



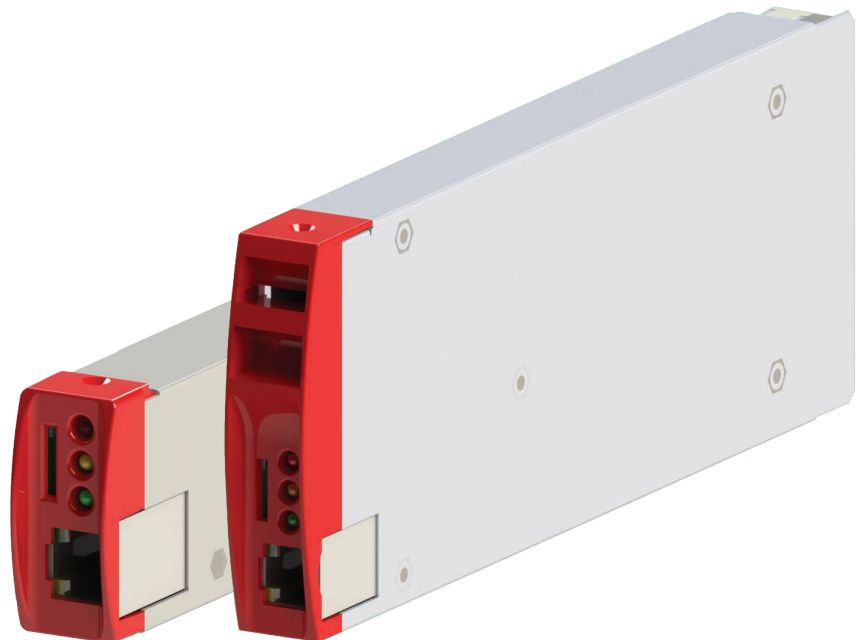
Leading Conversion Technology for Power Resilience

# MONITORING - T2S ETH with Catena

## User Manual V2.0

### THE NEW GENERATION OF MONITORING

- EXTENDED LOG CAPABILITIES
- WEB-BASED USER INTERFACE
- COMPATIBLE WITH CATENA



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## Release Note:

Version	Release date (DD/MM/YYYY)	Modified page number	Modifications
1.0	11/04/2016	-	First release of the manual.
1.1	27/01/2017	17, 32 and 39	Catena and SNMP details updated.
		46	Added Annex.
1.2	18/09/2017	42 - 47	Modbus Testing Procedure.
1.3	10/08/2018	-	Added SNMP Details.
1.4	03/10/2018	76	Updated Modbus details.
2.0	26/03/2020	-	New layout

# 1. CE+T at a glance

---

CE+T Power designs, manufactures, and markets a range of products for industrial operators with mission critical applications, who are not satisfied with existing AC backup system performances and related maintenance costs.

Our product is an innovative AC backup solution that unlike most UPS's available.

- Maximizes the operator's applications uptime;
- Operates with lowest OPEX;
- Provides best protection to disturbances;
- Optimizes footprint.

Our systems are:

- Modular
- Truly redundant
- Highly efficient
- Maintenance free
- Battery friendly

CE+T power puts 60+ years expertise in power conversion together with worldwide presence to provide customized solutions and extended service 24/7 - 365 days per year.

## 2. Abbreviations

---

TSI	Twin Sine Innovation
EPC	Enhanced Power Conversion
REG	Regular
DSP	Digital Signal Processor
AC	Alternating current
DC	Direct current
PE	Protective Earth (also called Main Protective Conductor)
N	Neutral
PCB	Printed Circuit Board
TRS	True Redundant Structure
PWR	Power
ESD	Electro Static Discharge
MET	Main Earth Terminal
MBP	Manual By-pass
TCP/IP	Transmission Control Protocol/Internet Protocol
USB	Universal Serial Bus
LAN	Local Access Network
ETH	Ethernet
SNMP	Simple Network Management Protocol
HTTP	HyperText Transfer Protocol
HTTPS	Secure HyperText Transfer Protocol
NTP	Network Time Protocol
MIB	Management Information Base
DHCP	Dynamic Host Configuration Protocol

## 3. Warranty and Safety Conditions\*

The electronics in the power supply system are designed for an indoor, clean environment.

When installed in a dusty and/or corrosive environment, outdoor or indoor, it is important to:

- Install an appropriate filter on the enclosure door or on the room's air conditioning system. Installation of filters may result in de-rating of module.
- Keep the enclosure door closed during operation.
- Replace the filters on a regular basis.

**Important Safety Instructions, Save These Instructions.**

### 3.1 Disclaimer

- The manufacturer declines all responsibilities if equipment is not installed, used, or operated according to the instructions herein by factory certified technicians according to local regulations.
- Warranty does not apply if the product is not installed, used, and handled according to the instructions in the manuals.

### 3.2 Technical care

- This electronic equipment can only be repaired or maintained by a "qualified employee" with adequate training. Even personnel who are in charge of simple repairs or maintenance are required to have knowledge or experience related to product maintenance.
- Please follow the procedures contained in this Manual, and note all the "DANGER", "WARNING" AND "NOTICE" marks contained in this Manual. Warning labels must not be removed.
- Qualified employees are trained to recognize and avoid any dangers that might be present when working on or near exposed electrical parts.
- Qualified employees understand how to lock out and tag out machines so the machines will not accidentally be turned on and injure employees working on them.
- Qualified employees also understand safety related work practices, including those by OSHA and NFPA, as well as knowing what personal protective equipment should be worn.
- All operators are to be trained to perform the emergency shut-down procedure.
- Never wear metallic objects such as rings, watches, or bracelets during installation, service and maintenance of the product.
- Insulated tools must be used at all times when working with live systems.
- When handling the system/units pay attention to sharp edges.

---

\* These instructions are valid for most CE+T Products/Systems. Some points might however not be valid for the product described in this manual.



### 3.3 Installation

- This product is intended to be installed only in restricted access areas.
- The user must observe the recommended upstream and downstream circuit breaker requirements as per the local regulations.
- Please use extreme caution when accessing circuits that may be at hazardous voltages or energy levels.
- The modular inverter rack is a dual input power supply. The complete system shall be wired in a way that both input and output leads can be made power free.
- In REG systems, to comply with local and international safety standards the N (output) and PE shall be bonded. The bonded connection between N (output) and PE must be removed once the AC input is connected.
- AC and DC circuits shall be terminated with no voltage / power applied.
- The safety standard IEC/EN62040-1-1 requires that, in the event of an output short circuit, the inverter must disconnect in 5 seconds maximum. The parameter can be adjusted on T2S ETH monitoring; however, if the parameter is set at a value > 5 seconds, an external protection must be provided so that the short circuit protection operates within 5 seconds. Default setting is 60 seconds.
- The system is designed for installation within an IP20 or IP21 environment. When installed in a dusty or humid environment, appropriate measures (air filtering) must be taken. Installation of filters may result in de-rating of module.
- All illustrations in the manual are for general reference, refer to the technical drawing which is received along with the system for exact information.

#### 3.3.1 Handling

- The cabinet shall not be lifted using lifting eyes.
- Remove weight from the cabinet by unplugging the inverters. Mark inverters clearly with shelf and position for correct rebuild. This is especially important in dual or three phase configurations.
- Empty T2S positions should not be left open. Replace either with a T2S or dummy cover.

#### 3.3.2 Surge and transients

The mains (AC) supply of the modular inverter system shall be fitted with Lightning surge suppression and Transient voltage surge suppression suitable for the application at hand. Manufacturer's recommendations of installation shall be adhered to. Selecting a device with an alarm relay for function failure is advised.

Indoor sites are considered to have a working lightning surge suppression device in service.

- Indoor sites Min Class II.
- Outdoor sites Min Class I + Class II or combined Class I+II. The modular inverter system/rack can reach hazardous leakage currents. Earthing must be carried out prior to energizing the system. Earthing shall be made according to local regulations.

#### 3.3.3 Other

- Isolation test (Hi-Pot) must not be performed without instructions from the manufacturer.

### 3.4 Pre-cautions before maintenance

- The modular inverter system/rack can reach hazardous leakage currents. Earthing must be carried out prior to energizing the system. Earthing shall be made according to local regulations.
- Prior to any work conducted on a system/unit make sure that AC input voltage and DC input voltage are disconnected.
- Inverter modules and shelves contain capacitors for filtering and energy storage. Prior to accessing the system/modules after power down, wait at least 5 minutes to allow capacitors to discharge.
- Some components and terminals carry high voltage during operation. Contact may result in fatal injury.

### 3.5 Replacement and Dismantling

- ESD Strap must be worn when handling PCBs and open units.
- CE+T cannot be held responsible for disposal of the Inverter system and therefore the customer must segregate and dispose of the materials which are potentially harmful to the environment, in accordance with the local regulations in force in the country of installation.
- If the equipment is dismantled, to dispose of its component products, you must comply with the local regulations in force in the country of destination and in any case avoid causing any kind of pollution.

To download the latest:

- Documents - [www.cet-power.com](http://www.cet-power.com)
- Softwares - [my.cet-power.com](http://my.cet-power.com)

## 4. Product Code and Identification

T2S-ETH product code with regards to sub rack:

A) T2S-ETH Monitor

Product Description	Part Number
TSI-T2S-ETH-NOVA - VEDA	T312010010
TSI-T2S-ETH-BRAVO-MEDIA 24/48/60 Vdc	T322010100
	T32201017N (without front 3 LED's)
TSI-T2S-ETH-BRAVO-MEDIA 110/220 Vdc	T322051000

B) Filler (Blank module to cover empty slots)

Product Description	Part Number
TSI-T2S-ETH-NOVA - VEDA	T312010010
BLANK PLASTIC T2S ETH ECI RED	T522010001

### 4.1 Identification labels for T2S-ETH



**Note:**

The part number, serial number, and burn in date are essential information when you contact CE+T to get help in commissioning or in troubleshooting or when the item is sent back for repair.

## 5. Introduction

---

The T2S ETH stands for T2S Ethernet. It replaces the former T2S with the same form factor but with a front Ethernet connector replacing the former USB one. Like his predecessor, T2S ETH is a monitoring solution for the full TSI inverter range and is able to monitor up to 32 inverters through a friendly web-based interface and it consumes power of 2W. T2S also supports Modbus Serial communication (RTU) and SNMP v1 Communication.

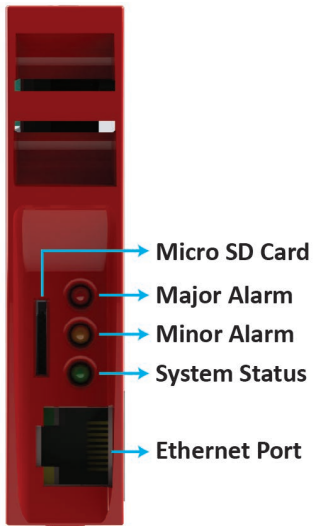
This new monitoring device provides a graphical user interface, embeds an SNMPv2c/SNMP v3 agent, and Modbus TCP support with Catena. If one needs a touch screen display, Catena can be connected to T2S ETH and is compatible. It also allows the user to change the configuration of the system via the touchscreen.

## 6. Hardware

The T2S ETH provides 3 LED's: Red for major alarm signaling, orange led for minor alarm signaling, and green led for power and network connection status.

The RJ45 is a standard ETH connector that could be connected to any IPv4 network.

T2S ETH software can be upgraded using the Micro SD card. The latest device softwares are available in [my.cet-power.com](http://my.cet-power.com)







## 6.1 LEDs code during operations

- S - Flash slow
- FS - Flash fast
- SA - Sequence one after the other
- X - Not used LED









### 6.1.1 LEDs code during normal operation










LEDs code below corresponds to system in operation and T2S ETH fully operational.

Green	Orange	Red	Status
			Slave mode (when several T2S ETH on the same bus)
			Master Mode « master »
			Minor alarm / Alarme Mineure
			Major alarm / Alarme Majeure

### 6.1.2 LED Error Code - upgrade or system start up

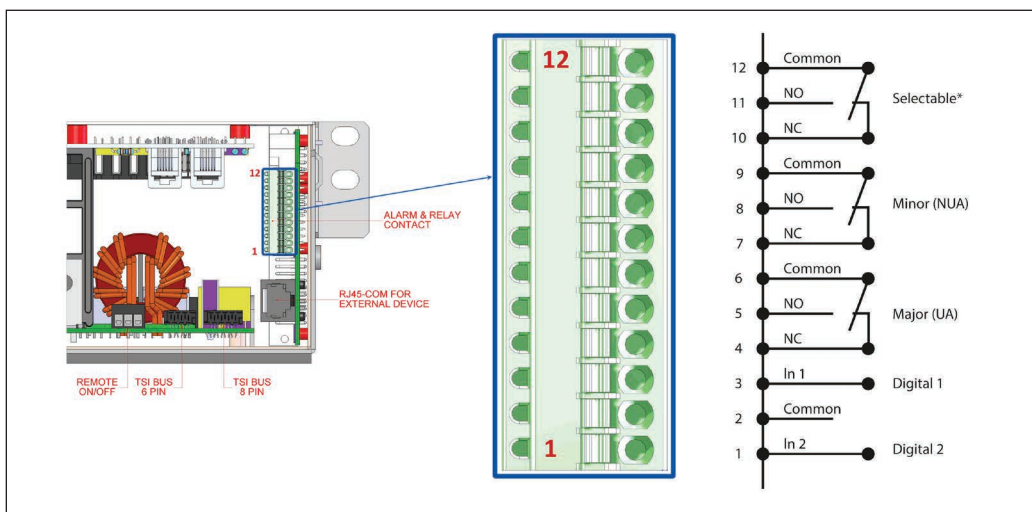
This section explains the state of the boot loader in function of his LED state. During start up, soft upgrade, configuration change or micro SD card changes.

Green	Orange	Red	Status
			Booting
			Cannot copy to flash
			No micro SD card or file *.bcf not valid or not present
			File *.acf found
			Installation *.saf please wait
			System error or no micro SD card
			Configuration.ini found waiting network

Green	Orange	Red	Status
			Boot loader Web interface ON and in operation
			System file OK but no config file *.ini
			Error SD Card / File
			Error no configuration.ini

## 6.2 Signaling Information

As it is designed to be used in the same shelf as former T2S, T2S ETH inherits the connections on the back.



**Note:** The terminal connector accepts maximum wire size of 0.5 mm<sup>2</sup>.

### Important remarks:

In a system with several shelves, T2S ETH is usually located in the top (although it is not mandatory), but relay signaling contacts will be terminated in the T2S ETH installed shelf. The above connection is an example, actual connection will be based on your shelf design and connections.

If the T2S ETH is included in a complete system, the alarm terminals will be located somewhere in the system. For exact location, refer to the system user manual.

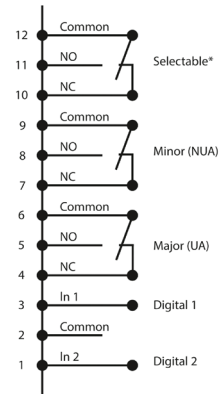
### 6.2.1 Alarm relay

There are 3 alarm contacts:

- Major
- Minor
- User selectable

As one can see in the picture: contacts 5 and 6 are closed when no major alarm is present, contact 8 and 9 are closed when no minor alarm is present.

Remark: Default mapping and level of each available alarm of the monitoring unit is available in “Annex 1: Supervisor alarms - T2S ETH”, page 65.



NB: Alarm relay are active (energized) when no alarm are present.

- Alarms relay features
  - Max current: 2 A @ 30 VDC or 1A @ 60 VDC
  - Max Power: 60 W
  - Max Voltage: 60 VDC SELV

Note that for higher voltages, it is mandatory to install an additional relay with appropriate characteristics – especially for 60/110/220 VDC.

### 6.2.2 Digital Inputs

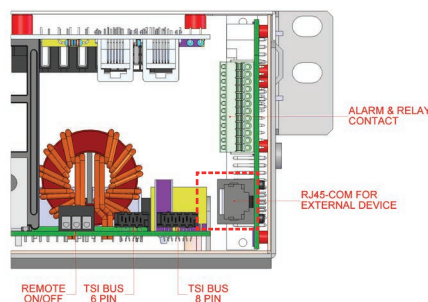
Two potential free Digital inputs are reserved for optional equipment.

- Digital Input 1 is assigned for MBP operation if used.
- Digital Input 2 is assigned for Surge Arrester if used.

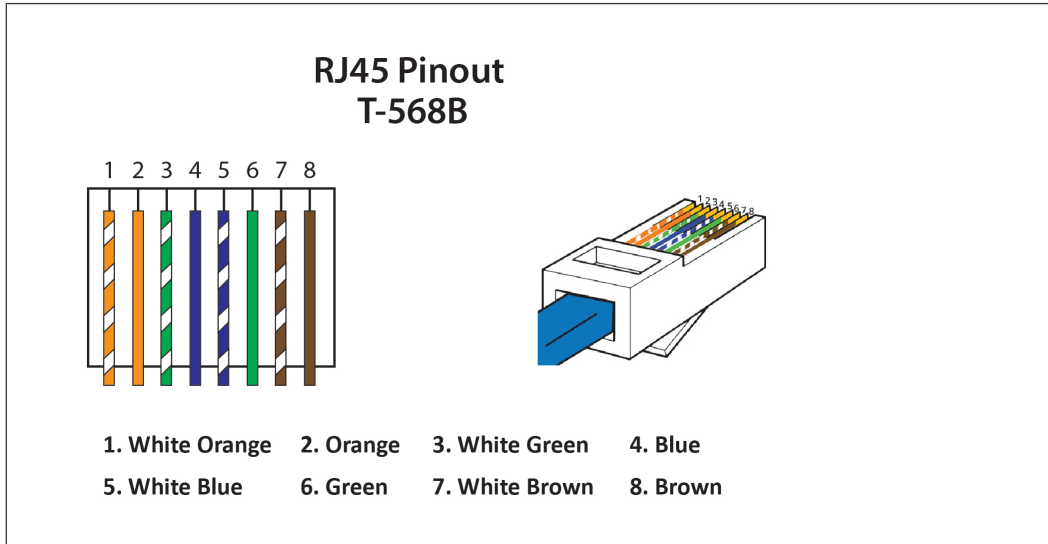
The voltage present on terminal 1 and 3 is +5 V (galvanic insulation). Care should be taken to avoid connecting any external voltage on terminal 1 to 3. External signals should be applied to these terminals via Volt-free contacts. The function is activated when the two terminals concerned are short-circuited (i.e., when the external Volt-free contact is closed).

### 6.2.3 Communication

An RJ45 connector is present at rear of the shelf and can be used for **Candis** display and **Modbus** (RTU) communication.







*Note: The colour of wires is irrelevant and may vary, but make sure the position of wires is exactly crimped.*

Pin Number	Name	Description
1	CANH	CANH pin for Candis
2	CANL	CANL pin for Candis
3	GND_IAX	Digital Communication Ground
4	GND_IAX	Digital Communication Ground
5	12V_IAX	+12 V unregulated
6	COM_A	RS 485 A
7	GND_IAX	Digital Communication Ground
8	COM_B	RS 485 B

RJ45 Pinout - Details

**Important remark:**

T2S ETH comes in only one type in terms of serial communication RS485 and support Modbus RTU (read-only).

Currently, no protocol is available for customer use on CAN bus connection and it is dedicated for Candis accessory.

The unregulated +12 V power supply is designed for powering CE+T accessories and should not be used for any other purpose.

## 6.3 Monitoring - Candis

T2S ETH also supports the Candis display and it is a monitoring device allowing the user to get information from the inverter system.

To enable Candis, connect RJ45 CAT straight cable between Candis and at rear side of the inverter shelf where T2S ETH is installed. Refer to the section 6.2.3, page 16 for the physical location of the connector and page 17 for both RJ45 PIN details for CANDIS communication.



TSI System with Candis

### 6.3.1 Display and Buttons



- 1 → Display (2 lines provided to display information).
- 2 → Up button to scroll UP in the menus.
- 3 → Down button to scroll DOWN in the menus.
- 4 → Enter button to change display or validate modifications.

### 6.3.2 Configuration

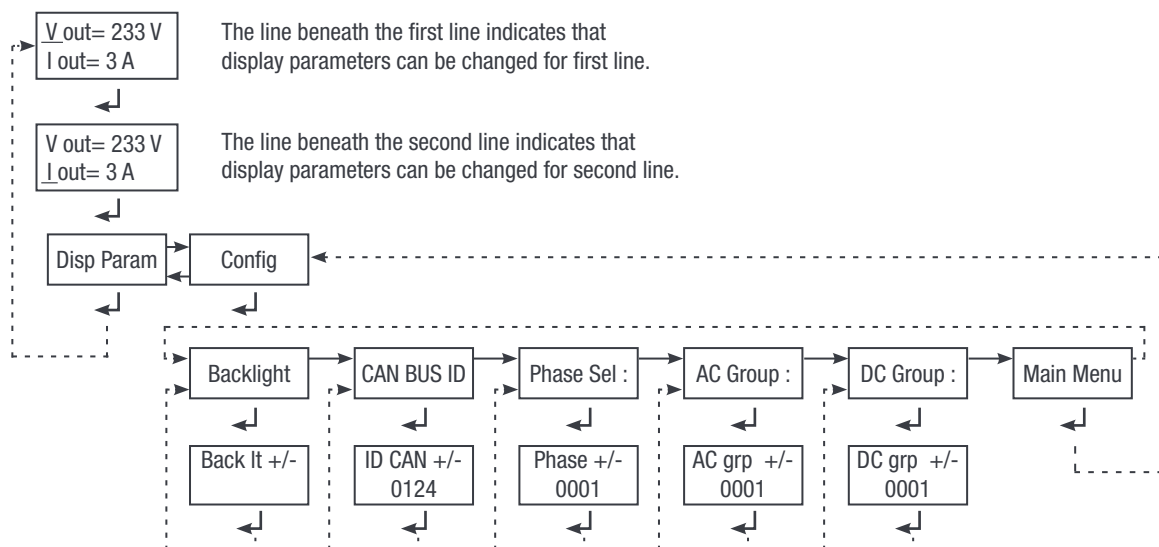
When more than one display is used on the same system, the CANBUS ID must be different for each LCD Panel and include values from 124 to 264 (i.e., as 134; 144; 154, ...264).

The other information that can be configured are the related phase, the AC group or DC group, and the adjustment of the back-light.

If the installed system is multi-phase or has multiple DC groups, the T2S and the inverter modules must be correctly configured to display the correct value by phase or DC group.

For instance, in three-phase systems, the inverter modules must be configured to show the 3 phases' output information, but also the one related to the three AC groups that correspond to each AC input phase. By doing so, the display will show the values phase by phase.

**Warning: The Candis Display is powered from the auxiliary power supply of the modules which are limited in power.**



Candis Display - Block diagram

## 6.4 Graphical User Interface - Catena

The Catena display can be used with the T2S ETH. Catena is either available in rack mount or door mount version. It consumes power of 15W.

### 6.4.1 Description

Catena has a wide 7" capacitive touch screen alongside three led following the same scheme as in T2S ETH and two connectors: USB type A and Ethernet (RJ45). A reset button is also provided. Catena software can be upgraded using the SD card. Device software is available at [my.cet-power.com](http://my.cet-power.com)

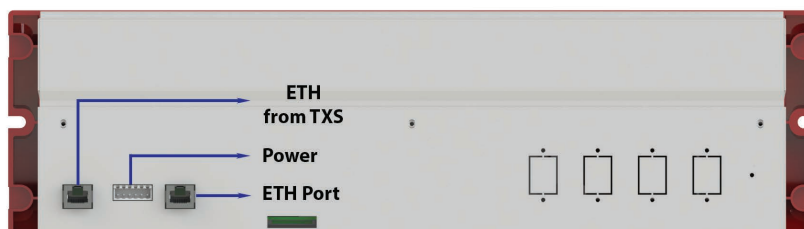


*Catena - Rack mount - Front view*

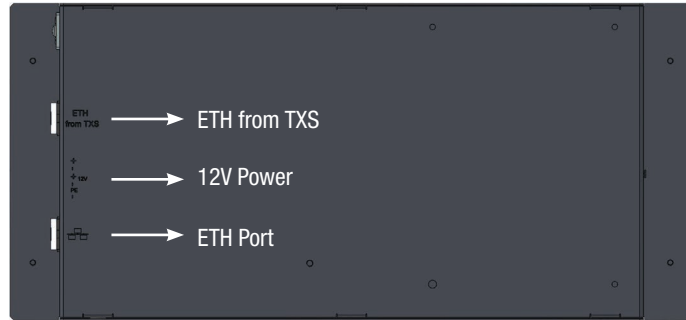


*Catena - Door mount - Front view*

At the rear of the display, there are two 12 VDC inputs that help Catena to power up via two different sources, one from the AC source and the other from the DC source. The PE is also available on power supply connector. Two Ethernet (RJ45) ports are available, one for connection to T2S ETH (see section 6.4.2, page 20) and one for permanent network connection.



*Catena - Rack mount - Rear view*



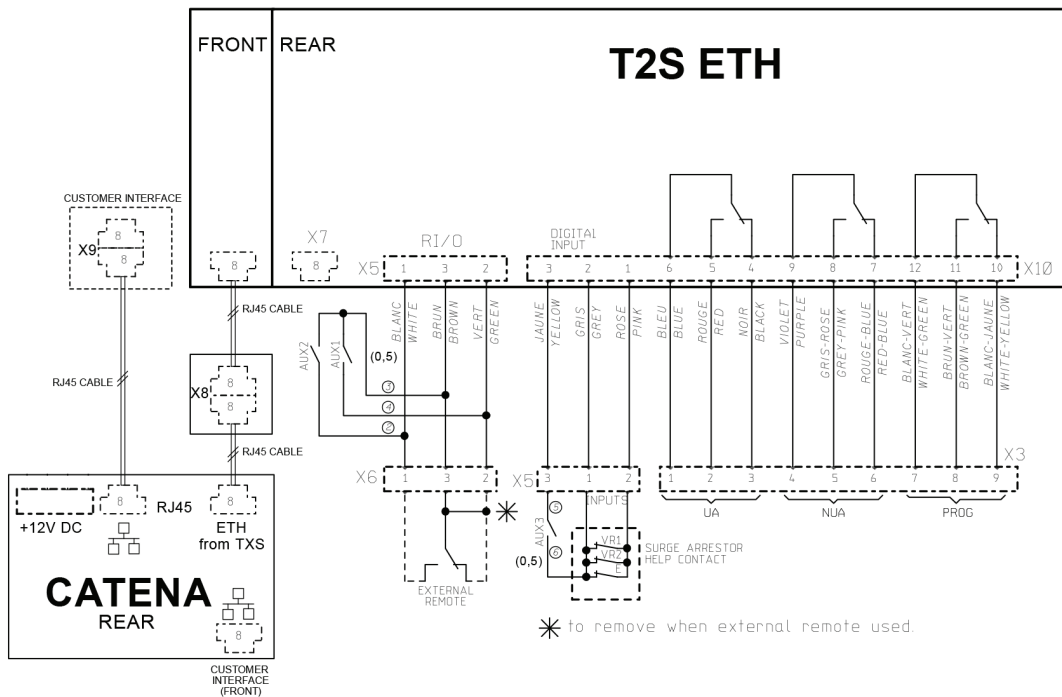
Catena - Door mount - Rear view

To establish the communication in Catena, connect RJ45 Straight CAT6e cable between rear side of the Catena (Named as ETH from TXS) and front side of the T2S-ETH connector.

**Note:** Catena has different versions. So, refer the system manual to identify the version of catena which you received.

### 6.4.2 Wiring

Catena configuration has to be selected in the T2S ETH under monitoring, network, connection mode, hardware setup should be "With Catena". Refer to section "Network", page 32 and this option has to be selected even before wiring.

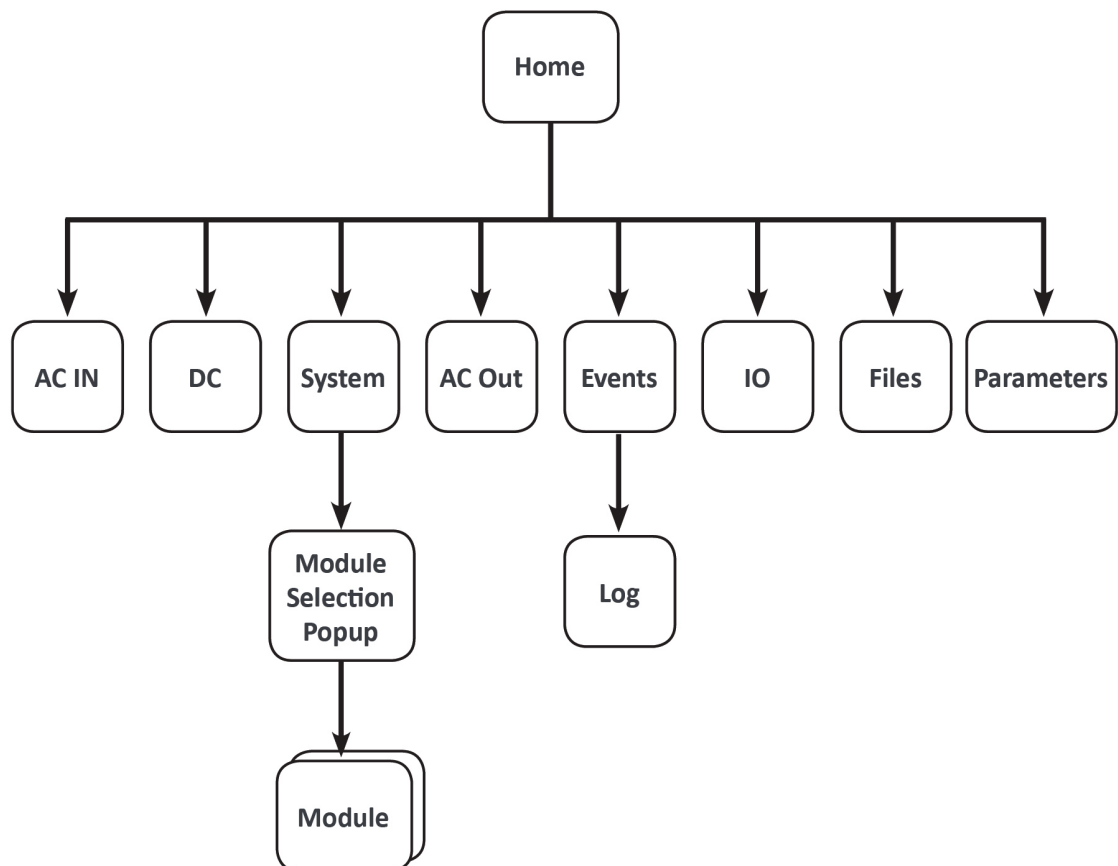


## 7. Graphical User Interface

The user interface is the same if accessed with a laptop connected on front ETH connection, remotely on a network, or through catena if one is present.

The interface has a “top-down” philosophy: the first screen gives a general overview, then one can go deeper and get more information on a specific area by clicking the “magnifier icon.”

