

FAB INTELLIGENT CONTROLLER USER'S MANUAL

FAB USER'S MANUAL

NEW



Be compatible with the earlier program

Improve RTC accuracy

485 communication port

Modbus RTU protocol

Don't be compatible with the earlier LCD panel

Ver 9.0



Preface

Thank you for choosing the FAB2 series intelligent controller. We recommend that you take some time to read this manual before using FAB2 products. You will find many more advantageous properties of FAB2, which will greatly simplify your operations of the FAB2.

FAB2 is a type of intelligent controller, which uses function blocks for programming and is provided with a removable LCD display. Function blocks enable the control functions of a PLC to be fulfilled without a large number of instructions and complicated programs. When several functions blocks are linked together in a specific way, relatively complicated control functions can be implemented.

FAB2 has a wide range of applications. It can be used for the automation of an extensive range of electrical and mechanical equipments, flow control, building automation and many other fields. To some degree, FAB2 really makes automation enter every corner of our daily life, from home to commerce, manufacturing, mining, utility and service sectors of the economy. This manual will describe in detail the function features and operating methods for FAB2.

Notes:

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(2) Our company reserves the right to make changes in design for improvement FAB2 Intelligent Controller Series without notification.

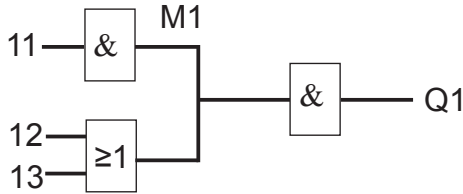
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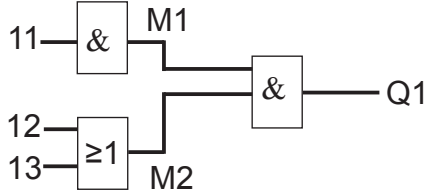
IMPORTANT APPLICATION NOTES:

1. The AF-C232/D232, AF-C485/D485, and LCD board, when a FAB2 is powered, must not be plugged in or out.
2. The default password for FAB2 is 0001.
3. The default address for FAB2 is 000.
4. When programming, the output of two function blocks must not be connected to one point, except for the CW function block.

For example:



The above way is wrong, and the correct way is as follows:



Safety Guide

This manual contains the precautions necessary for ensuring your personal safety as well as for protection of the products and the connected equipment. These precautions are highlighted with a triangle WARNING symbol in this manual and are marked according to the danger levels as follows:

Danger

It indicates that if appropriate precautions are not taken, serious incidents of personal injury or death, significant damages and loss of properties will be caused.



Caution

It indicates that if appropriate precautions are not taken, incidents of personal injury, damage or some loss of property will be caused.

Note

It indicates that particular attention is required to all published information related to the use or disposal of products.

Qualification

Only suitably qualified personnels are allowed to operate and debug the products. Qualified personnels are specified as those persons who carry out commissioning, grounding and apply the appropriate identifications to the circuits, equipments and systems according to the available safety practices and standards.

Application

Note

Only when this product is transported, stored , assembled, installed, operated and maintained in accordance with the documentation, it can carry out its designed functions properly and reliably.



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Warning

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Note

Only when this product is transported and stored with care, then assembled, installed, operated and maintained in accordance with the documentation, it can carry out its designed functions properly and reliably.



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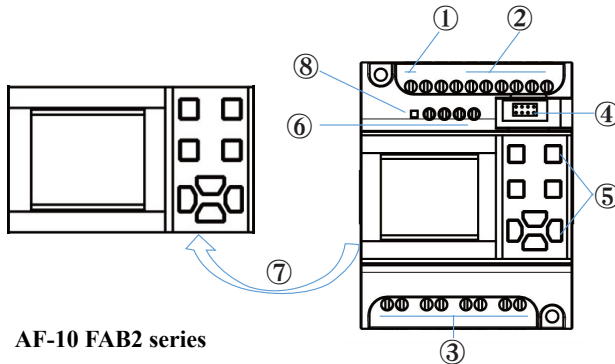
A large, rounded rectangular area with a double-line border, intended for writing a memo. The word "MEMO" is printed in bold at the top left corner of this area.



Chapter I Introduction

FAB2 series PLC is an upgraded version of old FAB PLC, which is programmed by the use of a Function Block Diagram. The programming of FAB2 is simpler and easier to learn than that of a conventional PLC, which uses ladder diagrams and associated instructions. In the design concept of FAB2 series products, it adds power indicator, comes with 2-way 485 communication interface, supports standard MODBUS RTU protocol and can modify parameters and other functions through the LCD panel, which greatly reduces the user's cost investment, and for the operation it brings great convenience. The volume of FAB2 series products follows the old FAB's small size, light weight and other characteristics, and is especially suitable for internal installation and use. Now FAB2 are being widely used in many fields such as industry, commerce, mining, agriculture, home automation etc.

1.1 Structure of FAB2



AF-10 FAB2 series

- 1-Power terminals
- 2-Input terminals
- 3-Output terminals (Relay or transistor)
- 4-Program download port
- 5-Operating keys
- 6-Two channel of 485 communication interface
- 7-LCD display panel
- 8-Power Indicator (Red Indicator, Flashing frequency 1hz)



1.2 Specifications and models

Item	Type	Power	Input	Output
1	AF-10MR-A2	AC100V-240V	6 points AC digital input	4 points relay output
2	AF-10MR-E2	AC14-20V/ DC12-24V	6 points AC/DC digital input	4 points relay output
3	AF-10MT-E2	DC12-24V	6 points DC digital input	4 points transistor output (equivalent NPN)
4	AF-10MR-D2	DC 12-24V	6 points DC(with analog) digital input	4 points relay output
5	AF-10MT-D2	DC12-24V	6 points DC(with analog) input	4 points transistor output (equivalent NPN)
6	AF-10MT-GD2	DC12-24V	6 points DC(with analog) input	4 points transistor output (equivalent PNP)
7	AF-20MR-A2	AC100V-240V	12 points AC digital input	8 points relay output
8	AF-20MR-E2	AC14-20V/ DC12-24V	12 points AC/DC digital input	8 points relay output
9	AF-20MT-E2	DC12-24V	12 points DC digital input	8 points transistor output (equivalent NPN)
10	AF-20MR-D2	DC 12-24V	12 points DC(with analog) digital input	8 points relay output
11	AF-20MT-D2	DC12-24V	12 points DC(with analog) input	8 points transistor output (equivalent NPN)
12	AF-20MT-GD2	DC12-24V	12 points DC(with analog) input	8 points transistor output (equivalent PNP)
13	AF-HMI	The removable LCD panel that can modify parameters through the panel		
14	AF-C232-2	232 interface communication lines for downloading programs		
15	AF-DUSB-2	USB interface communication lines for downloading programs		
16	RTD-FU-2	Temperature module (Detect the temperature signal directly)		



1.3 FAB2 Features

1. Removable LCD display (AF-HMI)

AF-HMI(Removable LCD display) can be used flexibly according to your needs. When you need it, you can install and use the keys on the panel to query/ set the FAB2 address, FAB2 system time, modify the function block parameters and manually calibrate the analog quantity, etc. When you don't need it, you can disassemble it and replace it with an ordinary panel, which will greatly reduce your cost of use. However, compared with AF-LCD, the AF-HMI operator panel cannot be programmed manually.

2. FB programming and big program storage capacity

FAB2 uses a function block to realize the control function that the previous PLC needed a large section of the program to realize, and several functional blocks are connected in a certain way to complete more complicated control functions. The FAB2 can accommodate up to 127 function block programs. There are enough resources for you to implement complicated control requirements. Once the program is written, it will never be lost. FAB2 uses a larger memory capacity chip than FAB.

3. Exquisite and compact design

If you are looking to make your device delicate, FAB2 will be your best partner.

It only needs to occupy you

AF-10 Series: 71.6mm*90.4*57.6mm

AF-20 Series: 126.4mm*90.4*57.6mm

4. Free programming software

The free QUICKII programming software is an extremely friendly human-machine programming interface. It not only can edit function charts, but also can provide functions such as off-line simulation of your programs and on-line monitoring of I/O status. It solves many inconveniences such as customer online testing.



5. Real-time clock function

The FAB2 has a clock-recording function that can run at any time you need, and you can set up to 127 different time periods, especially for systems that require time control. The timing is accurate to the second, and FAB2's RTC precision error is greatly improved to 20s/month compared with FAB, making your time control more accurate.

6. Analog inputs

FAB2 can receive analog input except for switch input so as to complete the control of temperature, humidity, pressure, flow, liquid level, etc., and can monitor the analog value status of the PC through short distance or long distance. And FAB2 simulation accuracy and FAB greatly improved to 10 (0.1v).

7. Security password lock function

FAB2 has absolute confidentiality for the program you write. You can set your own password before burning the program. You can modify the application only after entering the correct password. When the AF-HMI panel enters the function interface, it must enter the correct password and protect it with the * symbol.

8. Power indicator

FAB2 adds red power indicator to facilitate the customer to visually check whether the machine is properly connected to the power supply. When customers use FAB before, it is necessary to use a multimeter to test the voltage across the power supply to determine whether the power supply is properly connected to the customer, causing inconvenience to the customer.

9. Communication interface

In addition to downloading the communication port, FAB2 also adds two 485 ports to save the cost and space for customers directly. FAB2's A1B1 interface supports the standard MODBUS RTU protocol and can communicate with other manufacturers' branded touch screens and other devices. FAB2's A2B2 interface is used to communicate with our SH300 text display. A detailed description of the communication interface is given chapter 4.

10. Communication protocol

In addition to the custom protocol for the download port, FAB2 adds the standard MODBUS RTU protocol. The old FAB only supports custom protocols.



Chapter II Installation and wiring

2.1 Installation

2.1.1 Methods

FAB2 is small so it is suitable to be fit inside panels or machinery.

The installation of FAB2 is extremely easy.

1. Use standard 35mm DIN rail mounting FAB2, as shown in Fig 2.1,
2. Use the screw mounting holes on FAB2 for direct mounting

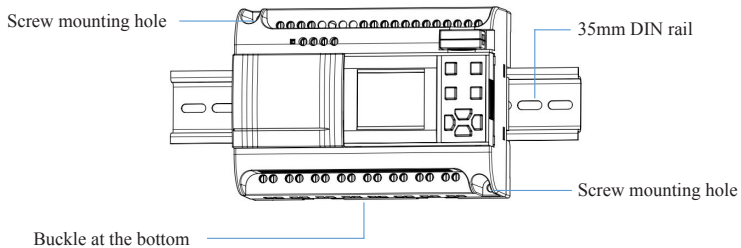


Fig.2.1 Use stand and DIN rail for installation of FAB2



Do not remove the AF-HMI while it is powered on. Otherwise it may cause mechanical damage and even endanger the safety of the operator. We recommend powering off and plugging the AF-HMI panel.

2.1.2 Dimensions (unit:mm)

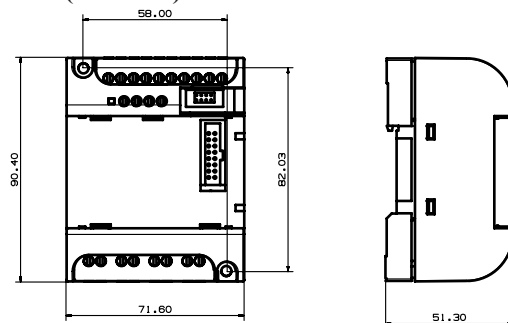


Fig 2.2 AF2-10 Series (mm)

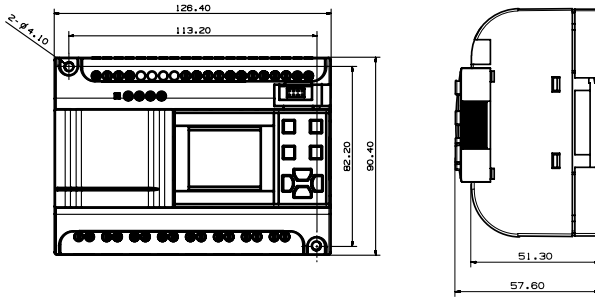


Fig. 2.3 AF2-20 Series (mm)

2.2 Wiring of FAB2

Screwdriver with a spade tip width of 3mm is needed for the wiring of FAB2 series. As for the cross section of a wire. The following two sizes are at choice:

- ※ $1 \times 2.5\text{mm}^2$
- ※ $2 \times 1.5\text{mm}^2$

2.2.1 Connection of power supply

1. For FAB2s like AF-10MR-A2 and AF-20MR-A2, its applicable power supply is 100~240VAC, 50/60Hz. The grid voltage fluctuation range is about 10%.
2. For FAB2s like AF-10MR-D2, AF-20MR-D2, AF-10MT-D2, AF-20MT-D2, AF-10MT-GD2, AF-20MT-GD2, AF-10MT-E2, AF-20MT-E2, Its applicable power supply voltage is DC12V-24V.
3. For FAB2s like AF-10MR-E2 and AF-20MR-E2, its applicable power supply voltage is AC/DC12V-24V.



FAB2 series power wiring diagram is as shown in Fig 2.4 and Fig 2.5,

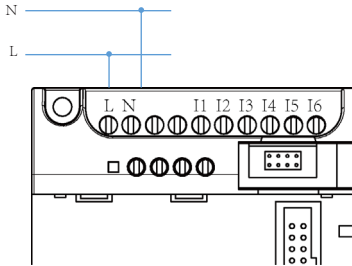


Fig 2.4 AC type

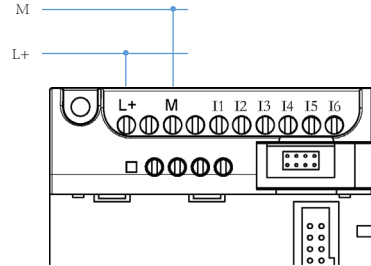


Fig 2.5 DC Type

2.2.2 FAB2 Input Connection

FAB2 input can be either switch, such as on/off switches and photoelectric baffle and sunshine switch etc., or analog, such as pressure, temperature, humidity, flow and so on. The specific requirements are as follows,

Demand	AF-10MR-A2 AF-20MR-A2	AF-10/20MR-D2 AF-10/20MT-D2 AF-10/20MT-GD2	AF-10MR-E2 AF-20MR-E2	AF-10MT-E2 AF-20MT-E2
Switch status 0	<AC40V	<DC3.5V	<AC/DC4.5V	<DC3.5V
Input current	<0.1mA	<0.4mA	<0.2mA	<0.5mA
Switch status 1	AC85V-240V	DC10V-24V	AC/DC10-24V	DC10V-24V
Input current	<0.2mA	<2.5mA	<2mA	<2.5mA

Proximity switch type with direct input 2-wire system/3-wire system/4-wire

Note:

1. Analog can be input into analog-receivable FAB2s like AF-10/20MR-D2, AF-10/20MT-D2, AF-10/20MT-GD2 through all the input ports (I1-I6/I1-IC). As long as the analog-related function blocks are used in the program, its port is automatically set to analog input. If in the program do not use the analog-related function blocks, its port is automatically set to digit input.
2. The analog inputs require DC 0V~10V voltage signals, which are divided equally in 0.1V increments. When you edit the program, all the block parameters related to the analog inputs are based on the minimum increment of 0.1V.
3. When the input voltage is higher than DC10.0V, it can only be used as switch, not be used as analog.
4. For digit input, when the switch state changes from 0 to 1, the time of the 1 state must be greater than 50ms. When the switch state changes from 1 to 0, the 0 state must also exist for more than 50ms.



FAB2 input connection is shown as shown in Fig 2.6 and Fig 2.7 and Fig 2.8,

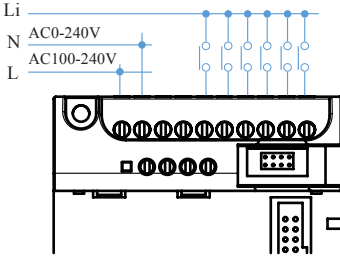


Fig 2.6 AC Type

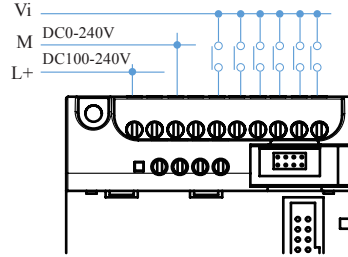


Fig 2.7 DC Type

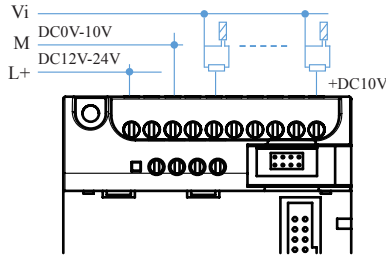


Fig 2.8 DC Type (D/GD)

2.2.3 FAB2 output connection

AF-10MR-A2/AF-20MR-A2/AF-10MR-E2/AF-20MR-E2/AF-10MR-D2/AF-20M R-D2 type FAB2 is the relay output, the relay's contact to the power and input is isolated.

AF-10MT-D2/AF-20MT-D2/AF-10MT-GD2/AF-20MT-GD2/AF-10MT-E2/AF-20MT-E2 type FAB2 is the transistor output.

1. Requirements for the relay outputs

Various loads can be connected to the output of FAB2, such as: incandescent lamps, fluorescent lamps, motors, contactors, etc. The maximum output current that FAB2 can provide is: non-inductive load 10A, inductive load 2A.



