User Manual

ADAM-3600-A1F

Intelligent Remote I/O Module

ADVANTECH

Enabling an Intelligent Planet

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Product Warranty

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.

Because of Advantech's high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

If you think you have a defective product, follow these steps:

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages you get when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain an RMA (return merchandize authorization) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

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Declaration of Conformity

CE

This product has passed the CE test for environmental specifications. We recommend the use of shielded cables.

FCC Class A

Note: 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 harmful interference in which case the user will be required to correct the 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 -20° C (-4° F) OR ABOVE 60° C (140° 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. 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.

Contents

Chapter 1

Product Overview

1.1 Introduction

ADAM-3600-A1F is an intelligent remote I/O module which provides 16 digital inputs, 8 relay outputs and 4 I/O expansion slots to approach different scenarios. Except various I/O type offering, ADAM-3600-A1F provides data processing, and data logger functions to transmit truly useful data to the user. These data can be access via mobile devices in anytime and anywhere.

1.2 Feature Highlights

1.2.1 RESTful Web Service

Integrated with HTML5, JavaScript, and RESTful web service which satisfy the needs of IT technology, and also open a new market for ADAM-3600-A1F. This remote I/O module will not only sell to automation SI, but also the SI who has high level programming skill and network integration abilities.

1.2.2 Data Storage Function

File-based cloud storage and data log function makes the data can be access at any time and in anywhere. User will never need to care about how to collect the data into any data logger or data gateway.

1.2.3 Access by Mobile Devices

Direct mobile devices access functions make the information easier to been access. With 3-levels security, these data can storage, access, and publish in more safety way.

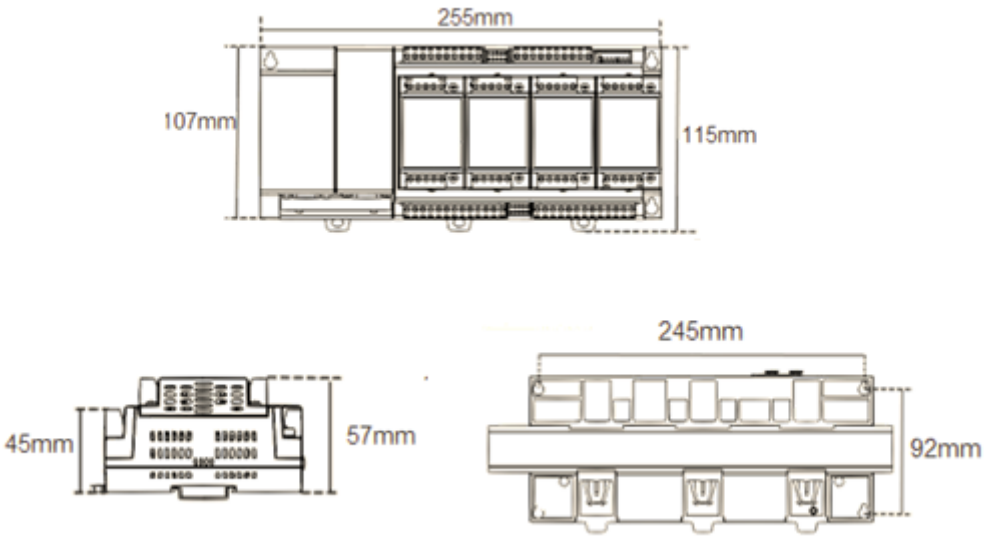
1.3 Flexible I/O deployment

The ADAM-3600 can approach different scenarios by switching I/O expansion modules. Users can easily change and expand ADAM-3600's I/O deployment by applying on board I/O and switching the I/O expansion modules.

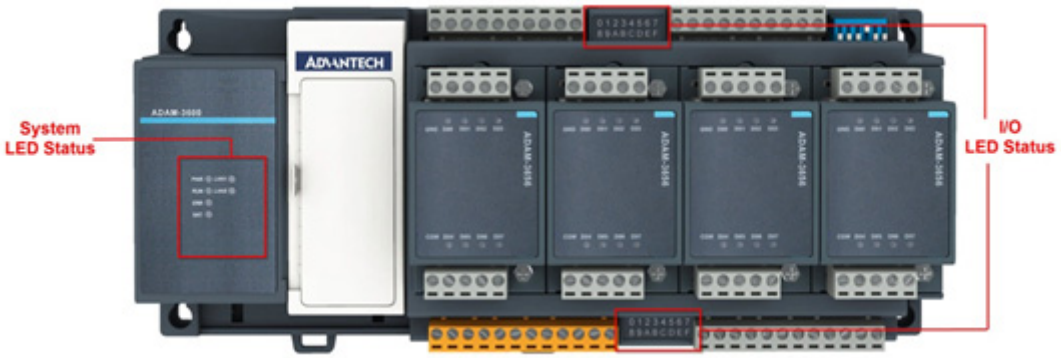
Expansion Module	Description
ADAM-3617	4-CH Analog Input Module (To be released in 2016)
ADAM-3618	4-CH Thermocouple Input Module (To be released in 2016)
ADAM-3622	2-CH Analog Output Module (To be released in 2016)
ADAM-3651	8-CH Digital Input Module
ADAM-3656	8-CH Digital Output Module
ADAM-3664	4-CH Relay Output Module

1.4 Mechanical Design and Dimensions

1.4.1 ADAM-3600-A1F



1.5 LED Definition



LED	Color	Indication	Description
Run	Green	0.5 second ON 0.5 second OFF	Module is working normally
		30 sec ON	When user enable LOCATE function
Error	Red	ON	Extension I/O fatal error
Power	Green	ON	Power On
Low Battery	Red	ON	Low voltage of RTC battery
Link/Speed 1	Green (Link 1)	ON	Ethernet is connected
		Blink	When TX/RX is in transmission
	Yellow (Speed 1)	ON/OFF	ON: Ethernet speed is at 100 Mbps OFF: Ethernet speed is at 10 Mbps
Link/Speed 2	Green (Link 2)	ON	Ethernet is connected
		Blink	When TX/RX is in transmission
	Yellow (Speed 2)	ON/OFF	ON: Ethernet speed is at 100 Mbps OFF: Ethernet speed is at 10 Mbps
Digital Input	Green	ON/OFF	ON: Logic 1 OFF: Logic 0
Relay Output	Green	ON/OFF	ON: Logic 1 OFF: Logic 0

1.6 Certification and Safety Standards

- FCC
  - FCC 47 CFR PART 15 (Class A)
  - IC ICES-003
- CE
  - EN 55011 / 55022 (Class A)
  - EN 61000-6-4
  - EN 61000-3-2
  - EN 61000-3-3
  - EN 55024
  - EN 61000-6-2
  - IEC 61000-4-2
  - IEC 61000-4-3
  - IEC 61000-4-4
  - IEC 61000-4-5
  - IEC 61000-4-6
  - IEC 61000-4-8
  - IEC 61000-4-11
  - RoHS
- China RoHS
- WEEE

Chapter 2

Product Specifications

2.1 General Specification

LAN Interface

- Ethernet: IEEE 802.3u 10/100Base-T(X)
- Connector: 2-port RJ-45

General

- Watchdog Timer
  - System: 1.6 second
  - Communication (Programmable)
- Mounting: DIN 35 rail, wall mount
- External Storage Interface
  - 1 x USB2.0 Port (Maximum supported storage capacity: 32GB)
  - 1 x Standard SD Card Slot (Maximum supported storage capacity: 32GB)
- Operation Temperature: -40~70°C (-40~158°F)
- Storage Temperature: -40~85°C (-40~185°F)
- Operating Humidity: 20~ 95% RH (non-condensing)
- Storage Humidity: 0~95% RH (non-condensing)

Note! *Equipment will operate below 30% humidity. However, static electricity problems occur much more frequently at lower humidity levels. Make sure you take adequate precautions when you touch the equipment. Consider using ground straps, anti-static floor coverings, etc. if you use the equipment in low humidity environments.*

Power

- Power Input Voltage: 10~30 V_{DC} (24 V_{DC} Standard)

Software

- Configuration Interface: Web Interface, Windows Utility
- Driver: ADAM/APAX.NET Class Library
- Industrial Protocol: Modbus/TCP
- Supported Protocols: TCP/IP, UDP, HTTP, DHCP, ARP, SNTP
- Supports RESTful Web API in JSON format
- Supports Web Server in HTML5 with JavaScript & CSS3

Reset Button

Users can push the Reset button on the left panel of the ADAM-3600-A1F to reboot the system directly.

2.2 Digital Input

2.2.1 Digital Input Specifications

Channel	16
Wet Contact (Uni-direction)	Logic 0: 0 ~ 5 V_{DC} Logic 1: 10 ~ 30 V_{DC}
Isolation Protection	2500 V_{DC}
Max. Input Frequency	3 kHz
Max. Counter Frequency	3 kHz

2.2.2 Digital Input Wiring

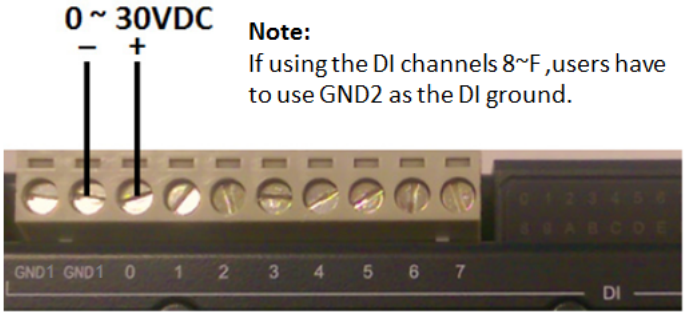


Figure 2.1 ADAM-3600-A1F Digital Input Wiring

2.3 Relay Output

2.3.1 Relay Output Specifications

Channel	8 (Form A)
Contact Rating (resistive load)	250 V_{AC} @ 5A 30 V_{DC} @ 5 A
Max. Switching Rate	20 operations/minute
Breakdown voltage	500V_{AC} (50/60Hz)
Relay operation time	On: 10ms Off: 5ms
Mechanical Endurance	20 Million operations
Insulation Resistance	1 GΩ @ 500 V_{DC}

2.3.2 Relay Output Wiring

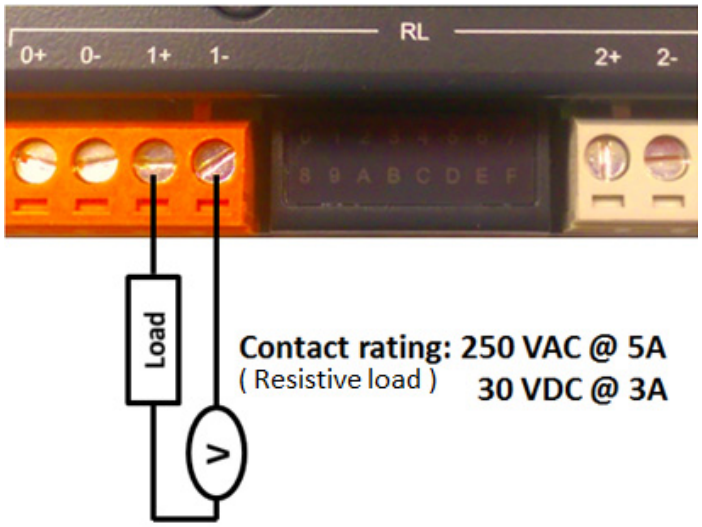
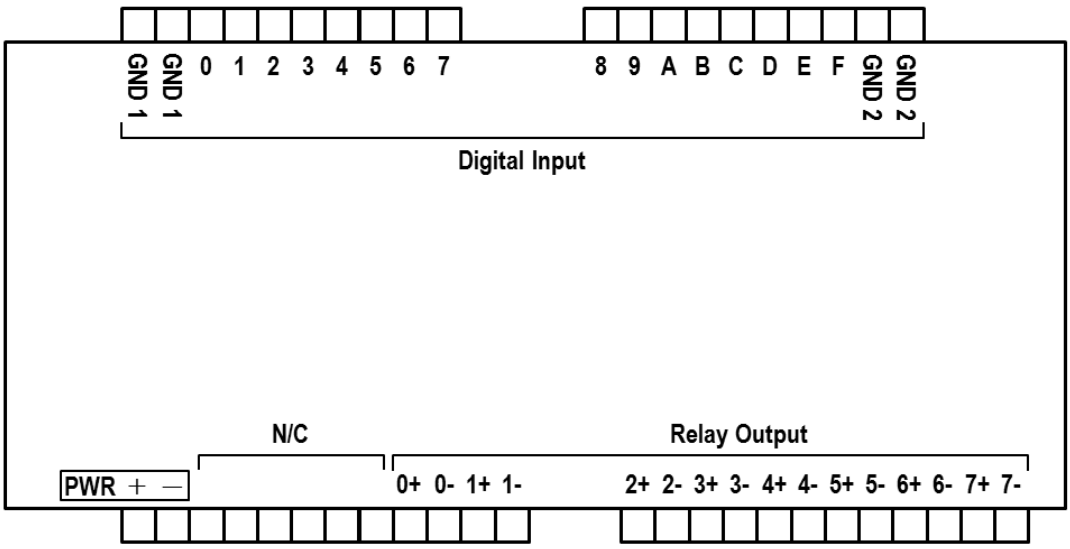


Figure 2.2 Relay Output Wiring

2.4 Pin Assignment

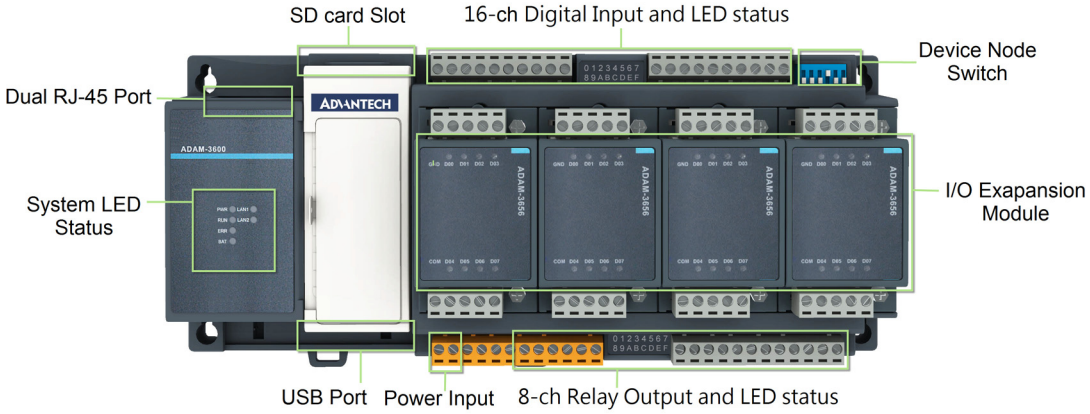


Channel Symbol	0	1	2	3	4	5	6	7	8	9	A	B	C	E	D	F
Channel Number	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Chapter 3

Hardware Installation

3.1 Interface Introduction



3.2 Mounting

ADAM-3600-A1F is designed as a compact unit and is able to be installed in the field site using the following methods.

