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NTP100 -SERIES

NETWORK TIME PROTOCOL SERVER



USER MANUAL

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See important *limited warranty* information at the end of this document.

ADVISORY NOTICE

CONCERNING GPS SATELLITE SYSTEM AND THE NTP100-GPS

Depending on many factors beyond the control of MC, the signals that are received from the GPS satellites **are subject to interference, fading, satellite failure and other influences *that could cause*** the NTP100-GPS to provide erroneous time and/or date information and, under some conditions, ***could prevent*** it from providing time/date information.

It is the responsibility of the user to determine the adequacy and suitability of this device for the intended use.

CONCERNING TIME CODE INPUT AND THE NTP100-TC

Depending on many factors beyond the control of MC, the signals that are received from the Time Code Input Source **are subject to interference, noise, loading effects and other influences such as time code format *that could cause*** the NTP100-TC to provide erroneous time and/or date information and, under some conditions, ***could prevent*** it from providing time/date information.

It is the responsibility of the user to determine the adequacy and suitability of this device for the intended use.

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Introduction

Installation and Model(s) Overview

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Introduction

The NTP100 is a family of high-precision, small profile, Ethernet network timeservers, utilizing the Network Time Protocol (NTP). The NTP100 family of NTP time servers consists of the following NTP100 members:

MODEL	Primary Reference	Secondary Reference	Tertiary Reference
NTP100-GPS-HS ***High Stability***	External GPS satellite signal • internal GPS receiver • requires external GPS antenna	Internal OCXO (*Oven Controlled Crystal Oscillator),* & RTC (real-time clock) reference.	Internal TCXO (*Temperature Compensated Crystal Oscillator),* & RTC (real-time clock) reference.
NTP100-GPS	External GPS satellite signal • internal GPS receiver • requires external GPS antenna	Internal TCXO & RTC	None
NTP100-GPS/GNSS	External GPS satellite signal • internal GPS receiver • internal GLONASS receiver • requires external GPS antenna	Internal TCXO & RTC	None
NTP100-TC	External Time Code signal using • internal time code decoder • requires external SMPTE 30/25/24 fps or IRIG-B/B(1) time code source	Internal TCXO & RTC	None
NTP100-OSC –HS ***High Stability***	Internal OCXO (*Oven Controlled Crystal Oscillator),* & RTC (real-time clock) reference.	Internal TCXO & RTC	None
NTP100-OSC	Internal TCXO (*Temperature Compensated Crystal Oscillator),* & RTC (real-time clock) reference.	None	None

Each NTP100 device can operate on a local area network (LAN) or act as an enterprise-wide source for traceably accurate time and date distribution, depending upon your network configuration.

Each NTP100 device includes the *WinDiscovery* configuration & management software, as well as a Telnet interface for configuration and maintenance. Other common features include:

- Internal battery backed real time clock (RTC) with temperature compensated crystal oscillator (TCXO), retains time during loss of power (all models), GPS satellite signal (model –GPS), or time code signal (model –TC). Typical holdover stability of TCXO is <165mS/day.
- High Stability models have Oven Controlled Crystal Oscillator (OXCO) and RTC which maintain typical holdover stability after GPS calibration of 1ppb/day (<50µs/day) while powered and after initial time input or GPS lock, and 30 days aging. High Stability models revert to a precision TCXO and battery backed RTC during loss of power
- Supports NTP broadcast, multicast, and/or unicast (query) mode.
- Fully configurable network settings, including DHCP/BOOTP or Static IP addressing support
- Security features include password protection of configuration, encrypted communication, and the ability to disable telnet management access
- Adjustable time display brightness
- Status display to remotely monitor status and behavior
- Selectable Stratum Identification levels
- Email

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UTC/Greenwich Mean Time

UTC is a time standard which is the basis for the worldwide system of civil time. This time scale is kept by time laboratories around the world, including the U.S. Naval Observatory, and is determined using highly precise atomic clocks. The UTC scale is coordinated in Paris by the International Bureau of Weights and Measures (BIPM).

UTC runs at the rate of the atomic clocks, but when the difference between this atomic time and one based on the Earth approaches one second, a one second adjustment (a "leap second") is made in UTC.

UTC is the local time at the prime reference meridian at Greenwich, England. At a given location on the planet, local time can be displaced (referenced to UTC) by -11 to +12 hours. North and South America are from -3 to -11 hours delayed; most of Europe and Africa and all of Asia and Australia are advanced by +1 to +12 hours. Because the NTP time distribution standard operates with UTC-reference time only, time zone and/or daylight savings (summer) time are not used.

UTC is sometimes colloquially referred to as "Greenwich Mean Time" (abbreviated GMT).

NTP (Network Time Protocol)

NTP is an open-standard time synchronization protocol designed for precision synchronization and maintenance of time/date on computers and other devices attached to TCP/IP networks. NTP itself is transported with the UDP/IP (User Datagram Protocol), and is usually served on port 123. NTP time/date is UTC-referenced, as the protocol has no provisions for representing time zones or daylight savings (summer) time.

A wealth of useful NTP information and resources can be found at http://www.ntp.org

GPS Satellites (model NTP100-GPS, GPS/GNSS, and GPS-HS only)

The GPS satellites are operated and maintained by the U.S. Department of Defense and allow for the precise determination of local time and location at any point on (or above) the Earth. This is accomplished via the transmission of very accurate timing information from a series of satellites that provide coverage of the entire planet.

The NTP100-GPS derives the precision UTC time that it serves from the GPS satellite network using an internal GPS receiver and requires the connection of a pre-amplified GPS antenna.

GNSS Satellites (model GPS/GNSS only)

Many systems that must be accurately synchronized use GNSS as a source of accurate time. GNSS (Global Navigation Satellite System) is a satellite system that is used to pinpoint the geographic location of a user's receiver anywhere in the world. Two GNSS systems are currently in operation: the United States' Global Positioning System (GPS) and the Russian Federation's Global Orbiting Navigation Satellite System (GLONASS).

GNSS can be used as a reference clock for time code generators or Network Time Protocol (NTP) time servers. The NTP100 uses GNSS as a precise time source, so events may be timed accurately.

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Installation

Operating Environment

The NTP100 is not water or moisture proof and is designed for indoor use only. Treat it as you would any other delicate electronic device and do not expose it to water, excessive heat or physical abuse. Please see the "Specifications" section.

GPS Antenna and Cable (model NTP100-GPS, GPS/GNSS, and GPS-HS only)

The NTP100-GPS or NTP100-GPS-HS requires a pre-amplified antenna. It provides +3 VDC via the center pin of the coaxial cable/connector for remote power to the antenna. An internal jumper for +5 VDC antenna can be used. Contact Masterclock before changing this jumper.

[WARNING: Attaching a passive (non pre-amplified) antenna to the NTP100 could destroy the GPS receiver module. This is a major repair cost which is not covered by warranty.]

The unit is tested and shipped with the appropriate cable for the antenna that was ordered. Should you require a longer antenna cable we recommend that you contact MC so that a properly matched cable and antenna can be supplied.

Although changing the GPS antenna or coaxial cable is not technically difficult, you are on your own should you decide to make such changes. We do not warrant or support operation with any hardware not installed or supplied by us.

The coaxial cable should not be crushed, crimped or bent at a sharp angle nor should it be strained by pulling. Any damage to the cable could result in the NTP100-GPS not functioning properly. If the cable is to be coiled for storage, the coil diameter should be at least 6".

Antenna Location

Depending on the type of building where the NTP100-GPS or GPS/GNSS is located and obstructions that may block reception of signals from the GPS satellites, the antenna may have to be located where it has an unobstructed view of the sky. In some cases this can be accomplished by placing the antenna adjacent to a window. However, in most cases it will require mounting the antenna outside of the building or on a roof. In the worse case, the basic requirement for assured system operation is that the antenna has a clear and unobstructed view of the sky for initial satellite acquisition and lock. It is possible that the system will operate indoors and under other obstructions however this can only be determined empirically; it is not guaranteed.

If a longer cable is required, cables of various lengths (up to 500 feet) with pre-amplified antennas are available from Masterclock, Inc.

[Note: bringing the NTP100-GPS, GPS/GNSS or GPS-HS up for the first time with an indoor antenna may prevent or significantly increase the time to first fix.]

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Pre-Installation Checklist

Before installing an NTP100 one should be prepared with the following basic configuration information that the device will require. It may be necessary to obtain some or all of this information from a network administrator in your organization.

- IP address
- Gateway (router)
- Net mask
- Domain Name Servers

- Or –

- Confirm availability of DHCP/BOOTP server (for dynamic networking configuration)

All Masterclock, Inc. network appliances can be provided with a verbose name. The name is not used for any internal purpose by the NTP100 and is arbitrary. It may be useful for organizing and managing devices once installed at a facility. By default, device names are the product name abbreviation followed by the device's Ethernet address (MAC address). Customers may wish to designate names relating to their own organizational requirements. It is recommended that a robust naming scheme be developed before devices are installed to different locations within an organization.

Network Security/Topology Considerations

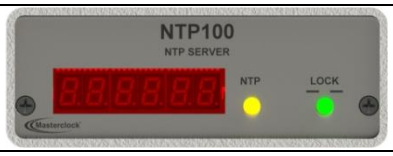
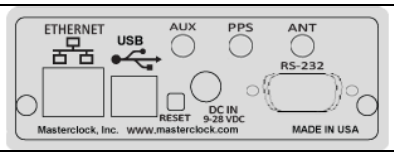
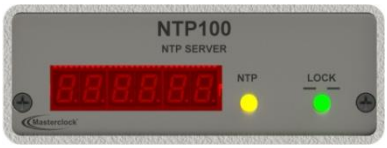
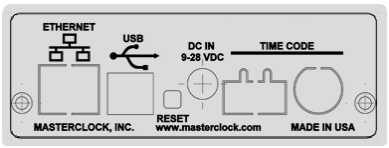
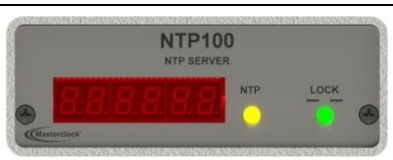
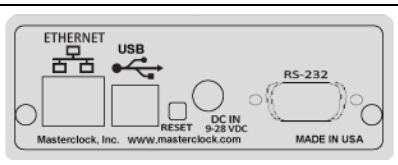
Networks separated by physical routers will often block UDP broadcasts preventing *WinDiscovery* from locating devices on a remote network. Under such circumstances, *WinDiscovery* must be operated from a computer within the remote network or routers separating the networks must be configured to pass through (both directions) UDP broadcasts on port 6163. Consult your network administrator for additional information.

Personal computer firewall applications, such as ZoneAlarm™ , BlackICE™, or the Windows firewall may also prevent *WinDiscovery* from operating correctly. Configure the firewall to allow bi-direction UDP traffic on ports 6163, 6263, 6170, 6171, 6172 or 6173.

Quick Start Information

Initial I/O Connections and Operation

Refer to the table below and begin your installation at the step indicated for your NTP100 model number.

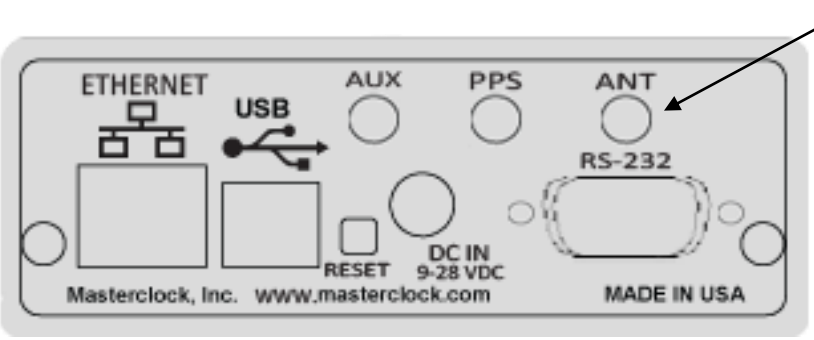
MODEL	Front Panel View	Rear Panel View	Begin at
NTP100-GPS **NTP100-GPS-HS** **&** **NTP100-GPS/GNSS**			**STEP 1**
NTP100-TC			**STEP 3**
NTP100-OSC **&** **NTP100-OSC-HS**			**STEP 4**

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Model NTP100-GPS (GPS/GNSS & GPS-HS)

1. Locate the antenna in a suitable area so that the top of the antenna module has a clear view of the sky. Do not move it until after the NTP100-GPS has achieved satellite lock (explained below). Route the antenna cable to the location of the NTP100-GPS

2. Connect the antenna cable coaxial connector to the gold SMA connector on the rear of the unit (labeled *ANT*).

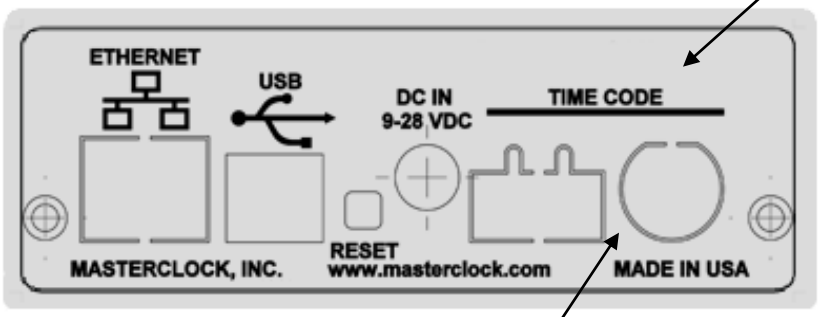


NTP100-GPS Rear View

Continue at step 4

Model NTP100-TC

3. Connect the time code signal cable to BNC female connector on the rear of the unit (labeled *Time Code Input*), and then to a valid UTC referenced time code signal source.



NTP100-TC Rear View

Un-balanced Signal: Connect the BNC coaxial cable (not included) to the BNC connector, located on the back panel.

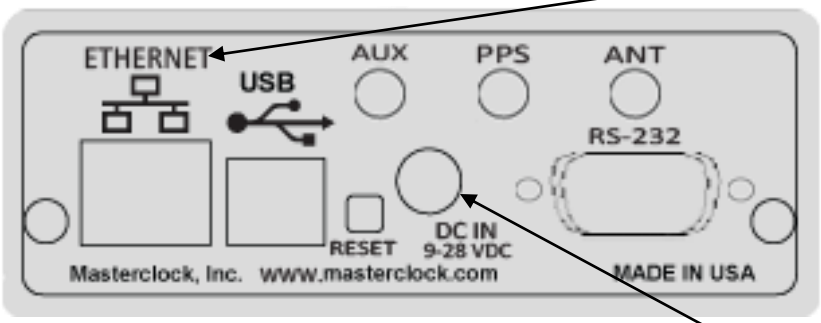
[Note: By default, the NTP100-TC assumes balanced date is encoded in the incoming time code signal and the time is UTC referenced time. Assumes date and year information is in one of the following formats: SMPTE – Leitch date encoding, IRIG B/B (1) – IEEE1344 day of year and year. WinDiscovery or telnet can be used to change this configuration.

Continue at step 4

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All NTP100 Models

4. Connect an RJ-45 10-baseT Ethernet cable to the female RJ-45 connector on the rear of the unit (labeled *Ethernet*), and then to a hub or switch on your Ethernet network.



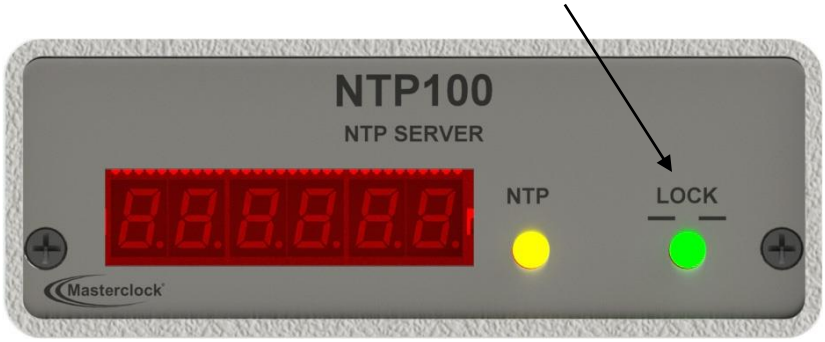
NTP100- Rear View, Common to all models-

Apply power by inserting the power supply module into an appropriate AC power source and the power connector into the male Switchcraft-style locking power socket on the rear of the unit (labeled *DC IN*).

5. If desired the unit can be operated from a nominal 12 VDC battery (9-18 VDC range). Observe voltage polarity as indicated on the rear panel (the center pin is positive +VDC, and is labeled 9 -28VDC).

6. When power is first applied the initial sequence of the front panel LED is:
   - amber and green LEDs on briefly, with time display showing 88:88:88
   - all LEDs extinguish briefly
   - amber (NTP) LED out, green (Status) LED steady on
   - green (Status) LED begins twice per second blink, with time display incrementing the seconds' digit once per second (indicating locked to internal TCXO oscillator , and acquiring lock to an external source, if applicable).

   - Green (Status) LED begins to blink once per second and time display increments the seconds' digit once per second when synchronized to an external reference source, if applicable.



NTP100- Front Panel, Common to all models

[Note: when configured to obtain network configuration through DHCP, the display may hesitate on startup while DHCP is resolved.] It typically takes 15-30 seconds for initialization of the network to complete.

At this time the NTP100 can be communicated with over the local network using the WinDiscovery application. WinDiscovery can find and identify the NTP100 through the exchange of broadcast messages even when TCP/IP networking parameters are not configured on the same network.

Once the NTP100 has a valid network configuration and the IP address of the unit is known, it can also be accessed via Telnet by computers in the same logical network.

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Start-Up and GPS Satellite Acquisition (model NTP100-GPS, GPS/GNSS & GPS-HS)

When the NTP100-GPS is initially powered up, after having been shipped to a new location, the time to first fix (time the unit takes to acquire satellites and extract correct time) could be up to 45-60 minutes although it is typically 1 - 5 minutes. Factors such as atmospheric conditions, type of antenna, antenna location, and antenna cable length will affect the time to first fix.

The NTP100-GPS's navigation module is connected to a backup battery that maintains startup data when the unit is powered down. If, when starting up, the location, time and number of satellites that the unit can receive have not changed significantly since last power down, then the unit will start up much faster.

Start-Up and Time Code Acquisition (model NTP100-TC)

When the NTP100-TC is initially powered up, after having been shipped to a new location, the time to first fix (time the unit takes to detect, acquire, decode, gain adjust time code and extract correct time) could be up to 90 seconds although it is typically 30 seconds or less. Factors such as the time code input signal level, time code signal type, time code cable length and type, and system noise, will affect the time to first fix.

Input Impedance

The input impedance for the Masterclock TC time code decoder circuit is considered to be relatively high , typically >100kOhm. This high input impedance allows for connecting multiple Masterclock TCR load devices in parallel without loading and/or distorting the time code input signal.

Input Level

The input level is controlled via an automatic gain control circuit. The NTP100-TC firmware will automatically determine the appropriate gain control setting for your incoming time code dB level.

The NTP100-TC cannot adjust for time code signal levels outside the range of -15 and +20dB.

The NTP100-TC typically requires up to 30 seconds completing automatic gain control when decoding SMPTE or IRIG-B/B1. When proper gain control has been achieved the incoming time code type and raw time code should be read and displayed on the status screen in WinDiscovery, and the front panel status LED on the card will blink once per second.

Time Code Input Select

The NTP100-TC will automatically detect which format of time code is being provided upon initial power up with a valid time code source, or if the time code input is varied. No user -programmable hardware or software adjustments are necessary.

The NTP100-TC contains a time code decoder circuit which is designed to auto detect and decode time code information along with date information from the following date encoded time code formats:

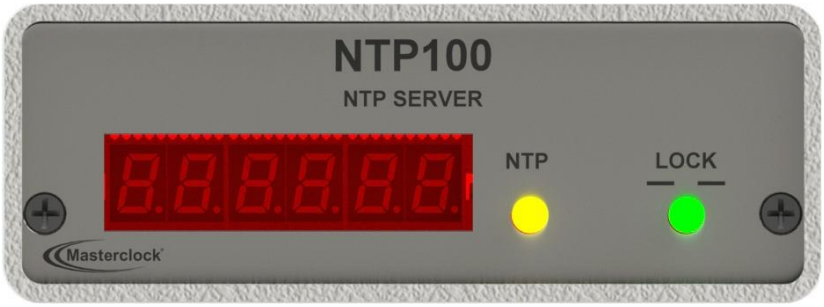
- SMPTE (30/25/25 fps) to Leitch Date Encoding Standard,
- IRIG-B pulse width coded (unmodulated) DC, to IEEE 1344 standard,
- IRIG-B(1) 1 kHz Amplitude Modulated, IEEE 1344 standard

Note: The time code input and date information is required and expected to be UTC. Time zone and/or Daylight Saving Time Offset can be configured by the customer.

In addition, the NTP100-TC has a special provision to support non-date encoded SMPTE or IRIG-B/B (1) time code. The NTP100-TC contains a feature to set/overwrite the date or year manually by writing this information to the battery backed real-time clock. When selected, this allows the user to either ignore the date/year information from the time code signal, or to provide a date/year for SMPTE (date) or IRIG-B/B (1) (year) time code formats without this information in the time code signal.

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Front-Panel Behavior



NTP100- Front Panel, Common to all models

The 6 digit LED time display shows the current time (referenced to UTC) available to the NTP100.

The green LED displays synchronization status with the internal time reference. When the LED is blinking at a twice per second rate it indicates that the NTP100 is not synchronized with an external reference such as GPS or time code. Once synchronized to the external reference, the green LED will blink at a once per second rate.

The amber LED light pulses briefly when an NTP request is serviced. This is provided as a general indication of when and how frequently NTP requests are being processed.

Major Feature Overview

The features discussed in this section can be configured in several ways - the WinDiscovery software application provided with your NTP100, or a terminal-style interface accessible via Telnet. Consult the section entitled Configuration for details on how to adjust settings through the aforementioned mediums.

DHCP/BOOTP Auto-Configuration

DHCP (Dynamic Host Configuration Protocol) is a mechanism for automating the configuration of networked devices that use TCP/IP. When DHCP is enabled, DHCP configuration acquisition will overwrite any manual configuration items. A precursor to DHCP is BOOTP. The NTP100 can obtain configuration from a BOOTP server when no DHCP server is present. *Factory default: DHCP enabled.*

The following RFC2132-defined optional configuration items are, when available, used by the NTP100 for configuration purposes:

Option	No.	Comments
Router	3	The first IP address provided will be used for router/gateway configuration.
Domain Name Server	6	One server IP address may be specified. NTP100 will treat address as primary DNS servers.

[WARNING: An NTP100 will not function properly if configured to use DHCP services when no DHCP server is present on the network.]

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NTP Addressing Modes

Unicast

The NTP100 supports the unicast method of NTP packets transfer. Unicast method involves direct transfer of requested information from the NTP server to the NTP client based on a query or NTP time request. The unicast method is supported simultaneously when either the broadcast or multicast modes are selected.

Broadcast

The NTP100 supports the broadcasting of NTP packets. This feature is useful in situation where network administration may wish to avoid the network traffic created by a large number of clients making periodic NTP requests, or in situations where such periodic requests end up synchronized is such a manner as to exceed the NTP100's ability to reply. The broadcast mode is a widespread or open-ended broadcast, not intended for any specific IP address.

The NTP100 provides NTP [UDP] broadcasts using the broadcast address [255.255.255.255].

Note that some firewalls and routers will not forward UDP broadcasts by default. Security configurations may need to be adjusted to allow the UDP broadcast packets to pass on the configured port.

Multicast

The NTP100 also supports multicast addressing of NTP packets. As opposed to broadcast mode, which is a widespread or open-ended broadcast of NTP packets whereby, data is sent to every possible receiver (client),. Multicasting is useful because it conserves bandwidth. It does this by replicating packets only as needed within the network to send them only to receivers (clients) that want them, thereby not transmitting unnecessary packets.

The concept of a group is crucial to multicasting. Every multicast requires a multicast group; the sender (or source) transmits to the group address, and only members of the group can receive the multicast data. A group is defined by a Class D address.

The NTP100 does not restrict the use of the multicast address assignment and supports the full range of class D multicast addresses or groups from 224.0.0.0 to 239.255.255.255. These groups or class D address ranges for multicasting are defined and governed by RFC3171, *IANA IPv4 Multicast Guidelines*.

Typically, the multicast address range 224.0.1.0 - 224.0.1.255 (224.0.1/24) [Internetwork Control Block] is utilized for NTP traffic, however, please refer to the RFC3171 for your specific application and implementation.

The Internet Group Management Protocol (IGMP) is a protocol that controls group membership for individual hosts. This protocol only operates in a LAN setting, but is required if you wish to be able to join a multicast group on a host. IGMP is defined in RFC 2236.

Note: Use of the multicast addressing method requires the use of routers & switches and other network devices that support the Internet Group Management Protocol (IGMP). In addition, the IGMP mode must be enabled and configured for multicasting addressing to be implemented properly. The implementation of multicasting addressing is beyond the scope of support available from Masterclock. Please ensure that your network system components are capable of and configured properly for IGMP before utilizing the multicast addressing feature.

Note: You will need to check with your firewall vendor to determine how to enable multicast traffic through a firewall. In addition, you may want to read RFC 2588: IP Multicast and Firewalls.

Any cast

The NTP100 does not currently provide any cast capability.

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Configuration

The NTP100 maintains an internal configuration that defines a number of parameters regarding the unit's operation. These configuration settings include the assigned [static or DHCP] IP address and network settings, assigned device name, operational mode, broadcast parameters, brightness level, assigned stratum levels, telnet access, RTC usage validity during primary reference outages, and password, along with the year, date, & time stored [and incrementing] in the real time clock. The internal configuration is maintained even when power is off.

This information, except for the time/date stored in the RTC, may be reset to the factory default state.

Battery Backed RTC and Configuration

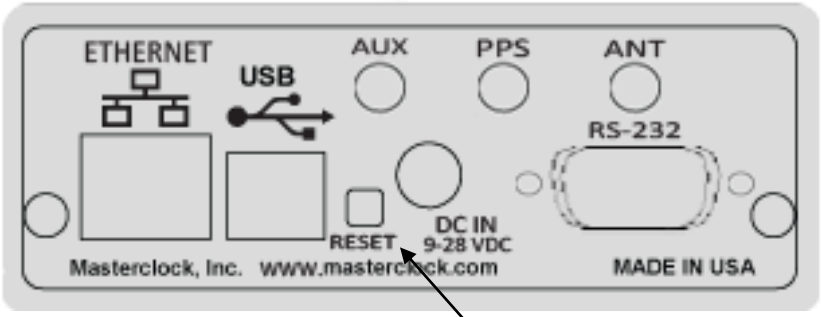
The NTP100 maintains its internal configuration and settings in battery backed memory located on the RTC chip. The battery supplies power to the TCXO 32kHz oscillator and RTC when the unit is powered off. This allows the internal configuration to be maintained and the time and date to increment, when power is off. Under normal operating condition, the memory devices maintaining the RTC data and configuration settings is powered by the external DC power supply and does not rely on the battery for data retention.

The Manganese Lithium battery is a rechargeable maintenance free battery that has an expected lifetime of 10 years.

Note: If the NTP100 does not retain its configuration, or its Date/Time settings (this may be indicated by the front panel time display counting up from 'zero') the battery will likely need replacement. Contact Masterclock for battery replacement.

Reset Factory-Default Configuration

In some situations (such as a lost password or removal of confidential information prior to sending the unit in for maintenance or repair service) it may be necessary to return the NTP100 to its factory default configuration. A recessed button labeled "RESET", located on the back of the NTP100 unit, performs this function. To reset configuration to factory default



NTP100- Rear View, Common to all models-

1) Depress and hold the "RESET" button, continue to depress the "RESET" button until the unit reboots.

2) **Note**: A momentary press of the reset button will display the current IP address of the unit.

Default Password

The factory-default password for an NTP100 is: "***public***"

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WinDiscovery

Management Window Settings

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Configuration Methods

Basic operation of the NTP100 is configured via the *WinDiscovery* software supplied with the unit, or via Telnet (or the RS-232 interface for the model(s) NTP100-GPS & NTP100-OSC). Only one configuration method should be used at a time.

WinDiscovery

WinDiscovery is an application designed to run on Windows XP and newer operating systems (32- or 64-bit). The WinDiscovery application is supplied with the NTP100 device and is used to configure the NTP100 or to review status information. Once configured, the NTP100 does not require WinDiscovery to be running in order to function. To install the *WinDiscovery* application on your server, workstation, or PC, complete the following steps:

1. Insert the WinDiscovery CD that shipped with your NTP100 or download the latest version from the support area of www.masterclock.com
2. If AutoRun is enabled on your PC the Installshield Wizard installation will begin automatically. Otherwise, browse to the CD root directory and run the 'setup.exe' application.
3. Select the installation options by selecting either the standard or custom installation. By default the standard installation will install all user manuals and application notes along with the WinDiscovery application. The custom installation will allow the optional installation of the user manuals and application notes.
4. By default, the setup utility will suggest installing files to C:\Program Files\Masterclock\WinDiscovery. (Another path may be selected if desired.)

Potential Communication Problems

Networks separated by physical routers will often block UDP broadcasts preventing WinDiscovery from locating devices on a remote network. Under such circumstances, WinDiscovery must be operated from a computer within the remote network or routers separating the networks must be configured to pass through (both directions) UDP traffic (including broadcasts) on ports 6163, 6263, 6170, 6171, 6172, 6173 and multicast addresses 224.0.1.254, 224.0.0.255.

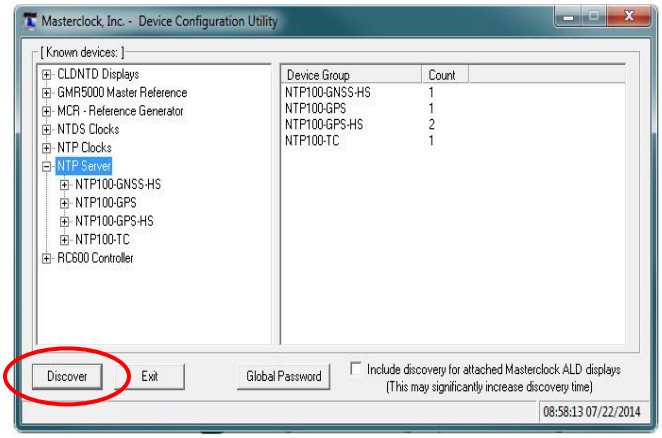
Personal computer firewall applications may also prevent WinDiscovery from operating correctly. Configure the firewall to allow bi-direction UDP traffic on port 6163 or temporarily disable the firewall while using the WinDiscovery application.

Note: Contact your IT department for proper configuration of switch.

Using WinDiscovery



Open WinDiscovery from the "Start Menu" or by double-clicking the shortcut icon on the desktop.



Click the [**Discover**] button to reveal all the devices accessible on the network. The status bar will display the count of devices found. When complete (please wait until '100%' appears then disappears), a list of **device families and groups** will be displayed in the **left pane** of the ***WinDiscovery*** window.

Click the [+] buttons to reveal the individual devices. Click the [-] buttons to hide them.

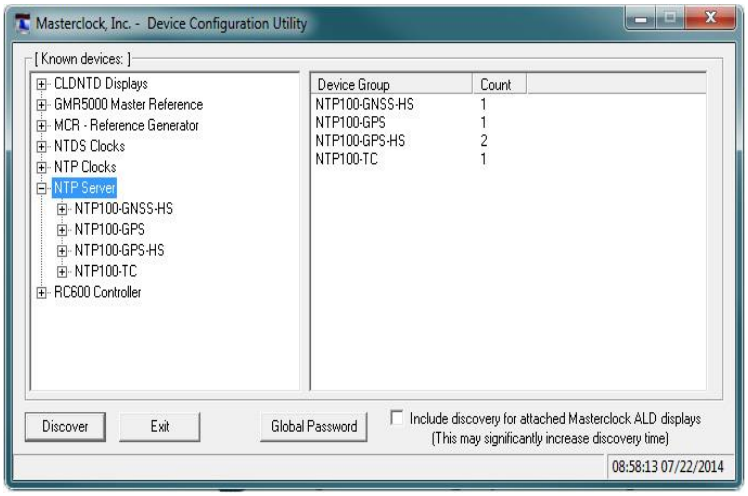
Each device is configured with a **device name** from the factory. Each device name includes the model name and a MAC address extension.

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You should change the device name to one that can identify the location of the device.

It is highly recommended that only one user opens **WinDiscovery** at a time. Other methods should not be used to manage the network devices while using this app. In the event of WinDiscovery crash issue, set to Windows XP compatibility mode.

Clicking on any device group will list in the right pane of the WinDiscovery window all devices of that type found. Only the devices shown in the right window can be managed. To configure another device group, click on the device name in the left window and the device names will then appear in the right window, ready to be managed.



MENU

To open a **Menu of Options** window**,** including **Properties and Device Settings**, right click the device name.

Or

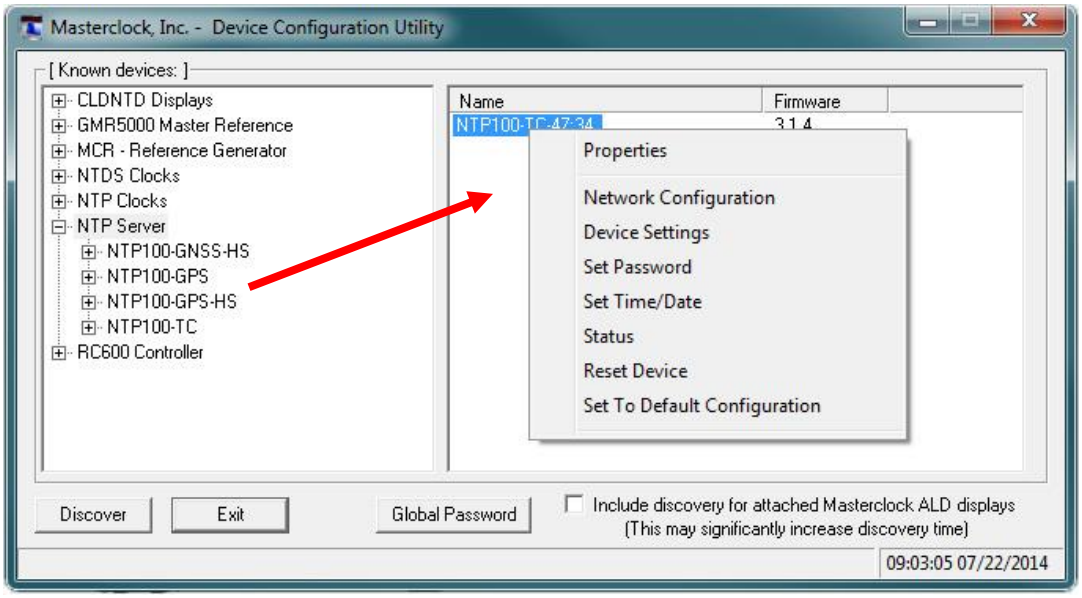
To open the **Device Settings** window, left click the device name.

Both options will be covered in the following instructions.

To configure and manage a device shown in the right window, double click or right mouse click the device name and a menu appears. The current choices are:

- Properties
- Network Configuration
- Device Settings
- Set Password
- Set Time
- Status
- Reset Device
- Set To Default Configuration

Below: This menu appears following a right click to the device name.

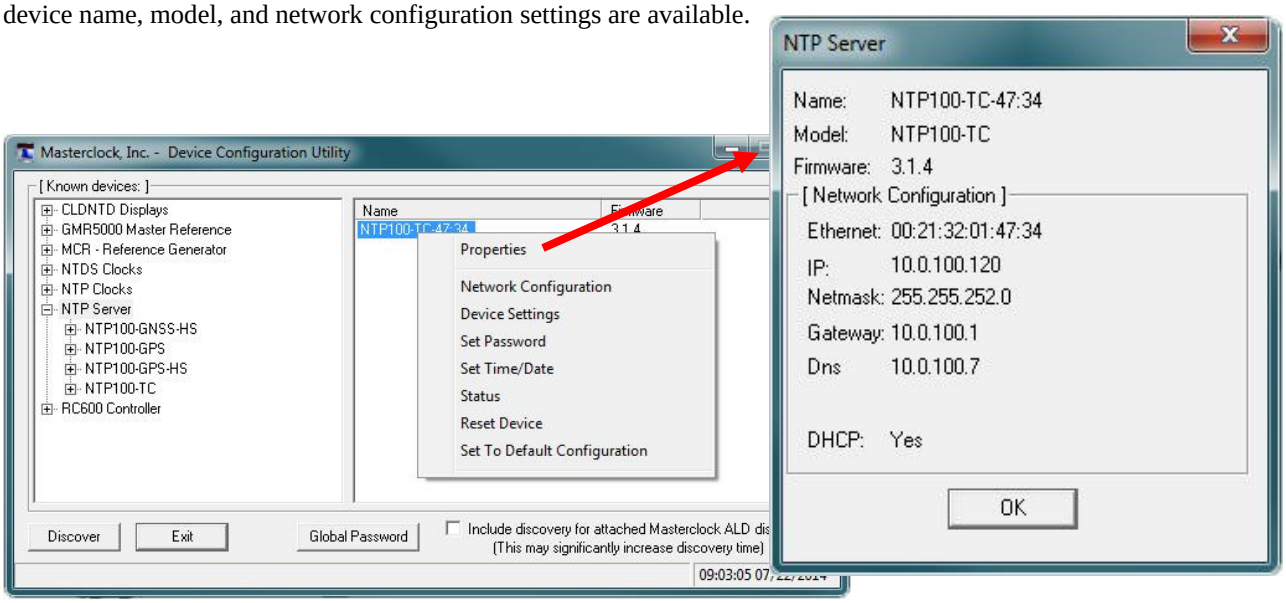


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Clicking a menu choice opens a new window for that function. When working in the management windows, use the *Save* and *OK* button to accept changes that you have made. Use the *Cancel* button to exit the screen without applying changes. **NOTE**: *Cancel* does not undo changes that have been saved using the *Save* button.

