

FULTEK

FULMATIC 7 – SILVER SERIES PLC

PLC USER'S MANUAL

A. GENERAL FEATURES

Fulmatic 7 - Series PLCs are the programmable control devices which are designed according to the automation needs by considering the tough conditions of the industry. Fulmatic 7 - Silver Series PLCs are offered with 2 different memory options, 32KB and 115KB. All PLCs include Ethernet, Modbus TCP and minimum 1 RS485 Modbus RTU connection as well as webserver feature. In Fulmatic PLCs, entire memory can be used for program or persistent variables (Data blocks). Additionally Flag (1024 byte) exists as temporary variable. Inputs that are not connected to the device (max. 1024 bytes) and outputs (max. 1024 bytes) can also be used as temporary variables.

Feature table:

Description	Order Code	Memory	Webserver	Ethernet	Serial Port	Digital Input	Digital Output	Analog Input	Analog Output
CPU 100	SC-10808-00-00	32 Kb.	Yes	Yes	1x Rs485	8x 50 KHz.	8x 20 KHz. 0.5 Amp.	No	No
CPU 100F	SC-10808-20-00	32 Kb.	Yes	Yes	1x Rs485	8x 200 KHz.	8x 655 KHz. 0.1 Amp.	No	No
CPU 100R	SC-10808-40-00	32 Kb.	Yes	Yes	1x Rs485	8x 50 KHz.	8x Relay 2 Amp.	No	No
CPU 101	SC-11410-00-00	32 Kb.	Yes	Yes	1x Rs485	8x 50 KHz.	8x 20 KHz. 0.5 Amp.	6x 12 Bit.	2x 12 Bit.
CPU 101F	SC-11410-20-00	32 Kb.	Yes	Yes	1x Rs485	8x 200 KHz.	8x 655 KHz. 0.1 Amp.	6x 12 Bit.	2x 12 Bit.
CPU 101R	SC-11410-40-00	32 Kb.	Yes	Yes	1x Rs485	8x 50 KHz.	8x Relay 2 Amp.	6x 12 Bit.	2x 12 Bit.
CPU 102	SC-11210-00-00	32 Kb.	Yes	Yes	2x Rs485	8x 50 KHz.	8x 20 KHz. 0.5 Amp.	4x 12 Bit.	2x 12 Bit.
CPU 102F	SC-11210-20-00	32 Kb.	Yes	Yes	2x Rs485	8x 200 KHz.	8x 655 KHz. 0.1 Amp.	4x 12 Bit.	2x 12 Bit.
CPU 102R	SC-11210-40-00	32 Kb.	Yes	Yes	2x Rs485	8x 50 KHz.	8x Relay 2 Amp.	4x 12 Bit.	2x 12 Bit.
CPU 200	SC-20808-00-00	115 Kb.	Yes	Yes	1x Rs485	8x 50 KHz.	8x 20 KHz. 0.5 Amp.	No	No
CPU 200F	SC-20808-20-00	115 Kb.	Yes	Yes	1x Rs485	8x 200 KHz.	8x 655 KHz. 0.1 Amp.	No	No
CPU 200R	SC-20808-40-00	115 Kb.	Yes	Yes	1x Rs485	8x 50 KHz.	8x Relay 2 Amp.	No	No
CPU 201	SC-21410-00-00	115 Kb.	Yes	Yes	1x Rs485	8x 50 KHz.	8x 20 KHz. 0.5 Amp.	6x 12 Bit.	2x 12 Bit.
CPU 201F	SC-21410-20-00	115 Kb.	Yes	Yes	1x Rs485	8x 200 KHz.	8x 655 KHz. 0.1 Amp.	6x 12 Bit.	2x 12 Bit.
CPU 201R	SC-21410-40-00	115 Kb.	Yes	Yes	1x Rs485	8x 50 KHz.	8x Relay 2 Amp.	6x 12 Bit.	2x 12 Bit.
CPU 202	SC-21210-00-00	115 Kb.	Yes	Yes	2x Rs485	8x 50 KHz.	8x 20 KHz. 0.5 Amp.	4x 12 Bit.	2x 12 Bit.
CPU 202F	SC-21210-20-00	115 Kb.	Yes	Yes	2x Rs485	8x 200 KHz.	8x 655 KHz. 0.1 Amp.	4x 12 Bit.	2x 12 Bit.
CPU 202R	SC-21210-40-00	115 Kb.	Yes	Yes	2x Rs485	8x 50 KHz.	8x Relay 2 Amp.	4x 12 Bit.	2x 12 Bit.



Fulmatic 7 - Silver Series PLCs can be programmed with ladder method via Speed Plc program. Please visit our website for more information. Although the Speed Plc is paid software for other platforms, you can use it freely with Fultek brand PLCs.

