

NTS 02-G & NTS 03-G+ Firmware Release Notes

Important Note: For firmware prior to 3.22r, if PRP is enabled on the clock, PRP must be temporarily disabled before performing firmware upgrades or downgrades. Following the firmware upgrade/downgrade, the clock must be restarted by disconnecting and reconnecting the power.

Known Issue: For TCG -G series clocks running GNSS receiver firmware version d1.07 or d1.08 and configured to use GLONASS as the only constellation for synchronization, the time reported on the front panel, Configuration Tool and outputs will be ahead of UTC by 3 hours. Note that the pulse and frequency outputs are not affected by this anomaly. It is recommended that TCG products running these firmware versions are not configured with GLONASS as the only constellation. TCG products configured with "GPS + GLONASS" or "GPS" only are not affected by this issue.

Known Issue: When a GNSS reset is performed through the Configuration Tool, the timing outputs may jump by up to 1 second and this time jump may not be reflected by the accuracy indicators in the output signals. This is a temporary condition and the clock returns to normal operation once GNSS synchronization is re-gained.

VERSION 3.22r (February 2022)

This firmware requires Configuration Tool version 4.6.1.0 or later. This firmware is not compatible with older Configuration Tool versions.

- **Feature:** A stability validation window has been added for when the device is synchronizing to incoming sync sources. The device will usually take under one minute to synchronize to the source, then it will spend an additional 30 seconds at most validating that the sync source is stable before reporting that it is 'in sync'.
- **Improvement:** Changed the PTP boundary clock functionality so that boundary clock master ports will use their own true clock accuracy, and increment the stepsRemoved field, which will allow the BMCA to work as expected for a boundary clock. Previously, the unit would have boundary clock master ports act as Grandmaster and always use a clock class of 6, which could cause that port to be selected by the BMCA while not being the actual best master on the network.
- **Improvement:** The week number base date will now automatically be updated to the current date once per year to prevent rollover. This is only applicable to GNSS receivers with a firmware version of d1.05 or greater.
GPS uses its own date and time scale, which consists of a week counter and a counter for seconds within the week. The week counter is 10 bits due to hardware limitations of the GPS satellites. It can therefore only count from 0 to 1023, before going back to 0 (sometimes referred to as a "rollover"). The handling of the week number field value is based on a base date stored within the GNSS receiver module of the unit. Correct operation is expected for the 1024 weeks (19.6 years) following that date. This improvement automatically updates the base date to ensure that correct operation continues beyond 1024 weeks following the

initial base date.

- **Bug Fix:** Fixed a bug that would cause the IP address configuration settings to be applied to the next port over from the one being configured after a firmware upgrade if PRP was enabled.
- **Bug Fix:** Fixed a bug that would cause PRP to stop operating, if it was enabled during a firmware upgrade/downgrade. Previously, two power cycles were required to recover PRP to normal operation.
- **Bug Fix:** Fixed a bug that caused Ethernet ports to temporarily swap MAC addresses after a firmware upgrade.
- **Bug Fix:** Fixed a bug that caused the front panel SYNC LED to continue to indicate that the unit is in the Tuning state when the unit moves from the Tuning state to the Out of Sync state.
- **Bug Fix:** Fixed a bug for NTS 03-G+ units fitted with OCXO or Rubidium that caused the frequency reference firmware version to be reported as 1.00 in the Configuration Tool discovery window, when connected to a non-administration Ethernet port.
- **Bug Fix:** Fixed a bug where a unit with a TCXO frequency reference fitted could intermittently report in the configuration tool that it was using a Rubidium frequency reference instead of a TCXO reference.
- **Bug Fix:** Fixed a bug where a PRP port in the passive state on a unit synced to GNSS would erroneously send the following SNMP trap message in bursts of 4, every 2 seconds: 'IEEE C37.238 Port State Change', 'Port Number 1', 'Port State 4'.
- **Bug Fix:** Fixed a bug that caused the "Antenna current high" alarm message to not be displayed in the Configuration Tool when the detected antenna current was too high.
- **Bug Fix:** Fixed a bug that caused the C37.238-2017 TLV extensions to not be present in the PTP Announce messages from the ETH5/ETH6 PRP port pair of the 6-port NTS 03-G+, when configured to use C37.238-2017 Power Profile.
- **Bug Fix:** Fixed a bug where the G.8265.1 slave was requesting a durationField of 3600 seconds for all messages from the master, which was outside the allowable 60-1000 seconds range specified in the ITU recommendation. It now requests a durationField of 300 seconds.
- **Bug Fix:** Fixed a bug where the device was reporting a clock accuracy value better than the true time output accuracy while regaining synchronization after a previous loss of sync.

