Tiny-CAT SCR Preselector

Five band tunable 1.8MHz to 30 MHz Software Controlled Radio modular preselector

Featuring tracking operation from dedicated radio software.

User manual. Rev 01

Features: Tiny-CAT SCR preselector is connected in line between the antenna and your receiver or transceiver providing filtering of R.F.spectrum to reduce broadband signal energy into the receiver.

Note: *If the preselector is connected to a transceiver, take precautions to prevent transmitting through it. An Input/Output by-pass dual power relay accessory is available to by-pass the preselector in transmission.*

Suitable to work with any SDR or analog radio.Tiny-CAT preselector is remotely operated from a personal computer via USB (VCP) by means of the USB control module option or from an application supporting I2C bus data communication by means of the I2C bus control module option.

It works connected to a PC via USB under Windows OS.

Remote control modes:

Using USB control module option:

- CAT serial protocol over Virtual Com Port (VCP), Kenwood TS-2000 protocol.

- Over the Internet or Local Network. (TCP/IP protocol).

- Graphic User Interface (GUI) on PC.

Using I2C control module option:

- From an external radio or digital system supporting I2C bus data communication. (e.g. FlexRadio/PowerSDR).

CAT remote control. Tracking feature using USB control module.

CAT (Computer Aided Transceiver), serial data communication protocol over Virtual Com Port (VCP) enables Tiny-CAT preselector to provide the user with a way to interface with several radios. The microcontroller on the USB control module board translate valid CAT commands into specific instructions.

Technical features:

■ Tuneable Band Pass Filter bank for HF Bands covering 1.8 to 30 MHz.
■ Five selectable bands.
■ Passive Band Pass Filters.
■ Removes strong signals radiated back to the antenna from SDR quadrature mixers.
■ No active switching or amplifier devices in the signal path, therefore it does not contribute to (IMD (Intermodulation Distortion).
■ High linearity (IP3). Suitable for Software Define Radios and analogue receivers.
■ Five Band Pass Filters: Tapped mono coil wound on large toroidal T-200 iron core avoiding saturation in front of large signals.
■ Digital tuning. Eight bits variable digital capacitor emulator.
■ 16 way IDC connector input for control signals and power supply.
■ Size: 157mm x 75mm. (6.181 x 2.953in).
■ USB or I2C bus control modules option.
■ Suitable aluminum enclosure option available.

USB control module option.
■ Full speed USB v2.0 compliant.
■ Plug and Play feature.
■ USB type B connector.
■ Power Supply: 12V DC/250mA max.
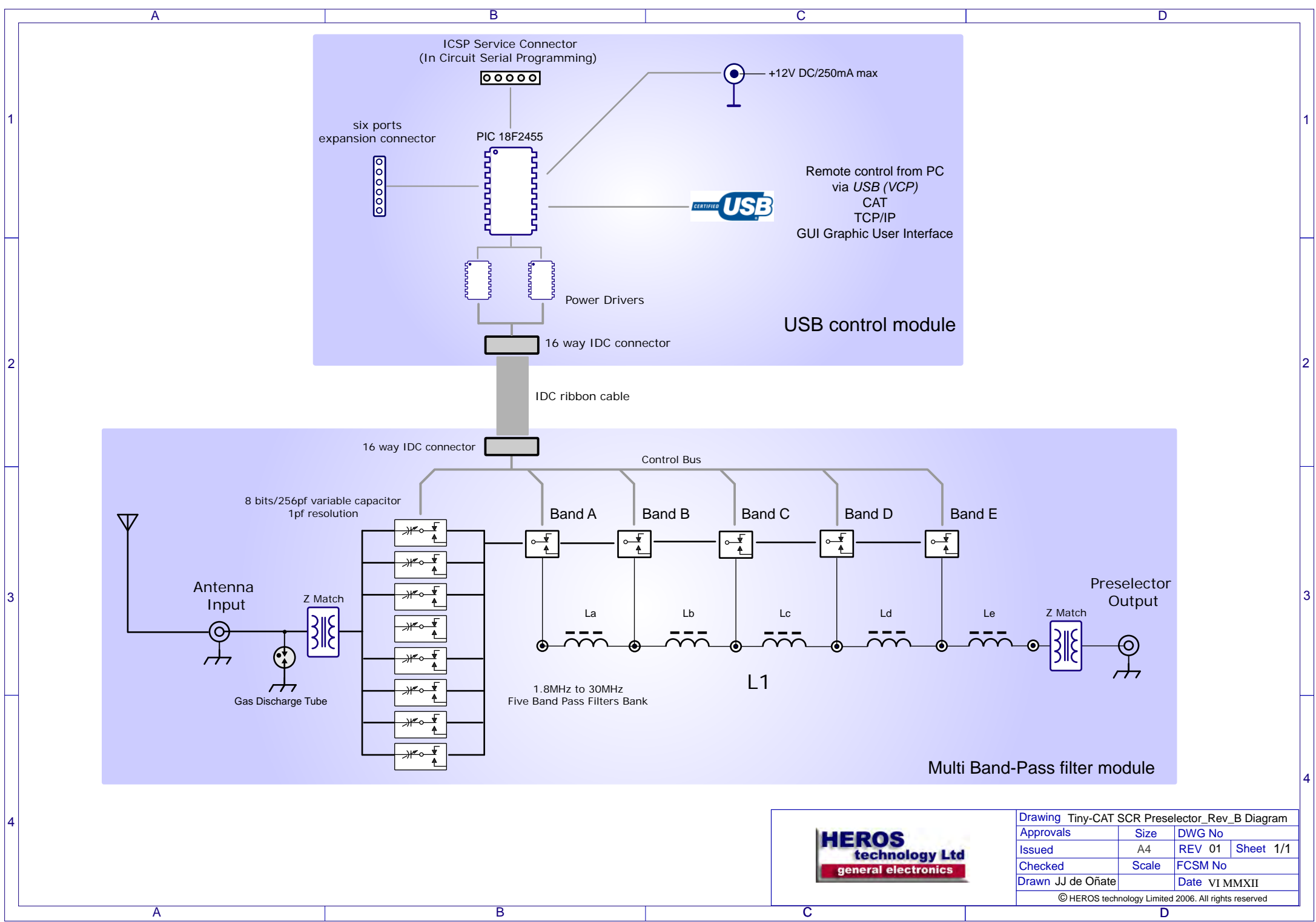■ Size: 61x50mm, (2.402 x 1.969in).

I2C bus control module option.
■ 16 bits standard I2C Bus serial bus interface. PCF8575 I2C controller.
■ Supports 100Kbits/s and 400kbits/s FAST I2C Bus protocol.
■ Auxiliary Input/Output ports to expand control signals.
■ Compatible with most microcontrollers.
■ Power Supply: 12V DC/250mA max.
■ Size: 70x46mm, (2.756 x 1.811in).

USB control module.

I2C bus control module.

ICSP Service Connector
(In Circuit Serial Programming)

○○○○○

+12V DC/250mA max

six ports
expansion connector

PIC 18F2455

Remote control from PC
via *USB (VCP)*
CAT
TCP/IP
GUI Graphic User Interface

CERTIFIED USB

Power Drivers

16 way IDC connector

USB control module

IDC ribbon cable

16 way IDC connector

Control Bus

8 bits/256pf variable capacitor
1pf resolution

Band A   Band B   Band C   Band D   Band E

Antenna
Input

Z Match

Preselector
Output

Z Match

La   Lb   Lc   Ld   Le

L1

Gas Discharge Tube

1.8MHz to 30MHz
Five Band Pass Filters Bank

Multi Band-Pass filter module

Drawing		Tiny-CAT SCR Preselector_Rev_B Diagram		
Approvals	Size	DWG No		
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Checked	Scale	FCSM No		
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Multi Band Pass Filter module

A five bands tuneable Band-Pass Filter bank make up the core of the Tiny-CAT SCR Preselector.

On SDR applications, where high linearity is needed its passive design keeps a high IP3 factor thanks to an unique large tapped mono coil, L1, wounded on a T-200 toroidal core, ultra low ESR, C0G (NP0) RF chip capacitors, low RF resistance magnetic shielded relays for tuning and telecom grade relays for band switching, instead of nonlinear semi-conductors that cause distortion in front of strong signals and exhibit low tolerance to transients.

The Tiny-CAT SCR Preselector incorporates on antenna input a gas discharge tube as surge suppressor providing safety against static spikes.

The five telecom grade relays are connected to its corresponding section of the tune coil through the Band Selector control on the program software.
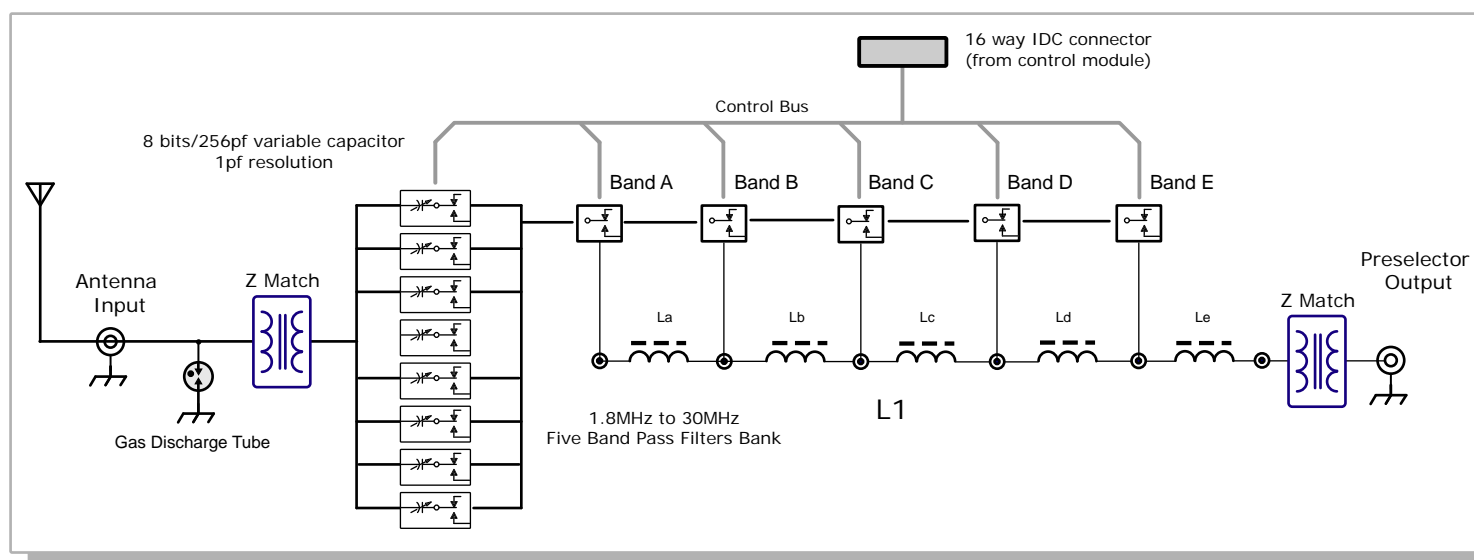
A network of low ESR RF capacitors of 1 pF, 2 pF, 4 pF, 8 pF, 16 pF, 32 pF, 64 pF and 128 pF are connected to the coil in serial fashion emulating the variable capacitor needed to tune the series resonant circuit formed. Each capacitor is connected to the network by means of its associated tuning relay. The band-pass filter formed in this way is a classic serial tuned LC circuit, offering narrow bandwidth and low attenuation on the band-pass segment of frequencies.

The program performs the task of adding or subtracting capacitor values in binary fashion in direct relationship with the tuning control on the program software. Increments or decrements are done in steps of 1pF.

Available bands are:
• A) 1.8 MHz to 3 MHz • B) 3 MHz to 5.5MHz • C) 5 MHz to 10 MHz • D) 10.5 MHz to 21 MHz E) • 16 MHz to 30 MHz.

A carefully PCB layout design and strong L/C decoupling prevent stages to couple in to each other improving the stop band response and filtering noise from control lines.

Connection to the control module is done with 16 way ribbon cable and IDC connectors on both sides, carrying control
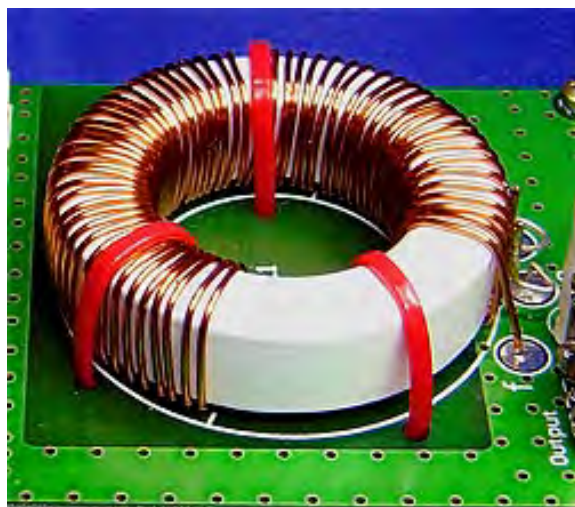
Why a large toroid core T-200 is used?
The reason is to keep a high IP3 or in other words achieve tolerance to large signals.

