



User Manual

ECU-1152 Series

ADVANTECH

Enabling an Intelligent Planet

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This manual is for ECU-1152 Series.

Product Warranty (2 years)

Advantech warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Advantech, or which have been subject to misuse, abuse, accident or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

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5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

Declaration of Conformity

CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from Advantech. Please contact your local supplier for ordering information.

FCC Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause interference in which case the user is required to correct interference at his own expense.

Technical Support and Assistance

1. Visit the Advantech web site at www.advantech.com/support where you can find the latest information about the product.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before you call:
 - Product name and serial number
 - Description of your peripheral attachments
 - Description of your software (operating system, version, application software, etc.)
 - A complete description of the problem
 - The exact wording of any error messages

Safety Instructions

1. Read these safety instructions carefully.
2. Keep this User Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. **DO NOT COVER THE OPENINGS.**
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following situations arises, get the equipment checked by service personnel:
 - The power cord or plug is damaged.
 - Liquid has penetrated into the equipment.
 - The equipment has been exposed to moisture.
 - The equipment does not work well, or you cannot get it to work according to the user's manual.
 - The equipment has been dropped and damaged.
 - The equipment has obvious signs of breakage.
15. **DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW -25° C (-13° F) OR ABOVE 70° C (158° F). THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.**
16. **CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER, DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.**
17. Due to the sensitive nature of the equipment it must be stored in a restricted access location, only accessible by qualified engineers.
18. When installing this equipment, ensure that the Earth cable is securely attached using a 3.5 mm screw.
19. The equipment does not include a power cord and plug.

The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

DISCLAIMER: This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Safety Precaution - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

- To avoid electrical shock, always disconnect the power from your PC chassis before you work on it. Don't touch any components on the CPU card or other cards while the PC is on.
- Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

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Chapter 1

Introduction

1.1 Product Concepts and Positioning

ECU-1152 is a RISC architecture platform with high performance, wide temperature and flexible design. It serves as a gateway connecting inverters and remote monitoring center in power and energy application, which plays an important role.

Chapter 2

Specifications

2.1 ECU-1152 System Specification

CPU	TI Cortex A8
RAM	DDR3L 512MB
Power Requirement	10-30VDC
Digital Input	4-ch (Reserved)
Digital Output	4-ch (Reserved)
Serial Port	6xRS-232/485 (Terminal Block) 1xDebug Port (DB9)
USB	1xUSB2.0
Ethernet	2x 10/100MB Base-T RJ-45 1x 10/100MB Base-T RJ-45 (Reserved)
Display	1x VGA (Reserved) 640 x 480 (3:6:4))
LEDs	PWR/Programmable LED/Serial Port
Storage	2x Micro SD (Storage & image)
Wireless	1 x Mini-PCle (Full-Size, USB Signal)
Node ID	8-bit
Operation Temperature	-40~70 °C
Storage Temperature	-40~85°C

2.2 Input/ Output Hardware Specifications (Reserved)

Digital Input		
Channel	4	
Input Type	Sink (Wet Contact)	
Wet Contact Input	Logic0: 0 ~ 4 VDC Logic1: 10~30 VDC	
Rated Voltage	12/24 VDC	
Rated Input Current	>5 mA @ 12 VDC >10 mA @ 24 VDC	
Over Voltage Protection	+40 VDC	
Isolation Voltage	3000 VDC	
Digital Output		
Channel	4	
Output Type	Open Collector (Sink)	
OC Output	Rated Voltage	5~30 VDC
	Rated Current	200 mA (max.load)
Over Voltage Protection	+40 VDC	
Isolation Voltage	3000 VDC	

2.3 Environment

- Operating Temperature: -40~70°C
- Storage Temperature: -40~85°C
- Operating Humidity: 20~95% (non-condensing)
- Storage Humidity: 0 ~ 95% (non-condensing)

2.4 LED Status Indicator

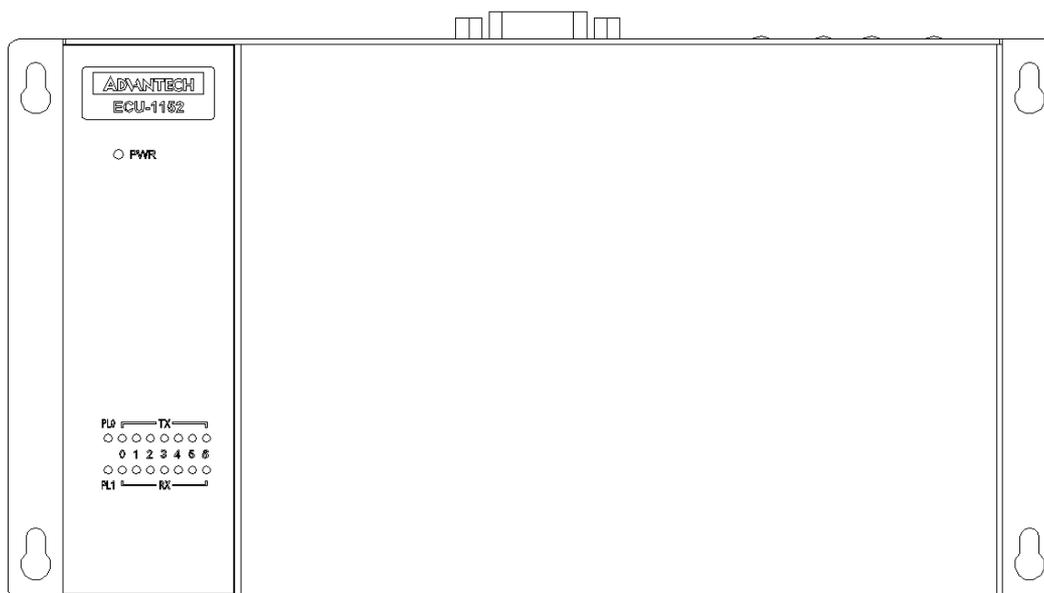


Figure 2.1 LED Status Indicator

2.4.1 System Status Indicator

LED	Status	Description
PWR	Green	Power is on
	Off	Power is off
PL	Green	Customers define according to the actual need.
	Off	

2.4.2 Serial Communication Status Indicator

LED	Color	Description
TX0	Green	Flash, Debug port data being transmitted
RX0	Green	Flash, Debug port data being received
TX1	Green	Flash, Serial port 1 data being transmitted
RX1	Green	Flash, Serial port 1 data being received
TX2	Green	Flash, Serial port 2 data being transmitted
RX2	Green	Flash, Serial port 2 data being received
TX3	Green	Flash, Serial port 3 data being transmitted
RX3	Green	Flash, Serial port 3 data being received
TX4	Green	Flash, Serial port 4 data being transmitted
RX4	Green	Flash, Serial port 4 data being received
TX5	Green	Flash, Serial port 5 data being transmitted
RX5	Green	Flash, Serial port 5 data being received
TX6	Green	Flash, Serial port 6 data being transmitted
RX6	Green	Flash, Serial port 6 data being received

2.4.3 Ethernet Status Indicator

LED	Color	Description
Link1	Orange	Lighting, Ethernet not connected
Act1	Green	Blinking, Ethernet data being transmitted
Link2	Orange	Lighting, Ethernet not connected
Act2	Green	Blinking, Ethernet data being transmitted

2.5 Chassis Dimensions

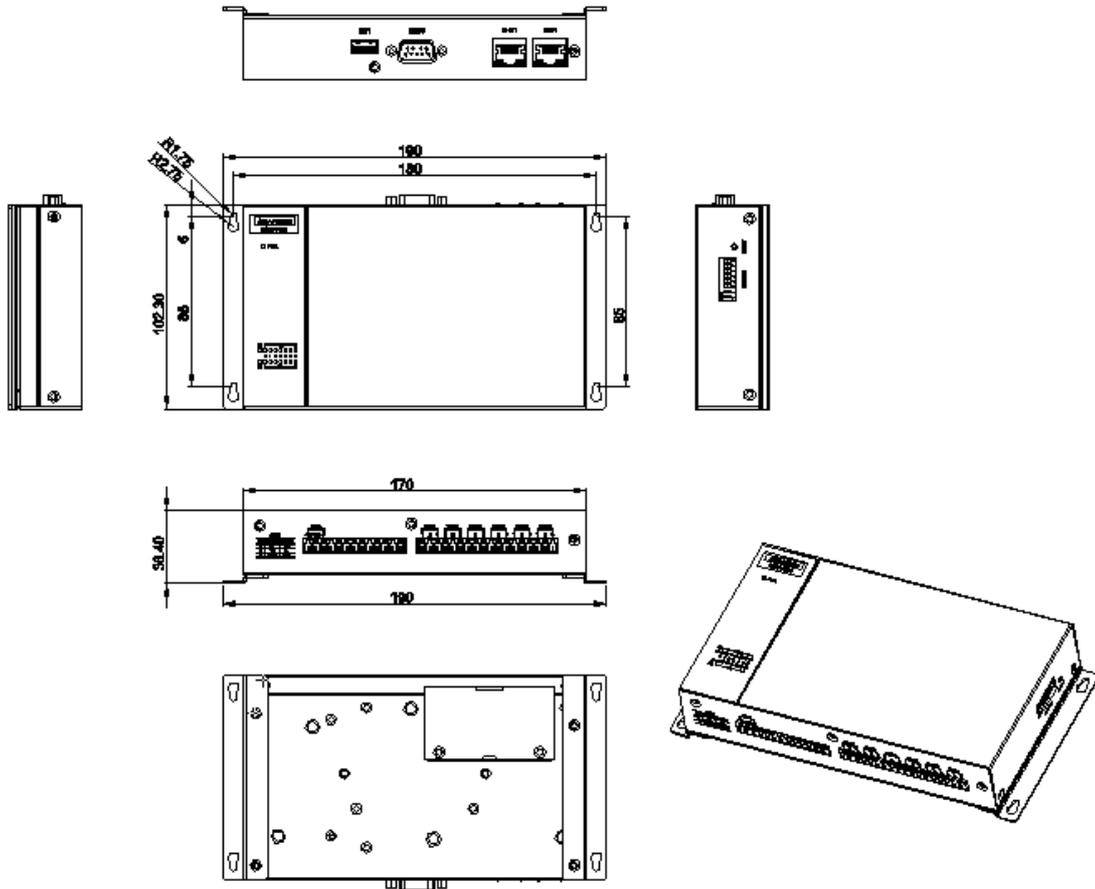


Figure 2.2 ECU-1152 Chassis Dimension

Chapter 3

Wiring and Installation

3.1 Wiring

3.1.1 Power Supply Wiring

ECU-1152 supports power input ranging from 10 VDC to 30VDC. Users can choose standard 12VDC or 24 VDC power supply.

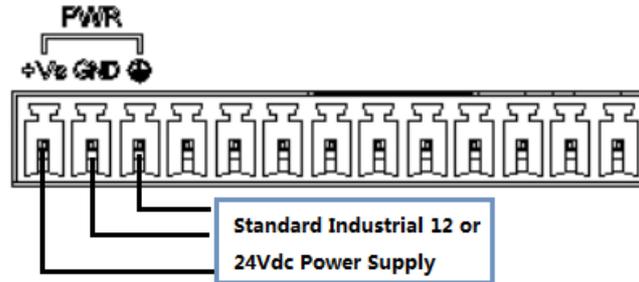
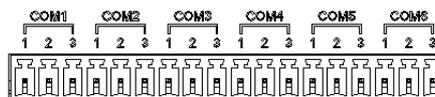


Figure 3.1 Power Supply Wiring

3.1.2 Serial Port Wiring

ECU-1152 is equipped with 6 RS-232/485 serial ports. Users can select RS-232 or RS-485 through a jumping node. The detailed jumping method is described in the installation section. The wiring of serial port is as following. ECU-1152 also has a DB9 interface. It is a debug interface, not a serial port.



COM1~6

PIN	RS-232	RS-485
1	RX	D+
2	TX	D-
3	GND	GND

Figure 3.2 RS-232/485 serial port definition

3.2 Installation

3.2.1 Wall-mounted and DIN-Rail Installation

ECU-1152 supports two types of installation: Wall-mounted and DIN-Rail Installation. For wall-mounted installation, users can fix the device on the wall with 4 screws as shown below.

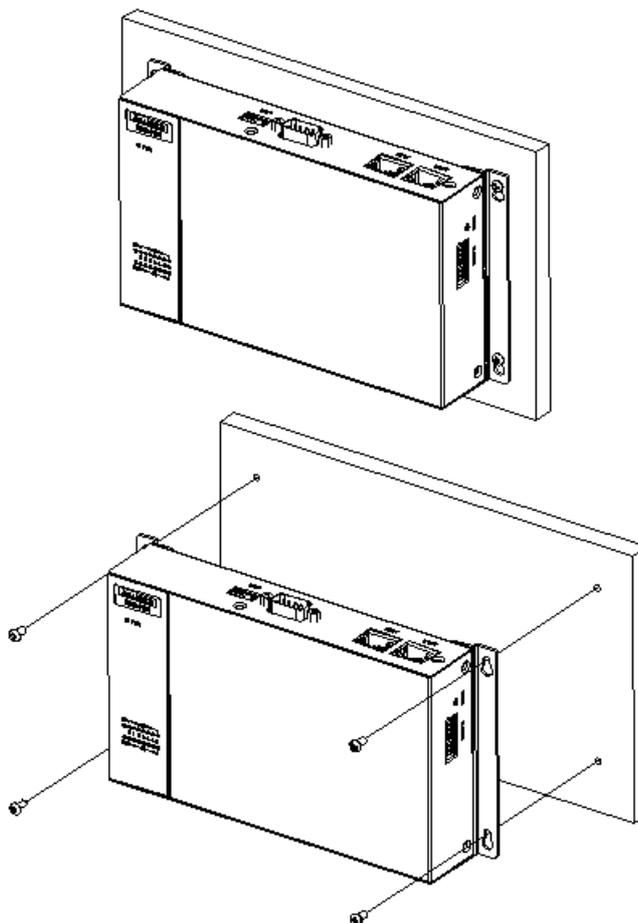


Figure 3.3 Wall-mounted installation

For DIN-Rail installation, ECU-1152 support horizontal or vertical installation. Users should order additional DIN-Rail buckle (SN: 1950020136T001) with this installation. The installation way is fixing the sliver DIN-Rail buckle with screws on the back of ECU-1152. And then fix ECU-1152 on the DIN-Rail. The detailed steps are shown as below:

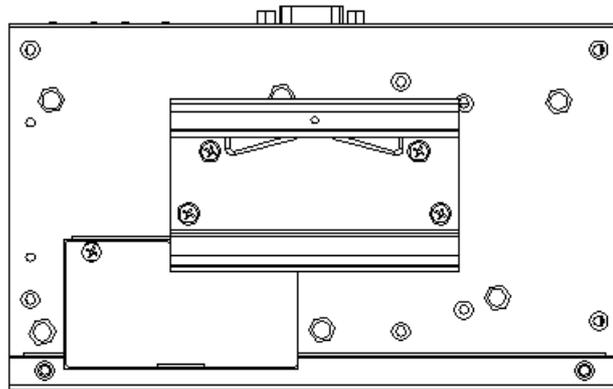
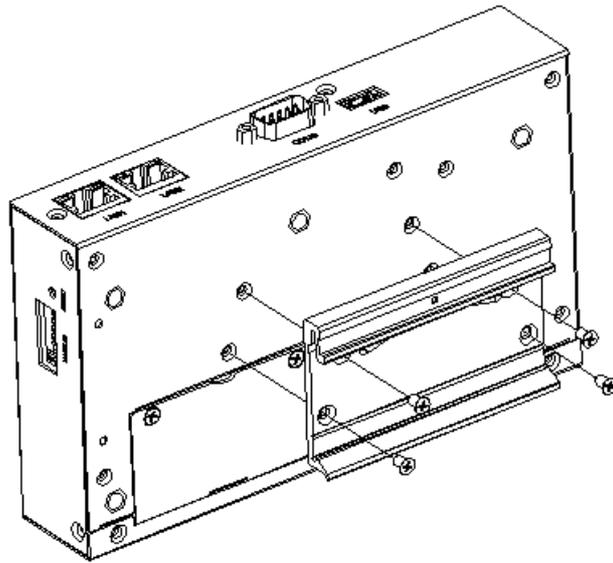


Figure 3.4 Horizontal DIN-Rail buckle Installation

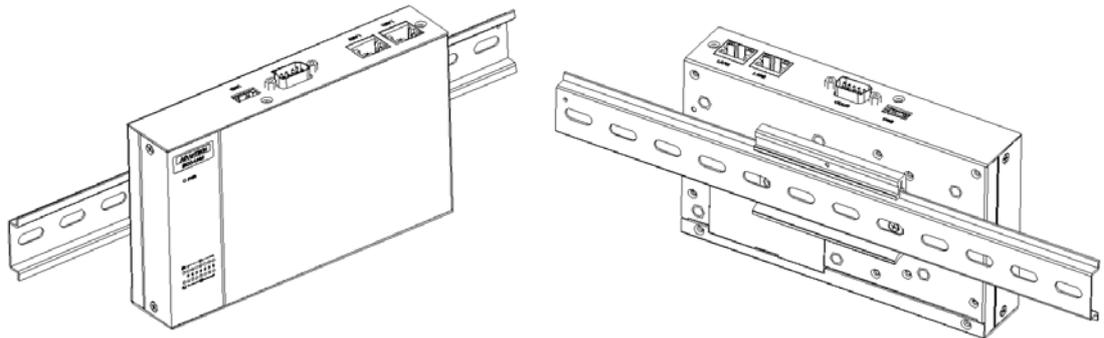


Figure 3.5 Horizontal DIN-Rail Installation

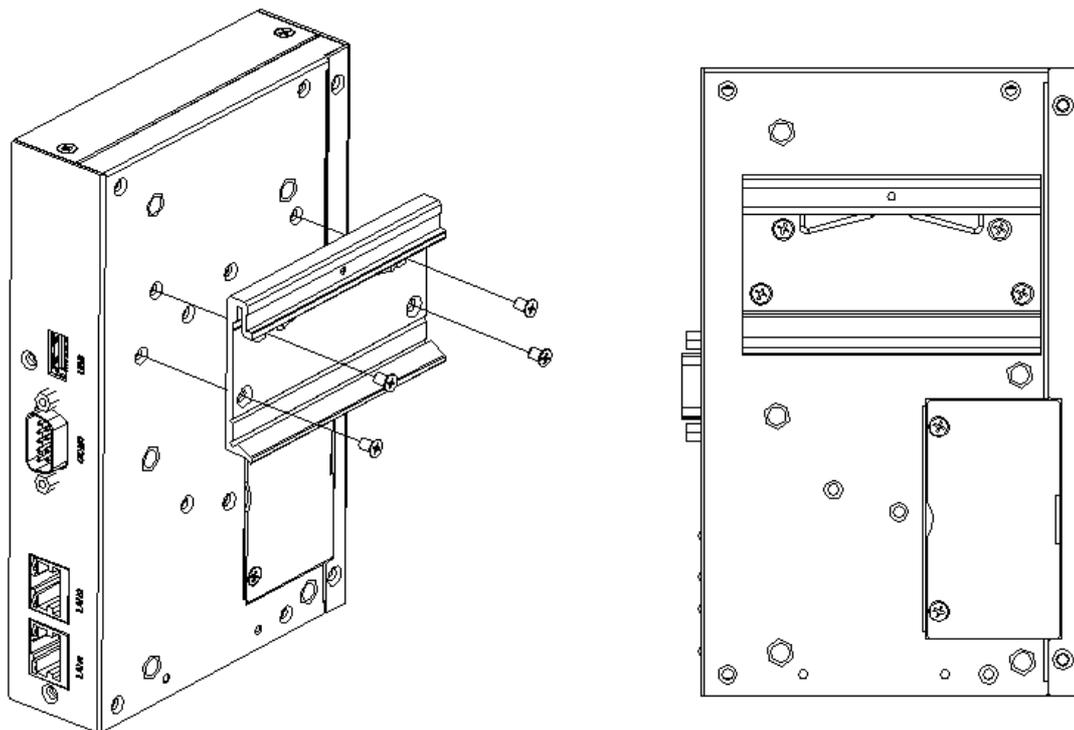


Figure 3.6 Vertical DIN-Rail buckle Installation

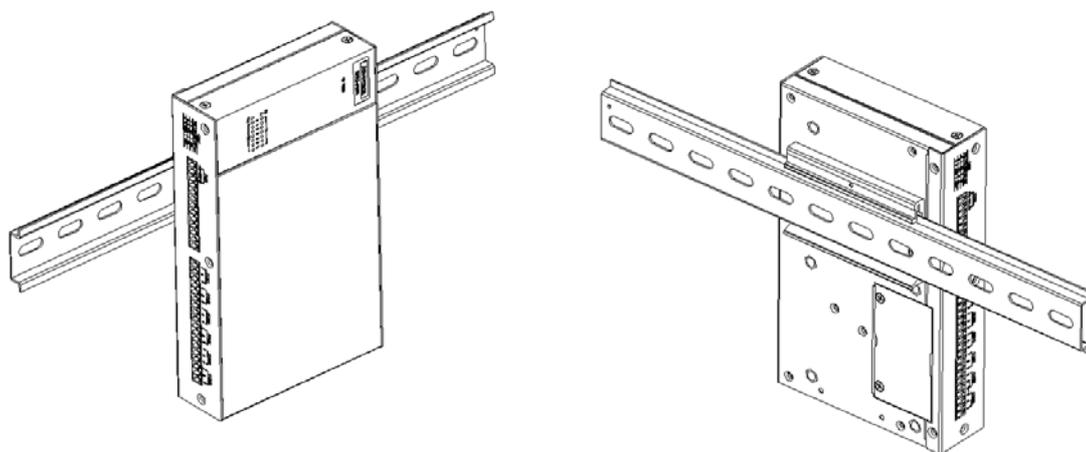


Figure 3.7 Vertical DIN-Rail Installation

3.2.2 SD Card Installation

ECU-1152 is equipped with two Micro SD slots. Open the left sliver plate, users can see two MicroSD slots. The left slot, the above of it written “storage”, is for storing data. The right slot, the above of it written “image”, carries the OS.

