

NlStune

NISSAN REALTIME TUNING



NlStune Diagnostics Technical Notes V1.1

(JECS ECCS 1984-1989 Legacy Engine Control Units)

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WARNING

If your ECU pulses the fuel pump, injectors, fuel regulator, flashes LEDs randomly (or they just stay on when they shouldn't) or your engine does not start then your ECU could be reading a corrupt ROM image.

Testing has shown that a corrupt ECU can keep the Mass Airflow Meter heater element on longer than 1 second and blow it like a fuse. This can even occur with other software driving an emulator or a bad EPROM image

Ensure a corrupted image in your ECU is rectified immediately and is powered off if corruption is suspected to avoid this situation possibly occurring to you.

Corrupted ECU images are likely to be caused by

- **Bad or incorrect image file loaded into the NVRAM / Romulator**
- **Poor connection between the NISTune board and ECU due to failure to secure the board correctly using hot glue or similar mechanism**
- **Poor header cable connection to the ECU from NISTune board**
- **Mismatched NISTune board configuration for the ECU image you are attempting to use**

How to fix this:

- **Always firstly try ECU with the factory ROM image without the NISTune board to attempt to start the car properly**
- **Then attempt with the factory ROM image with the NISTune board to verify the board works correctly**
- **Then attempt with the NISTune modified ROM image with the NISTune board to verify the ROM image works correctly**
- **Then attempt USB Consult connection to the NISTune board and this should verify valid ROM addresses for the patch code and checksum for the patch header**

This document covers some of these issues in further detail

| Revision History | | |
|-------------------------|-----------|---------------------------------|
| 1.0 | Feb 06 | Initial Version |
| 1.1 | 19 Nov 06 | Updates for latest FTDI drivers |

Part A

Solving USB Communications Device Problems

1. PC / NISTune fails to see USB device

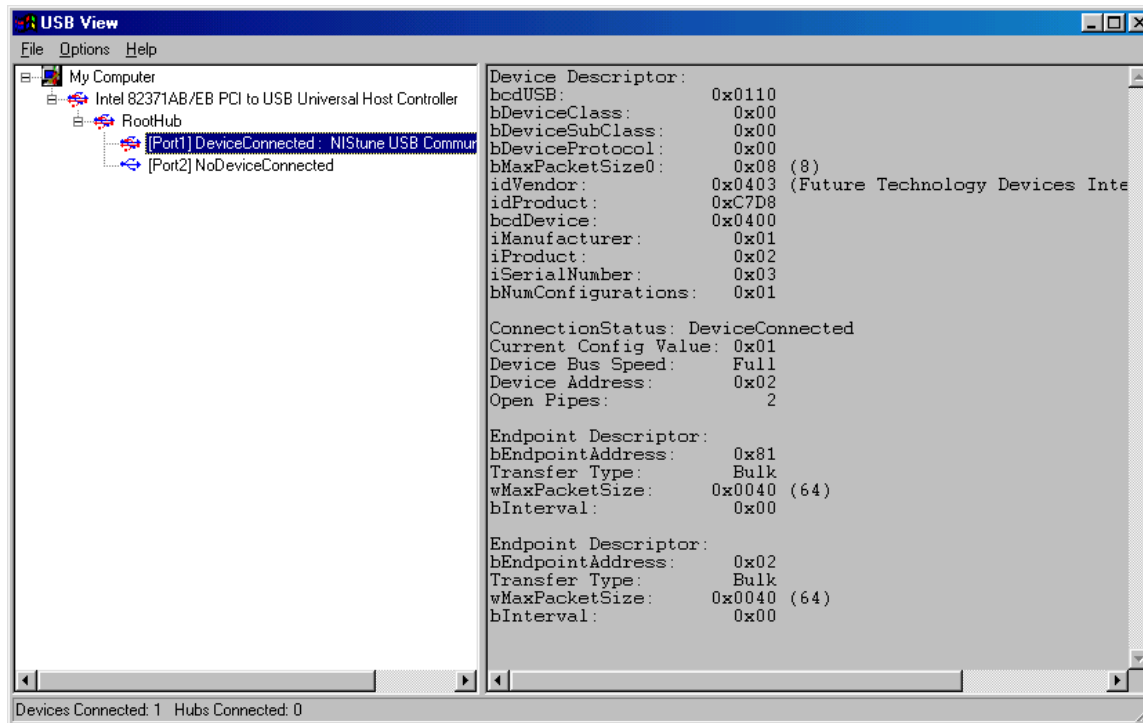


Download `usbview.zip` from the Utilities folder on the registered NISTune homepage. Run the `usbview.exe` file and check the **NISTune USB Communications Device** is detected when plugged in and ECU is turned on (Ignition switch on in vehicle).