B. USAGE AND SAFETY

GENERAL FEATURES	
Supply Voltage & Power Consumption	– 24V DC %15 tolerance band – 2,4W power consumption (standby)
Digital Input / Output	8 digital input and 8 digital output.
Analog Input / Output	There is a different number of analog inputs and outputs according to the CPU model.
RS 485	According to the CPU model, there is 1 or 2 Rs485 ports with 1200-230400 bps speed range. Modbus RTU support.
Ethernet	10/100 MBit Full duplex, DHCP support, WebServer support (10 socket), TCP Modbus support(5 socket)
WebServer	512KB file space for webserver
Program Cycle Time	Max loop speed 65KHz.
I/O Capacity	[1] 512 Analog Input and 512 Analog Output or, [2] 8192 Digital Input ve 8192 Digital Output
RTC	Real time clock (Runs 30 days without electricity.) Accuracy temperature 25°C ±100 Ms./Day
Working Conditions	-20 +60 °C / %5-95 Humidity



Security Notes



PLC must be de-energized before wiring. Wiring must be done in accordance with the connection diagram.



Sections of the cables that connect to terminals should be taken into consideration. The cables to be connected must be used by stripping them to the point where they can enter into the terminal. It should be noted that excessively stripped cables may come into contact with cables in other terminals.

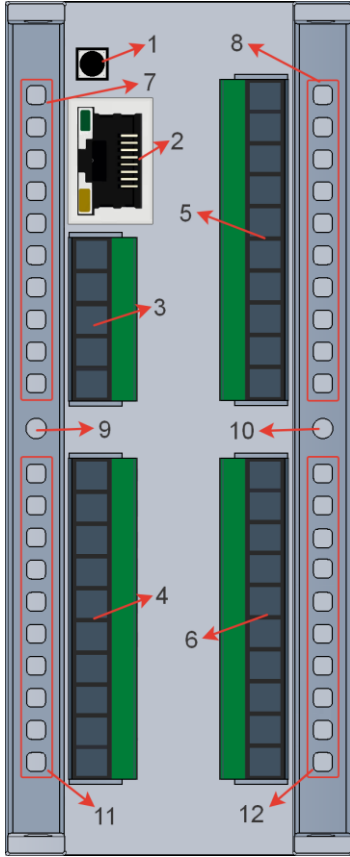


When the power is on, removing and installing the cables in the terminal, adding and removing the expansion modules can cause damage to the PLC.



Please read the instructions in the manual before energizing the device.

C. FRONT VIEW



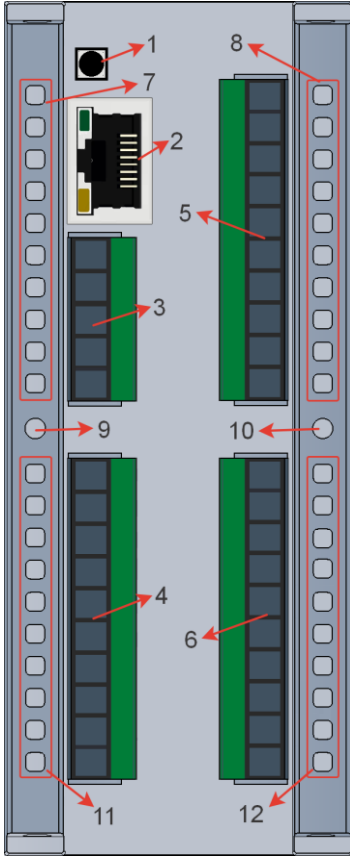
No	Connection Point	Description	
1		PLC Run/Stop Button	
2	Ethernet	Socket	10/100M Full duplex Ethernet Connection Point
		Green Led	Ethernet Link led
		Yellow Led	Ethernet Communication led
3	xA.0 Connection	1	+24V supply
		2	COM0 RS485 A endpoint
		3	COM0 RS485 B endpoint
		4	0V supply endpoint
		5	Ground endpoint
5	xB.0 Connection Terminal	1	+24V terminal supply
		2	I 0.0 input
		3	I 0.1 input
		4	I 0.2 input
		5	I 0.3 input
		6	I 0.4 input
		7	I 0.5 input
		8	I 0.6 input
		9	I 0.7 input
		10	0V terminal supply
6	xB.1 Connection Terminal	1	+24V terminal supply
		2	Q 0.0 output
		3	Q 0.1 output
		4	Q 0.2 output
		5	Q 0.3 output
		6	Q 0.4 output
		7	Q 0.5 output
		8	Q 0.6 output
		9	Q 0.7 output
		10	0V terminal supply

No	Connection Point	Group-1 Description	Group-2 Description	Group-3 Description
4	xA.1 Connection Terminal	1	----	0V supply
		2	----	Analog Input 0
		3	----	Analog Input 1
		4	----	Analog Input 2
		5	----	Analog Input 3
		6	----	Analog Input 4
		7	----	Analog Input 5
		8	----	Analog Output 0
		9	----	Analog Output 1
		10	----	0V supply

*Group-1: For CPU 100, CPU 100F, CPU 100R, CPU 200, CPU 200F, CPU 200R.

*Group-2: For CPU 101, CPU 101F, CPU 101R, CPU 201, CPU 201F, CPU 201R.

*Group-3: For CPU 102, CPU 102F, CPU 102R, CPU 202, CPU 202F, CPU 202R.



