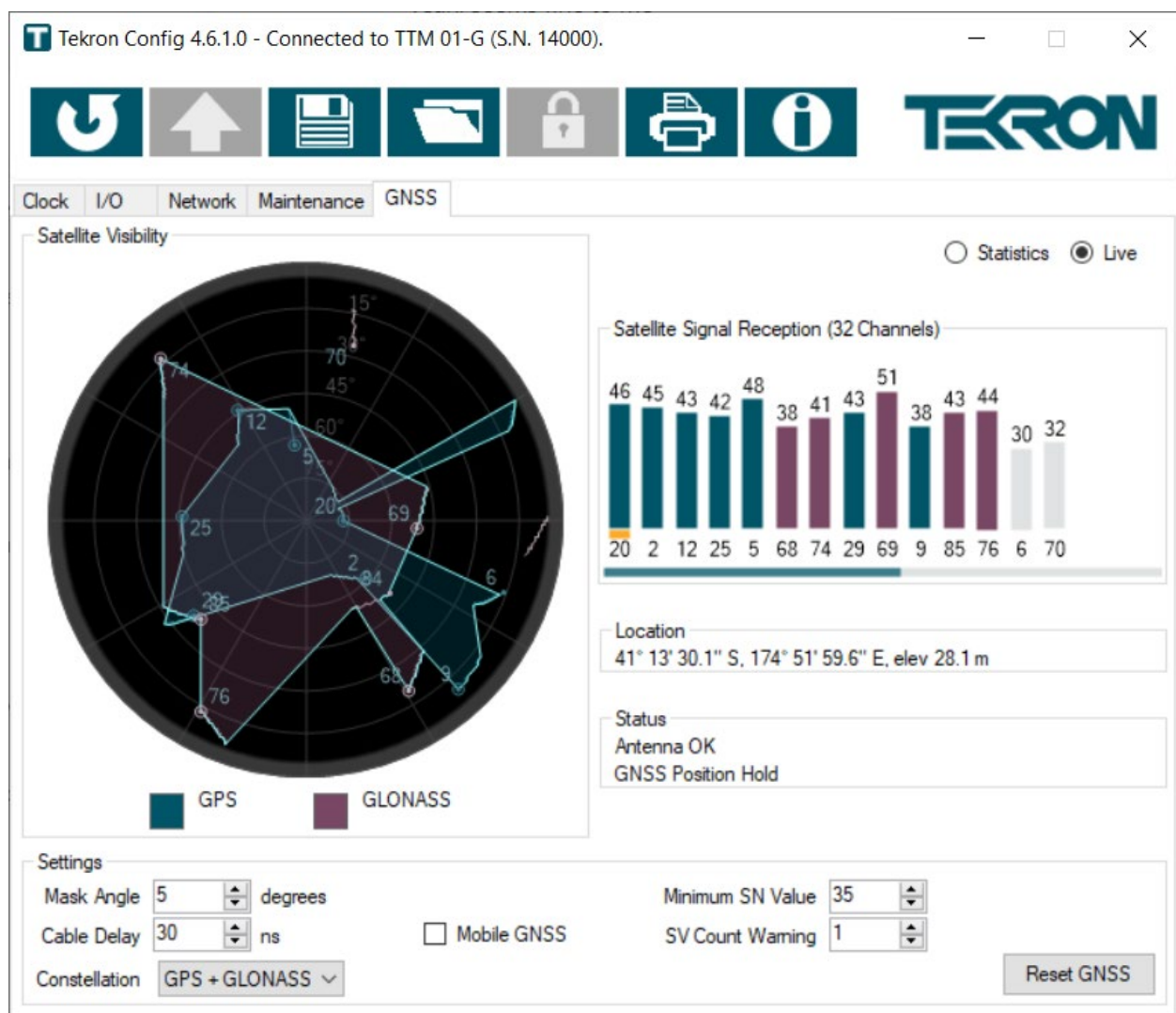


# Configuration Software

## USER MANUAL



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## Version Information

Release Date	Software Version	Manual
08/05/15	4.1.0.3	1.0
10/05/16	4.1.1.0	1.1
10/08/16	4.1.1.0	1.2
07/12/16	4.2.1.0	1.3
22/03/17	4.2.1.10	1.4
10/11/17	4.2.1.16	1.5
12/12/17	4.3.1.0	1.6
25/01/18	4.3.1.0	1.7
30/01/18	4.3.1.1	1.8
24/04/18	4.4.1.0	1.9
15/05/18	4.4.1.1	2.0
05/08/19	4.5.1.0	2.1
15/08/19	4.5.1.0	2.2
31/01/21	4.6.1.0	2.3 (Current Document)

## 1. Introduction

Tekron's proprietary Configuration Software is for performing device management and status monitoring for the Tekron NTS series, TCG series, TTM series, and PTP Translator products. It supports secure and encrypted communication, as well as legacy communication over Ethernet. Tekron's Configuration Software also supports USB configuration for compatible clocks manufactured from 2013 onwards which have a USB interface. This user manual describes the functionality of Tekron's Configuration Software, its operation, system requirements and dependencies. It is not intended to provide a technical resource on Ethernet networking or cyber security best practices.

This manual refers to clocks running in "Secure Mode" and "Legacy clocks". The definitions of which are as follows:

"Secure Mode": A Tekron clock with security enabled that is not a Legacy clock.

"Legacy clock": The following Tekron products are classified as legacy clocks – TCG 01-E, TCG 02-E and TTM 01-E.

## 2. Obtaining Tekron's Configuration Software

Tekron's Configuration Software is free to download from the resources tab on the product page on Tekron's website: [www.support.tekron.com](http://www.support.tekron.com)

## 3. System requirements

Tekron's Configuration Software is a standalone executable compatible with the following Operating Systems:

- Microsoft Windows XP
- Microsoft Windows Vista
- Microsoft Windows 7
- Microsoft Windows 8
- Microsoft Windows 10

Tekron's Configuration Software requires the host to be running Microsoft™ .NET Framework 4 or later. The Tekron USB driver is also required to perform configuration over USB connection, for clocks that support this feature.

## 4. Dependencies

Tekron's Configuration Software is designed to communicate via the Ethernet network or USB (for Tekron products which support this feature). To communicate with a clock, the Windows based machine running the executable and intermediary connected devices are expected to be configured to allow communications traffic to transition through each device. Tekron's Configuration Software should not be inhibited by the firewall, anti-virus or other communications software. Intermediary switches and routers should also be checked to ensure that they are not blocking network traffic flowing in either direction on the relevant connected network links. Refer to your network administrator if you are unsure.

In the case of an Ethernet network connection on a secure network, it should be noted that the following UDP ports may be used:

Port number	Used for
67, 68	DHCP
123	NTP and SNTP
161, 162	SNMP
319, 320	PTP
514	Syslog
9990, 9992, 9997, 9999	Configuration and management

## 5. Communication

Tekron's Configuration Software uses a combination of UDP unicast and broadcast packets for communication with Tekron clocks. It has been designed to minimize network traffic to reduce network bandwidth requirements. UDP broadcast packets are user initiated using the "Discover" function described in Section 6. If a network configuration problem exists (e.g. incorrect network settings), then broadcasts may continue to be used to communicate between the clock and Tekron's Configuration Software until the issue is resolved. All other communication is unicast. When Tekron's Configuration Software is open and connected to a clock via unicast, the expected network traffic between Tekron's Configuration Software and clock is 4 packets (2 transmit, 2 receive) per second, until the connection is closed.

## 6. Connecting to a Clock via Ethernet for the first time

Install the Tekron clock according to the recommended installation instructions in the product manual. Connect the clock directly to the Windows based machine, or to a network switch located on the same LAN using a CAT5e, CAT6, or Multimode Fiber (where applicable) Ethernet cable. Run Tekron's Configuration Software on the Windows based machine. Once it has opened, the "Discovery Window" is displayed, shown in Figure 1.

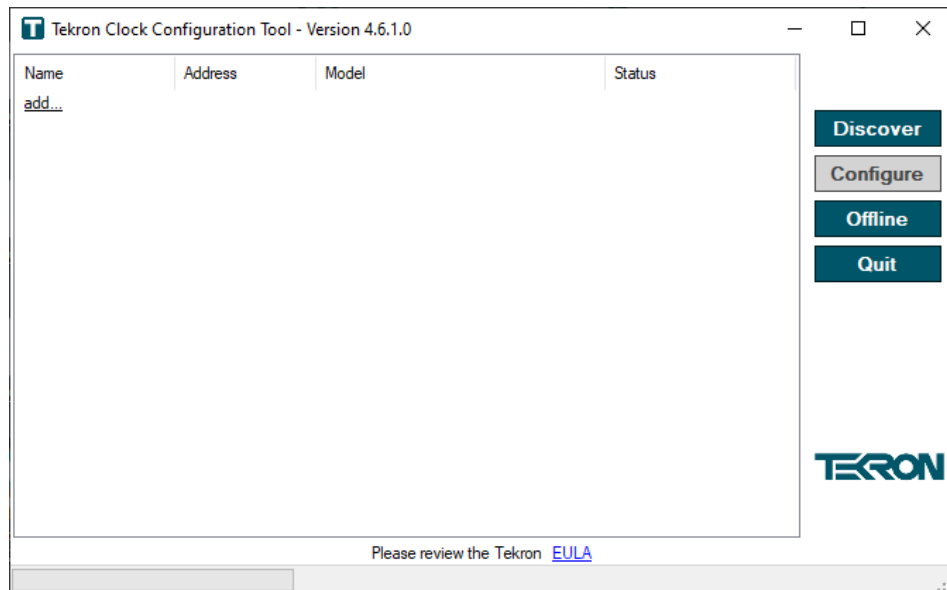


Figure 1 - Discovery Window

To find the clock on the network, click the “Discover” button. Tekron’s Configuration Software will send a UDP broadcast message on the LAN. Any clocks which receive the message will respond with a unicast UDP message to announce their presence. The response includes basic information about the clock including its name (“Clock Designation”), port name, model, firmware versions, and status.

**Note:** In some network environments, broadcast packets are undesirable. In the event that you do not want broadcast packets on your network, it is recommended that you configure the clock for the first time via direct connection, or by interrogating the network devices (such as the DHCP server) to establish the initial IP address of the clock. Once valid network settings have been set, there is no further need for broadcast communication.

Any clocks which respond to the “Discover” request will be listed in the “Discovery Window” clock list as shown in Figure 2. Highlight the clock you wish to configure and click the “Configure” button, which will initiate a UDP unicast communication with the selected clock. The Configuration Software prepends the clock’s serial number to the clock name of the discovered clock.

---

**Tekron clocks by default are shipped with all Ethernet interfaces set to DHCP enabled. In the event that the Ethernet interface is set to DHCP and there is no DHCP server running on the network, the Ethernet interface will fall back to a link local IP address (169.254.xxx.xxx). Legacy Tekron clocks running older firmware may revert to IP address 0.0.0.0.**

---

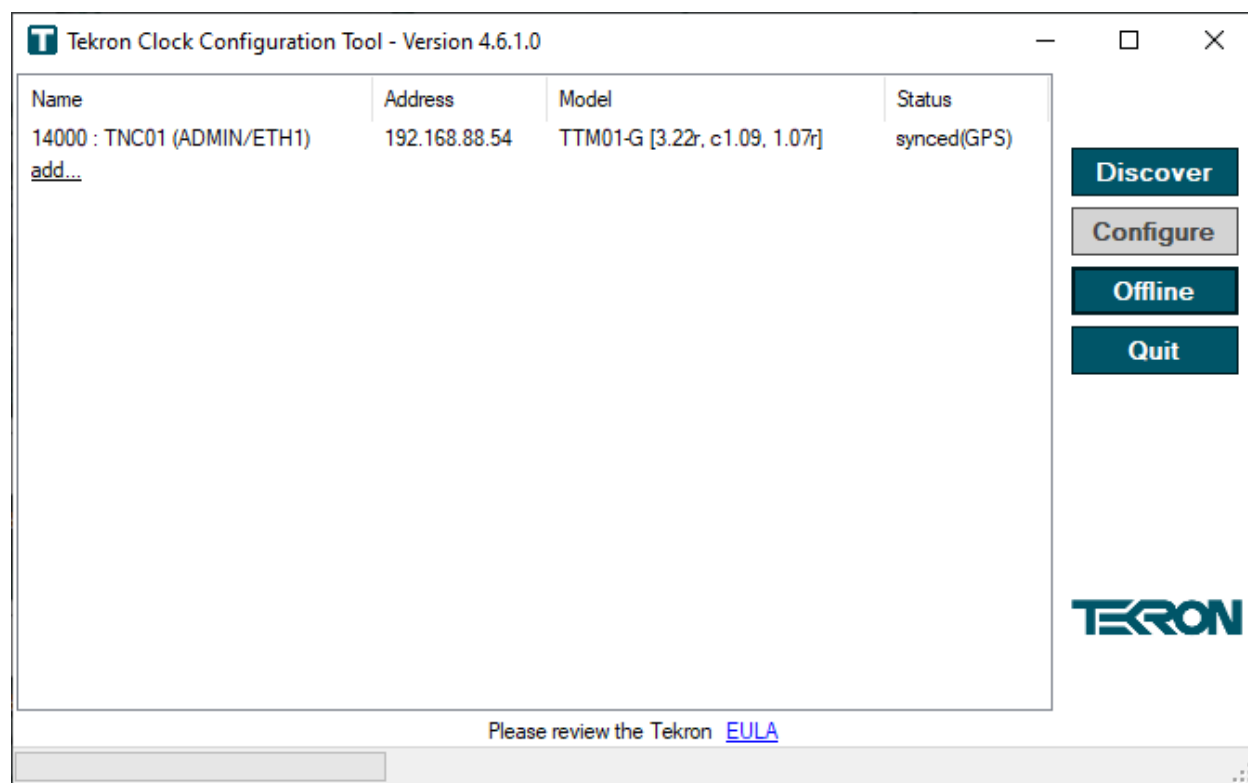


Figure 2 - Discovery Window clock list

If after clicking “Configure”, a “login” window opens (refer to Figure 3 below), then security has been enabled on the selected clock. You will need to enter a correct username and password to proceed.

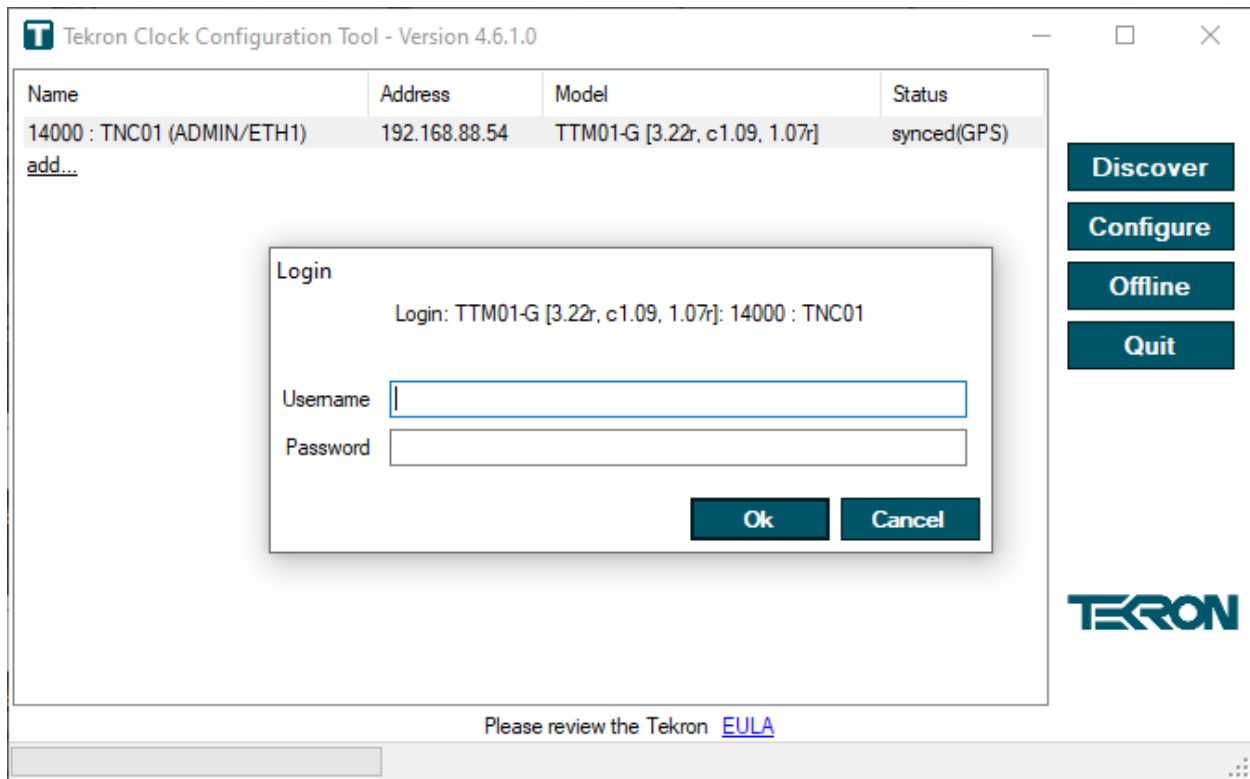


Figure 3 - Login window

If the clock has been configured with security disabled, or is a legacy clock, no login is required. The Configuration Software window will open and display the Clock tab.

Legacy clocks with password protection enabled will only require the correct password to be entered when storing changes. The password is not required to view the clock's configuration.

If you are configuring a new clock for the first time, and if you are prompted to login, you will use the factory default username and password which can be found in the product Quick Start Guide or the product manual. The factory default login credentials are:

---

**Factory default username: admin**

**Factory default password: Password**

---

*Note: the username and password are case sensitive.*

When logging in for the first time using the factory default credentials, you will be prompted to change the password.

---

**Important! Ensure that the password is securely recorded. If the administrator of the clock loses the login username and password, the unit will need to be returned to Tekron for re-programming at the customer's cost. To avoid this, some clocks support a Forgotten Password Reset procedure that can be enabled once logged in. Refer to Section 7.7.1.**

---

Once you have set up a new password and you are logged into the clock, you can proceed to configure its settings.



## 7. Configuring a Clock

### 7.1. Toolbar



Reloads (retrieves) the current configuration from the connected clock. **Note:** Any un-stored configuration changes will be lost.



Stores and applies the displayed configuration to the connected clock. If the button is greyed out (disabled), the configuration displayed in the tool is the same as the connected clock. If the button is blue (active), the configuration displayed has one or more changes from the stored configuration of the connected clock.

If the connected clock is a legacy clock with password protection enabled, attempting to store settings will cause a password prompt to appear. The

correct password must be entered before changes will be stored.

A dialog box will appear after storing the configuration to confirm that the configuration was stored successfully. Refer to Figure 4.



Save the current configuration to a file. This allows a back-up copy of the configuration file to be stored. The file format is XML. Refer to Section 8 for further information on editing XML configuration files.

When saving a file, a “Write Password” window will open, allowing the level of encryption to be selected. “Whole File” encrypts the entire file, preventing it from being read or modified without the password. “Sensitive Sections Only” will only encrypt security-related sections, such as password changes. “Not Encrypted” will not use any encryption, and a password is not required. Once selected, a file directory window will open to allow you to select the location to save the file. Refer to Figure 5.



This feature allows you to load existing configuration files into Tekron’s Configuration Software from a local drive on the Windows based machine, for the purpose of editing standard configuration settings.

Once this button is clicked, a file directory window will open to allow you to select the location of the file and load it into Tekron’s Configuration Software. If the selected file contains any encrypted sections, the software will prompt for the password. If the password entry is cancelled, the software will skip the encrypted sections and attempt to load only the non-encrypted sections. A “Change Window” (refer to Figure 6) will then open giving a comparison between current values and new values in the XML file. The “Load settings from basic network tab” check box is checked by default to include the Basic Ethernet network settings when loading the file. The checkbox can be unchecked for not loading basic network settings, allowing corporate users to have one standard generic settings file that can be loaded to all clocks, without changing the IP address of the clock.

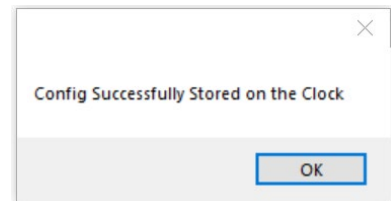


Figure 4 - Confirmation dialog box

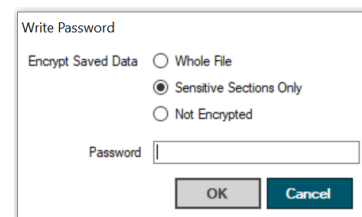


Figure 5 - "Encrypt Config" window

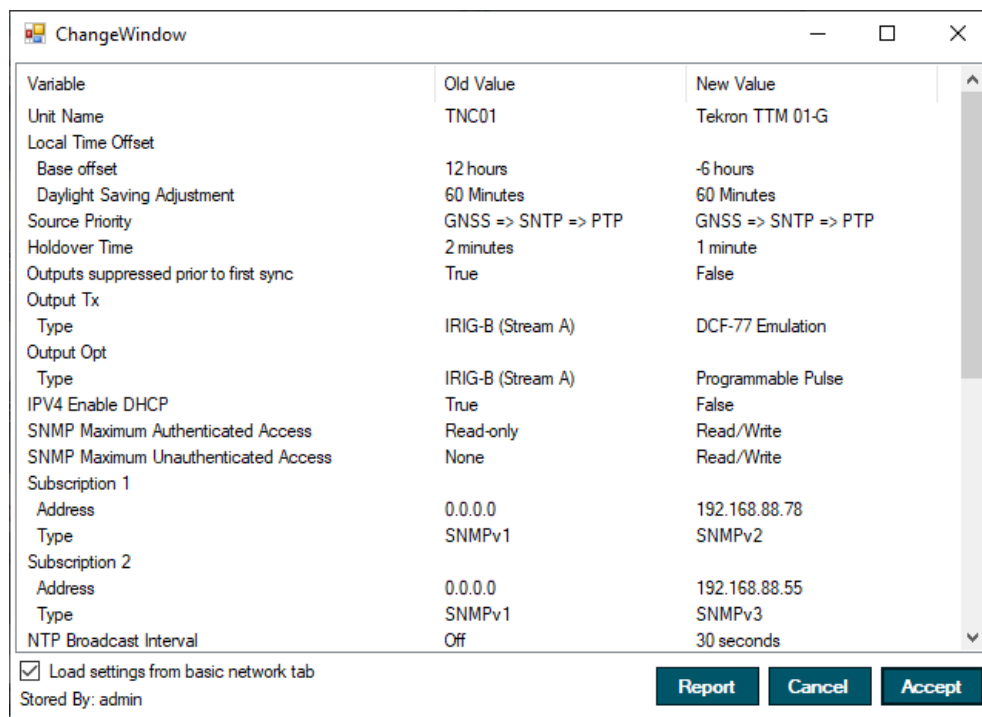
The “Report” button allows the user to print the contents of this window as a configuration report.

Select “Cancel” to cancel loading the selected file into Tekron’s Configuration Software, or “Accept” to accept the changes.

---

**Note:** Once the “Accept” button has been pressed, the new configuration is loaded into Tekron’s Configuration Software only. To load the new configuration into the clock, the “Store” button should be clicked.

---



Variable	Old Value	New Value
Unit Name	TNC01	Tekron TTM 01-G
Local Time Offset		
Base offset	12 hours	-6 hours
Daylight Saving Adjustment	60 Minutes	60 Minutes
Source Priority	GNSS => SNTP => PTP	GNSS => SNTP => PTP
Holdover Time	2 minutes	1 minute
Outputs suppressed prior to first sync	True	False
Output Tx		
Type	IRIG-B (Stream A)	DCF-77 Emulation
Output Opt		
Type	IRIG-B (Stream A)	Programmable Pulse
IPv4 Enable DHCP	True	False
SNMP Maximum Authenticated Access	Read-only	Read/Write
SNMP Maximum Unauthenticated Access	None	Read/Write
Subscription 1		
Address	0.0.0.0	192.168.88.78
Type	SNMPv1	SNMPv2
Subscription 2		
Address	0.0.0.0	192.168.88.55
Type	SNMPv1	SNMPv3
NTP Broadcast Interval	Off	30 seconds

☒ Load settings from basic network tab  
Stored By: admin

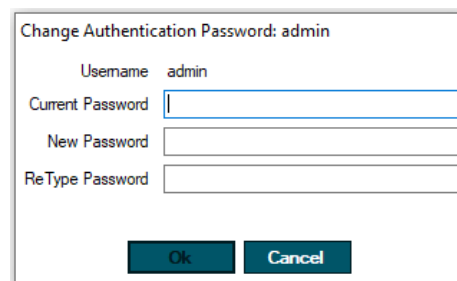
Report Cancel Accept

Figure 6 - "Change Window"



Click this button to change the password of the currently logged in user. Once clicked, a new window will open prompting you to enter the current password, enter the new password, and re-type the new password. Click “OK” to confirm or “Cancel” to cancel the change. Refer to Figure 7.

On legacy clocks, click this button to enable or disable password protection, or change the password. Once clicked, a new window will open. Check the “Password Enabled” box and enter the new password, and re-type the new password. Click “OK” to confirm or “Cancel” to cancel the change.



Change Authentication Password: admin

Username admin

Current Password

New Password

ReType Password

Ok Cancel

Figure 7 – "Change Authentication Password" window



This button allows the user to print a PDF or hardcopy of the clock configuration settings. If the GNSS statistics function is being logged, a summary of the statistics is appended to the report for commissioning purposes. Refer to Section 10 - Recommended Commissioning Procedure.



This button opens a window which displays the Tekron logo, copyright information, web address and build version of the current Configuration Software. Refer to Figure 8.



Figure 8 - "About" window

## 7.2. Clock Tab

The Clock tab is separated into five sections: Time, Localization, Clock Source Priorities, Test Source, and System Information (refer to Figure 9).