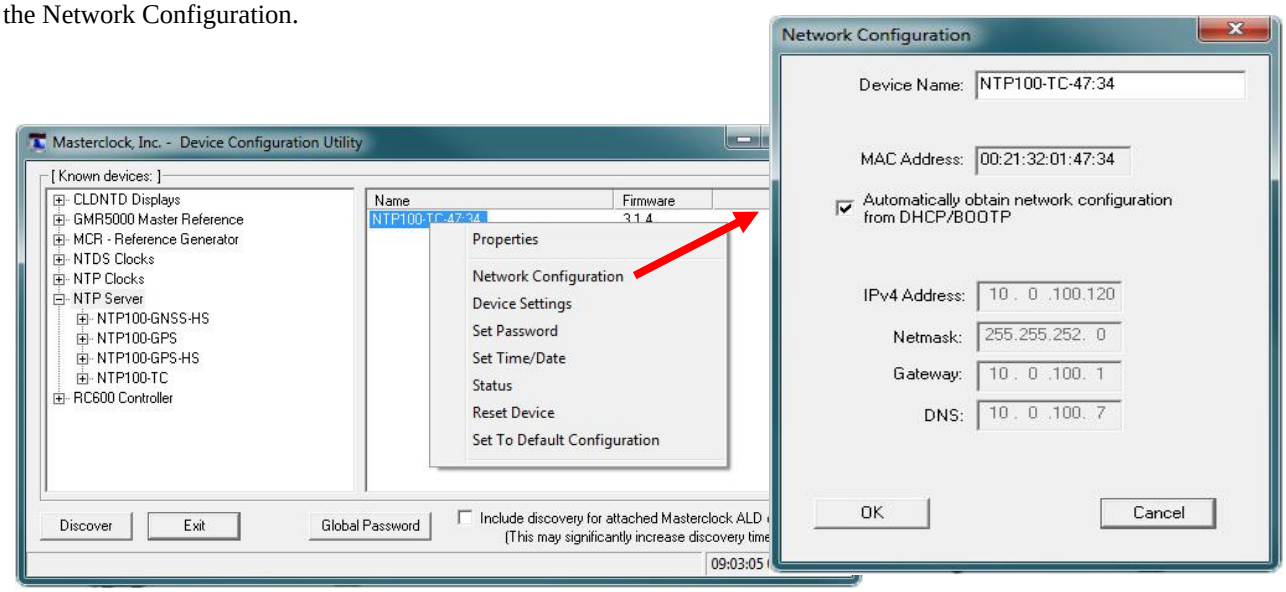
Properties

The properties of the NTP100 device of interest can be viewed in summary form, using this selection. Under "Properties" the device name, model, and network configuration settings are available.



Network Configuration

The network configuration must be established for the NTP100 to be accessible to the network. You must be a network administrator or have their support to complete these functions. Your network administrator determines the information for the Network Configuration.



[Note: The default factory setting for network configuration is to use DHCP/BOOTP.]

[Note: If a DHCP server cannot be found on the network by the NTD clock, the IP address will be assigned a fallback IP address of 169.254.xxx.xxx]

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To utilize static IP addressing, de-select the checkbox for "Automatically obtain network configuration from DHCP/BOOTP". You must enter the IP address, Netmask, Gateway, Primary DNS, and may enter a Secondary DNS.

[Note: The static IP address you enter must not be in use by another device on the network, this includes IP address ranges reserved for use by the DHCP server. If a static IP address is used which creates a duplicate IP address condition, the network clock will be re-assigned a fallback IP address of 169.254.xxx.xxx]

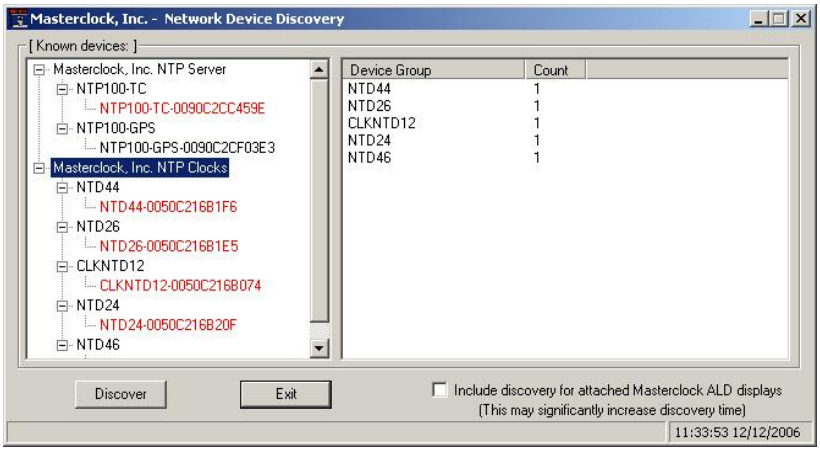
169.254.xxx.xxx IP (fallback) address

DHCP is enabled by default. If DHCP is enabled and no DHCP server can be found the NTP100 will default to a 169.254.xxx.xxx address.

In addition, if an IP address conflict is determined when the Ethernet interface is initialized (either DHCP or static) the NTP100 will default to a 169.254.xxx.xxx address.

This 169.254.xxx.xxx is a link local address range (i.e. not allowed on the internet) and is used when DHCP clients cannot find a DHCP server.

[Note: Devices which have been assigned a fallback IP address of 169.254.xxx.xxx will be displayed in the main WinDiscovery window with RED text, indicating a problem with the configuration.]



Device Name

Each clock is programmed at the factory with a factory device name. This name includes the model name and a "MAC address" extension.

[Hint: You can change the device name to one convenient for your site – preferably one that helps you to later identify the exact physical location of the device.]

Administrative Hub

[Note: the Administrative Hub configuration item is reserved for future use.]

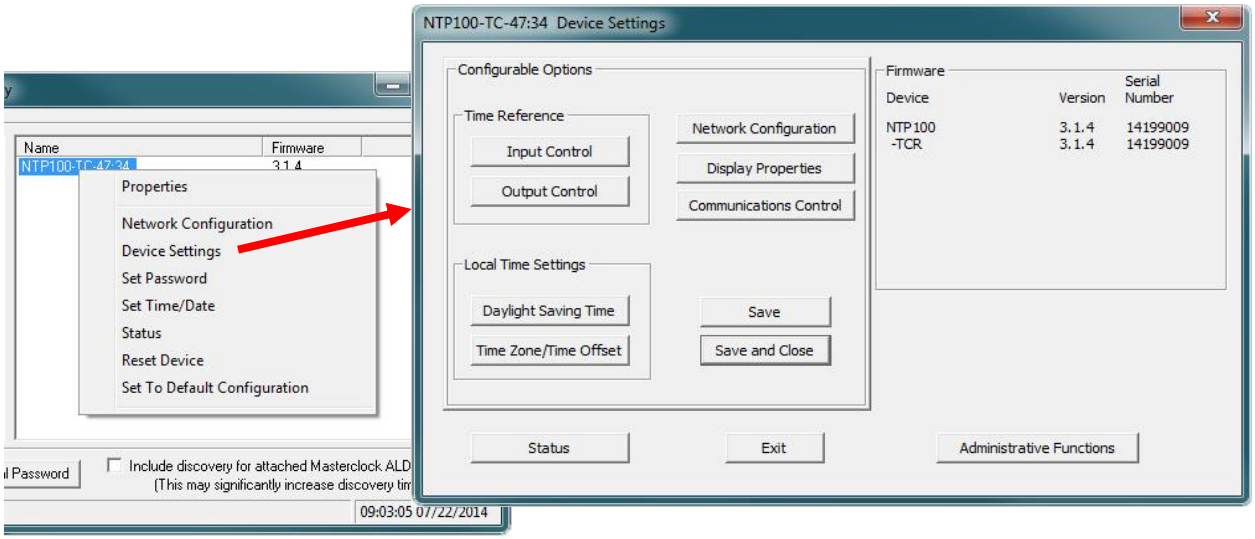
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Device Settings

The "**Device Settings**" window is the same one that appears with a left double-click of the device on the "Network Discovery" window**.**

The Device Settings window configures the NTP100 to receive and display in the format that you prefer, using Time Zone offsets and Daylight Saving Time (DST) settings to completely customize it relative to UTC time.

The top right section of the "Device Settings" window shows a list of the firmware and options associated with your NTP100.

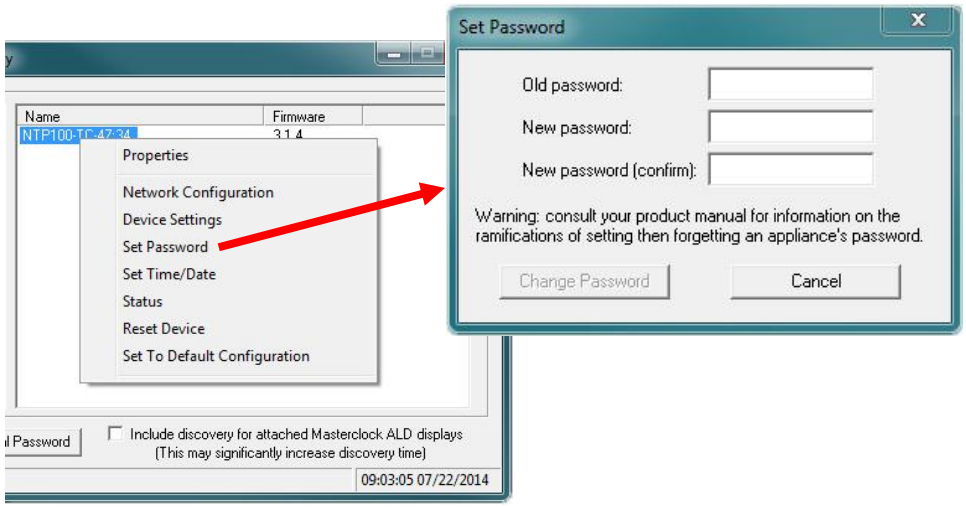


The rest of the "Device Settings" window includes access to all configuration options for the network. These include time reference inputs and outputs, display properties, communication control and administrative functions, such as password. There is also a status display to monitor remote devices from your computer screen using the WinDiscovery software application.

Any changes made in this window, including all the buttons thereon, will not be applied until you click the [**Save**] button, or the [**Save and Close**] button, prior to clicking the [**Exit**] button.

Set Password

Set/reset the password controlling access to the NTP100's configuration.



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A password can be a maximum of 10 characters and may contain any sequence of letters, numbers, and common punctuation. Passwords are case-sensitive.

WARNING: If the password is lost, the user must reset the NTP100 using the Reset button on the rear of the unit. This will cause the unit to return all configurations to factory-default settings.

WinDiscovery will not remember or store the password (s) after the session is closed. It is important for the user/system administrator to maintain passwords in a safe place.

Note: the factory default password is: "public"

When a password is set for a device, each time you click OK or Apply for that device you will be asked for the password. You may create a unique password for each device. You may enable the 'Remember this password for the session' checkbox to eliminate typing the password for each configuration change.

[Note: each device listed can have a unique password associated with it, which will default to the factory default password. You must enable the "Remember this password for the session' checkbox for each device that is being configured.]



If you enter the wrong password and selected the "remember password" checkbox, you will receive an error upon selecting OK or Apply to any configuration changes. You can close the WinDiscovery session to "forget" the password(s), however this will require entering the password again for each device. Alternately, you can remove the incorrect password entry during a WinDiscovery session by going to the right click menu for the device and selecting Forget memorized password option. This option will be added to the right click list and will only be displayed if a password is memorized.



[Hint: To remove password protection for a device, select the Set Password command. You will be prompted to enter the old password. Enter the old password. Do not enter anything into the New Password or Confirm Password fields. Click Change Password to save. Upon you next session, you will not be prompted for a password for the device.]

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Global Password



The **Global Password** feature allows the user to enter a single password for all NTP devices using the same password. During this session and subsequent sessions of **WinDiscovery**, you will not have to enter the password.

1. Check [**Enable Global Password]**.
2. Type your password.
3. Click [**OK**]

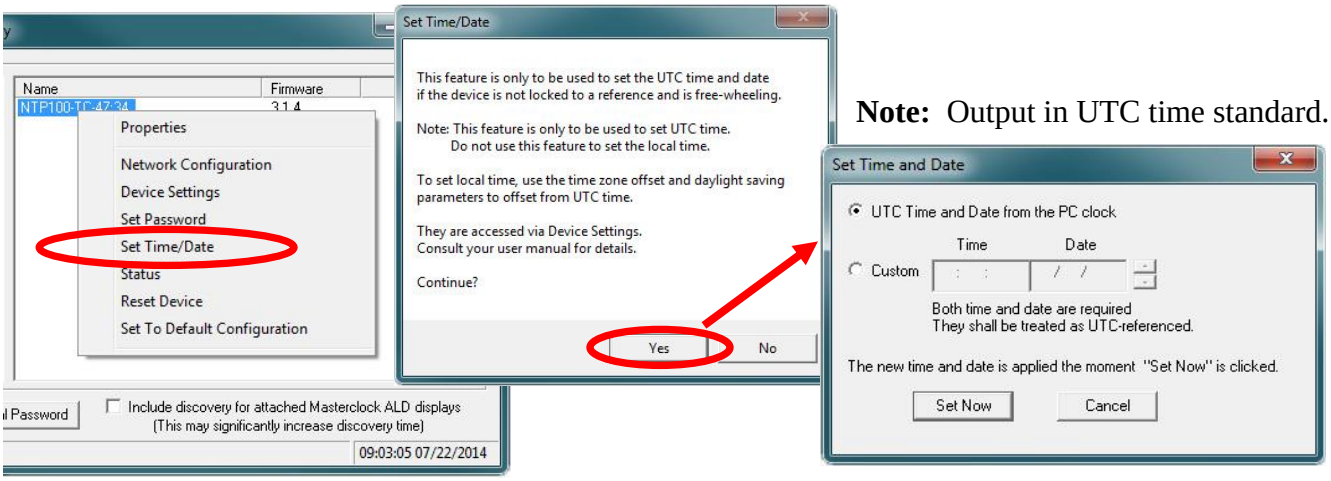
   To disable the Global Password, de-select the [**Enable Global Password]** checkbox and click [**OK**].

The **Global Password** being used must match the password on all the devices being administered. On any new system being installed, the factory default password on all devices is "**public**".

Note: Run program in administration mode if password doesn't retain in WinDiscovery after end of session.

Set Time/Date

Here you may break the link to UTC time to create a custom time. Click this button to reveal a preliminary warning. Read the warning and continue if you wish to create a custom time for your NTP100 by unclicking the [**UTC**] button. By clicking the [**UTC**] button you will return to UTC time.



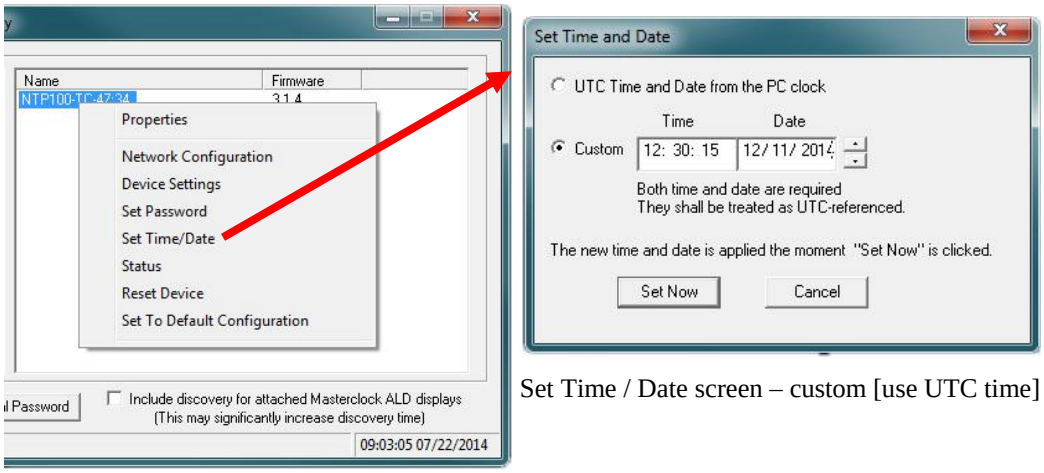
Note: Output in UTC time standard.

The Set Time menu item lets you manually set the time and date for the NTP100. The function may be most useful for demonstration, in lab situations, environments where an external signal is not available. The time for the NTP100 can either be set to the time of the PC or a manual custom time can be entered.

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Model –OSC and –OSC-HS

NTP100-OSC and NTP100-OSC-HS must receive an input time set manually during the initial installation. Both versions will revert to the battery backed RTC and TCXO and maintain <165mS day drift during power down (outages) and/or storage. The high stability version will have a much improved drift rate of <19mS/day, but the overall accuracy of both versions relies heavily on the initial time setting input.

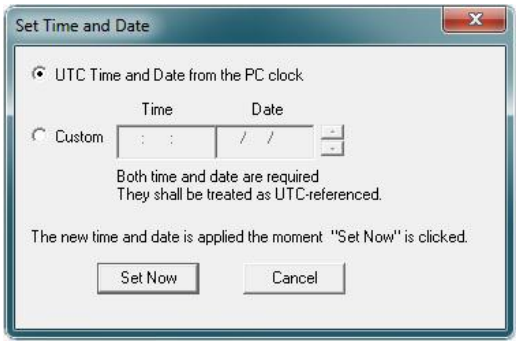


Set Time / Date screen – custom [use UTC time]

To set the time manually it is suggested to use a preset time source for best overall initial accuracy. While either method may be used, the "UTC Time from PC Clock" is recommended over the "Custom" manual entry method.

[Note: for the purpose of maintaining its internal clock, theNTP100 time server always assumes the time entered is UTC and saves this information as the internal UTC time.]

For best results using the "UTC Time from PC Clock" method, first set the time on the PC that WinDiscovery is installed on, using an NTP/SNTP client pointed to either an Internet NTP time server or another reliable NTP100. Immediately follow the time setting of the PC, by selecting the "UTC Time from PC Clock" option, and press the "Set Now" button.



Set Time / Date screen – UTC Time From PC Clock

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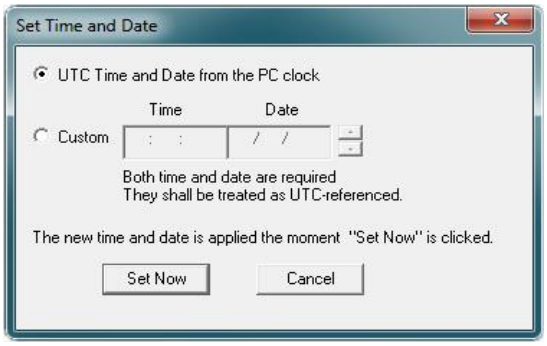
Model –GPS, GPS/GNSS and –GPS-HS

When the NTP100-GPS achieves a GPS satellite fix, the continuous time/date obtained from GPS will automatically overwrite any that is manually established. Therefore, practical ongoing use of this feature requires the NTP100 to be disconnected from its GPS antenna. The GPS models of the NTP100 use the same manually entry methods of Set/Time as the OSC (oscillator) versions, described on pg. 23.

Model -TC

Recommended (Default) Settings

NOTE: If your time code source outputs UTC referenced SMPTE 30/25/24 fps time code to the Leitch date encoded format or IRIG-B/B1 time code to the IEEE 1344 standard, then use factory default setting as shown. This will allow the automatic detection of time, date (or day of year), and year information from the incoming time code signal. This is the normal (factory default) setting.



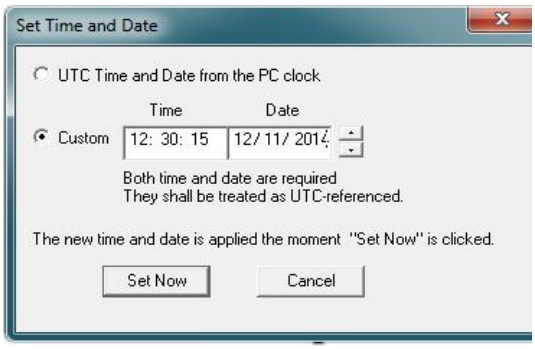
Note: the time of day information will continue to be decoded from the time code signal, and will overwrite the manual entry.

Using the default settings, will allow the automatic detection of time, date (or day of year), and year information from the incoming time code signal. These are the recommended settings.

Date or Year Manual Overwrite Feature

The *date overwrite* feature may be used if the Time Code signal (model –TC) does not contain date encoded time code to either the SMPTE 30/25/24 fps Leitch date format standard or the IRIG-B/B(1) IEEE 1344 standard.

The *year overwrite* feature may be used if the Time Code signal (model –TC) does not contain year information in the IRIG –B/B1 time code to the IEEE 1344 standard. **Note**: the time date /information will continue to be decoded from the time code signal, and will always overwrite the manual entry, unless the user changes the default operation.



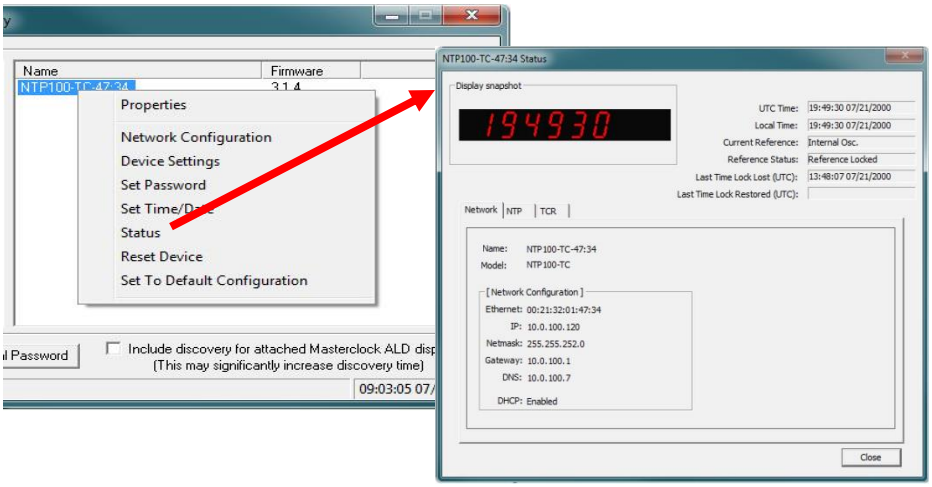
Date overwrite enabled

[Note: for the purpose of refreshing its internal clock, the NTP100 assumes the time and date entered is UTC.]

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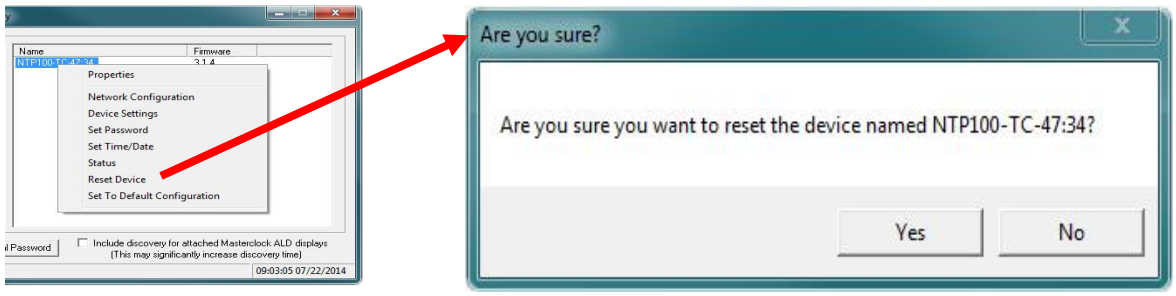
Status

The "**Status**" window includes a "**Display snapshot**" of the NTP100 face. On the right are constantly updated listings of the UTC Time, Local Time, Current Reference, Reference Status, Last Time Lock Lost and Restored (UTC)
.
Below are Network, NTP and TCR tabs. The first lists the name and model number of the unit followed by the network configuration numbers. These would echo the "**Network Configuration**" window figures (page 13). The NTP tab lists whether or not the server and/or client are enabled and various stats about each. The TCR tab indicates timecode received, when timecode is locked, lost, and restored, along with raw timecode. (See pg. 50 for more details on Status)



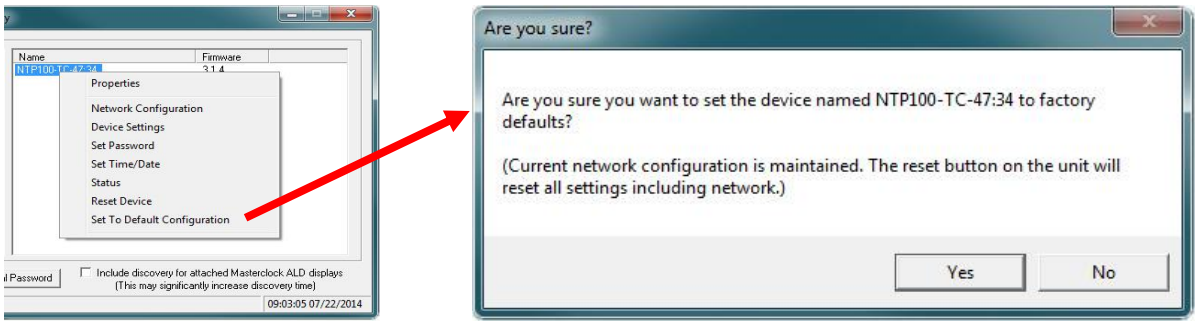
Reset Device

This button brings up the "**Are you sure?**" window. Press the [**Yes**] button and you will "soft reset" your NTP100 to allow the device to clear its current communications buffer and re-initialize its processing, which includes re-requesting of a DHCP address. This feature is intended to allow the user to remotely reset the unit and does not restore the factory default state.



Set To Default Configuration

This button brings up another "**Are you sure?**" window. Press the [**Yes**] button and you will reset your clock back to the factory defaults. No further windows will appear.



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WinDiscovery

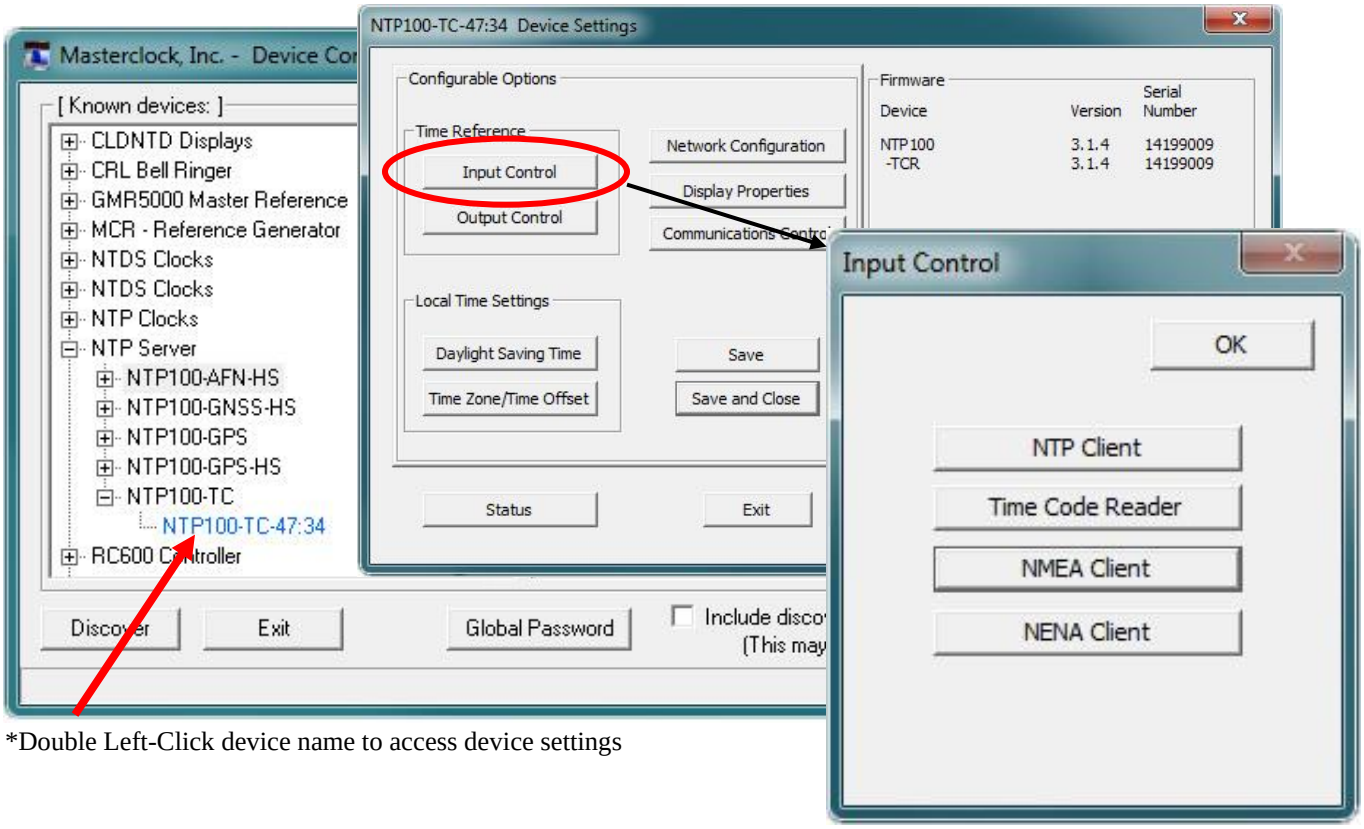
Input & Output Control

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Device Settings – Input Control

The "Device Settings" window includes three sections. In "Configurable options" the [**Input Control**] button takes you to [**NTP Client, Time Code Reader, NMEA Client and NENA Client button**].

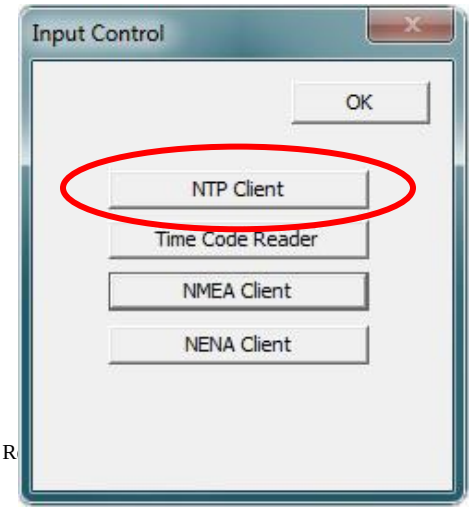
Clicking [**NTP Client]** permits the user to enable or disable the NTP client. If enabled, you can choose Query, Broadcast or Multicast services to receive Time Code. (Details below)



*Double Left-Click device name to access device settings

Clicking [**Time Code Reader]** permits the user to access SMPTE Time Code Settings, IRIG Time Code Settings, Incoming Time Code Reference and Calibration for SMPTE or IRIG. (Details pg. 30)

Clicking [**NMEA] and [NENA Client]** permits the user to enable or disable client. User can select and change Baud, Data Bits, Stop Bits and Parity settings. (Details pg. 30)



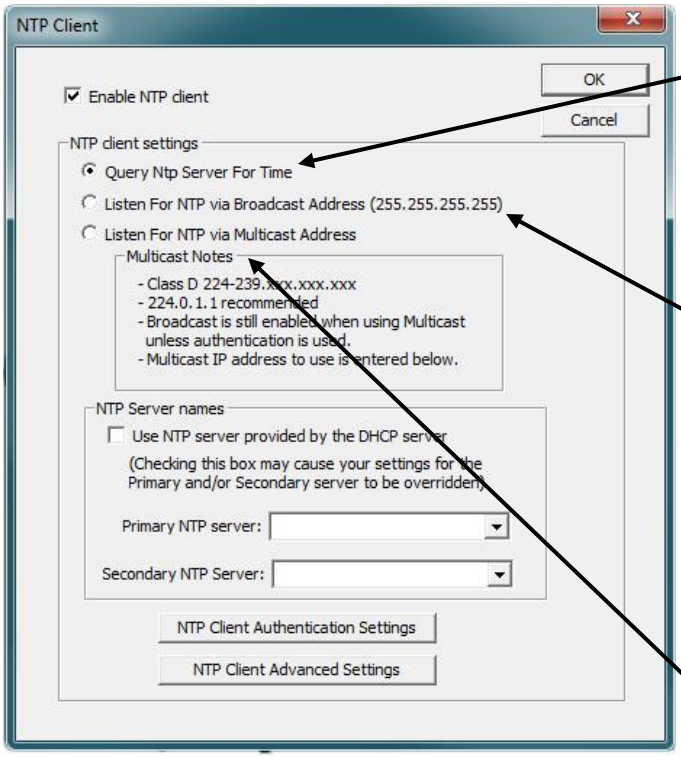
NTP CLIENT

While on the "**Input Control**" window (shown on left), click the [**NTP Client**] button to access settings for the NTP client.

ENABLE NTP CLIENT – is enabled by default. However, it may be desirable to disable the NTP client for certain applications, such as those in which the NTP100 will not reside on a network during typical operation. Deselect "**Enable NTP client**" if desired.

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The network client can be configured to either query the NTP time server at a selected interval, to listen to NTP broadcasts only, or to listen to multicast broadcasts.



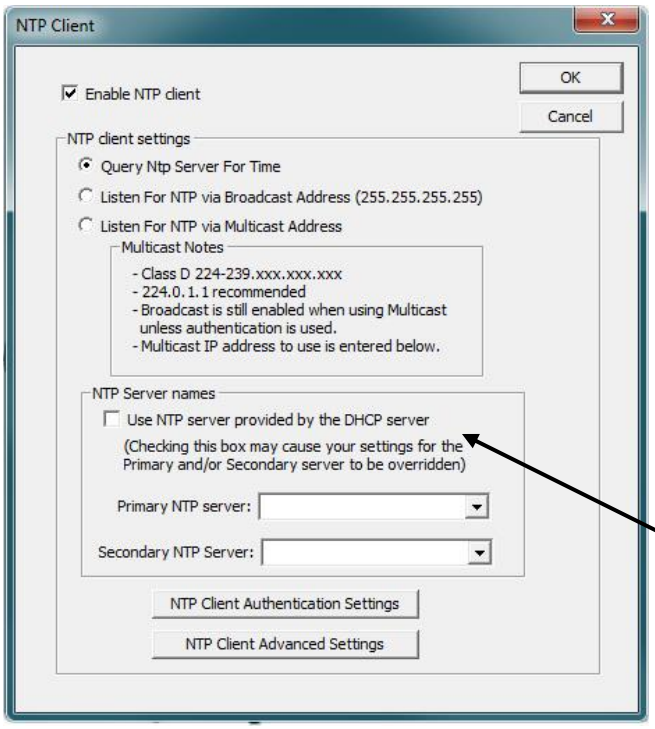
NTP CLIENT SETTINGS

QUERY NTP SERVER FOR TIME – is enabled by default. This is the **unicast** mode. The default configuration is to query the NTP server at 10-second intervals.

LISTEN FOR NTP VIA BROADCAST ADDRESS – The NTP100 can be configured to listen to NTP broadcasts by selecting the **"Listen for NTP via broadcast address [255,255,255,255]"** checkbox. When this is selected, the broadcast timeout period (in seconds) is adjustable. To configure the device to only listen to NTP broadcasts, click the checkbox [**Listen for NTP broadcasts only**] and enter a "**Broadcast/ Multicast Timeout**" in seconds. The default timeout is 3600 seconds (1 hour).

LISTEN FOR NTP VIA MULTICAST ADDRESS – The NTP100 can be set up to listen to NTP using multicast addressing by selecting the "**Listen for NTP via multicast address**" checkbox. When multicast mode is selected, the client will also listen to broadcast messages.

Note: Some NTP/SNTP clients will expect NTP servers to operate on port 123 and cannot be configured to utilize alternate ports.