3.2.1 DIN-Rail Mounting

The ADAM-3600-A1F can also be fixed to the cabinet by using mounting rails. You need to assemble the DIN rail adapter to the module with flathead screw driver as below. When the module is mounted on a rail, you may also consider using end brackets at each end of the rail to keep the module from sliding horizontally along the rail.

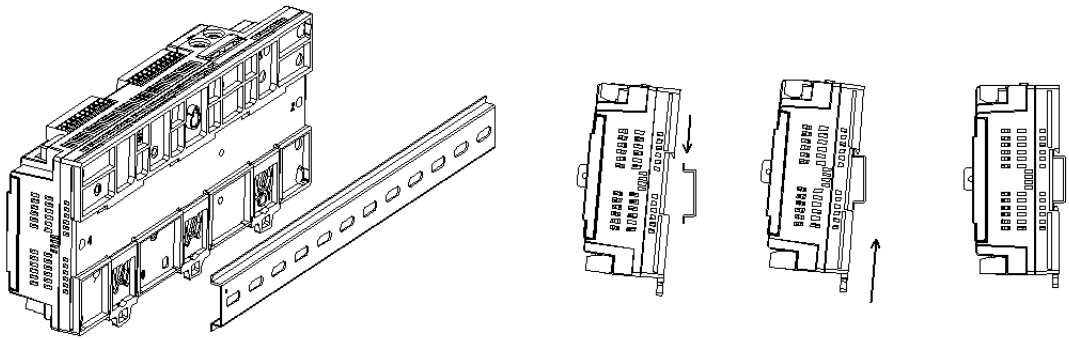


Figure 3.1 DIN-Rail Installation

3.2.2 Wall Mounted Installation

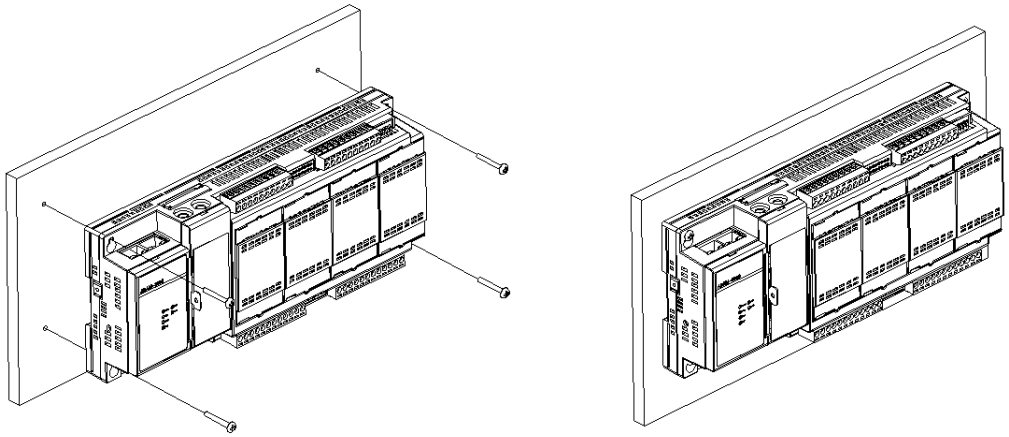


Figure 3.2 Wall-Mounted Installation

3.2.3 Expansion Module Installation

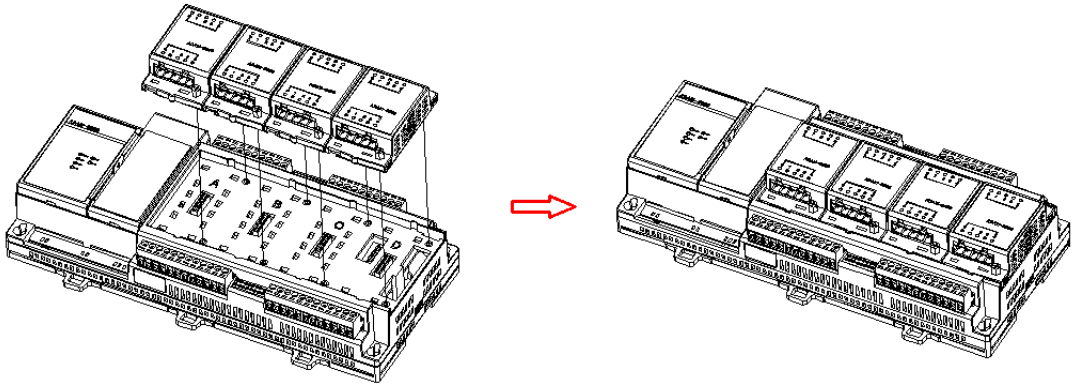


Figure 3.3 Expansion Module Installation

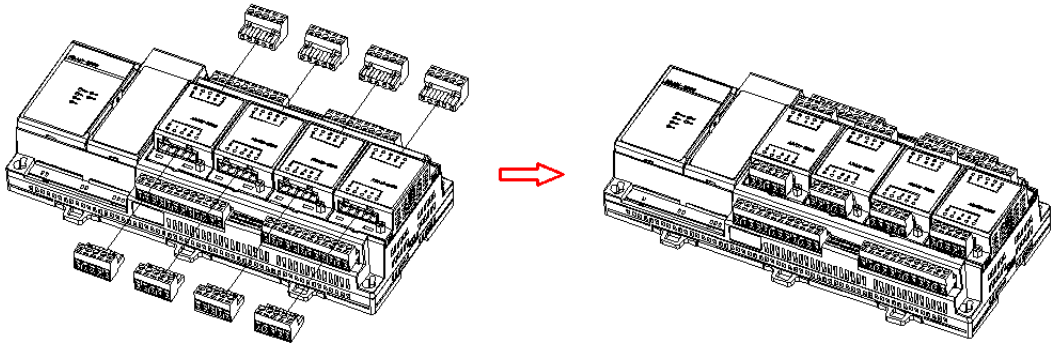


Figure 3.4 Expansion I/O Connector Installation

3.3 Wiring & Connections

This section introduces basic information on wiring the power supply, I/O units, and Ethernet connection.

3.3.1 Power Supply Wiring

The ADAM-3600-A1F is designed for a standard industrial unregulated 24 V_{DC} power supply. For further application, it can also accept +10 to +30 V_{DC} of power input, 200mV peak to peak of power ripple, and the immediate ripple voltage should be maintained between +10 and +30 V_{DC}.

Screw terminals PWR+ and PWR- are for power supply wiring

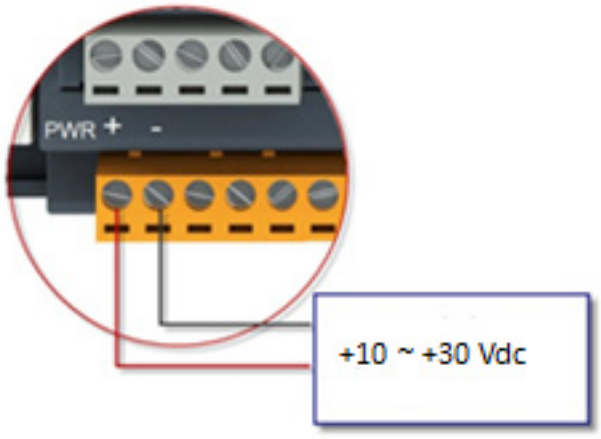


Figure 3.5 Power Supply Wiring

Note! *The wires used should be at least 2 mm.*

3.3.2 Ethernet Daisy Chain Wiring

The ADAM-3600-A1F module has built in Ethernet switches to allow daisy chain connections in an Ethernet network, making it easier to deploy, and helping improve scalability. The two Ethernet ports are fully compliant with IEEE 802.3u 10/100Mbpst through standard RJ-45 connectors.

Figure 3.6 Ethernet Daisy Chain Wiring

3.3.3 I/O Units

The system uses a plug-in screw terminal block for the interface between I/O modules and field devices. The following information must be considered when connecting electrical devices to I/O modules.

1. The terminal block accepts wires from 0.5 mm to 2.5 mm.
2. Always use a continuous length of wire. Do not combine wires.
3. Use the shortest possible wire length.
4. Use wire trays for routing where possible.
5. Avoid running wires near high-energy wiring.
6. Avoid running input wiring in close proximity to output wiring.
7. Avoid creating sharp bends in the wires.

Chapter 4

System Configuration

4.1 Connection

1. Plug DC power source in Power +, Power - pin of ADAM-3600-A1F module and turn the power on.
2. Connect your computer to Ethernet port of ADAM-3600-A1F module with RJ-45 cross-over Ethernet cable.

4.2 Configure the ADAM-3600-A1F with the Web Interface

4.2.1 System Requirements

The module is developed by public HTML 5 base, but for detailed indication and data transmission mode may be different on Web page of the operating system.

For mobile devices, the minimum requirement of web browsers as below:

- Safari 6 in Apple iOS
- Web Browser in Google Android 4.0 (Ice Cream Sandwich)
- Chrome in Google Android 4.0 (Ice Cream Sandwich)

Mobile Browse	Chrome	Android	Safari
Configuration	Y	Y	Y
File Upload	N	N	N
Data Log Chart	Y	Y	Y
Data Log Export	N	N	N

For PC platforms, the minimum requirement of web browsers as below:

- Internet Explorer (version 11)
- Google Chrome (version 30)
- Mozilla Firefox (version 25)

Mobile Browse	Chrome	Firefox	Safari	IE11	IE10	IE9
Configuration	Y	Y	Y	Y	Y	Y
File Upload	Y	Y	N	Y	N	N
Data Log Chart	Y	Y	Y	Y	Y	N
Data Log Export	Y	Y	N	N	N	N

4.2.2 List of ADAM-3600-A1F Default Ethernet Ports

Application	Protocol	Port	Note
WebServer	TCP	80	Configurable
Modbus Server	TCP	502	-
Search Engine	UDP	5048	-
SNTP Client	UDP	-	Randomly

4.2.3 Factory Default Settings

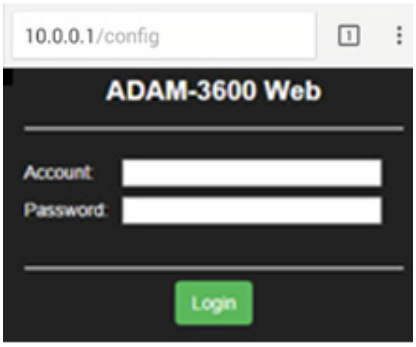
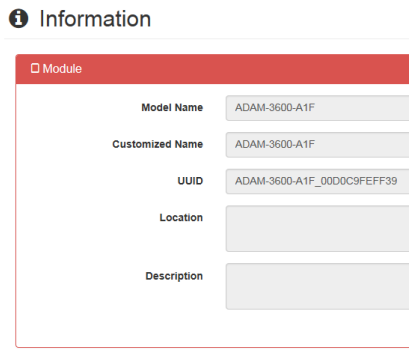
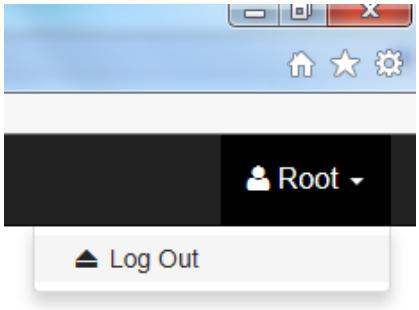
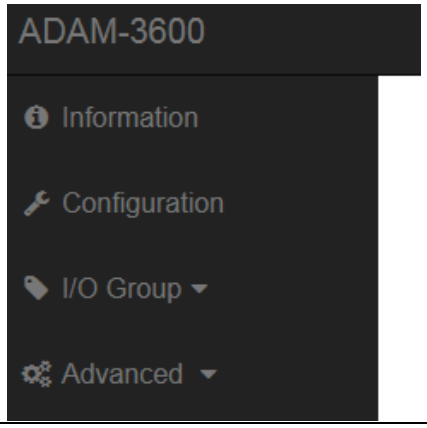
- IP Mode: Static IP Address
- Default IP: 10.0.0.1
- Subnet Mask: 255.0.0.0
- Default Gateway: 0.0.0.0
- Default Connection Timeout: 720 second
- HTTP Port: 80

4.2.4 Module Authorization

Account	Default Password	Access Ability
Root	00000000	All the privileges
Admin	00000000	All the privileges except access control configuration
User	00000000	View module status only, not allow to do configuration

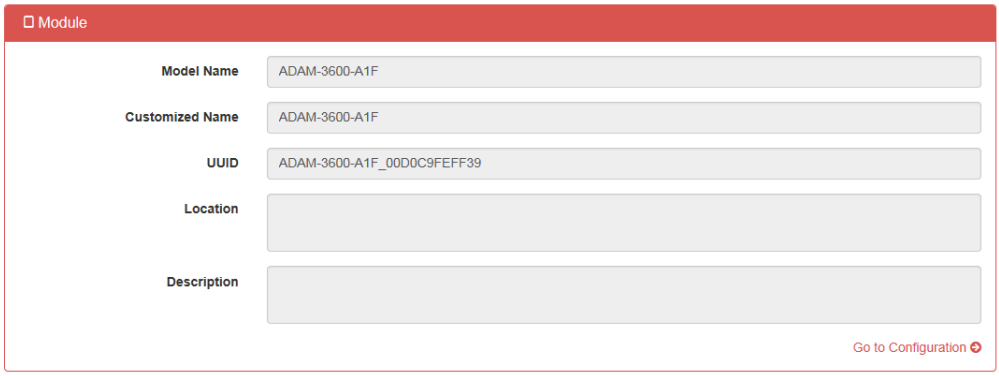
4.2.5 Using a Browser to Configure the Module

- Configure URL: http://IP_address/config
- Default URL: http://10.0.0.1/config
- Configuration Steps

Login Web Page	
	1. Connect the ADAM-3600-A1F to your local Ethernet network, then open the browser of your computer or mobile device. 2. Enter IP address of module with "/config", for example, the default URL: http://10.0.0.1/config. 3. Then you will see the login page, please enter the account and password, then click Login button.
	4. After login you will see the Information page.
	5. Scroll down the tab, you can change the login user here.
	6. You can switch to other pages by choosing the selection item at the left side of the Web page.

