NTS 03-G+

USER MANUAL

Contents

1. INTRODUCTION

Welcome to the NTS 03-G+ user manual! This document contains everything you need to know about the key features, hardware, and installation process for the NTS 03-G+.

Product Overview

The Network Time Server 03-G+ (NTS 03-G+) is a precision time reference with multiple independently addressed Ethernet ports and optional high drive IRIG-B outputs.

The NTS 03-G+ has three Ethernet ports and two alarm ports on the base unit with two different optional expansion options:

- Expansion 1 (6 port expansion) - Three additional Ethernet ports and two alarm ports
- Expansion 2 (4 port expansion) - One additional Ethernet port, two alarm ports, four DC IRIG-B (copper or fiber) and two DC/AM IRIG-B ports.

The NTS 03-G+ can be ordered with no expansion (NTS 03-G+ 3 port), or with either of the expansion options above (NTS 03-G+ 4 port, NTS 03-G+ 6 port).

Hardware

All NTS 03-G+ Ethernet ports can function as Stratum 1 (NTP) and Grandmaster (PTP) sources. Each unit has a built-in GPS/GLONASS synchronized master clock which provides the reference time used by all Ethernet ports. In addition, the NTS 03-G+ can be fitted with either a high precision OCXO or Rubidium oscillator, which increases holdover from hours to days.

With a dual redundant power supply option (not just dual power input connectors), the NTS 03-G+ product is ideally suited for use in industrial environments and can provide NTP and PTP server functions to multiple independent Ethernet networks.

Front Panel

The NTS 03-G+ features a front panel display (see Figure 1), giving visual feedback about the time data being generated on the outputs. LED indicators provide “at a glance” status information.

Figure 1 - NTS 03-G+ front panel

Configuration

The NTS 03-G+ features an administrative 10/100 Mbps Ethernet port through which the unit's inputs and outputs can be configured. When the IEEE 1588-2008 (PTPv2) option is enabled, the unit can operate as a PTP grandmaster, an ordinary PTP clock, or a slave only clock.

Accessories

The NTS 03-G+ comes complete with Ethernet cables to allow for customization and easy setup from the Windows™ Configuration software which is available to download from www.support.tekron.com.

Optional accessories include antenna, low loss antenna cable, antenna pipe mounting components, lightning protection kit, in-line amplifiers, and connector adaptors.

2. FRONT PANEL

Figure 2 - NTS 03-G+ front panel

The NTS 03-G+ features two LED indicators on the front panel (see Figure 2 - NTS 03-G+ front panel), together with a 2-line by 16-character backlit LCD display.

SYNC LED: Shows the status of the current sync source (as per LED Indicators Table 3).

ALM LED: Shows the alarm status of the NTS 03-G+ (as per LED Indicators Table 4).

ADMIN (USB) Port: This port can be used to configure the time server using the Tekron Configuration Tool available for download on the Tekron website www.tekron.com.

LCD Display

On initial power-up, the LCD display shows a copyright message, along with the serial number and revision level of the unit (see Figure 3).

After power-up, if the NTS 03-G+ is configured to operate in its default mode (GNSS synchronized), then the display changes automatically to indicate that it is waiting for satellites (see Figure 4).

Once one or more satellites have been discovered, it transitions to the operating default display (see Figure 5).

Figure 6 and Figure 7 show alternative time displays that the user can access by pushing the button on the front panel between the LED indicators. Successive button pushes can be used to cycle through all the display screens in turn. Examples of the display screens are shown below.

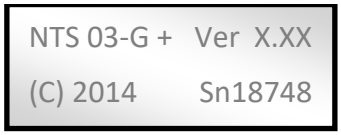


Figure 3 - Start Up (Time Server ID)

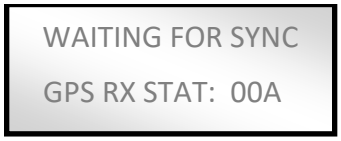


Figure 4 - Waiting for Satellites

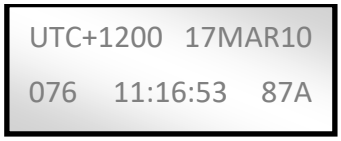


Figure 5 - Operating Default

Figure 6 - Local Time

Figure 7 - UTC Time

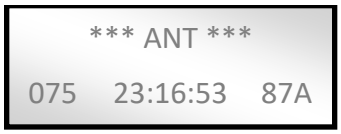


Figure 8 - Alarm

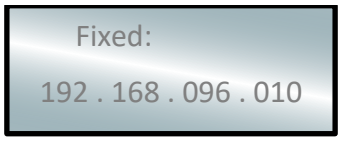


Figure 9 - IP Address

Figure 10 – LCD display screens (examples)

"UTC" is the abbreviation of Coordinated Universal Time (approximately equivalent to GMT). The top line of screen in Figure 5 shows the time server's current local time offset from UTC (hours and minutes), together with the local date. The local time day-of-year and time-of-day are on the bottom line.

Figure 5 shows that the time server is operating with a local time offset of 12 hours ahead of UTC. The local date is the 17th of March 2010, and the local time is 11:16:53 in the morning.

Figure 6 shows the same time and date, but also indicates that the time displayed is Local Standard Time, and that the day is Tuesday. "LST" denotes Local Standard Time. If daylight savings time is active, the "LST" in screen Figure 6 - Local Time changes to "LDT", denoting Local Daylight Time.