The connection is shown as shown in Fig 2.9,

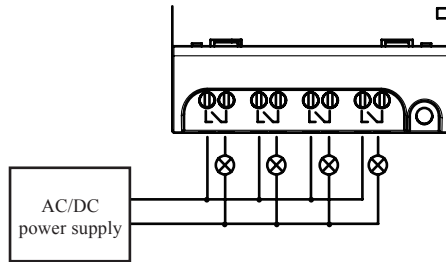


Fig 2.9 Relay output

2.Requirements for the transistors outputs

The transistor is divided into D type and GD type

The load connected to FAB2 must have the following characteristics: When the switch is ON(Q=1), the maximum current is 2A.

1) Type D connection is shown in Fig 2.10

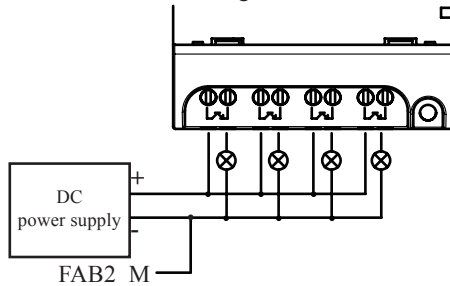


Fig 2.10 Transistor Output(D type)



- 1."M" line should be connected to "M" of FAB2 power supply, and the load should be directly conected the "L+" of the load power.
- 2.The load voltage should be less than DC80V.



2) Type GD connection is shown in Fig2.11,

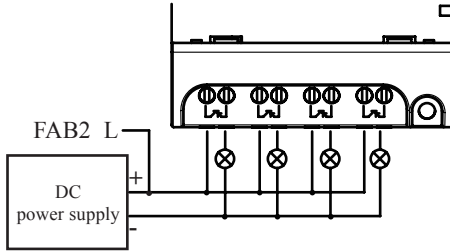


Fig 2.11 Transistor Output(GD type)



1. "L+" line should be connected to "L+" of FAB2 power supply, and the load should be directly connected the "M" of the load power.
2. The load voltage should be less than DC80V.

MEMO



Chapter III General Description of Function Blocks

FAB2 series adopts the programming method with the use of function blocks. 17 function blocks are configured in total, and each block can achieve a specific control function independently, e.g. time-delay ON, time-delay OFF, setting switch time, counter function, etc. As several blocks are linked up in a specific way relatively complicated control functions can be realised. Programming with function blocks is simpler and better appreciated than the conventional PLC instruction programming.

The following types of operator for FAB2 function blocks are available for options:

1. Options of input port: I1 - IC (Input port), Q1- Q8 (Output port),
 Moo-M126 (middle relay), HI (High potential status),
 LO (Low potential status), X (no input connection),
2. Options for output port: Q1 ~ Q8 (output port),
 M00~M126 (intermediate relay).




3.1 General function block (GF)

There are 6 general function blocks in total as listed in the following table:

Table 1: General function blocks

Line diagram	FAB2 function block	Function
Series Connection of NO contacts		AND
Parallel connection of NO contacts		OR
Phase inverter		NOT



Dual commutator contact		XOR
Parallel connection of NC contacts		NAND
Serial connection of NC contacts		NOR

3.1.1 AND

The electrical line diagram for serial connection of a certain number of NO contacts is shown as follows:

The symbol of AND is shown in the follows:



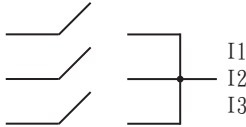
This function block is called AND, because only when all of I1, I2 and I3 are in status 1, the status of Output Q will be 1 (i.e. the output is closed).

I1	I2	I3	Q
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

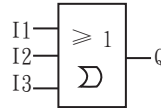


3.1.2 OR

The electrical line diagram for the parallel connection of a certain number of NO contacts is shown as follows:



The symbol of OR is shown in the follows:



This function block is called as OR, because the status for at least one of inputs I1 or I2 or I3 is 1 (i.e. close), then output Q is 1.

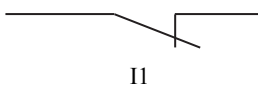
Logical frame of “OR”:

I1	I2	I3	Q
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

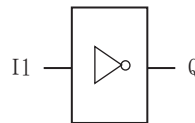
3.1.3 NOT

This function block is called NOT, because the input status is 0, Output Q is 1, and vice versa. In other words, NOT is the phase inverter for the input point.

The phase inverter is indicated in diagram shown as follows:



The phase inverter is called NOT the line in FAB2, its symbol is as follows:



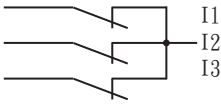


Logical frame of NOT:

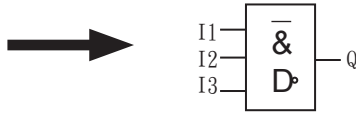
I1	Q
0	1
1	0

3.1.4 NAND

The electrical line diagram for parallel connection of certain number of NC contacts is shown as follows



The symbol of NAND in FAB2 is shown as follows:



This function block is called NAND, because only when all I1, I2 and I3 are in status 1 (i.e. close), its Output Q is in status 0.

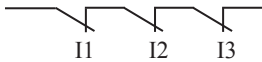
Logical frame of “NAND”:

I1	I2	I3	Q
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

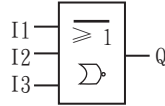


3.1.5 NOR

The electrical line diagram for parallel connection of a certain number of NC contacts is shown as follows:



The symbol of NOR in FAB2 is shown as follows:



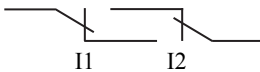
Only when all the input of NOR function blocks are at a low potential (status 0), the output will be closed (status 1). If any input is at high potential (status 1), the output will be open (status 0).

Logical frame of “NOR”:

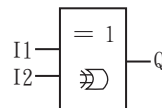
I1	I2	I3	Q
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

3.1.6 XOR

As shown in the line diagram, In FAB2, the two commutator contacts for XOR are connected in serial as follows:



In FAB2, the symbol of XOR is shown as follows:





When the status of input are not the same, the output status of XOR is 1.

When the status of input are the same, the output status of XOR is 0.

Logical frame of XOR:

I1	I2	Q
0	0	0
0	1	1
1	0	1
1	1	0

3.2 Special function blocks (SF)

Function	Representation	Graphic
DPR (ON time delay)		
DDR (OFF time delay)		
PLR (Pulse relay)		
CW (Clock switch)		
RS (RS relay)		
CPG (Clock pulse generator)		



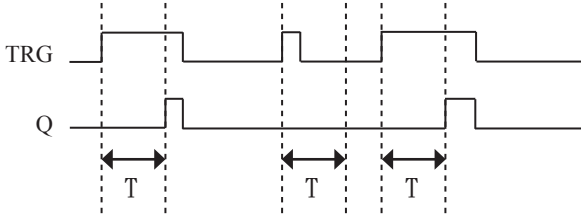
RPR (Hold ON time-delay relay)		
UCN (Up-counter)		
DCN (Down-counter)		
MPLR (Single pulse time relay)		
AN (analog input block)		

3.2.1 DPR

Line diagram/Symbol in FAB2	Pin	Description
	input TRG	After TRG is triggered, the time delay timer starts timing. (If TRG stops triggering during the timing of timer, the timer will terminate the timing).
	Parameter T	After time T, the output is on (the output signal transforms from 0 to 1).
	Output Q	If there is still trigger signal, when time T is over, the output will be on.



Time Sequence Frame:



Description:

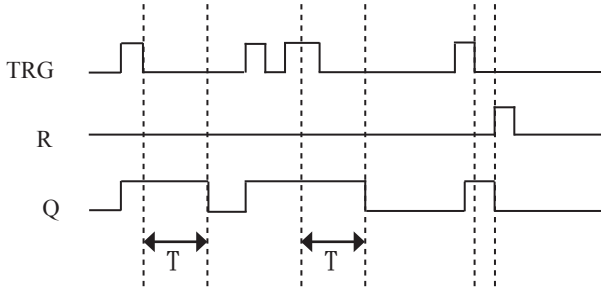
1. When the status of TRG input changes from 0 to 1, the time-delay timer starts timing. If Input TRG holds status 1 for a sufficiently long time, the output will be changed to 1 after the time T is over. There is a time delay between the input turning ON and the output turning ON, which is why the ON time-delay is so called.
2. When the input TRG is at Status 0, the output will reset to status 0.
3. This function is applicable to override vibrations of switches, delayed start-up of a motor, delayed turning-on of lights, etc.
4. The assigned range for T is 0.01-99.99, and the time units can be set respectively to hour (H), minute (M) and second (S). Its time accuracy can reach 0.5%.

3.2.2 DDR

Line diagram/Symbol in FAB2	Pin	Description
	Input TRG	Turn on the timer of the time-delay off relay when the input TRG (trigger) is at the descending edge (changing from 1 to 0)
	Input R	The timer of disconnecting time-delay relay is reset via R (Reset Input), and Output Q is set to 0. (R takes priority over TRG).
	Parameter T	The output is disconnected (the Q status is changed from 1 to 0) when the time T is over.
	Output Q	Input TRG is activated then the output is turned on (Q=1) and is kept ON until it is reset when the set time T is up.



Time Sequence Frame:



Description :

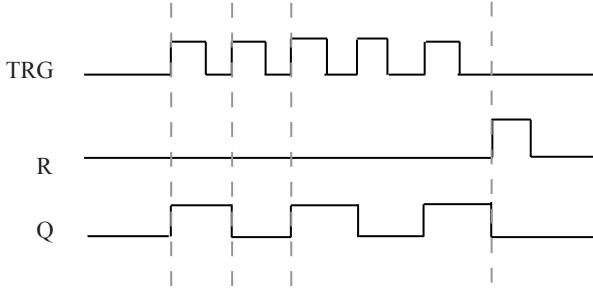
1. When Input TRG is at Status 1, Output Q changes at once to Status 1. When Input TRG changes from 1 to 0 (i.e. the descending edge comes), the internal time delay timer of FAB2 is activated and the Output Q still remains at Status 1. When the set time T is over, Output Q becomes 0 and the timer is reset.
2. If Input TRG changes from Status 1 to Status 0 again, the timer is activated again.
3. Before the set time T is over, the timer and output can be reset via R (Reset) input.
4. This function is applicable to the lighting of staircase, the control of barriers in a car park, the control of water throttling valve, etc.
5. The assigned range of T is 0.01 ~ 99.99, and the time units can be set respectively to hour (H), minute (M) and second (S). Its time accuracy can reach 0.5%.

3.2.3 PLR

Line diagram/Symbol in FAB2	Pin	Description
	Input TRG	Trigger input (TRG) makes the output On and Off
	Input R	The output Q is reset via R (Reset input) (Q=0, R takes priority over TRG)
	Output Q	Every time TRG changes from 0 to 1, the status of Q will change (i.e. from Status 0 to Status 1 or vice versa)



Time Sequence Frame:



Descriptions:

1. Every time the trigger input TRG changes from status 0 to Status 1, the status of Output Q will change accordingly (The status of Q will be reversed).
2. Reset Q to Status 0 via Input R.
3. This function can be applied to the lighting of corridors and staircases, and the start/ stop of a motor with a single push-button, etc.

3.2.4 CW

FAB2 has clock switches for 127 time intervals.

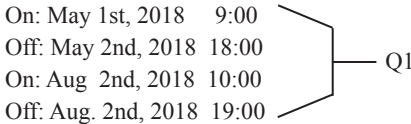
Line diagram/symbol in FAB2	Pin	Description
	Parameter D/W	Options of day system or week system (D is for the day system and W is for the week system).
	Output Q	If one of the parameterized time intervals is ON, the output is ON.



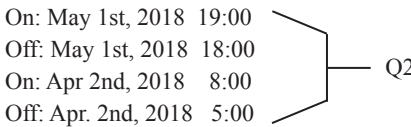
Notes regarding the time “CW”:

1. When the date system is selected for the timing of a time switch

A. For the same output channel, up to 127 time switches can be set, and these switches must be put in order according to the time sequence, e.g.



The above arrangement is correct, while the below arrangement is wrong:



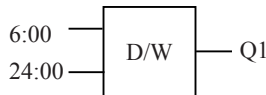
B. During the time setting of the time switch, if two time-points (on and off) are set, the output is on only in this period, that’s, time from on to off. Before the time the output maintains the former status, while after the off time the output is off.

2. The range of T1 (On time) and T2 (Off time)

You can set T1 or T2 to be any time point of the time period from 00:00:00 to 23:59:59. If you set T1 or T2 to be 24:00:00, it means that you have not set the ON time or OFF time, so we can set some special time intervals in a combination way by using an intermediate relay. (For example, a time interval without pre-set choices in a week, like “6:00 on Monday, ON and 7:00 on Wednesday, OFF”) e.g. 6:00 on Monday, ON and 8:00 on Tuesday, OFF

How can we get the logic result of the above on the FAB panel?

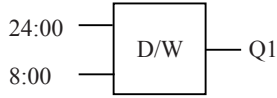
Firstly: you should select MO, and set it as follows.



This setting means no OFF time



Secondly: you should select TU, and set it as follows.



This setting means no ON time 24:00

Then, it can let Q1 switch on at 6:00 on Monday and switch off at 8:00 on Tuesday.



Note:

You can directly set time as follows by using Quick II, the programming Software.

ON MO: 6:00

OFF TU: 8:00

The PC directly transforms this to above-mentioned logic form and then transmits the form to a FAB2, which is invisible to users.

3. If only ON time or OFF time is set, the changes of output status are as follows:

Setting condition	Time	Output status
only ON time	Below ON time	Keeping the original status
	Greater than or equal to ON time	ON status
only OFF time	Below OFF time	Keeping the original status
	Greater than or equal to OFF time	OFF status

4. During the selection of time switches for timing by the week system:

The interval from Monday to Sunday is defined as a cycle (MO is the start point, and SU is the end point). In the same time interval, it is not allowed to set the start point after the end point. It must flow the Sequence of MO, TU, WE, TH, FR, SA, SU.

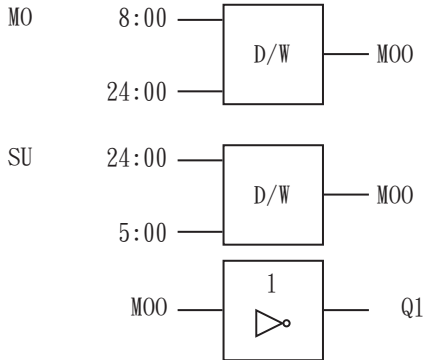


The following definition should be noted.

For example, ON: 5:00 every Sunday

OFF: 8:00 every Monday

It can be programmed by three blocks as follows:



Notes:

MO: Monday	MO-SU: every day from Monday to Sunday
TU: Tuesday	MO-TH: every day from Monday to Thursday
WE: Wednesday	MO-FR: every day from Monday to Friday
TH: Thursday	MO-SA: every day from Monday to Saturday
FR: Friday	FR-SU: every day from Friday to Saturday
SA: Saturday	SA-SU: every day from Saturday to Sunday
SU: Sunday	

In case only OFF time is set, e.g. it is set to be OFF at 5:00 from Monday to Thursday, and the FAB2 will turn OFF the output after 5:00 every day from MO to TH. As for the ON time, it depends on other factors (The original status will be maintained on Friday, Saturday and Sunday).

5. No matter which system is selected, the time intervals of the same day should be arranged in a chronological order, for example:



May 1st, 2018	9:00	ON	} Q1 (OK)
	11:00	OFF	
	12:00	ON	
	17:00	OFF	
May 1st, 2018	9:00	ON	} Q1 (ERROR)
	11:00	OFF	
	8:00	ON	
MO	8:30	OFF	} Q1 (OK)
	9:00	ON	
	11:00	OFF	
MO	15:00	ON	} Q1 (ERROR)
	18:00	OFF	
	9:00	ON	
	11:00	OFF	
	6:30	ON	
	8:30	OFF	



Note:

This phenomenon follows the principle that latter commands surpass former ones.

6. When the week system is selected, if ON is set at 8:00 and Off is set at 9:00 from Monday to Thursday (MO~TH), then FR, SR and SU will maintain their former status ,that's, the original ON status will keep ON while the original OFF status will keep OFF.

7. During your programming by using the LCD panel, if the week system is selected, D will be ignored by the FAB2 when you set D, T1 and T2. This means that only T1 and T2 are needed to be set. But if the day system is selected, D is a must. D is the setting of date, T1 is the setting of ON time, and T2 is the setting of OFF time.



8. Clock hold circuit

For a FAB2, when there is a power failure, the internal clock will continue running. The time that the FAB2 can maintain the internal clock to run depends on the temperature. When the temperature of the FAB2 is 25°C, the clock is able to continue its normal operation for more than 160 hours after the power is cut off.

9. Conflicts between time intervals

When time intervals are used to set the ON/OFF time of a clock, the clock switch will make the output ON at the ON time unless it has already been ON status, and make the output OFF at the OFF time unless it has already been OFF status.

10. Accuracy of a RTC (Real Time Clock)

The accuracy of a RTC can reach 1s. Only one FB (Function Block) is needed to do the work with duration of less than one minute. This function is applicable to the controls related to time, e.g. ringing bell for classes in school and work in factories, timed start-up and shutdown of machines, etc.

3.2.5 RS

Line diagram/Symbol in FAB2	Pin	Description
	Input S	Set Output Q to 1 via Input S (Set). S port can receive two-tone signal input such as P0~P9 phone signals.
	Input R	Set Output Q to 0 via Input R (Reset). If S and R are 1 at the same time, the Output Q is 0 (with R having a priority to S).
	Output Q	When S is input, Q is ON and held ON, and will not be reset until Input R is set.



