 2PF 200V 0603                             | 2pF     | CK7020AD1A  |
| C34  | CAP CER 10PF 200WV 5% NPO 0603                    | 10pF    | CK7100AD2A  |
| C55  | CAP CER 100PF 50WV NPO 0402                       | 100pF   | CK1101AK5A  |
| C40  | CAP CER 5PF 250WV NPO 0603                        | 5pF     | CK9050AD1A  |
| C22  | CAP CERAMIC NPO, MULTILAYER, HI RF POWER 1PF 1206 | 1pF     | CK3010DA4A  |
| C237 | CAP CERAMIC33PF 50WV NPO 0402                     | 33pF    | CK1330AK4A  |
| C68  | CAP TANT 47UF 6.3V 20% 1206                       | 47uF    | CTY064766A  |
| C45  | CAP TANT 10UF 6.3V 10% 1206                       | 10uF    | CTY101066Z  |
| C71  | CAP TANT 10UF 6.3V 10% 1206                       | 10uF    | CTY101066Z  |
| C72  | CAP TANT 10UF 6.3V 10% 1206                       | 10uF    | CTY101066Z  |
| C73  | CAP TANT 10UF 6.3V 10% 1206                       | 10uF    | CTY101066Z  |
| C205 | CAP TANT 10UF 6.3V 10% 1206                       | 10uF    | CTY101066Z  |
| C206 | CAP TANT 10UF 6.3V 10% 1206                       | 10uF    | CTY101066Z  |
| C207 | CAP TANT 10UF 6.3V 10% 1206                       | 10uF    | CTY101066Z  |
| C208 | CAP TANT 10UF 6.3V 10% 1206                       | 10uF    | CTY101066Z  |
| C212 | CAP TANT 10UF 6.3V 10% 1206                       | 10uF    | CTY101066Z  |
| C213 | CAP TANT 10UF 6.3V 10% 1206                       | 10uF    | CTY101066Z  |
| C214 | CAP TANT 10UF 6.3V 10% 1206                       | 10uF    | CTY101066Z  |
| C56  | CAP TANT 10UF 20V 20% 1206                        | 10uF    | CTY201066A  |
| C87  | CAP TANT 10UF 20V 20% 1206                        | 10uF    | CTY201066A  |
| C197 | CAP TANT 10UF 20V 20% 1206                        | 10uF    | CTY201066A  |
| C198 | CAP TANT 10UF 20V 20% 1206                        | 10uF    | CTY201066A  |
| C53  | CAP TANT 1UF 16V 10% 1206                         | 1uF     | CTY161056ZR |
| D1   | PIN DIODE                                         | UM9401F | EDUX09401YR |
| D2   | PIN DIODE                                         | UM9401F | EDUX09401YR |