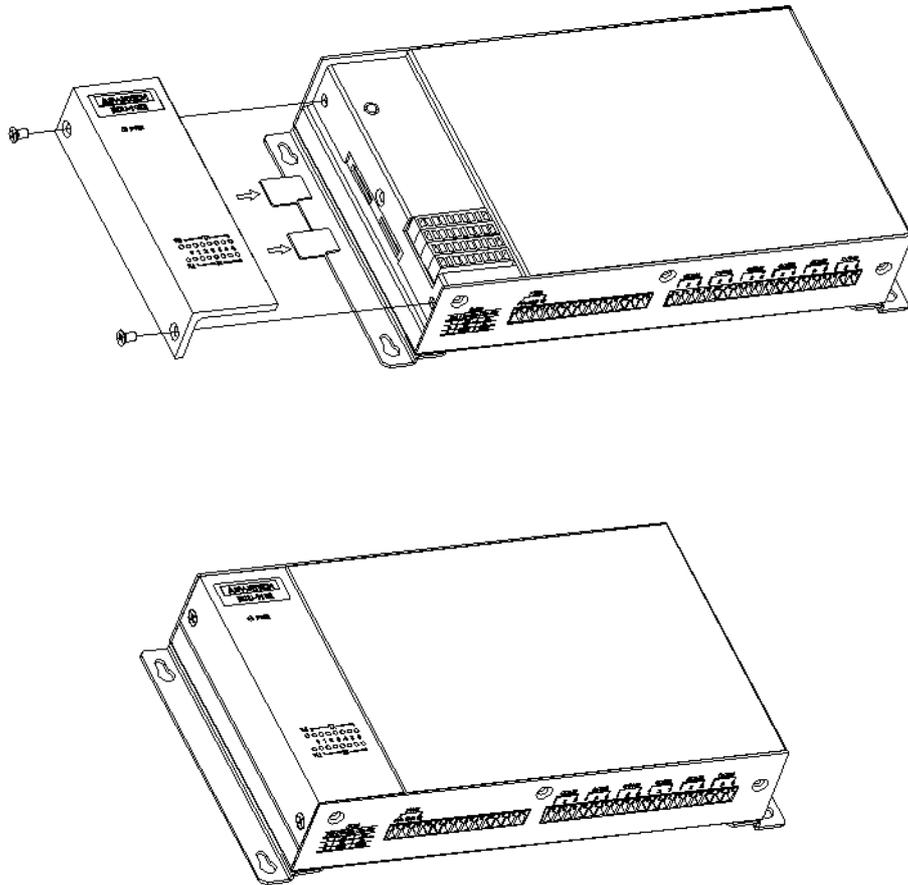


Figure 3.8 SD card installation

3.2.3 Wireless Card Installation

ECU-1152 is equipped with a Mini-PCle interface on the back of motherboard, which supports one full-size wireless network card. If users also need SIM card, slot on the front of motherboard can be used. The installation is shown as below.

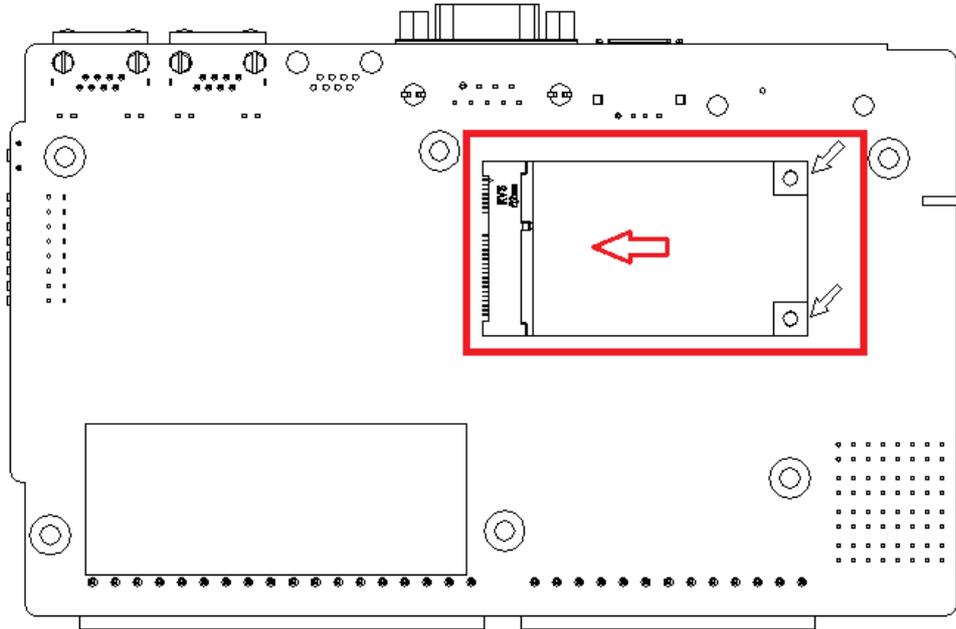


Figure 3.9 Wireless network card Installation

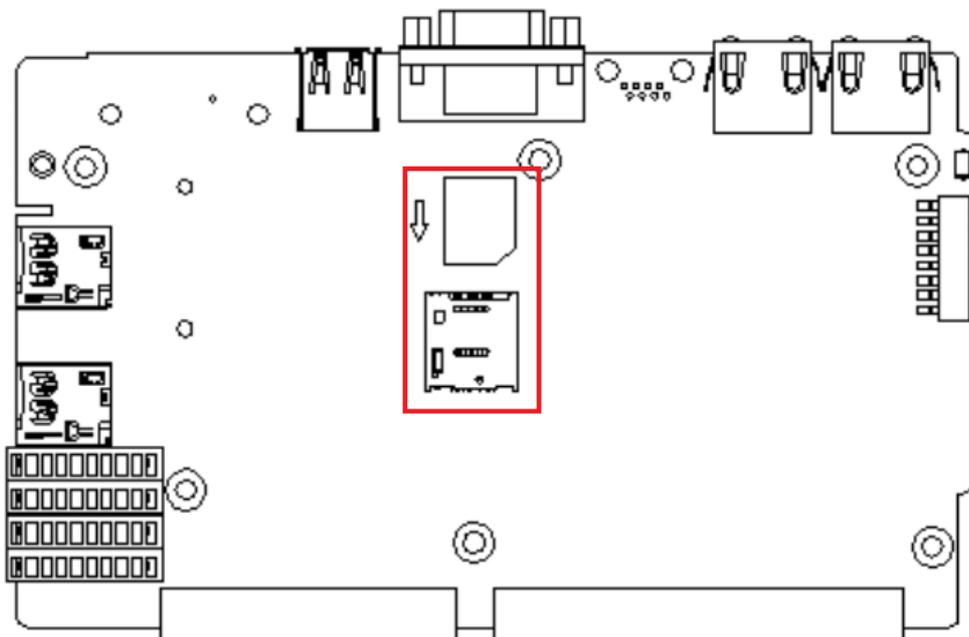
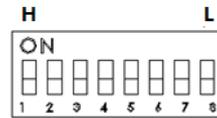


Figure 3.10 SIM card installation

3.3 Jumper/Switch Setting

3.3.1 Dial Switch Setting

ECU-1152 has an 8-bit node ID. The detailed definition is as follows:



NODE ID

Figure 3.11 Node ID setting

Table 3.1: ECU-1152 Node ID Setting

No.	Name	Meaning	Description
1	SW2	Node ID	8-bit, support 0~255 devices. In peer to peer application, the Node ID should be 1~255.

3.3.2 Jumper Setting

The motherboard of ECU-1152 has two types of jumper for users operating, as the below shown.

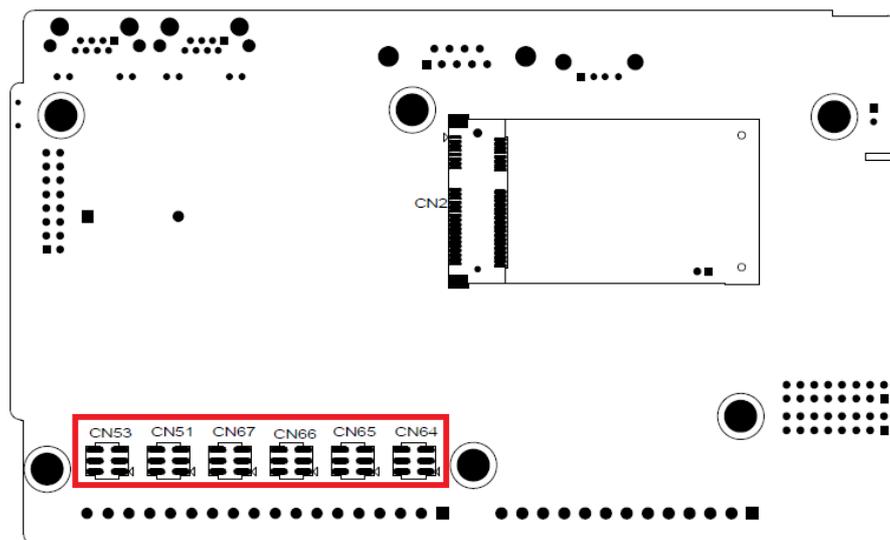


Figure 3.12 Jumper on the back motherboard

Table 3.2: ECU-1152 Jumper Setting

Location	Name	Meaning	Description
CN64	COM1		RS-232
CN65	COM2		
CN66	COM3		
CN67	COM4	RS-232 or RS-485 Selection	RS-485
CN51	COM5		
CN53	COM6		

Chapter 4

Advantech Tag Link

4.1 Advantech Tag Link Introductions

If there's one or more ECU-1152 in the field site, it's more convenient for users with a tool to complete the integrated configuration and remote management. To solve this, Advantech developed the Tag Link software to facilitate these tasks.

Advantech Tag Link can be operated in Windows XP/ Windows 7 system and has the following functions:

Provide interface for off-line project configuration, and remote deploy the configuration base on the adjustable NodeID.

Easy to configure the project tags with actual meaning, and easy to map these tags to the Modbus and DNP3 services.

With regard to network communications, user can complete the setting for Ethernet, Wi-Fi, 3G and GPRS via Taglink Studio.

ECU-1152 provides Modbus/RTU, Modbus/TCP and DNP 3.0 servers, and customers can flexibly choose protocol services according to their own needs.

Advantech Taglink Studio support remote monitoring of communication status of serial ports and Ethernet ports.

Advantech Taglink Studio can be downloaded from Advantech support website:

<http://support.advantech.com/>

4.2 Using Taglink Studio for Configuration and Management

4.2.1 Project Initialization

Project initialization can be achieved while users start Taglink software, and step by step complete 'Create Project' -> Right click to 'Add Device' -> Right click to 'Copy' (for large number ECU-1152)

4.2.1.1 Creating a new project

Start Taglink Studio software, click 'Create Project' button under the taskbar 'Project', and you will find the dialog box as follows. Then you should input the project name, description and select the storage directory, and click the 'OK' button.

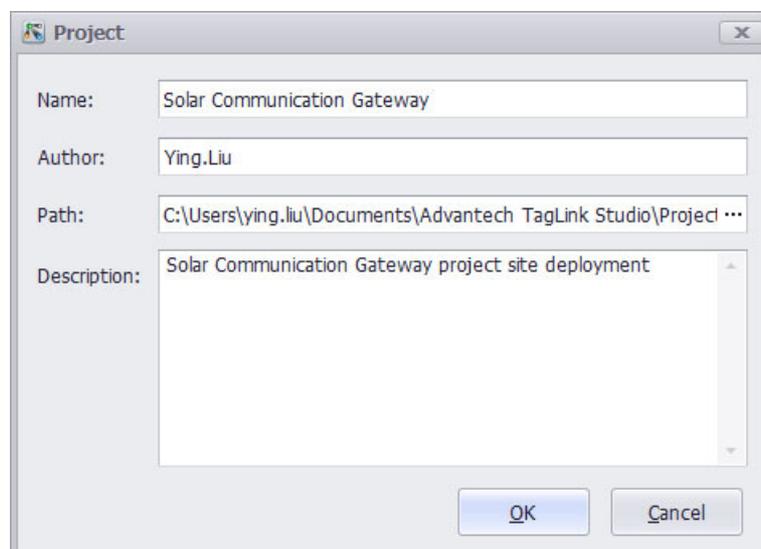
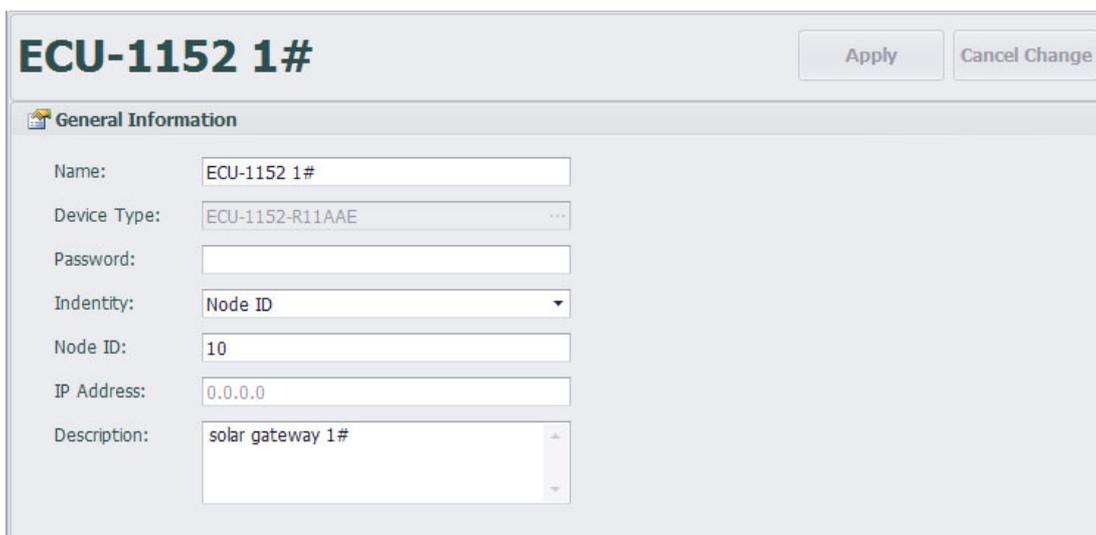


Figure 4.1 Creating a new project

4.2.1.2 Adding Devices and Editing a Project

After completing the creation of the new project, users can right click on the project name to check the project information and add new devices. To add devices, users need to input the general information of device: name, device type, password, indentity, and description. The indentity has two types: Node ID and IP Address. Users can select any of them according to their own needs. Then click “Apply” to add the device.

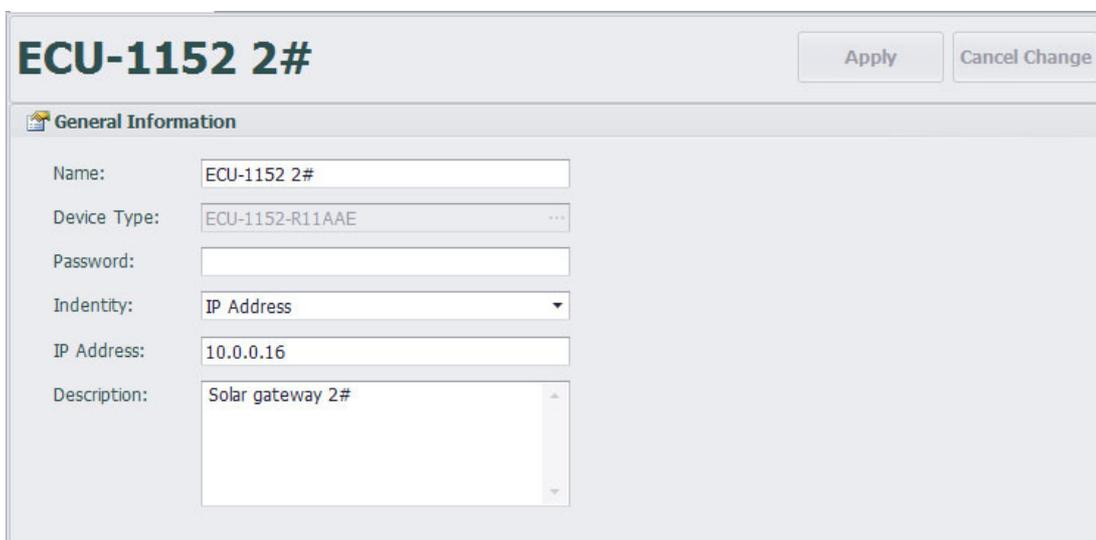
After adding the device, users can modify the device information by double-click the device name on the left-hand-side tree view, or right-click on the device name, and choose ‘edit’.



The screenshot shows a configuration window for a device named "ECU-1152 1#". At the top right, there are "Apply" and "Cancel Change" buttons. Below the title bar is a "General Information" section with the following fields:

Name:	ECU-1152 1#
Device Type:	ECU-1152-R11AAE
Password:	
Indentity:	Node ID
Node ID:	10
IP Address:	0.0.0.0
Description:	solar gateway 1#

Figure 4.2 Adding device with Node ID identity



The screenshot shows a configuration window for a device named "ECU-1152 2#". At the top right, there are "Apply" and "Cancel Change" buttons. Below the title bar is a "General Information" section with the following fields:

Name:	ECU-1152 2#
Device Type:	ECU-1152-R11AAE
Password:	
Indentity:	IP Address
IP Address:	10.0.0.16
Description:	Solar gateway 2#

Figure 4.3 Adding device with IP address identity

4.2.1.3 Copying Devices

To reduce the complexity of configuring a lot of devices on the field, Taglink Studio supports the ability to copy device information within a project. Users can right-click on the device name and choose “copy”. The copied device will have the same configuration as the original device. Users need to modify the name, Node ID or IP as well as the description according to the project planning.

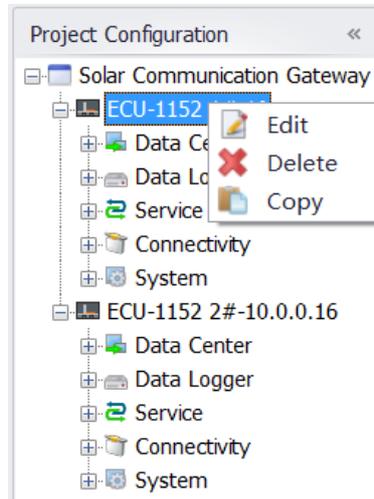


Figure 4.4 Copying devices

4.2.1.4 Deleting Devices

Users can also right-click on the device name and choose “delete” to delete the device in the project.

4.2.1.5 Project Download

After the device has been identified, users can download the device information to the relevant device. Batch download function is supported. If users select a project on the left tree menu and then click “Project Download”, a dialog will pop up listing all RTU devices for batch download. If users select a certain device and then click “Project Download”, a dialog will pop up with only one RTU device to be downloaded.

1. Select a project or a device.
2. Click “Project Download”
3. Click “Download” button to start downloading.
4. In “Project Download” dialog, “Progress” shows the current download progress. When complete, click “Close” button.
5. In “Project Download” dialog, “Reboot” allows users to set whether to reboot the device after the downloading is complete.

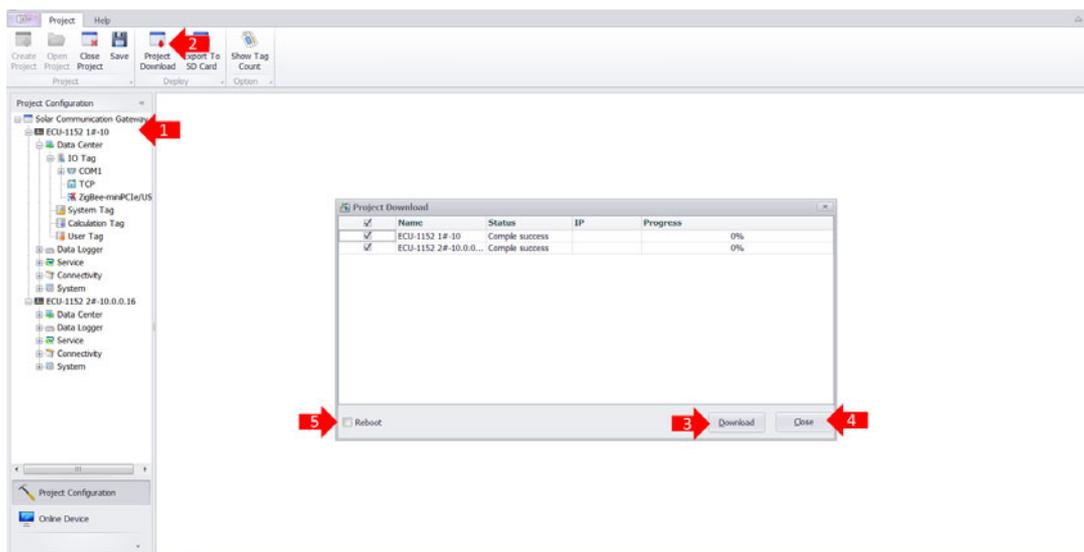


Figure 4.5 Project Download

4.2.1.6 Show Tag Count

Click “Show Tag Count” to show the number of the configured tags of each device under a project.

