

NTP (Network Time Protocol) and Date and Time Configuration

Overview

All eGauge meters use NTP (Network Time Protocol) to obtain the current date and time. The exact process used depends on the meter hardware version (eGauge2, EG30xx, EG4xxx). Access to an NTP server isn't required, but it is **highly recommended** to ensure the meter keeps the correct date and time. For 99% of installation scenarios, NTP works just fine with the default settings. However, it may be necessary to manually verify NTP synchronization is working, use different NTP settings, or troubleshoot problems with NTP.

This document is intended to provide a general overview of NTP functionality as it pertains to eGauge meters. However, in the interest of brevity many advanced concepts will be simplified or ignored. For more information on general NTP concepts, please refer to [this article](#).

When first installing a meter, it is **strongly recommended** to check the meter date and time (under **Settings -> Date & Time**) and manually update if necessary.

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Quick Troubleshooting Suggestions

If the meter date and time is incorrect or the meter isn't syncing with an NTP server:

- 1. Navigate to **Settings -> Date & Time** and ensure the meter date and time is correct and a valid NTP server is entered.
- 2. Verify the meter is on the [latest firmware](#).
- 3. Reboot the meter (either via the UI under **Tools -> Reboot** or by [manually power cycling](#) the meter) and wait 5 minutes.

See the [Checking Status section](#) of this document for more information on checking NTP synchronization status.

If you do not know your meter password, visit [this article](#).

Why do I need NTP?

The eGauge meter features an internal clock which can keep (approximate) time over short a short duration. However, without an active NTP connection the meter's internal clock may drift by as much as a few minutes per month. This may be acceptable for some users, but many monitoring scenarios require time-accurate data (e.g., for billing purposes).

Furthermore, if the meter experiences an extended power outage the internal battery or capacitor which maintains the internal clock will be depleted. This will cause the meter to use the last known date and time when power is restored - meaning data recorded after that point will have the wrong timestamps. If the meter can connect to an NTP server when it's brought back online, it should automatically adjust the date and time *before it starts recording*.

The amount of time a meter can maintain the correct date and time without power depends on the meter model:

Model	Charge Time	Run Time
EG4xxx	5 minutes	8 hours
EG30xx and eGauge2	~1 month	~1 day

In cases where an NTP server isn't available (e.g., locations without an Internet connection), the user must take care to keep the meter date and time updated manually. It's especially important to check the date and time *immediately* after any power outages.

To summarize, NTP is a convenience feature and helps ensure the collection of accurate data. Although it's possible to use a meter without NTP, doing so is not recommended.

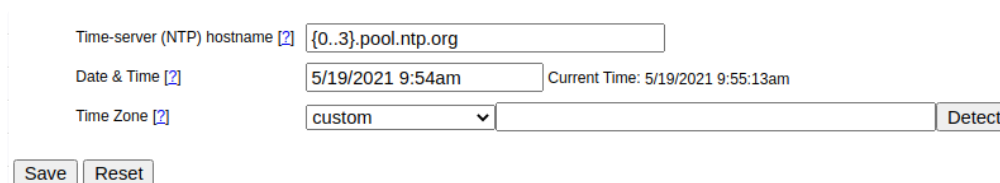
Configuration

By default, all eGauge meters ship with the default NTP server of {0..3}.north-america.pool.ntp.org. The {0..3} at the beginning of the URL indicates this can be expanded to 0.north-america.pool.ntp.org, 1.north-america.pool.ntp.org, and so on - in other words, this address describes four possible NTP servers.

Despite the "north-america" in the address, this is typically this is a suitable configuration option for meters anywhere in the world. However, it may be desirable to instead use {0..3}.pool.ntp.org (which should return up to four of the closest servers). It is also possible to point the eGauge to a locally hosted NTP server. This is common in more secure environments where external access to the internet isn't allowed. In this case, the local IP address of the NTP server may be used.

eGauge Systems LLC cannot offer assistance or advice on creating or maintaining a local NTP server.

The NTP server hostname is configured under **Settings -> Date & Time**. In the following example, the meter is set to use the {0..3}.pool.ntp.org option mentioned previously:



The screenshot shows the 'Date & Time' configuration page. It includes three main input fields: 'Time-server (NTP) hostname' with the value '{0..3}.pool.ntp.org', 'Date & Time' with the value '5/19/2021 9:54am' and a 'Current Time' display showing '5/19/2021 9:55:13am', and 'Time Zone' with a dropdown menu set to 'custom' and a 'Detect' button. At the bottom, there are 'Save' and 'Reset' buttons.

Make sure to click "Save" after making changes on this page. The meter will typically reboot after this step.

Checking Status

Although there is not a hard linked NTP status page built into the meter UI, it is possible to check the NTP status of a meter by appending /cgi-bin/get?ntp to the end of the meter URL. For example:

DEVNAME.egaug.es/cgi-bin/get?ntp

DEVNAME.egauge.io/cgi-bin/get?ntp

HOSTNAME.local/cgi-bin/get?ntp

LOCAL_IP_ADDR/cgi-bin/get?ntp

Each meter hardware version uses a different method to obtain this data, and has a different output style:

Meter Version	Method Used
EG4xxx	ntpctl -s all (OpenNTPD)
EG30xx	/usr/bin/ntpq -p (ntpq)
eGauge2	N/A (no data returned)

For best results, ensure your meter is on the [latest firmware version](#).