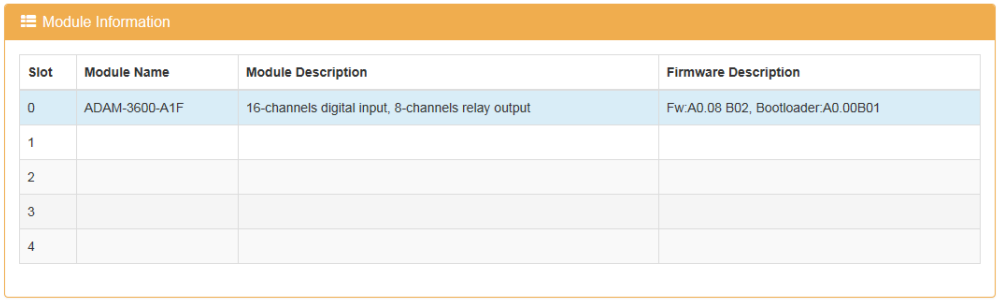
Information Page

1. In the information page, you can see the three dashboards: Module, Network and Module Information.
2. Click "Go to Configuration" to perform the configuration.



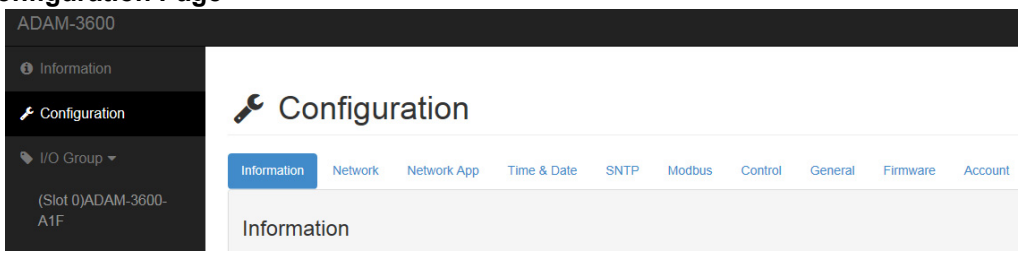
Users can view the basic information of the module. Users can view Module ID, Custom ID, Location and Description of the module.

Users can view the Network information of the module.

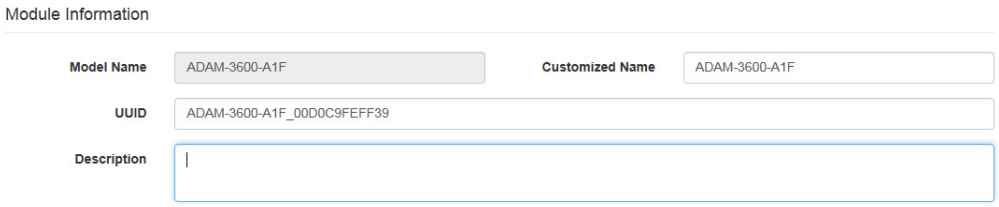


Users can see which expansion modules are installed in the ADAM-3600-A1F. ADAM-3600-A1F is always at Slot 0, then Slot 1~4 correspond to 4 expansion module slots in sequence.

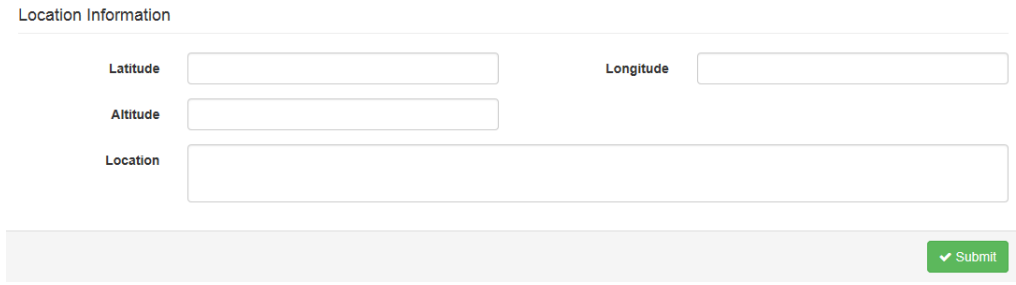
Configuration Page



Users can click different tab to switch the item you are going to configure

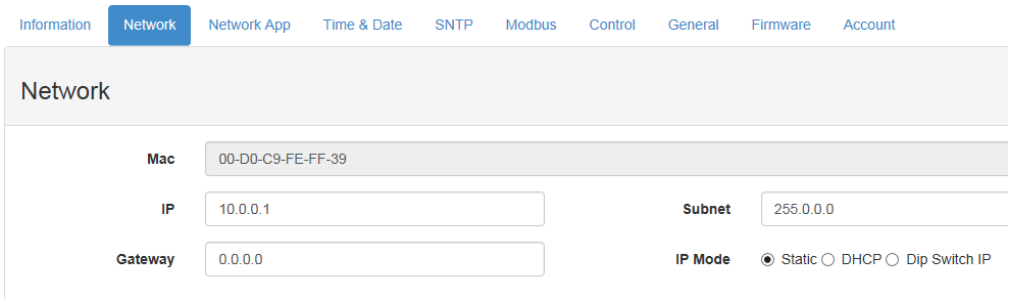


Choose the **Information** tab, then user can edit Module Information which contains Customized Name, Universally Unique Identifier (UUID) and Description.



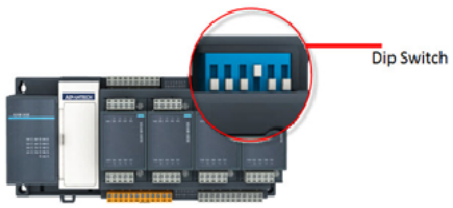
Users can edit the location information for the module. While the edition of Module and Location Information had been completed, click the button Submit to restore the new information.

Network Configuration

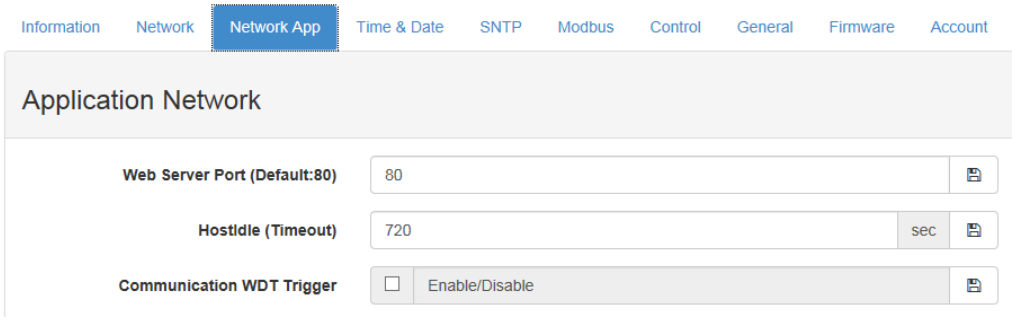


There are three options for the selection of IP Mode. They are Static (Insert the user defined IP directly), DHCP and DIP Switch IP respectively. Users can select the way they want to configure the IP address of the module by the IP Mode selection. They also can set the sub-net address and default gateway in this page.

For DIP Switch IP mode, users can set the IP address by setting the 6-bit DIP switch on the right-up corner of ADAM-3600-A1F. For example, if the default IP is 192.136.0.38, and after you adjust the DIP Switch IP shown in the figure below, the IP address will become 192.136.0.8 . Note: If the DIP switch was set to 0, it will keep the original IP address.

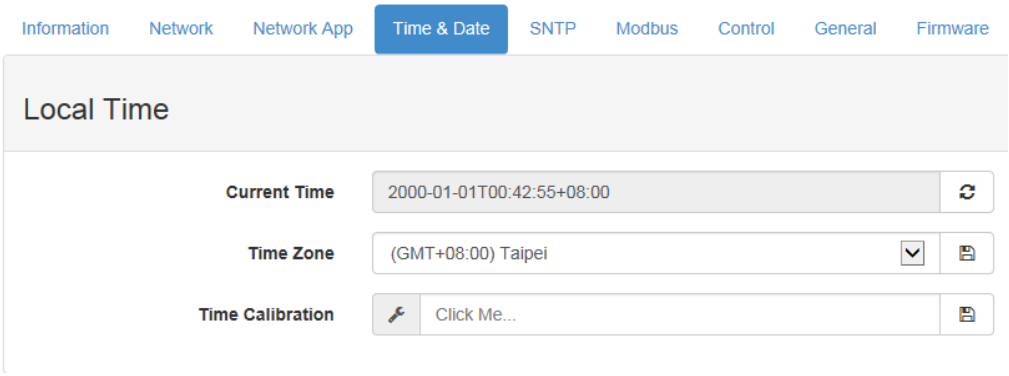


Network APP Configuration



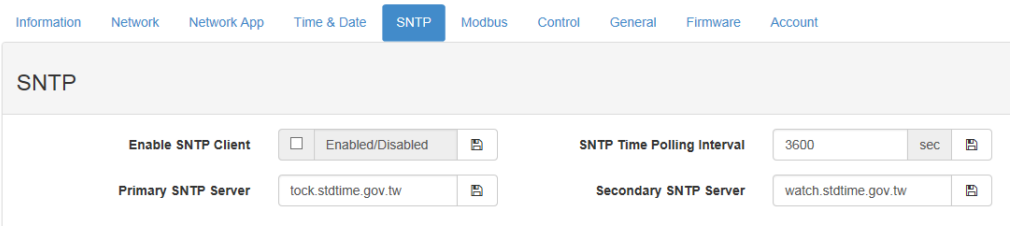
You can configure the web server port, Host Idle (timeout), and decide whether to enable communication WDT here.

Local Time Configuration



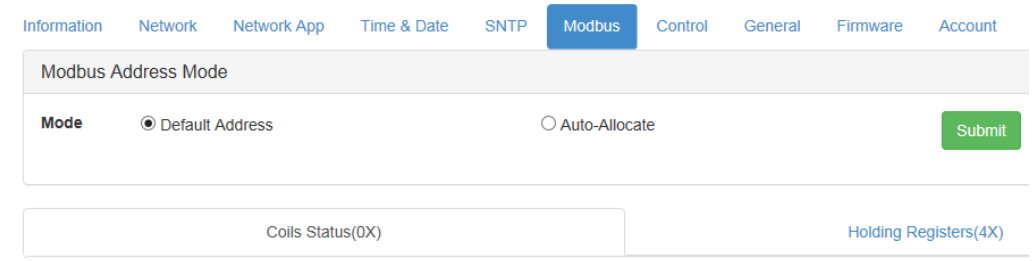
You can see the current time here, decide which time zone for your local time, and also do the time calibration by read the time from host devices.

SNTP Configuration



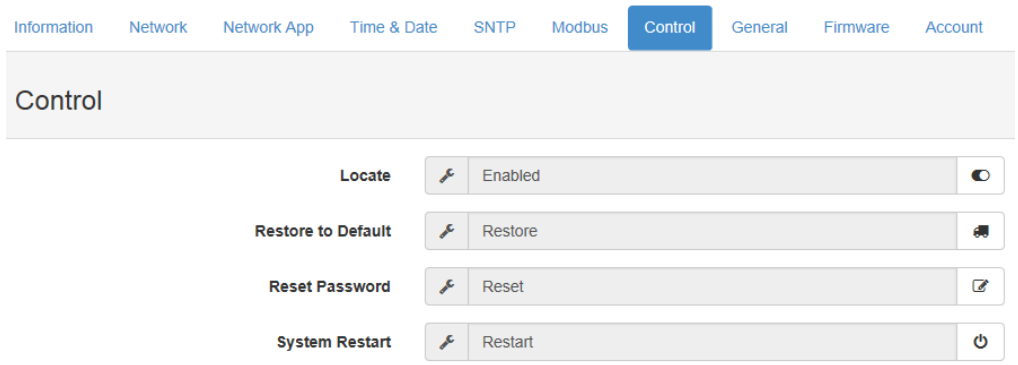
You can enable the SNTP function, so the module can act as a SNTP client to do time synchronization from assigned SNTP server.

