Preface

Thank you for purchasing Series FAB Intelligent Controllers of our company. This shows that you have a full understanding and a good knowledge of these products. However, for the purpose of allowing you to use these products better, you are requested to take some time to read this manual before operation. You will find more advantageous properties of the products, and it will be more convenient for you to operate these products.

Series FAB Intelligent Controller is an intelligent controller which uses the function block for programming and is provided with an LCD display panel. It allows the control functions of PLC, which required a large section of instructions and program to implement in the past, to be executed only by a function block. When several function blocks are linked together in a specific way, the relatively complicated control functions can be implemented so that the programming can be simplified.

Series FAB intelligent controller can be used very extensively. It can be used in a complete supply for the automation of mechanical equipment, flow-chart control, the building management automatic control and the other fields, and it makes the automation control go to every space of our life. This manual will describe in detail the function characteristics and operating methods of Series FAB controller.

Attention:

(1) This manual and proprietary of this machine are the property of ARRAY ELECTRONIC CO., LTD. No reproduction or duplication of all or part contents of this manual is permitted without consent in advance.

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

(3) In case that something missing or in shortage are found in this manual, contact our company directly and your comments will be appreciated. We will incorporate your comments into the next revision.

RESUME
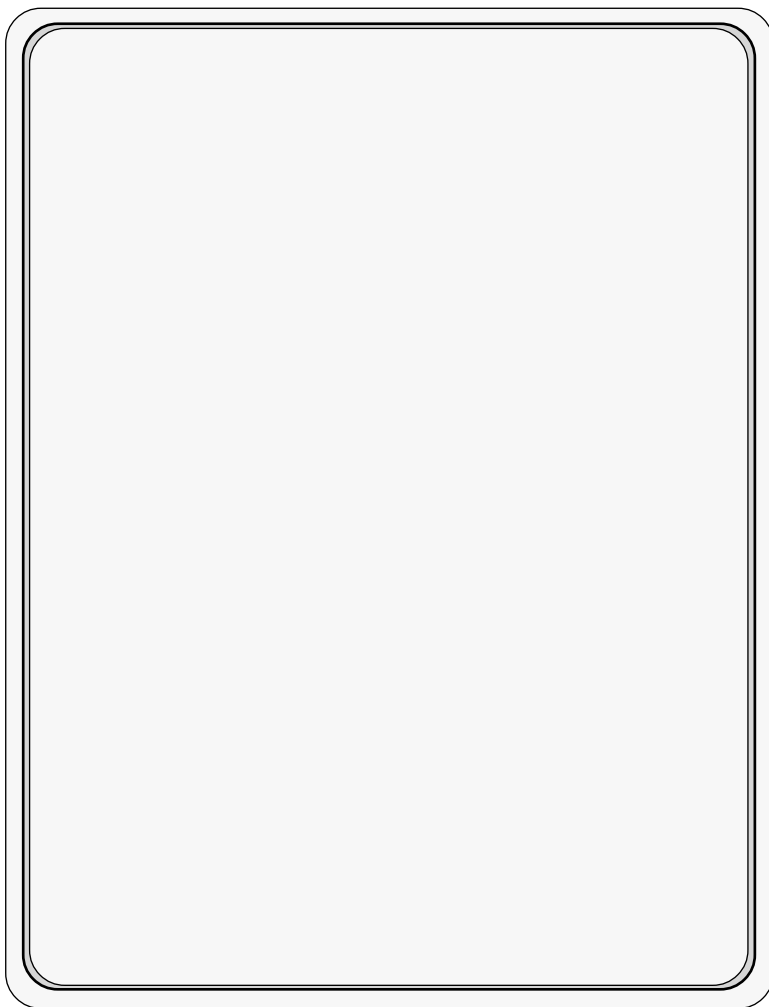
Chapter ⅠBrief Introduction to FAB

FAB intelligent controller is a new type of programmable controller. As it is programmed by the means of FBD (Function Block Diagram) , it is more simple and easier to learn the programming of FAB by comparison with the conventional PLC programming (ladder diagram and instruction). In the design concept of the products of FAB series, the host used in the conventional separating PLC is combined with writer, and the program can be written directly on LCD front panel, as a result, the cost of the users can be reduced greatly, and moreover the great convenience can be provided to operators. Products of FAB series has a compact structure with a small size and a light weight, and they are especially suitable to be used incorporated. Besides, series FAB intelligent controllers can be used in implementing the close and remote communication networking and monitoring so as to allow such small sized device to have stronger function. At present, FAB is widely used in various fields of industry, agriculture, automation control for home, etc., and it really can be applied everywhere.

1.1 Structure of FAB

Its main hardware structure consists of:

● Basic function blocks and special function blocks,
● Operation display panel
● Real-time clock circuitry
● Programming interface
● Telephone voice blocks
● I/O terminals
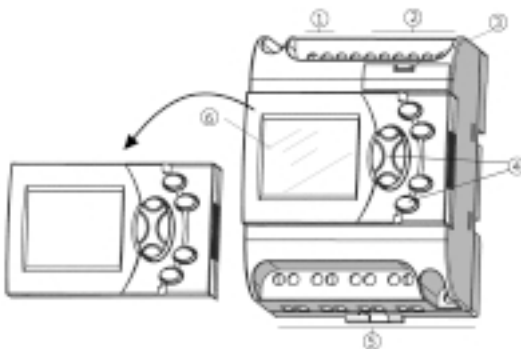
1. Input of AC power (AC 85 ~ 260V)
2. Input terminal
3. Communication interface
4. Operating keys
5. Output terminal (Output of relay or electronic transistors)
6. LCD display panel

Fig. 1.1 AF-10 FAB Series Shape
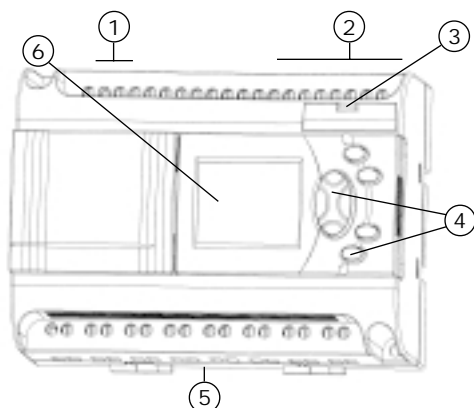
1. Input of AC power (AC 85 ~ 260V)
2. Input terminal
3. Communication interface
4. Operating keys
5. Output terminal (Output of relay or electronic transistors)
6. LCD display panel

Fig. 1.2 AF-20 FAB Series Shape

1.2 Specifications and models

Serial No.	Type No.	Power	Input	Output
1	AF-6MR-A	AC85-260V	4 points AC input	2 points relay output
2	AF-10MR-A	AC85-260V	6 points AC input	4 points relay output
3	AF-10MR-D	DC24V	6 points AC input	4 points relay output
4	AF-10MT-D	DC24V	6 points AC input	4 points transistor output
5	AF-20MR-A	AC85-260V	12 points AC input	8 points relay output
6	AF-20MR-D	DC24V	12 points AC input	8 points relay output
7	AF-20MT-D	DC24V	12 points AC input	8 points transistor output
8	AF-C232	Interface between FAB and PC, to implement programming and remote monitoring and control for the single machine.		
9	AF-C485	Interface between FAB and PC, to implement the monitoring and control function		
10	AF-MUL	FAB recording and playing back, telephone voice blocks		
11	AF-M232	Interface between AF-C232 and MODEM		
12	QUICK II	FAB programming software		
13	FAB-SCADA	FAB monitoring and control software		

1.3 Features of FAB

1. Removable programming panel with LCD display

    There is an operating panel with LCD display on the front panel of FAB. You can use the operating keys on this panel to program directly the edit control for FAB. Moreover, this LCD display panel is removable, and it can be set up flexibly according to your needs. When you need it, it can be plugged in, and when you don't need it, it can be pulled out and replaced with an ordinary front panel, as a result, your cost for using it can be decreased by a big margin. (**Note:** This panel can be plugged in or pulled out only after the power has been turned off).

2. Exquisite and compact design

    If you are thinking about to let your equipment become exquisite, FAB will be your best partner, and it only needs to occupy your space of 90mm ´ 71mm ´ 58mm (Size of AF-10 Series); 90mm ´ 126mm ´ 58mm(Size of AF-20 Series)

3. With the logic blocks used for programming, the program storage capacity is large

    The control functions of FAB can be implemented only with a function block, but it was implemented by PLC with a large section of program in the past. If several function blocks are linked together in a specific way, the relatively complicated control functions can be implemented. As FAB has a storage capacity of programs for up to 127 function blocks, there is a sufficient application resource for you to satisfy the requirements for the complicated control, and once the programs are written in, they will never be lost.

4. QUICK II: a free-of-charge programming software

    QUICK II can not only be used to program for FAB directly on the LCD display panel, but also be used to program for FAB on the computer, then the program is written into the memory of FAB. QUICK II is a very friendly man-machine programming interface. It cannot only edit the function diagrams, but also can analogously run the written program. It provides an off-line testing function to the users so as to avoid a lot of inconveniences in on-line testing. QUICK II will not only guide you to implement the edition of the control programs, but also to perform the instant monitoring for the field environment and the operation conditions of FAB.

5. Real-time clock function

    Series FAB intelligent controller has an instant real-time recording function, and it can execute the operations according to your required schedule. You can set as many as up to 127 different time intervals, and it is most suitable to be used for the systems which require time control.

6. Analog input and transmission
    In addition to receiving the switching input, FAB receives the analog inputs to implement the control for temperature, humidity, pressure, flow, level unit, etc., and transmit them remotely to PC for monitoring.

7. To implement the remote programming and the supervision and control of data acquisition through MODEM
    When you need to implement programming, write and modify programs for FAB controllers in a relatively far distance, it is only necessary to connect FAB to MODEM through telephone line, and it is also possible to perform data acquisition and real-time supervision and control through MODEM.

8. Security cipher code function
    FAB itself is provided with an absolute secrecy for the programs written by you. You can set you own cipher code before you write programs. The programs can be modified only after the correct cipher code is entered.

9. Telephone function
    FAB is provided with telephone and voice function blocks. It is possible to dial directly through telephone line (to set the telephone No. beforehand, FAB can be dialed automatically when the conditions are satisfied.), so as to implement notice or alarm functions. Moreover, FAB can also receive the signals transmitted from the far end through the telephone line in order to control the terminal equipment.

10. Voice function
    It is first time for FAB to apply the voice recording and playing back functions to the automatic controller industry, creating the intelligent controllers which can speak and implementing the voice prompt function.

11. Networking function
    FAB has a networking function. It can link up to 255 FABs to make up a network to implement the instant supervision and control on the same PC.

12. Fab-scada monitoring and control functions.

13. With the intermediate relay added, you are allowed to process easily the control with more complicated requirements.

Chapter Ⅱ Installation and wiring of FAB

2.1 Installation

2.1.1. Installation method

As FAB has a small size, it is suitable to fit it into machine, and installation is quite simple:

1. Use standard DIN rail for installation of FAB as shown in Fig. 2.1.
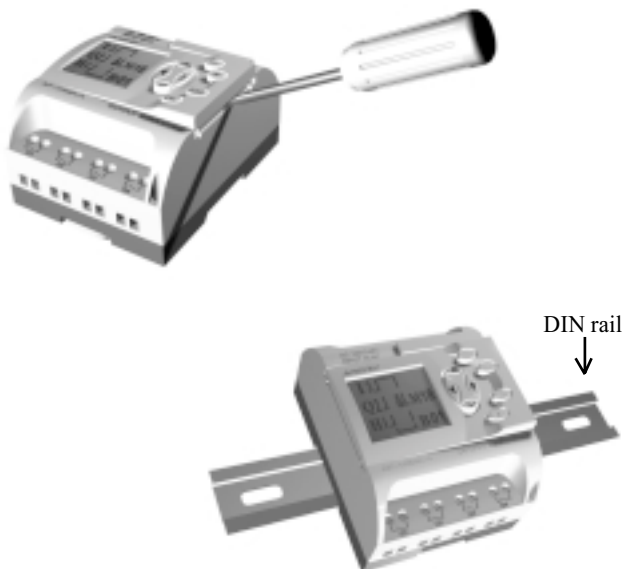2. Use the screw holes on FAB for installation of FAB.

