

MiniTiouner-Express DVB-S/DVB-S2 Receiver / Analyzer User Guide For Windows OS

Draft 17



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NOTICE: 4/15/20 Draft 17 revision - revised LNB current limiting

A change has been made to reduce the maximum LNB current that can be sourced if using the voltage available in the antenna coax cable when LNB jumper(s) are used.

Because each inductor in the tuner has a 200ma current limit, it's necessary to lower the thermal fuse on the MiniTiouner PCB to 100ma maximum. This prevents tuner inductor burnout under short circuit conditions. Additional details in text. MiniTiouner units are identified with revision "C" on serial label.

1.0 – Product overview

The MiniTiouner-Express hardware unit is an assembled and tested DVB-S/S2 tuner receiver/analyzer in an enclosure smaller than the size of a deck of playing-cards. It is sold fully assembled and fully tested with enclosure. Together with the free MiniTioune software available from F6DZP in France, this hardware becomes a great Ham-grade DATV receiver and a powerful DATV analyzer. It will receive DVB-S and DVB-S2 digital amateur television (DATV) signals from 144 MHz to 2420 MHz using symbol rates between 70K Symbols/sec and 30M Symbols/sec.

Jean-Pierre Courjaud F6DZP has been modifying Digital-ATV receivers for DVB-S/S2 protocol with software for years - in order to allow the tuner to provide more information that hams need. The MiniTiouner-Express Receiver/Analyzer hardware unit when used with the MiniTioune software developed by Jean Pierre F6DZP is the **best** ham-grade receiver for DVB-S/S2 protocol that we know of. In addition, MiniTioune software creates an outstanding ham-radio DATV analyzer tool for the DVB-S and DVB-S2 protocol.

The MiniTiouner-Express hardware board was designed by Art WA8RMC and the PCB layout was prepared by Tom WB6P. The hardware unit connects between an antenna(s) and a PC computer USB2 port that is using a Windows 7, 8 or 10 operating system. It has two "F" female connector RF inputs to receive two signals independently, but the video is viewed one signal at a time by selecting input A or B soft switches on the MiniTioune software display. The resultant video and diagnostics are then shown on the computer monitor display.

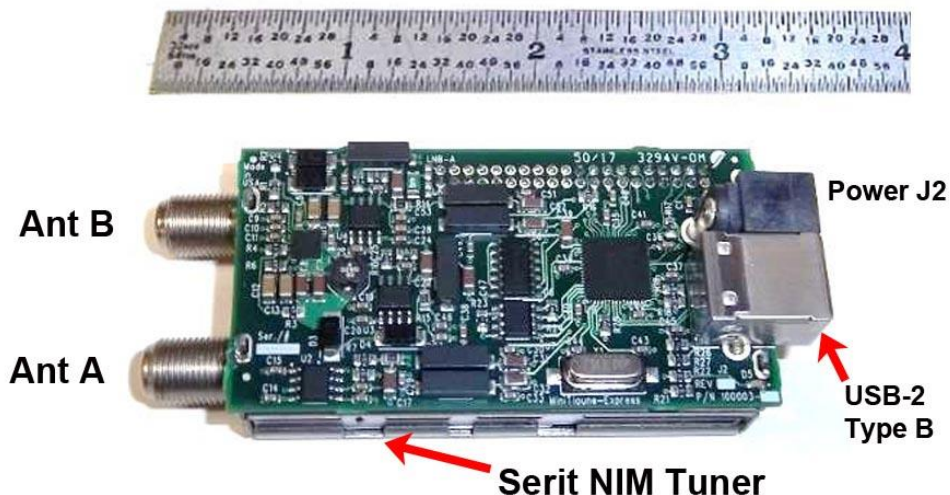


Figure 01 – Prototype using MiniTiouner-Express PCB with Serit NIM.
The NIM lies flat underneath the PCBA.

MiniTiouner-Express PCB Rev A must be powered through J2 by an external power supply (8 to 24 volts). The Rev B and later production units can use either an external power supply or powered directly from 5V using a USB-3 port on a PC. If you power directly from an external power supply, the MiniTiouner-Express PCB has provisions to source a DC voltage to either or both RF antenna connectors in order to power a preamplifier/LNB at the antenna(s). The DC voltage is sourced directly from the tuner input DC power. The LNB/preamp voltage is current limited to 500 ma (Rev B) or 100 ma (Rev C or later). Since the tuner itself will operate from an +8 to +24VDC source, the preamp/LNB voltage requirements dictate the needed tuner supply voltage. There are two solder pad selections on the hardware PCB that are NOT soldered at manufacturing time. If either or both RF connectors need to supply LNB or preamp power, the user must remove the cover held in place with hot melt glue and solder the proper jumper pads. Afterwards, the user must re-assemble the cover and again apply hot melt glue to secure it.

Figure 02 contains a basic Block Diagram of the NIM-tuner/MiniTiouner-Express board connected to a Windows PC.

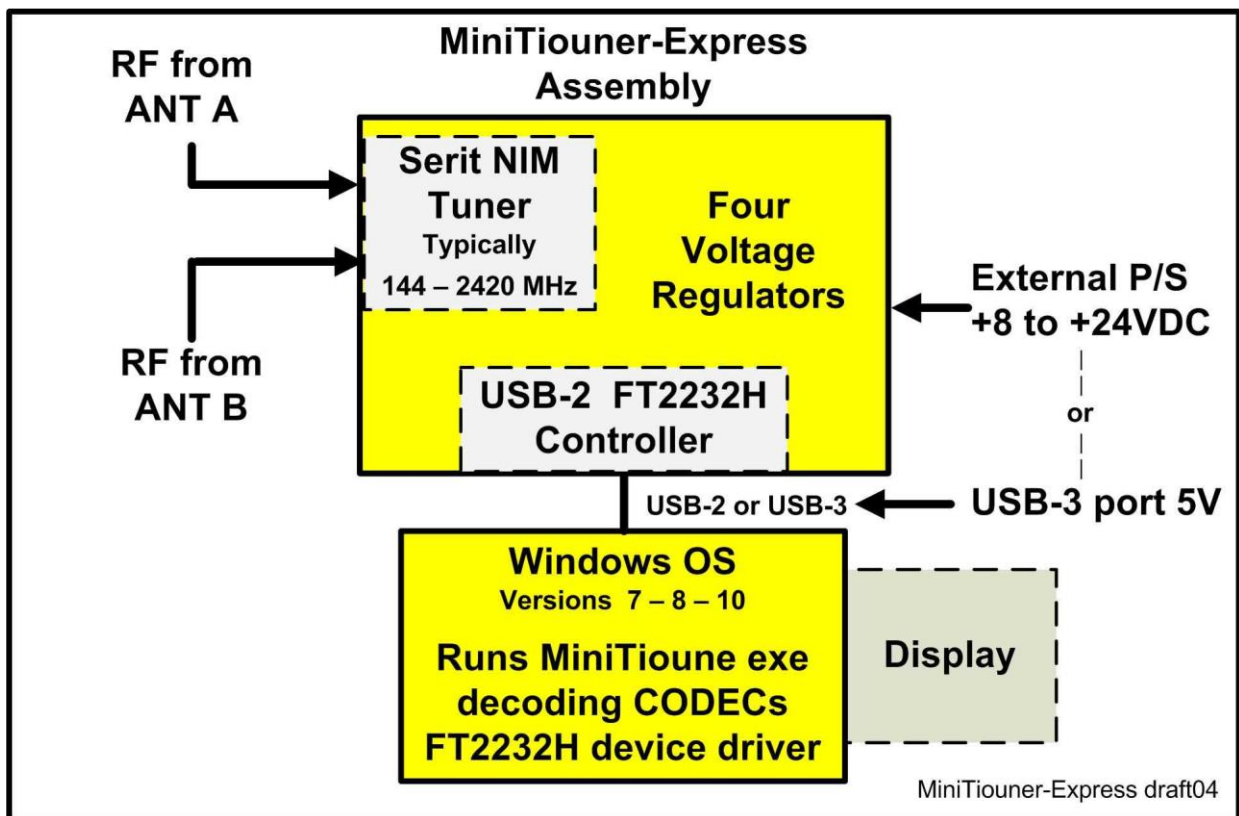


Fig 02 – Block Diagram of MiniTiouner-Express hardware set-up running MiniTioune software from F6DZP, that is connected to a PC

2.0 – MiniTioune software Feature overview

The MiniTioune software (MiniTioune v0.8s_pack.zip) is used to operate the MiniTiouner-Express hardware tuner/receiver/analyzer was created by Jean Pierre Courjaud, F6DZP in France and is now widely utilized by Hams all over the world as an excellent DVB-S and DVB-S2 receiver and diagnostic utility. Also, it is the primary software used by hams to receive the HamVideo DATV transmitter from the International Space Station. We congratulate Jean Pierre for his excellent software contribution to the advancement of DATV (Digital Amateur Television) DVB-S/S2 pioneering. His MiniTioune software program has many functions that are described in an overview manner in this Section.

For details on operating these many function and features, the user should review the details on the VivaDATV website at www.vivaDATV.com . For example:

- see <http://www.vivadatv.org/viewforum.php?f=80> (MiniTioune English section)
- see <http://www.vivadatv.org/viewtopic.php?f=60&t=521> (MiniTioune v0.8s software release)
- see <http://www.vivadatv.org/viewtopic.php?f=60&t=214> (TuTioune – English section)

2.1 The MiniTioune Receiver

The MiniTiouner-Express hardware running MiniTioune software makes a great DVB-S and DVB-S2 receiver. Running on Windows PC, the receiver can tune directly from 144 MHz to 2420 MHz without any up-converters or down-converters. Ken W6HHC reports that the MiniTioune is his favorite DVB-S/S2 receiver...so easy to use compared to commercial Set-Top-Box receivers!! No “blind scans”. Just set the frequency and the SymbolRate to the desired values. **Figure 03** shows the uncluttered video display on your Windows PC.



Fig 03 - The MiniTioune software is shown in receiver-mode for DVB-S. The Measurement-Panel at bottom can also be removed.

2.2 The MiniTioune Analyzer

The MiniTioune software is also a Ham-radio analyzer tool for DVB-S protocol and for DVB-S2 protocol. As Jean-Pierre F6DZP clearly explains: **“On commercial receivers the DATV video is either good or missing...perhaps only with a signal strength reading to guide you. With MiniTioune, digital transmissions are not really ‘all or nothing’. In between there are many things that can happen; it’s important to be able to observe and define the various stages.”**

The MiniTioune software as an analyzer can be switched into the “expert-mode” to:

- measure signal strength directly in –dBm units
- look at encountered FEC error rates,
- measure MER (Modulation Error Rate)
- visualize noise on the modulation “constellation”
- deviation of frequency received
- deviation of Symbol Rate received
- display PIDs for video and audio
- confirm selection of H.262 H.264 or H.265
- enable/disable “anti-rotation”
- capture TS files
- playback TS files with VLS

...and the list goes on.

2.3 The Expert Mode

When operating MiniTioune software in the “Expert Mode”, many measurements and selection switches are available to the user in addition to a small window for displaying the received video.

