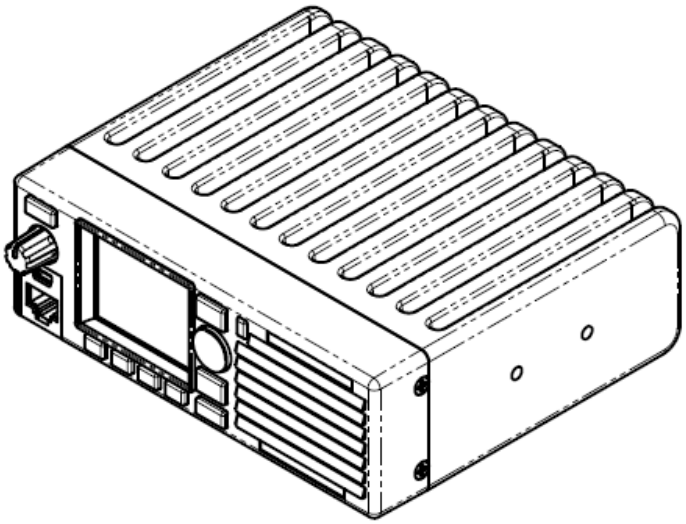
SmarTrunk Systems, Inc.

VHF FM DIGITAL TRANSCEIVER

ST-3118C (400Mhz ~ 470Mhz)

SERVICE MANUAL



SmarTrunk Systems, INC.

ST-3118C SM R1.1

Contents

1. Specifications:

	SPECIFICATION	ST-3118C
GENERAL	Frequency Range [Mhz]	400 TO 470
	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
	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
	Max frequency deviation	2.5Khz@12.5Khz BW
	Analog Modulation type	11K0F3E
	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	
	HUM and NOISE ratio	45dB
	Speaker Audio Power	5W
	External audio power	5W

Specifications subject to change without notice or obligation

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 form 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

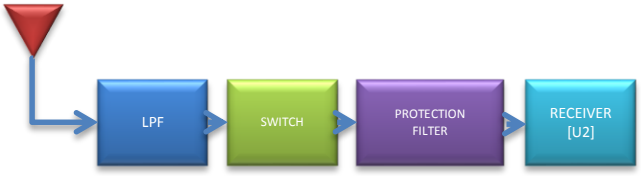


Figure 1: Receiver block Diagram

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

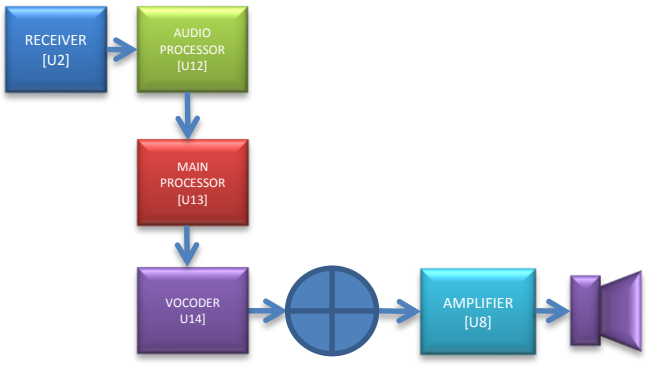


Figure 3: Digital Receiver Audio Path Block Diagram

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.