Group No	Connection Point	Description	
7	sA.0 Led Block	1	PLC Run Led
		2	Fault Led
		3	----
		4	----
		5	----
		6	----
		7	COM0 TX led
		8	COM0 RX led
		9	----
		10	Power on Led
8	sB.0 Led Block	1	RUN Led
		2	I 0.0 input led
		3	I 0.1 input led
		4	I 0.2 input led
		5	I 0.3 input led
		6	I 0.4 input led
		7	I 0.5 input led
		8	I 0.6 input led
		9	I 0.7 input led
		10	Power on Led
12	sB.1 Led Block	1	Power on Led
		2	Q 0.0 output led
		3	Q 0.1 output led
		4	Q 0.2 output led
		5	Q 0.3 output led
		6	Q 0.4 output led
		7	Q 0.5 output led
		8	Q 0.6 output led
		9	Q 0.7 output led
		10	PLC Stop led

No	Connection Point	Group-1 Description	Group-2 Description	Group-3 Description
11	sA.1 led block	1	----	Power On Led
		2	----	----
		3	----	----
		4	----	----
		5	----	----
		6	----	----
		7	----	----
		8	----	----
		9	----	----
		10	PLC Stop Led	PLC Stop Led

*Group-1: For CPU 100, CPU 100F, CPU 100R, CPU 200, CPU 200F, CPU 200R.

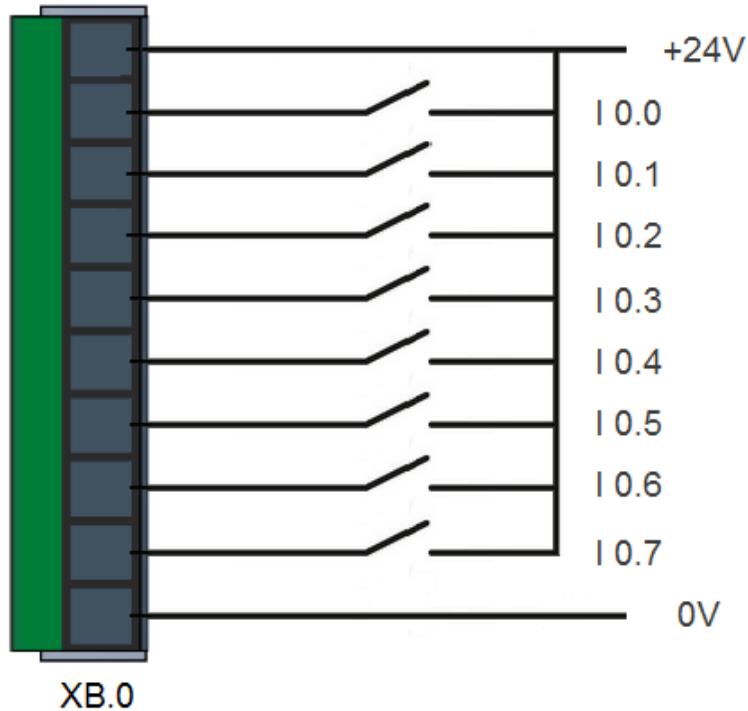
*Group-2: For CPU 101, CPU 101F, CPU 101R, CPU 201, CPU 201F, CPU 201R.

*Group-3: For CPU 102, CPU 102F, CPU 102R, CPU 202, CPU 202F, CPU 202R.

D. TECHNICAL SPECIFICATIONS

Scanning Time: The scanning time varies according to the size of the program, the blocks and functions used in the program and operations and the types of the inputs - outputs that used. You can see the real time and maximum scan times in the Speed PLC program's Plc Status section. The maximum scanning speed is 65kHz.

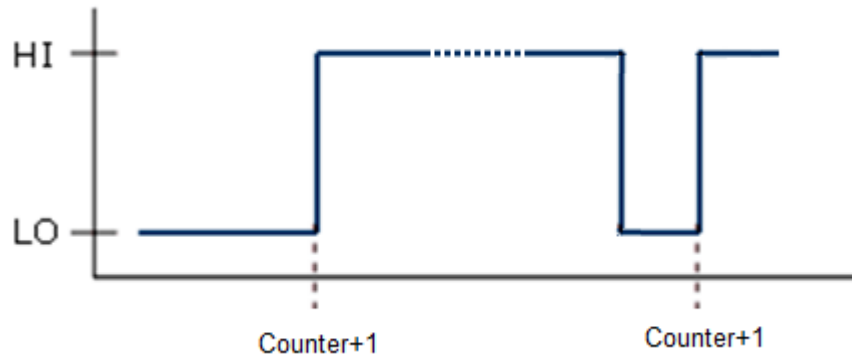
Digital Inputs: There are 8 inputs on the CPU module. The input sampling frequency changes 50kHz to 200kHz as indicated in the table. The sampling frequency is the speed at which the signal from the input is detected by the PLC. When defined as normal digital input, it is read once in each plc cycle.



