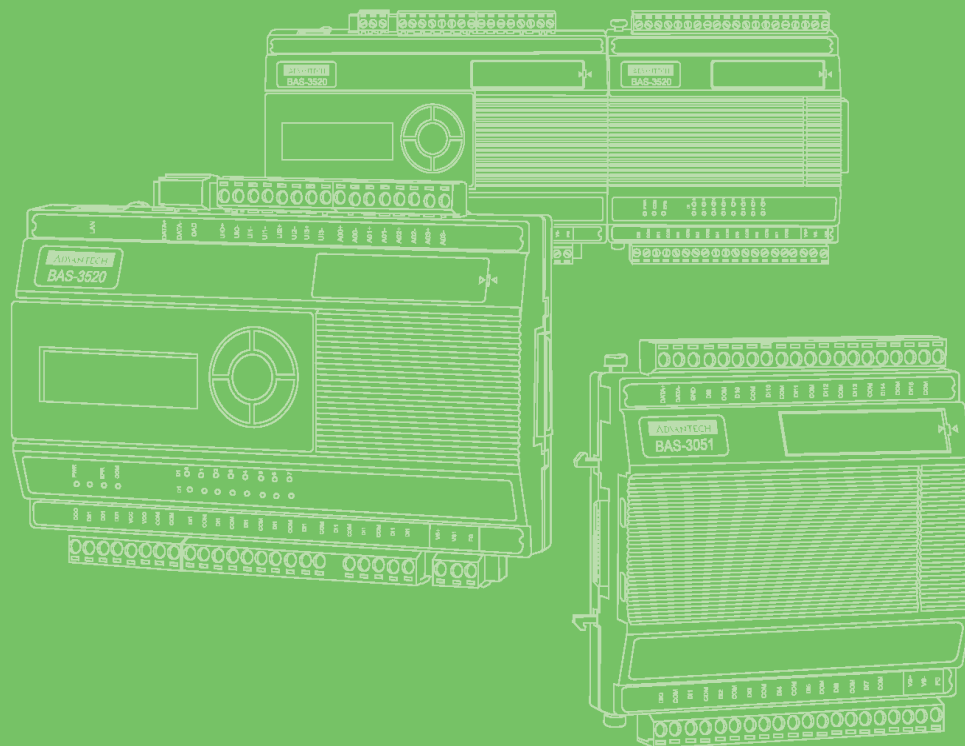


User Manual



BAS-3000 Series

Direct Digital Controller

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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.

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 merchandise 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.

Part No. XXXXXXXXXX

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Edition 1

May 2010

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.

CE

This product has passed the CE test for environmental specifications. Test conditions for passing included the equipment being operated within an industrial enclosure. In order to protect the product from being damaged by ESD (Electrostatic Discharge) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

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.

FCC Class B

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FM

This equipment has passed the FM certification. According to the National Fire Protection Association, work sites are classified into different classes, divisions and groups, based on hazard considerations. This equipment is compliant with the specifications of Class I, Division 2, Groups A, B, C and D indoor hazards.

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

Warnings, Cautions and Notes

Warning! *Warnings indicate conditions, which if not observed, can cause personal injury!*



Caution! *Cautions are included to help you avoid damaging hardware or losing data. e.g.*



There is a danger of a new battery exploding if it is incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

Note! *Notes provide optional additional information.*



Document Feedback

To assist us in making improvements to this manual, we would welcome comments and constructive criticism. Please send all such - in writing to: support@advantech.com

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.

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:
 15. The power cord or plug is damaged.
 16. Liquid has penetrated into the equipment.
 17. The equipment has been exposed to moisture.
 18. The equipment does not work well, or you cannot get it to work according to the user's manual.
 19. The equipment has been dropped and damaged.
 20. The equipment has obvious signs of breakage.
21. **DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW -20° C (-4° F) OR ABOVE 70° C (158° F). THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.**
22. **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.**
23. 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.

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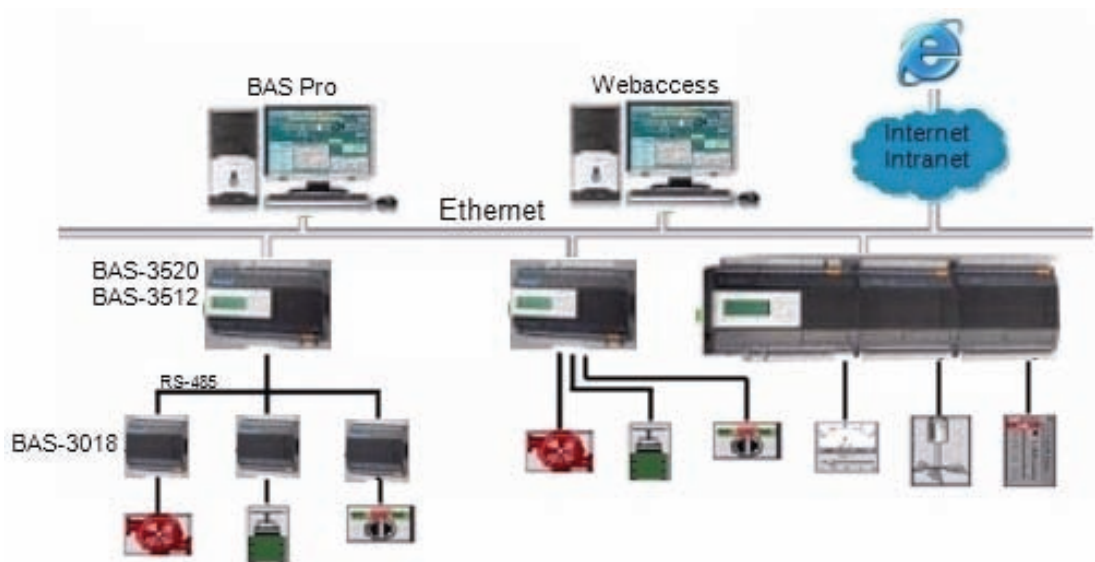
Chapter 1

System Overview

1.1 Introduction

The BAS-3000 series DDC (Direct Digital Controller) is a powerful integrated field controller, especially suitable for building automation applications. It communicates with the Host computer through Ethernet at the communication rate of 10/100 Mbps, which ensures the status of field equipments to be transmitted to upper computer quickly and accurately. BAS-3000 series provides several I/O options, including Analog Input (AI) channel, Analog Output (AO) channel, Digital Input (DI) channel, and Digital Output (DO) channel. BAS-3000 series controller provides an Ethernet network interface and a RS-485 communication port. The Ethernet interface is used to connect upper computer HMI and download logic programming. The RS-485 port is used for expanding remote I/O modules and third-party device expansion. The BAS-3000 series controller has built-in I/O channels. If the channels are not enough, you can use local or remote I/O expansion module to increase I/O channels. The BAS-3000 series controller both monitors and controls field devices distributed in a building by using BASPro (the powerful graphical configuration and programming software).

1.2 System Architecture



1.3 Features

- Fully Ethernet-based building automation controller
- The web server function allows the user to access data directly via standard web browser
- Powerful and Easy graphical configuration and programming software - BASPro
- Built-in specialized building automation domain function blocks which can be easily developed
- Ethernet connection at 10/100M, which ensures fast data communication
- Flexible I/O expansion options: up to 3 local I/O modules, up to 15 remote I/O modules (via RS-485)
- Real-time clock and watchdog timer
- Supports Modbus/TCP Client/Server protocol, Modbus RTU Master protocol
- Supports Auto-Tuning PID Control

1.3.1 Software

Graphical Programming

Graphical programming makes it convenient to develop device configuration and control logic; it can be easily mastered by developers. Programs developed with graphical programming are easy to modify, read, and maintain so as to shorten the project development duration and save cost. It supports at most 30 control pages.

Remote Access

The device supports Ethernet communication (including remote uploading and downloading of control logic), remote debugging, modification and monitoring of controller status, and IP configuration of remote DDC controller. Therefore, it makes it convenient to develop cross-area control management system.

Holiday and Schedule Configuration

The holiday and schedule configuration function allows the user to conveniently plan for holidays during the year. Four different periods of time can be configured and controlled separately for schedule configuration, which also provides with electrical period configuration. The schedule configuration function configures the periods of holidays differently from those of normal days. The user can control field device status by using various configuration parameters.

Flexible Control Module

Advantech BASPro integrates all control demands into function modules. This enables the user to complete control logic programming by simply dragging, combining, and connecting function modules, without needing to develop any control script.

Power Intelligent Building Control

Control modules designed for building automation control can solve any building control problems such as air-conditioner control, electrical energy saving control, and air environment control.

BAS-3000 DDC Automatic Scanning

The built-in automatic device scanning function can be used to scan BAS-3000 DDC devices, which are connected to Ethernet, in Builder. This enables the user to conveniently configure the field monitoring system.

Device Linkage

The device linkage configured by built-in logical function modules can be used to control devices. For example, by monitoring whether the windows are open or not, the user can control the start/ pause/ standby status of indoor air-conditioner ventilator. This could be implemented easily by dragging function modules in Advantech BASPro.

Time Synchronization

The built-in time synchronization module can either configure any DDC as the time server or client, or use an accurate external time source as the time server. This not only ensures the synchronized linkage between devices but also guarantees the accurate configuration of time and schedule.

1.3.2 TCP/IP Communication

The BAS-3000 series controller is a fully Ethernet-based controller. BAS-3000 controller can communicate with other device through Modbus/TCP Client/Server protocol.

1.3.3 RS-485 Communication

The BAS-3000 controller provides a serial communication port, which can be connected to various serial devices. The BAS-3000 can be connected with a maximum of 15 remote devices supporting Modbus/RTU Master.

1.3.4 Real-time Clock

BAS-3000 provides a real-time clock and a watchdog timer. When a system error occurs, the watchdog will reset automatically and the system will restart.

1.4 BAS-3000 Controller Specifications

1.4.1 General Specifications

Item	Description	
1.	CPU	32bits CPU processor, 320MHz
2.	System Memory	64MB SDRAM
3.	Flash Space	16MB (system) + 16MB (file)
4.	Watchdog	Built-in
5.	Real-time Clock	Battery powered real-time clock
6.	Serial Port	An isolated RS-485 terminal, automatic data flow control
7.	Ethernet Interface	10/100 Mbps
8.	Indicator	Four LEDs for indicating system status
9.	Backup RAM (Battery Powered)	512 KB
10.	I/O Expansion Amount	3 local and 15 remote I/O modules expansion at maximum
11.	Power Supply	24 VAC/ 24 VDC ($\pm 10\%$)
12.	Power Consumption	10 W @ 24 VDC
13.	Built-in I/O Channels	4 UI, 4 AO, 8 DI, 4 DO (BAS-3520) 8 DI, 4 DO (BAS-3512)
14.	Installation	Wall/ DIN-rail

1.4.2 BAS-3520 I/O Hardware Specifications

Universal Input

- Channels: 4
- Input Type: V, mA, RTD, Thermistor, DI (Dry Contact)
- Voltage Range: 0 ~ 10V
- Current Range: 0~20 mA, 4~20 mA
- RTD and Thermistor Type and Temperature Range:
 - Pt 100 (2-wire): -50 ~ 150° C
 - 0 ~ 100° C
 - 0 ~ 200° C
 - 0 ~ 400° C
 - 50 ~ 200° C
 - IEC RTD 100 ohms ($\alpha = 0.0385$)
 - JIS RTD 100 ohms ($\alpha = 0.0392$)
 - Pt 1000 (2-wire): -40 ~ 160° C
 - Thermistor 3k, 10 k: -20 ~ 100° C
- Input Impedance: > 2 M Ω (voltage), 120 Ω (current)
- Accuracy: $\pm 0.1\%$ or Better (voltage), $\pm 0.2\%$ or Better (current), $\pm 0.5^\circ \text{C}$ (RTD, Thermistor)
- Span Drift: ± 25 ppm/ $^\circ \text{C}$
- Zero Drift: ± 6 $\mu\text{V}/^\circ \text{C}$
- Resolution: 16-bit
- Sampling Rate: 10 sample/second
- CMR @ 50/60 Hz: 90 dB
- NMR @ 50/60 Hz: 60 dB
- Over Voltage Protection: ± 35 VDC
- Built-in TVS/ESD Protection
- Isolation Protection: 3000 VDC

Digital Input

- Channels: 8
- Dry Contact:
 - Logic level 0: Open
 - Logic level 1: Close to Ground
- Supports 1 kHz pulse input
- Supports 1 kHz pulse/accumulator input (maximum any 2 channels supported)
- Isolation Protection: 3000 VDC

Analog Output

- Channels: 4
- Range: 0 ~ 10 VDC, 0~20 mA, 4~20 mA
- Accuracy: $\pm 0.1\%$ of FSR (voltage), $\pm 0.2\%$ of FSR (current)
- Resolution: 12-bit
- Current Load Resistor: 0 ~ 500 Ω
- Isolation Protection: 3000 VDC
- Drift: ± 50 ppm/ $^\circ \text{C}$
- Common Ground

Digital Output

- Channels: 4
- Source type: 30 V @ 1 A (resistive load)
- Supports 1 kHz PWM output (maximum any 2 channels supported)
- Minimum PWM period: 0.1 second
- Maximum PWM period: 100 second
- Isolation Protection: 3000 VDC

1.4.3 BAS-3512 I/O Hardware Specifications

Digital Input

- Channels: 8
- Dry Contact:
 - Logic level 0: Open
 - Logic level 1: Close to Ground
- Supports 1 kHz pulse/accumulator input (maximum any 2 channels supported)
- Isolation Protection: 3000 VDC

Digital Output

- Channels: 4
- Source type: 30 V @ 1 A (resistive load)
- Supports 1 kHz PWM output (maximum any 2 channels supported)
- Minimum PWM period: 0.1 second
- Maximum PWM period: 100 second
- Isolation Protection: 3000 VDC

1.4.4 Environment

- Operating Temperature: -10~60°C
- Storage Temperature: -20~80°C
- Operating Humidity: 20~95% (non-condensing)
- Storage Humidity: 0 ~ 95% (non-condensing)

Note! Test is under 0.78~0.95 m/s air flow condition



Note! Static electricity will be generated if the relative humidity of environment is below 30%. Therefore, the user must take measures against static electricity, such as grounding.



1.4.5 Indicator

There are 4 system indicators located on the front panel of BAS-3000:

- 1) **Power:** Power indicator. The indicator will be turned on when BAS-3000 is power on.
- 2) **Error:** System error indicator.
- 3) **RUN/Ready:** After the system complete the boot process, the indicator will be turned on. When the logic is running on the controller, indicator will flash.
- 4) **COMM:** The indicator will flash when there is transmission and receiving via RS-485.

In addition, there are multiple DI/O status indicators by the side of the system indicators. If the value of the digital input/output channel is logic high, its relative DI/O status indicator will be turned on.

1.5 BAS-3000 I/O Expansion Module Specifications

BAS-3000 I/O expansion modules can act as local or remote I/O expansion. For local I/O expansion, BAS-3000 I/O module directly stacks behind the BAS-3000 controller. For remote I/O expansion, BAS-3000 controller uses RS-485 to connect with BAS-3000 I/O module. Please refer to Chapter 2 for installation.

1.5.1 BAS-3050 Hardware Specifications

General

- Communication: RS-485/local bus
- Power Consumption: 4 W (max) @ 24 VDC
- Power Supply: 24 VAC/ 24 VDC ($\pm 10\%$) (used as remote I/O)

Digital Input

- Channels: 8
- Dry Contact:
 - Logic level 0: Open
 - Logic level 1: Close to Ground
- Supports 1 kHz pulse/accumulator input (maximum any 2 channels supported)
- Isolation Protection: 3000 VDC

Digital Output

- Channels: 8
- Source type: 30 V @ 1 A (resistive load)
- Supports 1 kHz PWM output (maximum any 2 channels supported)
- Minimum PWM period: 0.1 second
- Maximum PWM period: 100 second
- Isolation Protection: 3000 VDC

1.5.2 BAS-3051 Hardware Specifications

General

- Communication: RS-485/local bus
- Power Consumption: 3 W (max) @ 24 VDC
- Power Supply: 24 VAC/ 24 VDC ($\pm 10\%$) (used as remote I/O)

Digital Input

- Channels: 16
- Dry Contact:
 - Logic level 0: Open
 - Logic level 1: Close to Ground
- Supports 1 kHz pulse/accumulator input (maximum any 2 channels supported)
- Isolation Protection: 3000 VDC

1.5.3 BAS-3018 Hardware Specifications

General

- Communication: RS-485/local bus
- Power Consumption: 3 W (max) @ 24 VDC
- Power Supply: 24 VAC/ 24 VDC ($\pm 10\%$) (used as remote I/O)

Analog Input

- Channels: 8
- Input Type: V, mA, RTD, Thermistor, DI (Dry Contact)
- Voltage Range: 0 ~ 10V
- Current Range: 0~20 mA, 4~20 mA
- RTD and Thermistor Type and Temperature Range:
 - Pt 100 (2-wire):
 - 50 ~ 150° C
 - 0 ~ 100° C
 - 0 ~ 200° C
 - 0 ~ 400° C
 - 50 ~ 200° C
 - IEC RTD 100 ohms ($\alpha = 0.0385$)
 - JIS RTD 100 ohms ($\alpha = 0.0392$)
 - Pt 1000 (2-wire): -40 ~ 160° C
 - Thermistor 3k, 10 k: -20 ~ 100° C
- Input Impedance: > 2 M Ω (voltage), 120 Ω (current)
- Accuracy: $\pm 0.1\%$ or Better (voltage), $\pm 0.2\%$ or Better (current), $\pm 0.5^\circ$ C (RTD, Thermistor)
- Span Drift: ± 25 ppm/ $^\circ$ C
- Zero Drift: ± 6 μ V/ $^\circ$ C
- Resolution: 16-bit
- Sampling Rate: 10 sample/second
- CMR @ 50/60 Hz: 90 dB
- NMR @ 50/60 Hz: 60 dB
- Over Voltage Protection: ± 35 VDC
- Built-in TVS/ESD Protection
- Isolation Protection: 3000 VDC

1.5.4 BAS-3024 Hardware Specifications

General

- Communication: RS-485/local bus
- Power Consumption: 4 W (max) @ 24 VDC
- Power Supply: 24 VAC/ 24 VDC ($\pm 10\%$) (used as remote I/O)
- Operating Temperature: 0~60°C
- Storage Temperature: -20~80°C
- Operating Humidity: 20~95%
- Storage Humidity: 0~95%

Analog Input

- Channels: 4
- Input Type: V, mA, RTD, Thermistor, DI (Dry Contact)
- Voltage Range: 0 ~ 10V
- Current Range: 0~20 mA, 4~20 mA
- RTD and Thermistor Type and Temperature Range:
 - Pt 100 (2-wire): -50 ~ 150° C
0 ~ 100° C
0 ~ 200° C
0 ~ 400° C
-50 ~ 200° C
 - IEC RTD 100 ohms ($\alpha = 0.0385$)
 - JIS RTD 100 ohms ($\alpha = 0.0392$)
 - Pt 1000 (2-wire): -40 ~ 160° C
 - Thermistor 3k, 10 k: -20 ~ 100° C
- Input Impedance: > 2 M Ω (voltage), 120 Ω (current)
- Accuracy: $\pm 0.1\%$ or Better (voltage), $\pm 0.2\%$ or Better (current), $\pm 0.5^\circ$ C (RTD, Thermistor)
- Span Drift: ± 25 ppm/ $^\circ$ C
- Zero Drift: ± 6 μ V/ $^\circ$ C
- Resolution: 16-bit
- Sampling Rate: 10 sample/second
- CMR @ 50/60 Hz: 90 dB
- NMR @ 50/60 Hz: 60 dB
- Over Voltage Protection: ± 35 VDC
- Built-in TVS/ESD Protection
- Isolation Protection: 3000 VDC

Analog Output

- Channels: 4
- Range: 0 ~ 10 VDC, 0~20 mA, 4~20 mA
- Accuracy: $\pm 0.1\%$ of FSR (voltage), $\pm 0.2\%$ of FSR (current)
- Resolution: 12-bit
- Current Load Resistor: 0 ~ 500 Ω
- Isolation Protection: 3000 VDC
- Drift: ± 50 ppm/ $^\circ$ C
- Common Ground

Digital Output

- Channels: 4
- Source type: 30 V @ 1 A (resistive load)
- Supports 1 kHz PWM output (maximum any 2 channels supported)
- Minimum PWM period: 0.1 second
- Maximum PWM period: 100 second
- Isolation Protection: 3000 VDC

1.5.5 Indicator

There are three system indicators on the front panel of the expansion module BAS-3000 I/O for indicating the running status.

- 1) **Power:** Power indicator. The indicator will be turned on when the expansion module is power on.
- 2) **COMM:** The indicator will flicker when the expansion module is running properly.
- 3) **Error:** System error indicator.

In addition, there are multiple DI/O status indicators by the side of the system indicators. If the value of the digital input/output channel is logic high, its relative DI/O status indicator will be turned on.

1.5.6 Environment

- Operating Temperature: 0~60°C
- Storage Temperature: -20~80°C
- Operating Humidity: 20~95% (non-condensing)
- Storage Humidity: 0 ~ 95% (non-condensing)

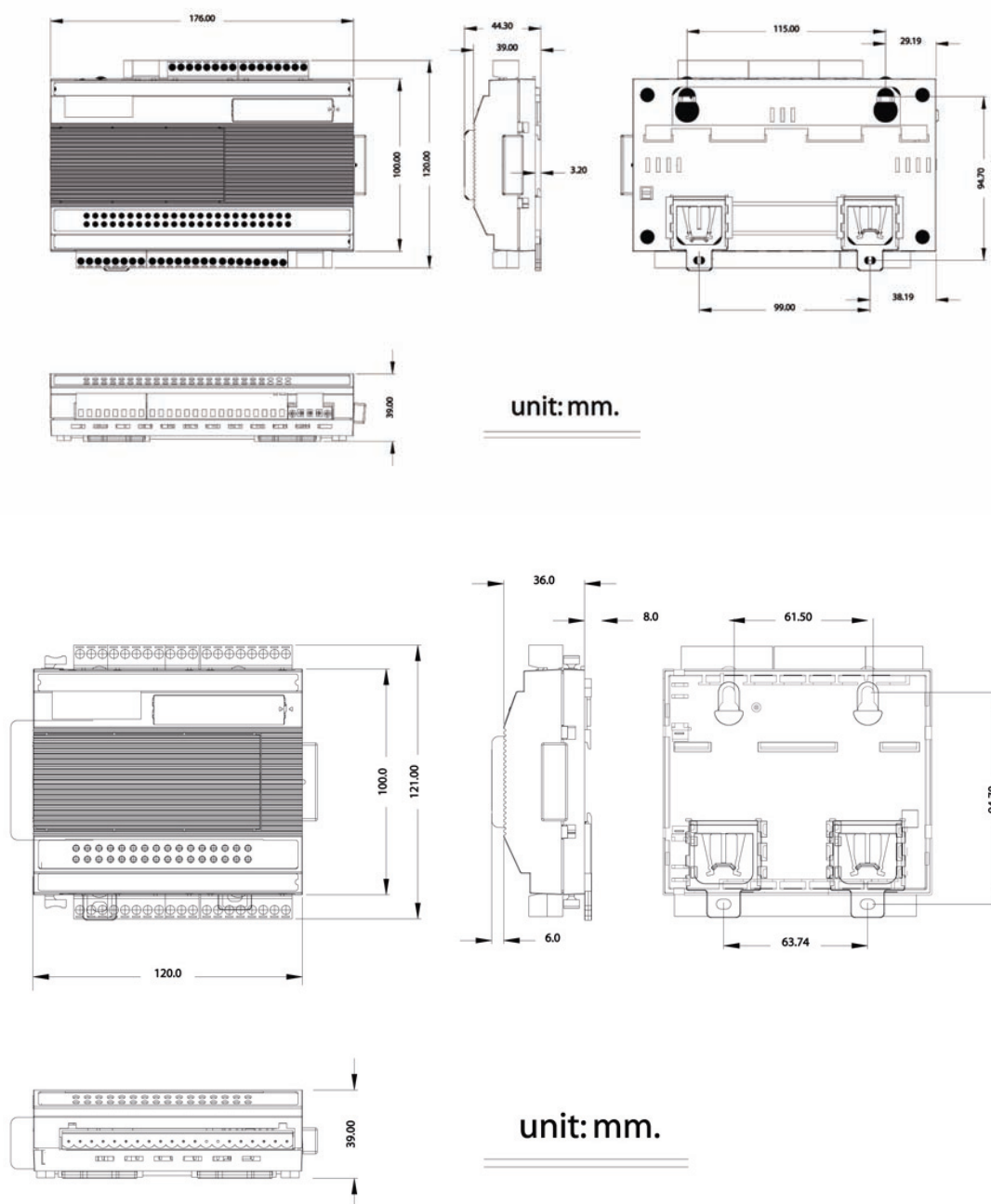
Note! Test was completed with less than 0.78~0.95 m/s air flow condition



Note! Static electricity will be generated if the relative humidity of environment is below 30%. Therefore, the user must take measures against static electricity, such as grounding.

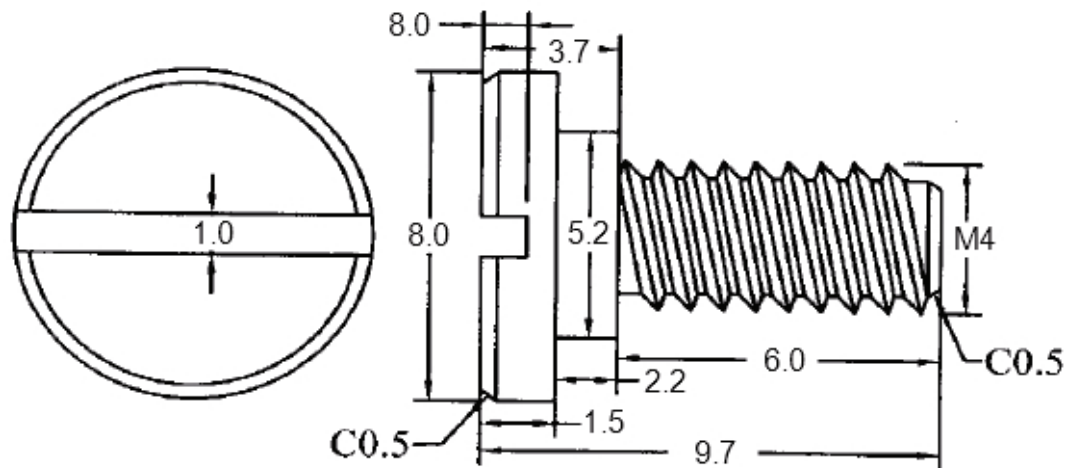


1.6 BAS-3000 Series Dimensions

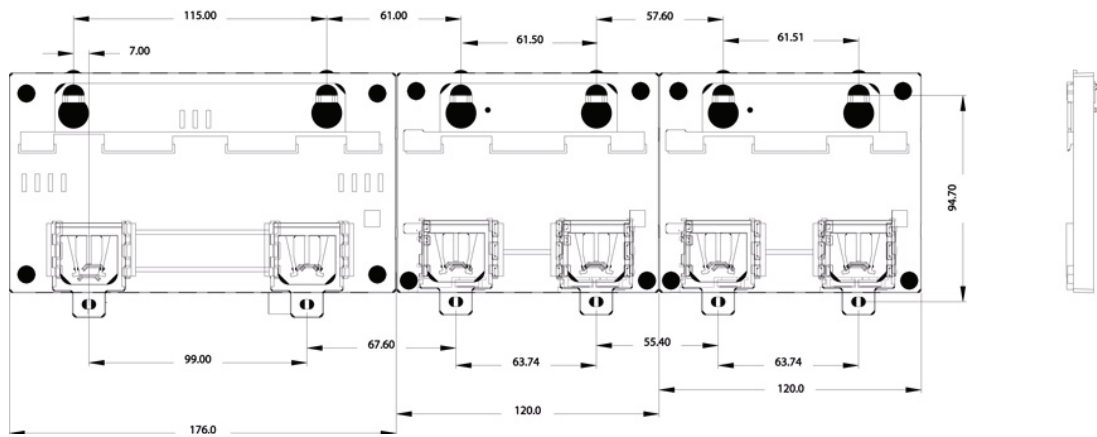


Wall Mount Screw Dimension

Unit : mm



1.7 BAS-3000 Wall Mounting Dimensions



Chapter 2

Installation

2.1 Pre-Installation Considerations

Host PC Requirements

- IBM PC compatible computer with Pentium 4 (1 GHz processor)
- Microsoft Windows 2000/XP
- At least 512 MB RAM
- 200 MB of hard disk space available
- VGA 256 colors monitor, 800X600 resolution
- CD-ROM
- Mouse or other pointing devices
- One Ethernet port

Power Supply Requirements

24VAC/DC power supply

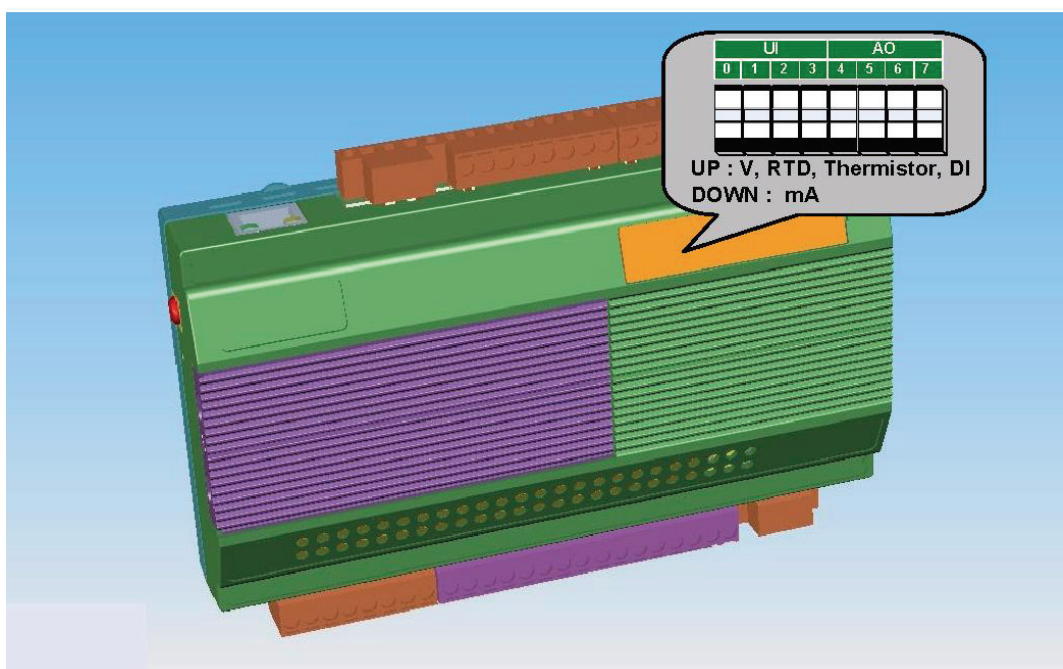
Communication and Network Cable Limits

The BAS-3500 has an external Ethernet interface which is 10/100M adaptive. The maximum transmission distance of network cable is 100 m; the user has to use a repeater if the distance is longer than 100 m.

2.2 System Installation

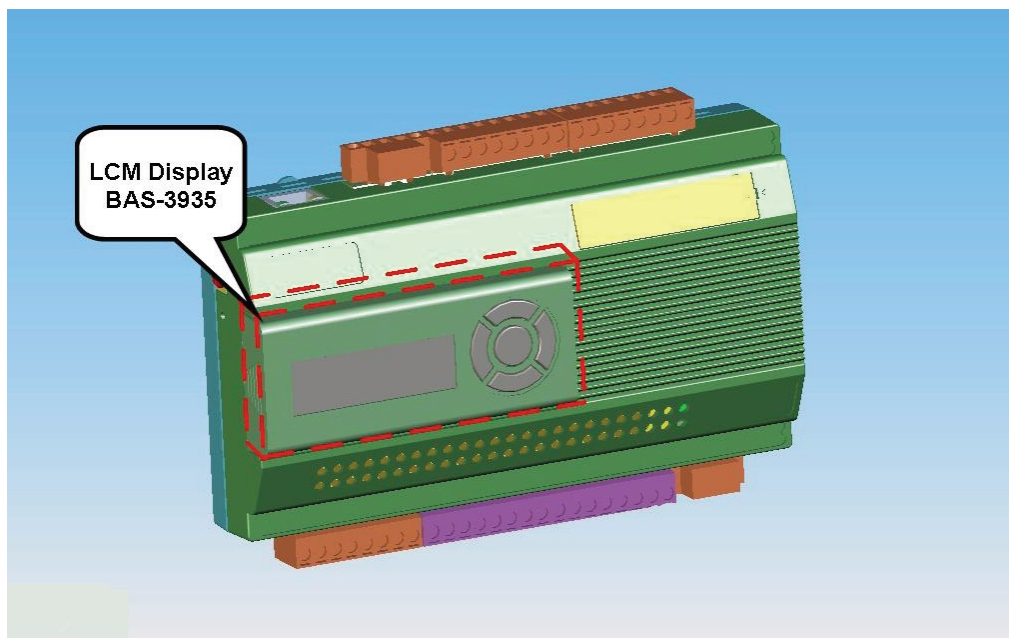
2.2.1 Controller

For BAS-3520, there are built-in analog input and output channels. You can use **DIP switch** to define the analog type (voltage or current). Please refer to the figure, you can find the location of the **DIP switch** and how to configure it.