|      |                                       |            |             |
|------|---------------------------------------|------------|-------------|
| D6   | PIN DIODE                             | UM9401F    | EDUX09401YR |
| D5   | SILICON SCHOTTKY BARRIER DIODE        | HSM88A     | EDHSM0088A  |
| D7   | DIODE 80V 100MA VMD2                  | 1SS400GT2R | EDSS00400Y  |
| D8   | Trench MOS Barrier Schottky Rectifier | V12P10     | EDV012P10Y  |
| D9   | BAND SWITCHING DIODE                  | DAN222     | EDDAN0222Y  |
| D10  | BAND SWITCHING DIODE                  | DAN222     | EDDAN0222Y  |
| D11  | ESD protection to IEC 61000-4-2,      | CDS3C15GTA | EDCDS3C15Y  |
| D13  | Dual Common Anode Schottky Diodes     | BAS70-04-V | EDBAS0704V  |
| D14  | Dual Common Anode Schottky Diodes     | BAS70-04-V | EDBAS0704V  |
| F1   | MINIATURE 0603 SIZE LOW CURRENT LGA   | 250mA      | EX02Y40262  |
| F3   | HIGH CURRENT FUSE                     | 10A        | EX02Y40261  |
| L7   | SPRING COIL                           | 14nH       | YCSPG18426  |
| L2   | SPRING COIL                           | 12nH       | YCSPG18431  |
| L3   | SPRING COIL                           | 12nH       | YCSPG18431  |
| L4   | SPRING COIL                           | 12nH       | YCSPG18431  |
| L9   | SPRING COIL                           | 12nH       | YCSPG18431  |
| L5   | AIRCORE INDUCTOR                      | 33nH       | YCSPG18424  |
| L8   | AIRCORE INDUCTOR                      | 82nH       | YCSPG18433  |
| L6   | CHOKE COIL                            | 15nH       | YCMCI1533D  |
| L12  | SMT Shielded Power Inductors          | 18581      | YCBAD18581R |
| L13  | FERRITE BEAD CHIP                     | BEAD       | YCBAD18594  |
| L14  | COIL                                  | 1nH        | YCMCI1054D  |
| Q1   | VHF to UHF Wide-Band Low-Noise        | 2SC5226    | TY2SC5226Z  |
| Q2   | NPN SILICON EPITAXIAL TRANSISTOR      | 2SC3357    | TY2SC3357Z  |
| Q3   | NPN Epitaxial Silicon Transistor      | 2SC3875    | TYKTC3875SR |
| Q4   | NPN Epitaxial Silicon Transistor      | 2SC3875    | TYKTC3875SR |
| Q5   | PRE-BIASED NPN TRANSISTOR             | KRC102S    | TYKRC0102S  |
| Q7   | PRE-BIASED NPN TRANSISTOR             | KRC102S    | TYKRC0102S  |
| Q9   | PRE-BIASED NPN TRANSISTOR             | KRC102S    | TYKRC0102S  |
| Q6   | MOSFET P-CH 20V 4.3A SOT23            | LML2244    | TYLML2244Z  |
| Q18  | MOSFET P-CH 20V 4.3A SOT23            | LML2244    | TYLML2244Z  |
| RT1  | THERMISTOR 33K OHM NTC 0402 SMD       | 33tk       | RTU143334Y  |
| C141 | RES 0.0 OHM 1/16W 0402 SMD            | 0          | RCY040004Z  |
| R3   | RES 0.0 OHM 1/16W 0402 SMD            | 0          | RCY040004Z  |
| R39  | RES 0.0 OHM 1/16W 0402 SMD            | 0          | RCY040004Z  |
| C195 | RES 0.0 OHM 1/16W 0402 SMD            | 0          | RCY040004Z  |
| L11  | RES 0.0 OHM 1/16W 0402 SMD            | 0          | RCY040004Z  |
| L10  | RES 0.0 OHM 0603 SMD                  | 0          | RCY060004ZR |
| R4   | RES 1.0K OHM 1/16W 5% 0402 SMD        | 1K         | RCY041024Z  |
| R5   | RES 1.0K OHM 1/16W 5% 0402 SMD        | 1K         | RCY041024Z  |
| R6   | RES 1.0K OHM 1/16W 5% 0402 SMD        | 1K         | RCY041024Z  |
| R16  | RES 1.0K OHM 1/16W 5% 0402 SMD        | 1K         | RCY041024Z  |
| R28  | RES 1.0K OHM 1/16W 5% 0402 SMD        | 1K         | RCY041024Z  |
| R29  | RES 1.0K OHM 1/16W 5% 0402 SMD        | 1K         | RCY041024Z  |
| R73  | RES 1.0K OHM 1/16W 5% 0402 SMD        | 1K         | RCY041024Z  |
| R82  | RES 1.0K OHM 1/16W 5% 0402 SMD        | 1K         | RCY041024Z  |
| R83  | RES 1.0K OHM 1/16W 5% 0402 SMD        | 1K         | RCY041024Z  |
| R84  | RES 1.0K OHM 1/16W 5% 0402 SMD        | 1K         | RCY041024Z  |