### 7.1 Hierarchy



## 7.2 Login

The user interface is accessible by typing the IP address of the system in a web browser. The default IP address is **192.168.0.2**.

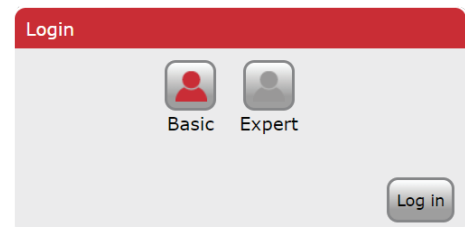
**Note:** Use any one of the following latest version of web browser: Google Chrome, Mozilla Firefox, Safari or Microsoft edge.

Before accessing, the user should select a user level and log in to the system. Currently, two users can be connected at the same time in the system: one basic and other is expert.

Basic users can just browse the pages and download the files. Users that login as Expert can access and modify the parameter values.

An auto-logout feature is available to avoid a user being connected all the time, blocking the system. Refer section “Regional settings”, page 31 for more information.

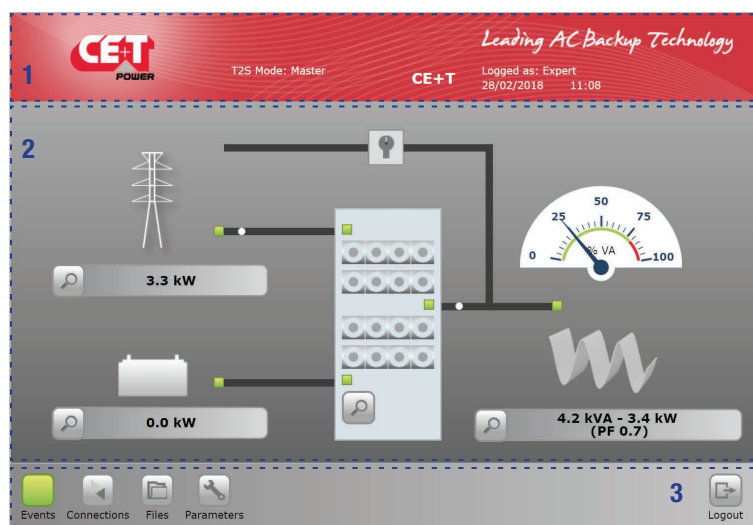
No password is required for Basic, but Expert mode is protected with a default password “*pass456*”. This password can be modified, and the option is available in section “Passwords”, page 32.



**In case of lost password, please refer to FAQ at page 60**

## 7.3 Interface Areas

- 1 → Banner
- 2 → Main Area
- 3 → Tool bar



### 7.3.1 Banner



**1 → T2S Mode**

T2S ETH can be used redundant (2 in the same system), one being master, the second is a slave. When used alone, T2S ETH automatically becomes master.

**2 → Site name**

It's a customizable field from the configuration menu. Users can set any string as required.

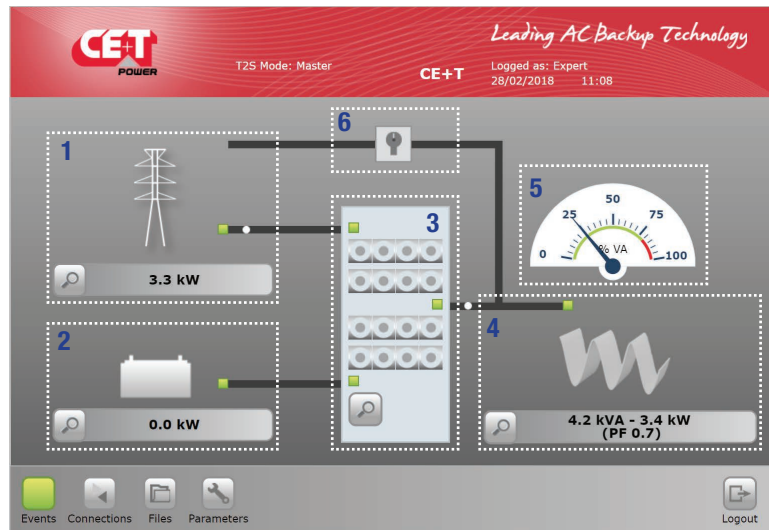
**3 → Access level**

Display the level in use to browse the interface. It can be either Expert or Basic.

**4 → Date and time**


This is the device time and date which can be adjusted in configuration menu.

### 7.3.2 Main Area




The above screen is a “Classic” home page, and the moving white ball appears, while the load consumes power from the module. While in the “Alternate” home page, displays brief information of the system.


**1 → AC IN**

Clicking the magnifier  will bring the user to all measurements regarding the AC input. The LEDs show the status of the input: if the source is absent, this LED's becomes red. Flowing (moving white ball) from this item to the system means power is taken from the source. The power displayed is the total power consumed, regardless of the system is 1P or 3P.

**2 → DC input**


Clicking the magnifier  will bring the user to all measurements regarding DC input. Given the system can be configured with up to 2 DC groups, power is the total power consumption. Flowing (moving white ball) from this item to the system means power is taken from the DC source.

### 3 → System

Clicking the magnifier  will bring the user to information regarding the system, such as redundancy, available power, and so on. It is also the path to module level monitoring. The three LEDs are showing the state of each converter.

Example: if any one of the internal converter of the module is in problem, then the led will turn to the corresponding color.

### 4 → AC out

Clicking the magnifier  will bring the user to all measurements regarding AC Out. Regardless of the system configuration (1P, 3P), displayed power is the total amount of power fed to the load.

Power is expressed in both KW and KVA, and the Power Factor (PF) is computed.

### 5 → Gauge

In a 1P output system, the gauge depicts the percentage of power used in VA.

In a “more than 1P” system, the gauge depicts the “worst case,” i.e., if the system is unbalanced, it shows the most loaded phase.

### 6 → MBP

MBP is configured in the system.

## 7.3.3 Toolbar



The tool bar is always accessible and provides quick access to the following pages:

- **Events page**

The events icon has the color of the highest priority alarm currently present in the system:

- Green: system healthy, no event present.
- Grey: at least one event is present in the system but not configured as major or minor.
- Orange: at least one minor event present in the system. No major event but other events could be present also.
- Red: at least one major event is present in the system. Other events or minor events could be present.



If more than one event is present, regardless of its level, a counter is present on the icon. It displays the total number of event currently present in the system.

- **Connections**

This brings to digital input and relays status. For configuring these inputs and outputs, it's in the configuration section.

- **Files**

This leads to the file management page. Files such as configuration, update and log download.

- **Parameters**

The parameters page allows user to change every parameter related to the system.



Throughout the browsing, the user can see the following icons:



When accessing a page of depth of two or more (such as module or log page), the user can go back to previous page by clicking “back” icon



Clicking on “Home” icon goes to the home page from any page you are accessing in the interface.



Clicking on “Logout” icon goes to the login page

## 7.4 Pages and Feature

### 7.4.1 AC IN

This page displays the measurements made by the modules on the AC input.

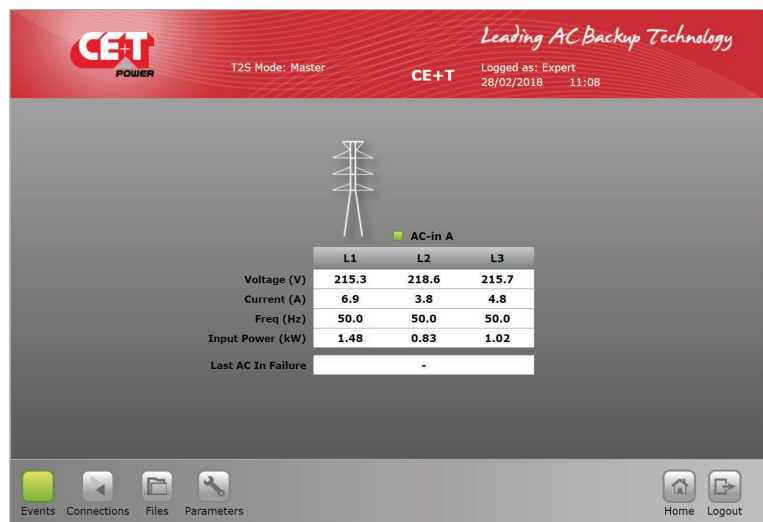
Available values are:

Measure	Unit
Voltage (V)	Volts (V)
Current (I)	Ampere (A)
Frequency(f)	Hertz (Hz)
Input Power(P)	Kilo Watts (kW)

The system also keeps track of last AC In failure timestamp.

**Remark:**

Modules have a Power Factor of 1, that's why power is only displayed in KW. This would be the same value in KVA. The Last AC in failure is non-persistent information. It means that it will be lost if the device is reset.

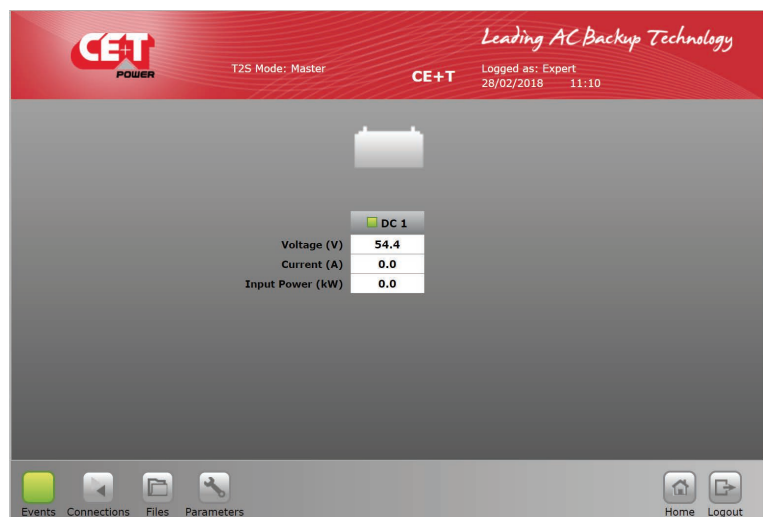


### 7.4.2 DC IN

This page displays the measurements made by the modules on the DC input.

Available values are:

Measure	Unit
Voltage (V)	Volts (V)
Current (I)	Ampere (A)
Input Power(P)	Kilo Watts (kW)

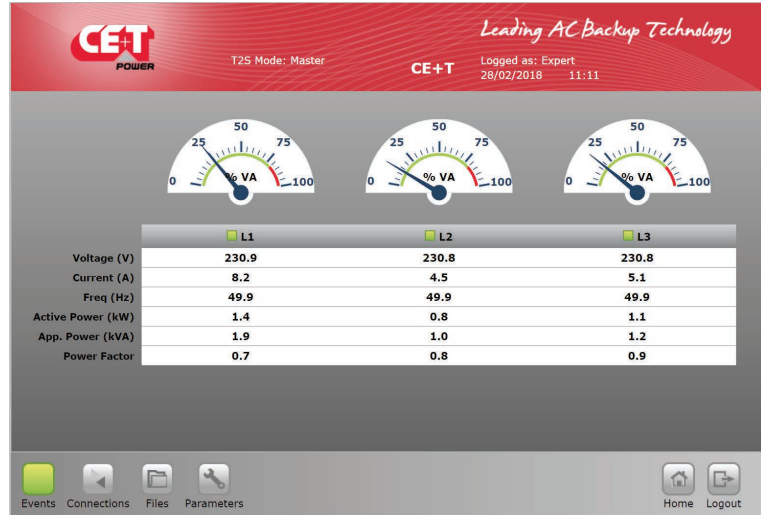


### 7.4.3 AC Out

This page displays the measurements made by the modules on the AC output

Available values are:

Measure	Unit
Voltage (V)	Volts (V)
Current (I)	Ampere (A)
Frequency(f)	Hertz (Hz)
Active Power(P)	Kilo Watt (KW)
Apparent Power(S)	Kilo Volt Ampere (KVA)
Power factor	-



### 7.4.4 System

Clicking the system picture on the home page brings the user to the related page, and the following information are displayed:


#### System level:

- **Installed power** - It is the total power of the configured modules, including redundancy.
- **Available power** - It is the total power of active modules present in the system.

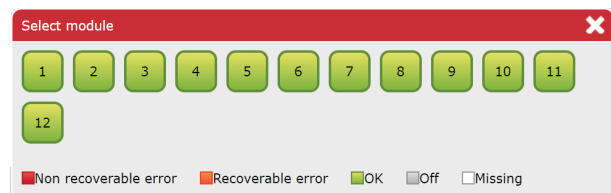
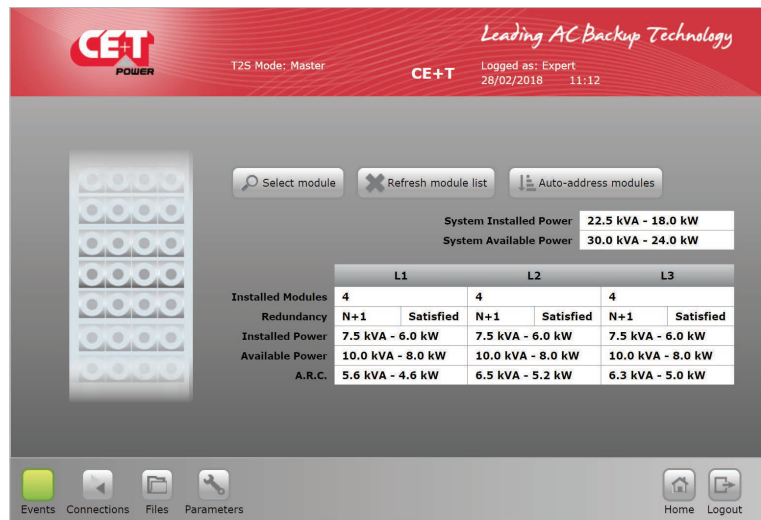
#### Phase level:

For each output phase, the following information are given:

- Number of installed modules
- Redundancy: defined or not, satisfied or not
- Installed and available power following the same logic as per system level
- A.R.C. (Available Redundant Capacity) is the remaining available power before reach the redundancy level.

Clicking the  button will launch the module selection pop-up. Each module's information can be accessed by clicking the corresponding button. A legend is always present to recall the color scheme:

- White: no module in slot
- Grey: module manually off



- Green: module OK
- Orange: module in recoverable error
- Red: module with unrecoverable error

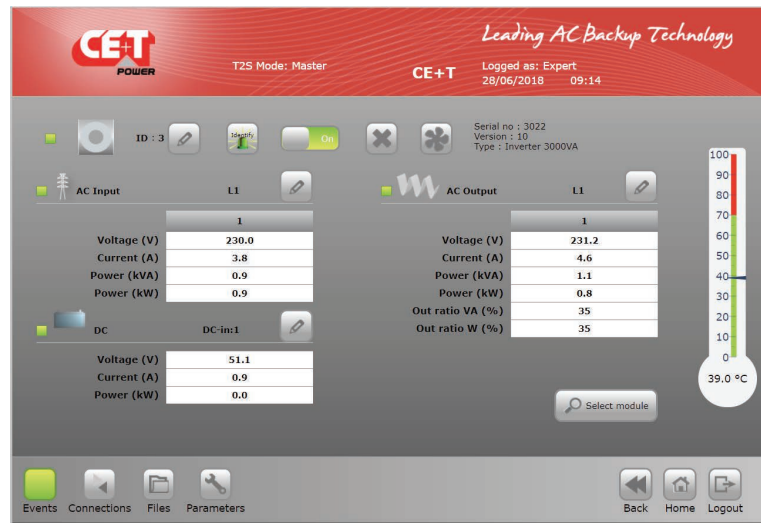
For last two, refer to module manual for troubleshooting.

### 7.4.5 Module

This page gives the module by module measurement.

T2S ETH is the monitoring solution for inverters, which are all one phase module.

Many controls are available from this page to manage the module:



Users can set the module address as required between 1 and 32.



Clicking on this button, the corresponding module LED's blink for few seconds. It helps to identify the module in the system and also the assigned phase of the module..



A module can be manually turned off through user interface. It will be still on the communication bus, but only the output is turned off. When you click on this button, it will change the state from display one to opposite.



T2S ETH keeps track of all modules which appear on the bus, and it means no installation is needed when a new module is plugged in. But when a module is removed, it's mandatory to tell the system about it, by "uninstalling" it, clicking this button. If not, the system will detect a missing module and raise the alarm.



For each of its converters, the module can be assigned an AC in phase, an AC out phase and a DC group. User can do so by using this control number to each converter measures. Module should be manually off to do changes for AC out phases.



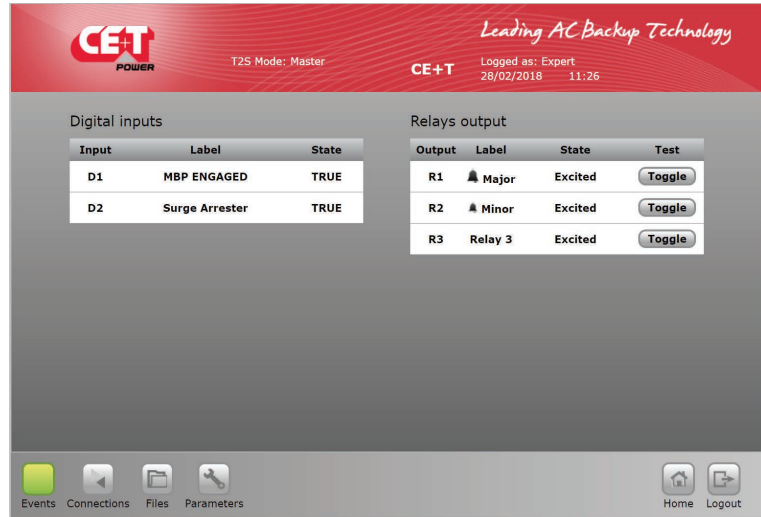
If module fan is replaced, click this icon to clear the corresponding alarm.

### 7.4.6 Events

The events page lists all events currently ongoing in the system. These are sorted by event occurrence time, and the latest event will be on top of the list. T2S ETH records maximum number of 2000 events as FIFO.

“Device” column provides the source of the alarm, which can be down to converter of a given module (example: module 4 AC IN) to System or monitoring level.

Events appear with a color corresponding to their alarm level (Grey – event, orange – minor, red – major).



A filter, as shown below is available to display only a subset of these events.



### 7.4.7 Log

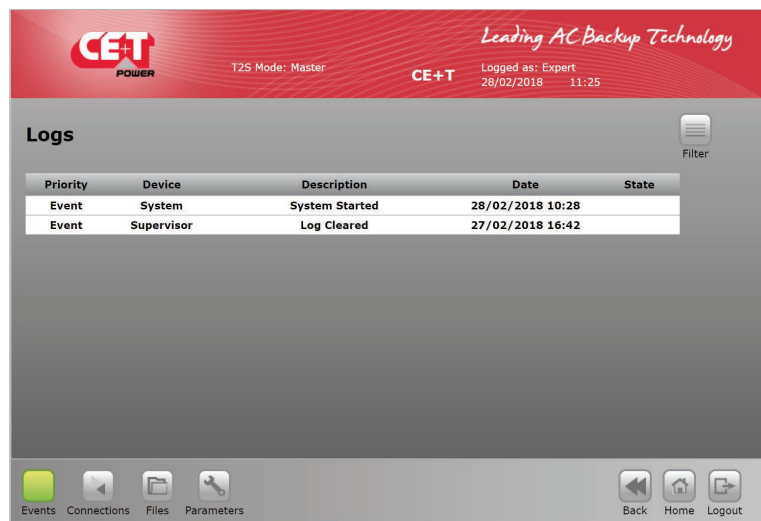
Log file lists all events which have occurred in the system since last log clear.

Compared to the event page, an extra column display if event has appeared or disappeared.

For each event, there are two log lines: one with the timestamp of the event appearing and the second one with the timestamp of the event disappearing.

Users can filter the log like in event page.

Users can see the difference between event and log page: no color for alarm level is used in log page, a column states it.



Log download and clear functions are available in “Files” menu.

### 7.4.8 Connections

As described before, T2S ETH has two digital inputs and three alarm relays.

State of each of these connections can be read through the “connections” page.

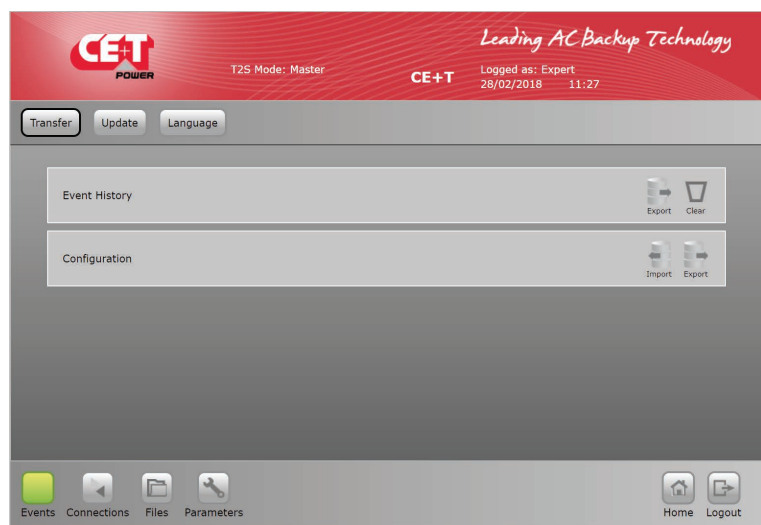
An extra “toggle” allows the user to test each relay manually, toggling it for a few seconds to detect a mechanically failing device over time.

### 7.4.9 Files

The Files page has three tabs.

The **Transfer tab** allows the user to download the log file and configuration files.

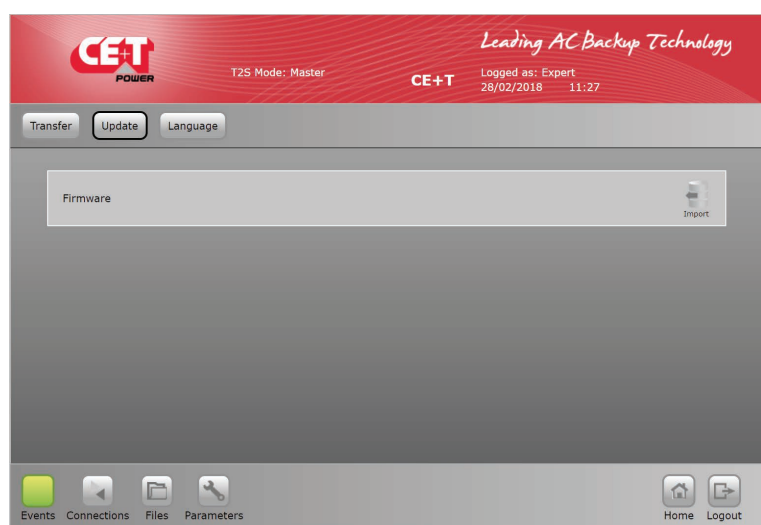
Users have the option to clear the log file by clicking “Clear” icon.



The **Update tab** allows the user to install the latest software version and get the latest features. Software is available through the CE+T customer area on the website (my.cet-power.com).

Software are provided in a proprietary format called “\*.saf” file. Once uploaded, the system will restart, installing the new application after verifications.

The dedicated procedure will be provided at the same location if needed.



The **Language tab** helps the user to upload a language file and translate the whole interface to the corresponding language. These files are available for certain languages in [my.cet-power.com](http://my.cet-power.com).

If the required language is not available, get in touch with sales representative to request the interface translation.

The first line **Install language file** allows uploading any language file while other lists are installed language. English is the default installed language. Apart from English, the user can install up to two different languages. Contact [my.cet-power.com](http://my.cet-power.com) to find supported Language packs.



## 7.4.10 Parameters

The **Parameters page** is divided into multiple tabs, which are compound of sub menus. As shown below, the whole list of parameters, organized as in the interface with remarks and comments about their use. Monitoring, Input relays, SNMP, Modbus, Power, and Info are the sub menus.

*Note: The following parameter sections provide brief information, to know more about each field, its function and values refer to section "16. Annex 3: Configuration parameters - T2S ETH", page 71.*

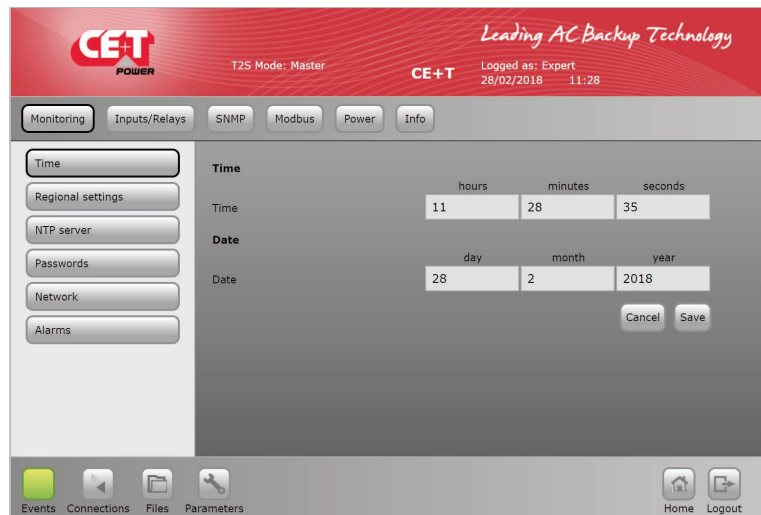
*Disclaimer: The configuration file should be manually edited only by CE+T crew or any especially trained operator. All modifiable values contained here are easily accessible through the T2S ETH web interface which allow you to change the configuration carefully. Any mistake done in this file could lead to system malfunction and CE+T shall not guarantee the behavior of the whole system once this file has been corrupted.*

### 7.4.10.1 Monitoring Tab

- **Time**

Time and date information of the T2S ETH system can be configured

*Note: If the system has no power, the Real-Time Clock in T2S ETH can run up to 24 hours. After that, the clock will reset the date to 01/10/2013 and time to 8.00.*



- **Regional settings**

- **Language:** users can select a language from the list. Refer the “Files” menu for installing the language pack.
- **Sitename:** it’s a standard string that is displayed in the banner.
- **Location** is the place where the system is installed.
- **Auto logout delay:** number of seconds after which any user will have to login again. When set to 0, auto-logout is disabled. A maximum value of 6000 seconds can be configured for the Auto-logout option.
- **Keyboard layout:** useful when using a Catena with the T2S ETH for in-display keyboard. It has two options AZERTY and QWERTY
- **New module identifier:** Always Ask, Always replace and Never Replace are the options available for New Module Identifier.
- **Home page:** Two different home page layouts are available and they are “Classic” and “Alternate” home page.
- **Display format:** DD/MM/YYYY, YYYY/MM/DD, MM/DD/YYYY are the different display format available
- **Time format:** 24 Hours and 12 Hours options are available.
- **Temperature format:** Celsius and Fahrenheit options are available.



- **NTP Server**

NTP Server: System date and time can be synchronized with NTP server. NTP configuration parameters.

- IP Address of NTP server
- Port Number
- Time zone offset
- Auto-refresh
- Synchronization interval (days)
- Force Synchronization.

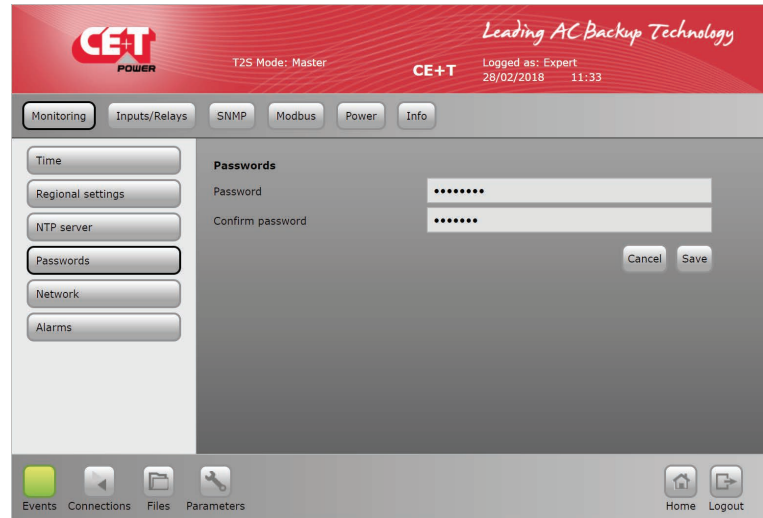


- **Passwords**

Expert password: default is “pass456” but it’s strongly recommended to change it.

Software update do not change your password.

In case of lost password, please refer to FAQ at page 60



- **Network**

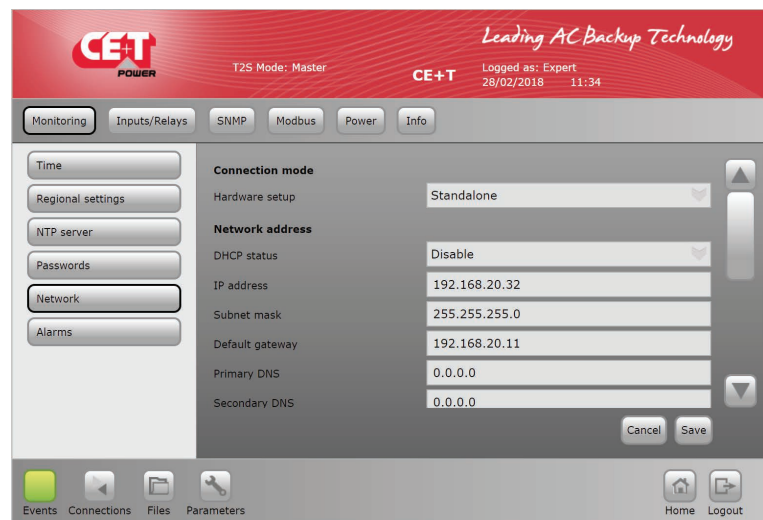
In Connection mode, Select Hardware setup as

- Standalone - System with T2S ETH or
- With Catena - System with T2S ETH and display unit - Catena

Network address is configuration of the T2S ETH

- **DHCP status:** DHCP Disable allows configuring static IP to T2S ETH card. When DHCP is enabled, IP to T2S will be assigned by the DHCP server or the Router to which T2S ETH is connected. To find the IP address of T2S ETH card IP Scanner tools can be used. For more information refer section 9.2, page 52.
- IP address
- Subnet mask
- Default gateway
- Primary DNS
- Secondary DNS

DNS has to be configured where server has host name.





- **Alarms**

**MBP configured:** If MBP is present in the system, this parameter should be configured and connected to Digital input 1. T2S ETH use this input to tell modules that MBP is engaged.

**Remote MBP:** It should be configured when a CE+T external MBP unit is present and it is applicable only for the systems in the US market.

*If it is enabled, the Relay 3 cannot be used.*

**Surge arrester configured:** If a surge arrester is installed in the system, this parameter should be configured and connected to Digital input 2.