Modbus Configuration



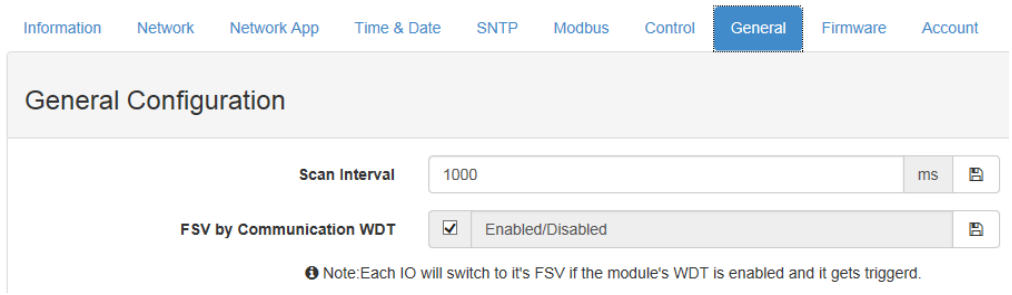
In this page, you can choose which Modbus address mode you want to use. Default Address means apply the Modbus by the default setting. Auto-Allocate Address means the Modbus address will be allocated automatically. Different from default Modbus address, it will fill in the unused address. Basically, there're two kinds of Modbus address section (0X and 4X) for you to configure each function item.

Control Configuration



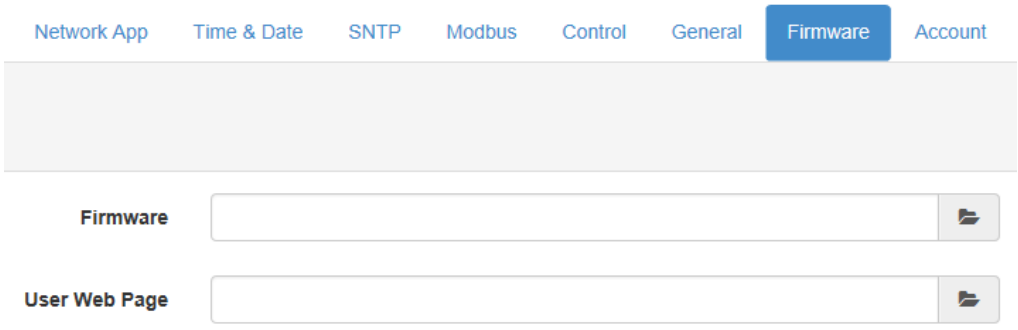
Enable Locate
It can help user search module with light sign. (Status LED will be on for 10 seconds after it's enabled.)
Restore to Default
The system configuration of the module will be cleared and restored to factory default after it's clicked.
Reset Password
You can reset the password here
System Restart
The system of this module will reboot after it's clicked.

General Configuration



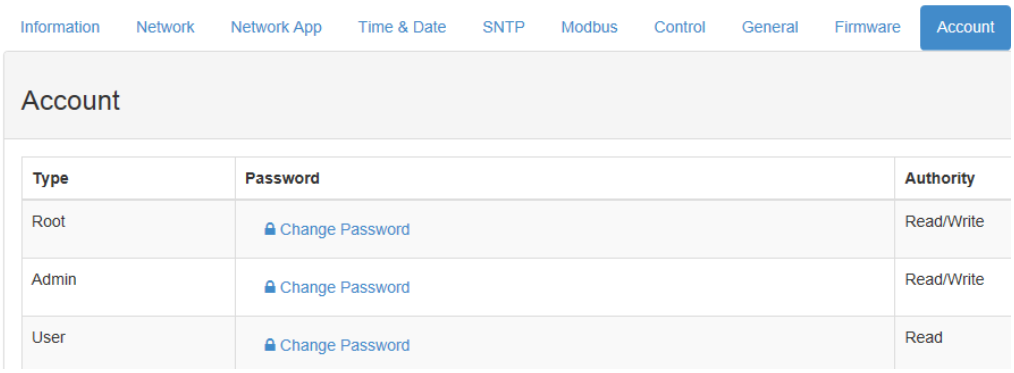
You can set the Scan interval in this page , After Communication WDT has been enabled in "Network App" tab, you can enable the IO FSV triggered by communication WDT

Firmware Update



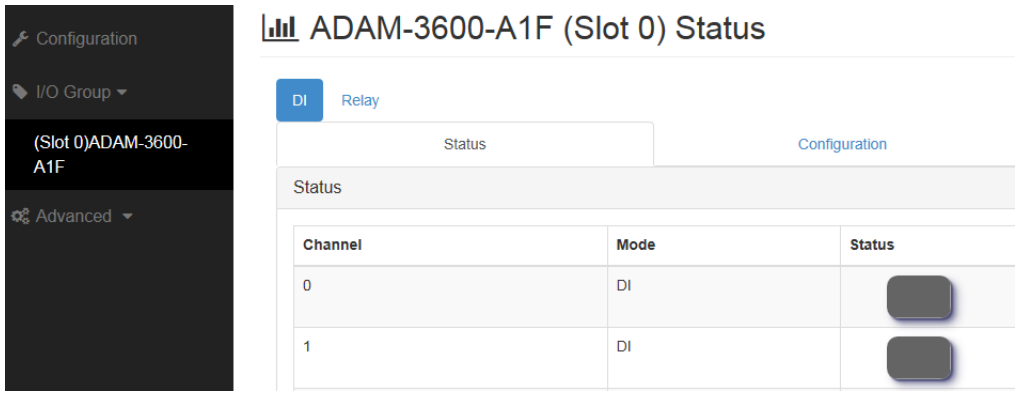
You can upgrade the firmware and the Web page here

Account Configuration



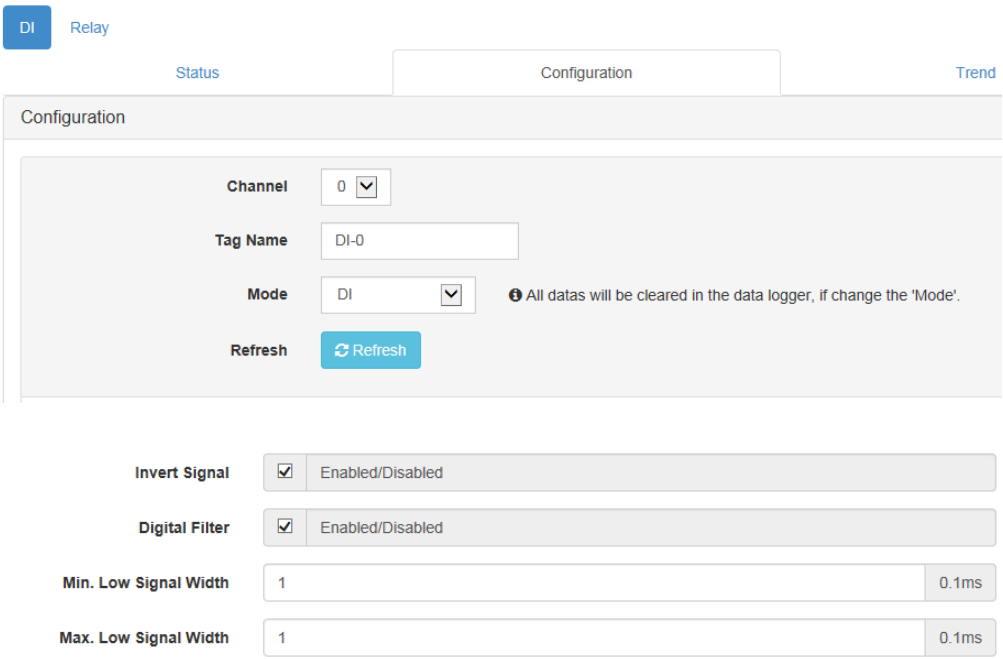
You can change the passwords of each account here.

I/O Status

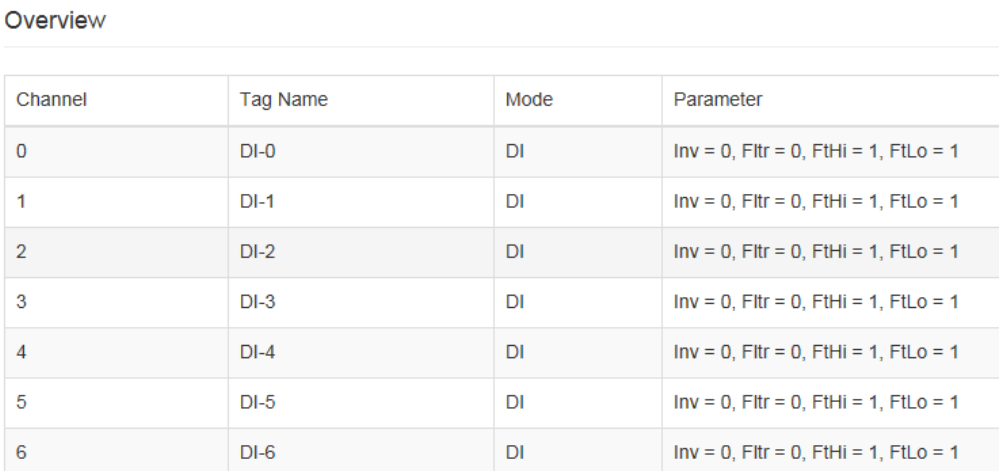


Choose the I/O Group tab, then the user will see the option “(Slot0) ADAM-3600-A1F “. Click it, the onboard I/O statuses are shown in this page. For the output status, you can also change the I/O status here. If ADAM-3600-A1F has been installed with expansion I/O modules, then the user will see the other options which corresponding to the expansion I/O modules. They can check and change the I/O statuses of the expansion modules in that page too.

I/O Configuration



User can do detail I/O setting in the configuration tab that include the Tag Name, Invert Signal enable, Digital Filter, and also the working mode of each channel.

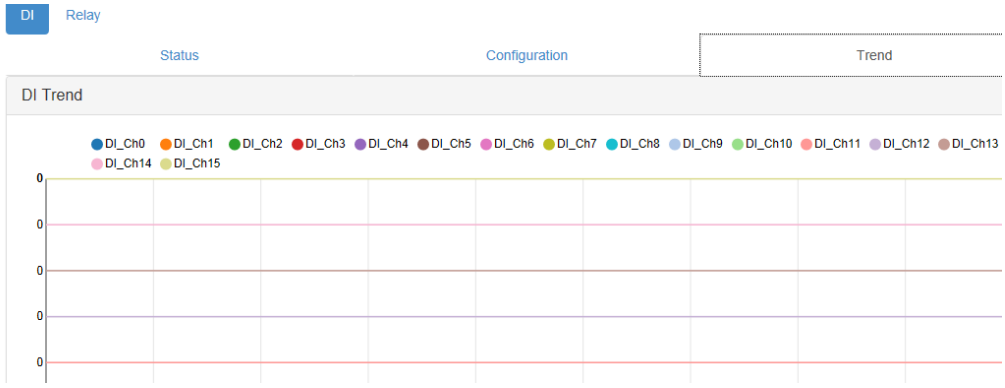


Overview

Channel	Tag Name	Mode	Parameter
0	DI-0	DI	Inv = 0, Fltr = 0, FtHi = 1, FtLo = 1
1	DI-1	DI	Inv = 0, Fltr = 0, FtHi = 1, FtLo = 1
2	DI-2	DI	Inv = 0, Fltr = 0, FtHi = 1, FtLo = 1
3	DI-3	DI	Inv = 0, Fltr = 0, FtHi = 1, FtLo = 1
4	DI-4	DI	Inv = 0, Fltr = 0, FtHi = 1, FtLo = 1
5	DI-5	DI	Inv = 0, Fltr = 0, FtHi = 1, FtLo = 1
6	DI-6	DI	Inv = 0, Fltr = 0, FtHi = 1, FtLo = 1

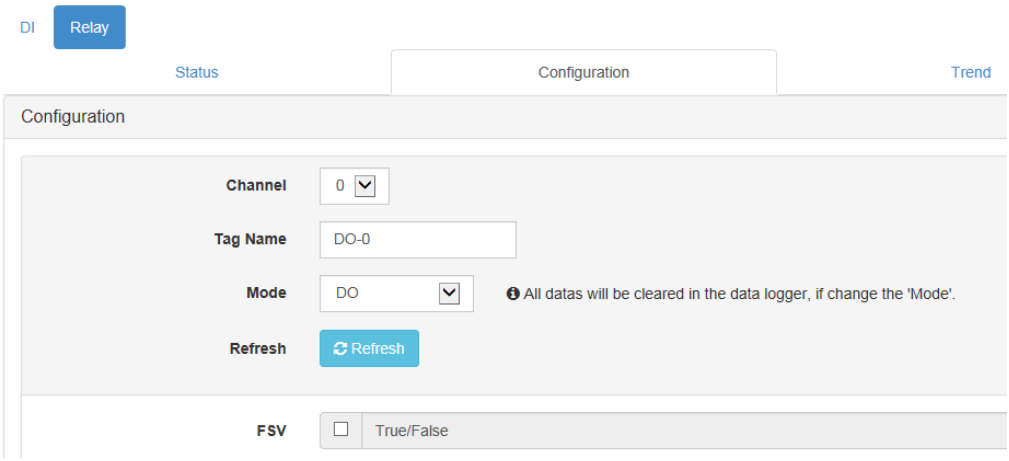
In the end, there is an overview table for the configuration summary of each channel.

Trend



The status trend of I/O will be shown here.