|      |                                |     |             |
|------|--------------------------------|-----|-------------|
| R96  | RES 1.0K OHM 1/16W 5% 0402 SMD | 1K  | RCY041024Z  |
| R106 | RES 1.0K OHM 1/16W 5% 0402 SMD | 1K  | RCY041024Z  |
| R110 | RES 1.0K OHM 1/16W 5% 0402 SMD | 1K  | RCY041024Z  |
| R118 | RES 1.0K OHM 1/16W 5% 0402 SMD | 1K  | RCY041024Z  |
| R120 | RES 1.0K OHM 1/16W 5% 0402 SMD | 1K  | RCY041024Z  |
| R121 | RES 1.0K OHM 1/16W 5% 0402 SMD | 1K  | RCY041024Z  |
| R127 | RES 1.0K OHM 1/16W 5% 0402 SMD | 1K  | RCY041024Z  |
| R128 | RES 1.0K OHM 1/16W 5% 0402 SMD | 1K  | RCY041024Z  |
| R133 | RES 1.0K OHM 1/16W 5% 0402 SMD | 1K  | RCY041024Z  |
| R150 | RES 1.0K OHM 1/16W 5% 0402 SMD | 1K  | RCY041024Z  |
| R152 | RES 1.0K OHM 1/16W 5% 0402 SMD | 1K  | RCY041024Z  |
| R153 | RES 1.0K OHM 1/16W 5% 0402 SMD | 1K  | RCY041024Z  |
| R9   | RES 150 OHM 5% .3W 1206        | 150 | RCY141514Z  |
| R7   | RES 100 OHM .25W 5% 0603 SMD   | 100 | RCY061014ZR |
| R12  | RES 100 OHM 1/16W 5% 0402 SMD  | 100 | RCY041014Z  |
| R13  | RES 100 OHM 1/16W 5% 0402 SMD  | 100 | RCY041014Z  |
| R34  | RES 100 OHM 1/16W 5% 0402 SMD  | 100 | RCY041014Z  |
| R65  | RES 100 OHM 1/16W 5% 0402 SMD  | 100 | RCY041014Z  |
| R76  | RES 100 OHM 1/16W 5% 0402 SMD  | 100 | RCY041014Z  |
| R105 | RES 100 OHM 1/16W 5% 0402 SMD  | 100 | RCY041014Z  |
| R8   | RES 2.2 OHM 1/4W 5% 0805 SMD   | 2.2 | RCY012294ZR |
| R107 | RES 10 OHM 1/16W 5% 0402 SMD   | 10  | RCY041004Z  |
| R139 | RES 10 OHM 1/16W 5% 0402 SMD   | 10  | RCY041004Z  |
| R15  | RES 1K OHM 1/10W 5% 0603 SMD   | 1K  | RCY061024ZR |
| R17  | RES 2.2M OHM 1/8W 5% 0805 SMD  | 2M2 | RCY012254Z  |
| R19  | RES 22K OHM 1/16W 5% 0402 SMD  | 22K | RCY042234Z  |
| R32  | RES 22K OHM 1/16W 5% 0402 SMD  | 22K | RCY042234Z  |
| R43  | RES 22K OHM 1/16W 5% 0402 SMD  | 22K | RCY042234Z  |
| R47  | RES 22K OHM 1/16W 5% 0402 SMD  | 22K | RCY042234Z  |
| R60  | RES 22K OHM 1/16W 5% 0402 SMD  | 22K | RCY042234Z  |
| R66  | RES 22K OHM 1/16W 5% 0402 SMD  | 22K | RCY042234Z  |
| R71  | RES 22K OHM 1/16W 5% 0402 SMD  | 22K | RCY042234Z  |
| R95  | RES 22K OHM 1/16W 5% 0402 SMD  | 22K | RCY042234Z  |
| R138 | RES 22K OHM 1/16W 5% 0402 SMD  | 22K | RCY042234Z  |
| R22  | RES 5.6 OHM 1/10W 5% 0603 SMD  | 5.6 | RCY065694Z  |
| R25  | RES 68 OHM 1/10W 5% 0603 SMD   | 68  | RCY066804Z  |
| R24  | RES 220 OHM 1/10W 5% 0603 SMD  | 220 | RCY062214Z  |
| R26  | RES 10K OHM 1/16W 5% 0402 SMD  | 10K | RCY041034Z  |
| R27  | RES 10K OHM 1/16W 5% 0402 SMD  | 10K | RCY041034Z  |
| R42  | 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  |
| R64  | RES 10K OHM 1/16W 5% 0402 SMD  | 10K | RCY041034Z  |
| R67  | RES 10K OHM 1/16W 5% 0402 SMD  | 10K | RCY041034Z  |
| R88  | 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 |
| R119 | RES 10K OHM 1/16W 5% 0402 SMD  | 10K  | RCY041034Z |
| R123 | RES 10K OHM 1/16W 5% 0402 SMD  | 10K  | RCY041034Z |
| R125 | RES 10K OHM 1/16W 5% 0402 SMD  | 10K  | RCY041034Z |
| R126 | RES 10K OHM 1/16W 5% 0402 SMD  | 10K  | RCY041034Z |
| R130 | RES 10K OHM 1/16W 5% 0402 SMD  | 10K  | RCY041034Z |
| R131 | RES 10K OHM 1/16W 5% 0402 SMD  | 10K  | RCY041034Z |
| R132 | RES 10K OHM 1/16W 5% 0402 SMD  | 10K  | RCY041034Z |
| R134 | RES 10K OHM 1/16W 5% 0402 SMD  | 10K  | RCY041034Z |
| R140 | RES 10K OHM 1/16W 5% 0402 SMD  | 10K  | RCY041034Z |
| R144 | RES 10K OHM 1/16W 5% 0402 SMD  | 10K  | RCY041034Z |
| R146 | RES 10K OHM 1/16W 5% 0402 SMD  | 10K  | RCY041034Z |
| R147 | RES 10K OHM 1/16W 5% 0402 SMD  | 10K  | RCY041034Z |
| R148 | RES 10K OHM 1/16W 5% 0402 SMD  | 10K  | RCY041034Z |
| R149 | RES 10K OHM 1/16W 5% 0402 SMD  | 10K  | RCY041034Z |
| R33  | RES 4.7K OHM 1/16W 5% 0402 SMD | 4K7  | RCY044724Z |
| R36  | RES 4.7K OHM 1/16W 5% 0402 SMD | 4K7  | RCY044724Z |
| R41  | RES 4.7K OHM 1/16W 5% 0402 SMD | 4K7  | RCY044724Z |
| R44  | RES 4.7K OHM 1/16W 5% 0402 SMD | 4K7  | RCY044724Z |
| R46  | RES 4.7K OHM 1/16W 5% 0402 SMD | 4K7  | RCY044724Z |
| R50  | RES 4.7K OHM 1/16W 5% 0402 SMD | 4K7  | RCY044724Z |
| R52  | RES 4.7K OHM 1/16W 5% 0402 SMD | 4K7  | RCY044724Z |
| R53  | RES 4.7K OHM 1/16W 5% 0402 SMD | 4K7  | RCY044724Z |
| R99  | RES 4.7K OHM 1/16W 5% 0402 SMD | 4K7  | RCY044724Z |
| R103 | RES 4.7K OHM 1/16W 5% 0402 SMD | 4K7  | RCY044724Z |
| R115 | RES 4.7K OHM 1/16W 5% 0402 SMD | 4K7  | RCY044724Z |
| R117 | RES 4.7K OHM 1/16W 5% 0402 SMD | 4K7  | RCY044724Z |
| R124 | RES 33K OHM 1/16W 5% 0402 SMD  | 33K  | RCY043334Z |
| R31  | RES 100K OHM 1/16W 5% 0402 SMD | 100K | RCY041044Z |
| R56  | RES 100K OHM 1/16W 5% 0402 SMD | 100K | RCY041044Z |
| R59  | RES 100K OHM 1/16W 5% 0402 SMD | 100K | RCY041044Z |
| R63  | RES 100K OHM 1/16W 5% 0402 SMD | 100K | RCY041044Z |
| R72  | RES 100K OHM 1/16W 5% 0402 SMD | 100K | RCY041044Z |
| R74  | RES 100K OHM 1/16W 5% 0402 SMD | 100K | RCY041044Z |
| R75  | RES 100K OHM 1/16W 5% 0402 SMD | 100K | RCY041044Z |
| R78  | RES 100K OHM 1/16W 5% 0402 SMD | 100K | RCY041044Z |
| R98  | RES 100K OHM 1/16W 5% 0402 SMD | 100K | RCY041044Z |
| R101 | RES 100K OHM 1/16W 5% 0402 SMD | 100K | RCY041044Z |
| R102 | RES 100K OHM 1/16W 5% 0402 SMD | 100K | RCY041044Z |
| R111 | RES 100K OHM 1/16W 5% 0402 SMD | 100K | RCY041044Z |
| R112 | RES 100K OHM 1/16W 5% 0402 SMD | 100K | RCY041044Z |
| R143 | RES 100K OHM 1/16W 5% 0402 SMD | 100K | RCY041044Z |
| R55  | RES 47K OHM 1/16W 5% 0402 SMD  | 47K  | RCY044734Z |
| R58  | RES 47K OHM 1/16W 5% 0402 SMD  | 47K  | RCY044734Z |
| R122 | RES 47K OHM 1/16W 5% 0402 SMD  | 47K  | RCY044734Z |
| R137 | RES 47K OHM 1/16W 5% 0402 SMD  | 47K  | RCY044734Z |
| R85  | RES 220K OHM 1/16W 5% 0402 SMD | 220K | RCY042244Z |
| R57  | RES 150K OHM 1/16W 5% 0402 SMD | 150K | RCY041544Z |
| R18  | RES 47 OHM 1/16W 5% 0402 SMD   | 47   | RCY044704Z |

