



NTL10X OEM-MODULES FAMILY FIRMWARE UPDATE

Reference Manual

2020





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1 GENERAL INFORMATION

NTL10X navigation receivers have one or two Primary Processing Units (PPU) - see relevant datasheet on OEM-module - and STM32H7-based RTK coprocessor. Each of these modules requires personal firmware. Thus, to perform full firmware update, you need three (or two) firmware files.

PPU interface includes set of commands for firmware flash memory access. Being a part of an embedded system OEM-module should be reprogrammed by host controller. See «GNSS-DCP-BUILD-6 - 62 - 00» document for commands description and «GNSS-PPU-SETUP-GUIDE-6-62-00» document for PPU description. To simplify this procedure OEM board should be connected to PC, then NTL Browser application should be used to reprogram the module. Special **NTL Eva Board** (interface adapter) or **NTL Adp Board** can be used to connect OEM receiver to PC. Step by step guidance will be stated in the next section.

The PPU's flash memory is capable of storing two firmware files - backup and basic firmware. The backup firmware version is programmed by the manufacturer only. Basic firmware can be updated by the user in a secure manner. In the case of a failure in the basic firmware updating process, the backup version will be used to load from and the device will remain functional. Special boot marker determines which firmware file to use upon start up. Boot marker setting is available via NTL Browser application as well, so both firmware versions can be used. If any receiver settings were saved in flash memory, they would be erased after firmware update. The receiver will start up with the default settings predefined by new firmware.

STM32H7¹ MCU reprogramming is available via JTAG interface only and requires some special hardware and software tools. See Section 3 for pin assignment of XP4 (JTAG) connector. ST-LINK/V2 (or any other compatible) debugging/programming tool should be used as well as appropriate drivers and software.

Before working with the OEM-module, refer to its actual datasheet to get information about its structure and basic features.

¹ Included in the NTL101, NTL104, NTL105 and NTL106 OEM-modules

2 PPU FIRMWARE UPDATE

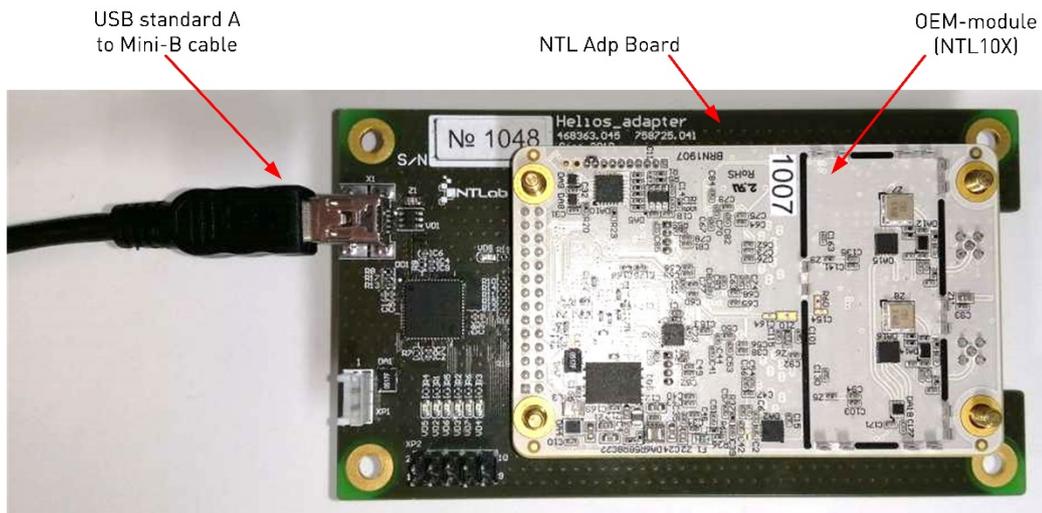
You are provided with the receiver having the latest version of firmware already installed. When more actual version of the firmware becomes available, you can use the NTL Browser to update the firmware on your receiver.