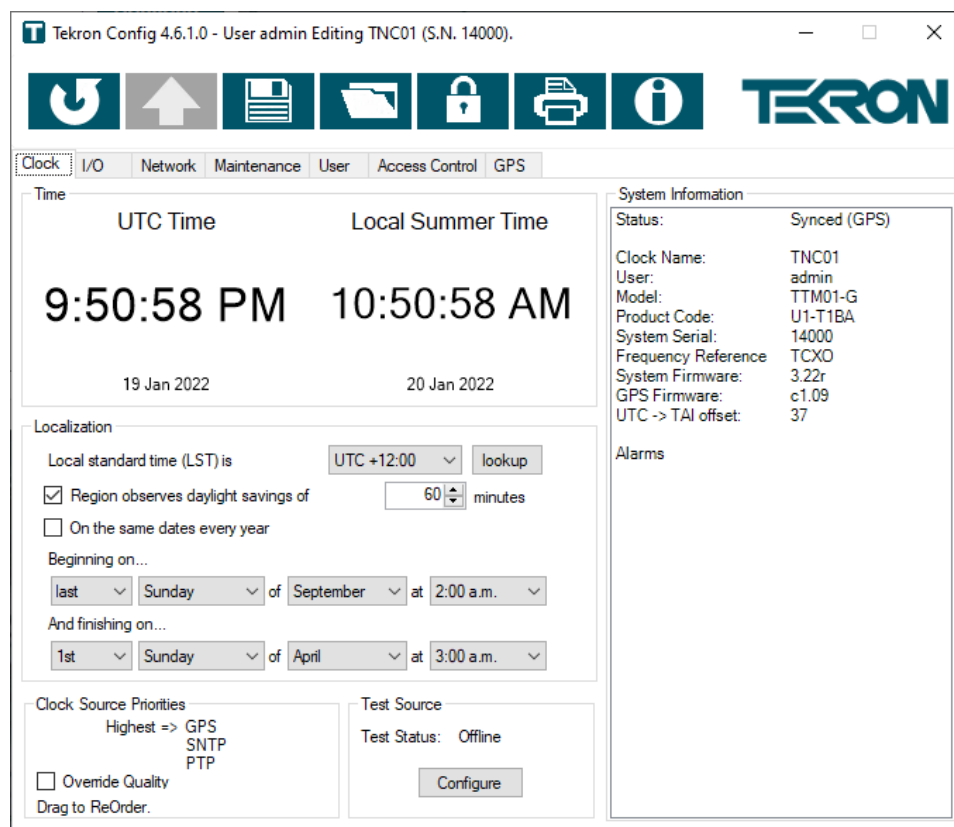


Figure 9 – Configuration Tool Clock Tab

### 7.2.1. “Time” section

This section shows the current UTC Time and Date, and the Local Standard Time and Date (or Local Summer Time if daylight savings is enabled and is in effect) which is programmed and being output by the connected clock.

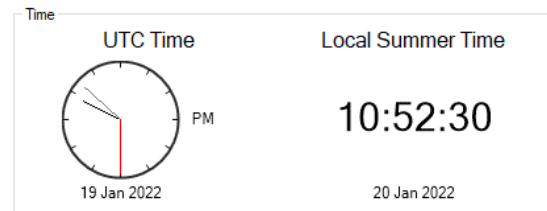


Figure 10 - “Time” displays

By clicking on the displayed time, you can change between digital 12 hour, 24 hour, and Analog formats as shown in Figure 10. Error! Reference source not found..

If the “Time currently unknown” message is shown below the digital or analog displays, then the clock is either in the process of start-up or does not currently know the time as it doesn’t have a sync source.

---

**Note: The time displayed is indicative only and may differ from the connected clock’s time by up to a second or more. This is because, unlike NTP or PTP, it does not include compensation for network delay.**

---

### 7.2.2. “Localization” section

The localization section contains the clocks Local Standard Time and Local Daylight Time settings. Refer to Figure 11.

#### Local Standard Time (LST) is

This drop-down list provides the facility to apply the regional time zone offsets from UTC to the clock. A positive offset means that the local time is ahead of UTC.

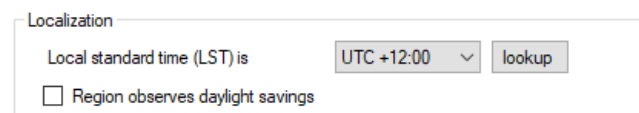


Figure 11 - “Localization” section

#### Lookup

The “lookup” button provides a convenient way to automatically set time offset and daylight savings parameters simply by selecting a geographical location.

---

**Note: The lookup function is derived from Windows™ Date and Time settings on the host PC running Tekron’s Configuration Software, and should be verified as being correct before use.**

---

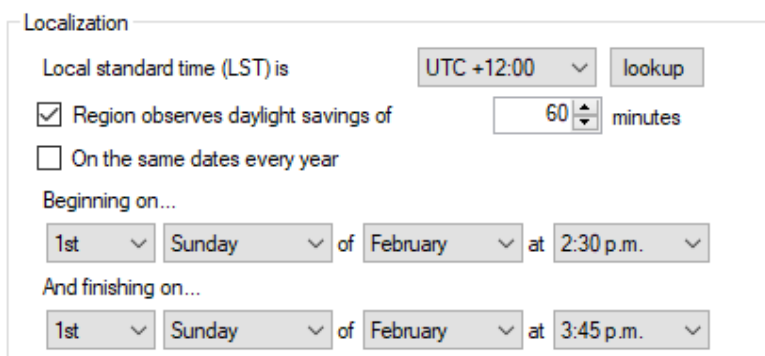
#### Region observes daylight savings

Selecting this option allows the clock to be configured to make daylight savings changes automatically. Once selected, additional options will appear. Refer to Figure 12.

The offset in minutes can be set which will be added when LST (Local Standard Time) transitions into DST (Daylight Savings Time).

By default, the fixed rule method is selected, however by checking the checkbox “On the same dates every year” the fixed date method can be applied.

Once the method is set, the daylight savings date and time can be set to suit the requirement of the user.



The screenshot shows a 'Localization' window with the following settings:

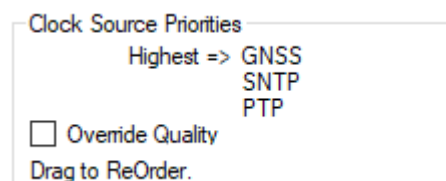
- Local standard time (LST) is: UTC +12:00 (dropdown menu) with a 'lookup' button.
- ☒ Region observes daylight savings of: 60 (spin box) minutes.
- ☐ On the same dates every year.
- Beginning on...: 1st (dropdown), Sunday (dropdown), of February (dropdown), at 2:30 p.m. (dropdown).
- And finishing on...: 1st (dropdown), Sunday (dropdown), of February (dropdown), at 3:45 p.m. (dropdown).

Figure 12 – “Region observes daylight savings”

### 7.2.3. “Clock Source Priorities” section

When a clock has the capability to synchronize to multiple time sources, the options shown will update appropriately. The priority in which each source is used is based on its position from top (highest priority) to bottom (lowest priority), and the default time source priority is ranked as follows:

GNSS (or GPS where applicable)  
IRIG-B  
SNTP  
PTP



The screenshot shows a 'Clock Source Priorities' window with the following settings:

- Highest => GNSS, SNTP, PTP (list).
- ☐ Override Quality.
- Drag to ReOrder.

Figure 13 – “Clock Source Priorities” section

The clock will automatically switch to the next preferred time source if the current time source is lost and will automatically switch back to the preferred source when it is regained.

To configure the priority settings, click on a time source and drag it to the desired position in the list. Other sources in the list will be automatically moved down if necessary. Refer to Figure 13.

*“Override Quality” checkbox:* By default, the clock source with the best accuracy is always used, with the configured priorities only used if two or more clock sources have the same accuracy. Check this box to force the configured priorities to always take effect regardless of the accuracy of the sources.

---

**Note:** Not all clock products have the capability to synchronize to multiple time sources. Tekron’s Configuration Software will omit the time source options not supported by the clock hardware or not licensed. Time sources that are supported, but not available or enabled, will still appear in this list.

**Note:** Setting PTP as a higher priority source without setting the PTP Forced Slave (Class 255) option on any network ports can result in the clock not synchronizing to PTP when expected, instead seemingly skipping PTP and selecting a lower priority sync source.

---

## 7.2.4. “Test Source” section

The test source section is for use in configuring the clock to operate in “Test Mode”, to enable the user to set the clock to an arbitrary time. Refer to Figure 14.

This can be used for pre-commissioning tests, or for laboratory testing when no other sync source is available.

When using the Test Source, the clock is running on its internal oscillator. Therefore, the frequency accuracy of the clock’s outputs will depend on the oscillator option fitted, and will be degraded compared to the accuracy the clock would have if it were synchronized to GNSS.

**Important! Under normal operating conditions the test source feature should never be used.**

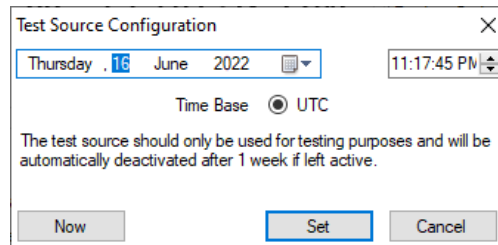


Figure 14 - “Test Source” configuration

To use the test source, the following conditions should be met:

1. If the clock is running firmware prior to 3.13r, there cannot be any other sync source present. If an alternative sync source is present, the clock will revert to that source. For firmware versions 3.13r and later, it is not necessary to ensure that all other time sources are disabled. The test source will override any other active time sources.
2. The timing ports on the clock will report the status as per the settings configured in the Sync section of the I/O tab.
3. The selection/settings for Test Source/Test Mode are not stored as part of the settings file. Setting test Mode takes immediate effect on the connected clock – you do not need to store settings to enable/disable Test Mode.
4. It is possible to exit test mode using Tekron’s Configuration Software by either:
  - a. Clicking the “Disable” button in the “Test Source Configuration” window
  - b. Clicking the “Restart Unit” button in the Maintenance tab. Refer to the Maintenance Tab section for further information.
  - c. Power cycling the clock, by disconnecting and re-connecting power to the clock. Note: For legacy clocks, the clock must be restarted by removing and reapplying power to exit Test Mode.

*Time Base “UTC”:* The test source sets the UTC time on the clock. The local time is automatically set using the local time settings on the clock.

*“Now” button:* This button retrieves the current time from your Windows based machine and updates the date and time fields.

*Date field:* The day, month and year can be manually edited, or alternately the calendar icon can be selected and used to pick a date from the calendar.

*Time field:* The time field can be manually edited by selecting the hour, minute, second and a.m. / p.m. fields.

**“Set” button:** Once you have selected the time you wish to set the clock to, press the “Set” button to change the clock to the selected time.

**“Cancel” button:** The “Cancel” button closes the test source configuration window without making any changes to the clock.

### Test Status

The Test Status shows whether the connected clock’s time has been set and whether it is currently being used.

**Offline:** Test Mode is not enabled.

**Active:** The clock is in Test Mode. Time output has been manually set.

**Available (Test Mode):** The clock has been configured for Test Mode, but Test Mode is not yet active due to a valid alternative sync source being available. Note that the clock will toggle in/out of Test Mode as the alternative sync source(s) become available. As the clock toggles in/out of Test Mode, the time will alternate between that of the sync sources. This status will not occur for clocks running firmware versions 3.13r and later, as the test source overrides all other sources.

A clock in “Test Mode” is indicated by:

1. “Test Mode” is present between the time displays in the Time section of the Clock tab.
2. Synced (Test) is indicated in the System Information section of the Clock tab.
3. Synced (TEST) is reported in the Discovery Window Status field in the Tekron Configuration Software, when the “Discover” button is clicked.
4. “TST” appears on the front panel LCD of the clock (where fitted). Refer to Figure 15.

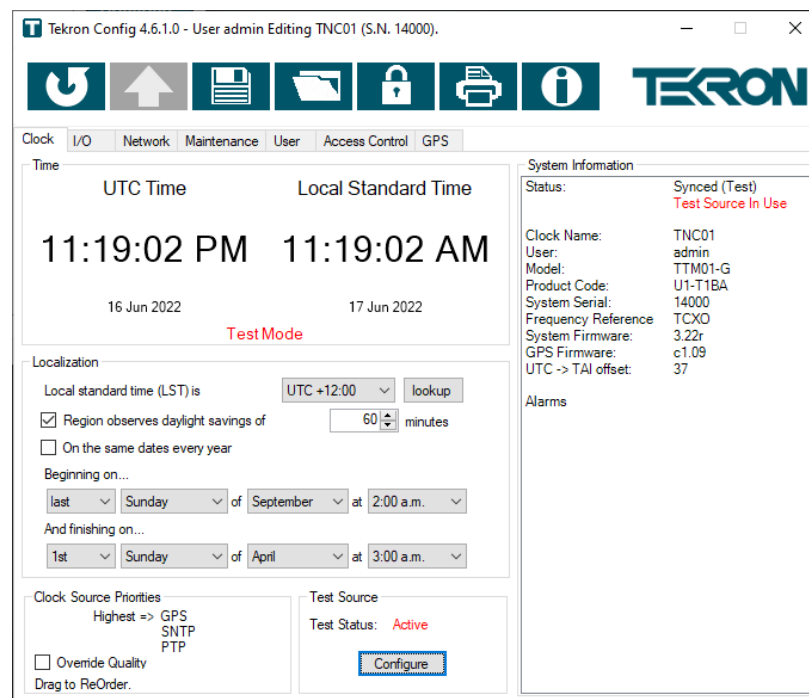


Figure 15 - Example of clock in Test Mode

## 7.2.5. "System Information" section

This section provides at a glance information on the clock, including its status, model, order code, serial number(s), and current firmware version(s) running in the device. Refer to Figure 16.

*"Status"*: Indicates the current synchronization status of the clock. A summary of the synchronization status values and their definitions are listed in the table below.

### Sync Status Message

### Definition

Synced (GPS)	Clock is synchronized to GPS constellation (GPS only).
Synced (GNSS)	Clock is synchronized to at least one of the available constellations (GPS + GLONASS or GLONASS only).
Synced (IRIG-B)	Clock is synchronized to an external IRIG-B source.
Synced (PTP)	Clock is synchronized to an external PTP source.
Synced (NTP)	Clock is synchronized to an external NTP source.
Synced (TEST)	Clock is in test mode and has been set with an arbitrary time.

*"Clock Name"*: This is the Clock Designation as configured in the Maintenance tab. Refer to section 7.7.1.

*"User"*: This is the username of the currently logged in user.

*"Model"*: This is the model name of the clock being configured.

*"Product Code"*: This is the order code of the clock being configured.

*"Clock Serial"*: This is the serial number of the clock being configured. This should be the same as the serial number displayed on the product label.

*"Net Serial"*: This is the serial number of the Ethernet module being configured, if different from the clock serial.

*"Clock Firmware"*: This is the version number of the firmware running on the main board of the clock.

*"Net Firmware"*: This is the version number of the firmware running in the Ethernet module being configured.

*"UTC -> TAI offset"*: This indicates the current number of seconds between TAI time and UTC time as used by the clock. This increases by 1 each time a leap second is added, and can be used to check that a leap second has been applied correctly. As of the 31<sup>st</sup> December 2016 leap second, the current UTC -> TAI offset is 37.

*"GPS Firmware / GNSS Firmware"*: This indicates the version number of the firmware running on the GPS/GNSS receiver module of the clock.

*"Frequency Reference"*: This indicates the type of oscillator installed in the clock. This can be TCXO (Temperature Compensated Crystal Oscillator), VCTCXO (Voltage Controlled Temperature Compensated Crystal Oscillator), OCXO (Oven Controlled Crystal Oscillator), or Rubidium (rubidium atomic oscillator).

System Information	
Status:	Synced (GNSS)
Clock Name:	TNC01
User:	admin
Model:	TCG02G-T1E1
Product Code:	R1-R118BB-M3BBBB
Clock Serial:	98768
Net Serial:	31337
Frequency Reference	Rubidium
Clock Firmware:	2.30r
Net Firmware:	3.22r
FreqRef Firmware:	2.04j
GNSS Firmware:	c1.08
UTC -> TAI offset:	37

Figure 16 - "System Information" section



When alarm conditions are met, active alarm messages will appear in red text in the System Information Alarms section. A summary of the alarm messages and their definitions are listed in Table 1.

**Table 1 - Configuration Tool Clock Tab Alarms**

Alarm Name	Specification
No Power A	No power source is detected on power inlet A, for clocks that are fitted with dual redundant power supplies.
No Power B	No power source is detected on power inlet B, for clocks that are fitted with dual redundant power supplies.
Satellites Low	The number of satellites currently being used for time and position calculations is below the threshold.
No Sync	Clock is not synchronized to any source, or holdover period has expired, or the timing output inaccuracy has been exceeded.
Holdover	Clock has lost synchronization and has entered the holdover state.
No Antenna	The antenna circuit current drain is low (typically under 3mA). This could be caused by poor connections, or if the connected antenna has a lower current drain specification or if a component in the antenna system is providing power to the antenna and therefore the clock is not seeing a connected load, or if there is no antenna connected.
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.
Antenna Fault	This alarm is generated if there is high current or low current detected on the antenna input.
Factory Reset Armed	This alarm is generated if the Forgotten Password Reset (Factory Reset Procedure) is enabled and has been initiated by the user.
No IRIG-B Input	No valid IRIG-B source is detected on the clock's input. This alarm is only generated if the clock is configured to have IRIG-B monitoring enabled. Refer to the Inputs section.
ETHx <sup>*1</sup> Link A Down <sup>**2</sup>	This message appears when the clock is configured with 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 the cable being unplugged from ETH2/ETH5, or the network switch connected to ETH2/ETH5 losing power.
ETHx <sup>*1</sup> Link B Down <sup>**2</sup>	This message appears when the clock is configured with 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 the cable being unplugged from ETH3/ETH6, or the network switch connected to ETH3/ETH6 losing power.
Overcurrent	The clock 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.
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 clock. Under such situations the clock defaults to a link local address.
Sync Forced	This alarm is generated when the "Never leave Sync (Test Mode)" option has been selected.

<sup>\*1</sup> x = 2 or 5

<sup>\*\*2</sup> Note: These alarms are only applicable for Tekron clocks with PRP support and with a PRP license.

### 7.3. I/O Tab

The I/O tab provides information on the available inputs, outputs, and alarms, and their configuration settings (refer to Figure 17).

The screenshot displays the I/O Tab configuration window. At the top, there are icons for various functions: a circular arrow, an upward arrow, a document, a folder, a lock, a printer, and an information icon, followed by the TEKRON logo. Below these is a navigation bar with tabs: Clock, I/O (selected), Network, Maintenance, User, Access Control, and GNSS.

The main area is divided into two sections. The left section, titled 'I/O Ports', lists various ports: INPUT - P2 - IRIG-B, OUTPUT - P3 - IRIG-B - Stream A - DCLS, ALARM - P4/A - Antenna, ALARM - P4/B - Sync, ALARM - P5/A - Power A, ALARM - P5/B - Power B, OUTPUT - P6 - IRIG-B - Stream A - DCLS [≈0mA] (highlighted), OUTPUT - P7 - IRIG-B - Stream A - DCLS [≈0mA], OUTPUT - P8 - IRIG-B - Stream A - DCLS [≈0mA], OUTPUT - P9 - IRIG-B - Stream A - DCLS [≈0mA], OUTPUT - P10 - IRIG-B - Stream A - AM / DCLS [≈0mA], and OUTPUT - P11 - IRIG-B - Stream A - AM / DCLS [≈0mA].

The right section, titled 'Sync', contains several checkboxes: 'Outputs always report 'Good' Quality' (unchecked), 'Suppress outputs before first sync' (checked), and 'Enable holdover timeout' (checked). Below these are input fields for 'days' (0), 'hours' (0), and 'minutes' (2). There are also checkboxes for 'Enable maximum inaccuracy check' (unchecked) and 'Never leave Sync (Test Mode)' (unchecked).

The bottom section is titled 'IRIG-B (A) IRIG-B (B) DCF77'. It has sub-sections for 'IRIG-B (A)' and 'IRIG-B (B)'. The 'IRIG-B (B)' section is expanded, showing 'IRIG-B / Pulse Output Port' configuration. It includes a dropdown for 'IRIG-B' (set to 'IRIG-B'), an 'Inverted' checkbox (unchecked), and a section for 'IRIG-B Output' with 'Modulation' (DCLS selected) and 'Payload' (Stream A selected). There is also a 'Suppress Output When' dropdown set to 'Never'.

Figure 17 - I/O Tab Example

#### 7.3.1. "I/O Ports" section

Tekron's Configuration Software automatically populates the list of input, output and alarm ports based on the product code (order code) which is obtained from the connected clock. Refer to Figure 18.

The screenshot shows a list of I/O ports. The list includes: INPUT - P2 - IRIG-B, OUTPUT - P3 - IRIG-B - Stream A - DCLS, ALARM - P4/A - Antenna, ALARM - P4/B - Sync, ALARM - P5/A - Power A, ALARM - P5/B - Power B, OUTPUT - P6 - IRIG-B - Stream A - DCLS (timeout) [≈0mA] (highlighted), OUTPUT - P7 - IRIG-B - Stream A - DCLS [≈0mA], OUTPUT - P8 - IRIG-B - Stream A - DCLS [≈0mA], OUTPUT - P9 - IRIG-B - Stream A - DCLS [≈0mA], OUTPUT - P10 - IRIG-B - Stream A - AM / DCLS [≈0mA], and OUTPUT - P11 - IRIG-B - Stream A - AM / DCLS [≈0mA].

Figure 18 - "I/O Ports" section

Each port in the list conveys the following information (from left to right):

Whether the port is an input, output or alarm

Port designation on the clock

The description of the configuration (output signal type)/function of the port.

If the port is an output, an indicator of when it will be suppressed – when the holdover timeout expires (timeout), when the inaccuracy threshold is exceeded (inaccuracy), or never (no indicator).

If the port supports current monitoring, the approximate output current.

**Note:** Click on a port to see further configuration information for the selected port.

The highlighted example, in Figure 18, shows:

The selected port is an output

The selected port uses port designator P6 on the clock

The selected port is programmed to output IRIG-B DCLS using Stream A content

The selected port is configured to be suppressed when the holdover timeout expires

The selected port is not connected so has approximately 0 milliamperes of current is being drawn.

When an output port is selected, the corresponding settings are displayed in the “IRIG-B / Pulse Output Port” section, located below the “I/O Ports” section. The most common output types and configurable options are detailed below.

### Programmable Outputs

A programmable output can be configured by selecting one of the following options from the drop-down list:

User defined pulse

DCF-77 simulation

IRIG-B

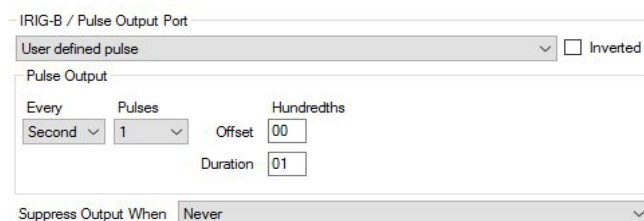


Figure 19 – “User defined pulse” configuration

#### User defined pulse

The user can configure a pulse to be output every “second”, “minute”, “hour”, or “day”. Specify the frequency of pulses under the “Every” and “Pulses” fields. Refer to Figure 19.

The table below shows the valid entries for each field:

Period “Every”	Number of “Pulses”
Second	1, 2, 4, 5, 10, 20, 25, 50, 1000
Minute	1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30
Hour	1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30
Day	1, 2, 3, 4, 6, 8, 12

*“Offset”*: This is the delay (in hundredths of a second) from the start of the day, hour, minute, or second to the start of the pulse.

*“Duration”*: This is the length of time (in hundredths of a second) the pulse stays asserted.

*“Inverted”*: Check this box to invert the polarity of the pulse.

### DCF-77 Simulation

The user can configure a DCF77 signal to be output from the programmable port. This signal is a 1 PPS variable pulse width signal that simulates the output of a DCF77 receiver. Refer to Figure 20.

The only configuration options for this output type are Local Standard Time or UTC, and inverted signal option. Refer to the DCF77 sub-tab section for local time and UTC settings.

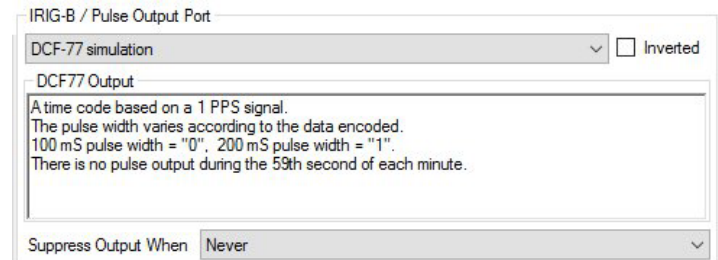
A screenshot of the 'IRIG-B / Pulse Output Port' configuration window. The 'DCF-77 simulation' tab is selected. It features a dropdown menu for 'DCF-77 simulation', an 'Inverted' checkbox, and a text box for 'DCF77 Output' containing a description of the signal. At the bottom, there is a 'Suppress Output When' dropdown menu set to 'Never'.

Figure 20 - "DCF77 simulation" configuration

*“Inverted”*: Check this box to invert the polarity of the DCF77 pulses.

### IRIG-B

The IRIG-B output options on the programmable output are DCLS (sometimes referred to as DC Level Shift, unmodulated/demodulated IRIG-B) or Modified Manchester. Refer to Figure 21.

The IRIG-B time code includes local (or UTC) time in the form of Seconds, Minutes and Hours fields, together with Day-of-Year and a two-digit Year field. Additional data can be selected for transmission in all of the outputs that are programmed for IRIG-B using the IRIG-B sub-tab situated below the I/O Ports section. This setting applies to all AM IRIG-B, DCLS IRIG-B, and Modified Manchester outputs driven from this stream. Refer to the IRIG-B sub-tab(s) section for further information.

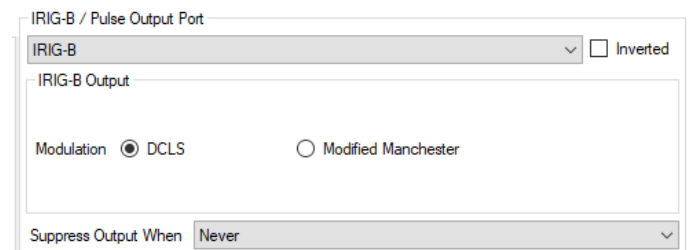
A screenshot of the 'IRIG-B / Pulse Output Port' configuration window. The 'IRIG-B' tab is selected. It shows a dropdown menu for 'IRIG-B', an 'Inverted' checkbox, and radio buttons for 'Modulation' (DCLS is selected) and 'Modified Manchester'. At the bottom, there is a 'Suppress Output When' dropdown menu set to 'Never'.

Figure 21 - "DCLS IRIG-B" configuration

*“DCLS” radio button*: Selecting this radio button will enable an IRIG-B B00x signal to be output from this port.

*“Modified Manchester” radio button*: Selecting this radio button will enable an IRIG-B B22x signal to be output from this port.

*“Inverted”*: Check this box to invert the polarity of the IRIG-B pulses.

*“Payload” radio button*: On clocks which support two IRIG-B streams, an additional field called “Payload” will be present. Refer to Figure 22. This feature allows the clock to be configured with two different IRIG-B streams which are generated independently from each other. This is sometimes used when two IRIG-B time bases are required (local time and UTC time), or when different IRIG-B extensions are required on each stream. The user can select “Stream A” or “Stream B” using the applicable radio button. Refer to the IRIG-B sub-tab(s) section for more information.