- **Bug Fix:** Fixed a bug where the unit would report a 100 ns accuracy over PTP when first powered up, when the accuracy at first start up should be reported as >10s, as the clock has not tuned to any sync sources yet.
- **Bug Fix:** Fixed a bug that prevented login to the device via the configuration tool if connecting to an Ethernet port on the unit with VLAN tagging enabled, from an untagged network.
- **Bug Fix:** Fixed a bug where the clock would continue to report in sync with the same accuracy for 60 seconds while a GNSS receiver reset was being performed, despite the GNSS sync source being unavailable during the reset.
- **Bug Fix:** Fixed a bug that could cause a PRP port pair to incorrectly send PTP Announce messages when in the PTP passive master state.
- **Bug Fix:** Fixed a bug that caused PTP ports that are configured to use the 61850-9-3 clock class rules to have an incorrect PTP clock class value while regaining synchronization.
- **Bug Fix:** Fixed a bug that could cause the clock to fail to synchronize correctly when switching its sync source from GNSS to a backup source such as PTP.
- **Bug Fix:** Fixed a bug that caused the front panel SYNC LED to continue indicating that the unit is in the Tuning state after changing clock sources without an intervening loss of synchronization.

VERSION 3.21r10 (November 2019)

- **Bug Fix:** Fixed a bug that could cause occasional duplicate PTP Sync messages to be sent when using PTP over PRP and operating as a master clock.

VERSION 3.21r8 (January 2019)

- **Bug Fix:** When the clock is configured using the Configuration Tool or via the SNMP tncDigitalInrigMonitor object to monitor IRIG-B Input, SNMP traps and/or Syslog Messages indicating a change in the availability of an IRIG-B source should be sent via Ethernet ports which have had notification subscriptions configured.

Subscribers can be added using the Configuration tool on each ports Network/Notifications tab, or by adding entries to the SNMP tncNotificationTargetTable table for the port.

Prior to this change, ports other than ADMIN/ETH1 did not send SNMP Traps and/or Syslog messages indicating a change in the availability of the IRIG-B source even if notification subscriptions had been added to those ports.

because timing is everything

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Following this bug fix, all ports that have had notification subscriptions added to them will send SNMP Traps and/or Syslog messages indicating a change in IRIG-B source availability if the clock has been configured to enable the Monitor IRIG-B Input option.

- **Bug Fix:** When clock sync is lost and then regained before the holdover period expires, the sync status could continue to be reported as holdover on ports other than ADMIN/ETH1.

Following this fix, the sync status reported from all ports via network time protocols, the Configuration Tool, SNMP object access and SNMP Traps and/or Syslog Messages (when network subscriptions have been added to the port) will contain the correct status.

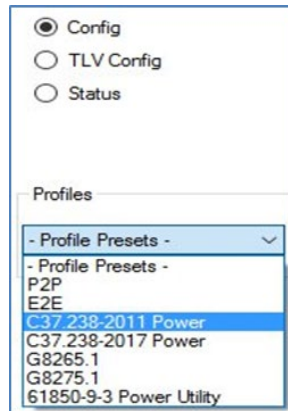
- **Bug Fix:** In clocks with OCXO or Rubidium oscillators, the oscillator was incorrectly reported on the Time Tab in the Configuration Tool as TCXO when connecting to the clock via a port other than ADMIN/ETH1. Following this fix the Configuration Tool will report the correct oscillator type regardless of the port that it is connected via.
- **Bug Fix:** The DCF77 output pulse stream was one second late. Following this fix the DCF77 output pulse time will be on time.