NTL Browser is a software tool designed to communicate with NTL10X through **NTL Adp Board**. NTL Browser provided as a zip file. It is available on NTLab company FTP server. Link (password and login) may be provided on request.

To upgrade the firmware:

1. Install NTL Browser on computer.
2. Install CP210x drivers on computer. Utility software downloadable from:
<https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers>
3. Connect NTL10X to the **NTL Adp Board**.
4. Connect **NTL Adp Board** to PC through mini USB cable (connector X1 of the **NTL Adp Board**).

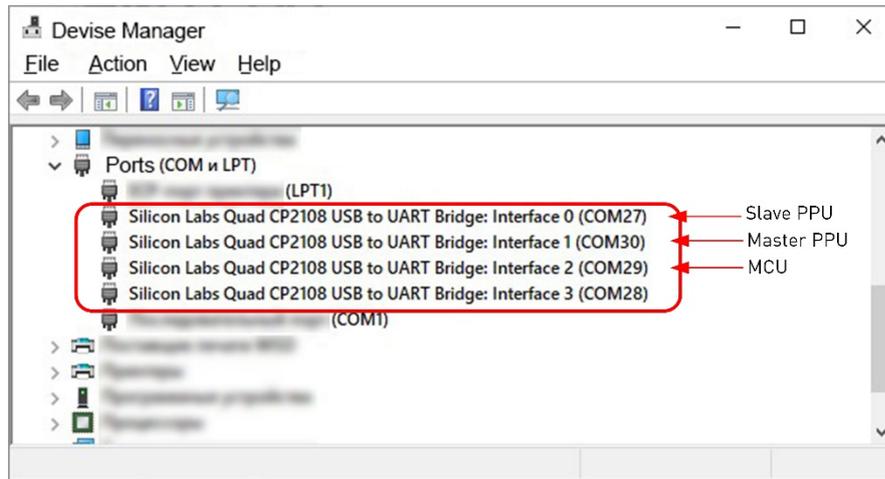
NTL Adp Board provides +5V supply voltage for navigation module and simplifies connection to host computer. NTL10X UART outputs is available on PC via on-board 4xUART to USB converter (CP210x based) as virtual COM ports.



5. At this stage, four virtual COM ports should be detected on operating system. Three¹ or two² of four virtual COM ports provide access to the NTL10X.

¹ For NTL105 and NTL106 modules

² For NTL101, NTL102, NTL103 and NTL104 modules



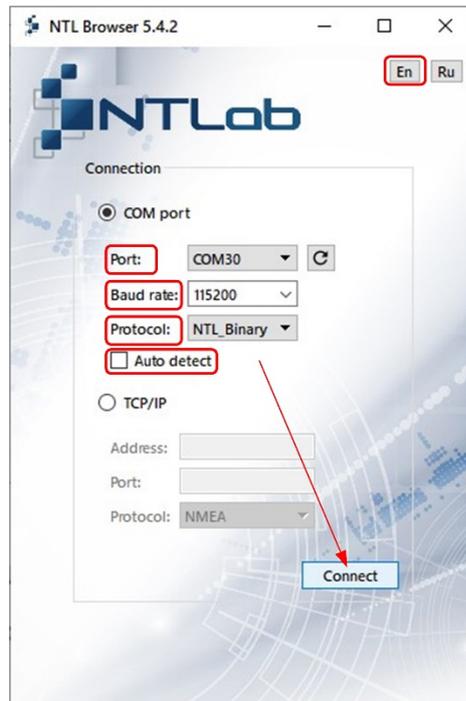
The Master PPU is available through **COM30 (Interface 1)**, the Slave PPU – through **COM27 (Interface 0)**. **Port numbers** could be different for alternative PC. **Interface numbers** could be different for alternative OEM-module (see Table 2.1).