|      |                                                   |             |            |
|------|---------------------------------------------------|-------------|------------|
| R68  | RES 47 OHM 1/16W 5% 0402 SMD                      | 47          | RCY044704Z |
| R69  | RES 47 OHM 1/16W 5% 0402 SMD                      | 47          | RCY044704Z |
| R79  | RES 47 OHM 1/16W 5% 0402 SMD                      | 47          | RCY044704Z |
| R151 | RES 47 OHM 1/16W 5% 0402 SMD                      | 47          | RCY044704Z |
| R37  | RES 22 OHM 1/5W 5% 0603 SMD                       | 22          | RCY062204Z |
| R97  | RES 22 OHM 1/16W 5% 0402 SMD                      | 22          | RCY042204Z |
| R100 | RES 22 OHM 1/16W 5% 0402 SMD                      | 22          | RCY042204Z |
| R135 | RES 22 OHM 1/16W 5% 0402 SMD                      | 22          | RCY042204Z |
| R136 | RES 22 OHM 1/16W 5% 0402 SMD                      | 22          | RCY042204Z |
| R108 | RES 330 OHM 1/16W 5% 0402 SMD                     | 330         | RCY043314Z |
| R104 | RES 330 OHM 1/16W 5% 0402 SMD                     | 330         | RCY043314Z |
| R142 | RES 2.0 OHM 2W 1% 4527 WW SMD                     | 2           | RCY202094Z |
| R30  | RES 2.2K OHM 1/16W 0402 SMD                       | 2K2         | RCY042224Z |
| R77  | RES 470K OHM 1/16W 0402                           | 470K        | RCY044744Z |
| R80  | RES 1MEGA OHM 1/16W 0402 SMD                      | 1M          | RCY041054Z |
| U2   | SINGLE CHIP RADIO TRANSCEIVER                     | RDA1846     | YNRD01846Z |
| U4   | LDO LINEAR REGULATOR 3.3V 300mA                   | HT7233      | YNHT07233Z |
| U19  | LDO LINEAR REGULATOR 3.3V 300mA                   | HT7233      | YNHT07233Z |
| U22  | LDO LINEAR REGULATOR 3.3V 300mA                   | HT7233      | YNHT07233Z |
| U5   | DUAL 4-CHANNEL ANALOG MULTIPLEXERS/DEMULTIPLEXERS | 14052       | YNTI04052A |
| U7   | IC OPAMP SNGL 1.8V R-R SC70-5                     | MCP6241U    | YNMR6241UT |
| U9   | IC OPAMP SNGL 1.8V R-R SC70-5                     | MCP6241U    | YNMR6241UT |
| U8   | 22 W BTL power amplifier                          | LM4950TS    | YNS04950T  |
| U10  | DUAL OPERATIONAL AMPLIFIER                        | BA10358     | YNRO0358FV |
| U12  | dPMR MODEM IC                                     | CMX-7141    | YNCM07141Q |
| U13  | IC                                                | ATUSB1286   | YNAT1286MU |
| U14  | VOCODER IC                                        | CMX-618     | YNCM00618Q |
| U15  | IC FLASH 32MBIT 100MHZ 8SOIC                      | AT23DF321   | YNAT25321A |
| U17  | IC SRL SRAM 64K 3.6V 8-TSSOP                      | 23K640      | YNMR23K640 |
| U18  | IC REG POS 1.5A 8V PREC DPAK                      | 7808        | YNRO7808FP |
| U20  | LDO LINEAR REGULATOR 1.8V 300mA                   | RT9167/18PB | YNRT916718 |
| Y1   | VC-TXCO 12.8Mhz                                   | VC-TXCO     | EFO128000Y |
| Y2   | TXCO 19.2Mhz                                      | TXCO19.2M   | EFO192000Y |
| Y3   | TXCO-16MHZ                                        | TXCO16MHZ   | EFO160000Y |
| D12  | SHOTKY BARRIER DIODERB886                         | RB886       | EDRB886CSY |
| D15  | SHOTKY BARRIER DIODERB886                         | RB886       | EDRB886CSY |
| D16  | SHOTKY BARRIER DIODERB886                         | RB886       | EDRB886CSY |
| D17  | SHOTKY BARRIER DIODERB886                         | RB886       | EDRB886CSY |

