

Chapter 7 Test Run, Monitor and Maintenance

Warning

Turn off the power to the PLC before connecting any terminal on the PLC, or before plugging in or removing components (such as extension cable, program memory etc) during maintenance. Otherwise, you may cause electrical shock, short circuit, or risk damaging the PLC, or causing error action on the PLC.

7.1 Inspection Prior to First Time Power Up after Completion of Installation

1. Clean all wire chips, screws and debris before power on. Peel off the dust proof film cover on the ventilation grid on the side of the PLC.
2. Confirm the specifications of the input power and the installed PLC in case of AC power supply, remember to connect the live (L) to "L" terminal of the PLC, neutral (N) to "N" terminal of the PLC. Electrical shock or serious damage may be caused to the PLC or other equipment in case of wrong power connections such as DC feed power or wrong AC supply lines.
3. Confirm the consistency between the load power and installed PLC output component, damage or error action will result if you apply AC power to the transistor output of the PLC, or DC power to TRIAC output.
4. Confirm the consistency between the SINK/SOURCE polarity of DC24V input or transistor output and your wiring, error matching may cause failure of PLC input and damage to output circuit.

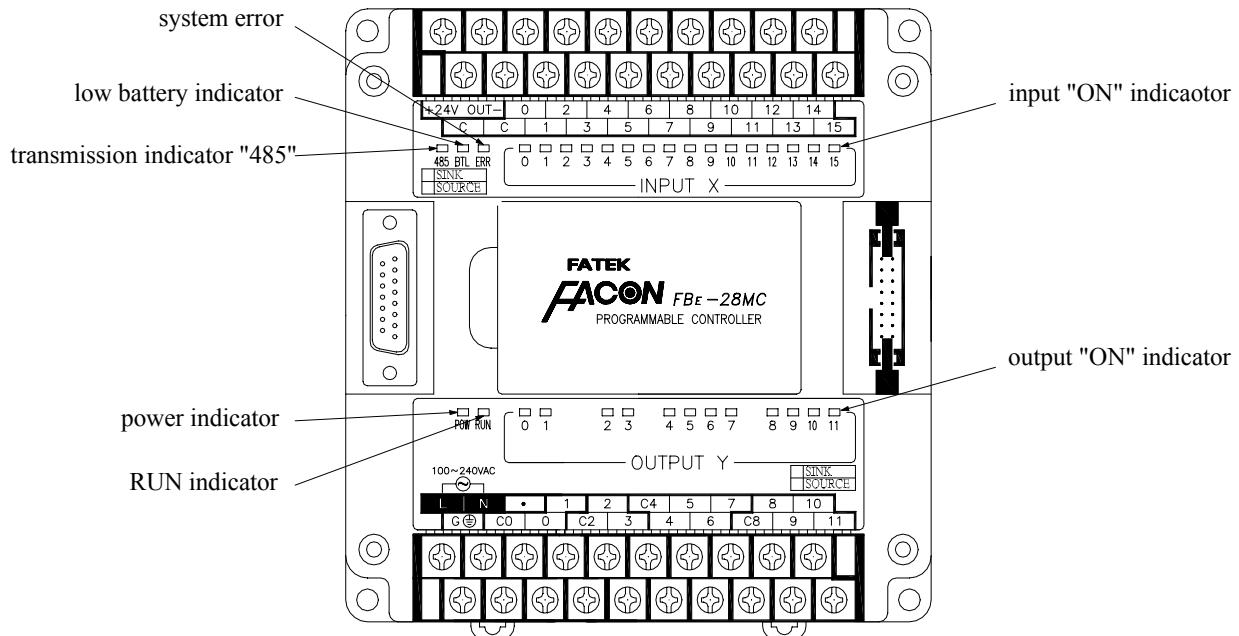
7.2 Operational Test and Monitoring

FB-PLC provide the functional ability to disable all inputs or outputs one by one or as a whole, i.e. though the PLC perform actual program scanning operation and I/O update action, it will not update the disabled input status according to actual external condition, and send no actual output result of execution to disabled outputs, instead it sets the status of the input or output point as forced by the user, in order to perform simulation of action. The user uses the disable function match with monitor function to simulate the input or output via FP-07 or PROLADDER, and observes the consequence of its algorithm, and enable all inputs and outputs to resume to normal operation for correct operation. Please refer to paragraph 2.2 "Fundamental Function Section" for the description of RUN/STOP PLC, disable/enable I/O contact and monitor I/O status or operation of the contents of the registers.