Table 2.1 – Description of the NTL10X Interfaces

NTL10X family	Interface numbers (Virtual COM port)	Description
NTL101	Interface 1	Master PPU (UART Tx/Rx line)
	Interface 2	STM32H7 MCU
NTL102	Depends on adapter type	-
NTL103	Depends on adapter type	-
NTL104	Interface 0	Master PPU (UART Tx/Rx line)
	Interface 1	STM32H7 MCU
NTL105	Interface 0	Slave PPU (UART Tx/Rx line)
	Interface 1	Master PPU (UART Tx/Rx line)
	Interface 2	STM32H7 MCU
NTL106	Interface 0	Slave PPU (UART Tx/Rx line)
	Interface 1	Master PPU (UART Tx/Rx line)
	Interface 2	STM32H7 MCU

6. Run NTL Browser on computer. Then configure it:
 - Select interface language in the upper right corner of welcome page;

- Connect to the **Master PPU*** (COM30 Port);
- Set up **115200 Baud rate** and NTL Binary **Protocol** type or Set up **Auto detect**** checkbox to define them automatically;
- Click on the **Connect** button to continue.



NTL Browser Main page consists of the multiple windows, that can be switched on/off in **Windows** toolbar.

* To upgrade firmware on NTL102 and NTL103, connect to one of the available COM port.

** Auto detect mode allows to setup connection with the receiver:

- **baud rate** would be scanned and selected automatically;
- **protocol** type would be set up to NTLBinary mode;
- current UART channel would be turned to **'Master'** mode;
- raw data, if coming from this port, would be switched off.

If interfacing parameters are known in advance you may enter them manually and skip Auto detect.

The screenshot shows the NTL Browser 5.4.2 interface with the 'Settings' menu highlighted in the top navigation bar. The interface is divided into several sections:

- General Information:** Displays UTC (11:06:20), Date (04.02.20), Latitude (53° 55' 34.433412" N), Longitude (27° 35' 28.037736" E), Altitude (260.085 m), Speed (0.048 km/h), and Course (307.860°). It also shows POOP (L5), HDOP (0.8), VDOP (1.2), and Fix Mode (M 3D).
- GPS 6/7 and GLONASS 8/8:** Two tables showing satellite status for GPS and GLONASS constellations, including PRN, C/No, El., Az., and signal strength.
- Course:** Includes a compass rose and a plot of the vessel's track.
- Slave Antenna (ECEP) and Master Antenna (ECEP):** Fields for X, Y, Z coordinates and Length in meters.
- Message Log:** A scrollable list of received NMEA messages.
- Plot:** Three sub-plots showing E-W (m), N-S (m), and U-D (m) coordinates over time.
- C/No Plots:** Five bar charts showing signal-to-noise ratio for GPS, GLONASS, Galileo, BeiDou, and SBAS.
- Track:** A 2D plot showing the vessel's movement path.
- Coordinates (ECEP):** Fields for Receiver coordinates (x, y, z in meters) and Receiver Speed (vx, vy, vz in m/s).
- ENU:** Fields for East, North, and Up velocities (ve, vn, vu in m/s) and heading (cop, climb in m/s).
- Total SA, ARF, and Age B5 data:** Additional status and timing information.

7. Select the Settings/Show settings section.

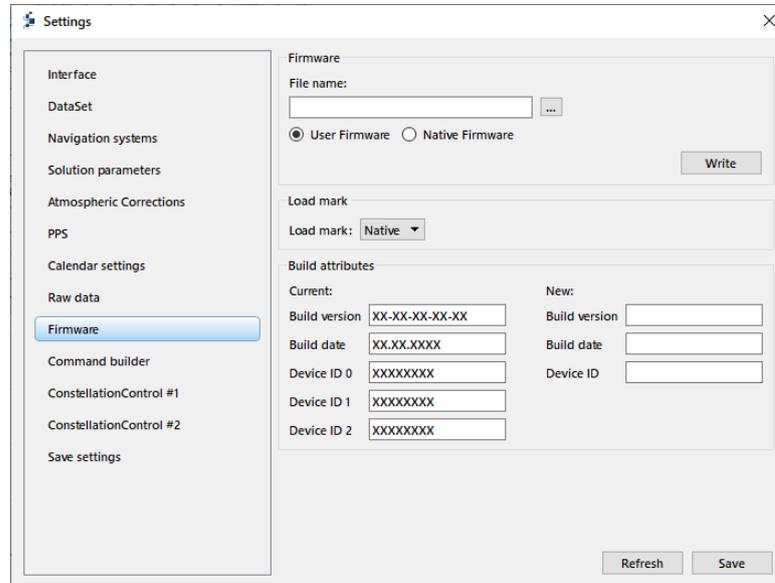
This screenshot shows the 'Settings' menu open in the NTL Browser 5.4.2 interface. The 'General' section is expanded, showing options for:

- Switch protocol
- Measurements (set to L2)
- NMEA messages (set to 0.7)
- Force restart (set to 0.9)
- Flash (set to 0.9)
- Clear windows (set to M 3D)
- Show settings (highlighted in blue)

The background shows the same data panels as the previous screenshot, but the 'Settings' menu is the primary focus.

If you are in NMEA interface mode, you will be proposed to switch into NTL Binary. Click on the **Yes** button.

8. Then select the **Firmware** section.

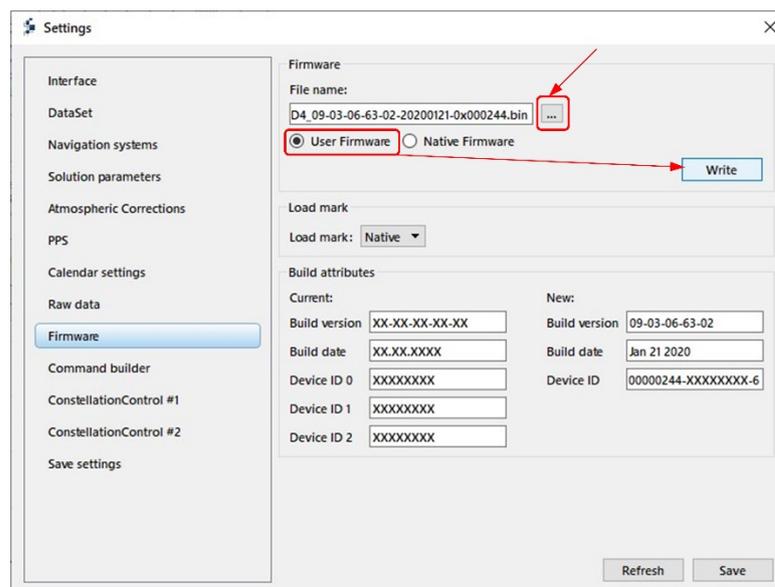


The screenshot shows the 'Settings' window with the 'Firmware' section selected in the left sidebar. The main area contains the following fields and controls:

- Firmware** section:
 - File name: [Text input field with a browse button (...)]
 - User Firmware Native Firmware
 - Write button
- Load mark** section:
 - Load mark: Native (dropdown menu)
- Build attributes** section:
 - Current:
 - Build version: [Text input field]
 - Build date: [Text input field]
 - Device ID 0: [Text input field]
 - Device ID 1: [Text input field]
 - Device ID 2: [Text input field]
 - New:
 - Build version: [Text input field]
 - Build date: [Text input field]
 - Device ID: [Text input field]

At the bottom right, there are 'Refresh' and 'Save' buttons.

- In the **Firmware** sub-section, select firmware file for master PPU as the **File name**. Then set **User Firmware** checkbox. Click on the **Write** button.



This screenshot is similar to the previous one but includes red annotations: a red box around the file name input field containing 'D4_09-03-06-63-02-20200121-0x000244.bin', a red arrow pointing to the 'User Firmware' radio button, and another red arrow pointing to the 'Write' button.