When enabled, the **Multicast Class D/Group Address** may be specified as well as the frequency that multicast broadcasts will be issued. This can be changed as desired. The NTP client can listen for NTP multicast broadcasts using the full Class D/Group Address range. The NTP client does not restrict the use of the multicast address assignment and supports the full range of Class D multicast addresses or groups from 224.0.0.0 to 239.255.255.255.

These group addresses are defined and governed by **RFC3171, IANA IPv4Multicast Guidelines.**

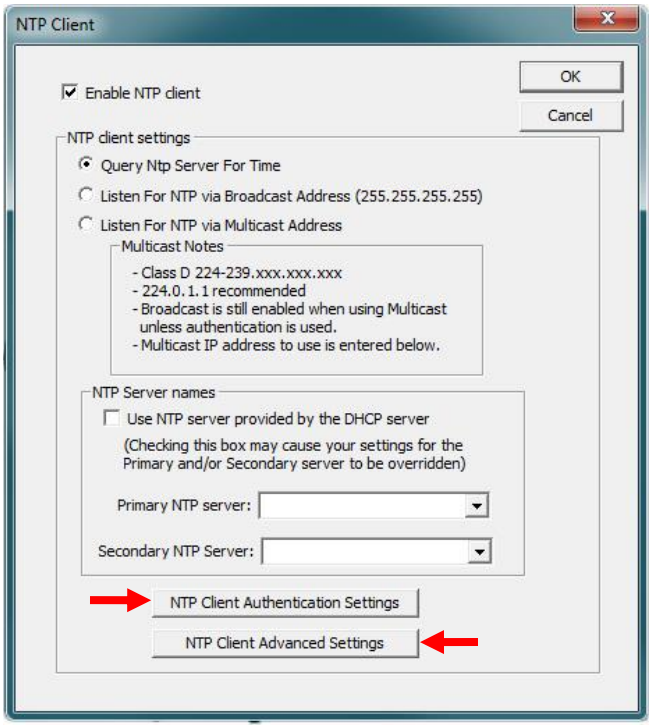
Typically, the multicast address range 224.0.1.0 to 224.0.1.255 is utilized for NTP traffic. Please refer to the **RFC3171** for your specific application.

http://www.rfc-editor.org/rfc/rfc3171.txt

NTP SERVER NAMES – By default the [**Use NTP server provided by the DHCP server]** box is checked and a primary NTP server address is displayed. If you wish to uncheck the box and provide your own server addresses for both primary and secondary servers, do so here.

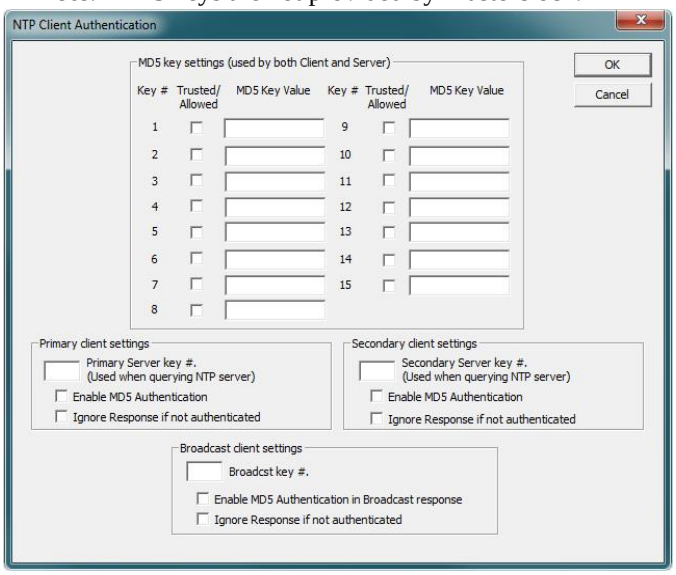
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Note: If using Static IP Address, uncheck box, otherwise unit will reboot after 10 minutes.

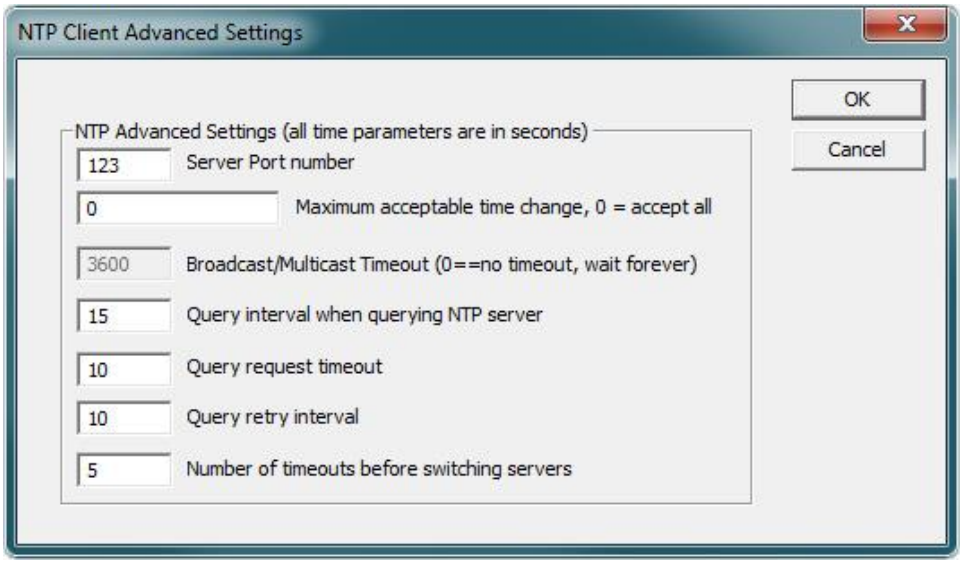


NTP CLIENT AUTHENTICATION SETTINGS – This window permits the entering of up to 15 MD5 key values to be trusted or allowed. Primary client settings permit the entry of a primary server key number, a secondary server key number and a broadcast key number.

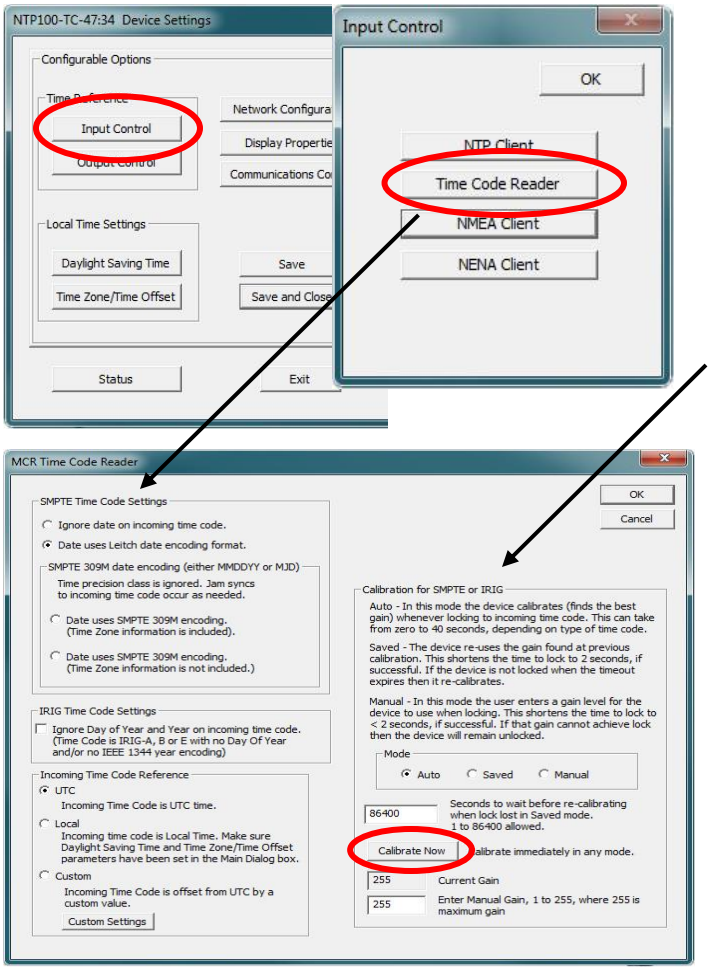
Note: MD5 keys are not provided by Masterclock.



NTP CLIENTADVANCED SETTINGS – Advanced settings allow for the adjustment of additional network communication settings. Under most typical operating circumstances it is not necessary, nor is it suggested, to change the advanced settings options.



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TIME CODE READER

The [**Time Code Reader**] button opens the "MCR Time Code Reader" window and will only operate when a Time Code reader is networked. Choose from the selections offered at lower left and click the [**OK**] button when complete.

Calibration for SMTPE 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.

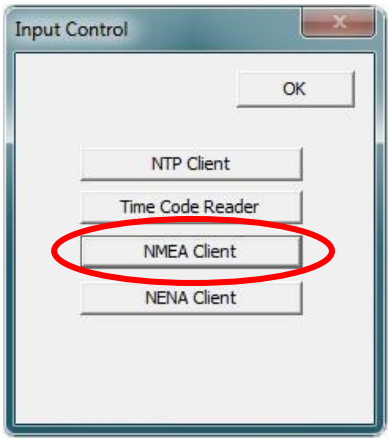
Manual - In this mode, the user enters a gain level for the device to use when locking. If that gain cannot achieve lock, then the device will remain unlocked. There is no timeout period; calibration will not be done for any reason. If the user enters an appropriate gain, then locking occurs in 2 seconds

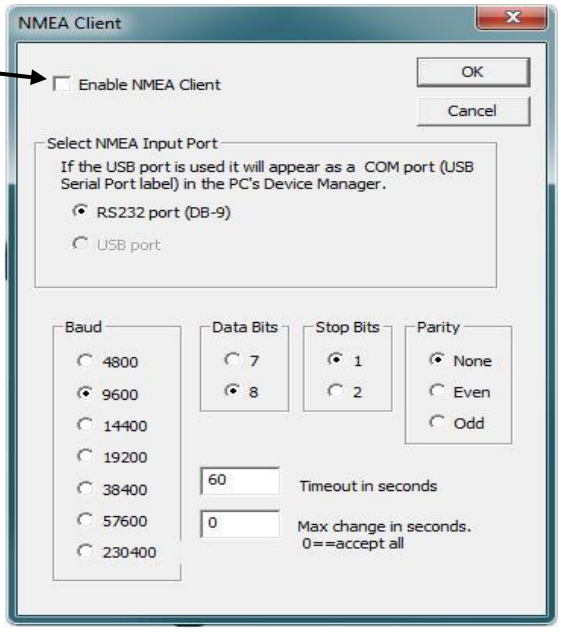
Note: The user must be aware that in Manual Mode he is responsible for gain used.

Calibrate Now - calibrates the time code reader when the user wants to. This is a manual calibration, not to be confused with manual gain. The gain found is put into use at once, and becomes the manual gain level. This can be done in any mode, and the mode does not change.

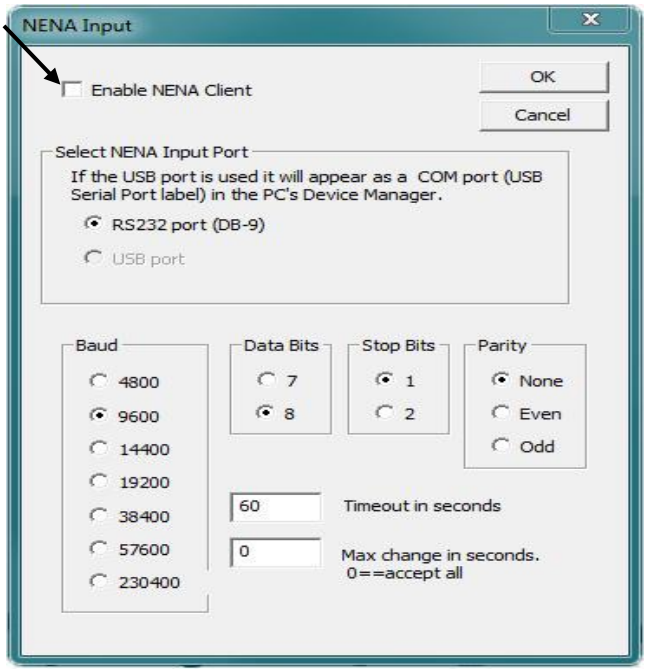
NMEA CLIENT (shown on right)

Click the [**Enable NMEA Client**] button to adjust the "**Port**, **Baud rate**, **Data bits**, **Stop bits**, **Parity**, **Time out** and **Maximum change for NMEA in seconds**" selections.



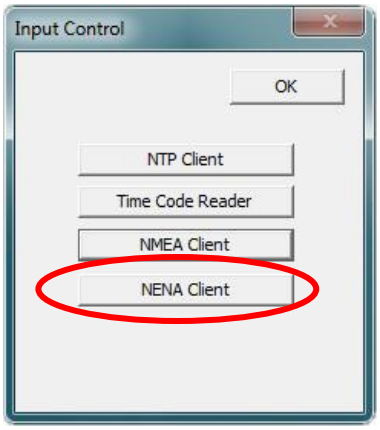


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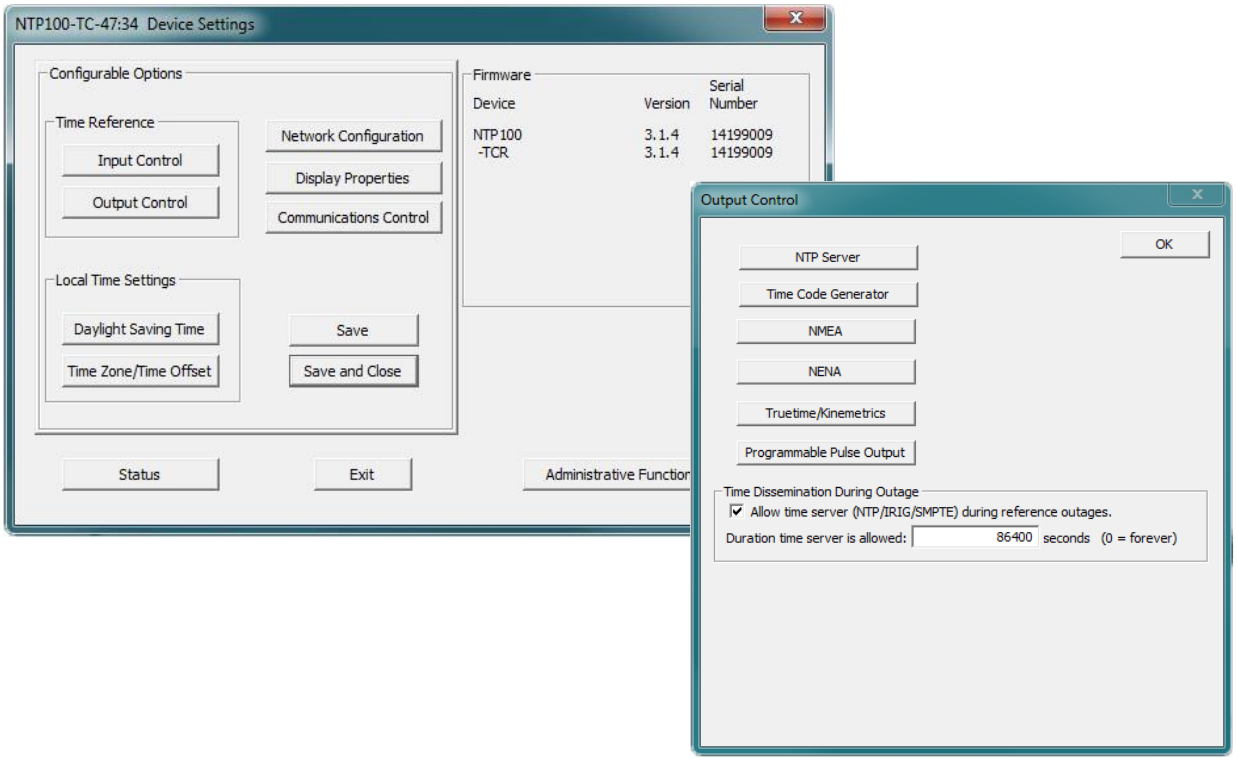
NENA CLIENT (shown on left)

Click the [**Enable NENA Client**] button to adjust the **"Port**, **Baud rate**, **Data bit**s, **Stop bits**, **Parity**, **Time out** and **Maximum change for NENA in seconds**" selections. Yes, the NENA window is virtually identical to the NMEA window.



Device Settings – Output

In "Configurable Options" the [Output Control] button takes you to [NTP Server, Time Code Generator, NMEA, NENA, Truetime/Kinemetrics, and Programmable Pulse Output button].



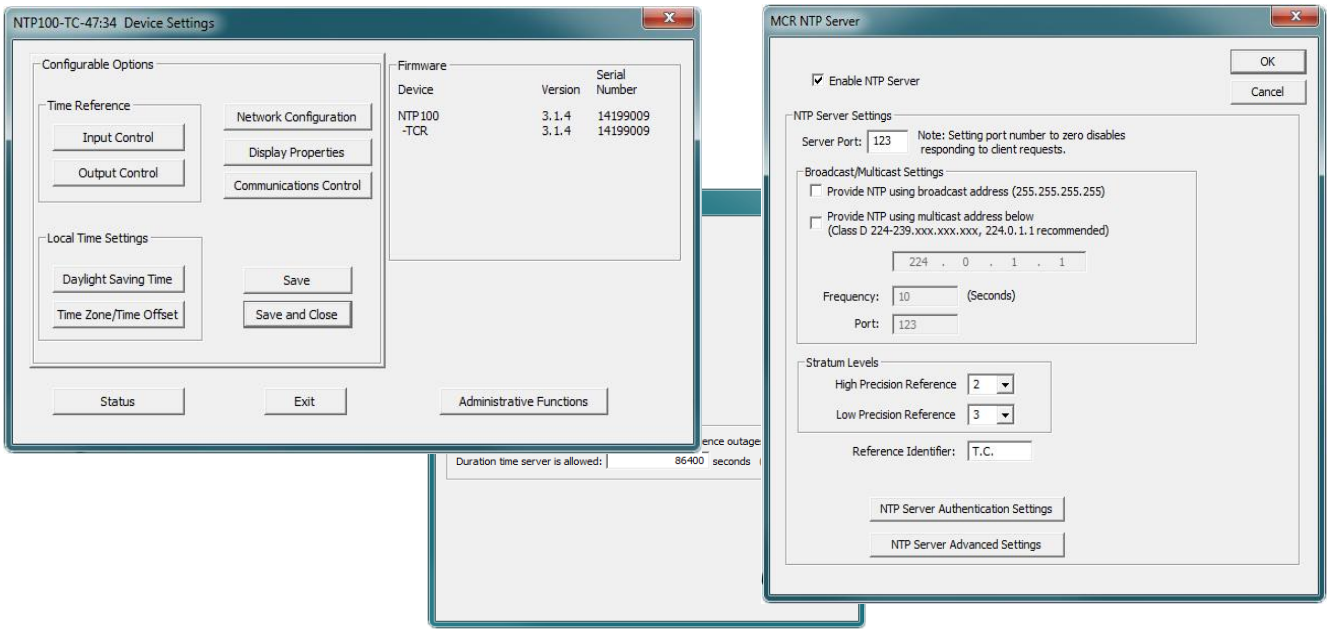
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NTP Server

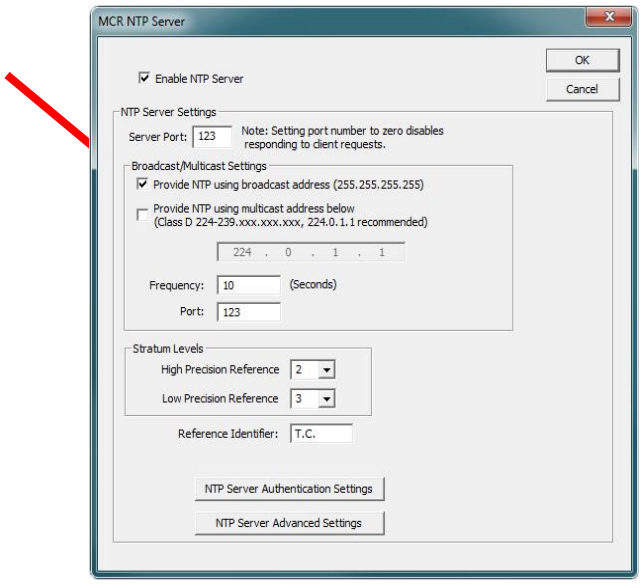
Adjust configurable parameters affecting NTP100 operation using the available NTP Server Settings.
The NTP Server Configuration interface allows for setting the Broadcast/Multicast Parameters, including selecting the mode the NTP100 will serve NTP, setting the multicast address, setting the broadcast frequency and port, as well as for, assigning stratum levels, and access to advanced settings.

Broadcast/Multicast Settings – Allows for setting the NTP mode and parameters of the NTP100 server.

Selecting Unicast Mode for NTP - By default, the NTP100 will operate only in Unicast /Query mode using server port 123 This mode is selected exclusively when neither the provide NTP broadcast nor the provide NTP multicast modes are selected.



Provide NTP broadcasts –. The NTP100 can be set up to provide NTP broadcasts by selecting the "Provide NTP using broadcast address [255,255,255,255]" checkbox. When enabled, the broadcast on/to port may be specified as well as the frequency that broadcasts will be issued. This can be changed as desired. The NTP100 provides NTP broadcasts using the broadcast address [255,255,255,255]



Note: While providing NTP broadcasts, the NTP100 device can also continue to be queried.

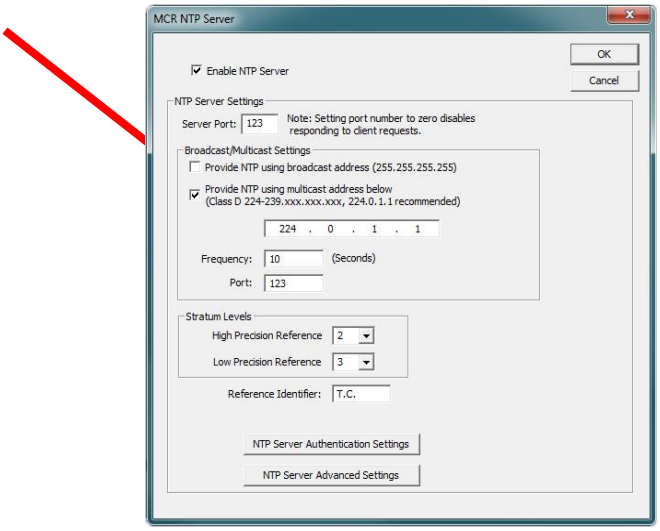
Note: Some NTP/SNTP clients will expect NTP servers to operate on port 123 and cannot be configured to utilize alternate ports.

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Provide Multicast

The NTP100 can be set up to provide NTP using multicast by selecting the "Provide NTP using multicast address below" checkbox. When enabled, the multicast class D / group address may be specified as well as the frequency that multicast broadcasts will be issued. This can be changed as desired. The NTP100 can provide NTP multicast broadcasts using the full class D/ group address range. The NTP100 does not restrict the use of the multicast address assignment and supports the full range of class D multicast addresses or groups from 224.0.0.0 to 239.255.255.255. These groups or class D address ranges for multicasting are defined and governed by RFC3171, *IANA IPv4 Multicast Guidelines*.

Typically, the multicast address range 224.0.1.0 - 224.0.1.255 (224.0.1/24) [Internetwork Control Block] is utilized for NTP traffic, however, please refer to the RFC3171 for your specific application and implementation.

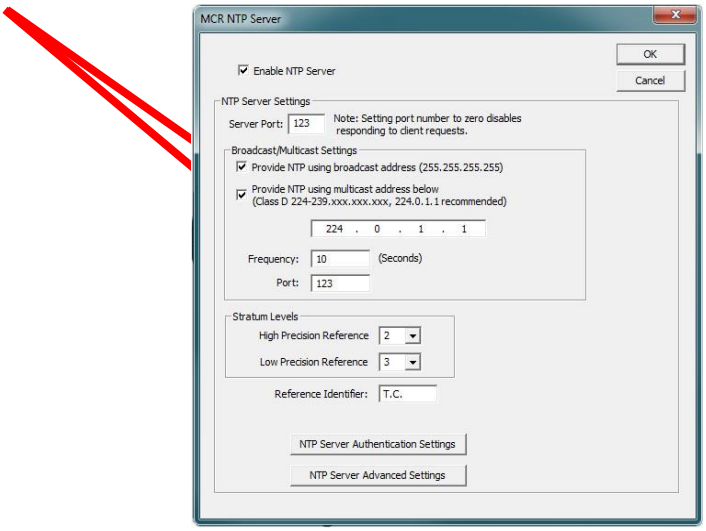


Note: While providing NTP broadcasts, the NTP100 device can also continue to be queried.

Note: Some NTP/SNTP clients will expect NTP servers to operate on port 123 and cannot be configured to utilize alternate ports.

Provide Broadcast and Multicast

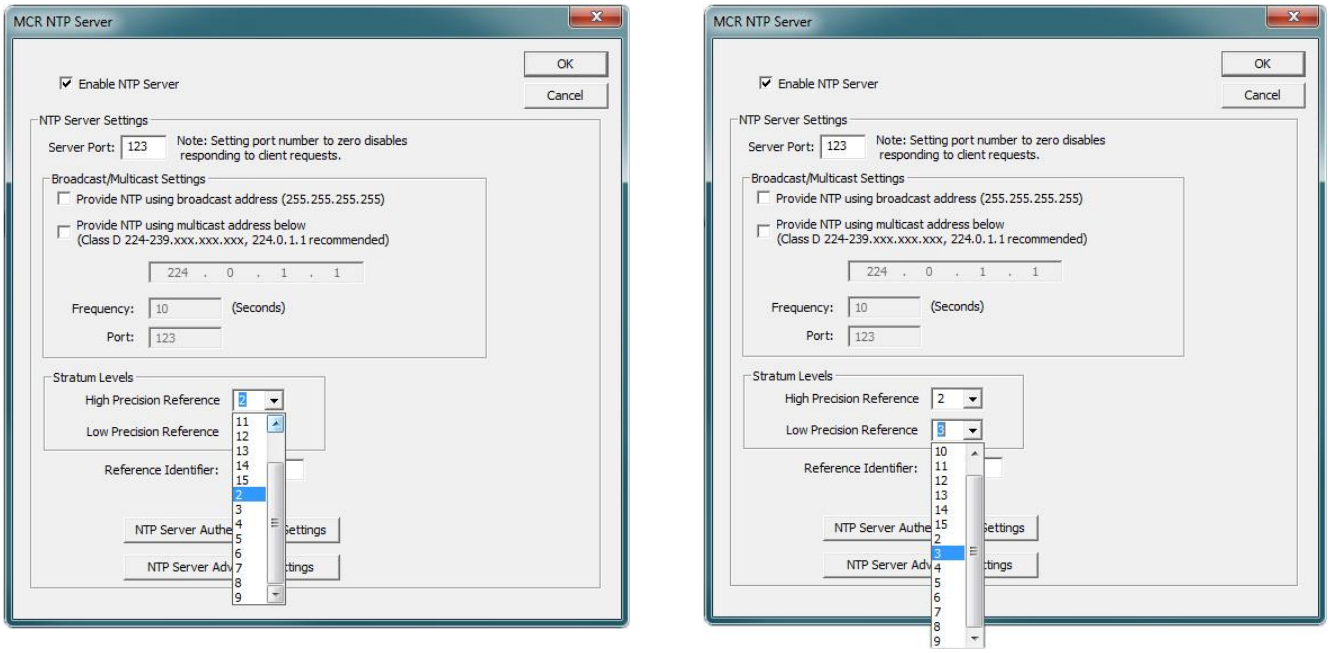
Broadcast and Multicast may be enabled at the same time to allow for a flexible network configuration. Unicast or query mode will always be available.



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Stratum Level Assignment – a unique added feature of the NTP100 are High and Low Precision Reference stratum levels that are user-assignable. The NTP100 stratum levels are user assignable from 0-15, for both High and Low Precision References. The factory default stratum level settings for the NTP100 family are "2" for the High Precision Reference and "3" for the Low Precision Reference. The Low Precision Reference stratum level cannot be adjusted to a reference level exceeding that of the High Precision Reference.

A reference level of "0" is defined to be "disabled".



Assignable High Precision and Low Precision Reference Stratum Levels for the models –GPS and -TC

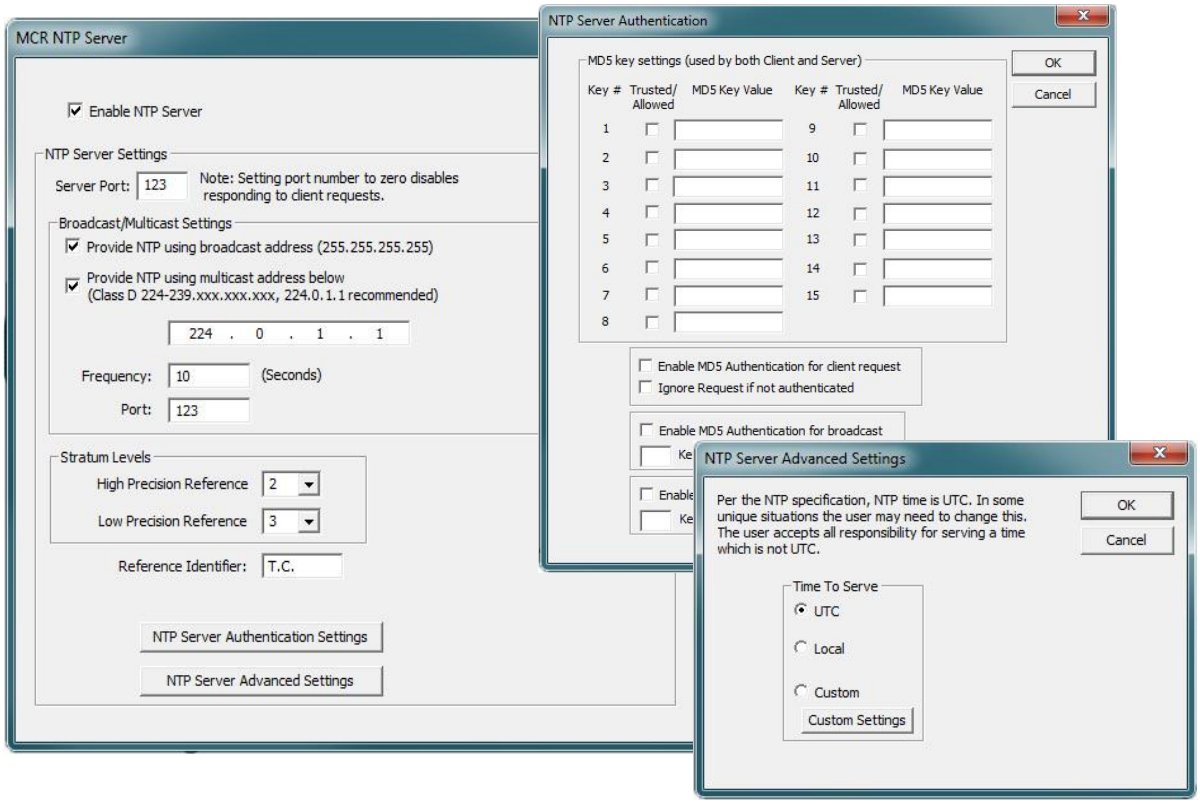
The time references for the various models are defined as:

MODEL	**High and Low Precision Reference**	**Internal Clock**	**Typical Holdover Stability of Internal Clock**
NTP100-GPS-HS ***High Stability***	GPS satellite signal	OCXO (*Oven Controlled Crystal Oscillator),* & RTC (real-time clock) reference.	1 ppb/day <50µs/day <7 sec/year
NTP100-GPS NTP100-GPS/GNSS	GPS satellite signal	TCXO (*Temperature Compensated Crystal Oscillator)* , & RTC (real-time clock) reference.	<165 mS/day <60 sec/year
NTP100-TC	Time Code signal	TCXO & RTC	<165 mS/day <60 sec/year
NTP100-OSC-HS ***High Stability***	Not Available	OCXO (*Oven Controlled Crystal Oscillator)* , & RTC (real-time clock) reference.	1 ppb/day <19 mS/day <7 sec/year
NTP100-OSC	Not Available	TCXO & RTC.	<165 mS/day <60 sec/year

NOTE: The NTP100-GPS has a GPS receiver built in and can be considered a Stratum Level 1 device, as such, it can be assigned a stratum level of "1" for the " High Precision Reference" (defined to be: when locked to GPS).
*Holdover high stability of <50µs/day (assumes recent GPS calibration).

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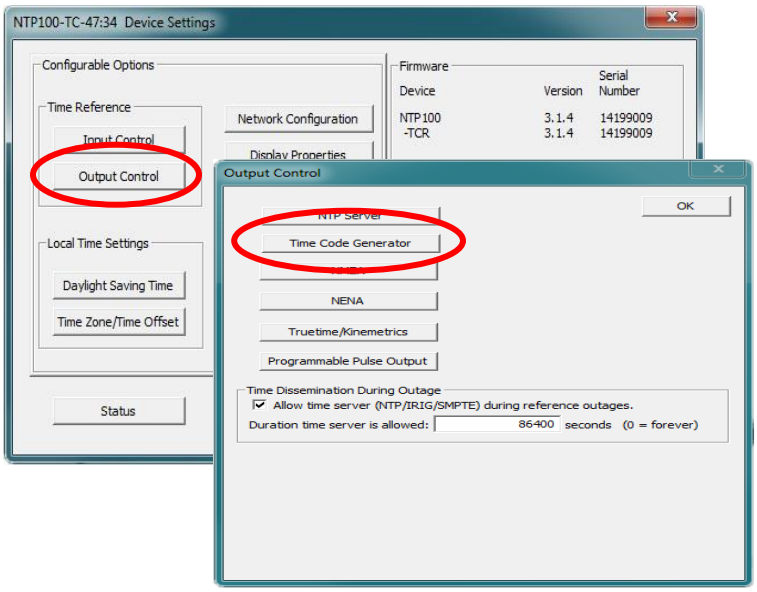
NTP Server Authentication Settings is used for MD5 key settings (used by both client and server). User can enable MD5 Authentication for client request, broadcast and multicast.



NTP Server Advanced Settings is used to access 'Time To Serve'. In unique situations, the user may change this setting from UTC to Local or Custom 'Time To Serve'.

Note: Output in UTC time standard.

Time Code Generator - This button operates only when a Time Code device is on the network.

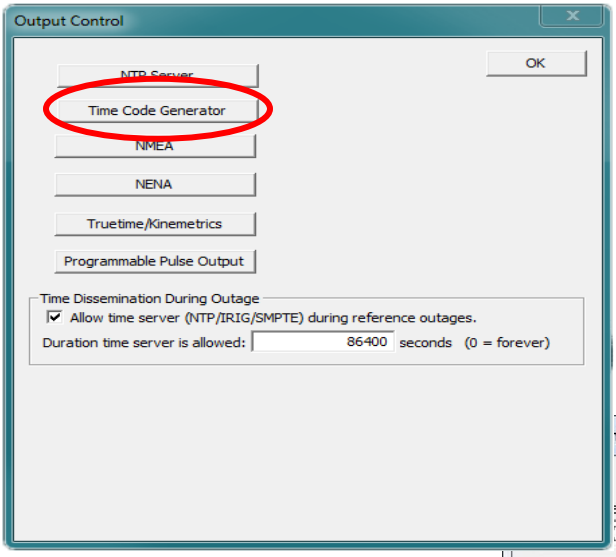


If you have the Time Code Generator Option, you will need to open the "**Device Settings**" window for your NTP100, then click the [**Output Control**] button, then click the [**Time Code Generator**] button.

The "**Time Code Generation**" window allows you to choose the **"Type of Time Code to Generate"** and the "**Coded Expression**". Modify these options to fit your location.

Then, within the "**Time To Generate"** box, select **Local Time** or **Custom Time** if different than the **UTC** default.

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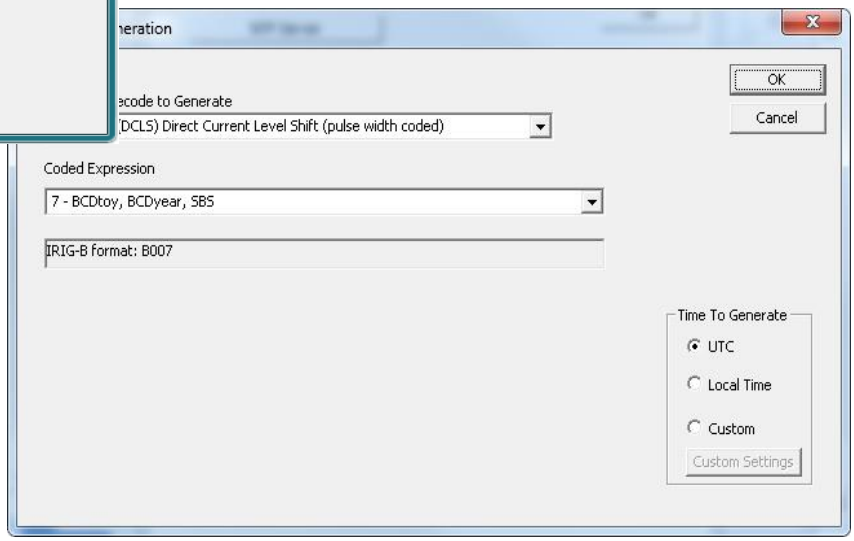
OTHER DROP DOWN MENUS

Depending on your options, other drop down menus will appear in this Time Code Generation window.