Relay setting

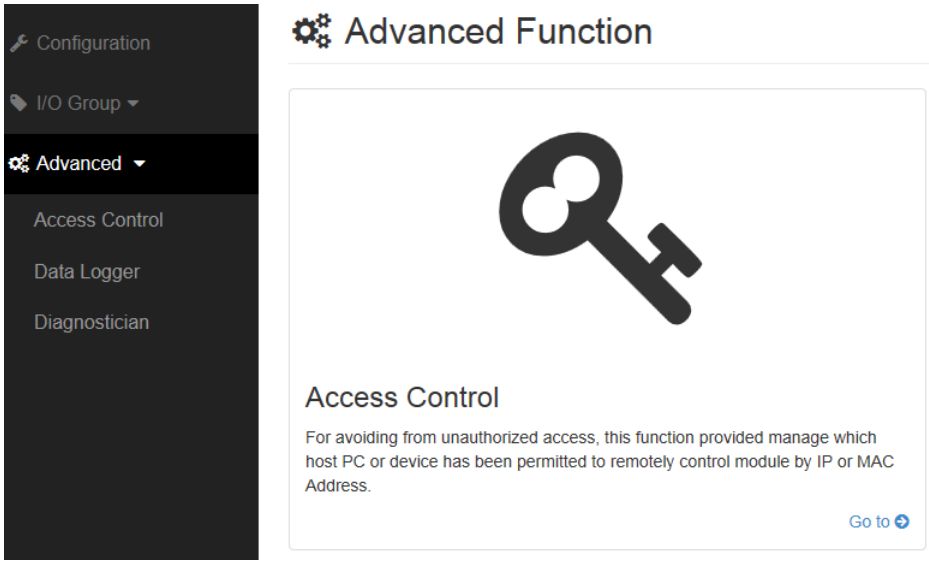


The user can also check and change the local Relay output statuses in the Relay-related pages that included Status, Configuration and Trend.

Advanced Functions

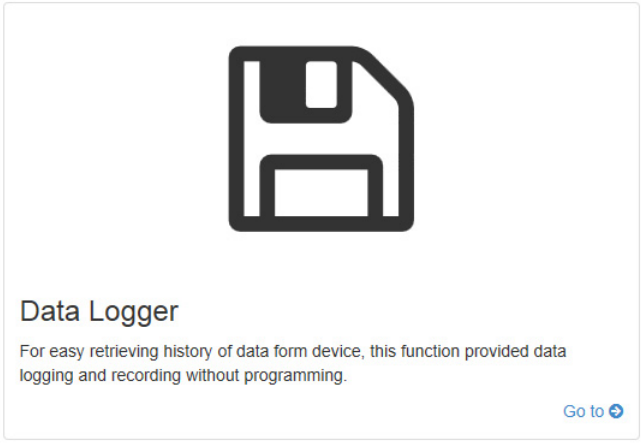
There are 3 advanced functions which contained Access Control, Data Logger and Diagnostician

Access Control

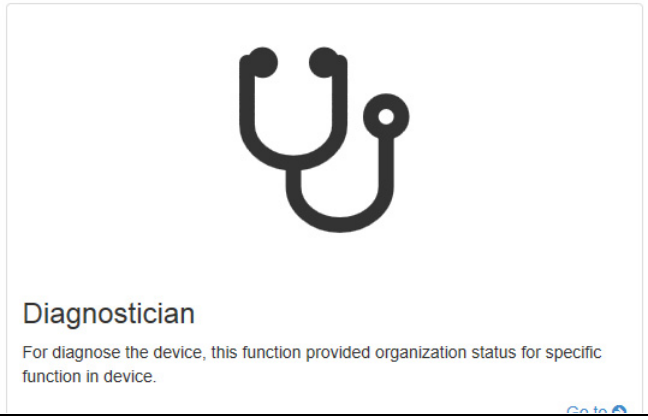


The status trend of I/O will be shown here.

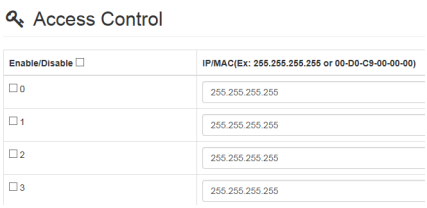
Data Logger



Diagnostics

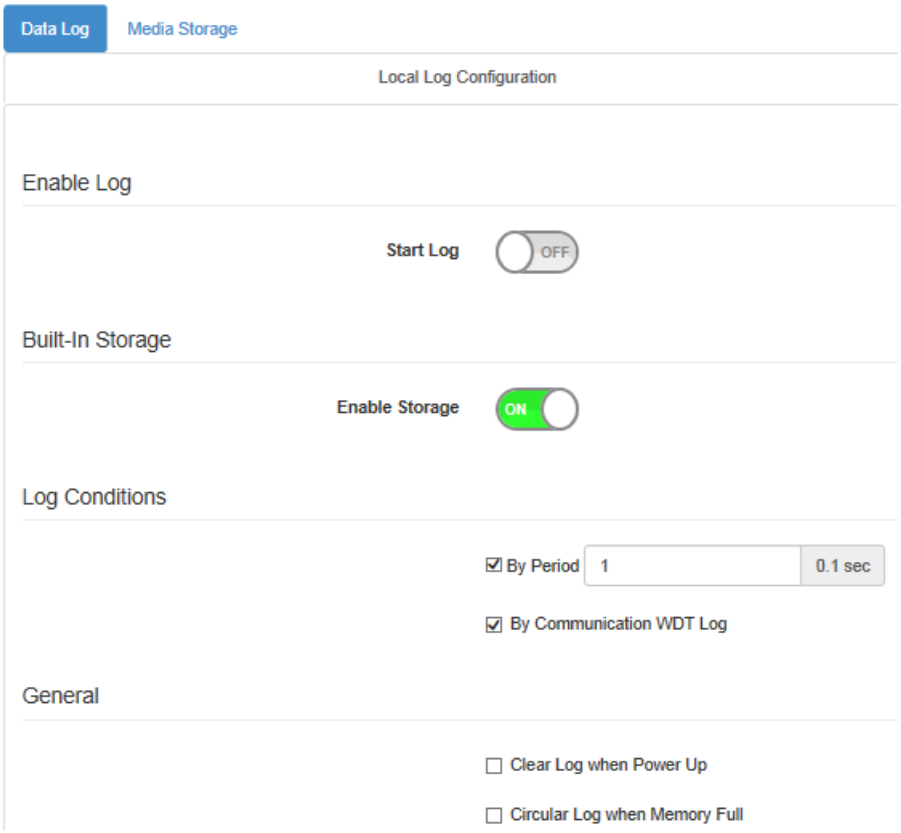


Access Control



Enable one of the rows and enter the IP address or MAC address which allowed to access-ing the ADAM-3600-A1F.

Data Logger



Go to Data Logger function, select the item “Data Log” and choose the tab “Local Log Con-figuration”, User can complete the setting for Data Logger function.

Enable Log

Decide whether to enable data log function here.

Built-In Storage

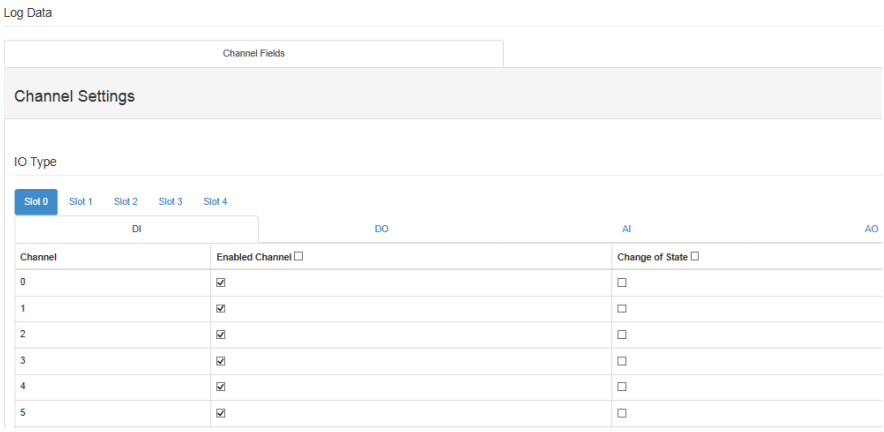
Decide whether to enable the built-in storage memory here.

Log Conditions

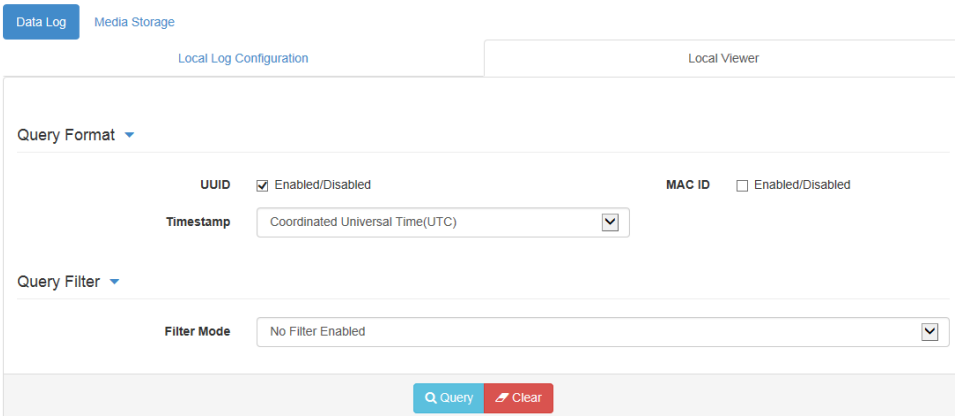
The log period can be decided in “By Period” box. Pleased been noted that the period is increased by 0.1seconds. It means if user set “600” here, the status of the I/O will be logged each minute. Otherwise If the communication WDT been enable, and user also choose “By Communication WDT Log”, once the condition of WDT had been met, the status of I/O will be logged.

General

Decided whether to clear the logged data when power up by choosing the option “Clear Log when Power Up”. Otherwise, decide whether to execute circular log when the memory is full by choosing the option “Circular Log when Memory Full”.



Users can configure which channels of the module in each slot will be logged and decide whether to log the data when the I/O status is changed by check the box of “Change of State”.



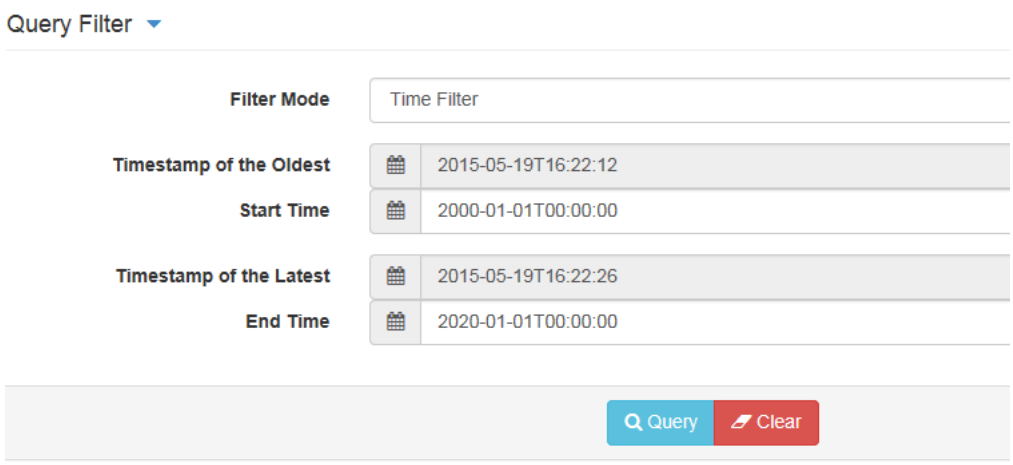
Tab “Local Viewer”

Query Format

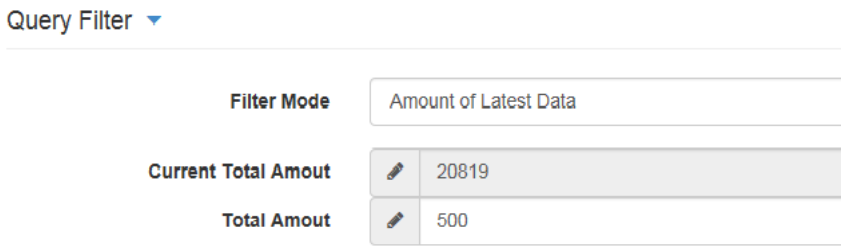
User can configure which kind of ID and the timestamp format will be logged here.

Query Filter

This filter is for setting the criteria to query the logged data. User can select the filter mode and click “Query” button to query the logged data.

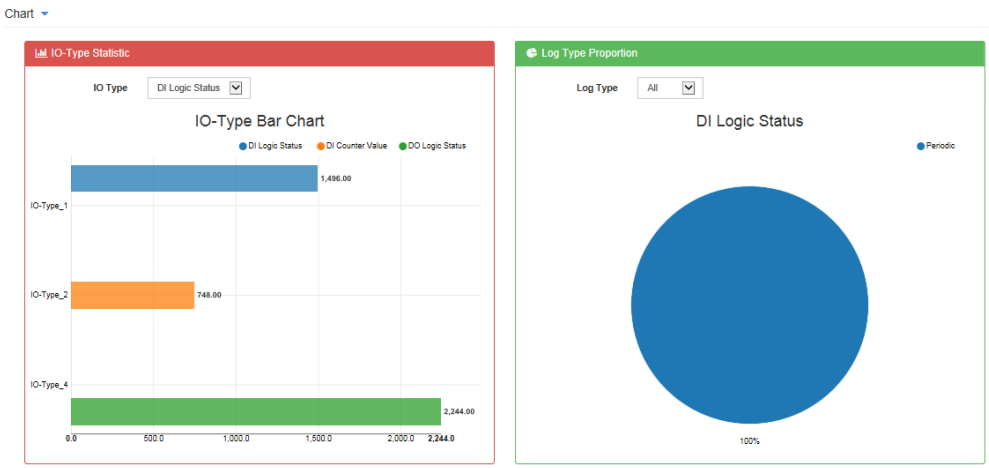


There are two filter modes that they are Time filter and Amount of Latest Files Filter and File Format Filter. If users selected Time Filter, they can see the time stamps of the oldest data and the latest data in the storage device. Then, users can set the time period by setting Start Time and End Time. This period has to be between the oldest timestamp and the latest time stamp. Then, they can query the data in the internal memory which the timestamps were in this period.