Usage of Digital Inputs

Digital inputs may be used as digital inputs or they can also be used as rising edge counter, rising edge directional counter, falling edge counter, falling edge directional counter, AB Encoder 2X, ABZ Encoder 2X, AB Encoder 4X, ABZ Encoder 4X, Frequency 1000ms, Period Rising Edge, Period Falling Edge, Period Rising and Falling Edge, Interrupt Block Rising Edge, Interrupt Block Falling Edge, Interrupt Block Rising and Falling Edge.

Rising Edge Counter: It is the digital input type which increases the counter in the rising edge of the signal applied to the input. The value in the counter increases by 1 when the signal applied to the input increases to the logical 1 level. The value in the counter does not change until the signal goes back to the logic 0 and the logic goes back to 1.

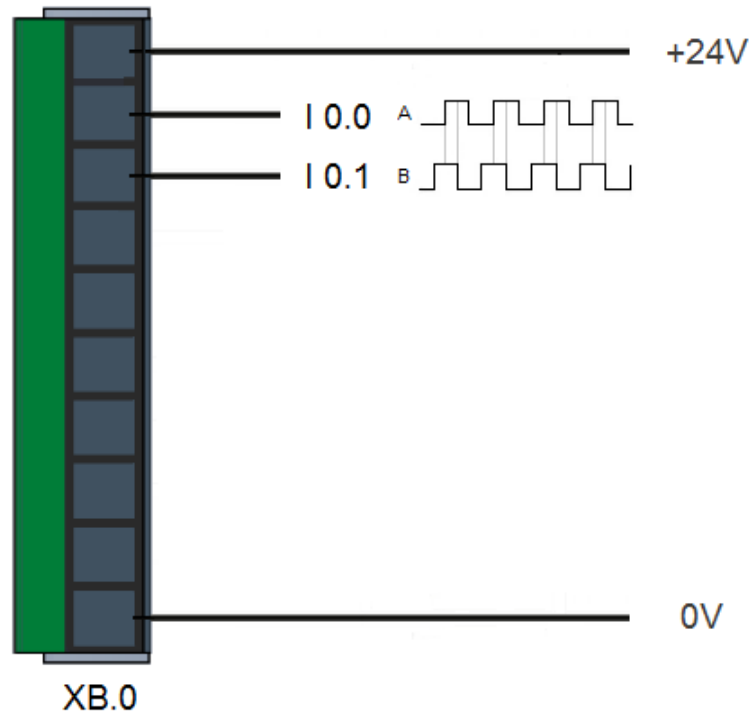


Rising Edge Directional Counter: When this type is selected, the next input is automatically assigned as the direction identifier. When logic 0 is applied to the direction identifier input, the counter moves in the negative direction, and when the logic 1 is applied, it moves in the positive direction. Signals are detected on the rising edge.

Falling Edge Counter: It is the digital input type which increases the specified counter at the falling edge of the signal applied to the input. When the signal applied to the input falls from logic 1 to logic 0, the value in the counter increases by 1. The value in the counter does not change until the signal raises to logic 1 and falls to logic 0.

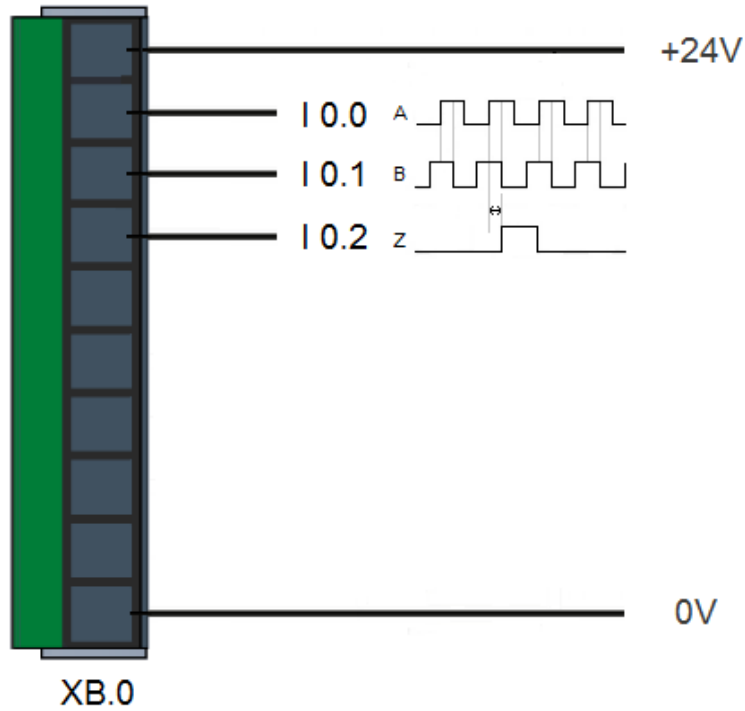
Falling Edge Directional Counter: When this type is selected, the next entry is automatically assigned as the navigator. When logic 0 is applied to the direction identifier input, the counter moves in the negative direction, and when the logic 1 is applied, it moves in the positive direction. The signals are detected on the falling edge.

