

Chapter 4 Power Supply Wiring and Power Calculations




There are AC and DC power inputs for FB-PLC power supply. The code on all main unit and expansion unit that is followed by a “D” tail code, indicates that the internal power supply needs a DC input power, otherwise it needs AC power.

4.1 Precautions in AC Power Specifications and Wiring

Item		Specification
Input range	Voltage	100~240VAC , -15%~+10%
	Frequency	50~60Hz , -5%~+5%
Rated power		30VA (max.)
Inrush current		20A @ 264VAC
Voltage drop and interruption		20ms (min.)
Fuse rating		2A , 250VAC
Power outputs	5VDC (for main unit)	5V , ±5% , 1A (max.)
	24VDC (for output and expansion)	24V , ±15% , 400mA (max.)
	24VDC (for input and Sensor)	24V , ±15% , 400mA (max.)
Isolation		Transformer/optical , 1500VAC/1min.

Caution

The main unit and expansion unit wiring for the power supply are as illustrated keeping the following in mind:

1. Please follow the local or national standards for wiring regulations using single cut switch (cut off live “L”) or double cut switch (cut off both “L” and “N”) to turn ON or OFF the AC input power.
2. The live “L” should be connected to the  terminal on the unit, and the neutral “N” to  terminal on the unit. The wire diameter should be 1mm² to 2mm².
3. The main unit and all  terminals of all expansion units/modules should connect to EG (Earth Ground) terminal of the main power system. The conductive wire diameter should be more than 2mm², for more details you might refer to the drawing below.
4. For all units equipped with AC power supply, there are two sets of separated DC24V output power, one of them is used for output circuit and expansion module (comes out of the extension connector), the other is for use in input circuit and external sensors (comes out from terminals at input side). For the output current capacity refer to section (4.3) about calculation of power capacity.

Warning

The output power used by sensors should not be connected in parallel to other power sources, this will cause conflict between the two sets of power supply and shorten the life span of both of them or produce immediate damage, resulting in unpredictable error action of the PLC that may cause death hazard or loss in property and equipment.

- Ⓐ : DC24V power for input circuit and external sensors
- Ⓑ : DC24V power for output circuit and expansion module

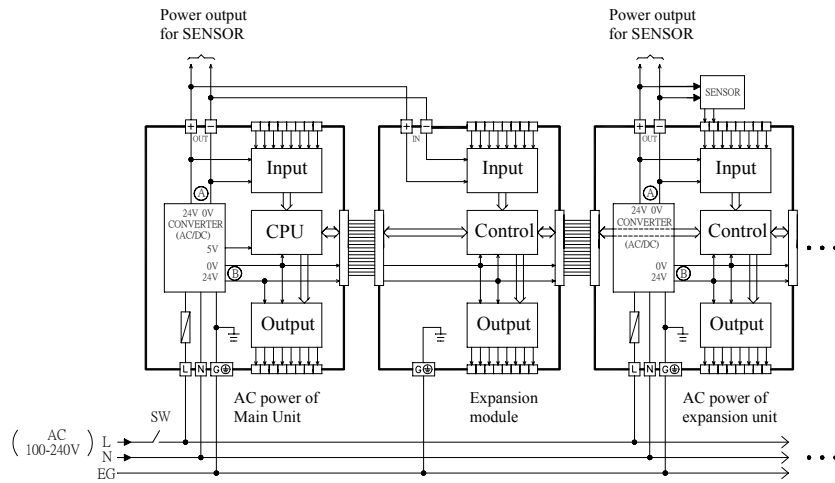


Illustration of 100~240VAC power input wiring

4.2 DC Power Specifications and Wiring Precautions

Item		Specification
Input voltage		24VDC , -15% to +20%
Rated power		18VA (max)
Inrush current		20A @ DC24V
Voltage drop and interruption		20ms (min)
Fuse		3A , 250V
Output power	5VDC (for main unit)	5V , ±5% , 1A (max.)
	24VDC (for output and expansion)	24V , ±15% , 400mA (max.)
Isolation		Transformer/optical, 1500VAC, 1min.

⚠ Caution

The main unit and expansion unit wiring for the power supply are as illustrated keeping the following in mind:

- Please follow the local or national standards for wiring regulations using single cut switch (cut off "24V+") or double cut switch (cut off both "24V+" and "24V-") to turn ON or OFF the DC input power.
- The DC24V+ should be connected to the \oplus terminal on the unit, and the DC24V- to \ominus terminal on the unit; the wire diameter should be 1mm^2 to 2mm^2 .
- The main unit and all $\text{G}\oplus$ terminals of all expansion units/modules should connect to EG (Earth Ground) terminal of the main power system. The conductive wire diameter should more than 2mm^2 , for more details you might refer to the drawing below.
- For all units equipped with DC power supply, there is a 24VDC output power for output circuit and expansion module (comes out of the extension connector), the power for input circuit and external sensors directly comes from the external DC power supply. For the output current capacity refer to section (4.3) about calculations of power capacity.