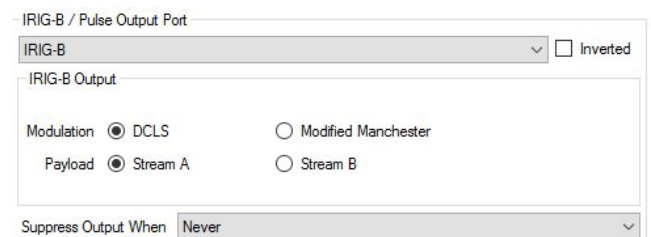
A screenshot of the 'IRIG-B / Pulse Output Port' configuration window. The 'IRIG-B' tab is selected. It shows a dropdown menu for 'IRIG-B', an 'Inverted' checkbox, and radio buttons for 'Modulation' (DCLS is selected) and 'Modified Manchester'. Below these, there are radio buttons for 'Payload' (Stream A is selected) and 'Stream B'. At the bottom, there is a 'Suppress Output When' dropdown menu set to 'Never'.

Figure 22 - DCLS IRIG-B "Payload" and multiple streams

## Serial String Outputs

A serial port can be configured to output a serial string. The configurable options include the string format, the time source (e.g. UTC or local time), the parity, and the baud rate. Further details on the configured string is contained in the Information box below the configurable fields (refer to Figure 23).

*“Serial String”*: The “Serial String” format is selected by using the drop-down list. The options are:

Figure 23 - "Serial String" configuration

Name	String format
No String	Not applicable
NGTS	TTYNNDDWHHMMU<CR><LF>
IRIG J-17	<SOH>DDD:HH:MM:SS<CR><LF>
String A	<SOH>DDD:HH:MM:SS:YY<CR><LF>
String B	<SOH>DDD:HH:MM:SSQ<CR><LF>
String C	<CR><LF>Q_YY_DDD_HH:MM:SS.000<SPACE><SPACE><SPACE>
String D	<SOH>DDD:HH:MM:SSQ<CR><LF>
String E	<SOH>YYYY:DDD:HH:MM:SSQ<CR><LF>
String F	<BEL><CR><LF>1100<CR><LF>44hhmmss<CR><LF>54ddd<CR><LF>45hhmmss<CRLF>55ddd<CR><LF><BEL>
String G	<STX>SWhhmmssddmmy<LF><CR><ETX>
String H	<STX>D:dd.mm.yy;T:w;U:hh.mm.ss;uvxy<ETX>
NMEA ZDA	\$GPZDA,hhmmss.ss,dd,mm,yyyy,xx,yy*CC<CR><LF>
NMEA RMC	\$GPRMC,hhmmss.ss,a,ddmm.mmmm,n, dddmm.mmmm,w,z,z,y.y,ddmmyy,d,d,v*CC<CR><LF>

Other proprietary string formats are configurable, but are not standardized and the format is subject to change without prior notice.

Refer to Appendix 13.7.3 for further information on specific Serial String formats, the transmission rate, and the “On Time” mark.

*“Time Source”*: Select the output time source by using the marked drop-down list. The options are:

Local time  
UTC time

*“Format”*: Select the number of data bits, parity, and number of stop bits of the serial string using the marked drop-down list. The options are detailed in Table 2:

Table 2 - Serial formats

Configuration Option	No. Data Bits	Parity	No. Stop Bits
8-N-1	8	None	1
7-O-1	7	Odd	1
7-E-1	7	Even	1
8-O-1	8	Odd	1
8-E-1	8	Even	1

*“Baud” rate:* The Baud rate of the selected string can be configured using the marked drop-down list. The options are:

1200  
2400  
4800  
9600  
19200  
38400

### AM IRIG-B Outputs

The AM IRIG-B output typically has very few configuration options. An information box typically appears and provides an overview of the output characteristics. Refer to Figure 24.

The IRIG-B time code includes Local (or UTC) time in the form of Seconds, Minutes and Hours fields, together with Day-of-Year and a two-digit Year field. Additional data can be selected for transmission in all of the outputs that are programmed for IRIG-B using the IRIG-B sub-tab situated below the “I/O Ports” section. This setting applies to all AM IRIG-B, DCLS IRIG-B, and Modified Manchester outputs driven from this stream. Refer to the IRIG-B sub-tab(s) section for further information.

*“Payload” radio button:* On clocks which support multiple IRIG-B streams, an additional field called “Payload” will be present. Refer to Figure 25. This feature allows the clock to be configured

with two different IRIG-B streams which are generated independently from each other. This is sometimes used when two IRIG-B time bases are required (local time and UTC time), or when different IRIG-B extensions are required on each stream. The user can select “Stream A” or “Stream B” using the applicable radio button. Refer to the IRIG-B sub-tab(s) section for further information.

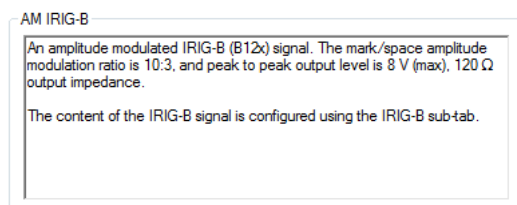


Figure 24 - "AM-IRIG-B" configuration

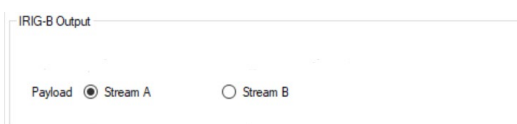


Figure 25 - IRIG-B "Payload" and multiple streams

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**Note:** On some clocks, there are hardware configurable options enabled via a physical switch. Tekron’s Configuration Software will list the ports as present and will provide help on what configuration options are available through the Information box under the “I/O Ports” section in the “I/O Tab”.

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## Telecom T1/E1/J1 and Frequency Outputs

Clocks fitted with Telecommunications options have options for frequency outputs and framed frequency outputs.

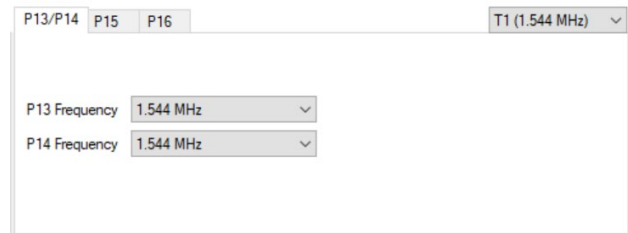
*“Frequency” outputs:* The frequency outputs are configured using drop-down boxes. For frequencies other than 10 MHz, the drop-down box top right of Figure 26

should also be configured with the required T1/E1/J1 mode. The configurable options are:

- 10 MHz
- 1.544 MHz
- 2.048 MHz

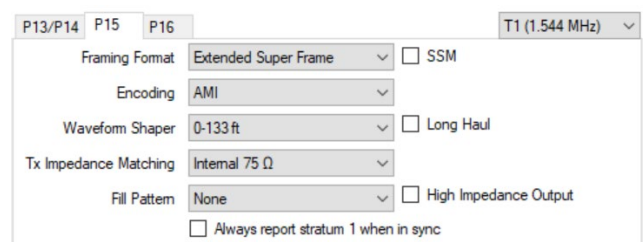
*“Framed Frequency” outputs:* The framed frequency outputs (refer to Figure 27) have configurable options for:

- Framing Format
- Encoding
- Waveform Shaper
- Transmitter (Tx) Impedance Matching
- Fill Pattern
- High Impedance Output
- Long Haul
- SSM
- Always report stratum 1 when in sync



The screenshot shows a configuration window for P13/P14, P15, and P16. The P15 tab is selected. At the top right, there is a dropdown menu labeled 'T1 (1.544 MHz)' with a downward arrow. Below this, there are two rows of configuration options. The first row is 'P13 Frequency' with a dropdown menu showing '1.544 MHz'. The second row is 'P14 Frequency' with a dropdown menu showing '1.544 MHz'.

Figure 26 - Frequency Outputs Configuration



The screenshot shows a configuration window for P13/P14, P15, and P16. The P15 tab is selected. At the top right, there is a dropdown menu labeled 'T1 (1.544 MHz)' with a downward arrow. Below this, there are several rows of configuration options. The first row is 'Framing Format' with a dropdown menu showing 'Extended Super Frame' and a checkbox for 'SSM'. The second row is 'Encoding' with a dropdown menu showing 'AMI'. The third row is 'Waveform Shaper' with a dropdown menu showing 'Q-133 ft' and a checkbox for 'Long Haul'. The fourth row is 'Tx Impedance Matching' with a dropdown menu showing 'Internal 75 Ω'. The fifth row is 'Fill Pattern' with a dropdown menu showing 'None' and a checkbox for 'High Impedance Output'. At the bottom, there is a checkbox for 'Always report stratum 1 when in sync'.

Figure 27 - Framed Frequency Outputs configuration

The following tables list the configuration options on P15/P16 Telecom outputs:

- T1 (1.544 MHz) refer to Table 3
- J1 (1.544 MHz) refer to Table 4
- E1 (2.048 MHz) refer to Table 5

Table 3 - T1 (1.544 MHz) configuration options

T1 Parameter	Configurable Options
Framing Format	<ul style="list-style-type: none"> <li>• None</li> <li>• Super Frame (SF)</li> <li>• Extended Super Frame (ESF)</li> <li>• Digital Multiplexer (DM)</li> <li>• Switch Line Carrier – 96 (SLC-96)</li> </ul>
Encoding	<ul style="list-style-type: none"> <li>• AMI</li> <li>• B8ZF</li> </ul>
Waveform Shaper	<p>When Long Haul is unchecked.</p> <ul style="list-style-type: none"> <li>• 0 ~ 133 ft.</li> <li>• 133 ~ 266 ft.</li> <li>• 266 ~ 399 ft.</li> <li>• 399 ~ 533 ft.</li> <li>• 533 ~ 655 ft.</li> </ul> <p>When Long Haul is checked.</p> <ul style="list-style-type: none"> <li>• 0 dB LBO</li> <li>• -7.5 dB LBO</li> <li>• -15.0 dB LBO</li> <li>• -22.5 dB LBO</li> </ul>
Transmitter Impedance Matching	<ul style="list-style-type: none"> <li>• Internal 75 <math>\Omega</math></li> <li>• Internal 100 <math>\Omega</math></li> <li>• Internal 110 <math>\Omega</math></li> <li>• Internal 120 <math>\Omega</math></li> </ul>
Fill Pattern	<ul style="list-style-type: none"> <li>• None</li> <li>• All Zeros</li> <li>• All Ones</li> </ul>
High Impedance Output	<ul style="list-style-type: none"> <li>• Unchecked</li> <li>• Checked</li> </ul>
Long Haul	<ul style="list-style-type: none"> <li>• Unchecked (Short Haul)</li> <li>• Checked</li> </ul>
SSM (only available for Extended Super Frame)	<ul style="list-style-type: none"> <li>• Unchecked</li> <li>• Checked - enables Synchronization Status Messages to be transmitted</li> </ul>
Always report stratum 1 when in sync	<ul style="list-style-type: none"> <li>• Unchecked - when the clock is synchronized, it will give the actual accuracy in the SSM (usually stratum 2 – G.812 quality)</li> <li>• Checked - when the clock is synchronized, it will give stratum 1 (G.811 PRC/PRS) quality in the SSM</li> </ul>



Table 4 - J1 (1.544 MHz) configuration options

J1 Parameter	Configurable Options
Framing Format	<ul style="list-style-type: none"> <li>• None</li> <li>• Super Frame (SF)</li> <li>• Extended Super Frame (ESF)</li> </ul>
Encoding	<ul style="list-style-type: none"> <li>• AMI</li> <li>• B8ZF</li> </ul>
Waveform Shaper	<ul style="list-style-type: none"> <li>• 0 ~ 655 ft.</li> </ul>
Transmitter Impedance Matching	<ul style="list-style-type: none"> <li>• Internal 75 <math>\Omega</math></li> <li>• Internal 100 <math>\Omega</math></li> <li>• Internal 110 <math>\Omega</math></li> <li>• Internal 120 <math>\Omega</math></li> </ul>
Fill Pattern	<ul style="list-style-type: none"> <li>• None</li> <li>• All Zeros</li> <li>• All Ones</li> </ul>
High Impedance Output	<ul style="list-style-type: none"> <li>• Unchecked</li> <li>• Checked</li> </ul>
Long Haul	<ul style="list-style-type: none"> <li>• Unchecked (Short Haul)</li> <li>• Checked</li> </ul>
SSM (only available for Extended Super Frame)	<ul style="list-style-type: none"> <li>• Unchecked</li> <li>• Checked – enables Synchronization Status Messages to be transmitted</li> </ul>
Always report stratum 1 when in sync	<ul style="list-style-type: none"> <li>• Unchecked - when the clock is synchronized, it will give the actual accuracy in the SSM (usually stratum 2 – G.812 quality)</li> <li>• Checked - when the clock is synchronized, it will give stratum 1 (G.811 PRC/PRS) quality in the SSM</li> </ul>

Table 5 - E1 (2.048 MHz) configuration options

E1 Parameter	Configurable Options
Framing Format	<ul style="list-style-type: none"> <li>• None</li> <li>• Basic Frame</li> <li>• CRC Multiframe</li> <li>• Modified CRC Multiframe</li> <li>• Channel Associated Signaling (CAS) Multiframe</li> </ul>
Encoding	<ul style="list-style-type: none"> <li>• AMI</li> <li>• HDB3</li> </ul>
Transmitter Impedance Matching	<ul style="list-style-type: none"> <li>• Internal 75 <math>\Omega</math></li> <li>• Internal 100 <math>\Omega</math></li> <li>• Internal 110 <math>\Omega</math></li> <li>• Internal 120 <math>\Omega</math></li> <li>• External resistor 9.4 <math>\Omega</math></li> </ul>
Fill Pattern	<ul style="list-style-type: none"> <li>• None</li> <li>• All Zeros</li> <li>• All Ones</li> </ul>
High Impedance Output	<ul style="list-style-type: none"> <li>• Unchecked</li> <li>• Checked</li> </ul>
Long Haul	<ul style="list-style-type: none"> <li>• Unchecked (Short Haul)</li> <li>• Checked</li> </ul>
SSM (only available for CRC Multiframe)	<ul style="list-style-type: none"> <li>• Unchecked</li> <li>• Checked - enables Synchronization Status Messages to be transmitted</li> </ul>
Always report stratum 1 when in sync	<ul style="list-style-type: none"> <li>• Checked - when the clock is in sync, it will give stratum 1 (G.811 PRC/PRS) in the SSM</li> <li>• Unchecked - when the clock is in sync, it will give a true indication of accuracy in the SSM (usually stratum 2 – G.812 quality)</li> </ul>

## Inputs

Clocks fitted with Event recording/IRIG-B inputs can be configured with the input options below using the drop-down list shown in Figure 28. The inputs are in pairs and generally marked with a port number and corresponding A & B markings. The configurable options are:

Port A Function	Port B Function
IRIG-B	IRIG-B
IRIG-B Monitor	IRIG-B Monitor
Event Record	Event Record
Event Record	IRIG-B Monitor

The definition of the functions is as follows:

**IRIG-B Monitor:** The IRIG-B input is monitored. If a clock is synchronized to a source, and the IRIG-B signal connected to this port fails, an alarm will be raised.

**IRIG-B:** The IRIG-B input is not monitored. If a clock is synchronized to a source other than IRIG-B, and the IRIG-B signal connected to this port fails, no alarms will be raised. If all forms of sync are lost, an alarm may be raised, dependent on the “Sync” settings (refer to 7.3.2 “Sync” section).

**Event Record:** The clock will record time tags in accordance with the rising edge of an incoming pulse. Refer to the product manual for further information on its operation and the commands.

Note: If you are using the event recording function, the “Enable Serial Config” setting on the Maintenance Tab must be checked in order to be able to retrieve event time tags. Refer to 7.7.1 “Maintenance” section for further information.

## Alarms

Tekron’s Configuration Software will list the Alarm ports fitted to the connected clock. When selected, an information box below the “I/O Ports” section will appear and give an overview of its functionality. Refer to Figure 29.

“*Delay Alarm Signal*”: If the selected alarm output supports a user-configurable delay, this field will be present. The activation of the selected alarm can be delayed by a user-defined time period of 0 to 25.5 seconds, specified in tenths of a second.

### IRIG-B sub-tab(s)

The IRIG-B sub-tab is situated below the “I/O Ports” section (refer to Figure 30). It contains the settings for the IRIG-B extensions that can be included in the IRIG-B stream. Options include Binary Seconds, UTC time, C37.118.1 extensions, or AFNOR S87-500 extensions.

The settings in this section apply to all outputs configured to output IRIG-B.

“*Binary seconds in code*”: This field is an option specified by IRIG standard 200-04. If this

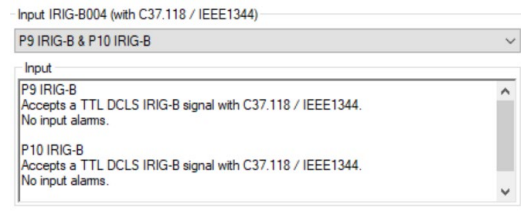


Figure 28 – Inputs section

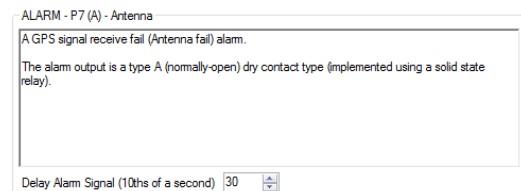


Figure 29 - Alarm information box

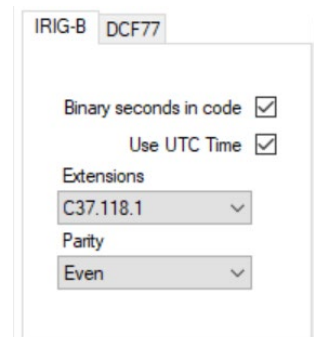


Figure 30 - "IRIG-B" sub-tab

option is selected, all outputs programmed for IRIG-B code – including the amplitude-modulated output - will include the “Binary Seconds of Day” data.

“Use UTC Time”: By default, IRIG-B is output in Local Standard Time. If you wish to output IRIG-B in UTC time, check this box.

“None” extensions: If this option is selected, all outputs configured to use IRIG-B code will set all of the IRIG-B control function bits to zero.

“C37.118.1” extensions: Outputs programmed for IRIG-B code will additionally output: upcoming leap second information, local time offset, upcoming daylight savings change, and time-quality information all in accordance with C37.118.1 specification. In addition, the parity field can also be set.

“Parity”: This option enables the selection of even or odd parity checking within the C37.118.1 extensions of the IRIG-B code. If AFNOR S87-500 or no extensions are configured, this option will be removed.

“AFNOR S87-500” extensions: If this option is selected, all of the outputs programmed for IRIG-B code will also output: day of week, month, and day of month in accordance with the European AFNOR NF S87-500 specification.

Tekron clocks support IRIG-B coded expressions 4-7. The following formats can be configured:

- IRIG-Bxx4: With C37.118.1 extensions and binary seconds
- IRIG-Bxx5: With C37.118.1 extensions
- IRIG-Bxx6: With no extensions
- IRIG-Bxx7: With no extensions and binary seconds

The ‘xx’ is dependent on what modulation type has been configured. It will be ‘00’ for DCLS, ‘12’ for AM, and ‘22’ for Modified Manchester. For example, a DCLS IRIG-B signal with C37.118.1 extensions and binary seconds enabled will be an IRIG-B004 signal according to the IRIG 200 standard.

---

**Note: On clocks which support multiple IRIG-B streams, two sub-tabs which are labelled “IRIG-B (A)” (IRIG-B Stream A) and “IRIG-B (B)” (IRIG-B Stream B) will appear. Refer to Figure 31. Under “Payload” in the individual port settings, the user will be able to configure the port to use either IRIG-B stream.**

---

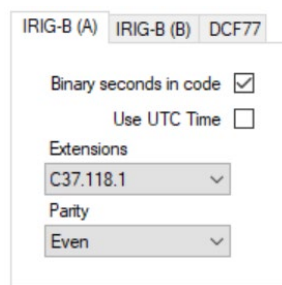


Figure 31 - IRIG-B sub-tabs with multiple streams

## DCF77 sub-tab

The DCF77 sub-tab is situated below the “I/O Ports” section in the I/O Tab. Refer to Figure 32.

The settings in this section apply to all ports configured to output DCF77.

*“Use UTC Time”*: By default, DCF77 is output in Local Standard Time. If you wish to output DCF77 in UTC time, check this box.

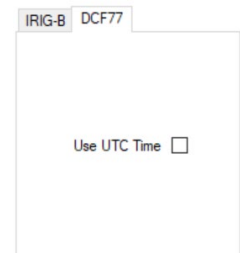


Figure 32 - "DCF77" sub-tab

## 7.3.2. Sync section

The sync section contains configuration settings which determine the behavior of the clock when it loses synchronization. Refer to Figure 33.

*“Outputs always report ‘Good’ Quality”*: Output signals that contain time quality/accuracy indicators (e.g. IRIG-B with C37.118.1 extensions) will continue to indicate a high time quality/accuracy level until the clock loses synchronization.

*“Suppress outputs before first sync”*: If this option is checked, on start-up, the clock outputs do not begin to output time signals until the clock has received a valid time. If not checked, the clock outputs immediately begin to output time signals on start-up. The sync relay operation is unaffected by this option and will indicate the true sync state of the clock.

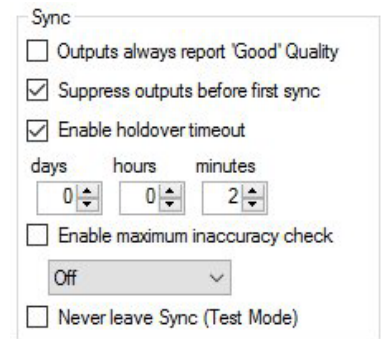


Figure 33 - "Sync" section

*“Never leave Sync (Test Mode)”*: Enabling this option forces the clock to output time synchronization signals as if it were synced to GNSS, even if this is not true (e.g. there is no antenna attached). In this mode, the sync relay will be on at all times (i.e. it will never enter the alarm state).

*“Suppress Output When: Never, Holdover timeout expires, Inaccuracy threshold is exceeded”*: This option is used to suppress the individual output ports, and is used to make the selected output port stop generating a time signal when the selected condition is met.

- Selecting **“Never”** means the output port will continue to output time sync signals even when the clock is out of sync. Refer to Figure 34.

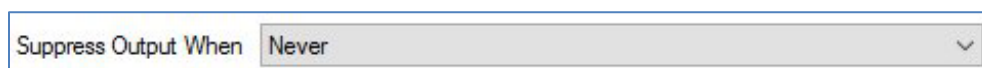


Figure 34 - Suppress Output When: Never

- Selecting **“Holdover timeout expires”** will suppress the output when the clock is out of sync and the time set for Holdover timeout (set in the clock by Enable holdover timeout) also expires. Refer to Figure 35.

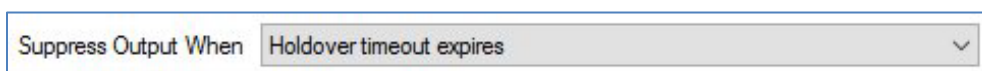


Figure 35 - Suppress Output When: Holdover timeout expires

- Selecting **“Inaccuracy threshold is exceeded”** will suppress the output when the clock is out of sync and the reported inaccuracy of the clock exceeds the maximum inaccuracy threshold configured in the clock through **“Enable maximum inaccuracy check”**. Refer to Figure 36.



**Figure 36 - Suppress Output When: Inaccuracy threshold is exceeded**

*“Enable holdover timeout”*: This option is used to control the period of time that the clock will stay in the holdover state before entering the out of sync state, after loss of all available sync source. Ports configured to use *“Suppress Output When: Holdover timeout expires”*, will suppress outputs when this timer has expired.

*“Enable maximum inaccuracy check”*: The option provides maximum inaccuracy as a drop-down list of times that can be selected. In the event of loss of sync, the clock time will slowly start drifting and when the time drift becomes greater or equal to the maximum inaccuracy time the clock moves from holdover to out of sync.

**Note:** If both *“Enable holdover timeout”* and *“Enable maximum inaccuracy check”* are checked, then the clock will show the loss of sync status and release the *“sync”* relay when both the holdover timer has expired and the inaccuracy threshold has been crossed. If only one option is checked then only that option will trigger loss of sync status and release the *“sync”* relay. If neither option is checked the clock will never enter the loss of sync state but will instead remain in the holdover state until a sync source becomes available again. Correct installation will make the *“loss of sync”* event rare; although in areas with poor GNSS satellite coverage there can be occasions where satellite tracking is momentarily lost, the *“holdover”* features are used to mask temporary effects.

## 7.4. Network Tab

The Network tab contains the communication and Time Server settings of the fitted Ethernet ports. Refer to Figure 37.

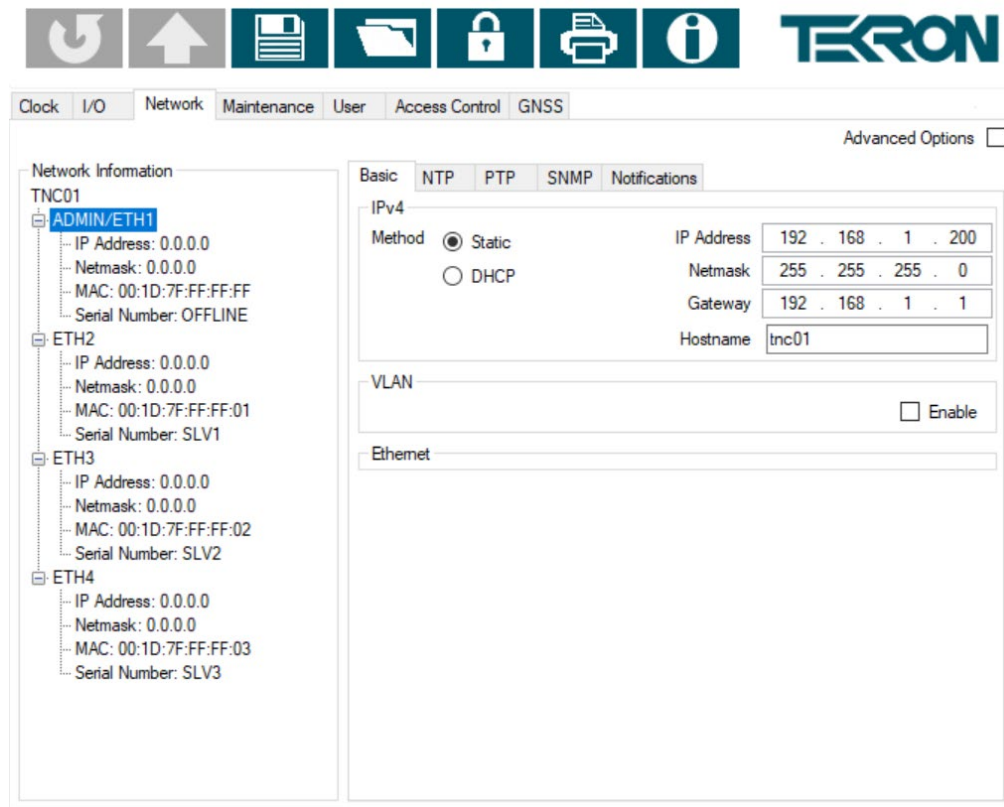


Figure 37 - Network tab

## 7.5. “Network Information” section

This section is dynamically populated depending on the number of Ethernet interfaces fitted within the clock. The name of each interface is based on the marking on the relevant port on the clock. Selecting an interface name will display the Ethernet settings of the selected interface in the sub-tabs to the right of the Network Information section.