Figure 7 shows the UTC time and date which is 23:16:53 (11:16:53pm) on the evening of Monday the 16th of March 2010.

Figure 8 shows that an antenna alarm is active in the time server. All active alarms will be displayed in the same way.

Figure 9 shows the basic Ethernet network settings for Admin/ETH1 port. In this example, it shows the port has been configured with a fixed/static IP address of 192.168.96.10.

All screens displayed after the initial start-up screen show a three-character status field at the bottom right-hand corner of the display. When the NTS 03-G+ is operating in its default mode (GNSS synchronized), this field provides further details about the GNSS function as shown in Figure 11 and Table 1 - GNSS Status below.

When the NTS 03-G+ is synchronized to a source other than GNSS, this field directly indicates the alternate sync source being used. Table 2 - Alternative Sync Source shows the alternate sync sources supported by the NTS 03-G+.

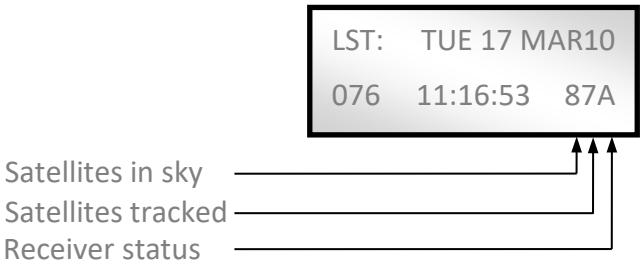


Figure 11 – Satellite tracking status

Table 1 - GNSS Status

Character	Values	Description
Satellites in the sky	"0 - 9": 0 - 9 "A - E": 10-14 "F": >14	This character represents the total number of satellites currently present in the sky according to the GNSS almanac. "0" in this position means that NTS 03-G+ has lost its knowledge of the GNSS satellites' orbit geometries. This occurs if the unit has been in storage for an extended period, or if the GNSS receiver has been reset. It will typically take 20 minutes (worst case two hours) for the unit to gain GNSS synchronization and resume normal operation.
Satellites tracked	"0 - 9": 0 - 9 "A - E": 10-14 "F": >14	This digit represents the number of satellites currently being used to compute the time solution. A "0" value means that no updated time solution is available, ("out of lock" condition). If this condition persists for the "Holdover" time the time server will indicate the "out of sync" condition.
Receiver status	"A"	NTS 03-G+ is in Acquiring mode - attempting to get satellite fixes.
	"G"	"Bad geometry": Satellites are positioned in almost a straight line so best accuracy cannot be obtained, but the unit will still sync to UTC.

Character	Values	Description
	“S”	Site Survey in progress. NTS 03-G+ is calculating an accurate position; once complete the mode will change to Position hold.
	“P”	“Position hold”: Position is known accurately, and the GNSS is providing its most accurate time, typically better than 40 ns to UTC.

Table 2 - Alternative Sync Source

Character	Values	Description
Alternate Sync Source	“PTP”	The NTS 03-G+ is synchronized to a PTP grandmaster
	“NTP”	The NTS 03-G+ is synchronized to a NTP server
	“SLC”	The NTS 03-G+ is synchronized to an IRIG-B source on P2 input “Slave: Copper”
	“SLF”	The NTS 03-G+ is synchronized to an IRIG-B source on the fiber input “Slave: Fiber”
	“TST”	The NTS 03-G+ is operating with manually set time.

If the NTS 03-G+ is configured to synchronize to IRIG-B only (ignore GNSS) then “SL?” will be displayed in the status field if there is no IRIG-B signal input or an invalid signal input.

Contrast Adjustment Mode

The LCD contrast can be adjusted by entering the Contrast Adjustment Mode. This mode is entered by holding down the button on the front panel for approximately 3 seconds.

Once in Contrast Adjustment Mode, pressing the button will lighten the contrast and decrease the contrast by one level. There are five different contrast levels, and the LCD will cycle from the darkest to the lightest if the button is pressed when on the lightest setting.

To exit the Contrast Adjustment Mode, hold down the button on the front panel for approximately 3 seconds again. The button will return to normal operation after this.

LED Indicators

The **SYNC LED** show the synchronization status of the NTS 03-G+ to the active primary reference source. The primary reference source could be GNSS, PTP, NTP or IRIG-B.

LED Indicators Table 3 – SYNC LED

State	Description
Off	The NTS 03-G+ has no power
On	The NTS 03-G+ is synchronized to the source indicated by the LCD display
Slow Flash (1 flash per second)	The NTS 03-G+ is operating in the “holdover” state (holdover timer running) or is operating in the “tuning” state (time server is gaining synchronization)
Fast Flash (5 flashes per second)	The NTS 03-G+ is not synchronized. “Out of Sync” condition

The **ALM LED** indicates the internal alarm status of the NTS 03-G+. It has only two operating states: -

LED Indicators Table 4 – ALM LED

State	Description
Off	The NTS 03-G+ is operating normally, i.e., there are no alarms
Fast Flash (5 flashes per second)	At least one alarm is active. Refer to the alarm window in the Clock tab of the Configuration Tool to find the name of the active alarm(s). A shorthand version of the alarm name will also appear on the LCD. Refer to the - Alarm Definitions table below for the details on each alarm by name.