DIN rail

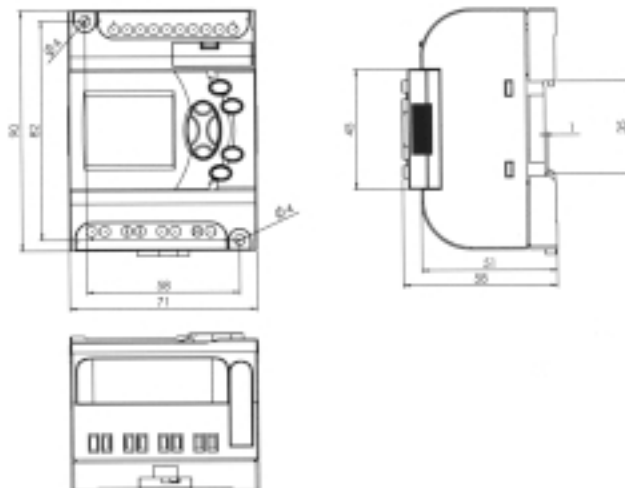**Fig.2.1 Use standard DIN rail for installation of FAB**

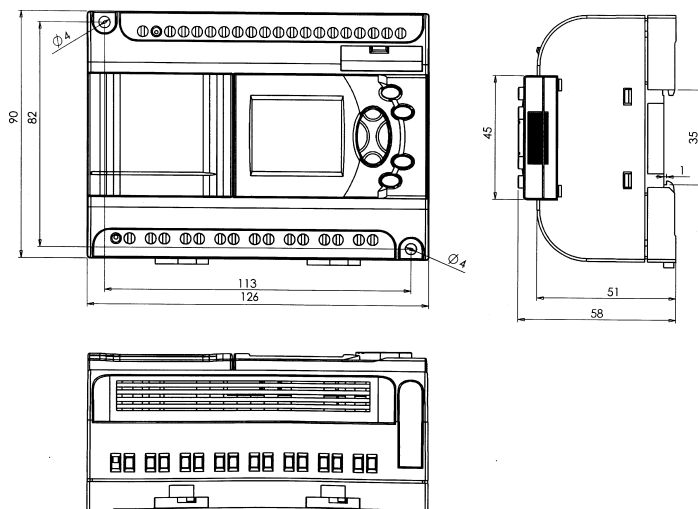**2.1.2 Installation Size**

Fig2.2 AF-10 FAB Series installation size (Unit: mm)

Fig2.3 AF-20 FAB Series installation size (Unit: mm)

2.2 Wiring of FAB

The screwdriver with a tip width of 3mm is used for wiring of FAB. The cross sections of the wires are determined according to the following ratings:

● 1× 2.5mm^2

● 2 × 1.5mm^2

2.2.1 Connection of power supply

The ratings of adaptable power supply for Model AF-10MR-A and Model AF-20MR-A (AC type) FABS are AC110V and AC 220V, 50/60Hz, and the grid voltage can be in a range of 85V ~ 260V. The current consumption for Model AF-10MR-A and Model AF-20MR-A FABs are 26mA and 50mA at a voltage of 220V. The ratings of adaptable power supply for Models AF-10MR-D / AF-10MT-D / AF-20MR-D and AF-20MT-D (DC type) FABs are 24VDC, and the voltage of power supply can be in a range of 20.4VDC ~ 28.8VDC.

The power connection for FAB is as shown in the following figure

AF-10MR-A and AF-20MR-A
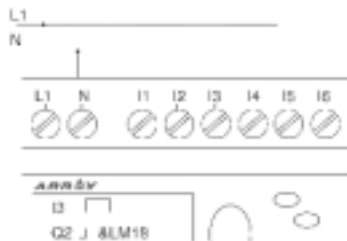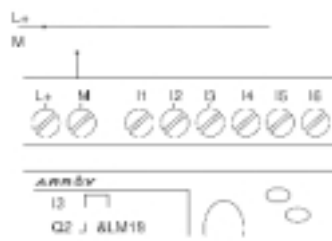
Fig2.4 AC Type   Fig2.5 DC Type

2.2.2 Connection of FAB input

The input to FAB can either be the digital values of switches, photoelectric damper, sunshine switch, etc., or be the analog values of pressure, level element, 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-20MR-D AF-20MT-D
Switch status 0	¡Õ40VAC	5VDC	¡Õ5VDC
Input current	¡Õ0.24mA		¡Õ1.5mA
Switch status 1	¡Ù80VAC	¡Ù5VDC	¡Ù15VDC
Input current	Typical 0.24mA	Typical 3mA	Typical 3mA
Proximity switch type with direct input	3lines 4lines	2lines 3lines 4lines	2lines 3lines 4lines
Switch with glow lamp	When the close current of glow lamp is less than or equal to 0.2mA, it can be connected directly, and when the close current of glow lamp is greater than 0.2mA, the glow lamp should be connected through a relay or an additional N-type drive.	/	/
Analog input	/	I5 and I6 receivable analog value	I11 and I12 receivable analog value

Note: 1. I5, I6, I11 and I12 that can receive analog inputs need to be assigned during programming, otherwise they will be processed as digital values. As soon as certain input is set to an analog, this input will not be the input port for the digital value unless it is assigned again by programming as the input port for the digital value.

2. The analog requires 0V ~ +10V voltage signals and it is divided equally in 0.1V proportion. In programming, all the block parameters related to the analog are based on the min. precision of Class 1.

3. As for the input of digital value, when the switch status changes from 0 to 1, the time of Status 1 presence must be greater than 50ms, and when the switch status changes from 1 to 0, the time of Status 0 also must be greater than 50ms.

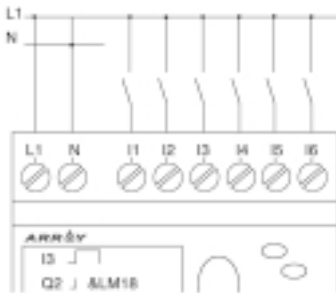Input connection of FAB is as shown in the following figure:

Fig 2.6 AC Type	**Fig2.7 DC Type**

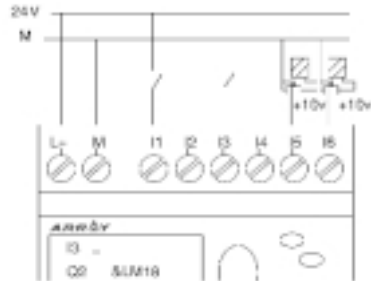### 2.2.3 Connection of FAB Output

The outputs of Models AF-10MR-A/AF-20MR-A/AF-10MR-D/AF-20MR-D FABs are the relays, and the contacts of relays are isolated from the power supply and inputs. The outputs for Models AF-10MT-D and AF-20MT-D are of electronic transistor type, and provided with the short circuit protection and overload protection. It is not necessary to have a separate power supply for the load, and FAB itself can supply the power for the load.

1. Requirement for the output of relay:

Various loads such as lamp, fluorescent tube, motor, contactor, etc., can be connected to the outputs of FABs. The max. ON output current that can be supplied by FAB, is 10A for the non-induced load and 2A for the induced load.

The connection is as shown in the following figure:
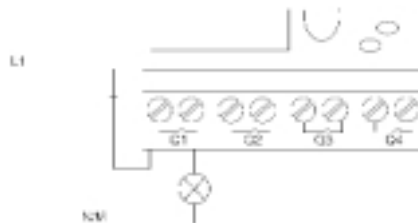
Fig2.8 Relay Output

1. Requirement for the output of electronic transistor type:

   The load connected to FAB must have the following characteristics:

   The maximum digital value of current can not exceed 0.3A;

   when the switch is ON (Q=1), the maximum current is 0.3A.
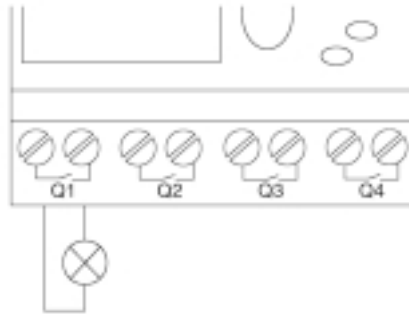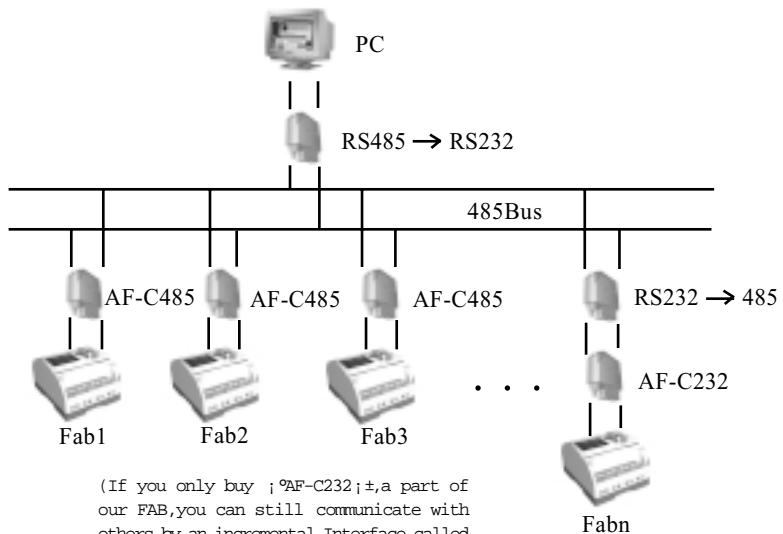
   The connection is as shown in the following figure:

Fig2.9 Transistor Output

2.2.4 Connection for FAB networking

PC

RS485 → RS232

485Bus

AF-C485   AF-C485   AF-C485

RS232 → 485

AF-C232

Fab1   Fab2   Fab3   . . .

Fabn

(If you only buy ¡ºAF-C232¡±,a part of
our FAB,you can still communicate with
others by an incremental Interface called
RS232→485)

Chapter III General Description of Function Blocks

FAB adopts the programming method with function blocks. 20 function blocks are configured in total, and each block can implement a specific control function independently, e.g. time-delay ON, time-delay OFF, setting switch time, counter function, etc. As several blocks are linked up in a specific way, the relatively complicated control function can be implemented. It will be more simple and apparent than the control function with the conventional PLC instruction programming.

The following types of edit arithmetic elements for the FAB function blocks are available for options:

1. Options of input port: I1 - I12 (Input port), Q1- Q8 (Output port), Moo-M126 (Intermediate relay), HI (High potential status), LO (Low potential status), X (without input connection), P0 - P9 (Telephone two-tone pulse)

2. The options for the output port: Q1 ~ Q8 (output port), Moo~M126 (intermediate relay).

3.1 Basic function block (GF)

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

Table 1: Basic function blocks

Line diagram	FAB function block	Function
Parallel Connection of NO contacts	&	AND
Serial connection of NO contacts	≥1	OR

Phase inverter		NOT
Dual commutator contact		XOR
Parallel connection of NC contacts		NAND
Serial connection of NC contacts		NOR

3.1.1 AND

Serial connection of a certain number of NO contacts are shown in the line diagram as follows:
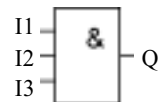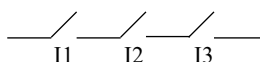
The symbol of "AND" is as shown in the following:

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

Logical frame of "AND":

I 1	I 2	I 3	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

Parallel connection of a certain number of NO contacts, which is as shown in the electrical line diagram as follows:

The symbol of "OR" is as shown in the following:

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

Logical frame of "OR":

I 1	I 2	I 3	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

The phase inverter is indicated in the line diagram as follows:

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

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.

Logical frame of "NOT":

I1	Q
0	1
1	0

3.1.4 NAND

Parallel connection of certain number of NC contacts, which is as shown in the electrical line diagram as follows:

The symbol of "NAND" in FAB is shown as follows:

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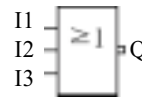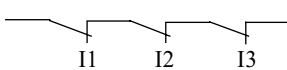
Logical frame of "NAND":

I 1	I 2	I 3	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

Parallel connection of certain number of NC contacts, which is as shown in the line diagram as follows:
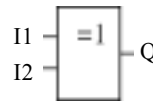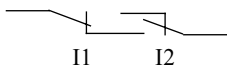
The symbol of "NOR" in FAB is shown as follows:

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

Logical frame of "NOR":

I 1	I 2	I 3	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

3.1.6 XOR

As shown in the line diagram, 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.
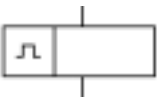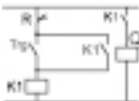
Logical frame of "XOR":
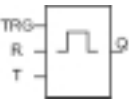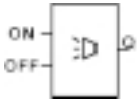
I1	I2	Q
0	0	0
0	1	1
1	0	1
1	1	0

3.2 Special function blocks (SF)

Function	Representation	Graphic
DPR(ON time delay)		
DDR(OFF time delay)		
PLR(Pulse relay)		
DW(Time relay)		
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 dial- ing blocks)		
AN(Comparison of general analogue)		
PLAY(Broadcast voice section & Selector switch blocks)		
MR(Recording voice section& Selector switch)		

3.2.1 DPR

| Line diagram/Legend in FAB	Pins	Description
	TRG input	After TRG is trigged, the time delay timer starts timing. (If during the timing of time delay timer TRG stops triggering, the timer will terminate the timing).
	Parameter T	After time T, the output is on (the output signal changes from 0 to 1).
	Output Q	If there is still trigging signal, when time T is up, the output will be on.

Time Sequence Frame:
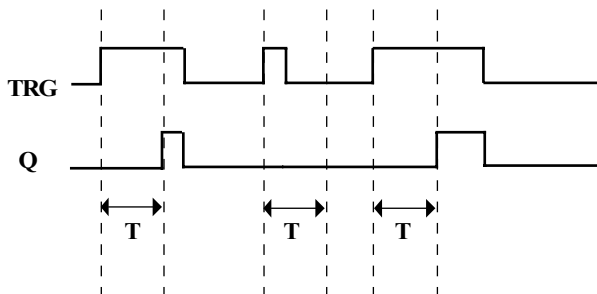
Description:

● 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 has been elapsed. There is a time delay between turning ON the input and turning On the output, that is why the ON time-delay is so called.