On SDR radios the high linearity of quadrature mixers demands the best linearity possible to the ancillary connected before the mixer stage to avoid to degrading its IP3. Wide cores with large sectional area let wind more turns on it (more inductance); these parameters are essential to keep a low magnetic flux inside the toroidal core to achieve so mush linearity as possible.

On the other hand, the large core offers a non-loaded Q (efficiency) value exceeding 400, providing selectivity and high stop band stop band characteristic, limiting the bandwidth in front of the mixer which improve signal to noise ratio, image rejection and prevents adjacent signals from reaching the circuits on the receiver side where 2nd order IMD and other spurs is most often created because of generalized use of nonlinear semiconductors especially on switching circuitry.

USB Control module.

The Tiny-CAT SCR Preselector USB control module lets to handle the Band pass Filter board from a PC via VCP providing remote control from dedicated radio software, CAT Tracking feature, Network connectivity and GUI application.
The Tiny-CAT SCR Preselector USB remote control is located in a separate module board to avoid introducing noise generated by the microprocessor itself and the noisy USB bus.
A 18F2455 PIC microcontroller is used. It incorporates a full speed (v2.0) USB port peripheral to communicate with the PC.
A 4 MHz quartz crystal is connected to the oscillator pins generating via internal PLL circuitry, the 48MHz clock for the microcontroller core and the 96 MHz clock to the USB embedded peripheral.
In circuit serial programming (ICSP) connector is provided to let programming the microcontroller firmware without remove it from the PCB.
Two power drivers ULN 2803 ICs interface the PIC microcontroller output ports with the relays in the Band Pass Filter module.
Connection to the Multi-band pass filter module is done with 16 ways ribbon cable and IDC connectors on both sides, carrying control signals and power supply.
To suppress ESD and other transient over voltage events on the USB signals lines, an array of Avalanche Diode Array are connected to them.
A carefully PCB design and strong decoupling avoid introduce noise on the filters board.
Standard 2.5mm diameter power jack and type B USB connectors are used.
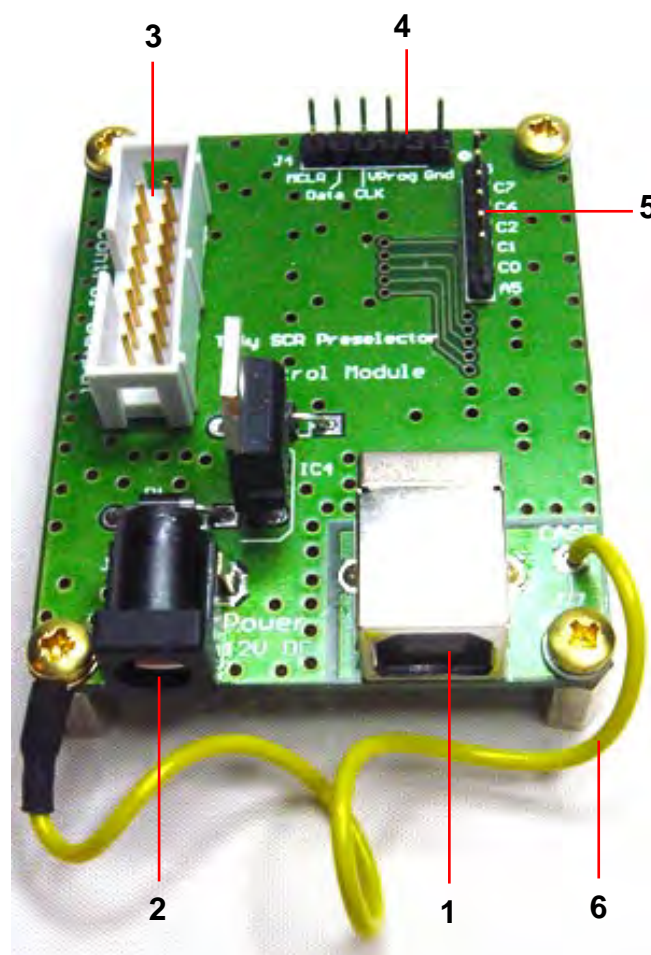
1- J1 type B USB connector to PC.

2- J2, DC 12V power connector.

3- J3, IDC connector (to BPF module).

4- J4, ICSP service connector.

5- J5, Expansion connector.

6- USB board chassis ground.

I2C Bus control module

The Tiny-CAT SCR Preselector I2C Bus control module, located in a separate module board, lets to handle easily the Band pass Filter board from an external radio or digital system supporting I2C bus data communication. (e.g. FlexRadio/PowerSDR), or from a digital control system or radio project due the simple implementation of the I2C protocol on any microcontroller.

It is based on the well know PCF8575 remote 16-bit I/O expander for I2C Bus. Two power drivers ULN 2803A interface the PCF8575 output ports with the relays. I2C addresses are configured through J4, J5 and J6 pin headers and J2 and J3 headers connect pull-up resistors to the I2C line if is needed.

Three auxiliary ports are provided for optional controls and/or signalling. J7 are Input/Output ports, 5volts level and J8 are buffered ports at 12volts level.

J11 provides an open-drain interrupt output which can be connected to the interrupt logic of the micro-controller.

Connection to the multi band pass filter module is done with 16 ways ribbon cable and IDC connectors on both sides, carrying control signals and power supply.

A carefully PCB design and strong decoupling avoid introduce noise on the filters board.

1- J9, IDC connector (to BPF module).

2- J7-J8, Expansion connectors.

3- J4-J5-J6, I2C adress configuration jumpers.

4- J2-J3, I2C pull-up resistors jumpers.

5- J1, I2C SCL-Gnd-SDA lines connector.
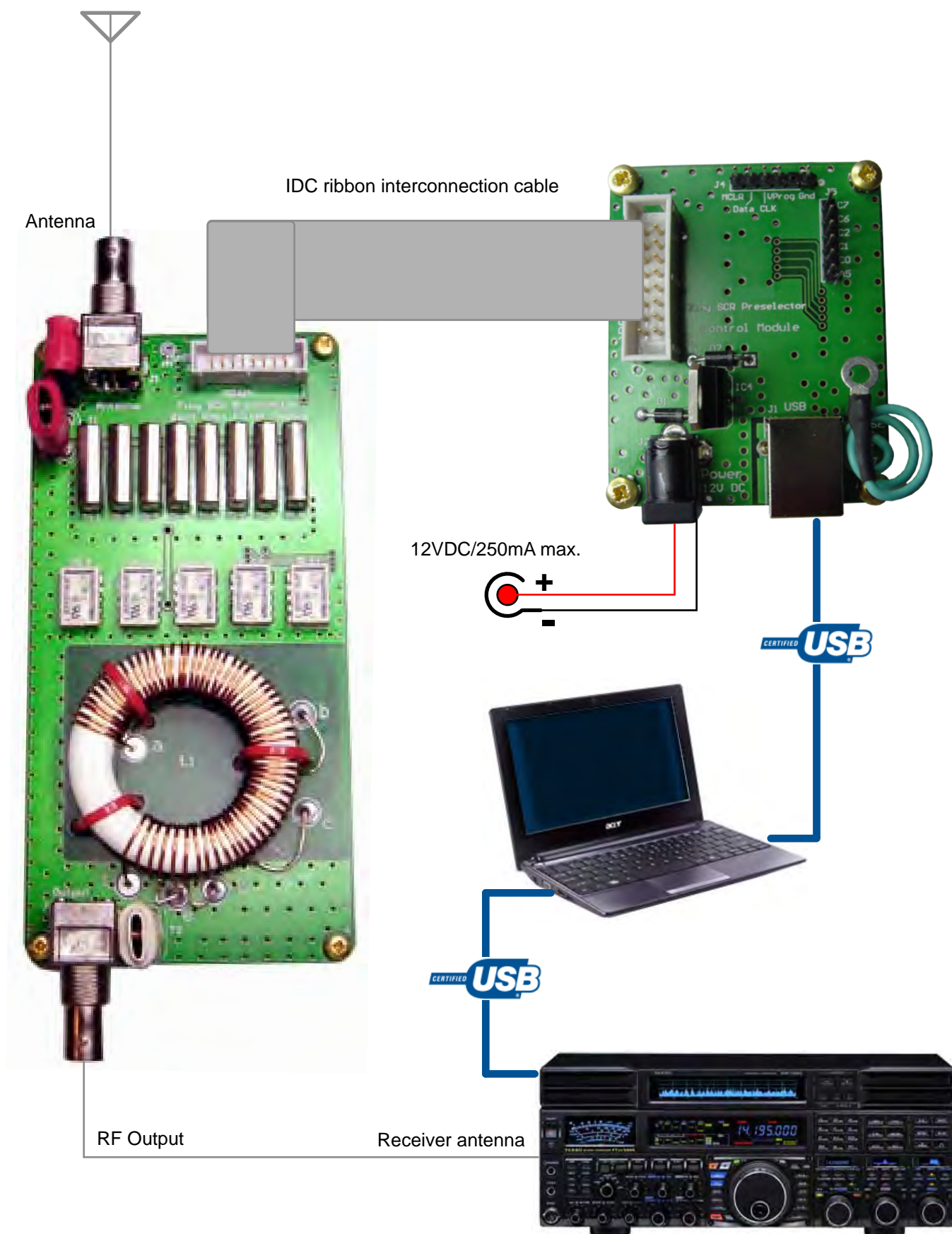
6- J10, DC 12V power connector.
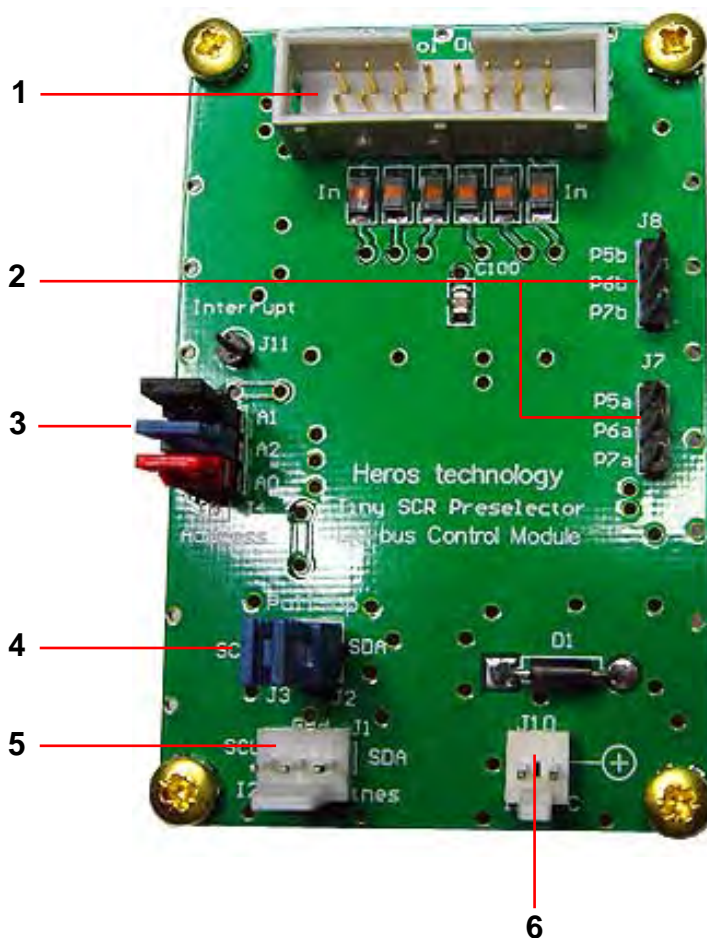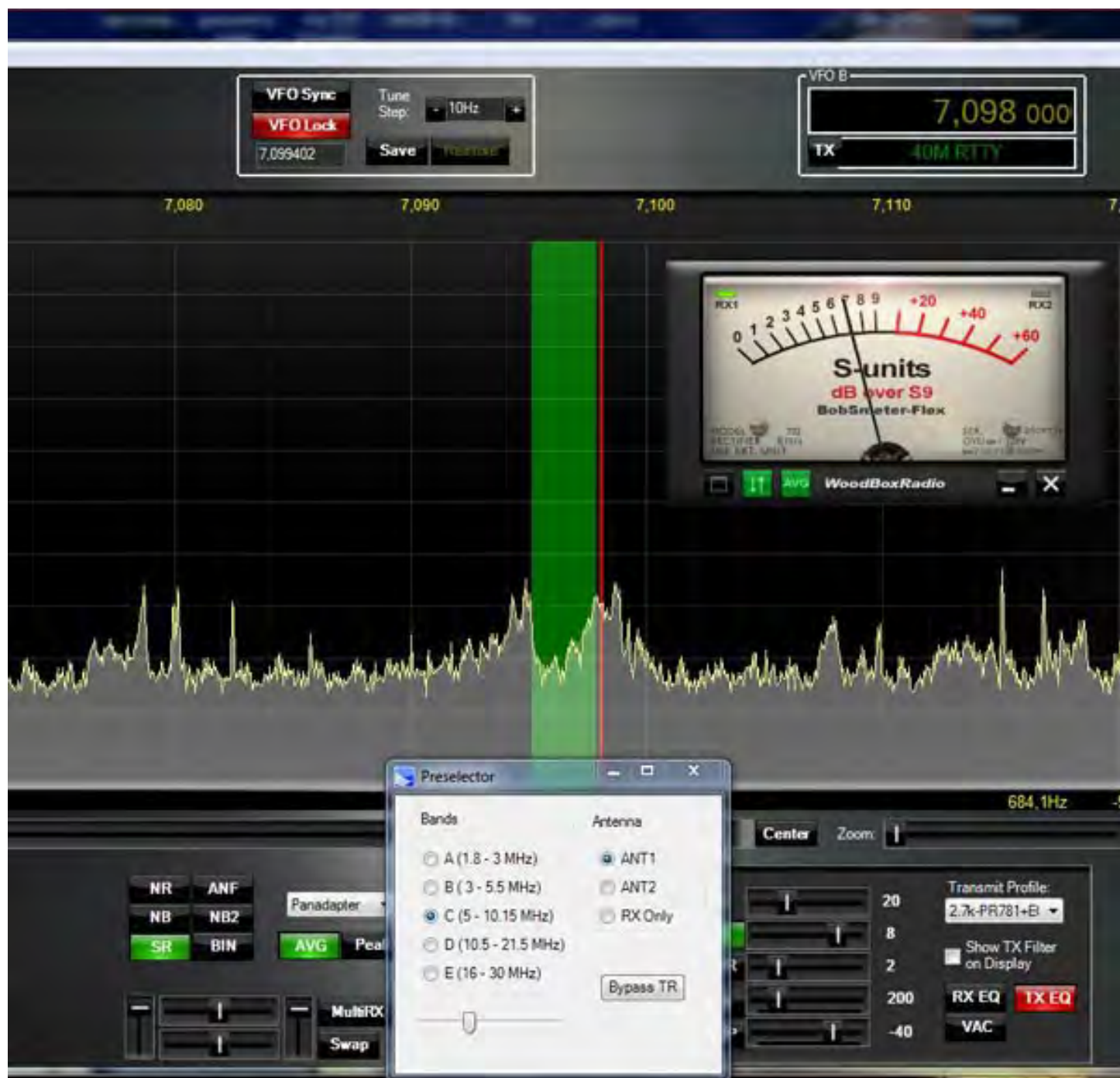
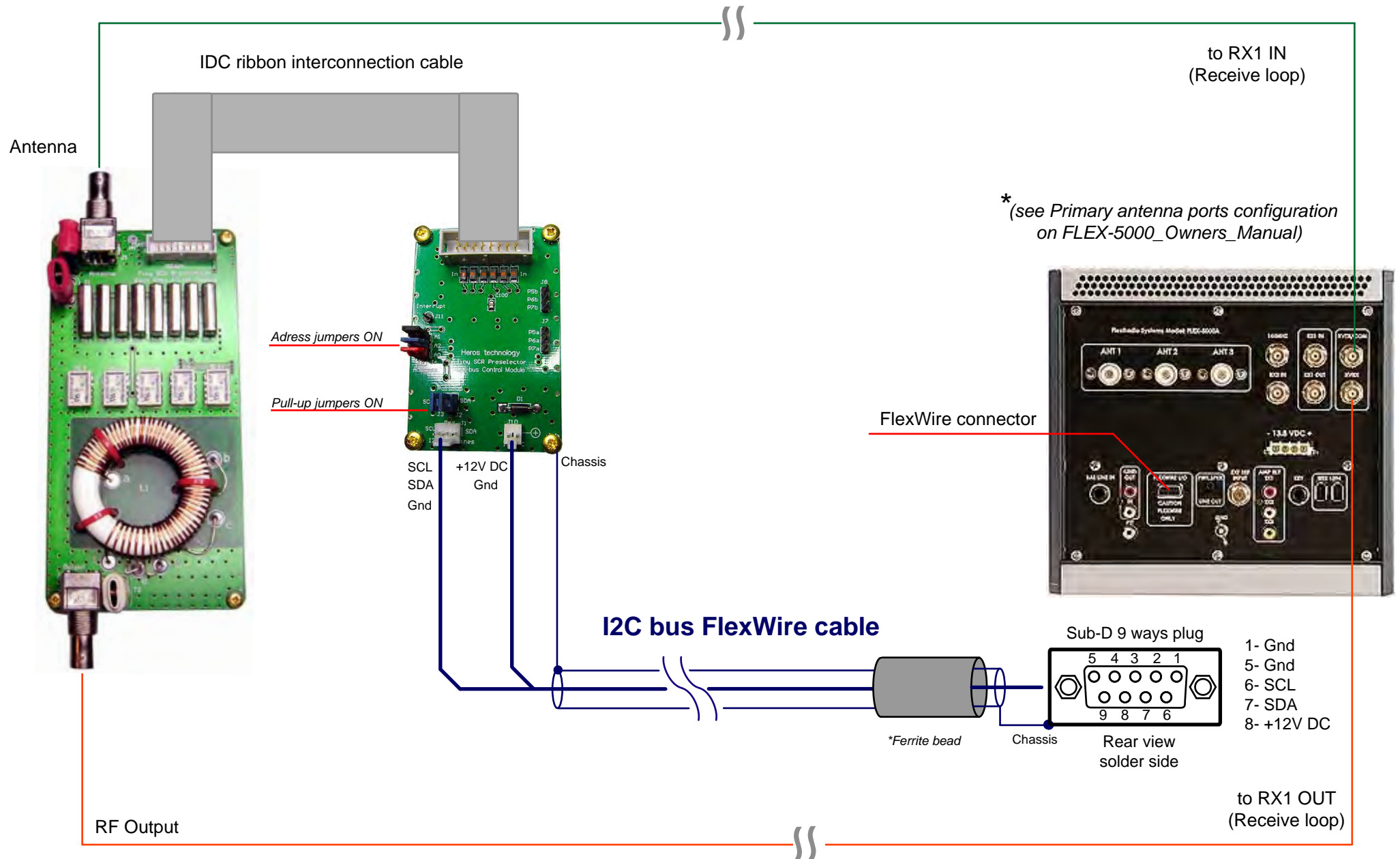Picture showing Tiny CAT SCR Preselector working in I2C mode with PowerSDR and FlexRadio .