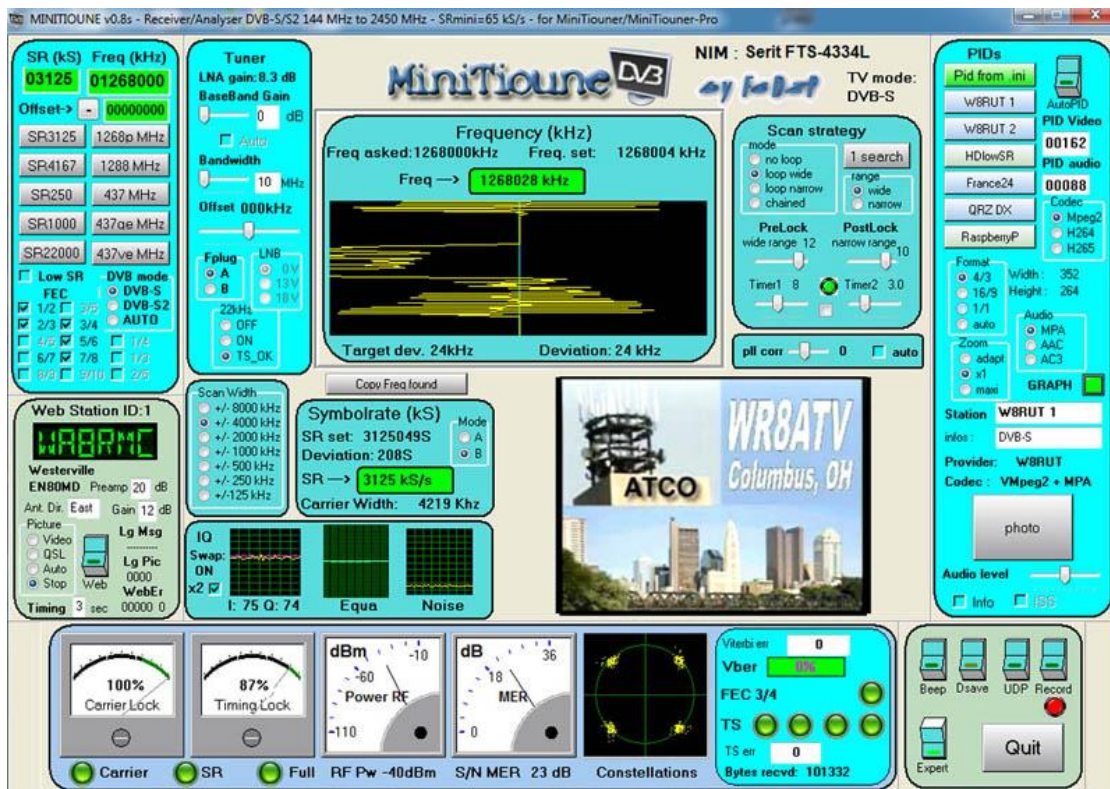


Figure 04 - Shows a typical control panel display for the “expert mode analyzer” mode of the MiniTiouner for a DVB-S transmission. The DVB-S video is from the WR8ATV ATCO repeater in Columbus, Ohio USA about 15 miles away. (24Km)

One of the many “expert mode” features is displaying the quality of the digital-modulation “constellation” for the received signal...a feature not provided on a commercial Set-Top-Box (STB). **Figure 05** provides an example of a typical weak-signal modulation “constellation” for inspection (QPSK modulation in this screen-capture). There is a lot of noise being shown with this received DATV signal, but the received picture video was perfect. Because the actual signal strength is dBm in real time, it is now possible to rotate the antenna and peak for maximum signal. This is not possible with most commercial STB’s!!!

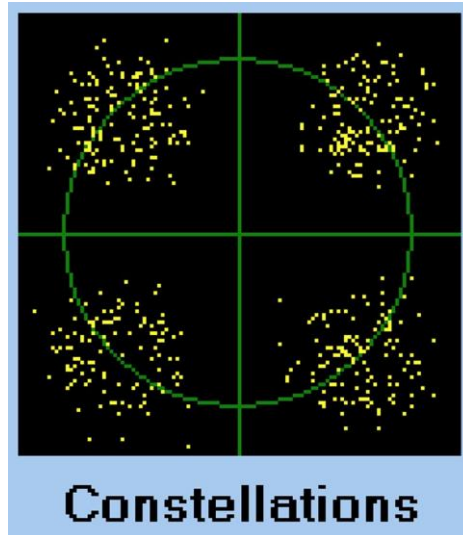


Fig 05 – The MiniTioune analyzer permits observing the quality of the “constellation” of the received DATV modulation (weak-signal QPSK modulation in this case).

2.4 Video Only Mode

Once you have tuned in the desired signal successfully, you probably have no need to display many of the settings. As shown in **Figure 06**, you can hide most or all of the switches and measurements.



Fig 06 – Enjoying full screen video in receiver-mode for DVB-S. The Measurement-Panel at bottom can also be removed.

2.5 Reduced-Bandwidth DATV

In 2015, hams in England were provided with a newly opened, but temporary, segment of 2 Meters (from 146.0 through 147.0 MHz). The challenge made to the hams in England was to use this new segment only for digital forms of communications (not just more FM repeaters) and to perhaps also invent a way to produce DATV in 0.5 MHz RF bandwidth...instead of just using the more typical 2 MHz RF band-width for DVB-S!! This is called RB-DATV.

Hams in England and France responded with enthusiasm and clever work to make DATV on 2M happen. The DATV-Express software was changed by Charles G4GUO to lower the Symbol Rates to 333 kSymb/sec (and lower) with changes to the anti-alias filters (all in software) to produce low-SR transmissions. Jean-Pierre F6DZP looked at the software of the older TuTioune design and the newer MiniTioune design and with much perseverance was able to allow the MiniTioune RB-DATV reception to work down to less than 70 kSymb/sec (RF bandwidth around 94 KHz). Hams in England started setting distance records on the 2M band with DATV QSO's. These pioneering hams also observed that transmitting H.264 encoding with DVB-S protocol (instead of the normal MPEG2) provided a better (smoother) low SymbolRate video. Noel G8GTZ explained to me that the significantly better low-SR video quality seen on the receiver is due to the H.264 design using a more suitable macro block size.

Then, even more benefits were confirmed (or better understood) from using RB-DATV than just reducing RF bandwidth to meet regulations. Reducing that bandwidth of the DATV transmission also increased the signal/noise (aka C/N) performance at the receiver. If you use the same transmitter power...but reduce the signal bandwidth by one-half (perhaps going from 2 MHz to 1 MHz) then the receiver is looking at less noise (power) and therefore the signal/noise ratio is doubled (3 dB better). **Figure 07** shows that the power required at the transmitter gets smaller as the channel-bandwidth of receiver is reduced: 25W for 2 MHz BW, 12.5W for 1 MHz BW and 6.25W for 0.5 MHz BW. Conversely, the same transmitter power will go further as the channel-bandwidth of the receiver gets smaller (and the signal S/N at receiver gets improved). [Note - this table was originally created by Rob M0DTS as he planned for ground stations transmitting on 2.4 GHz band to the future DATV satellite.]

Power required vs dish size vs bandwidth					
	8MHz	4MHz	2MHz	1MHz	0.5MHz
2.4m	100	50	25	12.5	6.25
1.7m	200	100	50	25	12.5
1.2m	400	200	100	50	25
0.85m	800	400	200	100	50

Fig 07 – Comparing power required at transmitter as channel-bandwidth of Receiver gets smaller. (courtesy of Rob M0DTS)

Noel G8GTZ also pointed out that use of the RB-DATV approach is NOT limited to the 2M band. Creating a more robust signal on 440 MHz, 1.2 GHz and even 10 GHz band by using RB-DATV communications theory also stretches the ability to work DX.

2.6 Receive DATV from ISS

Receiving DATV from the HamTV transmitter on the International Space Station (ISS) consists of dealing with three “hurdles” for hams:

- The ISS is a moving target and you need a fast-tracking antenna rotator.

- The ISS moving in orbit creates Doppler shifts in frequency.
- The DATV transmitter on ISS contains protocol issues that prevent the video and audio PIDs from being inserted in the signal normally.

The MiniTioune overcomes the last two ISS challenges in software.

The MiniTioune software package also includes a tool called Tioune Data Reader. In **Figure 08**, the green bar at the top shows where a “solid DATV lock” occurred on this pass of the ISS.

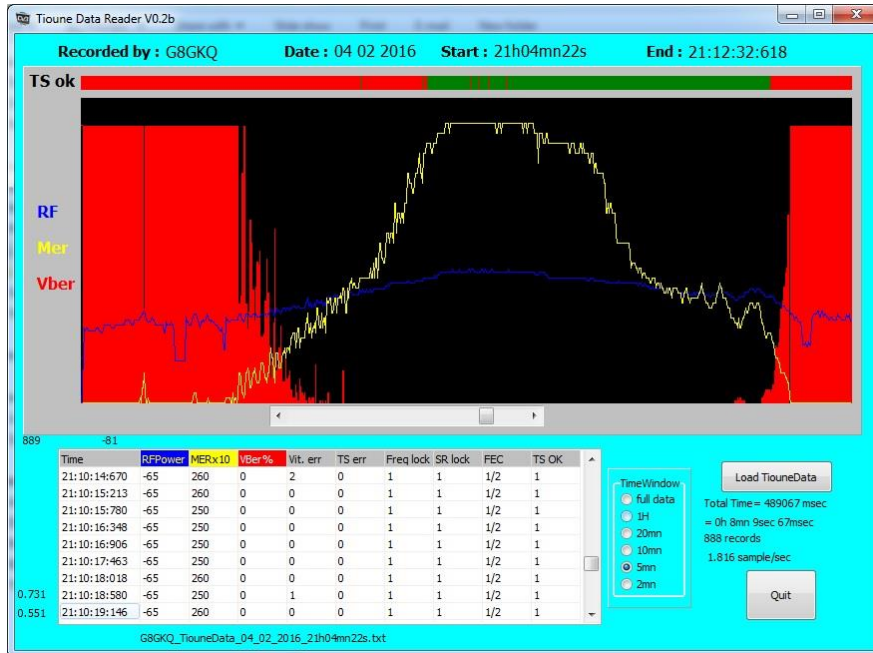


Fig 08 – The Tioune Data Reader tool allows plotting the receiver DATV parameters during an ISS pass. (Courtesy of Dave G8GKQ)

2.7 Noise Power Measurement Tool

The VivaDATV website for MiniTioune software also contains another software package tool called Noise_Power_Measurement_Vm1_1 . The NPM tool can be used for

- measuring the Sun noise,
- sweeping their antenna dish around the good value, to be sure their antenna rotator tracking is set correctly (see **Figure 09**) or
- for observing the noise/interferences.