Warning

Disable function is to detach the normal program control of the input or output point of PLC and allow the user (tester) to force the setting of the input or output point by switching them to ON or OFF freely. During normal operation of the PLC, care should be taken while forcing input or output points concerning safety (such as upper and lower limit detection input or emergency stop output). This is necessary in order to avoid damage to machinery or equipment or human injury.

7.3 LED Indicator on PLC Panel and Determination of its Abnormality



Power indicator "POW"

1. After powering up the PLC, the "POW" LED located at lower left of the PLC will come on if the power mains match with the wiring, this indicates normal supply of power. If the LED fails to come on, try to temporarily remove the wiring of DC24V output power for sensors. If the LED lights up, it indicates that the power load of DC24V sensors is too large, and have caused the PLC feed power circuitry to enter the low voltage protection mode. In this case, an external DC24V power supply should be used. (The LED doesn't come on and "hissing" sound can be heard if the PLC enters the low voltage output protection mode. This can also determine whether the DC24V output is overload or shorted)
2. If the above method failed to make the "POW" LED come on and you are sure that there is correct power input on L, N (AC) PLC power input terminals or +, - (DC), then the power supply may be malfunctioning.

Running indicator "RUN"

This LED remains ON while the PLC is in the RUN mode. The PLC stays in the STOP mode while ex-factory. If you intend to make the PLC enter the RUN mode or return to the STOP mode, you must execute this command via the FP-07 hand-held programmer or the PROLADDER software from the PC. Once the PLC is set to RUN or STOP, the status will be maintained it will also resume after power interruption. The only exception is when the ROM PACK is used, the PLC will enter RUN status automatically whenever power to the PLC is resumed regardless it was in RUN or STOP state before power interruption. The PLC will enter STOP state automatically if error happened (such as WDT timer action, program error) during normal operation of the PLC, and the "ERR" indicator light comes on if this error is attributed to a secondary fault (such as occurrence of WDT or temporary interference). The RUN status will be resumed by recycling power. In case of a major error, the cause of error should be resolved first and then the PROLADDER Software should be used to run the PLC. If you fail to make the PLC enter the RUN mode, please send it to the nearest dealer for repair.

Error indicator "ERR"

1. The "ERR" LED comes on together with the "POW" LED at the instant of power up, but goes off after 0.5 second. If the "ERR" LED light stays on constantly, it indicates PLC failure. If it is blinking, it indicates that there comes the error in the main unit (such as watchdog time-out error, program error or system error.)
2. If the "ERR" LED lights on constantly, please turn off the power and then switch it on again. If it remains on then it indicates CPU hardware failure and send for repair.
3. The PLC is unable to communicate or perform any action under constantly red error light on condition; if it is blinking, connecting with FP-07 handheld programmer or PROLADDER software executing in PC to acquire error code in order to determine the error condition. The other way to identify the errors described below:
 - a. The "ERR" LED is flickering with 0.25Hz (ON 2 seconds and OFF 2 seconds alternately), it means watchdog time-out error. Please turn off the power and then switch it on again, or check the ladder program whether there is endless loop or the scan time of PLC exceeding the setting of watchdog time-out timer.
 - b. The "ERR" LED is flickering with 1Hz (ON 0.5 seconds and OFF 0.5 seconds alternately), it means ladder checksum error. Please turn off the power and then switch it on again, or check whether the battery low or the unexpected error while programming.
 - c. The "ERR" LED is flickering with 10Hz (ON 0.05 seconds and OFF 0.05 seconds alternately), it means system error. Please turn off the power and then switch it on again, or check the ladder program whether there is illegal RTS or RTI instruction destroying the system stack.