EG4xxx

For an EG4xxx meter, the output will have a summary area at the top, along with some specific information for each peer:

```
2/4 peers valid, clock synced, stratum 3

peer
  wt tl st  next  poll      offset      delay      jitter
45.55.58.103 0.pool.ntp.org
  1  2  - 2492s 3064s      ---- peer not valid ----
216.240.36.24 1.pool.ntp.org
  1 10  2   13s   34s    -1.537ms    48.121ms    0.460ms
69.89.207.199 2.pool.ntp.org
  1  2  - 2474s 3046s      ---- peer not valid ----
72.5.72.15 3.pool.ntp.org
*  1 10  2   10s   33s    -0.411ms    46.456ms    6.319ms
```

At the top of the page, the meter will list the number of valid peers. In this case, 2 of the four peers are valid. As long as one peer is valid, NTP synchronization should work as expected.

Also at the top of the page, "clock synced" indicates the eGauge's internal clock is synchronized with the NTP server. It is normal for this to show "unsynced" for some time (up to five minutes) after a reboot.

If the summary area is completely blank, it means the NTP daemon is not running. A reboot may resolve this issue.

For more information on this output, see the [ntpctl manpage](#).

EG30xx

For an EG30xx meter, the output will simply contain information on each connected peer (no summary area):

remote	refid	st	t	when	poll	reach	delay	offset	jitter
=====									
+ntp17.doctor.co	50.205.244.27	2	u	862	1024	377	49.962	-0.388	1.802
*ntp.nyy.ca	.PPS.	1	u	95	1024	377	79.102	-4.200	0.762
2606:5580:30a:7	58.180.158.150	3	u	15d	1024	0	63.037	-5.829	0.000
+voipmonitor.wci	216.218.254.202	2	u	790	1024	337	59.775	4.503	1.395

Valid peers (technically, peers marked for consideration) are preceded by a "+". The peer currently used for synchronization is preceded with a "*". As long as at least one peer has a *, NTP synchronization should work as expected. In the above example, three peers are valid and the meter is synced with one peer. This status page may be blank or not show any + or * symbols for some time (up to five minutes) after a reboot.

If the summary area is completely blank, it means the NTP daemon is not running. A reboot may resolve this issue.

For more information on this output, see the [ntpq documentation](#).

eGauge2

eGauge2 meters use NTP to sync their internal clocks, but they do not provide a summary of connected peers. This is expected behavior and will not be changed due to meter hardware limitations.

NTP Functionality and Behavior

NTP timekeeping is a complex subject, and it would go beyond the scope of this article to fully explain. However, there are some basic concepts which are worth discussing here. For a more complete discussion of the subject, refer to [this article](#).

Functionality

Put simply, an NTP server works by obtaining the correct date and time from a reference clock and making that date and time information available to a device. Reference clocks are generally extremely accurate (and as a result, extremely expensive). The internal clocks of most computing devices are generally *inexpensive*, but also not very accurate. NTP serves as a software-based solution to this problem. NTP servers may be run and hosted by anyone, including home users.

The NTP software running on the eGauge uses several criteria to determine the quality of an NTP server. The criteria for this is too complex to detail here, but the takeaway is that the meter will automatically handle server selection and use the best (most accurate and accessible) available servers. This is where the **strata** statistic comes in - strata indicates the quality of a server, with 1 being the best quality.

Typically, all of this happens "behind the scenes" (this is also true for other computing devices, including personal computers). However, in certain cases it may be necessary to check the meter's NTP status (to ensure it's reaching a valid server) or modify settings (if the default servers can't be reached).

General Behavior

On bootup (e.g., after a reboot or when first installed), the eGauge will attempt to establish a connection to an NTP server. At this point, the meter may make a long jump to the correct date and time. This is technically referred to as a "step", using the `settimeofday()` function. This jump happens **instantaneously**, but it may *only* happen immediately after a reboot. However, if it takes too long to find an NTP server (e.g., because the network is not ready, because the NTP server is not resolvable, etc.) the meter may "miss" its chance to do this. Often, rebooting the meter will allow it to sync on the second try.

At any time during normal operation, the eGauge may attempt to slowly adjust the meter date and time to match the date and time provided by the NTP server. This is known as a "slew", using the `adjtime()` function. Unlike a "step", a "slew" will slowly change the date and time at a rate of about 1 ms per second. For example, a clock offset of 1 second would take about 1000 seconds or 16 minutes to sync up. Obviously this is much slower than a "step", but "slew" is really only intended to handle small changes. This is also part of the reason a meter may take several minutes to show "synced" status after a reboot - a reboot introduces about a 120ms offset into the date and time, which would take about 2 minutes to sync back up using "slew".

Please visit kb.egauge.net for the most up-to-date documentation.