


Frequency Synthesizer Mirami v3.1

Technical specifications

- Two outputs: main and reference oscillator from 1 to 160 MHz
- Control is performed by the encoder and buttons
- The ability to change the frequency tuning step – 50Hz, 500Hz, 1kHz, 50kHz and 1 MHz
- Sideband modes and switching between them USB, LSB, CW and AUTO
- UHF, ATT, AGC function control
- Input and outputs of reception/transmission/tone modes
- The presence of RIT mode using a variable resistor
- Built-in S-meter
- Supported programmed bands – 160, 80, 40, 30, 20, 17, 15, 12 and 10 meters
- 4-bit band switching output for our BPF-9, BPF-6, LPF-2 and BPF boards on FST3253 chips
- Built-in menu for setting the IF, the frequency of the reference generator and accurate quartz calibration
- IF operation mode: +IF, -IF, IF-and automatic mode (add up to 10 MHz, subtract after 10 MHz)
- High-performance Atmel atmega168A processor
- Ultra contrast display 16*02 with blue backlight. The letters are beautiful, white. 
- The frequency generator is organized on the Si5351a chip
- Low consumption –45-50mA
- Power supply 7..12V.

Operation

In operating mode, the synthesizer screen displays the frequency of the active main generator on the left side of the screen. The accuracy of the output frequency value is 10 Hertz. With the help of the encoder, the frequency is adjusted with a given step (turn left-right).

The encoder button. A single press changes the frequency tuning step: 50 Hz, 500 Hz, 1 kHz, 50 kHz and 1 MHz. Then in a circle.

The encoder button-a long press saves the current settings that are currently activated: the current band and frequency, PRE, ATT, AGC settings, the tuning step, as well as the use of the S-meter function.

SW1 " PTT " button-a short press of the button switches the synthesizer to the receive/transmit mode. When the transmission mode is turned on, "PTT" is displayed on the screen. In the receiving mode, the output 16 of the processor (the connector is marked as MISO) has a voltage of +3.3V. Output 17 (SCK output) has a voltage of 0 volts. In the transmission mode, the voltage at pin 16 is reset to zero, and +3.3V is set at output 17. When SW1 is briefly pressed again, the synthesizer returns to the receiving mode. This is convenient if you want to control the receive/transmit switching from the synthesizer. The synthesizer also has an input for receiving a signal about switching to the transmission mode. When a voltage of up to +3.5V appears at the input of 1 processor (the output is marked as "PTT"), the processor switches the synthesizer to the transmission mode. At the outputs at this moment, MISO and SCK also change the voltage, according to the description above.

SW1 "TON " button – long press (1-2 seconds). A long press of the button puts the synthesizer into the tone signal transmission mode. A voltage of +3.3 V appears at the output of processor 2 (the output is marked as "TON"). If you press it again for a long time, the synthesizer returns to the receiving mode.

The SW2 "BAND UP " button is a short press. Switches the bands up. When switching, the current frequency is saved. When the range of 10 meters (28 MHz) is reached, the next bande will be 160 meters (1.9 MHz)

SW2 "SHIFT UP " button – long press (1-2 seconds). A long press of the button increases the shift by 100 Hz. The current value of the set band appears in the upper right corner for half a second. In LSB, USB, AUTO modes (i.e. in SSB mode), the default value is 2700 Hertz. In the CW mode-800 Hertz. You can set any value from 0 to 9900 for both modes.

SW3 "BAND DOWN " button-short press. Switches the bands down. When switching, the current frequency is saved. When reaching the band of 160 meters (1.9 Mhz), the next range will be 10 meters

SW3 "SHIFT DOWN" button – long press (1-2 seconds). A long press of the button reduces the shift by 100 Hz. The current value of the set band appears in the upper right corner for half a second.

The SW4 – "ATT " button is a short press. Enables and disables the attenuator mode. At the output 12 of the processor (marked as ATT), a voltage of +3.3 V. If the PRE mode is turned on, the PRE is turned off; ATT is turned on. When the ATT is turned off, the PRE back mode is not automatically activated.

SW4 button – "AGC " - long press (1-2 seconds). Enables and disables the Automatic Gain Control mode (AGC). A voltage of 3.3 V appears on pin 13 of the processor (marked as AGC). The screen displays "AGC"

The SW5 – "PRE " button is a short press. Enables and disables the pre-amplifier of high-frequency (PRE) mode. A voltage of 3.3 V appears on pin 11 of the processor (marked as "PRE"). The screen displays "PRE". If the ATT mode was activated earlier, it will turn off.