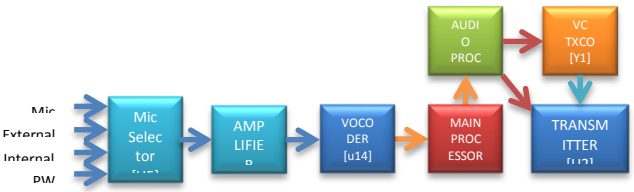


Figure 4: Digital Modulation path

4.3. Transmitter System

4.3.1. ANALOG TX SIGNAL

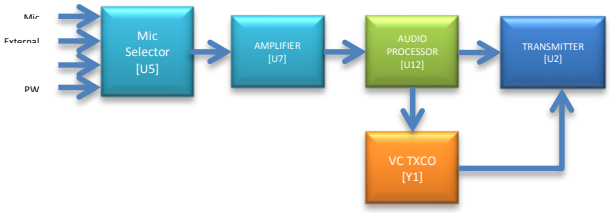


Figure 5: Analog Modulation path

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

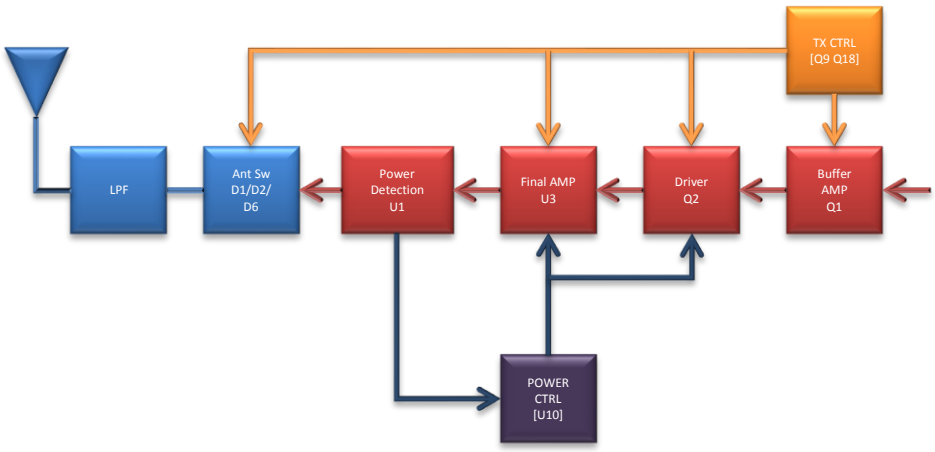


Figure 6: RF transmission path

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.

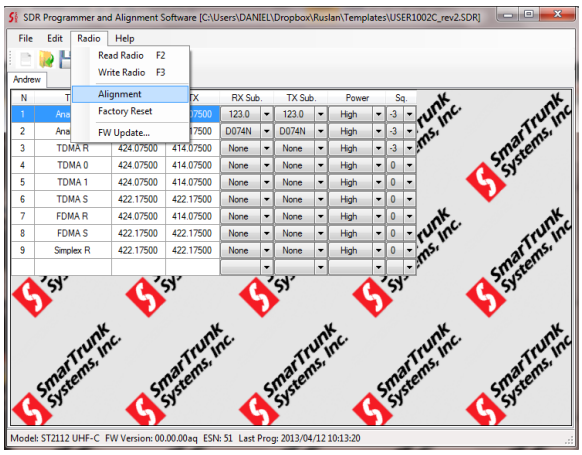


Figure 7: Accessing to the Alignment Menu

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

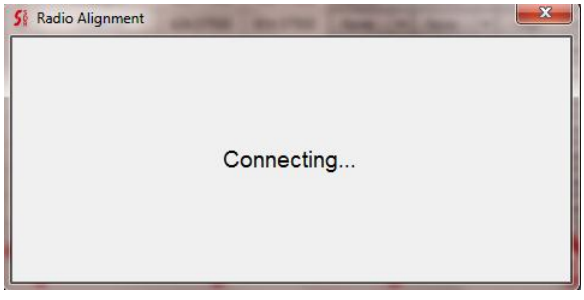


Figure 8: Connecting to the Alignment Mode

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 form the previous alignment.

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

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

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

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

5.6. TRANSMITTER ALIGNMENT:

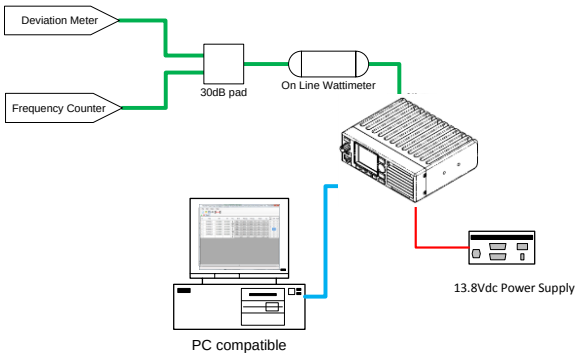


Figure 9s: Transmitter Alignment Instruments Connection

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.

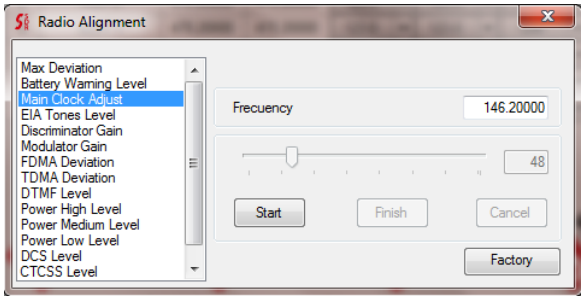


Figure 10: Main Clock Alignment

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.