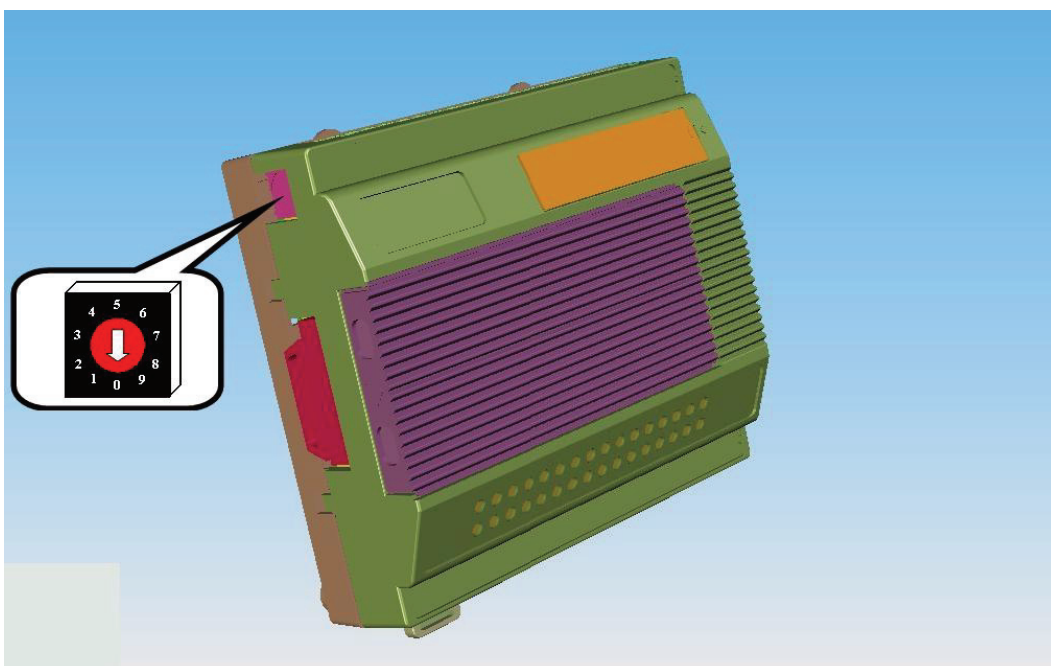
2.2.2 LCM Display Devices (Optional)

Advantech provides optional LCM display (BAS-3935) for system diagnosis and status display. If you have need for LCM display, please contact local sales people from Advantech or local distributor. You can insert LCM module on BAS-3000 controller directly or using a cable to connect LCM with the controller.

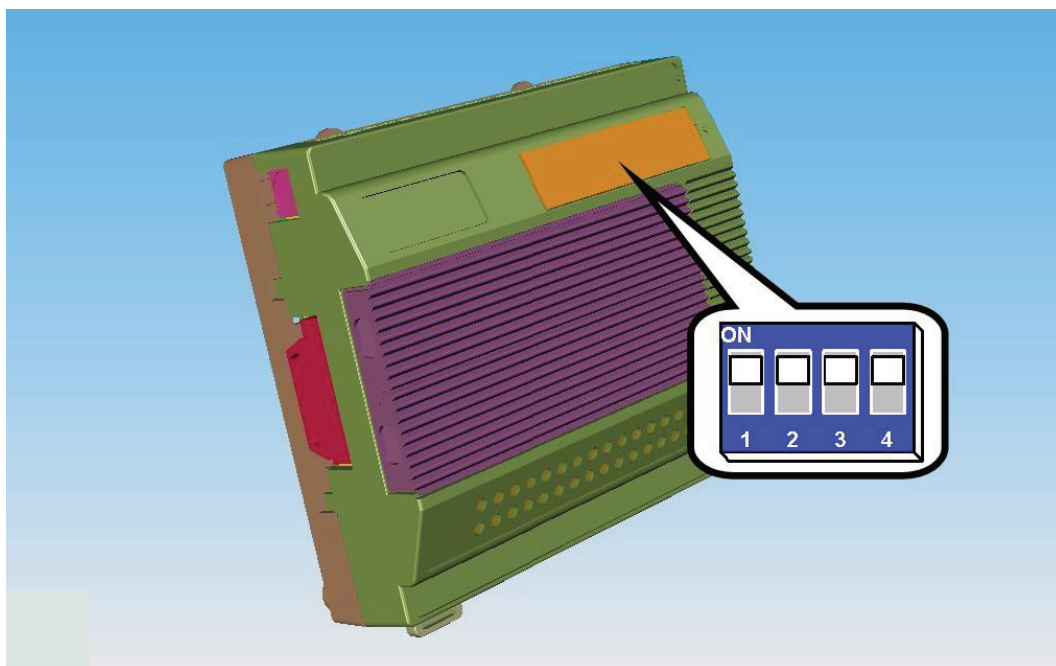


2.2.3 Local I/O Expansion

1. Set the **rotary switch** at the side of BAS-3000 I/O module to **position 0**. Refer to the figure below to see the location of the **rotary switch**.

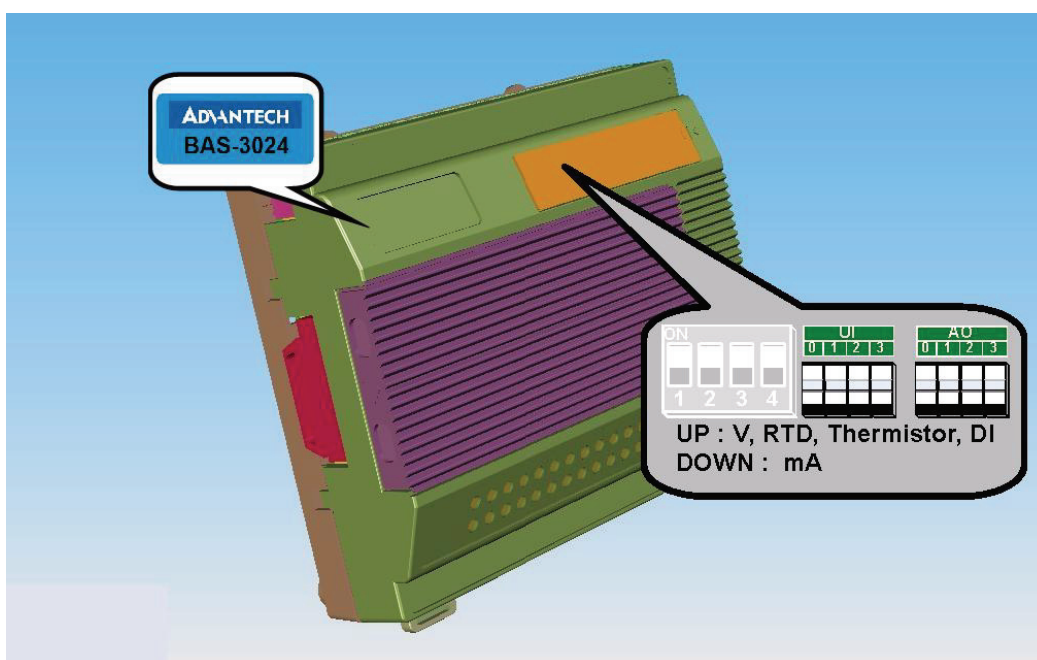
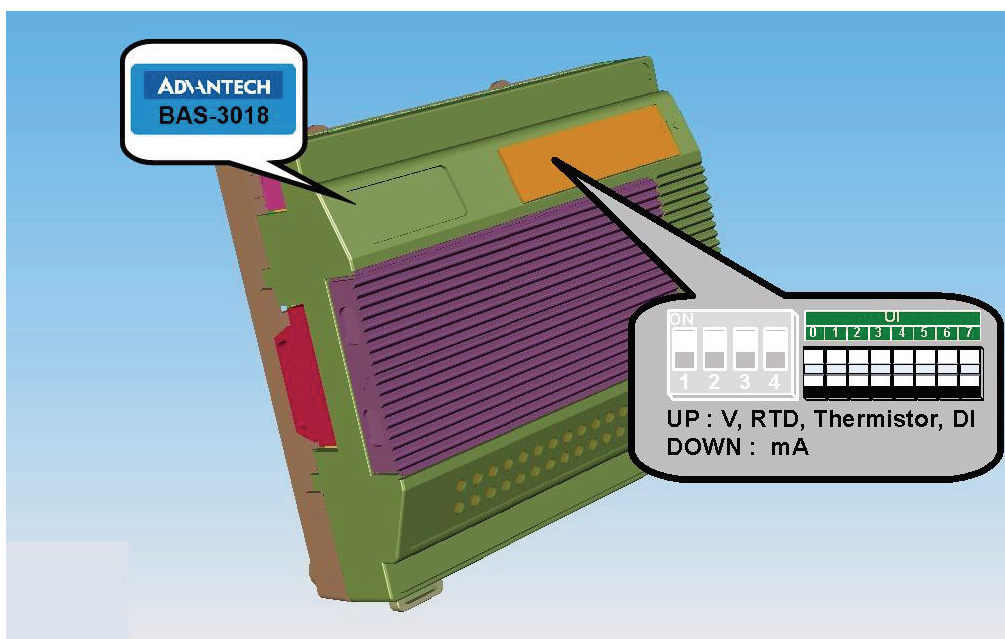


- Set the module ID by the **DIP switch**. Refer to the figure below to see the location of the **DIP switch**. Use screwdriver to open the cover to configure the **DIP switch**.

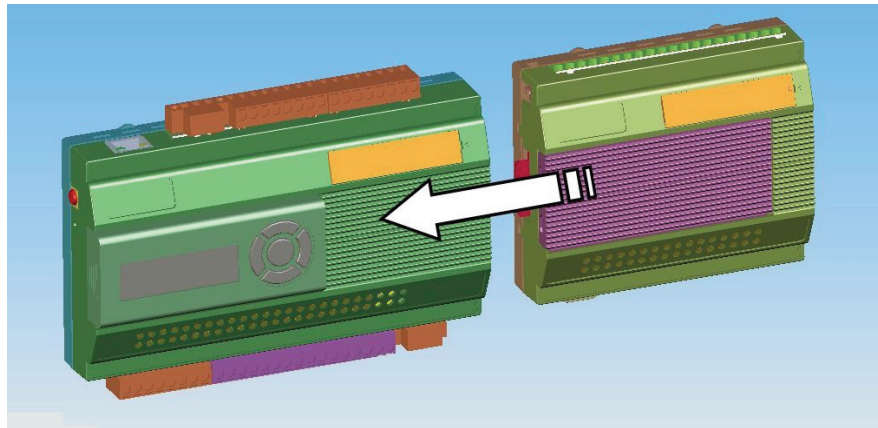


Node ID Table For I/O Expansion Module Setting					
		DIP Switch			
Expansion Type	ID	bit 1	bit 2	bit 3	bit 4
Local & Remote	1	1	0	0	0
	2	0	1	0	0
	3	1	1	0	0
Remote	4	0	0	1	0
	5	1	0	1	0
	6	0	1	1	0
	7	1	1	1	0
	8	0	0	0	1
	9	1	0	0	1
	10	0	1	0	1
	11	1	1	0	1
	12	0	0	1	1
	13	1	0	1	1
	14	0	1	1	1
	15	1	1	1	1
Notice : 1=ON , 0=OFF					

3. For analog input/output module (BAS-3018/3024), there are two **DIP switches**. One is used for the module ID. Another **DIP switch** is used to configure the analog type. Refer to figure below to see how to configure it.

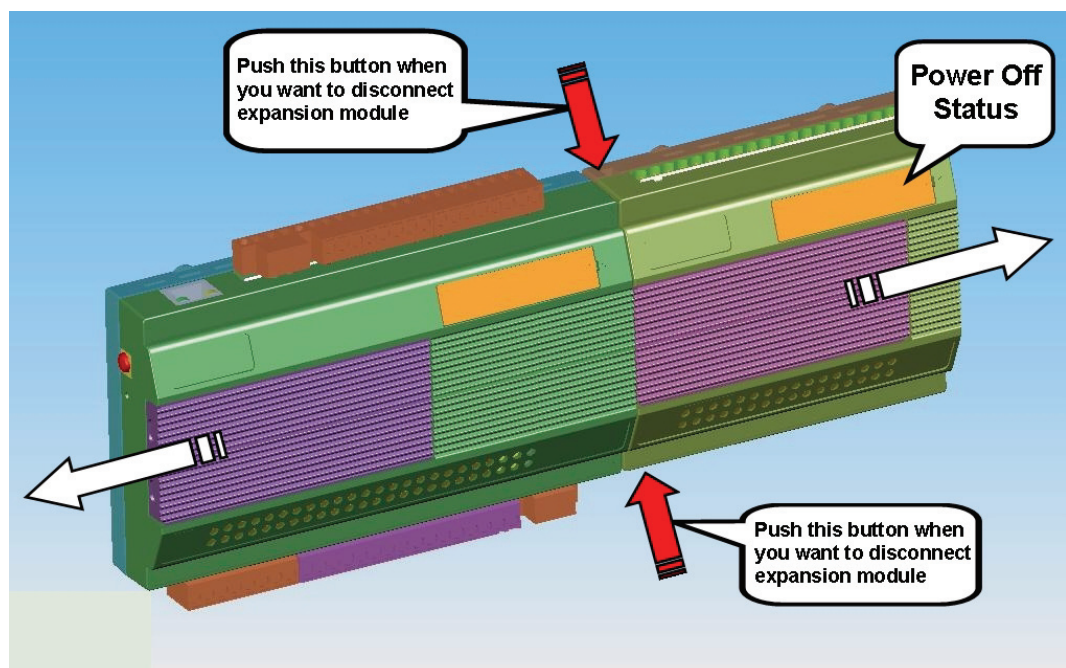
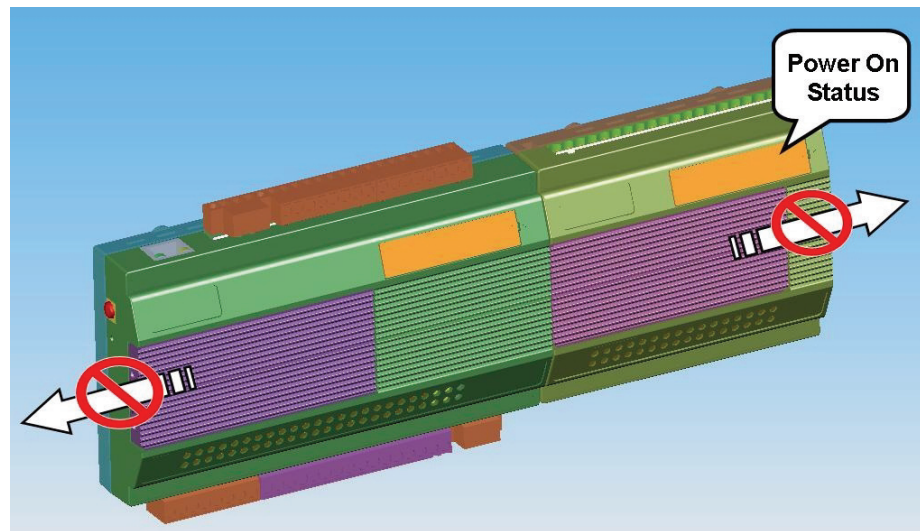


4. Connect BAS-3000 I/O expansion modules to the controller. The BAS-3000 I/O modules are stacked to the controller, sharing data exchange and power supply. Maximum 3 modules can connect to the controller.



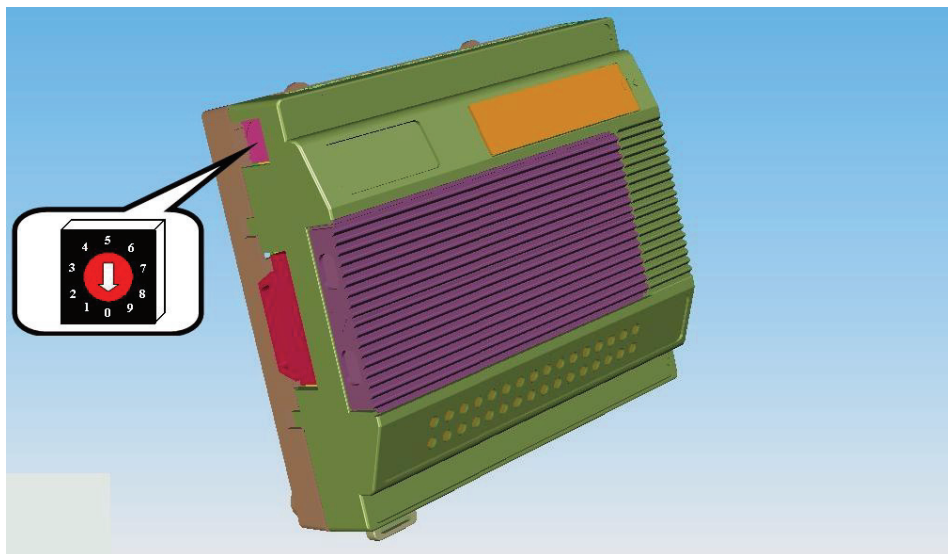
Attention!!

Please don't connect local I/O expansion modules to controller or disconnect local I/O expansion modules from controller during power-on status. In other words, local I/O expansion modules don't support hot-swap.



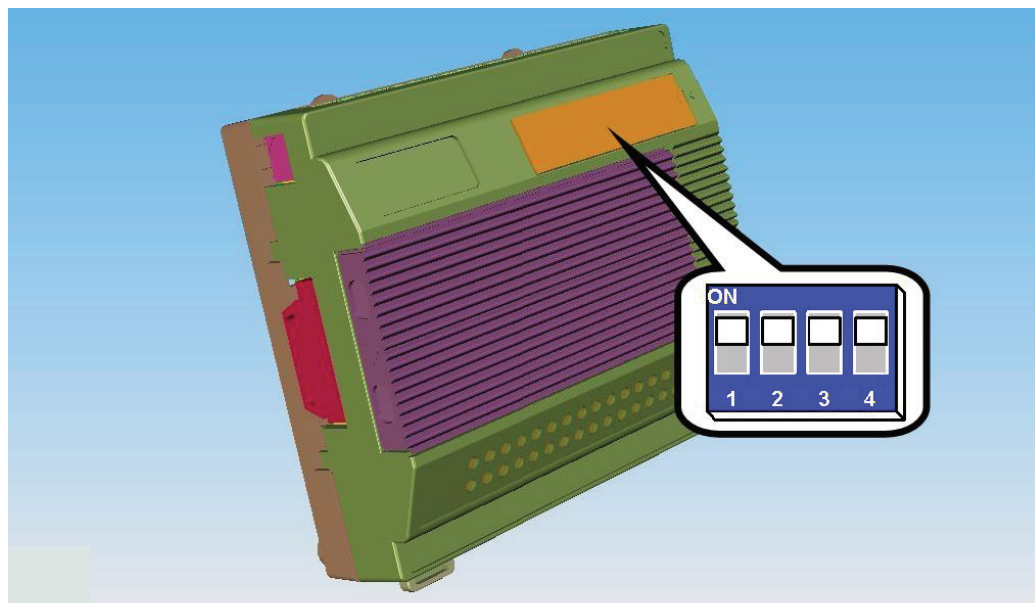
2.3 Remote I/O Expansion

1. Set the **rotary switch** at the side of BAS-3000 I/O module to define the baud rate for the RS-485 communication.



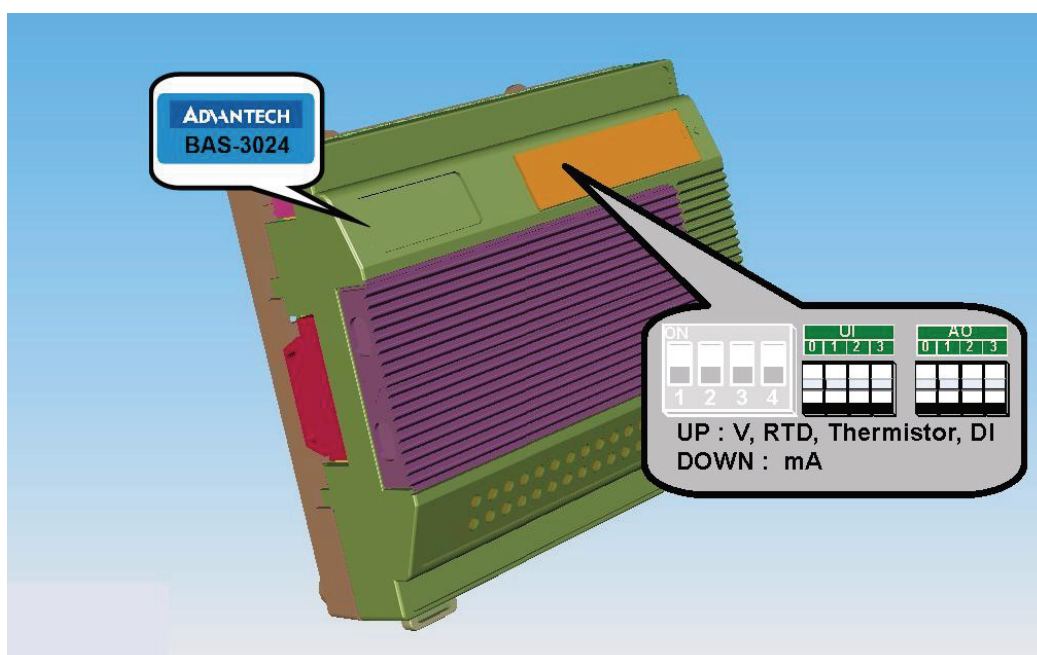
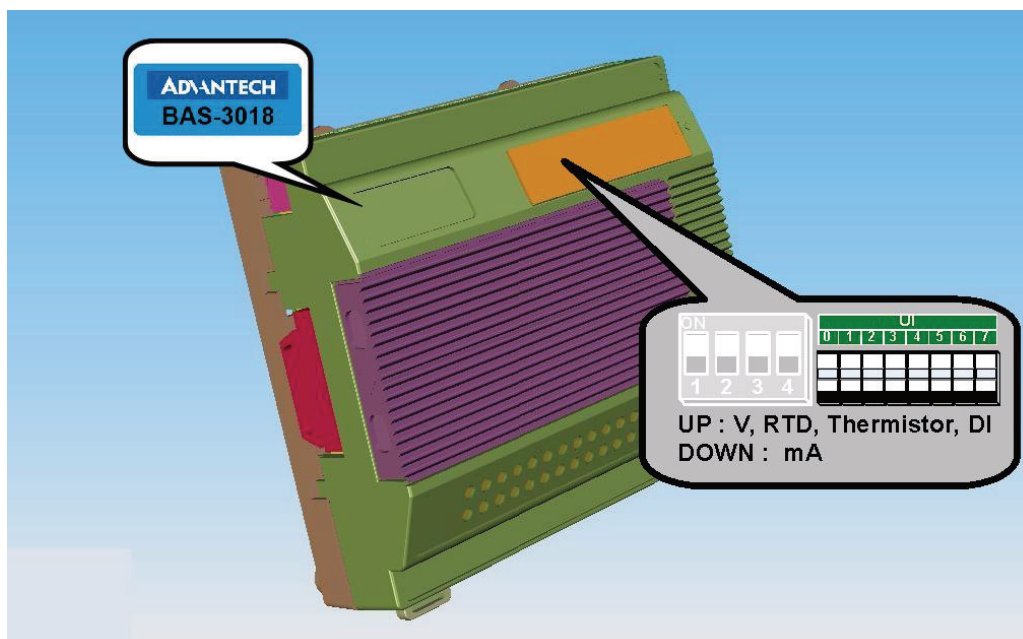
Baud Rate Table		
Rotary Switch	Baud Rate (bps)	Type
0	N/A	Local
1	N/A	Remote
2	N/A	
3	2400	
4	4800	
5	9600	
6	19200	
7	38400	
8	57600	
9	N/A	

2. Set the module ID by the **DIP switch**. Refer to the figure below to see the location of the **DIP switch**. Use screwdriver to open the cover to configure the **DIP switch**.



Node ID Table For I/O Expansion Module Setting					
		DIP Switch			
Expansion Type	ID	bit 1	bit 2	bit 3	bit 4
Local & Remote	1	1	0	0	0
	2	0	1	0	0
	3	1	1	0	0
Remote	4	0	0	1	0
	5	1	0	1	0
	6	0	1	1	0
	7	1	1	1	0
	8	0	0	0	1
	9	1	0	0	1
	10	0	1	0	1
	11	1	1	0	1
	12	0	0	1	1
	13	1	0	1	1
	14	0	1	1	1
	15	1	1	1	1
Notice : 1=ON , 0=OFF					

3. For analog input/output module (BAS-3018/3024), there are two **DIP switches**. One is used for the module ID. Another **DIP switch** is used to configure the analog type. Refer to figure below to see how to configure it.



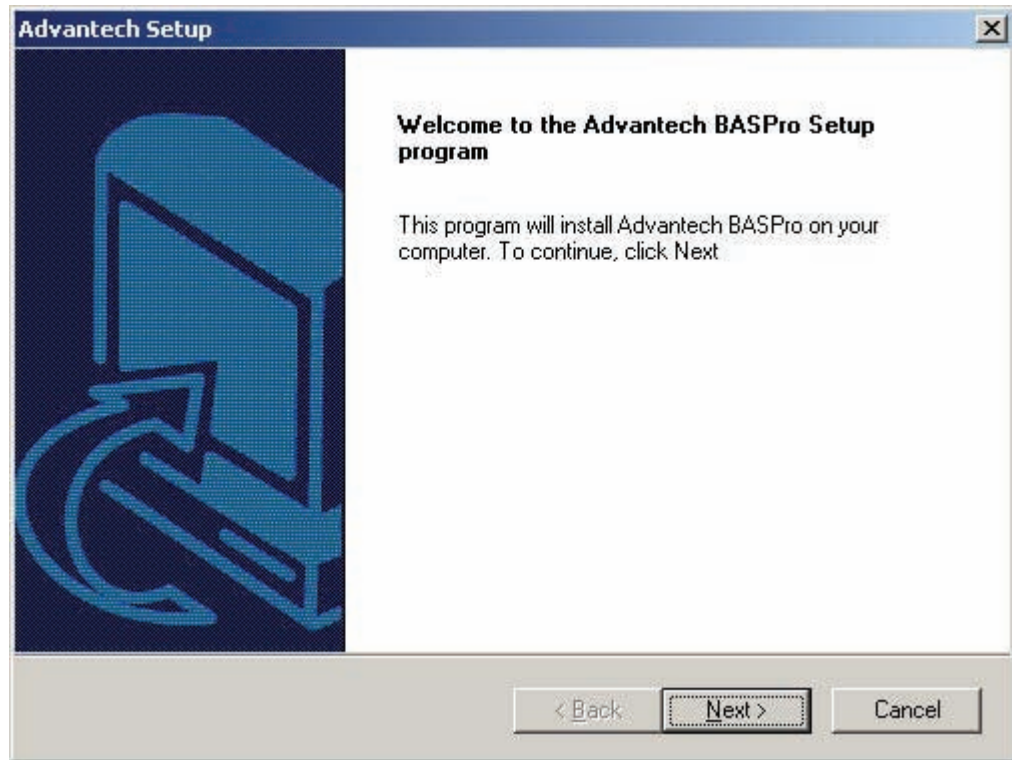
4. Connect BAS-3000 controller with remote BAS-3000 I/O expansion module through RS-485 wiring. (Connects all “Data+” and “Data-” connectors on BAS-3000 controller and remote I/O expansion modules together.) There are maximum 15 remote BAS-3000 I/O expansion module connected to the controller.

Chapter 3

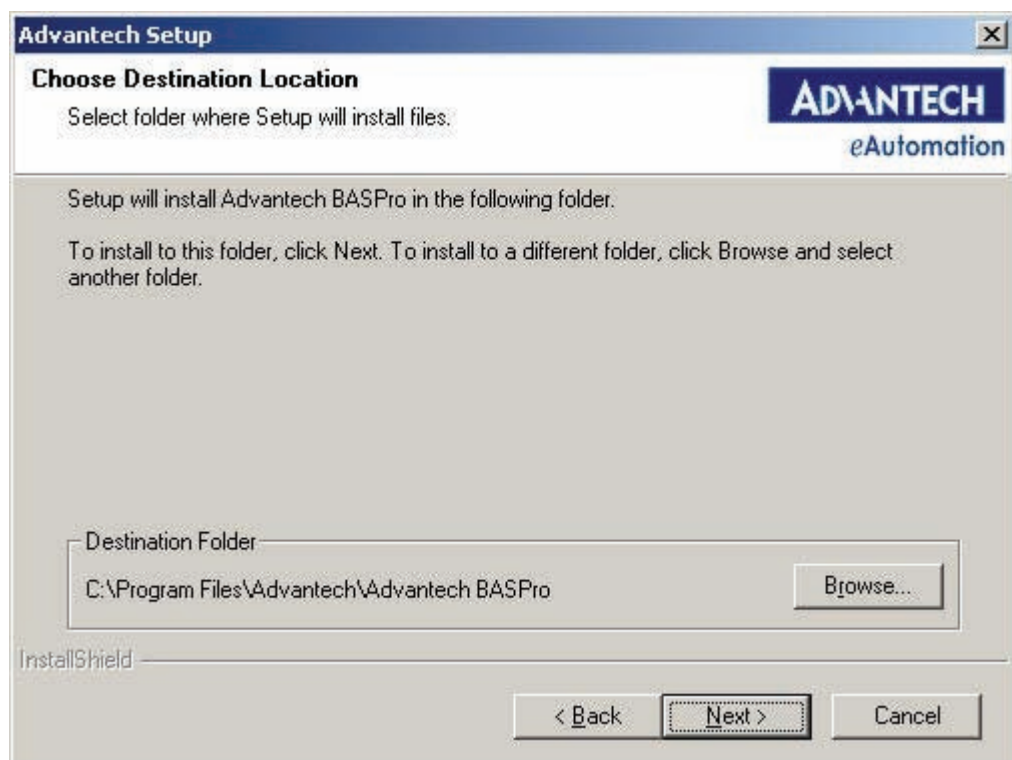
BASPro Builder

3.1 Install BASPro Builder

Step1. Insert the CD into your CD-ROM driver, it will automatically execute and there will one pop-up window showing. Click the "Install BASPro Programming Tool" button to launch BASPro Installation Wizard. The image will look as shown below:

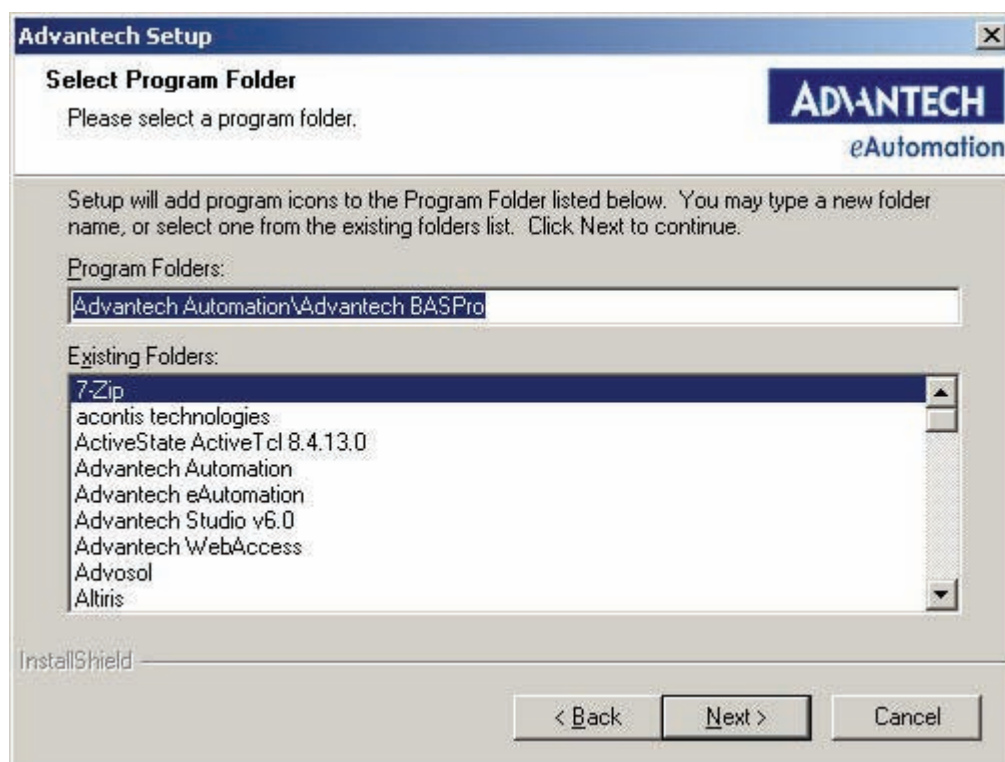


Step 2: Click "Next", the following message appears:

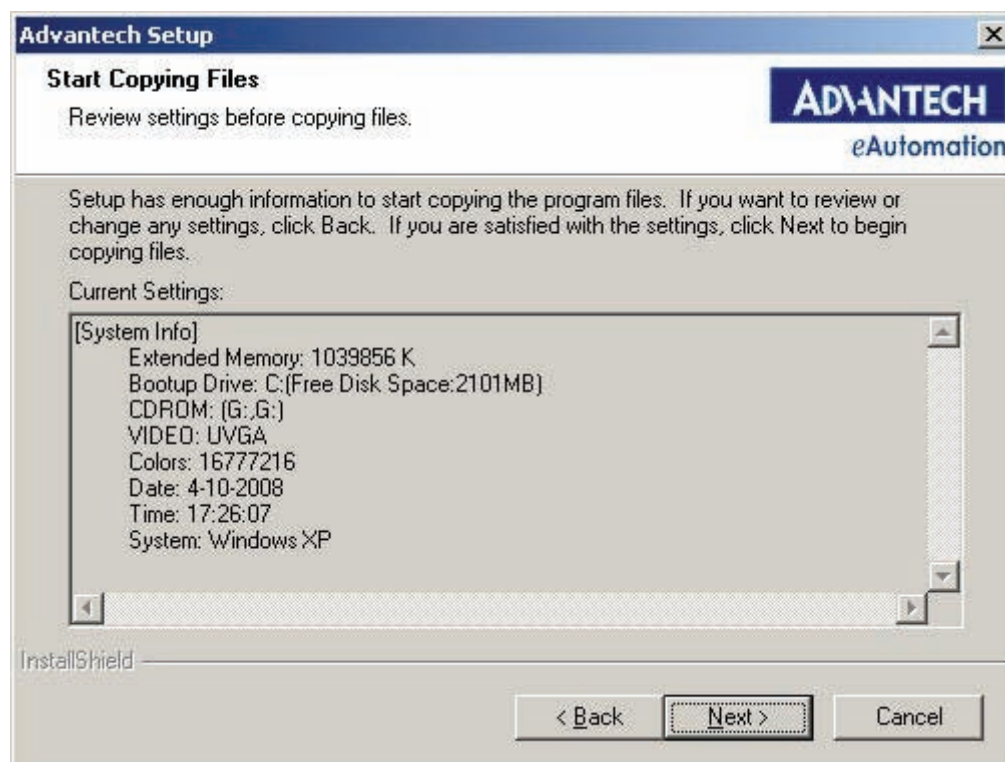


The default installation path is: C:\Program File\Advantech\Advantech BASPro. You can click "Modify" to change the installation path, then choose the installation path you want in the pop-up dialog box.

