

## Description of the controller the transceiver VisAir.

The controller is designed to control nodes and modules, transceivers Tulpan and VisAir.

The device is a continuation and modification of the controller transceiver Tulip and can be used without any changes in the transceiver Tulip.

The controller is equipped with a new processor STM32F746IGT6, which has higher performance computing and data processing. Also in this controller applied the Protocol LTDC together with the new SDRAM memory, which allowed to pass on this powerful processor full control of image construction. The controller interface now uses two active layers with full coverage of color space, but despite this managed to increase the screen refresh rate to 20 FPS.

The controller uses a large TFT matrix size of 7 inches and a resolution of 800 by 480 pixels.

Because of the high capabilities of the new processor, the controller received a new interface, now it is equipped with a needle indicator and the reading is easier to control.

Functions of the spectrum analyzer, also become more advanced. Changed the algorithm of the panorama, the signal level has become more real and accurate. Bodies adjustments of the spectrum analyzer enables to obtain a visible signal coverage from -150 dB to 10 dB. Such a deep range of data will allow the operator to configure the panorama under specific reception conditions. The main parameters of the spectrum analyzer are stored for each range separately. As they can quickly change or directly using the touchscreen or by pressing on the corresponding buttons using the main encoder. Which saves you time and makes setting of the spectrum analyzer handy. The new analyzer has a scale in dB, by which we can objectively evaluate the level of the received signals.

VisAir controller is versatile software that allows you to use this controller for analog option SDR option and for direct digitization of the DDC. In this regard, he has a large list of devices that it is able to manage.

Structurally, the controller is made in the form of a finished module, which is not difficult to mount a case with the right dimensions. The controller, in addition to the display have all the buttons set (26 PCs) and three encoders.

In the controller there is a possibility of power control of the transceiver, it has a separate entrance standby power +5V, and the button on/off. Power relay or other device can be connected directly to the controller, a transistor with open collector.

All bus ports and connectors decoupled through a RC-chain, and the PTT and KEY inputs with optical isolation. For compatibility and reduction nodes of the transceiver, the controller is equipped with enhanced keys for some tires for relay control (RX-TX, ANT, PRE, ATT, EXT, CALIBRATION).

The controller can control the power of the transceiver, there is a separate entrance for standby power connector XS9 (250 mA). When using it you need to remove the jumper and Fb3 + 5V to file for connector XS17 (600 mA).

It is recommended to perform controlled power, or reprogramming of the processor when not in power management, there is a desynchronization of the display matrix.

!!!! If not on duty, pitanja, then use the power button on the controller S21 may lead to damage of the display matrix. As the processor enters sleep mode when power is turned off and the voltage on the matrix display is actually not removed, which can lead to spoilage.

Connected to the controller electronic thermometer DS18B20 to the terminal 3 of the connector XS8, which controls the speed of the fan connected to the connector XS8, terminal 1. The output of the PWM amplifier equipped with an open collector up to 500 mA.

### A short description of the buttons on the display:

Button	Appointment	Actions with a long press
ANT	Switching antenna inputs (assuming the use of 2 antennas)	Mode selection switching of the antennas

		"ANT1-RXTX, ANT2-OFF", "ANT1-OFF, ANT2-RXTX", "ANT1-TX, ANT2-RX", "ANT1-RX, ANT2-TX"
PRE	Enabling, disabling, PRE	The choice of parameters PRE
ATT	Switching the attenuator	The choice of parameters ATT
AGC	On, off AGC	The selection of the delay AGC (Fast, Med, Slow, Long)
NB	On, off noise reduction	The choice of parameters (NB1, NB2, NB3)
BIN	Mode, pseudo-stereo	no
SQL	Noise reduction	no
SPLIT	Enabling, disabling frequency spacing of RX TX.	no
A/B	Swaps frequency transmission and reception	no
A=B	The receive frequency is equal to the transmission frequency	The transmission frequency is equal to the receive frequency
MENU	Select to enter the transceiver control	no
ANF	On, off auto Notch filter	no
SHIFT	Enabling, disabling the frequency shift of the reception	no
MEM	Opens a window of frequencies in memory	no
MODE	Opens a window for selecting modulation modes. Opens a window for managing audio	no
REC	Opens a window for records audio	Opens a widget for quick recording of an audio signal
TONE	On, off two tone	The call window automatic antenna tuner
INPUT	The select inputs of the transceiver (off the microphone, line-in)	no
VOX	Enabling, disabling voice control	no
NR	Adaptive noise reduction	no
PA	Control of external power amplifier	no

## The controls of the transceiver.

Controller Board is equipped with three mechanical encoders with buttons.