Switch characteristics

RS relay is a simple trigger. The output value depends on the input status and the original output status. The following list of true values is used to describe the logic relations:

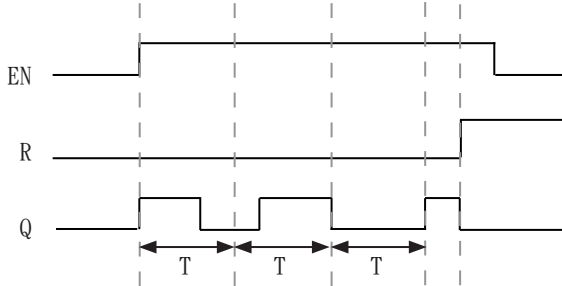
S	R	Q	REMARK
0	0		Status remains the original value
0	1	0	Reset
1	0	1	Set
1	1	0	Reset (taking priority over Set)

3.2.6 CPG (clock pulse generator)

Line diagram/ Symbol in FAB2	Pin	Description
	Input EN	Make the CPG ON or OFF via Input EN (Enable).
	Input R	Make Output Q be 0 via Input R (Reset).
	Parameter T	T is the time length of output from ON to OFF.
	Output Q	Every time EN changes from 0 to 1, the internal timer begins to time, and when Time T is up, the output is 1. If EN is kept 1, the timing will start again, and when Time T is up again, the output is 0. This cycle continues until EN is 0 and Output Q is 0. When R is 1, then the output Q is 0. And when R changes from 1 to 0 and EN is 1, all the initial status of Q changing from 0 to 1 will start its cycling changes.



Time sequence frame is as follows:



Notes:

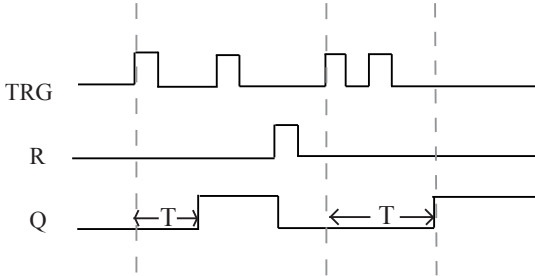
1. Use Parameter T to set ON/OFF time. The assignment range of T is 0.01 ~ 99.99, and the time units can be set respectively to hour (H), minute (M) and second (S). The time accuracy can reach 0.5%.
2. Input EN (Enable) enables the CPG to work. Output Q of the CPG will flip-flop the status every time the time T elapses, and this cycle operation continues until Input EN (Enable) is 0. Then the CPG stops operation and Output Q is 0.
3. This function is applicable to generate pulse automatically and to switch ON/OFF automatically.

3.2.7 RPR

Line diagram / Symbol in FAB2	Pin	Description
	Input TRG	Timer for ON time delay is started via Input TRG (Trigger).
	Input R	Timer for ON time delay is reset to ON via Input R, and make Output Q is 0 (R takes priority over TRG).
	Parameter T	After TRG is triggered and the time T elapses, the output is ON.
	Output Q	After time delay T elapses, the output is ON.



Time Sequence Frame:



Notes:

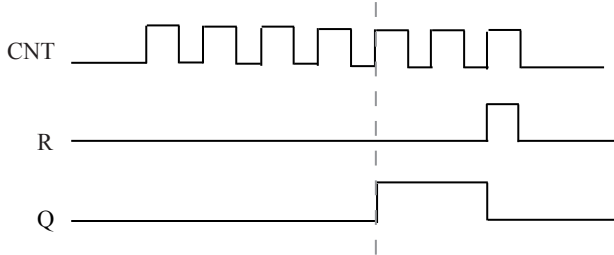
1. If the status of Input TRG changes from 0 to 1, the internal timer will be activated. When time T is over, Output Q becomes 1 and then the returned input TRG has no effect on output Q .Only when Input R becomes 1 again Output Q and Timer T will be reset to 0.
2. This function is applicable to the cases that the time-delay ON and hold ON status are required.
3. The assignment range for T is 0.01 - 99.99, and the time units can be set respectively to hour (H), minute (M) and second (S). Its time accuracy can reach 0.5%.

3.2.8 UCN

Line diagram/symbol in FAB2	Pin	Description
	Input R	Input R takes priority over other inputs. When it inputs a reset signal, the counter is reset to 0 and Q is reset simultaneously.
	Input CNT	When CNT counting is input, the counter only counts the leading edge triggering (the status changes from 0 to 1), i.e. every time the leading edge is triggering, and the counter will be increased by 1.
	Output Q	When the counting value has been reached, Output Q is On.



Time Sequence Frame(PAR=5):



Note:

This function is applicable to the cases that counting is required.

3.2.9 DCN

Line diagram/Symbol in FAB2	Pin	Description
	Input R	R takes priority over other inputs. When R inputs a reset signal, the counter is reset to 0 and output Q resets simultaneously.
	Input CNT	When CNT counting is input, the counter will only count the leading edge triggering (the status changes from 0 to 1), i.e. Every time the leading edge is triggering, and the counter will be decreased by 1.
	Output Q	When the counting value is 0, Output Q is On.

Note:

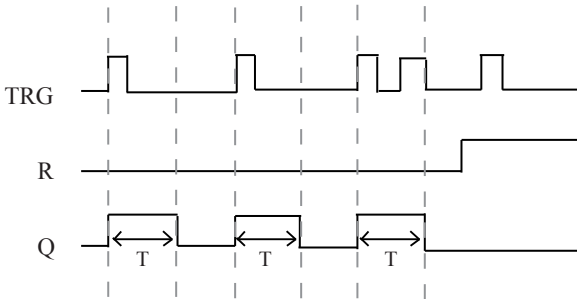
This function is applicable to the cases that counting is required.



3.2.10 MPLR (Single-pulse time relay)

Line diagram/Symbol in FAB2	Pin	Description
	Input TRG	Trigger an input to activate the single-pulse time relay. When the leading edge of TRG comes, a pulse with the duration of T is output.
	Input R	Reset the single-pulse time relay. When R is 1, Output Q becomes 0.
	Parameter T	The assignment range of the pulse duration setting is 0.01 ~ 99.99 (second, minute, hour). The time accuracy can reach 0.5%.
	Output Q	Every time TRG changes from 0 to 1, Q outputs a pulse with the duration of T.

Time Sequence Frame:



Notes:

This function can be used in applications where pulse width amplification is required.



3.2.11 AN

Figure in FAB2	Pin	Description
	Input 1	Comparative input port 1, with 0.0~10.0, I1~IC to be selected.
	Input 2	Function selection >, <, ≥, ≤.
	Input 3	Comparative input port 2, with 0.0~10.0, I1~IC to be selected.
	Output Q	Conditions permitted, output Q is 1 and the following outputs are at option: Q1~Q8, M00~M126.

Notes:

Only FAB2s like AF-10MR-D2, AF-10MT-D2, AF-10MT-GD2, AF-20MR-D2, AF-20MT-D2 and AF-20MT-GD2 have this function, which is used in the input function block for analog quantity.

Instructions for the comparison function of analog quantity:

The comparison function of AN block is the comparison between input 1 and input 3. For instance, when you select input 2 as “>”, it means that when input 1 > input 3, Q will be 1 while when input 1 < input 3, Q will be 0

Example 1:

Input 1 =I1 Input 3=I2 Input 2= “>”,

Q=Q1 If I1>5.0V,

then Q1 will be ON If I1<5.0V, then Q1 will be OFF.

Example 2:

Input 1=I1 Input 3=I2 Input 2= “<”,

Output=Q2 If I1<I2,

then Q2 will be ON If I1>I2, then Q2 will be OFF.



MEMO



Chapter IV Programming on FAB2 panel

FAB2 operation panel is a simple man-machine interface, which is completed by the following eight buttons to complete the panel operation.



Fig 4.1

4.1 FAB2 status display interface


After the FAB2 is powered on, the AF-HMI enters the FAB2 status display interface.

Take 10 points as an example, as shown in Fig 4.2,

The I listed above is input: the status of 6 input ports

The following Q is output: status of 4 output ports

(* indicate ON, i.e. status “1”, □ indicates OFF, i.e. status “0”)

 The screen contrast is adjusted as follows, Long press right key and click “+” button multiple times or Long press left key and click “-” button multiple times to adjust the contrast.

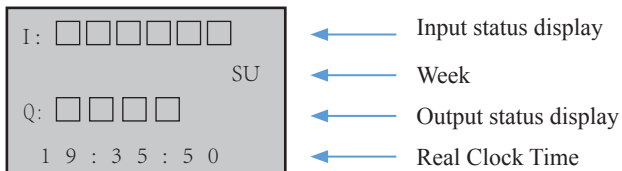


Fig 4.2



4.2 Password confirming

When the user observes the AF-HMI in the above status display interface, press the “ESC” and “OK” keys at the same time to enter the password confirmation screen, as shown in Fig 4.3, FAB2 needs to enter the password value at this time, and the cursor stays at the high position of the password. You can use the +/- keys to change the numeric value (0-9).

When you press the +/- key for the first time, the password value is 0. You can use the left/right keys to move the password input position and enter the remaining number of password values. If the user password is entered correctly, it will enter the panel function interface; If the user password is not entered correctly, it will stay on the input password interface.

Four-digit password, every time you enter a digit to enter the next digit, the previous digit is hidden with the * symbol, and you must enter the four-digit number to enter the FAB2 function interface.

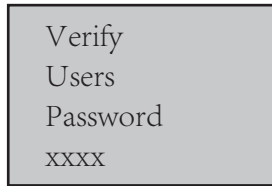


Fig 4.3 Password Interface

4.3 Function Interface

When the user enters the following function interface, please kindly use ▲ and ▼ keys to move the left “>” key and press OK key to select the function, including four options.

- | | |
|----------|--|
| Editor.. | Program Edit (System Reserved, FAB2 Not Enabled) |
| FAB2/Rom | Read FAB2 program, simulate calibration, modify FAB2 address, etc. |
| Set.. | Real time clock setting and password setting |
| Run | Run FAB2 program, click RUN to return to FAB2 status display interface |

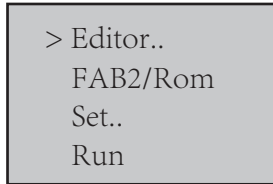


Fig 4.4 Function Interface

4.3.1 FAB2/Rom Interface

When the user enters into the FAB2/Rom interface as shown in Fig 4.5, then when the user enters the Calibrate interface, Rom → FAB2 interface and FAB2_Addr interface under the FAB2 function interface, the FAB2 machine will stop running.

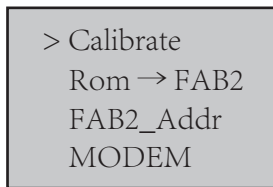


Fig 4.5

Calibrate	Analog calibration
Rom→FAB2	Read FAB2 program
FAB2_Addr	View or set the FAB2 address (default address 000)
MODEM	System Reserved (FAB2 is not enabled for this feature)

4.3.1.1 Analog Calibration Interface

The analog channel calibration method is as follows,

1. When the user enters the Calibrate interface as above, please kindly press and hold the ok and > keys on the LCD panel to enter the calibration page.

Separate each analog channel by analog (A11 corresponds to I1), and input the channel number to be calibrated, and press OK to confirm.

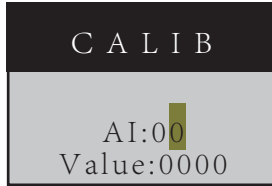


Fig 4.6

2. When the minimum value is prompted, an external power supply is required to input the minimum voltage value for this channel, then press OK to confirm and mark as V_{min} . When the maximum value is prompted, an external power supply is required to input the maximum voltage value for this channel.

Then Press OK to confirm it and mark as V_{max} . After calibrate successful, the screen will prompt succeed.

The V_{min} and V_{max} inputs must be between 0V and 10V. (The maximum calibration value of the value must be greater than the minimum calibration value)

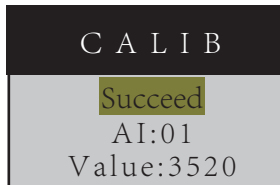


Fig 4.7

3. After successful analog calibration, FAB2 needs to be powered on again.

4. Other channel calibrations is similar as above. After the analog calibrate successful, when using an analog-related module, the value of the analog input pin input (0V–10V) is not the actual input voltage value, but follows the mathematical calculation formula $(V_{input} - V_{min}) / (V_{max} - V_{min}) * 10$.



4.3.1.2 Rom→FAB2 Read/write/modify Program Interface

The user can view the function block number of the FAB2 program on this interface, and can modify the parameters of the function block number. Such as DPR, DDR and UCN and so on.

When the user enters the Rom → FAB2 program interface through FAB2/Rom interface, select the function block number to be viewed or modified by the +/- keys. The function block number in the AF-HMI panel starts from 0, and the B0 block number corresponds to the B1 block number in the QUICKII software.

1) Timing function block

Time unit:

Unit Unit(1-hour, 2-minute, 4-second)

Int. Integer bit

M Decimal places

As shown in Fig 4.8, B002 function block is MPLR single pulse function block, The parameter is 30.3 seconds. If you want to modify the parameter, pls kindly remove the cursor to the modified bit you need, then set up the parameter via +/- keys.

B002	MPLR
T	Unit Int. M
	4 30 30

Fig 4.8

2) Counting function clock

Counting unit:

Consisting of six digits, the highest position is the leftmost, the lowest position is the rightmost, and his range is 1-999999

For example. As shown in Fig 4.9

B018 function block is COUNTU, the parameter of Upward counting function block is 100. If you want to modify the parameter, pls kindly remove the cursor to the modified bit you need, then set up the parameter via +/- keys.



B018	COUNTU
PreC	Counter 000100

Fig 4.9

3) Clock switching function

The parameter setting of the clock switch function block is divided into date type and week type.

For example, as shown in Fig 4.10

B000 function block for SCHD clock switch week type, open Monday to Saturday 8:30. If you want to modify the parameter, you could remove the cursor to the modified bit you need, then set up the parameter via +/- key.

B000	SCHD
	W 1-6 ON 000100 08-30-00

Fig 4.10 Week type

For example, as shown in Fig 4.11

B008 function block is SCHD clock switch date type, July 2nd, 2017 Closed at 21:00. If you want to modify the parameter, you could remove the cursor to the modified bit you need, then set up the parameter via +/- key.

B008	SCHD
	Day OFF 17-07-02 21-00-00

Fig 4.11 Date Type



4.3.1.3 FAB2_Addr address interface

The User can view the address of FAB2 machine in Fig 4.12, and can modify his address.

When the user enters the FAB2_Address interface through the FAB2/Rom interface, the FAB2 address can be viewed or modified through the +/- keys.

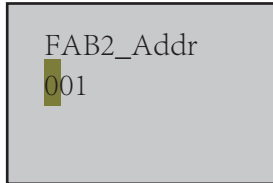


Fig 4.12

4.3.2 Setting interface

When the user enters the Set.. setting interface on the FAB2 function interface, as shown in Fig 4.13

When the user enters the Set.. setting interface under the FAB2 function interface, the FAB2 system time and FAB2 password can be viewed or modified.

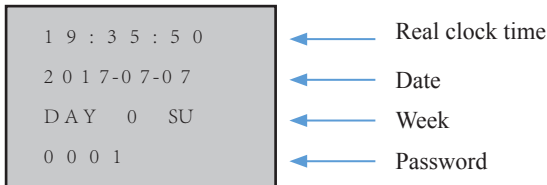


Fig 4.13

Real clock time: 24HR

Date: Y/M/D

Week: 0 for Sunday and 1-6 for Monday to Saturday

Password: FAB2 machine password



4.4 Edit FAB2 function program

During editing of FAB2 function program, special attention need be paid to Some programming rules, the application of the mid-relays and how to use FAB2's operation key panel with LCD to edit the FAB2 function program.

4.4.1 Programming rules

Rule 1: Before entering the line, you need to draw a complete circuit diagram on the drawing and indicate the intermedicate relay (M) you need to use, ordirectly draw the FAB2 circuit diagram using Quick II, then adjust the series NUMBER of the blocks according to rule 2 and rule 3.

Rule 2: The input of circuit is always from input to output, with the cause first and result next. The block sequence number of the cause block must be smaller than that of the result block. The block numbers that have no cause relationship with each other are irrelevant.

Example:

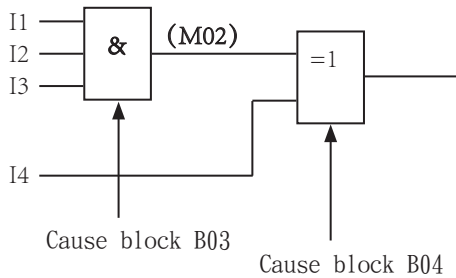


Fig 4.14

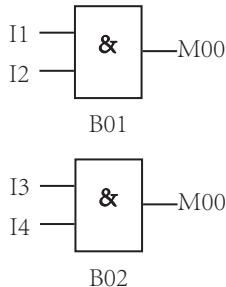
Rule 3: In a program path, an output may be connected to the lead input (for number transfer), but the block with a smaller sequence number shall be used as the lead input (cause block) and the one with a greater sequence number shall be the result block. If the user desires for contrary cause and result blocks it is only necessary to adjust the block sequence numbers.



Rule 4: One output may be connected to multiple inputs, but multiple outputs cannot be connected to one input.

Rule 5: At power-on and initialization of FAB2 (at the instant of power-on), the intermediate relay (M) and output port (Q) are all in logical 0 status. Their later status will be determined by the program.

Rule 6: It is not allowed to connect two outputs with are end. Such as the following.



the above is prohibited except for CW block.