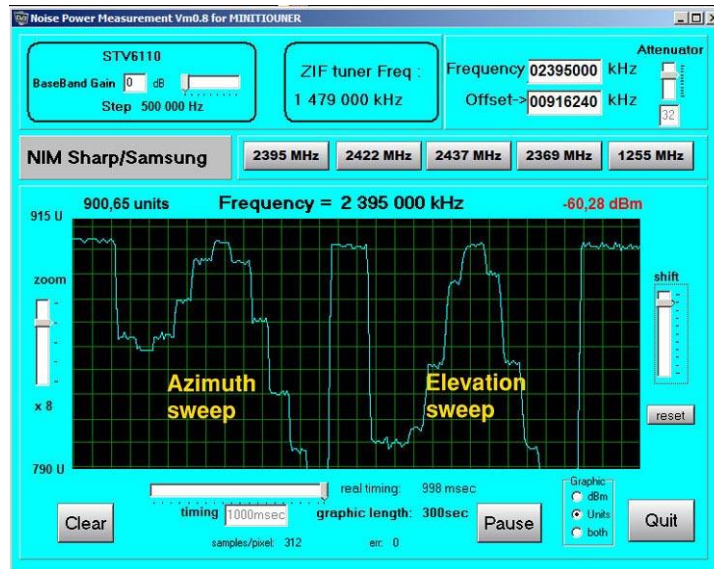


Fig 09 - Display of Noise Power Measurement tool sweeping the Sun with antenna rotator (Courtesy of Jean-Pierre F6DZP)

In the example shown in **Figure 09**, we are tracking the Sun, sweeping the antenna at -10°, -8°, -6°, -4°, -2°, 0°, +2°, +4°, +6°, +8°, +10° in azimuth and in elevation. At 0° we must have the top of the pyramid. If you obtain a symmetric pyramid, then your antenna is set well.

2.8 Recording Receiver Transport Stream (TS)

While there are still many more features provided by the MiniTioune software, the last one to be mentioned in this Users Guide is the ability to capture the receiver Transport Stream (TS) to a file. To enable this function, the MiniTioune software control panel, in the lower right-hand cluster contains the TS switch labeled "Record". Press the light on the Record switch to begin recording, and see the RECORD light blinking red. The TS file is written to your hard disk as a XXXXX.TS file in the same folder occupied by the MiniTioune exe file (the file name will be YOUR CALL and a time stamp). The computer memory used will be approximately _____ MByte/second.

You can playback the TS file with the video software program VLC.

3.0 – Connecting the hardware

The MiniTiouner-Express assembly is connected to the Windows PC with a USB-2 mini cable (not supplied). It is absolutely essential a high-quality USB cable no longer than 6 feet (~2 meters) is used or the program could frequently freeze and crash with no warning. Also, before using, check the cable shield continuity from end to end. The resistance from shell to shell must be less than 5 ohms and not jump around when wiggled. These cable shields are NOT soldered but just laid on the housing prior to molding and usually become intermittent with use. Intermittent shields can be disastrous! The recommended cable is a Lindy Cromo #41588 cable USB 2.0 type A/mini-B 1m long. <https://www.lindy.co.uk/cables-adapters-c1/usb-c449/1m-cromo-usb-2-0-type-a-to-mini-b-cable-p6866>

Connect J1 to an +8VDC to +24VDC fused power source dependent upon preamplifier power needs. The DC current requirements are 12VDC @ ~300Ma without DC preamplifier power. Details are in the specifications section.

4.0 – Installing the MiniTioune software

Here is a “big picture” view of the sequence of steps that you will be performing in Section 4.0.

- Downloading the MiniTioune software (see Section 4.1)
- Customizing a few software Program Variables in the .ini file (see Section 4.2)
- Installing the D2XX device drivers 2.12.24 for the USB controller (see Section 4.3)
- Installing LAV CODEC Filters (CODECs, etc) (see Section 4.4)
- Downloading GraphStudioNext software to be used later in Section 4.6 if tests in Section 4.6 do **NOT** work, or if having difficulty with poor video quality in Section 5.0 (see Section 4.4)
- Running TestMyMiniTiouner_V2_0a utility test program (see Section 4.5)
- Running CheckMiniTiouneDriverAndFilters_V0_5a utility test program (see Section 4.6)

4.1 Downloading the MiniTioune software

The software must be installed on a Microsoft Windows 7, 8, or 10 operating system PC computer. The software is freely obtained by first registering at the F6DZP website at www.vivadatv.org , and then downloading the packed (zipped) v0.8s file from

<http://www.vivadatv.org/viewtopic.php?f=60&t=521> .

This zipped file contains the 0.8s packed files with most of the required files and programs. The D2XX drivers 2.12.24 files and the LAV Filter files are also needed and are covered in Section 4.3 and Section 4.4 of this User Guide. The zipped v0.8s file also contains a READ ME PDF file called **Read_Me_Minitioune v08s.pdf**. This READ ME is well done and should be considered “**required reading**” before you begin to set up the software.

Create a MiniTioune directory on the computer. It is BEST if this new directory is NOT in the ROOT directory. I typically place my MiniTioune directory inside the **C:\Users\Ken Konechy\Documents** area of my files.

4.2 Customizing the software Program Variables

The **MiniTioune.ini** script file included in the downloaded packed file sets up the startup software program variables. It can be customized so that the initialization program parameters are set the way you need them when starting the program. Modify the file with a text editor and save it as minitioune.ini It is recommended to save the original file as minitioune_old.ini first so that it is available if needed.

The following list contains the .ini file parameters that should be modified before your first TEST of receiving a signal in Section 5.0. Go directly to the minitioune.ini file for more details.

Totalbuffers=6 **number of 1316 bytes buffers used for TS transfer to decoder --- use a value 2 to 30**

ID=MY CALL **enter your call sign for MY CALL, maximum 7 letters accepted**
ID=W6HHC (an example)

Locator=JJ00PP **enter your six-character GridSquare code for your location**
Locator=DM13CS (an example)

Ville=MY CITY **enter the city of your station location for MY CITY**
Ville=Orange Calif USA (an example)

(NOTE - set up the following two sets of parameters for the TEST signal you want to receive first)

; valeur en kSymbols / value in kSymbols
SR1Value=**2200** (an example)
; inscription sur le bouton
SR1Text=**SR2200** (an example)

; valeur en kHz / Value in khz >>> 8 DIGITS
Freq1Value=**01290000** (an example)
Offset1Value =00000000
Freq1Text=**1290 MHz** (an example)

(NOTE - set up the FEC values. Set needed FEC values to 1

; liste des Fec qui seront scannés 0=non, 1=oui / list of FEC allowed to scan 0=No 1 = Yes
Fec12=1
Fec35=0
Fec23=0
:
Fec78=1
:etc.

Station1=F6DZP-Mpeg2
Station1=**W6HHC-H262** (an example)
PIDVideo1=1001
PIDVideo1=**256** (an example)
PIDAudio1=1002
PIDAudio1=**257** (an example)
CodecVideo1=Mpeg2
CodecAudio1=Mpa

;Expert_switch 0=OFF 1=ON
Expert_switch=0
Expert_switch=**1** (an example)

;.....
; si on démarre en mode standard (Expert_switch=0) on peut choisir le type d'écran de démarrage
; if you start in standard mode(Expert_switch=0), you can choose which kind of screen you want
; 1: normal, 2: full screen, 3: full screen + measure, 4: maxi, 5 : mini
Video_mode=3 **IN ADDITION, while the EXPERT switch is turned OFF...you can press the ESC key multiple times to rotate through all of the "non-Expert" display settings.**

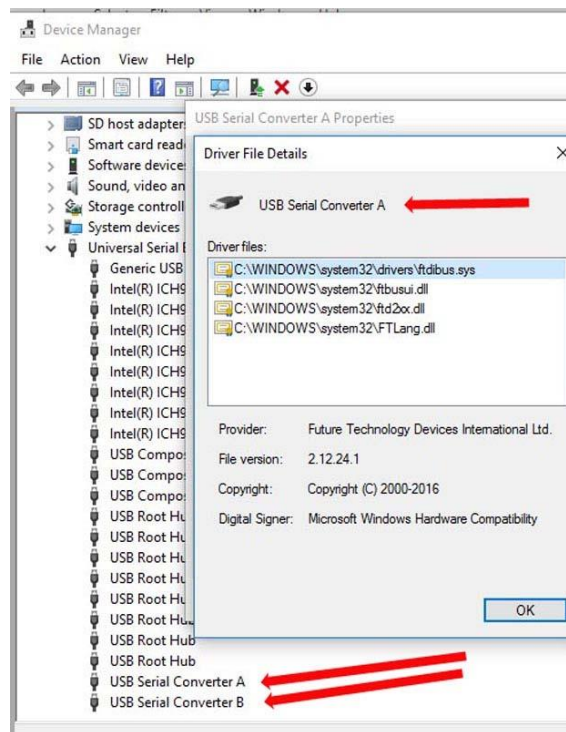
;.....
[Directshow_Graph]
; Graph : use of .grf file / utilisation des fichiers .grf
ReadGRF=yes
SaveGRF=no
SaveGRF=**yes** (recommended change to assist possible trouble-shooting)
AddToROT=no

As a final note, after successfully receiving good video in your first TEST, you are encouraged to explore all the settings in the .ini file.

4.3 Installing the D2XX drivers 2.12.24

Make sure your computer is connected to the internet – then plug-in the MiniTiouner-Express board and install FT2232H driver by allowing an internet connection to find the driver (it is all done silently on Windows 10...wait perhaps 5 minutes for installation to become completed). if the Win10 auto-install works correctly, then the Windows **CONTROL PANEL Device Manager** will display two new entries for USB Device Controllers • USB serial controller A • USB serial controller B: (see screenshot in **Figure 10**). Just double-click on USB SERIAL CONVERTER A shown in Figure 10, then select the **DRIVER TAB** – then select the **DRIVER DETAILS** to confirm the driver is from Future Technology Device International.

Everything should work smoothly with Windows 10...ELSE...go to the FTDigi website at http://www.ftdichip.com/Drivers/CDM/CDM21218_Setup.zip and review the manual steps in the



FTDichip drivers Application Note AN_396 (for Win10).

Fig10 – The Windows10 Device Manager showing correct installation of FT-2232H device driver in the USB-controllers area

4.4 Downloading/Installing LAV CODEC Filters

Run the file **LAVFilters-0.70.2-Installer.exe** that is inside your MiniTiouner folder.

You can also obtain these filters manually at <http://www.videohelp.com/software/LAV-Filters> (currently version 0.68.1), if you have any further interest.

Be sure you have registered the "usrc.ax" file in the Windows registry by running the file "install_usrc_ax_winXP.exe" tool as an administrator. This tool activates the usrc.ax directshow filter.

(NOTE this tool will work OK on **ANY** version of Windows from WinXP to Win10).

It is much easier to read, understand, and troubleshoot the directshow filters like LAV if you download a tool called GraphStudioNext. Download this tool from

<https://code.google.com/p/graph-studio-next/>

The GraphStudioNext software tool will allow you to read the .grf files and the GRAPHS used by MiniTioune (see **Figure 11**).