### The encoder 1.

1. Adjusts the upper cutoff frequency band of the reception.
2. Adjust the lower cut-off frequency band of the reception.

When the SHIFT:

1. Adjusts the frequency shift of the reception.
2. When enabled, the SHIFT adjusts the upper limit frequency of the reception.

The encoder button is the "SELECT" mode switching encoder

### The encoder 2.

At the reception:

1. Adjust the NB level.
2. The sensitivity of the DSP module for reception.
3. Squelch level SQL.

When you transfer:

1. Adjusts the level of power output.
2. Adjusts the level of microphone and line input, CW – speed electronic key.
3. The level of self-control

Button of the rotary encoder is "OK", the mode switching encoder

### The encoder 3.

Electronic volume control in DDC versions of the Tulip, and DSP VisAir.

Encoder button - "CANCEL", or switching the "Headphones+Speaker" - "Headphones" - MUTE , Long press to lock the frequency change "LOCK"

## Description of menu items .

Option	Description	Value
<b>Global options</b>		
LCD Brightness	The brightness of the display	10 .... 100%
Band to 74HC595N	Variant management switching card by SPI (connector XS10)	"Enable", "Disable"
PA IC-meter	The presence of the measuring currents of the power amplifier	"Enable", "Disable"
S-Meter calibration	Calibration of S-meter	-40...40
SWR-meter calibration	Calibrate the SWR connector terminals XS10 - 2, 3	0....8000
IC-meter calibration	Calibration of measuring Currents of the output transistors of the PA XS2 – 2, 3	100....300
CAT TX	To translate the transceiver via the CAT in the transmission mode for DTR and RTS	"Enable", "Disable"
AGC ref level	Threshold AGC	0...100
Beep level	The sound level button	1...10
Show Clock	To display the clock	"Time", "Time+Date", "Disable"
ATT 1 (dB)	The value of the first attenuator You can select the value by 2 dB	2,4,6,8,10
ATT 2 (dB)	The value of the second attenuator You can select the value by 2 dB	2,4,6,8,10,20
ATT to TX	The value of the attenuator for receiving during transmission	0,10,20,30,40
PRE 1 (dB)	The value of the first UHF	0.....60
PRE 2 (dB)	The value of the second UHF	0.....60
S-Metr correct	Allow the adjustment of the s-metra included with ATT and PRE	"Enable", "Disable"
SDR Mode	The operating mode selection DSP: SDR Analog, DDD, DDC Module 1	"SDR", "DDC", "DDC Module 1"
Enkoder step (Hz)	Step frequency tuning	1,5,10,15,20,50,100
Encoder factor	The divider pulses of the encoder	1,2,4,8,10,12
Encoder of pulses	The number of pulses of the encoder	24,48,68,128,256,300,400, 600,800,1200,1400
Encoder menu step	Speed adjustment in the menu	1...256
Control TX	During transmission the receiver is not disabled	"Enable", "Disable"
Freq NFO	Marker strip is mixed up in the panorama	"Enable", "Disable"
Automatic Tuner	The inclusion of a antenna tuner.	"Enable", "Disable"
Equalizer freq1	The frequency adjustment of the first slider equalizer	"80", "105", "135", "175"