If not check

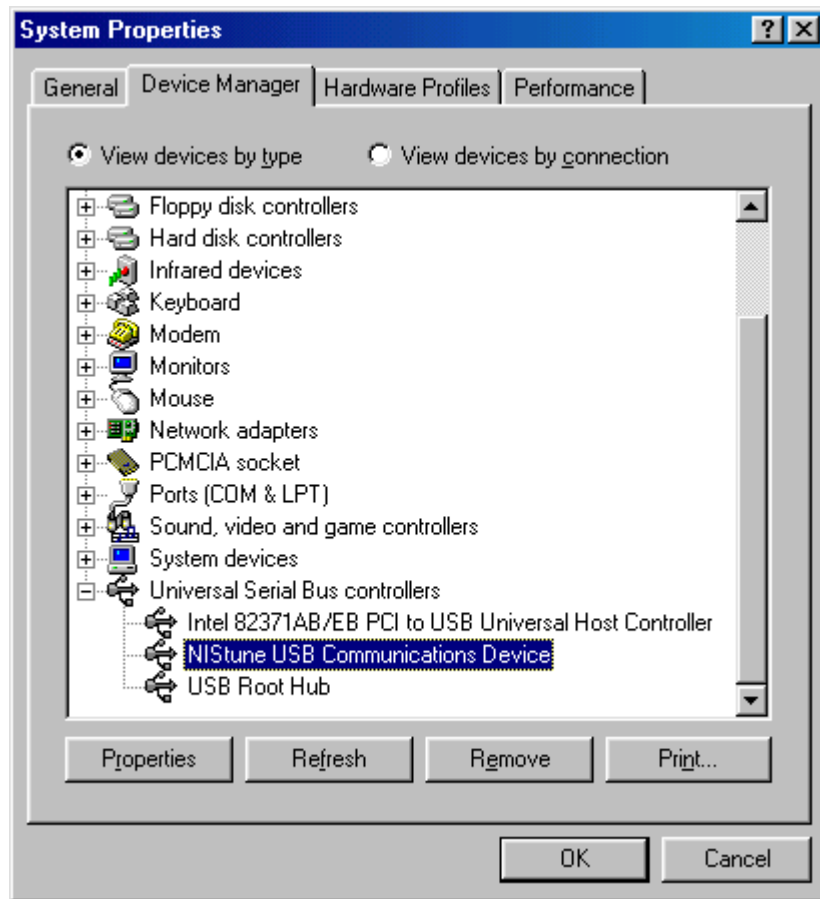
- USB cable connection
- Board correctly plugged in
- ECU has power (diagnostic lights are flashing)
- Car is able to start with NISTune board installed
- Other USB devices work and are detected in USBView on your PC USB port

Check correct vendor and product Ids (0403 for vendor, C7D8 for product)



2. USBView sees device but NISTune still cannot find USB device

Check correct driver installation from Control Panel – System – Device Manager. The board should appear when it is powered on (Ignition switch is on)



The NISTune USB Communications device should show up here as working. If not then follow the USB installation guide to install the driver.

If driver has previously been installed and doesn't work (it might have an exclamation mark against it) then reinstall the drivers. Do this by clicking on Properties and then Reinstall Drivers. Point to the driver location where you extracted `NISTune_USB_Drivers.zip`.

Another option is to uninstall and reinstall the driver. There is an uninstall utility within the USB drivers directory called `UNISTune.exe`.

If this fails, in the NISTune utilities folder on the NISTune Developments website is `Ftclean.zip` file you can try. Later in this document is another method of manual uninstallation located further in this document.

3. I connect to the USB device, it connects and then disconnects. USB read error is displayed

```
USB Read error ... Retrying
USBDisconnect: USB Disconnected
```

This happens when the USB chip on the NISTune board is detected and can be communicated with to but the ECU software is not functioning properly or is not communicating to the USB device. NISTune application does not receive a response to any of its commands so it disconnects.

First thing to check is that the header connections from the NISTune board to the ECU are in the correct order. Double check the order of the wires against the hardware installation manual. These do not follow any particular colour code, make sure each wire is connected to the correct pin on the HD6802 CPU.

(a) Check your ECU NISTune patched software is running correctly.

Emulator

Confirm your car will idle and operate as normal to check the ECU software properly. If it doesn't you may have a corrupt ECU image.

- i. You must upload the emulator again from the correct NISTune patched image matching the address file.
- ii. If this fails then try a standard factory image in the Emulator
- iii. If this fails, try the Emulator without the NISTune board with standard factory image
- iv. If the emulator fails to function then try the same image on EPROM
- v. If the EPROM fails to function you either have a corrupt image or an ECU connection problem. Try another image or ECU.

The Pocket Romulator is susceptible to internal damage from voltage leaks from a laptop. Ensure the laptop has a grounding strap from some metal chasis on the laptop to the vehicle chasis