SW5 – "RIT " button – long press (1-2 seconds). Enables and disables the RIT mode. To control the RIT, a variable resistor with a nominal value of 10-50 Kohm is supplied with the synthesizer. The resistor is connected to the VCC – RST - GND pins (the center pin of the resistor is connected to the RST). The RIT occurs within 2500 Hertz. When switching to transmission, the detuning mode is disabled.

SW6 – "MODE " button-a short press changes the mode of the side bands: LSB, USB, AUTO, CW. The voltage corresponding to the active mode +3.3 V appears on pins 9, 10, 14 (marked as USB, LSB, CW). In LSB mode, the frequency of the reference generator (if it is turned on) will be less than the shift value set (by default, 2700 Hertz-changed by the SW2 and SW3 buttons-see above). In USB mode, the frequency of the reference generator will be correspondingly higher by the same value. In AUTO mode, the side bands will switch according to the following rule: the lower side band (LSB) works up to 10.5 MHz, the upper side band (USB) will work above 10.5 MHz. In AUTO mode, the voltage at pins 9 and 10 also automatically changes depending on the range.

In the CW mode, the frequency of the reference oscillator will be equal to the set value plus the shift frequency (by default, 800 Hz; changed by the SW2 and SW3 buttons-see above) in the receiving mode. When switching to the transmission mode, the shift is removed, and the output of the reference generator will have the set frequency value of the reference generator without a shift.

SW6 – "S-METER " button-long press (1-2 seconds) turns on and off the S-meter mode in the upper right corner of the screen. When the s-meter mode is active, there will be no side LSB/USB displaying the current mode. The input for connecting the signal is output 22 of the processor (designated as S-meter). The maximum input voltage is +3.5 V. At voltages greater than +5V, the processor may fail. Be careful.

The SW6 button - "RESET BAND VALUES" – A long press (about 5-7 seconds) - resets the values for the band to the factory settings, while all other settings remain unchanged.

Menu and settings

The menu contains settings that are recorded in non-volatile memory and are applied in the synthesizer operation mode. To enter the service settings menu, you must:

- 1) turn off the synthesizer power
- 2) Press the encoder button
- 3) Turn on the synthesizer power by holding the encoder button for 0.5-1.0 seconds (as a rule, pressing it when turning it on is enough – you do not need to hold it for a long time). Release the encoder button – the “IF VALUE” setting screen will appear

Next, the following settings are displayed on the screen:

- **“IF VALUE”** - setting the value of the intermediate frequency (IF). By default, "0". You can set any value from 0 to 160 MHz. The installation is performed using the encoder (left-right), as well as the encoder button to switch the frequency tuning step

To save the current parameter and move to the next one, press the encoder button and do not release it until the next menu item appears

- **«IF OFFSET»**. Setting the display mode and the frequency calculation method. Switching between the options is performed by the SW6 (MODE) button.

Possible options:

- **“+ IF ”** - means that the current frequency on the screen will be added to the frequency of the IF (Frequency+IF)
- **“-IF”** – it means that from the current frequency on the screen will be deducted frequency drive (frequency - IF)
- **“IF - ”** means that the frequency of the drive will be deducted the current frequency on the screen (the IF - Frequency)
- **“AUTO”** AUTO switching mode according to the rule: up to 10.5 MHz on the screen is output Frequency+IF; above 10.5 MHz, we get the Frequency-IF.

Attention! In cases when the parameters-IF and IF-are involved, and the result of mathematical subtraction becomes negative (for example, 5 MHz - 8.867 MHz), then the output of the synthesizer will be zero. As soon as the result of the mathematical operation is above the lower threshold value (about 450 kHz), the synthesizer output will automatically have the expected result.

To save the current parameter and move to the next one, press the encoder button and do not release it until the next menu item appears

- **"BFO"** - Setting the frequency of the reference generator. The default value is "0". You can set any frequency from 0 to 160 MHz. (The real minimum threshold value is about 450 kHz. The maximum is about 170 MHz). The installation is performed using the encoder (left-right), as well as the encoder button to switch the frequency tuning step

To save the current parameter and move to the next one, press the encoder button and do not release it until the next menu item appears

- **"Crystal"** - Calibration of the frequency of the reference quartz of the Si5351 chip. By default, the value corresponds to the frequency of the installed quartz resonator. If necessary, you can make a calibration. For convenience, in the calibration mode, the output has a frequency of 3,600,000 Hertz (3.6 MHz). It is necessary to connect a configured frequency meter, and achieve a 3.6 MHz reading on the frequency meter. As a rule, by default, the error of readings without calibration is no more than 30 Hertz, which is permissible to use without finishing calibration in the absence of an accurate frequency meter.