If users selected Amount of Latest Files Filter, they can see the total number of data with different timestamps in the internal memory at the field Current Total Amount. Users can set how many records of data with different timestamps they want to query by setting the field Total Amount.

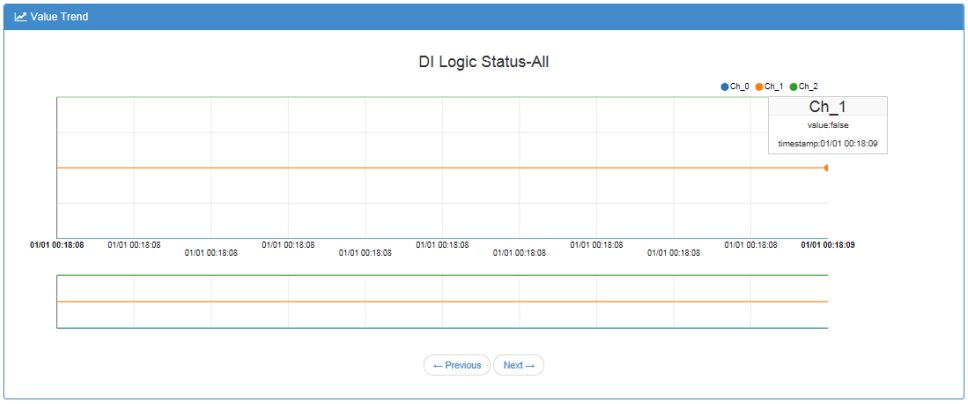
Note: The data querying page had supported the data drawing function. However, if there were too much data had been drawn on the web page, it would cause the web browser at the state of over loading. Thus, we set the limitation that there were about 5000 points of I/O data could be queried one time. For example, once the user entered a number 1000 at the field Total Amount, that meant the user want to query 1000 records of data with different timestamps. If each record of data contained 6 points of I/O data, then the total number of I/O points would be 6000. That exceeded the limitation. The user would see the notification message shown below.



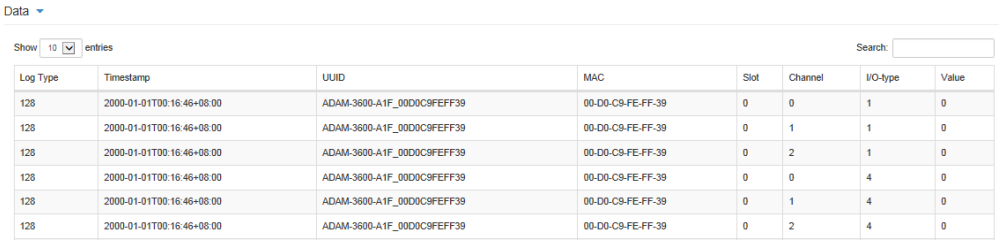
After clicking the button Query, users can see the graphic at IO-Type Statistic area which recorded the numbers of data with different I/O types. The proportion of data for each log way (Event or Periodic) also would be drawn at Log Type Proportion area. The explanation of I/O-Type is indicated in the form below.
Users also can see the data trend in Value Trend area

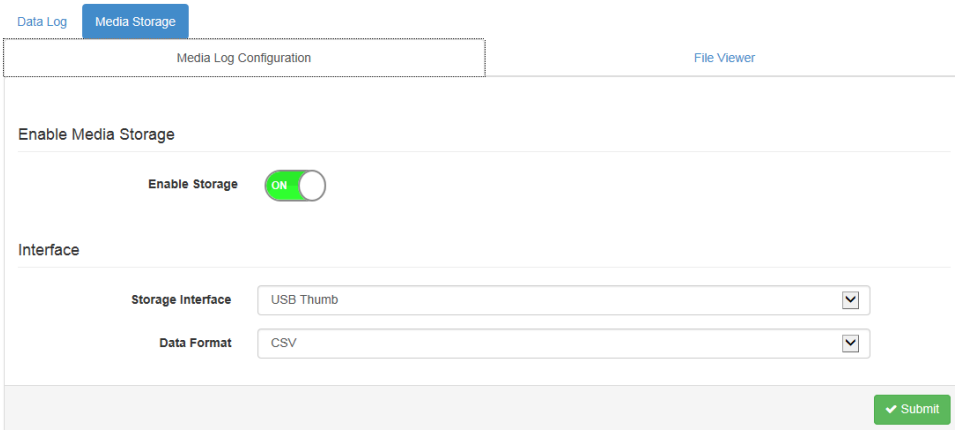
I/O Type	Description
1	The digital input is in general DI mode
2	The digital input is in Counter mode
3	The digital input is in Frequency mode
4	The digital output is in general DO mode
5	The digital output is in Pulse output mode

Users also can see the data trend in Value Trend area.

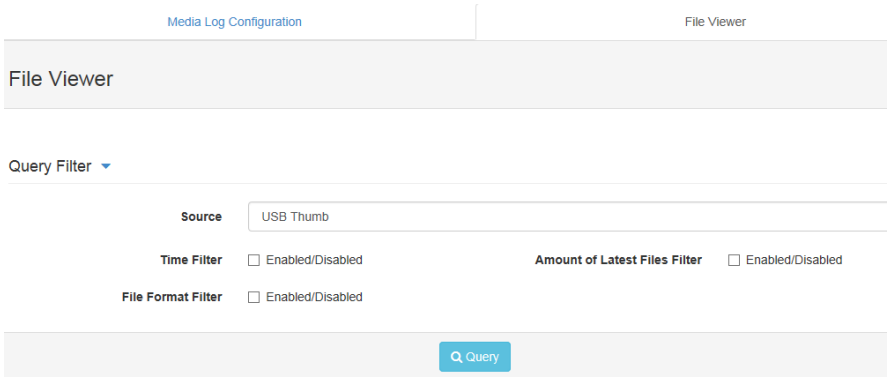


Users also can see the data list in Data area.





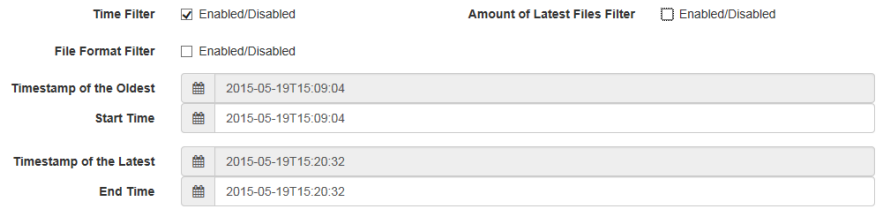
Select “**Media Storage**” and choose the “Media Log Configuration” tab, users can enable the data logger function in the external storage device, and choose to use USB Thumb or SD card as the storage device. In the field of Data Format, you can see the data will be stored in CSV format.



File Viewer Tab

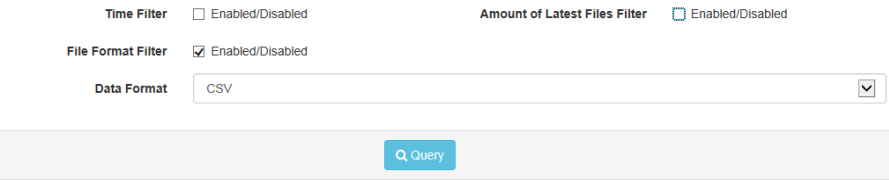
Query Filter

This filter is for setting the criteria to query the logged CSV file from USB Thumb or SD card. Users can select the filter modes they want to use, and click "Query" button to query the logged files.



There are three filter modes for the file viewer of the media storage: Time filter, Amount of Latest Files Filter and File Format Filter. If the user selects Time Filter, they can see the time stamps of the oldest file and the latest file in the storage device. Then, users can set the time period by setting Start Time and End Time. This period has to be between the oldest time-stamp and the latest timestamp. Then, they can query the files in the storage device that the timestamps in this period.

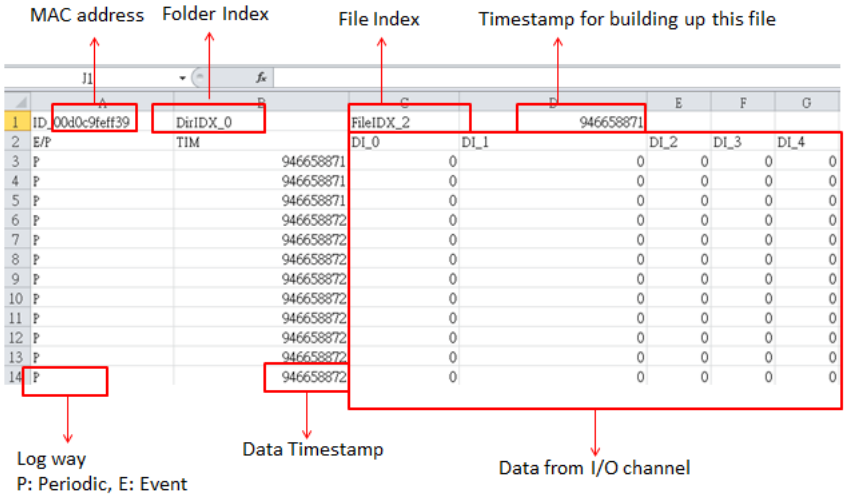
If users select Amount of Latest Files Filter, they can see the total number of files in the stor-age device at the field Current Total Amount. Users can set the index period by setting Start Index and End Index, then they can query the files in the storage device that the indexes in this period.



If users selected File Format Filter, then they can query the CSV files in the storage device

Users can check the file list at the Data area.The data logger function would generate a main folder ADAM_log in the external storage device. It would contain the first sub-folders which named with the index 0, and the logged file would be stored in the sub-folder. The file name would be the last two bytes of the MAC address and the index started from 0.

The indication of the CSV file format is shown below.



4.3 Configure ADAM-3600-A1F with ADAM.NET Utility

1. Install ADAM.NET Utility in your computer.
   (After successfully installation, there will be a shortcut generated on the screen)

2. Double click the shortcut icon, and then you will see the main operation window.
3. Click Search Module icon in Toolbar. You will see all online modules in the left Module Tree screen and an unconfigured new module, whose default password is 00000000, will appear on the Others section as below. Now you can define the network mode of the module in the beginning. After that, you will be able to perform other settings.

Note!	*The default password is 00000000*

4.3.1 Operation Framework

The operation window mainly contains 4 areas, including Menu, Toolbar, Module Tree screen and Main Operation screen.

4.3.1.1 Menu

a. File

- **Open Favorite Group**
  You can import the favorite configuration group file (.XML) from your computer.
- **Save Favorite Group**
  You can save the favorite group configuration group as XML file to your computer.
- **Auto-Initial Group**
  If you want to have the same favorite group configuration when you exit ADAM.NET utility and launch it again, you need to check this option.
- **Exit**
  Exit ADAM.NET Utility.

b. Tools

- **Search Device**
  Search all the ADAM-3600-A1F modules you connected in local Ethernet.
- **Add Devices to Group**
  It's used to add ADAM-3600-A1F modules to your favorite group. After activating search function, all online modules will show on Module Tree Screen area. Now you can enable this function to select the device you want to add in the Module Tree Screen.
- **Group Configuration**
  Group Configuration is on ADAM-3600-A1F module. It can help you efficiently configure or maintain massive ADAM-3600-A1F modules with the same configuration file or firmware upgrade at one time in the local network. The following steps will instruct you how to operate it.
- **Terminal for Command Testing**
  The ADAM-3600-A1F module Modbus/TCP as communication protocol, so you can launch the terminal to directly communicate with ADAM-3600-A1F module by these two protocols.
- **Print Screen**
  You can save current ADAM.NET Utility screen into an image file by this option.

c. Setup

- **Favorite Group**
  You can configure your favorite group including add one new device, modify or delete one current device, sort current devices and diagnose connection to one device.
- **Refresh Serial and Ethernet**
  ADAM.NET utility will refresh the serial and LAN network connection situation.
- **Add COM Ports**
  This option is used to add serial COM ports in ADAM.NET Utility. You won't need to use this option for ADAM-3600-A1F modules.
- **Show TreeView**
  Check this option to display the Module Tree Screen area.
- **Allow Calibration**
  Check this option to allow calibration function enabled on AI/O module.

d. Help

- **Check Up-to-Date on the Web**
  It will automatically connect to support and download page of Advantech web-site when it enabled. You can find and download the latest version of ADAM-3600-A1F utility there.
- **About ADAM.NET Utility**
  The current version of ADAM.NET Utility is installed on your computer.

4.3.1.2 Toolbar

There are 8 graphical icons for common used options of Menu on the toolbar.

Definition (from left to right)

1. Open favorite group
2. Save favorite group
3. Search Modules
4. Add Devices to Group
5. Terminal for Command Testing
6. Group Configuration
7. Monitor Data Stream/Event
8. Print Screen

4.3.1.3 Module Tree Screen

The Module Tree Screen locates on the left part of ADAM.NET utility operation window. There are four categories in this area:

Serial

All serial I/O Modules (ADAM-4000 and ADAM-5000 RS-485 serial modules) connected to the host PC will be listed in this category.