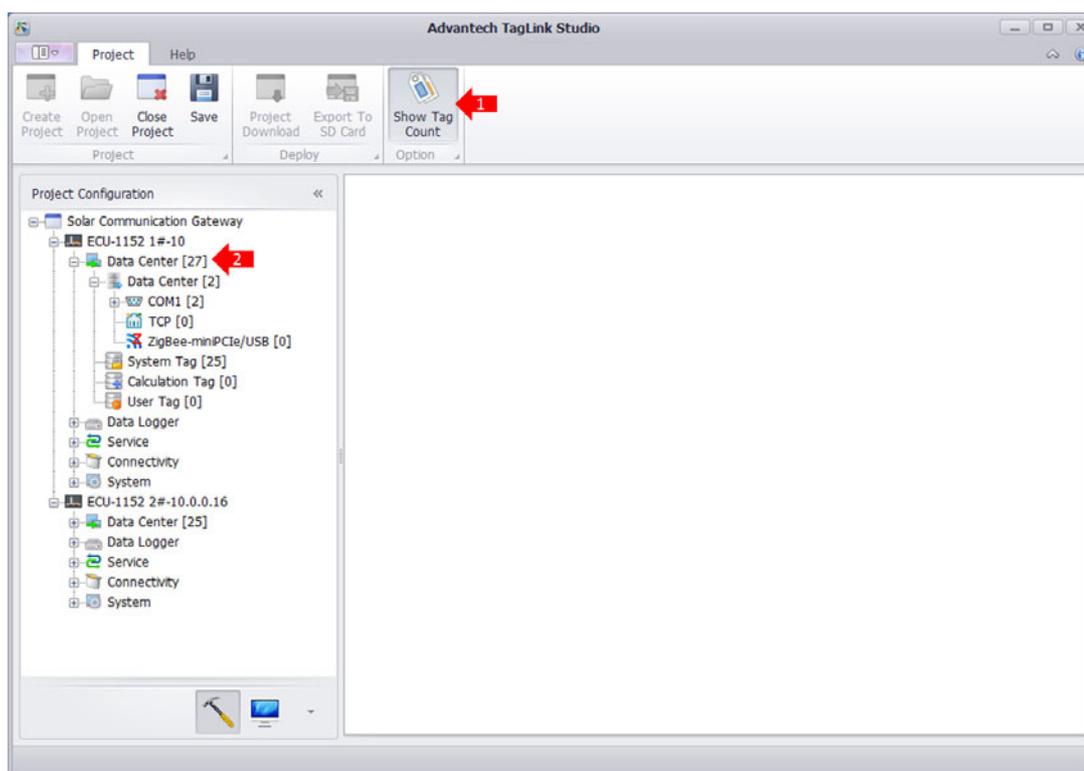


Figure 4.6 Show Tag Count

4.2.1.7 Export to SD Card

If users want to copy the configured project to ECU-1152 device in absence of network connection, “Export to SD Card” is an option.

1. If selecting a project, click “Export to SD Card” will pop up the window listing all devices in the project. If selecting a device, click “Export to SD Card” will pop up the window listing the selected device.
2. Select a target path to export to.
3. Click “Export” button. When the progress bar is complete, export action is successfully completed.
4. Click “Close” button.

Then insert SD card into ECU-1152 and power on it to update the project.

Note! This function will only be available when there is a corresponding Node ID.

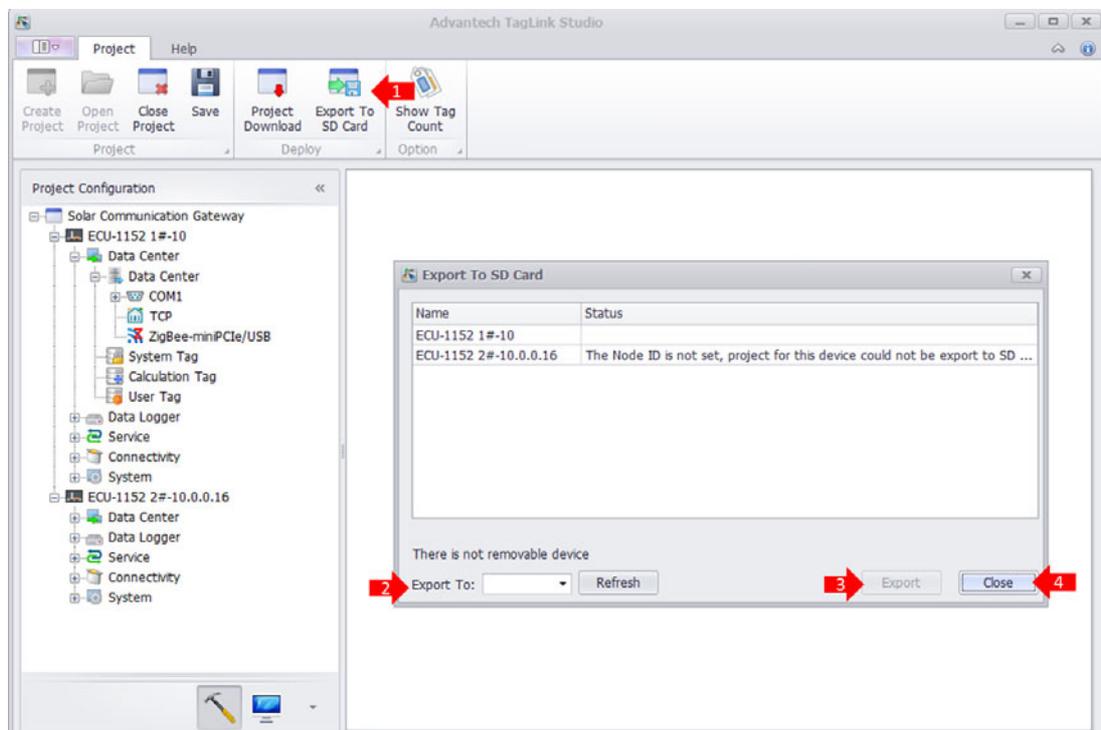


Figure 4.7 Export to SD Card

4.2.2 Data Acquisition Configuration

Data acquisition is an important function for ECU-1152 device. ECU-1152 supports the acquisition of serial IO devices, Ethernet devices as well as wireless Zigbee devices to satisfy the diversified acquisition needs. Therefore in Taglink Studio, users need to add and configure those tags based on the specific acquisition requirements. These IO tags added into the project are real tags. While in actual project deployment, local tags of engineering significance are also needed. Users are required to add and configure them in Taglink Studio.

4.2.2.1 Configure IO of Serial Devices

ECU-1152 offers 6 * RS232/485 serial ports. Users need to add new ports into Taglink Studio following the below procedures.

1. Right-click on “Data Center” and choose “Add Port”.
2. Select the port type from the drop-down list. Then “Serial Port Setting” will appear and allow users to set the related parameters according to their requirements.
In “General Information”, users can also set “Scan Time”, “Time Out”, “Retry Count” and “Auto Recover Time”.
3. After the setting, click “Apply” button to save the changes.
4. If users don’t want to save the changes, click “Cancel Change”.

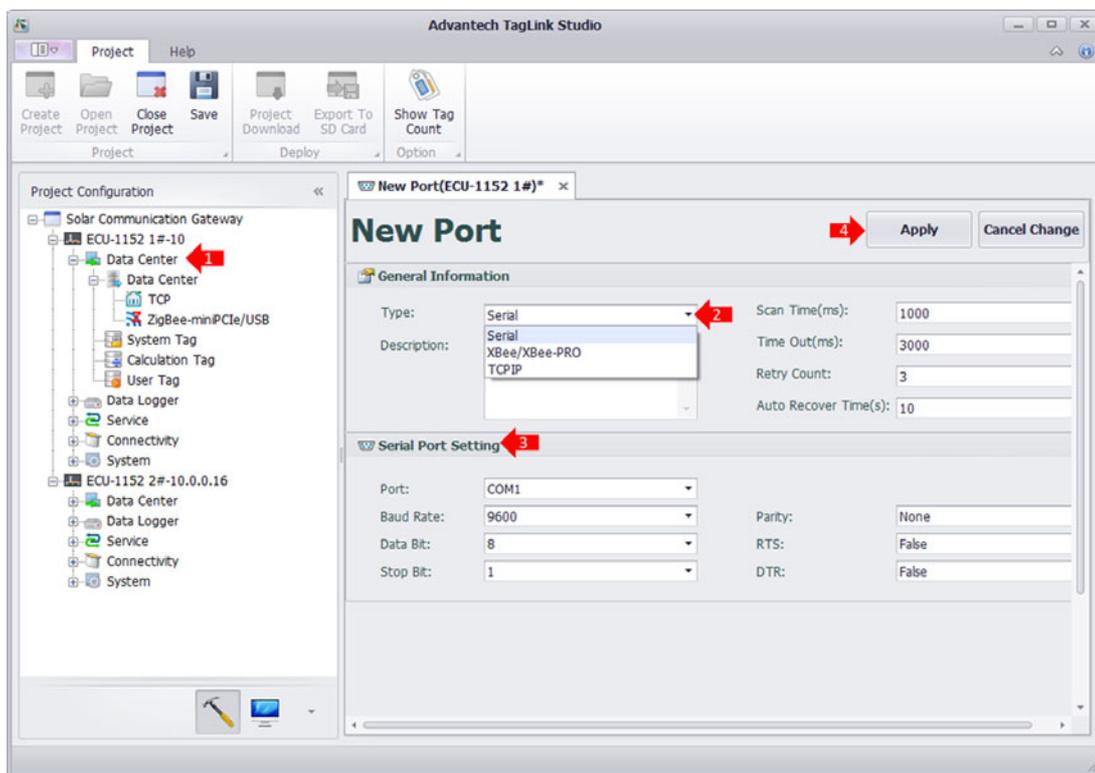


Figure 4.8 Adding COM port

5. After adding the COM port successfully, users can right click on the COM port to edit/delete it.

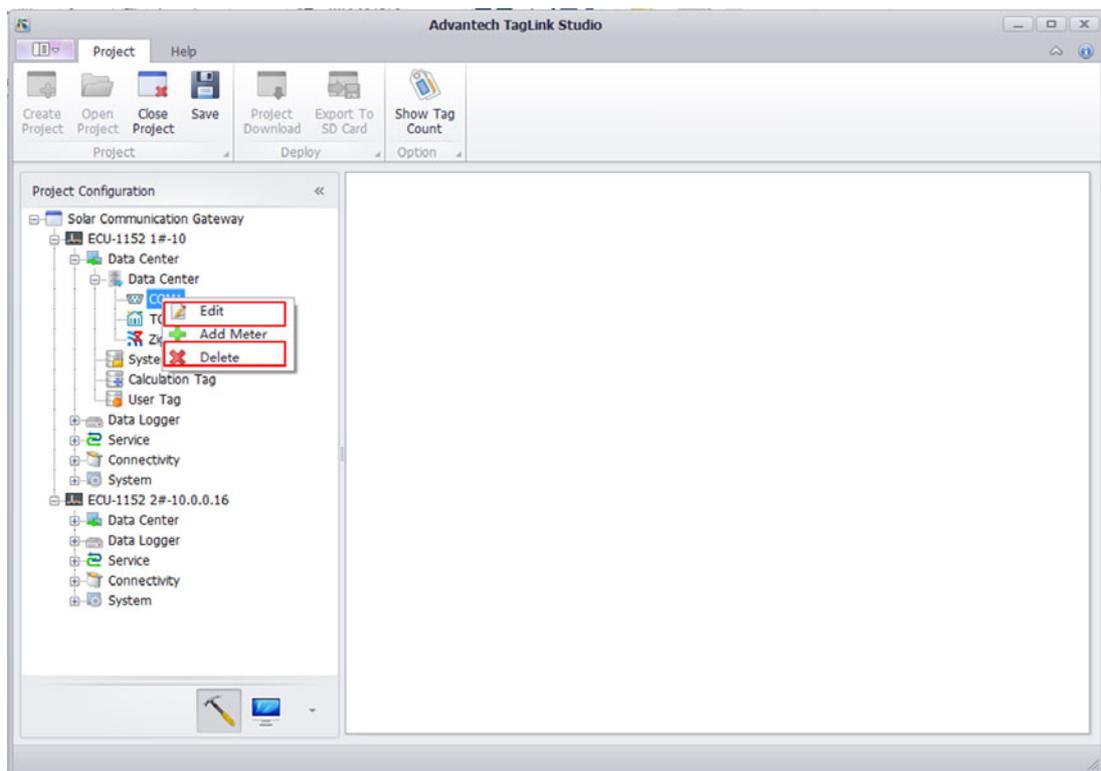


Figure 4.9 Edit or Delete COM port

6. Right-click on the port name and select "Add Meter" to configure the serial device, whose detailed setting are shown in the below figure.
 - a. Fill in a meter name.
 - b. Select the meter type. According to different meter types, it will appear "Extension Properties" or not.
 - c. Set the unit number of the meter.
 - d. Give a description of the meter, which is optional.
 - e. In "Extension Properties", users can set some related parameters of the protocols.
 - f. Then, click "Apply" button to save the setting.
 - g. If users don't want to save the changes, click "Cancel Change" button.

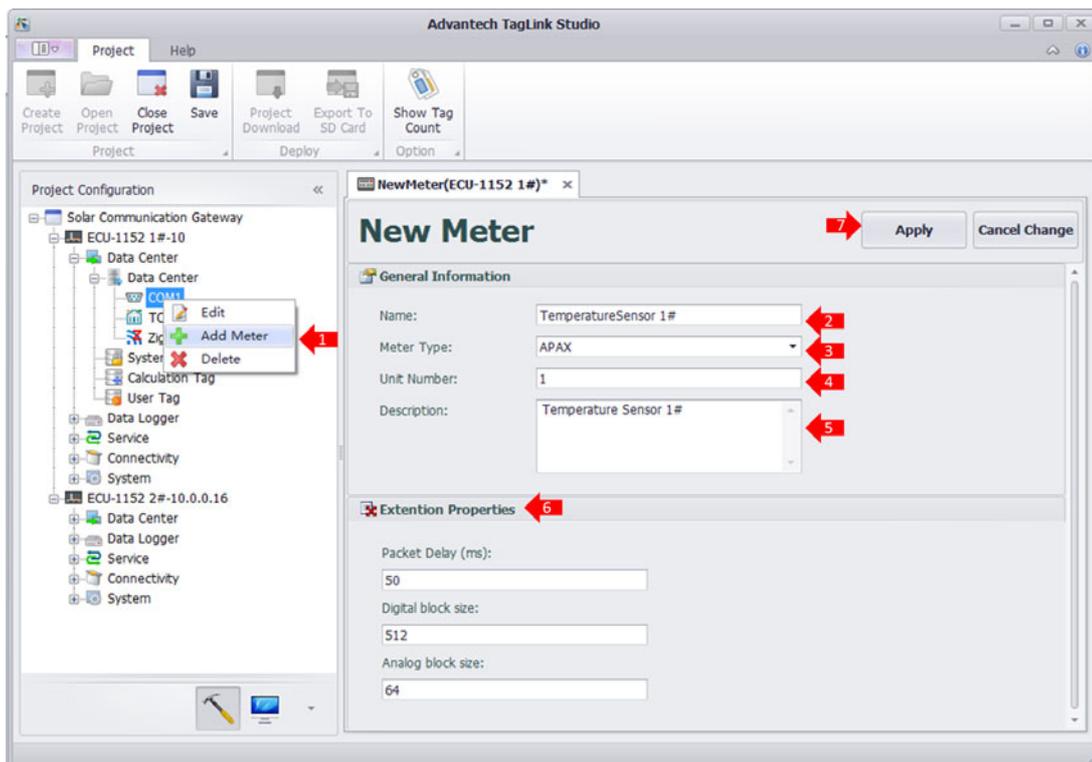


Figure 4.10 Adding COM Meter

7. After adding the new meter successfully, users need to configure IO tag. The procedures are as below.
 - a. Double-click “IO Tag” in the left tree menu or right-click on it and select “Edit”.
 - b. Click “Add” button to add IO tag.
 - c. Fill in the basic information of IO tag.
 - d. If the data type is “Analog”, it will appear the “Advanced” dialog. Users can select the scaling type according to real needs.
 - e. Click “OK” button to successfully adding the tag. Then this new tag will appear in I/O Tag list.
 - f. Users can select one tag to delete or modify it.

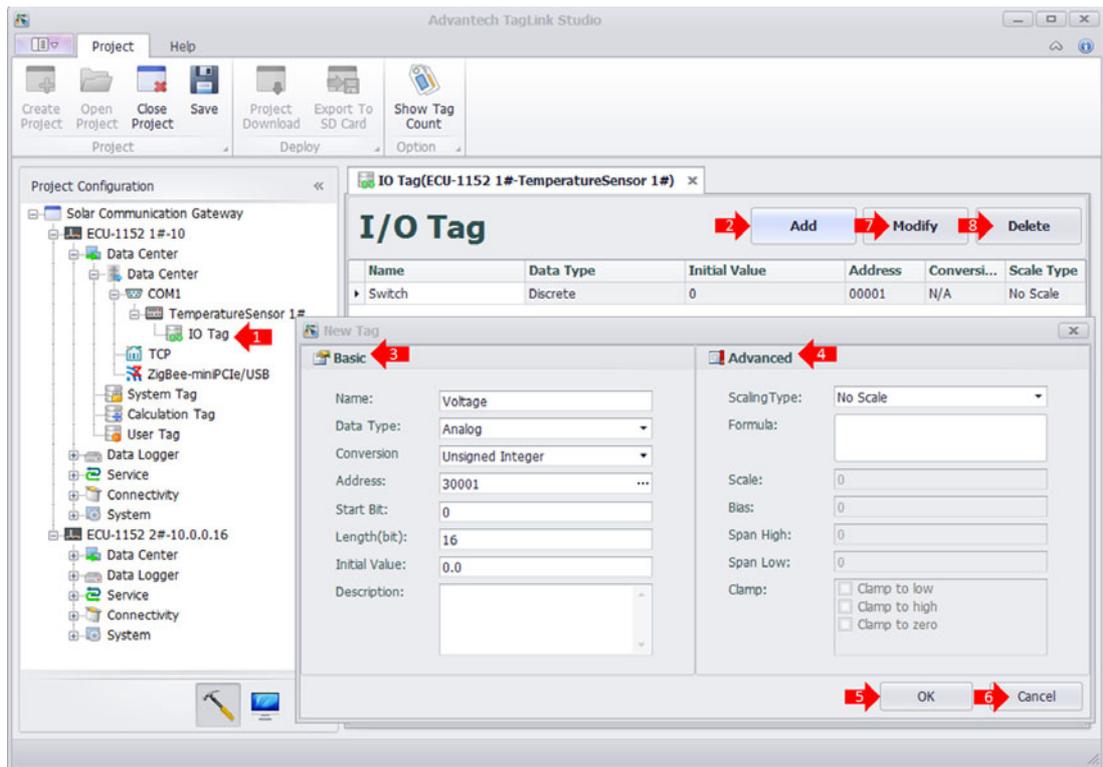


Figure 4.11 Adding COM Meter IO Tag

8. If users want to delete the newly added meter, right click on the meter name and select “Delete” to remove it.

4.2.2.2 Configure IO of Ethernet Devices

ECU-1152 offers 2 Ethernet port. TagLink Studio supports to edit/delete the port and add meter to it.

1. Right-click on the port name and select “Edit” to change the Ethernet port setting which are shown in below.

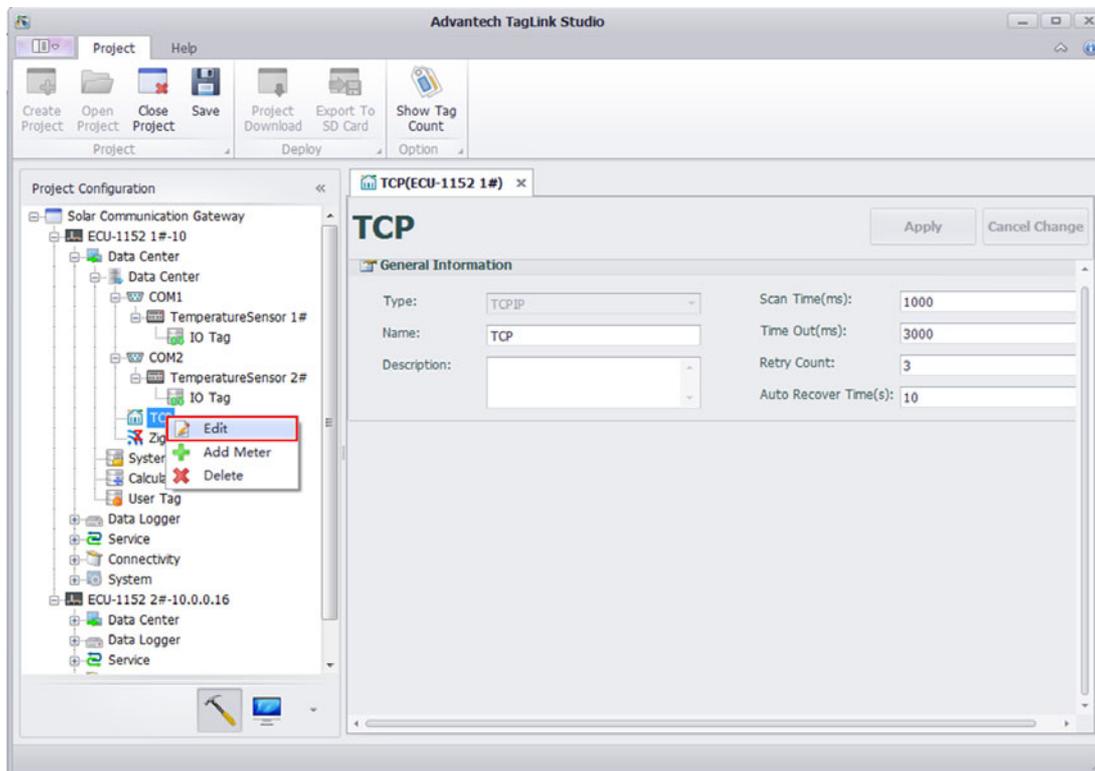


Figure 4.12 Editing Ethernet Information

Note! This TCP port is a software port, so the quantity of its entity ports is not restricted to 2. Users can freely add a new port as required.