## 12.2. ST-3118D FRONT PCB BOM

| ST-3118 FRONT BOARD BOM |     |                                                  |      |                |                   |
|-------------------------|-----|--------------------------------------------------|------|----------------|-------------------|
| ITEM                    | QTY | DESCRIPTION                                      | NAME | VALUE          | SmarTrunk Part No |
| 1                       | 1   | FRONT BOARD PCB                                  |      |                | EPL311821Z        |
| 2                       | 6   | CAP CER 0.1UF 10V 10% X5R 0402                   | C1   | 104            | CK5104AK5X        |
| 3                       | 4   | CAP TANT 1UF 10V 10% 1206                        | C2   | 106            | CTY161056ZR       |
| 4                       | 10  | CAP 1000PF 50V CERAMIC X7R 0402                  | C4   | 102            | CK1102AK5X        |
| 5                       | 3   | CAP CER 10000PF 50V 10% X7R 0402                 | C15  | 103            | CK5103AK5X        |
| 6                       | 4   | CAP CER 1UF 6.3V 10% X5R 0402                    | C82  | 105            | CK6105AK6T        |
| 7                       | 4   | CAP CER 1UF 16V 10% X5R 0402                     | C122 | 105            | CK5105AK7R        |
| 8                       | 1   | LED GREEN/RED BICOLOR 0606 SMD                   | D1   | LTST-C195KGJRT | EX01Y40203        |
| 9                       | 14  | LED WHITE 0603 SMD                               | D2   | LED            | EX01Y40206        |
| 10                      | 1   | FUSE 0.20A 32V FAST THIN 0402                    | F2   | 200mA          | EX02Y40259        |
| 11                      | 5   | RES 10K OHM 1/16W 5% 0402 SMD                    | R1   | 10K            | RCY041034Z        |
| 12                      | 4   | RES 100 OHM 1/16W 5% 0402 SMD                    | R2   | 100            | RCY041014Z        |
| 13                      | 7   | RES 280 OHM 1/16W 1% 0402 SMD                    | R5   | 280            | RCY042814Z        |
| 14                      | 3   | RES 10 OHM 1/16W 5% 0402 SMD                     | R12  | 10             | RCY041004Z        |
| 15                      | 1   | RES 27K OHM 1/16W 5% 0402 SMD                    | R14  | 27K            | RCY042734Z        |
| 16                      | 2   | RES 22K OHM 1/16W 5% 0402 SMD                    | R16  | 22K            | RCY042234Z        |
| 17                      | 2   | RES 2.2K OHM 1/16W 5% 0402 SMD                   | R51  | 2K2            | RCY042224Z        |
| 18                      | 1   | RES 0.0 OHM 1/16W 0402 SMD                       | R81  | 0              | RCY040004Z        |
| 19                      | 11  | SMD SWITCH                                       | SW1  | SW DPST        | EWPS33089X        |
| 20                      | 1   | IC MCU AVR 64K FLASH 44-TQFP                     | U1   | ATMega644P     | YNATGA644P        |
| 21                      | 1   | IC FLASH 32MBIT 100MHZ 8SOIC                     | U2   | AT25DF321      | YNAT25321A        |
| 22                      | 1   | DUAL PRE-BIASED TRANSISTORS FOR POWER MANAGEMENT | U3   | MIMD           | YNDCCMD10A        |
| 23                      | 1   | LDO LINEAR REGULATOR 3.3V 300mA                  | U4   | HT7233         | YNHT07233Z        |
| 24                      | 1   | IC OPAMP SNGL 1.8V R-R SC70-5                    | U6   | MCP6241U       | YNMR6241UT        |