The Preselector control window includes band switch and tune slider. Also complementary control functions for Tiny Plus-CAT SCR Preselector are included.

Notice PowerSDR do not perform tracking feature in I2C mode, only manual control of the preselector.

In order to track the preselector from PowerSDR or other dedicated radio software the USB remote control module must be used.

CAT, TCP/IP, GUI remote control from PC connection. USB control module.

Antenna

IDC ribbon interconnection cable

12VDC/250mA max.

+

−

RF Output

Receiver antenna

to RX1 IN
(Receive loop)

IDC ribbon interconnection cable

Antenna

*(see Primary antenna ports configuration
on FLEX-5000_Owners_Manual)

Adress jumpers ON

Pull-up jumpers ON

FlexWire connector

SCL
SDA
Gnd

+12V DC
Gnd

Chassis

I2C bus FlexWire cable

Sub-D 9 ways plug

5 4 3 2 1
9 8 7 6

1- Gnd
5- Gnd
6- SCL
7- SDA
8- +12V DC

*Ferrite bead

Chassis

Rear view
solder side

RF Output

to RX1 OUT
(Receive loop)

Starting procedure using USB control module. CAT, TCP/IP, GUI operating modes.

Set-up connections according with the above diagram.

IMPORTANT: If the preselector is connected to a transceiver take precautions to prevent transmitting through it.

Failing to do so may result in catastrophic damage of your preselector and/or radio and computer.

An Input/Output by-pass dual power relay accessory is available to by-pass the preselector in transmission.

Power Up.

Copy the contents of the provided CD-ROM on your computer, do not execute from CD-ROM.
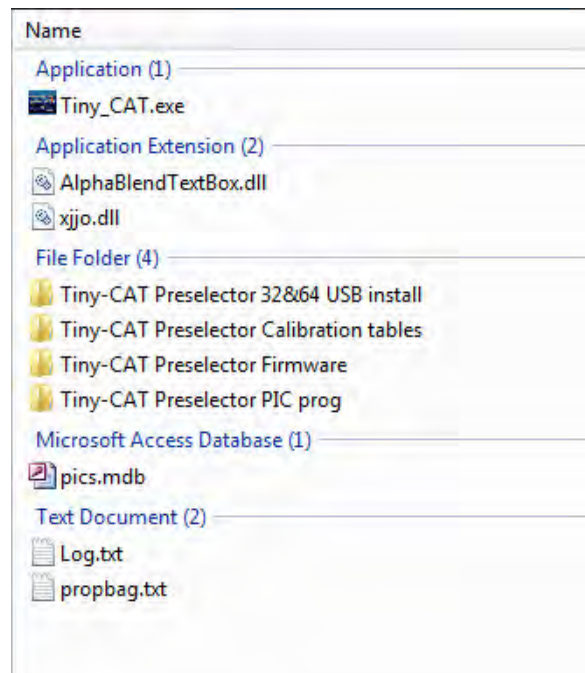
Tiny-CAT folder contents

Use a reliable external power supply providing 12 Volts/ 250mA DC. Power-on the preselector. Plug the USB cable from PC to the USB connector on control module.

Now the preselector is ready to be remotely operated via CAT from dedicated radio software, from GUI or TCP/IP modes.

Graphic User Interface (GUI) mode operation.

NOTE: *The preselector GUI application must be closed before interface with any CAT remote control software.*

Open the "tiny-CAT.exe" application located in the Tiny-CAT Preselector folder; a pop-up window will emerge indicating the USB connection status. By default the preselector application switchs to Band A on power-on.
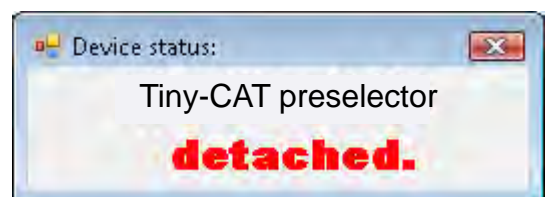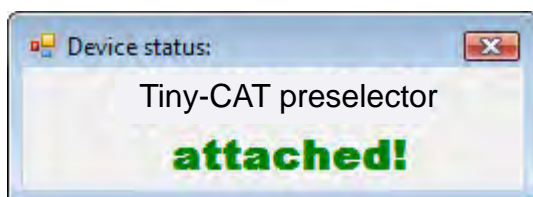
Control and modes of operation available to the operator are itemised below.

Power Down.

Close all open related applications before power down the preselector.

Control console. Graphic User Interface.(GUI)

The control console application provides manual remote control from PC and a set of options.

The preselector GUI application must be closed before interface the preselector with any dedicated radio software.