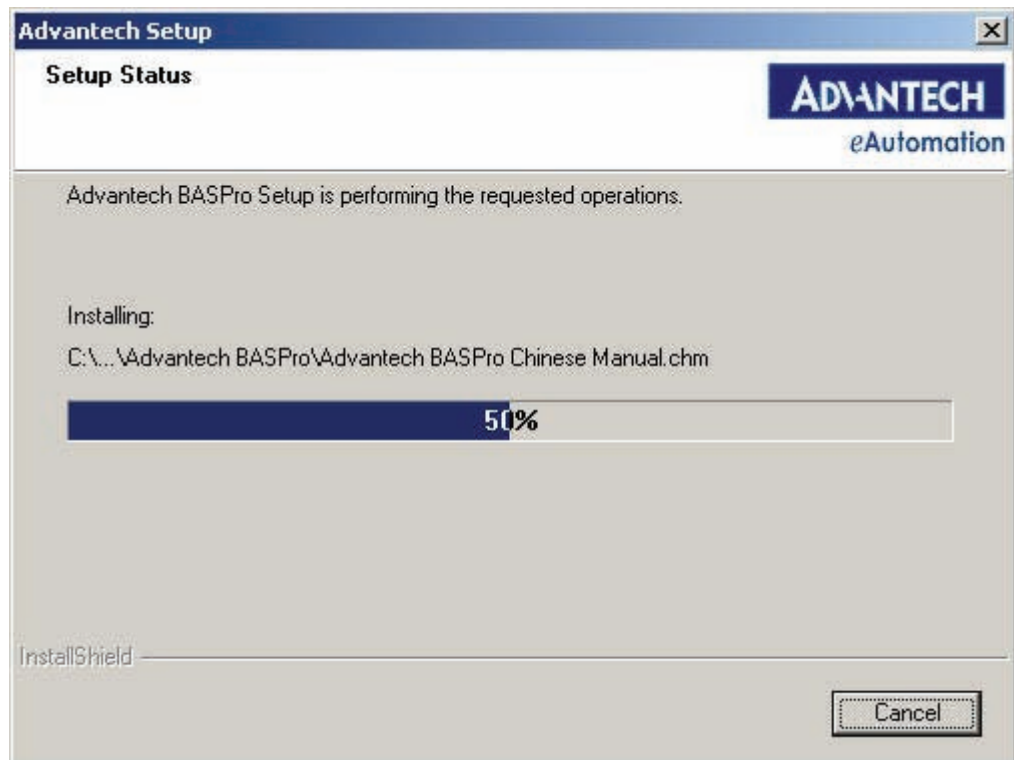
Step 3: Click "Next", the following message appears:



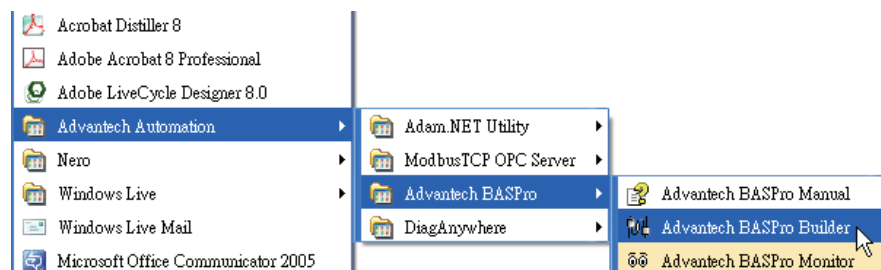
If you want to change the above options, please click "Back".



Step 4: Click "Install", the software will automatically finish the installation.

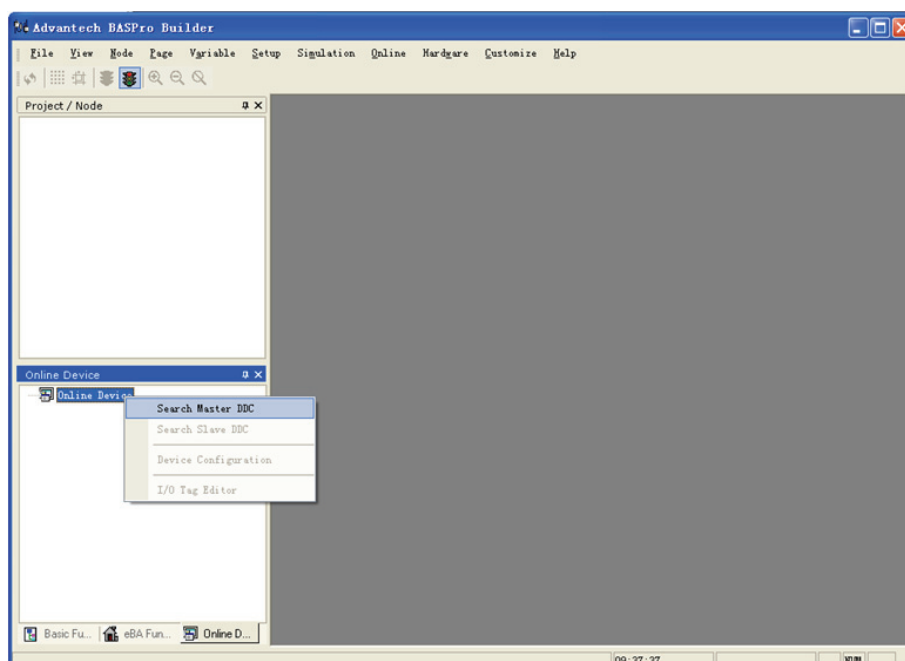


After you have installed the software properly, Advantech Automation\BASPro\BASPro Builder and Advantech Automation\BASPro\BASPro Monitor appear in the start menu.

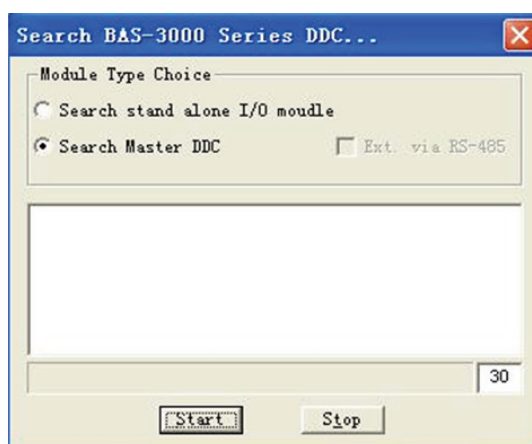


3.2 Configuring BAS-3000 I/O Hardware Settings

Launch BASPro. Click the “Online Device” tab on the left side. Right click on the Online Device item in the device tree window and choose “Search Master DDC”.



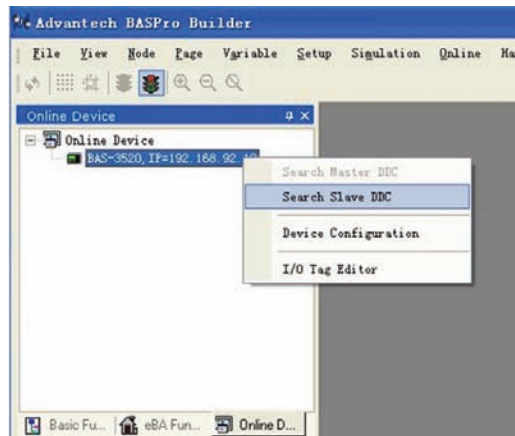
Choose the “Search Master DDC” and click the “Start” button. After you see the BAS-3000 controller shown, click the “Stop” button.



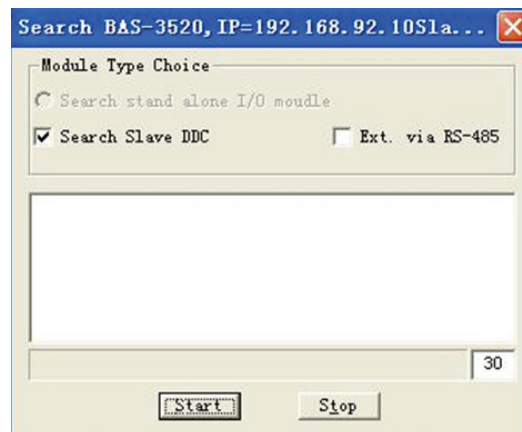
Note! When you find that you can't find your module, it may be caused by the firewall or anti-virus software.



Now the BAS-3000 controller item is shown in the device tree window. Right click the controller item and choose “Search Slave DDC” to find all the local I/O expansion modules.



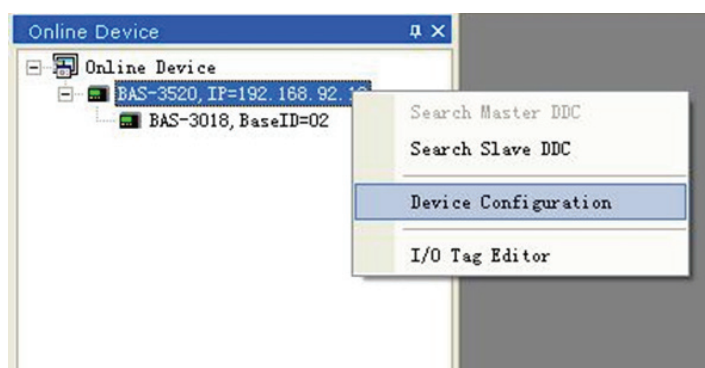
A search window will pop-up. Choose the “Search Slave DDC” and click the “Start” button. After you see all the BAS-3000 local I/O expansion modules shown, click the “Stop” button.



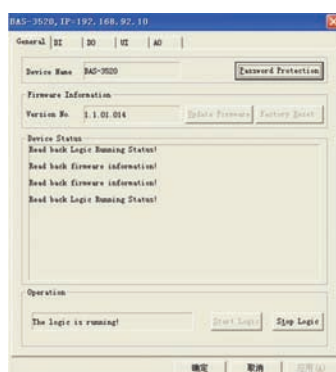
Now the found local I/O modules will appear under the BAS-3000 controller item in the device tree window. The “BaseID” represents the ID number of the local I/O expansion module.



You can configure all related hardware setting by right click the controller item in the device tree window and choose “Device Configuration”.



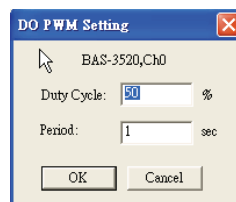
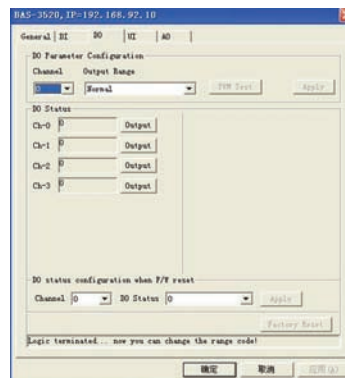
A pop-up window will appear and you can use this window to configure all settings. Taking BAS-3520 as example, there are 5 tabs on the window: **General**, **UI**, **AO**, **DI**, and **DO**. On the “**General**” tab, you can see the firmware version. You also can update the firmware by clicking the “Update firmware” button. (Note: You need to click the “Stop Logic” to terminate BASPro logic program running on the controller first, then you can download the firmware) Click the “Browser” button to find the correct firmware file, and then click the “Download” button to update the firmware to the BAS-3000 controller. When the download is complete, click the “Exit” button.



You can choose the “**DI**” tab to configure all digital input channels settings. You can select the channel you want to configure by the “Channel” combo box, and then choose the correct input type by the “Input Range” combo box. You can choose “DI”, “Accumulator” or “Pulse Input”. When you choose “Accumulator”, the digital input channel will count the pulse number of the input signal. When you choose “Pulse”, the digital input channel will read input signal frequency. You can define the counting and frequency reading is based on rising edge or falling edge by the “Edge Setting” combo box. After you have completed the setting for the specific channel, click the “Apply” button to save the setting. Besides, you also can read all digital input channel value in the “DI Status” area, by clicking the “Start” button for the channel you want to read.

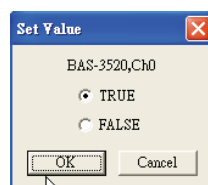


It is the same that you can choose the “**DO**” tab to configure all digital output channels settings. You can select the channel you want to configure by the “Channel” combo box, and then choose the correct input type by the “Output Range” combo box. You can choose “Normal” or “PWM Output”. When you choose “PWM Output”, you can click the “PWM test” to define the duty cycle and period. When you complete the setting, click the “OK” button. After you have completed the setting for the specific channel, click the “Apply” button to save the setting.

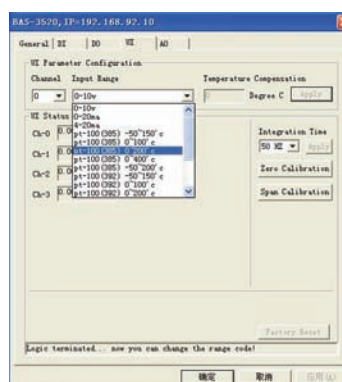


Besides, you can change the digital output channel value in the “DO status” area. Select the channel you want to control and click related “Output” button. A “Set Value” window will pop-up and you can choose the value by “True” or “False” radio button. After you choose the value, click the “OK” button to complete.

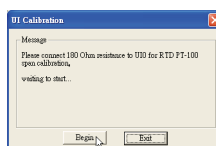




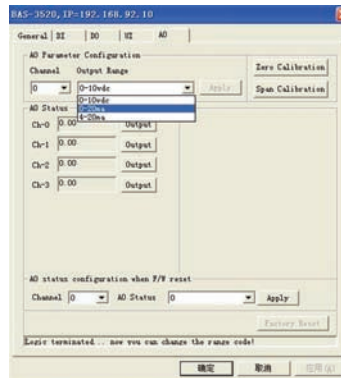
You can choose the “**UI**” tab to configure all universal input channels settings. You can select the channel you want to configure by the “Channel” combo box, and then choose the correct input type by the “Input Range” combo box. There are several different input types you can choose: voltage, current, RTD, Thermistor and digital input (DI). When you choose RTD or Thermistor input type, you can use “Temperature Compensation” text box to correct the temperature value by considering the lead resistance. After you have completed the setting for the specific channel, click the “Apply” button to save the setting.



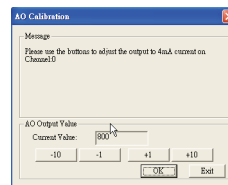
You can see current universal input channel value in the “UI Status” area. In order to increase the accuracy, BAS-3000 has built-in filter. You can choose to filter 50 or 60 Hz noise by choose the “Integrating Time” combo box. Once you change the filter setting, click the “Apply” button to save the setting. Besides, you also can perform span calibration and zero calibration by clicking the “Span Calibration” and “Zero Calibration”. After you click the calibration button, follow the instruction on the pop-up window, and click the “Begin” button to start calibration action. After you have completed the calibration, click the “Exit” button.



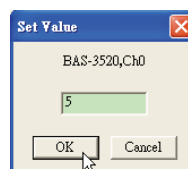
You can choose the “**AO**” tab to configure all analog output channels settings. You can select the channel you want to configure by the “Channel” combo box, and then choose the correct input type by the “Output Range” combo box. You can choose voltage or current. After you have completed the setting for the specific channel, click the “Apply” button to save the setting.



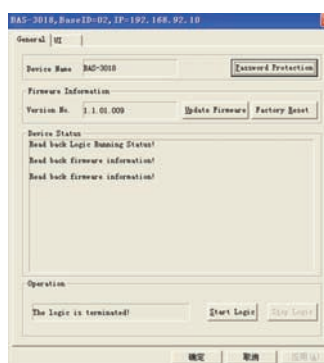
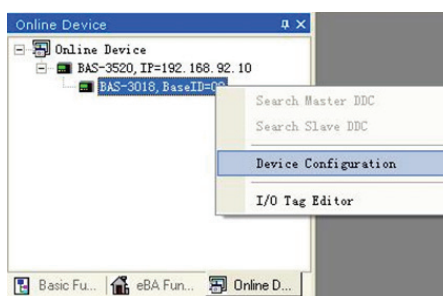
It is similar that you can play span calibration and zero calibration to analog output channel by clicking the “Span Calibration” and “Zero Calibration”. After you click the calibration button, follow the instruction on the pop-up window, and click the “OK” button to start calibration action. After you have completed the calibration, click the “Exit” button.



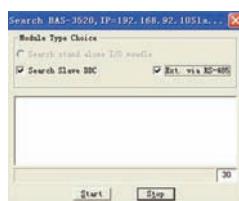
You can change analog output value in the “AO status” area. Select the channel you want to control and click related “Output” button. A “Set Value” window will pop-up and you can enter the value in the text box. After you choose the value, click the “OK” button to complete.



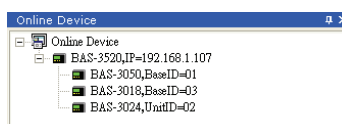
For the local I/O expansion modules, it is similar that you can configure all hardware setting by right click on the local I/O expansion module item, and then choose “Device Configuration”. All the hardware setting is similar to the setting for BAS-3000 controller.



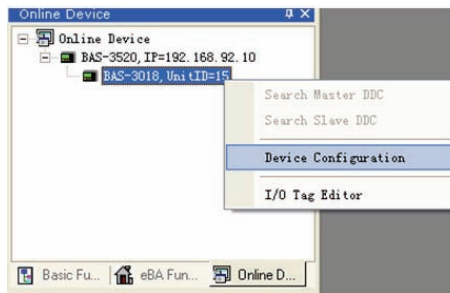
For the remote I/O expansion modules, you can find it by right click the BAS-3000 controller item in the device tree window, and choose “Search Slave DDC”. A Search window will pop-up, and then click the “Ext. via RS-485” and choose the “Search Slave DDC”. After that, click the “Start” button to search the local and remote I/O modules together. After you see all local and remote I/O expansion modules shown, click the “Stop” button.



Now, you can see all local and remote I/O expansion modules shown in the device tree window. The item with “BaseID” is local I/O expansion module, while the item with “UnitID” is remote I/O expansion module. The “BaseID” represents the ID number of the local I/O expansion module. The “UnitID” represents the ID number of the remote I/O expansion module.

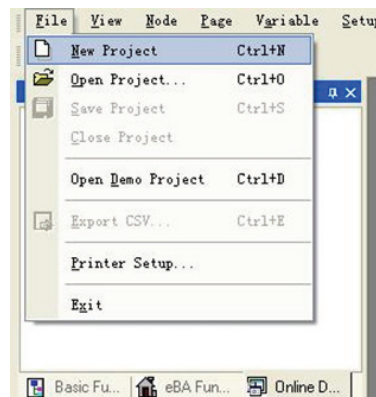


For the remote I/O expansion modules, it is similar that you can configure all hardware setting by right click on the remote I/O expansion module item, and then choose “Device Configuration”. All the hardware setting is similar to the setting for BAS-3000 controller.

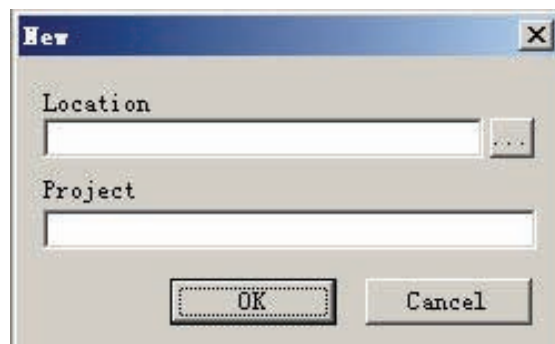


3.3 Create a Project

Run BASPro Builder, then click the "Create a new project" icon in the toolbar or "Create a new project" sub-menu in file menu.

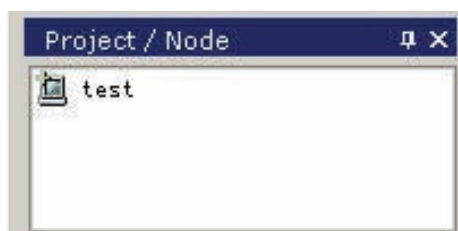


"Create a new project" dialog box appears:



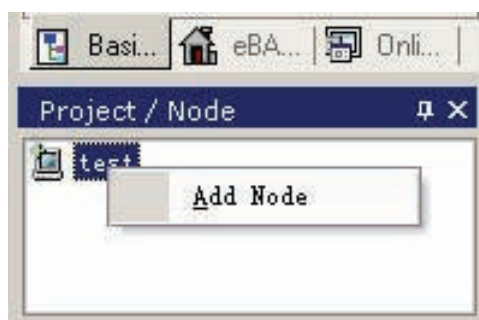
Please type the location where you want to save the project and the project name. Click button to browse disk path.

Note: The project name and path cannot contain any special characters.
Click "OK". A new project node appears in the left window:

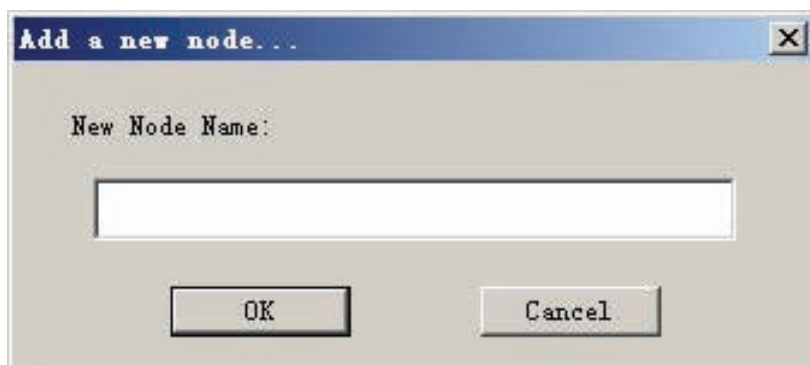


3.3.1 Add Nodes

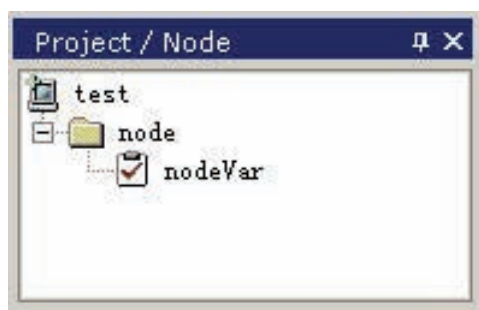
Right click project node, select "Add nodes" in the pop-up menu.



"Add new SCADA nodes" dialog box appears.



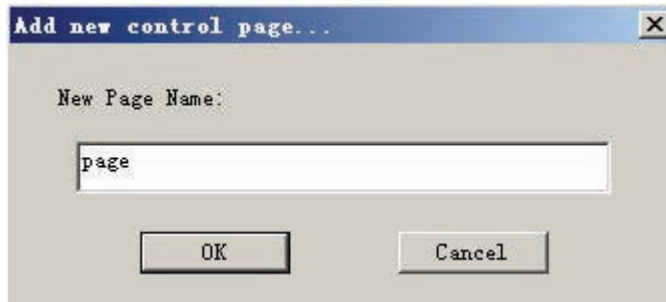
Type node name: node, then click "OK". Node information appears in the left window.



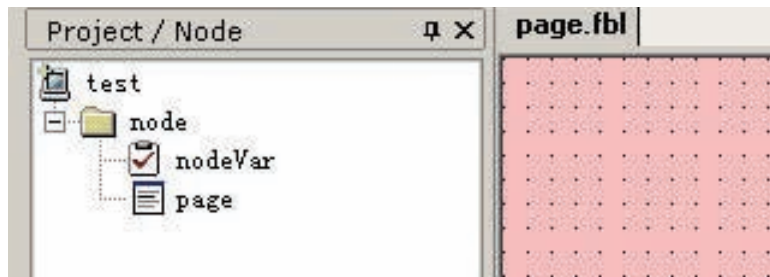
The nodeVar page will be added in the software automatically.

3.3.2 Add Control Pages

Right click node, and select "Add pages" in the pop-up menu.

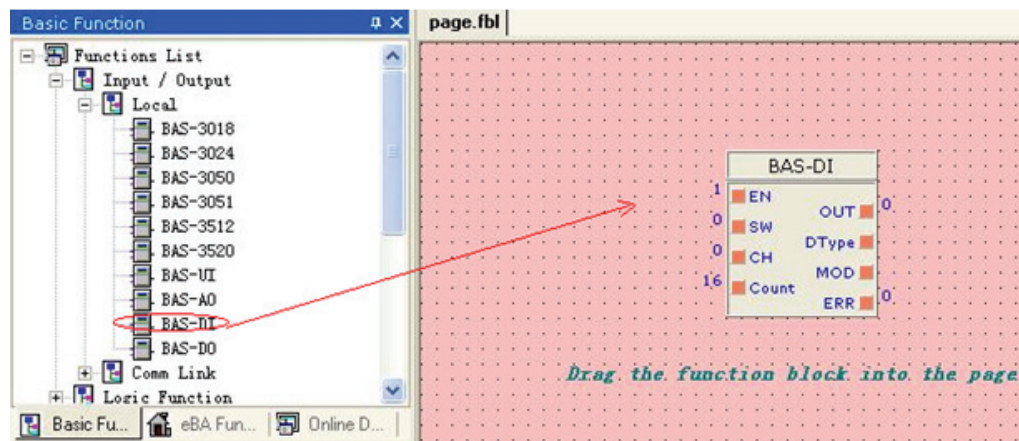


Type the page name, then click "OK". Page monitoring appears in the main window and a page subtree appears in the left window.



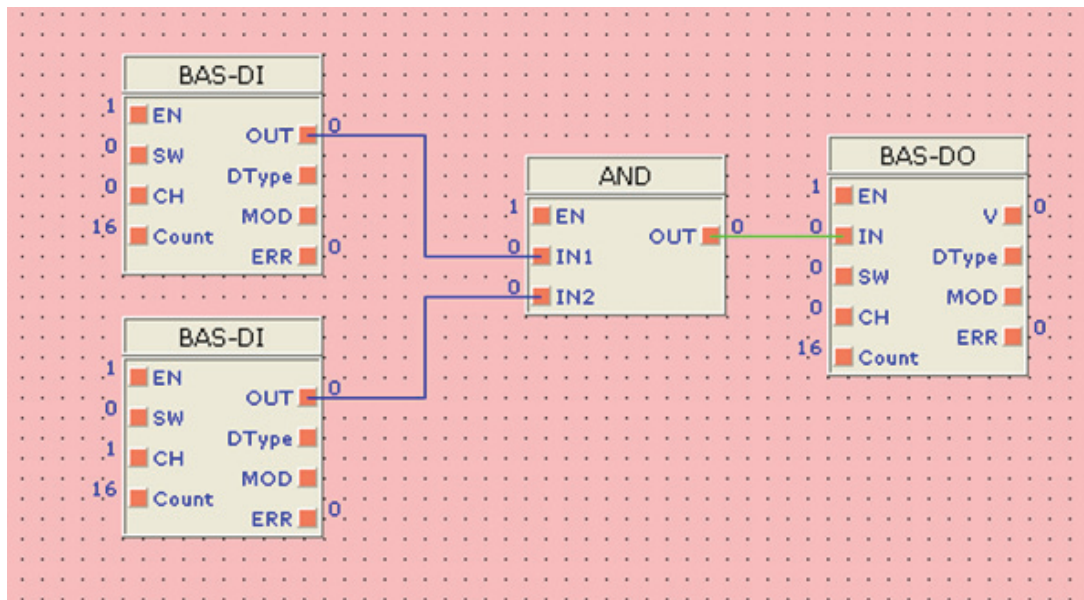
3.3.3 Insert Function Blocks into the Page

In the function block window, click the function block you want to insert with the left button of the mouse. Press the left button of the mouse and drag it to the control page.



3.3.4 Connections Between Function Blocks

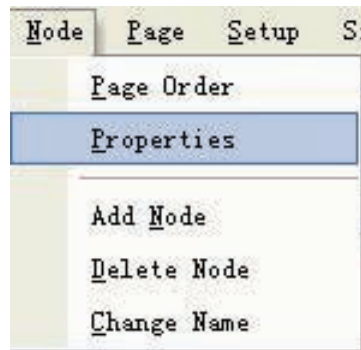
You can configure the field control logic through the function blocks in the control page. Also, you can simulate debugging running status of the logic in the control page. On the left of the function block are the input connectors, while the right are the output connectors. You can connect the output connectors to the input connectors.



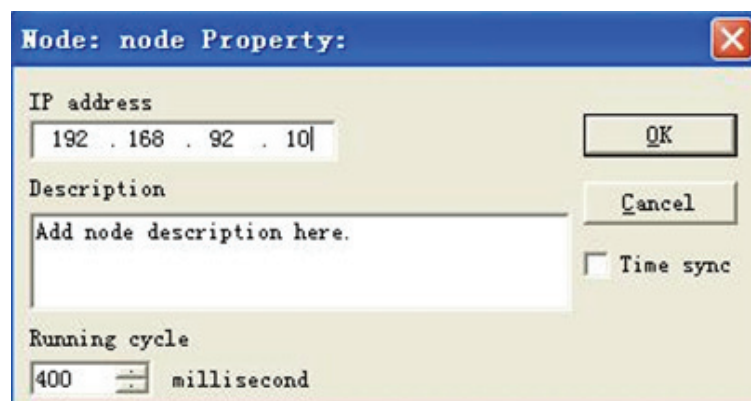
If you want to change the direction of the line, you can build an inflexion point in the control page by pressing left button of the mouse. If you want to cancel the operation, just right click. If you want to delete a connection, right click the line and select "Delete" in the pop-up menu.

3.3.5 Configure Node Properties

After designing control logic, you will have to configure node properties. Click node menu, then select "Properties" in the pop-up menu.



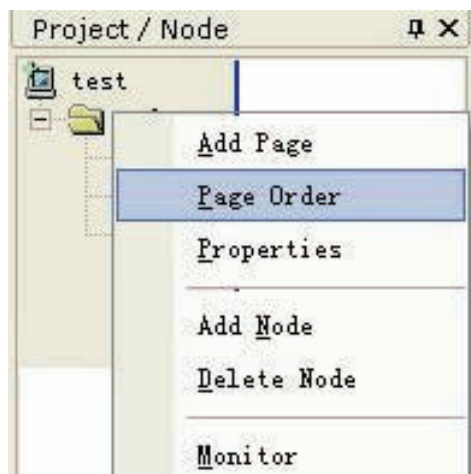
The following dialog box appears:



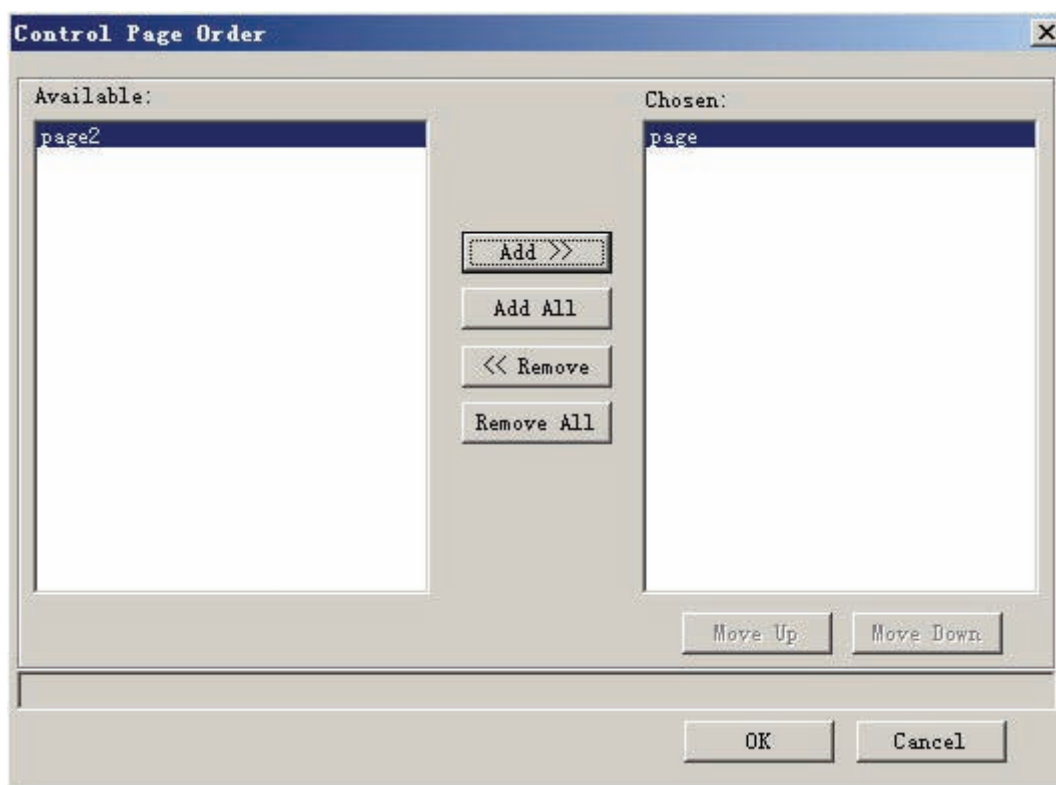
Type IP address of DDC device. Change the running cycle depending on the complexity of your control logic. Generally, 500 ms is recommended. BAS-3500 series controller offers Modbus TCP Server and Modbus RTU Server functions. By default, Advantech BASPro Builder supports DDC devices with Modbus TCP Server function.

3.3.6 Set Execution Sequence of Pages

If you have added multiple pages in the project, you will have to set the execution sequence of those pages:



Click "Execution sequence of control pages", the following dialog box appears:



Adjust the execution sequence with up and down buttons.

3.4 Download and Debug

The designed control logic should be downloaded to DDC device. This section demonstrates the downloading.