2. Right-click on the port name and select “Delete” to remove this port.
3. Right-click on the port name and select “Add Meter” to configure the Ethernet device, whose detailed settings are shown in the below figure.

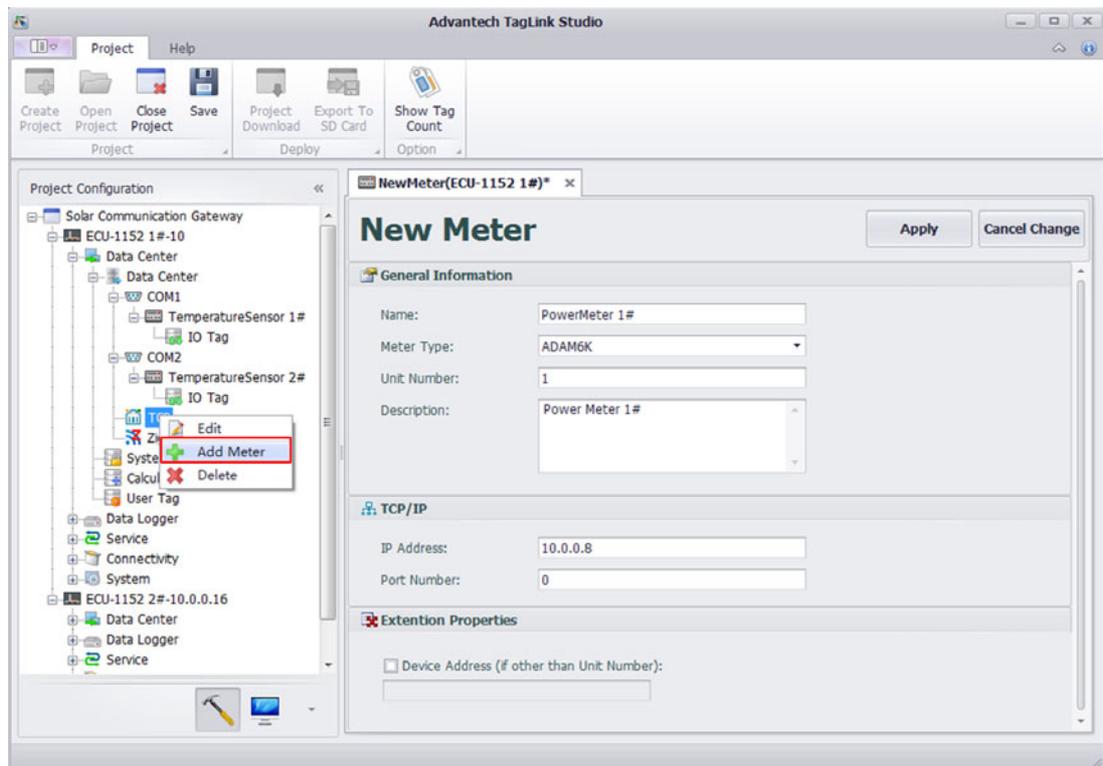


Figure 4.13 Adding TCP Meter

4. After adding a new meter successfully, users need to configure IO tag, the procedures of which are similar as for “Configure IO of Serial Devices”.

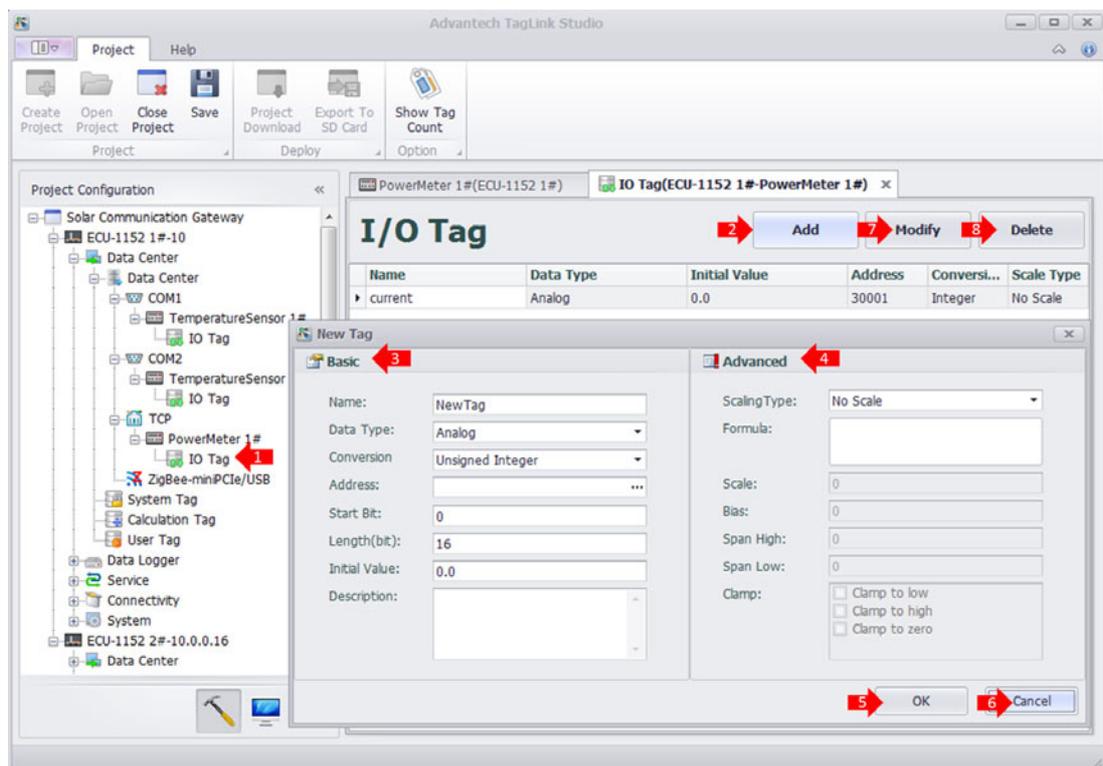


Figure 4.14 Adding TCP Meter IO Tag

If users want to delete the newly added meter, right-click on the meter name and select “Delete” to remove it.

It should be noted that Taglink Studio supports one Ethernet port by default. If two or more Ethernet ports are required, users need to add new ports referring to the following procedures.

1. Right-click on “IO Tag” and select “Add Port”.
2. Select the port type and fill in the port name.
3. Give a description basic setting of the Ethernet port.
4. Then, click “Apply” button to save the settings.
5. If users do not want to save the changes, click “Cancel Change” button.

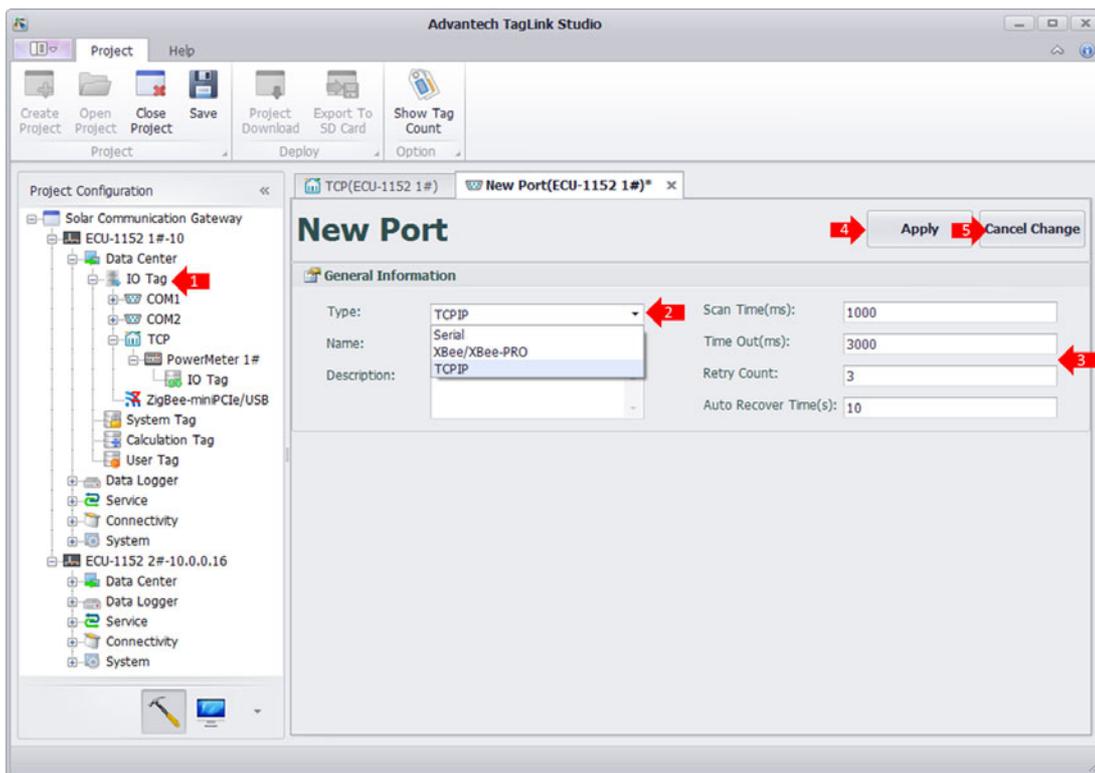


Figure 4.15 Adding and Editing TCP Port

4.2.2.3 Configure IO of Wireless Zigbee Devices

For acquisition requirements of wireless Zigbee devices, users can right-click on the port name to edit/delete it and add meter to it.

1. The port setting are preset when Zigbee port was firstly added. If there is any information needed to be changed, right-click on the port name and select “Edit” to modify, then click “Apply” button to save the changes.

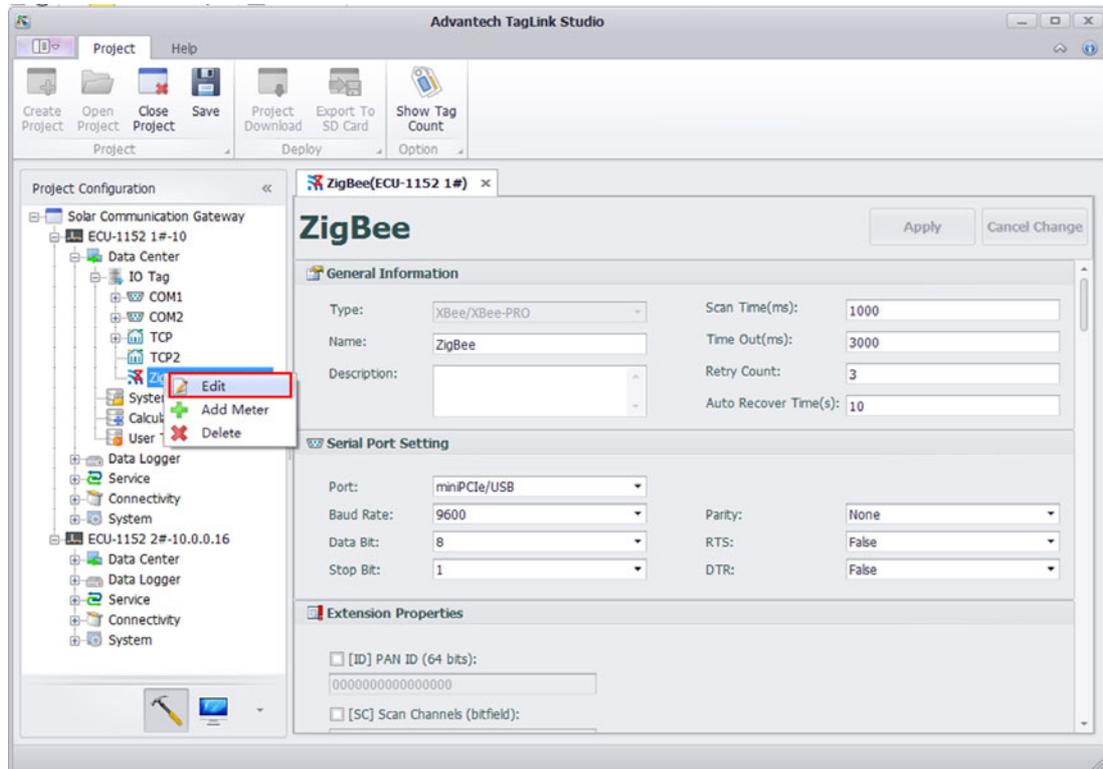


Figure 4.16 Editing Zigbee Information

2. Right-click on the port name and select “Add Meter” to add a new Zigbee device.

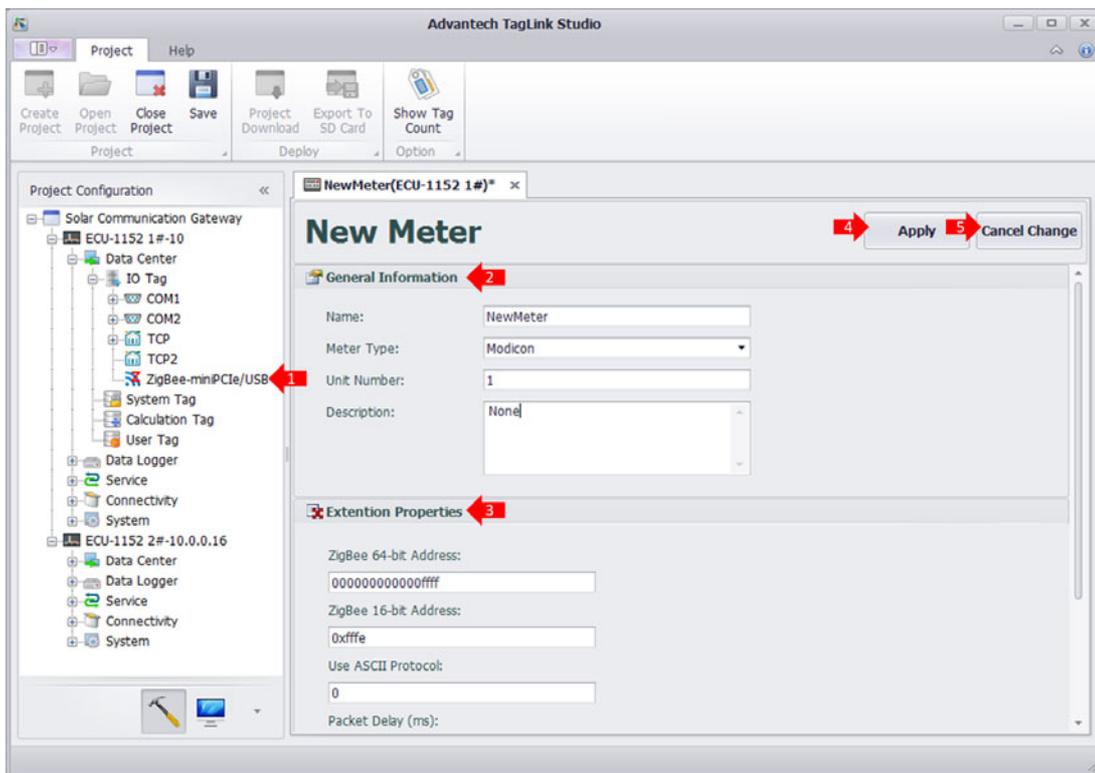


Figure 4.17 Adding Zigbee Meter

3. Add IO tag of wireless Zigbee device the procedures of which are similar with “Configure of Serial Devices”.
 - a. Double-click or right-click IO tag to edit it.
 - b. Click “Add” to add new I/O tag.
 - c. Fill in the basic information of IO tag.
 - d. If the data type is “Analog”, it will appear the “Advanced” dialog. Users can select the scaling type according to real needs.
 - e. Click “OK” button to successfully adding the tag. Then this new tag will appear in I/O Tag list.
 - f. Users can select one tag to delete or modify it.

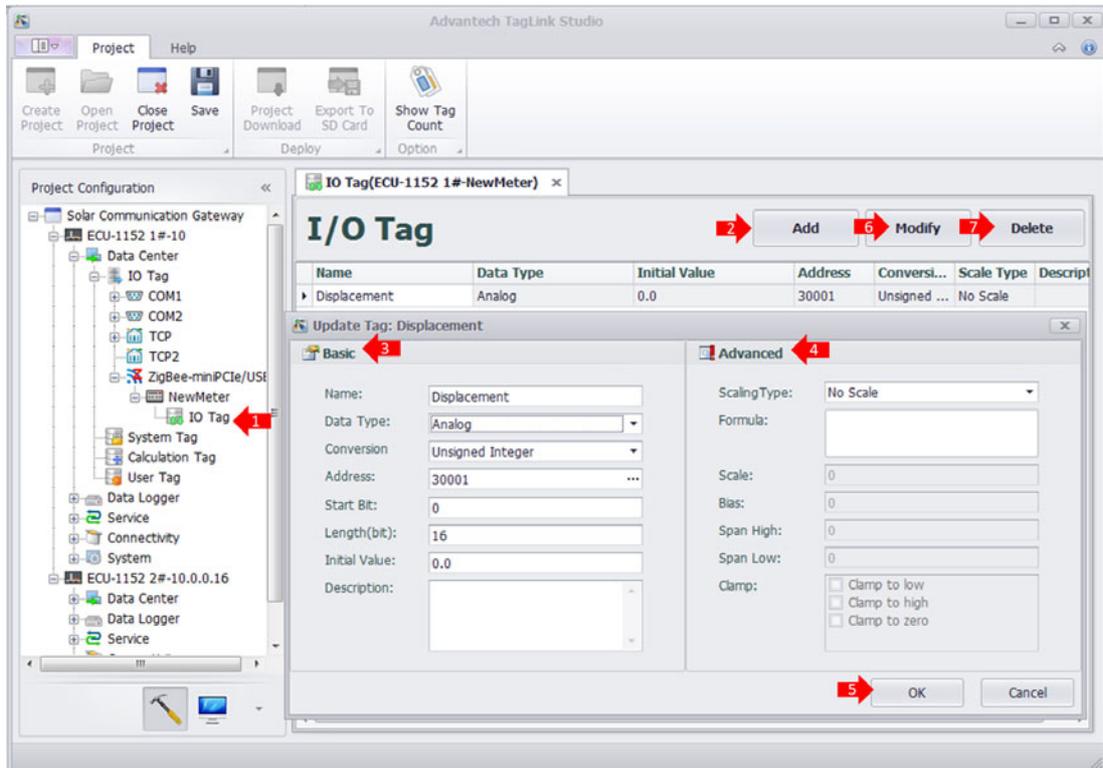


Figure 4.18 Adding Zigbee Meter IO Tag

4.2.2.4 View System Tag

System tag keeps basic information and hardware status of RTU. In this page, users can only view the preset system tags. The operations of adding, editing or deleting are not available.

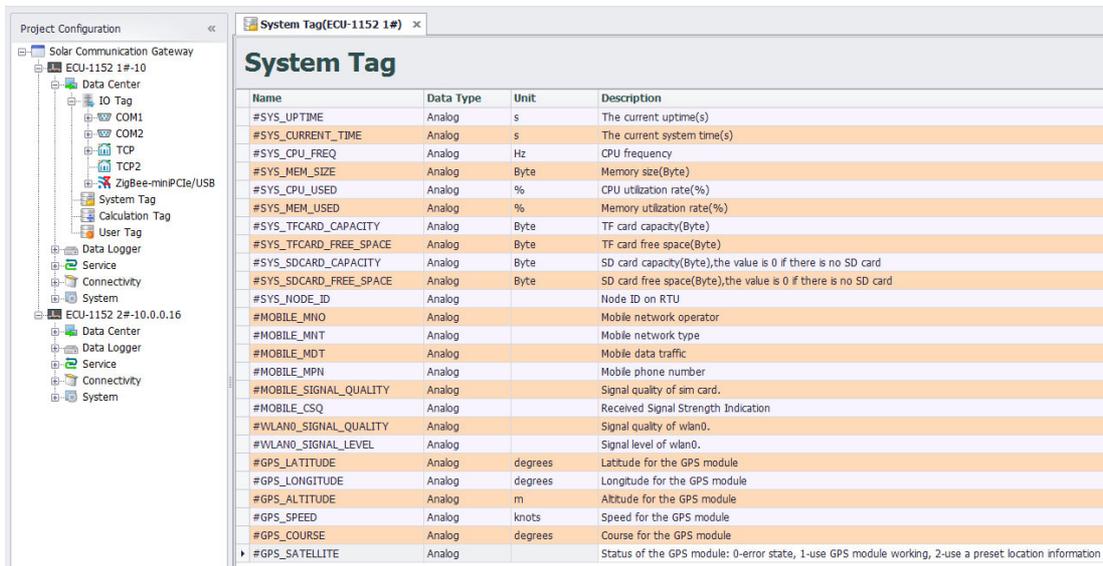


Figure 4.19 Viewing System Tag

SYS_UPTIME: The current time (s)
 # SYS_CURRENT_TIME: The current system time (s)
 # SYS_CPU_FREQ: CPU frequency (Hz)
 # SYS_MEM_SIZE: Memory size (Byte)
 # SYS_CPU_USED: CPU utilization rate (%)
 # SYS_MEM_USED: Memory utilization rate (%)
 # SYS_TFCARD_CAPACITY: TF card free space (Byte)
 # SYS_TFCARD_FREE_SPACE: TF card free space (Byte)
 # SYS_SDCARD_CAPACITY: SD card capacity (Byte), the value is 0 if there is no SD card
 # SYS_SDCARD_FREE_SPACE: SD card free space (Byte), the value is 0 if there is no SD card
 # SYS_NODE_ID: Node ID on RTU
 # MOBILE_MNO: Mobile network operator
 # MOBILE_MNT: Mobile network type
 # MOBILE_MDT: Mobile data traffic
 # MOBILE_MPN: Mobile phone number
 # MOBILE_SIGNAL_QUALITY: Signal quality of sim card
 # MOBILE_CSQ: Received signal strength indication
 # WLAN0_SIGNAL_QUALITY: Signal quality of wlan0
 # WLAN0_SIGNAL_LEVEL: Signal level of wlan0
 # GPS_LATITUDE: Latitude for the GPS module
 # GPS_LONGITUDE: Longitude for the GPS module
 # GPS_ALTITUDE: Altitude for the GPS module
 # GPS_SPEED: Speed for the GPS module
 # GPS_COURSE: Course for the GPS module
 # GPS_SATELLITE: Status of the GPS module: 0-error state, 1- use GPS module working, 2- use a preset location information

4.2.2.5 Configure Calculation Tag

Calculation tag is a kind of special tags, the value of which indicates the calculation result of a formula. The parameter of this formula can be a tag or a constant. Also, the expression can utilize some common calculation methods, including arithmetic & logic operation and trigonometric function, etc.