### 12.3. ST-3118D MIC CONNECTOR PCB BOM

| <b>ST-3118 MIC CONNECTOR PCB BOM</b> |            |                      |                          |
|--------------------------------------|------------|----------------------|--------------------------|
| <b>ITEM</b>                          | <b>QTY</b> | <b>DESCRIPTION</b>   | <b>SmarTrunk Part No</b> |
| 1                                    | 1          | MIC CONNECTOR PCB    | EPL311831Z               |
| 2                                    | 1          | PCB CONNECTOR SOCKET | EX07N49932               |
| 3                                    | 1          | MODULAR JACK (DIP)   | EX07N49934               |

### 12.4. ST-3118D FRONT PANEL ASSEMBLY BOM

| <b>ST-3118D FRONT PANEL ASS'Y BOM</b> |            |                                 |                          |
|---------------------------------------|------------|---------------------------------|--------------------------|
| <b>ITEM</b>                           | <b>QTY</b> | <b>DESCRIPTION</b>              | <b>SmarTrunk Part No</b> |
| 1                                     | 1          | MODEL PLATE ST-3118             | BL3118010E               |
| 2                                     | 1          | MODEL PLATE SMART TRUNK         | BL3118010D               |
| 3                                     | 1          | TFT WINDOW                      | BL3118020A               |
| 4                                     | 1          | SPEAKER                         | ES500858OL               |
| 5                                     | 1          | WIRE CONNECTOR/H 2P             | EX07N48196               |
| 6                                     | 1          | BRACKET                         | ML3118030A               |
| 7                                     | 2          | SPK SHIELD CLOTH                | LZZZ60092A               |
| 8                                     | 1          | FRONT HOUSING                   | PL3118010A               |
| 9                                     | 1          | BUTTON POWER                    | PL3118030A               |
| 10                                    | 1          | BUTTON MENU                     | PL3118030B               |
| 11                                    | 1          | BUTTON BACK                     | PL3118030C               |
| 12                                    | 1          | BUTTON FUNCTION                 | PL3118040A               |
| 13                                    | 1          | BUTTON F2                       | PL3118040B               |
| 14                                    | 1          | BUTTON F3                       | PL3118040C               |
| 15                                    | 1          | BUTTON F4                       | PL3118040D               |
| 16                                    | 1          | BUTTON ARROW                    | PL3118050A               |
| 17                                    | 1          | TX WINDOW                       | PL3118070A               |
| 18                                    | 1          | USB BRACKET                     | PL3118080A               |
| 19                                    | 5          | SET SCREW                       | JS012006TN               |
| 20                                    | 2          | SET SCREW                       | JS053008TN               |
| 21                                    | 1          | TFT 176 * (R、G、B) * 220 Dots 2" | EX03N40549               |
| 22                                    | 1          | 2X16 PIN HEADER                 | EX07Y49929               |

|    |   |                      |            |
|----|---|----------------------|------------|
| 23 | 1 | USB JACK             | EX07N49933 |
| 24 | 1 | SMD POT VERTICAL 10K | RV10303641 |
| 25 | 1 | SPONGE               | XZZZ90455Z |