It runs on PC under Windows 2K, XP, Vista and Windows 7 (32 & 64 bits) OS. It is an executable and does not need to be installed.
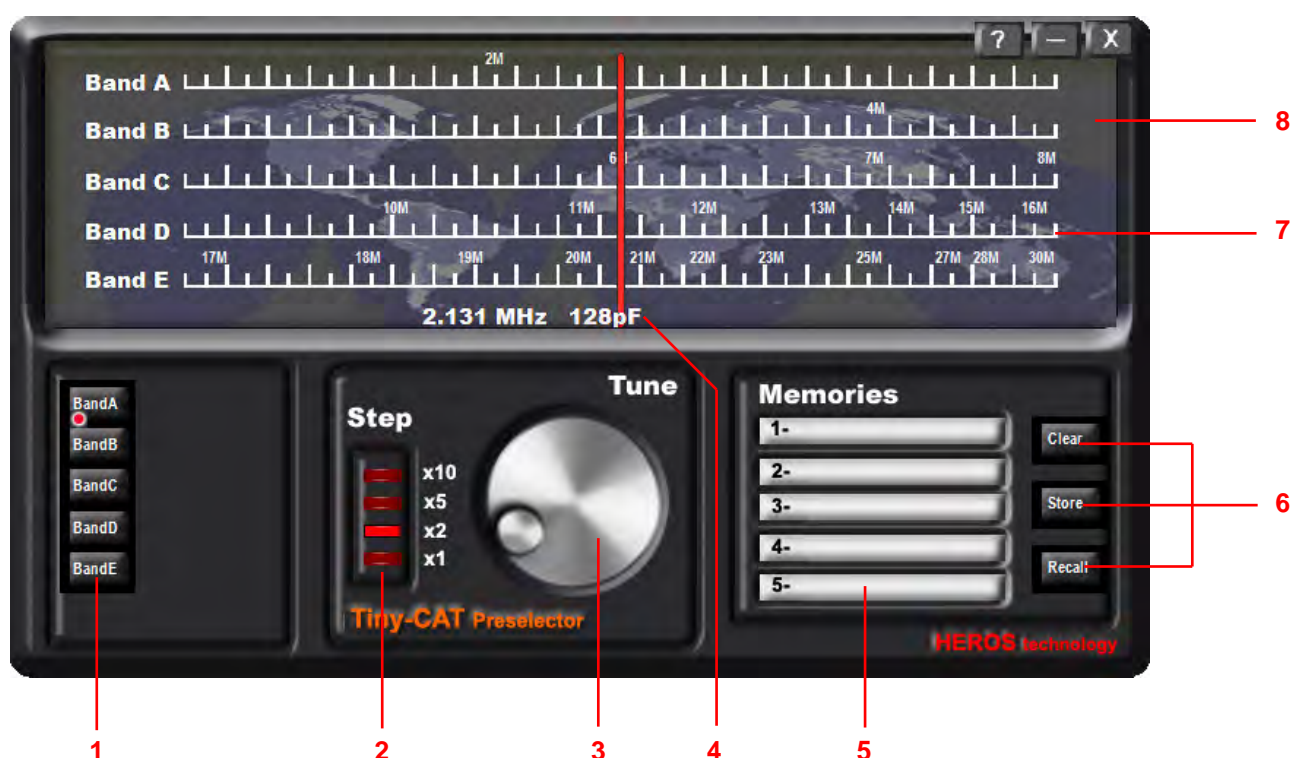
1- **Band selection.**
Click over band push-button to change band.

2- **Tuning step.** x1, x2, x5, x10

3- **Tuning knob.**
Performs tuning rolling the mouse wheel. Also by pressing left or right arrows on the keyboard. Adjust to maximum signal or background noise.

4- **Tune Reference Dial.** Displays the actual tuned frequency and the corresponding capacitor value. Notice the attenuation of the pass band filters increases with less capacity due to the response of series tuned circuits.

5 **Mnemonic text box**. A brief caption can be written in the text boxes. Five memories for each band can be stored, twenty-five in total. On band change memories and captions are updated.

6- **Memory management.**

7- **Frequency scale.** Frequency references on the scale are updated in accordance with the calibration tables.

8- Context menu.
Right mouse button click on dial or function key F2

A set of options are available to the user as follows:

Set Frequency...	F3
Write calibration tables...	F5
Logfile...	F6
Firmware update...	F7
Remote Client...	F8
Remote Server...	F9
Send CAT command...	F10

Set Frequency. Function key F3
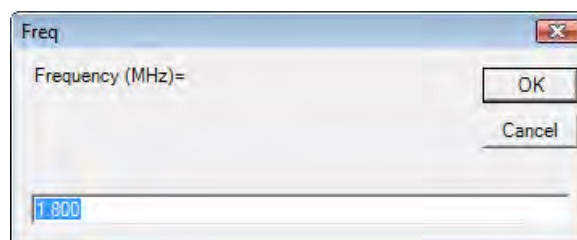
Enter any valid frequency expressed in MHz.

Write calibration tables. modes. Function key F5

IMPORTANT: Keep safe a back-up of the calibration tables.

Calibration tables are needed by the microcontroller on board to translate frequency CAT commands into tune capacity values.

Tiny-CAT Preselector comes calibrated from factory. Whenever the user can do recalibration with the aid of the calibration tables for each band.

The Tiny-CAT Preselector program folder contains five documents so-called

table_BAND_A.txt

table_BAND_B.txt

table_BAND_C.txt

table_BAND_D.txt

table_BAND_E.txt

The tables link the operating frequency with the tuning capacity value, comprised between 0 and 255. That value can be read on Tune Reference Dial (4)

The column on the left is the capacity value, on the right the frequency related in MHz.

With the aid of a reference frequency or receiver, values in the calibration tables can be modified. *Up to 64 reference points* can be added to the list. Intermediate values in the table are computed by the microcontroller on board.

To calibrate, tune the preselector at maximum reference frequency or background noise on your receiver; enter in the table the capacity value shown in the Tune Reference Dial (4) and the reference frequency from your RF generator or receiver dial. Frequency must be expressed in MHz.

Next, calibration tables must be uploaded into the microcontroller; function key "F5" opens the message box.

table_BAND_A.txt - Notepad	
255	1.768
245	1.799
235	1.822
225	1.853
215	1.883
205	1.914
195	1.952
185	1.998
175	2.037
165	2.075
155	2.121
145	2.167
135	2.221
125	2.282
115	2.343
105	2.405
95	2.474
85	2.550
75	2.623
65	2.711
55	2.857
45	2.957

Calibration table
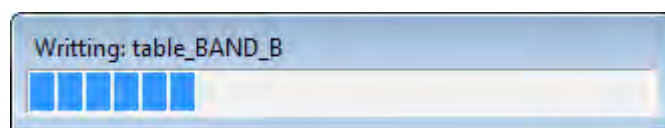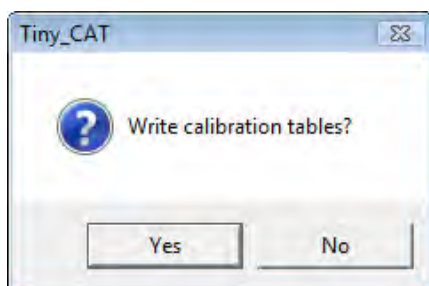
Uploading calibration tables.

Write tables succeeded.

If tables contain a syntax error a warning message is show.

Found error for frequency in line 22 in table_BAND_A.txt: 2.892
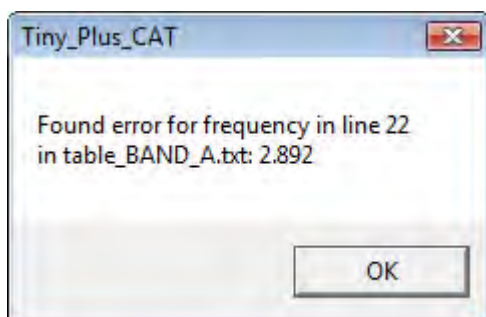
After upload resume normally.

Logfile viewer

Logfile. Function key F6

A Logfile is generated each time that the Tiny-CAT application is opened. It is helpfull to diagnosis purposes.
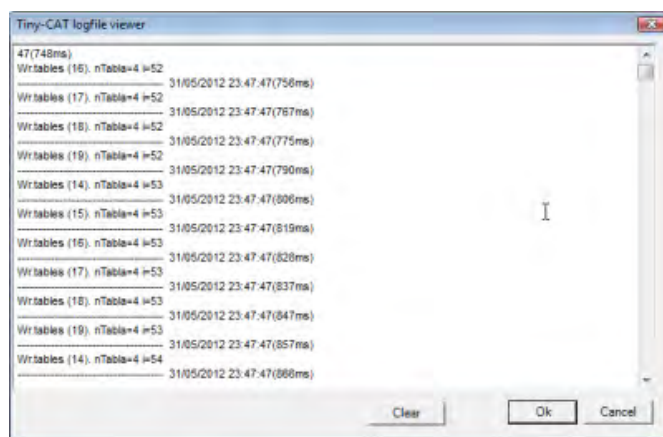
Function key "F6" opens the Logfile.

Also the file can be found in the Tiny-CAT Preselector folder.
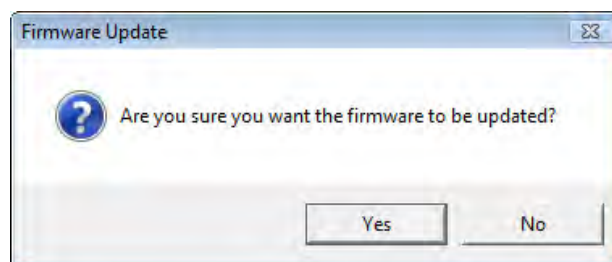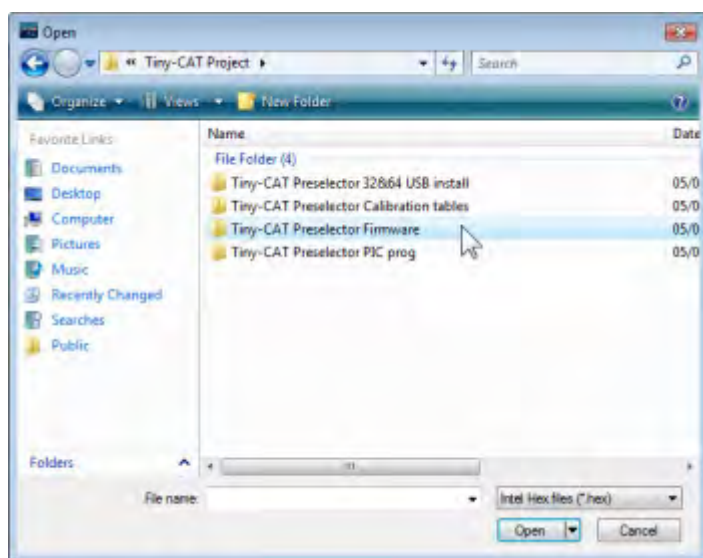
Firmware update. Function key F7

To update the on board microcontroller firmware, Function key "F7" pops-up the dialog window.

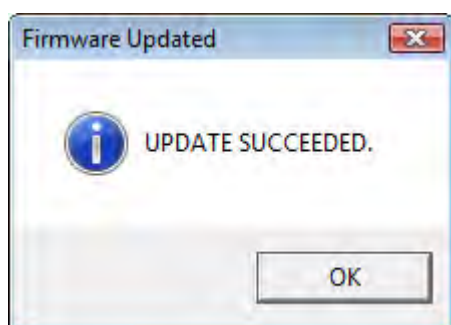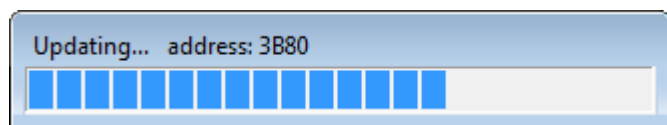Select Tiny-CAT_ firmware.hex file, located in Tiny-CAT Preselector folder.

WARNING! Do not stop the process, wait until finished.

Updating Firmware

After updated resume normally.
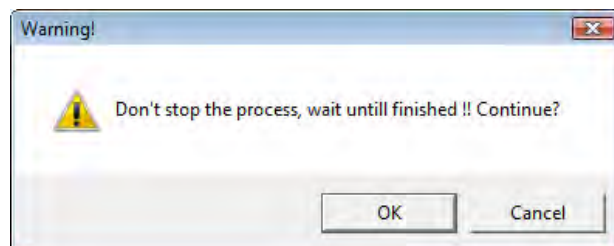
Internet/Local network remote control.

The Tiny-CAT preselector supports connections via the Internet and Local network.To make use of this feature execute the application on your computer and on a remote one.The protocol only uses TCP/IP; UDP which by definition is unreliable is not used.

Remember that you are accepting incoming TCP/IP connections so you must configure your firewall on your PC and on external hardware firewall. See details below.

Remote server (preselector side) Function key F9.

To start the communication open first the Remote Server, Function key "F9".
The connection console is displayed showing the address in dotted format of the computer where the server is running and the port number, default port 51000.
Click on Start button. If the connection is successful you will start to receive commands from the client computer, current commands are traced on the console. Tiny-CAT preselector will respond in accordace with valid CAT commands.
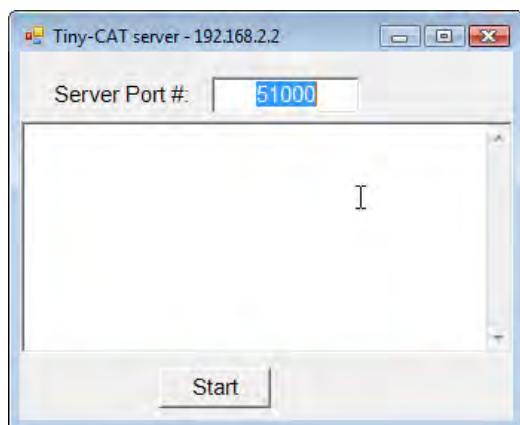
Remote Server console   *Receiving data from the Remote Client*
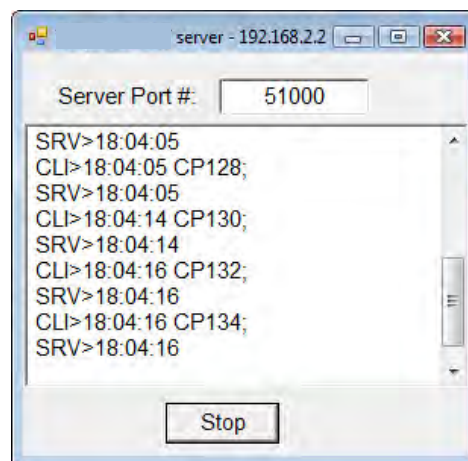
Remote Client (remote control side) Function key F8.