● When the input TRG is Status 0, the output reset is 0.

● This function is applicable to the switches connected to vibrations, delay start -up of motor, delay turning-on of lights, etc.

● 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 definition can reach 0.5 ¡ëS.

3.2.2 DDR

Line diagram/Legend in FAB	Wiring	Description
	Input TRG	The timer of time delay disconnecting relay is activated by the descending edge (changed from 1 to 0) of TRG input (trigger).
	Input R	The timer of disconnecting time-delay relay is reset via R (Reset Input), and Output Q is set to 0. (R has higher priority than TRG).
	Parameter T	The output is disconnected when the time T is elapsed for the output (the Q status is changed from 1 to 0).
	Output Q	Input TRG is activated to turn on the output (Q=1) and be kept ON until it is reset when the set time T is up.

Time Sequence Frame:
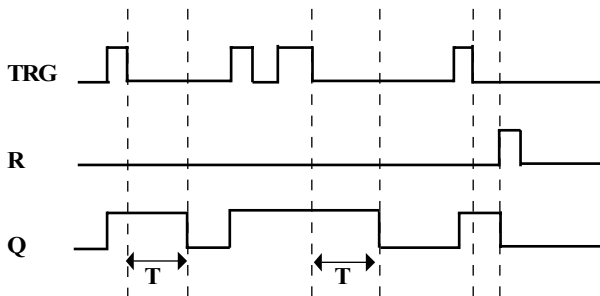
Description :

● When Input TRG is Status 1, Output Q is changed at once to Status 1. When Input TRG is changed from 1 to 0 (when the descending edge comes), the internal time-delay timer of FAB is activated and Output Q is still remained in Status 1. When the set time T is up, Output Q becomes 0 and the timer is reset.

● If Input TRG changes from Status 1 to Status 0 again, the timer is activated again.

● Before the set time T is up, the timer and output can be reset via R (Reset) input.

● This function is applicable to the lighting of staircase, the control of barriers in car park, the control of water throttling valve, etc.

● 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). Its time definition can reach 0.5 ¡ëS.

3.2.3 PLR

Line diagram/Legend in FAB	Wiring	Description
	Input TRG	Trigger the input (TRG) to turn ON and OFF the output.
	Input R	The output Q is reset via R (Reset input) (Q=0, R has a higher priority than TRG).
	Output Q	Every time TRG changes from 0 to 1, the status of Q will be changed (i.e. from Status 0 to Statues 1 or vice versa).

Time Sequence Frame:
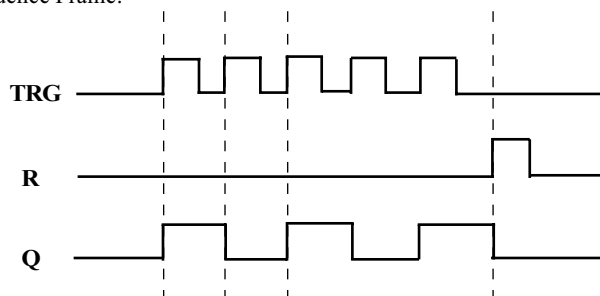
Description :

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

● Reset the impulse relay to Status 0 via Input R.

● After the power is ON or OFF, the impulse relay is reset and Output Q changes to 0.

● This function can be applied to the lighting of corridors and staircases, and the start/ stop motors with a single pushbutton, etc.

3.2.4 CW

FAB can provide the switches for 127 time intervals.

Legend in FAB	Pin	Description
	ON/OFF	Output switch time setting. ON is the time setting for output to begin turning on. OFF is the time setting for output to begin turning off.
	D/W	Options of date system and week system. D is the date system and W is the week system.
	Output Q	If one of the parameterized time intervals ON, the output is ON.

Notes regarding the time switches:

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

● 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

On: May 2nd, 2000   8:00

On: July 5th, 2000   19:00 ── Q1

On: Aug. 2nd,2000   5:00

The above arrangement is correct, and the following arrangement is wrong:

On: May 1st, 2000   9:00

On: July 5th, 2000   19:00

On: May 2nd, 2000   8:00 ── Q1

On: Aug. 2nd, 2000   5:00

● In the time setting for the time switches, if 2 time setting points for ON/OFF are set, the output is in ON status only in this time interval, and the output keeps the original status when it is below ON time, and the output is in OFF status when it is greater or equal to OFF time.

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

Setting conditions	Time	Output status
only ON time	Below ON time	Keeping the original statues
	Greater and equal to ON time	ON status
only OFF time	Below OFF time	Keeping the original statues
	Greater and equal to OFF time	OFF status

2. When the week system is selected for the timing of time switches:

● The interval from MO to SU is designated as a period (MO is the starting point, and SU is the end point). In the same time interval, it is not allowed to set the starting point after the end point. It is OK to follow the sequence of MO, TU, WE, TH, FR, SA, SU, e.g, for example:

ON   SU   5:00 ⎯⎯⎤
                           ⎬⎯ Q1(Error)
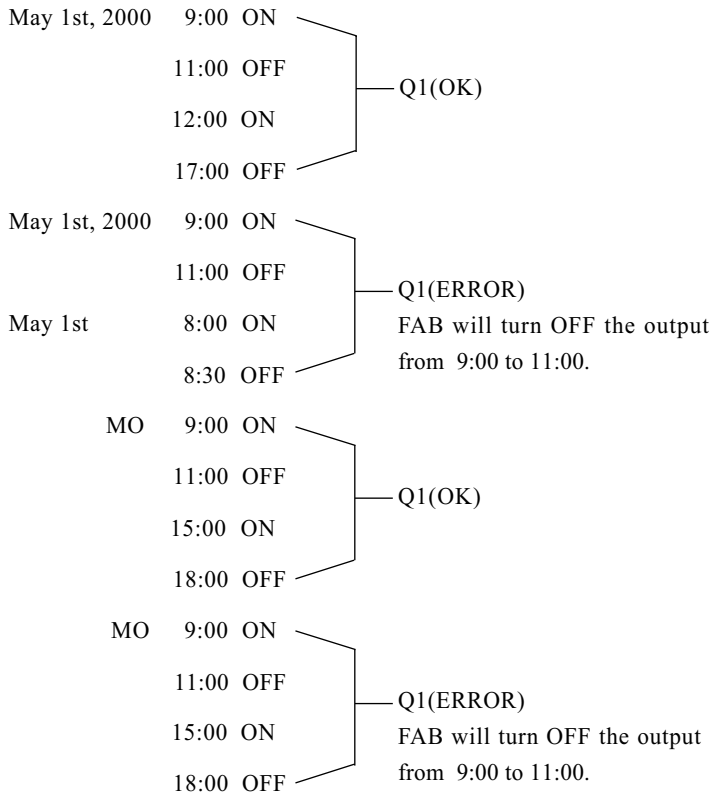OFF   MO   8:00 ⎯⎯⎦

It can be corrected as:

ON   MO   8:00 ⎯⎯⎤
                           ⎬⎯ M1, $\overline{M1}$=Q1
OFF   SU   5:00 ⎯⎯⎦

Note: MO-Monday, TU-Tuesday, WE-Wednesday, TH-Thursday, FR-Friday, SA-Saturday, SU-Sunday.

● As for the case that only OFF time is set without ON time, e.g. it is set to be OFF at 5:00 only from Monday to Thursday, and FAB can turn OFF the output after 5:00 everyday from MO ~ TH, as to when it is going to be turn ON, it depends on the other factors (the original status will be maintained for Friday, Saturday and Sunday).

3. Whether the date system or the week system is selected, the time intervals for the time of the same date should be arranged in chronological order, for example:

May 1st, 2000   9:00 ON

                 11:00 OFF

                 12:00 ON   Q1(OK)

                 17:00 OFF

May 1st, 2000   9:00 ON

                 11:00 OFF
                                    Q1(ERROR)
May 1st   8:00 ON   FAB will turn OFF the output
                                    from 9:00 to 11:00.
                  8:30 OFF

        MO   9:00 ON

                 11:00 OFF
                                    Q1(OK)
                 15:00 ON

                 18:00 OFF

        MO   9:00 ON

                 11:00 OFF
                                    Q1(ERROR)
                 15:00 ON   FAB will turn OFF the output
                                    from 9:00 to 11:00.
                 18:00 OFF

Note: this phenomenon is called as a principle of the later command surpasses the
       former command.

4. When the week system is selected, if ON is set at 8:00 and Off is set at 9:00 of MO
    ~ TH, the original statuses will be maintained for FR, SA and SU, i.e. the original ON
    status will be kept as ON and the original OFF status will be kept as OFF.

5. Assignment range for ON/OFF time:

    Any time during the period from 00:00:00 to 23:59:59;

    --:-- represents that there is no setting time

6. Clock hold circuit

For FAB, when there is a power failure or a power cutting off, the internal clock can continue to run. The time that FAB can maintain the internal clock to run depends on the temperature of racks, and when the temperature of racks is 25 ¡æ the clock can continue the normal operation of more than 100 hours.

7. Conflict between time intervals:

When using the time interval to set the ON/OFF time for the clock, the clock switch will make the output ON at the ON time unless it has already been ON, and the clock switch will make the output OFF at the OFF time unless it has already been OFF.

8. Accuracy of RTC clock:

1s.only one block is required to accomplish the jobs with duration below 1 minute easily. This function is applicable to the control related to time, e.g. ringing bell for classes in school, ringing bell for going to work or getting off work in factories, timed start-up and shut-down of machines, etc.

3.2.5 RS

Line diagram/Legend in FAB	Pins	Description
	Input S	Set Output Q to 1 via Input S (Set). P0~ P9 two-tone signal input that can be used to receive phone call.
	Input R	Set Output Q to 0 via Input R (Reset). If S and R are set to 1 at the same time, the Output Q is 0 (with a higher reset priority).
	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 are the 0 - 9 keys of two-tone telephone set.
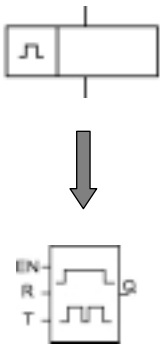
Switch characteristics

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

Sn	Rn	REMARK Q
0	0	Status remain to the original value
0	1	0 Reset
1	0	1 Set
1	1	0 Reset(has a higher priority than Set)

3.2.6 CPG

Line diagram/ Legend in FAB	Pins	Description
	Input EN	Make clock impulse generator ON and OFF via Input EN (Enable).
	Input R	Make Output Q be 0 via Input R (Reset).
	Parameter T	T is the time length for output to be ON and 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 held to 1, timing can be started again, and when Time T is up again, the output is 0. The cycle operation is continued in this way until EN is 0 and Output Q is 0. When R is 1, all the initial status of EN changing from 0 to 1 will start cycling changes.

Time Sequence Frame:
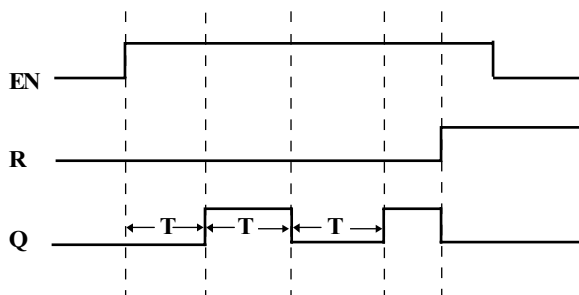
Attention:

- 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). Its time definition can reach 0.5 ¡ëS.

- Enable Input (EN) enables clock pulse generator to operate. Output Q of clock pulse generator will flip-flop the status every time the time T is elapsed, and cycle operation is continued in this way until Enable Input (EN) is 0 and the clock pulse generator stops operation and Output Q is 0.

- This function is applicable to the locations where the pulse is generated automatically and ON/OFF is activated automatically.

3.2.7 RPR

Line diagram / Legend 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 via Input R, and make Output Q is 0 (The priority of R is higher than that of TRG).
	Parameter T	After TRG is trigged and the time T is elapsed, the output is ON.
	Output Q	After time delay T is elapsed, the output is ON.

Time Sequence Frame:
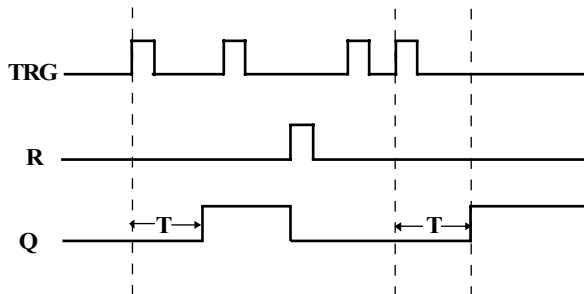
Attention:

● If the status of Input TRG changes from 0 to 1, the internal timer will be activated. When T of timing is up, Output Q becomes 1 while there is no effect of Input TRG that comes again, on Output Q. Only when Input R becomes 1 again that Output Q and Timer T will be reset to 0.