Table 5 - Alarm Definitions

LCD Alarm	Alarm Name	Specification
PwrA	No Power A	No power source is detected on power inlet A.
PwrB	No Power B	No power source is detected on power inlet B.
Sats	Satellites Low	The number of satellites currently being used for time and position calculations is below the threshold.
Sync	No Sync	The NTS 03-G+ is not synchronized to any source, or the holdover period has expired, or the timing output inaccuracy has been exceeded.
Hold	Holdover	The NTS 03-G+ has lost sync and is now in holdover.
AntL	No Antenna	The antenna circuit current drain is low (typically under 3mA). This could be caused by: • poor connections • the connected antenna having a lower current drain specification • a component in the antenna system providing power to the antenna and therefore the time server is not seeing a connected load • there being no antenna connected
AntH	Antenna Short	The antenna circuit current drain is high (typically over 100 mA). This is caused by a short in the antenna circuit, or by moisture ingress in the circuit, or if the antenna connected has a higher current drain specification.
N/A*	Antenna Fault	This alarm is generated if there is high current or low current detected on the antenna input.
Factory Reset Cycle Power	Factory Reset Armed	This alarm is generated if the Forgotten Password Reset (Factory Reset Process) is enabled and has been initiated by the user.
IRIG	No IRIG-B Input	No valid IRIG-B source is detected on the NTS 03-G+ input. (This alarm only appears if the NTS 03-G+ has IRIG-B monitoring enabled).
N/A*	ETHx Link A Down	This message appears when the NTS 03-G+ has a PRP link enabled on ETH2 with ETH3 and/or ETH5 with ETH6, and there is no link on ETH2/ETH5. This could be caused by an unplugged cable, or an unpowered network switch connected to PRP port A.
N/A*	ETHx Link B Down	This message appears when the NTS 03-G+ has PRP link enabled on ETH2 with ETH3 and/or ETH5 with ETH6, and there is no link on ETH3/ETH6. This could be caused by an unplugged cable, an unpowered network switch connected to PRP port B.
N/A*	Overcurrent	The time server supports output current monitoring and has detected excessive current on one or more outputs. Check the I/O tab to identify which output is experiencing the fault.

LCD Alarm	Alarm Name	Specification
IPeX	ETHx Address Fault	This alarm comes up when the DHCP server is unavailable or when the IP address is assigned to some other node in the network and cannot be assigned to the port. Under such situations the port defaults to a link local address. eX represents the port number which has the alarm. For example, IPe1 indicates address fault alarm on ETH1.
SYNC FORCED ON	Sync Forced	This alarm is generated when the "Never leave Sync (Test Mode)" option has been selected.

*__Note:__ N/A indicates that this alarm does not appear on the LCD

Admin (USB) Port

A second Admin port (USB type B) is provided to support local configuration/administration. The USB port has the same configuration options as the Admin Ethernet port 1. The configuration software supplied with the NTS 03-G+ supports both USB and Ethernet configuration. A USB driver for the NTS 03-G+ can be downloaded from www.support.tekron.com. The NTS 03-G+ can be configured using USB only configuration to add an extra security layer.

3. BACK PANEL

Examples of NTS 03-G+ back panels are shown (see Figure 12 - Figure 15). Their appearance will vary when fiber Ethernet ports are fitted, or the fiber slave option is selected.

Figure 12 – Rear panel of NTS 03-G+, 3 Port Option

Figure 13 – Rear panel of NTS 03-G+, 6 Port Option

Figure 14 – Rear panel of NTS 03-G+, 4 Port with BNC IRIG-B outputs

Figure 15 – Rear panel of NTS 03-G+, 4 Port with ST fiber outputs

P1A / P1B: Power Input(s)

Power is applied to the unit via P1A and/or P1B (when fitted – dual power supply option). The NTS 03-G+ can be ordered with high voltage AC/DC supplies, high voltage DC supplies or medium voltage DC supplies, or a combination. IEC-320 power connectors (shown to the left – P1A) are used for high voltage AC or DC, and 5.08 mm 2-pin connectors are used for low, medium or high voltage DC. The polarity of DC power sources is not important as both the unit and case are isolated from the supply inputs. This enables the use of positive earth, negative earth or fully floating DC power sources. If either of the power

supplies fails, the time server will remain operational provided that each power supply is powered from a different source.

The input voltage range is marked below the **P1A/P1B** connectors. Refer to Power Supply Options section, which lists the available power supply options and input voltage ranges that can be ordered.

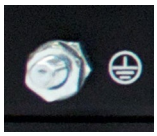
Check the label on the side of the unit for power supply voltage ratings before powering the unit.

If IEC connectors are used, then a 1 A, 250 Vac 5x20 mm glass or ceramic slow blow fuse should be fitted into the IEC connector.

If 2-pin connectors are used, then a 5 A fuse of appropriate voltage rating should be fitted into the non-earthed power supply line.

NOTE: The fuse working voltage should be greater than the supply voltage.

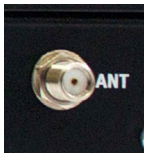
Earth Studs (M4 Nut)



Two M4 bolts (bonded to chassis) are provided for earthing. It is recommended that one of the two bolts is bonded to earth using a cable terminated with a ring terminal. This provides a safe discharge path in the event of a short circuit or high voltage transient.

4. BACK PANEL – INPUTS AND OUTPUTS

Ant: Antenna Connector (SMA Connector)



The “ANT” antenna input provides an interface for an external active antenna. The antenna should be connected using a high quality, low-loss 50 Ω coaxial cable. The center conductor supplies 5 VDC (100 mA max) to power an active antenna.