Equalizer freq2	The frequency adjustment of the second slider equalizer	"230","300","385","500"
Equalizer freq3	Frequency adjusting a third slider of the equalizer	"650","850","1100","1400"
Equalizer freq4	Frequency adjusting a fourth slider equalizer	"1800","2400","3200","4100"
Equalizer freq5	Frequency adjustment the fifth slider equalizer	"5300","6900","9000","11700"
RX Equalizer	The equalizer in the receive mode stations	"Disable","Enable"
ADC Driver	Modes preliminary driver before the ADC	"Enable","Disable","ADC OVR"
1,2,3 Encoder reverse	For some encoders require a reverse pulse	"Disable","Enable"
<b>DDS configuration</b>		
DDS Chip	Chip select synthesizer for SDR	"AD9952", "AD9958"
CLK Freq (MHz)	The frequency of the crystal oscillator DDS	40,50,80,100,200,400
CLK Freq correction (Hz)	Correction of frequency generator DDS	-1000000....1000000
DDS1 mux	The multiplier for the DDS	0....10
USB Freq correction (Hz)	The correction frequency for USB	-100....100
LSB Freq correction (Hz)	The correction frequency for LSB	-100....100
Frequency factor	A frequency divider at the output of the DDS (for AD9952)	1,2,4
EXT144 GEN Freq MHz	The installation of the frequency Converter 144 (MHz)	30....1000
EXT144 GEN Freq Hz	The installation of the frequency Converter 144 (Hz)	0.....1000000
EXT432 GEN Freq MHz	The installation of the frequency Converter 432 (MHz)	30....1000
EXT432 GEN Freq Hz	The installation of the frequency Converter 432 (Hz)	0.....1000000
EXT1236 GEN Freq MHz	The installation of the frequency Converter 1236 (MHz)	30....1300
EXT1236 GEN Freq Hz	The installation of the frequency Converter 1236 (Hz)	0.....1000000
<b>TX options</b>		
Equalizer	Turn on the equalizer	"Enable", "Disable"
Default RX-TX delay	The transition delay for the transfer	1....250
Default TX-RX delay	The delay of the transition to the reception	1....250
Filter LO freq	The lower limit frequency of the radiated signal spectrum	50....500
Filter HI freq	The upper limit frequency of the radiated signal spectrum	1000....3500
AGC level	The AGC level on the transmission	0....40
AGC	Enable AGC for the transfer	"Enable", "Disable"
Compressor TX	The compressor	"Enable", "Disable"
Compressor max gain (%)	Compression level	1....100
Compressor coef (%)	Compression ratio	1....100
Two tone gen gain (%)	The level of a tone	1....100
Two tone mode	Modes tone	"None","One","Two","One+Two"
Two tone gen freq1	The frequency of the first tone	100....3000
Two tone gen freq2	The frequency of the second tone	100....3000
VOX Threshold MIC(%)	The threshold to trigger the VOX MIC input	1....100
VOX Threshold LIN(%)	The threshold triggering the VOX line input	1....100
VOX Hold	The VOX hold time between sounds	1....50
Reverberation	The inclusion of reverberate	"Enable", "Disable"

Reverberation gain (%)	The reverberate level	1...100
Reverberation delay (%)	Signal delay reverberate	1...100
Mic boost	The power of electret microphone	"Enable", "Disable"
Drive Power (%)	DDC power level at the DAC output	1...100
Control SWR	Reduces the level of the output signal when SWR >3	"Enable", "Disable"
Control ALC	The inclusion of the ALC (limiting output power)	"Disable","Enable"
Level ALC (%)	Limiting level of the ALC	60...100
<b>Pan-adapter configurations</b>		
Fill Pan adapter	Frequency response on the panorama fill	"Enable", "Disable"
Waterfall auto level	Automatic level waterfall	"Enable", "Disable"
Pan-adapter AVG	The value of a smooth upgrade	0....230
Pan-adapter Correct	The gain adjustment of the panorama	1.....10000
Pan-adapter level	Adjustments to the level of a noise track The initial value is set in accordance with readings of the noise level without antenna with 50 Ohm load	40....160
Fill color	Color panorama	"Yellow", "White","Blue", "Green"
Freq NFO	Marker bandwidth moves the pan-adapter	"Enable", "Disable"
Panadapter Smoothing	Smoothing of peaks in the panorama	"Disable","Enable"
<b>El. key configuration</b>		
CW tone freq	Frequency CW parcel	100...1000
Break in time	Delay for receiving after sending the sign	0...300
Break in	The inclusion BREAK-IN	"Enable", "Disable"
CW el. key mode	Electronic key	"ACS","Electronic key", "Straight key","BUG key"
CW key reverse	Invert electronic key	"Enable", "Disable"
Space wight %	The ratio of pause duration to the point - in tens of per cent	1...100
Dash wight %	The ratio of dash to the duration of the point - in tens of per cent	1...100

**RX TX Equalizer** – opens the graphic equalizer through which you can adjust the frequency response of the received stations during the reception, during transmission the frequency response of the microphone signal.

