FAB INTELLIGENT CONTROLLER

USER'S MANUAL

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 8.0

Preface

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

FAB 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.

FAB 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, FAB 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 FAB.

Notes:

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

(3)Any comments on the improvement of the quality of this manual will be appreciated.

IMPORTANT APPLICATION NOTES:

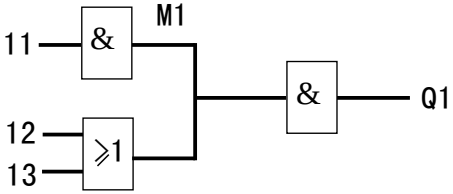
1. The AF-C232/D232, AF-C485/D485, and LCD board, when a FAB is powered, must not be plugged in or out.

2. The default password for FAB is 0001.

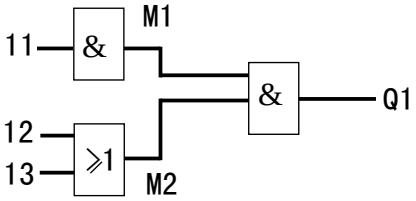
3. The default address for FAB is 000.

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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Chapter IVProgramming on FAB panel

ChapterV The Voice Module

ChapterVI Applications

Appendix I Technical Parameters

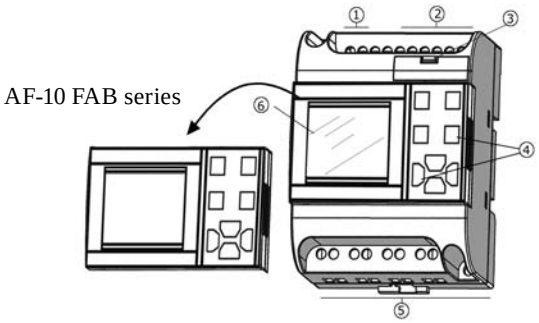
FAB2 PLC series

Chapter I Introduction

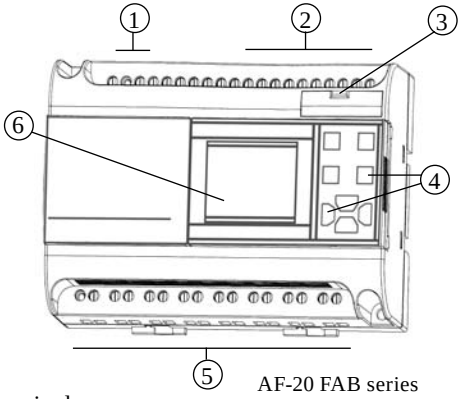
FAB is a new type of programmable controller, which is programmed by the use of a Function Block Diagram. The programming of FAB is simpler and easier to learn than that of a conventional PLC, which uses ladder diagrams and associated instructions. FAB combines the controller and the writer to a removable LCD panel, on which you can directly do the programming, so that the cost and time are greatly reduced.

FAB intelligent controller series are compact in size and light in weight. They can implement functions like telephone-control, voice alarm, information, and auto-dialing. Now FABs are being widely used in many fields such as industry, commerce, mining, agriculture, home automation etc.

1.1 Structure of FAB



① Power terminals
② Input ports
③ Communication interface
④ Operating keys
⑤ Output ports (Relay or transistor)
⑥ LCD display panel



AF-20 FAB series

① Power Terminals
② Input ports
③ Communication interface
④ Operating keys
⑤ Output ports (Output of relays or transistors)
⑥ LCD display panel

1.2 Parameters and models

Item	Type	Power	Input	Output
1	AF-10MR-A	AC100V-240V	6 points AC digital input	4 points relay output
2	AF-10MR-E	AC14-20V/ DC12-24V	6 points AC/DC digital input	4 points relay output
3	AF-10MT-E	DC12-24V	6 points DC digital input	4 points transistor output (equivalent NPN)
4	AF-10MR-D	DC 12-24V	6 points DC(with analog) digital input	4 points relay output
5	AF-10MT-D	DC12-24V	6 points DC (with analog) input	4 points transistor output (equivalent NPN)
6	AF-10MT-GD	DC12-24V	6 points DC (with analog) input	4 points transistor output (equivalent PNP)
7	AF-20MR-A	AC100V-240V	12 points AC digital input	8 points relay output
8	AF-20MR-E	AC14-20V/ DC12-24V	12 points AC/DC digital input	8 points relay output

9	AF-20MT-E	DC12-24V	12 points DC digital input	8 points transistor output (equivalent NPN)
10	AF-20MR-D	DC 12-24V	12 points DC(with analog) digital input	8 points relay output
11	AF-20MT-D	DC12-24V	12 points DC (with analog) input	8 points transistor output (equivalent NPN)
12	AF-20MT-GD	DC12-24V	12 points DC (with analog) input	8 points transistor output (equivalent PNP)
13	AF-LCD-L	The removable LCD panel for programming(The wide-range temperature type -20℃~70℃)		
14	AF-LCD-B	The removable LCD panel for programming(The wide-range temperature type -20℃~70℃ and back light display)		
15	AF-CAP	A general cover instead of AF-LCD panel		
16	AF-C232	A cable connecting FAB and PC (profile plug type)		
17	AF-D232	A cable connecting FAB and PC (frontispiece plug type)		
18	AF-C485	A cable connecting FAB and RS485 bus, monitoring via net (profile plug type)		
19	AF-D485	A cable connecting FAB and RS485 bus, monitoring via net (frontispiece plug type)		
20	AF-P485	The interface between PC and RS485 monitoring via net		
21	AF-MUL	Phone voice block for recording &broadcasting (AC power)		
22	AF-MUL-D	Phone voice block for recording &broadcasting (DC power)		
23	AF-COPY	Copy Module		
24	AF-CMP	The cable connecting PC to the voice block port “To PC”		
25	AF(SR)-USB	USB/RS232 converter (DIN installation)		
26	AF-S485	RS232/RS485 converter (DIN installation)		
27	AF-DUSB	A cable connecting FAB to PC USB port (frontispiece plug type)		
28	CD-ROM	FAB software QUICK II and SCADA		
29	AF-AUD	The wire between PC sound card and AF-MUL/AF-MUL-D		

1.3 Features

1. Removable programming panel with Liquid Crystal Display
   There is an operating panel with LCD display on the frontal side of FAB. You can use the operating keys on this panel to edit directly the control program for the FAB. Moreover, this LCD display panel is removable, and it can be set up according to your needs. When needed, it can be plugged in and when not needed, it can be removed and replaced with a frontal cover.

   Caution
   The LCD display panel shall be plugged in or removed only after AC or DC power has been cut off.

2. Well featured and compact design
   If you are thinking of improving the application of your equipment, a FAB is the solution because it is compact, 90mm x 71mm x 58mm (AF-10 Series) and 90mm x 126mm x 58mm (AF-20 Series).

3. FB programming and big program storage capacity
   The control functions of FAB can be implemented with only function blocks incorporated into a function block diagram. The same control implemented by a conventional PLC would require a much larger and more detailed program. When several function blocks are linked together in a specific way, then relatively complicated control functions can be implemented. A FAB is able to store programs made by as many as 127 FBs (Function blocks) and there are enough application resources to satisfy the requirements of a complicated control. A program, when written into FAB will never be lost as FAB does not rely on a battery for the memory function.

4. QUICK II: the programming software
   The control program can be written directly, with the use of the LCD panel, into a FAB unit. With more complicated control schemes the use of an ancillary computer, loaded with QUICK II software, is recommended. The control program can then be written into the memory of the FAB. QUICK II is a human-machine programming interface, which is perfectly friendly. It can edit the function diagrams and also can analogously run the written programs. It provides an off-line testing function to the user. This feature overcomes much of the possible inconveniences normally experienced with

on-line testing and commissioning. The system can be proven before being put into actual service. QUICK II will not only guide you to implement the editing of the control programs, but will also perform the real-time monitoring for the field environment and the operational conditions of FAB.

5. Real-time clock function
   FAB intelligent controller series have an instant real-time recording function. FAB can execute the operations according to the schedule. Up to 127 different time intervals can be set, it is very suitable for systems which require time controls.

6. Analog inputs and transmission
   In addition to receiving a switch input, FAB can also receive the analog input to implement the control of temperature, humidity, pressure, flow, level unit, etc., and transmit them to a computer for monitoring.

7. Security cipher code function
   FAB is provided with protection for the programs downloaded into it. A security cipher code can be set before programs are written. The programs can only be modified after the correct cipher code is entered.

   Note
   The default password for FAB is 0001.

8. Telephone function
   FAB is equipped with telephone and voice function blocks. It is possible to dial directly through a telephone line after the required telephone number has been preset. FAB can be dialed automatically, when the conditions are satisfied so as to implement advice or alarm functions. Moreover, FAB can also receive remote signals transmitted through a telephone line in order to control the terminal equipment.

   Note
   It is necessary to configure AF-MUL/AF-MUL-D block for the implementation of telephone function.

9. Voice function

For the first time, FAB puts voice recording and broadcasting functions into the automatic control industry, and creates an intelligent controller which can give audible voice outputs to finish voice prompt function.

10.Networking function

FAB has a networking function. It can link up many FABs to make up a network through 485 bus to implement the instant supervision and control from PC. If PC serial port can be expanded, the whole control system is unlimited.

11.FAB-Scada monitoring and control functions

FAB Scada software provides for the monitoring and control functions of a group of FABs.

12.The addition of an intermediate relay

With the addition of the intermediate relay, complicated programs can be developed easily.

MEMO

Chapter Ⅱ Installation and wiring

2.1 Installation

2.1.1 Methods

FAB is small so it is suitable to be fit inside panels or machinery. The installation of FAB is quite simple.

1. Use a standard DIN rail for the installation of FAB as shown in Fig. 2.1.

2. Use the screw mounting holes on FAB for direct mounting.

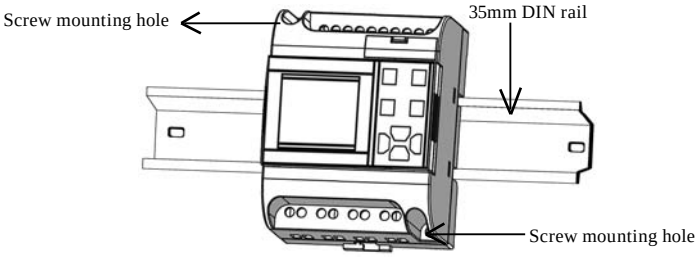


Fig.2.1 Use stand and DIN rail for installation of FAB

The LCD panel of FAB is readily removed by partially withdrawing it from the FAB, as illustrated, using a spade-tipped screwdriver. The LCD panel can then be manually withdrawn.

Caution

1.LCD panel can be removed by using a screwdriver, which is shown in Fig. 2.2.

2.Do not remove the LCD panel while the FAB is powered, otherwise the FAB and LCD panel may be damaged and endanger the personal safety of the user.

Fig. 2.2 Removing LCD panel as instructed

2.1.2 Dimensions (unit:mm)

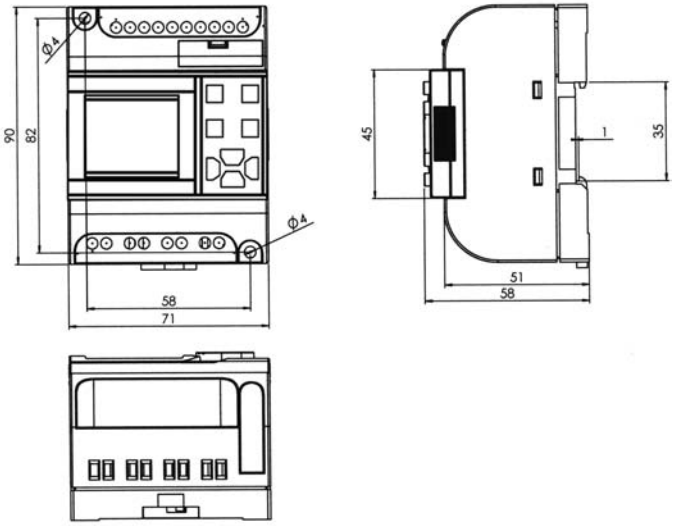


Fig. 2.3 AF-10 Series

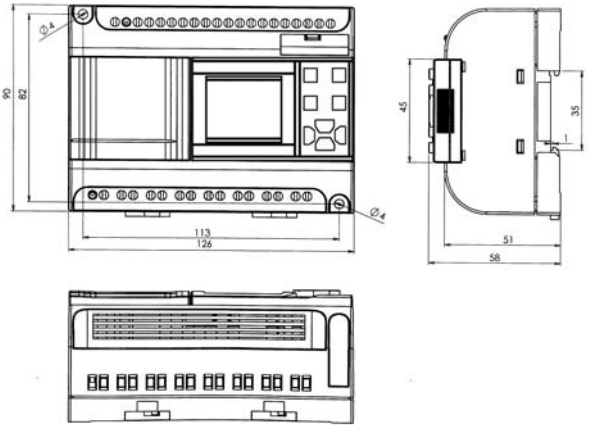


Fig. 2.4 AF-20 Series

2.2 Wiring of FAB

A screwdriver with a spade tip width of 3mm is needed for the wiring of FABs. As for the cross section of a wire, the following two sizes are at choice :

- 1 x 2.5mm^2
- 2 x 1.5mm^2

2.2.1 Connection of power supply

1. For FABs like AF-10MR-A and AF-20MR-A, the rated power supply requirement is 100-240VAC, 50/60Hz.

2. For FABs like AF-10MT-E, AF-10MR-D, AF-10MT-D, AF-10MT-GD, AF-20MT-E, AF-20MR-D, AF-20MT-D, AF-20MT-GD, the rated power supply requirement is 12-24V DC.

3. For FABs like AF-10MR-E and AF-20MR-E, the rated power supply requirement is 14-20V AC/12-24V DC.

The power connection for FABs is shown in the following drawings:

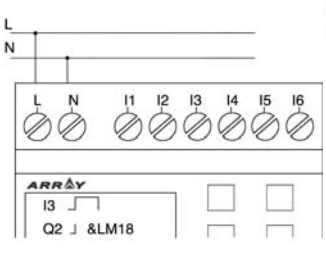


Fig 2.5 AC Type

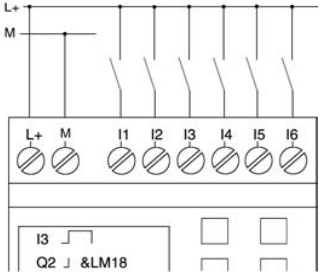


Fig 2.6 DC Type

2.2.2 FAB input connection

A FAB input can be either switch, such as on/off switches etc., or analog, such as pressure, temperature, humidity, flow, etc. The specific requirements are as follows:

Type / Demand	AF-10MR-A AF-20MR-A	AF-10MR-D AF-10MT-D AF-10MT-GD AF-20MR-D AF-20MT-D AF-20MT-GD	AF-10MR-E AF-20MR-E	AF-10MT-E AF-20MT-E
Switch status 0	<AC40V	<DC5V	<AC/DC5V	<DC5V
Input current	<0.1mA	<0.4mA	<0.2mA	<0.5mA
Switch status 1	AC80V-240V	DC10-24V	AC14-20V/ DC12-24V	DC10-24V
Input current	Typical 0.24mA	Typical 1mA	Typical 1mA	Typical 1mA
Proximity switch type with direct input		2-Line 3-Line 4-Line		

Switch with glow lamp	When the close current of a glow lamp is less than or equal to 0.2mA, it can be connected directly, and when the close current of a glow lamp is greater than 0.2mA, the glow lamp should be connected through a relay or an additional N-type drive.	None		
Receivable analog input	None	I1-I6/ I1-IC	None	None

Note:

1. Analog can be input into analog-receivable FABs like AF-10MR-D, AF-10MT-D, AF-10MT-GD, AF-20MR-D and AF-20MT-D, AF-20MT-GD through all the input ports. When analog-concerned FBs (Function Blocks) are needed in a program, the port will automatically make the setting of analog input, or it will automatically make the setting of switch input. But if the software of FAB-SCADA is used to monitor a FAB, special analog-input port should be set in FAB-SCADA so as to make the monitoring for data of input terminal more convenient.