● This function is applicable to the locations where the time-delay ON and hold ON status are required.

● 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 definition can reach 0.5 ¡ãS.

3.2.8 UCN

Line diagram/ Legend in FAB	Pin	Description
R → CO → Q CNT → ↑ PAR →	R	When R inputs the reset signal, the priority of R is higher than that of other inputs, the counter is reset to 0 and Output Q is reset at the same time.
	Input CNT	When CNT counting is input, the counter only count the leading edge triggering (the status changes from 0 to 1), i.e. every time the leading edge is triggered, the counter is added by 1.
	Parameter PAR	When the internal counting value is greater or equal to Parameter PAR, Output Q is 1 and the assignment of counter is 0 ~ 999999.
	Output Q	When the counting value has been reached, Output Q is On.

Time Sequence Frame:
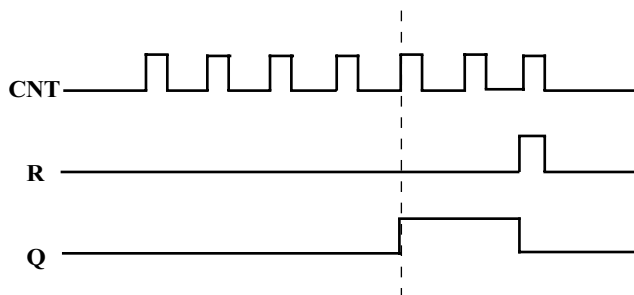
Note: This function is applicable to the locations where counting is required.

3.2.9 DCN

Line diagram/ Legend in FAB	Pin	Description
R CNT RAR — CO Q ↓	R	When R inputs the reset signal, the priority of R is higher than that of other inputs, the counter is reset to 0 and Output Q is reset at the same time.
	Input CNT	When CNT counting is input, the counter only count the front edge triggering (the status changes from 0 to 1), i.e. every time the leading edge is triggered, the counter is decreased by 1.
	Parameter PAR	When the internal parameter is decreased to 0, Output Q is 1 and the assignment of counter is 0 ~ 999999.
	Output Q	When the counting value is 0, Output Q is On.

Note: This function is applicable to the locations where the counting is required.

3.2.10 MPLR(Single-impulse time relay)

Line diagram/Legend in FAB	Pin	Description
TRG R — Q T	TRG	Trigger the input to activate the single-impulse time relay. When the leading edge of TRG comes, an impulse with width T is output.
	R	Reset the single-impulse time relay. When R is 1, Output Q becomes 0.
	T	The assignment of the pulse duration setting is 0.01 ~ 99.99 (second, minute, hour). Its time definition can reach 0.5¡ëS.
	Q	Every time TRG changes from 0 to 1, Q outputs a pulse with a duration of T.

Time Sequence Frame:
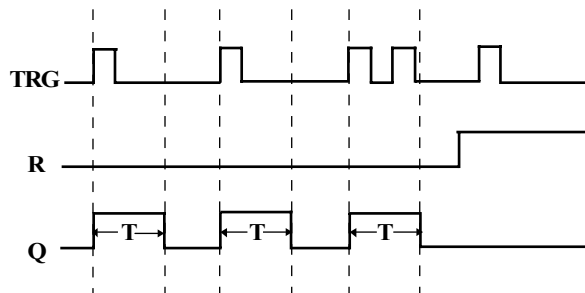
Note:

● When Q is 1, TRG pulse will have no effect on Output Q.

● This function is applicable to the locations where the pulse duration is required to amplify.

3.2.11 Tel (it is necessary to purchase AF-MUL for use in combination)

FAB Line diagram	Pin	Description
	Input	The input port is selected as follows: I1 ~ I12, Q1 ~ Q8, HI, LO, M00 ~ M126, P0 ~ P9.
	Output	When output is 1, the telephone number of output port will be dialed to output. If the input has been 1 all the time, dialing will be kept on, and when the input is 0, dialing stops. The options of output port will not exceed 25 digits of the telephone number.

Note:

● The function of telephone blocks is mainly dialing, output, alarm, etc. This blocks is used together with the function block of locking-up relay (RS relay). It can be used to not only receive the signals of incoming call to control the terminal equipment, but also dial the number to output the alarm under certain conditions. Presentation on how to implement it is made as follows:

a. The basic circuit for controlling periphery devices by incoming call is shown as in the following diagram:

This control requires to preset the telephone two-tone signal (P0 ~ P9) to drive RS relay during the programming of FAB, and the periphery devices is driven by the output of RS relay, so when FAB receives P0 ~ P9 signals of incoming call, it is possible to control the periphery devices.
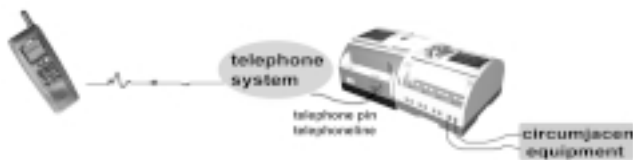
Step 1: Use the external telephone to dial the number of the telephones connected to FAB, and there appears the prompt voice "Please enter the information code".

Step 2: Enter the cipher of FAB, and there appears the prompt voice "Please enter the information code".

Step 3: Dial P0 - P9 control signals to control the output of FAB. RS blocks has telephone two-tone pulse signals P0 - P9, during programming, the input of RS needs to be set to P0 - P9, so as to implement the control function of telephone blocks.

b. Telephone alarm: When the input signal of this blocks is 1, start to dial automatically the preset number.

● It is used in the locations where the automatic dialing and automatic alarm are required.

3.2.12 PLAY (it is necessary to purchase AF-MUL for use in combination)

Legend of FAB	Pin	Description
ON — OFF — [symbol] Q	On	When ON is 1, Output Q is 1, i.e. the voice section is turned on for playing back. The options range for its input is I1 ~ I12, 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 option range for its input is I1 ~ I12, Q1 ~ Q8, HI, LO, M00~M126, X.
	Q	The options range for out is 01~ 98, and there are 98 voice sections in total.

● This function is applied to the locations where the voice prompt is required.

3.2.13 MR (it is necessary to purchase AF=MUL for use in combination)

Legend of FAB	Pin	Description
ON — OFF — [symbol] Q	ON	When ON is 1, record the voice sections. The options for the input port is I1 - I12, Q1 - Q8, HI, LO, M00~M126, X.
	OFF	When OFF is 1, recording is completed, turn off the switch for recording voice sections. The options of this input is I1 ~ I12, Q1 ~ Q8, HI, LO, M00~M126, X.
	Q	The options for the output port are 01 ~ 09. Please note that: when the output is selected as 99, it does not represent to record the 99th voice section but that to clear all the voice sections, therefore, care should be taken for using .

Notes:

When making recording, recording should be performed in an order of 01 - 98 and it is not allowed to be interrupted in the process, that is to say, it is not allowed to 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 can be input. (It is called as accumulated input).

● This function should be applied to the locations where the voice prompt is required. It is necessary to making recording first.

Example: Application of voice telephone block

Control requirements:

1. The telephone keys shall be used to control the switching on and off of some electrical appliance at your home;

2. when there is no body at home, probes shall be used to monitor the doors and windows and in case any stranger enters through the door or window, FAB will automatically shout "Stop thief!" and automatically dial your mobile telephone No. "0139021345" to inform you of the alarm.

Analysis:

In order to meet the above mentioned control requirements, the following main voice segments shall be set up:

1. Switch on the electrical appliance;

2. Switch off the electrical appliance;

3. Stop thief.

Step 1: recording of voice (using the accumulation input)
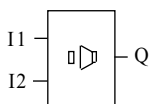
Record the three segments of voice into AF-MUL while constantly changing the status of 11 and 12. Then assign the input points, with 11 to be connected to the door/window probes; P0, as key number 0 of the telephone set, to be set to switch-on of the electrical appliance; and P9, as key number 9 of the telephone set, to be set to switch-off of the electrical appliance.

Step 2: programming (the function block diagram being as follows:)
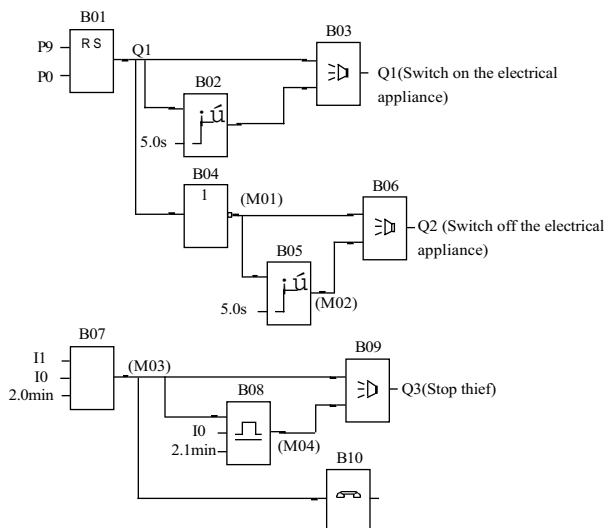
After the telephone lines and power supply lines of FAB and AF-MUL are connected, dial the number of the telephone that is connected with FAB. When you have got through, you will hear "Please input password". Now input the password for programming through the telephone number keyboard and please don't forget to start with "*" before inputting. After the password is properly inputted, please input "*" and "0". You will hear the prompt voice "Electrical appliance is switched on" and relay Q1 will be on at the same time. If "*" and "9" are inputted, you will hear "Electrical appliance is switched off" and relay Q1 will be off. The prompt voices for switch-on and switch-off will continue for 5 seconds.

3.3   Extension Function block (EF) of FAB

Functions	graphics
General Analog Quantity Comparator. This comparator has two ports and "0.0-10.0, I1-I12" may be selected for each of them. When the conditions are available, output Q is "1" and its selection range is "Q1-Q8, M00-M126"Remarks: It may be compared with "<, >, =, ¡Ü, ¡Ý, ¡Ù".	≤ AN
Temperature Block (for setup of temperature by the user): with the same function as that for "General Analog Quantity Comparator"	≤ TE
Humidity Block (for setup of humidity by the user): with the same function as that for "General Analog Quantity Comparator"	≤ HU
Pressure Block (for setup of pressure by the user): with the same function as that for "General Analog Quantity Comparator"	≤ PR

Level Block (for setup of water level by the user): with the same function as that for "General Analog Quantity Comparator"	≤ WP
Flow Block (for setup of flow by the user): with the same function as that for "General Analog Quantity Comparator"	≤ FL
Speed Block (for setup of rotation speed by the user): with the same function as that for "General Analog Quantity Comparator"	≤ SP
Gas Concentration Block (for setup of gas concentration by the user): with the same function as that for "General Analog Quantity Comparator"	≤ DE
Voltage Block (for setup of voltage by the user): with the same function as that for "General Analog Quantity Comparator"	≤ VO
Current Block (for setup of current by the user): with the same function as that for "General Analog Quantity Comparator"	≤ CU
Power Block (for setup of power by the user): with the same function as that for "General Analog Quantity Comparator"	≤ PO
Function Block (for setup of function by the user): with the same function as that for "General Analog Quantity Comparator"	≤ WO

3.3.1 General Analog Quantity Comparator

Graphics	pins	notes in FAB
	Input 1	comparator input port 1, with 0.0~10.0, I1~I12 to be selected.
≤ AN	Input 2	comparator input port 2, with 0.0~10.0, I1~I12 to be selected.
	Input Q	with conditions available, output Q is 1 and its selection range is Q1~Q8, M00~M126. Remarks: It may be compared with " ¡Ü, ¡Ý,< , >, = , ¡Ù, ".

Note: Only AF-10MR-D, AF-10MT-D, AF-20MR-D, AF-20MT-D type FAB's have this function.

● This function is used in the input block for analog quantity.

