



*Powering Business Worldwide™*

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5012617602-PC22

## **ELC2 Series**

### **Programmable Logic Controllers**

## **INSTRUCTION SHEET**

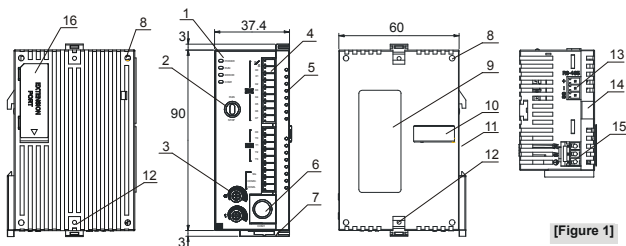
[Applicable Controllers]

- ELC2-PC12NNDR
- ELC2-PC12NNDT

The ELC2-PCs are 12-point (8DI + 4DO) controllers, offering various instructions and with 16k steps program memory, able to connect to all ELC series extension modules and high-speed extension modules, including digital I/O (max. 224 I/O points) and analog modules (for A/D, D/A conversion and temperature measurement). Two points of 100 kHz and two points of 10 kHz high-speed pulse outputs are included. ELC2-PC series controllers are small in size and easy to install. Users do not have to install any batteries in ELC2-PCs. The ELC programs and the latched data are stored in the high-speed flash memories.

- EN ✗ ELC2-PC is an OPEN-TYPE device. It should be installed in a control cabinet free of airborne dust, humidity, electric shock and vibration. To prevent non-maintenance staff from operating ELC2-PC, or to prevent an accident from damaging ELC2-PC, the control cabinet in which ELC2-PC is installed should be equipped with a safeguard. For example, the control cabinet in which ELC2-PC is installed shall require a tool or key to be opened.
- EN ✗ DO NOT connect AC power to any of I/O terminals, otherwise serious damage may occur. Please check all wiring again before ELC2-PC is powered up. After ELC2-PC is disconnected, Do NOT touch any terminals in a minute. Make sure that the ground terminal (⊕) on ELC2-PC is correctly grounded in order to prevent electromagnetic interference.
- FR ✗ ELC2-PC est un module OUVERT. Il doit être installé que dans une enceinte protectrice (boîtier, armoire, etc.) saine, dépourvue de poussière, d'humidité, de vibrations et hors d'atteinte des chocs électriques. La protection doit éviter que les personnes non habilitées à la maintenance puissent accéder à l'appareil (par exemple, une clé ou un outil doivent être nécessaire pour ouvrir a protection).
- FR ✗ Ne pas appliquer la tension secteur sur les bornes d'entrées/Sorties, ou l'appareil ELC2-PC pourra être endommagé. Merci de vérifier encore une fois le câblage avant la mise sous tension du ELC2-PC. Lors de la déconnection de l'appareil, ne pas toucher les connecteurs dans la minute suivante. Vérifier que la terre est bien reliée au connecteur de terre afin d'éviter toute interférence électromagnétique.

## ■ Product Profile & Outline





[Figure 1]

Unit: mm

1. POWER, RUN, ERROR, COM1 indicator	9. Nameplate
2. RUN/STOP switch	10. Right-side extension port
3. VR0/VR1	11. DIN rail mounting slot (35mm)
4. I/O terminals and COM3 comm. port (RS-485)	12. Extension unit clip
5. I/O point and COM2, COM3 indicator	13. COM2 communication port (RS-485)
6. COM1 communication port (RS-232)	14. Mounting rail for extension module
7. DIN rail clip	15. DC power input
8. Mounting hole for extension module	16. Left-side module connection port