Care should be taken to ensure that the connector is not cross threaded when attaching the antenna lead-in cable. The connector should be tightened firmly by hand only. Do NOT over-tighten! Ensure the antenna SMA male connector center pin is straight before plugging in.

Antenna Cable Considerations

The NTS 03-G+ antenna port expects a signal with a gain of at least 15 dB, and no more than 35 dB, with 20 - 35 dB being the optimal gain range.

All antenna cables will introduce some signal loss in the antenna installation system, which will be dependent on cable length. The total gain of the antenna installation should fall within the ranges specified below. The total gain is calculated by the gain of the antenna (Tekron supplied antenna provides 40 dB gain) minus the antenna cable loss.

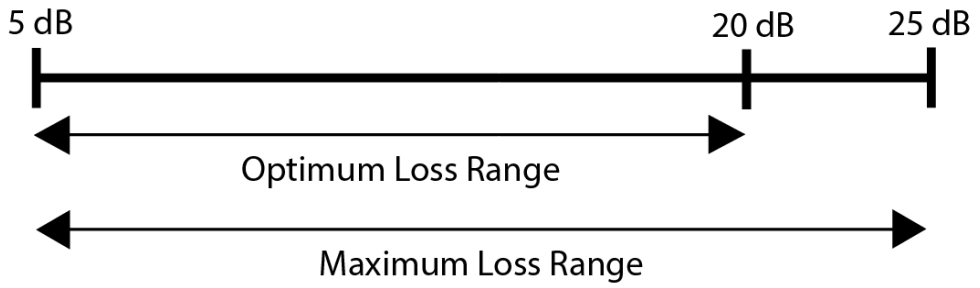


Figure 16 Recommended antenna cable loss range

Note: The above figures are based on an average GNSS signal strength of -130 dBm at sea level, and assumes that the Tekron supplied antenna is used.

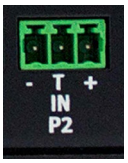
CNT-240	32.8 dB/100 m (10dB/100ft). Plus 1 dB/connector Approximate optimum length range: 15m to 60m (50 ft – 197 ft) Approximate maximum length range: 15m to 76m (50 ft – 250 ft)
CNT-400	16.73 dB/100 m. Plus 1 dB/connector Approximate optimum length range: 30m to 120m (99 ft – 394 ft) Approximate maximum length range: 30m to 150m (99 ft – 493 ft)

A lightning protection device should be inserted into the antenna lead. A suitable device, complete with additional cable connectors, a connector crimping tool and mounting hardware is available as an option. The introduction of the lightning protector introduces an additional loss of 0.1 dB and the loss of two connectors.

Care should be taken to ensure that the connector is not cross threaded when attaching the antenna lead-in cable. The connector should be tightened firmly by hand only. DO NOT OVER TIGHTEN!

P2: IRIG-B Input (3-pin 3.81 mm Connector)

This port accepts an RS422 level un-modulated IRIG-B signal of the following formats:



- IRIG-B004 with C37.118.1 extensions
- IRIG-B005 with C37.118.1 extensions
- IRIG-B006*
- IRIG-B007*

*Note: When no extensions are contained in the incoming IRIG-B signal, the incoming time is assumed to be UTC.

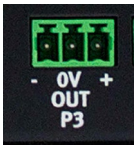
When configured appropriately, the NTS 03-G+ can synchronize to this source rather than the internal GNSS receiver, operating as a slaved device from another master source or other time server.

A 120 Ω twisted pair cable is recommended for the incoming RS422 line.

The incoming RS422 line should be connected to pins “+” and “-” of the mating connector. An RS422 termination load is provided on pin “T” and can be activated by linking pins “T” and “-” in the mating connector.

The ability to synchronize to IRIG-B may not be supported for units fitted with the advanced oscillators (OCXO or Rubidium options).

P3: Programmable Output (3-pin 3.81 mm Connector)



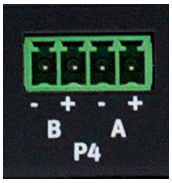
This port transmits an un-modulated IRIG-B, programmable pulse, or DCF77 signal using RS422 level on pins "+" and "-" of the mating connector. It can be used as the master source signal to drive the P2 inputs of one or many slave NTS 02/03-G units or other end devices.

The IRIG-B timing pulses (both leading and trailing edges) from this port are typically to within 100 ns of UTC. A low drive 0 V to +3.3 V signal (single-ended, 0 V referenced) can be obtained by connecting the signal cable to "+" and "0V" instead of to "+" and "-".

P3 is a programmable RS422 output that may be configured to output in either inverted or non-inverted polarity:

- A configurable number of pulses per second, minute, hour, day with adjustable pulse-width and offset.
- IRIG-B time code (Un-modulated DCLS or Modified Manchester) with option C37.118.1 or AFNOR extensions.
- Simulated DCF77 receiver time code.

P4: Sync and Antenna Alarm Relays (4-pin 3.81 mm Connector)



The port provides two alarm output channels. The alarm outputs are type "A" (normally open) dry contact types.

Note: the "Normally-Open" (NO) descriptor refers to the de-energized state of the relay.