Calculation tag can perform some relatively complex operations, such as converting the acquired sensor value to the real physical quantity (liquid level, wind speed, etc.), so as to make the computation less intensive for the upper computer as well as the device more intelligent.

Each calculation tag corresponds to one expression which may support at most 8 tags as its input variables. For users' convenience, 8 tags are represented by A, B, C, D, E, F, G and H (case insensitive) in the expression.

1. Please follow the procedures to add a calculation tag:
 - a. Double-click on "Calculation Tag" in the left tree menu.
 - b. Click "Add" button to add a new calculation tag.
 - c. Fill in the basic information. "Periods (s)" specifies how often the tags are calculated, and its unit is second.
 - d. Enter an expression. Users can select default function or operator from the pull-down lists or type them manually. The example figure shows the calcu-

lation expression of “Lighting Failure”, the expression logic of which is that the lighting is failed when the value of any tag in four switches is 0.

- e. Double-click the variable box to add a tag.
- f. Click “OK” button to add the calculation tag.

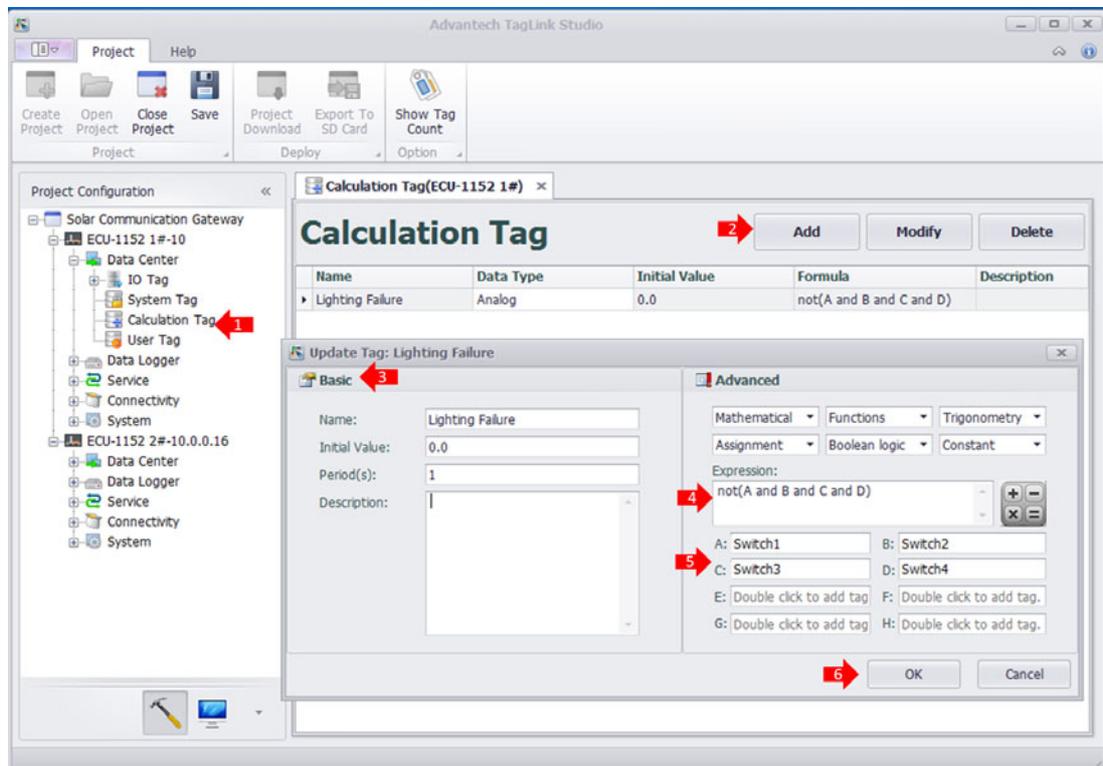


Figure 4.20 Adding Calculation Tag

- Users can click the calculator button on the right of "Expression" box to check the expression right or not. Then the "Calc Expression" window will show as below. This interface is roughly the same as "Advanced" setting interface in the above, but with a "=" button and a box displaying the operation result. Besides, the variable boxes here require users to input the variable values rather than tag names. To verify the expression is correct or not, users can click the "=" button to get the result.

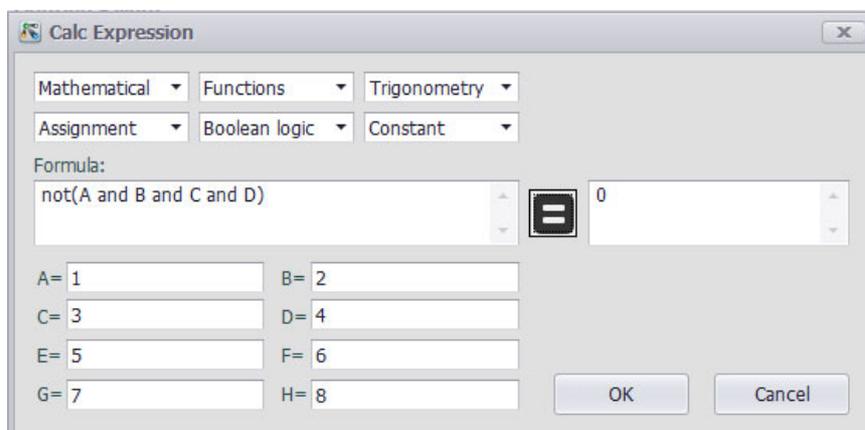


Figure 4.21 Checking Calculation Expression

Through the drop-down boxes, users can set the functions and operators calculation tag supports, which are divided into five categories: "Mathematical", "Functions", "Trigonometry", "Assignment" and "Boolean logic". Moreover, "Constant" box is also provided, allowing users to select from three constants: pi (the ratio of the circumference to the diameter of a circle), epsilon (the smallest positive double value that is greater than zero) and inf (infinity).

As shown in the figure below, the functions or operators listed in the box can be classified into three types: With no brackets, this indicates binary operations (labeled with 1); With brackets but no comma, this means this function only has one parameter (labeled with 2); With brackets and comma, this means the function supports more than one parameter (labeled with 3).

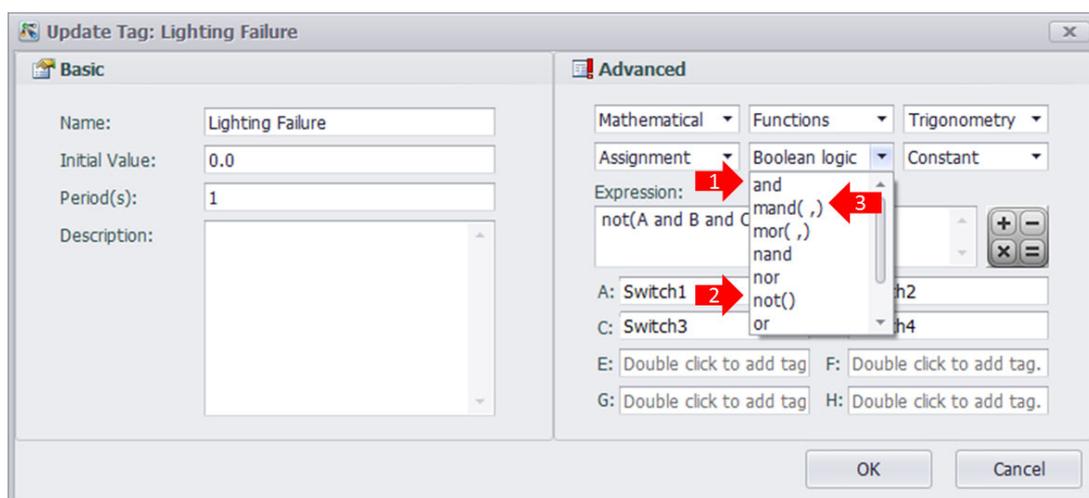


Figure 4.22 Function and Operator Description

All functions and operators are described as follows:

Arithmetical Operation	Description
+	Addition
-	Subtraction
*	Multiplication
/	Division
%	Remainder. For example: $7\%3=4$
^	Exponentiation. For example: $2^3=8$
Function	Description
min	Minimum. Several parameters can be included. For example: $\text{min}(1,2,3,4)=1$
max	Maximum. Several parameters can be included. For example: $\text{max}(1,2,3,4)=4$
avg	Average. Several parameters can be included. For example: $\text{avg}(1,2,3,4)=2.5$
sum	Sum. Several parameters can be included. For example: $\text{sum}(1,2,3,4)=10$
abs	Absolute value. For example: $\text{abs}(-1)=1$
ceil	Ceil. For example: $\text{ceil}(1.1)=2$? $\text{ceil}(-1.1)=-1$
floor	Floor. For example: $\text{floor}(1.1)=1$? $\text{floor}(-1.1)=-2$
round	Round. For example: $\text{round}(1.1)=1$? $\text{round}(1.5)=2$? $\text{round}(-1.1)=-1$? $\text{round}(-1.5)=-2$
roundn	Roundup and rounddown. Parameter 1 is the numerical value and parameter 2 is the number of decimal places. For example: $\text{roundn}(1.246,0)=1$? $\text{roundn}(1.246,1)=1.2$? $\text{roundn}(1.246,2)=1.25$
exp	Exponential function with base e $e \approx 2.71828182845905$?. For example: $\text{exp}(0)=1$? $\text{exp}(1)=2.71828182845905$
log	Natural logarithm with base e. For example: $\text{log}(2.71828182845905)=1$? $\text{log}(1)=0$
log10	Logarithm with base 10. For example: $\text{log}_{10}(1)=0$? $\text{log}_{10}(10)=1$
logn	Logarithm with base n. Parameter 1 is the antilogarithm and parameter 2 is the base. For example: $\text{log}_n(8,2)=3$
root	Cubic root of n. Parameter 1 is the radicand and parameter 2 is the radical exponent. For example: $\text{root}(9,2)=3$
sqrt	Square root of a non-negative real number. For example: $\text{sqrt}(9)=3$
clamp	Clamp calculation. Restrict the variable value between the maximum value and the minimum value. Parameter 1 is the min. value, parameter 2 is the variable value and parameter 3 is the max. value. For example: $\text{clamp}(1,2,3)=2$? $\text{clamp}(1,-1,3)=1$? $\text{clamp}(1,10,3)=3$
inrange	Determine whether the variable value is within the given value field. Parameter 1 is the min. value, parameter 2 is the variable value and parameter 3 is the max. value. For example: $\text{inrange}(1,2,3)=1$? $\text{inrange}(1,-1,3)=0$? $\text{inrange}(1,10,3)=0$, $\text{inrange}(1,1,3)=1$
Trigonometric Function	Description (Note: The unit of all parameters used in trigonometric function is radian rather than angle degree. For example, an angle of 90 degrees is represented by $\pi/2$)
sin	Sine function. For example: $\text{sin}(\pi/2)=1$? $\text{sin}(\pi/6)=0.5$? $\text{sin}(0)=0$
cos	Cosine function. For example: $\text{cos}(0)=1$? $\text{cos}(\pi)=-1$? $\text{cos}(\pi/3)=0.5$
tan	Tangent function. For example: $\text{tan}(0)=0$? $\text{tan}(\pi/4)=1$
acos	Arc-cosine function. For example: $\text{acos}(1)=0$? $\text{acos}(-1)=3.14159265358979$
asin	Arc-sin function. For example: $\text{asin}(0)=0$? $\text{asin}(1)=1.5707963267949$

atan	Arc-tangent function. For example: $\text{atan}(0)=0$? $\text{atan}(1)=0.785398163397448$
atan2	To get the radian of the angle formed by a line with origin of coordinates as its endpoint and X-axis, in which parameter 1 is y and parameter 2 is x. For example: $\text{atan2}(0,1)=0$? $\text{atan2}(1,0)=1.5707963267949$
sinh	Hyperbolic sine function. Equivalent formula is $\sinh(x)=(\exp(x)-\exp(-x))/2$
cosh	Hyperbolic cosine function. Equivalent formula is $\cosh(x)=(\exp(x)+\exp(-x))/2$
tanh	Hyperbolic tangent function. Equivalent formula is $\tanh(x)=\sinh(x)/\cosh(x)=(\exp(x)-\exp(-x))/(\exp(x)+\exp(-x))$
cot	Cotangent function, which calculates the ratio of the adjacent side of a right triangle against its opposite side.
csc	Cosecant function, which calculates the ratio of the hypotenuse of a right triangle against the opposite side of an acute angle.
sec	Secant function, which calculates the ratio of the hypotenuse of a right triangle against the adjacent side of an acute angle.
Logical Judgment	Description (Note: If the result of a logical judgment is true, the value is 1; otherwise, the value is 0)
==	Equality
!=	Inequality
<	Less than
<=	Less than or equal to
>	Greater than
>=	Greater than or equal to
Boolean Operation	Description
and	And operation. There are two variables on both sides of "and", separated by a blank space. If both two variables are not 0, the operation result is 1; otherwise, the result is 0. For example: $1 \text{ and } 2=1$? $0 \text{ and } 1=0$
or	Or operation. There are two variables on both sides of "or", separated by a blank space. If both two variables are 0, the operation result is 0; otherwise, the result is 1. For example: $1 \text{ or } 0=1$? $0 \text{ or } 0=0$
mand	And operation function. Here, more than two variables are supported. If all variables are not 0, the operation result is 1; otherwise, the result is 0. For example: $\text{mand}(1,2,3)=1$? $\text{mand}(1,2,0)=0$
mor	Or operation function. Here, more than two variables are supported. If all variables are 0, the operation result is 0; otherwise, the result is 1. For example: $\text{mor}(1,0,0)=1$? $\text{mor}(0,0,0)=0$
nand	Nand operation. There are two variables on both sides of "nand", separated by a blank space. If both two variables are not 0, the operation result is 0; otherwise, the result is 1. For example: $1 \text{ nand } 0=1$? $1 \text{ nand } 1=0$? $0 \text{ nand } 0=1$
nor	Nor operation. There are two variables on both sides of "nor", separated by a blank space. If both two variables are 0, the operation result is 1; otherwise, the result is 0. For example: $0 \text{ nor } 0=1$? $1 \text{ nor } 1=0$? $0 \text{ nor } 1=0$
not	Not operation function. If the variable is 0, the result is 1; otherwise, the result is 0. For example: $\text{not}(0)=1$? $\text{not}(1)=0$
xor	Exclusive or operation. There are two variables on both sides of "xor", separated by a blank space. If both two variables are 0 or both are not 0, the operation result is 0; otherwise, the result is 1. For example: $0 \text{ xor } 0=0$, $1 \text{ xor } 1=0$, $0 \text{ xor } 1=1$

xnor	Xnor operation. There are two variables on both sides of "xor", separated by a blank space. If both two variables are 0 or both are not 0, the operation result is 1; otherwise, the result is 0. For example: 0 xor 0=1, 1 xor 1=1, 0 nor 1=0
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4.2.2.6 Configure User Tag

IO tags described in the previous sections are all real ones, while some unreal IO tags are also need in the process of project deployment. This kind of tags is optional and called User Tag which can be used for C and KW language programming, as a control signal or a manifestation of an operation result.

User tag configuration is supported by TagLink Studio. Users can configure them one by one based on real needs for future programming. Please follow the below procedures to configure a user tag:

1. Double-click or right-click "User Tag" in the left menu tree to select "Edit".
2. Click "Add" button to add a new user tag.
3. Fill in the basic information of the tag.
4. Click "OK" button to save the changes.
5. If users do not want to save the changes, click "Cancel" button.
6. Users can select one or more tags and click "Delete" or "Modify" button to delete or modify the tag.

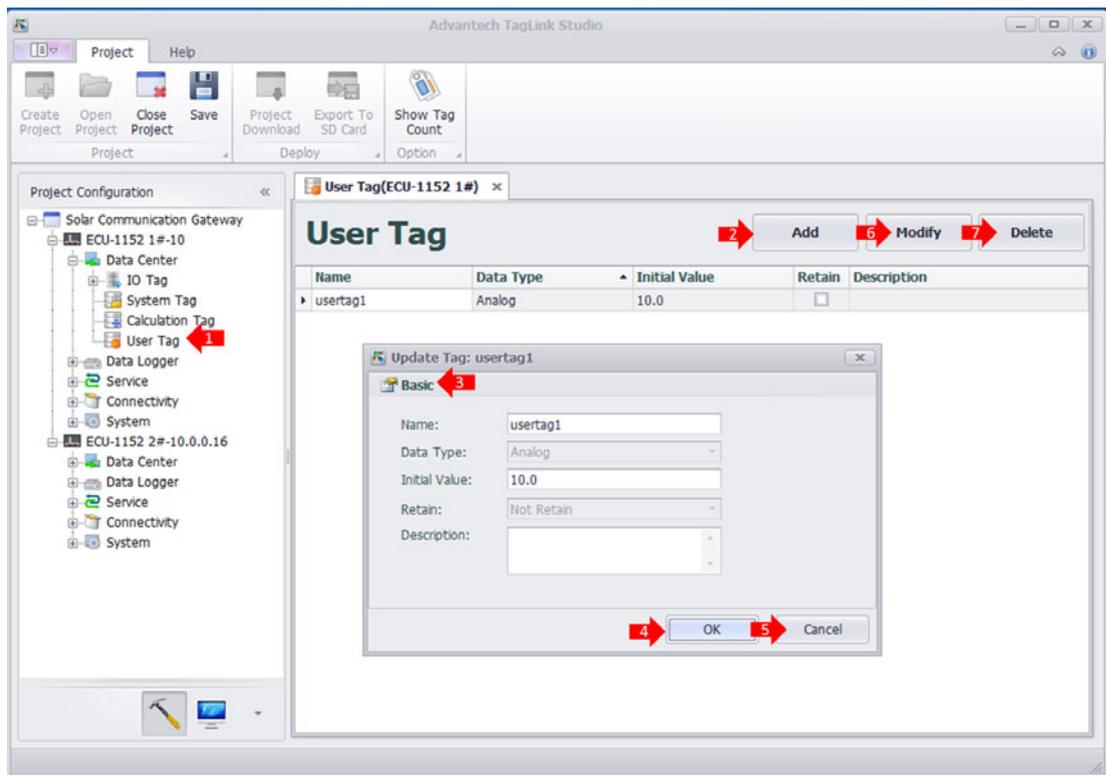


Figure 4.23 Adding User Tag

4.2.3 Data Logger Configuration

ECU-1152 supports data logger function to store the tag data.

4.2.3.1 Add Data Logger Tag

ECU-1152 has no tag configured by default. In project configuration, users can add and configure tags according to the real application. Please follow the below procedures to add a tag for data logger configuration.

- Double-click “Periodic Logger” to add the tag. Users can set the logger parameter according to the real needs.
 - Enable:** Tick this box to enable the data logging function.
 - USB Disk Backup:** Tick this box to automatically backup the historical data to USB disk when it is inserted.
 - Storage Path:** The data storage path is SD card.
 - Periods (s):** The data storage period. The unit is second and the default value is 1 second.
 - Max Days (d):** The maximum days the historical data can be stored. The default value is 7. The earliest data will be deleted if the maximum days have been exceeded.
 - Space needed:** The least disk space needed to save the historical data for the configured number of days.
- Double-click “Double click to edit”.
- In “Select Tag” window, tick the needed tags. Click “OK” button to add the selected tags.
- Click “Apply” button.