In the "**Type of Timecode to Generate"** window all IRIG choices create two further dropdown windows, as shown at left. SMPTE choices create one drop down menu and a checkbox.

If you do not change these selections the default selections will remain in effect.

Click the [**OK**] button when all your choices have been made.



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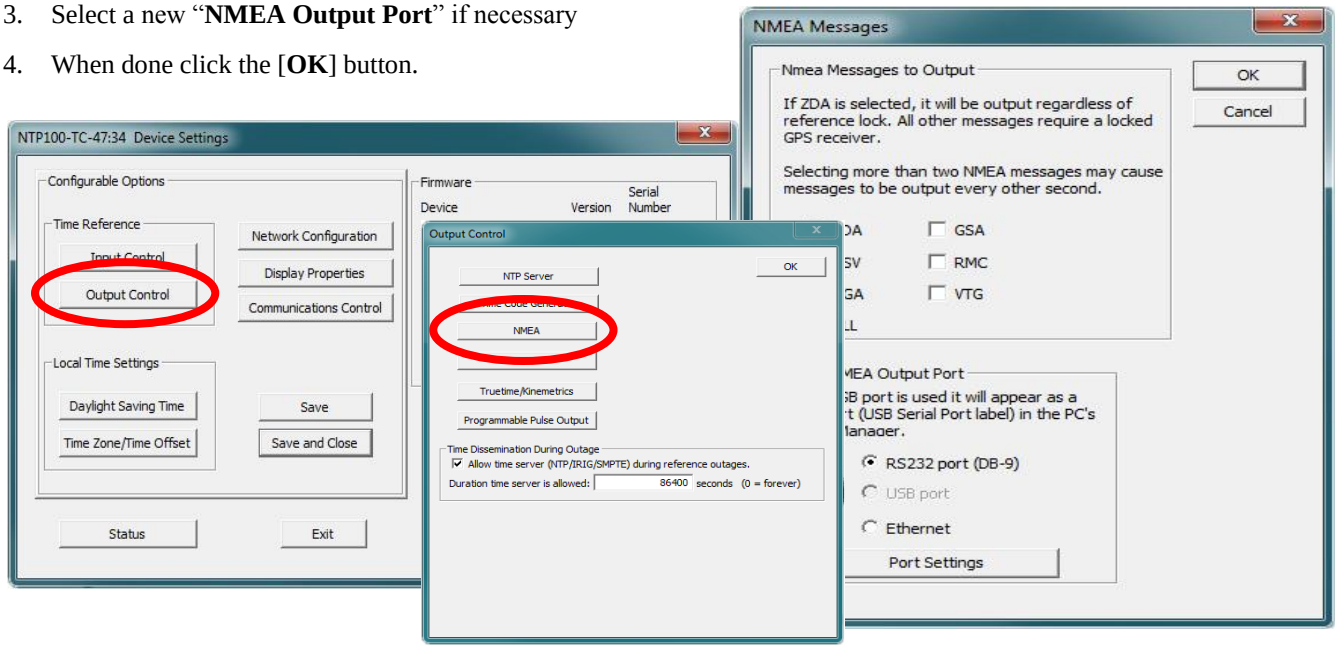
NMEA Messages

The NTP100 may be configured with the NMEA 0183 option for communication between marine electronic devices such as an echo sounder, sonar, gyrocompass, autopilot and GPS, among other instruments.

NMEA (**National Marine Electronics Association**) **0183** message output on the RS232 serial port. All NTP100-GPS units transmit the simple ZDA format NMEA message as it contains only time and date updates.

NMEA Messages to Output

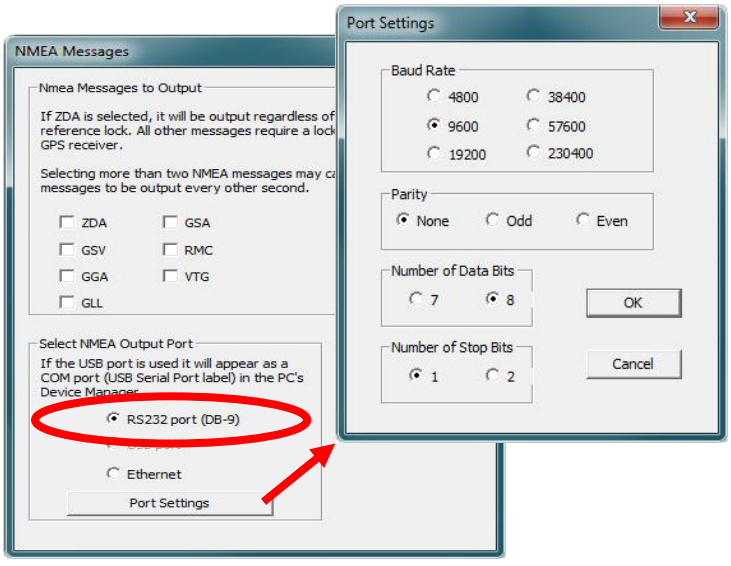
1. Click on the [**Output Control**] button
2. Click on [**NMEA**] to reveal the "NMEA Messages" window with the **NMEA Messages to Output** box. Here you may select which one of the seven GPS sentences (**ZDA/GSA/ GSV/RMC/GGA/VTG/GLL**) is appropriate for your needs
3. Select a new "**NMEA Output Port**" if necessary
4. When done click the [**OK**] button.



NMEA Message Output – is disabled by default.

Note: Click the [**Save and Close**] button on the Device Settings window to save settings.

Select the RS232 settings button to adjust the baud rate and communications settings in the Port Settings window. The RS232 port can be configured for baud rates of 4800, 9600, 19200, 38400, 57600 and 230400; along with 7 or 8 data bits, 1 or 2 stop bits, and the parity bits can be selected as None, Odd, and Even The default settings will be 9600 baud, 8 data bits, no parity, 1 stop bit.



The NMEA messages may be monitored on a computer using **HyperTerminal** or **PuTTY** or the output may be connected to other devices or apps that accept NMEA 0183 messages.

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NMEA and the RS-232 Interface

Pin	Signal	**NTP100 signal name**
2	TxD	Transmit Data
3	RxD	Receive Data
5	SG	Signal/System Ground

NMEA

In order to receive NMEA (National Marine Electronics Association) 0183 sentences (messages), the RS-232 interface [DB-9 male connector] may be used to connect your PC with your NTP100.

Unless the GPS option is included, only ZDA sentences will be output as they contain only UTC time and date signals. Other sentences with latitude and longitude data are available with the GPS option.

D-Sub Connector 1		D-Sub Connector 2	
Dsub1	Signal	Signal	Dsub2
2	Transmit Data	Transmit Data	2
3	Receive Data	Receive Data	3
5	Signal/System Ground	Signal/System Ground	5

SERIAL PINOUT FOR RS-232

The NTP100 serial port pinout is defined at left. RS-232 communications from a standard IBM PC or compatible host computer use a standard straight thru cable (3 wires only: pins 2, 3 and 5).

The default communication settings for the RS-232 port are: **9600 baud, 8 data bits, 1 stop bit, no parity.**

D-Sub Connector 1		D-Sub Connector 2	
Dsub 1	Signal	Signal	Dsub2
2	Receive Data	Transmit Data	3
3	Transmit Data	Receive Data	2
5	Signal/System Ground	Signal/System Ground	5

FOR OTHER TYPES OF RS-232 RECEIVERS

it may be necessary to observe the following requirements:

Connect the **Transmit (TX) line** of the MCR (pin 3 of the DB-9 connector) to **the Receive (RX) line** of the host system.

Connect the **Receive (RX) line** of the clock (pin 2 of the DB-9 connector) to the **Transmit** (**TX**) line of the host system.

Connect the **Ground Line** of the clock (pin 5 of the DB-9 connector) to the ground of the host system.

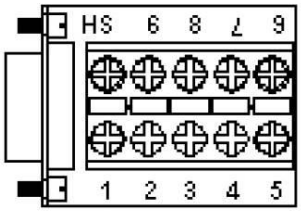
Ensure the host system can communicate via standard RS-232 at 9600 baud, 8 data bits, 1 stop bit, and no parity.

Pins 2 and 3 must use RS-232 voltage levels. The NTP100 cannot decode TTL-level serial communications at pin 2 and 3 of the DB-9 connector.

Ensure that any cable you are using for communication with the NTP100 is within the RS-232 standard length and is a working cable.

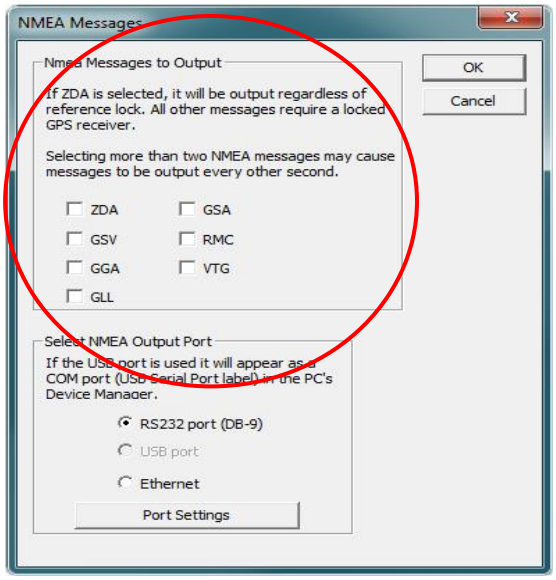
The interface may require a null modem cable.

A “null modem” 3-wire serial cable
or simple RS-232 cable utilizing pins 2,3 and 5 only should be used.



DB9 Breakout Adapter (Item sold separately)

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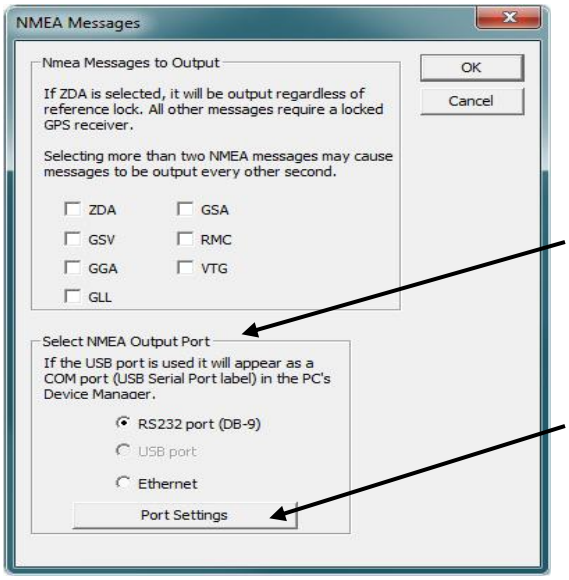
ADDITIONAL NMEA MESSAGES TO OUTPUT WITH THE GPS OPTION

The NTP100 can output additional NMEA 0183 sentences (aka: messages). If you have the GPS option these can be accessed by simply checking the appropriate boxes (at left) on the "NMEA Message" page.

ZDA - GSV GGA GLL GSA RMC VTG

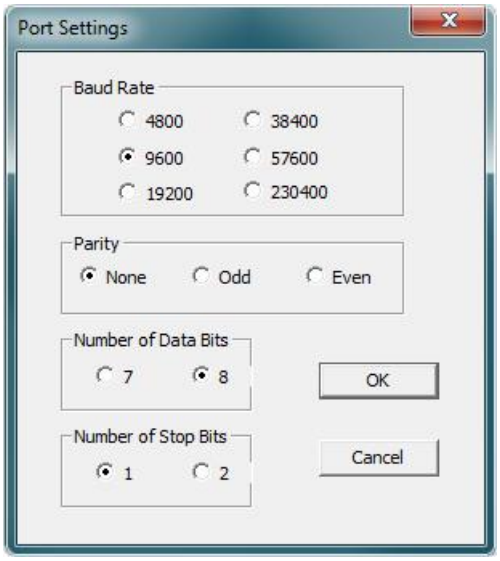
Note: Selecting more than two NMEA sentences may cause the sentences to be output every other second as opposed to every second. This characteristic is an inherent function of the GPS receiver and is particularly true when selecting GSV sentence output.

When GSV is selected, up to three GSV sentences will be output with information coming in from at least four satellites per sentence. It would help to manually increase the baud rate (maximum = 230400) when adding additional sentences to help increase delivery capability.



SELECT NMEA OUTPUT PORT

The first two selections (**RS-232** and **USB**) produce a "**Port Settings**" window (lower left) with preselected [**Baud rate**], [**Parity**], [**Number of Data Bits**] and [**Number of Stop Bits**] buttons.



RS232 PORT SETTINGS

On the "**NMEA Messages**" window select the [**RS232 settings**] button. Click on the [**Port Settings**] button to adjust the baud rate and communications settings. Select from baud rates of 4800, 9600, 19200, 38400, 57600 and 230400.

The parity bits can be selected as None, Odd, and Even.

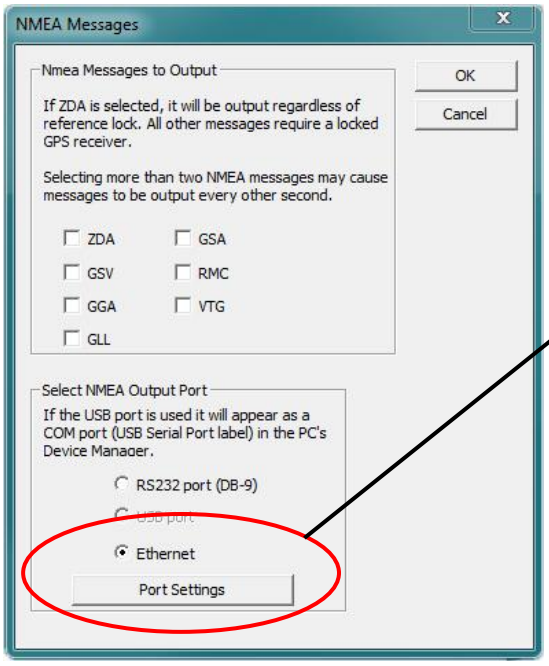
The number of Data Bits can be set to 7 or 8.

The number of Stop Bits can be set to 1 or 2.

The **default settings** are 9600 baud, 8 data bits, no parity, 8 data bits and 1-stop bit.

NOTE: USB PORT FOR NMEA OR NENA NOT IMPLEMENTED**.**

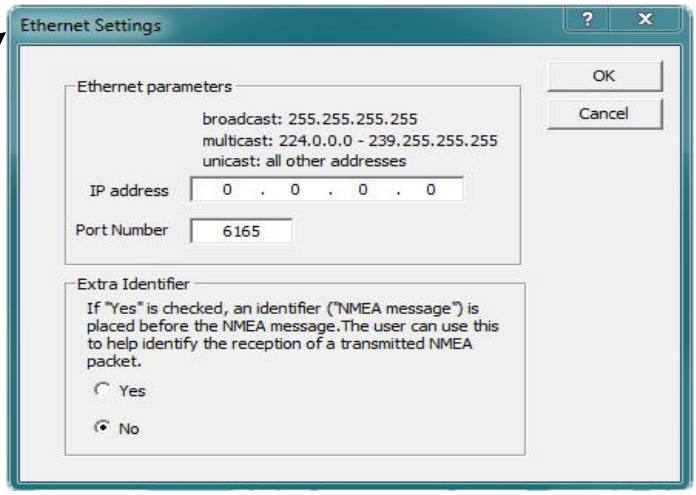
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ETHERNET SETTINGS

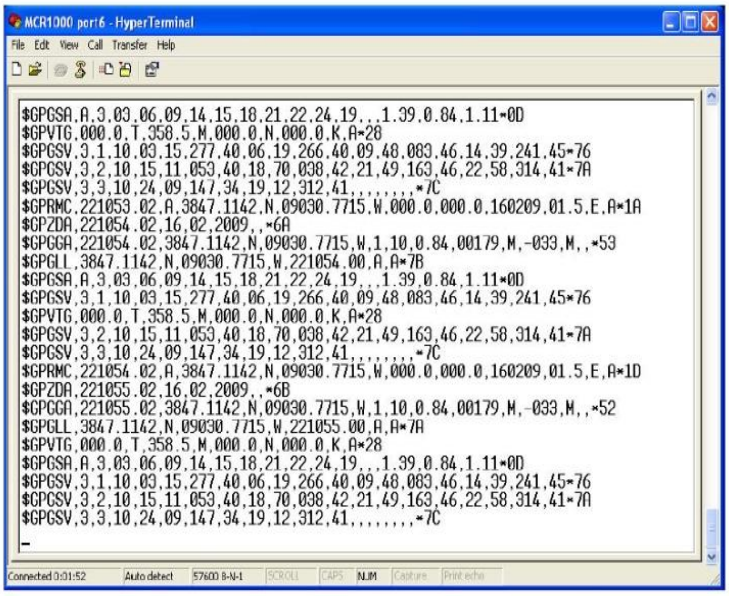
The third selection from the "**NMEA Output Port**" box produces the window at left, "**Ethernet Settings."** Here you may adjust the "**IP Address**" and "**Port Number**."

You may also select to output an "**Extra Identifier"** to precede every NMEA message by clicking the [**Yes**] button.



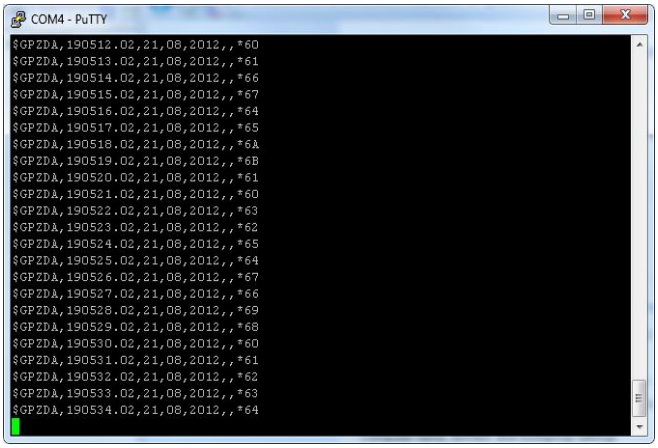
STREAMING NMEA DATA USING HYPERTERMINAL

Incoming NMEA sentences may be monitored on a legacy PC OS using **HyperTerminal** (at left) which was bundled with earlier versions of Windows. **HyperTerminal Private Edition** and **HyperACCESS** are paid upgrades that continue to support more recent versions of Windows. The HyperTerminal image at left was provided by a legacy system. It portrays several seconds of satellite data.



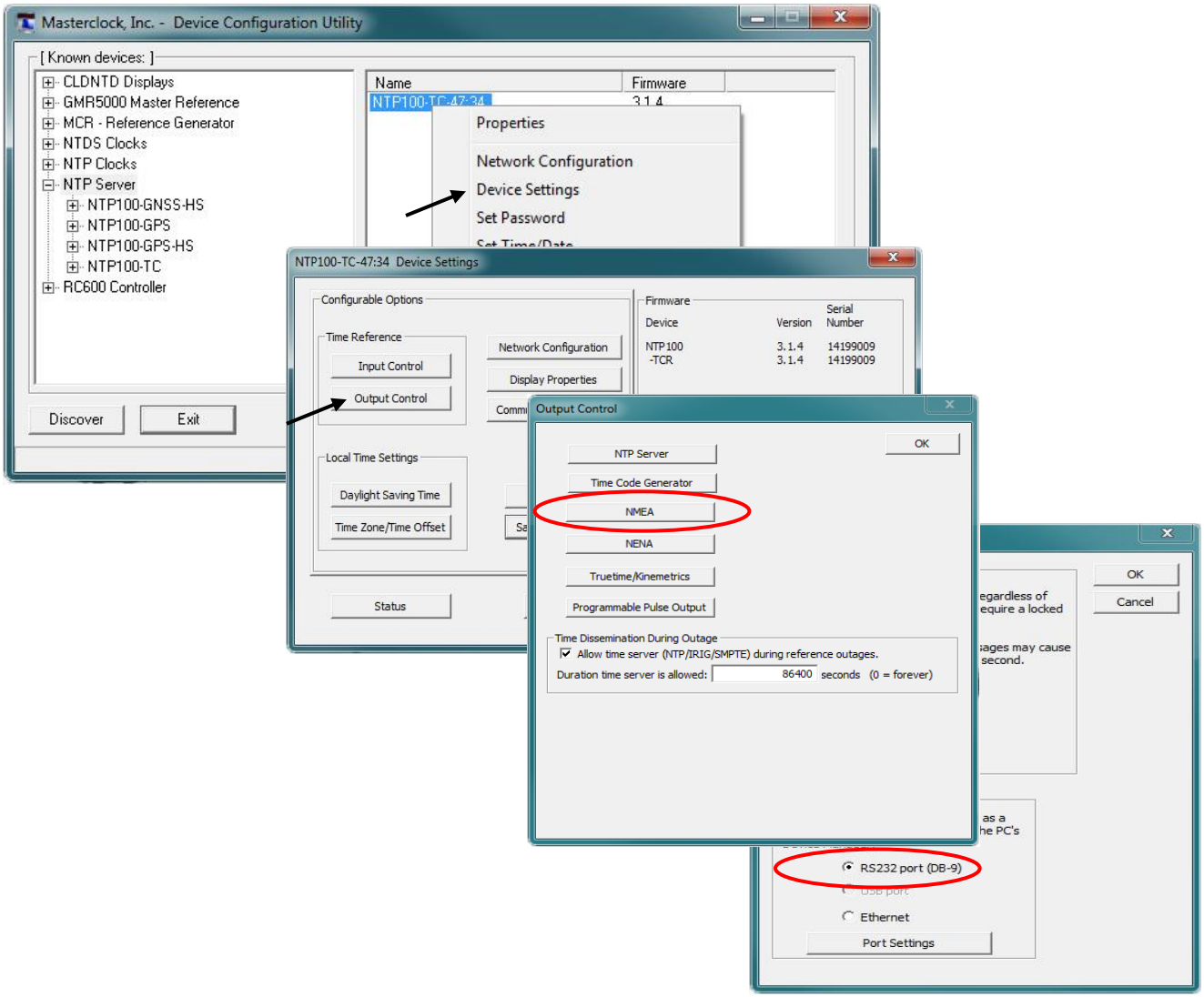
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STREAMING GPS DATA USING PUTTY



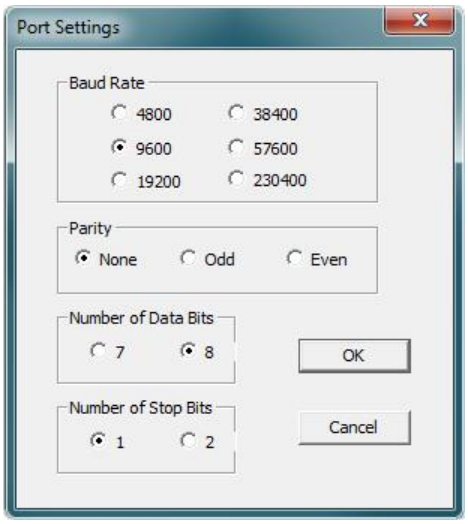
For those of you with a more recent PC OS you may access several sentences of GPS data by using **PuTTY.exe** (right).

1. Assuming all electronic connections have been made...
2. **Open** WinDiscovery.
3. **Click** on the [**Discover**] button.
4. **Right click** on your NTP100 to reveal the **NTP100** "**Device Settings**" window.
5. **Click** on the [**Output Control**] button.
6. **Click** on the [**NMEA**] button.
7. That reveals the "**NMEA Messages**" window. In the upper box, **select ZDA** or any other NMEA sentence.
8. In the lower box (NMEA output port), **select** the [**RS232 port**] button and click on [**Port Settings**].



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9. **Select** your BAUD rate (e.g. 9600). Parity = None. Number of Data Bits = 8. Number of Stop Bits = 1. Click [**OK**].

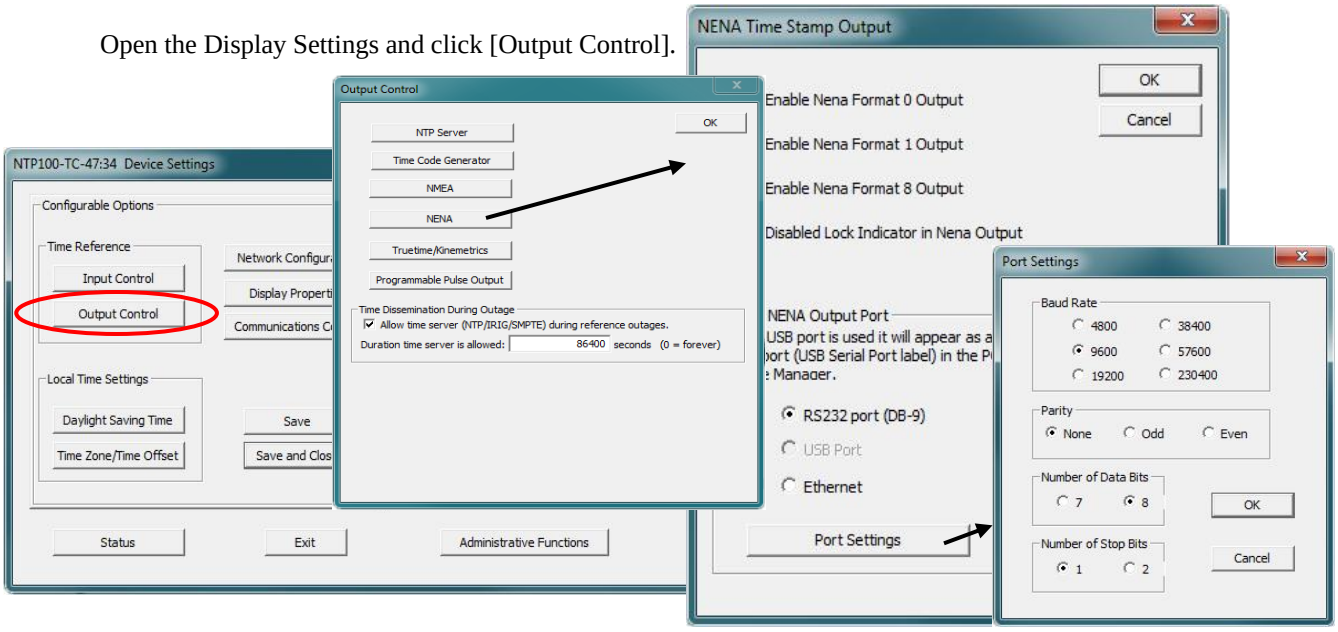


10. In the "**NMEA Message"** window, **click** [**OK**].
11. When the "**Output Control**" window reappears, **click** [**OK**].
12. When the NTP100 "Device Settings" window reappears. **Click** [**Save and Close**].
13. When the "**WinDiscovery**" window reappears. **click** [**Exit**].
14. **Open PuTTY.exe**.
15. **Click** the [**Run**] button. That reveals the "**PuTTY Configuration**" window. On the right **input** your basic options for your PuTTY session:
16. For "Connection Type," **select** the [**Serial**] button.
17. That reveals "**Serial Line**" and "**Speed**" choices that are automatically filled in. If they need to be changed to match the settings you earlier input to WinDiscovery (step 9), then do so.
18. Click the [**OPEN**] button.
19. This reveals another PuTTY window displaying **streaming satellite data** (pg. 46) incrementally delivered onscreen once per second. ZDA data delivers UTC time and date. Other sentences deliver geographical coordinates.

NENA Time Stamp Output

The ability to access the NENA (National Emergency Number Association, otherwise known as the 911 system) signal is standard to the NTP100, but requires the GPS option to operate to NENA requirements. To configure the **NENA** input see the instructions on page 24, which are identical to the **NEMA** input. To configure the **NENA** output settings, follow these instructions:

Open the Display Settings and click [Output Control].

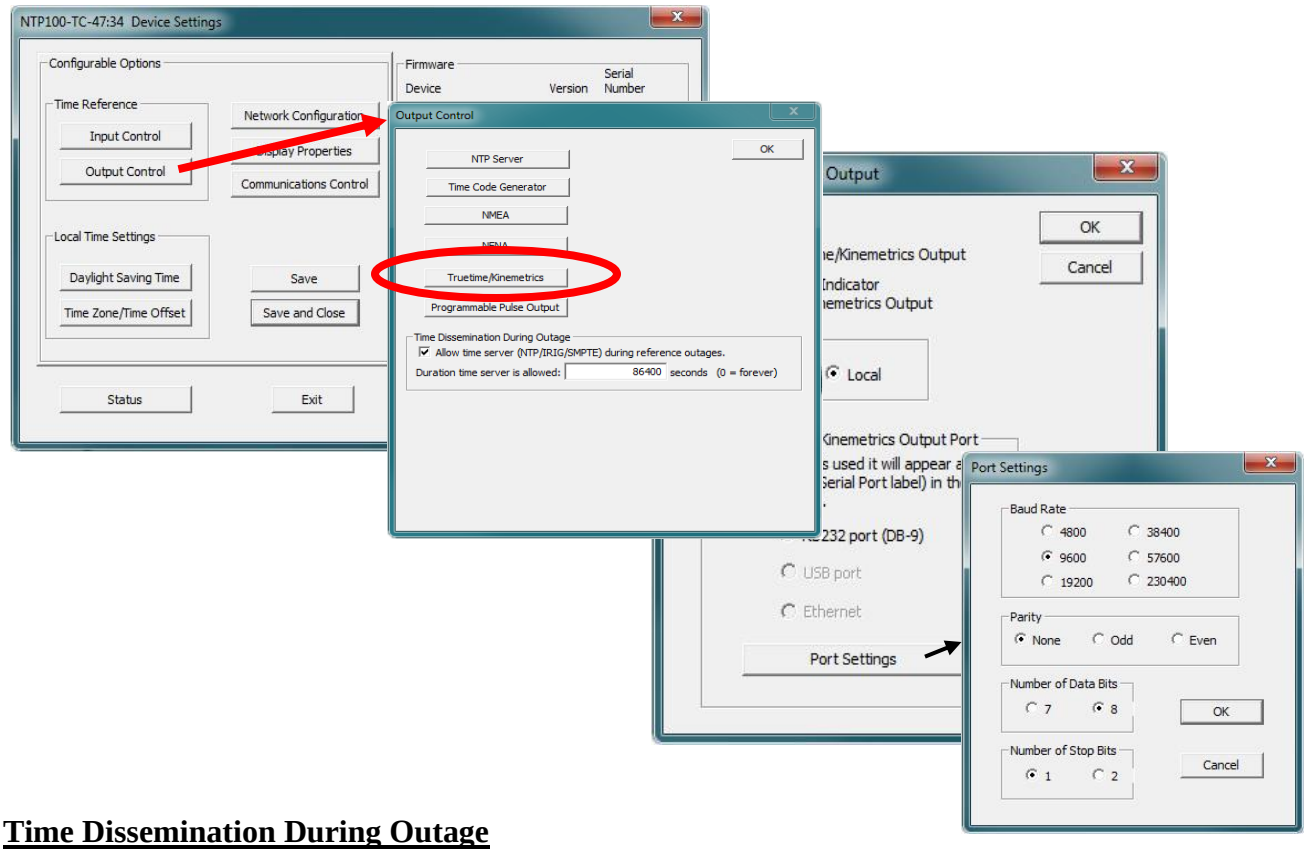


Click on the **[NENA]** button – to provide access to the "**NENA Time Stamp Output**" window. Select your preferred format from the four choices. Select and modify the output port.

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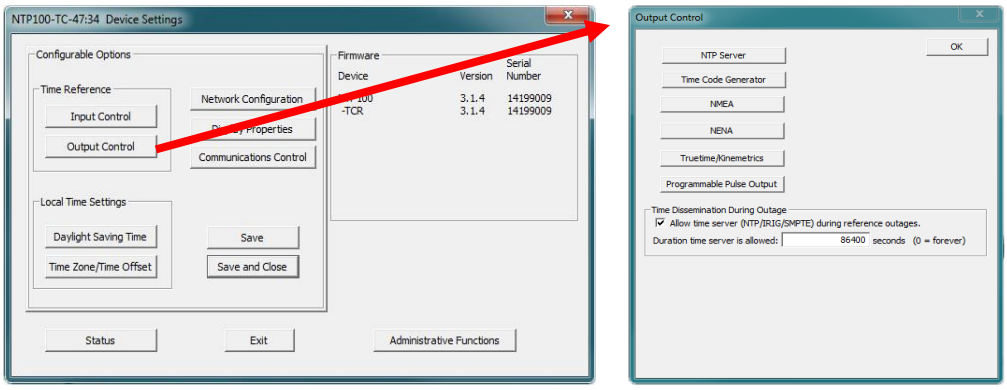
Truetime/Kinemetrics Output

This button enables selection of this output and adjustment of the port settings.



Time Dissemination During Outage

By default, the models NTP100-GPS, GPS/GNSS, GPS-HS, and NTP100-TC will allow time dissemination (NTP service) for a period of 24 hours from loss of the primary source (GPS or Time Code respectively). During this "free-wheeling" or "holdover" period, the NTP100-GPS and NTP100-TC will rely on the internal real-time clock (RTC) and temperature compensated crystal oscillator, (TCXO)oscillator, which has a typical holdover of +/- 1 min /year (+/- 165mSec drift over 24 hours or +/- 6.875 mSec drift over 1 hour). The model NTP100-GPS-HS will rely on the internal RTC and OCXO (oven controlled crystal oscillator), which has a typical holdover (stability) of < 7 sec/year (<50µs per day)

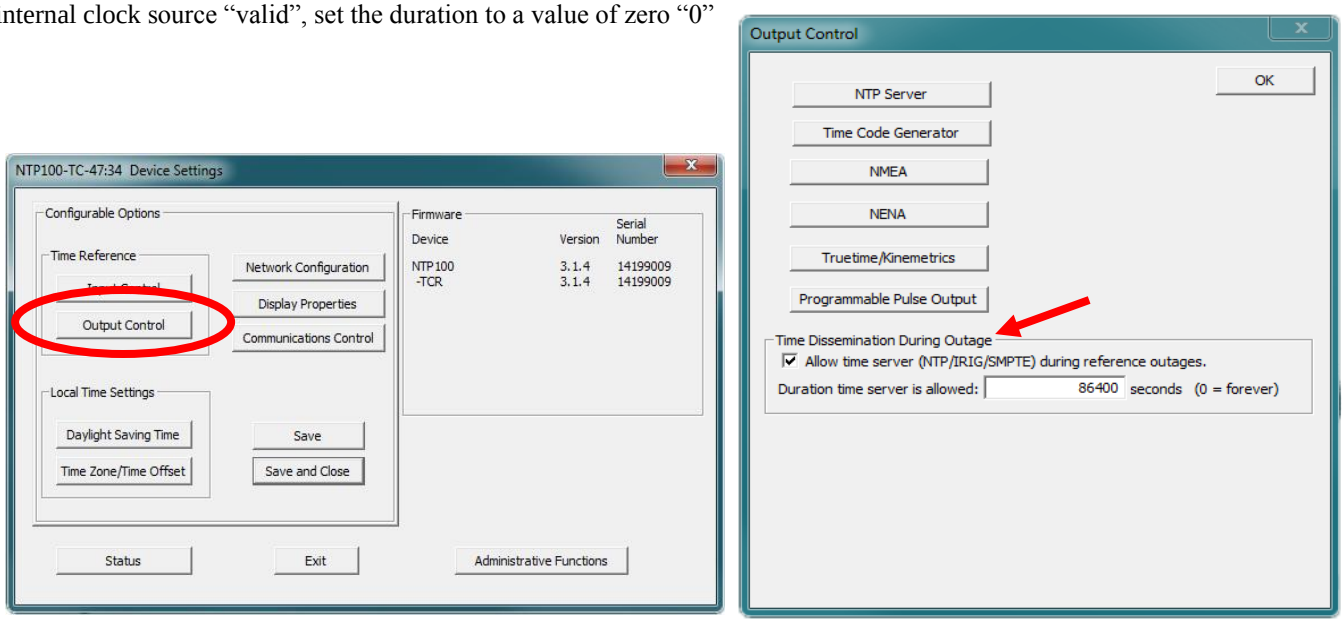


The NTP100 (models –GPS and –TC) will continuously discipline the internal RTC to provide maximum accuracy, while locked to the primary GPS or Time Code reference, when trusted and available).

