

Universal frequency synthesizer with static indication

RUStatic-6A

The universal frequency synthesizer with static indication RUStatic-6A is designed to work with the Druzhba-M transceiver, but in fact it is also universal for other amateur radio designs from receiver to transceiver. A distinctive feature of this synthesizer is a simple, affordable and easy-to-use 7-segment indicator. This indication has proven itself in many designs around the world. On the screen - only the frequency! The eye does not get tired of the insane amount of information, unlike the large modern displays of transceivers!

We chose a high-performance Atmel processor, an Si5351 generator chip (already proven in amateur radio), as well as an indication control system using 74HC595 microcircuits, as the main components of the synthesizer, which makes the synthesizer low-noise.

Specifications

- The frequency generator is organized on the Si5351a chip
- Two outputs: main and reference oscillator from 1 to 99 MHz
- Controlled by encoder and buttons
- Ability to change the tuning step 100Hz/1KHz
- Keyboard of 12 buttons for manual entry of frequency and change of synthesizer settings
- Joystick buttons (left-right-up-down-“OK”) for more convenient control of the synthesizer.
- Switching control of RF amplifier (PRE), ATT, AGC and CW (output - 12V). Switching indication LED (above the main indicator)
- Supported bands - 160, 80, 40, 30, 20, 17, 15, 12 and 10 meters
- RIT mode up to 2.5 kHz.
- 4-bit output for switching ranges for BPF-9, BPF-6 bandpass filter boards, as well as LPF-2 filters
- Built-in menu for setting the intermediate frequency (IF), the frequency of the reference oscillator and fine-tuning the quartz
- Automatic IF operation: up to 10.5 MHz we add “+ IF”, above the frequency of 10.5 MHz we subtract “-IF” accordingly
- High performance Atmel ATMEGA168A processor
- LED static indication (6 digits) controlled by 74HC595
- Consumption - up to 200 mA (with optical encoder)
- Power supply 12V.

Operation

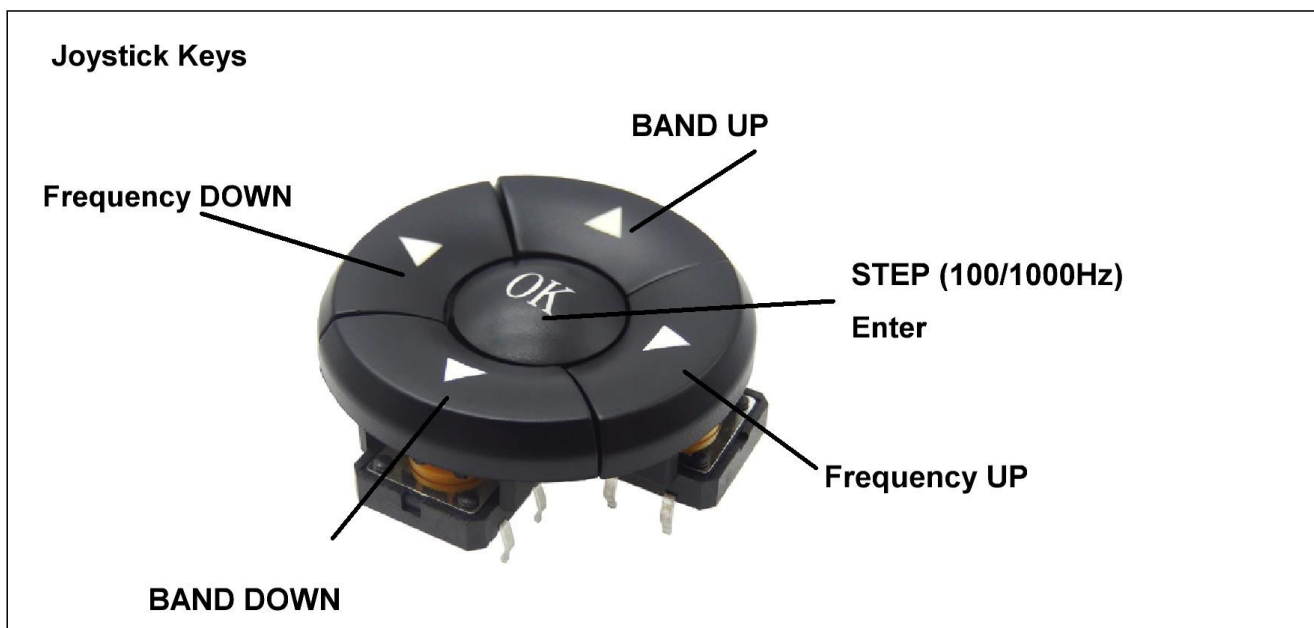
Before starting work, make sure that the power supply of the synthesizer is DC 12V; the display unit is securely fixed between the main board of the synthesizer, and the cable of the external keyboard and encoder (if any) is connected correctly.