The NTS 03-G+ operates with the alarm relays energized during normal operation, and de-energized in the alarm state. It follows that, in the event of all power to the time server being lost, both of the alarm relays default to the "alarm" state (open contact). The "+" and "-" symbols are included for reference purposes only, as the alarm contacts are not polarized.

P4 A is a GNSS signal fail (antenna disconnected or antenna short (over-current)) alarm. Activation of the alarm (opening of the contact) is delayed by 10 seconds from the onset of the triggering condition.

P4 B is a synchronization fail alarm. This alarm is active (contact open) when the unit is not synchronized and is not in the holdover state. initially powered on and remains active until

synchronization is achieved. The contact then closes, deactivating the alarm. If a loss of synchronization later occurs, then the NTS 03-G+ will operate in “Sync Hold” mode for a period defined by the “Sync Hold time”.

At the expiry of the “Sync Hold time”, the alarm condition is again activated (contact open). Note that the “Sync Hold Time” is configurable up to a maximum of 970 days. The default setting is 2 minutes. A configurable option is also provided to disable the “Sync Hold Time”, allowing the unit to remain in “Sync Hold” mode indefinitely.

P5: Power Alarm Relays (4-pin 3.81 mm Connector)

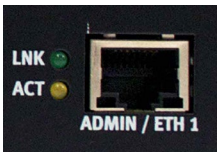
The pluggable connector provides two alarm output channels. Wiring size is up to 1.00 mm². The alarm outputs are type A (normally open) dry contact types.

Note: The “Normally-Open” (NO) descriptor refers to the de-energized state of the solid-state relay. The convention used in the NTS 03-G+ is to have the alarm relays energized during normal operation, and de-energized in the alarm state.

In the case that all power to the time server is lost, all the alarm relays then default to the “alarm” state (open contact). The “+” and “-” symbols are included for reference purposes only, as the alarm contacts are not polarized.

P5 A is a Power A fail alarm and **P5 B** is a Power B fail alarm. The power alarms will only be triggered if it is enabled in the Tekron configuration Tool. Alarm signaling is delayed by 10 seconds. That is, if power supply A fails, the Power A alarm contact will open 10 seconds[1] later.

ADMIN/ETH 1: Ethernet Administration Port (RJ-45)



The Ethernet administration port (ETH1) features an RJ-45 connector and supports 10/100 Mbps, Auto MDI-X and Auto Negotiate. The port indicator LEDs conveys the Link (LNK) and Activity (ACT) status for the port. This port is used to configure clock settings and all network ports via the Tekron Configuration Tool, which is available for download from the Tekron website at www.support.tekon.com.

ETH 2 – ETH 6: Ethernet Communication Ports (RJ-45/ST Fiber Connector)

The Ethernet communication ports (ETH2 – ETH6), feature an RJ-45 connector that supports 10/100 Mbps, Auto MDI-X and Auto Negotiate, or ST Fiber (100 Mbps) connectors (if Fiber option is ordered). These ports include indicator LEDs which convey Link (LNK) and Activity (ACT) status for the associated port.

If fitted with an ST Fiber connector the following cable core structures are supported:

- 50/125 µm plastic optical fiber (POF)
- 62.5/125 µm POF
- 100/140 µm POF
- 200 µm hard-clad silica (HCS)

Note: ST Fiber Ethernet ports are not an orderable option for the NTS 03-G+ 4 port and 6 port options with the advanced OCXO oscillator.

PRP: Parallel Redundancy Protocol

The NTS 03-G+ supports Parallel Redundancy Protocol (PRP) on ports ETH2 and ETH3, and when fitted with the 6-port option, ETH5 and ETH6. When enabled via the Tekron Configuration Tool, the ports ETH2 and ETH3, or ETH5 and ETH6, are paired and operate as a single redundant interface. PRP support requires the purchase of a PRP license from Tekron.

PRP operation is compliant with IEC 62439-3 (2016) and supports PTP master or slave operation in IEEE 1588-2008 default profiles or C37.238 power profile.

Note:

At no time will the NTS attempt to operate as an Ethernet router, switch or hub.

P6 – P9: Programmable Output (50 OHM BNC connector/ ST Fiber connector)

These ports can be ordered as either four BNCs (copper, 5 V, 150 mA) or as four ST Fiber transmitters.

Figure 17 – BNC Connector

Figure 18 – ST Fiber Connector

These ports provide high drive, isolated TTL outputs. Each output can be uniquely programmed through the Tekron Configuration Tool. All ports are electrically isolated from the main clock. The outputs are paired P6 and P7 as one pair and P8 and P9 as the second pair. Each pair shares a common reference and power supply.

The user may configure these outputs in either inverted or non-inverted polarity with:

- A configurable number of pulses per second, minute, hour, day with adjustable pulse-width and offset
- IRIG-B code (un-modulated DCLS or Modified Manchester) with option C37.118.1 or AFNOR extensions.
- DCF77 receiver time code simulation

P10 & P11: Programmable Output (50 OHM BNC connector)

Figure 19 – BNC connector with switch

These two ports provide two high drive, isolated TTL outputs (paired) or two AM IRIG-B outputs. These ports share a common earth but have separate drivers with the AM IRIG-B transformer isolated from the rest of the system and the DCLS IRIG-B optically isolated. A switch located under the connector allows the port to be set up as either an AM or DCLS IRIG-B port. The switch can be slid to either the DC side to provide DCLS IRIG-B, or to the AM side to provide AM IRIG-B.