To save the current parameter, press the encoder button and do not release it until the "REBOOT" label appears. Attention! It is established that with a possible rattle of the encoder contacts, it is possible to return to the frequency calibration setting, but at this stage all the parameters have already been successfully recorded and the synthesizer can be restarted!

After restarting, the Synthesizer will be in working mode with the user settings set.

Restoring factory settings

There are cases that when exposed to static or strong leads near the synthesizer, some parameters in the memory of the chip can change without the user's participation. If all the elements are working properly and the synthesizer continues to work, then you can return to the factory settings of the firmware.

To restore the factory firmware, you must:

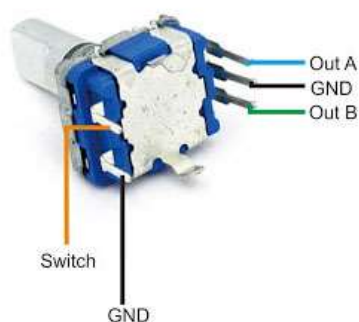
- 1) Turn off the synthesizer power
- 2) Press and hold the encoder button
- 3) Continue to hold the encoder button for about 10 seconds after turning on the power.
- 4) After a successful reset, the IF VALUE menu will open with the default value "0"
- 5) After that, we recommend restarting the device again to return to operating mode (without pressing the encoder button)

Sockets

| Name | Description | Voltage map |
|-----------------------------------|--|---|
| VFO + GND | Output of the main frequency generator | RF voltage is about 0.8-1 V |
| BFO + GND | The frequency output of the reference generator (if enabled via the menu). It is disabled by default, i.e. "0" | RF voltage in the operating mode 0.8-1 V |
| BPF Select (1,2,3,4,5) | 4-bit output for controlling the decoder board for subsequent control over the physical switching of bandpass filters and the LPF board. The decoder kit is on sale in our store www.rv3yf.us | The voltage at the terminals varies depending on the range (either 0 or 3.3 V). The table of voltage values is indicated on the synthesizer circuit (0 means 0, "1" means 3.3 V). |
| S-meter (J1+GND) | Connector for connecting a signal measuring signal power (S-meter). | The maximum input voltage is 3.5 V. Be careful! At a higher voltage, the processor may fail. |
| CW, AGC, ATT, PRE, LSB, USB + GND | Output connector for switching CW, LSB, USB modes, as well as switching on and off the UHF, AGC and attenuator. | The 3.3 V voltage appears on the corresponding pins when the operating modes are switched on. |
| TON + GND | Output for turning on the tone signal | The 3.3 V voltage appears when the TONE is turned on |
| PTT + GND | INPUT for enabling the transmission mode. | The maximum input voltage is 3.5 V. Be careful! At a higher voltage, the processor may fail. |
| +5+12V | Synthesizer power connector | It is recommended to connect a stabilized power supply from 7 to 15V. From 5V, it can work unstable. |
| PH0,PH1,SW | Connector for connecting the encoder. The connection diagram is shown below in the illustration | Power to the encoder is not required. The control is carried out by pulses between the encoder and the processor. |
| VCC,RST, GND | Connector for connecting a variable resistor for controlling the detuning (RIT). The connection illustration is shown below in the illustration | The VCC pin has a constant voltage of 3.3 V. RST is the input for the regulated voltage from the variable resistor. |
| SCK, MISO | Connector for controlling the receive/transmit mode. | In the receiving mode, the voltage at the SCK pin is 3.3 V. On the output of MISO-0B. In the transmission mode, on the contrary-SCK=0, and MISO = 3.3 V. |

| | | |
|-----------------------------|--|---|
| MOSI | Connector for switching between bandpass filters BPF-9, BPF-6, LPF-2 and BPF on inductors on FST3253 chips. | By default, the voltage on the MOSI is zero. The synthesizer in this mode works with the BPF-6, BPF9 and LPF-2 boards. When using PTF on FST3253, it is necessary to apply a voltage of 3.3 V to the MOSI pin (it is convenient to do this by installing a jumper between the MOSI MCI) |
| SCK,MISO,MOSI, VCC, RST,GND | Also, this group of pins is used for programming the processor. The processor is protected from reading and writing. Do not try to connect to the processor with a programmer to avoid damaging the processor. This case is not covered by warranty obligations. | |

Connection diagram of the encoder and variable resistor for RIT





Frequency Synthesizer MIRAMI Compact v.3.1

| Package includes | Qty |
|-------------------------|--------|
| - Assembled Synth board | 1 pcs. |
| - Encoder | 1 pcs |
| - Potentiometer 10-50K | 1 pcs. |
| - Current manual | 1 pcs. |

Web: rv3yf.us