Low battery indicator "BTL"

Power on the PLC, the "BTL" LED will not come on if the lithium battery of the PLC main unit is normal, but the "BTL" will come on if the battery is exhausted and lead to insufficient voltage, and the battery voltage is low and activating internal relay M1928 of the PLC. The battery can be used for one more month after the "BTL" comes on, the program of the PLC or the data in the battery backup RAM may disappear or become scrambled if this condition exceeds one month and after power has been interrupted. Thus, the battery should be replaced as soon as possible. But the effect of this indicator is minimal in actual applications since the PLC is usually installed in the control box, and the lifetime of the battery is unpredictable with large time variations and one may not be able to notice the "BTL" LED when it comes on. So, it is a bad practice to replace the battery by relying on the "BTL" indicator. (Refer to section 7.4 for correct replacement procedure).

RS-485 transmission indicator "485" (MC model only)

The RS-485 is the third communication port of the MC main unit, there is no display of "485" indicator during receiving, but display (comes on) only when the PLC performs 485 data transmission. Because the RS-485 can have multi-drop connections, but only one unit can perform transmission at a time, and all others perform receiving, i.e. only "485" light of one PLC unit will come on in any instant. Thus operation of each station can be easily monitored via this indicator. The light intensity is constant (current), but the time of light on is consistent with transmission data. Thus, visually, the light duration is higher if the transmitted data is large and the transmission speed (bps) is lower, and the light duration is lower if the data is less and in high speed. If the light does not come on at all, confirm whether the program is accessing this PLC station. If it is accessing the station but still doesn't come on, please check the hardware wiring if it is inserted firmly, correct polarity of twisted pairs (D+ to D+, D- to D-), or check wire terminators.

Input indicator "Xn"

When the external input Xn is ON, the corresponding LED Xn indicator comes on, gone in contrast. Check the wiring terminal for good contact or measure the voltage at Xn and common point "C" if the indicator doesn't correspond to the real input condition. It should be consistent with the input ON/OFF conditions and should present about 0V/22V voltage variation when checked with a voltmeter. If the indicator doesn't correspond to the external input condition, it indicates faulty input circuit to the PLC or LED failure and you may use the monitoring mode of the PROLADDER to monitor whether the status of this input point is consistent with the external input in order to determine the cause of defect.

Output indicator "Yn"

When the status of output Yn is ON, the corresponding output indicator Yn will come on and make the external load ON. Check the wiring terminal for good contact if the indicator doesn't correspond to the external output condition or the ON/OFF indicator. If the contact is correct and good, then there is failure in the output component of the PLC. The major causes of failure in the output components of the PLC are: (1) overload or short circuit causing output component of the PLC to become constantly opened or closed, (2) no overload, but the inrush current of a capacitive load caused the contact of the relay to become permanently ON, or has destroyed the TRIAC. (3) no overload, but there is a conductive load without adding an appropriate snubber to it.

7.4 Maintenance

The suggested maintenance for the user during operation of the FB-PLC is only replacement of the Lithium battery. For other defects, please replace the complete board, and send the defected part to your local dealer for repair.

Time to replace battery

⚠ Caution

The program and the data in the PLC memory may be lost if the battery is not replaced within one month after the low battery indicator "BTL" comes on. Please follow the following methods to replace the battery, we recommended the second method below.

The life span of the lithium battery varies and depends on the surrounding environment (mainly the ambient temperature), energy consumption, type of internal memory used inside the PLC, and whether an RTC is installed. The variation of battery life is between 5 and 10 years or more. There are two methods for timing battery replacement: (1) regularly replace in three years' interval, (2) continuously check the status of M1928 relay which captures the battery low indication in the program (the status will be ON when the battery is low). When M1928 is ON, alert the user to replace the battery by sounding an output alarm, or send a message from the PLC to a computer or a human-machine interface. This makes use of the battery full life and avoids potential problems in frequent battery replacements that may cause data and program loss from memory.

Replacement procedure of the battery

1. Remove the small cover plate at the center of PLC.
2. Take out the old battery from battery holder and remove it from socket.
3. Place in the new battery and insert back into its holder. Complete steps 1 & 2 within one minute if the operation is performed under power off condition to the PLC power Supply. Otherwise do the same under power to the PLC.
4. Replace the small cover.

⚠ Warning



Never re-charge, disassemble, heat, or discard the used battery into fire. It may cause explosion, fire, or other hazard. The internal substance of the battery may cause environmental pollution, do not discard arbitrarily, please dispose according to local or national regulations for waste battery disposal.