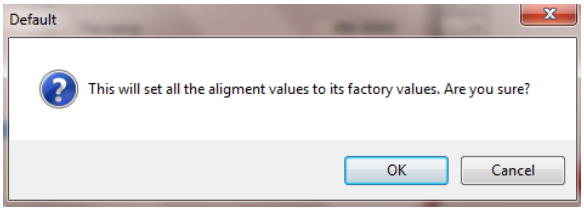


Figure 11: Default Alignment Values Retrieve

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.

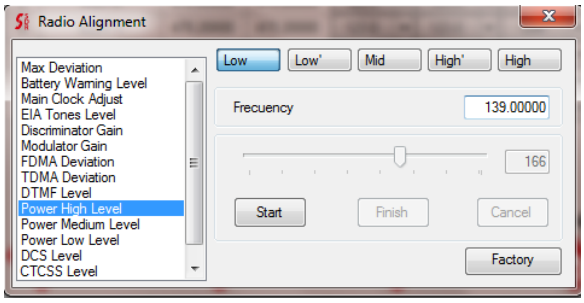


Figure 12: Power High Level Alignment

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

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

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

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

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

Press [OK] to confirm.

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

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

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

Please be sure that the PLL is locked as soon as you press [Start], otherwise the alignment should be not correct.

5.6.2.2. Mid POWER LEVEL ALIGNMENT

Repeat the same procedure to align High Power, but select

Power Medium Level

on the alignment menu.

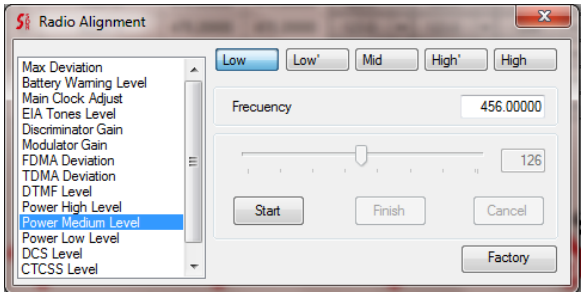


Figure 13: Medium Power Level Alignment

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.

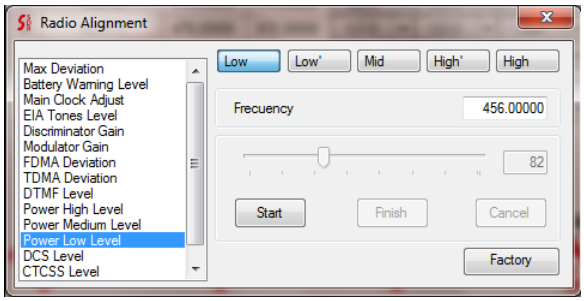


Figure 14: Low Power Level Alignment

5.6.3. ANALOG MAXIMUM DEVIATION

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

Max Deviation

alignment option form the alignment menu.

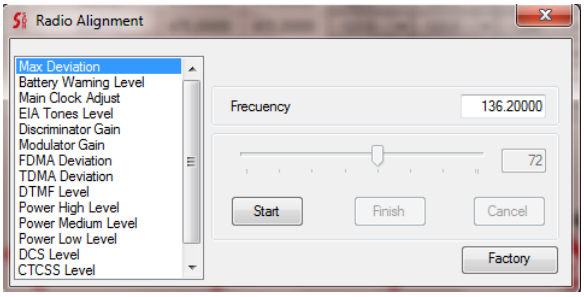


Figure 15: Analog Max Deviation Alignment

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.

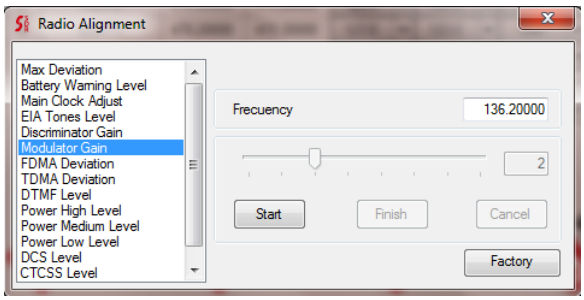


Figure 17: Modulator Gain Alignment

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.