Underneath the name, the IP Address, Netmask, MAC Address, and Ethernet module serial number are also listed. Refer to Figure 38.

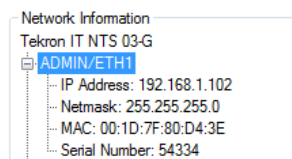


Figure 38 - “Network Information” section

### 7.5.1. “Advanced Options” settings

When the Advanced Options box has been checked, additional Ethernet configuration options appear on the Basic, NTP and PTP sub-tabs. Refer to Figure 39. It is recommended that only advanced users with a thorough knowledge of IP networks should use these options. The prefix “Adv” is used in the sections below to denote the additional settings when the “Advanced Options” box is checked.

Advanced Options ☒

Basic NTP PTP SNMP Notifications

IPv4

Method ☒ Static ☐ DHCP ☐ Link Local

IP Address 192 . 168 . 1 . 200

Netmask 255 . 255 . 255 . 0

Gateway 192 . 168 . 1 . 1

DHCP Retries 3

Hostname tnc01

VLAN

ID 0

Priority 0

☐ Block zero ID

Tagged Traffic ☒ PTP ☐ NTP ☐ Other

☒ Enable

Ethernet

Link Settings Auto

Figure 39 - "Advanced Options" configuration



## 7.6. Basic sub-tab

The “Basic” sub-tab contains the Ethernet network settings of the selected Ethernet interface.

### IPv4 section

*“Method”*: This setting allows the selected Ethernet interface to be configured with a Static IP address or set to Dynamic Host Configuration Protocol (DHCP) via the radio buttons.

*“Static”*: If “Static” is selected, then a valid IP Address, Netmask and Gateway (if applicable) should be assigned to that clock Ethernet port.

*“DHCP”*: The clock is by default shipped with all Ethernet interfaces set to DHCP enabled. In the event that the Ethernet interface is set to DHCP and there is no DHCP server running on the network, the interface will fall back to a link local IP address (169.254.xxx.xxx). Legacy clocks will not revert to link local and instead will assume the IP address 0.0.0.0.

*“Hostname”*: This setting allows a plain text “Hostname” to be set, which will be used in DHCP messages to identify the Ethernet port to DHCP servers. The Hostname can contain only letters, numbers, and the ‘-’ (hyphen/minus) character.

*Adv. “DHCP Retries”*: This option is only configurable when DHCP method is selected. This is the number of additional attempts that the selected Ethernet port will attempt to make to obtain network information from a DHCP server. If after all attempts a DHCP server is not detected, the IP address will revert to the link local address. Legacy clocks do not have this feature.

*Adv. “Link Local”*: If this option is selected, the IP address is randomly chosen from the link local address range 169.254.0.0 to 169.254.255.255. Addresses are tested using ARP until a vacant address is identified. Legacy clocks do not have this feature.

### VLAN section

*“Enable”*: As shown in Figure 39, check the Enable checkbox to enable Virtual Local Area Network (VLAN).

*“ID”*: This parameter sets the ID inside the VLAN tag (as shown in Figure 39), used by the selected packets. The input range is 0 to 4095.

*“Priority”*: This parameter sets the priority inside the VLAN tag as shown in Figure 39. The input range is 0 to 7.

*“Block zero ID”*: This setting, as shown in Figure 39, cannot be enabled unless the clock has already been configured with VLAN enabled, and Tekron’s Configuration Software is connected to the clock via VLAN. If this option is enabled, packets received on the selected interface on VLAN ID 0 will be blocked. Legacy clocks do not have this feature.

*“Tagged Traffic”*: VLAN traffic tagging (as shown in Figure 39) can be configured for “PTP” and/or “NTP” and/or “Other” (i.e. all other Ethernet packets), or all three options (all Ethernet packets). Legacy clocks do not have this feature.

---

**Note: It is recommended that you do not configure “Other” traffic to operate on VLAN, unless you are an advanced user who has a thorough knowledge of VLAN tagging and Ethernet networks.**

---

## Ethernet section

Adv. “Link Settings”: This is the Ethernet port override settings for Auto-negotiate. Configurable settings are:

- Auto
- 10Mbps + Half Duplex
- 10Mbps + Full Duplex
- 100Mbps + Half Duplex
- 100Mbps + Full Duplex

Legacy clocks do not have this feature.

Adv. “PRP Link”: On Tekron clocks with PRP support, this option appears when the Parallel Redundancy Protocol (PRP) license has been activated. Refer to Figure 40. When enabled, the linked port will disappear from the Network Information section, and [PRP] will appear next to the selected port. The settings configured will be applied to the PRP linked port pair. Note: PRP can only be enabled through the administration port.



Figure 40 - “Ethernet” section configuration

## Redundancy section

This section only appears when configuring a PRPTP Translator.

“Protocol”: This option is used to select the Ethernet redundancy protocol (refer to Figure 41). The PRPTP Translator supports Parallel Redundancy Protocol (PRP) and High-availability Seamless Redundancy (HSR). This can also be set to ‘None’ to allow the PRPTP Translator to operate without using redundancy.

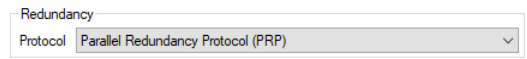


Figure 41 - Redundancy configuration

---

**Note: When the PRPTP Translator is configured to use redundancy, it may not be possible for the Configuration Software to discover it when not connected to a redundant network. In this case, it is possible to force the PRPTP to revert to no redundancy by removing one of the SFP modules. Refer to the PRPTP Translator User Manual for further information.**

---

## SFP section

This section only appears when configuring a PRPTP

Translator. The PRPTP Translator uses Small Form-factor Pluggable (SFP) transceiver modules for its Ethernet interfaces. Refer to Figure 42. This section displays manufacturer, model number, serial number and connector type information for the currently installed SFP modules.

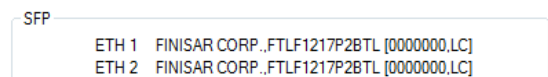


Figure 42 - SFP module information

### 7.6.1. NTP sub-tab

If Tekron's Configuration Software is connected to a clock which supports Network Time Protocol (NTP), and the NTP license has been activated, then the NTP sub-tab will be present. Refer to Figure 43.

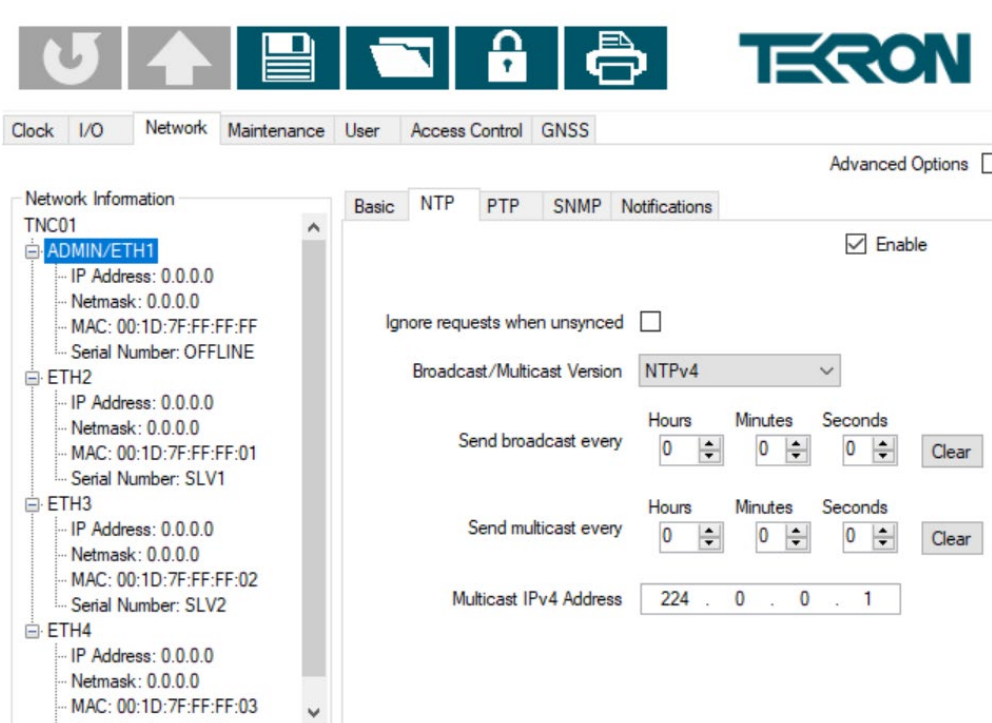


Figure 43 - "NTP" sub-tab

**"Enable" NTP:** Check this box to enable Network Time Protocol (NTP).

#### NTP "Server" settings:

**"Ignore requests when unsynced":** If this option is checked, the port will not respond to NTP client time sync requests unless the clock is synchronized to an external time source referenced to UTC time.

**"Broadcast/Multicast Version":** Select the preferred NTP version for broadcast and/or multicast traffic. Legacy clocks do not have this feature, and by default output NTPv3.

Configurable options are:

- NTPv1
- NTPv2
- NTPv3
- NTPv4

**"Send broadcast every":** By default, this option is set to 0 hours, 0 minutes and 0 seconds, which means the port never sends NTP broadcast messages (NTP broadcasts disabled). If the user wishes to configure the port to send periodic NTP broadcast messages within the sub-net, the user can select a specific interval in hours, minutes and seconds as shown in Figure 43. The "Clear" button resets the interval to 0.

**"Send multicasts":** By default, this option is set to 0 hours, 0 minutes and 0 seconds, which is means the port never sends NTP multicast messages (NTP multicasts disabled). If the user wishes to configure the port to send periodic

NTP multicast messages within the sub-net, the user can select a specific interval in hours, minutes and seconds as shown in Figure 43. The “Clear” button resets the interval to 0.

*“Multicast IPv4 Address”*: This option sets the IPv4 destination address for the port to use when sending NTP multicast messages. If the address entered here is within the multicast address range (224.0.0.0 to 239.255.255.255), the destination MAC address of the NTP multicast messages will be set to a multicast MAC address generated from the given IPv4 address according to RFC 1112. If the given IPv4 address is not within the multicast address range, the destination MAC address will be the broadcast MAC address.

*Adv. “Operate in Localtime”*: If this option is checked, the port will use local time instead of UTC for the timestamps in NTP messages. This option will also cause the SNTP client on this port, if used, to use local time for timestamps.

---

**Note:** The “Operate in Localtime” option is non-standard, as NTP is defined in the relevant RFCs to always use UTC time for timestamps. This option is very rarely required, and should not be selected unless you are sure that it is required.

---

#### *Adv. SNTP “Client” Settings*

Checking the “Advanced Options” checkbox reveals the “Client (SNTP)” and “Authentication” radio buttons. Refer to Figure 44.

Advanced Options ☒

Basic NTP PTP SNMP Notifications

☒ Enable

☒ Server

☐ Client (SNTP)

☐ Authentication

Ignore requests when unsynced ☐

Broadcast/Multicast Version NTPv4

Send broadcast every Hours Minutes Seconds

0 0 0 Clear

Send multicast every Hours Minutes Seconds

0 0 0 Clear

Multicast IPv4 Address 224 . 0 . 0 . 1

Operate in Localtime ☐

Figure 44 - Advanced NTP settings

Click the 'Client (SNTP)' radio button to navigate to the SNTP client settings. Refer to Figure 45 and Figure 46.

Figure 45 - "Client (SNTP)" configuration

Figure 46 - "Client (SNTP)" configuration with PRP enabled

The SNTP client function allows the clock to synchronize to an NTP/SNTP server. Refer to Figure 45. This feature has been added for testing purposes. This feature is not available on legacy clocks. It is recommended that the SNTP client functionality be restricted to a laboratory or controlled environment, and should not be used on corporate LANs or in Ethernet networks on a permanent basis, as some configuration options do not comply with the published RFC. The SNTP client operation is also dependent on the clock source priorities. Refer to the 7.2.3 "Clock Source Priorities" section for further information.

When PRP is active, the details of both ports are shown on the SNTP client, as shown in Figure 46.

*Adv. "Server Address":* Enter the IPv4 Address of the NTP/SNTP server that the SNTP client will synchronize to.

*Adv. "Server Version":* Select the NTP version the Ethernet port will use when polling the server. Configurable options are:

- NTPv1
- NTPv2
- NTPv3
- NTPv4

---

**Note:** Ensure that the NTP/SNTP server supports the NTP server version you have configured.

---

*Adv. Accept Broadcasts:* When this option is checked, the Ethernet port will accept incoming NTP broadcast messages from the configured NTP server address.

*Adv. "Poll Interval":* This is the frequency of time requests sent by the Ethernet port to the NTP server.  
Configurable options are:

- Off
- 1/8 second
- 1/4 second
- 1/2 second
- 1 second
- 2 seconds
- 4 seconds
- 8 seconds
- 16 seconds
- 32 seconds
- 64 seconds

---

**Note: Although shorter poll intervals will provide higher levels of accuracy in reference to the server, the network traffic is subsequently higher.**

---

*Adv. "Offset from the Server":* This is informational only and shows the time offset between the Ethernet port and the NTP server in nanoseconds (ns).

*Adv. "Broadcasts Received":* This is informational only and shows the number of NTP/SNTP broadcast messages received and accepted by the port.

*Adv. "Requests Sent/Received":* This is informational only and shows the number of time requests sent, and responses received.

*Adv. "Status":* This is informational only and shows the current status of the SNTP client port.

### Adv. Authentication

Tekron clocks support MD5 Authentication for NTP. When the “Advanced Options” box is checked, the “Authentication” radio button will appear. Refer to Figure 47.

*Adv. “Enable MD5 Authentication”:* Checking this field will enable MD5 authentication for NTP, using the keys entered below.

*Adv. “Broadcast”:* If the clock is configured to output periodic NTP broadcast or multicast messages, checking the broadcast field next to the corresponding keys will enable MD5 authentication in the broadcast/multicast messages. If more

than one key is selected, the selected keys will be chosen at random for outgoing NTP broadcast/multicast messages.

*Adv. “Key”:* This is a text entry field, where the MD5 authentication key is defined. Clocks can be configured with up to eight keys consisting of up to 16 ASCII characters or hexadecimal values in length.

*Adv. “Hex”:* Checking this field will convert the corresponding key from ASCII to hex, or vice versa.

Basic NTP PTP SNMP Notifications

☒ Enable

☐ Server

☐ Client (SNTP)

☒ Authentication

☐ Enable MD5 Authentication

	Broadcast	Key	Hex
1	<input checked="" type="checkbox"/>		<input type="checkbox"/>
2	<input checked="" type="checkbox"/>		<input type="checkbox"/>
3	<input checked="" type="checkbox"/>		<input type="checkbox"/>
4	<input checked="" type="checkbox"/>		<input type="checkbox"/>
5	<input checked="" type="checkbox"/>		<input type="checkbox"/>
6	<input checked="" type="checkbox"/>		<input type="checkbox"/>
7	<input checked="" type="checkbox"/>		<input type="checkbox"/>
8	<input checked="" type="checkbox"/>		<input type="checkbox"/>

Figure 47 - "MD5 Authentication" section

## 7.6.2. PTP sub-tab

The PTP sub-tab is present when connected to a clock which supports PTP and has an activated PTP license.

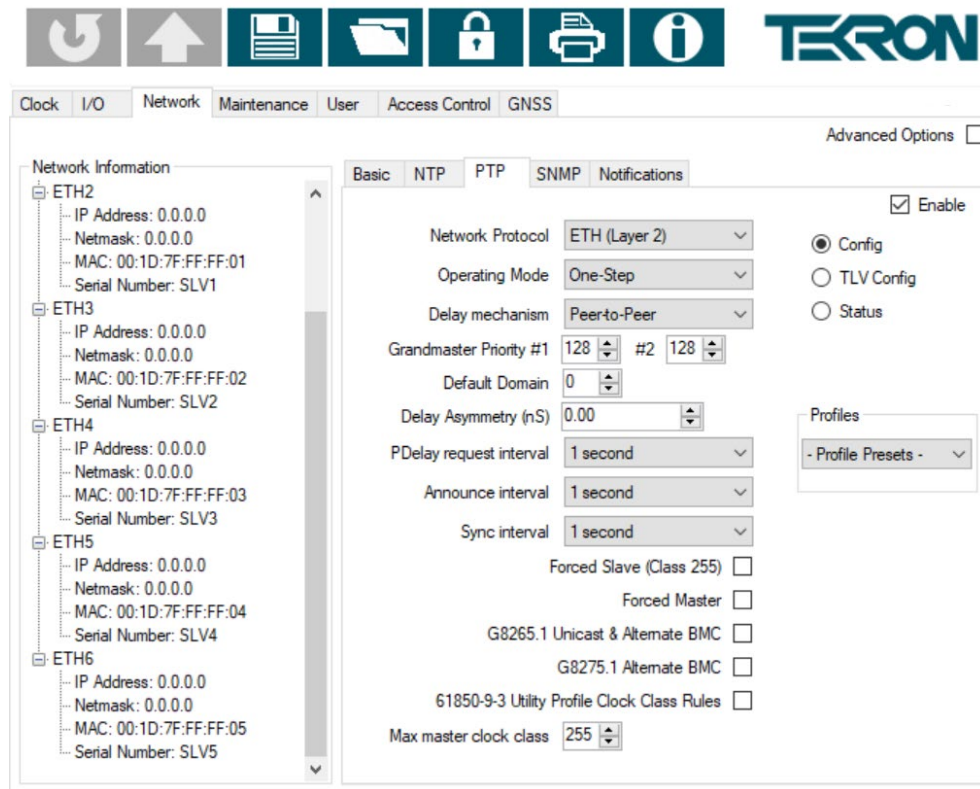


Figure 48 - PTP sub-tab

**“Enable” PTP:** Check this box to enable Precision Time Protocol (PTP) and view the “Config”, “TLV Config”, “Status” and PTP profile settings and status information.

### “Profiles”

The PTP sub-tab contains a “Profile Presets” drop-down list which enables the user to quickly configure a port to meet a published profile by simply selecting the appropriate profile from the list. In many cases, all that is needed to configure PTP is to select a profile, after which there is no need to change any other settings on the PTP sub-tab.

**“P2P”:** Configures PTP settings to comply with IEEE 1588-2008 Peer-to-Peer Default PTP Profile.

**“E2E”:** Configures PTP settings to comply with IEEE 1588-2008 Delay Request-Response Default PTP Profile.

**“C37.238-2011 Power”:** Configures PTP settings to comply with IEEE C37.238-2011 Power Profile.

**“C37.238-2017 Power”:** Configures PTP settings to comply with IEEE C37.238-2017 Power Profile.

**“G8265.1”:** Configures port as a Telecom Slave Clock to comply with ITU-T G.8265.1 “Telecom Profile for Frequency Synchronization”. Master clocks will need to be configured in the “G8265.1 (Telecom) Masters” section. This profile preset is not present for PRP linked ports.



*"G8275.1"*: Configures port as a Telecom Clock to comply with ITU-T G.8275.1 "Telecom Profile for Phase/Time Synchronization". G.8275.1 Alternate BMCA settings will need to be configured in the G8275.1 section. This profile preset is not present for PRP linked ports.

*"61850-9-3 Power Utility"*: Configures PTP settings to comply with IEC 61850-9-3 Power Utility Profile.

---

**Note: The Configuration Tool does not restrict the displayed configurable options based on the selected profile preset. Therefore, changing PTP settings after selecting a profile preset may make the PTP configuration no longer compliant to the selected profile.**

---

**"Config" radio button:** This is the default settings section which appears when PTP has been enabled. It contains the basic PTP settings. Where a setting corresponds to a data set member defined in IEEE 1588-2008, that data set member will be given in square brackets below.

*"Network Protocol"*: This setting determines whether PTP messages will be encapsulated as UDP datagrams (IEEE 1588-2008 Annex D) or Ethernet frames (IEEE 1588-2008 Annex F). Configurable options are:

UDP (Layer 3)  
ETH (Layer 2)

*"Operating Mode"*: [defaultDS.twoStepFlag] This setting determines the behavior when the port is sending Sync and Peer Delay Response messages. When set to Two-Step, each Sync and Peer Delay Response message sent by this port is accompanied by a Follow Up message confirming the precise sending timestamp. Configurable options are:

One-Step  
Two-Step

---

**Note: One-Step operation is recommended for the Operating Mode. For Tekron products, One-Step and Two-Step operating modes provide equal timestamp accuracy, so there is no accuracy advantage gained by selecting Two-Step. One-Step and Two-Step PTP devices can interoperate on the same network.**

---

*"Delay mechanism"*: [portDS.delayMechanism] Delay mechanism is a network wide parameter. The delay mechanism selected should be consistent across the network. Configurable options are:

End-to-End  
Peer-to-Peer  
Fixed-Manual

---

**Note: The Peer-to-Peer option requires the network to use PTPv2 (IEEE 1588-2008) transparent switches.**

---

*"Grandmaster Priority"*: [defaultDS.priority1, defaultDS.priority2] These parameters modify the automatic selection of master clocks in PTP networks. Lower values will cause this port to take precedence over other grandmaster-capable PTP clocks on the network. The first value overrides all other selection criteria, whereas the second value gives a finer-grained priority used for selection between otherwise-equal clocks. The input range is 0 to 255 (inclusive), where 0 is the highest priority. The default setting is 128.

*“Default Domain”*: [defaultDS.domainNumber] Only PTP devices with the same domain number will communicate with each other using the PTP protocol. This allows multiple PTP domains to coexist on the same network. Incoming PTP messages containing a different domain number are ignored. The input range is 0 to 255 (inclusive).

*“Delay Asymmetry”*: PTP cannot automatically measure and compensate for delay asymmetry, which means that the presence of delay asymmetry reduces the time accuracy of PTP. Delay asymmetry is the difference between the sending path delay and the receiving path delay. If the delay asymmetry is known, entering it manually will allow it to be compensated for, and improve time accuracy. The input range is -5,000,000,000.00 to 5,000,000,000.00 nanoseconds (-5 to 5 seconds).

*“Fixed Path Delay”*: When using the Fixed-Manual delay mechanism, the path delay is not automatically measured, and so must be specified. The accuracy of this value will determine the PTP synchronization accuracy. This option only appears when the Fixed-Manual delay mechanism is selected. The input range is 0.00 to 5,000,000,000.00 nanoseconds (0 to 5 seconds).

*“Forced Slave (Class 255)”*: [defaultDS.slaveOnly] Check this box to force the port to become a PTP slave. In this mode, the port will never become a master clock. The PTP slave operation is also dependent on the clock source priorities configured for the clock. Refer to 7.2.3 “Clock Source Priorities” section for further information.

*“Forced Master”*: Check this box to prevent the port from entering the Slave state. In this mode, the port will only operate in the Master or Passive states.

*“G8265.1 Unicast & Alternate BMC”*: Check this box to force the port to become an ITU-T G.8265.1 slave. When checked, a radio button called “G8265.1” will appear top right of the PTP sub-tab (refer to Figure 50) which contains the “G8265.1 (Telecom) Masters” configuration settings. Legacy clocks do not have this option. In this mode, the port will become a unicast slave and will negotiate using unicast to establish sync with one of the configured master clocks. Selecting the G8265.1 profile preset automatically selects this option. This option is not present for PRP linked ports.

*“G8275.1 Alternate BMC”*: Check this box to use the alternate BMCA defined in ITU-T G.8275.1. When checked, a radio button called “G8275.1” will appear top right of the PTP sub-tab (refer to Figure 51) which contains the configurable attributes defined in the alternate BMCA. Legacy clocks do not have this option. Selecting the G8275.1 profile preset automatically selects this option. This option is not present for PRP linked ports.

*“61850-9-3 Utility Profile Clock Class Rules”*: Check this box to use the PTP clock classes as defined in IEC 61850-9-3 Power Utility Profile. Selecting the 61850-9-3 Power Utility profile preset automatically selects this option.

*“Advertised Delay Interval”*: [portDS.logMinDelayReqInterval] This option specifies the time interval advertised by the master clock to slave clocks in Delay Response messages. This determines the average time interval between successive Delay Request messages sent by slave clocks. This option only appears when the End-to-End delay mechanism is selected. This option does not appear when the port is configured as a Forced Slave.

*“PDelay Request Interval”*: [portDS.logMinPdelayReqInterval] The PDelay request interval specifies the time interval between successive Peer Delay Request messages being sent to other PTP devices on the network. This option only appears when the Peer-to-Peer delay mechanism is selected.

*“Announce Interval”*: [portDS.logAnnounceInterval] Announce interval specifies the time interval between successive Announce messages from ports acting as a master. This option is replaced by the “Master announce interval” setting when the port is configured as a Forced Slave.

*“Master Announce Interval”*: Master announce interval specifies the expected time interval between successive Announce messages from the PTP master clock. This allows the port to determine when the master clock is no longer sending Announce messages. This option only appears when the port is configured as a Forced Slave. When the port is configured as a G.8265.1 slave, this field represents the requested rate of Announce messages.

*“Sync Interval”*: [portDS.logSyncInterval] The sync interval specifies the time interval between successive Sync messages. When configured as a G.8265.1 slave, this field represents the requested rate of Sync messages. This option does not appear when the port is configured as a Forced Slave.

*“Max master clock class”*: Maximum master clock class specifies the maximum advertised clock class that the port will synchronize to as a slave. When the master’s clock class exceeds this value, the port will stop synchronizing to it. For example, setting this to 6 will cause the port to stop synchronizing to the master as soon as the master enters holdover (class 7).

**“TLV Config” radio button**: This section contains PTP TLV settings. Refer to Figure 49. TLVs are optional extensions to PTP messages, to allow additional information to be communicated between clocks.

Figure 49 - "TLV Config" settings

#### *“Alternate Time Offset” TLV: (As per IEEE 1588-2008 section 16.3)*

The “Alternate Time Offset” TLV allows the grandmaster clock to include local time offset information in Announce messages, which provides slave clocks with the necessary information to convert the time provided by PTP to local time.

*“Include in outgoing”*: If checked, the Alternate Time Offset TLV will be added to Announce messages. Legacy clocks do not have this option.