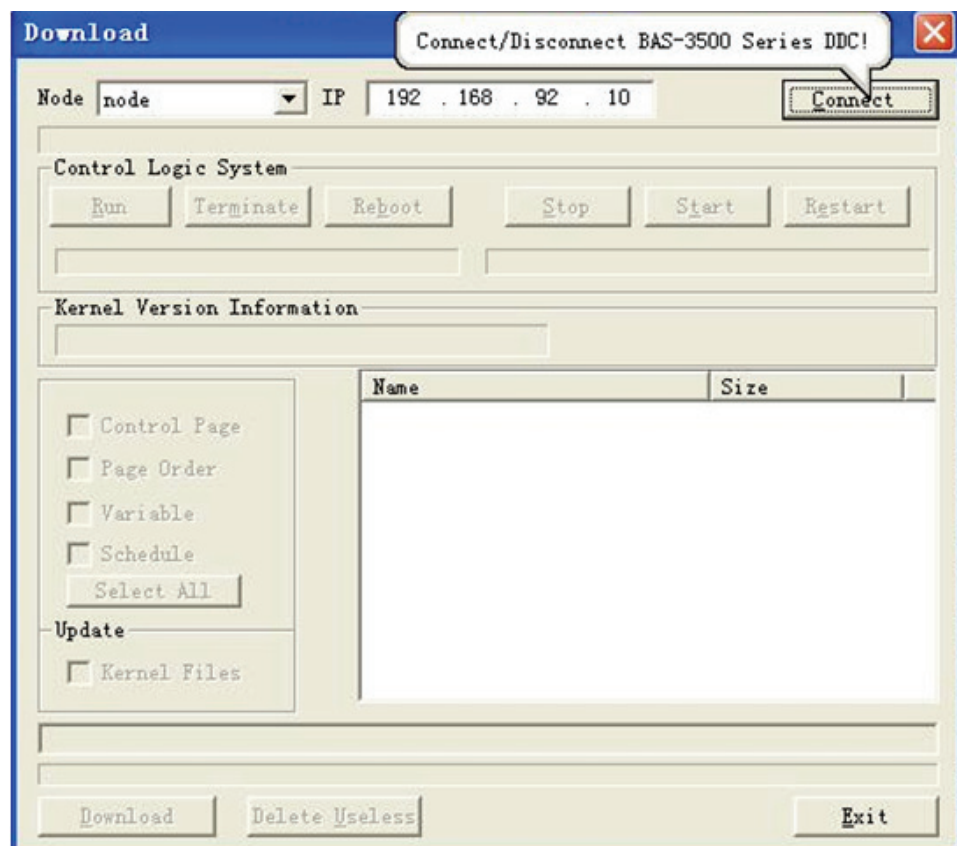
It is supposed that the user has built a SCADA node monitoring page and some function blocks.

Note! *The monitoring page has to be downloaded and restarted after each modification so that previous files could be replaced; or else, the files will just be saved in the computer and won't be implemented.*



Please follow the following steps to restart:

Step 1. Select "Download" in "Communication" menu, the following dialog box appears:



Step 2. Select node name from the drop-down list of node.

Note! *The IP here could not be changed and can only be modified in "Node Properties". Please confirm that the address shown is the same with the device address. If the IP address is incorrect or does not exist, then it will cost the system a period of time to search for the address. The user will be informed if no IP device is searched. Please wait patiently while the system is searching.*

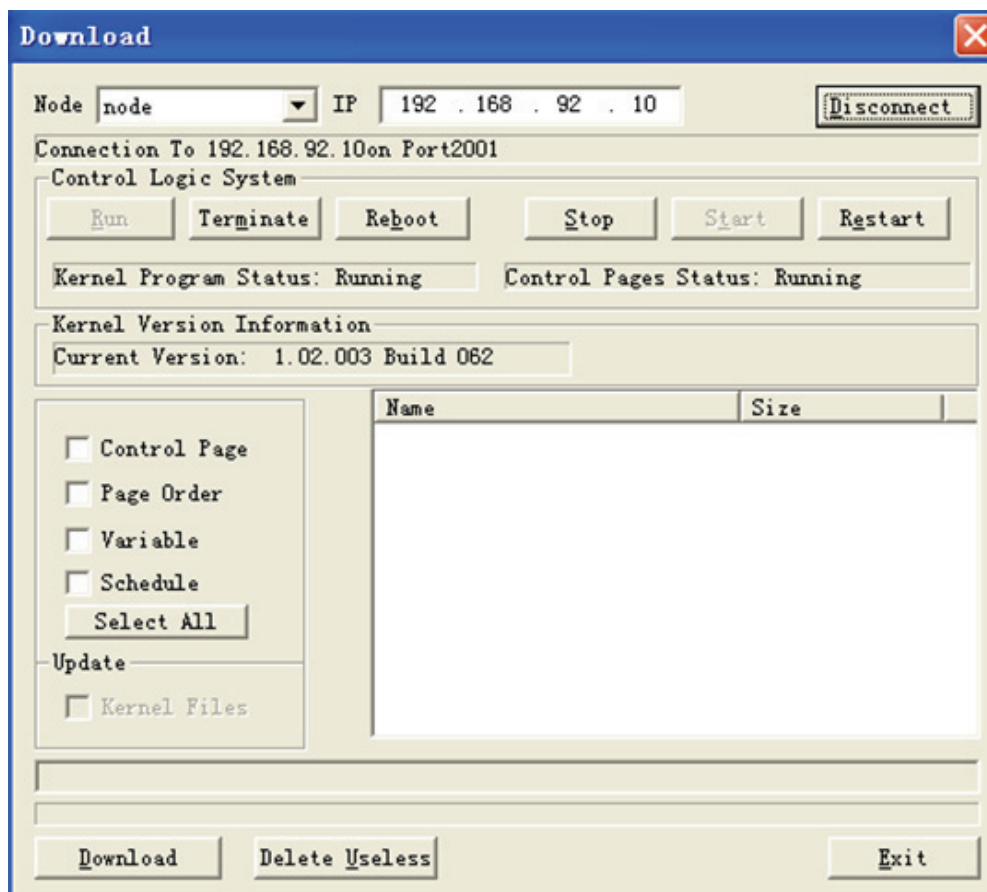


Step 3. Click "Connect".

After clicking “Connect”, the system will automatically be connected to DDC device. If the connection is successful, then “Connected to xxx.xxx.xxx.xxx port 2001” will be shown. “xxx.xxx.xxx.xxx” is the IP address of target DDC device of SCADA node. If the connection fails, the user will be informed.

Disconnect

If the connection is successful, the “Connect” button will alternate to “Disconnect” as shown below:



Step 4. Check DDC unit.

In the operating window, “Terminate”, “Restart System”, “Stop” and “Restart” commands are available. The user could view the operating status of logic executing program and monitoring page.

Logic executing program state:

Operating state: Logic executing program is running on DDC.

Stop state: Logic: Logic executing program has stopped running.

Monitoring page state:

Operating state: Monitoring page is running on DDC.

Stop State: Monitoring page has stopped running.

Step 5. On monitoring page, select “Monitoring Page Executing Order”->“Variable”->“Scheduler”->“Type”.

Monitoring Page: When this is selected, names and types of all monitoring page files on the node will be listed to the right.

Monitoring Page Executing Order: When this is selected, names of all monitoring page executing order files on the node and the corresponding .dat file types, such as order.dat, will be listed to the right.

Variable: When this is selected, names and types of all global variable table files will be listed to the right.

Scheduler: When this is selected, names and types of .ini data files will be listed to the right.

Note! *If a new project is created for the SCADA node, then the user needs to download the configured file to DDC unit which has yet no data file to operate.*



If the user has not defined any variable, then no variable file needs to be downloaded

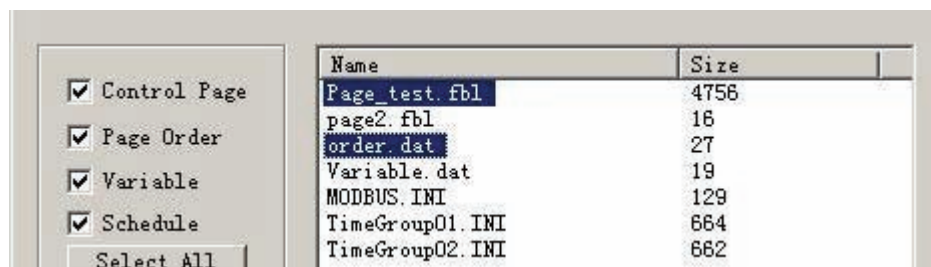
If the user has not defined any scheduler function module, then no schedule file needs to be downloaded.

Step 6. Select the file to download. After selecting the type, the user has to choose the target file from the list on the right.

Note! If there are several files to be downloaded at the same time, the user could press Ctrl and click on the file name; click again to deselect.

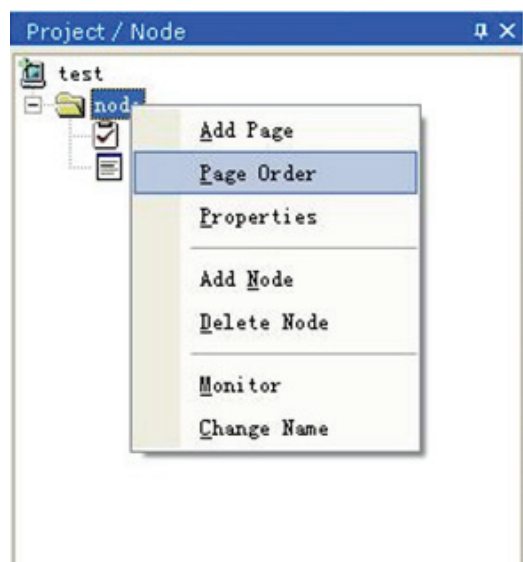
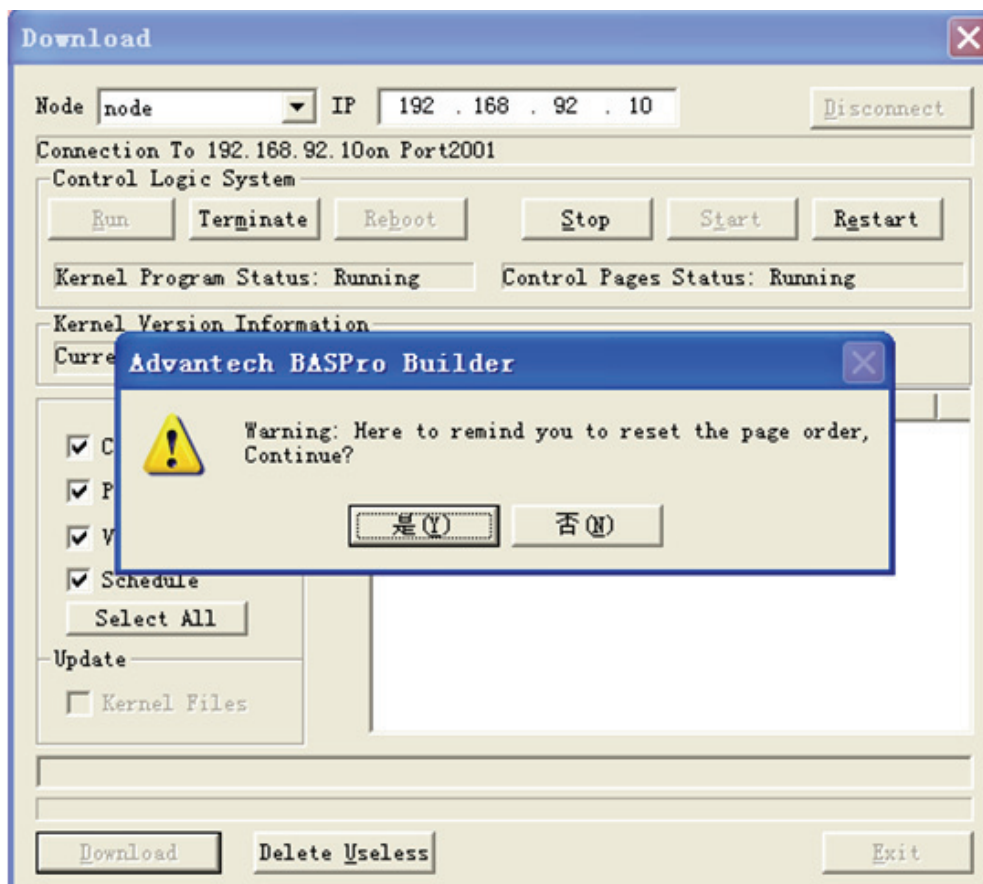


Click "Select All" button, all files will be downloaded.



Name	Size
Page_test.fbl	4756
page2.fbl	16
order.dat	27
Variable.dat	19
MODBUS.INI	129
TimeGroup01.INI	664
TimeGroup02.INI	662

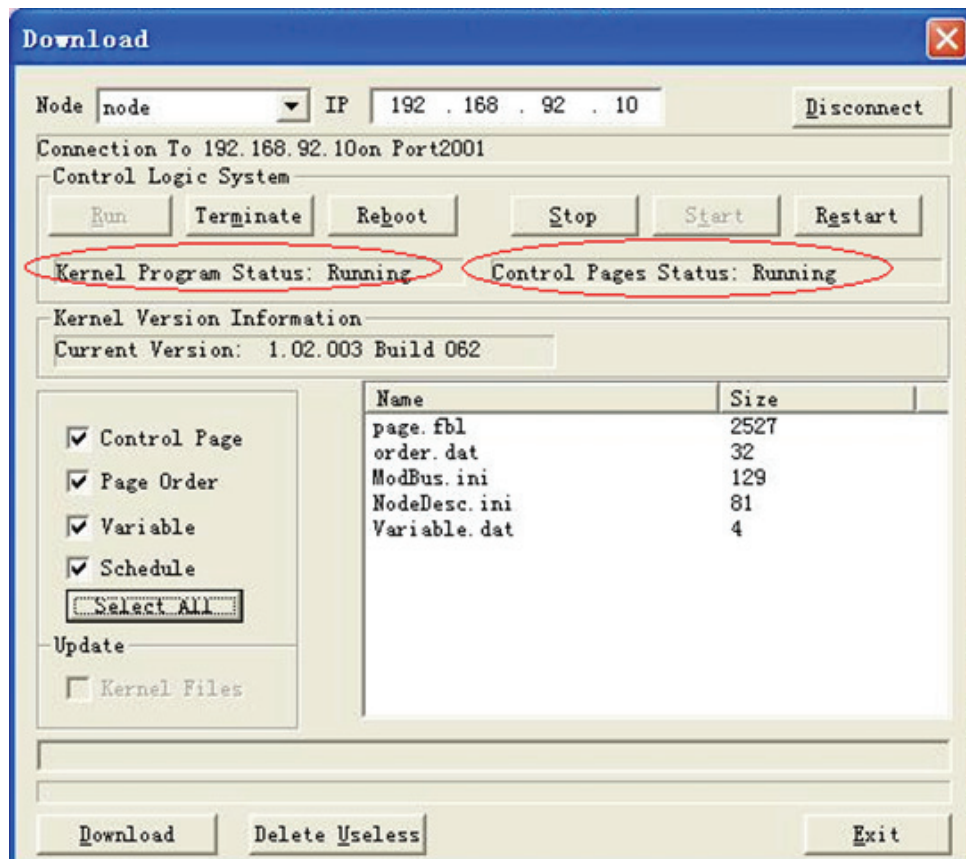
Step 7. Click "Download". The system will remind the user to configure the executing order of monitoring page in the pop-up list of Page Executing Order on the node.



After the configuration is completed, click “Yes” and the control page will be downloaded to DDC device automatically. When the downloading is completed, the following dialog box will pop up:



Step 8. Click “Restart”.



When the downloading is completed, the user has to restart the executive program on DDC device in order to replace old files with new ones. Click “Stop” and “Restart”.

Note! If the user clicks “Stop” and “Start”, the new monitoring page will not be used. The new logic can be operated only by clicking “Restart”.



Stop: If this button is clicked, the connected DDC unit will turn into Stop mode and all monitoring pages will not be operated.

Start: If this button is clicked, the connected DDC unit will turn into Operation mode and all monitoring pages will be operated.

Restart: If this button is clicked, the connected DDC unit will turn into Stop mode and automatically turns into Run mode. Previous saved project will be executed.

Step 9. Click “Exit” and close the downloading dialog box.

Other commands included in the downloading window:

Operate: Click this button to initiate the logic executing program.

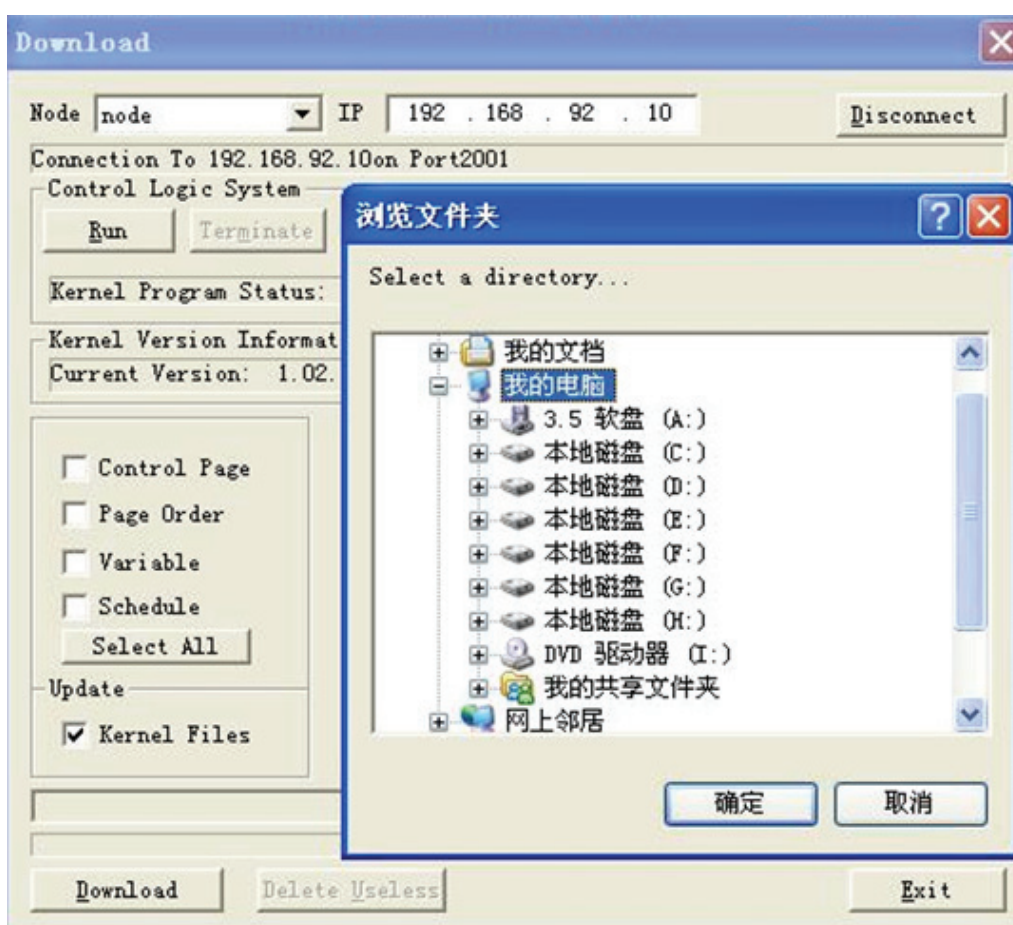
Terminate: Click this button to exit the logic executing program. The operating monitoring page will be saved before the program exits. If the monitoring page is downloaded and the user has not make it available by following Step 8, then the latest downloaded file with the same name will be covered when the user clicks “Terminate” to save the operating monitoring page.

Restart System: Click “Restart System” to restart the WinCE operating system on DDC.

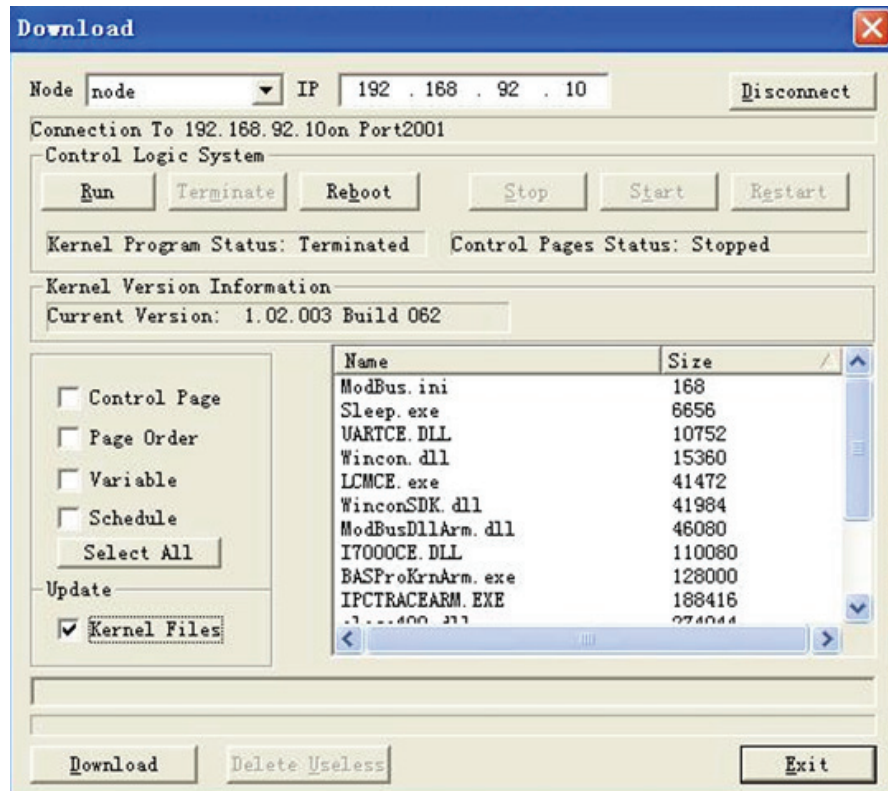
Update

When a new version of BASPro WinCE executive file needs to be updated, click the check box “**Kernel File**”.

The update could be done only when the logic executing program is in terminated state so that the check box is available. Click on the check box and the user will be asked to go to the folder the target file is in.

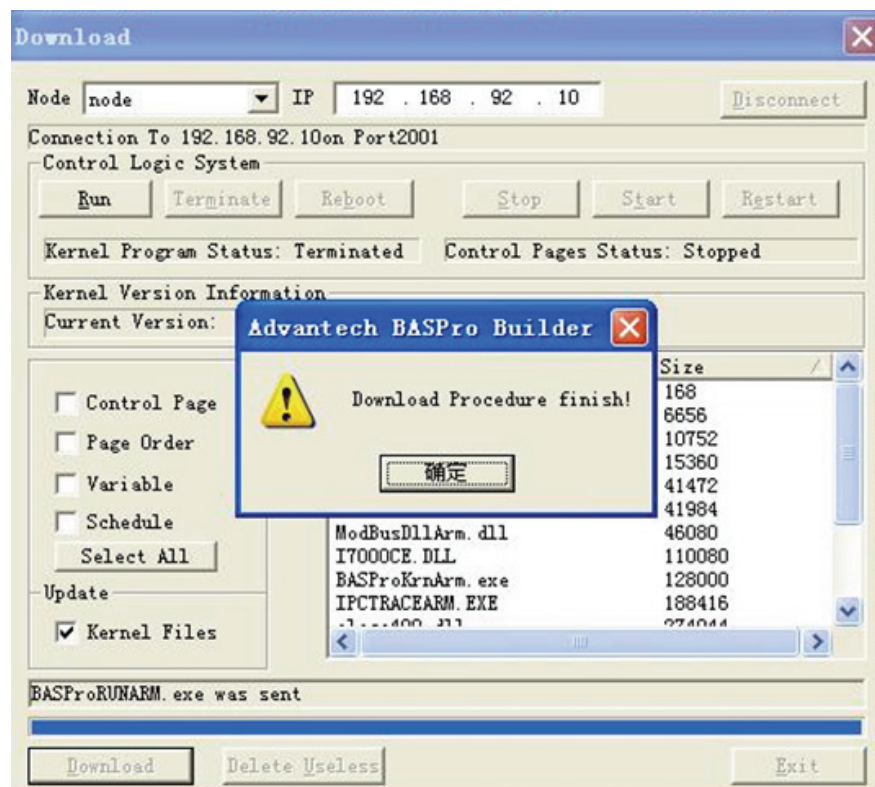


Click "OK" and the target files will be added to the list box.

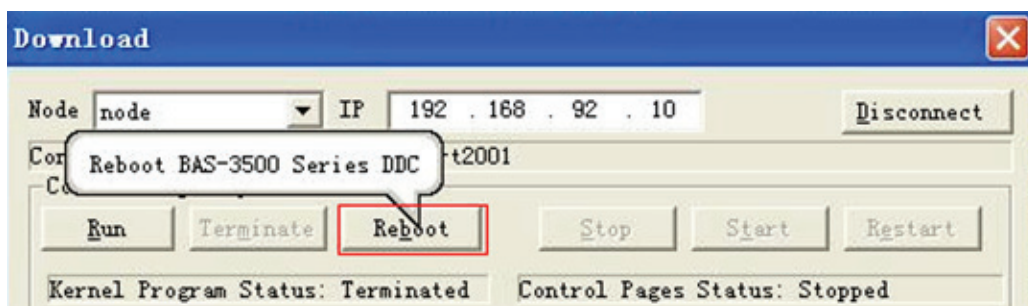


Click "Download" and all updated files will be downloaded to DDC. The user has to click "Restart System" to make the latest downloaded kernel files available. In order to effectively update the executive files of WinCE operating system, the target files should be downloaded completely.

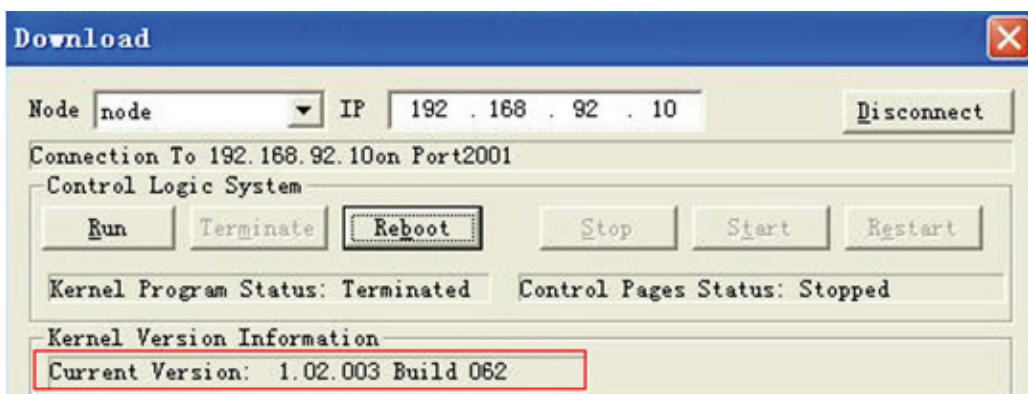
The user will be informed by a pop-up window if the downloading is successful as shown below:




Restart System: Reboot WinCE operation system.



The updated version information of executive files is shown in the area of Executive Procedure Version.



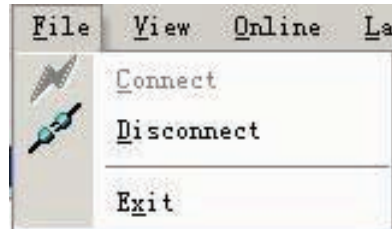
Note!  The Terminate command is used only when the logic executive program needs to be updated. After the update is completed, click “Run” to start the kernel program.

Chapter 4

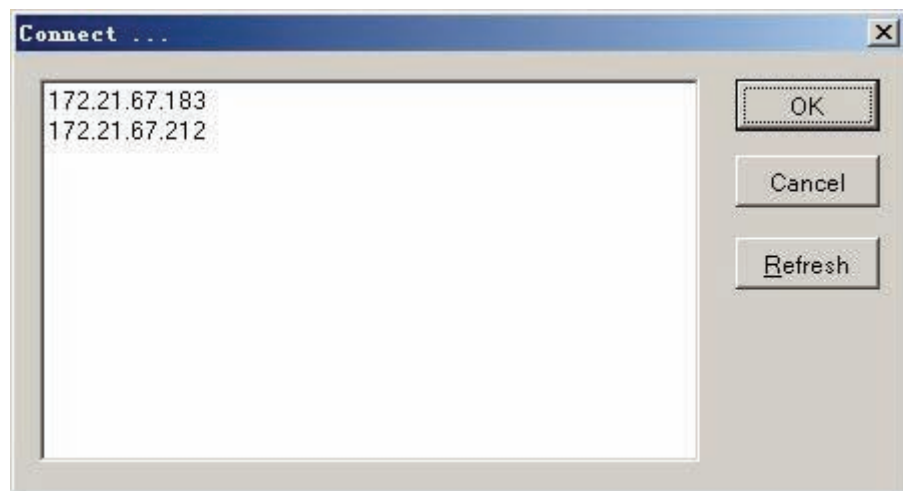
BASPro Monitor

4.1 Connection

You can monitor the running status of the device through BASPro Monitor program when your logic is running in DDC device. Select "BASProMonitor" in Windows programs menu and you can see four tabs: File, View, Online and Help (?). Click "Connect to" under the File tab.

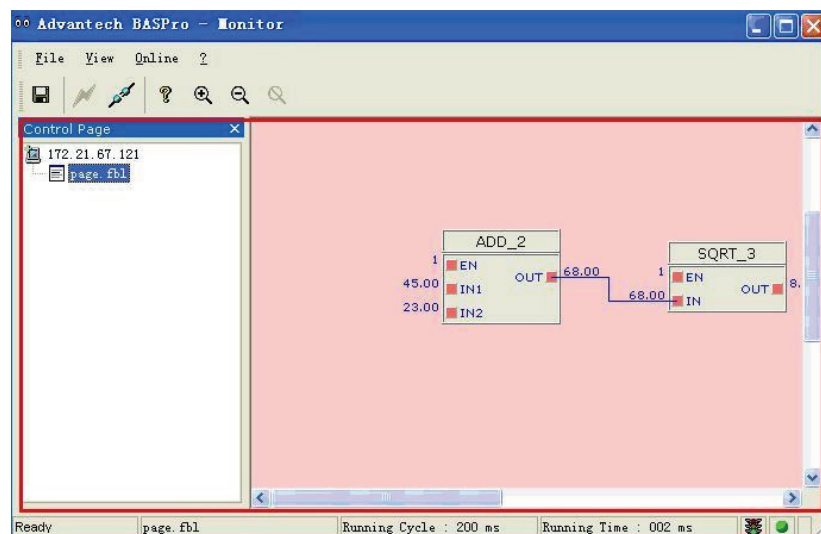


Select IP address of specific node to connect.



4.2 Control Page

When node is connected, node IP and page will appear in the control page zone. Double-click the page name; you will see the control logic.



4.3 Monitor

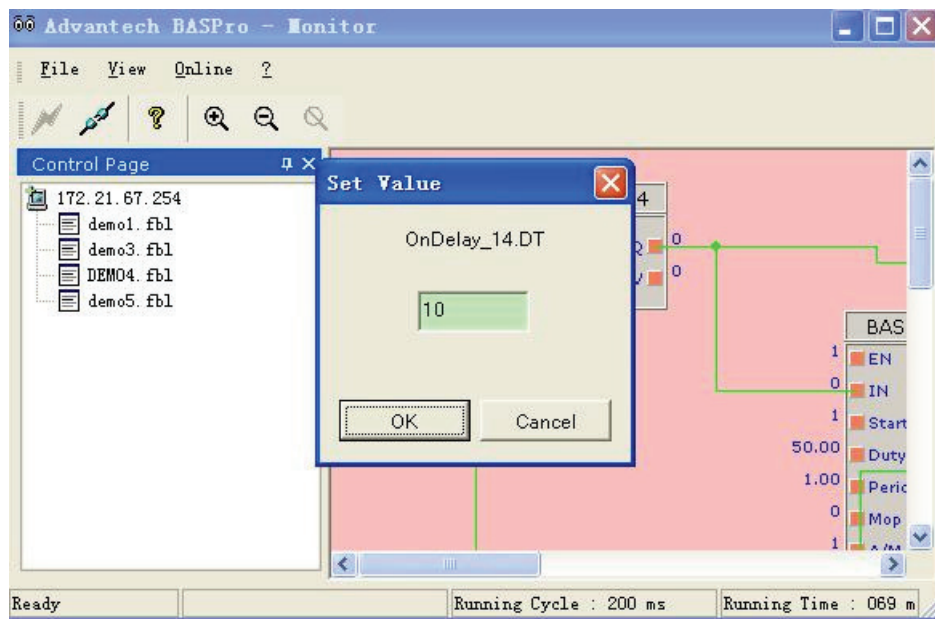
To monitor the connected device, follow the steps below:

Step 1. Make sure the control page is in connection mode.

Step 2. Move the mouse to the selected connector. (The red box on the left side of function block).

Step 3. Make sure the selected input connector is connected to the output connector of other function blocks.

Step 4. Double click the red box, "Setting values" window appears:



Enter a new value to replace the old one. Once the value is changed, the system will automatically check whether this value is within the range. If it is not within the range, the system will not accept it. Click "OK" to accept the change, or click "Cancel" to stop the operation and close the window.

Chapter 5

Web Server

5.1 System Management

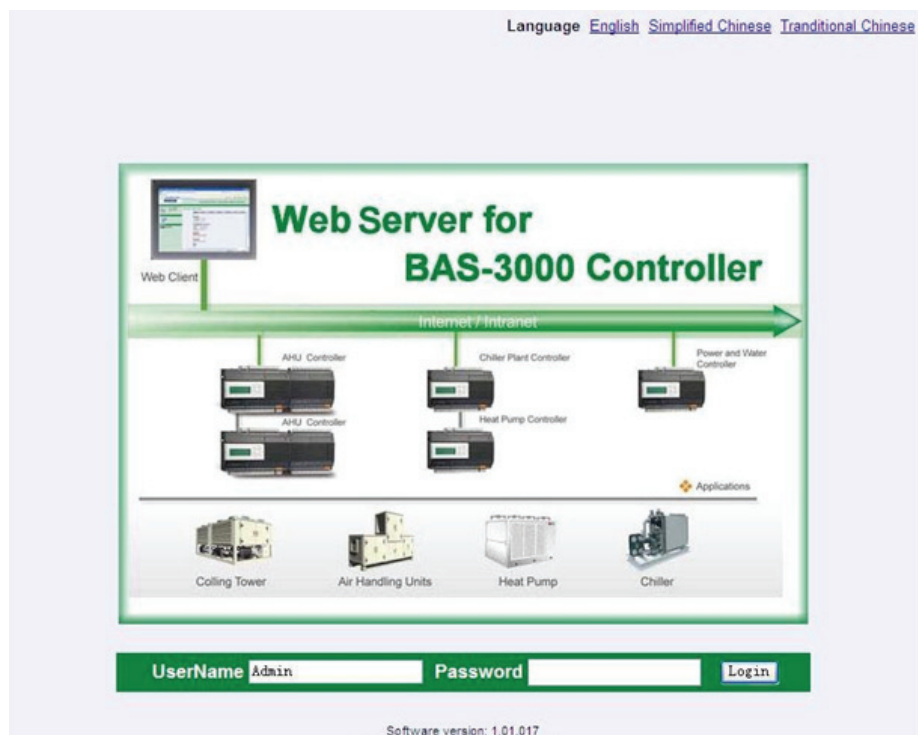
Access System: type `http://IPAddress` in the IE address bar.