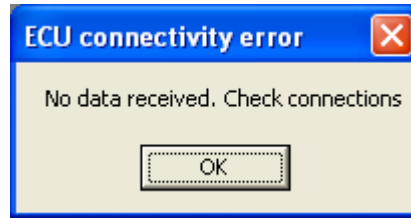
This is detailed in their FAQ

<http://xtronics.com/memory/pktROM.htm>

NVRAM

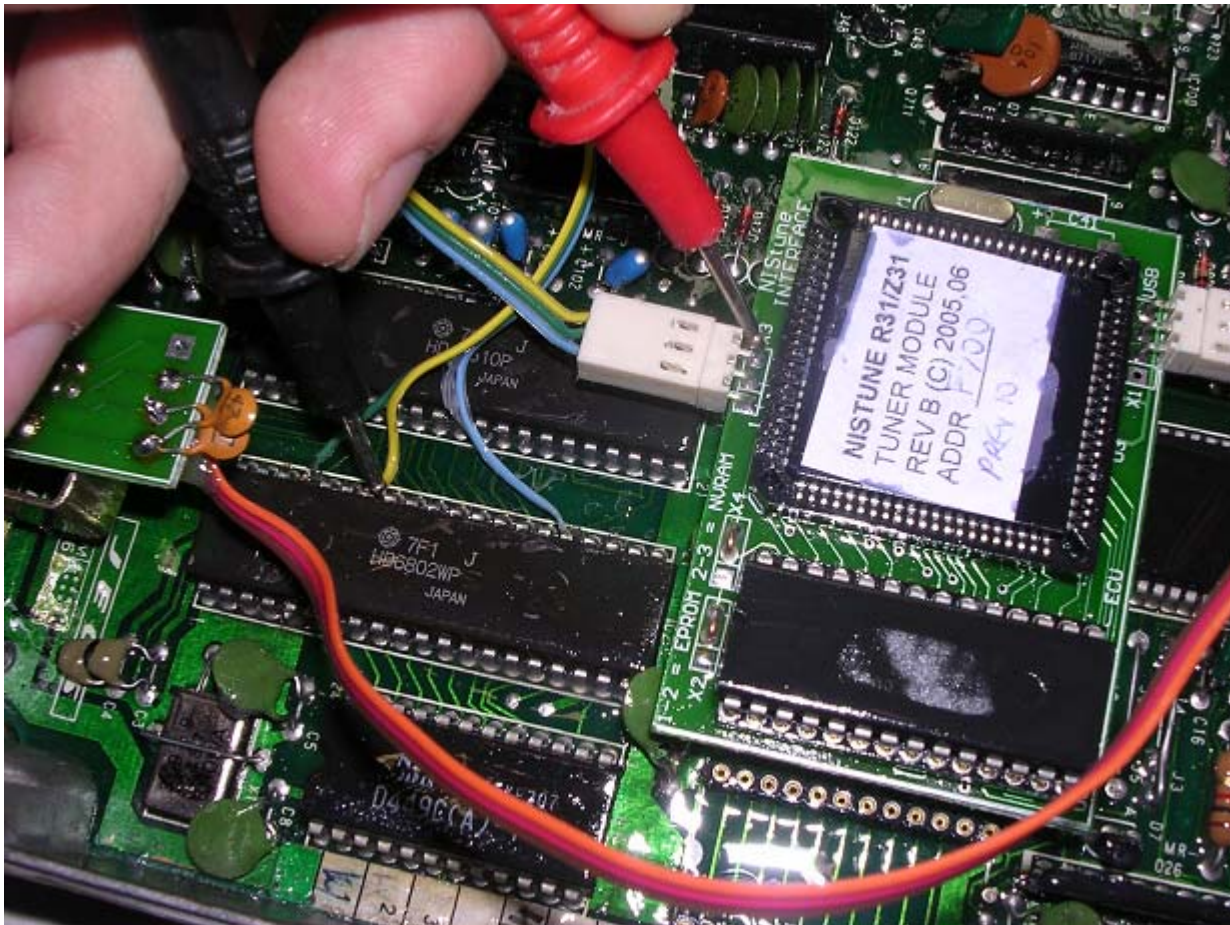
- i. Ensure NVRAM is programmed from addresses 0x4000 – 0x7FFF. You may need to duplicate the ECU image from 16K to 32K to perform this. If this is not programmed correctly the car will not start and NISTune will not connect.
- ii. Reprogram and plug the NVRAM chip into the NISTune board again to double check programming
- iii. Ensure that correct jumpers are set for NVRAM as per hardware installation document. If the car runs but no communications or corruption then report the problem to NISTune Developments.
- iv. If car does not run program then program a factory image into NVRAM on the NISTune Board . If this works, but the NISTune patched image doesn't work then there is a problem with the patched image. Contact NISTune Developments.
- v. If the factory image in NVRAM does not work, then try a EPROM with the factory image with jumpers set accordingly to EPROM this time
- vi. If EPROM with the NISTune board does not work then attempt EPROM without the NISTune board. If EPROM without the NISTune board works then there is a problem with the NISTune board. Verify it is connected correctly to the ECU and none of the pins are bent/broken. If so, the board will need to be returned for repair at a cost. However if there is a defect on the NISTune board when returned not operator caused, it will be repaired free of charge.
- vii. If the factory image on EPROM without NISTune board does not work, the ECU is most likely got some type of hardware problem. Try another ECU and to verify this and repeat the above steps to check the NISTune board

4. NISTune patched image is running in the vehicle but still not communicating with the PC



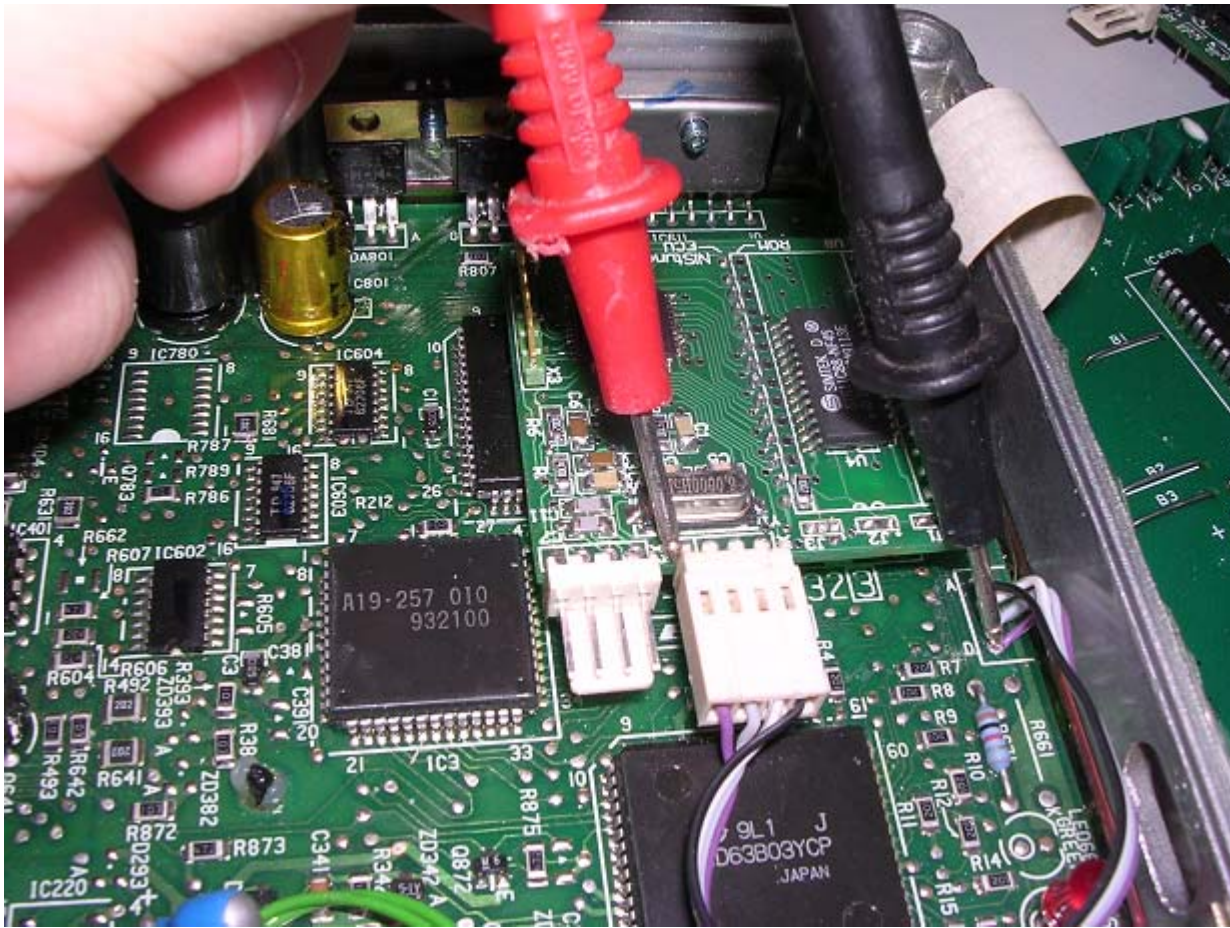
- (a) First check your cable connections are working. You need a multimeter and put it in to 'continuity mode' which makes a buzzing sound then the probes connect together.