*“Require on incoming”*: If checked, incoming Announce messages that do not contain the Alternate Time Offset TLV will be ignored. Note that selecting this option will cause this port to no longer comply with the IEEE 1588-2008 default BMCA and ignore the best available master clock if that master clock is not transmitting the Alternate Time Offset TLV.

*“Offset relative to UTC”*: If checked, the “currentOffset” field of the Alternate Time Offset TLV will be the local time offset from UTC, instead of the local time offset from TAI. This option is non-standard, but may be required by some non-compliant C37.238 client implementations. Legacy clocks do not have this option.

*“Time of next jump in UTC”*: If checked, the “timeOfNextJump” field of the Alternate Time Offset TLV will be in reference to UTC Time instead of TAI. This option is non-standard, but may be required by some non-compliant C37.238 client implementations. Legacy clocks do not have this option.

#### *C37.238 Organization Specific TLV:*

The C37.238 Organization Specific TLV is specific to the C37.238 Power Profiles. It allows the grandmaster clock to include additional identification and accuracy information in Announce messages, and is required for compliance with the C37.238-2011 Power Profile. Where a setting corresponds to a data set member defined in IEEE C37.238-2011, that data set member will be given in square brackets below.

*“C37.238-2017”*: This option selects between the 2011 and 2017 versions of the C37.238 TLV. When checked, the port will use the C37.238-2017 TLV. When unchecked and the GM identity is 3 or greater, the port will use the C37.238-2011 TLV.

*“GM Identity”*: [ieeeC37238defaultDS.GMIdentity] This is the “GMIdentity” (or “Grandmaster Identity”) as defined in C37.238-2011. The GM Identity is intended to be a unique number assigned to each grandmaster-capable clock on the network, to aid in identification of which grandmaster clock is currently being used by slave clocks. The configurable range is 0 to 254 (inclusive), however, if the value is set to less than 3 and the C37.238-2017 checkbox is unchecked, then the TLV will not be sent. Legacy clocks do not have this option.

*“Require on incoming”*: If checked, incoming Announce messages which do not contain the C37.238-2011 or C37.238-2017 TLV will be ignored. Note that selecting this option will cause this port to no longer comply with the IEEE 1588-2008 default BMCA and ignore the best available master clock if that master clock is not transmitting the C37.238 TLV. Selecting this option is required for compliance with the C37.238-2011 Power Profile, but is optional for the C37.238-2017 Power Profile.

*“Accept 2011 or 2017 on incoming”*: If checked, this option modifies the behavior of the “Require on incoming” option to accept any C37.238 TLV, regardless of whether it is the 2011 or 2017 version. When not checked, only the version specified by the selection of the “C37.238-2017” option will be accepted.

*“Network Time Inaccuracy”*: [ieeeC37238defaultDS.NetTimeInacc] This configurable field sets the “networkTimeInaccuracy” as defined in C37.238-2011. It is intended to be set at the grandmaster and is an

estimate of the time error in nanoseconds accumulated in the worst network path. If this is not known, this field can remain set to the default value of 0. The value specified here will be included in the C37.238 TLV in any Announce messages sent by this port. When using the 2017 version of the C37.238 TLV, the value specified here is summed with the grandmaster time inaccuracy to set the “totalTimeInaccuracy” field, as defined in C37.238-2017. The configurable range is 0 (default) to 4294967295 ns. Legacy clocks do not have this option.

*“Engineered Time Inaccuracy”*: [ieeeC37238defaultDS.EngTimeInacc] This configurable field sets the “engineeredTimeInaccuracy” as defined in C37.238-2011. It is intended to be set at the slave clock and is an estimate of the time error in nanoseconds accumulated in worst network path to all preferred grandmasters. If this is not known, this field can remain set to the default value of 0. The value specified here is not transmitted in any PTP messages. The configurable range is 0 (default) to 4294967295 ns. Legacy clocks do not have this option.

**“G8265.1” radio button**: This section of the Configuration Software contains the “G8265.1 (Telecom) Masters” configuration settings (refer to Figure 50). It only appears if the “G8265.1 Unicast & Alternate BMC” option is checked.

Figure 50 - G8265.1 settings

*“IPv4 Address”*: Enter the IP Addresses of Telecom master clocks. Up to five master clocks can be configured. This port will communicate with all configured master clocks via unicast messages and will synchronize to the best available master clock.

*“Priority”*: This port will synchronize to the highest accuracy master clock available. If multiple master clocks have the same accuracy level, the master with the lowest priority number is selected. If the accuracy level and priority are the same, then the order in the list determines which master is used.

**“G8275.1” radio button:** This section of the Configuration Software contains the ITU-T G.8275.1 alternate BMCA configurable attributes (Refer to Figure 51). It only appears if the “G8275.1 Alternate BMC” option is checked.

*“Default Local Priority”:* This priority is applied to the local clock (this port) when comparing the local clock to a foreign master. Setting this to a lower value will give preference to the local clock over foreign masters. The input range is 0 to 255 (inclusive), where 0 is the highest priority. The default setting is 128. This attribute is not used when operating as a Telecom grandmaster.

*“Port Local Priority”:* This priority is applied to the Announce information received on this port from a potential master when comparing that potential master to the local clock or other potential masters. Setting this to a lower value will give preference to foreign masters connected to this port over the local clock or foreign masters connected to other ports, if present. The input range is 0 to 255 (inclusive), where 0 is the highest priority. The default setting is 128. This attribute is not used when operating as a G.8275.1 grandmaster.

*“Port 1 - Not Slave”:* When selected, the port will never enter the slave state. This must be selected in order to meet G.8275.1 Telecom grandmaster requirements and advertise good clock accuracy in outgoing Announce messages. This must not be selected in order for the port to operate as a Telecom Slave Clock. Note that the “Not Slave” attribute is instead referred to as “Master Only” in later versions of ITU-T G.8275.1.

Basic NTP PTP SNMP Notifications

☒ Enable

☐ Config

☐ TLV Config

☒ G8275.1

☐ Status

Default Local Priority 128

Port 1 Local Priority 128

☐ Port 1 - Not Slave

Profiles

- Profile Presets -

Figure 51 - "G8275.1" settings

**“Status” radio button:** This section of Tekron’s Configuration Software is for informational purposes only. Refer to Figure 52, where the left image shows the status information for a single PTP port and the right image shows the status information on a PRP enabled port. Legacy clocks do not have this feature. Where a field corresponds to a data set member defined in IEEE 1588-2008, that data set member will be given in square brackets below.

The figure consists of two side-by-side screenshots of the Tekron Configuration Software interface, specifically the PTP configuration tab. Both screenshots show the 'Status' radio button selected under the 'Enable' section.

**Left Screenshot (Single PTP port):**

- Clock Info (DefaultDS):** Identity: 00-1D-7F-FF-FE-FF-FF-FF, Accuracy: BAD, Class: 187 (Degraded Master).
- Port Info (PortDS):** State: Disabled, Peer Path Delay: 0 nS.
- Parent Info (ParentDS):** Identity: 00-00-00-00-00-00-00-00, Grand Master: 00-00-00-00-00-00-00-00, Offset from master: 0 nS, GM Clock Accuracy: Other (00).

**Right Screenshot (PRP enabled port):**

- Clock Info (DefaultDS):** Identity: 00-1D-7F-FF-FE-80-D4-36, Accuracy: 100 nS, Class: 6 (Primary).
- Port Info (PortDS):** State: Disabled, Master: 21898 nS, Peer Path Delay: 0 nS.
- Parent Info (ParentDS):** Identity: 00-1D-7F-FF-FE-80-D4-36, Grand Master: 00-1D-7F-FF-FE-80-D4-36, Offset from master: 0 nS, GM Clock Accuracy: 100 nS.

Figure 52 - "Status" Information

**“Clock Info (DefaultDS)” section:**

**“Identity”:** [defaultDS.clockIdentity] This is the unique PTP Clock Identity of this port.

**“Accuracy”:** [defaultDS.clockQuality.clockAccuracy] This is the current estimate of the accuracy of this port based on the sync source, and the characterization of the internal oscillator as defined in IEEE 1588-2008.

**“Class”:** [defaultDS.clockQuality.clockClass] This is the current clockClass of this port as defined in IEEE 1588-2008.

**“Port Info (PortDS)” section:**

**“State”:** [portDS.portState] This is the current PTP protocol state of this port as defined in IEEE 1588-2008.

**“Peer Path Delay”:** [portDS.peerMeanPathDelay] This is the current calculated one-way propagation delay between this port and the connected peer clock. For ports that have PRP or HSR enabled, a second peer path delay value will be shown for the second path to the peer clock. Refer to the Ethernet section for PRP or HSR configuration.

**“Parent Info (ParentDS)” section:**

**“Identity”:** [parentDS.parentPortIdentity] This is the unique PTP Clock Identity of the master clock that is sending the Sync messages that are synchronizing this port. If this port is currently a master, it will show its own PTP Clock Identity here.

**“Grand Master”:** [parentDS.grandmasterIdentity] This is the unique PTP Clock Identity of the current grandmaster clock. If this port is currently the grandmaster, it will show its own PTP Clock Identity here.

**“Offset from Master”:** [currentDS.offsetFromMaster] This is the current calculated time difference between this port and the master clock. A negative value indicates that the master’s time is ahead of this port’s time.

**“GM Clock Accuracy”:** [parentDS.grandmasterClockQuality] This is the clockAccuracy currently being advertised by the grandmaster clock.

### 7.6.3. SNMP sub-tab

The SNMP sub-tab contains the configuration and access settings for Simple Network Management Protocol (SNMP) functionality. Refer to Figure 53. Legacy clocks do not have this feature.

*“Maximum Authenticated Access”*: This field sets the access limits for authenticated clients using SNMPv3 with USM Authentication. Configurable options are:

None  
Read Only  
Read/Write

*“Require Privacy”*: Check this box to require SNMPv3 USM privacy on SNMP requests.

Figure 53 - "SNMP" sub-tab

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**Note:** When *“Require Privacy”* is enabled, SNMPv1, SNMPv2c and unauthenticated SNMPv3 are disabled.

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*“Maximum Unauthenticated Access”*: This field sets the access limits for unauthenticated clients using SNMPv1, SNMPv2c and SNMPv3 without USM Authentication. Configurable options are:

None  
Read Only  
Read/Write

*“Community Strings (v1, v2c)” section*: This section contains the configuration settings for private and public access.

*“Name 1”*: This field is the *“private”* string access key. The maximum number of characters the clock can accept is 32.

*“Security Group 1”*: This field sets the group who governs the access rights for the *“private”* string. Access can be further restricted using the *“Maximum Unauthenticated Access”* field.

*“Name 2”*: This field is the *“public”* string access key. The maximum number of characters the clock can accept is 32.

*“Security Group 2”*: This field sets the group who governs the access rights for the *“public”* string. Access can be further restricted using the *“Maximum Unauthenticated Access”* field.

---

**Note:** SNMPv1 and SNMPv2c use an unencrypted 'community string' as the only authentication mechanism. Packet analyzers such as Wireshark can be used to read the community string.

---



## 7.6.4. Notifications sub-tab

Clocks which support SNMP and Syslog have the ability to act as an SNMP Agent or Syslog Originator. The settings for this functionality are managed in this section. Refer to Figure 54.

*“Subscriptions” section:*

*“Add”:* To add a subscriber (SNMP Manager or Syslog collector), click the add button and a new window will open (refer to Figure 55).

*“Type”:* Select the SNMP or Syslog message type which the subscriber is expecting. Configurable options are:

- SNMPv1
- SNMPv2c
- SNMPv3
- Syslog
- SNMPv1 Historic <sup>1</sup>
- Syslog Historic <sup>2</sup>

For legacy clocks, the configurable options are:

- SNMPv1 Historic
- Syslog Historic

*“IP Address”:* Enter the IP address of the subscriber.

*“Security name”:* This field is the security key. When the “Type” selected is SNMPv2, the key can consist of any character combination, up to 32 characters maximum length.

If the “Type” selected is SNMPv3, and a “Username” (set-up in under the “User” tab) is input as the key, then the authentications settings of the user will be applied.

*“Remove”:* Select the subscriber you wish to remove and click the “Remove” button.

*“Edit”:* Select the subscriber you wish to edit and click the “Edit” button.

*“Syslog facility”:* This is the setting for the Syslog Facility Number. It represents the “Local Use” value range 0 to 7 (i.e. Facility Number range 16 to 23).

Figure 54 - "Notifications" sub-tab

Figure 55 - "Subscriptions" window

<sup>1</sup> Historic SNMPv1 refers to the early implementation of SNMP Traps in older Tekron products. It is not recommended that this setting is used.

<sup>2</sup> Historic Syslog refers to the early implementation of Syslog in older Tekron products. It is not recommended that this setting is used.

*“Report Low Satellites”*: If one or more subscribers have been set-up, then this feature will be enabled and this Ethernet port will send out a warning to all subscribers if the number of satellites that the clock synchronizes to drops below the set threshold. This setting is only visible for the TCG G series clocks and is equivalent to the *“SV Count Warning”*: field visible for the NTS series, TTM 01-G and PTP Translator in the GPS/GNSS tab.

## 7.7. Maintenance Tab

This section contains features for the purpose of identification of the clock, conveying its purpose, and any other information relevant to the ongoing operation and maintenance of the clock. It also provides the facility to add features to the clock via license keys, and contains various other features which are product dependent. Refer to Figure 56.

The screenshot displays the Maintenance tab of the Tekron configuration software. At the top, there is a navigation bar with icons for Clock, I/O, Network, Maintenance (selected), User, Access Control, and GPS, followed by the Tekron logo. Below the navigation bar, the Maintenance tab contains several sections:

- Clock Identification:** Fields for Clock Designation (Tekron NTS 03-G+), Clock Contact (Tekron International Ltd), and Clock Location.
- Feature Enablement:** A list of checkboxes for enabling various features:
  - ☐ Enable Supervisor Mode
  - ☒ Enable Ethernet Config
  - ☒ Enable GPS
  - ☒ Enable Security
  - ☒ Enable Power Alarms
  - ☐ Enable Forgotten Password Reset
- System Actions:** Buttons for Login Banner, View Log, Factory Reset, and Restart Unit.
- License Management:** A License Entry field and an Add License button.
- Licenses:** A list showing the current license status: NTP licensed, PTP licensed, and PRP licensed.
- System Information:** A panel on the right displaying:
  - Model: NTS 03-G+
  - Product Code: F5-O11B-GG-EXPGB
  - System Firmware: 3.22r

Figure 56 - Maintenance tab

### 7.7.1. “Maintenance” section

**“Clock Designation”:** A user configurable 255-character text field which can be used to name clocks on a LAN or WAN for differentiation of purpose or location. The “Clock Designation” appears in the “Name” Column in the discovery window, as well is in saved configuration files. Refer to Figure 57.

**“Clock Contact”:** A user configurable 255-character text field which can be used to enter a contact person and/or contact information for enquiries regarding the clock. Legacy clocks do not have this option. Refer to Figure 57.

**“Clock Location”:** A user configurable 255-character text field which can be used to describe the location of clocks on a LAN or WAN for differentiation of purpose or location. Legacy clocks do not have this option. Refer to Figure 57.

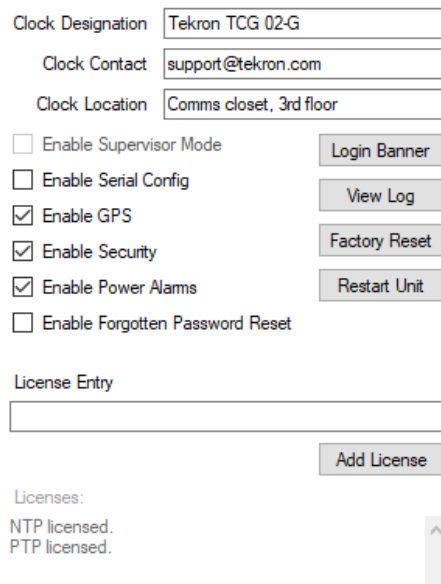


Figure 57 - "Maintenance" section

**“Enable Supervisor Mode”:** This option is available if one or more individual users have been configured as Supervisors in the “Group Policy” section under the “User Tab”. Refer to section 7.8 - User Tab for further information.

Once enabled, users who are not supervisors will have to arrange for a “Supervisor” user to store changes. When a clock setting change is made, and the “Store” button is clicked, a warning box will pop up advising the user that Supervisor Mode is enabled, and that changes will need to be sent to a supervisor for verification. Refer to Figure 58.

A new window will open and will allow the changes to be saved to an XML file. The file can then be electronically sent to a supervisor who will then connect to the clock, load the file, review the changes made, and accept or cancel the changes. Refer to section 7.1 for further information.

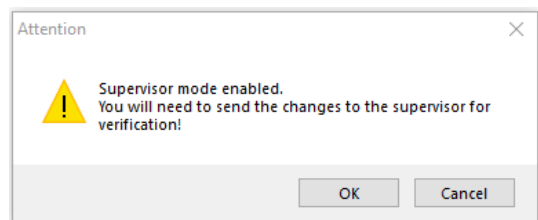


Figure 58 - Supervisor mode warning box

**“Enable Serial Config”:** This option appears if the clock is capable of being configured via the serial port using Tekron’s Legacy Serial Configuration Tool. Ethernet settings cannot be changed using the Serial Configuration Tool.

By default, configuration via the serial port is disabled on clocks running in “Secure Mode”. This is implemented by turning off the Receive Line (Rx) on the serial port. For clocks that support Event Recording or other features which require two-way serial communications, the “Enable Serial Config” box must be checked for those functions to operate.

**“Enable Ethernet Config”:** This option is enabled if the Configuration Software is connected to the clock via the USB port. When unchecked, the clock is *only* able to be configured via a local connection through the USB interface using Tekron’s Configuration Software. Not all clocks feature a USB port.

**“Enable GPS”:** This feature appears when a clock is fitted with a GPS or GNSS receiver. When the box is unchecked, the time signals from the GPS or GNSS receiver are ignored. Additionally, when unchecked, the Low Satellites, No Antenna, and Antenna Short alarms are disabled. Legacy clocks do not have this option.

**“Enable Security”:** By default, security is turned on unless the clock is ordered with security turned off, in which case the clock runs in “Insecure Mode”. Security can be enabled again at which point the clock will revert to the original factory default username and password (refer to section 6). Secure mode is not available on legacy clocks.

**“Enable Power Alarms”:** This configurable setting appears if connected to a clock which supports dual power supply modules. By default, this option is checked. If unchecked, the power alarm relays remain in the energized, no-alarm state, and no power alarms are generated in the Clock tab.

**“Enable Forgotten Password Reset”:** This setting appears if connected to a clock that supports it. When enabled, this setting allows the clock to be reset to factory defaults in order to recover from a forgotten administrator password or to recover a clock that has become unreachable on a network. Physical access is required to perform the reset procedure. This reset procedure is different from the factory reset performed by the Factory Reset button, as that reset does not require physical access, but requires an administrator password. By default, this setting is disabled.

**“License Entry”:** This section facilitates the addition of features on applicable products by way of a License Key. If options such as NTP or PTP are ordered after a clock has been commissioned, the License Key can be copied into the License Entry box and activated by clicking the “Add License” button. A physical power cycle is required after activation of a license to ensure correct operation.

**“Licenses”:** This is an information only section which lists the activated licenses on the clock.

**“Login Banner” button:** A login banner can be created to open when a user connects to a clock. To set up a banner, click the “Login Banner” button and the “Edit Login Banner” window will appear. Enter the text that you wish to appear upon connection to the clock. If the clock is running in Secure Mode, the text will appear after correct login credentials have been entered.

Below is an example of the “Edit Login Banner” window (refer to Figure 59) and the corresponding message (refer to Figure 60) that appears when a user attempts to connect to the clock.

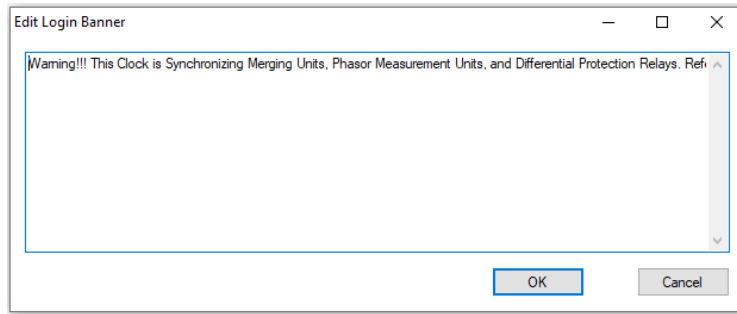


Figure 59 - Edit Login Banner

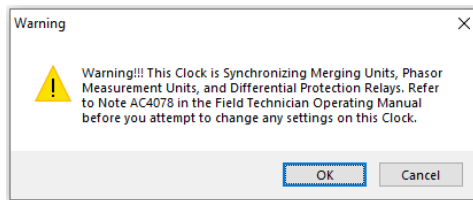


Figure 60 - Login Banner

To dismiss the Login Banner, press the “OK” Button, and you will continue to the configuration window of the clock.

**“Factory Reset” button:** The Factory Reset button returns the clock to the factory default settings, and removes all of the groups and users configured on the device. When clicked, the “Factory Reset” warning window appears. Refer to Figure 61.

Clicking this button also resets the network settings and reverts all Ethernet ports to DHCP.

After a reset, the clock closes the connection with Tekron’s Configuration Software.

To re-connect, the procedure in section 6 should be followed.

The username and password will revert to the default setting. Refer to the product manual or quick start guide to confirm the login credentials.

The typical login credentials are:

**Factory default username: admin**

**Factory default password: Password**

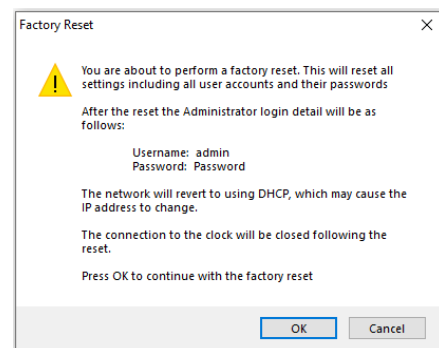


Figure 61 - "Factory Reset" window

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**Note: The username and password are case sensitive.**

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**“Restart Unit” button:** The Restart Unit button re-initiates the clock in a manner similar to removing and re-applying the power. No configuration settings are changed when performing this action. Legacy clocks do not have this option.

When the button is clicked, a new window will appear to confirm your action (refer to Figure 62). By clicking the “OK” button, the unit will proceed to restart, and the clock will close the connection with Tekron’s Configuration Software. To reconnect, return to the Discovery Window, select the clock and click configure. Refer to section 6 for more detailed instructions.

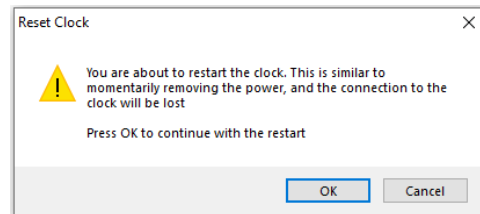


Figure 62 - "Restart Unit" window

**“View Log” button:** The View Log button retrieves and shows the configuration change log (System Log) from the clock. A window containing a list of configuration changes will appear. Refer to Figure 63 for an example.

Age	Boot	UpTime	Time (TAI)	User	Variable
17	1	0	3/11/2021 12:28:44 AM	system	Boot count
16	1	6	3/11/2021 12:28:50 AM	system	Legacy Security: Reset key
15	1	6	3/11/2021 12:28:50 AM	system	Disable clock security
14	1	6	3/11/2021 12:28:50 AM	system	Security Policy: Single Password
13	1	12	3/11/2021 12:28:56 AM	system	Local Time Offset: Time of change is TAI
12	1	12	3/11/2021 12:28:56 AM	system	GNSS Version
11	1	455	3/11/2021 12:36:19 AM	system	Security Policy: Security will be disabled on next reboot
10	2	0	3/11/2021 12:36:35 AM	system	Boot count
9	2	6	3/11/2021 12:36:41 AM	system	Disable Serial Config
8	2	6	3/11/2021 12:36:41 AM	system	Disable clock security
7	2	45	3/11/2021 12:37:20 AM	admin	User 1: (admin) Localized authentication password
6	2	45	3/11/2021 12:37:20 AM	admin	User 1: (admin) Localized privacy password
5	2	925	3/11/2021 12:52:00 AM	admin	Group 3: (Supervisor) Is Supervisor
4	2	925	3/11/2021 12:52:00 AM	admin	Group 4: (Observer) Is Supervisor
3	2	930	3/11/2021 12:52:05 AM	admin	Group 3: (Supervisor) Is Supervisor
2	2	974	3/11/2021 12:52:49 AM	supervisor	User 3: (supervisor) Localized authentication password
1	2	974	3/11/2021 12:52:49 AM	supervisor	User 3: (supervisor) Localized privacy password

Figure 63 - Configuration change log retrieved from clock

The configuration change log can be saved to a .CSV file from this window, by clicking the “Save” button. Clicking the “Close” button will close the “System Log” window.

## 7.7.2. “System Information” section

This is an informational section only which lists information about the connected clock.

**“Model”:** This is the model name of the Tekron clock being configured.

**“Product Code”:** This is the order code of the Tekron clock being configured.

**“System Firmware”:** This is the version number of the firmware running on the Ethernet module being configured.

## 7.8. User Tab

This tab contains the Group and User settings configured in the connected clock. This tab is only visible when the connected clock is running in Secure Mode. Refer to Figure 64.

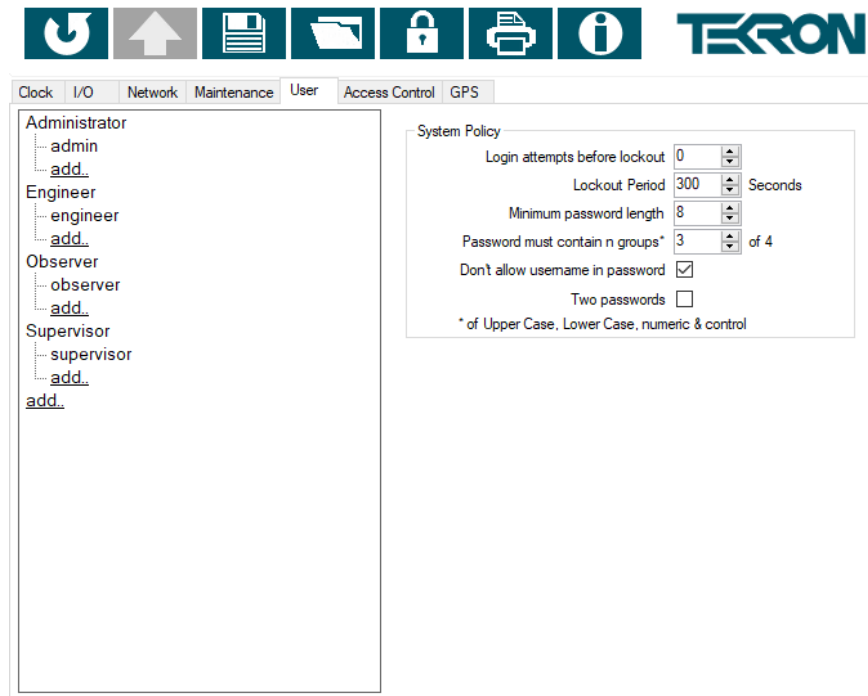


Figure 64 - "User" tab

### 7.8.1. Group and User Directory

The Group and User Directory are presented in a tree structure. On the first level of the tree is the "Group", and the second level of the tree contains "Users" which belong to the group.

