GridTime™ 3000 Installation Manual

Overview

The GridTime 3000 is a rack mountable precision time server for digital substation applications. Its timing protocols and ports are enabled through license bundles (See 4. Licenses for a full list of all license bundles), allowing for different functionality to be enabled as requirements change.

The GridTime 3000 has an extensive collection of different ports, including:

- Ten Ethernet ports (two RJ-45, eight SFP) on its front panel for Network Time Protocol (NTP) and Precision Time Protocol (PTP) time synchronization
- Fifteen ports on its back panel for input of IRIG-B, and output of a range of legacy time and frequency signals
- An antenna connector on its back panel to utilize a GNSS reference.

The GridTime 3000 is suitable for use in synchronizing industrial control and supervisory control and data acquisition (SCADA) equipment. It can provide time synchronization to many different devices simultaneously, such as Phasor Measurement Units (PMUs), Protection Relays, Remote Telemetry Units (RTUs) and other Intelligent Electronic Devices (IEDs) used in electrical substations and industrial control installations.

The GridTime 3000 is suitable for harsh electromagnetic environments as all its ports are electrically isolated. This allows output wiring to feed out to operating areas in different earth potential zones without compromising site earthing security. The isolation also protects the device from high voltage spikes.

Table of Contents

1. How to Use this Manual

This chapter describes the format, layout, and purpose of this manual.

1.1 Purpose of this Manual

Welcome to the GridTime™ 3000 GNSS Time Server.

This document aims to help you use the GridTime 3000 to reliably deliver high accuracy time to your end devices.

The GridTime 3000 Installation Manual contains everything you need to know for unpacking, installing, using, maintaining, and troubleshooting the Microchip GridTime 3000 GNSS Time Server.

1.2 Who Should Read This Manual

This section describes who should read this manual and what chapters they should read.

Overview is written for general readers who want information about the product. Subsequent chapters contain technical information about the product. Other chapters describe installation, maintenance, and configuration instructions or details primarily intended for qualified maintenance personnel. This manual is designed for the following categories of users:

- Systems Engineers – Overview provides an introduction to the GridTime™ 3000 GNSS Time Server. Cross-references in this chapter direct you to detailed system information in other chapters as appropriate.
- Installation Engineers – Chapters 6. Installation through 10. Operating provide detailed information and procedures to ensure proper installation, operation, configuration, and testing of the GridTime 3000.
- Maintenance Engineers – 11. Maintenance and Troubleshooting and the appendices provide preventive and corrective maintenance guidelines, as well as procedures for diagnosing and troubleshooting fault indications and alarms.

1.3 Conventions Used in This Manual

This section describes the conventions used in the GridTime 3000 Installation Manual.

This manual uses the following conventions:

- **Acronyms and Abbreviations** — Terms are spelled out the first time they appear in text. Thereafter, only the acronym or abbreviation is used.
- **Revision Control** — The title page lists the printing date and versions of the product this manual describes.
- **Wording Conventions** — This manual uses the typographical conventions described in the table below.

Apperance of text	Example	Meaning
First letter initialized	GridTime 3000 Installation Manual	The title of a document or section.
All capital letters	ADMIN	An operating mode, alarm state, status, or chassis label.
Bold and italicized.	Microchip ***does not*** recommend...	A word or term given special emphasis.

1.4 Warnings, Cautions, Tips, and Notes

This section describes how warnings, cautions, tips and notes are used in the GridTime 3000 Installation Manual.

Warnings, Cautions, Tips, and Notes attract attention to essential or critical information in this guide. The types of information used in this guide are as follows:

Important: All important information use this symbol. The information icon contain installation, operation, or maintenance procedures, practices, conditions, or statements, that provide important information for successful operation of the device.

DANGER

To avoid serious personal injury or death, *do not* disregard warnings. All warnings use this symbol. Warnings are installation, operation, or maintenance procedures, practices, or statements, that if not strictly observed, may result in serious personal injury or even death.

CAUTION

To avoid personal injury, *do not* disregard cautions. All cautions use this symbol. Cautions are installation, operation, or maintenance procedures, practices, conditions, or statements, that if not strictly observed, may result in damage to, or destruction of, the equipment. Cautions are also used to indicate a long-term health hazard.

Tip: All tips use this symbol. Tips indicate manufacturer-tested methods or known functionality. Tips contain installation, operation, or maintenance procedures, practices, conditions, or statements, that provide important information for optimum performance results.

Note: All notes appear like this. Notes contain installation, operation, or maintenance procedures, practices, conditions, or statements, that alert you to important information, which may make your task easier or increase your understanding.

1.5 Related Documents and Information

See your Microchip representative or sales office (nzp-allsales@microchip.com) for a complete list of available documentation.

1.6 Where to Find Answers to Product and Document Questions

For additional information about the products described in this guide, please contact your regional sales representative or nzp-allsales@microchip.com.

For assistance with a GridTime 3000 installation issue or to arrange a return, please contact nzp-support@microchip.com. See www.microchip.com/support for more information.

2. Key Benefits

This section provides an overview of the GridTime™ 3000 GNSS Time Server's key features.

2.1 Flexibility

With much of the power industry undergoing a digital migration, many utilities are transitioning from legacy time code distribution to Ethernet-based time distribution. Consequently, time distribution requirements are evolving.

This is why the GridTime 3000 has been designed with a licensable hardware model, where licenses are loaded onto the device to enable specific ports and functionality.

This way, if the time distribution needs change, and a legacy timing bus system is replaced with an Ethernet time distribution system or a hybrid system, licenses can be purchased to enable the Ethernet timing functionality on the GridTime 3000, instead of purchasing an entirely new time server.

2.2 Redundancy

As the power industry involves mission critical applications, ensuring equipment remains operational in the event of a system failure is essential. This is why having redundant backup systems in place is crucial for bolstering resiliency against failures.

For this reason, the GridTime 3000 includes multiple features, and expansion options for adding additional redundancy.

These include:

- Parallel Redundancy Protocol (PRP) support on all Ethernet ports.
- Dual firmware images - the device stores a primary firmware image and a backup image.
  - If the primary image cannot be booted, the backup image is booted instead, which becomes the new primary image.
  - This protects the device against upload of malicious or corrupted firmware.
- A dual oscillator expansion option. This offers resiliency in the event of an oscillator failure. See 3.3. Hardware Options.
- A dual band GNSS receiver. This offers protection if GNSS spoofing or jamming is detected on one of the GNSS bands.

2.3 Reliability

To meet the needs of the power industry, the GridTime 3000 has been equipped with features for ensuring robust and reliable operation in the field.

These include:

- Isolated electrical inputs and outputs. This offers protection in the event of surges or large voltage transients.
- Field replaceable power supplies and power supply fuses. See 11.7. Power Supply Replacement and 11.6. Power Supply Fuse Replacement.
- High temperature range tolerance on internal components: -10 ℃ ambient to ≥ +55 ℃ (14°F to 149 °F).
- Alarms (5. Alarms) and detailed internal logging. The GridTime 3000's detailed alarm and logging systems allow users to easily self diagnose and remedy issues that appear in the field.

2.4 Time and Frequency Signals

This section describes the timing and frequency signals the GridTime™ 3000 GNSS Time Server can output, or use as a time source for synchronization.

The GridTime 3000 can send and receive a variety of modern and legacy time signals for time and frequency synchronization and syntonization.

The GridTime 3000 can output the following time and frequency signals:

- Unmodulated IRIG-B signals:
  - IRIG-B004 with AFNOR or C37.118.1 extensions
  - IRIG-B005 with AFNOR or C37.118.1 extensions
  - IRIG-B006
  - IRIG-B007
- Amplitude modulated IRIG-B (AM IRIG-B) signals:
  - IRIG-B124 with AFNOR or C37.118.1 extensions
  - IRIG-B125 with AFNOR or C37.118.1 extensions
  - IRIG-B126
  - IRIG-B127
- Modified Manchester modulated IRIG-B signals:
  - IRIG-B224 with AFNOR or C37.118.1 extensions
  - IRIG-B225 with AFNOR or C37.118.1 extensions
  - IRIG-B226
  - IRIG-B227
- Simulated DCF77 receiver output signal
- Custom pulse train signal (Programmable Pulse):
  - Custom frequency — 1 pulse per day to 250 pulses per second
  - Custom phase offset — none through to 1 wave period, configurable to the millisecond
  - Custom Duration — none through to 1 wave period, configurable to the millisecond
- Output of ITU-T G.703 signals:
  - T1/J1 interface at 1.544 kbits/s - G.703 section 7
  - E1 interface at 2.048 kbits/s - G.703 section 11
  - 2.048 MHz fixed frequency sine and square wave - G.703 section 15
  - 1.544 MHz fixed frequency sine and square wave - Also follows G.703 section 15
  - 10 MHz fixed frequency sine and square wave - G.703 section 20
- Output of time strings over a serial RS422 or RS232 connection (See 12.7. Time String Specifications for string content definitions):
  - NGTS string
  - IRIG J-1x string
  - String A-String H serial strings
  - NMEA ZDA string
  - NMEA RMC string
- PTP server mode support:
  - IEEE® 1588-2008 E2E Default Profile server
  - IEEE 1588-2008 P2P Default Profile server
  - IEEE C37.238-2011 Power Profile server
  - IEEE C37.238-2017 Power Profile server
  - IEC/IEEE 61850-9-3 Power Utility Profile server
  - ITU-T G.8275.1 Telecom Profile
  - ITU-T G.8265.1 Telecom Profile
- NTP server support:

– NTP v1, v2, v3, and v4 server support

The GridTime 3000 can receive multiple time signals at once, but will only synchronize to one signal at a time. The device follows its configured time source hierarchy when deciding which source to use for synchronization.

- **GNSSs**

  GNSS time synchronization is supported and is recommended for use as the primary reference source for the device. Any of the following GNSSs can be used simultaneously:

  – GPS and QZSS
  – GLONASS
  – Galileo
  – BeiDou
- **IRIG-B**

  IRIG-B synchronization is supported through either of the IRIG In ports. The following signal formats can be used:

  – 0-5V TTL DCLS IRIG-B004 signals with C37.118.1 extensions
  – 0-5V TTL DCLS IRIG-B005 signals with C37.118.1 extensions
- **PTP**

  Depending on configuration, PTP ports could be either; forced PTP clients or can automatically enter client mode after synchronization loss. The following PTP profiles can be used:

  – IEEE 1588-2008 E2E Default Profile client
  – IEEE 1588-2008 P2P Default Profile client
  – IEEE C37.238-2011 Power Profile client
  – IEEE C37.238-2017 Power Profile client
  – IEC/IEEE 61850-9-3 Power Utility Profile client
  – ITU-T G.8275.1 Telecom Profile
  – ITU-T G.8265.1 Telecom Profile
- **Simple Network Time Protocol (SNTP) client support**

  – SNTP v1, v2, v3, and v4 client support

2.5 IEC 62439-3:2016 Parallel Redundancy Protocol (PRP)

This section describes the functionality of PRP on the GridTime™ 3000 GNSS Time Server.

The GridTime 3000 supports PTP over Parallel Redundancy Protocol (PRP) on all of its Ethernet timing ports. This allows a PTP client or server to be identically duplicated across two Ethernet ports on the device as a single redundant interface. The GridTime 3000 can be configured to operate PRP over Ethernet timing ports 1 and 2, Ethernet timing ports 3 and 4, Ethernet timing ports 5 and 6, Ethernet timing ports 7 and 8 and, Ethernet timing ports 9 and 10.

Note: This feature requires a PRP license to activate, and the Ethernet timing ports used must also be activated via licenses.

Note: At no time will the GridTime 3000 operate as an Ethernet router, switch, or hub.

2.6 Event Monitoring

This section describes the supported methods for monitoring the GridTime™ 3000 GNSS Time Server's operational events.

2.6.1 Notifications

The GridTime 3000 generates a notification when a state change occurs, such as 'out of sync' to 'in sync', or a system variable crosses a threshold This could include the satellite count dropping below the minimum allowable satellites threshold.

Syslog notifications, SNMP notifications, or both can be configured to be sent from the admin Ethernet port to a list of user-defined IP addresses.

2.6.2 Internal Logging

The GridTime 3000 internally logs key operational events as they occur. The logs can be extracted using the CMT. See 10.6. Retrieving the Internal Log Files

2.6.3 Alarms

When an event that risks the operation of the device occurs, an alarm and notification is generated.

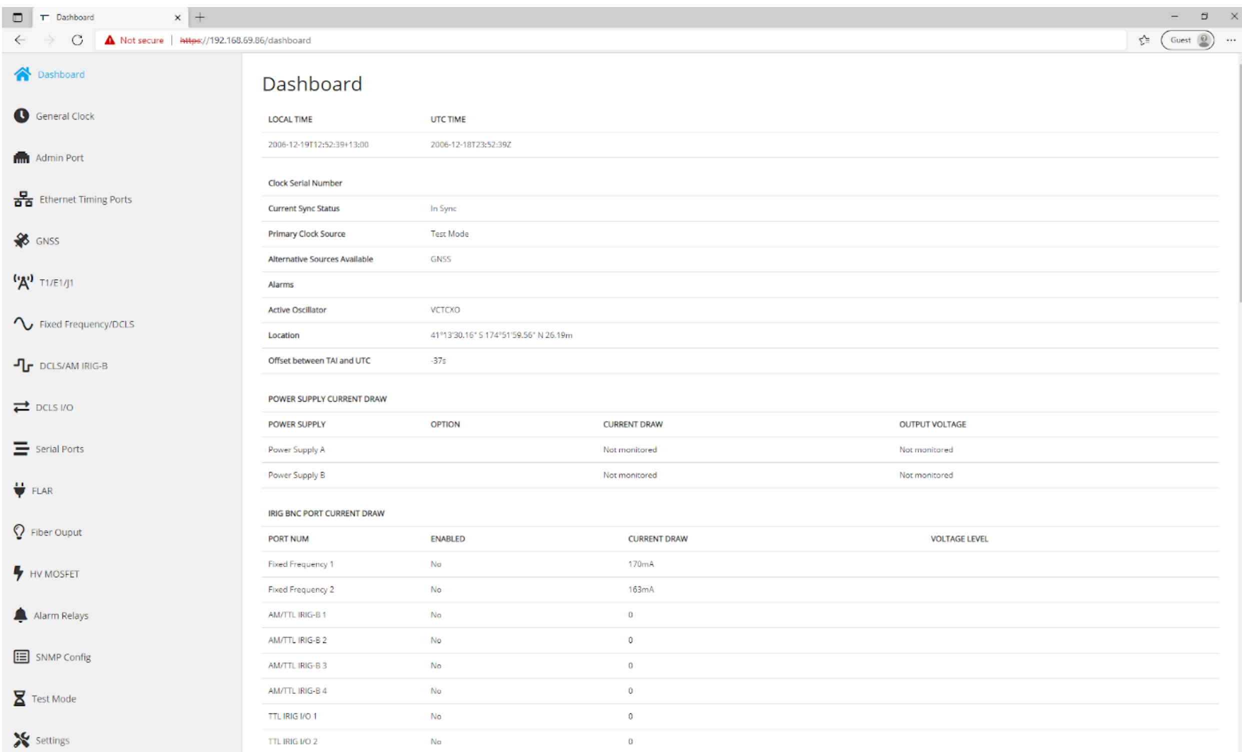
The methods for monitoring alarms, and guidance on clearing alarms as they occur are described in 5. Alarms.

2.7 Device Management

This section describes the device management features the GridTime™ 3000 GNSS Time Server supports.

For device configuration and system monitoring, the GridTime 3000 hosts its own web browser accessible configuration tool called the Clock Management Tool (CMT).

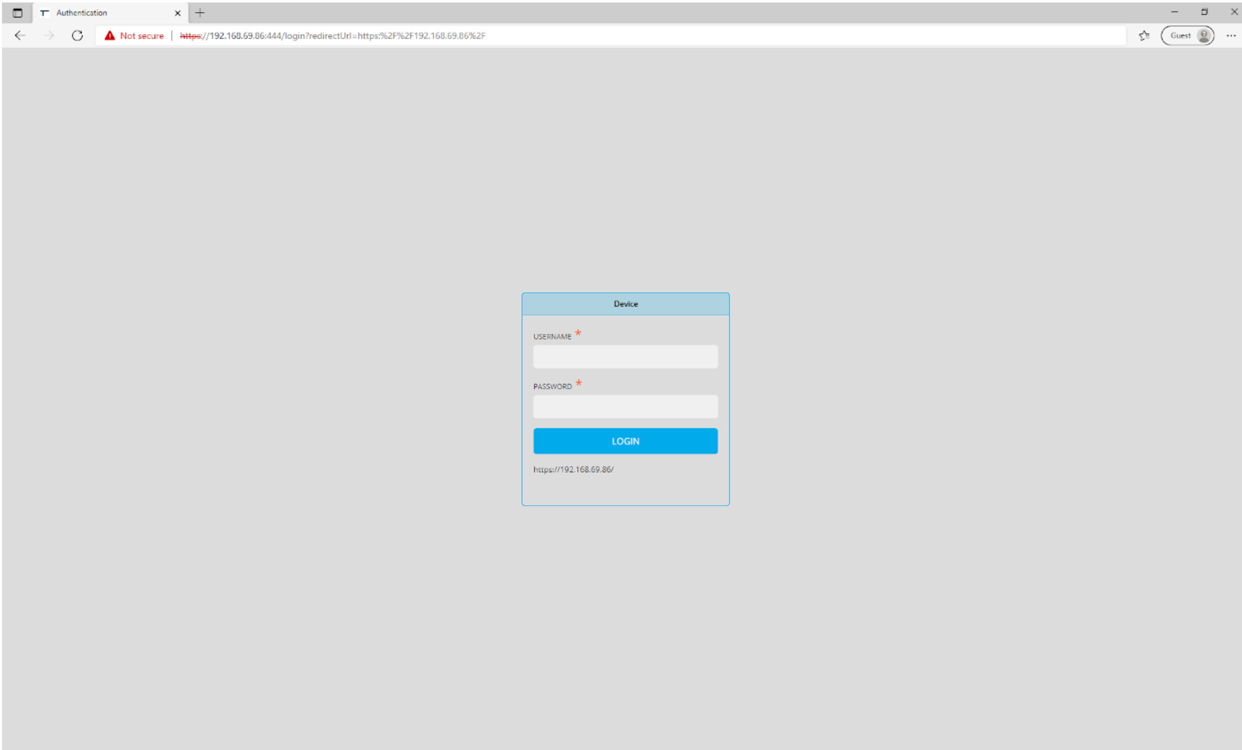
Figure 2-1. CMT Dashboard



The CMT can be accessed by establishing a connection to the device's administrator (admin) USB-C® port or its administrator (admin) Ethernet port. This process is described in 9.1. Establishing a Connection to the GridTime 3000. Once a connection has been established, an admin port IP address can be typed into a web browser on your PC, and the login screen for the CMT will appear.

The active IP addresses of both admin ports are displayed on the device's LCD.

Figure 2-2. CMT Login Screen



2.8 Security

This section describes the key GridTime 3000's security features.

The GridTime 3000's Clock Management Tool (CMT) is password protected, and supports multiple user logins with administrator controlled levels of access.

It also has additional security built into the upgrade procedure with RSA signatures and RSA/AES encryption and hardware based assurance and validation modules. Preventing the upload of malicious or corrupted firmware images.

The GridTime 3000 also supports Industry standard RSA based security on its Clock Management Tool (CMT), AES/SHA on Simple Network Management Protocol (SNMPv3), as well as MD5 hashed Network Time Protocol (NTP).

2.8.1 User Security Model

This section describes the user security model used by the GridTime 3000.

The GridTime 3000 features a user security model (USM) that is split into users and roles. A user is an indidivual log in and represents one person, a role is a group in which a user may be placed in. Each role has it's own set of admin-configured permissions and will dictate what configuration settings each user can read or write to.

With the GridTime 3000's USM each role may have multiple users assigned to it.

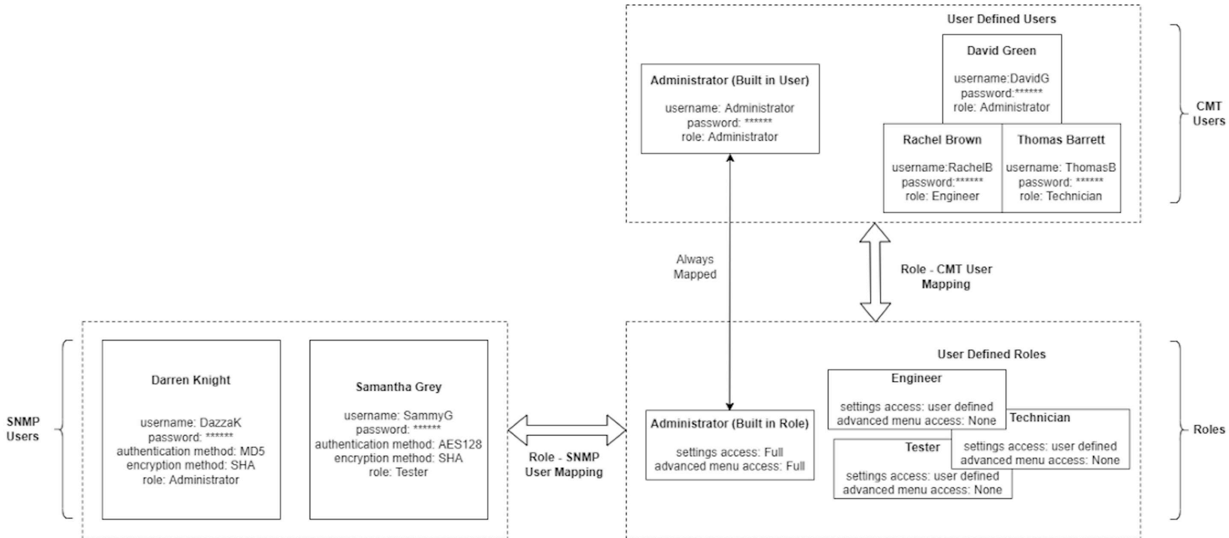
Note: Both Clock Management Tool (CMT) and SNMPv3 users can be assigned to a role and will have the permission set of that role enforced..

There is always an administrator role defined, this role allows full read and write access to all settings and access to all CMT menus. The administrator role permissions cannot be viewed or edited. Additional roles with variable permission sets can be generated by the administrator user. Only the administrator role allows access to the advanced CMT menus, and the CMT authorization module where CMT user login settings are modified.

In addition to the administrator role, there is always an administrator CMT user defined, which is always mapped to the administrator role. Additional CMT users can be generated in the CMT authorization module by the administrator role. 9.13. Provisioning Users

SNMP users have to be defined by the CMT user, and in addition to basic login details (username + password), the authentication and encryption method has to be defined. SNMP users are used by the SNMPv3 USM.

The diagram below shows a representation of the GridTime 3000 USM.



3. Physical Overview

This section gives a physical overview of the GridTime™ 3000 GNSS Time Server. This includes an overview of key device features including:

- Timing ports
- Device management ports
- Alarm and Sync LEDs
- Liquid Crystal Display (LCD)
- Power ports
- Case

The device has a 19 inch rack mount case, and features ten 1 Gbps capable Ethernet ports on its front panel, with an array of legacy timing and frequency ports on its back panel.

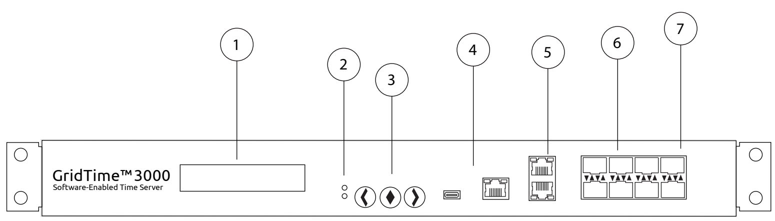
3.1 Front Panel

This section describes the functionality on the GridTime™ 3000 GNSS Time Server's front panel.

The front panel of the GridTime 3000 features the following:

- LCD
- Alarm and Sync LEDs
- LCD navigation buttons
- USB-C Admin and RJ-45 Admin ports
- Ethernet ports

Figure 3-1. GridTime 3000 Front Panel Features



1. LCD
2. Alarm and Sync LEDs
3. LCD Navigation Buttons
4. USB-C Admin and RJ-45 Admin Ports
5. Ethernet Ports 1-2: RJ-45 Ports (x2)
6. Ethernet Ports 3-8: SFP Ports (x6)
7. Ethernet Ports 9-10: SFP+ Ports (x2)

Table 3-1. Front Panel Feature Description

Feature Number	Feature	Description
1	LCD	• Shows the device's current time and other system observables • Information such as active alarms, synchronization state, firmware version, and the current UTC offset are displayed • Information is organized by type on different LCD tabs, which are accessed with the front panel buttons. The contents of each tab is described in 3.1.1. LCD Tabs.
2.1	Alarm LED	• Flashes red when one or more alarms is active • Off if no alarms are active • Active alarms are listed on the LCD Alarm Status tab
2.2	Sync LED	• Solid green when device is synchronized to a time source - 'in sync' state • Flashes green when in 'holdover' state, or 'out of sync' state
3	LCD Navigation Buttons	• The left and right buttons are used to scroll through the LCD tabs. • If the center button is pressed, the LCD will display its main tab. If held, it will load the clock power screen, where the device can be safely shutdown or rebooted.
4.1	USB-C Admin Port	• Can be connected to the following with a USB cable to perform device management: – A PC's USB host port – A tablet's USB host port • Supports USB 2.0 • Cannot be used to charge a device
4.2	RJ-45 Admin Port	• Can be connected to the following over an Ethernet network to perform device management: – PC Ethernet port • SNMP and Syslog notifications can be configured to be sent from the port to a list of user-defined IP addresses • Left LED (ACT LED) flashes green as traffic passes through • Right LED (LNK LED) shows link speed: – Green if 1 Gbps – Orange if 100 Mbps – Off if 10 Mbps • Cannot be used for timing

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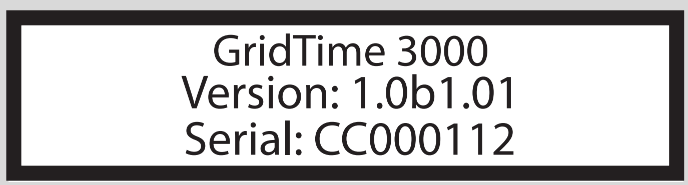
Feature Number	Feature	Description
5	RJ-45 Ports	• Can be used for NTP and PTP time synchronization over copper Ethernet at speeds up to 1 Gbps • Left LED (enabled LED) illuminates if the port has been enabled • Right LED (ACT LED): – Illuminates orange when an active link is established with the port – Blinks as traffic passes through the port • Cannot be used for configuration
6	SFP Ports	• Can be used with an SFP for NTP or PTP time synchronization at speeds up to 1 Gbps • Left LED that points at the port (enabled LED) illuminates if the port has been enabled • Right LED that points at the port (ACT LED): – Illuminates orange when an active link is established with the port – Blinks as traffic passes through the port • Cannot be used for configuration
7	SFP+ Ports	• Can be used with an SFP for NTP or PTP time synchronization at speeds of up to 10 Gbps • Left LED that points at the port (enabled LED) illuminates if the port has been enabled • Right LED that points at the port (ACT LED): – Illuminates orange when an active link is established with the port – Blinks as traffic passes through the port

3.1.1 LCD Tabs

This section summarizes the information on each of the GridTime™ 3000 GNSS Time Server's LCD tabs.

Table 3-2. LCD Tab Information

Name	Display
Startup display sequence	 Startup screen 1. GT3K logo text.
	 Startup screen 2. GT3K logo text and startup counter. Each number maps to a specific boot stage in the firmware. Inform Microchip Support if the startup freezes on a particular number.
	 Startup screen 3. GridTime 3000 logo text.
	 Startup screen 4. Device information.

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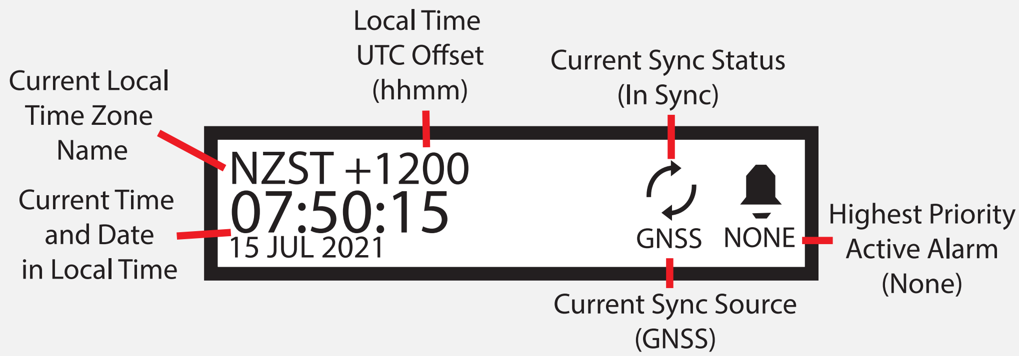
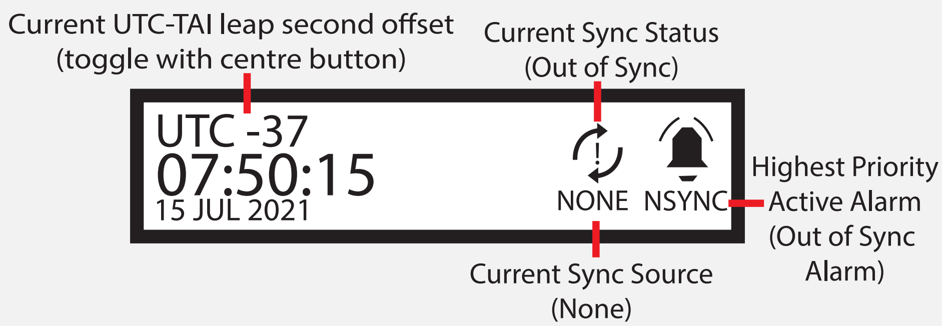
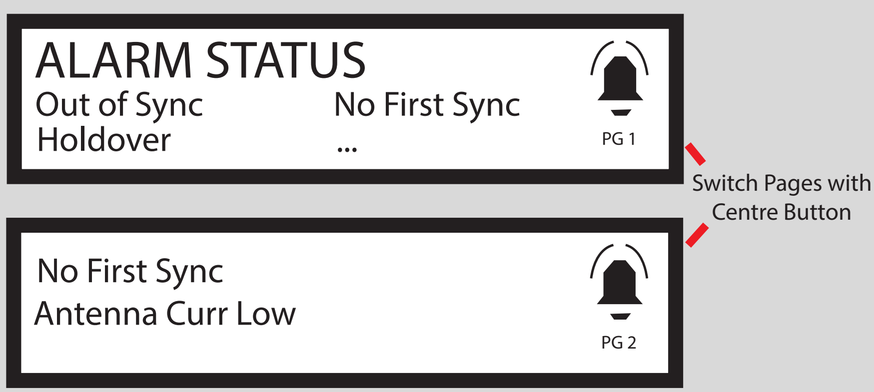
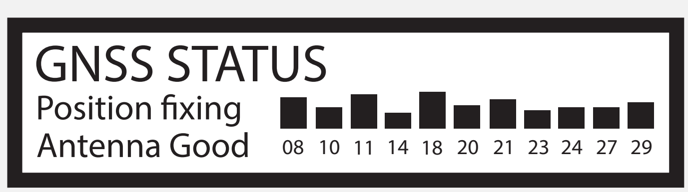
Name	**Display**
Main dispaly tab	  The main display shows the local time and date, the current sync status and sync source, and the alarm status.
Alarm Status Tab	 Shows all currently active alarms.
GNSS Status Tab	 Shows the current GNSS status, the antenna state, and the first 10 satellites being used for time synchronization ordered by ID. A bar chart shows the signal strength of each satellite.

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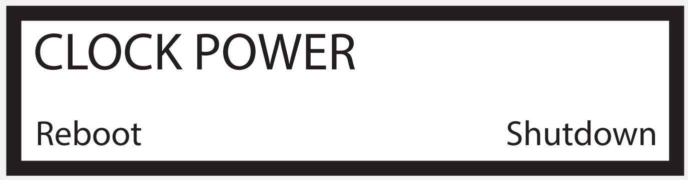
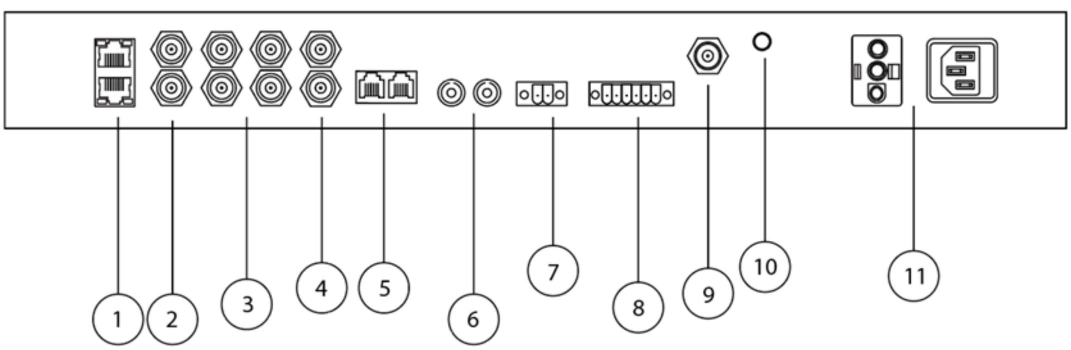
Name	**Display**
Clock Information Tab	 Shows the serial number, the firmware version and the IP address of the administration port.
Clock Power Tab	 Accessed by holding the middle front panel button when on any other tab. Press the left button to restart the device, the right button to shut down, or the middle button to return to the main tab. **Note:** The shutdown is a software shutdown only, and will not switch off power to the device or its internal components.

3.2 Back Panel

This section describes the functionality on the GridTime™ 3000 GNSS Time Server's back panel.

Figure 3-2. GridTime 3000 Back Panel Features



1. RJ-48C T1/E1/J1 ports (x2)
2. BNC Ports 1-2 -Fixed frequency/TTL ports (x2)
3. BNC ports 3-6 -AM IRIG/TTL ports (x4)
4. BNC ports 7-8 -IRIG in/TTL out ports (x2)
5. RJ-12 RS232 and RS422 serial string output ports (x1 of each)
6. ST optical fiber output port (x2)
7. HV MOSFET port — (x1)
8. Form-C Alarm Relay Ports — (x2)
9. TNC GNSS antenna port (x1)
10. Earth Stud
11. Power supply port(s) (up to x2)

Table 3-3. Back Panel Feature Description

Feature Number	Feature	Description
1	T1/E1/J1 Ports	• RJ-48C receptacle • Can be configured as a T1/J1 output interface at 1.544 kbits/s - G.703 section 7 • Can be configured as an E1 output interface at 2.048 kbits/s - G.703 section 11
2	Fixed frequency/TTL ports	• Female BNC Connector • Can output 2.048 MHz fixed frequency sine or square waves - G.703 section 15 • Can output 1.544 MHz fixed frequency sine or square waves - follows G.703 section 15 • Can output 10 MHz fixed frequency sine or square waves - G.703 section 20 • Can output standard GridTime 3000 Pulse output signals[1] over copper
3	AM IRIG/TTL ports	• Female BNC Connector • Can output 1kHz amplitude modulated IRIG-B, with a 3:1 ratio. • Can output standard GridTime Pulse output signals[1] over copper
4	IRIG in/TTL out ports	• Female BNC Connector • Can receive a 0-5V TTL DCLS IRIG-B signal with C37.118 extensions as a synchronization source • Can output standard GridTime Pulse output signals[1] over copper
5.1	RS232 Serial String port	• RJ-12 receptacle • Can output serial time strings at RS232 levels
5.2	RS422 Serial String port	• RJ-12 receptacle • Can output serial time strings at RS422 levels
6	ST optical fiber ports	• Female ST optical connector • Can transmit all standard GridTime pulse output signals[1] over fiber

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Feature Number	Feature	Description
7	HV MOSFET	• Two pin male phoenix connector • with an external voltage supply connected, can output all standard GridTime pulse signals[1] at that supply voltage
8	Alarm relay ports	• 6 pin male phoenix connector (3 pins per port) • Form-C relay contacts. Each port has: – Normally Closed (NC) contact – Common (C) contact – Normally Open (NO) contact • Specific alarms can be mapped to each port in the CMT — see 5. Alarms. Port enters alarm state if any mapped alarm activates.
9	GNSS antenna port	• Female TNC connector • Can be connected to a suitable GNSS antenna installation to provide a GNSS reference for the device. See 6.7. Installing the GNSS Antenna. • Outputs 5V (80 mA max) to power connected GNSS antenna
10	Earth stud	• Earthing point for device. • Connect to earth to provide a safe electrical discharge path. 6.5.1. Ground Connections
11	Power supply port(s)	Device can be ordered with a single power supply, or two power supplies for redundancy. Two power supply options are available for selection: • Low voltage option: – Supports DC Only – Range: 24 Vdc-120 Vdc • High voltage option: – Supports AC or DC – AC Range: 100 Vac-240 Vac – DC Range: 120 Vdc-250 Vdc

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Feature Number	**Feature**	**Description**
1 - Standard GridTime 3000 pulse output signals include: • Unmodulated IRIG-B • Amplitude modulated IRIG-B • Modified Manchester modulated IRIG-B • Simulated DCF77 receiver output • Custom pulse signals		

3.3 Hardware Options

This section gives an overview of the GridTime™ 3000 GNSS Time Server's base hardware, and hardware expansion options.

3.3.1 Power Supply

This section describes the GridTime 3000's power supply options.

The GridTime 3000 can be ordered with a single power supply, or two power supplies for redundancy.

Two different power supply types can be ordered — low voltage or high voltage.

The voltage ranges for the two supplies are as shown in the following table.

Table 3-4. Voltage Ratings For Two Power Supplies

Power Supply	AC/DC Support	Ratings
Low voltage	DC support only	24 Vdc-120 Vdc 2.92 A-580 mA
High voltage	AC and DC support	**DC**: 120 Vdc-250 Vdc 590-280 mA **AC**: 100 Vac-240 Vac 700-292 mA 50-60 Hz Only

The voltage ranges are also marked on the product label on the chassis. Operating the device outside of these ratings may cause permanent hardware damage, Microchip assumes no liability for any damage resulting from operating the device outside its operational voltage ratings.

3.3.2 Oscillator

This section describes the GridTime 3000's oscillator options.

The GridTime 3000's base oscillator configuration includes a VCTCXO (Voltage Controlled, Temperature Compensated Crystal Oscillator) .

Additionally, the GridTime 3000 can be ordered with either a VCOCXO (Voltage Controlled, Oven Controlled Crystal Oscillator) or Rubidium oscillator as well. A dual oscillator configuration offers superior redundancy and holdover compared to the VCTCXO only. The expansion oscillators — Rubidium and VCOCXO, are high stability oscillators, and will revert to the VCTCXO oscillator in the event that something goes wrong.

3.4 Case Overview

This section gives an overview of the GridTime 3000's case.

The GridTime 3000 case has a 1U (1.75 inch) height, a 19 inch (482 mm) width, and a length of 12.97 inch (329.4 mm).

The dimensions of the GridTime 3000 case are outlined in GridTime 3000 Case Dimensions - Front, and GridTime 3000 Case Dimensions - Top .

Figure 3-3. GridTime 3000 Case Dimensions - Front

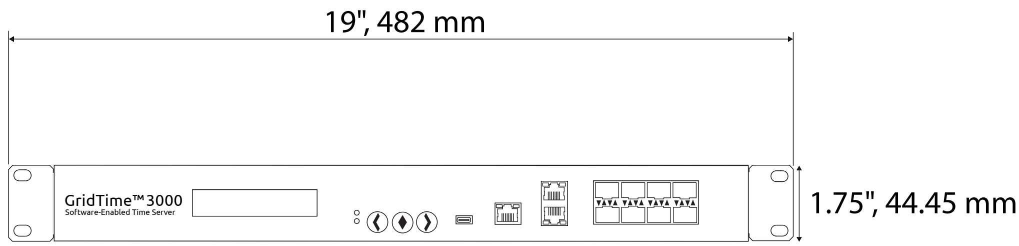
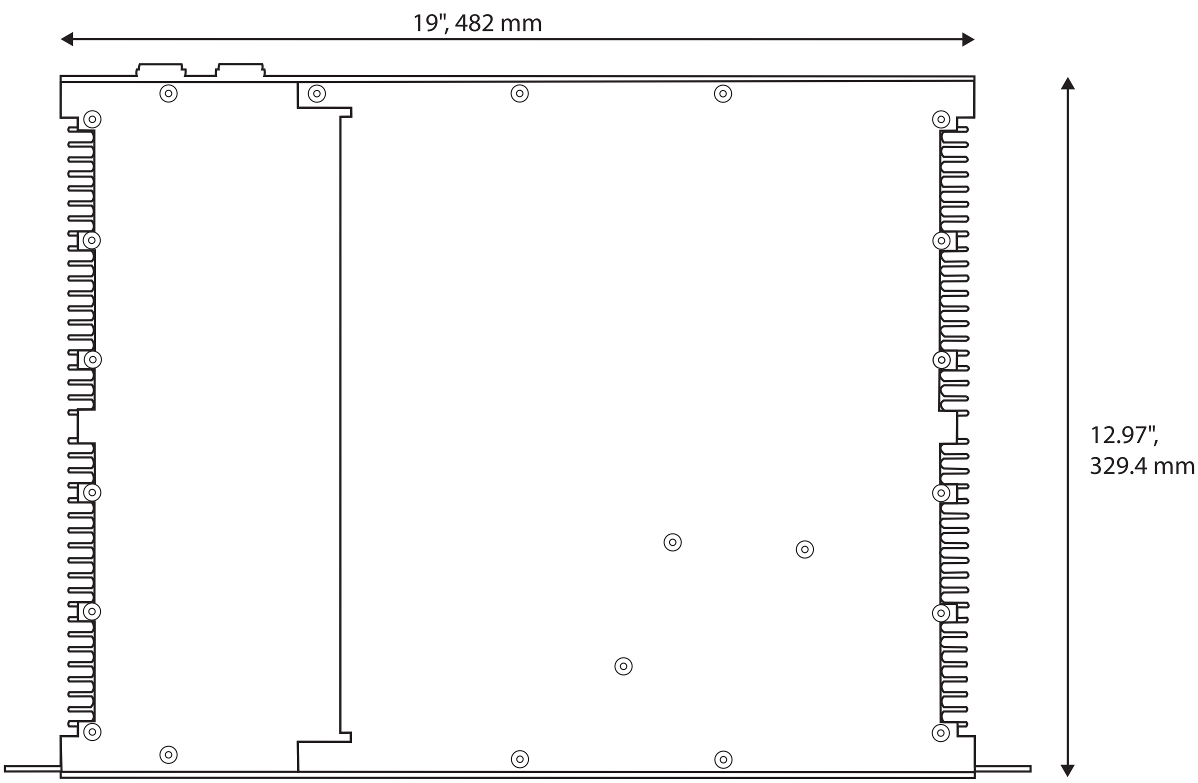


Figure 3-4. GridTime 3000 Case Dimensions - Top



The case's lid is comprised of two segments — the main compartment, and the power supply bay.

The lid's main compartment must never be opened, or else it will induce a breach in warranty.

Once all power supply(s) have been switched off, the power supply bay may be opened by a qualified user to replace a failed power supply in the device, or to replace a blown power supply fuse. Instructions on how to do both of these can be found in 11.6. Power Supply Fuse Replacement and 11.7. Power Supply Replacement.

The side of the GridTime 3000 case features fins for passive heat dissipation.

⚠ CAUTION Take care when handling the sides of the case, as the heat sink fins can be uncomfortable to hold.

4. Licenses

This section gives an overview of the licenses that can be purchased with the GridTime™ 3000 GNSS Time Server, and describes the features activated by each bundle.

The licenses that are purchasable with the GridTime 3000, as well as the features activated by each license, are described in Table 4-1.

For licenses that enable all timing protocols on a group of ports, see Table 3-1 and Table 3-3 for a description of the protocols supported on each port.

Table 4-1. GridTime 3000 licenses

License name	Activated features
Front Panel Features	
Ethernet Copper	Activates 1x RJ-45 Ethernet ports (up to x2 available). **Note:** An additional NTP or PTP license needs to be purchased to use NTP or PTP on ports.
Ethernet SFP (Copper or Fiber)	Activates 1x SFP or SFP+ Ethernet ports for use at 10/100/1000 Mbps communication speeds (up to 6x SFP and 2x SFP+ available). **Note:** An additional NTP or PTP license needs to be purchased to use NTP or PTP on ports.
10GB License	Activates 10 Gbps communication speed on Ethernet timing ports 9 and 10. **Note:** An additional NTP or PTP license needs to be purchased to use NTP or PTP on ports.
PTP	Enables PTP client and server on all activated Ethernet ports. Enables all PTP profiles, see 2.4. Time and Frequency Signals for a list of all supported PTP profiles.
NTP/SNTP	Enables NTP broadcast, multicast, and unicast server mode on all activated Ethernet ports, as well as SNTP multicast, broadcast and unicast client.
PRP	Enables PRP on all activated Ethernet ports. See 2.5. IEC 62439-3:2016 Parallel Redundancy Protocol (PRP)
Back Panel Features	
T1/E1 & Fixed Frequency	Activates T1/E1/J1 ports (x2), and ITU G.703 square/sine wave output on Fixed Frequency/TTL BNC ports (x2)
BNC Outputs	Activates BNC ports and their supported I/O signals (x8) (apart from G.703 signals on Fixed Freq/TTL ports)
Fiber Pulse	Activates ST fiber ports and their supported pulse outputs (x2)
Serial Ports	Activates the RS232 serial port and the RS422 serial port, along with their supported time strings
HV MOSFET	Activates HV MOSFET port and its supported pulse outputs.

5. Alarms

This section describes the GridTime™ 3000 GNSS Time Server's alarms, how they can be monitored, and what corrective action is required when they occur.

The GridTime 3000 generates an alarm when an event that causes a risk to the operation of the device occurs.

Some alarms are expected in isolated occurrences due to signal quality fluctuations. These alarms only show an installation problem when they become recurring. Recurring means the alarm does any of the following:

- never clears
- triggers and clears repeatedly for an extended period
- appears again when the unit is power cycled.

Some alarms may indicate that maintenance needs to be performed on the device or installation, and/or may require technical support to be contacted. See 11.10. Contacting Technical Support.

- Low satellites alarm: not enough usable GNSS satellites detected. If recurring, it requires the antenna installation to be modified.
- Power supply alarm: a power supply has failed. Technical Support may need to be contacted.

See 5.1. Alarm Monitoring for a detailed description of the trigger and clearance conditions for each of the GridTime 3000's alarms.

5.1 Alarm Monitoring

This section describes the various alarm monitoring methods used with the GridTime 3000.

All active alarms are listed on the alarms tab of the device's LCD and on the dashboard of its Clock Management Tool (CMT) in priority order.

The highest priority alarm is also abbreviated and displayed under the alarm icon on the main screen of the device's LCD. See Table 2-2 LCD Tab Information

If notifications have been configured, alarms cause SNMP or Syslog notifications to be sent from the admin Ethernet port to a list of user-defined IP addresses.

A notification is sent when an alarm is triggered or cleared. All alarms map to a unique notification, but not all notifications map to an alarm, as some notifications simply describe standard operational events.

- antenna current high event: Generates alarm, and trigger and clearance notifications.
- first sync achieved event: Does not generate alarms, only a trigger notification.

The device includes two alarm relay ports, consisting of two 3-pin phoenix form C alarm relay contacts. Each alarm relay port includes a normally closed (NC) contact, a common (C) contact, and a normally open contact (NO).

Each alarm relay port can have any alarms enabled for it through configuration. If any of the alarms enabled on an alarm relay port become active, the port goes from the non-alarm state to the alarm state. The alarm state contact impedances are as follows:

- the impedance between the NC an C contacts becomes under 40 ohm(Ω)
- the impedance between the NO and C contacts becomes open circuit.

When all the mapped alarms clear, the port goes to the non-alarm state again. The non-alarm state contact impedances are as follows:

- the impedance between the NC and C contacts becomes open circuit
- the impedance between the NO and C contacts becomes under 40Ω.

6. Installation

This chapter describes the installation procedures for the GridTime 3000.

6.1 Getting Started

Before you begin installing the GridTime™ 3000 GNSS Time Server, review the information in this section.
If you encounter any difficulties during the installation process, or require additional technical information, contact Microchip FTS Services and Support. See 11.10. Contacting Technical Support for contact details.

6.1.1 Security Considerations for Installations

This section described some of the security considerations to be made when installing the GridTime 3000.

The following security considerations should be made when installing the GridTime 3000:

- Equiment is intended for installation in a Restricted Access Area / Les matériels sont destinés à être installés dans des EMPLACEMENTS À ACCÈS RESTREINT
- The GridTime 3000 should be installed where only certified personnel are allowed access.
- The GridTime 3000's Ethernet service ports should be installed with cyber security best pratices in mind

6.1.2 Site Survey

This section outlines the site surveying process that is recommended prior to installing the GridTime 3000.

The GridTime 3000 is intended to be installed in the following locations:

- dry indoor locations
- isolated control rooms with few electromagnetic interference (EMI) sources
- far from switchyards

Before you begin installation, determine the device location, ensure the appropriate power source is available nearby, and ensure that the equipment rack is properly grounded.

Survey the GNSS antenna installation location. Ensure that the sky is mostly clear of obstacles, and that few electromagnetic interference (EMI) sources are nearby (within a few meters) including other antennas. If the location is prone to lightning strikes, ensure high reaching metallic objects such as lightning rods are nearby to discharge lightning strikes.

The GridTime 3000 is designed to be mounted in a 19-inch (480 mm) rack. It occupies 1.75 in (4.5 cm, 1 RU) of vertical rack space, and has a depth of 11.93 in (303 mm).

Rack mounting tabs are provided with the device, which provide rack mounting holes once they are slid into the slots at both ends of the GridTime 3000's front panel.

The dimensions of the GridTime 3000 case are outlined in Figure 6-1, and Figure 6-2.

Figure 6-1. GridTime 3000 Case Dimensions - Front

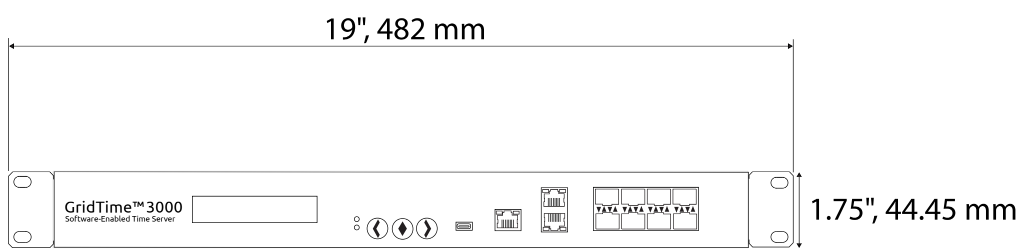
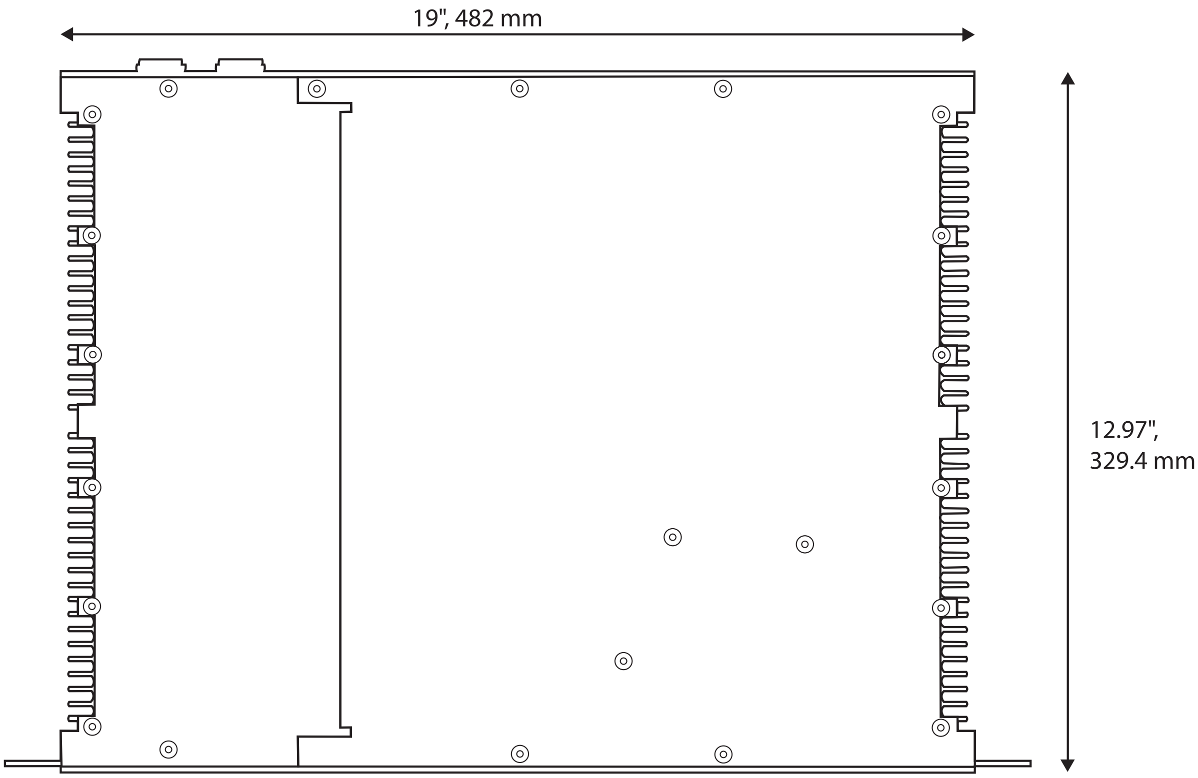


Figure 6-2. GridTime 3000 Case Dimensions - Top



6.1.2.1 Environmental Requirements

This section outlines the environmental requirements of the GridTime 3000's site of installation.

To prevent the unit from malfunctioning or interfering with other equipment, install and operate the unit according to the following guidelines:

- Operating temperature: – 10 °C to 55 °C (14°F to 131°F)
- Operating Humidity: 90% to 100% RH maximum, non-condensing
- Use only shielded cable for all signal wiring, including I/O, clocks and Ethernet. Ground the shields appropriately at both ends (6.5. Making Ground and Power Connections).
- Secure all cable screws to their corresponding connectors.

Important: To avoid interference, you must consider the electromagnetic compatibility (EMC) of nearby equipment when you install the GridTime 3000. Electromagnetic interference can adversely affect the operation of nearby equipment.

6.1.3 Installation Tools and Equipment

This section summarises the equipment and tools required to install the GridTime 3000.

Installation Equipment:

- The GridTime 3000 unit
- Standard tool kit. Useful equipment to include: screwdrivers, spanners, Hexagonal (Allen) keys, wirecutters.
- Cable ties, waxed string or acceptable cable clamps
- 1 mm² / 18 AWG (minimum) stranded wire at 300 volt insulation for -48 VDC
- 1 mm² / 16 AWG wire to connect grounding lug to permanent earth ground

- Two UL listed Ring Lugs for grounding connections
- Crimping tool to crimp a ring lug to the earth stud — recommended
- Shielded cabling of the appropriate impedance required by the specific signal type for signal wiring (including GPS, and Ethernet)
- Mating connectors for terminating signal wiring
- ESD wrist strap — recommended
- Fasteners for mounting the device to your rack
- Cables and connectors for interfacing with relevant timing ports
- Tools for assembling cables if cables are not already available and fitted with required connectors - wire strippers, crimping tools etc.
- Multi-meter or Voltmeter for verifying continuity in ground connections to the GridTime 3000's chassis.
- PC with a SNMP Management Information Base (MIB) browser, or a supported web browser installed.

Provisioning Equipment:

- Device for performing configuration:
  – A device with a recent version of Google Chrome, Microsoft Edge, or Mozilla Firefox installed.

Tip:
The following browser versions have been tested:

Google Chrome 97.04692.99 (Offical Build 64-bit) , 98.0.4758.102(Offical Build 64-bit), 99.0.4844.51(Offical Build 64-bit)

Microsoft Edge 99.0.1150.39 (Official build) (64-bit)

Mozilla Firefox 98.0.1 (64-bit)

- If using the USB-C Admin port for configuration:
  – Cable for forming a direct connection between the GridTime 3000's USB-C port, and the USB port on your configuration device.
  – For example, use a USB-C to USB-C cable if your device has a USB-C port, or a USB-C to USB-A cable if your device has a USB-A port.
  – Must be USB 2.0.
- If using the RJ-45 Admin port for configuration:
  – RJ-45 Ethernet cables
  (two needed if going through a DHCP capable switch)
  – Preferred: DHCP server for assigning IP address to RJ-45 Admin port. Without this, you will need to wait for the port to receive a link local IP address (~50 s), and you will have to assign a subnet link local static IP address to the port on your configuration device.

Tip: Additionally, it is also suitable to connect to the RJ-45 Admin port through an existing Ethernet network with a DHCP server present.

  – If your configuration device has no Ethernet port: A RJ-45 Ethernet to USB adapter can be used to connect the Ethernet cable to a USB port on your device.

6.2 Installation Checklist

This section gives a summary of the key installation steps for the GridTime 3000.

Please refer to this Installation Checklist when setting up the device to ensure all the required steps have been completed.

☐ Review all safety documentation and procedures

☐ Unpack the unit and accessories — 6.3. Unpacking the Unit

☐ Install the device in the rack — 6.4. Rack Mounting the GridTime 3000

☐ Install an antenna system — 6.7. Installing the GNSS Antenna

☐ Connect all signal cables and connectors — 6.6. Signal Connections

☐ Connect safety ground, then power connections — 6.5. Making Ground and Power Connections

☐ Power the device — 6.8. Powering the GridTime 3000

☐ Configure the device using the CMT or SNMP — 7. Clock Management Tool (CMT), 8. Simple Network Management Protocol (SNMP)

6.3 Unpacking the Unit

This section describes how to unpack the GridTime 3000 and its accessories from the box it was shipped in.

When unpacking the device, perform the following steps:

1. Inspect the box for damage before opening. If the box has sustained damage, take photos of the damage immediately and check the packed items for damage.
2. Remove each item from the packaging. Check the package for small items including adapters and antennas.
3. Visually inspect each item for damage. If any item is damaged, take photos of the damage immediately and contact technical support. See 11.10. Contacting Technical Support.
4. Check each item on the purchase order to confirm the correct items were shipped and received.
5. Validate that the product code matches what has been ordered

If the items have sustained physical damage or if an item is missing, please contact support. See 11.10. Contacting Technical Support.

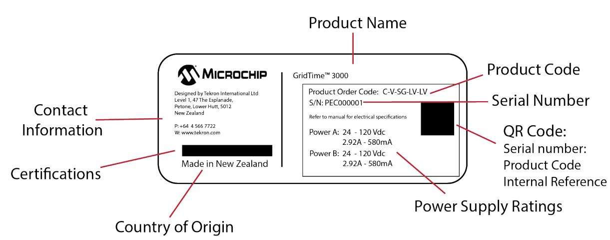
Note: Licenses ordered at the time of manufacture are installed on the device and a paper copy of the license is not provided.

6.3.1 Product Label

This section describes the information on the GridTime 3000 product label, and where the label can be found on the device.

The product label is located on the top lid directly above the SFP ports. See 6.3.1. Product Label for a description of the information on the label.

Figure 6-3. Product Label



6.4 Rack Mounting the GridTime 3000

This section describes the process for rack mounting the GridTime 3000.

The GridTime 3000 has been designed to be installed in a 19-inch rack. It is 1U (1.75 Inch) high and has two rack mounting tabs at the front to provide rack mounting holes.

1. Insert the GridTime 3000 so the LCD is facing out of the rack. This will place the mounting fins at the front of the rack.

2. Ensure access to the back of the unit is possible to wire up the device.
3. Fix the unit to the rack using four #10-32 (M6) screws.

Note: Rack mounting screws are not provided.

Note: The device will heat up and cause the surrounding devices to heat up as well. Forced air flow is not required for the unit to operate throughout its rated temperature range. However, any reduction in temperature will improve the long-term reliability of all the equipment in the rack space.

6.5 Making Ground and Power Connections

This section describes how to establish safe ground and power connections to each of the GridTime 3000's ports.

6.5.1 Ground Connections

This section describes how to establish safe grounding connections to the GridTime 3000.

Frame ground connections are made using the M4 Grounding Terminal Studs, which are marked with the universal ground symbol, as shown in Universal Ground Symbol. These studs are located in the middle of the back panel (above the ST Fiber ports) for the GridTime 3000 GridTime 3000 Ground connection.

Figure 6-4. GridTime 3000 Ground Connection

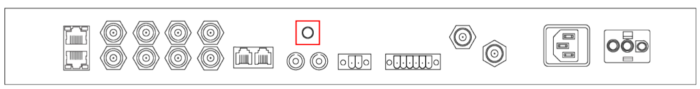
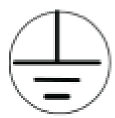


Figure 6-5. Universal Ground Symbol



After installing the GridTime 3000 into the rack, connect the chassis to the proper grounding zone or master ground bar per local building codes for grounding.

Run a 16 AWG (1.5 mm²) green/yellow-striped insulated wire from the GridTime 3000 grounding lug to the earth ground on the rack. All bare grounding connection points to the GridTime 3000 shall be cleaned and coated with an anti-oxidant solution before connections are made.

Tip: Recommendation: Although there are a number of methods for connecting the equipment to earth ground, Microchip recommends running a cable of the shortest possible length from the ground lug to earth ground

1. Crimp the customer-supplied UL listed 18 AWG Ring Lug to one end of the 16 AWG wire. Connect the ring lug to the ground terminal on the left side of the front panel using the supplied M4 Kept machine nut, tightening to a torque value of 30 in-lbs, (3,4 Nm). The surface of the GridTime 3000 earth grounding terminal must be clean of contaminants and oxidation.
2. Crimp the appropriate customer-supplied UL listed 18 AWG Ring Lug to the other end of the 1.5 mm² / 16 AWG green/yellow-striped wire. Remove the paint and sand the area around the screw hole to ensure the proper conductivity. Coat the connection with an electrically conductive antioxidant compound such as Kopr-shield spray. Connect this Ring Lug to the rack with appropriate customer supplied screws and external star lock washers, tightening to a torque value of 53.45 in-lbs, (6 Nm).
3. Using a digital voltmeter, measure between the ground and chassis and verify the resistance between them.

6.5.2 Power Connections

This section describes how to establish safe power connections to the GridTime 3000.

The GridTime 3000 can be fitted with one or two power supplies. With a single supply configuration, it will have a power supply connected to its P1A port. With a dual supply configuration, it will have one power supply connected to its P1A and one connected to its P1B ports.

There are two power supplies that the GridTime 3000 can be ordered with:

- a low voltage supply.
- a high voltage supply.

The power supply bay in GridTime 3000 has a separate lid to allow in-field power supply maintenance to be performed. See 11.6. Power Supply Fuse Replacement and 11.7. Power Supply Replacement.

⚠ DANGER

The following ports must have the power removed before opening the power supply bay:

- P1A (Power Supply)
- P1B (Power Supply)
- Alarm Relay 1 and 2
- HV MOSFET output

Important: The power input connector requires an external over current protection rated to twice the expected maximum operating current.

⚠ DANGER

Exposed terminals present the risk of electrocution. Ensure all wires are covered.

⚠ CAUTION

In case of fire or electric shock, cut-off power at the circuit breaker

6.5.2.1 Installation Best Practices

This section describes the installation best practices that should be used when wiring up power connections for the GridTime 3000.

- A circuit breaker rated at twice the maximum expected operating current must be installed between the GridTime 3000 device and the supply.
- For maximum redundancy:
  - Each power supply should be fed by independent UPS (uninterruptible power supply) sources.
  - A separate circuit breaker should be used for each supply.
- Equipment must be installed according to applicable local wiring codes and standards.

6.5.2.2 Power Supply Ratings

This section outlines the ratings of the GridTime 3000 power supplies.

Operating the device outside of these ratings may cause permanent hardware damage, Microchip assumes no liability for any damage resulting from operating the device outside its operational ratings.

The voltage and current ranges for the two supplies are as follows. The ranges are marked on the product label on the chassis.

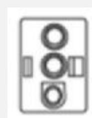
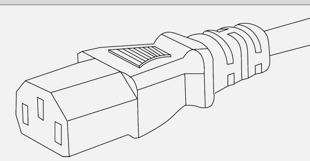
Table 6-1. Power Supply Voltage and Current Range

Power Supply	Ratings
Low voltage	**(DC Only)** 24 Vdc -120 Vdc 2.92 A - 580 mA
High voltage	**DC Ratings** 120 Vdc - 250 Vdc 590 mA - 280 mA **AC Ratings** 100 Vac - 240 Vac 700 mA - 292 mA

6.5.2.3 Connectors

This section describes the connectors used with the GridTime 3000's power supplies.

Table 6-2. Power Supply Connectors

Power Supply	Low Voltage	High Voltage
Connector Image		
Connector Type	AMP Universal MATE-N-LOK	IEC 320-C14
Mating Connector	Molex HCS-125 	
Mating Connector Crimps	Molex 0018121222	Not Applicable
Crimp tool	Molex 638191100	Not Applicable

Instructions for crimping the low voltage DC connector can be found in the 14.1. Crimping the DC Connector section.

Instructions for crimping the high voltage AC/DC connector can be found in the 14.2. Crimping the AC Connector section.

6.5.2.4 Fuses

This section describes the fuses supplied with the GridTime 3000.

The fuses for the power supplies are located on the power supply circuit boards. Each supply has two fuses; one larger fuse on the input to the power supply module and one on the output of the module.

Important: This port may be connected to supply voltages up to 250V DC and/or 230V AC if it is a high voltage (HV) PSU.

DANGER The following ports must have the power removed before proceeding:

- P1A (Power Supply)
- P1B (Power Supply)
- Alarm Relay 1 and 2
- HV MOSFET output

DANGER Exposed terminals present the risk of electrocution. Ensure all wires are covered.

Table 6-3. Fuse Rating

Power Supply	Low Voltage	High Voltage
Input Fuse Rating	250V 10A Slow Blow	150Vdc 4A Slow Blow
Input Fuse Model	Cylindrical 5mm x 20mm	Cylindrical 5mm x 20mm
Suggested Part	Littelfuse 0218010.MXP	Littelfuse 0239003.MXP
Output Fuse Rating	125V 10A Fast Blow	125V 10A Fast Blow
Output Fuse Model	Nano 2.69mm x 6.1mm	Nano 2.69mm x 6.1mm
Suggested Part	Littelfuse 0451010.NRL	Littelfuse 0451010.NRL

For instructions on how to replace the fuse in a GridTime 3000 product, please see the instructions in Replacing a fuse.

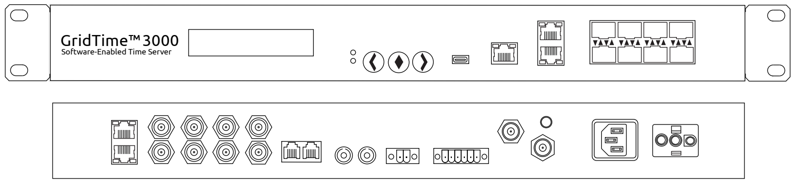
6.6 Signal Connections

This section describes how to make a reliable connection between each of the GridTime 3000's ports and an end device. This includes:

- a summary of what each port is for — more detailed descriptions are in the 3. Physical Overview section
- equipment installation recommendations for each port
- how to configure high performance timing connections between applicable ports and your end device
- how to optimize each connection's reliability
- how to safely connect and disconnect a connector on each port

The GridTime 3000 has a wide array of ports for receiving and delivering time signals, and two ports for device management.

Figure 6-6. GridTime 3000 Ports



6.6.1 Admin Port Connections

This section describes how to make connections to the GridTime 3000’s administration ports.

The GridTime 3000 features two ports for device management:

- the admin Ethernet port
- the admin USB-C port.

Either port can be used for:

- device configuration
- monitoring system observables, such as the device's current time.

The IP addresses currently used by the Admin Ethernet and Admin USB-C ports are displayed on the clock info tab of the GridTime 3000’s LCD See LCD Tab Information, these addresses are used to access the web configuration interfaces, and for performing device management over SNMP.

6.6.1.1 Admin Ethernet Port

This section describes how to connect to the GridTime 3000's admin Ethernet port.

The admin Ethernet port is a standard 10/100/1000 Base-T RJ-45 receptacle intended for connection to a personal computer (PC) over a direct copper Ethernet link, or through a switched Ethernet network.

Link Negotiation Checks

DHCP Server (Optional)

By default, the admin Ethernet port is configured to use DHCP addressing. First connection to the port should therefore be made through a switched network with a DHCP server present. If no DHCP server is available, a direct link can be used, but the user will have to wait for the port to fall back to a link local IP address (~50 seconds of wait time).

Link Speed Auto-negotiation Support

The admin Ethernet port uses auto-negotiation to establish link speed, so the switch or PC port it is connected to should also support auto-negotiation.

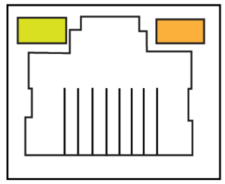
To make a connection, ensure:

- a copper Ethernet cable terminated with an RJ-45 plug
- your network adapters are compatible with 10/100/1000 Base-T operation

A straight-through or crossover cable can be used as the port is Auto MDI-X.

To connect the cable to the port:

1. place one hand on the GridTime 3000 to ensure it doesn’t move
2. with the other hand, gently slide the cable’s RJ-45 plug into the port. Ensure the orientation of the plug aligns with the port.
3. connect the other end of the cable to a switch or a PC’s Ethernet port.



If the link has been successfully established:

- the right-side LED (LNK LED) will illuminate to a constant green or orange or will stay off depending on the link speed. green = 1Gbps, orange = 100Mbps, off = 10Mbps.
- The left-side LED (ACT LED) will flash green as Ethernet traffic passes through the port.

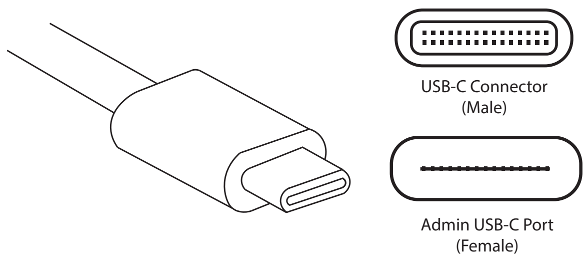
6.6.1.2 Admin USB-C Port

This section describes how to connect to the GridTime 3000's Admin USB-C Port.

The admin USB-C port is a USB-C 2.0 device port, intended for direct connection to:

- a personal computer (PC)
- a tablet with a web browser.

The port must be connected to another device port. *It cannot be a host port.*



To form a direct connection:

- if the end device has a USB-C port: use a male USB-C to male USB-C cable
- if the end device has a USB-A port: use a male USB-C to male USB-A cable

Ensure the cable is USB 2.0 or greater so that it supports the required link speeds.

To connect the cable to the port:

1. If it isn't rack mounted, place one hand on the GridTime 3000 to ensure it doesn't move
2. gently slide the cable's USB-C connector into the port. The orientation of the connector doesn't matter as USB-C connectors are rotationally symmetrical
3. Do the same for the other end of the cable at the end device.

The GridTime 3000 will appear as a virtual Ethernet port on the end device if the link has been successfully established.

6.6.2 Synchronization and Timing Connections

This section explains how to configure all synchronization and timing port connections on the GridTime™ 3000 GNSS Time Server.

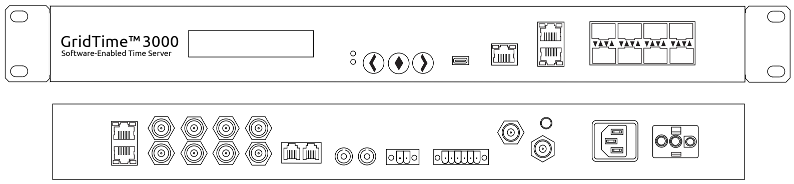
The GridTime 3000 features ten network timing ports on its front panel, all of which can allow the device to act as a PTP or NTP time source to other devices, or to synchronize to an external PTP or NTP time source as a client.

The GridTime 3000 features the following ports on its back panel:

- Two RJ-48C T1/E1/J1 time signal output ports
- Eight BNC ports that can output user-defined pulses, simulated DCF77 receiver timecodes, DLCS and Modified Manchester IRIG-B (the standard GridTime 3000 pulse outputs). The fixed frequency/TTL BNC ports can also output fixed frequency waveforms, and the AM IRIG/TTL BNC ports can also output AM IRIG. The IRIG In/TTL Out BNC ports can also receive an IRIG-B signal, allowing IRIG to be used as a device time source.

- Two RJ-12 serial string output ports
- Two optical fiber output ports that can output the standard GridTime 3000 pulse outputs
- A high voltage MOSFET switch, that can also be used with an external voltage source to output the standard GridTime 3000 pulse outputs

Figure 6-7. Synchronization and Timing Port Connections



6.6.2.1 Ethernet Ports - RJ-45, SFP, and SFP+ Ports

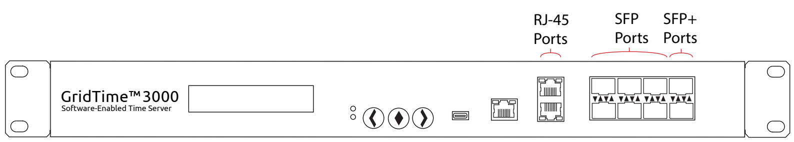
This section describes how to form a connection to the GridTime 3000's Ethernet ports.

The GridTime 3000 features ten ports for NTP and PTP time synchronization over a packet-switched network:

- two 10/100/1000BASE-T RJ-45 ports — ETH01 and ETH02
- six 1 Gbps Ethernet small form factor pluggable (SFP) ports — ETH03-ETH08
- two 10 Gbps Ethernet SFP+ ports — ETH09 and ETH10.

These are collectively labeled the ‘ETH’ ports, as seen on the front panel decal.

Figure 6-8. GridTime 3000 Ethernet Ports



6.6.2.1.1 Network Architecture Recommendations

This section provides some general architecture recommendations when using the GridTime 3000 to deliver time over Ethernet.

- Take note of all the network hops between the time server port and your end devices
- Optimize your architecture to reduce network hops, this improves timing accuracy. A star topology is recommended over a ring or single bus topology for this reason.
- Use boundary clocks if long transmission distances and multiple network hops are needed. This helps to reduce jitter and signal instability that can accumulate with multiple hops through switches.

6.6.2.1.2 ETH01 and ETH02 (RJ-45)

This section describes how to connect to Eth1 or Eth2 on the GridTime 3000.

The RJ-45 ports are standard 10/100/1000BASE-T RJ-45 receptacles.

Cabling recommendations:

- use a copper Ethernet cable terminated with an RJ-45 plug
- follow the cable’s manufacturer recommendations
- ensure the cable supports your link speed requirements

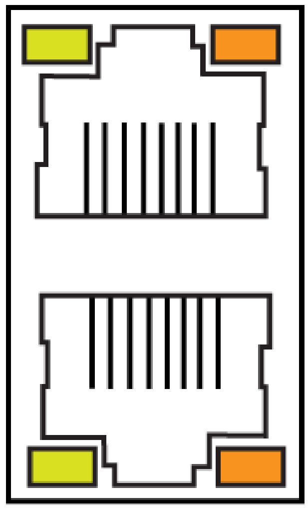
Network device recommendations:

- ensure all relevant network ports can auto-negotiate link speed, and are capable of at least one of the following:
  – 10BASE-T transmission
  – 100BASE-T transmission
  – 1000BASE-T transmission.
- use PTP aware network switches if you plan to use PTP as this will greatly improve timing accuracy.

Connecting a cable into a RJ-45 port:

- If not rack mounted, place one hand on the GridTime 3000 to ensure it doesn't move
- Gently slide the cable's RJ-45 plug into the port. Ensure the orientation of the plug aligns with the orientation of the port.
- Connect the other end of the cable into the relevant port in your network.
- Ensure the port is enabled in software. Once enabled, check it's left-hand LED when directly facing the front-panel (enabled LED), is illuminated solid green.
- The right LED (ACT LED) will flash orange as traffic passes through if the cable's network link has successfully been established.

Figure 6-9. RJ-45 Port



Removing a cable from a RJ-45 port:

- If not rack mounted, place one hand on the GridTime 3000 to ensure it doesn't move
- with the other hand, press down on the flap on cable's the RJ-45 plug
- gently slide the RJ-45 plug out of the port.

6.6.2.1.3 Eth3- Eth10 (SFP and SFP+ Ports)

This section describes how to connect to Eth3-Eth10 on the GridTime 3000.

The SFP ports support direct attach cables (DAC cables), optical and copper SFP transceivers, and up to 1G transmission speeds. The SFP+ ports support direct attach cables, optical and copper SFP transceivers, and up to 10G transmission speeds.

Only the direct attach cables and SFP transceivers in Recommended SFP transceivers are officially recommended and supported for use with the GridTime 3000. Other cables and SFP transceivers can be used, but they may cause the device to be unable to meet its timing performance ratings. Assistance from Microchip support in debugging issues related to unsupported SFPs cannot be guaranteed. Contact Microchip technical support for the most up to date list of supported direct attach cables and SFP transceivers.

Table 6-4. Supported SFP Transceivers

Brand	Model Number
Finisar	FTLF1217P2BTL
ROBOfiber	SFP-5000-RJ45
FS	SFP-100FX-31
FS	SFP-FB-GE-T
FS	SFP-GB-GE-T

...........continued	
Brand	**Model Number**
FS	SFP-10GSR-85
FS	SFP-10GLR-31
FS	SFP-PC03
Bel	SFP-1GBT-06
Bel	SFP-1GBT-09

SFP and Cable Recommendations:

- ensure your cables and SFPs support the link speeds you are using.
- follow manufacturer recommendations for correct use of cables and SFP transceivers
- If SFP+ ports are going to be run at 10G speeds, use suitable Direct Attach Copper (DAC) cables or fiber SFP transceivers, do not use copper SFP transceivers as these may create thermal issues.

Network device recommendations

- ensure all relevant network ports can auto-negotiate link speed.
- ensure all network switches in the path support the timing protocol (NTP or PTP) you plan to use.

<u>For SFP Ports:</u>

Ensure all relevant network ports support one of the following:

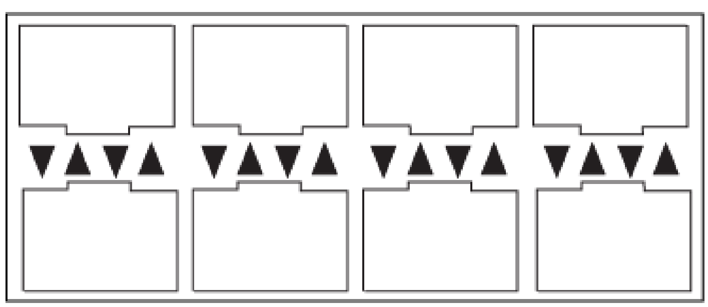
- 10BASE-T transmission
- 100BASE-T transmission
- 1000BASE-T transmission

<u>For SFP+ Ports:</u>

Ensure all relevant network ports support one of the following:

- 10BASE-T transmission
- 100BASE-T transmission
- 1000BASE-T transmission
- 10G BASE-T transmission.

Figure 6-10. SFP Port



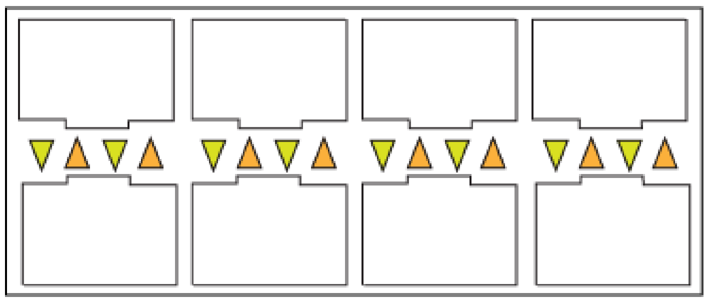
Connecting a cable into a SFP port:

1. For copper and fiber SFP transceivers:
   – Remove any rubber protection from inside the SFP’s bore(s)
   – Ensure the SFP’s clasp is closed
   – If not rack mounted, place one hand on the GridTime 3000 to ensure it doesn’t move
   – Align the SFP with the receptacle. The SFP's product label should be face up for the top row of ports, and face down for the bottom row of ports

- Gently slide the SFP into the port, if the orientation is correct it will click into place, if it is incorrect it will be stopped short and will not click into place.
- plug the cable into the SFP, align its flap(s) with the SFP bore(s).

2. for DAC Cables:
   - If not rack mounted, place one hand on the GridTime 3000 to ensure it doesn't move
   - Align the cable's SFP plug with the receptacle. Its product label should be face up for the top row of ports, and face down for the bottom row of ports
   - Gently slide the cable into the port, if the orientation is correct it will click into place, if it is incorrect it will be stopped short and will not click into place.
3. plug the other end of the cable into the relevant port in your network.
4. ensure the port is enabled in software. Once enabled, the left-most LED that points at the port when directly facing the front-panel (enabled LED), will go solid green.
5. The right-most LED that point at the port (ACT LED) will flash orange as traffic passes through if the cable's network link has successfully been established.

Figure 6-11. Cable Connected SFP Port



Removing a cable from a SFP port:

1. If not rack mounted, place one hand on the GridTime 3000 to ensure it doesn't move
2. For Copper and Fibre SFP Transceivers:
   - Press down on the clip of the cable plugged into SFP
   - Gently pull the cable out of the SFP
   - To remove the SFP as well, rotate its bail latch so it is at 90 degrees to the SFP
   - Gently pull out the SFP by its clasp, maintaining the 90-degree angle
3. For DAC cables:
   - Gently pull out the cable by pulling on its tag

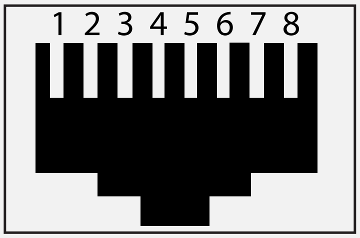
6.6.2.2 T1/E1/J1 Ports

This section describes how to connect to the T1/E1/J1 ports on the GridTime 3000.

The GridTime 3000 features two RJ-48C ports as shown in GridTime 3000 Front Panel Features. The ports can be configured to output a T1, E1, or J1 signal. Both ports will always output the same signal type.

A detailed explanation of the pinout for the RJ-48C ports is given in RJ-48C Pinout.

Table 6-5. RJ-48C Pinout



Pin	Signal
1	End of line termination (120Ω to pin 2)
2	End of line termination, with pin 1
3	GND
4	TX Ring -
5	TX Tip +
6	Not Connected
7	Not Connected
8	Not Connected

Connecting a cable into a RJ-48Cport:

- If not rack mounted, place one hand on the GridTime 3000 to ensure it doesn’t move
- Gently slide the cable’s RJ-48C plug into the port. Ensure the orientation of the plug aligns with the orientation of the port.
- Connect the other end of the cable into the relevant port in your network.

Removing a cable from a RJ-48C port:

- If not rack mounted, place one hand on the GridTime 3000 to ensure it doesn’t move
- Press down on the flaps on the cable’s RJ-48C plug
- Gently slide the cable out of the port

6.6.2.3 BNC Ports

This section describes how to form a connection to the GridTime 3000's BNC ports.

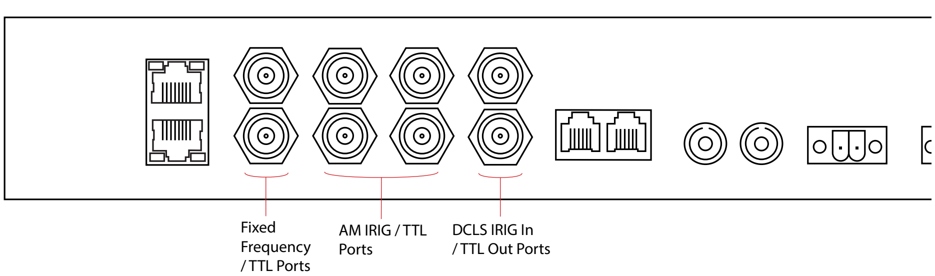
The GridTime 3000 features eight BNC ports (Ports 3-10). Each port can output the standard GridTime 3000 pulse output signals:

- DCLS IRIG-B
- Modified Manchester IRIG-B
- Square wave pulses with a configurable frequency, duration, and phase offset (user-defined pulses)
- DCF77 simulated receiver time signal (DCF77)

The BNC ports are split into three subgroups, each with a unique additional functionality:

- the first two BNC ports (Ports 3 and 4) can also output fixed frequency sinusoidal or square wave signals
- the second four BNC ports (Ports 5-8) can also output AM-IRIG B
- the final two BNC ports (Ports 9 and 10) can also receive a 0-5 V TTL DCLS IRIG-B signal with C37.118.1 extensions as a timing reference input.

Figure 6-12. BNC ports



6.6.2.3.1 Cable Recommendations

This section describes how to select a cable to use with the GridTime 3000 BNC ports.

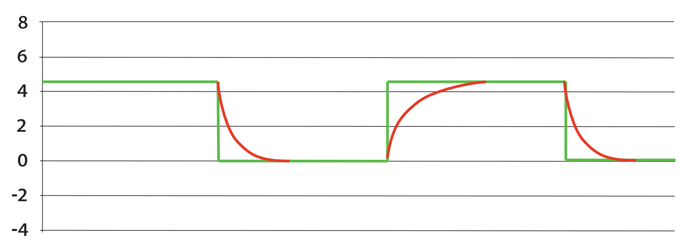
Cable Type — Shielded Twisted Pair (STP) or Coaxial

Either Coaxial or shielded twisted pair (STP) cables can be used with the BNC ports if they have been terminated with a female BNC connector.

STP cable use is recommended over Coaxial cable, as Coaxial cable introduces more line capacitance than STP. Capacitance reduces the cable lengths that can be used before excessive signal loss occurs.

The effects of a high line capacitance can round the edges of TTL signals, which can reduce time accuracy, and in extreme cases can cause end devices to falsely trigger rising or falling edges, preventing the device from reliably decoding signals.

Figure 6-13. Signal rounding caused by the high capacitance of a Coaxial cable



Cable Frequency Rating

The frequency rating of the cable used should exceed the highest frequency content of the output signal. For AM-IRIG this is 1 kHz, for fixed frequency sine waves it is the configured fixed frequency (1.544, 2.048 or 10MHz), for fixed frequency square waves and TTL signals this will be far higher due to the harmonics introduced by the sharp edges (~1 MHz).

6.6.2.3.2 Output Circuitry Recommendations

This section describes best installation practices for output circuitry connected to the GridTime 3000's BNC ports.

Topology Recommendations

Connecting a Single End Device to a port

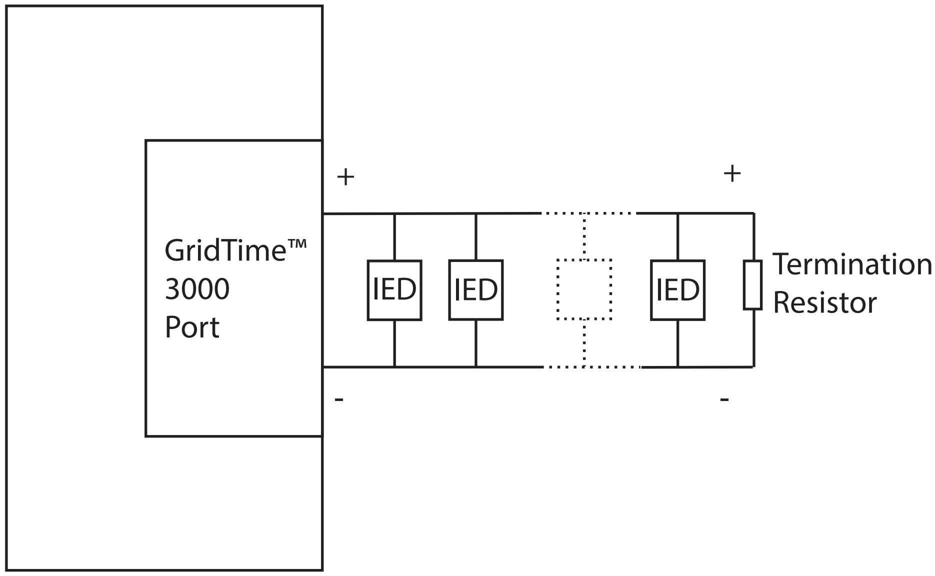
If the connection from the BNC port needs to go to only a single device, make a direct connection between the BNC port and the port of the end device, and put a termination resistor in parallel with the cable. Ensure the cable and end device input meet the 6.6.2.3.1. Cable Recommendations below.

Connecting Multiple End Devices to a port

If multiple end devices need to be connected to a single BNC port, connect the end devices in parallel along a single bus, with a termination resistor also in parallel. Refer to 6.6.2.3.1. Cable Recommendations to determine how many devices can be used on the bus, and the wire length restrictions on the bus.

The circuitry should use a multi-dropping topology, *not* a star topology.

Figure 6-14. Circuitry Topology



Termination Resistor Selection

TTL Signals

When outputting TTL signals:

- DCLS or Modified Manchester IRIG-B
- User-defined pulses
- DCF77

It is recommended that a single termination resistor is used to dampen signal overshoot and reflections that result from the sharp edges of the signal. The termination resistor must meet the following requirements:

- its resistance should be approximately the same as the characteristic impedance of the bus cable, which should be in the cable's datasheet.
- it should have a sufficient power rating. Use *Power* = *Voltage*^{2}/*Resistance* to calculate the maximum power dissipation required, with 5 V as the Voltage term (all TTL signals from the ports are 0-5 V), and the resistance value of the resistor as the Resistance term.

AM-IRIG

When outputting AM IRIG-B signals it is recommended that a termination resistor is used to ensure end devices receive the correct voltage levels.

$R_{term} = (((R_s \times V_{req})/(V_{out} - V_{req})) - 1/R_l)^{-1}$

If R_{term} comes out negative, the bus is overloaded. Refer to the 6.6.2.3.1. Cable Recommendations.

Fixed Frequency

Loading and Cable Length Recommendations

The BNC ports are rated to supply 150 mA of current, more current than this will trigger a high current alarm. Ensure the combined maximum current draw of all devices doesn't exceed 150 mA. The maximum expected current draw of each end device can be added to calculate the combined maximum current draw.

Earth Cables

For STP, earth shield in a way that avoids earth loops.

Limit bending of cables

No installation cables should be bent beyond their rated bend radius. Cables should gradually bend around corners where possible. Bending cables beyond their rated bend radius can alter their impedance and permanently damage the cable.

Run cables far away from interference sources

Cables should be run far away from potential interference sources such as radio frequency (RF) emitters. The distance required is dependent on the strength of the interference source.

Removing a cable from a BNC port:

- align the slots on the cable’s connector with the bumps on either side of the BNC port
- if not rack mounted, use one hand to hold the GridTime 3000 in place
- gently slide the cable’s connector over the port
- gently twist the cable’s connector clockwise to fasten it in place, ensure the bumps on the BNC port are fully pushed down into the cable’s connector slots.

Removing a cable from a BNC port:

- If not rack mounted, use one hand to hold the GridTime 3000 in place
- gently twist the cable’s BNC connector counterclockwise to release it
- gently slide the cable’s out of the port

6.6.2.4 RJ-12 Serial String Ports

This section describes how to form a connection to the GridTime 3000's RJ-12 ports.

The GridTime 3000 features two RJ-12 serial string output ports:

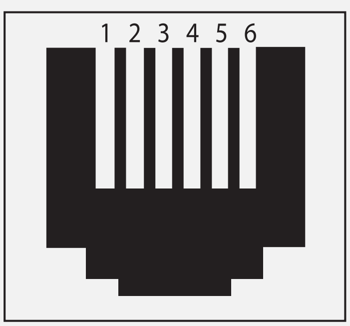
- the RS-422 port — uses RS-422 transmission (Port 11)
- the RS-232 port — uses RS-232 transmission (Port 12)

Each port can be configured to output its own ASCII time code string from a list of supported strings. See 12.7. Time String Specificationsfor a complete list of these strings.

The ports are standard RJ-12 receptacles.

The pinout of the RS-232 port is given in RS-232 Port pinout.

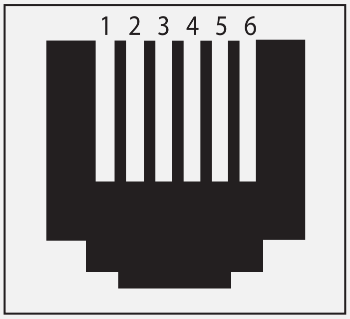
Table 6-6. RS-232 Port Pinout



Pin	Signal
1	0V
2	Clock Receive
3	0V
4	Clock Transmit
5	Clock CTS
6	Clock RTS

The pinout of the RS-422 port is given in RS-422 Port pinout.

Table 6-7. RS-422 Port Pinout



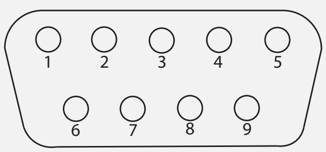
Pin	Signal
1	Not Connected
2	Isolated 0V*
3	Clock Transmit -ve
4	Clock Transmit +ve
5	Isolated 0V*
6	Not Connected

*Isolated 0V is not connected to Chassis earth.

An RJ-12 to male DB9 cable accessory is optionally sold with the GridTime 3000, which can be used to interface the RJ-12 ports with a female DB9 connector.

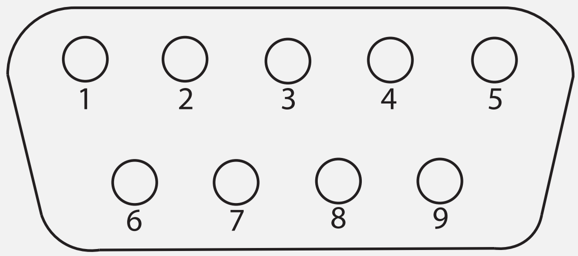
The DB9 pin mappings when the cable is plugged into the device's RS-422 and RS-232 ports are given in tables RJ-12 to DB9 cable pin mapping when plugged into RS-422 port and RJ-12 to DB9 cable pin mapping when plugged into RS-232 port.

Table 6-8. RJ-12 to DB9 Cable Pin Mapping When Plugged Into RS-232 Port



Pin	Description
1	Not Connected
2	Clock Transmit
3	Clock Receive
4	Not Connected
5	0V
6	0V
7	Clock CTS
8	Clock RTS
9	Not Connected

Table 6-9. RJ-12 to DB9 Cable Pin Mapping When Plugged Into RS-422 Port



Pin	Description
1	Not Connected
2	Clock Transmit +ve
3	0V
4	Not Connected
5	Not Connected
6	Clock Transmit -ve
7	0V
8	Not Connected
9	Not Connected

Connecting a cable into a RJ-12 port:

1. If not rack mounted, place one hand on the GridTime 3000 to ensure it doesn’t move
2. Gently slide the cable’s RJ-12 plug into the port. Ensure the orientation of the plug aligns with the orientation of the port
3. Plug the other end of the cable into the relevant port in your network, ensure the orientation is correct.

Removing a cable from a RJ-12 port:

1. If not rack mounted, place one hand on the GridTime 3000 to ensure it doesn’t move
2. Press down on the flaps on the cable’s RJ-12 plug
3. Gently slide the cable out of the port

Note:
Serial String Outputs RS232 and RS422 are output only and will not accept a serial string input.

6.6.2.5 TX Fiber Ports

This section describes how to connect to the GridTime 3000's TX Fiber ports.

The GridTime 3000 features two optical fibre transmitters (Port 13 and 14) for the output of IRIG-B, DCF-77, and custom pulse signals, as shown in .

To connect to the TX Fibre ports, the link must:

- Be optical
- Use a multimode fiber cable with a straight-tip (ST) connector
- Use a cable with one of the following core structures:
  - 50/125 µm plastic optical fiber (POF)
  - 62.5/125 µm POF
  - 100/140 µm POF
  - 200 µm hard-clad silica (HCS)
- Use a transmission wavelength of λ=820 nm
- Not force the cable to exceed its bend radius
- Have a length that allows sufficient power to be delivered to the receiver of the end device.

Cable Length

The allowable cable length is dependent on:

- the environmental temperature
- the core structure of the cable
- the termination quality of the cable’s connector

- the sensitivity of the receiver on the end device
- the optical power delivered into the cable.

The optical power delivered into a cable by the device's transmitter is as follows:

Core Structure	50/125 µm POF	62.5/125 µm POF	100/140 µm POF	200 µm HCS
Typical Optical Power	-15.8 dBm	-12 dBm	-8.5 dBm	-4.5 dBm
Worst Case Optical Power	-19.8 dBm	-16 dBm	-12.5 dBm	-8.5 dBm

Assuming worst case temperature conditions, and that the fiber cable has a high-quality polished termination, an upper boundary for the cable length can be calculated using the worst-case optical power from the table above, and:

- the cable's attenuation figure (check its datasheet)
- the receiver sensitivity (check its datasheet)

Length (km) = (Worst Case Optical Power (dBm) – Receiver Sensitivity (dBm))/(Cable Attenuation Figure (dB/km))

If you were using:

- a 62.5/125 µm POF cable with a high-quality polished termination
- a typical 62.5/125 µm cable attenuation figure of 4 dB/km
- a Microchip Isolated Timing Repeater (ITR) as the end device, which has a receiver sensitivity of -24 dBm

the upper bound for the cable length would be:

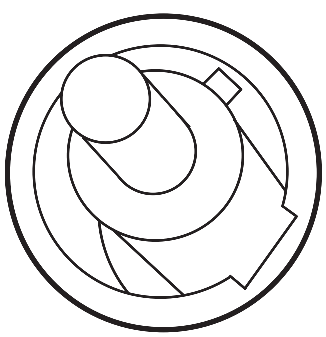
Length = ((-16 dBm) – (-24 dBm))/(4 dB/km) = 2 km

In this scenario the cable length shouldn't significantly exceed 2 km. Ensuring the environmental temperature is always roughly 25°C allows for more cable length.

A repeater such as the Microchip ITR can be used if cable runs that greatly exceed the length boundary are required.

Connecting a cable into a ST Fiber port:

1. If present, twist the device's black plastic cap on the fiber port counterclockwise so it is no longer locked in by its notches, then gently pull it off the port
2. Rotate the outer part of the cable's ST connector so that the outer notch is at 90 degrees to the inner notch



3. Line up the ST connector so that the port's inner notch is in in line with the topmost notch on the TX fiber port
4. If not rack mounted, place one hand on the GridTime 3000 to ensure it doesn't move
5. Gently slide the ST port into the TX fiber port until it hits the end
6. Push the outer part of the ST connector down the tracks and twist it clockwise so it locks in place
7. Connect the other end of the cable into the relevant port on your end device, follow a similar process to plug in the connector.

Removing a cable from a ST Fiber port:

1. If not rack mounted, place one hand on the GridTime 3000 to ensure it doesn't move
2. Push in the cable's ST connector and twist it counterclockwise to release the connector
3. Gently slide the cable out of the port

6.6.2.6 HV MOSFET Port

This section describes how to connect to the GridTime 3000's HV MOSFET port.

The GridTime 3000 features a power MOSFET Switch port for the output of IRIG-B, DCF77, and user-defined pulse TTL timing signals at custom amplitudes (HV MOSFET Port).

The port allows timing signals to be outputted at custom amplitudes up to ±250 V to suit end device input requirements. If a 0-5V TTL signal is sufficient for your end device(s), the BNC port(s) should be used instead of the HV MOSFET port.

An external DC supply that provides sufficent voltage for the end device input logic levels must be used with this port. This can be the same supply used to power the GridTime 3000 if it is being DC powered.

The switching voltage and current ratings are provided in HV MOSFET Port Specifications.

Table 6-10. HV MOSFET Port Specifications

Ratings	Connector
Allows switching of 250 V at 100 mA maximum.	2-pin

Cable Recommendations

- Use a cable terminated with a 2-pin phoenix connector
- Ensure the cable is rated for the current expected to run through it

Tip: To meet IEC 61850-3 standards, this port should be installed with a shielded cable. The shield should be connected to earth at both ends.

Wiring Recommendations

- As the port is only a switch, an external power supply must provide the switching voltage. The port does not provide its own voltage.
  – conventional current flow must be into the "+" terminal and out of the "-" terminal. Incorrect polarity will cause the output state to always be low.
- Use a circuit breaker with twice the rated current to protect the port and the connected end device.

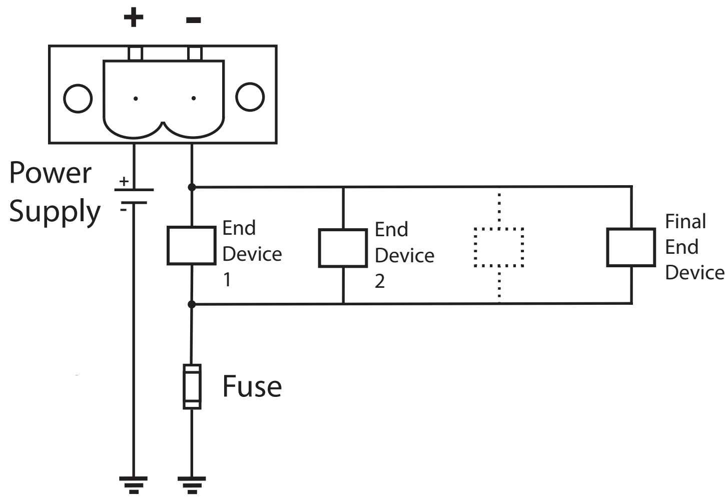
Single End Device

- The end device should also be connected in series with the port, power supply, and circuit breaker.
- An inline resistor should also be included in series if the end device doesn't load the circuit with the current it requires. Use $R = V_{required}/I_{required}$ to determine its resistance.

Multiple End Devices

- The end devices should be multi-dropped into a bus. The device bus should be connected in series with the port, power supply and circuit breaker.
- An inline resistor should also be included in series if the end devices don't load the circuit with the current they require. Use $R = V_{required}/I_{required}$ to determine its resistance.

Figure 6-15. HV MOSFET Port Suggested Circuitry Configuration



CAUTION In case of fire or electric shock, cut-off power at circuit breaker

Output isolation (from chassis and I/O) is still maintained when the HV MOSFET is enabled. This simplifies the external load/supply arrangements, particularly when operating with positive-earth systems.

6.6.2.7 Antenna Port

This section describes how to connect to the GridTime 3000's GNSS Antenna port.

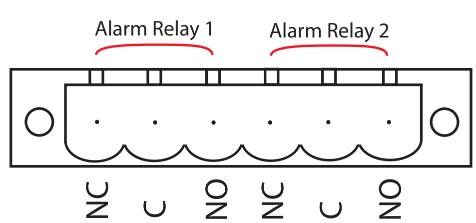
To connect to the antenna port, refer to 6.7. Installing the GNSS Antenna.

6.6.3 Alarm Relay Connections

This section describes how to wire up and monitor the GridTime 3000’s alarm relay ports.

The GridTime 3000 includes two alarm relay ports on its back panel, consisting of two 3-pin phoenix form C alarm relay contacts. Each alarm relay port includes a normally closed (NC) contact, a common (C) contact, and a normally open contact (NO).

Figure 6-16. Alarm Relay Ports



Contact Impedances

Each alarm relay port can have any of the supported alarms enabled through configuration. If any alarms enabled on an alarm relay port become active, the port goes from the non-alarm state to the alarm state. It returns to the non-alarm state once all enabled alarms are cleared.

When in the alarm state:

- The impedance between the NC and C contacts is less than 40Ω
- The impedance between the NO and C contacts is open circuit

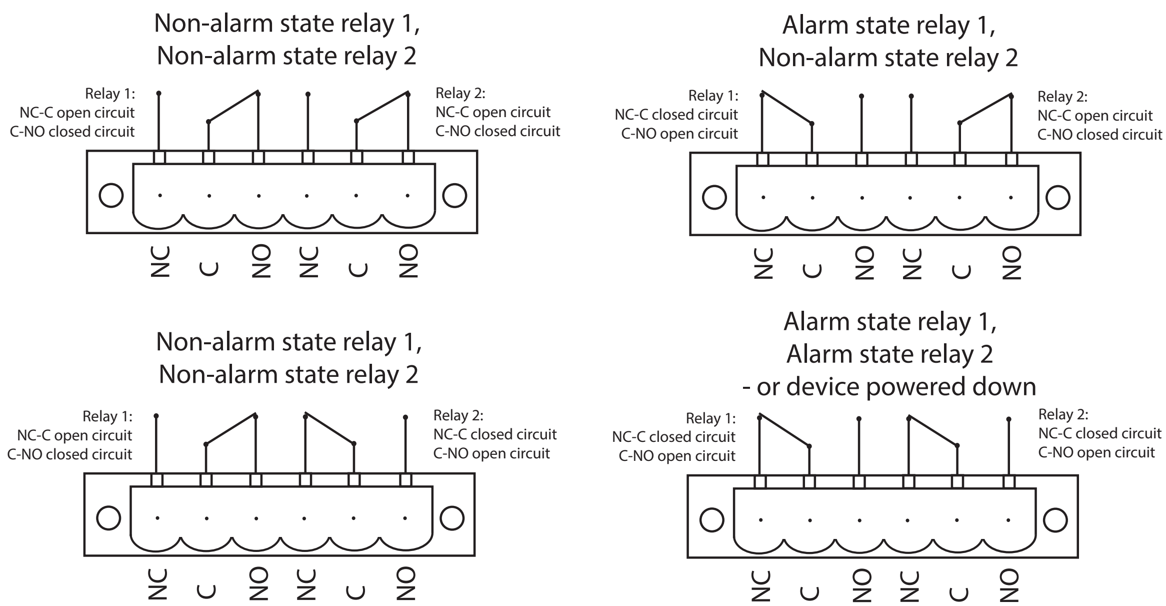
When in the non-alarm state:

- The impedance between the NC and C contacts is open circuit
- The impedance between the NO and C contacts is less than 40Ω

When the GridTime 3000 is powered down:

- Same impedances between contacts as the alarm state
- The impedance between the NC and C contacts is less than 40Ω
- The impedance between the NO and C contacts is open circuit

Figure 6-17. Alarm Relay Port States



Cable Recommendations

- Use a cable terminated with a six-pin phoenix connector with locking screws
- Ensure the cable is rated for expected current from the end device

Connection Recommendations:

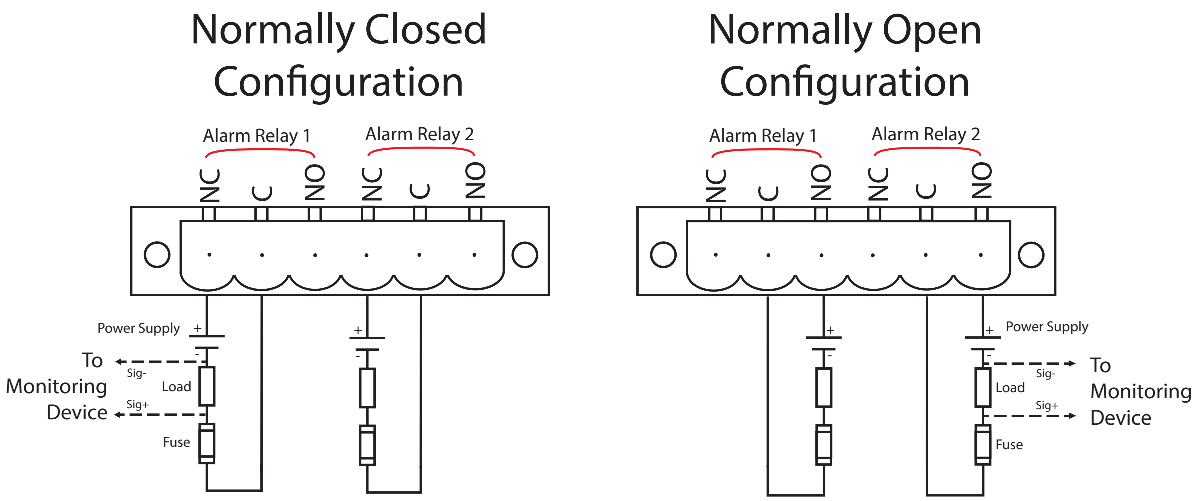
- Use an in-line resistor or load which draws a safe current amount. This will ensure excessive current isn’t drawn when a pair of contacts is in the low impedance state
- Use a circuit breaker with twice the rated current to protect the relay port and the connected end device
- Apply an external source of power to monitor whether current is passing through the relay
- For a normally closed alarm configuration, plug the cable’s 2 pin connector into the NC and C contacts
- For a normally open alarm configuration, plug the cable’s 2 pin connector into the NO and C contacts.

⚠ CAUTION In case of fire or electric shock, cut-off power at circuit breaker

Equivalent Circuit Diagrams

Connect the alarm relay and the external components for a normally closed or normally open configuration as per the equivalent circuit diagrams in Alarm Relay Recommended Circuit Configuration.

Figure 6-18. Alarm Relay Recommended Circuit Configuration



Note: The diagrams above are equivalent circuits of what is recommended, the external components shown may be present internally in the end monitoring device.

Connecting a cable into the alarm relay:

- align the 6-pin phoenix connector with the port contacts
- if not rack mounted, hold the GridTime 3000 in place with one hand
- gently slide the connector into the port until it can't be pushed any further

Removing a cable from the alarm relay:

- if not rack mounted, hold the GridTime 3000 in place with one hand
- gently slide the connector out of the port

6.7 Installing the GNSS Antenna

This section describes:

- GNSS constellations and signals the GridTime 3000 supports
- how to reliably install an antenna with the GridTime 3000
- how to design your antenna system
- how to connect your antenna cable

The GridTime 3000 features one TNC port which allows for synchronization to time from global navigation satellite systems (GNSSs). This port is named the 'antenna port' and is labeled 'ANT 1' on the device's decal.

A GNSS antenna can be connected to the antenna port through a radio frequency (RF) cable terminated with a TNC connector. A 50 ohm coaxial cable is recommended.

Unless configured to do otherwise, the device's default settings will always treat GNSS as its highest priority time source for synchronization even if other time source(s) are also available (NTP, PTP, or IRIG-B).

Four GNSS constellations are supported, and a different upper and lower baseband signal can be received from each. This is shown in Baseband Signals of Supported GNSS Constellations.

Table 6-11. Baseband Signals of Supported GNSS Constellations

GNSS	Lower Baseband Signal	Upper Baseband Signal
GPS/QZSS	L2C (1227.600 MHz)	L1C/A (1575.420 MHz)

GNSS	Lower Baseband Signal	Upper Baseband Signal
GLONASS	L2OF (1246 MHz + k*437.5 kHz, k= -7, …, 5, 6)	L1OF (1602 MHz + k*562.5 kHz, k= -7, …, 5, 6)
Galileo	E5b (1207.140 MHz)	E1-B/C (1575.420 MHz)
BeiDou	B2I (1207.140 MHz)	B1I (1561.098 MHz)

Any number of the supported GNSSs can simultaneously be used for time synchronization. Either their upper signal, or simultaneously their upper and lower signals can be used for synchronization.

It is best to utilize as many GNSSs and GNSS basebands as possible. This can improve accuracy, make jamming and spoofing more difficult, and removes vulnerability to a malfunction or deliberate denial of a particular GNSS system.

When synchronized to one or more GNSS signals, the device's Clock Management Tool and LCD dashboards will show 'GNSS' as the current time source See Table 2-2 LCD Tab Information.

6.7.1 Microchip Antenna Kit versus Custom Equipment Installations

This section describes the differences between custom GNSS and antenna equipment and the Microchip antenna kit.

The GNSS receiver inside the device is highly sensitive and supports a wide range of antenna and lead-in cable combinations. However, the Microchip antenna kits are recommended in preference to other equipment, and support cannot be guaranteed if equipment issues result from custom equipment choices. The Microchip antenna kits have been tested with the GridTime 3000 and are proven to give good GNSS performance.

The Microchip antenna kits offer a range of cable lengths and protection levels. They are electrically compatible with the device's antenna port and are compatible with all supported GNSS input signals. See the antenna kits section for detailed specifications of each antenna kit.

If custom equipment is chosen, read the next three sections on custom antenna installation recommendations, otherwise, skip to the 'All installations' sections.

6.7.2 Custom Installation - Antenna Port Input Requirements

This section describes the input requirements that must be met by a custom antenna installation.

Custom antenna installations must meet the antenna port input specifications in Antenna Port Input Specifications.

Table 6-12. Antenna Port Input Specifications

Parameter	Specification
Signal Type	Must support at least one of the following: GNSS L1C/A, L2C, L1OF, L2OF, E1B/C, E5b, B1I, or B2I
Gain	Between 15 dB and 30 dB of gain including gain of antenna and loss of cable and inline components
Frequency	Must support frequency bands used by the desired signal types
Impedance	50 ohms
Coupling	DC-center pin provides power to GNSS antenna or inline amplifier
Output voltage to antenna	5 Vdc
Output current to antenna	80 mA maximum
Connector type	Female TNC connector
Decal label	ANT1

6.7.3 Custom Installation - Antenna Recommendations

This section provides key recommendations when selecting an antenna for a custom antenna installation with the GridTime 3000.

The following recommendations should be considered when selecting an antenna for a custom antenna installation:

- Select an amplified active antenna with integral low-noise amplifer (LNA) to ensure good performance under nominal signal reception.
- Select a dual-band antenna that is compatible with at least one of the supported GNSS constellations.
- Use an active antenna that can be powered with less than 5V and under 80 mA, accounting for cable and in-line component losses.

6.7.4 Custom Installation - Cable recommendations

This section provides key recommendations when selecting an antenna cable for a custom antenna installation with the GridTime 3000.

The following recommendations should be considered when selecting an antenna cable for a custom installation:

- Select a cable with shielding against radio frequency (RF) interference
- Select a cable that is compatible with your antenna
- Ensure the cable is terminated with a TNC connector – you may need to terminate the cable yourself
- Use a low-loss 50 Ω coaxial cable

6.7.5 All Installations - Connection Recommendations

This section provides key recommendations on how to safely connect an antenna cable to the GridTime 3000.

- Safe cable grounding techniques should be used on the RF cable.
- A lightning arrestor should be installed in-line with the antenna cable to protect the device from lightning strikes
- The GNSS cables should only be connected once the device's chassis is properly earth grounded
- Follow local building electrical codes for grounding the device's chassis

DANGER To avoid serious personal injury or death, use extreme caution when installing the antenna near, under, or around high voltage lines.

6.7.6 All Installations - Antenna Placement Recommendations

This section provides recommendations on positioning the GNSS antenna in your installation for optimum timing performance.

- Mount the antenna outside, preferably on the roof with an unobstructed view of the sky
- Do not mount the antenna near a wall or other obstruction that may impact the sky view.
- Do not mount the antenna near other RF emitters such as satellite dishes or WiFi routers
- Mount the antenna well above roads or parking lots.
- For a multi-antenna installation, place antennas at least one meter apart from one another.

To achieve the highest level of accuracy it is recommended the antenna is provided with an RF gain between 15 to 35 dB and positioned in an area with an unobstructed view of the sky and in a low multipath environment. If the antenna is not placed in the correct environment and these conditions are not met, the device may require a longer GNSS acquisition window or will prevent the GNSS input from being used.

6.7.7 All Installations - Delay Compensation

This section describes how to compensate for the signal propagation delay through an antenna installation.

Ensure that the cable delay on the device is set to compensate for the total propagation delay through the antenna and cable, and any lightning arrestors or in-line amplifiers in the installation. Time synchronization to GNSSs will be inaccurate by the value of the propagation delay error if left uncompensated.

See 9.6. Provisioning GNSS for the delay values of the Microchip supplied antenna accessories, and further guidance on setting up the delay compensation value.

6.8 Powering the GridTime 3000

This section describes how to power up the GridTime™ 3000 GNSS Time Server once all signal connections have been established.

The GridTime 3000 does not have a power switch; the device will power up as soon as power is applied to its P1A port or P1B port. Power application monitoring and switching must be done externally to the device.

6.8.1 Powering Up

This section summarizes the key power up steps for the GridTime 3000.

1. If the power supply to the device is controlled by a switch, check the switch is in the off position.
2. Connect a power supply cable to the device's P1A power port, and to its P1B power port if it has a dual power supply configuration
3. Turn on the supply to the unit if the supply is switch controlled.

6.8.1.1 Normal Power Up Indicators

This section describes the key indicators that should be observable after a successful power up of the GridTime 3000.

Once power has successfully been applied to the GridTime 3000, its LCD backlight will illuminate blue, and its start-up sequence will begin. Refer to Table 2-2-1 Start Up LCD Tab Information

A counter will appear on the LCD which shows the progression of the start-up sequence. Refer to Table 2-2-2 Start Up LCD Tab Information

Once the start-up sequence has finished, the LCD's dashboard screen will load up. Refer to Table 2-2-3 Start Up LCD Tab Information

If the power up sequence is successful, the following front panel indicators can be observed.

Table 6-13. Normal Power Up Indicators

Indicator	Expected Behavior	Conditions
ALM LED	Will initially flash red to indicate that alarms are active. The following alarms will be active at start-up until cleared: • Out of sync alarm • Low sats alarm • GNSS no Fix alarm • No First sync alarm	**Flashing Red** — at least one alarm is active **Off** — no alarms are active
ADMIN Ethernet port	If a cable is connected, LNK LED will give link speed color, and ACT LED will flash as traffic passes through if the port has a live Ethernet link connected	**LNK LED (Right)** — off for 10Mbps link, orange for 100 Mbps link, green for 1 Gbps link, off for no active link **ACT LED (Left)** — sold orange and flashes with traffic, off for no active link
ETH1-ETH10 ports	Enabled LEDs will go green if port is enabled, and the ACT LED will flash as traffic passes through if the port has a live Ethernet link connected	**Enabled LED** – green when port is enabled, off if disabled **ACT LED** – sold orange and flashes with traffic, off for no active link

...........continued		
Indicator	**Expected Behavior**	**Conditions**
SYN LED	Will initially flash green to indicate that the device has not gained synchronization to a time source yet	**Flashing Green** – device is not synchronized to a time source **Solid Green** – device is synchronized to a time source

6.8.2 Powering Down

This section describes how to safely power down the GridTime™ 3000.

It is recommended that the GridTime™ 3000 is shutdown prior to removing power. To perform a shutdown:

1. Hold down the center button on the front panel until the clock power screen appears.
   Refer to Table 2-2 Clock Power Tab Information
2. Once the screen appears, press the right-hand button when facing the front panel directly to perform a shutdown.
3. Wait ~20 seconds for the LCD to go completely blue to validate that the shutdown is complete, it will remain backlit while the unit is still powered.

Once the unit has fully shut down:

- If the power supply is switch controlled, switch off power to the device.
- Gently slide the power supply cable out of P1A, and P1B if the unit has dual supplies.
  – IEC cables can be directly pulled out.
  – DC connectors will need to be unclipped and then pulled out.

7. Clock Management Tool (CMT)

This chapter describes the GridTime 3000's Clock Management Tool (CMT).

The CMT is a web browser management interface that is used to configure and monitor the GridTime 3000.

Once a a USB-C Admin or Admin Ethernet connection has been established with the GridTime 3000 — see 9.1. Establishing a Connection to the GridTime 3000, the CMT can be accessed by entering the IP address of the admin port into a web browser. Refer to Table 2-2 Clock Information tab

8. Simple Network Management Protocol (SNMP)

This chapter describes how SNMP can be used with the GridTime 3000.

The Simple Network Management Protocol (SNMP) is an application layer protocol that allows you to manage network devices. SNMP is based on a client-server query-response mode that requires an Ethernet connection. A manager application (software installed on a computer) is the client generating the queries, and an agent (GridTime 3000 software) is the server generating responses.

The GridTime 3000 supports SNMPv1, SNMPv2c, and SNMPv3. SNMPv3 provides additional security features not previously available in SNMPv2c. In addition to SNMPv2c functions, SNMPv3 allows user and trap-user levels that are based on authentication and privacy settings. The authentication algorithm is either HMAC-SHA-1-96 or MD5, with a 20-character key. The privacy settings are based on either the CBC-DES or AES encryption standard, with a 16-character key. All keys are uppercase.

The GridTime 3000 sends SNMP notifications into the network from its Admin Ethernet ports if notifications are configured. If SNMP read/write privileges are enabled, it can also be used to monitor and configure GridTime 3000 variables.

Note:
SNMP is an optional feature for the GridTime 3000 that must be enabled to function. See 9.12. Provisioning SNMP Settings for details.

8.1 GridTime 3000 Management Information Base (MIB)

This section describes the GridTime 3000 MIB.

A Management Information Base (MIB) is a database of managed objects, their object identifiers, and variables.

The GridTime 3000 has its own MIB, which can be downloaded from my.microsemi.com as a text file. This MIB describes all of the GridTime 3000's settings and system observables.

With the use of a MIB browser, the GridTime 3000 MIB can be used to monitor status and configure variables. With the GridTime 3000, an SNMP network manager can be set up to monitor the status of the GridTime 3000.

Other MIBs can also be used to monitor the GridTime 3000's status and configure its variables, these are described in the following section.

8.2 Public MIB Support

This section describes the public MIBs the GridTime 3000 supports.

The GridTime 3000 supports the following MIBs for configuration and monitoring system observables:

- RFC 1213 MIB - Management Information Base for Network Management of TCP/IP-based internets

9. Provisioning

This chapter describes how to provision the GridTime 3000. This should be followed after the GridTime 3000 has been installed (6. Installation) and (6.6. Signal Connections) have been complete.

9.1 Establishing a Connection to the GridTime 3000

This section describes how to establish a connection to the GridTime 3000.

To provision the GridTime 3000, a connection must be established between a PC and the GridTime 3000's admin USB-C or admin Ethernet port.

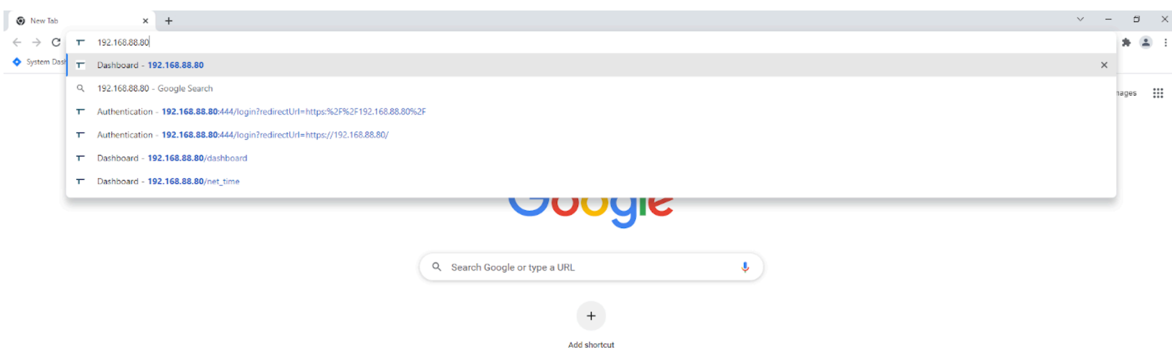
For step-by-step guidance on this, see 6.6.1. Admin Port Connections.

For guidance on how to access and log into the GridTime 3000's Clock Management Tool (CMT) see the following section.

9.2 Logging In and Out

This section describes how to log in and out of the GridTime 3000's Clock Management Tool (CMT).

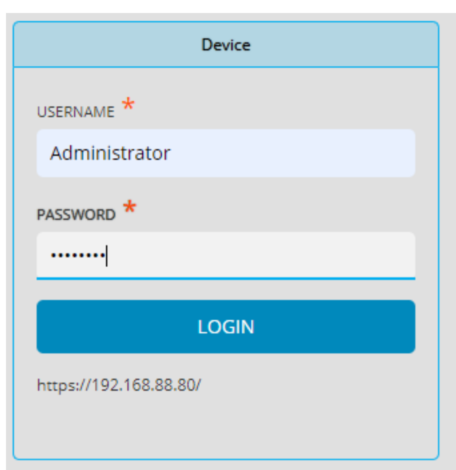
1. Open the GridTime 3000's Clock Management Tool (CMT) by typing the IP address of a connected admin port into a web browser on a connected PC. See 9.1. Establishing a Connection to the GridTime 3000 if a connection is not already established between a PC and one of the GridTime 3000's admin ports.



   If the correct IP address was entered, the CMT login screen should appear.

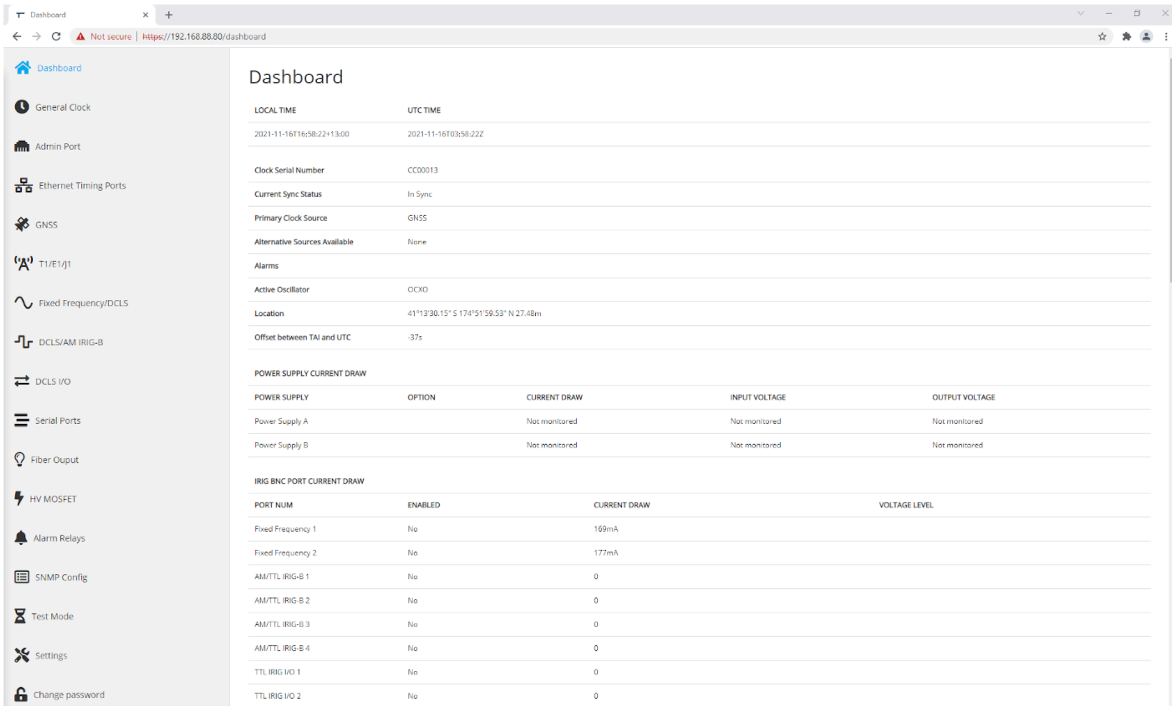
   Note:
   The current IP address of the administration ports can be viewed on the front LCD.

2. Enter the login username and password for the GridTime 3000 unit and click 'login'.



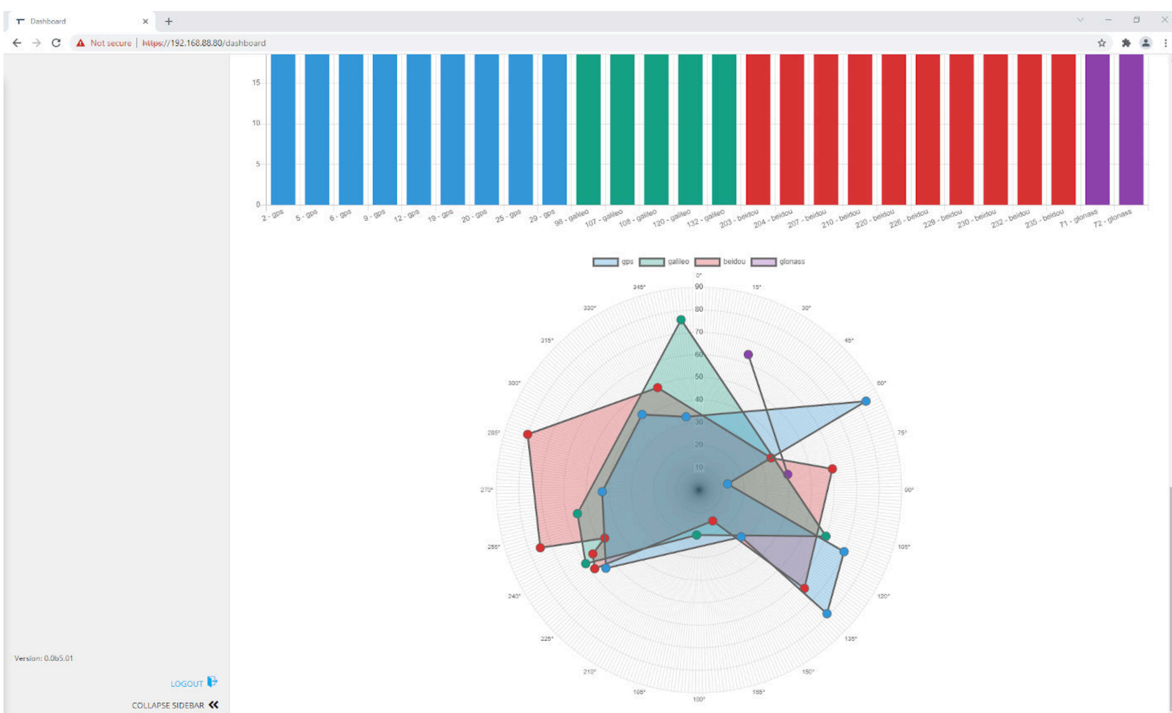
Note: If the GridTime 3000 has not previously been set up with a password, the login screen will instead instruct you to choose an Administrator password for the unit. After this has been done, you can login using the login window above.

If successful, the CMT dashboard should appear.

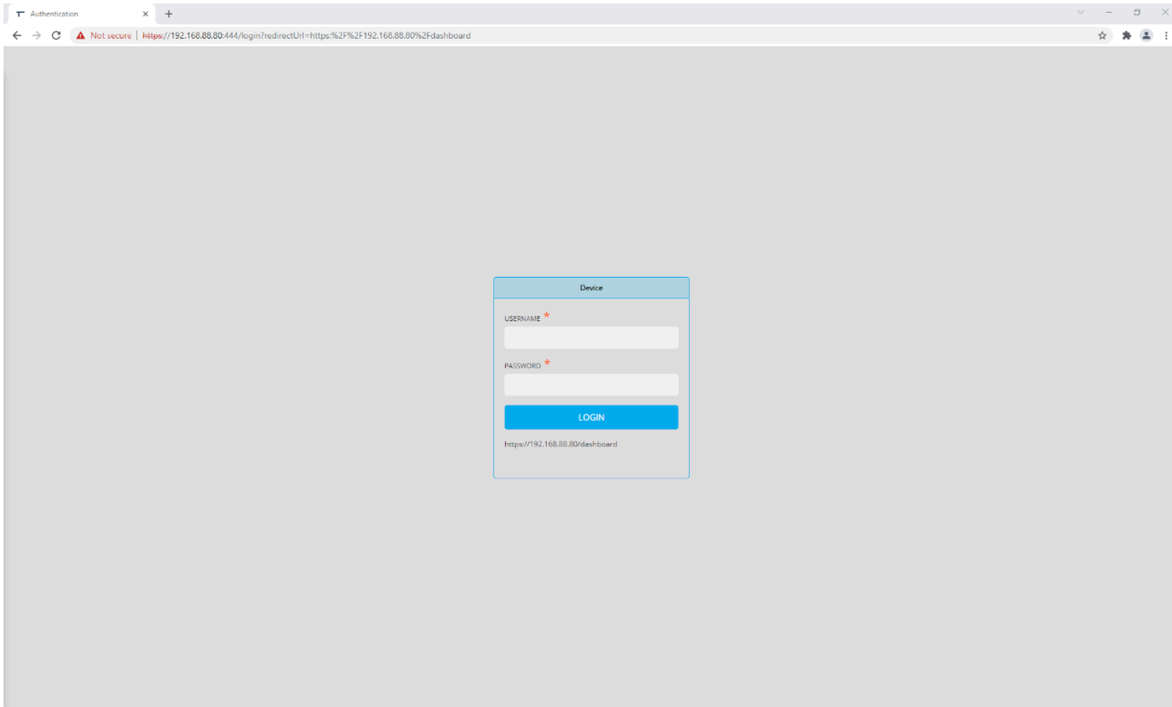


You have now successfully logged into the CMT of your GridTime 3000.

3. To log out of the CMT, scroll to the bottom of the page and click the 'LOGOUT' button with the door icon.



This will take you back to the CMT login screen.



9.3 Provisioning the General Clock Settings

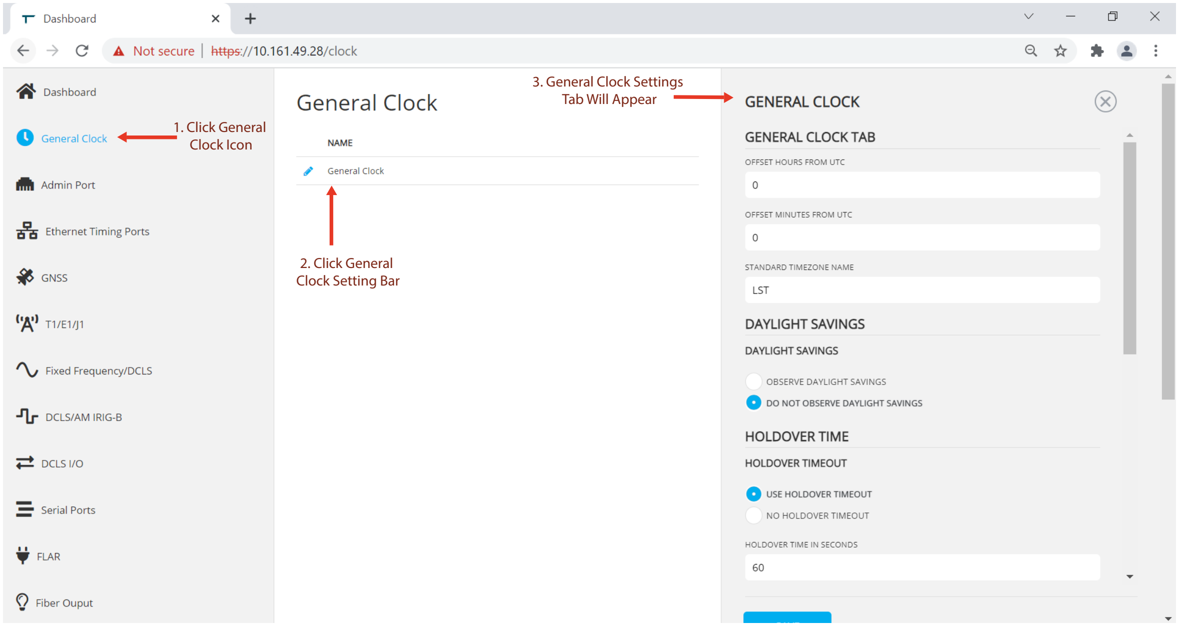
This section describes how to provision the GridTime 3000's general clock settings.

The general clock settings are used to configure the time zone offset and daylight savings behavior, the holdover entry and exit behavior, and the sync source selection behavior.

1. **Navigate to General Clock Window**

   To navigate to the general clock tab, click on the general clock icon, then the general clock settings bar in the center of the screen.

Figure 9-1. Clock Management Tool - General Clock Tab



2. **Setup Local Time Zone**

Using the offset hours from UTC, offset minutes from UTC and the standard time zone name settings, configure your local standard time offset from UTC in hours and minutes, and the name of your local timezone.

The offset in hours can be configured in the range of -12 to 14 hours, and the offset in minutes can be configured in the range of 0 to 59 minutes. The standard timezone name can be configured as any ASCII string, but only the first five characters will be displayed on the LCD and used in messages.

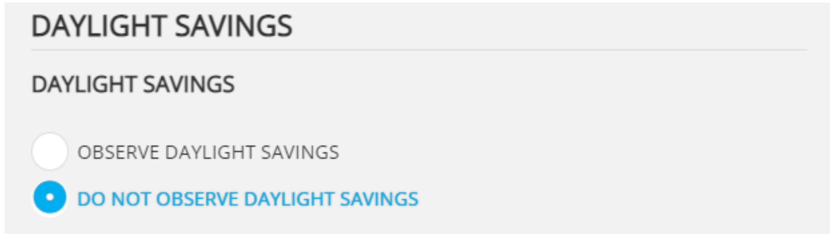
Note: This step is for configuring the standard timezone offsets only. If your region observes daylight savings, daylight savings offsets are configured in step 3.

Important:
Regional time zone UTC offsets and daylight savings offsets are not automatically detected by the GridTime 3000, and must be manually entered by a user. Updates to the UTC offset or daylight savings in the region of use must also be actively monitored and maintained by a user.

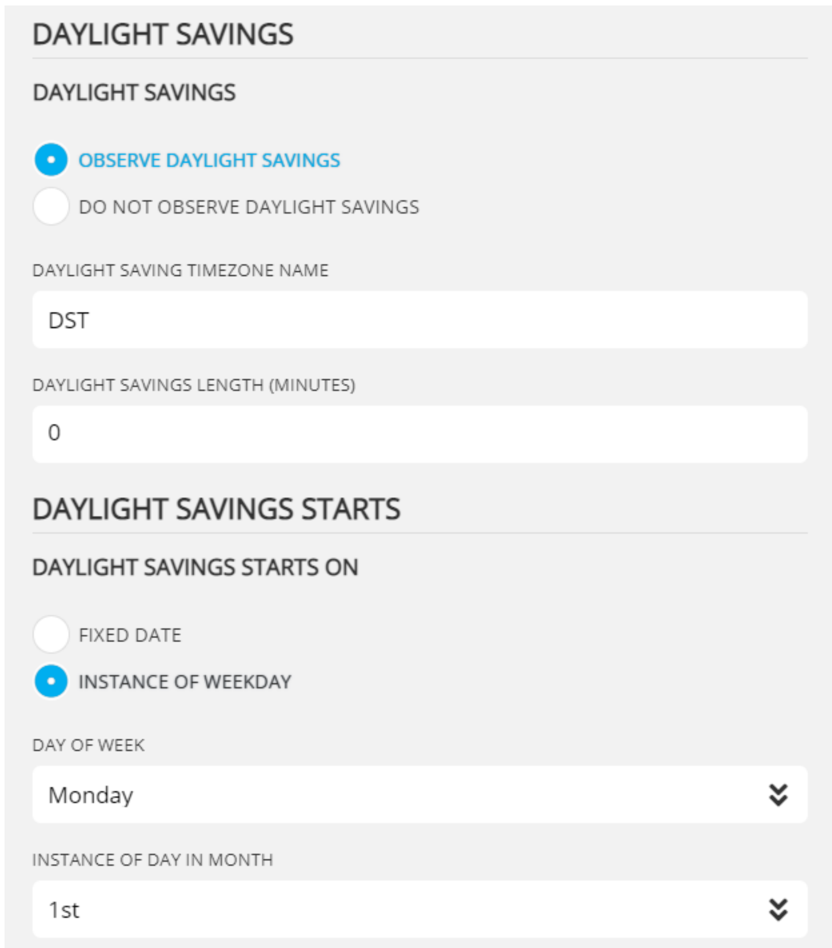
Visit www.timeanddate.com/time/change/ for up to date information on regional UTC offsets and daylight savings offsets.

3. **Setup Daylight Savings**

If your region does not observe daylight savings, select 'DO NOT OBSERVE DAYLIGHT SAVINGS' in the daylight savings menu. This will hide all other daylight savings settings. Once this has been done, skip to step 4.

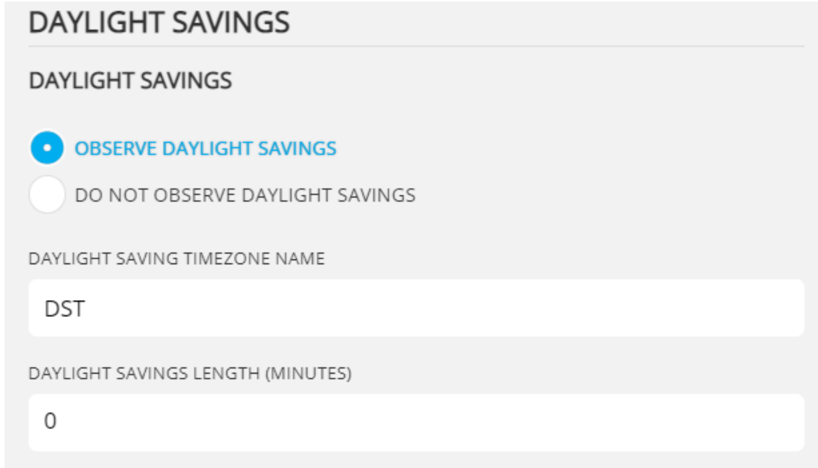


If your region does observe daylight savings, select 'OBSERVE DAYLIGHT SAVINGS' in the daylight savings menu. This will show all additional daylight savings that need to be configured.



a. **Setup Daylight Savings Time Zone**

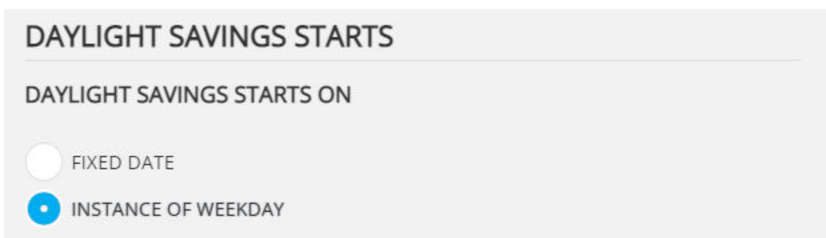
Using the daylight savings timezone name and daylight savings length settings, configure the name of your daylight savings timezone, and your regional daylight savings time jump in minutes.



The daylight savings timezone name can be any ASCII string, but only the first five characters will be displayed on the LCD or used in messages. The daylight savings length can be any jump value from 0 to 3600 minutes (60 hours). If the daylight savings length is set to 0, then the clock will behave as though it is not observing daylight savings.

b. **Setup Daylight Savings Start**

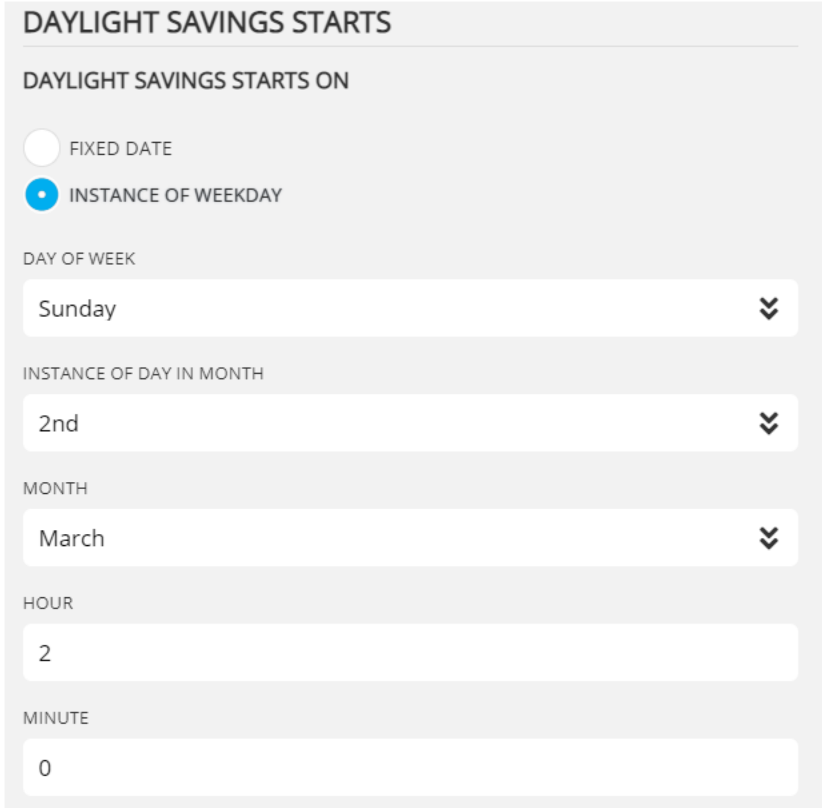
If your regional daylight savings jump begins on a specific instance of a weekday, select 'INSTANCE OF WEEKDAY' in the 'DAYLIGHT SAVINGS STARTS ON' radio-buttons and go to step 3.2.1. If your daylight savings time jump begins on a fixed date, select 'FIXED DATE' and go to step 3.2.2.



i. **Setup Daylight Savings Start Instance of Weekday**

When using the 'DAYLIGHT SAVINGS STARTS ON INSTANCE OF WEEKDAY' settings, configure the 'DAY OF WEEK' and 'INSTANCE OF DAY IN MONTH" the daylight savings jump occurs on, and the 'TIME OF DAY' when the jump occurs in hours and minutes from midnight.

For example, if the GridTime 3000 was being installed in Denver Colorado, where daylight savings currently begins on the 2nd Sunday of March at 2.00 am, you would configure the following settings.



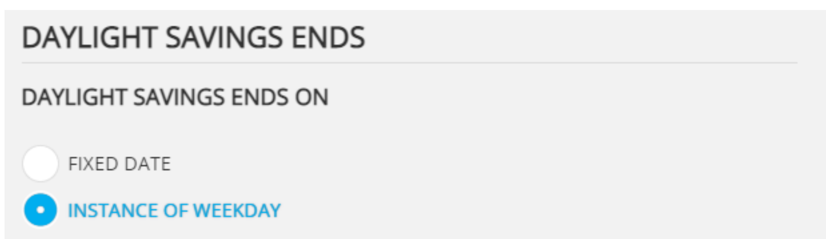
ii. **Setup Daylight Savings Start Fixed Date**

When using the 'DAYLIGHT SAVINGS STARTS ON FIXED DATE' settings, configure the 'MONTH' and 'DAY' the daylight savings jump occurs on, and the 'TIME OF DAY' when the jump occurs in hours and minutes from midnight.

For example, if your region's daylight savings began on the 13th of April at 3.00 am, you would use the following settings.

c. **Setup Daylight Savings End**

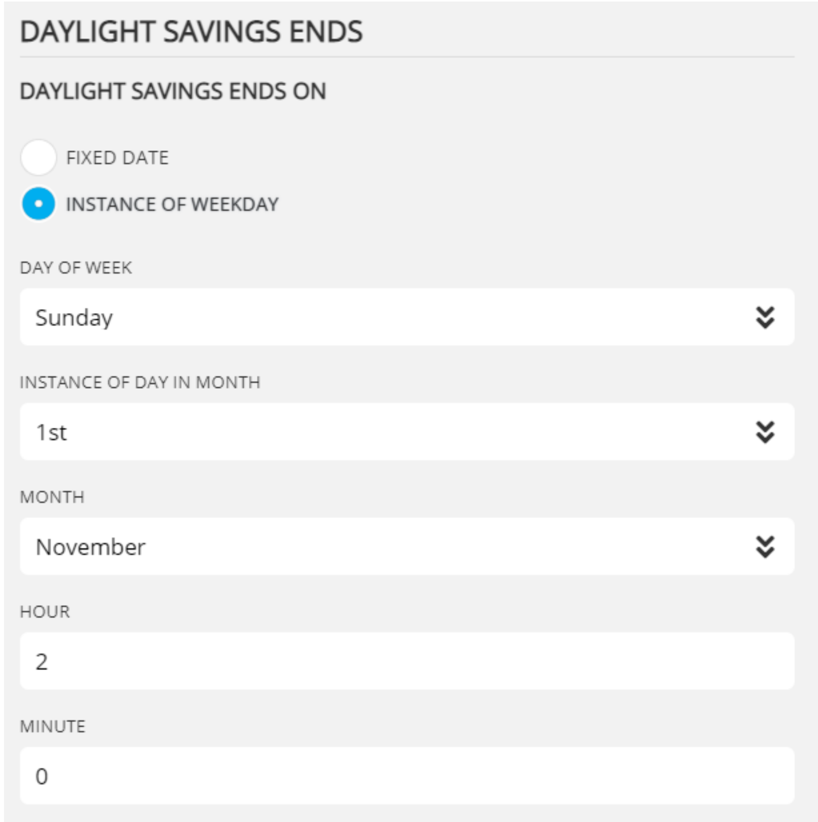
If your regional daylight savings time ends on a specific instance of a weekday, select 'INSTANCE OF WEEKDAY' in the ' DAYLIGHT SAVINGS ENDS ON' radio-buttons and go to step 3.3.1. If your daylight savings time ends on a fixed date, select 'FIXED DATE' and go to step 3.3.2.



i. **Setup Daylight Savings Ends Instance of Weekday**

In the ' DAYLIGHT SAVINGS ENDS ON INSTANCE OF WEEKDAY' settings, configure the 'DAY OF WEEK' and 'INSTANCE OF DAY IN MONTH' daylight savings time ends, and the ' TIME OF DAY ' when this occurs in hours and minutes from midnight.

For example, if the GridTime 3000 was being installed in Denver Colorado, where daylight savings currently ends on the 1st Sunday of November at 2.00 am, you would configure the following settings.



ii. **Setup Daylight Savings Ends Fixed Date**

Within the 'DAYLIGHT SAVINGS ENDS ON FIXED DATE' settings, configure the ' MONTH' and 'DAY' when the end of daylight savings occurs, and the 'TIME OF DAY" when it occurs in hours and minutes from midnight.

For example, if your region's daylight savings ended on the 18th of December at 3.30 pm, you would use the following settings.

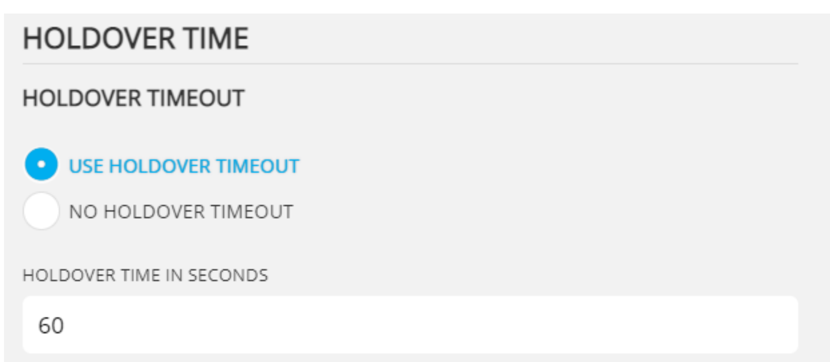
4. **Setup Holdover Timeout**

   Use the holdover time settings to configure the maximum time in seconds the GridTime 3000 will remain in the 'holdover' state after losing all of its sync sources before entering the 'out of sync' state. When in the 'holdover' state, the GridTime 3000 relies on its internal oscillator in free run mode as a time reference. The accuracy of the oscillator time reference will slowly degrade as the oscillator drifts. This slow decline in accuracy during holdover is tracked by the accuracy reported in the GridTime 3000's outputs. If a rubidium or OCXO (Oven Controlled Crystal) Oscillator expansion is fitted in the GridTime 3000, the oscillator time will drift slower than the time drift of the base VCTCXO (Voltage Controlled, Temperature Compensated crystal) Oscillator that is fitted.

   Once the holdover time has expired, the GridTime 3000's time will be considered too inaccurate to be usable and the GridTime 3000 will enter the 'out of sync' state. In the 'out of sync' state the GridTime 3000 will still rely on its oscillator as a reference, but will trigger the out of sync alarm and and will trigger the indication of out of sync on outputs that have a specific out of sync indicator, such as PTP clockClass .

   The GridTime 3000 can resynchronize to a sync source if it becomes available when in the 'holdover' or 'out of sync' states, which makes it reenter the 'in sync' state.

   To use holdover timeout, select 'USE HOLDOVER TIMEOUT' with the holdover timeout radio buttons. You can then enter the time you want the GridTime 3000 to remain in holdover after losing its sync sources with the 'HOLDOVER TIME IN SECONDS' textbox.



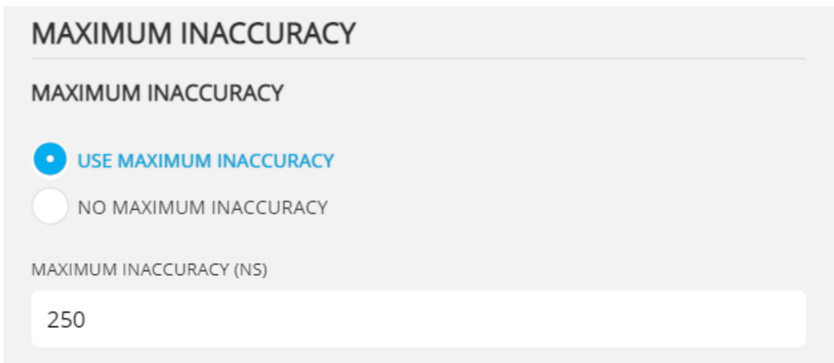
If you don't want to put a time limit on the GridTime 3000's time in holdover, select 'NO HOLDOVER TIMEOUT' with the holdover timeout radio buttons.

5. **Setup Maximum Inaccuracy**

   The maximum inaccuracy setting functions similarly to the holdover timeout setting, except that instead of limiting the GridTime 3000's time in holdover, it sets up an inaccuracy threshold instead. This means that when the GridTime 3000 loses all of its synchronization sources and enters the 'holdover' state, it will exit the 'holdover' state and enter the 'out of sync' state once the reported inaccuracy of its oscillator derived time reaches the user-defined inaccuracy threshold.

   This setting can be used simultaneously with the holdover timeout setting, the GridTime 3000 will just transition from 'holdover' to 'out of sync' when either holdover timeout occurs or the maximum inaccuracy threshold is reached — whichever occurs first.

   To set up a maximum inaccuracy threshold, select 'USE MAXIMUM INACCURACY' with the maximum inaccuracy radio buttons. You must then enter the maximum inaccuracy threshold in nanoseconds in the maximum inaccuracy textbox.



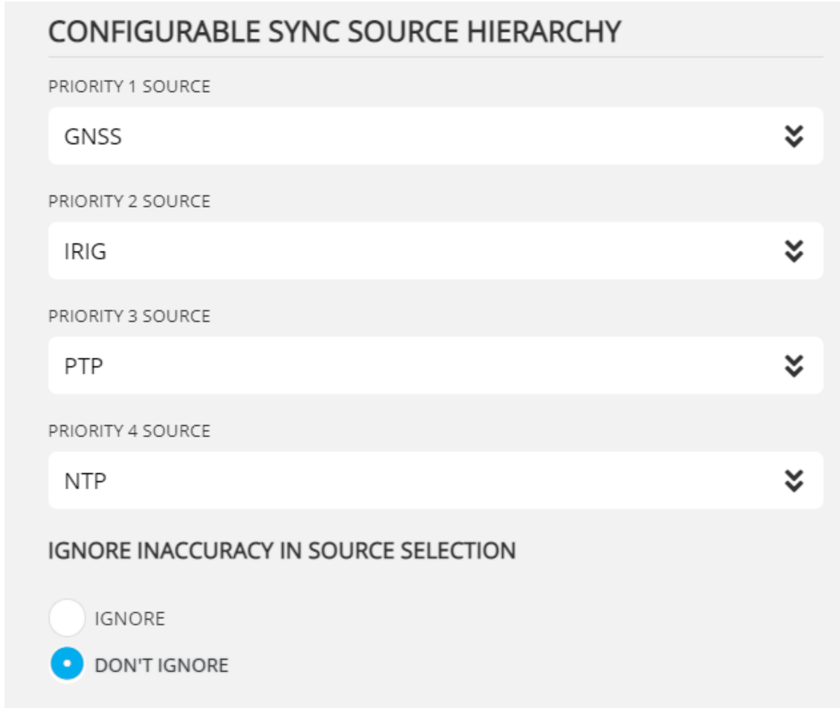
Important:
Once the GridTime 3000 enters the 'out of sync' state,it will trigger the out of sync alarm and and will trigger the indication of out of sync on outputs that have a specific out of sync indicator, such as PTP clockClass. Other devices will be unlikely to synchronize to the GridTime 3000 when it is in this state, so if you are setting up holdover timeout or a maximum inaccuracy threshold, ensure you have other backup time sources for critical systems in your installation, or that your devices have their own holdover during an extended sync dropout.

If you need the GridTime 3000 to act as an indefinite time source during a GNSS dropout, disable holdover timeout and the maximum inaccuracy threshold and it will stay permanently in the 'holdover' state when all synchronization sources are lost until it regains a sync source and reenters the 'in sync' state.

6. **Setup the Sync Source Hierarchy**

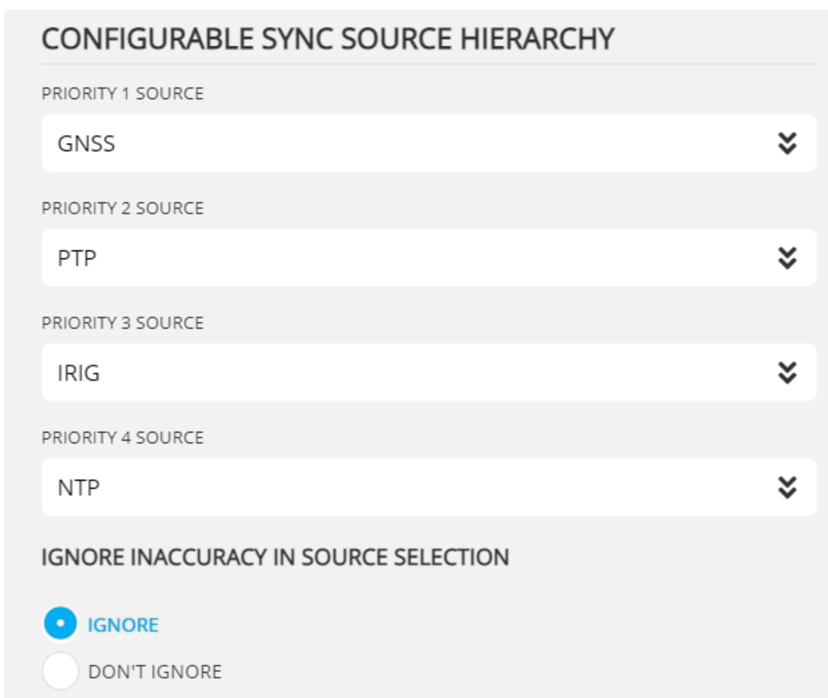
   By default, when the GridTime 3000 has multiple sync sources available it will select the most accurate sync source and synchronize to this. If one or more sync sources is reporting the same accuracy, it will apply the sync source hierarchy and synchronize to the highest priority source available. This is the behavior when 'IGNORE INACCURACY IN SOURCE SELECTION' is set to 'DON'T IGNORE', which is the default setting.

   If 'IGNORE INACCURACY IN SOURCE SELECTION' is set to 'IGNORE', the GridTime 3000 will ignore the reported accuracy of all of the available sync sources and will simply synchronize to the highest priority source as per the sync source hierarchy.



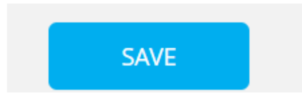
Note:
Microchip recommends leaving the configurable sync source hierarchy settings as their defaults unless you have a specific reason to modify the hierarchy and sync source selection behavior.

For example, if you have PTP and IRIG available as sync sources but the IRIG is falsely reporting an artificially high accuracy, you may wish to set 'IGNORE INACCURACY IN SOURCE SELECTION' to 'IGNORE', and configure PTP as the higher priority sync source as per the screenshot below.

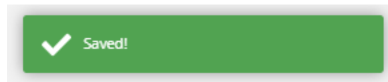


7. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.



9.4 Provisioning the Admin Ethernet Port

This section describes how to provision the GridTime 3000's Admin Ethernet port.

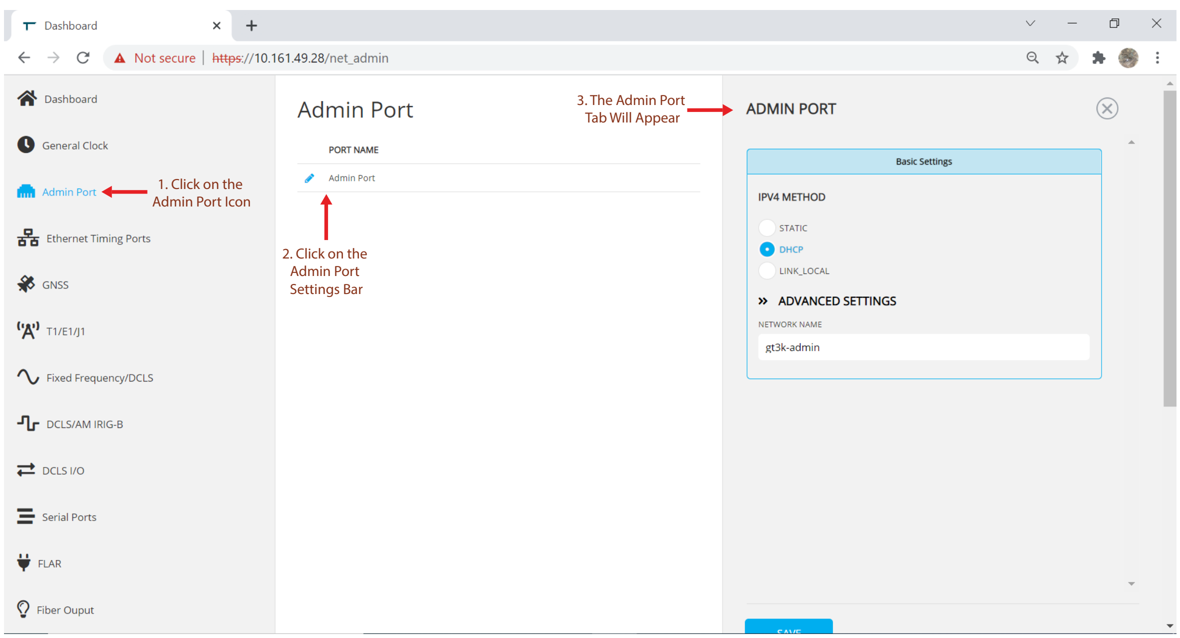
The Admin Ethernet port settings are used to configure the IP addressing behavior and related settings for the GridTime 3000's Admin Ethernet port.

By default, the Admin Ethernet port is configured to use DHCP addressing, with a hostname of 'gt3k-admin'.

All Admin Ethernet port settings can be modified, but do not necessarily need to be modified while provisioning the GridTime 3000. For example, if a DHCP server won't be available when operating the GridTime 3000 in the future, the addressing mode should be changed to static and a static address should be configured, but otherwise it should be left as DHCP (the default setting).

1. **Navigate to Admin Port Configuration Window**

   To navigate to the Admin Ethernet Port configuration window, click on the Admin Port icon, then the Admin Port settings bar in the center of the screen.



2. **Addressing Mode**

   Follow the instructions in one of the following three sections depending on whether you want to set up the port with a static, link local, or DHCP IP addressing mode:

   – 9.4.1. Static IP Address
   – 9.4.2. DHCP IP Address
   – 9.5.3. Link Local IP Address

Note:
Please note that TCP port number 8080 is 'open' on the administrator port. This port number is used by the Microchip 'upgrade and log retrieval' tool and will require a valid username and password to be entered before traffic is allowed through the port.

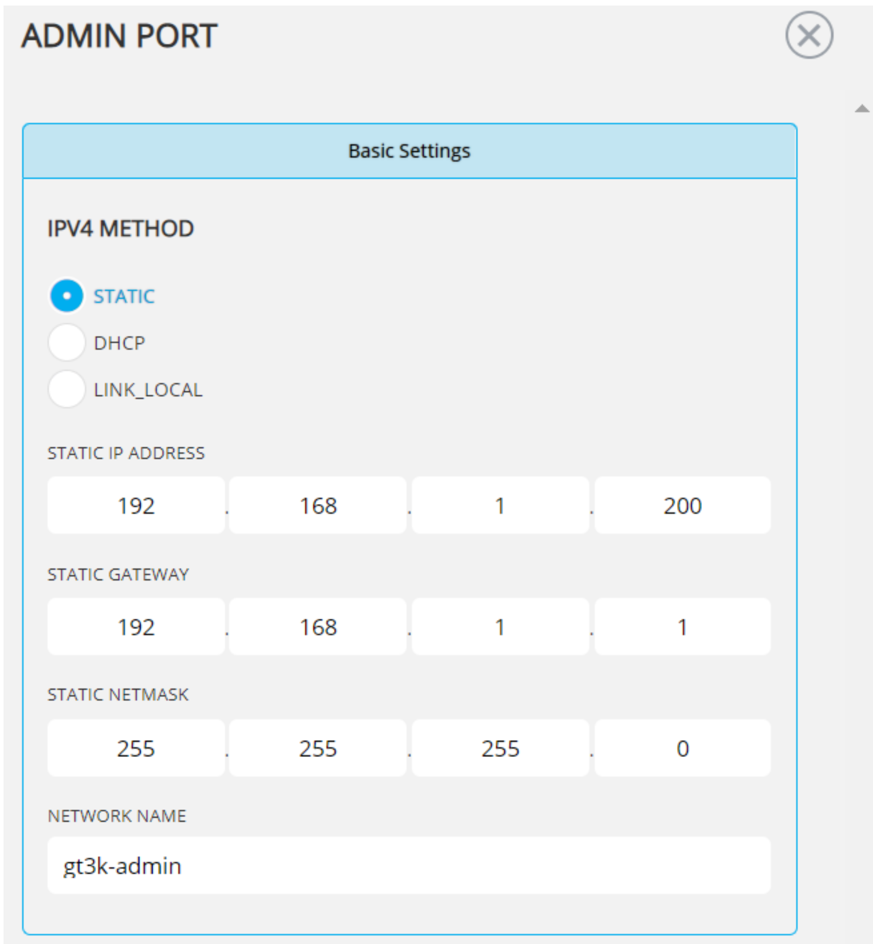
The Microchip 'upgrade and log retrieval' tool is available on request in the event that an upgrade via the Clock Management Tool is unsuccessful.

9.4.1 Static IP Address

This section describes how to provision the Admin Ethernet Port with a static IP Address.

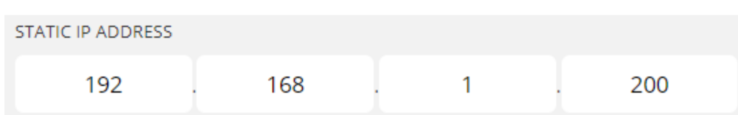
1. **Set IP Addressing Mode to Static**

   Select 'STATIC' from the 'IPV4 METHOD' radio buttons, causing the static IP addressing settings to appear.



2. **Set Static IP Address**

   By default the static IP address is 192.168.1.200. To change this address, enter a different valid IP address in the subnet your configuration PC is using.

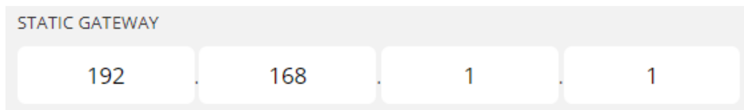


Important:
Make sure that the IP address you choose is in subnet with your PC prior to saving the settings. If you are accessing the CMT via the Admin Ethernet port, once the address has been set you will have to log back into the CMT using the new address as your URL. If the new address is out of subnet with your PC's port, you won't be able to access the CMT via the GridTime 3000's Admin Ethernet port until you change your PC's IP address to be in subnet.

If this happens by mistake, you can also use the Admin USB-C port to log back into the CMT and change the IP address of the Admin Ethernet port to an in subnet address.

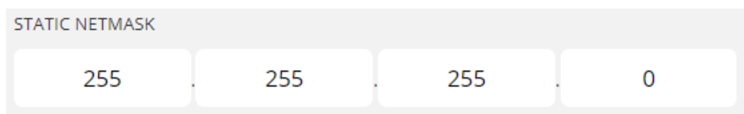
3. **Set Gateway**

   By default the gateway address is set to 192.168.1.1. If a gateway is present in your network, modify the static gateway setting to your gateway address. If no gateway is present the static gateway address can be configured as 0.0.0.0.



4. **Set Netmask**

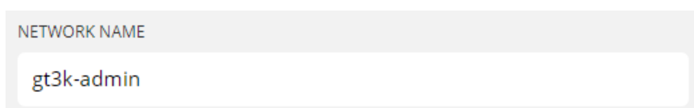
   By default the netmask is set to 255.255.255.0. If your network requires a different netmask, modify the static netmask setting as required. By combining the netmask and static IP address you have configured, you can validate that your network and host addresses are correct for your network.



5. **Network Name**

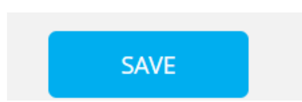
   If required, the network name can be modified if by typing the new name into the 'NETWORK NAME' textbox. This field will set the hostname of the port.

   By default, the network name will be 'gt3k-admin'.



6. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



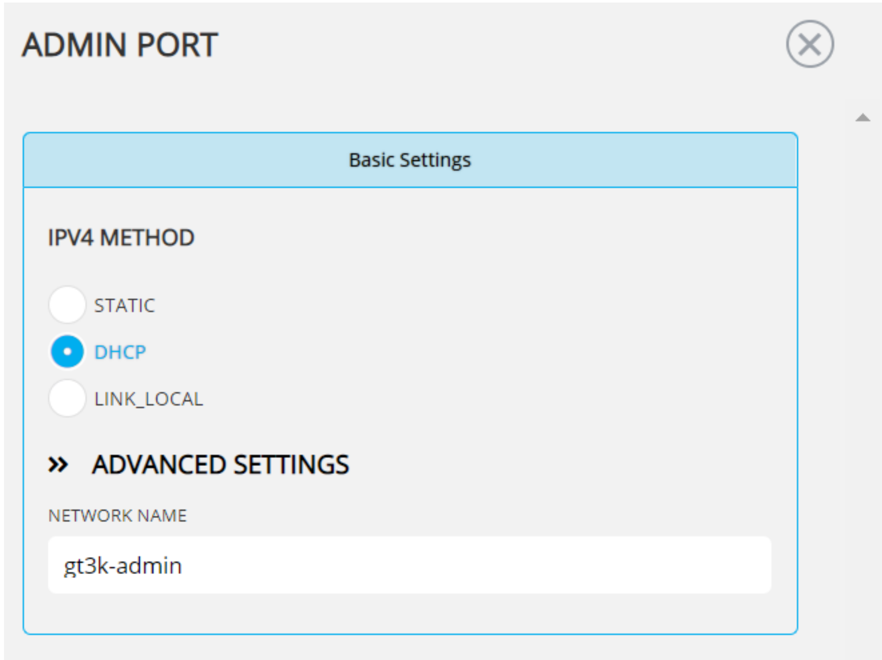
   A 'Saved!' notification will appear in the bottom right corner of the page, indicating that the settings have successfully been written to the GridTime 3000.

9.4.2 DHCP IP Address

This section describes how to provision the Admin Ethernet Port with a DHCP IP Address.

1. **Set DCHP IP Addressing Mode**

   By default, the Admin Ethernet port's IP addressing mode is set to DHCP. If changed to another mode, to set it back to DHCP, select 'DHCP' from the 'IPV4 METHOD' radio buttons.



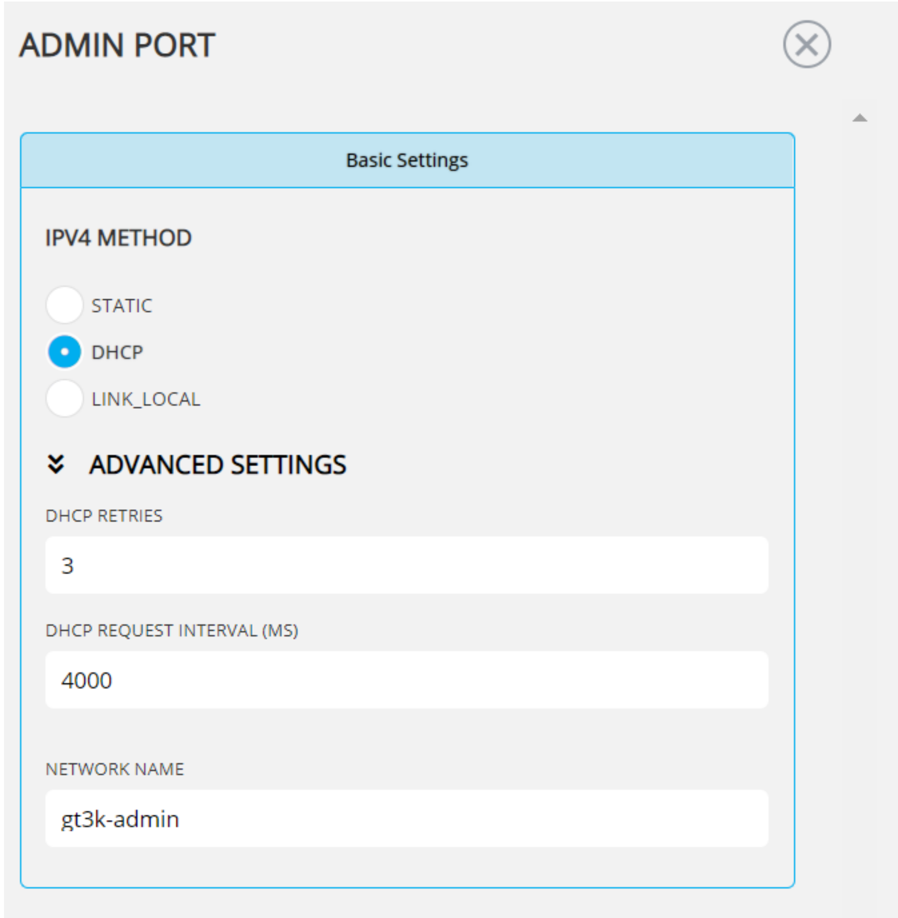
Important:
Make sure that prior to saving with the addressing mode changed to DHCP that you either have a DHCP server available, or a PC Ethernet port that can be set to a static link local IP address in subnet with the Admin Ethernet Port's address. As soon as the addressing mode has been saved as DHCP, the Admin Ethernet port will attempt to get a new IP address from a DHCP server, and if this fails, it will fall back to a link local address.

If you are accessing the CMT via the Admin Ethernet port, any time the IP address of the port changes you will have to log back into the CMT using the new address as your URL. If the new address is out of subnet with your PC's port, you will be unable to access the CMT via the GridTime 3000's Admin Ethernet port until you change your PC's IP address to be in subnet.

If this happens by mistake, you can also use the Admin USB-C port to log back into the CMT and change the IP address of the Admin Ethernet port to an in subnet address.

2. **Advanced Settings**

   Click the 'ADVANCED SETTINGS' text to reveal the advanced port settings. These settings should not be modified in most cases.

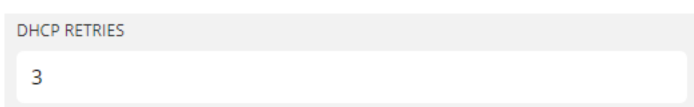


a. **DHCP Retries**

To gain an IP address over DHCP, the port will send DHCP discovery messages into the network expecting a DHCP server to respond. If it sees no response after the first message, it will send another discovery message — this is known as a DHCP retry.

The DHCP Retries setting determines how many DHCP retries the port will make before falling back to a link local IP Address.

To modify the number of DHCP retries the port will make, enter the new number into the 'DHCP RETRIES' textbox, the default value is 3.



b. **DHCP Request Interval**

The DHCP Request Interval sets the base time between DHCP discover attempts in milliseconds. The time between DHCP discover messages is multiplied by two between the first message and the second (first DHCP retry), then the time is multiplied by two again for the following message and so on up to a limit of 64 seconds.

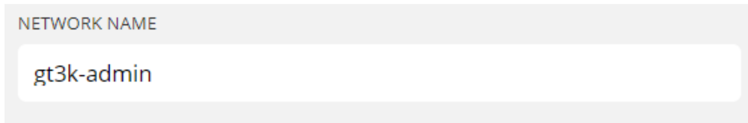
If a different base interval is required, enter the interval into the 'DHCP REQUEST INTERVAL (MS)' textbox.

The default DHCP Request Interval is 4000 ms (4 seconds).

3. **Network Name**

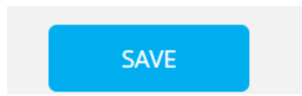
   If required, a unique hostname can be given to the admin Ethernet port by entering it into the 'NETWORK NAME' textbox. This field will set the hostname of the port.

   By default, the hostname is 'gt3k-admin'.

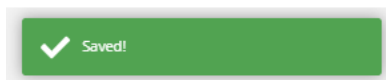


4. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



   A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

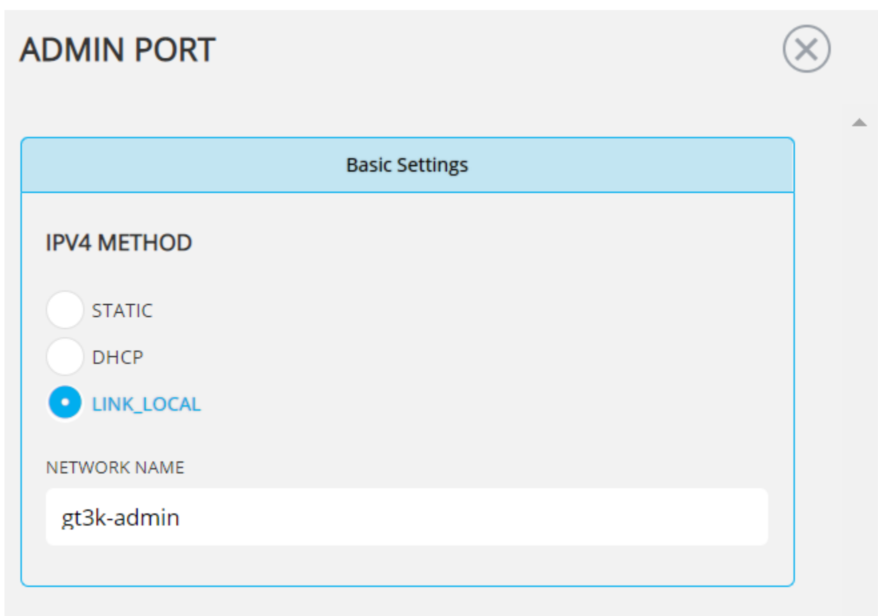


9.4.3 Link Local IP Address

This section describes how to provision the Admin Ethernet Port with a Link Local IP Address.

1. **Set IP Addressing Mode to Link Local**

   Select 'LINK_LOCAL' from the 'IPV4 METHOD' radio buttons to set the IP addressing mode to link local.



Important:
Make sure that prior to setting the port to a link local addressing mode that you have a PC Ethernet port that can be set to a static link local IP address in subnet with the Admin Ethernet Port's address. As soon as the addressing mode has been saved as link local, the Admin Ethernet port will receive a new a link local address.

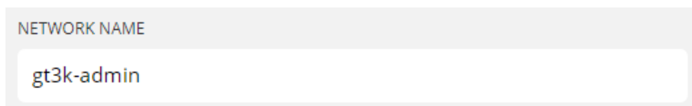
If you are accessing the CMT via the Admin Ethernet port, any time the IP address of the port changes you will have to log back into the CMT using the new address as your URL. If the new address is out of subnet with your PC's port, you will be unable to access the CMT via the GridTime 3000's Admin Ethernet port until you change your PC's IP address to be in subnet.

If this happens by mistake, you can also use the Admin USB-C port to log back into the CMT and change the IP address of the Admin Ethernet port to an in subnet address.

2. **Network Name**

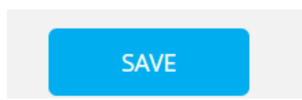
   If required, the network name can be modified if by typing the new name into the 'NETWORK NAME' textbox. This field will set the hostname of the port.

   By default, the network name will be 'gt3k-admin'.



3. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



   A 'Saved!' notification will appear in the bottom right corner of the page, indicating that the settings have successfully been written to the GridTime 3000.

9.5 Provisioning the Ethernet Ports

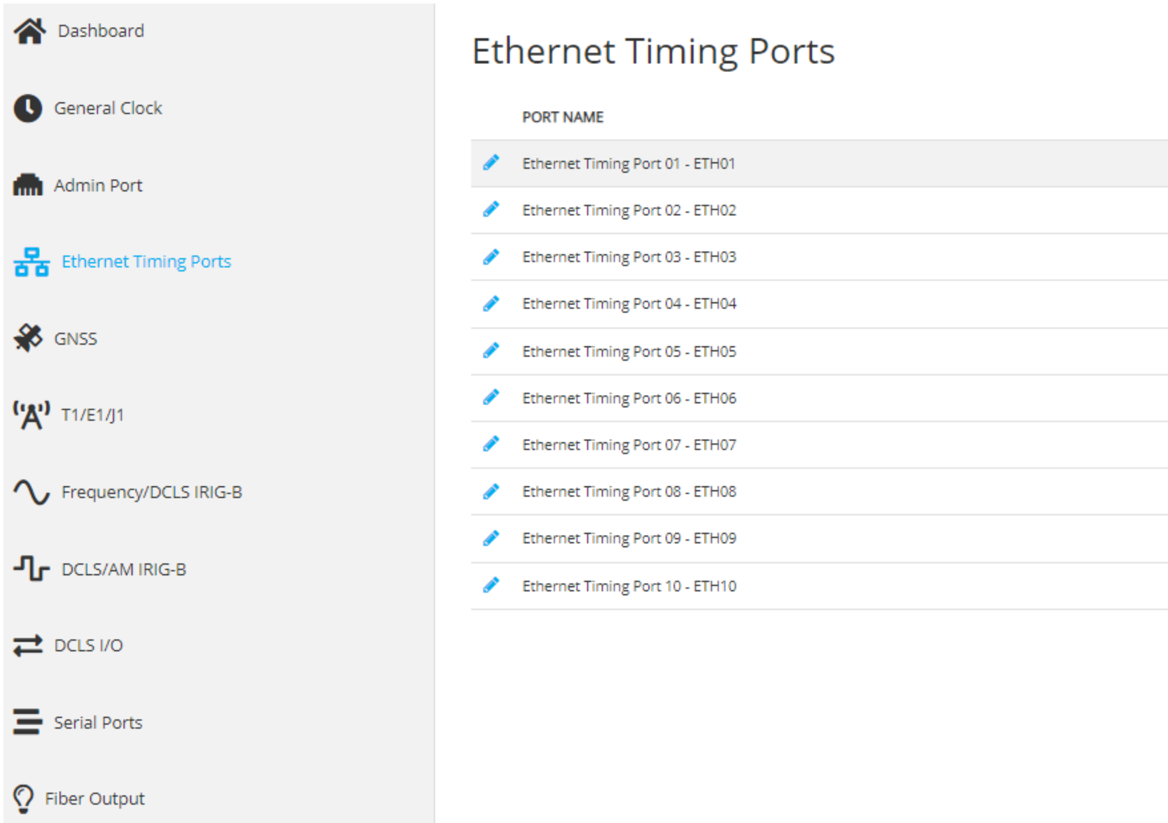
This section describes how to provision the Ethernet ports on the GridTime 3000.

The Ethernet ports on the GridTime 3000 can be configured as Network Time Protocol (NTP) clients and servers, and Precision Time Protocol (PTP) clients and servers. PTP can also be run over two ports simultaneously as a Parallel Redundancy Protocol (PRP) pair.

Prior to configuring the NTP or PTP settings, basic port network settings should be set up according to the steps below.

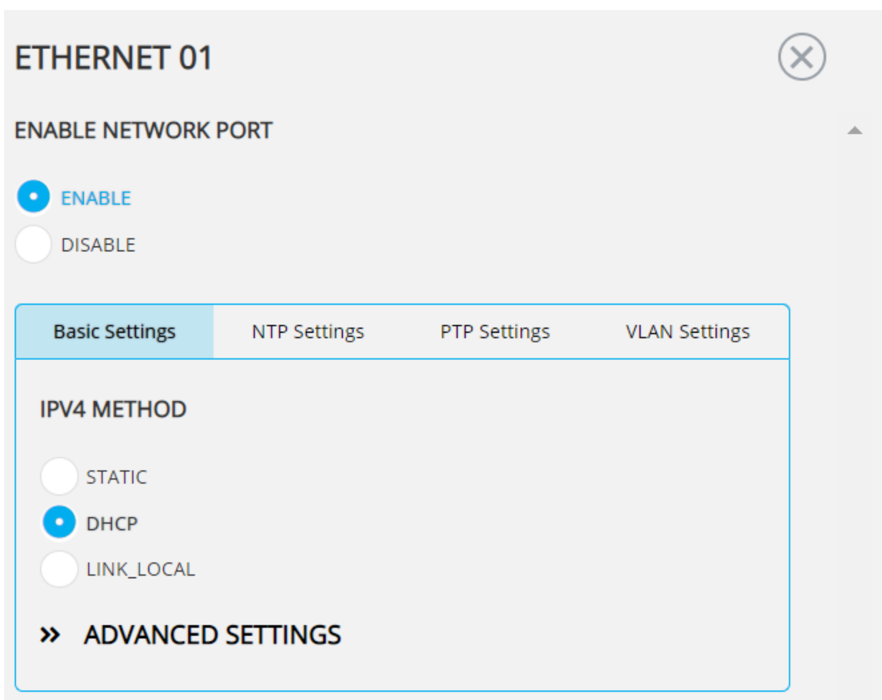
1. **Navigate to Ethernet Port Configuration Window**

   The port tab should be brought up by clicking on the Ethernet Timing Ports icon, then clicking the settings bar corresponding to the port.



2. **Enable Port**

   Select the 'ENABLE' radio button to enable the port and bring up the relevant port settings.



3. **Addressing Mode**

Follow the instructions in one of the following three sections depending on whether you want to set up the port with a static, link local, or DHCP IP Addressing mode:

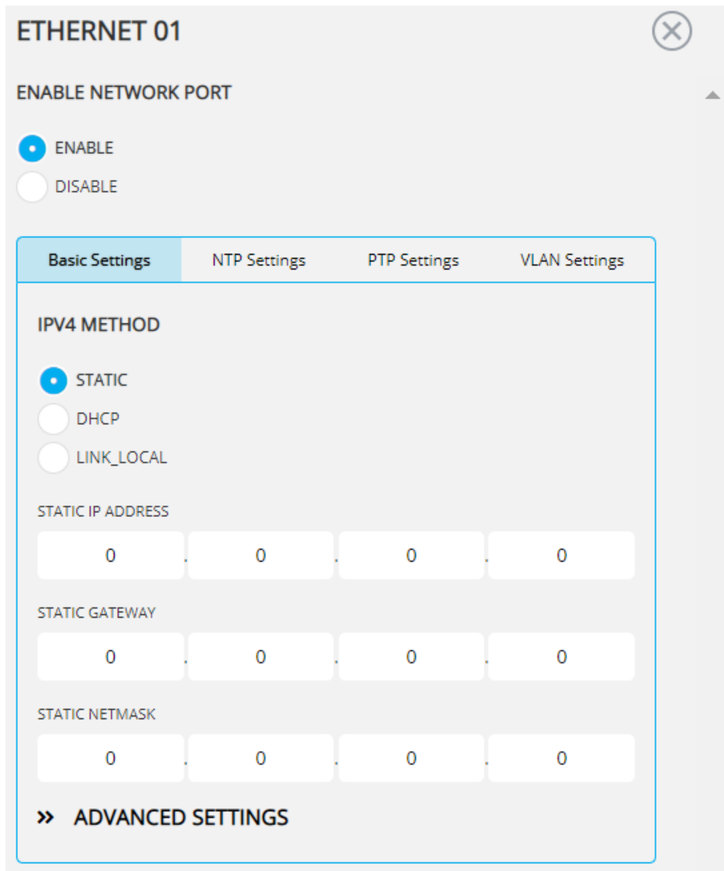
– 9.5.1. Static IP Address
– 9.5.2. DHCP IP Address
– 9.5.3. Link Local IP Address

9.5.1 Static IP Address

This section describes how to provision an Ethernet port with a static IP Address.

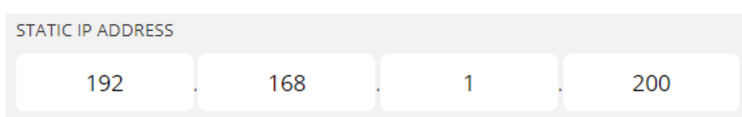
1. **Select Static for IPv4 Method**

   Select 'STATIC' from the 'IPV4 METHOD' radio buttons, causing the static IP addressing settings to appear.



2. **Set IP Address**

   Enter a different valid IP address in the subnet your configuration PC is using.



3. **Set Gateway**

   If a gateway is present in your network, enter the address of your gateway. If no gateway is present the static gateway address can be configured as 0.0.0.0.

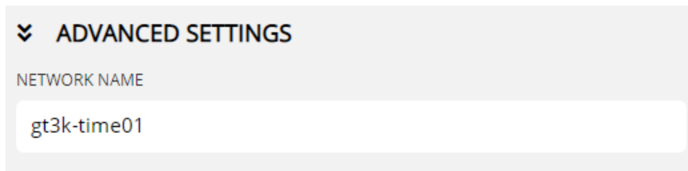
4. **Set Netmask**

   Enter the netmask used by your network. By combining the netmask and static IP address you have configured, validate that your network and host addresses are correct for your network.

5. **Network Name**

   If required, the network name can be modified by typing the new name into the 'NETWORK NAME' textbox under the 'ADVANCED SETTINGS' dropdown. This field will set the hostname of the port.

   By default, the network name will be 'gt3k-time[port number]'.



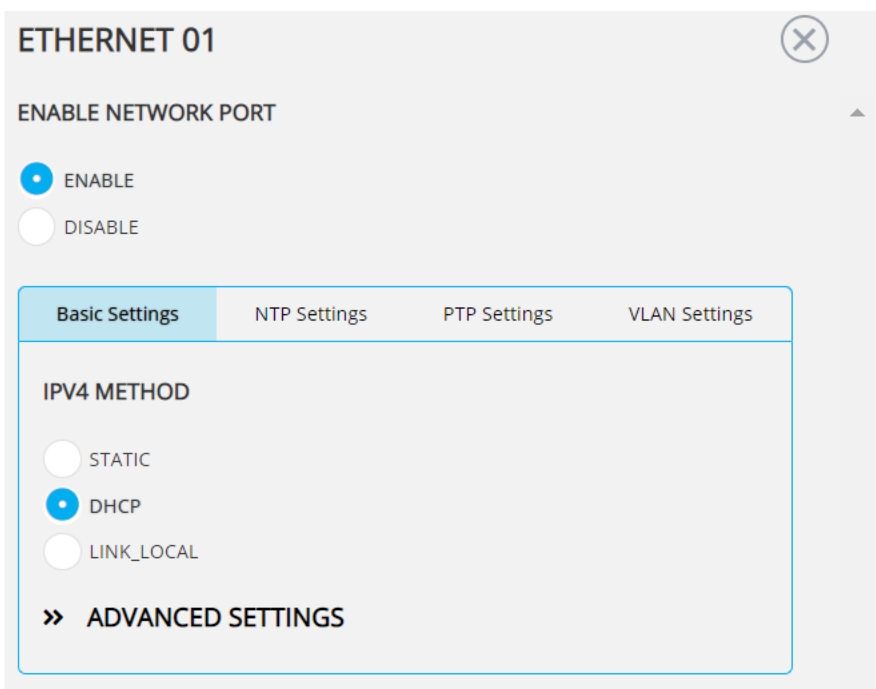
6. **PRP and VLANs**
   - To provision PRP on the port, see 9.5.4. Provisioning PRP.
   - To provision VLAN use on the port, see 9.5.5. Provisioning VLAN Settings.
7. **PTP and NTP**
   - To provision PTP on the port, see 9.5.7. Provisioning PTP.
   - To provision NTP on the port, see 9.5.6. Provisioning NTP.

9.5.2 DHCP IP Address

This section describes how to provision an Ethernet port with a DHCP IP Address.

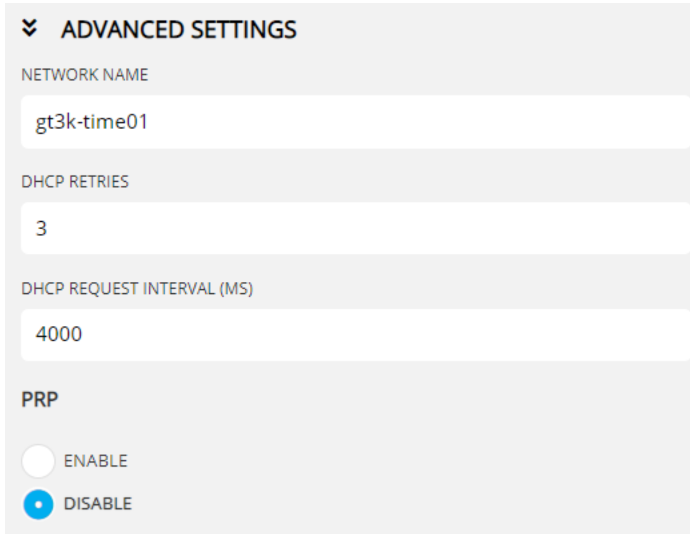
1. **Select DHCP for IPv4 Method**

   Select 'DHCP' from the 'IPV4 METHOD' radio buttons. This should be selected by default.



2. **Advanced Settings**

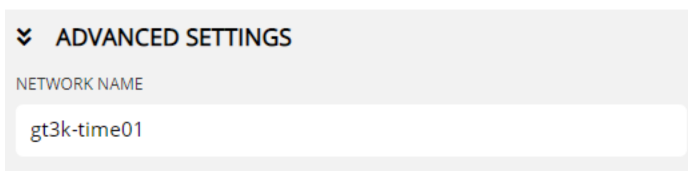
Click the 'ADVANCED SETTINGS' text to reveal the advanced port settings.



a. **Network Name**

If required, the network name can be modified if by typing the new name into the 'NETWORK NAME' textbox. This field will set the hostname of the port.

By default, the network name will be 'gt3k-time[port number]'.

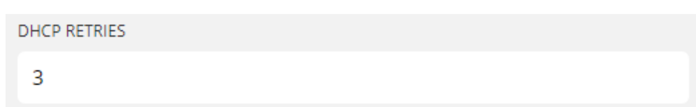


b. **DHCP Retries**

To gain an IP address over DHCP, the port will send DHCP discovery messages into the network expecting a DHCP server to respond. If no response after the first message is seen, it will send another discovery message — this is known as a DHCP retry.

The DHCP retries setting determines how many DHCP retries the port will make before falling back to a link local IP Address.

To modify the number of DHCP retries the port will make, enter the new number into the 'DHCP RETRIES' textbox, the default value is 3.

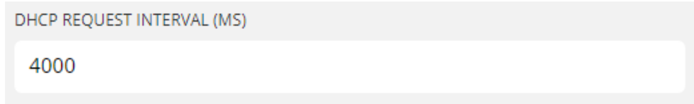


c. **DHCP Request Interval**

The DHCP Request Interval sets the base time between DHCP discover attempts in milliseconds. The time between DHCP discover messages is multiplied by two between the first message and the second (first DHCP retry), then the time is multiplied by two again for the following message and so on up to a limit of 64 seconds.

If a different base interval is required, enter the interval into the 'DHCP REQUEST INTERVAL (MS)' textbox.

The default DHCP Request Interval is 4000 ms (4 seconds).



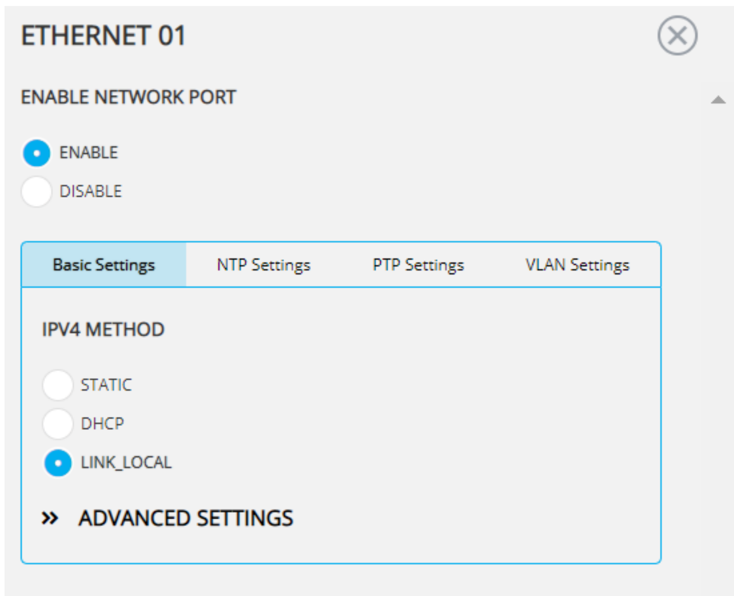
3. **PRP and VLANs**
   - To provision PRP on the port, see 9.5.4. Provisioning PRP.
   - To provision VLAN use on the port, see 9.5.5. Provisioning VLAN Settings.
4. **PTP and NTP**
   - To provision PTP on the port, see 9.5.7. Provisioning PTP.
   - To provision NTP on the port, see 9.5.6. Provisioning NTP.

9.5.3 Link Local IP Address

This section describes how to provision an Ethernet port with a link local IP Address.

1. **Select Link Local for IPv4 Method**

   Select 'LINK_LOCAL' from the 'IPV4 METHOD' radio buttons.

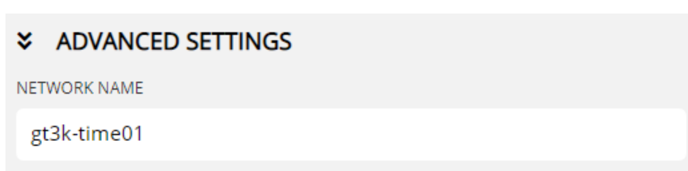


2. **Network Name**

   If necessary, the network name can be modified if by typing the new name into the 'NETWORK NAME' textbox under the 'ADVANCED SETTINGS' dropdown.

   This field will set the hostname of the port.

   The default network name will be 'gt3k-time[port number]'.



3. **PRP and VLANs**
   - To provision PRP on the port, see 9.5.4. Provisioning PRP.
   - To provision VLAN use on the port, see 9.5.5. Provisioning VLAN Settings.
4. **PTP and NTP**

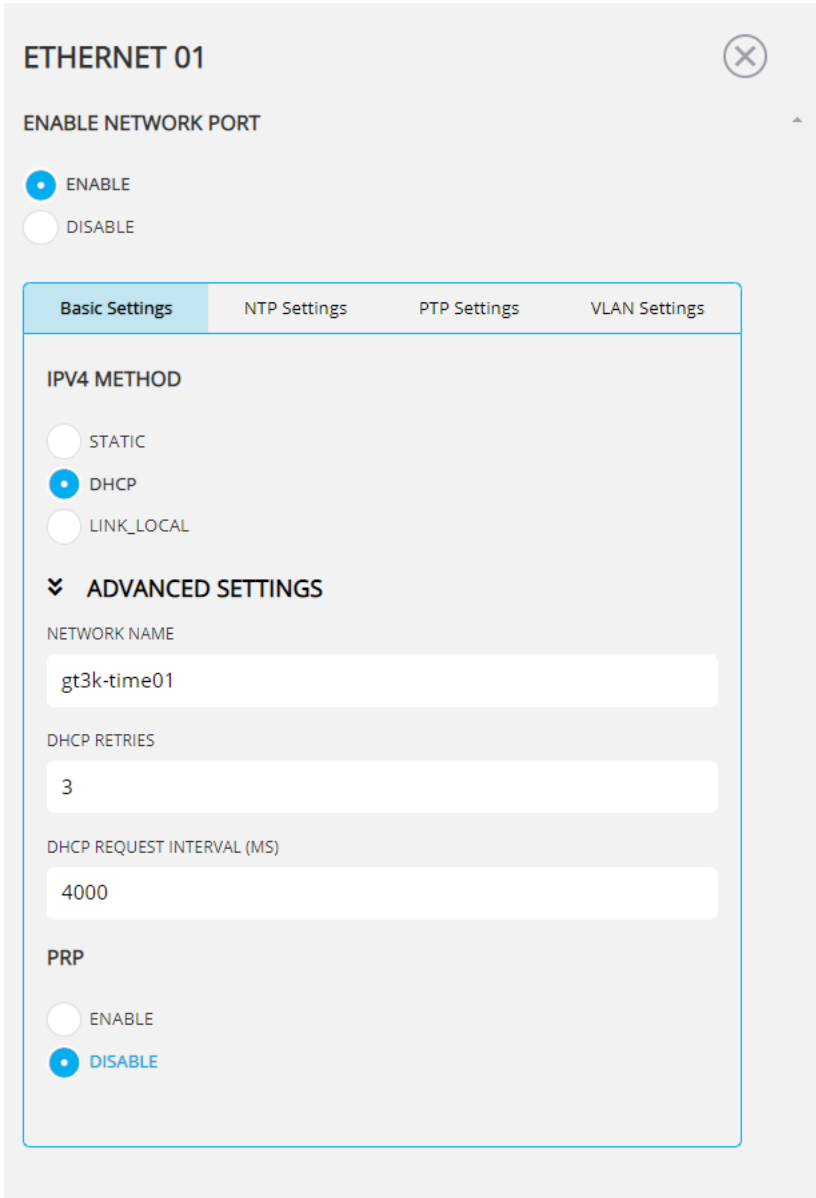
– To provision PTP on the port, see 9.5.7. Provisioning PTP.
– To provision NTP on the port, see 9.5.6. Provisioning NTP.

9.5.4 Provisioning PRP

This section describes how to provision PRP on a GridTime 3000 Ethernet Port.

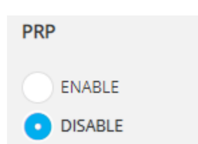
1. **Reveal Advanced Settings**

   Click the 'ADVANCED SETTINGS' text to reveal the advanced Ethernet port settings.



2. **Enable PRP**

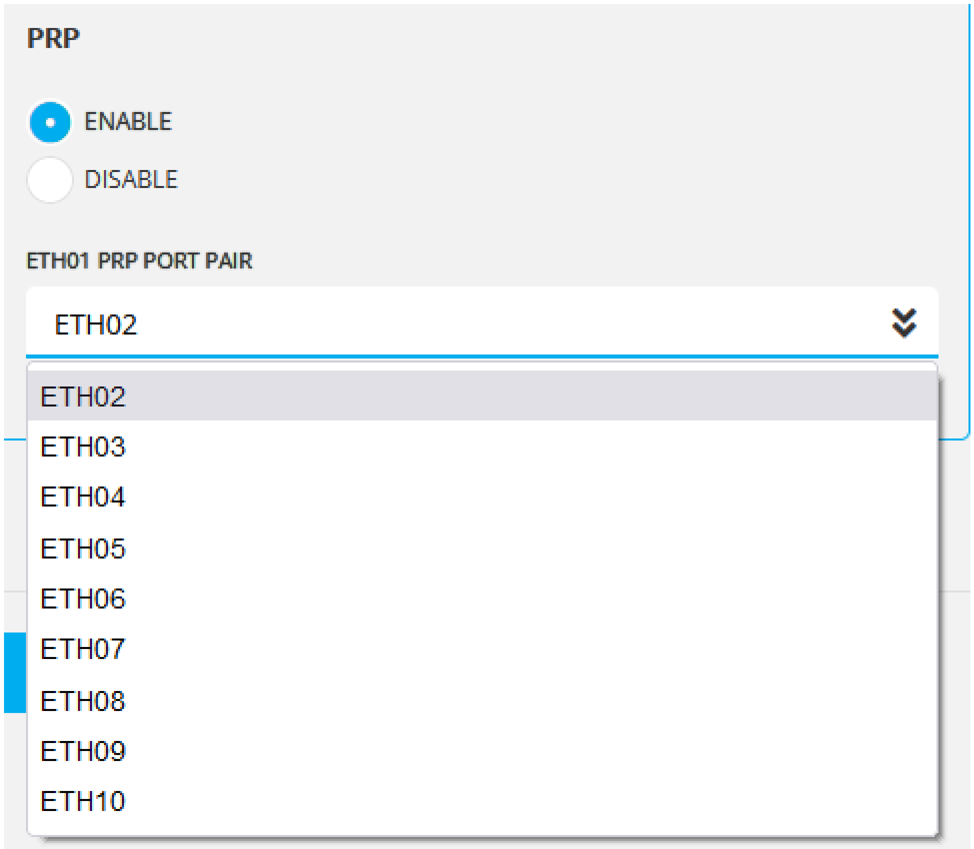
   Select ENABLE from the PRP radio buttons.



This will make the current port you are configuring a PRP LAN A port. All PTP traffic coming from this port will be duplicated on the port you select as the PRP LAN B port.

3. **Select PRP LAN B Port**

   To configure a port to be the PRP LAN B port, choose the port's name from the PRP PORT PAIR drop down.



Tip:
Although the GridTime 3000 allows any pair of ports to be configured as PRP LAN A and PRP LAN B, this is not recommended by Microchip Technology or by IEC-62439-3:2016. PRP LAN A should be either immediately above PRP LAN B, or directly to the left of PRP LAN B.

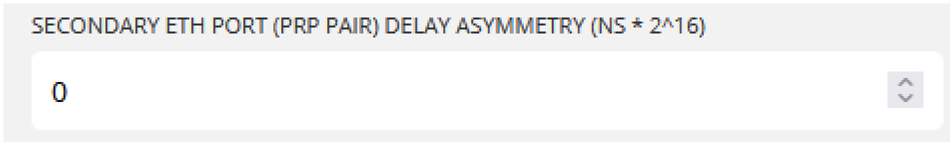
Note: Once you have selected a port as the PRP LAN B port, no configuration is required on the PRP LAN B port you have selected. All settings you have configured on the PRP LAN A port will automatically be used on the PRP LAN B port, and all previously configured settings on the PRP LAN B port will be ignored, although they are still accessible and modifiable.

Note:
The PRP LAN B port will be marked with a warning as shown.

Note:
Configure Port B PTP Delay Asymmetry (If Applicable)

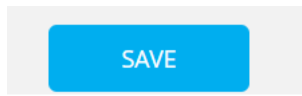
If the delay asymmetry of the PRP Port B is known and the user is configuring PRP to use PTP, the delay asymmetry can be entered in the PTP tab of Eth 01 in the 'PRP SECONDARY (PRP PAIR) DELAY ASYMMETRY' number box as shown in Secondary Eth Port Delay Asymmetry.

Figure 9-2. Secondary Eth Port Delay Asymmetry

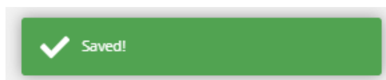


4. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



A 'Saved!' notification will appear in the bottom right corner of the page, indicating that the settings have successfully been written to the GridTime 3000.

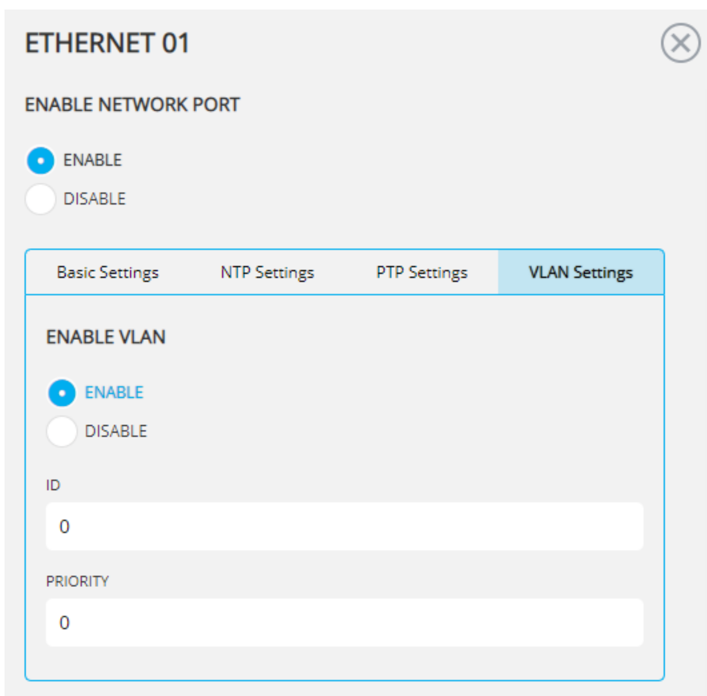


9.5.5 Provisioning VLAN Settings

This section describes how to provision VLAN use on a GridTime 3000 Ethernet Port.

1. **Enable VLAN Tagging**

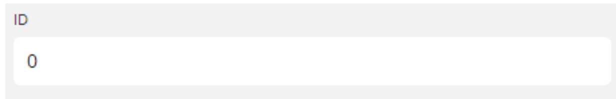
   To enable VLAN tagging, navigate to the port's VLAN Settings tab. Select enable VLAN from the 'Enable VLAN' radio buttons.



Once enabled, VLAN tags will be applied to all outgoing traffic from the port including NTP and PTP.

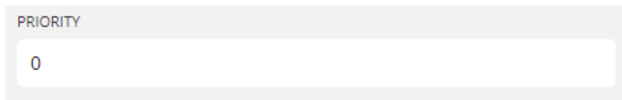
2. **Set VLAN ID**

   Type your network's VLAN ID into the 'ID' textbox. VLAN IDs in the range of 0-4094 are supported, a VLAN ID of 0 will disable VLAN tagging.



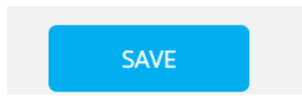
3. **Set VLAN Priority**

   Type the priority you want to be included in the VLAN tags on outgoing traffic into the 'priority' textbox. Priority values in the range of 0-7 are supported.

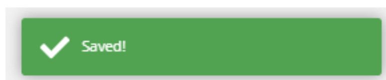


4. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.



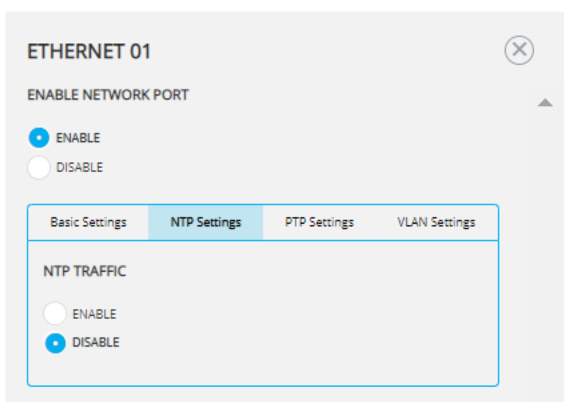
9.5.6 Provisioning NTP

This port describes how to setup a GridTime 3000 Ethernet port as an NTP server or client.

Note: Both an NTP Server/Client and PTP Server/Client can be simultaneously set up on a GridTime 3000 Ethernet Port.

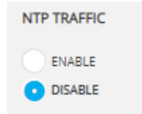
1. **Navigate to NTP Sub Tab**

   Navigate to the NTP sub tab by clicking on the 'NTP Settings' Tab in the port's configuration window.



2. **Enable NTP Traffic**

   Select 'ENABLE' from the “NTP TRAFFIC” radio buttons.



This will reveal the NTP settings for the port.

3. Follow the instructions in one of these following sections for the next steps:
   - 9.5.6.1. NTP Client
   - 9.5.6.2. Listening Server
   - 9.5.6.3. Broadcast Server
   - 9.5.6.4. Multicast Server
   - 9.5.6.5. Broadcast and Multicast Server

   The supported NTP modes are NTP Client, Listening Server, Broadcast Server, Multicast Server and Broadcast and Multicast Server.

   The NTP Client can poll a server for the time, and can also sync to NTP broadcasts and multicasts it receives.

   A Listening NTP server is quiet until it receives a client request, which it will respond to with the appropriate timestamps upon reception.

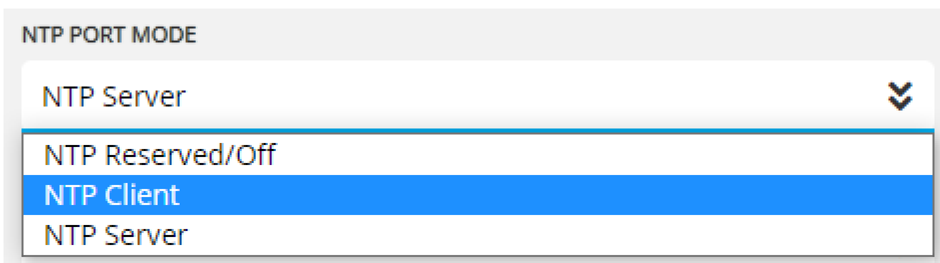
   The other server modes will behave the same as the listening server when requests are received, but will also send NTP multicasts and broadcasts into the network at user defined intervals.

9.5.6.1 NTP Client

This section describes how to provision an NTP client.

1. **Select NTP Client for NTP Port Mode**

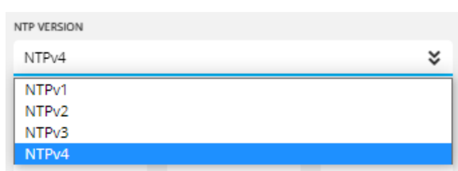
   Select 'NTP Client' from the 'NTP PORT MODE' dropdown.



   This will reveal additional SNTP client related settings.

2. **Select NTP Version**

   Select the NTP Version to be used by the NTP client from the 'NTP VERSION' dropdown. By default, this is set to NTPv4.

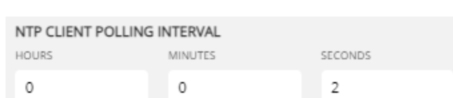


3. **Enter Client Polling Interval**

   Enter the NTP client's polling interval into the 'NTP CLIENT POLLING INTERVAL' timeboxes.

   This interval determines how frequently the NTP client will send unicast NTP requests to the NTP Server IP Address specified by the 'NTP SERVER IP ADDRESS' setting.

   The supported range for this setting is 0-24 hours. By default it is set to 2 seconds.



Note: NTP client to server polling is unicast so relies on the NTP client port's IP address being in the same subnet as the NTP server's IP address. Review the network settings of the port under configuration to ensure this is the case.

Tip: If the NTP client should not poll an NTP server and instead synchronize only to broadcasts/ multicasts from an NTP server, this setting should be configured as '0' in all fields, meaning that the port will never send unicast requests to a server.

4. **Accept or Decline Broadcast Messages**

   Select whether the NTP client will accept or ignore broadcast messages from an NTP server using the 'CLIENT BROADCAST MESSAGES' radio buttons.

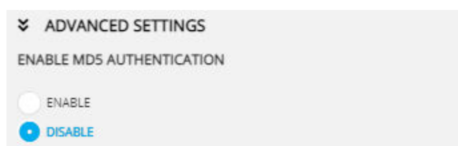
   If 'ACCEPT' is selected, the NTP client will synchronize to broadcast messages it receives, if 'DECLINE' is selected broadcasts will be ignored.

5. **Enter NTP Server IP Address**

   Enter the IP address of the NTP server that unicast NTP requests will be sent to.

6. **Advanced Settings**

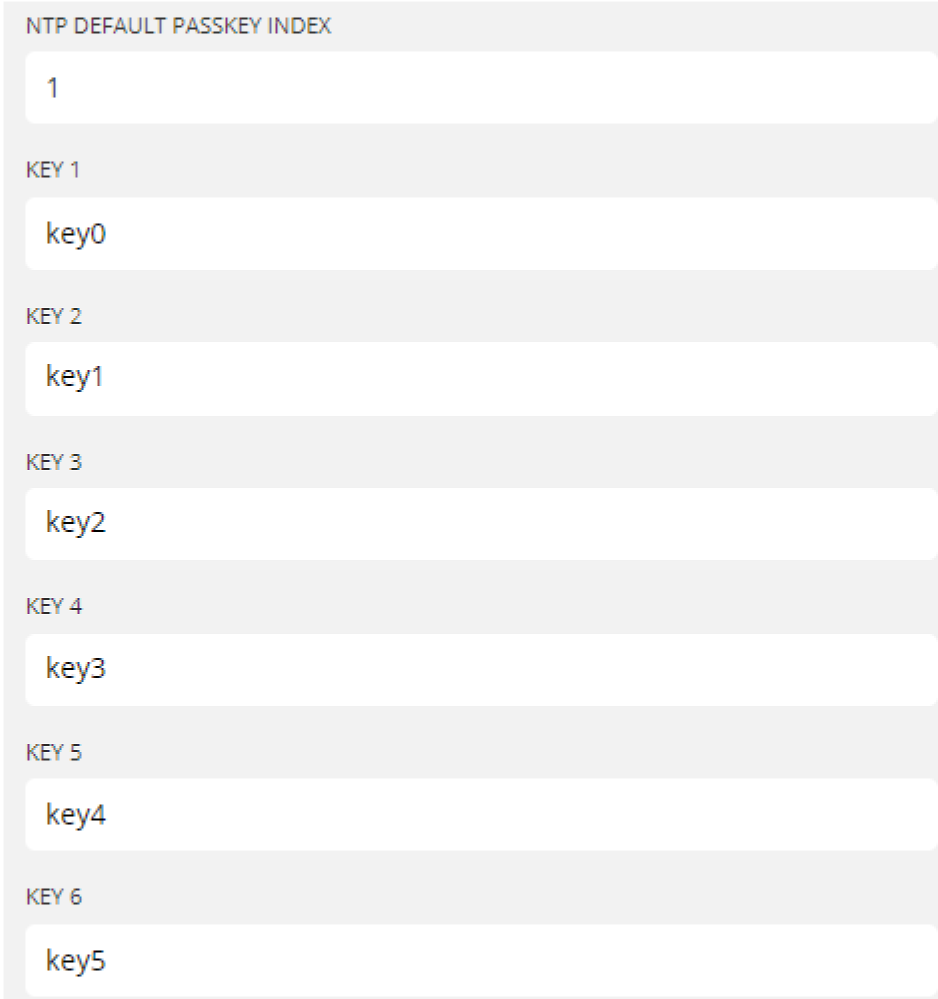
   Click the 'ADVANCED SETTINGS' dropdown to reveal the advanced NTP settings.



7. **Enable MD5 Authentication**

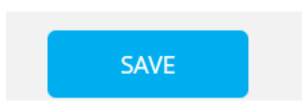
   If the NTP server on the network is using MD5 authenticated NTP communication, select 'ENABLE' from the 'ENABLE MD5 AUTHENTICATION' radio buttons. This will reveal the MD5 Authentication Key textboxes and will authenticate the incoming NTP packets. To set the hash key change one or more of the 'KEY' textboxes and change the 'NTP DEFAULT PASSKEY INDEX' to the index of the 'KEY' you have changed.

   In the below example setting 'NTP DEFAULT PASSKEY INDEX' is set to '1' and will enable the use of the 'key0' as the hashkey.



8. **Save Settings**

A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.



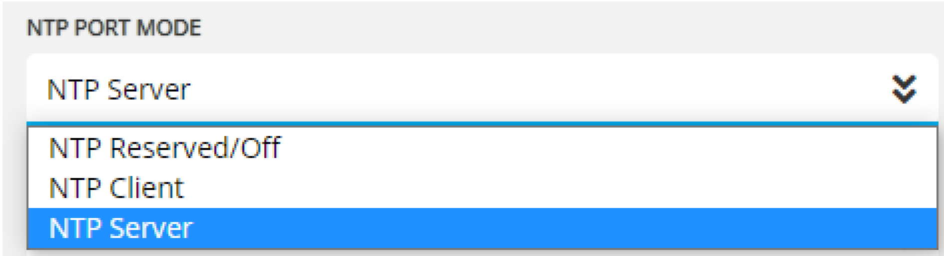
Click the 'SAVE' button to write the settings to the GridTime 3000.

9.5.6.2 Listening Server

This section describes how to provision a listening NTP server.

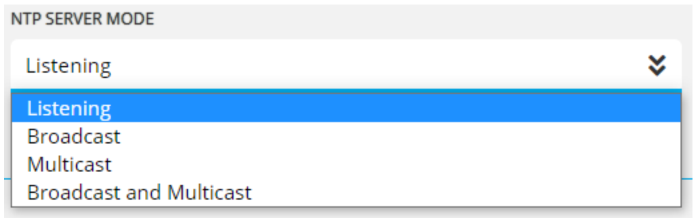
1. **Select NTP Server for the NTP Port Mode**

   Select 'NTP Server' from the 'NTP PORT MODE' dropdown.



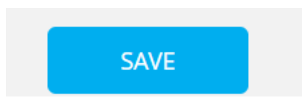
2. **Select Listening Server for the NTP Server Mode**

   Select 'Listening' from the 'NTP SERVER MODE' dropdown.



3. Ensure that the port's IP address is in the same subnet as the NTP clients that will be making NTP requests to the server.
4. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



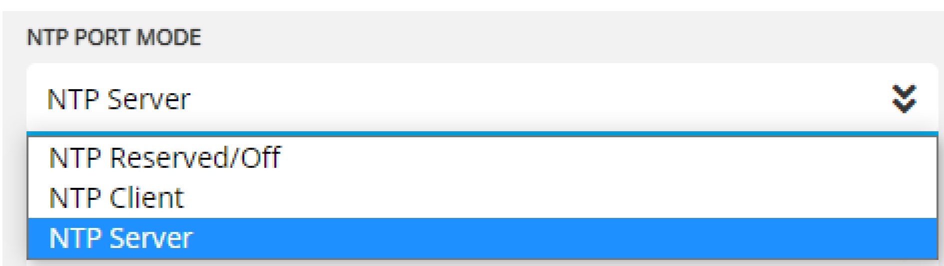
   A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.6.3 Broadcast Server

This section describes how to provision a broadcast NTP Server

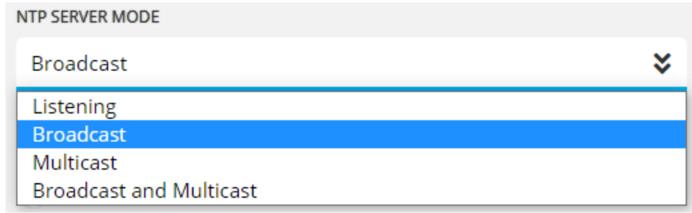
1. **Select NTP Server for the NTP Port Mode**

   Select 'NTP Server' from the 'NTP PORT MODE' dropdown.



2. **Select Broadcast for the NTP Server Mode**

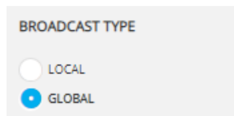
   Select 'Broadcast' from the 'NTP SERVER MODE' dropdown.



3. **Local or Global Broadcasts**

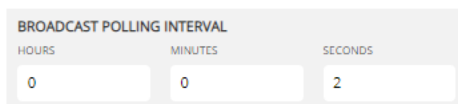
   Choose whether broadcasts will be local or global from the 'BROADCAST TYPE' radio buttons. The setting changes between using the global broadcast address or a local broadcast address. The global broadcast address is 255.255.255.255, while the local broadcast address depends on the network settings. For example, if the port's IP is 192.168.1.1 and the netmask is 255.255.255.0, then the local broadcast address will be 192.168.1.255.

   By default, the broadcast type is set to 'GLOBAL'.



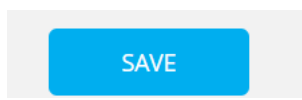
4. **Enter Broadcast Interval**

   Enter the broadcast interval into the 'BROADCAST POLLING INTERVAL' timeboxes. This setting determines how frequently the port will send broadcast NTP messages into the network. The supported interval range is 0-24 hours, the default setting is 2 seconds.



5. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



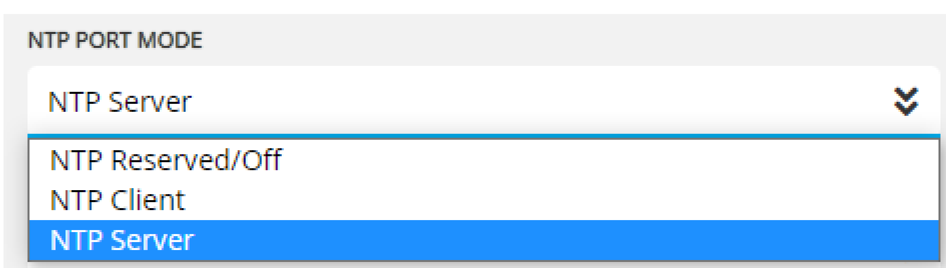
A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.6.4 Multicast Server

This section describes how to provision a multicast NTP server.

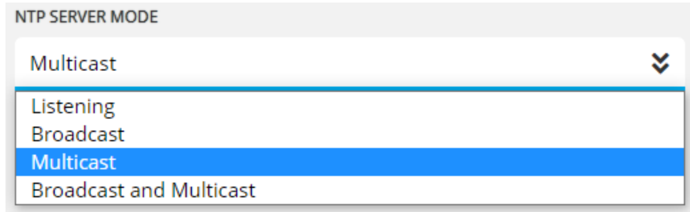
1. **Select NTP Server for NTP Port Mode**

   Select 'NTP Server' from the 'NTP PORT MODE' dropdown.



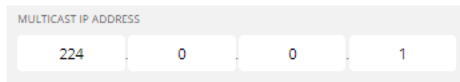
2. **Select Multicast Server for NTP Server Mode**

Select 'Multicast' from the 'NTP SERVER MODE' dropdown.



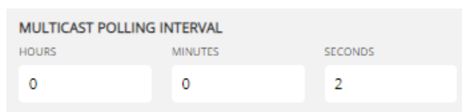
3. **Enter Multicast IP Address**

   Enter the IP Address for the port to send multicasts NTP messages to. If the entered address is within the reserved multicast address range (224.0.0.0–239.255.255.255), the message will also use a multicast destination MAC address, otherwise it will use the broadcast MAC address.



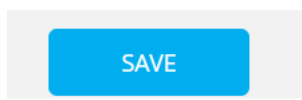
4. **Enter Multicast Interval**

   Enter the broadcast interval into the 'MULTICAST POLLING INTERVAL' timeboxes. This setting determines how frequently the port will send multicast NTP messages into the network. The supported interval range is 0-24 hours, the default setting is 2 seconds.



5. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



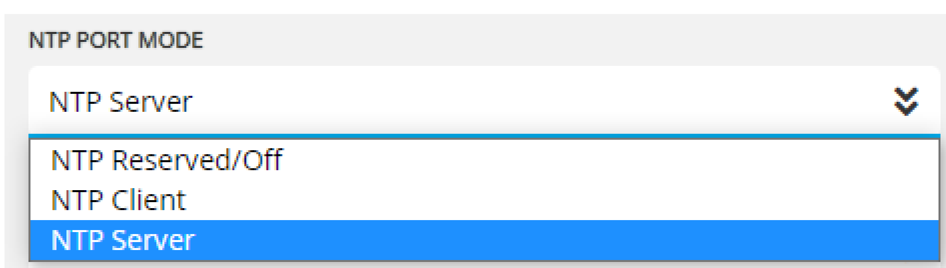
   A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.6.5 Broadcast and Multicast Server

This section describes how to provision a broadcast and multicast NTP server.

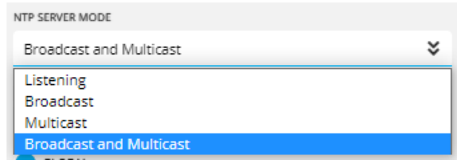
1. **Select NTP Server for NTP Port Mode**

   Select 'NTP Server' from the 'NTP PORT MODE' dropdown.



2. **Select Broadcast and Multicast Server for NTP Server Mode**

   Select 'Broadcast and Multicast' from the 'NTP SERVER MODE' dropdown.

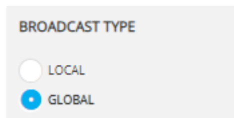


This will reveal additional SNTP client related settings.

3. **Local or Global Broadcasts**

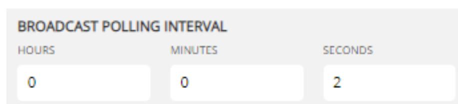
   Choose whether broadcasts will be local or global from the 'BROADCAST TYPE' radio buttons. The setting changes between using the global broadcast address or a local broadcast address. The global broadcast address is 255.255.255.255, while the local broadcast address depends on the network settings. For example, if the port's IP address is 192.168.1.1 and the netmask is 255.255.255.0, then the local broadcast address will be 192.168.1.255.

   By default, the broadcast type is set to 'GLOBAL'.



4. **Enter Broadcast Interval**

   Enter the broadcast interval into the 'BROADCAST POLLING INTERVAL' timeboxes. This setting determines how frequently the port will send broadcast NTP messages into the network. The supported interval range is 0-24 hours, the default setting is 2 seconds.

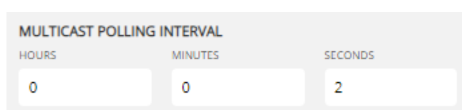


5. **Enter Multicast IP Address**

   Enter the IP Address for port to send multicasts NTP messages to. If the entered address is within the reserved multicast address range (224.0.0.0–239.255.255.255), the message will also use a multicast destination MAC address, otherwise it will use the broadcast MAC address.

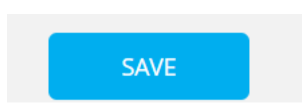
6. **Enter Multicast Interval**

   Enter the broadcast interval into the 'MULTICAST POLLING INTERVAL' timeboxes. This setting determines how frequently the port will send multicast NTP messages into the network. The supported interval range is 0-24 hours, the default setting is 2 seconds.



7. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

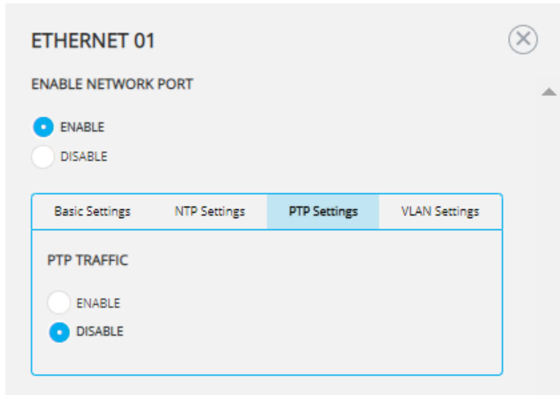
9.5.7 Provisioning PTP

This section describes how to provision PTP on the GridTime 3000.

Note: Both an NTP server/client and PTP server/client can be simultaneously set up on a GridTime 3000 Ethernet Port.

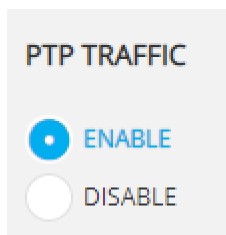
1. **Navigate to PTP Sub Tab**

   Navigate the PTP sub tab by clicking on the 'PTP Settings' Tab in the port's configuration window.



2. **Enable PTP Traffic**

   Select 'ENABLE' on the PTP Traffic radio buttons.



   This will reveal the PTP settings for the port.

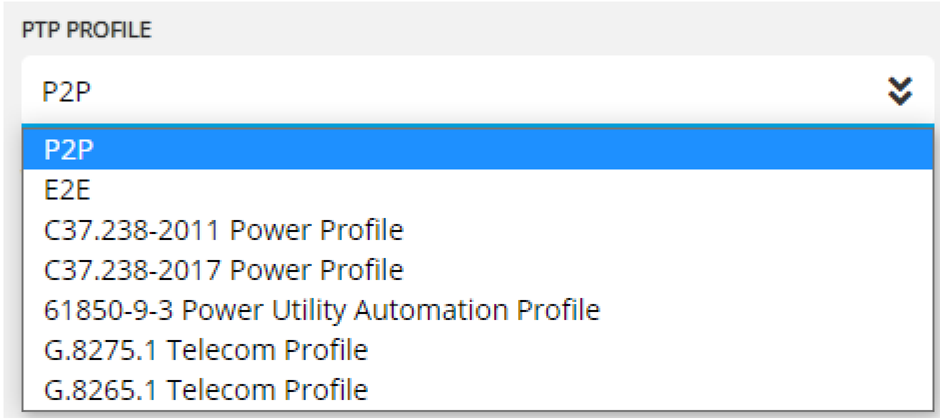
3. Follow the instructions in one of the following sections for guidance on provisioning each PTP profile:
   - 9.5.7.1. Peer to Peer Default Profile
   - 9.5.7.2. End to End Default Profile
   - 9.5.7.3. C37.238-2011 Power Profile
   - 9.5.7.4. C37.238-2017 Power Profile
   - 9.5.7.5. 61850-9-3 Power Utility Profile
   - 9.5.7.6. G.8275.1 Telecom Profile
   - 9.5.7.7. G.8265.1 Telecom Profile

9.5.7.1 Peer to Peer Default Profile

This section describes how to provision a GridTime 3000 with the Peer to Peer Default Profile.

1. **Select Peer to Peer Default Profile**

   Select 'P2P' from the 'PTP PROFILE' dropdown.



2. Follow the instructions in one of the following sections depending on your desired PTP Clock Mode:
   – 9.5.7.1.1. Peer to Peer Default Profile Auto Mode
   – 9.5.7.1.2. Peer to Peer Default Profile Server Only Mode
   – 9.5.7.1.3. Peer to Peer Default Profile Client Only Mode

PTP Clock Mode Descriptions

Auto mode allows the port to operate either in the server or client state depending on whether the GridTime 3000 is in sync or not. When the GridTime 3000 is in sync or in holdover, the port will be in the server or passive server state, when the GridTime 3000 is out of sync the port will be in the client state unless it is the only time server on the network.

In server only mode, the port will always either be in the server or passive server state depending on whether it has won the Best Master Clock Algorithm (BMCA) or not.

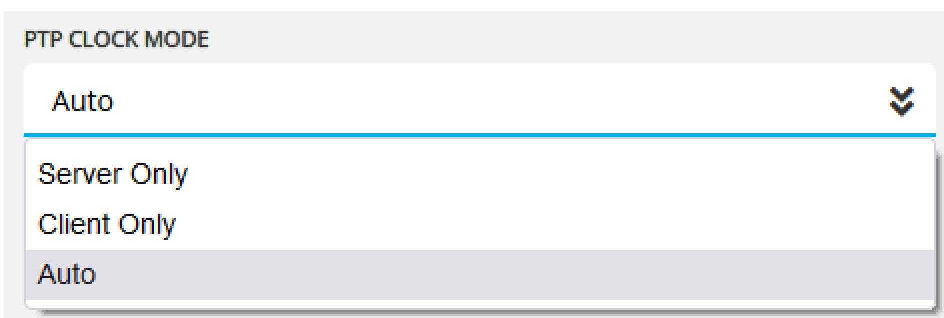
In client only mode, the port will always be in the client or listening state depending on whether or not there is a PTP server available to sync to.

9.5.7.1.1 Peer to Peer Default Profile Auto Mode

This section describes how to provision a PTP Peer to Peer Default Profile Auto Mode Clock.

1. **Select Auto for PTP Clock Mode**

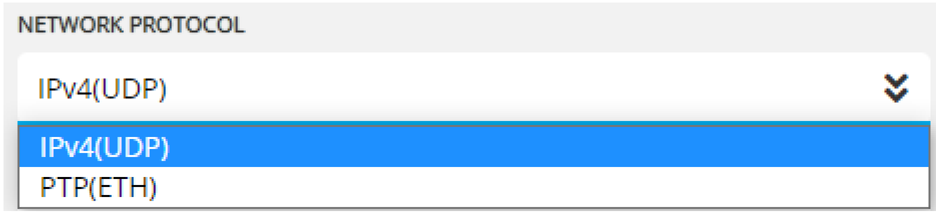
   Select 'Auto' from the 'PTP CLOCK MODE' dropdown.



2. **Select Network Protocol**

   Select the network protocol PTP will operate on using the 'NETWORK PROTOCOL' dropdown.

   The Network protocol should be consistent across the network subnet. The supported options are IPv4 (layer 4) and PTP over Ethernet (layer 2). By default, the network protocol is set to IPv4.

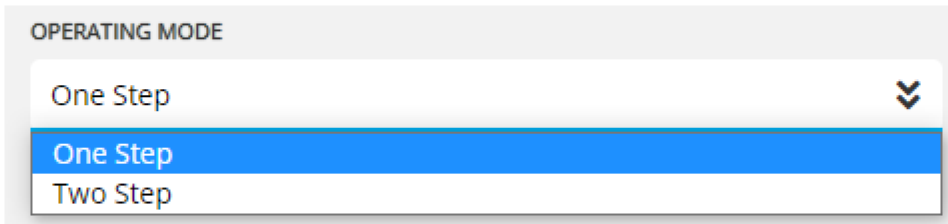


Note: IPv4 is the most common PTP Network Protocol.

3. **Select Operating Mode**

   Select the operating mode for the PTP network from the 'OPERATING MODE' dropdown.

   Operating mode is a network wide parameter. The configurable options are 'One Step' or 'Two Step'.



Note: Select Two Step operation if the Operating Mode is unknown.

4. **Delay Mechanism**

   By default the 'DELAY MECHANISM' will be set to P2P, which will set the delay mechanism to peer to peer as defined in IEEE 1588v2-2008.

5. **Configure Priority 1 and Priority 2 Fields**

   Modify the 'PRIORITY #1' and 'PRIORITY #2' fields if required, otherwise it is recommended that these are left as their default values.

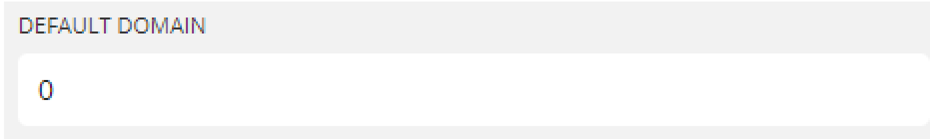
   These parameters modify the automatic selection of server clocks in PTP networks. Lower values mean that the unit will be preferred against other server capable clocks during the selection process. The priority 1 value is used to manually select which server capable clock will become the grandmaster and will be used in preference over other selection criteria including clock accuracy, so should be modified very carefully. The priority 2 value is treated as the least important criteria, providing greater selection control between otherwise-equal clocks

   For both priority fields, the input range is 0 to 255, where 0 is the highest priority. The default setting is 128.

6. **Configure Default Domain**

   Modify the 'DEFAULT DOMAIN' number if required, otherwise it is recommended that it is left as its default value of '0'.

   A domain consists of one or more PTP devices communicating with each other. By default, PTP aware devices are configured with domain '0'. Changing the domain will cause only devices with the specified domain to communicate using the PTP protocol. The input range is 0 to 127.



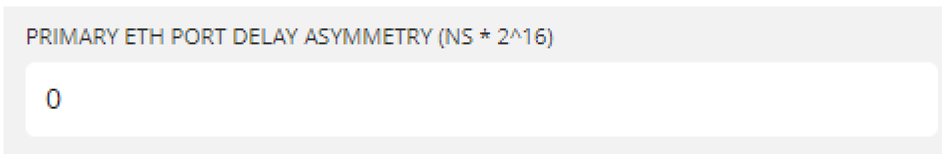
7. **Configure Delay Asymmetry**

   Modify the 'PRIMARY ETH PORT DELAY ASYMMETRY' setting if the delay asymmetry in the network link is known, otherwise it is recommended that the setting is left as its default value of '0'.

   PTP automatically calculates the propagation delay between a server and client, but this calculation assumes the delay in each direction of transmission is the same. PTP cannot measure and compensate for delay asymmetry, which means that the presence of delay asymmetry reduces the PTP time accuracy.

   Delay asymmetry is calculated by the server to client path delay minus the client to server path delay. A client uses the delay asymmetry value to compensate for the error caused by delay in asymmetry in the PTP delay calculation mechanism.

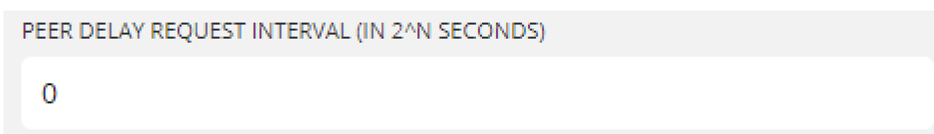
   If the delay asymmetry is known, entering it manually will allow it to be compensated for, and improve time accuracy. The input range is 3.2768e+14 ns×$2^{\wedge 16}$ to −3.2768e+14 ns×$2^{\wedge 16}$ (-5 to 5 seconds).



8. **Configure Peer Delay Request Interval**

   The Peer Delay Request interval specifies the time interval between successive Peer Delay Request messages being sent to other PTP devices on the network. This option only appears when a profile that uses the Peer-to-Peer delay mechanism is selected.

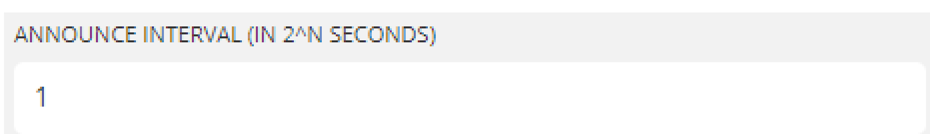
   By default this is set to 0 in $2^{\wedge n}$ seconds, or 1 second. The supported range is 0-5 in $2^{\wedge n}$ seconds, or 1-32 seconds.



9. **Configure Announce Interval**

   The Announce interval specifies the time interval between successive Announce messages being sent to other PTP devices on the network.

   By default this is set to 1 in $2^{\wedge n}$ seconds, or 2 seconds. The supported range is 0-4 in $2^{\wedge n}$ seconds, or 1-16 seconds.



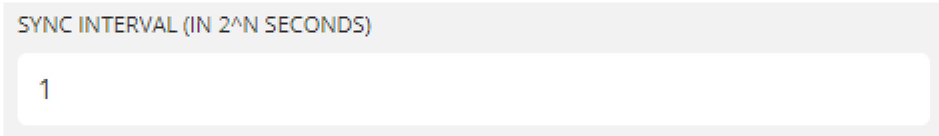
10. **Announce Receipt Timeout**

    By default the 'ANNOUNCE RECEIPT TIMEOUT' is set to 3. This means that after 3 announce intervals, if the device has not recieved an announce message it will trigger an announce receipt timeout event, which will move the port into a listening state.

11. **Configure Sync Interval**

    The Sync interval specifies the time interval between successive Sync messages being sent to other PTP devices on the network. This option only appears when a the PTP clock is server capable.

By default this is set to 1 in $2^{\wedge n}$ seconds, or 2 seconds. The supported range is -1 to 1 in $2^{\wedge n}$ seconds, or 0.5 to 2 seconds.

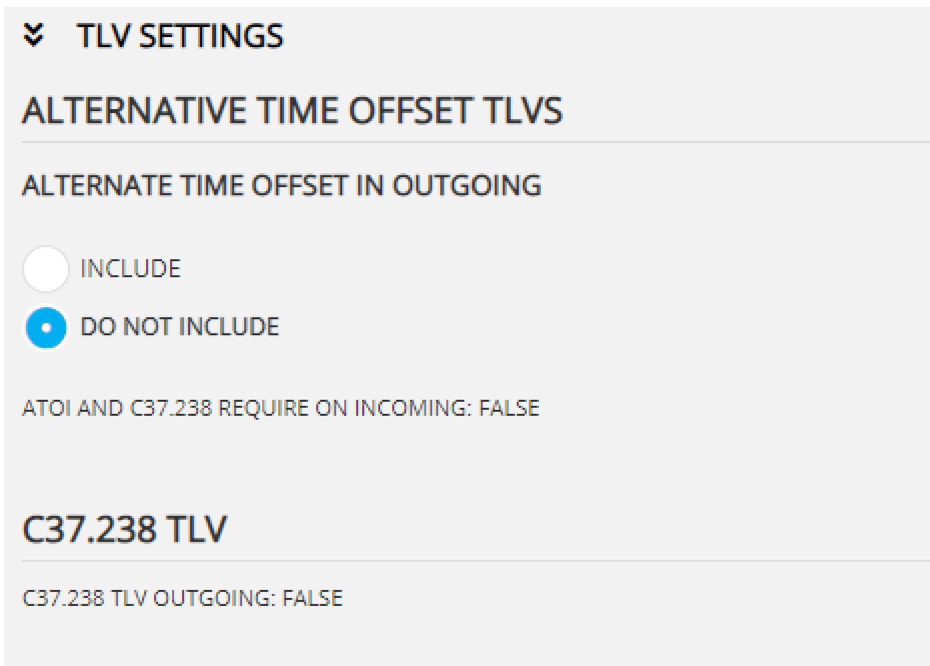


12. **BMCA**

    By default, 'BMCA' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008
13. **Clock Class Rules**

    By default, 'CLOCK CLASS RULES' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008
14. **Configure TLV Settings > Alternate Time Offset In Outgoing**

    In the End to End Default and Peer to Peer Default profiles there is the option to either include or exclude Alternative Time Offset TLVs (ATOI TLVs) in outgoing PTP messages by using the 'ALTERNATE TIME OFFSET IN OUTGOING' setting.

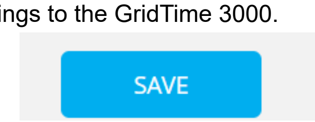


15. **TLV Settings > ATOI and C37.238 Require on incoming**

    By default, the 'ATOI AND C37.238 REQUIRE ON INCOMING' setting is set to false.
16. **TLV Settings > C37.238 TLV Outgoing**

    By default, the 'C37.238 TLV OUTGOING' is set to false, preventing the C37.238 TLV from being sent on outgoing packets.
17. **Save Settings**

    Click the 'SAVE' button to write the settings to the GridTime 3000.



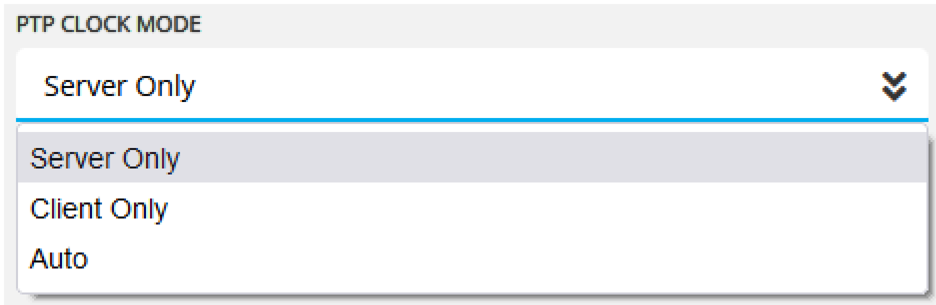
A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.7.1.2 Peer to Peer Default Profile Server Only Mode

This section describes how to provision a PTP Peer to Peer Default Profile Server Only Mode Clock.

1. **Select Server Only for PTP Clock Mode**

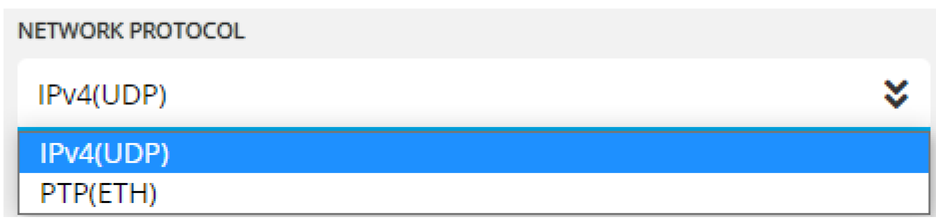
   Select 'Server Only' from the 'PTP CLOCK MODE' dropdown.



2. **Select Network Protocol**

   Select the network protocol PTP will operate on using the 'NETWORK PROTOCOL' dropdown.

   The Network protocol should be consistent across the network subnet. The supported options are IPv4 (layer 4) and PTP over Ethernet (layer 2). By default the network protocol is set to IPv4.

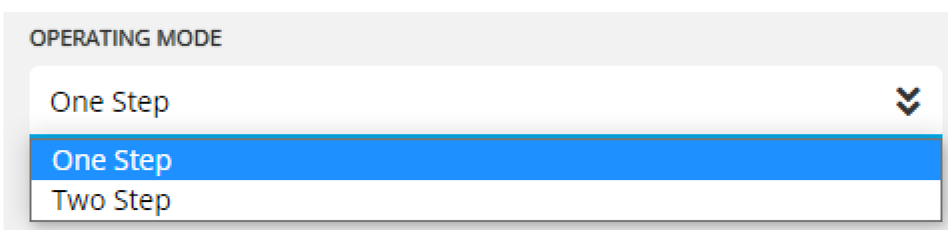


   Note: IPv4 is the most common PTP Network Protocol.

3. **Select Operating Mode**

   Select the operating mode for the PTP network from the 'OPERATING MODE' dropdown.

   Operating mode is a network wide parameter. The configurable options are 'One Step' or 'Two Step'.



   Note: Select Two Step operation if the Operating Mode is unknown.

4. **Delay Mechanism**

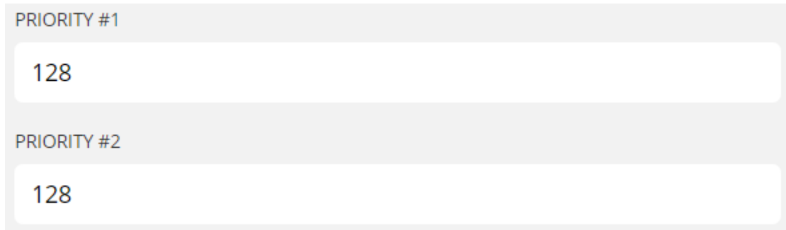
   By default the 'DELAY MECHANISM' will be set to P2P, which will set the delay mechanism to peer to peer as defined in IEEE 1588v2-2008.

5. **Configure Priority 1 and Priority 2 Fields**

   Modify the 'PRIORITY #1' and 'PRIORITY #2' fields if required, otherwise it is recommended that these are left as their default values.

   These parameters modify the automatic selection of server clocks in PTP networks. Lower values mean that the unit will be preferred against other server capable clocks during the selection process. The priority 1 value is used to manually select which server capable clock will become the grandmaster and will be used in preference over other selection criteria including clock accuracy , so should be modified very carefully. The priority 2 value is treated as the least important criteria, providing greater selection control between otherwise-equal clocks.

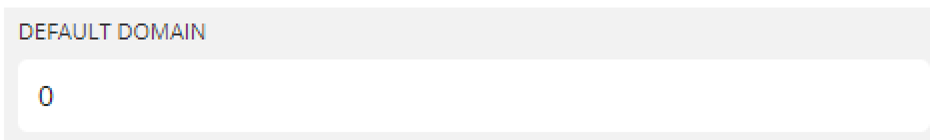
For both priority fields, the input range is 0 to 255, where 0 is the highest priority. The default setting is 128.



6. **Configure Default Domain**

   Modify the 'DEFAULT DOMAIN' number if required, otherwise it is recommended that it is left as its default value of '0'.

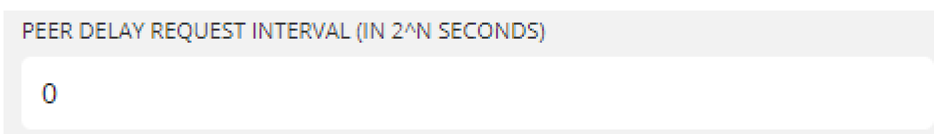
   A domain consists of one or more PTP devices communicating with each other. By default, PTP aware devices are configured with domain '0'. Changing the domain will cause only devices with the specified domain to communicate using the PTP protocol. The input range is 0 to 127.



7. **Configure Peer Delay Request Interval**

   The Peer Delay Request interval specifies the time interval between successive Peer Delay Request messages being sent to other PTP devices on the network. This option only appears when a profile that uses the Peer-to-Peer delay mechanism is selected.

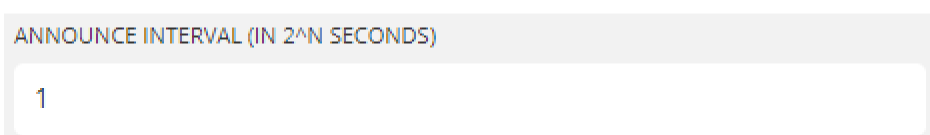
   By default this is set to 0 in $2^{\wedge n}$ seconds, or 1 second. The supported range is 0-5 in $2^{\wedge n}$ seconds, or 1-32 seconds.



8. **Configure Announce Interval**

   The 'ANNOUNCE INTERVAL' specifies the time interval between successive Announce messages being sent to other PTP devices on the network.

   By default this is set to 1 in $2^{\wedge n}$ seconds, or 2 seconds. The supported range is 0-4 in $2^{\wedge n}$ seconds, or 1-16 seconds.

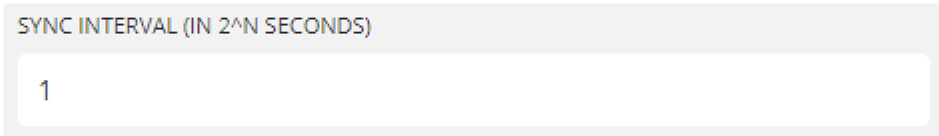


9. **Announce Receipt Timeout**

   By default the 'ANNOUNCE RECEIPT TIMEOUT' is set to 3. This means that after 3 announce intervals, if the device has not recieved an announce message it will trigger an announce receipt timeout event, which will move the port into a listening state.
10. **Configure Sync Interval**

The Sync interval specifies the time interval between successive Sync messages being sent to other PTP devices on the network. This option only appears when the PTP clock is server capable (When clock mode is set to auto or server only).

By default this is set to 1 in $2^{\wedge n}$ seconds, or 2 seconds. The supported range is -1 to 1 in $2^{\wedge n}$ seconds, or 0.5 to 2 seconds.



11. **BMCA**

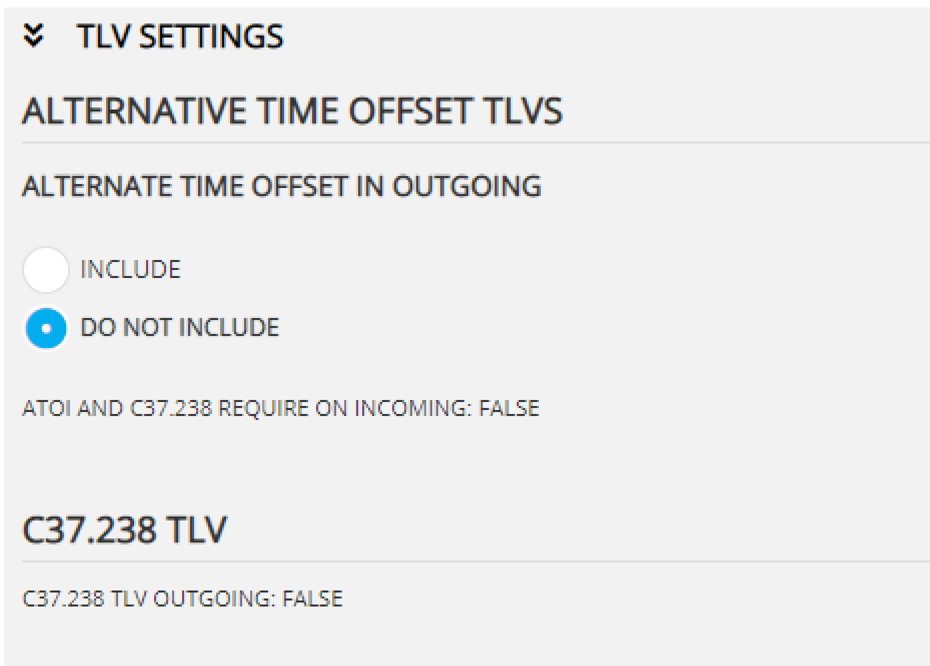
    By default, the 'BMCA' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008

12. **Clock Class Rules**

    By default, the 'CLOCK CLASS RULES' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008

13. **Configure TLV Settings > Alternate Time Offset In Outgoing**

    In the End to End Default and Peer to Peer Default profiles there is the option to either include or exclude Alternative Time Offset TLVs (ATOI TLVs) in outgoing PTP messages by using the 'ALTERNATE TIME OFFSET IN OUTGOING' setting.



14. **TLV Settings> ATOI and C37.238 Require on incoming**

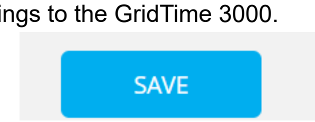
    By default, the 'ATOI AND C37.238 REQUIRE ON INCOMING' setting is set to false.

15. **TLV Settings> C37.238 TLV Outgoing**

    By default, the 'C37.238 TLV OUTGOING' is set to false, preventing the C37.238 TLV from being sent on outgoing packets.

16. **Save Settings**

    Click the 'SAVE' button to write the settings to the GridTime 3000.



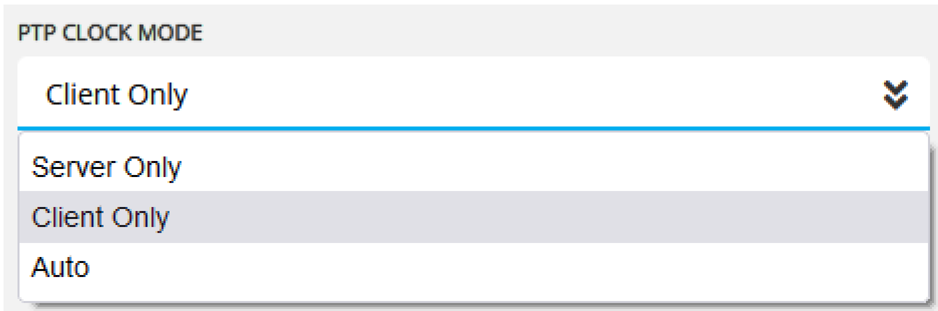
A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.7.1.3 Peer to Peer Default Profile Client Only Mode

This section describes how to provision a PTP Peer to Peer Default Profile Client Only Mode Clock.

1. **Select Client Only for PTP Clock Mode**

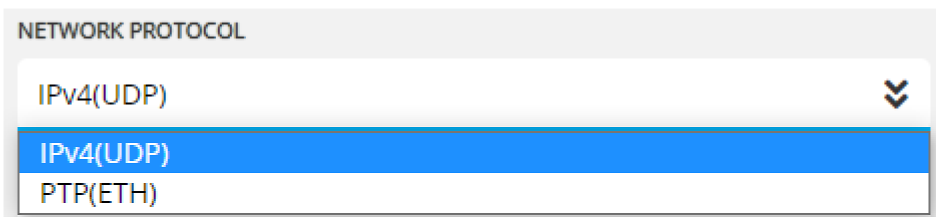
   Select 'Client Only' from the 'PTP CLOCK MODE' dropdown.



2. **Select Network Protocol**

   Select the network protocol PTP will operate on using the 'NETWORK PROTOCOL' dropdown.

   The Network protocol should be consistent across the network subnet. The supported options are IPv4 (layer 4) and PTP over Ethernet (layer 2). By default the network protocol is set to IPv4.

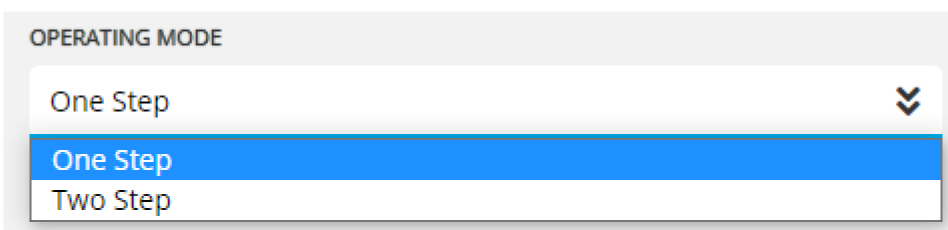


   Note: IPv4 is the most common PTP Network Protocol.

3. **Select Operating Mode**

   Select the operating mode for the PTP network from the 'OPERATING MODE' dropdown.

   Operating mode is a network wide parameter. The configurable options are 'One Step' or 'Two Step'.



   Note: Select Two Step operation if the Operating Mode is unknown.

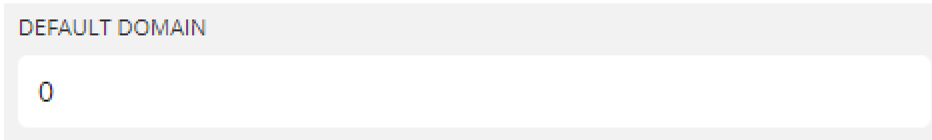
4. **Delay Mechanism**

   By default the 'DELAY MECHANISM' will be set to P2P, which will set the delay mechanism to peer to peer as defined in IEEE 1588v2-2008.

5. **Configure Default Domain**

   Modify the 'DEFAULT DOMAIN' number if required, otherwise it is recommended that it is left as its default value of '0'.

A domain consists of one or more PTP devices communicating with each other. By default, PTP aware devices are configured with domain '0'. Changing the domain will cause only devices with the specified domain to communicate using the PTP protocol. The input range is 0 to 127.



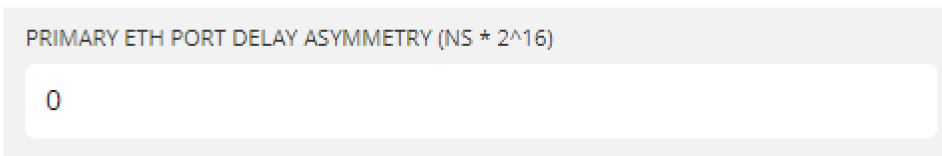
6. **Configure Delay Asymmetry**

   Modify the 'PRIMARY ETH PORT DELAY ASYMMETRY ' setting if the delay asymmetry in the network link is known, otherwise it is recommended that the setting is left as its default value of '0'.

   PTP automatically calculates the propagation delay between a server and client, but this calculation assumes the delay in each direction of transmission is the same. PTP cannot measure and compensate for delay asymmetry, which means that the presence of delay asymmetry reduces PTP time accuracy.

   Delay asymmetry is a calculation consisting of the server to client path delay minus the client to server path delay. A client uses the delay asymmetry value to compensate for the error caused by asymmetry delay in the PTP delay calculation mechanism.

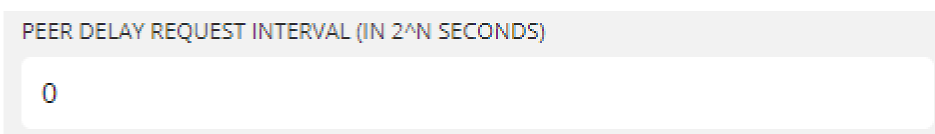
   If the delay asymmetry is known, entering it manually will allow it to be compensated for, and improve time accuracy. The input range is 3.2768e+14 ns×$2^{\wedge 16}$ to −3.2768e+14 ns×$2^{\wedge 16}$ (-5 to 5 seconds).



7. **Configure Peer Delay Request Interval**

   The Peer Delay Request interval specifies the time interval between successive Peer Delay Request messages being sent to other PTP devices on the network. This option only appears when a profile that uses the Peer-to-Peer delay mechanism is selected.

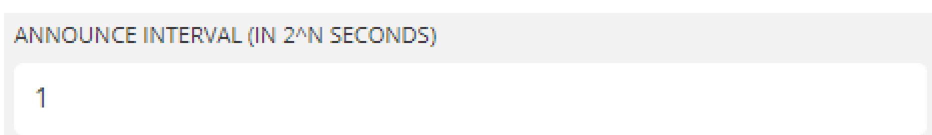
   By default this is set to 0 in $2^{\wedge n}$ seconds, or 1 second. The supported range is 0-5 in $2^{\wedge n}$ seconds, or 1-32 seconds.



8. **Configure Announce Interval**

   The ANNOUNCE INTERVAL specifies the time interval between successive Announce messages being sent to other PTP devices on the network.

   By default this is set to 1 in $2^{\wedge n}$ seconds, or 2 seconds. The supported range is 0-4 in $2^{\wedge n}$ seconds, or 1-16 seconds.



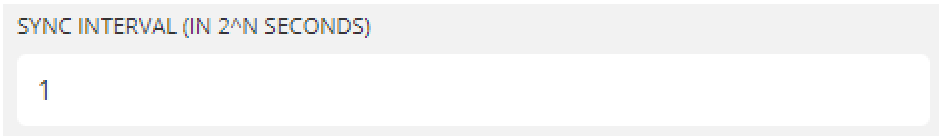
9. **Announce Receipt Timeout**

   By default the 'ANNOUNCE RECEIPT TIMEOUT' is set to 3. This means that after 3 announce intervals, if the device has not recieved an announce message it will trigger an announce receipt timeout event, which will move the port into a listening state.

10. **Configure Sync Interval**

The 'SYNC INTERVAL' specifies the time interval between successive Sync messages being sent to other PTP devices on the network. This option only appears when the PTP clock is server capable.

By default this is set to 1 in $2^{\wedge n}$ seconds, or 2 seconds. The supported range is -1 to 1 in $2^{\wedge n}$ seconds, or 0.5 to 2 seconds.



11. **BMCA**

    By default, the 'BMCA' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008

12. **Clock Class Rules**

    By default, the 'CLOCK CLASS RULES' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008

13. **TLV Settings > Alternate Time Offset in Outgoing**

    By default the 'ALTERNATE TIME OFFSET IN OUTGOING' is set to false, preventing the ATOI TLV from being sent on outgoing packets.

14. **TLV Settings > ATOI and C37.238 Require on Incoming**

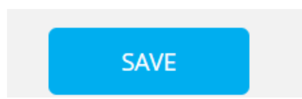
    By default, the 'ATOI AND C37.238 REQUIRE ON INCOMING' setting is set to false.

15. **TLV Settings > C37.238 TLV Outgoing**

    By default, the 'C37.238 TLV OUTGOING' is set to false, preventing the C37.238 TLV from being sent on outgoing packets.

16. **Save Settings**

    Click the 'SAVE' button to write the settings to the GridTime 3000.



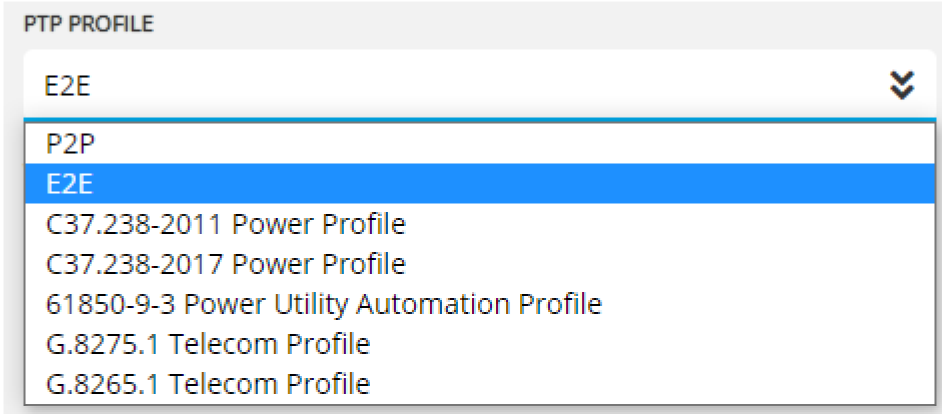
A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.7.2 End to End Default Profile

This section describes how to provision a GridTime 3000 with the End to End Default Profile.

1. **Select End to End Default Profile**

   Select 'E2E' from the 'PTP PROFILE' dropdown.



2. Follow the instructions in one of the following sections depending on your desired PTP Clock Mode:
   – 9.5.7.2.1. End to End Default Profile Auto Mode
   – 9.5.7.2.2. End to End Default Profile Server Only Mode
   – 9.5.7.2.3. End to End Default Profile Client Only Mode

PTP Clock Mode Descriptions

Auto mode allows the port to operate either in the server or client state depending on whether the GridTime 3000 is in sync or not. When the GridTime 3000 is in sync or in holdover, the port will be in the server or passive server state, when the GridTime 3000 is out of sync the port will be in the client state.

In server only mode, the port will always either be in the server or passive server state depending on whether it has won the BMCA .

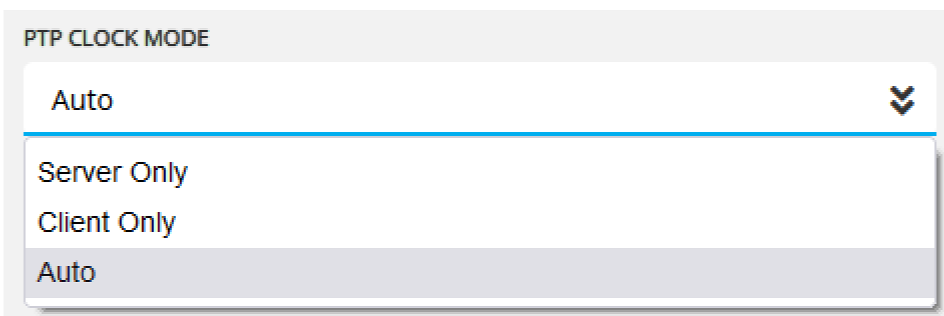
In client only mode, the port will always be in the client or listening state depending on whether there is a PTP server available to sync to.

9.5.7.2.1 End to End Default Profile Auto Mode

This section describes how to provision a PTP End to End Default Profile Auto Mode Clock.

1. **Select Auto for PTP Clock Mode**

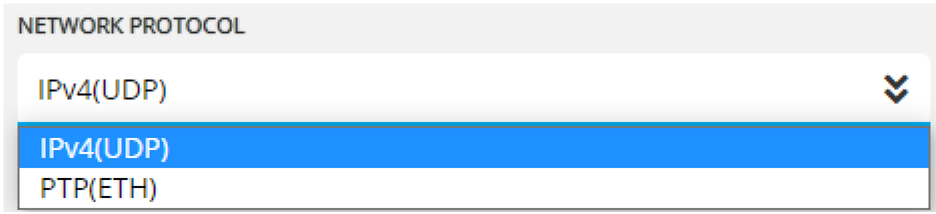
   Select 'Auto' from the 'PTP CLOCK MODE' dropdown.



2. **Select Network Protocol**

   Select the network protocol PTP will operate on using the 'NETWORK PROTOCOL' dropdown.

   The Network protocol should be consistent across the network subnet. The supported options are IPv4 (layer 4) and PTP over Ethernet (layer 2). By default the network protocol is set to IPv4 (UDP).

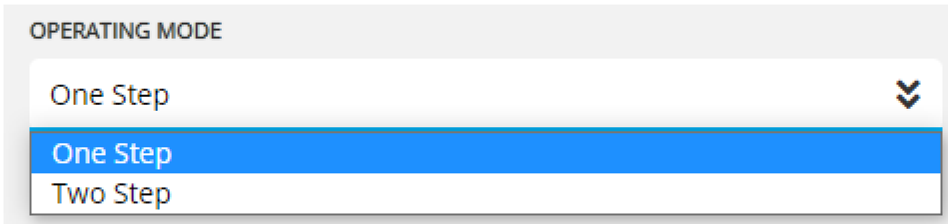


Note: IPv4 is the most common PTP Network Protocol.

3. **Select Operating Mode**

   Select the operating mode for the PTP network from the 'OPERATING MODE' dropdown.

   Operating mode is a network wide parameter. The configurable options are 'One Step' or 'Two Step'.



Note: Select Two Step operation if the Operating Mode is unknown.

4. **Delay Mechanism**

   By default the 'DELAY MECHANISM' will be set to E2E, which will set the delay mechanism to end to end as defined in IEEE 1588v2-2008.

5. **Configure Priority 1 and Priority 2 Fields**

   Modify the 'PRIORITY #1' and 'PRIORITY #2' fields if required, otherwise it is recommended that these are left as their default values.

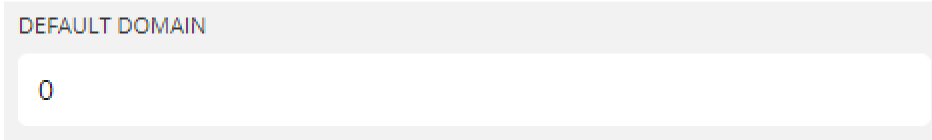
   These parameters modify the automatic selection of server clocks in PTP networks. Lower values mean that the unit will be preferred against other server capable clocks during the selection process. The priority 1 value is used to manually select which server capable clock will become the grandmaster and will be used in preference over other selection criteria including clock accuracy , so should be modified very carefully. The priority 2 value is treated as the least important criteria, providing greater selection control between otherwise-equal clocks

   For both priority fields, the input range is 0 to 255, where 0 is the highest priority. The default setting is 128.

6. **Configure Default Domain**

   Modify the 'DEFAULT DOMAIN' number if required, otherwise it is recommended that it is left as its default value of '0'.

   A domain consists of one or more PTP devices communicating with each other. By default, PTP aware devices are configured with domain '0'. Changing the domain will cause only devices with the specified domain to communicate using the PTP protocol. The input range is 0 to 127.



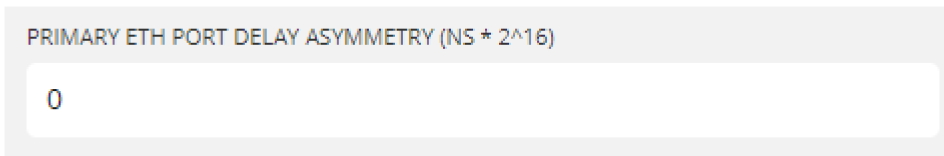
7. **Configure Delay Asymmetry**

   Modify the 'PRIMARY ETH PORT DELAY ASYMMETRY' setting if the delay asymmetry in the network link is known, otherwise it is recommended that the setting is left as its default value of '0'.

   PTP automatically calculates the propagation delay between a server and client, but this calculation assumes the delay in each direction of transmission is the same. PTP cannot measure and compensate for delay asymmetry, which means that the presence of delay asymmetry reduces PTP time accuracy.

   Delay asymmetry is the server to client path delay minus the client to server path delay. A client uses the delay asymmetry value to compensate for the error caused by delay in asymmetry in the PTP delay calculation mechanism.

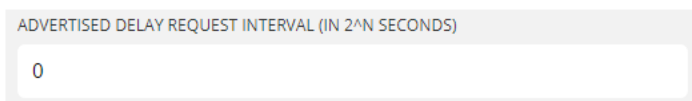
   If the delay asymmetry is known, entering it manually will allow it to be compensated for, and improve time accuracy. The input range is 3.2768e+14 ns×$2^{\wedge 16}$ to −3.2768e+14 ns×$2^{\wedge 16}$ (-5 to 5 seconds).



8. **Configure Advertised Delay Request Interval**

   The 'ADVERTISED DELAY REQUEST INTERVAL' specifies the time interval between successive Delay Request messages being sent to other PTP devices on the network. This option only appears when the End to End Default Profile is selected. This option does not appear when the port is configured as a Forced Client.

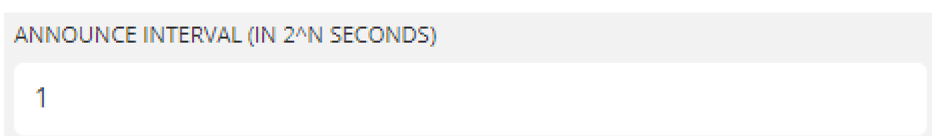
   By default, this is set to 0 in $2^{\wedge n}$ seconds, or 1 second. The supported range is 0-5 in $2^{\wedge n}$ seconds, or 1-32 seconds.



9. **Configure Announce Interval**

   The 'ANNOUNCE INTERVAL' specifies the time interval between successive Announce messages being sent to other PTP devices on the network.

   By default, this is set to 1 in $2^{\wedge n}$ seconds, or 2 seconds. The supported range is 0-4 in $2^{\wedge n}$ seconds, or 1-16 seconds.



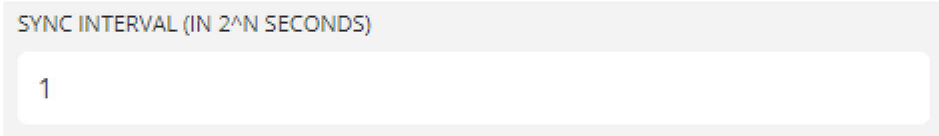
10. **Announce Receipt Timeout**

    By default the 'ANNOUNCE RECEIPT TIMEOUT' is set to 3. This means that after 3 announce intervals, if the device has not recieved an announce message it will trigger an announce receipt timeout event, which will move the port into a listening state.

11. **Configure Sync Interval**

    The 'SYNC INTERVAL' specifies the time interval between successive Sync messages being sent to other PTP devices on the network. This option only appears when a the PTP clock is server capable.

    By default, this is set to 1 in $2^{\wedge n}$ seconds, or 2 seconds. The supported range is -1 to 1 in $2^{\wedge n}$ seconds, or 0.5 to 2 seconds.



12. **BMCA**

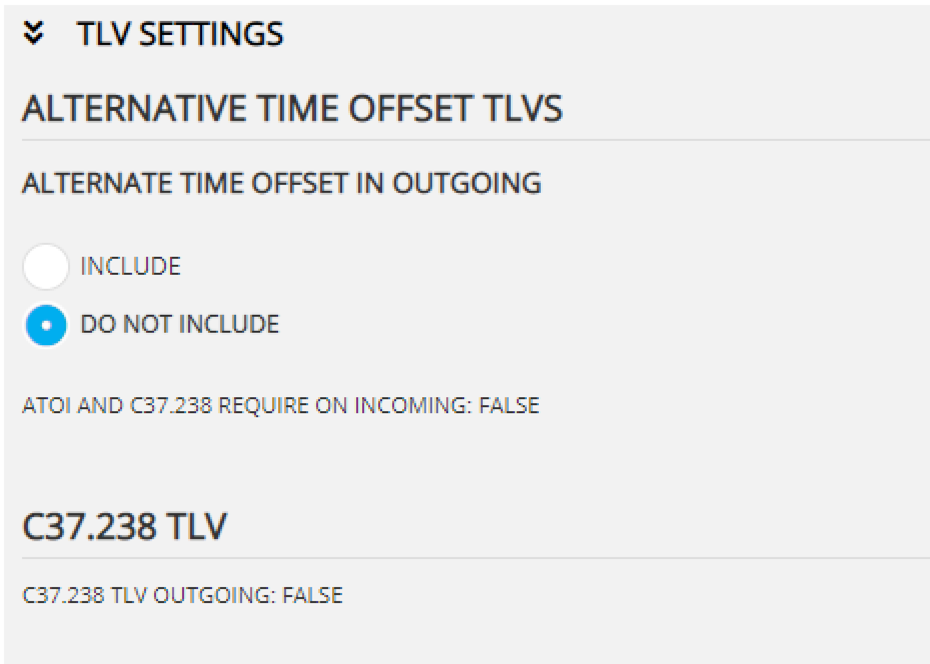
    By default, the 'BMCA' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008

13. **Clock Class Rules**

    By default, the 'CLOCK CLASS RULES' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008

14. **Configure TLV Settings > Alternate Time Offset In Outgoing**

    In the End to End Default and Peer to Peer Default profiles there is the option to either include or exclude Alternative Time Offset TLVs (ATOI TLVs) in outgoing PTP messages.



15. **TLV Settings > ATOI and C37.238 Require on Incoming**

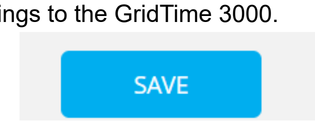
    By default, the 'ATOI AND C37.238 REQUIRE ON INCOMING' setting is set to false.

16. **TLV Settings > C37.238 TLV Outgoing**

    By default, the 'C37.238 TLV OUTGOING' is set to false, preventing the C37.238 TLV from being sent on outgoing packets.

17. **Save Settings**

    Click the 'SAVE' button to write the settings to the GridTime 3000.



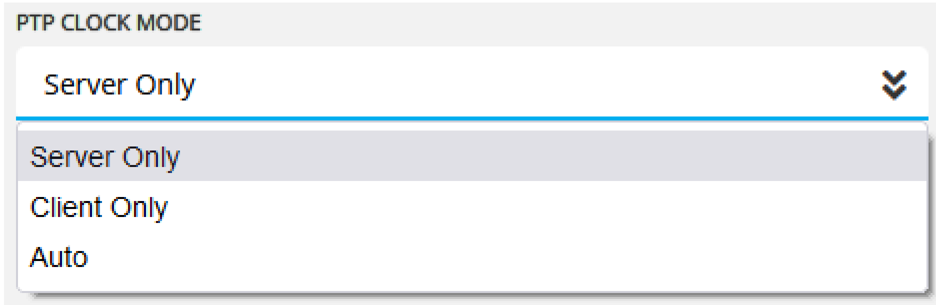
A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.7.2.2 End to End Default Profile Server Only Mode

This section describes how to provision a PTP End to End Default Profile Server Only Mode Clock.

1. **Select Server Only for PTP Clock Mode**

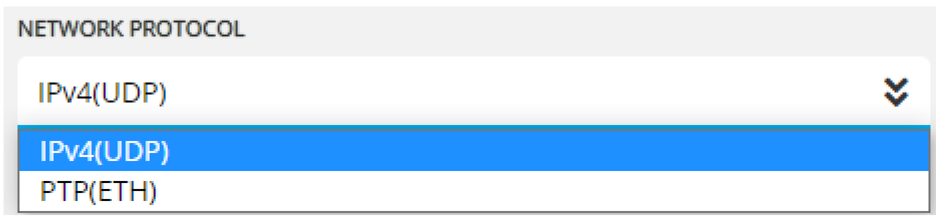
   Select 'Server Only' from the 'PTP CLOCK MODE' dropdown.



2. **Select Network Protocol**

   Select the network protocol PTP will operate on using the 'NETWORK PROTOCOL' dropdown.

   The Network protocol should be consistent across the network subnet. The supported options are IPv4 (layer 4) and PTP over Ethernet (layer 2). By default the network protocol is set to IPv4 (UDP).

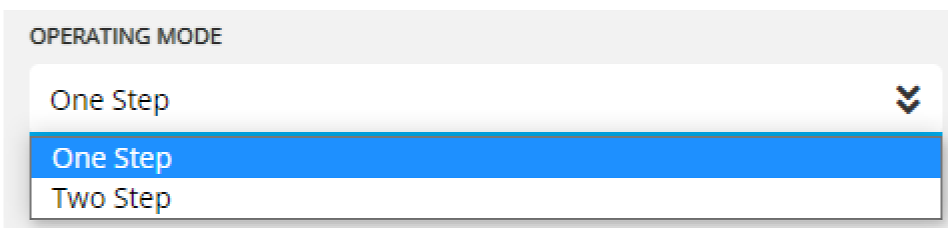


   Note: IPv4 is the most common PTP Network Protocol.

3. **Select Operating Mode**

   Select the operating mode for the PTP network from the 'OPERATING MODE' dropdown.

   Operating mode is a network wide parameter. The configurable options are 'One Step' or 'Two Step'.



   Note: Select Two Step operation if the Operating Mode is unknown.

4. **Delay Mechanism**

   By default the 'DELAY MECHANISM' will be set to E2E, which will set the delay mechanism to end to end as defined in IEEE 1588v2-2008.

5. **Configure Priority 1 and Priority 2 Fields**

   Modify the 'PRIORITY #1' and 'PRORITY #2' fields if required, otherwise it is recommended that these are left as their default values.

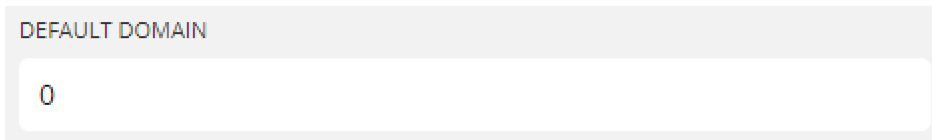
   These parameters modify the automatic selection of server clocks in PTP networks. Lower values mean that the unit will be preferred against other server capable clocks during the selection process. The priority 1 value is used to manually select which server capable clock will become the grandmaster and will be used in preference over other selection criteria including clock accuracy , so should be modified very carefully. The priority 2 value is treated as the least important criteria, providing greater selection control between otherwise-equal clocks

For both priority fields, the input range is 0 to 255, where 0 is the highest priority. The default setting is 128.

6. **Configure Default Domain**

   Modify the 'DEFAULT DOMAIN' field if required, otherwise it is recommended that it is left as its default value of '0'.

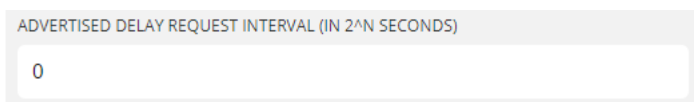
   A domain consists of one or more PTP devices communicating with each other. By default, PTP aware devices are configured with domain '0'. Changing the domain will cause only devices with the specified domain to communicate using the PTP protocol. The input range is 0 to 127.



7. **Configure Advertised Delay Request Interval**

   The 'ADVERTISED DELAY REQUEST INTERVAL' specifies the time interval between successive Delay Request messages being sent to other PTP devices on the network. This option only appears when the End to End Default Profile is selected. This option does not appear when the port is configured as a Forced Client.

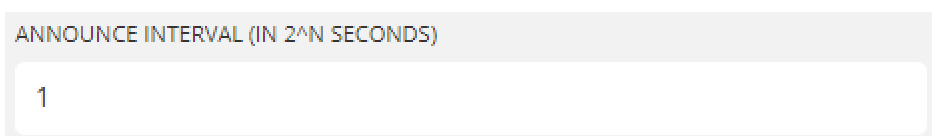
   By default, this is set to 0 in $2^{\wedge n}$ seconds, or 1 second. The supported range is 0-5 in $2^{\wedge n}$ seconds, or 1-32 seconds.



8. **Configure Announce Interval**

   The 'ANNOUNCE INTERVAL' specifies the time interval between successive Announce messages being sent to other PTP devices on the network.

   By default, this is set to 1 in $2^{\wedge n}$ seconds, or 2 seconds. The supported range is 0-4 in $2^{\wedge n}$ seconds, or 1-16 seconds.



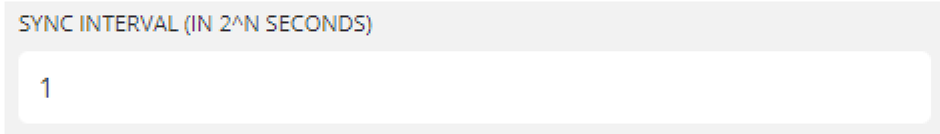
9. **Announce Receipt Timeout**

   By default the 'ANNOUNCE RECEIPT TIMEOUT' is set to 3. This means that after 3 announce intervals, if the device has not recieved an announce message it will trigger an announce receipt timeout event, which will move the port into a listening state.

10. **Configure Sync Interval**

    The 'SYNC INTERVAL' specifies the time interval between successive Sync messages being sent to other PTP devices on the network. This option only appears when a the PTP clock is server capable.

    By default, this is set to 1 in $2^{\wedge n}$ seconds, or 2 seconds. The supported range is -1 to 1 in $2^{\wedge n}$ seconds, or 0.5 to 2 seconds.



11. **BMCA**

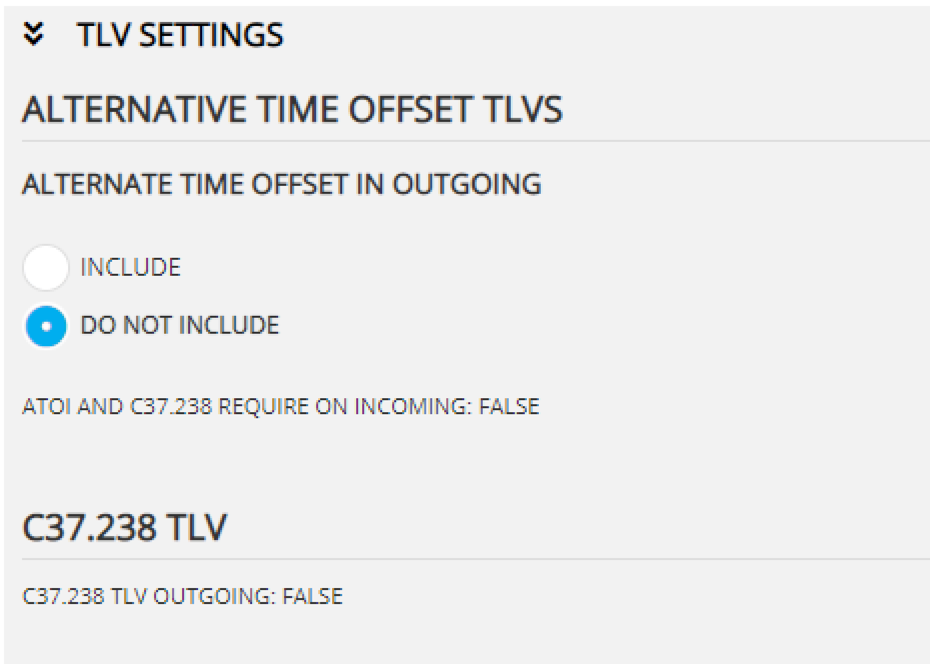
    By default, the 'BMCA' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008

12. **Clock Class Rules**

    By default, the 'CLOCK CLASS RULES' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008

13. **Configure TLV Settings > Alternate time Offset In Outgoing**

    In the End to End Default and Peer to Peer Default profiles there is the option to either include or exclude Alternative Time Offset TLVs (ATOI TLVs) in outgoing PTP messages.



14. **TLV Settings > ATOI and C37.238 Require on Incoming**

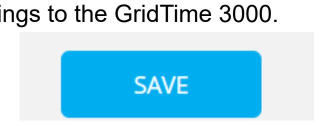
    By default, the 'ATOI AND C37.238 REQUIRE ON INCOMING' setting is set to false.

15. **TLV Settings > C37.238 TLV Outgoing**

    By default, the 'C37.238 TLV OUTGOING' is set to false, preventing the C37.238 TLV from being sent on outgoing packets.

16. **Save Settings**

    Click the 'SAVE' button to write the settings to the GridTime 3000.



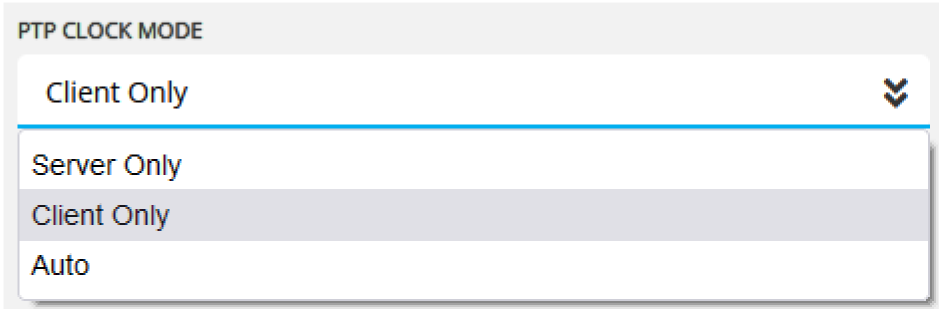
A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.7.2.3 End to End Default Profile Client Only Mode

This section describes how to provision a PTP End to End Default Profile Client Only Mode Clock.

1. **Select Client Only for PTP Clock Mode**

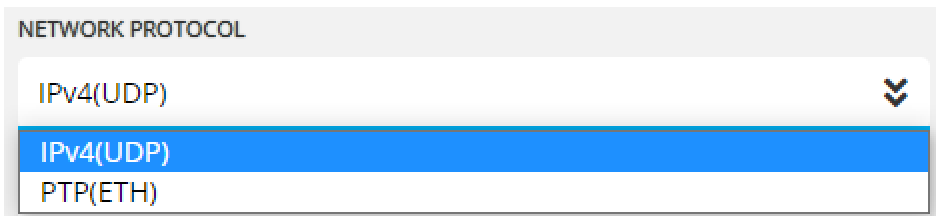
   Select 'Client Only' from the 'PTP CLOCK MODE' dropdown.



2. **Select Network Protocol**

   Select the network protocol PTP will operate on using the 'NETWORK PROTOCOL' dropdown.

   The Network protocol should be consistent across the network subnet. The supported options are IPv4 (layer 4) and PTP over Ethernet (layer 2). By default the network protocol is set to IPv4 (UDP).

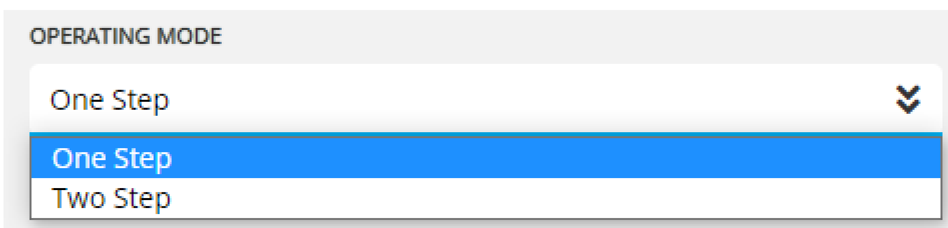


   Note: IPv4 is the most common PTP Network Protocol.

3. By default the 'DELAY MECHANISM' will be set to E2E, which will set the delay mechanism to end to end as defined in IEEE 1588v2-2008.
4. **Select Operating Mode**

   Select the operating mode for the PTP network from the 'OPERATING MODE' dropdown.

   Operating mode is a network wide parameter. The configurable options are 'One Step' or 'Two Step'.



   Note: Select Two Step operation if the Operating Mode is unknown.

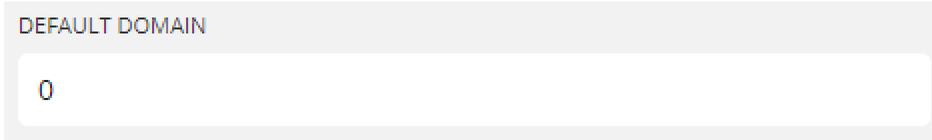
5. **Delay Mechanism**

   By default the 'DELAY MECHANISM' will be set to E2E, which will set the delay mechanism to end to end as defined in IEEE 1588v2-2008.

6. **Configure Default Domain**

   Modify the 'DEFAULT DOMAIN' number if required, otherwise it is recommended that it is left as its default value of '0'.

   A domain consists of one or more PTP devices communicating with each other. By default, PTP aware devices are configured with a domain of '0'. Changing the domain will cause only devices with the specified domain to communicate using the PTP protocol. The input range is 0 to 127.



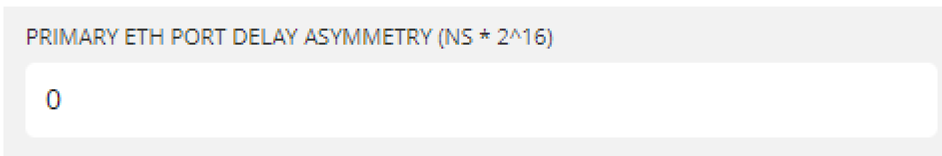
7. **Configure Delay Asymmetry**

   Modify the 'PRIMARY ETH PORT DELAY ASYMMETRY' setting if the delay asymmetry in the network link is known, otherwise it is recommended that the setting is left as its default value of '0'.

   PTP automatically calculates the propagation delay between a server and client, but this calculation assumes the delay in each direction of transmission is the same. PTP cannot measure and compensate for delay asymmetry, which means that the presence of delay asymmetry reduces PTP time accuracy.

   Delay asymmetry is calculated from the server to client path delay minus the client to server path delay. A client uses the delay asymmetry value to compensate for the delay asymmetry error caused in the PTP delay calculation mechanism.

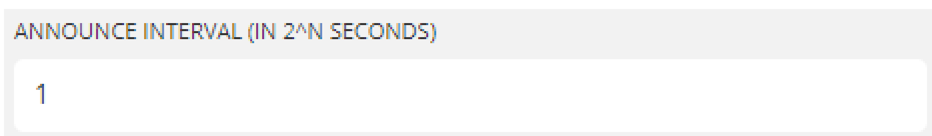
   If the delay asymmetry is known, entering it manually will allow it to be compensated for, and improve time accuracy. The input range is 3.2768e+14 ns×$2^{\wedge 16}$ to −3.2768e+14 ns×$2^{\wedge 16}$ (-5 to 5 seconds).



8. **Configure Announce Interval**

   The 'ANNOUNCE INTERVAL' specifies the time interval between successive Announce messages being sent to other PTP devices on the network.

   By default, this is set to 1 in $2^{\wedge n}$ seconds, or 2 seconds. The supported range is 0-4 in $2^{\wedge n}$ seconds, or 1-16 seconds



9. **Announce Receipt Timeout**

   By default the 'ANNOUNCE RECEIPT TIMEOUT' is set to 3. This means that after 3 announce intervals, if the device has not recieved an announce message it will trigger an announce receipt timeout event, which will move the port into a listening state.

10. **BMCA**

    By default, the 'BMCA' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008

11. **Clock Class Rules**

    By default, the 'CLOCK CLASS RULES' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008

12. **TLV Settings > Alternate Time Offset in Outgoing**

    By default the 'ALTERNATE TIME OFFSET IN OUTGOING' is set to false, preventing the ATOI TLV from being sent on outgoing packets.

13. **TLV Settings > ATOI and C37.238 Require on Incoming**

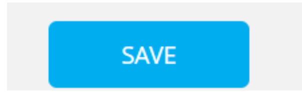
    By default, the 'ATOI AND C37.238 REQUIRE ON INCOMING' setting is set to false.

14. **TLV Settings > C37.238 TLV Outgoing**

    By default, the 'C37.238 TLV OUTGOING' is set to false, preventing the C37.238 TLV from being sent on outgoing packets.

15. **Save Settings**

Click the 'SAVE' button to write the settings to the GridTime 3000.



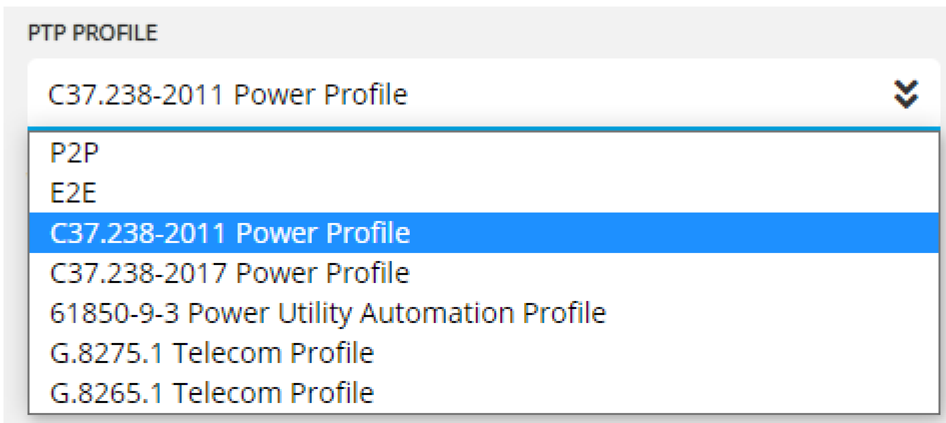
A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.7.3 C37.238-2011 Power Profile

This section describes how to provision a GridTime 3000 with the C37.238-2011 Power Profile.

1. **Select C37.238-2011 Power Profile**

   Select 'C37.238-2011 Power Profile' from the 'PTP PROFILE' dropdown.



2. Follow the instructions in one of the following sections depending on your desired PTP Clock Mode:
   - 9.5.7.3.1. C37.238-2011 Power Profile Auto Mode
   - 9.5.7.3.2. C37.238-2011 Power Profile Server Only Mode
   - 9.5.7.3.3. C37.238-2011 Power Profile Client Only Mode

PTP Clock Mode Descriptions

Auto mode allows the port to operate either in the server or client state depending on whether the GridTime 3000 is synchronized or not. When the GridTime 3000 is in sync or in holdover, the port will be in the server or passive server state, when the GridTime 3000 is out of sync the port will be in the client state.

In server only mode, the port will always either be in the server or passive server state depending on whether it has won the BMCA or not.

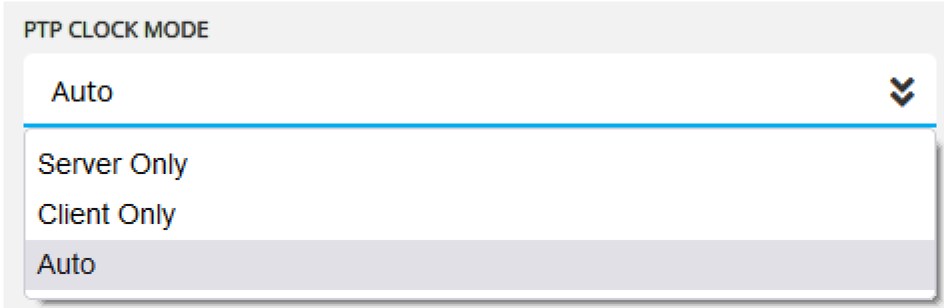
In client only mode, the port will always be in the client or listening state depending on whether there is a PTP server available to sync to.

9.5.7.3.1 C37.238-2011 Power Profile Auto Mode

This section describes how to provision a PTP C37.238-2011 Power Profile Auto Mode Clock.

1. **Select Auto for PTP Clock Mode**

   Select 'Auto' from the 'PTP CLOCK MODE' dropdown.



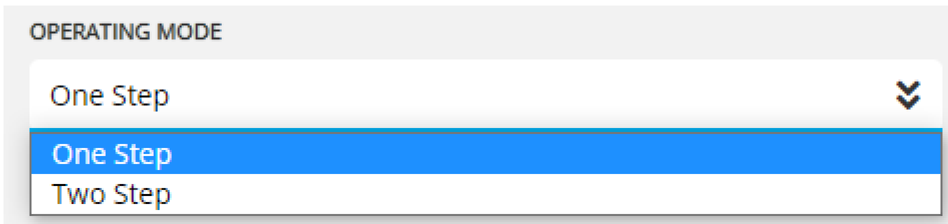
2. **Network Protocol**

   By default, the 'NETWORK PROTOCOL' is set to Layer 2 (Ethernet), which will send packets via the Ethernet data layer

3. **Select Operating Mode**

   Select the operating mode for the PTP network from the 'OPERATING MODE' dropdown.

   Operating mode is a network wide parameter. The configurable options are 'One Step' or 'Two Step'.



   Note: Select Two Step operation if the Operating Mode is unknown.

4. **Delay Mechanism**

   By default the 'DELAY MECHANISM' will be set to P2P, which will set the delay mechanism to peer to peer as defined in IEEE 1588v2-2008.

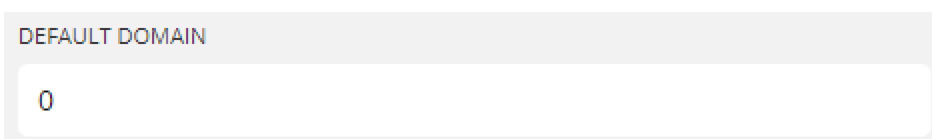
5. **Priority #1 and Priority #2**

   By default, both Priority #1 and Priority #2 are set to 128 and cannot be changed.

6. **Configure Default Domain**

   Modify the 'DEFAULT DOMAIN' number if required, otherwise it is recommended that it is left as its default value of '0'.

   A domain consists of one or more PTP devices communicating with each other. By default, PTP aware devices are configured with a domain of '0'. Changing the domain will cause only devices with the specified domain to communicate using the PTP protocol. The input range is 0 to 127.



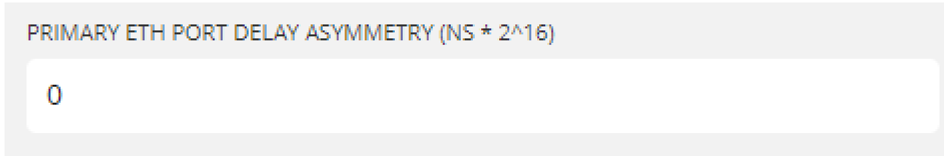
7. **Configure Delay Asymmetry**

   Modify the 'PRIMARY ETH PORT DELAY ASYMMETRY' setting if the delay asymmetry in the network link is known, otherwise it is recommended that the setting is left as its default value of '0'.

   PTP automatically calculates the propagation delay between a server and client, but this calculation assumes the delay in each direction of transmission is the same. PTP cannot measure and compensate for delay asymmetry, which means that the presence of delay asymmetry reduces PTP time accuracy.

   Delay asymmetry is determined by the server to client path delay minus the client to server path delay. A client uses the delay asymmetry value to compensate for the error caused by delay in asymmetry in the PTP delay calculation mechanism.

If the delay asymmetry is known, entering it manually will allow it to be compensated for, and improve time accuracy. The input range is 3.2768e+14 ns×2^{16} to −3.2768e+14 ns×2^{16} (-5 to 5 seconds).



8. **Peer Delay Request Interval**

   By default, the 'PEER DELAY REQUEST INTERVAL' is set to 1 second

9. **Announce Interval**

   By default, the 'ANNOUNCE INTERVAL' is set to 1 second

10. **Announce Receipt Timeout**

    By default the 'ANNOUNCE RECEIPT TIMEOUT' is set to 3. This means that after 3 announce intervals, if the device has not recieved an announce message it will trigger an announce receipt timeout event, which will move the port into a listening state.

11. **Sync Interval**

    By default, the 'SYNC INTERVAL' is set to 1 second

12. **BMCA**

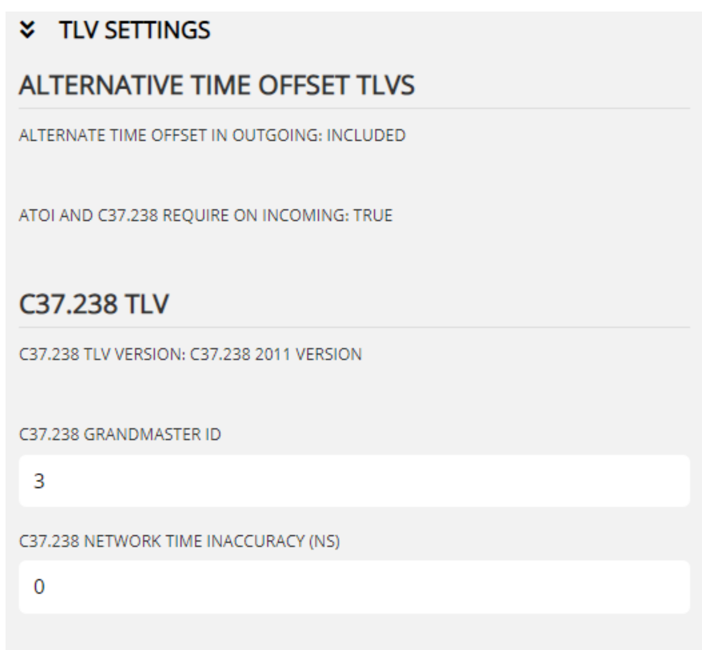
    By default, the 'BMCA' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008

13. **Clock Class Rules**

    By default, the 'CLOCK CLASS RULES' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008

14. **Configure TLV Settings**

    With the C37.238-2011 profile the ATOI TLV is always included in outgoing messages, and is required on incoming messages — otherwise they will be ignored. The same applies for the C37.238 TLV, however, the C37.238 TLV includes two configurable settings — the C37.238 Grandmaster ID, and the C37.238 Network Time Inaccuracy.



TLV Settings > GrandMaster ID

Set the C37.238 Grandmaster ID setting using the 'C37.238 GRANDMASTER ID' setting.

This is the “GMIdentity” (or “Grandmaster Identity”) as defined in C37.238-2011. Grandmaster Identity is transmitted in IEEE_C37_238 TLV (2 bytes). The configurable range is 3 to 254. By default it is set to 3.

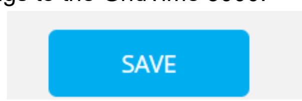
TLV Settings > C37.238 Network Time Inaccuracy

Set the C37.238 Network Time Inaccuracy setting using the 'C37.238 NETWORK TIME INACCURACY' setting.

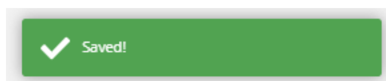
This configurable field sets the “networkTimeInaccuracy” as defined in C37.238-2011. It will set the estimated worst-case error in nanoseconds from the grandmaster. The configurable range is 0 (default) to 2,147,483,647 ns.

15. **Save Settings**

Click the 'SAVE' button to write the settings to the GridTime 3000.



A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

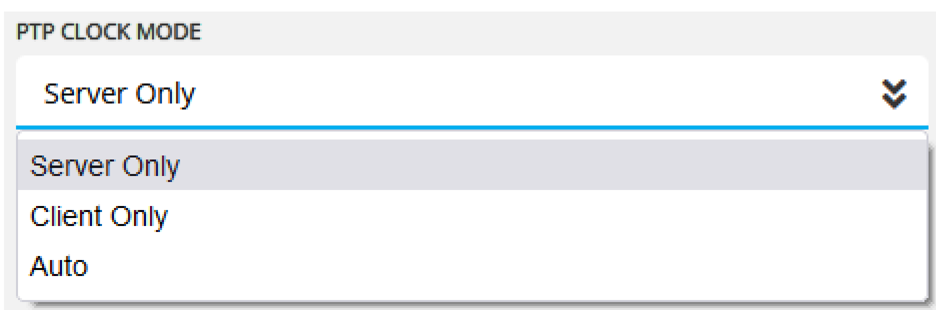


9.5.7.3.2 C37.238-2011 Power Profile Server Only Mode

This section describes how to provision a PTP C37.238-2011 Power Profile Server Only Mode Clock.

1. **Select Server Only for PTP Clock Mode**

Select 'Server Only' from the 'PTP CLOCK MODE' dropdown.



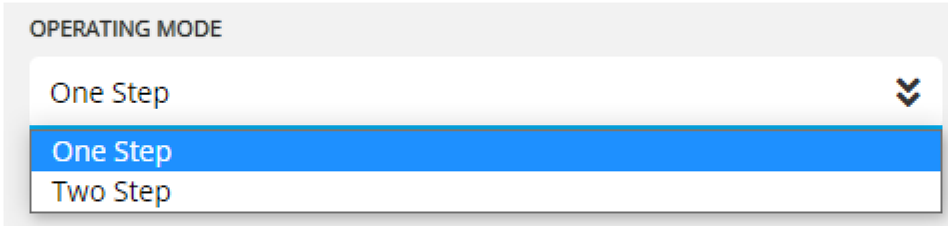
2. **Network Protocol**

By default, the 'NETWORK PROTOCOL' is set to Layer 2 (Ethernet), which will send packets via the Ethernet data layer

3. **Select Operating Mode**

Select the operating mode for the PTP network from the 'OPERATING MODE' dropdown.

Operating mode is a network wide parameter. The configurable options are 'One Step' or 'Two Step'.



Note: Select Two Step operation if the Operating Mode is unknown.

4. **Delay Mechanism**

   By default the 'DELAY MECHANISM' will be set to P2P, which will set the delay mechanism to peer to peer as defined in IEEE 1588v2-2008.

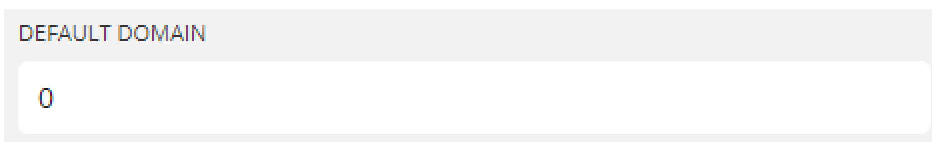
5. **Priority #1 and Priority #2**

   By default, both Priority #1 and Priority #2 are set to 128 and cannot be changed.

6. **Configure Default Domain**

   Modify the 'DEFAULT DOMAIN' number if required, otherwise it is recommended that it is left as its default value of '0'.

   A domain consists of one or more PTP devices communicating with each other. By default, PTP aware devices are configured with a domain of '0'. Changing the domain will cause only devices with the specified domain to communicate using the PTP protocol. The input range is 0 to 127.



7. **Peer Delay Request Interval**

   By default, the 'PEER DELAY REQUEST INTERVAL' is set to 1 second

8. **Announce Interval**

   By default, the 'ANNOUNCE INTERVAL' is set to 1 second

9. **Announce Receipt Timeout**

   By default the 'ANNOUNCE RECEIPT TIMEOUT' is set to 3. This means that after 3 announce intervals, if the device has not recieved an announce message it will trigger an announce receipt timeout event, which will move the port into a listening state.

10. **Sync Interval**

    By default, the 'SYNC INTERVAL' is set to 1 second

11. **BMCA**

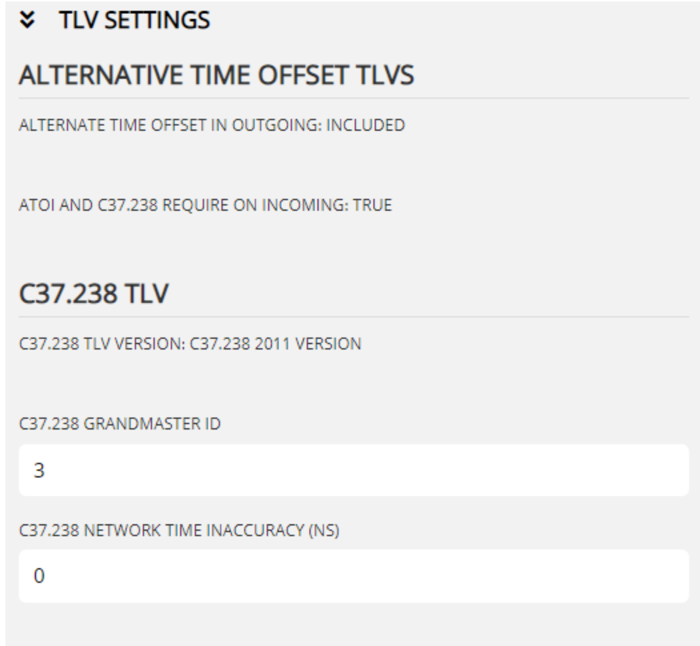
    By default, the 'BMCA' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008

12. **Clock Class Rules**

    By default, the 'CLOCK CLASS RULES' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008

13. **Configure TLV Settings**

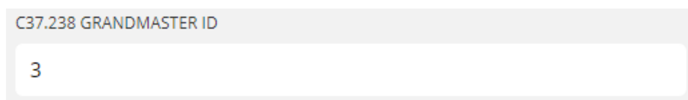
    With the C37.238-2011 profile the ATOI TLV is always included in outgoing messages, and is required on incoming messages — otherwise they will be ignored. The same applies for the C37.238 TLV, however, the C37.238 TLV includes two configurable settings — the C37.238 Grandmaster ID, and the C37.238 Network Time Inaccuracy.



GrandMaster ID

Set the C37.238 Grandmaster ID setting using the 'C37.238 GRANDMASTER ID' setting.

This is the “GMIdentity” (or “Grandmaster Identity”) as defined in C37.238-2011. Grandmaster Identity is transmitted in IEEE_C37_238 TLV (2 bytes). The configurable range is 3 to 254. By default it is set to 3.



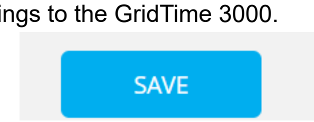
C37.238 Network Time Inaccuracy

Set the C37.238 Network Time Inaccuracy setting using the 'C37.238 NETWORK TIME INACCURACY' setting.

This configurable field sets the “networkTimeInaccuracy” as defined in C37.238-2011. It will set the estimated worst-case error in nanoseconds from the Grandmaster. The configurable range is 0 (default) to 2,147,483,647 ns.

14. **Save Settings**

Click the 'SAVE' button to write the settings to the GridTime 3000.



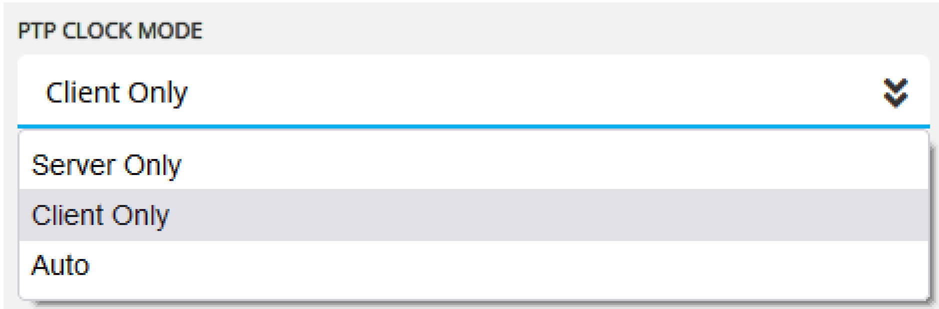
A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.7.3.3 C37.238-2011 Power Profile Client Only Mode

This section describes how to provision a PTP C37.238-2011 Power Profile Client Only Mode Clock.

1. **Select Client Only for PTP Clock Mode**

Select 'Client Only' from the 'PTP CLOCK MODE' dropdown.



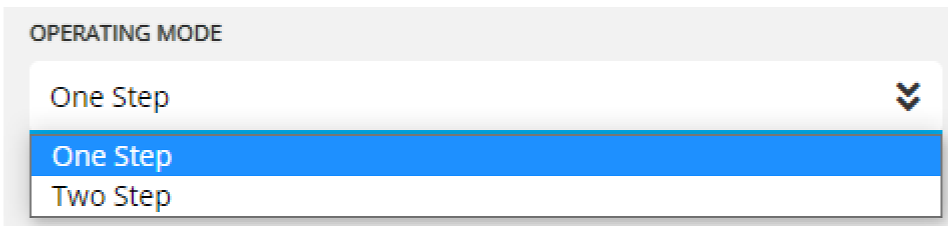
2. **Network Protocol**

   By default, the 'NETWORK PROTOCOL' is set to Layer 2 (Ethernet), which will send packets via the Ethernet data layer

3. **Select Operating Mode**

   Select the operating mode for the PTP network from the 'OPERATING MODE' dropdown.

   Operating mode is a network wide parameter. The configurable options are 'One Step' or 'Two Step'.



Note: Select Two Step operation if the Operating Mode is unknown.

4. **Delay Mechanism**

   By default the 'DELAY MECHANISM' will be set to P2P, which will set the delay mechanism to peer to peer as defined in IEEE 1588v2-2008.

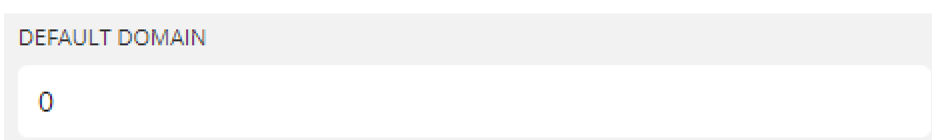
5. **Priority #1 and Priority #2**

   By default, both Priority #1 and Priority #2 are set to 128 and cannot be changed.

6. **Configure Default Domain**

   Modify the 'DEFAULT DOMAIN' number if required, otherwise it is recommended that it is left as its default value of '0'.

   A domain consists of one or more PTP devices communicating with each other. By default, PTP aware devices are configured with a domain of '0'. Changing the domain will cause only devices with the specified domain to communicate using the PTP protocol. The input range is 0 to 127.



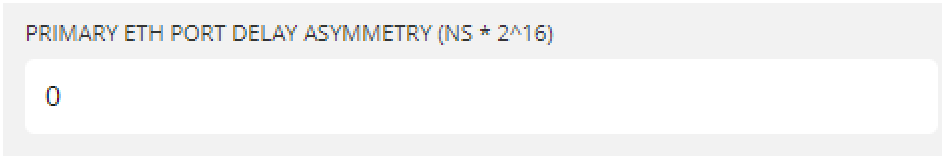
7. **Configure Delay Asymmetry**

   Modify the 'PRIMARY ETH PORT DELAY ASYMMETRY' setting if the delay asymmetry in the network link is known, otherwise it is recommended that the setting is left as its default value of '0'.

   PTP automatically calculates the propagation delay between a server and client, but this calculation assumes the delay in each direction of transmission is the same. PTP cannot measure and compensate for delay asymmetry, which means that the presence of delay asymmetry reduces PTP time accuracy.

Delay asymmetry is determined by the server to client path delay minus the client to server path delay. A client uses the delay asymmetry value to compensate for the error caused by delay in asymmetry in the PTP delay calculation mechanism.

If the delay asymmetry is known, entering it manually will allow it to be compensated for, and improve time accuracy. The input range is 3.2768e+14 ns×$2^{\wedge 16}$ to −3.2768e+14 ns×$2^{\wedge 16}$ (-5 to 5 seconds).



8. **Peer Delay Request Interval**

   By default, the 'PEER DELAY REQUEST INTERVAL' is set to 1 second
9. **Announce Interval**

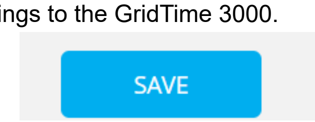
   By default, the 'ANNOUNCE INTERVAL' is set to 1 second.
10. **Announce Receipt Timeout**

    By default the 'ANNOUNCE RECEIPT TIMEOUT' is set to 3. This means that after 3 announce intervals, if the device has not recieved an announce message it will trigger an announce receipt timeout event, which will move the port into a listening state.
11. **BMCA**

    By default, the 'BMCA' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008
12. **Clock Class Rules**

    By default, the 'CLOCK CLASS RULES' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008
13. **Save Settings**

    Click the 'SAVE' button to write the settings to the GridTime 3000.



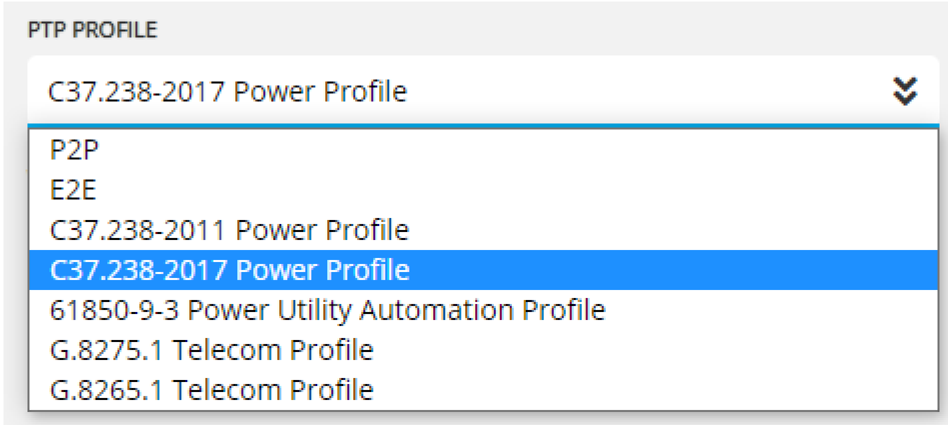
A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.7.4 C37.238-2017 Power Profile

This section describes how to provision a GridTime 3000 with the C37.238-2017 Power Profile.

1. **Select C37.238-2017 Power Profile**

   Select 'C37.238-2017 Power Profile' from the 'PTP PROFILE' dropdown.



2. Follow the instructions in one of the following sections depending on your desired PTP Clock Mode:
   – 9.5.7.4.1. C37.238-2017 Power Profile Auto Mode
   – 9.5.7.4.2. C37.238-2017 Power Profile Server Only Mode
   – 9.5.7.4.3. C37.238-2017 Power Profile Client Only Mode

PTP Clock Mode Descriptions

Auto mode allows the port to operate either in the server or client state depending on whether the GridTime 3000 is in sync. When the GridTime 3000 is in sync or in holdover, the port will be in the server or passive server state, when the GridTime 3000 is out of sync the port will be in the client state.

In server only mode, the port will always either be in the server or passive server state depending on whether it has won the BMCA.

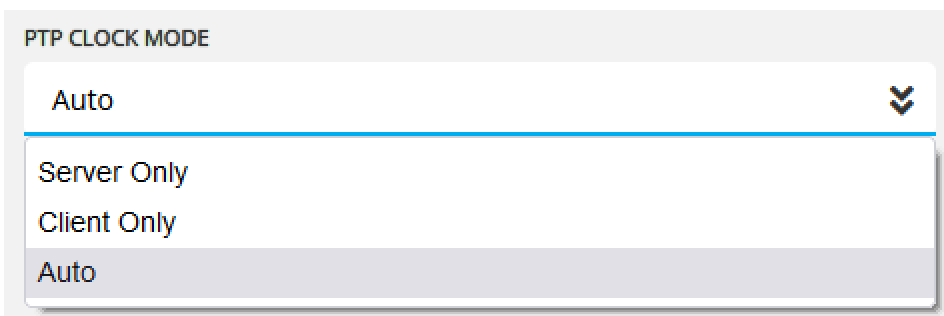
In client only mode, the port will always be in the client or listening state depending on whether there is a PTP server available to sync to.

9.5.7.4.1 C37.238-2017 Power Profile Auto Mode

This section describes how to provision a PTP C37.238-2017 Power Profile Auto Mode Clock.

1. **Select Auto for PTP Clock Mode**

   Select 'Auto' from the 'PTP CLOCK MODE' dropdown.



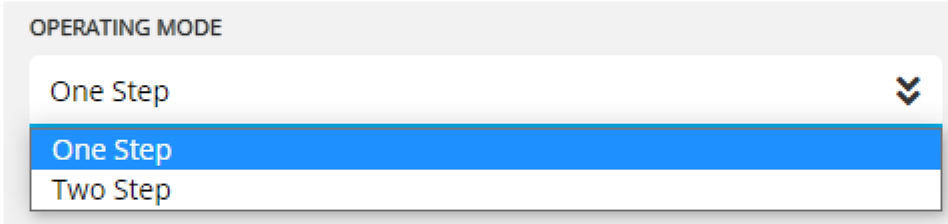
2. **Network Protocol**

   By default, the 'NETWORK PROTOCOL' is set to Layer 2 (Ethernet), which will send packets via the Ethernet data layer

3. **Select Operating Mode**

   Select the operating mode for the PTP network from the 'OPERATING MODE' dropdown.

   Operating mode is a network wide parameter. The configurable options are 'One Step' or 'Two Step'.



Note: Select Two Step operation if the Operating Mode is unknown.

4. **Delay Mechanism**

   By default the 'DELAY MECHANISM' will be set to P2P, which will set the delay mechanism to peer to peer as defined in IEEE 1588v2-2008.

5. **Configure Priority 1 and Priority 2 Fields**

   Modify the 'PRIORITY #1' and 'PRORITY #2' fields if required, otherwise it is recommended that these are left as their default values.

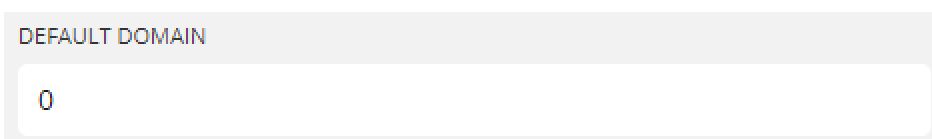
   These parameters modify the automatic selection of server clocks in PTP networks. Lower values mean that the unit will be preferred against other server capable clocks during the selection process. The priority 1 value is used to manually select which server capable clock will become the grandmaster and will be used in preference over other selection criteria including clock accuracy , so should be modified very carefully. The priority 2 value is treated as the least important criteria, providing greater selection control between otherwise-equal clocks

   For both priority fields, the input range is 0 to 255, where 0 is the highest priority. The default setting is 128.

6. **Configure Default Domain**

   Modify the 'DEFAULT DOMAIN' number if required, otherwise it is recommended that it is left as its default value of '0'.

   A domain consists of one or more PTP devices communicating with each other. By default, PTP aware devices are configured with a domain of '0'. Changing the domain will cause only devices with the specified domain to communicate using the PTP protocol. The input range is 0 to 127 and 254.



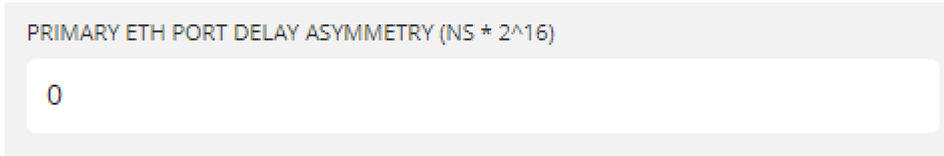
7. **Configure Delay Asymmetry**

   Modify the 'PRIMARY ETH PORT DELAY ASYMMETRY' setting if the delay asymmetry in the network link is known, otherwise it is recommended that the setting is left as its default value of '0'.

   PTP automatically calculates the propagation delay between a server and client, but this calculation assumes the delay in each direction of transmission is the same. PTP cannot measure and compensate for delay asymmetry, which means that the presence of delay asymmetry reduces the PTP time accuracy.

   Delay asymmetry is determined by the server to client path delay minus the client to server path delay. A client uses the delay asymmetry value to compensate for the error caused by delay in asymmetry in the PTP delay calculation mechanism.

If the delay asymmetry is known, entering it manually will allow it to be compensated for, and improve time accuracy. The input range is 3.2768e+14 ns×$2^{\wedge 16}$ to −3.2768e+14 ns×$2^{\wedge 16}$ (-5 to 5 seconds).



8. **Peer Delay Request Interval**

   By default, the 'PEER DELAY REQUEST INTERVAL' is set to 1 second
9. **Announce Interval**

   By default, the 'ANNOUNCE INTERVAL' is set to 1 second.
10. **Announce Receipt Timeout**

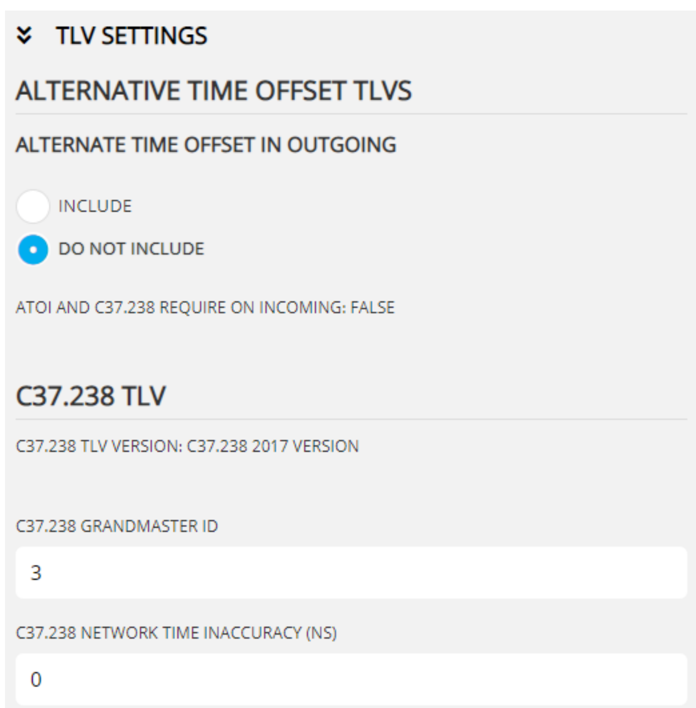
    By default the 'ANNOUNCE RECEIPT TIMEOUT' is set to 3. This means that after 3 announce intervals, if the device has not recieved an announce message it will trigger an announce receipt timeout event, which will move the port into a listening state.
11. **Sync Interval**

    By default, the 'SYNC INTERVAL' is set to 1 second
12. **BMCA**

    By default, the 'BMCA' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008
13. **Clock Class Rules**

    By default, the 'CLOCK CLASS RULES' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008
14. **Configure TLV Settings**

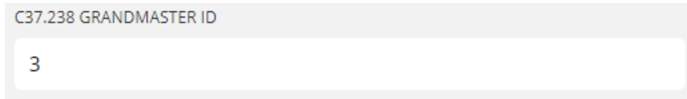
    With the C37.238-2017 profile, neither the ATOI TLV or the C37.238 TLV are required on incoming traffic. The ATOI TLV can be included in outgoing traffic using the 'ALTERNATIVE TIME OFFSET IN OUTGOING' setting, and the C37.238 TLV is always included in outgoing traffic. The C37.238 TLV includes two configurable settings — the C37.238 Grandmaster ID, and the C37.238 Network Time Inaccuracy.



GrandMaster ID

Set the C37.238 Grandmaster ID setting using the 'C37.238 GRANDMASTER ID' setting.

This is the “GMIdentity” (or “Grandmaster Identity”) as defined in C37.238-2017 Grandmaster Identity is transmitted in IEEE_C37_238 TLV (2 bytes). The configurable range is 0 to 65,535. By default it is set to 3.



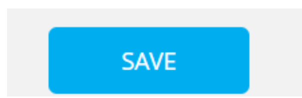
C37.238 Network Time Inaccuracy

Set the C37.238 Network Time Inaccuracy setting using the C37.238 ‘NETWORK TIME INACCURACY” setting.

This configurable field sets the “networkTimeInaccuracy” as defined in C37.238-2011. I It will set the estimated worst-case error in nanoseconds from the grandmaster. The configurable range is 0 (default) to 2,147,483,647 ns.

15. **Save Settings**

Click the 'SAVE' button to write the settings to the GridTime 3000.



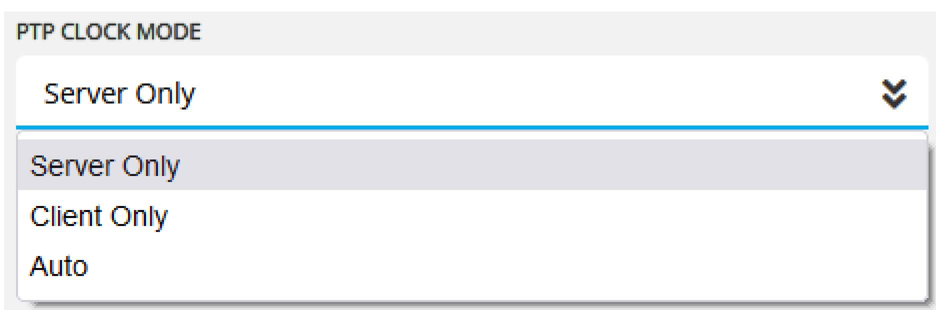
A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.7.4.2 C37.238-2017 Power Profile Server Only Mode

This section describes how to provision a PTP C37.238-2017 Power Profile Server Only Mode Clock.

1. **Select Server Only for PTP Clock Mode**

Select 'Server Only' from the 'PTP CLOCK MODE' dropdown.



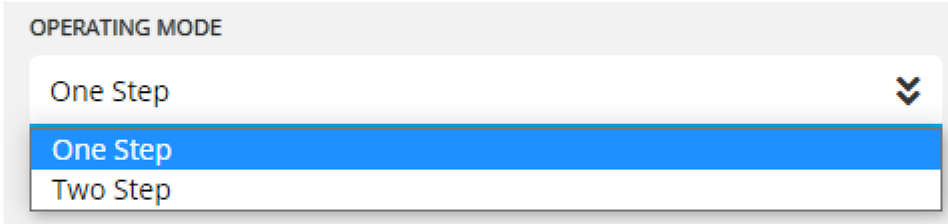
2. **Network Protocol**

By default, the 'NETWORK PROTOCOL' is set to Layer 2 (Ethernet), which will send packets via the Ethernet data layer

3. **Select Operating Mode**

Select the operating mode for the PTP network from the 'OPERATING MODE' dropdown.

Operating mode is a network wide parameter. The configurable options are 'One Step' or 'Two Step'.



Note: Select Two Step operation if the Operating Mode is unknown.

4. **Delay Mechanism**

   By default the 'DELAY MECHANISM' will be set to P2P, which will set the delay mechanism to peer to peer as defined in IEEE 1588v2-2008.

5. **Configure Priority 1 and Priority 2 Fields**

   Modify the 'PRIORITY #1' and 'PRORITY #2' fields if required, otherwise it is recommended that these are left as their default values.

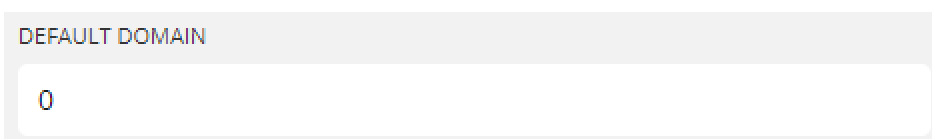
   These parameters modify the automatic selection of server clocks in PTP networks. Lower values mean that the unit will be preferred against other server capable clocks during the selection process. The priority 1 value is used to manually select which server capable clock will become the grandmaster and will be used in preference over other selection criteria including clock accuracy , so should be modified very carefully. The priority 2 value is treated as the least important criteria, providing greater selection control between otherwise-equal clocks

   For both priority fields, the input range is 0 to 255, where 0 is the highest priority. The default setting is 128.

6. **Configure Default Domain**

   Modify the 'DEFAULT DOMAIN' number if required, otherwise it is recommended that it is left as its default value of '0'.

   A domain consists of one or more PTP devices communicating with each other. By default, PTP aware devices are configured with a domain of '0'. Changing the domain will cause only devices with the specified domain to communicate using the PTP protocol. The input range is 0 to 127 and 254.



7. **Peer Delay Request Interval**

   By default, the 'PEER DELAY REQUEST INTERVAL' is set to 1 second

8. **Announce Interval**

   By default, the 'ANNOUNCE INTERVAL' is set to 1 second.

9. **Announce Receipt Timeout**

   By default the 'ANNOUNCE RECEIPT TIMEOUT' is set to 3. This means that after 3 announce intervals, if the device has not recieved an announce message it will trigger an announce receipt timeout event, which will move the port into a listening state.

10. **Sync Interval**

    By default, the 'SYNC INTERVAL' is set to 1 second

11. **BMCA**

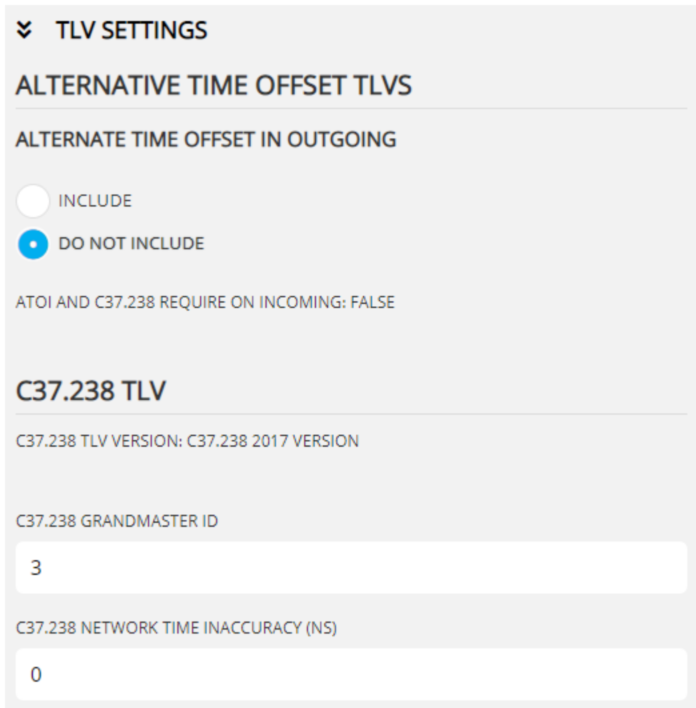
    By default, the 'BMCA' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008

12. **Clock Class Rules**

    By default, the 'CLOCK CLASS RULES' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-200

13. **Configure TLV Settings**

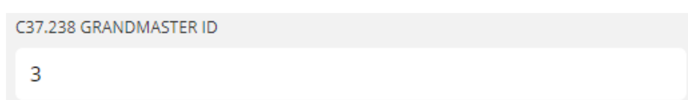
    With the C37.238-2017 profile, neither the ATOI TLV or the C37.238 TLV are required on incoming traffic. The ATOI TLV can be included in outgoing traffic using the 'ALTERNATIVE TIME OFFSET IN OUTGOING' setting, and the C37.238 TLV is always included in outgoing traffic. The C37.238 TLV includes two configurable settings — the C37.238 Grandmaster ID, and the C37.238 Network Time Inaccuracy.



GrandMaster ID

Set the C37.238 Grandmaster ID setting using the 'C37.238 GRANDMASTER ID' setting.

This is the “GMIdentity” (or “Grandmaster Identity”) as defined in C37.238-2017. Grandmaster Identity is transmitted in IEEE_C37_238 TLV (2 bytes). The configurable range is 0 to 65,535. By default it is set to 3.



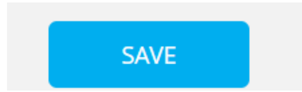
C37.238 Network Time Inaccuracy

Set the C37.238 Network Time Inaccuracy setting using the 'C37.238 NETWORK TIME INACCURACY'' setting.

This configurable field sets the “networkTimeInaccuracy” as defined in C37.238-2011. It will set the estimated worst-case error in nanoseconds from the Grandmaster. The configurable range is 0 (default) to 2,147,483,647 ns.

14. **Save Settings**

Click the 'SAVE' button to write the settings to the GridTime 3000.



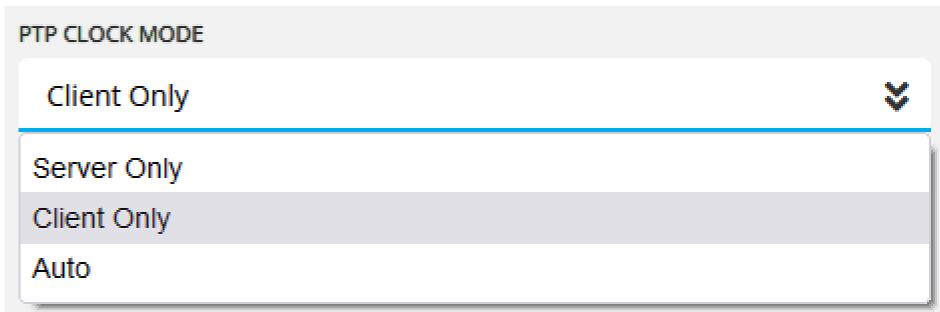
A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.7.4.3 C37.238-2017 Power Profile Client Only Mode

This section describes how to provision a PTP C37.238-2017 Power Profile Client Only Mode Clock.

1. **Select Client Only for PTP Clock Mode**

   Select 'Client Only' from the 'PTP CLOCK MODE' dropdown.



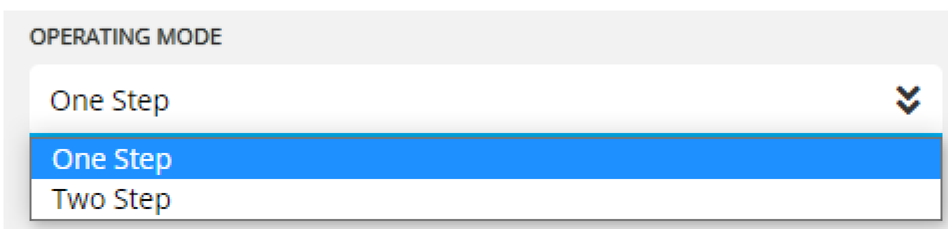
2. **Network Protocol**

   By default, the 'NETWORK PROTOCOL' is set to Layer 2 (Ethernet), which will send packets via the Ethernet data layer

3. **Select Operating Mode**

   Select the operating mode for the PTP network from the 'OPERATING MODE' dropdown.

   Operating mode is a network wide parameter. The configurable options are 'One Step' or 'Two Step'.



   Note: Select Two Step operation if the Operating Mode is unknown.

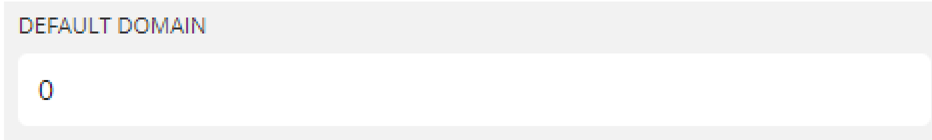
4. **Delay Mechanism**

   By default the 'DELAY MECHANISM' will be set to P2P, which will set the delay mechanism to peer to peer as defined in IEEE 1588v2-2008.

5. **Configure Default Domain**

   Modify the 'DEFAULT DOMAIN' field if required, otherwise it is recommended that it is left as its default value of '0'.

   A domain consists of one or more PTP devices communicating with each other. By default, PTP aware devices are configured with a domain of '0'. Changing the domain will cause only devices with the specified domain to communicate using the PTP protocol. The input range is 0 to 127 and 254.



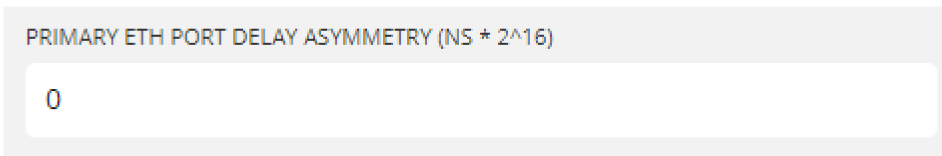
6. **Configure Delay Asymmetry**

   Modify the 'PRIMARY ETH PORT DELAY ASYMMETRY' setting if the delay asymmetry in the network link is known, otherwise it is recommended that the setting is left as its default value of '0'.

   PTP automatically calculates the propagation delay between a server and client, but this calculation assumes the delay in each direction of transmission is the same. PTP cannot measure and compensate for delay asymmetry, which means that the presence of delay asymmetry reduces PTP time accuracy.

   Delay asymmetry is calculated from the server to client path delay minus the client to server path delay. A client uses the delay asymmetry value to compensate for the error caused by delay in asymmetry in the PTP delay calculation mechanism.

   If the delay asymmetry is known, entering it manually will allow it to be compensated for, and improve time accuracy. The input range is 3.2768e+14 ns×2$^{\wedge 16}$ to −3.2768e+14 ns×2$^{\wedge 16}$ (-5 to 5 seconds).



7. **Peer Delay Request Interval**

   By default, the 'PEER DELAY REQUEST INTERVAL' is set to 1 second
8. **Announce Interval**

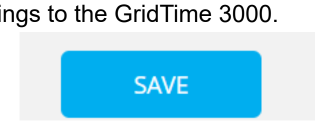
   By default, the 'ANNOUNCE INTERVAL' is set to 1 second.
9. **Announce Receipt Timeout**

   By default the 'ANNOUNCE RECEIPT TIMEOUT' is set to 3. This means that after 3 announce intervals, if the device has not recieved an announce message it will trigger an announce receipt timeout event, which will move the port into a listening state.
10. **BMCA**

    By default, the 'BMCA' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008
11. **Clock Class Rules**

    By default, the 'CLOCK CLASS RULES' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008
12. **Save Settings**

    Click the 'SAVE' button to write the settings to the GridTime 3000.



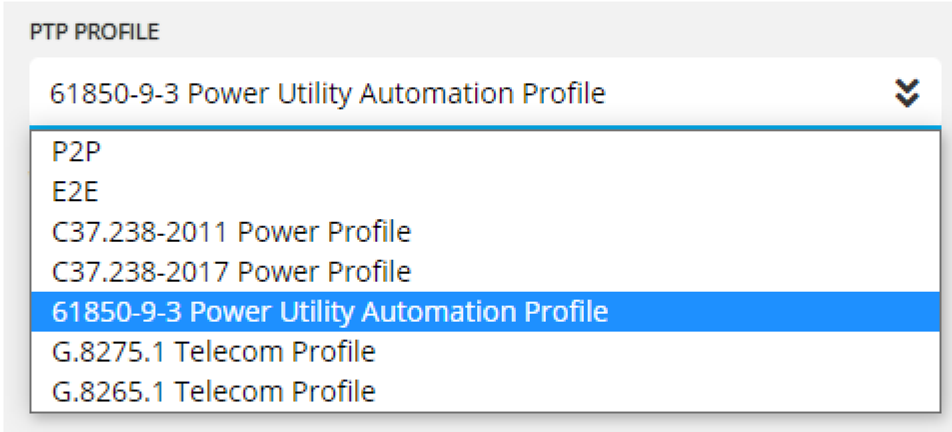
    A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.7.5 61850-9-3 Power Utility Profile

This section describes how to provision a GridTime 3000 with the 61850-9-3 Power Utility Profile.

1. **Select 61850-9-3 Power Utility Profile**

   Select '61850-9-3 Power Utility Profile' from the 'PTP PROFILE' dropdown.



2. Follow the instructions in one of the following sections depending on your desired PTP Clock Mode:
   - 9.5.7.5.1. 61850-9-3 Power Utility Profile Auto Mode
   - 9.5.7.5.2. 61850-9-3 Power Utility Profile Server Only Mode
   - 9.5.7.5.3. 61850-9-3 Power Utility Profile Client Only Mode

PTP Clock Mode Descriptions

Auto mode allows the port to operate either in the server or client state depending on whether the GridTime 3000 is in sync or not. When the GridTime 3000 is in sync or in holdover, the port will be in the server or passive server state, when the GridTime 3000 is out of sync, the port will be in the client state.

In server only mode, the port will always either be in the server or passive server state depending on whether it has won the BMCA or not.

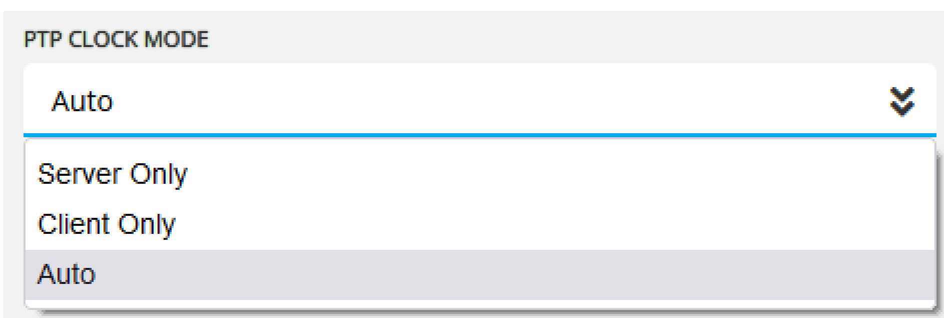
In client only mode, the port will always be in the client or listening state depending on whether there is a PTP server available to sync to.

9.5.7.5.1 61850-9-3 Power Utility Profile Auto Mode

This section describes how to provision a PTP 61850-9-3 Power Utility Profile Auto Mode Clock.

1. **Select Auto for PTP Clock Mode**

   Select 'Auto' from the 'PTP CLOCK MODE' dropdown.



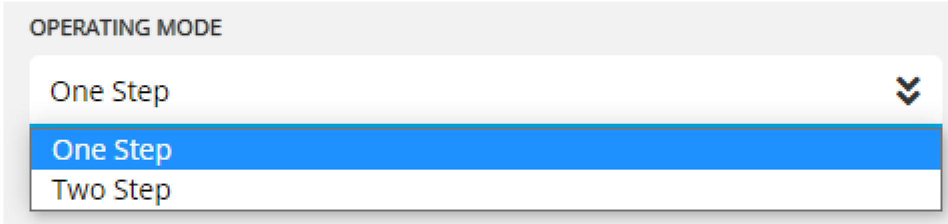
2. **Network Protocol**

   By default, the 'NETWORK PROTOCOL' is set to Layer 2 (Ethernet), which will send packets via the Ethernet data layer

3. **Select Operating Mode**

   Select the operating mode for the PTP network from the 'OPERATING MODE' dropdown.

   Operating mode is a network wide parameter. The configurable options are 'One Step' or 'Two Step'.



Note: Select Two Step operation if the Operating Mode is unknown.

4. **Delay Mechanism**

   By default the 'DELAY MECHANISM' will be set to P2P, which will set the delay mechanism to peer to peer as defined in IEEE 1588v2-2008.

5. **Configure Priority 1 and Priority 2 Fields**

   Modify the 'PRIORITY #1' and 'PRIORITY #2' fields if required, otherwise it is recommended that these are left as their default values.

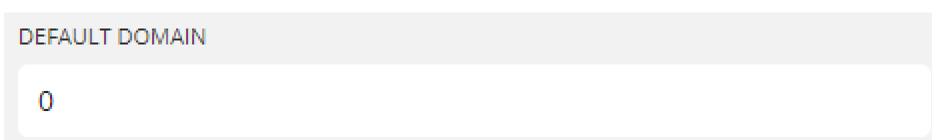
   These parameters modify the automatic selection of server clocks in PTP networks. Lower values mean that the unit will be preferred against other server capable clocks during the selection process. The priority 1 value overrides all other selection criteria including clock accuracy, so should be modified carefully. The priority 2 value is treated as the least important criteria, providing greater selection control between otherwise-equal clocks.

   For both priority fields, the input range is 0 to 255, where 0 is the highest priority. The default setting is 128.

6. **Configure Default Domain**

   Modify the 'DEFAULT DOMAIN' number if required, otherwise it is recommended that it is left as its default value of '0'.

   A domain consists of one or more PTP devices communicating with each other. By default, PTP aware devices are configured with a domain of '0'. Changing the domain will cause only devices with the specified domain to communicate using the PTP protocol. The input range is 0 to 127 and 254.



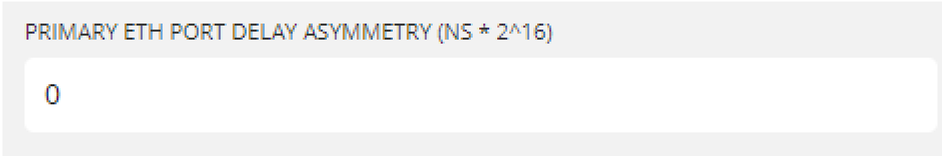
7. **Configure Delay Asymmetry**

   Modify the 'PRIMARY ETH PORT DELAY ASYMMETRY' setting if the delay asymmetry in the network link is known, otherwise it is recommended that the setting is left as its default value of '0'.

   PTP automatically calculates the propagation delay between a server and client, but this calculation assumes the delay in each direction of transmission is the same. PTP cannot measure and compensate for delay asymmetry, which means that the presence of delay asymmetry reduces PTP time accuracy.

   Delay asymmetry is calculated from the server to client path delay minus the client to server path delay. A client uses the delay asymmetry value to compensate for the error caused by delay in asymmetry in the PTP delay calculation mechanism.

   If the delay asymmetry is known, entering it manually will allow it to be compensated for, and improve time accuracy. The input range is 3.2768e+14 ns*2^16 to -3.2768e+14 ns*2^16 (-5 to 5 seconds).



8. **Peer Delay Request Interval**

   By default, the 'PEER DELAY REQUEST INTERVAL' is set to 1 second

9. **Announce Interval**

   By default, the 'ANNOUNCE INTERVAL' is set to 1 second.

10. **Announce Receipt Timeout**

    By default the 'ANNOUNCE RECEIPT TIMEOUT' is set to 3. This means that after 3 announce intervals, if the device has not recieved an announce message it will trigger an announce receipt timeout event, which will move the port into a listening state.

11. **Sync Interval**

    By default, the 'SYNC INTERVAL' is set to 1 second

12. **BMCA**

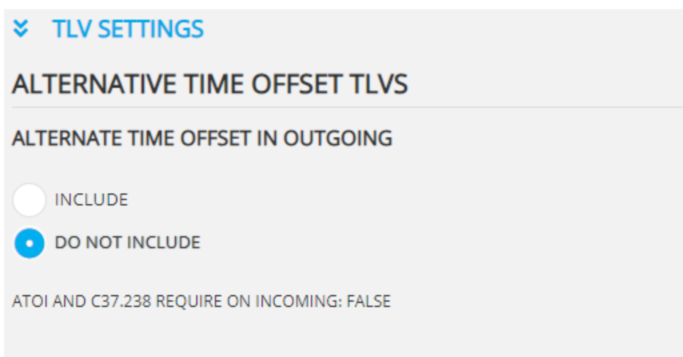
    By default, the 'BMCA' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008

13. **Clock Class Rules**

    By default, the 'CLOCK CLASS RULES' operations will be set to '61850' and will operate as defined in IEC 61850-9-3

14. **Configure TLV Settings > Alternate Time Offset In Outgoing**

    With the 61850-9-3 Power Utility Profile no TLVs are required on incoming traffic. The ATOI TLV can be included in outgoing traffic using the 'ALTERNATIVE TIME OFFSET IN OUTGOING' setting.

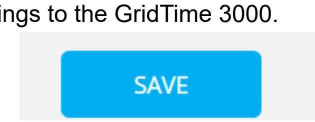


15. **TLV Settings > ATOI and C37.238 Require on Incoming**

    By default, the 'ATOI AND C37.238 REQUIRE ON INCOMING' setting is set to false.

16. **Save Settings**

    Click the 'SAVE' button to write the settings to the GridTime 3000.



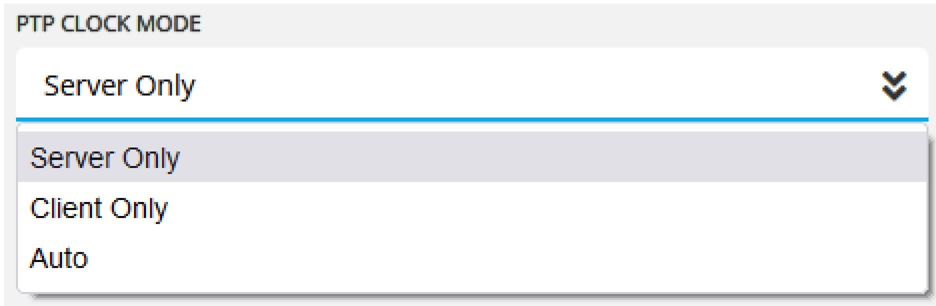
A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.7.5.2 61850-9-3 Power Utility Profile Server Only Mode

This section describes how to provision a PTP 61850-9-3 Power Utility Profile Server Only Mode Clock.

1. **Select Server Only for PTP Clock Mode**

   Select 'Server Only' from the 'PTP CLOCK MODE' dropdown.



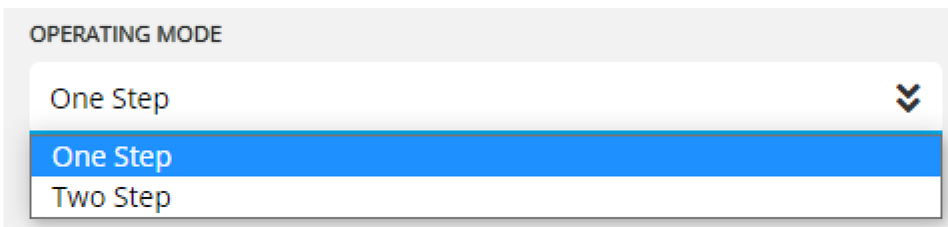
2. **Network Protocol**

   By default, the 'NETWORK PROTOCOL' is set to Layer 2 (Ethernet), which will send packets via the Ethernet data layer

3. **Select Operating Mode**

   Select the operating mode for the PTP network from the 'OPERATING MODE' dropdown.

   Operating mode is a network wide parameter. The configurable options are 'One Step' or 'Two Step'.



Note: Select Two Step operation if the Operating Mode is unknown.

4. **Delay Mechanism**

   By default the 'DELAY MECHANISM' will be set to P2P, which will set the delay mechanism to peer to peer as defined in IEEE 1588v2-2008.

5. **Configure Priority 1 and Priority 2 Fields**

   Modify the 'PRIORITY #1' and 'PRIORITY #2' fields if required, otherwise it is recommended that these are left as their default values.

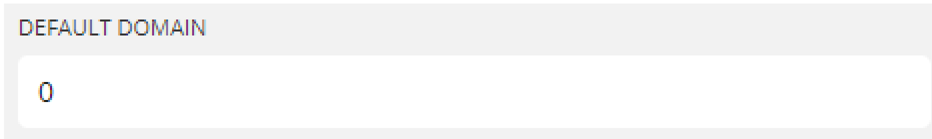
   These parameters modify the automatic selection of server clocks in PTP networks. Lower values mean that the unit will be preferred against other server capable clocks during the selection process. The priority 1 value overrides all other selection criteria including clock accuracy, so should be modified very carefully. The priority 2 value is treated as the least important criteria, providing greater selection control between otherwise-equal clocks.

   For both priority fields, the input range is 0 to 255, where 0 is the highest priority. The default setting is 128.

6. **Configure Default Domain**

Modify the 'DEFAULT DOMAIN' number if required, otherwise it is recommended that it is left as its default value of '0'.

A domain consists of one or more PTP devices communicating with each other. By default, PTP aware devices are configured with a domain of '0'. Changing the domain will cause only devices with the specified domain to communicate using the PTP protocol. The input range is 0 to 127 and 254.



7. **Peer Delay Request Interval**

   By default, the 'PEER DELAY REQUEST INTERVAL' is set to 1 second

8. **Announce Interval**

   By default, the 'ANNOUNCE INTERVAL' is set to 1 second.

9. **Announce Receipt Timeout**

   By default the 'ANNOUNCE RECEIPT TIMEOUT' is set to 3. This means that after 3 announce intervals, if the device has not recieved an announce message it will trigger an announce receipt timeout event, which will move the port into a listening state.

10. **Sync Interval**

    By default, the 'SYNC INTERVAL' is set to 1 second

11. **BMCA**

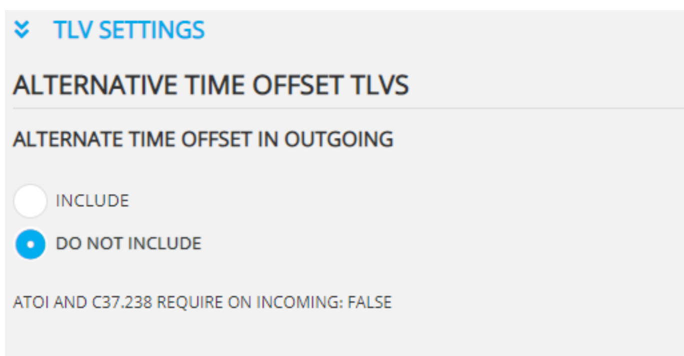
    By default, the 'BMCA' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008

12. **Clock Class Rules**

    By default, the 'CLOCK CLASS RULES' operations will be set to '61850' and will operate as defined in IEC 61850-9-3

13. **Configure TLV Settings > Alternate Time Offset In Outgoing**

    With the 61850-9-3 Power Utility Profile no TLVs are required on incoming traffic. The ATOI TLV can be included in outgoing traffic using the 'ALTERNATIVE TIME OFFSET IN OUTGOING' setting.

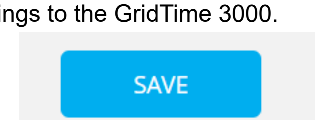


14. **TLV Settings > ATOI and C37.238 Require on Incoming**

    By default, the 'ATOI AND C37.238 REQUIRE ON INCOMING' setting is set to false.

15. **Save Settings**

    Click the 'SAVE' button to write the settings to the GridTime 3000.



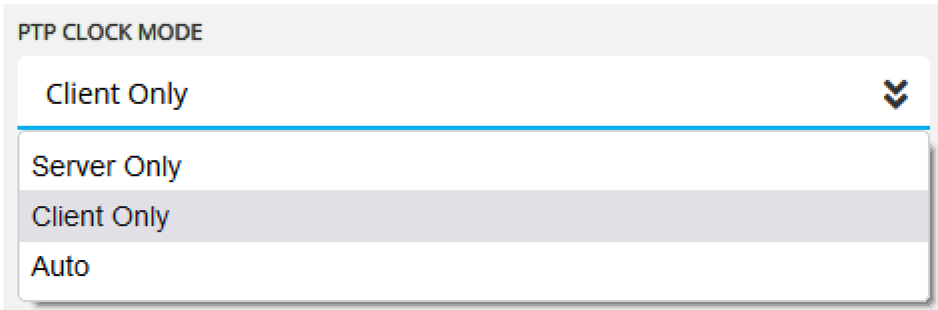
A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.7.5.3 61850-9-3 Power Utility Profile Client Only Mode

This section describes how to provision a PTP 61850-9-3 Power Utility Profile Client Only Mode Clock.

1. **Select Client Only for PTP Clock Mode**

   Select 'Client Only' from the 'PTP CLOCK MODE' dropdown.

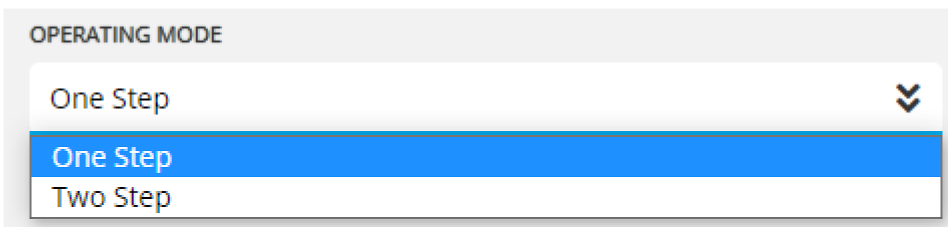
2. **Network Protocol**

   By default, the 'NETWORK PROTOCOL' is set to Layer 2 (Ethernet), which will send packets via the Ethernet data layer

3. **Select Operating Mode**

   Select the operating mode for the PTP network from the 'OPERATING MODE' dropdown.

   Operating mode is a network wide parameter. The configurable options are 'One Step' or 'Two Step'.

   Note: Select Two Step operation if the Operating Mode is unknown.

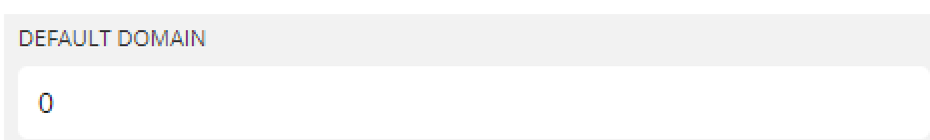
4. **Delay Mechanism**

   By default the 'DELAY MECHANISM' will be set to P2P, which will set the delay mechanism to peer to peer as defined in IEEE 1588v2-2008.

5. **Configure Default Domain**

   Modify the 'DEFAULT DOMAIN' number if required, otherwise it is recommended that it is left as its default value of '0'.

   A domain consists of one or more PTP devices communicating with each other. By default, PTP aware devices are configured with a domain of '0'. Changing the domain will cause only devices with the specified domain to communicate using the PTP protocol. The input range is 0 to 127 and 254.

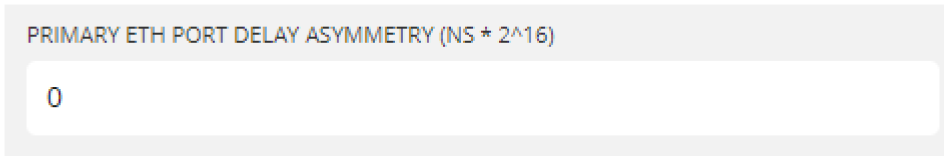
6. **Configure Delay Asymmetry**

   Modify the 'PRIMARY ETH PORT DELAY ASYMMETRY' setting if the delay asymmetry in the network link is known, otherwise it is recommended that the setting is left as its default value of '0'.

PTP automatically calculates the propagation delay between a server and client, but this calculation assumes the delay in each direction of transmission is the same. PTP cannot measure and compensate for delay asymmetry, which means that the presence of delay asymmetry reduces PTP time accuracy.

Delay asymmetry is calculated from the server to client path delay minus the client to server path delay. A client uses the delay asymmetry value to compensate for the error caused by delay in asymmetry in the PTP delay calculation mechanism.

If the delay asymmetry is known, entering it manually will allow it to be compensated for, and improve time accuracy. The input range is 3.2768e+14 ns×2^16 to −3.2768e+14 ns×2^16 (-5 to 5 seconds).



7. **Peer Delay Request Interval**

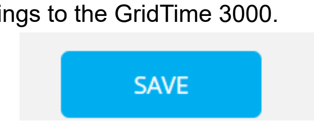
   By default, the 'PEER DELAY REQUEST INTERVAL' is set to 1 second
8. **Announce Interval**

   By default, the 'ANNOUNCE INTERVAL' is set to 1 second.
9. **Announce Receipt Timeout**
10. By default the 'ANNOUNCE RECEIPT TIMEOUT' is set to 3. This means that after 3 announce intervals, if the device has not recieved an announce message it will trigger an announce receipt timeout event, which will move the port into a listening state.
11. **BMCA**

    By default, the 'BMCA' operations will be set to 'BASIC' and will operate as defined in IEEE 1588v2-2008
12. **Clock Class Rules**

    By default, the 'CLOCK CLASS RULES' operations will be set to '61850' and will operate as defined in IEC 61850-9-3.
13. **Save Settings**

    Click the 'SAVE' button to write the settings to the GridTime 3000.



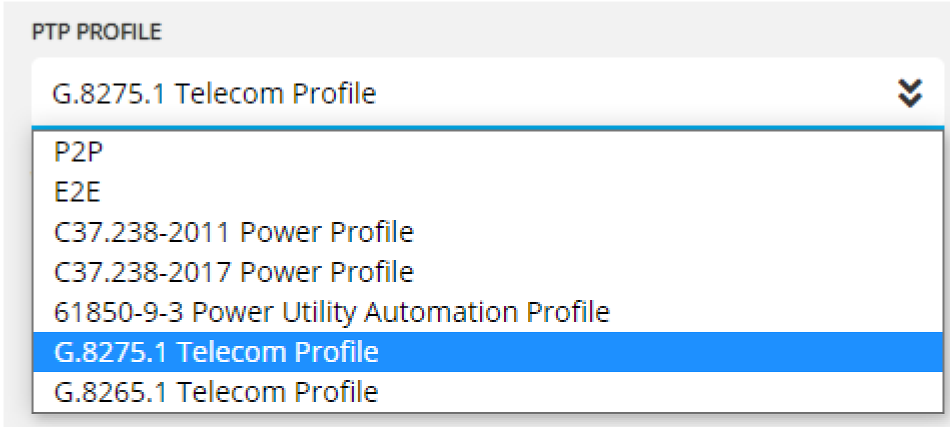
A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.7.6 G.8275.1 Telecom Profile

This section describes how to provision a GridTime 3000 with the G.8275.1 Telecom Profile.

1. **Select G.8275.1 Telecom Profile Profile**

   Select 'G.8275.1 Telecom Profile' from the 'PTP PROFILE' dropdown.



2. Follow the instructions in one of the following sections depending on your desired PTP Clock Mode:
   – 9.5.7.6.1. G.8275.1 Telecom Profile Server Only Mode
   – 9.5.7.6.2. G.8275.1 Telecom Profile Client Only Mode

PTP Clock Mode Descriptions

In server only mode the port will always either be in the server or passive server state depending on whether it has won the BMCA or not.

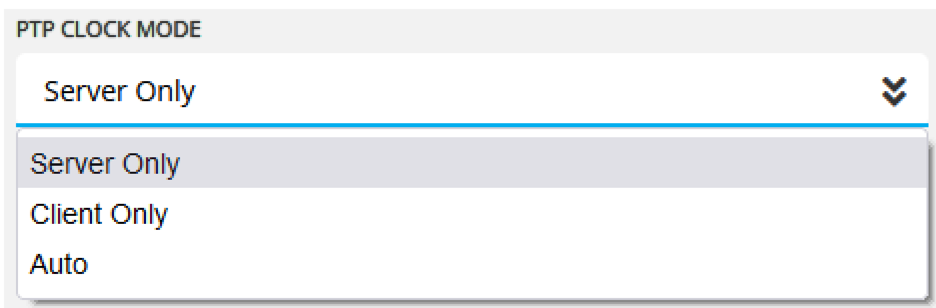
In client only mode, the port will always be in the client or listening state depending on whether there is a PTP server available to sync to.

9.5.7.6.1 G.8275.1 Telecom Profile Server Only Mode

This section describes how to provision a PTP G.8275.1 Telecom Profile Server Only Mode Clock.

1. **Select Server Only for PTP Clock Mode**

   Select 'Server Only' from the 'PTP CLOCK MODE' dropdown.

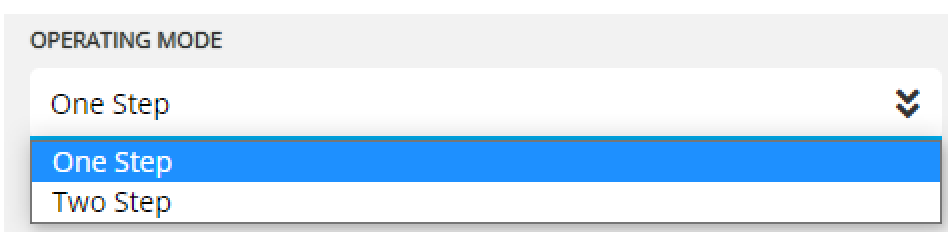


2. **Network Protocol**

   By default, the 'NETWORK PROTOCOL' is set to Layer 2 (Ethernet), which will send packets via the Ethernet data layer
3. **Select Operating Mode**

   Select the operating mode for the PTP network from the 'OPERATING MODE' dropdown.

   Operating mode is a network wide parameter. The configurable options are 'One Step' or 'Two Step'.



Note: Select Two Step operation if the Operating Mode is unknown.

4. **Delay Mechanism**

   By default the 'DELAY MECHANISM' will be set to E2E which will set the delay mechanism to end to end as defined in IEEE 1588v2-2008.

5. **Configure Priority Fields**

   The 'PRIORITY #1' field is not used by the G.8275.1 Alternate BMCA, so is not configurable for the G.8275.1 profile and thus will appear with a default value of 128.

   The 'PRIORITY # 2' field is used by the alternate BMCA, in addition to two additional priority fields, the port local priority and clock local priority fields. These parameters modify the automatic selection of server clocks in PTP networks.

   Priority 2

   In the alternate BMCA selection process, the 'PRIORITY # 2' value is treated as the fouth most important selection criteria below clock class, clock accuracy, and clock variance in order, much like the traditional PTP BMCA except that the priority 1 field isn't considered.

   Below the priority 2 field, the clock local priority and port local priority fields are compared.

   Clock Local Priority

   The 'CLOCK LOCAL PRIORITY' is applied to the local clock when it is compared to a foreign server. Setting this to a lower value will give preference to the local clock over foreign servers. The input range is 1 to 255, where 1 is the highest priority. The default setting is 128. This attribute is not used when operating as a Grandmaster.

   Modify these fields to achieve your desired BMCA outcome.

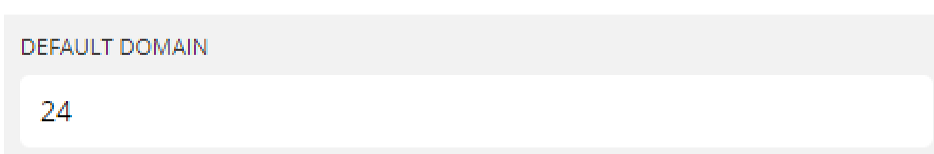
   Port Local Priority

   The 'PORT LOCAL PRIORITY' is applied to the Announce messages received on the port from a potential server when comparing that potential server to the local clock or other potential servers. Setting this to a lower value will give preference to foreign servers connected to this port. The input range is 1 to 255, where 1 is the highest priority. The default setting is 128. This attribute is not used when operating as a Grandmaster.

6. **Configure Default Domain**

   Modify the 'DEFAULT DOMAIN' number if required, otherwise it is recommended that it is left as its default value of '24'.

   A domain consists of one or more PTP devices communicating with each other. By default, PTP aware devices are configured with a domain of '0'. Changing the domain will cause only devices with the specified domain to communicate using the PTP protocol. The input range is 24-43.



7. **Advertised Delay Request Interval**

By default, the 'ADVERTISED DELAY REQUEST INTERVAL' is set to 1/16 second

8. **Announce Interval**

   By default, the 'ANNOUNCE INTERVAL' is set to 1/8 second.

9. **Announce Receipt Timeout**

   By default the 'ANNOUNCE RECEIPT TIMEOUT' is set to 3. This means that after 3 announce intervals, if the device has not recieved an announce message it will trigger an announce receipt timeout event, which will move the port into a listening state.

10. **Sync Interval**

    By default, the 'SYNC INTERVAL' is set to 1/16 second.

11. **BMCA**

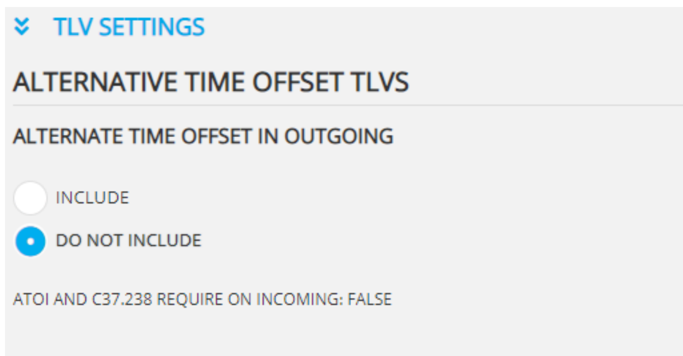
    By default, the 'BMCA' operations will be set to 'G.8275' and will operate as defined in ITU-T G 8275.1.

12. **Clock Class Rules**

    By default, the 'CLOCK CLASS RULES' operations will be set to 'G.8275' and will operate as defined in ITU-T G 8275.1.

13. **Configure TLV Settings > Alternate Time Offset In Outgoing**

    With the ITU-T G8275.1 TelecomProfile no TLVs are required on incoming traffic. The ATOI TLV can be included in outgoing traffic using the 'ALTERNATIVE TIME OFFSET IN OUTGOING' setting.

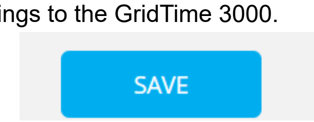


14. **TLV Settings > ATOI and C37.238 Require on Incoming**

    By default, the 'ATOI AND C37.238 REQUIRE ON INCOMING' setting is set to false.

15. **Save Settings**

    Click the 'SAVE' button to write the settings to the GridTime 3000.



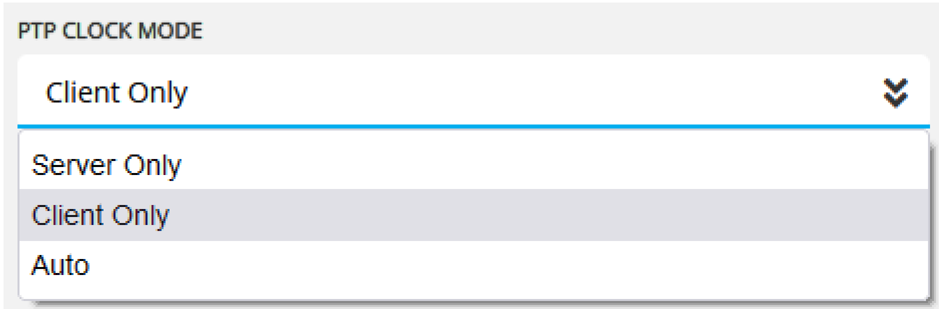
A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.7.6.2 G.8275.1 Telecom Profile Client Only Mode

This section describes how to provision a PTP G.8275.1 Telecom Profile Client Only Mode Clock.

1. **Select Client Only for PTP Clock Mode**

   Select 'Client Only' from the 'PTP CLOCK MODE' dropdown.



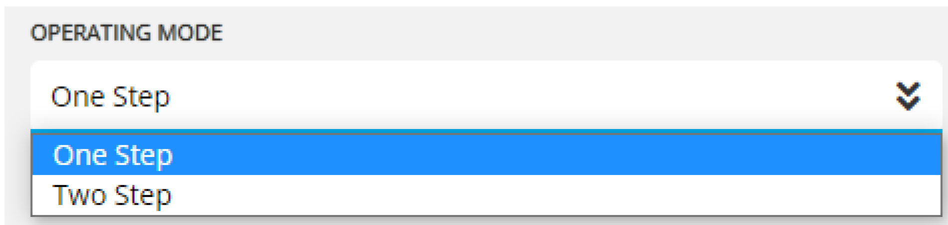
2. **Network Protocol**

   By default, the 'NETWORK PROTOCOL' is set to Layer 2 (Ethernet), which will send packets via the Ethernet data layer

3. **Select Operating Mode**

   Select the operating mode for the PTP network from the 'OPERATING MODE' dropdown.

   Operating mode is a network wide parameter. The configurable options are 'One Step' or 'Two Step'.



   Note: Select Two Step operation if the Operating Mode is unknown.

4. **Delay Mechanism**

   By default the 'DELAY MECHANISM' will be set to E2E which will set the delay mechanism to end to end as defined in IEEE 1588v2-2008.

5. **Configure Priority Fields**

   The 'PORT LOCAL PRIORITY' setting doesn't have a significant behavioural impact in client only mode and the clock local priority setting has no impact. The port local priority only affects the BMCA comparison of different servers it can see, as it can't consider itself as a server candidate.

   Clock Local Priority

   The 'CLOCK LOCAL PRIORITY' doesn't affect the execution of the BMCA in client only mode, as the port cannot consider itself as a potential server in the BMCA process. Therefore, it can be left unchanged.

   Modify these fields to achieve your desired BMCA outcome.

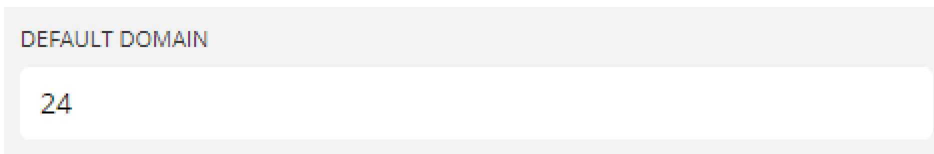
   Port Local Priority

   The 'PORT LOCAL PRIORITY' is applied to the announce messages received on the port from a potential server when comparing that potential server to the local clock or other potential server. Setting this to a lower value will give preference to foreign servers connected to this port, against servers connected to a different port. The input range is 1 to 255, where 1 is the highest priority. The default setting is 128. This attribute is not used when operating as a grandmaster.

6. **Configure Default Domain**

   Modify the 'DEFAULT DOMAIN' number if required, otherwise it is recommended that it is left as its default value of '24'.

   A domain consists of one or more PTP devices communicating with each other. By default, PTP aware devices are configured with a domain of '0'. Changing the domain will cause only devices with the specified domain to communicate using the PTP protocol. The input range is 24-43.



7. **Announce Interval**

   By default, the 'ANNOUNCE INTERVAL' is set to 1/8 second.

8. **Announce Receipt Timeout**

   By default the 'ANNOUNCE RECEIPT TIMEOUT' is set to 3. This means that after 3 announce intervals, if the device has not recieved an announce message it will trigger an announce receipt timeout event, which will move the port into a listening state.

9. **BMCA**

   By default, the 'BMCA' operations will be set to 'G.8275' and will operate as defined in ITU-T G 8275.1.

10. **Clock Class Rules**

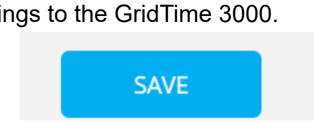
    By default, the 'CLOCK CLASS RULES' operations will be set to 'G.8275' and will operate as defined in ITU-T G 8275.1.

11. **TLV Settings > ATOI and C37.238 Require on Incoming**

    By default, the 'ATOI AND C37.238 REQUIRE ON INCOMING' setting is set to false.

12. **Save Settings**

    Click the 'SAVE' button to write the settings to the GridTime 3000.



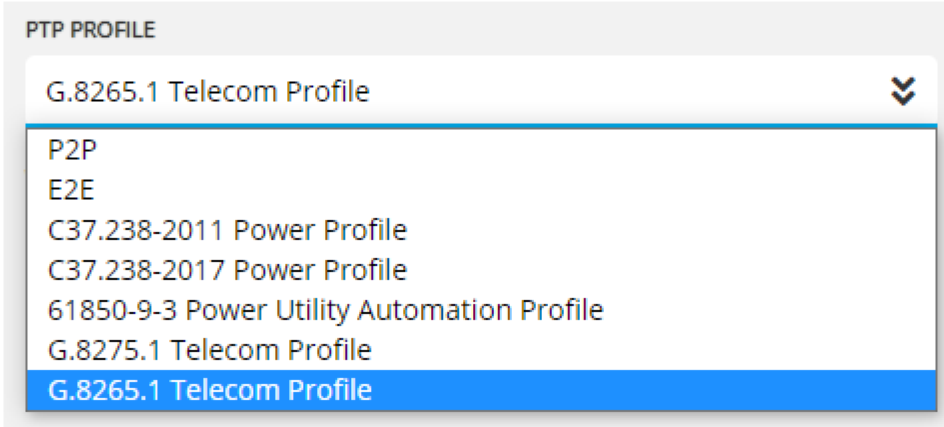
    A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.7.7 G.8265.1 Telecom Profile

This section describes how to provision a GridTime 3000 with the G.8265.1 Telecom Profile.

1. **Select G.8265.1 Telecom Profile Profile**

   Select 'G.8265.1 Telecom Profile' from the 'PTP PROFILE' dropdown.



2. Follow the instructions in one of the following sections depending on your desired PTP Clock Mode:
   – 9.5.7.7.1. G.8265.1 Telecom Profile Server Only Mode
   – 9.5.7.7.2. G.8265.1 Telecom Profile Client Only Mode

PTP Clock Mode Descriptions

In server only mode, the port will always either be in the server or passive server state depending on whether it has won the BMCA or not.

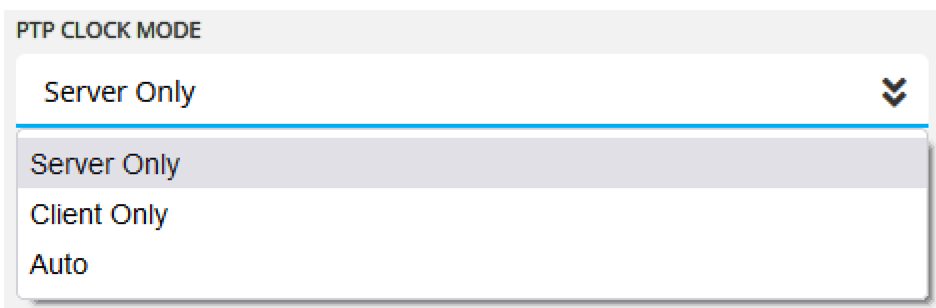
In client only mode, the port will always be in the client or listening state depending on whether there is a PTP server available to sync to.

9.5.7.7.1 G.8265.1 Telecom Profile Server Only Mode

This section describes how to provision a PTP G.8265.1 Telecom Profile Server Only Mode Clock.

1. **Select Server Only for PTP Clock Mode**

   Select 'Server Only' from the 'PTP CLOCK MODE' dropdown.



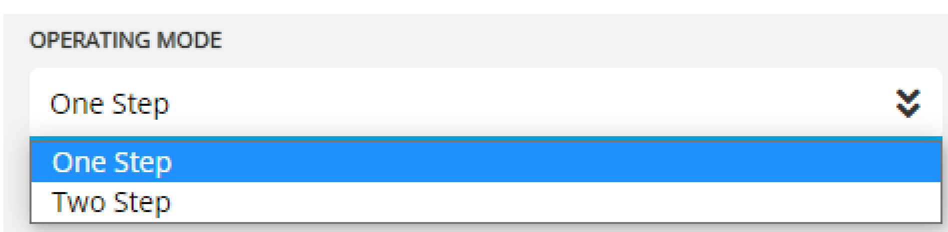
2. **Network Protocol**

   By default, the 'NETWORK PROTOCOL' is set to Layer 3 (UDP), which will send packets via the network data layer

3. **Select Operating Mode**

   Select the operating mode for the PTP network from the 'OPERATING MODE' dropdown.

   Operating mode is a network wide parameter. The configurable options are 'One Step' or 'Two Step'.



Note: Select Two Step operation if the Operating Mode is unknown.

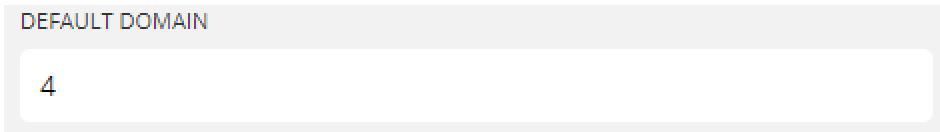
4. **Delay Mechanism**

   By default the 'DELAY MECHANISM' will be set to E2E which will set the delay mechanism to end to end as defined in IEEE 1588v2-2008.

5. **Configure Default Domain**

   Modify the 'DEFAULT DOMAIN' number if required, otherwise it is recommended that it is left as its default value of '4'.

   A domain consists of one or more PTP devices communicating with each other. By default, PTP aware devices are configured with domain “4”. Changing the domain will cause only devices with the specified domain to communicate using the PTP protocol. The input range is 4-23.



6. **Advertised Delay Request Interval**

   By default, the 'ADVERTISED DELAY REQUEST INTERVAL' is set to 1/16 second

7. **Announce Interval**

   By default, the 'ANNOUNCE INTERVAL' is set to 1/8 second.

8. **Announce Receipt Timeout**

   By default the 'ANNOUNCE RECEIPT TIMEOUT' is set to 3. This means that after 3 announce intervals, if the device has not recieved an announce message it will trigger an announce receipt timeout event, which will move the port into a listening state.

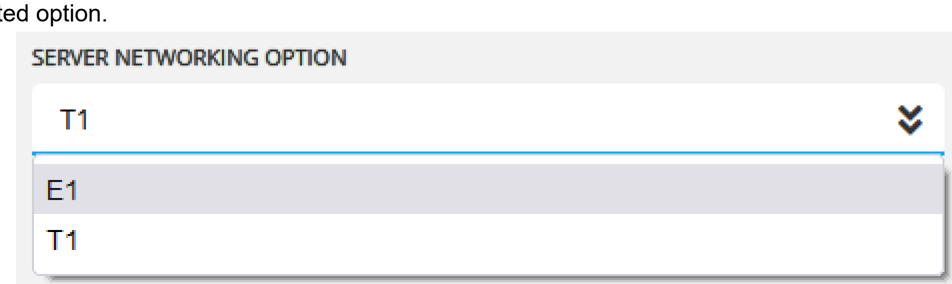
9. **Sync Interval**

   By default, the 'SYNC INTERVAL' is set to 1/16 second.

10. **BMCA**

    By default, the 'BMCA' operations will be set to 'G.8265' and will operate as defined in ITU-T G 8265.1.

11. **Configure Server Networking Option**
    Select the 'SERVER NETWORKING OPTION' from either T1 or E1. The clock class rules will change to reflect the selected option.



12. **Clock Class Rules**

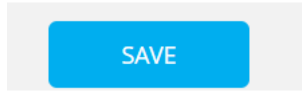
    By default, the 'CLOCK CLASS RULES' operations will be set to 'G.8265' and will appear as either 'G.8265 (Option I)' if a 'SERVER NETWORKING OPTION' of 'T1' is selected or 'G.8265 (Option II)' if 'E1' is seleted and will operate as defined in ITU-T G.8265.1.

13. **Configure the Server Force Quality (Optional)**

    If this option is configured, then the GridTime 3000 will report its accuracy as being equal to the specified level, regardless of the quality of the sync sources or the actual accuracy of the GridTime 3000. The options available will depend on the configured Server Networking Option, and are defined in clause 5.4.2 of [ITU-T G.781]. If the GridTime 3000 should report its true accuracy, select the 'None' option.

14. **Save Settings**

    Click the 'SAVE' button to write the settings to the GridTime 3000.



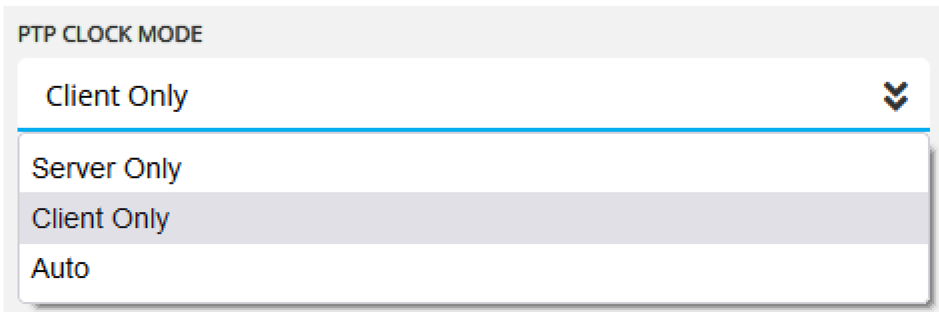
A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.5.7.7.2 G.8265.1 Telecom Profile Client Only Mode

This section describes how to provision a PTP G.8265.1 Telecom Profile Client Only Mode Clock.

1. **Select Client Only for PTP Clock Mode**

   Select 'Client Only' from the 'PTP CLOCK MODE' dropdown.



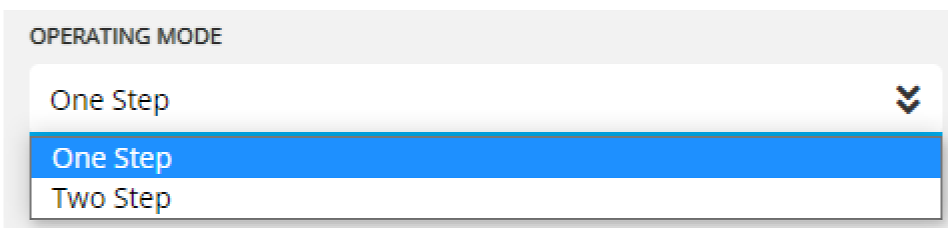
2. **Network Protocol**

   By default, the 'NETWORK PROTOCOL' is set to Layer 3 (UDP), which will send packets via the Network data layer

3. **Select Operating Mode**

   Select the operating mode for the PTP network from the 'OPERATING MODE' dropdown.

   Operating mode is a network wide parameter. The configurable options are 'One Step' or 'Two Step'.



Note: Select Two Step operation if the Operating Mode is unknown.

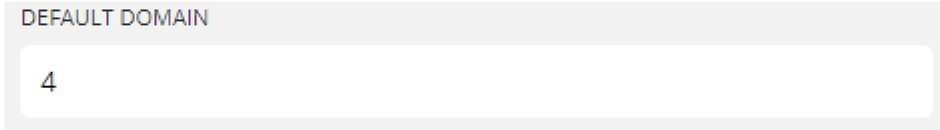
4. **Delay Mechanism**

   By default the 'DELAY MECHANISM' will be set to E2E which will set the delay mechanism to end to end as defined in IEEE 1588v2-2008.

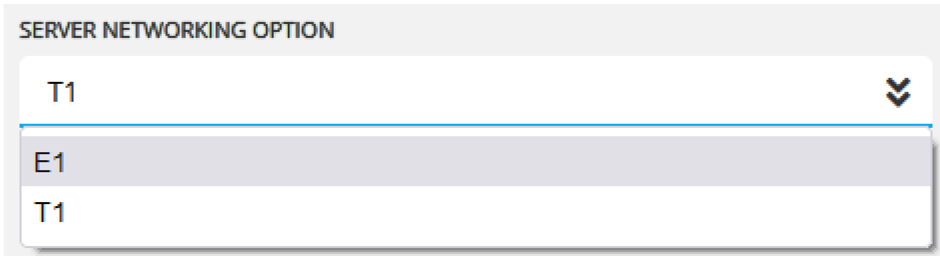
5. **Configure Default Domain**

   Modify the 'DEFAULT DOMAIN' number if required, otherwise it is recommended that it is left as its default value of '4'.

   A domain consists of one or more PTP devices communicating with each other. By default, PTP aware devices are configured with domain '0'. Changing the domain will cause only devices with the specified domain to communicate using the PTP protocol. The input range is 4-23.

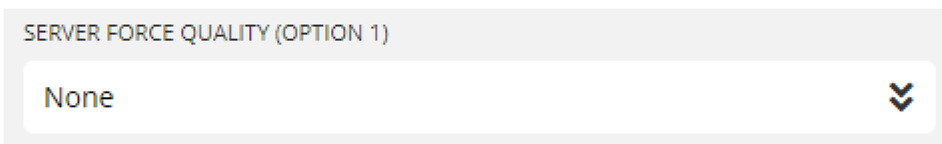


6. By default the 'ANNOUNCE RECEIPT TIMEOUT' is set to 3. This means that after 3 announce intervals, if the device has not recieved an announce message it will trigger an announce receipt timeout event, which will move the port into a listening state.
7. **Configure Server Networking Option**
   Select the 'SERVER NETWORKING OPTION' from either T1 or E1. The clock class rules will change to reflect the selected option.



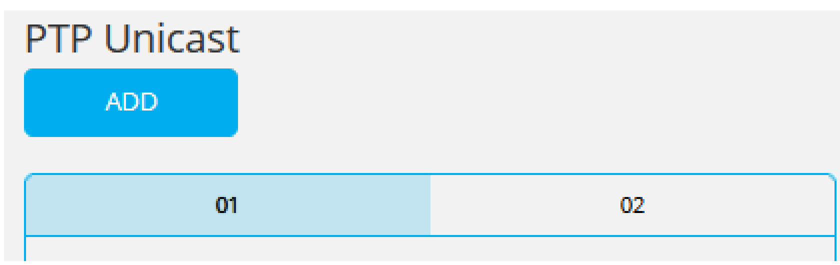
8. **Configure the Forced Quality**

   The 'SERVER FORCE QUALITY' option should be set to 'None' regardless of the Server Networking Option selected.



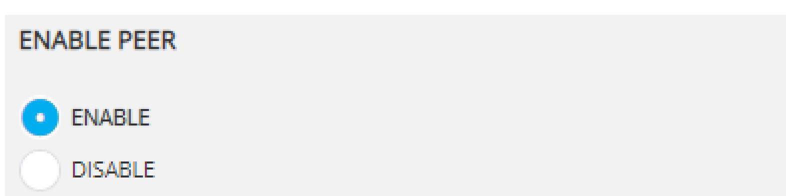
9. **Add the PTP Peer**

   Click the blue 'ADD' button as shown. A tabbed collection of settings will be as displayed. Multiple peers can be added, and will be accessible via the clicking the light blue tabs. Each will be numbered in the order they were created. This is as shown below.



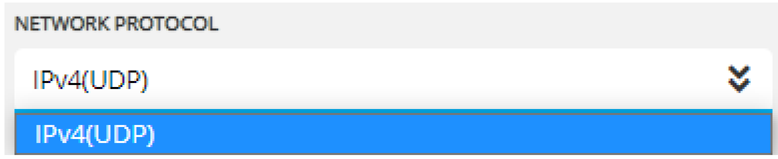
10. **Enable the Peer.**

    By default, the enable settings will be blank. Select 'ENABLE'. If desired, an operator can later disable the peer without deleting it by selecting the 'Disable' option. A disabled peer will not send signaling messages, or respond to sync messages.

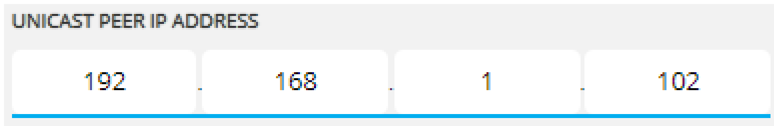


11. **Configure the IP settings**

Select 'IPv4(UDP)' from the 'NETWORK PROTCOL' dropdown as shown. It is the only option available to G.8265.1 peers, but the GridTime 3000 Ethernet port will not operate as a G.8265.1 client unless this option is selected.

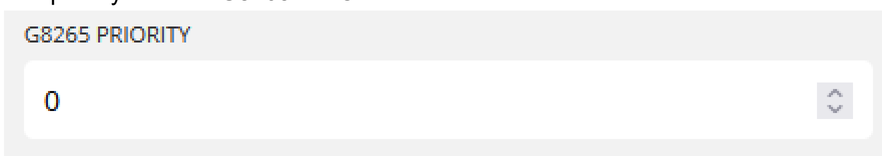


Add the IP address of the server to the 'UNICAST PEER IP ADDRESS' section. The GridTime 3000 will send signaling messages to this IP address requesting announce and sync messages.



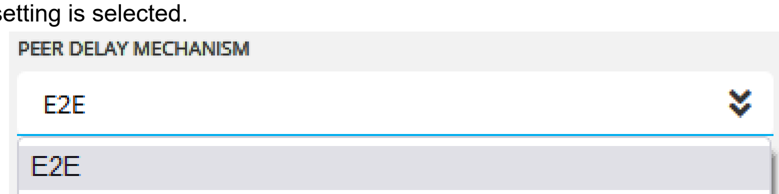
12. **Configure the G.8265 Priority**

    Enter the desired priority into the 'G8265 PRIORITY' box.



13. **Configure the Delay Mechanism**

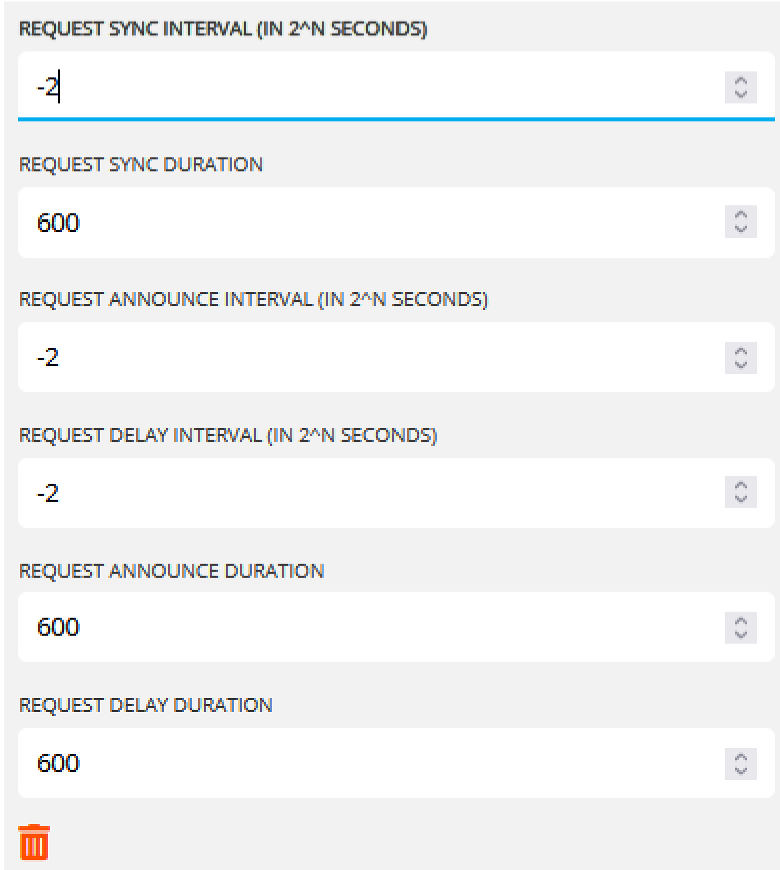
    The G.8265.1 PTP profile only supports the End-to-End delay mechanism. Select this item from the drop-down as shown. This is the only option available, but the GridTime 3000 Ethernet port will not operate as a G.8265 client unless this setting is selected.



14. **Configure the Sync Interval, Announce Interval, and Delay Interval**

    These settings control the interval at which the G.8265.1 server will send the associated packets. All of these fields will take values from -7 to 4 seconds.

    The units for these fields are in units $2^{\wedge n}$. For example, if '-2' is entered into one of these fields, then the server will send the associated message every 0.5 seconds.



15. **Configure the Request Sync Duration, Request Announce Duration, and Request Delay Duration**

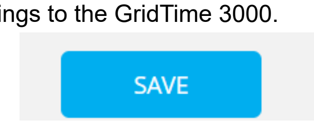
    These settings control the duration for which the G.8265.1 server will send the associated packets. All of these fields will take values from 60 to 1000 seconds.

16. **Delete Unwanted Peers or Repeat Steps 6-12 to Add Additional Peers (Optional)**

    Unwanted peers can be deleted using the orange 'trash can' button at the bottom left of the PTP Unicast Peer pane. The GridTime 3000 imposes no software restrictions on the number of G.8265.1 peers that can be added.

17. **Save Settings**

    Click the 'SAVE' button to write the settings to the GridTime 3000.



A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.6 Provisioning GNSS

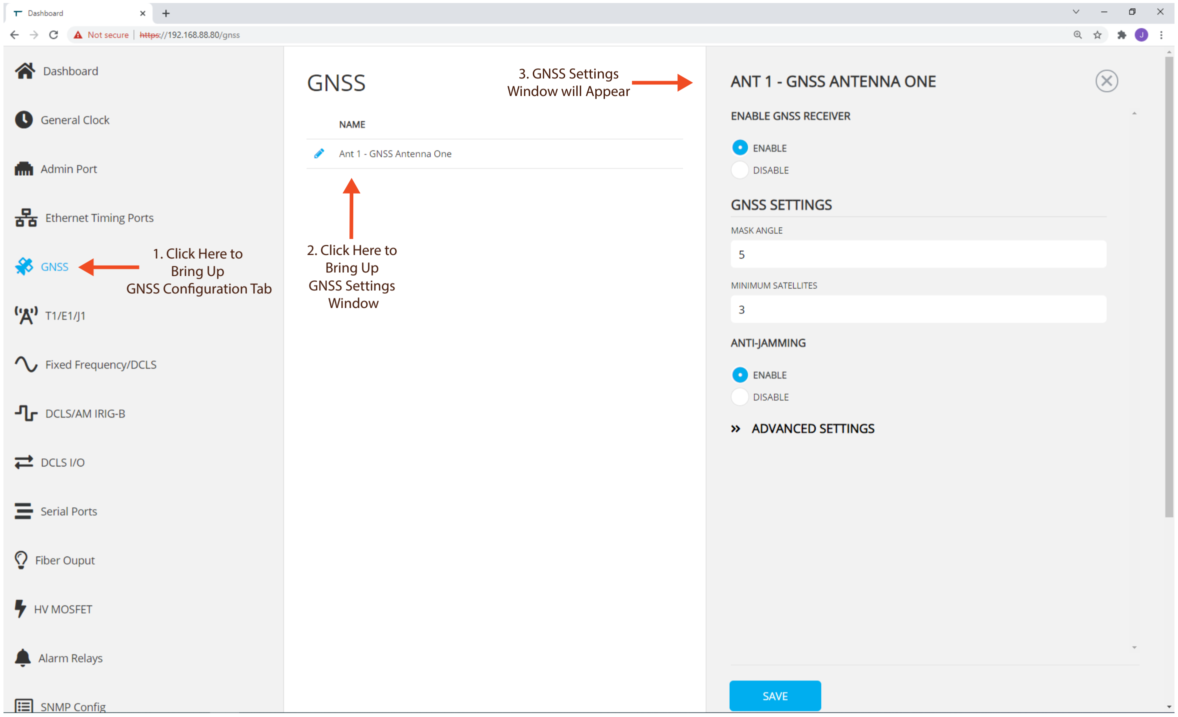
This section describes how to provision the antenna port settings on the GridTime 3000.

The GNSS configuration tab is used to configure the GridTime 3000's antenna ports. Choosing the correct settings ensures that the GridTime 3000 can receive GNSS time signals and accurately synchronize to time from GNSS satellites.

Follow the steps below to configure the GridTime 3000 for GNSS time synchronization.

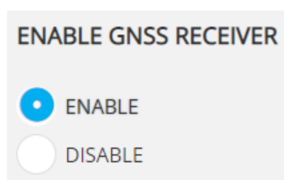
1. **Navigate to the GNSS Settings Window**

Figure 9-3. GNSS Configuration Tab



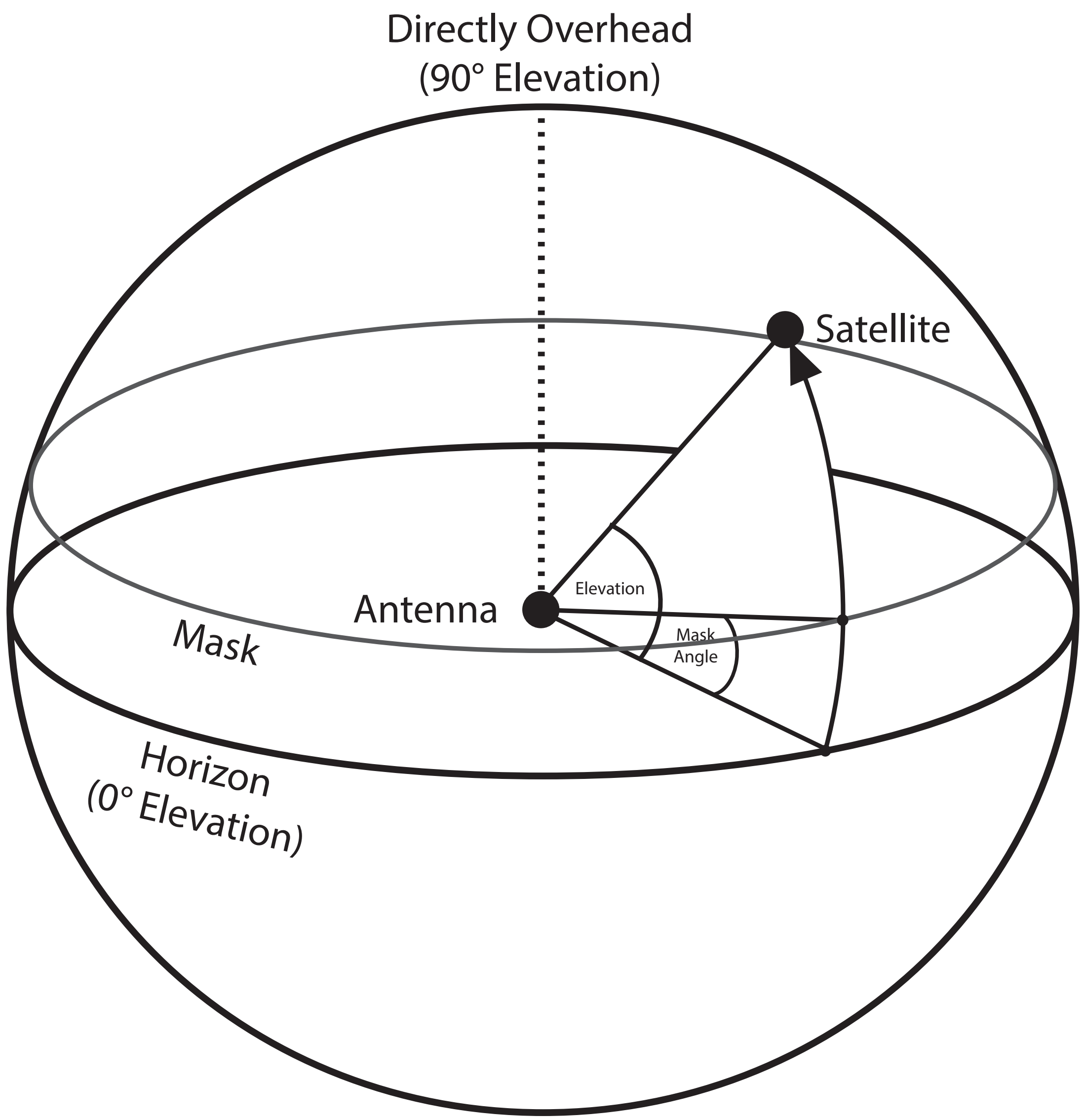
2. **Enable GNSS Receiver**

Select 'ENABLE' for the 'ENABLE GNSS RECEIVER' setting.



3. **Set Mask Angle**

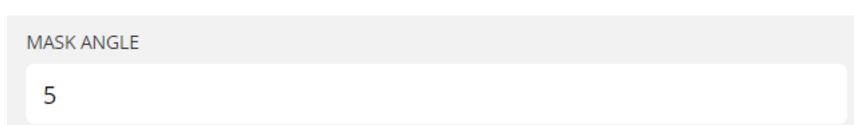
The 'MASK ANGLE' threshold setting defines the minimum required elevation angle of GNSS satellites above the horizon when viewed from the antenna's current position. This angle is commonly referred to as elevation, and ranges from 0° - on the horizon, to 90° - directly overhead.



Signals from satellites that are obstructed by objects on the horizon such as mountains may provide inconsistent GNSS coverage due to interference. The mask angle threshold setting provides a method to filter out these inconsistent signals ensuring the GridTime 3000 only uses stable and accessible satellites.

By default the mask angle is set to 5 degrees, which means that only satellites with an elevation of 5° or more will be used for time synchronization.

For a different mask angle, type a value into the 'MASK ANGLE' textbox between 0° and 90°.



Tip:
A higher mask angle setting can help ensure more accurate time is received from GNSS satellites, as signal interference from objects in the environment can be reduced.

However, as the mask angle is made higher, satellites that are closer to the horizon cannot be used, meaning there are less usable satellites. This creates a higher risk of a GNSS synchronization dropout occuring as satellites enter and exit the usable mask angle throughout the day. With a 90° mask angle no satellites can be used at all.

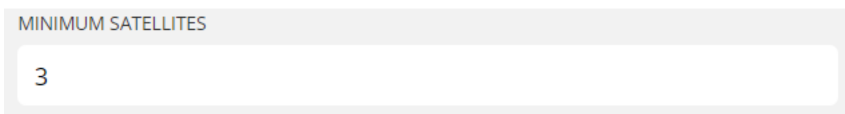
Important: We recommend not increasing the mask angle value above 20° for most use cases.

4. **Set Minimum Satellites**

   The 'MINIMUM SATELLITES' threshold setting determines the minimum number of usable GNSS satellites that should be available at a given time. If the number of detected satellites is is less than this the 'low satellites' alarm will be triggered, see 11.4.1. Alarm Conditions and Correction Actions.

   By default, this is set to three satellites, as three satellites is the minimum number required for the GridTime 3000 to calculate a position fix. Position fixes are required to calculate the time from GNSS satellite signals, so if less than three usable satellites are detected, the GridTime 3000 cannot synchronize to GNSS regardless of the minimum satellites threshold.

   For a different minimum satellites threshold, type a value into the textbox between 0 and 184 satellites.



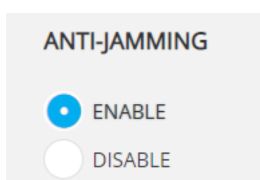
Tip:
A higher minimum satellites setting will give you more warning when your GridTime 3000 has insufficient satellites available, alerting you of the need to relocate your antenna to a site with better GNSS satellite reception before synchronization loss. This offers superior GNSS synchronization dropout prevention.

However, if the value is made too large, your GridTime 3000 will frequently trigger the 'low satellites' alarm unnecessarily, flooding your system with meaningless alarms.

For this reason, we recommend not increasing this value above 10 for most cases.

Set Anti-Jamming Mode

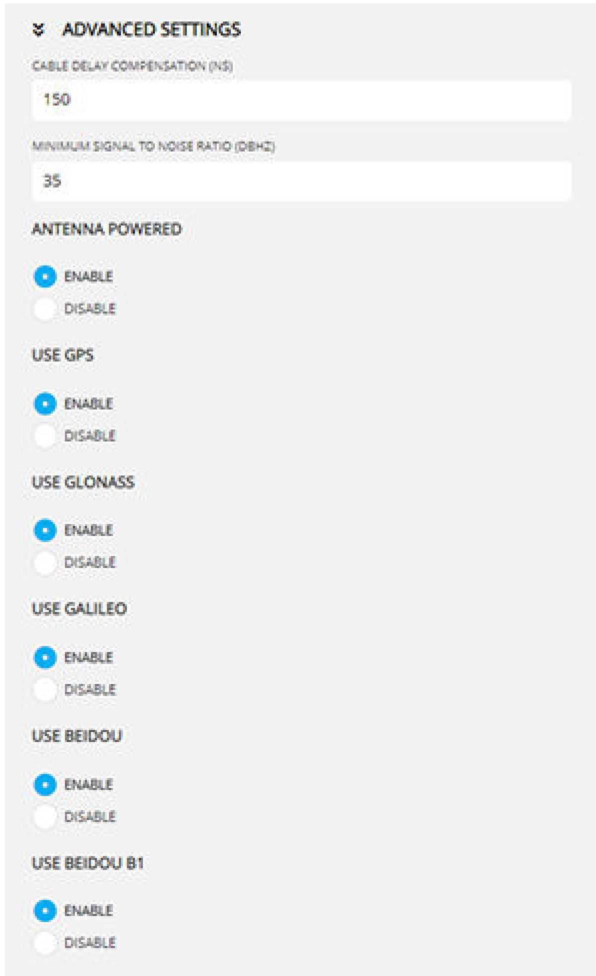
This setting enables the GridTime 3000 to utilize the GNSS receiver's anti-jamming and spoofing algorithms that offer protection against jamming or spoofing GNSS attacks.



Note: This setting is enabled by default, and Microchip recommends leaving it enabled to ensure the most amount of protection from jamming and spoofing attacks.

1. **Expand Advanced Settings**

   The advanced settings dropdown contains additional settings when it is expanded.



2. **Set Cable Delay Compensation**

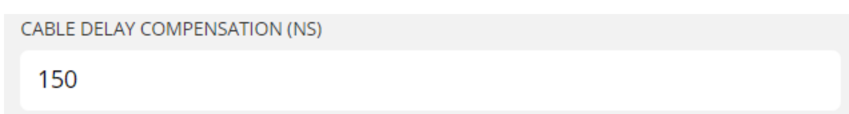
   The 'CABLE DELAY COMPENSATION (NS)' setting determines how much delay compensation the GridTime 3000 will apply to the calculated time when it is synchronized to GNSS. The GridTime 3000 adds the value of this setting to the calculated time in nanoseconds to compensate for the propagation delay of the GNSS signals as they pass through the antenna installation to the GridTime 3000's antenna port.

   For optimal time accuracy, the propagation delay of the installation should be calculated using the following formula:

$$Total\ Antenna\ Installation\ Delay\ (ns) = Antenna\ Delay\ (ns) + Cable\ Delay\ (ns/m) \times Cable\ Length\ (m)$$

   This gives a fairly good approximation of the total antenna installation delay, but the delay values of inline amplifiers and lightning arrestors can be included as well if they are known. The delay values for the stock accessories provided with the GridTime 3000 are approximately 1ns-2ns, low enough to be considered negligible. Other accessories, especially those with high quality filters, may have more than 30ns delay. If the cable delay is not known, 4 ns/m is a good approximation for most coaxial cable.

   The default value of the cable delay compensation is 150 ns.



Note: If the antenna installation propagation delay is incorrectly compensated for, GNSS time synchronization will have an additional constant delay equal to the difference between the delay compensation setting and the true antenna installation delay

3. **Set Minimum Signal to Noise Ratio (Db)**

   Signal to noise ratio (SNR) is the ratio of the usable component of a signal to the unusable noise component. It is defined as the signal power; the component of a signal containing only the transmitted information, divided by the noise power; the unwanted random disturbance component of the signal caused by environmental and electrical factors.

$$SNR = \frac{Signal\ Power\ (W)}{Noise\ Power\ (W)}$$

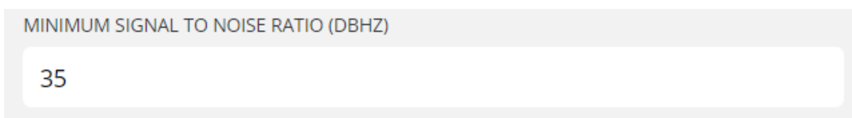
   When measured in logarithmic units, more commonly known as decibels (dB), SNR is defined as:

$$SNR\ (dB) = 10log_{10}(SNR) = 10log_{10}\left(\frac{Signal\ Power\ (W)}{Noise\ Power\ (W)}\right)$$

   The 'MINIMUM SIGNAL TO NOISE RATIO (DBHZ)' setting determines the minimum SNR (dB) expected from GNSS satellite signals for satellites to be considered usable for time synchronization by the GridTime 3000.

   GNSS signals with a low SNR are considered low quality, and are less reliably decoded. This results in less accurate time synchronization, hence, satellites that are below the signal to noise ratio threshold are filtered out.

   By default, the minimum signal to noise ratio is 35 dB.

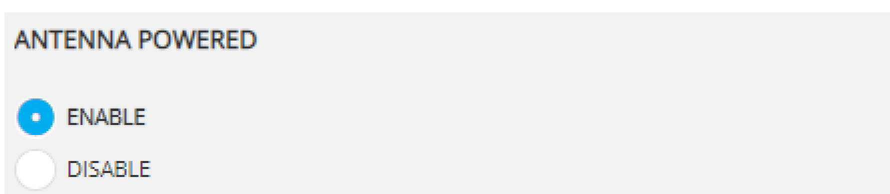


   Note: Microchip recommends leaving this setting at 35 dB unless a large number of GNSS satellites are consistently available at the site of installation. A 35 dB SNR is sufficient for high quality, accurate GNSS time synchronization.

4. **Configure Internal Antenna Power Supply**

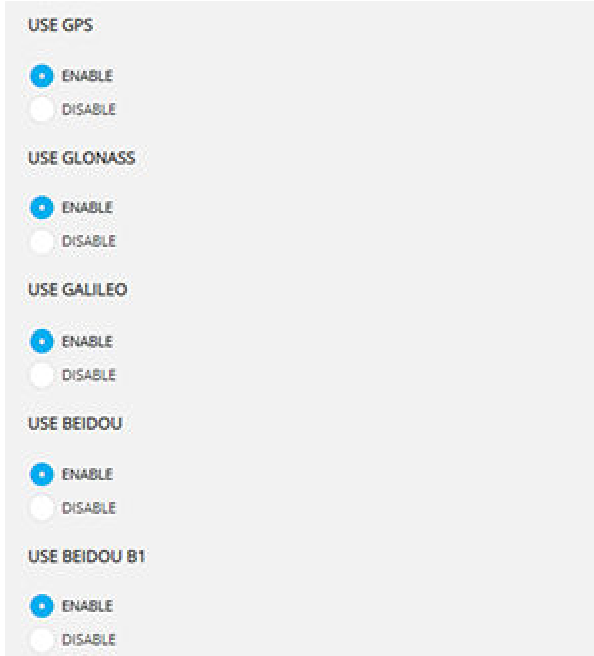
   The GridTime 3000 can supply 5V and at most 80mA to RF equipment via the antenna connector and cable. This checkbox can be used to enable and disable this supply.

   Figure 9-4.



5. **Configure GNSS Checkboxes**

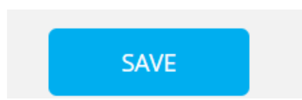
   The GNSS checkboxes determine which GNSS constellations will be used by the GridTime 3000 for time synchronization.



Tip: Microchip recommends leaving all GNSS constellations enabled for time synchronization. This ensures as many GNSS satellites as possible are available at a given time, reducing the risk of GNSS synchronization dropouts.

6. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



   A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

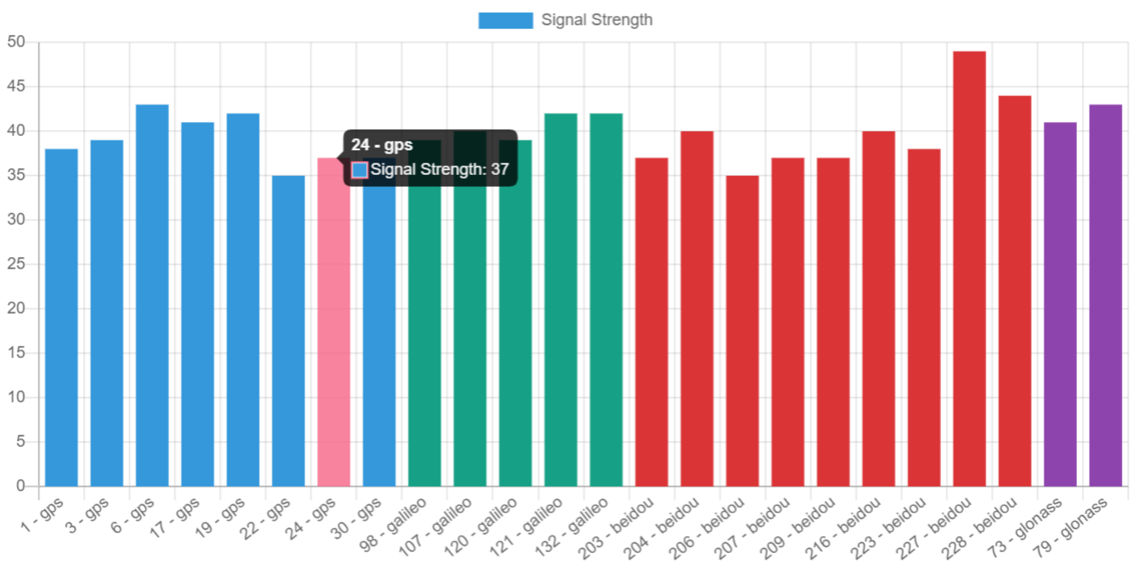
7. **Verify settings**

   Validate the GNSS settings against the information on the Clock Management Tool (CMT) dashboard.

   The satellite graph is a bar chart representing the SNR values of all the satellites being used by the GridTime 3000, as well as the GNSS constellation they belong to. The satellite ID is shown at the base of each bar on the chart Satellite Graph.

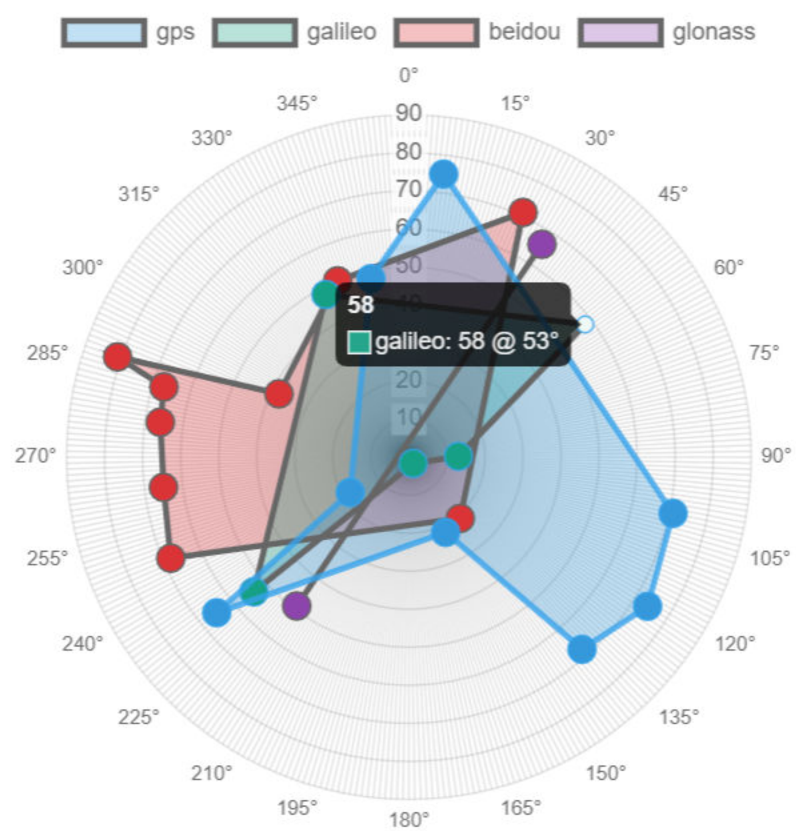
   Check that the Signal to Noise Ration (SNR) values are above the signal to noise ratio threshold, and that only satellites from enabled constellations are present. Hover over individual satellites to check their signal strength.

Figure 9-5. Satellite Graph



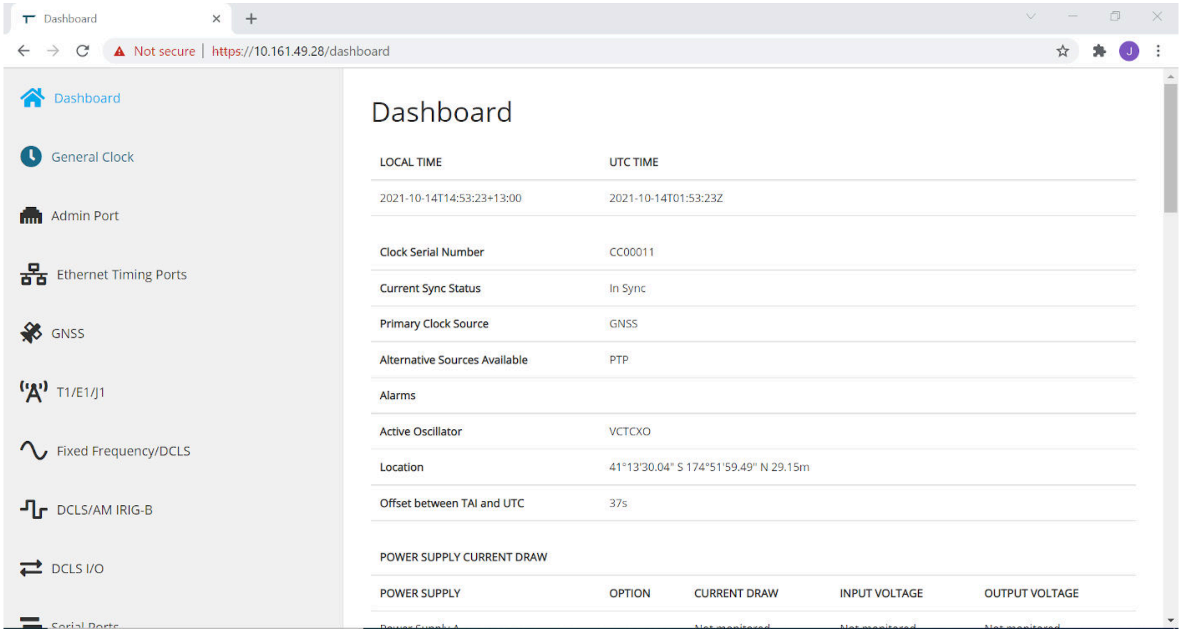
The satellite almanac shows the sky position of the satellites, including the elevations. Check that the satellite elevations are above the mask angle. The axis going up the middle of the almanac indicates elevation. When hovering on the satellite the first number that appears will also indicate the elevation. In the below example the satellite is at an elevation of 58 degrees and a position of 53 degrees from the receiver.

Figure 9-6. Satellite Almanac



Lastly, check that the GridTime 3000 is GNSS synchronized by navigating to the CMT dashboard. The GridTime 3000 should report that its current sync state is 'In Sync', and that its primary clock source is GNSS.

Figure 9-7. CMT Dashboard

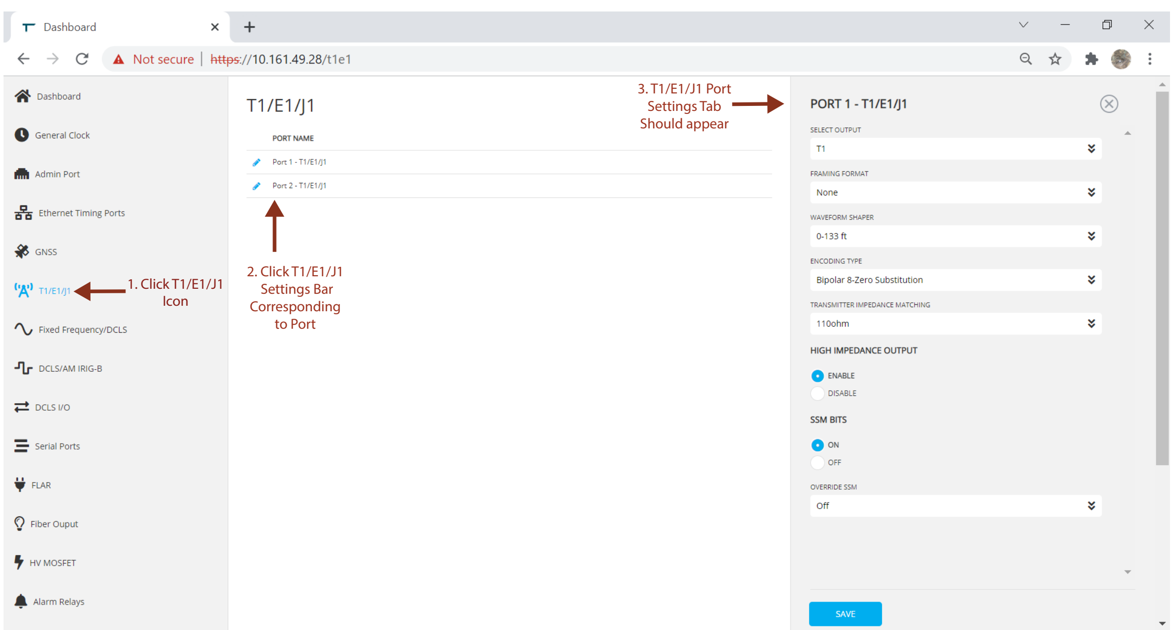


9.7 Provisioning the T1/E1/J1 Ports

This section describes how to provision the T1/E1/J1 ports.

1. **Navigate to the T1/E1/J1 Port Configuration Window**

   Navigate to the T1/E1/J1 Port settings tab by clicking on the settings bar corresponding to the port you want to configure.



2. Follow the instructions in one of the following sections depending on what type of output signal you want to configure:

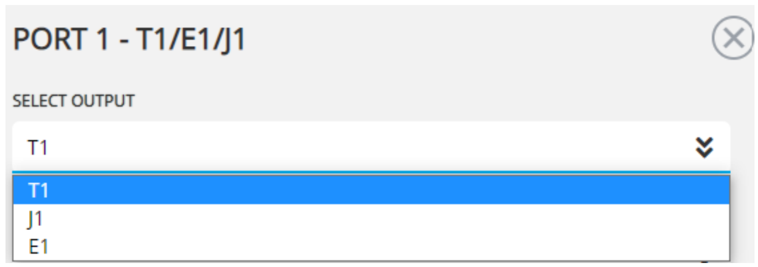
9.7.1 Provisioning T1 Output

This section describes how to provision a T1/E1/J1 Port to output a T1 signal.

1. **Select Output**

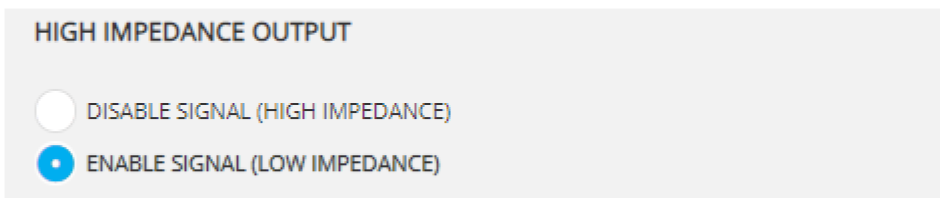
   Select 'T1' from the 'SELECT OUTPUT' dropdown. This will reveal the T1 specific configuration options.

   Note: As the T1/E1/J1 ports must both output the same signal type (T1, J1, or E1), the signal output type for both ports is only configurable in the port 1 configuration window.



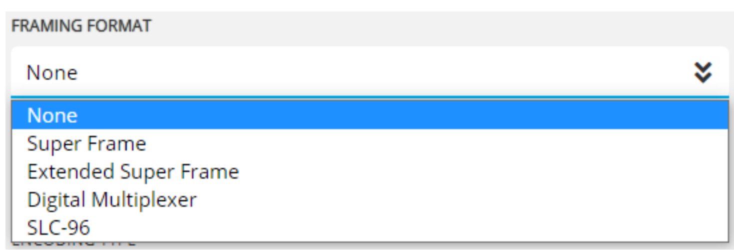
2. **Enable Port**

   Select 'ENABLE SIGNAL (LOW IMPEDANCE)' from the 'HIGH IMPEDANCE OUTPUT' radio buttons. This will reveal the T1 output specific settings.



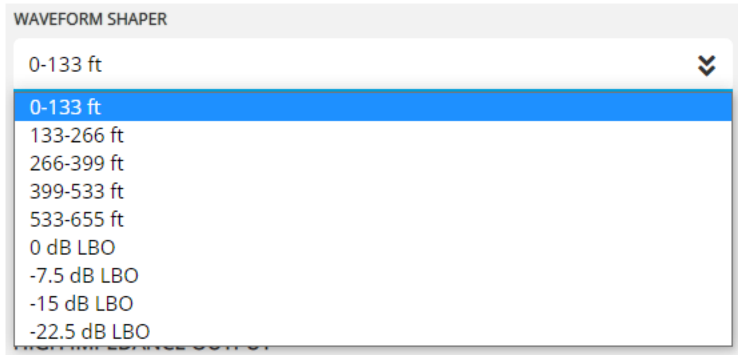
3. **Select Framing Format**

   Select the appropriate 'FRAMING FORMAT' option from the 'FRAMING FORMAT' dropdown. By default the 'FRAMING FORMAT' is set to none.



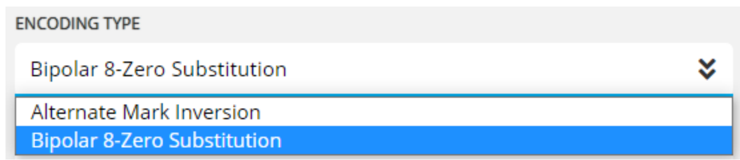
4. **Select Waveform Shaper**

   Select the appropriate waveform shaper from the 'WAVEFORM SHAPER' dropdown. By default, the 'WAVEFORM SHAPER' is set to 0-133 ft



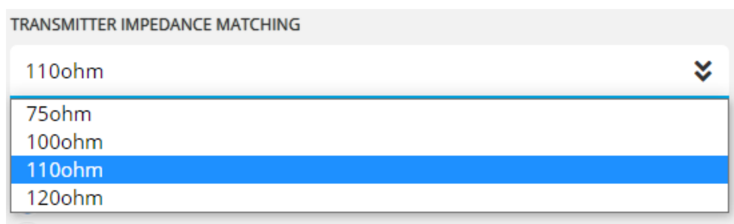
5. **Select Encoding Type**

   Select the encoding type from the 'ENCODING TYPE' dropdown. By default, the 'ENCODING TYPE' is set to Bipolar 8-Zero Substitution.



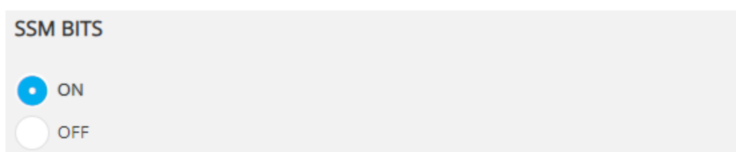
6. **Select Transmitter Impedance Matching**

   Select the correct transmitter impedance matching from the 'TRANSMITTER IMPEDANCE MATCHING' dropdown. By default, the 'TRANSMITTER IMPEDANCE MATCHING' is set to 110ohm.



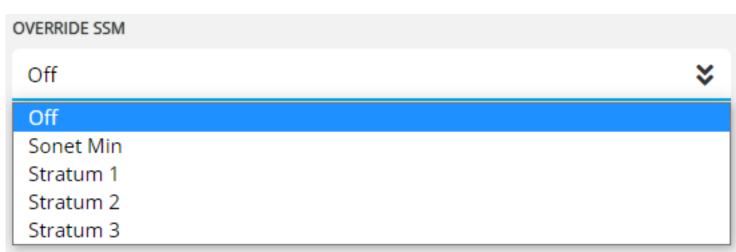
7. **Enable or Disable SSM Bits**

   Enable or disable SSM bits in the output signal using the 'SSM BITS' radio buttons.



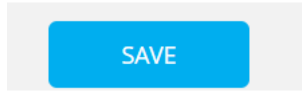
8. **Select Override SSM Behaviour**

   Select the override SSM value from the 'OVERRIDE SSM' dropdown.



9. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



A 'Saved!' notification will appear in the bottom right corner of the page, indicating that the settings have successfully been written to the GridTime 3000.

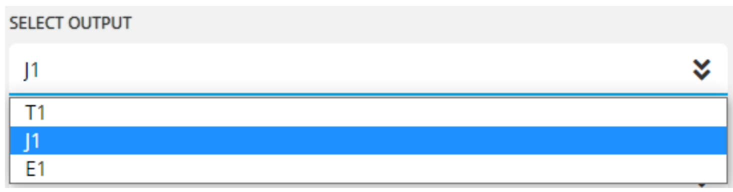
9.7.2 Provisioning J1 Output

This section describes how to provision a T1/E1/J1 Port to output a J1 signal.

1. **Select Output**

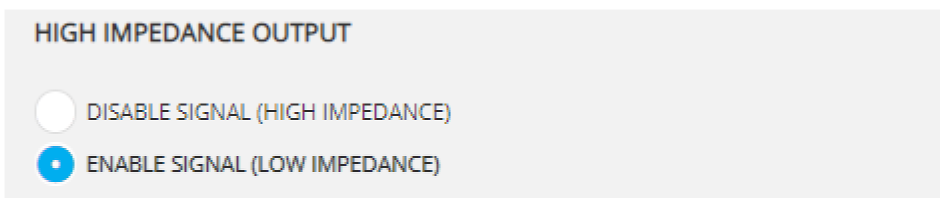
   Select 'J1' from the 'SELECT OUTPUT' dropdown. This will reveal the J1 specific configuration options.

   Note: As the T1/E1/J1 ports must both output the same signal type (T1, J1, or E1), the signal output type for both ports is only configurable in the port 1 configuration window.



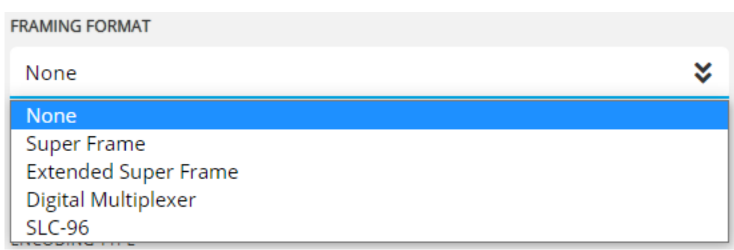
2. **Enable Port**

   Select 'ENABLE SIGNAL (LOW IMPEDANCE)' from the 'HIGH IMPEDANCE OUTPUT' radio buttons. This will reveal the J1 output specific settings.



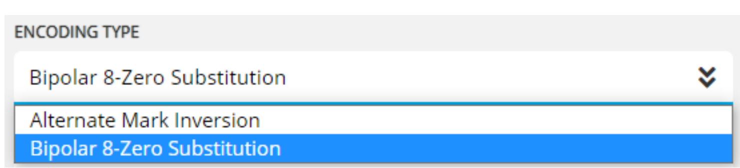
3. **Select Framing Format**

   Select the appropriate 'FRAMING FORMAT' option from the 'FRAMING FORMAT' dropdown. By default the 'FRAMING FORMAT' is set to none.



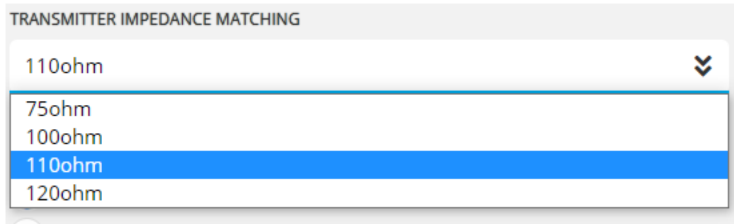
4. **Select Encoding Type**

   Select the encoding type from the 'ENCODING TYPE' dropdown. By default, the 'ENCODING TYPE' is set to Bipolar 8-Zero Substitution.



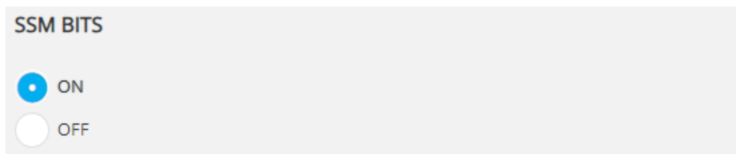
5. **Select Transmitter Impedance Matching**

   Select the correct transmitter impedance matching from the 'TRANSMITTER IMPEDANCE MATCHING' dropdown. By default, the 'TRANSMITTER IMPEDANCE MATCHING' is set to 110ohm.



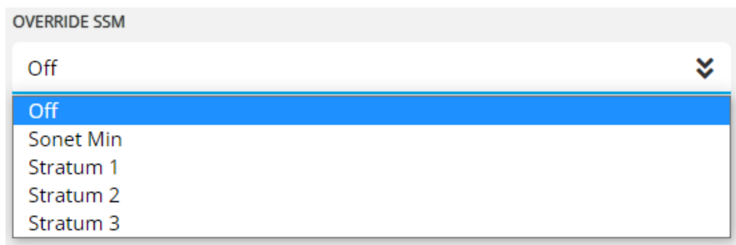
6. **Enable or Disable SSM Bits**

   Enable or disable SSM bits in the output signal using the 'SSM BITS' radio buttons.



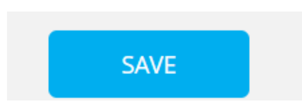
7. **Select Override SSM Behaviour**

   Select the override SSM value from the 'OVERRIDE SSM' dropdown.



8. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



   A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

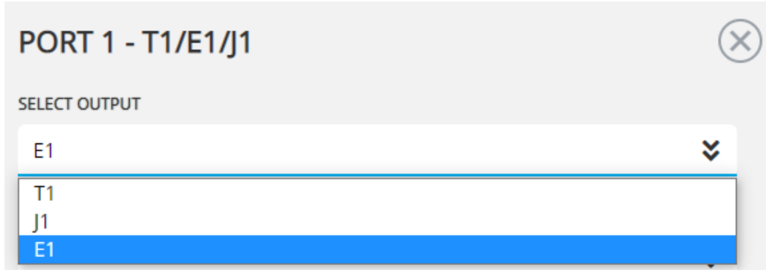
9.7.3 Provisioning E1 Output

This section describes how to provision a T1/E1/J1 Port to output a E1 signal.

1. **Select Output**

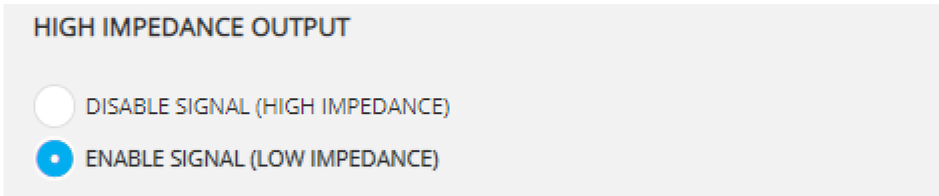
   Select 'E1' from the 'SELECT OUTPUT' dropdown. This will reveal the E1 specific configuration options.

   Note: As the T1/E1/J1 ports must both output the same signal type (T1, J1, or E1), the signal output type for both ports is only configurable in the port 1 configuration window.



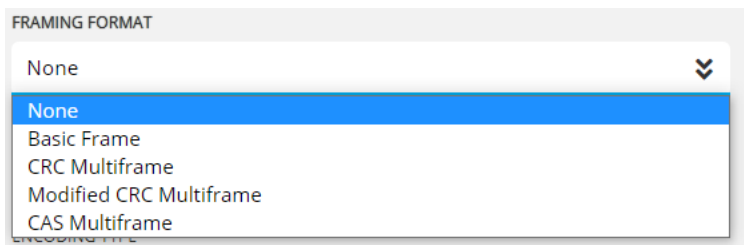
2. **Enable Port**

   Select 'ENABLE SIGNAL (LOW IMPEDANCE)' from the 'HIGH IMPEDANCE OUTPUT' radio buttons. This will reveal the E1 output specific settings.



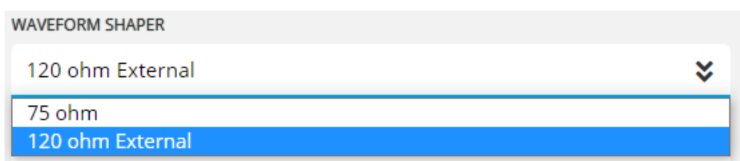
3. **Select Framing Format**

   Select the appropriate 'FRAMING FORMAT' option from the 'FRAMING FORMAT' dropdown. By default the 'FRAMING FORMAT' is set to none.



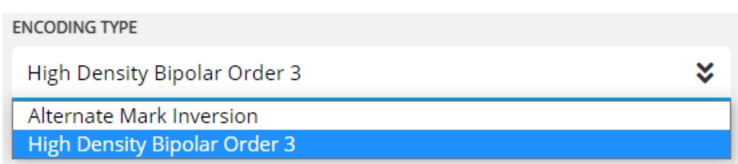
4. **Select Waveform Shaper**

   Select the waveform shaper from the 'WAVEFORM SHAPER' dropdown. By default, the 'WAVEFORM SHAPER' is set to 120 ohm External



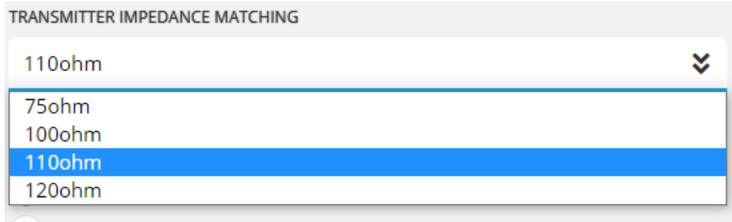
5. **Select Encoding Type**

   Select the applicable encoding type from the 'ENCODING TYPE' dropdown. Select the encoding type from the 'ENCODING TYPE' dropdown. By default, the 'ENCODING TYPE' is set to High Density Bipolar Order 3.



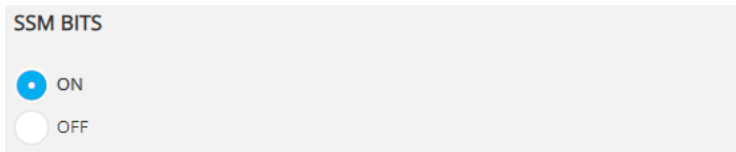
6. **Select Transmitter Impedance Matching**

   Select the correct transmitter impedance matching from the 'TRANSMITTER IMPEDANCE MATCHING' dropdown. By default, the 'TRANSMITTER IMPEDANCE MATCHING' is set to 110ohm.



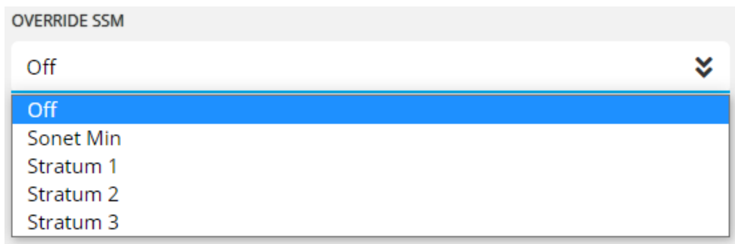
7. **Enable or Disable SSM Bits**

   Enable or disable SSM bits in the output signal using the 'SSM BITS' radio buttons.



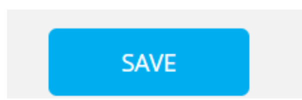
8. **Select Override SSM Behaviour**

   Select the appropriate override SSM value from the 'OVERRIDE SSM' dropdown.



9. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



   A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.8 Provisioning the Pulse Ports

This section describes how to provision the GridTime 3000's pulse ports. The pulse ports include the BNC ports, the ST Fiber ports, and the HV MOSFET Port.

9.8.1 Provisioning Standard Pulse Outputs

This section describes how to provision pulse ports with standard pulse outputs. The standard pulse outputs can be configured on any of the GridTime 3000 pulse ports. Standard ouputs include:

- Unmodulated IRIG-B
- Modified Manchester Modulated IRIG-B
- Simulated DCF77 Receiver Signal
- Programmable Pulses

See 2.4. Time and Frequency Signals for the complete specifications of all the standard pulse outputs.

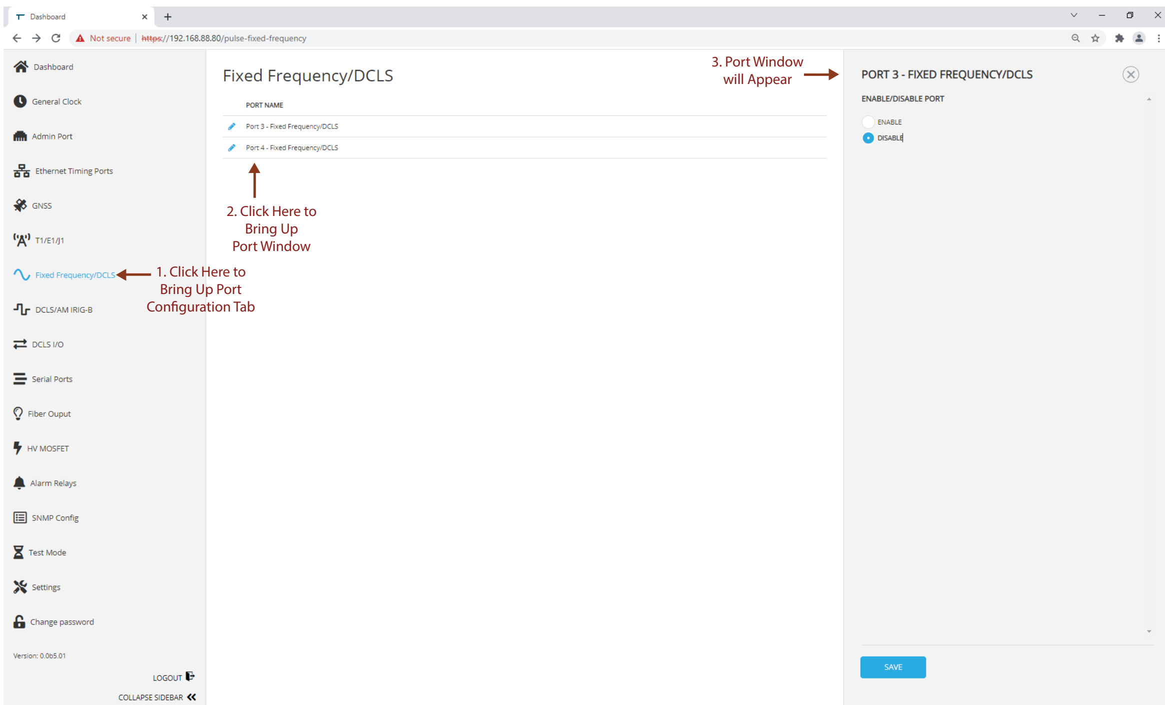
9.8.1.1 Unmodulated IRIG-B Output

This section describes how to provision a GridTime 3000 pulse port to output unmodulated IRIG-B.

Note: The unmodulated IRIG-B output provisioning process is the same for all BNC ports, the ST Fiber outputs, and the HV MOSFET port. The screenshots in this section will use port 3 - a fixed frequency/DCLS BNC port, as an example.

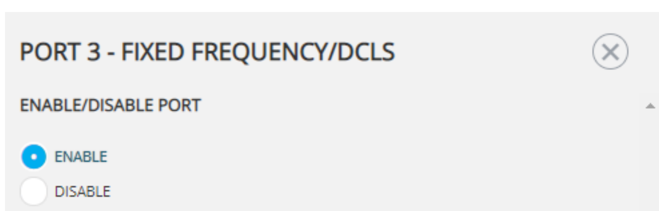
1. **Navigate to Port's Window**

   Navigate to the window for the port you want to configure by clicking on the port's corresponding icon, then clicking the settings bar corresponding to the port.



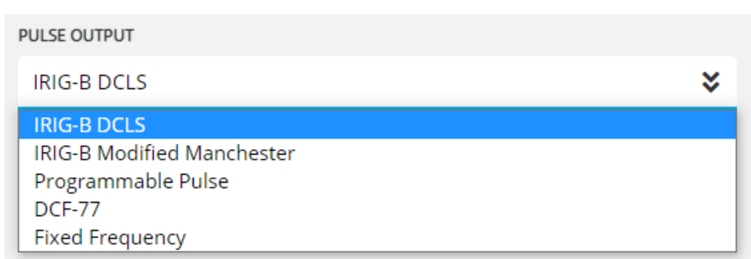
2. **Enable Port**

   Select 'ENABLE' for the enable/disable port setting.



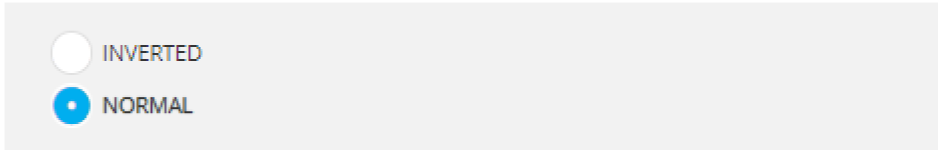
3. **Select Pulse Output**

   Select 'IRIG-B DCLS' (Unmodulated IRIG-B for ST Fiber outputs) from the 'PULSE OUTPUT' dropdown.



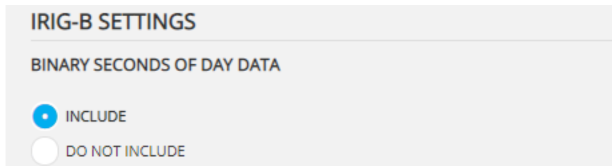
4. **Select Signal Inversion**

Select whether the signal will be inverted or normal from the radio buttons below the pulse output drop down. It will be set to 'NORMAL' by default.



5. **Include or Exclude Binary Seconds of Day Data**

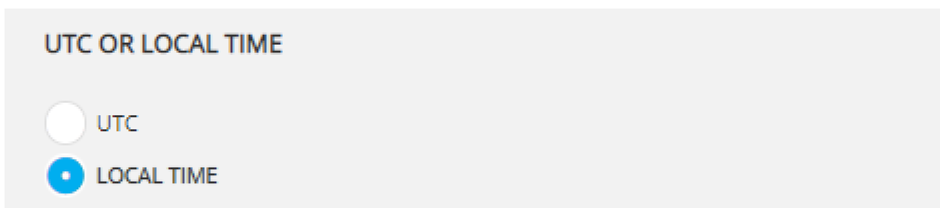
   Select whether binary seconds of day data will be included in the output with the 'BINARY SECONDS OF DAY DATA' radio buttons. Binary seconds of day data will be set to 'INCLUDE' by default.



   Note: Microchip recommends including binary seconds of day data in case it is required by the end device.

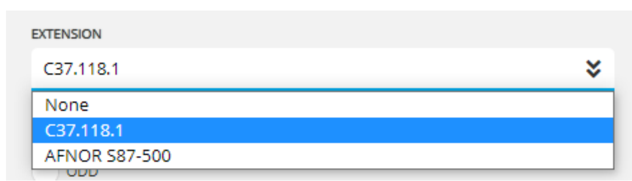
6. **UTC or Local Time**

   Select whether the output will use a UTC or Local Time format using the 'UTC OR LOCAL TIME' radio buttons. 'LOCAL TIME' will be selected by default.



7. **Select Extensions**

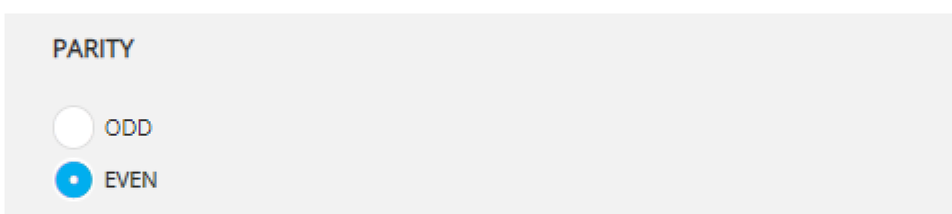
   Select what extensions will be included in the control field of the output IRIG-B signal. C37.118.1 extensions will be selected by default.



   Note: Microchip recommends using C37.118.1 extensions here as they are widely supported by end devices and contain useful information such as pending leap seconds and daylight savings jumps.

8. **Select Even or Odd Parity**

   Select whether the signal will use odd or even parity from the 'PARITY' radio buttons. The 'PARITY' is set to 'EVEN' by default.

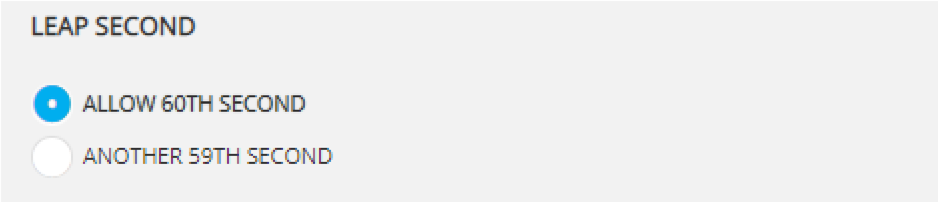


9. **Select Leap Second Behavior**

   Choose the leap second behavior from the following options:

– 'ALLOW 60TH SECOND': In the event of a leap second, the seconds counter in the IRIG-B signal will count an extra second up to 60 before rolling back to 0 and incrementing the minute counter.
– 'ANOTHER 59TH SECOND': In the event of a leap second, the seconds counter in the IRIG-B signal will count to 59, then will repeat second '59' again a second later, before rolling back to 0 and incrementing the minute counter.

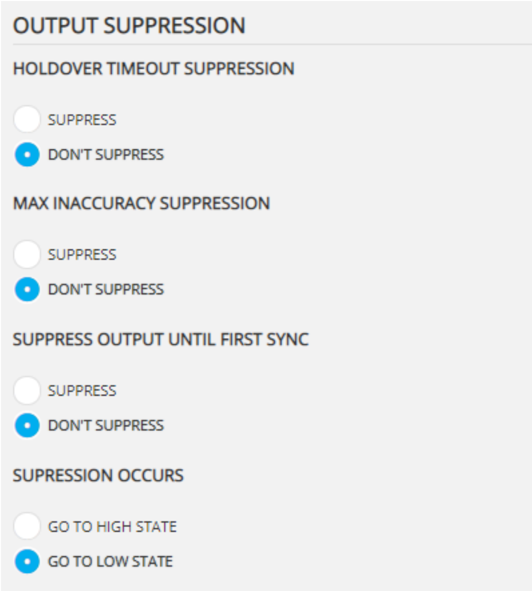
By default this is set to 'ALLOW 60TH SECOND'.



Note: Microchip recommends setting this to 'ALLOW 60TH SECOND' unless the end device does not support a 60th second.

10. **Provision Output Suppression Behavior**

The 'OUTPUT SUPPRESSION' settings determine under what conditions the output will be suppressed, and whether it will be held high or low when suppressed.

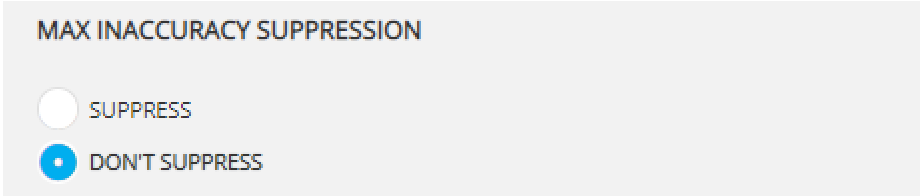


a. **Holdover Timeout Suppression**

Choose whether the IRIG-B output will be suppressed in the event of the GridTime 3000 experiencing a holdover timeout. The 'HOLDOVER TIMEOUT SUPPRESSION' radio buttons is set to 'DON'T SUPPRESS' by default.

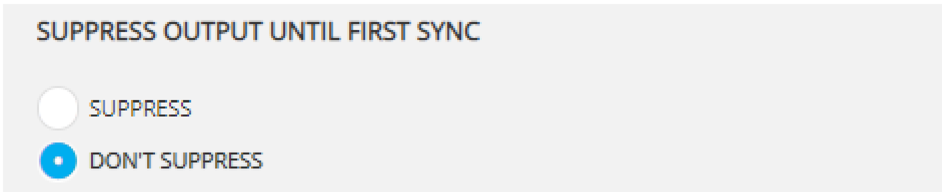
b. **Max Inaccuracy Suppression**

Choose whether the IRIG-B output will be suppressed in the event of the GridTime 3000 hitting its maximum inaccuracy threshold. The 'MAX INACCURACY SUPPRESSION' radio buttons is set to 'DON'T SUPPRESS' by default.



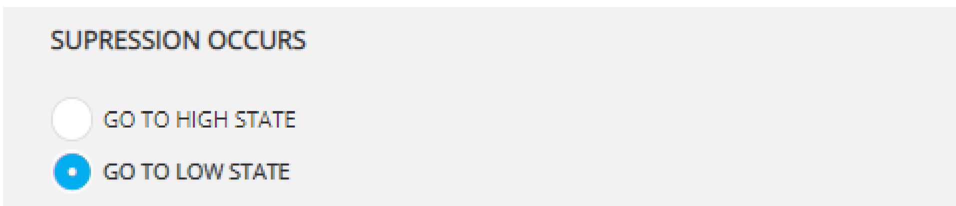
c. **Suppress Output Until First Sync**

Choose whether the IRIG-B output will be suppressed until the GridTime 3000 has synchronized to its first time source on startup.The 'SUPPRESS OUTPUT UNTIL FIRST SYNC' radio buttons is set to 'DON'T SUPPRESS' by default.



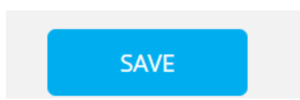
d. **Suppression Occurs**

Choose whether the output signal will get locked into a high or low (on the Fiber port these will be displayed as illuminated or dark and for the HV MOSFET open or closed) state during suppression. The 'SUPPRESSION OCCURS' radio buttons are set to 'GO TO LOW STATE' by default.



11. **Save Settings**

Click the 'SAVE' button to write the settings to the GridTime 3000.



A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

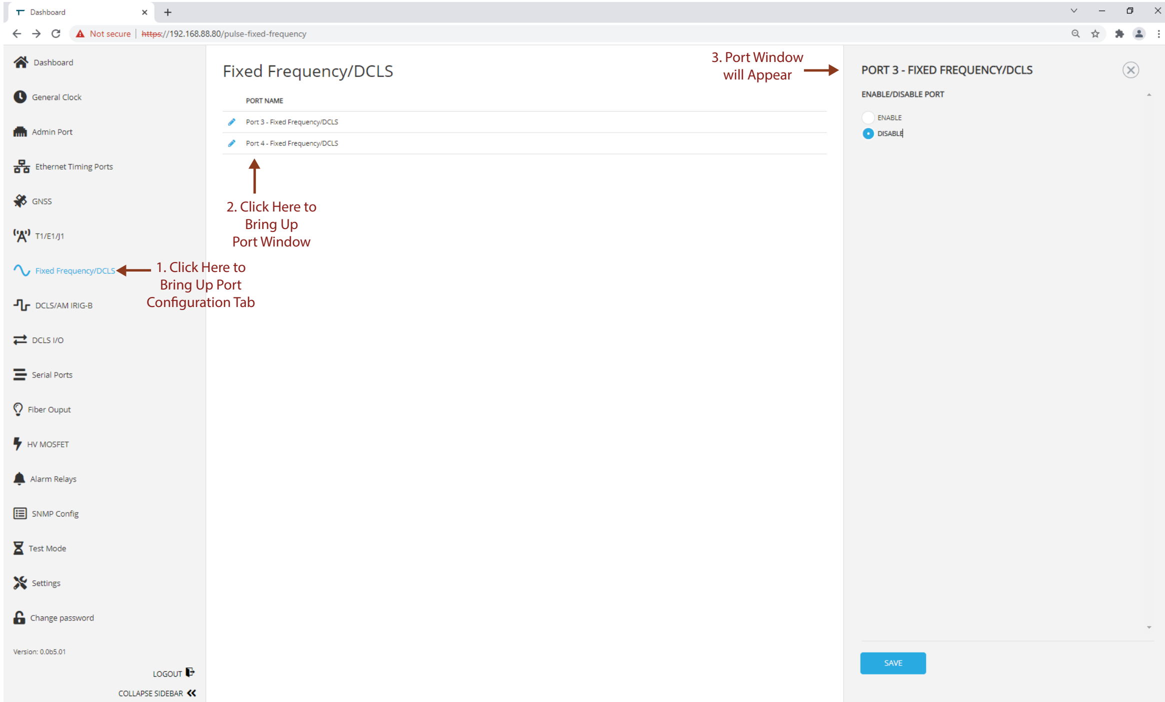
9.8.1.2 Modified Manchester Modulated IRIG-B Output

This section describes how to provision a GridTime 3000 pulse port to output modified manchester modulated IRIG-B.

Note: The IRIG-B Modified Manchester output provisioning process is the same for all BNC ports, the ST Fiber outputs, and the HV MOSFET port. The screenshots in this section will use Port 3 — a fixed frequency/DCLS BNC port as an example.

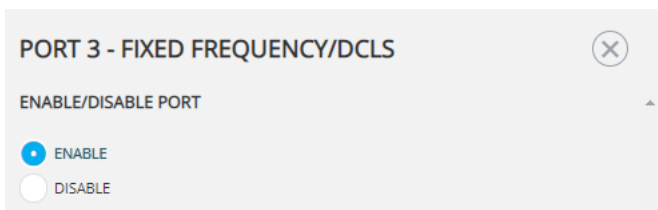
1. **Navigate to Port's Window**

Navigate to the window for the port you want to configure by clicking on the port's corresponding icon, then clicking the settings bar corresponding to the port.



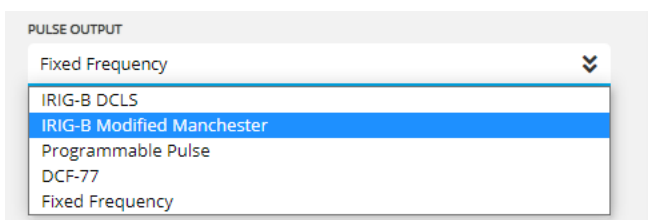
2. **Enable Port**

   Select 'ENABLE' for the enable/disable port setting.



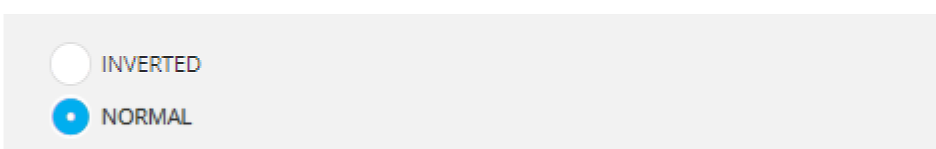
3. **Select Pulse Output**

   Select 'IRIG-B Modified Manchester' from the 'PULSE OUTPUT' dropdown.



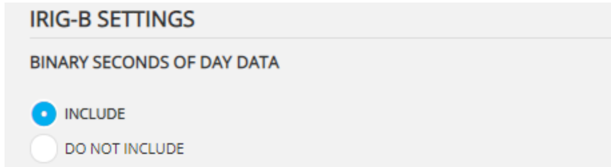
4. **Select Signal Inversion**

   Select whether the signal will be inverted or normal from the radio buttons below the pulse output dropdown. It will be set to 'NORMAL' by default.



5. **Include or Exclude Binary Seconds of Day Data**

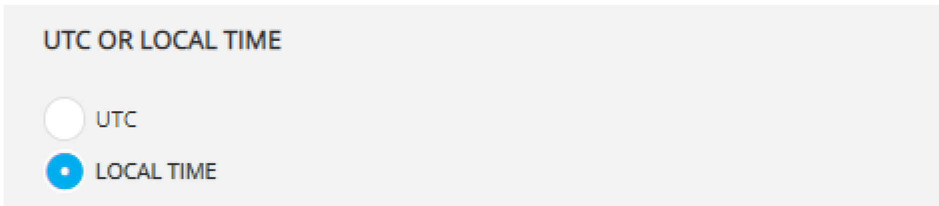
Select whether binary seconds of day data will be included in the output with the 'BINARY SECONDS OF DAY DATA' radio buttons. Binary seconds of day data will be set to 'INCLUDE' by default.



Note: Microchip recommends including binary seconds of day data in case it is required by the end device.

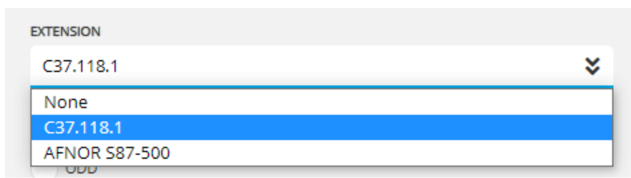
6. **UTC or Local Time**

   Select whether the output will use a UTC or Local Time format using the 'UTC OR LOCAL TIME' radio buttons. 'LOCAL TIME' will be selected by default.



7. **Select Extensions**

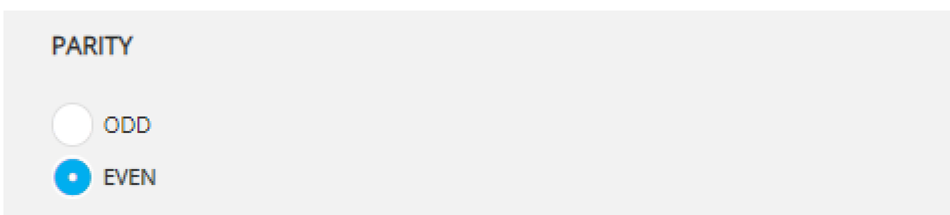
   Select what 'EXTENSION' will be included in the control field of the output IRIG-B signal. C37.118.1 extensions will be selected by default.



Note: Microchip recommends using C37.118.1 extensions. They are widely supported by end devices and contain useful information such as pending leap seconds and daylight savings jumps.

8. **Select Even or Odd Parity**

   Select whether the signal will use odd or even parity from the 'PARITY' radio buttons. This is set to 'EVEN' by default.

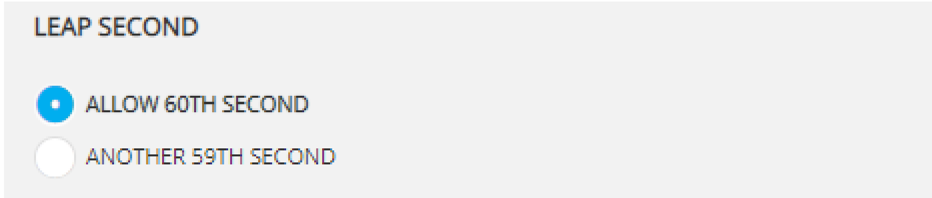


9. **Select Leap Second Behavior**

   Choose the leap second behavior from the following options:

   – 'ALLOW 60TH SECOND': In the event of a leap second, the IRIG-B signal seconds counter will count an extra second up to 60 before rolling back to 0 and incrementing the minute counter.
   – 'ANOTHER 59TH SECOND': In the event of a leap second, the IRIG-B signal seconds counter will count to 59, then will repeat second '59' again a second later, before rolling back to 0 and incrementing the minute counter.

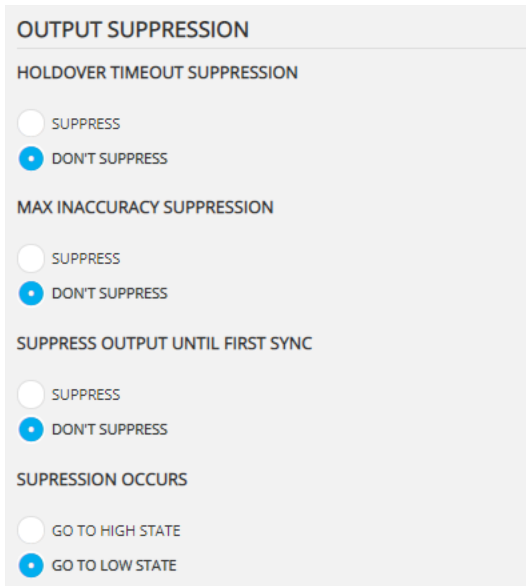
   By default this is set to 'ALLOW 60TH SECOND'.



Note: Microchip recommends setting this to 'ALLOW 60TH SECOND' unless the end device does not support a 60th second.

10. **Provision Output Suppression Behavior**

The 'OUTPUT SUPPRESSION' settings determine under what conditions the output will be suppressed, and whether it will be held in a high or low state when suppressed.

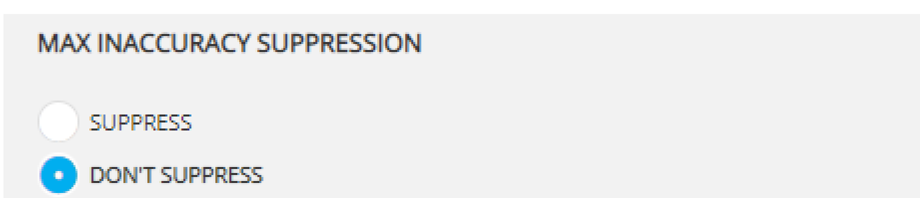


a. **Holdover Timeout Suppression**

Choose whether the Modified Manchester output will be suppressed in the event of the GridTime 3000 experiencing a holdover timeout. The 'HOLDOVER TIMEOUT SUPPRESSION' radio buttons is set to 'DON'T SUPPRESS' by default.

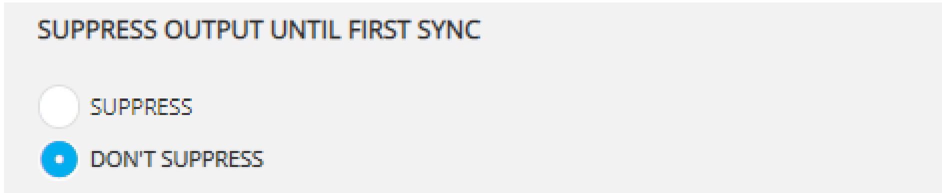
b. **Max Inaccuracy Suppression**

Choose whether the Modified Manchester output will be suppressed in the event of the GridTime 3000 hitting its maximum inaccuracy threshold. The 'MAX INACCURACY SUPPRESSION' radio buttons is set to 'DON'T SUPPRESS' by default.



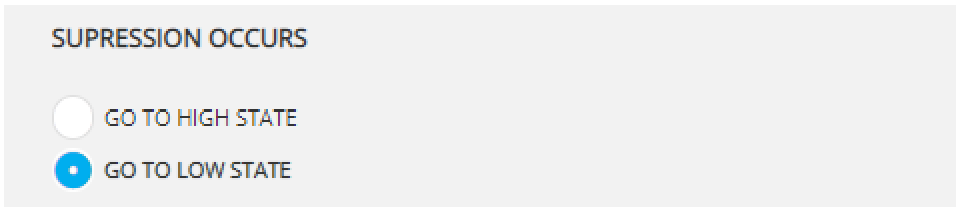
c. **Suppress Output Until First Sync**

Choose whether the Modified Manchester output will be suppressed until the GridTime 3000 has synchronized to its first time source since startup. The 'SUPPRESS OUTPUT UNTIL FIRST SYNC' radio buttons is set to 'DON'T SUPPRESS' by default.



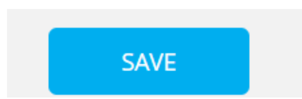
d. **Suppression Occurs**

Choose whether the output signal will get locked into a high or low (on the Fiber port these will be displayed as illuminated or dark and for the HV MOSFET open or closed) state during suppression. The 'SUPPRESSION OCCURS' radio buttons are set to 'GO TO LOW STATE' by default.



11. **Save Settings**

Click the 'SAVE' button to write the settings to the GridTime 3000.



A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

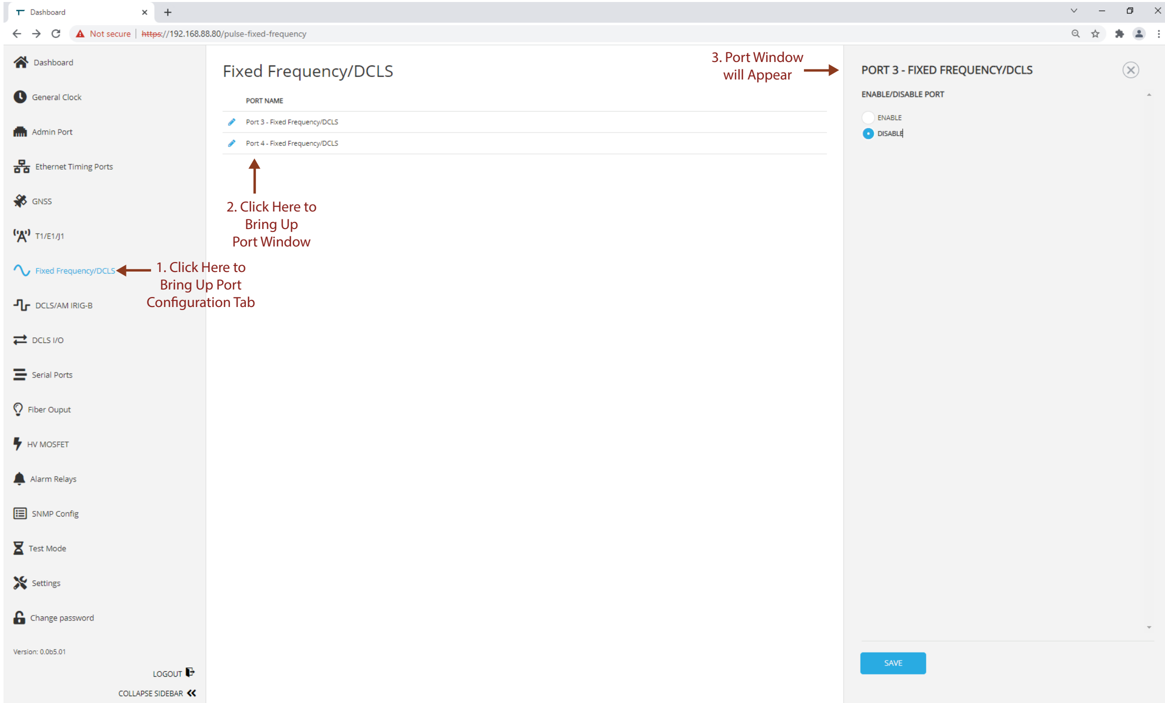
9.8.1.3 Simulated DCF77 Receiver Signal Output

This section describes how to provision a GridTime 3000 pulse port to output a simulated DCF77 receiver signal.

Note: The simulated DCF77 receiver signal output provisioning process is the same for all BNC ports, the ST Fiber outputs, and the HV MOSFET port. The screenshots in this section will use Port 3 — a fixed frequency/DCLS BNC port as an example.

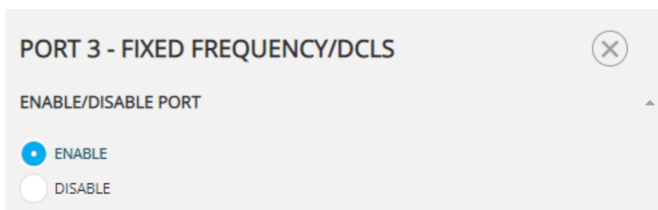
1. **Navigate to Port's Window**

Navigate to the Window for the port you want to configure by clicking on the port's corresponding icon, then clicking the settings bar corresponding to the port.



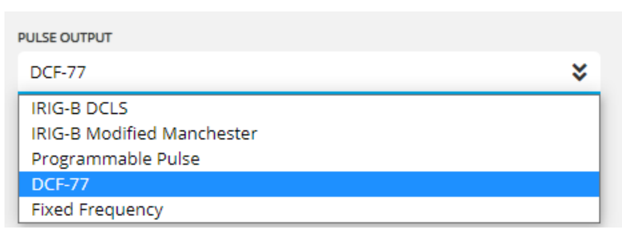
2. **Enable Port**

   Select 'ENABLE' for the enable/disable port setting.



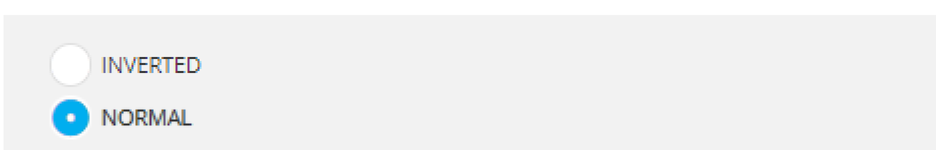
3. **Select Pulse Output**

   Select 'DCF-77' from the 'PULSE OUTPUT' dropdown.



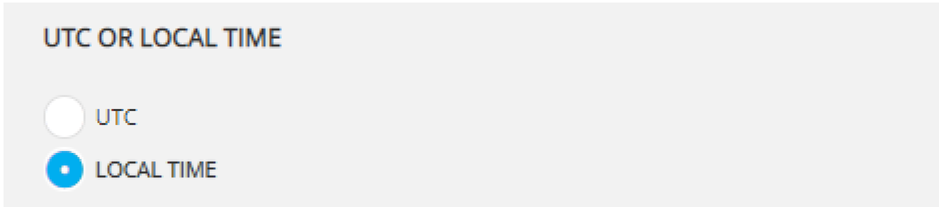
4. **Select Signal Inversion**

   Select whether the signal will be inverted or normal from the radio buttons below the pulse output dropdown. It will be set to 'NORMAL' by default.



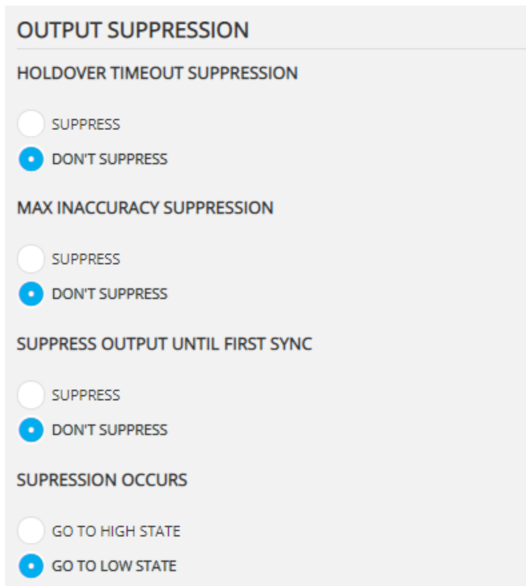
5. **UTC or Local Time**

Select whether the output will use a UTC or Local Time format using the 'UTC OR LOCAL TIME' radio buttons. 'LOCAL TIME' will be selected by default.



6. **Provision Output Suppression Behavior**

   The 'OUTPUT SUPPRESSION' settings determine under what conditions, the 'DCF-77' output will be suppressed, and whether it will be held high or low when suppressed.



   a. **Holdover Timeout Suppression**

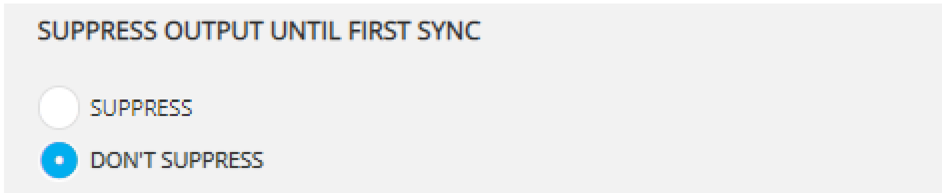
      Choose whether the DCF-77 output will be suppressed in the event of the GridTime 3000 experiencing a holdover timeout. The 'HOLDOVER TIMEOUT SUPPRESSION' radio buttons is set to 'DON'T SUPPRESS' by default.

   b. **Max Inaccuracy Suppression**

      Choose whether the DCF-77 output will be suppressed in the event of the GridTime 3000 hitting its maximum inaccuracy threshold. The 'MAX INACCURACY SUPPRESSION' radio buttons is set to 'DON'T SUPPRESS' by default.

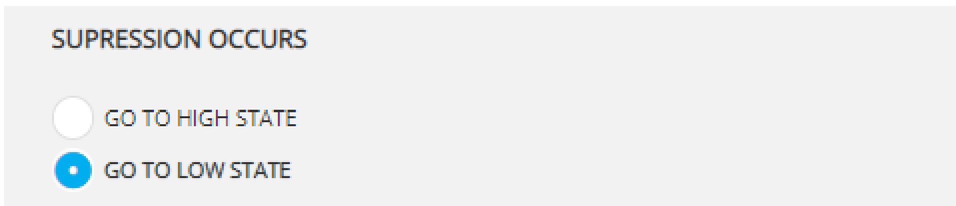
c. **Suppress Output Until First Sync**

Choose whether the DCF-77 output will be suppressed until the GridTime 3000 has synchronized to its first time source on startup. The 'SUPPRESS OUTPUT UNTIL FIRST SYNC' radio buttons is set to 'DON'T SUPPRESS' by default.



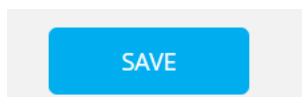
d. **Suppression Occurs**

Choose whether the output signal will get locked into a high or low (on the Fiber port these will be displayed as illuminated or dark and for the HV MOSFET open or closed) state during suppression. The 'SUPPRESSION OCCURS' radio buttons are set to 'GO TO LOW STATE' by default.



7. **Save Settings**

Click the 'SAVE' button to write the settings to the GridTime 3000.



A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

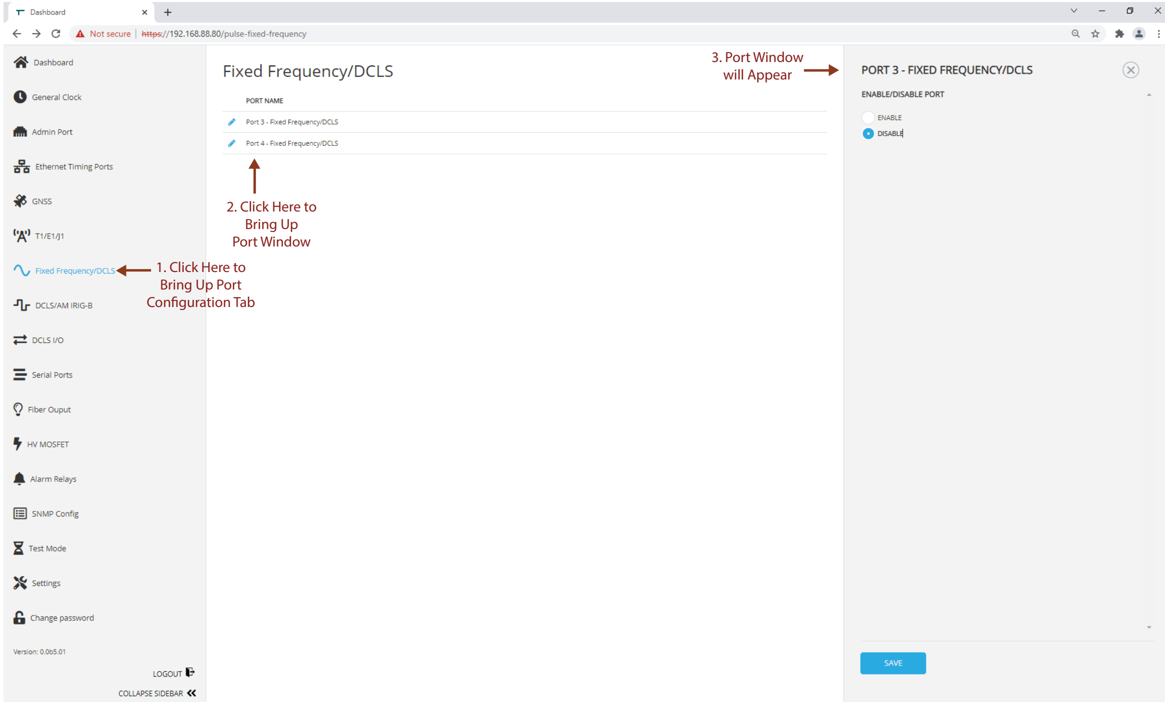
9.8.1.4 Programmable Pulse Output

This section describes how to provision a GridTime 3000 pulse port to output custom pulses.

Note: The programmable pulse output provisioning process is the same for all BNC ports, the ST Fiber outputs, and the HV MOSFET port. The screenshots in this section will use Port 3 — a Frequency/DCLS BNC port as an example.

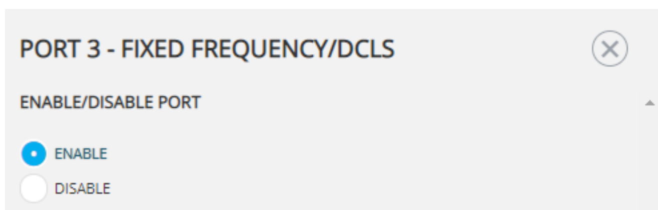
1. **Navigate to Port's Window**

Navigate to the window for the port you want to configure by clicking on the port's corresponding icon, then clicking the settings bar corresponding to the port.



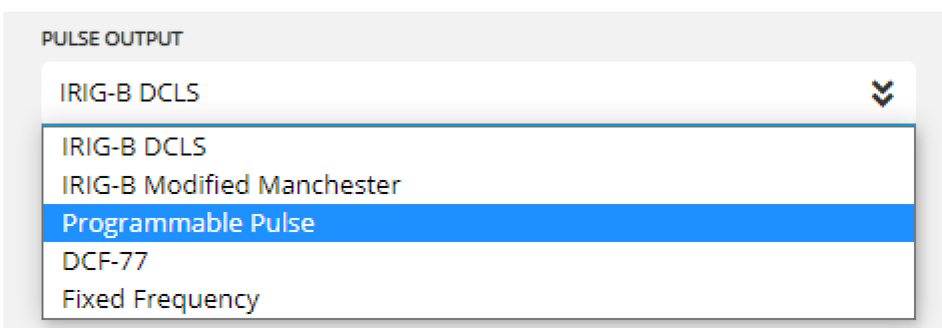
2. **Enable Port**

   Select 'ENABLE' for the enable/disable port setting.



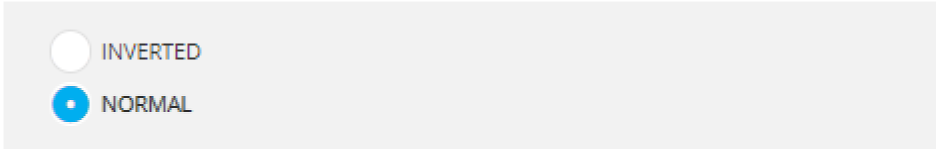
3. **Select Pulse Output**

   Select 'Programmable Pulse' from the 'PULSE OUTPUT' dropdown.



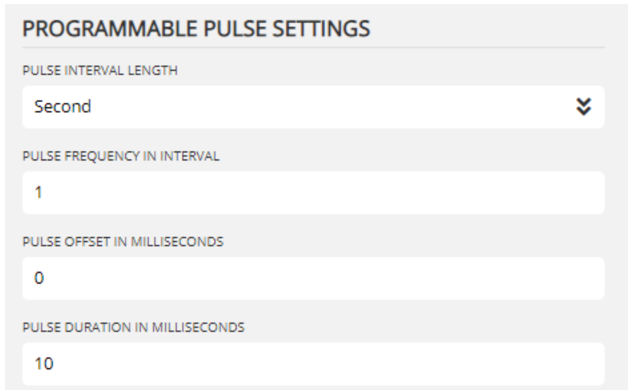
4. **Select Signal Inversion**

   Select whether the signal will be inverted or normal from the radio buttons below the pulse output dropdown. It will be set to 'NORMAL' by default.



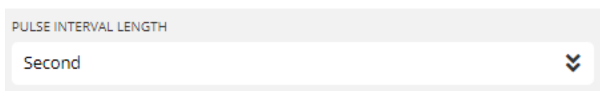
5. **Programmable Pulse Settings**

   The 'PROGRAMMABLE PULSE' settings define the interval length, phase offset, frequency, and duration of the outputted pulses. By default, these specify a 1PPS signal with a 10ms pulse duration.



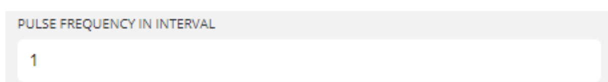
   a. **Set Interval Length**

      The 'PULSE INTERVAL LENGTH' dropdown determines the time base for the programmable pulses. By default, this is set to 'Second'.



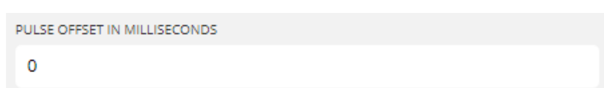
   b. **Set Pulse Frequency in Interval**

      The 'PULSE FREQUENCY IN INTERVAL' setting determines the number of pulses that occur in the interval length specified in the previous step. By default, the 'PULSE FREQUENCY IN INTERNVAL' is set to 1.



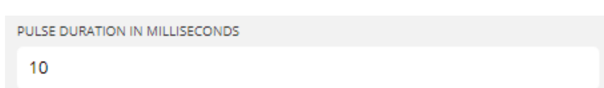
   c. **Set Pulse Offset**

      The 'PULSE OFFSET IN MILLISECONDS' setting determines the phase offset the pulses will experience from the beginning of the time interval in milliseconds. By default, the 'PULSE OFFSET IN MILLISECONDS' is set to 0 ms.



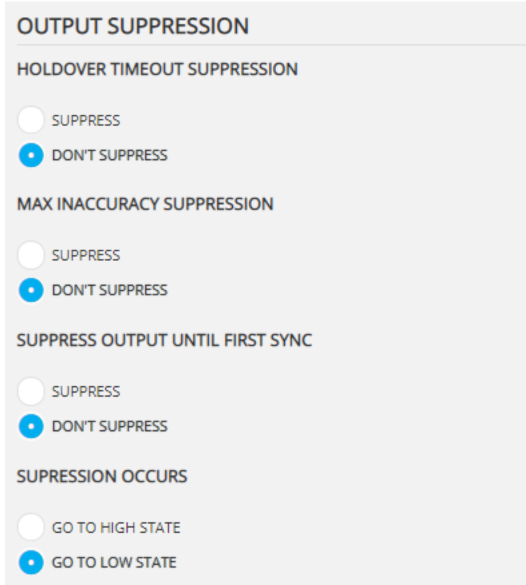
   d. **Set Duration**

      The 'PULSE DURATION IN MILLISECONDS' setting determines the duration of the pulses from the beginning of the time interval in milliseconds. By default, the 'PULSE DURATION IN MILLISECONDS' is set to 10 ms.



6. **Provision Output Suppression Behavior**

The 'OUTPUT SUPPRESSION' settings determine under what conditions the output will be suppressed, and whether it will be held in a high or low state when suppressed.

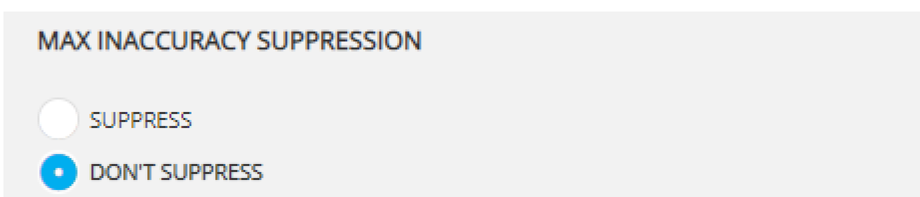


a. **Holdover Timeout Suppression**

Choose whether the programmable pulse output will be suppressed in the event of the GridTime 3000 experiencing a holdover timeout. The 'HOLDOVER TIMEOUT SUPPRESSION' radio buttons is set to 'DON'T SUPPRESS' by default.

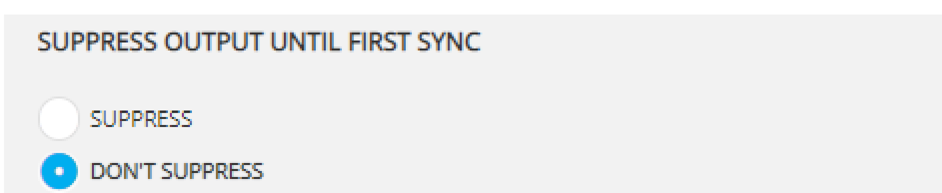
b. **Max Inaccuracy Suppression**

Choose whether the programmable pulse output will be suppressed in the event of the GridTime 3000 hitting its maximum inaccuracy threshold. The 'MAX INACCURACY SUPPRESSION' radio buttons is set to 'DON'T SUPPRESS' by default.



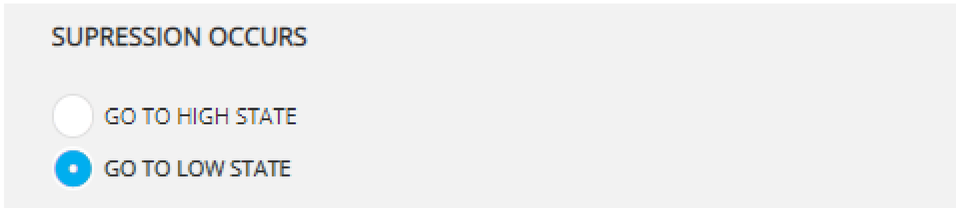
c. **Suppress Output Until First Sync**

Choose whether the programmable pulse output will be suppressed until the GridTime 3000 has synchronized to its first time source on startup. The 'SUPPRESS OUTPUT UNTIL FIRST SYNC' radio buttons is set to 'DON'T SUPPRESS' by default.



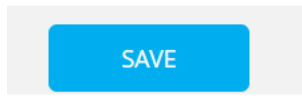
d. **Suppression Occurs**

Choose whether the output signal will get locked into a high or low (on the Fiber port these will be displayed as illuminated or dark and for the HV MOSFET open or closed) state during suppression. The 'SUPPRESSION OCCURS' radio buttons are set to 'GO TO LOW STATE' by default.



7. **Save Settings**

Click the 'SAVE' button to write the settings to the GridTime 3000.



A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

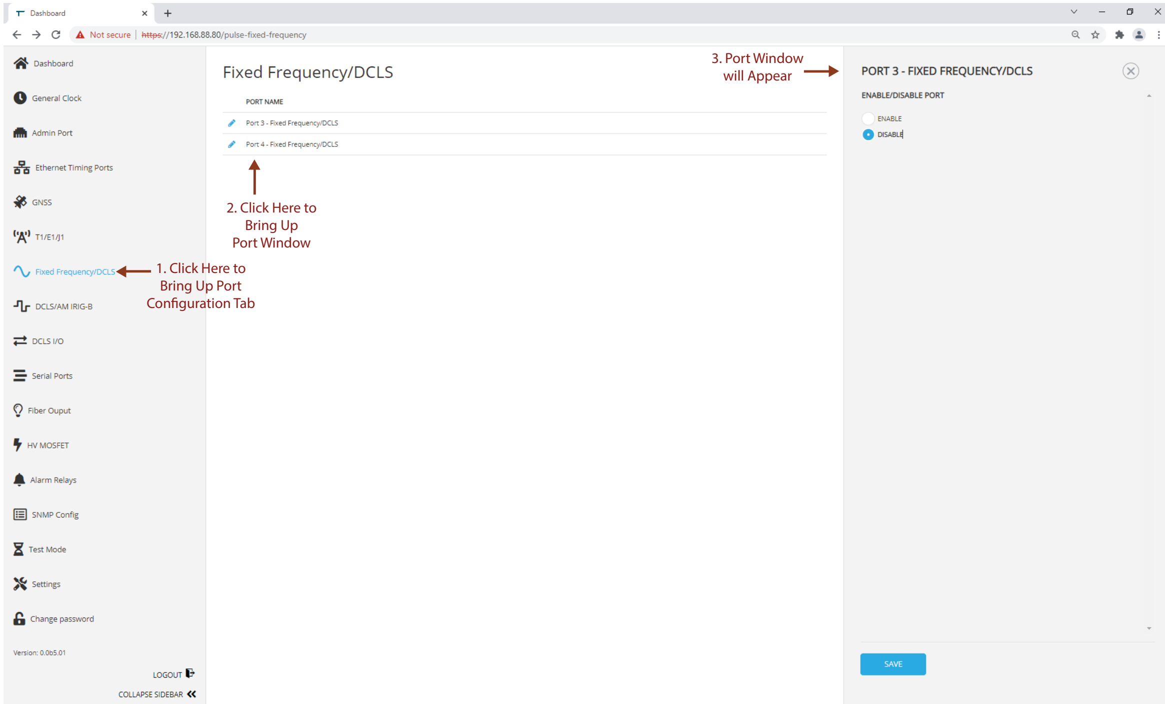
9.8.2 Provisioning G.703 Fixed Frequency Outputs

This section describes how to provision a GridTime 3000 Fixed Frequency/DCLS port to output a G.703 fixed frequency signal.

Note: Only the Fixed Frequency/DCLS BNC ports (Ports 3 and 4) can be used to output fixed frequency signals.

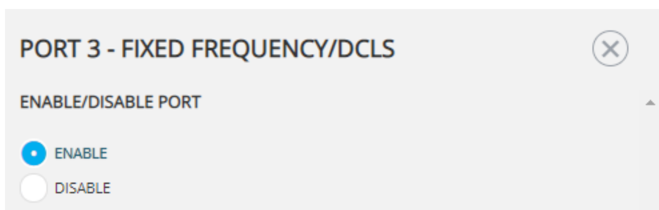
1. **Navigate to Port's Window**

Navigate to the corresponding window for the port you want to configure by clicking on the correct port icon, then clicking the settings bar corresponding to the port.



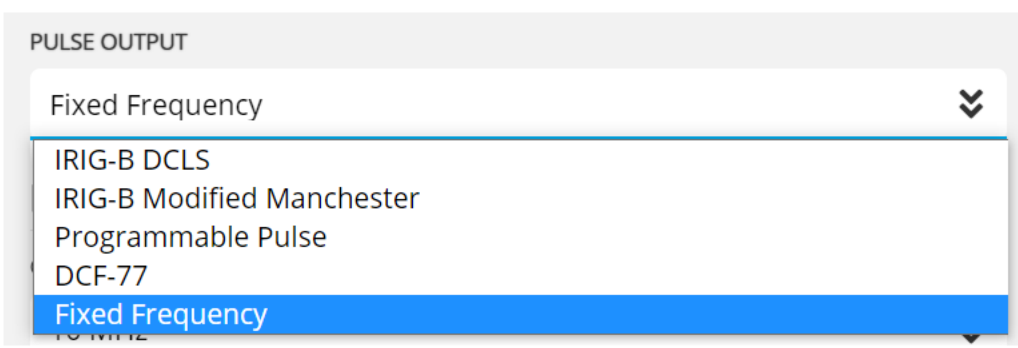
2. **Enable Port**

   Select 'ENABLE' for the enable/disable port setting.



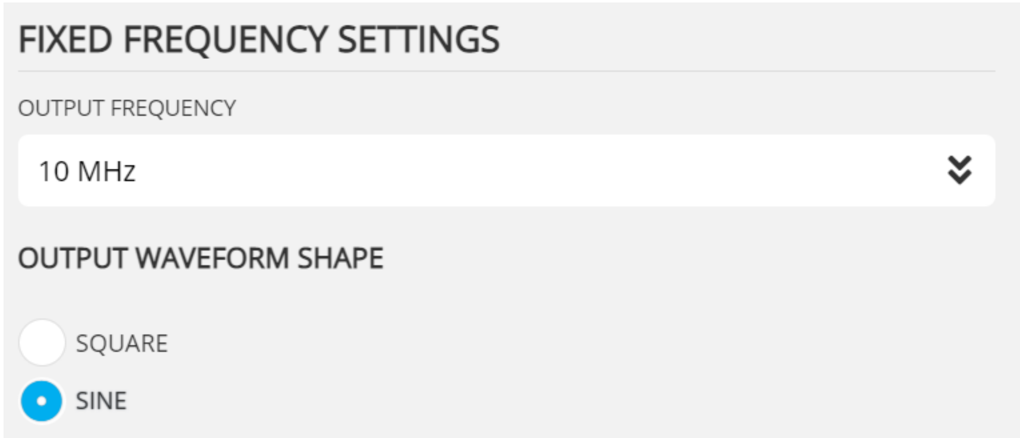
3. **Select Pulse Output**

   Select 'Fixed Frequency' from the 'PULSE OUTPUT' dropdown.



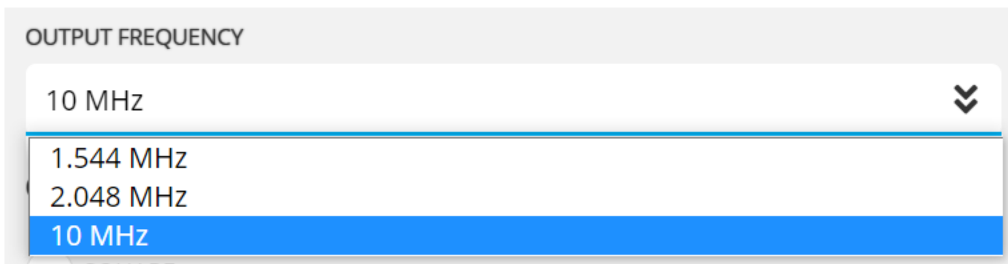
4. **Provision Fixed Frequency Settings**

   The fixed frequency settings define whether the output signal will be a sine or square wave, and what signal the frequency will be. By default, these settings specify a 10 MHZ sinusoidal wave.



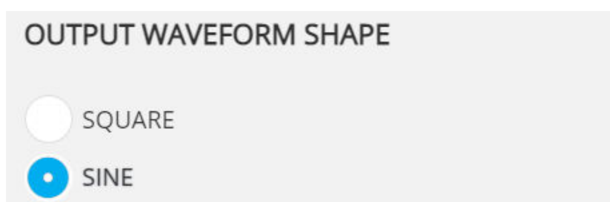
a. **Select Output Frequency**

Select the frequency of the output signal using the 'OUTPUT FREQUENCY' dropdown. By default, this is set to 10 MHz.



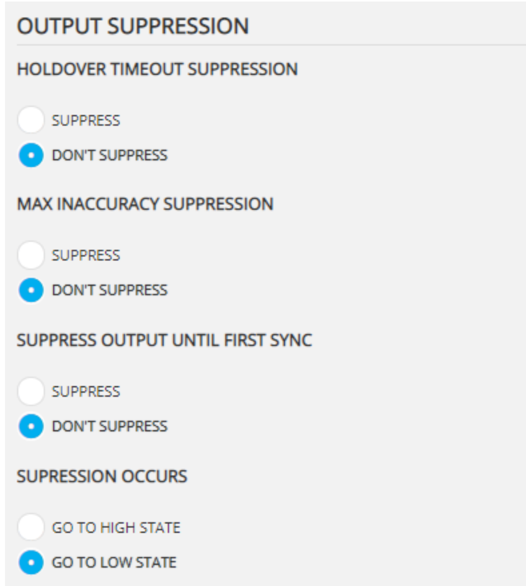
b. **Select Waveform Shape**

Select the waveform shape of the output signal using the 'OUTPUT WAVEFORM SHAPE' setting radio buttons. By default this is set to a sinusoidal wave ('SINE').



5. **Provision Output Suppression Behavior**

The 'OUTPUT SUPPRESSION' settings determine under what conditions the output will be suppressed, and whether it will be held in a high or low state when suppressed.

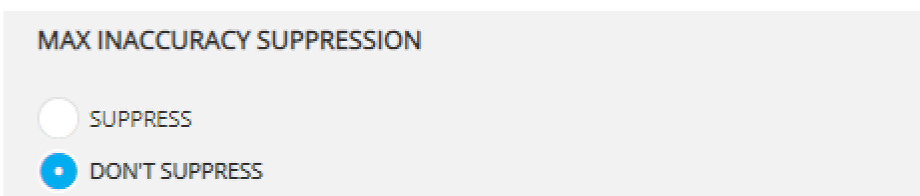


a. **Holdover Timeout Suppression**

Choose whether the frequency output will be suppressed in the event of the GridTime 3000 experiencing a holdover timeout. The 'HOLDOVER TIMEOUT SUPPRESSION' radio buttons is set to 'DON'T SUPPRESS' by default.

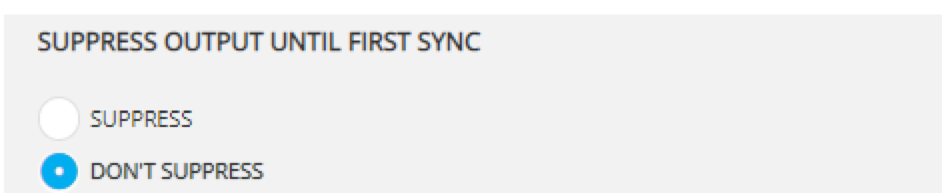
b. **Max Inaccuracy Suppression**

Choose whether the frequency output will be suppressed in the event of the GridTime 3000 hitting its maximum inaccuracy threshold. The 'MAX INACCURACY SUPPRESSION' radio buttons is set to 'DON'T SUPPRESS' by default.



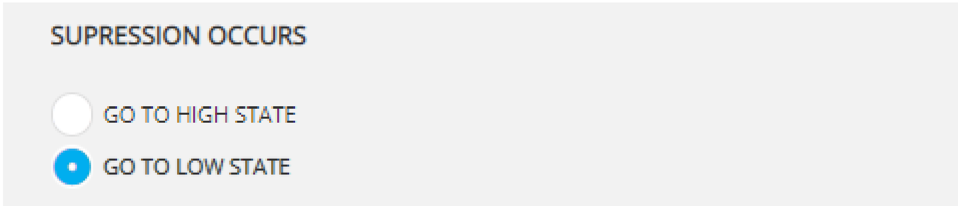
c. **Suppress Output Until First Sync**

Choose whether the frequency output will be suppressed until the GridTime 3000 has synchronized to its first time source on startup. The 'SUPPRESS OUTPUT UNTIL FIRST SYNC' radio buttons is set to 'DON'T SUPPRESS' by default.



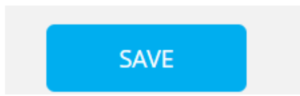
d. **Suppression Occurs**

Choose whether the output signal will get locked into a high or low (on the Fiber port these will be displayed as illuminated or dark and for the HV MOSFET open or closed) state during suppression. The 'SUPPRESSION OCCURS' radio buttons is set to 'GO TO LOW STATE' by default.

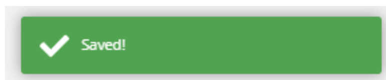


6. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



   A 'Saved!' notification will appear in the bottom right corner of the page, indicating that the settings have successfully been written to the GridTime 3000.



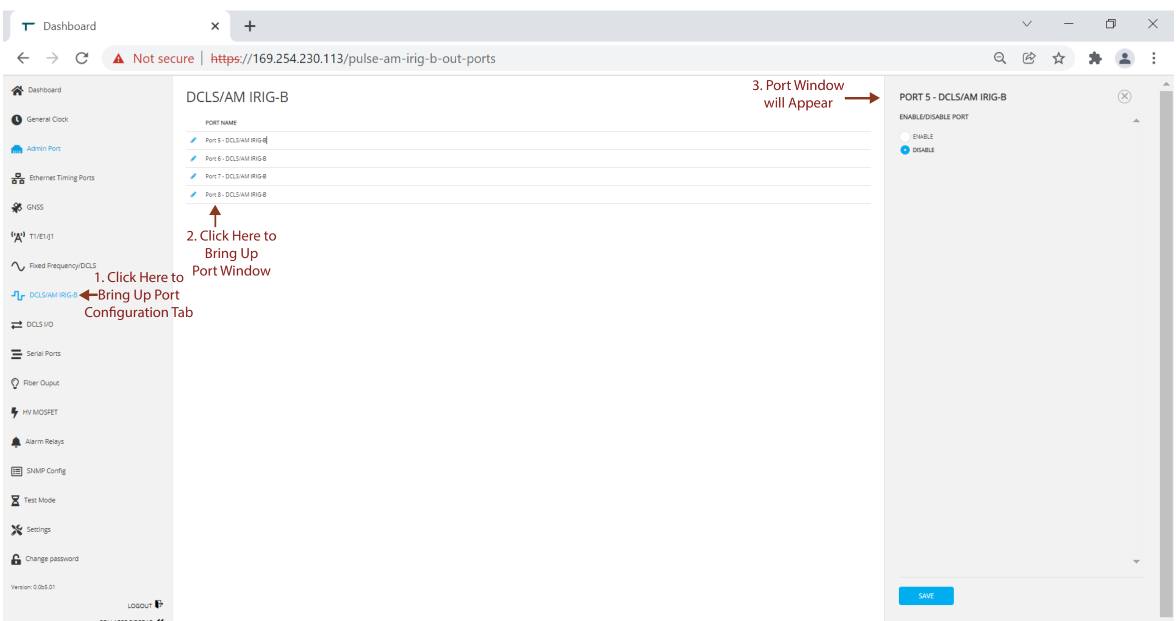
9.8.3 Provisioning AM IRIG-B Outputs

This section describes how to provision a GridTime 3000 AM IRIG/TTL port to output AM IRIG-B.

Note: Only the DCLS/AM IRIG-B BNC ports (Ports 5-8) can output AM IRIG-B.

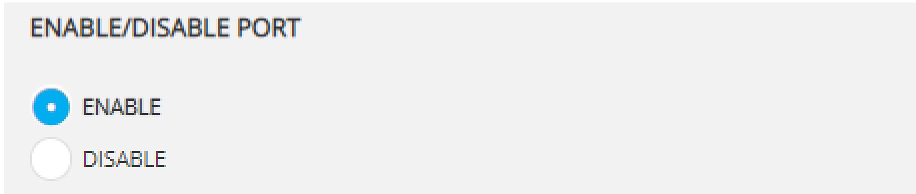
1. **Navigate to Port's Window**

   Navigate to the window for the port you want to configure by clicking on the port's corresponding icon, then clicking the settings bar corresponding to the port.



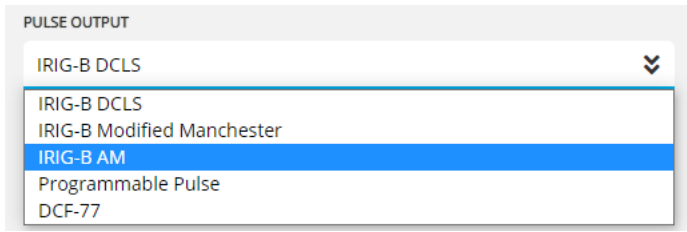
2. **Enable Port**

   Select 'ENABLE' for the enable/disable port setting.



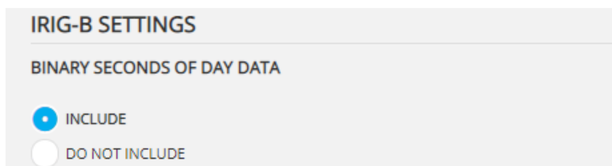
3. **Select Pulse Output**

   Select IRIG-B AM from the 'PULSE OUTPUT' dropdown.



4. **Include or Exclude Binary Seconds of Day Data**

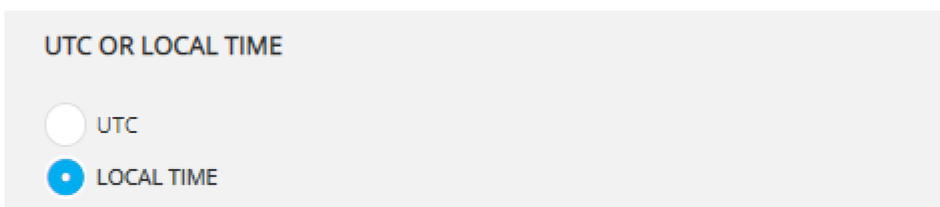
   Select whether binary seconds of day data will be included in the output from the 'BINARY SECONDS OF DAY DATA' radio buttons. Binary seconds of day data will be set to 'INCLUDE' by default.



Note: Microchip recommends including binary seconds of day data in case it is required by the end device.

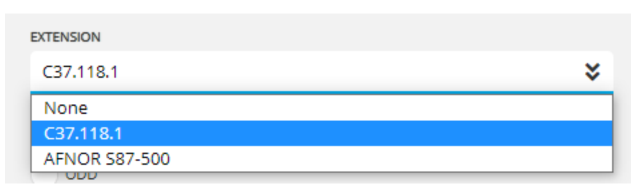
5. **UTC or Local Time**

   Select whether the output will use a UTC or Local Time format using the 'UTC OR LOCAL TIME' radio buttons. 'LOCAL TIME' will be selected by default.



6. **Select Extensions**

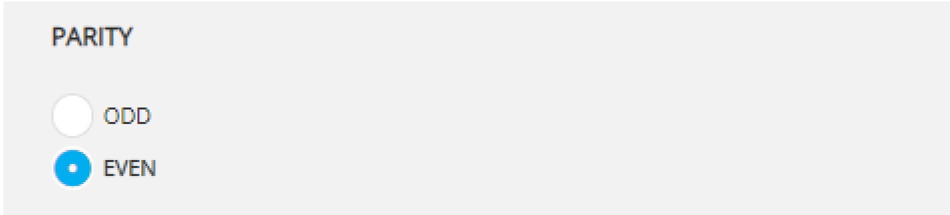
   Select what extensions will be included in the control field of the output IRIG-B signal. C37.118.1 extensions will be selected by default.



Note: Microchip recommends using C37.118.1 extensions as they are widely supported by end devices and contain useful information, such as pending leap seconds and daylight savings jumps.

7. **Select Even or Odd Parity**

   Select whether the signal will use odd or even parity from the 'PARITY' radio buttons. This is set to 'EVEN' by default.

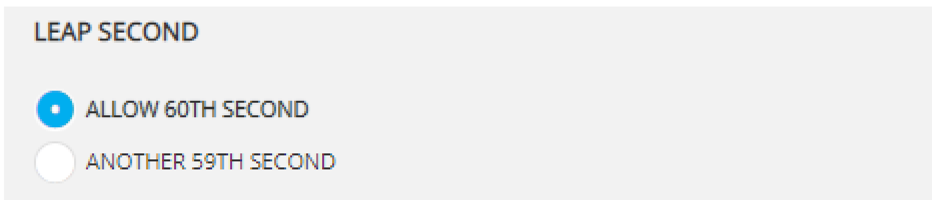


8. **Select Leap Second Behavior**

   Choose the leap second behavior from the following options:

   – 'ALLOW 60TH SECOND': In the event of a leap second, the seconds counter in the IRIG-B signal will count an extra second up to 60 before rolling back to 0 and incrementing the minute counter.
   – 'ANOTHER 59TH SECOND': In the event of a leap second, the seconds counter in the IRIG-B signal will count to 59, then will repeat second '59' again a second later, before rolling back to 0 and incrementing the minute counter.

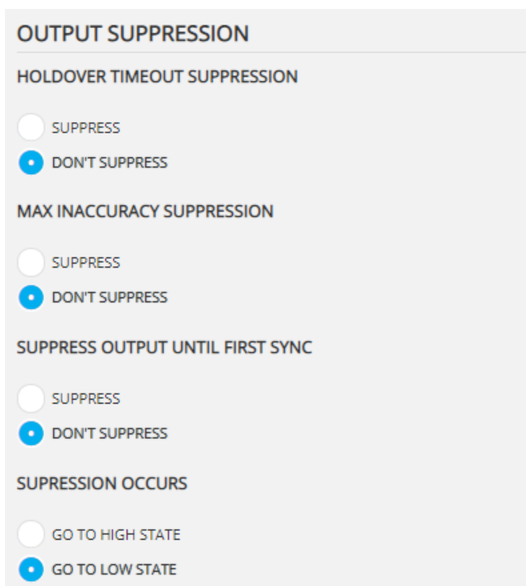
   By default this is set to 'ALLOW 60TH SECOND'.



   Note: Microchip recommends setting this to 'ALLOW 60TH SECOND' unless the end device does not support a 60th second.

9. **Provision Output Suppression Behavior**

   The 'OUTPUT SUPPRESSION' settings determine under what conditions the output will be suppressed, and whether it will be held in a high or low state when suppressed.

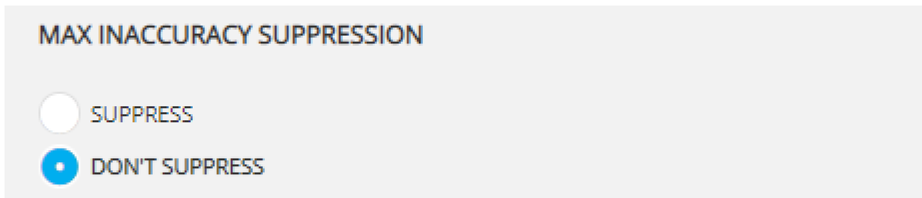


   a. **Holdover Timeout Suppression**

      Choose whether the AM IRIG-B output will be suppressed in the event of the GridTime 3000 experiencing a holdover timeout. The 'HOLDOVER TIMEOUT SUPPRESSION' radio buttons is set to 'DON'T SUPPRESS' by default.

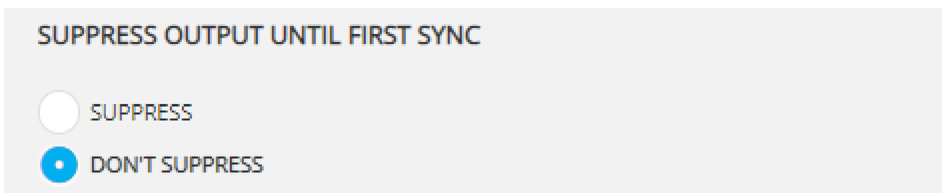
b. **Max Inaccuracy Suppression**

Choose whether the AM IRIG-B output will be suppressed in the event of the GridTime 3000 hitting its maximum inaccuracy threshold. The 'MAX INACCURACY SUPPRESSION' radio buttons is set to 'DON'T SUPPRESS' by default.



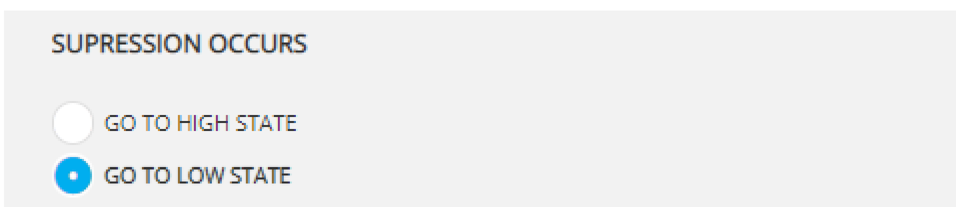
c. **Suppress Output Until First Sync**

Choose whether the AM IRIG-B output will be suppressed until the GridTime 3000 has synchronized to its first time source on startup. The 'SUPPRESS OUTPUT UNTIL FIRST SYNC' radio buttons is set to 'DON'T SUPPRESS' by default.



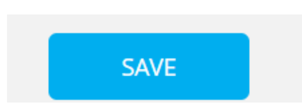
d. **Suppression Occurs**

Choose whether the output signal will get locked into a high or low (on the Fiber port these will be displayed as illuminated or dark and for the HV MOSFET open or closed) state during suppression. The 'SUPPRESSION OCCURS' radio buttons are set to 'GO TO LOW STATE' by default.



10. **Save Settings**

Click the 'SAVE' button to write the settings to the GridTime 3000.



A 'Saved!' notification will appear in the bottom right corner of the page, indicating that the settings have successfully been written to the GridTime 3000.

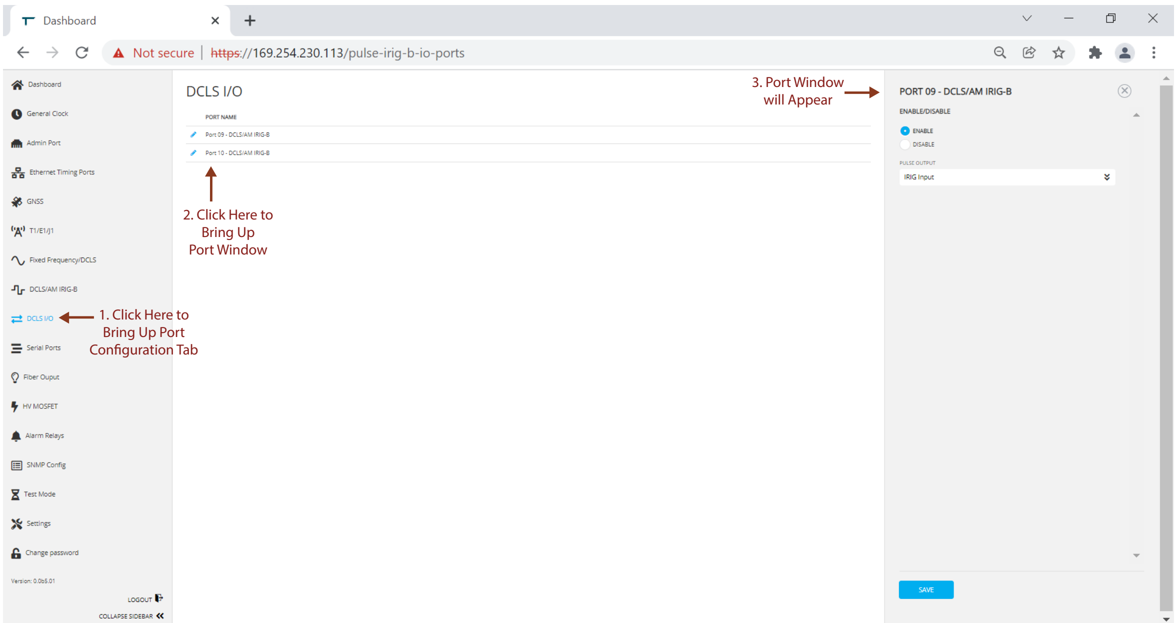
9.8.4 Provisioning IRIG-B Inputs

This section describes how to provision a GridTime 3000 DCLS I/O port to receive an IRIG-B signal.

Note: This port can only receive 0-5 V TTL IRIG-B004 with C37.118.1 Extensions. The GridTime 3000 will not be able to synchronize to the IRIG-B signal if it is not in this format.

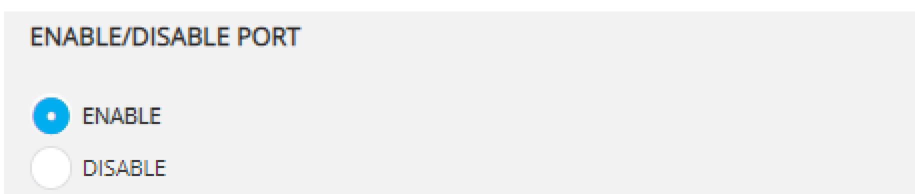
1. **Navigate to Port's Window**

   Navigate to the relevant port window you want to configure by clicking on the port's corresponding icon, then clicking the settings bar corresponding to the port.



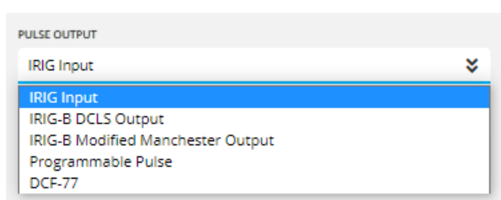
2. **Enable Port**

   Select 'ENABLE' for the enable/disable port setting.



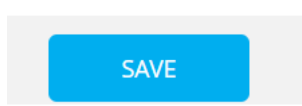
3. **Select IRIG Input Option**

   Select 'IRIG Input' from the 'PULSE OUTPUT' dropdown.



4. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.9 Provisioning the Serial String Ports

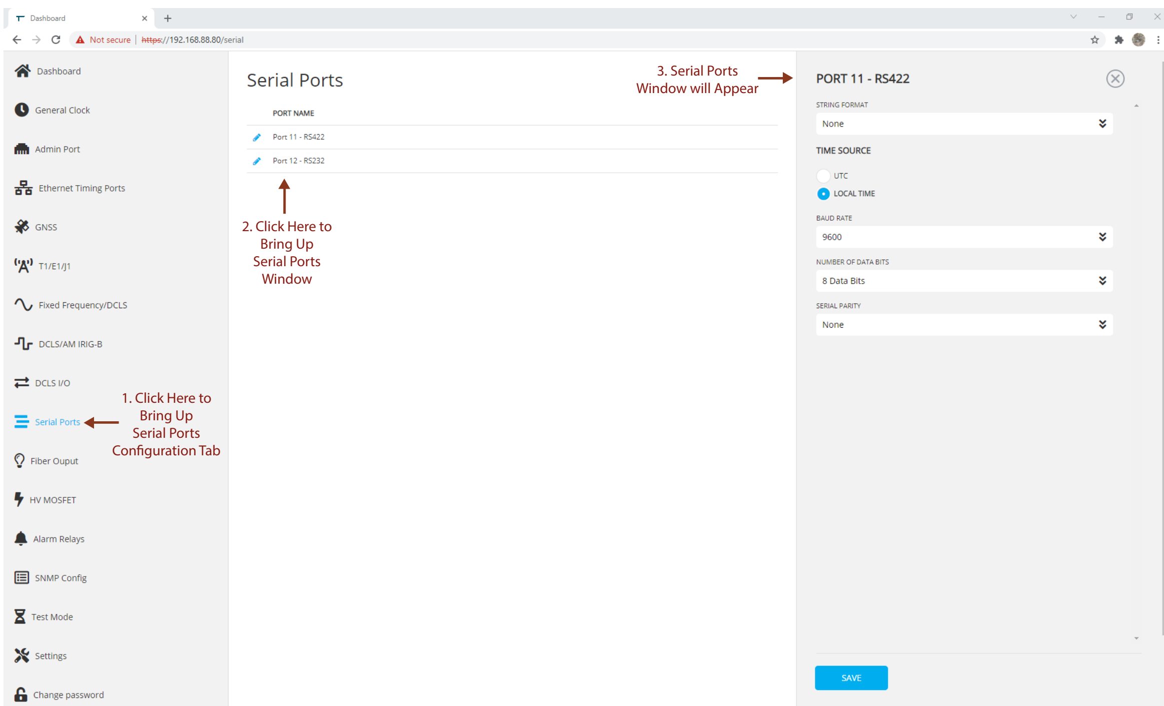
This section describes how to provision the serial string ports.

The Serial Ports configuration tab is used to configure the GridTime 3000's serial string ports. Choosing the correct settings ensures that the end device receiving the serial strings can successfully decode them once they are received.

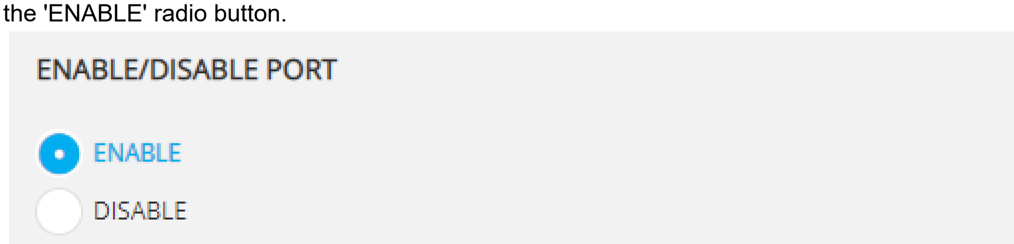
Follow the steps below to provision the GridTime 3000's serial string ports.

1. **Navigate to Serial String Ports Window**

   Navigate to the tab for the port you want to configure by clicking on the serial ports icon, then clicking the settings bar corresponding to the port (Port 11 for RS422 and Port 12 for RS232).

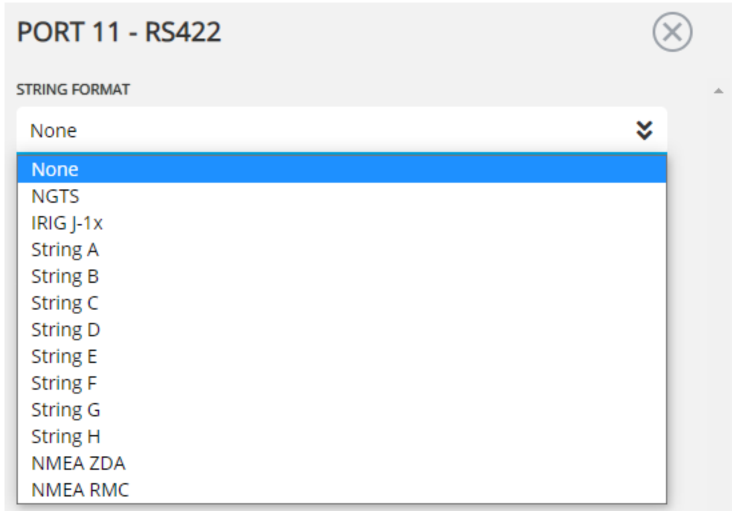


2. **Enable Serial String Port**
   Select the 'ENABLE' radio button.



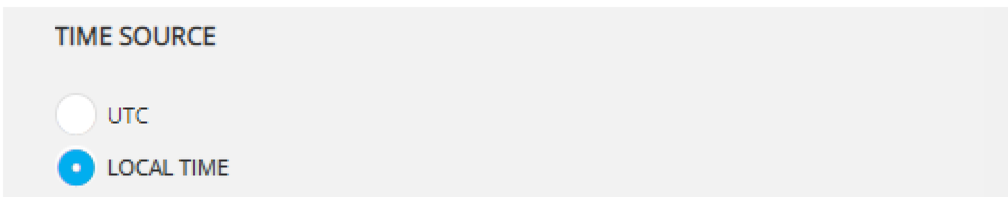
3. **Select the Serial String to Output**

   Select the serial string you wish the port to output from the 'STRING FORMAT' dropdown. If 'None' is selected, no serial string will be outputted by the port.



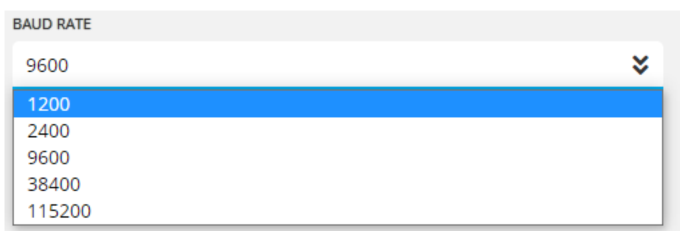
4. **Select whether UTC or Local Time will be used in the output**

   Select the whether UTC or Local time will be used by the output strings from the 'TIME SOURCE' radio buttons. 'LOCAL TIME' will be selected by default.



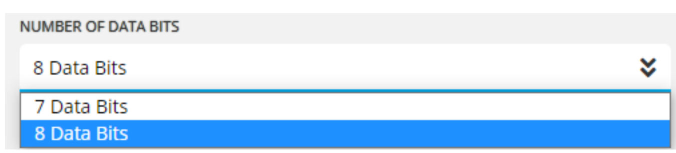
5. **Select Output Baud Rate**

   Select the serial string output baud rate from the 'BAUD RATE' dropdown. This determines the output baud of serial strings in units of Hz. By default, the 'BAUD RATE' will be set to 9600, allowing a maximum of 9600 bits per second.



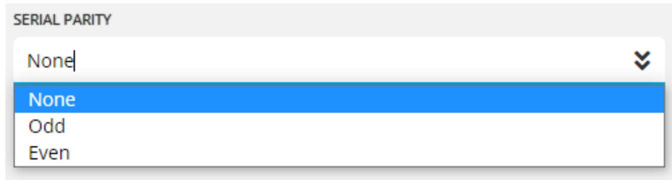
6. **Select the Number of Data Bits**

   Select the number of data bits to be used in the serial string output from the 'NUMBER OF DATA BITS' dropdown. The options are 7 bits or 8 bits. By default 'NUMBER OF DATA BITS' is set to '8 Data Bits'.



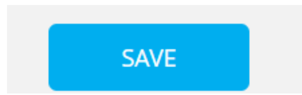
7. **Select the Serial Parity**

   Select the serial parity option from the 'SERIAL PARITY' dropdown. The options are 'None' (no parity), 'Odd' parity and 'Even' parity. By default the 'SERIAL PARITY' is set to 'None'.

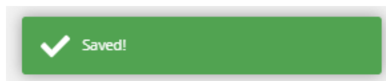


8. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



   A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.



9.10 Provisioning the Alarm Relay Ports

This section describes how to provision the Alarm Relay Ports.

The Alarm Relays configuration tab is used to map alarms to the GridTime 3000's Alarm Relay ports.

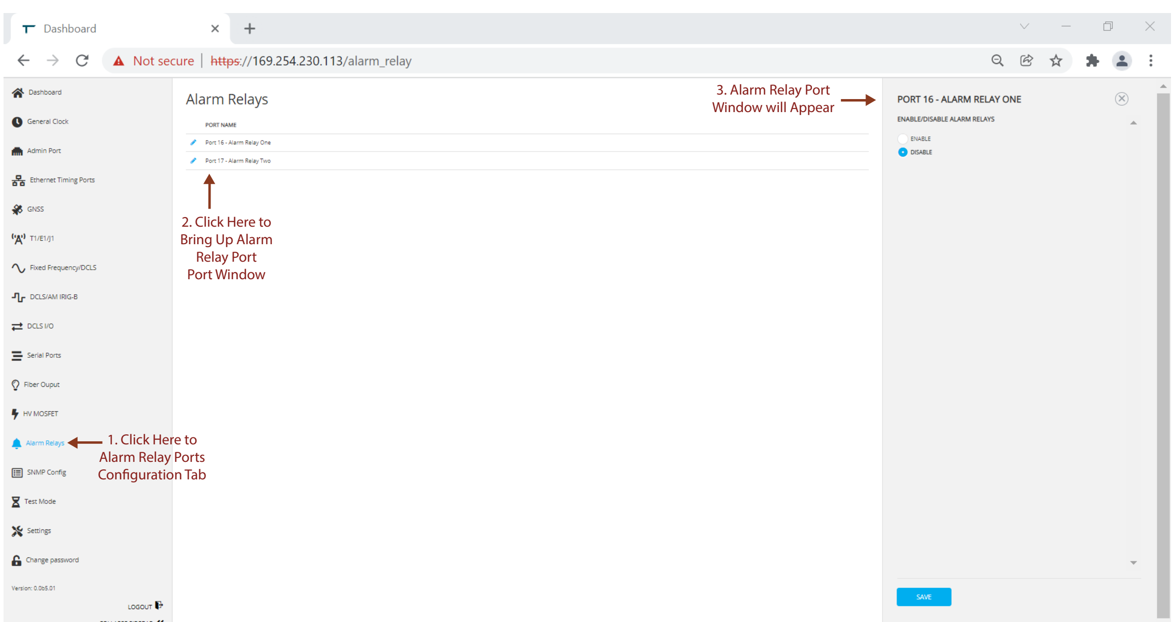
When any of the alarms mapped to an Alarm Relay port becomes active, the port transitions from the non-alarm state to the alarm state. When all active alarms on an Alarm Relay port clear, the port transitions from the alarm state to the non-alarm state.

See 11.4.1. Alarm Conditions and Correction Actions for the trigger and clearance conditions of all the GridTime 3000's alarms.

Follow the steps below to provision the GridTime 3000's Alarm Relay ports.

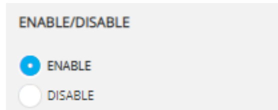
1. **Navigate to Alarm Relay Port Window For Port 1**

   Navigate to the window for the port you want to configure by clicking on the Alarm Relays icon, then clicking the settings bar corresponding to Alarm Relay 1 or 2 (Port 16 or Port 17) .



2. **Enable Port**

   Select 'ENABLE' from the 'ENABLE/DISABLE' port radio buttons.



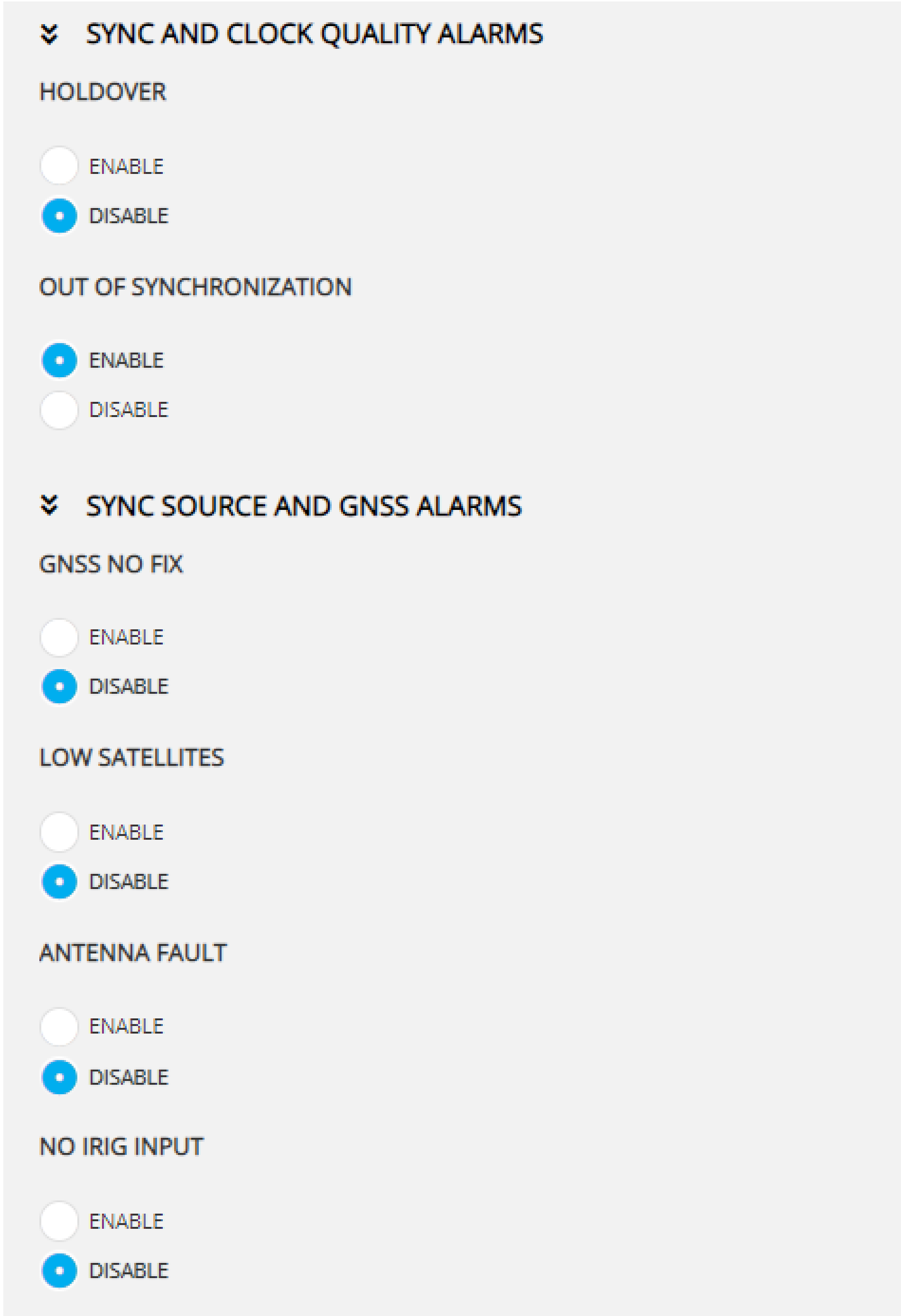
3. **Set Alarm Signal Delay**

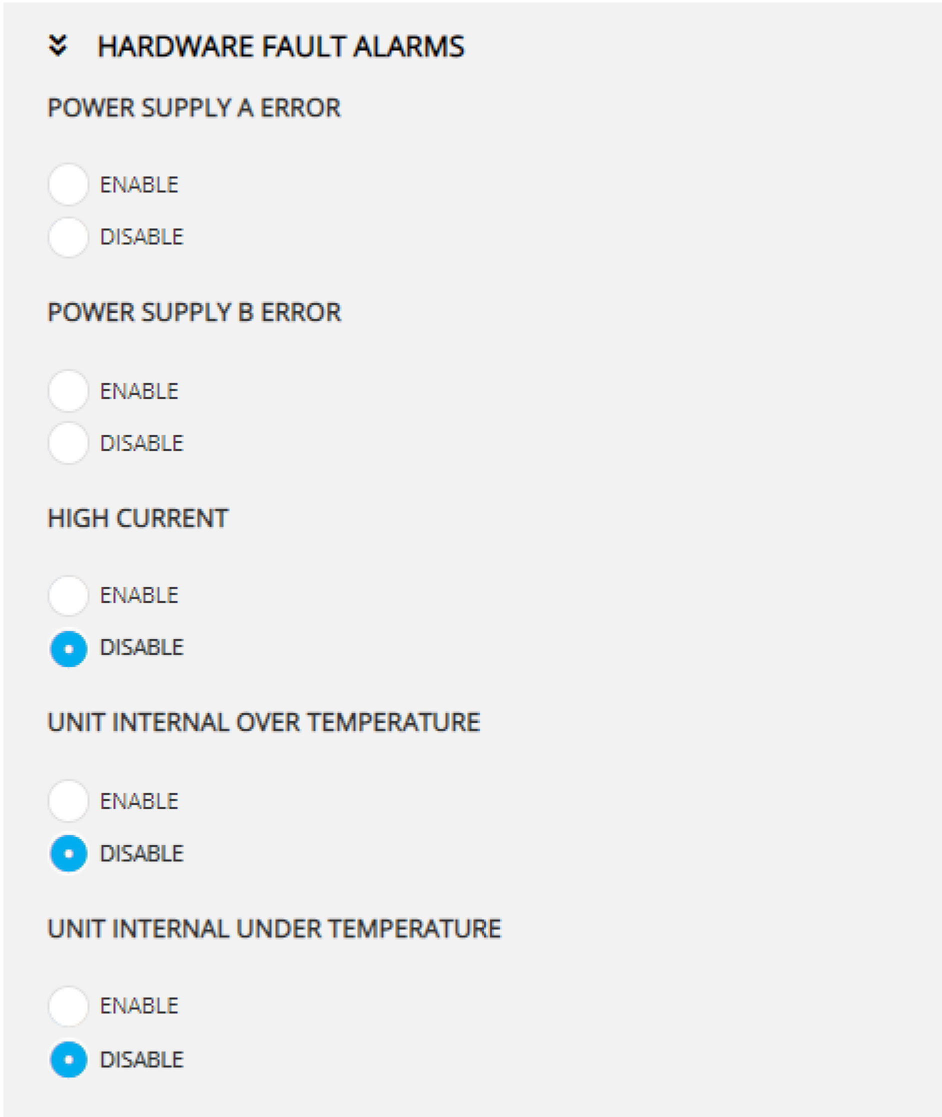
   The 'ALARM SIGNAL DELAY IN SECONDS' setting will delay the trigger of the alarm relay by the configured value. Type this value in seconds into the 'ALARM SIGNAL DELAY IN SECONDS' textbox.
   By default, this is set to '0' seconds of delay.

4. **Map Alarms to Alarm Relay Port**

   Map the alarms to the Alarm Relay port by setting the radio buttons to 'Enabled' next to the alarms you wish to map.

   By default, only the 'OUT OF SYNCHRONIZATION' Alarm is mapped to Alarm Relay One (Port 16), and only the 'ANTENNA FAULT' Alarm is mapped to Alarm Relay Two (Port 17), all other alarms are disabled.


SYNC AND CLOCK QUALITY ALARMS
HOLDOVER
ENABLE
DISABLE
OUT OF SYNCHRONIZATION
ENABLE
DISABLE
SYNC SOURCE AND GNSS ALARMS
GNSS NO FIX
ENABLE
DISABLE
LOW SATELLITES
ENABLE
DISABLE
ANTENNA FAULT
ENABLE
DISABLE
NO IRIG INPUT
ENABLE
DISABLE

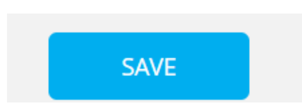


See 11.4.1. Alarm Conditions and Correction Actions for a complete description list of the supported GridTime 3000 alarms.

Note: Not all alarm conditions have an associated alarm relay option.

5. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



   A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

6. **Repeat on Port 2**

   Repeat this process on Alarm Relay Two (Port 17).

9.11 Provisioning Roles

This section describes how to provision roles for the GridTime 3000.

Note: Only an 'Administrator' user can configure Roles on the GridTime 3000.

All CMT and SNMP users set up on the GridTime 3000 have a role mapped to them. The role defines what settings the user can view and edit (read and write permissions).

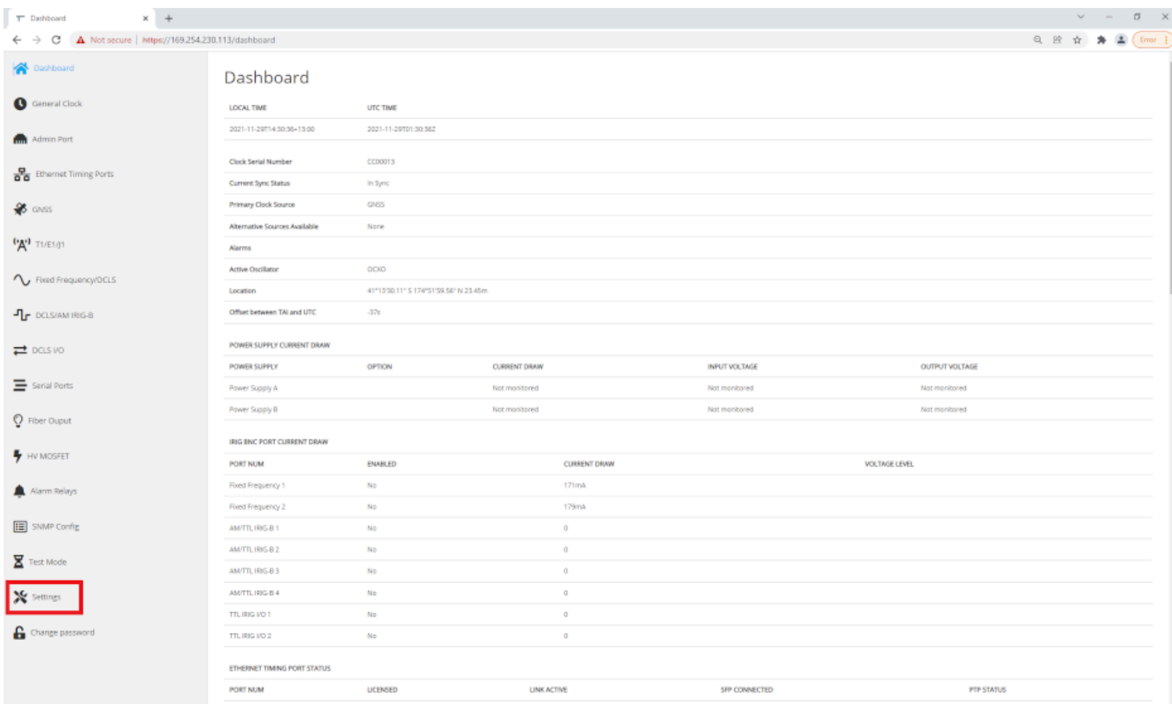
By default, the GridTime 3000 only has the 'Administrator' role set up, additional roles have to be set up using the instructions in this section. Along with the Administrator role, an Administrator user is also set up by default which has the Administrator role mapped to it.

The Administrator role is hidden in CMT as it can't be edited or removed. The Administrator role allows full access to all of the GridTime 3000's settings. It is also the only role that can access the CMT settings menu, and is the only role that can access the CMT's Users module — where CMT user settings are modified and users are added or removed.

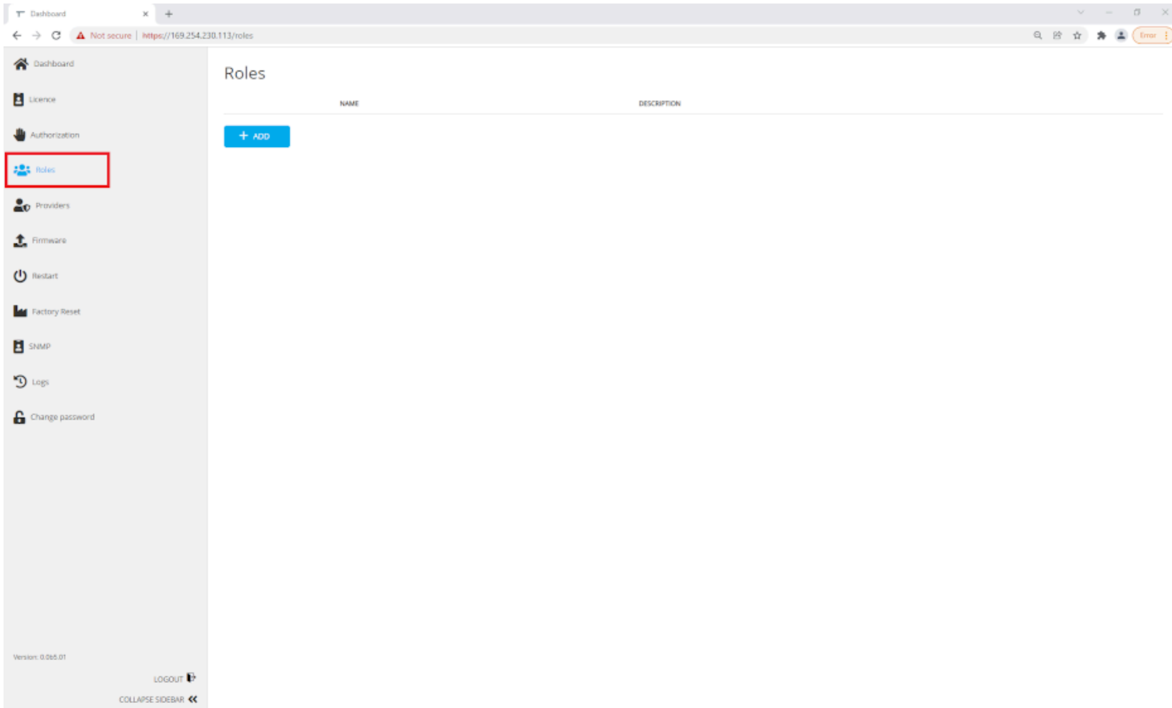
Follow the instructions below to set up additional roles for the GridTime 3000 apart from the Administrator role. If no additional roles are required apart from the Administrator role, please skip this section.

1. **Navigate to the Roles Tab**

   Click on the 'Settings' icon in the bottom left corner of the CMT's sidebar.



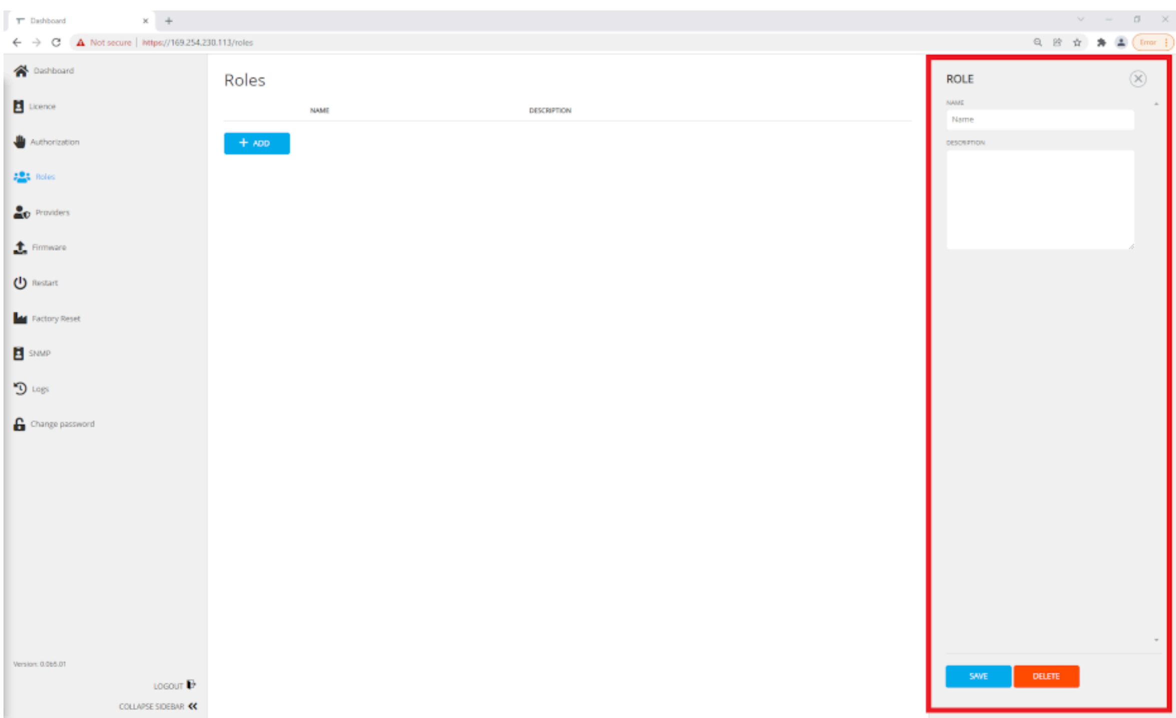
   Click on the 'Roles' icon to bring up the Roles window.



Here all of the GridTime 3000's user roles are shown apart from the Administrator role.

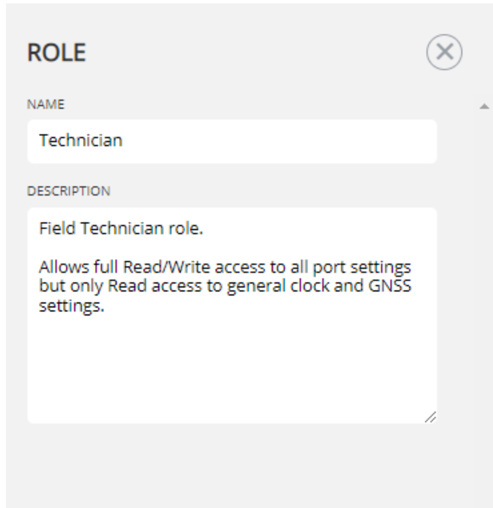
2. **Add New Role**

   Click the big blue '+ Add' button to add a new role, this will bring up the role information window on the right hand side.



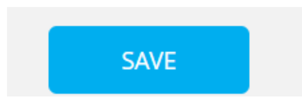
3. **Enter New Role Name and Description**

   Type the name and description for the new role into the respective textboxes.



4. **Save Settings**

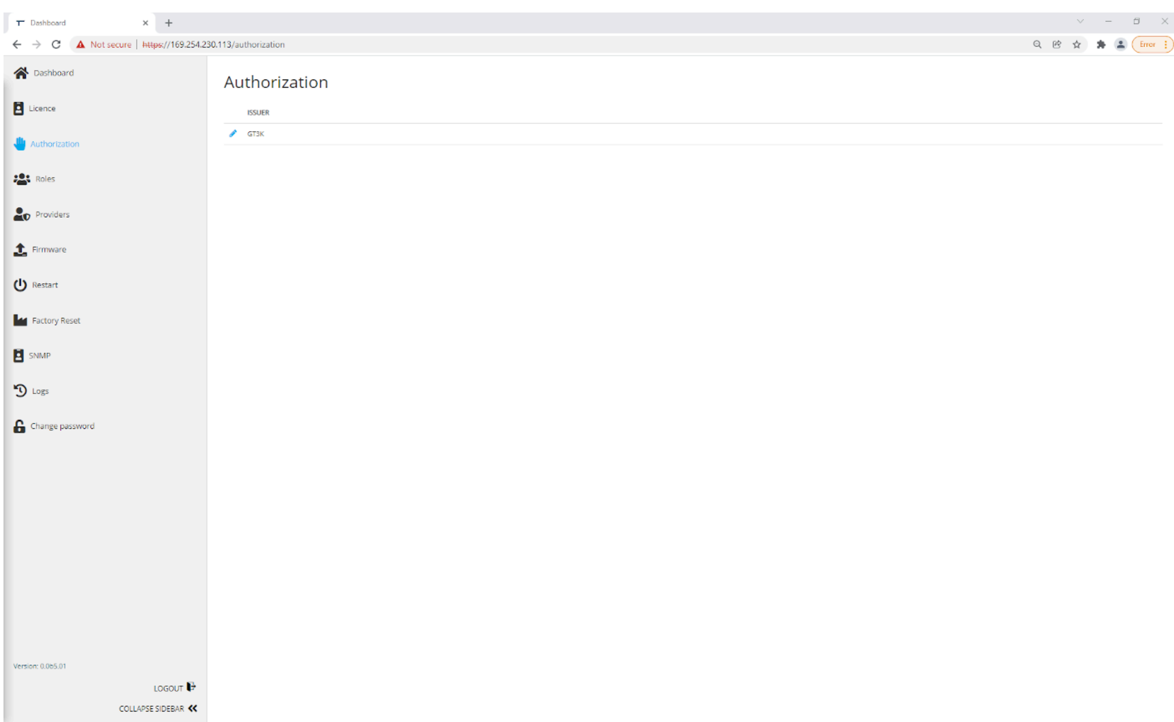
   Click the 'SAVE' button to write the settings to the GridTime 3000.



   A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

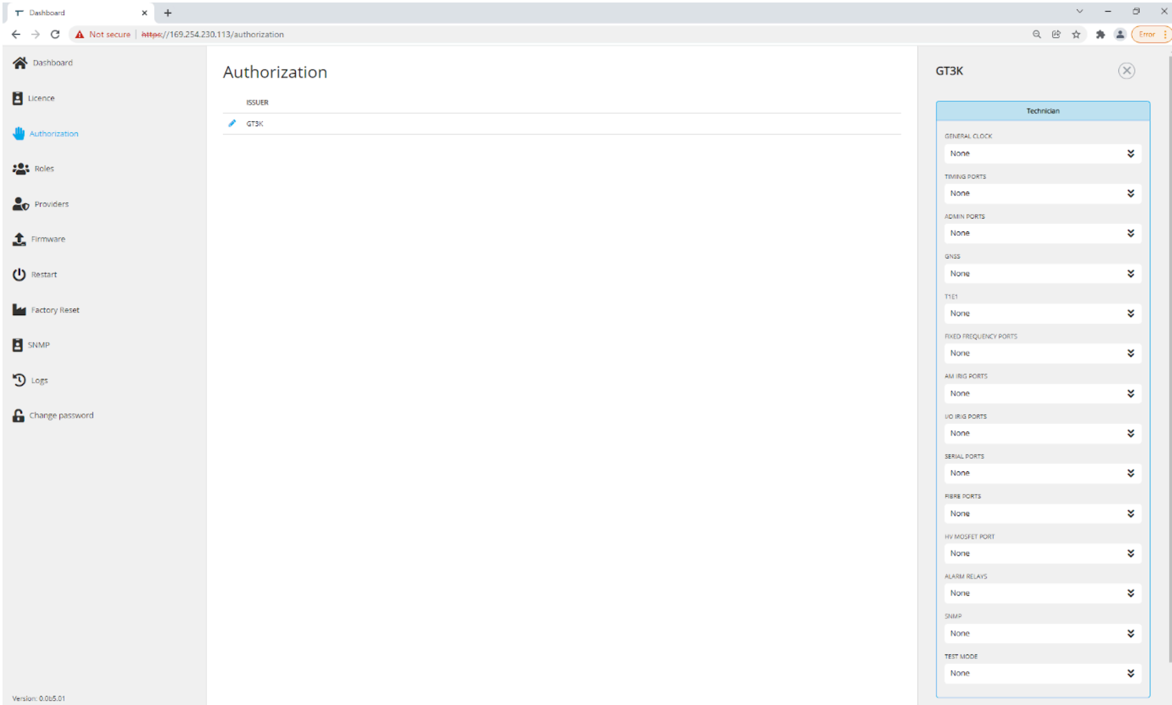
5. **Navigate to the Authorization Tab**

   Click on the 'Authorization' icon to bring up the Authorization window



6. **Open Settings Window for New Role**

Click on the 'GT3K' issuer to load up the role authorization window. Click on the name of the role you have just configured in the right-hand window to bring up its associated permissions.

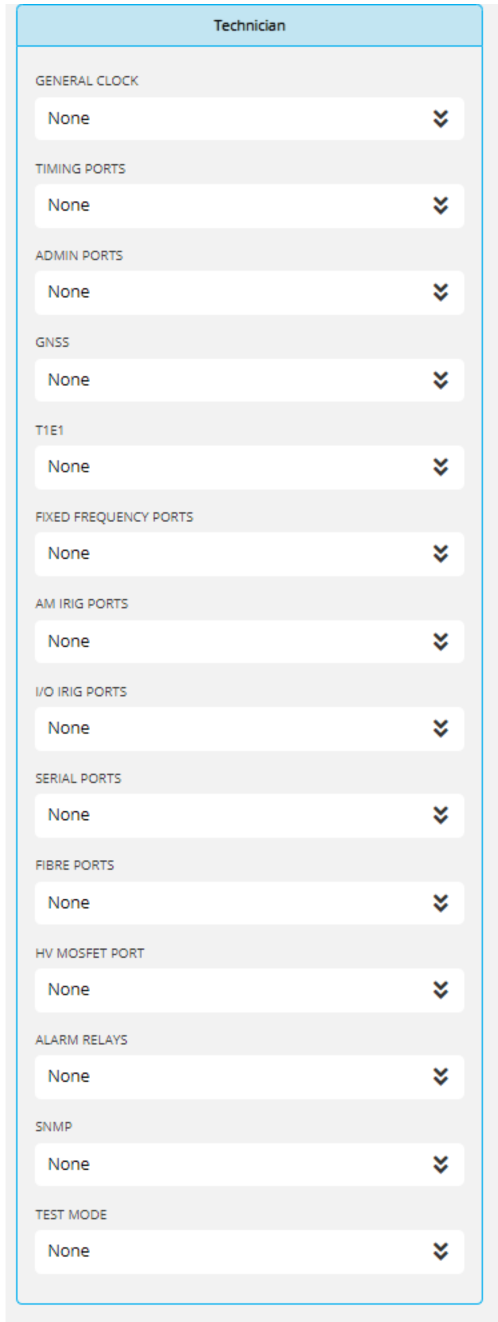


A series of dropdowns should appear in the window, each corresponding to a group of settings.

Each group of settings — i.e. the general clock settings, will have its own dropdown showing the role's access permissions for that group of settings.

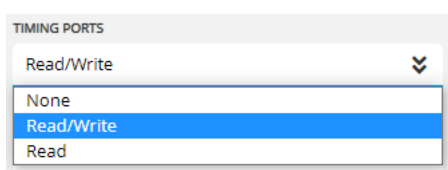
Settings are grouped by port type, or by functionality.

By default, a new role will have 'None' (no access), for all settings.



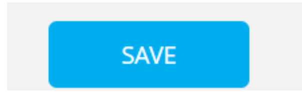
7. **Edit Permissions**

   Go through and modify the role's access to each group of settings, using the dropdown options.



8. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.12 Provisioning SNMP Settings

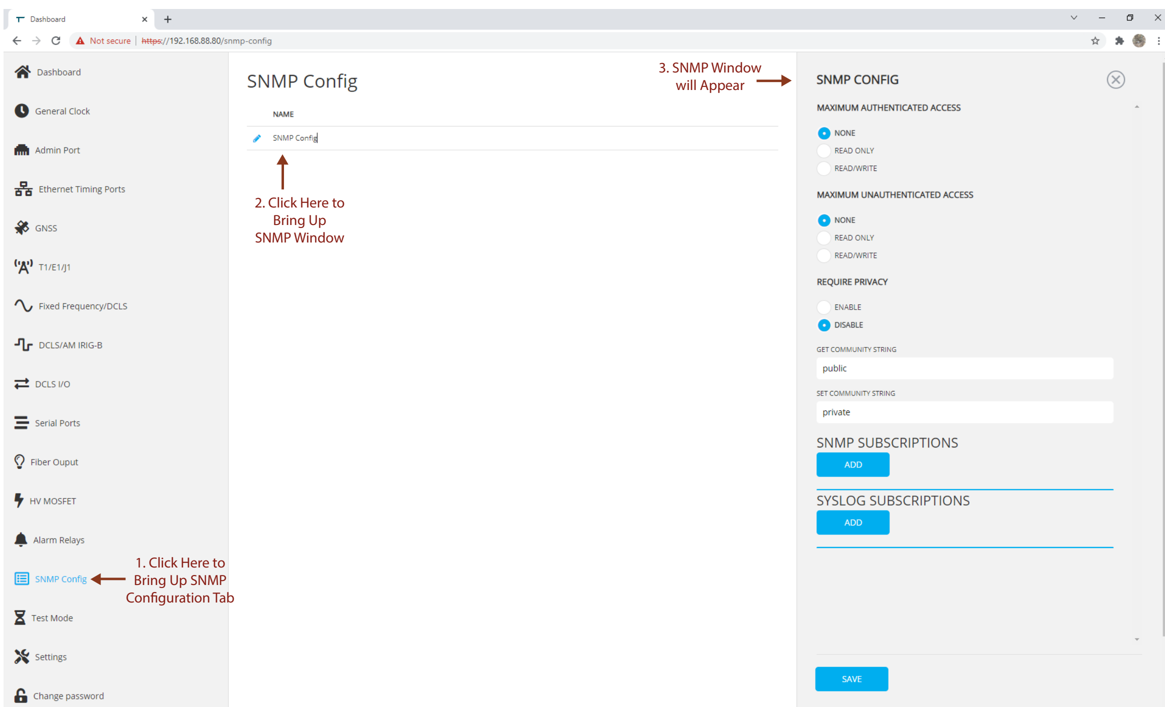
This section describes how to provision the SNMP settings on the GridTime 3000.

The SNMP configuration tab is used to configure the GridTime 3000's SNMP related settings.

Follow the steps below to provision the GridTime 3000's SNMP agent.

1. **Navigate to SNMP Config Window**

   Navigate to the SNMP Config window by clicking on the SNMP Config icon, then clicking the SNMP Config settings bar.

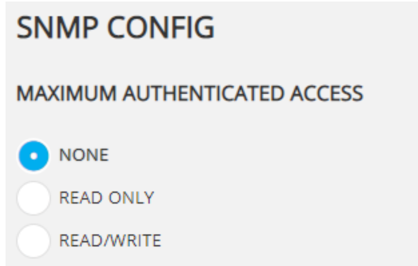


2. **Set Maximum Authenticated Access**

   This field sets the access limits for authenticated clients using SNMPv3 with User-based Security Model (USM) Authentication. The configurable access levels are:

   – None
   – Read only
   – Read/Write

   By default this is set to 'NONE', meaning no access.

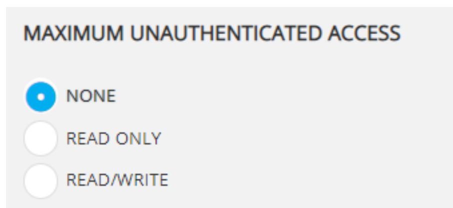


3. **Set Maximum Unauthenticated Access**

   This field sets the access limits for unauthenticated clients using SNMPv1, SNMPv2c and SNMPv3 without USM Authentication. The configurable levels are:

   – None
   – Read only
   – Read/Write

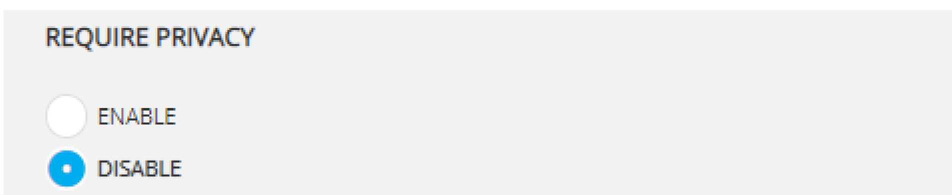
   By default this is set to 'NONE', meaning no access.



4. **Require or don't require privacy**

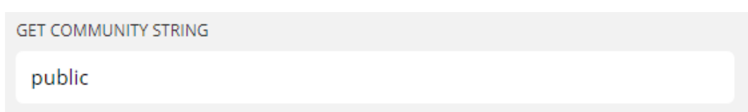
   The 'REQUIRE PRIVACY' radio buttons determine whether SNMPv3 USM privacy is required on SNMP requests.

   By default this is set to 'DISABLE', meaning SNMPv3 USM privacy is not required.



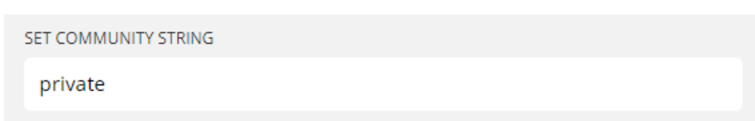
5. **Enter Get Community String (SNMPv1, SNMPv2c)**

   This field is the 'Public' string access key. By default this is set to 'public'.



6. **Enter Set Community String (SNMPv1, SNMPv2c)**

   This field is the 'Private' string access key. By default this is set to 'private'.



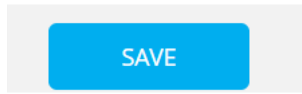
7. **Setting up Subscriptions**

   If SNMP or Syslog subscriptions have been set up on the network, follow the instructions in one of the following sections:

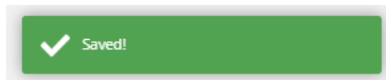
Note: All SNMP and Syslog notifications are sent from the GridTime 3000's admin Ethernet port only, ensure SNMP trap clients are set up with the IP address of the admin Ethernet port.

8. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



   A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.



9. **Set up SNMPv3 Users**

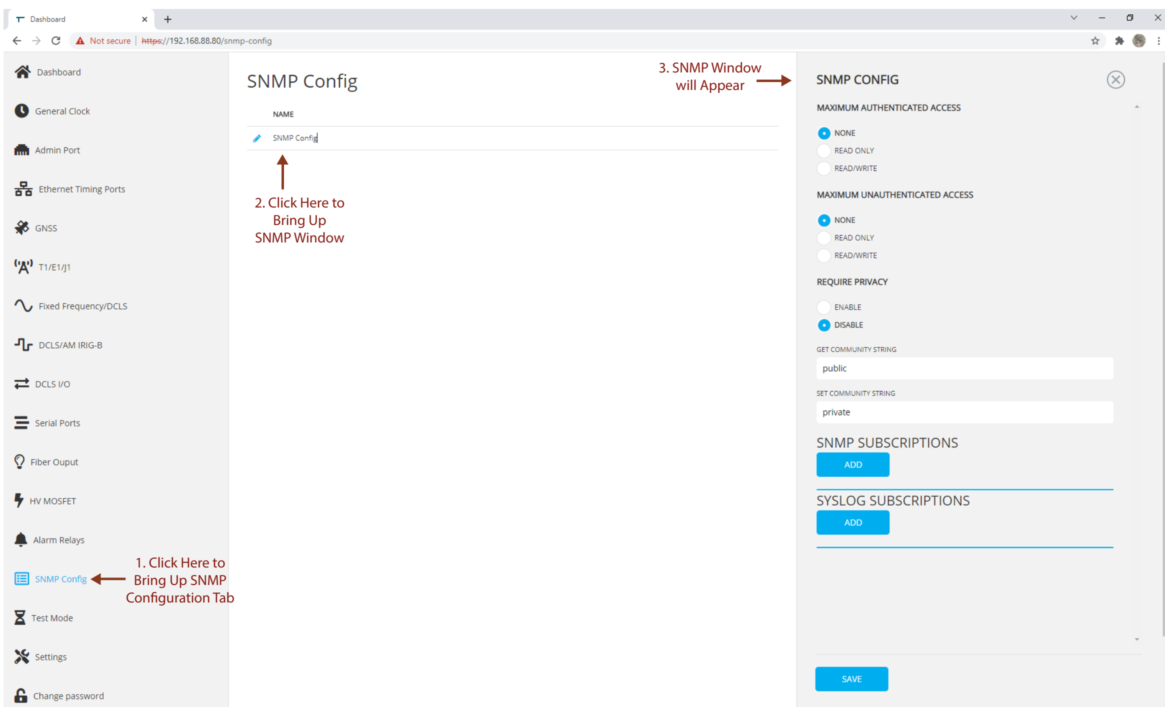
   Follow the instructions in 9.12.3. Provisioning SNMP Users if SNMPv3 USM privacy is to be used.

9.12.1 Provisioning SNMP Notifications

This section describes how to provision SNMP notifications.

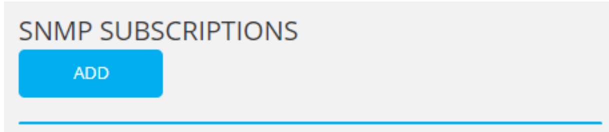
1. **Navigate to SNMP Config Window**

   Navigate to the SNMP Config window by clicking on the SNMP Config icon, then clicking the SNMP Config settings bar.



2. **Add New SNMP Subscription**

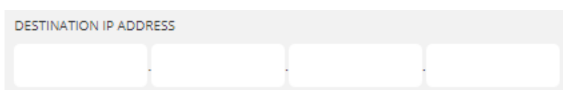
   Click the big blue 'ADD' button under the 'SNMP SUBSCRIPTIONS' heading to add a new SNMP subscription.



This will make the new subscription settings appear.

3. **Enter Subscription's Destination IP Address**

   Enter the IP address of the SNMP client subscribing to GridTime 3000 notifications.



4. **Enter Subscription's User Name**

   When the SNMP version selected is SNMPv2, this field will be used as the security key. The key can consist of any character combination, up to 32 characters maximum length.

   If the SNMP version selected is SNMPv3, and the username of a user set up in the 'SNMP Users' window is entered, then the user authentication settings will be applied. See 9.12.3. Provisioning SNMP Users.

   If SNMPv3 is being used and the username doesn't map to an SNMP user, SNMP notifications will be unauthenticated and unencrypted.

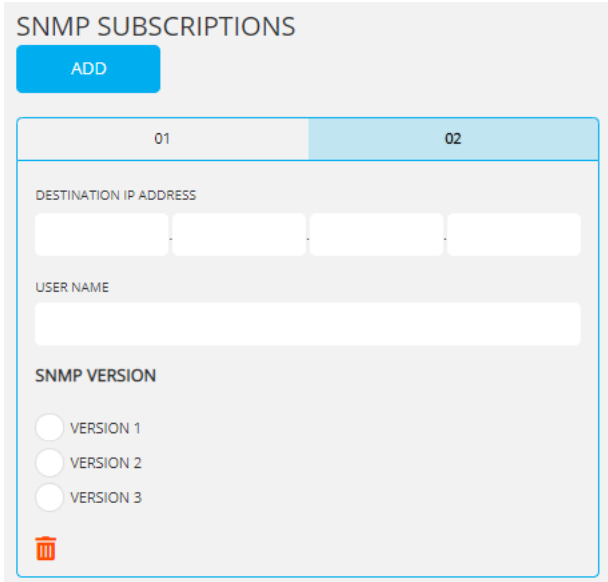
   Enter the user name for the SNMP subscriber.

5. **Select SNMP Version Used by Subscription**

   Select the SNMP version to be used by the SNMP subscriber from SNMPv1, SNMPv2c, and SNMPv3.

6. **Repeat Steps 2-5 for Each Additional Subscriber**

Click 'ADD' again to add another SNMP subscriber, click on the '02' tab under the 'ADD' button to navigate to the settings for the new SNMP Subscription. The '01' tab contains the settings for the subscription that was previously set up.

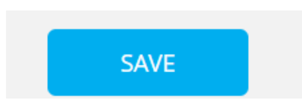


Repeat for as many subscriptions as are present on the network.

Tip:
Click the red bin icon to remove an SNMP subscription.

7. **Save Settings**

Click the 'SAVE' button to write the settings to the GridTime 3000.



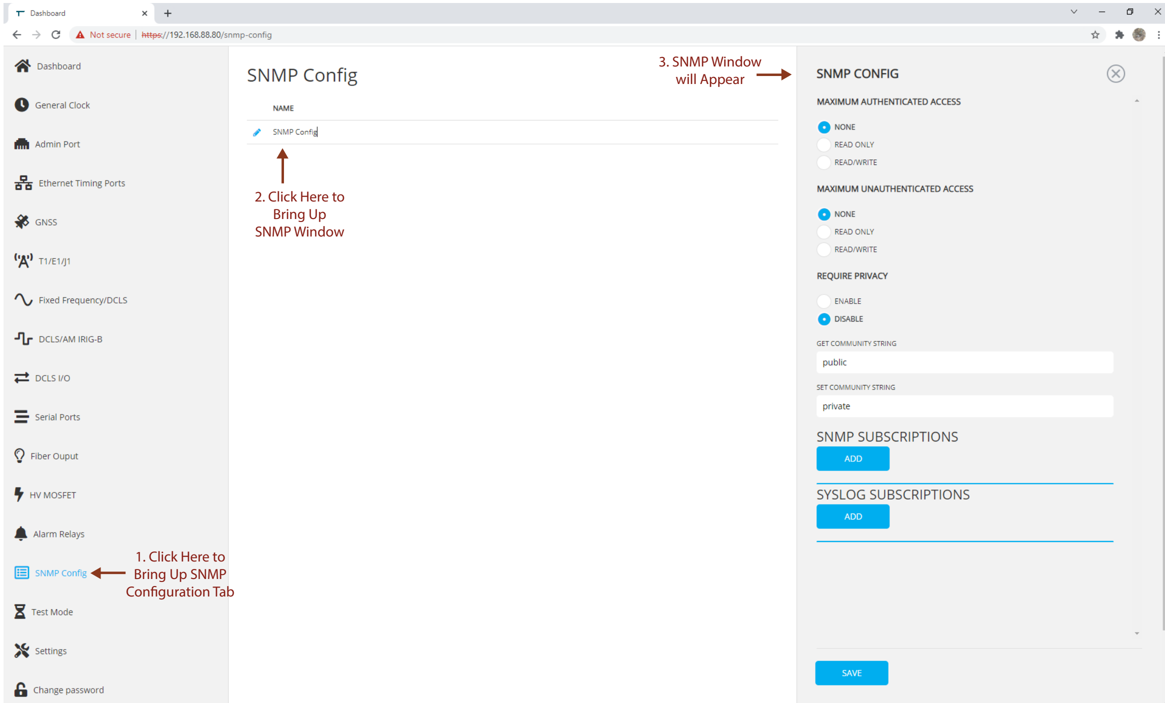
A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.12.2 Provisioning Syslog Notifications

This section describes how to provision Syslog notifications.

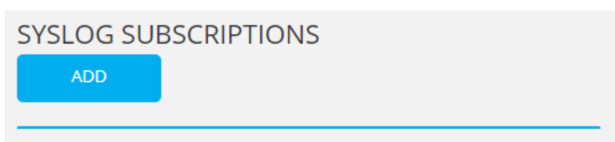
1. **Navigate to SNMP Config Window**

Navigate to the SNMP Config window by clicking on the SNMP Config icon, then clicking the SNMP Config settings bar.

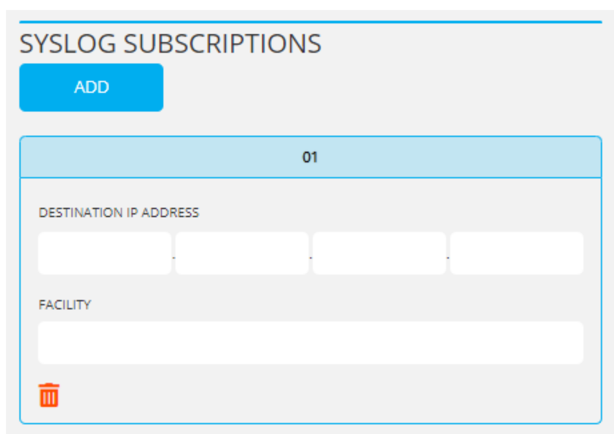


2. **Add New Syslog Subscription**

   Click the big blue 'ADD' button under the 'SYSLOG SUBSCRIPTIONS' heading to add a new Syslog subscription.



   This will make the settings for the new subscription appear.



3. **Enter Subscriber's Destination IP Address**

   Enter the IP address of the Syslog subscriber.

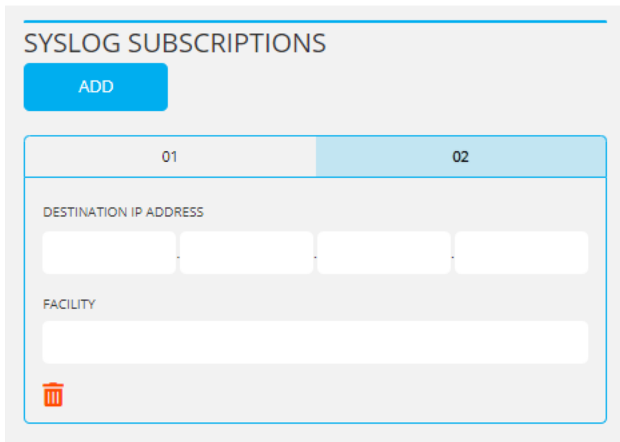
4. **Enter Subscriber's Facility Number**

This is the setting for the Syslog facility number. It represents the “Local Use” value range 0 to 7 (i.e. Facility Number range 16 to 23).

Enter the Facility Number of the Syslog subscriber.

5. **Repeat Steps 2-4 for Each Additional Subscriber**

   Click 'ADD' again to add another Syslog subscriber, click on the '02' tab under the 'ADD' button to navigate to the new Syslog subscriber settings. The '01' tab contains the settings for the subscriber that was previously set up.

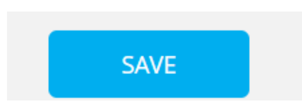


   Repeat for as many subscriptions as are present on the network.

Tip:
Click the red bin icon to remove a Syslog subscription.

6. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



   A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

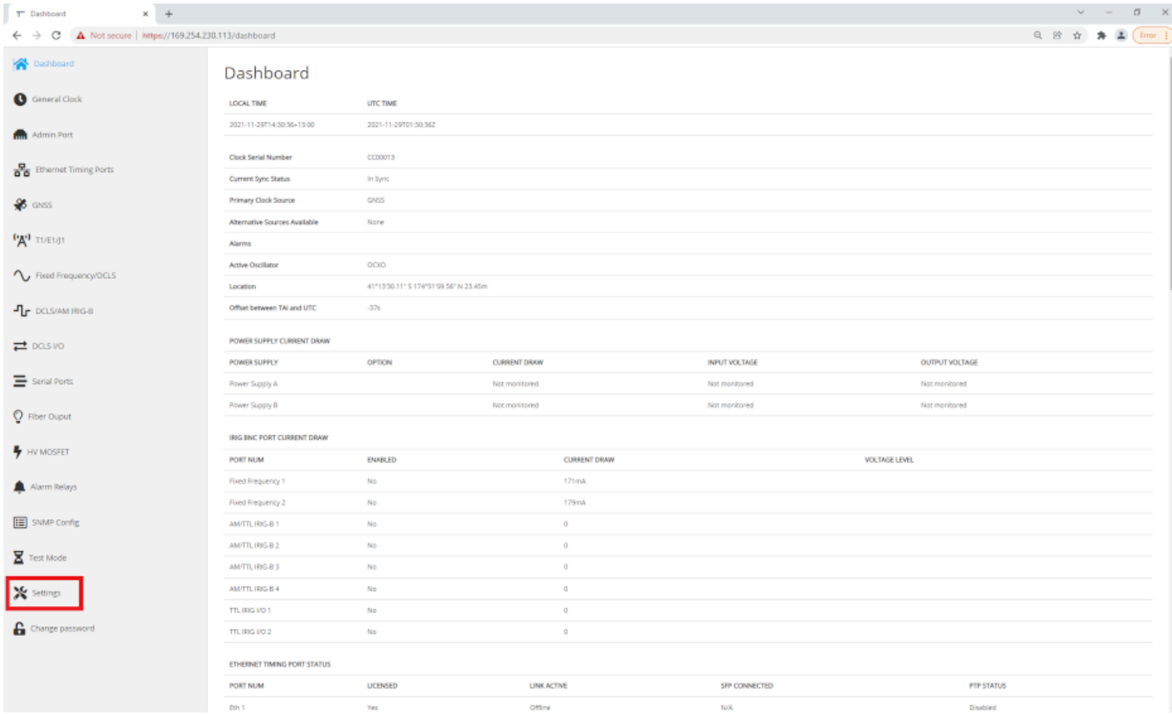
9.12.3 Provisioning SNMP Users

This section describes how to provision SNMPv3 USM users.

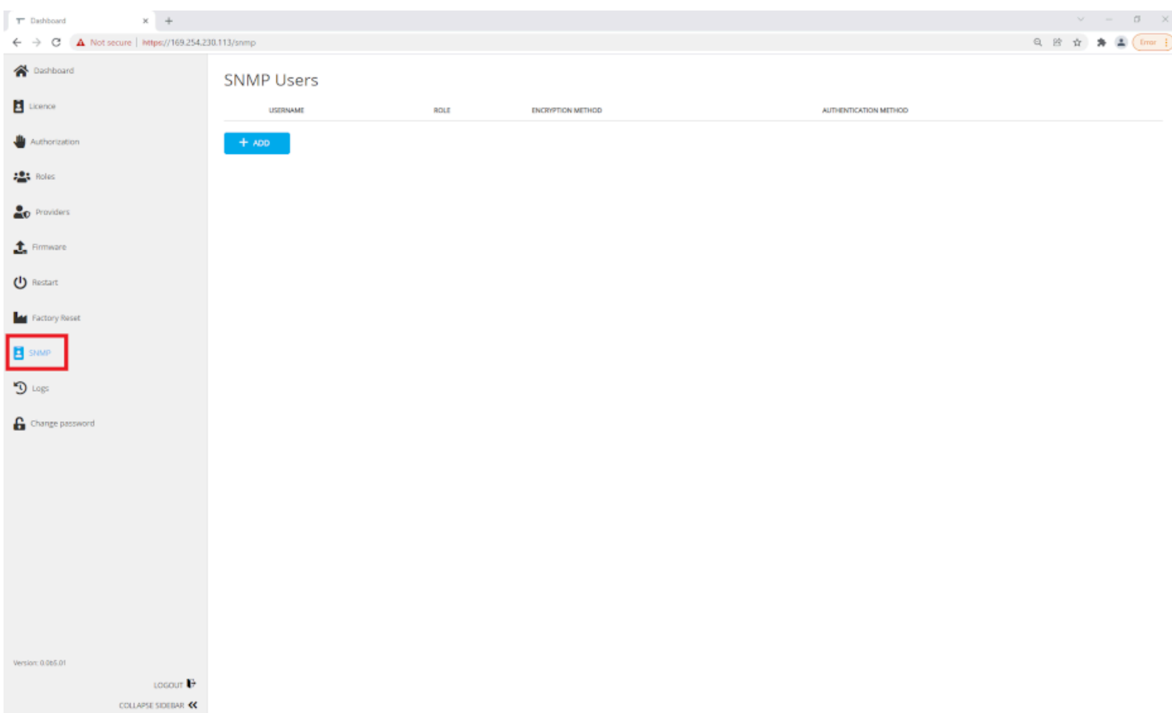
Note:
Only an 'Administrator' user can configure SNMP Users on the GridTime 3000

1. **Navigate to SNMP Users Tab**

   Click on the 'Settings' icon in the bottom left corner of the CMT's sidebar.

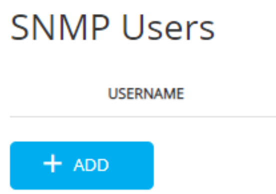


Click on the 'SNMP' tab to bring up the SNMP Users window

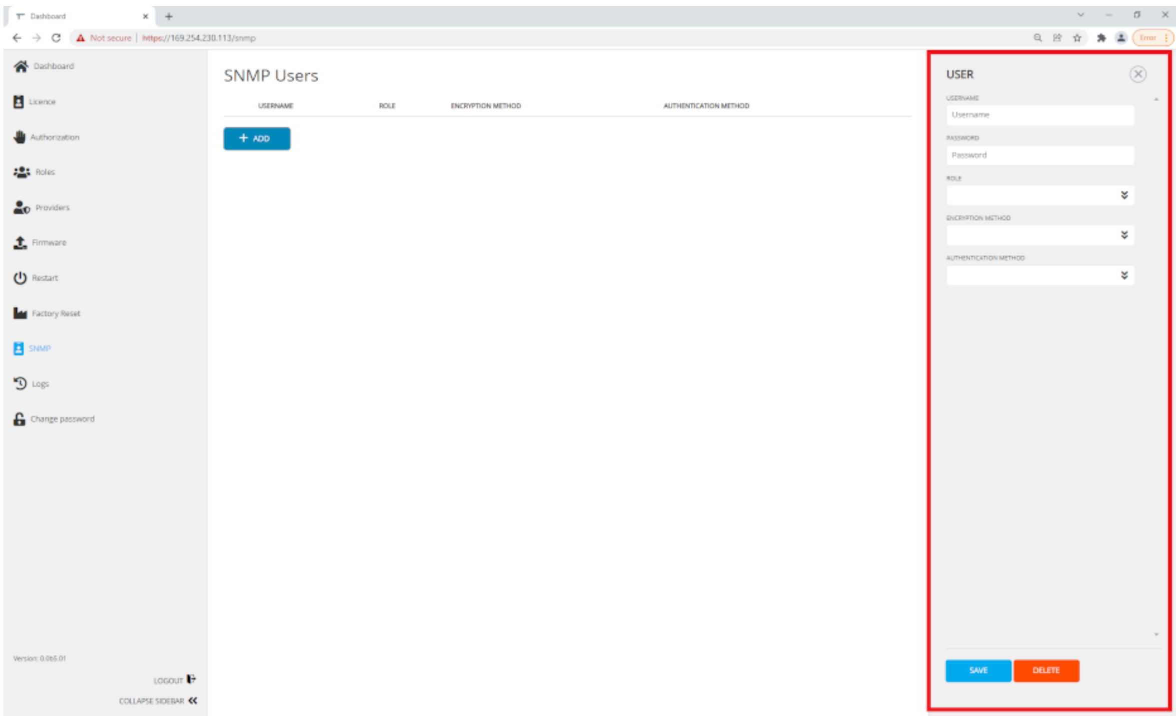


2. **Add User**

   Click the big blue '+ ADD' button to add a new SNMP user.

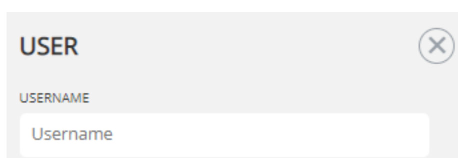


This will make the settings window appear for the new user.



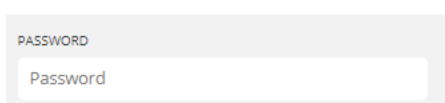
3. **Enter Username**

   Enter the SNMPv3 USM username for the new user.



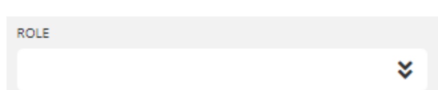
4. **Enter Password**

   Enter the SNMPv3 USM password for the new user.



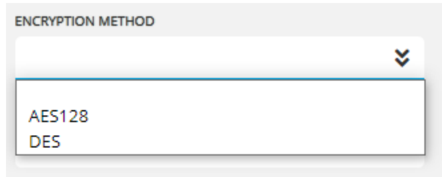
5. **Select Role**

   Select the mapped user role from the 'ROLE' dropdown. Read the 9.11. Provisioning Roles section before proceeding with this step.



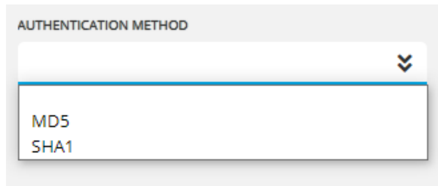
6. **Select Encryption Method**

   Select the encryption type to be used from the 'ENCRYPTION METHOD' dropdown.



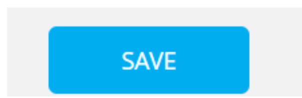
7. **Select Authentication Method**

   Select the authentication method to be used from the 'AUTHENTICATION METHOD' dropdown.



8. **Save Settings**

   Click the 'SAVE' button to write the settings to the GridTime 3000.



   A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9.13 Provisioning Users

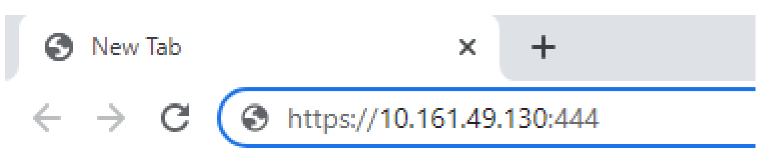
This section describes how to provision users for the GridTime 3000.

Note:
By default, The GridTime 3000 only allows the 'Administrator' role to have read and write access to all settings and advanced configuration menus. Follow the instructions in 9.11. Provisioning Roles to set up additional roles.

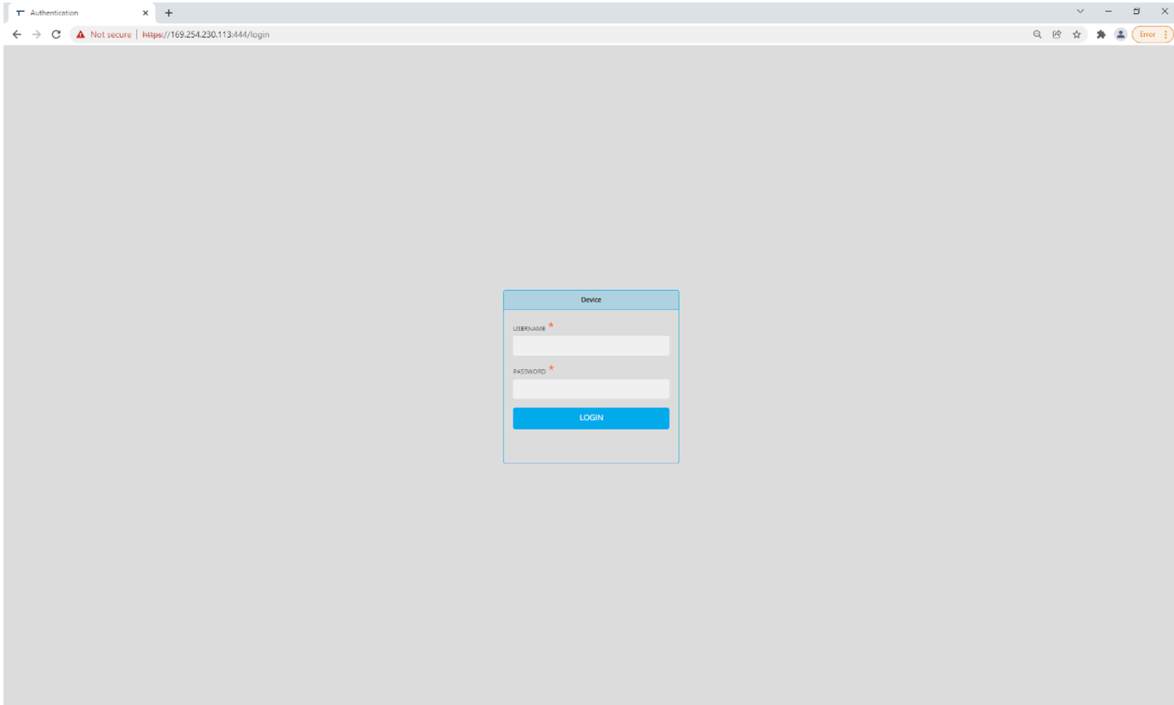
By default, it also has a single Administrator user with the Administrator role mapped to it. The username for the Administrator user is 'Administrator', and the password will be what was entered the first time the Clock Management Tool (CMT) was logged into.

Important: Only a user with the role of 'Administrator' can provision users on the GridTime 3000.

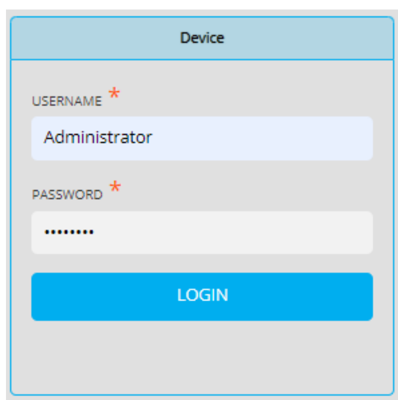
1. Navigate to the CMT authentication module by adding ':444' to the end of the IP address you would normally use to access the CMT in your browser's URL textbox.



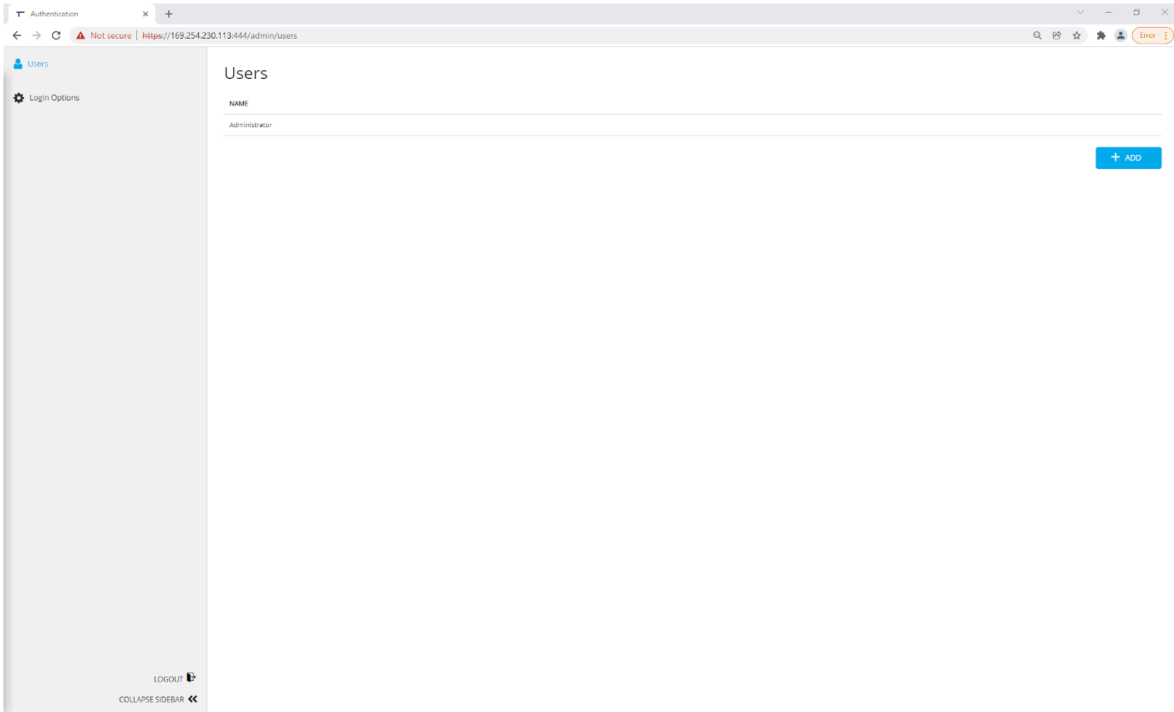
This should bring up a new login screen for the authentication module.



2. Enter the Administrator user login details and click 'LOGIN'.



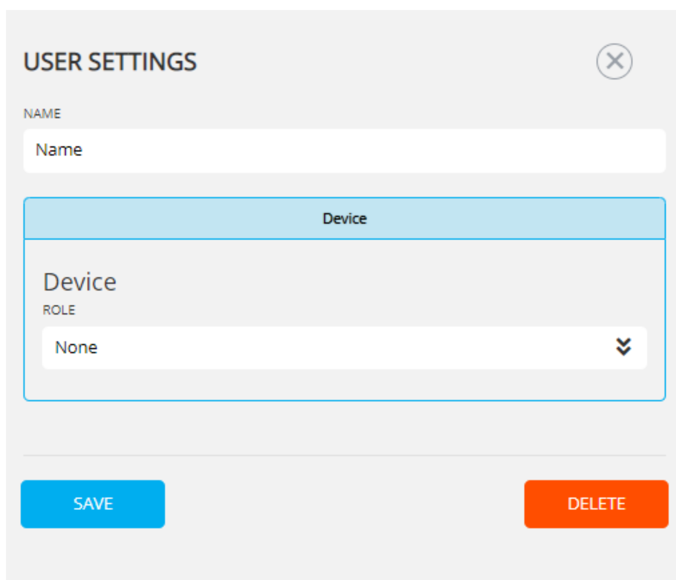
If the login was successful, the users tab of the authentication module should load up.



Unless previously modified, only the 'Administrator' user should be present as per the GridTime 3000's default settings.

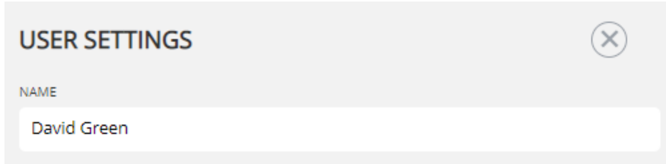
3. To add a new user, click the big blue '+ ADD' button.

This should make the user settings window appear on the right hand side of the screen.



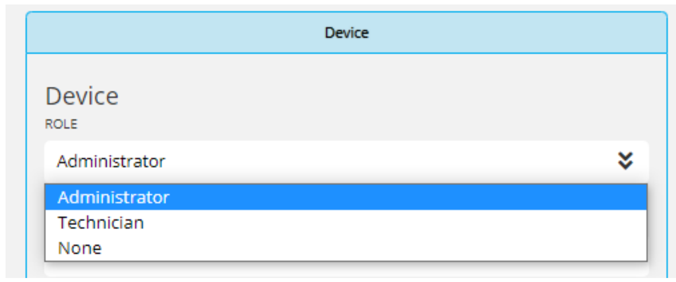
4. **Enter Name**

Type the Name of the user into the 'NAME' textbox.
Note: This is not the username used by the user during login, this is simply a name used to identify the user in the Users Configuration Module.



5. **Select Role Mapped to User**

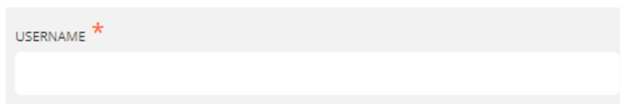
   Select the role mapped to the user with the 'ROLE' dropdown. If the role still needs to be set up, see 9.11. Provisioning Roles.



   This will reveal additional user settings.

6. **Enter Username**

   Enter the login username used by the user into the 'USERNAME' field.



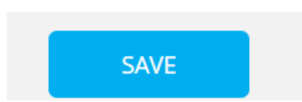
7. **Enter Password**

   Enter the login password used by the user into the 'PASSWORD' field.

   Note:
   'FAILED ATTEMPTS' and 'LOCK OUT UNTIL' settings are available in the Clock Management Tool but will not have any affect on the configured user.

8. **Save Settings**

   Click the 'SAVE' button to write the user settings to the GridTime 3000.

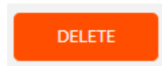


   A 'Saved!' notification will appear in the bottom right corner of the page indicating that the settings have successfully been written to the GridTime 3000.

9. **Repeat Across All Required Users**

   Repeat the steps above until all required users are added.

Note:
To delete a user, bring up it's user settings using the earlier steps (Steps 1, 2 and 3), and click the big red 'DELETE' button.



Note: The login username, password, and other details for the default 'Administrator' user can be changed, but the user cannot be deleted.

10. Operating

This chapter provides the GridTime 3000 operating guidelines.

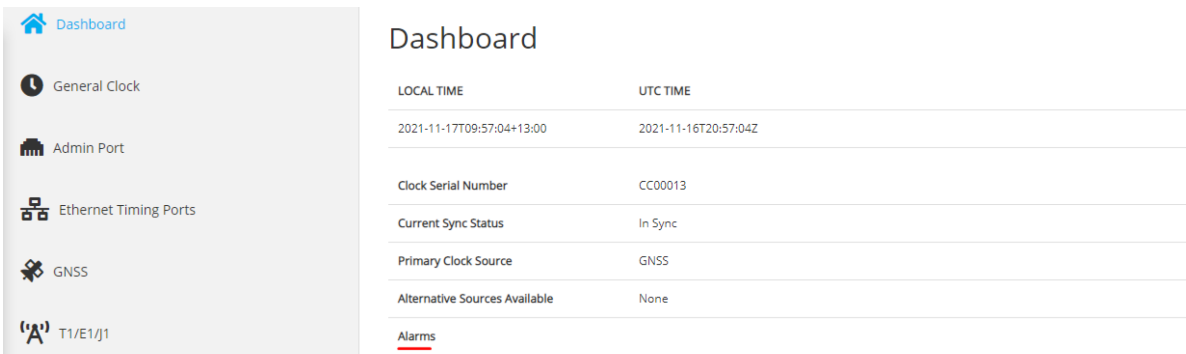
10.1 Determining Status

This section describes how to determine the status of the GridTime 3000.

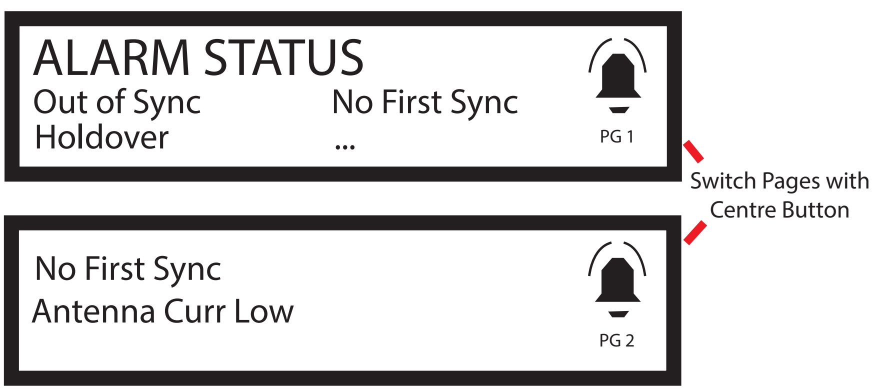
The status of the GridTime 3000 can be monitored by observing what alarms are currently active, and by observing the current sync status.

The GridTime 3000's alarms can be monitored through the following methods:

- Monitoring SNMP traps/notifications— SNMP subscriptions must have previously been set up
- Viewing the alarms section of the CMT dashboard for a list of active alarms



- Viewing the LCD alarms tab

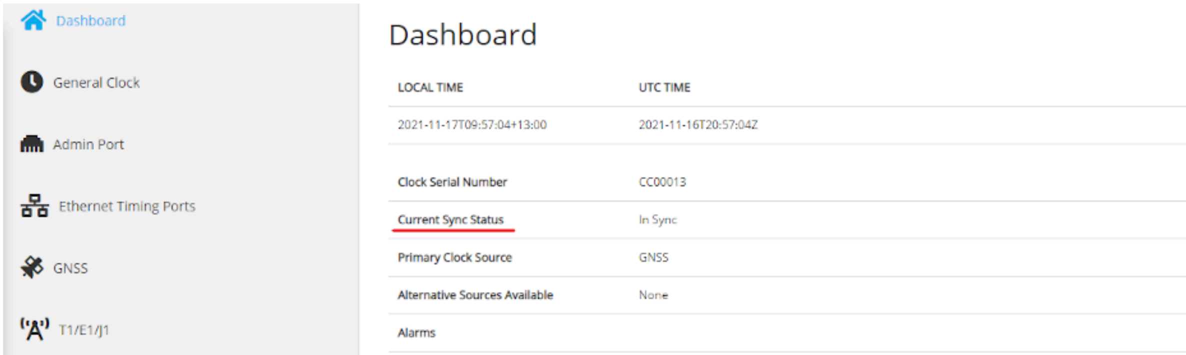


- Monitoring the alarm relays — alarm relays must have previously had alarms mapped to them

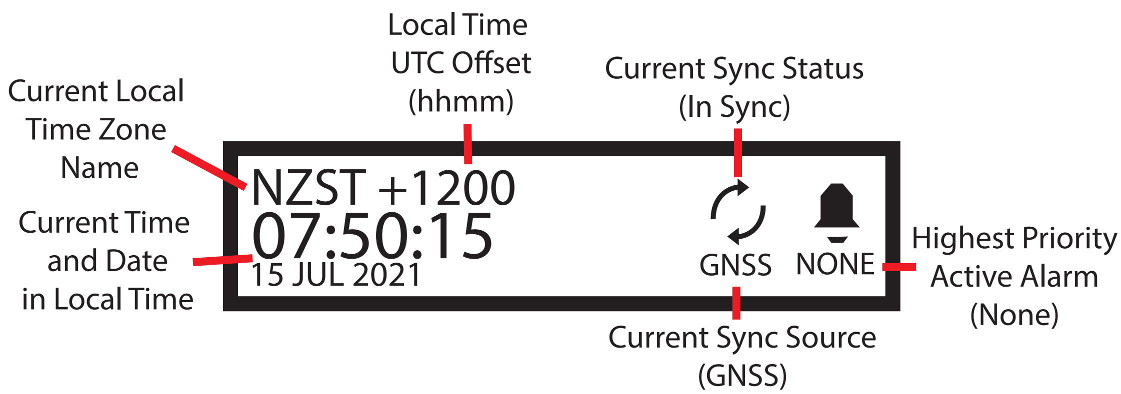
For more information on how to monitor the GridTime 3000's alarms, and alarm specifications, see 5. Alarms.

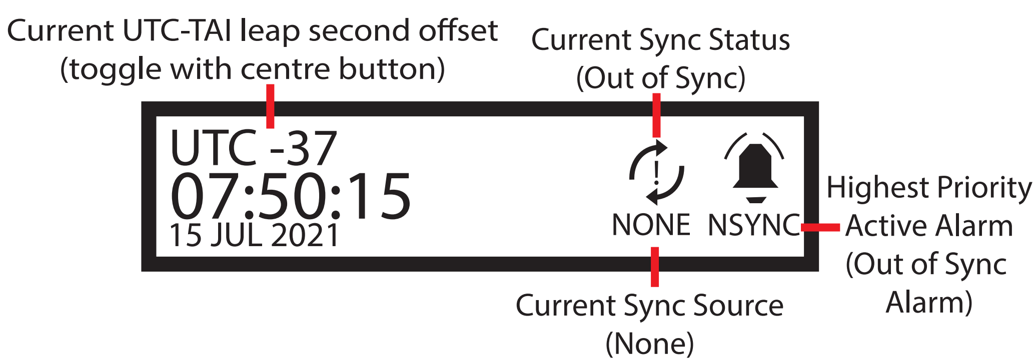
The sync status of the GridTime 3000 can be determined through the following methods:

- Viewing the sync status section of the CMT dashboard



- Viewing the LCD main screen





- Performing a SNMP 'get' on the current sync status object (OID .1.3.6.1.4.1.34689.7.1.1.1.1.6)
- Determine if any sync alarms are active — if none are active the unit is in sync

10.2 Test Mode

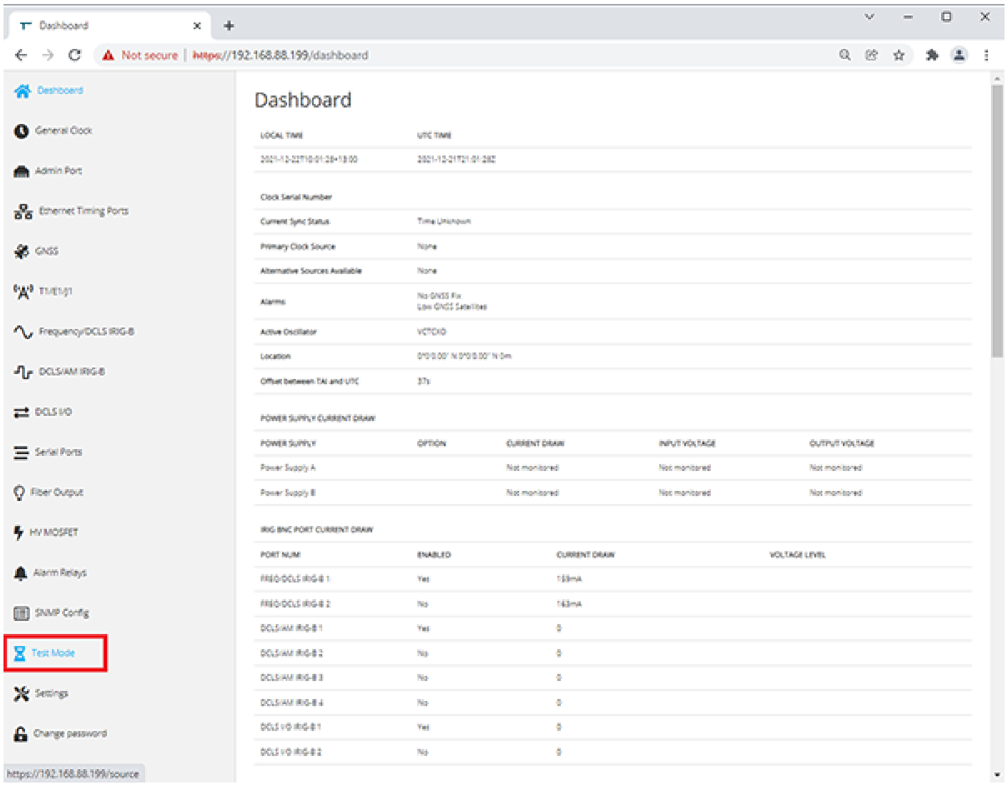
This section describes how to set the GridTime3000 into test mode, and how to change the time to one selected by the user.

The Test Mode behaves like an additional sync source, which overrides all other synchronization sources, reports perfect time accuracy, and can be set to a time specified by the user. While in test mode, the other behavior of the GridTime 3000 will remain the same. For example, GNSS associated alarms will still trigger based off the physical inputs to the clock.

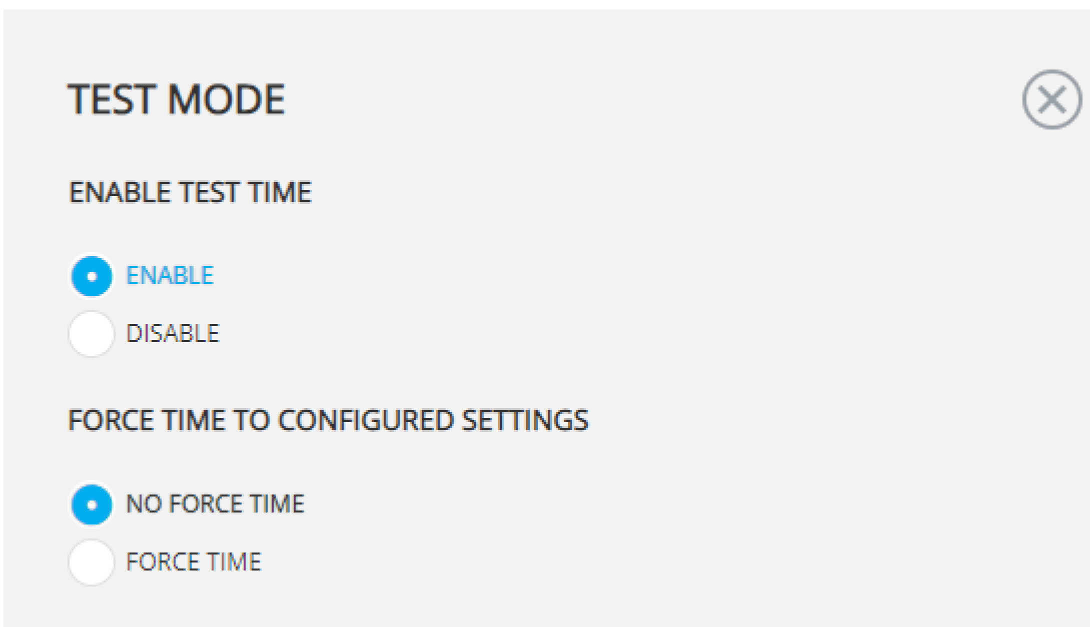
Test Mode will be disabled when the GridTime 3000 is power cycled.

1. Load up the CMT dashboard — see 9.2. Logging In and Out

2. Click the 'Test Mode' icon



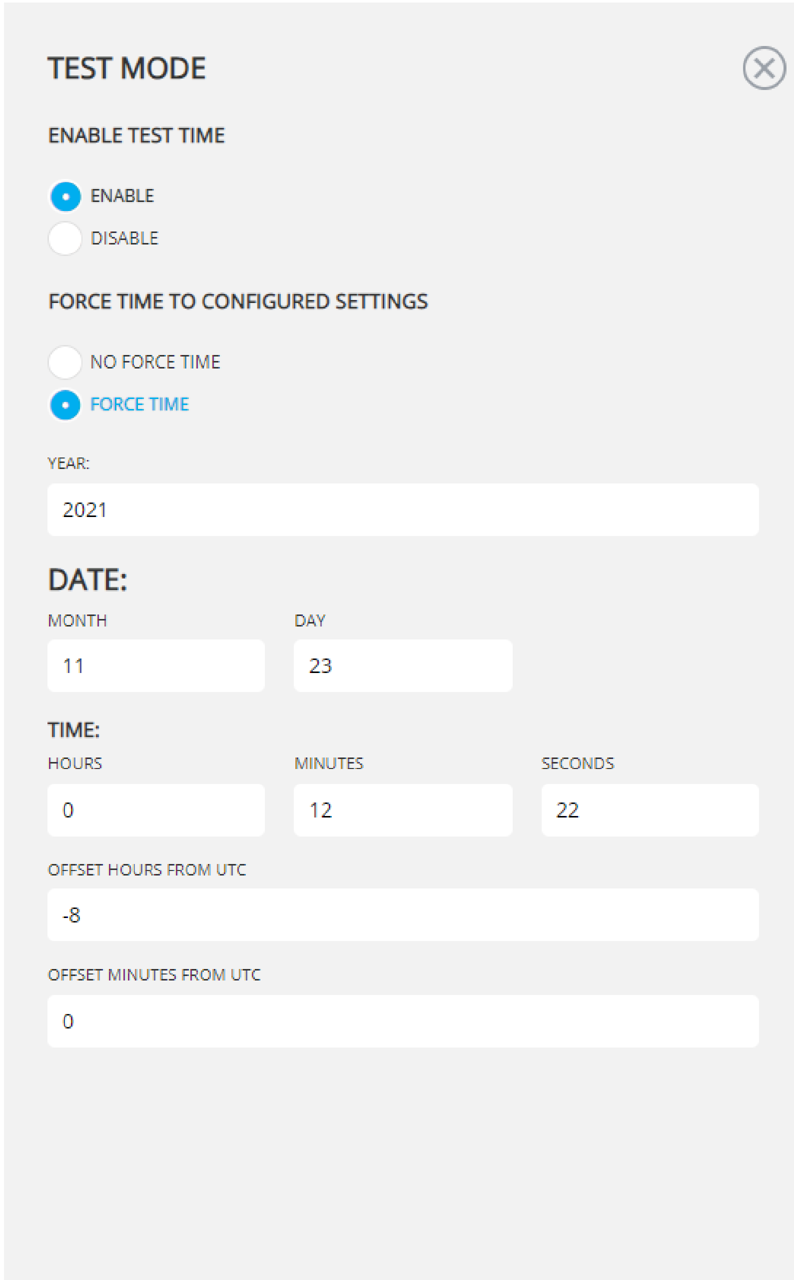
3. Change the 'ENABLE TEST TIME' option to 'Enable'.



Note:
Test Mode will be automatically disabled when then the GridTime 3000 is power cycled.

4. To change the test mode time first set the 'FORCE TIME TO CONFIGURED SETTINGS' option to 'FORCE TIME'. Then enter the desired date, local time, and offset from UTC.

The 'OFFSET HOURS FROM UTC' and 'OFFSET MINUTES FROM UTC' should be entered as the offset between local time and UTC. Test Mode will automatically compensate for the offset and compute UTC for its internal time.

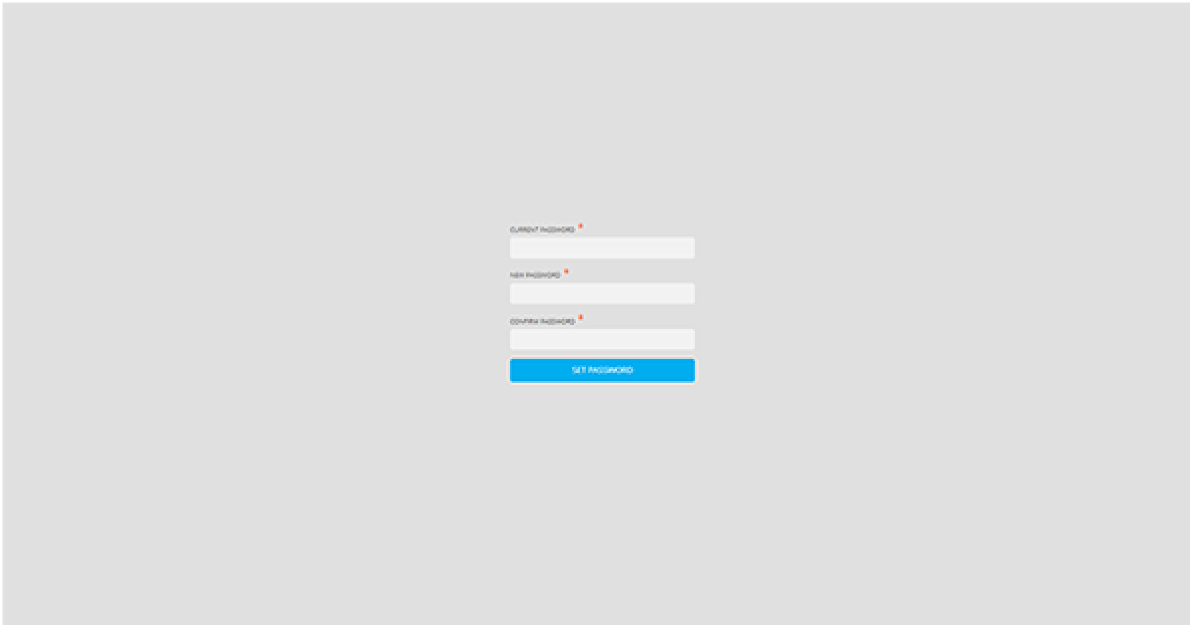


10.3 Changing Password

This section describes how a non-administrator user can change their password on the GridTime 3000

1. Log in to the CMT dashboard —see 9.2. Logging In and Out
2. Click the 'Change Password' icon
3. Enter the current user's password into the 'CURRENT PASSWORD' textbox. Enter the desired new password into the 'NEW PASSWORD' and 'CONFIRM PASSWORD' textboxes. Then click the blue ' SET PASSWORD' button to confirm the change.

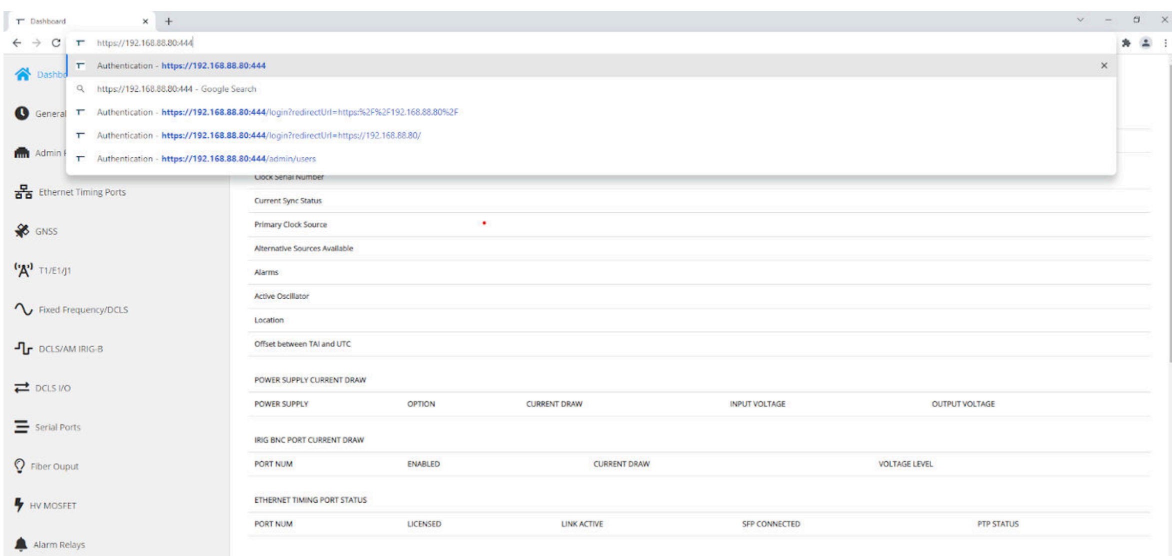
Note: If the user's current password is not known, an administrator can reset the password by following the steps found here: 10.4. Changing a User's Password (Admin Only)



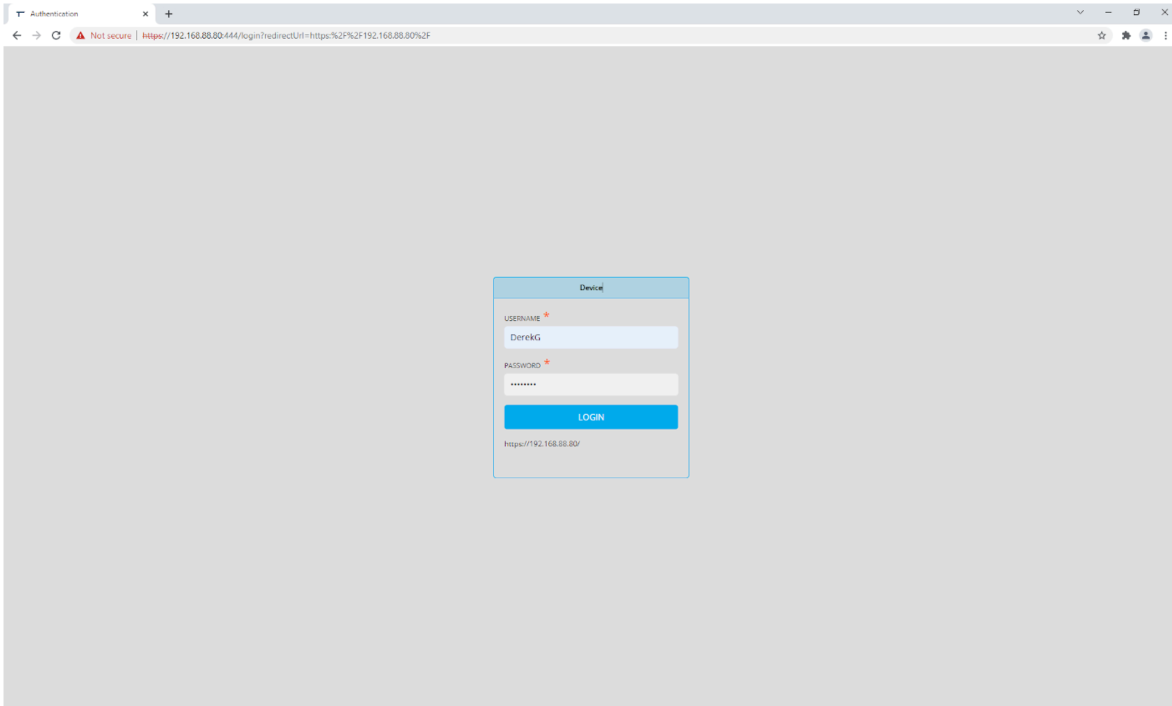
10.4 Changing a User's Password (Admin Only)

This section describes how to change the GridTime 3000's user passwords.

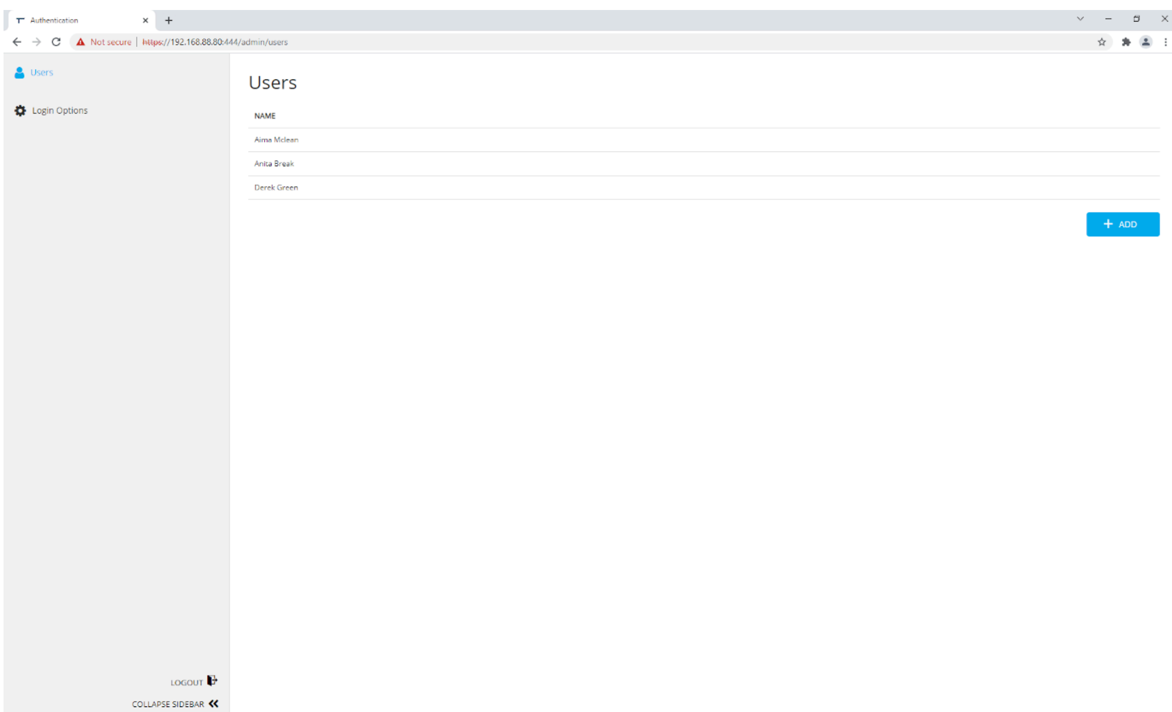
1. To modify a password for a GridTime 3000 user, navigate to the CMT authentication module by adding ':444' to the end of the IP address you would normally use to access the CMT in your browser's URL textbox.



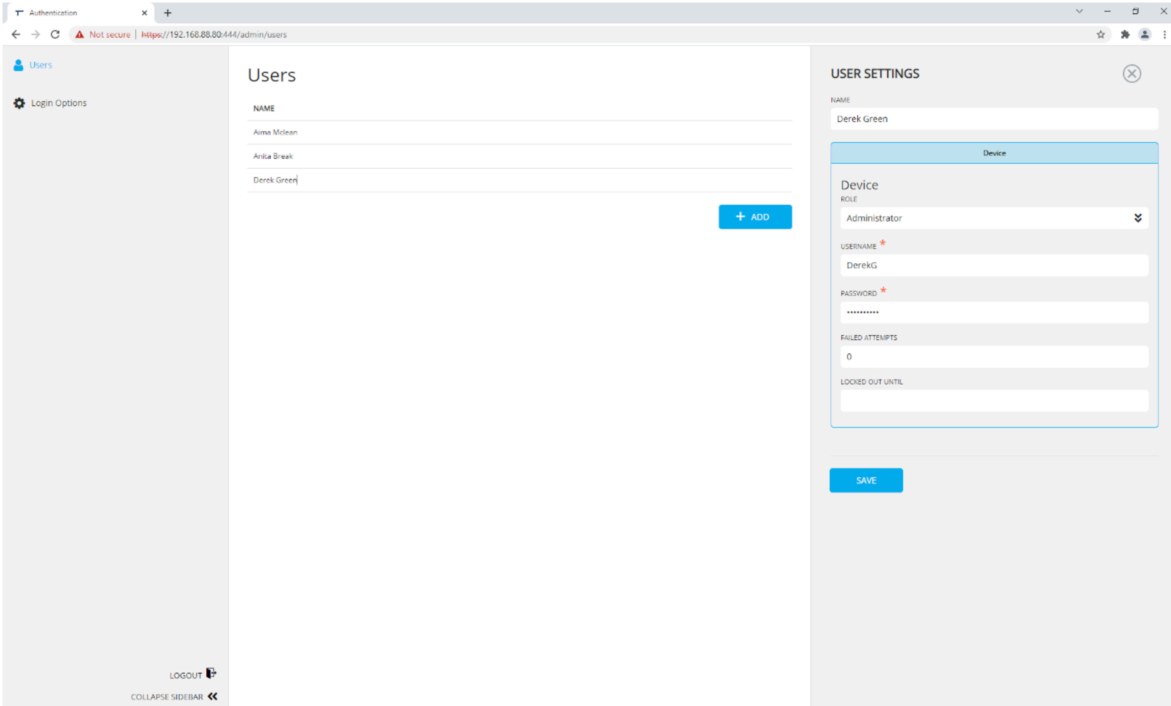
This should bring up the new authentication module login screen.Enter the login details for an administrator user and click 'LOGIN'.



2. If the login was successful, the users tab of the authentication module should load up.



3. To modify the login settings for a particular user, click on a user's name, and the user settings tab should appear. Click 'device' to show all user login settings.



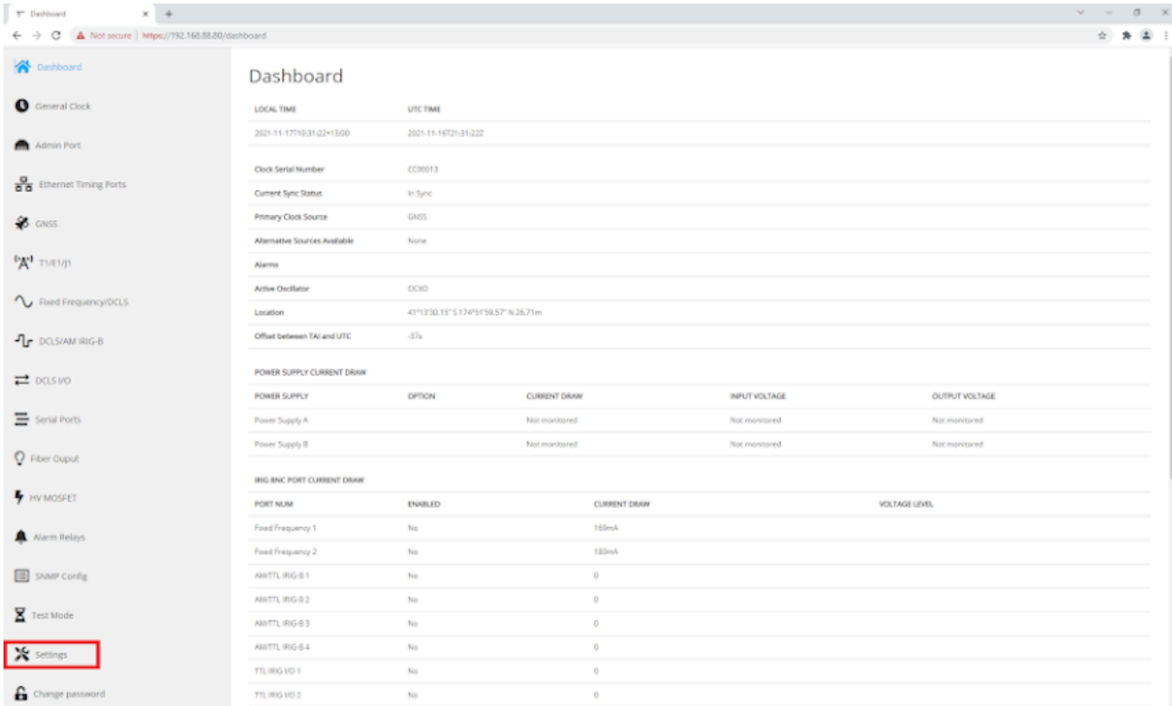
4. Modify the password setting as required, and click the blue 'SAVE' button at the bottom, when finished.

10.5 Upgrading the Firmware

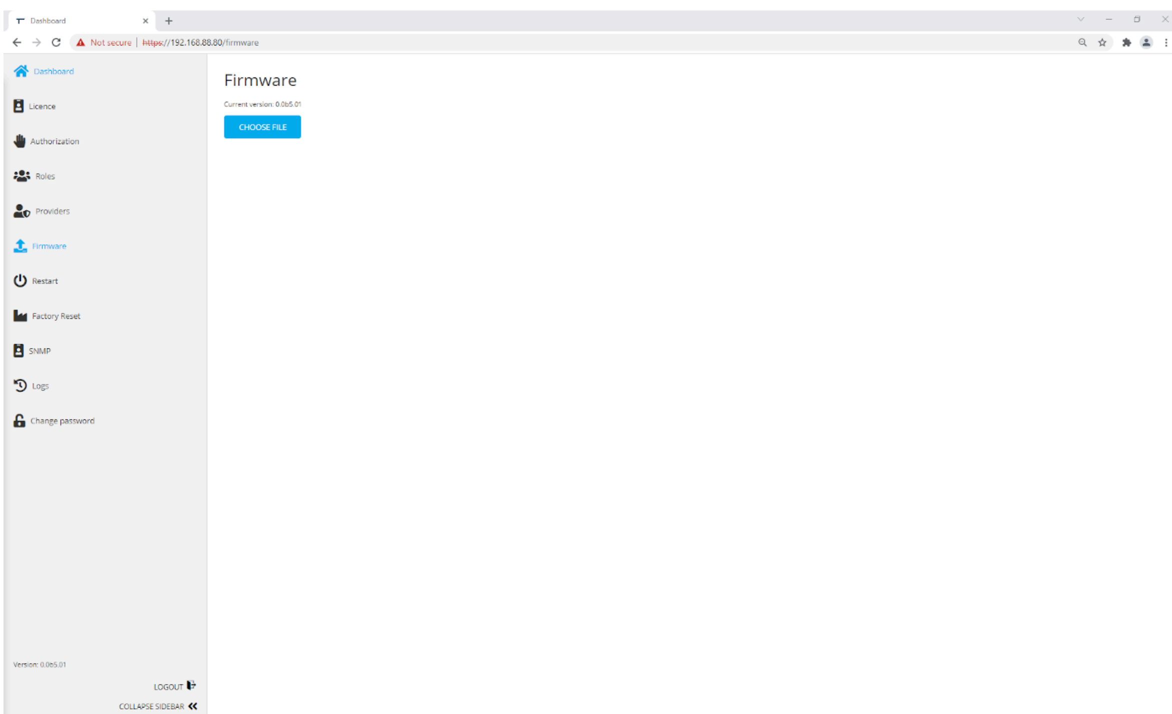
This section describes how to upgrade the GridTime 3000's firmware.

Note: Only an administrator user can upgrade the GridTime 3000's firmware.

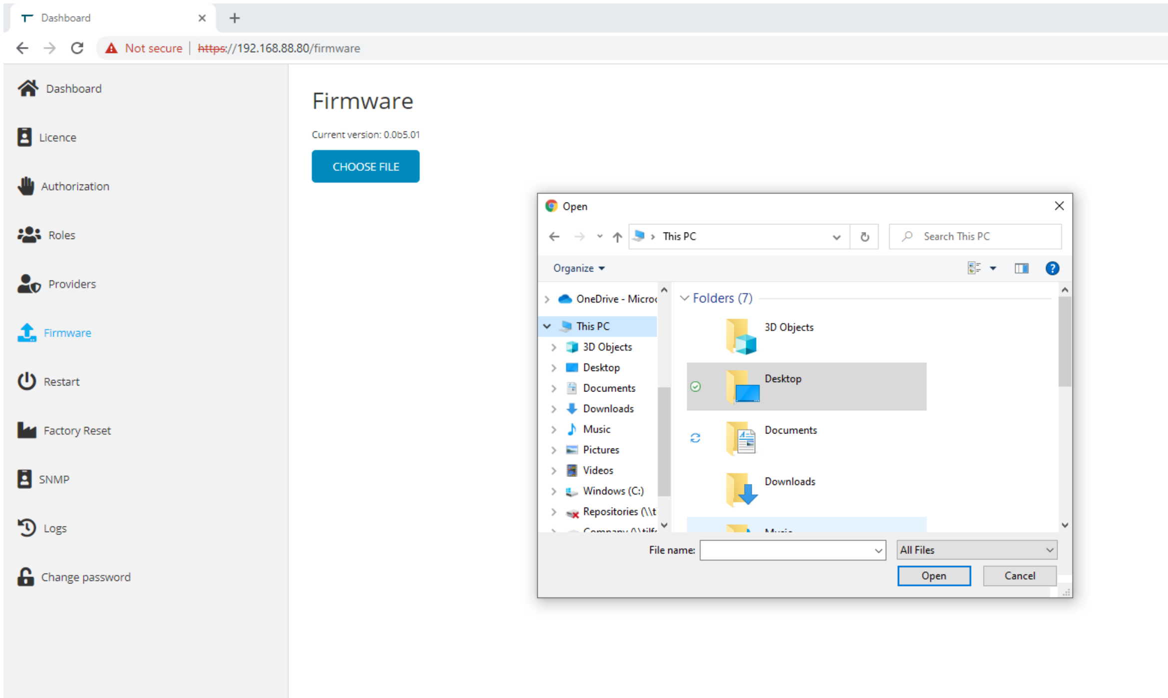
1. Load up the CMT dashboard — see 9.2. Logging In and Out
2. Click the 'Settings' icon



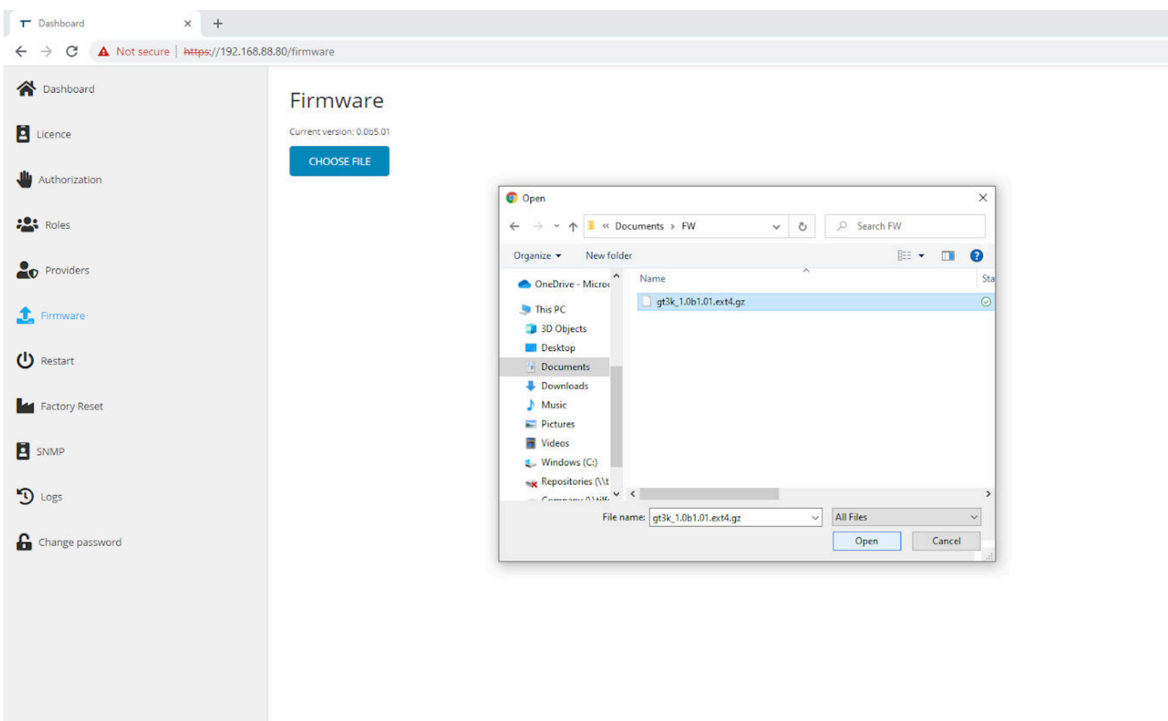
3. Click the 'Firmware' icon to bring up the firmware window



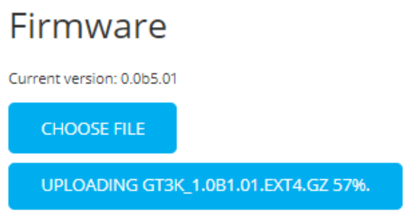
4. Click the blue 'CHOOSE FILE' button to open a file explorer for selecting the new firmware image.



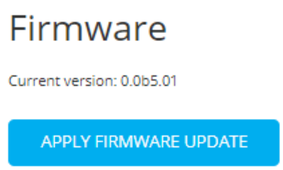
5. Once you have located the firmware image on your PC's file system, click on the image and click 'Open'.



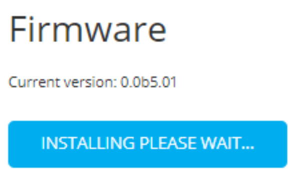
6. An 'UPLOAD [Firmware Image]' button should appear. Click this button to upload the new firmware image to the device. A percentage will be shown tracking the upload of the image to the device.



7. Once the percentage has reach 100% an 'APPLY FIRMWARE UPDATE' button will then appear. Click this button to upload the device's firmware.



8. An 'INSTALLING PLEASE WAIT' icon will appear, and the device will reboot.



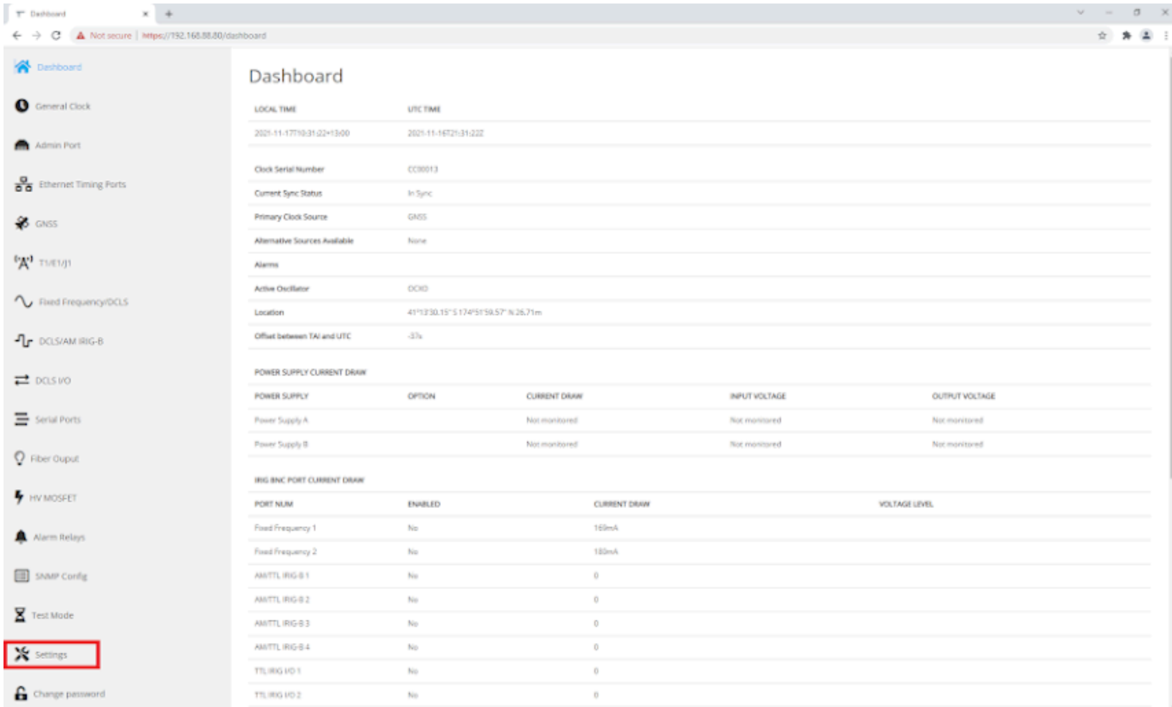
9. If the upgrade was successful, the device will show the new firmware on its LCD during boot up, and the new firmware version will be shown on screen and in the firmware tab of its CMT once you have logged out and back in.
If the firmware version remains the same, this may indicate a potential upgrade failiure. If the upgrade failure persists, Microchip Support should be contacted. See Contacting Technical Support.

10.6 Retrieving the Internal Log Files

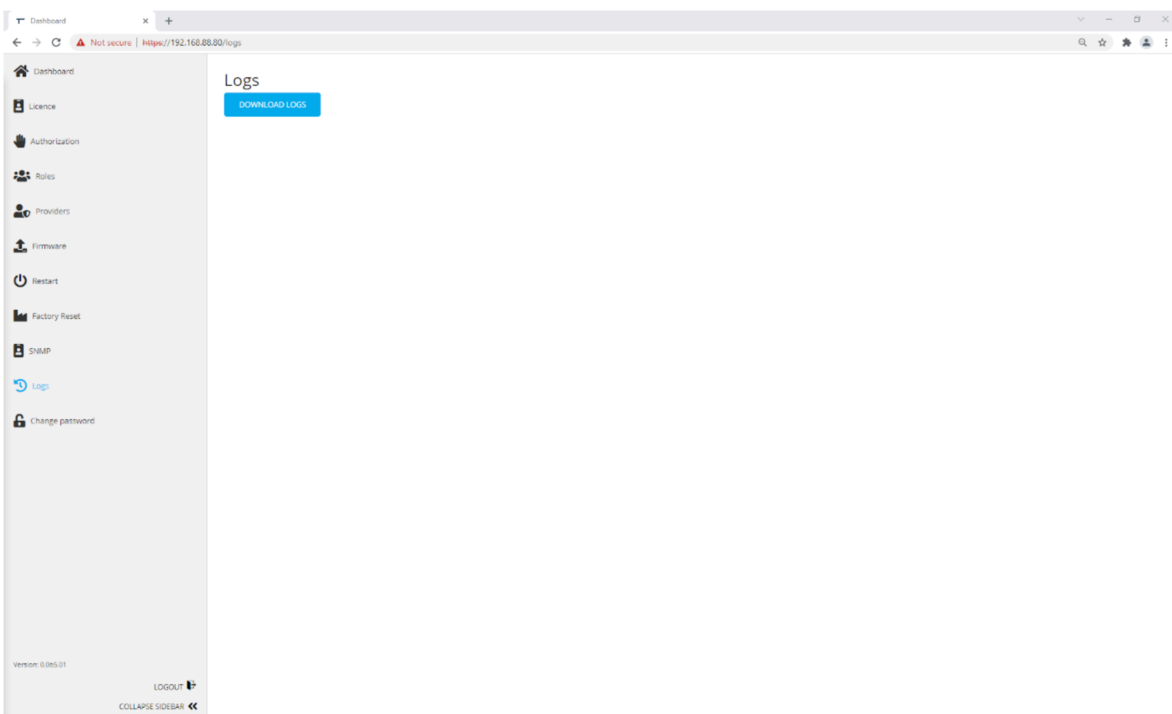
This section describes how to retrieve the GridTime 3000's internal log files.

Note: Only an administrator user can retrieve the GridTime 3000's internal log files.

1. Log in to the the CMT dashboard — see 9.2. Logging In and Out
2. Click the 'Settings' icon



3. Click the 'Logs' icon to bring up the logs window



4. Click the blue 'Download logs' button to download the GridTime 3000's log files.

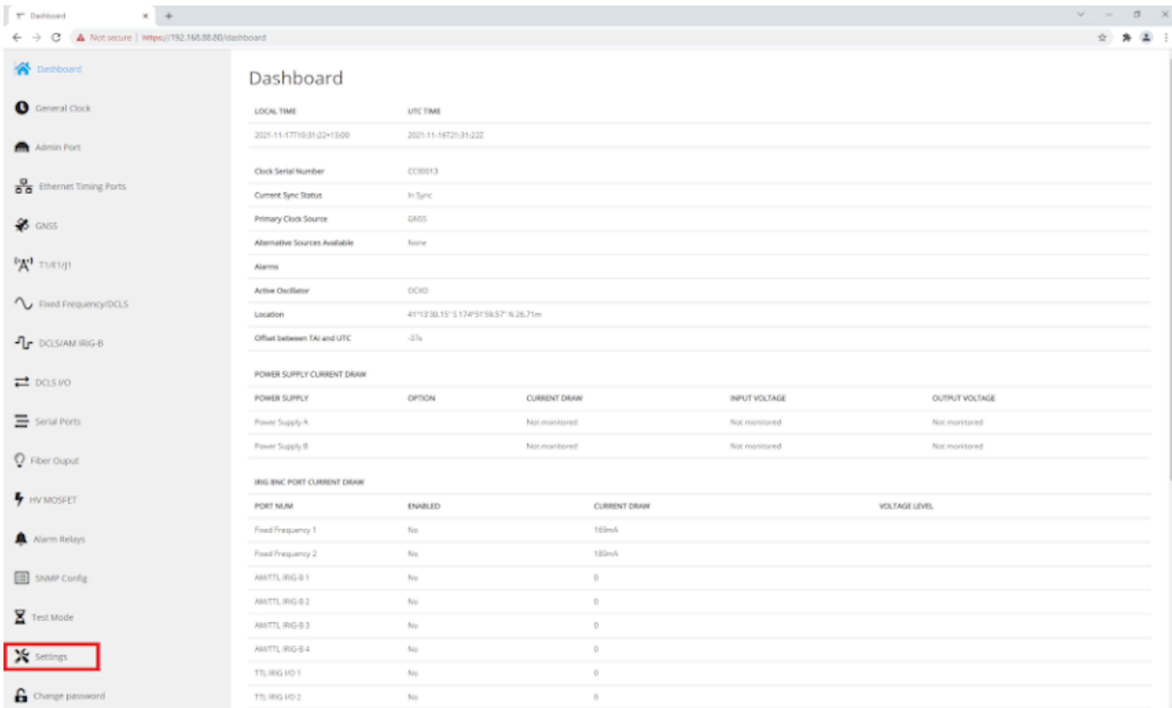
5. Extract the log files from the compressed .gz file using 7zip or other file decompressor.

10.7 Adding new Licenses

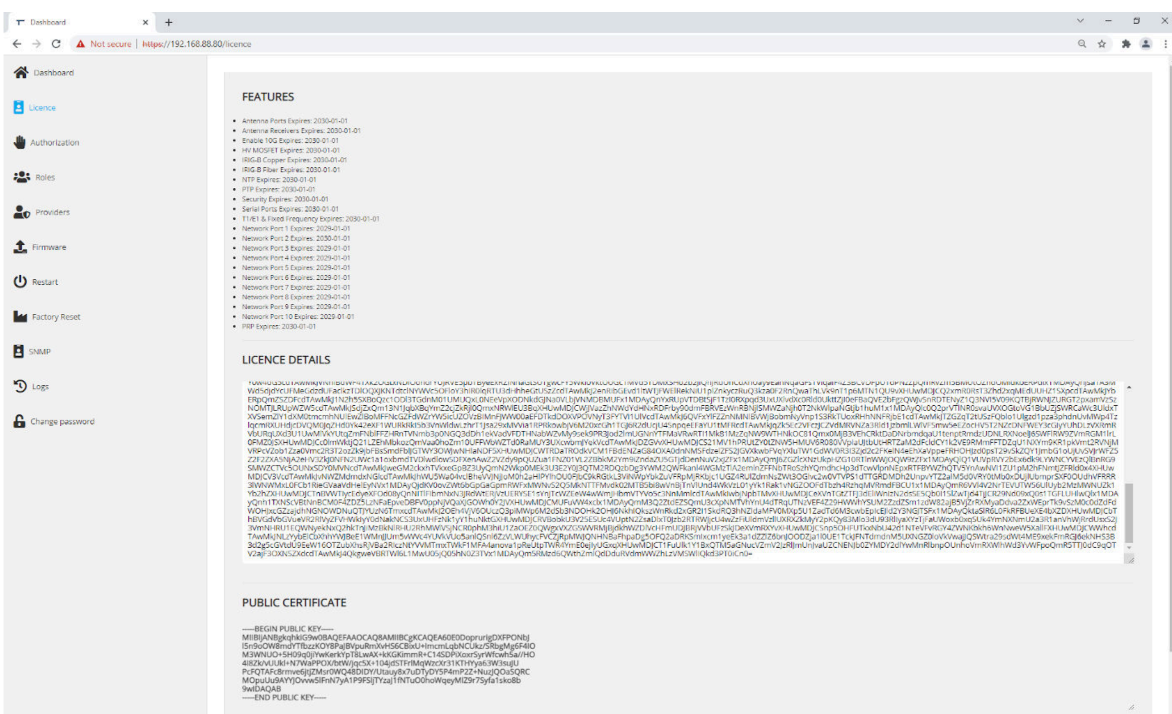
This section describes how to add a new license key to the GridTime 3000 to enable new licensed features.

Note: Only an administrator user can add new licenses

1. Log in to the CMT dashboard —see 9.2. Logging In and Out
2. Click the 'Settings' icon

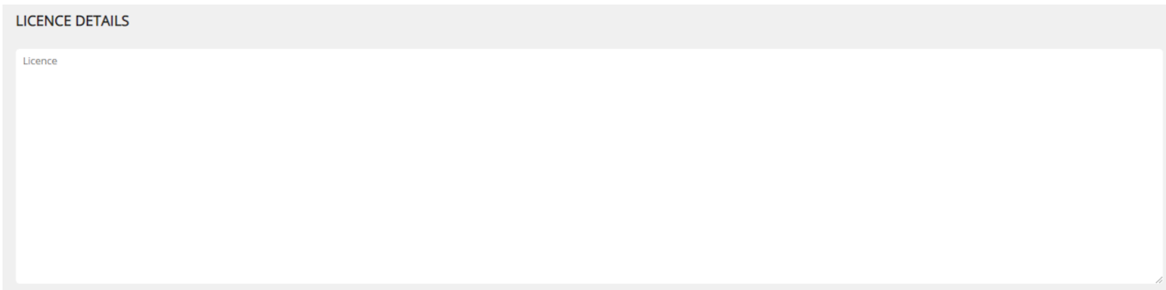


3. Click the 'License' icon to bring up the license window



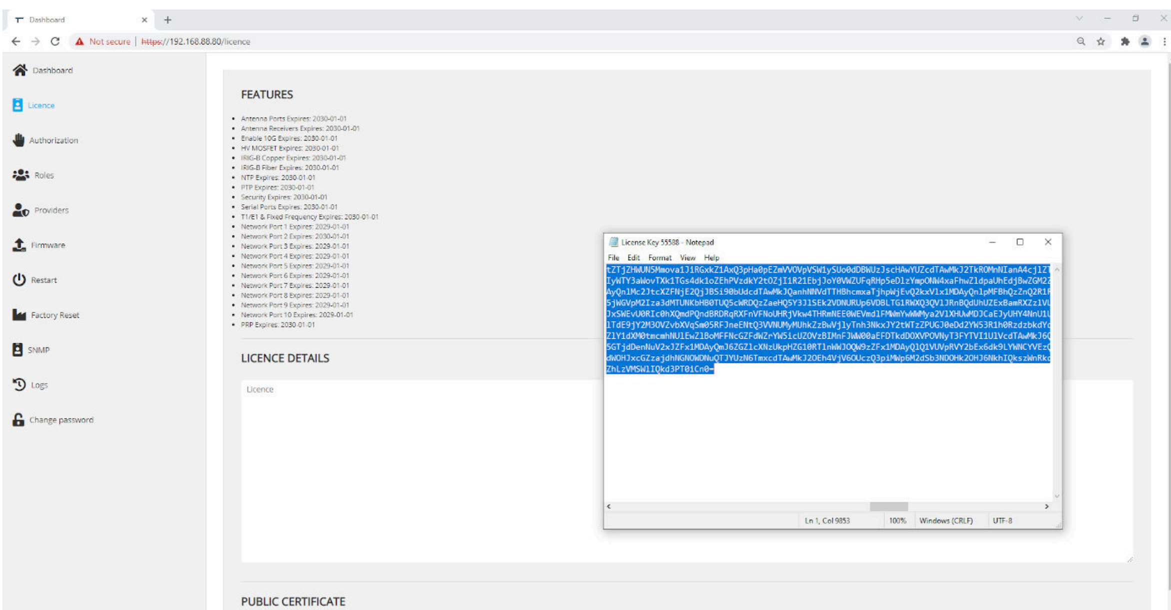
4. Delete all text in the 'LICENSE DETAILS' textbox as this is the existing license key. Once this has been done, the textbox should appear empty, as shown in the image below.

Tip: The easiest method for doing this is by clicking into the textbox, then pressing: Ctrl + A and then backspace.



5. Open the license key text file sent to you by Microchip, and copy all text from the file into the 'LICENSE DETAILS' textbox.

Tip: The easiest method for doing this is by clicking into the license key text file, then pressing: Ctrl + A , Ctrl + C, then clicking into the 'LICENSE DETAILS' textbox and pressing: Ctrl + V.



6. Scroll down to the bottom of the license window in the CMT and click the 'SAVE' button to store the license to the device. If successful, a 'Saved!' notification will appear in the bottom right corner of the web page, and the page will refresh.

7. The features you activated with the new license key should now be available. Test the functionality activated by the license key to validate that it was successfully enabled. If the newly licensed functionality is not working, please contact technical support 11.10. Contacting Technical Support

11. Maintenance and Troubleshooting

This chapter describes maintenance and troubleshooting procedures for the GridTime 3000.

11.1 Preventative Maintenance

This section describes how to perform preventative maintenance on the GridTime 3000 to help reduce the chance of future faults.

The GridTime 3000 requires minimal preventive maintenance. Ensure the unit is not exposed to hazards such as direct sunlight, open windows, water, or extreme heat. See 6.1.2.1. Environmental Requirements, for electromagnetic compatibility conditions that may cause damage.

⚠ CAUTION To avoid electromagnetic discharge damage to the circuitry, never attempt to vacuum the GridTime 3000.

⚠ CAUTION To avoid damage, under no circumstances should the interior chassis of the GridTime 3000 be allowed to come in contact with water.

The following table lists preventive maintenance measures to be performed periodically. Do not disassemble components just for the purpose of inspection.

Table 11-1. Preventive Maintenance

Item	Inspection	Corrective Action	Interval
Chassis	Inspect for dirt or foreign material	Clean the exterior of chassis with a soft dry cloth	Periodically (Once a year)
Cables	Inspect for pinched, worn or damaged cable(s)	Replace pinched, worn or damaged cable at the first opportunity	Periodically (Once a year)
Connectors	Inspect for loose or damaged connector(s)	Tighten loose connectors. If damaged, replace the connector and/or cable at the first opportunity	Periodically (Once a year)

11.2 Safety Considerations

Follow industry or company-specific safety guidelines and policies when working on or around live equipment.

11.3 ESD Considerations

Maintenance personnel should wear ESD (electrostatic discharge) wrist straps when installing or working on all GridTime 3000 equipment and modules. Plug the user-supplied wrist strap onto the ground nut of the GridTime 3000.

11.4 Troubleshooting

This section describes how to troubleshoot issues with the GridTime 3000.

Troubleshooting Common Symptoms presents troubleshooting information for the GridTime 3000 based on symptoms.

See 5.1. Alarm Monitoring for a detailed description of the trigger and clearance conditions for each of the GridTime 3000's alarms.

Table 11-2. Troubleshooting Common Symptoms

Symptom	Probable Cause	Troubleshooting Procedure / Corrective Action
No LED lit on any port	No power to unit	Check power supply to ensure that uninterruptible power supply (UPS) (if applicable) is operating correctly.
	Power supply fuse(s) are blown	Remove and replace fuse(s) . See 11.6. Power Supply Fuse Replacement.
	Loss of ground connection	See 6.5. Making Ground and Power Connections and re-attach the ground wires.
	Loose power cabling to unit	Check that the unit's external power cables are securely fastened.
No Ethernet Traffic (PTP or NTP) between GridTime 3000 Server and client(s) (If ACT LED for port is OFF)	Cable connections	Check that cables and SFP transcievers are securely connected to the device. Verify that the SFP transciever model in use is supported Table 6-4.
	Ethernet auto-negotiation not enabled on a device between Server and client.	Check that Ethernet auto-negotiation is enabled on all connected network elements.
No Ethernet Traffic (PTP or NTP) between GridTime 3000 Server and client(s) (If ACT LED for port is ON)	Incorrect virtual LAN (VLAN) configuration.	Verify that VLAN configuration is enabled correct in the VLAN tab of the Ethernet Timing Ports window in the CMT. See 9.5.5. Provisioning VLAN Settings
	Incorrect IP address configuration	Verify that the server IP configuration is correct in the Ethernet Timing Port Basic settings window in the CMT 9.5. Provisioning the Ethernet Ports, and ensure it is on the same subnet as the client(s).
	Client configuration for server is incorrect	Verify that the client settings match the server's settings.
	PTP domain setting for server do not match client's domain	Verify the domain setting for each server matches the domain setting for the client. This setting can be found in the PTP Tab of the Ethernet Timing Ports Configure Default Domain
Upgrading firmware failed	Internal memory has failed	Retry the upgrade. If upgrade fails again, Contact Microchip technical support. 11.10. Contacting Technical Support
	Corrupt firmware package	Redownload the latest firmware package from my.microsemi.com and retry the upgrade

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Symptom	Probable Cause	Troubleshooting Procedure / Corrective Action
GridTime 3000 in Holdover No GNSS position fix	No visible satellites	Check if GNSS Antenna Installtion has a clear view of the sky. See 6.7. Installing the GNSS Antenna for additional information
	Wrong antenna type, cable length, or power level into GNSS Antenna port	Check that the antenna installation (including cables, arrestors, amplifiers and splitters) delivers sufficient gain into the antenna port, and that the antenna in use is compatible with the antenna port's current and voltage specification as per: 12.8. GNSS Receiver Specification. The GNSS receiver requires a gain at the antenna connector input to be between 17 dB and 50 dB, and the noise figure to be <4dB.

11.4.1 Alarm Conditions and Correction Actions

This section describes the trigger and clearance conditions, and the recommended corrective user action for the GridTime 3000’s alarms.

Each alarm has unique trigger and clearance conditions based on system observables. Hence, each alarm requires unique corrective action when triggered.

For guidance on how to monitor the GridTime 3000's alarms, see 5.1. Alarm Monitoring.

Table 11-3. Alarm Trigger and Clearance Conditions Table

Alarm Name	Trigger Condition	Clearance Condition	Recommended Corrective Action
No Fix	Device lacks reception of enough usable[1]GNSS satellites to calculate an estimate of its position.	Device has reception of enough usable [1] GNSS satellites to calculate an estimate of its position.	If alarm is recurring, validate antenna installation using 11.5. Antenna Installation Troubleshooting. Ensure the antenna has a full sky view.
Satellite Count Low	Number of usable satellites detected by the device drops below the minimum satellites setting. The minimum satellites setting can be modified in the Clock Management Tool. See 9.6. Provisioning GNSS	Number of usable satellites detected by the device reaches the minimum satellites setting.	If alarm is recurring, ensure minimum satellites setting isn’t too large (>10). If it isn’t too large, validate antenna installation using 11.5. Antenna Installation Troubleshooting. Ensure the antenna has a full sky view.
Antenna Current High	Current through the antenna port increases above 60 mA.	Current through the antenna port drops below 58 mA.	Electrically test antenna installation according to How to Check for a short in an Antenna Installation guide.

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Alarm Name	Trigger Condition	Clearance Condition	Recommended Corrective Action
Antenna Current Low	Current through the antenna port drops below 3 mA.	Current through the antenna port increases above 5 mA.	Electrically test antenna installation using 11.5. Antenna Installation Troubleshooting.
Holdover	Device was synchronized to a time source, but has lost all time sources it can synchronize to, causing a transition from ‘in sync’ to ‘holdover’.	Device regains synchronization to a time source, becoming ‘in sync’. Device becomes ‘out of sync’ by exceeding an inaccuracy threshold or going through holdover timeout.[2]	If alarm is recurring, ensure that the device’s primary time source is consistently available.
Out of Sync	Device entered ‘holdover’ then became ‘out of sync’ by exceeding the maximum internal time inaccuracy threshold, or through holdover timeout.[2]	Device is ‘in sync’ again through synchronization to an external time source.	Ensure device has a reliable external time source available.
No First Sync	Device has not synchronized to a time source since powering up.	Device has synchronized to a time source since powering up.	Ensure device has external time sources available. If sources are available, wait a few minutes to allow the device to gain synchronization.
No IRIG In	IRIG-B input signal previously sensed on at least one active IRIG-In port is no longer being sensed.	IRIG-B signal sensed on at least one IRIG input again.	If alarm is recurring, check if IRIG signal is present on the device’s input with an IRIG-B Analyzer or oscilloscope.
No Valid IRIG In	IRIG-B input signal has been detected on input. Signal doesn’t meet IRIG synchronization input requirements .[3]	IRIG-B input signal that meets synchronization input requirements detected.	If alarm is recurring, check the input signal meets IRIG-B input requirements.
Power Supply {A|B} (dual power supply units only)	Power supply A or B has failed.	Power supply A or B is operational again.	Contact Microchip technical support. 11.10. Contacting Technical Support
No Frequency Info	Frequency adjustment information is no longer being generated from the internal oscillator due to a failure.	Frequency adjustment information is being generated again.	Contact Microchip technical support. 11.10. Contacting Technical Support
Internal Loss of Comms	An internal communications failure has occurred.	Normal internal communications resumes.	Contact Microchip technical support.11.10. Contacting Technical Support

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Alarm Name	**Trigger Condition**	**Clearance Condition**	**Recommended Corrective Action**
Over Temperature	Currently not implemented		
Under Temperature	Currently not implemented		
High Current	Currently not implemented		

1 – For a satellite to be considered usable as a time source it must:

- be a GNSS satellite
- be in an enabled constellation (configurable)
- have a Signal to Noise Ratio (SNR) exceeding the SNR threshold (configurable)
- be positioned in the sky within the mask angle (configurable).

2 – Maximum inaccuracy thresholding and holdover timeout are both configurable. By default, no maximum inaccuracy thresholding and a 60s holdover timeout are used.

3 – IRIG input signal requirements:

- TTL signal over copper
- 0V logic low (±0.4 V) to 5V logic high (±1 V)
- DCLS IRIG-B
- Includes C37.118.1 Extensions.

Note:
If any alarm persists after corrective action, please contact Microchip technical support. 11.10. Contacting Technical Support

11.5 Antenna Installation Troubleshooting

This section describes how to troubleshoot issues with the GridTime 3000's antenna installation.

To troubleshoot an antenna installation perform the following steps:

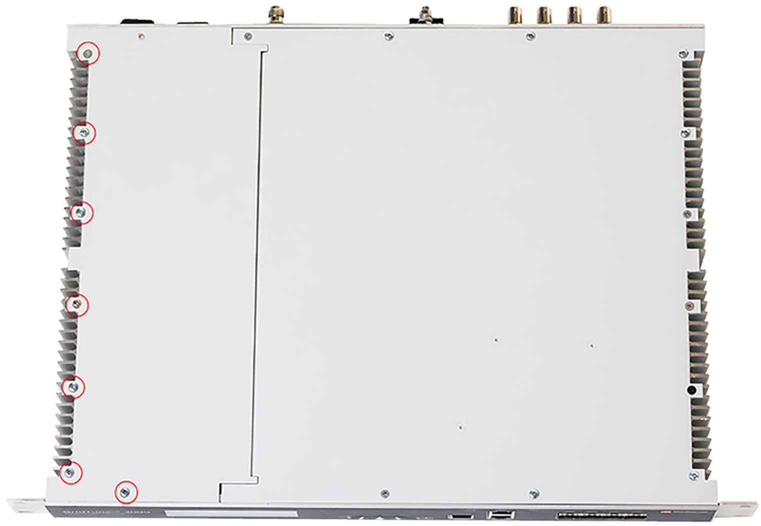
1. Check that the antenna has a good view of the sky.
2. Check the antenna installation for a short circuit. This can be done by following the steps found in this article.
3. Ensure the antenna installation is compatible with the 12.8. GNSS Receiver Specification.
4. If none of these steps resolve the issue, contact Microchip technical support. 11.10. Contacting Technical Support

11.6 Power Supply Fuse Replacement

This section describes how to replace the fuse on a GridTime 3000 power supply.

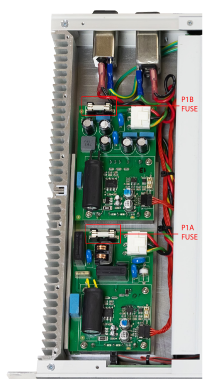
DANGER Remove power to all of the GridTime 3000's power supplies, wait a few minutes for the power supply capacitors to discharge fully

1. Remove the power supply bay lid compartment screws highlighted in the image below.

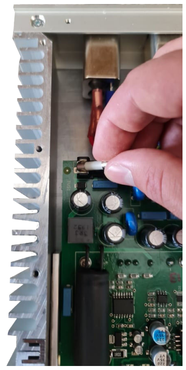


2. Remove the power supply bay lid compartment, shown below.

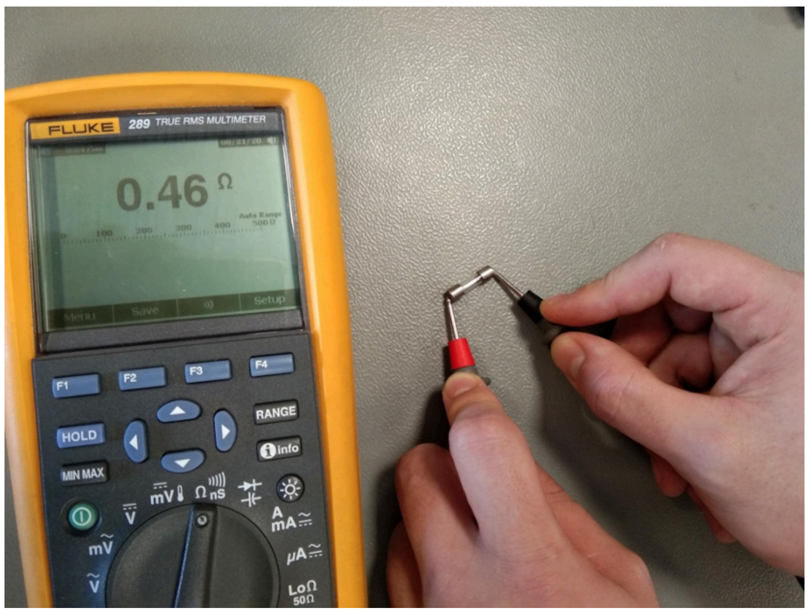
3. The faulty fuse(s) will be located in the power supply's fuse holder as per the image below.



4. The faulty fuse should be carefully removed from its holder as shown below.



5. Before the replacement fuse is inserted into the fuse holder on the power supply, it should be probed with a multimeter on a resistance measurement setting to verify that it isn't faulty. The resistance should be ~1 ohm (Ω) or less. The image below shows how to probe the fuse appropriately.



6. Once it has been confirmed that the replacement fuse is not faulty, insert it into the power supply fuse holder where the original fuse was.
7. Replace the lid for the power supply bay compartment, and reinsert the screws.
8. Verify that the fuse replacement was successful by powering the GridTime 3000 through the applicable power supply only, and verify that it has started by checking if it's front panel LCD has lit up.

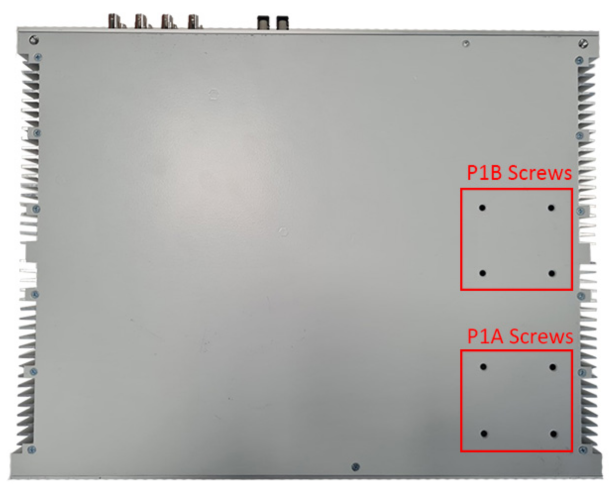
11.7 Power Supply Replacement

This section describes how to replace a GridTime 3000 power supply.

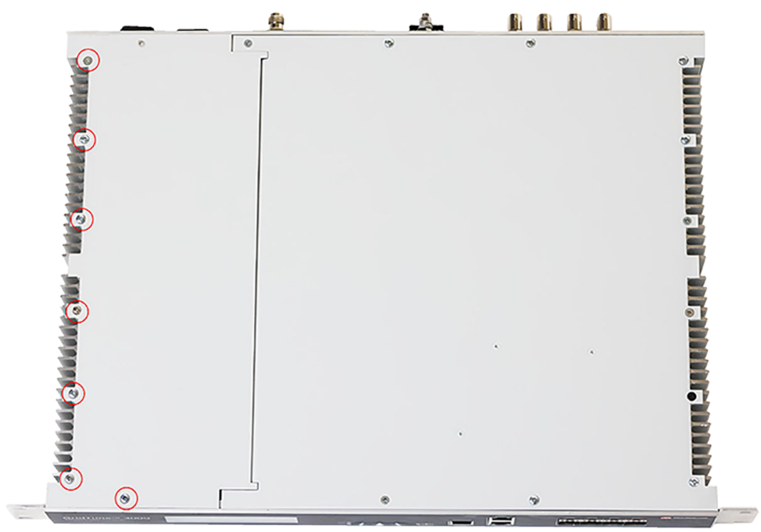
⚠ DANGER	Remove power to all of the GridTime 3000's power supplies, wait a few minutes for the power supply capacitors to discharge fully

⚠ CAUTION	Power supplies should only be replaced with the same equivilant power supply module.

1. Remove all other cables connected to the GridTime 3000 and if rack mounted, remove it from it's rack.
   Note: If both supplies are to be replaced, replace them one at a time so that the heat sink remains bolted to the chassis at all times during the operation.
2. Flip the GridTime 3000 upside down and remove the power supply screws, as shown in the image below.

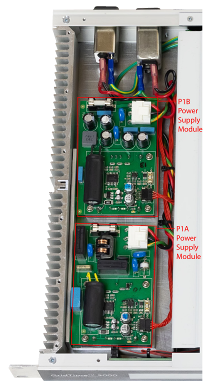


3. Once the screws have been removed for the relevant power supply(s), flip the GridTime 3000 upright again.
4. Remove the power supply bay lid compartment screws highlighted below.

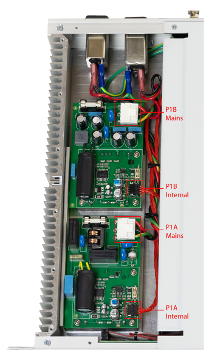


5. Remove the power supply bay lid compartment.

6. Identify the power supply(s) you wish to replace.



7. Remove the cables for the mains and internal cabling connectors to the power supply you wish to replace.

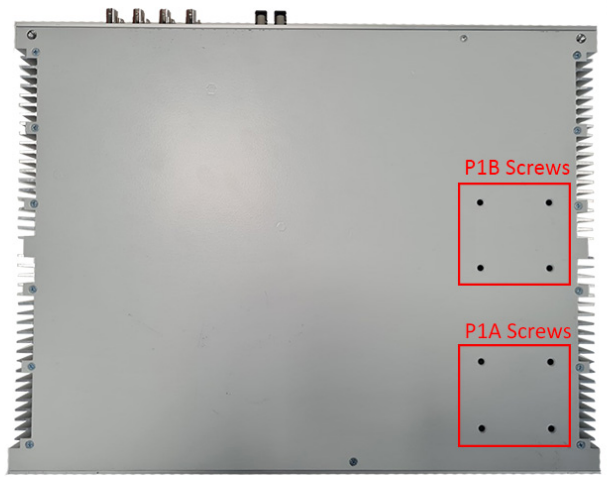


8. Remove the old PSU module, and connect the mains and internal cabling connectors to the new PSU module in the same position and orientation as when you removed them.

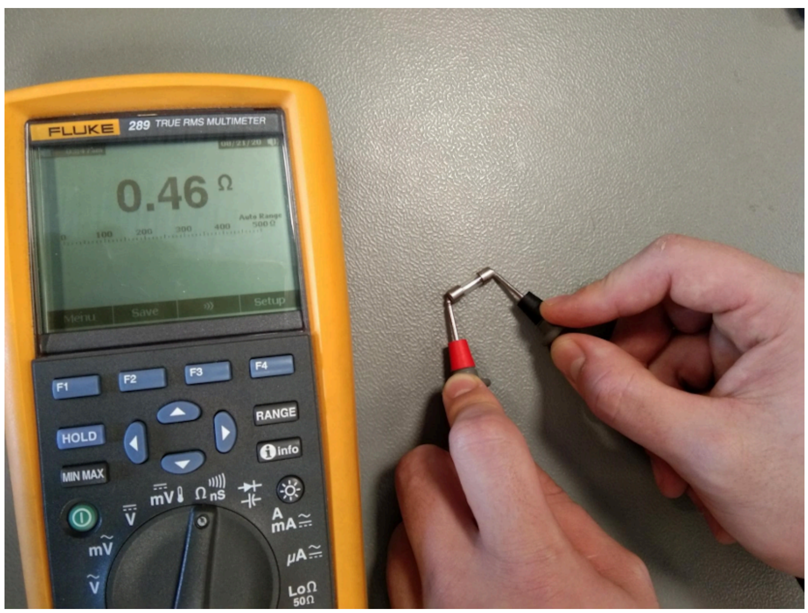
DANGER If cables are damaged before or during the replacement of the power supplies, do not connect power and contact Microchip technical support 11.10. Contacting Technical Support

Note: Ensure the internal cable connector is oriented so the bevel is on the top, before inserting the connector.

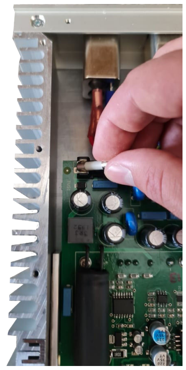
9. Hold the new PSU module in place, and carefully flip over the GridTime 3000 unit. Replace the screws holding the PSU module in place.



10. Flip the GridTime 3000 unit back over.
11. Retrieve a new ceramic fuse for the power supply and test it for continuity. If the fuse has a resistance of open circuit it is faulty and a different fuse should be used, if it has a low resistance (< 1 ohm) it is suitable.



12. Carefully place the new fuse into the power supply.



13. Replace the lid for the power supply bay compartment, and reinsert it's screws.
14. Verify that the power supply replacement was successful by powering the GridTime 3000 through the applicable power supply, verify that it has started by checking if it's front panel LCD has lit up.

11.8 Returning the GridTime 3000

This section describes under what conditions the GridTime 3000 should be returned.

You should return the equipment to Microchip only after you have exhausted the troubleshooting procedures described earlier in this chapter, or Microchip Support has advised you to return the unit.

Important: Please retain the original packaging for re-shipping the product. If the original packaging is not available, contact Microchip Support for assistance.

11.9 Manual Updates

When this manual is updated the updated version will be available for downloading from Microchip's web site. Manuals are provided in PDF format for ease of use. After downloading, you can view the manual on a computer or print it using Adobe Acrobat Reader.

Updated manuals are available at: Microchip.com

11.10 Contacting Technical Support

This section describes how to contact Microchip technical support.

To order any accessory, contact the Microchip Sales Department. If you encounter any difficulties installing or using the product, contact Microchip Frequency and Time Systems (FTS) Services and Support:

U.S.A. Call Center:

including Americas, Asia and Pacific Rim

Frequency and Time Systems (FTS)

3870 N 1st St.San Jose,

CA 95134

Toll-free in North America: 1-888-367-7966

Telephone: 408-428-7907Fax: 408-428-7998

email: sjo-ftd.support@microchip.com OR nzp-support@microchip.com

Internet: www.microsemi.com/ftdsupport

Europe, Middle East, and Africa (EMEA):

Microsemi FTS Services and Support EMEA

Altlaufstrasse 4285635

Hoehenkirchen-Siegertsbrunn

Germany

Telephone: +49 700 3288 6435

Fax: +49 8102 8961 533

email: sjo-ftd.support@microchip.com OR nzp-support@microchip.com

ftd.emea_sales@microsemi.com

Australia and New Zealand

Tekron International Ltd

Level 1, 47 The Esplanade

Lower Hutt, 5022

New Zealand

Telephone: +64 566 7722

Toll-free in Australia: 1 800 506 311

email: nzp-support@microchip.com

12. Appendix A: Specifications

This appendix provides specifications for the GridTime 3000 and its accessories.

12.1 Factory Hardware Options

This section specifies the hardware options the GridTime 3000 can be ordered with.

Product Code	Product Description
C-V-SG-HV	1 x GridTime 3000 , VCTCXO, Single GNSS, 1 x HV PSU
C-V-SG-HV-HV	1 x GridTime 3000 , VCTCXO, Single GNSS, 2 x HV PSU
C-V-SG-HV-LV	1 x GridTime 3000 , VCTCXO, Single GNSS, 1 x HV PSU and 1 x LV PSU
C-V-SG-LV-LV	1 x GridTime 3000 , VCTCXO, Single GNSS, 2 x LV PSU
C-V-SG-LV	1 x GridTime 3000 , VCTCXO, Single GNSS, 1 x LV PSU
C-O-SG-HV	1 x GridTime 3000 , OCXO, Single GNSS, 1 x HV PSU
C-O-SG-HV-HV	1 x GridTime 3000 , OCXO, Single GNSS, 2 x HV PSU
C-O-SG-HV-LV	1 x GridTime 3000 , OCXO, Single GNSS, 1 x HV PSU and 1 x LV PSU
C-O-SG-LV-LV	1 x GridTime 3000 , OCXO, Single GNSS, 2 x LV PSU
C-O-SG-LV	1 x GridTime 3000 , OCXO, Single GNSS, 1 x LV PSU
C-R-SG-HV	1 x GridTime 3000 , Rubidium, Single GNSS, 1 x HV PSU
C-R-SG-HV-HV	1 x GridTime 3000 , Rubidium, Single GNSS, 2 x HV PSU
C-R-SG-HV-LV	1 x GridTime 3000 , Rubidium, Single GNSS, 1 x HV PSU and 1 x LV PSU
C-R-SG-LV-LV	1 x GridTime 3000 , Rubidium, Single GNSS, 2 x LV PSU
C-R-SG-LV	1 x GridTime 3000 , Rubidium, Single GNSS, 1 x LV PSU

12.2 Software License Options

This section specifies the available software license options for the GridTime 3000.

Part Number	Description
LIC-GT3K-T	GridTime 3000 2x T1/E1/J1 & 2x Fixed Frequency License
LIC-GT3K-J	GridTime 3000 8x BNC, IRIG-B, Programmable pulse, DCF-77 License
LIC-GT3K-F	GridTime 3000 2x ST Fibre IRIG-B License
LIC-GT3K-S	GridTime 3000 1x RS232, 1x RS422 Serial String License
LIC-GT3K-M	GridTime 3000 1x HV MOSFET License
LIC-GT3K-C1	GridTime 3000 1x Copper Ethernet License

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Part Number	**Description**
LIC-GT3K-C2	GridTime 3000 2x Copper Ethernet License
LIC-GT3K-SF1	GridTim e3000 1x SFP Ethernet (1GB) License
LIC-GT3K-SF2	GridTime 3000 2x SFP Ethernet (1GB) License
LIC-GT3K-SF3	GridTime 3000 3x SFP Ethernet (1GB) License
LIC-GT3K-SF4	GridTime 3000 4x SFP Ethernet (1GB) License
LIC-GT3K-SF5	GridTime 3000 5x SFP Ethernet (1GB) License
LIC-GT3K-SF6	GridTime 3000 6x SFP Ethernet (1GB) License
LIC-GT3K-SF7	GridTime 3000 7x SFP Ethernet (1GB) License
LIC-GT3K-SF8	GridTime 3000 8x SFP Ethernet (1GB) License
LIC-GT3K-SG	GridTime 3000 10Gb License
LIC-GT3K-NTP	GridTime 3000 NTP/SNTP License
LIC-GT3K-PTP	GridTime 3000 PTP License
LIC-GT3K-PRP	GridTime 3000 PRP License

12.3 Power Supply and Electrical Protection

This section describes the electrical specifications of the GridTime 3000's power supplies.

Table 12-1. Power Supply Electrical Specifications

Power Supply Type	Input Range		Frequency	Maximum Power Consumption
	Min	Max		
High Voltage (DC)	120VDC	250VDC	N/A	60W
High Voltage (AC)	100VAC	240VAC	50Hz/60Hz	60W
Low Voltage	24VDC	120VDC	N/A	60W

Protection	Safety earth, fuse, surge and transient suppression	
Isolation	HV Power Supply:	2.0 kV Input to Ground 3.0 kV Input to Output
	LV Power Supply:	3.0 kV Input to Ground 3.0 kV Input to Output

12.4 Mechanical Specifications

This section describes the mechanical specifications of the GridTime 3000.

External Dimensions (standard 1U case)	**Width**	430mm (481mm across front/rear mounts)
	Depth	330mm
	Height	44mm

Weight	3.76kg
Ingress Protection	IP40
Enclosure	Aluminum, Painted and anodized
LCD Display	80x15mm

12.5 Factory Default Settings

This section describes the factory default settings.

Table 12-2. Factory Default Settings

Port	Description	Function
LCD Screen	Real-time clock status	• Clock information and time • Alarm states • Sync states • Firmware version
Alarm LED Indicator	Alarm condition	• Red LED for alarm condition
Sync LED Indicator	Sync state	• Green LED for sync state
Navigation Buttons	Screen navigation and safe shutdown of unit	• Left/Right buttons to scroll LCD screen • Centre button for safe shutdown/reboot
Ethernet Administration Port	GridTime 3000 configuration and administration	• DHCP enabled • SNMP disabled by default
USB Administration Port	GridTime 3000 configuration and administration	• DHCP enabled (Will act as DHCP Server)
RJ-45 Ethernet Timing Ports	Eth 1:	• DHCP enabled • NTP — Disabled by default • PTP — Disabled by default
	Eth 2:	• DHCP enabled • NTP — Disabled by default • PTP — Disabled by default

...........continued		
Port	**Description**	**Function**
SFP Ethernet Transceiver Sockets	Eth 3:	• DHCP enabled • NTP — Disabled by default • PTP — Disabled by default
	Eth 4:	• DHCP enabled • NTP — Disabled by default • PTP — Disabled by default
	Eth 5:	• DHCP enabled • NTP — Disabled by default • PTP — Disabled by default
	Eth 6:	• DHCP enabled • NTP — Disabled by default • PTP - Disabled by default
	Eth 7:	• DHCP enabled • NTP — Disabled by default • PTP — Disabled by default
	Eth 8:	• DHCP enabled • NTP — Disabled by default • PTP — Disabled by default
	Eth 9:	• DHCP enabled • NTP — Disabled by default • PTP — Disabled by default
	Eth 10:	• DHCP enabled • NTP — Disabled by default • PTP — Disabled by default
RJ-48 (T1/E1/J1)	Port 1	• Disabled by default
	Port 2	
BNC (Freq/DCLS IRIG-B)	Port 3	• Disabled by default
BNC (Freq/ DCLS IRIG-B)	Port 4	• Disabled by default
BNC (DCLS/AM IRIG-B)	Port 5	• Disabled by default
BNC (DCLS/AM IRIG-B)	Port 6	• Disabled by default
BNC (DCLS/AM IRIG-B)	Port 7	• Disabled by default
BNC (DCLS/AM IRIG-B)	Port 8	• Disabled by default
BNC (DCLS I/O)	Port 9	• Disabled by default
BNC (DCLS I/O)	Port 10	• Disabled by default
Serial String	Port 11 (RS422)	• Disabled by default
	Port 12 (RS232)	

...........continued		
Port	**Description**	**Function**
ST Optical Fibre	Port 13	• Disabled by default
	Port 14	
HV MOSFET	Port 15	• Disabled by default
Alarm Relay Terminal Block	Port 16	• Alarm relays disabled by default
	Port 17	
GNSS Antenna Socket	TNC antenna connector	• GPS, GLONASS, Beidou, Galileo enabled • Cable delay 150 ns

12.6 Input and Output Electrical Specifications

This section describes the electrical specifications of the GridTime 3000's ports.

Table 12-3. Input and Output Specifications

Circuit	Connector	Voltage	Current Rating	Isolation
T1 (at 75Ω)	RJ-48	2.4 V	110mA	1.5kV
E1 (at 75Ω)	RJ-48	2.37 V	110mA	1.5kV
J1 (at 75Ω)	RJ-48	2.4 V	110mA	1.5kV
1.544 MHz square wave (at 75Ω)	BNC	1.3 V	17mA	2.5kV
1.544 MHz sinusoidal wave (at 75Ω)	BNC	1.3 V	17mA	2.5kV
2.048 MHz square wave (at 75Ω)	BNC	1.3 V	17mA	2.5kV
2.048 MHz sinusoidal wave (at 75Ω)	BNC	1.3 V	17mA	2.5kV
10 MHz square wave (at 50Ω)	BNC	1 V	20mA	2.5kV
10 MHz sinusoidal wave (at 50Ω)	BNC	800 mV	16mA	2.5kV
AM IRIG-B (Modulated)	BNC	8 V	80mA	2.5kV
DCLS IRIG-B/Pulse output	BNC	5.5 V	150mA	2.5kV
DCLS IRIG-B input	BNC	5 V	5mA	2.5kV
RS232 String	RJ-12	±3 V - ±15 V	10mA	2.5kV
RS422 String	RJ-12	±5 V	35mA	2.5kV
HV Switching	Green screw terminal —2pin	250 Vdc max	1A	3kV

...........continued				
Circuit	**Connector**	**Voltage**	**Current Rating**	**Isolation**
Alarm relay	Green screw terminal —6pin	250 Vdc max	100mA	3.75kV
Fiber	ST Fiber (multi-mode 820nm)	n/a	n/a	n/a
Administration port	RJ-45	n/a	n/a	1.5kV
Timing ports ETH1, ETH2	RJ-45	n/a	n/a	1.5kV

12.7 Time String Specifications

This section outlines the specifications for the GridTime 3000's time strings.

The GridTime 3000 supports 12 different time strings, which can be outputted from either its RS232 serial port (Port 12) or its RS422 serial port (Port 11).

The on-time point of each serial string is accurate to within ±50 µs of UTC.

The specifications for both serial ports are given in RS422 and RS232 Port Specifications.

Table 12-4. RS422 and RS232 Port Specifications

Port	Connector	Voltage	Current Rating	Isolation
RS422 Port	RJ-12	±5 V	35 mA	2.5 kV
RS232 Port	RJ-12	±3 V-±15 V	10 mA	2.5 kV

The content specifications for each time string are given below.

NGTS Time Code

Transmitted once per minute. Sent during the last second before the minute rollover to which the data in the string refers.

Default settings: 9600bps, 8-bit ASCII, no parity.

Definition:

```
TyyMMDDwhhmmx<CR><LF>
```

Table 12-5. NGTS Time Code Content Specification

Placeholder	Content
T	ASCII "T"
yy	Last two digits of the year: e.g. "12" = the year 2012 ASCII
MM	Month: "00" = January ... "12" = December ASCII
DD	Day of month: 01 ... 31 ASCII
w	Day of week: "1" = Monday ... "7" = Sunday ASCII
hh	Two digit hour ASCII
mm	Two digit minute ASCII
x	Time mode: "0" = Local time, "1" = UTC time ASCII
<CR>	Carriage return (HEX 0D)

...........continued	
Placeholder	**Content**
<LF>	Line feed (HEX 0A)

Example:

```
T020422112340<CR><LF>
```

Monday 22 April 2002 - 12:34 local time

IRIG J-17 Time Code

This code is compatible with IRIG Standard 212-00.

Transmitted once every second. The leading edge of the "start" bit of the first character <SOH> is exactly on the second that the message describes.

Default settings: 9600bps, 7-bit ASCII, odd parity.

Definition:

```
<SOH>ddd:hh:mm:ss<CR><LF>
```

Table 12-6. IRIG J-17 Time Code Content Specification

Placeholder	Content
<SOH>	Start of heading (HEX 01)
ddd	Day of year: range "001"-"366" ASCII
:	HEX 3A (colon)
hh	Hour: "00"-"23" ASCII
mm	Minute: "00"-"59" ASCII
ss	Second: "00"-"59" ASCII
<CR>	Carriage return (HEX 0D)
<LF>	Line feed (HEX 0A)

Example:

```
<SOH>112:12:34:36<CR><LF>
```

Day 112, time 12:34:36

String-A Time Code

This code is very similar in data content to the IRIG J-17 code, but adds a two-character field containing the year, and uses 8-bit ASCII, no parity data format.

Transmitted once per second. The leading edge of the "start" bit of the first character <SOH> is exactly on the second that the message describes.

Default settings: 9600bps, 8-bit ASCII, no parity.

Definition:

```
<SOH>ddd:hh:mm:ss:yy<CR><LF>
```

Table 12-7. String-A Content Specification

Placeholder	Content
<SOH>	Start of heading (HEX 01)
ddd	Day of year: range "001"-"366" ASCII
:	HEX 3A (colon)
hh	Hour: "00"-"23" ASCII
mm	Minute: "00"-"59" ASCII
ss	Second: "00"-"59" ASCII
yy	Year: "00"-"99" representing the last two digits of the year
<CR>	Carriage return (HEX 0D)
<LF>	Line feed (HEX 0A)

Example:

```
<SOH>112:12:34:36:10<CR><LF>
```

Day 112, time 12:34:36, year 2010

String-B Time Code

This code substitutes a "Quality" indicator byte for the year field, but otherwise is identical in form, function and timing to String-A.

Transmitted once every second. The leading edge of the "start" bit of the first character <SOH> is exactly on the second that the message describes.

Default settings: 9600bps, 8-bit ASCII, no parity.

Definition:

```
<SOH>DDD:hh:mm:ssQ<CR><LF>
```

Table 12-8. String-B Content Specification

Placeholder	Content
<SOH>	Start of heading (HEX 01)
ddd	Day of year: range "001"-"366" ASCII
:	HEX 3A (colon)
hh	Hour: "00"-"23" ASCII
mm	Minute: "00"-"59" ASCII
ss	Second: "00"-"59" ASCII

<table>
<tr><td colspan="2">...........continued</td></tr>
<tr><th>Placeholder</th><th>Content</th></tr>
<tr><td>Q</td><td>
<table>
<tr><th colspan="2">Character</th><th>Meaning</th></tr>
<tr><th>HEX</th><th>ASCII</th><th></th></tr>
<tr><td>20</td><td>" " (space)</td><td>Clock in sync, timing accuracy is better then 60 ns</td></tr>
<tr><td>2E</td><td>"." (full stop)</td><td>Clock is accurate to 1 µs</td></tr>
<tr><td>2A</td><td>"*" (asterisk)</td><td>Clock is accurate to 10 µs</td></tr>
<tr><td>23</td><td>"#" (hash)</td><td>Clock is accurate to 100 µs</td></tr>
<tr><td>3F</td><td>"?" (question)</td><td>Clock accuracy may be worse than 100 µs</td></tr>
</table>
</td></tr>
<tr><td><CR></td><td>Carriage return (HEX 0D)</td></tr>
<tr><td><LF></td><td>Line feed (HEX 0A)</td></tr>
</table>

Example:

```
<SOH>112:12:34:36?<CR><LF>
```

Day 112, time 12:34:36, >100 µs sync error

String-C Time Code

This code is effectively a combination of String-A and String-B. It provides both year information and a sync indicator field.

Transmitted once every second. The leading edge of the "start" bit of the first character <CR> is exactly on the second to which the message data refers.

Default settings: 9600bps, 8-bit ASCII, no parity.

Definition:

```
<CR><LF>Q<SPACE>yy<SPACE>ddd<SPACE>hh:mm:ss.000<SPACE><SPACE><SPACE>
```

Table 12-9. String-C Content Specification

Placeholder	Content
<CR>	Carriage return (HEX 0D)
<LF>	Line feed (HEX 0A)
Q	Quality indicator: " " (space) = in sync, "?" = out of sync
<SPACE>	HEX 20
yy	Year: "00"-"99" ASCII representing the last two digits of the year
ddd	Day of year: range "001"-"366" ASCII

...........continued	
Placeholder	Content
hh	Hour: "00"-"23" ASCII
mm	Minute: "00"-"59" ASCII
ss	Second: "00"-"59" ASCII
.	ASCII "." (full stop)
0	ASCII "0" (zero)

Example:

```
<CR><LF>? 02 112 12:34:36.000
```

Day 112 of year 2002, time 12:34:36, out of sync

String-D Time Code

String-D is **identical** in content to String-B, but the second mark is at the leading edge of the "start" bit of the <CR>.

Transmitted once every second. The leading edge of the "start" bit of the character <CR> is exactly on the second to which the message data refers.

Default settings: 9600bps, 8-bit ASCII, no parity.

Definition:

```
<SOH>DDD:hh:mm:ssQ<CR><LF>
```

Table 12-10. String-D Content Specification

Placeholder	Content
<SOH>	Start of heading (HEX 01)
ddd	Day of year: range "001" - "366" ASCII
:	HEX 3A (colon)
hh	Hour: "00"-"23" ASCII
mm	Minute: "00"-"59" ASCII
ss	Second: "00"-"59" ASCII

<table>
<tr><th colspan="2">...........continued</th></tr>
<tr><th>Placeholder</th><th>Content</th></tr>
<tr><td>Q</td><td>
<table>
<tr><th colspan="2">Character</th><th>Meaning</th></tr>
<tr><th>HEX</th><th>ASCII</th><th></th></tr>
<tr><td>20</td><td>" " (space)</td><td>Clock in sync, timing accuracy is better then 60 ns</td></tr>
<tr><td>2E</td><td>"." (full stop)</td><td>Clock is accurate to 1 μs</td></tr>
<tr><td>2A</td><td>"*" (asterisk)</td><td>Clock is accurate to 10 μs</td></tr>
<tr><td>23</td><td>"#" (hash)</td><td>Clock is accurate to 100 μs</td></tr>
<tr><td>3F</td><td>"?" (question)</td><td>Clock accuracy may be worse than 100 μs</td></tr>
</table>
</td></tr>
<tr><td><CR></td><td>Carriage return (HEX 0D)</td></tr>
<tr><td><LF></td><td>Line feed (HEX 0A)</td></tr>
</table>

Example:

```
<SOH>112:12:34:36?<CR><LF>
```

Day 112, time 12:34:36, >100 μs sync error

String-E Time Code

This provides the time, year information, and a sync indicator field.

The string is transmitted once every second, with the leading edge of the "start" bit of the first character <SOH> exactly on the second to which the message data refers.

Default settings: 9600bps, 8-bit ASCII, no parity.

Definition:

```
<SOH>YYYY:ddd:hh:mm:ssQ<CR><LF>
```

Table 12-11. String-E Content Specification

Placeholder	Content
<SOH>	Start of heading (HEX 01)
YYYY	4-digit year
:	HEX 3A (colon)
ddd	Day of year: range "001"-"366" ASCII
hh	Hour: "00"-"23" ASCII
mm	Minute: "00"-"59" ASCII
ss	Second: "00"-"59" ASCII

<table>
<tr><th colspan="2">...........continued</th></tr>
<tr><th>Placeholder</th><th>Content</th></tr>
<tr><td>Q</td><td>
<table>
<tr><th colspan="2">Character</th><th>Meaning</th></tr>
<tr><th>HEX</th><th>ASCII</th><th></th></tr>
<tr><td>20</td><td>" " (space)</td><td>Clock in sync, timing accuracy is better then 60 ns</td></tr>
<tr><td>2E</td><td>"." (full stop)</td><td>Clock is accurate to 1 μs</td></tr>
<tr><td>2A</td><td>"*" (asterisk)</td><td>Clock is accurate to 10 μs</td></tr>
<tr><td>23</td><td>"#" (hash)</td><td>Clock is accurate to 100 μs</td></tr>
<tr><td>3F</td><td>"?" (question)</td><td>Clock accuracy may be worse than 100 μs</td></tr>
</table>
</td></tr>
<tr><td><CR></td><td>Carriage return (HEX 0D)</td></tr>
<tr><td><LF></td><td>Line feed (HEX 0A)</td></tr>
</table>

Example:

```
<SOH>2004:112:12:34:36?<CR><LF>
```

Year 2004, day 112, time 12:34:36, >100 μs sync error

String-F Time Code
This string complies with the protocol required to drive Vorne type Time Displays.

The string is transmitted once every second, with the leading edge of the "start" bit of the last <BEL> character exactly on the second.

Default settings: 9600bps, 8-bit ASCII, no parity.

Definition:

```
<CR><LF>1100<CR><LF>44hhmmss<CR><LF>54ddd<CR><LF>45HHMMss<CR><LF>55DDD<CR><LF><BEL>
```

Table 12-12. String-F Content Specification

Placeholder	Content
<CR>	Carriage return (HEX 0D)
<LF>	Line feed (HEX 0A)
1	ASCII "1" (one)
0	ASCII "0" (zero)
4	ASCII "4" (four)
hh	Local hour: "00"-"23" ASCII
mm	Local minute: "00"-"59" ASCII

...........continued	
Placeholder	**Content**
ss	Second: "00"-"59" ASCII
5	ASCII "5" (five)
ddd	Local day of year: "001"-"365" ASCII
HH	UTC hour: "00"-"23" ASCII
MM	UTC minute: "00"-"59" ASCII
DDD	UTC day of year: "001"-"365" ASCII
<BEL>	Bell (HEX 07)

Example:

1100

44123456

54112

45003456

55111

Local time 12:34:56, local day 112, UTC time 00:34:56, UTC day 111

String-G Time Code

This general time string is used predominantly in Europe.

The string is transmitted once every second, with the leading edge of the "start" bit of the last <ETX> exactly on the second.

Default settings: 9600bps, 8-bit ASCII, no parity.

Definition:

```
<STX>swhhmmssddMMyy<LF><CR><ETX>
```

Table 12-13. String-G Content Specification

Placeholder	Content
<STX>	Start of text (HEX 02)

<table>
<tr><td colspan="2">...........continued</td></tr>
<tr><th>Placeholder</th><th>Content</th></tr>
<tr><td>s</td><td>The "Clock Status" is an ASCII character in the range 0-9, A-F representing a single hex digit.
To interpret the value, the Hex digit should be converted to a Nibble (half a byte) and referenced against the state chart below which contains the bit position and subsequent definition ("x" is a place holder).
<table>
<tr><th>Bit 3</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th><th>Definition</th></tr>
<tr><td>x</td><td>x</td><td>x</td><td>0</td><td>No announcement for time change</td></tr>
<tr><td>x</td><td>x</td><td>x</td><td>1</td><td>Announcement for time change - active for an hour before</td></tr>
<tr><td>x</td><td>x</td><td>0</td><td>x</td><td>Local Standard Time (LST)</td></tr>
<tr><td>x</td><td>x</td><td>1</td><td>x</td><td>Daylight Saving Time (DST)</td></tr>
<tr><td>0</td><td>0</td><td>x</td><td>x</td><td>Time/date invalid/unknown</td></tr>
<tr><td>0</td><td>1</td><td>x</td><td>x</td><td>Time is known but clock running on oscillator - not synced</td></tr>
<tr><td>1</td><td>0</td><td>x</td><td>x</td><td>Clock is synced</td></tr>
<tr><td>1</td><td>1</td><td>x</td><td>x</td><td>Clock is synced, high accuracy</td></tr>
</table>
</td></tr>
<tr><td>w</td><td>The "Day of Week" is an ASCII character in the range 0-9, A-F representing a single hex digit.
To interpret the value, the Hex digit should be converted to a Nibble (half a byte) and referenced against the state chart below which contains the bit position and subsequent definition ("x" is a place holder).
<table>
<tr><th>Bit 3</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th><th>Definition</th></tr>
<tr><td>1</td><td>x</td><td>x</td><td>x</td><td>UTC time</td></tr>
<tr><td>x</td><td>0</td><td>0</td><td>1</td><td>Monday</td></tr>
<tr><td>x</td><td>0</td><td>1</td><td>0</td><td>Tuesday</td></tr>
<tr><td>x</td><td>0</td><td>1</td><td>1</td><td>Wednesday</td></tr>
<tr><td>x</td><td>1</td><td>0</td><td>0</td><td>Thursday</td></tr>
<tr><td>x</td><td>1</td><td>0</td><td>1</td><td>Friday</td></tr>
<tr><td>x</td><td>1</td><td>1</td><td>0</td><td>Saturday</td></tr>
<tr><td>x</td><td>1</td><td>1</td><td>1</td><td>Sunday</td></tr>
</table>
</td></tr>
<tr><td>hh</td><td>Hour: "00"-"23" ASCII</td></tr>
<tr><td>mm</td><td>Minute: "00" - "59" ASCII</td></tr>
<tr><td>ss</td><td>Second: "00" - "59" ASCII</td></tr>
<tr><td>dd</td><td>Day of month: "01" - "31" ASCII</td></tr>
<tr><td>mm</td><td>Month of year: "01"-"12" ASCII</td></tr>
<tr><td>yy</td><td>Year: "10"-"99" representing the last two digits of the year</td></tr>
<tr><td><LF></td><td>Line feed (HEX 0A)</td></tr>
<tr><td><CR></td><td>Carriage return (HEX 0D)</td></tr>
<tr><td><ETX></td><td>End of text (HEX 03)</td></tr>
</table>

Example:

```
<STX>E3123456170410<LF><CR><ETX>
```

Synced high accuracy, DST, no announcement, Wednesday, time 12:34:56, date 17/04/2010

String-H Time Code

Transmitted once every second. The leading edge of the "start" bit of the first character <STX> is exactly on the second that the message describes.

Default settings: 9600bps, 8-bit ASCII, no parity.

Definition:

```
<STX>D:dd.MM.yy;T:w;U:hh.mm.ss;uvxy<ETX>
```

Table 12-14. String-H Content Specification

Placeholder	Content
<STX>	Start of text (HEX 02)
D	ASCII "D"
:	HEX 3A (colon)
dd	Day of month: "01"-"31" ASCII
.	HEX 2E (full stop)
MM	Month of year: "01"-"12" ASCII
yy	Year: "10"-"99" ASCII
;	HEX 3B (semicolon)
T	ASCII "T"
w	Day of week: "1"-"7", "1" = Monday ASCII
U	ASCII "U"
hh	Hour: "00"-"23" ASCII
mm	Minute: "00"-"59" ASCII
ss	Second: "00"-"59" ASCII
u	ASCII "#" (hash) if not synchronized since last reset, or space (HEX 20) if synchronized since last reset
v	ASCII "*" (asterisk) if clock is running on local oscillator, or space (HEX 20) if clock is currently synchronized
x	ASCII "U" if UTC time, or ASCII "S" if DST, or space (HEX 20) if standard time
y	ASCII "!" (exclamation) if DST change pending, or ASCII "A" if leap second pending, or space (HEX 20) otherwise
<ETX>	End of text (HEX 03)

Example:

```
<STX>D:17.04.10;T:6;U:12.34.56;#*S!<ETX>
```

17/04/2010, Saturday, 12:34:56, out of sync, DST, DST change pending

NMEA ZDA Time Code

This string is in accordance with NMEA-0183 standard in content, but is transmitted at 9600bps by default.

Transmission is once per second. The leading edge of the "start" bit of the "$" character is exactly on the second.

Default settings: 9600bps, 8-bit ASCII, no parity.

Definition:

```
$GPZDA,hhmmss.00,dd,MM,yyyy,s,xx,YY*CC<CR><LF>
```

Table 12-15. NMEA ZDA Time Code Content Specification

Placeholder	Content
$GPZDA	ASCII "$GPZDA"
,	ASCII "," (comma)
hh	UTC hour: "00"-"23" ASCII
mm	UTC minute: "00"-"59" ASCII
ss	UTC second: "00"-"59" ASCII
.00	ASCII ".00" (fullstop zero zero)
dd	UTC day of month: "01"-"31" ASCII
MM	UTC month: "01"-"12", "01" = January ASCII
yyyy	UTC year, 4 digits
s	Local time zone offset sign (positive means local time leads UTC)
xx	Local time zone offset from UTC in hours
YY	Local time zone offset from UTC in minutes
*	ASCII "*" (asterisk)
CC	2-digit hex representation of the result of XORing the 8 data bits of each character between, but not including, the "$" and "*". ("00"-"FF")
<CR>	Carriage return (HEX 0D)
<LF>	Line feed (HEX 0A)

Example:

```
$GPZDA,123456.00,23,04,2010,+,12,00* <CR><LF>
```

UTC time 12:34:56, UTC date 23 April 2010, local time offset is +12:00

NMEA RMC Time Code

This string is compatible with and defined by the NMEA-0183 standard.

Transmission is once every second. The leading edge of the "start" bit of the "$" character is exactly on the second.

Default settings: 9600bps, 8-bit ASCII, no parity.

Definition:

```
$GPRMC,hhmmss.00,a,tttt.tttt,N,ggggg.gggg,W,0.0,0.0,DDMMYY,0.0,E*CC<CR><LF>
```

Table 12-16. NMEA RMC Time Code Content Specification

Placeholder	Content
$GPRMC	ASCII "$GPRMC"
,	ASCII "," (comma)
hh	UTC hour
mm	UTC minute
ss	UTC second
.	ASCII "." (full stop)
0	ASCII "0" (zero)
a	Status: ASCII "A" = valid, ASCII "V" = invalid
tttt.tttt	Latitude (degrees, minutes): "0000.0000" - "8959.9999" ASCII
N	Latitude (north/south): ASCII "N" = north, ASCII "S" = south
ggggg.gggg	Longitude (degrees, minutes): "00000.0000" - "35959.9999" ASCII
W	Longitude (east/west): ASCII "E" = east, ASCII "W" = west
DD	UTC day of month, ASCII
MM	UTC month, ASCII
YY	UTC year: 2 digits representing the last two digits of the year, ASCII
E*	ASCII "E*" (E asterisk)
CC	2-digit hex representation of the result of XORing the 8 data bits of each character between, but not including the "$" and "*". ("00"-"FF")
<CR>	Carriage return (HEX 0D)
<LF>	Line feed (HEX 0A)

Example:

```
$GPRMC,123456.00,A,1234.5678,S,12345.6789,E,0.0,0.0,230410,0.0,E* <CR><LF>
```

UTC time 12:34:56, valid, latitude 1234.5678 degrees south, longitude 12345.6789 degrees east, UTC date 23 April 2010

12.8 GNSS Receiver Specification

This section gives the specifications of the GNSS receiver connected to the GridTime 3000's antenna port.

Table 12-17. Supported Constellations

GPS	GLONASS	BeiDou	Galileo
L2C (1227.60 Mhz)	L2OF (1246 MHz + k×437.5kHz, k = –7,..., 5, 6)	B2I (1207.140 Mhz)	E5 b/Q (1207.140 Mhz)
L1C/A (1575.42 MHz)	L1OF (1602 MHz + k×562.5kHz, k = –7,..., 5, 6)	B1I (1561.098 MHz)	E1-B/C (1575.42 MHz)

Position Accuracy	**Horizontal**	2m
	Altitude	<18 m
Timing	**Accuracy**	<5 ns to UTC (1-sigma, clear sky)
	Jitter	±4ns, 2.5ns using dual receivers
Acquisition	**Reacquisition**	<2 s
	Hot Start	<2 s
	Cold Start	<30 s
Sensitivity	**Tracking**	-167 dBm
	Re-acquisition	-160 dBm
	Hot start	-157 dBm
	Cold start	-148 dBm
Antenna supply voltage		5 V
Antenna supply current		Typical 10-30mA (current limited to 80mA)

13. Appendix B: Third Party Software Licenses

This appendix provides the third party software licenses used by the GridTime 3000.

This product contains licensed third party software, including software available under the GPL licensing scheme. You can obtain these licenses and the open-source soft-ware by contacting Microchip Technical support at the following numbers:

- Worldwide (Main Number): 1-408-428-7907
- USA, Canada, Latin America including Caribbean, Pacific Rim including Asia, Australia and New Zealand: 1-408-428-7907
- USA toll-free: 1-888-367-7966
- Europe, Middle East & Africa: 49 700 32886435

An administrative fee may be charged to obtain the source code.By using the GridTime 3000, the user agrees to the terms of these licenses.

The licenses can be obtained using the following URL:

- www.gnu.org/licenses
- www.opensource.org/licenses/BSD-3-Clause
- www.opensource.org/licenses/BSD-2-Clause
- www.opensource.org/licenses/MIT
- www.spdx.org/licenses/bzip2-1.0.6.html
- spdx.org/licenses/ICU.html
- www.openssl.org/source/license.html
- www.openldap.org/software/release/license.html
- www.opensource.org/licenses/Artistic-1.0
- www.opensource.org/licenses/Artistic-2.0
- creativecommons.org/publicdomain/mark/1.0/
- www.zlib.net/zlib_license.html

13.1 Third Party Software

The following is a list of third-party software applications provided with the GridTime 3000

- PACKAGE NAME: base-files

  PACKAGE VERSION: 3.0.14

  RECIPE NAME: base-files

  LICENSE: GPLv2
- PACKAGE NAME: base-passwd

  PACKAGE VERSION: 3.5.29

  RECIPE NAME: base-passwd

  LICENSE: GPLv2+
- PACKAGE NAME: bash

  PACKAGE VERSION: 4.4.18

  RECIPE NAME: bash

  LICENSE: GPLv3+
- PACKAGE NAME: busybox

  PACKAGE VERSION: 1.30.1

  RECIPE NAME: busybox

LICENSE: GPLv2 & bzip2

- PACKAGE NAME: busybox-hwclock

  PACKAGE VERSION: 1.30.1

  RECIPE NAME: busybox

  LICENSE: GPLv2 & bzip2
- PACKAGE NAME: busybox-syslog

  PACKAGE VERSION: 1.30.1

  RECIPE NAME: busybox

  LICENSE: GPLv2 & bzip2
- PACKAGE NAME: busybox-udhcpc

  PACKAGE VERSION: 1.30.1

  RECIPE NAME: busybox

  LICENSE: GPLv2 & bzip2
- PACKAGE NAME: cryptsetup

  PACKAGE VERSION: 2.1.0

  RECIPE NAME: cryptsetup

  LICENSE: GPL-2.0-with-OpenSSL-exception
- PACKAGE NAME: dropbear

  PACKAGE VERSION: 2019.78

  RECIPE NAME: dropbear

  LICENSE: MIT & BSD-3-Clause & BSD-2-Clause & PD
- PACKAGE NAME: e2fsprogs-e2fsck

  PACKAGE VERSION: 1.44.5

  RECIPE NAME: e2fsprogs

  LICENSE: GPLv2
- PACKAGE NAME: eudev

  PACKAGE VERSION: 3.2.7

  RECIPE NAME: eudev

  LICENSE: GPLv2.0+ & LGPL-2.1+
- PACKAGE NAME: eudev-hwdb

  PACKAGE VERSION: 3.2.7

  RECIPE NAME: eudev

  LICENSE: GPLv2.0+ & LGPL-2.1+
- PACKAGE NAME: expat

  PACKAGE VERSION: 2.2.6

  RECIPE NAME: expat

  LICENSE: MIT
- PACKAGE NAME: firmware-imx-brcm

  PACKAGE VERSION: 7.8

  RECIPE NAME: firmware-imx

  LICENSE: Proprietary
- PACKAGE NAME: firmware-imx-epdc

PACKAGE VERSION: 7.8

RECIPE NAME: firmware-imx

LICENSE: Proprietary

- PACKAGE NAME: glibc

  PACKAGE VERSION: 2.29

  RECIPE NAME: glibc

  LICENSE: GPLv2 & LGPLv2.1
- PACKAGE NAME: glibc-locale-en-gb

  PACKAGE VERSION: 2.29

  RECIPE NAME: glibc-locale

  LICENSE: GPLv2 & LGPLv2.1
- PACKAGE NAME: gmp

  PACKAGE VERSION: 6.1.2

  RECIPE NAME: gmp

  LICENSE: GPLv2+ | LGPLv3+
- PACKAGE NAME: gnutls

  PACKAGE VERSION: 3.6.8

  RECIPE NAME: gnutls

  LICENSE: LGPLv2.1+
- PACKAGE NAME: init-ifupdown

  PACKAGE VERSION: 1.0

  RECIPE NAME: init-ifupdown

  LICENSE: GPLv2
- PACKAGE NAME: iproute2

  PACKAGE VERSION: 4.19.0

  RECIPE NAME: iproute2

  LICENSE: GPLv2+
- PACKAGE NAME: iptables

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ebt-802-3

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ebt-ip

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ebt-log

  PACKAGE VERSION: 1.6.2

RECIPE NAME: iptables

LICENSE: GPLv2+

- PACKAGE NAME: iptables-module-ebt-mark-m

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ip6t-ah

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ip6t-dnat

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ip6t-dnpt

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ip6t-dst

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ip6t-eui64

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ip6t-frag

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ip6t-hbh

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ip6t-hl

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ip6t-icmp6

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

LICENSE: GPLv2+

- PACKAGE NAME: iptables-module-ip6t-ipv6header

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ip6t-log

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ip6t-masquerade

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ip6t-mh

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ip6t-netmap

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ip6t-redirect

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ip6t-reject

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ip6t-rt

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ip6t-snat

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ip6t-snpt

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ip6t-srh

PACKAGE VERSION: 1.6.2

RECIPE NAME: iptables

LICENSE: GPLv2+

- PACKAGE NAME: iptables-module-ipt-ah

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ipt-clusterip

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ipt-dnat

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ipt-ecn

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ipt-icmp

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ipt-log

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ipt-masquerade

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ipt-netmap

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ipt-realm

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ipt-redirect

  PACKAGE VERSION: 1.6.2

RECIPE NAME: iptables

LICENSE: GPLv2+

- PACKAGE NAME: iptables-module-ipt-reject

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ipt-snat

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ipt-ttl

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-ipt-ulog

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-addrtype

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-audit

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-bpf

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-cgroup

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-checksum

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-classify

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

LICENSE: GPLv2+

- PACKAGE NAME: iptables-module-xt-cluster

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-comment

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-connbytes

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-connlimit

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-connmark

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-connsecmark

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-conntrack

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-cpu

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-ct

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-dccp

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-devgroup

PACKAGE VERSION: 1.6.2

RECIPE NAME: iptables

LICENSE: GPLv2+

- PACKAGE NAME: iptables-module-xt-dscp

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-ecn

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-esp

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-hashlimit

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-helper

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-hmark

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-idletimer

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-ipcomp

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-iprange

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-ipvs

  PACKAGE VERSION: 1.6.2

RECIPE NAME: iptables

LICENSE: GPLv2+

- PACKAGE NAME: iptables-module-xt-led

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-length

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-limit

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-mac

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-mangle

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-mark

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-multiport

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-nfacct

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-nflog

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-nfqueue

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

LICENSE: GPLv2+

- PACKAGE NAME: iptables-module-xt-notrack

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-osf

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-owner

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-physdev

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-pkttype

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-policy

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-quota

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-rateest

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-recent

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-rpfilter

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-sctp

PACKAGE VERSION: 1.6.2

RECIPE NAME: iptables

LICENSE: GPLv2+

- PACKAGE NAME: iptables-module-xt-secmark

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-set

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-socket

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-standard

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-state

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-statistic

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-string

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-synproxy

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-tcp

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-tcpmss

  PACKAGE VERSION: 1.6.2

RECIPE NAME: iptables

LICENSE: GPLv2+

- PACKAGE NAME: iptables-module-xt-tcpoptstrip

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-tee

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-time

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-tos

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-tproxy

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-trace

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-u32

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-module-xt-udp

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: iptables-modules

  PACKAGE VERSION: 1.6.2

  RECIPE NAME: iptables

  LICENSE: GPLv2+
- PACKAGE NAME: json-c

  PACKAGE VERSION: 0.13.1

  RECIPE NAME: json-c

LICENSE: MIT

- PACKAGE NAME: kernel-base

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-image

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-image-fitimage

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-image-zimage

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-8021q-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ah4-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ah6-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-arp-tables-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-arpt-mangle-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-arptable-filter-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-binfmt-misc-4.9.67-fslc+g953c6e30c970

PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-br-netfilter-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-bridge-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-bsd-comp-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-can-bcm-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-can-gw-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-can-raw-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-crc-ccitt-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-crc-itu-t-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-crc7-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-echainiv-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-esp4-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-esp6-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-flexcan-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-fou-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-fou6-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-g-acm-ms-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-g-cdc-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-g-ether-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-g-mass-storage-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-g-ncm-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-g-serial-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-g-zero-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-gadgetfs-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-garp-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-geneve-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-gre-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-i2c-algo-pca-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-i2c-algo-pcf-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip-gre-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip-tables-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip-vti-4.9.67-fslc+g953c6e30c970

PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-ip6-gre-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip6-tables-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip6-tunnel-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip6-udp-tunnel-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip6-vti-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip6t-ah-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip6t-eui64-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip6t-frag-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip6t-hbh-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip6t-ipv6header-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-ip6t-masquerade-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip6t-mh-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip6t-npt-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip6t-reject-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip6t-rpfilter-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip6t-rt-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip6t-synproxy-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip6table-filter-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip6table-mangle-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip6table-nat-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-ip6table-raw-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ip6table-security-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ipcomp-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ipcomp6-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ipip-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ipt-ah-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ipt-clusterip-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ipt-ecn-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ipt-masquerade-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ipt-reject-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ipt-rpfilter-4.9.67-fslc+g953c6e30c970

PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-iptable-filter-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-iptable-mangle-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-iptable-nat-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-iptable-raw-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-iptable-security-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-libcomposite-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-libcrc32c-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-llc-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-md5-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-mip6-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-mrp-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-msdos-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-mxc-mipi-csi2-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-conntrack-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-conntrack-ftp-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-conntrack-ipv4-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-conntrack-ipv6-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-conntrack-tftp-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-defrag-ipv4-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-defrag-ipv6-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-nf-dup-ipv4-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-dup-ipv6-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-log-common-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-log-ipv4-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-log-ipv6-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-nat-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-nat-ftp-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-nat-ipv4-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-nat-ipv6-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-nat-masquerade-ipv4-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-nat-masquerade-ipv6-4.9.67-fslc+g953c6e30c970

PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-nf-nat-redirect-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-nat-tftp-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-reject-ipv6-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nf-synproxy-core-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nfnetlink-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nfnetlink-acct-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nfnetlink-log-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nfnetlink-queue-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-nls-iso8859-15-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-p8022-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-ppp-async-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ppp-deflate-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ppp-generic-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ppp-synctty-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-psnap-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-sctp-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-sctp-diag-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-slhc-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-spi-ad568x-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-spi-idt82p2282-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-spi-st7920-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-spidev-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-stp-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ts-bm-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ts-fsm-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-ts-kmp-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-tun-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-tunnel6-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-u-ether-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-u-serial-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-udp-tunnel-4.9.67-fslc+g953c6e30c970

PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-uio-jaguar2-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-usb-f-acm-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-usb-f-ecm-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-usb-f-ecm-subset-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-usb-f-eem-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-usb-f-fs-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-usb-f-mass-storage-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-usb-f-ncm-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2\
- PACKAGE NAME: kernel-module-usb-f-obex-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-usb-f-rndis-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-usb-f-serial-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-usb-f-ss-lb-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-userspace-consumer-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-w1-gpio-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-w1-max31826-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-wire-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xfrm-algo-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xfrm-ipcomp-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xfrm-user-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xfrm4-mode-beet-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-xfrm4-mode-transport-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xfrm4-mode-tunnel-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xfrm4-tunnel-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xfrm6-mode-ro-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xfrm6-tunnel-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-addrtype-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-bpf-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-cgroup-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-checksum-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-classify-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-cluster-4.9.67-fslc+g953c6e30c970

PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-xt-comment-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-connbytes-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-connlabel-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-connlimit-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-connmark-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-conntrack-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-cpu-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-ct-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-dccp-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-devgroup-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-xt-dscp-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-ecn-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-esp-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-hashlimit-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-helper-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-hl-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-hmark-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-idletimer-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-ipcomp-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-iprange-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-xt-l2tp-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-led-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-length-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-limit-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-log-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-mac-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-mark-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-multiport-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-nat-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-netmap-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-nfacct-4.9.67-fslc+g953c6e30c970

PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-xt-nflog-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-nfqueue-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-osf-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-owner-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-physdev-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-pkttype-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-policy-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-quota-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-rateest-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-realm-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-xt-recent-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-redirect-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-sctp-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-socket-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-state-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-statistic-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-string-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-tcpmss-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-tcpoptstrip-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-tee-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

LICENSE: GPLv2

- PACKAGE NAME: kernel-module-xt-time-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-tproxy-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-trace-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-module-xt-u32-4.9.67-fslc+g953c6e30c970

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: kernel-modules

  PACKAGE VERSION: 4.9-1.0.x+gitAUTOINC+953c6e30c9

  RECIPE NAME: linux-fslc-imx

  LICENSE: GPLv2
- PACKAGE NAME: keyutils

  PACKAGE VERSION: 1.5.9

  RECIPE NAME: keyutils

  LICENSE: GPLv2
- PACKAGE NAME: kmod

  PACKAGE VERSION: 26

  RECIPE NAME: kmod

  LICENSE: GPL-2.0+ & LGPL-2.1+
- PACKAGE NAME: libacl

  PACKAGE VERSION: 2.2.52

  RECIPE NAME: acl

  LICENSE: LGPLv2.1+
- PACKAGE NAME: libaio

  PACKAGE VERSION: 0.3.111

  RECIPE NAME: libaio

  LICENSE: LGPLv2.1+
- PACKAGE NAME: libattr

  PACKAGE VERSION: 2.4.47

  RECIPE NAME: attr

  LICENSE: LGPLv2.1+

- PACKAGE NAME: libcap

  PACKAGE VERSION: 2.26

  RECIPE NAME: libcap

  LICENSE: BSD | GPLv2
- PACKAGE NAME: libcomerr

  PACKAGE VERSION: 1.44.5

  RECIPE NAME: e2fsprogs

  LICENSE: GPLv2 & LGPLv2 & BSD & MIT
- PACKAGE NAME: libcrypto

  PACKAGE VERSION: 1.1.1g

  RECIPE NAME: openssl

  LICENSE: openssl
- PACKAGE NAME: libdevmapper

  PACKAGE VERSION: 2.03.02

  RECIPE NAME: libdevmapper

  LICENSE: GPLv2 & LGPLv2.1
- PACKAGE NAME: libe2p

  PACKAGE VERSION: 1.44.5

  RECIPE NAME: e2fsprogs

  LICENSE: GPLv2 & LGPLv2 & BSD & MIT
- PACKAGE NAME: libelf

  PACKAGE VERSION: 0.176

  RECIPE NAME: elfutils

  LICENSE: GPLv2 | LGPLv3+
- PACKAGE NAME: libext2fs

  PACKAGE VERSION: 1.44.5

  RECIPE NAME: e2fsprogs

  LICENSE: GPLv2 & LGPLv2 & BSD & MIT
- PACKAGE NAME: libgcc

  PACKAGE VERSION: 8.3.0

  RECIPE NAME: libgcc

  LICENSE: GPL-3.0-with-GCC-exception
- PACKAGE NAME: libgcrypt

  PACKAGE VERSION: 1.8.4

  RECIPE NAME: libgcrypt

  LICENSE: LGPLv2.1+
- PACKAGE NAME: libgpg-error

  PACKAGE VERSION: 1.35

  RECIPE NAME: libgpg-error

  LICENSE: GPLv2+ & LGPLv2.1+
- PACKAGE NAME: libgpiod

PACKAGE VERSION: 1.3

RECIPE NAME: libgpiod

LICENSE: LGPLv2.1+

- PACKAGE NAME: libgpiod-tools

  PACKAGE VERSION: 1.3

  RECIPE NAME: libgpiod

  LICENSE: LGPLv2.1+
- PACKAGE NAME: libicudata

  PACKAGE VERSION: 63.1

  RECIPE NAME: icu

  LICENSE: ICU
- PACKAGE NAME: libicui18n

  PACKAGE VERSION: 63.1

  RECIPE NAME: icu

  LICENSE: ICU
- PACKAGE NAME: libicuuc

  PACKAGE VERSION: 63.1

  RECIPE NAME: icu

  LICENSE: ICU
- PACKAGE NAME: libidn2

  PACKAGE VERSION: 2.0.5

  RECIPE NAME: libidn2

  LICENSE: (GPLv2+ | LGPLv3)
- PACKAGE NAME: libkmod

  PACKAGE VERSION: 26

  RECIPE NAME: kmod

  LICENSE: LGPL-2.1+
- PACKAGE NAME: libmnl

  PACKAGE VERSION: 1.0.4

  RECIPE NAME: libmnl

  LICENSE: LGPLv2.1+
- PACKAGE NAME: libpcre

  PACKAGE VERSION: 8.43

  RECIPE NAME: libpcre

  LICENSE: BSD
- PACKAGE NAME: libssl

  PACKAGE VERSION: 1.1.1g

  RECIPE NAME: openssl

  LICENSE: openssl
- PACKAGE NAME: libstdc++

  PACKAGE VERSION: 8.3.0

RECIPE NAME: gcc-runtime

LICENSE: GPL-3.0-with-GCC-exception

- PACKAGE NAME: libudev

  PACKAGE VERSION: 3.2.7

  RECIPE NAME: eudev

  LICENSE: LGPL-2.1+
- PACKAGE NAME: libunistring

  PACKAGE VERSION: 0.9.10

  RECIPE NAME: libunistring

  LICENSE: LGPLv3+ | GPLv2
- PACKAGE NAME: libusb1

  PACKAGE VERSION: 1.0.22

  RECIPE NAME: libusb1

  LICENSE: LGPLv2.1+
- PACKAGE NAME: libxcrypt

  PACKAGE VERSION: 4.4.2

  RECIPE NAME: libxcrypt

  LICENSE: LGPLv2.1
- PACKAGE NAME: linux-firmware-imx-sdma-imx7d

  PACKAGE VERSION: 20190815

  RECIPE NAME: linux-firmware

  LICENSE: Firmware-imx-sdma_firmware
- PACKAGE NAME: linux-firmware-imx-sdma-license

  PACKAGE VERSION: 20190815

  RECIPE NAME: linux-firmware

  LICENSE: Firmware-imx-sdma_firmware
- PACKAGE NAME: locale-base-en-gb

  PACKAGE VERSION: 2.29

  RECIPE NAME: glibc-locale

  LICENSE: GPLv2 & LGPLv2.1
- PACKAGE NAME: locale-base-en-us

  PACKAGE VERSION: 2.29

  RECIPE NAME: glibc-locale

  LICENSE: GPLv2 & LGPLv2.1
- PACKAGE NAME: logrotate

  PACKAGE VERSION: 3.15.0

  RECIPE NAME: logrotate

  LICENSE: GPLv2
- PACKAGE NAME: lrzsz

  PACKAGE VERSION: 0.12.20

  RECIPE NAME: lrzsz

LICENSE: GPLv2+

- PACKAGE NAME: lsof

  PACKAGE VERSION: 4.91

  RECIPE NAME: lsof

  LICENSE: BSD
- PACKAGE NAME: lvm2

  PACKAGE VERSION: 2.03.02

  RECIPE NAME: lvm2

  LICENSE: GPLv2 & LGPLv2.1
- PACKAGE NAME: lvm2-scripts

  PACKAGE VERSION: 2.03.02

  RECIPE NAME: lvm2

  LICENSE: GPLv2 & LGPLv2.1
- PACKAGE NAME: lvm2-udevrules

  PACKAGE VERSION: 2.03.02

  RECIPE NAME: lvm2

  LICENSE: GPLv2 & LGPLv2.1
- PACKAGE NAME: modutils-initscripts

  PACKAGE VERSION: 1.0

  RECIPE NAME: modutils-initscripts

  LICENSE: PD
- PACKAGE NAME: ncurses-libncurses

  PACKAGE VERSION: 6.1+20181013

  RECIPE NAME: ncurses

  LICENSE: MIT
- PACKAGE NAME: ncurses-libtinfo

  PACKAGE VERSION: 6.1+20181013

  RECIPE NAME: ncurses

  LICENSE: MIT
- PACKAGE NAME: ncurses-terminfo-base

  PACKAGE VERSION: 6.1+20181013

  RECIPE NAME: ncurses

  LICENSE: MIT
- PACKAGE NAME: netbase

  PACKAGE VERSION: 5.6

  RECIPE NAME: netbase

  LICENSE: GPLv2
- PACKAGE NAME: nettle

  PACKAGE VERSION: 3.4.1

  RECIPE NAME: nettle

  LICENSE: LGPLv3+ | GPLv2+

- PACKAGE NAME: nginx

  PACKAGE VERSION: 1.15.7

  RECIPE NAME: nginx

  LICENSE: CLOSED
- PACKAGE NAME: nodejs

  PACKAGE VERSION: 10.15.3

  RECIPE NAME: nodejs

  LICENSE: MIT & BSD & Artistic-2.0
- PACKAGE NAME: ntpdate

  PACKAGE VERSION: 4.2.8p13

  RECIPE NAME: ntp

  LICENSE: NTP
- PACKAGE NAME: openldap

  PACKAGE VERSION: 2.4.47

  RECIPE NAME: openldap

  LICENSE: OpenLDAP
- PACKAGE NAME: openldap-bin

  PACKAGE VERSION: 2.4.47

  RECIPE NAME: openldap

  LICENSE: OpenLDAP
- PACKAGE NAME: openssl-bin

  PACKAGE VERSION: 1.1.1g

  RECIPE NAME: openssl

  LICENSE: openssl
- PACKAGE NAME: openssl-conf

  PACKAGE VERSION: 1.1.1g

  RECIPE NAME: openssl

  LICENSE: openssl
- PACKAGE NAME: packagegroup-base

  PACKAGE VERSION: 1.0

  RECIPE NAME: packagegroup-base

  LICENSE: MIT
- PACKAGE NAME: packagegroup-base-ipv6

  PACKAGE VERSION: 1.0

  RECIPE NAME: packagegroup-base

  LICENSE: MIT
- PACKAGE NAME: packagegroup-base-usbgadget

  PACKAGE VERSION: 1.0

  RECIPE NAME: packagegroup-base

  LICENSE: MIT
- PACKAGE NAME: packagegroup-base-usbhost

PACKAGE VERSION: 1.0

RECIPE NAME: packagegroup-base

LICENSE: MIT

- PACKAGE NAME: packagegroup-core-boot

  PACKAGE VERSION: 1.0

  RECIPE NAME: packagegroup-core-boot

  LICENSE: MIT
- PACKAGE NAME: packagegroup-core-ssh-dropbear

  PACKAGE VERSION: 1.0

  RECIPE NAME: packagegroup-core-ssh-dropbear

  LICENSE: MIT
- PACKAGE NAME: packagegroup-distro-base

  PACKAGE VERSION: 1.0

  RECIPE NAME: packagegroup-base

  LICENSE: MIT
- PACKAGE NAME: packagegroup-machine-base

  PACKAGE VERSION: 1.0

  RECIPE NAME: packagegroup-base

  LICENSE: MIT
- PACKAGE NAME: perl

  PACKAGE VERSION: 5.28.1

  RECIPE NAME: perl

  LICENSE: Artistic-1.0 | GPL-1.0+
- PACKAGE NAME: perl-module-config-heavy

  PACKAGE VERSION: 5.28.1

  RECIPE NAME: perl

  LICENSE: Artistic-1.0 | GPL-1.0+
- PACKAGE NAME: popt

  PACKAGE VERSION: 1.16

  RECIPE NAME: popt

  LICENSE: MIT
- PACKAGE NAME: procps

  PACKAGE VERSION: 3.3.15

  RECIPE NAME: procps

  LICENSE: GPLv2+ & LGPLv2+
- PACKAGE NAME: pv

  PACKAGE VERSION: 1.6.6

  RECIPE NAME: pv

  LICENSE: Artistic-2.0
- PACKAGE NAME: run-postinsts

  PACKAGE VERSION: 1.0

RECIPE NAME: run-postinsts

LICENSE: MIT

- PACKAGE NAME: shadow

  PACKAGE VERSION: 4.6

  RECIPE NAME: shadow

  LICENSE: BSD | Artistic-1.0
- PACKAGE NAME: shadow-base

  PACKAGE VERSION: 4.6

  RECIPE NAME: shadow

  LICENSE: BSD | Artistic-1.0
- PACKAGE NAME: shadow-securetty

  PACKAGE VERSION: 4.6

  RECIPE NAME: shadow-securetty

  LICENSE: MIT
- PACKAGE NAME: sysvinit

  PACKAGE VERSION: 2.88dsf

  RECIPE NAME: sysvinit

  LICENSE: GPLv2+
- PACKAGE NAME: sysvinit-inittab

  PACKAGE VERSION: 2.88dsf

  RECIPE NAME: sysvinit-inittab

  LICENSE: GPLv2
- PACKAGE NAME: sysvinit-pidof

  PACKAGE VERSION: 2.88dsf

  RECIPE NAME: sysvinit

  LICENSE: GPLv2+
- PACKAGE NAME: thin-provisioning-tools

  PACKAGE VERSION: 0.7.6

  RECIPE NAME: thin-provisioning-tools

  LICENSE: GPLv3
- PACKAGE NAME: tzdata

  PACKAGE VERSION: 2019c

  RECIPE NAME: tzdata

  LICENSE: PD & BSD & BSD-3-Clause
- PACKAGE NAME: tzdata-africa

  PACKAGE VERSION: 2019c

  RECIPE NAME: tzdata

  LICENSE: PD & BSD & BSD-3-Clause
- PACKAGE NAME: tzdata-americas

  PACKAGE VERSION: 2019c

  RECIPE NAME: tzdata

LICENSE: PD & BSD & BSD-3-Clause

- PACKAGE NAME: tzdata-antarctica

  PACKAGE VERSION: 2019c

  RECIPE NAME: tzdata

  LICENSE: PD & BSD & BSD-3-Clause
- PACKAGE NAME: tzdata-arctic

  PACKAGE VERSION: 2019c

  RECIPE NAME: tzdata

  LICENSE: PD & BSD & BSD-3-Clause
- PACKAGE NAME: tzdata-asia

  PACKAGE VERSION: 2019c

  RECIPE NAME: tzdata

  LICENSE: PD & BSD & BSD-3-Clause
- PACKAGE NAME: tzdata-atlantic

  PACKAGE VERSION: 2019c

  RECIPE NAME: tzdata

  LICENSE: PD & BSD & BSD-3-Clause
- PACKAGE NAME: tzdata-australia

  PACKAGE VERSION: 2019c

  RECIPE NAME: tzdata

  LICENSE: PD & BSD & BSD-3-Clause
- PACKAGE NAME: tzdata-core

  PACKAGE VERSION: 2019c

  RECIPE NAME: tzdata

  LICENSE: PD & BSD & BSD-3-Clause
- PACKAGE NAME: tzdata-europe

  PACKAGE VERSION: 2019c

  RECIPE NAME: tzdata

  LICENSE: PD & BSD & BSD-3-Clause
- PACKAGE NAME: tzdata-misc

  PACKAGE VERSION: 2019c

  RECIPE NAME: tzdata

  LICENSE: PD & BSD & BSD-3-Clause
- PACKAGE NAME: tzdata-pacific

  PACKAGE VERSION: 2019c

  RECIPE NAME: tzdata

  LICENSE: PD & BSD & BSD-3-Clause
- PACKAGE NAME: tzdata-posix

  PACKAGE VERSION: 2019c

  RECIPE NAME: tzdata

  LICENSE: PD & BSD & BSD-3-Clause

- PACKAGE NAME: tzdata-right

  PACKAGE VERSION: 2019c

  RECIPE NAME: tzdata

  LICENSE: PD & BSD & BSD-3-Clause
- PACKAGE NAME: u-boot-fslc

  PACKAGE VERSION: v2019.07+gitAUTOINC+ca0ab15271

  RECIPE NAME: u-boot-fslc

  LICENSE: GPLv2+
- PACKAGE NAME: udev-rules-imx

  PACKAGE VERSION: 1.0

  RECIPE NAME: udev-rules-imx

  LICENSE: MIT
- PACKAGE NAME: update-alternatives-opkg

  PACKAGE VERSION: 0.4.0

  RECIPE NAME: opkg-utils

  LICENSE: GPLv2+
- PACKAGE NAME: update-rc.d

  PACKAGE VERSION: 0.8

  RECIPE NAME: update-rc.d

  LICENSE: GPLv2+
- PACKAGE NAME: usbutils

  PACKAGE VERSION: 010

  RECIPE NAME: usbutils

  LICENSE: GPLv2+
- PACKAGE NAME: util-linux-libblkid

  PACKAGE VERSION: 2.32.1

  RECIPE NAME: util-linux

  LICENSE: GPLv2+ & LGPLv2.1+ & BSD
- PACKAGE NAME: util-linux-libuuid

  PACKAGE VERSION: 2.32.1

  RECIPE NAME: util-linux

  LICENSE: GPLv2+ & LGPLv2.1+ & BSD
- PACKAGE NAME: util-linux-sulogin

  PACKAGE VERSION: 2.32.1

  RECIPE NAME: util-linux

  LICENSE: GPLv2+ & LGPLv2.1+ & BSD
- PACKAGE NAME: zlib

  PACKAGE VERSION: 1.2.11

  RECIPE NAME: zlib

  LICENSE: Zlib

14. Appendix C: Crimping Connectors

This appendix describes how to crimp connectors for the cables used by the GridTime 3000.

14.1 Crimping the DC Connector

This section describes how to crimp a cable with the connector for the GridTime 3000's low voltage power supply.

1. Strip the wire exposing 8mm of copper.
2. Place the crimp into the crimping tool die in the correct orientation, with the crimping tool jaws open.
3. Ensure the insulation crimp and wire crimps are located in the die correctly and the rest of the crimp terminal will clear the die when the jaw is closed.
4. Close the crimp tool so it holds the crimp in place, and no further.
5. Fit the crimped wire into the crimp. Make sure the wires are pointing straight and the insulation does not exceed past the insulation clamp.
6. Squeeze the tool to start the crimping process, and check the wire is sitting straight in the tool.
7. Complete the process by applying pressure to the tool and closing the crimp.
8. Remove the completed crimp and test it is securely fastened. You should be able to hold the end of the crimped terminal and the wire, and be unable to pull it apart. It should not move or break the wire.

Figure 14-1. Alignment of the wire in the crimp

9. Push the completed crimped wire into the housing.
10. Check that it is securely fitted by holding the housing and the wire and try to pull it apart. It should not move or break the wire.

14.2 Crimping the AC Connector

This section describes how to crimp a cable with the connector for the GridTime 3000's high voltage power supply.

1. Strip the wire exposing 8mm of copper.
2. Lie the copper wire under the screw of the crimp.
3. Tighten the screw of the crimp so it is held fast. You should be able to hold the end of the crimped terminal and the wire and try to pull it apart. It should not move or break the wire.

Figure 14-2. Screw holding copper in place

4. Insert the crimp into socket and press firmly into place.
5. Repeat steps 1 through 3 for the other two wires.
6. Add the wire clamp, fastening the two screws.

Figure 14-3. Wire clamp added to hold wires in place

7. Add rubber strain relief.

Figure 14-4. Rubber strain relief

8. Clip the second half of the housing in place and fasten the screw.

Figure 14-5. Assembled connector

15. Revision History

Revision Level	Date	Description
A	7/2022	Initial version.

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