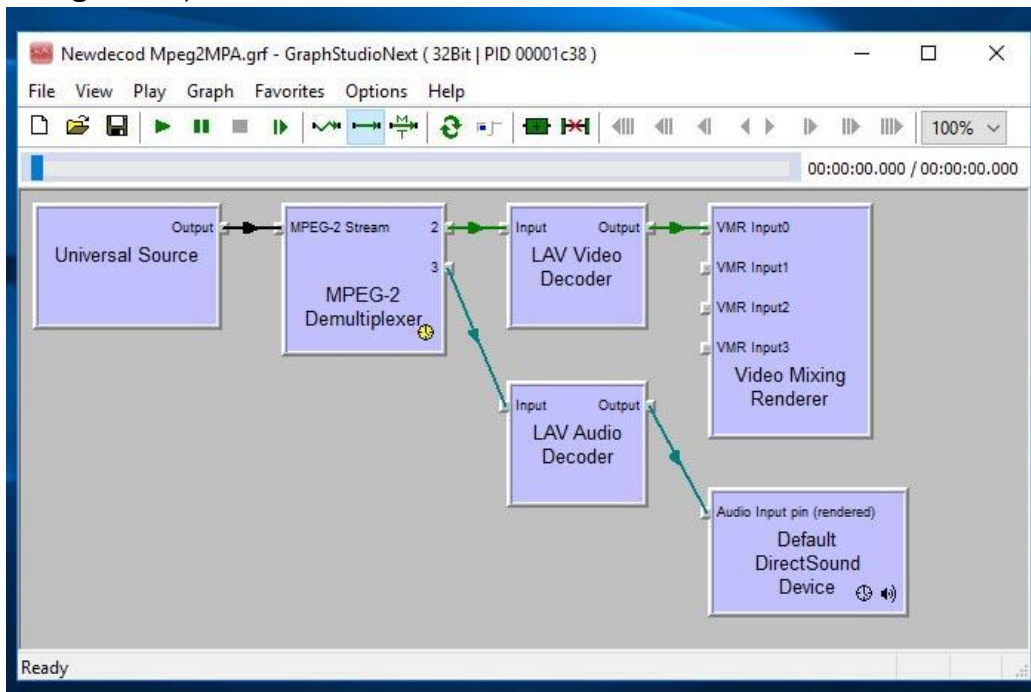


Fig 11 – An example of a successful LAV filters installation using the GraphStudioNext software to inspect a “Newdecod Mpeg2MPA.grf” file. (just double-click on this file to open the GraphStudioNext tool)

4.5 Running TestMyMiniTiouner_V2_0a utility test program

[**Note:** Pierre HB9IAM-F8BXA cautions that when performing the two working tests of the MiniTiouner-Express unit (TestMyMiniTiouner and CheckMiniTiouneDriverAndFilters), to be attentive to temporarily disable the antivirus, especially AVAST, to prevent it from erasing these two test files !]

- Run the “TestMyMinitiouner_V2_0a.exe” file.
- UDP status: LED must be green.
- Click on “Test I2C INIT” button. LED must be green.
- You must have 0 errors
- Close the “TestMyMiniTiouner_V2_0a” program.

4.6 Running CheckMiniTiouneDriverAndFilters_V0_5a utility test program

- Run the “CheckMinitiouneDriverAndFilters_V0_5a” file.
- Click on “usb filter” button. All 4 LEDs must be green.
- Click on “directshow” button. Top 4 LEDs will turn green. QSL display turns on.
- Click on “play ts from file” button. The Slideshow will rotate and sound will play. The 3 LEDs turn green.
- Click on “network” button. Web and UDP LEDs turn green.
- If all steps are successful, close the testing program

NOTE: If any of the above steps are not as detailed above, re-check all instructions for accuracy.

5.0 – Running MiniTioune Software for the first time

The MiniTioune software is a very comprehensive DVB-S and DVB-S2 receiver and diagnostic analyzer, but can be a little overwhelming when you run it for the first time! This section of the User Guide will provide just enough guidance to get you started for a successful first TEST....and will assume that you will use the vivaDATV.com web site for additional MiniTioune software details and features. After the software installation is completed and tested, then a TEST signal needs to be input to the tuner. Any of the following sources of a TEST signal are suggested for your first testing:

- A signal transmitted from your home DATV station...**DO NOT EXCEED -20dBm. (0.01 mw).**
- A satellite signal from your home commercial satellite dish.
- A local DATV signal or DATV repeater transmitter signal or a signal from a "buddy down the road". A short piece of wire in the tuner input socket will probably pick up enough signal but be careful - there may be DC volts on the NIM F connector socket if you connected the LNB solder pads on your PCBA.

The best approach is to first successfully receive the above TEST signal on another DATV receiver first. This gives you confidence that the TEST signal parameters are correct and that the signal can be successfully received with your different receiver, first.

It's a good idea to have a filter between your outdoor antenna and the LNB or pre-amp. A filter between the preamp and tuner is not a good idea. If there is no preamp, be careful placing a filter between antenna and tuner- there maybe DC volts on the input socket and most filters are DC short circuit. Bottom line, a filter in the line somewhere is good as if nothing else, it provides some lightning protection.

5.1 Testing the MiniTioune software using a TEST signal

The User Guide is written assuming that you selected the TEST signal to be your home DATV station transmitter. Whichever RF source you have selected to be used, the following **four** parameters in the ini file in Section 4.0 must be entered-and-saved into the .ini file to match those of your TEST signal:

1. **Incoming signal frequency** - signal out of the LNB or direct Amateur band frequency - 1240 MHz to 1299 MHz
2. **DVB mode** - DVB-S or DVB-S2
3. **Symbol Rate or SR** - This will probably be listed as MegaSymbols/sec - enter kiloSymbols.
4. **FEC** (Forward Error Correction) - this will be “checked” in the form of **1/4** through **9/10** in the .ini file.

5.2 Other “soft” controls

The MiniTioune software uses some soft Radio-Button switches to control some functions. **Figure 12** shows configuring the soft controls located at the upper-left of the screen for the **A RF** jack on the NIM tuner. This configuration is not selectable in the .ini file....AND once these soft settings are selected during a session, the setting will **NOT** be remembered on the next power up.

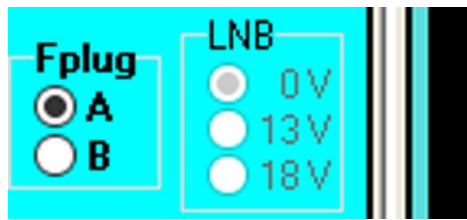


Fig 12 – The “expert mode” shows the radio switches for selecting the NIM Tuner RF jacks (this screen-shot shows that Fplug A is selected)

5.3 Start up the MiniTioune software

- Remove the antenna cable from the NIM tuner RF jacks.
- Make sure that the MiniTiouner hardware is powered-UP.
- Double click on the v0.8s exe file icon to start up the MiniTioune software

The following message will appear. “Please wait 10 seconds MiniTioune is loading”. If you see the more complex “expert mode” displayed on the PC as in **Figure 13** – then you are configured correctly with “no signal” present. If you get an error message, the hardware is not connected or the software cannot communicate with it. IF YOU SEE MINITIOUNE SOFTWARE SAY “**HARDWARE INCOMPATIBLE...WE QUIT**” when starting up, then it is possible that you have a very early MiniTiouner-Express unit that needs the EEPROM reprogrammed to be compatible with v0.8s MiniTioune software. If you have a very early MiniTioune-Express unit (shipped before 2018-04-16) then look at **APPENDIX B** in this User Guide for instructions for reprogramming the EEPROM.

If MiniTioune start-up is successful, **Figure 13** shows three normal important indications:

- 1) The GRAPH LED in **Figure 13** will be GREEN
- 2) The Video Display area of the control panel in **Figure 13** will be gray and not have any video (this is normal). The error message inside the video display area should say “NO VIDEO or BAD CODEC/PIDS”.
- 3) The digital-modulation CONSTELLATIONS display should look like **Figure 14**. This is normal.

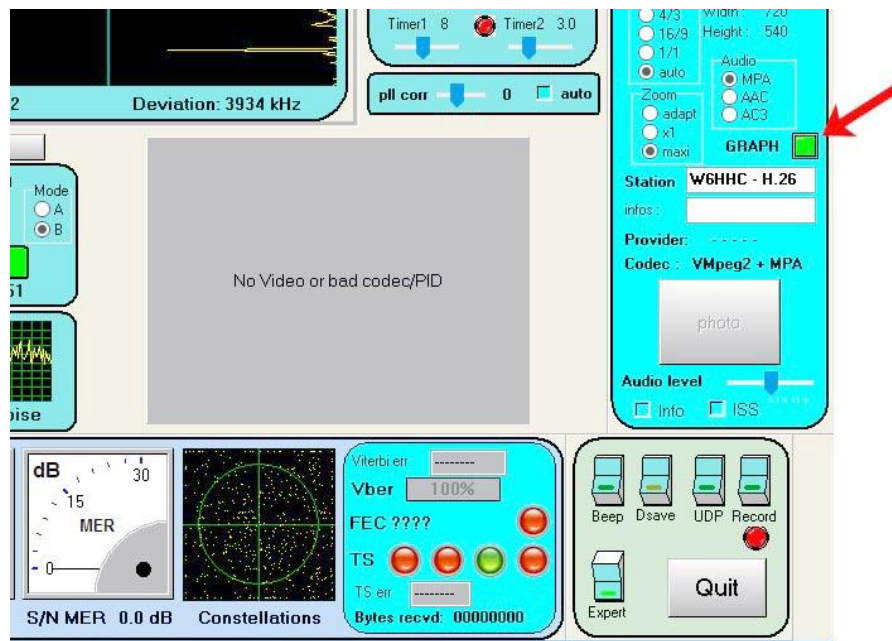


Fig 13 – The complex “expert mode” display should appear like this if you successfully configured the set-up .ini file and display a GREEN GRAPH light (see red arrow)

With no cable attached to the NIM Tuner RF connectors, there should be no signals present. The “constellations” display of Expert Mode should look like **Figure 14** at this point in your testing.

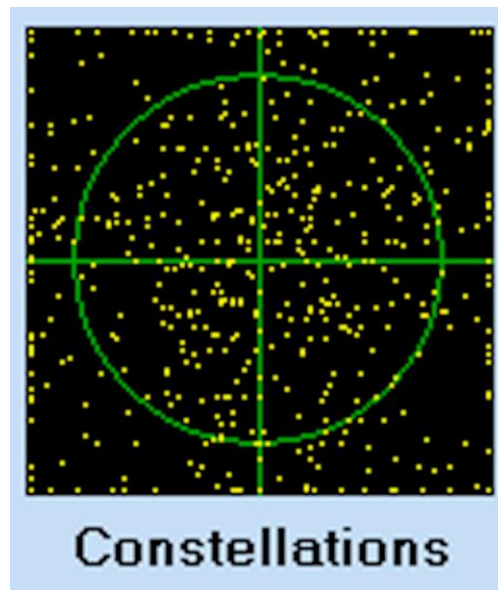


Fig 14 – The “constellation display” when there is NO SIGNAL to NIM tuner (only random noise appears)

5.4 Re-start the MiniTioune software with antenna and TEST signal

- QUIT the MiniTioune software
- Turn off power to MiniTiouner-Express hardware
- Install the antenna cable to the desired NIM ANT connector

- Power-up the MiniTiouner-Express hardware
- Make sure the TEST signal is present
- Start up the MiniTioune software.

If everything has been configured correctly, then an “expert control panel” similar to **Figure 15** should be displayed with video running.