#### Adding or editing groups:

##### Adding a group:

To add a group, click the "add..." button on the first level of the tree. This button is always appended at the bottom of the Group and User Directory. Once the "add..." button is clicked, a new window will appear (refer to Figure 65).

**"Group Name":** Enter in the Group Name text field, the name of the group you wish to create.

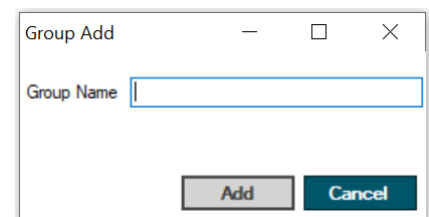


Figure 65 - "Group Add" window

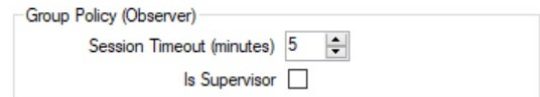
##### Editing an existing group:

##### "Changing the name of an existing group":

Select the Group Name you wish to change. Click the Group Name again to edit the name.

*Changing the policy settings of an existing group:*

The policy for the group can be set by selecting the applicable group. Once selected, the "Group Policy" section will appear to the right of the directory as well as the name of the group which is displayed in brackets (refer to Figure 66). The Group Policy Settings apply to all users who belong to the group.



Group Policy (Observer)

Session Timeout (minutes) 5

Is Supervisor ☐

Figure 66 - "Group Policy" configuration

*"Session Timeout":* If a user within the group does not interact with Tekron's Configuration Software for the set time period, the session will prompt the user and if ignored, will close the connection. Setting the Session Timeout to zero will disable session timeout for that group.

*"Is Supervisor":* This setting is the first step to enable Supervisor Mode. At least one group containing one or more users should be configured with the "Is Supervisor" box checked. Once checked, "Supervisor mode" under the Maintenance Tab can be enabled.

---

**Note: Supervisors cannot make changes to the clock configuration, they can only store changes made by a non-supervisor user.**

---

### Adding or editing users:

#### Adding a user:

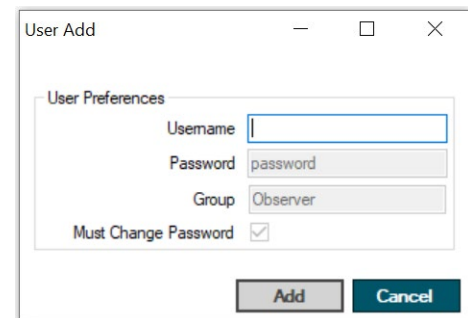
To add a user, click the "add..." button on the second level of the tree. This button is always appended after the last user in the applicable group. Once the "add..." button is clicked, a new window will appear (refer to Figure 67).

*"Username":* Enter in the Username text field, the name of the user you wish to create.

*"Password":* This field is for informational purposes only and contains the initial default password for the user.

*"Group":* This field is for informational purposes only and is the group that the user belongs to.

*"Must Change Password":* This is for informational purposes only. By default, new users must change their password when they first log in.



User Add

User Preferences

Username

Password password

Group Observer

Must Change Password ☒

Add Cancel

Figure 67 - "User Add" window

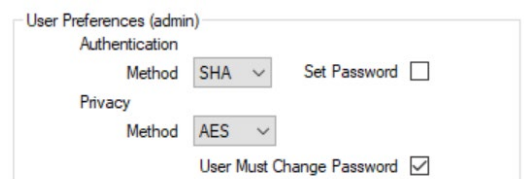
#### Editing an existing user:

##### Changing the name of an existing user:

Select the username you wish to change. Click the username again to edit the name.

##### Changing the User Preferences of an existing user:

The "User Preferences" can be set by selecting the applicable user. Once selected, the "User Preferences" section will appear to the right of the directory as well as the name of the user which is displayed in brackets (refer to Figure 68).



User Preferences (admin)

Authentication

Method SHA Set Password ☐

Privacy

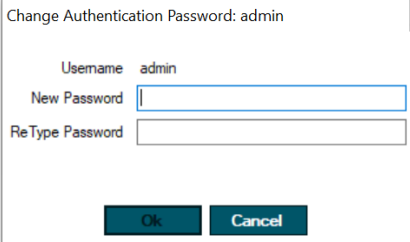
Method AES User Must Change Password ☒

Figure 68 - "User Preferences" settings



*"Authentication"*: Select the Authentication Protocol type using the drop-down list. Configurable options include MD5 and SHA.

*"Set Password"*: This option enables the password of an existing user to be changed. When the "Set Password" box is checked, a new window will open (refer to Figure 69) prompting for a New Password and to re-type the new password to validate it and click "OK". The new password should abide by the System Policy settings. Refer to section 7.8.2 - System Policy for further information.



**Figure 69 - "Change Authentication Password" window**

*"Privacy"*: Select the Privacy Protocol type using the drop-down list. Configurable options include None, DES and AES.

*"User Must Change Password"*: Check this option to force the selected user to change their password the next time they attempt to login to this clock.

## 7.8.2. System Policy

This section contains the Password Login Attempts and Policy Settings for the connected clock.

*"Login attempts before lockout"*: This is the maximum number of attempts a user is allowed to try passwords before they are locked out of the clock. If set to 0, it allows infinite attempts. To prevent the leaking of security information, there is no notification to the user that the lockout is in place, and the standard login failed message will be displayed. The configurable setting is from 0 to 10 (inclusive).

*"Lockout Period"*: This is the time period (in seconds) for which the user is locked out of the clock when they have exceeded the configured number of login attempts before lockout. Subsequent incorrect login attempts during the lockout period will not increase that period. The configurable setting is from 0 to 86400 seconds (inclusive).

*"Minimum password length"*: This is the minimum number of characters a password should contain. The configurable setting is from 3 to 20 characters.

---

**Note: The maximum Password length is 32,000 characters.**

---

*"Password must contain n groups"*: This is the number of character types that should be contained within the password. Valid Types include:

- Upper case letters
- Lower case letters
- Numbers
- Symbols

*"Don't allow username in password"*: Check this option to decline passwords which contain the username, or a prefix of the username over three characters long.

*"Two Passwords"*: Check this option to enable separate user configurable passwords for the selected authentication and privacy protocols.

By default, a single password is used at login and is used for both authentication and privacy protocols (where applicable). When the Two Passwords option is initially enabled; the “Set Password” checkbox appears next to the Privacy setting. This enables the user to configure two independent passwords. To change a password, both Authentication and Privacy passwords should be entered into the applicable fields, otherwise the change will not be saved.

If this feature is enabled initially, and disabled at a future time, the single login password will be the authentication password saved in the unit.

## 7.9. Access Control Tab

The Access Control tab contains the access settings for each group, which apply to the users within the group. This tab is only visible when the connected clock is running in Secure Mode. Refer to Figure 70.

Settings Access	None	Read Only	ReadWrite
Information	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Clock	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
I/O	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Network	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Notifications	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Maintenance	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Security	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
GNSS	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
PTP	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
NTP	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Test	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

Global Access  
Admin port access only ☐

Figure 70 - "Access Control" tab

The “Settings Access” sub-tab determines user access to clock settings, whereas the “Port Access” sub-tab determines a user’s read and write permissions on each Ethernet port. The “Port Access” sub-tab only appears on clocks with more than one Ethernet port. Refer to Figure 71.

Refer to the Settings Access section for further information on the particular settings that are controlled by each access category in the “Settings Access” sub-tab.

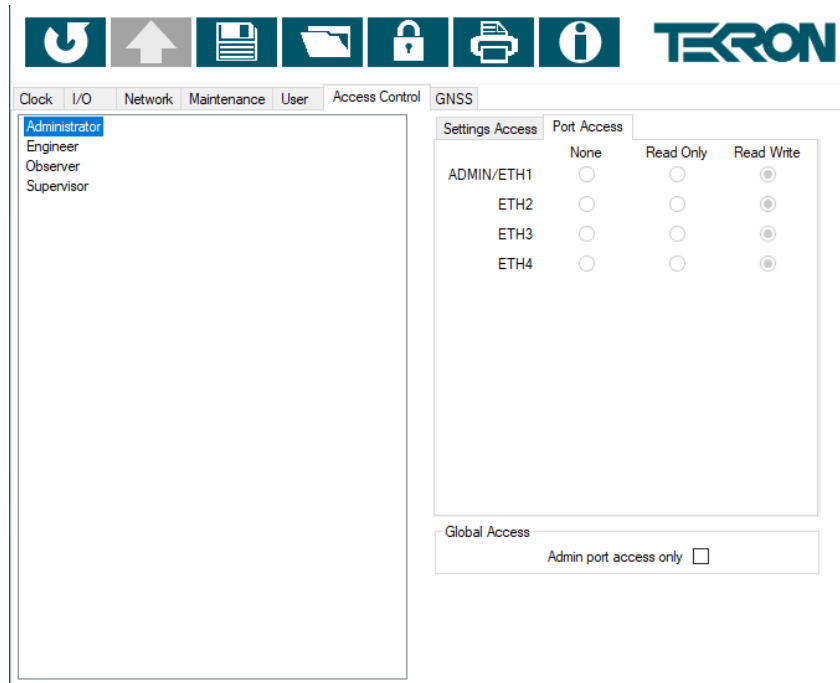


Figure 71 - "Access Control" tab showing "Port Access" sub-tab

The "Admin port access only" checkbox is used to block or allow clock settings access through non-administration Ethernet ports. If checked, the Admin Ethernet port can be used to read to and write from the clock, but no other Ethernet ports have any level of access. If unchecked, access through each Ethernet port is determined by the "Port Access" tab.

### 7.9.1. Group Directory

The Group Directory lists the groups configured on the connected clock in alphabetical order. Refer to Figure 72. To edit the Settings Access or Port Access rights of a group, click on the applicable group and change the settings in the adjacent "Settings Access" and "Port Access" sub-tab.



Figure 72 - "Group Directory" section

#### Settings Access

This section enables the clock to be configured to allow or remove access to the applicable configuration settings. The settings are independently configured for each group, and apply to subsequent Users which belong to the particular group. The access levels are:

- None (No access)
- Read Only
- Read Write

Table 6 below details the particular configuration settings that are controlled by each access category in the “Settings Access” sub-tab.

**Table 6 - User Access Control categories**

Access Category	Description
Information	Allows access to the following: <ul style="list-style-type: none"> <li>- System Information section in the Clock tab</li> <li>- Alarm ports in the “I/O Ports section” and the Sync section in the I/O tab</li> <li>- Network Information section in the Network tab</li> </ul>
Clock	Allows access to the following: <ul style="list-style-type: none"> <li>- System Information, Time, Localization and Clock Source Priorities section in the Clock tab</li> <li>- Alarm ports in the “I/O Ports section” and the Sync section in the I/O tab</li> </ul>
I/O	Allows access to the following: <ul style="list-style-type: none"> <li>- System Information section in the Clock tab</li> <li>- I/O Ports, Sync sections and the IRIG-B (A), IRIG-B (B) and DCF77 sub-tabs in the I/O tab</li> </ul>
Network	Allows access to the following: <ul style="list-style-type: none"> <li>- System Information section in the Clock tab</li> <li>- Alarm ports in the “I/O Ports section” and the Sync section in the I/O tab</li> <li>- Network Information section and the Basic sub-tab in the Network tab</li> </ul>
Notifications	Allows access to the following: <ul style="list-style-type: none"> <li>- System Information in the Clock tab</li> <li>- Alarm ports in the “I/O Ports section” and the Sync section in the I/O tab</li> <li>- Network Information section and the Notifications sub-tab in the Network tab</li> </ul>
Maintenance	Allows access to the following: <ul style="list-style-type: none"> <li>- System Information in the Clock tab</li> <li>- Alarm ports in the “I/O Ports section” and the Sync section in the I/O tab</li> <li>- Maintenance tab and some settings</li> </ul>
Security	Allows access to the following: <ul style="list-style-type: none"> <li>- System Information in the Clock tab</li> <li>- Alarm ports in the “I/O Ports section” and the Sync section in the I/O tab</li> <li>- Network Information section and the SNMP sub-tab in the Network tab</li> <li>- User tab and settings</li> <li>- Access Control tab and settings</li> </ul>
GNSS/GPS	Allows access to the following: <ul style="list-style-type: none"> <li>- System Information in the Clock tab</li> <li>- Alarm ports in the “I/O Ports section” and the Sync section in the I/O tab</li> <li>- GPS/GNSS tab and settings</li> </ul>
PTP	Allows access to the following: <ul style="list-style-type: none"> <li>- System Information in the Clock tab</li> <li>- Alarm ports in the “I/O Ports section” and the Sync section in the I/O tab</li> <li>- PTP sub-tab and settings in the Network tab</li> </ul>
NTP	Allows access to the following: <ul style="list-style-type: none"> <li>- System Information in the Clock tab</li> <li>- Alarm ports in the “I/O Ports section” and the Sync section in the I/O tab</li> <li>- NTP sub-tab and settings in the Network tab</li> </ul>
Test	Allows access to the following: <ul style="list-style-type: none"> <li>- System Information and Test Source sections in the Clock tab</li> <li>- Alarm ports in the “I/O Ports section” and the Sync section “Never leave Sync (Test Mode)” in the I/O tab</li> </ul>

---

**Note: All of the access settings are conditional on the “Port Access” settings of the group which the user belongs to.**

---

### **Port Access**

This section is dynamically populated depending on the number of Ethernet interfaces fitted within the clock. The name of each interface is based on the marking on the relevant port on the clock. This section enables the clock to be configured to allow or remove access to the applicable ports. The settings are independently configured for each group, and apply to subsequent users which belong to the group. The access levels are:

- None
- Read Only
- Read Write

## 7.10. GNSS / GPS Tab

This tab contains GNSS or GPS configuration settings and real-time information on the constellation status. If the selected clock supports more than one constellation and is configured to use GLONASS only or GPS + GLONASS constellations, the tab will be labelled GNSS (refer to Figure 73). For clocks that support only GPS constellation only, or for clocks that support more than one constellation and have GPS only configured, the tab will be named GPS.

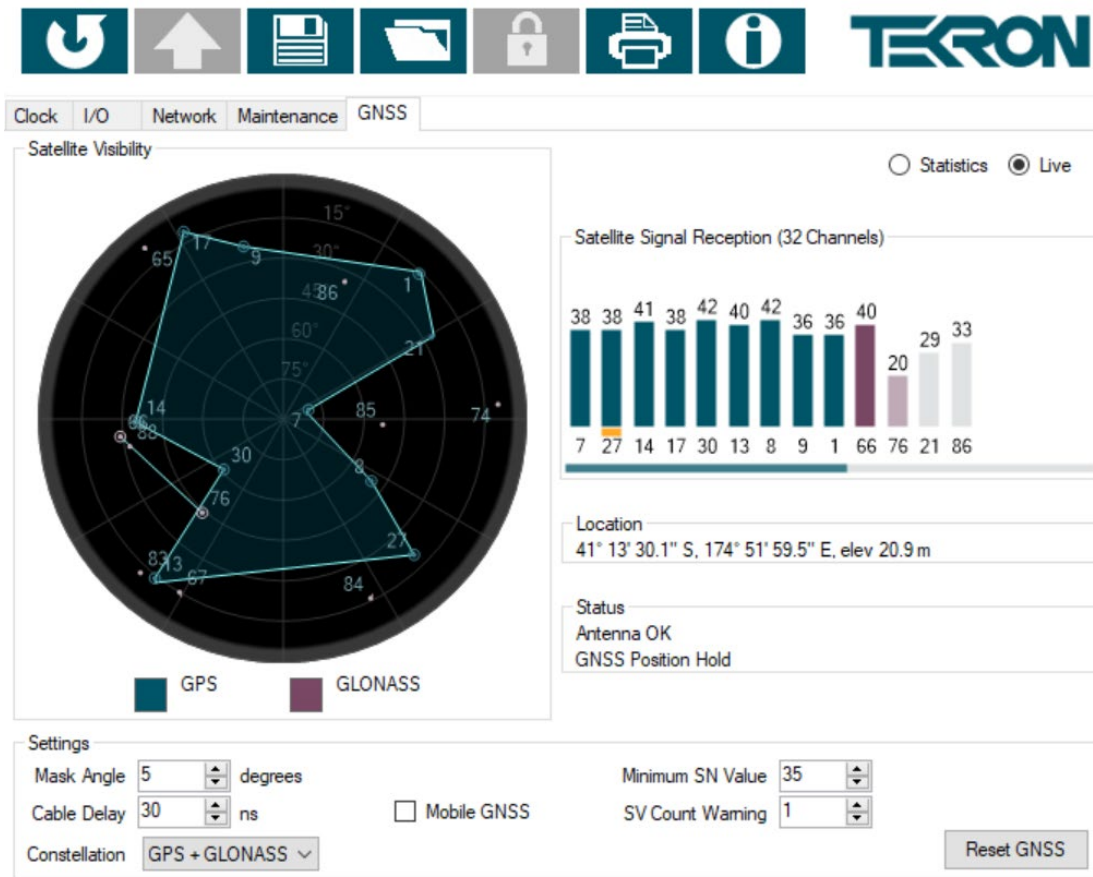


Figure 73 - GNSS tab

### 7.10.1. Satellite Visibility

This section contains a satellite map and over time plots each tracked satellites orbital path (refer to Figure 74). GPS satellites and their trails are in blue, and GLONASS satellites and their trails are in purple. The present location of the satellite is represented by the marker "⊙", and the Space Vehicle (SV) Identifier is located adjacent to it.

The top of the satellite map marked as 0° degrees is the bearing in relation to North. The 90°, 180° and 270° markings represent East, South and West respectively.

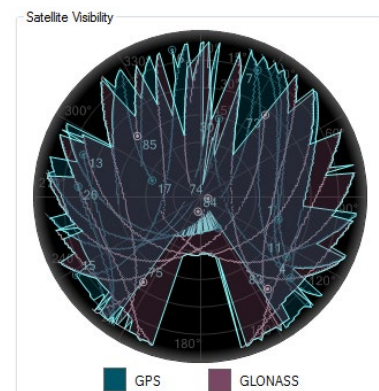


Figure 74 - "Satellite Visibility" section

The concentric circles on the satellite map represent the angle above the horizon. Therefore, the center of the map represents the space directly above the antenna looking up into orbit.

Refer to Figure 75 for a graphical representation.

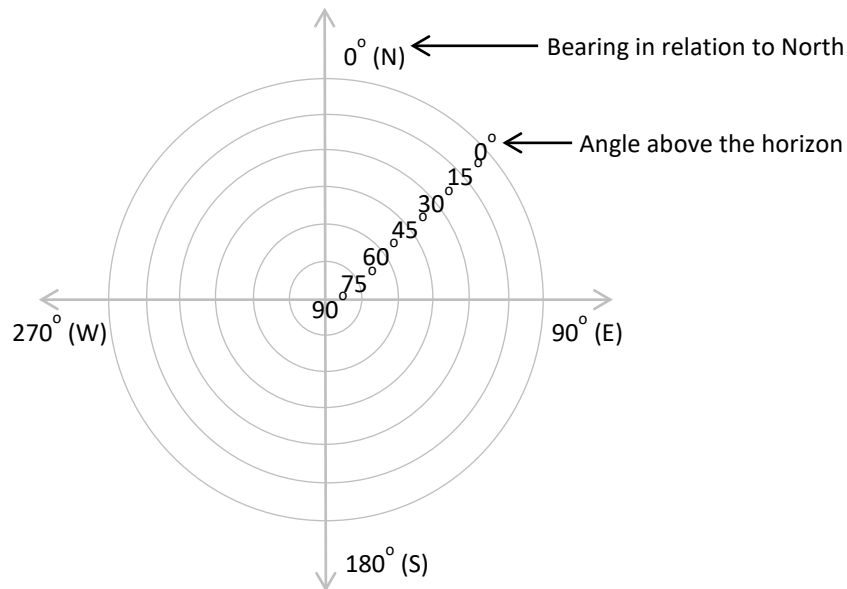


Figure 75 - Satellite Map Orientation

### 7.10.2. Live

By default, the “Live” radio button is selected. When selected, the “Settings”, “Satellite Signal Reception”, “Location”, and “Status” sections appear.

#### “Settings” section

This section contains the Mask Angle, Cable Delay, Mobile GNSS, Minimum SN Value, SV Count Warning and Constellation settings where applicable. Refer to Figure 76.

Settings					
Mask Angle	<input type="text" value="5"/>	degrees	Minimum SN Value	<input type="text" value="35"/>	
Cable Delay	<input type="text" value="30"/>	ns	<input type="checkbox"/> Mobile GNSS	SV Count Warning	<input type="text" value="1"/>
Constellation	<input type="button" value="GPS + GLONASS"/>			<input type="button" value="Reset GNSS"/>	

Figure 76 - GNSS/GPS tab “Settings” section

*“Mask Angle”:*

This is the angle (in degrees) from the horizontal plane (horizon) below which satellite signals will not be used in calculating time and position. Increasing the mask angle will avoid errors caused by ionosphere, troposphere and multipath effects; however, this will also limit the number of satellites being tracked. The default setting is five degrees. The configurable range is 0 to 90 degrees.

When the mask angle is modified, the satellite map is dynamically updated with grey shading which indicates the masked section of the horizon.

*“Cable Delay” compensation:*

All antenna systems introduce a signal delay that is dependent on the cable length. To optimize the accuracy of the output signals at the clock output terminals, enter a value in this field corresponding to approximately 4 ns per meter of antenna cable. For example, if the antenna cable is 30 meters long, the cable compensation should be set to 120 ns.

*“Constellation”:*

This setting allows the user to select the constellations which the connected clock will synchronize to. Configurable options include:

GPS  
GLONASS  
GPS + GLONASS

---

**Note:** The “Constellation” configuration settings only appear on clocks which support multiple constellations.

---

*“Mobile GNSS”:*

This feature is only available on the TTM 01-G clock model, and can be enabled by checking the “Mobile GNSS” checkbox. This feature is intended for when the clock is installed on a moving platform, such as moving vehicles or vessels. When this option has been checked, the position and timing solution is updated more frequently than it would be otherwise, compensating for the device’s changing position.

**Note:** This feature is only supported on the TTM 01-G. All other Tekron products do not include this feature, and therefore should be installed in a stationary site.

*“Minimum SN Value”:*

This is the minimum required signal strength (in dBHz) of a tracked satellite, in order for the clock to use it in its time and position calculations. The SN value of the tracked satellite is displayed above the SV bar. Refer to the next section for further information. This setting is only visible for the NTS series and TTM 01-G clocks. This setting is equivalent to the “Report Low Satellites” setting in the SNMP sub-tab of the Network tab, which is only visible for the TCG G series clocks.

*“SV Count Warning”:*

This setting controls the threshold at which the clock activates the low satellites alarm. If the number of satellites that the clock synchronizes to drops below the set threshold, the low satellites alarm will be triggered.



### “Satellite Signal Reception” section:

This section is for informative purposes only, and displays the real-time signal strength of satellites being tracked (refer to Figure 77). Satellites with a signal strength meeting the configured minimum SN value, with good health reported in the almanac, and which are not below the antenna mask angle, are used for time and position calculations and are displayed as solid-colored bars. Satellites that are being tracked but do not meet the criteria above are displayed as faded colored bars.

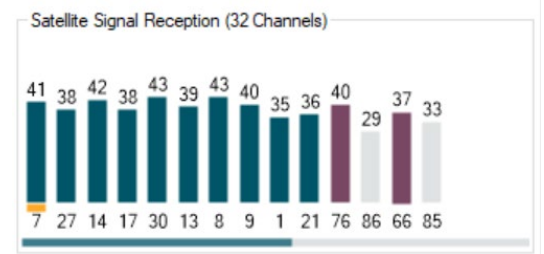


Figure 77 - "Satellite Signal Reception" section

Blue bars indicate GPS satellites, and purple bars indicate GLONASS satellites.

The number above each bar is the signal strength (in dBHz). The number below each bar is the Space Vehicle (SV) Number. If you hover the mouse pointer on a bar, the SV Number and marker in the adjacent satellite map will be highlighted.

The number of channels indicated in the title of the Satellite Signal Reception section is the number of channels supported by the GPS/GNSS receiver fitted. The number of channels determines the maximum number of satellites that can be tracked simultaneously.

### “Location” section:

This section is for information purposes only, and is the current stored position reported by the GPS/GNSS receiver. The position is displayed in degrees, minutes and seconds, and the elevation is displayed in meters. Refer to Figure 78.

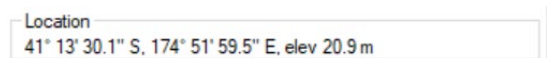


Figure 78 - "Location" information

### “Status” section:

This section provides real-time information on the status of the antenna and GNSS receiver. Refer to Figure 79.



Figure 79 - GNSS/GPS "Status" section

The top line of this section gives information on the antenna connection. Below are a list of valid messages and their interpretation.

Message	Definition
Antenna current low	The antenna circuit current drain is low (typically under 3mA). This could be caused by poor connections, or if the connected antenna has a lower current drain specification or if a component in the antenna system is providing power to the antenna and therefore the clock is not seeing a connected load.
Antenna current high	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.
Antenna OK	Antenna system is connected and is perceived to be operating normally.

---

Note: If an antenna fault is detected, the connected clock may not report that it is synchronized, even though it can track satellites.

---

The second line of this section gives information on the GPS/GNSS receiver status.

Message	Definition
GPS/GNSS Position Hold	Position is known, and GNSS is providing its most accurate time.
Doing Fixes	Tracking a sufficient number of satellites and now calculating position and timing solution.
Acquiring	Searching for satellites.
Bad Geometry	Insufficient satellite distribution to calculate an accurate position.

*“Reset GPS” or “Reset GNSS” button:* Click this button to reset the GPS or GNSS receiver, clear the receiver’s memory and discard the stored almanac.

### 7.10.3. Statistics

The “Statistics” radio button contains the “GPS/GNSS Availability”, “Average strength of usable satellites” and “Control” sections.

While connected to a clock, Tekron’s Configuration Software monitors the GPS/GNSS status and presents the information in the form of a pie chart and bar chart.