2. The analog inputs require 0V~+10V voltage signals, which are divided equally in 0.1V increments. In programming, 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 10.0 V, it can be used as switch, but not analog.

4. As for switch input, when on-off status transforms from 0 to 1, time for status 1 must be longer than 50ms. When the on-off status transforms from 1 to 0, then the time for status 0 must be longer than 50 ms, too.

FAB input connection is shown as follows:

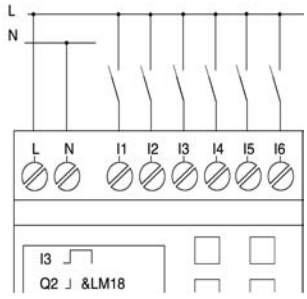


Fig 2.7 AC Type

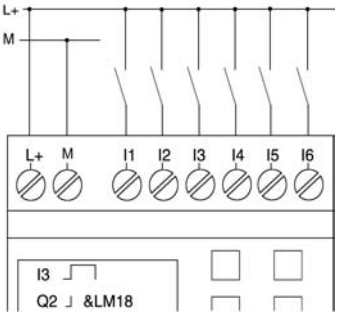


Fig 2.8 DC Type(E Type)

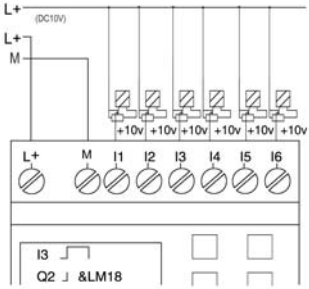


Fig 2.9 AC(D/GD Type**)**

2.2.3 FAB output connection

Outputs of FABs like AF-10MR-A, AF-20MR-A, AF-10MR-D, AF-20MR-D, AF-10MR-E and AF-20MR-E are relays whose contacts are separated from the power supply and input ports; while the outputs of FABs like AF-10MT-E, AF-20MT-E, AF-10MT-D, AF-10MT-GD, AF-20MT-D and AF-20MT-GD are transistors.

1. Requirements for the relay outputs

   Various loads such as lamps, fluorescent tubes, motors, contactors, etc., can be connected to the outputs of FABs. The maximum currency of turn-on outputs supplied by a FAB is 10A for the resistance load and 2A for the inductive load.

The connection is shown as follows:

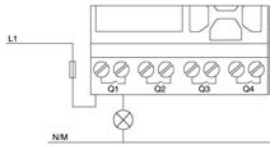


Fig 2.10 Relay Output

2. Requirements for the transistor outputs

Transistors can be classified as D transistors and GD ones.

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

1) D type

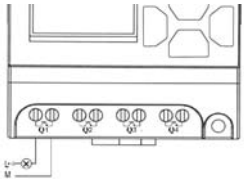


Fig. 2.11 Transistor Output (D type)

Note:

1."M" line should be connected to "M" of FAB Power supply, and the load should be directly connected the "L+ ① " of the load power.

2. The load voltage should be not more than DC80V.

2) GD type

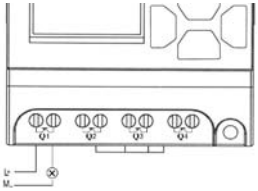


Fig. 2.12 Transistor Output (GD type)

Note:

1."L+" line should be connected to "L+" of FAB Power supply, and the load should be directly connected to the "M-" of the load power.

2.The load voltage should be not more than DC80V.

2.2.4 FAB network connection

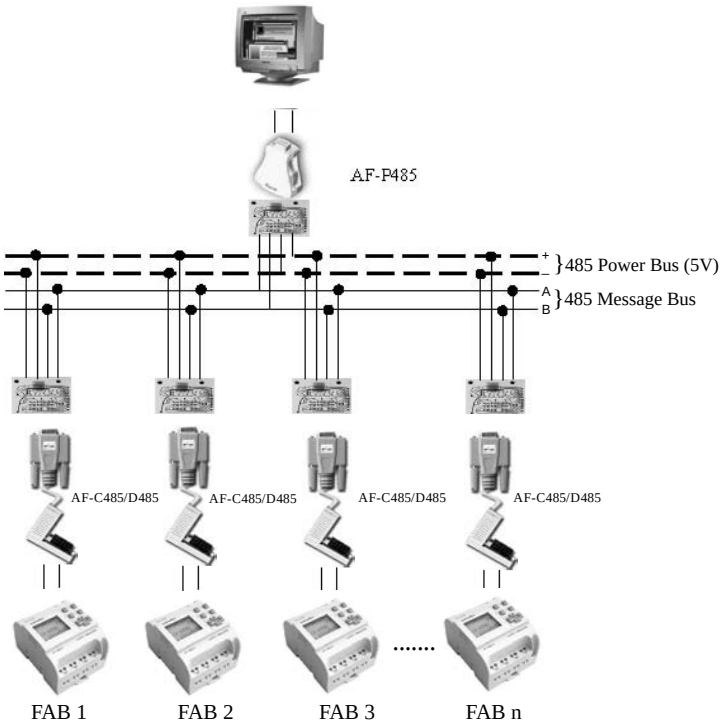


Fig. 2.13 connecting method

Note

Without any intermediate relay, RS485 bus will only permit 32 FABs to be linked up.

MEMO

Chapter III General Descriptions for Function Blocks

FAB series products adopt the programming method by the use of twenty kinds of FBs (function blocks), each of which is able to independently implement a specific controlling function like time-delay On, time-delay Off, Switch time setting and counting. If several FBs are linked together, then complicated controlling functions can be implemented. Contrasted with the traditional PLC instruction programming, FAB's FB programming is much easier and simpler.

The following types of editing operands for FBs are available for options:

1. Options of input ports: I1 - IC (Input ports), Q1 ~ Q8 (output ports), Moo-M126 (middle relay), HI (High potential status), LO (Low potential status), X (no input connection), P0 - P9 (Telephone two-tone pulse)

2. Options for output ports: Q1 ~ Q8 (output ports), M00~M126 (intermediate relays).

3.1 General function blocks (GF)

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

Table 1: General function blocks

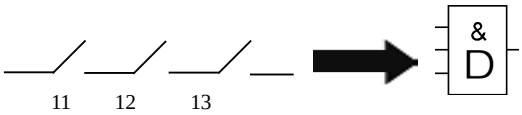
Line diagram	FAB function block	Function
Series Connection of NO contacts		AND
Parallel connection of NO contacts		OR
Phase inverter		NOT

Dual commutator contact	=1	XOR
Parallel connection of NC contacts	&	NAND
Serial connection of NC contacts	≥1	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:



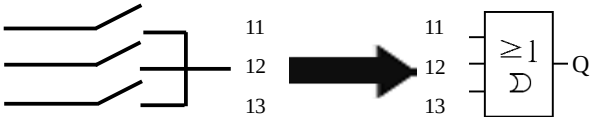
This function block is called AND, because only when all of I1, I2 and I3 are in status 1, the status of Output Q will be 1 (i.e. the output is closed).

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 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:

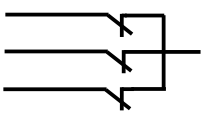
The phase inverter is called NOT the line in FAB, its symbol is as follows:

Logical frame of "NOT":

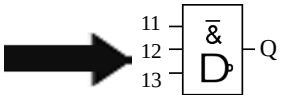
I1	Q
0	1
1	0

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 FAB is shown as follows:



This function block is called NAND, because only when all of 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 FAB is shown as follows:

Only when all the inputs 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 FAB, the two commutator contacts for XOR are connected in serial as follows:

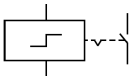
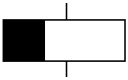
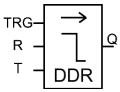
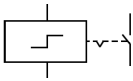
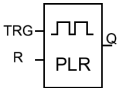
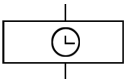
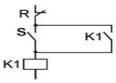
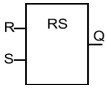
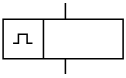
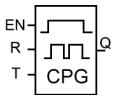
In FAB, the symbol of XOR is shown as follows:

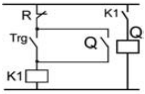
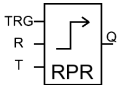
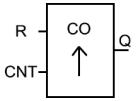
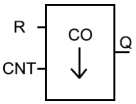
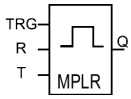
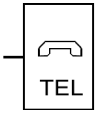
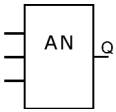
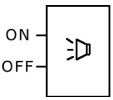
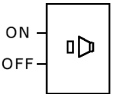
When the statuses of inputs are not the same, the output status of XOR is 1. When the statuses of inputs are the same, the output status of XOR is 0.

Logical frame of XOR:

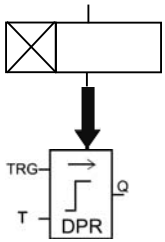
I1	I2	Q
0	0	0
0	1	1
1	0	1
1	1	0

3.2 Special function blocks (SF)

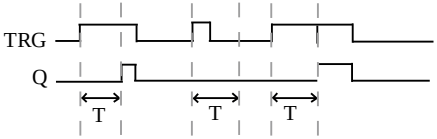
Function	Representation	Graphic
DPR (ON time delay)		
DDR (OFF time delay)		
PLR (Pulse relay)		
CW (Clock switch)		
RS (RS relay)		
CPG (Clock pulse generator)		

RPR (Hold ON time-delay relay)		
UCN (Up-counter)		
DCN (Down- counter)		
MPLR (Single pulse time relay)		
TEL (Telephone dialing block)		
AN (analog input block)		
PLAY(Broadcast voice section & Selector switch locks)		
MR (Recording voice section & Selector switch)		

3.2.1 DPR

Line diagram/Symbol in FAB	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:

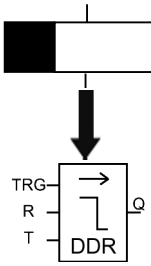
1. When the status of TRG input changes from 0 to 1, the time-delay timer starts timing. If Input TRG holds status 1 for a sufficiently long time, the output will be changed to 1 after the time T is over. There is a time delay between the input turning ON and the output turning ON, which is why the ON time-delay is so called.

2. When the input TRG is at Status 0, the output will reset to status 0.

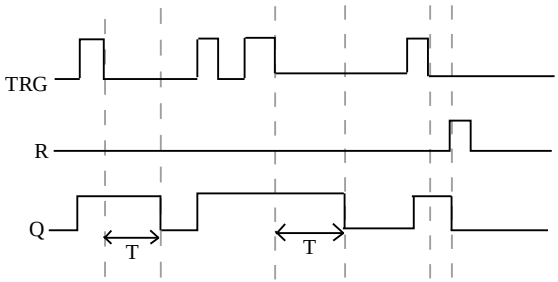
3. This function is applicable to override vibrations of switches, delayed start -up of a motor, delayed turning-on of lights, etc.

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 FAB	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:

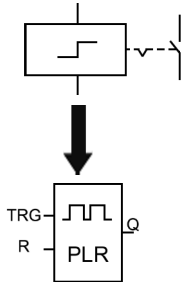


Description:

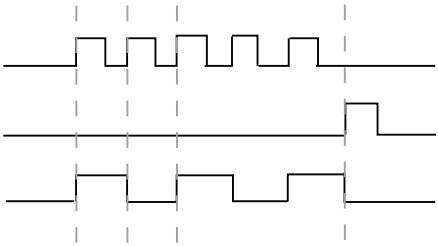
1. When Input TRG is at Status 1, Output Q changes at once to Status 1. When Input TRG changes from 1 to 0 (i.e. the descending edge comes), the internal time delay timer of FAB is activated and the Output Q still remains at Status 1. When the set time T is over, Output Q becomes 0 and the timer is reset.

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 FAB	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 Statues 1 or vice versa)

Time Sequence Frame:



Descriptions:

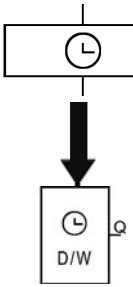
1.Every time the trigger input TRG changes from status 0 to Status 1, the status of Output Q will change accordingly (The status of Q will be reversed).

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

FAB has clock switches for 127 time intervals.

Line diagram/symbol in FAB	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. If the day 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.

On: May 1st, 2000 9:00
Off: May 2nd, 2000 18:00
On: Aug 2nd, 2000 10:00
Off: Aug. 2nd, 2000 19:00
} Q1

The above arrangements are correct, while the below arrangements are wrong:

On: May 1st, 2000 19:00
Off: May 1st, 2000 18:00 } Q2
On: Apr. 2nd, 2000 8:00
Off: Apr. 2nd, 2000 5:00

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.

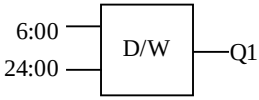
2.The range of T1 (On time) and T2 (Off time)

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

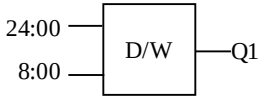
How can we get the logic result of the above on the FAB panel?

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 FAB, which is invisible to users.

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

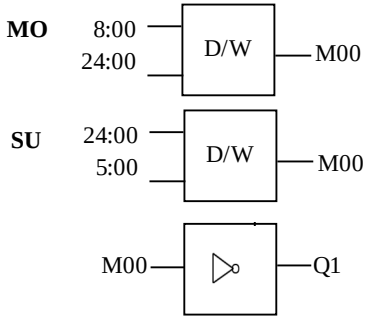
Setting condition	Time	Output status
only ON time	Below ON time	Keeping the original status
	Greater than or equal to ON time	ON status
only OFF time	Below OFF time	Keeping the original status
	Greater than or equal to OFF time	OFF status

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 FAB 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, 2000	9:00	ON	Q1 (OK)
	11:00	OFF	
	12:00	ON	
	17:00	OFF	
May 1st, 2000	9:00	ON	Q1 (ERROR)
	11:00	OFF	
	8:00	ON	
	8:30	OFF	
MO	9:00	ON	Q1 (OK)
	11:00	OFF	
	15:00	ON	
	18:00	OFF	

MO	9:00	ON	
	11:00	OFF	Q1 (ERROR)
	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 FAB 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 FAB, when there is a power failure, the internal clock will continue running. The time that the FAB can maintain the internal clock to run depends on the temperature. When the temperature of the FAB is 25℃, the clock is able to continue its normal operation for more than 100 hours after the power is cut off.