VERSION 3.21r7 (May 2018)

- **Feature:** A new feature, **NTP on PRP** has been introduced in this firmware version. This allows NTP to function with PRP. Previously the NTP was disabled when PRP was activated.
- **Bug Fix:** When the clock was synchronizing to PTP, the clock would use the leap second value if the UTC valid flag was not set. This behaviour has been corrected, and the clock will only take the leap second value if the UTC valid flag is set. If the flag is not set, the clock will ignore the incoming value and continue to use any previously set value.

VERSION 3.21r6 (March 2018)

- **Feature:** PTP C37.238-2017 and 61850-9-3 Power Utility profile has been added. ConfigTool v4.3.1.5 or later is required to select this Profile.



- **Improvement:** While configuring NTP multicast address, if the IPv4 address assigned for multicast is an invalid address, then the clock will use the broadcast MAC address. For valid IPv4 multicast addresses a valid multicast MAC will still be used.
- **Improvement:** Clocks getting their Sync from IRIG-B or PTP will advertise Stratum-1. Previously they were advertised as Stratum-2
- **Improvement:** Added ability to lockout a user for a period following several unsuccessful login attempts. Both the number of unsuccessful attempts and the period of lockout can be configured.

By default, this feature is disabled (Logging attempts before lockout set to 0) and this will be the case for clocks upgraded to this version.

To prevent the leaking of security information there is no notification to a user that the lockout is in place, and the standard login failed message will be displayed.

The lockout is based on the user account and operates regardless of the IP address that the attempt is made from or if the attempt is made via SNMP or the Config Tool. Similarly, a failed login via any method or from any address adds to the users failed login attempts count.

The lockout is per account and a lockout on one account does not prevent other accounts from logging in.

Subsequent incorrect login attempts during the lockout period will not increase that period.

SNMPv3 traps authenticated with the credentials of a locked-out user will still be sent.

Config Tool 4.3.1.0 Is required to access this feature.

- **Improvement:** Modified NTP broadcast and multicast periods to be expressed in raw seconds, rather than powers of two. This will allow a wider range of options than previously available but excludes rates of more than one message per second.

When upgrading the intervals will automatically be converted from the earlier format and any intervals of less than one second will be rounded up to one second.

ConfigToolII 4.3.1.1 is required to select or view the full range of intervals.

Figure 1 NTP Broadcast/Multicast Rate Selection in ConfigToolII 4.3.1.1 and later.

Config Tools earlier than 4.3.1.1 offer a fixed set of options and will map the interval to one of the these as follows:

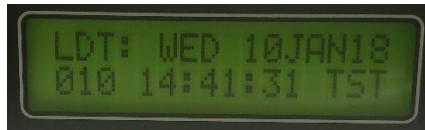
Old Value	New Value		Old Value	New Value
1/8 th Second	1 Second		128 Seconds	2 Minutes
1/4 th Second	1 Second		256 Seconds	5 Minutes
½ Second	1 Second		512 Seconds	10 Minutes
1 Second	1 Second		1024 Seconds	15 Minutes
2 Seconds	2 Seconds		2048 Seconds	30 Minutes
4 Seconds	5 Seconds		4096 Seconds	1 Hour
8 Seconds	10 Seconds		8192 Seconds	2 Hours
16 Seconds	15 Seconds		16384 Seconds	5 Hours
32 Seconds	30 Seconds		32768 Seconds	10 Hours
64 Seconds	1 Minute			

The NTP client request rate is not modified by this change.

There is a new MIB (201801250000Z) which includes the new objects

- tncNTPBroadcastInterval
- tncNTPMulticastInterval
- **Bug Fix:** With Soft PRP bug was discovered were if one Ethernet connection was removed the Soft PRP link was lost.

- **Bug Fix:** A bug in the PTP BMCA algorithm was discovered where the PTP Slave clock would go into an Uncalibrated State if the Best Master changed frequently in the network.
- **Bug Fix:** Front panel display now indicates 'LDT' when daylight savings is in effect and the local time is being displayed. Previously, 'LST' was shown regardless of daylight savings settings.



