

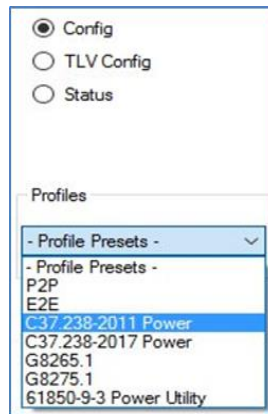
NTS 02-E & NTS 03-E Firmware Release Notes

VERSION 3.21r7 (May 2018)

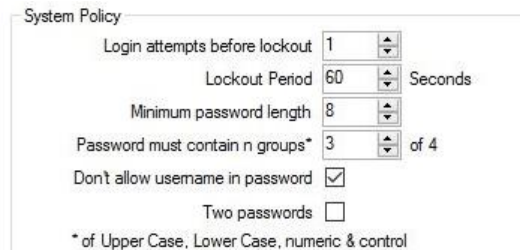
- **Bug:** When the clock was synchronizing to PTP, the clock would use the leap second value if the UTC valid flag was not set. This behaviour has been corrected, and the clock will only take the leap second value if the UTC valid flag is set. If the flag is not set the clock will ignore the incoming 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.

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

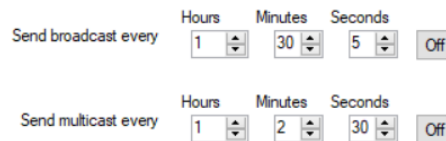


Figure 1 NTP Broadcast/Multicast Rate Selection in ConfigToolIII 4.3.1.1 and later.

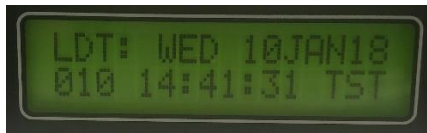
Config Tools earlier than 4.3.1.1 offer a fixed set of options and will map the interval to one of the these as follows:

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:** 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.

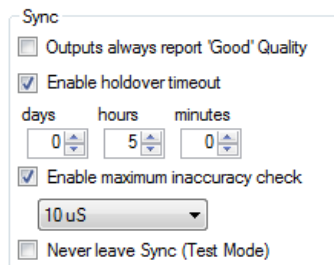


VERSION 3.21r3 (November 2017)

- **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

The screenshot shows a configuration window titled "IRIG-B / Pulse Output Port". It includes a dropdown menu for "User defined pulse" and an "Inverted" checkbox. Below this is a "Pulse Output" section with fields for "Every" (set to "Second"), "Pulses" (set to "1"), "Offset" (set to "00"), and "Duration" (set to "01"). At the bottom, a "Suppress Output When" dropdown menu is highlighted with a red border and set to "Holdover timeout expires".

- **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.

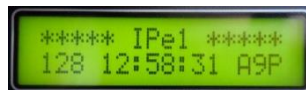
VERSION 3.21r1 (October 2017)

- **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.

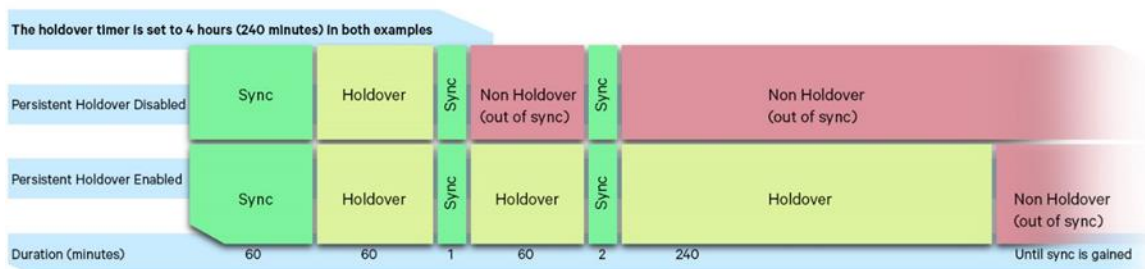
VERSION 3.20r2 (April 2017)

- **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 (Not Released)

VERSION 3.18r4 (Not Released for NTS E series)

VERSION 3.18r3 (Not Released for NTS)

VERSION 3.18r2 (February 2016)

- **Bug Fix:** Fixed a bug that could cause disruption to the communications between internal clock modules. This resulted in a number of symptoms including a mismatch between sync-status reported from different ports and an inability to save settings when connected to a non-admin Ethernet port. The bug was most likely to occur when a non-admin Ethernet port was acting as a PTP or NTP slave.