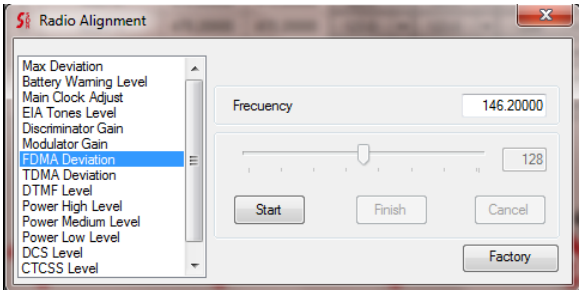


Figure 16: FDMA Deviation Alignment

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.

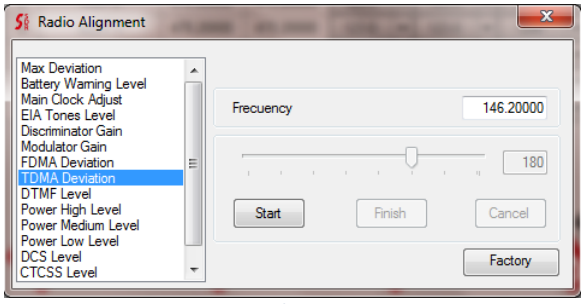


Figure 18:TDMA Deviation Alignment

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.

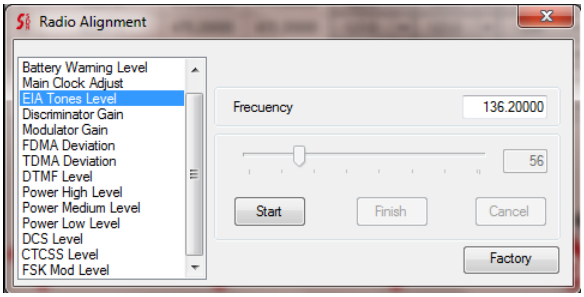


Figure 19: EIA Tones Level Alignment Screen

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.

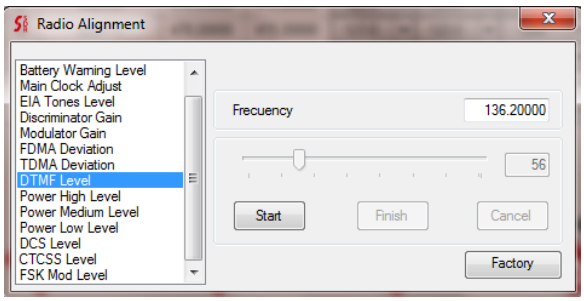


Figure 20: DTMF Level Alignment Screen

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.

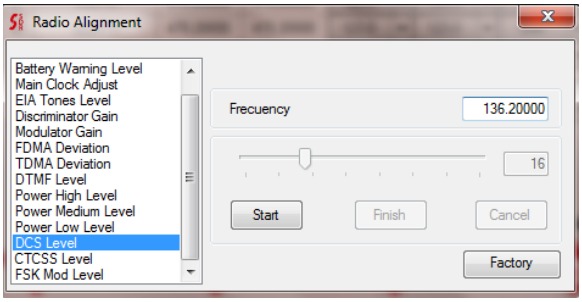


Figure 21DCS Level Alignment Screen

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.

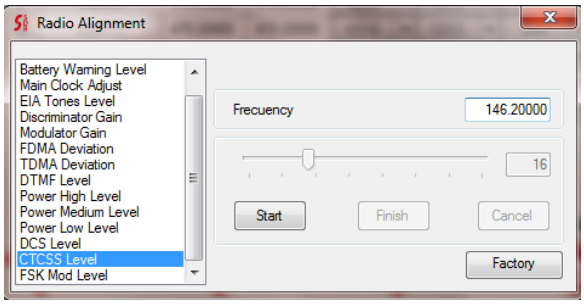


Figure 22: CTCSS Level Alignment Screen

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.