**Log full alarms:** Alarm will be generated once it reaches the maximum limit and record as FIFO.  
*It is recommended to download the log.*



### 7.4.10.2 Input/Relays tab

- **Inputs Label**

- **Digital Input 1:** label for DigIn1
- **Digital Input 2:** label for DigIn2



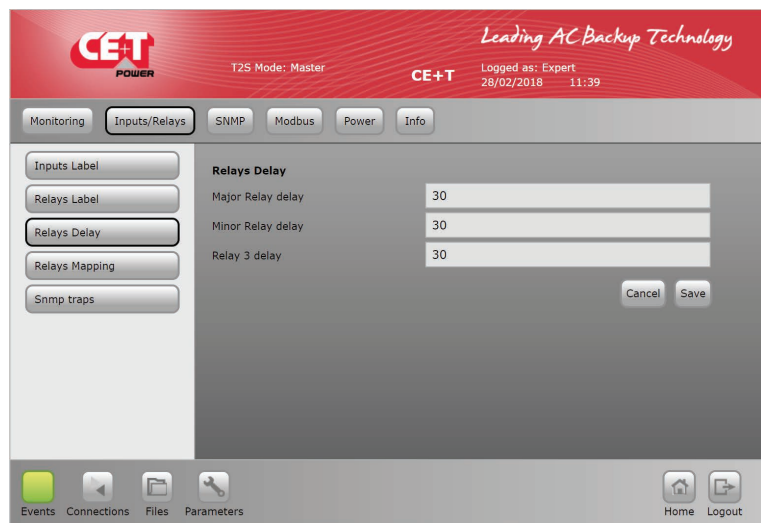
• **Relays Label**

- **Major Relay Name:** dedicated to major relay – not possible to change
- **Minor Relay Name:** dedicated to minor relay – not possible to change
- **Relay 3 name:** It is a programmable relay, and the user can select a particular alarm.  
*Relay 3 cannot be used if remote MBP is enabled*



• **Relays Delay**

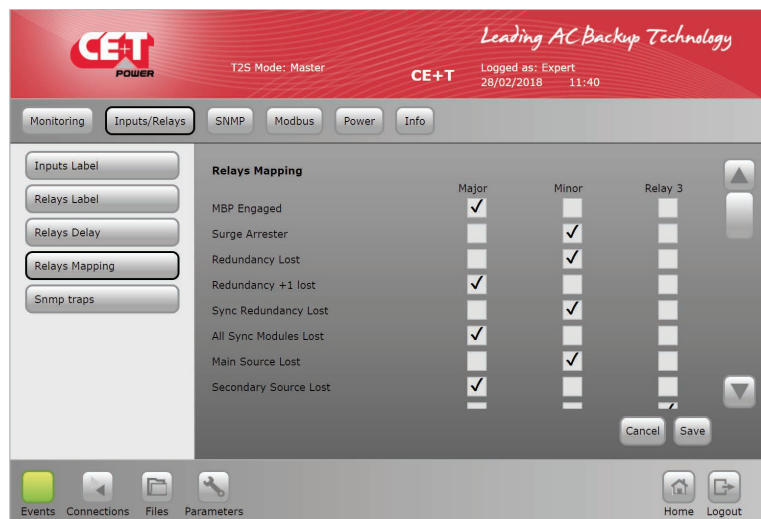
- **Major Relay delay:** delay in seconds before toggling when the condition is met (major alarm present)
- **Minor Relay delay:** delay in seconds before toggling when the condition is met (minor alarm present)
- **Relay 3 delay:** delay in seconds before toggling when the condition is met.



• **Relays Mapping**

- Relay mapping page is a matrix: all events can be mapped on one relay, all relays can be mapped on one event, or any other combination the customer would like.

*Note: While selecting an alarm type for a relay, choose either Major or Minor. If both selected, only the major alarm will be enabled during that relay energized.*



- **SNMP Traps**

- Traps can be enabled for different events and alarms under this section. Trap receiver configuration has to be done under the SNMP tab.
- Test Traps can also verified.

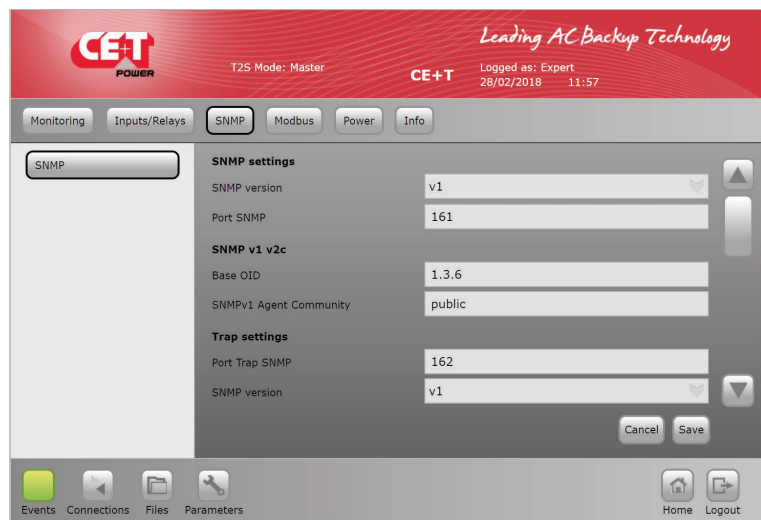


### 7.4.10.3 SNMP

- **SNMP**

SNMP configuration can be done from T2S ETH web page when logged in as expert login. T2S ETH when used as a standalone communication card; it supports only SNMP V1. When T2S ETH is connected to Catena Display, then user can configure SNMPV2C and SNMPV3.

For configuration refer to section “SNMP”, page 42.

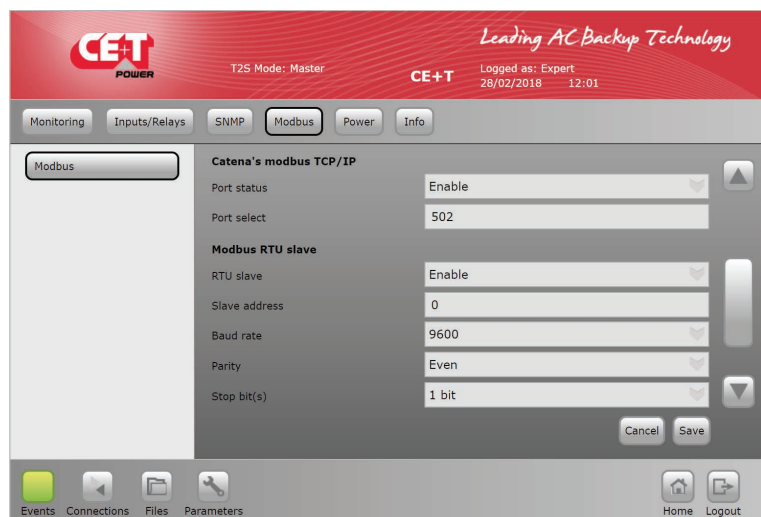


### 7.4.10.4 Modbus

- **Modbus**

Modbus RTU configuration can be done from T2S ETH web page when logged in as expert login. T2S ETH when used as a standalone communication card; it supports only Modbus RTU. When T2S ETH is connected to Catena Display, then user can configure Modbus TCP.

For configuration refer to the sections “Modbus over TCP/IP”, page 101 and “Modbus over RTU”, page 91.



### 7.4.10.5 Power

- **General**

**Redundancy:** The number of redundant modules can be set for each output phase.

**Source power ratio DC vs. AC:** percentage of power fed by DC. By default, this parameter is set to 0. 0% - Only AC source (EPC mode), 100% - Only DC source (On-line mode).

**Booster 10x lin:** enable the boost (see the manual of power module used for information on this feature).

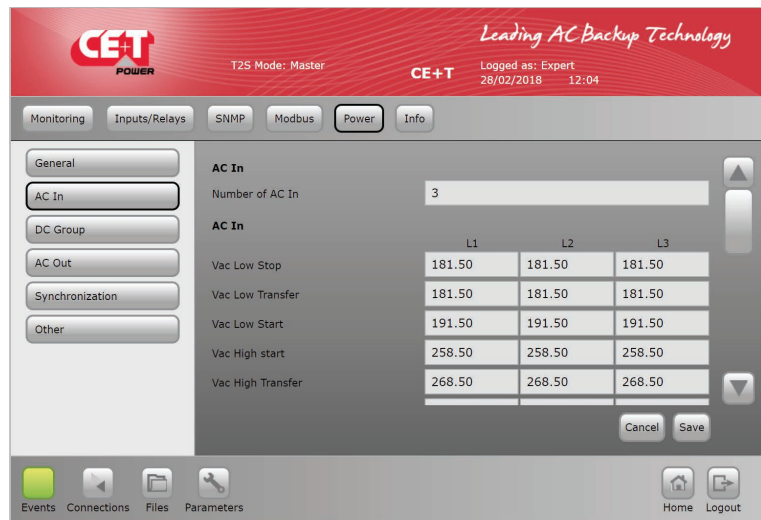
**AC In grid feed Disable:** enable this feature, if “Booster.”



- **AC In**

Threshold values for module operation on the AC input side. User shall modify it ONLY if he has followed a proper training by CET.

*Note: To know more about each field, refer to “AC In”, page 79.*



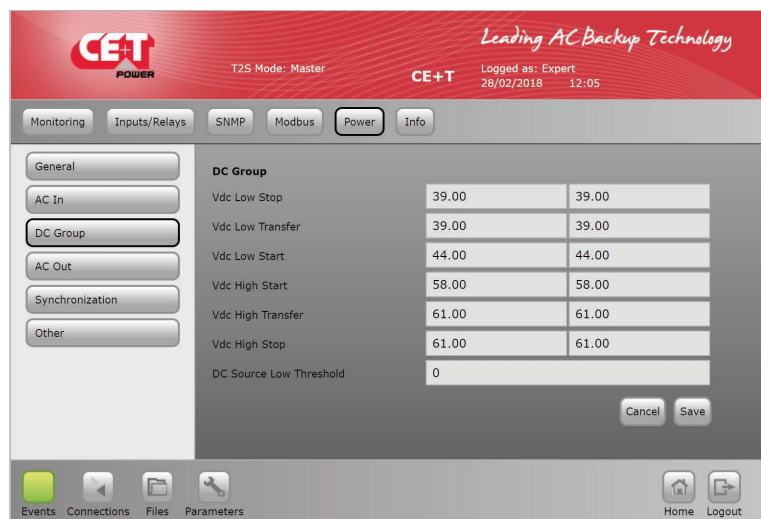
- **DC Group**

User can configure the DC input as per the number of battery bank installed.

Maximum two DC groups can be configured. First column for DC 1 and second column for DC 2.

By default, both columns will have default battery parameters. User can modify according to the installed battery bank.

*Note: To know more about each field, refer to “DC Group”, page 80.*



- **AC Out**

**Phase shift & Vout for each phase:** define phase shift between phase.

**Nominal Freq:** nominal frequency 50 or 60 Hz.

**Nb of phases:** Number of phase single or three phase.

**Short circuit voltage & hold time:** short circuit hold time before shut down 10 to 600 seconds (default 60).

**Max power/current derating.**

**Max overload duration.**

**Saturation Threshold:** Saturation level (default 80%) generate alarm if AC output power exceed 80% of the total installed power.

**Delta mode:** operation mode delta for 3 phase configuration only.

*Note: To know more about each field, refer to "AC Out", page 80.*

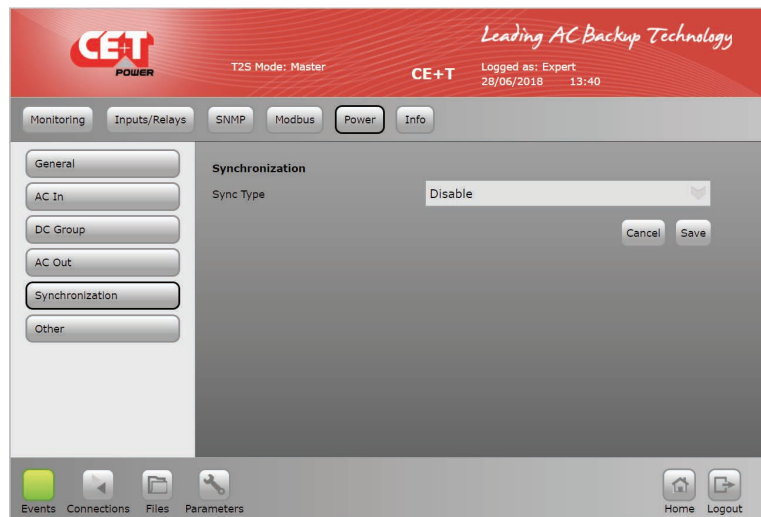


- **Synchronization**

Synchronization parameters are used to configure in the higher capacity system (> 32 inverter modules) by using TUS.

TUS is a synchronization kit.

*Note: To know more about each field, refer to "Synchronization", page 81.*



- **Other**

- Remote OFF disable AC power.
- Walk in mode time.
- Airco mode.
- Force start without T2S.
- No power from AC IN phase 1
- No power from AC IN phase 2
- No power from AC IN phase 3

Note: To know more about each field, refer to "Other", page 82



#### 7.4.10.6 Info

- **T2S-ETH**

This tab provides information about the T2S ETH:

- Serial Number
- Software version
- Interface version
- Bootloader version
- MAC Address: In case of required support, it's mandatory to provide information listed in this page or a screenshot of it.



## 8. Catena

### 8.1 Introduction

Catena is the display solution for T2S ETH. Using it, you get access on a 7” display directly in the system, providing the same graphical user interface as the T2S ETH when accessed remotely.

### 8.2 User interface

As described before, the user interface is the same if the system is accessed remotely or directly on the 7” display.

The only limitation is the relay testing button, which is not available in Catena.

### 8.3 Ethernet connections

Catena has 3 ETH connections, two at rear and one at front.

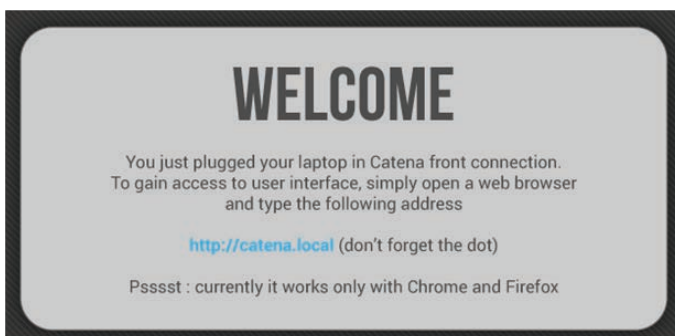
#### 8.3.1 Rear connections

One is dedicated to connection with T2S ETH while the second one is for permanent network connection. On this one, Catena offers extra protocols: SNMP v2c, v3 and Modbus over TCP/IP. See following section “Protocols” about these.

#### 8.3.2 Front connection

The front ETH connection is the maintenance access of the Catena. As it's providing a DHCP server, it's not needed anymore to change your laptop settings to connect point to point on the device.

When plugging an RJ45 cable between Catena and your laptop, the following pop-up will be displayed:



To get access to the user interface, just follow instruction from the pop-up:

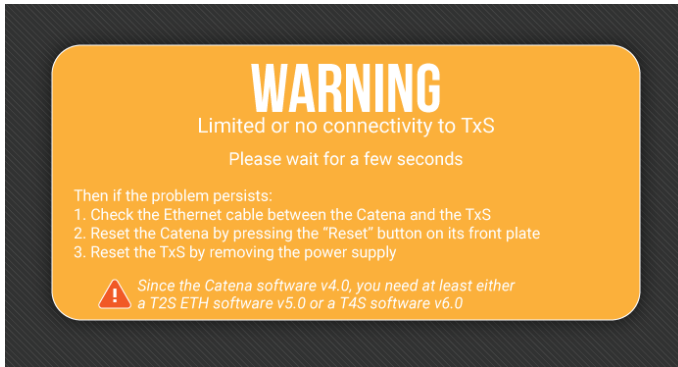
- Open a web browser (Chrome or Firefox)
- Type `http://catena.local` in the address bar

When the cable is unplugged, the display is accessible again.

**Important remark: this feature is only available in latest version (both Hardware and Software).**

### 8.3.3 Troubleshooting

For any reason, if connection between Catena and T2S ETH is not established, the following pop-up will be appeared:



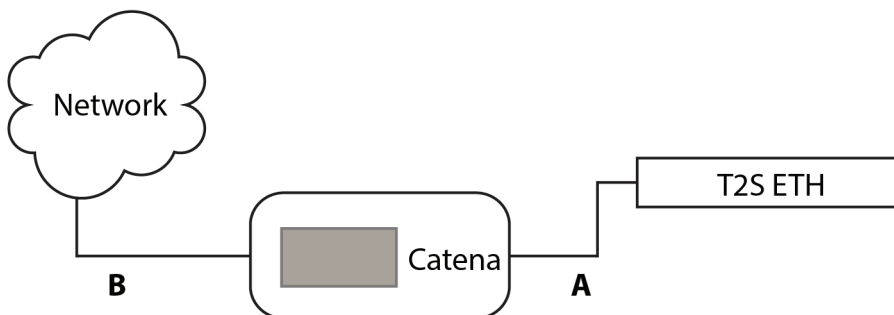
Follow the steps listed in the screen. If the problem persists even after a reset (or hard reset by power supply), try to connect directly on T2S ETH and check that it's properly configured "With Catena" (See section 8.4, page 40).

## 8.4 Configuration

In Catena installed system, it is mandatory to set the option as "With CATENA" in Network page. (Parameters > Monitoring > Network > Connection mode > Hardware setup). Refer section "Network", page 32

### 8.4.1 Network architecture

When using Catena with T2S ETH, the network architecture is the following:



"A" is a private network between Catena and T2S ETH. Catena provides a DHCP server on this port to provide an IP address to T2S ETH. Even if not usable for user, the address range used there is 10.240.240.X and therefore, this address range is not available on interface B.

"B" is the user "permanent network connection" to the Catena. It can be either in DHCP client or in fixed IP address. When using a Catena, the network parameters in user interface are the ones used on interface B.

**Important remark:** when "With Catena" mode is selected, T2S ETH is listening for DHCP client. For any reason, if you want to connect on T2S ETH directly by removing the cable "A", then you have to wait for the DHCP client timeout of about 2 minutes. Only after that, T2S ETH will use the defined IP address in network parameters and you can reach it.



## 8.5 Protocols

Using Catena SNMP V2C, SNMP V3 and Modbus TCP support is enhanced to monitor the system.

### 8.5.1 SNMP v2c

Implemented MIB file is CET-MIB.

For configuration refer to section “SNMP”, page 42.

### 8.5.2 SNMP v3

Implemented MIB file is CET-MIB. Three different modes are available in SNMP v3 with subsequent parameters:

- No Auth/No Priv
- Auth/No Priv
- Auth/Priv

## 9. SNMP

### 9.1 SNMP Configuration

#### 9.1.1 Introduction

This document describes the Management Information Base (MIB) schema design for standalone T2S ETH for SNMPv1 configuration and T2S ETH with Catena for SNMP V2C and V3 configuration. A MIB schema describes the structure of information served by a Simple Network Management Protocol Subsystem (SNMP) agent.

#### 9.1.2 General NMS, SNMP Agent and MIB Role

This section describes the Management Information Base's (MIB's) and SNMP Agent's roles.

##### 9.1.2.1 NMS Role

SNMP's purpose is to report operational status information about networked computing devices to a centralized Network Management System (NMS) endpoint. The status information is typically polled from an SNMP Agent on regular intervals by a Network Management System (NMS) Endpoint. The SNMP Agent can also check internal status at regular intervals, and when status of certain metrics falls outside pre-defined acceptable tolerances, an asynchronous Notification is transmitted to the NMS. This notification is termed as a Trap.

##### 9.1.2.2 MIB Role

The MIB file describes the specific format of data provided by the SNMP agent running within the subsystem. The data is grouped in terms of high-level objects and therefore models a top-down hierarchical design. There exist a high-level object defined in a TOP LEVEL MIB file; they are CET-TSI-MIB and CET-TSI-SMI

##### 9.1.2.3 SNMP Agent Role

An agent is a network-management software module that resides on a managed device. An agent has local knowledge of management information and translates that information to or from an SNMP-specific form. A network management station (NMS) executes applications that monitor and control managed devices. As mentioned above, the SNMP agent's purpose is reporting data elements to a Network Management System tool, such as MG Soft, I reasoning on a periodic basis. Also, if the system is exhibiting non-ideal behavior, Notifications can be distributed to the NMS on a per incident basis called the Traps. After Notifications that denote non-conforming or malfunctioning behavior are triggered, the system may further distribute Notifications indicating the system is back to its normal state.

### 9.1.3 MIB General Design

This section describes the general design for the T2S ETH and Catena products

#### 9.1.3.1 Industry Identification

The private CET MIB shall be represented by the object identifier 1.3.6.1.4.1.12551, or iso.org.dod.internet.private.enterprise.cetMIB.

The TSI MIB shall be named cetTSI and will be located as a child object of the cetMIB, using object identifier 1.3.6.1.4.1.12551.4, taking the next available spot at the top level of the cet MIB's Products node.

### 9.1.3.2 MIB Design in the T2S ETH and Catena Products

Each component in the system or device shall be monitored, and therefore will be described by its own Management Information Base (MIB) structure file, which describes the data provided by that MIB. The data elements in a MIB are grouped in objects, and each object may hold any number of child objects specified as either scalar values or tabular values.

In CET-TSI MIB Device objects are grouped to a high level table tsiObjects, a Table is effectively specified as a group of scalar values each scalar is a column in the table. Tables are used to provide multiple groups of information (multiple rows). The first child of tsiObjects are tsiModules, tsiPhases, tsiACGroups, tsiDcGroups, tsiAlarms, tsiTraps, tsiEventDescription, tsiT2SInfo, tsiConfiguration

For example, tsiModules is the table which holds all module information; if there are multiple Module components on a given system, the tsiModuleseen MIB table will provide an instance (row) for each module like tsiModuleSeen.1 (.1) is the instance referring to the first module.

### 9.1.4 SNMP V1 Configuration

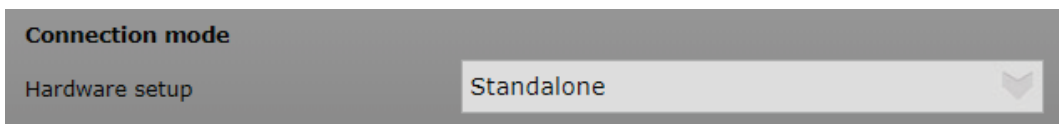
SNMP version 1: the oldest flavor. Easy to set up - only requires a plaintext community. A community string sent in plaintext, possibly from a restricted range of allowed IP addresses, is as good as the security gets.

#### 9.1.4.1 T2S ETH web

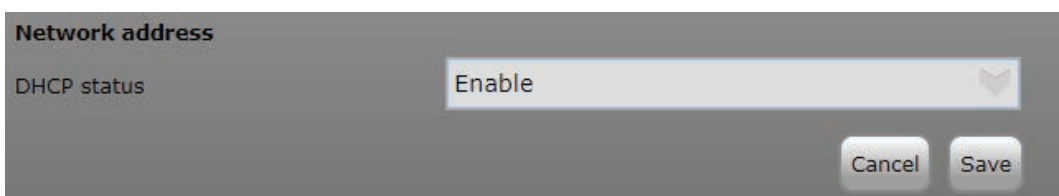
SNMP configuration can be done from T2S ETH web page when logged in as expert login. T2S ETH when used as a standalone communication card; it only supports SNMP V1. When T2S ETH is connected to Catena Display, then the user can configure SNMPV2C and SNMPV3.

#### 9.1.4.2 Network Configurations for T2S ETH Standalone

1. Login to T2S web link <http://192.168.0.2/index.html> as Expert login.
2. Click “**Parameters**” button in the toolbar.
3. Go to “**Monitoring**” tab and click “**Network**”.
4. In Connection mode the “Hardware setup” should be **Standalone**.

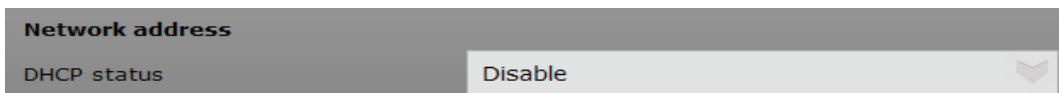


5. If you are on a network with DHCP, you can enable the DHCP inside the Network submenu of the “**Monitoring**” menu.
6. Turn DHCP to “Enable”.



7. Click “Save”.

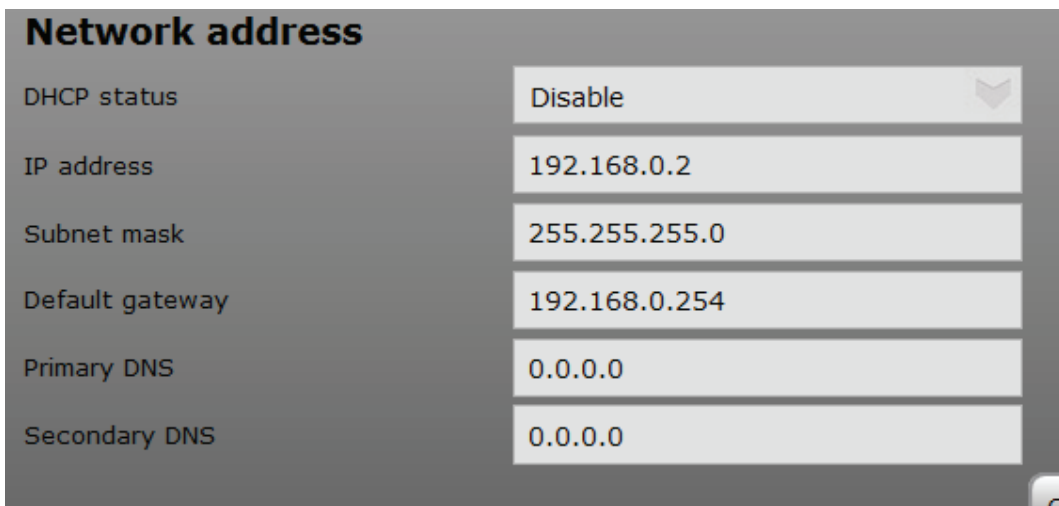
8. When DHCP is enabled IP to T2S will be assigned by the DHCP server or the Router to which T2S ETH is connected.
9. To find the IP address of T2S ETH card IP Scanner tools can be used.
10. Refer section 9.2, page 52 for more information.
11. If DHCP status is “Disable”.



**Network address**

DHCP status: Disable

12. Configure Network



**Network address**

DHCP status: Disable

IP address: 192.168.0.2

Subnet mask: 255.255.255.0

Default gateway: 192.168.0.254

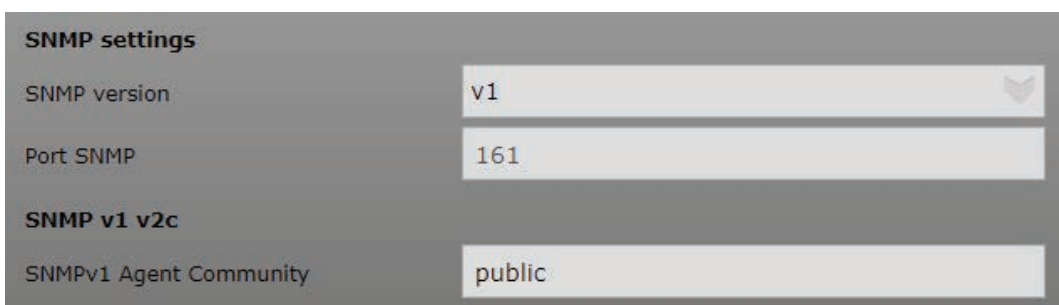
Primary DNS: 0.0.0.0

Secondary DNS: 0.0.0.0

13. If your Trap receiver is a server with host name, then configure DNS if you want your trap to be received.

### 9.1.4.3 SNMP V1 agent configuration

1. Once your network is ready, you can configure the SNMP server, and the TRAP
2. Click “Parameters” button in the toolbar.
3. Click “SNMP” tab.
4. As mentioned earlier, T2S ETH standalone card supports only SNMP V1 configuration, here you can select only SNMP V1. Ignore SNMP V2C and SNMP V3 from the drop down list and these configurations will not communicate with T2S ETH card.
5. SNMP Port is configurable through **Expert login**



**SNMP settings**

SNMP version: v1

Port SNMP: 161

**SNMP v1 v2c**

SNMPv1 Agent Community: public

6. SNMP Port number is standard port 161 for V1 communication
7. SNMP V1 will not communicate when port number is changed from default port number even if the same port number is configured at the NMS end.
8. SNMP Agent Community is configurable, the same agent community name has to be used in NMS SNMP V1 profile.
9. Community name accepts a maximum of 15 ASCII characters.

#### 9.1.4.4 SNMP V1 trap settings

1. Port Trap Chooses the port on which the trap is send and default port is port 162
2. Traps will not be received if the port number is changed.
3. Choose SNMP Version V1 as T2S ETH only supports SNMP V1 communication.
4. Community for V1 traps can be ignored as V1 traps does not consider community name.
5. Trap version for T2S ETH is CET MIB Traps
6. Traps will not be received when UPS MIB Traps are selected.

Trap settings	
Port Trap SNMP	162
SNMP version	v1
Community v1 v2c	public
Traps version	CET MIB traps

#### 9.1.5 SNMP V2C Configuration

SNMP v2C includes improvements over version 1 in the areas of performance, security, confidentiality, and manager-to-manager communications. It introduced GetBulkRequest, an alternative to iterative GetNextRequests for retrieving large amounts of management data in a single request.

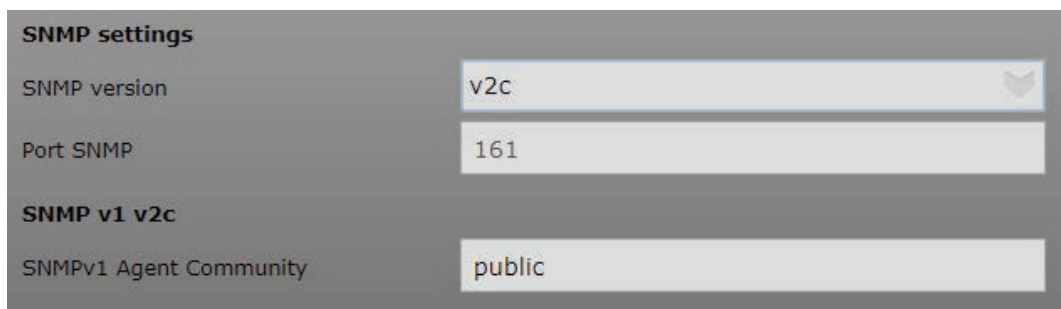
##### 9.1.5.1 Network Configuration from T2S ETH with Catena.

1. Login to T2S web link <http://192.168.0.2/index.html> as Expert login
2. Click “**Parameters**” button in the toolbar.
3. Go to “**Monitoring**” tab and click “**Network**”.
4. Connection mode Hardware setup should be with CATENA.
5. Ensure this option is selected before connecting T2S ETH to CATENA.