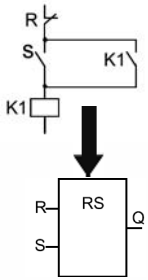
9. Conflicts between time intervals

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 FAB	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.

Note:

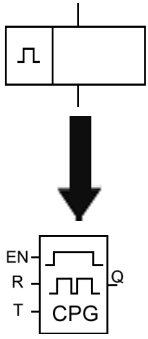
P0-P9 represents the 0-9 buttons of the telephone. RS function block has the function to receive a two-tone signal. You can use the RS function block to receive telephone signals and control the external equipment.

Switch characteristics

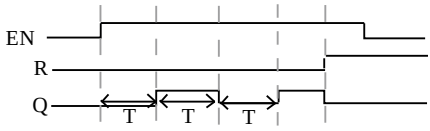
RS relay is a simple trigger. The output value depends on the input status and the original output status. The following list of true values is used to describe the logic relations:

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 FAB	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:



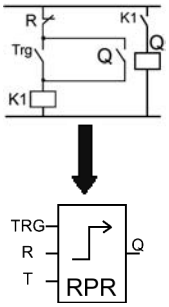
Notes:

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‰.

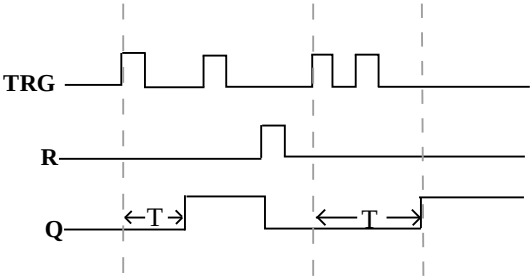
2. Input EN (Enable) enables the CPG to work. Output Q of the CPG will flip-flop the status every time the time T elapses, and this cycle operation continues until Input EN (Enable) is 0. Then the CPG stops operation and Output Q is 0.

3. This function is applicable to generate pulse automatically and to switch ON/OFF automatically.

3.2.7 RPR

Line diagram / Symbol in FAB	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:



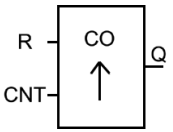
Notes:

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.

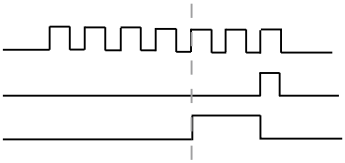
2. This function is applicable to the cases that the time-delay ON and hold ON status are required.

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

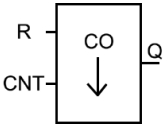
Line diagram/symbol in FAB	Pin	Description
	Input R	Input R takes priority over other inputs. When it inputs a reset signal, the counter is reset to 0 and Q is reset simultaneously.
	Input CNT	When CNT counting is input, the counter only counts the leading edge triggering (the status changes from 0 to 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):



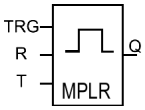
Note: *This function is applicable to the cases that counting is required.*

3.2.9 DCN

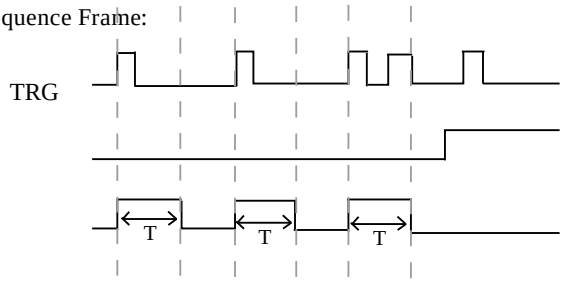
Line diagram/Symbol in FAB	Pin	Description
	Input R	R takes priority over other inputs. When R inputs a reset signal, the counter is reset to 0 and output Q resets simultaneously.
	Input CNT	When CNT counting is input, the counter will only count the leading edge triggering (the status changes from 0 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 FAB	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.

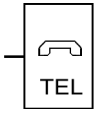
Time Sequence Frame:



Notes:

This function is applicable to the cases that the pulse duration needs to be increased.

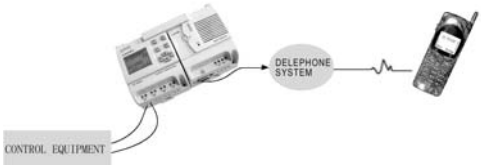
3.2.11 Tel (The Voice Module needs to be used in conjunction with FAB)

Figure	Pin	Description
	Input	The following input ports are at choice: I1 ~ IC, Q1 ~ Q8, HI, LO, M00 ~ M126, P0 ~ P9.
	Output	When the output is 1, the telephone number of output port will be dialed to output. If the input is kept 1 all the time, dialing repeats every 20 seconds and when the input transforms to be 0, dialing stops. The option range of the output port should not exceed 25-digit telephone number.

Note:

The telephone blocks are mainly used to auto-dial for an alarm. If these blocks are used together with a locked relay, the terminal equipment, which not only receives calling signals but also dials to output an alarm, should be made.

a. The basic circuit of periphery devices for controlling calling signals is shown in the following diagram:

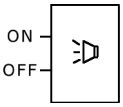


This control requires the presetting of the telephone two-tone signal (P0 ~ P9) to drive RS relay during the programming of FAB. The periphery devices are driven by the output of RS relay, so when FAB receives a P0 ~ P9 signal of a calling, it is possible to control the peripheral devices.

Step 1: Use the external telephone to dial the telephone numbers of the FAB-connected telephones, to connect FAB, and then you will hear the voice prompt as “please enter the password”.
Step 2: Enter the password of the FAB correctly.
Step 3: Dial P0 - P9 controlling signals to control the output of FAB. The RS block input has telephone two-tone pulse signals or rather P0 -P9. During the programming, the input of RS needs to be set as P0 - P9 so as to implement the controlling function of the telephone function block.

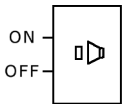
b. Telephone alarm
When the input signal of this function block is 1, the FAB will automatically dial the preset number.
This function is applicable to the cases that a voice prompt is required. It is necessary to make a recording beforehand.
This feature is used in the cases that both auto-dialing and auto-alarming are required. FAB, matching with AF-MUL/AF-MUL-D, will achieve functions of telephone control and voice response.
When you program the TEL clock on the LCD panel, at the end of the telephone number you should add”:”, which marks of the end of the telephone number.

3.2.12 PLAY (The Voice Module needs to be used in conjunction with FAB)

Figure of FAB	Pin	Description
	On	When ON is 1, Output Q is 1, i.e. the voice section is turned on for broadcasting. The following inputs are at option : I1 ~ IC, Q1 ~ Q8, HI, LO, M00~M126,X.
	OFF	When OFF is 1, Output Q is 0, i.e. the voice section is turned off. The following inputs are at option : I1 ~ IC, Q1 ~ Q8, HI, LO, M00~M126, X.

This function is applied to the cases that the voice prompt is required.

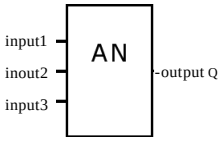
3.2.13 MR (The Voice Module needs to be used in conjunction with FAB)

Figure of FAB	Pin	Description
	ON	When ON is 1, record for the voice sections starts. The following inputs are at option :I1 - IC, Q1 - Q8, HI, LO, M00~M126, X.
	OFF	When OFF is 1, the record is completed, and turns off the switch for recording voice sections. The following inputs are at option : I1 ~ IC, Q1 ~ Q8, HI, LO, M00~M126, X.

Notes:

When making a recording, the recording should be performed in an order of 0 - 98 and the process should not be interrupted , that is to say, it is not allowed to directly record the third section after the first section is recorded. (If the same block is used, the sections can be accumulated automatically as long as the conditions change) e.g. I1 - ON, I2 - OFF and Q=01, the first section is input at the beginning when I1 is ON and I2 is OFF. When I1 is OFF and I2 is ON, the first section is turned off. when I1 is on and I2 is off again ,the second section is impact.

3.2.14 AN

Figure in FAB	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.
	OutputQ	Conditions permitted, output Q is 1 and the following outputs are at option: Q1~Q8, M00~M126.

Notes:

Only FABs like AF-10MR-D, AF-10MT-D, AF-10MT-GD, AF-20MR-D, AF-20MT-D and AF-20MT-GD 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 input1<input3, Q will be 0

Example 1:
Input 1 =I1 Input 3=5 Input 2= ">", Q=Q1 If I1>5.0V, then Q1will be ON If I1<5.0V, then Q1 will be OFF.

Example 2:
Input 1=I1 Input3=I2 Input 2= "<", Output=Q2 If I1<I2, then Q2 will be ON If I1>I2, then Q2 will be OFF.

Chapter Ⅳ Programming on FAB panel

The programming of a FAB is available for two methods : one way is to do the operation directly on a LCD panel, and the other one is to program by using QUICK II, the programming software, on a PC. Both of them are able to do the FAB programming work. In this chapter we will present a detailed introduction to the first method.

As Fig. 4.1 shows, the LCD panel is a simple man-machine interface. All the programming work can be done through the 8 keys on the right: —、+、ESC、OK、▶、◀、▲、▼.

The following rules shall be observed for the programming on the panel:

1. When the cursor appears as an under-line, it can be moved:
   a. Move the cursor along the lines with ◀、▶、▲ and ▼ keys.
   b. Press the OK key to confirm the selection of an input/output connection or a function block.
   c. Press the ESC key to exit the programming input.

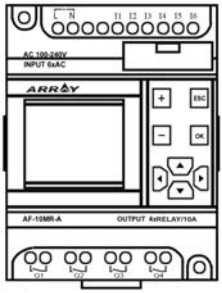


Fig.4.1

2. When the cursor appears as >, the input/output or function block may be selected:

a. Select the input/output or function block with ▼ and ▲ keys;
b. Press OK key to confirm the selection;
c. Press ESC key to return to the previous step.

4.1 FAB status display

After the power supply is switched on, the LCD panel will display a frame (Fig. 4.2), which is the Status Display Frame:

The upper line I contains the status values of inputs 1 ~ 6.
The lower line Q contains the status values of outputs 1 ~ 4.
(* indicates ON, i.e. status 1, □ indicates OFF, i.e. status 0)

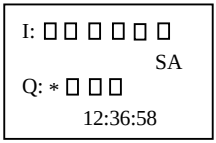


Fig. 4.2 Status Display Frame

4.2 Password confirming

Press ESC and OK simultaneously at the appearance of the Status Display Frame as shown in Fig. 4.2, then the FAB enter the Password Confirming Frame, as shown in Fig. 4.3.

Now input the password value for FAB. The cursor stays at the highest digit of the password, and you can change the digit value (0~9) with the — and + keys (when you initially press — or + key, the password value is 0). Then you can use the ▶ and ◀ keys to change the password input position and input the remaining digit values. After a proper password has been input, you will enter the Editing Frame shown in Fig4.4. But if the password is incorrectly input for three times, the Status Display Frame, as shown in Fig. 4.2, will present.

Fig. 4.3 Password Confirming Frame

Note:

The default password is 0001.

4.3 Function

The editing frame is shown in Fig4.4. The user can use ▲ and ▼ keys to move the arrow > on the left and press the OK key to confirm the selection of functions, four types of which are:

Editor: The function for programming editing. Editing-function Selecting Frame (shown in Fig. 4.5) will appear when this function is selected;
FAB/Rom: The function for reading programs, modifying an address etc.
Set: The function for the setups of RTC and password;
RUN: The function for the beginning of running a FAB program.

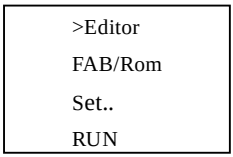


Fig 4.4

4.3.1 Editor

If this function key is selected, the FAB will enter the Editing Function Selecting Frame as shown in Fig. 4.5. The user may use ▲ and ▼ keys to move the arrow > on the left and press OK key to select the functions.

Edit PRG (or New Prg): Input a new function block (consult 4.3.1.1);
Insert FB: Insert a function block into the existing program (consult 4.3.1.2);
Delete FB: Delete a function block from the existing program (consult 4.3.1.3);
Clear PRG: Delete all program blocks

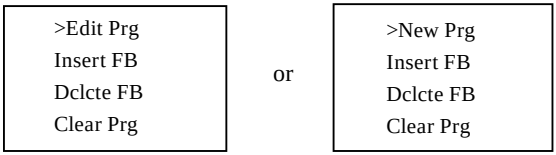


Fig.4.5 Editing-function selecting Frame

4.3.1.1 Edit PRG/New Prg

The Edit PRG Menu Frame is shown in Fig. 4.6 and the function blocks are to be selected under this menu.

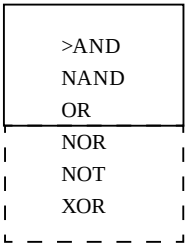


Fig 4.6

Select a Function Block

The user may use the ▲ and ▼ keys to move the arrow > at the left to select the function blocks. Press OK to confirm the selection of a function block, and then the Function Block Setting Frame shown in Fig. 4.6 will appear (please refer to Chapter III Specification of function Blocks). This menu includes the following function blocks: AND, NAND, OR, NOR, XOR, NOT, RS, UCN, DCN, PLR, MPLR, CPG, RPR, DPR, DDR, CW, TEL, PLAY, MR, AN(D/GD type).

Set the Function Block

When the Input Function Block is selected, FAB will automatically help you define in sequence the numbers of the blocks beginning with letter B and be displayed the said numbers in the bottom right corner (e.g. B01), as shown in Fig. 4.7.

The user can make the selection of the Input/Output and Parameter values of to-be set function blocks by moving the keys (Please refer to the Function Block Specification in Chapter III for the Input/Output and Parameter value)

After the selection of Input/Output PIN, press OK to enter the Parameter Setting Status, shown at the top left corner of Fig. 4.7. Firstly move the cursor to "I" position, which is at the top left corner, with ◄, ► keys, and then change the to-be connected types (I, Q, H, L, X, M, P), and press OK to confirm the changes. Finally, increase or decrease the operands (e.g. I0, I1 and I2) for the connection points with — and + keys.