Note: The switches are delicate and are not designed to be actuated multiple times after installation. Ideally, they should be actuated once at most during installation to permanently select the IRIG-B modulation compatible with the installation.

Use either a coaxial cable or a shielded twisted pair (using Tekron BNC to 2 pin adaptor), to feed a signal from P10/P11 output to any connected IED. When using shielded twisted pair, connect the shield to ground.

The mark/space amplitude modulation ratio of the AM IRIG-B is 3:1, and peak to peak output level is 7.2 Vpp (max), 120 Ω impedance. The output is fully floating and is transformer-isolated to 3.75 kV.

⚠ **Most devices with AM IRIG-B time sync inputs have an input impedance of between 4 kΩ and 20 kΩ, and maximum allowable peak-to-peak level of 6 V. The P10/P11 output is designed to drive multiple devices in parallel, with a terminating resistor (typically 100 - 180 Ω) fitted at the far end of the co-ax. line feeding all of the attached loads. In this way P10/P11 can drive at least 20, and typically 30 or more devices without any external amplification. The terminating resistor is essential to ensure correct voltage levels.**

5. SOFTWARE

Configuration Tool

The NTS 03-G+ can be configured via USB or Ethernet. The configuration tool can be downloaded from the Tekron Support Website: www.support.tekon.com. By default, the unit is shipped with DHCP enabled for automatic IP address assignment, with a fall back to link local addressing (169.254.xxx.xxx) if no DHCP server is present.

Default Username: admin

Default Password: Password

Note:
The user is required to change the default password on first login.

USB driver

The USB driver can be downloaded from the NTS 03-G+ product page of the Tekron website (https://tekron.com/products/multiport-network-time-server-nts03g).

6. INSTALLATION

Identification

Each NTS 03-G+ unit is shipped with identification labels on the side of the unit. The label provides details of the particular options fitted to the unit during manufacture, as well as the power supply requirements and the unit serial number.

Check the identification label on the side of the unit to ensure that the correct model has been supplied before proceeding to install!

Location

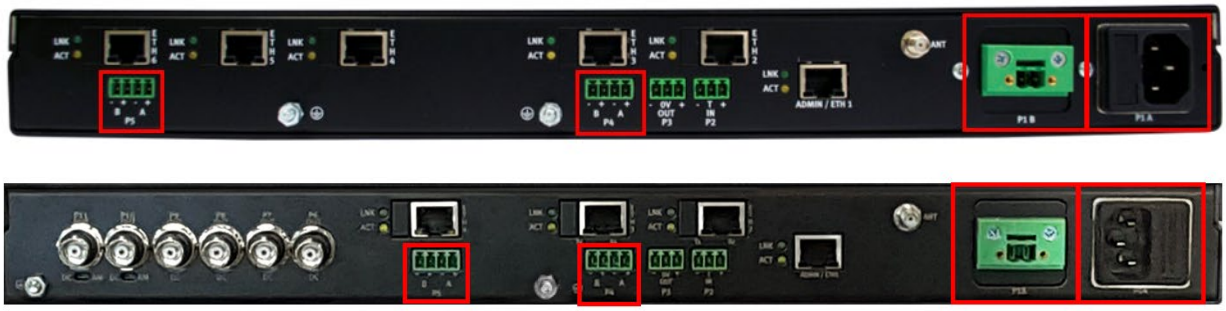
WARNING

The unit is intended for installation in restricted access areas. A restricted access area can be accessed only using a lock and key or other means of security. Installation is to be done by suitably qualified personnel.

Power Supply(s)

The input voltage range is marked on the product label on the side of the unit. Do not apply voltage outside the range noted.

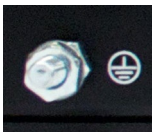
Hazardous Voltage



WARNING

Up to 300 V may be present at the Power Input ports P1A and P1B. Up to 200 V may be present at the Alarm Relay port P4 and P5. These voltages are supplied to the unit only, and not generated by the unit. However, the installer must exercise care in wiring the associated plugs to ensure bare copper is not accessible.

Earthing



The unit must be safety earthed whenever it is powered on, using the earth terminal as pictured above. The cable cross section must be equal to or greater than 0.75 mm2 (18 AWG).

Mounting the NTS 03-G+

The NTS 03-G+ is designed to be mounted in a 19” rack. The unit is mounted to the 19” rack by using the four corner front panel screws.

Operation

Check the label on the side of the unit for voltage requirements before switching on! Connect the antenna lead and the antenna (with a good view of the sky). Then connect the power source to P1A/P1B.

The time required to achieve tracking and synchronization given a good view of the sky is typically within one minute and 30 seconds. The NTS 03-G+ will usually take under one minute to synchronize to the GNSS 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’. The NTS 03-G+ performs stability validation on all incoming sync sources before reporting that it is ‘in sync’.

Once powered up, the operator can determine correct operation of the NTS 03-G+ by observing the LEDs. The ALM LED should be off, and the SYNC LED should be solid on. If the LEDs are flashing, refer to LED Indicators for an explanation of the status.

7. FACTORY RESET

The NTS 03-G+ features the ability to reset to factory default settings in the event that the administrator password is forgotten, or if the NTS 03-G+ is rendered unreachable on the network due to incorrect settings, provided that physical access to the unit is available.

This feature is disabled by default in order to maximize security and must be enabled via the Tekron Configuration Tool before it can be used. When disabled, there is no method to gain full access to the unit without the administrator password, and if the administrator password is forgotten, the unit must be returned to Tekron for reprogramming at the customer's expense.