**Set Date Time** – Setting the date and time. The encoder button "Select" you can select the editable option, and rotate the main encoder to adjust the selected parameter .

**Calibration imbalance** — Enables calibration mode of suppression of the mirror channel on the transmission is governed by two parameters, gain and phase. The settings are performed for each range separately. Before adjusting to choose the maximum possible level of a tone, before the start of the signal distortion in the panorama .

**BPF configuration** – This menu item opens a window in which you are installing the used frequency band-pass filters. The controller can control the nine bandpass filters. If you have fewer of them, then the available places are not filled.

Navigate to the desired parameter in three ways, the main knob's encoder, use the touch by clicking on the names of the ranges Start or End kHz kHz and from the keyboard by pressing on the corresponding numbers. Enter your values are, respectively, the beginning and the end of the filter pass band without overlapping. Example range 0 - beginning of 1500, 2500 end; range 1 - starting 2500, 4000 end and so on .

## Reset setting -

0 – Reset basic setting – reset to the initial settings .

1- Scheme BPF Tulip (reset band-pass filters to the scheme of a Tulip )

2- Scheme BPF HiQSDR (reset band-pass filters to the scheme HiQSDR)

3- Scheme BPF VisAir (reset band-pass filters to the scheme VisAir)

You can perform a manual reset to the initial settings when you turn on the controller. To do this, when it starts and the screen appears to the inscription "Starting:" we need to press and hold the selection button modulation mode (Mode)/Menu for more than 2 seconds. The screen will show RESET... and reset to the initial settings .

The settings menu in which you want images or any other control when modifying values are in real time. But if you sign out from the menu with the button "CANCEL", the value of the parameters will not be saved.

## Description keyboard controller .

Short press	Long press
<b>The left row of buttons :</b>	
Power ON/OFF	None
MODE	MENU
NR	No- (reserved for additional functions DSP)
TONE	AUTOTUNER
VOX	Adjusting the maximum value of the level analyzer
INPUT	Adjustment of minimum level values of the analyzer
<b>Lower rad buttons</b>	
(1) 160M	Adjusting the position of the waterfall
(2) 80M	Zoom panoramas
(3) 40M	
(4) 30M	MEM
(5) 20M	
(6) 17M	
(7) 15M	
(8) 12M	BIN
(9) 10M	SQL
(0) GEN	EXT
<b>The top right number</b>	
ANT	Modes switching antennas
ANF	Lock the main encoder LOCK
PRE	Mode selection PRE
ATT	Mode selection ATT
SPLIT	A/B
<b>The lower right number</b>	
NB	Mode selection NB
AGC	Mode selection AGC
SHIFT	-
REC	-
A=B	The transmission frequency is equal to the receive frequency B=A

To expand service capabilities of the transceiver on each Amateur band arranged on three banks to store frequencies and operating modes. Banks preferred to associate with defined ranges and types of radiation.

**For**

**example:**

Bank 0 is the Telegraph site, the type of radiation CWL or CWU, the band 100-1000 Hz.

Bank 1 is the digital site, the type of radiation or FSKL FSKU, the band of 100-3000 Hz.

Bank 2 is the SSB phase, mode LSB or USB, strip 100-2700 Hz.

For each Bank sets its output power level .

Switching between banks is carried out by repeated pressing the button the current range. I want to note that maintaining the current values of the banks is carried out in the time of the change of the Bank or of the range and for 3 seconds after any action associated with the parameter change (ATT, PRE, ANT, Level panoramas, the values of the filter's bandwidth, receive frequency, level panoramas, the power level modulation mode).