## 12.5. ST-3118D MECHANICAL BOM

| ST-3118D MECHANICAL BOM |     |                                                         |                   |
|-------------------------|-----|---------------------------------------------------------|-------------------|
| ITEM                    | QTY | DESCRIPTION                                             | SmarTrunk Part No |
| 1                       | 1   | SUPPORT BAR                                             | ML3118050X        |
| 2                       | 1   | MAIN CHASSIS                                            | ML3118010A        |
| 3                       | 1   | BOTTOM COVER                                            | ML3118020A        |
| 4                       | 1   | KNOB                                                    | PL3118020A        |
| 5                       | 1   | WIRE BUSHING                                            | PL3118060A        |
| 6                       | 10  | SET SCREW                                               | JS053008MNR       |
| 7                       | 4   | SET SCREW                                               | JS213006MBR       |
| 8                       | 3   | SET SCREW                                               | JS033010MBR       |
| 9                       | 1   | DC WIRE 2P AWG#14                                       | EX07N49964        |
| 10                      | 1   | CAP ELECT 470uF X 25V                                   | CE0254777ZR       |
| 11                      | 1   | CAP ELECT 2200uF X 25V                                  | CE0252287Z        |
| 12                      | 1   | 3.5MM PHONE JACK                                        | EX06N41045R       |
| 13                      | 1   | PCB Angle Bulkhead Receptacle                           | EX06N41276        |
| 15                      | 1   | 60W RF POWER AMPLIFIER                                  | YNMI64452M        |
| 16                      | 1   | 2.54X2.54 HEADER RECEPTACLE (16X2)                      | EX07N49930        |
| 17                      | 1   | DSUB 15 PIN FEMALE CONNECTOR (DB15FL3L/D-SUB(L-FEMALE)) | EX07N49931        |
| 18                      | 1   | PCB CONN. 2P                                            | EX07N48204        |
| 19                      | 4   | SHIELD CLOTH (85x5x0.5tmm)                              | LZZZ60093A        |
| 20                      | 1   | SET SCREW                                               | JS033018MBR       |
| 21                      | 2   | SOLDER PLATE                                            | XZZZ90002Z        |
| 22                      | 1   | HEAT CONDT. RUBBER (10x10x0.75t)                        | QV2112A10A        |
| 23                      | 1   | HEAT CONDT. RUBBER (6.5MMX6.5MMX8.5MMT)                 | QL3118A10A        |