The 'File name' field now contains: D4_09-03-06-63-02-20200121-0x000244.bin

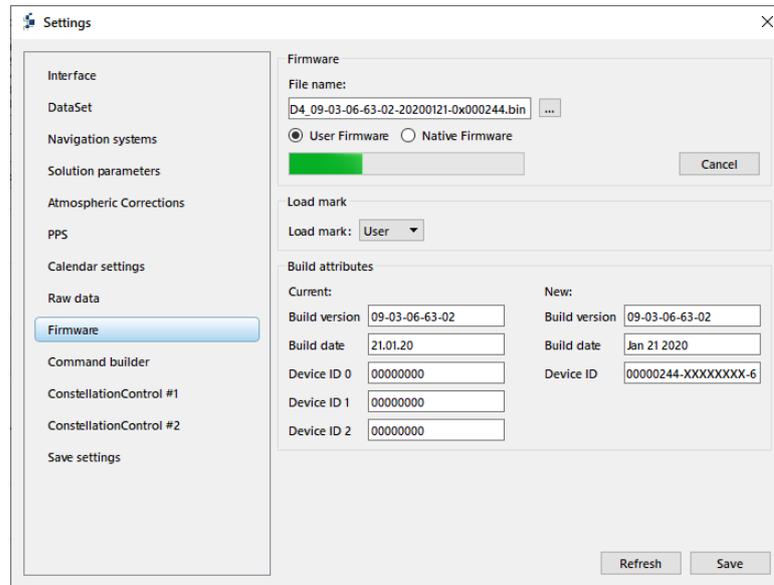
The 'User Firmware' radio button is selected.

The 'Write' button is highlighted.

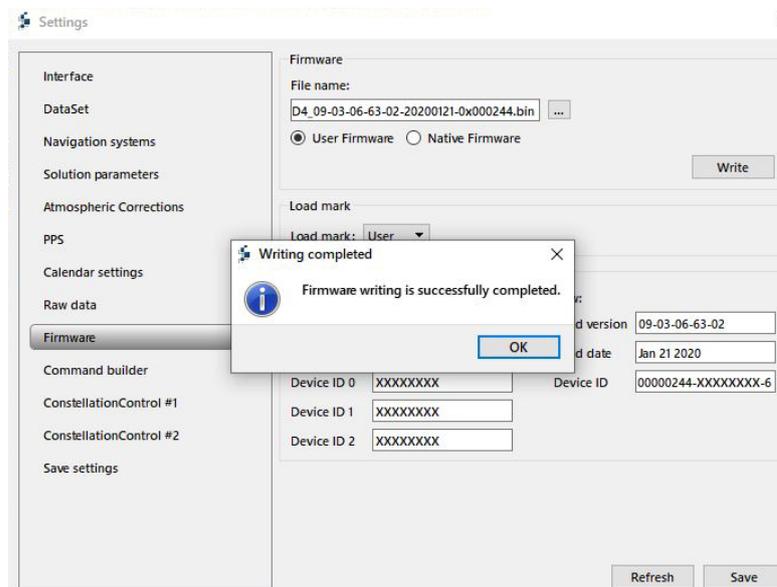
The 'New' section build attributes are populated:

- Build version: [Text input field]
- Build date: Jan 21 2020
- Device ID: 00000244-XXXXXXXX-6

Loading and verification process takes some minutes.