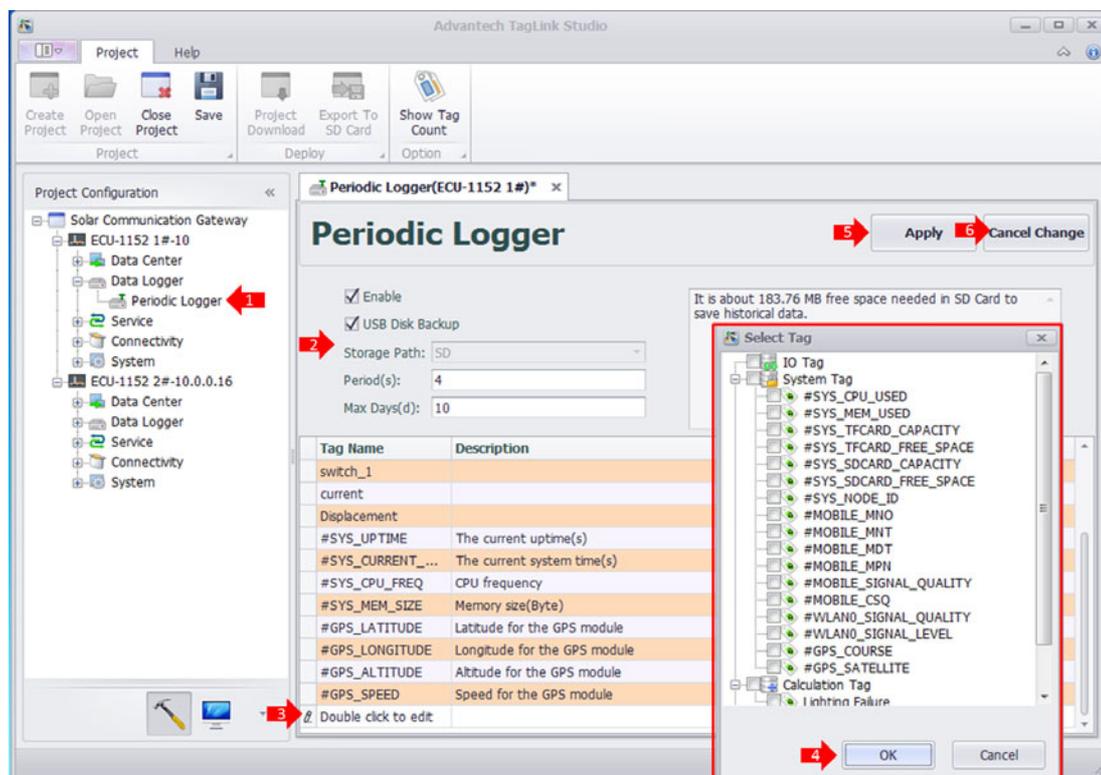


Figure 4.24 Adding Data Logger Tag

4.2.3.2 Delete Data Logger Tag

In project configuration, users can delete the unneeded tags as required. Please follow the below procedures to delete a data logger Tag.

1. Right-click on the unneeded tags, click “Delete”.
2. In the pop-up dialog box, click “Yes” button.
3. Then click “Apply” button.

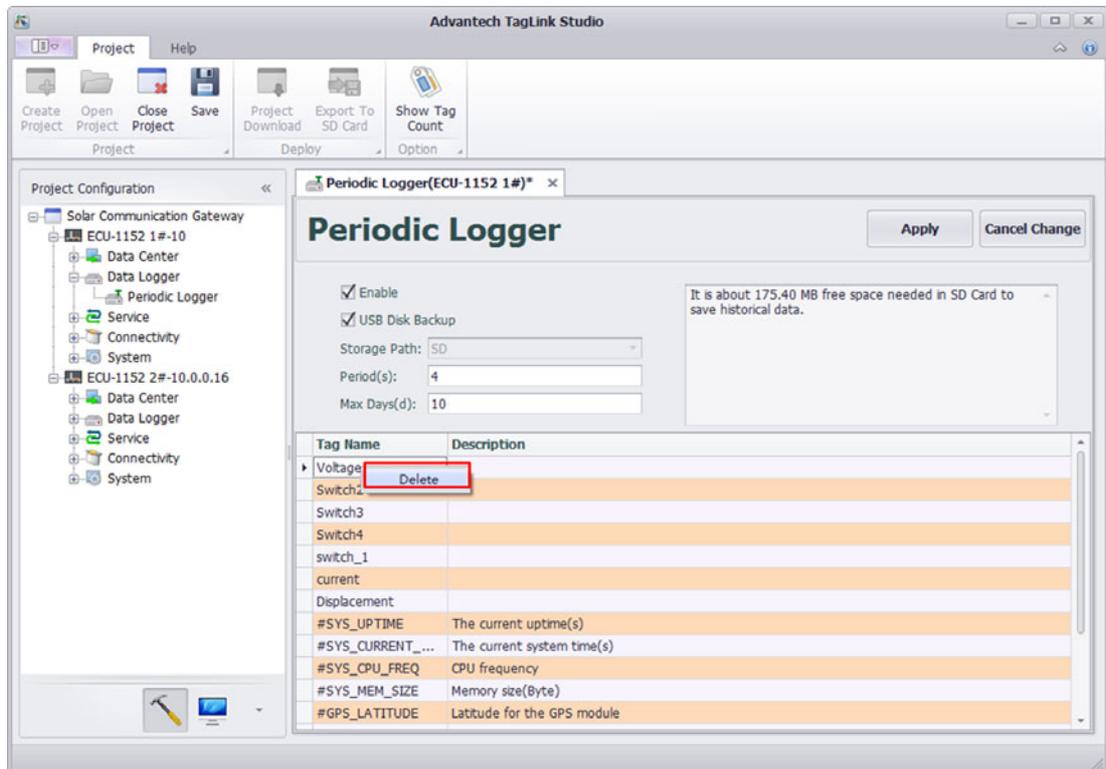


Figure 4.25 Deleting Data Logger Tag

4.2.4 Protocol Service Configuration

ECU-1152 supports four standard protocols: Modbus, DNP3, WASCADA and IEC-104, which can realize the communication between ECU-1152 and the lower acquisition devices as well as the upper central devices.

4.2.4.1 Modbus Server

Modbus server achieves the mapping from tag to Modbus address, allowing Modbus Client on the upper computer to read/write tags via Modbus TCP or Modbus RTU.

1. Modbus TCP Configuration

Modbus TCP service allows the upper computer to access the device through Modbus TCP protocols of TCP/IP.

The configurations of Modbus TCP are as follows:

- Port Number: Set the number of the port Modbus TCP listens on. The default number is 502.
- Max Users: Set the maximum number of users that can be connected at the same time. The default value is 4, which means at most 4 client ends can simultaneously access the device through Modbus TCP protocol.
- Idle Time: Specify the maximum time when the client writes/reads no data to/from the server after the TCP connection has been established. The default value is 120 seconds. After that, the client will be automatically disconnected from the server. If this value is set to 0, the server will never be disconnected.

2. Modbus RTU Configuration

Modbus RTU service allows the upper computer to access the device through serial port connection (RS-232/485) or virtual serial port connection via Modbus RTU protocol.

The configurations of Modbus TCP are as follows:

- Device ID: It is sometimes called Station Number, which is the node ID of a Modbus RTU device on serial bus.
- Port: Specify the serial port number Modbus RTU service will apply to. The drop-down list shows all available ports of the current device. If a certain port is missed, it means this port may be occupied by other services.
- Baud Rate: Set the baud rate of the serial transmission. The default value is 9600.
- Data Bit: Set the data bit of the serial transmission. The default value is 8.
- Stop Bit: Set the stop bit of the serial transmission. The default value is 1.
- Parity: Specify the parity check rules of the serial transmission. The default option is Node, which means no parity check is applied.

3. Modbus Address Mapping

To let Modbus client capable of accessing to the tags on the device, users should map the tags to the corresponding Modbus addresses first. The procedures are as below:

- a. Add the tag to Modbus address list.
 - 1) Double-click "Double click to edit" cell.
 - 2) Tick the tag(s) to be added into Modbus address list. One or multiple tags can be selected at the same time.
 - 3) Select the data type and data converting method of the mapping, which will be applied to all the selected tags.
 - 4) Click "OK" button to finish adding tags to the address list.
 - 5) Repeat the above steps to add more tags.

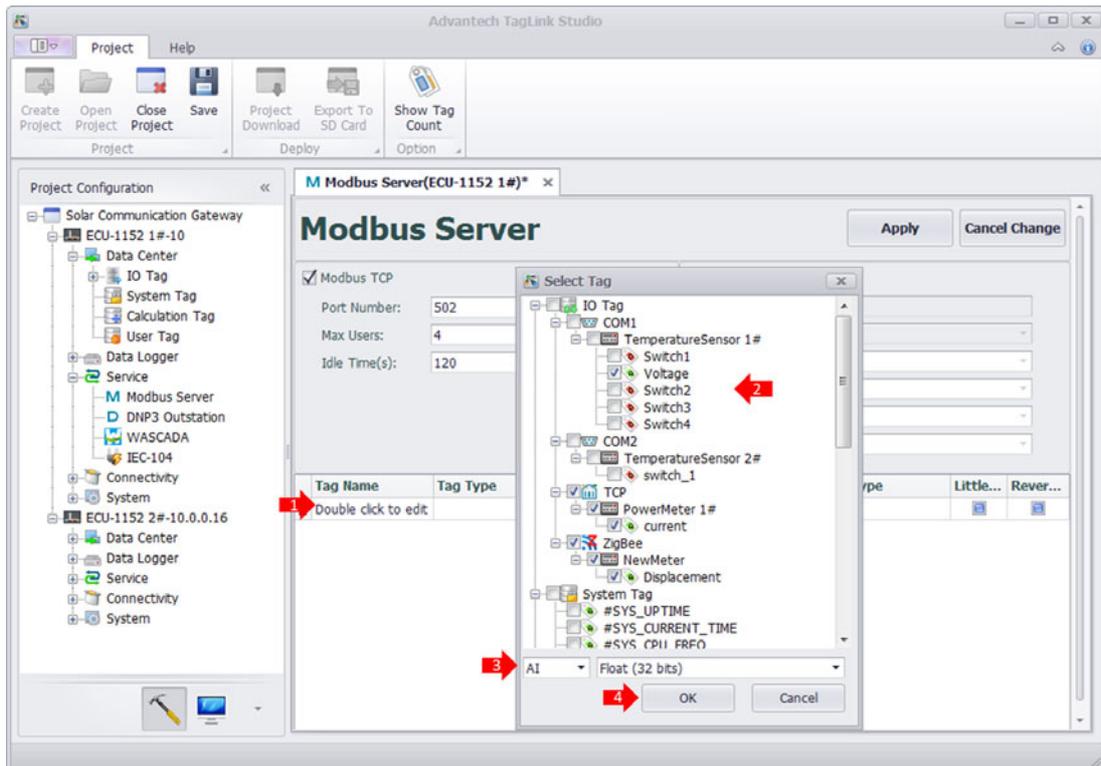


Figure 4.26 Adding Modbus Tag

- b. If users want to change the mapping setting, the available options are:
- **Tag Type:** There are four tag types: AI, AO, DI and DO, respectively corresponding to four tag types of Modbus protocol.
 - **Address:** Set the starting address of a tag in Modbus address space. The minimum address is 1. On the right is Modbus Address column, which is non-editable. The values within this column are made of tag type and tag address, ruled by Modicon.
 - **Data Type:** There are 2 broad types: Integer and Float. The former one is further classified to 6 categories by sign and bit number (16, 32, 64); while the later one is classified to 2 categories (Float and Double) by its precision (single or double).
 - **Little Endian:** The default option is big endian (Network Byte Order). If the client only can accept the data of little endian, please tick "Little Endian" box.
 - **Reverse Word:** If "Little Endian" is ticked, then this option will reverse the byte order. Normally, this option will reverse the word (two bytes) order. It should be noted that "Little Endian" option is before "Reverse Word" option, which means if both options are ticked, the byte order will be firstly reversed and then the word order will be reversed when the mapped tag value is read.

Tag Name	Tag Type	Address	Modbus Address	Data Type	Little Endian	Reverse Word
Voltage	AI	0001	30001	Float (32 bits)	<input type="checkbox"/>	<input type="checkbox"/>
current	AI	0003	30003	Float (32 bits)	<input type="checkbox"/>	<input type="checkbox"/>
Displacement	AI	0005	30005	Float (32 bits)	<input type="checkbox"/>	<input type="checkbox"/>
Switch1	DI	0001	10001		<input type="checkbox"/>	<input type="checkbox"/>
Switch2	DI	0002	10002		<input type="checkbox"/>	<input type="checkbox"/>
Switch3	DI	0003	10003		<input type="checkbox"/>	<input type="checkbox"/>
Switch4	DI	0004	10004		<input type="checkbox"/>	<input type="checkbox"/>
switch_1	DI	0005	10005		<input type="checkbox"/>	<input type="checkbox"/>

* Double click to edit

Figure 4.27 Changing Modbus Tag

4. Comparison Table of Modbus Data Type Conversion

To facilitate the understanding of the data type conversion, please refer to the below examples, in which the tag values are hexadecimal and every byte is separated by space.

	Original Value	Little Endian	Reverse Word	Little Endian + Reverse Word
Signed/Unsigned Integer (16 bits)	12 34	34 12	12 34	34 12
Signed/Unsigned Integer / Float (32 bits)	12 34 56 78	78 56 34 12	56 78 12 34	34 12 78 56
Signed/Unsigned Integer / Double (64 bits)	12 34 56 78 90 AB CD EF	EF CD AB 90 78 56 34 12	CD EF 90 AB 56 78 12 34	34 12 78 56 AB 90 EF CD

4.2.4.2 DNP3 Server

ECU-1152 can work as DNP3 Outstation (hereinafter referred to as DNP3 server) to exchange data with DNP3 Master of HMI/SCADA (hereinafter referred to as DNP3 client).

Users should double-click “DNP3 Outstation” under “Service” item in the left menu tree to pop up the configuration interface. The main configuration interface of DNP3 server is shown as below. Some terms appeared here should be explained:

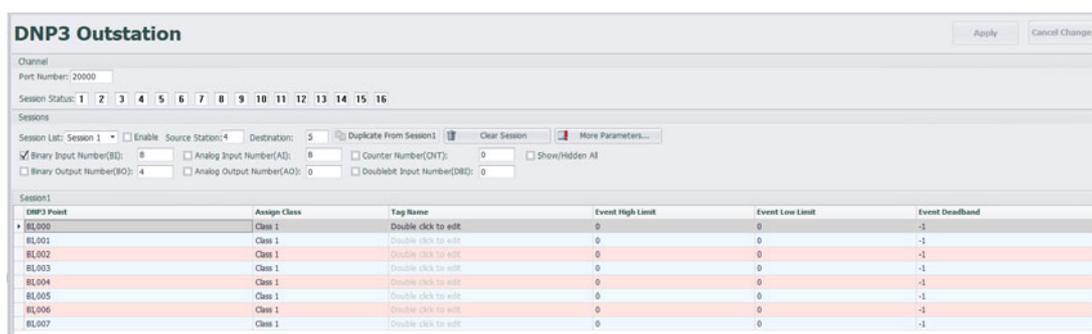


Figure 4.28 DNP3 Outstation Configuration

1. Channel

It represents the media of DNP3 server to communicate with the outside. Current version of DNP3 server only supports Ethernet communication which indicates TCP/IP network communication protocol by default.

- **Slave Station:** It is DNP3 server address. DNP3 protocol specifies that source address and target address of DLL should be set. If users are not quite familiar with this part, please keep the default settings.
- **Port Number:** It is the port number of TCP/IP communication on DNP3 server. The default number is 20000.
- **Session Status:** There are in all 16 sessions here. When any of them is enabled, it will turn green to show its status: read-only.

2. Session

Here the supported number of sessions means at most 16 DNP3 clients are supported to communicate with DNP3 server at the same time. Users should set an appropriate number of sessions based on real needs to avoid extra idle sessions, so as to less burden the CPU and improve the operating efficiency of ECU-1152.

- **Session List:** Before starting to edit a session, users should select a session from the drop-down list. The default setting is Session 1.

- Enable: Users need to tick "Enable" option to give the right to DNP3 client to access this session.
- Source Station: It is DNP3 server address.
- Destination: It is DNP3 client address. DNP3 protocol specifies that source address and target address of DLL should be set. If users are not quite familiar with this part, please keep the default settings.
- Duplicate From Session 1: When users want to configure multiple sessions which are basically similar, please click this button to clone session 1.
- Clear Session: When users make too many configuration errors, please click this button to clear the session and re-start editing. Note: This operation can't be undone, please operate with care.
- More Parameters: For advanced users who want to customize DNP3 service, please click this button to pop up "DNP3 Session Advanced Parameters Configuration" page which includes four part:
 - a. Default Variation

Click this tab to show the default data type of each DNP3 group. "Information" box provides the related description and remarks.

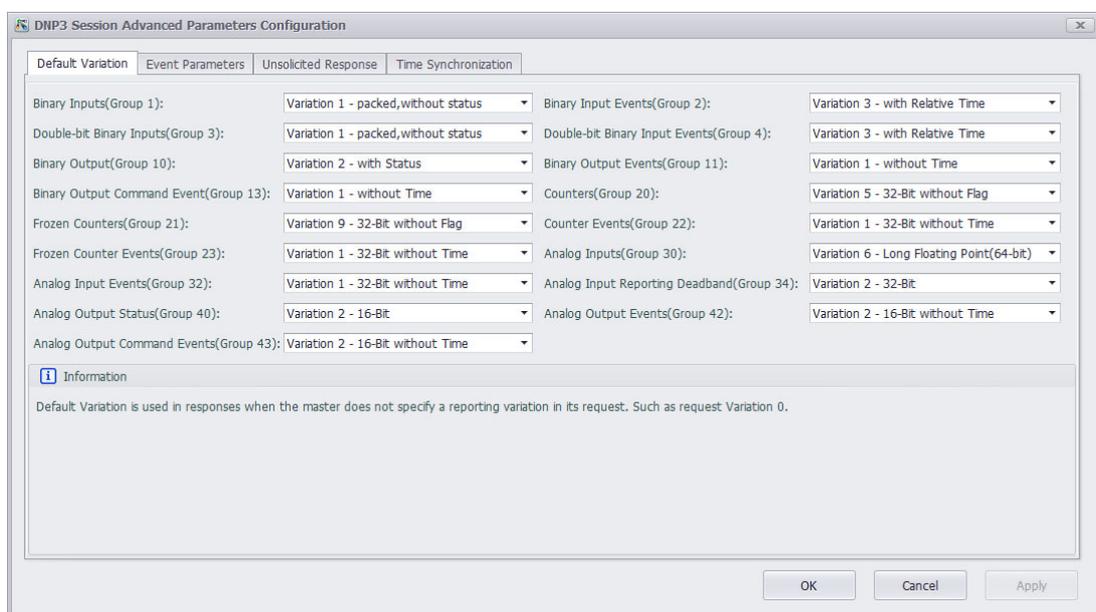


Figure 4.29 DNP3 Session Advanced Parameters Configuration - Default Variation

b.Event Parameters

Click this tab to configure the behavior pattern parameters of the events created by DNP3 point groups. "Information" box provides the related description and remarks.

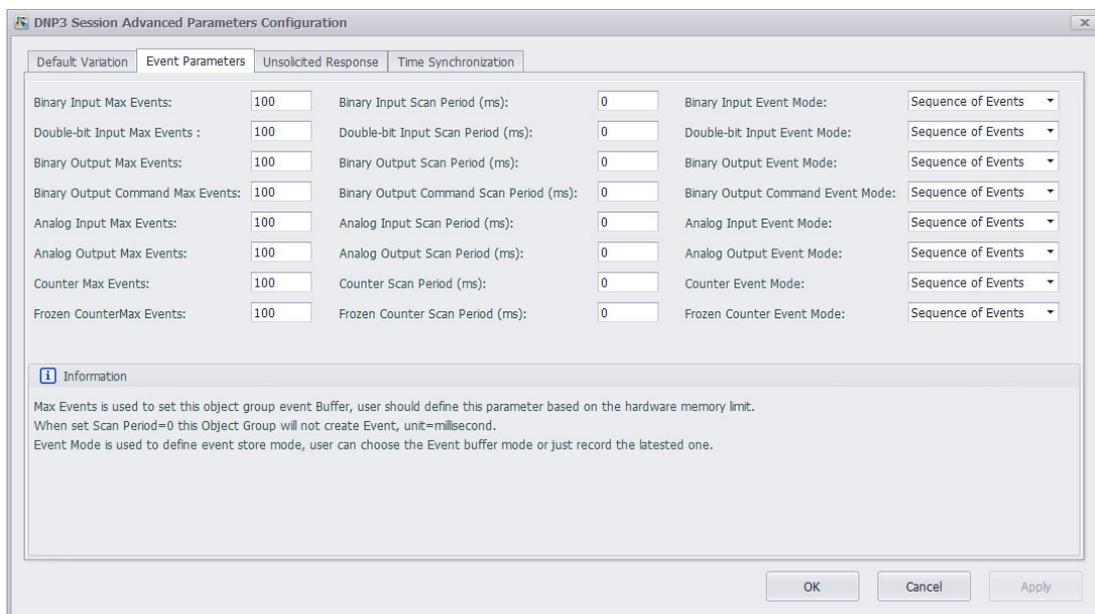


Figure 4.30 DNP3 Session Advanced Parameters Configuration – Event Parameters

c.Unsolicited Response

Click this tab to choose to enable the unsolicited response function of DNP3 server based on the premise that DNP3 client actively enables this function of DNP3 server. Users can select the class (Class 1, Class 2 and Class 3) to implement this function. "Information" box provides the related description and remarks.