AB Encoder 2x: When the AB type 2x Encoder is selected, the A end of the Encoder should be inserted in the pin where the selection is made and the B end should be inserted in the next input.



AB Encoder Connection

ABZ Encoder 2x: When ABZ type 2x Encoder is selected, A end of the Encoder should be inserted into the pin where the selection is made, B end should be inserted into the next input and Z pin should be inserted into the next input.



ABZ Encoder Connection

AB Encoder 4x: When the AB type 4x Encoder is selected, the A end of the Encoder should be inserted in the pin where the selection is made and the B end should be inserted in the next input.

ABZ Encoder 4x: When ABZ type 4x Encoder is selected, A end of the Encoder should be inserted into the pin where the selection is made, B end should be inserted into the next input and Z pin should be inserted into the next input.

Frequency 1000ms. : It is the input type which counts the pulses applied to the input within 1000 ms. The count is updated every 1000ms and the value in the counter is updated.

Period Rising Edge: It is a type of input that measures the time difference between periods. The measurement is found by the time difference between the rising edge in the first signal and the rising edge of the subsequent signal. The measurement is done in microseconds. The measurement resolution is 1 microsecond. The minimum continuous measurement period is 10 microseconds.

Period Falling Edge: It is a type of input that measures the time difference between periods. The measurement is found by the time difference between the falling edge in the first signal and the falling edge of the subsequent signal. The measurement is done in microseconds. The measurement resolution is 1 microsecond. The minimum continuous measurement period is 10 microseconds.

Period Rising and Falling Edge: It is the type of input that measures the period length. The measurement is found by calculating the time difference between the rising edge or falling edge and the subsequent falling or rising edge in the signal. The

measurement is done in microseconds. The measurement resolution is 1 microsecond. The minimum continuous measurement period is 10 microseconds.

Interrupt Block Rising Edge: The interrupt block works by detecting the rising edge of the signal applied to its input.

Interrupt Block Falling Edge: The interrupt block works by detecting the falling edge of the signal applied to its input.

Interrupt Block Rising and Falling Edge: The interrupt block works by detecting both the rising edge and the falling edge of the signal applied to the input.

Fast Counter : When the inputs of the Fulmatic 7 – Silver series PLCs with fast digital inputs* are used as fast counters, one channel can be read at 200 KHz, 3 channels 150 KHz or 8 channels at 100 KHz. For other CPU models, the read speed is 50 KHz for single channel or 8 channels.

* CPU models with fast counter inputs: CPU 100F, CPU 101F, CPU 102F, CPU 200F, CPU 201F, CPU 202F.

Analog Inputs: Sampling time is the period of writing the values of the analog inputs to the corresponding variable. The total sampling frequency of the analog inputs is 66.5 kHz. The sampling time of the used analog inputs is found by dividing the total sampling frequency by the number of analog inputs used.

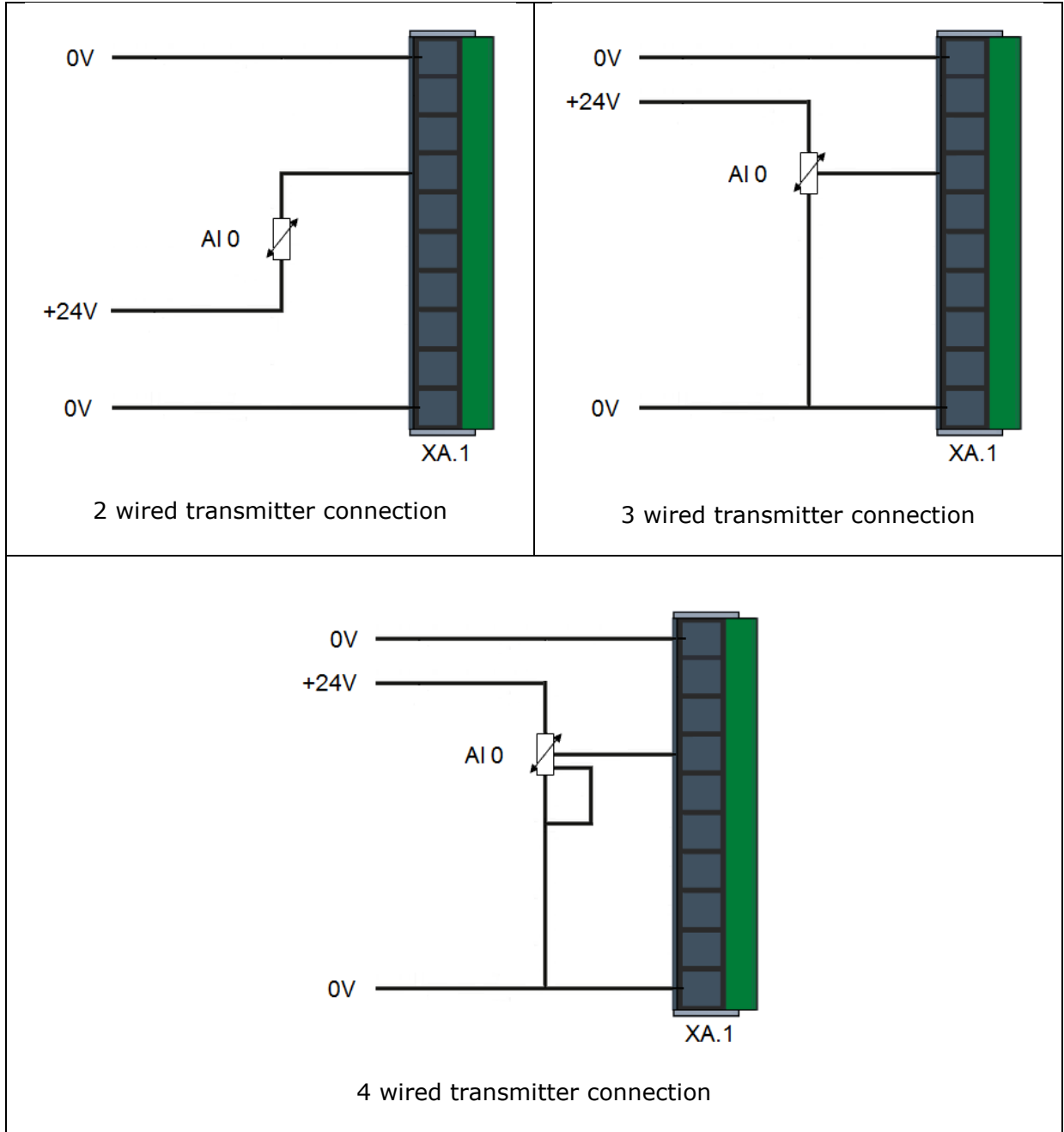
$$f_{\text{analogue channel sample freq}} = \frac{\text{Total sampling frequency}}{\text{Number of analog channels using}}$$