RESUME
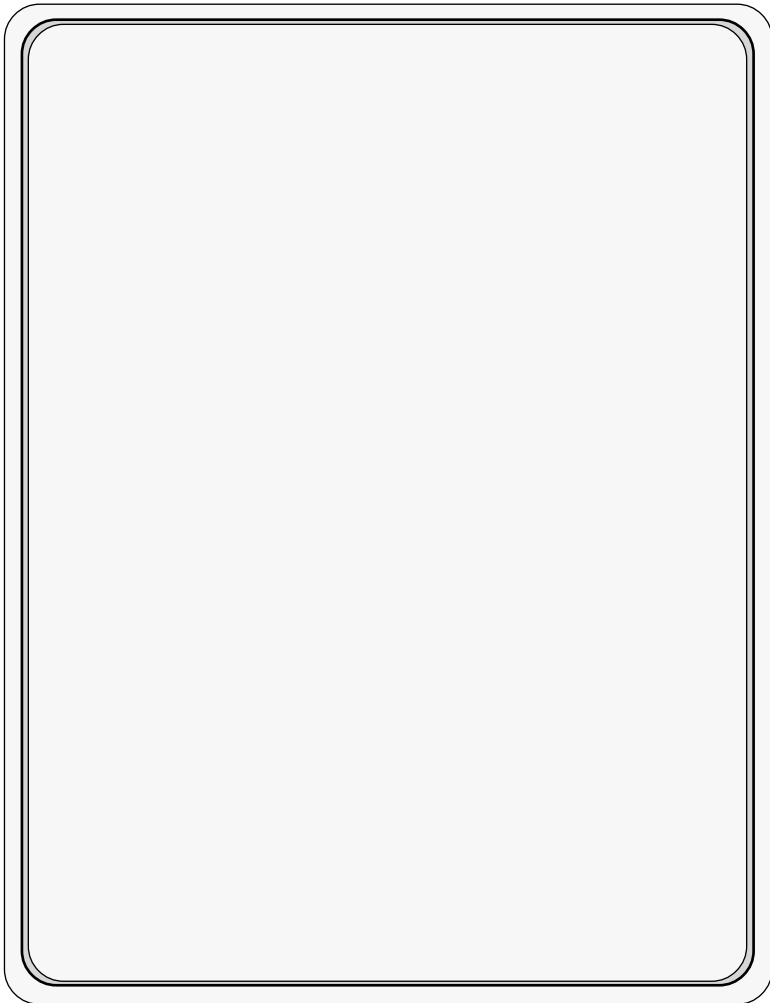
Chapter I V   Programming operation on FAB panel

There are two methods of programming for FAB, one is to complete editing of the function diagram directly on the operation panel of FAB using the keys, while the other is to do the same on the computer using the dedicated programming software QUICK II of FAB. Programming for FAB can be completed with either of the two methods. This Chapter will describe in detail how to use the operation panel of FAB to edit the Function Diagram Program and the programming method using QUICK II will be covered in detail in the second part of this manual.

As shown in the following figure, the operation panel of FAB is a simple man-machine interface and the program editing operation will be completed through the 8

keys on the right: ⬤ , ⬤ , ESC , OK , ◖ , ◗ , ⬤ , ⬤ .

The following rules shall be observed for programming operation on this panel:

1. When the cursor appears as an under line, it may be moved:

● Move the cursor along the lines with t, u, q and p keys;

● Press "OK" key to confirm selection of the input/output connection or the function block;

● Press "ESC" key to exit the programming input.

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

● Select the input/output or function block with q and p keys;

● Press "OK" key to confirm the selection;

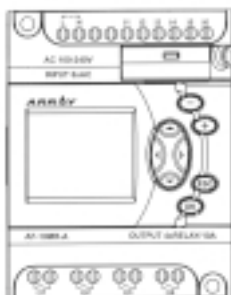● Press "ESC" key to return to the previous step.

Fig. 4.1

4.1 Switch-on

Connect the power line of FAB using the method as described in Chapter II. After power is on, LCD displays a frame as shown in Fig. 4.2, which is the Switch-on Frame. This frame will remain 2 ~ 3 seconds before it is automatically turned into the Status Display Frame. In the later frame:

the first line contains the Company Name and the controller's symbol;

the second line contains the time in the sequence of "hour, minute, second";

the third line contains the weekdays that are represented by their first two English letters;

the forth line contains the date in the sequence of "year, month, day";

The ex-factory date and time of FAB is the current date and time.

```
ARRAY-FAB
20:00:51
Day SA
2000/07/24
```

Fig. 4.2 Switch-on Frame of LCD

This frame will remain 2 ~ 3 seconds.

4.2 FAB status display

In 2 ~ 3 seconds after power of FAB is on, FAB Status Display Frame will be entered on the LCD.

4.2.1 Status Display Frame

As shown in Fig. 4.3 (10 points type):

the upper column I contains the status values of inputs 1 ~ 6

the lower column Q contains the status values of outputs 1 ~ 4

(in which "*" indicates ON, i.e. status "1"; " □ " ðindicates OFF, i.e. status "0".)

```
I: □ □ □ □ □ □
                    SA
Q: * □ □ □
       12:26:58
```
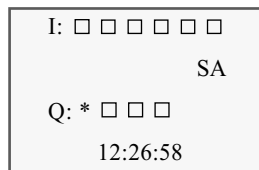
Fig. 4.3 Status Display Frame

4.2.2 Confirm password

By pressing ESC and OK simultaneously at the Status Display Frame as shown in Fig. 4.3, the user can enter the Confirm Password Frame, as shown in Fig. 4.4. Now it is required by FAB to input the password value. Now the cursor stays at a high digit of the password, where you can change the digit value (0~9) with "-" and "+" keys (when you initially press "-" or "+" key, the password value is 0). Then you can use " ¡ú" and " ¡û" keys to change the password input position and input the remaining digits of the password value. If a proper password is inputted, the Editor Frame as shown in Fig. 4.5 will be entered. If the password is incorrectly inputted for three consecutive times, the Status Display Frame as shown in Fig. 4.3 will be returned to.

Note: The ex-factory password of FAB is 0001.

```
┌─────────────────────┐
│    Verify           │
│    Users            │
│    Password:        │
│    XXXX             │
└─────────────────────┘
```

Fig. 4.4 Confirm Password Frame

4.3 Editor Frame

When the Editor Frame shown in Fig. 4.5 is entered, the user may use " ¡Ý" and " ¡ü" keys to move the arrow ">" on the left and press OK key to select the functions, with the following 4 options for selection:

Editor: edit program; the Select Edit Function Frame as shown in Fig. 4.6 will be entered when this function is selected;

FAB/Rom: read EEPROM command and write EEPROM command;

Set.. : setup of RTC real time clock and setup of password;

RUN: start running of FAB program.

```
┌─────────────────────┐
│    >Editor          │
│     FAB/Rom         │
│     Set..           │
│     RUN             │
└─────────────────────┘
```

Fig. 4.5

4.3.1 Editor (edit program)

When this function key is selected, FAB will enter the Select Edit Function Frame, as shown in Fig. 4.6. The user may use "¡ý' and "¡ü' keys to move the arrow ">" on the left and press OK key to select the functions.

Edit PRG: Input a function block FB (see 4.3.1.1);

Insert FB: Insert a function block FB into the existing program (see 4.3.1.2);

Delete FB: Delete a function block FB from the existing program (see 4.3.1.3);

Clear PRG: Delete the whole program.

```
>Edit Prg
 Insert FB
 Delete FB
 Clear
```
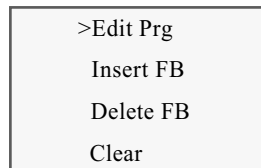
Fig. 4.6 Select Edit Function Frame

4.3.1.1 Edit PRG (input Function Block Menu)

The Edit PRG Menu Frame is as shown in Fig. 4.7 and the function blocks are to be selected under this menu.

● Select Function Blocks:

The user may use " ¡ý" and " ¡ü" keys to move the arrow ">" on the left and select the function blocks. Press OK key when a function block is selected and the Set Function Block Frame as shown in Fig. 4.8 will appear (please refer to Chapter III Function Block Sizes). 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.

```
>AND
 NAND
 OR
 NOR
 NOT
 XOR
```
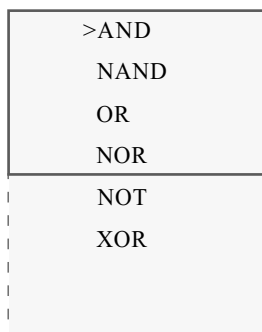
Fig. 4.7 Select Function Frame

● Set Function Block:

When Input Function Block is selected, FAB will automatically help you to define in sequence the numbers of the blocks beginning with "B" and display the said numbers in the bottom right corner (e.g. B01), as shown in Fig. 4.8.

The user may select the input/output and parameter values to be set up for the function block by moving " ¡Ÿ", " ¡ü", " ¡û", " ¡û" keys (please refer to Chapter III Function Block Sizes for the input/output/parameter values for different function blocks).

When Set Output/Input Pin is selected, press OK key to enter Set Parameter Status. The user may use " ¡û", " ¡û" keys to select the connection point type and operand for the said output/input, as shown in the top left corner of Fig. 4.8. First move the cursor to "I" in the top left corner with " ¡û", " ¡û" keys, change the type of the point to be connected with "-" and "+" keys and press OK to confirm it. Then increase or decrease the operand for the connection point with "-" and "+" keys (e.g. I0, I1, I2, etc.).

Note: The operands for different types of connection points have different ranges. It is I1 ~ I6 for I (input) and Q1 ~ Q4 for Q (output). Operands are not required for H (high), L (low) and X (empty). M means intermediate relays M001 ~ M100.
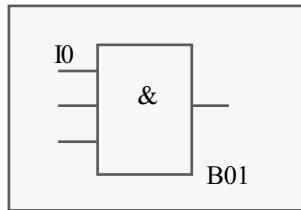
Fig. 4.8 Setting the parameter of function blocks

Described above are set up of basic function blocks. It is also necessary to explain setup of the operands for some special function blocks in the following.

1. Function blocks with timing function

   Function blocks with timers include:

   DPR: Delayed On Relay   CPG: Clock Pulse Generator

   DDR: Delayed Disconnection Relay   RPR: Retentive On Relay

   MPLR: Single Pulse Relay   CW: Clock Switch

   PLR: Pulse Relay

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

Fig. 4.9

   1st line: Block number and timing mark

   2nd line: time units-- HOU(Hour) , MIN(Minute),SEC(second)

   3th line: Setting integral place of time (00-99)

   4th line: Setting decimal place of time(00-99)

2. Function blocks with counting function include:

UCN: Up Counter

DCN: Down Counter.

When the pin parameter PAR is set, the following frame will appear on the LCD:

```
B01: Count
00: B1
00: B2
00: B3
```

Fig. 4.10

the 1st line contains the block number and timing mark

the 2nd line contains the high digit of the count value

the 3rd line contains the second-high digit

the 4th line contains the low digit.

You may set the parameters in turn, as required, by pressing ⬆ and ⬇ to move the cursor and select the parameters and pressing ⊕ and ⊖ to change the value.

3. Set parameters for the Clock Switch

1) As the date system D is selected, the following will be displayed on LCD:

```
Day
D    2000,00,00
T1   000000
T2   000000
```

Fig. 4.11

the 1st line contains date system

the 2nd line contains year, month and day

the 3rd line contains the output ON time

the 4th line contains the output OFF time.

2) As the weekday system W is selected, the following will be displayed on LCD:

```
Week
            SU
```
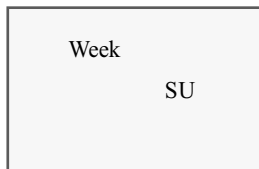
Fig. 4.12

MO represents Monday

TU represents Tuesday

WE represents Wednesday

TH represents Thursday

FR represents Friday

SA represents Saturday

SU represents Sunday

MO-TH represents Monday to Thursday

MO-FR represents Monday to Friday

MO-SA represents Monday to Saturday

MO-SU represents Monday to Sunday

FR-SU represents Friday to Sunday

SA-SU represents Saturday to Sunday.

After the type of the week system is selected, press the ESC key to select the timing and the following will be displayed on LCD:

Week	
D	2000,00,00
T1	000000
T2	000000

Fig. 4.13

the first line contains the week system

the second line contains year, month and day

the third line contains the output ON time

the forth line contains the output OFF time.

4. Set the Telephone Block

When the Telephone Block is selected, the following will be displayed on LCD. Set the input on the left of the block first, move the cursor to the output on the right and press OK key.
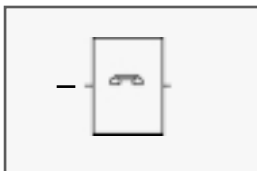
Fig. 4.14

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

Phone Code
_0000000000
0000000000
00000

Fig. 4.15

Set each digit of the telephone number in turn by pressing ⬤, ⬤, ◗, ◗ keys to

move the cursor and select the digit of the telephone number and pressing ⬤ , ⬤

to change the value. After the number is set, move the cursor to the last digit of the set

number and press ⬤ to exit the frame.

4.3.1.2 Insert FB

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

1. Press OK at ">Insert FB" in the Editor Frame and the insert status is entered, as shown in Fig. 4.16.

<div style="text-align:center">

Insert:

_10

</div>
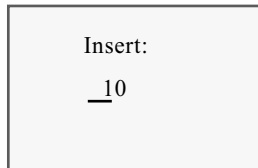
Fig. 4.16 Insert Function Block

2. After the number of the function block to be inserted (e.g. 3, 6, 10……) is inputted at the cursor position as shown in Fig. 4.16, press "OK" and the Select Function Block Frame is entered. A corresponding function block will be inserted when it is selected and 1 will be automatically added to the numbers of all the function blocks following the inserted one.

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" at ">Delete FB" in the Editor Frame and the delete status is entered, as shown in Fig. 4.17.
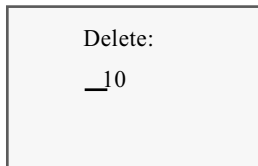
Delete:
__10

Fig. 4.17 Delete Function Block

2. After the number of the function block to be deleted (e.g. 10) is inputted at the cursor position as shown in Fig. 4.17, press OK and function block B10 is deleted. 1 will be automatically subtracted from the numbers of all the function blocks following B10.