Ethernet

All Ethernet I/O Modules (ADAM-6000, ADAM-6100, ADAM-5000 TCP and ADAM-3600-A1F) connected to the host PC will be listed in this category.

Favorite Group

You can define which devices listed in the three categories above into your personal favorite group. This will make you easier to find your interested modules. Right click on the ADAM-3600-A1F item under the Favorite Group item and you can select Add New Group to create a new group. After you create your own group, right click on your group and Add New Device into your group. You can also select Diagnose connection to check the communication.

ADAM-4500_5510 Series

This is a DOS interface utility for remote controllers such as ADAM-4500 and ADAM-5510 series.

Wireless Sensor Networks

All wireless I/O Modules (ADAM-2000 modules) connected to the host PC, through wireless gateway, will be listed in this category.

4.3.1.4 Main Operation Screen

Main Operation Screen located on the right side of utility includes I/O status display and function setting. You can select different items in Module Tree Screen, and then Main Operation Screen will change dependently. You can do all configurations and test in this area.

In Information page (after clicking Ethernet), you can configure Connection/Send/Receive/Scan Timeout. The supervisor password is a shortcut to let you enter a password at one time which's applied for certain modules, so you don't need to enter the same password for each module when you check it.

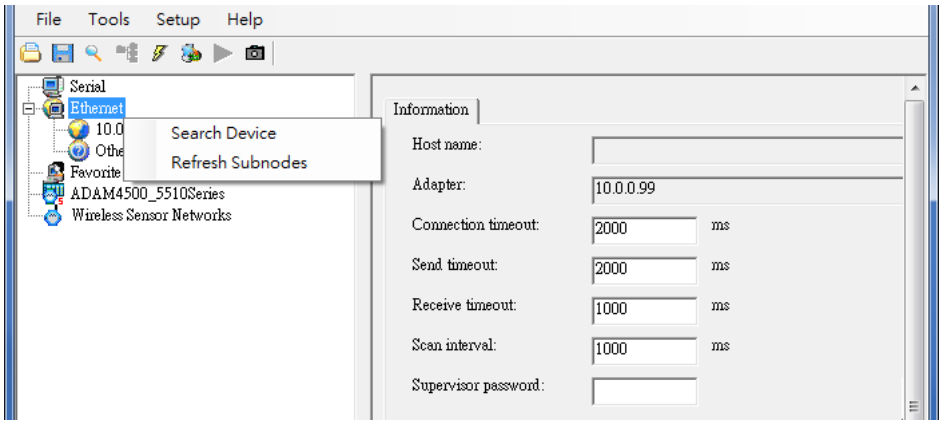
4.4 Configuring ADAM-3600-A1F with ADAM.NET Utility (software)

ADAM.NET Utility, which is designed with graphical operation interface, is aimed to offer users directly configure, control and monitor the real-time status of remote ADAM-3600-A1F module via Ethernet or Wireless connection.

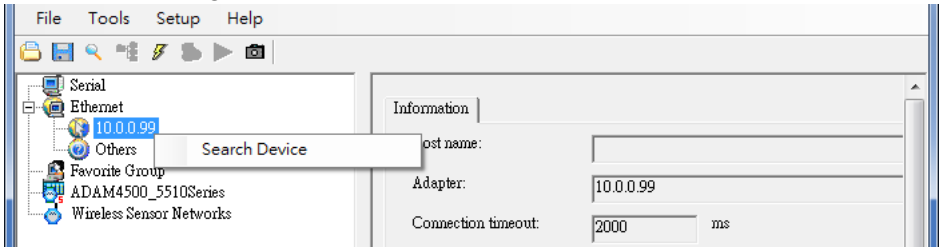
To keep you informed with latest update, you also can check it from the following download link on Advantech website.
http://support.advantech.com.tw/Support/DownloadSRDetail.aspx?SR_ID=1-2AKUDB

Note!	■ *Before installing ADAM.NET Utility, you need to install .NET Framework 2.0 or higher version.* ■ *System requirement* – *Microsoft Windows XP/7* – *At least 32 MB RAM* – *20 MB of hard disk space available* – *VGA color or higher resolution monitor* – *Mouse or other pointing devices* – *10/100 Mbps or higher Ethernet Card*

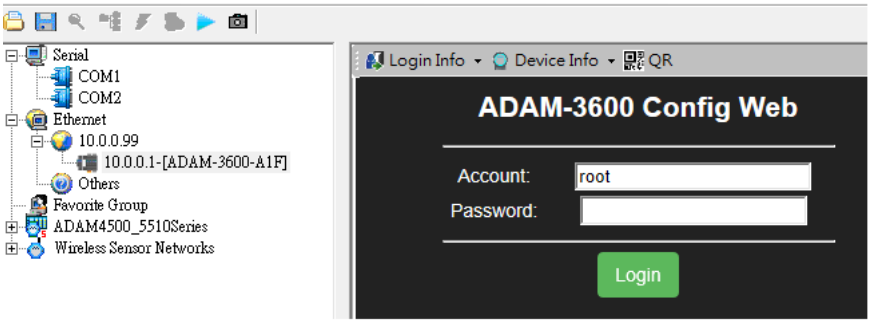
1. Configure the computer's IP address as the same domain as ADAM-3600-A1F module. For the new ADAM-3600-A1F which default IP address is 10.0.0.1, the IP address of computer can be configured as 10.0.0.99 for example as following.
2. Open the Adam/Apax .NET Utility then you can see the IP address of computer been shown under "Ethernet" tree. You can right click to refresh the subnodes of this tree. Or click "Search Device" to find ADAM-3600-A1F module.



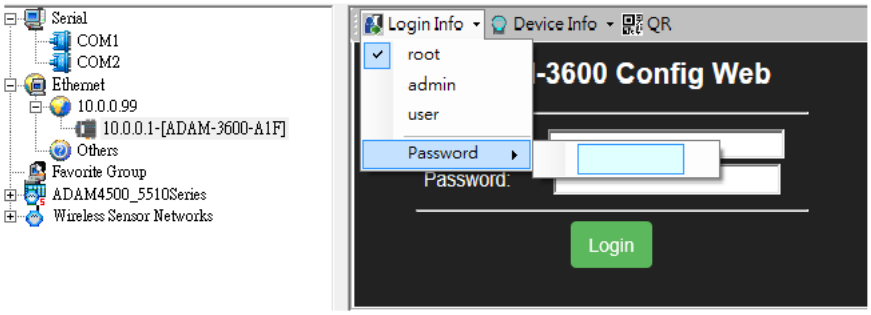
3. Users can also right click the IP address to find ADAM-3600-A1F.



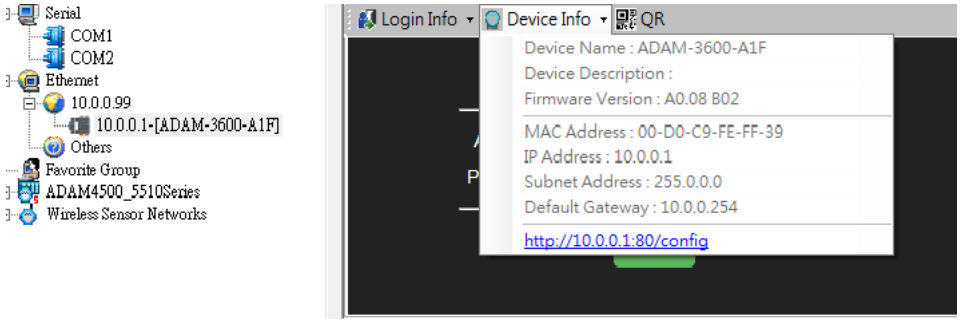
4. After the module been found, it will be listed under IP address in same domain, you can login the embedded web configuration web page for further configuration as introduced in previous section



5. There are some function provide in same pages in utility, first you can enter the account and password faster in "Login Info" tab.

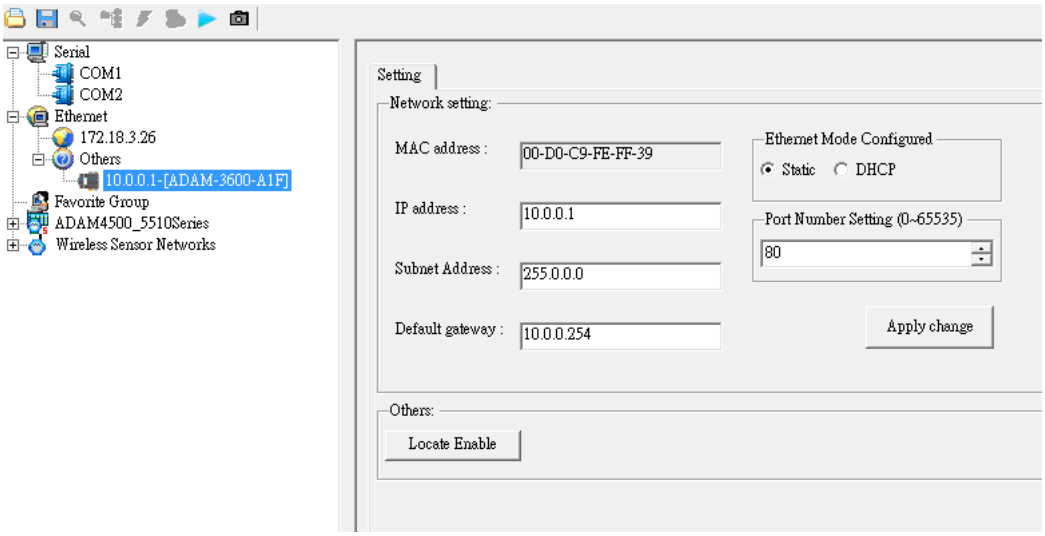


6. In the "Device Info" tab, the detail information of this module will been shown



7. The "QR" tab will generate the QR code of the web configuration web page for mobile device to access the module. User can also click the QR code to open the browser for further configuration.

Note!	*If the ADAM-3600-A1F is not in the same domain as the computer, after power up and searching for it in the utility, the device name will been shown in the "Others" tree . Users have to change the device network setting to the same domain with the computer in the page as below. Then, the module just can be accessed by the computer.*



Appendix A

I/O Modbus Mapping Table

A.1 Modbus Function Code Introduction

To full-fill the programming requirement, there is a series of function code standard for user's reference.

Code (Hex)	Name	Usage
01	Read Coil Status	Read Discrete Output Bit
02	Read Input Status	Read Discrete Input Bit
03	Read Holding Registers	Read 16-bit register. Used to read integer or floating point process data.
04	Read Input Registers	
05	Force Single Coil	Write data to force coil ON/OFF
06	Preset Single Register	Write data in 16-bit integer format
08	Loopback Diagnosis	Diagnostic testing of the communication port
0F	Force Multiple Coils	Write multiple data to force coil ON/OFF
10	Preset Multiple Registers	Write multiple data in 16-bit integer format

A.2 ADAM-3600-A1F Default Modbus Mapping Table

The address value for each item is fixed regardless of the type or existence of extension I/O slots.

Address 0X	Ch	Slot	Description	Attribute	Address 4X	Ch	Slot	Description	Attribute
Digital Input ***(Default Coil Base :* 00001, *Default Register Base :* 40001 *)***									
00001~00016	0~15	0	DI Value (1 addr / ch)	Read	40001~40032	0~15	0	Counter value (2 addr / ch)	Read
00017~00032	0~15	1		Read	40033~40064	0~15	1		Read
00033~00048	0~15	2		Read	40065~40096	0~15	2		Read
00049~00064	0~15	3		Read	40097~40128	0~15	3		Read
00065~00080	0~15	4		Read	40129~40160	0~15	4		Read
00101~00116	0~15	0	Counter Start / Stop (1 addr / ch)	R/W	40211~40212		0	Module Name (2 addr / module)	Read
00117~00132	0~15	1		R/W	40213~40214		1		Read
00133~00148	0~15	2		R/W	40215~40216		2		Read
00149~00164	0~15	3		R/W	40217~40218		3		Read
00165~00180	0~15	4		R/W	40219~40220		4		Read
00401~00416	0~15	0	Clear Counter (1 addr / ch)	Write	40221~40222		0	FW Major Ver. (2 addr / module)	Read
00417~00432	0~15	1		Write	40223~40224		1		Read
00433~00448	0~15	2		Write	40225~40226		2		Read
00449~00464	0~15	3		Write	40227~40228		3		Read
00465~00480	0~15	4		Write	40229~40230		4		Read
00501~00516	0~15	0	Clear Over-flow (1 addr / ch)	R/W	40231~40232		0	FW Build Ver. (2 addr / module)	Read
00517~00532	0~15	1		R/W	40233~40234		1		Read
00533~00548	0~15	2		R/W	40235~40236		2		Read
00549~00564	0~15	3		R/W	40237~40238		3		Read
00565~00580	0~15	4		R/W	40239~40240		4		Read