Analog inputs are 12bit resolution, ie the value to be read is between 0-4095. Analog inputs can be used as 0-10V input and/or 0-20mA.

The internal resistance in the voltage measurement is 14.3kΩ. The 0V value is 0, and for the 10V value, the 3925 value is read. Max readable voltage (4095 value) is 10.47V.

In the measurement of the current, the internal resistance is 150Ω. The value 0mA corresponds to 0 and value 3930 is read for 20mA. The maximum readable current (4095 value) is 20,8mA.



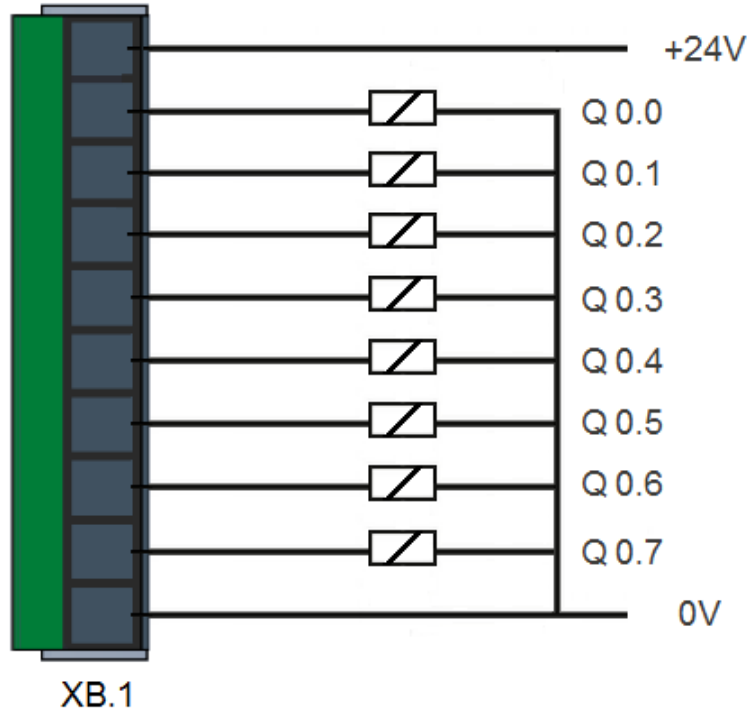


Use of Analog Inputs

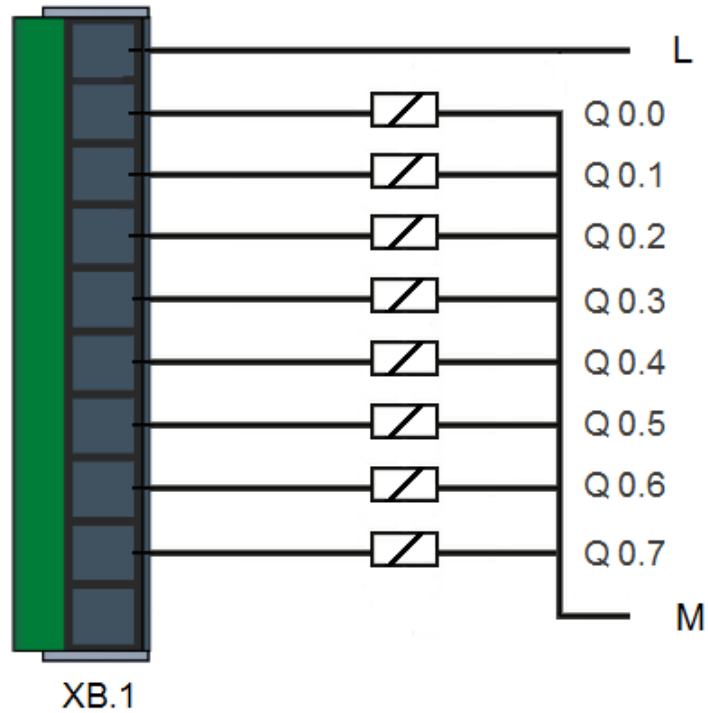
Digital Outputs: The PLC CPU modules that digital outputs are relay* have a single channel output current of a maximum of 2 Amps and a total output current of a maximum of 10 Amps. The output current is 0.1 Amperes for CPU modules with fast** (max. 655KHz) outputs. For other CPU modules the output current is 0.5 Amperes.

* CPU Modules That Digital Outputs Are Relay: CPU 100R, CPU 101R, CPU 102R, CPU 200R, CPU 201R, CPU 202R

** CPU Modules With Fast Output: CPU 100F, CPU 101F, CPU 102F, CPU 200F, CPU 201F, CPU 202F

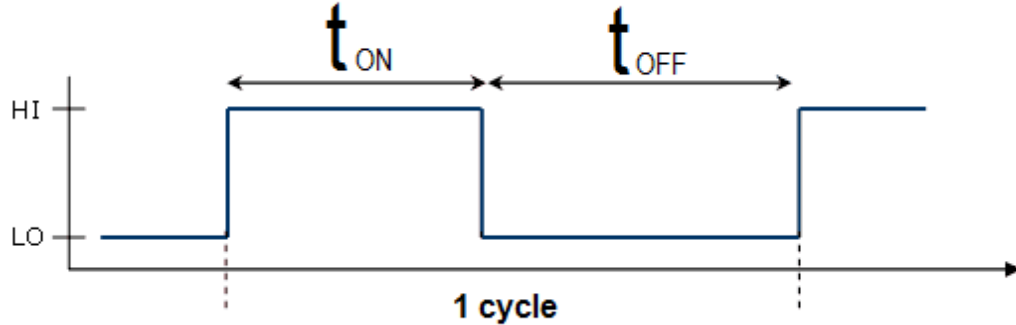


Use of Digital Outputs
(For the PLC CPU modules that digital outputs are not relay)



Use of Digital Outputs
(For the PLC CPU modules that digital outputs are relay)

PWM Output: Hardware PWM (Pulse Width Modulation) is a function that allows effect control to be made by changing the **logic 1** state intervals of the square waves produced at a specific frequency.