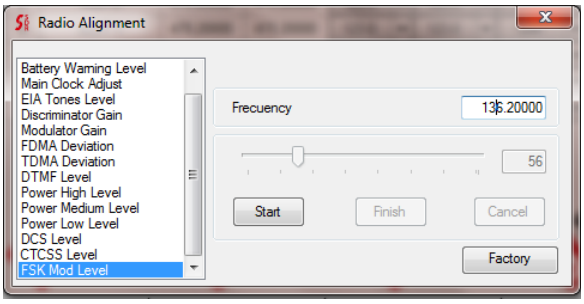


Figure 23: FSK Modulation Level Alignment Screen

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.

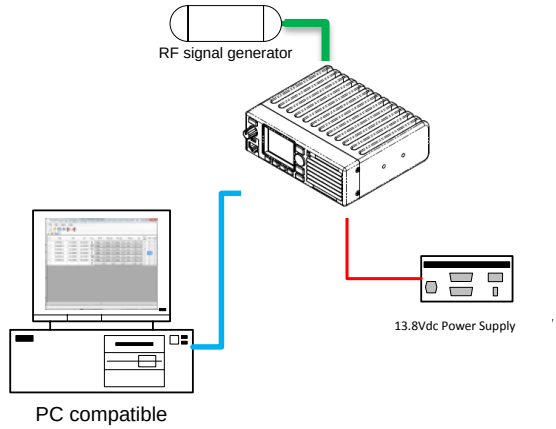


Figure 24: Receiver Alignment Setup

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.

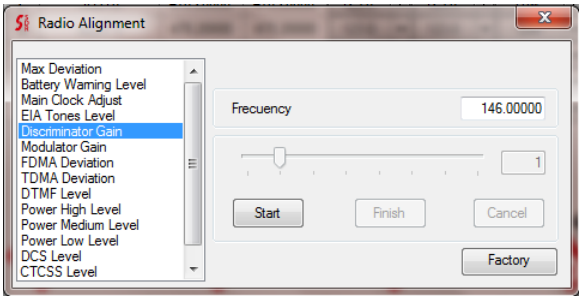


Figure 25: Discriminator Gain Alignment Screen

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:

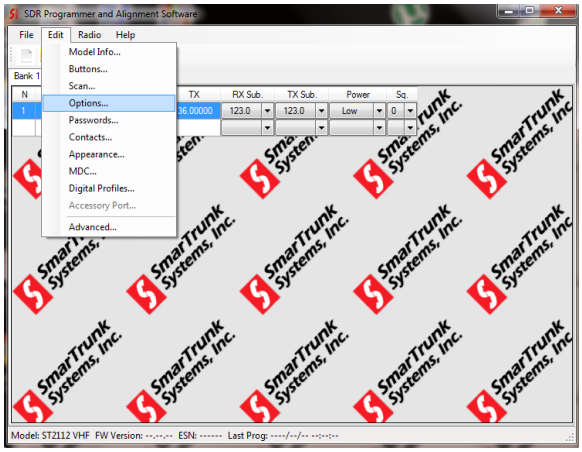


Figure 26: Optional Alignment Access

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

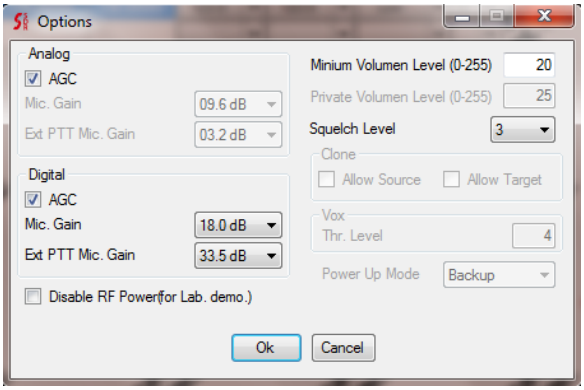


Figure 27: Option Alignment Screen

From this screen the user can adjust:

6.1.1. ANALOG Microphone gain:

It aligns microphone sensitivity.

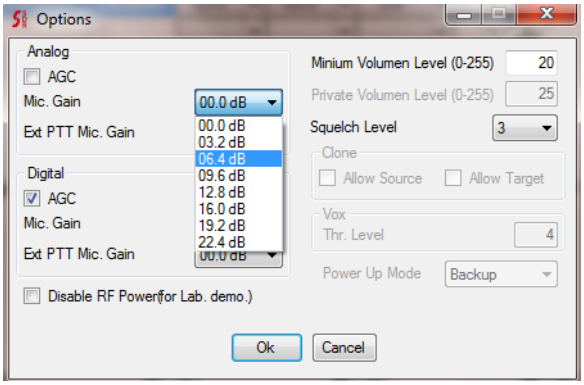


Figure 28: Analog Mic Gain Selection

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.