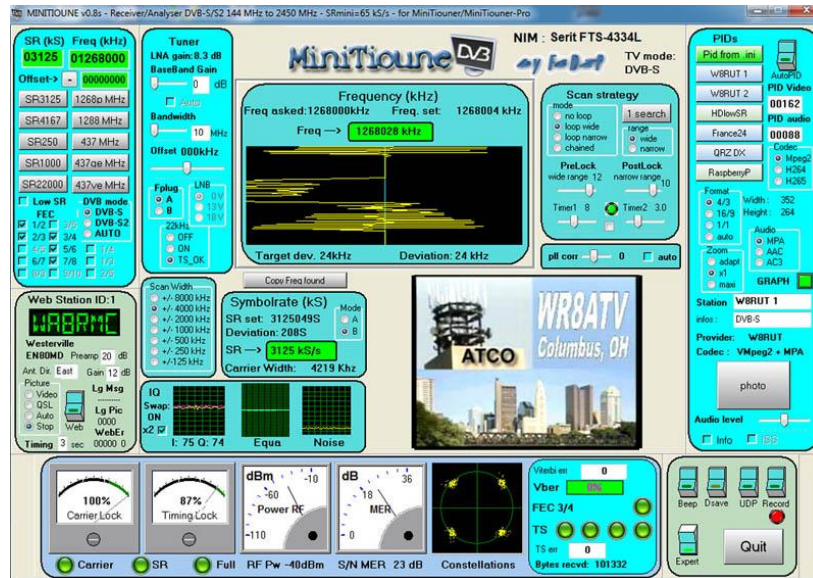


Fig 15 – Typical successful display of TEST signal on Expert Control Panel (this signal is QPSK)

If NO VIDEO is displayed, then check that the correct parameters for the TEST signal are being on t control panel:

- dBm meter looks like a reasonable signal level
- DVB MODE is displaying the protocol you are receiving (DVB-S or DVB-S2 protocol)
- FREQ (kHz) and SR (kS) in upper-left area are displaying what you intended for the TEST sig
- Confrim the PIDs you set match the TEST signal are being displayed

If the VIDEO is poor quality; for example “bands of color streaking” or “jerky motion”. The FILTERS being used may not be the LAV filters. See Section 5.6 about Trouble-shooting poor Video Quality for FILTERS issues

5.5 Trouble-shooting for NO VIDEO

[Note: Jean-Pierre F6DZP cautions that you do **NOT** want to use a generic Windows video driver for the Graphics controller card on your PC, ...ELSE...you will not have successful access to a "Video Mixing renderer". Some graphic cards have a bad driver that doesn't allow the use of a "Video Mixing renderer" after the decoder filter, but only a simple "renderer". So, you will absolutely need a good/recent specific graphics driver from the manufacturer (not from Microsoft) for the graphic card in your PC.]

When starting up MiniTioune software with the hardware already powered-up and waiting, if you see the GRAPH light in the Expert Display displaying **RED** (as shown in **Figure 16**). Then you have a problem creating the correct Direct Show GRAPH on your Windows computer. You may have a graphic card with “bad” (incompatible) driver that doesn't allow the use of a "Video Mixing renderer" after the decoder filter. Or you may be currently using a Microsoft video driver with your graphics card....you may then need to obtain the

specific graphics driver from your graphics card manufacturer? Another possibility is that the Windows Operating System (especially Win7) is making decisions about creating your Direct Show GRAPH that is not optimized for the MiniTione software or good video display. In this last case of NO VIDEO, we need to use the software tool, GraphStudioNext, that you installed in **Section 4.4** to troubleshoot and determine what the Window's OS is doing incorrectly.

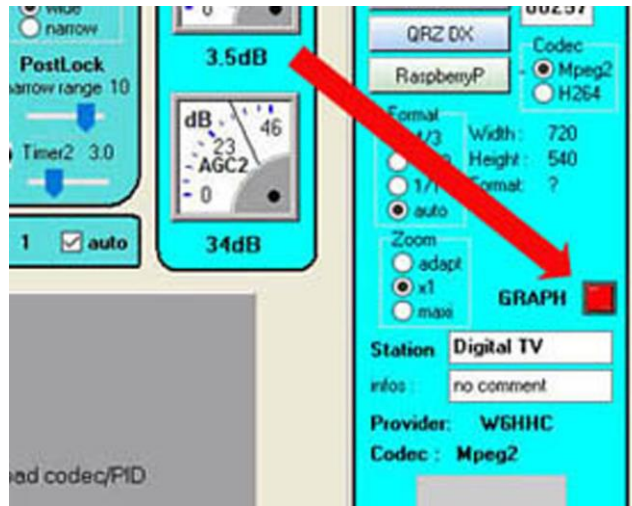


Fig16 – The RED GRAPH indicator “means NO ‘new decode graph file’ is available” (that is: the file could not be successfully created)

This **NO VIDEO PROBLEM** can occur with MPEG2 or H264 or H265 video CODECs. In this example, the problem will focus on a MPEG2 issue. BUT all three video CODEC issues can have a similar solution.

The VivaDATV.org forum is an excellent forum for questions and problems with the MiniTione software. The following URL discusses a **NO VIDEO PROBLEM** on an earlier version of MiniTione...but the concept is the same in v0.8s.

<http://www.vivadatv.org/viewtopic.php?f=80&t=394>

Figure 17 shows how the **decod Mpeg2MPA.grf** file can be modified with GraphStudioNext to suggest filters.

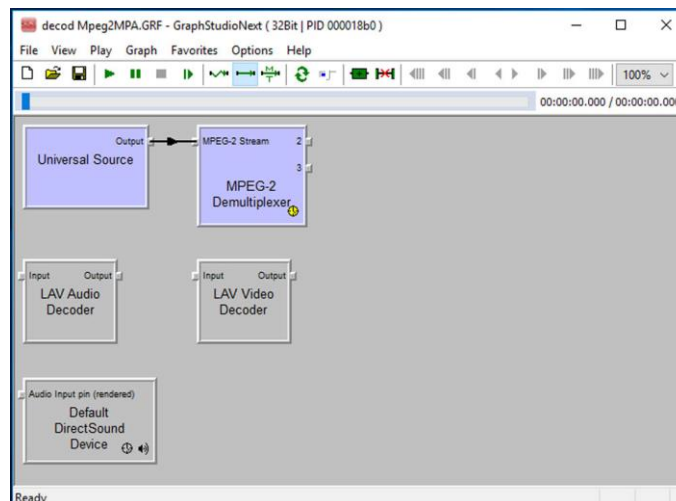


Fig17 –The decod Mpeg2MPA.grf GRAPH file modified with GraphStudioNext software to “suggest” that Microsoft OS uses certain filters

To be completed...

5.6 Trouble-shooting poor Video Quality for FILTERS issues

If the GRAPH for MiniTioune is NOT created using the best LAV filters, then the received video can look poor. This section describes two different poor video quality root-causes encountered by the editor, which involved the directshow CODECS and FILTERS.

The first case involved having old FILTERS that are not well suited for Windows 10 Operating System. In **Figure 18** you can see yellow/green color streaks and some extra-images of video text in the same yellow/green color. In this first case, MiniTioune was using old FILTERS from MainConcepts. When the recommended CODECS and filters were replaced with LAV filters...the video quality was perfect.



Fig 18 – Poor video-quality (yellow/green color streaks appeared when using old MainConcepts FILTERS (instead of the recommended LAV filters).

The second poor video quality case involved having MicroSoft Windows 10 OS selecting Microdoft DTV-DVD Video Decoder filters instead of the expected LAV filters that had been already installed (see **Figure 19**). The Video quality was very “jerky” (maybe 1 FPS) when using MiniTione with the MicroSoft filters shown in **Figure 19**.

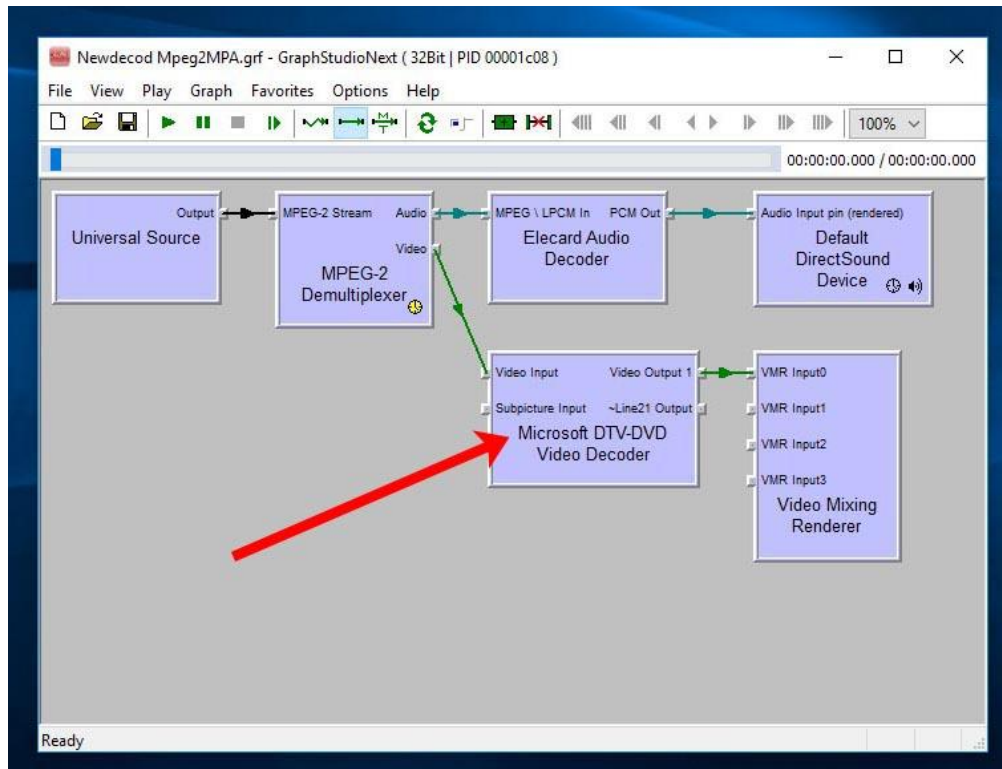


Fig 19 – The Newdecod Mpeg2MPA.grf GRAPH ended up unexpectedly installing Microsoft DTV/DVD Video Decoder instead of the planned LAV filters.

In this second case, Jean Pierre F6DZP suggests to try “suggesting” to Microsoft to install the LAV filters, by modifying the decod Mpeg2MPA.grf file to add unconnected LAV video filter and LAV Audio filter as shown in **Figure 20**. It is important that these “LAV suggestions” are NOT connected in this .grf file!! As F6DZP explained, “you must allow Microsoft OS to make the connections!!”