This feature may be permanently disabled by Tekron on request.

For further details on this feature, see the Configuration Tool Manual, which can be downloaded from the Tekron website at [(www.tekron.com/downloads)](www.tekron.com/downloads)

8. FACTORY HARDWARE OPTIONS

Power Supply Options

This table shows the three different power supply connection inputs that may be ordered with NTS 03-G+. The NTS 03-G+ supports dual redundant power supplies, which are independently configurable during manufacture.

Designator	Input Range
Medium Voltage (2 pin)	20 - 75 Vdc
High Voltage (2 pin)	90 - 300 Vdc
High Voltage (IEC-320 Inlet)	90 - 300 Vdc; 85 - 250 Vac

Expansion Board Options

The table below shows two additional Expansion board configurations that may be ordered with NTS 03-G+.

Expansion	Description
Expansion 1 – 3x Ethernet	Additional 3 Ethernet ports (RJ-45 or Fiber)
Expansion 2 – 1x Ethernet, 4x DC IRIG-B, 2x AM/DC IRIG-B	Additional 1 Ethernet port (RJ-45 or Fiber) Additional 4 High Drive OR ST Fiber DC IRIG-B ports Additional 2 High Drive DC IRIG-B OR AM IRIG-B ports

Slave Only Option (Fiber input)

NTS 03-G+ can be ordered as a slave only device in which case, the SMA antenna jack is removed, and an ST Fiber receiver port (multi-mode) is fitted instead. The unit will then synchronize to an incoming IRIG-B signal on either P2 (RS422 format signal required) or on the Fiber input.

OCXO Option

NTS 03-G+ can be ordered with a GPS locked precision OCXO. This can provide better than ±10 µs holdover over 24 hours (7 days aging).

Rubidium Option

NTS 03-G+ can be ordered with a GPS locked Rubidium oscillator. This can provide better than ±10 µs holdover over 7 days (7 days aging).

9. APPENDIX

NTS 03-G+ Specifications

Physical Specifications

Performance Property		Metric
Dimensions	Width	430 mm
	Depth	270 mm
	Height	45 mm
	Weight	2.0 kg

GNSS Receiver

L1/GLONASS (1575.42 / 1598-1606 MHz) Frequency, C/A Code, 32 Channel, parallel-tracking receiver

Performance Property		Metric
Position Accuracy	Horizontal	<9 m (90%)
	Altitude	<18 m (90%)
Timing Accuracy		15 ns (1 sigma) to UTC
Sensitivity	Acquisition	-148 dBm
	Tracking	-160 dBm

Input & Output Connector Specifications

Type	Electrical	Physical	Accuracy at the port
AM IRIG-B (modulated)	7.2 V_{p-p}	50 OHM BNC	≤2 µs of UTC
TTL (DC)	5 V	50 OHM BNC	≤100 ns of UTC
Fiber (λ=820 nm) • 50/125 µm plastic optical fiber (POF) • 62.5/125 µm POF • 100/140 µm POF • 200 µm hard-clad silica (HCS)	N/A	ST	≤100 ns of UTC

Input & Output Specifications

Performance Property		Metric	Isolation
Ethernet Port (Administrator)		RJ-45, 10/100 BASE-T	1.5 kV Isolation
Ethernet Ports (2 - 6)	- Copper	RJ-45, 10/100 BASE-T	1.5 kV Isolation
	- Fiber	ST Fiber, 100 BASE-FX	n/a
USB		Type B	n/a
P2, RS422/485		200 mV sensitivity, 3.3 V drive level, 32 unit loads (3 Pin)	n/a
P3, RS422/485		200 mV sensitivity, 3.3 V drive level, 32 unit loads (3 Pin)	n/a
P4 Relay		300 V, 100 mA (AC/DC)	3.5 kV Isolation
P5 Relay		300 V, 100 mA (AC/DC)	3.5 kV Isolation
P6, P7	- Copper	TTL - 5V, 150mA	3 kV Isolation
	- Fiber	ST Fiber	n/a
P8, P9	- Copper	TTL - 5V, 150mA	3 kV Isolation
	- Fiber	ST Fiber	n/a
P10, P11	- Copper	TTL - 5V, 150mA	3 kV Isolation
	- AM-IRIG	7.2 Vpp (max), 120 Ω impedance	3 kV Isolation

DC-IRIG/AM-IRIG Availability

Port	Signal Support	Base Model	6 Port	4 Port + IRIG-B
P3	IRIG-B00x[1], IRIG-B22x, DCF77, Pulses[2]	X	X	X
P6, P7	IRIG-B00x[1], IRIG-B22x, DCF77, Pulses[2]			X
P8, P9	IRIG-B00x[1], IRIG-B22x, DCF77, Pulses[2]			X

Port	Signal Support	Base Model	6 Port	4 Port + IRIG-B
P10, P11	IRIG-B00x[1], IRIG-B22x, DCF77, Pulses[2], AM IRIG-B12x			X

[1] x = 4 to 7

[2] Programmable pulses ranging from 1000 pulses per second to pulse per day. Refer to Tekron Configuration Tool manual for full details.