Connection mode	
Hardware setup	With CATENA

### 9.1.5.2 SNMP V2C agent configuration

1. SNMP V2C can be configured when T2S ETH is connected to Catena
2. Login to T2S web page in Expert login
3. Click “**Parameters**” button in the toolbar.
4. Click “**SNMP**” tab.
5. Configure SNMP version under SNMP settings SNMP version V2C



The screenshot shows the 'SNMP settings' configuration panel. It includes the following fields:

- SNMP version:** A dropdown menu set to 'v2c'.
- Port SNMP:** A text input field containing '161'.
- SNMP v1 v2c:** A sub-section header.
- SNMPv1 Agent Community:** A text input field containing 'public'.

6. SNMP Port number is standard port 161 for V2C communication
7. SNMP V2C will not communicate when the port number is changed from default port number even if the same port number is configured at the NMS end.
8. SNMP Agent Community is configurable, the same agent community name has to be used in NMS SNMP V2C profile. Keep public if you want that everybody can connect.
9. Community name accepts a maximum of 15 ASCII characters.

### 9.1.5.3 SNMP V2C trap settings

1. Port Trap Choose the port on which the trap is send and default port is port 162
2. Traps will not be received if the port number is changed.
3. Choose SNMP versions as SNMP V2C
4. Community for V2C traps can be ignored as V2C traps does not consider community name.
5. Trap version for T2S ETH is CET MIB Traps
6. Traps will not be received when UPS MIB Traps are selected.



The screenshot shows the 'Trap settings' configuration panel. It includes the following fields:

- Port Trap SNMP:** A text input field containing '162'.
- SNMP version:** A dropdown menu set to 'v1'.
- Community v1 v2c:** A text input field containing 'public'.
- Traps version:** A dropdown menu set to 'CET MIB traps'.

## 9.1.6 SNMP V3 Configuration

SNMPv3 defines a secure version of SNMP and also facilitates the remote configuration of the SNMP entities. SNMP V3 configuration is possible **only if you have a catena**.

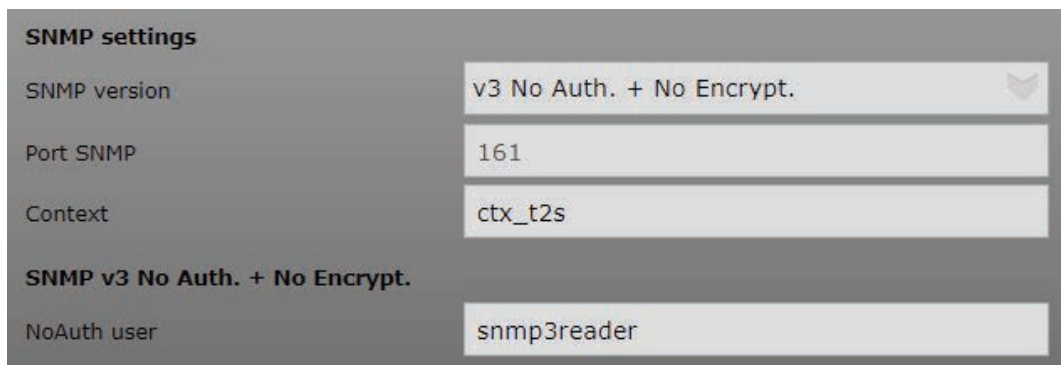
Network Configuration is the same as SNMP V2C.

**The three possible configuration options are**

- **No Auth + No Encrypt:** no authentication required, so anybody on the network can access or know what you're doing.
- **Auth + No Encrypt:** To have access one must be logged (authenticate). But anybody on the network knows what he is doing by reading the network packets.
- **Auth + Encrypt:** must be authenticate AND all the network packets send are encrypted and thus, nobody know what the user is doing except the user himself of course.

### 9.1.6.1 SNMP V3 Configuration No Auth + No Encrypt.

1. SNMP V3 can be configured when T2S ETH is connected to Catena
2. Login to T2S web page in Expert login
3. Click "**Parameters**" button in the toolbar.
4. Click "**SNMP**" tab.
5. Configure SNMP version under SNMP settings select "v3 No Auth. + No Encrypt".



**SNMP settings**

SNMP version: v3 No Auth. + No Encrypt.

Port SNMP: 161

Context: ctx\_t2s

**SNMP v3 No Auth. + No Encrypt.**

NoAuth user: snmp3reader

6. SNMP Port number is standard port 161 for V3 communication
7. SNMP V3 will not communicate when port number is changed from default port number even if the same port number is configured at the NMS end.
8. Context name has to match the name used in NMS, context name accepts a maximum of 15 ASCII characters.
9. SNMP **NoAuth user** is configurable, the same user name has to be used in NMS SNMP V3 profile.
10. User name accepts a maximum of 15 ASCII characters.

### 9.1.6.2 SNMP V3 No Auth + No Encrypt trap settings.

1. Port Trap choose the port on which the trap is send and default port is port 162
2. Traps will not be received if the port number is changed.
3. Choose SNMP versions as SNMP V3 No Auth. + No Encrypt.

- Only for SNMP V3 trap mode: specify the “engineID”. Identifier that allows you to know which device is sending you the trap. EngineID should not be modified.

*Note: SNMPv3 mandates that the message is rejected unless the SNMPv3 user sending the trap already exists in the user database. The user database in a SNMPv3 application is actually referenced by a combination of the user’s name (called a “security Name”) and a identifier for the given SNMP application your talking to (called an “engineID”). (source : <http://www.net-snmp.org/tutorial/tutorial-5/commands/snmptrap-v3.html>)*

Trap settings	
Port Trap SNMP	162
SNMP version	v3 No Auth. + No Encrypt.
Trap engine ID	0x0102030405
Traps version	CET MIB traps

- Standard user name for SNMP v3 No Auth. + No Encrypt. User is “snmp3TrapUser” this not configurable, But this username has to be added in NMS to receive traps.
- Trap version for T2S ETH is CET MIB Traps.
- Traps will not be received when UPS MIB Traps are selected.

### 9.1.6.3 SNMP V3 Configuration Auth + No Encrypt.

- SNMP V3 can be configured when T2S ETH is connected to Catena
- Login to T2S web page in Expert login
- Click “**Parameters**” button in the toolbar.
- Click “**SNMP**” tab.
- Configure SNMP version under SNMP settings select “v3 Auth. + No Encrypt”.

SNMP settings	
SNMP version	v3 Auth. + No Encrypt.
Port SNMP	161
Context	ctx_t2s
<b>SNMP v3 Auth. + No Encrypt.</b>	
NoPriv user	snmp3user
NoPriv password	snmp3password
NoPriv authentication	MD5

- SNMP Port number is standard port 161 for V3 communication



7. SNMP V3 will not communicate when port number is changed from default port number even if the same port number is configured at the NMS end.
8. Context name has to match the name used in NMS, Context name accepts a maximum of 15 ASCII characters.
9. NoPriv user name has to match the name used in V3 profile in NMS, user name accepts a maximum of 15 ASCII characters.
10. When No Auth same user name used for NoPriv user Error (109) will be displayed. Try creating new user name.

Error (109): "Wrong monitoring parameter value"  
Param (598): "NoAuth user"

11. NoPriv password has to match the password used in V3 profile in NMS, Password accepts a maximum of 15 ASCII characters.
12. NoPriv authentication is the hash method used to login (take care that MD5 is the weakest of the list. SHA recommended).

#### 9.1.6.4 SNMP V3 Auth + No Encrypt trap settings

1. Port Trap Choose the port on which the trap is send and default port is port 162
2. Traps will not be received if the port number is changed.
3. Choose SNMP versions as SNMP V3 Auth. + No Encrypt.
4. Only for SNMP V3 trap mode specify the "engineID". Identifier that allows you to know which device is sending you the trap, engineID is not to be modified.
5. Trap user name is configurable has to match the name created in Trap receiver, User name accepts a maximum of 15 ASCII characters.
6. Trap password is configurable has to match with the password created in Trap receiver, Password accepts a maximum of 15 ASCII characters.
7. Trap authentication is the hash method used to login (take care that MD5 is the weakest of the list. SHA recommended).
8. Trap version for T2S ETH is CET MIB Traps
9. Traps will not be received when UPS MIB Traps are selected.

Trap settings	
Port Trap SNMP	162
SNMP version	v3 Auth. + No Encrypt.
Trap engine ID	0x0102030405
Trap user	snmp3TrapUser
Trap password	snmp3password
Trap authentication	MD5
Traps version	CET MIB traps

### 9.1.6.5 SNMP configuration Auth + Encrypt

1. SNMP V3 can be configured when T2S ETH is connected to Catena
2. Login to T2S web page in Expert login
3. Click “**Parameters**” button in the toolbar.
4. Click “**SNMP**” tab.
5. Configure SNMP version under SNMP settings select “v3 Auth. + Encrypt”.

SNMP settings	
SNMP version	v3 Auth. + Encrypt.
Port SNMP	161
Context	ctx_t2s
SNMP v3 Auth. + Encrypt.	
Priv user	snmp3priv
Priv password	snmp3password
Priv authentication	MD5
Priv encryption key	snmp3key
Priv encryption	DES

6. SNMP Port number is standard port 161 for V3 communication
7. SNMP V3 will not communicate when port number is changed from default port number even if the same port number is configured at the NMS end.
8. Context name has to match the name used in NMS, Context name accepts a maximum of 15 ASCII characters.
9. Priv user name has to match the name used in V3 profile created in NMS, user name accepts a maximum of 15 ASCII characters.
10. Priv password has to match the password used in V3 profile created in NMS, Password accepts a maximum of 15 ASCII characters.
11. Priv authentication is the hash method used to login (take care that MD5 is the weakest of the list. SHA recommended).
12. Priv encryption key has to match the key used in V3 profile created in NMS, encryption key accepts a maximum of 15 ASCII characters. It is the passphrase to encrypt the data.
13. Priv encryption: The encryption method used to secure the channel (note DES is weak protection; use AES if you can choose to).

### 9.1.6.6 SNMP V3 Auth + Encrypt trap settings.

1. Port Trap Choose the port on which the trap is send and default port is port 162
2. Traps will not be received if the port number is changed.
3. Choose SNMP versions as SNMP V3 Auth. + Encrypt.
4. Only for SNMP V3 trap mode specify the “engineID”. Identifier that allows you to know which device is sending you the trap, not to be modified.
5. Trap user name is configurable has to match the name created in Trap receiver, User name accepts a maximum of 15 ASCII characters.
6. Trap password is configurable has to match with the password created in Trap receiver, Password accepts a maximum of 15 ASCII characters.
7. Trap authentication is the hash method used to login (take care that MD5 is the weakest of the list. SHA recommended).
8. Trap priv encryption key is configurable has to match the name created in Trap receiver, encryption key accepts a maximum of 15 ASCII characters.
9. Trap priv encryption: Only for SNMP V3+ auth+ encryption: method used to encrypt packet! Use AES if you have the choice.
10. Trap version for T2S ETH is CET MIB Traps
11. Traps will not be received when UPS MIB Traps are selected.

Trap settings	
Port Trap SNMP	162
SNMP version	v3 Auth. + Encrypt.
Trap engine ID	0x0102030405
Trap user	snmp3TrapUser
Trap password	snmp3password
Trap authentication	MD5
Trap priv encryption key	snmp3key
Trap priv encryption	DES
Traps version	CET MIB traps

### 9.1.6.7 SNMP Traps receiver settings

SNMP allow sending trap when event occur. This section is here to explain how to configure them.

1. First configure the target IP, each time a trap is sent, you have to specify to whom it is being sent to. So always in the same SNMP menu, go to the bottom and enter the target IP for all trap receivers..
2. You can configure up to five trap receivers.

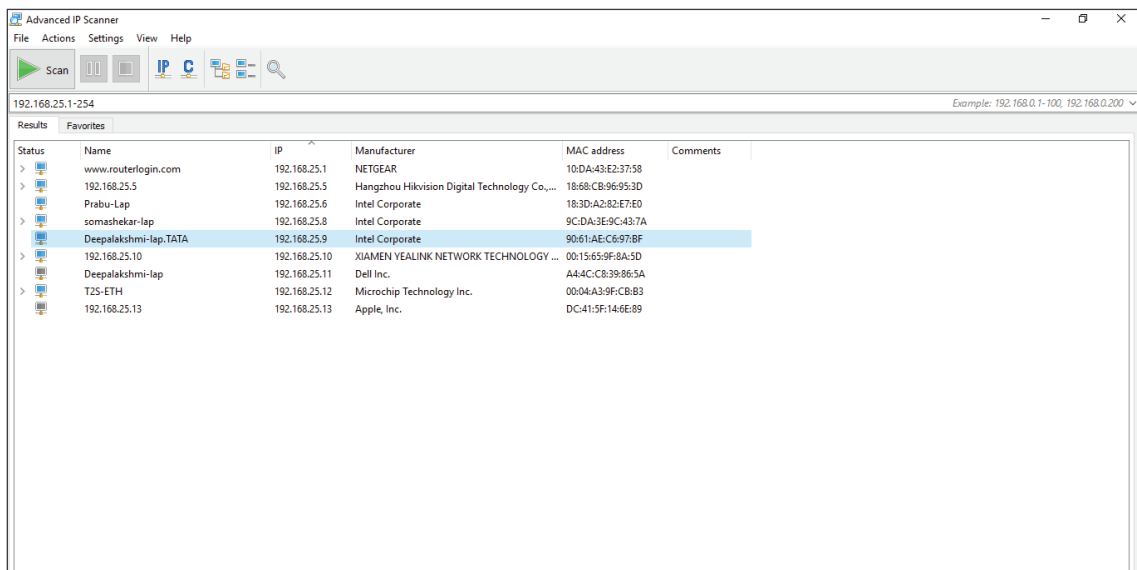


## 9.2 Advanced IP Scanner

This section helps you identify your T2S ETH IP when DHCP is enabled. Advanced IP Scanner open-source software is available in online, and this application needs not be installed in local machine. It is a reliable and free network scanner to analyze LAN. The program shows all network devices, gives you access to shared folders, and provides remote control of computers.

Download the application from <https://www.advanced-ip-scanner.com>

Run the .exe file when the application opens, click on RUN scan.

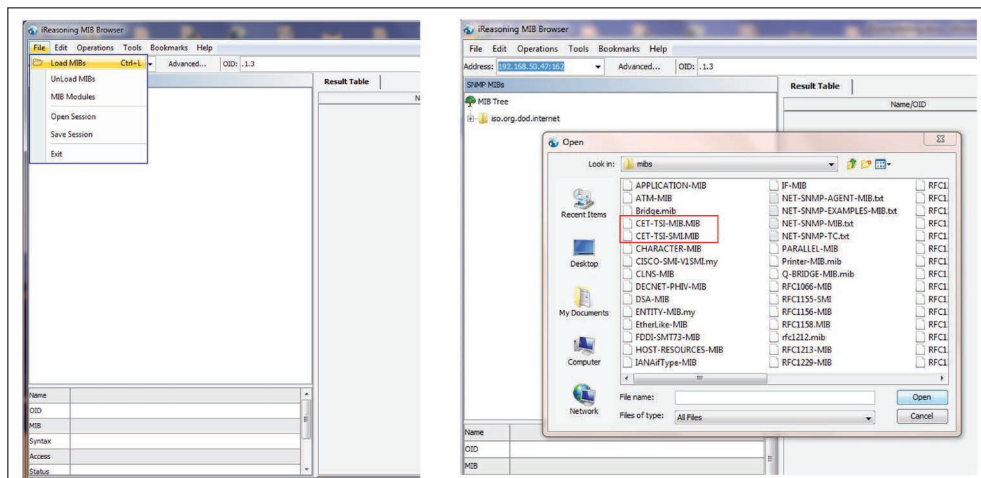


### 9.3 SNMP V1 Testing

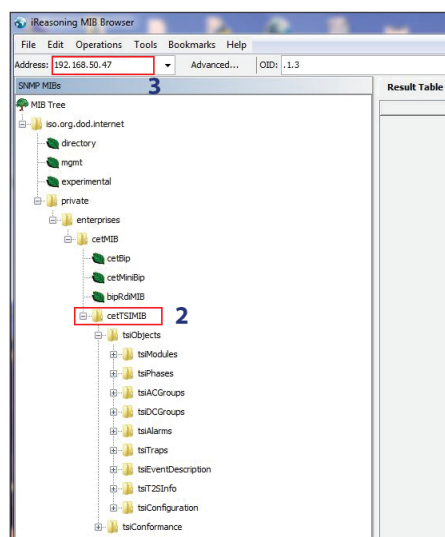
This section helps you to test the SNMP of your T2S ETH unit. There are several different software programs (some are free) is available online to download. Current example is given using “iReasoning MIB Browser”.

Here are the steps to follow:

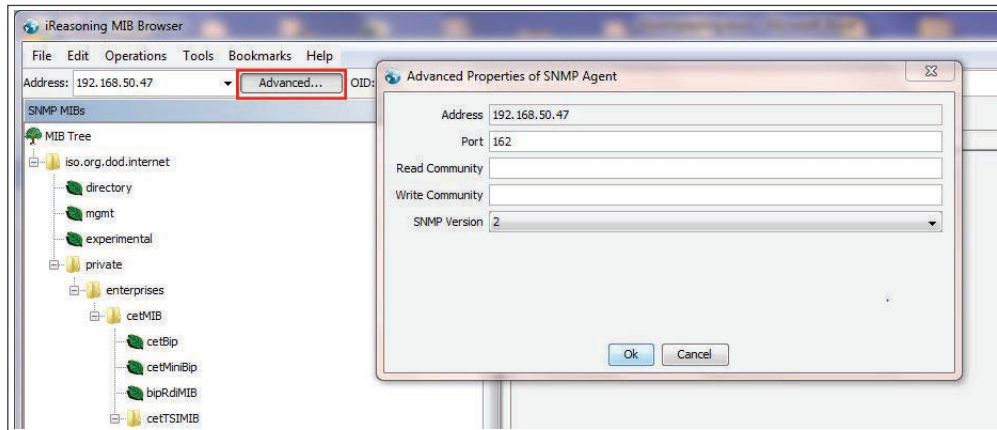
1. Click **File > Load MIBs** and browse to locate on your hard drive, where the files downloaded on my.cet-power.com portal (CET-TSI-MIB.mib & CET-TSI-SMI.mib).



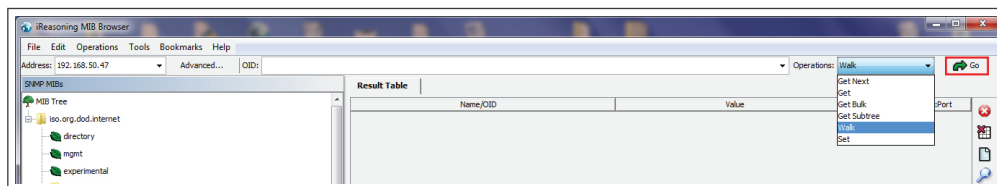
2. Once it is done, you can browse the MIB content under **MIB Tree > iso.org.dod.internet > private > enterprises > cetMIB > cetTSIMIB**
3. Fill the address field with your unit IP address.



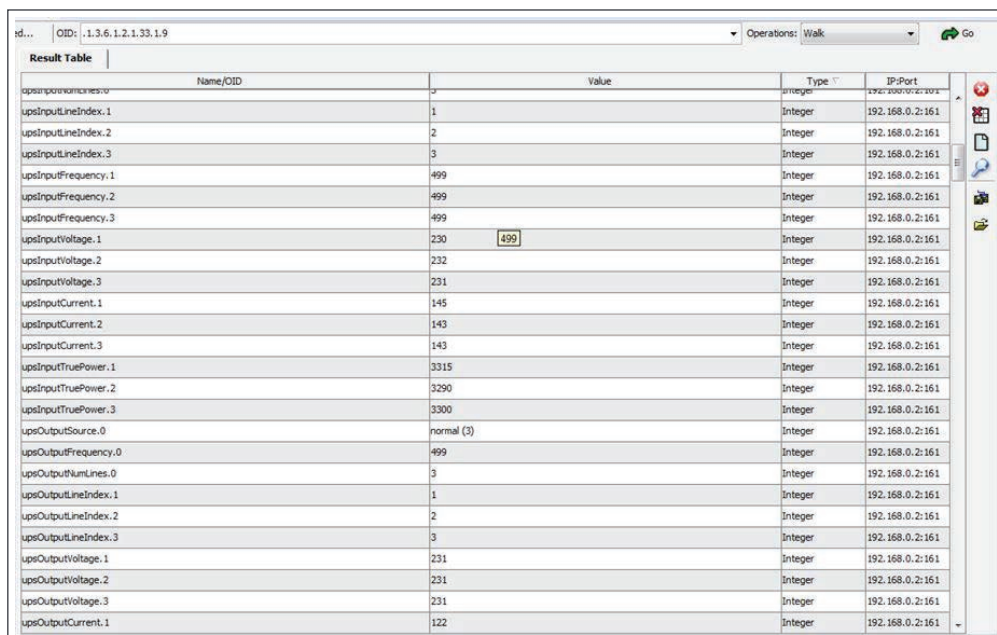
- Click “advanced” if you changed settings like Read Community.



- Select the operation, for example “WALK” and click “Go”.



- The result looks like

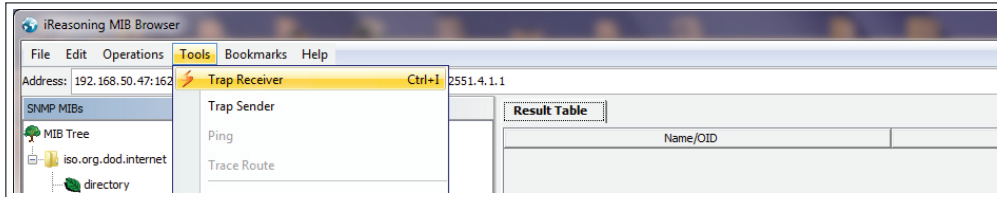


Name/OID	Value	Type	IP:Port
upsInputLineIndex.1	1	Integer	192.168.0.2:161
upsInputLineIndex.2	2	Integer	192.168.0.2:161
upsInputLineIndex.3	3	Integer	192.168.0.2:161
upsInputFrequency.1	499	Integer	192.168.0.2:161
upsInputFrequency.2	499	Integer	192.168.0.2:161
upsInputFrequency.3	499	Integer	192.168.0.2:161
upsInputVoltage.1	230	Integer	192.168.0.2:161
upsInputVoltage.2	232	Integer	192.168.0.2:161
upsInputVoltage.3	231	Integer	192.168.0.2:161
upsInputCurrent.1	145	Integer	192.168.0.2:161
upsInputCurrent.2	143	Integer	192.168.0.2:161
upsInputCurrent.3	143	Integer	192.168.0.2:161
upsInputTruePower.1	3315	Integer	192.168.0.2:161
upsInputTruePower.2	3290	Integer	192.168.0.2:161
upsInputTruePower.3	3300	Integer	192.168.0.2:161
upsOutputSource.0	normal (3)	Integer	192.168.0.2:161
upsOutputFrequency.0	499	Integer	192.168.0.2:161
upsOutputNumLines.0	3	Integer	192.168.0.2:161
upsOutputLineIndex.1	1	Integer	192.168.0.2:161
upsOutputLineIndex.2	2	Integer	192.168.0.2:161
upsOutputLineIndex.3	3	Integer	192.168.0.2:161
upsOutputVoltage.1	231	Integer	192.168.0.2:161
upsOutputVoltage.2	231	Integer	192.168.0.2:161
upsOutputVoltage.3	231	Integer	192.168.0.2:161
upsOutputCurrent.1	122	Integer	192.168.0.2:161

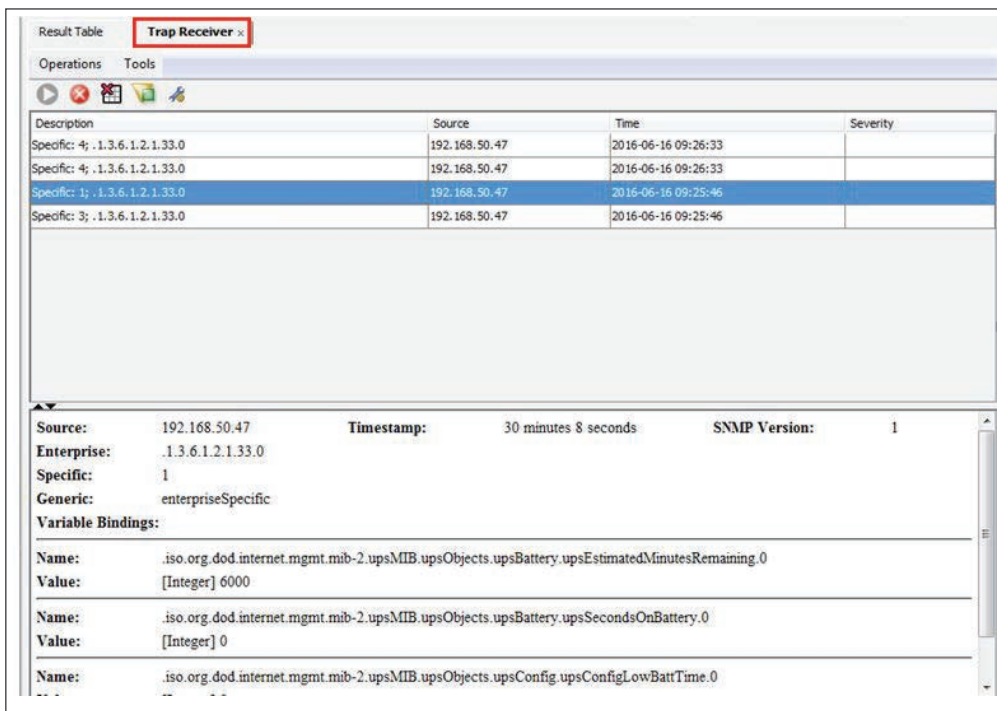
## 9.4 SNMP V1 Traps

To check the SNMP V1 traps,

1. Click **Tools > Trap Receiver** on the menu bar.



2. You should have defined the IP address of the laptop running MIB Browser in the T2S ETH configuration in order to retrieve trap.



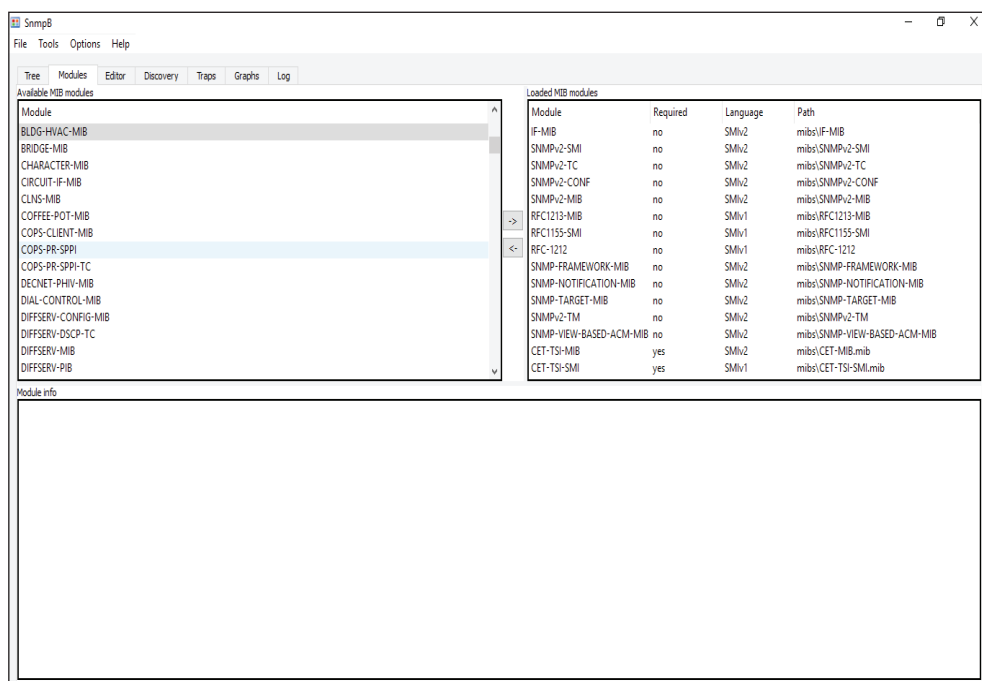
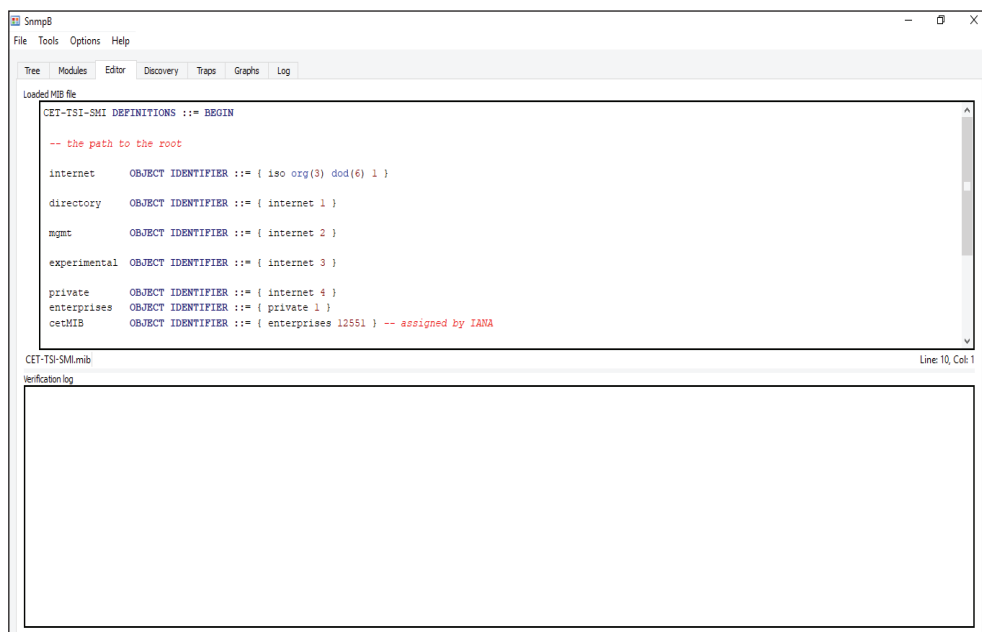
## 9.5 SNMP V3 Testing

Snmpb-0.8.exe is the latest version of snmp tool. Download the file from this URL <https://sourceforge.net/projects/snmpb/> and run the exe to install the application.