Note: *The operands for different types of connection points have different ranges: I1 ~ I6 (10-point type) or I1~IC (20-point type) for I (input) and Q1 ~ Q4 (10-point type) or Q1~Q8 (20-point type) for Q (output). Operands are not required for H (high), L (low) and X (empty). M means intermediate relays M00 ~ M126. P means two-tone code.*

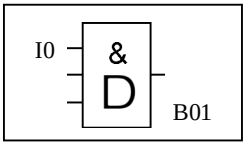


Fig. 4.7 Setting the parameter of function blocks

The above mentioned setting is for the basic function blocks. As for the special ones, we need another explanation:

1. Function blocks with timing function
   This kind of block includes:
   DPR: Delay putting Relay
   DDR: Delay Disconnection Relay
   MPLR: Mono-pulse Relay Pulse Relay
   PLR: Pulse Relay
   CPG: Clock Pulse Generator
   CPG: Clock Pulse Generator
   RPR: Retentive On Relay
   CW: Clock Switch
   DPR: Delay putting Relay

   When parameter T is set, the following frame will appear on the LCD panel

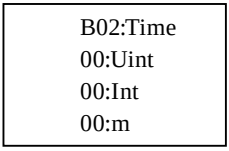


Fig. 4.8

The first line:Block number and timing mark
The second line: time units— HOU (Hour), MIN (Minute), SEC (second)
The third line: Setting integer of time (00-99)
The forth line: Setting decimal of time (00-99)

2. Function blocks with counting function include:
UCN: Up Counter
DCN: Down Counter.
When the PAR is set, the following frame will appear on the LCD:

B01:Count
00:D1
00:D2
00:D3

Fig. 4.9

The first line:the block number and counter mark
The second line:the highest digit of the counting value
The third line:the second-highest digit
The forth line:he lowest digit

According to your own need, you can select the parameters by moving the cursor with ▲ and ▼ keys, and then press — or + to change the value so as to make the setting for each parameter one by one.
For example, if the number is set to be 967843, then D1=96, D2=78, D3=43.

3. Set parameters for the Clock Switch

1) If the day system D is selected, the following will be displayed on LCD:

Day	
D	2000,00,00
T1	000000
T2	000000

Fig. 4.10

The first line: the day system
The second line: year, month and day
The third line: the output ON time (T1)
The forth line: the output OFF time (T2)
2) If the week system W is selected, the following will be displayed on the LCD panel:

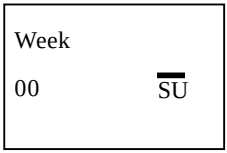


Fig. 4.11

The type of the week can be selected by pressing —、+ keys.

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

After selecting the week system, press the ESC key and then the timing can selected, which will be b displayed on LCD as follows:

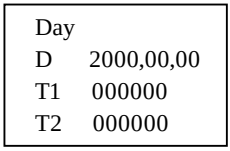


Fig. 4.12

The first line: the week system
The second line: year/month/day
The third line: the output-ON time
The forth line: the output-OFF time.

Note

If the week system is selected, then only T1 and T2 need to be set because the system will ignore D whether it has been set or not.

4. Set the Telephone Blocks

When a Telephone Block is selected, LCD panel will be displayed as Fig. 4.13 shows. Set the input on the left of the block first, then move the cursor to the output on the right and press.

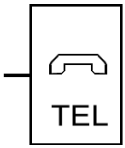


Fig. 4.13

After OK key is pressed, the following will be on the LCD panel:

Phone Code
0000000000
0000000000
00000

Fig. 4.14

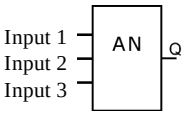
Press ▲, ▼, ▶, ◀ keys to move the cursor to select the digit of the telephones (as many as 25 digits can be set) and press +, — keys to change the value to set each digit of the telephone number in turn. After the number is set, move the cursor to the last digit of the set number and press ESC to exit.

Note:

After the setting of the telephone number, ":" must be added to mark the end of the number.

5. Set the AN block

AN block is shown as follows:



Input 1**:** Input I and Input K are available for options.

(1) Input I means this port is connected to FABs input, whose assignment range is I1~I6 (AF-10 series) and I1~IC (AF-20 series). Its operation on the LCD panel is the same with that of general I. While K means a digital value, whose range is between 000 and 100, which represents a voltage ranging from 0V to 10.0V. The first two digits represent integer, while the last one represents the decimal part.

(2) When input 1 is K or I, press OK to confirm and then to press + and − to change the digital value. Finally press OK to confirm.

Input 2**:** It represents function selection. Five comparison functions, >,<, ⩽,⩾,=and ≠, are available for choice. Select by using ▲ , ▼ and then press OK to confirm.

Input 3**:** It is the same with Input 1.

4.3.1.2 Insert FB

This function can be used to insert a function block into a scheduled block position. The operating process is as follows:

1. Press OK when the cursor points at “Insert FB” in the Editor Frame, that’s, “>Insert FB”, then the inserting status appears, as shown in Fig. 4.15.

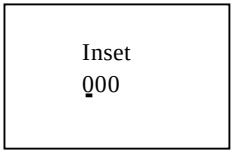


Fig. 4.15 Insert Function Block

2. In the above frame 000 is the original value. You can press + or — to select the block number and then press OK to confirm your selection. The range of inserted block number is from 001 to the maximum number of the current program. If the selected number is not in this range, press OK will have no influence upon your selection and it will return to the original status for your second selection.

If you want to give up inserting a block, please press ESC to exit. If you are not clear about the maximum number in the program, you can use ROM→FAB in FAB/ROM to read the program and get the number.

3. If you select a number correctly and press OK to confirm it, then the machine will accept your operation and the function block codes (e.g. AND, OR, NOT, RS, TEL etc.) will appear for your option.

Note: *If you do not do the selection but exist after the appearance of these codes, FAB will copy a function block which has the same block number with the old one. This function block can be deleted by the function of Delete FB. But if you have already been in the editing status, then only after all the settings for the Input/Output terminals of this function block can you exist and do the deletion with the function of Delete FB.*

4.3.1.3 Delete FB

This function can be used to delete any function block.

The operating process is as follows:

1. Press OK when the cursor points at “Delete FB” in the Editor Frame, that’s, “>Delete FB”, then the deleting status appears, as shown in Fig. 4.16.

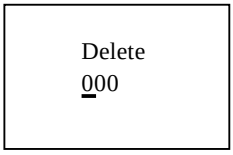


Fig. 4.16 Delete Function Block

2. In the above frame 000 is the original value. You can press + and — to select the block number, and then press OK to confirm your selection. The range of block number for Delete FB is from 001 to the maximum number of the current program. If the selected number is not in this range, press OK will have no influence upon the selection and it will return to the original status for your second selection. If you do not want to continue the deleting operation, please press ESC to exit. If you are not clear about the maximum number in the program you can use ROM→FAB in FAB/ROM to read the program and get the number.

3. If you correctly select the bock number and press OK, then FAB will display as shown in Fig. 4.17. It means the selected block has been deleted.

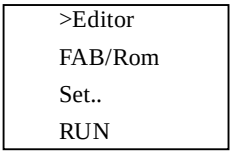


Fig. 4.17

4.3.1.4 Clear Prg

This function can be used to delete all of the existing programs in FAB.

1. In the EDIT frame, Select ">clear Prg" and press OK, then the following frame will appear:

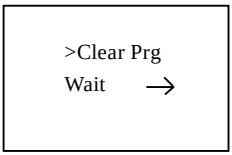


Fig. 4.18 Clear Prg

2. The above frame will last 5~6 seconds, then it will automatically transform to the function block selection frame, shown in Fig.4.5. Then the old programs have been cleared and you can program again.

4.3.2 FAB/Rom

There are three options in Select FAB/Rom Frame, as shown in Fig. 4.19.

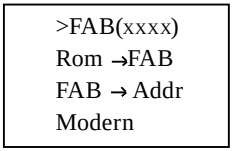


Fig. 4.19

FAB (XXXX): (The series number of a FAB system service)
Rom→FAB: read the program from a FAB
FAB-Addr: view or modify a FAB address
MODEM: initializing MODEM

4.3.2.1 Read program from FAB (Rom→FAB)

1. Select Rom→FAB in FAB/ROM, and press OK, the follow frame will appear:

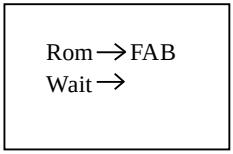


Fig. 4.20

2. Press"→" in the frame shown in Fig 4.20, then the program will be read, block by block (in sequence as B01, B02...)

4.3.3 SET (set password and time)

The SET Frame is shown in Fig. 4.21. With this SET Frame a password as well as a real time clock can be set for the edited FAB function program, which can be modified only after the correct input of the password.(Note: the factory password of FAB is 0001). This function is the password lock function of a FAB.

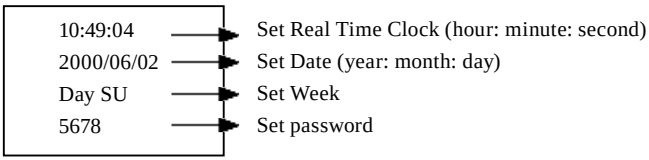


Fig. 4.21 Set Password Frame

4.4 Edit a FAB function program

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

Note: *If you directly enter "Editor..." to do an editing without reading an existing program, the editing will begin with B01. If you want to save the existing program and continue your editing, you should read the to-be edited program from ROM→FAB and then edit it from "Editor...".*

4.4.1 Programming rules

Rule 1: A complete line diagram is needed before the input of circuit, and on this diagram to-be used intermediate relay should be marked. You can also directly draw this diagram by using QUICKⅡ, and then adjust the sequence 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 sequence number of the cause blocks must be smaller than that of the result ones. If the blocks have no consequence between them, their sequence numbers have no relation.

Example:

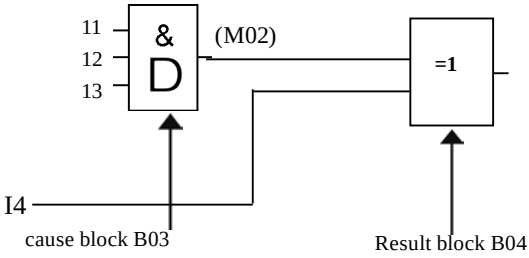


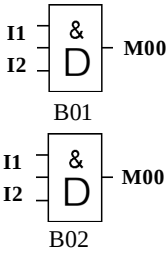
Fig. 4.22

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), while 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 several inputs together, but multiple outputs cannot be connected to one input.

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

Rule 6: It is not allowed to connect two outputs with blocks to the same block mark, as follows.



The above is prohibited except for CW block.

4.4.2 Intermediate relay

During the programming, the intermediate relay is a very important part which acts like a bridge. The intermediate relay of a FAB 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 other 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:

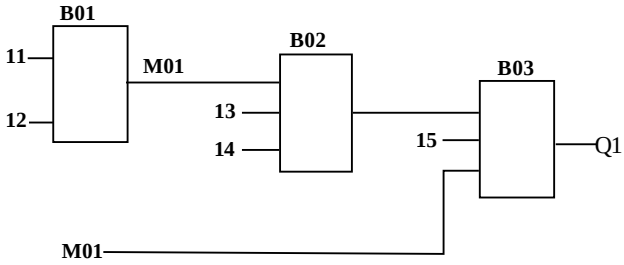


Fig. 4.23

In the above figure, the output status of B01 may not only be used directly as the input of B02 block, but also be stored by M01 and then used as the input of B03.

4.4.3 Edit program

Take the stair lighting system for an example, the control requirements are listed as follows:
1. When the switch button is pressed, the light will be turned on and normally keeps this state;

2. When the sound sensing switch is on, the light will be turned on and keeps this state for 2 minutes.

The Function Block Diagram for the mentioned control function is as follows:

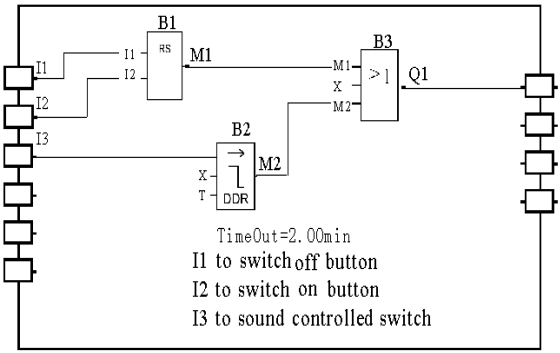


Fig. 4.24

The following steps should be followed in the programming of this control function on FAB operation panel:

Step I: Enter FAB Editor Frame

1. After switch-on, the following will appear on the LCD panel:

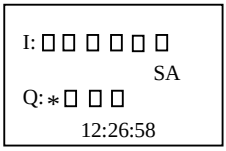


Fig. 4.25

2. When ESC and OK are pressed simultaneously, the Confirm Password Frame is entered. At this time the cursor will stay at the highest digit of the password and the following will be displayed on the LCD panel:

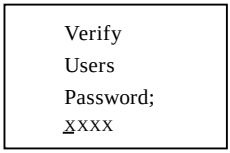


Fig. 4.26

3. Input the password (assume the password is 2165);

Press + twice and the first digit value of the password will change to 2;

Press right moving key ▶ and the cursor will move to for the second digit of the password value to be input;

Press + once and the second digit of the password value will become 1;

Press ▶ again and the cursor will move to the third digit of the password value to be input

Press + 6 times and the third digit of the password value will become 6;

Press ▶ and the cursor will move to the last digit of the password value to be input;

Press + 5 times and the last digit of the password value will become 5.

After the password is completely input, the following will be displayed on the LCD panel:

Verify
Users
Password;
2165 —

Fig. 4.27

4. Press OK to enter the Editing Function Selection Frame with the selection mark > staying at Editor Function then the following is displayed on the LCD panel:

>Editor
FAB/Rom
Set..
RUN

Fig. 4.28

Step 2: Edit Function Diagram

1. Press OK to select Editor. After the display of Edit Prg, press OK to enter the Function Block Selection List which is displayed on the LCD panel as follows:

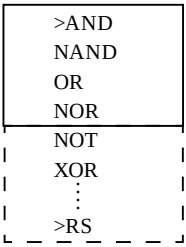


Fig. 4.29

2. Select and set the first function block:

Move > to the position of RS relay with ▼ and press OK to enter the Function Block Set Status with the cursor at the top input Link. The following will be on LCD panel:

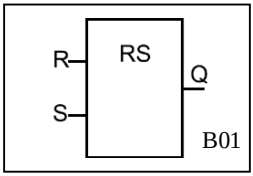


Fig. 4.30

Press OK to enter the Set Parameter R Pin. Now "I" will appear at R Pin. If you do not want to select "I", you may press ▼ to select Q and press it again to select H. You can continue this pressing until M, which means that the user may select any parameter among I, Q, H, L, C, P and M by pressing OK. After "I" is selected, the following will be on the LCD panel:

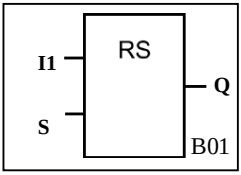


Fig. 4.31

Then the value of this parameter needs to be set by pressing — or +.

For example; if I1 is to be set, just press OK key when I1 is displayed, as shown in Fig. 4.31 (the variation range of I is I1-I6 or I1-IC).

Press ▼ to move the cursor to position S and then press OK to set the S link input.

Select I in the parameter list and set it to be I2 by the same method as setting I. Press OK once, and then the LCD panel will be as Fig. 4.32.