To connect to the server make sure the server side is started and is listening. Open the Remote Client, Function key "F8".

The connection console is displayed showing the default address in dotted format of the host computer and the port number, default port 51000. Enter the Host IP address in the text window and start operating the Tiny CAT preselector GUI application. Executed commands on the GUI are traced on the console. Also valid CAT commands can be send from the text box.
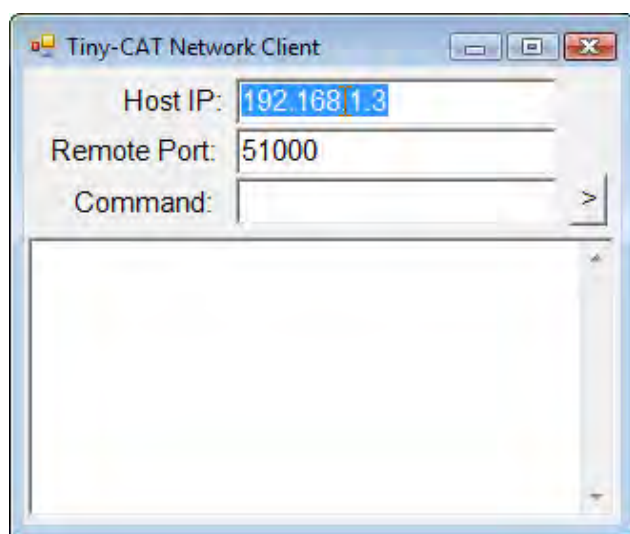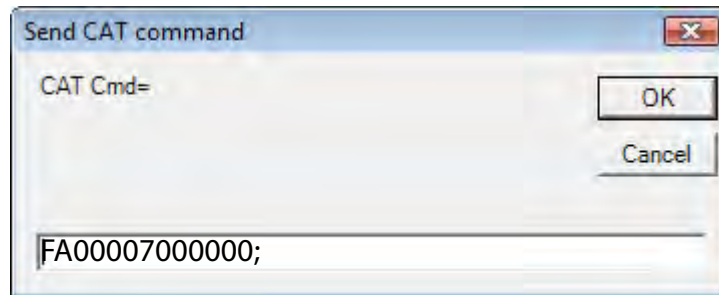
Remote Client console
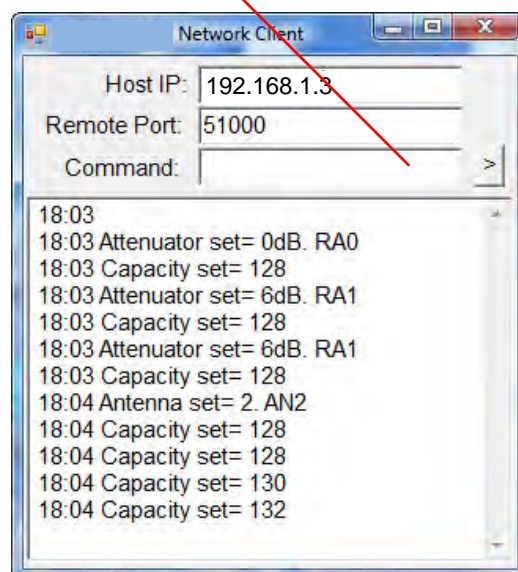
Sending data to the Remote Server

Send CAT command. Function key F10

Let send valid CAT commands for testing purposes.

Network Configuration

Public IP Address.

To make your Tiny-CAT Remote server visible to the outside world you must have a public IP address; this is an address that is reachable on the global Internet. Some ISP's assign public addresses which may change from time-to-time; this is known as a dynamic IP address.

Firewall configuration

You must allow incoming TCP/IP connections on the port number selected in the Remote server's Console, by default this port number is 51000.

You may have more than one firewall activated on your router and Windows Firewall. If the Windows firewall is enabled then when you start the Remote server for the first time you will see a popup window as below (from Windows Vista)
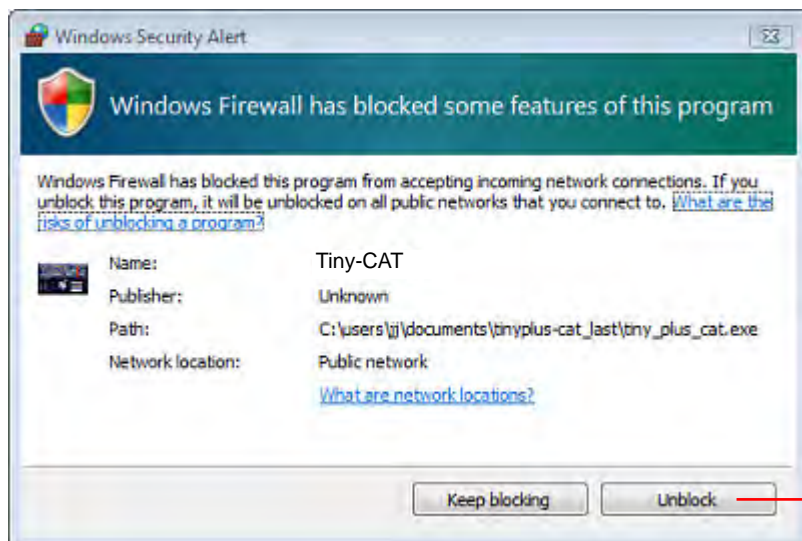
Unblock

Windows Firewall
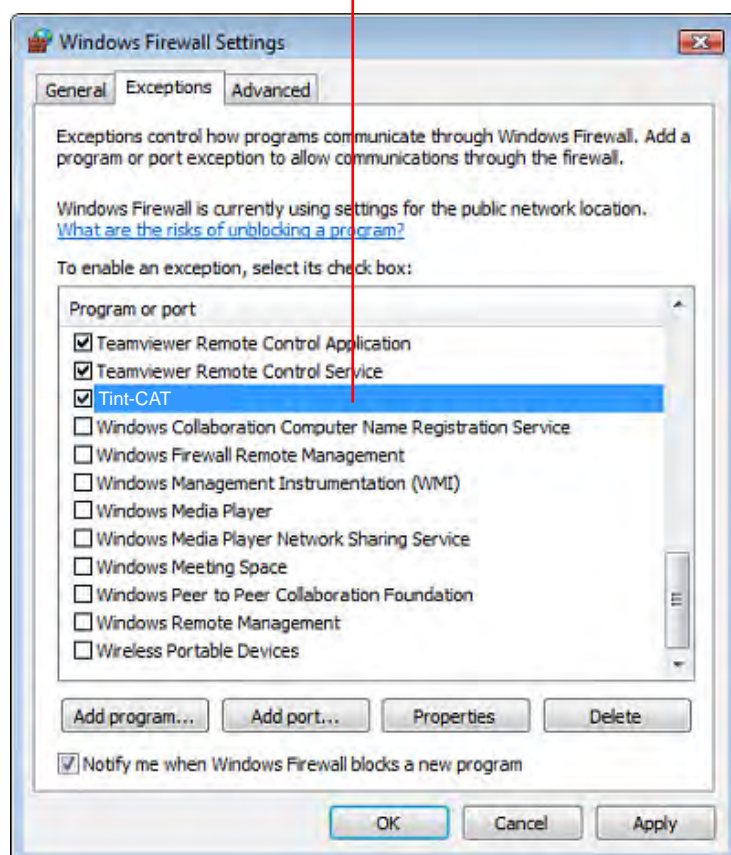
Anti-virus.

Make sure you do not have anti-virus software inspecting and/or blocking TCP/IP traffic on the server port.

Port Forwarding

As well as allowing incoming TCP/IP connections on port 51000 you must route connections on this port to the computer where the server is running, this is known as Port Forwarding.
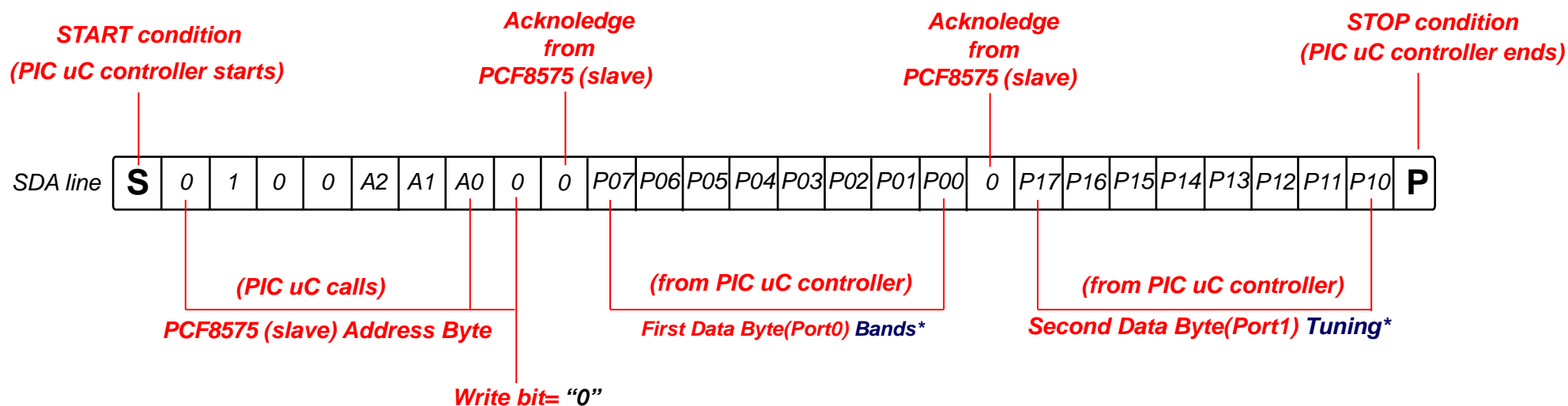
Depending on your router configuration software this may be referred to as Firewall> Virtual Servers, Port Forwarding, Forwarding - Virtual Servers,etc.

The screenshot below is from a Belkin router.

I2C Bus remote control software implementation

Write sequence.Two 8 bits data Bytes.

START condition
(PIC uC controller starts)

Acknoledge from PCF8575 (slave)

Acknoledge from PCF8575 (slave)

STOP condition
(PIC uC controller ends)

SDA line | S | 0 | 1 | 0 | 0 | A2 | A1 | A0 | 0 | 0 | P07 | P06 | P05 | P04 | P03 | P02 | P01 | P00 | 0 | P17 | P16 | P15 | P14 | P13 | P12 | P11 | P10 | P

(PIC uC calls)

PCF8575 (slave) Address Byte

(from PIC uC controller)

First Data Byte(Port0) Bands*

(from PIC uC controller)

Second Data Byte(Port1) Tuning*

Write bit= "0"

First data byte

bit	Relay	Action
P00	RL11	Band C
P01	RL10	Band B
P02	RL12	Band D
P03	RL13	Band E
P04	RL9	Band A
P05	NC	
P06	NC	
P07	NC	

Second data byte

P10	RL8	Cap 128pF
P11	RL7	Cap 64pF
P12	RL6	Cap 32pF
P13	RL5	Cap 16pF
P14	RL4	Cap 8 pF
P15	RL3	Cap 4pF
P16	RL2	Cap 2pF
P17	RL1	Cap 1pF

Band A- P04 - Set ——— (Default on Power Up)
Band B- P04, P01 - Set
Band C- P04, P01, P00 - Set
Band D- P04, P01, P00, P02 - Set
Band E- P04, P01, P00, P02, P03 - Set

I2C default hardware address A0-A1-A2 = 0-0-0

(FlexRadio default)

I2C bus controller on I2C control module.

INT	Vdd
A1	SDA
A2	SCL
P00	A0
P01	P17
P02	P16
P03	P15
P04	P14
P05	P13
P06	P12
P07	P11
Vss	P10
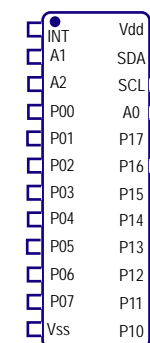
PCF 8575DW
I2C Address format
0100 A2 A1 A0

A0,A1,A2 address bits set by hardware

CAT remote control. Kenwood TS-2000 compatible.