---

Note: GPS/GNSS statistics are only recorded while the Configuration window remains open. When the Configuration window is closed, any statistics that have not been printed out or logged to file will be lost.

---

#### “GNSS Availability” section:

The pie chart provides statistics on the average number of satellites tracked, and if during the logged period the receiver is momentarily unable to track any satellites, it will indicate the duration of the longest of the occurrences. Refer to Figure 80.

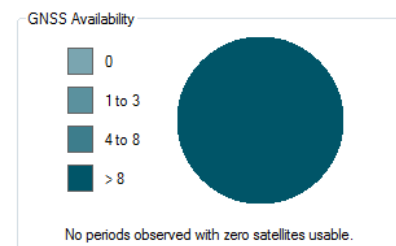


Figure 80 - “GNSS/GPS Availability” pie chart

#### “Average Strength of usable satellites” section:

The bar chart gives an indication as to the average strength in dBHz of all the usable satellites that were logged. Refer to Figure 81.

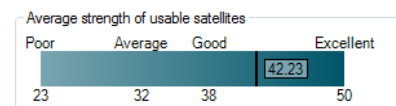


Figure 81 - “Average strength of usable satellites” bar chart

### “Control” section:

This section contains the settings for logging GPS/GNSS Statistics. Refer to Figure 82.

*“Log to File”*: Check this box to log information on tracked GPS/GNSS satellites to a text file. Once this option is checked, a new window will open to allow the location of the file on the local hard drive to be selected. Deselect this checkbox to stop logging to file.

The information logged to file consists of: Date, Time, Latitude, Longitude, Height, GPS/GNSS receiver state, and the Satellite Vehicle Identifier, used / not used for timing status, signal strength, azimuth and elevation of each tracked satellite. The date and time used in the log file is in UTC and is derived from the date and time settings on the host PC.

*“Disable Automatic Logout”*: Check this box to override the Session Timeout enforced by the clock’s Group Policy, allowing logging to occur over a longer time period. If this box is not checked, statistics gathering may be interrupted by the connection closing due to inactivity.

*“Schedule” button*: Click this button to schedule a time at which statistics will be gathered. When clicked, a new window will open prompting for a begin time and duration. Refer to Figure 83.

*“Begin” time*: Enter the local time at which statistics gathering is to begin. The default is “Immediately”. Many time formats are accepted. Examples of valid times:

11:30  
5/02/2022 11:30  
11 pm  
23:30  
11:30 a.m.  
Friday, 11:30  
5 Feb 2022 11:30 p.m.

*“Duration”*: Enter the length of time that statistics gathering is to continue for. The default is “Indefinite”, which will continue until manually stopped. Examples of valid durations:

1 Minute  
2 Hours  
1d 10h 30m  
1D 10:30  
1 Day, 10 Hours, and 30 Minutes

Existing statistics will be cleared, and the “Disable Automatic Logout” checkbox will be automatically selected to avoid interruption of statistics gathering. Statistics gathering will begin automatically at the specified time, and continue for the specified duration. After statistics gathering is complete, the “Print clock configuration” button in the toolbar can be used to obtain a printout that includes the gathered statistics.

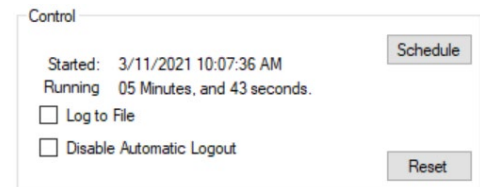


Figure 82 - “Control” section

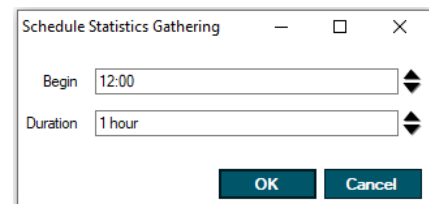


Figure 83 - “Schedule Statistics Gathering” window

*“Reset” button:* Click the reset button to clear existing statistics. The software will prompt for confirmation before clearing the statistics.

## 8. Converting Configuration File Formats

Tekron’s Configuration Software supports file format conversion, for transferring configuration from legacy clocks. This version of Tekron’s Configuration Software saves configuration files in XML format, and can load configuration files in XML and TCF formats.

Older versions of Tekron’s Configuration Software save configuration files using a different file format. Older .tcf configurations can be loaded into Tekron’s Configuration Software, but not edited and saved in the original format. They can however be saved as .xml configuration files.

---

**Note: If you are trying to load a .cfg file, it is recommended that you use Tekron’s Configuration Software version 3.x.y.z to convert from .cfg to .tcf format, and then load the .tcf file into this software version.**

---

Tekron has checked backwards compatibility with as many Ethernet configurable older generation products as practicable, which used older .tcf file formats. We cannot guarantee that the conversion will be 100% accurate, and advise you to verify the settings are correct, before loading the settings into a clock or saving for future use.

## 9. Creating and Editing Configuration files in “Offline” mode

Tekron’s Configuration Software has provision to create and edit configuration files without being connected to a clock (offline mode).

### Creating a Clock configuration file

Click the “Offline” button in the discovery window. Refer to Figure 84.

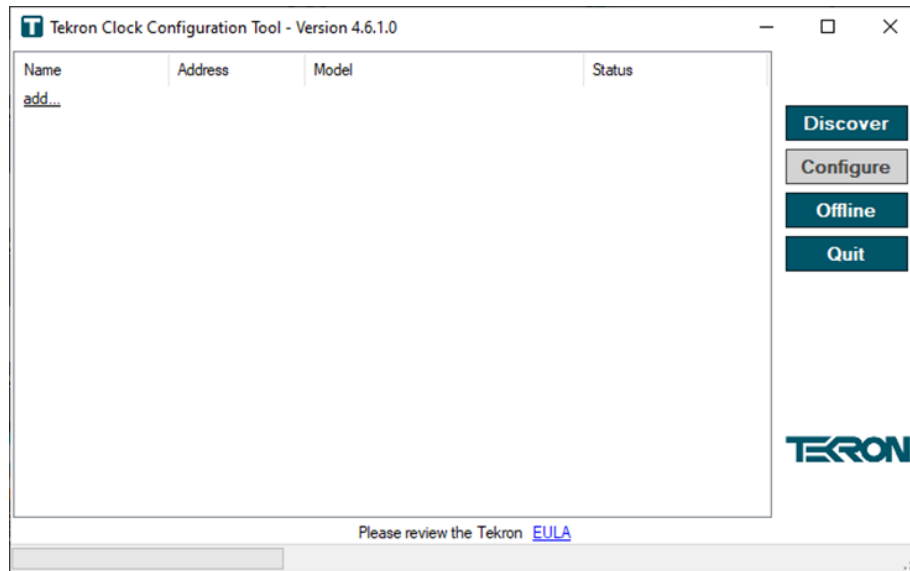


Figure 84 - Discovery Window showing the "Offline" button

Select the clock type from the tree directory and subsequent branches. Refer to Figure 85.

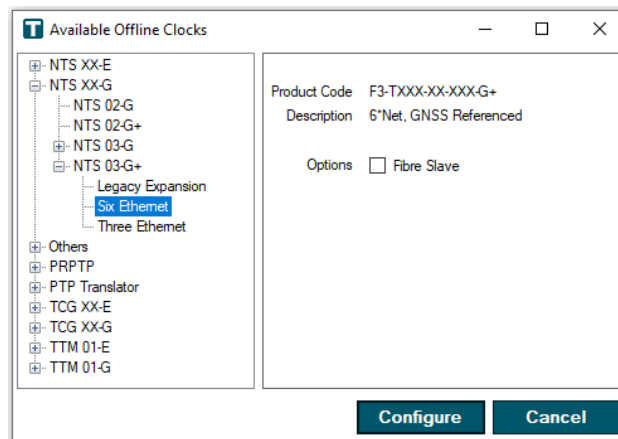


Figure 85 - "Available Offline Clocks" window

Select the desired clock and click the “Configure” button. A new window will open, and the default configuration settings will be set-up. Edit the clock settings as described in section 7. The configuration file may be saved for later uploading to a connected clock.

### Opening a stored configuration file

To open a stored setting file without the clock being connected, first select offline mode, and choose the correct clock type that the file was created for (check the product code). Then use the Load button as described in section 7.7.1 to load the stored configuration file.

## 10. Recommended Commissioning Procedure

When commissioning a GPS/GNSS clock, it is recommended that once the antenna system is installed and the clock has been configured with the required settings, the Satellite Statistics should be logged for 12 hours to confirm the suitability of the antenna position.

*Method:* Once connected to the clock, navigate to the GPS/GNSS tab, select the Statistics radio button, and click the Schedule button. Schedule logging to last for a duration of 12 hours, as described in the “Control” section of this manual under section 7.10.3.

After the 12-hour period has concluded, analyze the satellite map for GPS/GNSS blind spots. In the Southern hemisphere, a blind spot due south will be observed as the GPS and GLONASS constellations do not pass over the South Pole (vice versa is also true for locations in the Northern Hemisphere). Below are two examples of antenna installations. Figure 86 shows a good antenna installation, while Figure 87 shows a poor installation, where an obstruction is blocking the view to the East.

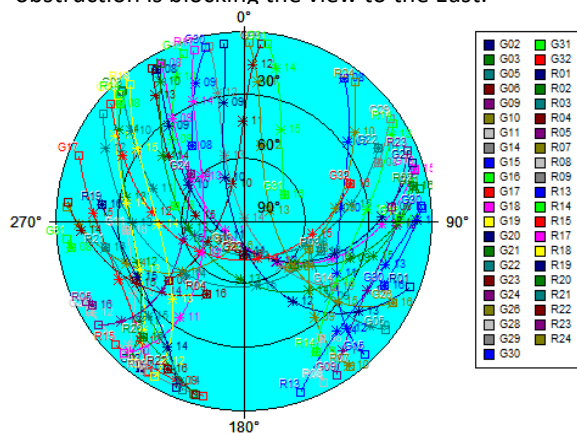


Figure 86 - Example A

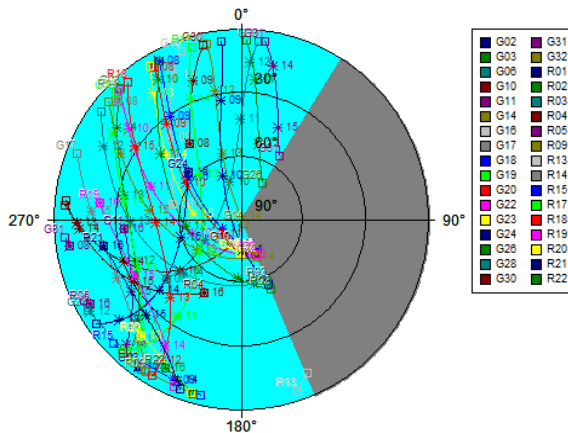


Figure 87 - Example B

Once 12 hours of logging has been completed, click the “Print Clock Configuration” button to print out a summary of the configuration settings and the GPS/ GNSS Statistics over the 12-hour logging interval.

**Clock Configuration** Printed: Tuesday, 30 December 2014 4:51 p.m.  
Printed By: admin

Unit Info

Serial Number	05001
Product Code	Q1-T3AAA
Source Port	ADMINETH1
Model and Versions	TCG01G (P2.15, 3.11r, c1.06, 1.04b)
Unit Name	Tekron IT TCG 01-G
MAC Address	00:1677:60:00:a1
Configuration tool version	4.0.5.12

Clock

Daylight savings and	1st Sunday of April at 03:00
Daylight savings start	Last Sunday of September at 02:00
Daylight Saving Offset	60 Minutes
Local Time Offset	12 Hours
Source Priority	GNSS => PTP => SNTP

IO

Holdover Time	2 Minutes
Outputs report the true sync state	True
Outputs suppressed when 'out of sync'	False
Outputs always report 'in sync'	False
Sync relay is always on (Test Mode)	False
Output P2	
Type	Programmable Pulse
Inverted	False
Pulse Frequency/ Base	1.10 mS pulse per second offset by 0 mS
Output P3	
Type	IRIG-B (Stream A)
Inverted	False
Output P4(Pin1)	
Type	IRIG-B (Stream A)
Inverted	False
Serial port 1	
Baud rate	9600
Parity	None
String	Tekron-C
Use UTC time	False
IRIG-B stream A	
Use AFNOR NF S87-600 extensions	False
Output binary seconds	True
Use C37.118 extensions	True
Use odd parity	False
Use UTC Time	False
DCF-77 Use UTC time[1]	False
Input Event Recording Enabled	False
Monitor Input (IRIG-B)	False

Network (ADMINETH1) / Basic

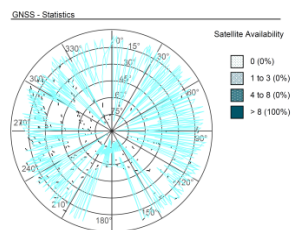
TCG01G	
Ethernet Link Settings Auto	True
VLAN Block VLANID	0
VLAN ID	0
VLAN Mask NTP	False
VLAN Mask Other	True
VLAN Mask PTP	0
IPV4 Address	192.168.96.97
IPV4 DHCP	True
IPV4 DHCP Maximum Retries	3
IPV4 Enable Link Local Address	False
IPV4 Address Mask	255.255.255.0

Clock Configuration: TCG01G Tekron IT TCG 01-G SN05001 Page 1 of 5

Network (ADMINETH1) / Basic - Continued

IPV4 Gateway	0.0.0.0
Network (ADMINETH1) / NTP	
NTP Enable	True
NTP Ignore When Unsynchronized	False
NTP Broadcast Interval	64 Seconds
NTP Broadcast Version	4
NTP Multicast Interval	Off
NTP Multicast IPV4 Address	224.0.0.1
SNTP Client Server Address	0.0.0.0
SNTP Client Server Version	4
SNTP Client Server Poll Interval	Off
SNTP Client Request Key ID	1
SNTP Client Accept Broadcasts	False
NTP ACS Authentication	False
Network (ADMINETH1) / PTP	
PTP Enable	True
PTP Default Domain	0
PTP Grand Master Priority 1	128
PTP Grand Master Priority 2	128
PTP Slave Only	False
PTP Two Step	False
PTP Port 1	
Advertised Min Delay Request Interval	2 Seconds
delay mechanism	Peer-to-Peer (P2P)
Announce Interval	1 Second
Peer Delay Request Interval	1 Second
Sync Interval	1 Second
transport	Ethernet (Layer 2)
PTP TLV C37.238	
Required	True
Engineered Time Inaccuracy	0 Nano Seconds
GM Identity	3
Network Time Inaccuracy	0 Nano Seconds
PTP TLV Localtime	
Enable	True
Required	True
UTC Relative	False
UTC	False
PTP Telecom (G825.1) Slave	False
Network (ADMINETH1) / SNMP	
SNMP Community String 1	private
Security Group	Administrator
SNMP Community String 2	
Name	public
Security Group	Observer
SNMP Requires Privacy	False
SNMP Maximum Authenticated Access	Read-only
SNMP Maximum Unauthenticated Access	None
Network (ADMINETH1) / Notifications	
Notify when satellite count below	1
Subscription SYSLOG Facility	0
Maintenance	
Unit Name	Tekron IT TCG 01-G
License Installed	PTP, NTP, advanced CONFIGadvanced_config
SNMP Contact	support@tekron.com
SNMP Location	Tekron
Disable GNSS	False

Clock Configuration: TCG01G Tekron IT TCG 01-G SN05001 Page 2 of 5



Test Started 30/12/2014 8:30:00 a.m.  
 Test ran for 7 Hours, 59 Minutes, and 59 seconds  
 Longest period with zero usable satellites none  
 Average signal strength of usable satellites 43.32 (Good)

## 11. Connecting to a clock via a WAN

Tekron clocks that have already been configured with the appropriate IP Address, Netmask and Gateway settings support remote configuration over one or more network routers (WAN). The user can communicate with the target clock by clicking the “add...” button in the clock list, or by right-clicking in the clock list section and clicking “add” from the drop-down list (refer to Figure 88) , and then entering the clock’s IP address in the “IP address entry” window (refer to Figure 89). The availability of the remote configuration feature over a WAN is dependent on the WAN configuration. It is likely that port forwarding and/or firewall exceptions will be required (refer to section 4 for port numbers). Refer to your Network Administrator if you are unsure.

Once connected to the target clock, follow the instructions in section 7 to configure the clock.

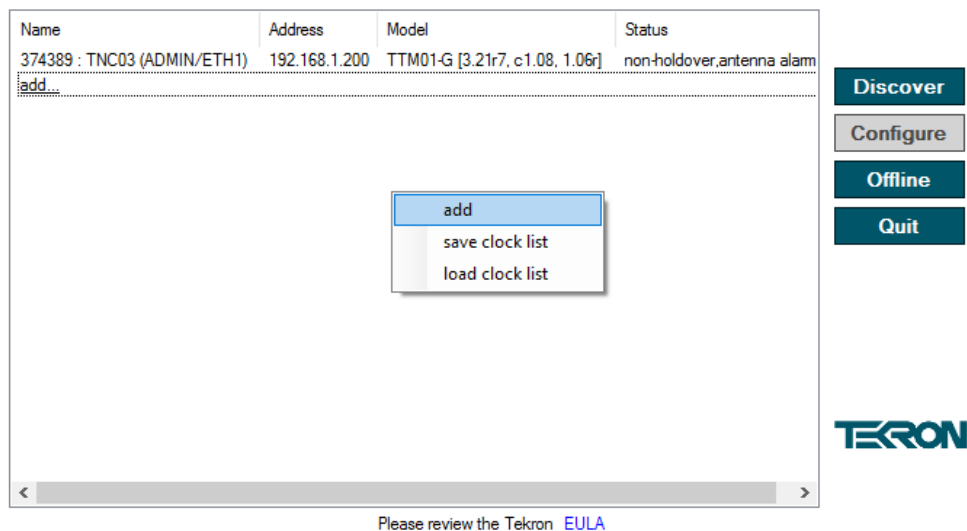


Figure 88 - Add clock

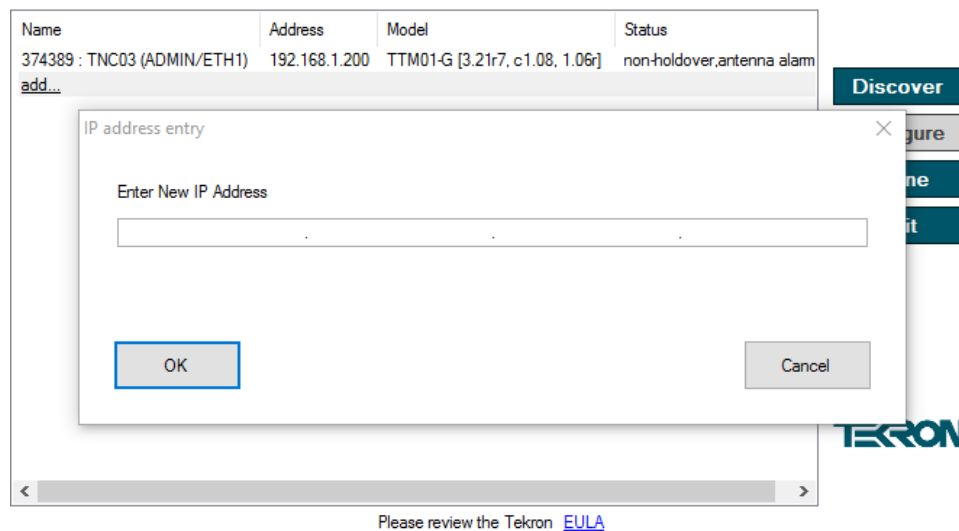


Figure 89 - "IP address entry" window



## 12. Remote Management

As an administrator, you may wish to access all clocks remotely via a WAN to obtain real-time information on their status. To facilitate this without manually having to enter in the IP address of the clocks each time, the software provides functionality to save clocks to a list in .txt format. The file can then be loaded using the “load clock list” function. It can also be edited using the “add” and “remove” options, and then the list can be re-saved (refer to Figure 90).

**Note:** when loading a saved clock list, the IP address of a clock may have since been changed by a third party who has access to the clock. In this case, the configuration software will be unable to contact that clock.

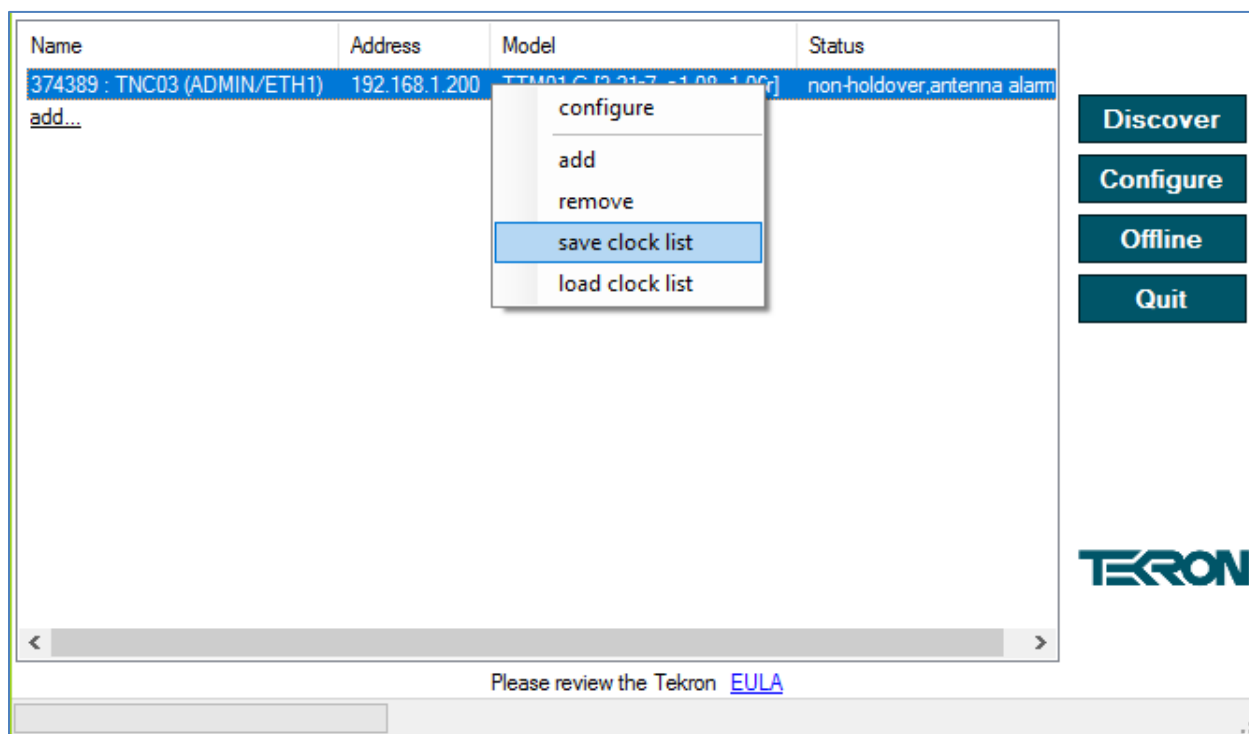


Figure 90 - Clock list options

### Automatically loading a clock list

Tekron's Configuration Software supports a command line option that allows a specified saved clock list to be automatically loaded when launching the configuration tool. Appending the file name of a saved clock list to the command used to launch the configuration tool will cause that list to be loaded automatically.

It is possible to create a shortcut that will automatically load a saved clock list. Create a shortcut to the configuration software executable and add a space, then the file name of the saved clock list to the end of the Target of the shortcut. Refer to Figure 91 for an example.

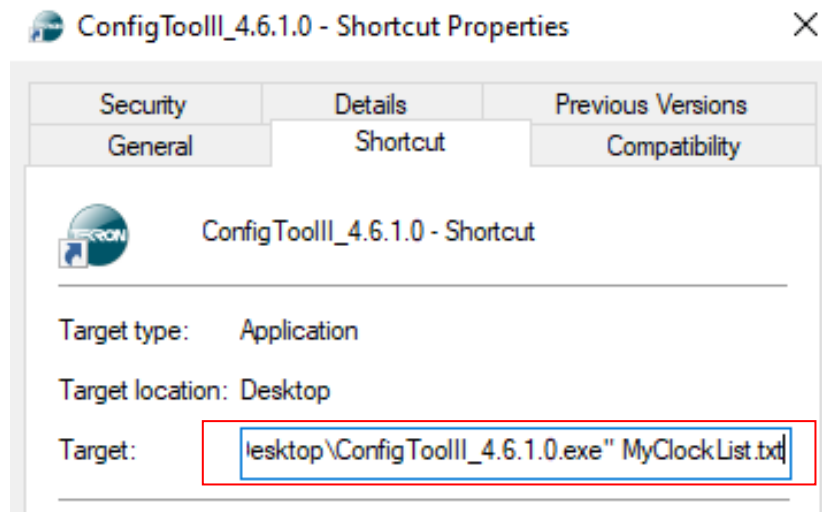


Figure 91 - Clock list shortcut example

## 13. Glossary

This manual contains commonly used abbreviations (acronyms and initialisms) which are used industry wide. Below is a list of the abbreviations used, their meanings and corresponding definitions.

ARP	Address Resolution Protocol
BMC	Best Master Clock
BMCA	Best Master Clock Algorithm
Clock	A Tekron Ethernet configurable clock
DCF77	D (Deutschland) C (signifies long range transmitter) F (location identifier) 77 (carrier frequency) Follows the ITU Article 19 of Radio Regulations, "Identification of Stations"
DCLS	Direct Current Level Shift
DNS	Domain Name System
GLONASS	GLObal NAvigation Satellite System (Operated by the Russian Aerospace Defense Forces)
GNSS	Global Navigation Satellite System
GPS	Global Positioning System (Operated by the US Department of Defense)
HSR	High-availability Seamless Redundancy
IED	Intelligent Electronic Device
IP	Internet Protocol
IRIG-B	Inter Range Instrumentation Group IRIG STANDARD 200-04 time code format B
LAN	Local Area Network
LBO	Line Build-Out
LCD	Liquid Crystal Display
LDT	Local Daylight Time
LST	Local Standard Time
MAC	Media Access Control
NAVSTAR	NAVigation System using Timing And Ranging
NMEA	National Marine Electronics Association
NTP	Network Time Protocol
PRP	Parallel Redundancy Protocol
PTP	Precision Time Protocol
SFP	Small Form-factor Pluggable
SNMP	Simple Network Management Protocol
SNTP	Simple Network Time Protocol
SSM	Synchronization Status Message
SV	Space Vehicle
TAI	International Atomic Time
TCF	Tekron Configuration File
UDP	User Datagram Protocol
USB	Universal Serial Bus
USM	User-based Security Model
UTC	Coordinated Universal Time

VLAN	Virtual Local Area Network
WAN	Wide Area Network
XML	Extensible Markup Language

## Appendix

### 7.1. Troubleshooting

#### Failed to Discover or connect to Clock

##### **Retry Discover**

If the clock is connected to the local subnet, then try the Discover button again. Any clocks that were not found during the first discovery attempt will be added to the list.