4.4.2 Middle relay

In FAB2 programming, the middle relay is a very important bridge in FAB2 programming. The intermediate relay of FAB2 is similar to that in the relay control system. They can store some intermediate status and then transfer it to a block requiring this status for input. Use of intermediate relays has two advantages:

1. The output terminal of the previous block can be used as the input signal for different blocks;
2. When a block is inserted or deleted, the original logical relation can be retained. The basic functions of the intermediate relay are as shown in the following figure:

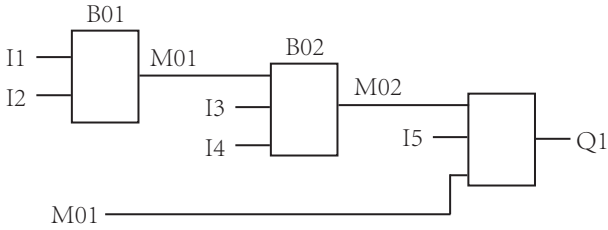


Fig 4.15

In the above figure, the output status of B01 can be registered by M01 in addition to input of the B02 module, and then used as the input of the B03 module.

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Chapter V Communication connection

FAB2 series PLC not only has a download port custom protocol, but also supports Modbus RTU protocol, and can communicate with other devices that support modbus RTU protocol.

The upper right side of the FAB2 is the program download port, as shown Fig 5.1
The upper left side of FAB2 front view is 485 interface, as shown in Fig 5.1

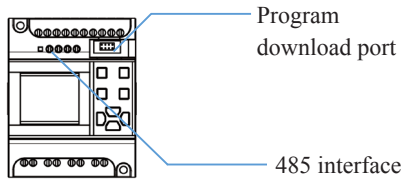


Fig 5.1

5.1 FAB2 download port

The user could communicate with FAB2 PLC and QUICKII directly through AF-C232-2 and AF-DUSB-2 so as to realize read and write programs, read and write FAB2 address and online monitoring functions.

5.2 FAB2 485 interface

FAB2 supports 2-way 485 interface, One way is A1B1 standard MODBUS RTU protocol, another way is A2B2 and sh300 communication.

5.2.1 FAB2 A1B1 interface

A1B1 supports MODBUS RTU protocol. the address of MODBUS RTU is as below,



Address Type	Read-write Property	Function Code	Comment
0X	Only Read	01	Read the status of system (00-FF)
0X	Only Read	01	Read status of digit input(100-1FF)
4X	Only Read	03	Read status of AI(300-3FF)
0X	Only Read	01	Read status of Output Q(200-2FF)

1: FAB2 is act as Modbus slave device, which responds according to the requested data by Modbus master device.

2: Communication parameters: 19200bps, 8 data bits, 1 stop bit and no parity.

5.2.2 FAB2 A2B2 interface

The A2B2 interface is used for communication between our SH300 text display. His related parameters are as follows:

Item	content
SH300 Communication port	9-pin communication port
PLC Communication port	485 interface (A2B2)
Communication parameters	9600bps, 8bits, 1stop, none
Station	0-254
communication mode	485

Using Address Type Description in SH300 Software

Component type	Address type	Address range	Read /Write	Description
Indicator lamp	I	1-12	Read	Reading input status
	Q	1-8	Read	Reading output status
	M	Corresponding intermediate relay number in FAB2 program (0-127)	Read	Reading function block output status in FAB2 program



Function keys	Q	1-8	Write	Write empty output port status (unoccupied output port in FAB2 program)
Dynamic text	I	1-12	Read	Reading input analog value (DC PLC)
	B	Corresponding block number in FAB2 program (1-128)	Read	Reading parameter values of function blocks in FAB2 programs
Register	I	1-12	Read	Reading input analog value
	B	Corresponding block number in the FAB2 program (1-128)	Read	Reading parameter values of function blocks in FAB2 programs
			Write	Write parameter values of function blocks in FAB2 programs
Stick/ Trend Chart	I	1-12	Read	Reading input analog values
	B	Corresponding block number in the FAB2 program (1-128)	Read	Reading parameter values of function blocks in FAB2 programs



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A large, vertically oriented rectangular area with rounded corners and a double-line border, intended for writing a memo. The word "MEMO" is printed in bold, uppercase letters in the top-left corner of this area.



Chapter VI Application

FAB2 has a very wide application range. In order to let the user know the wide application area and the convenience for FAB2, we will show some common and representative control schemes herein. After you read these schemes, it is easy and convenient for using FAB2 to achieve automatically control requirements, especially in a system requiring time control and intelligent living area etc.

6.1 Bell control for schools, factories etc

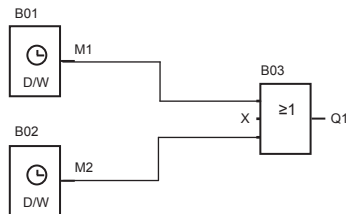
Control requirements:

Monday to Friday: During 6:00:00 to 12:00:00 AM and 14:00:00 to 17:00:00 PM, the bell shall ring once every hour for 10 seconds.

Saturday and Sunday: During 8:00:00 to 12:00:00 AM and 13:00:00 to 17:00:00 PM, the bell shall ring once every 2 hours for 10 seconds.

Analyze:

The control of 11 time intervals from Mon to Fri and 6 time intervals from Sat and Sun is necessary. As the traditional method, it must adopt lots of time-delayed relays and the circuitry is quite complex, whereas it is easy and simple by using FAB2. Please refer to in the below figure, there is only one line section for its required external circuitry, i.e. an output of FAB2 is directly connected to the bell to perform the bell control. The program dialogue is as follows:



FAB2 Intelligent Controller



When FAB2 is used for the above control, it is very simple both in the connection of the external line and in editing the program. When QUICK II programming software is used for editing the control program, it is only necessary to set two time switch blocks.

B01



The set of FB is as follows:

Number	State	Week	Time
0	On	from Mon to Fri	6-0-0
1	Off	from Mon to Fri	6-0-10
2	On	from Mon to Fri	7-0-0
3	Off	from Mon to Fri	7-0-10
4	On	from Mon to Fri	8-0-0
5	Off	from Mon to Fri	8-0-10
6	On	from Mon to Fri	9-0-0
7	Off	from Mon to Fri	9-0-10
8	On	from Mon to Fri	10-0-0
9	Off	from Mon to Fri	10-0-10
10	On	from Mon to Fri	11-0-0
11	Off	from Mon to Fri	11-0-10
12	On	from Mon to Fri	12-0-0
13	Off	from Mon to Fri	12-0-10

B02



The set of FB is as follows:

Number	State	Week	Time
0	On	from Sat to Sun	8-0-0
1	Off	from Sat to Sun	8-0-10
2	On	from Sat to Sun	10-0-0
3	Off	from Sat to Sun	10-0-10
4	On	from Sat to Sun	12-0-0
5	Off	from Sat to Sun	12-0-10
6	On	from Sat to Sun	13-0-0
7	Off	from Sat to Sun	13-0-10
8	On	from Sat to Sun	15-0-0
9	Off	from Sat to Sun	15-0-10
10	On	from Sat to Sun	17-0-0
11	Off	from Sat to Sun	17-0-10

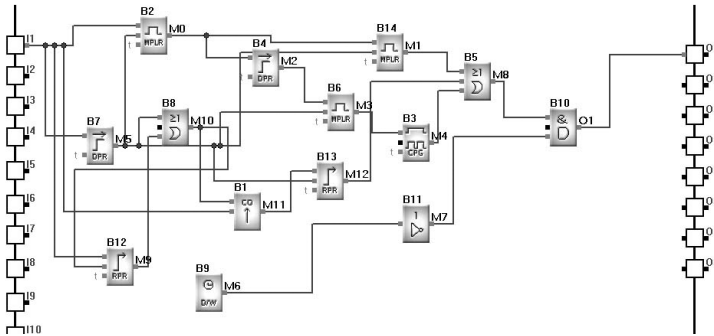


6.2 The illumination of multi-function switch in stairs and halls

Control requirements:

1. When pressing switch, illumination is turned on, and automatically turned off after 3 minutes. Illumination is twinkled 5 seconds before automatically turned off.
2. Illumination is always turned on after pressing twice in 5 seconds.
3. Illumination is turned off when pressing for 2 seconds and more.
4. Automatically turn on at PM 18:30 and off at AM 6:30 every day.

The program diagram is as below:



Description: I1: connected to the button switch

Q1: connected to the illumination lamp

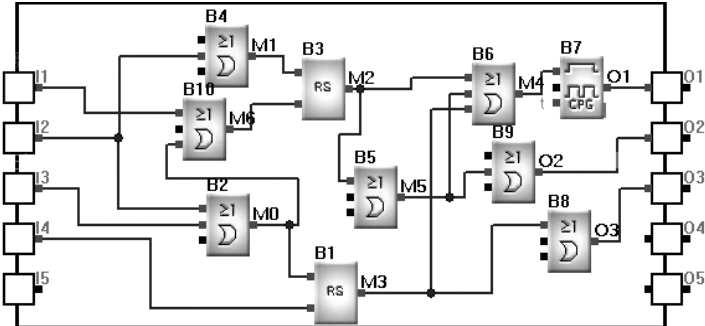
6.3 Automatic gate control

Control requirements:

1. Opening and closing of the gate shall be controlled by the guard in the control room.
2. Normally the gate shall be opened or closed completely, but the opening and closing action can be interrupted at any time.
3. The alarm lamp shall begin to flash when the gate acts and shall keep flashing as long as the gate continues to move.
4. A pressure damper shall be provided so that the gate can be automatically opened when it touches a person or an article.



The Function Block Program Diagram is as follows:



Description:

- I1, connected to the open switch
- I2, connected to the stop switch
- I3, connected to the safe pressure damper
- I4, connected to the close switch
- Q1, connected to the flashing lamp
- Q2, connected to the gate-open motor contactor
- Q3, connected to the gate-close motor contactor

6.4 Ventilation system

Control requirements:

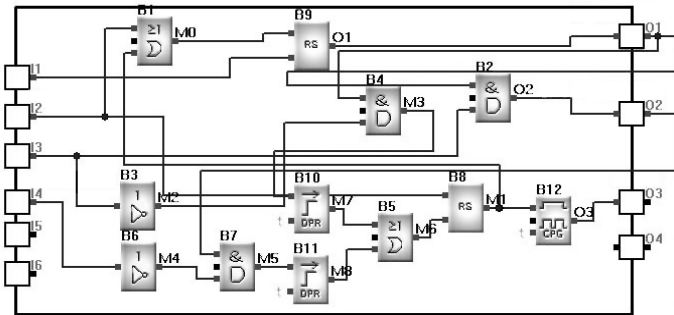
The ventilation system shall be able to send fresh air into the room and to exhaust the waste gas out of the room.

1. Waste gas exhaust unit and fresh air forced-draft unit must be installed in the room.
2. The ventilation system shall be controlled by the control monitor such as smoke sensor, temperature sensor etc.
3. No over atmospheric pressure is allowed in the room at any time.
4. The fresh air forced-draft unit can not be put into service until the flow monitor indicates that the waste gas exhaust unit is in normal operation.



5. In case of any fault in the ventilation system, the alarm lamp shall be on. The ventilation system is controlled by the flow sensor; if no atmosphere flows in the room, then wait a short time, cut off this system and send failure.

The Function Block Program Diagram is as follows:



Description:

- I1: connected to the start button
- I2: connected to the stop button
- I3: connected to the waste gas flow monitor
- I4: connected to the fresh air flow monitor
- Q1: connected to the waste gas exhaust equipment
- Q2: connected to the fresh air forced-draft equipment
- Q3: connected to the alarm lamp

6.5 The neon lamp control system

1. Display mode, for example: Array Electronics Welcomes You !
 - 1.1 Displaying “Array”
 - 1.2 Displaying “Array Electronics”
 - 1.3 Displaying “Welcomes You!”
 - 1.4 Cycling 1.1-1.3
2. Control requirements
 - (1) It shall be automatically turned on at 18:00:00 and off at 23:59:59 every day.
 - (2) The control transition is performed by the manual/self-acting selection switch.



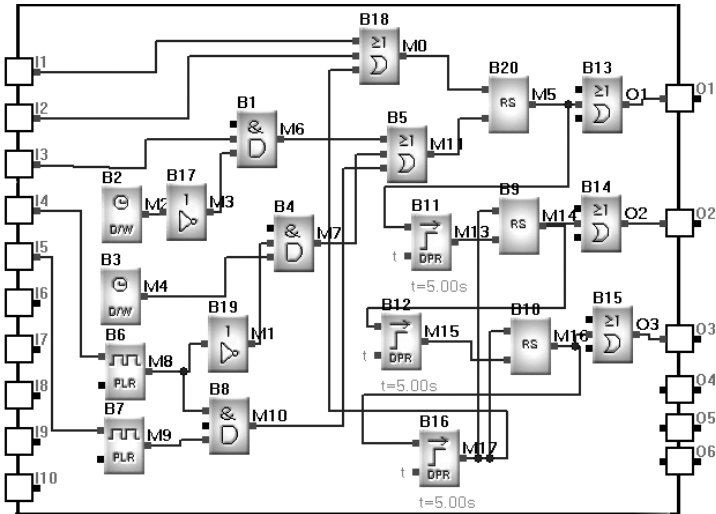
It can be activated by the manual switch at any time; when the clock switch or light sensitive switch triggers, it can be activated.

- (3) The light sensitive switch shall be provided to complement the time switch, so that the lamp will be automatically turned on when the light is weak and off when the light is sufficient. And it can't be enabled at 00:00 ~ 10:00 every day.
- (4) Rain detector: in case of a rainy day, it shall be switched off automatically.
- (5) Over/under voltage detector: it will be automatically switched off when its operating voltage is too high or too low.

3. Input/output assignment

- I1: connected to the rain detector
- I2: connected to the over/under voltage detector
- I3: connected to the light sensitive switch
- I4: connected to the manual/self-acting selection switch
- I5: connected to the manual switch
- Q1: connected to the enable terminal "Array"
- Q2: connected to the enable terminal "Electronics"
- Q3: connected to the enable terminal "Welcome you!"

The program dialogue is as below:





6.6 Illumination system for display windows

Control requirements:

1. The display time

- Monday to Friday 8:00~22:00
- Saturday 8:00~23:59:59
- Sunday 9:00~20:00

2. Requirement in display time

a. The basic lighting

Open the basic lighting equipment;
 Close the additional lighting and the lighting for non-display period;

b. The strong lighting

Open the basic lighting equipment and additional lighting equipment;
 Close the non-display lighting equipment;

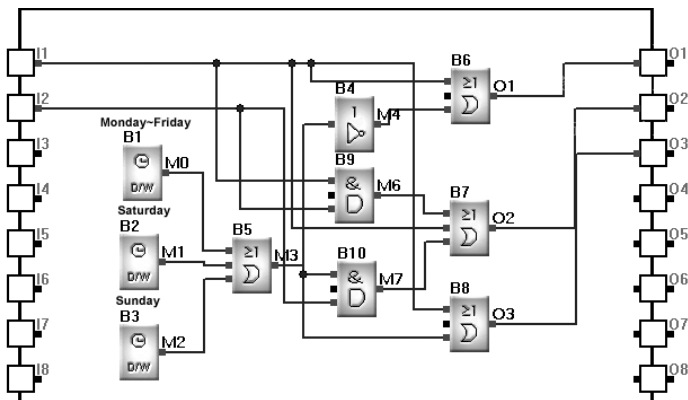
3. Requirement in non-display time

Close the basic lighting equipment and additional lighting equipment;
 Open the non-display lighting equipment;

4. Test switch

All lamp groups can be tested when pressed

The program dialogue is as below:





Description:

I1: connected to the detect test switch

I2: connected to the light sensitive switch

Q1: connected to the non-display lighting

Q2: connected to the additional lighting in display time

Q3: connected to the basic lighting in display time

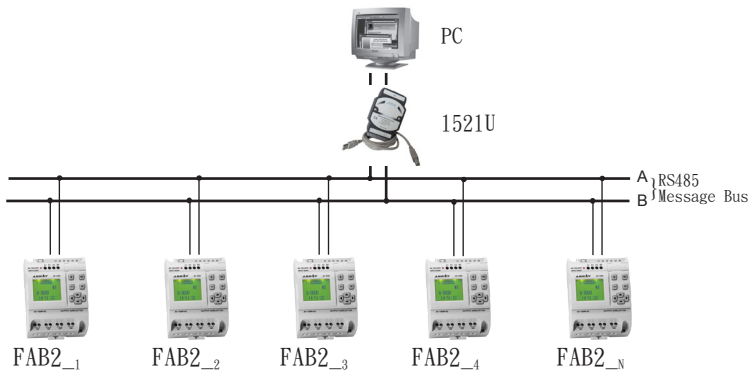
6.7 Application of FAB2 in building management

Control requirements:

1. Automatic reading of various meters: the watt-hour meter, water meter and gas meter can be read automatically.
2. Fire protection and anti burglar functions can be realized;
3. Start and stop of relevant electrical equipments can be controlled;

FAB2 can flexibly satisfy the automatic building control requirements and can realize central monitor and control in modern intelligent living quarter.