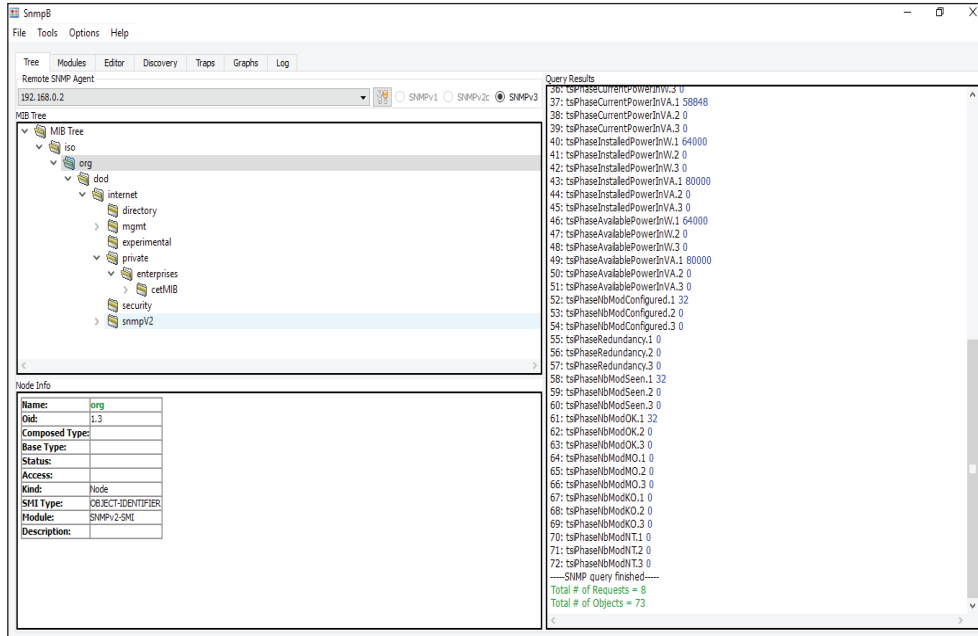
### 9.5.1 Steps to Load CET MIB

1. Open the application and navigate to editor.
2. Open CET-TSI-MIB and paste it in the editor.
3. Press Ctrl + S to save the file with the same file name.
4. Open CET-TSI-SIM and paste it in the editor.

5. Press Ctrl + S to save the file with the same file name.
6. Navigate to Modules Tab.
7. Check CET-TSI-MIB and CET-TSI-SMI are listed under available MIB Modules.
8. Select the above files and Press right arrow to move the files to Loaded MIB Module.
9. By doing this CET MIB files are loaded to SNMPB MIB tree.
10. Navigate to tree tab and check for CET MIB under iso-org-dod-internet-private-enterprises-cetMIB.

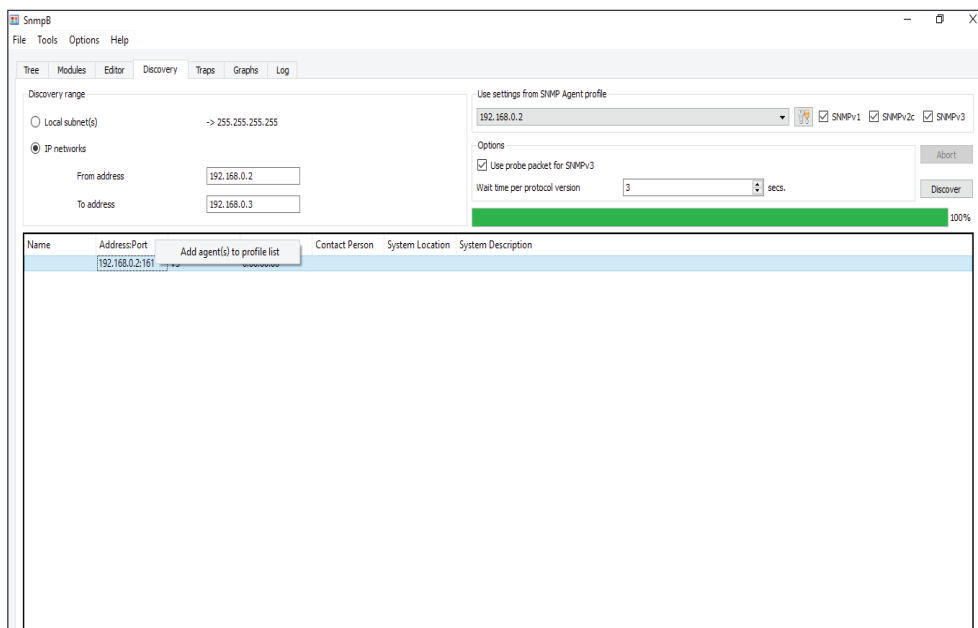






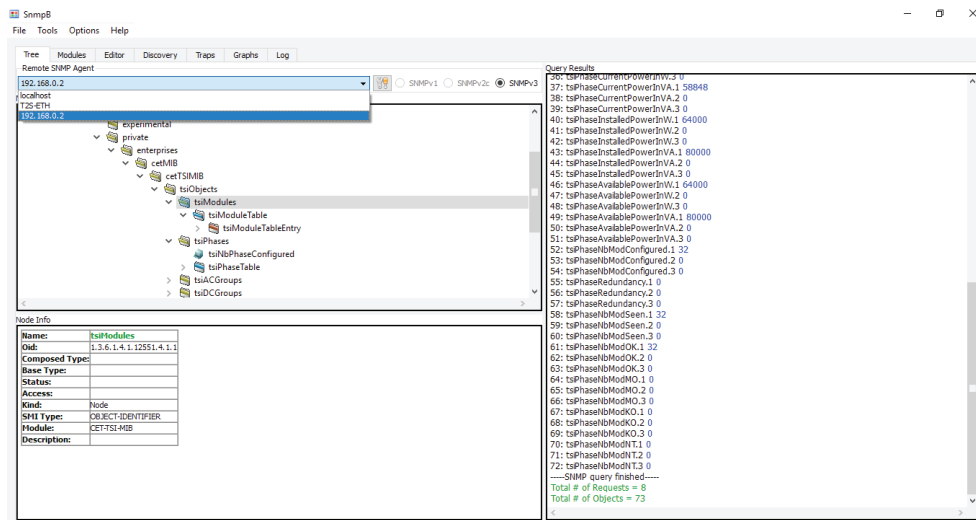
### 9.5.2 Steps to Discover Device

1. Navigate to Discovery tab.
2. Select IP option and enter From and To IP addresses, this would be the IP address range of T2S ETH IP.
3. SNMP Agent profile to be selected based on the type of SNMP communication.
4. Click on discover device.
5. T2S device will be discovered.
6. Right click on the device and add device to agent profile list.



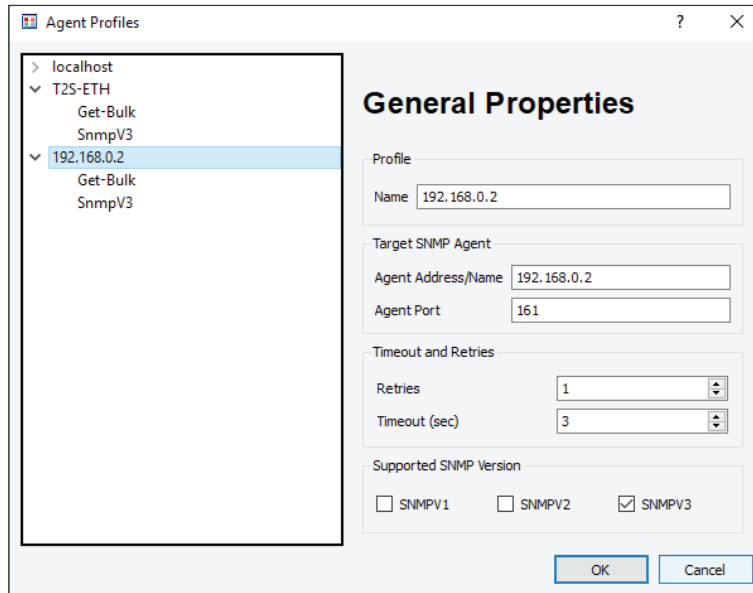
### 9.5.3 Steps to Get / Walk OID

1. Select the SNMP Agent under remote SNMP agent.
2. The Added SNMP Agent has to be listed in the list.
3. Right click on the OID to perform walk or Get.



### 9.5.4 Steps to add SNMP V3 User

1. Navigate to Options – manage Agent Profile.
2. Select the Agent Profile and select the supported SNMP Version.
3. Select Manage SNMP3 USM User.
4. Right click on User profile Table and add new user profile.
5. Security username should be the Priv user name given in T2S ETH web page.
6. Authentication protocol, Authentication password, Privacy Protocol and Privacy password should also match with the values given in T2S ETH web page.
7. Click OK.
8. Navigate to Options – manage Agent Profile.
9. Select SNMP agent and select SNMP v3, under SNMP properties security name drop down list select the USM user created.
10. Select Security level NoAuth/NoPriv or Auth/NoPriv or AuthPriv as the once configured in T2S ETH web page.
11. Enter SNMP content text same as in T2S ETH web page.



**Agent Profiles**

- localhost
  - T2S-ETH
    - Get-Bulk
    - SnmpV3
  - 192.168.0.2
    - Get-Bulk
    - SnmpV3

**General Properties**

Profile

Name: 192.168.0.2

Target SNMP Agent

Agent Address/Name: 192.168.0.2

Agent Port: 161

Timeout and Retries

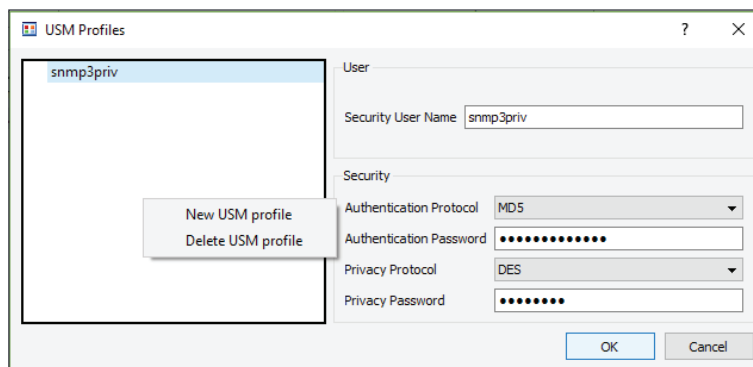
Retries: 1

Timeout (sec): 3

Supported SNMP Version

SNMPV1  SNMPV2  SNMPV3

OK Cancel



**USM Profiles**

snmp3priv

New USM profile  
Delete USM profile

User

Security User Name: snmp3priv

Security

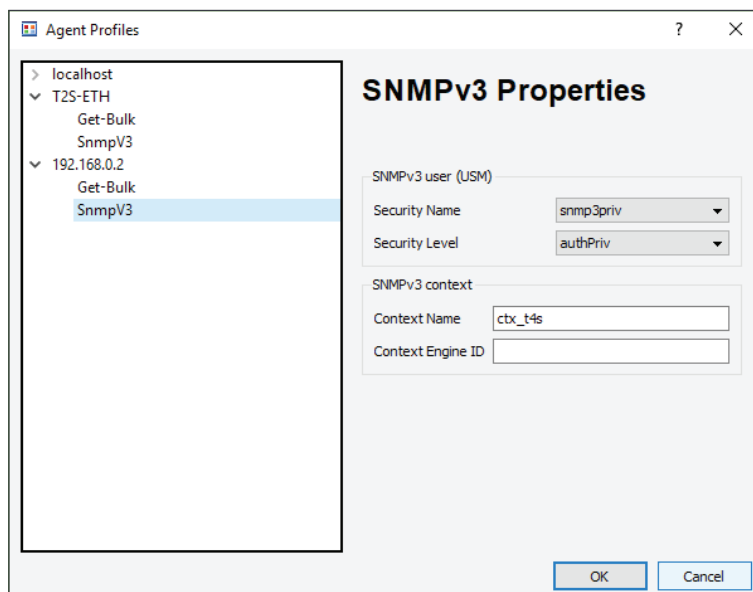
Authentication Protocol: MD5

Authentication Password: .....

Privacy Protocol: DES

Privacy Password: .....

OK Cancel



**Agent Profiles**

- localhost
  - T2S-ETH
    - Get-Bulk
    - SnmpV3
  - 192.168.0.2
    - Get-Bulk
    - SnmpV3

**SNMPv3 Properties**

SNMPv3 user (USM)

Security Name: snmp3priv

Security Level: authPriv

SNMPv3 context

Context Name: ctx\_t4s

Context Engine ID:

OK Cancel

## 10. FAQ

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1. I am unable to change the output phase of a module?

- Check that the number of phases is correctly configured in Configuration > Power > AC OUT > Nb of phase.
- Module should be manually turned off (module page).
- Don't forget to turn the module back on when the phase is changed.

2. I have a system properly running with T2S USB, can I replace it with T2S ETH?

Of course, T2S ETH and T2S are 100% compatible. Once the load is fed, monitoring cannot cause any issue to it. Feel free to replace your old T2S with a new T2S ETH.

- T2S ETH is compatible with Candis.
- T2S ETH featured with SNMP and SNMP supports only V1. So, the TCP IP section is not required. (SNMP V2c and V3 are available through Catena.)

Pay attention to:

- MBP monitoring is a T2S configuration parameter that should be reconfigured in your new T2S ETH once it's up and running.
- Operating parameter need to be cross check, and IP setting must reconfigured.

3. I want to replace a power module in my system. What should I do?

- Remove the module
- Browse to module selection pop-up.
- The removed module appears in red. Click on it.
- This brings you to module page. Uninstall the module by clicking the uninstall button.
- Insert the new module.
- Module will appears on module selection pop-up.
- Its address can be changed by browsing to module page.

4. How can I reset my admin password if I have unfortunately forgotten it?

In case of password lost, a new temporary password (valid 24 hrs after creation) can be issued by CE+T Power. To receive a temporary password, send an email with your T2S ETH serial Number and the date at which you expect to go back on site to change the password to [customer.support@cet-power.com](mailto:customer.support@cet-power.com) specifically requesting a new temporary password. The serial number can be found on the sticker on the T2S ETH, or on screen in "Parameters" then "Info".

5. What is the purpose of the SNMP trap community?

T2S ETH device features the ability to send SNMP Trap events to a configured SNMP trap receiver. This could be Test Traps and Traps sent when there is an alarm.

These traps receivers can be configured in T2S ETH web page under parameters -> SNMP -> Trap receiver in Expert Login.

Trap settings	
Port Trap SNMP	162
SNMP version	v2c
Community v1 v2c	public
Traps version	CET MIB traps

A maximum of 5 Trap receivers can be configured in T2S ETH.

Trap receivers	
IP for trap 1	0.0.0.0
IP for trap 2	0.0.0.0
IP for trap 3	0.0.0.0
IP for trap 4	0.0.0.0
IP for trap 5	0.0.0.0

The purpose of SNMP trap community string:

- This is an added measure of security, operators may configure a trap community string which is used by the trap receiver to determine which traps are to be accepted from a device.
- This parameter is useful to avoid unwanted floods of Traps from a malicious source, by configuring Trap community string only relevant traps are processed by the trap receiver.
- Filtering on Trap Community string is used to process relevant Traps.

6. After migrating from T2S USB to T2S ETH, what changes can you expect in Modbus?

There are more changes between USB and ETH versions, to know about the changes, refer to section 17.6, page 109.

# 11. Trouble Shooting and Defective Situations Fixing

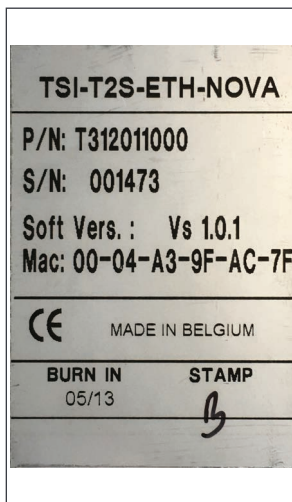
## 11.1 Defective T2S ETH

### 11.1.1 Return defective T2S interface

A T2S totally dark (indication area) or that cannot interface with your laptop are evidence of failure.

### 11.1.2 Return defective T2S ETH

- A repair request should follow the regular logistics chain:  
End-user => Distributor => CE+T Power.
- Before returning a defective product, a RMA number must be requested through the <http://my.cet-power.com> extranet. Repair registering guidelines may be requested by email at [repair@cet-power.com](mailto:repair@cet-power.com).
- The RMA number should be mentioned on all shipping documents related to the repair.
- Be aware that products shipped back to CE+T Power without being registered first will not be treated with high priority!
- Information on failure occurrence as well as module status in “Events” page shall be attached to defective unit return package or recorded in RMA.



## 12. Service

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### For Service

- Check Service Level Agreement (SLA) of your vendor. Most of the time they provide assistance on call with integrated service. If such SLA is in place, you must call their assistance first.
- If your vendor doesn't provide such assistance (\*) you may call CE+T directly. Toll free Number **1(855) 669 - 4627(\*\*)**

Service is available from 8:00 A.M. to 10:00 P.M. EST, Monday through Friday, except closing periods for holidays or inclement weather.

Major Incidents and Emergency conditions can be invoked for immediate handling of same number or by dropping a mail on [customer.support@cetamerica.com](mailto:customer.support@cetamerica.com) (\*\*\*)

(\*) CE+T will redirect your call to your vendor if he has such SLA in place.

(\*\*) Valid in USA and Canada only.

(\*\*\*) Messages that are not Major Incident or Emergency will be served at the next scheduled working a day.

## 13. Maintenance Task

As maintenance will perform on live system, all task should perform only by trained people with sufficient knowledge on TSI and ECI product.

### Tasks:

- Identify the site, customer, responsible, cabinet number, product type.
- Download and save configuration file for back up.
- Check configuration file to be in accordance with operational site conditions.
- Read and save log file for back up.
- Check and analyze log file, and if alarm are present.
- Replace dust filter if present. Filter is mandatory in dusty environment.
- Check module temperature and log value. If the internal temperature is higher than the previous year, determine if this is due to increased load, accumulated dust or reduced airflow. It is common to have a delta of 15°C by 30% of the load between the ambient and the internal temperature. If temperature increases due to internal dust built up, clean the module by air suction blower or vacuum cleaner.
- Clean cabinet (vacuum cleaner or dry cloth)
- Control the inverter mapping (AC Group, DC Group, Address)
- Check load level and record the rate value (print in word document the 4 screen modules information for the 32 modules, the 3 screen for the phases value and the 2 screens for the group AC and DC value)
- Change the configuration file for AC and DC mix mode to check that all TSI work on both power supply
- Check alarm operation (e.g., redundancy lost, mains failure, DC failure) on dry contact and through SNMP system or web interface.
- Switch OFF AC IN and check alarms.
- Check temperature terminal and temperature wiring. If possible use an infrared camera.
- Read and record value as wave form, power factor, Crest factor, THD I from power analyzer.
- Take cabinet picture
- Keep track of report and provide end user with a copy.
- Perform a MBP procedure. This task is not really recommended\*, but could be demanded by site manager.

\* It is not recommended because when you perform a By-pass procedure, generally there is no back up on AC input line, and the load shutdown if mains disappear.



## 14. Annex 1: Supervisor alarms - T2S ETH

This is the list of alarms issued by the supervisor. Other alarms are issued by other modules (see section 15, page 67). The supervisor is able to generate alarms that are related to the system, to inverter modules, or to itself. Alarms related to inverters will be seen as system alarms when module alarm is present on all inverters.

Each alarm has a priority level. The level can be (disabled, event, minor, major). If the level can be configured in the user interface, then it is marked as “mappable”.

System Alarms				
Text ID	Name	Level	Default Mapping	Description
256	MBP Engaged	mappable	major	When the Inverter system operates in bypass mode, T2S ETH will display the alarm by using auxiliary contact from MBP switch through Digital input 1. Digital input 1 is dedicated to MBP if it is installed in the system.
257	Surge Arrester	mappable	minor	In the inverter system, if surge arrester fails, T2S ETH will display the alarm by using auxiliary contact from surge arrester through Digital input 2. Digital input 2 is dedicated to surge arrester if it is installed in the system.
258	Redundancy Lost	mappable	minor	It is a lost of inverter redundancy. Redundancy is configured, and redundancy is lost on any output group.
259	Redundancy +1 Lost	mappable	minor	It is a lost of inverter redundancy + 1 inverter. Redundancy is configured and more than redundancy is lost on any output group.
260	Main Source Lost	mappable	major	Priority source is lost ( depend on the configuration EPC or Online). Any of the groups from the main source does not conform. Example: there are 3 AC input groups, and the AC source is the main source. If one AC input is offline, the alarm is triggered.
261	Secondary Source Lost	mappable	minor	Secondary source is lost ( depend on the configuration EPC or Online) Any of the groups from secondary source does not conform.
262	AC Source Lost	mappable	R3	Any AC input group does not conform.
263	DC Source Lost	mappable	disabled	Any DC input group does not conform.
264	AC Source Not Sync	mappable	minor	Any AC input group is not synchronized with AC output or has an out of range frequency.
265	DC Source Low	mappable	major	Check Vdc parameter and live value. Any DC input group has a voltage lower that defined threshold.
266	Output Saturated	mappable	disabled	The load on any output group is higher than the saturation threshold (80% of configured output power).
267	Output Overloaded	mappable	major	The load on any output group is higher than the configured output power.
268	Output Failure	mappable	major	Any output group has 0 seen modules, or no module running (and they are not manually off).
269	System Started	event		System just started.

<b>System Alarms</b>				
<b>Text ID</b>	<b>Name</b>	<b>Level</b>	<b>Default Mapping</b>	<b>Description</b>
272	Missing Module	event		Module is removed or defect. No module is detected on system bus.
273	New Module	event		All modules have just been detected on system bus.
274	Manually OFF	mappable	disabled	Inverter are switched OFF by the OFF function in hyper terminal. All modules outputs are manually turned off.
275	Output Fault	event		All modules outputs are turned off because of a fault.
276	Brownout Derating	event		AC in below threshold - reduce power from the AC input and pulls power form the DC input. All modules AC inputs are derated because of a brown-out.
278	Temperature Derating	event		Heat sink temperature is over rating. All modules outputs are derated because of an over temperature.
279	Overtemperature	event		Temperature is too high in the room or bad cooling, or component defective inside inverter. All modules outputs are turned off because of an over temperature.

<b>Supervisor T2S ETH Alarms</b>				
<b>Text ID</b>	<b>Name</b>	<b>Level</b>	<b>Def. Map</b>	<b>Description</b>
512	Digital Input 1	mappable	disabled	Digital input 1 is in low state and digital input 1 is NOT used for MBP signaling.
513	Digital Input 2	mappable	disabled	Digital input 2 is in low state and digital input 2 is NOT used for surge arrester signaling.
514	Log Nearly Full	mappable	disabled	Log file is nearly full.
515	Log Full	mappable	disabled	Log file is full (with information loss).
516	Log Cleared	event		Log file has just been cleared.
517	Config modified	event		Configuration has just been modified.

## 15. Annex 2: Module alarms - T2S ETH

<b>Module not Recoverable Alarms</b>				
<b>Text ID</b>	<b>Name</b>	<b>Level</b>	<b>Def. Map</b>	<b>Check and Action</b>
1	Fan Failure	Minor		Fan replacement
2	Permanent Fault (2)	Minor		
3	Permanent Fault (3)	Minor		
4	Permanent Fault (4)	Minor		
5	Permanent Fault (5)	Minor		
6	Permanent Fault (6)	Minor		
7	Too Many Starts	Minor		10 starts in 10 min (one a min)-Unplug and replug inverter and check status
8	Permanent Fault (8)	Minor		
9	Permanent Fault (9)	Minor		
10	Permanent Fault (10)	Minor		
11	Permanent Fault (11)	Minor		
12	Permanent Fault (12)	Minor		
13	Output Polarity	Minor		
14	Overload Too Long	Minor		Check load condition
15	Output Fuse	Minor		
16	Permanent Fault (16)	Minor		
18	Permanent Fault (18)	Minor		
19	Permanent Fault (19)	Minor		
28	Permanent Fault (28)	Minor		
29	Permanent Fault (29)	Minor		
30	Permanent Fault (30)	Minor		
31	Permanent Fault (31)	Minor		
32	Permanent Fault (32)	Minor		

<b>Module Recoverable Alarms</b>				
<b>Text ID</b>	<b>Name</b>	<b>Level</b>	<b>Def. Map</b>	<b>Check and Action</b>
33	Output Synchronization	Minor		Check frequency TSI and Mains
34	Temperature Too High	Minor		Check temperature inside inverter
35	Com. Bus Failure	Minor		T2S bus failure or no T2S seen. TSI blinks red - hardware problem
36	Com. Bus Conflict	Minor		When two TSI have the same ADX - will self repair
37	No Power Source	Minor		No input AC and inout DC available
38	Com. Bus Failure	Minor		TSI has not started must have a T2S - orange LED
39	Parameter Query	Minor		Inverter is updating his parameters
40	Parameter Mismatch	Minor		Parameters incompatible with configuration file

<b>Module Recoverable Alarms</b>				
<b>Text ID</b>	<b>Name</b>	<b>Level</b>	<b>Def. Map</b>	<b>Check and Action</b>
41	Parameter Not Ready	Minor		Check AC, configuration and allocated phases
42	Recoverable Fault (42)	Minor		
43	Inv Mismatch	Minor		Inverter incompatible with inverter installed in system (pack with "a la carte")
44	Backfeed Error	Minor		Inverter OFF due backfeed error
45	Recoverable Fault (45)	Minor		
46	Ext. Clock Fault	Minor		System OFF due external clock failure
47	Overload Triangle	Minor		Inverter OFF due internal failure

<b>Module Alarms</b>				
<b>Text ID</b>	<b>Name</b>	<b>Level</b>	<b>Def. Map</b>	<b>Check and Action</b>
65	TSI Com. Bus Failure	Minor		synchronization problem
66	T2S Com. Bus Failure	Minor		problem will be stored in internal black box- return for investigation
67	TSI Com. Bus Failure	Minor		cabling or module problem
68	T2S Com. Bus Failure	Minor		Problem will be stored in internal black box- return for investigation
69	Recoverable Fault (69)	Minor		
70	Recoverable Fault (70)	Minor		
71	Output Volt. Changing	Minor		Happens when there is a config change to the voltage- lasts 1 min for a change from 100V to 120V - never insert a new module while this is happening!
72	Output Overload (I)	Minor		Check load condition
73	Com. Bus Mismatch	Minor		Alarm- triggered when it sees more or less modules on bus A vs bus B - used to identify a module problem while the module is still running - module needs to be replaced
74	Imminent Start	Minor		reported from a stopped module 10 seconds before it is going to start
75	Booster Not Ready	Minor		Wait 1 minute to recover the situation
76	Overload Not Ready	Minor		Wait 1 minute to recover the situation
77	Temperature Derating	Minor		temperature measured from the heat sink - 88C for bravo and 70C for media
78	Output Overload (P)	Minor		Check load condition
79	Recoverable Fault (79)	Minor		
80	Brownout Derating	Minor		AC in below 180V - reduce power from the AC input and pulls power form the DC input
81	Fan Life	Minor		Write an event "FAN LIFE ELAPSED" in log file when the counter elapsed time is reach for one inverter.
82	Remote Off	Minor		Write an event "REMOTE OFF" in log file when inverter is set OFF through REM ON/OFF terminal

Module Alarms				
Text ID	Name	Level	Def. Map	Check and Action
83	Manual Off	Minor		Write an event "MANUALLY OFF" in log file when module is set OFF through hyperterminal
84	Triangle Off	Minor		Inverter in OFF position due triangle mode failure
85	Recoverable Fault (85)	Minor		
86	Recoverable Fault (86)	Minor		
88	Recoverable Fault (88)	Minor		

Module AC Input Alarms				
Text ID	Name	Level	Def. Map	Check and Action
160	Ok			No error on AC IN
161	Source V Too Low Transfert	Minor		Check AC IN configuration and live value
162	Source V Too High Transfert	Minor		Check AC IN configuration and live value
163	Error (163)	Minor		
164	Error (164)	Minor		
165	Source V Too Low Transfert	Minor		Check AC IN configuration and live value
166	Source V Too High Transfert	Minor		Check AC IN configuration and live value
167	Source Not conform	Minor		Check AC IN configuration and live value
168	Source Not conform	Minor		Check AC IN configuration and live value
169	Source Not conform	Minor		Check AC IN configuration and live value
170	Power Disabled	Minor		AC input converter is only use for synchronization
171	Source Not conform	Minor		Check AC IN configuration and live value
172	THD Too High	Minor		Check AC IN configuration and live value
173	Output Synchronization	Minor		Check AC IN configuration and live value
174	Error (174)	Minor		
175	Output Synchronization	Minor		Check synchronization between AC IN and AC OUT
176	Inv. Synchronization	Minor		Check synchronization between AC IN and AC OUT
177	Synchronization failure	Minor		Check synchronization between AC IN and AC OUT
179	Source V Too Low Stop	Minor		Check AC IN configuration and live value
180	Source V Too High Stop	Minor		Check AC IN configuration and live value
181	Source Frequ. Too Low	Minor		Check AC IN configuration and live value
182	Source Frequ. Too High	Minor		Check AC IN configuration and live value
183	Phase Not Ready	Minor		Check AC IN configuration and live value
184	Backfeed Error	Minor		Inverter in backfeed protection

<b>Module AC Input Alarms</b>				
<b>Text ID</b>	<b>Name</b>	<b>Level</b>	<b>Def. Map</b>	<b>Check and Action</b>
188	Error (188)	Minor		
189	Error (189)	Minor		
190	Error (190)	Minor		
191	Error (191)	Minor		

<b>Module DC Input Alarms</b>				
<b>Text ID</b>	<b>Name</b>	<b>Level</b>	<b>Def. Map</b>	<b>Check and Action</b>
193	Ok			No error on DC IN
194	Source V Too Low Transfert	Minor		Check VDC parameter and live value
195	Source V Too High Transfert	Minor		Check VDC parameter and live value
196	Error (196)	Minor		
202	Source V Too Low Transfert	Minor		Check VDC parameter and live value
203	Source V Too High Transfert	Minor		Check VDC parameter and live value
204	Source V Too Low Stop	Minor		Check VDC parameter and live value
210	Source V Too Low Stop	Minor		Check VDC parameter and live value
211	Source V Too High Stop	Minor		Check VDC parameter and live value
217	Error (217)	Minor		
220	Error (220)	Minor		

## 16. Annex 3: Configuration parameters - T2S ETH

### 16.1 Monitoring

**Disclaimer:** The configuration file should be manually edited only by CE+T crew or any especially trained operator. All modifiable values contained here are easily accessible through the T2S ETH web interface which allow you to change the configuration carefully. Any mistake done in this file could lead to system malfunction and CE+T shall not guarantee the behavior of the whole system once this file has been corrupted.