Press the probes of the multimeter from the ECU connector side of the connection (either from the CPU leg or jumper cable connector) to the board connector where it enters the NISTune board. See pictures below



Earlier model NISTune RevB board. Measuring the yellow wire from CPU is connecting to the socket on the NISTune board

It might be necessary to push the probes through conformal coating which is a laquer which protects the circuit boards from corrosion.



Later model NISTune RevC board checking from the header pin (D) to pin 1 on the NISTune board.

(b) Next check the jumper settings are correct for the chip you are using

- RevA/B boards must jumper X2 (1-2) and X4 (1-2) for EPROM/Romulator mode or X2 (2-3) and X4 (2-3) for NVRAM mode. The wrong mode make still run the ECU but NISTune wont work
- Rev C boards must have X1 (1-2) and X2 (1-2) for EPROM/Romulator mode or X2 (2-3) and X2 (2-3) for NVRAM mode. Also the J3 must be left unjumpered and J4 left unjumpered
- Rev D boards are NVRAM only boards and must have both jumpers J1 and J2 left open.

(c) Make sure you are using the correct address file. The latest NISTune version has the following board types:

RevA/B boards (Support 16K ROM images only)

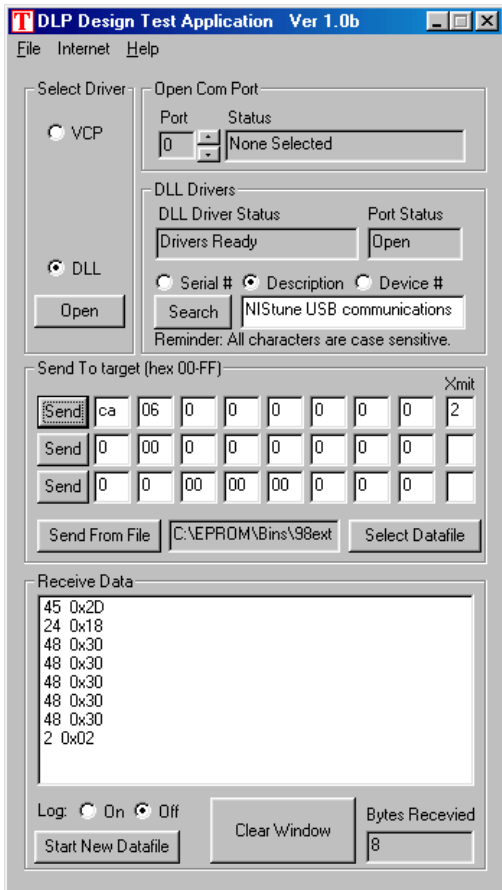
CR31_128_E.adr
 Z31_128_E.adr
 VLT_128_E.adr

RevC/D boards (Support 32K ROM images with J3 left open)

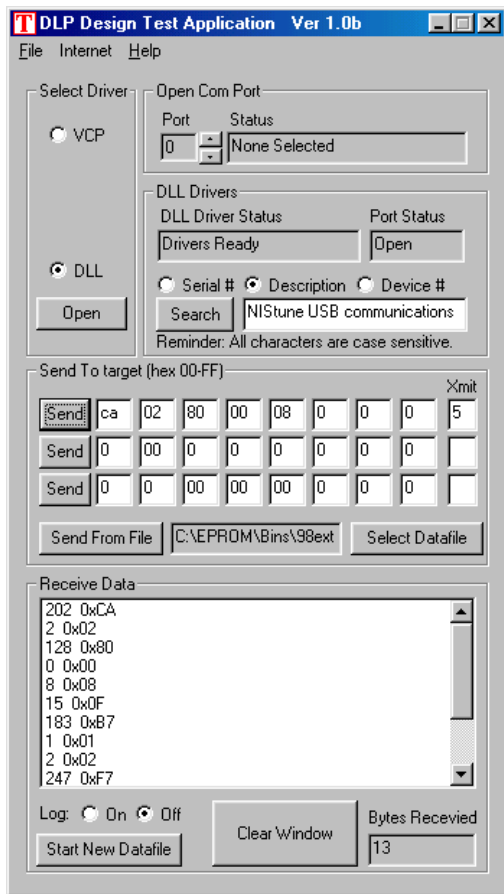
CR31_256_E.adr
 Z31_256_E.adr
 VLT_256_E.adr

If NISTune does not connect with the above steps then try checking the connection directly to the ECU without NISTune.