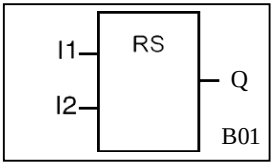


Fig. 4.32

Press ▶ to move the cursor to position Q and press OK to set the Q Pin output. After selecting M in the parameter list and set it to be M01 with +、— again. The following will be displayed on the LCD panel:

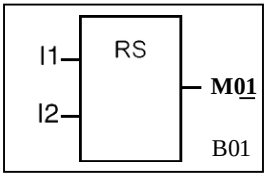


Fig. 4.33

Now, all the three Pins of the RS relay function block have been set. Press ESC to exit this block, and to continue the editing of other function blocks.

Note:
After your entering the edit function block frame, only after all the settings for their Input/Output Pins have been done can you exist.

3. Select and set the second function block

Press ESC to return to the Function Block Selection List Frame and select the second function block.

Move ">" to the position of DDR function block and press OK. Now you can set the parameters for this function block. The following will be on the LCD panel:

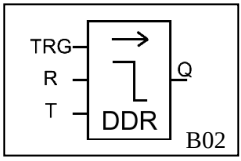


Fig. 4.34

Press OK to enter Set Trg Pin Parameter Status. Select I in the parameter list with ▲ or ▼ and press OK again. Then set Trg to be I3 with +、−

After that the following will be displayed on the LCD panel:

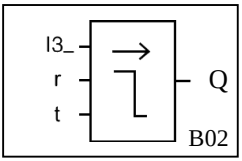


Fig. 4.35

Press ▼ to move the cursor to position "r "and press OK to set the r input parameter. Select × in the parameter list and then press OK to set X parameter. The following will be displayed on the LCD panel:

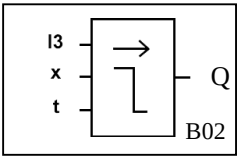


Fig. 4.36

Press ▼ to move the cursor to position T and press OK to enter the Set Timer Frame. The following will be displayed on the LCD panel:

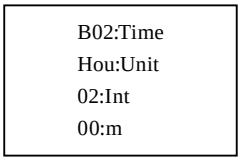


Fig. 4.37

Press OK to enter the Time Unit Selection Status. Now the options can be changed with +, −. If "Min" appears, it means that minute is the unit, and the following will be displayed on the LCD panel:

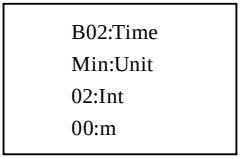


Fig. 4.38

Press ▼ to set the time integer digit and use +, − to change the value. Set it to be 02.

Press ▼ to set the time decimal digit and use +, − to change the value. Set it to be 00. Now the time setting has been finished. Press OK to confirm the setting, and after that press ESC to exist.

Press ▶ to move the cursor to position Q, then press OK. Set Q to be M02 and then press OK again. The following will be on the LCD panel:

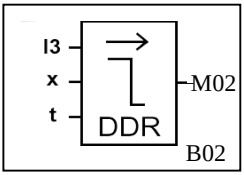


Fig. 4.39

4. Select and setup the third function block

Press ESC to return to the Function Block Selection List Frame and select the third function block.

Move > to the position of OR function block and press OK. Now you can set the parameters for the third function block. The following will be displayed on the LCD panel:

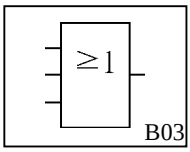


Fig. 4.40

Press OK to enter the first input parameter setting status. Select parameter M with + , — and set its parameter value with ▲ or ▼. When M01 appears, press OK and the first parameter will be set to M1. The following will be on the LCD panel:

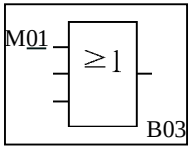


Fig. 4.41

Press ▼ to move the cursor to the second input parameter. Press OK key, then the second input parameter can be set. After selecting X with ▲ or ▼ , the mentioned input is set to be X. The following will be displayed on the LCD panel:

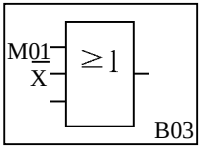


Fig. 4.42

Move the cursor to the third input Pin and press OK. After selecting M in the parameter list, press OK and set this input to be M2 with + and —.

The following will be on the LCD panel:

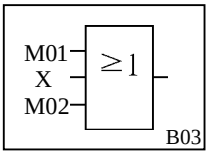


Fig. 4.43

Move the cursor to the output link with ▶ and press OK.

After selecting Q in the parameter list, press OK and set the said output Pin to be Q1 with + and —. Then the following will be displayed on the LCD

panel:

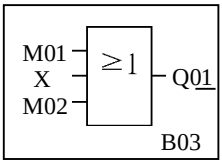


Fig. 4.44

Now all the three function blocks required for the editing of this function diagram are selected and set, which means that the Function Diagram is completely edited.

Step 3: Run

1. After Step 2 is finished, press ESC twice consecutively to return to the Select Function Selection. The following will be displayed on the LCD panel:

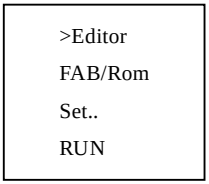


Fig. 4.45

2. Move">" to RUN and press OK. Then the following will be on the LCD panel:

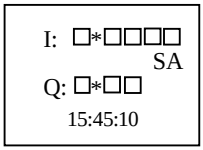


Fig. 4.46

3. It means that the program is now written into FAB and can be run according to the new program.

Notes:

How to read and modify the current program

1. Firstly press ESC and OK keys simultaneously to enter the password frame. And then input the correct password, and press OK.

2. Select FAB/ROM and press OK

3. Select ROM→FAB, and press OK

4. Press ▶ and ◀ to select and read the function block, and then press OK for your confirm and modification to it.

MEMO

Chapter Ⅴ The Voice Module

FAB has three important special functions: Voice alarm function, telephone control function, and auto-dialing. Without the help of the Voice Module, all of the three functions are not able to be implemented.

5.1 The structure of the voice module

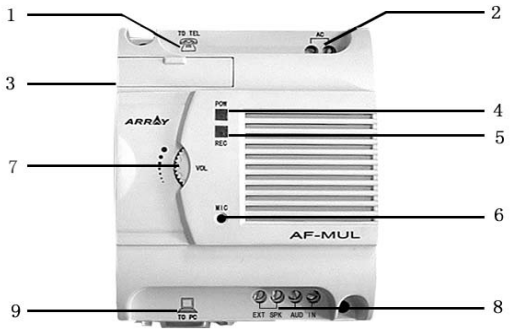


Fig 5.1

1. Socket of telephone crystal plug
2. Power terminals (AC100-240V/DC12-24V)
3. Connection Port with FAB
4. Power indicator
5. Recording indicator
6. Recording Microphone
7. Volume Setting (only control the volume of Voice Module speaker)
8. Terminal port for the external speaker (it can be connected to an external powered-speaker to amplify the voice, the volume is not controlled by item 7)
9. Communication Port: Connect with PC to monitor or program for FAB

5.2 Connection between Voice Module and FAB

Firstly connect the power to the Voice Module and FAB, and then plug the telephone connector into the TEL socket. Connect the Voice Module and FAB by using the special connection (Note: using the special part of FAB series) in figure 5.2. For convenient installation, there is a DIN rail clamp on the bottom of the Voice Module. It can be easily installed on a common DIN rail.

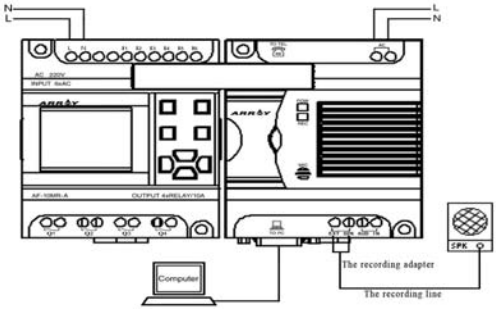


Fig 5.2

Note: *Before recording or playing the voice messages, Voice Module and FAB need to be connected with a special connection. At the same time, the FAB can communicate with a PC through the communication cable to modify a program,as shown in the above picture. After connecting FAB with Voice Module, then power them simultaneously or Voice Module first and then FAB.*

5.3 Instructions

1.The first four sections (section 0, section 1, section 2 and section 3) are for the voice system, which users can not record randomly:
Section 0: the prompt voice message for playing when external telephone is dialed into Voice Module.
Section 1: the prompt voice message for playing after inputting the correct password.
Section 2: the prompt voice message for playing, after entering the wrong password.

Section 3: the prompt voice message for playing when the Voice Module dials to the external telephone.

2. Section 4-98: the voice messages used for programming. The user can play any of these sections, all according to their needs. But if they want to record some of them, it needs to begin with section 0 and among the recorded sections section0,section1,section 2 and section 3 are for voice system.

NOTE

A) When Voice Module dials to an external telephone (a password has been set)

1. FAB will stop dialing if there is no response within 40 seconds, and keeps dialing every 20 seconds.

2. When you pick up TEL and inputs "*", the Voice Module will keep mute. At the same time you must input the 4-digit password. If you don't input the password or input a less-than-4-digit password in 10 seconds, the Voice Module will replay section 3; if you input the correct password, the Voice Module will play section 1 and then enter the control code to operate according to your preset program steps .

3. If the input password is incorrect, Voice Module will play section 2.

Note: *you are permitted to input the password only for three times. If you input a wrong password again in the third time, FAB will hang up the telephone and return to the main system.*

4. After finishing operations, enter ## key for ringing up.

B) When Voice Module dials to an external telephone (no password has been set):

1. FAB will stop dialing if there is no response within 40 seconds, and keeps dialing every 20 seconds.

2. When you pick up TEL, play the section 3 then enter the control code to operate.

3. After finishing the operations, enter ## key for ringing up.

C) When an external telephone dials into Voice Module (a password has been set)

1. When the Voice Module responds to the external telephone, section 0 will be broadcasted circularly.

If you don't input * key in 60 seconds, the Voice Module will ring off. If he inputs * key the Voice Module will keep mute for 10 seconds, and you must input the 4-digit password within this 10 seconds. If you do not input the password or inputs a less-than-4-digit password within 10 seconds Voice Module will play section 0 again. If you input the password correctly, then Voice Module will play section 1 and you can continue your operations.

2. If the entered password is incorrect, Voice Module will play section 2.

Note: *you are permitted to input the password only for three times. If you input a wrong password again in the third time, FAB will hang up the telephone and return to the main system.*

3. After finishing your operations, input ## key for ringing up.

D) When an external telephone dials into Voice Module (no password has been set)

1. When the Voice Module responds to the external telephone, section 0 will be broadcasted circularly.

If you don't input * key in 60 seconds, the Voice Module will ring off. If you input * key the Voice Module will keep mute for 10 seconds, and you must enter the control mode to continue your operations according to your preset steps.

2. After finishing the operations, input ## key for ringing up.

E) When inputting the external line number, you can add a "," before the number for a delay for 2 seconds.

F) If the password has not been set or has been verified, you can enter "*#" to run off forcibly, and even if the old alarm condition exists and can not be performed forever, the new ones can be effected.

Note: *the above is defined with default state for our ex-work products, and you can modify the voice sections by QUICK II software.*

5.4 Recording

The recording function of Voice Module is similar to a recorder. There are two methods for recording: on-line recording and manual recording.

A) Recording on line

The first step: Firstly, connect the Voice Module to FAB, then plug one terminal of recording line into the PC, and plug the other into the recording port of the Voice Module. Lastly, connect PC to the Voice Module via the cable AF-CMP as Fig. 5.4-1 shows:

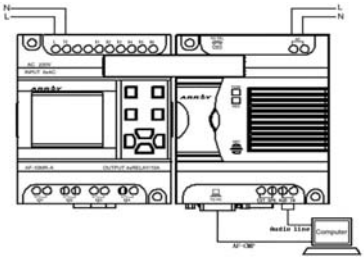


Fig 5.4-1

The second step: power the FAB and the Voice Module simultaneously (it is also OK to power the Voice Module and then FAB, but not reversed).

The third step: on the interface of QUICK II, click "Com→configuration" in order to build a Connection between PC and FAB, as shown in Fig. 5.4-2.

Fig 5.4-2

The fourth step: on the interface of QUICK II, click "Option→ Set Voice Module Type" to choose the length type of recording as Fig. 5.4-3 shows.

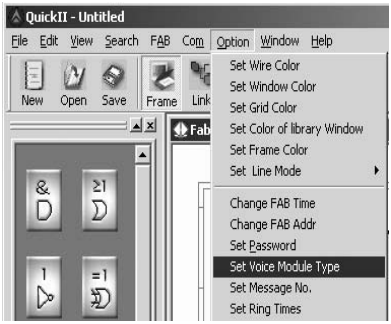


Fig 5.4-3

The fifth step: the prompt frame of "setting the Voice Module type" is shown in Fig. 5.4-4.

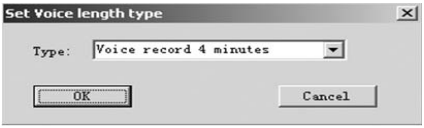


Fig 5.4-4

Note:

1. The sampling frequency for 4 minutes recording is 3.4 KHz, while for 6 minutes one the frequency is 2.3 KHz, and for 8 minutes 1.7 KHz. Higher frequency means better real voice, so we recommend you choose the 4 minutes recording.
2. There are totally 99 sections for recording. The length of each section is not restricted, but there is a limit of 8 minutes for the total length. Section 99 means cleaning away all the recordings of Voice Module, and all the recordings should be played in a progressive sequence from 0 to 98.

The sixth step: on the interface of QUICK II, chooses the item "online record", as Fig. 5.4-5 shows.

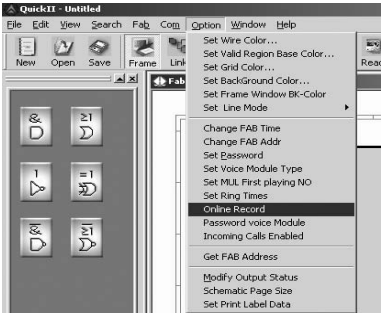


Fig. 5.4-5

The seventh step: the prompt frame of “copy voice to MUL” is shown in Fig. 5.4-6.

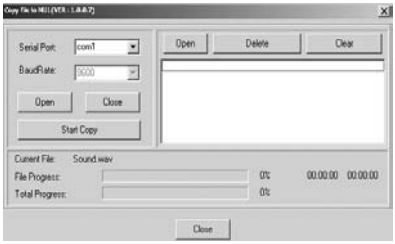


Fig. 5.4-6

The eighth step: choose the right communication port, and then click the “open” item, to choose a recording voice file, as shown in Fig. 5.4-7.

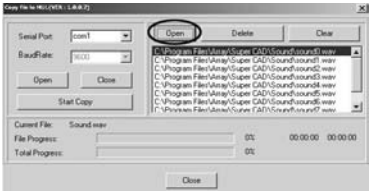


Fig. 5.4-7

The ninth step: first click “open” button and then “start copy” button. The copy course is shown in Fig. 5.4-8.