1) FAB2 central control communication connection





2) Assignment of FAB2 I/O points

Input part: I1- connected to the temperature sensor

I2- connected to the smoke detector

I3- connected to the door/window sensor

I4- connected to the gas detecting sensor

I5- connected to the water meter

I6- connected to the gas meter

I7- connected to the watt-hour meter

Output part: Q1- connected to the air-condition equipment

Q2- connected to the ventilation equipment

Q3- connected to the alarm equipment

6.8 Application of FAB2 in a voltage diode counting and packing assembly line

The control requirement and configuration:

(一) Control of 2000V withstand voltage counting assembly line, to be completed by FAB2_{_1}

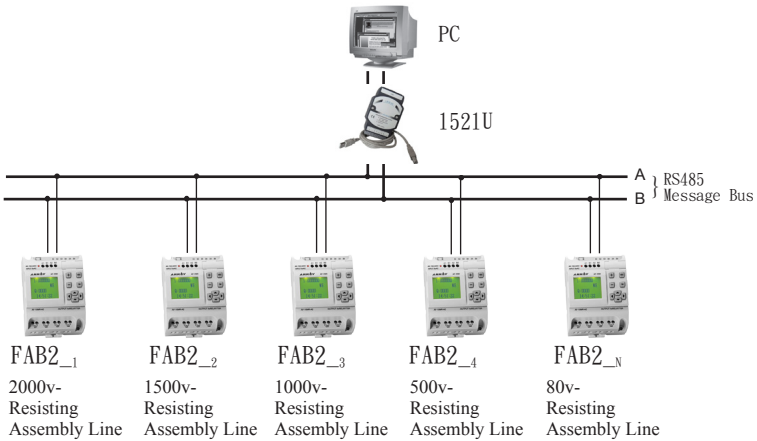
1. I5 is used for counting the diodes entering the assembly line (automatically giving the sum of the diodes to be tested)
2. I6 is used for counting of diodes with 2000V withstand voltage
3. Q1 is used for labeling of diodes with acceptable withstand voltage
4. Q2 is used for enclosing of diodes already labeled
5. If the counting value of I6 is multiples of 1000, Q3 will be switched on to start the packing equipment
6. Diodes that can not withstand 2000V voltage shall be transferred to 1500V assembly line.

(二) Control shall be completed by FAB2_{_2} for 1500V withstand voltage assembly line, by FAB2_{_3} for 1000V withstand voltage, by FAB2_{_4} for 500V withstand voltage, by FAB2_{_5} for 80V withstand voltage. The control requirements and configuration are the same as mentioned above.



(三) Monitoring of all FAB2s can be realized by installation of monitoring software on PC. Each FAB2 answers the instruction of PC through bus 485, including diode counting and I/O status for FAB2; the data from FAB2 is displayed on PC screen and saved on PC, as well PC can acquired FAB2 data on the screen and can provide data storage and inquiry functions, to allow prompt analysis of the counting of different withstand voltage diodes.

Control System Figure is as blew:



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QuickII: SOFTWARE FOR FAB2 Controller

QUICK II is programming software for FAB2 to perform programming and simulation on PC. It can not only perform edit of control program (FBD) for FAB2, but also simulate program and display clearly the running results in order to determine the accuracy. Besides, QUICK II can perform short-distance and remote communication of FAB2, and write edited program into EEPROM of FAB2 machine.



Chapter I Installation and unloading

1.1 Installation of Quick II

The installation of Quick II is very simple. A prompt dialogue box will appear automatically and you will complete the installation smoothly on your PC . The main steps are as follows:

1. Insert the CD-ROM with Quick II into the CD Drive and Installation Guidance will appear automatically. Select Install>Setup. The dialogue box, as shown in figure 1.1, will appear. Then wait for installation instructions.

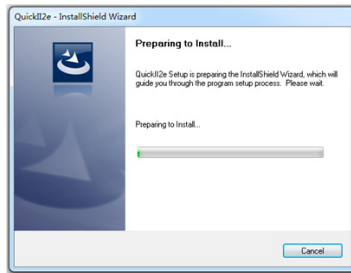


Fig 1.1

2. Enter introducing window of Quick II, as shown in the figure 1.2.

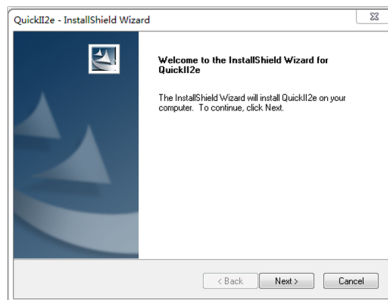


Fig 1.2



- If you click NEXT to enter the next step of installation, the User Name and Computer Name will be displayed, as shown in Fig. 1.3, and you can modify them.
- If you click CANCEL, the installation program will be terminated.

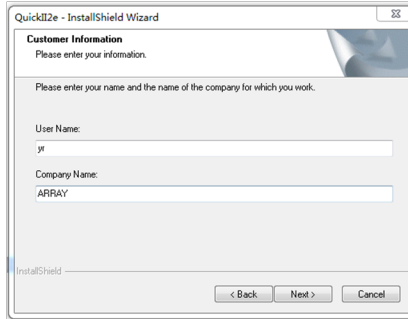


Fig 1.3

3. Enter the next frame which can set the installing route in fig. 1.4, you can click “browse” button to change the installing route (the default is C:\program files\Array\QUICK II).

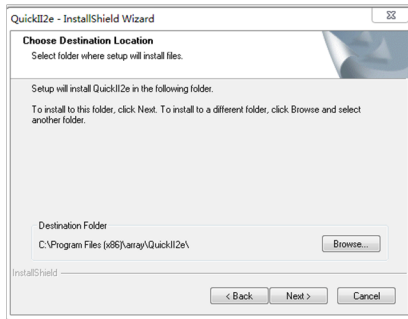


Fig 1.4

- Click “next”, enter the next step in fig. 1.5
- Click “back”, return back the above step in fig. 1.3.
- Click “Cancel”, so quit setup.



4. Enter the next frame of “ Ready to install the program”, as shown in Fig1.5
 - Click the (Back) button with the left mouse button, you will return to the previous installation screen, as shown in Figure 1.4.
 - Click the (Install) button with the left mouse button, you will enter the installation interface, as shown in Figure 1.6.

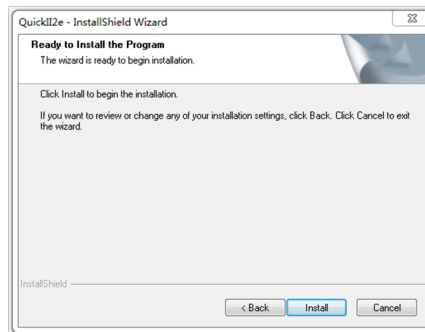


Fig 1.5

5. The installer begins the automatic installation step, as shown in Figure 1.6. If you want to quit at this time, please kindly press (Cancel) button.

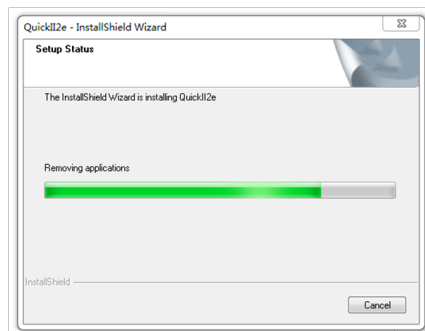


Fig 1.6 Install Shield Wizard complete



6. Enter into the “InstallShield Wizard Complete” screen as shown in Figure 1.7 and click “Finish” with the left mouse button to end the entire installation process.

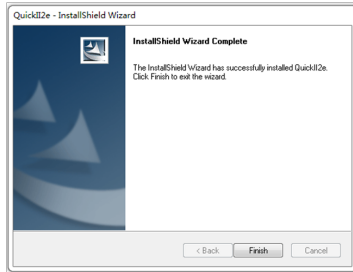


Fig 1.7

7. Enter installing step automatically, if quit setup, click “cancel” button.

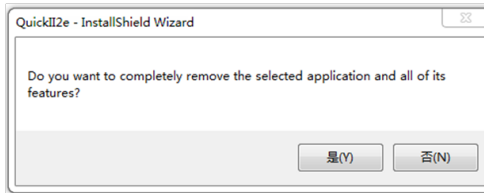


Fig 1.8

1.2 unloading

There are two ways to unload QUICK II:

1. Removed from the program:

- Under the Windows screen, pls kindly use the left mouse button to click the “Assembly” option under the “Start” menu, then select the assembly with ARRAY.
- Under the Windows screen, pls kindly use the left mouse button to click the “Assembly” option under the “Start” menu, then select the assembly with ARRAY.



- A confirmation uninstall dialog appears, click “Yes”
- The removal screen appears as shown in Figure 1.10, which can be removed.

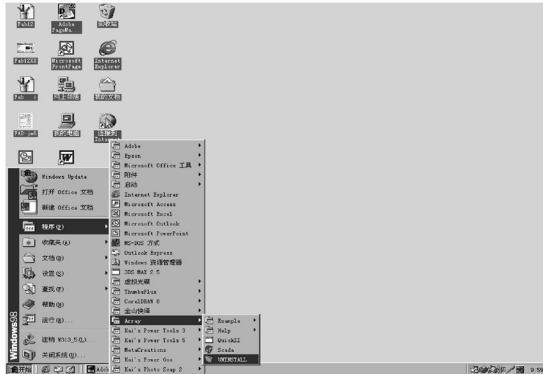


Fig 1.9 unloading

This removal method is quite convenient for the user.

2. Remove on the desktop

- Under the Windows screen, double-click “My Computer” button with the left mouse button to open the “My Computer” to manage file.
- Double-click the “Control Panel” button with the left mouse button to open the control panel screen.
- Double-click “Add/Remove Programs” with the left mouse button on the control panel content screen, and the “Add/Remove Programs” dialog box will appear.
- After selecting the “ARRAY QUICK II” program in this dialog, click “Add/Remove Programs” button. A dialog box appears as shown in Figure 1.9, asking if you decide to remove. Click “Yes” with the left mouse button will bring up the removal screen as shown in Figure 1.10:
- Click the (OK) button to complete the removal and close “Add/Remove Programs” window.



Fig 1.11 The removal screen of Quick II

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Chapter II Brief Introduction to Quick II

In order to obtain a quick and initial understanding of Quick II, we will, from this chapter forward, make a comprehensive introduction to Quick II with the help of visual pictures.

2.1 Operating interface

The operating interface of Quick II is friendly and all of its operations can be completed by clicking the mouse. By clicking Start→Programs→Array→Quick II in the Windows taskbar, you can enter the main interface of Quick II, as shown in Fig. 2.2.

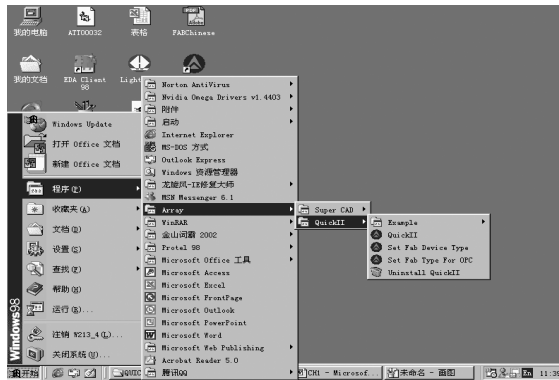


Fig 2.1

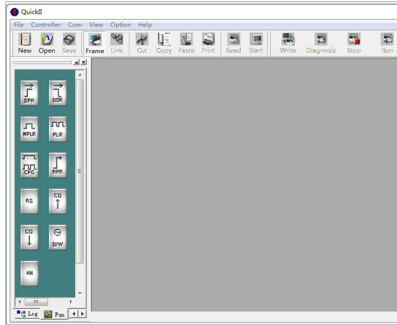


Fig 2.2

For QUICK II, we can use pull-down instruction tools and shortcut button to operate, and all function blocks are directly distributed in the window. Operating in the window with the mouse you can finish creation and writing, simulation, running and monitoring of a FAB2 program very quickly.

2.2 Editing windows of logical diagram for FAB2

When click “New” button, editing window of logical diagram is shown, you can click the desired block library on the left to plot its diagram and set the property. After completed, you can simulate and run your program in this frame and then write it into FAB2.

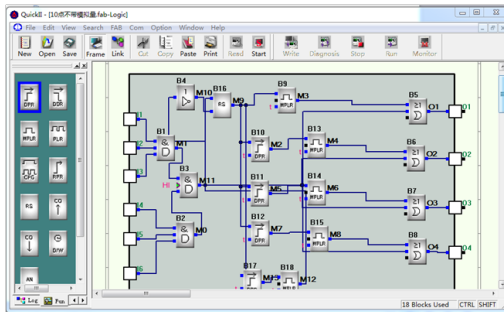


Fig 2.3



2.3 Main functions

2.3.1 Editing function

Chiefly it can supply editing program for FAB2 in its logic window, you can edit your desired FAB2 program by means of various function blocks and can also save, print etc.

2.3.2 Simulation running function

After program is edited, you can view the program running result on PC and conveniently check whether it meets your demand. QUICK II provides you with a completely new off-line test function, through which you can test the correctness of your program without installing the controller on site so that many inconveniences of on-line test is avoided.

2.3.3 Real-time monitoring

QUICK II has a Real-time monitoring function, through which you can view the process of the control system and running status and control FAB2s remotely by connecting FAB2 to PC.

2.3.4 Communication with FAB2

Through the communication cable such as AF-C232-2/AF-DUSB-2 etc., it can realize to communicate between FAB2 and PC, you can easily write your program from PC to FAB2 and read FAB2 program to PC and also monitor FAB2 running status.



MEMO



Chapter III Operation Instructions and Block Library

3.1 Function Instructions

Some basic operations including file, tool bar, status bar, help etc, are completed by using pull-down menu under Fill, Controller, Communication, View, Option and Help. The Instruction Function list of QUICK II is characterized by flexibility and variation according to the main selection, so that you can operate conveniently.

3.1.1 File

The instruction is mainly used for file management, including New, Open, Save and Print etc.

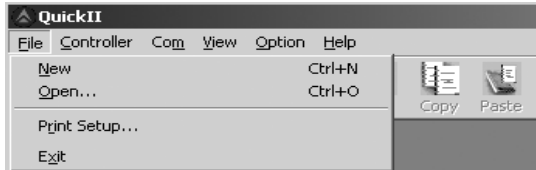


Fig 3.1

Instruction Name	Function
New	Open a new file
Open	Open an old file
Print setup	Set up printing format
Exit	Exit Quick II

3.1.2 Controller

The instruction is mainly used for reading programs from FAB2. Start QuickII after its operating interface appears, click Controller Function List as shown in fig.3.2.



Fig 3.2

3.1.3 Communication

The instruction is mainly used for on-line setup of FAB2 with PC.

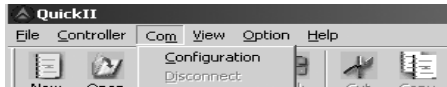


Fig 3.3

Configure: selection of communication mode and setup of communication port.
 Disconnect: if communicated without PC, click this option to stop communication.

3.1.4 Display

After setting new file, the pull-down menu “display” is shown as follows.

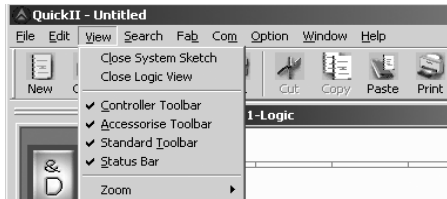


Fig 3.4

Instruction name	Function
Standard tool bar	Select standard tool bar
Controller tool bar	Select controller tool bar
Block frame tool bar	Select block library tool bar
Status bar	Select status bar
Size zoom	Zoom in or out the window



3.1.5 Options

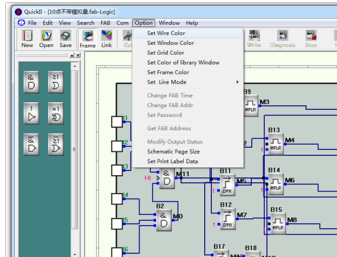


Fig 3.5

Instruction	Function
Set Wire Colour	Setup the linked line color
Set Valid Region Base Colour	Setup the logic view valid region color
Set Grid Colour	Setup the logic view valid grid color
Set Frame Windows BK-colour	Setup Window background colour
Set Line Mode	Setup block line types
Change FAB2 Time	Modify FAB2 time
Change FAB2 Address	Modify FAB2 address
Set Password	Set FAB2 password
Get FAB2 address	Get FAB2 address
Modify output status	Modify output status
Schematic page size	Set schematic page size
Set print label data	Set print parameter

3.1.6 Help



Fig 3.6

Contents: Quick II manual
 About QUICK II: Brief about QUICK II



3.1.7 Edit

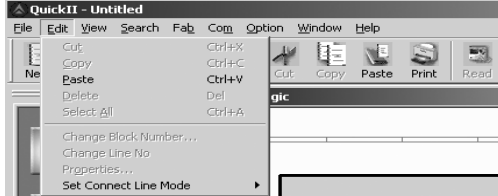


Fig 3.7

- Cut: cut the contents in the area highlighted with the cursor
- Copy: Copy the contents highlighted with the cursor
- Paste: Paste the contents cut or copied
- Delete: Delete various graphic components
- Select all: Select all the contents in the current window
- Change block number: change block number
- Change line number: change line number
- Property: the property of selected block

3.1.8 Search

This instruction is mainly used for finding blocks in the function diagram that meet certain conditions.



Fig 3.8

- Search by comment: lookup by block's comment
- Search by block number: lookup by block's Number



3.1.9 FAB2 Operation

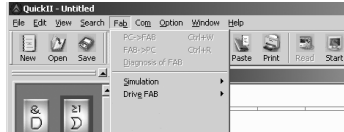


Fig 3.9

Instruction name	Function
PC→FAB2	write program from PC to FAB2
FAB2→PC	read program from FAB2 to PC
Diagnosis of FAB2	detect the status of FAB2
Simulation	simulate program
Drive FAB2	start/stop FAB2

3.1.10 Windows

This instruction is mainly used for the arranging of multiple opening windows. When more than two windows are opened, they can be arranged with this instruction.



Fig 3.10

Cascade: Cascade sub-lists

Tile: Display sub-lists in parallel

Arrange: Arrange the sub-lists in the form of icons



3.2 Tool Bar

After activated, it will appear in the edit window. You can use these directly without trying to locate them; you can edit and draw faster and better.