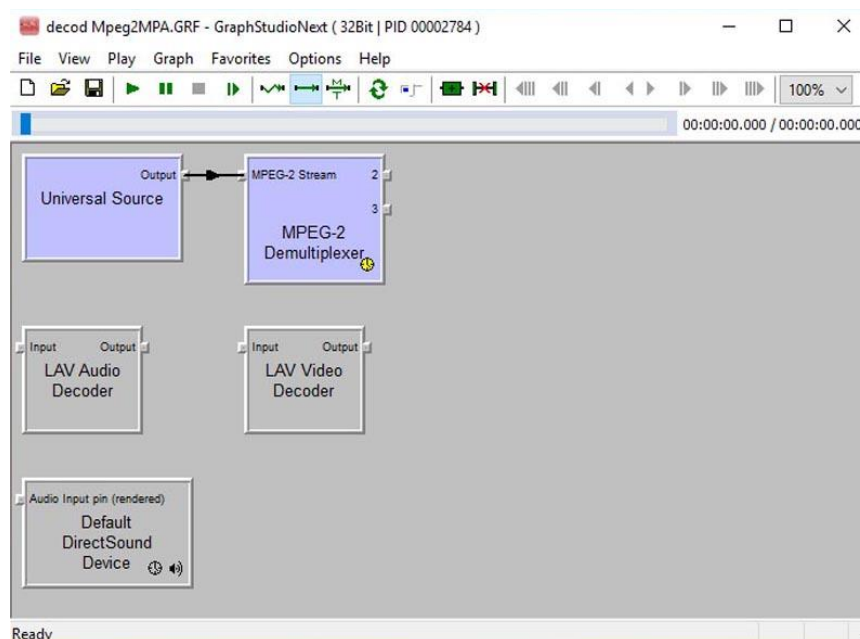


Fig 20 – Modified Mpeg2MPA GRAPH file to “suggest” Microsoft OS uses LAV filters

The modified “decod Mpeg2MPA.grf” resulted in the correct file NewDecode Mpeg2MPA.grf GRAPH shown in **Figure 21** and great video.

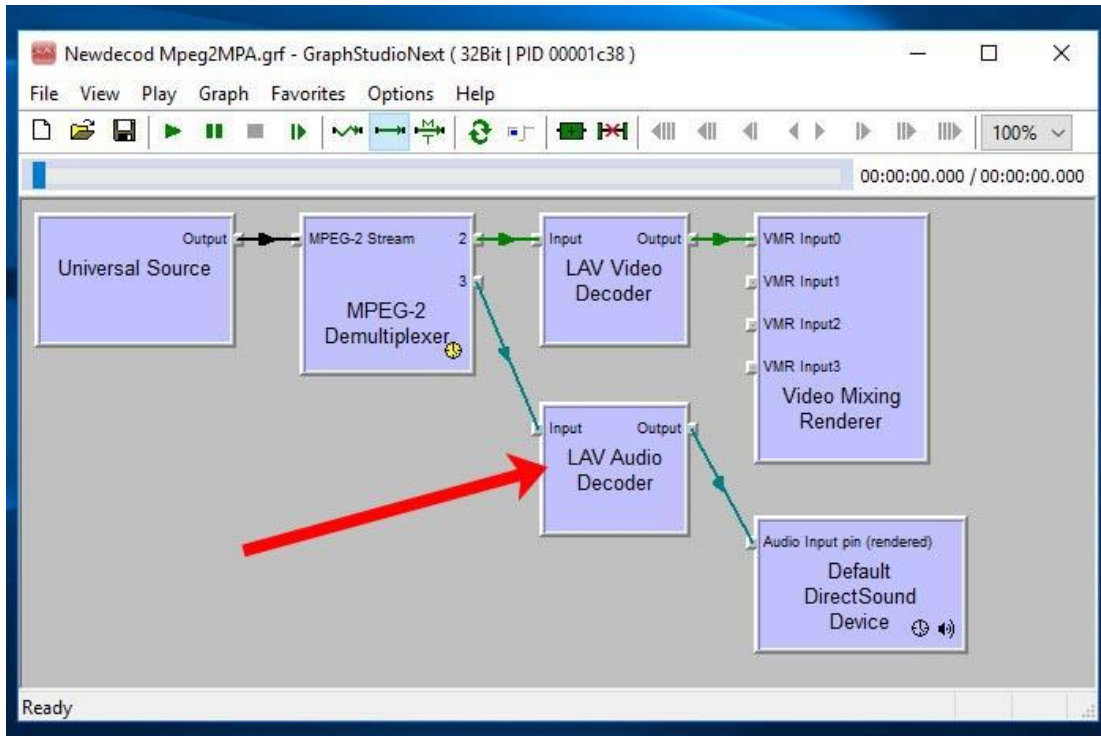
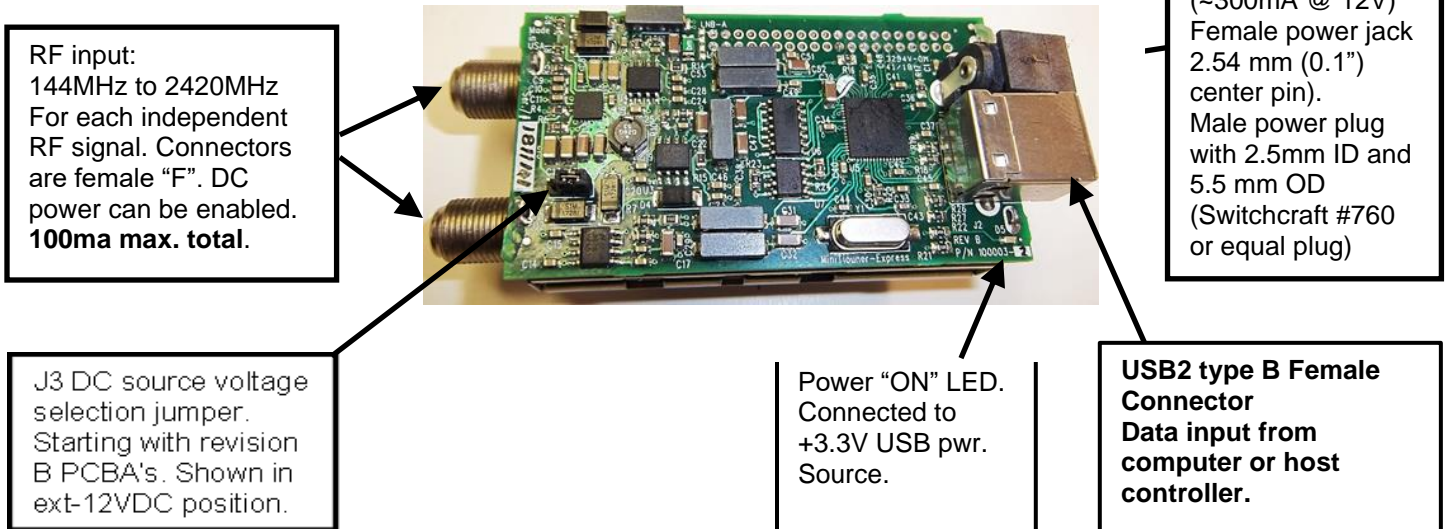


Fig 21 – After the modifications shown in Fig 20, the next time MiniTione is run, LAV filters are shown successfully installed by Windows OS in the “Newdecod Mpeg2MPA.grf” file (see red arrow)

6.0 – MiniTiouner-Express Specifications:

Physical details:



This unit is a self-contained assembly with enclosure (enclosure removed in picture above). The aluminum enclosure is not weather or dust proof but it provides enough protection to keep foreign objects from interfering with operation. It can be powered with either an external +8 to +24VDC power source supplying at least 300 mA @ 12VDC (exclusive of any preamplifier or antenna control device) or directly from the +5vdc at the computer USB3 port if available.

Environmental Details:

Temperature - 0 to +30°C (32-86°F)
Humidity - 10 to 95% non-condensing

Electrical Details:

Required Windows Computer components

Host computer with at least (1) USB2 or USB3 I/O port.
USB I/F cable – USB type "A" conn. at computer, USB type "B" conn. at MiniTiouner-Express.
Software support requirements – Pentium 4 or better, 2GB available hard drive.
Operating system - 32 or 64 bit Windows 7, 8 or 10.

Input voltage requirements (J1)

+8 to + 24VDC (300 ma@12vdc). Input is polarity protected but not fuse protected. An external 1 amp Slo-Blo fuse is required by user for safe operation.

Symbol Rate (Symbols/sec)

Select 70K Symbols/sec to 30M Symbols/sec

FEC SETTINGS:

DVB-S protocol – 1/2, 2/3, 3/4, 5/6, 6/7, or 7/8
DVB-S2 protocol – 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, or 9/10

CODECS

- Video H.262 - (aka MPEG2)
- Video H.264 - (aka MPEG4)
- Video H.265 - (aka High Efficiency Video Coding)
- Audio MPA - (aka MPEG Audio)
- Audio AAC - (aka MPEG4)
- Audio AC3 - (aka Dolby Audio)

RF Input (LNB-A and LNB-B)

Frequency Range:

Each input may be configured independently for simultaneous 144MHz to 2420MHz operation. (Tests show operation becomes marginal at 2450 MHz with reduced sensitivity and some NIMs not working).

Sensitivity: -20 to -96dBm. Tests demonstrate the cliff point at 1288MHz is about -96dBm @ FEC=7/8 and about -100dBm @ FEC=1/2. (The cliff point is where an input level below that specified will result in a loss of signal lock (usually with a 1dB signal change).

RF Input filtering: **VERY IMPORTANT!!!! Read carefully.**

It is highly recommended the user provide some type of **band pass** filtering between the MiniTiouner-Express module and the antenna. If an external preamp is used, the filter must be placed between the antenna and preamp, **not** between the preamp and MiniTiouner-Express. MiniTiouner-Express has an internal preamp included but it has a poor noise figure due to its wide band specifications so an external low noise figure band-specific preamp is very helpful. The internal MiniTiouner-Express tuner preamp DOES offer some benefit over no internal preamp at all but it is minimal without a low noise external preamp. In addition, the band pass filter keeps out-of-band signals from swamping the front-end sensitivity. Tests show that a signal 5MHz away from the desired signal and at the same main signal level will reduce the input sensitivity by as much as 5 to 10 dB!

Connector Details:

RF Connectors

Two Female "F" connectors are located on the end of the tuner module. Each independent input is specified for 75 ohm impedance operation with a slight degradation using 50 ohm cables without external impedance matching.

DC power is applied to each or both "F" connectors when the internal solder pads on PCB is (are) jumpered. An "LNB" or preamp voltage is selected by varying the main input DC voltage at J1. Since the MiniTiouner DC input will accept +8 to +24VDC, select it to be the LNB voltage requirements +1.5 Volts. (The module voltage passes through diode isolation and current limiting before appearing at the RF connectors). Both LNB voltages are current limited through a single PTC resistor. 500Ma hold and 1amp trip (Rev A, B). 100Ma hold and 250 Ma trip (Rev C and later). The current rating is for **BOTH** RF inputs sourcing power at the same time.