00601~00616	0~15	0	DI Latch Status (1 addr / ch)	R/W	40301	All	0	DI Value	Read
00617~00632	0~15	1		R/W	40302	All	1		Read
00633~00648	0~15	2		R/W	40303	All	2		Read
00649~00664	0~15	3		R/W	40304	All	3		Read
00665~00680	0~15	4		R/W	40305	All	4		Read
Digital Output (Default Coil Base : 01001 , *Default Register Base :* 41001 *)*									
01001~01016	0~15	0	DO Value (1 addr / ch)	R/W	41001~41032	0~15	0	Pulse Output Low Level Width (2 addr / ch)	R/W
01017~01032	0~15	1		R/W	41033~41064	0~15	1		R/W
01033~01048	0~15	2		R/W	41065~41096	0~15	2		R/W
01049~01064	0~15	3		R/W	41097~41128	0~15	3		R/W
01065~01080	0~15	4		R/W	41129~41160	0~15	4		R/W
					41301	All	0	DO Value	R/W
					41302	All	1		R/W
					41303	All	2		R/W
					41304	All	3		R/W
					41305	All	4		R/W
					41401~41432	0~15	0	Pulse Output High Level Width (2 addr / ch)	R/W
					41433~41464	0~15	1		R/W
					41465~41496	0~15	2		R/W
					41497~41528	0~15	3		R/W
					41529~41560	0~15	4		R/W
					41601~41632	0~15	0	Set Absolute Pulse (2 addr / ch)	R/W
					41633~41664	0~15	1		R/W
					41665~41696	0~15	2		R/W
					41697~41728	0~15	3		R/W
					41729~41760	0~15	4		R/W
					41801~41832	0~15	0	Set Incremental Pulse (2 addr / ch)	R/W
					41833~41864	0~15	1		R/W
					41865~41896	0~15	2		R/W
					41897~41928	0~15	3		R/W
					41929~41960	0~15	4		R/W

A.3 Auto-Allocated Modbus Address

Case study: Slot-0 (16DI and 8DO),Slot-1(8DI),Slot-2(8DO)

Address 0X	Ch	Slot	Description	Attribute	Address 4X	Ch	Slot	Description	Attribute
Digital Input and GCL									
00001~00016	0~15	0	DI Value (1 addr / ch)	Read	40001~40032	0~15	0	Counter value (2 addr / ch)	Read
00017~00024	0~7	1		Read	40033~40048	0~7	1		Read
00101~00116	0~15	0	Counter Start / Stop (1 addr / ch)	R/W	40211~40212		0	Module Name (2 addr / module)	Read
00117~00124	0~7	1		R/W	40213~40214		1		Read
					40215~40216		2		Read
00401~00416	0~15	0	Clear Counter (1 addr / ch)	Write	40217~40218		3		Read
00417~00424	0~7	1		Write	40219~40220		4		Read
00501~00516	0~15	0	Clear Overflow (1 addr / ch)	R/W	40221~40222		0	FW Major Ver. (2 addr / module)	Read
00517~00524	0~7	1		R/W	40223~40224		1		Read
					40225~40226		2		Read
00601~00616	0~15	0	DI Latch Status (1 addr / ch)	R/W	40227~40228		3		Read
00617~00624	0~7	1		R/W	40229~40230		4		Read
					40231~40232		0	FW Build Ver. (2 addr / module)	Read
					40233~40234		1		Read
					40235~40236		2		Read
					40237~40238		3		Read
					40239~40240		4		Read
					40301	All	0	DI Value	Read
					40302	All	1		Read
Digital Output									
01001~01008	0~7	0	DO Value (1 addr / ch)	R/W	41001~41016	0~7	0	Pulse Output Low Level Width (2 addr / ch)	R/W
01009~01016	0~7	2		R/W	41017~41032	0~7	2		R/W
					41301	All	0	DO Value	R/W
					41302	All	2		R/W
					41401~41416	0~7	0	Pulse Output High Level Width (2 addr / ch)	R/W
					41417~41432	0~7	2		R/W
					41601~41616	0~7	0	Set Absolute Pulse (2 addr / ch)	R/W
					41617~41632	0~7	2		R/W

					41801~41816	0~7	0	Set Incremental Pulse (2 addr / ch)	R/W
					41817~41832	0~7	2		R/W

Appendix B

REST for ADAM-3600-A1F

B.1 Introduction

REpresentational State Transfer (REST) is a design style of software architecture for Web application behaves and services including image indication, resource request and response and message delivery. It can be developed compatible with popular protocols or standards like HTTP, URI, JSON, HTML. With the advantage of scalability, simplicity and performance, it's already adopted in Web service by Amazon, Yahoo. The Web service of is developed based on HTML5 language, if user need to integrate this into other Web services, the following information/command list should be referred for implementation.

B.2 REST Resources for ADAM-3600-A1F

B.2.1 Digital Input

B.2.1.1 /di_value/slot_index/ch_num

Description	Retrieves information about the digital input value resource on specific slot.
URL Structure	http://10.0.0.1/di_value/slot_index http://10.0.0.1/di_value/slot_index/ch_num
HTTP Method	GET:Returns the representation of all of digital input value resource. PUT:Replace all of digital input value resource PATCH:Apply partial modifications to digital input value resource.

GET	Multiple Channel Request:
	GET /di_value/slot_index
	Single Channel Request:
	GET /di_value/slot_index/ch_num
	
	[Example]
	
	Request: **GET /di_value/slot_0**
	
	Content-type: application/json
	Response: 200 OK
	{
	"DIVal": [
	{
	"Ch":0,
	"Md":0,
	"Stat":1,
	"Val":1,
	"Cnting":0,
	"ClrCnt":0,
	"OvLch": 0
	},
	{
	"Ch":1,
	"Md":0,
	"Stat":0,
	"Val":0,
	"Cnting":0,
	"ClrCnt":0,
	"OvLch": 0
	},
	{
	"Ch":2,
	"Md":1,
	"Stat":0,
	"Val":3378,
	"Cnting":1,
	"ClrCnt":0,
	"OvLch": 0
	},
	{
	"Ch":3,
	"Md":3,
	"Stat":0,
	"Val":1,
	"Cnting":0,
	"ClrCnt":0,
	"OvLch": 0
	}
	]
	}
	
	Request : **GET /di_value/slot_0/ch_2**
	
	Content-type: application/json
	Response: 200 OK
	{
	"Ch":2,
	"Md":0,
	"Stat":1,
	"Val":1,
	"Cnting":0,
	"ClrCnt":0,
	"OvLch": 0
	}

PUT	Single/Multiple Channel Request:
	PUT /di_value/slot_index
	Single Channel Request:
	PUT /di_value/slot_index/ch_num
	
	[Example]
	
	Request: **PUT /di_value/slot_0**
	
	Content-type: application/json
	{
	"DIVal": [
	
	{
	"Ch":0,
	"Md":0,
	"Stat":0,
	"Val":0,
	"Cnting":0,
	"ClrCnt":0,
	"OvLch": 0
	},
	{
	"Ch":1,
	"Md":0,
	"Stat":0,
	"Val":0,
	"Cnting":0,
	"ClrCnt":0,
	"OvLch": 0
	},
	{
	"Ch":2,
	"Md":1,
	"Stat":0,
	"Val":3378,
	"Cnting":0,
	"ClrCnt":1,
	"OvLch": 0
	},
	{
	"Ch":3,
	"Md":3,
	"Stat":0,
	"Val":0,
	"Cnting":0,
	"ClrCnt":0,
	"OvLch": 0
	}
	]
	}
	
	Response: 200 OK
	
	Request: **PUT /di_value/slot_0/ch_2**
	
	Content-type: application/json
	{
	"Ch":2,
	"Md":1,
	"Stat":0,
	"Val":3378,
	"Cnting":0,
	"ClrCnt":1,
	"OvLch": 0
	}
	
	Response: 200 OK

PATCH	Single/Multiple Channel Request:
	PATCH /di_value/slot_index
	Single Channel Request:
	PATCH /di_value/slot_index/ch_num
	
	[Example]
	
	Request: **PATCH /di_value/slot_0**
	
	Content-type: application/json
	{
	"DIVal": [
	{
	"Ch":2,
	"Cnting": 1
	},
	{
	"Ch":3,
	"OvLch":0
	}
	]
	}
	
	Response: 200 OK
	
	Request: **PATCH /di_value/slot_0/ch_3**
	Content-type: application/json
	{
	"Ch":3,
	"ClrCnt":1
	}
	
	Response: 200 OK

- JSON array name definition:

Field	Abbreviation	Data Type
Array of Digital input configurations	DIVal	Array

- Resource value definitions:

Field	Abbreviation	Data Type	Property	Description
Channel Number	Ch	Number	R	0, 1, …: Digital input channel number.
Mode	Md	Number	R	Digital input mode. 0 DI 1 Counter 2 LowToHighLatch 3 HighToLowLatch 4 Frequency
Signal Logic Status	Stat	Number	R	1, 0: Input signal is Logic High or Low.
Channel Value	Val	Number	R	DI measurement data **Input Mode** / **Value Description** **DI** / **Logic Status of DI** **Counter** / **Counter Value** **LowToHighLatch** / **Logic status of DI** **HighToLowLatch** / **Logic status of DI** **Frequency** / **Frequency(unity 0.1 Hz**
Start Counter	Cnting	Number	RW	Start/Stop counter counting Read 1 : counter is counting 0 : not counting Write 1 : start counting 0 : stop counting
Clear Counter	ClrCnt	Number	W	1 : Clear the counter value
Get/Clear Counter Overflow or Latch Status	OvLch	Number	RW	counter overflow or latch status Read 1 : overflow/latch occurred. 0 : no overflow or latch Write 0 : clear the overflow or latch status

B.2.2 Digital Output

B.2.2.1 /do_value/slot_index/ch_num

Description	Retrieves information about the digital output value resource on specific slot.
URL Structure	http://10.0.0.1/do_value/slot_index http://10.0.0.1/do_value/slot_index/ch_num
HTTP Method	GET:Returns the representation of all of digital output value resource. PUT:Replace all of digital output value resource PATCH:Apply partial modifications to digital output value resource.

GET	Multiple Channel Request:
	GET /do_value/slot_index
	Single Channel Request:
	GET /do_value/slot_index/ch_num
	
	[Example]
	
	Request: **GET /do_value/slot_0**
	
	Content-type: application/json
	Response: 200 OK
	{
	"DOVal": [
	{
	"Ch":0,
	"Md":0,
	"Stat":1,
	"Val":1,
	"PsCtn":0,
	"PsStop":0,
	"PsIV": 0
	},
	{
	"Ch":1,
	"Md":0,
	"Stat":0,
	"Val":0,
	"PsCtn":0,
	"PsStop":0,
	"PsIV": 0
	},
	{
	"Ch":2,
	"Md":1,
	"Stat":1,
	"Val":3378,
	"PsCtn":0,
	"PsStop":0,
	"PsIV": 0
	},
	{
	"Ch":3,
	"Md":3,
	"Stat":1,
	"Val":1,
	"PsCtn":0,
	"PsStop":0,
	"PsIV": 0
	}
	]
	}
	
	Request : **GET /do_value/slot_0/ch_2**
	
	Content-type: application/json
	Response: 200 OK
	{
	"Ch":2,
	"Md":0,
	"Stat":1,
	"Val":1,
	"PsCtn":0,
	"PsStop":0,
	"PsIV": 0
	}

PUT	Single/Multiple Channel Request:
	PUT /do_value/slot_index
	Single Channel Request:
	PUT /do_value/slot_index/ch_num
	
	[Example]
	
	Request: **PUT /do_value/slot_0**
	
	Content-type: application/json
	{
	"DOVal": [
	{
	"Ch":0,
	"Md":0,
	"Stat":1,
	"Val":1,
	"PsCtn":0,
	"PsStop":0,
	"PsIV": 0
	},
	{
	"Ch":1,
	"Md":0,
	"Stat":0,
	"Val":0,
	"PsCtn":0,
	"PsStop":0,
	"PsIV": 0
	},
	{
	"Ch":2,
	"Md":1,
	"Stat":1,
	"Val":3378,
	"PsCtn":0,
	"PsStop":0,
	"PsIV": 0
	},
	{
	"Ch":3,
	"Md":3,
	"Stat":1,
	"Val":1,
	"PsCtn":0,
	"PsStop":0,
	"PsIV": 0
	}
	]
	}
	
	Response: 200 OK
	
	Request: **PUT /do_value/slot_0/ch_2**
	
	Content-type: application/json
	{
	"Ch":2,
	"Md":2,
	"Stat":0,
	"Val":0,
	"PsCtn":0,
	"PsStop":0,
	"PsIV": 0
	}
	
	Response: 200 OK

PATCH	Single/Multiple Channel Request:
	PATCH /do_value/slot_index
	Single Channel Request:
	PATCH /do_value/slot_index/ch_num
	
	[Example]
	
	Request: **PATCH /do_value/slot_0**
	
	Content-type: application/json
	{
	"DOVal": [
	{
	"Ch":2,
	"Md": 2
	},
	{
	"Ch":3,
	"PsStop":1
	}
	]
	}
	
	Response: 200 OK
	
	Request: **PATCH /do_value/slot_0/ch_3**
	
	Content-type: application/json
	{
	"Ch":3,
	"PsCtn":1
	}
	
	Response: 200 OK

■ JSON array name definition:

Field	Abbreviation	Data Type
Array of Digital input configurations	DOVal	Array

■ Resource value definitions:

Field	Abbreviation	Data Type	Property	Description
Channel Number	Ch	Number	R	0, 1, …: Digital output channel number.
Mode	Md	Number	R	Digital output mode. 0 DO 1 Pulse Output 2 LowToHighDelay 3 HighToLowDelay
Signal Logic Status	Stat	Number	R	1, 0: Output signal is Logic High or Low.
Channel Value	Val	Number	RW	DO measurement data Output Mode Value Description DO Get the current signal status or set its status Pulse Output Get or set the absolute pulse count value LowToHighDelay Get the current signal status or set its status HighToLowDelay Get the current signal status or set its status
Pulse Output Continue State	PsCtn	Number	RW	1 / 0: Pulse outputting is continuous or not.
Stop Pulse Output	PsStop	Number	W	1: Stop the pulse outputting. (Continue is disabled, Absolute and incremental values are reset to zero. DO signal status is set to logic low.)
Incremental Pulse Output Value	PsIV	Number	RW	Incremental Pulse Output Value

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