3.2.1 Standard Tool Bar

Standard Tool Bar			
	New		Copy
	Open		Paste
	Save		Print
	Read Program from FAB2		Block Link
	Block Library		Start Simulation
	Cut		

3.2.2 Control Tool Bar

Control Tool Bar			
	Write Program to FAB2		Run FAB2
	Stop running FAB2		Monitor FAB2 running status
	Diagnose FAB2 System Information.		



3.3 Block Library



Fig 3.11

There are 4 kinds in Block library, distributing LOG、FUN、IN、OUT. LOG represents logical blocks, which will be displayed when clicked. FUN represents the special function blocks, which will be displayed when clicked. IN represents the input blocks, which will be displayed when clicked. OUT represents the output blocks, which will be displayed when clicked.

This library has all of the Basic/Special Function Block, I/O Blocks required for editing Function Diagram. Click LOG under it to display all of the Basic Function Blocks, click FUN to display Special Function Blocks, click IN to display Input Blocks and OUT to display Output Blocks, as shown in fig. 3.12(A), 3.12(B), 3.12(C), 3.12(D).



Fig 3.12 (A)



Fig 3.12 (B)



Fig 3.12 (C)



Fig 3.12 (D)

Separating various kinds of blocks: LOG represents logical blocks, which will be displayed when the button is clicked with the mouse. FUN represents the special function blocks, which will be displayed when the button is clicked. IN represents the input blocks, which will be displayed when the button is clicked. OUT represents the output blocks, which will be displayed when the button is clicked.

The graphs of I/O library are only for you to select I/O devices corresponding to the actual equipments, so that we simulate running and understand conveniently, without any actual logical operation function, as shown in fig. 3.13.

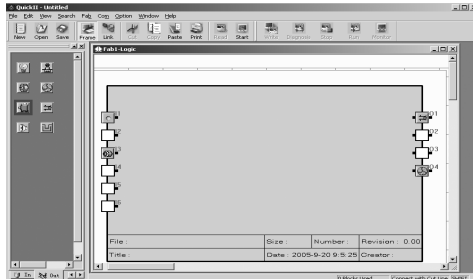


Fig 3.13

Note: the graphs of IN library are only placed in the Input ports but not in Output ports vice versa.



3.3.1 Block Library Operation

1. Click LOG、FUN、IN、OUT buttons under the block library, and display corresponding blocks in its frame.
2. Click the desired block on it.
3. Move the cursor to the editing function block in the edit window and click it, so the selected block will be placed in the logical function diagram.

3.3.2 Block classification

The blocks are classified into four types: Logical Block, Function Block, Input Block and Output Block. The Input and Output blocks are only used to graphically represent the input and output ends of FAB, without any actual functions. The key parts are the Logical Block and Function Block, the combination of which realizes several types of FAB control.

3.3.3 Setup of block attributes

When drawing the logic diagram, you need to set block attribute, which are divided into general attribute and special attribute.

3.3.3.1 General Property

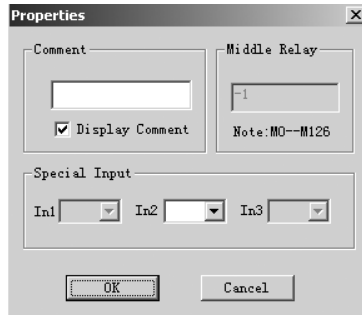


Fig 3.14

The settings of General property mainly include:

1. Comment: for filling of a comment string, no more than 20 characters, and 10 Chinese characters.



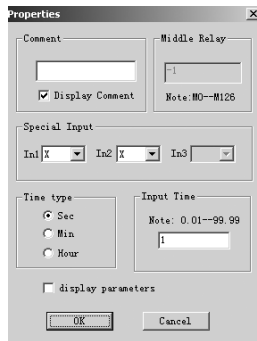
2. Middle Relay: for setting of the Intermediate Relay connected with the current block. When set it, the other blocks can't use it any more, which means that its usage is unique. Its parameter value is from M0-M126, totally amounting to 127.
3. Special Input: X represents empty, HI represents high potential and LO represents low potential. When the input is X, this terminal allows connection with a lead from another block. When the input is HI, no lead from any other block can be connected to this terminal and its status is always at high level. When the input is LO, this terminal allows connection with no lead from any other block and its status is always at low level.

3.3.3.2 Setup of Special Properties

Some special blocks have special properties including RS relay block, D/W clock switch, counter. These blocks are described respectively as follows.

1. Blocks with timer

The blocks such as MPLR、DPR、DDR、CPG、RPR and so on, have timing function. Their block properties setup dialogue box is as shown in fig. 3.15.



Time type: Three units, namely second, minute and hour, are available for selection;

Input time: set the time value timing, its accuracy is up to 0.01s, other setup is referred to setup of the general block;



2. Blocks with counter

The blocks including UCN、DCN, have counting function. Their block properties setup dialogue box is as shown in fig. 3.16.



Fig 3.16

Count value: set count value, its range is from 1-999999. Other setup is referred to setup of the general block.

3. Properties of RS relay

The dialogue box of RS relay properties setting is as shown in fig. 3.17.

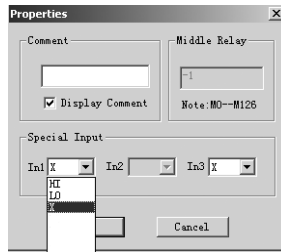


Fig 3.17

Special input: Please refer to general properties for X, HI and LO. Other setup is referred to general attribute.



4. Properties of CW Clock Switch Block

The setup dialogue of CW block is as shown in fig. 3.18.

Clock setup: The status of output can be regularly changed. Two options, Date style and Week style, are provided to meet the particular requirements of users.

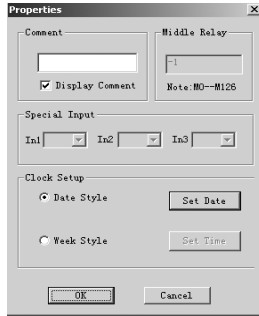


Fig 3.18

If week style is selected, and click “set time” button, the frame of setting time will be on and you can set up to 127 intervals for the time switch according to a time sequence, as shown in fig. 3.19.

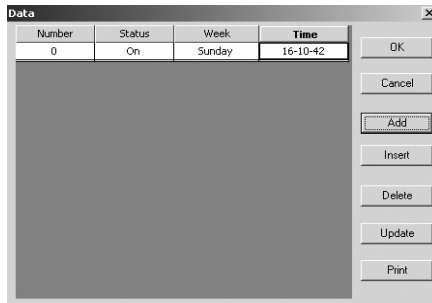


Fig 3.19

In fig. 3.20, there are some setup items such as Number, State, Week, and Time. Time setting operations



Add: when add a time, click Add and dialogue box will appear, as shown in fig. 3.20. Select Week and state ON/OFF, and set the switch time. Then click OK and a time record is added.

Note: they must be set in a time sequence.

Insert: When you need to insert a time in the existing time, please click INSERT and a dialogue box will appear, as shown in fig. 3.20.

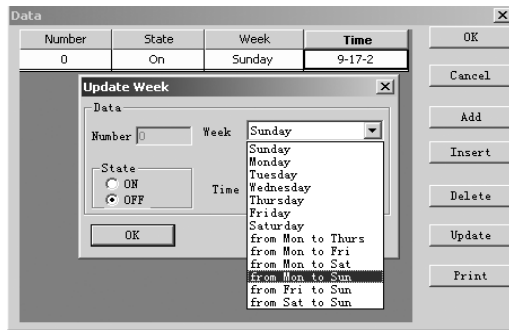


Fig 3.20

Delete: When you want to delete a time, put the cursor on the said time record and click Delete. When the confirm DEL frame appears, click OK to delete the said time record.

Modify: When you want to modify a time, put the cursor on the said time record and click MODIFY. As a time setting frame, similar to that shown in Fig. 3.21 appears, reset the time, click OK and the said time record is modified.

Print: When you want to print your set time on paper then click PRINT.

If DATE STYLE is selected, click SETUP DATE. As the Setup Date frame appears, the date and time can be set, as shown in Fig. 3.21.

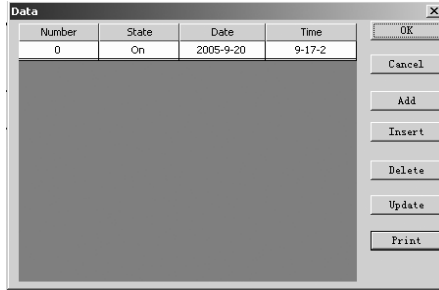


Fig 3.21

You can key in a new time or make changes through the keyboard in this box. Number, State, Date and Time items are set in the Setup Time box.

The time setting operations are as follows:

Add: when add a time, click Add and dialogue box will appear, as shown in fig. 3.22. Select Date and state ON/OFF, and set the switch time. Then click OK and a time record is added.

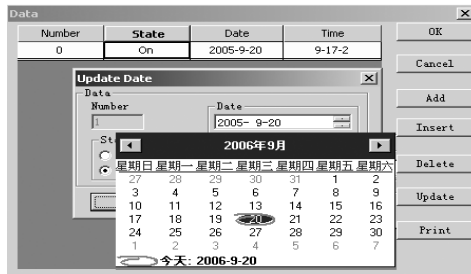


Fig 3.22

It should be pointed out that Quick II provides you with the best date setting method. You will have a permanent calendar chart appear, as shown in Fig. 3.22, only by clicking once the Page Down arrow on the right of the Date box. You may select whatever date you want to set on this permanent calendar and click OK to complete setting of the date. Therefore FAB2 can realize real-time control without any limitation.



Insert: When you need to insert a time in the existing time, please click INSERT and a dialogue box will appear, as shown in fig. 3.22.

Delete: When you want to delete a time, put the cursor on the said time record and click “Delete”. When the confirm DEL frame appears, click OK to delete the said time record.

Modify: When you want to modify a time, put the cursor on the said time record and click MODIFY. As a time setting frame, similar to that shown in Fig. 3.22 appears, reset the time, click OK and the said time record is modified.

Print: When you want to print your set time on paper then click PRINT.

Notes:

- (1) The time is arranged in an order from earlier to later and the time sequence shall be considered for adding or modifying any time record, for example: AM 9:00, AM 11:00, PM 3:00, PM 6:00, etc.
- (2) In the case of multiple records, the said block will be divided into multiple blocks when written into FAB2 and you can view the number of blocks used by the current program in the State Bar of the Function Graph Edit Window.
- (3) If the first time is set ON and the second time is set OFF , the two times share one block, if two consecutive times are both set to ON or OFF, each of them should occupy a separate block.

5. Properties of AN Block

The diagram box of AN block is shown in fig. 3.23.

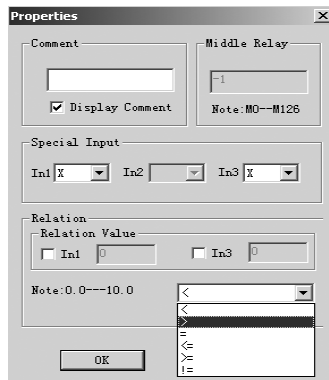


Fig 3.23



The explanation of option listed in Fig 3.23 is as follows:

(1) Comment: User can add letters of explanation in this bar.

(2) Special input: HI, LO, X, LM.

If X has been selected, this said port can be connected to Input port.

If LM has been selected, it means that this said port can be set to a fixed digital value. Please refer to (3) to know how to set the value.

(3) setup Fixed Value

The range of LM is 0.0~10.0.

(4) Comparison

It provides $<$, $>$, $=$, $>=$, $<=$, \neq 6 options. And this comparison block is for the comparison between input 1 and input 2.

For example:

When “ $<$ ” has been selected,

If input 1 $<$ input 2, then $Q=1$.

MEMO



Chapter IV Basic operations

That recommends you how to use QUICK II to edit the Logical Function Diagram Program and simulate operation of your set program, and how to communicate between PC and FAB2 so as to perform writing program into FAB2.

If you want to make a Function Diagram Program, first open a new file and put all required blocks for satisfying the control requirements into the Edit Box, then set the properties of different function blocks and link them up with line according to their logical control relations, thus completing a Logical Function Diagram. Moreover, in order to find out if your set program can achieve your expected control effects, Quick II provides the special function “simulation”, you can run it on the Function Diagram, and then in detail you can observe process of FAB2 running by your consecution. Give an example for demonstration as below:

Example: multi-function switches, for a staircase lighting system

Control requirements:


1. When pressing switch, illumination is turned on, and automatically turned off after 3 minutes
2. Illumination is twinkled 5 seconds before automatically turned off
3. Illumination is always turned on after pressing twice in 5 seconds
4. Illumination is turned off when pressing for 2 seconds and more
5. Automatically turn on at PM 18:30 and off at AM 6:30 every day



4.1 Open File

4.1.1 Open a new file

Operating method

1. Click NEW option under the File menu or the  icon in the Tool Bar, as shown in Fig 4.1.

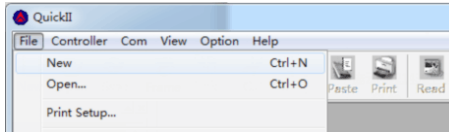


Fig 4.1

2. Now a dialogue box will appear, as shown in Fig 4.2:

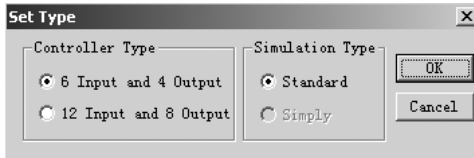


Fig 4.2

In the above figure, the left box is the option of controller type, you can click your required FAB2 type.

- a. 6 input 4 output: FAB2 with 6 input and 4 output
- b. 12 input 8 output: FAB2 with 12 input and 8 output



3. After its type is selected, click OK, here Save Box will appear as shown in Fig 4.5, you can select save path or select Cancel, Function Editing Box will appear as shown in Fig 4.3.

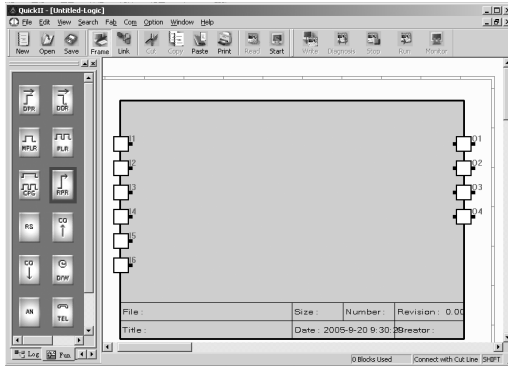



Fig 4.3

4.1.2 Open the existing file

Operation method:

1. Click Open under the File menu or the icon  in the tool bar, as shown in Fig 4.4.
2. A dialog box will appear as shown in Fig 4.6.

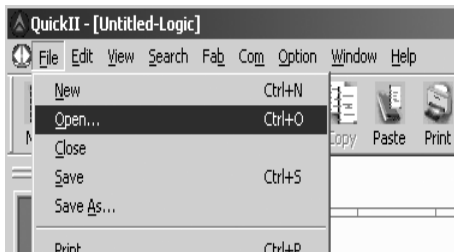


Fig 4.4

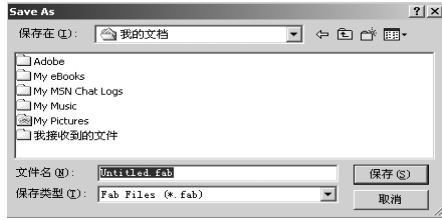


Fig 4.5

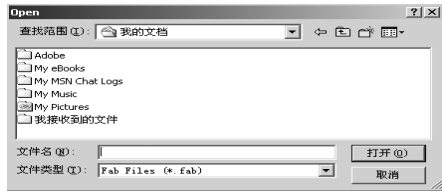


Fig 4.6

3. Click and open your required file, you can modify and print your program etc.

4.2 Edit Function Diagram Program

As multi-function switch an example, we know about its control requirement and function of all blocks, and understand its logical relation. Step 1: Place blocks. Step 2: Edit the attributes of blocks. Step 3: link.

4.2.1 Place blocks

The desired block can be directly selected from the left block library window and place on the Edit Window.

Operating step:

1. Select the relevant block group. To select the Basic Block and click LOG; to select the special block and click FUN.
2. Click and select your desired blocks.
3. Move the cursor to the proper position in the Editing Box and click, thus the block is placed.



4. Repeat the above operation, place all required blocks.

Example: there are totally 14 blocks for the staircase illumination system, as shown in Fig. 4.7.

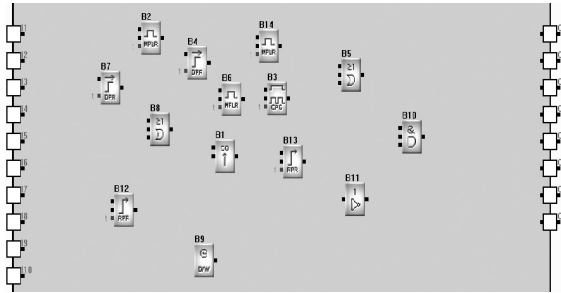


Fig 4.7

4.2.2 Edit block properties

Different blocks have different properties, which may be set by control requirements.

Operating methods:

1. Select a function block and click by right key, a new menu will appear as shown in Fig. 4.8, and then click Property option; Or double-click it directly.
2. A property dialogue box appears, as shown in Fig. 4.9, and set the attributes by required.