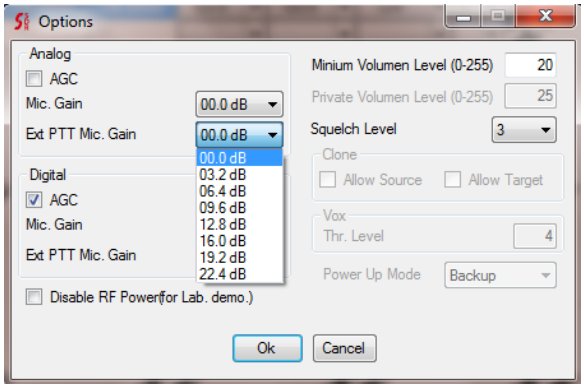


Figure 29: External Microphone Sensitivity Alignment

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 ACG Check Box.

For example, if you want a dynamic gain which causes the same effect that a gain of 6.4dB when the voice on the microphone causes 50mV RMS in the microphone 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:

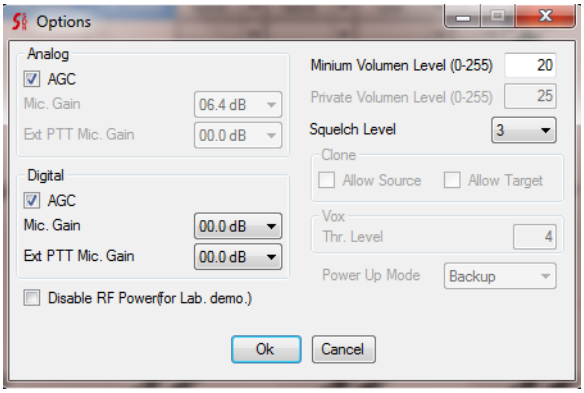


Figure 30: Analog Microphone AGC Control

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 ACG Check Box.

For example, if you want a dynamic gain which causes the same effect that a gain of 15.0dB when the voice on the microphone causes 50mV RMS in the microphone 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:

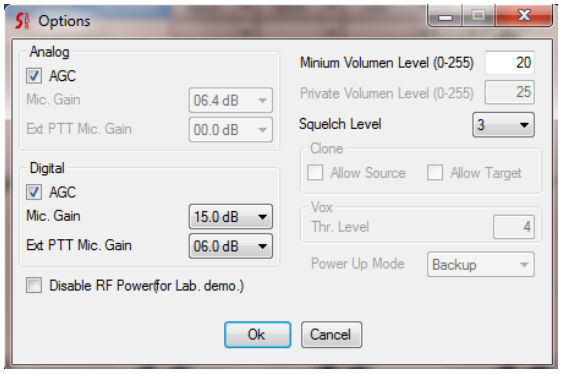


Figure 31: Digital Microphone Path AGC Control

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:

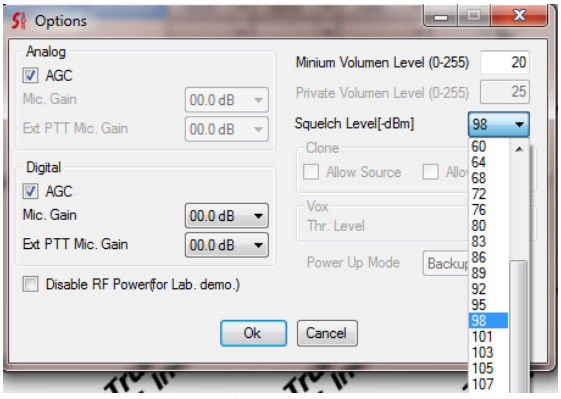


Figure 32: Squelch Level Setting Screen

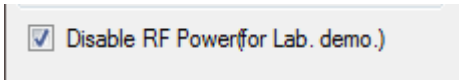
Press [OK] to store it in the file.