## ■ Specifications

Item				Specification	
Control method				Stored program, cyclic scan system	
I/O processing method				Batch processing method (when END instruction is executed)	
Execution speed				LD instructions – 0.54μs, MOV instructions – 3.4μs	
Program language				Instruction List + Ladder + SFC	
Program capacity				15872 steps	
Bit contacts	X	External inputs		X0~X377, octal number system, 256 points max.	Total 480+32 I/O(*4)
	Y	External outputs		Y0~Y377, octal number system, 256 points max.	
	M	Auxiliary relay	General	M0~M511, 512 points (*1) M768~M999, 232 points (*1) M2000~M2047, 48 points (*1)	Total 4096 points
			Latched	M512~M767, 256 points (*2) M2048~M4095, 2048 points (*2)	
			Special	M1000~M1999, 1000 points, some are latched	
	T	Timer	100ms (M1028=ON, T64~T126: 10ms)	T0~T126, 127 points (*1) T128~T183, 56 points (*1) T184~T199 for Subroutines, 16 points (*1) T250~T255(accumulative), 6 points (*1)	Total 256 points
			10ms (M1038=ON, T200~T245: 1ms)	T200~T239, 40 points (*1) T240~T245(accumulative), 6 points (*1)	
			1ms	T127, 1 points, (*1) T246~T249(accumulative), 4 points (*1)	
	C	Counter	16-bit count up	C0~C111, 112 points (*1) C128~C199, 72 points (*1) C112~C127, 16 points (*2)	Total 233 points
				C200~C223, 24 points (*1) C224~C232, 9 points (*2)	
			32-bit high-speed count up/down	C235~C242, 1 phase 1 input, 8 points (*2) C233~C234, 2 phase 2 input, 2 points (*2)	Total 22 points
				C243~C244, 1 phase 1 input, 2 points (*2)	
				C245~C250, 1 phase 2 input, 6 points (*2)	
				C251~C254 2 phase 2 input, 4 points (*2)	
	S	Step point	Initial step point	S0~S9, 10 points (*2)	Total 1024 points
			Zero point return	S10~S19, 10 points (use with IST instruction) (*2)	
			Latched	S20~S127, 108 points (*2)	
			General	S128~S911, 784 points (*1)	
			Alarm	S912~S1023, 112 points (*2)	

Item			Specification
Word register	T	Current value	T0~T255, 256 words
	C	Current value	C0~C199, 16-bit counter, 200 words
	D	Data register	C200~C254, 32-bit counter, 55 words
			D0~D407, 408 words (*1)
			D600~D999, 400 words (*1)
			D3920~D9799, 5880 words (*1)
			D408~D599, 192 words (*2)
			D2000~D3919, 1920 words (*2)
			D1000~D1999, 1000 words, some are latched
			D9900~D9999, 100 words (*1) (*5)
			D9800~D9899, 100 words (*1) (*6)
			E0~E7, F0~F7, 16 words (*1)
			Total 10000 points
Pointer	N	Master control loop	N0~N7, 8 points
	P	Pointer	P0~P255, 256 points
	I	Interrupt service	I000/I001(X0), I100/I101(X1), I200/I201(X2), I300/I301(X3), I400/I401(X4), I500/I501(X5), I600/I601(X6), I700/I701(X7), 8 points (01: rising-edge trigger  , 00: falling-edge trigger  )
			I602~I699, I702~I799, 2 points (Timer resolution = 1ms)
		High-speed counter interrupt	I010, I020, I030, I040, I050, I060, I070, I080, 8 points
		Communication interrupt	I140(COM1), I150(COM2), I160(COM3), 3 points (*3)
Constant	K	Decimal	K-32,768~K32,767 (16-bit operation) K-2,147,483,648~K2,147,483,647 (32-bit operation)
	H	Hexadecimal	H0000~HFFFF (16-bit operation) H00000000~HFFFFFFFF (32-bit operation)
Serial ports			COM1: built-in RS-232 (Client/Server) COM2: built-in RS-485 (Client/Server) COM3: built-in RS-485 (Client/Server) COM1 is typically the programming port.
Real time clock			Year, Month, Day, Week, Hours, Minutes, Seconds
Special I/O modules			Right side: Up to 8 I/O modules can be connected Left side: Up to 8 high-speed I/O module can be connected
File register			K0~K4999, 5000 points (*2)

Notes:

1. Non-latched area cannot be modified
2. Latched area cannot be modified
3. Please refer to the table above for more information about serial ports.
4. There are 8 input points (X0~X7) and 4 output points (Y0~Y3) in ELC2-PC. ELC2-PC occupies 16 input points (X0~X17), and 16 output points (Y0~Y17). Extension input points start from X20, and extension output points start from Y17.
5. If ELC2-PC is connected to a right-side special module, and M1183 is off, the range of data registers can be used. Every special module connected to ELC2-PC occupies ten data registers.
6. If ELC2-PC is connected to a left-side special module, and M1182 is off, the range of data registers can be used. Every special module connected to ELC2-PC occupies ten data registers.