VERSION 3.18r (December 2015)

- **Improvement:** The P3 output port on the NTS is now configurable. It can be configured to provide an IRIG-B signal, DCF77 simulation or a user-defined pulse. Configuration options can be found on the I/O tab of the Tekron Config Tool. Requires Config Tool 4.1.0.22 or later. Previously, the P3 output provided a non-configurable unmodulated IRIG-B signal with C37.118.1 extensions enabled. IRIG-B with C37.118.1 extensions is now the default configuration. This is to allow the IRIG-B output and input to be used out of the box for a redundant link between two NTS units.
- **Improvement:** When synchronized to an incoming IRIG-B signal, the NTS will now use the Continuous Time Quality (CTQ) field if it is present. The CTQ field was added to C37.118.1 2011 to give IRIG-B receivers more detailed information about the time accuracy of the source they are synchronized to, because the definition of the Time Quality field value "0" (Clock is locked to a UTC traceable source) is ambiguous. Previously, the NTS only used the Time Quality field.
- **Improvement:** Added a display page which will display the current firmware version and serial number on the front panel LCD when the front panel button is pressed during startup. Pressing the front panel button will cycle through available display pages.
- **Bug Fix:** The handling of request IDs by the SNMP agent has been modified to improve compatibility with some SNMP management engines.
- **Bug Fix:** SNMP v2c trap messages sent by the NTS now contain the correct variable binding for the system up time. Previously, trap messages contained an incorrect variable binding for system up time, which could cause compatibility issues with some SNMP management engines.
- **Bug Fix:** Fixed a bug which could cause an NTS fitted with a single power supply unit to incorrectly indicate power failure alarms.
- **Bug Fix:** IP addresses are now tested with ARP requests before being used. If using static IP addressing and the IP address is found to be in use, that port will revert to a link-local address (169.254.xxx.xxx).
- **Bug Fix:** The NTS will now send gratuitous ARP responses when the network interface starts. This is to provide compatibility with network routers that have very long or no ARP table timeouts.
- **Bug Fix:** The peer clock precision value reported in NTP responses is now correct when the NTS is not synchronized. Previously, the NTP peer clock precision value was not updated in the event of the NTS losing synchronization.
- **Bug Fix:** The IRIG-B output signal from the NTS now indicates correct values in the time quality and CTQ fields when the NTS is synchronized to an incoming IRIG-B signal. Previously, the IRIG-B output contained incorrect and conflicting values in the time quality and CTQ fields when synchronized to IRIG-B.

VERSION 3.16 (Not released for NTS)

- **Improvement:** The peer clock precision reported in NTP responses when synchronized to GPS is now set at -23 (119 nanoseconds). Previously, NTP responses reported an incorrect precision of -34 (0.058 nanoseconds).
- **Bug Fix:** The IRIG-B output is now correctly suppressed when the “Suppress outputs when out of sync” option is selected. Previously, when this option was selected, the IRIG-B output was not suppressed.
- **Bug Fix:** The time quality and continuous time quality (CTQ) indicators included in the IRIG-B C37.118.1 extensions now indicate matching quality levels. Previously, these quality indicators indicated conflicting quality levels.
- **Bug Fix:** The daylight savings time change upcoming indicators are now suppressed when no daylight savings are observed. Previously, the clock could incorrectly output daylight savings change indicators when “Region observes daylight savings” is not selected.
- **Bug Fix:** A power cycle is no longer required before the PTP foreign master timeout is updated. The foreign master timeout determines how often a slave clock must see announce messages in order to recognize a master as valid, and is determined by the configured announce interval. Previously, a change to the configured announce interval did not update the foreign master timeout until a power cycle occurred.

VERSION 3.14 (Not released for NTS)

- **Improvement:** Initialization and auto-negotiation timeout periods have been increased to improve interoperability with network infrastructure equipment.
- **Improvement:** The default TAI -> UTC offset has been updated to the current value of 36.

VERSION 3.13 (Not released for NTS)

- **Improvement:** When active, Test Mode will now override any other active time sources. This improves the ease of use of test mode, as it is no longer necessary to ensure that all other time sources are disabled.
- **Improvement:** The sync forced on setting will now be automatically deactivated after 1 week. This setting should only be used for testing purposes and should not be left on, and the timeout will ensure that it is deactivated if accidentally left on.
- **Improvement:** Added the ability to select None as the delay calculation method for PTP. This allows a fixed delay to be used instead of a calculated delay.