PWM control is done by checking period length and activity status. The period length is controlled by the PWM frequency. The maximum output frequency for Fulmatic 7 - Silver Series Plc is 655kHz. PWM channels are grouped in pairs. There are different frequency variables for each group. This variable's value can be 0 to 65535. The frequency will be 10 times the value of this variable.

$$f_{\text{PWM output freq}} = \text{Set. value} \times 10$$

Period is the one cycle of the frequency.

$$t_{\text{Period Duration (sec.)}} = \frac{1}{f_{\text{PWM output freq.}}}$$

The set value %tON, which controls the PWM logic high status, can be up to 16-bit resolution (between 0-65535) depending on the frequency. When the frequency rises, the resolution decreases. The set value %tON must be 65535 in order to get 100% output even if the resolution decreases.

$$\text{Resolution} = \frac{84000000}{f_{\text{PWM Output freq.}}}$$



Note: In the Speed Plc program, except for hardware Pwm, software Pwm is also available. The hardware Pwm described in this section. For the software Pwm, you can refer to the help pages of Speed Plc software.

PTO çıkışı : PTO (pulse train output); is a function that gives a certain number of square wave outputs. After the set number of square wave outputs is operated, output logic will be 0. The process frequency is determined by multiplying the value of the frequency variable of the square wave by 10. In the first cycle of the process frequency, output is logic 1 and in the other cycle output is logic 0. Thus, the pto output frequency is half of the process frequency.