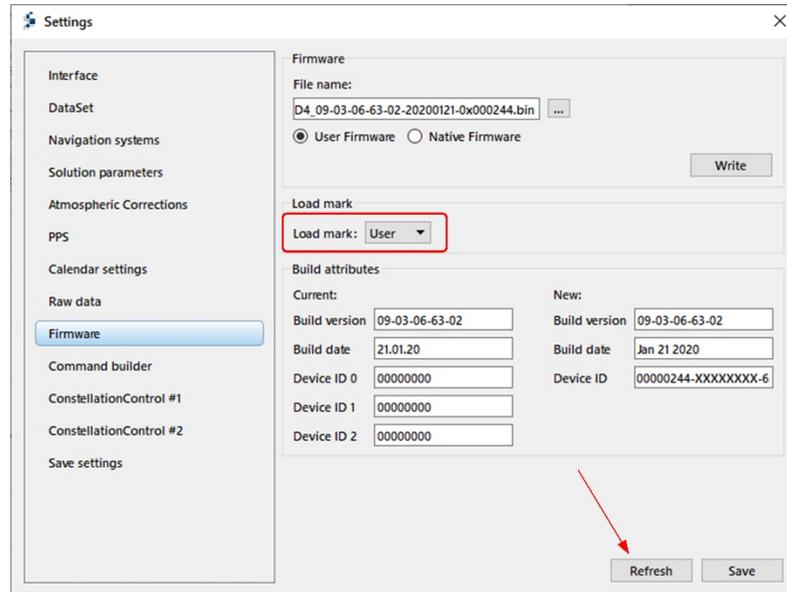


Wait for completion.



If connection is lost here, basic firmware file will be corrupted. In this case embedded firmware would be loaded from backup section, **Load mark** would indicate **Native**.

- Click on the **Refresh** button.

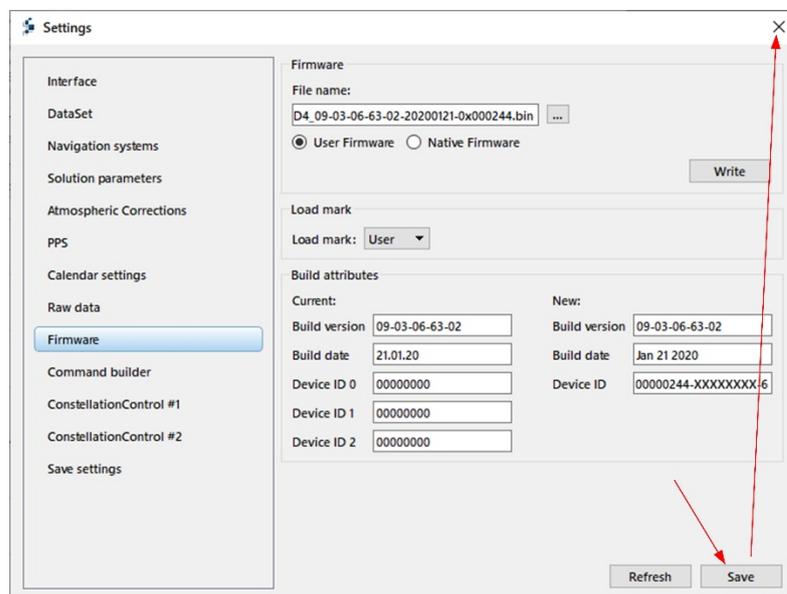


The screenshot shows the 'Settings' window with the 'Firmware' section selected in the left sidebar. The 'Firmware' section contains the following fields:

- File name:** D4_09-03-06-63-02-20200121-0x000244.bin
- Radio buttons:** User Firmware, Native Firmware
- Write button:** Write
- Load mark:** Load mark: User (highlighted with a red box)
- Build attributes:**
 - Current:**
 - Build version: 09-03-06-63-02
 - Build date: 21.01.20
 - Device ID 0: 00000000
 - Device ID 1: 00000000
 - Device ID 2: 00000000
 - New:**
 - Build version: 09-03-06-63-02
 - Build date: Jan 21 2020
 - Device ID: 00000244-XXXXXXXX-6
- Buttons:** Refresh, Save

Load mark will get **User** value automatically after successful completion of User Firmware Update procedure. Though, this field is available for editing and firmware section to be loaded from may be selected manually. To do this, setup **Load mark** and click on the **Save** button.

9. Click on the **Save** button. Exit the **Settings** section.



The screenshot shows the 'Settings' window with the 'Firmware' section selected in the left sidebar. The 'Load mark' dropdown is still set to 'User'. A red arrow points to the 'Save' button at the bottom right.

