User Guide

Networked Frequency Standard

Model NFS-220

P/N 091000001

Model NFS-220 Plus

P/N 095000001, 091000002

Revision M

September 2021

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Revision History

REVISION	DATE	COMMENTS	ECO NUMBER
NC	8-13-2008	Original release of NFS-220 user guide.	N/A
A	02-20-2009	Updated	N/A
B	02-19-2010	Change Alarm Status on J9 INPUT/OUTPUT	N/A
C	05-20-2011	Update to reflect updated web pages. Incorporated Free run mode	N/A
D	12-11-2013	Updated to add firmware and FPGA update procedures	N/A
E	01-24-2014	Updated to include power consumption.	N/A
F	08-22-2014	Updated to include default IP address information.	N/A
G	05-29-2015	Added factory default instructions	N/A
H	09-04-2015	Added MIB Description	N/A
J	12-15-2015	Corrected information about pulse width	N/A
K	04-03-2018	Clarified IRIG local time settings, updated Java installation instructions.	N/A
L	07-28-2021	Added front panel drawing of NFS-220 Plus, updated to reflect new firmware, removed Java installation instructions	ECO11832
M	09-23-2021	Changed all instances of the product name to NFS-220 for consistency	ECO11910

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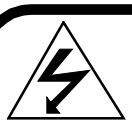
Safety Warnings

WARNING: This unit contains lethal AC voltages. Disconnect the unit from the AC supply before removing the cover.



WARNING:

The lightning flash with an arrowhead inside of an equilateral triangle is intended to alert the user to the presence of un-insulated "dangerous voltage" within the product's enclosure. The "dangerous voltage" may be of sufficient magnitude to constitute a risk of electrical shock to people. Do not attempt to repair the unit without first unplugging it.

CAUTION:

The exclamation point inside of an equilateral triangle is intended to alert the user to the presence of important operation and maintenance instructions in the user guide. This unit should only be repaired by qualified personnel. Several board assemblies contain static sensitive devices. Appropriate procedures must be used when handling these board assemblies.

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1 Introduction

The NFS-220 is a precision time and frequency standard that uses a Global Navigation Satellite System (GNSS).

It is designed for use in WI-FI, Wi-Max, satellite communications, telecommunications and military communication applications.

The NFS-220 utilizes a high performance 16 channel GNSS receiver. An automatic position-averaging feature enables the best use of GNSS when operating in a fixed location.

The NFS-220 is fitted with an internal back up oscillator that is continuously calibrated to GNSS using an advanced algorithm, providing optimal frequency control of the oscillator. This ensures that the highest time and frequency accuracy is maintained if no satellites can be tracked, and ensures an ultra stable, low noise frequency reference.

The basic NFS-220 includes a precision OCXO frequency standard, while TCXO and Rubidium oscillators are available options that offer a variety of price and performance options. An option with a low noise OCXO phase locked to a Rubidium is also available, combining the low noise characteristic of the OCXO with the long term stability of a Rubidium oscillator.

The NFS-220 provides “at a glance” status indication via front panel LED’s and can be integrated with other management systems using Ethernet and serial ports.

The NFS-220 provides simple integration into military platforms by allowing synchronization from Have Quick time code, which is available on military SA-ASM GPS receivers such as the DAGR(AN/PSN-13) or PLGR(AN/PSN-11). The NFS-220 also generates Have Quick and 1PPS signals compatible with ICD-GPS-060.

The integrated Ethernet interface provides Network Time Protocol (NTP) synchronization to other connected computers. In addition to NTP, the NFS-220 Ethernet interface contains a built-in web server that allows the NFS-220 to be controlled using a standard web browser such as Internet Explorer or Chrome. Simple Network Management Protocol (SNMP) allows easy integration of the NFS-220 with industry standard network management systems.

The NFS-220 provides three 1PPS time mark outputs. A unique feature allows precise controlled delays to be inserted into these outputs to compensate for cable- and other propagation delays. Compensation delay is independent for each output and has <1ns resolution.

Serial time code outputs are provided to allow time synchronization to be distributed to computers, displays, and other equipment requiring precision time. Two outputs are dedicated to Have Quick time code. Two outputs (one modulated, one DC level shift) may be user selected from IRIG A, IRIG B, IRIG E or IRIG G.

Four low phase noise 10 MHz sine wave outputs from the disciplined oscillator are provided. Signal amplitude is able to be set using the software available.

All outputs are provided with activity detectors. Loss of any output is indicated by means of an individual front panel alarm LED as well as through the network interface or a discrete alarm output.

2 Specifications

Reference Inputs

GNSS		
	Receiver Type	Parallel 32 Channel. All-in-view satellites tracked continuously and simultaneously
	Satellite Signal	GPS L_1 1575.42 MHz, GLONASS, QZSS, Galileo (not enabled by default)
	GPS Satellite Code	C/A 1.023 MHz
	Warm Start	<10 sec(Open Sky)
	Autonomous Start	<60 seconds Cold Start (Open Sky)
	Cold Start Requirement	Automatic: No input of time or position required
	Position Accuracy	2.4 m horizontal, 5 m altitude with respect to WGS84 after 24 hour position averaging
	Antenna Connector	BNC Female
Have Quick		
	Signal Type	Have Quick II per ICD-GPS-060
	Input Impedance	50 ohm
	Level	0-5V
	TFOM Threshold	4
	Connector	DB-9 (J-10)
External 1PPS	Signal Type	1PPS
	Input Impedance	50 ohm
	Level	2.5 - 5V
	Maximum Frequency Error	$2x10^{-9}$
	Connector	DB-9 (J10)

Input Modes

GNSS	Default
Have Quick/1PPS	Uses 1PPS for synchronization, Time of Day is loaded automatically from Have Quick
External 1PPS only	Uses 1PPS for synchronization, Time of Day is loaded manually by user

System Accuracy

	Specifications are based on GNSS mode tracking satellites unless noted.
Timing Accuracy	± 100 ns. absolute UTC Std Deviation 15ns (OCXO)
Timing Accuracy (holdover mode, ± 5ºC)	< 25 μsec/day (OCXO) < 2 μsec /day (Rb2)
Frequency stability)	See tables below

Oscillator Option	Stability	Allan Variance					
	-10 to 50 °C	1s	10s	100s	1000s	10000s	1 day
TCXO	$2.5x10^{-6}$	$1x10^{-7}$	$1x10^{-7}$	$1x10^{-7}$	$5x10^{-8}$	$2x10^{-9}$	$1x10^{-11}$
OCXO (std)	$3x10^{-9}$	$5x10^{-12}$	$8x10^{-12}$	$1x10^{-11}$	$1x10^{-11}$	$5x10^{-12}$	$1x10^{-12}$
Rb1	$7x10^{-10}$	$3x10^{-11}$	$1.6x10^{-11}$	$8x10^{-12}$			$<1x10^{-12}$
Rb2	$4x10^{-10}$	$1x10^{-11}$	$3x10^{-12}$	$1x10^{-12}$			$<1x10^{-12}$
Rb/OCXO	$4x10^{-10}$	$5x10^{-12}$	$1x10^{-11}$	$3x10^{-12}$			$<1x10^{-12}$

System Outputs

1PPS Output		3 Outputs
Connector		BNC (2) DB9 (1)
	Level	0-10V for output 1 and 2 (BNCs) 0-5V for output 3 (DB9)
	On Time	Rising Edge
	Width	100ns to 6.5 ms software settable in 100ns steps
	Delay	-0.5 to +0.5 seconds in 1 ns steps Individually settable for each output
Network Interface		
Interface Type		10BaseT, Half-Duplex.
	Protocols	TCP/IP, UDP, NTPv3, HTTP, SNMP v1, DHCP
Serial Interface		
	Type	RS232 RS422 link selectable by user
	Baud rate	115200, N,8,1
Sine Wave Outputs		
	Outputs	4 independently buffered outputs with software level adjustment
	Connector	BNC
	Frequency	10MHz
	Level	9-16dBm into 50 ohm Software settable
Phase Noise (OCXO, RB/OCXO)		Offset — dBc/√Hz 1Hz -90 10Hz -120 100Hz -130 1kHz -140 10kHz -150 100kHz -155
Time Code 1 Output		(Modulated)
	Connector	BNC
	Code Type	IRIG A135, B125, E115, G145 software selected
	Control Functions	IEEE 1344
	Level	3 V p-p into 600 ohm
Time Code 2 Output		(DCLS)
	Connector	DB9 J9-2
Code Type		IRIG A005, B005, E005, G005
	Selection	same as modulated code
	Levels	DC Level Shift (0-5V)
Time Code 3,4 Output		
	Connector	BNC (1) DB9 (1)
	Code Type	Have Quick per ICD-GPS-060
	Levels	0-10V for output 1 (BNC) 0-5V for output 2 (DB9)
Alarm Status		Voltage free relay changeover contacts. Link settable for +5V alarm out
Status Indicator LED's		Power
		Tracking Satellites
		Valid Time

		Holdover/12hr Holdover alarm
		Output Good/Fail (8 LEDs)

Environmental

Temperature		Instrument: -10 to +50 °C
		Antenna: -40 to +85 °C
	Humidity	95% non condensing
	Power	85-265VAC 50/60Hz
	Consumption	40 Watts
	Optional	12VDC, 24VDC, -48VDC, 125VDC
Dimensions		19” rack mount
		1.75” (1U) height, 6.5“ depth
Weight		3.5 lb. typical
EMC Emission		EN55022
		FCC Chapter 15 Subpart B, Class A
EMC Immunity		EN55024

2.1 LED Indicators

Table 1 below describes each LED indicator on the front panel of the NFS-220.

LED	COLOR	COMMENT
Power	Green	Indicates Prime Power is applied to the NFS-220.
Time Valid	Green	Indicates that the unit has been synchronized to an external reference.
	Amber	Indicates that the unit is in Holdover.
Tracking Satellites	Green	Indicates that the GNSS receiver is tracking satellites OR that the Have Quick time code has been successfully decoded if HQ is selected as a reference.
	Red	Indicates that the NFS-220 has not had a valid reference for 12 hours.
	Off	Indicates that the NFS-220 is not tracking satellites or successfully decoding HQ.
IRIG J8	Green	Indicates that the IRIG time code output on J8 is operating.
	Red	Indicates that the IRIG time code output on J8 has failed or that there is an excessive load on the output.
HQ J7	Green	Indicates that the Have Quick time code output on J7 is operating.
	Red	Indicates that the Have Quick time code output on J7 has failed or that there is an excessive load on the output.
1PPS J6	Green	Indicates that the 1PPS pulse output on J6 is operating.
	Red	Indicates that the 1PPS pulse output on J6 has failed or that there is an excessive load on the output.
1PPS J5	Green	Indicates that the 1PPS pulse output on J5 is operating.
	Red	Indicates that the 1PPS pulse output on J5 has failed or that there is an excessive load on the output.
10MHz J4	Green	Indicates that the 10MHz output on J4 is operating.
	Red	Indicates that the 10MHz output on J4 has failed, that there is an excessive load on the output, or that the output is connected to a cable that is improperly terminated and is causing a reflection on the line.
10MHz J3	Green	Indicates that the 10MHz output on J3 is operating.
	Red	Indicates that the 10MHz output on J3 has failed, that there is an excessive load on the output, or that the output is connected to a cable that is improperly terminated and is causing a reflection on the line.
10MHz J3	Green	Indicates that the 10MHz output on J2 is operating.
	Red	Indicates that the 10MHz output on J2 has failed, that there is an excessive load on the output, or that the output is connected to a cable that is improperly terminated and is causing a reflection on the line.
10MHz J3	Green	Indicates that the 10MHz output on J1 is operating.
	Red	Indicates that the 10MHz output on J1 has failed, that there is an excessive load on the output, or that the output is connected to a cable that is improperly terminated and is causing a reflection on the line.
Ethernet J11	Yellow	Activity
	Green	Link

Table 1 LED Indicators

2.2 Connections

Table 2 shows the signal interface connections provided on the NFS-220.

CONNECTOR REFERENCE	CONNECTOR TYPE	CONNECTOR PIN	SIGNAL
J1 10 MHz OUTPUT 1	BNC FEMALE	CENTER	10 MHz
		SHIELD	GROUND
J2 10 MHz OUTPUT 2	BNC FEMALE	CENTER	10 MHz
		SHIELD	GROUND
J3 10 MHz OUTPUT 3	BNC FEMALE	CENTER	10 MHz
		SHIELD	GROUND
J4 10 MHz OUTPUT 4	BNC FEMALE	CENTER	10 MHz
			GROUND
J5 1 PPS OUTPUT 1	BNC FEMALE	CENTER	1 PPS
		SHIELD	GROUND
J6 1 PPS OUTPUT 2	BNC FEMALE	CENTER	1 PPS
		SHIELD	GROUND
J7 HAVE QUICK OUT	BNC FEMALE	CENTER	HAVE QUICK II TIME CODE per ICD-GPS-060
		SHIELD	GROUND
J8 IRIG OUT	BNC FEMALE	CENTER	MODULATED IRIG TIME CODE
		SHIELD	GROUND
J9 INPUT/OUTPUT	DB-9 FEMALE	1	NO CONNECTION
		2	DC LEVEL SHIFT IRIG TIME CODE
		3	HAVE QUICK II TIME CODE per ICD-GPS-060
		4	ALARM OUT CONTACT-CLOSED ON ALARM
		5	ALARM OUT CONTACT-CLOSED ON NO-ALARM
		6	GROUND
		7	1 PPS OUTPUT 3
		8	GROUND
		9	ALARM OUT COMMON
J10 CONSOLE PORT	DB-9 MALE	1	HAVE QUICK INPUT (EXTERNAL REFERENCE)
		2	RS232 RECEIVE DATA
		3	RS232 TRANSMIT DATA (SERIAL DATA)
		4	1PPS INPUT (EXTERNAL REFERENCE)
		5	GROUND
		6	RS422 RECEIVE DATA -
		7	RS422 RECEIVE DATA +
		8	RS422 TRANSMIT DATA – (SERIAL DATA)
		9	RS422 TRANSMITDATA + (SERIAL DATA)
J11 ETHERNET	RJ-45	1	TX+
		2	TX-
		3	RX+
		4	-
		5	-
		6	RX-
		7	-
		8	-
J12 ANTENNA	BNC FEMALE	CENTER	GNSS, +5V power for antenna
		SHIELD	GROUND

Table 2 Interface Connections

2.3 Source Impedance Selection and Signal Termination

Signal/Connector	Connector	Link Setting	Source Impedance	Recommended Load Impedance	Factory Setting
10 MHz	J1	N/A	50 ohm	50 ohm	N/A
10 MHz	J2	N/A	50 ohm	50 ohm	N/A
10 MHz	J3	N/A	50 ohm	50 ohm	N/A
10 MHz	J4	N/A	50 ohm	50 ohm	N/A
1PPS 1	J5	LK5 on	Low Z	50 ohm	
		LK5 off	50 ohm	50 ohm	✓
1PPS 2	J6	LK6 on	Low Z	50 ohm	
		LK6 off	50 ohm	50 ohm	✓
1PPS 3	J9-7	LK7 on	Low Z	50 ohm	
		LK7 off	50 ohm	1 kohm	✓
Have Quick 1	J7	LK2 on	Low Z	50 ohm	
		LK2 off	50 ohm	50 ohm	✓
Have Quick 2	J9-3	LK3 on	Low Z	50 ohm	
		LK3 off	50 ohm	1 kohm	✓
IRIG modulated	J8	N/A	6 ohm	600 ohm	N/A
IRIG DCLS	J9-2	LK3 on	Low Z	50 ohm	
		LK3 off	50 ohm	1 kohm	✓

Table 3 Source Impedance and Recommended Signal Terminations

3 Unpacking and Installation

3.1 Unpacking

Remove the NFS-220 from the shipping carton. The following items should be included in the shipment:

- 1 NFS-220
- 1 GNSS antenna
- 1x 100 feet of coaxial antenna cable
- 1 user guide (CD-ROM)

3.2 Installation

3.2.1 Mounting

The NFS-220 can be installed into a 19" rack mount cabinet either using rack slides or only using the front panel flanges. For static applications, the short depth and light weight of the NFS-220 ensures that the front panel is not stressed when only the front panel is used for support.
If the NFS-220 is installed on a mobile platform and must survive shock and vibration, the use of slides is recommended. Slides are installed using 10-32 UNF-2B hardware.

Optional Rack Mount Slides:

P/N 002000123, SLIDE, RACK, 24", 21" TRAVEL, 85 LB
P/N 002000150, SLIDE, RACK, 28", 27" TRAVEL, 80 LB

Original Manufacturer: General Devices Chassis Trak Type C300.

3.2.2 Power

Insert the power cord of the NFS-220 into an electrical socket to power up the unit. The Power LED indicator will illuminate green.

3.2.3 Ethernet

Connect one end of an Ethernet patch cable to the NFS-220 Ethernet port J11. Connect the other end of the Ethernet cable to your network with an Ethernet hub or switch.

3.2.4 Input Reference Connections

3.2.4.1 GNSS Antenna

Connect the GNSS antenna to the J12 Antenna BNC connector on the rear panel of the unit. The GNSS antenna must be located in a suitable location with a clear view of the sky. In most cases, the GNSS signals do not penetrate buildings. Use the cable provided in the shipment to connect the

GNSS antenna and NFS-220. In the event that a longer cable is required, a low loss cable must be used so that the total signal attenuation at 1575 MHz is < 20 dB. For more information on suitable cables contact Brandywine Communications.

- Location

Several factors need to be considered when installing the GNSS antenna. In most cases, the antenna is mounted externally (outdoor) and exposed to the elements. A good quality coaxial cable of 50 ohm impedance is required to connect the GNSS antenna to the NFS-220. The cable provides two functions, which are to conduct the GNSS RF signals (1575.42 MHz) that are received from the GNSS antenna to the NFS-220 and to conduct the DC bias voltage (5 VDC) provided by the NFS-220 to the LNA (low noise amplifier) contained inside of the GNSS antenna. The antenna should be mounted securely, with a clear view of the sky, and with the top of the antenna pointing upward. In some installations it may not be possible to mount the antenna such that the antenna has a clear 360-degree view of the sky. In such cases pick the location with the best view of the sky.

- Exposure to High RF Fields

Some installations may occur in locations where a variety of high power transmitters and antennas are located. The GNSS antenna should not be directly exposed to or bombarded with high level RF energy. In such cases, the antenna should be located either above, below, or to the side of these high power RF transmission antennas.

- Lightning Protection

The NFS-220 does not provide any inherent protection against lightning strikes. In general, lightning protection (when desired or needed) is provided by an externally mounted protection device that is designed to shunt the high voltage transient to a well-established earth ground. Lightning arresting devices designed for use with the GNSS antenna system are available at Brandywine Communications (P/N 001000914).

- RF Loss

The most important source of signal loss is the RF signal attenuation experienced in the cable. The amount of attenuation is related to the type (quality) of coaxial cable and cable length. The antenna provides about 30 dB of gain to the received GNSS signal. The purpose of this gain is to offset the loss that is experienced in the cable between the GNSS antenna and NFS-220. It is recommended that the overall antenna system gain (antenna gain - cable loss) be between 10 dB - 33 dB. Using an antenna with 30 dB of gain allows for about 20 dB of cable loss. The NFS-220 is shipped with 100' of Belden 8240 antenna cable with a cable loss of approximately 18 dB. For distances beyond 100', Brandywine recommends low loss Belden 9914 with a loss of 5.84 dB/100ft
Standard antenna cable using this configuration is available from Brandywine as shown in Table 4. For distances beyond 330', an in-line amplifier is required.

- Tempest Facilities/Extremely Long Cable Runs

For applications where no conductive penetration of EMC shielding can be tolerated or for extremely long cable runs, Brandywine Communications offers a remotely powered fiber optic antenna link.

This comprises two external units. The remote down-converter and fiber unit is connected to the antenna and it converts the GNSS RF signal to an optic signal at lower frequencies that is suitable for transmissions over a fiber optic cable. The local fiber and up-converter unit accepts the optical signal and converts it back into an electrical RF signal that is processed by the NFS-220. Please note that the unit does not require calibration.

PART NUMBER	CABLE LENGTH	CABLE TYPE
002-0037	100 feet	RG58 (supplied)
002-0040	150 feet	RG8
002-0052	250 feet	RG8
002-0039	330 feet	RG8
051000001	In-line amplifier 20 dB	TNC/TNC connectors
002-0065	Fiber optic cable converter up to 1500 meters	Multi-mode fiber optic

Table 4 NFS-220 Antenna Cable options

Please note that it can take up to five (5) minutes for the unit to lock on to a GNSS signal after powering up. Until then, the unit will not be sending out valid time.

The unit must have at least four (4) GNSS satellites in view at all times in order to generate valid time.

3.2.4.2 External GNSS Receiver (Have Quick/1PPS)

The NFS-220 can also be synchronized to an external GNSS receiver such as the AN/PSN-13 Defence Advanced GNSS Receiver (DAGR), or AN/PSN-11 PLGR .
Both of these receivers incorporate a 1PPS Time Mark and Have Quick time code output that are used by the NFS-220 as references. Both signals are required for automatic operation. The NFS-220 requires that the TFOM is ≤4 before it will accept the time.
The cable connections to the NFS-220 are shown in Table 5 and Table 6:

AN/PSN-13 DAGR	Signal Name	Direction	NFS-220 (J10)
J2-7	Have Quick	>	1
J2-6	1PPS	>	4
J2-11	Signal Return	>	5

Table 5 Cable Connection to DAGR

AN/PSN-11 PLGR	Signal Name	Direction	NFS-220 (J10)
7	Have Quick	>	1
6	1PPS	>	4
11	Signal Return	>	5

Table 6 Cable Connection to PLGR

3.2.4.3 External 1PPS Receiver

The NFS -220 can also be synchronized to an external receiver that incorporates a 1PPS Time Mark only as a reference. An accurate manual time entry is necessary in this case. See section 4.5.1.3

3.2.5 NTP Server Connection Example

The NFS-220 is suitable for use as a Network Time Server, supporting Network Time Protocol (NTP). An example of the deployment of the NFS-220 in this role is shown below.

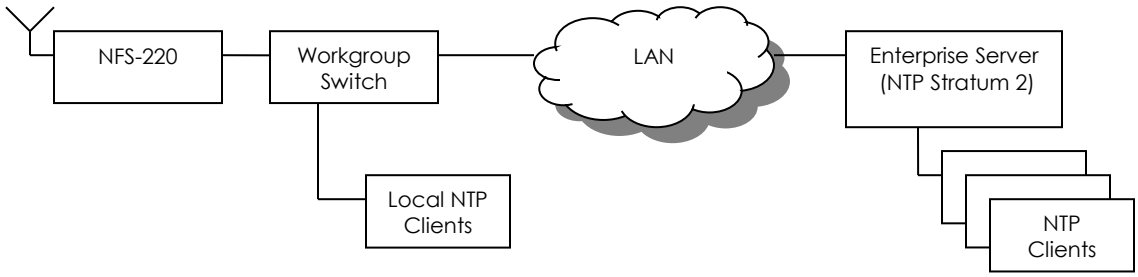


Figure 1 Typical NFS-220 NTP Server Network Connection

3.3 Output signal connections

3.3.1 Signal Connections

The output signals from the NFS-220 should be connected as required using appropriate connectors/cables. The cable should be terminated in the impedance shown in **Table 3** for optimum operation. In particular, the 1PPS signal has very fast rise times, and to prevent unwanted reflections, these outputs should be terminated correctly in 50 ohm
All BNC connectors are 50 ohm.

3.3.2 Network Connections

The NFS-220 is shipped with a label that indicates the IP address stored in the unit. The default settings are:

- IP Address: Automatic – set by DHCP server
- Subnet Mask: Automatic – set by DHCP server
- Gateway:Automatic – set by DHCP server

To change the network address, the user may use a web browser, or the console port. The two processes are described below.

If the NFS-220 cannot find a DCHP server on the network, it will set itself to the default IP Address of 192.168.1.220, unless it has already been set to an existing static IP.

The NFS-220 Plus will display the IP address on the front panel display as it powers up.

3.3.2.1 Discovering the automatically assigned NFS-220 IP address

In the default configuration, the NFS-220 is automatically assigned an IP address by the network's DHCP server. **If it cannot find a DHCP server, it will set itself to 192.168.1.220.** In order to use a web browser to control the unit, this address must be discovered.
This can be done, either by using the "Microchip Ethernet Device Discoverer" application from a computer on the same network as the unit, or by connecting a computer to the NFS-220 console port J10, via RS232, and using a terminal program such as HyperTerminal or Tera Term.

1. Configure the terminal program to accept ASCII data at 115,200 baud, No Parity, 8 bits/character, 1 stop bit (115200, N, 8,1); No Flow Control.
2. Cycle Power to the NFS-220.
3. A short string will be broadcast by the NFS-220 that has the IP address of the unit.
4. Note that in the example shown in Figure 2 the IP address changed upon power up from 192.168.2.206 (previous setting) to 192.168.1.129 which is the new address that the DHCP server assigned to it upon power up.

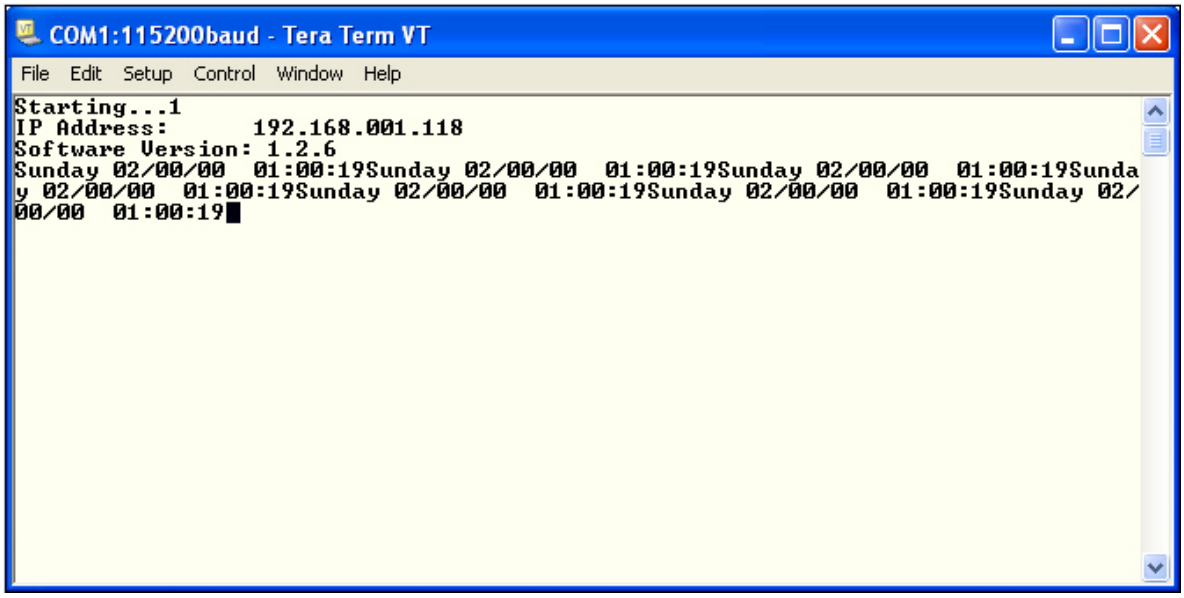


Figure 2 NFS-220 console port start-up string

3.3.2.2 Changing NFS-220 Network IP address using Internet Explorer

Enter the IP address of the NFS-220 into the address bar of a web browser running on a computer that is connected to the same network as the NFS-220, as shown in **Figure 3**

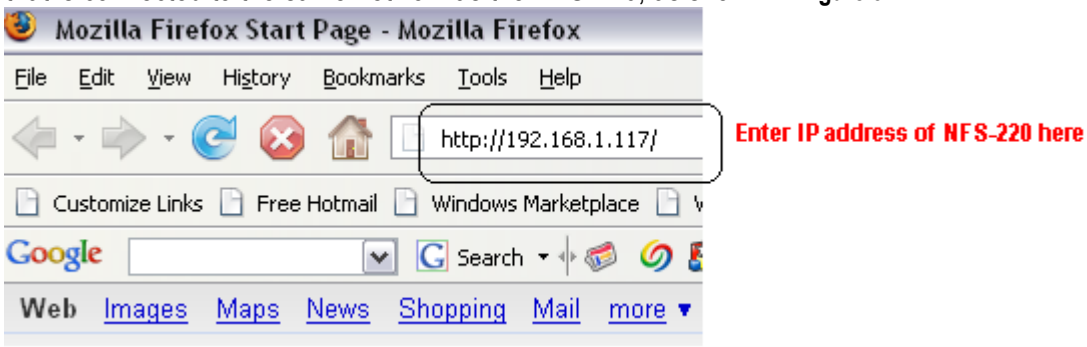


Figure 3 Browser settings for NFS-220

The browser page for the NFS-220 will load. Select the tab for Setup, as shown in **Figure 4**.

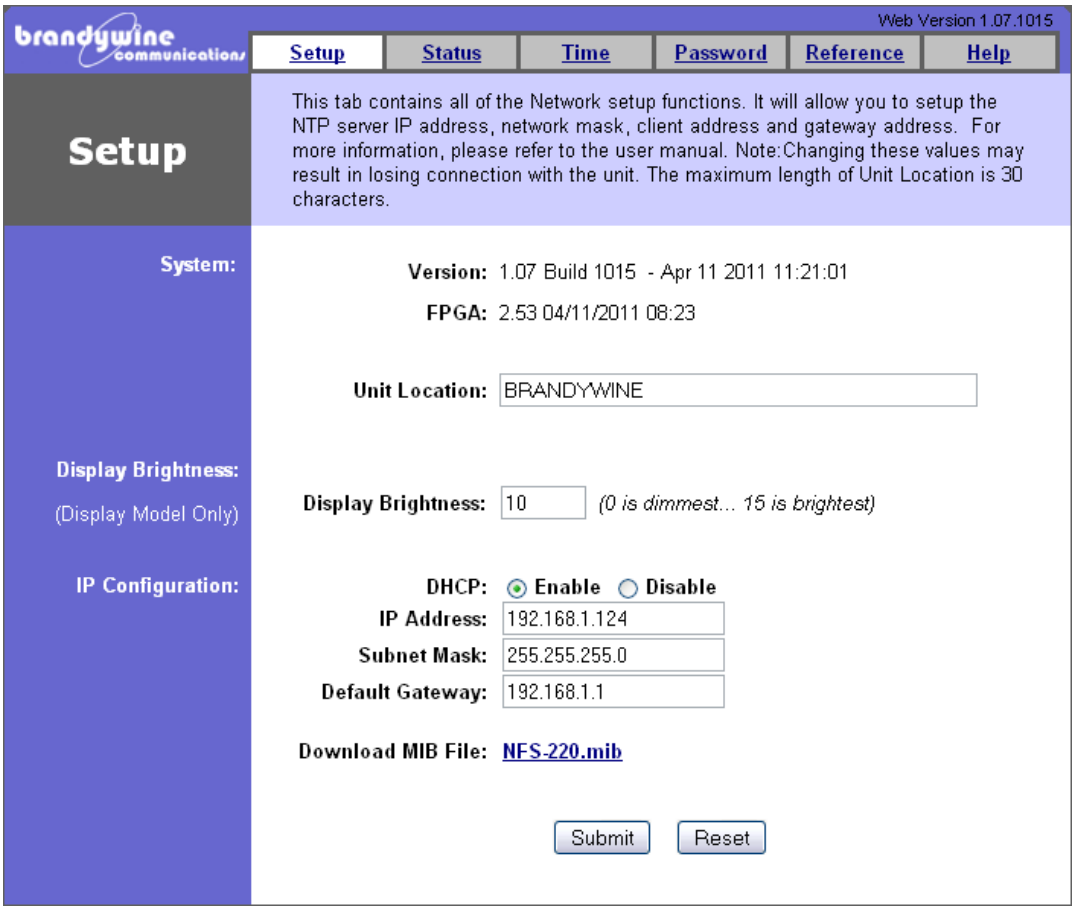


Figure 4 Setting IP address through the browser

1. Check the Box to Disable DHCP
2. Enter the desired parameters for the device IP address, the Subnet Mask and the gateway.

If you enter an invalid IP address, subnet mask and gateway, you may not be able to reach the NFS-220 using a web browser. Carefully check this information prior to entry, and check with your network administrator for the correct settings.

3. Click on the Submit button. Submit
4. Note that the browser will not reload the page, because the NFS-220 IP address has now changed.
5. Set the browser to the newly configured IP address and confirm that the NFS-220 IP address has changed as desired.

4 Configuration

Please note that the unit will automatically reboot when a serious error or lock up occurs. This allows the unit to reset and run instead of locking up.

4.1 Setup

The Setup tab consists of two sections, the System and IP Address. This tab allows you to modify setup information for the NFS-220. To save all modifications made to the Setup screen, click the Submit button. To undo all modifications made to the Setup screen, click the Reset button.

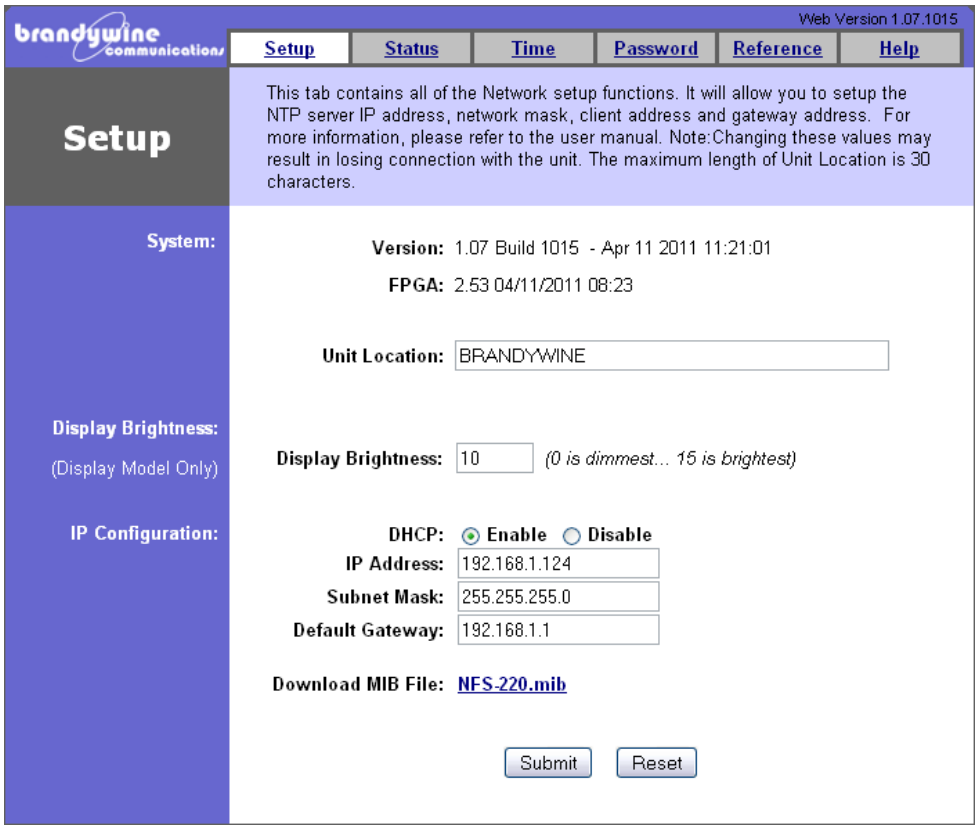


Figure 5: Setup

4.1.1 System

The System section consists of two fields, the Version and Unit Location. The Version refers to the version number of the firmware. The Unit Location refers to the location of the unit. A maximum of 127 characters may be entered in the Unit Location field. Entering apostrophes (') in the Unit Location field is not recommended.

4.1.2 IP Address

The IP Address section consists of two radio buttons, the DHCP Enable and DHCP Disable and three fields, the Device IP Address, Device Subnet Mask, and Device Gateway. If the DHCP Enable radio button is selected, the NFS-220 will retrieve its configurations from the DHCP server. If the DHCP Disable radio button is selected, the user must manually enter the configurations for the device.

The Device IP Address is a 32-bit number that identifies the device on an IP network. The Device Subnet Mask is a 32-bit number that enables the user to define sub-networks. The Device Gateway is a 32-bit number used as the point of entrance from one network to another.

4.1.3 SNMP Download MIB File

The NFS-220 supports Simple Network Management Protocol (SNMP v1.0) for monitoring and management. To use this protocol to monitor and control the NFS-220, download the MIB file by clicking on the link shown at the bottom of the Setup Page (See Figure 6)

Download MIB File: NFS-220.mib

Figure 6 Download MIB file

This will open a web page that contains the MIB for the NFS-220. Select all of the text on this page (Figure 7) and save it as a .txt file. This .txt file may be compiled by an SNMP application to provide control the NFS-220.. the full text is shown in

```
-- PICDEM.net control MIB.
--
-- Author                      Date        Comment
-- ================================================================
-- Wayne Bui                   09/10/08    Initial
-- Bao Nguyen                  10/19/09    Cleaned up.
--

BRANDYWINECOMM DEFINITIONS ::= BEGIN

IMPORTS
   enterprises, IpAddress, Gauge, TimeTicks     FROM RFC1155-SMI
   DisplayString                                FROM RFC1213-MIB
   OBJECT-TYPE                                  FROM RFC-1212
   TRAP-TYPE                                    FROM RFC-1215;

    brandyWineComm  OBJECT IDENTIFIER ::= { enterprises 18954 }
    NFS           OBJECT IDENTIFIER ::= { brandyWineComm 5 }

    Product             OBJECT IDENTIFIER ::= { NFS 1 }
    Setup                       OBJECT IDENTIFIER ::= { NFS 2 }
    Status              OBJECT IDENTIFIER ::= { NFS 3 }
    Time                        OBJECT IDENTIFIER ::= { NFS 4 }
    Reference   OBJECT IDENTIFIER ::= { NFS 5 }

   ON-OFF          ::=   INTEGER { ON(1), OFF(0) }

--
-- product number
--

ProductName    OBJECT-TYPE
   SYNTAX DisplayString
   ACCESS read-only
   STATUS mandatory
   DESCRIPTION
      "NFS-220 or NFS-220 TCXO"
   ::= { Product 1 }


SerialNumber   OBJECT-TYPE
    SYNTAX       DisplayString (SIZE (0..11))
    ACCESS       read-only
    STATUS       mandatory
    DESCRIPTION  "Serial Number string."
    ::= { Product 2 }
```

Figure 7 NFS-220 MIB (sample)

4.2 Status

The Status tab consists of four sections Local Time, Reference Status, Oscillator Status, Fault Status. This tab allows you to monitor the functional status of the NFS-220. There are no functions that can be modified on this tab – it is all read-only information.

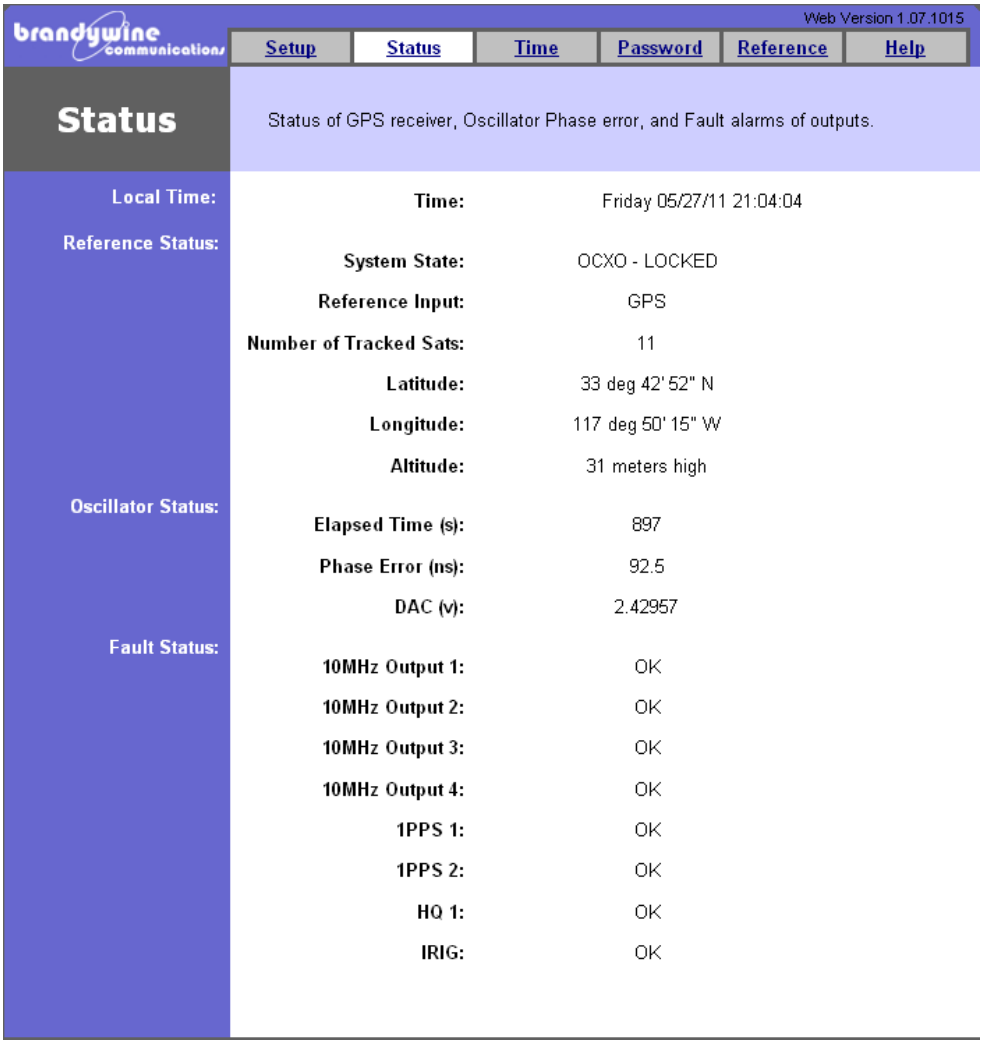


Figure 8: Status

4.2.1 Local Time

This section displays the local time of the NFS-220. This display updates the current time each second.

4.2.2 Reference Status

This section displays whether the NFS-220 time is locked to the selected reference. The default reference is GNSS. If GNSS is selected as the reference then this section of the screen shows the number of satellites being tracked (typically 6-10 satellites are tracked at any given time, depending

on the sky view of the antenna. If less than 4 are being tracked then the antenna location is not satisfactory, and it should be moved to a location where a better view of the sky can be obtained. The latitude, longitude and altitude calculated by the GNSS receiver are also shown. These are computed using the WGS-84 datum.

At powering up, System State sets to Warm-up for five minutes. Within this period, the unit will check for input reference like 1PPS/HQ or GNSS. For first time using GNSS input, it may take up about 30 minutes. Just after five minutes, if the input reference is good, then the unit will change to Lock or stays in Warm-up mode. During the unit is locked, if the input reference is disconnected, then the unit will change to Holdover (Using its internal OCXO or rubidium to maintain time). The unit will change to Lock if the input reference is re-connected.

4.2.3 Oscillator Status

The NFS-220 contains an internal disciplined oscillator that is used as the basis of the NFS-220 time and frequency outputs. The oscillator is divided down to 1 pulse per second and the difference between this 1pulse per second and the reference 1 pulse per second is measured and displayed as “Phase Error”. This value is the input to the oscillator control loop, which applies a voltage to the frequency control input of the oscillator. This voltage is displayed as “DAC”. It varies over the range 0-5 VDC.

The time that the control loop has been running is shown as “Elapsed time”.

4.2.4 Fault Status

Each rear panel output is monitored by a level detector circuit. If the output level falls below a factory set threshold, then the output is determined to be faulty. The Status Tab will indicate “FAULT” next to any output that falls below the fault threshold. The state of LED’s on the front panel will also reflect the status of each output.

4.3 Time

The Time tab consists of five sections, the Serial Output (TOD), Time Zone Settings, Daylight Saving Time, and Daylight Saving Time (Advanced) and Time Code. This tab allows you to modify the time settings for the NFS-220. To save all modifications made to the Time screen, click the Submit button. To undo all modifications made to the Time screen, click the Reset button.

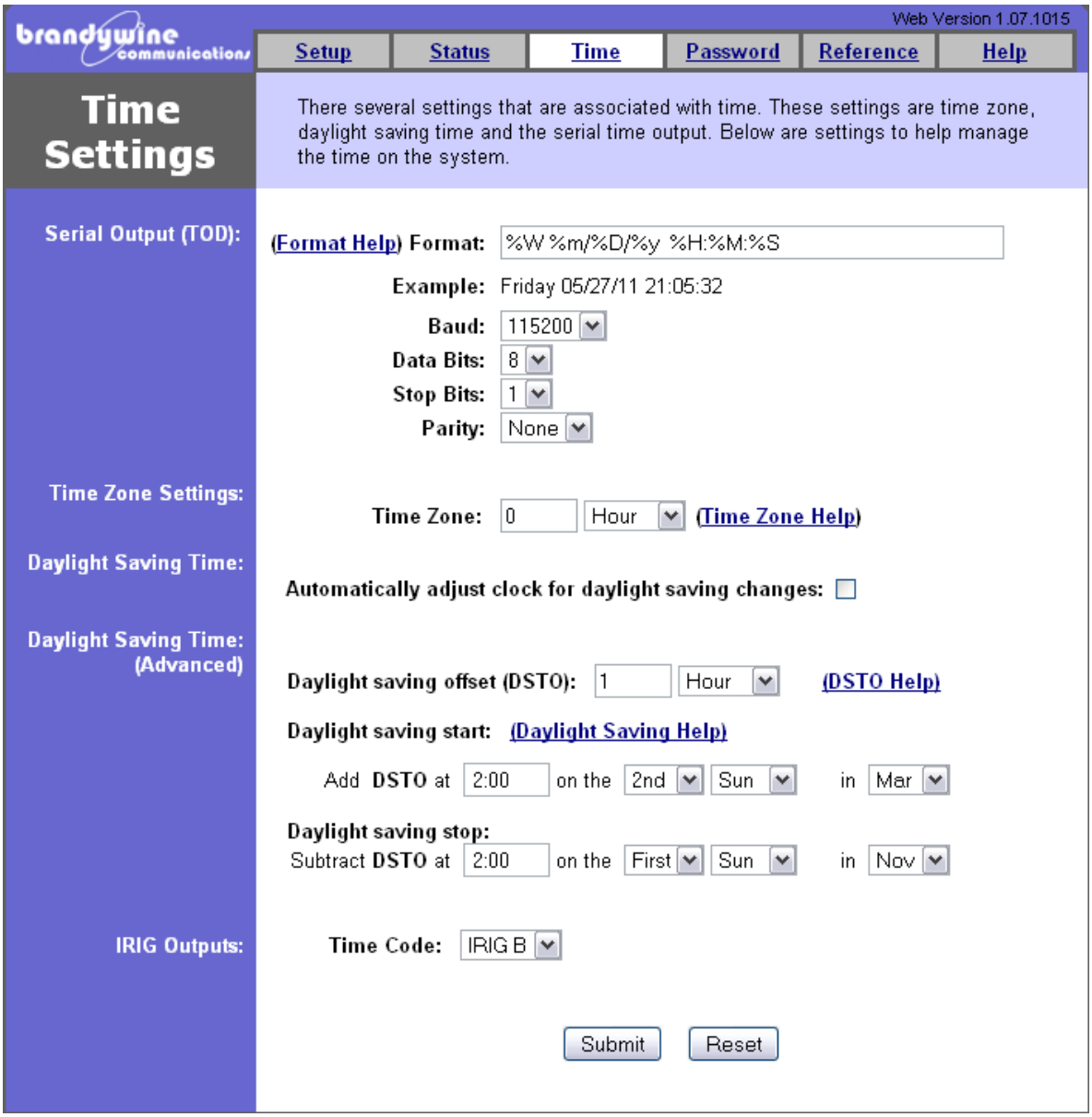


Figure 9: Time

4.3.1 Serial Output (TOD)

The Serial Output (TOD) consists of one text field, the Format, four combo boxes, the Baud, Data Bits, Stop Bits and Parity. The Format refers to the format of the time messages sent from both the RS232 and RS422 serial ports of the NFS-220 once per second. Table 7 below lists the characters and descriptions used in the Format field. The Baud refers to the number of bits transmitted per second. The Data Bits and Stop Bits follow RS232 standard. The Parity enables the user to check the validity of the data by using either odd or even parity checking.
The Serial output message is broadcast on J10, the Console port. If enabled, the message will also be available on the RS422 pins.

CHARACTER	DESCRIPTION
%A	AM/PM
%C	Carriage return (ASCII 13)
%D	Day of the month
%H	24 hour format
%h	12 hour format
%L	Oscillator Status, 0= Warm up, 1= Locked, 2= Hold Over, 3= Fault
%M	Minutes
%m	Number of the month
%N	Full name of the month
%n	3 character name of the month
%O	3 digit day of the year starting at 0
%o	3 digit day of the year starting at 1
%R	Line feed (ASCII 10)
%S	Seconds
%W	Full day of the week
%w	3 character day of the week
%X	Any printable hex value (%X20 = ASCII space
%y	2 digit year (2004 = 04)
%Y	4 digit year (2004 = 2004)
%%	% symbol

Table 7: Format Field Characters and Descriptions

4.3.2 *Time Zone Settings*

4.3.2.1 Standard Time Zone settings

The Time Zone Settings consist of two fields, the Time Zone text field and Time Zone combo box. The Time Zone text field allows the user to enter the Standard Time offset from the Universal Time. The Time Zone combo box allows the user to select either hour or minute. The table below lists all time zones and their Standard Time offsets from the Universal Time. Once the time zone has been set, the IRIG output of the NFS-220 will supply time of day with that time zone offset applied.

TIME ZONE	STANDARD TIME OFFSET FROM UNIVERSAL TIME
Eniwetok (Marshall Islands)	-12
Samoa (Polynesian Islands)	-11
Hawaii	-10
Alaska	-9
Pacific Time	-8
Mountain Time	-7
Central Time	-6
Eastern Time	-5
Atlantic Time	-4
Brazilia (Brazil)	-3
Mid-Atlantic	-2
Azores (Azores Islands)	-1
Rome (Italy)	1
Israel	2
Moscow (Russia)	3
Baku (Azerbaijan)	4
New Delhi (India)	5
Dhakar (Jordan)	6
Bangkok (Thailand)	7
Hong Kong	8
Tokyo (Japan)	9
Sydney (Australia)	10
Magadan (Russia)	11
Wellington (New Zealand)	12

Table 8: Time Zones

4.3.2.2 Special case – 30 minute time zone setting.

For those special cases where there is a time zone that has 30 minute offset from UTC, then the time zone must be calculated and entered in ***minutes***.

4.3.3 Daylight Saving Time

The Daylight Saving Time consists of the "Automatically adjust clock for daylight saving changes" check box. If the user clicks the check box, the system will automatically adjust the time of the NFS-220 when daylight saving time occurs. If the user does not click on the check box, the system will not automatically adjust the time of the NFS-220 when daylight saving time occurs.

4.3.4 Daylight Saving Time (Advanced)

The Daylight Saving Time (Advanced) consists of three fields, the Daylight Saving Time Offset (DSTO), Daylight saving start, and Daylight saving stop. The DSTO is a number that is added to or subtracted from the time zone setting. The DSTO entered by the user may be either in hours or minutes.

The Daylight saving start allows the user to add the daylight saving offset to the time the daylight saving should start. The user must enter the daylight saving start time, the occurrence of the specific day, the day of the week, and the month that the daylight saving should start. Note that the 24 hour standard is used (e.g. 1:00 p.m. will be written as 13:00). For example, Pacific Standard Time adds an hour at 02:00 on the second Sunday of March.

The Daylight saving stop allows the user to subtract the daylight saving offset from the time the daylight saving should stop. The user must enter the daylight saving stop time, the occurrence of the specific day, the day of the week, and the month that the daylight saving should stop. Note that the 24 hour standard is used (e.g. 1:00 p.m. will be written as 13:00). For example, Pacific Standard Time subtracts an hour at 02:00 on the first Sunday of November.

Please note that the daylight saving start time and daylight saving stop time must be in 24 hour format. For example, if daylight saving start time and daylight saving stop time are at 1:00 pm, the user must enter 13:00.

4.3.5 *Setting the IRIG Time Code format.*

The NFS-220 has two separate time code generators included. One time code generator is fixed to generate Have Quick II time code, as defined in ICD-GPS-060. The second time code generator generates one of 4 IRIG time codes. The selected IRIG time code is generated in two variants- the modulated time code (J8) and the DC level shift version (DCLS) is output on J9-2.
The formal IRIG descriptions are shown in **Table 9 IRIG time Code Formats**. Detailed information on IRIG time code formats may be found in IRIG 200-04, which may be downloaded from https://wsmrc2vger.wsmr.army.mil/rcc/PUBS/pubs.htm.
An extract from IRIG 200-04 is shown in **Figure 10**.

Selection	Modulated time code (J8)	DCLS Output (J9-2)
IRIG A	A135	A005
IRIG B (factory setting)	B125	B005
IRIG E	E115	E005
IRIG G	G145	G005

Table 9 IRIG time Code Formats

1. Select the desired time code by using the pull-down box to highlight the time code.
2. Click Submit [Submit] to enter the desired format.

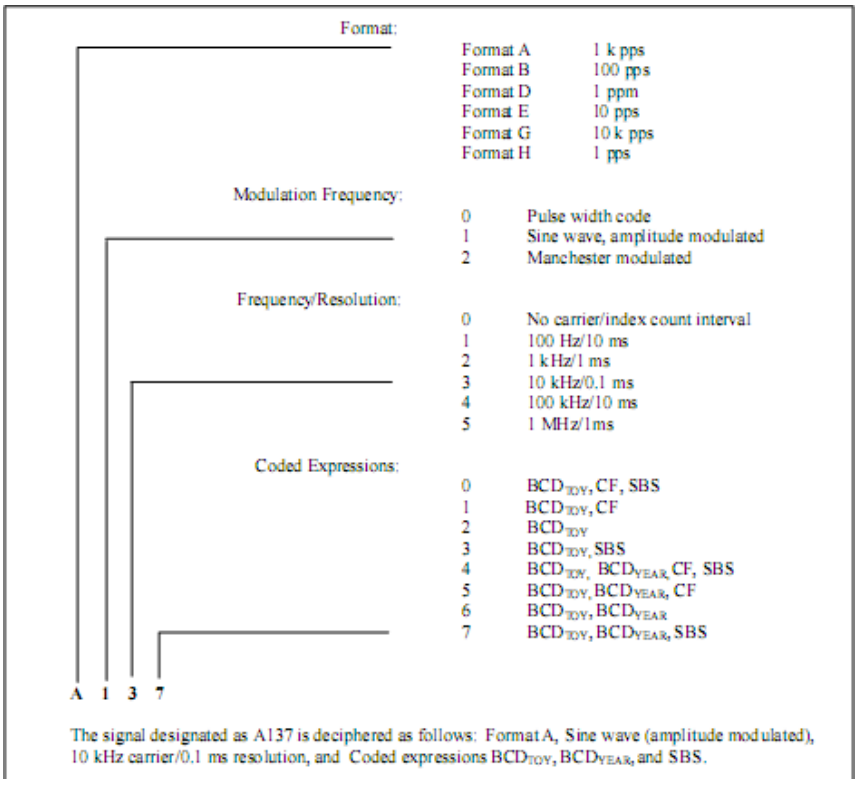


Figure 10 Standard IRIG Formats

4.4 Password

The Password tab allows you to change the user name and password for the system. To save all modifications made to the Password screen, click the Submit button. To undo all modifications made to the Password screen, click the Reset button.

IMPORTANT INFORMATION:
The default user name and password for the system is BRANDYWINE and the user must always enter a user name and password when submitting changes to the system.

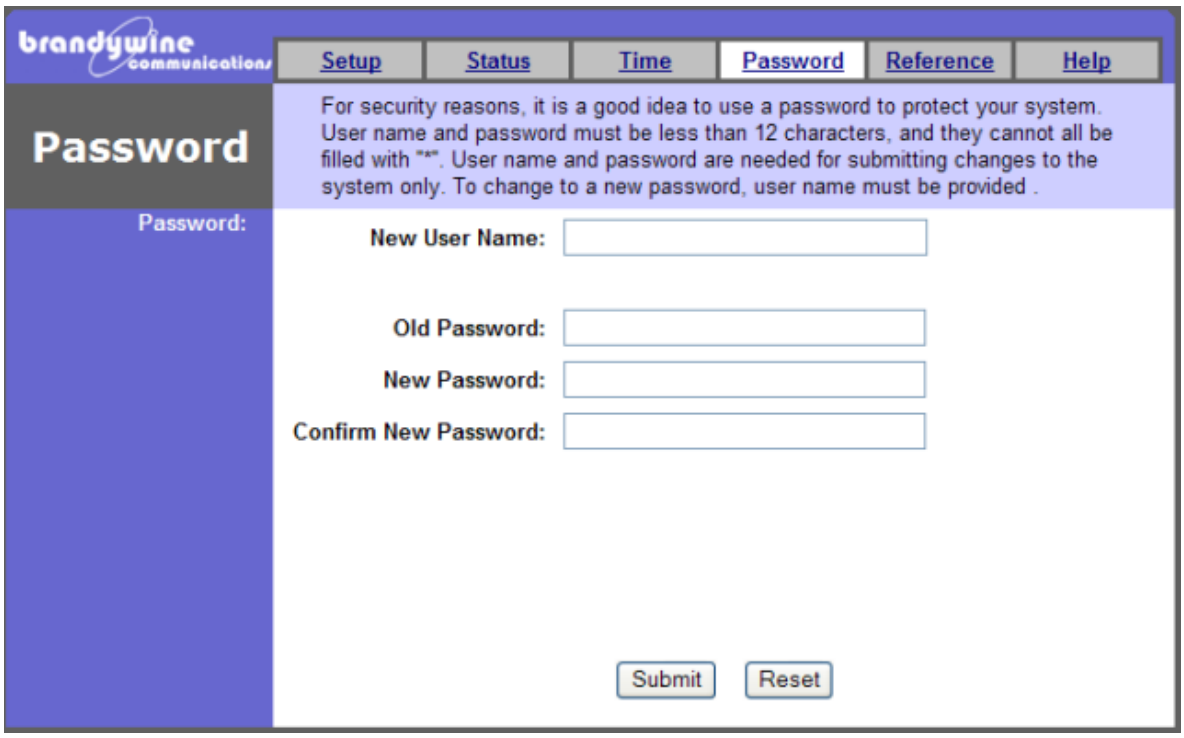


Figure 11: Password

4.4.1 Password

The Password consists of four fields, the New User Name, Old Password, New Password, and Confirm New Password. The new password must be less than 31 characters and cannot contain any asterisks. Moreover, the system is case sensitive.

4.5 Reference

The Reference tab consists of four sections: Reference, Application, Oscillator Settings and Manual Time Set. This tab allows you to modify the reference for the NFS-220, and to set the output amplitude of the 10 MHz outputs. Please note that while the NFS-220 is acquiring time from the references the Valid Time LED indicator will be extinguished. Once the NFS-220 has acquired time from the reference the Valid Time LED indicator will illuminate green. To save all modifications made to the Reference screen, click the Submit [Submit] button. To undo all modifications made to the Reference screen, click the Reset button.

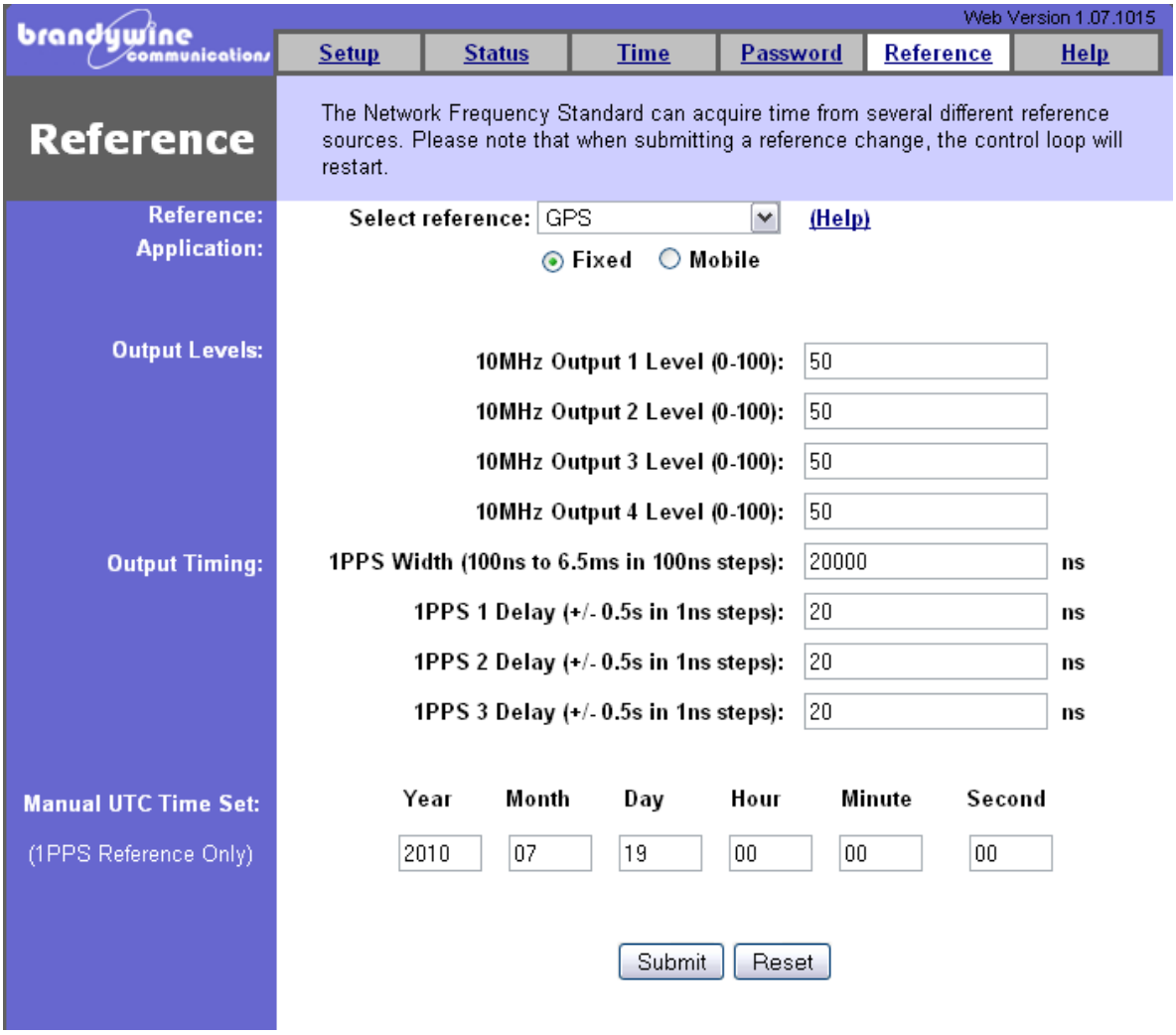


Figure 12 Reference Tab

4.5.1 *Reference Selection*

The Select reference pull down menu allows the user to select one of three reference types to acquire time from. The only references used by the system are GNSS, Have Quick & 1PPS, and 1PPS.

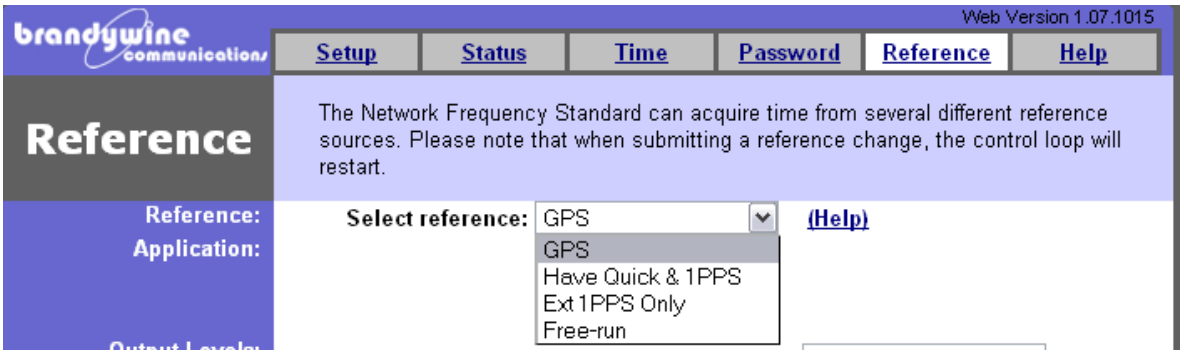


Figure 13 Selecting the NFS-220 reference

Select the Reference type desired and click the Submit button.

4.5.1.1 GNSS Reference (Factory default)

In this mode, an internal 16 channel GNSS receiver is used as the system reference. The NFS-220 operates automatically in acquiring and tracking all GNSS satellites in view. If the GNSS receiver is selected, then a secondary selection should be made to determine whether the NFS-220 is being used in a stationary or mobile application.

4.5.1.1.1 GNSS Fixed Location Application

If the fixed location mode is selected, the NFS-220 will begin to survey it's location by collecting and averaging the position that it computes from the GNSS satellites. The averaged position is then stored into the GNSS receiver, and the receiver transitions to a timing mode, where the averaged position is assumed correct, and time is only calculated from all satellites in view. Erroneous satellite tracking data can be detected and removed from the over-determined timing solution using the receiver's built in Receiver Autonomous Integrity Monitoring (RAIM) function. In locations where the satellite visibility is poor, the NFS-220 can operate with as few as 1 satellite when in the timing mode.

Figure 14 GNSS Fixed/Mobile Selection

4.5.1.1.2 GNSS Mobile Application

If the Mobile Application mode is selected, the internal GNSS receiver will not perform any position averaging, and will continuously compute both position and time from all satellites in view. The RAIM function is still active, but requires a minimum of 5 satellites tracked to provide fault detection and isolation.

4.5.1.2 Have Quick & 1PPS Reference

If the Have Quick & 1PPS reference is selected, the NFS-220 will synchronize to the external 1PPS appearing on J10-4. The epoch of this 1PPS will be determined by decoding the Have Quick time code received on J10-1.
The NFS-220 will decode the Time Figure of Merit (TFOM) embedded in the Have Quick Time Code to determine whether the 1PPS reference and time of day is correct.

- If the TFOM is ≤4 then the reference will be used
- If the TFOM is ≥5 then the reference will NOT be used and the "Time Valid " LED will not illuminate.

Once the NFS-220 has synchronized to the Have Quick /1PPS reference, if the TFOM in the Have Quick time code indicated >4, then the NFS-220 will enter Holdover mode.

4.5.1.3 External 1PPS Only Reference

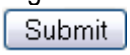
If the External 1PPS Only mode is selected then the NFS-220 will synchronize to the external 1PPS appearing on J10-4. The epoch of this 1PPS must be manually entered by entering the time of the next second using the function provided. Prior to the next second, click Submit  to load the time into the NFS-220.

Figure 15 Manual Setting of Time in NFS-220

In this mode the external 1PPS will always be used as the reference to which the internal oscillator is steered, so that it is critical that the 1PPS comes from a high stability, highly accurate source.

4.5.1.4 Free-Run Reference

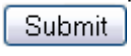
If the Free-Run mode is selected then the NFS-220 will free run without disciplining its internal oscillator or setting its internal time to any reference signal. The time epoch of the free running output 1PPS must be manually entered by entering the time using the function provided. Enter the desired time of day in the Manual Time Set boxes , and click Submit  to load the time into the NFS-220. **In the Free-run mode the Time Figure of Merit (TFOM) in the Have Quick output time code is fixed at 3 (estimated accuracy is <100ns)**

Figure 16 Manual Setting of Time in NFS-220

4.5.2 10 MHz Output Level Settings

The Amplitude of each of the four 10MHZ outputs may be individually set by entering a nominal amplitude value on the reference screen.
Each individual 10 MHz (J1 through J4) level may be set over a range of 1 to 100. These numbers correspond to voltage levels shown in Figure 17 .

Note that the settings are accurate to ±10%, so the user should make fine adjustments by measuring the actual output level with an oscilloscope or spectrum analyzer and make the necessary adjustments by entering the number that provides the exact output level required. Note that all values measured in Figure 17 assume the signal is terminated with a 50 ohm load.

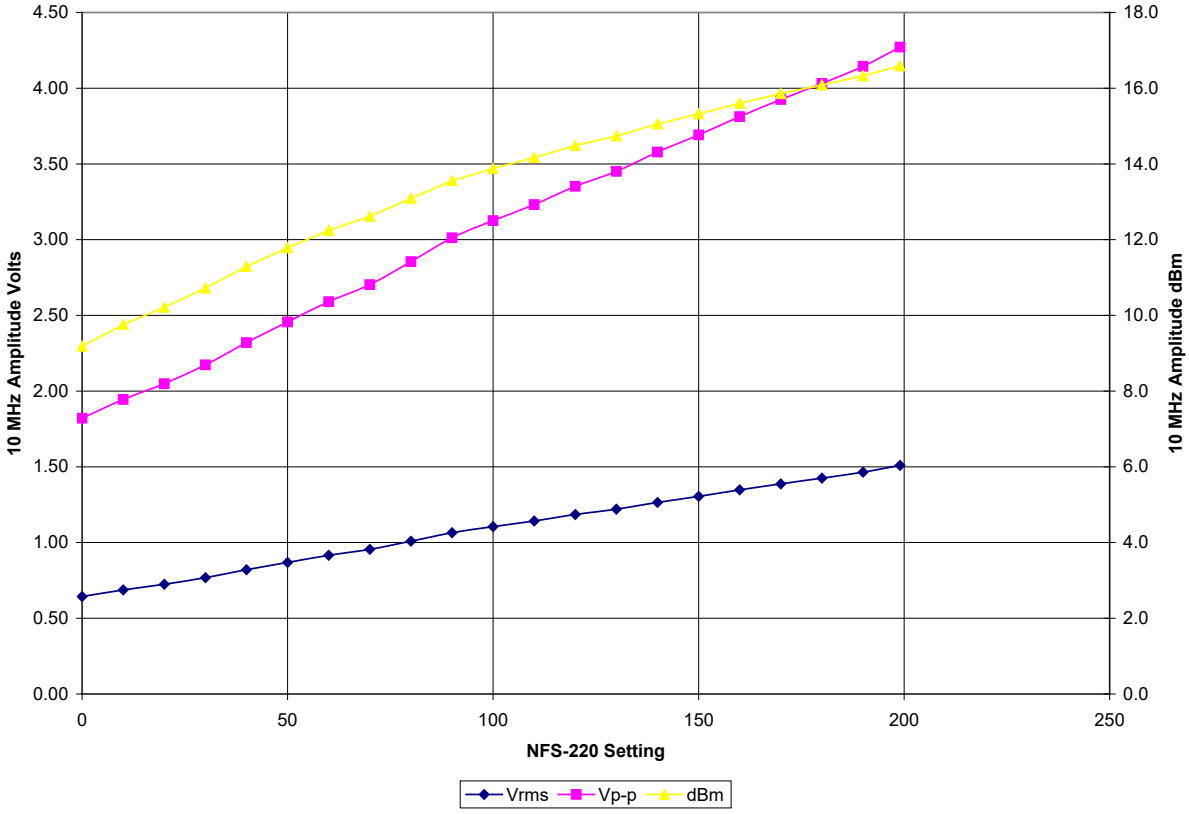


Figure 17 Setting NFS-220 10 MHz output level

4.5.3 Output Timing Setting

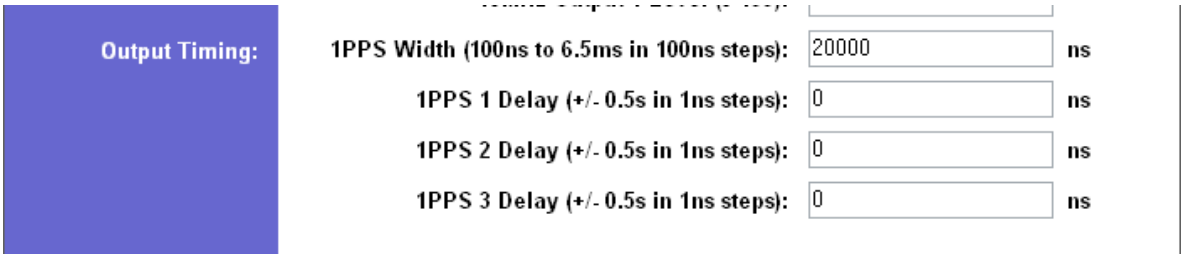


Figure 18 Output Timing Settings

4.5.3.1 Setting 1PPS Pulse width

The NFS-220 1PPS outputs are adjustable in both width and phase. The Pulse width may be varied over the range of 100ns to 650µs.
Enter the desired pulse width (in nanoseconds) in the box labelled 1PPS Pulse width and press Submit. The pulse width setting applies to all 1PPS outputs.

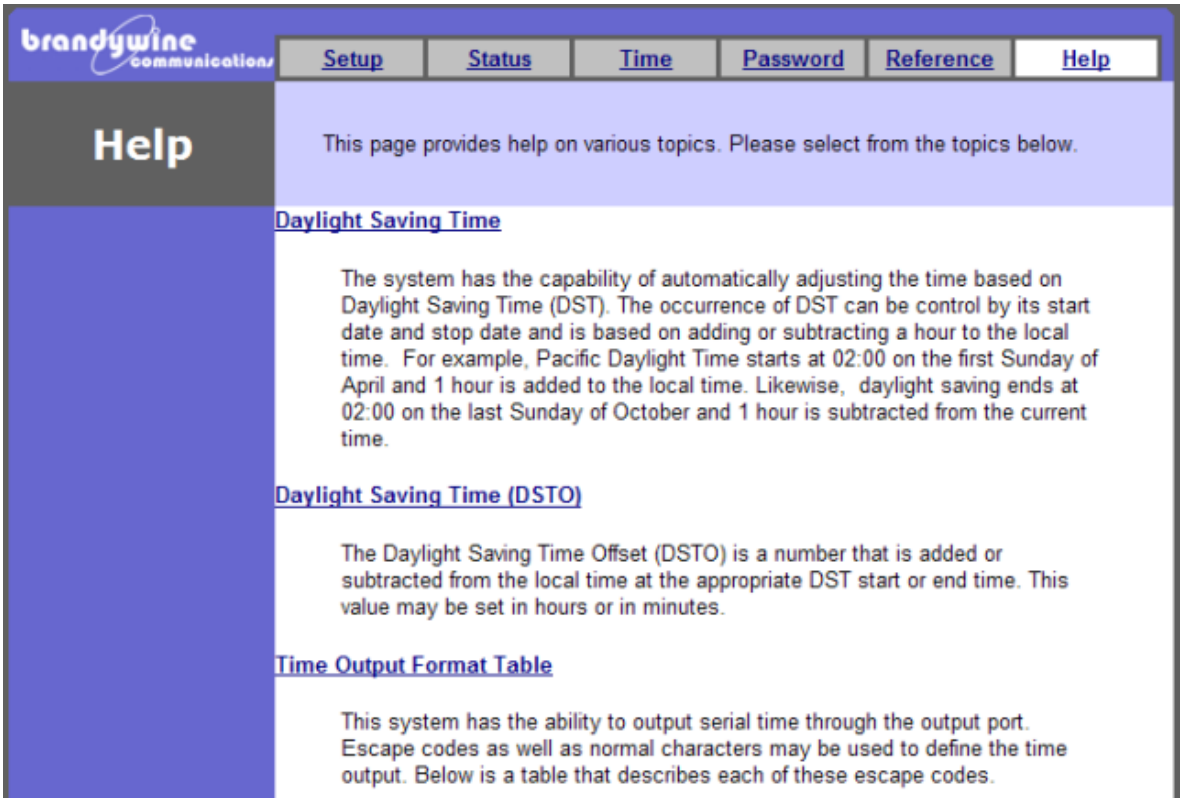
The factory default setting is 20 microseconds (20000)

4.5.3.2 Setting 1PPS Pulse delay

The NFS-220 incorporates a unique feature that allows the three 1PPS outputs to be offset from the main internal time base (which is synchronized to the reference).
This feature may be used to compensate for propagation delay in the cables between the NFS-220 and the point of use.
A negative delay will ADVANCE the 1PPS relative to the reference.
A positive delay will RETARD the 1PPS relative to the reference.
Each individual 1PPS output can be delayed over a full second range (± 0.5 seconds) in 1ns steps, independent of the settings of the other outputs.

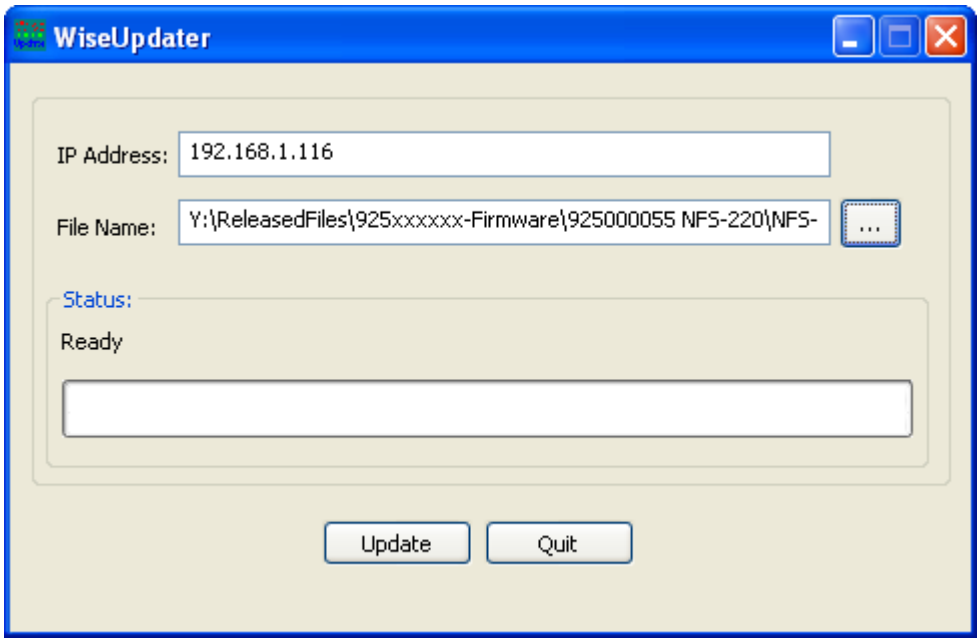
4.6 Help

The Help tab provides the user with help while using difficult areas in the system. Help links are located throughout the entire system so the user has access to the Help screen whenever the user encounters a problem. Once the user clicks on the help link the user will be automatically redirected to the Help screen.

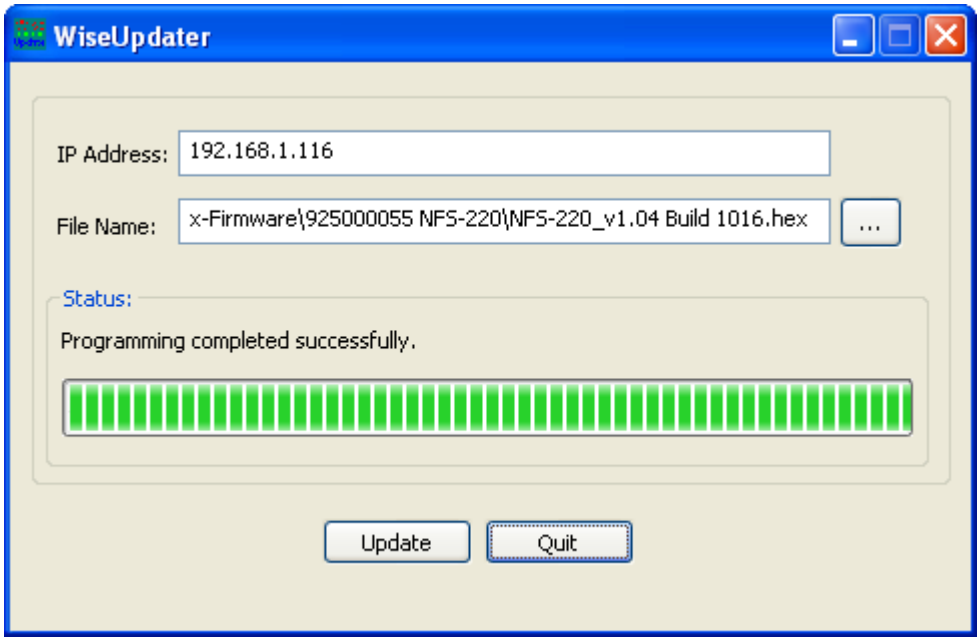


4.7 Firmware Upgrade

1. Launch WiseUpdater.exe and type the unit's IP address (ex: "192.168.1.116") to IP Address box.
2. Click Browse button (…) to browse for a firmware file in .Hex format. Click Update button when ready.

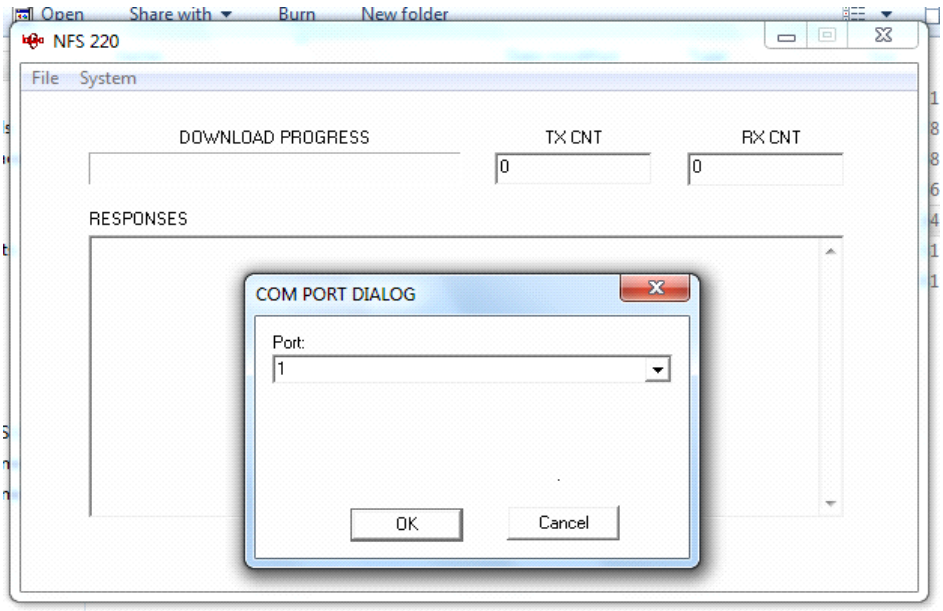


3. WiseUpdater.exe starts programming the unit. PLEASE DO NOT power down the unit during the programming.

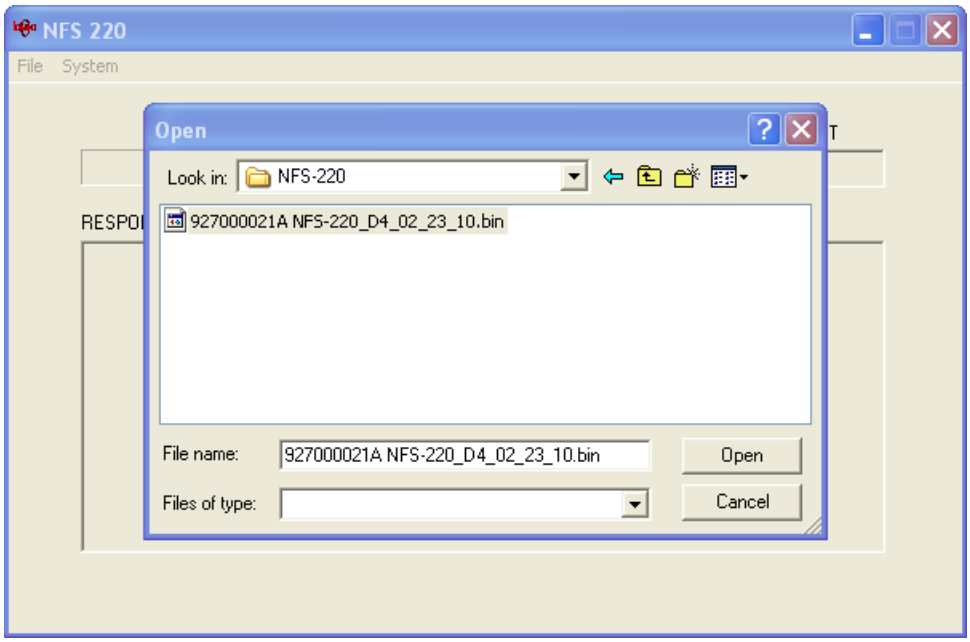


4.8 FPGA Upgrade

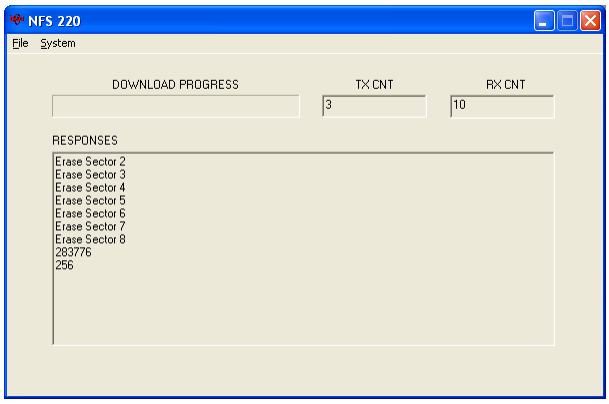
1. Launch NFS_Util.exe and click File/Set COM Port to select an available computer's COM port. Click OK to save COM setting.

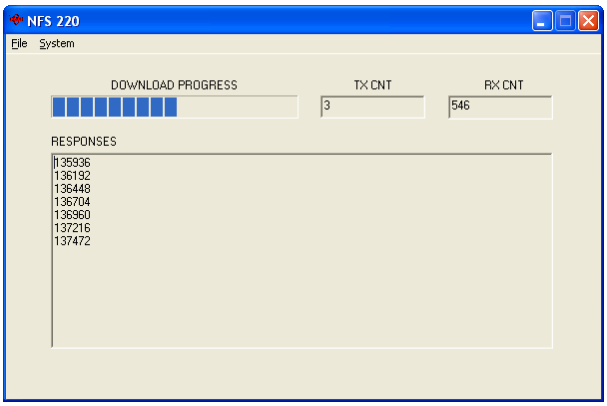


2. Connect a Null Serial Cable (crossed-over) from the computer's COM port to the unit's J10 (Console).
3. Make sure the unit (NFS-220 or NFS-221) is up and running.
4. From NFS_Util.exe, click System/Disable Broadcast.
5. From NFS_Util.exe, click System/Update FPGA and Open File Dialog will open. Browse and select a FPGA file in .bin format (Ex: 927000021A NFS-220_D4_02_23_10.bin). Click Open button when ready.

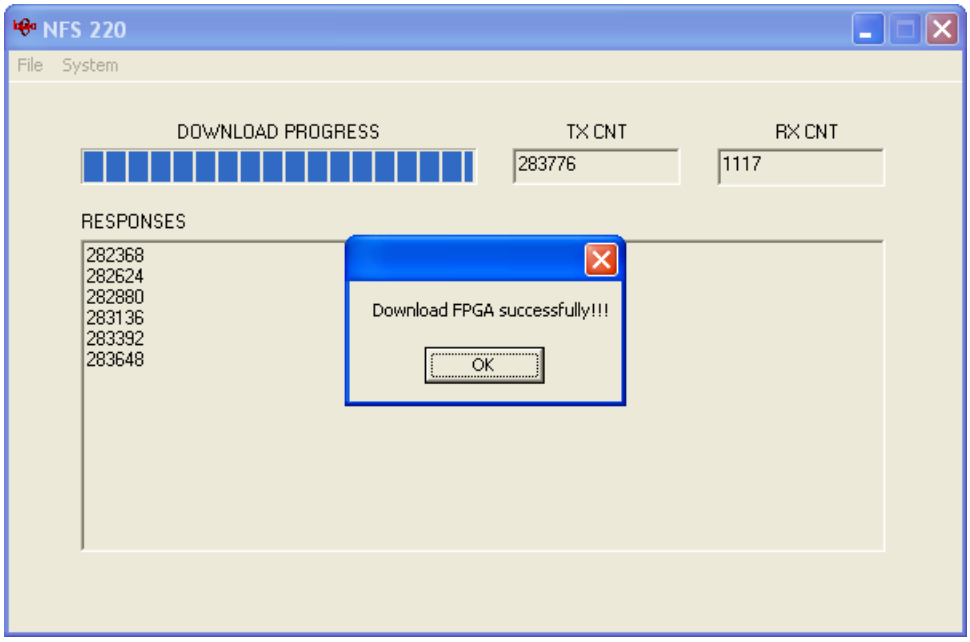


6. NFS_Util.exe starts programming the unit. PLEASE DO NOT power down the unit during the programming.





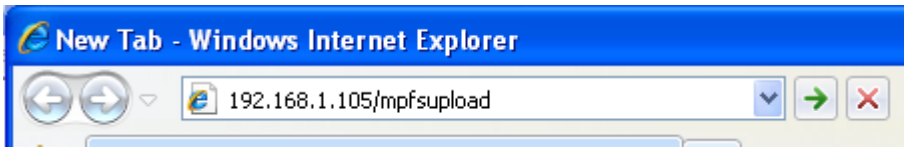
7. NFS_Util.exe will show the programming status.



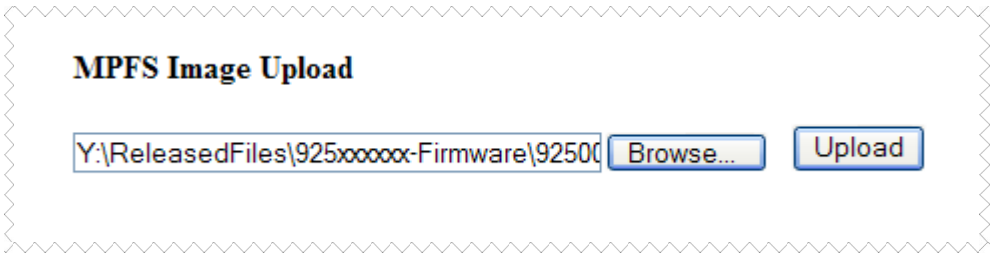
4.9 Webpage Upgrade

1. Recycle power the unit.

2. Open Internet Explorer (IE is used) or FireFox. Type unit's IP address and "/mpfsupload" to IE's address box and click Go button or hit Enter.



3. Click Browse button to browse for a Webpage file in .Bin format (ex, NFS-220_Web v1.4.6.bin). Click Upload button when ready.



4. This will program Webpage file into unit's web flash and return the programming status. The message below tells Webpage file was programmed successfully.

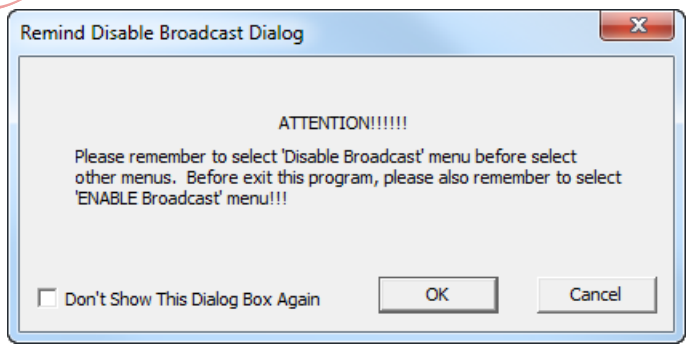
4.10 Reset to Factory Defaults

Warning: all your saved settings will be lost!

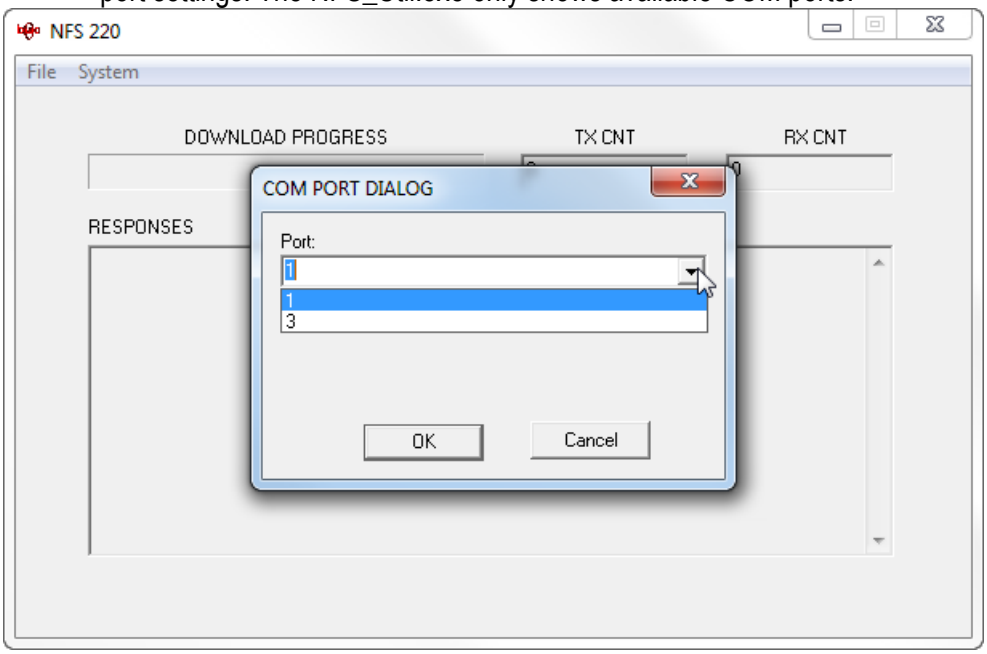
1. Connect a null serial (crossed) cable from an available serial port of the computer to NFS's Console port (J10).

Note: NFS stands for NFS-220, NFS-221, PTU I models.

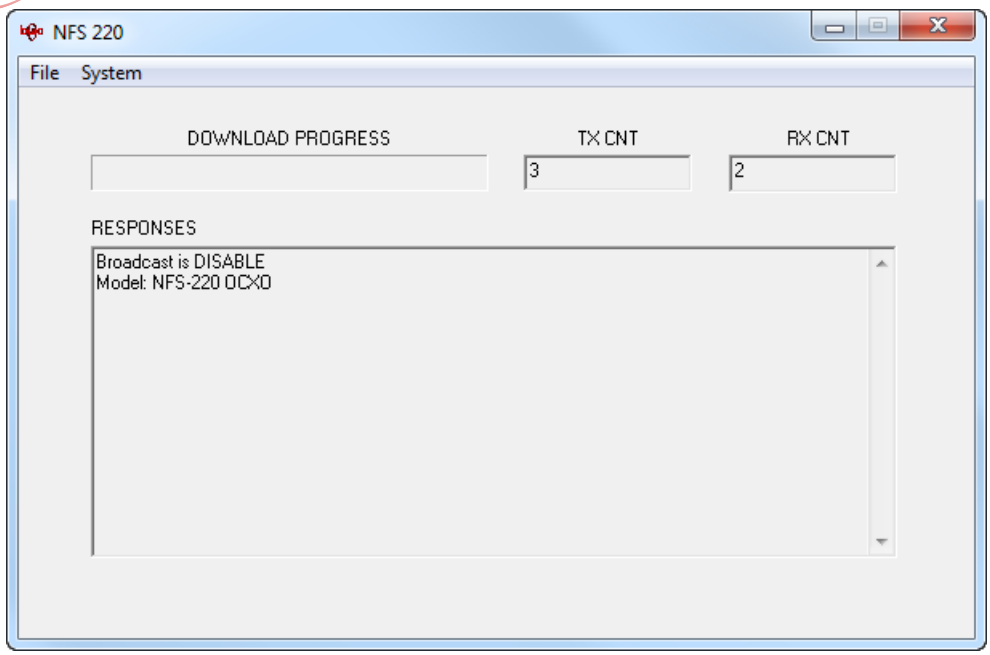
2. Launch the NFS_Util.exe. Follow the Attention dialog instruction.



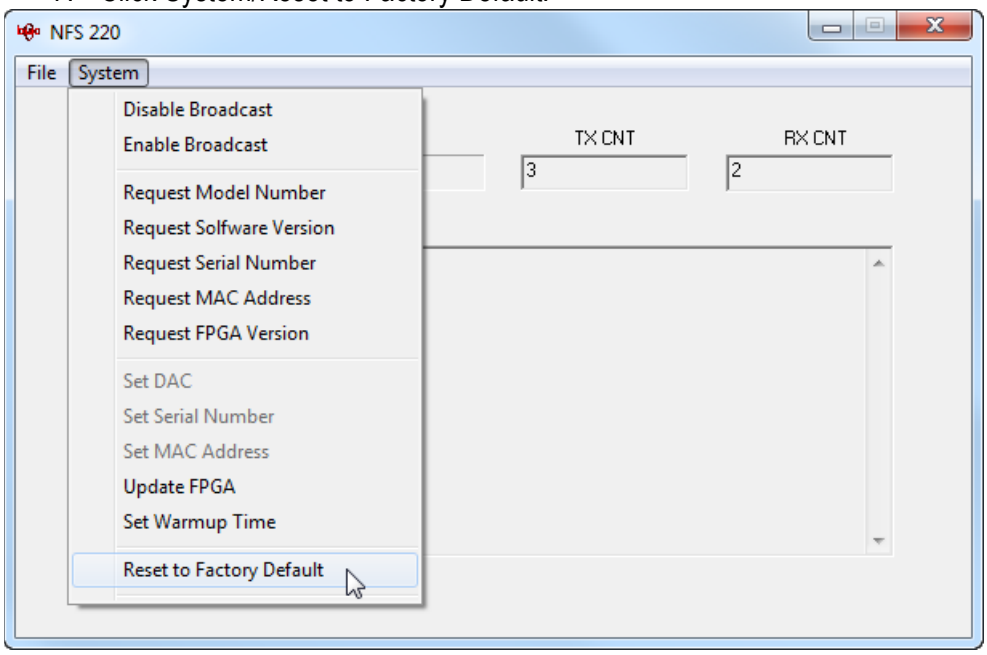
3. Click File/Set COM Port. Select a correct COM port number and click OK to save the COM port settings. The NFS_Util.exe only shows available COM ports.



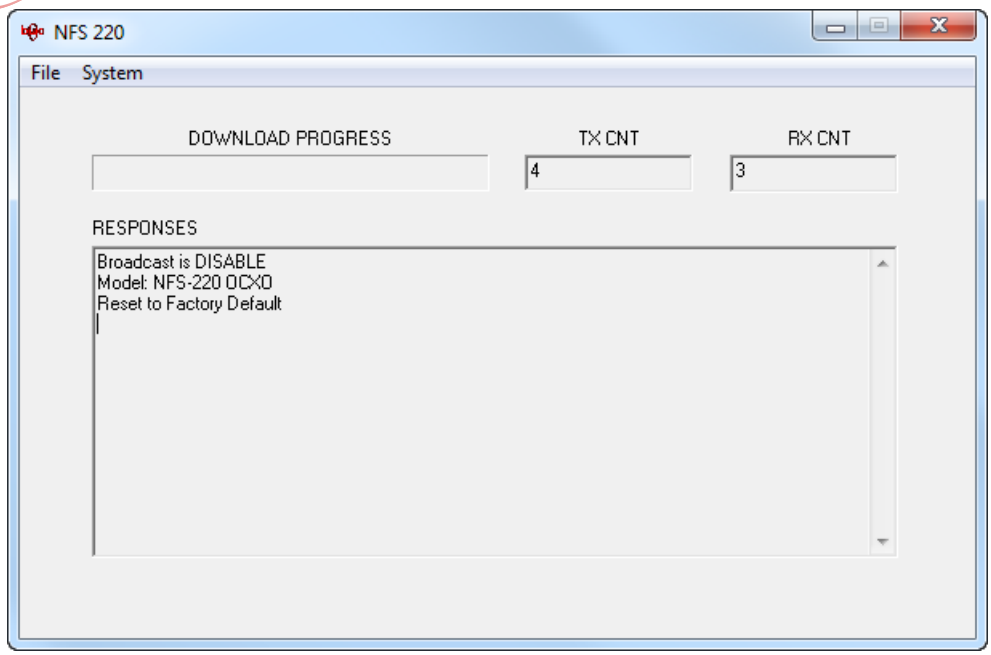
4. Make sure the NFS unit is up and running.
5. From the NFS_Util.exe, click System/Disable Broadcast, click System/Request Model Number for communication testing.
6. A model number or “Broadcast is DISABLE” must be responded from the step 5 above. If there was no response from the step 5, repeat the step 5 again, check cable, or COM port number.



7. Click System/Reset to Factory Default.



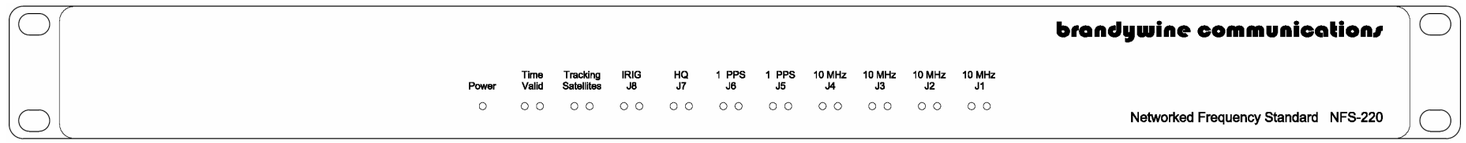
8. "Reset to Factory Default" message was responded from the NFS unit.



9. Cycle power the NFS unit and configure the NFS's settings as necessary.

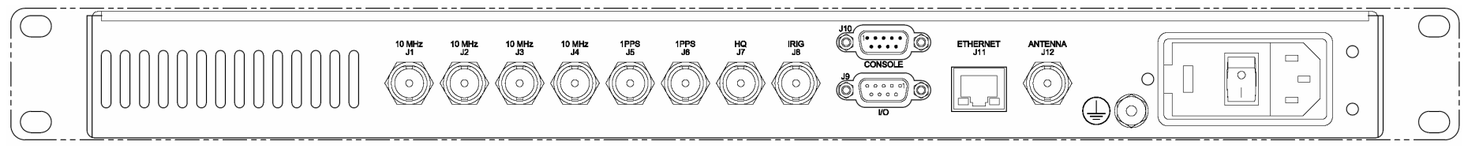
5 Drawings

FIGURE	DESCRIPTION
	NFS-220 Front Panel
	NFS-220 Plus Front Panel
	NFS-220 Rear Panel
	Link Settings /Component Location

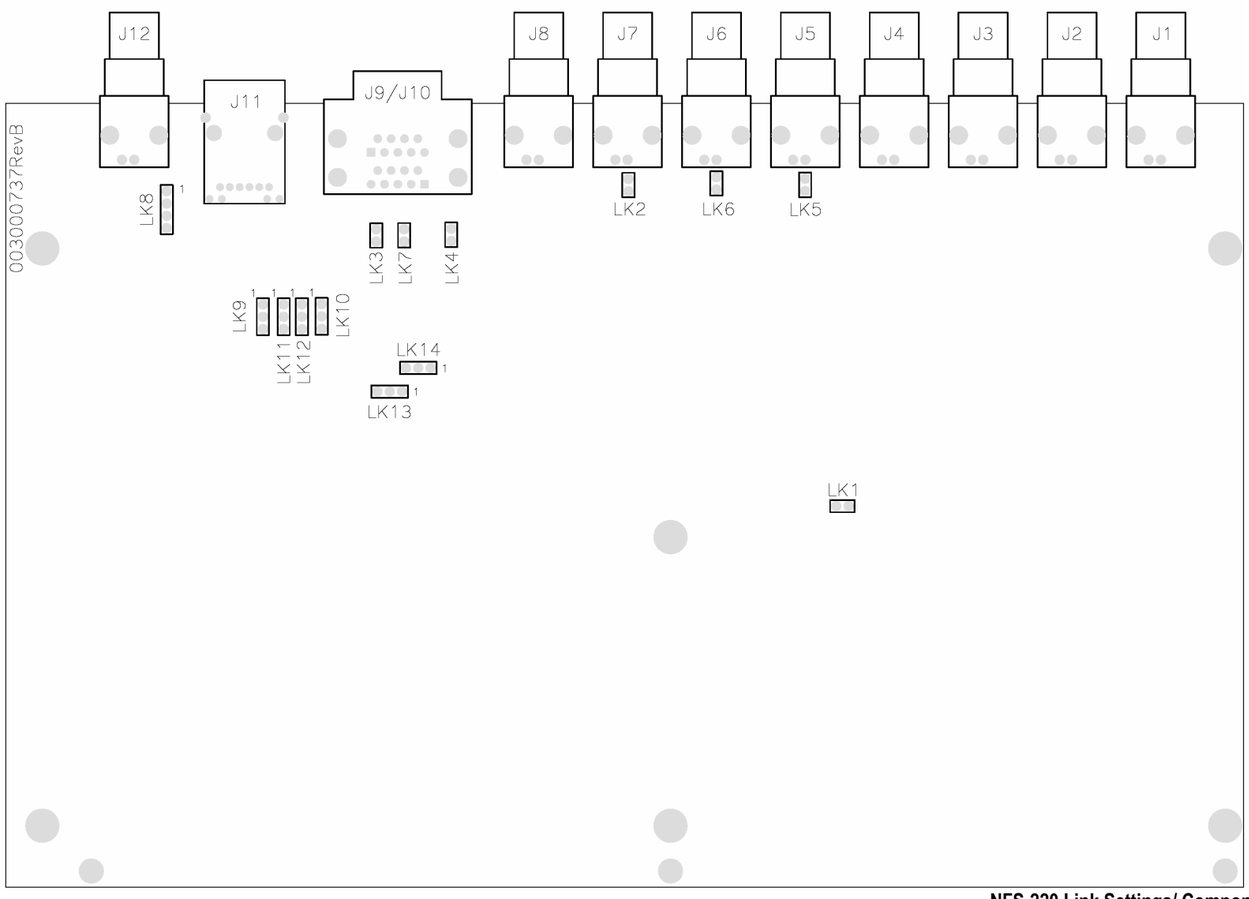


NFS-220 Front Panel

NFS-220 Plus Front Panel



NFS-220 Rear Panel



NFS-220 Link Settings/ Component Location

6 Link Settings

The link settings below can be used to configure the NFS-220 to specific applications. Link settings are changes as follows:

There is potentially un-insulated "dangerous voltage" within the NFS-220 enclosure. The "dangerous voltage" may be of sufficient magnitude to constitute as a risk of electrical shock to people.

Before removing the top cover of the NFS-220, ensure that ESD precautions are taken to prevent damage to the NFS-220.

1. Remove the power cord from the NFS-220
2. Remove the top cover of the NFS-220 (6 screws)
3. Identify the link that must be changed
4. Install/remove the desired link as required

Link		Function	Factory Default Setting
1	1-2	Processor Reset [Reserved for Factory Use only]	Open
2	1-2	Low Z output impedance for Have Quick 1	Open
	Open	50 ohm output impedance for Have Quick 1	
3	1-2	Low Z output impedance for Have Quick 2	Open
	Open	50 ohm output impedance for Have Quick 2	
4	1-2	Low Z output impedance for IRIG DCLS	Open
	Open	50 ohm output impedance for IRIG DCLS	
5	1-2	Low Z output impedance for 1PPS 1	
	Open	50 ohm output impedance for 1PPS 1	Open
6	1-2	Low Z output impedance for 1PPS 2	
	Open	50 ohm output impedance for 1PPS 2	Open
7	1-2	Low Z output impedance for 1PPS 3	
	Open	50 ohm output impedance for 1PPS 3	Open
8	1-2	Applies GND to Alarm NO relay contact	Open
	3-4	Applies +5V to Alarm NC relay contact	Open
9	1-2	Disable RS422 Serial output RS422 RX-	
	2-3	Enable RS422 Serial output RS422 RX-	2-3
10	1-2	Disable RS422 Serial output RS422 RX+	
	2-3	Enable RS422 Serial output RS422 RX+	2-3
11	1-2	Disable RS422 Serial output RS422 TX-	
	2-3	Enable RS422 Serial output RS422 TX-	2-3
12	1-2	Disable RS422 Serial output RS422 TX-	
	2-3	Enable RS422 Serial output RS422 TX-	2-3
13		[Reserved for Factory Use only]	

Link		Function	Factory Default Setting
14		[Reserved for Factory Use only]	

Table 10 Hardware Link Settings

7 Appendix A – Serial Output for firmware version V1.18.00

For firmware version V1.18.00, the serial port is designed to output Time, Position and Velocity. To display this, access the serial port as described in Section 4.3.1 and enter the command "#gp"

Date: Wednesday 12/11/13 17:51:00

Field# 1 2 3 4 5 6 7

#.	Description	Range	
1.		Date	Sunday – Saturday
2.		UTC: Month	
	"12": MM	01-12	
3.		UTC: Date	
	"11": DD	01-31	
4.		UTC: Year	
	"13": YY	00-79	
5.		UTC: Hour	
	"17": hh	00-23	
6.		UTC: Minute	
	"51": mm	00-59	
7.		UTC: Second	
	"00": ss	00-59	

Lat: 33 42' 52" N Long: 117 50' 15" W Alt: 19 m

Field# 1 2 3 4 5 6 7 8 9 10

#.	Description	Range
1-4		Latitude
	"33": degree	00-90
	"42": minute (integer)	00-59
	"52": second (integer)	00-59
	"N": North/South	N or S
5-8		Longitude
	"117": degree	00-180
	"50": minute (integer)	00-59
	"15": second (integer)	00-59
	"W": East/West	E or W
9-10	Altitude	
	"19": Height	-999 to 4000
	"m": Unit for Altitude	Meter

GNSS Mode: Mobile

Field# 1

#.	Description	Range
1		GNSS Mode
	"Mobile": Estimate Observation	Fixed or Mobile

Track: 9

Field# 1

#.	Description	Range
1	Track	
	"9": Number of Satellites used for Positioning	00-12

Velocity: 344.5,T,331.5,M,000.0,N,000.0,K,A

Field# 1 2 3 4 5 6 7 8 9

#.	Description	Range	[Bytes]	(unit)
1-2.	True Course			
	"344.5"	000.0-359.9	[5]	(degree)
	"T"(meaning TRUE)	T	[1]	(n/a)
	Note: A null field is output unless true course information is available.			
3-4.	Magnetic Course			
	"331.5"	000.0-359.9	[5]	(degree)
	"M"(meaning MAGNETIC)	M	[1]	(n/a)
	Note: A null field is output unless magnetic course information is available.			
5-6.	Speed (kts)			
	"000.0"	000.0-999.9	[5]	(kts)
	"N"(meaning kNot)	N	[1]	(n/a)
	Note: A null field is output unless speed information is available.			
7-8.	Speed (km/h)			
	"0000.0"	0000.0-9999.9	[6]	(km/h)
	"K"(meaning Km/h)	K	[1]	(n/a)
	Note: A null field is output unless speed information is available.			
9.	Position System Mode Indicator	A: Autonomous mode D: Differencial mode N: Data not valid	[1]	

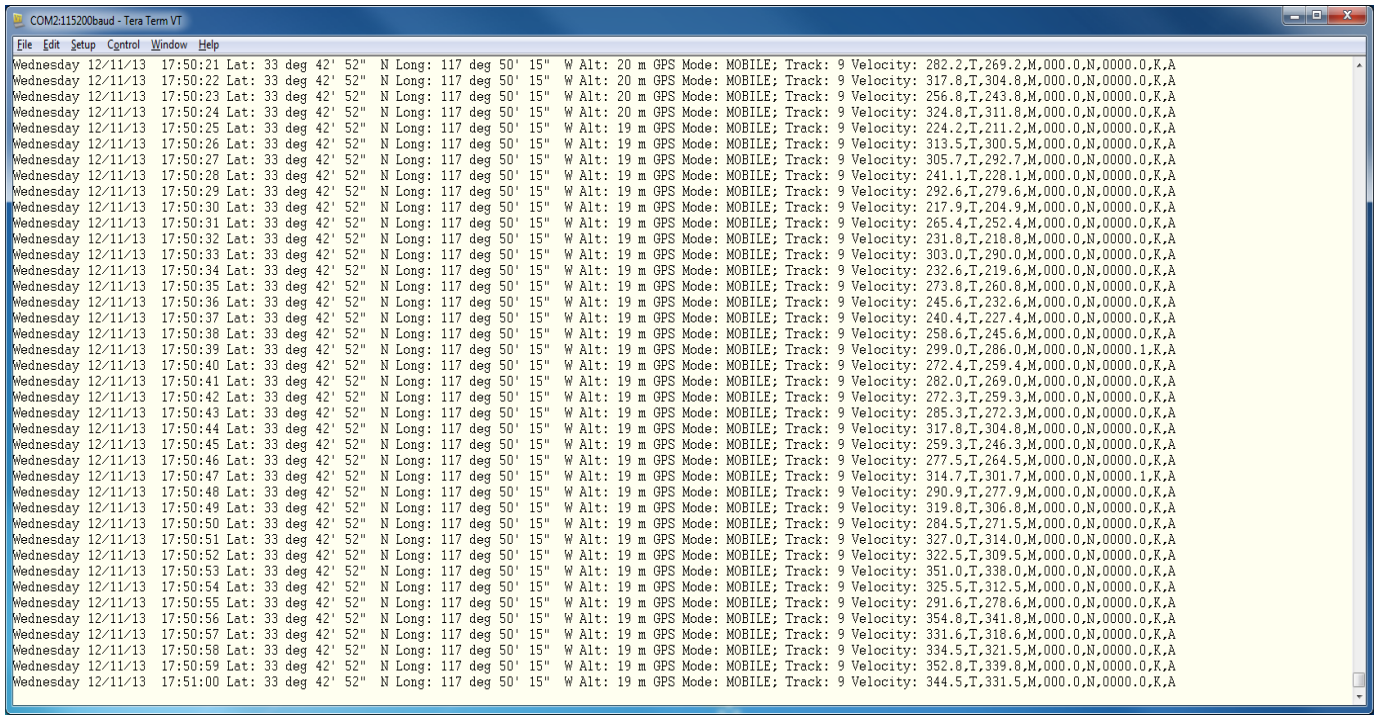


Figure 19 - Serial Time, Position and Velocity output.

7.1 Normal Mode (TOD) output

To output only the time of day (TOD) information via the serial output port, enter "#nm" in the RS232 console. This will set the serial output message to the user-specified format that is set via the web interface.

For more information on setting or adjusting this format, refer to section 4.3.1

8 Appendix B – MIB File and Description

8.1 Scope

This section defines the SNMP message and data format. The Brandywine NFS-220 supports setting 1PPS pulse width, 1PPS offset and analog oscillator amplitudes. An SNMP client has accessed to the system via TCP connection interface. The system uses a standard SNMP data format (SNMP Version 1) for moving the string or integer message type.

8.2 Product

The Product Name, Version, and manufacturing date are reserved fields for manufacturing and cannot be modified using the SNMP interface. **These fields can only be written to by the manufacturer.**

Table 11 - MIB File Product Fields

MAXSERIALNUM	12 Bytes	// Maximum number of digits in a serial number
MAXMODELNUM	12 Bytes	// Maximum number of digits in a model number
MAXDATELENGTH	10 Bytes	// Maximum number of digits in Date field
MAXSOFTVERNUM	20 Bytes	// Maximum number of characters in software version number
IP_ADDRESS	4 Bytes	// IP Address Data

8.2.1 Product Name

Description	PRODUCT_NAME	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.1.1.0	String	
MIB Write		String	

The product name is an ASCII character string that has a length of MAXMODELNUM as defined in Table 11.

```
NAME            OBJECT-TYPE
    SYNTAX      DisplayString
    ACCESS      read-only
    STATUS      mandatory
    DESCRIPTION  "NFS-220"
   ::= { product 1 }
```

8.2.2 Serial Number

Description	System S/N	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.1.2.0	String	
MIB Write		String	

The system serial number is an ASCII character string that has a length of MAXSERIALNUM as defined in Table 11.

```
SERIAL NUM   OBJECT-TYPE
```

SYNTAX DisplayString
ACCESS read-only
STATUS mandatory
DESCRIPTION ""
::= { product 1 }

8.2.3 Product Version

Description	PRODUCT_VERSION	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.1.3.0	String	
MIB Write		String	

The product version is an ASCII character string that has a length of MAXSOFTVERNUM as defined in Table 11.

VERSION OBJECT-TYPE
SYNTAX DisplayString
ACCESS read-only
STATUS mandatory
DESCRIPTION "v1.00 Build 1010"
::= { product 3 }

8.2.4 Version Date

Description	VERSION_DATE	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.1.4.0	String	
MIB Write		String	

The product name is an ASCII character string that has a length of MAXDATELENGTH as defined in Table 11.

DATE OBJECT-TYPE
SYNTAX DisplayString
ACCESS read-only
STATUS mandatory
DESCRIPTION "Sep 16 2008"
::= { product 4 }

8.3 Set up

Trap Table Subtree

The size of the Trap table is **5**. Once a Trap table entry is created with Trap Enabled set (1=SET), the NFS-220 will generate a Trap whenever an LED output is failed.

8.3.1 trapReceiverNumber

Description	trapReceiverNumber	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.2.1.1.1.0	Integer	
MIB Write		Integer	

Index of trap receiver.

trapReceiverNumber OBJECT-TYPE

```
    SYNTAX      INTEGER (0..4)
    ACCESS      not-accessible
    STATUS      mandatory
    DESCRIPTION  ""
   ::= { trapEntry 1 }
```

8.3.2 trapEnabled

Description	trapEnabled	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.2.1.1.2.0	Integer	
MIB Write	1.3.6.1.4.1.18954.5.2.1.1.2.0	Integer	

Indicates if this trap entry is enabled or not (1=Enable; 0=Disable).

```
trapEnabled      OBJECT-TYPE
    SYNTAX      INTEGER
    ACCESS      read-write
    STATUS      mandatory
    DESCRIPTION  " Indicates if this trap entry is enabled or not."
   ::= { trapEntry 2 }
```

8.3.3 trapReceiverIPAddress

Description	trapReceiverIPAddress	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.2.1.1.3.0	IP_Address	
MIB Write	1.3.6.1.4.1.18954.5.2.1.1.3.0	IP_Address	

Trap receiver IP address where the trap message will be sent to.

```
trapReceiverIPAddress   OBJECT-TYPE
    SYNTAX      IP_Address
    ACCESS      read-write
    STATUS      mandatory
    DESCRIPTION  ""
   ::= { trapEntry 3 }
```

8.3.4 trapCommunity

Description	trapCommunity	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.2.1.1.4.0	String	
MIB Write	1.3.6.1.4.1.18954.5.2.1.1.4.0	String	

Trap community to be used by agent to send trap.

```
trapCommunity   OBJECT-TYPE
    SYNTAX      DisplayString
    ACCESS      read-write
    STATUS      mandatory
    DESCRIPTION  "Trap community to be used by agent to send trap"
   ::= { trapEntry 4 }
```

8.3.5 IPAddress

Description	IPAddress	**Type**	

MIB Read	1.3.6.1.4.1.18954.5.2.2.0	IP_ADDRESS	
MIB Write		IP_ADDRESS	

The IP address will be stored in the Non Volatile Memory after the “WriteNVM” command is issued.

```
IPAddress        OBJECT-TYPE
    SYNTAX      IP_ADDRESS
    ACCESS      read-write
    STATUS      mandatory
    DESCRIPTION  "System IP Address"
   ::= { setup 2 }
```

8.3.6 IPSubNetAddress

Description	IPSubNetAddress	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.2.3.0	IP_ADDRESS	
MIB Write	1.3.6.1.4.1.18954.5.2.3.0	IP_ADDRESS	

The IP Subnet address will be stored in the Non Volatile Memory after the “WriteNVM” command is issued.

```
 IPSubNetAddress        OBJECT-TYPE
    SYNTAX      IP_ADDRESS
    ACCESS      read-write
    STATUS      mandatory
    DESCRIPTION  "System Subnet IP Address"
   ::= { setup 3 }
```

8.3.7 IPGatewayAddress

Description	IPGatewayAddress	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.2.4.0	IP_ADDRESS	
MIB Write	1.3.6.1.4.1.18954.5.2.4.0	IP_ADDRESS	

The IP Gateway address will be stored in the Non Volatile Memory after the “WriteNVM” command is issued.

```
IPGatewayAddress OBJECT-TYPE
    SYNTAX      IP_ADDRESS
    ACCESS      read-write
    STATUS      mandatory
    DESCRIPTION  "System Gateway IP Address "
   ::= { setup 4 }
```

8.3.8 Enable_DHCP

Description	Enable_DHCP	**Type**	
MIB Read	1.3.6.1.4.1.18954.6.2.5.0	Integer	
MIB Write	1.3.6.1.4.1.18954.6.2.5.0	Integer	

Enable=1/Disable=0 DHCP. If the DHCP is disable, the static IP address will be used.

```
Enable_DHCP   OBJECT-TYPE
    SYNTAX      INTEGER
    ACCESS      read-write
```

```
    STATUS      mandatory
    DESCRIPTION  "Enable/Disable DHCP"
   ::= { setup  5 }
```

8.3.9 WriteNVM

Description	WriteNVM	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.2.6.0	Integer	
MIB Write	1.3.6.1.4.1.18954.5.2.6.0	Integer	

The SNMP function writes the values to Non-Volatile memory. Changes made will automatically be loaded into the NFS-220 system the next time the unit is restarted. Use extreme care when issuing this command.

```
WriteNVM   OBJECT-TYPE
    SYNTAX      INTEGER
    ACCESS      read-write
    STATUS      mandatory
    DESCRIPTION  ""
   ::= { setup  6 }
```

8.3.10 Soft Reset

Description	Reset the CPU	**Type**	
MIB Read			
MIB Write	1.3.6.1.4.1.18954.5.2.7.0	Integer	

Reset the CPU (1=RESET).

```
SOFTRESET    OBJECT-TYPE
    SYNTAX      INTEGER
    ACCESS      write-only
    STATUS      mandatory
    DESCRIPTION  "Soft Reset (1=RESET)."
   ::= { setup  7 }
```

8.4 STATUS

8.4.1 SysState

Description	SysState	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.3.1.0	Integer	
MIB Write			

The System State states the model (TCXO, OCXO, or Rb) and the state is Locked or unlocked.

```
  SysState         OBJECT-TYPE
    SYNTAX      INTEGER
    ACCESS      read-only
    STATUS      mandatory
    DESCRIPTION  "Rb/OCXO/ TCXO – LOCKED or UNLOCKED"
   ::= { status  1 }
```

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
												M0		S1	S0

System State

S1	S0	
0	0	Warm up
0	1	Locked
1	0	Hold over
1	1	Failed

Model

M0	
0	OCXO
1	Rb

8.4.2 NTrackSat

Description	NTrackSat	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.3.2.0	Integer	
MIB Write			

Number of tracking satellites in the position solution.

```
NTrackSat OBJECT-TYPE
    SYNTAX      INTEGER
    ACCESS      read-only
    STATUS      mandatory
    DESCRIPTION  "Number of Tracking Satellites"
   ::= { status 2 }
```

8.4.3 Altitude

Description	Altitude	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.3.3.0	String	
MIB Write			

GNSS Position – Altitude displays in string with format in meter unit.

```
Altitude          OBJECT-TYPE
    SYNTAX      DisplayString
    ACCESS      read-only
    STATUS      mandatory
    DESCRIPTION  "GNSS height - Altitude"
   ::= { status 3 }
```

Ex: 25 meters high

8.4.4 Latitude

Description	Latitude	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.3.4.0	String	
MIB Write			

GNSS Position – Latitude displays in string with format (degree[0-90], minute[0-59], seconds[0-59], and 'N' or 'S' character)

```
Latitude          OBJECT-TYPE
   SYNTAX      DisplayString
   ACCESS      read-only
   STATUS      mandatory
   DESCRIPTION  "GNSS Position - Latitude"
  ::= { status 4 }
```

Ex: 33 degree 45'38" N

8.4.5 Longitude

Description	Longitude	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.3.5.0	String	
MIB Write			

GNSS Position – Longitude displays in string with format (degree[0-180], minute[0-59], seconds[0-59], and 'E' or 'W' character)

```
Longitude       OBJECT-TYPE
   SYNTAX      DisplayString
   ACCESS      read-only
   STATUS      mandatory
   DESCRIPTION  "GNSS Position - Longitude"
  ::= { status 5 }
```

Ex: 117 degree 45'38" W

8.4.6 ElapsedTime

Description	ElapsedTime	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.3.6.0	Integer	
MIB Write			

Elapsed seconds since the system was started up.

```
ElapsedTime   OBJECT-TYPE
   SYNTAX      Integer
   ACCESS      read-only
   STATUS      mandatory
   DESCRIPTION  "System Elapsed Time"
  ::= { status 6 }
```

8.4.7 PhaseErr

Description	PhaseErr	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.3.7.0	String	
MIB Write			

Phase error in nanoseconds between the internal 1PPS versus the input reference 1PPS.

```
PhaseErr        OBJECT-TYPE
   SYNTAX       DisplayString
   ACCESS       read-only
   STATUS       mandatory
   DESCRIPTION  "Phase Error"
  ::= { status 7 }
```

8.4.8 DACVOLT

Description	DACVOLT	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.3.8.0	String	
MIB Write			

DAC voltage (0-5V).

```
DACVOLT      OBJECT-TYPE
   SYNTAX       DisplayString
   ACCESS       read-only
   STATUS       mandatory
   DESCRIPTION  "DAC Volt (0-5V)"
  ::= { status 8 }
```

8.4.9 Output Status

Description	OutputStatus	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.3.9.0	Integer	
MIB Write			

```
FaultStatus     OBJECT-TYPE
   SYNTAX       INTEGER
   ACCESS       read-only
   STATUS       mandatory
   DESCRIPTION  "Output Status"
  ::= { status 9 }
```

15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
	PPS11	PPS10	PPS9	PPS8	PPS7	PPS6	PPS5	PPS4	PPS3	PPS2	PPS1	I_DC	IRIG	HQ2	HQ1

PPS[11..1]	1 = PPS[11..1] output fault
I_DC	1 = IRIG DC output fault
IRIG	1 = Modulated IRIG output fault
HQ[2..1]	1 = HaveQuick output[n] fault

NOTE: PPS 4 to 11 are supported for the NFS 221 product only

8.5 TIME

8.5.1 SerialBaudRate

Description	SerialBaudRate	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.4.1.0	Integer	
MIB Write	1.3.6.1.4.1.18954.5.4.1.0	Integer	

The Baud rate control register controls the User's Serial interface. The default baud rate setting is 115200 baud.

```
SerialBaudRateOBJECT-TYPE
    SYNTAX      INTEGER
    ACCESS      read-write
    STATUS      mandatory
    DESCRIPTION  "Serial Baud Rate 115.2K to 4.8K "
   ::= { time 1 }
```

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
							DB1	DB0	SB0	P1	P0	B3	B2	B1	B0

Baud Rate

B3	B2	B1	B0	
0	0	0	0	Baud Rate 115.2 K
0	0	0	1	Baud Rate 57.6 K
0	0	1	0	Baud Rate 38.4 K
0	0	1	1	Baud Rate 19.2 K
0	1	0	0	Baud Rate 9.6 K
0	1	0	1	Baud Rate 4.8 K

Parity

P1	P0	
0	0	None
0	1	Odd
1	0	Even
1	1	

Stop Bit

SB0	
0	1 bit
1	2 bits

Data Bits

DB1	DB0	
0	0	5 bits
0	1	6 bits
1	0	7 bits
1	1	8 bits

8.5.2 TimeZone

Description	TimeZone	**Type**	
MIB Read	1.3.6.1.4.1.18954.5.4.2.0	Integer	
MIB Write	1.3.6.1.4.1.18954.5.4.2.0	Integer	

Time Zone setting (-12..+13).

```
TimeZone      OBJECT-TYPE
   SYNTAX     INTEGER
   ACCESS     read-write
```

8.6 MIB File

```
-- PICDEM.net control MIB.
--
-- Author                    Date        Comment
-- ================================================================
-- Wayne Bui                    09/10/08     Initial
-- Bao Nguyen                   10/19/09     Cleaned up.
--

BRANDYWINECOMM DEFINITIONS ::= BEGIN

IMPORTS
   enterprises, IpAddress, Gauge, TimeTicks     FROM RFC1155-SMI
   DisplayString                                FROM RFC1213-MIB
   OBJECT-TYPE                                  FROM RFC-1212
   TRAP-TYPE                                    FROM RFC-1215;

    brandyWineComm  OBJECT IDENTIFIER ::= { enterprises 18954 }
    NFS           OBJECT IDENTIFIER ::= { brandyWineComm 5 }

    Product            OBJECT IDENTIFIER ::= { NFS 1 }
    Setup                     OBJECT IDENTIFIER ::= { NFS 2 }
    Status             OBJECT IDENTIFIER ::= { NFS 3 }
    Time                      OBJECT IDENTIFIER ::= { NFS 4 }
    Reference  OBJECT IDENTIFIER ::= { NFS 5 }

   ON-OFF          ::=   INTEGER { ON(1), OFF(0) }

--
-- product number
--

ProductName    OBJECT-TYPE
   SYNTAX DisplayString
   ACCESS read-only
   STATUS mandatory
   DESCRIPTION
      "NFS-220 or NFS-220 TCXO"
   ::= { Product 1 }


SerialNumber   OBJECT-TYPE
    SYNTAX       DisplayString (SIZE (0..11))
    ACCESS       read-only
    STATUS       mandatory
    DESCRIPTION  "Serial Number string."
```

```
    ::= { Product 2 }

Version    OBJECT-TYPE
   SYNTAX DisplayString
   ACCESS read-only
   STATUS mandatory
   DESCRIPTION
      "Version string. e.g. 1.05 Build 1000."
   ::= { Product 3 }

Date    OBJECT-TYPE
   SYNTAX DisplayString
   ACCESS read-only
   STATUS mandatory
   DESCRIPTION
      "Date of version"
   ::= { Product 4 }

--
-- setup 1
--

Traps OBJECT-TYPE
    SYNTAX SEQUENCE OF TrapEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "Trap table"
    ::= { Setup 1 }

TrapEntry OBJECT-TYPE
    SYNTAX TrapEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "Single trap entry containing trap receiver info."
    INDEX { trapReceiverNumber }
     ::= { Traps 1 }

TrapEntry ::=
    SEQUENCE {
        TrapReceiverNumber
            INTEGER,
        TrapEnabled
            INTEGER,
        TrapReceiverIPAddress
            IpAddress,
        TrapCommunity
            DisplayString
    }

TrapReceiverNumber  OBJECT-TYPE
    SYNTAX INTEGER (0.. 4)
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "Index of trap receiver"
    ::= { TrapEntry 1 }
```

```
TrapEnabled OBJECT-TYPE
    SYNTAX INTEGER { Yes(1), No(0) }
    ACCESS read-write
    STATUS mandatory
    DESCRIPTION
        "Indicates if this trap entry is enabled or not."
    ::= { TrapEntry 2 }


TrapReceiverIPAddress OBJECT-TYPE
    SYNTAX  IpAddress
    ACCESS  read-write
    STATUS mandatory
    DESCRIPTION
        "Trap receiver IP address"
    ::= { TrapEntry 3 }

TrapCommunity OBJECT-TYPE
    SYNTAX  DisplayString (SIZE (0..7))
    ACCESS  read-write
    STATUS mandatory
    DESCRIPTION
        "Trap community to be used by agent to send trap"
    ::= { TrapEntry 4 }

--
-- setup 2
--
  IPAddress  OBJECT-TYPE
      SYNTAX       IP_ADDRESS
      ACCESS       read-write
      STATUS       mandatory
      DESCRIPTION  "System IP Address"
     ::= { Setup  2}

  IPSubNetAddress  OBJECT-TYPE
      SYNTAX       IP_ADDRESS
      ACCESS       read-write
      STATUS       mandatory
      DESCRIPTION  "System Subnet IP Address"
     ::= { Setup  3}

  IPGatewayAddress     OBJECT-TYPE
      SYNTAX       IP_ADDRESS
      ACCESS       read-write
      STATUS       mandatory
      DESCRIPTION  "System Gateway IP Address"
     ::= { Setup  4}

  DHCP_Enable      OBJECT-TYPE
      SYNTAX       INTEGER
      ACCESS       read-write
      STATUS       mandatory
      DESCRIPTION  "DHCP Enable"
     ::= { Setup  5}

  WriteNVM             OBJECT-TYPE
      SYNTAX       INTEGER
      ACCESS       read-write
```

```
      STATUS       mandatory
      DESCRIPTION  "Save NVM.
          WriteNVM needs to set at last after any change was made."
     ::= { Setup  6}

  SoftReset             OBJECT-TYPE
      SYNTAX       INTEGER
      ACCESS       read-write
      STATUS       mandatory
      DESCRIPTION  "Soft Reset"
     ::= { Setup  7}

--
-- Status
--
  SysState  OBJECT-TYPE
      SYNTAX       INTEGER
      ACCESS       read-only
      STATUS       mandatory
      DESCRIPTION  "System State
          (0=WarmUp; 1=Locked; 2=HoldOver; 3=Failed)"
     ::= { Status  1 }

  NTrackSat  OBJECT-TYPE
      SYNTAX       INTEGER
      ACCESS       read-only
      STATUS       mandatory
      DESCRIPTION  "Number of Tracked Satellites"
     ::= { Status  2 }

  Altitude      OBJECT-TYPE
      SYNTAX       DisplayString
      ACCESS       read-only
      STATUS       mandatory
      DESCRIPTION  "GNSS Position: Altitude (meter)"
     ::= { Status  3 }

  Latitude      OBJECT-TYPE
      SYNTAX       DisplayString
      ACCESS       read-only
      STATUS       mandatory
      DESCRIPTION  "GNSS Position: Latitude "
     ::= { Status  4 }

  Longitude      OBJECT-TYPE
      SYNTAX       DisplayString
      ACCESS       read-only
      STATUS       mandatory
      DESCRIPTION  "GNSS Position: Longitude"
     ::= { Status  5 }

  ElapsedTime      OBJECT-TYPE
      SYNTAX       INTEGER
      ACCESS       read-only
      STATUS       mandatory
      DESCRIPTION  "System Elapsed Time (s)"
     ::= { Status  6 }

  PhaseError      OBJECT-TYPE
```

```
      SYNTAX       DisplayString
      ACCESS       read-only
      STATUS       mandatory
      DESCRIPTION  "Phase Error"
     ::= { Status  7 }

  DACVOLT      OBJECT-TYPE
      SYNTAX       DisplayString
      ACCESS       read-only
      STATUS       mandatory
      DESCRIPTION  "DAC Volt (0-5V)"
     ::= { Status  8 }

  OutputStatus      OBJECT-TYPE
      SYNTAX       INTEGER
      ACCESS       read-only
      STATUS       mandatory
      DESCRIPTION  "Output Status"
     ::= { Status  9 }

--
-- Time
--
  SerialBaudRate  OBJECT-TYPE
      SYNTAX       INTEGER
      ACCESS       read-write
      STATUS       mandatory
      DESCRIPTION  "Serial Baud Rate 115.2K to 4.8K
          (384=115K,8,1,N; 385= 57.6K; 386=38.4K; 387=19.2K; 388=9.6K;
389=4.8K)"
     ::= { Time 1 }


  TimeZone  OBJECT-TYPE
      SYNTAX       INTEGER
      ACCESS       read-write
      STATUS       mandatory
      DESCRIPTION  "Time Zone"
     ::= { Time  2 }

  TimeZoneUnit  OBJECT-TYPE
      SYNTAX       INTEGER
      ACCESS       read-write
      STATUS       mandatory
      DESCRIPTION  "Time Zone Unit (0=Hour; 1=Minute)"
     ::= { Time  3 }

  AdjClockDLST  OBJECT-TYPE
      SYNTAX       INTEGER
      ACCESS       read-write
      STATUS       mandatory
      DESCRIPTION  "Automatically adjust for daylight Saving changes"
     ::= { Time  4 }

  TimeCodeOut  OBJECT-TYPE
      SYNTAX       INTEGER
      ACCESS       read-write
      STATUS       mandatory
      DESCRIPTION  "IRIG A, B, E, or G"
```

```
     ::= { Time  5 }


--
-- ref
--

  SelectReference OBJECT-TYPE
      SYNTAX  INTEGER
      ACCESS  read-write
      STATUS  mandatory
      DESCRIPTION "Select Reference.
          Request current reference input (0=GNSS, 1=HQ, 2=External 1PPS
or 3=Freerun).
          Use TOD command to set time for the external 1PPS reference
input."
      ::= { Reference 1 }

  Mode OBJECT-TYPE
      SYNTAX  INTEGER
      ACCESS  read-write
      STATUS  mandatory
      DESCRIPTION "Mode: 0=Mobile or 1=Fixed"
      ::= { Reference 2 }

  Amplitude10MHz1 OBJECT-TYPE
      SYNTAX  INTEGER
      ACCESS  read-write
      STATUS  mandatory
      DESCRIPTION "10MHZ Output 1 Level (0-100)"
      ::= { Reference 3 }

  Amplitude10MHz2 OBJECT-TYPE
      SYNTAX  INTEGER
      ACCESS  read-write
      STATUS  mandatory
      DESCRIPTION "10MHZ Output 2 Level (0-100)"
      ::= { Reference 4 }

  Amplitude10MHz3 OBJECT-TYPE
      SYNTAX  INTEGER
      ACCESS  read-write
      STATUS  mandatory
      DESCRIPTION "10MHZ Output 3 Level (0-100)"
      ::= { Reference 5 }

  Amplitude10MHz4 OBJECT-TYPE
      SYNTAX  INTEGER
      ACCESS  read-write
      STATUS  mandatory
      DESCRIPTION "10MHZ Output 4 Level (0-100)"
      ::= { Reference 6 }

   PPSWidth OBJECT-TYPE
      SYNTAX  INTEGER
      ACCESS  read-write
      STATUS  mandatory
      DESCRIPTION "Pulse Width in ns (Default = 20us) "
      ::= { Reference 7 }
```

```
   PulseOffset1 OBJECT-TYPE
      SYNTAX       DisplayString
      ACCESS       read-write
      STATUS       mandatory
      DESCRIPTION  ""
     ::= { Reference 8  }

   PulseOffset2 OBJECT-TYPE
      SYNTAX       DisplayString
      ACCESS       read-write
      STATUS       mandatory
      DESCRIPTION  ""
     ::= { Reference 9  }

   PulseOffset3 OBJECT-TYPE
      SYNTAX       DisplayString
      ACCESS       read-write
      STATUS       mandatory
      DESCRIPTION  ""
     ::= { Reference 10 }

        TODCounter      OBJECT-TYPE
               SYNTAX       DisplayString
               ACCESS       read-write
               STATUS       mandatory
               DESCRIPTION  "Set/Get the current value of its Time of Day
in the format of
                        yyyymmddhhmmss
                         Ex:20100713121930"
               ::= { Reference  11 }

        LEDStatus OBJECT-TYPE
               SYNTAX INTEGER
               ACCESS read-only
               STATUS mandatory
               DESCRIPTION           "LED status"
               ::= { Reference 12 }

END
```