IRIG-B Translation Chart

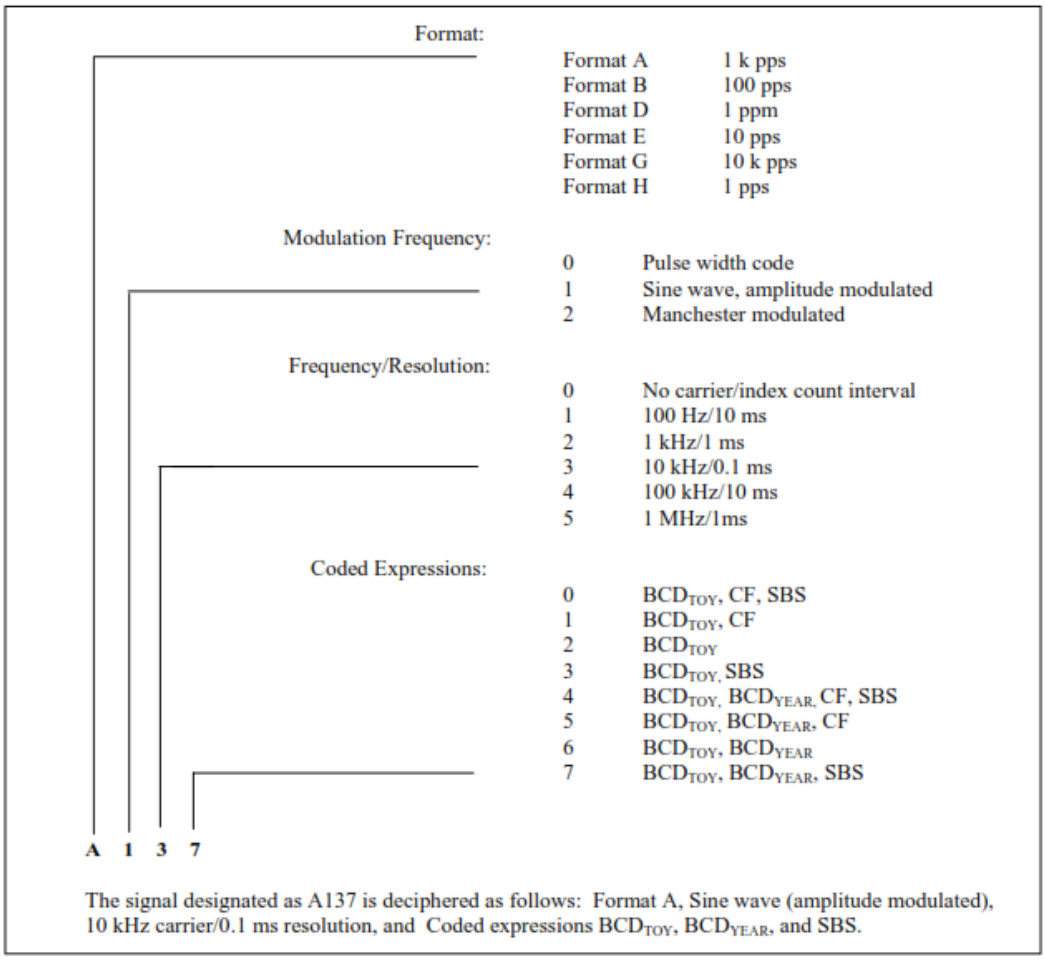


Figure 20 – Image sourced from IRIG Standard 200-04

Only the IRIG 'B' format is supported by Tekron products, but all three modulations are supported. With DCLS/no modulation (pulse width code) no carrier is used, and with Manchester modulated (Modified Manchester) and amplitude modulation (AM) only the 1 kHz carrier is supported. Therefore, Tekron products support IRIG-B00x, IRIG-B12x, and IRIG-B22x where 'x' is the coded expression.

For the coded expression, BCDtoy (binary coded decimal time of year) and BCDyear are always included in the signal. Straight binary seconds (SBS) are only included if 'binary seconds in code' is enabled, and the control field (CF) is only included if either AFNOR or C37.118.1 extensions are used. Therefore, coded expressions 4-7 are supported by Tekron products. Tekron recommends using coded expression 4 with C37.118.1 extensions on IRIG outputs, as this provides the most information possible to end devices. By default, the IRIG-B outputs use the B004 format in local time.

Environmental Specifications

Performance Property	Metric
Operating Temperature Range	-10 to +65 °C -10 to +60 °C (Rubidium)
Operating Humidity	10 ~ 95% non-condensing

Electrical Specifications

Performance Property	Connector Type		Metric
Power Supply	2 pin	Medium Voltage (DC)	20 - 75 Vdc
	2 pin	High Voltage (DC)	90 - 300 Vdc
	IEC-320	High Voltage (AC/DC)	90 - 300 Vdc / 85 - 250 Vac
		Connector fuse	250 Vac, 1 A, 5x20 mm, slow blow
Power Drain		Expansion 2 with Rubidium/OCXO	28W
		Expansion 1 or 3 with Rubidium/OCXO	22W
		NTS-03G+ without Rubidium/OCXO	12W

10. WARRANTY

For terms and conditions of Tekron's Warranty see the Web Site

http://tekron.com/about-tekron/warranty

WARNING:

This product has been designed to comply with the limits for a Class A digital device pursuant to Part 15 of FCC rules. These limits are designed to provide reasonable protection against such interference when operating in a commercial environment.

Notes

The information in this manual may change without notice. The manufacturer assumes no responsibility for any errors that may appear in this manual.

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