Note: The NTP100-OSC should periodically be set manually to the time of an accurate external reference such as another NTP Server. See the Set Time/Date section on pg. 22 for suggestions.

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The duration time server is adjustable in ‘seconds’ increments. To always allow time dissemination and always consider the internal clock source “valid”, set the duration to a value of zero “0”



[Hint: It is suggested to configure the unit to allow time dissemination and to enter a value of 0 in the “duration time server” field when using the NTP100-GPS-HS High Stability model.]

Deselect the “Allow time server” if you do not want the NTP100-GPS or NTP100-TC to serve time using the internal RTC and TXCO oscillator while the unit is free-wheeling.

You may deselect the “Allow time server during reference outages” if you do not want the NTP100-GPS-HS to serve time using the internal RTC and OCXO high stability oscillator while the unit is free-wheeling.
The [**Network Configuration**] button and window are detailed on page 18.

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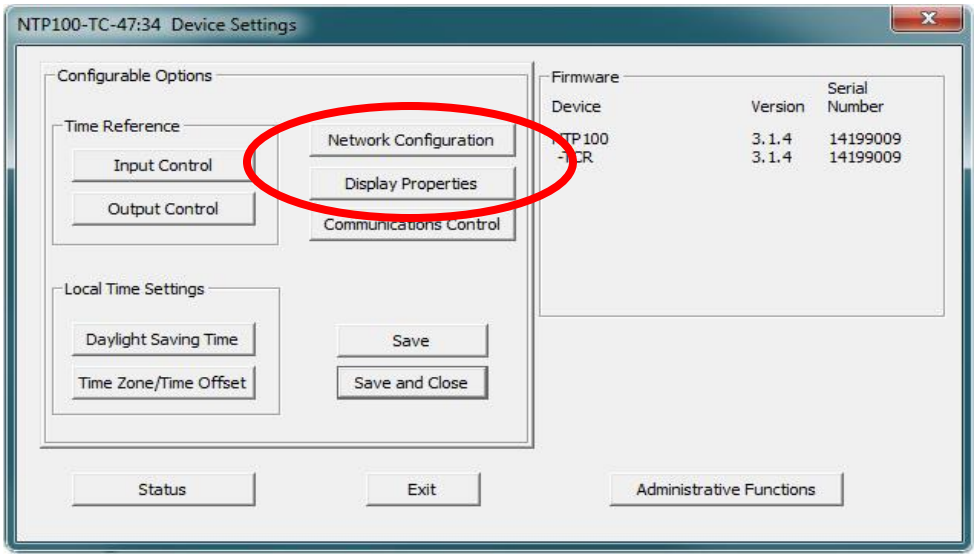
WinDiscovery

Network Configuration
Display Properties
Communication Control
Status

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The [**Network Configuration**] button accesses window to view Device Name, MAC Address, IPv4 Address, Netmask, Gateway, and DNS. The network configuration must be established for the NTP100 to be accessible to the network. You must be a network administrator or have their support to complete these functions. Your network administrator determines the information for the Network Configuration. (Details on pg. 20)

The [**Display Properties**] button and window (shown below) permits the user to change the brightness of the LEDs, to change the Time/Date presentation order, to choose 12 or 24-hour time formats with leading zeroes on or off and to choose UTC or local time (once local time offsets have been input).

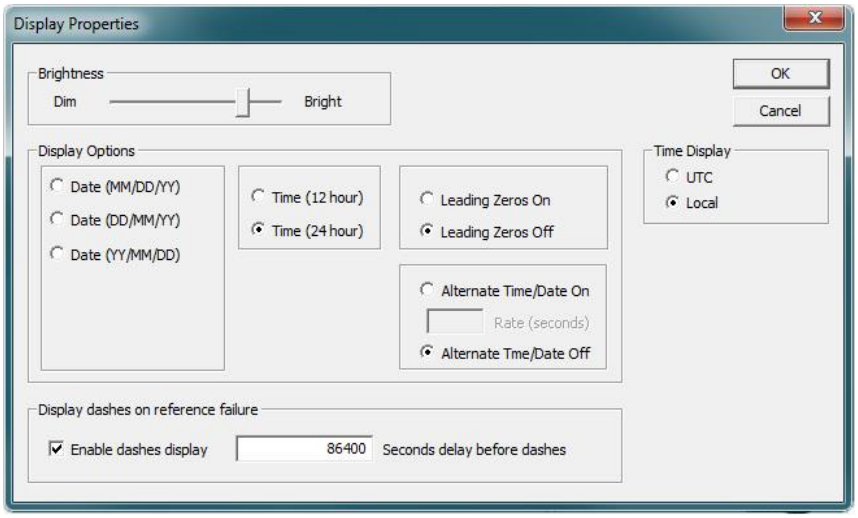


Brightness - The brightness or intensity of the NTP100's front-panel time display can be adjusted from dim to bright. The display can be dimmed here for low-light environments.

Display Options – Select date format (MM/DD/YY, DD/MM/YY or YY/MM/DD), 12 or 24-hour time, leading zeros, and Alternate Time/Date.

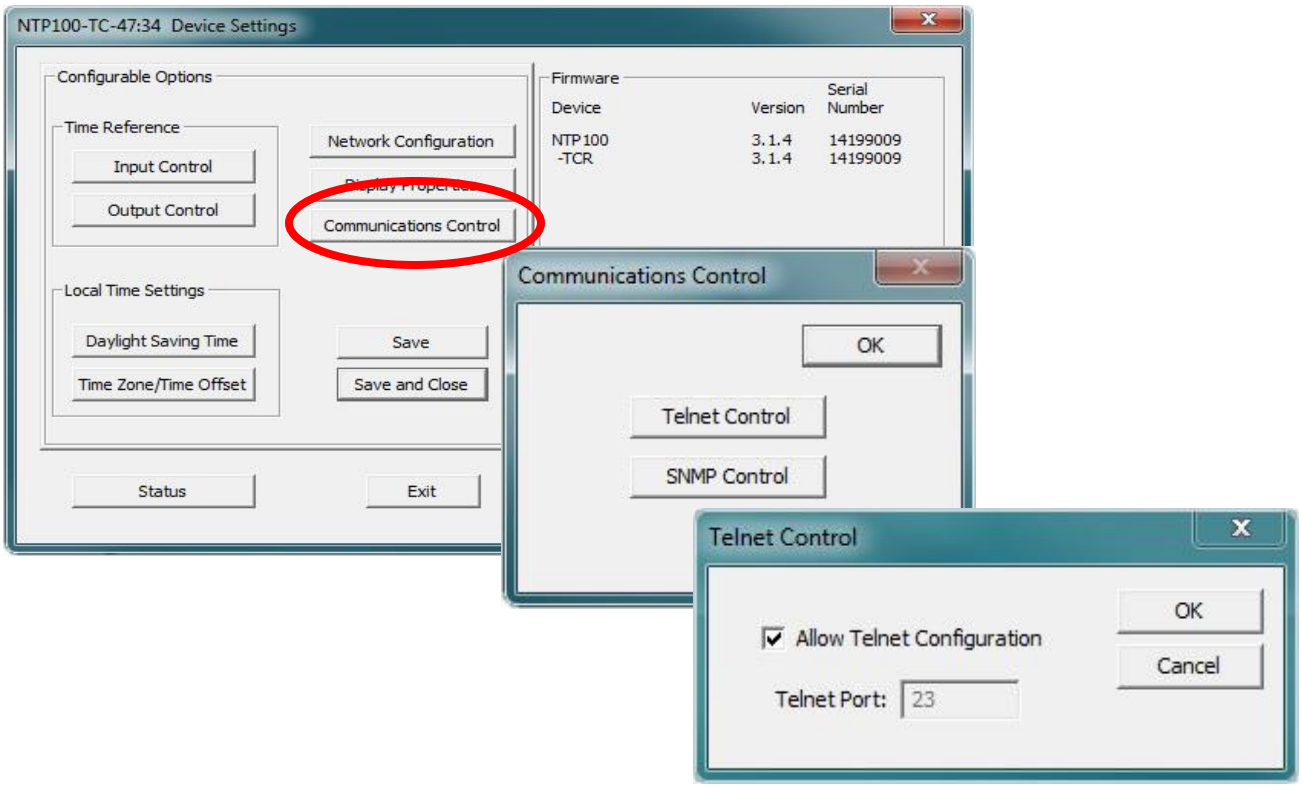
Time Display – Choose UTC or Local Time Display.

Display dashes on reference failure – Enable dashes display and enter seconds delay before dashes.

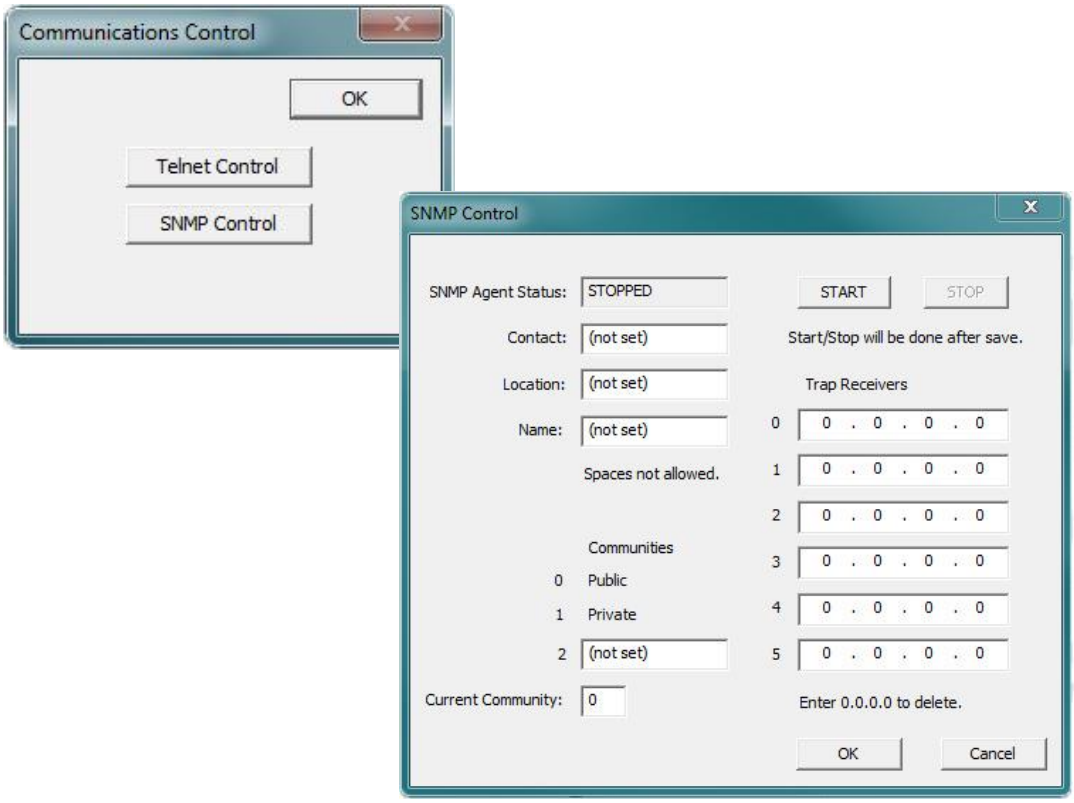


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The [**Communications Control**] button and window enable or disable Telnet. (Details onTelnet pg. 56)



The [**Communications Control**] button and window enable SNMP settings.



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SNMP = Simple Network Management Protocol

SNMP is a standard way to monitor a device on an Ethernet network. It is used so a network manager can get a lot of data about the health and network traffic on an Ethernet LAN.

SNMP's purpose is to convey the network status of a NTP100; it is not for fully controlling the device.

Note: Do NOT control the NTP100 via SNMP; that will continue to be done via WinDiscovery.

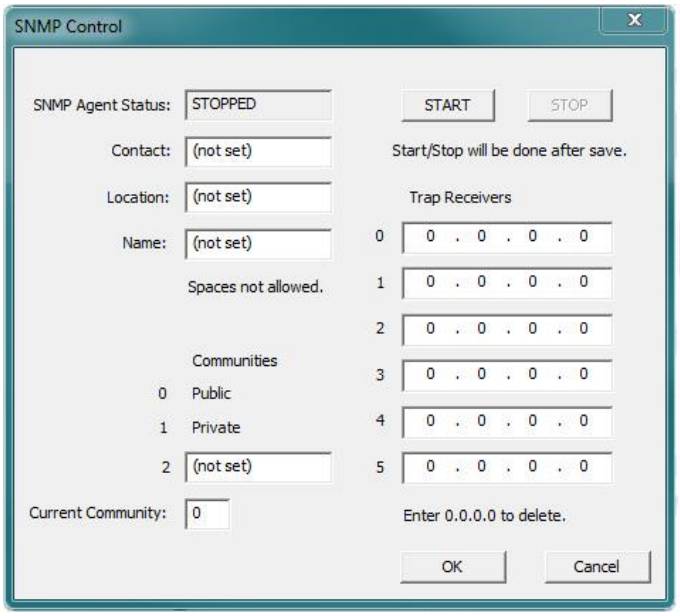
The NTP100 runs firmware called the SNMP Agent. The user runs software called the SNMP Manager (or Client) on a PC. THE USER MUST ACQUIRE THE MANAGER SOFTWARE; Masterclock does not offer one.

Our Agent supports versions 1 and 2 of SNMP. The PC on which the Manager is running a NTP100 must also have SNMP abilities for Manager and Agent to communicate. Windows 7 and XP support SNMP v1 and 2. The user runs the Manager to get the data, issuing requests to the Agent. If some security tests are passed, then the Agent responds with the data.

SNMP Control window in WinDiscovery (shown on pg.47), can set options like: Name and location for the device, and the name of the person responsible for it, called the Contact, thus a device could be named "Conference Room Clock", with the location "Room A - Bldg. 1", and the contact "Maint. ext. 10".

There are messages that the Agent can send to the Receiver PC without being asked. They are called Traps, which tell of events like:

1. Device Restart
2. Ethernet Link Up
3. Authentication Failure (Community mismatch)

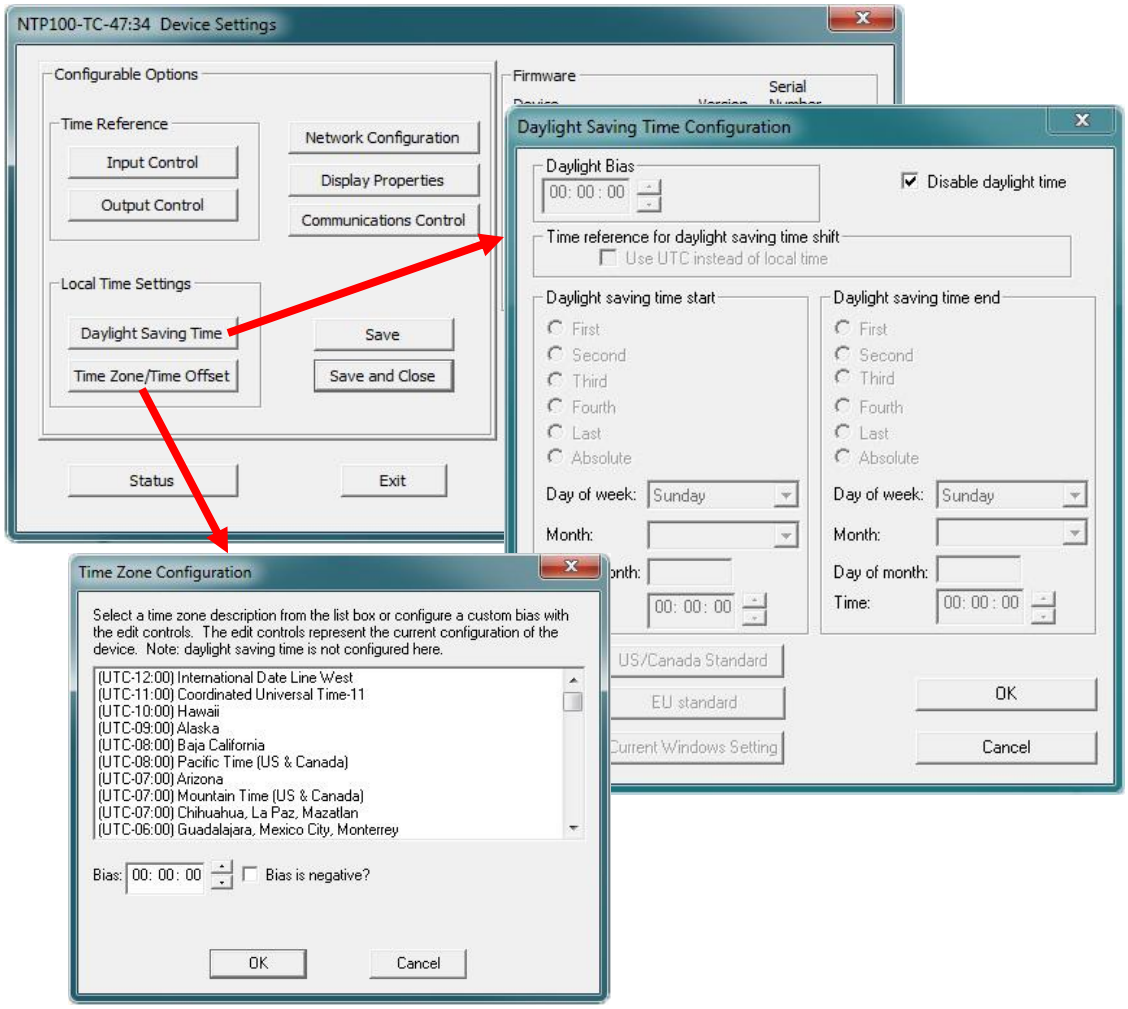


Traps are sent to the IP addresses listed as Receivers, 6 of which can be stored in the device. Not every Manager can receive traps, as such the case when an SNMP Manager is part of a multi-function utility.

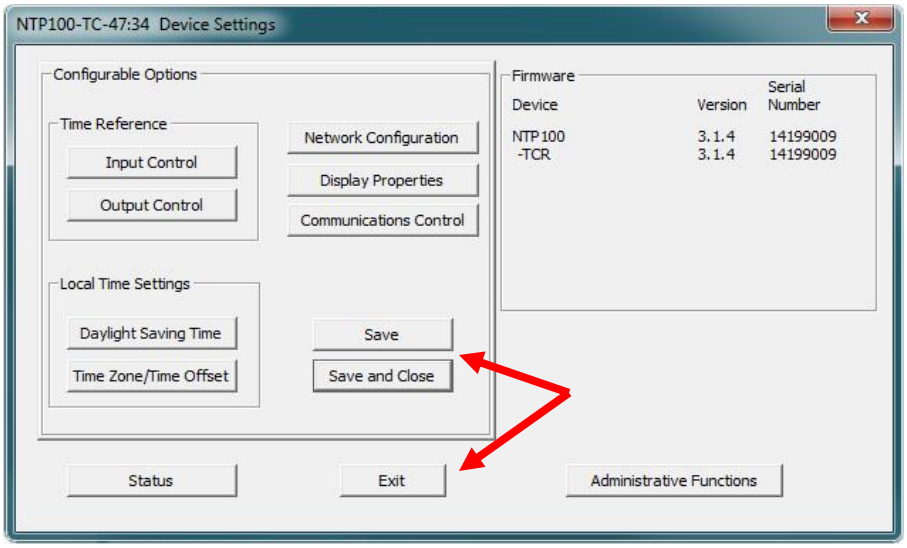
Note: The SNMP is NOT a server/client scheme.

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The "**Local Time Settings**" section includes two buttons for [**Daylight Savings Time**] and [**Time Zone/Time Offset**] to offset your displayed time from UTC to Local time.



Note: The [**Save**] and [**Save and Close**] buttons must be clicked before hitting the [**Exit**] button. Otherwise any entered changes will not take effect.

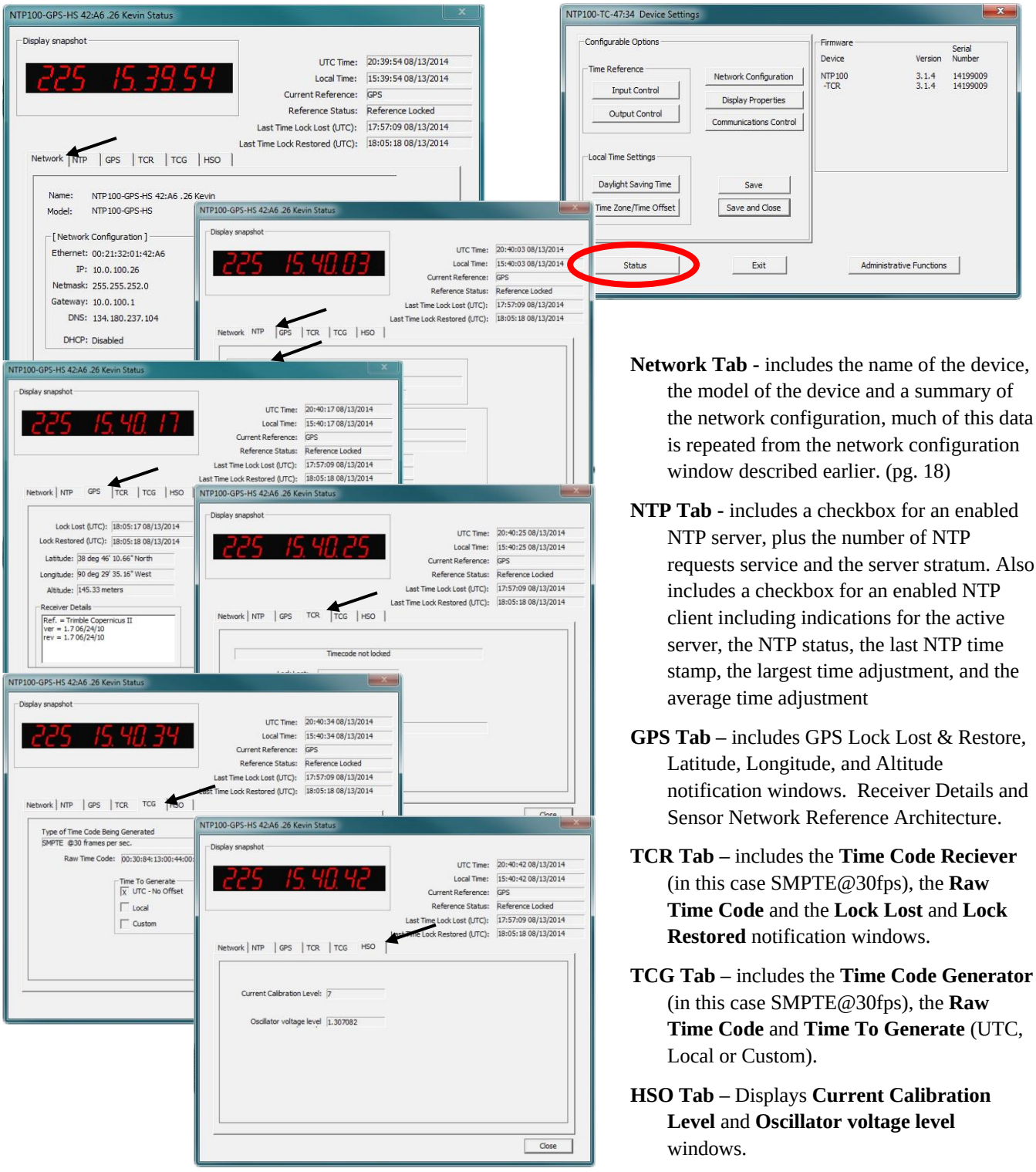


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STATUS

At the bottom left of the "**NTP100 Device Settings**" window is the [**Status**] button. The "**NTP100 Status**" window includes a "**Display Snapshot**" of a graphic digital clock representing the face of the actual NTP100 in real time. On the right appear the "UTC Time" and date, "Local Time" and date, the "Current "Reference" signal (in this case Time Code), the "Reference Status" (in this case Locked) and two windows listing **Last Time Lock Lost** and **Restored**.

Below these listings are tabbed windows for **Network**, **NTP**, and **TCR**.



Network Tab - includes the name of the device, the model of the device and a summary of the network configuration, much of this data is repeated from the network configuration window described earlier. (pg. 18)

NTP Tab - includes a checkbox for an enabled NTP server, plus the number of NTP requests service and the server stratum. Also includes a checkbox for an enabled NTP client including indications for the active server, the NTP status, the last NTP time stamp, the largest time adjustment, and the average time adjustment

GPS Tab – includes GPS Lock Lost & Restore, Latitude, Longitude, and Altitude notification windows. Receiver Details and Sensor Network Reference Architecture.

TCR Tab – includes the **Time Code Reciever** (in this case SMPTE@30fps), the **Raw Time Code** and the **Lock Lost** and **Lock Restored** notification windows.

TCG Tab – includes the **Time Code Generator** (in this case SMPTE@30fps), the **Raw Time Code** and **Time To Generate** (UTC, Local or Custom).

HSO Tab – Displays **Current Calibration Level** and **Oscillator voltage level** windows.

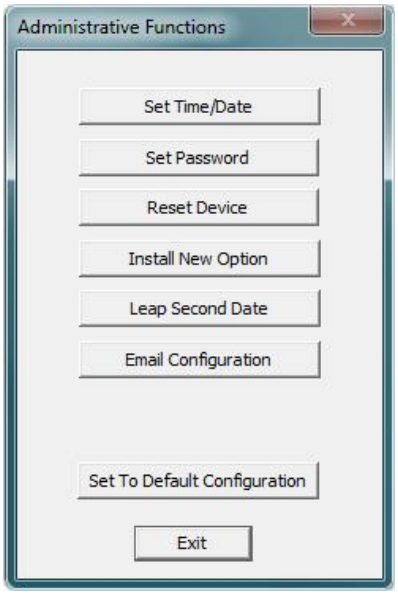
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WinDiscovery

Administrative Functions

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ADMINISTRATIVE FUNCTIONS

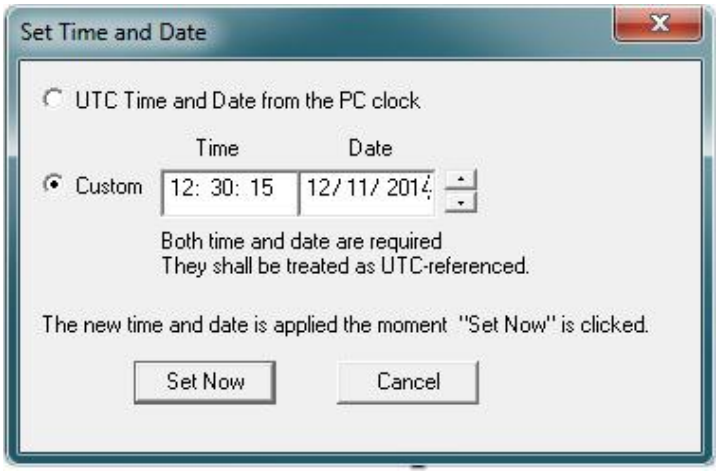


From the "**Device Settings**" window, click [**Administrative Functions**] button to open a menu that is rarely accessed. These include:

1. [**Set Time/Date**] (for custom time, not UTC or local time)
2. [**Set Password**]
3. [**Reset Device**]
4. [**Install New Option**]
5. [**Leap Second Date**] (input this whenever announced);
6. [**Email Configuration**] (to automatically alert you via email of any situations within the system when they happen)
7. [**Set To Default Configuration**] Below we'll look at these windows in detail.

SET TIME AND DATE

There may be situations where you do not want to display UTC or local time. This feature may be most useful for demonstrations, in lab situations or in environments where an external reference time signal is not available. Use this when the built-in NTP client is disabled or when a network connection to an NTP server is not available.



Click the [**Set Time/Date**] button to reset the time to your preference. You will be prompted with some additional instructions then offered the choice to continue. Click [**Yes**].

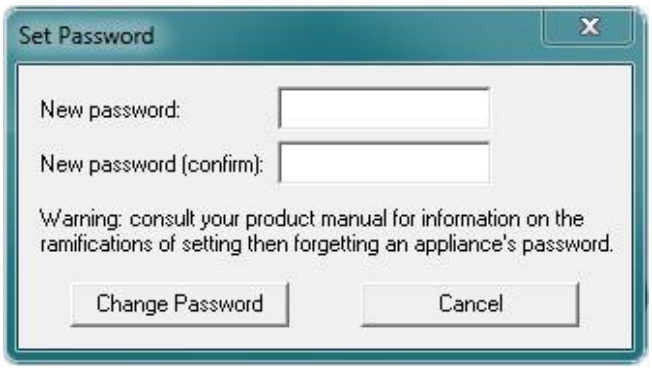
In the **"Set Time and Date"** window (left) click the [**Custom**] button to enter your new time and date. Click the [**Set Now**] button to activate your custom time. To return to UTC time choose [**UTC Time and Date button from the PC clock**] then click [**Set Now**].

See page 22.

SET PASSWORD

Click the [**Set Password**] button to create a new password. In a worst-case scenario you would have to reset the NTP100 to its factory default settings. That reverts back to the factory default password: "**public**".

There is a second way to set a password on page 15 and describes more fully the rules surrounding password usage.



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RESET DEVICE

Click [**Rest Device**] to induce a soft reset. This procedure allows the NTP100 to clear its current communications buffer and re-initialize its processing, which includes another software request for a DHCP address. This feature is intended to allow the user to remotely reset the unit and does not restore the factory default state.

Alternatively, if you are not in the "**Administrative Functions**" window, but are viewing the list of devices after pressing the [**Discover**] button, simply right click on the device you are interested in and select the [**Reset Device**] button.

See page 25.



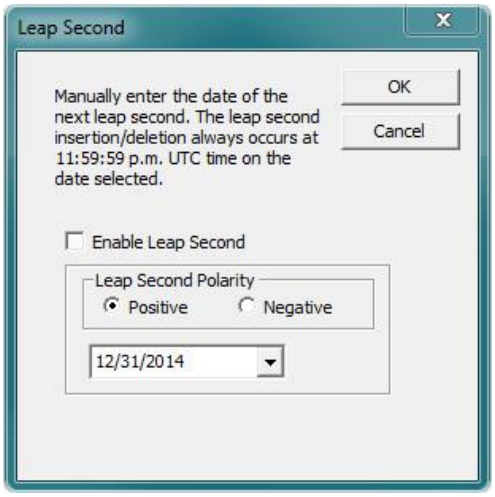
INSTALL NEW OPTION

This window will ask you to "Paste the Option Key you received here. Then click Install." This will install the new option into the software. Keys are generated by a Masterclock Technician (NTP, Event Time, TCR/TCG, and NMEA 0183).



LEAP SECOND DATE

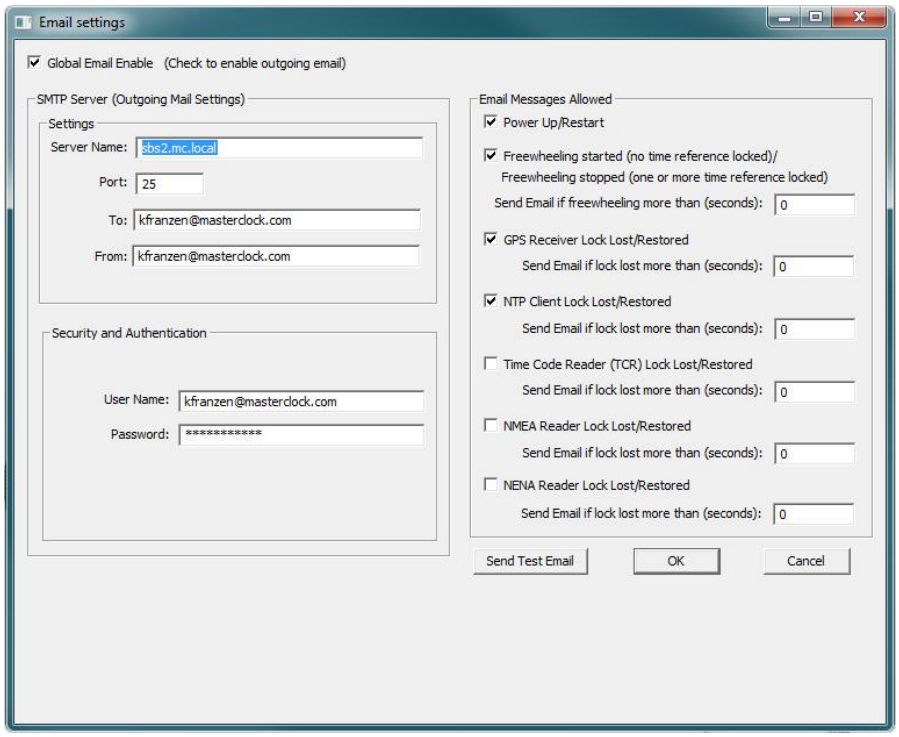
This window enables the placement of a leap second when it occurs. Enter the date and polarity ahead of time. Click the [**Leap Second Date**] button to enable a future leap second to occur on any specific date that you manually enter.



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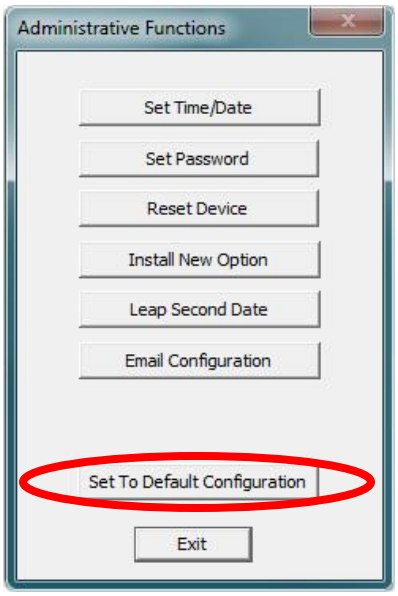
EMAIL CONFIGURATION

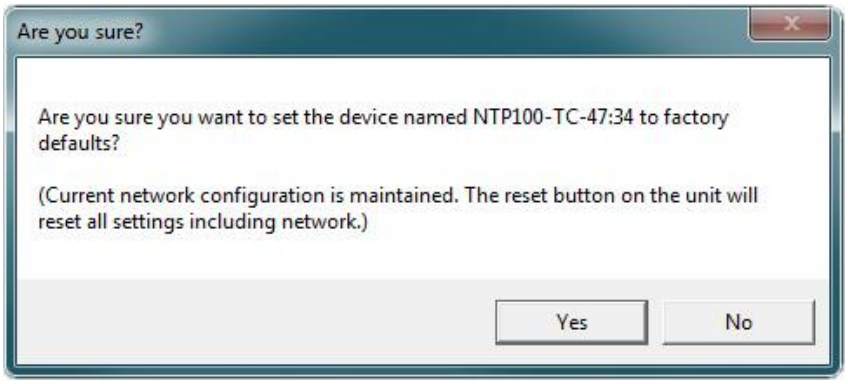
Click the [**Email Configuration**] button to generate email alerts when certain conditions are met. Only use unsecured networks.



SET TO DEFAULT CONFIGURATION

Click the [**Set to Default Configuration**] button to reset all of your previously entered options and customs settings back to the original factory settings. You will get the "Are you sure?" window. Click the [**Yes**] button if you are sure you want to return to the default configuration with the default password: "**public**".