- Time

Text ID	Name	Values	Description
	Time	HH : MN : SS	Set the Time in Hours : Minutes : Seconds
	Date	DD : MM : YY	Set the Date in Day : Month : Year

- Regional settings

Text ID	Name	Values	Description
Regional settings			
525	Language	English	Select a language for User interface
		French	
		German	
523	Sitename	CE+T	Enter the site name which will appear in user interface banner
524	Location	Belgium	Enter the location of the system installed.
562	Auto logout delay	1 - 6000 seconds	The auto logout time for Expert login
561	Keyboard layout	azerty	Keyboard layout for Catena touch screen
		qwerty	
631	New module identifier	Always ask	Select a function to perform while inserting a new module. <ul style="list-style-type: none"> <li>Always ask - System will ask to assign the address of every newly inserted module.</li> <li>Always replace - System will assign the address of the replaced module automatically.</li> <li>Never replace - System will assign the module address randomly.</li> </ul>
		Always replace	
		Never replace	
634	Home page	Classic homepage	User interface display for home page. <ul style="list-style-type: none"> <li>Classic home page - Displays information of AC IN, DC IN, and AC OUT parameters, for more information user has to click Magnifier button.</li> <li>Alternate homepage - Displays brief information of parameters in single page without clicking Magnifier button.</li> </ul>
		Alternate homepage	
Display format			
620	Date format	DD/MM/YYYY	Date format for user interface and user log
		YYYY/MM/DD	
		MM/DD/YYYY	
621	Time format	24H	Time format for user interface and user log
		12H	

Text ID	Name	Values	Description
622	Temperature format	Celcius °C	Temperature format for user interface and user log
		Fahrenheit °F	

- NTP Server

Text ID	Name	Values	Description
NTP server			Time to be synchronized with Global Time Zone Offset by using NTP server IP.
554	IP address of NTP server	0.0.0.0	Enter the NTP Server IP address. It is used to synchronize the clocks of the inverter system to local time.
555	Port	123	NTP server port
556	Timezone offset	UTC-12 to UTC+12	UTC – Coordinated Universal Time, set your country UTC time zone.
557	Auto-refresh	Disable	Enable or disable the automatic synchronization to NTP server.
		Enable	
558	Synchronization interval (days)	Integer : 1 - 365	Interval in days between two automatic time synchronizations to NTP server.

- Passwords

Text ID	Name	Values	Description
Passwords			Password is used for Expert login, the default password is “pass456”. It is recommended to change the password.
	Password	-	Type your new password
	Confirm Password	-	Re-type the same password

- Network

Text ID	Name	Values	Description
Connection mode			
627	Hardware setup	With CATENA	Select “With CATENA” option if monitoring device (Catena) is installed in the system. In this option user can access the network connection through Catena at rear. SNMP available version: v1, v2c and v3
		Standalone	Select “Standalone” option if monitoring device (Catena) is not installed. User can access the network connection from T2S ETH at front (Wait at least 3 minutes to establish connection). SNMP available version: v1
Network address			
517	DHCP status	Disable	Disable: It allows to configure static IP to T2S ETH card Enable: IP to T2S will be assigned by the DHCP server or the Router to which T2S ETH is connected. To find the IP address of T2S ETH card IP Scanner tools can be used
		Enable	
512	IP address	192.168.0.2	Default IP address is 192.168.0.2, user can set their own System IP address



Text ID	Name	Values	Description
513	Subnet mask	255.255.255.0	Enter the system subnet mask address
514	Default gateway	192.168.0.254	Enter the system default gateway address
515	Primary DNS	0.0.0.0	Enter the system Primary DNS address
516	Secondary DNS	0.0.0.0	Enter the system Secondary DNS address

- Alarms

Text ID	Name	Values	Description
<b>Alarms</b>			
552	MBP Configured	Disable	Enable: If MBP switch is installed in the system and engaged, the alarm will generate through Digital Input 1. Disable: If not installed, user can utilize the Digital Input 1 for other inputs.
		Enable	
559	Remote MBP	Disable	Enable: If remote MBP is engaged, the alarm will generate through Digital Input 1 and relay 3 is connected to remote MBP unit. Disable: If not installed, user can utilize the Digital Input 1 for other inputs. (It is applicable only for the systems in USA market)
		Enable	
553	Surge arrester configured	Disable	Enable: If Surge arrested is installed and activated, the alarm will generate through Digital Input 2. Disable: If not installed, user can utilize the Digital Input 2 for other inputs.
		Enable	
538	Log full alarms	Disable	If enabled, an alarm will be generated once it reaches the maximum limit. It is recommended to download the log files before it goes to FIFO.
		Enable	

## 16.2 Inputs/Relays

- Inputs Label

Text ID	Name	Values	Description
<b>Labels</b>			
521	Digital Input 1	MBP	By default the label is "MBP ENGAGED". If MBP switch is not installed, user can define the name of their Digital Input 1.
522	Digital Input 2	Surge Arrester	By default the label is "Surge Arrester". If Surge Arrester is not installed, user can define the name of their Digital Input 2.

- Relays Label

Text ID	Name	Values	Description
<b>Relays Label</b>			
535	Major Relay Name	Major	User label for major alarm relay and cannot be modified.
536	Minor Relay Name	Minor	User label for minor alarm relay and cannot be modified.
537	Relay 3 Name	Relay 3	User can define the label name according to the selected alarm in Relays Mapping page.

- Relays Delay

Text ID	Name	Values	Description
Relays Delay			
532	Major Relay delay	2 to 60 seconds	User can set the time (2 to 60s) for Relay to get energize after the alarm is generated.
533	Minor Relay delay		
534	Relay 3 delay		

- Relays Mapping

Text ID	Name	Values	Description	
Relays Mapping				
543	MBP Engaged	Major	In this page, all the alarms from the modules and systems will be listed. User can set these alarms as major or minor. T2S ETH has one user selectable Alarm – Relay 3. It can be assigned any one alarm from the list.	
549	Surge Arrester			
545	Redundancy Lost			
550	Redundancy +1 lost			
563	Sync Redundancy Lost			
564	All Sync Modules Lost			
580	Main Source Lost			
581	Secondary Source Lost			
539	AC Source Lost			
585	DC Source Lost			
546	AC Source Not Sync			
586	DC Source Low			
551	Output Saturated			Minor
544	Output Overload			
540	Output Failure			Relay 3
590	System Manual Off			
582	Missing Module			
583	Module Manual Off			
584	Module Output fault			
589	Module Brownout Derating			
591	Module Temperature Derating			
548	Module Over Temperature			
541	Dig Input 1			
542	Dig Input 2			
587	Log Nearly Full			
588	Log Full			

- Snmp traps

Text ID	Name	Values	Description	
<b>General</b>				
543	MBP Engaged	Disable	If enabled, by using SNMP protocol these alarms can be used for TRAP receivers. ( number of TRAP receivers can set in SNMP page)	
549	Surge Arrester			
545	Redundancy			
550	Redundancy +1 lost			
563	Sync Redundancy Lost			
564	All Sync Modules Lost			Enable
580	Main Source Lost			
581	Secondary Source Lost			
539	AC Source Lost			
585	DC Source Lost			
546	AC Source Not Sync	Disable	If enabled, by using SNMP protocol these alarms can be used for TRAP receivers. (number of TRAP receivers can set in SNMP page)	
586	DC Source Low			
551	Output Saturated			
544	Output Overload			
540	Output Failure			
590	System Manual Off			
582	Missing Module			
583	Module Manual Off			
584	Module Output fault			Enable
589	Module Brownout Derating			
591	Module Temperature Derating			
548	Module Over Temperature			
541	Dig Input 1			
542	Dig Input 2			
587	Log Nearly Full			
588	Log Full			
633	Other alarms			

## 16.3 SNMP

- SNMP

Text ID	Name	Values	Description
<b>SNMP settings</b>			
626	SNMP version	v1	Select the SNMP version <ul style="list-style-type: none"> <li>T2S ETH supports SNMP v1.</li> <li>SNMP v2c and v3 can be done by using Catena and T2S ETH.</li> </ul>
		v2c	
		v3 No Auth. + No Encrypt.	
		v3 Auth. + No Encrypt.	
		v3 Auth. + Encrypt.	
571	Port SNMP	161	The SNMP default value is 161 and should not modify it.
596	Context;	ctx_t2s	Set the context string in V3.
<b>SNMP v1 v2c</b>			
597	SNMPv1 Agent Community	public	Set the community string for V1 and V2c.
598	SNMP v3 No Auth. + No Encrypt.	NoAuth user	User string for SNMP V3 NoAuth connection.
599	SNMP v3 Auth. + No Encrypt.	NoPriv user	User string for SNMP V3 NoPriv connection.
601	SNMP v3 Auth. + No Encrypt.	NoPriv password	Password string for SNMP V3 NoPriv connection.
600	SNMP v3 Auth. + No Encrypt	NoPriv authentication;select;	Select if using HMAC MD5 or SHA algorithm for authentication in SNMP V3 NoPriv connection.
602	SNMP v3 Auth. + Encrypt.	Priv user	User string for SNMP V3 Priv connection.
604	SNMP v3 Auth. + Encrypt.	Priv password	Password string for SNMP V3 Priv connection.
603	SNMP v3 Auth. + Encrypt.	Priv authentication	Select if use HMAC MD5 or SHA algorithm for authentication in SNMP V3 Priv connection.
610	SNMP v3 Auth. + Encrypt.	Priv encryption key	Key string for encryption in SNMP V3 Priv connection.
605	SNMP v3 Auth. + Encrypt.	Priv encryption	Select if use DES or AES privacy protocol in SNMP V3 Priv connection.
<b>Trap Settings</b>			
572	Port Trap SNMP	162	Set the port to which SNMP trap are sent.
617	Trap security level	'authPriv' : 'Auth + Encrypt' 'authNoPriv' : 'Auth + No Encrypt' 'noAuthNoPriv' : 'No Auth. + No Encrypt.']}	Select the security level for traps sent by agent in SNMP V3.

Text ID	Name	Values	Description
630	SNMP version	v1	Select the SNMP version for traps sent by agent. Only V1 can be used in Stand-Alone mode.
		v2c	
		v3 No Auth. + No Encrypt.	
		v3 Auth. + No Encrypt.	
		v3 Auth. + Encrypt.	
629	Community v1 v2c	public	Set the community string for traps in SNMP V1 and V2c.
611	Trap engine ID		Set trap context engine ID in SNMP V3.
612	Trap user		Set user string for traps sent in SNMP V3.
614	Trap password		Set password string for traps sent in SNMP V3
613	Trap authentication	'MD5' : 'MD5' 'SHA' : 'SHA'	Select if use HMAC MD5 or SHA algorithm for authentication in traps sent in SNMP V3.
618;	Trap priv encryption key		Key string for encryption in traps sent in SNMP V3 Priv.
619	Trap priv encryption	'DES' : 'DES' 'AES' : 'AES'	Select if use DES or AES privacy protocol in traps sent in SNMP V3 Priv.
632	Traps version	0 : 'No trap'	Select among the MIBs in T2S-ETH which one is allowed to send traps.
		1 : 'CET MIB traps'	
		2 : 'UPS MIB traps'	
<b>Trap receivers</b>			
573	IP for trap 1	0.0.0.0	Set SNMP traps receiver IP.
574	IP for trap 2		
575	IP for trap 3		
576	IP for trap 4		
577	IP for trap 5		

## 16.4 Modbus

- Modbus

Text ID	Name	Values	Description
<b>Catena's modbus TCP/IP</b>			
635	Port status	Enable	Enable of ModBus TCP slave on Catena. Available only through Catena.
		Disable	
636	Port select	1 to 65535	Set port for ModBus TCP on Catena.
<b>Modbus RTU slave</b>			
566	RTU slave	Enable	Enable or disable ModBus RTU slave on T2S-ETH.
		Disable	
567	Slave address	1,2,...	Set slave address for ModBus RTU.
568	Baud rate	9600	Set baud rate for ModBus RTU.
		19200	
		38400	
		115200	

Text ID	Name	Values	Description
569	Parity	Even Odd No parity	Set parity for ModBus RTU.
570	Stop bit(s)	1 bit , 2 bits	Set stop bit(s) for ModBus RTU.

## 16.5 Power

- General

Text ID	Name	Values	Description
<b>General</b>			
529	Redundancy	L1	Define the number of redundant modules for each phase.
530		L2	
531		L3	
96	Source power ratio DC vs AC (%)	0 to 100	Defines the priority source. Default value is "0" <b>0</b> - Feeding from AC IN has priority (Inverter AC/AC - EPC mode) <b>100</b> - Feeding from DC has priority (Inverter DC/AC - On Line mode)
102	Booster 10X lin	Enable Disable	Allow to inhibit the Booster option which generates a current of 10In for 20ms in case of short-circuit (For Nova inverter - 9In for 20 ms).
547	AC in present	Enable Disable	If enabled the T2S ETH monitor and display the AC input source parameter in the web interface. If disabled, alarms related to AC source will be inactive and it will not display in the web interface.
104	AC In grid feed Disable	Enable Disable	If enable, power will re-inject to AC input source.

- AC In

Text ID	Name	Values		Description
		230 Vac	120 Vac	
<b>AC In</b>				
637	Number of AC In	1 to 3		Define the number of AC Input phase
<b>AC In</b>				
56	Vac Low Stop	182	98	Define the minimum and maximum for AC Input voltage range. Note: AC input low and high values have fixed hysteresis between stop and restart. Hysteresis is fixed to 10 Vac for 230 Vac module and 5 vac for 120 VAC modules.
57				
58				
52	Vac Low Transfer	185	100	
53				
54				
48	Vac Low Start	195	105	
49				
50				
60	Vac High start	255	135	
61				
62				
64	Vac High Transfer	260	139	
65				
66				
68	Vac High Stop	265	140	
69				
70				
73	Freq AC Low Stop	47.0	57.0	Define the minimum and maximum of AC input frequency range. Note: It is recommended not to change the AC input frequency values.
72	Freq AC Low Start	47.3	57.3	
74	Freq AC High Start	52.7	62.7	
75	Freq AC High Stop	53.0	63.0	
97	Synchro speed (s)	-2, -1, 0, 1 & 2		
101	Mode On Line (Safe)	Enable		If enabled, Load feed by DC source. If DC out of range, Load transfer to AC IN with delay transfer of 10 ms.
		Disable		

• DC Group

Text ID	Name	Values					Description
		24 Vdc	48 Vdc	60 Vdc	110 Vdc	220 Vdc	
<b>DC Group</b>							
16	Vdc Low Stop	19.0	39.0	49.0	90.0	165.0	Define the minimum and maximum of DC input voltage range. Note: It is recommended not to change the DC input values.
17							
8	Vdc Low Transfer	19.5	40.0	50.0	92.0	169.0	
9							
0	Vdc Low Start	23.0	45.0	56.0	100.0	18.0	
1							
24	Vdc High Start	31.0	57.0	71.0	150.0	280.0	
25							
32	Vdc High Transfer	34.5	60.0	74.0	158.0	296.0	
33							
40	Vdc High Stop	35.0	61.0	75.0	160.0	300.0	
41							
593	DC Source Low Threshold	0 to 300					Set DC source low threshold voltage in volts. If DC source voltage drops under this threshold a "DC source low" alarm is raised."

• AC Out

Text ID	Name	Values		Description
		230 Vac	120 Vac	
<b>AC out</b>				
78	Phase shift	L1 - 0.00		Phase shift between AC input phase 1 and AC output phase 1.
79		L2 - 120.00		Phase shift between AC input phase 1 and AC output phase 2.
80		L3 - 240.00		Phase shift between AC input phase 1 and AC output phase 3.
86	Vout nominal	L1 - 230	L1 - 120	Define AC output voltage for AC output phase 1, 2 and 3.
87		L2 - 230	L2 - 120	Output voltage per phase can be selectable
88		L3 - 230	L3 - 120	(N-L : 200 V, 220 V, 230 V & 240 V)
76	Nominal Freq	50	60	Free running AC output frequency when AC input is not available.
77	Nb of phases	1 to 3		Define the number of system output phase. It should be same as number of AC input phase.
94	Short Circuit Voltage Threshold (V)	80	60	Minimum AC output voltage under which module considers output as in short-circuit.
95	Short Circuit Hold Time (s)	1 to 60		Default value is 60 seconds. Time duration during which module tries to eliminate the short-circuit existing on output. If the voltage remains under the "Short Circuit Voltage Threshold" for this duration the module stops.
98	Max Power Derating (%)	150% (TSI)		Maximum power that module can supply.
99	Max Current Derating (%)	125% (ECI)		Maximum current that module can supply.



Text ID	Name	Values		Description
		230 Vac	120 Vac	
100	Max Overload Duration (s)	15 to 600 s		Maximum time duration in seconds for modules to run in overload.
592	Saturation Threshold	80		Set saturation threshold in %. If the saturation i.e. the ratio between output power and rated power reaches this threshold an "Output saturated" alarm is raised.
107	Delta Mode	Enable		Enable Delta Mode, if the load has 3 phase input, without Neutral.
		Disable		

- Synchronization

Text ID	Name	Values	Description
Synchronization			TUS (TSI Universal Synchronization) is used for paralleling the system having more than 32 numbers of modules.
638	Sync Type	Disable	Select the type of synchronizator module (TUS) in the system.
		ALS	
		PLS	
105	In case of sync failure	Never stop	Select the expected behavior of the system in case of synchronization failure.
		Stop after 1 min	
		Stop directly	
118	Number of sync modules	1 or 2	Set number of TUS modules in the system.
119	System ID	1, 2, 3, .....	Set the ID for each sub-system and T2S ETH must have a different ID.
120	Output phase ID	1	Select the sub-system phase. Each sub-system belongs to one and only one output phase.
121	Group ID	1	This parameter is used for configuring A + B system. In this case Group ID can be either 1 or 2 if sub system belongs to group A or group B. These systems can be either mono dual or tri-phases given the output phase ID configured.
122	Number of lines in system	3	Set the number of lines in the system. This is the number of phases.
123	Aux X power supply alarm	Don't care	Set the option as "Don't care"
		On AC source	
124	Aux Y power supply alarm	On DC source	
		Via module	
125	DC sync ID	Disable	If each sub-system has its own independent DC group then this parameter should be set to '0'. If the user want to share a DC group between multiple sub-systems all of these should have the same value for this parameter.
		DC 1 to DC 8	

- Other

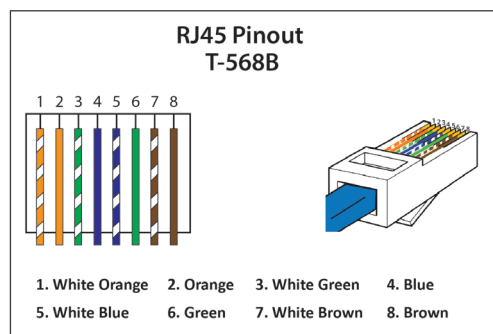
Text ID	Name	Values	Description
103	Remote Off Disable AC Power	Enable	Enable special mode in which “remote off” disables only AC input stage. AC input source is still used for synchronization.
		Disable	
106	Other;Walk In Mode Time (x10 s.)	Integer	The Walk-in mode allow at the TSI to comeback progressively on the AC priority source after an outage. Friendly use on Genset.
108	Airco Mode	Enable	Enable airco mode. It allows to start load with high inrush current and it is applicable only for TSI modules.
		Disable	
109	Force Start Without T2S	Enable	Enable modules start without T2S
		Disable	
110	Pdc Max (W)	0.000000	Maximum power allowed on DC even during overload. 0 means no limit.
111	No power from ACin phase 1	Enable	Not Applicable for EPC mode operation. It is recommended to set in “Disable”
		Disable	
112	No power from ACin phase 2	Enable	
		Disable	
113	No power from ACin phase 3	Enable	
		Disable	

## 17. Annex 4: Modbus

### 17.1 Hardware Requirements

#### 17.1.1 Cabling:

ModBus RTU is available on the RJ45 connector located on the back plane of the rack containing the T2S ETH controller. The below image provides the pinout details of the connector.



Pin Number	Name	Description
1	CANH	CANH pin for Candis
2	CANL	CANL pin for Candis
3	GND_IAX	Digital Communication Ground
4	GND_IAX	Digital Communication Ground
5	12V_IAX	+12 V unregulated
6	COM_A	RS 485 A
7	GND_IAX	Digital Communication Ground
8	COM_B	RS 485 B

#### 17.1.2 Baud rate, parity and mode

Only RTU mode is supported.

Item	Value	Default
Slave address	From 1 to 247	1
Baud Rate	9600, 19200, 38400 or 115200	19200
Parity	Even, odd, none	Even
Stop bits	One, two	One
Mode	RTU	-
Electrical interface	RS485	-

## 17.2 Database Description

### 17.2.1 Typographic convention:

In this document, the following naming convention will be used to represent the type of a variable:

The first letter will indicate if the variable is signed (S) or unsigned (U). Then the following digit(s) will indicate the number of bits needed to store the variable.

Thus:

- U8 will represent an unsigned variable stored in an 8-bit wide memory
- U16 will represent an unsigned variable stored in a 16-bit wide memory
- U32 will represent an unsigned variable stored in a 32-bit wide memory

And:

- S8 will represent a signed variable stored in an 8-bit wide memory
- S16 will represent a signed variable stored in a 16-bit wide memory
- S32 will represent a signed variable stored in a 32-bit wide memory

What is more, the Modbus RTU register base type is a 16-bit wide variable. This means it is possible to store two 8-bit variables in a register. These two variables will be accessed using the same index in the structure. Thus in order to know if the variable is stored in the upper byte or in the lower byte, letter **H(High)** or **L(Low)** is added to the index.

As specified by the protocol, variables longer than 8-bit are always represented in big-Endian format (MSB first).

### 17.2.2 Data types:

Modbus RTU protocol defines four types of variables class described in the following table.

Name	Type	Access	Supported by T2S ETH
Discrete input	1-bit wide	Read-only	No
Coil	1-bit wide	Read-write	No
Input register	16-bit wide	Read-only	Yes
Holding register	16-bit wide	Read-write	No

Data address mapping and signification are described in the following sections.

### 17.2.3 Supported function:

Accordingly to Modbus RTU specification, supported functions by the T2S ETH controller are the following:

- Read Input registers (0x04)

### 17.2.3.1 INPUT REGISTERS ELEMENTS (Read-Only 16-bit wide)

#### Module table (0x0000)

The table described below represents the information that can be retrieved regarding a particular module. The Maximum amount of the module is set to 32. Each of them is identified by an address ranging from 1 to 32.

**BASE ADDRESS:** 0(0x0000) + 31\*(Module address – 1).

Index	Name	Description	Type
0H	eStatusACOut	AC output status number (see 17.3.1.1, page 89)	U8
0L	eStatusACIn	AC input status number (see 17.3.1.2, page 90)	U8
1H	eStatusDCIn	DC Input status number (see 17.3.1.3, page 90)	U8
1L	bAddress	Configured address	U8
2H	bLoadPosition	Position of the load regarding input power sources (0:AC, 100:DC, 50:mixed, 101:unknown)	U8
2L	bLoadRatioW	Loading ratio regarding power in watts (%)	U8
3H	bLoadRatioVA	Loading ratio regarding power in VA (%)	U8
3L	bPhaseNumber	Number of the phase module is belonging to	U8
4	wVout	Output voltage value (0.1V)	U16
5	wIout	Output current value (0.1A)	U16
6	wPoutW	Output power value (W)	U16
7	wPoutVA	Output power value (VA)	U16
8	wVinAC	AC input voltage value (0.1V)	U16
9	wIinAC	AC input current value (0.1A)	U16
10	wPinACW	AC input power value (W)	U16
11	wPinACVA	AC input power value (VA)	U16
12	wACInFreq	AC input frequency value (0.1Hz)	U16
13	wVinDC	DC input voltage value (0.1V)	U16
14	wIinDC	DC input current value (0.1A)	U16
15	wPinDC	DC input power value (W)	U16
16	wTemperature	Temperature value (K)	U16
17	wSoftVersion	Software version number	U16
18	lSerialNumber	Serial number	U32
22H	bStatusMod	Event number of the status related to the output stage and the module internal status	U8
22L	bStatusAC	Event number of the status related to the AC input stage	U8
23H	bStatusDC	Event number of the status related to the DC input stage	U8
23L	bPresent	Flag (true or false) that indicates if module is seen by T2S ETH or not	U8
24H	bGroupAC	AC input group number module is belonging to	U8
24L	bGroupDC	DC input group number module is belonging to	U8
25H	bRestrained	Flag (true or false) that indicates if module cannot cope with more than five other module or not	U8
25L	bNoEPC	Flag (true or false) that indicates if module has an AC input (EPC) or not	U8
26	wPoutNominalW	Nominal output power (W)	U16

Index	Name	Description	Type
27	wPoutNominalVA	Nominal output power (VA)	U16
28	wVinNominalAC	Nominal AC input voltage (0.1V)	U16
29	wVinNominalDC	Nominal DC input voltage (0.1V)	U16
30	wVinNominalFreqAC	Nominal AC frequency (0.1Hz)	U16

### Phase table (0x0640)

The following table described represents the information that can be retrieved regarding a particular phase. The Maximum amount of phase is set to 8. Each of them is identified by a label ranging from 1 to 8.

**BASE ADDRESS:** 600(0x0640) + 27\*(Phase label – 1).

Index	Name	Description	Type
0H	bRatioAvailableW	Ratio between output load and available power in watts (%)	U8
0L	bRatioAvailableVA	Ratio between output load and available power in VA (%)	U8
1H	bRatioInstalledW	Ratio between output load and installed power (Nb modules – redundancy) in watts (%)	U8
1L	bRatioInstalledVA	Ratio between output load and installed power (Nb modules – redundancy) in VA (%)	U8
2	wVout	Output voltage value (0.1V)	U16
3	wIout	Output current value (0.1A)	U16
4H	bNbOndCfg	Number of modules configured in the phase	U8
4L	bRedundancy	Amount of redundancy configured in the phase	U8
5	wACOutFreq	AC output frequency value (0.1Hz)	U16
6	IPinDC	DC input power value (W)	U32
8	IPinACW	AC input power value (W)	U32
10	IPinACVA	AC input power value (VA)	U32
12	ICurrentPowerInVA	Output power value (VA)	U32
14	ICurrentPowerInW	Output power value (W)	U32
16	IInstalledPowerInW	Installed power value (W)	U32
18	IInstalledPowerInVA	Installed power value (VA)	U32
20	IAvailablePowerInW	Available power value (W)	U32
22	IAvailablePowerInVA	Available power value (VA)	U32
24H	bNbInvSeen	Number of module seen by T2S ETH in that phase	U8
24L	bNbInvOK	Number of modules that are delivering output in the phase	U8
25H	bNbInvMO	Number of modules manually off in the phase	U8
25L	bNbInvKO	Number of modules that are not delivering output due to a failure in the phase	U8
26H	bNbInvNT	Number of modules not seen by T2S ETH in the phase (accordingly to bNbOndCfg)	U8

### AC group table (0x0730)

The table described below represents the information that can be retrieved regarding a particular AC group. The Maximum amount of AC group is set to 4. Each of them is identified by a label ranging from 1 to 4.

**BASE ADDRESS:** 1840(0x0730) + 10\*(AC group label – 1).

Index	Name	Description	Type
0H	bNblnvOK	Number of modules that are delivering output in the group	U8
0L	bNblnvMO	Number of modules manually off in the group	U8
1H	bNblnvKO	Number of modules that are not delivering output due to a failure in the group	U8
1L	bNblnvSeen	Number of module seen by T2S ETH in that group	U8
2	IPinACW	AC input power value (W)	U32
4	IPinACVA	AC input power value (VA)	U32
6	wVinAC	AC input voltage value (0.1V)	U16
7	wlinAC	AC input current value (0.1A)	U16
8	wACInFreq	AC input frequency value (0.1Hz)	U16
9H	bACInOk	Number of modules stating that their AC input stage is fully functional	U8

### DC group table (0x076C)

The table described below represents the information that can be retrieved regarding a particular DC group. The Maximum amount of DC group is set to 8. Each of them is identified by a label ranging from 1 to 8.

**BASE ADDRESS:** 1900(0x076C) + 7\*(DC group label – 1).

Index	Name	Description	Type
0H	bNblnvOK	Number of modules that are delivering output in the group	U8
0L	bNblnvMO	Number of modules manually off in the group	U8
1H	bNblnvKO	Number of modules that are not delivering output due to a failure in the group	U8
1L	bNblnvSeen	Number of module seen by T2S ETH in that group	U8
2	IPinDC	DC input power value (W)	U32
4	wVinDC	DC input voltage value (0.1V)	U16
5	wlinDC	DC input current value (0.1A)	U16
6H	bDCInOk	Number of modules stating that their DC input stage is fully functional	U8

### Miscellaneous information table (0x07BC)

The table described below represents the miscellaneous information that can be retrieved regarding T2S ETH and system.

**BASE ADDRESS:** 1980(0x07BC)

Index	Name	Description	Type
0H	bOldVersionNumber	Deprecated. Always 0x00	U8
0L	ePhaseNumber	Number of phase configured in the system	U8

Index	Name	Description	Type
1	ISerialNumber	T2S ETH serial number	U32
3	wTempoMajorAl	Temporization of major alarm relay	U16
4	wTempoMinorAl	Temporization of minor alarm relay	U16
5H	bNbMajor	Number of major alarm in the system	U8
5L	bNbMinor	Number of minor alarm in the system	U8
6H	bNbTotalAlarmNumber	Total number of alarm in the system	U8
6L	bACInputPresent	Flag (true or false) that indicates if AC input should be considered as present or not	U8
7H	bSaturationThresh	Value of the ratio over which the saturation alarm will be raised (%)	U8
7L	bNbGroupsDC	Number of DC groups configured in the system	U8
8H	bNbGroupsAC	Number of AC groups configured in the system	U8
8L	bProgRelay	Always 0xFF	U8
9	wSoftMainRevision	Main revision software number of T2S ETH	U16
10	wSoftSubRevision	Sub revision software number of T2S ETH	U16
11H	bSystemLoadPosition	Position of the load at the system level (0:AC, 100:DC, 50:mixed, 101:unknown)	U8
11L	bT2S ETHMaxKnownParameters	Version number of TSI modules configuration parameters	U8
13H	bNbrModConf	Total number of module configured on the installation	U8
13L	bNbrModSeen	Total number of module configured on the installation	U8

### Date and time table (0x07D0)

The table described below represents the information that can be retrieved regarding date and time.

**BASE ADDRESS:** 2000(0x07D0)

Index	Name	Description	Type
0	ITime	Time in epoch	U32
2H	bSeconds	Seconds number	U8
2L	bMinutes	Minutes number	U8
3H	bHours	Hours number	U8
3L	bDay	Day of the month	U8
4H	bMonth	Month number	U8
4L	bDaylightSaving	Flag (true or false) that specify if daylight saving is enable or not	U8
5	wYear	Year number	U16

### Alarm table (0x07DA)

The table described below represents the information that can be retrieved regarding alarms. Maximum amount of entries is set to 50. A valid entry represents an alarm present in the system. An invalid entry is an entry where all bits of each field are set. All entries following an invalid entry will be invalid.

**BASE ADDRESS:** 2010(0x07DA) + 2\*(Entry number – 1)



Index	Name	Description	Type
0H	bDeviceNumber	Identifier that specifies which device is responsible of this alarm (see 17.3.1, page 89)	U8
0L	bEventType	Type of the alarm (Major or minor) (see 17.3.1, page 89)	U8
1	wEventNumber	Alarm number identifier	U16

**Rem:** See alarm types in the annexes for *bEventType* description.

### Configuration table (0x1040)

The table described below represents the information that can be retrieved regarding parameters that can be configured in the T2S ETH controller. Maximum amount of entries is set to 500. Not all entries are valid. An invalid entry is an entry where all bits of each field are set. Invalid entries might be interleaved with valid entries.