### **Frequency control is possible in three ways:**

1. The main encoder, which is intelligent and changes the pitch frequency depending on the speed of rotation of the encoder handle.

2. Visually the frequency response or waterfall stations,, use the touch clicking on the panorama controller.

3. Manual frequency setting. If you perform a long press (over 2 seconds) on the frequency indicator, it opens the window for manually entering the frequency. Click the first encoder "Select", you can select the category of megahertz, kilohertz, Hertz, and rotate the main encoder to set the desired frequency value. After click on "OK" if correct or "Cancel" if you change your mind to use manual frequency input.

### **The controller supports three converters on 144, 432 and 1236 MHz.**

To manage these devices, the controller generates the necessary signals at the connector XS11.

**Change modes XS11 contact default to activate the old regime, it is necessary to close the housing KT4 on the controller Board.**

<b>KT4 not shorted to ground</b>	<b>KT4 is shorted to ground</b>
PA_TX	ATT1
ATT	ATT0
PRE	PRE1
EXT GEN 144	PRE0
EXT GEN 432	CALIB
EXT GEN 1236	EXTGEN
ANT	ANT
COM	COM

To activate Converter, simply enter the desired frequency by any of the methods, and the controller independently go to the range GEN. You need to pre-specify in the settings menu the frequency of the reference generators, converters. The frequency at shutdown is stored in memory. For convenience of work recommended for these three bands to use three banks on the range GEN.

In the applied controller S-metr in the form of a pointer-type measuring instrument that allows you to more clearly monitor readings. In the transmit mode, the device can show several options for dimensions:

1. Video (signal) and the reflected wave.
  2. The currents of the output stage. (when using the power amplifier VisAir )
- Switching between measurements is performed by pressing the touch in the area of the gauge.

### **Calibration of the mirror channel in an analog radio channel.**

Calibration of mirror channel, then KPC, can be performed in several ways. Depending on the radio band-pass filters and methods will be different. It depends on the availability of the switching circuits of the inputs / outputs of the radio. But the most accurate results can be obtained in the KPC control to control the receiver.

Consider the example of the KPC on the radio channel and band-pass filters of the transceiver VisAir. This radio channel has an universal switching system inputs and can perform different methods of control of the output signal when the KPC.

To perform the operation of KPC need to pre-set the maximum value of ATT at the time of transfer to perekrasit the input circuit of the receiver. To do this, click Global options in ATT to TX set to 40 dB. In the future this value will be available if you want to adjust.

If in Global options in the menu item Control TX is set to "Enable", then KPC will be used through the receiving channel, bypassing the bandpass filters, thus controlled by the signal, must be removed from the tap output stage. This is the most correct way in which we see the signals on the output of the transceiver.

If in Global options in the menu item Control TX is set to "Disable", then KPC is powered on, the relay connects the output of the radio with his entrance. At the same time, such a connection can be paid once the balancing resistance of the cascades, in consequence of which, the adjustment may not be accurate.

In both cases, the whole process of KPC need to observe in the control receiver.

Next, go to the menu imbalance Calibration, set the required level of the tone generator to the panorama was not overloading the DSP module, and sequentially switching by pressing the encoder SELECT between Gain and Phase and adjusting the values using the main encoder, to achieve a minimum level mirror channel.