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:



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:

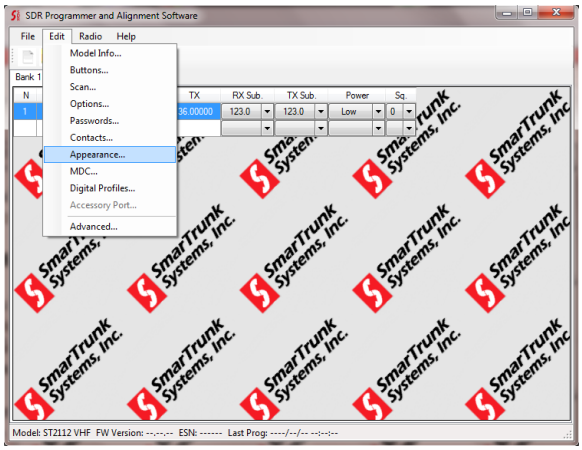


Figure 33: Access to the Appearance Menu

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

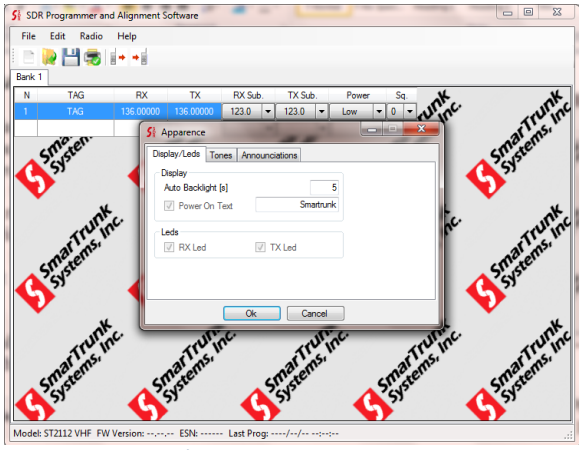


Figure 34: Display/Leds Appearance Screen

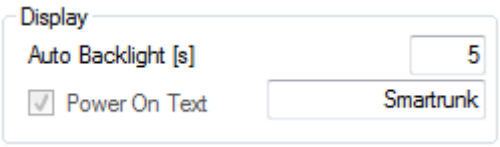
7.1. DISPLAYS AND LEDS:

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.

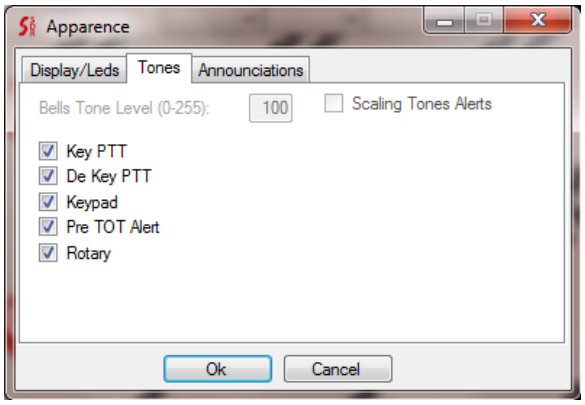


Figure 35: Courtesy Tones Programming Screen

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.

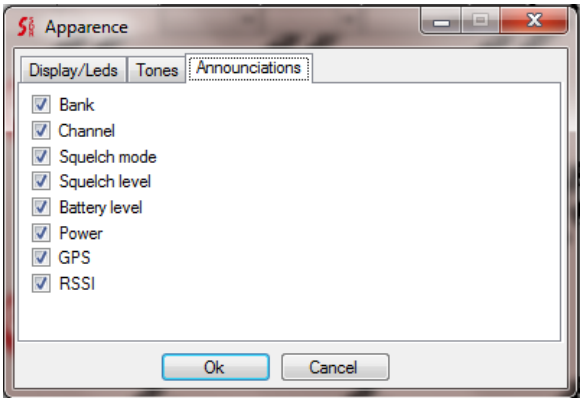


Figure 36: Annunciations Programming Screen

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:

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www.smartrunk.com
ST-3118C SM R1.1
Jan-14

FCC Notices

FEDERAL COMMUNICATIONS COMMISSION INTERFERENCE STATEMENT

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-Reorient or relocate the receiving antenna.

-Increase the separation between the equipment and receiver.

-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-Consult the dealer or an experienced radio/ TV technician for help.

CAUTION:

Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment

Use only shielded cables to connect I/O device to this equipment. You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

RF exposure warning ·

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 105 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provide with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.