Note! *IPAddress is the IP address of the DDC controller, shown as below:*



Address `http://172.21.67.238`

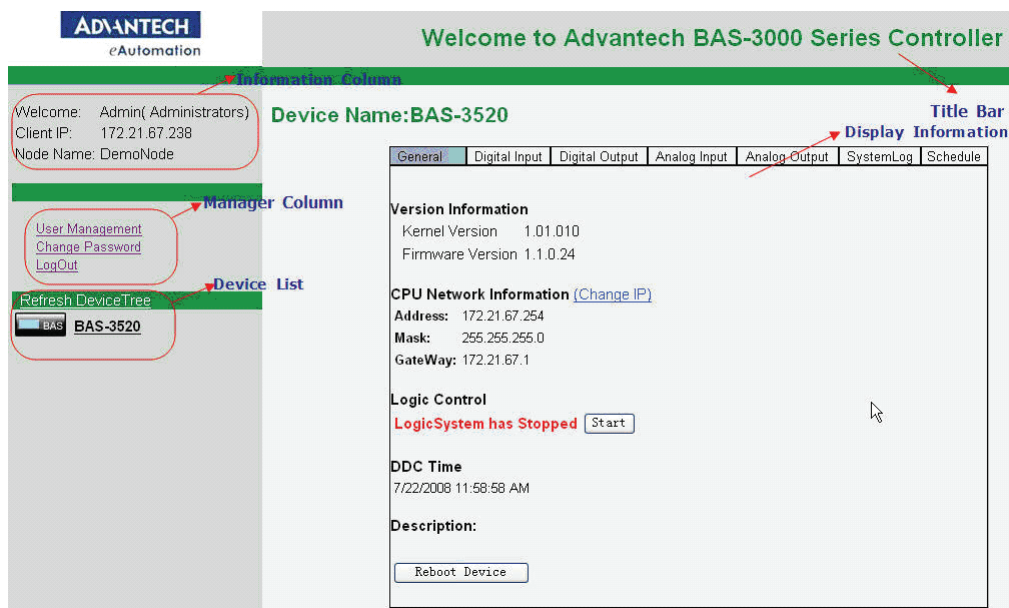
The “Web Server for BAS-3000 Controller” page appears:



Three versions for choice of languages are provided: English, Simplified Chinese, and Traditional Chinese. Switch between languages by clicking the links at top right. Type in the User Name and Password. The default User Name is “Admin” with the Password “advantech”.

Click the “Login” button to access the Web Server System.

5.1.1 Introduction



The welcome page includes Title bar, Information column, Management column, Device list, and Info display area.

Title bar: "Welcome to Advantech BAS-3000 Series Controller"

Information column: Display the login User Name, Client IP address of the DDC Main Device, and Node Name.

Management column: Manage Users such as Adding/Deleting users, changing the Password, and Logging out.

Device List: Display the nameS of currently connected Modules.

Device Information Display area: Display/Configure the information and parameters of the selected device.

5.1.2 Adding Users

After you click "User Management," the following information will be displayed:

[Add User](#)

User Management-Admin

UserName	Operation	Group
Admin	Delete	Administrators

Click "Add User" to add users:

User Name:	<input type="text" value="Smith"/>
Password:	<input type="password" value="••••••"/>
Confirm Password:	<input type="password" value="••••••"/>
User Group	Administrators ▼
<input type="button" value="Submit"/> <input type="button" value="Back"/>	

Three types of user account are available in User Group: Administrators, Operators, and Guests.

Administrators: Have the highest level of authority

Operator: Have the authority to stop or start some IO functions

Guests: Has no authority to perform operations other than to read information in WebServer.

Click "Submit."



The added users will be displayed on the User Management page:

[Add User](#)

User Management-Admin

UserName	Operation	Group
Admin	Delete	Administrators
Smith	Delete	Administrators

Then user can log into Web Server with this user name.

UserName	<input type="text" value="Smith"/>	Password	<input type="password" value="••••••"/>	<input type="button" value="Login"/>
----------	------------------------------------	----------	-----------------------------------------	--------------------------------------

And the information area will change accordingly.

```

Welcome:  Smith( Administrators)
Client IP:  172.21.67.120
Node Name: DemoNode
  
```

5.1.3 Delete Users

Click **Delete** in the User Management page in Web Server to delete users.

Note! An Administrator has the authority to delete all users except himself.



Add User

User Management-Admin

UserName	Operation	Group
Admin	Delete	Administrators
Smith	Delete	Administrators

Add User

User Management-Smith

UserName	Operation	Group
Admin	Delete	Administrators
Smith	Delete	Administrators



5.1.4 Change Password

Click **Change Password** in the Management column to change the password:

Change Password- Admin

Old Password


New Password

Confirm New Password

Input the old password, set new password, and then click **Submit**:



Use this new password to log into system next time.

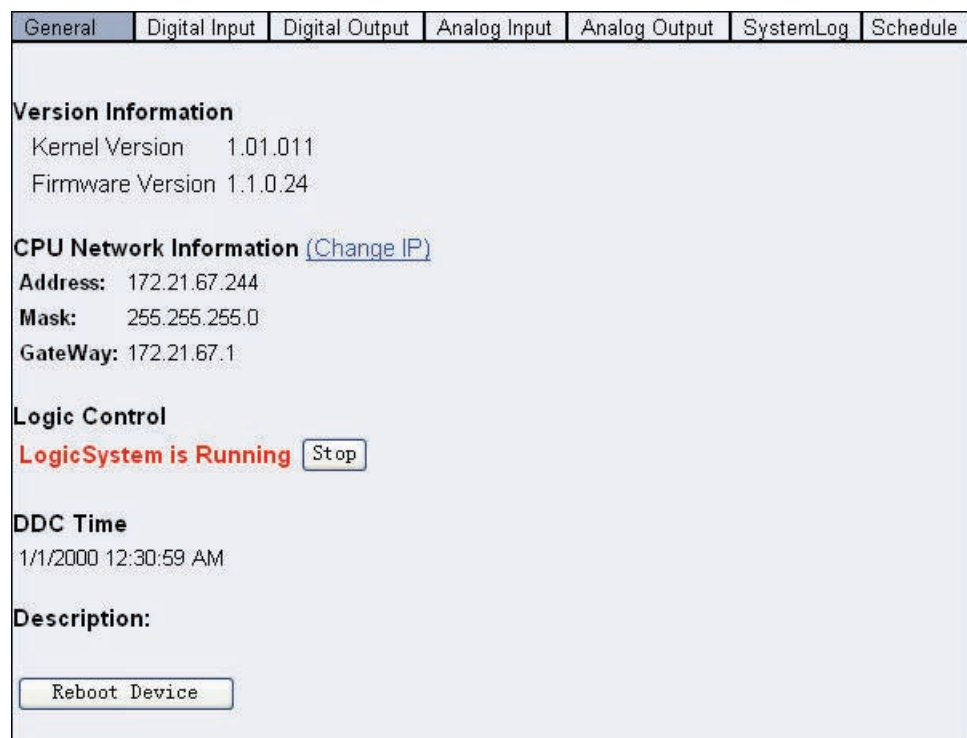
Note! In Web Server, three users at most can log into the system at the same time.
 Please Click “Log out” exit the system.

5.2 BAS-3000 Series Functions

Currently connected Modules are displayed in the device list, Refresh the Device Tree to search for more devices.



Click the selected device, and the corresponding information of the device will be displayed:



By Clicking different tabs on the top of the information area, the user can get different device information such as General, Digital/ Analog IO, System Log, Schedule.

General: Displays the general Device Information, including Version Information, CUP Network Information, Logic Control, DDC Time, etc. In this area, User can start/ stop the Logic, or reboot device.

Analog/Digital IO: What IO functions will be displayed depends on the Devices. For BAS-3520, it has Digital Input, Digital Output, Analog Input, and Analog Output functions.

System Log: Display the system status, such as start time, running cycle, memory load, etc.

Schedule: To set the Holiday or Schedule.

Note! The displayed page will be refreshed every 2 seconds.



For better understanding, we will take BAS-3520 as an example to show you some details.

5.2.1 General

General	Digital Input	Digital Output	Analog Input	Analog Output	SystemLog	Schedule
Version Information Kernel Version 1.01.012 Firmware Version 1.1.0.25						
CPU Network Information (Change IP) Address: 172.21.67.254 Mask: 255.255.255.0 GateWay: 172.21.67.1						
Logic Control LogicSystem has Stopped <input type="button" value="Start"/>						
DDC Time 7/30/2008 4:31:17 PM						
Description: <input type="button" value="Reboot Device"/>						

Version Information: Display the Kernel Version and Firmware Version of the current device.

CPU Network Information: Displays the Device IP Address, Mask, and GateWay. Click **Change IP** to change the IP address, the reboot the device.



Logic Control: Start/Stop the Logic downloaded in DDC.



Note! Please stop the logic before any changes.



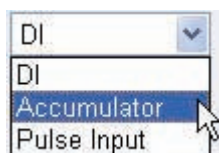
5.2.2 Digital Input

Device Name: BAS-3520

Channel	Function	State	TriggerEdge
0	Pulse Input	0	Rising
1	DI	0	
2	DI	0	
3	DI	0	
4	DI	0	
5	DI	0	
6	DI	0	
7	DI	0	

The number of channels for each device differs for different modules. Please refer to Hardware Manual.

Three types of digital Input functions are provided: DI, Accumulator, and Pulse Input.



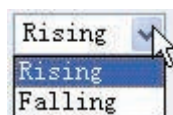
DI:Digital Input, value can be 0 or 1.

Accumulator:Counting the input pulses

Pulse Input:Input pulse status

For details, please refer to the hardware manual.

Note! For Accumulator and Pulse Input modes, the trigger edge(rising/falling) must be set. Click Start/Stop to control the mode.



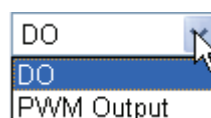
5.2.3 Digital Output

Device Name:BAS-3520

General	Digital Input	Digital Output	Analog Input	Analog Output	SystemLog	Schedule
Channel	Function	State	PWM Period(sec) PWM Duty(%)			
0	DO	0	Reverse			
1	DO	0	Reverse			
2	DO	0	Reverse			
3	PWM Output	1	Stop	1	50	PWM Setting

The number of channels for each device differs for different modules. Please refer to the Hardware Manual.

Two types of digital Output functions are provided: DO, PWM Output.



DO: Digital Output, can output 0/1

PWM Output:Display the pulses with definite Cycle and Duty Cycle.

Refer to the Hardware Manuals for details.

Note! Please click PWM Setting after set the duty cycle. Click Start/Stop to control the mode



5.2.4 Analog Input

Device Name: **BAS-3520**

General	Digital Input	Digital Output	Analog Input	Analog Output	SystemLog	Schedule
Common Mode Rejection: 60HZ						
Channel	Function	State				
0	pt-100 (385) -50~150' c	-1.25				
1	0-10vdc	0.00				
2	0-10vdc	0.00				
3	0-10vdc	0.00				

The number of channels for each device differs for different modules. Please refer to the Hardware Manual.

17 analog functions are provided as shown in the following picture:

Function

Thermistor (3k) -20~100' c

0-10vdc

0-20ma

4-20ma

pt-100 (385) -50~150' c

pt-100 (385) 0~100' c

pt-100 (385) 0~200' c

pt-100 (385) 0~400' c

pt-100 (385) -50~200' c

pt-100 (392) -50~150' c

pt-100 (392) 0~100' c

pt-100 (392) 0~200' c

pt-100 (392) 0~400' c

pt-100 (392) -50~200' c

pt-1000 -40~160' c

Thermistor (3k) -20~100' c

Thermistor (10k) -20~100' c

DI

Select different Input types for different requirements.

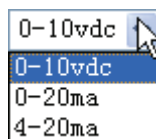
5.2.5 Analog Output

Device Name: BAS-3520

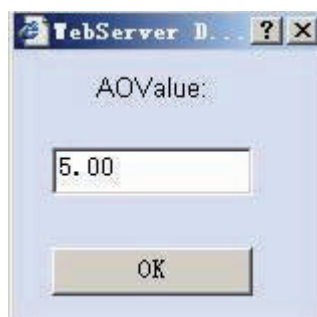
General	Digital Input	Digital Output	Analog Input	Analog Output	SystemLog	Schedule																				
<table border="1"> <thead> <tr> <th>Channel</th> <th>Function</th> <th>State</th> <th>Output</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0-20ma</td> <td>0.00</td> <td>Output</td> </tr> <tr> <td>1</td> <td>0-10vdc</td> <td>0.00</td> <td>Output</td> </tr> <tr> <td>2</td> <td>0-10vdc</td> <td>0.00</td> <td>Output</td> </tr> <tr> <td>3</td> <td>0-10vdc</td> <td>0.00</td> <td>Output</td> </tr> </tbody> </table>							Channel	Function	State	Output	0	0-20ma	0.00	Output	1	0-10vdc	0.00	Output	2	0-10vdc	0.00	Output	3	0-10vdc	0.00	Output
Channel	Function	State	Output																							
0	0-20ma	0.00	Output																							
1	0-10vdc	0.00	Output																							
2	0-10vdc	0.00	Output																							
3	0-10vdc	0.00	Output																							

The number of channels for each device differs for different modules. Please refer to the Hardware Manual.

Three types of Analog Output are provided: Voltage: 0-10vdc, Current: 0-20ma, 4-20ma. For details, please refer to hardware manual.



Click the **Output** button to change the output value.



Click **OK** and the Output value will be displayed.

General	Digital Input	Digital Output	Analog Input	Analog Output	SystemLog	Schedule																				
<table border="1"> <thead> <tr> <th>Channel</th> <th>Function</th> <th>State</th> <th>Output</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0-20ma</td> <td>0.00</td> <td>Output</td> </tr> <tr> <td>1</td> <td>0-10vdc</td> <td>0.00</td> <td>Output</td> </tr> <tr> <td>2</td> <td>0-10vdc</td> <td>0.00</td> <td>Output</td> </tr> <tr> <td>3</td> <td>0-10vdc</td> <td>5.00</td> <td>Output</td> </tr> </tbody> </table>							Channel	Function	State	Output	0	0-20ma	0.00	Output	1	0-10vdc	0.00	Output	2	0-10vdc	0.00	Output	3	0-10vdc	5.00	Output
Channel	Function	State	Output																							
0	0-20ma	0.00	Output																							
1	0-10vdc	0.00	Output																							
2	0-10vdc	0.00	Output																							
3	0-10vdc	5.00	Output																							

5.2.6 System Log

Device Name: BAS-3520

General	Digital Input	Digital Output	Analog Input	Analog Output	SystemLog	Schedule
---------	---------------	----------------	--------------	---------------	-----------	----------

[Refresh](#)
Current Time: 2010/03/30, 13:51:19
Start Time: 2010/03/30, 13:42:18
Running Cycle=400 ms
Memory Load=50 %, Total Physical Memory: 29128KB, In Used: 14372KB, Total Virtual Memory: 32768KB, In Used: 6144KB
Free disk rate=66.36%, Free Disk Volume=9.29 MB, Total Disk Volume=13.99 MB
OverRun Times: 0
Local IO Read Fail Times: 0
Remote IO Read Fail Times: 10
Read Remote No.0, Occur Time: 2010/03/30, 13:42:25
Read Remote No.1, Occur Time: 2010/03/30, 13:42:30
Read Remote No.2, Occur Time: 2010/03/30, 13:44:35
Read Remote No.3, Occur Time: 2010/03/30, 13:44:39
Read Remote No.4, Occur Time: 2010/03/30, 13:46:45
Read Remote No.5, Occur Time: 2010/03/30, 13:46:49
Read Remote No.6, Occur Time: 2010/03/30, 13:48:54
Read Remote No.7, Occur Time: 2010/03/30, 13:48:59
Read Remote No.8, Occur Time: 2010/03/30, 13:51:04
Read Remote No.9, Occur Time: 2010/03/30, 13:51:08
[Refresh](#)

- System Log displays the system running status.
- Now Time:** Current time of the DDC.
- Start Time:** Start time of the System
- Running Cycle:** Displays the running cycle of the Logic.
- OverRun Times:** Logs system overrun times.
- Local IO Read Fail Times:** Log local IO read fail times.
- Remote IO Read Fail Times:** Logs remote IO read fail times.
- Stop Time:** Stop time of the System.

5.2.7 Schedule

Two tabs are available for Schedule: Holiday and Schedule

2008 . 8						
Su	Mo	Tu	We	Th	Fr	Sa
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	1	2	3	4	5	6

Holiday: To set holiday for the year. The user can set special controls for holidays.

Click the date to be set as a “holiday,” and the font of date will be red.

Holiday	Schedule
(DDC Current Date: 1/1/2000)	
Group No: <input checked="" type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9 <input type="radio"/> 10 <input type="button" value="Save"/>	
Description: ok11	

Save the holiday to the right group.



Schedule: We set 'Week' as a unit, to make schedule settings for each day, with exceptions for Special Holidays.

Time/Range	Range1		
Week	Start	Stop	G/L
Monday	00 : 20	00 : 50	LDWH <input type="button" value="v"/>
Tuesday	00 : 00	16 : 10	None <input type="button" value="v"/>
Wednesday	10 : 15	23 : 45	None <input type="button" value="v"/>
Thursday	00 : 00	00 : 00	None <input type="button" value="v"/>
Friday	00 : 00	00 : 00	None <input type="button" value="v"/>
Saturday	00 : 00	00 : 00	None <input type="button" value="v"/>
Sunday	00 : 00	00 : 00	None <input type="button" value="v"/>
Holiday	00 : 00	00 : 00	None <input type="button" value="v"/>

Save your settings after modification.



Chapter 6

LCM Module
(Optional)

6.1 LCM Module Introduction

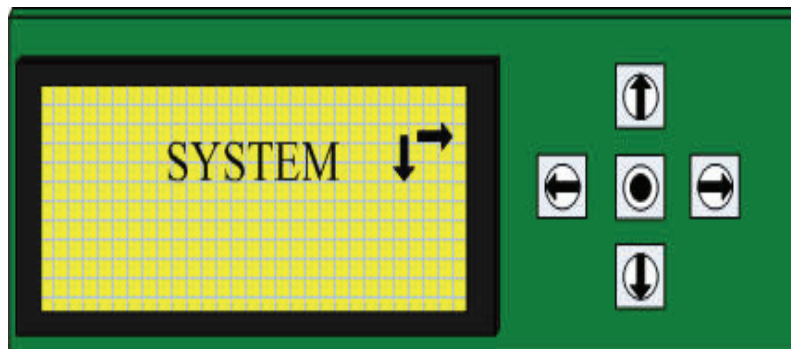
LCM Module is a built in control module with monitor for Master DDC Device, composed of an LCD monitor and a keyboard with 5 buttons.

6.1.1 User Interface

This module is used to display and configure DDC parameters by clicking the buttons. Please note that:

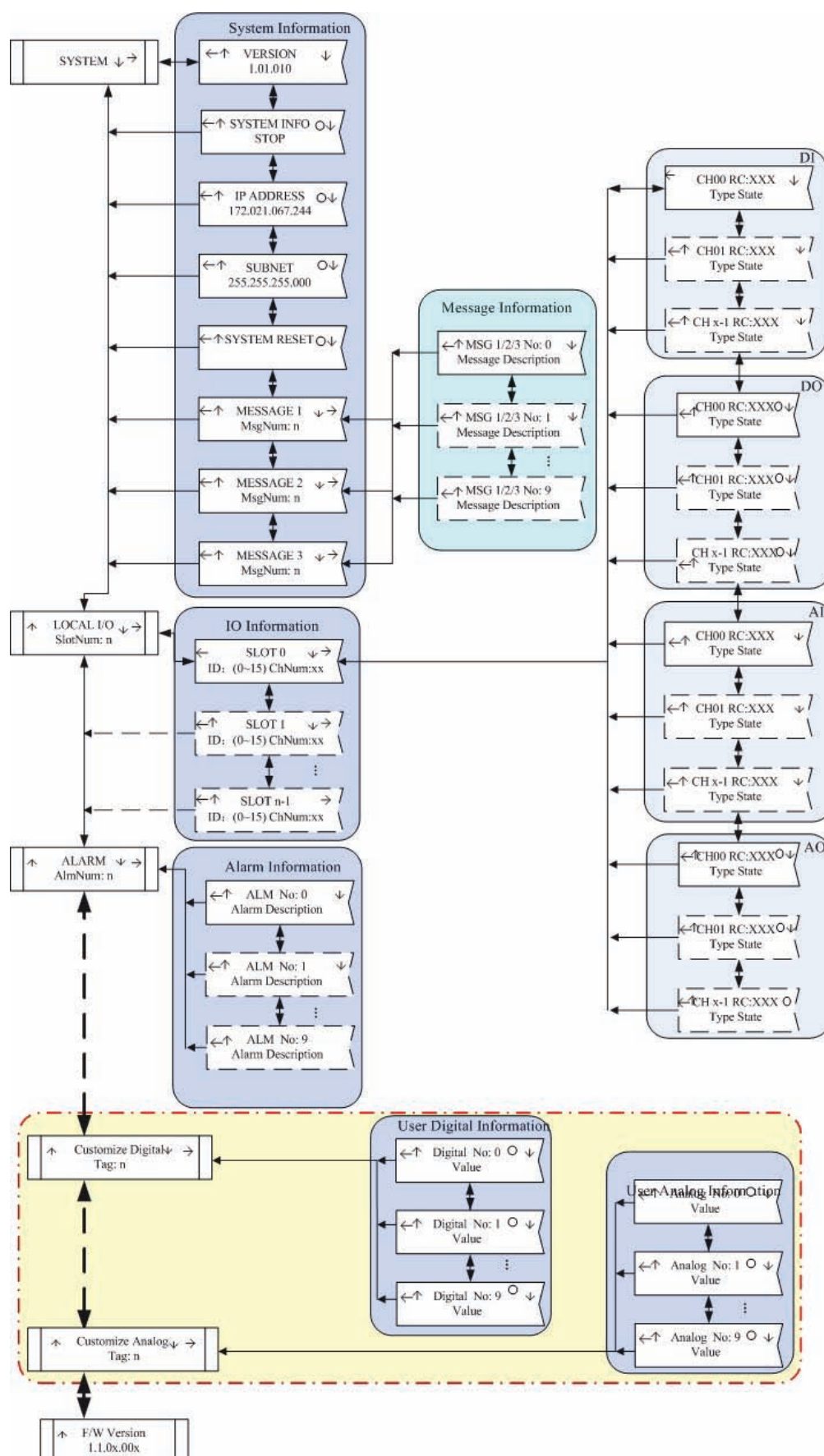
1. Arrows on the screen indicates which buttons can be operated, eg. <- means that you can click the button on the left to control.
2. When there is an **●** on the top left of screen, this means the button in the center can be clicked to confirm the “write” operation.
3. Please refer to the flow chart for operations.
4. The first line on the screen displays the operation types, and the second line displays the information.

Take the following display as an example, the user can click the buttons on the right and at the bottom.








6.1.2 Instructions

The operation flow of LCM is as follows:



1. When the system is on, LCM Module is in the System Information cycle, displaying the configuration information of DDC Master Controller. Right click to exit the cycle and display the system interface. The arrows on the first line of screen indicate which buttons could be operated.

Table 6.1: Display Table 6.2: Operation button	
	Left
	Right
	Up
	Down
	Confirm

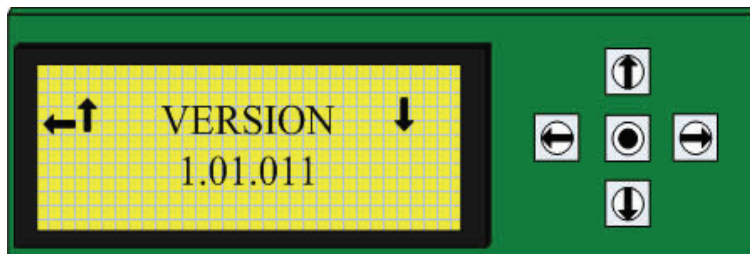
- 2. DDC Master Controller information and parameter settings are displayed in System Information area.
- 3. In the Local IO area, the count of IO Modules connected to the Master Module will be displayed.
- 4. In the IO Information area, the parameters of the DDC master controller and extended module will be displayed. Master Module is displayed as SLOT0, displaying the searched Module ID and number of channels. Click buttons on the top or at the bottom to enter the corresponding module for operations. Modules connected to the Master module will be numbered 1,2...
- 5. Click the button on the right to view the channel information and configure the channels. The channel sequence is DI->DO->AI->AO, channel type and number depend on hardware. For DI and AI channel types, they are read only, for DO and AO channel types, user can change the state.
- 6. In Alarm Information area, the digital and analog alarm message will show when user had configured then in BASPro Logic. The system allowed user to configure 10 digital alarms and 10 analog alarms in each system.
- 7. In Variable Information area, the digital and analog variable can be viewed and edit via LCM module. The system allowed user to configure 32 digital alarms and 32 analog alarms in each system.
- 8. In Firmware Information area, user can read back this LCM module Firmware information from this node.

6.1.3 System Information

In System Information area, user can view DDC Master module information and do some configurations.

Here you can get 11 screens to display:

VERSION: Displays the Version number of the Master DDC Module.

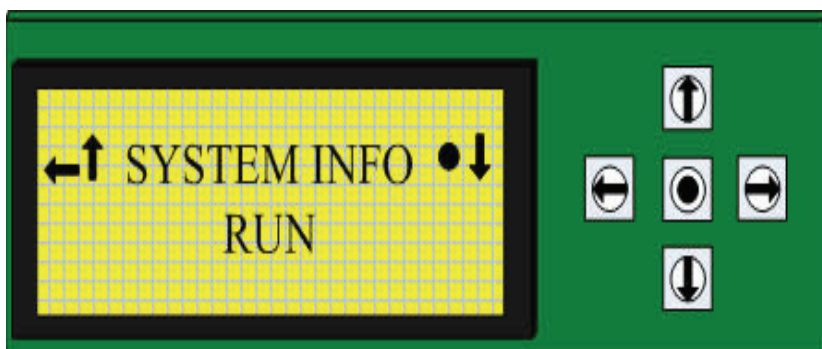
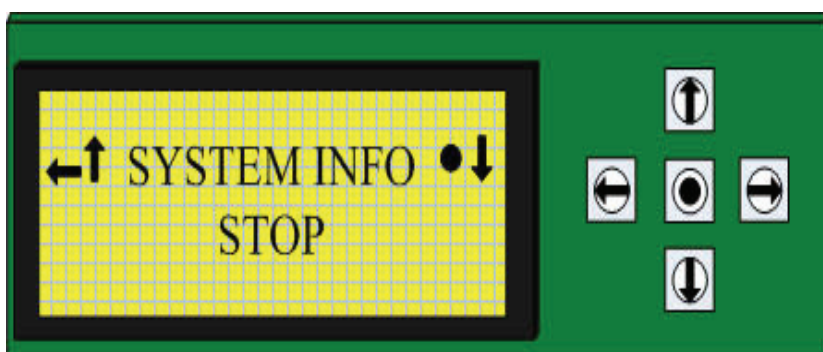


Click Left button to return to **SYSTEM**

Click Up button to enter into **Message** in **System Information** area.

Click the Down button to enter into **SYSTEM INFO**

SYSTEM INFO: Displays running status of system



The **STOP** and **RUN** states are used to indicate the logic of IO Module.

Change the Logic

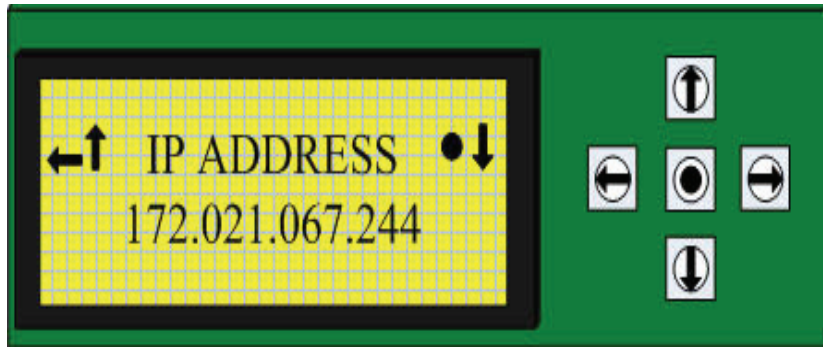
Select the running state

Confirm the change

Note! If you want to change the DO/AO parameters, set the running logic to *stop*



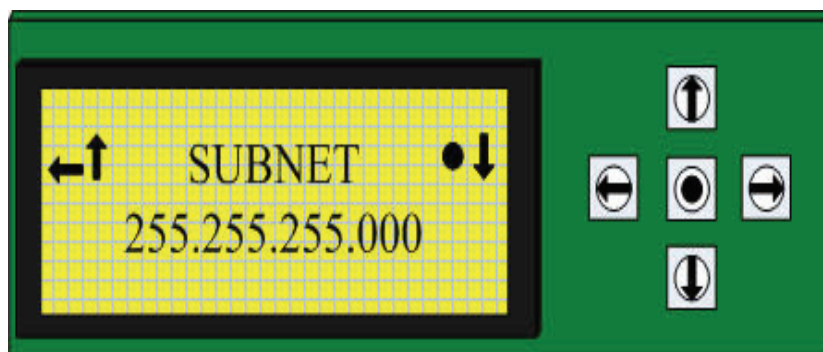
IP ADDRESS:Displays the IP address of the Master Module.



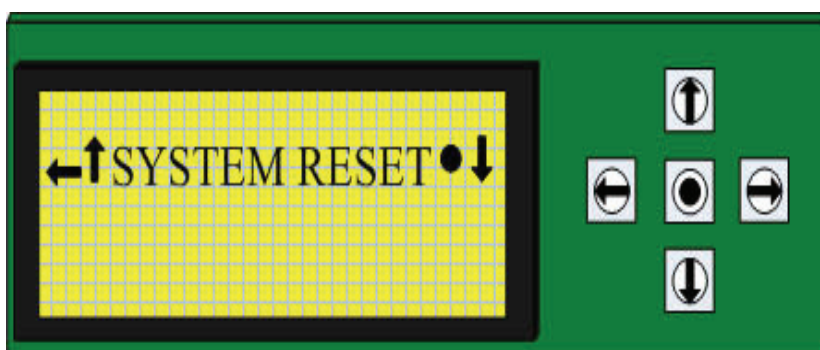
Click to change the IP address
Select a valid Range of address

Add/Decrease 1 for selected address
Confirm the change


SUBNET:Display or change the Master Module Subnet.

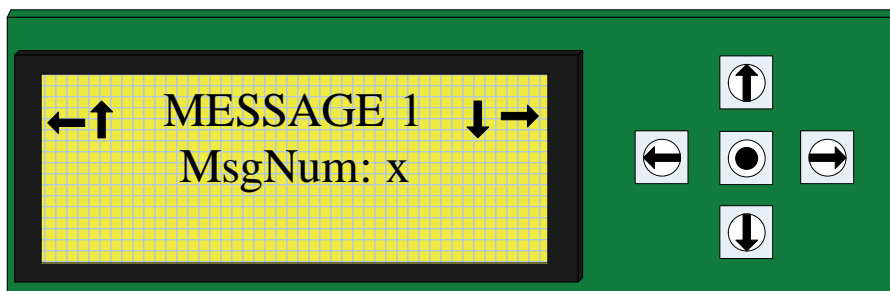


SYSTEM RESET:Restart the Master Module Kernel.

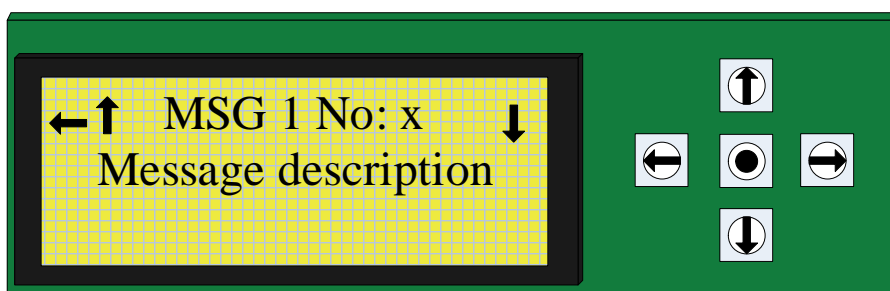





For operations of buttons, please refer to SYSTEM INFO.

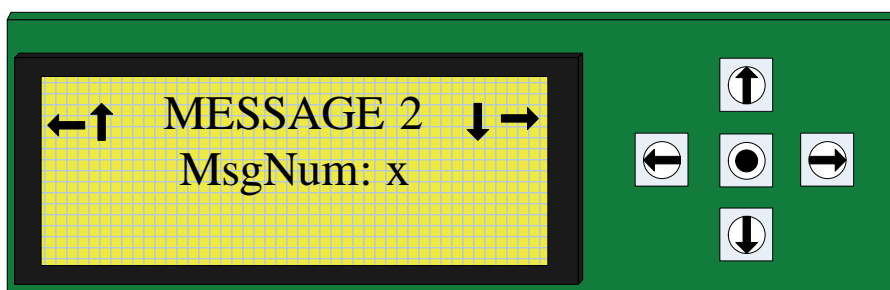
Message 1: This is the root node to show the Message Number in total, to hint user how many Messages are valid in Message1 now. If there are valid message in this group, user can access them by click  button.



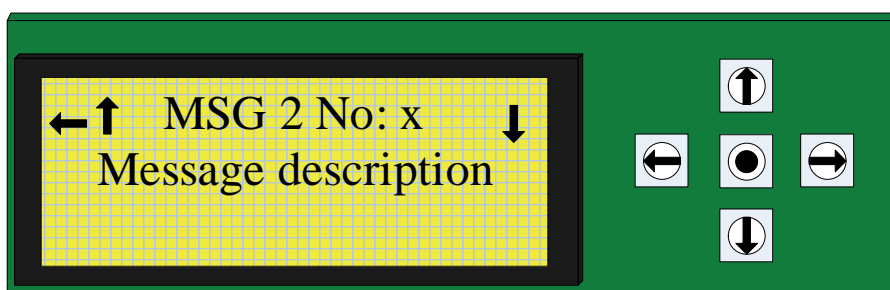
The detail message information will show as follow, in each group, user can define 10 messages.