USB Connector (J2)

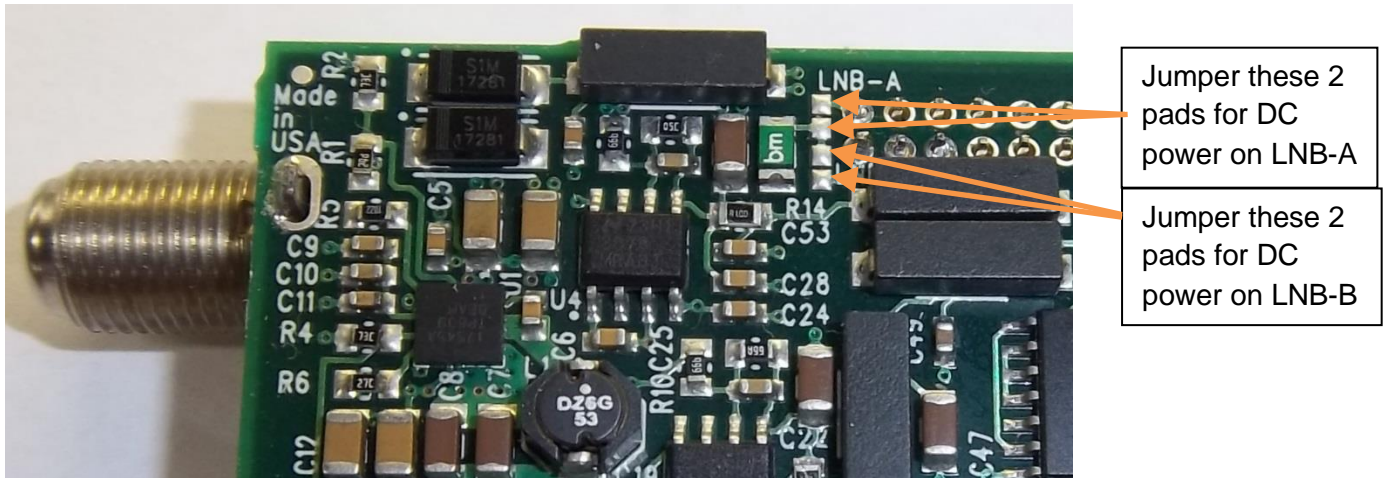
USB2 type "B" connector (J2) - Standard USB2 connections to/from host computer.

DC Power Connector (J1)

Female DC power jack 2.54 mm (0.10") center contact, 5.28 mm (0.25") barrel inside diameter. Mates to Switchcraft #760 or equal plug.

LNB Voltage selection

To access the LNB voltage selection provision, remove the aluminum cover by removing the 4 small hot melt glue dabs at the tuner tab connection points. Then quickly apply a small dab of solder across the two PCB pads corresponding to the LNB that needs power (or both if they both require a voltage source). **Be VERY careful with soldering.** Use a very low power iron (**DO NOT** use a soldering gun!) at a static free work station. Apply only a small amount of solder quickly so the pads are not damaged. **WARNING:** if you do not feel confident doing this, take the module to a qualified technician for the needed work. See detail below.



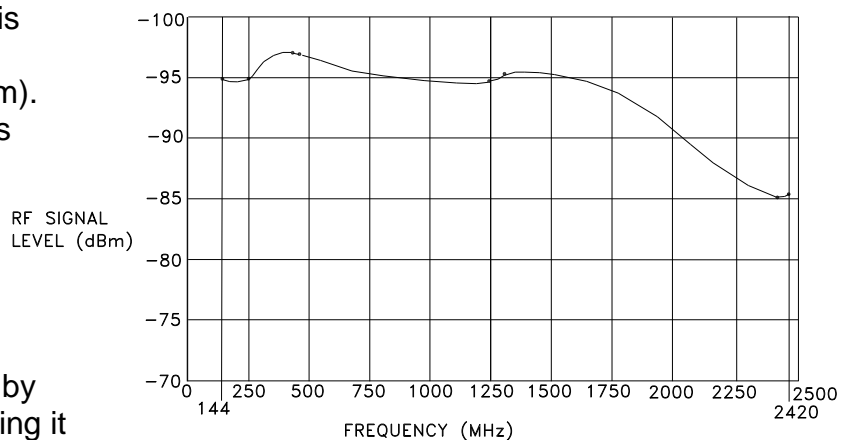
Starting with assembly revision "C" the LNB voltage at the antenna connectors has a current limit of 100 ma. This limit is the total current for both connectors. (If 75 Ma is needed for LNB-A, only 25 Ma is available to power LNB-B). The main power voltage must be about 1.5 volts greater than needed at the antenna connectors for the LNB because of diode and PTC voltage drops.

Operational data

Input sensitivity (cliff point)

The normal operational range of this unit is -20dBm to -95dBm (-95dBm = ~ 4 microvolts in a 50 ohm system). The minimum signal for this tuner is about -95 dBm at 1288 MHz using an FEC of 7/8. If FEC=1/2, minimum signal is about -100 dBm. See graph for minimum signal levels at other frequencies.

The minimum signal is determined by lowering the signal level until lowering it one more dB causes the tuner to lose lock. This is referred to as the cliff point.



7.0 – MiniTiouner-Express Support Contacts

7.1 E-Mail

- Art Towslee – WA8RMC Towslee1@EE.net
- Charles Brain – G4GUO G4GUO@ARRL.net
- Ken Konechy – W6HHC W6HHC@ARRL.net
- Tom Gould – WB6P WB6P@ARRL.net
- Project Team Support SUPPORT@DATV-Express.com

7.2 Web Site

www.DATV-Express.com

WebMaster – Bob Tournoux – N8NT

7.3 Product Support

Support Forum for MiniTiouner-Express and DATV-Express

<https://groups.io/G/DigitalATV>

You can subscribe by sending an email to:

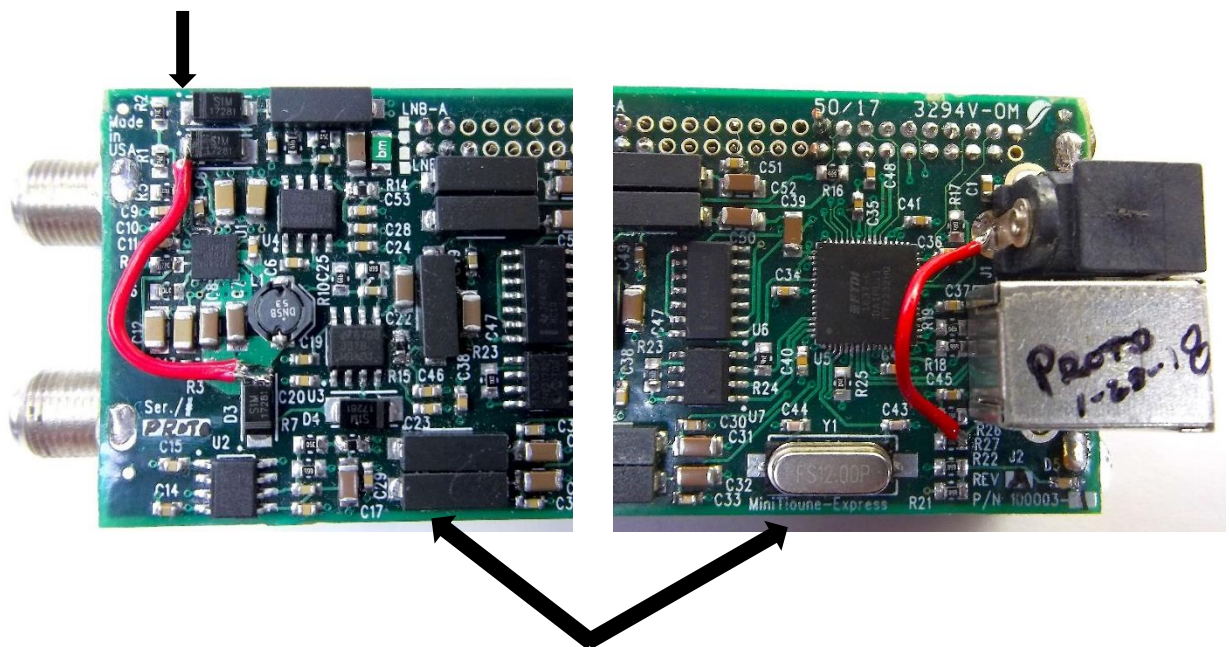
DigitalATV+subscribe@groups.io

Appendix A – Modifications

Below are modifications that can be made to enhance the functionality of the MiniTiouner-Express unit. Since these involve modifying the PCB by adding jumper wires, no operational guarantee can be made when the user performs the task. **WARNING!** Since soldering is involved, work must be done only by a qualified person experienced in surface mount PCB soldering techniques. Use only a light duty (25 watts or less) soldering iron and solder quickly. **DO NOT** use a soldering gun. Wire used should be stranded number 28 gauge or less. Excessive wire flexing can easily break the fragile PCB traces.

Appendix A-1 - 5VDC Operation of Unit – Modifications for revision “A” only.

For those who would rather operate the older-production MiniTiouner-Express unit from a 5VDC power supply instead of a 12VDC unit, add a soldered jumper shown at the lower left from D2 cathode to D3 anode to bypass the 12V to 4V switching regulator. Use a separate 5VDC regulated power supply rated for at least 1 amp output for DC power.



If a computer with a USB3 port is used, it's possible to use the 5VDC (Vbus) power available on that USB-3 connector to power the MiniTiouner-Express. **That eliminates the separate 5VDC power supply.** (The current needed by the MiniTiouner-Express is approximately 700mA and current available at the USB3 port is 900mA). Use the standard USB2 cable and plug it into the USB3 port. +5VDC power will be on the MiniTiouner-Express USB type B connector pin 1 and R27. Then a jumper is required from R27 (right side as viewed above) to the DC power jack center pin in addition to the jumper described at above left.

NOTE: If the user uses either 5VDC unit-power approach, then providing DC power for an LNB or remote preamp is **NOT POSSIBLE** because a source of 12VDC power will not be available. It is advised that if the USB3 option is implemented, put tape across the DC power jack or otherwise disable it to prevent accidental power application here. **Applying +12V here to the DC power jack after the above modifications are made...would be disastrous to both MiniTiouner-Express AND the connected computer!**

Appendix A-2 - 5VDC Operation of Unit - Board revision “B” and later

The “B” revision board has been modified to add a J3 jumper in order to select the use of either an external 12VDC power supply or +5VDC power from the attached computer USB3 port. This eliminates the need to hand modify the board illustrated in Appendix A-1.