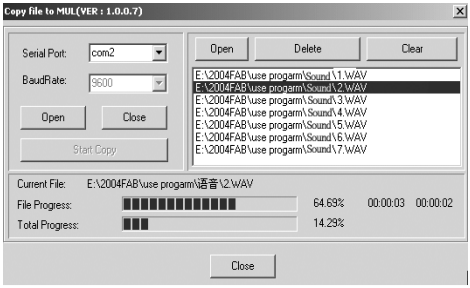


Fig. 5.4-8

The tenth step: the prompt frame for confirming is shown in Fig. 5.4-9, and click OK button.

Fig. 5.4-**9**

B) Manual Recording

The first step: Connect the Voice Module to FAB

Connect PC to the Voice Module via the cable AF-CMP

Connect K1 between L and I1

Connect K2 between L and I2

Connect K3 between L and I3

Connect K4 between L and I4

This step is shown in Fig. 5.4-10.

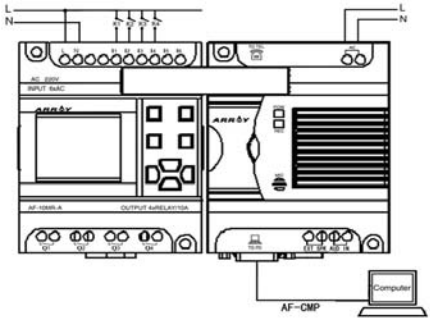


Fig. 5.4-10

The second step: on the interface of QUICK II software, make a recording program. B1 is to set section 99, which means all the voice sections in the Voice Module are cleared up; while B2 is to set section 0, which means recording sections begin from section 0. The recording must be made in a progressive sequence from 0 to 98, as Fig.5.4-11 shows.

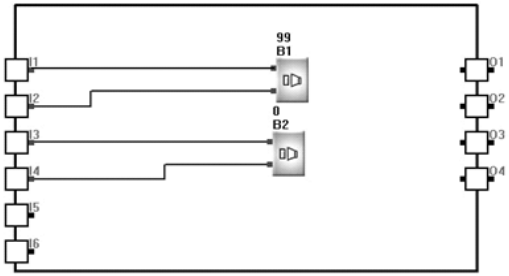


Fig.5.4-11

The third step: write the program into FAB

The fourth step: when FAB running status begins, turn on switch K1 for 1 second then off, and continuously, turn on switch K2 for 1 second then off. After that all the recording sections in Voice Module are deleted.

The fifth step: turn on switch K3 for 1 second then off. When you see the red re-

cording indicator light is on, you should say “please enter the password” into MIC. After that, turn on switch K4 for 1 second and then off, you will hear the above recording section “please enter the password” is played by the Voice Module, which means section 0 has been recorded into Voice Module successfully.

The sixth step: because Voice Module has a progressive function, so you will see the red recording indicator light is on again when you return on switch K3 for 1 second and then off. When the light is on again you should say “correct password” into MIC, then return on switch K4 for 1 second and then off. After that, you will hear the above recording section “correct password” is played by the Voice Module, which means section 1 has been recorded in Voice Module successful.

Repeat the above steps until all sequential voice recording have been done.

5.5 Sound broadcasting

After finishing recording voice sections, you can make an easy program and then write these voice sections into FAB, as shown in Fig. 5.5-1.

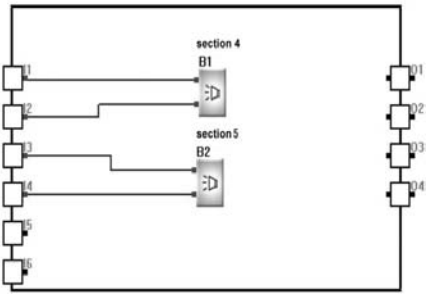


Fig.5.5-1

Note: *if the two broadcasting function blocks are both active, the block with larger number will be played, which follows the principle “the latter command takes precedence over the earlier command”.*

5.6 Update “set message No.” online

1) Firstly connect FAB to a PC, and then click “Option—Set first voice message” , as shown in Fig. 5.6-1.

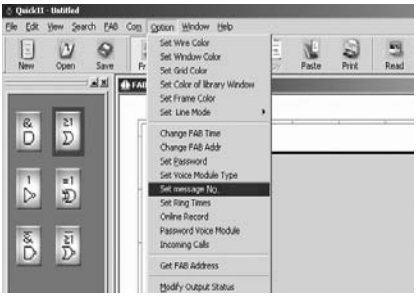


Fig. 5.6-1

2) The prompt frame is shown as below:

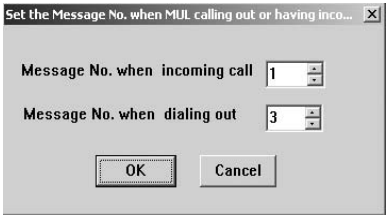


Fig. 5.6-2

With the dialogue box, you can select any section of your prerecorded voice sections to broadcast for receiving a call and dialing out.

5.7 Update “password Voice Module” online

1) First connect FAB to a PC, and then click “Option →Password Voice Module” , as shown in Fig. 5.7-1.

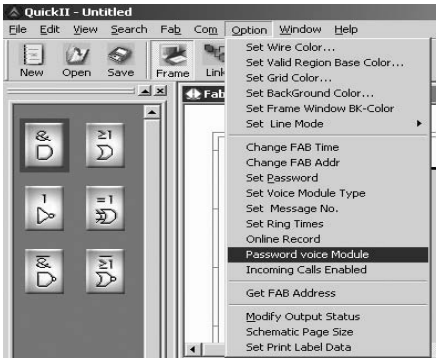


Fig. 5.7-1

2) The prompt frame is shown as below:

Fig. 5.7-2

You must first input FAB password, then you can enter the password interface of Voice Module. After inputting the FAB password, then click OK button.

3) The prompt frame is shown in Fig. 5.7-3.

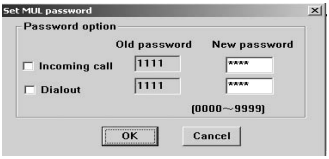


Fig. 5.7-3

With the dialogue box, you can select the check box on the left to confirm whether it needs to set a password, and then enter your new password below “new password”, lastly click OK to complete.

5.8 Update “incoming call” online

1) Firstly connect FAB to a PC, and then click “Option→Incoming call”, as shown in Fig.5.8-1.

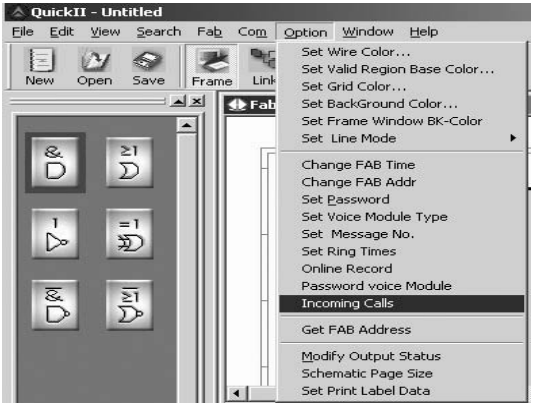


Fig.5.8-1

2) The prompt frame is shown in Fig. 5.8-2.

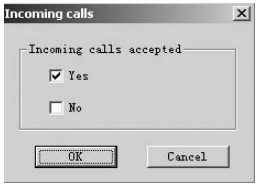


Fig.5.8-2

With the dialogue box, select Yes or No to confirm whether incoming calls is accepted or not. If not, please select No, and if accept, please select Yes. Finally click OK to complete.

5.9 Telephone remote control function

If you want to control a distant equipment by your mobile telephone or a fixed telephone, firstly you should connect FAB to the Voice Module, and then plug the telephone line as shown in Fig. 5.9-1.

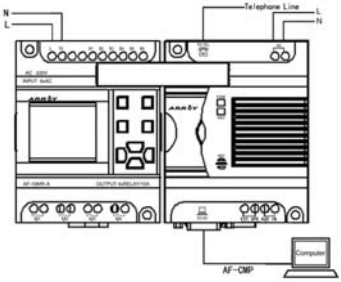


Fig. 5.9-1

FAB has a RS block which can be driven by the double-tone information, so you only need to write the RS block program driven by Signal P0-P9 into FAB and it will work.

For example, you control on-off for output Q1 by the telephone keys.
(Note: set Voice Module password for dialing in and out to avoid illegal operation by others).

P0: Q1 open
P1: Q2 close

Firstly write your program into FAB, the program is shown in Fig. 5.9-2.

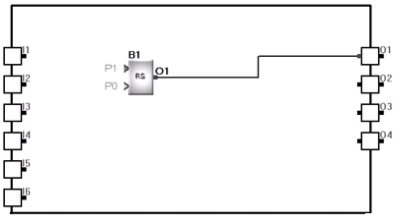


Fig. 5.9-2

Explanations:

After getting through, dialing into the Voice Module;

1) Firstly you will hear the voice section 0 as “please enter the password” in your telephone, and at the same time the Voice Module also plays section 0.

2) Enter the correct password and enter * key first, and then you will hear the voice section 1 as “correct password, please enter the control code”, and the Voice Module also plays section 1 simultaneously.
3) Control output Q1 by telephone key: enter *0 to open Q1, and enter *1 to close Q1 (* key must be input before inputting the digital keys)
4) Enter # twice to ring off the telephone.

5.10 Automatic dialing function

If you want to use FAB to automatically dial one number at emergency, firstly you should connect FAB to the Voice Module and plug the telephone line. The wiring diagram is shown in Fig. 5.9-1.

Example:
Control Requirements:
A probe is fitted to the doors and windows. At the entry of a stranger, Voice Module will be activated to automatically dial the police-calling number, and broadcast “thief found in my house and enter *0 to ring off” in the telephone.
Analysis: according to this requirement, a password needn’t be set for dialing out by Voice Module.

Steps:
1. Firstly you should record voice sections 0-3 according to your own needs, and record section 4 as “thief found in my house and enter *0 key to ring off”.
2. Connect I1 to the probe of doors and windows
3. Refer to section 5.7 “Update the Voice Module Password online”, and do not select the pane before “dialing out”.
4. Your program is shown in Fig. 5.10-1.

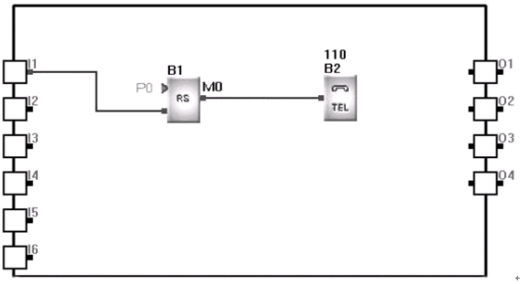


Fig. 5.10-1

5. Write your program into FAB

Description: when a thief breaks into your room, I1 is activated. At the same time Voice Module auto-dials the police-calling number and broadcasts “thief found in my house and enter *0 key to ring off” in the telephone. You need to set the volume of indoor Voice Module to the lowest level in order for the thief not to hear the sound.

5.11 Example for Voice Module

Control requirements:
1.Control start-stop of the air-condition by using telephone keys
P0: Open for the air-condition
P1: Close for the air-condition

2.At the entry of a stranger, Voice Module will broadcast “catch the thief” and dial to your telephone number of 354678 at the same time.

Analysis: It isn’t necessary to set a password when dialing out but it is needed to set a password so that other people are not able to operate the external telephone dials into the Voice Module.

To perform the above control, set the voice sections as below:

Section 0: Please enter your password

Section 1: Correct password, please enter the control code

Section 2: Wrong password, please re-enter

Section 3: Catch a thief

Section 4: Open for the air-condition

Section 5: Close for the air-condition

Steps:

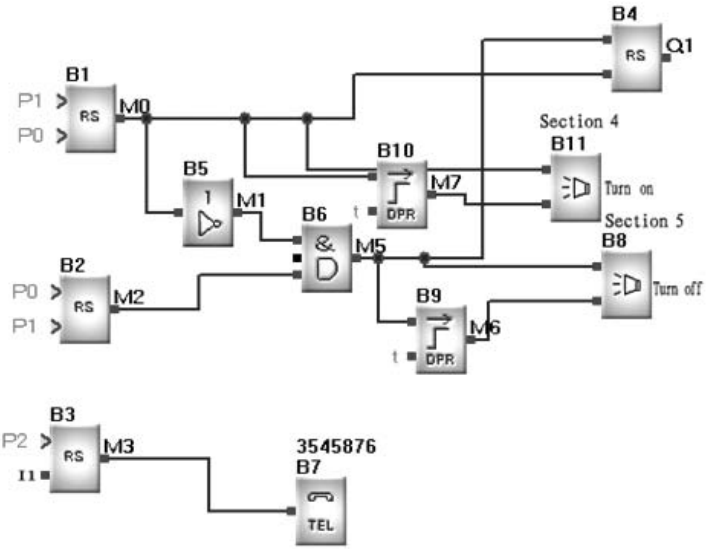
Step 1: Connect I1 to the doors and windows probe, and connect Q1 to the air-condition switch

Step 2: Refer to section 5.4 to record the above five voice sections

Step 3: Refer to section 5.5 “update message No. online”, set section 0 for dialing in and section 3 for dialing out.

Step 4: Refer to section 5.7 “update Voice Module password”, set password 0001 for dialing in and do not set a password for dialing out.

Step 5: Make your program as bellow:



Firstly, you should connect FAB to Voice Module and record voice sections. Then write your program into FAB. When dialing into the Voice Module, you will hear the prompt voice “please enter the password”. After inputting the correct password, you will hear the prompt voice “correct password, please enter the control code”. Enter *0 and you will hear “Open for air-condition” and air-condition is open, and enter *1 and you will hear “Close for air-condition” and air-condition is close.

If I1 is triggered, the Voice Module will dial out to the external phone number 3545876. When the phone is gotten through, you will hear voice section 3 “catch the thief”, and you can enter *2 to ring off.

MEMO

Chapter Ⅵ Applications

FAB has a wide application range. For your good knowledge of its application fields and your convenience of using it, in this chapter we will list some common but representative control schemes, which will show you the convenience and simplicity of auto-control by using FAB, especially the auto-control in a system requiring time control and an intelligent living zone.

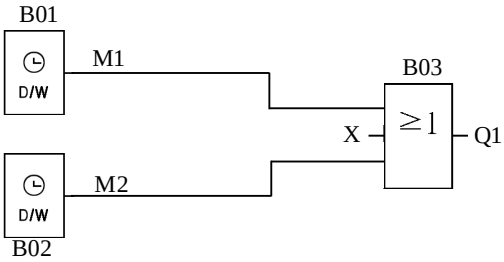
6. 1 Bell control for schools and factories

Control requirements:

Monday to Friday: From 6:00:00 to 12:00:00 AM and 14:00:00 to 17:00:00 PM, the bell shall ring for 10 seconds every hour.
Saturday and Sunday: From 8:00:00 to 12:00:00 AM and 13:00:00 to 17:00:00 PM, the bell shall ring for 10 seconds every 2 hours.