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Telnet

Configuration
Access Commands

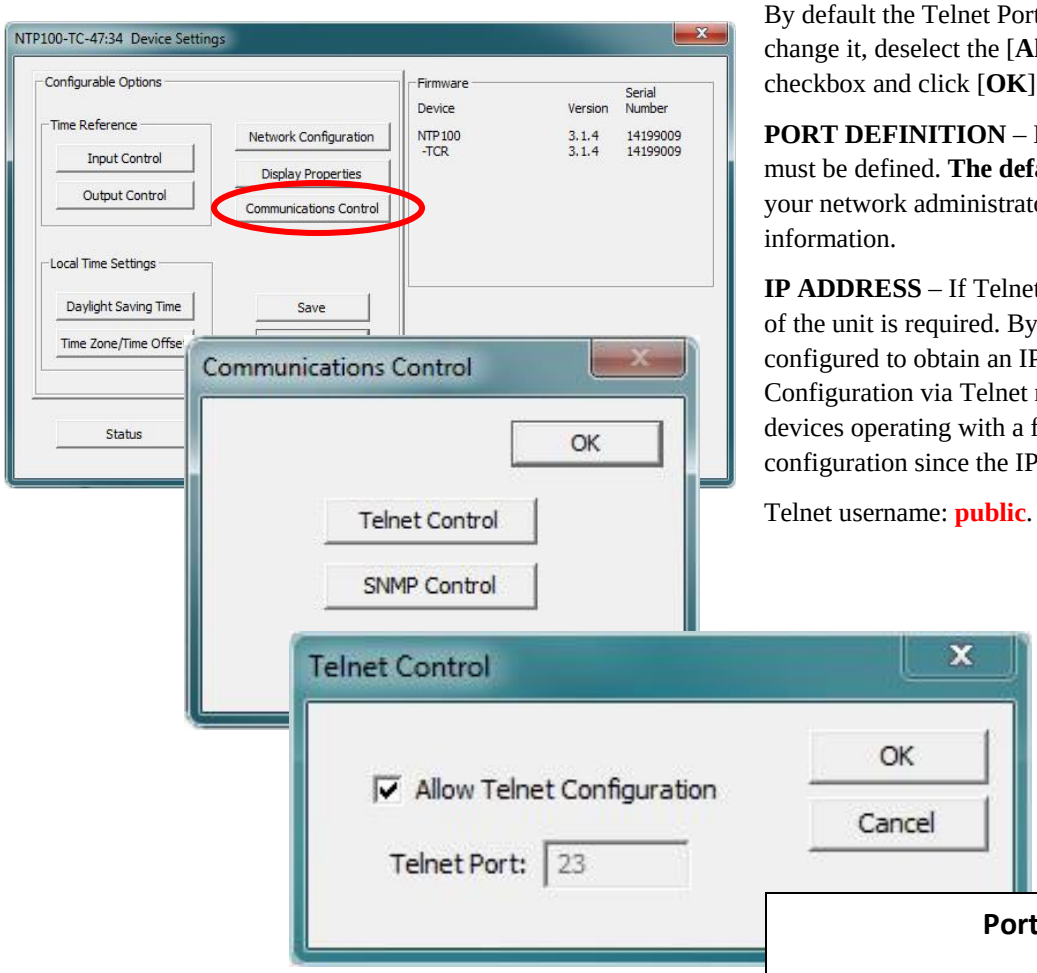
© Masterclock®, Inc.

TELNET OPTION



Typically in Windows OS you'll use the free WinDiscovery app to establish first-time networking configuration. However, in other operating systems you may use **Telnet** to configure your DHCP server.

To access the Telnet button, go back to "**Device Settings**" and click the [**Communications Control**] button. In the "**Communications Control**" window, click the [**Telnet Control**] button and select [**OK**]. By default the Telnet Port is set at **23**. If you wish to change it, deselect the [**Allow Telnet Configuration**] checkbox and click [**OK**].



PORT DEFINITION – If Telnet is allowed, the port must be defined. **The default Telnet port is 23**. See your network administrator if you need additional information.

IP ADDRESS – If Telnet is allowed, the IP address of the unit is required. By default, the NTP100 is configured to obtain an IP address via DHCP. Configuration via Telnet may not be convenient for devices operating with a factory default network configuration since the IP address is not known.

Telnet username: **public**. Telnet password: **public**.

Port 23

Some NTP/SNTP servers will expect NTP clients to operate on port 123.

If the advanced settings have been altered for your clock and you begin experiencing difficulty in getting your clock to synchronize to the NTP time server, or the clock begins acting erratically, try returning the advanced settings to the default values: **"23**."

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Telnet Terminal Configuration

A terminal-style configuration interface is available via Telnet. To connect with the NTP100 in this manner use any standard Telnet client application, specifying the IP address of the NTP100 as the server with which to connect. The factory default port is well-known telnet server port 23.

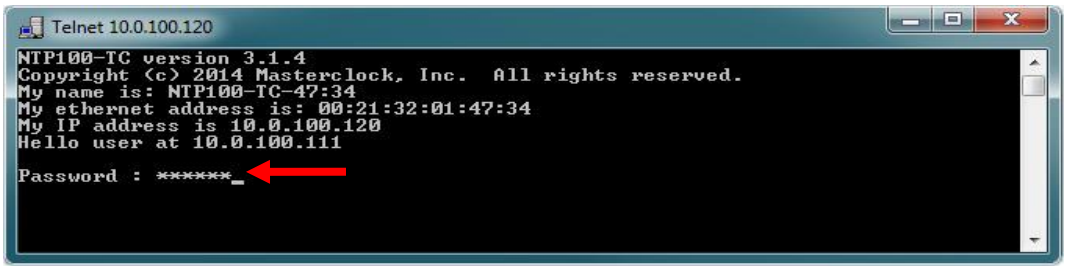
Configuration via Telnet may not be convenient for devices operating with a factory default network configuration since the IP address is not known. Use the WinDiscovery application to establish first-time networking configuration.

Note: Momentarily pressing the "RESET" button will display the IP address.

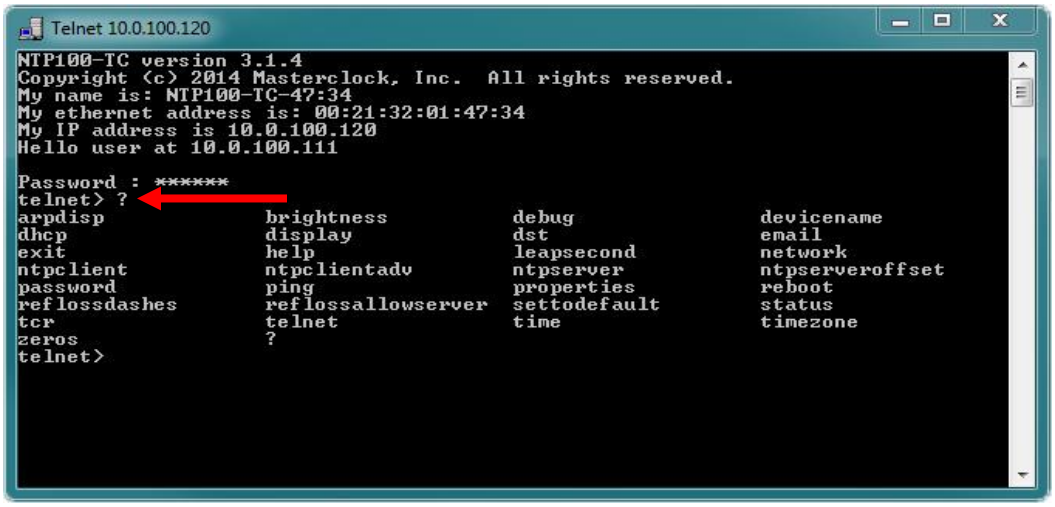
If you are not familiar with the Telnet application, ask your network system administrator for assistance.

[Note: for security purposes, the Telnet interface can be disabled. When disabled, you will no longer be able to access the unit with Telnet. To re-enable the Telnet feature, one of the other configuration methods must be used, or the unit must be reset to factory default configuration.]

Upon entering the NTP100 configuration via Telnet, the initial screen is shown below. The NTP100 displays its firmware version, its name, Ethernet address, IP address, and the IP address of the PC with which you are accessing it. A login prompt is presented if a password has been configured for the unit. The configuration menu will be displayed when the correct password has been provided. Password default: **public**



Enter '?' to access telnet commands.



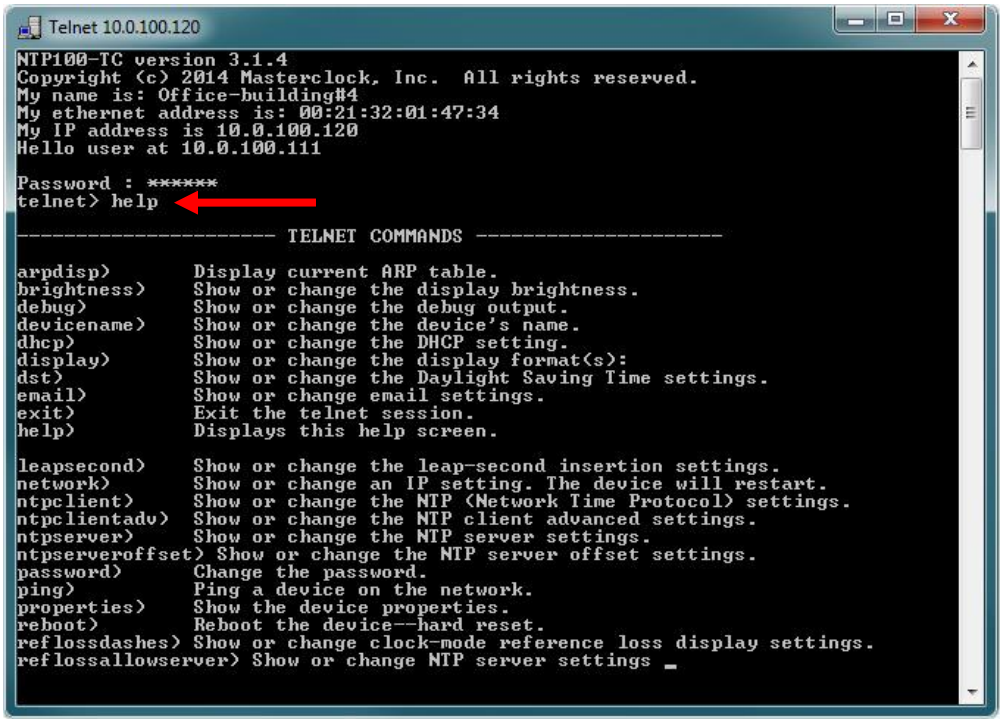
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Access Commands

Following telnet>, enter the command and press the enter key. Example: telnet> help

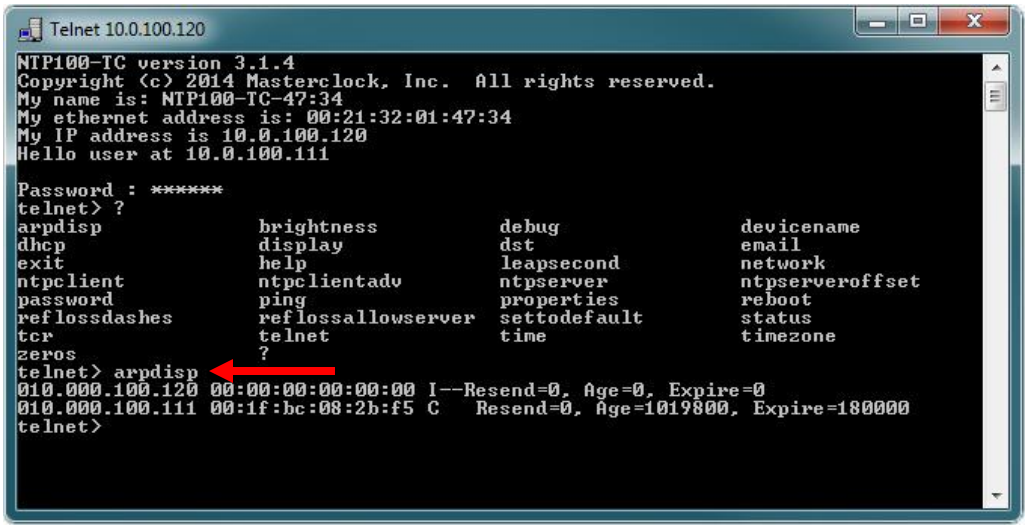
Help

To enable a list of telnet commands, along with a brief description, enter 'help' in command field. Example: telnet> help



ARP Display

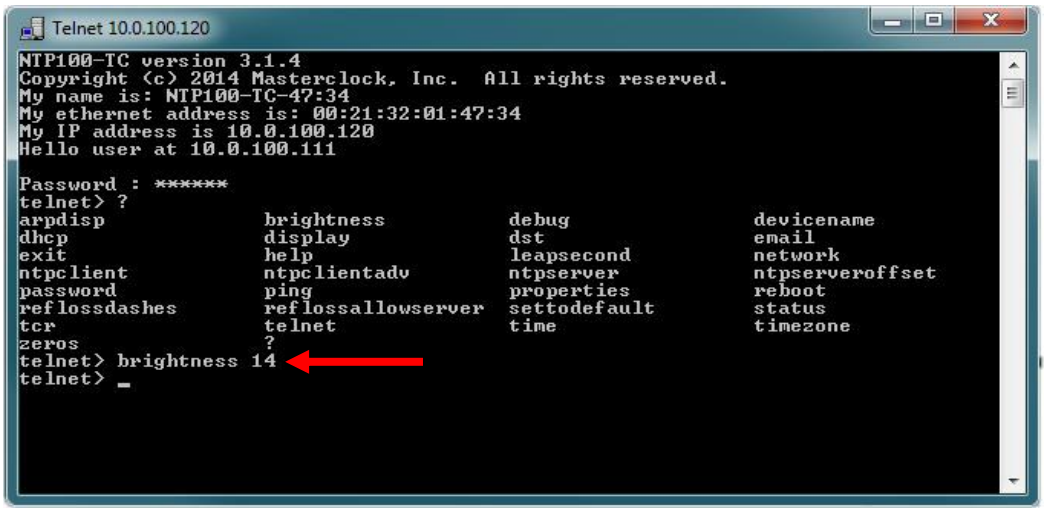
Address Resolution Protocol (ARP) is a protocol for mapping an Internet Protocol address (IP address) to a physical machine address that is recognized in the local network. To access ARP Display, enter 'arpdisp' in command field.
Example: telnet>arpdisp



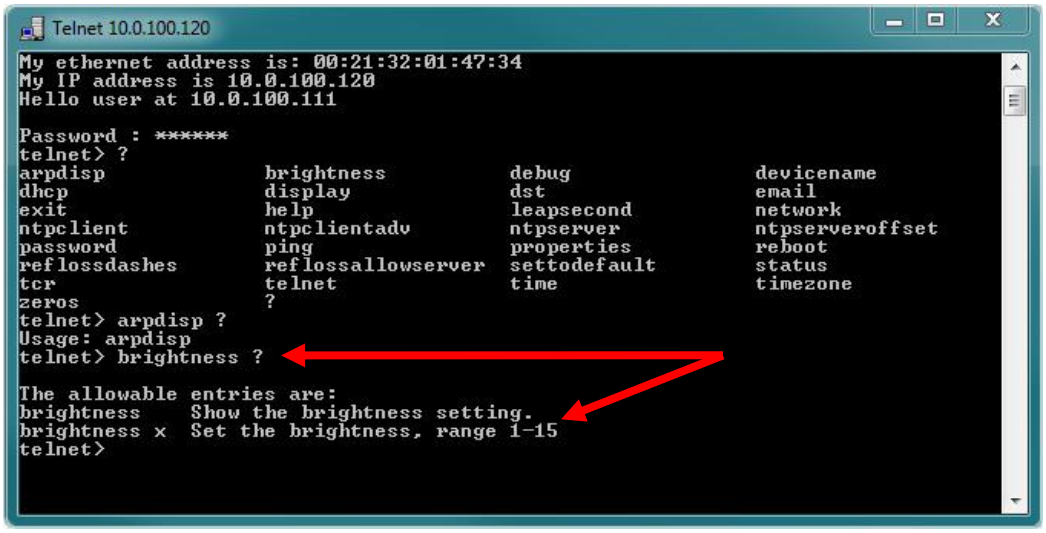
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Brightness Display Settign

To adjust the clock display intensity (brightness), enter ‘brightness with a scale of 1 to 15’ with 15 being brightest in command field. Example: telnet>brightness 14 (then press enter to set brightness level).



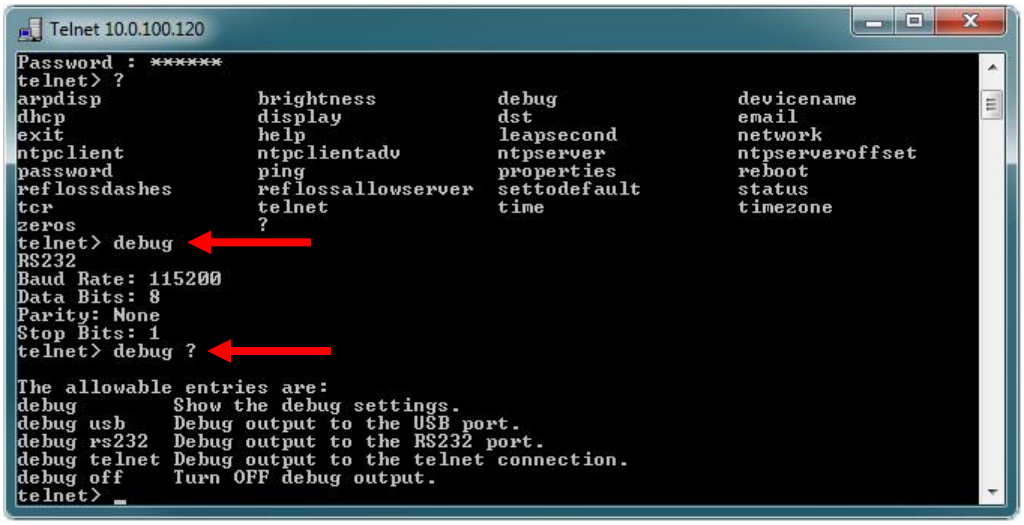
NOTE: Entering a command, followed by ‘?’, will display a list of allowable entries on select commands. Example: telnet>brightness ?



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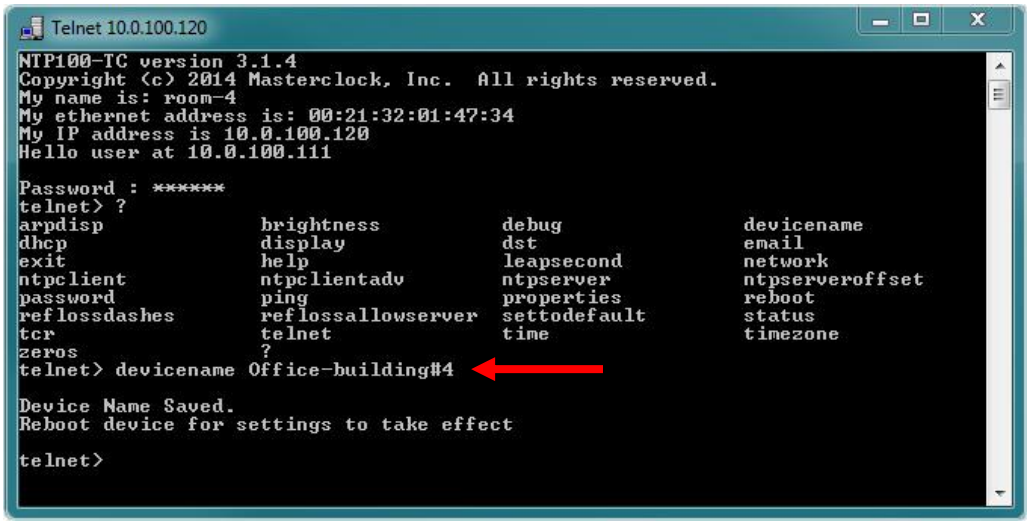
Debug

To display debug settings and output, enter 'debug' in command field. Example: telnet>debug
NOTE: Entering a command, followed by '?', will display a list of allowable entries on select commands. Example: telnet>debug ?



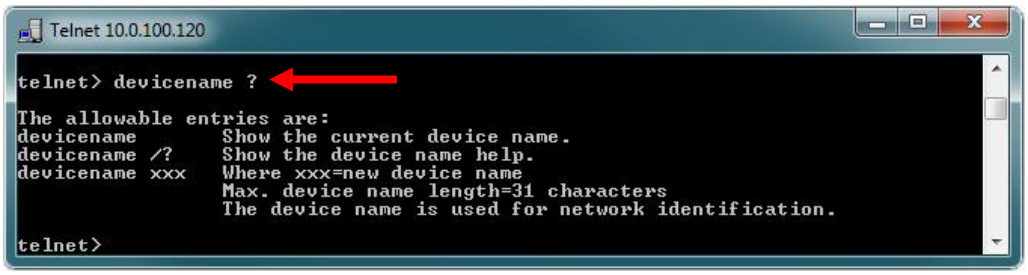
Device Name

To set the device name, type 'devicename', followed by desired name (do not use spaces in desired name) in command field. As with the WinDiscovery configuration utility, you may enter a unique alphanumeric device name.
Example: telnet>devicename Office-building#4 (Note: Reboot device for settings to take effect)



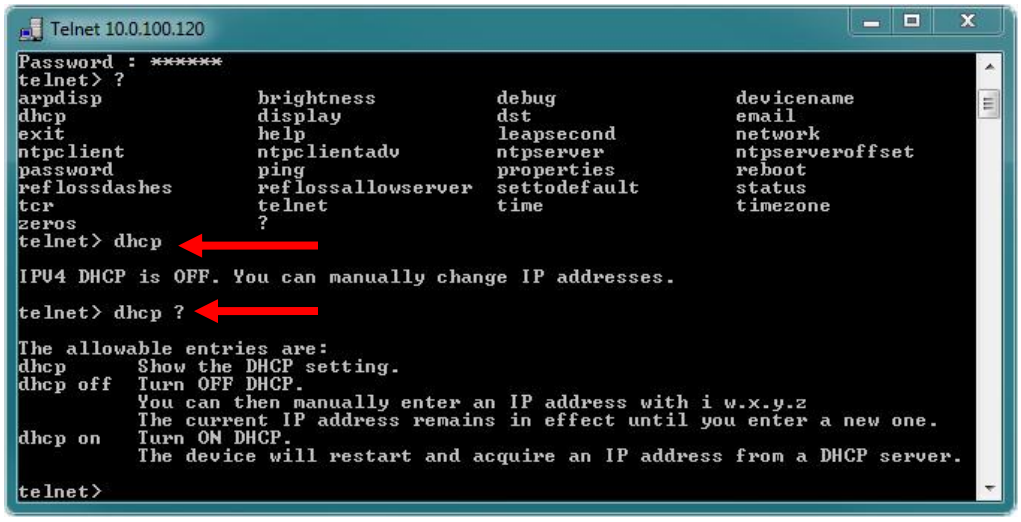
NOTE: Entering a command, followed by '?', will display a list of allowable entries on select commands.
Example: telnet>devicename ?

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DHCP

Dynamic Host Configuration Protocol (DHCP) is a network protocol that enables a server to automatically assign an IP address to a computer from a defined range of numbers (i.e., a scope) configured for a given network. To display DHCP settings, turn on and off, enter 'dhcp' in command field. Example: telnet>dhcp

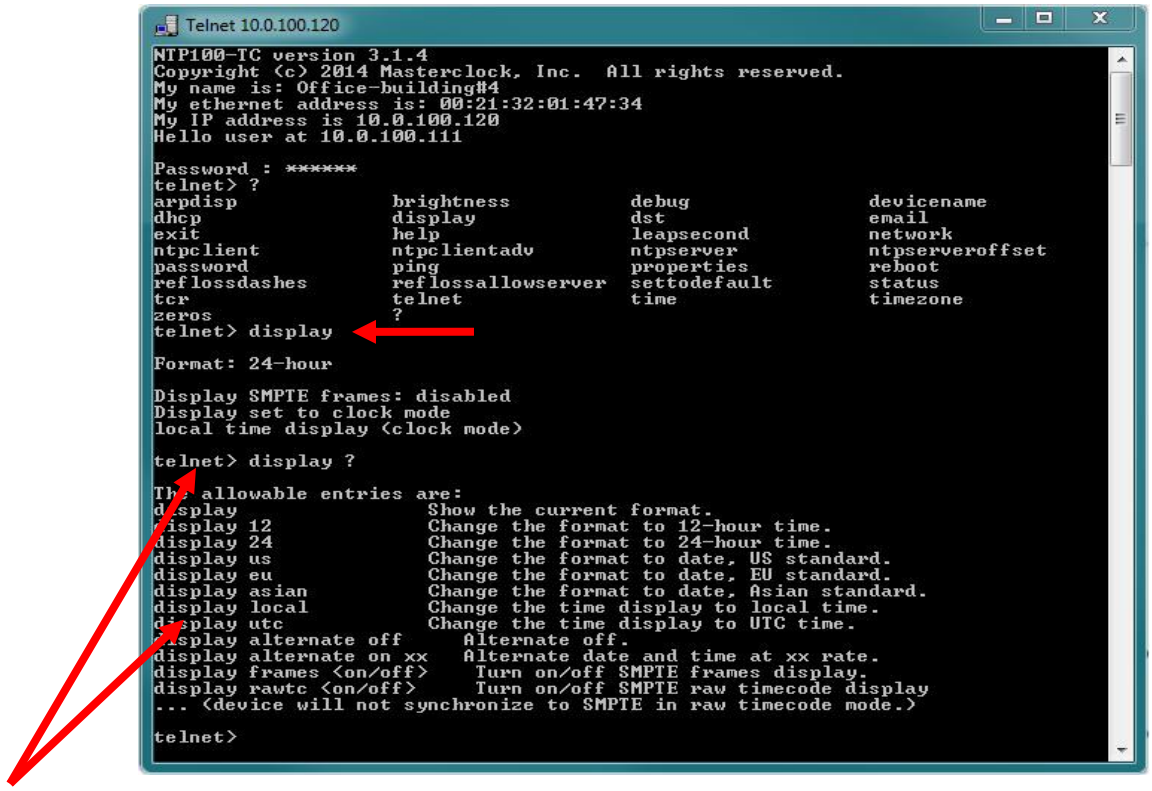


NOTE: Entering a command, followed by '?', will display a list of allowable entries on select commands. Example: telnet>dhcp ?

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Display

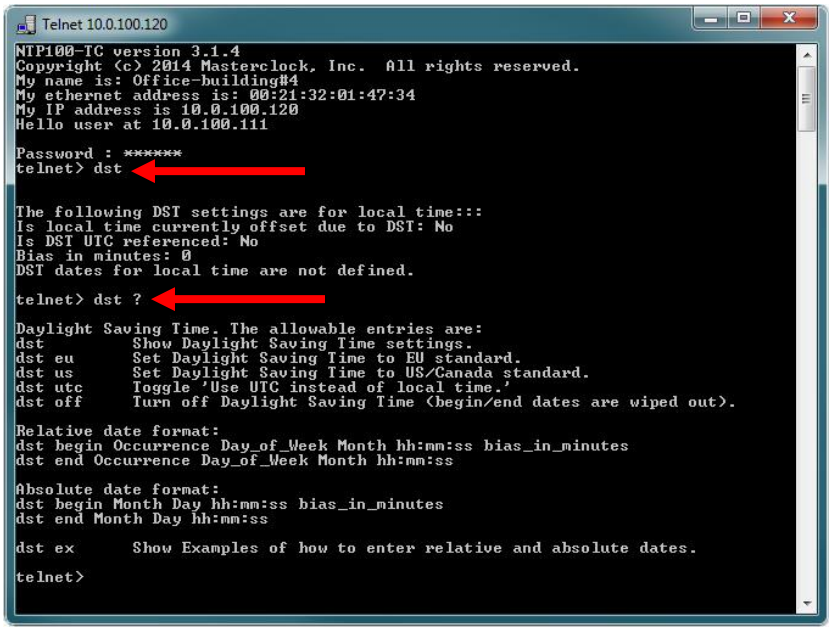
To set 12 or 24-hour time format, enter 'display' into command field. Example: telnet>display



NOTE: Entering a command, followed by '?', will display a list of allowable entries on select commands.
Example: telnet>display ?

DST – Daylight Saving Time

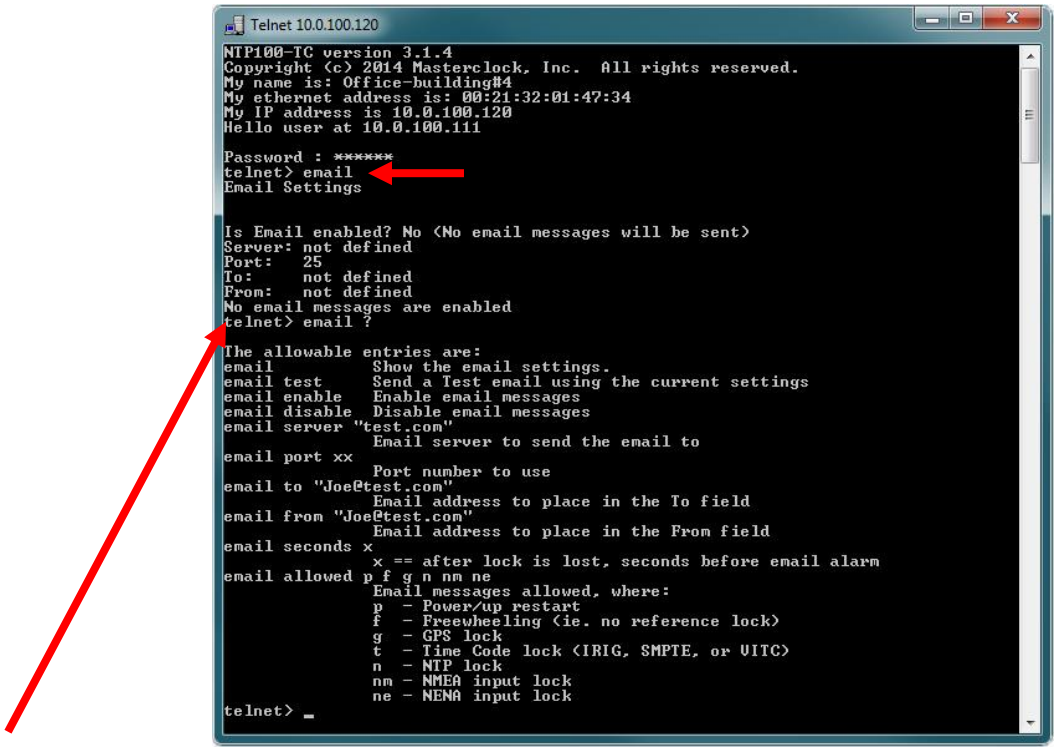
To set Daylight Saving Time (DST), relative and absolute date formats, enter 'dst' into command field. Example: telnet>dst
NOTE: Entering a command, followed by '?', will display a list of allowable entries on select commands.
Example: telnet>dst ?



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Email Configuration

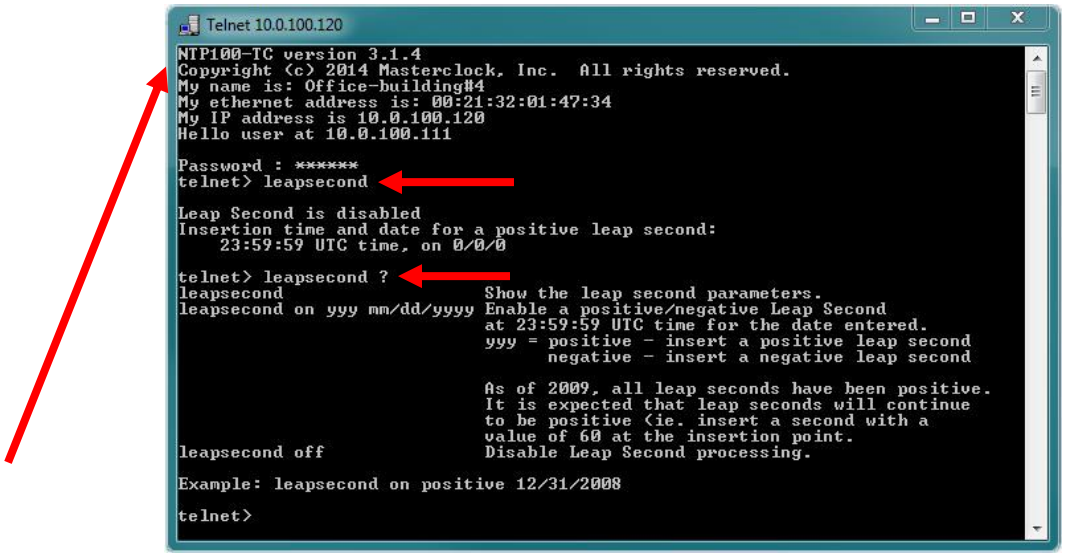
To enable email settings, enter 'email' into command field. Example: telnet>email



NOTE: Entering a command, followed by '?', will display a list of allowable entries on select commands.
Example: telnet>email ?

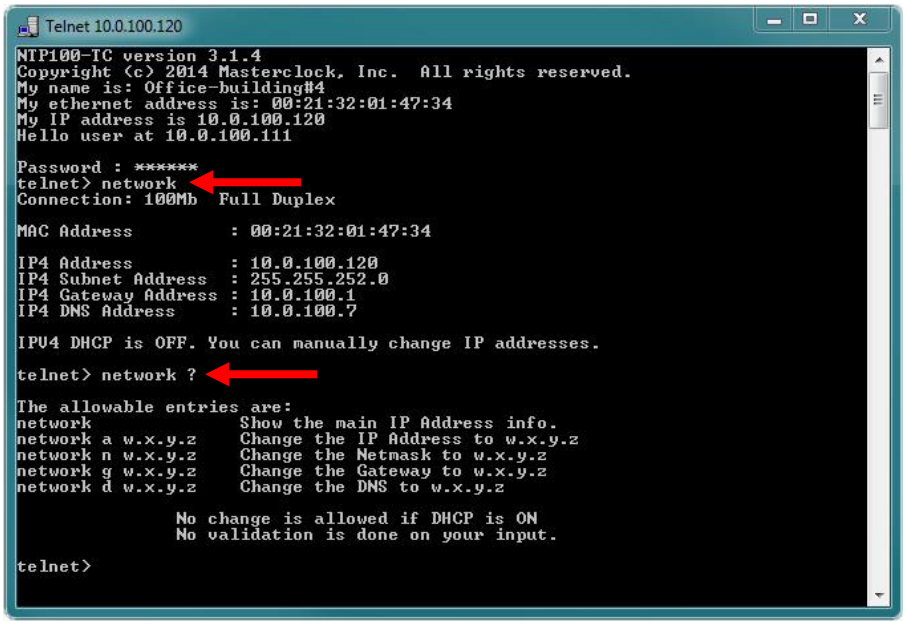
Leap Second

To enable positive/negative leap second or disable, enter 'leapsecond' into command field. Example: telnet>leapsecond
NOTE: Entering a command, followed by '?', will display a list of allowable entries on select commands.
Example: telnet>leapsecond ?



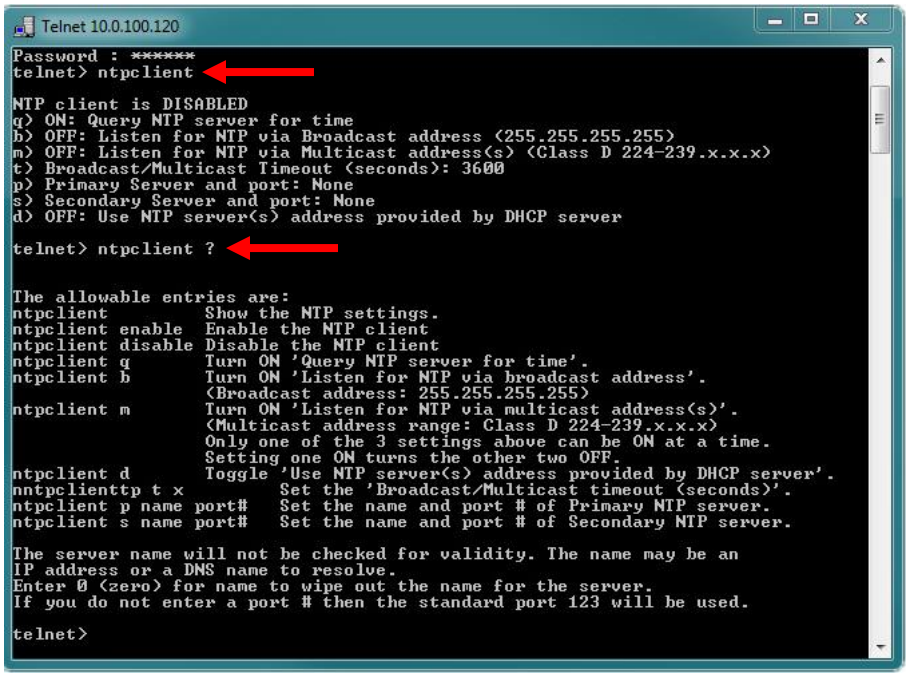
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Network



NTP Client

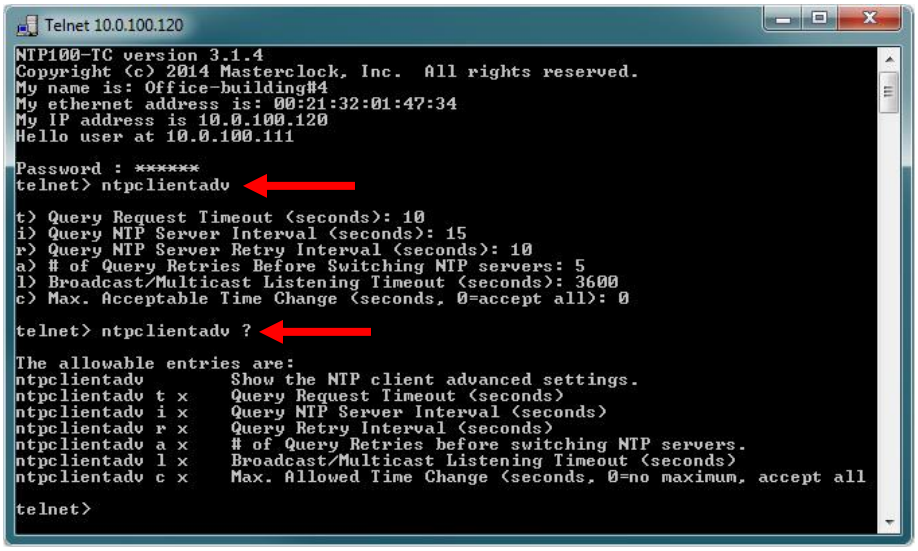
To access NTP Client settings, enter 'ntpclient' into command field. Example: telnet>ntpclient
The NTP Client can be enabled or disabled, NTP via broadcast can be turned on or off. NTP client can set broadcast/multicast timeout (in seconds) and set the name and port number of NTP server.
NOTE: Entering a command, followed by '?', will display a list of allowable entries on select commands. Example: telnet>ntpclient ?