4.3.2 FAB/Rom (Read/Write Program)

There are three options in Select FAB/Rom Frame, as shown in Fig. 4.18.

>FAB¡úRom
Rom¡úFAB
FAB-Addr
Modem
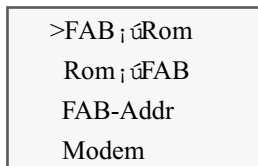
Fig. 4.18

FAB¡úRom: write the program to EEPROM

Rom¡úFAB: read the program in EEPROM

FAB-Addr: view or modify FAB address

MODEM: initialize MODEM.

4.3.3 SET (set password and time)

The SET Frame is as shown in Fig. 4.19. A password can be set for the FAB function program edited by you through this SET Frame. When you want to modify the control function, the said password shall be properly inputted before the edit modification status can be entered (note: the ex-factory password of FAB is 0001). This function is the password lock function of FAB.
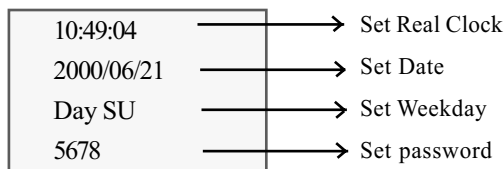

Fig. 4.19 Set Password Frame

4.4 Edit FAB function program

During editing of FAB function program, special attention need be paid to how to observe the programming rules and apply the intermediate relays, how to use FAB's operation key panel with LCD to edit the FAB function program and how to write the edited FAB function program to the EEPROM of FAB.

4.4.1 Programming rules

Rule 1: Before the circuit is inputted, the complete circuit diagram shall be made on a drawing with the necessary intermediate relays (M) to be marked, or the FAB circuit diagram shall be drawn directly with QUICK II, with the sequence numbers of the blocks to be adjusted next according to Rule 2 and Rule 3.

Rule 2: The circuit is always inputted from input to output, with the cause first and result next. The block sequence number of the cause block must be smaller than that of the result block. The number of a block without causal relation shall be greater than that of an irrelevant one.

Example:

Cause block B03
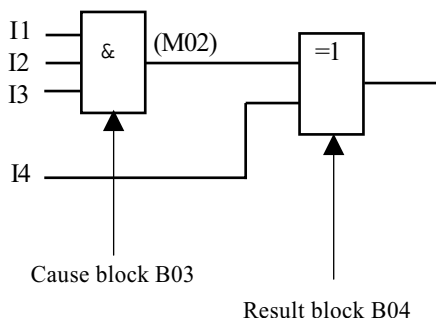
Result block B04

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

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

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

Rule 6: The circuit shall be inputted under programming mode and the programming mode can be entered by pressing of ESC and OK keys at the same time.

4.4.2 Intermediate relay

There is a very important bridge in FAB programming, which is the intermediate relay. The intermediate relay of FAB is similar to that in the relay control system. It can store some intermediate status and then transfer it to a block requiring this status for input. Using of intermediate relays has two advantages:

1. The Q terminal of the previous block can be used as the input signal for different blocks;

2. When a block is inserted or deleted, the original logical relation can be retained.

No intermediate relay is provided for other products of the same category. The basic functions of the intermediate relay are as shown in the following figure:
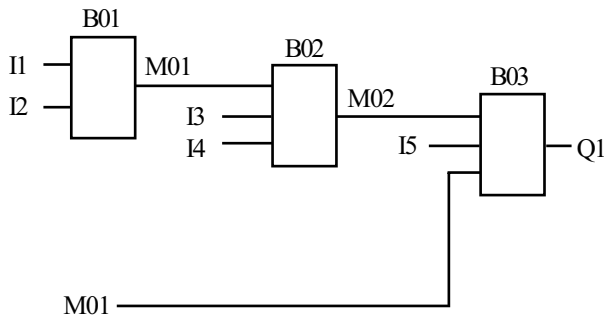
In the above figure, the output status of B01 may not only be used directly as the input of B02 block, but also be stored by M01 and then used as the input of B03.
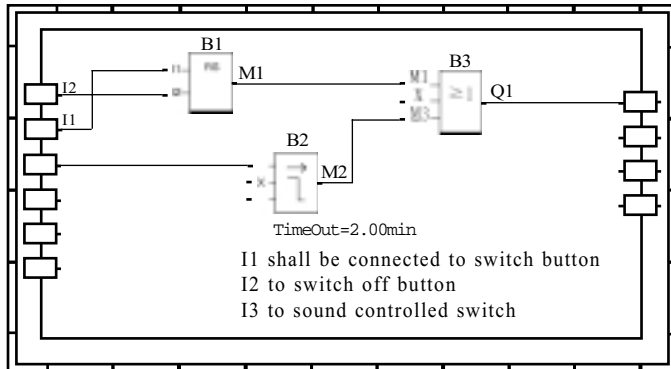
4.4.3 Edit program

Take the stair lighting system for an example, with the following control requirements:

1. When the switch button is pressed, the light will be turned on and kept normally on;

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

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

TimeOut=2.00min
I1 shall be connected to switch button
I2 to switch off button
I3 to sound controlled switch

The following procedure shall be followed for editing of the said control function with FAB operation panel:

In case a user program already exists in FAB:

Step 1: Enter FAB Editor Frame

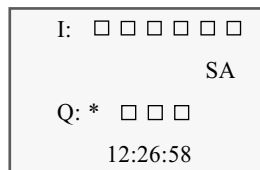   1. In 2 ~ 3 seconds after switch-on, the following will be displayed on LCD:

I: □ □ □ □ □ □

                        SA

Q: * □ □ □

        12:26:58

Fig. 4.20

2. After ⬭ᴱˢᶜ and ⬭ᴼᴷ are pressed simultaneously, the Confirm Password Frame is entered, when the cursor will stay at the highest digit of the password and the following will be displayed on LCD:

```
┌─────────────────────┐
│  Verify             │
│  Users              │
│  Password:          │
│  _XXXX              │
└─────────────────────┘
```

Fig. 4.21

3. Input the password, with the password assumed as 2165;

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

- press right moving key ◖ and the cursor will move one digit to the right for the second digit of the password value to be inputted;

- press ⊕ once and the second digit of the password value will become 1;

- press ◖ and the cursor will move one digit to the right for the third digit of the password value to be inputted;

- press ⊕ 6 times and the third digit of the password value will become 6;

- press ◖ and the cursor will move one digit to the right for the last digit of the password value to be inputted;

- press ⊕ 5 times and the last digit of the password value will become 5.

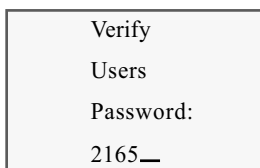After the password is completely inputted, the following will be displayed on LCD:

```
Verify
Users
Password:
2165▂
```

Fig. 4.22

4. Press (OK) to enter the Select Edit Function Frame, with the selection mark ">"
staying at Editor function. The following is displayed on LCD:

```
>Editor
 FAB/Rom
 Set..
 RUN
```

Fig. 4.23

Step 2: Edit Function Diagram

1. Press (OK), to select Editor and the Function Block Selection List is entered. The
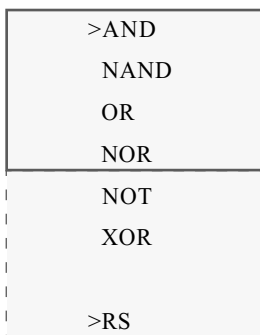following is displayed on LCD:

```
>AND
 NAND
 OR
 NOR
 NOT
 XOR

>RS
```

Fig. 4.24

2. Select and set the first function block:

● move ⬇ to the position of RS relay with 🔘 and press OK to enter the Set Function Block Status, when the cursor will stay at the highest input pin. The following will be displayed on LCD:
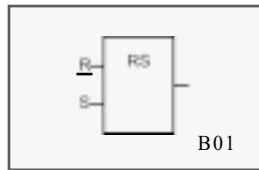

Fig. 4.25

● Press 🔘 and the Set Parameter Status of R pin input will be entered. 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" and may continue with the same till "M". It means that the user may select any parameter among I, Q, H, L, C, P and M by pressing 🔘. After "I" is selected, the following will be displayed on LCD:
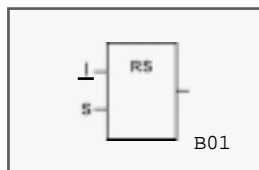

Fig. 4.26

● Then it is necessary to set the parameters, namely to set the values with ⊕, ⊖ . For example, if I1 is to be set up, just press 🔘 key when I1 is displayed, as shown in Fig. 4.27 (the variation range of I is I0 ~ I12).
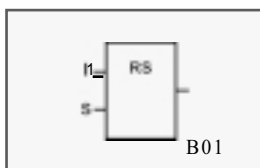
Fig. 4.27

● Press ⬇ to move the cursor to S and press ⬭OK⬮ to set the S pin input. Select "I"

first and then set it to I2 with the same method as for I1, except for pressing

⬭+⬮ once. The following will be displayed on LCD:

Fig. 4.28

● 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 M1 with ⬭+⬮, ⬭−⬮, press

⬭OK⬮ again. The following will be displayed on LCD:

Fig. 4.29

Now, all the three pins of the RS relay function block are set.

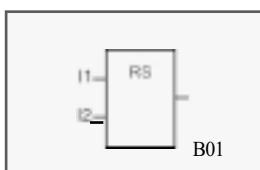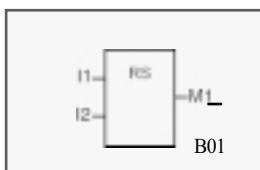3. Select and set the second function block

- Press ⬤ 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 ⬤.Now you can set the parameters for the function block. The following will be displayed on LCD:
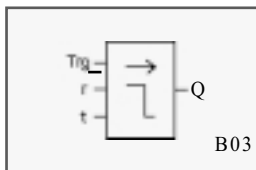
Fig. 4.30

- Press ⬤ to enter Set Trg Pin Parameter Status. Select "I" in the parameter list with "⬤, ⬤" and press ⬤. Then set Trg to I3 with "⬤, ⬤". The following will be displayed on LCD:
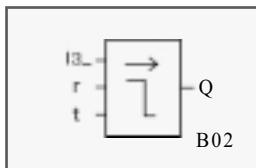
Fig. 4.31

- Press ⬤ to move the cursor to position R and press ⬤ to set the r input parameter status. After selecting "X" in the parameter list, press ⬤ to set the parameter X. The following will be displayed on LCD:
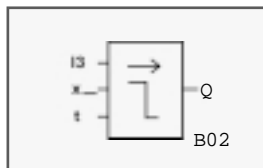
Fig. 4.32

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

B02: Time
Hou: Unit
02:   Int
00:   M

Fig. 4.33

● Press **OK** to enter the Select Time Unit Status. Now the options can be changed
   with ➕, ➖ . When "min" appears, press **ESC** to set the time unit to minute.
   The following will be displayed on LCD:

B02: Time
Min: Unit
02:   Int
00:   M

Fig. 4.33

● Press ⬇ to set the time integer digit and use ➕, ➖ to change the value. When "min" appears, press ⎋ to set the integral number for timing to 02.

● Press ⬇ to set the time decimal digit and use ➕, ➖ to change the value. When "min" appears, press ⎋ to set the decimal number for timing to 00. Now the time is set to 2 minutes.

● Press ▸ to move the cursor to position Q, press ⏺ . Set Q to M02 and then press ⏺ again. The following will be displayed on LCD:
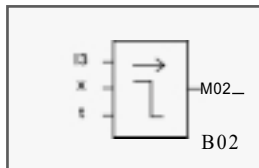
Fig. 4.35

4. Select and setup the third function block

Press ⎋ 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 ⏺ . Now you can set the parameters for the third function block. The following will be displayed on LCD:
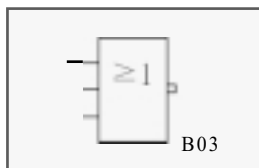
Fig. 4.36

● Press ⬭ to enter the set first input parameter status. Select parameter M with

⬭, ⬭ and set the parameter value with ⬭, ⬭. When M01 appears, press

⬭ and the first parameter will be set to M1. The following will be displayed on LCD:
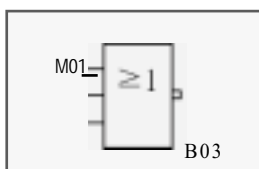
Fig. 4.37

● Press ⬭ to move the cursor to the second input parameter and press ⬭. Now

the second input parameter can be set. After selecting X with ⬭, ⬭ and pressing

⬭ , the same input is set to X. The following will be displayed on LCD:
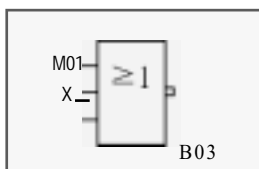
Fig. 4.38

● Move the cursor to the third input pin and press ⬭.