- (d) Check you can talk to the board outside of NISTune. Download DLPtest.exe and FT2XX.dll from the NISTune website utility directory
- (e) Copy FT2XX.dll to c:\windows\system
- (f) Copy DLPtest.exe to a spare folder and execute it
- (g) In the DLP Design Test Application program select
 - Select Driver = DLL
 - DLL Drivers = Description
- (h) Click 'Search' and you should see 'NISTune USB communications device'. So select this
- (i) Then this should show in the field next to 'Search' so now click 'Open' and Port Status should change to 'open'
- (j) If the above did not work then your driver is not installed correctly or FTD2XX.DLL cannot be found. If the DLL is not found then the 'Search' button will not function.
- (k) Send bytes CA 06 with 'Xmit' length field set to 2 and press SEND as per picture below
You should receive the ECU ID field data (older patch revisions only return 0x69)



Next check you can receive streamed data. Streamed data is done by CA 06 80 00 08 with 5 bytes in the transmit field. This should retrieve from address 8000, 8 bytes as displayed below



If the above does not work

- (a) First check you have soldered the header connections to the CPU correctly. If any of these are in the wrong order or connect properly, you will not have any of the above communications.

NISTune RevA/RevB: Note that the lines **do not** connect to the CPU in the same 1,2,3 order. First line goes to A15, second line goes to pin E and third pin goes to R/W. Ensure correct ordering here. Check contacts with a multimeter and ensure that the correct pins on the HD6802 CPU are connected. See the USB Installation manual for more details

NISTune RevC/RevD: Note that the lines **are** 1,2,3,4 order for ECUs with a 1,2,3,4 numbering system, for ECUs with A,B,C,D the ordering is **reverse** (1,2,3,4 => D,C,B,A). For boards with only a 6802 chip, check the connections match as per the installation document.

- (b) The ECU is running bad patch code or patch code not compiled for address written on the chip. By default NISTune will talk to addresses B700,B701 on the ECU. This is compiled in the patch code to those addresses for R31,Z31, VL/VLT ECUs

If the above does work but the NISTune software does not connect, your Address file is not matching your ECU patch file loaded in the emulator/NVRAM.

4. USB Communications works and connects fine. However when running in the car it drops out frequently and I need to reconnect

Things to check

1. Does your laptop have a part of its earth connected to the chassis of your car? This is highly recommended if you are running the Pocket Romulator, to avoid damage to it and the NISTune board
2. Does the problem occur at a certain rev range, say when it hits 5000-6000 RPM that's when the drop out occurs. If so there is a frequency and noise issue.
3. Do you get noise through your stereo system which sounds like a buzz that increases as the RPMs increase? You may need to check your electrical system has sufficient noise suppressors on it.

Most dropouts occur because there is excessive USB noise going to the USB chip on the NISTune board. This problem can be made worse when you are running other USB devices, such as USB-Serial converters or other peripherals which can assist in creating more noise on the USB lines.

The problems could be associated with the type of USB A-B cable that you are using. Several users have indicated that they had frequent dropouts with particular USB cables. These have been significantly improved swapping for another higher quality USB cable. Higher quality cables tend to have better shielding characteristics which reduce noise. It has also been noticed that shorter cables will assist in doing this also. During development and testing I have used ~6 foot length USB A-B cables with minimal problems on my R31.

Poor shielding on any USB cable will cause problems, especially in an automotive environment where there is a greater amount of electrical noise (from coil, spark plugs, distributor etc) that at a normal PC workstation for instance would not experience this.

5. NIStune reports the error 'Cannot connect - Invalid CONSULT valid in address file' or 'Consult checksum error' or 'Invalid USB ECU address access' on connection

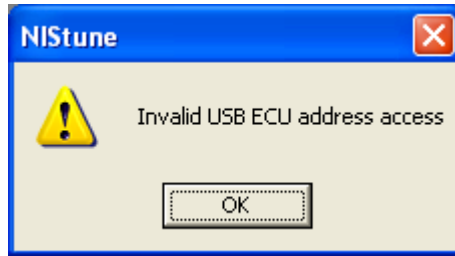


Image loaded in the maptracer board must contain the patched NIStune image. This is generated by the autopatcher software at NIStune Developments and delivered with the NIStune software to the customer.

In order for NIStune software to read all the consult values from the ECU must either retrieve the consult table from the patched image within the ECU itself.

The CONSULT location parameter must exist in the ADR file and must match that generated by the patch code. It is the following values dependent on ECU type:

Note that the base address is offset by the OFFSET value, so CONSULT &H3000 + ROM OFFSET &H8000 = &HC000 physical address

Eg. R31 Skyline

- RB30E Nissan R31 Skyline, GMH VL Commodore

CONSULT=&H3000

6. NISTune runs fine except when I try to make a change to the maps, tables or constants and then disconnects

This means that NISTune has attempted to write to your onboard NVRAM device or Romulator, but either during the write to the device or the readback verify by the ECU patch code, there was a failure.

Check that you have the correct offset and length specified in your address file

```
OFFSET=&H8000
```

```
LENGTH=&H4000
```

NVRAM:

- i. Check you are using a correct NVRAM chip. You cannot make changes on EPROM versions and any attempt will disconnect NISTune.
- ii. NVRAM board: If the NVRAM has been connected as 'Write Protect' - Verify that jumper X2 and X4 are both set to NVRAM. Setting jumper X4 to EPROM will set the 'Write Protect'

Check the NISTune log next

If you get an entry with the wrong upload area, things may not work properly. Below indicates the write error

```
21:41:45 USB Consult: Uploading byte C1 to 3D54
```

```
21:41:45 USB write error: S:CA,01,3D,54,C1
```

This fails because the address is wrong. On EPROM based ECUs the address access must always be between C000-FFFF (this is mirrored between 8000-BFFF).