Analyses:

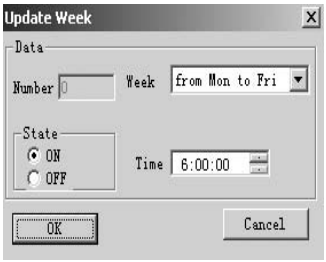
In this control, there are eleven time intervals from Monday to Friday and six time intervals from Saturday to Sunday. According to the traditional method, it will adopt lots of time-delay relays and its circuit will be very complex. FAB, by contrast, only needs a line section for its external circuit, or we say that we are able to implement the bell control only by connecting a FAB output port to the bell. The program diagram is shown as follows:

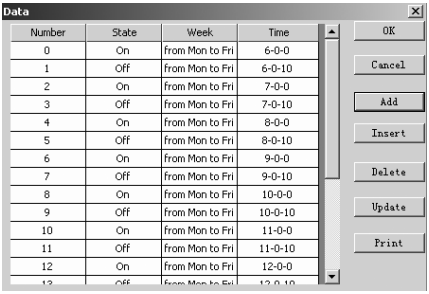


When FAB is used for this control, it will be very simple both in the connection of the external line and in editing the program. If QUICK II, the programming software, is used for editing the control program, it is only necessary to set two time switch blocks.

B01 

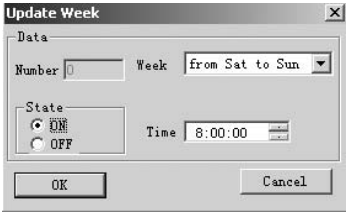
The set of FB is as follows:





B02 

The set of FB is as follows:



6. 2 The multi-function switch for lights in stairs and halls

Control requirements:

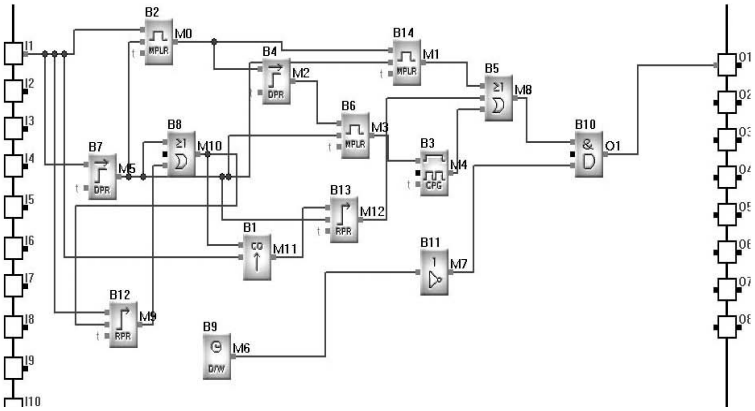
1. When you press the switch, the light is turned on, and will be automatically turned off after 3 minutes. The light will twinkle for 5 seconds before the turn-off.

2. The light will keep on if the switch is pressed twice in 5 seconds.

3. The light will be off if the switch is pressed for 2 seconds or more.

4. The light will be automatically turned on at PM 18:30 and turned off at AM 6:30 every day.

The program diagram is as below:



Description:

I1: connected to the switch button

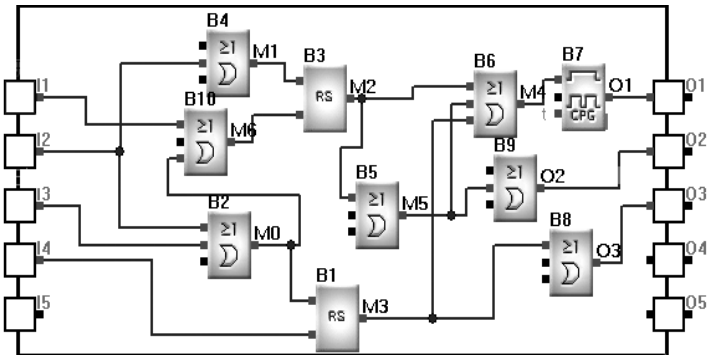
Q1: connected to the light

6. 3 Auto-gate control

Control requirements:

1. Opening and closing of the gate should 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 begins to move, and the lamp will keep flashing as long as the gate is moving.
4. A pressure damper shall be provided so that the gate can be automatically opened when it touches a person or an object.

The Function Block Program Diagram is shown 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

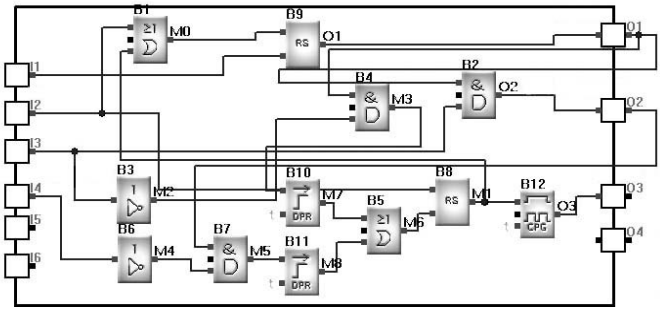
Control requirements:

The ventilation system shall be able to send fresh air into the room as well as 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 cannot 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 there is no atmosphere flow in the room, then after a short time the sensor will cut off this system and send the failure report.

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 Display “Array”
1. 2 Display “Electronics”
1. 3 Display “welcomes you!”
1. 4 Cycle 1.1-1.3

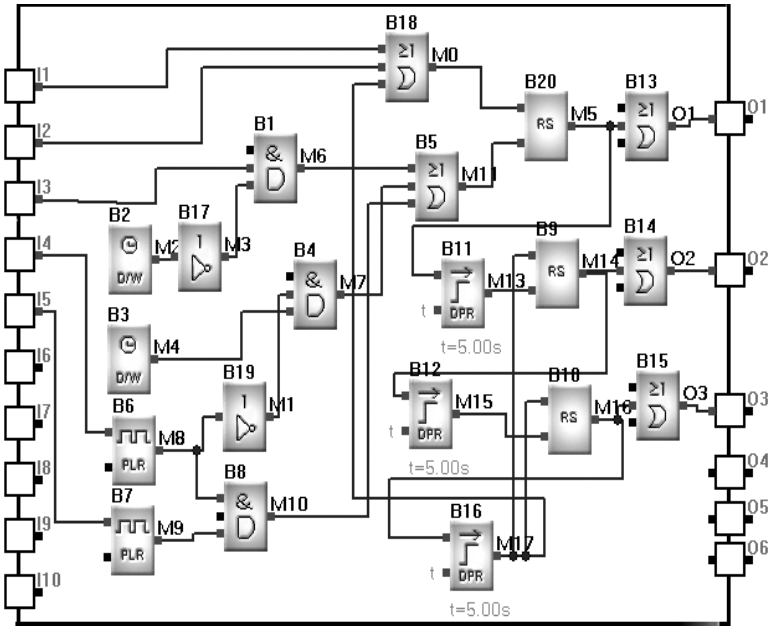
2. Control requirements

(1) It should be automatically turned on at 18:00:00 and turned off at 23:59:59 every day.
(2) The control transition can be performed by selecting the switch manually or automatically.
The neon lamp control system can be activated by hand at any time, but it can also automatically run through the clock switch or the light sensitive switch.
(3) The light sensitive switch should act as a complement of the time switch. When the light is plenty, the light sensitive switch will be automatically turned off, while when the light becomes weak it will be automatically turned on. What’s more, the light sensitive switch is useless from 0 o’clock to 10 o’clock every day.
(4) Rain detector: in case of a rainy day, it should turn off automatically.
(5) Over/under voltage detector: it will be automatically turned off when its operating voltage becomes 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 “welcomes you!”

The program dialogue is as below:



6. 6 The Illumination system for display windows

Control requirements:

1.1 The display time

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

1.2 Requirements for the illumination during display time

a. The basic lighting
Open the basic lighting equipments;
Close the additional lighting equipments and that during non-display time;

b. The strong lighting
Open the basic lighting equipments and additional ones;
Close the non-display lighting equipments;

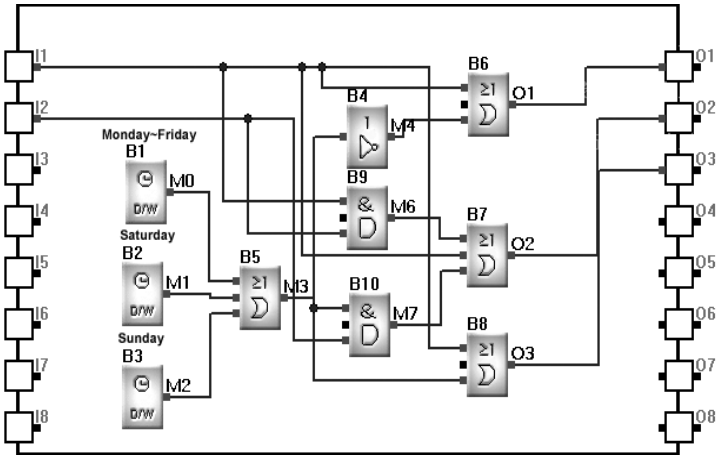
1.3 Requirements for the illumination during non-display time

Close the basic lighting equipments and additional ones;
Open the non-display lighting equipments;

1.4 Test switch

All the lamps will be turned on when the switch is pressed.

The program dialogue is shown 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

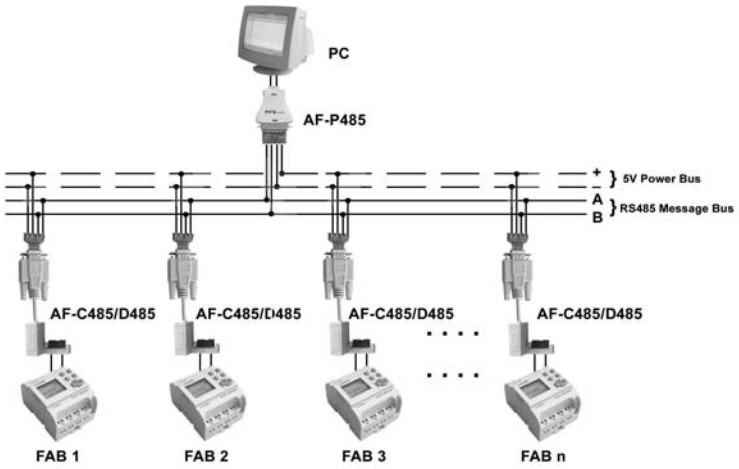
6.7 The building management

Control requirements:

1. Automatically read various meters which includes the watt-hour meter, water meter and gas meter
2. Proof against fires and protect against thieves;
3. Control the start and stop of relevant electrical equipments.

FAB can flexibly meet the needs of the automatic building control in a modern intelligent living zone as well as realize a central monitoring.

1) FAB central control communication connection



2) Assignment of FAB I/O points

Input parts:

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 parts:

Q1- connected to the air-condition equipment

Q2- connected to the ventilation equipment

Q3- connected to the alarm equipment

6.8 The application of FAB in a voltage diode counting and packing assembly line

The control requirement and configuration:

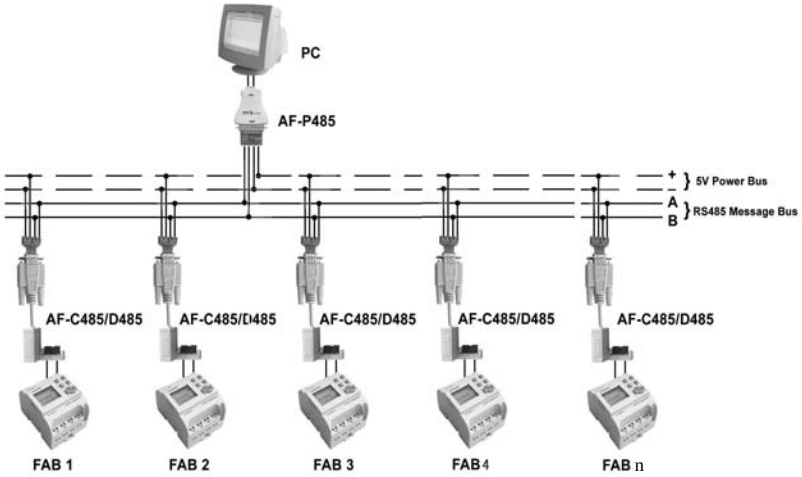
(一)FAB1 controls the 2000V withstand voltage counting assembly line

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

(二)FAB2 will control 1500V withstand voltage assembly line, while FAB3 will control 1000V withstand voltage assembly line, FAB4 the 500V withstand voltage one and FAB5 the 80V withstand voltage one. Their control requirements and configurations are the same with FAB1.

(三)FAB-SCADA, the monitoring software, can be used to monitor all the FABs. Through bus 485 each of these FABs can respond to the instructions of the PC, which include the counting of diodes and FAB I/O status. After receiving the data from the FABs, the PC will display them on the screen. What's more, the PC provides the data storage and inquiry function to count and analyze diodes in time.