- Improvement:** During the leap second the sub second fraction of the NTP time stamp is now held at one count before the end of the second (for the entire second). Previously the sub-second fraction rolled to zero at the start of the leap second and counted up as per a normal second. Because most leap seconds are a repetition of the last second of the day, if the sub second fraction is not held at one count before the end of the second, timestamps taken during the leap second could appear to be earlier in time than stamps recorded during the previous second.

Old Leap Second Behavior	New Leap Second Behavior
23:59:58.00	23:59:58.00
23:59:58.25	23:59:58.25
23:59:58.50	23:59:58.50
23:59:58.75	23:59:58.75
23:59:59.00	23:59:59.00
23:59:59.25	23:59:59.25
23:59:59.50	23:59:59.50
23:59:59.75	23:59:59.75
23:59:59.00	23:59:59.99
23:59:59.25	23:59:59.99
23:59:59.50	23:59:59.99
23:59:59.75	23:59:59.99
00:00:00.00	00:00:00.00
00:00:00.25	00:00:00.25

- Improvement:** Added new display page which will display the current IP address on the front panel LCD. To change the front panel display, press the button on the front of the unit between the two LED's. Pressing the front panel button will cycle through available display pages. This feature can be used to check the IP address of the clock.



- Improvement:** Added Mobile GPS mode, which allows for the GPS Clock to be installed on board a slow-moving vehicle or vessel. This mode is considered experimental.
- Bug Fix:** SNMPv3 requests that fail authentication are now rejected when the maximum unauthenticated access is set to None. Previously, unauthenticated SNMPv3 'Get' requests succeeded when the maximum unauthenticated access was set to None, in which case they should have been rejected.

- **Bug Fix:** When acting as a PTP telecom slave, the clock will now resend subscription requests immediately after selecting a PTP telecom master if the running rate is faster than the discovery rate.
- **Bug Fix:** Fixed a bug which could cause the USB interface to become unresponsive when the USB cable is disconnected and reconnected.
- **Bug Fix:** Fixed a bug where the USB interface could excessively consume system resources, reducing the ability of the clock to handle high network traffic.
- **Bug Fix:** Fixed a bug which could cause the NTS to erroneously reject an incoming IRIG-B signal.

VERSION 3.11 (Not released for NTS)

- **Improvement:** Added name of new sync source to "Sync source changed" syslog message.
- **Improvement:** Minor improvement to configuration communication protocol for compatibility with latest version of the configuration tool.
- **Bug Fix:** Fixed a bug that could cause recoverable failure of loader upgrades.
- **Bug Fix:** PTP Delay Asymmetry value is now stored to clock correctly. Previously, this value was incorrectly reversed when stored.
- **Bug Fix:** Fixed a bug that could cause a factory reset to not reset all settings.

VERSION 3.10r

- **Improvement:** Increase the time taken for the clock to obtain GPS position hold from 10 minutes to 33.3 minutes. The clock is 'in sync' during this period but will continue to improve its absolute accuracy to UTC.
- **Improvement:** The holdover message shown on the LCD display and in the configuration tool now disappears when the holdover period expires (The clock announces a sync alarm when holdover expires).
- **Improvement:** Add slave only PTP telecom profile to NTS 03-E.
- **Improvement:** Add ability to suppress power alarms.
- **Improvement:** Remove GPS related functions and alarms when acting as a fiber slave.
- **Improvement:** Increase range of the daylight savings change time to include 24:00.
- **Improvement:** Allow Block VLAN 0 to be set (But only via USB or a VLAN tagged Ethernet request).
- **Bug Fix:** Re-Work USB support to improve reliability.
- **Bug Fix:** IPv4 addresses with final octet > 233 were incorrectly rejected.

- **Bug Fix:** This bug caused occasional NTP multicast packets to be sent via broadcast.
- **Bug Fix:** Allow group creation in supervisor mode.
- **Bug Fix:** Security disabled mode not available on expansion ports (ETH2 – ETH6) in rare situations.
- **Bug Fix:** Ensure ports (ETH2 – ETH6) acquire an IPv4 address via DHCP (if available) at start-up.

VERSION 3.08r & 3.09r (Not released for NTS)

VERSION 3.07r

- **Improvement:** Tighter constraints on DHCP for improved security.
- **Improvement:** NTP broadcasts are no longer subnet directed. They use the global broadcast address 255.255.255.255.
Improvement: SNMPv3 MIB support.
- **Bug Fix:** Some NTP requests sent without MD5 authentication when it was requested.
- **Bug Fix:** Fix bug in VLAN processing that caused tags to be omitted from replies to configuration protocol file requests (even if the requests were tagged).

VERSION 3.06r (Not released for NTS)

VERSION 3.05r (First release)