● After selecting M in the parameter list, press ⬭ and set the same input to M2

with ⬭, ⬭ . The following will be displayed on LCD:
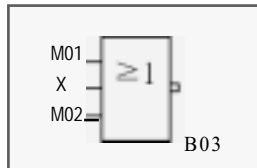
Fig. 4.39

● Move the cursor to the output pin with ◀ and press ▣▣;

● After selecting Q in the parameter list, press ▣▣ and set the same output pin

to Q1 with ➕, ➖ . The following will be displayed on LCD:
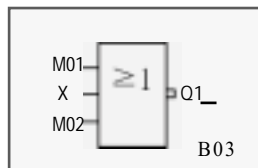
Fig. 4.40

Now all the three function blocks required for editing of this function diagram are

selected and set up, which means that the Function Diagram is completely edited.

Step 3: Write the program

1. After the second step is finished, press ▣▣ twice consecutively to return to the

Select Function Frame. The following will be displayed on LCD:

```
>Editor
 FAB/Rom
 Set..
 RUN
```
Fig. 4.41

2. Move ">" to FAB/Rom and press ████. The following will be displayed on LCD:

```
>FAB¡úRom
 Rom¡úFAB
 FAB-Addr
 Modem
```
Fig. 4.42

3. Move the cursor to Rom¡úFAB and press ████. Now the program can be written
   to FAB.

Chapter V Remote programming and monitoring

5.1 Remote programming and monitoring through MODEM

FAB can realize ultra-remote programming and monitoring function through MO-
DEM. If you need to program or monitor an FAB on a worksite kilometers away or
even to do the same between two cities, this function of FAB will just satisfy your
requirement.

After connecting FAB, AF-C232 (or AF-MUL), AF-M232 and MODEM (refer to
5.2 for details of the connection diagram), switch on the power and MODEM will
automatically complete the initialization. If MODEM is not initialized, you may
press OK on the MODEM menu under FAB/ROM of LCD programming interface to
initialize it.

Connect the MODEM to a PC provided with QUICK II or FAB-SCADA and make
connection with FAB by dialing through the PC the telephone number connected to
FAB. Now remote programming and monitoring can be carried out.

Note: AF-M232 is merely one modified from a standard DB9 1 DB9. It is only necessary
to connect the internal 4 1 6, 2 1 3, 3 1 2, 5 1 5, 4 1 6, 9. You may buy our
company's AF-M232 product or make it by yourself.

The Cable Connection Diagram for AF-M232 is as follows:

to FAB side   to MODEM side
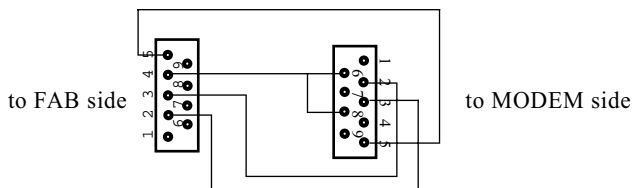
5.2 Two connection methods for FAB remote programming and monitoring

5.2.1 Connect MODEM by means of AF-C232 and AF-M232

For connecting with this method, you need to purchase the following parts: AF-C232, AF-M232. The connection diagram is as follows:
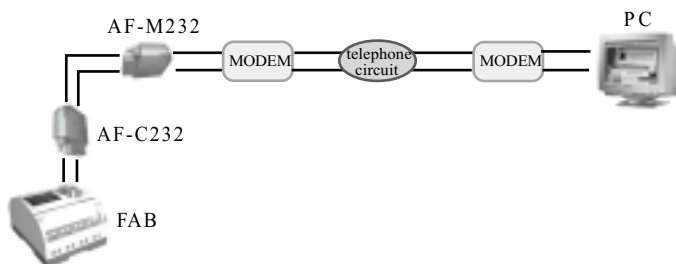
5.2.2 Connect MODEM by means of AF-MUL

If you have purchased the telephone voice multi-function block, it is not necessary to have AF-C232. The connection diagram is as follows:
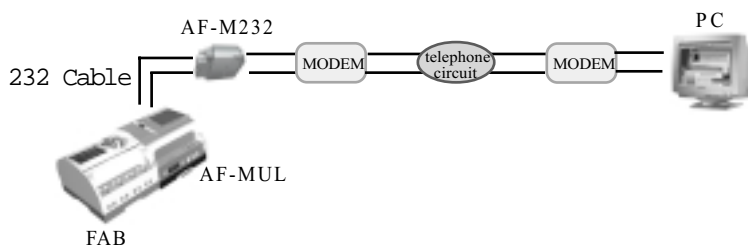
Chapter VI Technical specifications

6.1 General technical specifications

Item	basis	conditions
Climate environment		
ambient temperature	cold: IEC68-2-1, hot: IEC68-2-2	
Horizontal installation		0 ~ 55 ¡æ
vertical installation		0 ~ 55 ¡æ
Storage/transportation		-40 ¡æ~ +70 ¡æ
Relative humidity	IEC68-2-30	5%~95%,without condensation
Atmospheric pressure		795 ~ 1080hpa
Pollutants	IEC68-2-42	H2Slcm3/m3, 4days
	IEC68-2-43	SO210cm3/m3, 4days
Mechanical environment		
protection type		IP20
Vibration 2	IEC68-2-6	10~57Hz (constant amplitude 0.15mm)
		57~150Hz (constant acceleration 2g)
Impact	IEC68-2-27	18 impacts (semi sine 15g/11ms)
Fall	IEC68-2-31	falling height 50mm
Freely falling body (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	2kV for power line
	severe grade 3	2kV for signal line
IEC/VDE safety information		
Dielectric strength	IEC1131	meeting the requirement

6.2 AF-10MR-A / AF-20MR-A

Power Supply	AF-10MR-A AF-20MR-A
Allowable range of 8 input voltage rating	115V/120V/230V/240VAC
VDE0631:	85V ~ 250VAC
IEC1131:	85V ~ 256VAC
Allowable main frequency	47 ~ 63Hz
40 ¡æ clock buffer memory	Undetermined
Real time clock accuracy	Typical ¡Ã5s /day
Power consumption	AF-10MR-A (3W)
	AF-20MR-A (5W)
Data Capacity Input	
Input Voltage L1	
Signal 0	0V ~ 40VAC
Signal 1	79V ~ 256VAC
Input Current	Typical 0.24mA
Signal 1	at 230VAC
Delay Time	
Changed From 1 to 0	Typical 50ms
Changed From 0 to 1	Typical 50ms
Length of Power Line (without shield)	100m
Data Capacity Output	Yes
Output Type	Relay Output
Electrical Isolation	yes
Group	1
Continuous Current Ith	max. 10A
Incandescent Lamp Load	1000W (230/240VAC)
(25,000 switch cycles)	500W (115/120VAC)

Fluorescent Light Tube With Electrical Controller (25,000 Switch Cycles)	10 x 58W (230/240VAC)
Fluorescent Light Tube With Regular Compensation (25,000 Switch Cycles)	1 x 58W (230/240VAC)
Fluorescent Light Tube Without Compensation (25,000 Switch Cycles)	10 x 58W (230/240 VAC)
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. 20mA Feature B16
Switch Frequency	
Mechanical	10Hz
Resistor Load / Lamp Load	2Hz
Induced Load	0.5Hz

6.3 AF-10MT-D / AF-20MT-D

Power supply	
Input Voltage Rating Allowable Range	24VDC 20.4V ~ 28.8VDC
24VDC Power Consumption (Output Full Load)	Typical 1.23A
	Typical 0.6W
Data Capacity Input	
Input Voltage 24VDC Rating Signal 0 Signal 1	24VDC <5.0V >15.0VDC

Input Current for Signal 1	Typical 3mA
Delay Time	
Changed from 1 to 0	Typical 50ms
Changed from 0 to 1	Typical 50ms
Length of Power Line (Without Shield)	100m
Data Capacity Output	
Output Type	Crystal Tube Current Source
Output Voltage	Power Supply Voltage
Output Current	Max. 0.3A
Short Circuit Protection and Overload Protection	Yes
Short Circuit Current Limit	Approximately 1A
Rating Reduction	Rating Not to Be Reduced in the Whole Temperature Range

6.4 Telephone Number Receive and Transmit and Voice Block (Optional)

Index	Conformity
Automatic Receive	CCITT-DTMF
Automatic transmit	CCITT-DTMF
Voice Record and Play	Max. 98 segments, Each with Arbitrary Length (20s~16min)

6.5 AF-10MR-D   AF-20MR-D

Power Supply	
Input Voltage	
Rating	24V DC
Allowable Range	20.4 ~ 28.8VDC
Power Consumption of AF-10MR-D / AF-20MR-D at 24VDC	Typical 1.5W
Data Capacity Input	
Input Voltage	24VDC
Rating	24VDC
Signal 0	<5.0V DC
Signal 1	>15.0V DC
Input Current for Signal 1	Typical 3mA
Delay Time	
Changed from 1 to 0	Typical 50ms
Change from 0 to 1	Typical 50ms
Length of power line (Without Shield)	100m
Data Capacity 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
Output Parallel Increased Power	Not Allowed
Output Relay Protection	Max. 20mA Feature B16
Switch Frequency	
Mechanical	10Hz
Resistor Load/Lamp Load	2Hz
Induced Load	0.5Hz

Chapter VII Application

FAB has a very wide application range. In order to let the users understand the wide application space of FAB and the convenience brought by using of FAB, we will show some common and representative control schemes herein. After you have read these application examples, you will realize how simple and easy it is to use FAB to satisfy your automatic control requirements, especially in a system requiring time control and in automatic control of intelligent living quarters.

7.1 Control of school bells or factory bells

Control requirements:

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

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

Analysis:

To realize the above control, 11 time segments of control are necessary from Monday to Friday and 6 time segments of control are necessary on Saturday and Sunday. In the relay control used in the past, a lot of delay relays are needed and the line connection is quite complicate. But with FAB, all these will become very simple. Please refer to the function diagram for realization of the control, as shown in the following figure. There is only one line section for its required external connection, which means that you can realize the timing control of the school bell only by connecting one output of FAB directly to the bell. The program diagram is as follows:
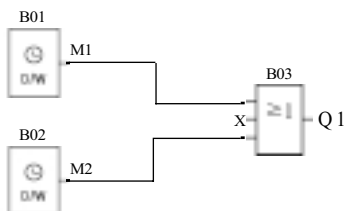
When FAB is used for the above control, it is very simple both in connection of external line and editing of program. Especially when QUICK II programming software is used for editing the control program, it is only necessary to set two time switch blocks.

7.2 Telephone alarm

This function is a special function of FAB that makes it different from other products of the same category. When the telephone alarm function of FAB is used, as long as the alarm conditions are available, the system will automatically dial 119 alarm telephone or the mobile telephone number of the user. It can be easily realized through such household control systems as the burglar alarm or gas leakage alarm systems.

Requirements:

1) In case of such emergencies as burglar alarm, fire alarm and so on, FAB will automatically dial the designated alarm telephone (e.g. 110, etc.) or the mobile telephone number of the user;

2) In case of such emergencies as burglar alarm, fire alarm and so on, FAB will give voice alarm (to be provided in the house or in the monitor center);

3) In case of gas leakage alarm, the alarm lamp will flash and the exhaust fan will be turned on.

The Function Program Diagram is as follows:
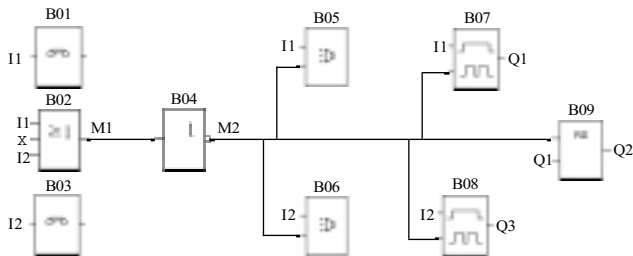
7.3 Multi-function switch for lighting of stair, hall or corridor

Requirements:

1) Lighting shall be turned on when the switch button is pressed and shall be automatically turned off when the 3 preset minutes have elapsed;

2) lighting flashes for 5 seconds before automatic disconnection;

3) lighting shall be normally on when the switch is pressed twice;

4) lighting shall be turned off when the switch is held pressed for more than 2 seconds;
5) lighting shall be automatically turned on at 6:30PM and off at 6:30AM every day.

The Function Block Program Diagram is as follows:
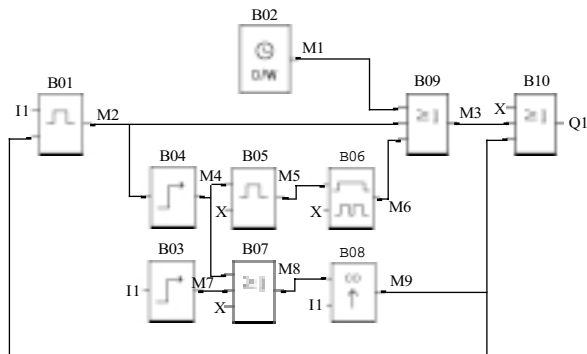
7.4 Automatic gate control requirements:

1. Opening and closing of the gate shall be controlled by the guard in the control room;

2. Normally the gate shall be opened or closed completely, but the opening and closing action can be interrupted at any time;
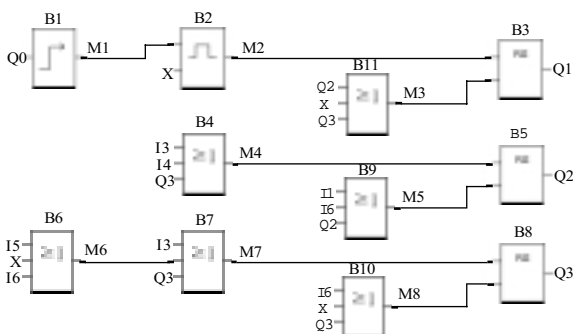
3. The alarm lamp shall begin to flash when the gate acts and shall keep flashing as long as the gate continues to move;

4. A pressure damper shall be provided so that the gate can be automatically opened when it touches a person or an article.