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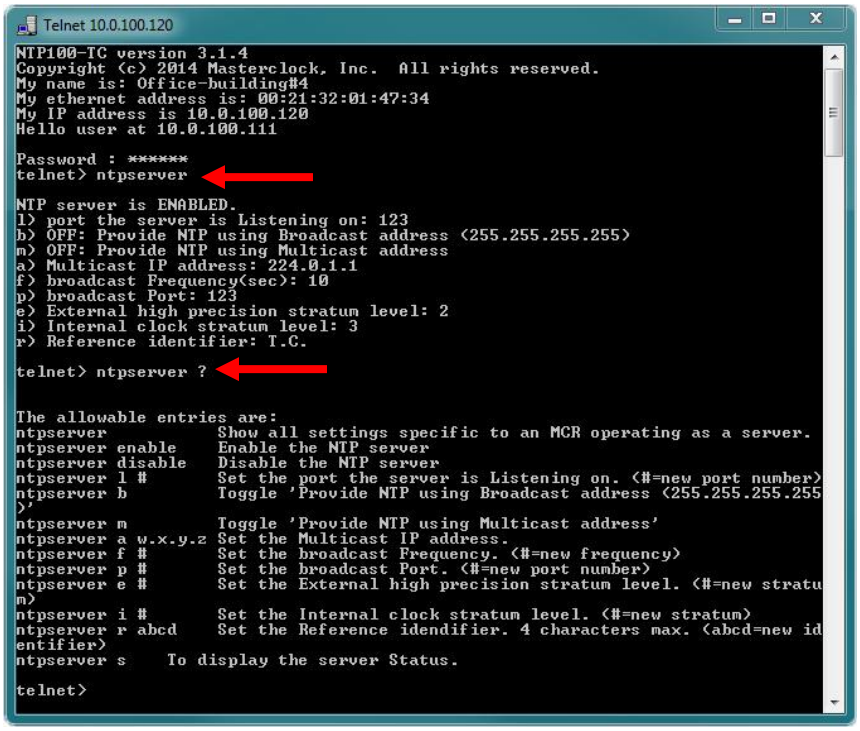
NTP Client Advance

To access NTP Client Advance settings, enter 'ntpclientadv' into command field. Example: telnet>ntpclientadv
The NTP Client Advance setting is used for request timeout and retries intervals in seconds.
NOTE: Entering a command, followed by '?', will display a list of allowable entries on select commands.
Example: telnet>ntpclientadv ?



NTP Server

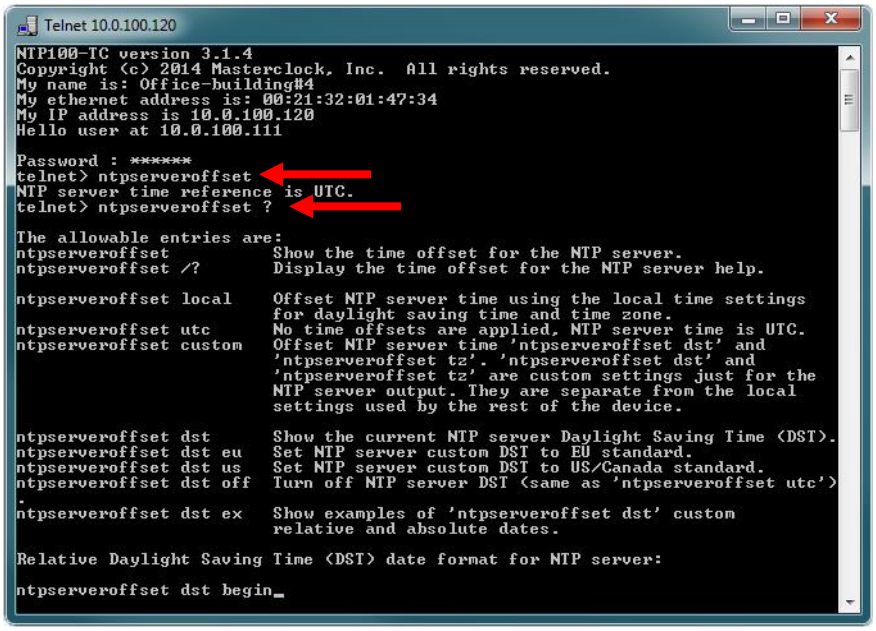
To show all settings specific to an MCR operating as a server, enter 'ntpserver' into command field.
Example: telnet>ntpserver
NOTE: Entering a command, followed by '?', will display a list of allowable entries on select commands.
Example: telnet>ntpserver ?



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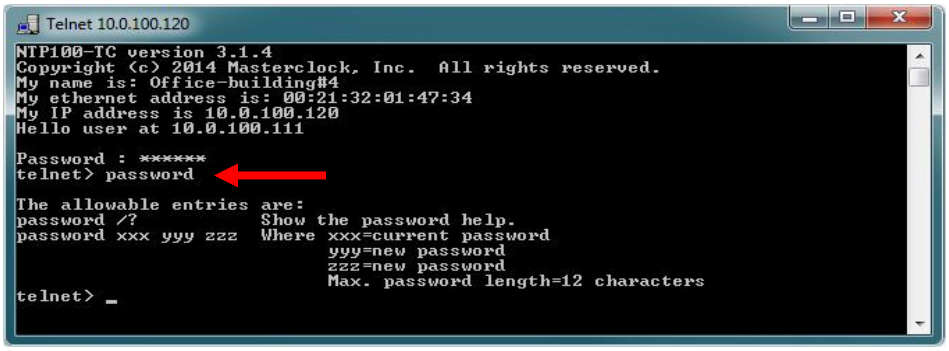
NTP Server Offset

To display the time offset for the NTP server, enter 'ntpserveroffset' into command field. Example: telnet>ntpserveroffset
NOTE: Entering a command, followed by '?', will display a list of allowable entries on select commands.
Example: telnet>ntpserveroffset ?



Password Set/Reset

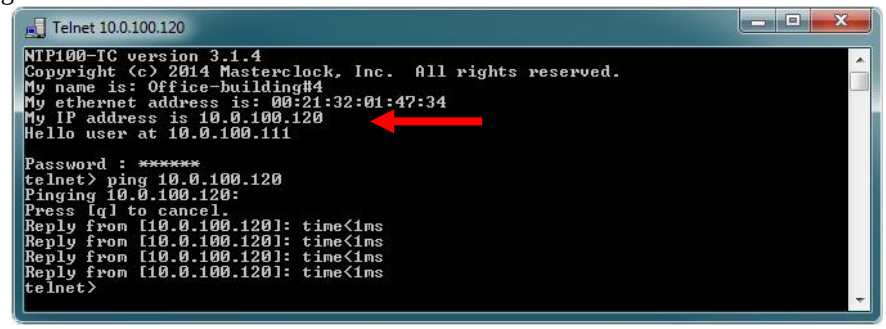
To set, change or remove the password, enter 'password' into command field. Example: telnet>password
Bear in mind that a lost/forgotten password cannot be recovered.



*[Note: the factory default password is**: public**]*

Ping

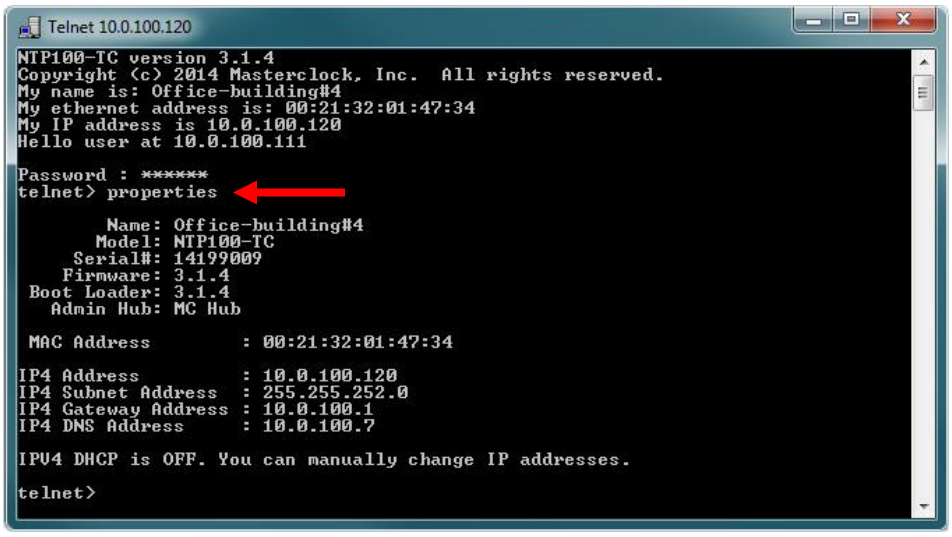
Enter 'ping IP Address' into command field as a test tool to verify device is communicating within the network.
Example: telnet>ping 10.0.100.120



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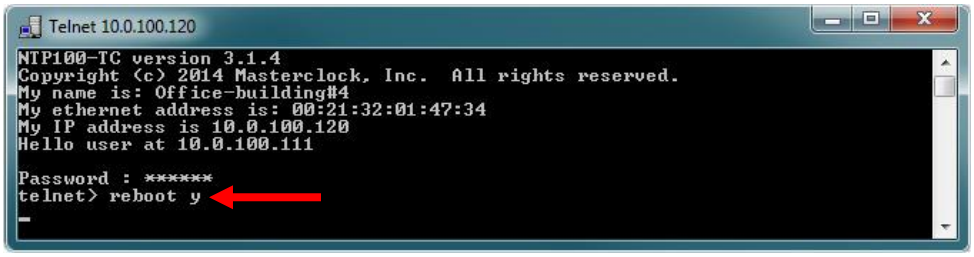
Properties

To view properties, enter ‘properties’ into command field. Example: telnet>properties
(Properties will display Name, Model, Serial Number, Firmware, Boot Loader and Administrative Hub)



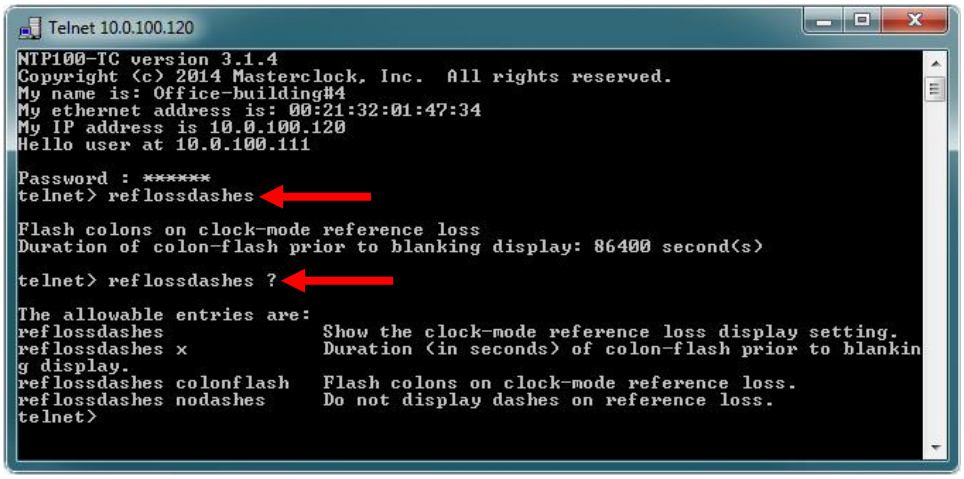
Reboot

Enter ‘reboot y’ into command field to reboot/restart the device. Example: telnet>reboot y



Reference Loss Dashes

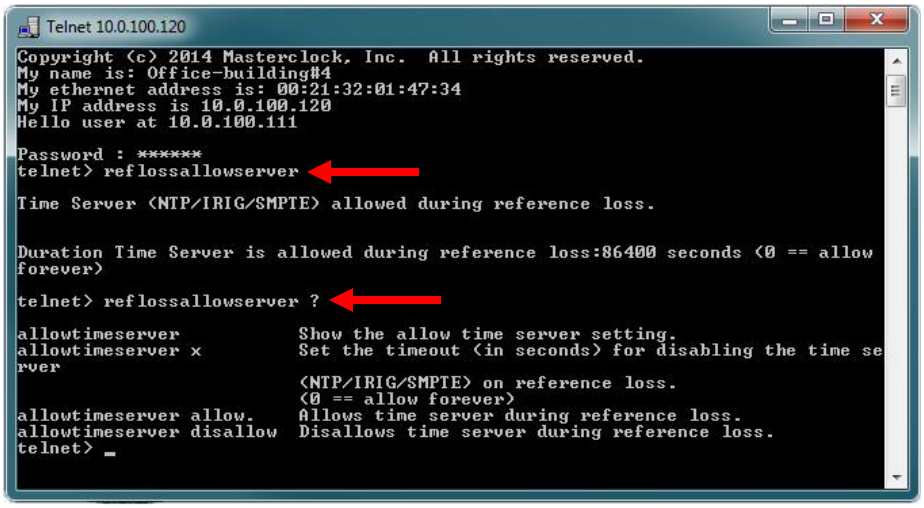
To view clock-mode reference loss display setting, enter ‘reflossdashes’ into command field. Example: telnet>reflossdashes
NOTE: Entering a command, followed by ‘?’, will display a list of allowable entries on select commands.
Example: telnet>reflossdashes ?



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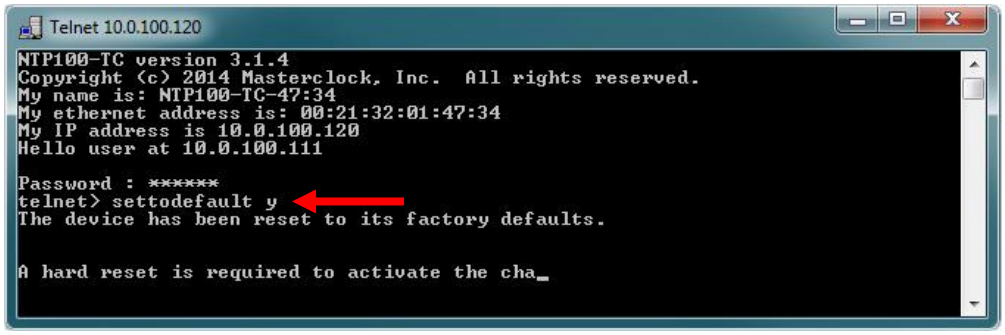
Reference Loss Allow Server

To set duration time server is allowed during reference loss, enter 'reflossallowserver' into command field.
Example: telnet>reflossallowserver
NOTE: Entering a command, followed by '?', will display a list of allowable entries on select commands.
Example: telnet>reflossallowserver ?



Set To Default

To reset device to its factory default, enter 'settodefault y' into command field. Example: telnet>settodefault y

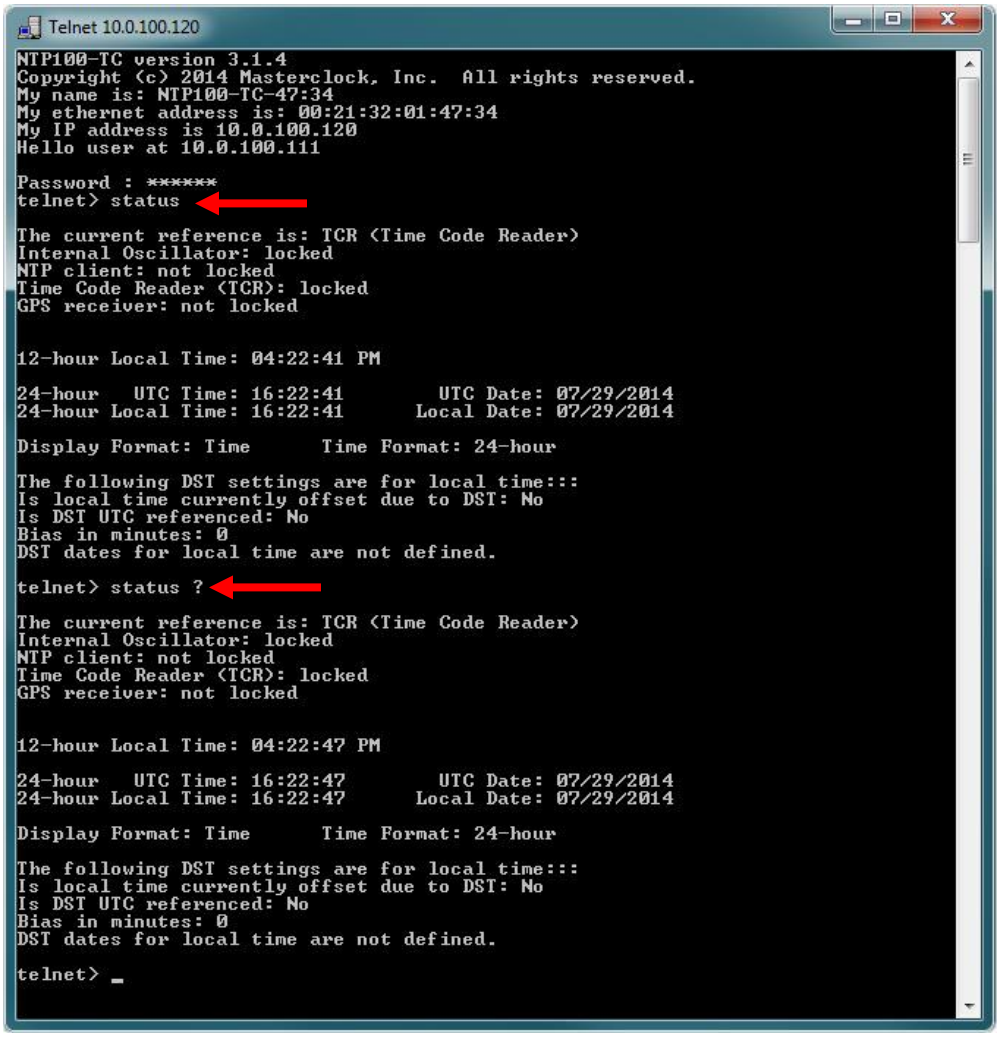


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Status

To check status, enter ‘status’ into command field. Example: telnet>status

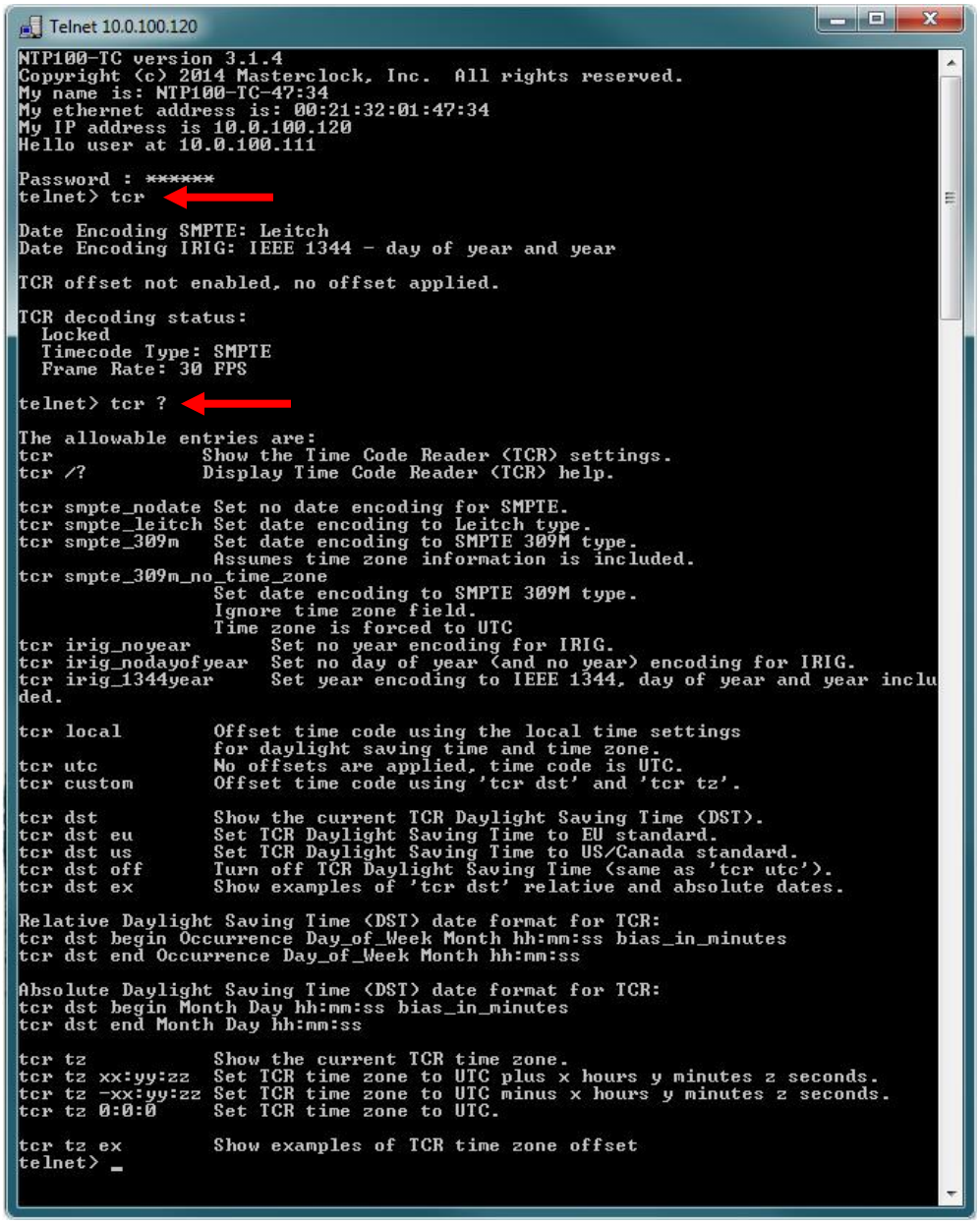
NOTE: Entering a command, followed by ‘?’, will display a list of allowable entries on select commands.
Example: telnet>status ?



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TCR – Time Code Reader

For Time Code Reader settings and status, enter 'tcr' into command field. Example: telnet>tcr
NOTE: Entering a command, followed by '?', will display a list of allowable entries on select commands.
Example: telnet>tcr ?

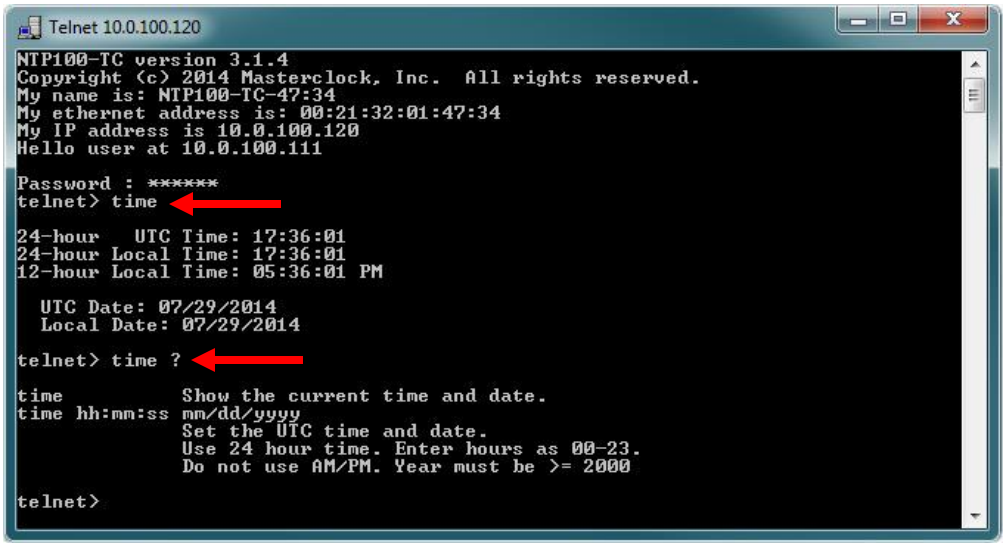


Telnet

To turn telnet access off, enter 'telnet off' into command field. Example: telnet>telnet off
NOTE: Once you exit this session you will not be able to enter another one unless you reset the device or use WinDiscovery to turn on telnet access.

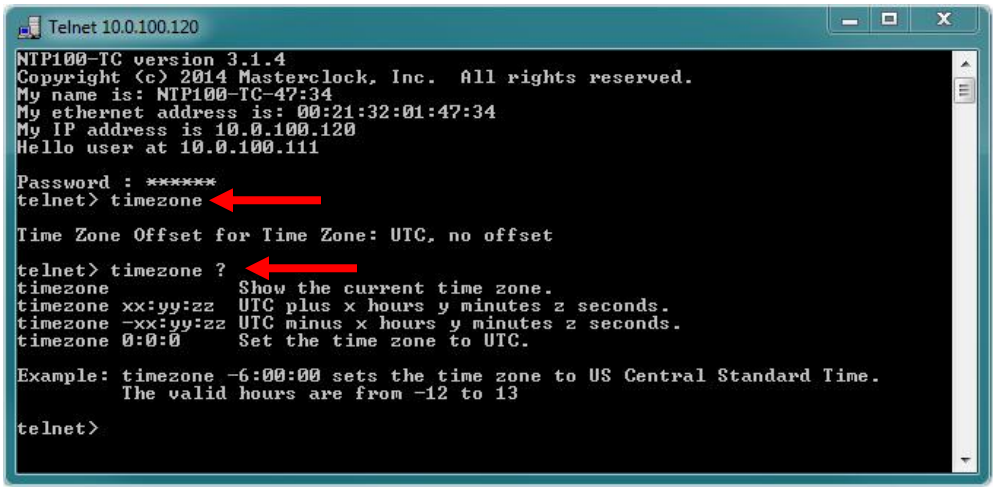
Time

To set time and date, enter ‘time’ into command field. Example: telnet>time
NOTE: Entering a command, followed by ‘?’, will display a list of allowable entries on select commands.
Example: telnet>time ?



Time Zone

To view time zone status or set time zone offset, enter ‘timezone’ into command field. Example: telnet>timezone
NOTE: Entering a command, followed by ‘?’, will display a list of allowable entries on select commands.
Example: telnet>timezone ?



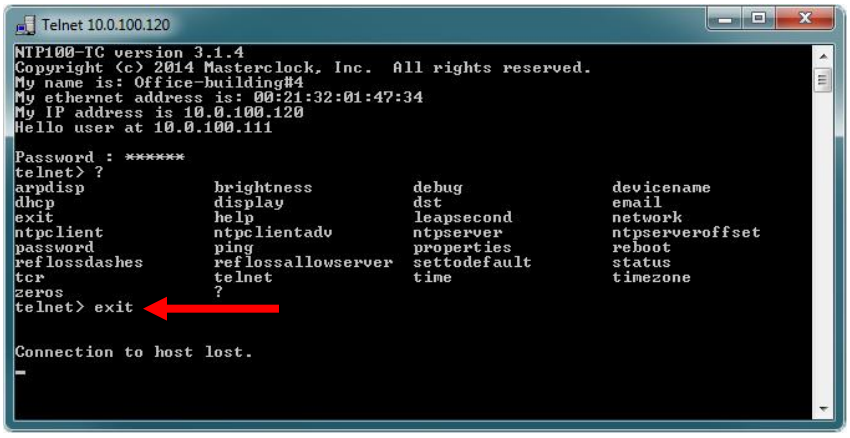
Zeros

To show the status of clock leading zeros or disable leading zeros, enter ‘zeros’ into command field. Example: telnet>zeros
NOTE: Entering a command, followed by ‘?’, will display a list of allowable entries on select commands.
Example: telnet>zeros ?

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Exiting Telnet

To exit the terminal interface, enter ‘exit’ into command field. Example: telnet>exit



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SSH-Secure Shell

Configuration
Access Commands

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SSH - Secure Shell

SSH is intended for users who cannot access WinDiscovery (for network security reasons) and is a secure command line way to control a NTP100. The commands available are those also available via Telnet. (pgs. 55-68)
The difference between SSH and Telnet is security and access method.

SECURITY:

The user must enter a user name and password to control a NTP100 device via SSH. After logging in, add new name and password, then delete the default to assured device is secure. The names/passwords are stored in the device (current maximum pair of names and passwords is 3).

Data between the client and server are encrypted by both 3DES and 128-bit AES methods, which is a very high level of security.

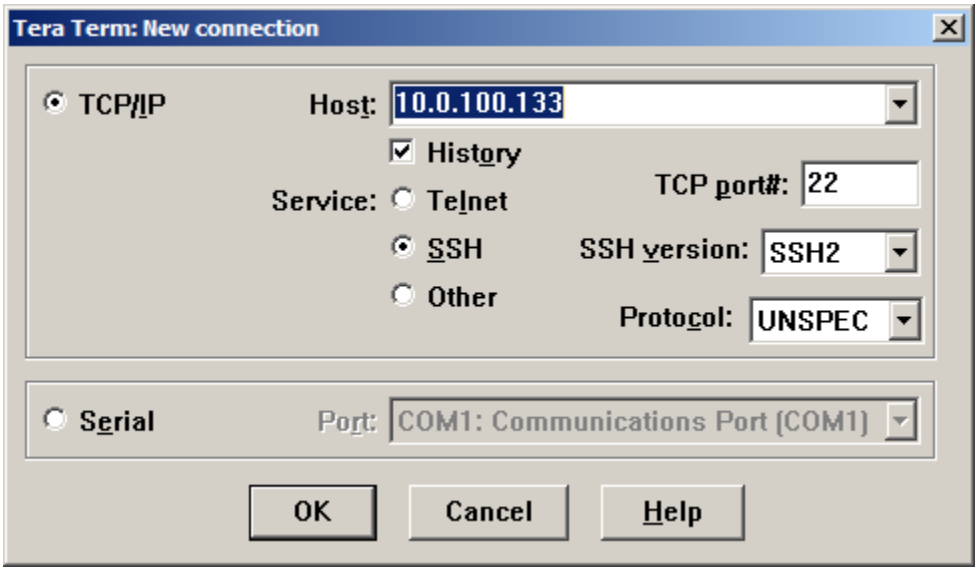
ACCESS METHOD:

To run an SSH session, a special client is needed to run on the user's PC. The client will connect with the SSH server running in the Masterclock device. TeraTerm is such a client (free for download: http://ttssh2.sourceforge.jp/).
Note: Masterclock does **NOT** make such a client.

To use the client, enter the IP address of the device to connect, and then enter a user name and password to log in.
A command window appears in which the user types commands to control the device or just get information from it.
Note: Same Telnet commands are available to use as detailed on pages 54-68.

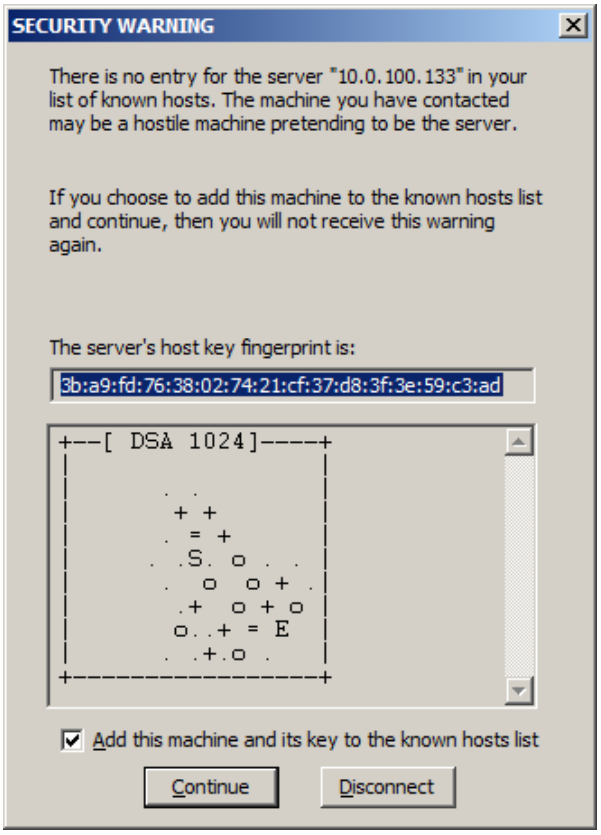
Examples below are snapshots of the Tera Term windows.

The first screen (shown below) needs IP address of the device to be filled in as Host:

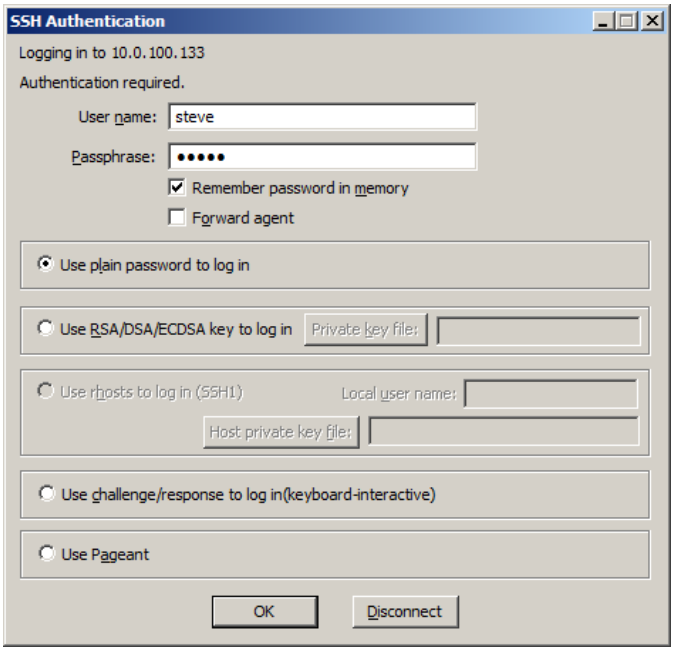


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The first time you connect to a device, a security warning window will appear showing this host has never been seen before and ask if you want to add it to the list of known hosts (click Continue).