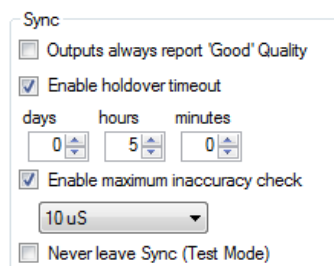
- **Change:** The Anti-Jamming feature was removed as it was found to be ineffective on some GNSS receiver models

VERSION 3.21r3 (November 2017)

- **Improvement:** Added a “maximum inaccuracy check” option, which allows a time inaccuracy threshold to be set, at which the clock will leave holdover and indicate out of sync. This option can be used instead of, or in addition to, the “holdover timeout” option, which causes the clock to indicate out of sync after a specified time in holdover.

The “maximum inaccuracy check” option is useful for ensuring that the clock does not exceed a specific accuracy level. The clock will automatically take into account factors such as the fitted frequency reference and time in sync to determine how long to remain in holdover.

If both “holdover timeout” and “maximum inaccuracy check” are enabled, the clock will leave holdover and indicate out of sync only when both the holdover time has expired, and the inaccuracy threshold has been crossed.



- **Improvement:** Added the ability to independently suppress individual outputs based on inaccuracy threshold or holdover timeout. When “holdover timeout expires” is selected, that particular output will stop providing a time signal when the clock is out of sync and the specified holdover time has expired.

When “Inaccuracy threshold is exceeded” is selected, that particular output will stop providing a time signal when the clock is out of sync and the reported inaccuracy has

exceeded the specified maximum inaccuracy. When “Never” is selected, that particular output will continue to provide a time signal even when the clock is out of sync.

This applies to the following ports:

- P3 configurable IRIG-B / Pulse output port
- P6, P7, P8, P9, P10, P11 configurable IRIG-B / Pulse output ports

- **Change:** The persistent holdover availability option is now no longer optional, and is permanently enabled. This is required for correct operation of the clock with the added “maximum inaccuracy check” option.

VERSION 3.21r2 (October 2017)

- **Bug Fix:** Fixed a bug where the leap second pending and daylight saving pending bits in IRIG-B C37.118.1 outputs, and the leap indicator in NTP responses, were cleared one second late. This bug was introduced in version 3.21r.

VERSION 3.21r1 (October 2017)

- **Improvement:** Added the ability to apply firmware upgrades to the GNSS receiver module of NTS 03-G+ clocks fitted with OCXO or Rubidium oscillators. This change allows for future field upgrades to be applied to the GNSS receiver module. Clocks not fitted with OCXO or Rubidium oscillators already have this capability.
- **Bug Fix:** Fixed a bug introduced in version 3.21r that prevented the “GPS Reset” command from having any effect on NTS 03-G+ units fitted with OCXO or Rubidium oscillators.

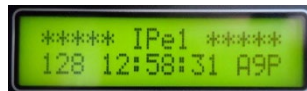
VERSION 3.21r (May 2017)

- **Improvement:** The “Reset GPS” or “Reset GNSS” command sent from the Tekron Configuration Tool will now perform a factory reset of the clock’s integrated GNSS receiver. This will reset all configuration parameters stored in the memory of the GNSS receiver. Note that this does not change any configuration settings applied by the Tekron Configuration Tool. Previously, a “cold” reset of the GNSS receiver was performed, which did not clear all

parameters.

- **Improvement:** The time quality reported by the SNTP client time source for the purpose of source selection is now limited to be no better than 1 μ s. This is to prevent the SNTP source from being selected when a high-quality GPS or PTP source is available.
- **Improvement:** The time quality comparison performed by the clock to select between multiple available time sources now uses “banding”. The time quality reported by each available source is rounded to the nearest 100ns “band”, before it is compared to other sources. This helps to prevent unnecessary frequent switching between two sources of similar quality.
- **Improvement:** The failure to obtain an IPv4 address via DHCP will result in the clock adopting an ARP tested Link-Local address (169.254.xxx.xxx). An IPv4 address fail alarm will now be displayed both in the Configuration Tool and on the LCD display. When this alarm occurs, the user may need to update their network adaptor settings to a Link-Local address to gain access to the clock. The alarm will persist until the IPv4 address settings are changed or the clock is connected to a DHCP enabled network.