Emulator

- i. If you are using a Pocket Romulator or similar emulator, ensure that the emulator is selected in the File - Configuration screen and the Emulator button is enabled (it changes RED when enabled). All updates when the emulator is selected will be performed to the emulator

Part B

Other Configuration Problems

1. What must I configure in the ADR file?

Number of cylinders in car (used for TP scale estimated boost calculations)
CYLINDER=6

Total CC of engine (used for TP scale estimated boost calculations)
ENGINECC=3000

Current injector CC of engine (and matching image). Used for base value calculations when doing an injector upgrade and for TP scale boost calculations.
INJECTORCC=200

2. I get 'Address file invalid instruction line xxx', but the address file name and address are valid

Address (ADR) files must not have any spaces between the variable name and the value. Valid address file variables are

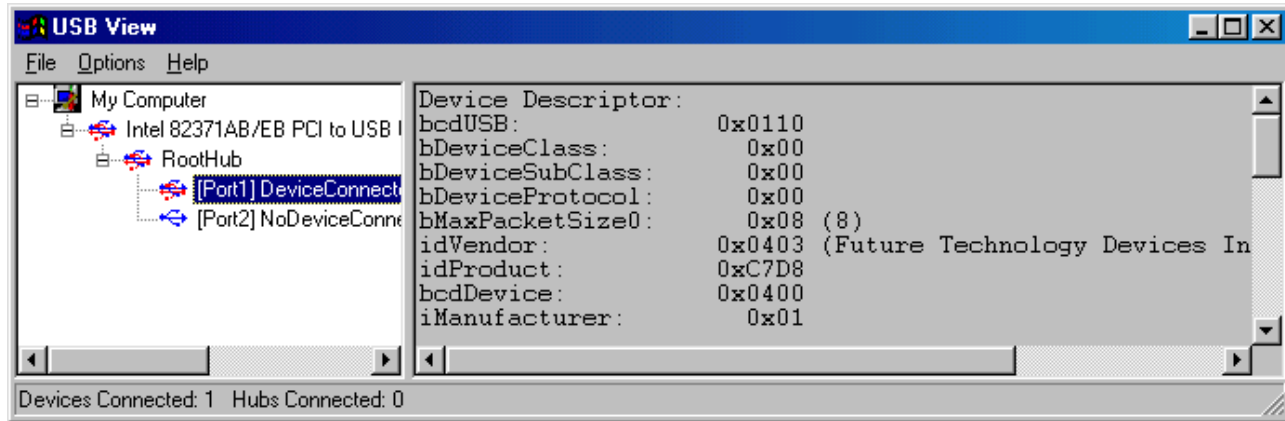
| | | | | |
|---------------|----------------|---------------|---------------|--------------|
| TYPE UNIT | TP_SCALE_FIRE | REV4_LIMIT, | ADD_MAP6, | AS_ENRICH |
| HIGH_FUEL | RPM_SCALE_FUEL | SPEED1_LIMIT, | ADD_MAP7, | AI_ENRICH |
| REG_FUEL | RPM_SCALE_FIRE | SPEED2_LIMIT, | ADD_MAP8, | TEMP_ENRICH |
| HIGH_FIRE | TTP_MIN | SPEED3_LIMIT, | ADD_MAP9, | CRANK_TIMING |
| REG_FIRE | TTP_MAX | SPEED4_LIMIT, | FUEL_RECOVER, | IDLE_TIMING |
| K_DATA | AF_LIMIT | ADD_MAP1, | FUEL_CUT, | IDLE_SPEED |
| IGN_TIME | ADD_FUEL | ADD_MAP2, | TEMP_CONV, | CYLINDER |
| FB_SWITCH | REV1_LIMIT | ADD_MAP3, | DWELL_TIME | ENGINECC |
| VQ_MAP | REV2_LIMIT | ADD_MAP4, | DWELL_DUTY | INJECTORCC |
| TP_SCALE_FUEL | REV3_LIMIT | ADD_MAP5 | FT_INJECT | KCONST |
| OFFSET | LENGTH | CONSULT | TPREF | CPU |
| RAM_MAX | | | | |

Part C

Manually reinstalling FTDI245 USB drivers

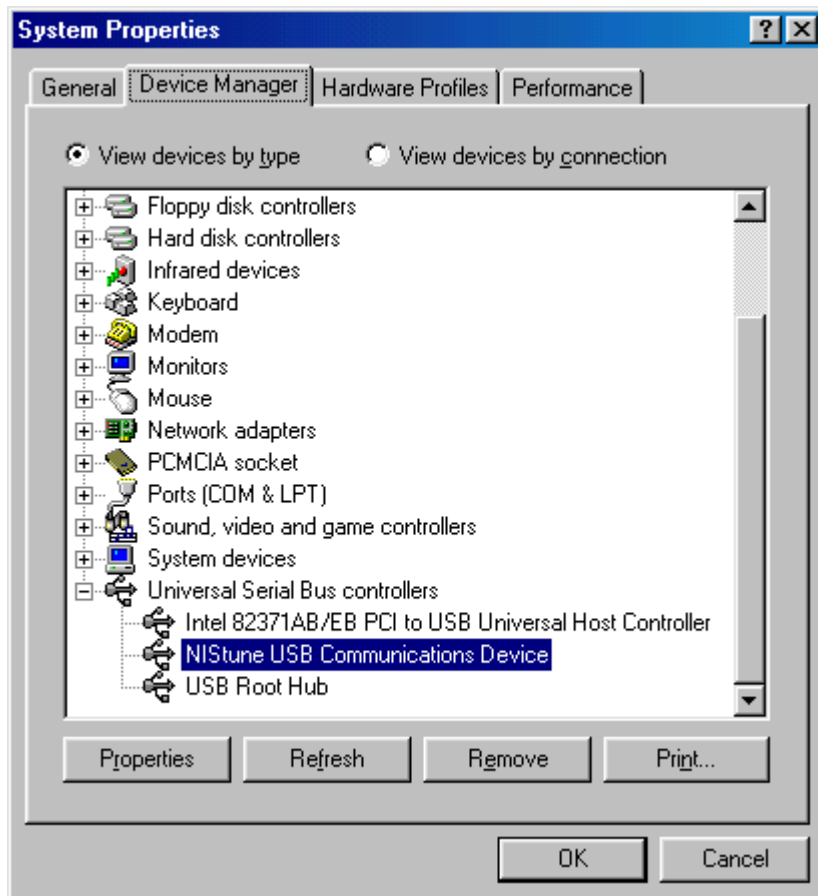
Follow the below if you are having problems getting NISTune to talk to your ECU. Ensure ECU powered at all times during following procedure.