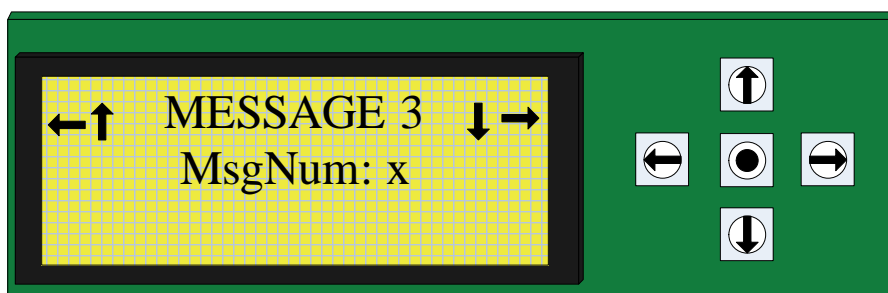
Message 2: This is the root node to show the Message Number in total, to hint user how many Messages are valid in Message2 now. If there are valid message in this group, user can access them by click  button. And user also can access **Message1** by click  button; can access **Message3** by click  button.



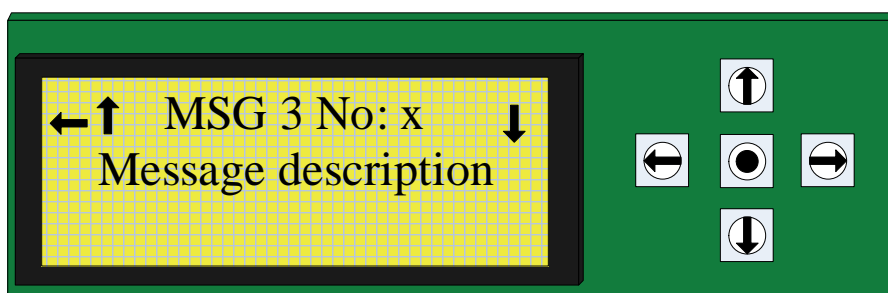
The detail message information will show as follow, in each group, user can define 10 messages.



Message 3: This is the root node to show the Message Number in total, to hint user how many Messages are valid in Message3 now. If there are valid message in this group, user can access them by click  button. If user clicks  button, will run to the **Version** node in cycle.



The detail message information will show as follow, in each group, user can define 10 messages.

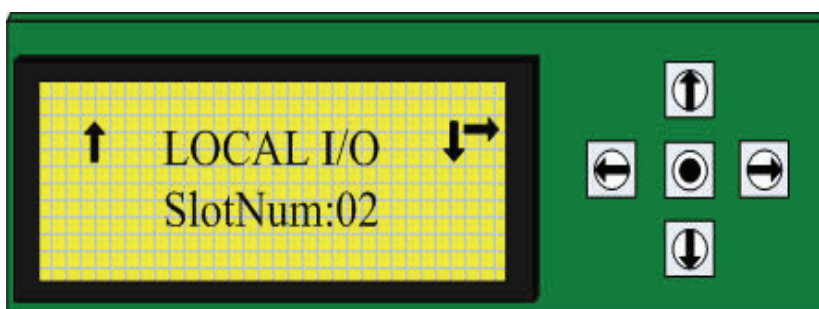


6.1.4 I/O Information

Slot location of the local IO modules.

Access: In System Root Node click down arrow to switch into LOCAL I/O screen.

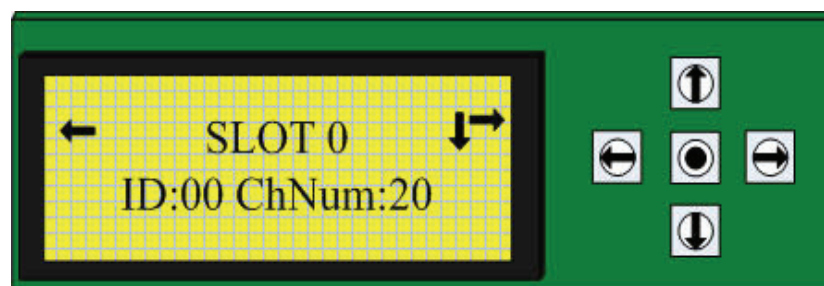
LOCAL I/O: Displays the number of connected DDC devices.



Return to SYSTEM

Enter into IO Information area

Each screen in this area will display one connected DDC. The number of screens is the same with the number of slots.



The first line indicates the location of the DDC:0~(SlotNum-1)

ID: ID of DDC module. Defined by Hardware switch.

ChNum: The amount of channels for the device.

6.1.4.1 I/O Channels

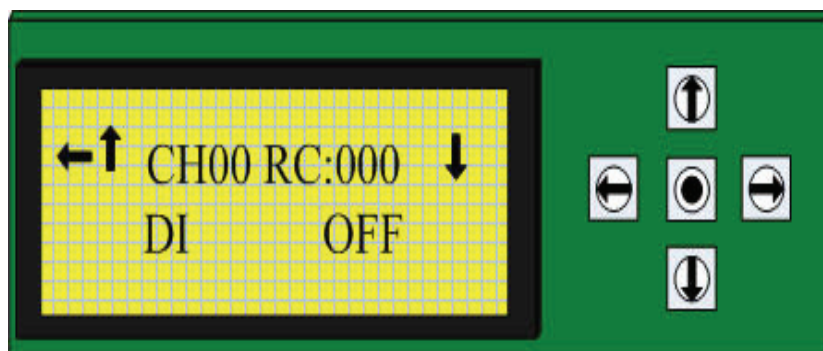
Display/Configure the specified channel for selected Module.

Access: In SLOT screen, click ->

4 types of IO channels are available:

In IO Channel area, the system will automatically scan the channels by the sequence of DI->DO->AI->AO. When some specified channel types are not available for the device, the system will continue to scan the next type of channel.

DI: Read only, displays the DI channel status.

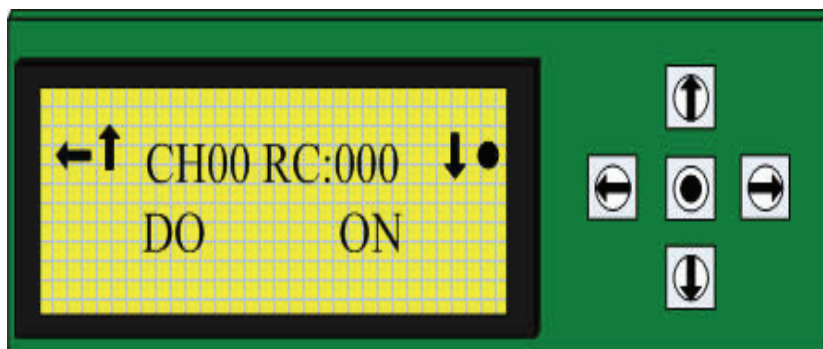


RC: Displays the function code. Refer to RC table for details.

DI: Digital input

OFF: input state(ON/OFF) is OFF.

DO: Display/Configure DO channels

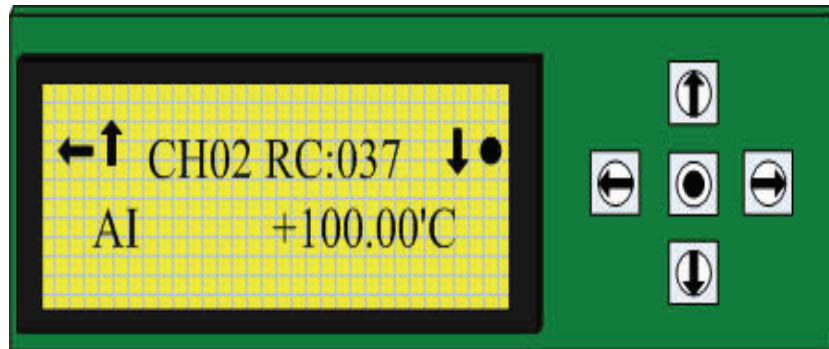


RC: Displays RC code.

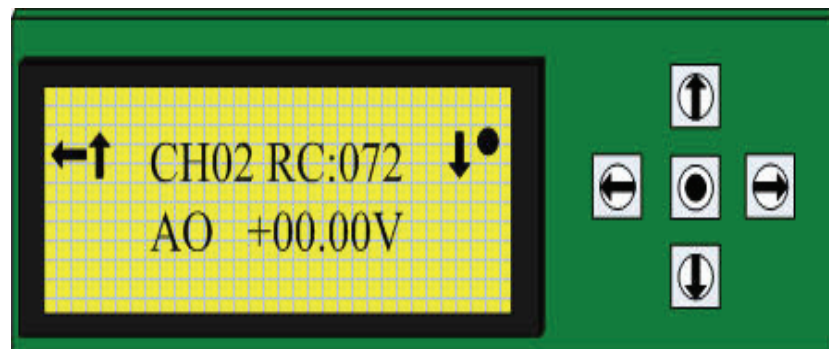
DO: Digital output

OFF: Digital Output state(ON/OFF) is OFF.

AI: Displays AI channel states



RC:Displays RC code
AI:Analog Input
+100.00:Sampled Temperature.
AO:Displays AO channel states.




RC:Displays RC code.
AO:Analog output
+00.00V:Analog output value. Click the buttons to change the value.

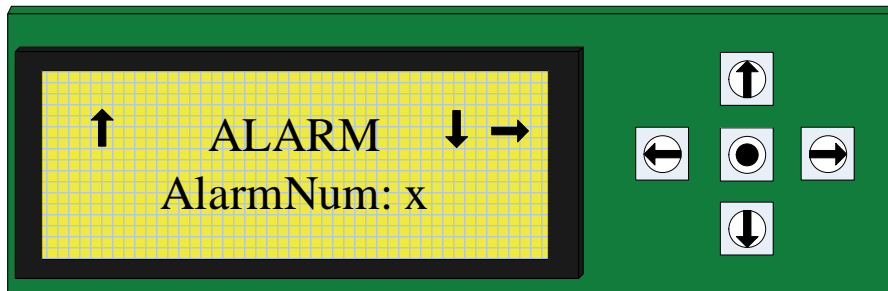
Range Code Table

Analog Input	Range Code	Analog Output	Range Code
0-10v	72	0-10vdc	72
0-20ma	20	0-20ma	70
4-20ma	7	4-20ma	7
Pt-100(385) - 50~150°C	31	Digital Input	Range Code
Pt-100(385) 0~100°C	33	DI	0
Pt-100(385) 0~200°C	34	Accumulator	1
Pt-100(385) 0~400°C	30	Pulse Input	2
Pt-100(385) - 50~200°C	29	Digital Output	Range Code
Pt-100(392) - 50~150°C	28	Normal	0
Pt-100(392) 0~100°C	37	PWM Output	1
Pt-100(392) - 50~200°C	38		
Pt-100(392) 0~400°C	40		
Pt-100(392) - 50~200°C	41		
Pt-1000 - 40~160°C	42		
Thermistor(3k) - 20~100°C	46		
Thermistor(10k) - 20~100°C	47		
UDI	0		

6.1.5 Alarm Messages

Access: In LOCAL I/O Root node then click  button.




Alarm: In the Alarm message root node, the system will show the Alarm Number in total, to hint user how many alarms are valid now.

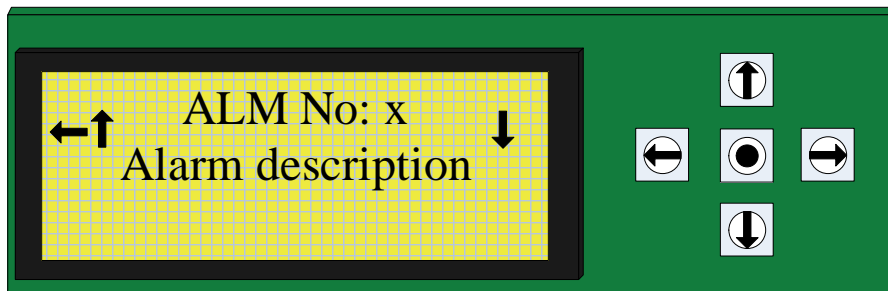


↑ Return to **LOCAL I/O**

↓ Enter into **Variable** area

→ Enter into the alarm detail message.


Click  button on the Alarm root node then enter in the alarm details area, here user can choose to view each Alarm detail message by click  button and  button, here will just show the valid alarm not all the 10 alarm message.



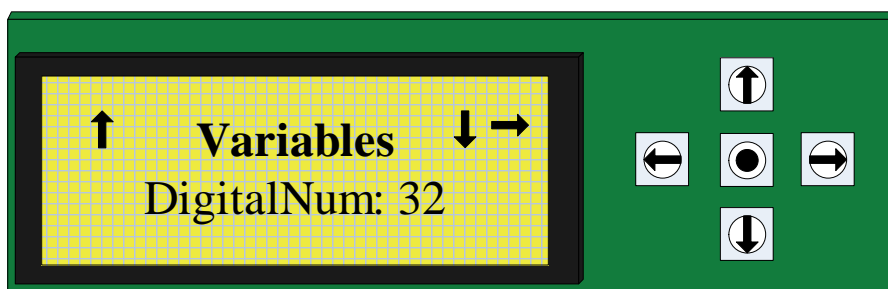
6.1.6 Variables

In the Variables node, user can access digital variables and analog variables in separated tree.

6.1.6.1 Digital Variables

Access: In **ALARM** Root node then click  button.





Variables: The system will show the digital variable number in total, to hint user how many digital variable are valid now.

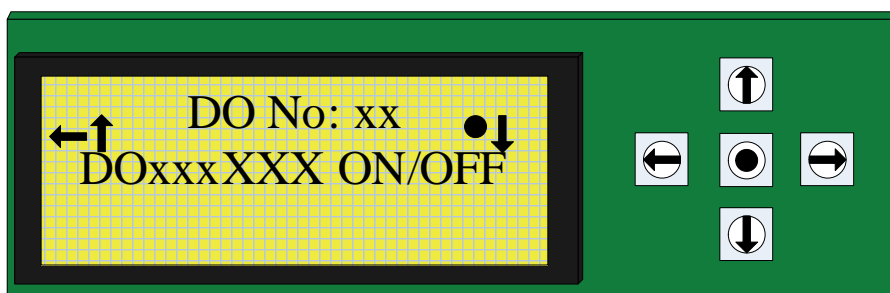


↑ Return to **ALARM**

↓ Enter into Analog variables area

→ Enter into the digital detail message.

Click  button on the Variables root node then enter in the variable details area, here user can choose to view each variable detail message by click  button and  button, and can click  button to edit this DO On/Off Status. If user didn't configure it, in this index will show "Invalid Data" message.

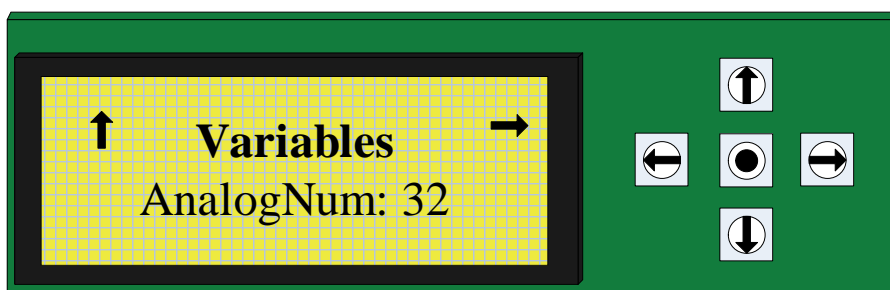


6.1.6.2 Analog variables

Access: In **Variables Digital** Root node then click  button.

Access: In **Variable Digital** Root node then click  button.





Variables: The system will show the analog variable number in total, to hint user how many analog variable are valid now.

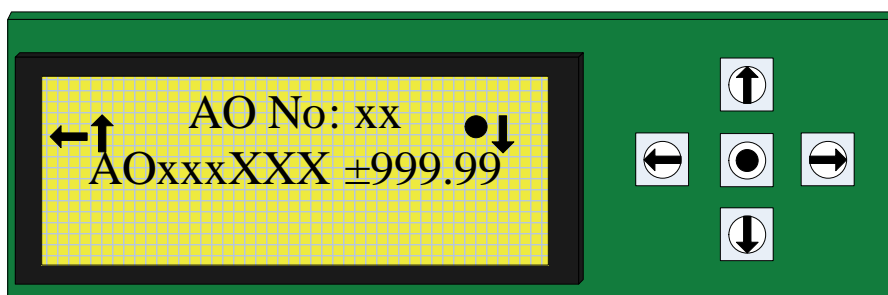


↑ Return to **Digital Variables**

↓ Enter into F/W Information area

→ Enter into the analog detail message.

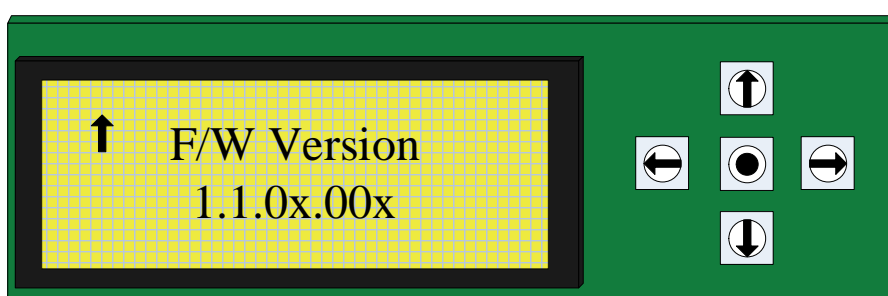
Click  button on the Variables root node then enter in the variable details area, here user can choose to view each variable detail message by click  button and  button, and can click  button to edit this AO value. If user didn't configure it, in this index will show "Invalid Data" message.



6.1.6.3 Firmware Information

Access: In **Analog Variables** Root node then click  button.

F/W Version: In the F/W Version node, the system will show this LCM Module Firmware information via this screen.



 Return to **Analog Variables** area

Chapter 7

Examples

7.1 Function Target

The example below is a BAS-3520 control logic through Ethernet. This control logic can realize that when the measured temperature is higher than the configured temperature, the air valve will be turned on and then the air fan will be turned on. If the measured temperature is lower than the configured temperature, the air fan will be turned off and then the air valve will be turned off.

To realize this logic, the following function blocks may be used:

1. BAS-UI
2. BAS-DI
3. BAS-DO
4. OnDelay
5. Other function modules.

The project development can be implemented by the following steps:

Create a project -> Design the control logic -> Download the project to DDC controller -> Online debugging

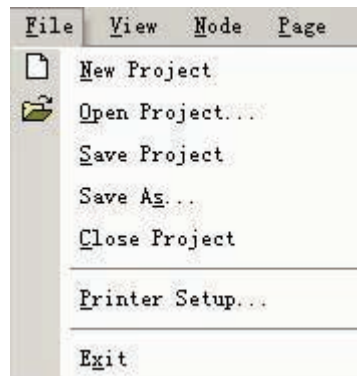
The procedure is explained in detail in the following sections.

7.1.1 Create a project

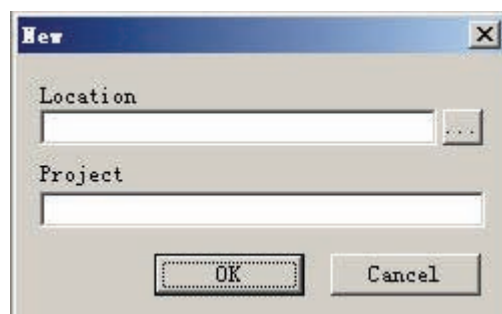
This section demonstrates the steps of creating a project. By following the demonstration, the user could easily create a simple DDC project and connect it with the hardware for simulating and debugging.

Create a new project

Click "New Project" or click the icon.



The "New Project" window will pop up.



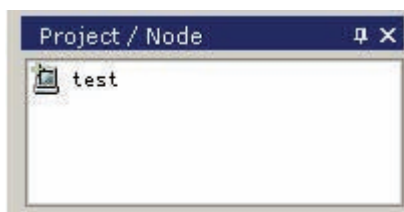
Please enter the location and the project name of the new project. Click on the button to view the path.

Note! The project name and location should not contain special characters. Click "Ok". A project node will be added in the left window.

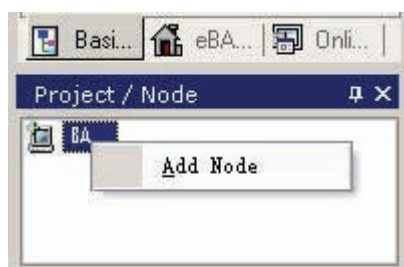


7.1.2 Add a node

Right-click on Project/Node" and select Add a node".



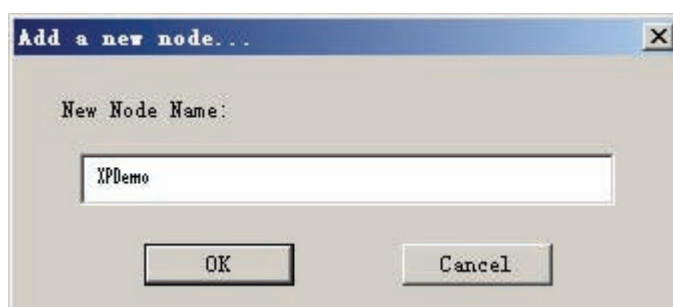
The Add a new SCADA node dialog box will pop up.



Note! Node is the name of BAS-3500 DDC controller. Each controller corresponds to a node.



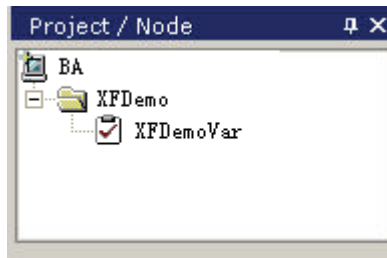
Enter the node name: XFDemo. Click "OK," The node will be added to the left window.



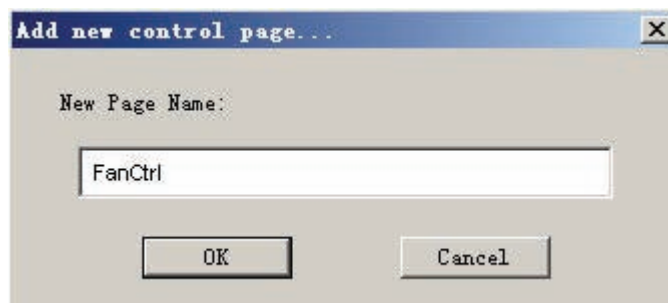
The XFDemoVar variable page will be added automatically by software.

7.1.3 Add a page

Right-click on the XFDemo node. Select "Add a page" in the pop-up list.



The Add a new SCADA page dialog box will pop up.



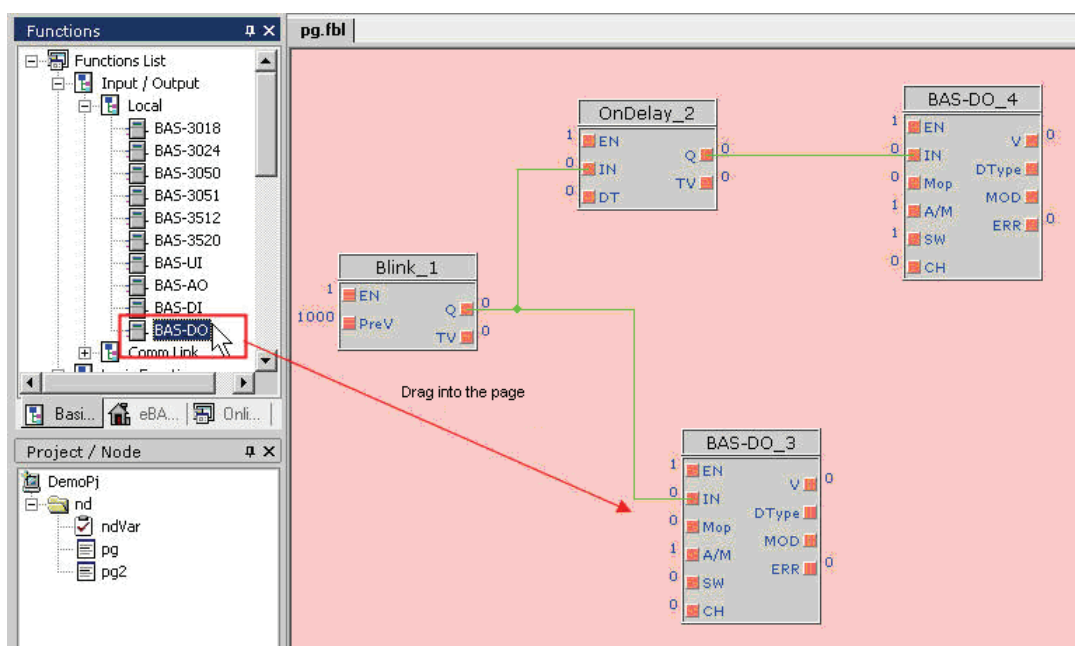
Note! *Page is the logic program block. It is the name of the control logic developed by the user*



Enter the page name and click "OK". The control page is added to the main window and the page sub tree is added below the node in the left window.

7.1.4 Create function block on the page

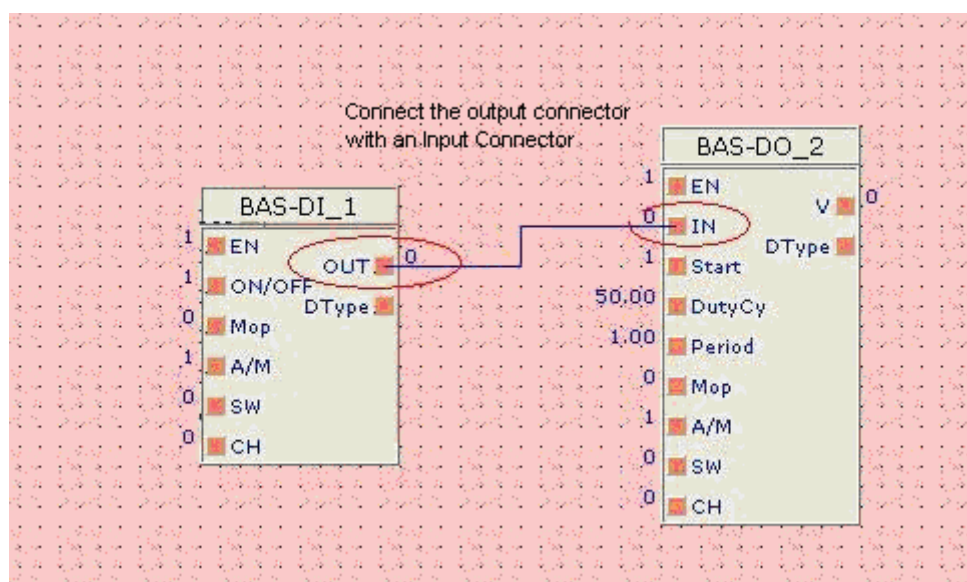
In the function block window, click on the target function block (eg. BAS-DO) and drag it to the control page.



7.1.5 Connection between function blocks

The user can configure field process control logic by function blocks on the control page and simulate the logic operating status of the control page.

The left connectors of each function block are for input and the right connectors are for output. Output connectors can be connected to input connectors.



The user could adjust the direction of the connection line by clicking on the control page to create an inflection point and change the direction of the line. To cancel and redraw a line, the user can simply right-click the mouse.

To delete the created connection, the user could right-click on the line and select "Delete" in the pop-up list.

Note: The user has to the rules of block connection. Connectors of different types can not be connected.

7.1.6 Logic implementation

This defines the IO address allocation list of the controlled variable.

Before developing the program, the user has to confirm the IO address list of the controlled variable as shown below.

Control Function	AI	DI	AO	DO	IO	Channel	Allocation	Modbus Address	Variable Name
Fan Working State	00	1	00	00	00	DI0	00	00001	FanState
Fan Failure Alarm	00	1	00	00	00	DI1	00	00002	FanFault
Manual/Automation State	00	1	00	00	00	DI2	00	00003	FanAuto
Filter Alarm	00	1	00	00	00	DI3	00	00004	Filter
Supply Air Temperature	1	00	00	00	00	UI1	00	40001	Temperature
Valve Adjustment	00	00	1	00	00	00	AO0	40401	WaterValveCtrl
Freeze Alarm	00	1	00	00	00	DI4	00	00005	Lowtemp
Fan Start-stop Control	00	00	00	1	00	00	DO0	00401	FanCtrl
New Air Valve Control	00	00	00	1	00	00	DO1	00402	AirValveCtrl
Air Valve State	00	1	00	00	00	DI5	00	00006	AirValveState

The program also uses the Modbus address spaces in the following table in order to connect to the upper computer.

Control Function	AI	DI	AO	DO	IO	Channel	Allocation	Modbus Address	Variable Name
Configured Temperature	00	00	1	00	00	00	00	40801	SetTemp
Manually Start-stop Fan	00	00	00	1	00	00	00	00801	FanCtrl_Man
Program/Manual Control Switch	00	00	00	1	00	00	00	00802	Valid_Man

Confirm control objective and draw logic control flow chart.

The example below is a BAS-3520 DO output control logic through Ethernet. This control logic can realize that when the measured temperature is higher than the configured temperature, the air valve will be turned on and then the air fan will be turned

on. If the measured temperature is lower than the configured temperature, the air fan will be turned off and then the air valve will be turned off.

7.1.7 Develop Logic Program

The blocks used in this example include:

BAS-UI Block: The universal input block of BAS DDC

BAS-DI Block: The digital input block of BAS DDC

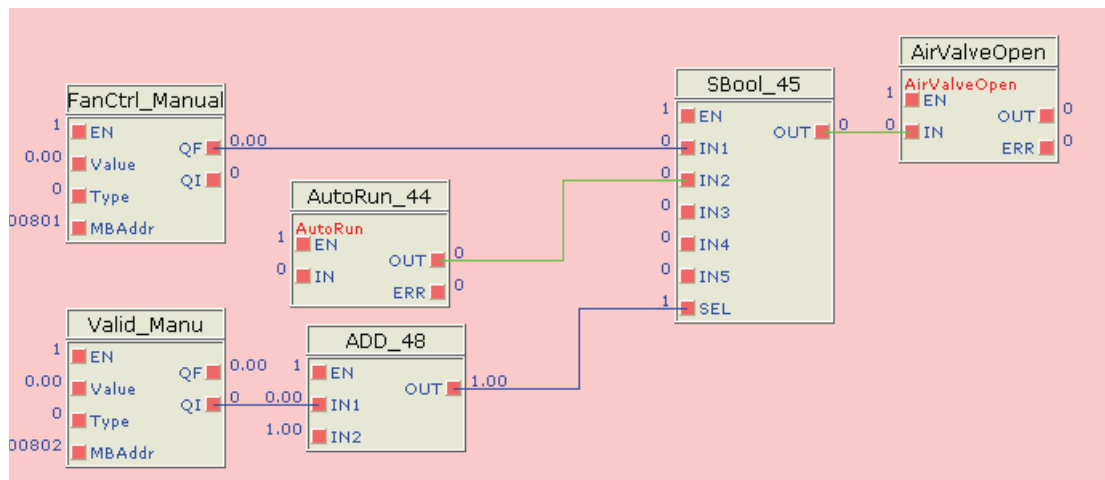
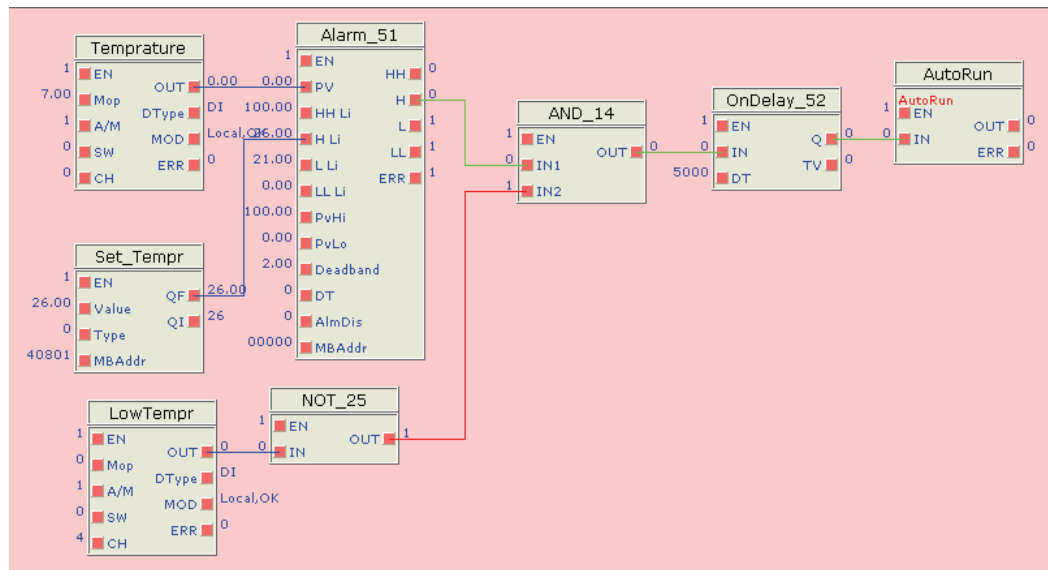
BAS-DO Block: The digital output block of BAS DDC

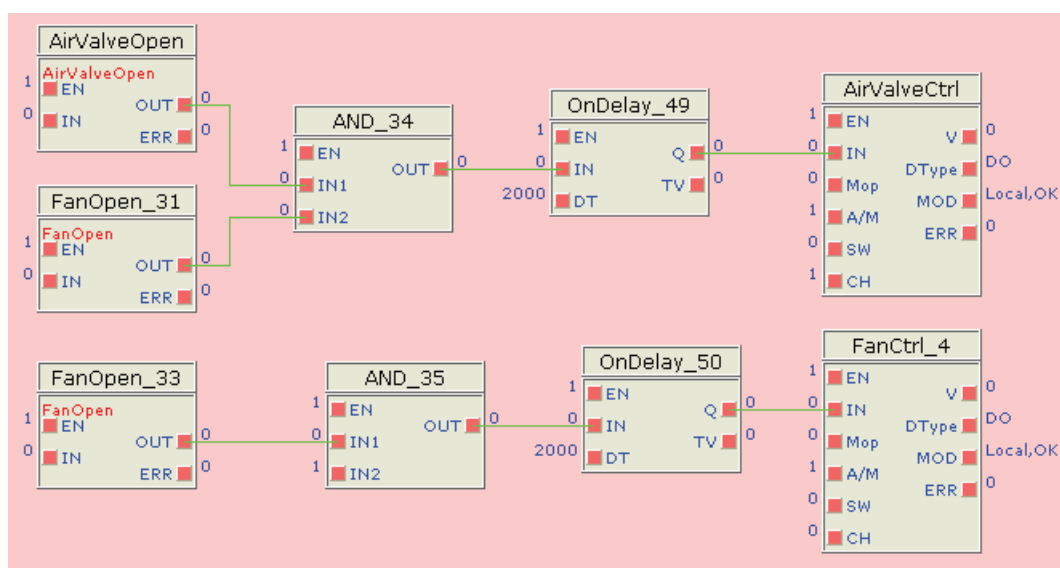
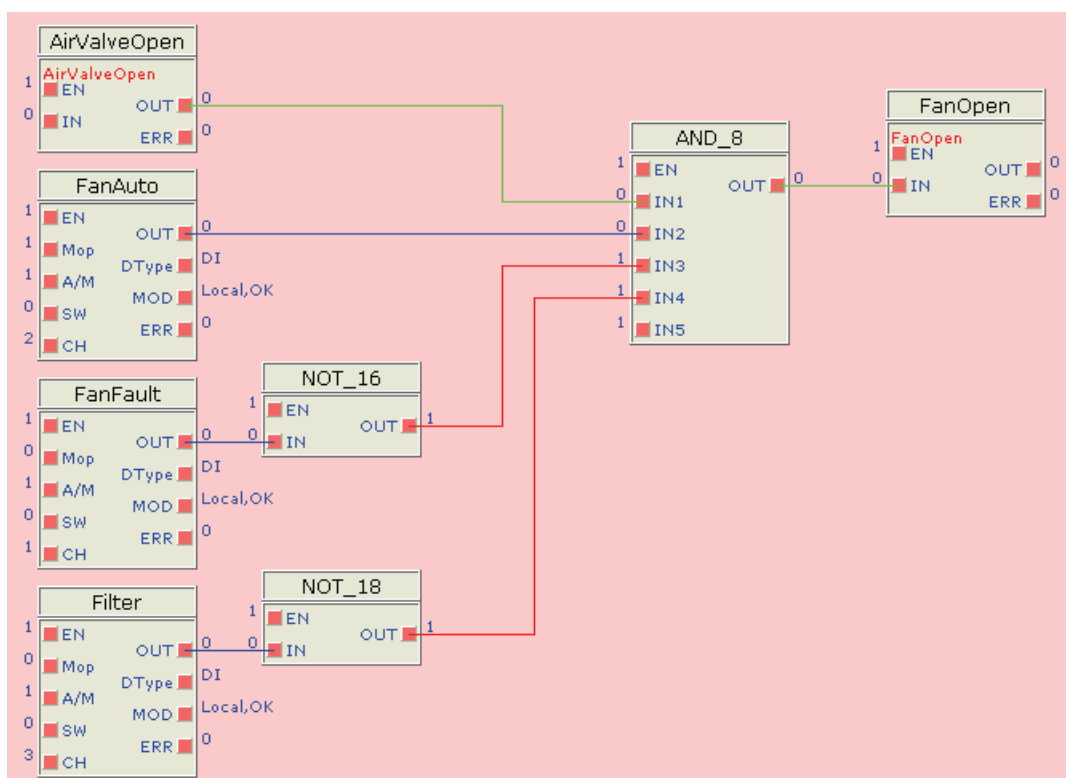
On-delay Block: When IN is changed from 0 to 1, a delay is created. If IN is not changed after the delay time, then Q will be set to 1; if IN is changed to 0, then Q will be set to 0.