##### **Clock Add**

If the clock is connected via a WAN, then click on 'add...' and enter the IP address of the clock.

##### **Check Network settings**

If the clock is on the same subnet as your host PC, you will need to check that the clock and host PC have the same netmask and appropriate IP addresses. For example, if your PC has IP address 192.168.1.1 and netmask 255.255.255.0 then the clock should be given an IP address in the range 192.168.1.2 to 192.168.1.254 and the netmask 255.255.255.0. Use the host PC "ping" feature to see if a connection can be made to the clock, or if IP address conflicts exist. If the clock features a front panel LCD, it may be capable of displaying the current IP address when the front panel button is pressed, depending on firmware version.

##### **Check Firewall settings**

Your host PC firewall or antivirus software may be blocking the Tekron Configuration Software. To allow the software to communicate through your firewalls, you will need to make Tekron's Configuration Software an exception in the Firewall Settings. Refer to your network administrator if you are unsure. Refer to Appendix 7.2 for a guide to creating an exception in Windows Firewall.

##### **Check for other Third-Party Communications Software**

In some cases, third party communications software installed for remote connectivity to a corporate network via a WAN can inhibit Tekron's Configuration Software from binding to the host's Ethernet port. Consult your network administrator if you feel this may be an issue.

##### **Check the settings on all switches and routers on the WAN and/or LAN**

Some network devices will block, in either one direction or both directions, the UDP ports which Tekron's Configuration Software uses to communicate. Check your settings on all switches and routers to ensure they are not blocking communication. Consult your network administrator if you are unsure.

##### **Clock IP Address may have been changed**

If you have loaded a copy of a clock list from a local file, check that the clock's network settings have not been changed by a third party who has access to the clock. Connect to the same LAN as the clock and run Tekron's Configuration Software and click the "Discover" button to find the clock.

##### **Check your Network Cabling**

Check that the link (Ink) LED is illuminated on the clock and intermediary network devices. If the Ink LED is not illuminated on the clock, ensure that the cable is plugged in properly, and that is the correct type. Older clocks may require an Ethernet crossover cable if you are directly connected.

## Clock will not store changes

It is sometimes possible for Tekron's Configuration Software to connect to a clock on a network despite having incorrect network settings configured in the clock or the host PC. However, in these circumstances, connectivity is often intermittent causing issues storing configuration changes. The most effective way to resolve this is to correct the network configuration issues.

If the clock has incorrect network settings, try configuring via direct connection and changing the network adaptor settings for the host to the appropriate settings to match the clock's subnet settings. Once you have a successful connection, change the clock's network settings to match the network it is being installed in and revert the host's network adaptor settings to its original configuration.

## Cannot see features described in this manual

If a clock is configured in "Secure Mode", administrators can configure individual Groups with various levels of access to control what users who belong to the group can view and edit. If you cannot see features described in this manual, it is either because they are unsupported on the clock that you are connected to, or you do not have sufficient administrative rights. In this case, verify that the feature should be supported and contact your clock administrator. If you still cannot resolve the issue, contact your local Tekron Partner for assistance.

Not all clocks feature all screens/options shown in this manual, or may not be licensed for that feature. 'Online' information will not be available if using the Tekron Configuration Software 'offline' mode.

## Features available in earlier versions of Tekron's Configuration Software are not available in this version

Due to substantial changes in technology, some of the older features may not be configurable using the latest Tekron Configuration Software version. It is recommended that you revert to an earlier version to use these features. These features may be added in a later version as the Tekron Configuration Software is constantly being developed and improved.

## Clock has an unexpected IP address

If the clock is configured for DHCP, and it does not receive a response from a DHCP server on the network, it will revert to a link local address (169.254.xxx.xxx). Check that there is a working DHCP server on the same subnet as the clock, or alternately configure the clock to use a static IP address.

If a DHCP server is present but obtaining an address via DHCP is unreliable, increasing the number of DHCP retries may help. Refer to section 7.7.6.

## Clock has no IP address

Clock Ethernet ports that have no link will indicate an IP address of 0.0.0.0. Check that the Ethernet cable is plugged in properly, and that the link LED is illuminated.

If the clock is a legacy clock configured to use DHCP, and it does not receive a response from a DHCP server on the network, it may revert to an IP address of 0.0.0.0. In this case, the Clock will need to be connected to a network with a working DHCP server in order to configure it.

## 7.2. Creating a firewall exception for the Tekron Configuration Software

Firewall software running on your host PC can block Tekron's Configuration Software from communicating with your network, causing it to be unable to discover or connect to clocks. To resolve the problem, the Configuration Software must be allowed access through the firewall by adding a firewall exception.

The following procedure outlines how to create a firewall exception in Windows Firewall on Windows 7. The following procedure is provided as a guide only, as the required steps may differ from those described here, depending on your version of Windows.

If your PC is a member of a domain, your Network Administrator may have restricted access to Windows Firewall settings. Refer to your Network Administrator if you are unsure.

If your PC is running third-party firewall software, please refer to the documentation provided by the vendor of that software. Refer to section 4 - "Dependencies", if port numbers are required to create a firewall exception.

### Procedure:

1. Go to Windows Firewall settings. This can be done by clicking the Start button, then click "Control Panel", then click "Windows Firewall". If the "Windows Firewall" option is not visible, first click "System and Security".

**Note:** In Windows 10 'Windows Firewall' has been renamed to 'Windows Defender Firewall'

2. In the left sidebar, click the "Allow a program or feature through Windows Firewall" link. Refer to Figure 83.

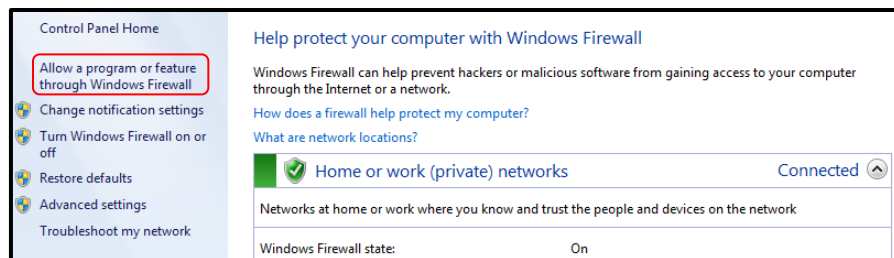


Figure 83 - Allowing a program through Windows Firewall

3. Click the "Change settings" button. Refer to Figure 84.

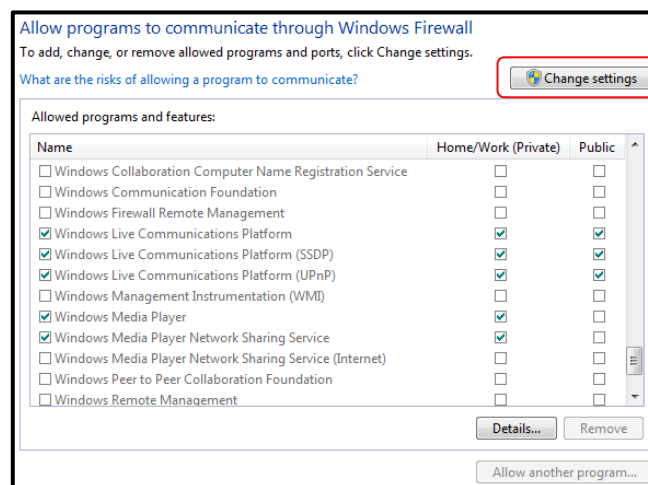


Figure 84 - Enabling firewall settings changes

- Click the “Allow another program...” button. Refer to Figure 85.

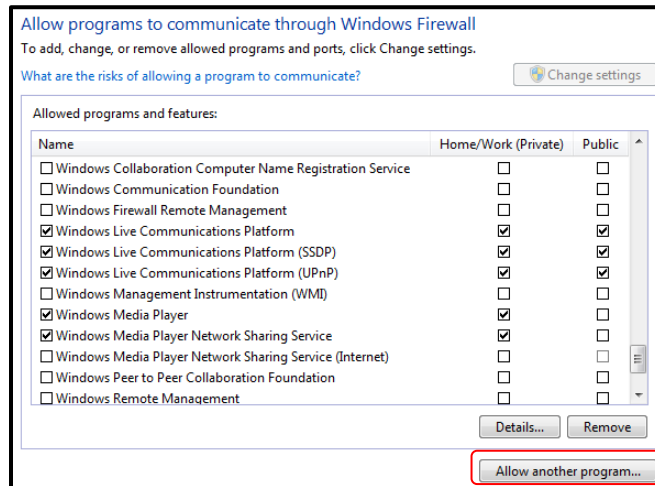


Figure 85 - Adding another program to allowed list

- Click the “Browse...” button. Refer to Figure 86.

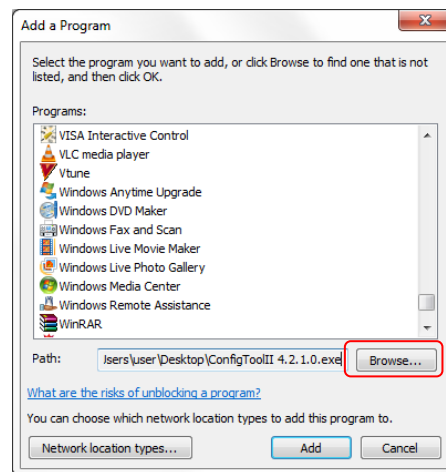


Figure 86 - Browsing for executable to add

- Browse to the location of the Configuration Tool executable, select it, and click the “Open” button.
- Click the “Network location types...” button. Refer to Figure 87.

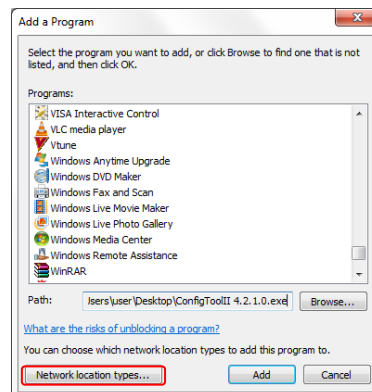
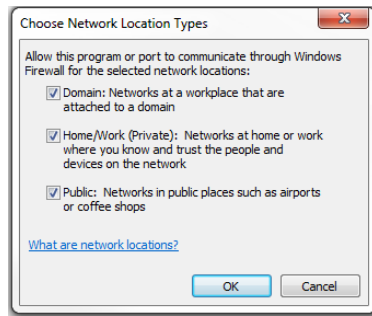


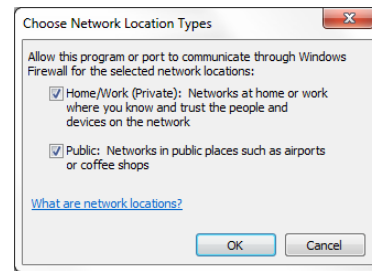
Figure 87 - Choose network location types



8. Check all checkboxes next to the Domain (if present), Home/Work, and Public network locations, and click the “OK” button.



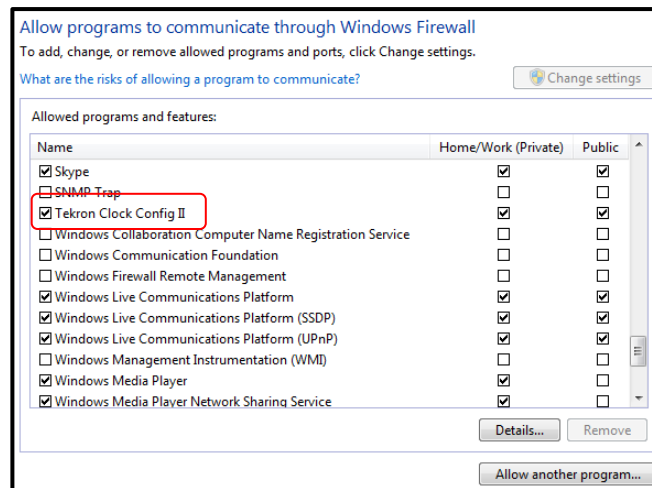
**Figure 88 - Selecting network location types (domain network)**



**Figure 89 - Selecting network location types (non-domain network)**

This is necessary to ensure that the Configuration Software can communicate with a directly connected Clock. Windows will be unable to determine the network type when connected directly to a clock, and so will use the “Public” network type by default.

9. Click the “Add” button. “Tekron Clock Config II” should now appear in the allowed programs list. Refer to Figure 90.



**Figure 90 - Configuration software added to allowed programs list**

10. Click the “OK” button.
11. Close the Windows Firewall settings window.

The Configuration Software should now be allowed through the firewall and able to connect to clocks.

## 7.3. Serial String Formats

### NGTS Time Code

About	Normally used in conjunction with 10 ms pulse on P4 pin 1 that finishes precisely on the minute.
Timing	Transmitted once per minute. Sent during the last second before the minute rollover to which the data in the string refers.
Recommended Settings	9600bps, 8-bit ASCII, no parity
Definition	TyyMMDDwhhmmx<CR><LF>

Placeholder	Content
T	"T"
yy	Last two digits of the year: e.g. "12" = the year 2012
MM	Month: "00" = January ... "12" = December
DD	Day of Month: 01...31
w	Day of week: "1"=Monday ... "7"=Sunday
hh	Two digit hour
mm	Two digit minute
x	Time mode: "0" = Local time, "1" = UTC time
<CR>	Carriage Return: HEX 0D
<LF>	Line Feed: HEX 0A

Example	Interpretation
T020422112340<CR><LF>	Monday 22 April 2002 – 12:34 local time

## IRIG J-17 Time Code

About	This code is compatible with IRIG Standard 212-00.
Timing	Transmitted once every second. The leading edge of the “start” bit of the first character <SOH> is exactly on the second that the message describes.
Recommended Settings	9600bps, 7-bit ASCII, odd parity
Definition	<SOH>ddd:hh:mm:ss<CR><LF>

Placeholder	Content
<SOH>	HEX 01
ddd	Day of year: range “001” – “366”
:	HEX 3A
hh	hour: “00” – “23”
mm	minute: “00” – “59”
ss	Seconds: “00” – “59”
<CR>	HEX 0D
<LF>	HEX 0A

Example	Interpretation
<SOH>112:12:34:36<CR><LF>	day 112, time 12:34:36

## String-A Time Code

About	This code is very similar in data content to the IRIG J-17 code, but adds a two-character field containing the year, and uses 8-bit ASCII, no parity data format.
Timing	Transmitted once every second. The leading edge of the “start” bit of the first character <SOH> is exactly on the second that the message describes.
Recommended Settings	9600bps, 8-bit ASCII, no parity
Definition	<SOH>ddd:hh:mm:ss:yy<CR><LF>

Placeholder	Content
<SOH>	HEX 01
ddd	Day of Year: range “001” – “366”
:	HEX 3A
hh	hour: “00” – “23”
mm	minute: “00” – “59”
ss	seconds: “00” – “59”
yy	year: “00” – “99” representing the last two digits of the year
<CR>	HEX 0D
<LF>	HEX 0A

Example	Interpretation
<SOH>112:12:34:36:10<CR><LF>	day 112, time 12:34:36, year (20)10

## String-B Time Code

About	This code substitutes a “Quality” indicator byte for the year field, but otherwise is identical in form, function and timing to String-A.
Timing	Transmitted once every second. The leading edge of the “start” bit of the first character <SOH> is exactly on the second that the message describes.
Recommended Settings	9600bps, 8-bit ASCII, no parity
Definition	<SOH> DDD:hh:mm:ssQ<CR><LF>

### Placeholder

<SOH>

ddd

:

hh

mm

ss

Q

### Content

HEX 01

Day of Year: range “001” – “366”

HEX 3A

hour: “00” – “23”

minute: “00” – “59”

seconds: “00” – “59”

### Character

HEX

ASCII

20

' ' (space)

Clock in sync, timing accuracy is better than 60 ns

2E

'.' (full

Clock is accurate to 1  $\mu$ s

stop)

2A

'\*'

Clock is accurate to 10  $\mu$ s

23

'#'

Clock is accurate to 100  $\mu$ s

3F

'?'

Clock accuracy may be worse than 100  $\mu$ s

<CR>

HEX 0D

<LF>

HEX 0A

### Example

<SOH>112:12:34:36?<CR><LF>

### Interpretation

day 112, time: 12:34:36, >100  $\mu$ s sync error

## String-C Time Code

About	This code is effectively a combination of String-A and String B. It provides both year information and a sync indicator field.
Timing	Transmitted once every second. The leading edge of the “start” bit of the first character, <CR>, is exactly on the second to which the message data refers.
Recommended Settings	9600bps, 8-bit ASCII, no parity
Definition	<CR><LF>Q_yy_ddd_hh:mm:ss.000<SPACE><SPACE><SPACE>

Placeholder	Content
<CR><LF>	HEX 0D,0A
Q	Quality indicator: “ ” = in-sync, “?” = out-of-sync
(space)	HEX 20
yy	Year: “00” – “99” representing the last two digits of the year
(space)	HEX 20 (space)
ddd	Day of year: range “001” – “366”
(space)	HEX 20 (space)
hh	hour: “00” – “23”
mm	minute: “00” – “59”
Ss	seconds: “00” – “59”
.000	ASCII “.000”
(space)	HEX 20 (space)
(space)	HEX 20 (space)
(space)	HEX 20 (space)

Example	Interpretation
<CR><LF>? 02 112	day 112 of year (20)02, time: 12:34:36, out-of-sync
12:34:36.000	

## String-D Time Code

About	String-D is IDENTICAL in content to String-B, but the second mark is at the leading edge of the start-bit of the (<CR>).
Timing	Transmitted once every second. The leading edge of the “start” bit of the first character, <CR>, is exactly on the second to which the message data refers.
Recommended Settings	9600bps, 8-bit ASCII, no parity
Definition	<SOH> DDD:hh:mm:ssQ<CR><LF>

### Placeholder

<SOH>

ddd

:

hh

mm

ss

Q

### Content

HEX 01

Day of Year: range “001” – “366”

HEX 3A

hour: “00” – “23”

minute: “00” – “59”

seconds: “00” – “59”

### Character

HEX

ASCII

20

‘ ’ (space)

Clock in sync, timing accuracy is better than 60 ns

2E

‘.’ (full

Clock is accurate to 1  $\mu$ s

stop)

2A

‘\*’

Clock is accurate to 10  $\mu$ s

23

‘#’

Clock is accurate to 100  $\mu$ s

3F

‘?’

Clock accuracy may be worse than 100  $\mu$ s

<CR>

HEX 0D

<LF>

HEX 0A

### Example

<SOH>112:12:34:36?<CR><LF>

### Interpretation

day 112, time: 12:34:36, >100  $\mu$ s sync error

## String-E Time Code

About	This provides time, year information, and a sync indicator field.
Timing	The string is transmitted once every second, with the leading edge of the “start” bit of the <CR> exactly on the second.
Recommended Settings	9600bps, 8-bit ASCII, no parity
Definition	<SOH>YYYY:dd:hh:mm:ssQ<CR><LF>

Placeholder	Content
<SOH>	HEX 01
YYYY	4-digit year
:	HEX 3A
ddd	Day of year: range “001” – “365”
hh	hour: “00” – “23”
mm	minute: “00” – “59”
ss	seconds: “00” – “59”
Q	Quality character, as defined in String-B (above)
<CR>	HEX 0D
<LF>	HEX 0A

Example	Interpretation
<SOH>2004:112:12:34:36?<CR><LF>	2004, day 112, 12:34:36pm, >100us sync error



## String-F Time Code

About	This string complies with the protocol required to drive Vorne type Time Displays.
Timing	The string is transmitted once every second, with the leading edge of the “start” bit of the last <BEL> exactly on the second.
Recommended Settings	9600bps, 8-bit ASCII, no parity
Definition	<CR><LF> 1100<CR><LF> 44hhmmss<CR><LF> 54ddd<CR><LF> 45HHMMss<CR><LF> 55DDD<CR><LF><BEL>

Placeholder	Content
<CR>	HEX 0D
<LF>	HEX 0A
1100	ASCII “1100”
44	ASCII “44” (means local time follows)
hh	Local hour of day: “00” – “23”
mm	Local minute of day: “00” – “60”
ss	seconds: “00” – “59”
54	ASCII “54” (means local day of year follows)
ddd	Local day of year: “001” – “365”
45	ASCII “45” (means UTC time follows)
HH	UTC hour: “00” – “23”
MM	UTC minute: “00” – “59”
55	ASCII “55” (means UTC day of year follows)
DDD	UTC Day of year: “001” – “365”
<BEL>	HEX 07
<CR>	HEX 0D
<LF>	HEX 0A

## String-G Time Code

About	This general time string is used predominantly in Europe.
Timing	The string is transmitted once every second, with the leading edge of the “start” bit of the last <ETX> exactly on the second.
Recommended Settings	9600bps, 8-bit ASCII, no parity
Definition	<STX>swhhmmssddMMyy<LF><CR> <ETX>

### Placeholder

<STX>

s

### Content

HEX 02

The s “Clock Status” is an ASCII character in the range 0-9, A-F representing a single hex digit. To interpret the value, the Hex digit should be converted to a Nibble (half a byte) and referenced against the state chart below which contains the bit position and subsequent definition (“x” is a place holder).

Bit 3	Bit 2	Bit 1	Bit 0	Definition
x	x	x	0	No announcement for time change
x	x	x	1	Announcement for time change – active for an hour before
x	x	0	x	Local Standard Time (LST)
x	x	1	x	Daylight Saving Time (DST)
0	0	x	x	Time/date invalid – clock is out of sync
0	1	x	x	Hold-over mode – running on local Oscillator
1	0	x	x	GNSS / IRIGB controlled mode
1	1	x	x	GNSS / IRIGB controlled mode (high accuracy)

w

The w “Day of Week” is an ASCII character in the range 0-9, A-F representing a single hex digit. To interpret the value, the Hex digit should be converted to a Nibble (half a byte) and referenced against the state chart below which contains the bit position and subsequent definition (“x” is a place holder).

Bit 3	Bit 2	Bit 1	Bit 0	Definition
1	x	x	x	UTC time
X	0	0	1	Monday
X	0	1	0	Tuesday
X	0	1	1	Wednesday
X	1	0	0	Thursday
X	1	0	1	Friday
X	1	1	0	Saturday
X	1	1	1	Sunday

hh

hour of day: “00” – “23”

mm

minute of day: “00” – “60”

ss

seconds: “00” – “59”

dd

day of month: “01” – “31”

MM

month of year: “01” – “12”

yy

year: “10” – “99”

<LF>

HEX 0A

<CR>

HEX 0D

<ETX>

HEX 03

### Example

### Interpretation

<STX>E3123456170410<LF><CR><ETX> High Accuracy Mode, DST, Wed, 12:34:56, 17/4/2010

## String-H Time Code

About

Timing Transmitted once every second. The leading edge of the “start” bit of the first character <STX> is exactly on the second that the message describes.

Recommended Settings 9600bps, 8-bit ASCII, no parity

Definition <STX>D:dd.MM.yy;T:w;U:hh.mm.ss;uvxy<ETX>

Placeholder	Content
<STX>	HEX 02
D	ASCII “D”
:	HEX 3A
dd	day of month: “01” – “31”
.	HEX 2E
MM	month of year: “01” – “12”
yy	year: “10” – “99”
;	HEX 3B
T	ASCII “T”
w	day of week: “1” – “7”, “1” = Monday
U	ASCII “U”
hh	hour: “00” – “23”
mm	minute: “00” – “59”
ss	seconds: “00” – “59”
u	ASCII “#” if out of sync or space (HEX 20) if in sync
v	ASCII “*” if out of sync or space (HEX 20) if in sync
x	ASCII “U” if UTC time, ASCII “S” if DST, or space (HEX 20) if standard time
y	ASCII “!” if DST change pending, ASCII “A” if leap second pending, space (HEX 20) otherwise
<ETX>	HEX 03

Example	Interpretation
<STX>D:17.04.10;T:6;U:12:34:56;#*S!<ETX>	17/4/2010, Sat, 12:34:56, out of sync, DST, DST change pending

## NMEA ZDA Time Code

About	This string is in accordance with the NMEA-0183 standard in content, but is transmitted at 9600bps.
Timing	Transmission is once every second. The leading edge of the “start” bit of the “\$” is exactly on the second.
Recommended Settings	9600bps, 8-bit ASCII, no parity
Definition	\$GPZDA,hhmmss.00,dd,mm,yyyy,s,xx,yy*CC<CR><LF>

Placeholder	Content
\$GPZDA	ASCII “\$GPZDA”
,	ASCII “,” (comma)
hh	UTC hour of day: “00” – “23”
mm	UTC minute of day: “00” – “60”
ss	UTC Seconds: “00” – “59”
.00	ASCII “.00”
dd	UTC day of month: “01” – “31” depending on which month
mm	UTC month: “01” – “12”, “01” = January
yyyy	UTC year, 4 digits.
s	Local time zone offset sign (positive means local time leads UTC)
xx	Local time zone offset from UTC in hours
yy	Local time zone offset from UTC in minutes
*	ASCII “*”
CC	2-digit hex representation of the result of XORing the 8 data bits of each character between, but not including the “\$” and “*”. (00-FF)
<CR>	HEX 0D
<LF>	HEX 0A

Example	Interpretation
\$GPZDA,123456.0023042010+1200*	UTC time is 12:34:56, 23 April 2010, the local time offset is +12:00

## NMEA RMC Time Code

About	This string is compatible with and defined by the NMEA-0183 standard.
Timing	Transmission is once every second. The leading edge of the “start” bit of the “\$” is exactly on the second.
Recommended Settings	9600bps, 8-bit ASCII, no parity
Definition	\$GPRMC,hhmmss.00,a,tttt.tttt,N,ggggg.gggg,W,0.0,0.0,DDMMYY,0.0,E *CC<CR><LF>

Placeholder	Content
\$GPRMC	ASCII “\$GPRMC”
,	ASCII “,” (comma)
hhmmss	UTC hour of day, minute of day, seconds
.	ASCII “.” (full stop)
0	ASCII “0”
a	Status: “A” = valid, “V” = invalid
tttt.tttt	Latitude (degrees, minutes): “0000.0000” – “8959.9999”
N	Latitude (north/south): “N” = north, “S” = south
ggggg.gggg	Longitude (degrees, minutes): “00000.0000” – “35959.9999”
W	Longitude (east/west): “E” = east, “W” = west
ddmmyy	UTC day of month, month, 2-digit year:
E*	ASCII “E*”
CC	2-digit hex representation of the result of XORing the 8 data bits of each character between, but not including the “\$” and “*”.
<CR>	HEX 0D
<LF>	HEX 0A

### NOTES

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