Run USB View and double check the NISTune USB module hardware is detected (enumerated)

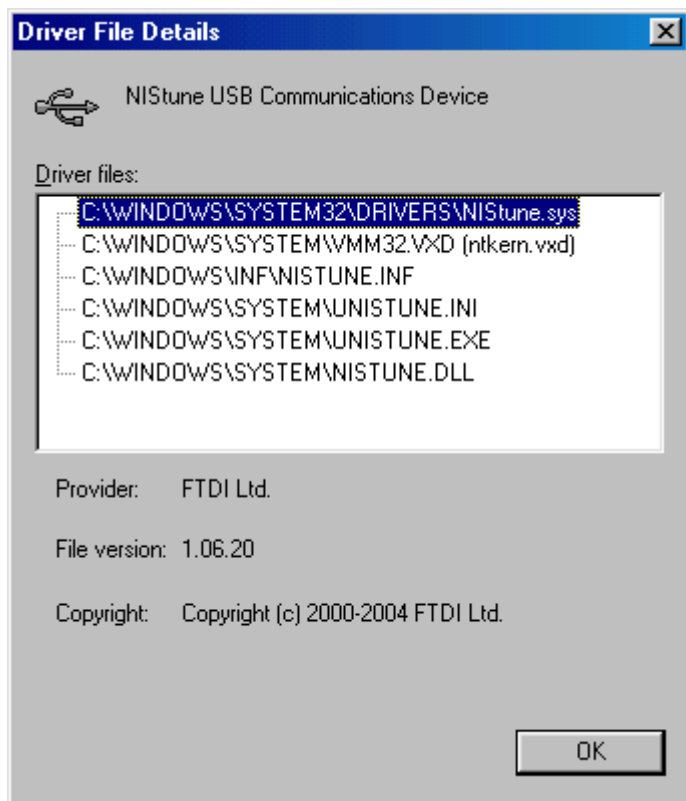


Make sure the idVendor is 0x0403 and idProduct is 0xC7D8. If not things wont work with NISTune

1. Open Control Panel

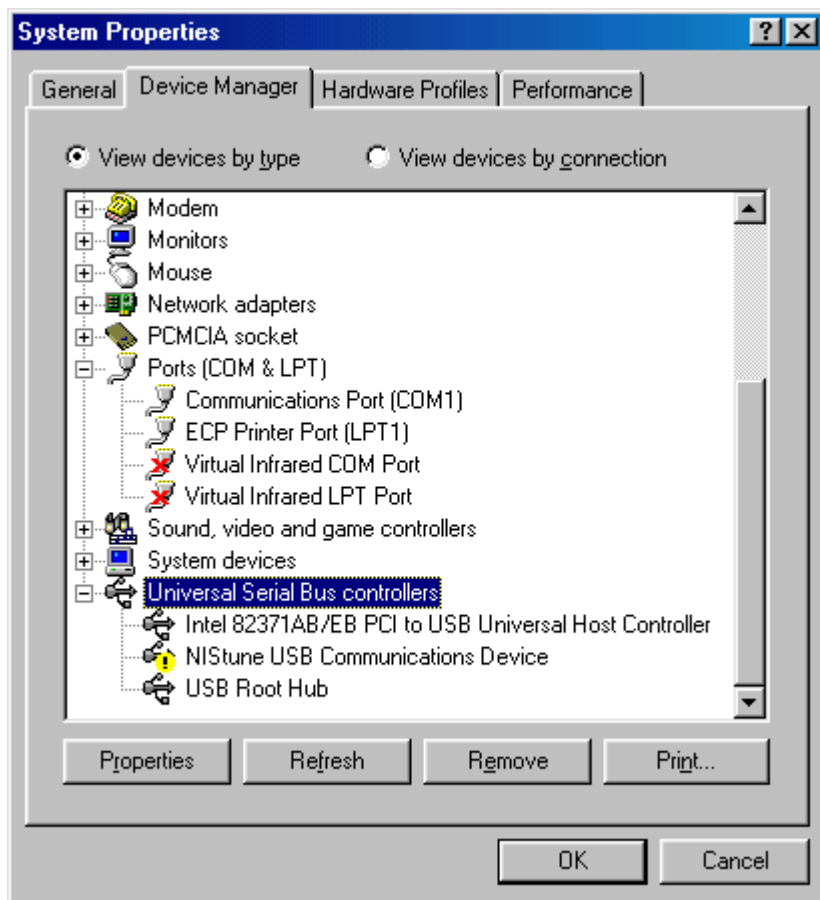


2. Properties – Driver – Driver File Details



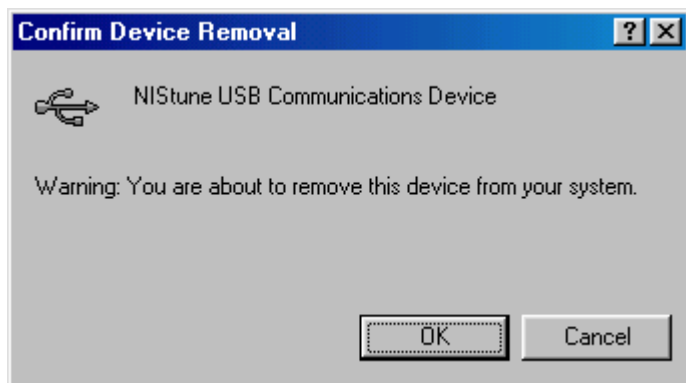
Remove the USB cable and delete these files, apart from VMM32.VXD as in following window