The 'Firmware' section contains the following fields:

- File name:** D4_09-03-06-63-02-20200121-0x000244.bin
- Radio buttons:** User Firmware, Native Firmware
- Write button:** Write
- Load mark:** Load mark: User
- Build attributes:**
 - Current:**
 - Build version: 09-03-06-63-02
 - Build date: 21.01.20
 - Device ID 0: 00000000
 - Device ID 1: 00000000
 - Device ID 2: 00000000
 - New:**
 - Build version: 09-03-06-63-02
 - Build date: Jan 21 2020
 - Device ID: 00000244-XXXXXXXX-6
- Buttons:** Refresh, Save


```

_S&H_Master_SBASPLUS

Message Log
Messages:
SGNXT,01,01,02,Helios_V4-Master*7E
SGNXT,01,01,02,Version 6.63 2020-01-21 0903*3C
SGNXT,01,01,02,Device ID 000000-000000-000000-0602*4F
SGNZDA,....*56
SGNGGA,000000,00,0000,00000000,N,00000,0000000,E,0,00,0,00,0,0000,M,,M,0,0,0,0000*43
SGNVTG,000,00,T,,M,0,0,000,N,0,000,K,N*2C
SGPGSA,M,I,.....*12
SGLSSA,M,I,.....*0E
SGNHDG,000000,00,0,0000,0,0000,0,0000,0,0,0,0*70
SYPR,200,0,0,0,0,....
SHVECT,200,0,0,0,0,....
SGNZDA,....*56
SGNGGA,000000,00,0000,00000000,N,00000,0000000,E,0,00,0,00,0,0000,M,,M,0,0,0,0000*43
SGNVTG,000,00,T,,M,0,0,000,N,0,000,K,N*2C
SGPGSA,M,I,.....*12
SGLSSA,M,I,.....*0E
SGNHDG,000000,00,0,0000,0,0000,0,0000,0,0,0,0*70
SYPR,400,0,0,0,0,....
SHVECT,400,0,0,0,0,....
SGNZDA,....*56
SGNGGA,000000,00,0000,00000000,N,00000,0000000,E,0,00,0,00,0,0000,M,,M,0,0,0,0000*43
SGNVTG,000,00,T,,M,0,0,000,N,0,000,K,N*2C
SGPGSA,M,I,.....*12
SGLSSA,M,I,.....*0E
SGNHDG,000000,00,0,0000,0,0000,0,0000,0,0,0,0*70
SYPR,600,0,0,0,0,....
SHVECT,600,0,0,0,0,....
SGNZDA,....*56
SGNGGA,000000,00,0000,00000000,N,00000,0000000,E,0,00,0,00,0,0000,M,,M,0,0,0,0000*43
SGNVTG,000,00,T,,M,0,0,000,N,0,000,K,N*2C
SGPGSA,M,I,.....*12
SGLSSA,M,I,.....*0E
SGNHDG,000000,00,0,0000,0,0000,0,0000,0,0,0,0*70
SYPR,800,0,0,0,0,....
SHVECT,800,0,0,0,0,....
SGPGSV0,1,00*78
SGLSSV0,1,00*64
SGSGSV1,1,02,123,,39,136,,40*72
SGNZDA,....*56
SGNGGA,000000,00,0000,00000000,N,00000,0000000,E,0,00,0,00,0,0000,M,,M,0,0,0,0000*43
SGNVTG,000,00,T,,M,0,0,000,N,0,000,K,N*2C
  
```

14. Exit from NTL Browser. To do this, select **Connection/Disconnect**.
15. Connect to the **Interface 0 (COM27 Port)** and repeat steps 7...14 to update **Slave PPU** firmware. Use appropriate firmware file.

3 JTAG PIN DEFINITION

Table 3.1 – XP4 connector (JTAG) pin definitions

Pin Nº	Name	I/O	Description
1	3.3V	Power	Power supply voltage
2	JTRST	Input	Test Reset
3	TDI	Input	Test Data In
4	TMS	Input	Test Mode Select
5	TCK	Input	Test Clock
6	TDO	Output	Test Data Out
7	-	-	not connected
8	JSRST	Input	Reset
9	-	-	not connected
10	GND	Power	Signal and Power Ground

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