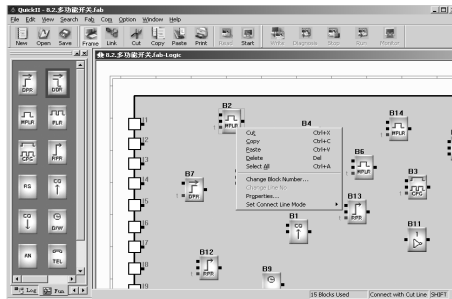


Fig 4.8

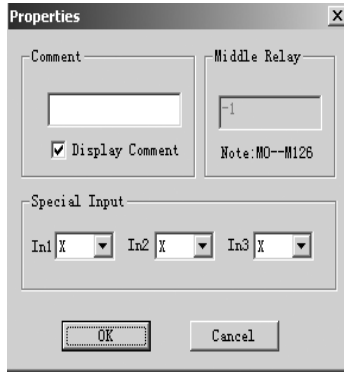


Fig 4.9 Put the blocks required in the Edit box

Comment: for filling in comment string, less than 20 characters (or 10 Chinese characters).

Middle Relay: for setting the Middle Relay connected with the current block (the value range is 0-126).

Special Input: X is empty, HI is high potential, LO is low potential.

3. Click OK button.

4. Repeat the above operation, set properties of all blocks.

Note: Different blocks have different properties setup, especially the special function blocks. Please refer to chapter III, section 3.3 in detail.

4.2.3 Link


After the above operation, it is necessary to buildup link by control relation, so as to make a complete diagram. There are two link methods: auto-link and hand-link.

Operation method:

1. Click Option→Set line mode, and then click Auto or Manual, as shown in Fig. 4.10, the default mode is automatic link mode.



Fig 4.10

2. After selecting link mode, click Link button  , the mouse changes to the shape of a pen, i.e. the link status.
3. Multi-function switch diagram is complete, as shown in Fig. 4.11.

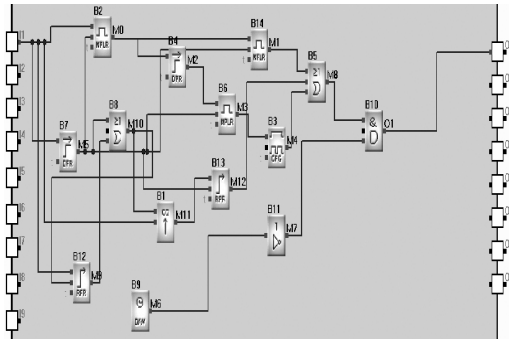


Fig 4.11

- a. With automatic link, as the mouse is moved to I/O ports of the blocks, its shape will change into a “+”, indicating that an link port by click, click it and move to I/O port of the next block and then click, this link is complete, as shown in Fig. 4.12.
- This method is suitable for the case in which the program is simple and relatively less blocks.

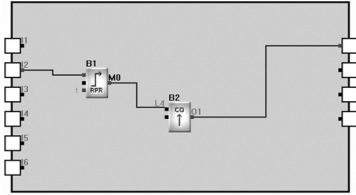


Fig 4.12

b. With auto-link or manual link, you can operate as follows: first move the mouse to the link start port, and its shape is “+”, click and move the mouse into your desired place and click, as shown in Fig. 4.13.

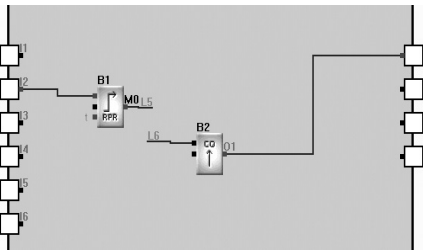


Fig 4.13

At the ends of the lines, there will appear mark numbers, such as L5, L6.

If you define that a line is from L5 to L6, so modified method is as follows: Click the modified Mark Number to need by right mouse, select “change line Number”, then Fig. 4.15 will be shown, and you can modify the mark number.

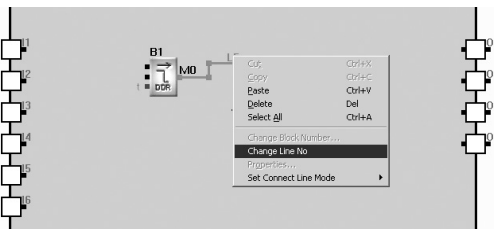


Fig 4.14

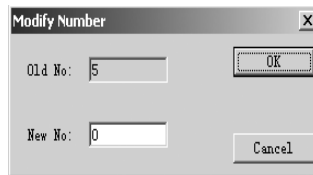


Fig 4.15

c. If the manual link is selected in step 1, click I/O port of the former block, then by your desired path move it to I/O port of the next block, and click it i.e. link is complete.

4.2.4 Move the link or block

In case that there are a lot of links and blocks in your Function Diagram, which are difficult for you to read due to so many crisscrossing lines, you can move some of the links or blocks to make tidy and easier.

Operating methods:

1. Click the link or block to be moved and it will turn to a red color
2. Move it to the proper position
3. Click again to complete it
4. As the above method, make the function diagram tidy and clear

4.2.5 Delete block or link

When you want to delete unnecessary blocks or wrong links, the operating methods are as follows:


1. Select the link or block to be deleted ;
2. Press DEL key or click by right mouse and select the delete option, thus Del is complete.



4.2.6 Simulation operation

Quick II has a Simulation Run Function in addition to editing function, after programming is completed, you can start Simulation Function, for checking if it meets your control requirement.

Operating methods:

1. Click FAB2 Operation→Simulation→Start, as shown in Fig. 4.16, or directly click  icon in the Tool Bar. Now you can see the result of program running through I/O status in the frame as shown in Fig. 4.17.

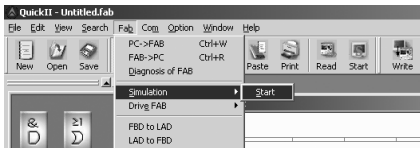



Fig 4.16

2. Please observe that your programs are running carefully.
3. Click  again to end Simulation Function.

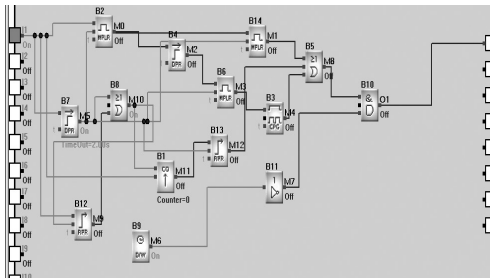


Fig 4.17

In the above simulation graph, you can see I/O status, as well as the current status of timing and counting blocks. So you can easily judge through this Simulation Function if the edited program meets your control requirement.



4.2.7 Save and Print

Operating method for Save:


1. To save your desired program, click Save or Save as under File menu, as shown in Fig. 4.18, or click  icon in the tool bar ;
2. A new dialogue box appears, as shown in Fig. 4.19, in which you can set the path and file name of save ;
3. Click “Save” or “Save as” and save is completed.



Fig 4.18

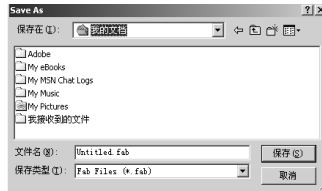


Fig 4.19

Operating methods for Print:

1. Click Print option under File menu ;
2. A dialogue box appears, as shown in Fig. 4.20, set the print requirements by the prompt setup ;
3. Click OK.

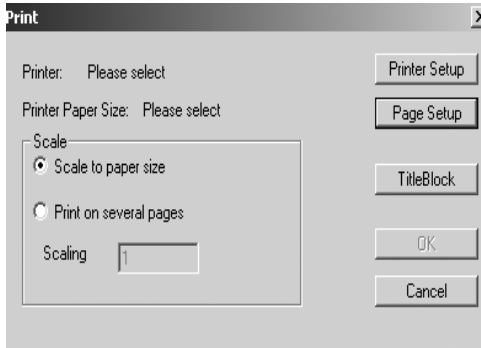


Fig 4.20

4.2.8 Write/Read

When the program is edited and has been proved through the simulation test to meet your control requirement, the Com. Port of the computer can be connected with FAB2 directly through the programming interface or through the interface. In this way, communication between the computer and FAB2 will be realized so that programs can be uploaded to and downloaded from FAB2. All these operations are very simple in Quick II.



Fig 4.21



Operating method:

1. Click Communication→Configuration on the main menu as shown in Fig. 4.22.



Fig. 4.22

2. A dialogue box appears, as shown in Fig. 4.23.

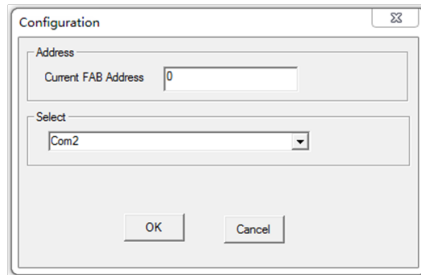


Fig 4.23

3. Fill in the FAB2 address ;
4. Select COM port ;
5. Click OK ;
6. Write/Read
 - 1) Click FAB2→“PC→FAB2” or “FAB2→PC” on the main menu, as shown in Fig. 4.24, a confirm password frame appears, shown in Fig. 4.25.

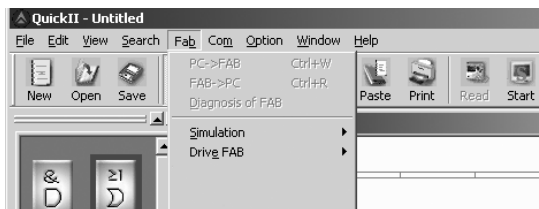


Fig 4.24



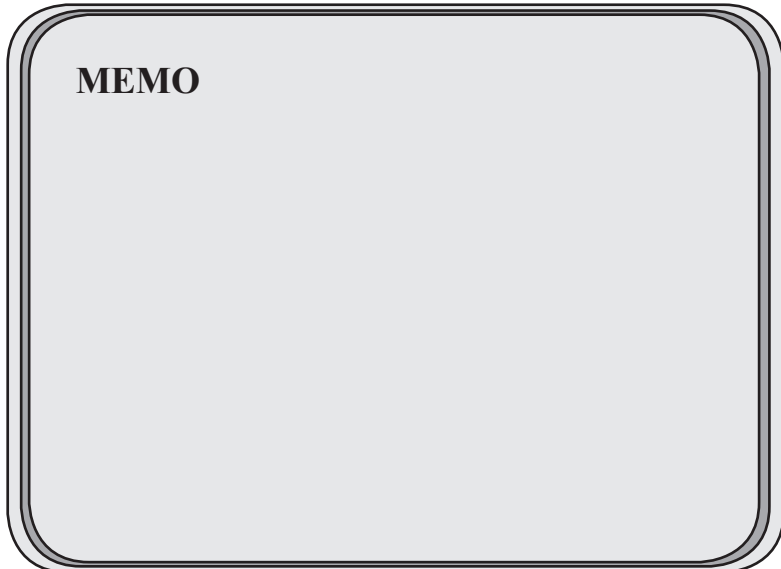
2) Enter the correct password, and click OK.

Note:

1. Only after setup communication configure, communication between PC and FAB2 is played so as to complete read-write program.
2. When writing the program into FAB2, if “Run after write at once” is selected, FAB2 will run immediately, otherwise need to electrify over again or click Run option on the tool bar, and FAB2 will start the program execution.



Fig 4.25





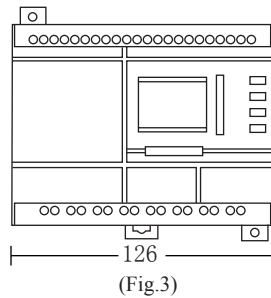
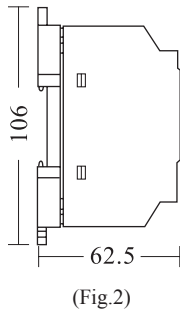
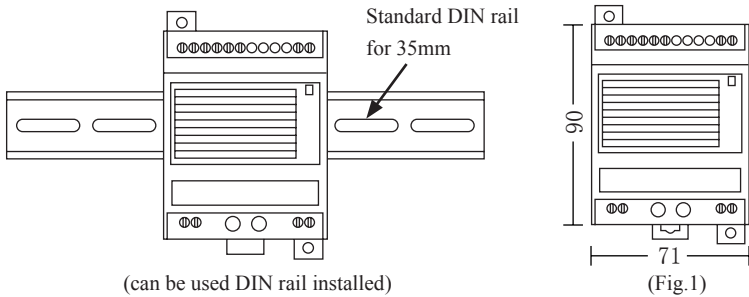
SP-AS/AL Series Switch Power

1.1 Introduction and Installtion Dimensions

The SP-AS/AL Series Switch Power have many features: being mini-sized, light weight, high efficiency, good reliability and so on. In special, it has the remote control and UPS function.

SP-AS Series:SP-05AS (5V/6A)
 SP-12AS (12V/3A)
 SP-24AS (24V/1.5A)
 71mm×106mm×62.5mm

SP-AL Series:SP-05AL (5V/10A)
 SP-12AL (12V/6A)
 SP-24AL (24V/3A)
 126mm×106mm×62.5mm





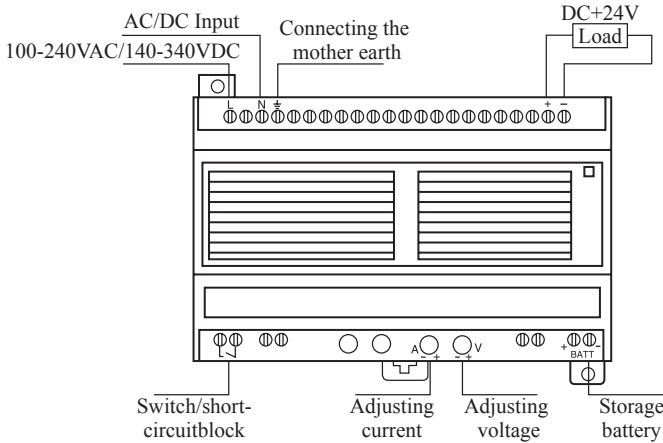
1.2 Features

1. EMI filter condenser
2. Input frequency: 47-63Hz
3. Output voltage stability: $\pm 0.5\%$
4. Can be used for DIN rail mounting (EN50022-35)
5. Wide range voltage input (100-240VAC/140-340VDC)
6. Ripple voltage tolerance range(85-264VAC/120 370VDC)
7. Output voltage fine adjustment range (-5%~+10%, adjusting potentiometer V)
8. Have the function of soft-start (to limit the peak current of start and the pressure of the voltage to the components)
9. The current of the load can be roughly adjusted (Means the maximum protective current of the load , adjusting potentiometer A)
10. Effective: $>75\%$
11. Insulation voltage endurance: $>1.5KV$
12. Power supply output with the LED indicator
13. Ripple: $\leq 150mVp-p$
14. Have the short circuit and over-load protection(short circuit protection means miss-connect the output voltage in short ,after disconnect,the output will be renew. Over-load protection:105%-135%)
15. With the UPS function.(External-connected battery, provide with the UPS by the power supply and the battery)
16. With the remote control function (By the switch control the having and non-having of the output voltage)
17. With the over heat protection function (the main control CMOS chip stops output when the temperature is beyond $135^{\circ}C$ and the output will renew automatically when the temperature reduces)



1.3 Using Methods (Taking SP-24AL as example)

a. General operation



(Fig.3.1 General application)

Operation Steps:

1. Twist firmly the short-circuit block of the switch terminal (If the switch / short-circuit is off,the switch power have no output)
2. Adjusting potentiometer (A) and rotate it to the end clockwise
3. Connect the power (100-240VAC/140-340VDC)
4. Adjusting potentiometer(V) to make the voltage of the output terminal be +24VDC
5. Connect the load in the output terminal (pay attention to the straight polarity and the negative polarity and that the maximum working current must be $\leq 3A$)

b. Remote Control

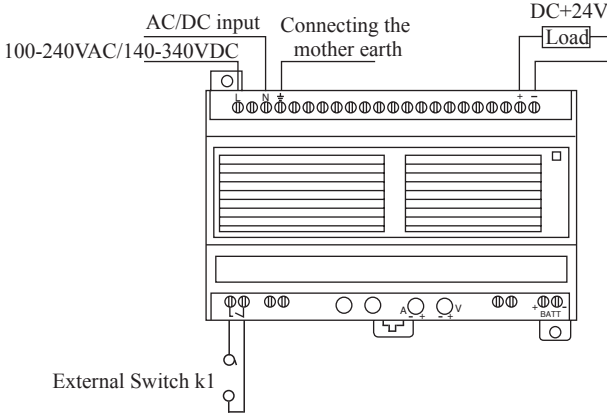
Attn: Externally-Connect the switch terminal,remote the switch to control output voltage having or non-having

Operation steps:

1. Remove the short circuit block from the switch terminal and replace it with a switch k1
2. Adjusting potentiometer (A) and rotate it to the end clockwise
3. Connect the power (100-240VAC/140-340VDC)



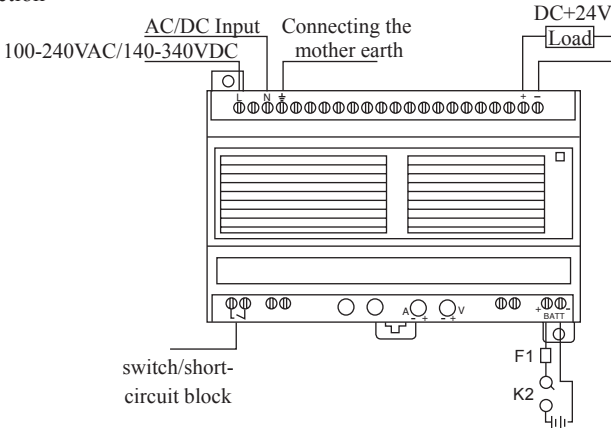
4. Adjust potentiometer(V) to make the voltage of the output terminal be +24VDC(Close the switch k1)
5. Load (the working current $\leq 3A$)
6. Close the switch k1,no voltage output



(Fig.3.2 Remote Control application)

c. Using UPS Function

Attn: If the load can provide with UPS voltage methods, then you can use this function