Close the control panel windows and then reopen. Plug in the NIStune USB board



You should have the explanation mark next to the NISTune USB Communications Device

Click 'Remove' and then OK



Now remove the USB connector and then replug in

You should get a 'New Hardware Found' window now and asking for **NEW** drivers



Extract the NISTune_USB_drivers.zip to c:\ drive

This will install into C:\Nistune_USB_drivers

Click 'OK' on the 'Insert Disk' window. And select where to copy the files from in the 'New Hardware Found' box

Select 'Browse'

Then open NISTune.dll in C:\Nistune_USB_drivers and click OK

Now the directory is entered, click OK on this window also

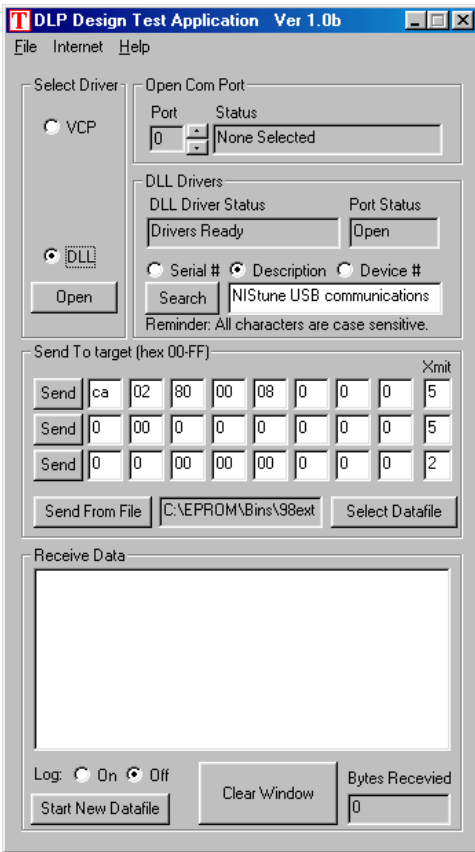
Ensure that control panel reports device is working correctly



And files listed below with File version matching are shown

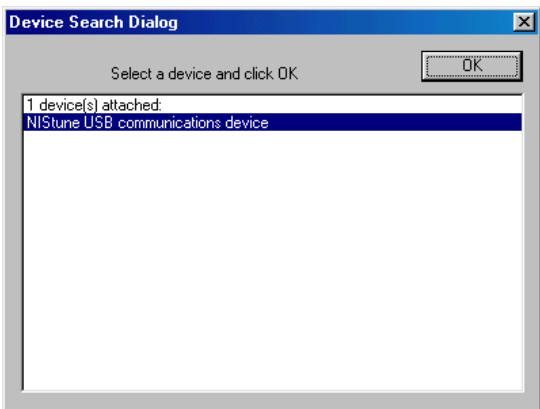
Copy FT245XX.DLL from the NISTune developments website folder to C:\WINDOWS\SYSTEM\FTD2XX.DLL. This is required for DLPtest.exe to communicate with this DLL and talk to your NISTune board

Run DLPTest.exe



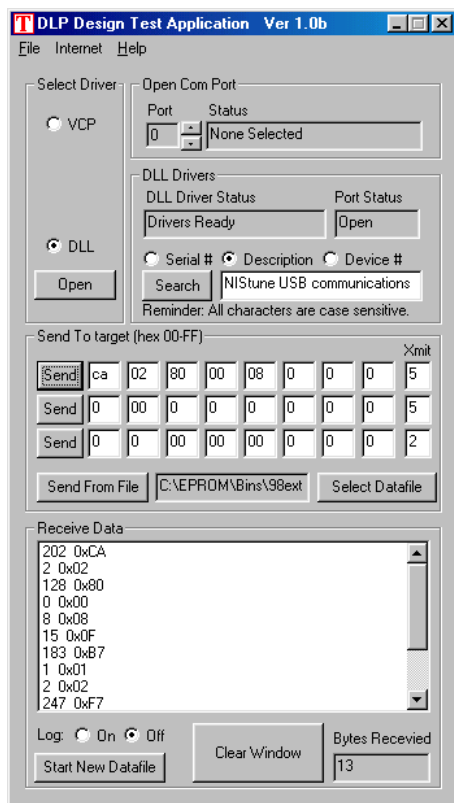
Ignore COM port and virtual com port drivers. We do not use these as NISTune communicates via the FTD2XX DLL

Ensure that DLL is selected. Click 'Search' and 'NISTune USB communications' should show as per window below. If the window refuses to appear then the FTD2XX.DLL cannot appear. NISTune requires the NISTune.DLL file to be present. These are actually the same files, but renamed in the NISTune USB drivers install file.



If it doesn't there is possibly a hardware detection error or the USB vendor/product ID is not matching. If the device is found attached, then select and click 'OK' then click 'Open'. Port Status should change to open

Type in 'CA 02 80 00 08' with Xmit field set to 5



You should now get data from the ECU. If you don't either invalid NISTune image has been loaded into ECU and patch code isn't running properly or the ECU jumpers to the HD6802 chip have not been wired correctly.