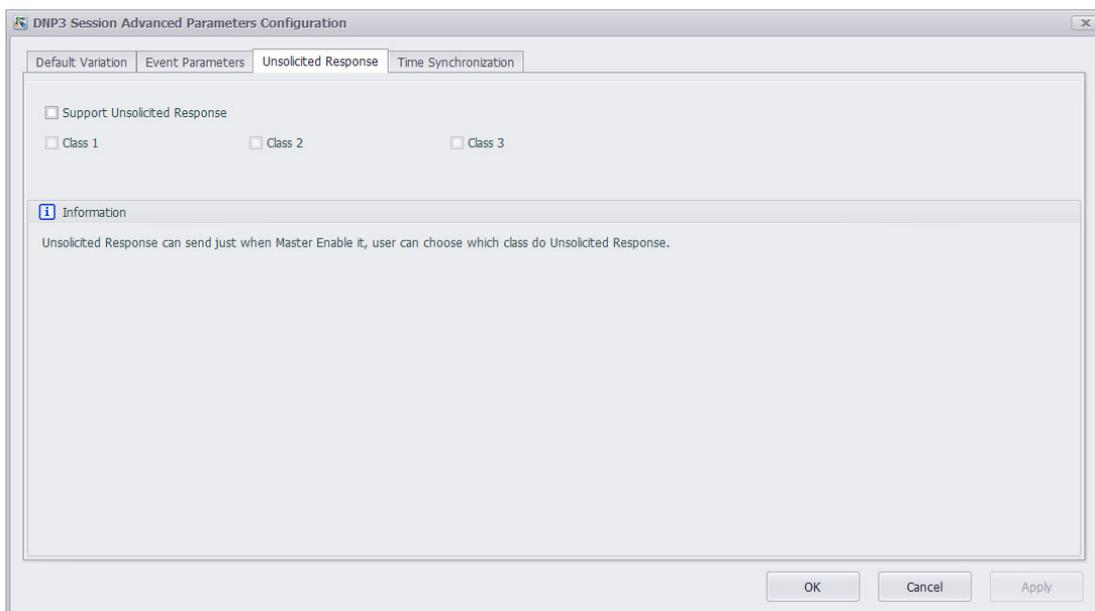


Figure 4.31 DNP3 Session Advanced Parameters Configuration – Unsolicited Response

d. Time Synchronization

DNP3 protocol supports time synchronization function by default. Click this tab to choose whether to enable this function on DNP3 client end. If the box is ticked, the default setting is 30 minutes, which means the synchronization will be carried out every 30 minutes. The length of synchronization time depends on the requirements of time precision in users' application. "Information" box provides the related description and remarks.

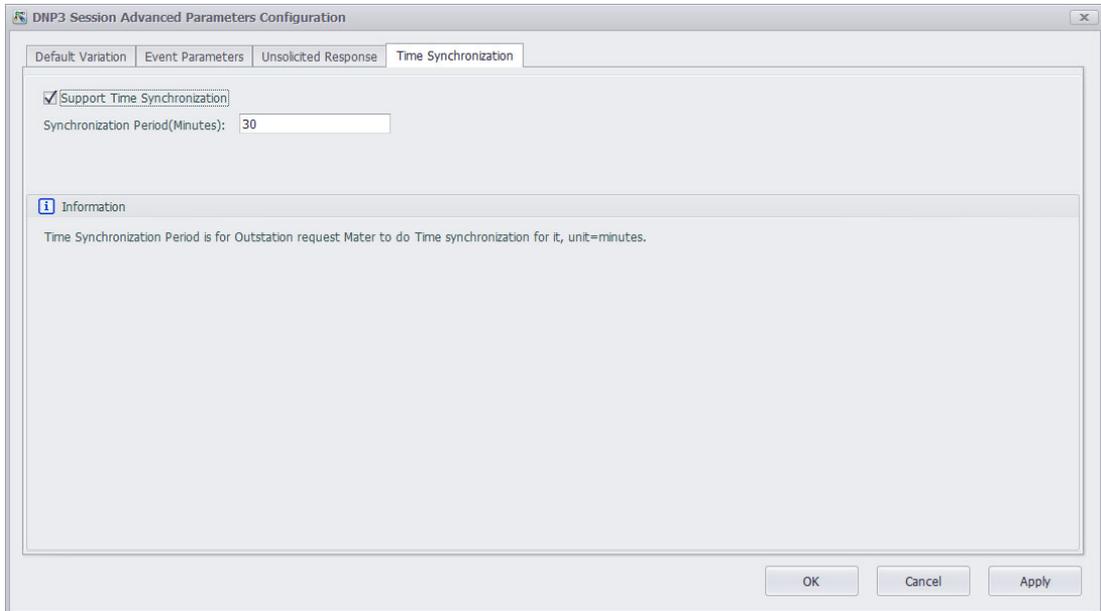


Figure 4.32 DNP3 Session Advanced Parameters Configuration – Time Synchronization

Users should also choose whether to show and use 6 categories of DNP3 points. The box before each category allows users to select to show or hide points in the editing interface below; while the box after allows users to set the number of DNP3 points. The studio provides 8 BIs, 8 AIs and 4 BOs by default, and all BI points are shown in the editing interface. "Show/Hide All" determines whether to show all points in each category in the editing interface, to avoid a long list which may in turn affect operation convenience of users. See the below screenshot:

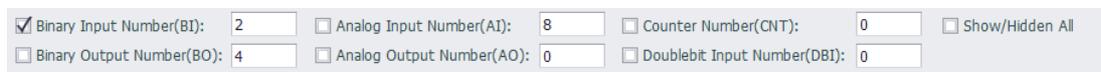


Figure 4.33 DNP3 Points Setting

DNP3 point in each session should be associated with a tag. Double-click on a cell in "Tag Name" column to add a tag. After the association, the changes of "Switch0" will be sent to [BI0] of DNP3 point. Columns of "Event High Limit", "Event Low Limit" and "Event Deadband" are only effective for Analog Input; while for other columns, please keep the default settings.

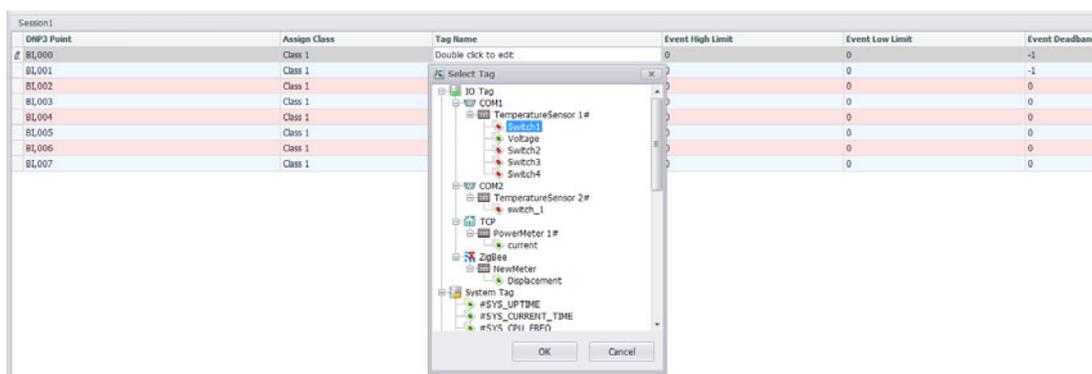


Figure 4.34 Adding DNP3 Point

4.2.4.3 WASCADA Service

WASCADA protocol is a private communication protocol of WebAccess which can directly access all tags on RTU through TCP connection with the help of WACADA service, with no address mapping needed (such as Modbus service). In addition, the tags supporting periodic data storage will be capable of resuming broken transmission through WASCADA service.

WASCADA service is enabled by default. Barring special circumstances, please do not disable it. WASCADA has three configuration options:

- Port: Set the port WASCADA listens on. The default setting is 504.
- Character Encoding: Select the character encoding of WebAccess from the drop-down list. Please set it base on the real character encoding used by WebAccess, otherwise parse error may occur when it comes to a non-Chinese tag name. If WebAccess is the simplified Chinese version, please keeps the default setting "Simplified Chinese (GBK)".
- Time Zone: Select the time zone for WebAccess server. Sometimes, the time zone of WebAccess server may be different from that of RTU devices. In order to keep the consistency of data time stamp, please set the correct time zone here.

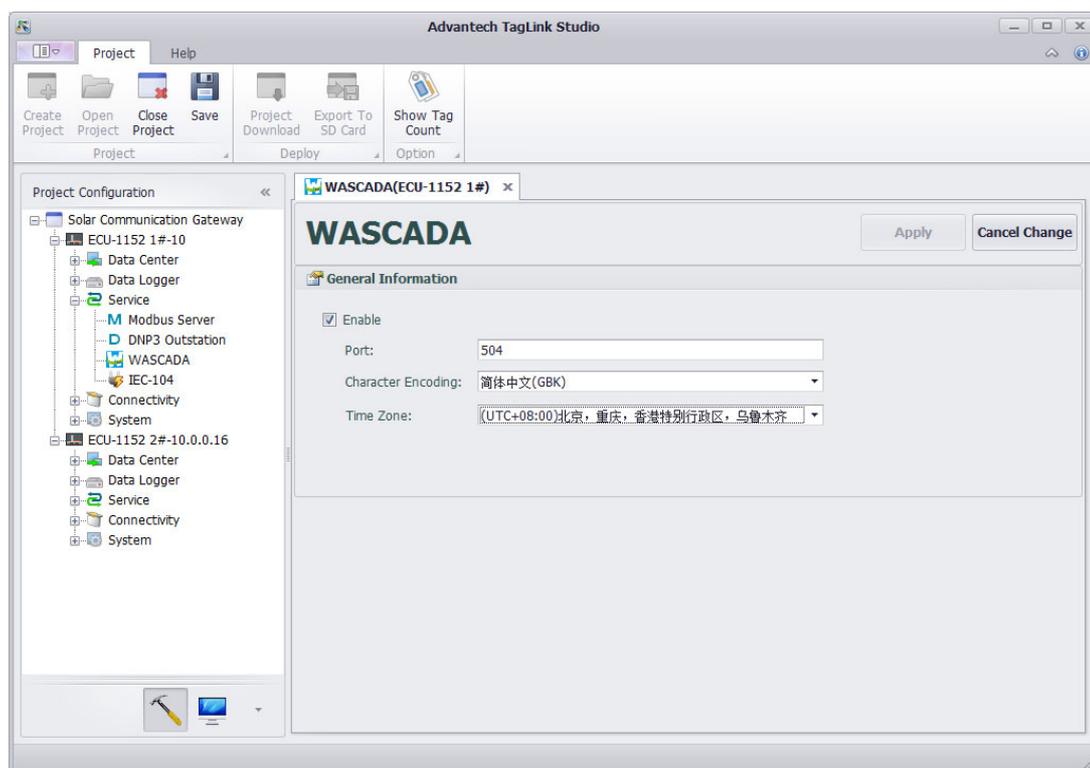


Figure 4.35 WASCADA Service

4.2.5 Active Connection

The main application scenario of active connection: ECU-1152 can directly access SCADA center, while the latter has no direct access to the former. ECU-1152 connected via cellular wireless connection or ECU-1152 behind the firewall is such kind of situation. In this case, the traditional TCP connection created by SCADA is not applicable any more. It should be the responsibility of ECU-1152 to actively connect with SCADA which will access data in future through this connection.

The fundamentals of active connection is illustrated in the below figure. In active connection, two connections will be established: one is the connection with a service of the device over TCP port or virtual serial port, which is called upward connection; the other is the connection with SCADA center, which is called downward connection. After the establishment, active connection will perform the data forwarding between two connections. Downward connection adopts the standard TCP connection, so it can support all protocols that listen on TCP port, including Modbus TCP, NDP3, etc.; while upward connection supports two protocols: one is WhereIAM protocol, used to connect with WebAccess; the other is DTU protocol of Four Faith, used to realize the connection with the server which supports four faith DTU.

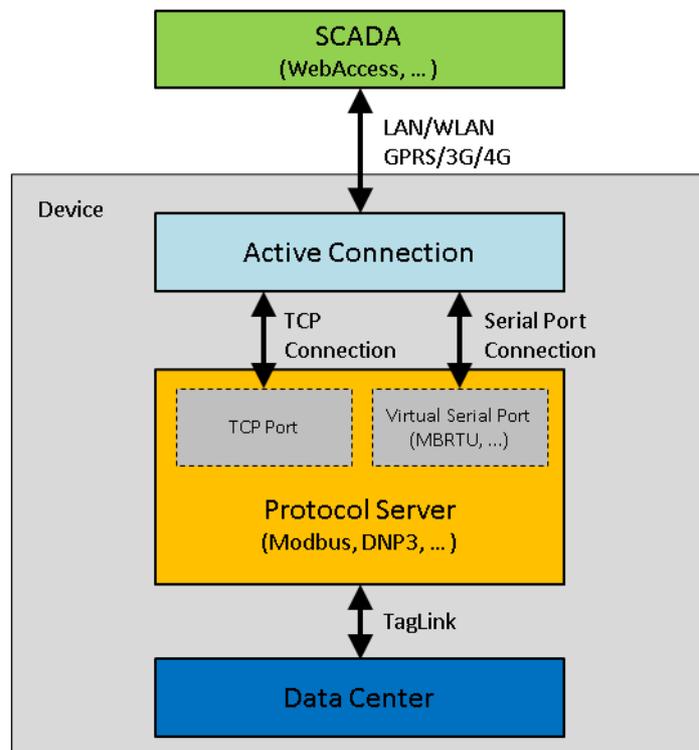


Figure 4.36 Active Connection Fundamental Function

In active connection page, the items that should be configured include upward connection protocol, downward connection service, center list of upward connection as well as some related parameters. Please follow the below steps to add an active connection:

1. Locate "Active Connection" in "Connectivity" in the left tree menu, and then double-click it to open the configuration page.
2. Click "Add" button to add an active connection.
3. Set the related parameters of active connection, including:
 - Protocol: Select the upward connection protocol from the drop-down list. "WebAccess WhereIAM" is used to connect with WebAccess server, while "DTU - Four Faith PROT" is used to connect with four faith DTU server. Dif-

ferent protocol requires users to set different parameters in the lower right corner of the page. For WhereIAm protocol, users only need to set one parameter: "Device Identifier" which should be consistent with the device name in WebAccess project so as to make sure WebAccess can correctly identify every connected device.

- Local Service: Select the downward connection service from the drop-down list. "Modbus RTU" means to connect with Modbus RTU through the virtual serial port, while other options realize the connection through TCP connection.
 - Slave Address: This item is only available when "Local Service" is set to "Modbus RTU". It specifies the slave address of Modbus RTU.
 - Bind Interface: Specify the communication port of active connection. "None" means no port is blinded. This parameter is typically used when a device has multiple network connections, the data channel of active connection should be explicitly specified to avoid the uncertainties of the system default route. For example, if "Cellular" option is selected, only cellular wireless network can be applied to data transmission.
 - Period (s): Set the time interval for active connection to establish a second upward connection.
 - Duration (s): Set the time duration before the upward connection is disconnected. "0" means the connection will never be actively disconnected after it is established.
 - Retry Count: Set the retry times after an upward connection is failed. If the count is exceeded, active connection will never try to reconnect again until the next period comes.
 - Idle Time (s): After an upward connection is established, if there is no data transmission within the specified idle time, active connection will disconnect and try to reconnect. "0" means no idle time is set.
4. Click "+" button to add center IP and center port of the upward connection.
 5. Enter a center IP, which can be either an IP address or a domain name address.
 6. Enter a center port. If WebAccess is used, this item is usually set to 504 by default.
 7. Click "OK" button to add the center information to "Center List". Repeat steps 4~7 to add more centers. Each active connection can support at most 5 centers.
 8. Click "OK" button to add this new connection to active connection list.

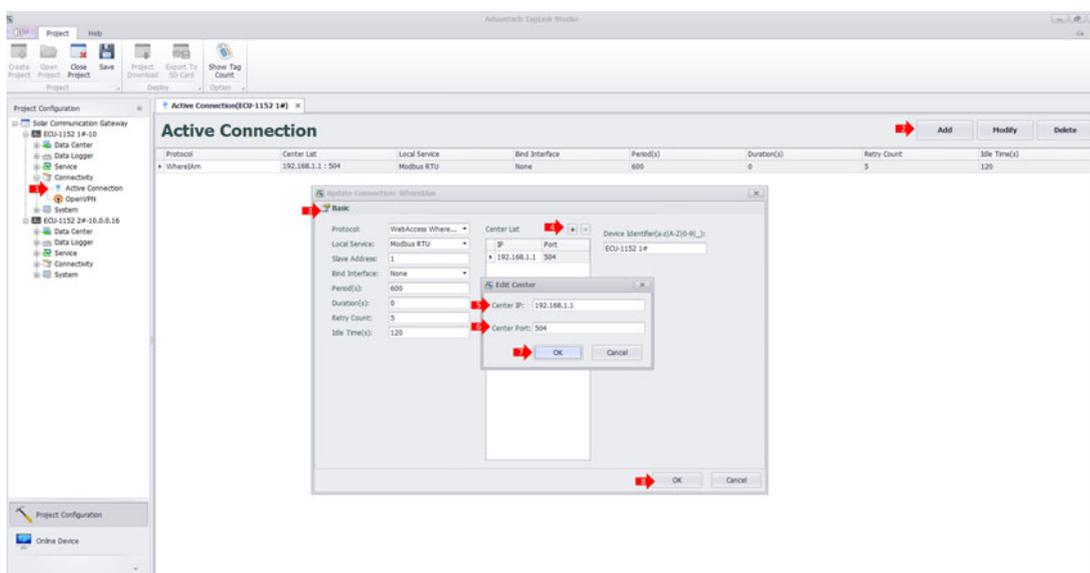


Figure 4.37 Active Connection Configuration

4.2.6 System Setting

System settings for Advantech TagLink Studio mainly include three parts: Network Setting, Time Sync Setting and GPS Setting.

4.2.6.1 Network Setting

ECU-1152 offers two ways to implement the communication between ECU-1152 and other devices: wired network and wireless network. Users should configure these two communication ways in TagLink Studio.

■ Wired Network Setting

ECU-1152 provides two Ethernet ports: LAN1 and LAN2. LAN1 and LAN2. In an Ethernet network, both IPv4 and IPv6 are supported, both of which allow users to enable DHCP mode or fill in a fixed IP address.

1. Select a port: LAN1 or LAN2
2. Check "DHCP" box to enable DHCP mode; Uncheck it to fill in fixed IP information. Then click "Apply" button to complete the settings.

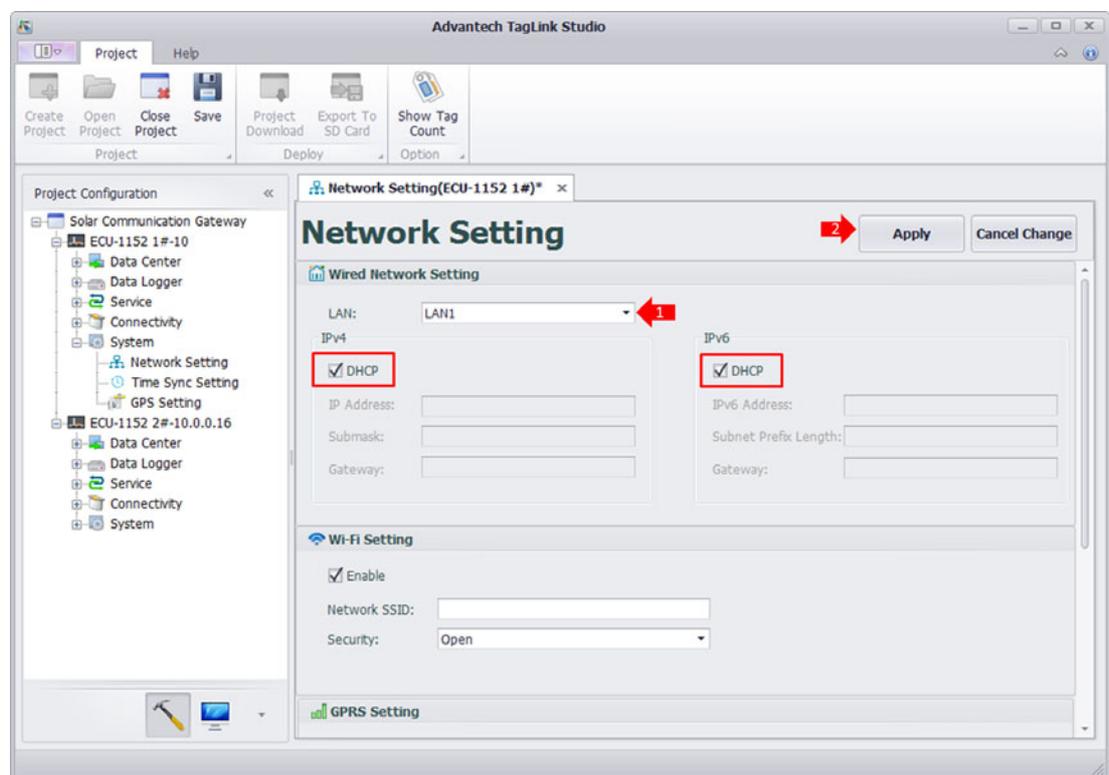


Figure 4.38 Wired Network Setting

- **Wi-Fi Setting**
Here, users need to input the network SSID name to access a Wi-Fi network. The network security has three options:
 1. Open: The local area network is open, requiring no password;
 2. WEP: A security protocol for encrypted wireless local area network, requiring a password;
 3. WPA/WPAS PSK: A security protocol for advanced encrypted wireless local area network, requiring a password;

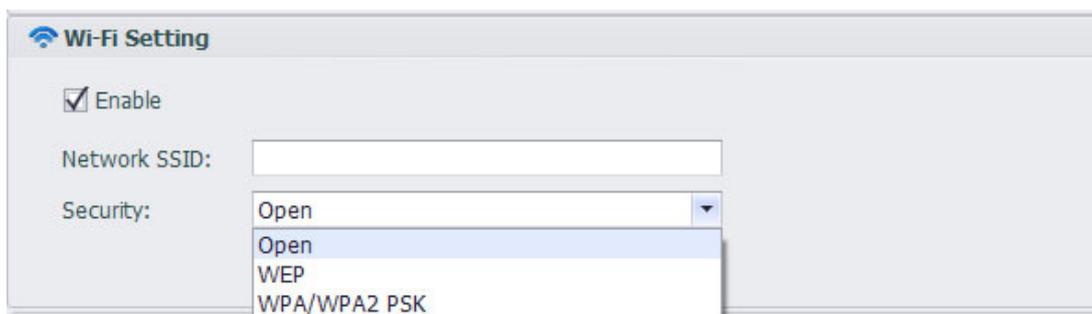


Figure 4.39 Wi-Fi Setting

- **GPRS Setting**
Check "Connect" box to enable GPRS function of ECU-1152. GPRS function allows ECU-1152 to access 2G, 3G or 4G mobile network through SIM card and to be used in wireless private network.
 1. When "Connect" box is checked, users can select the type of wireless data terminal. During the project compiling, different scripts will be generated due to different types of the terminal device.
 2. "Operator" provides all operators supported by the wireless terminal. After the operator is selected, users should also input APN, user name, password and phone number. However, users also can set it to "Auto", which requires no APN, user name, password and phone number. During the compiling process, a set of scripts will be generated for each operator by default, helping ECU-1152 to connect to the appropriate network based on the type of SIM card.
 3. ECU-1152 provides two kinds of connection check types: "Ping IP/URL" and "Monitor data traffic".
If "Ping IP/URL" is selected, users should input at least one URL which ECU-1152 will ping periodically. If ECU-1152 needs to be restarted after the connection is confirmed lost, check "Reboot system after" to restart RTU after a period of time.
If "Monitor data traffic" is selected, ECU-1152 will affirm the connection is lost when no data is transmitted within the max. silence time.
 4. If ECU-1152 needs to be restarted after the connection is confirmed lost, check "Reboot system after" to restart ECU-1152 after a period of time.