The Function Block Program Diagram is as follows:

Note:

Q1 shall be connected to the flashing lamp; Q2 to the contactor of open-gate motor; Q3 to the close-gate motor contactor;

I1 to the open-gate switch; I2 to the close-gate switch; I3 to the stop switch; I4 to the open-gate limit switch; I5 to the close-gate limit switch; and I6 to the safety pressure damper.

7.5 Ventilation system

Requirements: The ventilation system shall be able both to send fresh air into the room and to exhaust the waste gas out of the room;

1. Waste gas exhaust unit and fresh air forced-draft unit shall be installed in the room;

2. The ventilation system shall be controlled by the control monitor;

3. No over atmospheric pressure is allowed in the room at any time;

4. The fresh air forced-draft unit can not be put into service until the flow monitor indicates that the waste gas exhaust unit is in normal operation;

5. If case of any fault in the ventilation system, the alarm lamp shall be on.

The Function Block Program Diagram is as follows:
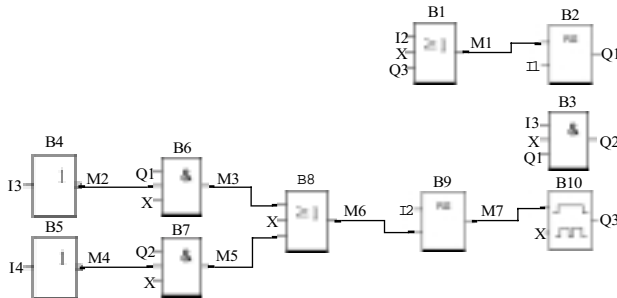
Note:

Q1 shall be connected to the contactor of waste gas exhaust unit;

Q2 to the contactor of the fresh air forced-draft unit;

Q3 to the fault alarm lamp;

I1 to the activate exhaust switch;

I2 to the stop exhaust switch;

I3 to the waste gas flow monitor;

I4 to the fresh air flow monitor.

7.6 Control requirements for neon lamp control system:

1. Display mode, for example: Array Electronics Welcomes You !

   1.1 Displaying "Array"

   1.2 Displaying "Array Electronics"

   1.3 Displaying "Welcomes You!"

   1.4 Displaying "Array Electronics Welcomes You"

   1.5 Displaying "Welcomes You!"

   1.6 Displaying "Array Electronics"

   1.7 Cycling   1.1 ~ 1.6

2. Control requirements

   1) The neon lamp shall be automatically turned on at 18:00 and off at 24:00 every day;

   2) The control can be switched over with the manual/automatic/off selection switch:

      Manual: The neon lamp control system can be activated through the manual switch at any time;

      Automatic: The neon lamp control system can be automatically activated when the clock switch or light sensitive switch triggers the output;

      Off: The neon lamp system shall be switched off as the manual/automatic/off selection switch is pressed twice and switched on as it is pressed for the third time;

   3) The light sensitive switch shall be provided to complement the time switch so that the lamp will be automatically turned on when the light is weak and off when the light is sufficient;

   4) Rain detector: On a rainy day, the neon lamp system shall be automatically switched off;

   5) Over (under) voltage detector: The system will be automatically switched off when the operating voltage of the neon lamp is too high or too low.

3. Input/output assignment

   I1 rain detector;

   I2 over (under) voltage detector;

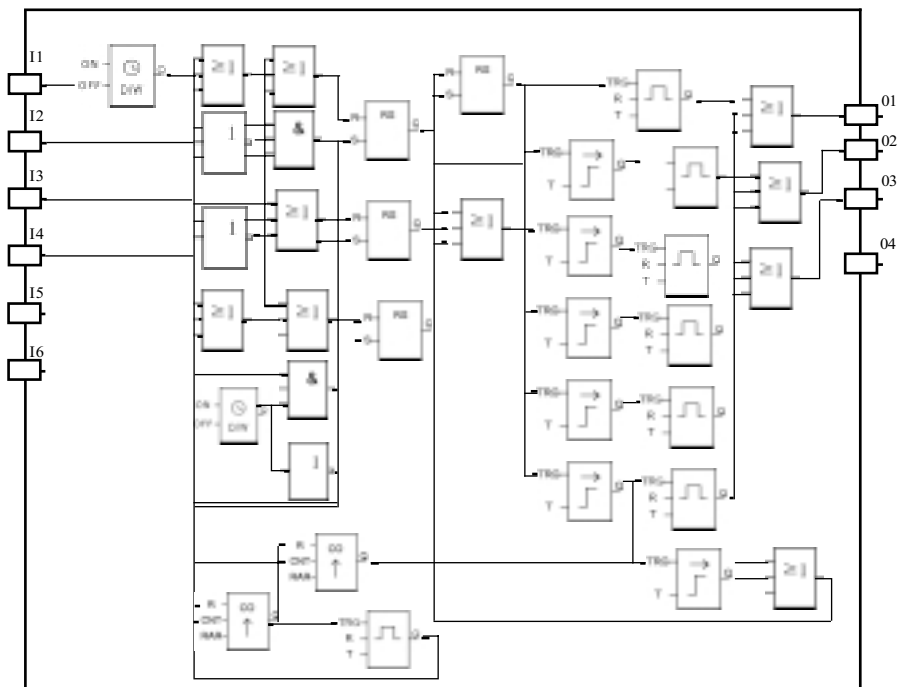   I3 light sensitive switch;

   I4 manual/ automatic/off selection switch;

   Q1 to be connected to the enable terminal of "Array" segment;

   Q2 to the enable terminal of "Electronics" segment;

   Q3 to the enable terminal of "Welcome You!" segment.

   Following is the Function Block Program Diagram:

7.7 Display window lighting system

Control requirements:

1. Basic lighting for display period:

a) Time:

Monday to Friday   8:00~22:00;

On Saturday   8:00~24:00;

On Sunday   9:00~20:00;

b) Automatic on/off: the light can be automatically turned off to maintain the minimum illuminance and the focus lamp when it is on and can be automatically turned on to maintain the same when it is off.

2. Additional night lighting requirements:

a) Time:

Monday to Friday   light sensitive switch is triggered at 22:00 ;

On Saturday   light sensitive switch is triggered at 24:00;

On Sunday   light sensitive switch is triggered at 20:00 ;

b) Light sensitive switch triggering/ automatic off: the light can be automatically turned off to maintain the minimum illuminance and the focus lamp when it is on and can be automatically turned on to maintain the same when it is off.

3. Maintaining minimum illuminance and focus lamp in non-display period:

a) Minimum illuminance shall be maintained and the focus lamp shall be automatically turned on when the show time ends and the basic lighting and additional night lighting are turned off.

4. Test switch:

All lamp groups can be tested when the test switch is pressed.

The Function Block Program Diagram is as follows:
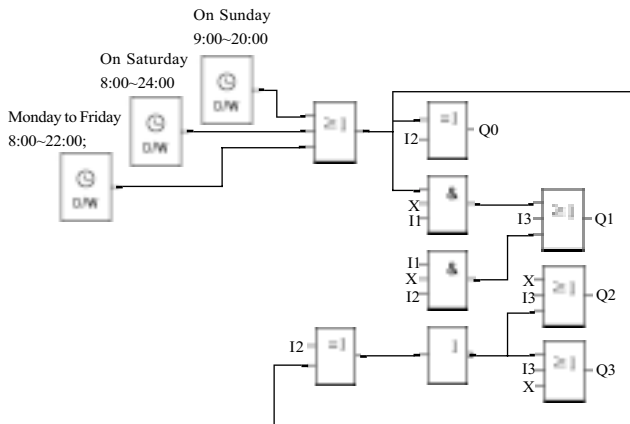
Note:

I1 shall be connected to the light sensitive switch;

I2 to the auto/manual selection switch;

I3 to the test switch;

Q1 to the basic lighting for display period;

Q2 to the additional night lighting within display period;

Q3 to the minimum illumination maintained during non-display period;

Q4 to the projection light for special commodities in non-display period.

7.8 Application of FAB in building management

Control requirements:

1. Automatic reading of various meters: the watt-hour meter, water meter and gas meter can be read automatically;

2. Fire protection and anti burglar functions can be realized;

3. Start and stop of relevant electrical appliances can be controlled.

FAB can flexibly satisfy the automatic building control requirements of sophisticated intelligent living quarters and can realize central monitor and control.

1) FAB central control communication connection
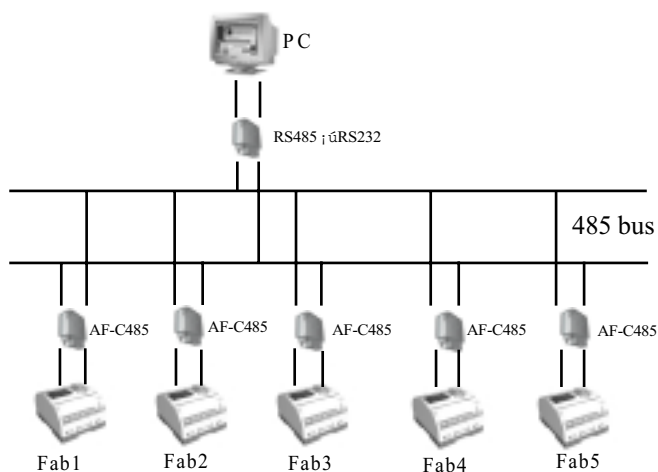
2) Assignment of FAB input/output points.

I1 shall be connected to the temperature transducer and Q0 shall be connected to the air conditioner so that the air conditioner is controlled by the temperature;

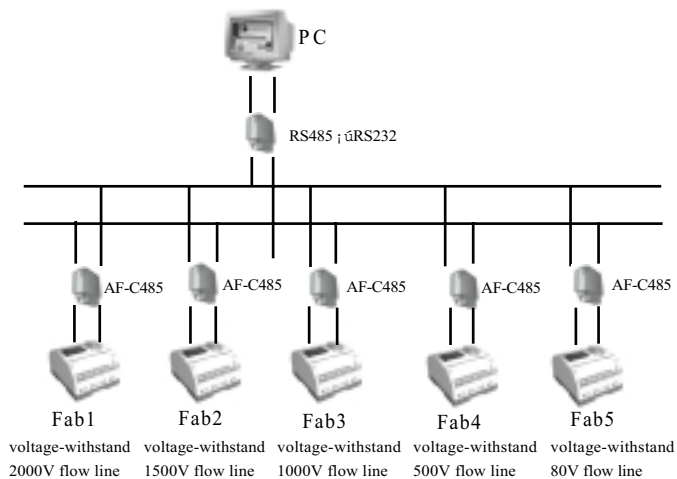I2 shall be connected to the fire detector for alarm of fire;

I3 shall be connected to the gas detector transducer, Q1 shall be connected to the ventilation equipment and Q2 shall be connected to the alarm so that the ventilation equipment is controlled by the air status;

I4 shall be connected to the door/window probes for activation of alarm;

I5 shall be connected to the water meter, while I6 shall be connected to the watt hour meter.

7.9 Application of FAB in a withstand voltage diode counting and packing flow line

The PC Flow Line Central Control System Diagram is as follows:

Fab1	Fab2	Fab3	Fab4	Fab5
voltage-withstand 2000V flow line	voltage-withstand 1500V flow line	voltage-withstand 1000V flow line	voltage-withstand 500V flow line	voltage-withstand 80V flow line

Control requirements and configuration:

1. Control of 2000V withstand voltage counting flow line, to be completed by FAB1

   1) I5 is used for counting the diodes entering the flow line (automatically giving the sum of the diodes to be tested);

   2) I6 is used for counting of diodes with 2000V withstand voltage;

   3) Q1 is used for labeling of diodes with acceptable withstand voltage;

   4) Q2 is used for enclosing of diodes already labeled;

   5) If the counting value of I6 is multiples of 1000, Q3 will be switched on to start the packing equipment;

   6) Diodes that can not withstand 2000V voltage shall be transferred to 1500V flow line.

2. Control shall be completed by FAB2 for 1500V withstand voltage flow line, by FAB3 for 1000V withstand voltage flow line, by FAB4 for 500V withstand voltage flow line and by FAB5 for 80V withstand voltage flow line. The control requirements and configuration are the same as mentioned above.

3. Monitoring of all FAB's can be realized by installation of monitoring software FAB-SCADA on PC. Each FAB answers through bus 485 the instructions from PC, including diode counting and input/output (I/O) status of FAB; PC will display each acquired FAB data on the screen and can provide data storage and inquiry functions, to allow prompt analysis of the counting of different withstand voltage diodes.