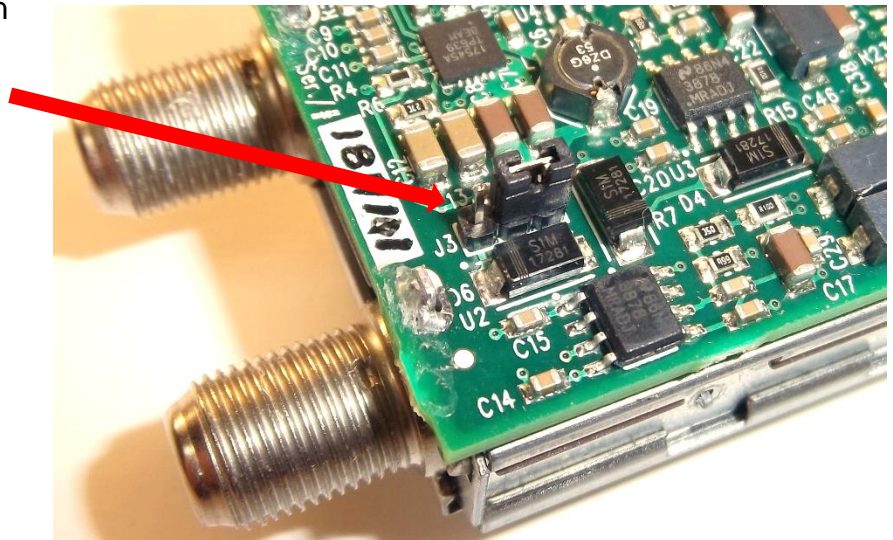
To access J3 the cover must be removed by separating the 3 “hot glue” tabs holding it in place. Remove cover and place the jumper in the position desired. Place it closest to end of board for computer power operation or away from end for 12VDC operation. **The J3 jumper default position is away from end of board as shown in the picture below.**

Note that when using computer +5vdc power:

- a) The USB3 port must be used. The USB2 port cannot supply enough current.
- b) The computer to MiniTiouner-Express cable must be ≤ 6 feet (~2m) long. Longer cables could have an unacceptable voltage drop.
- c) +12VDC will not be available to power LNB cable preamplifiers.

The board and J3 jumper are shown in the default 12VDC position.

If the jumper position is changed, replace cover and reseal with hot melt glue to hold the cover in place.



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Appendix B – Reprogramming EEPROM in Hardware

Appendix B-1 - Updating early MiniTiouner-Express EEPROMs for running v0.8s SW

MiniTioune software from France was upgraded from version 0.7 to version 0.8s in late April of 2018. Because of existing product variations, it's necessary to incorporate a product code signature so version 0.8 can enable the proper functions. MiniTiouner-Express modules shipped after April 19, 2018 have the version 0.8 recognition code (string) for MiniTiouner-Express built into the product EEPROM, but units shipped before that must be software upgraded to add the signature so v0.8 will recognize it. The EEPROM-Updating process is simple and can be done at the user's computer.

B-1.1 Confirm FTDichip device drivers are installed.

If you have never run MiniTiouner or MiniTiouner-Express on your computer, then you need to install the FTDichip FT-2232H USB drivers for Windows. See Section 4.3 for instructions how to install the device drivers...or to just confirm that the correct drivers are on your computer. **Figure 22** shows what the Windows Device Manager tool in the Windows Control Panel should display when the MiniTiouner-Express unit is powered-up and plugged into the computer's USB port.

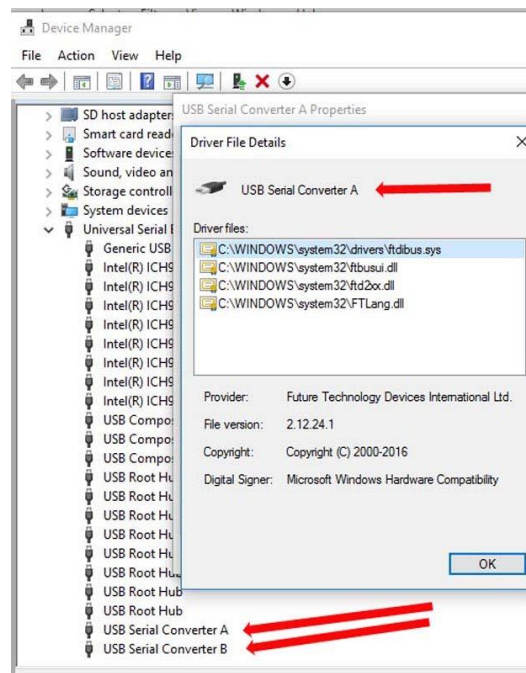


Fig22 - Windows10 Device Manager showing correct installation of FTDI FT-2232H device driver in the USB-controllers area

B-1.2 Microsoft Framework 4.0 must be installed

The Microsoft Framework 4.0 must be installed to run the FT_PROG programming utility. If you get a message that says MSVCP100.dll is missing, install the Microsoft Visual C++ 2010 Service Pac 1 redistributable package at:

[https://www.microsoft.com/en-us/download/details.aspx?id=26999&irgwc=1&OCID=AID681541_aff_7593_1211691&tduid=\(ir_xF82gyxXvxYnwZ4x7SQMk0w-Ukky3YRgiyst0A0\)\(7593\)\(1211691\)\(TnL5HPStwNw-.E.XmdJKxPDd3oxTejdvxA\)\(\)&irclidid=xF82gyxXvxYnwZ4x7SQMk0w-Ukky3YRgiyst0A0](https://www.microsoft.com/en-us/download/details.aspx?id=26999&irgwc=1&OCID=AID681541_aff_7593_1211691&tduid=(ir_xF82gyxXvxYnwZ4x7SQMk0w-Ukky3YRgiyst0A0)(7593)(1211691)(TnL5HPStwNw-.E.XmdJKxPDd3oxTejdvxA)()&irclidid=xF82gyxXvxYnwZ4x7SQMk0w-Ukky3YRgiyst0A0)

B-1.3 Running FT_PROG to update the EEPROM Product ID String

The instructions are as follows:

1. Download the FT_PROG installation program from the URL below, install it and follow the wizard.
www.ftdichip.com/support/utilities/ft_prog_v3.6.88.402_installer.exe
2. Plug in the USB cable & power up the MiniTiouner-Express unit.
3. Start the FT_PROG program from your chosen location.
4. Hit F5 on your computer. A typical Product Descriptor display is shown in **Figure 21**.

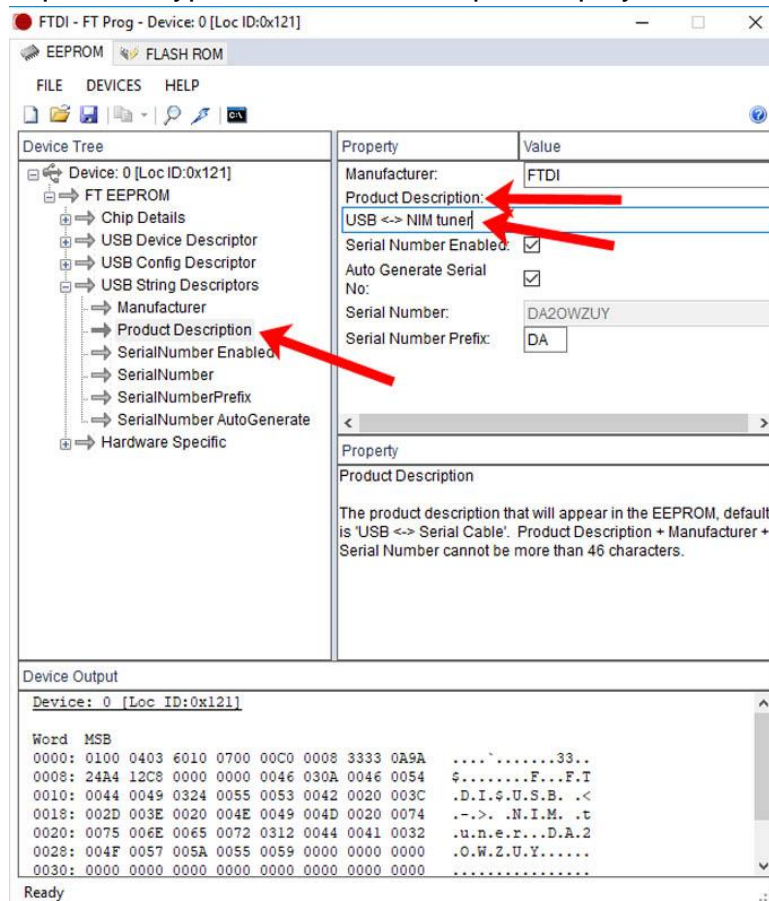


Fig 23 - If FT_Prog “USB STRING DESCRIPTORS” shows product as “USB <-> NIM tuner”, then EEPROM needs to be reprogrammed for this product field.

5. Click on **USB String Descriptors**. **Figure 23** shows the “old Product ID string” that would need to be updated. That enables the Product Description edit box. In the box, change name from “USB <-> NIM Tuner” to “MiniTiouner-Express”. The string is case sensitive. Type as shown, but not the quotation marks.
6. Click on DEVICES then Program. The successful EEPROM Product Description will appear like **Figure 24**.

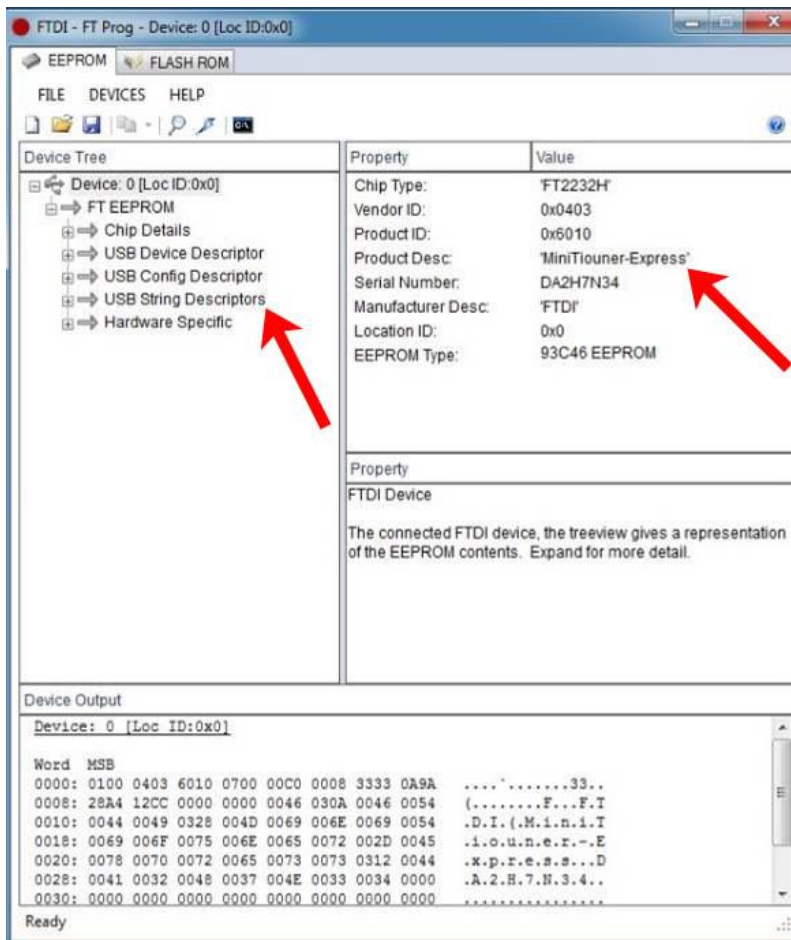


Fig 24 - FT_Prog “USB STRING DESCRIPTORS” showing product correctly as “MiniTiouner-Express” for v0.8s software compatibility.

7. Click on PRROGAM at the bottom, and then select CLOSE.
8. Click on FILE then EXIT. (make sure you are connected to the internet at this time).
9. Unplug MiniTiouner-Express USB cable then re-connect the cable to install the FTDI drivers. Computer message at the bottom may say “Installing device driver software. Click on “status” to view progress.
10. Click on CLOSE and then start up the v0.8 MiniTioune program.

That’s it!