The alarm appears in the Configuration Tool as “ipv4 address”, and on the display as “IPe1”, or “IPe2”. “IPe1” and “IPe2” stand for “IP error, port ETH1” and “IP error, port ETH2” respectively. This alarm does not open any alarm relays, and does not send an SNMP notification.



- **Change:** Updated the default new clock UTC-TAI offset to be 37 seconds as per the leap second added on January 1st, 2017.
- **Bug Fix:** During the recent (December 2016) leap second event, it was observed that the GNSS/GPS receiver module continued to report the previous UTC-TAI offset for many hours following the actual changeover. Prior to 3.21r, the firmware would ignore the UTC offset advice from the GNSS/GPS module for six and a quarter hours following the leap second event. This was found to be insufficient, and has been increased to 36 hours.
- **Bug Fix:** Fixed a bug that, if the ‘Suppressed when out of sync’ option is selected, caused the first pulse of the first IRIG-B frame to occur 2 milliseconds early when sync is achieved.
- **Bug Fix:** Fixed a bug introduced in version 3.18r that could, in rare conditions, cause an Ethernet port configured with a fixed IP address to unexpectedly revert to a link local (169.254.xxx.xxx) IP address.

- **Bug Fix:** Fixed a bug that could, in rare conditions, cause PTP timestamps to be miscalculated.
- **Bug Fix:** The “Block VLAN 0” advanced configuration option can now be set on non-admin ports with the Configuration Tool connected to the admin port. Previously, this configuration option was not accessible on non-admin ports while connected to the admin port.

VERSION 3.20r2 (April 2017)

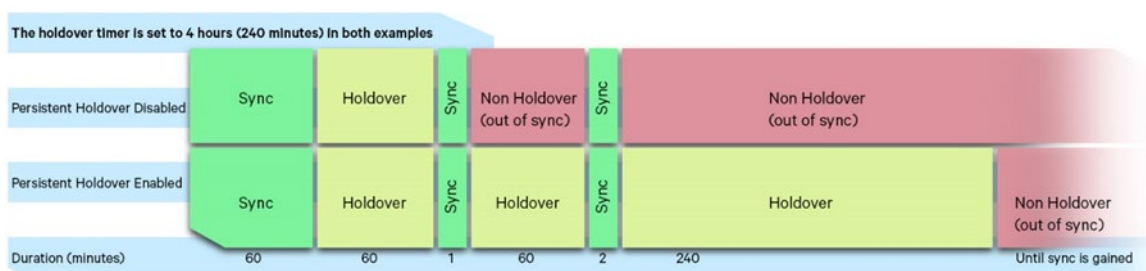
- **Change:** This firmware allows for the NTS 03-G+ to use either the NTS 03-G or NTS 03-G+ branding. This is a factory configurable option only.

VERSION 3.20r1 (January 2017)

- **Feature:** Added support for enabling the persistent holdover availability option. Tekron Configuration Tool 4.2.1.10 or later is required to enable this option.

Normally, the clock can only enter holdover if it has been in sync for at least 5 minutes. If persistent holdover is enabled, and the clock has initially been in sync for at least 5 minutes, then the clock can still enter holdover if it experiences a sync switching condition. For example, sync is lost, regained for less than 5 minutes, then lost again. Such a condition may exist when GNSS jamming is present, or in the case of a poor antenna installation.

Please note, when entering holdover after a period of intermittent sync the holdover period timer is reset. This may cause the clock to enter into an extended holdover period, if the sync switching condition continues to be present. By disabling persistent holdover, you can ensure that the time in holdover is not extended by periods of intermittent sync lasting less than 5 minutes.



- **Bug Fix:** Fixed a bug that, in a rare event, could cause the clock to output a time exactly 2 seconds behind the correct time. This bug was most likely to affect NTS 03-G+ units fitted with the OCXO or Rubidium frequency reference option.