(Attn: the connection of the positive and negative pole)

(Fig.3.3 UPS application)



Operation Steps:

1. Twist firmly the short circuit block of the switch terminal (If the switch / short-circuit block is off, the switch power have no output)
2. Adjusting potentiometer (A) and rotate it to the end clockwise
3. Connect the power (100-240VAC/140-340VDC)
4. Adjusting potentiometer(V) to make the voltage of the output terminal be +24VDC (Due to SP-12AS/AL to make the output voltage be 12V)
5. Disconnect the AC/DC power wire
6. Connect the switch and fuse wire and the battery according to the positive pole and negative pole marked on the crust
7. Connect the power (100-240VAC/140-340VDC)(If the battery voltage is over +24V, you need to adjust potentiometer(V) to make it over battery voltage, the adjustable voltage is not exceed 26.5V)

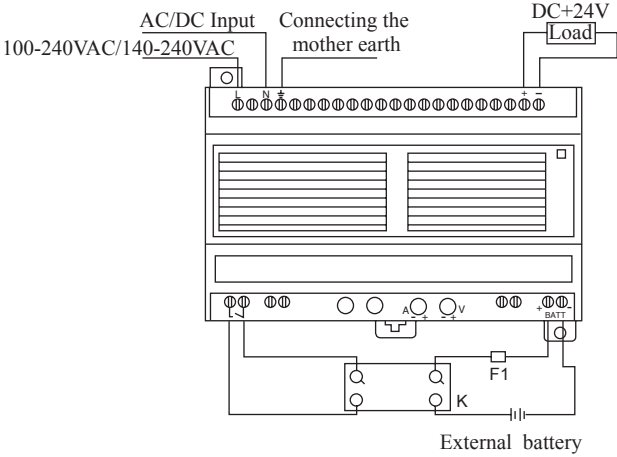
Attn:

1. At this time the main output voltage is provided by load: BATT port charges the accumulator battery by the switch k2 and fuse wire F1; If there is no AC/DC voltage input, battery power supply the load by the internal circuit, the Maximum working current $\leq 3A$
2. At this time the main output voltage provided by load is more 24V.

d. Using Remote Control and UPS simultaneously

Attn: Using remote control and UPS simultaneously, the using method is combined by the method 2 and method 3 as follows:

FAB2 Intelligent Controller



(Attn: the connection of the positive and negative pole)
 (Fig3.4: Using Remote and UPS simultaneously application)

1.4 Specification

Type	SP-05AS	SP-12AS	SP-24AS	SP-05AL	SP-12AL	SP-24AL
Voltage	5V	12V	24V	5V	12V	24V
Current	6A	3A	1.5A	10A	6A	3A
Dimension (W*H*D)	71mmx106mmx65mm			126mmx106mmx65mm		
Gamut voltage	100-240VAC/140-340VDC					
Ripple voltage tolerance range	85-264VAC/120 370VDC					
Input frequency	47-63Hz					
Output voltage Stabillity	$\leq \pm 0.5\%$					
Ripple	$\leq 150\text{mVp-p}$					
Operation Temperature	$-25^{\circ}\text{C} \sim +70^{\circ}\text{C}$					
Efficiency	$> 75\%$					



(I) Functional comparison

The FAB2 series PLC is an upgraded version of the FAB series PLC. The function comparison diagrams of the two are as follows:

Item	FAB	FAB2
Basic features		
25°CRTC buffer	100h	160h
RTC accuracy	150s/month	20s/month
Password Protection	Yes	Yes (*protection)
Expanded module	Yes (voice module)	None (without voice module)
Panel parameters	queried/modified	queried/modified
Panel programming	Yes	None
The function of Automatic Startup	None	Yes (0.5 second after Power on or download the program)
Quick II	Not shared	Not shared
Integration Communication		
RS485	None	Two Groups(One group sh300+One modbus only read)
Communication Rate	9600	9600/19200
Communication Protocol	Self-defined protocol	Self-defined/Standard Modbus (Note 1)
AI Characteristics		
AD Resolution	8 bits (0.2v)	10 bits (0.1v)
Signal Type	0-10VDC	0-10VDC



MEMO

A large, vertically oriented rectangular area with rounded corners and a double-line border, intended for handwritten notes or a memo.



(II) Technical Parameters

2.1 General technical parameters

Item	Basis	Condition
Climate environment		
Humidity	Cold: IEC68-2-1 Heat: IEC68-2-2	
Horizontal installation Vertical installation		0-55°C
Storage/Transportation		-40°C~70°C
Relative humidity	IEC68-2-30	5%~95% without condensation
Atmospheric pressure		795-1080Kpa
Pollutants	IEC68-2-42 IEC68-2-43	SO ₂ 10cm ³ /m ³ ,4 days H ₂ S 1cm ³ /m ³ ,4 days
Mechanical environment		
Protection type		IP20
Vibration 2	IEC68-2-6	10~57Hz(constant amplitude 0.15mm) 57~150Hz(constant acceleration 2g)
Impact	IEC68-2-27	18 impacts (semi sine 15g/11ms)
Fall	IEC68-2-31	Falling height 50mm
Freely falling objects(with package)	IEC68-2-32	1m
Electromagnetic compatibility (EMC)		
Static discharge	Severe grade 3	8kv air discharge,6kv contact discharge
Electromagnetic field	IEC801-3	Field strength 10V/m
Interference suppression	EN55011	Limitation grade B group 1
Shock pulse	IEC801-4 Severe grade 3	2kv for power line 2kv for power line



IEC/VDE safety information		
Insulation Intensity	IEC1131	Meet the requirements
25°C clock buffer memory	Typical 100h	
RTC accuracy	±Max 20S/Month	

2.2 AF-10MR-A2/AF-20MR-A2

Power Supply	
The rated voltage of power supply	AC100-240V
Allowable range of the rated input voltages VDE0631: IEC1131: Allowable main frequency	AC85-260V AC85-260V 47~63Hz
Power consumption (AC220V)	AF-10MR-A2(6W) AF-20MR-A2(10W)
Digit input	
Input voltage L1 Signal 0 Signal 1	AC0-40V AC80-240V
Input Current of signal 1	Typical 0.2mA(AC230V)
Delay Time Changed From 1 to 0 Changed From to 1	Typical 50ms Typical 50ms
Length of Power Line (without shield)	100m
Digital output	
Output Type	Relay Output
Electrical Isolation	Yes
Group	1
Continuous Current Ith	Max 10A
Incandescent Lamp Load (25,000 switch cycles)	1000W (AC230/240V) 500W (AC115/120V)



Fluorescent Light Tube With Electrical Controller (25,000 Switch cycles)	10×58W(AC230/240V)
Fluorescent Light Tube With Regular Compensation (25,000Switch cycles)	1×58W(AC230/240V)
Fluorescent Light Tube without Compensation (25,000 Switch Cycles)	10×58W(AC230/240V)
Short Circuit Protectioncos1	Power Supply ProtectionB16 600A
Short Circuit Protection cos0.5-0.7	Power Supply ProtectionB16 900A
Output Relay Protection	Max.20A FeatureB16
Switch Frequency	
Machine	10Hz
Resistor Load/Lamp Load	2Hz
Induced Load	0.5Hz

2.3 AF-10MT-D2/AF-20MT-D2

Power Supply	
The rated voltage of power supply	DC12/24V
Allowable range of the rated input voltage Power Consumption(DC24V) (Output full load)	DC10-28V Typical 80mA Typical 2W
Input section (digital input)	
Signal 0 Signal 1	<DC4.5V DC7.5V-24V
Input current of signal 1	<2.5mA
Input section(analog input)	
Signal 1	DC0-10V
Input current of signal 1	<0.8mA



Delay Time Changed From 1 to 0 Changed From to 1	Typical 50ms Typical 50ms
Length of Power Line(without shield)	100m
Digital output	
Output type Output voltage Output Current	Transistor output(equivalent NPN) ≤DC80V Max 2A
Short Circuit and Overload Protection	No
Current limit of short circuit	about 2A
Reduction of the rated value	No(even in the whole temperature range)

2.4 AF-10MR-D2/AF-20MR-D2

Power Supply	
The rated Voltage of power supply	DC12/24V
Allowable range of the rated input voltage	DC10-28V
Power Consumption (DC24V) (Output full load)	AF-10MR-D2(4W) AF-20MR-D2(5W)
Input section (digital input)	
Signal 0 Signal 1	<DC4.5V DC7.5-24V
Input current of Signal 1	<2.5mA
Input section (analog input)	
Signal 1	DC0-10V
Input current of Signal 1	<0.8mA
Delay Time Changed From 1 to 0 Changed From to 1	Typical 50ms Typical 50ms
Length of Power Line(without shield)	100m



Digital output	
Output Type	Relay output
Electrical Isolation	Yes
Group	1
Continuous Current Ith	Max. 10A
Incandescent Lamp Load (25,000 switch cycles)	1000W
Fluorescent Light Tube With Electrical Controller (25,000 Switch cycles)	10×58W
Fluorescent Light Tube With Regular Compensation (25,000Switch cycles)	1×58W
Fluorescent Light Tube without Compensation (25,000 Switch Cycles)	10×58W
Short Circuit Protection cos1	Power Supply Protection B16 600A
Short Circuit Protection cos0.5-0.7	Power Supply Protection B16 900A
Output Relay Protection	Not allowed
Switch Frequency	Max. 20A FeatureB16
Machine	
Resistor Load/Lamp Load	10Hz
Induced Load	2Hz
Output Type	0.5Hz

2.5 AF-10MT-E2/AF-20MT-E2

Power supply	
The rated Voltage of power supply	DC12/24V
Allowable range of the rated input voltage	DC10-28V
Power Consumption (DC24V) (Output full load)	Typical 80mA Typical 2W
Input section (digital input)	
Signal 0 Signal 1	<DC4.5V DC7.5-24V
Input current of Signal 1	<2.5mA
Delay Time Changed From 1 to 0 Changed From to 1	Typical 50ms Typical 50ms
The length of power line(without shield)	100m



Digital Output	
Output type Output voltage Output Current	Transistor output(equivalent NPN)
Short Circuit and Overload Protection	≤DC80V
Current limit of short circuit	Max. 2A
Reduction of the rated value	No
Output type Output voltage Output Current	about 2A
Short Circuit and Overload Protection	No(even in the whole temperature range)

2.6 AF-10MR-E2/AF-20MR-E2

Power supply	
The rated Voltage of power supply	AC/DC12V-AC/DC24V
Allowable range of the rated input voltage	AC/DC10V-28V
Power Consumption (AC/DC24V) (Output full load)	AF-10MR-E2(3W) AF-20MR-E2(5W)
Digital Input	
Signal 0 Signal 1	<AC/DC4.5V AC/DC10-24V
Input current of Signal 1	Typical 2mA
Input section (analog input)	Typical 50ms Typical 50ms
The length of power line(without shield)	100m
Digital output	
Output Type	Relay output
Electrical Isolation	Yes
Group	1
Continuous current Ith	Max.10A
Incandescent Lamp Load (25,000 switch cycles)	1000W
Fluorescent Light Tube With Electrical Controller (25,000 Switch cycles)	10×58W
Fluorescent Light Tube With Regular Compensation (25,000Switch cycles)	1×58W
Fluorescent Light Tube without Compensation (25,000 Switch Cycles)	10×58W
Short Circuit Protection cos1	Power supply protection B16 600A



Short Circuit Protection cos0.5-0.7	Power supply protection B16 900A
Parallel connected output for increased power	Not allowed
Output Relay Protection	Max.20A FeatureB16
Switch Frequency	
Machine	10Hz
Resistor Load/Lamp Load	2Hz
Induced Load	0.5Hz

2.7 AF-10MT-GD2/AF-20MT-GD2

Power supply	
Supply voltage rating	DC12/24V
Fluctuation voltage allowable range Consumption(DC24V) (Output full load)	DC10V-28V Typical 80mA Typical 2W
Input section (digit input)	
Signal 0 Signal 1	<DC4.5V DC7.5-24V
Input current of signal 1	<2.5mA
Input section (analog input)	
Signal 0 Signal 1	DC0-10V
Input current of Signal 1	<0.8mA
Input section (analog input)	Typical 50ms Typical 50ms
The length of power line (without shield)	100m
Digital Output	
Output type Output Voltage Output Current	Transistor output(equivalent PNP)≤DC80V Max.2A
Short circuit and Overload Protection	No
Current limit of short circuit	Circa2A
Reduction of the related value	The entire temperature range does not degrade the rating



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(III) Quality Guarantee

Quality Guarantee	<p>The product has been strictly tested for quality before delivery from our plant and it complies with all product requirements listed in this manual. When properly installed it will work in accordance with its specifications.</p>
Warranty Period	<p>This product is warranted against defects in material and manufacturing for a period of one year from the date of delivery.</p> <p>During the warranty period, ARRAY shall be responsible for necessary repairs or replacement, as long as the product is proven to be inherently defective.</p>
Warranty Range	<p>During the above mentioned Warranty Period, if the product is fails to perform in accordance with its specifications and has not been misused it shall be delivered to a service centre, which ARRAY authorizes, for free repair. ARRAY reserves the right to repair or replace the product in accordance with it's discretion. In the event of product replacement the buyer will be informed and shall be responsible for reloading software, unless agreed otherwise.</p> <p>The buyer shall pay the shipping charge for delivery to the ARRAY service centre and the ARRAY service centre will repair or replace the product and deliver it to the buyer free of charge.</p>
Remark	<p>The above warranty does not include the following circumstances.</p> <ol style="list-style-type: none"> 1. Improper installation testing or operation 2. Misuse 3. Damage caused by unauthorized dismantling of the product 4. Damage to consumable parts such as rubber cover, buttons, batteries, relays etc.



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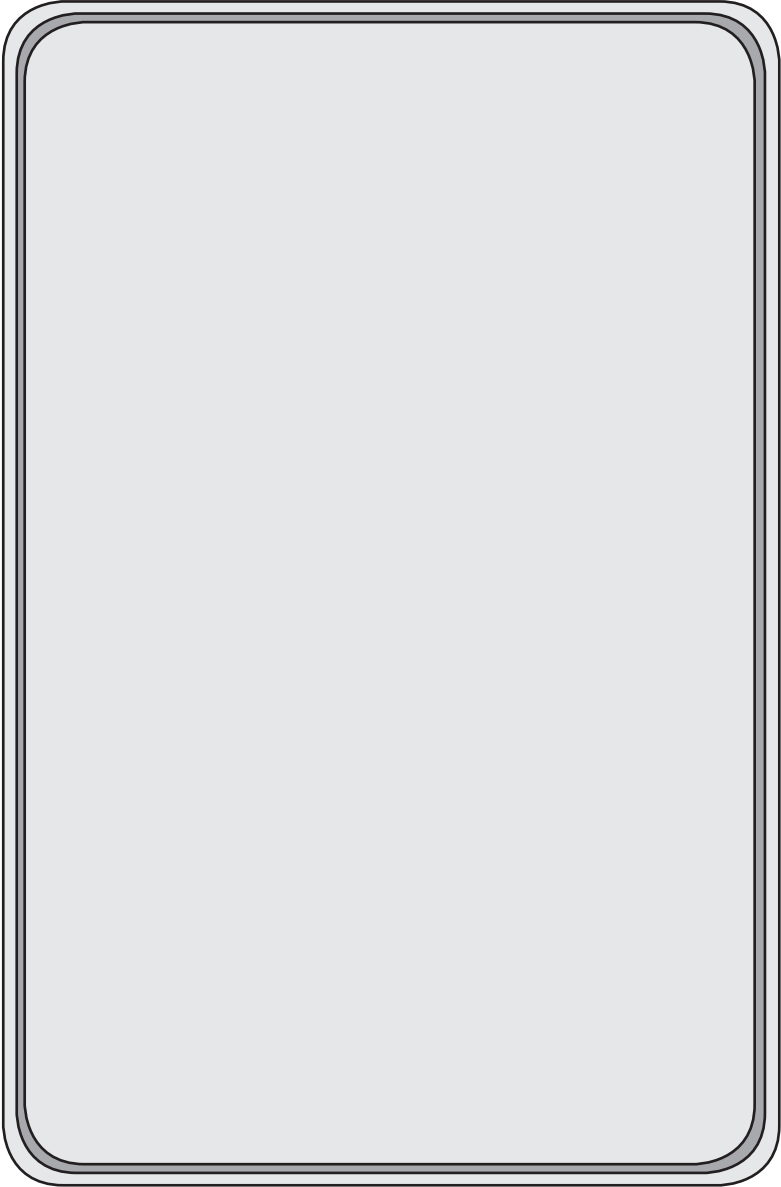
(IV) The instruction of USB driver

1. The USB driver of ARRAY is FTD232. His corresponding USB drive cable is AF-DUSB2.
2. After you install USB driver, pls kindly plug in AF-DUSB2, then show USB pattern in the lower right corner of the PC.(The initial inspection plan is like plugging in a USB flash drive.)
3. After AF2 is power on, pls kindly select “Communication configuration”, then could perform the upload and download between AF2 and PC.
4. If the communication is failed, pls kindly operate as below,
A,Pls kindly detect the communication port(my computer-property-firmware-Device manager). If you could not find it, pls kindly install USB driver again, and if you could find it,pls set the COM port optimally between COM1-COM6.

B. Pls kindly confirm if the AF2’s password is correct, and if you do not confirm it, pls kindly check with your supplier.

C. Pls kindly self-check PLC address(New set-Communicate-Option-Query PLC address), the default of communicated setting’s address is “0”.

FAB2 Intelligent Controller _____



FAB USER'S MANUAL

Ver 9.0