In operating mode, the synthesizer indicator displays the frequency of the active main oscillator. The accuracy of the indicator is 6 digits, that is, 100 Hertz. Above the main indication, additional LEDs are installed to display the active operating modes of CW, AGC, Attenuator and RF amplifier on the BPF-9 or BPF-6 boards.

1. Joystick Keys.

Frequency tuning is performed using an optical encoder (turn left and right) or using the RIGHT and LEFT keys on the joystick buttons. The tuning step is changed by briefly pressing the “OK” key on the joystick buttons: 100 Hertz or 1 KHz.

Use the "UP" and "DOWN" buttons on the joystick to change the band. 9 cells for amateur radio bands are programmed in the processor memory. When changing the band, the frequency information is saved and returning to this cell, you can continue working. Initially, all nine cells are tuned to amateur radio frequencies: 160, 80, 40, 30,20,17,15,12 and 10 meters.

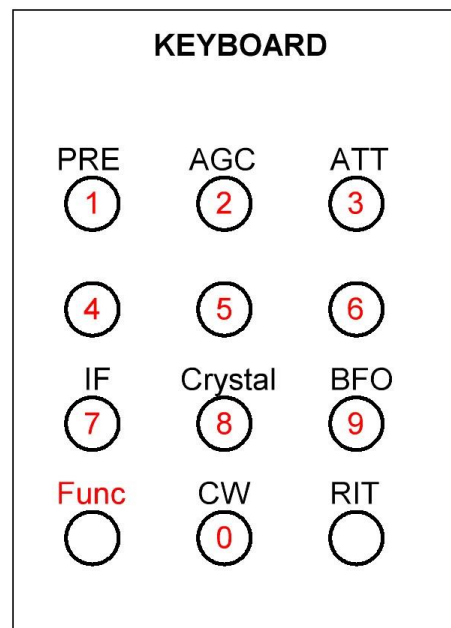


2. Keyboard

The keyboard is made of twelve keys: 10 of them are numbers from 0 to 9, and two function buttons "Func" and "RIT".

Almost all keyboard buttons have a dual purpose: that is, entering numbers and quickly switching modes. The priority is the switching mode of the transceiver. That is, with a short press on the number buttons, the following operating modes are switched:

- Button "1" - switching the PRE mode (ON / OFF)
- Button "2" - AGC control (ON / OFF).
- Button "3" - switching Attenuator (ON / OFF)
- Buttons "4,5,6" are empty.
- Button "7" - setting the intermediate frequency (IF)
- Button "8" - calibration of the reference quartz from Si5351
- Button "9" - setting the frequency of the BFO reference oscillator
- Button "0" - is responsible for switching between CW and SSB.
- "RIT" button - Turns the detune mode on and off.



Further, the "Func" button switches the mode change mode to a regular keyboard, i.e. by pressing the "Func" key, the current frequency indication is reset on the screen (in this case, the generator continues to operate at the current frequency until the input of the new frequency is confirmed), and the synthesizer waits for the numbers of the new desired frequency to be entered. The frequency is entered in numbers from 0 to 9 with an accuracy of 100 Hertz. You can enter up to 6 digits. When you enter the sixth digit, the synthesizer automatically generates a new entered frequency. With a smaller number of digits (for example, five), this combination must be confirmed with the "OK" key, because the synthesizer will wait for the next digit to be entered. That is, for example: entering the frequency for the 20-meter band looks like this: press Func, then 14,070.0. (total 6 digits). Another example: to enter a frequency of 3.570 MHz, we enter 3.570.0 (5 digits) and confirm with the "OK" key.

If we need 500 kHz, then enter 500.0 (4 digits) and the "OK" key to confirm.

Synthesizer modes and settings

• Button "7" - Intermediate frequency (IF) setting mode.

The default value is "0". You can set any value from 0 to 99 MHz. The setting is done using the encoder (left-right) or the left-right buttons, and by entering the frequency using the keyboard (Func button and entering numbers). Be sure to set the correct IF frequency before connecting to the transceiver, otherwise the frequency display on the screen will be incorrect. To accurately calibrate the IF frequency, you need to do the following: find a station on the air and find out what frequency it operates on. For example, the station operates on a frequency of 3.650.0 (80 meters). Indications on the synthesizer 3.650.3 MHz. This value needs to be configured. We set the value of 3.650.0 MHz on the screen (accordingly, the station will leave the setting a little), and switch to the IF tuning mode. We turn the encoder and achieve fine tuning to the station.