CAT (Computer Aided Transceiver), serial data communication protocol over Virtual Com Port (VCP) enables Tiny-CAT preselector to provide the user with a way to interface with several radios. The user can operate from remote control software such as Power SDR, DDUtil, HamRadio de Luxe, SDR Console, HDSDR, SDRMAX, etc., radio Logging programs, N1MM and others, CAT utilities like CSP Manager, OmniRig and SDRMAX-CAT Connection among others.
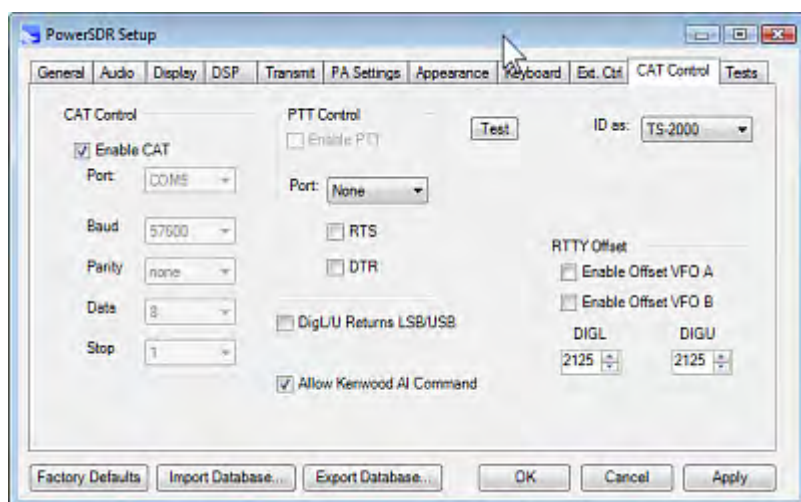
Refer to your specific software application manual about CAT operation.

The microcontroller on board translate valid CAT commands and responds in accordace.

Starting in CAT remote control mode.

NOTE: The preselector GUI application must be closed before interface with any remote control software.
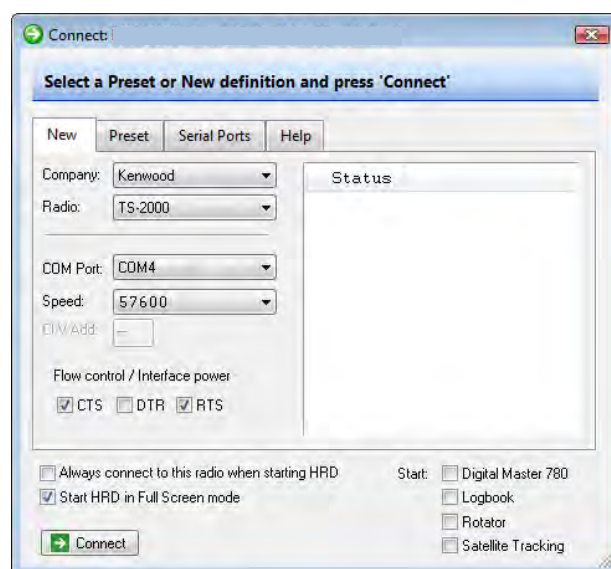
Power-On the preselector and plug the USB cable, a new virtual COM port is open; start and configure your application to control remotely the preselector.

Tiny-CAT Virtual Com Port


Conexion console on PowerSDR

Conexion console on HamRadio Deluxe

CAT control commands list *(Kenwood 2000 compatible)*

CAT CONTROL COMMANDS. General information.

A CAT control command is composed of an alphabetical command, parameter, and the terminator that signals the end of the control command.

EXAMPLE: Command to set tune frequency to 14.250 MHz

Alphabetic command (prefix)　　*Parameter(11 digits)*　　*Terminator (semicolon)*

FA00014250000;
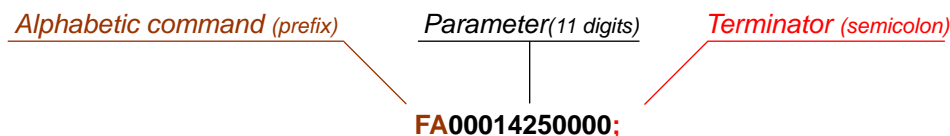
There are three command categories: Set (write) command that change preselector status, Get (read) command that request status information from the preselector and Answer (response) command that return information requested in a Get command.

A correctly executed Set command does not return an Answer command.

The terminator for all CAT commands is the semicolon (;). CAT commands are not case sensitive. Get and Set commands must contain the correct number of parameter characters as shown below. Get commands are simply the prefix followed by a termination.

Tiny-CAT preselector. Available CAT commands. Notice that several implemented CAT commands are not used.

Band commands: *prefix BNx (x band number, 1 digit ;). SET commands*

BN0;	*By-Pass*
BN1;	*Band A*
BN2;	*Band B*
BN3;	*Band C*
BN4;	*Band D*
BN5;	*Band E*
BU;	Band-up
ZZBU	(PowerSDR)
BD;	Band-down
ZZBD;	(PowerSDR)
BN;	*(answer: BNx; where x is the band number) request information about Band status. GET command.*

Frequency commands: prefix *FA (band number, 11 digit ;). frequency in Hz. SET commands.*

FA000xxxxxxxx;	*(e.g. 3.8MHz FA00003800000, e.g. 21.315MHz FA00021315000*
ZZFA;	*(PowerSDR)*
FA;	*(answer FA000xxxxxxxx;) request information about frequency status. GET command.*

Antenna commands: *prefix ANx (x antenna number, 1 digit ;). SET commands.*

AN1;	antenna 1.
AN2;	antenna 2
AN;	*(answer ANx; where x is the antenna number) request information about antenna status. GET command.*

Attenuator commands: *prefix RAxx (xx attenuator number, 2 digit ;). SET commands.*

|	
RA00;	*attenuator 0dB*
RA06; or RA01;	*attenuator 6dB*
RA12; or RA02;	*attenuator 12dB*
RA18; or RA03;	*attenuator 18dB*
RA;	*(answer RAxx; where xx is the attenuator value) request information about attenuator status. GET command.*

Tune capacity commands: *(non standard Kenwood) prefix CPxxx (xxx capacity value (pF.), 3 digit ;). SET commands.*

|	
CPxxx;	*(e.g. CP210; sey capacity to 210pF, e.g. CP009; set capacity to 9pF).*
CP;	*(answer CPxxx; where xxx is the capacity value in pF.) request information about tune capacity status. GET command.*

Virtual Com Port (USB) software installation. 32-64 bits OS.

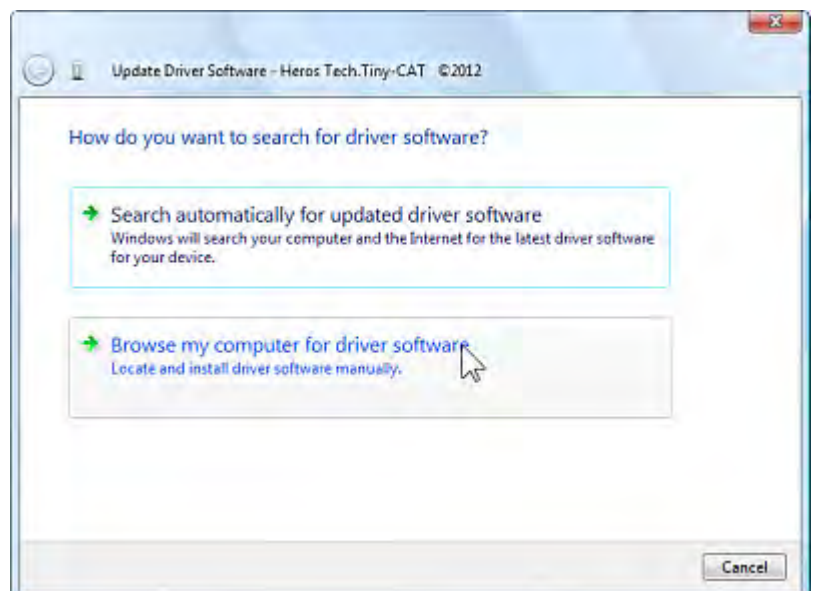When plug to the USB port for the first time the system will ask for install the driver software.

- Ignore the "Found New Hardware" window and go to "Device Manager"; path: Control Panel/System/Device Manager`.
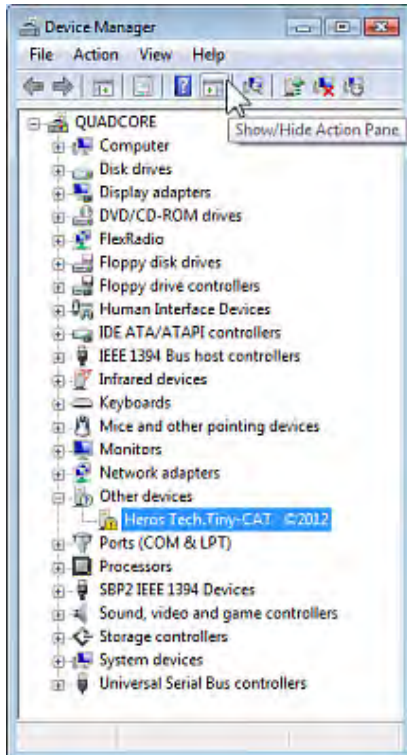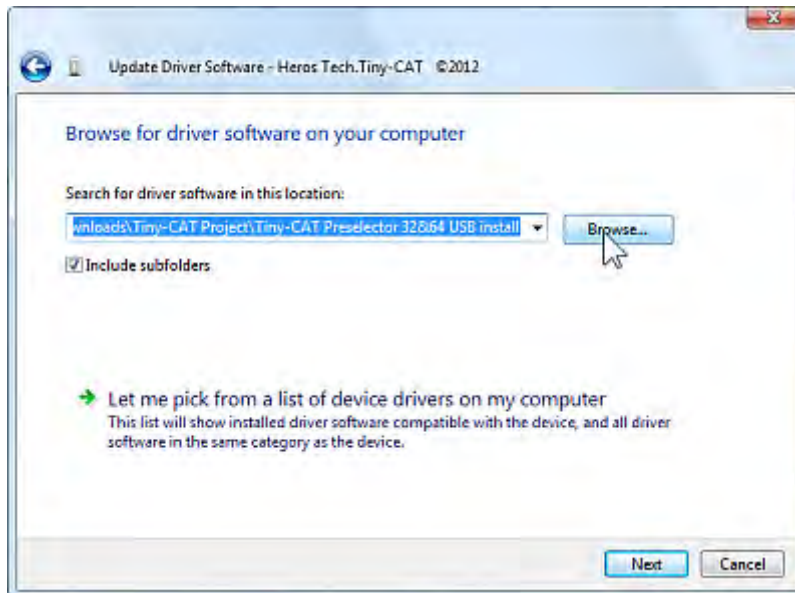

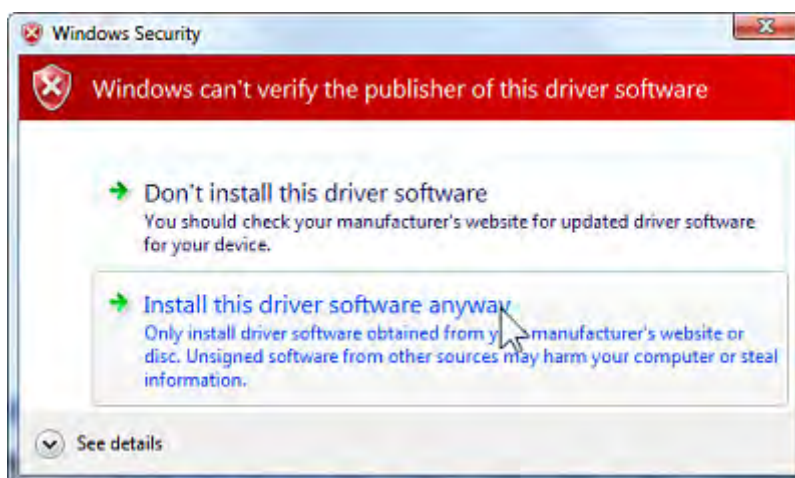- Rigth mouse button on "Heros Tech Tiny-CAT 2012" and click on " Update Driver Software"
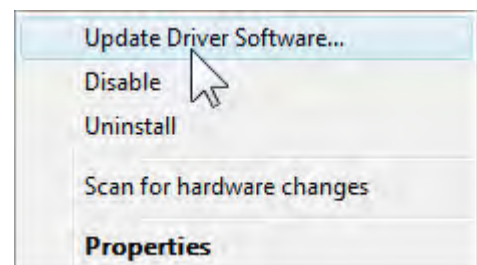
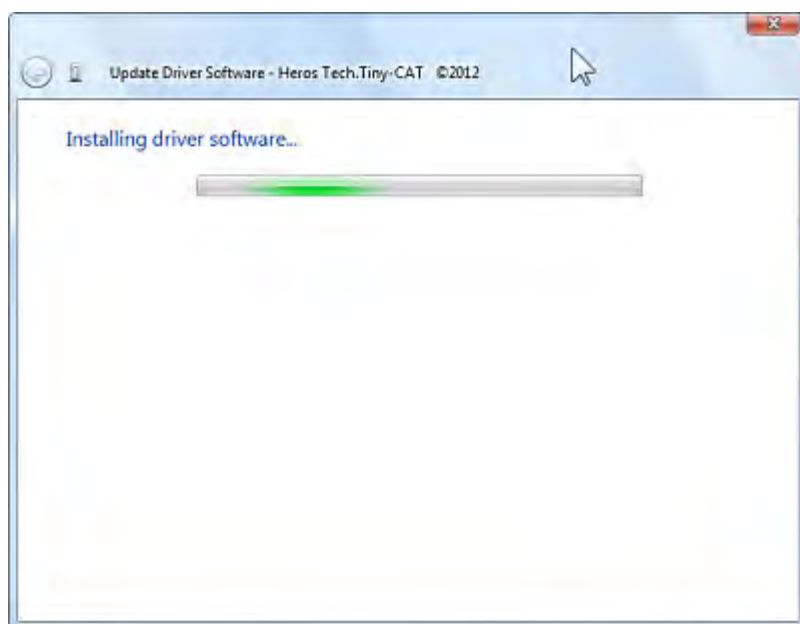
- Click on "Browse my computer for driver software"