The blocks also include logic computation blocks, such as AND logic, OR logic and NOT Logic, and intermediate variable blocks MBVar and GVar. Please refer to the following steps to implement the logic development.

- 1) Drag the BAS-UI block to the page and change the name to Temperature which indicates the measured temperature. Set SW to 0 and Ch to 0, which indicates the UIO channel of BAS-3520.
- 2) Drag the MBVar block to the page and change the name to SetTemp4 which indicates the configured temperature. Set MBAddr to 40801.
- 3) Drag the Alarm block to the page as the dead band. When the temperature changes within the range of Beadband, the output will not be changed. This could protect field devices from frequent starting and stopping in order to ensure devices run safely.
- 4) Drag the BAS-DI block to the page and change the name to LowTempr which indicates the freezing alarm signal. Set SW to 0 and Ch to 4, which indicates channel D14 of BAS-3520 is for freezing alarm signal.
- 5) Drag NOT and AND blocks to the page as Logic NOT and Logic AND.
- 6) Drag the OnDelay block to the page for creating the delay. If IN changes from 0 to 1, Q will output 1; if IN is 1, Q will output 1; if IN changes from 1 to 0, Q will output 0.
- 7) In the variable group XFDemoVar, create the global Boolean variable AutoRun which indicates the automatic starting of intermediate variable. Drag the Gvar block to the page and change the name to AutoRun; connect the property configuration –Variable-Name to AutoRun. This will temporarily save the result in the intermediate variable AtutoRun.
- 8) There are two operation modes: manual start-stop and automatic program start-stop. If the automatic program start-stop mode is selected, the installation program will start or stop the device automatically. If the manual start-stop mode is selected, the user will have to manually start or stop the device. This function requires two address spaces MBVar and Modbus for data exchange with the upper computer as well as the selection function SBOOL for switching output.
- 9) Requirements for turning on the fan: air valve state is 1 (AirValueState=1; this program uses the intermediate variable AirValveOpen for easy debugging); the fan is in auto state (FanAuto=1); the fan is not in failure alarm state (FanFault=0); the filter is not in alarm state (Filter=0).
- 10) The program uses the OnDelay block when the fan and the air valve are turned on. The delay time are set to 2 seconds and 5 seconds in order to prevent the device from frequent starting and stopping.

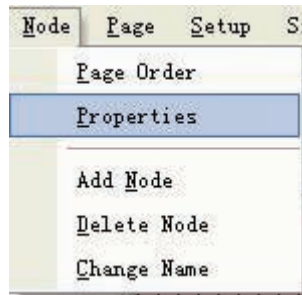
All programs are shown below:



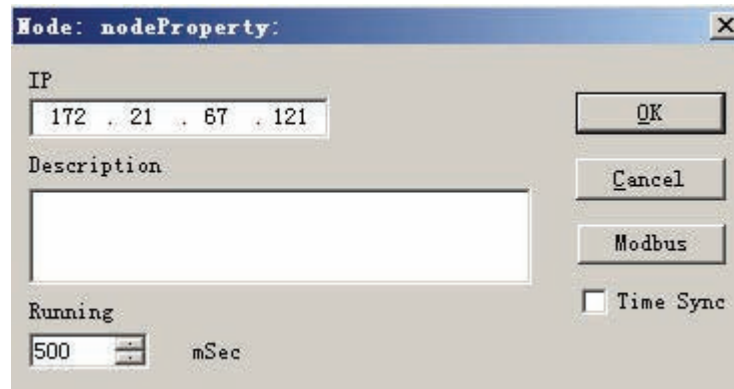


7.1.8 Configure node property

Node property should be configured after the control logic is designed.
Click "Node" and select "Property"



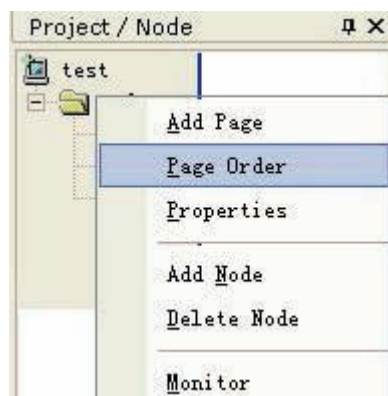
The following dialog box will pop up:



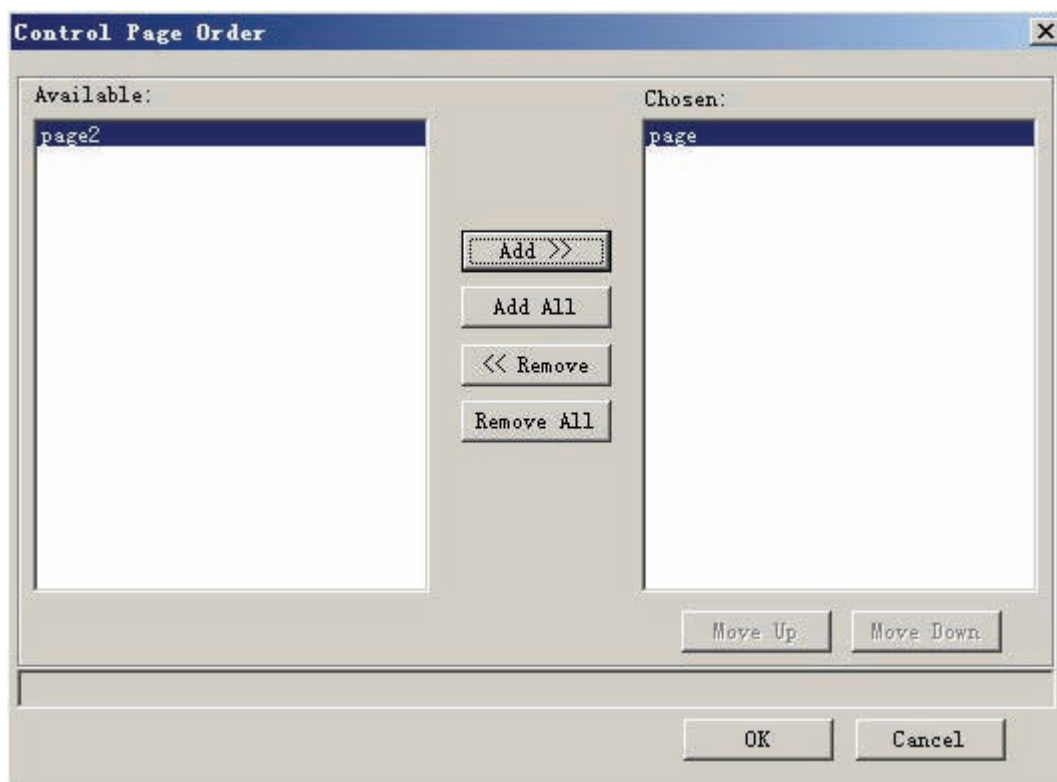
Enter the IP address of DDC device. The operating period will be adjusted according to the control logic designed by the user. Generally the period is set to the default 200 milliseconds.

7.1.9 Configure page executing order

The user has to set page executing order for the configuration at the first time.



Click "Page Order" and the following window will pop up. Select the page and click "Add" to add the page to the right column so that the program will be downloaded and implemented.



After the configuration, a basic DDC application project is created. Please refer to the following sections for development and application of complicated projects.

7.2 Hardware Configuration

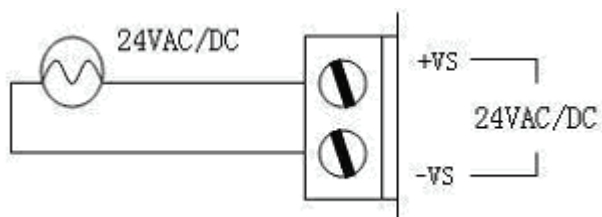
7.2.1 Equipment

The demonstrated project uses the following devices:

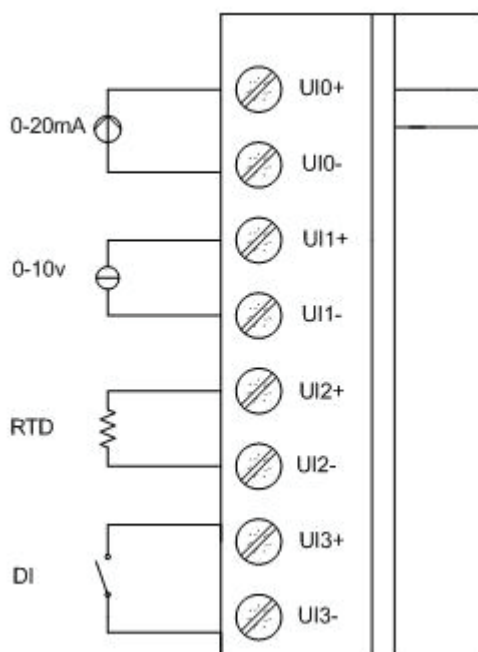
1. BAS-3520 master module
2. BAS-3050 slave module
3. Ethernet cable

7.2.2 Wiring

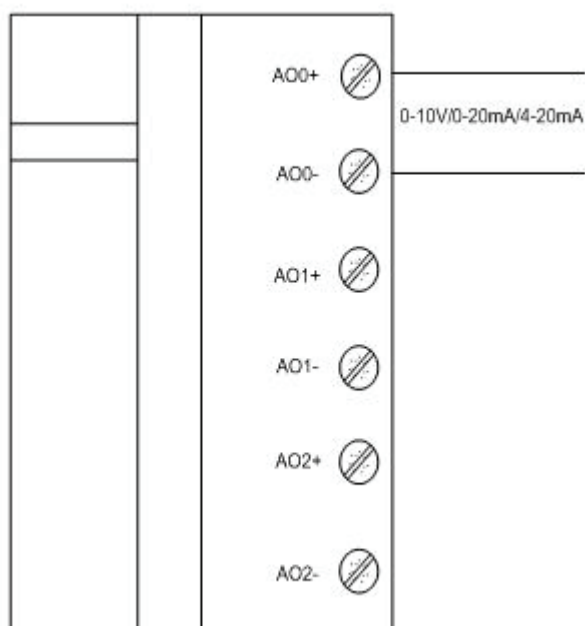
BAS-3520 requires 24 V DC power supply. Please refer to the following image for wiring:



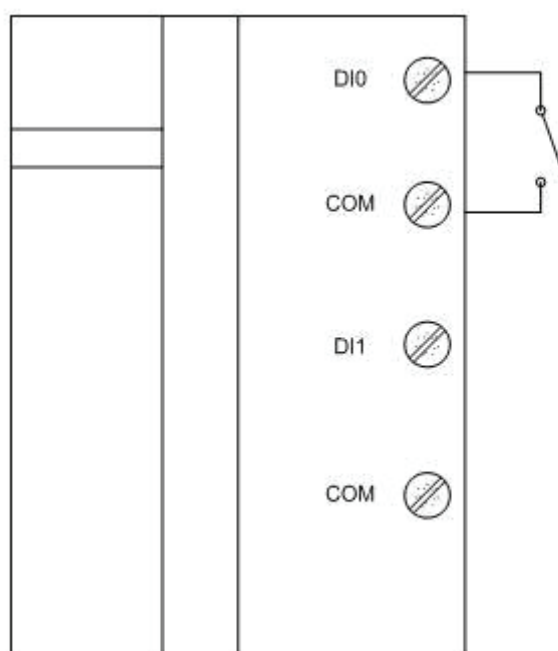
Note! The section size of the cable should not be less than 2 mm.



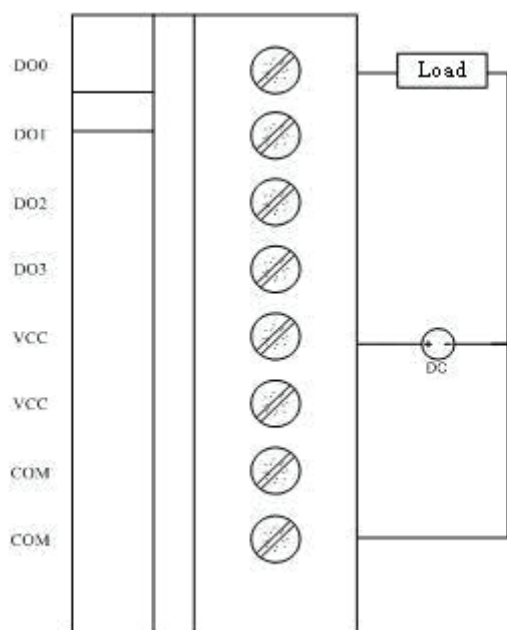
BAS-3520 master module uses the wiring of UI, DI, DO and AO. UI is for AI and DI multiplexing; it only supports dry contact when used as DI. The program uses PT1000 for room temperature collection; the user has to switch the DIP of UI0 on the panel to the V/RTD side. At the same time, UI0 should be set as PT1000 in BASPro channel configuration.



BAS-3520 analog output wiring:



For BAS-3520 digit input, dry contact and wet contact are connected in the same way so that no wiring is needed.

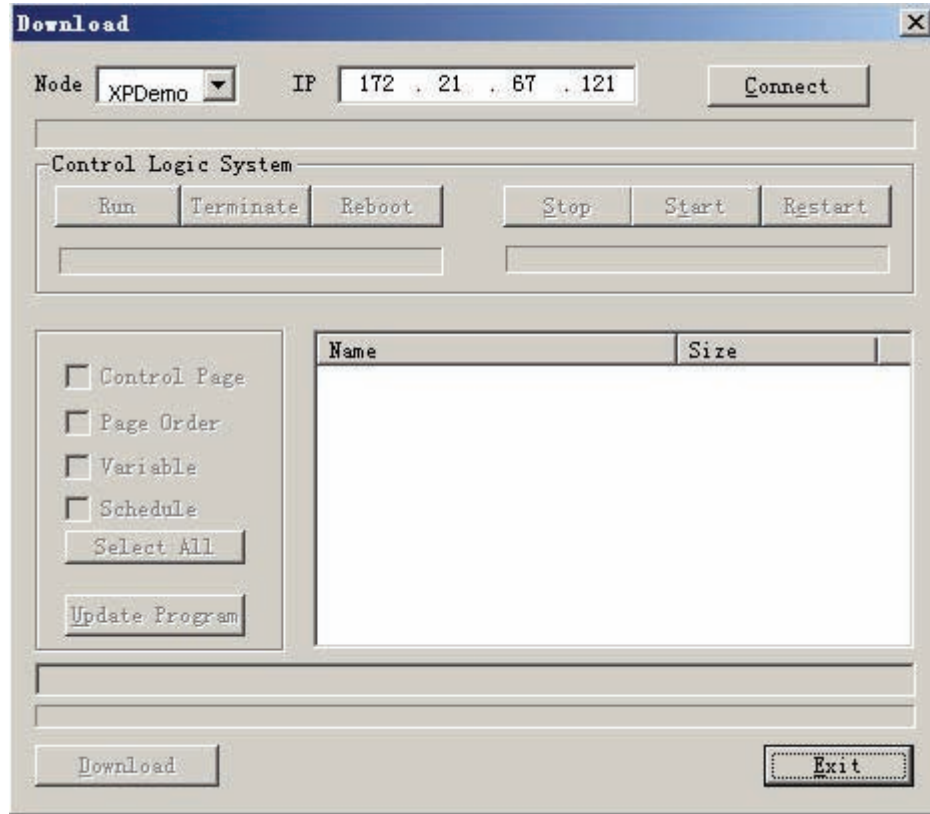


BAS-3520 digital output supports up to 35 VDC/1 A load; it is recommended to use external power supply.

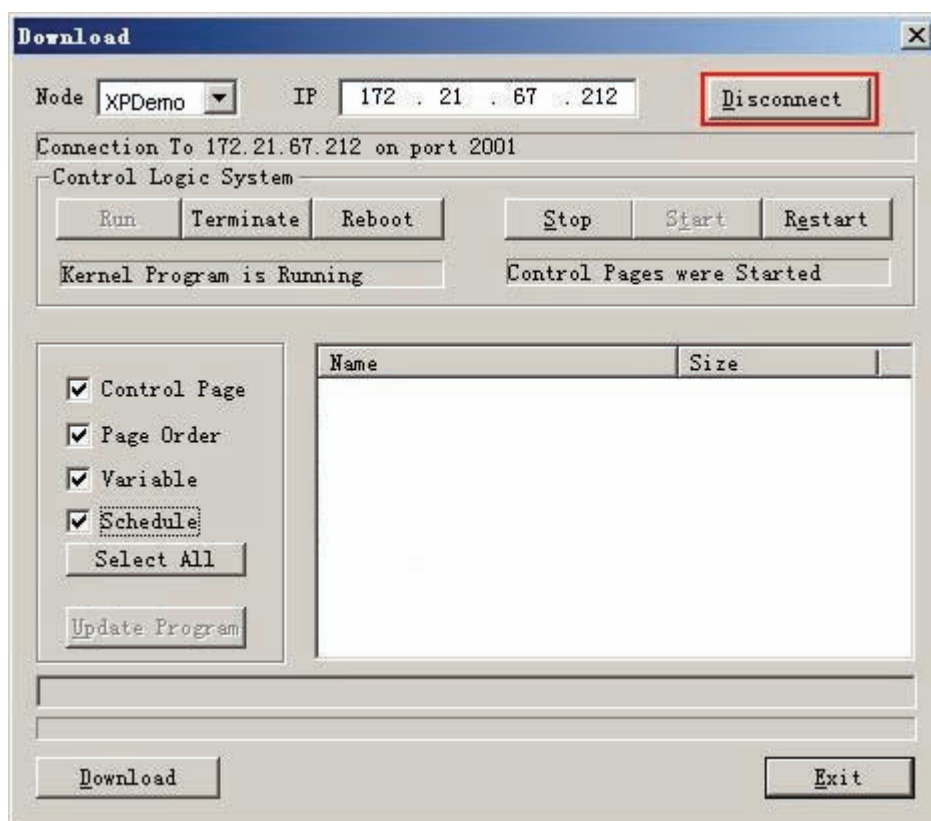
7.3 Downloading and Debugging

7.3.1 Downloading

When the control logic is designed, the user has to download the logic to DDC device. Select "Download" in the "Connect" list and the following window will pop up:



Select the target node name and the IP address will be shown automatically. Click "Connect" to connect with devices. After the connection, the following dialog box will pop up:



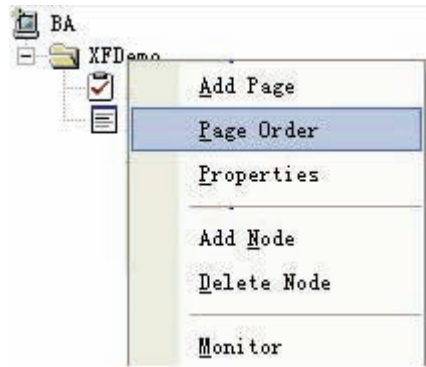
Select "Control Page" and "Page Order", all pages and order.dat files will be listed to the right.

Name	Size
XPDemo.fbl	16
order.dat	36

Note! Click "select all" and all files will be selected and downloaded

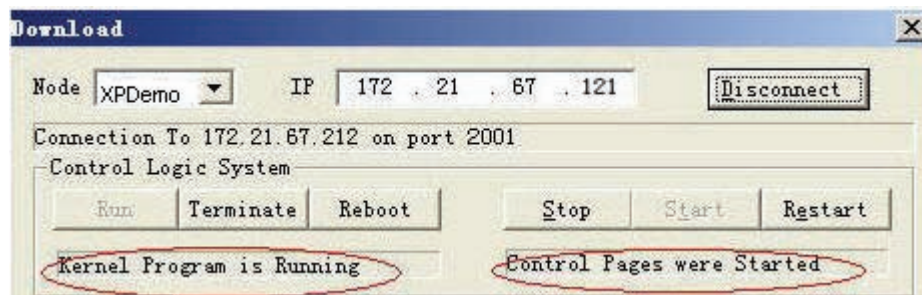


Click "Download" the system will remind the user to configure SCADA page executing order. The user could then return to the pop-up list of page executing order for the configuration.



After the configuration is completed, click "Yes" The software will automatically download the control page to the DDC device and a dialog box will pop up:

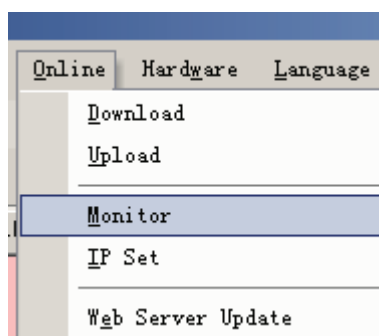
Click "Restart" and initiate the control logic in the DDC device. The logic in the DDC device is running and the page is shown below.



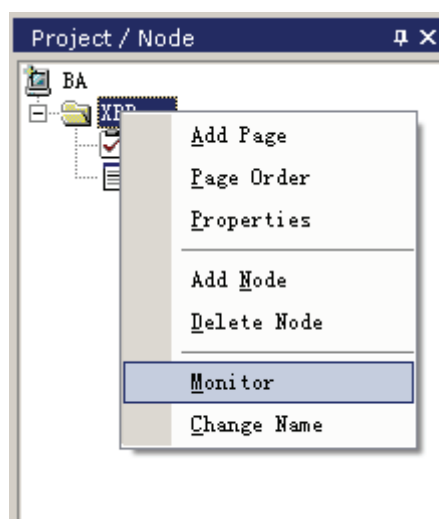
Please refer to section 3.9 or the BASPro Manual for details about other buttons on the downloading page.

7.4 Monitoring

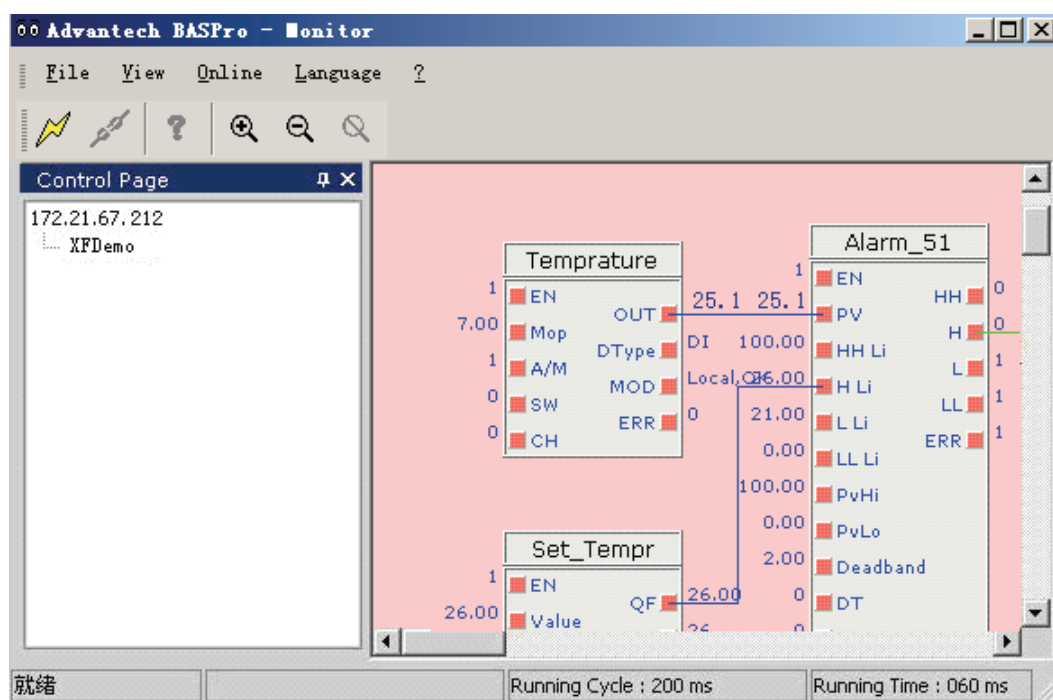
If the designed control logic in DDC device is running, then the user could monitor the device running status through BASPro Monitor program. Initiate BASPro Monitor and click "Monitor" in the "Online" list.



Or, right-click on the node and select "Monitor" in the pop-up list.



The BASPro Builder program will automatically run the BASPro Monitor program. Double-click on ; the running status of XFDemo control page will be shown.