ATTENTION: The exit from the IF mode is also carried out by pressing the number "7".

• Button "8" - Fine calibration mode of reference quartz from Si5351

Reference quartz frequency calibration of the Si5351 microcircuit. By default, the value corresponds to the frequency of the quartz resonator installed on the board. Find this crystal on the board - ZQ1 (next to si5351). You can calibrate if necessary. For tuning, you need to connect a tuned frequency counter to the VFO output. Set the desired frequency on the synthesizer, for example 10,000.0 MHz, and switch to the calibration mode by pressing the "8" key. On the indications of the frequency meter, it is necessary to achieve values as close as possible to 10 MHz. Entering and changing data is also carried out through the rotation of the encoder or the Left-Right keys, as well as using the keyboard.

To exit the calibration mode, press the "8" key again.

Attention! Before setting the frequency of the quartz, make sure the value of the quartz resonator on the board. There are quartz at 25MHz, 27MHz and 30MHz. If the calibration value is incorrect, the wrong frequency will be output at the output of the VFO and BFO.

• Button "9" - Mode setting the frequency of the reference oscillator BFO

Setting the frequency of the reference oscillator. The default value is "0". You can set any frequency from 0 to 160 MHz. (The actual minimum threshold is about 450 kHz. The maximum is about 170 MHz). The setting is carried out using the encoder, the Left-Right keys, as well as using the keyboard.

At values greater than zero, the reference oscillator output will be active. If the BFO output is not used in your project, we recommend turning it off to avoid additional interference with your device. To turn off the output, the BFO value must be set to "0". Disabling will happen automatically when you return from the setup menu.

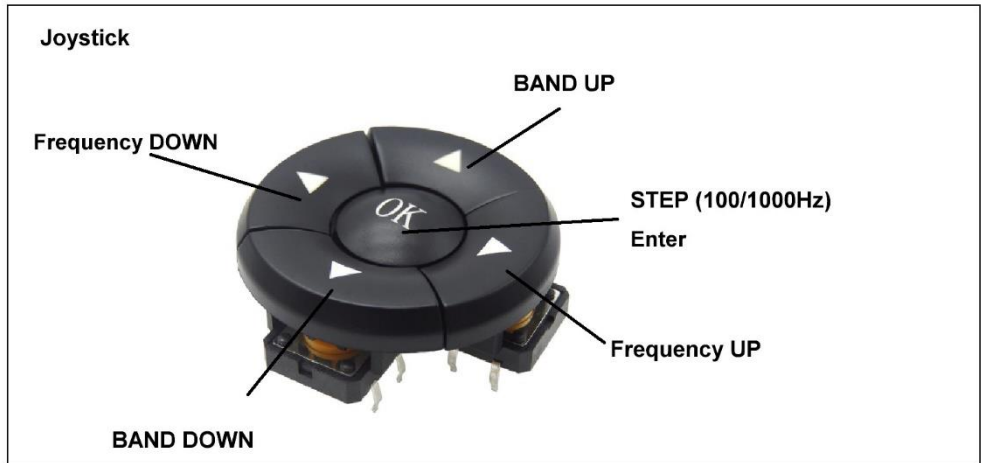
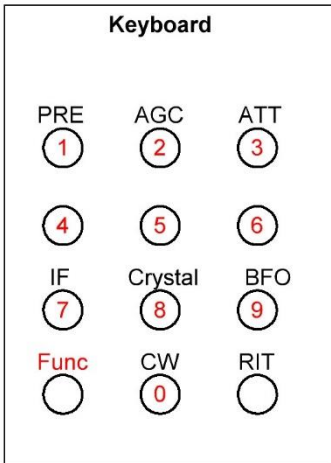
To exit the BFO setting mode, press the "9" key again.

Restoring factory settings

Factory settings are restored by pressing and holding (more than 10 seconds) any button on the keyboard. This rule does not apply to joystick keys. That is, press and hold for about 10 seconds. After releasing the key, the synthesizer will be returned to the factory settings and restarted.