**BASE ADDRESS:** 4160(0x1040) + 20\*(Entry number – 1)

Index	Name	Description	Type
0	swParameter	Configured value of the parameter	S16
1	wValidity	Value indicating if last configured parameter value is valid (see 17.3.4, page 91)	U16
2	wIdentifier	Unique value identifying the parameter	U16
3	wUnit	Value indicating in which units the parameter is expressed (see 17.3.4, page 91)	U16
4	strParamDescription	Textual description of the parameter	32*U8

### Event string table (0x4114)

The table described below represents the information that can be retrieved regarding event textual description. Maximum amount of entries is set to 300. Each event is identified by a unique number (Event 0 exists!).

**BASE ADDRESS:** 16660(0x4114) + 8\*Event number

Index	Name	Description	Type
0	strEventTxt	Textual description of event	16*U8

## 17.3 Status and Constants Description

### 17.3.1 Module status explanation (A1):

#### 17.3.1.1 eStatusACOut:

Name	Description	Value
SBR	Standby running. This means that the module is delivering output	0
SB	Standby. This mean that the module is manually OFF	1
SBWE	Standby with error. This means that the module is not delivering output due to an unrecoverable error	2

Name	Description	Value
SBWRE	Standby with recoverable error. This means that the module is not delivering output due to a recoverable error.	3
UNKNOWN	Unknown. This means status is unknown	4

### 17.3.1.2 eStatusACIn:

Name	Description	Value
OK	OK. This means the AC input is OK for the module	0
SAFE	Safe. This means the AC input is not considered as “good” but some power can still be drawn from it.	1
NOT_SYNC	Not synchronized. This means that the AC input and output are not synchronized together thus invalidating AC input.	2
OFF	Off. This means that the AC input stage of the module has been turned off due to an invalid AC input (maybe not safe).	3
UNKNOWN	Unknown. This means the status is unknown	4

### 17.3.1.3 eStatusDCIn:

Name	Description	Value
OK	OK. This means the AC input is OK for the module	0
FAIL	Fail. This means the DC input voltage is out of valid range.	1
UNKNOWN	Unknown. This means the status is unknown	2

### 17.3.2 Alarm types:

Name	Description	Value
NO_ALARM	Defines an event that is not considered as an alarm	0
MINOR	Defines an event that is to be considered as a minor alarm	1
MAJOR	Defines an event that is to be considered as a major alarm	2

### 17.3.3 Alarm sources:

Name	Description	Value
T2S_ETH	Device responsible of the alarm is the T2S ETH controller.	0
MOD XX	Device responsible of the alarm is the module number XX where XX is the value	1-32
SYSTEM	Source of the alarm is the whole system (e.g. if all module are sharing the same alarm).	33

### 17.3.4 Validity and Unit description (A2):

wValidity should be interpreted as follow:

Name	Description	Value
PARAM_OK	Parameter value is valid	0
PARAM_TOO_LOW	Parameter value is too low	1
HYST_TOO_LOW	Parameter value is in an acceptable range but is too close from another related parameter value	2
PARAM_TOO_HIGH	Parameter value is too high	3
TSI_MUST_BE_OFF	Parameter value can only be changed if TSI modules are not delivering output	4
BAD_VALUE	Parameter value is not acceptable	5
INV_MISMATCH	Parameter cannot be configured for that type of module	6

wUnit is divided in two part:

- High byte is exponent value for parameter conversion (e.g. 2 means to be divided by  $10^2 = 100$ ).
- Low byte represents the unit in which the parameter is expressed. This unit can be one of the one represented in the array below.

Name	Description	Value
NO_UNIT	No unit. Represented by a blank character	0
VOLT	Volt. Represented by the "V" character	1
AMPERE	Ampere. Represented by the "A" character	2
HERTZ	Hertz. Represented by the "Hz" characters	3
SECOND	Second. Represented by the "s" character	4
ANGLE	Angle. Represented by the "deg" or "°" characters	5
WATT	Watt. Represented by the "W" character	6
VA	VA. Represented by the "VA" character	7
PERCENT	Percent. Represented by the "%" character	8
DEGREE	Degree. Represented by the "deg" or "°" characters	9
OHM	Ohm. Represented by the "Ohm" character	10

**Example:** if wUnit value is 0x0201 the parameter is expressed in centivolts.

## 17.4 Modbus over RTU

### 17.4.1 Introduction

In all the following examples, assumption will be made that T2S ETH controller Modbus RTU slave address is 1 (0x01).

#### 17.4.1.1 Reading simple variables:

##### Ex 1: Reading output voltage of module #5

Field	Value	Description
Function	4 (0x04)	Read input register
Address	128 (0x0080)	$31*(5-1) + 4 = 128$ (see module table, page 85)
Number of registers	1 (0x01)	Vout value is 16-bit wide

Master frame: 0x01 0x04 0x00 0x80 0x00 0x01 0x71 0xE3

T2S ETH frame: 0x01 0x04 0x02 0x09 0x1B 0xFF 0x6B

Received value: 0x091B = 2331 → Output voltage is 233.1V (see module table, page 85)

#### Ex 2: Reading T2S ETH serial number

Field	Value	Description
Function	4 (0x04)	Read input register
Address	128 (0x0080)	$31*(5-1) + 4 = 128$ (see module table, page 85)
Number of registers	1 (0x01)	Vout value is 16-bit wide

Master frame: 0x01 0x04 0x07 0xC5 0x00 0x02 0x60 0x82

T2S ETH frame: 0x01 0x04 0x04 0x00 0x01 0x00 0x07 0xEB 0x86

Received value: 0x0001 and 0x0007 → T2S ETH revision is Vs1.7

### 17.4.1.2 Reading alarm and history log:

#### Reading entry #1

Field	Value	Description
Function	4 (0x04)	Read input register
Address	2010 (0x07D4)	$2010 + 2*(1-1) = 2010$ (see alarm table, page 88)
Number of registers	2 (0x02)	Alarm entry is 2 registers wide

Master frame: 0x01 0x04 0x07 0xDA 0x00 0x02 0x51 0x44

T2S ETH frame: 0x01 0x04 0x04 0x21 0x01 0x00 0xB3 0xE1 0xCD

Alarm entry #1 is a minor (0x01) alarm generated by the system (0x21) and this alarm has the ID 179 (0x00B3)

#### Reading an invalid entry

Let's assume that there are only 2 alarms present in the system. Then reading alarm entry #3 should return an invalid entry

Field	Value	Description
Function	4 (0x04)	Read input register
Address	2014 (0x07DE)	$2010 + 2*(3-1) = 2014$ (see alarm table, page 88)
Number of registers	2 (0x02)	Alarm entry is 2 registers wide

Master frame: 0x01 0x04 0x07 0xDE 0x00 0x02 0x10 0x85  
T2S ETH frame: 0x01 0x04 0x04 0xFF 0xFF 0xFF 0xFF 0xFA 0x10

Conclusion, there is no alarm entry #3 and nor are there further entries. This leads to the conclusion that only 2 alarms are present at the time in the system.

#### Linking alarm ID to alarm description text:

If we consider the alarm ID #179 of example above, we can get description text for this alarm by reading related entry in the "Event string table".

Field	Value	Description
Function	4 (0x04)	Read input register
Address	18092 (0x46AC)	16660 + 8*179 = 18092
Number of registers	8 (0x08)	Event description string is 16 characters long

Master frame: 0x01 0x04 0x46 0xAC 0x00 0x08 0x24 0xA5  
T2S ETH frame: 0x01 0x04 0x10 0x56 0x61 0x63 0x5F 0x69 0x6E 0x20  
0x54 0x4F 0x4F 0x20 0x4C 0x4F 0x57 0x20 0x20 0x36 0x7C

String description: Vac\_in TOO LOW

### 17.4.1.3 Reading configuration:

#### Reading entry #1

Field	Value	Description
Function	4 (0x04)	Read input register
Address	4160 (0x1040)	4160 + 20*(1-1) = 4160
Number of registers	20 (0x14)	Alarm entry is 20 registers wide

Master frame: 0x01 0x04 0x10 0x40 0x00 0x14 0xF5 0x11  
T2S ETH frame: 0x01 0x04 0x28 0x01 0xB8 0x00 0x00 0x01 0x04 0x01  
0x01 0x44 0x43 0x20 0x31 0x20 0x3A 0x20 0x56 0x64  
0x63 0x5F 0x69 0x6E 0x20 0x4C 0x6F 0x77 0x20 0x53  
0x74 0x61 0x72 0x74 0x20 0x20 0x20 0x20 0x20  
0x20 0x20 0x20 0x64 0x36

Configured Value: 0x01B8 → 440  
Validity: 0x0000 → PARAM\_OK (see 17.3.4, page 91)  
Parameter ID: 0x0104 → 260  
Units: 0x0101 → unit is dV (0.1V) (see 17.3.4, page 91)  
String description: DC 1 : Vdc\_in Low Start

### Reading an invalid entry

Let's assume that entry #189 is invalid

Field	Value	Description
Function	4 (0x04)	Read input register
Address	7920 (0x1EF0)	$4160 + 20 \times (189 - 1) = 7920$
Number of registers	20 (0x14)	Alarm entry is 20 registers wide

Master frame:           0x01 0x04 0x1E 0xF0 0x00 0x14 0xF6 0x1E  
 T2S ETH frame:        0x01 0x04 0x28 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF  
                           0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF  
                           0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF  
                           0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF  
                           0xFF 0xFF 0xFF 0xF0 0x04

Due to internal memory organization, the configuration might have valid entries interleaved with invalid ones. Thus, in order to read all configurations, one should read all entries to determine which ones are valid and which ones are not.

### Exceptions: Textual parameter

The configured value field is 16 bit wide. Consequently, only integer values can be read (or further configured) using this way. There are 3 parameters that are not integer values but strings. Thus, the values returned in the "Configured value" field of the configuration table for those 3 IDs are dummy values that have no meaning.

Those IDs are the following

ID	Description	Remark
901	Digital input 1 label	Can be read in the digital inputs table in the holding registers (0x0686)
902	Digital input 2 label	Can be read in the digital inputs table in the holding registers (0x0686)

### Note 1:

Caution should be taken while changing the module address because it will affect the addresses where to retrieve information regarding this module. What is more, there can be a delay between the moment where the change address order is received and the moment where the module address has been physically changed. Moreover, a module address can be changed to a new address that is already assigned to another module! In this case, the modules will swap their addresses.

For all those reasons, the best and secure way to change a module address is the following one:

1. Get module serial number using "Module information table" using the current address to calculate the index.
2. Send to the new address for this module using the "Module action table" using the current address to calculate the index.
3. Poll the serial number using "Module information table" using the new address as index until there is a match with the serial number collected at point 1.

## 17.4.2 Modbus RTU - Testing

In order to test the Modbus communication functionalities, please install the program “Radzio ! Master Modbus Simulator” on your computer.

- **Website:** <http://en.radzio.dxp.pl/modbus-master-simulator/>
- **Direct download:** <http://en.radzio.dxp.pl/modbus-master-simulator/RMMS.zip>

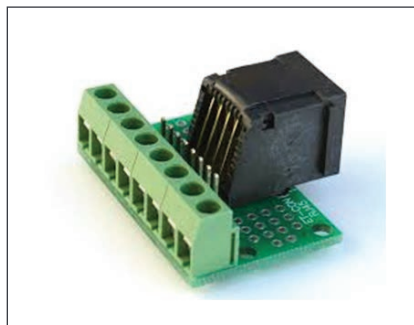
### 17.4.2.1 Requirement

- USB to RS485 interface cable (For example USB-RS485-WE cable, FTDI chip), Fig 1



*Fig 1: FTDI cable*

- RJ45-TERM (Gravitech.us) Fig 2

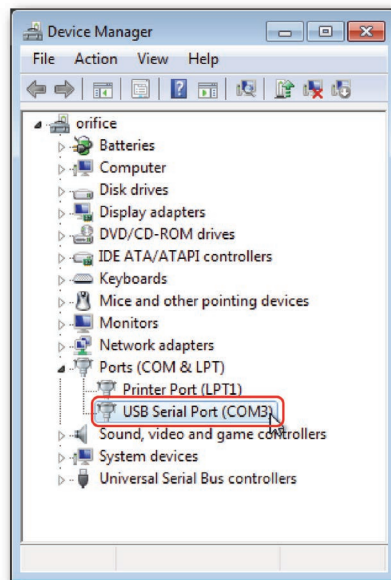


*Fig 2: Adapter for RJ45*

### 17.4.2.2 Modbus RTU - Testing procedure

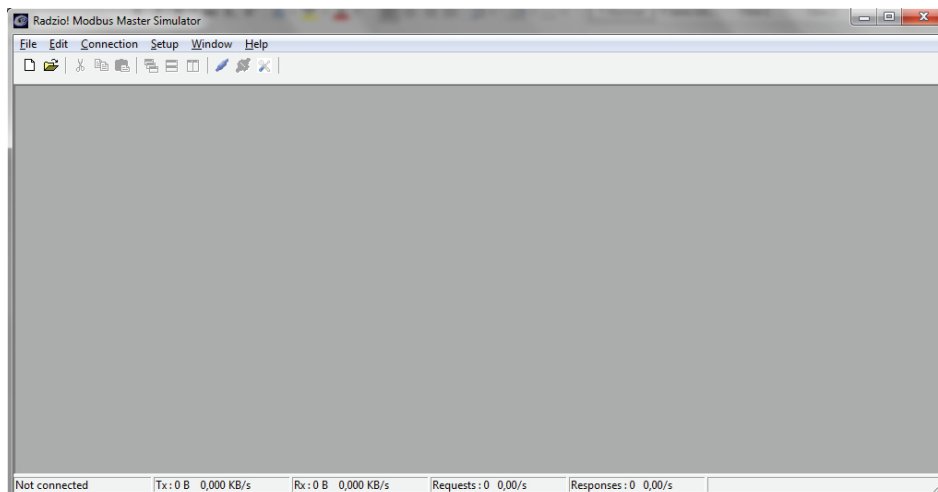
Perform the following steps to test the Modbus:

1. Connect FTDI cable on the **RJ45 port** at the back plane of the T2S-ETH with
  - Yellow on pin 8.
  - Orange on pin 6.
  - Black on pin 7.
2. Use RJ45-TERM to help you.
3. Read the COM port number in your computer settings (In the device manager), Fig 3.



*Fig 3: COM port number*

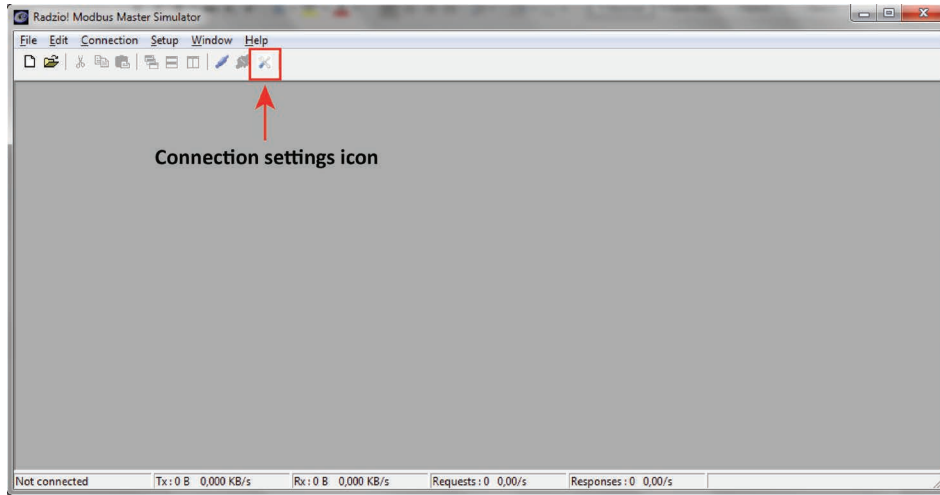
4. Open the downloaded **Radzio!**, Fig 4



*Fig 4: Radzio! Home Screen*

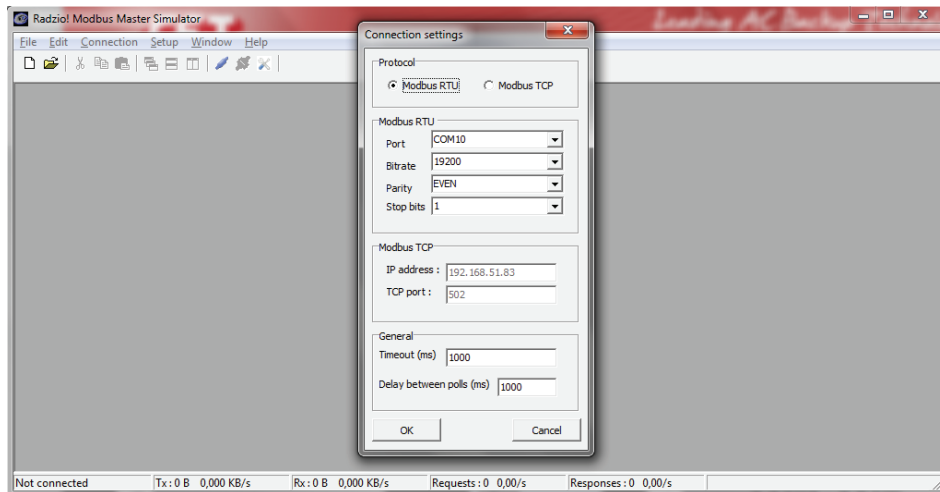


5. Click on the **Connection settings** icon in the tool bar.



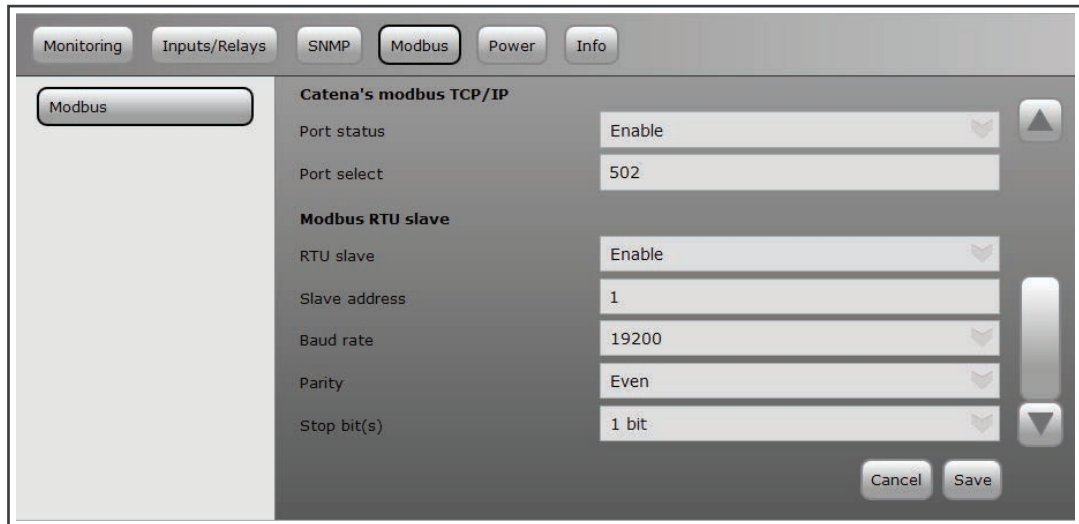
*Fig 5: Connection settings icon*

6. Select **Modbus RTU** in the Connections settings window



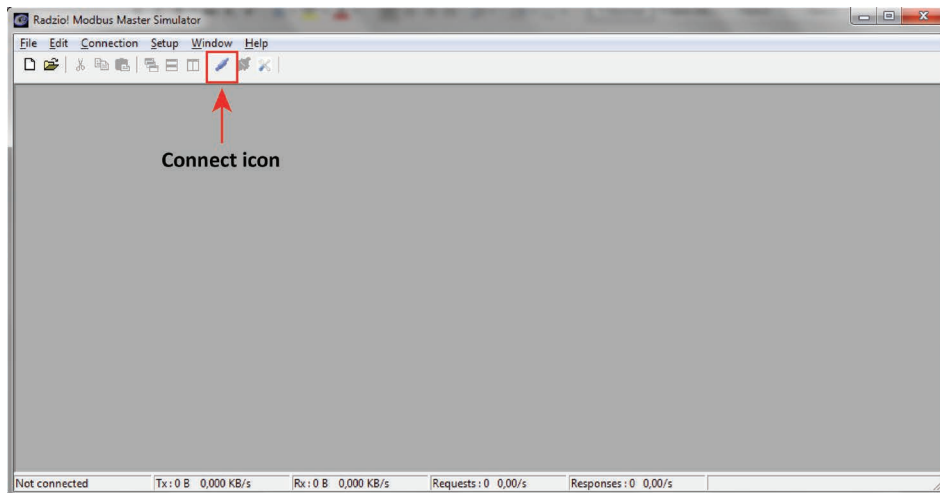
*Fig 6: Connection settings window*

- Verify the **Modbus RTU** parameters are matching with the **T2S-ETH** in the Modbus section (Fig 7).



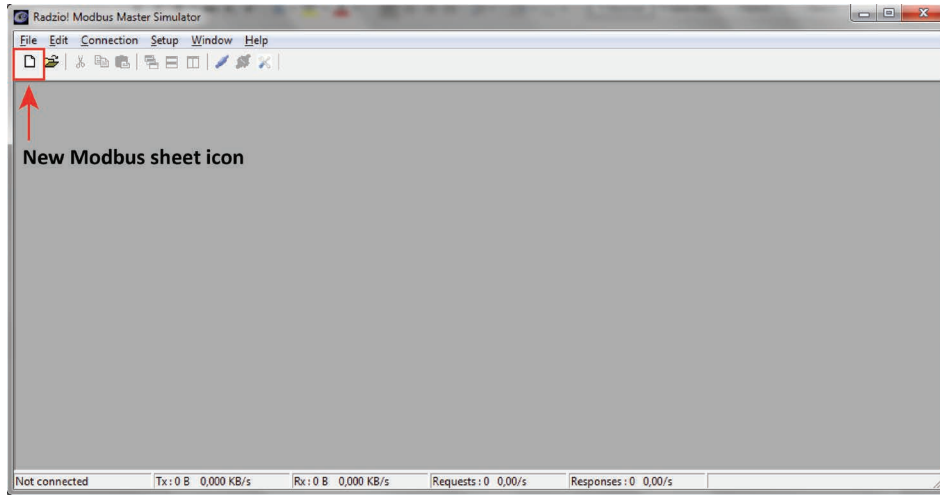
*Fig 7: Modbus settings in T2S ETH*

- Close the **Connection settings window** in Radzio!.
- Click on the **Connect** icon in the Radzio tool bar in order to establish the connections. (Fig 8)



*Fig 8: Connect icon*

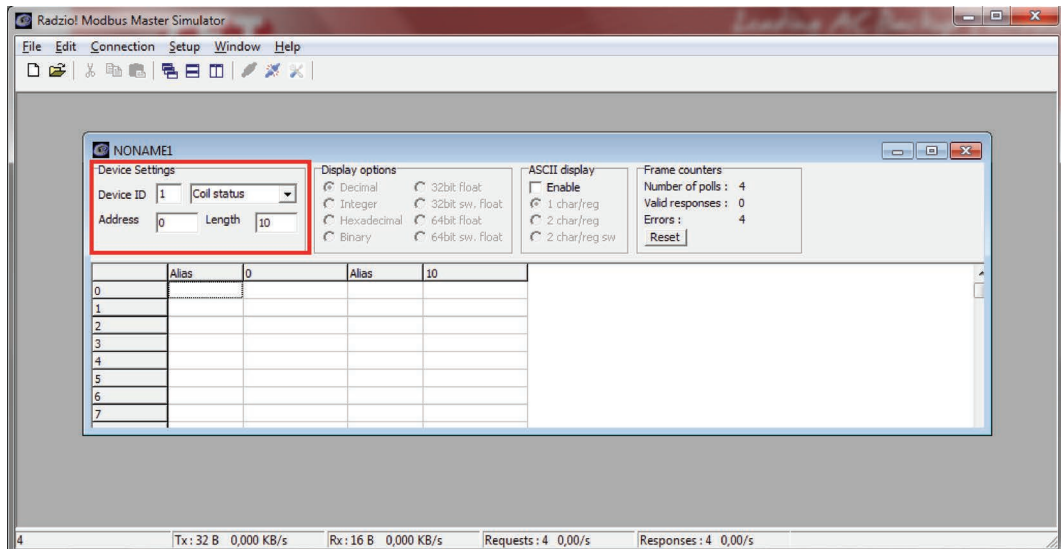
10. Click **New Modbus sheet** icon, to open the new Modbus sheet. (Fig 9)



*Fig 9: New Modbus sheet icon*

11. Modify the **Device Settings** in the new modbus sheet. (Fig 10)

- Set the **Device ID** (Default value is 1)
- Set the **entity** of Device ID as **Input Register** (Default value is Coil status)



*Fig 10: Default Radzio settings to Modify*

12. Access the desired addresses at the Modbus sheet in Radzio (Fig 11) as described in the Modbus document (Fig 12).

If you only see zeros or bad values, check the Frame counter (Fig 11) to be sure that you receive “Valid responses”. If not, the settings may be wrong.

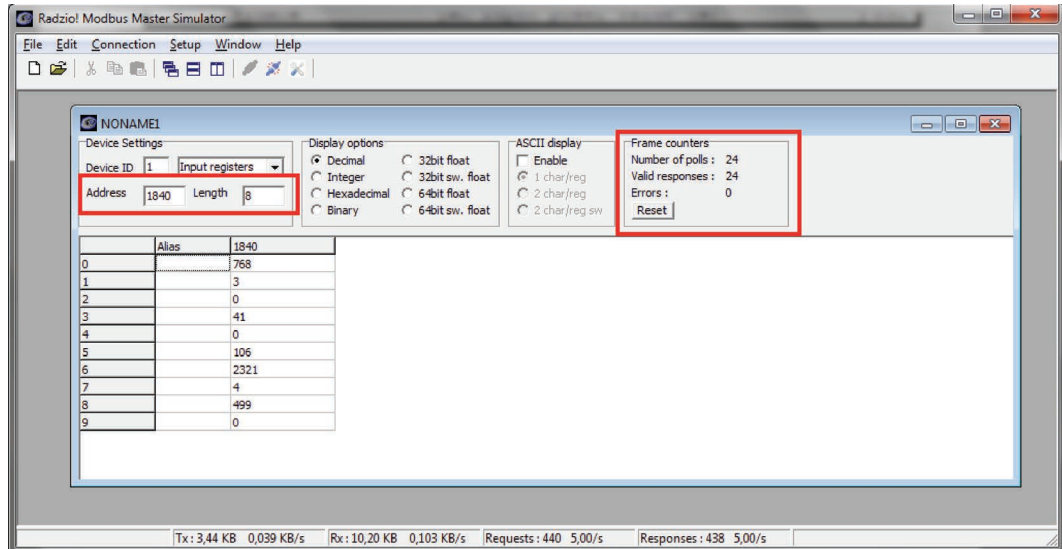


Fig 11: Modbus Example

4	lPinACVA	AC input power value (VA)	U32
6	wVinAC	AC input voltage value (0.1V)	U16
7	wIinAC	AC input current value (0.1A)	U16
8	wACInFreq	AC input frequency value (0.1Hz)	U16

Fig 12: MODBUS\_protocol\_for\_T2S\_Vs4.pdf

**For example, you can read from base address 1840 (AC input L1)**

AC input power value (U32 so address 4 will be MSB and address 5 LSB) = 106 [VA]

- Input voltage (U16) at address 6 = 2321 [0.1 V] = 232.1 [V]
- Input current (U16) at address 7 = 4 [0.1 A] = 0.4 [A]
- Input frequency (U16) at address 8 = 499 [0.1 HZ] = 49.9 [Hz]

## 17.5 Modbus over TCP/IP

### 17.5.1 Introduction

Only “read” mode is available, which means that Modbus can only be used for monitoring, not to execute actions on the system.

Port is fixed to standard Modbus TCP/IP port 502. This protocol can be either enabled or disabled.  
The Reserved parameters are not implemented in the current version of T2S ETH and are for future use.

Address	Description	Unit	Type
600	Serial number H		U16
601	Serial number L		U16
602	Application version		U16
603	Application revision		U16
604	Application built		U16
605	Reserved		
606	Reserved		
607	Reserved		
608	Bootloader version		U16
609	Bootloader revision		U16
610	Bootloader built		U16
1002	Total AC output true power	W	S32
1004	Total AC output apparent power	VA	S32
1006	Worse phase load ratio	%	S32
1008	Reserved		
1010	Total configured AC output true power	W	S32
1012	Total configured AC output apparent power	VA	S32
1014	Total available AC output true power	W	S32
1016	Total available AC output apparent power	VA	S32
1030	Total AC input true power	W	S32
1032	Total AC input apparent power	VA	S32
1034	Total DC input true power	W	S32
1080	Worse AC output load status		U16
1081	Worse AC output hardware status (inverters)		U16
1082	Reserved		
1083	Reserved		
1084	Worse AC input source status		U16
1085	Worse AC input hardware status		U16
1086	Worse DC input source status		U16
1087	Worse DC input hardware status		U16

Address	Description	Unit	Type
1088	Redundancy lost		U16
1089	On DC		U16
1090	Reserved		U16
1091	MBP engaged		U16
1096	Number of events (all alarms types)		U16
1097	Number of major alarms		U16
1098	Number of minor alarms		U16
<b>Output phase 1</b>			
2050	Phase 1 true power	W	S32/float
2052	Phase 1 apparent power	VA	S32/float
2054	Phase 1 voltage	V/10	S32/float
2056	Phase 1 current	A/10	S32/float
2058	Phase 1 frequency	Hz/100	S32/float
2060	Reserved		
2062	Phase 1 worse power factor	%	S32/float
2064	Phase 1 worse temperature	°C/10	S32/float
2066	Phase 1 load ratio (W)	%	S32/float
2068	Phase 1 load ratio (VA)	%	S32/float
2070	Phase 1 available true power	W	S32/float
2072	Phase 1 available apparent power	VA	S32/float
<b>Output phase 2</b>			
2100	Phase 2 true power	W	S32/float
2102	Phase 2 apparent power	VA	S32/float
2104	Phase 2 voltage	V/10	S32/float
2106	Phase 2 current	A/10	S32/float
2108	Phase 2 frequency	Hz/100	S32/float
2110	Reserved		
2112	Phase 2 worse power factor	%	S32/float
2114	Phase 2 worse temperature	°C/10	S32/float
2116	Phase 2 load ratio (W)	%	S32/float
2118	Phase 2 load ratio (VA)	%	S32/float
2120	Phase 2 available true power	W	S32/float
2122	Phase 2 available apparent power	VA	S32/float
<b>Output phase 3</b>			
2150	Phase 3 true power	W	S32/float
2152	Phase 3 apparent power	VA	S32/float
2154	Phase 3 voltage	V/10	S32/float
2156	Phase 3 current	A/10	S32/float
2158	Phase 3 frequency	Hz/100	S32/float

Address	Description	Unit	Type
2160	Reserved		
2162	Phase 3 worse power factor	%	S32/float
2164	Phase 3 worse temperature	°C/10	S32/float
2166	Phase 3 load ratio (W)	%	S32/float
2168	Phase 3 load ratio (VA)	%	S32/float
2170	Phase 3 available true power	W	S32/float
2172	Phase 3 available apparent power	VA	S32/float
<b>Input Group 1 Phase 1</b>			
Reserved	Phase true power	W	S32
Reserved	Phase apparent power	VA	S32
Reserved	Phase voltage	V/10	S32
Reserved	Phase current	A/10	S32
Reserved	Phase frequency	Hz/100	S32
<b>Input Group 1 Phase 2</b>			
Reserved	Phase true power	W	S32
Reserved	Phase apparent power	VA	S32
Reserved	Phase voltage	V/10	S32
Reserved	Phase current	A/10	S32
Reserved	Phase frequency	Hz/100	S32
<b>Input Group 1 Phase 3</b>			
Reserved	Phase true power	W	S32
Reserved	Phase apparent power	VA	S32
Reserved	Phase voltage	V/10	S32
Reserved	Phase current	A/10	S32
Reserved	Phase frequency	Hz/100	S32
<b>Input Group 2 Phase 1</b>			
Reserved	Phase true power	W	S32
Reserved	Phase apparent power	VA	S32
Reserved	Phase voltage	V/10	S32
Reserved	Phase current	A/10	S32
Reserved	Phase frequency	Hz/100	S32
<b>Input Group 2 Phase 2</b>			
Reserved	Phase true power	W	S32
Reserved	Phase apparent power	VA	S32
Reserved	Phase voltage	V/10	S32
Reserved	Phase current	A/10	S32
Reserved	Phase frequency	Hz/100	S32
<b>Input Group 2 Phase 3</b>			
Reserved	Phase true power	W	S32

Address	Description	Unit	Type
Reserved	Phase apparent power	VA	S32
Reserved	Phase voltage	V/10	S32
Reserved	Phase current	A/10	S32
Reserved	Phase frequency	Hz/100	S32
<b>DC Group 1</b>			
Reserved	Group true power (flowing into system)	W	S32
Reserved	Group voltage	V/10	S32
Reserved	Group current (flowing into system)	A/10	S32
<b>DC Group 2</b>			
Reserved	Group true power (flowing into system)	W	S32
Reserved	Group voltage	V/10	S32
Reserved	Group current (flowing into system)	A/10	S32

**Status (1080-1087):**

These entries allow getting the status of power system, power inputs, and loading. The status is the one provided on web interface, main page, through status “LED”.