Locate "Tiny-CAT SCR Preselector.inf" file in Tiny-CAT preselector folder and click "Next" button.
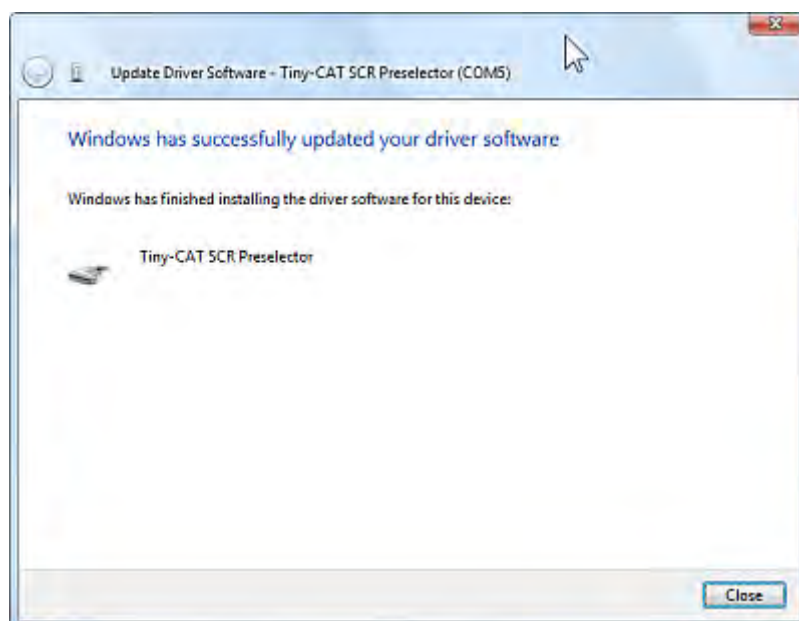

Click on "Install this driver software anyway.

Installing driver software

Driver succesfully installed
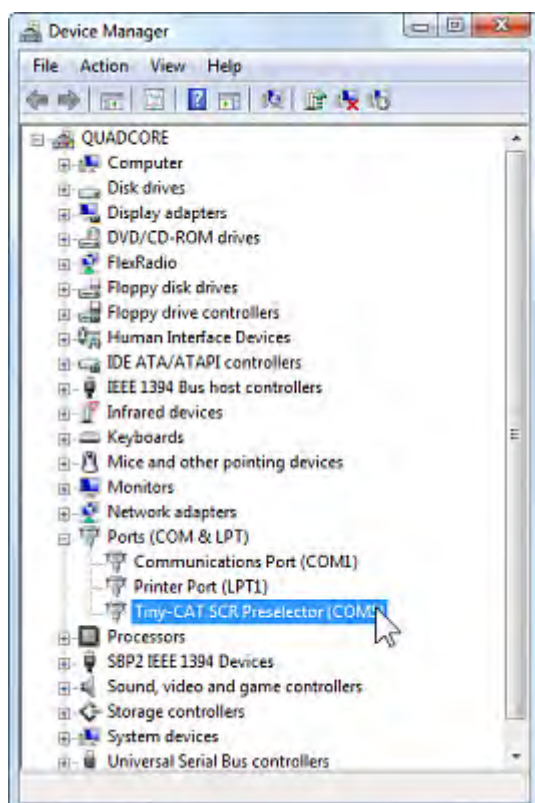
A Virtual Com Port has been created over the USB port

![HEROS technology Ltd — general electronics]

Tiny-CAT Preselector options.

Boxed USB version.

The tiny SCR Preselector, boxed USB version ready to use with optional enclosure.

The tiny SCR Preselector should be preferably enclosed in a RF tight box due the antenna effect of its large coil that easily gathers nearby signals or noise.

The follwing pictures show the tiny SCR preselector assembled on metallic enclosure from Hammond model 1455T1601.

Dimensions are: 160mm X 160mm X 51mm. (6.29 x 6.29 x 2 inch)

Tiny-CAT Preselector options.
Boxed I2C bus version.

The tiny SCR Preselector, boxed I2C bus version ready to use with optional enclosure.

The tiny SCR Preselector should be preferably encloused in a RF tight box due the antenna effect of its large coil that easily gathers nearby signals or noise.

The follwing pictures show the tiny SCR preselector assembled on metallic enclosure from Hammond model 1455T1601.

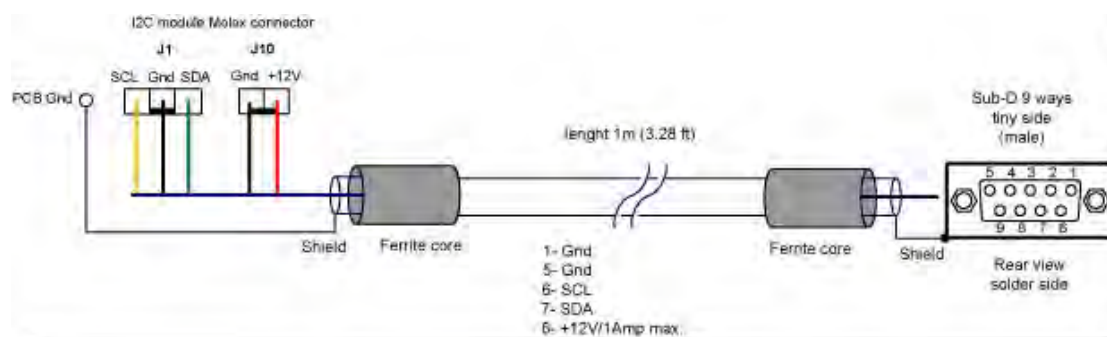Dimensions are: 160mm X 160mm X 51mm. (6.29 x 6.29 x 2 inch)

Accessories

Tiny SCR Preselector - Flexwire I2C bus interconnection cables (Shielded, EMI protection)
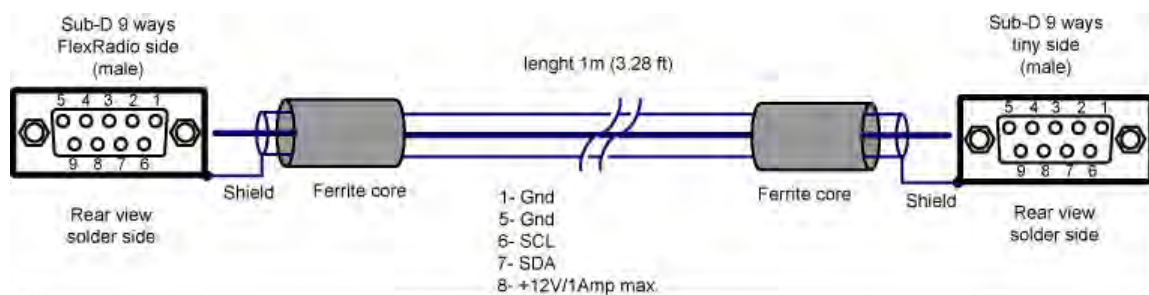
Flexwire I2C bus boxed interconnection cable.

Flexwire I2C bus module interconnection cable.

USB Galvanic Digital Isolator for SDR radios

The USB Galvanic Digital Isolator for SDR radios is designed to break the galvanic connection between USB host PC and the attached SDR radio peripheral avoiding that whatever power and ground noise from the PC side do not influence the sensible radio on the other side.

The resultant galvanic isolation improves common-mode voltage, prevents ground loops, a common cause of interference and data distortion issues, improves reception, as the noise floor in the receiver is lowered, and removes spikes and birdies on the PC panoramic screen. In addition provides isolation of 1000V AC between the host PC and the radio peripheral that guard against surges that may come from the antenna connected to the receiver.

The USB Galvanic Digital Isolator for SDR radios is based on ADuM 4160 Full/Low Speed 5 kV USB Digital Isolator and ADuM 5000 Isolated DC-to-DC Converter both from Analog Devices combining high speed CMOS and chip-scale air transformer iCoupler technology.

The USB Galvanic Digital Isolator complies with specifications USB 1.1, Low speed (1.5Mbit/s) and USB 2.0 Full Speed (12Mbit/s). The speed mode is set manually via two jumpers inside (default full speed). Most of the time it is not necessary change between modes but if automatic speed detection is desired, an external hub can be connected to the peripheral side configured for full speed.

The USB Galvanic Digital Isolator is self powered from the host PC through the USB cable. An embedded DC/DC converter provides a galvanic isolated voltage of 5VDC/100mA to the peripheral side. It includes additionally ESD, EMC protection of the data lines and power transient short-circuit guard.

It is highly advisable not to power any part of the connected radio from the USB bus, instead an external dedicated power supply must be used.

The USB Galvanic Digital Isolator behaves like an USB cable, no USB drivers are needed. It works on all operating systems, Mac, Windows, Linux, etc.

Features:

Isolation 1.000 Volts AC

Protection: EMC, ESD, Overvoltage Surge, Short-circuits.

Power supply:

- PC side: From USB cable, 5VDC. Attached signalling LED.

- Drawn power from peripheral radio max: Through USB cable, 5V DC/100mA.

USB modes: Full speed (12 MBit/S) Low speed (1.5 MBit/S). Switchable.

Standard socket connectors: PC side: USB type B, peripheral side: USB type A.

Dimensions 67 mm x 66 mm x 28 mm. (2.638x2.598x 1.102inch)

USB2 pair of cables included

Accessories

Input/Output ports by-pass dual power relay

Let by-pass the Input and Output RF ports of devices such as Preselectors, Amplifiers, Filters,etc.
Typical applications are:
- Inserting in line between the antenna and transceiver a preselector, preamplifier or filter device to be by- passed on transmission.
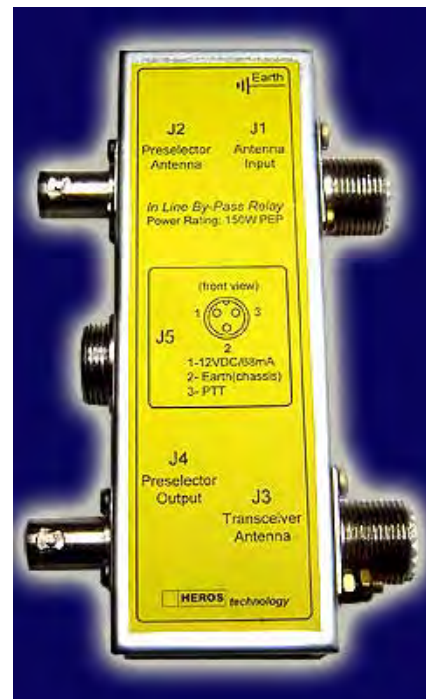- Switching antennas or RF signals.
A control line permits switch ON or OFF the dual relay. If the control line is connected to a transceiver, on transmission switchover, via PTT or Keying line, the Input and Output RF ports of any device in line are by-passed avoiding being overloaded.