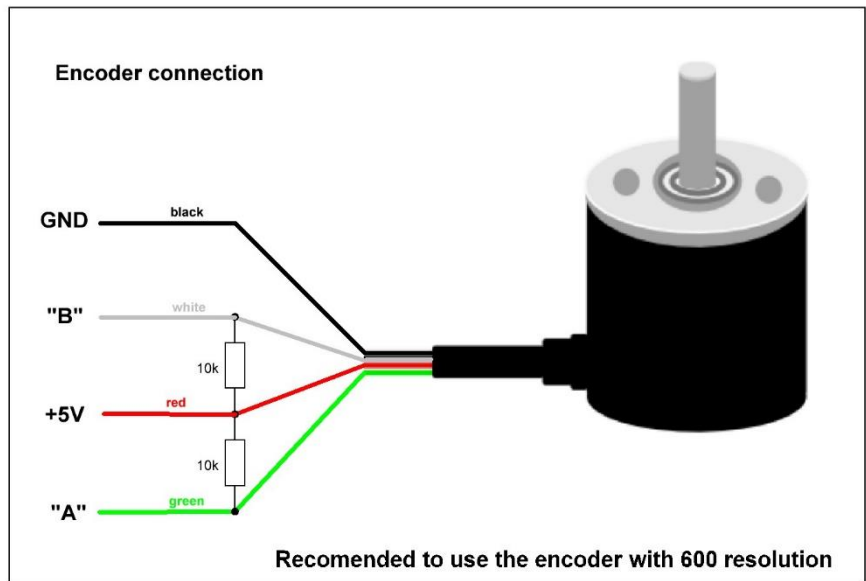
Sockets

Label	Description	Details
VFO + GND	Main frequency generator output	RF voltage about 0.8-1V
BFO + GND	Reference oscillator frequency output (if enabled via menu). Disabled by default, i.e. "0"	RF voltage about 0.8-1V
BPF Select (1,2,3,4,5)	4-bit output to control the decoder board for subsequent control over the physical switching of band pass filters and the low-pass filter board. Decoder kit supplied separately; is for sale on the site WWW.RV3YF.RU	The voltage at the pins varies depending on the range (either 0 or 3.3V). The voltage table is shown below (0 means 0, "1" means 3.3V).
CW, AGC, ATT, PRE	Output jack for switching CW, PRE, AGC and attenuator modes.	When UHF, ATT and CW modes are activated, + 12V voltage appears on the corresponding outputs. When AGC mode is activated, the output will be "0".
+12-15V	Synthesizer power connector	It is recommended to connect a stabilized power supply from 12V. If necessary, you can work up to 15V, but 12V is recommended.
SW-GND-A-B-GND-5V	Connector for encoder connection.	<ul style="list-style-type: none"> • "Red" and "black" wires of the encoder are connected to +5V and GND respectively. • "Green" and "white" wires of the encoder must be connected to +5V through 10K surface-mounted resistors. • "Green" wire of the encoder is connected to the output "A" • "White" wire of the encoder is connected to the output "B" • Output SW - not used.
LEDs, +9V, GND, DS, ST, SH, GND	Connectors for connecting the display unit	
SCK, MISO, MOSI, RST, GND, VCC	Connector for programming the processor.	Attention! The processor is protected by bits from copying and cloning information. Do not attempt to remove or reprogram the processor. In this case, the synthesizer is removed from the warranty. A paid repair is offered.



Decoder table

BAND	D	C	B	A
1.8MHz	0	0	0	1
3.5 MHz	0	0	1	0
7 MHz	0	0	1	1
10 MHz	0	1	0	0
14 MHz	0	1	0	1
18 MHz	0	1	1	0
21 MHz	0	1	1	1
24 MHz	1	0	0	0
28 MHz	1	0	0	1



Questions, offers and warranty conditions

If you have any questions, feedback or suggestions regarding the operation of the device, you can contact us by e-mail: SALES@RV3YF.RU or through the contact window on our website WWW.RV3YF.RU.

Under the order we can make minor changes in the firmware of the program according to your terms of reference. The cost is negotiated depending on the complexity of the changes (from free to reasonable amounts).

The warranty period for the product is 4 months from the date of receipt of the order. The warranty does not cover soldered (re-soldered / removed from the board) elements, as well as external interference in the operation of the processor and other components of the synthesizer. In case of failure of the device, we carry out diagnostics, establish the cause; We do emergency repairs. Term of diagnostics and repair: 1-2 working days from the moment we receive the synthesizer.



Радиолавка КВ и УКВ

RV3YF.store

www.rv3yf.com

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Contents of delivery	Qty
- Assembled and tuned synthesizer boards, indications and keyboards	1 pcs
- Variable resistor 10-50 k Ω to adjust the detuning	1 pcs.
- Cable for connecting the keyboard and the main board of the synthesizer	1 pcs.

web: www.rv3yf.com