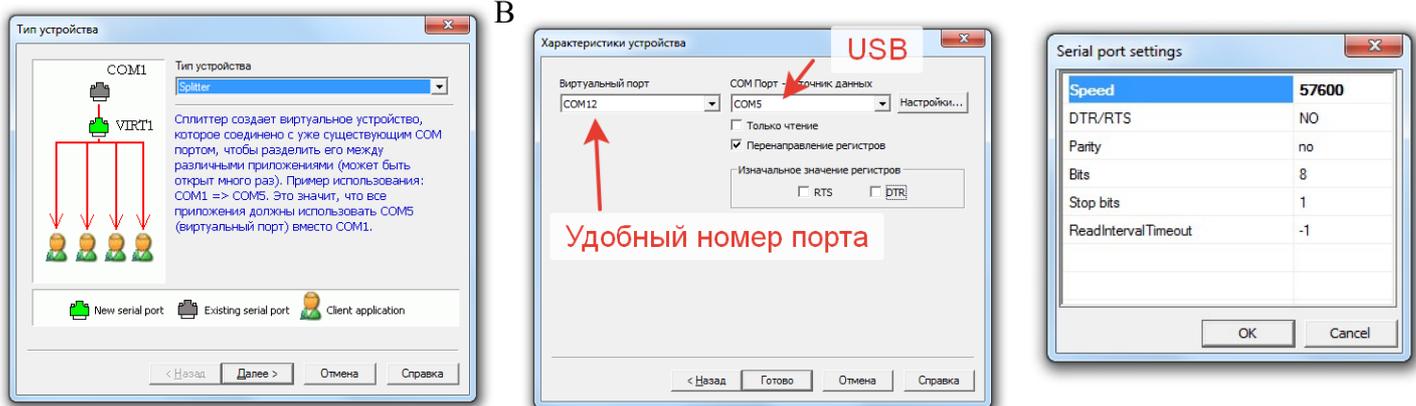
After that, click the "OK" button, thereby maintain the set values.

This operation must be done for each band.

## Protocol support CAT.

The controller has the capability of sharing with your computer using a CAT Protocol, it uses the USB port connector XS3. For normal operation you need USB on the computer to install the driver STM32 Virtual COM Port Driver . Download it need on the STM website

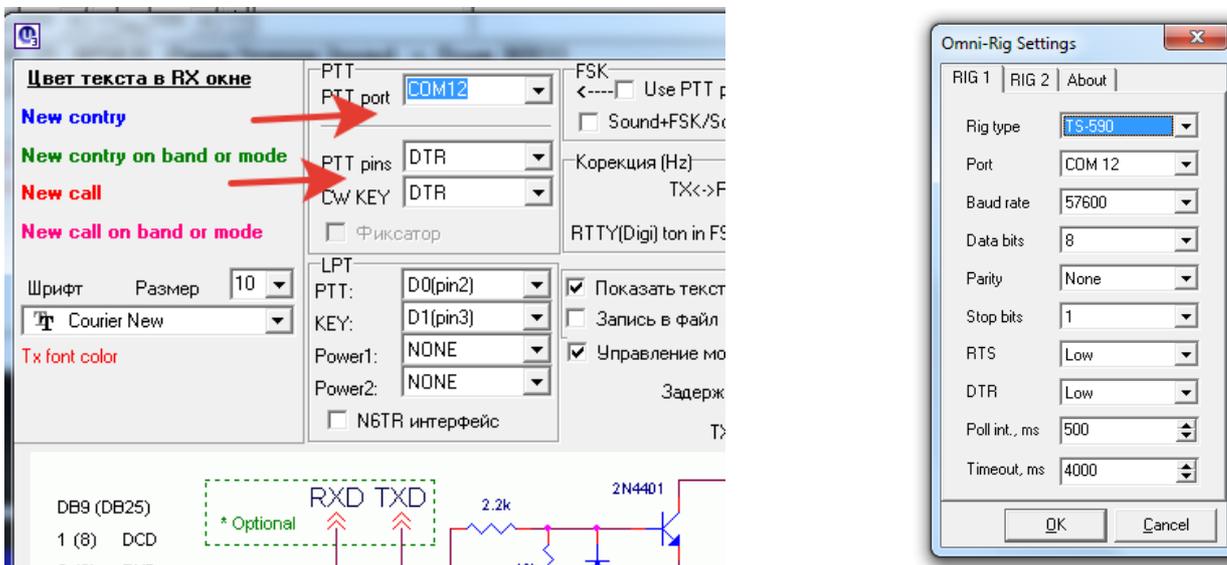
Next, the example program connections Virtual Serial Port Emulation. It is necessary to create a new device type Splitter.



setting specifies the baud rate to 57600, RTS and DTR check boxes need to remove

The rest of the settings on the sample program log UR5EQF.

These are the settings for CAT and PTT settings .



In the controller settings you need to enable "CAT TX". When working CW through the computer, you need to select "CW el. key mode" as a "Straight key". As well as to adjust delay "delay Break in" to avoid going to the reception between words.