- Ⓐ : DC24V power for input circuit and external sensors (directly from external power supply)
- Ⓑ : DC24V power for output circuit and expansion module

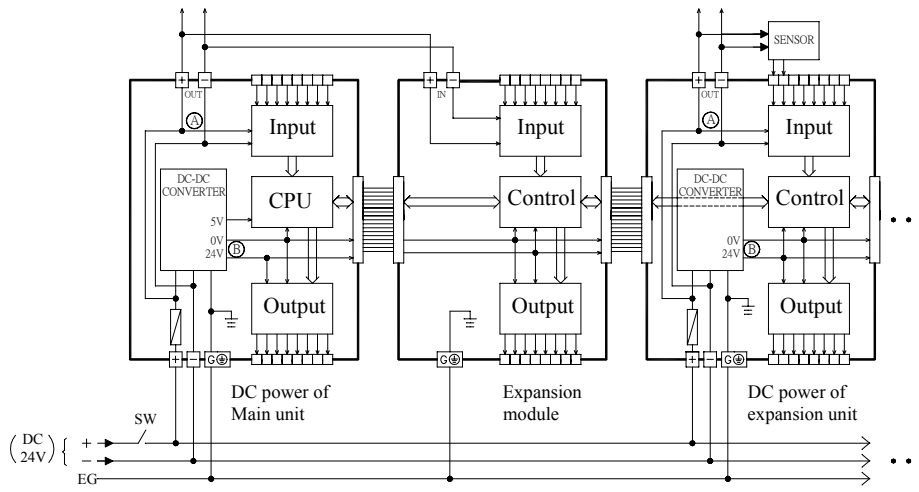



Illustration of 24VDC power input wiring

4.3 Calculations of Allowable Current Capacity of Main/Expansion Unit, and Current Consumption of Expansion Modules

As stated above, the main unit and expansion unit are both provided with power supply; in addition to their own usage, there are extra capacity of power for input circuit and external sensors, and output circuit and expansion module. Followings are the ratings of current provided by the main unit/expansion unit and the max. current consumption of expansion modules.

 Caution	
<p>When the main unit/expansion unit is attached to the external sensors or expansion module, regardless of the connections, the DC24V power supply used by input circuit and external sensors, or the other DC24V power supply used by output circuit and expansion module, the max. total current consumption should not exceed the allowable current capacity listed in paragraph 4.3.1, otherwise the power supply may enter protective mode due to overload and lower its voltage rating and resulting in unexpected action of the PLC, and may cause human casualty or loss of equipment or property.</p>	

4.3.1 Allowed Current Capacity of Main/Expansion Unit

Current capacity			24VDC power supply for external sensors	24VDC power supply for output circuit and expansion module
Model				
AC power supply (100~240 VAC)	Main unit	FBE -20M△ FBN -19M△	320mA	320mA
		FBE -28M△ FBN -26M△	280mA	280mA
		FBE -40M△ FBN -36M△	240mA	240mA
	Expansion unit	FB-28EAP	320mA	320mA
		FB-40EAP	280mA	280mA
	Expansion power supply	FB-EPOW	400mA	400mA
	DC power supply (24VDC)	Main unit	FBE -20M△-D FBN -19M△-D	Directly comes from the external DC24V power supply; $\leq 400\text{mA}$
FBE -28M△-D FBN -26M△-D			280mA	
FBE -40M△-D FBN -36M△-D			240mA	
Expansion unit		FB-28EAP-D	320mA	
		FB-40EAP-D	280mA	
Expansion power supply		FB-EPOW-D	400mA	

4.3.2 Current Consumption of Expansion Modules

Model		Input circuit	Output or Control circuit
Current consumption			
Digital expansion module	FB-28EA	112mA	124mA
	FB-40EA	168mA	168mA
	FB-32EX	225mA	30mA
	FB-8EA	30mA	20mA
	FB-8EX	56mA	20mA
	FB-8EY	—	80mA
	FB-48EAT	168mA	60mA
	FB-48EX	336mA	60mA
	FB-48EYT	—	60mA
Special expansion module	FB-7SG1	Please refer to chapter 17 of "Advanced Function Section"	20mA
	FB-7SG1		20mA
	FB-6AD	80mA	20mA
	FB-2DA	60mA	15mA
	FB-2AJ(K)4	80mA	20mA
	FB-2AH(T)4	80mA	20mA
	FB-4AJ(K)12	80mA	20mA
	FB-4AJ(K)18	85mA	20mA
	FB-4AJ(K)24	90mA	20mA

Because there is no power supply in the expansion module itself, therefore the circuit power supply regardless if input circuits, or output and control circuits are supplied externally. This includes, the power supply of input circuit supplied by "DC24V INPUT" terminal on top of the expansion module, and the power supply of output and control circuit supplied directly from "expansion connector" at left of module.

The current consumption listed in the table above is the max. consumable current (assuming that all input points and output points are "ON", (its input current consumption based on 7mA for every "ON" input, 9 mA for every "ON" output, and 1.2mA for every "ON" output of high density) of each expansion module.