- **Bug Fix:** Fixed a bug that could cause the Configuration Tool to unexpectedly lose the connection to the clock when running on a PC that is singly attached to a PRP network (connected to only one of the two PRP redundant networks).

VERSION 3.20r (November 2016)

- **Feature:** Added support for NTS 03-G+ 4 Port Plus IRIG-B Expansion. Tekron Configuration Tool 4.2.1.0 or later is required to configure the 4 Port Plus IRIG-B Expansion programmable outputs.
- **Feature:** Added support for NTS 03-G+ OCXO and Rubidium frequency reference options.
- **Feature:** Added support for Parallel Redundancy Protocol (PRP). Ports ETH3 and ETH4 (and ETH5 and ETH6 where fitted), can be linked to form a redundant pair. PRP support is available on all existing NTS 02-G and NTS 03-G hardware. Tekron Configuration Tool 4.2.1.0 or later and a PRP license are required to enable PRP support. Please contact Tekron to purchase a PRP license.
- **Feature:** Added support for ITU-T G.8275.1 PTP Telecom Profile. Both Telecom Grandmaster and Slave operation is supported. Tekron Configuration Tool 4.1.1.0 or later is required to configure PTP in this profile.
- **Feature:** Added an option to allow the unit to be reset to factory defaults in the event of a forgotten administrator password. Physical access to the unit is required to perform the reset procedure. This option is disabled by default. Tekron Configuration Tool 4.2.1.0 or later is required to enable this option. When this option is disabled, the unit must be returned to Tekron for reprogramming in the event of a forgotten administrator password. This option may be permanently disabled by Tekron on request. This factory reset is different from the factory reset that can be performed with the Configuration Tool, as that reset does not require physical access, but requires an administrator password.
- **Improvement:** Added ability to disable the holdover time setting, allowing the clock to remain in holdover indefinitely. This leaves it up to client devices to determine when they will stop synchronizing to the clock, based on the advertised quality in the time outputs.
- **Improvement:** Added a configurable option for suppression of output signals at startup, when the clock has not yet received a valid time.
- **Improvement:** Added a Fixed Manual delay mode to the available PTP delay mechanisms, in addition to the existing End-to-End and Peer-to-Peer options. Fixed Manual delay mode may be useful in some non PTP aware networks (networks which do not have switches with PTP support).

- **Improvement:** Added a PTP Forced Master option. When selected, this option ensures that the port will not operate as a PTP Slave.
- **Bug Fix:** Fixed a bug that could cause loss of communication to non-admin Ethernet ports after 25 days of operation. If this event occurs, non-admin Ethernet ports (ETH2 and above) will stop acting as an NTP or PTP master. Resetting the clock will restore normal operation.
- **Bug Fix:** Fixed a bug that could cause PTP Announce messages generated by the unit to occasionally contain incorrect information when the unit is itself synchronized to an external PTP grandmaster, that is, when the unit is operating as a PTP boundary clock.

VERSION 3.18r6 (October 2016)

- **Bug Fix:** The NTP time stamp consists of two fields, a 32 bit field for the number of seconds since 1 January 1900 and a 32 bit field for the sub-second fraction. From 23:00:00 UTC on December 31st 2016 (one hour before the leap second is applied) the sub-second fraction will be frozen at its maximum value (binary all 1's). However, the number of seconds field will continue to update and maintain correct time. This has the effect of decreasing the time stamp resolution from 16ns to 1s and means that the date and time will remain accurate down to 1 second accuracy only. At 23:59:00 UTC the sub-second fraction will return to normal operation and the leap second will be applied correctly.
- **Bug Fix:** Added the ability to automatically recover from an internal communication error. This rare event could cause non-admin Ethernet ports (ETH2 and above) to unexpectedly lose synchronization. Resetting the unit will return it to normal operation.

VERSION 3.18r5 (Limited Release)

- **Feature:** Fiber Slave option introduced.

VERSION 3.18r4 (March 2016)

- Initial Release