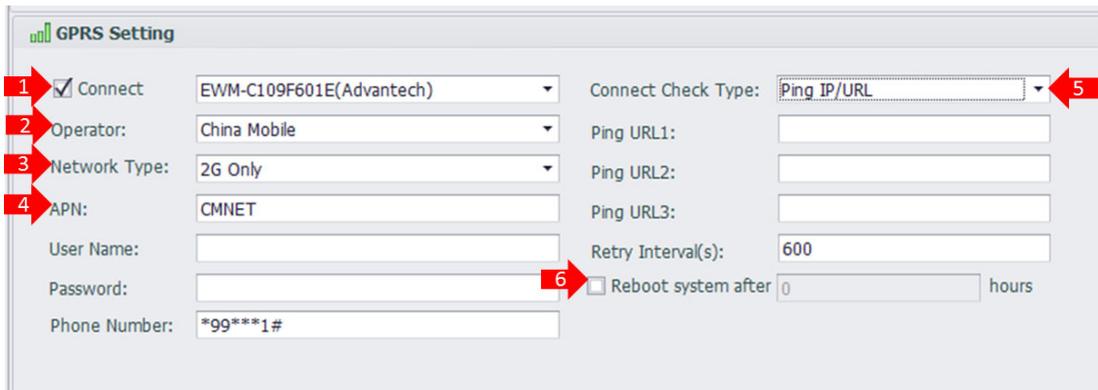


Figure 4.40 GPRS Setting

4.2.6.2 Time Sync Setting

Users can perform the time synchronization settings, making ECU-1152 time consistent with another time source. Meanwhile, users can also set RTU as a time synchronization source. The specific procedures are as follows?

1. Double-click or right-click on "Time Sync Setting" of "System" in the left tree menu to open the configuration page.
2. Check "Synchronize with NTP Server" to make RTU synchronized with another time source which could be a domain name or an IP address.
3. Check "Enabled as a NTP Server" to make RTU as a time synchronization source allowing other devices to synchronize with it.

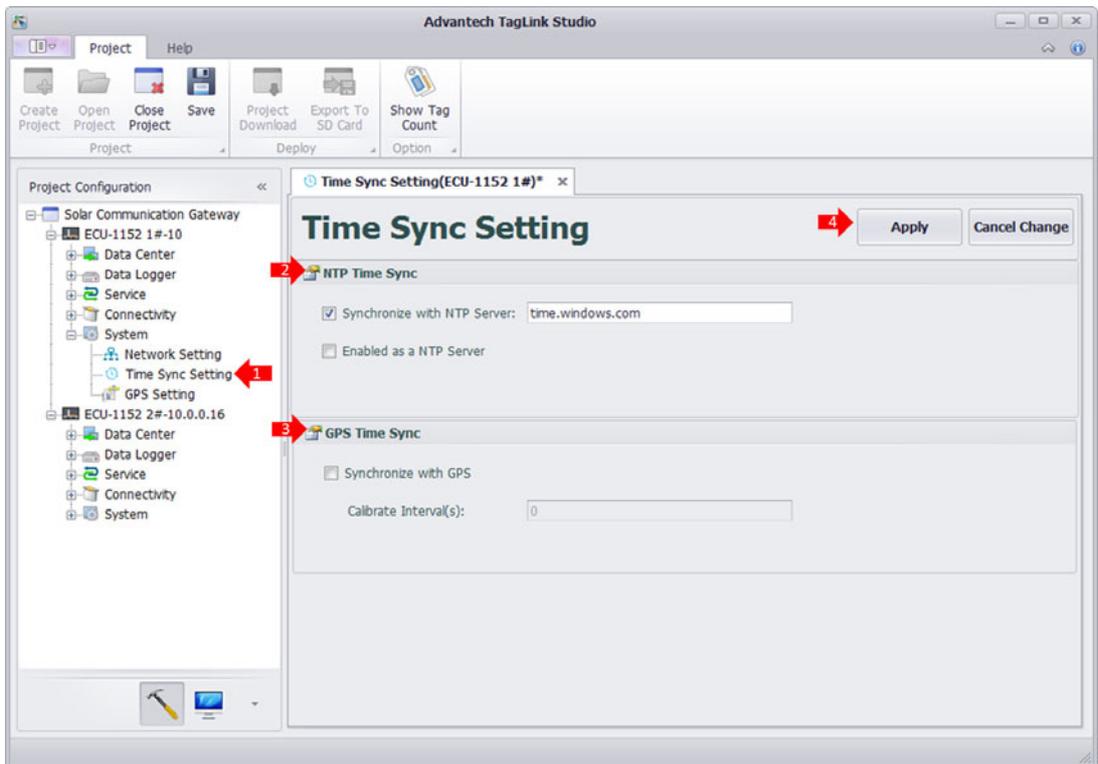


Figure 4.41 Time Sync Setting

4.3 Advantech Tag Link Online Functions

Advantech Taglink supports online device operations, such as adding, searching and clearing device online; setting password online. This password is used for project download and online login; monitoring device status, including read/write action of tag value, IO status and system information; changing IP address of ECU-1152.

4.3.1 Online Configurations

Advantech Taglink supports online configuration of ECU-1152, such as adding device, searching device, clearing device and password setting.

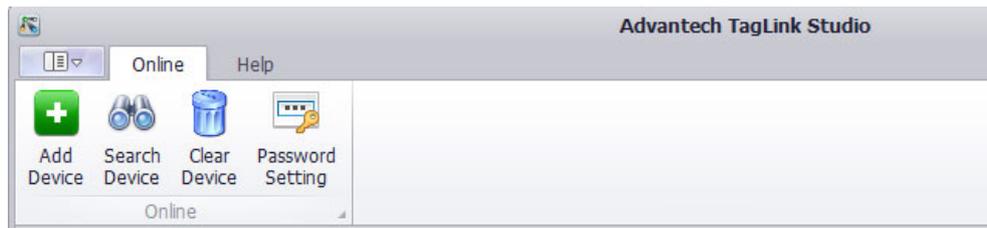


Figure 4.42 Online Configurations

Users can change IP address and subnet mask of the online device through Taglink Studio. For example, when two LANs of ECU-1152 have been set to DHCP mode (which will assign IP dynamically) and there is no server in the network can provide DHCP server, ECU-1152 can be searched but cannot be accessed via IP address. In this case, users can set a temporary IP address of ECU-1152 to perform the necessary operations, such as project download.

Note! *The setting will not be ineffective until the restart. After the restart, RTU will set the status of LAN based on the configuration file.*



1. Right-click on the online device that has been searched and select "IP Setting" to show the pop up box.
2. In "IP Setting" box, users should firstly select a LAN, and then input the new IP address and subnet mask.

4.3.2 Online Monitor

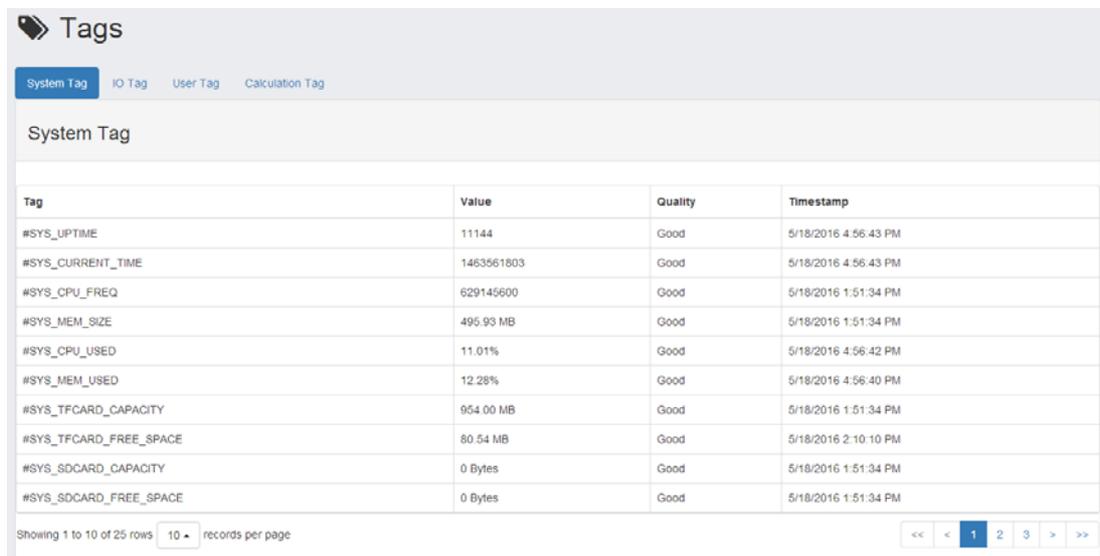
Online monitoring mainly supports the following functions: monitoring all tags on the device, including tag value, online status and time stamp; monitoring IO status, including the setting and read status; monitoring system status, including GPRS status and image information. Besides, online image update is also supported.

4.3.2.1 Tags

ECU-1152 online operations support the get and set functions of the tag. Different tags may have different tabs: System Tag; IO Tag; User Tag and Calculation Tag.

1. System Tag

Here, users can read system tags. The number of rows to be displayed in tag list is 10 by default. Users can also set it to 20 or 50. The tag list applies paged display. Users can click the number buttons or arrows in the lower right corner of the page to view other tags.



Tag	Value	Quality	Timestamp
#SYS_UPTIME	11144	Good	5/18/2016 4:56:43 PM
#SYS_CURRENT_TIME	1463561803	Good	5/18/2016 4:56:43 PM
#SYS_CPU_FREQ	629145600	Good	5/18/2016 1:51:34 PM
#SYS_MEM_SIZE	495.93 MB	Good	5/18/2016 1:51:34 PM
#SYS_CPU_USED	11.01%	Good	5/18/2016 4:56:42 PM
#SYS_MEM_USED	12.28%	Good	5/18/2016 4:56:40 PM
#SYS_TFCARD_CAPACITY	954.00 MB	Good	5/18/2016 1:51:34 PM
#SYS_TFCARD_FREE_SPACE	80.54 MB	Good	5/18/2016 2:10:10 PM
#SYS_SDCARD_CAPACITY	0 Bytes	Good	5/18/2016 1:51:34 PM
#SYS_SDCARD_FREE_SPACE	0 Bytes	Good	5/18/2016 1:51:34 PM

Figure 4.43 Online Monitor – System Tag

2. IO Tag

In this tab, users can read and set IO tags:

- Select a tag row to be modified from the tag table. Then the tag name will appear in "Tag Name" box above the table.
- Fill in a tag value in "Tag Value" box.
- Click "Submit" button.

Note! Only when users have logged in the studio, all the setting will take effect. Please click "Login" button first.



Tags

System Tag **IO Tag** User Tag Calculation Tag

IO Tag

Tag Name Tag Value

Tag	Value	Quality	Timestamp
current	0.00	Device Error	Thu Jan 01 1970 08:00:00 GMT+0800 (中国标准时间)
Displacement	0.00	Comm Error	Thu Jan 01 1970 08:00:00 GMT+0800 (中国标准时间)
Switch1	0	Device Error	Thu Jan 01 1970 08:00:00 GMT+0800 (中国标准时间)
Voltage	0.00	Device Error	Thu Jan 01 1970 08:00:00 GMT+0800 (中国标准时间)
Switch2	0	Device Error	Thu Jan 01 1970 08:00:00 GMT+0800 (中国标准时间)
Switch3	0	Device Error	Thu Jan 01 1970 08:00:00 GMT+0800 (中国标准时间)
Switch4	0	Device Error	Thu Jan 01 1970 08:00:00 GMT+0800 (中国标准时间)
switch_1	0	Device Error	Thu Jan 01 1970 08:00:00 GMT+0800 (中国标准时间)

Showing 1 to 8 of 8 rows

Figure 4.44 Online Monitor – IO Tag

3. User Tag
In this tab, users can read and set user tags, the setting method is the same with IO tag.
4. Calculation Tag
In this tab, users can read and set calculation tags, the setting method is the same with IO tag.

4.3.2.2 System Information

ECU-1152 online functions also provide some related system information and online image update.

1. GPRS Information
GPRS information tab displays all GPRS related information, including: Mobile Network Operator, Mobile Network Type, Mobile Phone Number, Mobile Data Traffic, Signal Quality and Public IP, as the following picture shows.

System Information

GPRS Information System Log Image Information

GPRS Info

Mobile Network Operator	Mobile Network Type	Mobile Phone Number	Mobile data traffic	Signal quality	Public IP
No GPRS Service	No GPRS Service	0	0 Bytes	Not Connected(0)	0.0.0.0

Showing 1 to 1 of 1 rows

Figure 4.45 Online Monitor - GPRS Information

2. System Log

Here, it will show all the log information of the monitoring ECU-1152.

System Log

```

May 20 15:14:24 ecu1152 user.info AdvAgentMain: broadcast if.eth0,nodeid:10
May 20 15:14:24 ecu1152 user.info AdvAgentMain: broadcast if._nodeid:10
May 20 15:14:23 ecu1152 user.info AdvAgentMain: broadcast if.eth0,nodeid:10
May 20 15:14:23 ecu1152 user.info AdvAgentMain: broadcast if._nodeid:10
May 20 15:13:11 ecu1152 daemon.info udhcpd[2382]: No lease, failing
May 20 15:13:08 ecu1152 daemon.info udhcpd[2382]: Sending discover...
May 20 15:13:05 ecu1152 daemon.info udhcpd[2382]: Sending discover...
May 20 15:13:02 ecu1152 daemon.info udhcpd[2382]: Sending discover...
May 20 15:13:02 ecu1152 daemon.info udhcpd[2382]: udhcpd (v1.22.1) started
May 20 15:13:02 ecu1152 daemon.info udhcpd[2131]: No lease, failing
May 20 15:12:59 ecu1152 daemon.err ifplugd(eth0): exit code: 1
May 20 15:12:59 ecu1152 daemon.info udhcpd[2131]: Sending discover...
May 20 15:12:56 ecu1152 daemon.info udhcpd[2131]: Sending discover...
May 20 15:12:54 ecu1152 user.notice ActiveConnection: enter main loop
May 20 15:12:54 ecu1152 user.notice ActiveConnection: start all links
May 20 15:12:54 ecu1152 user.err ActiveConnection: load_actconn_cfg: load module /home/root/bin/acm_WhereIAm so
May 20 15:12:54 ecu1152 user.notice WebService: main: loading config file /home/root/project/WebService.acr
May 20 15:12:53 ecu1152 user.info AdvSystemTag: get_gprs_config_node_name:find serial =
May 20 15:12:53 ecu1152 user.info AdvSystemTag: Advantech AdvSystemTag Start!
May 20 15:12:53 ecu1152 user.notice ModbusDaemon: enter main loop
May 20 15:12:53 ecu1152 user.notice ModbusDaemon: mb_delegate_init
May 20 15:12:53 ecu1152 user.notice ModbusDaemon: on_event_disconnected [ModbusDaemon_2173] open IPC failed
May 20 15:12:53 ecu1152 user.notice ModbusDaemon: create servers...
May 20 15:12:53 ecu1152 user.notice ModbusDaemon: start polling...
May 20 15:12:53 ecu1152 user.notice ModbusDaemon: create data mapping list
May 20 15:12:53 ecu1152 user.notice ModbusDaemon: mbdp_init
    
```

Figure 4.46 Online Monitor – System Log

3. Image Information

Image Information tab displays both system and software version information of the current device, meanwhile allows users to update firmware and software online.

a. Information Display

System version information of the current device is shown as below:

System Version Info			
Item	RTU Version Info	Current Version Info	Description
MLO		-	
am335x-ecu1152.dtb		-	
ramdisk.gz		-	
u-boot.img	U-Boot 2013.01.01R0002-svn6061	-	
ulmage	Linux-3.12.10-r15-t2013.12.01	-	
rootfs.tar.gz	ECU-1152-R11AAE image version 1.2.1 Release May 13 2016	-	

Showing 1 to 6 of 6 rows

Figure 4.47 Online Monitor – System Version Information

App & Lib version information of the current device is shown as below:

App & Lib Version Info			
Item	RTU Version Info	Current Version Info	Description
wtdtd	1.2.1 rev 6144	-	
AdvSystemSetting	1.2.1 rev 6072	-	
GPRSTrafficMonitor	1.2.1 rev 6072	-	
AdvUserTag	1.2.1 rev 6072	-	
AdvAgentMain	1.2.1 rev 6072	-	
AutoDialup4G	1.2.1 rev 6072	-	
AdvBumInTest	1.2.1 rev 6072	-	
WAScadaServer	1.2.1 rev 6072	-	
DataCollector	1.2.1 rev 6072	-	
DataLogger	1.2.1 rev 6072	-	

Showing 1 to 10 of 64 rows

Figure 4.48 Online Monitor – App & Lib Version Information

b. Image Update

Note! This operation is only available when users have logged in Taglink Studio.



- Click “Load File” button to select the bin package to be updated.
- Click “Upload” button to upload the file.
- The upload process will take about 2 minutes.
- After the file has been successfully uploaded, click “Update” button to start image updating.
- After the updating, ECU-1152 will restart. Then, “ECU-1152 boot successful” message will pop up to indicate a successful reboot.

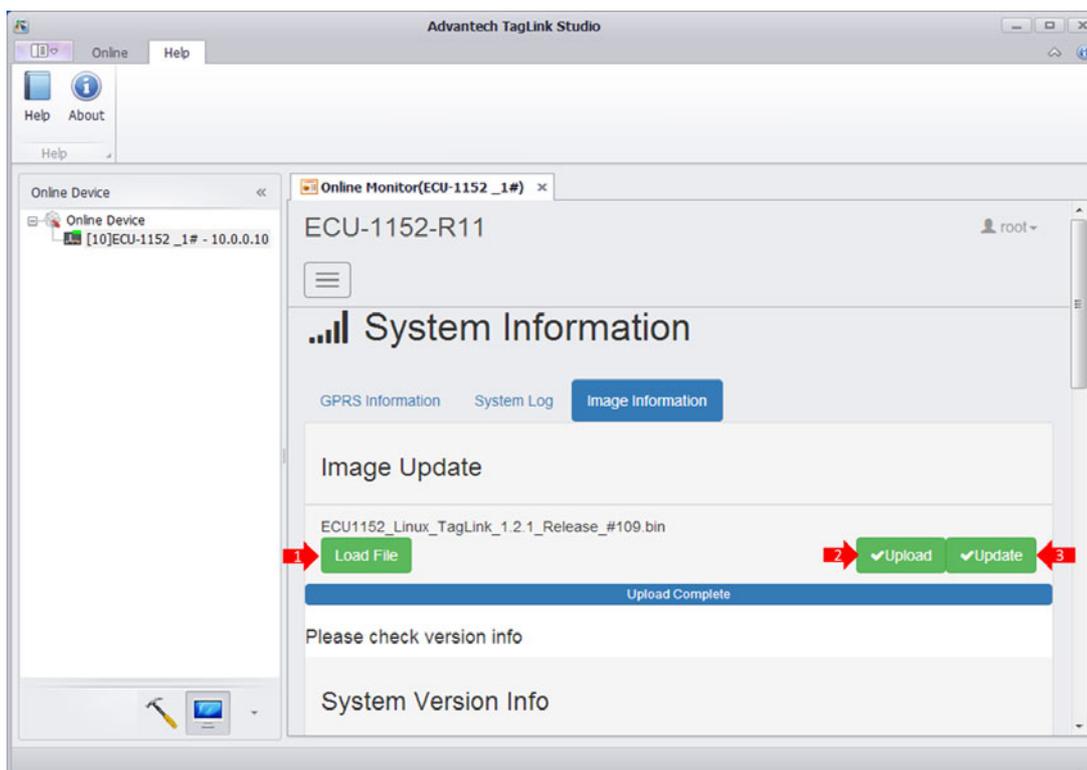


Figure 4.49 Online Monitor – Image Updating

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