Features:
- Specialised high performance, low insertion loss set of RF relays is used in order to keep impedances and isolation between ports.
- Frequency range: HF: 60MHz
- Insertion loss: HF: 0.2 dB
- Isolation: >100 dB
- Power rating: 150 W PP max.
- Impedance: 50 Ohm
- Diode protection.
- Power supply: 12 Volts DC/60 mA (Active state)
- Switching time:
- Set: 5mS
- Reset: 4mS
- Life expectancy (Mechanical): 20,000,000 operations (at 18,000 operations/hr)
- External Dimensions: 40x111 40x37mm.(1.57x4.37x1.45in)
- Connectors: SO-239 or N type for Antenna Input/Output; BNC for Device Input/Output.
          (N or combined connectors configurations also available. Please ask.)
- Coaxial tails and complete shielded control cable with snap-on RFI-EMI suppressor ferrite cores are included.
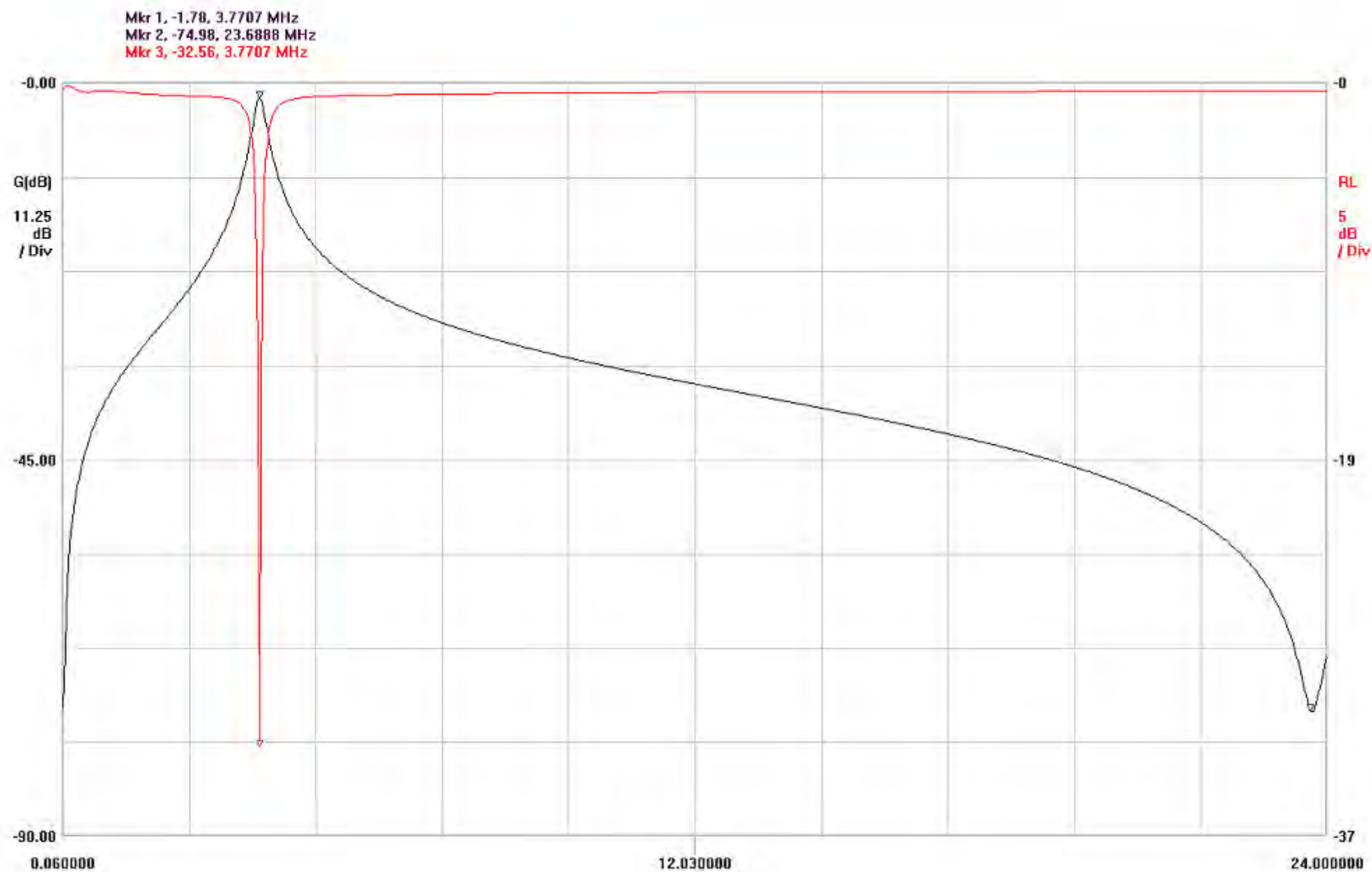
WARNING! TO AVOID DAMAGE THE UNIT
In order to give enough time to the relays to switch before the RF power signal outputs the transceiver when the PTT is pressed, assure that your transceiver provides a delayed "SEND" control line signal. Alternatively a TX/RX Sequencer can be used.
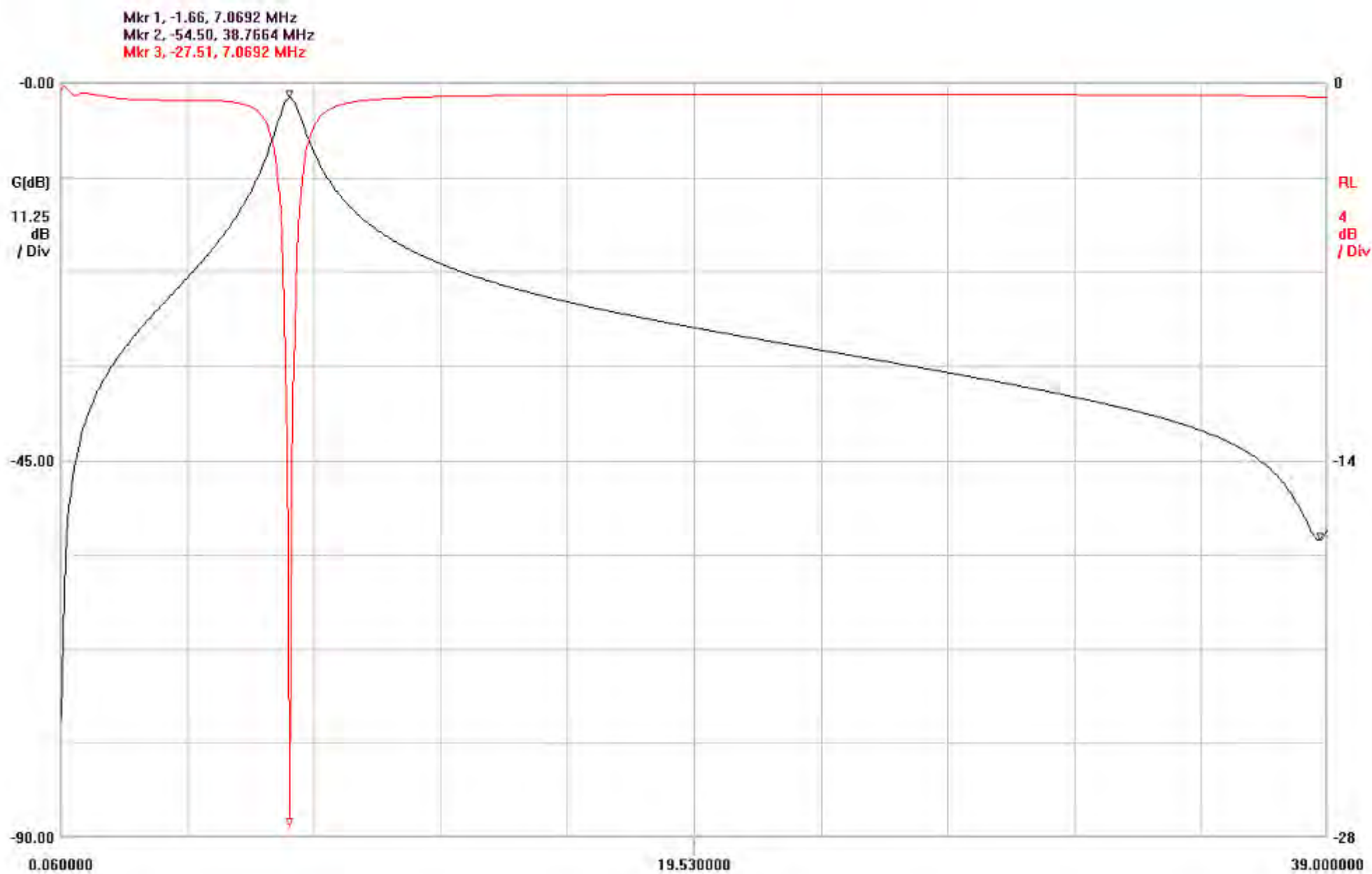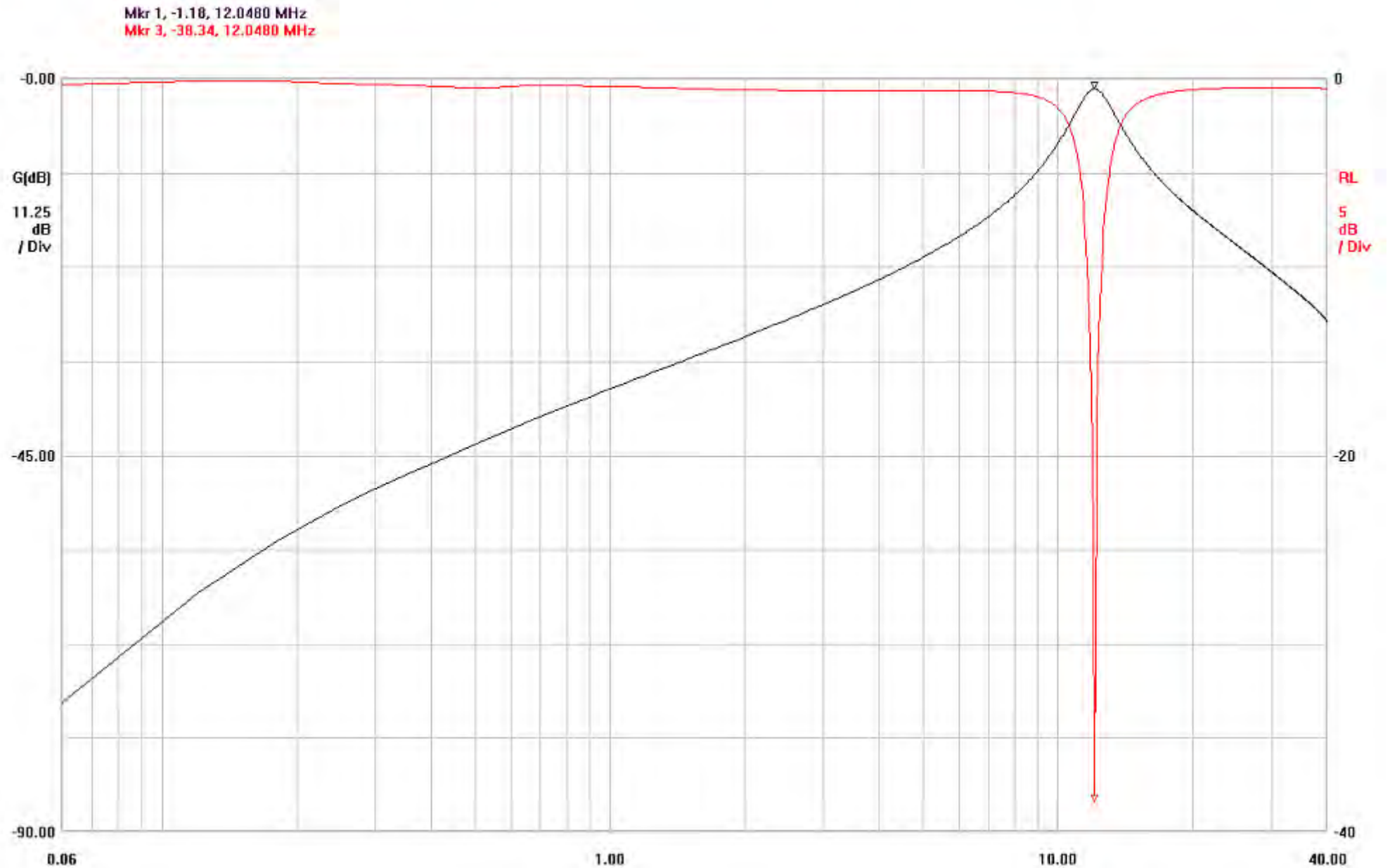
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Band A response plot.

Mkr 1, -2.17, 1.8528 MHz
Mkr 3, -35.39, 1.8528 MHz

Band B response plot.

Mkr 1, -1.78, 3.7707 MHz
Mkr 2, -74.98, 23.6888 MHz
Mkr 3, -32.56, 3.7707 MHz

Band C response plot.

Mkr 1, -1.66, 7.0692 MHz
Mkr 2, -54.50, 38.7664 MHz
Mkr 3, -27.51, 7.0692 MHz

Band D response plot.

Mkr 1, -1.18, 12.0480 MHz
Mkr 3, -38.34, 12.0480 MHz

Band E response plot.

Mkr 1, -1.16, 17.7423 MHz
Mkr 3, -46.30, 17.7423 MHz

NOTES: