



GMR6000

Resilient, High-Precision, Multi-Function
NTP & PTP Master Clock

Configuration Guide

Engineered and Manufactured
in St. Charles, MO, USA



Disclaimer

Disclaimer

The information in this quick start guide is provided to assist users in the installation, first-time setup, and operation of the Masterclock GMR6000. While every effort has been made to ensure accuracy, Masterclock, Inc. assumes no responsibility for any errors or omissions that may appear.

Specifications, features, and firmware functionality are subject to change as part of Masterclock's policy of continuous product improvement. Some functions or options described may not be available in all versions or configurations of the GMR6000.

If discrepancies are found between this document and the operation of your unit, or if further clarification is needed, please contact Masterclock Technical Support for assistance.

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Contact and Technical Support

If you have questions or require information not found in this manual, or need assistance with setup, configuration, or troubleshooting, please contact Masterclock Technical Support.

Our team is available to provide detailed guidance for your specific application and ensure your equipment operates at its full capability.

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Package Contents

Each GMR6000 shipment includes the following items:

- GMR6000
- Power cable - supplied according to configuration
 - IEC cable for AC models
 - DC terminal block connector for DC models
- Rack-mount hardware
- Ethernet Cable (10ft)

Optional accessories may also be included if ordered, such as GNSS antenna, or SFP modules. Verify all contents before installation and retain packaging for warranty service.

For a complete list of items included with your purchase, please refer to your sales order invoice.



The **GMR6000** master clock is a modern and versatile time server and frequency generator. The device can reference and synchronize to a variety of input sources and provides a local physical realization of time for systems to utilize. With built in power redundancy and intelligent switching and monitoring, the GMR6000 meets or exceeds contemporary system requirements for ensuring availability, accuracy, and traceability of time and frequency signals for mission-critical applications.



STANDARD INPUTS

- NTP - Network Time Protocol Client
- RS232 (DB-9) / RS422 (5 Pos TB) and/or IP packet serial messages - NMEA 0183, NENA Format 0,1, or 8, Truetime-Kinometrics
- 2-Independently addressable RJ45 Ports
- 1-Independently addressable SFP, supporting fiber or copper modules
- Configuration via USB or Ethernet (Port 1 only)

INPUT OPTIONS

CONFIGURABLE REFERENCE PRIORITY INPUTS:

The following input reference sources can be used to synchronize the system and/or discipline the internal high stability oscillator.

- GNSS Receiver, Single or Multiconstellation selectable
Single L1 or Multiband L1, L2/L5 supporting:
GPS/GALILEO/BeiDou
(or M-Code GPS Receiver)
- PTP/IEEE1588 - Precision Time Protocol
- Timecodes - IRIG (DCLS/AM) /SMPTE
- PPS - Pulse Per Second (Sync In)
- 10 MHz - 10MHz reference frequency

The priority of all input signals can be freely configured.

Notes: The unit is shipped with the NTP client disabled.

NMEA serial input may be used in conjunction with the Sync-In feature.

STANDARD OUTPUTS

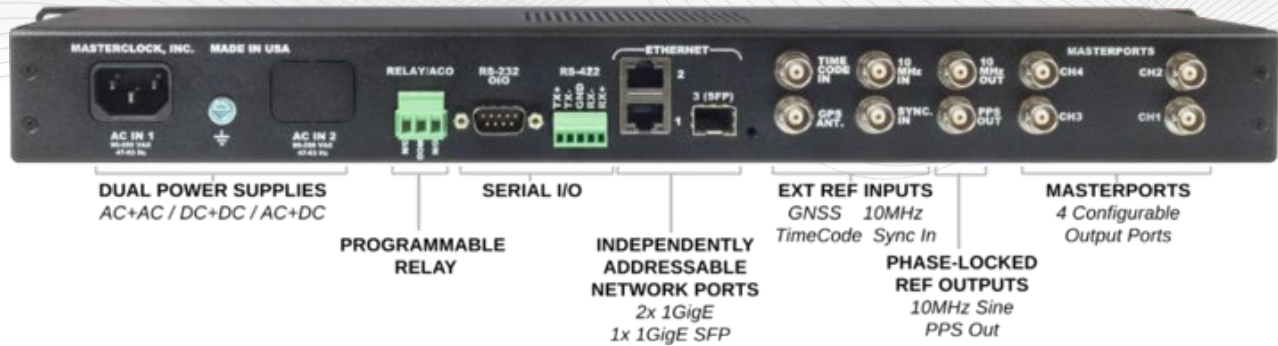
- NTP - Network Time Protocol Server
- 10 MHz Sinewave (BNC, 50 Ω , low phase noise and phase locked to PPS out)
- 1 PPS (BNC, 50 Ω)
- RS232 (DB-9) /RS422 (5 Pos TB) and/or IP packet serial messages - NMEA 0183, NENA Format 0,1, or 8, Truetime-Kinometrics
- Programmable relay closure - NO/NC dry contact relay
- Relay/ACO (Automatic Change Over) output

OUTPUT OPTIONS

CONFIGURABLE (MASTERPORT) OUTPUTS:

Four configurable Masterport BNC outputs supporting:

- Time codes: IRIG (DCLS and AM) / SMPTE
- Audio/Video Sync: Genlock Black-Burst, Tri-Level Sync, Wordclock
- 1, 5, or 10 MHz Square Wave (Phase locked with PPS)
- Additional PPS
- User-defined Square Wave (Hz or kHz)
- Custom Period Square Wave (User-defined period/frequency)
- Programmable Pulse Output
- Programmable Reference Frequency
- HaveQuick II (Non-NATO) (Feature currently in development)
- Masterport outputs software switchable between 50 Ω and 75 Ω
- PTP/IEEE1588v2 - Precision Time Protocol (Network ports only)



Network Features

STANDARD

- Three Independently Addressable isolated 1GigE Ethernet ports (Two RJ45 , one SFP)
- NTP Server: Synchronization of NTP and SNTP compatible clients
- NTP authentication: MD5, SHA-1, SHA-2

OPTIONAL

- PTP/IEEE 1588 **Boundary Clock, Ordinary Clock, Transparent Clock** or **Grandmaster**
Synchronization of IEEE1588-2008 (PTPv2) compatible clients
 - Default E2E IEEE 1588-2008
 - Default P2P IEEE 1588-2008
 - SMPTE ST 2059-2 Professional Broadcast Environment
 - AES67 Profile for Audio/Video Bridging and Time Sensitive Networks
 - SMPTE 2110 for Audio/Video combined ST 2059-2 and AES67 Interoperability
 - Power IEC 61850-9-3
 - Power IEEE C37.238-2011
 - Power IEEE C37.238-2017
 - Telecom G.8275.1
 - Other PTP profiles by adjusting PTP settings manually

Security Features

Advanced Anti-Jamming, Anti-Spoofing Detection and Mitigation, Authentication on Dedicated Management Port(s), Authenticated NTP

Holdover Features

Features FAST Disciplining, and Low Phase Noise options for OCXO and Rubidium (RB) oscillators for extended holdover with low drift.

OCXO Oscillator:	$\pm 1.5 \text{ usec/24 hours}$
------------------	---------------------------------

Rubidium Oscillator:	$\pm 500 \text{ nSec/24 hours}$
----------------------	---------------------------------

Management Features

- Dedicated isolated management network port
- Additional USB management port (Feature currently in development)
- Local or network firmware updates and licensing of new features
- WinDiscovery UI network device discovery launches HTTPS webpage configuration and status monitoring.(Feature currently in development)
- SSH CLI (Command Line Interface)
Additional SNMP v1, v2, and v2c,v3 AES-256 configuration (Sets), monitoring (Traps), and logging with provided MIBs. Syslog client
- Easy to read 13-digit 7 segment LED display (Date/Time or Day of year/Time)
- Eight multicolor LEDs on the front panel showing status/alarm of:
 - Power supplies
 - Holdover status
 - Lock indication
 - Stability - System Ready Indication
 - Current Reference (GNSS, PTP, TimeCode, Internal Oscillator)
 - GNSS Satellite Status

Power Features

STANDARD SINGLE OR OPTIONAL REDUNDANT POWER:

Select between single or dual power supplies

- AC: 90-264VAC, 50/60Hz, IEC (Universal IEC C14 AC input connector)
- DC: 24VDC, 48VDC, or 125 VDC
- < 20W Power Dissipation

SUPPORTED NETWORK PROTOCOLS

Protocol	Description
Transmission Control Protocol (TCP) and User Datagram Protocol (UDP)	Layer 4 - Transport Layer Network Protocol
Internet Protocol (IP)	IPv4, IPv6
Network Autoconfiguration	IPv4: Dynamic Host Configuration Protocol, DHCP (RFC 2131) IPv6: DHCPv6 (RFC 3315)
Network Time Protocol (NTP) Simple Network Time Protocol (SNTP)	NTP v2 (RFC 1119), NTP v3 (RFC 1305), NTP v4 (RFC 5905) SNTP v3 (RFC 1769), SNTP v4 (RFC 4330)
NTP Authentication	MD5, SHA-1 , SHA-2
Secure Shell (SSH)	SSH v1.3, SSH v1.5, SSH v2 (OpenSSH) - CLI (Command Line Interface)
Hypertext Transfer Protocol (HTTP)	HTTP/HTTPS (RC 2616) (Feature currently in development)
Simple Network Management Protocol (SNMP)	SNMPv1 (RFC 1157), SNMPv2c (RFC 1901-1908), SNMPv3 (RFC 3411-3418)
Precision Time Protocol (PTP)	IEEE1588-2008 v2, IEEE1588-2019 v2.1
Internet Group Management Protocol (IGMP)	IGMPv2 (RFC 2236), IGMPv3 (RFC 3376)
Syslog Protocol (SYSLOG)	SYSLOG (RFC 5424)

PTP PROFILES (PRE-CONFIGURED)

Default	Default E2E IEEE 1588-2008 Default P2P IEEE 1588-2008
Media, Audio/Video	SMPTE ST 2059-2 Professional Broadcast Environment AES67 Profile for Audio/Video Bridging and Time Sensitive Networks SMPTE 2110 for Audio/Video combined ST 2059-2 and AES67 Interoperability Power IEC 61850-9-3 Power IEEE C37.238-2011 Power IEEE C37.238-2017 Telecom G.8275.1
Compliance	Safety: IEC 62368-1:2018 Audio/video, information and communication technology equipment - Part 1: Safety requirements EMC: EN IEC 55035 Electromagnetic compatibility of multimedia equipment FCC, CE Marked, ANSI , ROHS TAA Compliant Traceability to <1 microsecond (ref: tf.nist.gov/general/pdf/3167.pdf)
Temperature & Humidity	Operating: 0 to 60°C (32 to 140°F), Up to 90% (non-condensing) Storage: -20 to 70°C (-4 to 158°F), Up to 90% (non-condensing)
MTBF	>500,000 hours (Calculated using Fixed/Ground Mil HDBK 217F assumptions)
Size & Weight	Size: 16.90w x 1.750h x 9.75d in (42.92w x 4.445h x 24.76d cm) Weight: 2.6 lbs. (1.2 kg)

SUPPORTED TIME CODES

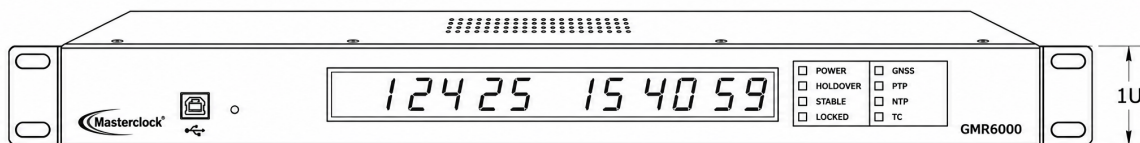
Time Code (LTC, Serial Formats)	Description
IRIG (DCLS, Amplitude Modulated)	Inter-Range Instrumentation Group - IRIG STANDARD 200-16 IRIG-A, IRIG-B
SMPTE	Society of Motion Picture and Television Engineers SMPTE 12M, 309M, 24/25/30 ND fps - 29.97 Drop Frame
HaveQuick II	HaveQuick Non-NATO version (Feature currently in development)
Serial ASCII Codes	
NMEA-0183	National Marine Electronics Association
NENA	National Emergency Number Association , Format 0,1,8 per NENA PSAP Master Clock Standard, NENA-STA-026.5-2022, February 28, 2022
Truetime/Kinometrics	Legacy Truetime Kinometrics DDD:HH:MM:SS format
IRIG	Inter-Range Instrumentation Group - IRIG STANDARD 212-00 IRIG-J

OPTIONAL CONFIGURATION ITEMS

Part #	Description	
GMR-AVSync	Blackburst (BB), Tri-Level Sync (TLS), Word Clock & SMPTE, BNC Cntr	Licensable
GMR-TCADV	IRIG-A, IRIG-E, IRIG-G, IRIG-H, BNC Cntr (IRIG-J Serial Cntr)	Licensable
GMR-PTP	PTP IEEE 1588 Server / Client, 1 GigE, all network ports	Licensable
GMR-PPO	Custom Waveform Output	Licensable
GMR-GNSS	GNSS Receiver, BNC Connector	Specify at order
GMR-M-Code	Encrypted GPS M-Code receiver - Contact sales for information	Contact Sales
GMR-HSO-3	Internal Rubidium Ultra High Stability Oscillator	Specify at order
GMR-SYNC-IN	PPS, PPM, PPH, Input, BNC Cntr	Licensable
GMR-TCG	Time Code Generator (IRIG-A, IRIG-B, SMPTE 12M, 309M, 24/25/30 ND fps - 29.97 Drop Frame)	Licensable
GMR-TCR	Time Code Reader (IRIG-A, IRIG-B, SMPTE 12M, 309M, 24/25/30 ND fps - 29.97 Drop Frame).	Specify at order
AC Power Cords Available:	IEC C13 to North American (NEMA 5-15, Type B), Euro Plug (CEE 7/7, Type F), U.K. Style (Type D), or Australia/New Zealand (Type I)	Specify at order

Unpack and Inspect

- Before installation, verify that the GMR6000 and all accessories are present and undamaged.
- Handle the unit carefully during unpacking to prevent accidental impact or static discharge.
- Take note of the device's serial number, MAC address, and initial password printed on the label. This information will be required for technical support or service inquiries. The default password is randomly generated at the time of manufacturing. Product registration is not required for warranty coverage.



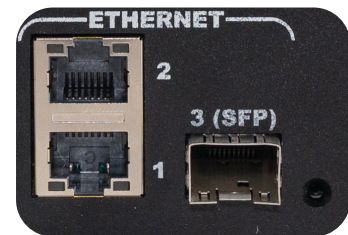
Mount the Unit

- Select a suitable location for operation. The GMR6000 requires 1U of a standard 19-inch equipment rack. Always utilize all four mounting bolts to ensure a secure mount.
- The GMR6000 uses passive heat dissipation - avoid obstructing the top, bottom, and side ventilation whenever possible.
 - Devices equipped with Rubidium (Rb) oscillators will generate additional heat compared to those outfitted with a standard OCXO. This is expected behavior and should not impact the functionality of the unit.
- For temporary testing, the GMR6000 can be placed on a stable workbench, table, or other flat surface. Be mindful of static discharge.
- Ensure that the unit is properly grounded according to local or site-specified electrical codes. Additional grounding is recommended by utilizing the dedicated grounding screw located between the two power inlets. Attach a suitable wire from this screw to a ground source.

Network Connections

The GMR6000 provides multiple network interfaces for time synchronization, network communication, and administrative access. Connect the appropriate ports based on your network design requirements.

- The GMR6000 is outfitted with three interfaces; ports 1 and 2 are ethernet, and port 3 is a standard SFP module (copper or fiber).
- Port 1 is the dedicated network management interface; other network ports will not allow configuration changes through the WinDiscovery software or SSH.
- Each port supports 10/100/1000 Mbps operation and automatically negotiates link speed and duplex.
- By default, each port has DHCP enabled. Static IP addresses can be configured through the WinDiscovery software or SSH through port 1.



Network Interfaces

Input References

In addition to NTP and PTP, the GMR6000 can synchronize to several external timing references and utilizes them one at a time in the order of a user-specified priorities list. All connections use a standard BNC port; adapters may be required.

- GNSS Connection – Connect a suitable GPS/GNSS antenna to the GPS ANT. port on the rear I/O panel. The GMR6000 outputs 5V from its antenna port to accommodate powered antennas. Avoid using passive antennas.
- Time Code Input – For synchronizing to an external Time Code source (IRIG-B or SMPTE LTC), connect the source via standard BNC cable to the TIME CODE IN located on the rear I/O panel. The GMR6000 will automatically detect and decode incoming signals.
- PPS – Allows the input of a stable Pulse-Per-Second (PPS) signal from another source. It is recommended that both the GMR6000 and PPS source use a shared common ground to maintain signal integrity.
- 10MHz – Allows the input of an external 10MHz clock source. Using this reference will override the GMR6000's internal 10MHz clock. Useful for synchronizing two devices that may not have a shareable timing reference.

Output

- **PPS** – Allows other devices to synchronize to the Pulse-Per-Second (PPS) generated by the GMR6000's internal oscillator. The PPS and 10MHz signals are synchronized and always stay aligned with one another.
- **10MHz** – Allows other devices to synchronize to the 10MHz signal generated by the GMR6000's internal oscillator. This does not alter the 10MHz output, though users are unlikely to see any large variance between them.

MasterPorts

MasterPorts are a new feature exclusive to the GMR6000. These consist of four fully independent, user-configurable BNC ports that can output various types of signals.

- **IRIG** – Generates an IRIG Time Code output. This can be configured as IRIG-B00x, IRIG-B12x, IRIG-A00x, or IRIG-A12x. These also include configurable coded expressions for most common IRIG signals. Can output UTC, Local Time, or Custom time.
- **SMPTE** – Generates a standard SMPTE Time Code, configurable to 24, 25, 29.97, or 30 FPS (frames per second). These also support date encoding with 309M, Leitch, or zero-filled.
- **Video/Audio Sync** – Generates synchronous output of NTSC or PAL Black Burst, Tri-Level Sync (TLS) from 720i/p, 1080i/p at 50, 59.94 and 60Hz, or Wordclock between 32KHz to 192KHz.
- **Waveform Output** – Generates Custom Frequency Square Waves (user-defined), Custom Period Square Waves (user-defined), High Frequency Square Waves of 1, 5 or 10MHz, or a secondary PPS (Pulse Per Second).
- **None** – Output of individual ports can be disabled.

Power

The GMR6000 is designed for redundancy, allowing customers to select between single or dual power configurations. Both AC and DC are acceptable power inputs (specify at order). Units equipped with two power connectors will automatically and seamlessly switch between them with no interruption of service.

- Units with AC power should be connected to a properly grounded outlet rated at 100-240 VAC, 50/60 Hz.
- Units with DC power should be connected ensuring that the positive and negative terminals are correctly chosen, these will be labeled on the connector along with voltage and current ratings.
- To maximize the use of dual-power GMR6000's, connect each port to a separate source. If both inlets are powered by the same source, redundancy will not be effective.
- A blue-green colored grounding screw is present between the two power inlets on the rear I/O. This screw effectively grounds the main PCB inside to the metal chassis. It is recommended to attach a wire from this screw to a proper ground source in the facility such as a server rack or dedicated equipment ground.





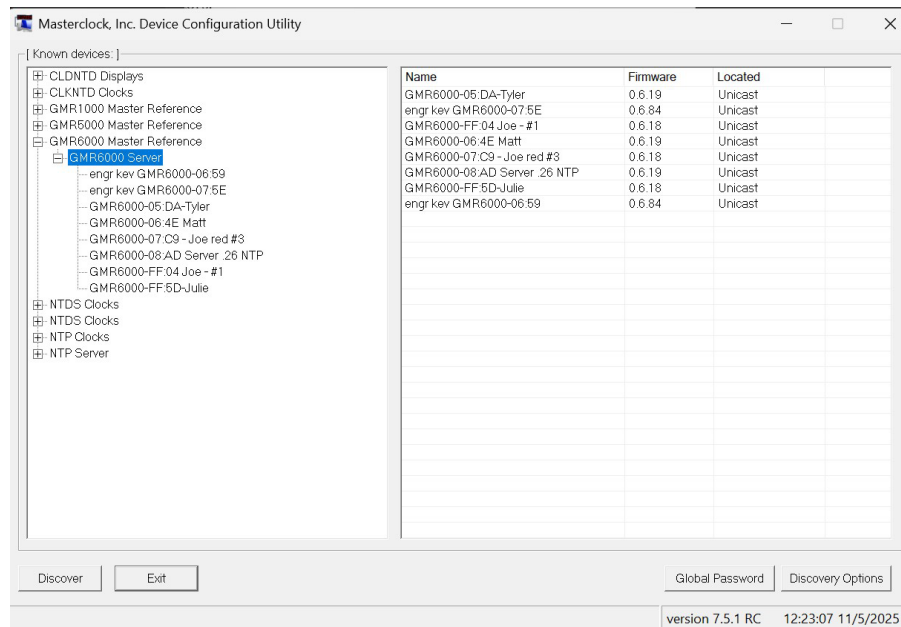
WinDiscovery

WinDiscovery

[Download
WinDiscovery at
Masterclock.com](#)



WinDiscovery is Masterclock's dedicated device management software. This software runs on Windows computers and allows users to configure, monitor and manage any Masterclock device. It provides a graphical interface for network discovery, setup, and monitoring, making it the ideal tool for system administrators who want to configure, verify, or troubleshoot their device without a command-line. SSH is available for users who prefer command line interface configuration. See page 37 for SSH information.



When launched, the program scans all local subnets for connected Masterclock devices after pressing the “Discover” button. Detected units appear in the main window with their model, firmware version, and network “Location” (Unicast/Broadcast/Multicast).

As the GMR6000 is password-protected, WinDiscovery prompts for the administrator password before configuration can be made.

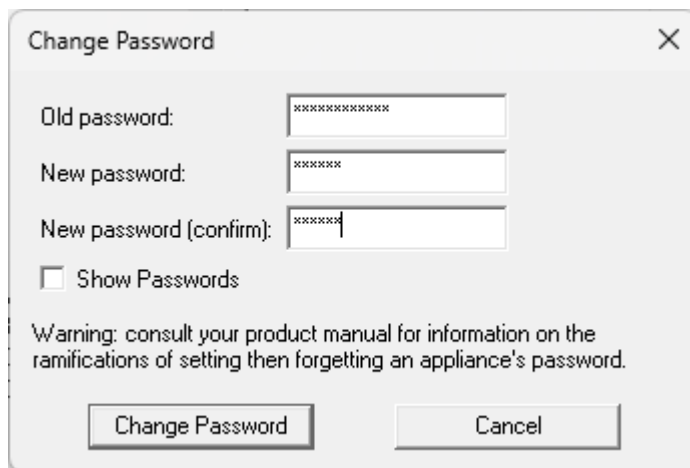
Tip: You can view basic device properties or status without a password by right-clicking the device entry and selecting the appropriate option.

First Time Setup

- Connect applicable inputs and outputs required by your configuration.
- Connect an ethernet cable to network port 1, or a USB to the front panel port.
- Insert the power cable(s) to power on the device.
- Load WinDiscovery software on your computer - this can be downloaded from Masterclock.com under either Products > Software, or Resources > Firmware.
- Providing the GMR6000 and the computer being used are on the same network, click “Discover” in the lower corner of WinDiscovery to bring up a list of available devices to configure.
- Click on your device where it appears in the list to open the Device Settings.

The GMR6000 is shipped with a randomized alphanumeric password. This password is specific to its respective device, and no two units will share the same unique default password. The default password is printed on the device’s label, box label, or by giving the front reset button a short press to display it on the GMR6000’s LED display (this method will no longer work after initial setup).

Upon Discovering the device in WinDiscovery (or first-time connection through SSH) the user will be prompted to enter the default password, followed by a field to enter a new password.



A screenshot of a 'Change Password' dialog box. The dialog has a title bar with 'Change Password' and a close button (X). It contains three password input fields: 'Old password:', 'New password:', and 'New password (confirm):'. Each field is filled with a series of 'x' characters representing masked text. Below the fields is a checkbox labeled 'Show Passwords' which is currently unchecked. At the bottom, there is a warning message: 'Warning: consult your product manual for information on the ramifications of setting then forgetting an appliance's password.' Below the warning are two buttons: 'Change Password' and 'Cancel'.

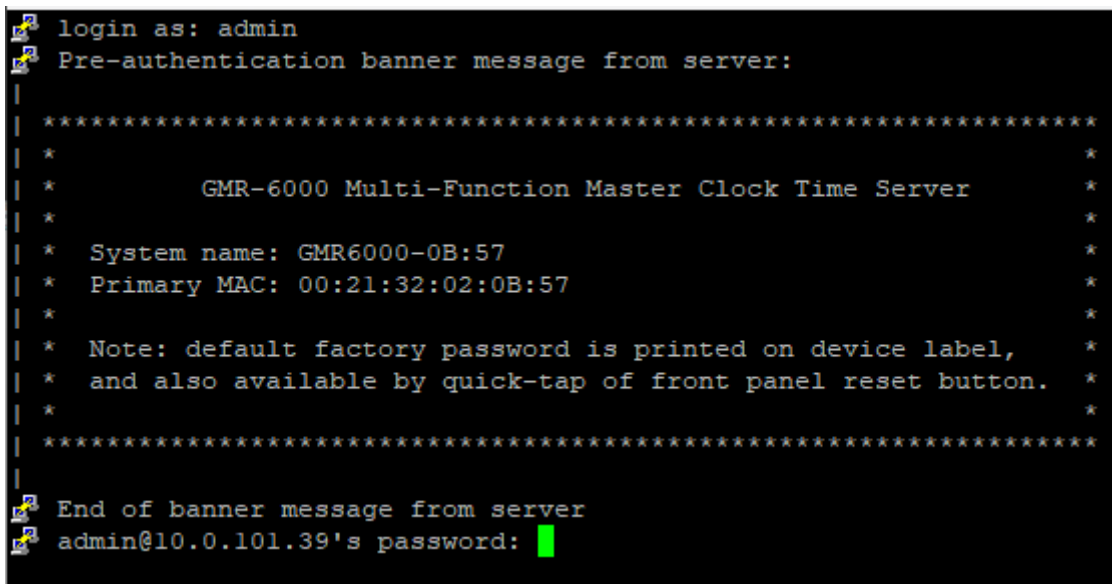
SSH

SSH (Secure Shell) is an alternate method of configuring and managing functions of the GMR6000 when WinDiscovery is not available or not allowed by your organization's security policy. SSH uses a CLI (Command Line Interface) as opposed to the GUI (Graphical User Interface) provided by WinDiscovery.

- Connect an ethernet to network port 1 (USB is not applicable for SSH configuration)
- Insert the power cable(s) to power on the device.
- Using a terminal program of your choosing, such as TeraTerm, PuTTY, OpenSSH etc. establish a connection to your GMR6000 using the IP address. The device's IP address can be shown on its LED display by giving a single short press of the reset button. This will also display the factory default password.
- The default username for SSH is **admin**

Upon first-time connection through SSH the user will be prompted to enter the default password, followed by a field to enter a new password.

For additional information regarding SSH, please refer to page 40 of this guide.



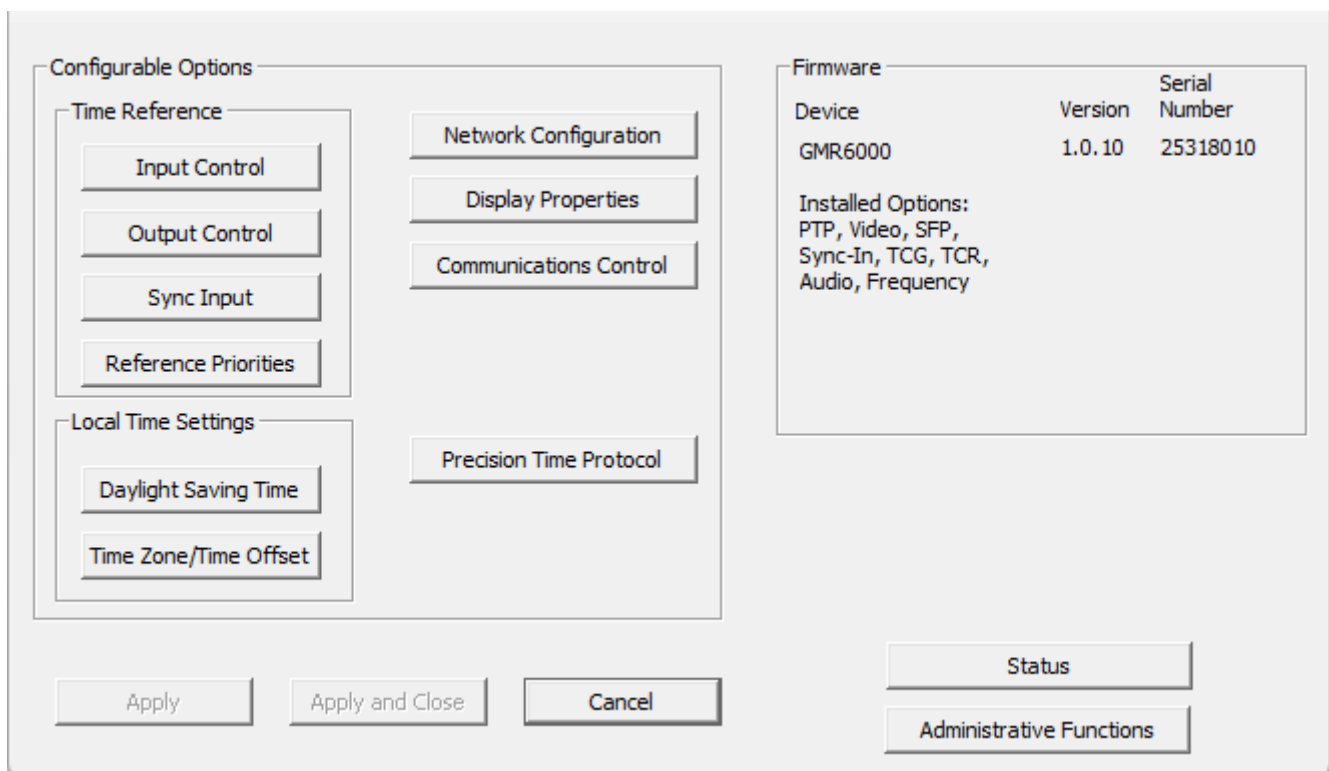
```
login as: admin
Pre-authentication banner message from server:

*****
*
*      GMR-6000 Multi-Function Master Clock Time Server      *
*
*  System name: GMR6000-0B:57                                *
*  Primary MAC: 00:21:32:02:0B:57                             *
*
*  Note: default factory password is printed on device label, *
*  and also available by quick-tap of front panel reset button.*
*
*****

End of banner message from server
admin@10.0.101.39's password: [REDACTED]
```

Device Settings

This is the primary screen shown when configuring the GMR6000 through WinDiscovery. It consists of several Configurable Options, Time References, Local Time Settings, Network and Display Configurations, and if applicable to your order specifications it will also have a Precision Time Protocol (PTP) options button.



The screenshot shows the Primary Configuration WinDiscovery interface for the GMR6000 device. The interface is divided into two main sections: Configurable Options and Firmware.

Configurable Options

- Time Reference**
 - Input Control
 - Output Control
 - Sync Input
 - Reference Priorities
- Local Time Settings**
 - Daylight Saving Time
 - Time Zone/Time Offset
- Network Configuration
- Display Properties
- Communications Control
- Precision Time Protocol

Firmware

Device	Version	Serial Number
GMR6000	1.0.10	25318010

Installed Options:
PTP, Video, SFP,
Sync-In, TCG, TCR,
Audio, Frequency

At the bottom of the interface, there are buttons for **Apply**, **Apply and Close**, **Cancel**, **Status**, and **Administrative Functions**.

The right side provides Firmware information status; showing you the Device, Firmware Version, Device Serial Number, as well as any Options that were installed by the factory (per device order). Additional options may be purchased and remotely unlocked through an option key, contact sales@masterclock.com to learn more about unlockable features.



Network Configuration (Device Settings)

The most important place to start is with the Network Configuration option in Device Settings. In this menu you will have the ability to set a device Name, as well as configure all three network interfaces with DHCP or a user-defined IP Address for static settings independently.

A screenshot of the 'Network Configuration' dialog box. At the top, there's a 'Device Name' field containing 'GMR6000-0B:57-Support'. To the right are 'OK' and 'Cancel' buttons. Below this, the dialog is divided into three columns for 'Interface 1', 'Interface 2', and 'Interface 3'. Each column has a checked 'Enable DHCP' checkbox. Under each checkbox are five input fields: 'IPv4 Address', 'Netmask', 'Gateway', 'Primary DNS', and 'Secondary DNS'. Each of these fields contains four dots, indicating a placeholder for an IP address or DNS value.

Changing the default Device Name can be incredibly useful for keeping track of multiple devices. By default, the Device Name is the model number and the last four digits of the primary MAC address. By appending the name with a location such as “BREAKROOM” or “FRONTDESK”, you can help others involved in IT and networking by making clocks easy to physically locate or manage on a network.

The screen capture above has a device named “GMR6000-0B:57-Support”, indicating this device is located in the Technical Support area of Masterclock.

If DHCP is enabled but no DHCP server is available, the GMR6000 will assign a fallback address to the affected interface. This usually begins with 169.254.xx.xx Where xx.xx is the decimal representation of the last two bytes of the MAC address.



Input Control (NTP Client)

The GMR6000 can utilize other NTP servers as a timing reference. These NTP servers can be on your local network or located on the broader internet and can be configured through the Input Control > NTP Client menu.

In this menu you can enable or disable the GMR6000's NTP Client, you may also enable a list of specific servers to query, set it to query a DHCP provided server, and enable or disable Broadcast/Multicast listening.

In the NTP Server List users may also define a polling interval for individual servers, as well as selecting whether to send an initial burst of requests when first connecting in order to quickly calculate delay and offset.

Users may also select a specific Broadcast/Multicast address if enabled.

You can choose to accept or ignore NTP responses that contain alarm flags which indicate whether or not the queried server itself has a valid reference.

An offset for NTP time stamps can be set to a resolution of microseconds.

Users may select up to one Network Interface to act as an NTP client at a time.



Input Control (NTP Client Authentication)

The GMR6000 is able to query and receive authenticated NTP responses from a server. Users can specify up to sixteen (16) key numbers. These can be enabled or disabled individually, can be required for specific communicating with specific servers that were configured in the previous menu, and hex strings can be generated in this window.

You may select between MD5, SHA-1 or SHA-2 authentication for each key. **Only hexadecimal keys are accepted.** For ASCII keys, utilize the generation tool in the lower right corner of the window to convert them to hexadecimal.

The dialog box is titled "NTP Client Authentication" and contains the following sections:

- Key Store Settings:** This section contains two identical tables, each with 8 rows. Each row has columns for "Key #", "Trust", "Hash", and "Key (Hex String)". The "Key #" column contains numbers 1 through 8. The "Trust" column contains checkboxes. The "Hash" column contains dropdown menus currently set to "MD5". The "Key (Hex String)" column contains empty text boxes.
- Authentication Settings:** This section contains several checkboxes and key number inputs:
 - ☐ Require for broadcast/multicast
 - ☐ Require for Server 1, with a "Key #:" input box below it.
 - ☐ Require for Server 2, with a "Key #:" input box below it.
 - ☐ Require for Server 3, with a "Key #:" input box below it.
 - ☐ Require for Server 4, with a "Key #:" input box below it.
- Generate Hex String:** This section contains two empty text boxes for generating a hex string.
- Buttons:** "OK" and "Cancel" buttons are located at the bottom right.



Input Control (Time Code Reader)

The GMR6000 is able decode multiple types of incoming Time Code from other devices. In the Input Control > Time Code Reader menu, users can modify various settings related to SMPTE and IRIG inputs. In most cases using the automatic calibration is sufficient for decoding, but you can also select specific gain levels for incoming signals.

Time Code Reader

SMPTE Time Code Settings

- ☐ Ignore date on incoming time code.
- ☒ Date uses Leitch date encoding format.

SMPTE 309M date encoding (either MMDDYY or MJD)

Time precision class is ignored. Jam syncs to incoming time code occur as needed.

- ☐ Date uses SMPTE 309M encoding. (Time Zone information is included).
- ☐ Date uses SMPTE 309M encoding. (Time Zone information is not included.)

IRIG Time Code Settings

- ☐ Ignore Day of Year and Year on incoming time code. (Time Code is IRIG-A, B or E with no Day Of Year and/or no IEEE 1344 year encoding)

Incoming Time Code Reference

- ☒ UTC
Incoming Time Code is UTC time.
- ☐ Local
Incoming time code is Local Time. Make sure Daylight Saving Time and Time Zone/Time Offset parameters have been set in the Main Dialog box.
- ☐ Custom
Incoming Time Code is offset from UTC by a custom value.

OK

Cancel

Calibration for SMPTE or IRIG

Auto - In this mode the device calibrates (finds the best gain) whenever locking to incoming time code. This can take from zero to 40 seconds, depending on type of time code.

Saved - The device re-uses the gain found at previous calibration. This shortens the time to lock to 2 seconds, if successful. If the device is not locked when the timeout expires then it re-calibrates.

Manual - In this mode the user enters a gain level for the device to use when locking. This shortens the time to lock to < 2 seconds, if successful. If that gain cannot achieve lock then the device will remain unlocked.

Mode

- ☒ Auto
- ☐ Saved
- ☐ Manual

86400 Seconds to wait before re-calibrating when lock lost in Saved mode. 1 to 86400 allowed.

Calibrate immediately in any mode.

155 Current Gain

255 Enter Manual Gain, 1 to 255, where 255 is maximum gain

Fractional second time code offset

Nanosecond offset: 0



Input Control (NMEA Client)

NMEA messages may be used as a reference in conjunction with the Sync-In feature.

The NMEA client can be manually enabled or disabled. Input is allowed through the RS232 port located on the rear IO, or through the front USB port. Users can specify a common Baud rate between 4800 to 38400, as well as specify Data Bits, Stop Bits, and Parity type.

A screenshot of the "NMEA Client" configuration window. The window has a title bar with a close button (X). Inside, there is a checkbox labeled "Enable NMEA Client" which is currently unchecked. To the right of this checkbox are "OK" and "Cancel" buttons. Below the checkbox is a section titled "Select NMEA Input Port" with a descriptive note: "If the USB port is used it will appear as a COM port (USB Serial Port label) in the PC's Device Manager." This section contains two radio button options: "RS232 port (DB-9)" which is selected, and "USB port". At the bottom of the window, there are four grouped settings: "Baud" with options 4800, 9600 (selected), 14400, 19200, and 38400; "Data Bits" with options 7 and 8 (selected); "Stop Bits" with options 1 (selected) and 2; and "Parity" with options None (selected), Even, and Odd.



Input Control (GPS/GNSS)

GPS/GNSS is the preferred method of timing synchronization for the GMR6000. Through this menu users may set an offset to account for cable delay between the antenna and the receiver. Cable delay calculations can vary based on the length and type of cable used, refer to the manufacturer's specifications sheet to determine the correct offset.

Survey-In

A useful for stationary installations where the GMR6000 will consistently lock to certain satellites based on its location. This allows the device to lock with higher accuracy to fewer satellites than it would normally need.

Interference Detection

Allows the GMR6000's internal receiver to monitor for excessive or unexpected signal noise and report interference when necessary.

Jamming Detection

Similarly monitors the signal for broadband interference or continuous wave signals attempting to overwhelm the receiver.

GNSS Tracking

Allows users to select which constellations should be used for reference. Up to three may be selected. Note that Beidou and GLONASS may not be enabled at the same time.

GNSS Augmentation

When GPS is enabled, this allows for various systems of augmentation to be used. By default, the QZSS system primarily used in Japanese and Asian markets is enabled.



Output Control

The GMR6000's Output Control menu serves as the primary configuration window for signal and reference output from the device.

The image shows a software window titled "Output Control" with a standard Windows-style title bar (minimize, maximize, close buttons). Inside the window, there are five buttons stacked vertically: "NTP Server", "MasterPorts", "NMEA", "NENA", and "Truetime/Kinematics". In the top right corner of the window is an "OK" button. At the bottom of the window is a section titled "Time Dissemination During Outage". This section contains a checked checkbox with the label "Allow time server (NTP/IRIG/SMPTE) during reference outages." Below this checkbox is a text label "Duration time server is allowed:" followed by a text input field containing the number "0", and then the text "seconds (0 = forever)".

At the bottom of this window you'll find an important option; **Time Dissemination During Outage**. This setting allows the GMR6000 to continue to output reference signals such as NTP, Time Code, and more, without a valid external input reference. By default, the device is configured to cease most signal output after 24-hours (86400 seconds), unless this value is changed to 0 where it will output signal regardless of having a valid external input reference.



Output Control (NTP Server)

The GMR6000's NTP Server can be enabled or disabled with no effect on other outputs such as PTP or Time Code. If enabled, NTP clients will be able to query the IP address of the GMR6000 and receive replies over UDP port 123.

Broadcast/Multicast - allows the GMR6000 to provide NTP to clients over a broadcast address, with user-defined frequency.

Stratum Levels – When locked to a reference such as GPS/GNSS, the GMR6000 is considered to be a Stratum 1 time server. By default, without a reference the GMR6000 will report itself as Stratum16, or unsynchronized. This setting allows the user to choose how the time server reports itself, allowing you to bypass standard Stratum levels as needed.

Network Interfaces – Specifies which network ports on the back will act as NTP servers.

NTP Alarm Flag – If checked, this applies extra data bits to each NTP packet that informs compatible devices that the GMR6000 is currently responding with no valid external reference. Masterclock displays such as the NTDS series will then begin to flash their colons at a rate of once per second to alert viewers that the time it is displaying may be without a valid reference.

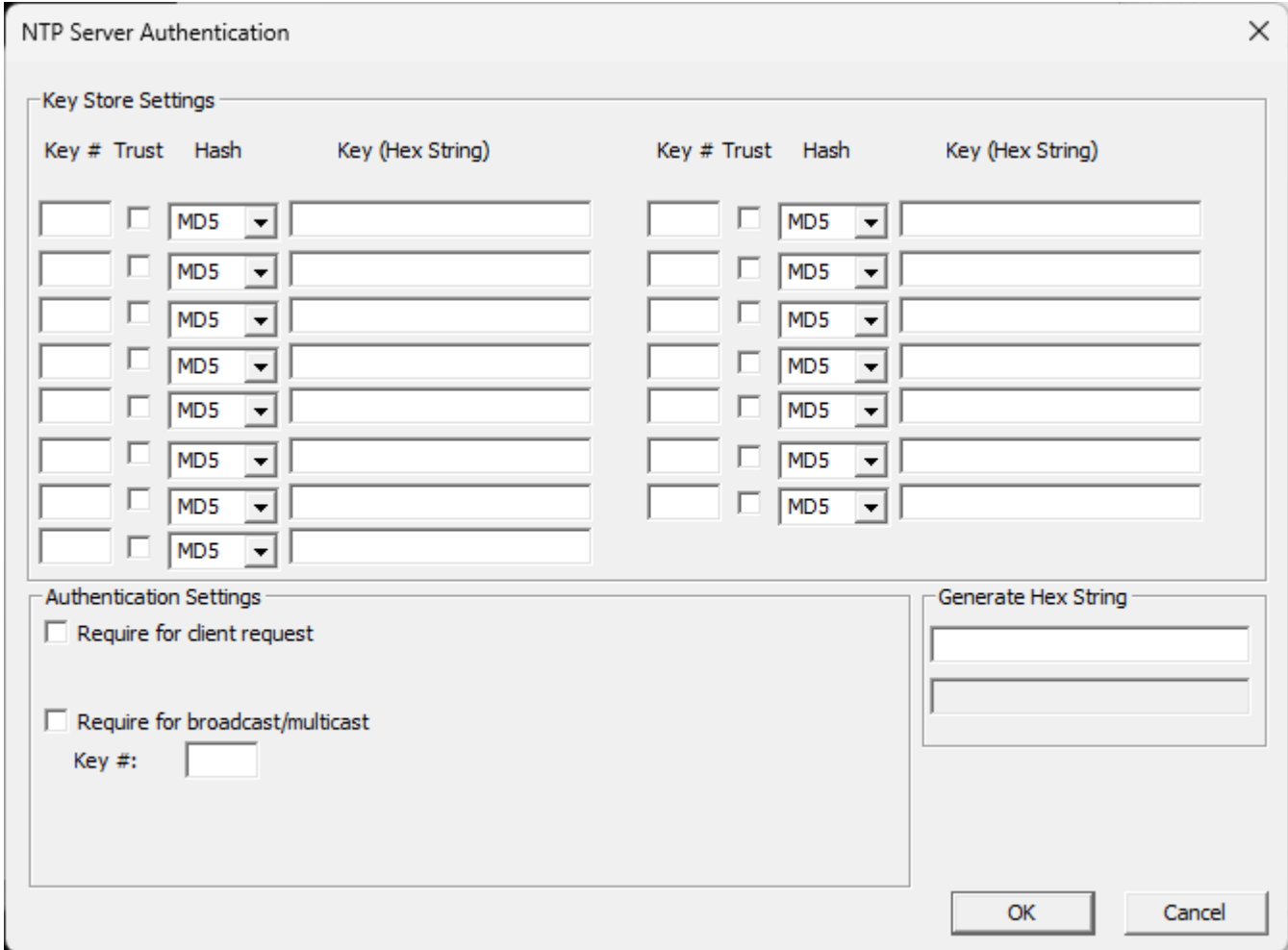
Microsecond Offset – Allows the user to input a fractional offset to the timestamp to account for delays.



Output Control (NTP Server Authentication Settings)

The GMR6000 is able to respond to authenticated NTP queries from a client. Users can specify up to sixteen (16) key numbers. These can be enabled or disabled individually, can be required for specific communicating with specific servers that were configured in the previous menu, and hex strings can be generated in this window.

You may select between MD5, SHA1 or SHA2 authentication for each key. **Only hexadecimal keys are accepted.** For ASCII keys, utilize the generation tool in the lower right corner of the window to convert them to hexadecimal.



The dialog box is titled "NTP Server Authentication" and contains the following sections:

- Key Store Settings:** A table with two identical sections, each containing 8 rows. Each row has columns for Key #, Trust, Hash, and Key (Hex String). The Hash column has a dropdown menu currently set to MD5.
- Authentication Settings:** Two checkboxes: "Require for client request" and "Require for broadcast/multicast". Below the second checkbox is a "Key #:" label and a text input field.
- Generate Hex String:** A section with two empty text input fields for generating a hex string.
- Buttons:** "OK" and "Cancel" buttons at the bottom right.

Key #	Trust	Hash	Key (Hex String)	Key #	Trust	Hash	Key (Hex String)
	☐	MD5			☐	MD5	
	☐	MD5			☐	MD5	
	☐	MD5			☐	MD5	
	☐	MD5			☐	MD5	
	☐	MD5			☐	MD5	
	☐	MD5			☐	MD5	
	☐	MD5			☐	MD5	
	☐	MD5			☐	MD5	



Output Control (MasterPorts)

MasterPorts are a new feature available exclusively on the GMR6000. These are four independently controllable outputs using standard BNC connections. Depending on the options installed with your GMR6000, these can be configured to output:

- IRIG (A/B, AM/DCLS)
- SMPTE
- Video/Audio Sync
- Waveform Output.

Each port can output any one of the aforementioned signals. All ports can be set to the same output, or each a different type. Ports can also be individually disabled.

MasterPort Configuration

Port 1 | Port 2 | Port 3 | Port 4

Type of Signal to Generate
IRIG Timecode

IRIG Timecode Type
IRIG-B00x (DCLS) Direct Current Level Shift (pulse width coded)

IRIG Coded Expression
0 - BCDtoy, CF, SBS

Select which IEEE 1344 Control Function (CF) bits to generate:

☐ Leap Second (LSP, LS), Control bit 10-11

☐ Daylight Saving (DSP, DST), Control bit 12-13

☐ Time Offset, Control bits 14-19

☐ Time Quality bits, Control bits 20-23

☐ Parity bit, Control bit 24

Time To Generate
☒ UTC
☐ Local Time
☐ Custom

Apply OK Cancel

IRIG Time Code

IRIG time code can be configured to output with A00x (DCLS), B00x (DCLS), A12x(AM), or B12x (AM) with coded expressions and control functions. It can then generate these as UTC, Local, or a Custom time.

SMPTE

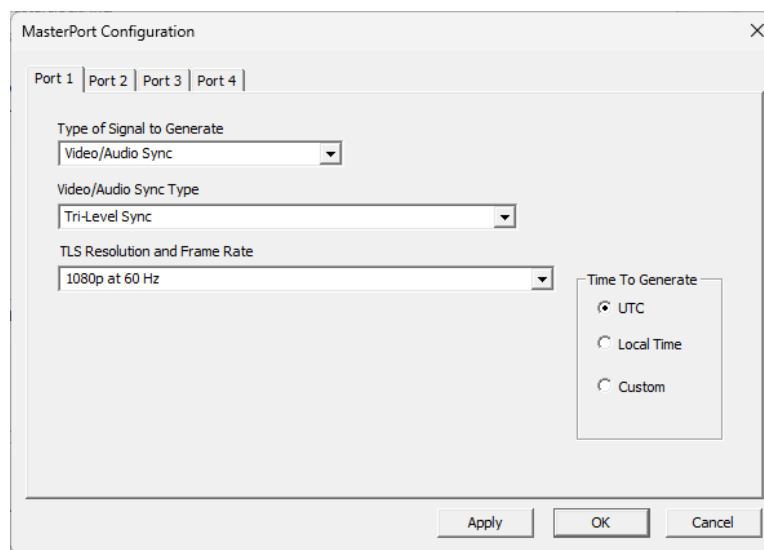
Available to output SMPTE Time Code in 24, 25, 29.97 (drop frame), or 30 FPS (frames per second). Extra encoding options are available such as 309M, Leitch, or zero filled.



Video/Audio Sync

With Video/Audio Sync, each MasterPort can be configured to generate common broadcast signal types like NTSC/PAL Black Burst, Tri-Level Sync and Wordclock.

- NTSC/PAL Black Burst is primarily used in standard-definition broadcast. It is an analog signal containing horizontal and vertical timing information, along with a color burst reference. Sometimes called Bi-Level Sync.



- Tri-Level Sync is also an analog video reference signal, though it is mainly used with high-definition and UHD systems. It is more precise than Black Burst and reduces timing errors in HD production environments.
 - TLS is supported at 720i/p, 1080i/p, using refresh rates of 50Hz, 59.94Hz, or 60Hz.
- Wordclock is a digital audio timing reference used to synchronize the sample clocks of digital audio equipment. It does not contain any actual audio data, but instead maintains the sample rate of recording devices to prevent clicks, pops and drift.
 - Wordclock supports common sample rates from 32kHz up to 192kHz.



Waveform Output

Waveform is a highly customizable MasterPort output. In the simplest terms, this can be used a frequency generator. Its default behavior is similar to that of the dedicated PPS (Pulse-Per-Second) output, and it can act as another PPS output if desired.

High Frequency Square Wave

This setting allows the user to output a preset square wave signal, choosing between 1MHz, 5MHz and 10MHz.

Custom Frequency Square Wave

This option allows users to specify a set frequency to generate. Hz or kHz are selectable, and a maximum value of 937500Hz or 750kHz can be entered.

Custom Period Square Wave

This option allows users to set a custom period of time, pulse width, and starting time to generate a waveform. The resolution of period and pulse width are in microseconds, milliseconds, seconds, minutes or hours. The waveform can also be inverted if desired. A time to start generating can also be set in UTC.

The "Waveform Settings" dialog box is a light gray window with a close button (X) in the top right corner. It contains several input fields and a checkbox. The "Period:" field has a text box with "1" and a dropdown menu with "us". The "Pulse Width:" field has a text box with "1" and a dropdown menu with "us". Below these is a checkbox labeled "Invert/Negate Waveform". A paragraph of text explains that custom frequency is calculated from period and pulse width, and that pulse width specifies the "high" time unless inverted. The "Start Time (UTC):" field has a time spinner set to "7:00:00 PM" and a date dropdown set to "7/17/2026". A final paragraph explains that the start time indicates when the first pulse is calculated to start, in UTC. At the bottom right are "OK" and "Cancel" buttons.

Waveform Settings

Period: us

Pulse Width: us

☐ Invert/Negate Waveform

Custom Frequency is calculated from a Period and a Pulse Width. The Pulse Width specifies how long the signal is "high", unless the Invert/Negate Waveform checkbox is set, then it will specify how long the signal is "low".

Start Time (UTC): 7/17/2026

The Start Time indicates, in UTC time, when the first pulse is calculated to start, and can either be in the past or future.

OK Cancel



Output Control (NMEA)

NMEA output is a standardized text-based data format that transmits navigation, position and timing information between the GNSS receiver and other equipment. Masterclock uses the NMEA 0183 standard. This feature is most commonly used in maritime, aviation, and defense and aerospace industries but may be useful for other applications.

NMEA Messages

Users may choose what type of messages to output including:

- ZDA
- GSV
- GGA
- GSA
- RMC
- VTG

RMC messages also contain an option to output at 5x per second, this only updates the timing information at an increased rate while positioning is updated normally at 1x per second.

The image shows a software dialog box titled "NMEA Messages". It has a close button (X) in the top right corner. The dialog is divided into two main sections. The top section, "Nmea Messages to Output", contains a text box with the instruction: "If ZDA is selected, it will be output regardless of reference lock. All other messages require a locked GPS receiver." Below this is another text box: "Selecting more than two NMEA messages may cause messages to be output every other second." There are six checkboxes: ZDA (checked), GSV (unchecked), GGA (unchecked), GSA (unchecked), RMC (checked), and VTG (unchecked). To the right of the RMC checkbox is an option "Output RMC 5x per second" which is unchecked, with a note below it: "Note: Position is from the previous second, only time gets updated 5x per second." There are "OK" and "Cancel" buttons on the right. The bottom section, "Select NMEA Output Port", has three radio button options: "RS232 + RS422 ports" (unchecked), "RS232 port" (checked), and "RS422 ports" (unchecked). To the right of these is an "Ethernet" radio button which is unchecked. At the bottom of this section is a "Port Settings" button.

NMEA Output Port

The GMR6000 is capable of transmitting NMEA messages over both its RS232 and RS422 ports, as well as ethernet. Users may select either the RS232, RS422, or both simultaneously. If Ethernet is selected, NMEA will only be output over Ethernet.



Output Control (NENA)

NENA is a standardized serial time-message format made for PSAPs (Public Safety Answering Points). This is most commonly used in facilities that process emergency calls such as police, fire or medical. These messages help maintain consistent timestamps across equipment.

NENA Formats

Users may choose what format of messages to output including:

- Format 0 which provides
 - Day of Year
 - Time in H:M:S
 - Sync status
 - Daylight Saving status
 - Time Zone
- Format 1 which provides
 - Day of Week
 - Calendar date
 - Two-digit year
 - Time in H:M:S
 - Sync status
- Format 8 which provides
 - Four-digit year
 - Day of Year
 - Time in H:M:S
 - Sync status
 - Daylight Saving status
 - Offset from UTC.

NENA Output Port

The GMR6000 is capable of transmitting NENA messages over both its RS232 and RS422 ports, as well as ethernet. Users may select the RS232, RS422, or both simultaneously. If Ethernet is selected, NENA will only be output over Ethernet.



Output Control (TrueTime/Kinematics)

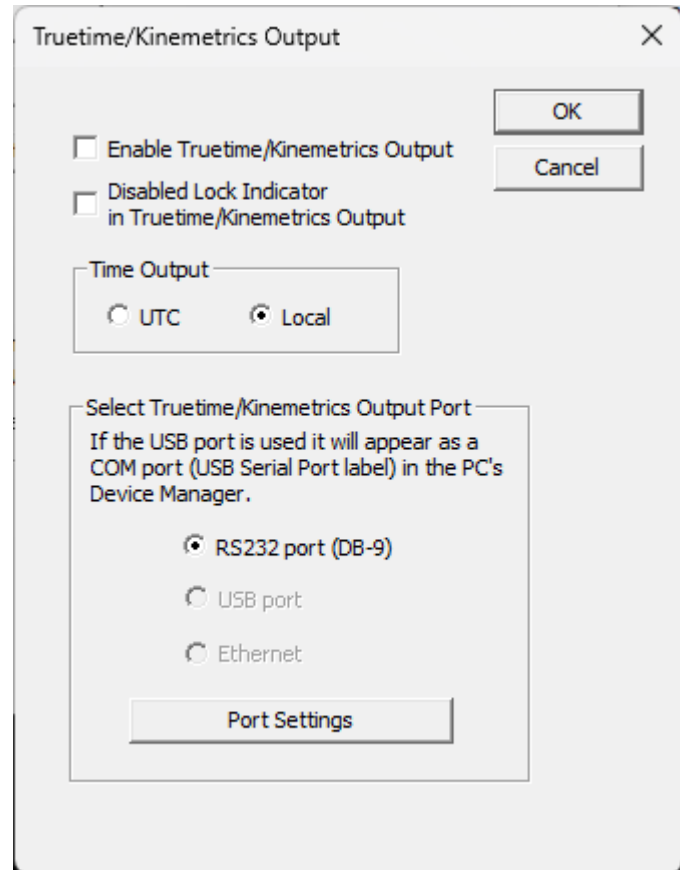
An older system of synchronization used primarily for seismic-monitoring instruments.

Users may select whether to enable or disable TrueTime/Kinematics Output.

The Lock indicator can be disabled when using T/K output.

Users may select whether to output UTC or Local time.

Currently TrueTime/Kinematics can only be output over the RS232 port which uses a standard DB9 (DE-9) connector.





Sync Input

This feature allows the GMR6000 to use a pulse signal as a synchronization reference. If NMEA is enabled, users can synchronize the NMEA input with the addition of a pulse signal to keep messages aligned.

Only one option (Sync NMEA / Sync Manually) may be used at a time.

Users can also specify an offset with nanosecond resolution to compensate for cable delays.

A screenshot of a software dialog box titled "Sync Input". The dialog has a standard Windows-style title bar with a close button (X) in the top right corner. In the top right of the dialog area, there are two buttons: "OK" and "Cancel". On the left side, there are two unchecked checkboxes. The first checkbox is labeled "Sync NMEA input to pulse input". The second checkbox is labeled "Sync manually-set time to pulse input". Below these checkboxes, a line of text reads: "Using SYNC_IN with manual time disables other uses." At the bottom of the dialog, there is a section titled "Nanosecond Offset" which is enclosed in a rectangular box. Inside this box, there is a descriptive text: "Allows the user to specify a fractional second offset to the top of second pulse received from the SYNC_IN input. A typical use would be for adding a cable delay." Below this text, there is a label "Signed offset in nanoseconds:" followed by a text input field that contains the number "0".

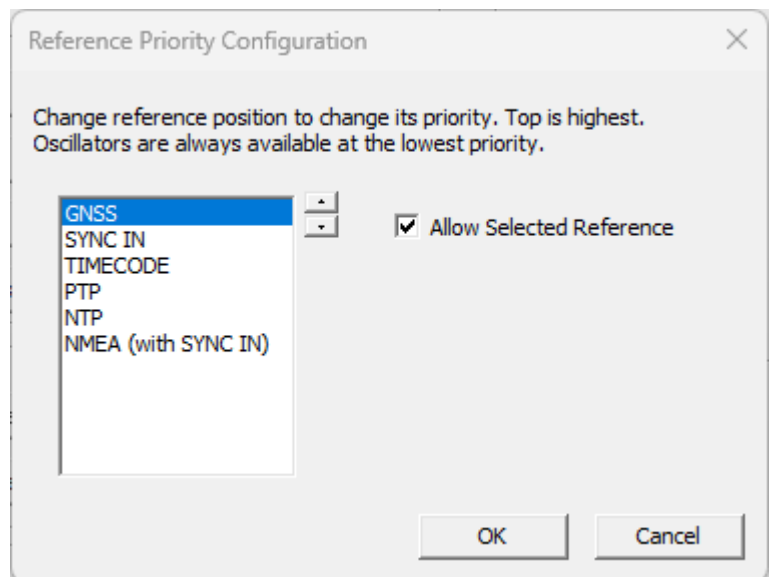


Reference Priorities

This menu allows users to manually define which references should be used and in which order. Internal oscillators are always considered to be the lowest priority and will not be used if other references are available. Users can force the oscillator to be used by issuing an HSO Holdover command in SSH.

GNSS is usually the highest priority as it provides the most accurate timing reference possible, but the order can be changed if users prefer to use other references such as Time Code, PTP, or NTP.

In the screenshot (right) the reference sources are listed top to bottom in order of highest to lowest. If GNSS were unavailable, the GMR6000 would attempt to use Sync In, if this were unavailable it would proceed to using Time Code, and so forth.



References can also be disabled entirely, individually, to prevent unwanted references from being selected.



Daylight Saving Time (DST)

Daylight Saving Time settings commonly used in North America. This allows the GMR6000 to compensate local time output automatically based on the time changes used in North America throughout the year.

Users can specify a time and date to begin and end DST. Clicking either the US/Canada Standard or EU Standard buttons will automatically configure the time, day and month to begin and end the time change.

US DST begins on the second Sunday of March, and ends on the first Sunday of November. EU Standard changes this to begin on the last Sunday in March, ending on the last Sunday in October.

Daylight Saving Time can also be disabled for countries that do not observe yearly time adjustments.

The "Daylight Saving Time Configuration" dialog box is a standard Windows-style window with a title bar and a close button (X) in the top right corner. It contains several sections for configuring DST settings. At the top left, there's a "Daylight Bias" section with a time input field set to "01:00:00" and a "Disable daylight time" checkbox. Below this is a "Time reference for daylight saving time shift" section with a checkbox for "Use UTC instead of local time". The main body is divided into two columns: "Daylight saving time start" and "Daylight saving time end". Each column has a list of radio button options: "First", "Second", "Third", "Fourth", "Last", and "Absolute". In the "start" column, "Second" is selected. In the "end" column, "First" is selected. Below the radio buttons, each column has dropdown menus for "Day of week" (both set to "Sunday") and "Month" (start is "March", end is "November"). There are also input fields for "Day of month" and "Time" (both set to "02:00:00"). At the bottom, there are three buttons: "US/Canada Standard", "EU standard", and "Current Windows Setting". On the right side, there are "OK" and "Cancel" buttons.



Time Zone/Time Offset

The Time Zone settings allow you to specify the time zone in which the GMR6000 is located. This has no impact on UTC time, but will change the local time display and output.

The offset can be set to the resolution of seconds, minutes and/or hours. You may also choose from a preset list of available time zones. The offset can be either positive or negative compared to UTC.

A screenshot of a "Time Zone Configuration" dialog box. The dialog has a title bar with a close button (X). Inside, there is instructional text: "Select a time zone description from the list box or configure a custom bias with the edit controls. The edit controls represent the current configuration of the device. Note: daylight saving time is not configured here." Below this is a list box containing the following items: "(UTC-12:00) International Date Line 'West", "(UTC-11:00) Coordinated Universal Time-11", "(UTC-10:00) Hawaii", "(UTC-10:00) Aleutian Islands", "(UTC-09:30) Marquesas Islands", "(UTC-09:00) Coordinated Universal Time-09", "(UTC-09:00) Alaska", "(UTC-08:00) Pacific Time (US & Canada)", "(UTC-08:00) Baja California", and "(UTC-08:00) Coordinated Universal Time-08". Below the list box is a "Bias:" label followed by a time input field showing "00: 00: 00" with up/down arrows. To the right of the input field is a checkbox labeled "Bias is negative?". At the bottom are "OK" and "Cancel" buttons.

Time Zone Configuration

Select a time zone description from the list box or configure a custom bias with the edit controls. The edit controls represent the current configuration of the device. Note: daylight saving time is not configured here.

(UTC-12:00) International Date Line 'West
(UTC-11:00) Coordinated Universal Time-11
(UTC-10:00) Hawaii
(UTC-10:00) Aleutian Islands
(UTC-09:30) Marquesas Islands
(UTC-09:00) Coordinated Universal Time-09
(UTC-09:00) Alaska
(UTC-08:00) Pacific Time (US & Canada)
(UTC-08:00) Baja California
(UTC-08:00) Coordinated Universal Time-08

Bias: 00: 00: 00 ☐ Bias is negative?

OK Cancel



Display Properties

These settings allow you to change the behavior of the GMR6000's front panel display. The brightness of the display can be manually adjusted.

Choose whether to display the Date as MM/DD/YY, DD/MM/YY, or YY/MM/DD. You may also choose to display Day of Year, which will display the current day as a number out of 365.

Users can also configure the display to show time in 12-hour or 24-hour format, with or without a leading 0. They may also choose between displaying UTC or Local time.

Upon reference loss, the GMR6000 can alert users by changing its display entirely to dashes (-----), indicating a loss of timing reference.

The 'Display Properties' dialog box is a standard Windows-style window with a title bar and a close button. It contains several sections: 'Brightness' with a slider and 'Auto', 'Dim', 'Bright' buttons; 'Display Options' with radio buttons for date formats (MM/DD/YY, DD/MM/YY, YY/MM/DD), Day of Year, and time formats (12 hour, 24 hour); 'Time Display' with radio buttons for UTC and Local; 'Display dashes on reference failure' with a checked 'Enable dashes display' checkbox and a '600' seconds delay field; and 'Display Color' with color pickers for Red, Green, and Blue, and buttons for 'Save Custom Color', 'Delete Custom Color', and 'Schedule'. At the bottom are 'Apply', 'OK', and 'Cancel' buttons.



Communications Control

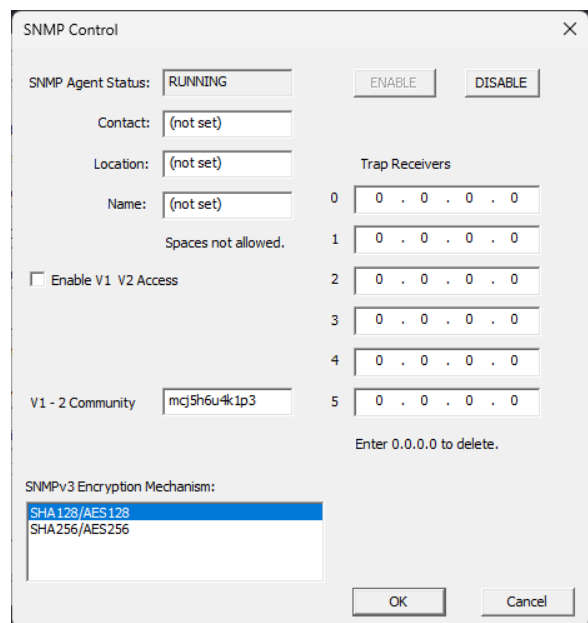
SNMP and Syslog are available for monitoring the GMR6000. These can provide important status information on the operation of the device to remote operators. These can be enabled or disabled.

SNMP

The GMR6000 uses SNMP V3 by default, and V1 and V2 can be enabled. Users may specify Trap Receivers, as well as the type of encryption to use (SHA128 or SHA256).

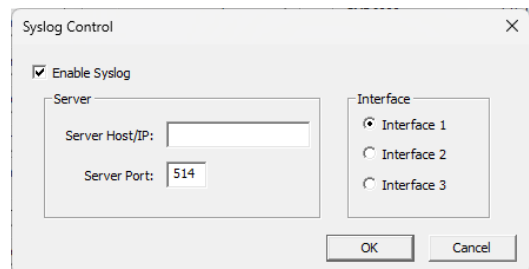
Masterclock provides a set of custom MIBs to be used with an MIB browser. These are included with the downloads for the latest firmware, or separately on our website under Products > Software.

Please note that Masterclock does not provide or support any specific MIB browser. This is designed to work with most available browsers.



Syslog

Disabled by default, but can be enabled by the user. Allows specifying of a Server Host/IP, port, and which network interface of the GMR6000 should be used for Syslog communication.





Precision Time Protocol (PTP)

The GMR6000 can distribute precise time using Precision Time Protocol, or PTP. PTP is configured through WinDiscovery and may be enabled independently on Ethernet Interface 1, Interface 2, and Interface 3.

The main PTP - Precision Time Protocol window controls whether PTP is active and provides access to the detailed configuration menus.

Select **PTP Enabled** to enable PTP operation on the GMR6000.

Clearing this option disables PTP on all interfaces, regardless of the individual interface selections below it.

The **Domain** identifies the PTP timing system in which the GMR6000 participates. PTP devices must normally use the same domain to exchange timing information.

The available domain range depends on the selected profile. For the IEEE 1588 Defaults profile, the available range is 0 through 127, with a default value of 0. Some industry profiles may automatically apply a different default domain or restrict the available range.

Priority 1 and **Priority 2** influence Grandmaster selection through the Best Master Clock Algorithm, or BMCA. Lower values are preferred. Priority 1 is normally used to establish the intended Grandmaster hierarchy. Priority 2 provides an additional comparison between clocks that otherwise advertise similar clock quality. Lower values are higher priorities.

Changing these values does not guarantee that the GMR6000 will become Grandmaster. BMCA also evaluates clock class, clock accuracy, clock variance, and clock identity.



Precision Time Protocol (PTP) Cont.

The Synchronization Mode determines how precise Sync-message timestamps are transmitted.

- One Step inserts the precise transmit timestamp directly into the Sync message.
- Two Step sends a Sync message followed by a Follow Up message containing the precise transmit timestamp.

The available mode may depend on the selected profile. The IEEE 1588 Defaults profile supports both 1 Step and 2 Step, with 2 Step selected by default.

The GMR6000 supports a variety of common PTP profiles, including:

Profile	Application
IEEE 1588 Defaults	General-purpose PTP operation
Default E2E	General-purpose PTP using End-to-End delay measurement
Default P2P	General-purpose PTP using Peer-to-Peer delay measurement
SMPTE ST 2059-2	Broadcast and professional media synchronization
AES67	Professional audio-over-IP synchronization
SMPTE ST 2110	Professional media-over-IP systems
AES67/ST 2059-2 Interoperability	Mixed AES67 and SMPTE timing environments
Telecom G.8275.1	Telecom networks with full PTP timing support
Power IEC 61850-9-3	Power utility and substation timing
Power IEEE C37.238-2011	IEEE power profile, 2011 edition
Power IEEE C37.238-2017	IEEE power profile, 2017 edition

SSH Commands

On the next several pages you will find lists of the most common commands used when configuring through SSH, their variables, and what their function is. Please note that this list is not exhaustive, and many commands are subject to change depending on features introduced in newer firmware versions.

The default credentials to log in through SSH are:

Username: admin

Password: (See your device label for the default password)

Once users connect to SSH, they can send a '?' through the CLI for a complete list of available commands and functions. Appending a command with '?' will provide a list of all function variables and a short description of their usage.

Please note that Masterclock does not provide or support any specific terminal software, it is recommended that users utilize a client with which they are most familiar or comfortable using.

```
ssh> ?

admin          brightness    debug         devicename
display        dropframe    dst           hsoholdover
gnss           hso          igmpmode      igmpv3
leapsecond     ledtest      memfree       memtest
mport          network      nenaoutput    nmeainput
nmeaoutput     ntpclient    ntpserverauth ntpclientauth
ntpserver      options      password      ping
properties     ptp          reboot        refstatus
reflossdashes reflossallowserver refpri        schevt
settodefault   snmp         snmplogin     status
syncinput      syslog       tcr           tcr_cal
time           timezone     truetype      zeros
?
```

Command	Variables / Arguments	Usage
admin	lockout	Enable or disable the network administrative management lockout.
brightness		Show the display brightness level.
brightness	x	Set the display brightness level to x.
devicename		Show the current device name.
devicename	xxx	Set the device name to xxx.
display		Show the current display format.
display	12eu	Use 12-hour time and European date format (dd/mm/yy).
display	12us	Use 12-hour time and U.S. date format (mm/dd/yy).
display	12asian	Use 12-hour time and Asian date format (yy/mm/dd).
display	24eu	Use 24-hour time and European date format (dd/mm/yy).
display	24us	Use 24-hour time and U.S. date format (mm/dd/yy).
display	24asian	Use 24-hour time and Asian date format (yy/mm/dd).
display	eu12	Use European date format (dd/mm/yy) and 12-hour time.
display	us12	Use U.S. date format (mm/dd/yy) and 12-hour time.
display	asian12	Use Asian date format (yy/mm/dd) and 12-hour time.
display	eu24	Use European date format (dd/mm/yy) and 24-hour time.
display	us24	Use U.S. date format (mm/dd/yy) and 24-hour time.
display	asian24	Use Asian date format (yy/mm/dd) and 24-hour time.
dayofyear	on	Turn on day-of-year display.
dayofyear	off	Turn off day-of-year display.
dropframe	jam	Command drop-frame time to jam-sync at the top of the second.
dropframe	jamtime hh:mm	Set the local daily time for the drop-frame jam.
dst		Show Daylight Saving Time settings.
dst	eu	Set Daylight Saving Time to the EU standard.
dst	us	Set Daylight Saving Time to the U.S./Canada standard.
dst	off	Turn off Daylight Saving Time and clear the begin/end dates.
dst	ex	Show examples for entering relative and absolute dates.
gnss		Show information about the GNSS receiver.
gnss	offset #	Set the GNSS offset in nanoseconds. # is a signed nanosecond value.
gnss	sat x y z	Select one to three satellite constellations to receive.
gnss	interference x	Turn interference detection on or off, where x is on or off.
gnss	jam-bb #	Set the broadband jamming-detection threshold, where # is 1 dB to 15 dB.
gnss	jam-cw #	Set the continuous-wave jamming-detection threshold, where # is 1 dB to 31 dB.
gnss	aug x y z	Select augmentation systems. Each value may be SBAS, QZSS, IMES, D-GPS, or none.
gnss	survey-in x	Enable or disable survey-in for improved stationary timing performance, where x is on or off.
gnss	defaults	Restore the GNSS receiver default settings.
gnss	dynamic x	Set the GNSS dynamic mode, where x is normal or airborne.
gnss	acquisition x	Set the acquisition mode, where x is normal, high, or highest.
hso		Show HSO status information.
hso	savecal	Save the current HSO calibration.
hso	reset	Reset the oscillator calibration.
hso	jam	Jam the PPS output to the current reference.
hso	jam_threshold	Show the jam threshold in microseconds.
hso	jam_threshold x	Set the jam threshold. A value of 0 disables jamming.
hso	eval osc	Recalibrate the oscillator frequency range.

SSH (Cont.)

Command	Variables / Arguments	Usage
hsoholdover		Show HSO holdover settings.
hsoholdover	on/off	Immediately enable or disable use of external references.
hsoholdover	start hh:mm:ss	Set the scheduled UTC start time for holdover.
hsoholdover	stop hh:mm:ss	Set the scheduled UTC stop time for holdover.
hsoholdover	enable	Enable scheduled holdover.
hsoholdover	disable	Disable scheduled holdover.
igmpmode	x	Set the IGMP reporting mode, where x is 0 to 3.
leapsecond		Show leap-second parameters.
leapsecond	on yyy mm/dd/yyyy	Enable a positive or negative leap second at 23:59:59 UTC on the entered date.
leapsecond	off	Disable leap-second processing.
ledtest		Show the current LED test mode.
ledtest	1	Turn on all display segments.
ledtest	2	Rotate through the segments of each digit at full brightness.
ledtest	off	Turn off the LED test.
memfree		Display current system and extended-memory usage and status.
memtest		Test system and extended memory and report the results.
mport		Show MasterPort settings for all outputs.
mport	[i]	Show MasterPort settings for output [i].
mport	[i] local	Offset time code using the local DST and time-zone settings.
mport	[i] utc	Apply no time-code offset; use UTC.
mport	[i] custom	Offset time code using custom DST and time-zone settings.
mport	[i] dst	Set the custom Daylight Saving Time offset for the time-code output.
mport	[i] tz	Set the custom time-zone offset for the time-code output.
mport	[i] smpte	Enable SMPTE time code on a MasterPort.
mport	[i] irig	Enable IRIG time code on a MasterPort.
mport	[i] wave	Enable a waveform output on a MasterPort.
mport	[i] video	Enable a video/audio synchronization output on a MasterPort.
mport	[i] off	Disable a MasterPort.
network		Show the network-interface summary.
network	[i]	Show details for interface [i].
network	[i] dhcp on/off	Enable or disable DHCP on the interface.
network	[i] a4 [address]	Set a static IPv4 address for the interface.
network	[i] n4 [address]	Set a static IPv4 netmask for the interface.
network	[i] g4 [address]	Set a static IPv4 default gateway for the interface.
network	[i] dns 1 [address]	Set the primary static IPv4 DNS server for the interface.
network	[i] dns 2 [address]	Set the secondary static IPv4 DNS server for the interface.
network	[i] static show	Show the configured static settings for the interface.
network	[i] static commit	Commit static configuration changes on the interface.
network	[i] arp	Show the ARP table for the interface.
network	[i] mcast report	Trigger a multicast report for the interface.
network	[i] mcast show	Show multicast subscriptions on the interface.
network	[i] dhcp release	Immediately release the DHCP lease and revert to a fallback IP address.
network	[i] dhcp renew	Immediately renew the DHCP lease on the interface.
nenaaoutput		Display basic information about NENA output.
nenaaoutput	xxx yyy port baud parity	Enable NENA output. xxx is format0, format1, or format8; yyy is lock or nolock; port is rs232, rs422, or rs232/rs422; baud is 4800, 9600, 19200, or 38400; parity is none, odd, or even.
nenaaoutput	off	Disable NENA output.

SSH (Cont.)

Command	Variables / Arguments	Usage
nmeainput		Display basic information about NMEA input.
nmeainput	port baud parity	Enable NMEA input. port is rs232 or rs422; baud is 4800, 9600, 19200, or 38400; parity is none, odd, or even.
nmeainput	timeout n	Set the number of seconds to wait for an NMEA message.
nmeainput	max n	Set the maximum permitted time change, in seconds.
nmeainput	off	Disable NMEA input.
nmeaoutput		Display basic information about NMEA output.
nmeaoutput	off	Disable NMEA output.
nmeaoutput	on	Enable all NMEA output messages.
nmeaoutput	on xxx	Enable NMEA output message xxx.
nmeaoutput	port baud parity	Enable NMEA output. port is rs232, rs422, or rs232/rs422; baud is 4800, 9600, 19200, or 38400; parity is none, odd, or even.
ntpcient		Display current NTP client settings.
ntpcient	stats	Show detailed statistics for the current servers.
ntpcient	start/stop	Start or stop the NTP client.
ntpcient	dhcp on/off	Enable or disable use of DHCP-provided NTP servers.
ntpcient	alarm on/off	Enable or disable rejection of packets with the alarm flag set.
ntpcient	set interface [i]	Set the interface used by the NTP client.
ntpcient	set timeout [number]	Set the server timeout in seconds. The source guide marks this command as not working.
ntpcient	set offset [number]	Apply a microsecond offset to received packets. The source guide marks this command as not working.
ntpcient	set broadcast on/off	Enable or disable NTP client broadcast mode.
ntpcient	set broadcast addr [ip]	Set the IP address used for broadcast messages.
ntpcient	set broadcast timeout [number]	Set the timeout for broadcast servers.
ntpcient	set broadcast auth on/off	Enable or disable broadcast authentication.
ntpcient	list	View the current NTP server list.
ntpcient	list on/off	Enable or disable the NTP server list.
ntpcient	list add [server name] interface [i]	Add a server by IP address or URL and assign it to interface [i].
ntpcient	list remove [server num]	Remove a server from the list.
ntpcient	list [server num] name [server name]	Change a server name.
ntpcient	list [server num] interface [i]	Change the interface assigned to a server.
ntpcient	list [server num] interval [number]	Set the polling interval in log2 seconds.
ntpcient	list [server num] burst on/off	Enable or disable an initial burst of requests after connecting.
ntpcient	list [server num] auth enable/disable	Enable or disable authentication for a server.
ntpcient	list [server num] key [number]	Set the authentication key ID for a server.
ntpcientauth		Show current NTP client authentication settings and keys.
ntpcientauth	key x y z -a "str"	Add an ASCII key. x is the key entry (up to 15), y is the key number (1-65535), z is MD5, SHA1, or SHA2, and str is the ASCII key string.
ntpcientauth	key x y z -h "hex"	Add a hexadecimal key. x is the key entry (up to 15), y is the key number (1-65535), z is MD5, SHA1, or SHA2, and hex is the hexadecimal key string.
ntpcientauth	trusted x y ... z	Mark the listed key numbers as trusted.
ntpcientauth	nottrusted x y ... z	Mark the listed key numbers as untrusted.
ntpserver		Display current NTP server settings.
ntpserver	start/stop	Start or stop the NTP server.
ntpserver	interface [i] on/off	Enable or disable the NTP server on an interface.
ntpserver	alarm on/off	Enable or disable the alarm flag in outgoing NTP packets after reference loss.
ntpserver	set id [name]	Set the NTP reference ID to a name of four or fewer characters.
ntpserver	set offset [number]	Set the microsecond offset applied to outgoing NTP packets. The source guide marks this command as not working.
ntpserver	set stratum_locked [number]	Set the stratum reported while locked to a non-NTP reference.
ntpserver	set stratum_unlocked [number]	Set the stratum reported while not locked.
ntpserver	broadcast on/off	Enable or disable the broadcast server.
ntpserver	broadcast frequency [number]	Set the broadcast-message interval in seconds.
ntpserver	broadcast addr [ip]	Set the IP address used for broadcast messages.
ntpserver	broadcast ttl [number]	Set the TTL for broadcast packets.
ntpserver	broadcast auth enable/disable	Enable or disable broadcast authentication.
ntpserver	broadcast auth keyid [number]	Set the key ID used by the broadcast server.

SSH (Cont.)

Command	Variables / Arguments	Usage
ntpserverauth		Show current NTP server authentication settings and keys.
ntpserverauth	key x y z -a "str"	Add an ASCII key. x is the key entry (up to 15), y is the key number (1-65535), z is MD5, SHA1, or SHA2, and str is the ASCII key string.
ntpserverauth	key x y z -h "hex"	Add a hexadecimal key. x is the key entry (up to 15), y is the key number (1-65535), z is MD5, SHA1, or SHA2, and hex is the hexadecimal key string.
ntpserverauth	trusted x y ... z	Mark the listed key numbers as trusted.
ntpserverauth	nottrusted x y ... z	Mark the listed key numbers as untrusted.
options		Display licensable features.
password	password xxx yyy zzz	Change the password, where xxx is the current password, yyy is the new password, and zzz confirms the new password.
ping	-l intf	Select the network interface used to transmit requests.
ping	-c count	Stop after sending count packets.
ping	-h hoplimit	Set the IPv6 hop limit or IPv4 TTL.
ping	-i interval	Wait interval seconds between packets.
ping	-p pattern	Set the byte pattern used for packet data.
ping	-s size	Set the number of data bytes.
properties		Show system properties such as model, serial number, software versions, and MAC address.
ptp	status	Show a summary of PTP service status.
ptp	config	Enter interactive PTP configuration.
ptp	start/stop	Start or stop the PTP service.
ptp	enable/disable	Enable or disable the PTP service at system start.
ptp	syslog enable/disable	Enable or disable PTP diagnostic output to syslog.
ptp	verbosity 0-7	Set the PTP diagnostic verbosity level.
reflossallowserver		Show the allow-time-server setting.
reflossallowserver	x	Set the timeout, in seconds, before disabling the server after reference loss.
reflossallowserver	allow	Allow the time server to continue operating during reference loss.
reflossallowserver	disallow	Disallow time-server operation during reference loss.
reflossdashes		Show the clock-mode reference-loss display setting.
reflossdashes	x	Set the colon-flash duration before the display is blanked.
reflossdashes	colonflash	Flash the colons during reference loss.
reflossdashes	nodashes	Do not display dashes during reference loss.
refpri		Show current reference-priority status and settings.
refpri	<reference> enable/disable	Enable or disable a specific reference.
refpri	<reference> <priority>	Set the priority of a specific reference.
refpri	default	Reset references to their default priorities.
refpri	10 mhz auto/internal/external	Select automatic, internal-only, or external-only 10 MHz operation.
refstatus		Show reference priority, condition, and eligibility.
settddefault	y	Reset configuration to defaults without changing network settings.
settddefault	all y	Reset configuration and network settings to defaults.
snmp		Show basic SNMP settings.
snmp	start	Start the SNMP agent.
snmp	stop	Stop the SNMP agent.
snmp	contact abc	Set system.sysContact to abc.
snmp	name abc	Set system.sysName to abc.
snmp	location abc	Set system.sysLocation to abc.
snmp	add xxx.xxx.xxx.xxx	Add an IP address as a trap destination.
snmp	del x	Delete trap-destination address number x.
snmp	coldstart	Send a test cold-start trap.
snmp	warmstart	Send a test warm-start trap.
snmp	linkup	Send a test link-up trap.
snmp	linkdown	Send a test link-down trap.
snmp	sendtrap abc	Send a test trap containing text abc.
snmp	community add abc	Set the custom community name to abc.
snmp	community del	Delete the custom community name.
snmp	v12 on/off	Enable or disable SNMP v1 and v2 read-only access.

SSH (Cont.)

Command	Variables / Arguments	Usage
snmplogin	trapuser X	Set the Xth trap user.
snmplogin	authpriv 1	Use SHA128/AES128 authentication and privacy.
snmplogin	authpriv 2	Use SHA256/AES256 authentication and privacy.
snmplogin	names	Show SNMP names.
snmplogin	add name pw	Add a new SNMP name and password.
snmplogin	del name	Delete an SNMP name.
status		Show system time-dissemination status and current references.
syncinput	disable	Disable SYNC IN.
syncinput	nmea on/off	Enable or disable use of NMEA for date/time with SYNC IN supplying the top of second.
syncinput	manual on/off	Enable or disable synchronization of the current or manually set system time to SYNC IN.
syncinput	edge rising/falling	Capture the rising or falling edge.
syncinput	offset #	Set the SYNC IN offset in nanoseconds.
syslog	enable/disable	Enable or disable syslog output.
syslog	interface [interface name]	Set the network interface used for syslog.
syslog	server [hostname/IP]	Set the remote syslog server.
syslog	port [port-number]	Set the remote syslog port.
syslog	test	Send a test message.
tcr		Show Time Code Reader settings.
tcr	nanoseconds #	Set the nanosecond offset for the TCR top of second.
tcr	smpte_nodate	Set SMPTE date encoding to none.
tcr	smpte_leitch	Set SMPTE date encoding to Leitch.
tcr	smpte_309m	Set SMPTE date encoding to 309M.
tcr	smpte_309m_no_time_zone	Set SMPTE date encoding to 309M without a time-zone field.
tcr	irig_nodate	Set IRIG date encoding to none.
tcr	irig_1344year	Set IRIG date encoding to IEEE 1344.
tcr	local	Offset time code using local time settings.
tcr	utc	Apply no offset; use UTC.
tcr	custom	Offset time code using custom time settings.
tcr	dst eu/us/off/ex	Set the custom time-code Daylight Saving Time mode. ex shows manual-entry examples.
tcr	tz xx:yy:zz	Set the custom time-zone offset to x hours, y minutes, and z seconds.
tcr_cal		Show the calibration setting.
tcr_cal	auto	Use automatic calibration mode.
tcr_cal	manual x	Use manual calibration gain x, from 1 to 255.
tcr_cal	saved	Use saved calibration mode.
tcr_cal	timeout x	Set the saved-mode timeout before recalibration after lock loss, in seconds.
tcr_cal	now	Break lock and calibrate immediately.
time		Show the current time and date.
time	hh:mm:ss mm/dd/yyyy	Set UTC time and date using 24-hour time and a year of 2000 or later.
timezone		Show the current time zone.
timezone	xx:yy:zz	Set the time zone to UTC plus x hours, y minutes, and z seconds.
truetime		Show TrueTime/Kinematics output parameters.
truetime	on	Enable TrueTime output.
truetime	on xxx port baud parity	Enable TrueTime output. xxx is lock or nolo; port is rs232 or rs422; baud is 4800, 9600, 19200, or 38400; parity is none, odd, or even.
truetime	off	Disable TrueTime output.
truetime	time utc	Output UTC time.
truetime	time local	Output local time.
zeros		Show the leading-zero setting.
zeros	on	Turn on leading zeros in 24-hour mode.
zeros	off	Turn off leading zeros in 24-hour mode.

Safety Information

These devices generate, use and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. There is no guarantee that interference will not occur in a particular installation. If this device does cause harmful interference to radio or television reception, which can be determined by removing power from the device, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Connect the device's AC or DC power cord into an outlet on a different circuit than other devices.
2. Increase the physical distance between the GMR6000 and other devices.
3. Contact technical support.

This GMR6000 has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

Only qualified persons are authorized to carry out maintenance on this device. Read this User's Manual carefully, and follow the correct procedure when setting up the device. Do not open your Masterclock product or attempt to disassemble or modify it.

Electrical Safety:

Operate only within rated AC/DC ranges.

Ensure proper grounding.

Do not operate with damaged cables or connectors.

Environmental Safety:

Operate between 0-60 °C, <90% RH non-condensing.

Avoid exposure to static, liquids or corrosive environments.

Mechanical Safety:

Use rack-mount hardware for installation.

Do not place on desktops or block vents located on the top and bottom of the unit. Always secure your device using proper mounting hardware. Do not put unnecessary stress on connected cables.



	WARNING
Electrical Hazard	

Never insert any metallic object into the device's case. Doing so increases the risk of electrical shock, short circuiting, fire or personal injury.

Never expose this device to rain, or use it near water or in damp or wet conditions.

Never place objects containing liquids on or near this device, as they may spill into its openings increasing the risk of electrical shock, short circuiting, fire or personal injury



Health and Safety

Warnings:

No user-serviceable parts inside.

Opening the unit risks electric shock or shorting sensitive components. Contact the Masterclock Support Team for assistance if your device is not working as expected.

Compliance:

Meets IEC 62368-1 and EN IEC 55035 standards.