Name	Description	Value
White	Missing	0 (bit 00000000)
Grey	OFF	1 (bit 00000001)
Green	OK. This means the input/output is OK	2 (bit 00000010)
Orange	Recoverable Error	4 (bit 00000100)
Red	Non Recoverable Error	64 (bit 01000000)

### 17.5.2 Modbus TCP - Testing

In order to test the Modbus communication functionalities, please install the program “**Radzio! Master Modbus Simulator**” on your computer.

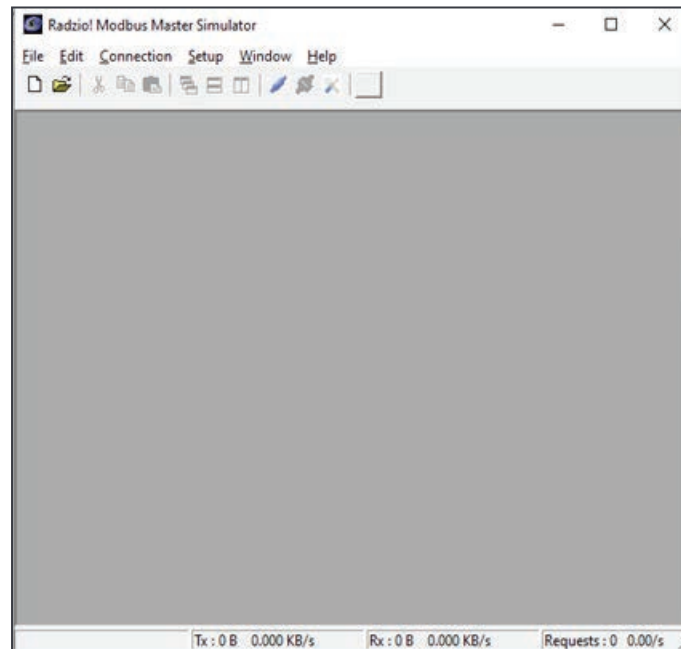
- Website: <http://en.radzio.dxp.pl/modbus-master-simulator/>
- Direct download: <http://en.radzio.dxp.pl/modbus-master-simulator/RMMS.zip>



### 17.5.2.1 Modbus TCP - Testing procedure

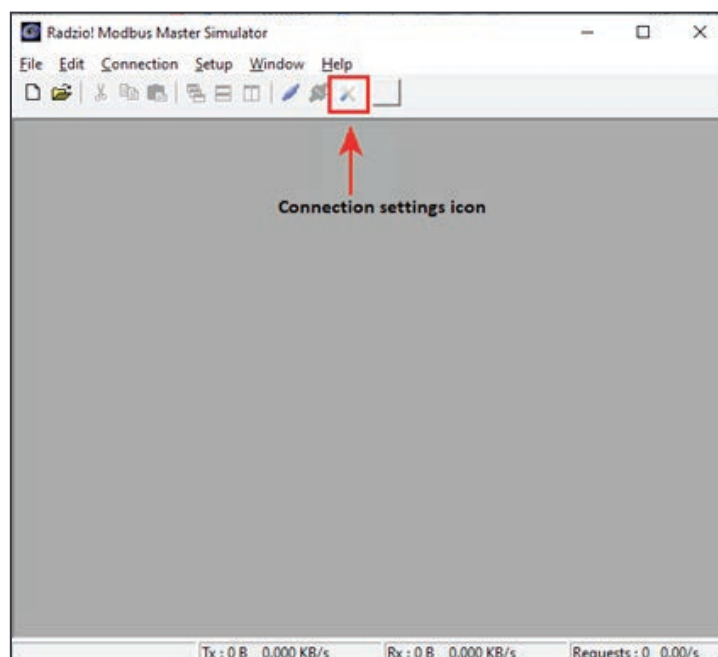
Perform the following steps to test the Modbus - TCP

1. Open the downloaded **Radzio! Modbus Master Simulator** tool. (Fig 1)



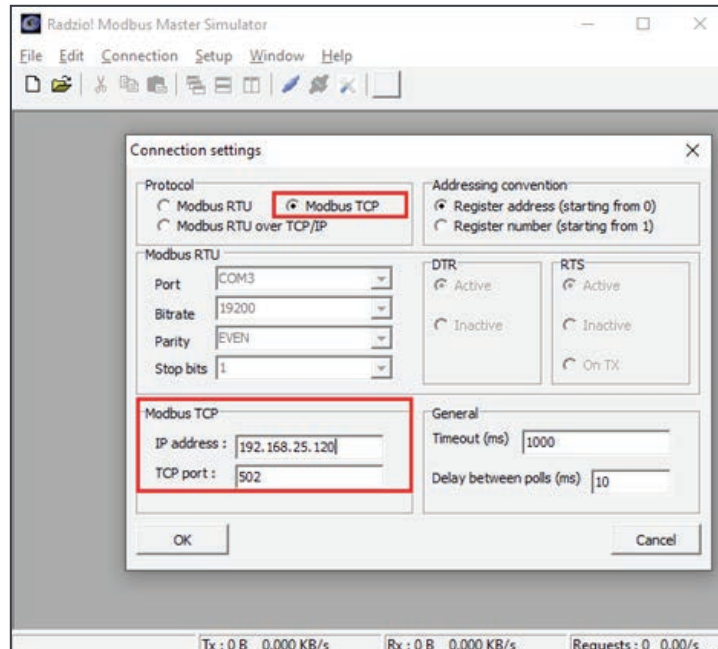
*Fig 1: Radzio! Home Screen*

2. Click on the **Connection settings** icon in the tool bar. (Fig 2)



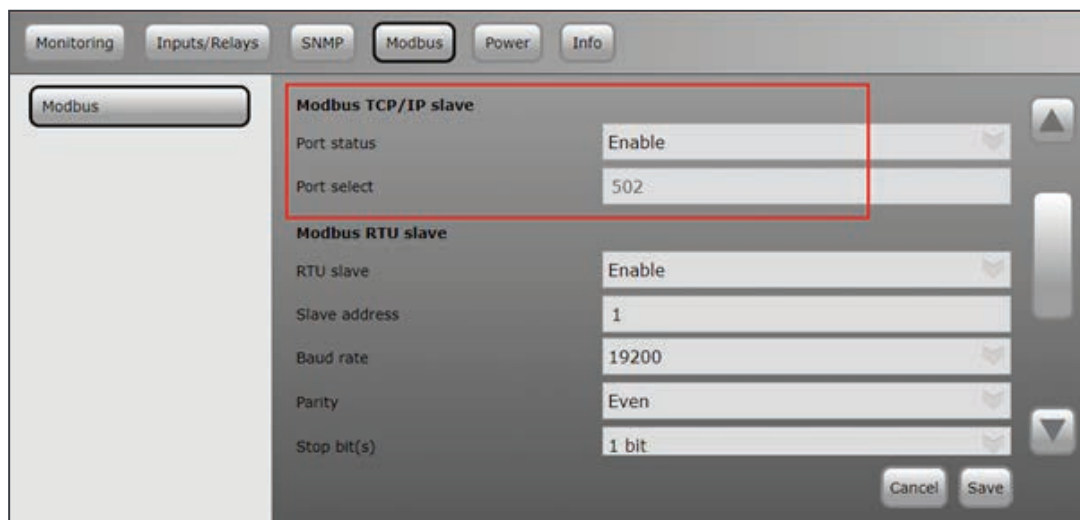
*Fig 2: Connection settings icon*

3. Select **Modbus TCP**, enter the T2S IP address and TCP port in the connection settings window. (Fig 3)



*Fig 3: Connection settings window*

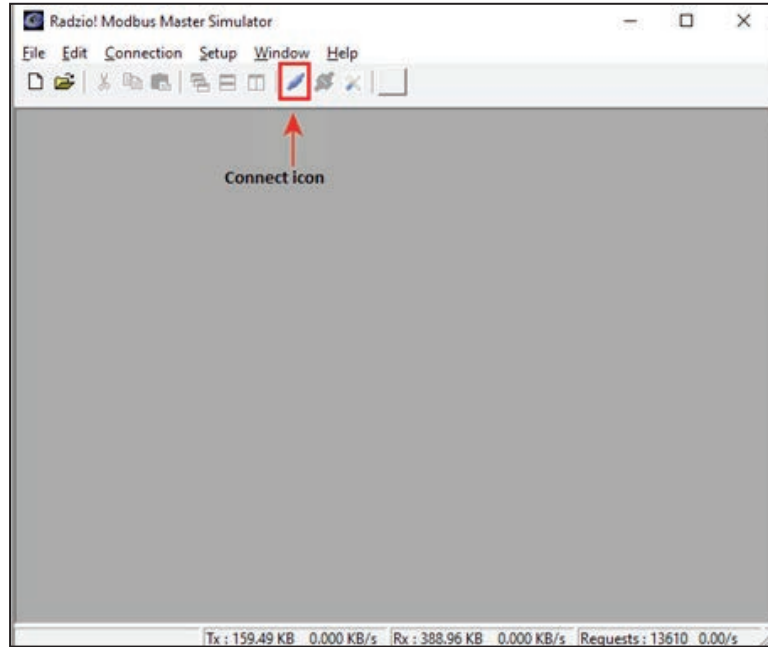
4. Verify the **Modbus TCP** parameters are matching with the **T2S-ETH** in the Modbus section. (Fig 4)



*Fig 4: Modbus settings in T2S ETH*

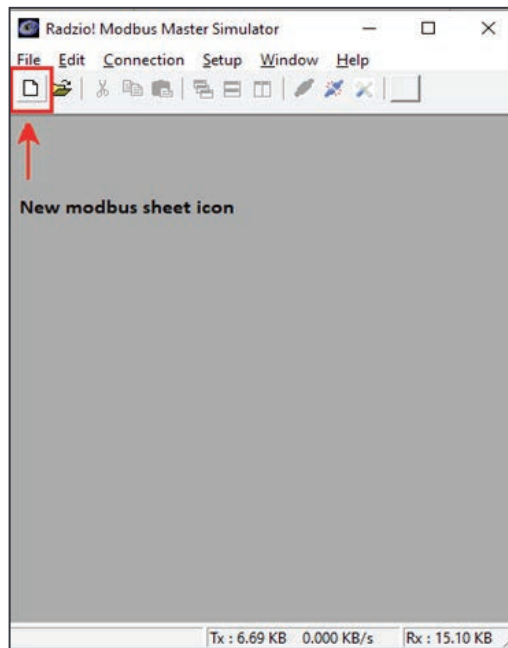
5. Close the **Connection settings** window in Radziol!

6. Click on the **Connect** icon in the **Radzio tool bar** in order to establish the connections. (Fig 5)



*Fig 5: Connect icon*

7. Click **New Modbus sheet** icon, to open the new Modbus sheet. (Fig 6)



*Fig 6: New Modbus sheet icon*

8. Modify the **Device Settings** in the new modbus sheet. (Fig 7)

- Set the Device ID as **1** (Default value is 255)
- Set the Function code as **Input Register** (Default value is Coil status)

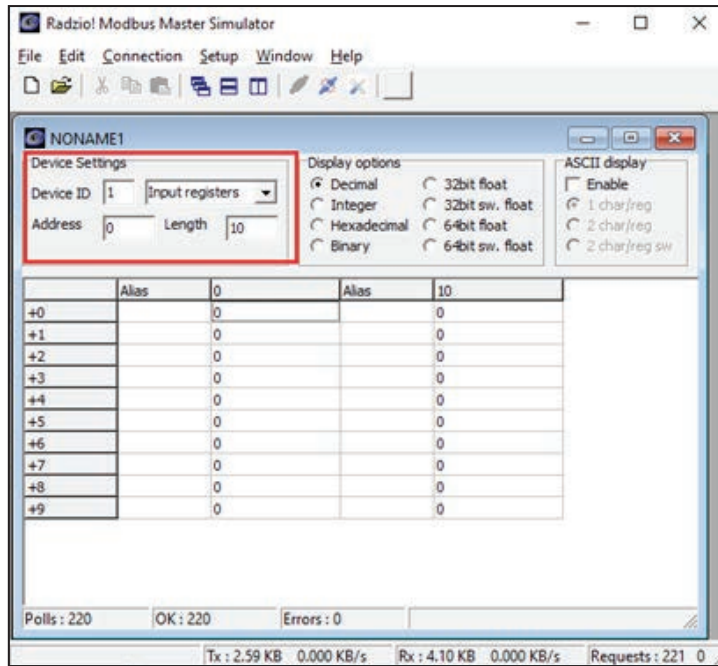


Fig 7: Default Radzio settings to Modify

9. Access the desired addresses at the Modbus sheet in Radzio (Fig 8) as described in the Modbus document (Fig 9).

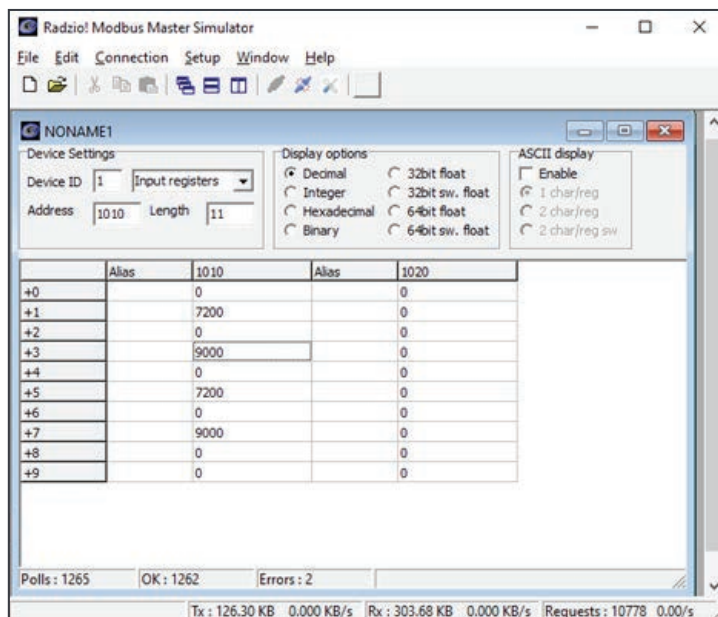


Fig 8: Modbus Example

1010	Total configured AC output true power	W	S32
1012	Total configured AC output apparent power	VA	S32
1014	Total available AC output true power	W	S32

*Fig 9: Modbus over TCP/IP table*

**For example, you can read from base address 1010**

- Total configured AC output true power (S32 so address 0 will be MSB and address 1 is LSB) = 7200W
- Total configured AC output apparent power (S32 so address 2 will be MSB and address 3 is LSB) = 9000VA
- Total available AC output true power (S32 so address 4 will be MSB and address 5 is LSB) = 7200W

## 17.6 Migrating from T2S USB to T2S ETH

After migrating from T2S USB to T2S ETH, the following changes can occur in T2S ETH Modbus RTU:

- Alarm ID in Modbus USB and Alarm ID in Modbus ETH are not the same for all Alarms. There are changes in the Alarm ID, refer to the following table in section 17.6.1, page 110.
- Modbus History Log table, Parameter validity string table and Modbus holding register tables which was available in T2S USB are not available in T2S ETH.
- 8L bProgRelay, wT2SVersionTextError and bNbrEvent Parameters which was available in T2S USB are not available in Miscellaneous table (1980(0x07BC)).
  - 8L bProgRelay (return always 0xFFFF).
  - 12 wT2SVersionTextError (return 0).
  - 14H bNbrEvent (return 0xFFFF).
- wIdentifier field in Modbus configuration table (4160(0x1040)) returns parameter ID from 0, like in config.ini file in T2S ETH. But this may not be matching with T2S USB ID. Refer to the table in section 17.6.2, page 115.
- IBusErrorCnt Parameter under module table (0x0000) which was available in T2S USB is not available in the T2S ETH Module table.
- Field strParamDescription returns the text from language file but with a maximum of 31 characters in T2S ETH.
- There could be differences in Event string name between T2S USB and T2S ETH, but meaning remains the same.
- Digital Input Labels are read-only in Modbus T2S ETH.
- There are separate alarms ID for MBP and Surge arrester in T2S ETH over and above the Digital Inputs.

**17.6.1 T2S ETH and USB Alarm ID list**

T2S ETH		T2S USB	
Alarm ID	Description	Alarm ID	Description
<b>Module not recoverable Alarm</b>			
		0	NO ERROR
1	Fan Failure	1	FAN FAILURE
2	Permanent Fault (2)	2	STATUS 2
3	Permanent Fault (3)	3	STATUS 3
4	Permanent Fault (4)	4	STATUS 4
5	Permanent Fault (5)	5	STATUS 5
6	Permanent Fault (6)	6	STATUS 6
7	Too Many Starts	7	TOO MANY STARTS
8	Permanent Fault (8)	8	STATUS 8
9	Permanent Fault (9)	9	STATUS 9
10	Permanent Fault (10)	10	STATUS 10
11	Permanent Fault (11)	11	STATUS 11
12	Permanent Fault (12)	12	STATUS 12
13	Output Polarity	13	STATUS 13
14	Overload Too Long	14	OVRLD TOO LONG
15	Output Fuse	15	STATUS 15
16	Permanent Fault (16)	16	STATUS 16
17	Not defined 17	17	STATUS 17
18	Permanent Fault (18)	18	STATUS 18
19	Permanent Fault (19)	19	STATUS 19
20	Not defined 20	20	STATUS 20
21	Not defined 21	21	STATUS 21
22	Not defined 22	22	STATUS 22
23	Not defined 23	23	STATUS 23
24	Not defined 24	24	STATUS 24
25	Not defined 25	25	STATUS 25
26	Not defined 26	26	STATUS 26
27	Not defined 27	27	STATUS 27
28	Permanent Fault (28)	28	STATUS 28
29	Permanent Fault (29)	29	STATUS 29
30	Permanent Fault (30)	30	STATUS 30
31	Permanent Fault (31)	31	STATUS 31
32	Permanent Fault (32)	32	STATUS 32
<b>Module recoverable Alarm</b>			
33	Output Synchronization	33	OUT OF SYNC
34	Temperature Too High	34	TEMP TOO HIGH
35	Com. Bus Failure	35	COM BUS FAILURE

T2S ETH		T2S USB	
Alarm ID	Description	Alarm ID	Description
36	Com. Bus Conflict	36	COM BUS CONFLICT
37	No Power Source	37	NO POWER SOURCE
38	Com. Bus Failure	38	COM BUS FAILURE
39	Parameter Query	39	PARAM QUERY
40	Parameter Mismatch	40	PARAM MISMATCH
41	Parameter Not Ready	41	PHASE NOT READY
42	Recoverable Fault (42)	42	STATUS 42
43	Inv Mismatch	43	INV MISMATCH
44	Backfeed Error	44	Error backfeed
45	Recoverable Fault (45)	45	STATUS 45
46	Ext. Clock Fault	46	External Clock
47	Overload Triangle	47	Overload Triangle
48	Not defined 48	48	STATUS 48
49	Not defined 49	49	STATUS 49
50	Not defined 50	50	STATUS 50
51	Not defined 51	51	STATUS 51
52	Not defined 52	52	STATUS 52
53	Not defined 53	53	STATUS 53
54	Not defined 54	54	STATUS 54
55	Not defined 55	55	STATUS 55
56	Not defined 56	56	STATUS 56
57	Not defined 57	57	STATUS 57
58	Not defined 58	58	STATUS 58
59	Not defined 59	59	STATUS 59
60	Not defined 60	60	STATUS 60
61	Not defined 61	61	STATUS 61
62	Not defined 62	62	STATUS 62
63	Not defined 63	63	STATUS 63
64	Not defined 64	64	STATUS 64
<b>Module Alarm</b>			
65	TSI Com. Bus Failure	65	TSI COM BUS FAIL
66	T2S Com. Bus Failure	66	T2S COM BUS FAIL
67	TSI Com. Bus Failure	67	TSI COM BUS FAIL
68	T2S Com. Bus Failure	68	T2S COM BUS FAIL
69	Recoverable Fault (69)	69	STATUS 69
70	Recoverable Fault (70)	70	STATUS 70
71	Output Volt. Changing	71	VOUT CHANGING
72	Output Overload (I)	72	OVERLOAD CURRENT
73	Com. Bus Mismatch	73	COM BUS MISMATCH

T2S ETH		T2S USB	
Alarm ID	Description	Alarm ID	Description
74	Imminent Start	74	IMMINENT START
75	Booster Not Ready	75	BOOSTER NOT RDY
76	Overload Not Ready	76	OVERLOAD NOT RDY
77	Temperature Derating	77	TEMP DERATING
78	Output Overload (P)	78	OVERLOAD POWER
79	Recoverable Fault (79)	79	STATUS 79
80	Brownout Derating	80	BROWNOUT DERATNG
81	Fan Life	81	FAN LIFE ELAPSED
82	Remote Off	82	REMOTE OFF
83	Manual Off	83	MANUALLY OFF
84	Triangle Off	84	Triangle OFF
85	Recoverable Fault (85)	85	STATUS 85
86	Recoverable Fault (86)	86	STATUS 86
87	Not defined 87		
88	Recoverable Fault (88)		
<b>Module AC Alarms</b>			
		159	STATUS 159
160	Ok	160	AC IN OK
161	Source V Too Low Transfert	161	Vac_in TOO LOW
162	Source V Too High Transfert	162	Vac_in TOO HIGH
163	Error (163)	163	STATUS 163
164	Error (164)	164	STATUS 164
165	Source V Too Low Transfert	165	Vac_in TOO LOW
166	Source V Too High Transfert	166	Vac_in TOO HIGH
167	Source Not conform	167	ACin NOT CONFORM
168	Source Not conform	168	ACin NOT CONFORM
169	Source Not conform	169	ACin NOT CONFORM
170	Power Disabled	170	POWER DISABLED
171	Source Not conform	171	ACin NOT CONFORM
172	THD Too High	172	ACin THD TooHIGH
173	Output Synchronization	173	AC OUT NOT SYNC
174	Error (174)	174	STATUS 174
175	Output Synchronization	175	ACout NOT SYNC
176	Inv. Synchronization	176	INV NOT SYNC
177	Synchronization failure	177	SYNC FAILURE
178	Not defined 178	178	STATUS 178
179	Source V Too Low Stop	179	Vac_in TOO LOW
180	Source V Too High Stop	180	Vac_in TOO HIGH
181	Source Frequ. Too Low	181	Fac_in TOO LOW



T2S ETH		T2S USB	
Alarm ID	Description	Alarm ID	Description
182	Source Frequ. Too High	182	Fac_in TOO HIGH
183	Phase Not Ready	183	PHASE NOT READY
184	Backfeed Error	184	BACKFEED
185	Not defined 185	185	STATUS 185
186	Not defined 186	186	STATUS 186
187	Not defined 187	187	STATUS 187
188	Error (188)	188	STATUS 188
189	Error (189)	189	STATUS 189
190	Error (190)	190	STATUS 190
191	Error (191)	191	STATUS 191
192	Not defined 192	192	STATUS 192
<b>Module DC Alarm</b>			
193	Ok	193	DCin OK
194	Source V Too Low Transfert	194	Vdc_in TOO LOW
195	Source V Too High Transfert	195	Vdc_in TOO HIGH
196	Error (196)	196	STATUS 196
197	Not defined 197	197	STATUS 197
198	Not defined 198	198	STATUS 198
199	Not defined 199	199	STATUS 199
200	Not defined 200	200	STATUS 200
201	Not defined 201	201	STATUS 201
202	Source V Too Low Transfert	202	Vdc_in TOO LOW
203	Source V Too High Transfert	203	Vdc_in TOO High
204	Source V Too Low Stop	204	Vdc_in TOO Low
205	Not defined 205	205	STATUS 205
206	Not defined 206	206	STATUS 206
207	Not defined 207	207	STATUS 207
208	Not defined 208	208	STATUS 208
209	Not defined 209	209	STATUS 209
210	Source V Too Low Stop	210	Vdc_in TOO LOW
211	Source V Too High Stop	211	Vdc_in TOO HIGH
212	Not defined 212	212	STATUS 212
213	Not defined 213	213	STATUS 213
214	Not defined 214	214	STATUS 214
215	Not defined 215	215	STATUS 215
216	Not defined 216	216	STATUS 216
217	Error (217)	217	STATUS 217
218	Not defined 218"	218	STATUS 218
219	Not defined 219	219	STATUS 219

T2S ETH		T2S USB	
Alarm ID	Description	Alarm ID	Description
		226	NO TRANSMISSION
		227	DIG INP1 FAILURE
		228	DIG INP2 FAILURE
		229	REDUNDANCY LOST
		230	REDUND + 1 LOST
		231	SYS SATURATED
		232	MAIN SOURCE LOST
		233	SEC SOURCE LOST
		234	TS BUS FAIL
		235	TS FAILURE
		236	TS STARTED
		237	LOG CLEARED
		238	CONFIG MODIFIED
		239	NEW MOD DETECTED
		240	DATE & TIME MOD
		241	CFG READ IN MOD
		242	LOG NEARLY FULL
		243	TS FLASH ERROR
		244	CHECK LOG FILE
		245	DC 1
		246	DC 2 - DC 8
		247	MISSING MODULE
		248	STATUS 248
		249	STATUS 249
		250	STATUS 250
<b>Module Monitoring Alarm</b>			
256	MBP Engaged		
257	Surge Arrester		
258	Redundancy Lost		
259	Redundancy +1 Lost		
260	Main Source Lost		
261	Secondary Source Lost		
262	AC Source Lost		
263	DC Source Lost		
264	AC Source Not Sync		
265	DC Source Low		
266	Output Saturation		
267	Output Overload		
268	Output Failure		

T2S ETH		T2S USB	
Alarm ID	Description	Alarm ID	Description
269	System Started		
270	Not defined 270		
271	Not defined 271		
272	Missing Module		
273	New Module		
274	Manual Off		
275	Output Fault		
276	Brownout Derating		
277	Remote Off		
278	Temperature Derating		
279	Overtemperature		
<b>Supervisor Alarm</b>			
512	Digital Input 1		
513	Digital Input 2		
514	Log Nearly Full		
515	Log Full		
516	Log Cleared		
517	Config Modified		

### 17.6.2 wIdentifier field in Modbus configuration table (4160(0x1040))

wIdentifier - Unique value identifying the parameter

Register Address	wIdentifier ID T2S ETH	wIdentifier ID T2S USB
4162	0	260
4182	1	270
4202	2	280
4222	3	290
4242	4	300
4262	5	310
4282	6	320
4302	7	330
4322	8	261
4342	9	271
4362	10	281
4382	11	291
4402	12	301
4422	13	311
4442	14	321

Register Address	wIdentifier ID T2S ETH	wIdentifier ID T2S USB
4462	15	331
4482	16	262
4502	17	272
4522	18	282
4542	19	292
4562	20	302
4582	21	312
4602	22	322
4622	23	332
4642	24	263
4662	25	273
4682	26	283
4702	27	293
4722	28	303
4742	29	313
4762	30	323
4782	31	333
4802	32	264
4822	33	274
4842	34	284
4862	35	294
4882	36	304
4902	37	314
4922	38	324
4942	39	334
4962	40	265
4982	41	275
5002	42	285
5022	43	295
5042	44	305
5062	45	315
5082	46	325
5102	47	335
5122	48	380
5142	49	390
5162	50	400
5182	51	410
5202	52	381
5222	53	391
5242	54	401

Register Address	wIdentifier ID T2S ETH	wIdentifier ID T2S USB
5262	55	411
5282	56	382
5302	57	392
5322	58	402
5342	59	412
5362	60	383
5382	61	393
5402	62	403
5422	63	413
5442	64	384
5462	65	394
5482	66	404
5502	67	414
5522	68	385
5542	69	395
5562	70	405
5582	71	415
5602	72	370
5622	73	371
5642	74	372
5662	75	373
5682	76	75
5702	77	70
5722	78	160
5742	79	170
5762	80	180
5782	81	190
5802	82	200
5822	83	210
5842	84	220
5862	85	230
5882	86	161
5902	87	171
5922	88	181
5942	89	191
5962	90	201
5982	91	211
6002	92	221
6022	93	231
6042	94	80

Register Address	wIdentifier ID T2S ETH	wIdentifier ID T2S USB
6062	95	81
6082	96	60
6102	97	100
6122	98	91
6142	99	90
6162	100	92
6182	101	61
6202	102	82
6222	103	101
6242	104	102
6262	105	103
6282	106	62
6302	107	71
6322	108	93
6342	109	104
6362	110	94
6382	111	386
6402	112	396
6422	113	406
6442	114	416
6462	115	420
6482	116	421
6502	117	105
6522	118	106
6542	119	107
6562	120	108
6582	121	109
6602	122	110
6622	123	111
6642	124	112
6662	125	113