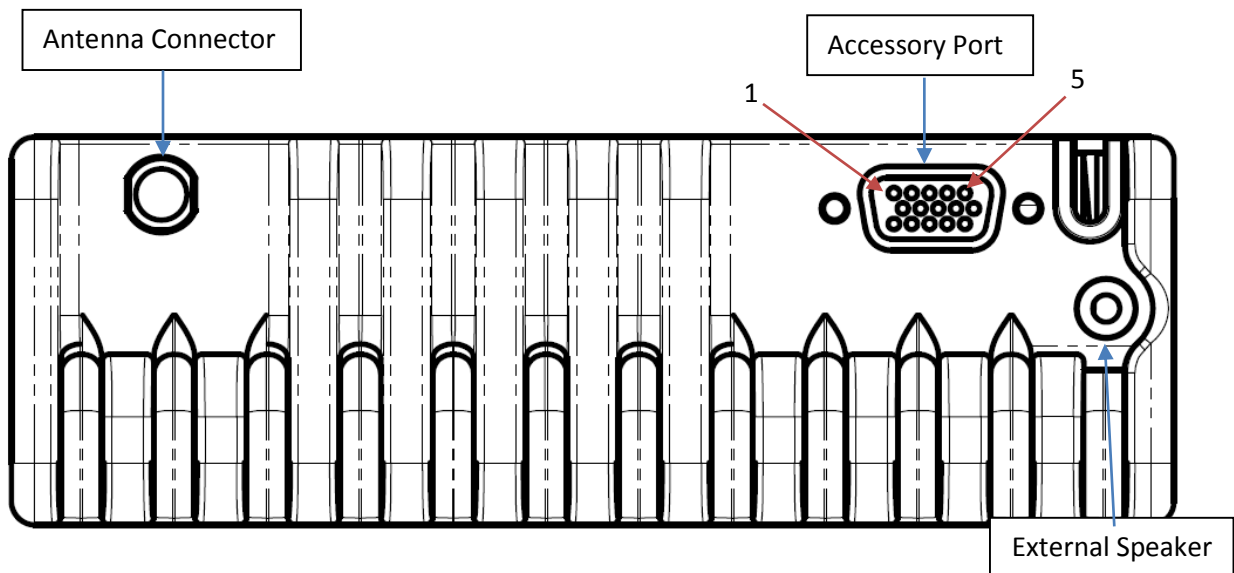
## 12.6. ST-3118D PACKING BOM

| <b>ST-3118D PACKING R1.0 BOM</b> |            |                          |                       |
|----------------------------------|------------|--------------------------|-----------------------|
| <b>ITEM</b>                      | <b>QTY</b> | <b>DESCRIPTION</b>       | <b>Ranger Part No</b> |
| 1                                | 1          | INSTRUCTION MANUAL       | AT3118010A            |
| 3                                | 1          | MICROPHONE               | EX04N40757            |
| 4                                | 2          | RC-3118 STICKER          | LMZZ61665A            |
| 5                                | 1          | HANDLE                   | ML3118040A            |
| 6                                | 1          | DC CORD WITH FUSE AWG#14 | WA0012200K            |
| 7                                | 1          | PVC BAG (ACCESSORY)      | UB051015ZZR           |
| 8                                | 1          | PVC BAG (MANUAL)         | UB051625ZZ            |
| 9                                | 1          | PVC BAG (CARTON)         | UB07604183            |
| 10                               | 1          | PVC BAG (SET)            | UB052030ZZ            |
| 10                               | 1          | INNER BOX                | UN03118A1A            |
| 11                               | 1          | CARTON                   | UC03118A1A            |
| 12                               | 1          | MIC HOOK                 | MT7799090N            |
| 13                               | 2          | RUBBER PAD               | XZZZ90457A            |
| 14                               | 4          | MOUNTING SCREW 8mm BLK   | XZZZ90010Z            |
| 15                               | 1          | GIFT BOX                 | UG03118A1A            |
| 16                               | 1          | STOPPER                  | UD03118A1A            |
| 17                               | 1          | ACCESSORY BOX            | UD03118A2A            |

## 13. EXTERNAL CONNECTIONS

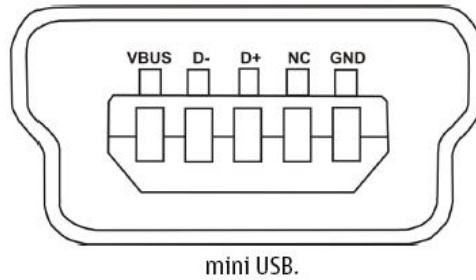
### 13.1. ACCESSORY PORT:

On the backside of your ST-3118 radio, you will find the accessory port connector:



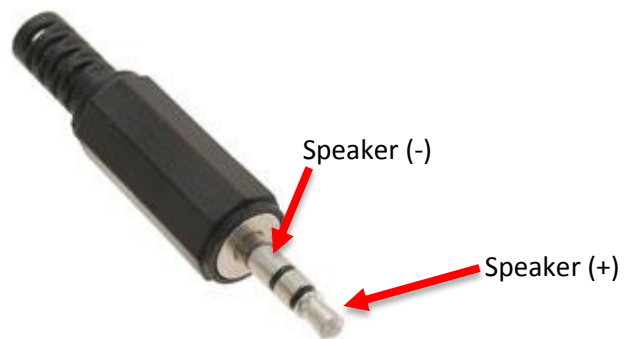
| ACCESSORY PORT (P1) |              |                                                               |
|---------------------|--------------|---------------------------------------------------------------|
| PIN #               | FUNCTION     | DETAIL                                                        |
| 1                   | GND          | GROUND CONNECTION                                             |
| 2                   | EXTERNAL MIC | AC COUPLED. 100mV. HI IMPEDANCE                               |
| 3                   | IO1          | ANALOG/DIGITAL INPUT, DIGITAL OUTPUT 0 TO 3.3V HIGH IMPEDANCE |
| 4                   | IO2          | ANALOG/DIGITAL INPUT, DIGITAL OUTPUT 0 TO 3.3V HIGH IMPEDANCE |
| 5                   | DC OUT       | POWER SUPPLY FOR ACCESSORIES. 12V@1A, 5V@200mA OR 3.3V@200mA  |
| 6                   | DISC         | DISCRIMINATOR OUT (FLAT AUDIO RESPONSE HIGH IMPEDANCE)        |
| 7                   | AF OUT       | RECEIVE AUDIO FILTERED VOL/SQ CONTROLLED                      |
| 8                   | IO7          | DIGITAL I/O 0 TO 3.3V, HIGH IMPEDANCE                         |
| 9                   | RXD          | RECEIVE SERIAL RS-232 TTL LEVEL                               |
| 10                  | TXD          | TRANSMITE SERIAL RS-232 TTL LEVEL                             |
| 11                  | GND          | GROUND CONNECTION                                             |
| 12                  | IO3          | ANALOG/DIGITAL INPUT, DIGITAL OUTPUT 0 TO 3.3V HIGH IMPEDANCE |
| 13                  | IO4-IGN      | ANALOG/DIGITAL INPUT 0 TO 15V HIGH IMPEDANCE                  |
| 14                  | IO5          | DIGITAL I/O 0 TO 3.3V, HIGH IMPEDANCE                         |
| 15                  | IO6          | DIGITAL I/O 0 TO 3.3V, HIGH IMPEDANCE                         |

### 13.2. USB: USB 2.0 compliance



### 13.3. External Speaker, (3.5mm)

Speaker is balanced output. Do not connect any pin to GND



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