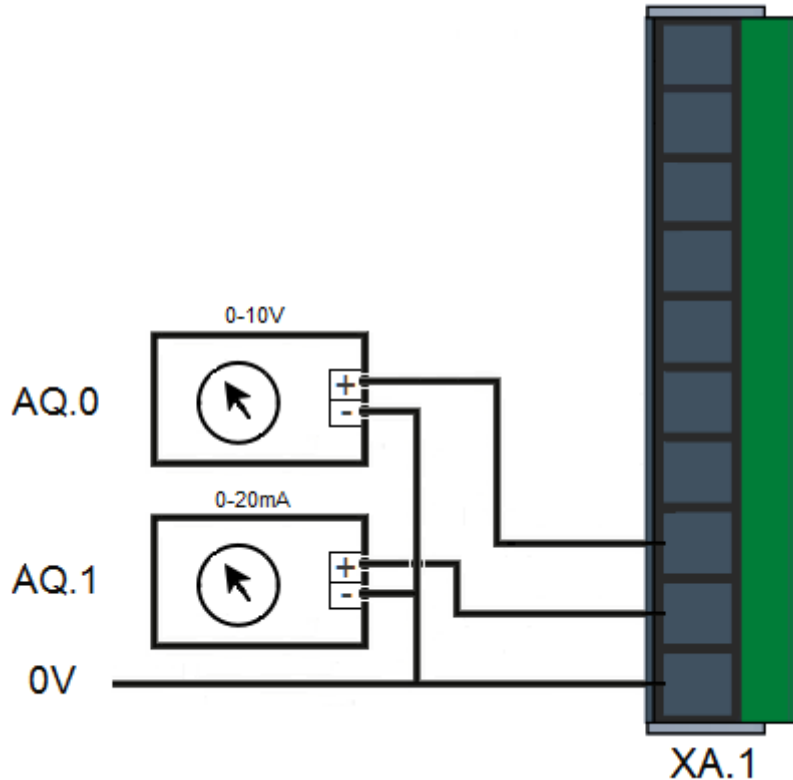
$$f_{\text{PTO Output freq}} = \frac{\text{Set. value}}{2} \times 10$$



When multiple PTO channels are used at a very high frequency at the same time, the PLC may switch to stop mode because the PLC cycle time will increase. There is no such risk below 100 KHz.

Analog Outputs: In the CPU modules with analog output*, two outputs can be obtained as 0-10V from the analog output channel AQ0 and 0-20mA from the analog output channel AQ1.

The analog output refreshing period is equal to the operation cycle of the PLC CPU module. Maximum 20mA current can be obtained from 0-10V output.



Use of Analog Outputs

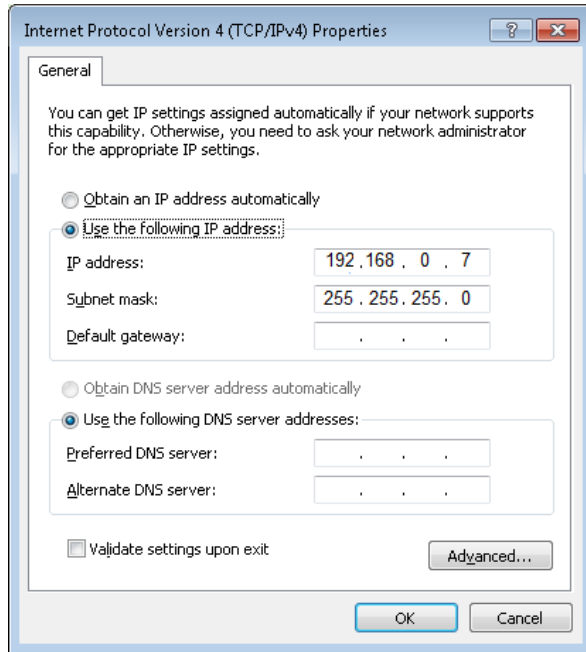
* CPU Models With Analog Output: CPU 101, CPU 101F, CPU 101R, CPU 102, CPU 102F, CPU 102R, CPU 201, CPU 201F, CPU 201R, CPU 202, CPU 202F, CPU 202R

E. OTHER FEATURES

Modbus Communication: Fulmatic 7 - Silver Series PLC CPU modules support Modbus RTU and Modbus TCP communication. 5 connections can be provided simultaneously with Modbus TCP. Up to 32 devices can be connected with the Modbus RTU from each serial port.

SpeedPLCBUS: With the SpeedPLCBUS communication protocol which developed by Fultek Control Systems, intelligent read and the ability to write different data fields features provides faster communication. Further information can be found in the help pages of Speed Plc.

MAC Address: The Mac address of the PLC CPU module is available on the product label. If you wish, you can change the MAC address of the PLC CPU module in the DBO data block with the Speed Plc program. Check the same MAC address on the network not exist when changing the MAC address. Please note that there may be communication problems with the PLC CPU module if there is a MAC address conflict.



Ethernet Connection: If you wish, you can connect your PLC CPU module on your local network or connect it directly on your computer without cross cable. To make a direct connection to your computer, you must set your network adapter settings as follows and then connect the Ethernet cable.

Factory Settings: Off the power of PLC CPU module, supply the PLC CPU module while pressing and holding the PLC Run/Stop button. Release the button when the PLC Run LED is turned on, the PLC CPU will return to the factory settings. COM0 Serial port at factory settings: 115200 bps, none parity, 1 stop bit, 8 data bit. IP address factory setting: 192.168.0.10. Modbus Plc address factory setting: 0.

RTC: Real Time Clock life span is 30 days, during this time if the PLC is not energized, System Fault led lights on. You can remove this warning by updating system time in Speed PLC DBO.