Control System Figure is as blew:



2000v-Resising Assembly Line	1500v-Resisting Assembly Line	1000v-Resisting Assembly Line	500v-Resising Assembly Line	80v-Resisting Assembly Line

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Technical Parameters

1.1 General technical parameters

Item	Basis	Condition
Climate environment		
Humidity	Cold: IEC68-2-1 Heat: IEC68-2-2	
Horizontal installation Vertical installation		-20 ~ 70℃ -20 ~ 70℃
Storage/transportation		-40℃ ~ +70℃
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, 4days H_2S 1cm^3/m^3, 4days
Mechanical environment		
Protection type		IP20
Vibration 2	IEC68-2	10~57Hz(constant amplitude 0.15mm) 57~150Hz(constant acceleration 2g)
Impact	IEC68-2-27	18 impacts(semi sine 15g/11mins)
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	2.2KV for power line 2.2KV for signal line
IEC/VDE safety information		
Insulation Intensity	IEC1131	Meet the requirements

25°C clock buffer memory	Typical 100h
RTC accuracy	±Max 5S/day

1.2 AF-10MR-A / AF-20MR-A

Power Supply	
The rated voltage of power supply	AC100-240V
Allowable range of the rated input voltage VDE0631: IEC1131: Allowable main frequency	 AC 85V ~ 260V AC 85V ~ 260V 47 ~ 63Hz
Power consumption	AF-10MR-A (3W) AF-20MR-A (5W)
Digital Input	
Input voltage L1 Signal 0 Signal 1	 AC 0V ~ 40V AC 80V ~ 240V
Input Current of signal 1	Typical 0.2mA(AC230V)
Delay Time Changed From 1 to 0 Changed From 0 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 x 58W (AC230/240V)
Fluorescent Light Tube With Regular Compensation (25,000 Switch Cycles)	1 x 58W (AC230/240V)

Fluorescent Light Tube Without Compensation (25,000 Switch Cycles)	10 x 58W (AC230/240 V)
Short Circuit Protection cos 1	Power Supply Protection B16 600A
Short Circuit Protection cos 0.5 ~ 0.7	Power Supply Protection B16 900A
Output Relay Protection	Max. 20A Feature B16
Switch Frequency	
Machine	10Hz
Resistor Load / Lamp Load	2Hz
Induced Load	0.5Hz

1.3 AF-10MT-D / AF-20MT-D

Power supply	
The rated voltage of power supply	DC12V/24V
Allowable range of the rated input voltage Power Consumption (DC 24V) (Output full load)	DC10-28V Typical 80mA Typical 2W
Input section (digital input)	
Signal 0	<DC 5.0V
Signal 1	DC 10-24V
Input current of signal 1	Typical 1mA
Input section (analog input)	
Signal 1	DC 0-10V
Input current of signal 1	<0.3mA
Delay time From 1 to 0 From 0 to 1	Typical 50ms Typical 50ms
Length of Power Line (Without Shield)	100m
Digital output	

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

1 .4 AF-10MR-D/AF-20MR-D

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-D (4W) AF-20MR-D (5W)
Input section (digital input)	
Signal 0 Signal 1	< DC5.0V DC10-24V
Input Current of Signal 1	Typical 1mA
Input section (analog input)	
Signal 1	DC0-10V
Input Current of Signal 1	<0.3mA
Delay time From 1 to 0 From 0 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 I th	Max. 10A
Incandescent Lamp Load (25,000 switch cycles)	1000W

Fluorescent Light Tube With Electrical Controller (25,000 Switch Cycles)	10 x 58W
Fluorescent Light Tube With Regular Compensation (25,000 Switch Cycles)	1 x 58W
Fluorescent Light Tube Without Compensation (25,000 Switch Cycles)	10 x 58W
Short Circuit Protection cos 1	Power Supply Protection B16 600A
Short Circuit Protection cos 0.5 ~ 0.7	Power Supply Protection B16 900A
Parallel connected output for increased power	Not allowed
Output Relay Protection	Max. 20A Feature B16
Switch Frequency	
Machine	10Hz
Resistor Load / Lamp Load	2Hz
Induced Load	0.5Hz

1. 5 AF-10MT-E/AF-20MT-E

Power supply	
The rated voltage of power supply	DC12V/24V
Allowable range of the rated input voltage	DC10-28V
Power consumption (DC 24V) (Output full load)	Typical 80mA Typical 2W
Input section (digital input)	
Signal 0 Signal 1	<DC 5.0V DC 10-24V
Input current of signal 1	Typical 1mA

Delay time From 1 to 0 From 0 to 1	 Typical 50ms Typical 50ms
The length of power line(without shield)	100m
Output type	Transistor output (equivalent NPN)
Output Voltage	⩽DC80V
Output Current	Max. 2A
Short Circuit and Overload Protection	NO
Current limit of short circuit	Circa 2A
Reduction of the rated value	No (even in the whole temperature range)

1. 6 AF-10MR-E/AF-20MR-E

Power supply	
The rated voltage of power supply	AC/DC12V- AC/DC 24V
Allowable range of the rated input voltage	AC/DC10V-28V
Power consumption (AC/DC 24V) (Output full load)	AF-10MR-E (4W) AF-20MR-E (5W)
Digital input	
Signal 0 Signal 1	<AC/DC 5.0V AC/DC 10-24V
Input current of signal 1	Typical 1mA
Delay time From 1 to o From 0 to 1	 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 x 58W
Fluorescent Light Tube With Regular Compensation (25,000 Switch Cycles)	1 x 58W
Fluorescent Light Tube Without Compensation (25,000 Switch Cycles)	10 x 58W
Short Circuit Protection cos 1	Power Supply Protection B16 600A
Short Circuit Protection cos 0.5 ~ 0.7	Power Supply Protection B16 900A
Parallel connected output for increased power	Not allowed
Output Relay Protection	Max. 20A Feature B16
Switch Frequency	
Machine	10Hz
Resistor Load / Lamp Load	2Hz
Induced Load	0.5Hz

1. 7 AF-10MT-GD / AF-20MT-GD

Power supply	
The rated voltage of power supply	DC12V/24V
Allowable range of the rated input voltage Power Consumption (DC 24V) (Output full load)	DC10-28V Typical 80mA Typical 2W
Input section (digital input)	
Signal 0	<DC 5.0V
Signal 1	DC 10-24V
Input current of signal 1	Typical 1mA
Input section (analog input)	
Signal 1	DC 0-10V

Input current of signal 1	<0.3mA
Delay time From 1 to o From 0 to 1	 Typical 50ms Typical 50ms
Length of Power Line (Without Shield)	100m
Digital output	
Output Type	Transistor output (equivalent PNP)
Output Voltage	≤DC80V
Output Current	Max. 2A
Short Circuit and Overload Protection	No
Current limit of short circuit	Circa 2A
Reduction of the rated value	No (even if in the whole temperature range)

1. 8 Voice Module

Index	Conformity
Automatic Receiving	CCITT-DTMF
Automatic transmitting	CCITT-DTMF
Voice record and play	Max.99 segments, each with arbitrary time

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Quality Guarantee

Quality

Array Electronics Co., Ltd (abbreviated to ARRAY hereinafter) promises that this product has been strictly tested before its delivery from our plant and complies with all the all product requirements listed in this manual. Once properly installed, it will work in accordance with its specifications.

Warranty

This product is warranted against defects in material and manufacturing for a period of one year from the date of delivery. During the warranty period, ARRAY shall be responsible for all necessary repairs or replacement, as long as the product is proven to be inherently defective.

Range

Within the above mentioned Warranty Period, if the product fails to perform in accordance with its specifications and has not been misused it shall be delivered to a service center, which ARRAY authorizes, for free repair. ARRAY reserves the right to repair or replace the product in accordance with its discretion.

In the event of product replacement the buyer shall be informed and be responsible for re-installing the software. The buyer shall pay the shipping charge for the delivery to the ARRAY service center and the ARRAY service center shall repair or replace the product and deliver it to the buyer for free of charge.

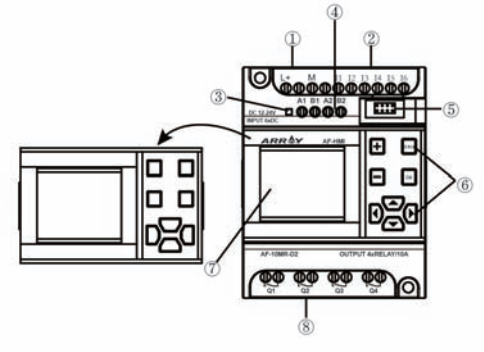
Remarks

The above warranty does not include the following circumstances.

1. Improper installation testing or operation as well as misusing the product
2. Damages caused by unauthorized dismantling of the product
3. Damages to consumable parts such as rubber covers, buttons, batteries, relays etc.

FAB2 PLC series

1.1 Structure of FAB2(take 10 point for instance)



① Power input
② Input terminals
③ Power indicator(blink once a second,red indicator)
④ 485 communication port
⑤ Program port
⑥ Operating keys
⑦ LCD display panel
⑧ Output terminals(relay or transistor)

1.2 Specification

Type	Type	Power	Input	Output
1	AF-10MR-A2	AC100-240V	6 points AC input	4 points relay output
2	AF-10MR-E2	AC/DC12-24V	6 points AC/DC input	4 points relay output
3	AF-10MT-E2	DC12-24V	6 points DC input	4 points transistor (NPN)output
4	AF-10MR-D2	DC12-24V	6 points DC input (with analog)	4 points relay output
5	AF-10MT-D2	DC12-24V	6 points DC input (with analog)	4 points transistor (NPN)output
6	AF-10MT-GD2	DC12-24V	6 points DC input (with analog)	4 points transistor(PNP)output

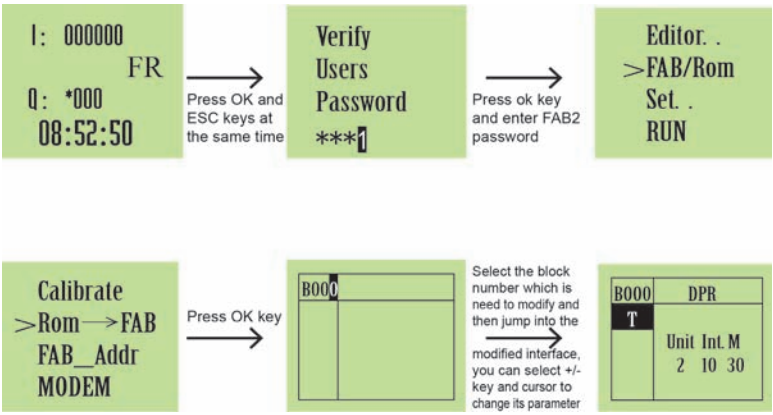
Type	Type	Power	Input	Output
7	AF-20MR-A2	AC100-240V	12 points AC input	8 points relay output
8	AF-20MR-E2	AC/DC12-24V	12 points AC/DC input	8 points relay output
9	AF-20MT-E2	DC12-24V	12 points DC input	8 points transistor (NPN)output
10	AF-20MR-D2	DC12-24V	12 points DC input (with analog)	8 points relay output
11	AF-20MT-D2	DC12-24V	12 points DC input (with analog)	8 points transistor (NPN)output
12	AF-20MT-GD2	DC12-24V	12 points DC input (with analog)	8 points transistor (PNP)output
13	AF-HMI	Removable HMI panel		
14	APB_DUSB	Download program cable(same as apb-dusb cable)		

1.3 Parameter changeI

Modify time parameters through HMI panel

Unit	1-hour;2-minute;4-second
Int	Integer part
M	Decimal part

Example:2 10 30 said 10.3minuts



1.4 Analog calibration

(1) Press OK and ESC simultaneously and enter FAB2 password to jump into the function interface, select FAB/ROM ok, and then press OK and → keys to calibration interface, each channel must be calibrated separately(AI0 said I1).

(2) When "minimum" is prompted, input voltage value to this channel. Press OK key to confirm, then success message will be prompted, and the input value will be identified by Vmin. When "maximum" is prompted, input maximum voltage value to this channel. Press OK key to confirm, then success message will be prompted, and the input value will be identified by Vmax. The input range for Vmin and Vmax is between 0V to 10V.

(3) After the analog has been calibrated successfully, FAB2 need to be cut off the power supply and then it is powered on.

(4) It is the same for the calibration of other channels. If the analog has been calibrated successfully, when using relevant analog function blocks, the analog input value (0V-10V) is not the actual input voltage value, but the calculation result of the math formula: (V input -Vmin) / (Vmax -Vmin)* 10.

1.5 485 interface

1) communication with sh300(A2B2)

Item	Content
SH-300 COM port	9 pin COM port
PLC COM port	485 interface(A2B2)
Default parameter	9600bps、8bits、1stop、none
Station No.	0-254, default value is 0
Communication method	485

The description of address types used in SH300 software:

Object type	Address type	Address range	Read/write	Description
Indicator	I	1～12	Read	Read input status
	Q	1～8	Read	Read output status
	M	The number of the corresponding auxiliary relays in FAB2 program (0～127)	Read	Read the output status of the function block in FAB2 program
Function key	Q	1～8	write	Write the status of empty output port(the output port that is not programmed in FAB2 program)
Dynamic text	I	1～12	Read	Read input analog value(DC type PLC)
	B	The number of the corresponding blocks in FAB2 program（1～128）	Read	Read the parameter value of the function block in FAB2 program
register	I	1～12	Read	Read input analog value
	B	The number of the corresponding blocks in FAB2 program（1～128）	Read	Read the parameter value of the function block in FAB2 program
			write	Write the parameter value of the function block in FAB2 program
Bar graph/ Trend line	I	1～12	Read	Read input analog value
	B	The number of the corresponding blocks in FAB2 program（1～128）	Read	Read the parameter value of the function block in FAB2 program

2) Modbus RTU(A1B1）

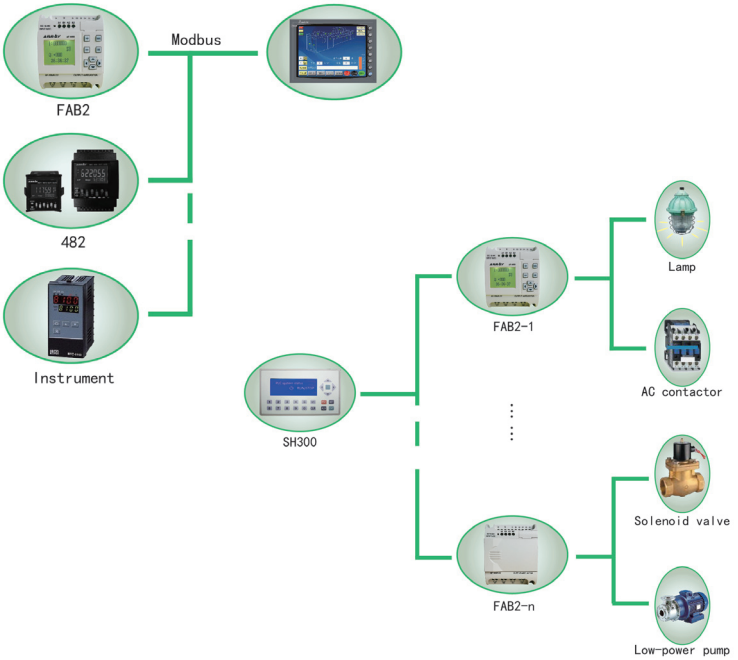
MODBUS RTU Introduction

Address type	R/W	Function code	remark
0X	Only read	01	Read system status (00-FF)
0X	Only read	01	Read digital inputs status (100-1FF)
4X	Only read	03	Read analog input AI status (300-3FF)
0X	Only read	01	Read output Q status (200-2FF)

Note 1:Fab2 is act as modbus slave device, which responds according to the requested data by modbus master device.

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

3) Network



1.6 Comparison table

		FAB	FAB2015
I/O points	Digital input	6/12	6/12
	Digital output	4/8	4/8
Memory		64k/127blocks	64k/127blocks
Supply voltage		DC12-24V/AC110-220V	DC12-24V/AC110-220V
Extension module		none	none
general characteristics			
Programming language		FBD	FBD
Timer number		127	127
Counter number		127	127
Password protection		yes	yes
25℃ RTC buffer		120h	160h
RTC accuracy		150s/month	20s/month
Program between new and old		shared	shared
Modify parameter on LCD		yes	yes
Manual programming on LCD		yes	no
LCD panel		Not shared	Not shared
Quick ii software		shared	shared
cable		Not shared	Same as apb cable
communication			
RS485		none	Two groups
isolation		none	none
Communication rate		9600	9600/19200
protocol		Self-defined protocol	Self-defined/modbus protocol
DI characteristics			
Input voltage range		AC85-265V/DC10-28V	AC85-265V/DC10-28V
isolation		none	none
AI characteristics			
AD resolution		8bits	10bits
Signal type		0-10v	0-10v
physical characteristics			
weight (g)		same	same
size (mm)		90*71*58	90*71*58
Working temperature		-20℃-70℃	-20℃-70℃
Storage temperature		-40℃-70℃	-40℃-70℃
humidity		5%~95% no condensation	5%~95% no condensation

FAB USER'S MANUAL

Ver 8.0