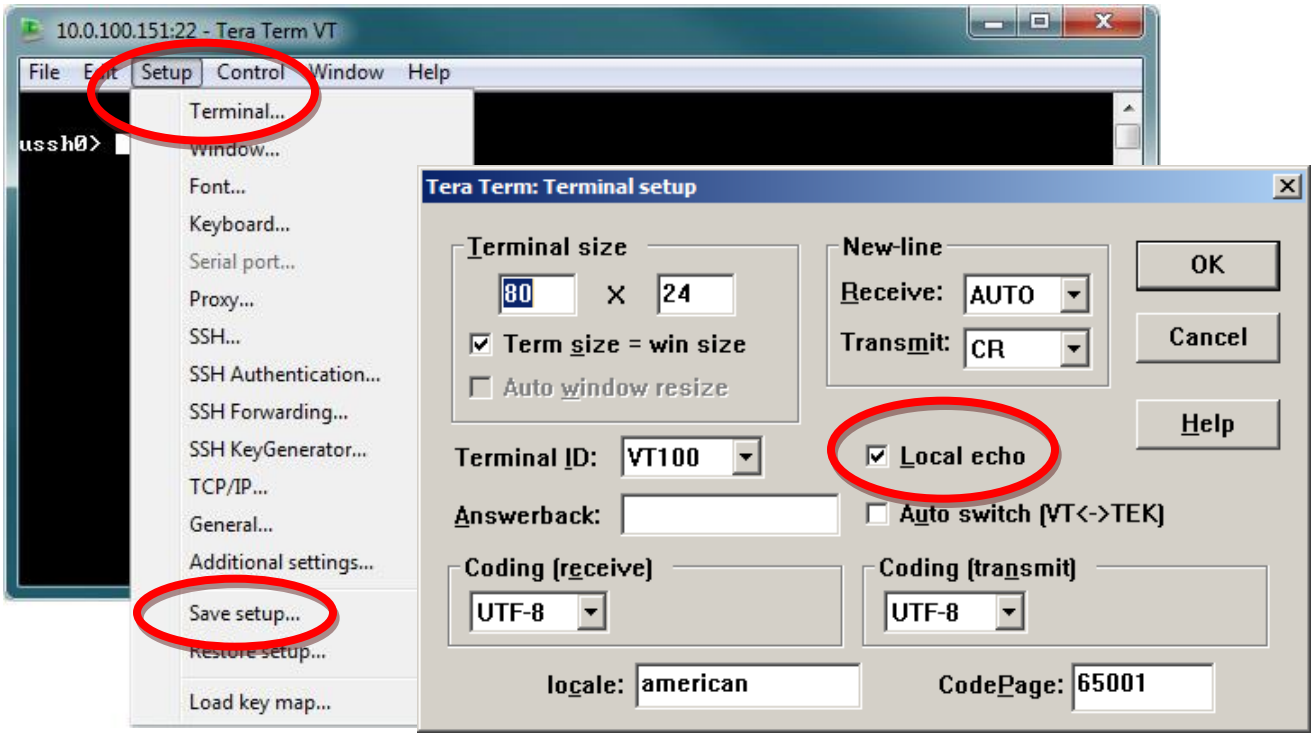
The SSH Authentication requires a username and password be filled in. (click OK)



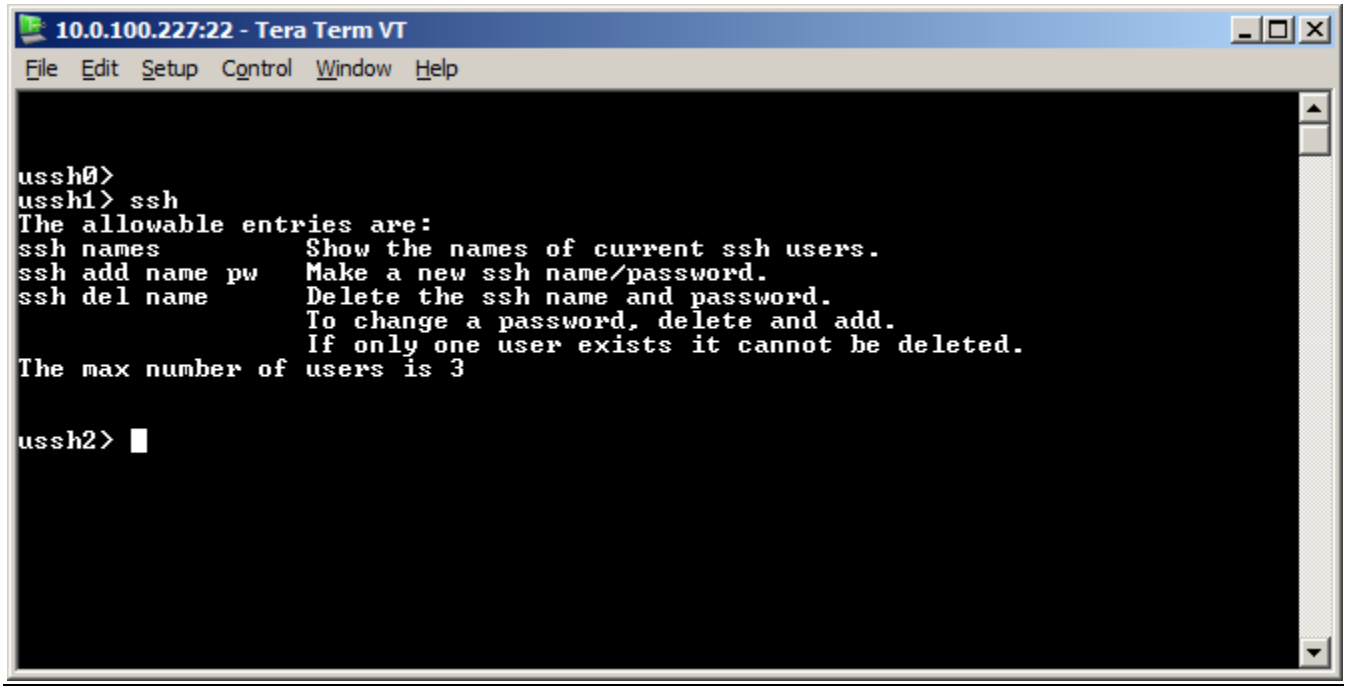
To get local echo (necessary for SSH) open the Setup menu, choose Terminal, checkmark "Local echo", click OK, then again in the Setup menu, choose "Save setup...".

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Note: Echo should then be present the next time you use the application.



The command window should display and enter commands to control the device or just get information about its status:



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Limited Warranty

NTP Client Information
Trouble Shooting Tips
Specifications
Contact

LIMITED WARRANTY

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This Masterclock product warranty extends to the original purchaser.

Masterclock warrants the NTP100 against defects in materials and workmanship for a period of five years from the date of sale. If Masterclock receives notice of such defects during the warranty period, Masterclock will, at its option, either repair or replace products that prove to be defective.

Should Masterclock be unable to repair or replace the product within a reasonable amount of time, the customer's alternate remedy shall be a refund of the purchase price upon return of the product to Masterclock. This warranty gives the customer specific legal rights. Other rights, which vary from state to state or province to province, may be available.

EXCLUSIONS

The above warranty shall not apply to defects resulting from improper or inadequate maintenance by the customer, customer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product or improper site preparation and maintenance (if applicable).

WARRANTY LIMITATIONS

MASTERCLOCK MAKES NO OTHER WARRANTY, EITHER EXPRESSED OR IMPLIED, WITH RESPECT TO THIS PRODUCT. MASTERCLOCK SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

In any state or province which does not allow the foregoing disclaimer, any implied warranty of merchantability or fitness for a particular purpose imposed by law in those states or provinces is limited to the one-year duration of the written warranty.

EXCLUSIVE REMEDIES

THE REMEDIES PROVIDED HEREIN ARE THE CUSTOMER'S SOLE AND EXCLUSIVE REMEDIES. IN NO EVENT SHALL MASTERCLOCK BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

In any state or province that does not allow the foregoing exclusion or limitation of incidental or consequential damages, the customer may have other remedies.

HARDWARE SERVICE

You may return your NTP100 device to Masterclock for repair service. Please contact the factory for RETURN AUTHORIZATION before returning the unit. Under the Limited Warranty, when you return your device for service, Masterclock will pay for transportation cost if within one year of the purchase date. For international returns, please contact the factory.

NTP Client Information

Any computer system desiring to synchronize its time to the NTP100 server must incorporate an NTP/SNTP client. A NTP/SNTP client is responsible for asking the NTP server for time/date information, or in some cases simply listening on the network for NTP time broadcasts, then setting the internal time of the computer or device. NTP client applications come in a variety of offerings, supporting different features, and with different levels of accuracy, fault tolerance, and reporting. Many are inexpensive to license, or free. A listing of NTP/SNTP clients can be found at the NTP home page, http://www.ntp.org, as well as many shareware/freeware file search engines. A partial list is found below:

Dimension 4

Operates in most Windows environments. Concise user interface can be minimized to the system tray. Can also be run as a service. http://www.thinkman.com/

TimeSync

Operates in a Windows NT/2000 environment, and can run as a service. http://www.intsoft.com

XNTP

XNTP is the commonly used Unix distribution of NTP server/client software. XNTP is distributed with many UNIX operating system packages, and is licensed for use without fee. The distribution can also be built for Windows operating systems although it is generally not needed for the Windows 2000/XP platforms (see Win32Time below). http://www.ntp.org

W32Time Service (Windows Time Service)

The Windows Time service is supplied with the Windows operating system and is typically active (started or running) by default. W32Time is started by default on Windows XP and Windows Server 2003 machines regardless of whether they belong to a workgroup or a domain. On Windows 2000, W32Time must be manually started on machines belonging to a workgroup.

The Windows Time service is designed to loosely synchronize (or set) the system time and allows for a 20 sec variance between machines on a WAN or enterprise level ,and up to about 2 seconds at a local level (LAN). In addition, the system time (network time) may not be accurate time relative to the UTC reference. In many applications, this type of inaccuracy is not acceptable. The default poll times are often extended allowing for significant drift.

In general, most 3rd party SNTP or NTP client applications or services designed to run under Windows will disable (or attempt to disable) the W32Time service. This is to allow for a more accurate system clock pointing directly to one or more time servers and allowing a higher polling rate. If the Windows Time service is not disabled, this may cause undesirable results with other applications or services which attempt to set the system time accurately. However, for certain network configurations the user may be required to continue to use the Windows Time service. In such cases, the W32Time registry entries will require modification from the default settings to achieve synchronization with the NTP100, within the framework of the W32Time service capabilities.

A dissertation on configuring and deploying Win32Time in an enterprise network environment using an Authoritative Time Server, Primary Domain Controller, Secondary Domain Controllers, or an Active Directory environment is beyond the scope of this manual, and the support provided by Masterclock.

For suggestions on using the W32Time service, please see the troubleshooting area of this manual , as well as the appropriate knowledgebase articles available at the Microsoft support site. Please also refer to the documentation included with your Windows operating system for details. The Microsoft Knowledge Base also contains a number of other useful articles regarding the W32Time service. Search on the ‘net time’, ‘w32time’, ‘symmetric active’, ‘authoritative time source’, and ‘trusted time source’ keywords.

Disclaimer

Masterclock, Inc. cannot provide technical support for the above-described client packages. Masterclock, Inc. makes no warranty, either expressed or implied, with respect to any of these client software packages. Masterclock, Inc. specifically disclaims the implied warranties of merchantability or fitness for a particular purpose.

Troubleshooting Tips

[Important Note: WinDiscovery uses bi-directional UDP messaging on ports 6163, 6263, 6170, 6171, 6172, 6173 and multicast addresses 224.0.1.254, 224.0.0.225 for both the discovery process and to communicate configuration and status packets to and from the Masterclock® network clock(s). Delivery of UDP messages/packets is not guaranteed. If you experience intermittent problems with WinDiscovery , try closing the current session and restart the application. If this does not resolve the issue try the following trouble shooting tips, or switch to an alternate method of configuration such as telnet.]

All NTP100 units are fully checked and system tested at the factory for proper operation before shipment and unless physical damage is found, the unit is probably functional.

Problem: Unable to find [discover] the Masterclock® network device(s) on the network with WinDiscovery.

Possible reasons/solutions:

1. Verify that you have supplied power to the network device.
2. The discovery process was not complete before selecting clock(s). After selecting "Discover" button, wait until the discovery status indicates 100% completion.
3. Verify that the network device is a Masterclock® brand. WinDiscovery is not designed to work with network products from other vendors.
4. Verify that the network device is on the same physical network as the computer from which you are running WinDiscovery.
5. If the computer is separated from the device by a router (on a remote network) or a firewall it is likely that the router/firewall is blocking communication with the device. Run WinDiscovery from a computer within the remote network, or ask a network system administrator to configure the router/firewall in question to pass through (both directions) UDP broadcasts on port 6163 [Note: If this does not resolve the detection problems you may additionally configure to pass through both directions UDP broadcasts on ports 6165, 6166, and 6264]. Some routers will not forward UDP broadcasts across networks – currently, this capability is required to use WinDiscovery for enterprise-level management of Masterclock, Inc. network appliances. If you are running a personal firewall product, such as ZoneAlarm™ or BlackICE™, or the built in Windows firewall you must adjust their configuration to pass through (both directions) UDP traffic on port 6163.
6. Verify that the hub/router/switch is capable of supporting the 10MB speed that the attached network device requires.
7. Verify that a DHCP/BOOTP server is present on the network. If the clock has been configured to use DHCP for network configuration but no DHCP/BOOTP server is present, the clock may not respond to discovery requests for up to twenty seconds after power-on. *[Note: DHCP configuration is enabled as a factory-default.]* In addition, the clock will reset its address (fallback) to one within the link-local address space (169.254.xxx.xxx) when no DHCP server is present or is not able to be reached. Reset the clock to initiate a new DHCP IP address request, or use static IP address mode. Consult your network system administrator to ensure that a DHCP server is present and accessible on your network and/or to obtain a list/range of available IP addresses.
8. Verify that the network device and the computer running WinDiscovery are attached to the network.
9. Verify that all network cables, hubs, etc. are in proper working order. Be sure that Ethernet crossover cables are not being used where inappropriate.

Problem: Device was found using WinDiscovery, but the status display is intermittent or not updating and/or clock does not appear to be responding to configuration changes under the current WinDiscovery session.
Problem: Device(s) previously found during a recent session of WinDiscovery do not show up during the current session.
Problem: The device's status or settings displayed under WinDiscovery show garbled characters.

Possible reasons/solutions:

1. The WinDiscovery application has been open for too long and the device's configuration(s) has(have) changed. For example, this can occur if the DHCP server has issued new/refreshed addresses. Close the WinDiscovery application and restart.
2. The discovery process was not complete before selecting clock(s). After selecting "Discover" button, wait until the discovery status indicates 100% completion.
3. Verify that the physical network cables and equipment and configuration for UDP have not changed.
4. Verify that you are currently the only user accessing the clock via WinDiscovery or telnet.

5. The network may currently be experiencing heavy traffic which is reducing bandwidth and/or causing collisions with the UDP messages/packets between the clock(s) and WinDiscovery. Since delivery of UDP messages are not guaranteed, this can cause WinDiscovery to not receive the latest configuration or status packets, and thus show outdated or garbled information. In some cases, the clock may not be discovered and displayed in the WinDiscovery device tree. In others, previously discovered clocks may no longer be accessible or responding.
   - Press the "Discover" button again and wait until the discovery process completes. This will occasionally resolve issues with units not being discovered.
   - Close the current WinDiscovery session and restart the WinDiscovery application.
   - Take steps to increase the bandwidth and reduce network traffic.
   - If this is an ongoing problem, consider the Telnet configuration method or remove the clock system to an isolated LAN.

Problem: Device appears in RED text under WinDiscovery device tree.
Problem: Device is being assigned an IP address of 169.254.xxx.xxx
Problem: Device not maintaining its assigned IP address.
Problem: Device function is erratic, appears to periodically reset itself.

Possible reasons/solutions:

1. Incorrect network configuration may be causing the device to receive a fallback IP address and or perform soft restarts. Verify that the IP address configured for the clock is correct. If you manually enter (or DHCP assigns) an IP address that already exists on the network, this will create an IP address conflict. The device will reset its address (fallback) to one within the link-local address space. Determine the cause of fallback IP address and resolve issue. View the error status field under the status window to help determine the cause of why the clock received a 169.254.xxx.xxx. Near the bottom of the Status window the error will be displayed. (If there is no error the text box will not be displayed.)

[Note: Devices which have been assigned a fallback IP address of 169.254.xxx.xxx will be displayed in the main WinDiscovery window with RED text, indicating a problem with the configuration.]

When the Ethernet interface is initialized the network device will verify that the IP address (either static or assigned by DHCP) is not being used by another device on the network. If a conflict is found the NTD clock will default to a 169.254.xxx.xxx address. The IP address that caused the error is saved and returned as an error to WinDiscovery. This error status is available to the user via the Status window on WinDiscovery.

- If static IP addressing is being used the original conflicting static IP address can be restored by doing a soft restart of the device using either WinDiscovery or telnet prior to changing any other configuration parameters.

[IMPORTANT NOTE: if the configuration of the network device is changed while a 169.254.xxx.xxx is being use, then the current 169.254.xxx.xxx address will become the permanent static address and the original conflicting static address is lost. At this point, it is necessary to manually change the static IP address to a one that will not conflict, or you may do a "Reset Configuration" to restore the system to factory default settings.]

- If DHCP was selected and the network device fell back to a 169.254.xxx.xxx address approximately every 10 [depending upon the "Advanced Settings" values] minutes the Ethernet interface will be reinitialized and the NTD clock will attempt to get an IP address from the DHCP server. If the NTD is successful, the error will be cleared and the new address from the DHCP server will be used. If a discovery was done using WinDiscovery or telnet was used this initialization will be delayed by 2 hours.

Problem: Device appears to 'reset' periodically.

Possible Reasons/solutions:

1. Check the network connection and setup. If DHCP is enabled *[Note: DHCP is enabled by default]* and a DHCP server is not active on the local network the clock will hesitate periodically while attempting to resolve DHCP configuration. To correct the problem, switch to manual networking configuration or determine why the local DHCP server is not operating.
2. If the device cannot resolve its DHCP address in DHCP mode, the unit will periodically perform a soft restart to re-initialize its communication port and DHCP configuration. See the trouble shooting section on fallback IP address
3. If the device has not been configured with at least one valid DNS server (or that DNS server is down) hesitations similar to those described in #1 will occur. At least one valid DNS server is required for operation.

Problem: Unable to communicate with the NTP100 on the network with Telnet

1. If the NTP100 has been configured to use DHCP for network configuration but no DHCP/BOOTP server is present, the NTP100 may not respond to discovery requests for up to twenty seconds after power-on. *[Note: DHCP is enabled as a factory-default.]*
2. Verify that you have the correct IP address for the unit and the IP address did not change. If using DHCP to provide the IP address, this address may change periodically, you must know the IP address of the unit to use the TELNET interface.
3. Verify that the device does not have the Telnet interface disabled.

[Note: for security purposes, the Telnet interface can be disabled. When disabled, you will no longer be able to access the unit with Telnet. To re-enable the Telnet feature, one of the other configuration methods must be used, or the unit must be reset to factory default configuration.]

Problem: NTP/SNTP client application or W32Time service is unable to communicate with the NTP100

1. Verify that the NTP100 is attached to the network.
2. Verify that all network cables, hubs, etc. are in proper working order. Be sure that Ethernet crossover cables are not being used where inappropriate.
3. Verify that the NTP100 is actually reachable from the client. Try "pinging" the IP address of the NTP100. If this fails, it is possible that the NTP100 has an invalid network configuration or that the network is down. Consult your network administrator for assistance.
4. Verify that the NTP100 is set to output if operating in internal oscillator/real time clock mode and that the maximum time difference has not been exceeded.
5. Verify that the client application or service is not using "Symmetric Active" mode. The NTP100 device does not use Authentication and will not work with NTP/SNTP clients that are configured for operation in a symmetric active mode. The client application or service must be configured to use **client mode**.

   Note: By default – The Windows 32Time service for Windows Server 2003 and Windows XP (service pack 2 and above) is configured to use Symmetric Active mode.

   Note: Adjusting the W32Time service involves stopping the service, adjusting /editing registry settings and then restarting the W32Time service. Recommendations or procedures for adjusting or editing the registry in order to utilize the W32Time service as a client/server is out of the scope of the support provided by Masterclock.. Please refer to the appropriate knowledgebase article at the Microsoft support site. . http://support.microsoft.com/

   If using the Windows W32Time service, See the appropriate knowledgebase articles at the Microsoft website regarding using the Windows W32Time service (built in NTP/SNTP time client for the Windows VISTA, Windows Server 2003, Windows XP and Windows 2000 OS's).

   The Microsoft support knowledgebase article #875424 entitled: "Time synchronization may not succeed when you try to synchronize with a non-Windows NTP server in Windows Server 2003" pertains to addressing the symmetric active mode issue with Windows 2003 server. http://support.microsoft.com/kb/875424/
   If setting up an authoritative time server from a PDC in Windows Server 2000 or Windows Server 2003 refer to the knowledgebase articles on the Microsoft support site regarding editing the registry settings for the selection of the internal hardware clock or external time source for Windows 32Time service.

The Microsoft support knowledgebase article #816042 entitled: "How to configure an authoritative time server in Windows Server 2003" pertains to addressing the hardware clock issue in Windows Server 2003.
http://support.microsoft.com/kb/816042/

The Microsoft support knowledgebase article #3140542 entitled: "How to configure an authoritative time server in Windows XP" pertains to addressing the hardware clock issue in Windows XP.
http://support.microsoft.com/kb/314054/

The Microsoft support knowledgebase article #216734 entitled: "How to configure an authoritative time server in Windows Server 2000" pertains to addressing the hardware clock issue in Windows Server 2000 (Note: This article was previously published under Q216734 http://support.microsoft.com/kb/216734/

The Microsoft support knowledgebase article #223184 entitled: " Registry entries for the W32Time service" pertains to addressing the registry entries Windows Server 2000 and Windows 2000 (Note: This article was previously published under Q223184 http://support.microsoft.com/kb/223184/

The Microsoft support knowledgebase article #884776 entitled: " How to configure the Windows Time service against a large time offset" contains useful information regarding the W32Time service in Windows Server 2003, Windows XP Pro, and Windows Server 2000 http://support.microsoft.com/kb/884776/

Problem: NTP client indicates that the NTP100 is providing invalid time, or has flagged time as invalid.

The NTP100 will always answer NTP requests (unless the client is set to use symmetric active mode), but will flag time as invalid if it does not have trusted time to distribute. This may occur temporarily during GPS navigation state changes or before the first GPS acquisition after the NTP100 has been powered on after being off for an extended period of time.

By default, the NTP100 will begin flagging time invalid after 24 hours of consecutive GPS acquisition failure or non-operation (powered off). This is a protective feature, and can be adjusted or disabled if desired – see device configuration sections of this user manual.

Problem: The UTC date/time is incorrect and the unit does not retain configuration settings when powered up.

The NTP100 maintains its internal configuration and settings in battery backed memory located on the RTC chip. The battery supplies power to the TCXO 32 kHz Oscillator and RTC when the unit is powered off. This allows the internal configuration to be maintained and the time and date to increment, when power is off. Under normal operating condition, the memory devices maintaining the RTC data and configuration settings is powered by the external DC power supply and does not rely on the battery for data retention.

Note: If the NTP100 does not retain its configuration, or its Date/Time settings (often indicated by the front panel time display counting up from 'zero') the battery will likely need replacement.

Check and replace the battery, if necessary. The battery type is a 'replaceable' 3V lithium coin cell battery and can be replaced by a qualified technician, or the unit can be sent to technical support at Masterclock for repair/replacement for service using our RMA procedure. The battery size/type vary for the various models. See the "Specifications" section for details on the recommended battery replacement, or contact technical support for assistance.

Problem: You have lost your password.

Possible reasons/solutions:

1. The password cannot be recovered if it is lost. Reset the clock to the factory default configuration using the procedure described in the Configuration section. After the clock has been reset to factory defaults, the unit must be reconfigured. The factory - default password is "*public*"

Problem: Multiple error window titled "Bad Password" continues to pop-up each time a configuration setting is applied.

Possible reasons/solutions:

1. You have entered and "remembered" an incorrect password in the password windows. This is now causing multiple error indication windows titled "bad password" to pop-up for each portion of the configuration message that is being sent to the clock. You must clear the memorized password using one of the options below.
    a. WinDiscovery only remembers the password for the current session, close the WinDiscovery session and reopen. All passwords will be forgotten by the WinDiscovery application.
    b. As alternative to closing the WinDiscovery session, Right click on the device being administered in the main WinDiscovery window. The right click pop-up menu now contains an entry for "Forget Memorized Password". Select this option.
    c. You have entered and "remembered" a global password in WinDiscovery that does not match the unit you are trying to send configuration changes or commands to. This is now causing multiple error indication windows titled "bad password" to pop-up for each portion of the configuration message that is being sent to the clock. If using the Global password feature, you must match the global password to that of the unit you wish to administer. Or, simply disable the global password feature.

Note: In the event of WinDiscovery crash issue, set to Windows XP compatibility mode.

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GPS Lock Related Issues

The following items are specific to the NTP100-GPS and NTP100-GPS-HS models.

Please remember, for an initial startup at a new location the GPS unit could take up to 30 minutes. After the unit has acquired satellites at the new location the startup time is greatly reduced to anywhere from a few seconds to several minutes.

Note: All components of the GPS system [NTP100-GPS unit with GPS receiver, power supply, GPS antenna, antenna cable] are tested as a system at the factory before shipment. If the GPS antenna, the NTP100-GPS unit itself, and the supplied coaxial antenna cable has not been damaged; And if the installation has been performed such that the GPS antenna has an unobstructed view of the sky, the power connector is properly installed, and the front panel LED follows the startup sequence described earlier (on, off & then on) the system will probably work. However, you may have to wait for some time [typically up to 20-30 minutes] for the unit to achieve a first-lock to and initialize itself to the available GPS satellites at your location.

Problem: Unit is not locking to GPS.
Problem: The LED on the front panel is always steady ON.
Problem: Unit is not serving time.

Possible reasons/solutions:

1. There are many reasons why the GPS receiver will not lock to the GPS satellites, please see the following items.
2. The LED will stay steady ON when the unit has never locked to GPS and is not serving NTP time.
   The status/ GPS lock LED on the front of the unit will flash once per second when locked to GPS, and it will flash twice per second when freewheeling.
3. The NTP100 must first acquire an initial lock to GPS before it will serve time. Once locked, the unit can continue to serve time (either while locked to GPS or while freewheeling) as long as the DC input power is not interrupted.

   - Wait at least 45-60 minutes if installing the GPS receiver device in a new location. The GPS receiver must find and acquire the signal from at least 4 GPS satellites simultaneously, and will continue to acquire up to the eight satellites. When placed in a new location, time to first lock will vary, but can be quite lengthy since the GPS receiver must update its internal almanac and ephemeris data from the GPS satellites.
   - Check the GPS antenna, antenna cable, and connectors. Make sure the cables and connectors are not damaged and the threaded connectors are tightly coupled.
   - If you have not already done so, install or locate the GPS antenna outdoors with a clear/unobstructed view of the sky. Preferably on a rooftop or similar location such as a large open field or parking lot with an unobstructed view. While the unit may lock to GPS on some occasions with the antenna located indoors in a window, such use is not recommended.
   - Locate your GPS antenna away from satellite dishes or sources of RF interference such as transmitters or other antennas. Try relocating your GPS antenna if you are experiencing problems.
   - Your antenna/antenna cable installation may be faulty. Your antenna cable or connectors may be shorted or open. You may be using too long of an antenna cable or improper impedance cable. You may have damaged the cable(s) or connector(s) during installation.

     Masterclock highly recommends using only the pre-made/pre-tested antenna cables provided by Masterclock, Inc. For best performance, it is best to order these cables (see available antenna packages) at the same time that you order your NTP100-GPS or NTP100-GPS-HS, since your NTP100 GPS unit has been factory tested as a system with such cables and antenna before shipment.

     Note: The use of customized [altered] or customer provided cables is not covered under warranty or under the free limited technical support by Masterclock. If your cables have been damaged during installation, please order an additional cable set or contact technical support at Masterclock to have the cable(s) repaired.

   - If necessary, remove the long antenna cable and connect the NTP100 directly to the short cable on the GPS antenna using the short SMA male to SMA male adapter provided with your antenna package.

4. The GPS receiver located within the unit may have been damaged during the installation or handling.
   - Handle the NTP100 GPS receiver as you would any electronic device do not subject the unit, particularly the antenna input connector, to static discharge (ESD) during handling. When handling or installing the device, observe proper ESD protection methods; and as a minimum, discharge yourself to a convenient ground before handling the

unit. Preferably, use a static discharge wrist strap connected to earth ground when handling, installing, and or configuring the device.

- The NTP100 GPS unit provides power to the pre-amplified GPS antenna using low voltage supplied on the center pin of the antenna cable. To avoid damage to the GPS receiver (and/or GPS antenna) caused by a short circuit, **make antenna connections only with power removed from the unit**.
- Do not use GPS antennas provided by other sources. Non-amplified GPS antennas or antennas that are not compatible with the GPS antenna supplied with your system may damage the GPS receiver unit.

Note: Damage to the GPS receiver is not covered under warranty. Please purchase a replacement NTP100-GPS or NTP100-GPS-HS or contact technical support at Masterclock, Inc for repair.

5. The GPS antenna may have been damaged during installation or handling.
   - Handle the GPS antenna carefully. The GPS antenna may be damaged by dropping or other impact on hard surfaces.
   - To avoid damage to the GPS antenna (and/or the NTP100 GPS receiver), caused by a short circuit, **make antenna connections only with power removed from the unit.**

   Note: Damage to the GPS antenna is not covered under warranty. Please purchase a replacement. If the GPS antenna is damaged please contact Masterclock, Inc. to order a replacement. The GPS antenna cannot be repaired.

6. The GPS antenna cable may have been damaged during the installation or handling.
   - The GPS antenna cables may be damaged by pulling/twisting of the connectors or by pinching/over bending the cables, such as while pulling the cables with a cable puller or other method. Pull and route the antenna cables carefully. Ensure that you do not pull directly on the connectors during the installation. Ensure that you do not twist the connector at the location where the connector meets the cable, as this can damage the braid. If the GPS antenna cables are damaged please contact Masterclock, Inc. to order a replacement.

   Note: Damage to the GPS cables is not covered under warranty. Please purchase a replacement set of cables. If the GPS antenna is damaged please contact Masterclock, Inc. to order a replacement. The GPS antenna cannot be repaired.

Time Code Decoding Issues

The following items are specific to the NTP100-TC model.

The easiest way to verify that the NTP100-TC is decoding time code is to observe the status of the LED on the front panel and with the WinDiscovery "Status". The green LED will be flashing at 1 pulse per second when the NTP100-TC is properly decoding time code. If the LED is not lit, or is not flashing at 1 pulse per second (1 Hz), then there is a problem with the time code signal.

Time code decoding problems can include any of the following:

- no time code present
- ground loops or other interference
- bad/intermittent cables, wiring, or connectors
- a signal level that is out of range (too high or too low)
- a signal level that is fluctuating
- a time code type that the NTP100-TC does not support

Before concluding that there is a physical problem with time code decoding on the NTP100-TC, please rule out all of the above possibilities.

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Problem: The UTC time (&/or date) is incorrect

There are several potential failure points:

- invalid, intermittent, or missing time code source,
- date/year overwrite function for non-date encoded time code may be enabled improperly,
- battery may need replacement (see the previous problem item)
- an NTP/SNTP client or Windows local time zone configuration may be misleading you.

Verify that your time code source is generating the UTC referenced time and date that you expect, and that this time code format is at an acceptable signal level and quality that can be detected at the receiver (input to the NTP100-TC). Please see the NTP100-TC specifications for details.

When using SMPTE time code, verify that you are not using drop frame time code. Use only NDF (non-drop frame) SMPTE time code. Please see the NTP100-TC specifications for details.

If you are using "house" time code, verify that the time code source is locked to the GPS satellite system, such as the Masterclock GPS200A, for UTC/GMT time code. Time code sources such as SMPTE time code that is fed via a broadcast satellite will have a delay due to the satellite transmission. The NTP100-TC cannot compensate for satellite transmission delays.

If you have a time code source from an alternate vendor, be sure that your time code actually contains encoded date /year information to the Leitch/Masterclock [SMPTE] or IEEE1344 [IRIG-B] time code formats. SMPTE-type time codes must have the date be encoded to the Leitch™ specification in the user bits. IRIG-B (0)/B (1) time code format, must have the year/date encoded to the IEEE 1344 specification in the CF (Control Functions). Verify through your master clock's documentation that date encoding is both supported and enabled.

If you are using an acceptable UTC time code source with date encoded time code, ensure that the time/date overwrite function of the NTP100-TC is not enabled.

If your time code source is providing daylight savings time adjustments (during DST) or time zone offsets these must be functions must be disabled. The NTP100-TC only accepts and decodes UTC referenced time code.

If you are using an NTP client or the date/time display such as on a Windows system, this may provide misleading information as these may be configured to display local time zone and daylight saving time information. This is configured through the Date/Time applet in the Control Panel. Use the WinDiscovery or Telnet interface or a system with the time zone and DST disabled. Confirm the time using the front panel LED display of the NTP100-TC.

A Time Code Reader Card with a *Time Code Viewer* utility or a time code display are useful diagnostic tools in making these determinations regarding the source. These items are available for separate purchase from Masterclock, Inc.

Masterclock,Inc also provides, for separate purchase, date encoded time code sources such as time code generators, oscillators, and converters to industry standard time code formats, which can be used directly with the auto detection circuitry of the NTP100-TC. Please contact Masterclock, Inc. to inquire about available date-encoded time code sources.

If these troubleshooting tips do not solve your problem, contact technical support at **support@masterclock.com** or call (636) 724-3666.

If these troubleshooting tips do not solve your problem, consult the support area of the www.masterclock.com website or contact technical support at: **support@masterclock.com or call: ….. (636) 724-3666**

Specifications

Communications – Protocol

- DHCP (enabled by default) configuration, or via Static IP mode entry.
  - Network configuration: IP address, Netmask,
  - Gateway (Router - DHCP Option 03),
  - Primary and Secondary DNS (Domain Name Server - DHCP option 06)
- IPV4
- SNTP /NTP version 4 – UDP, port 123 (default)
  - Unicast [Query] (default), and broadcast, multicast
- Telnet – TCP, port 23 (default)
- Control/WinDiscovery protocol – UDP, port 6163
- Multicast ports 6163, 6263, 6170, 6171, 6172, 6173
- Multicast addresses 224.0.1.254, 224.0.0.225
- RS-232 (ASCII) - 9600 baud, 8 data bits, one stop bit, no parity (Models NTP100-GPS and NTP100-OSC only)

Communications – I/O

Ethernet (10mbps)	RJ45, 10baseT
Length of communication cable (Cat5/5e)	100 meters maximum
RS-232 (Programming/Configuration Port)	DB9 male, (Models NTP100-GPS and NTP100-OSC only)
Length of communication cable	10 meters maximum (use standard straight thru cable)

Time Code Input – (model –TC)

Time Code Input Connector	BNC-female, balanced,
Time Code Input Impedance	>100kOhm
Supported Time Code Formats	(Auto- Detection, Auto-Gain Adjust) SMPTE/EBU/Film, (30/25/24 fps), NDF non-drop frame SMPTE 12M and SMPTE 309M bit encoding LTC Linear/Longitudinal, Forward running User bits with date encoding to Leitch/Masterclock IRIG-B (0) pulse width coded DC (unmodulated), IEEE 1344 IRIG-B (1) 1 kHz Amplitude Modulated, IEEE 1344

Power Requirements

DC Input Voltage	9–28 VDC
DC Input Connector	Male Switchcraft locking (p/n L722A)
Optional Threaded Female DC Input Power plug	Switchcraft p/n S761K *(available by special order)*
Power Consumption	<10V – HSO units (Non-HSO units <5)
Battery	3V, 17 mAh, 12.5 mm **Maintenance Free** Rechargeable Manganese Lithium

Physical

Size	6.75 x 4.13 x 1.5 in. (17.15 x 10.48 x 3.81 cm)
Weight	17.3 oz. (490.5 g)

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Pre-Amplified Antenna (required for model NTP100-GPS & GPS/GNSS only)

Frequency	1575 MHz ± 10 MHz
Polarization	Right Hand Circular
Impedance	50 Ohm
Weight	8.3 Oz (235 gr.)
Voltage	3 VDC or 5 VDC (based on jumper inside the unit)
Power Consumption	@ 20 ma (.24W)
Gain	26 dB Standard
Temperature	-40 to +70°

Operating/Storage Temperature & Humidity

Operating Temperature	0 to +50°C
Note: Holdover accuracy with TCXO	*0 to +50°C (+/- 1min/year), +40°C to +50°C (+/- 4min/year)*
Relative Humidity	Up to 90% (non condensing @ 25°C)
Storage Temperature	-40 to +70° C
Relative Humidity	Up to 90% (non condensing @ 25°C)

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Compliance

FC	**This device complies with part 15, Subpart B of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation**
CE	Models NTP100-GPS, NTP100-GPS/GNSS NTP100-GPS-HS, NTP100-OSC, NTP100-GPS-HS, NTP100-TC **Electromagnetic Compatibility 89/336/EEC ; 92/31/EC ; 93/68/EEC ; 2004/108/EC** Tested and Conforms to the following EMC standards : EN61000-4-2:1995 +A1:1998 +A2:2001 (Electrostatic Discharge) EN61000-4-3:2006 +A1:2008 (RF Immunity) EN61000-4-4:2004 (Fast Transient Common Mode) EN61000-6-7:2007 (RF Injection Common Mode) EN61000-6-3:2001 (EMC Emissions Generic Commercial) EN55022:2006 +A1:2007CISPR22:2008 ANSI C63.4:2009 **Tested and Conforms to the following Safety standards:** EN60950-1:2006 (Safety of Information Technology Equipment)
	Waste Electrical and Electronic Equipment Directive (WEEE) 2002/95/EC The NTP100 Models –GPS, -GPS/GNSS, -OSC, -TC are considered WEEE Category 3 (IT and Telecommunications Equipment as defined by the WEEE Directive and therefore fall within the scope of the WEEE Directive. For more information about Masterclock's WEEE compliance and recycle program, please visit the Masterclock WEEE/RoHS website at http:// www.masterclock.com/rohs_compliance.php
RoHS COMPLIANT by EXEMPTION	Restriction of the Use of Certain Hazardous Substances Directive 2002/95/EC The NTP100 Models –GPS,-GPS/GNSS, -GPS-HS, -OSC,-OSC-HS, and -TC are considered WEEE Category 3 (IT and Telecommunications Equipment as defined by the WEEE Directive and therefore fall within the scope of the RoHS Directive. **These units are RoHS Compliant except that they will be manufactured using the RoHS Directive exemption allowing the use of lead in "solders for servers, storage and storage array systems, network infrastructure equipment for switching, signaling, transmission as well as network management for telecommunications". Reference RoHS Directive Annex Point 7 as amended by 2005/747/EC.**

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