Appendix **A**

I/O Wiring

A.1 I/O Wiring Diagrams

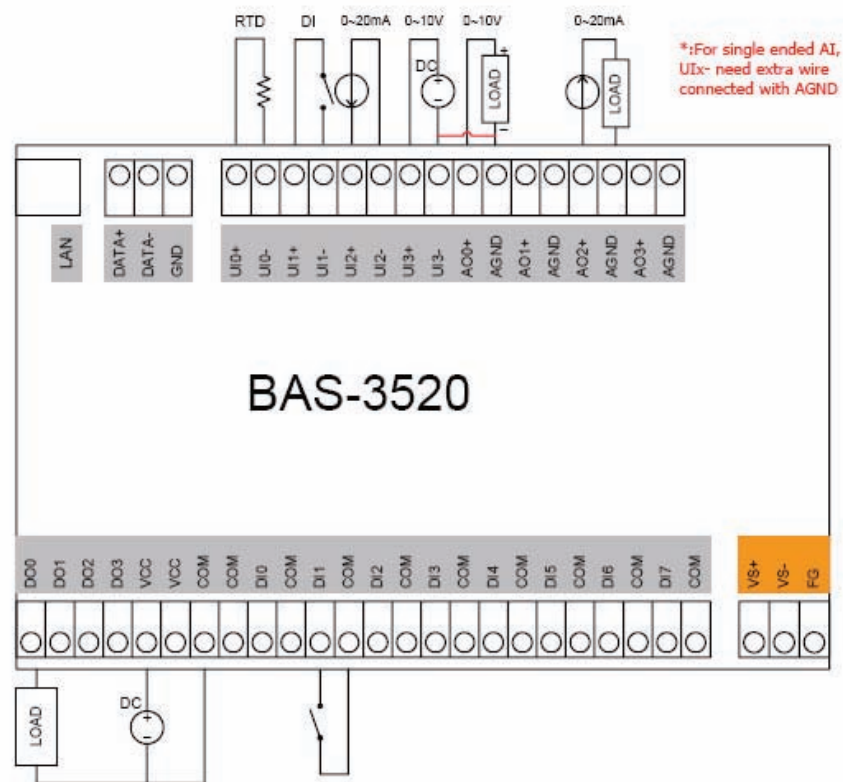


Figure A.1 BAS-3520 Connection

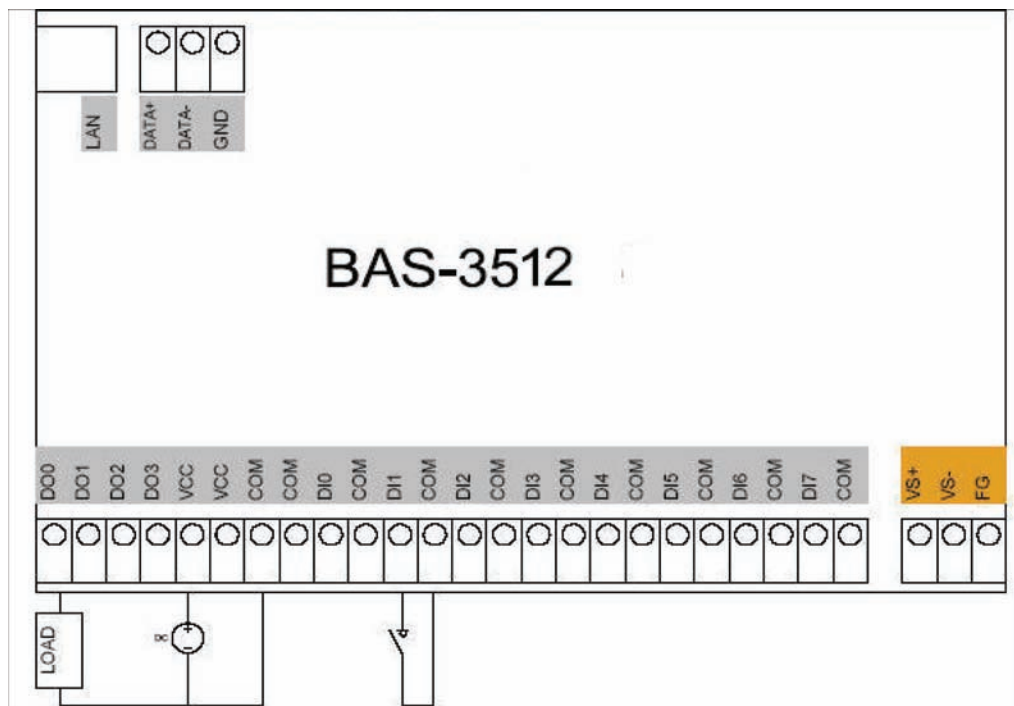


Figure A.2 BAS-3512 Connection

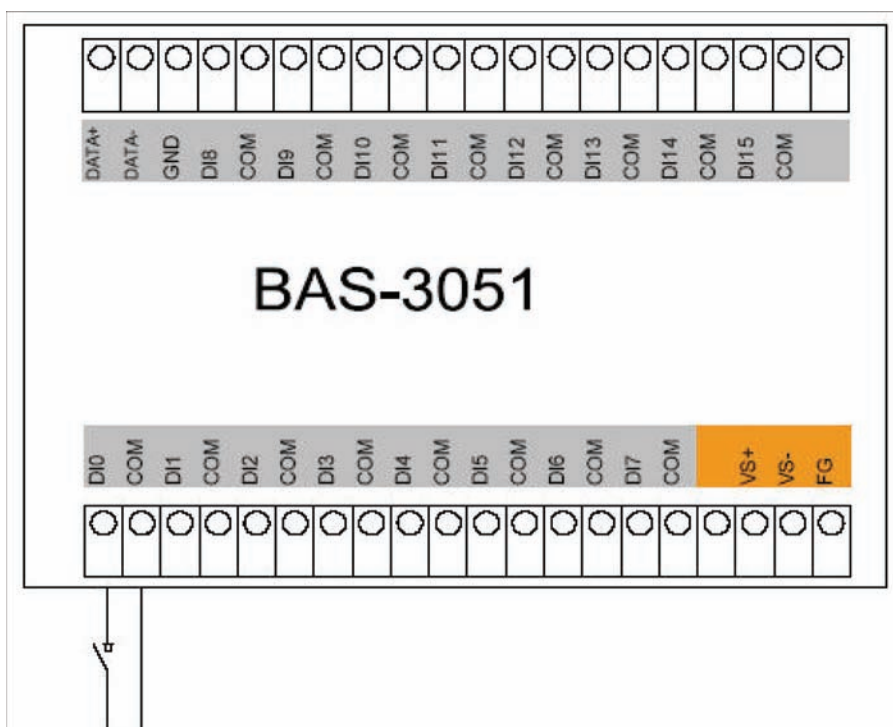


Figure A.3 BAS-3051 Connection

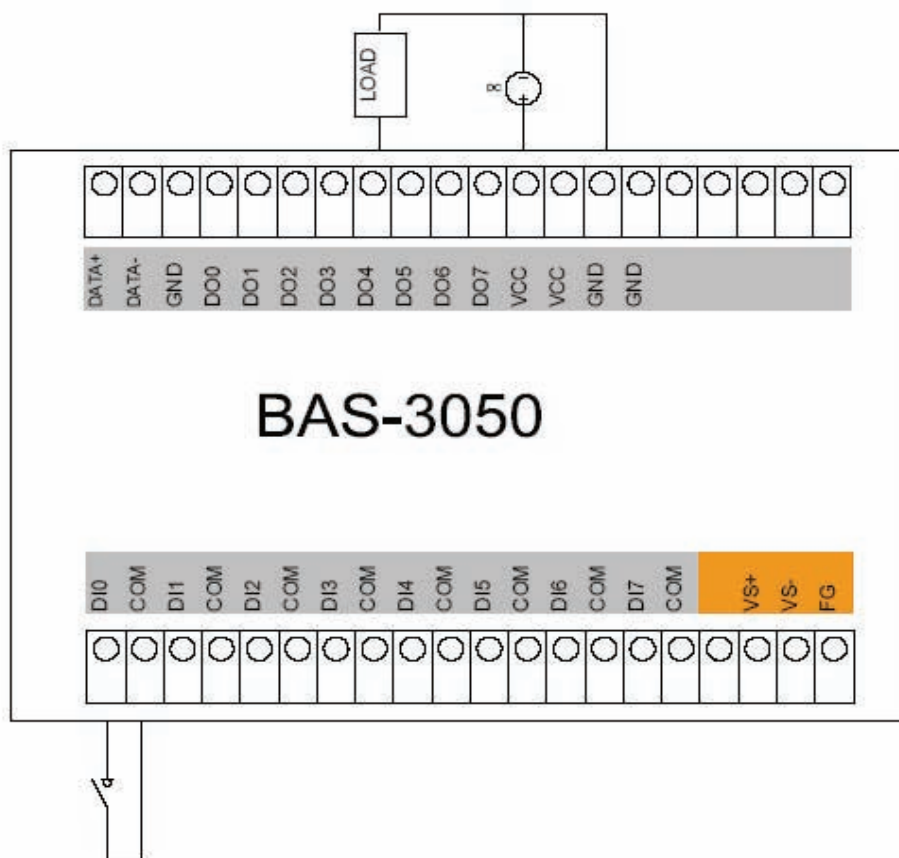


Figure A.4 BAS-3050 Connection

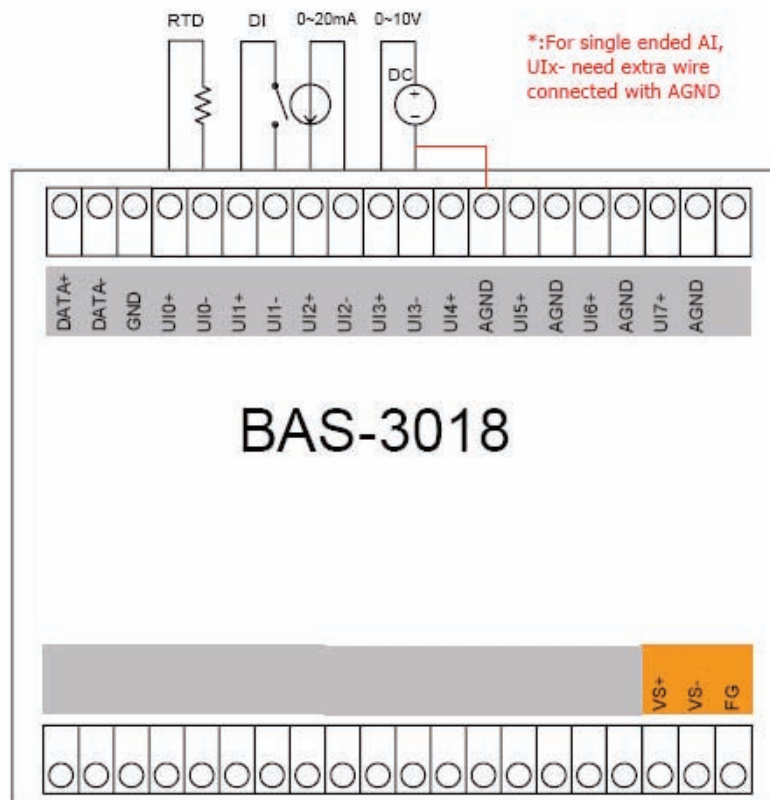


Figure A.5 BAS-3018 Connection

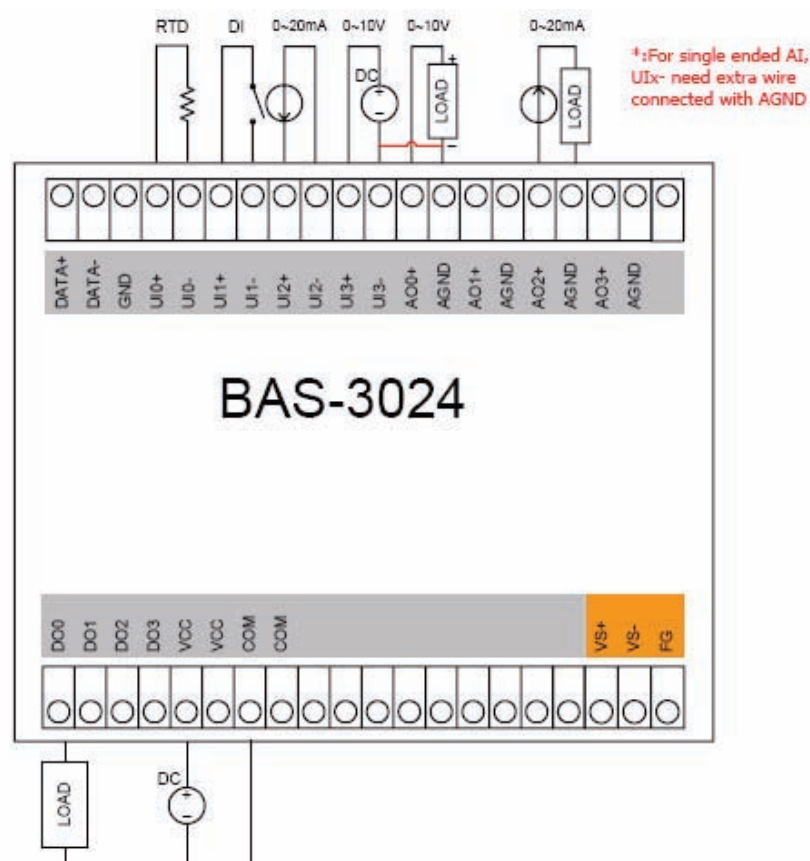


Figure A.6 BAS-3024 Connection

Appendix **B**

RS-485 Network Layout

B.1 Daisychain

The last module of a segment is a repeater. It is directly connected to the main-wires thereby ending the first segment and starting the next segment.

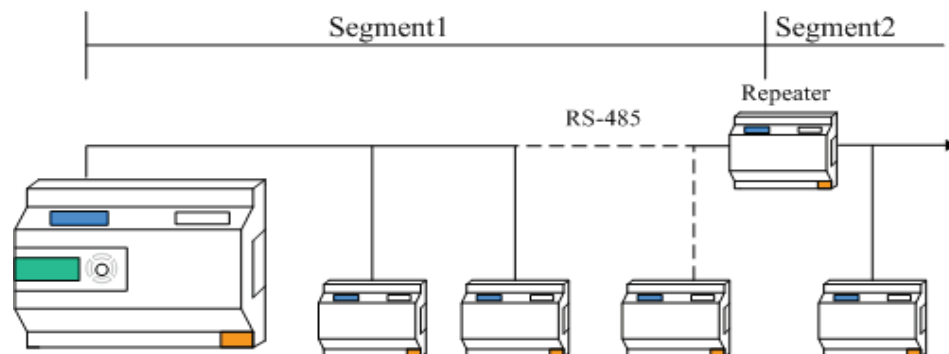


Figure B.1 Daisychaining

B.1.1 Star Layout

In this scheme the repeaters are connected to drop-down cables from the main wires of the first segment. A tree structure is the result. This scheme is not recommended when using long lines since it will cause a serious amount of signal distortion due to a signal reflection in a several line endings.

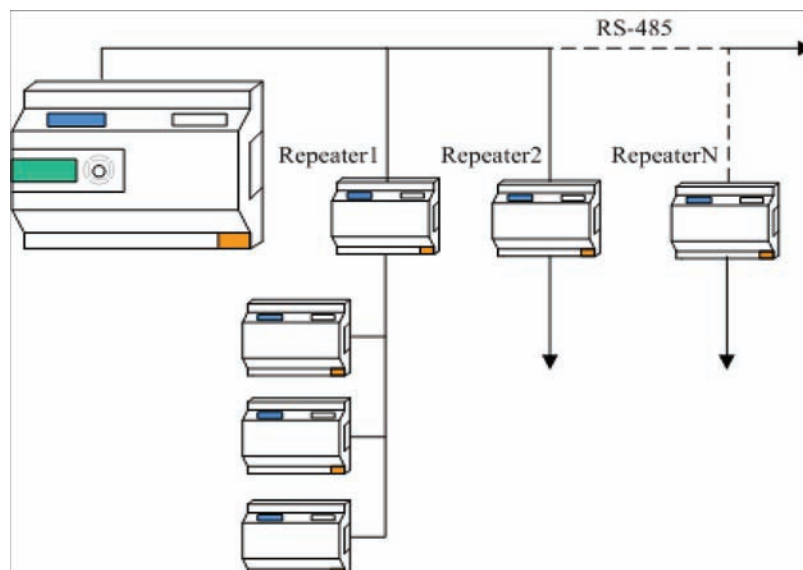


Figure B.2 Star Structure

B.1.2 Random

This is a combination of daisychain and hierarchical structure

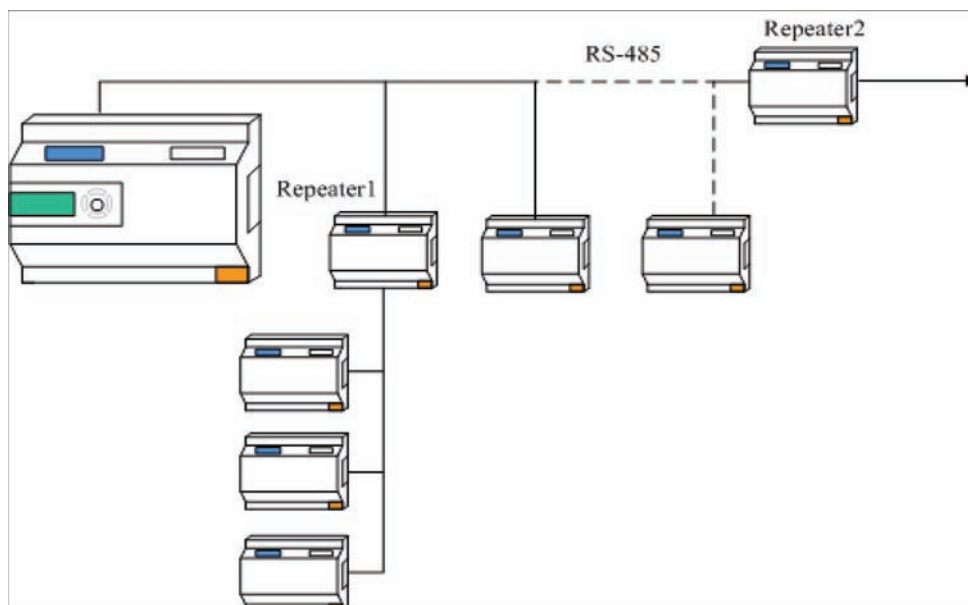


Figure B.3 Line Termination

Each discontinuity in impedance causes reflections and distortion. When an impedance discontinuity occurs in the transmission line the immediate effect is signal reflection. This will lead to signal distortion.

Specially at line ends this mismatch causes problems. To eliminate this discontinuity terminate the line with a resistor.

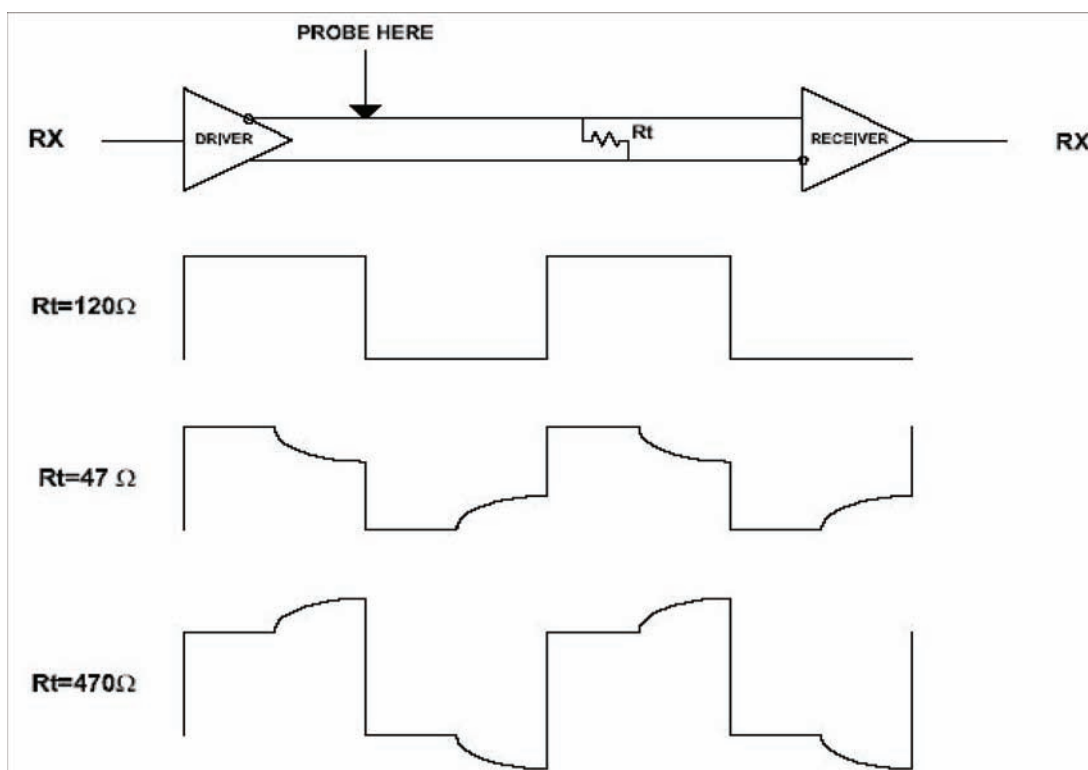


Figure B.4 Signal Distortion

The value of the resistor should be as close as possible to the characteristic impedance of the line. Although receiver devices add some resistance to the whole of the transmission line, normally it is sufficient that the resistor impedance should equal the characteristic impedance of the line.

Appendix **C**

Modbus Address Mapping Table

C.1 Modbus Address Mapping Table

Firmware Address List	DI 16Channels 00001-00016	UI 16Channels 40001-40032
	DO 16Channels 00401-00416	AO 16channels 40401-40432
		System information 41201-41216
		UI RangeCode 41601-41616
		AO RangeCode 42401-42416
		DI RangeCode 43201-43216
		DORangeCode 44001-44048
		DI as Freq and Count
		Factory Reset 45601
		Read/Write FastValue 46001 47001
		UI cable resistance compensation32
	SRAM Total = 512KB Direct operate = 256KB File system = 256KB	

Figure C.1 BAS-3000 DDC Firmware Modbus Address

When using several devices that contain master and slaves modules, Advantech BASPro will combine Modbus addresses of all connected hardware into an ordered Modbus Address mapping table for the user's convenience to configure the 3rd party software. The figure below is the Modbus Address mapping table of hardware I/O channels, whose conversion is show as the following:

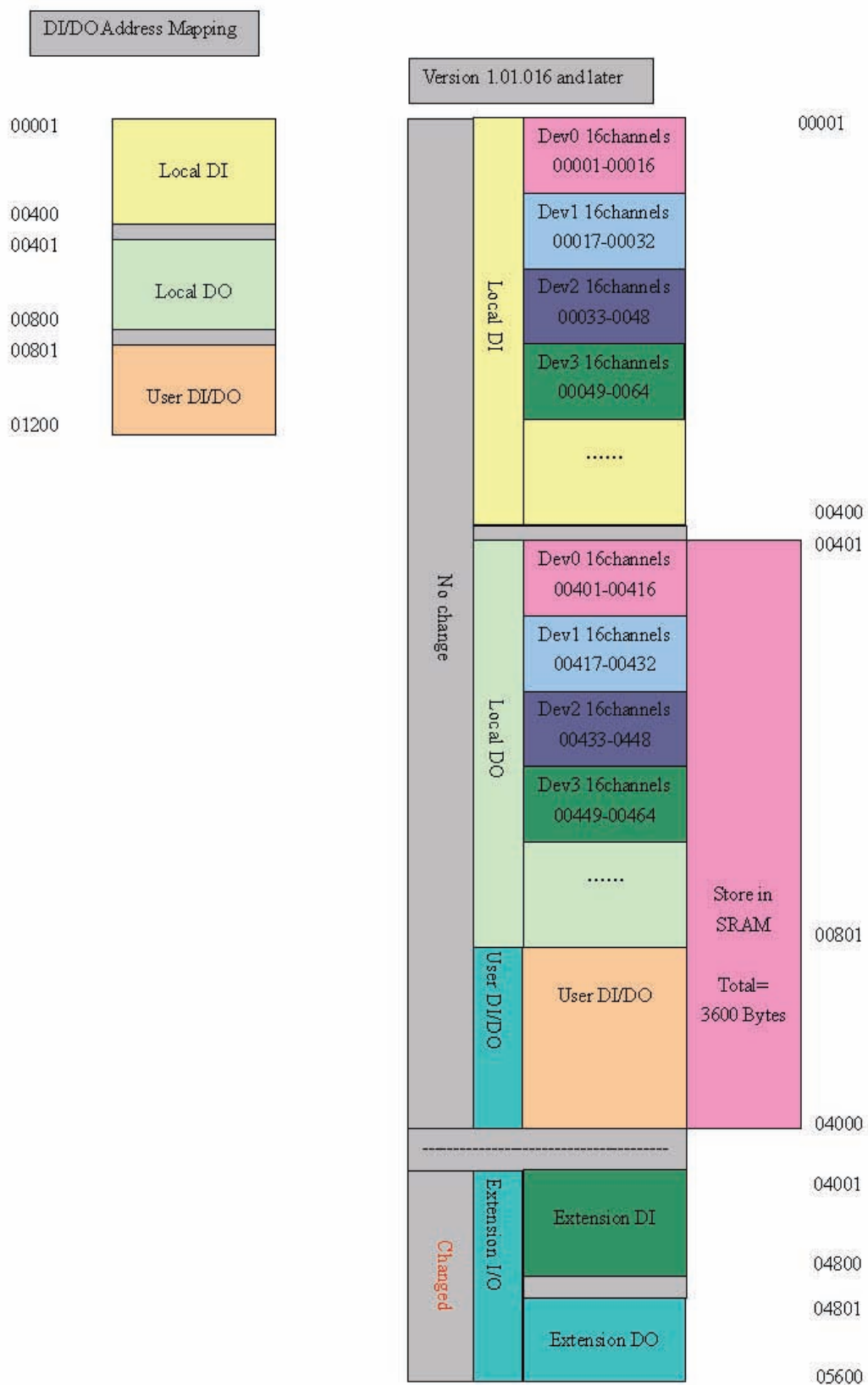


Figure C.2 Modbus Address Mapping Table 1

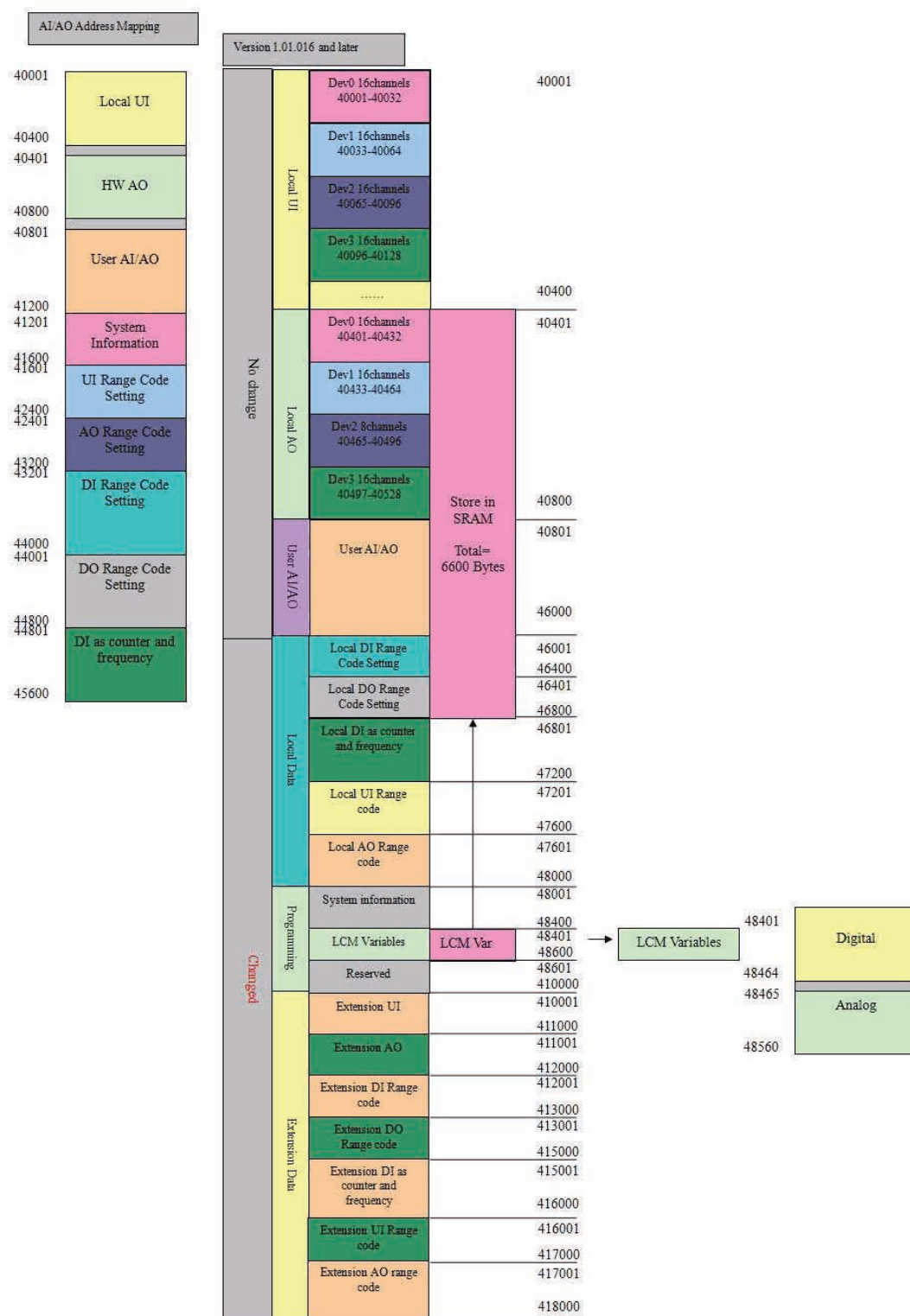

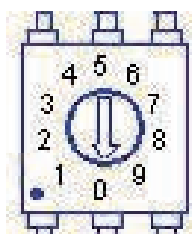


Figure C.3 Modbus Address Mapping Table 2

Note!  *Modbus Address Mapping Areas (DI/DO is 00801~01200, and version 1.01.016 and later will extend to 00801~04000; for UI/AO is 40801~41200 and version 1.01.016 and later will extend to 40801~46000) are read/write, when users apply the third part software which supports Modbus Protocol, users can change each channel's value of DDC by these addresses, but the other Modbus Address Mapping Areas are used by BASPro logic, so in the third part software, users cannot change their values, they are read only for the third part software!*

BAS-3000 IO module supports Modbus TCP protocol and Modbus RTU protocol. If Modbus TCP protocol is used, the user has to adjust the switch to point to "0" as shown in the following image.



1. If Modbus TCP protocol is used, then the DIP switch of each extended module will be set to 1, 2, 3 respectively; that is, SW = 1, 2, 3. The Modbus TCP starting addresses of each extended module's AI, AO, DI, and DO are shown below:

AI Start Address= 40001

AO Start Address= 40401

DI Start Address= 00001

DO Start Address = 00401

Therefore, the Modbus TCP address of extended module is:

For DI/DO:

Address = Start + SW*16

For UI/AO:

Address = Start + SW*16*2

For example, if SW = 1, then the Modbus TCP address of a module's UI is:

Address = 40001 + 1*16*2= 40033.

Exception: When DI set as Pulse input, the Modbus address mapping of DI should be set to Modbus address of UI, and Modbus Address Mapping offset should set as **32**.

For example: if extended module's DI as Pulse input, SW=1, the master module DI as Pulse input Address=46801, so, DI as Pulse input Address = 46801 + 32*1 = 46833.

oo

2. If Modbus RTU protocol is used, then the DIP switch of each extended module will be set to 1~15 respectively; that is, SW = 1~15. The Modbus RTU starting addresses of each extended module's AI, AO, DI, and DO are shown below:

AI Start Address = 40001

AO Start Address = 40401

DI Start Address = 00001

DO Start Address = 00401

Therefore, the Modbus RTU address of extended module is:

For DI/DO:

Address = Extension Start + SW * 16.

For UI/AO:

Address = Extension Start + SW * 16 * 2.

For example, if SW = 1, then the Modbus RTU address of a module's UI0 is:

Address = 410001 + 1 * 16 * 2 = 410033.

Exception: When DI set as Pulse input, the Modbus address mapping of DI should be set to Modbus address of AI, and Modbus Address Mapping offset should be set as **32**. For example: if extended module's DI as Pulse input, SW=1, the master module DI as Pulse input Address=415001, so, DI as Pulse input Address = 415001 + 1 * 16 * 2 = 415033.

For example, Modbus Address Setting in common use as follow,

oo

1 Master DDC Module

BAS-3520/BAS-3512 DDC Module					
Channel	DI	FI	UI	DO	AO
0	00001	44801	40001	00401	40401
1	00002	44803	40003	00402	40403
2	00003	44805	40005	00403	40405
3	00004	44807	40007	00404	40407
4	00005	44809	oo	oo	oo
5	00006	44811	oo	oo	oo
6	00007	44813	oo	oo	oo
7	00008	44815	oo	oo	oo
FI: Represents Pulse input function, only supports 2 channels DI as Pulse input function each DDC Only supports 2 channels DO as PWM function each DDC BAS-3520 DDC Module: 8DI/4DO/4UI/4AO BAS-3512 DDC Module: 8DI/4DO					

2 Extended DDC Module

a. DI

BAS-3000 DI Module as local ext.					BAS-3000 DI Module as remote extension						
Ch.	SW=1	SW=2	SW=3	°°	Ch.	SW=1	SW=2	SW=3	SW=4	SW=5	.....
0	00017	00033	00049	°°	0	04001	04017	04033	04049	04065	.....
1	00018	00034	00050	°°	1	04002	04018	04034	04050	04066	.....
2	00019	00035	00051	°°	2	04003	04019	04035	04051	04067	.....
3	00020	00036	00052	°°	3	04004	04020	04036	04052	04068	.....
4	00021	00037	00053	°°	4	04005	04021	04037	04053	04069	.....
5	00022	00038	00054	°°	5	04006	04022	04038	04054	04070	.....
6	00023	00039	00055	°°	6	04007	04023	04039	04055	04071	.....
7	00024	00040	00056	°°	7	04008	04024	04040	04056	04072	.....
8	00025	00041	00057	°°	8	04009	04025	04041	04057	04073	.....
9	00026	00042	00058	°°	9	04010	04026	04042	04058	04074	.....
10	00027	00043	00059	°°	10	04011	04027	04043	04059	04075	.....
11	00028	00044	00060	°°	11	04012	04028	04044	04060	04076	.....
12	00029	00045	00061	°°	12	04013	04029	04045	04061	04077	.....
13	00030	00046	00062	°°	13	04014	04030	04046	04062	04078	.....
14	00031	00047	00063	°°	14	04015	04031	04047	04063	04079	.....
15	00032	00048	00064	°°	15	04016	04032	04048	04064	04080	.....
Only supports 2 channels DI as Pulse input function each DDC BAS-3050: 8DI/8DO, BAS-3051: 16DI											

b. DI as Pulse input function

BAS-3000 DI Module as local extension					BAS-3000 DI Module as remote extension				
Ch.	SW=1	SW=2	SW=3	°°	Ch.	SW=1	SW=2	SW=3	SW=4
0	46833	46865	46897	°°	0	415001	415033	415065	415097
1	46835	46867	46899	°°	1	415003	415035	415067	415099
2	46837	46869	46901	°°	2	415005	415037	415069	415101
3	46839	46871	46903	°°	3	415007	415039	415071	415103
4	46841	46873	46905	°°	4	415009	415041	415073	415105
5	46843	46875	46907	°°	5	415011	415043	415075	415107
6	46845	46877	46909	°°	6	415013	415045	415077	415109
7	46847	46879	46911	°°	7	415015	415047	415079	415111
8	46849	46881	46913	°°	8	415017	415049	415081	415113
9	46851	46883	46915	°°	9	415019	415051	415083	415115
10	46853	46885	46917	°°	10	415021	415053	415085	415117
11	46855	46887	46919	°°	11	415023	415055	415087	415119
12	46857	46889	46921	°°	12	415025	415057	415089	415121
13	46859	46891	46923	°°	13	415027	415059	415091	415123
14	46861	46893	46925	°°	14	415029	415061	415093	415125
15	46863	46895	46927	°°	15	415031	415063	415095	415127
Only supports 2 channels DI as Pulse input function each DDC BAS-3050: 8DI/8DO, BAS-3051: 16DI									

c. DO

BAS-3000 DO Module as local ext.					BAS-3000 DO Module as remote extension						
Channel	SW=1	SW=2	SW=3	°°	Ch.	SW=1	SW=2	SW=3	SW=4	SW=5	.....
0	00417	00433	00449	°°	0	04801	04817	04833	04849	04865	.....
1	00418	00434	00450	°°	1	04802	04818	04834	04850	04866	.....
2	00419	00435	00451	°°	2	04803	04819	04835	04851	04867	.....
3	00420	00436	00452	°°	3	04804	04820	04836	04852	04868	.....
4	00421	00437	00453	°°	4	04805	04821	04837	04853	04869	.....
5	00422	00438	00454	°°	5	04806	04822	04838	04854	04870	.....
6	00423	00439	00455	°°	6	04807	04823	04839	04855	04871	.....
7	00424	00440	00456	°°	7	04808	04824	04840	04856	04872	.....
8	00425	00441	00457	°°	8	04809	04825	04841	04857	04873	.....
9	00426	00442	00458	°°	9	04810	04826	04842	04858	04874	.....
10	00427	00443	00459	°°	10	04811	04827	04843	04859	04875	.....
11	00428	00444	00460	°°	11	04812	04828	04844	04860	04876	.....
12	00429	00445	00461	°°	12	04813	04829	04845	04861	04877	.....
13	00430	00446	00462	°°	13	04814	04830	04846	04862	04878	.....
14	00431	00447	00463	°°	14	04815	04831	04847	04863	04879	.....
15	00432	00448	00464	°°	15	04816	04832	04848	04864	04880	.....
Only supports 2 channels DO as PWM function each DDC											
BAS-3050: 8DI/8DO, BAS-3024: 4UI/4DO/4AO, BAS-3060: 8 Relay, BAS-3061: 16 Relay											

d. UI

BAS-3000 UI Module as local ext.					BAS-3000 UI Module as remote extension						
Ch.	SW=1	SW=2	SW=3	°°	Ch.	SW=1	SW=2	SW=3	SW=4	SW=5	.....
0	40033	40065	40097	°°	0	410001	410033	410065	410097	410129	.....
1	40035	40067	40099	°°	1	410003	410035	410067	410099	410131	.....
2	40037	40069	40101	°°	2	410005	410037	410069	410101	410133	.....
3	40039	40071	40103	°°	3	410007	410039	410071	410103	410135	.....
4	40041	40073	40105	°°	4	410009	410041	410073	410105	410137	.....
5	40043	40075	40107	°°	5	410011	410043	410075	410107	410139	.....
6	40045	40077	40109	°°	6	410013	410045	410077	410109	410141	.....
7	40047	40079	40111	°°	7	410015	410047	410079	410111	410143	.....
8	40049	40081	40113	°°	8	410017	410049	410081	410113	410145	.....
9	40051	40083	40115	°°	9	410019	410051	410083	410115	410147	.....
10	40053	40085	40117	°°	10	410021	410053	410085	410117	410149	.....
11	40055	40087	40119	°°	11	410023	410055	410087	410119	410151	.....
12	40057	40089	40121	°°	12	410025	410057	410089	410121	410153	.....
13	40059	40091	40123	°°	13	410027	410059	410091	410123	410155	.....
14	40061	40093	40125	°°	14	410029	410061	410093	410125	410157	.....
15	40063	40095	40127	°°	15	410031	410063	410095	410127	410159	.....
°°											
BAS-3018: 8UI, BAS-3024: 4UI/4DO/4AO											

e. AO

BAS-3000 AO Module as local ext.					BAS-3000 AO Module as remote extension						
Ch.	SW=1	SW=2	SW=3	°°	Ch.	SW=1	SW=2	SW=3	SW=4	SW=5	.....
0	40433	40465	40497	°°	0	411001	411033	411065	411097	411129	.....
1	40435	40467	40499	°°	1	411003	411035	411067	411099	411131	.....
2	40437	40469	40501	°°	2	411005	411037	411069	411101	411133	.....
3	40439	40471	40503	°°	3	411007	411039	411071	411103	411135	.....
4	40441	40473	40505	°°	4	411009	411041	411073	411105	411137	.....
5	40443	40475	40507	°°	5	411011	411043	411075	411107	411139	.....
6	40445	40477	40509	°°	6	411013	411045	411077	411109	411141	.....
7	40447	40479	40511	°°	7	411015	411047	411079	411111	411143	.....
8	40449	40481	40513	°°	8	411017	411049	411081	411113	411145	.....
9	40451	40483	40515	°°	9	411019	411051	411083	411115	411147	.....
10	40453	40485	40517	°°	10	411021	411053	411085	411117	411149	.....
11	40455	40487	40519	°°	11	411023	411055	411087	411119	411151	.....
12	40457	40489	40521	°°	12	411025	411057	411089	411121	411153	.....
13	40459	40491	40523	°°	13	411027	411059	411091	411123	411155	.....
14	40461	40493	40525	°°	14	411029	411061	411093	411125	411157	.....
15	40463	40495	40527	°°	15	411031	411063	411095	411127	411159
BAS-3024: 4UI/4DO/4AO											

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*e*Automation

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