# ■ Electrical Specifications

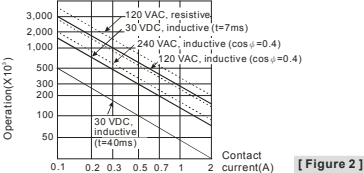
Model		
Item	ELC2-PC12NNDR	ELC2-PC12NNDT
Power supply voltage	24 Vdc (-15 to 20%) (with reverse polarity protection on the DC input power) ELC-PS01: input 100 to 240 Vac, output 24 Vdc/1A ELC-PS02: input 100 to 240Vac, output 24Vdc/2A	
Connector	European standard removable terminal block (Pin pitch: 3.5mm)	
Operation	Maximum power loss time is 10ms or less.	
Inrush current	Max. 7.5 A@24 Vdc, I <sup>2</sup> t = 0.25 A <sup>2</sup> S	
Fuse capacity	2.5 A/30 Vdc, Polyswitch	
Power consumption	1.8 W	1.5 W
Power protection	With reverse polarity protection on the DC input power	
Insulation resistance	> 5 MΩ (all I/O point-to-ground: 500 Vdc)	
Noise immunity	ESD (IEC 61131-2, IEC 61000-4-2): 8kV Air Discharge EFT (IEC 61131-2, IEC 61000-4-4): Power Line: 2kV, Digital I/O: 1kV, Analog & Communication I/O: 1kV RS (IEC 61131-2, IEC 61000-4-3): 26MHz ~ 1GHz, 10V/m	
Grounding	The diameter of grounding wire cannot be smaller than the wire diameter of terminals L and N (All ELC2 controllers should be grounded directly to the ground pole).	
Operation / storage	Operation: 0 to 55°C (temp.), 5 to 95% (humidity), Pollution degree 2 Storage: -25 to 70°C (temp.), 5 to 95% (humidity)	
Agency approvals	UL508 European community EMC Directive 89/336/EEC and Low Voltage Directive 73/23/EEC	
Vibration / shock resistance	International standards: IEC61131-2, IEC 68-2-6 (TEST Fc)/IEC61131-2 & IEC 68-2-27 (TEST Ea)	
Weight (g)	140g	131g

Spec.		Input Points	
Items		24 Vdc (-15 to 20%) single common port input	
Input No.		X0 to X2	X3 to X7
Input type		DC (SINK or SOURCE)	
Input current (±10%)		24 Vdc, 5 mA	
Input impedance		4.7 kΩ	
Max. frequency		100 kHz	10 kHz
Action level	Off → On	> 15 Vdc	
	On → Off	< 5 Vdc	
Response time	Off → On	< 2.5 μs	< 20 μs
	On → Off	< 5 μs	< 50 μs
Filter time		Adjustable within 0 ~ 20ms by D1020 (Default: 10ms)	

Spec.		Output Points		
Items		Relay	Transistor	
Output No.		Y0 to Y3	Y0, Y2	Y1, Y3
Max. frequency		1 Hz	100 kHz	10 kHz
Working voltage		250 ac, < 30 Vdc	5 to 30 Vdc <sup>#1</sup>	
Max. load	Resistive	1.5 A/1 point (5 A/COM)	0.5 A/1 point (2 A/COM)	
	Inductive <sup>#2</sup>		15 W (30 Vdc)	
	Lamp	20 WDC/100 WAC	2.5 W (30 Vdc)	
Response time	Off → On	Approx. 10 ms	2 μs <sup>#3</sup>	20 μs <sup>#3</sup>
	On → Off		3 μs <sup>#3</sup>	30 μs <sup>#3</sup>

#1: UP, ZP must work with external auxiliary power supply 24 Vdc (-15 to +20%), rated consumption approx. 1mA/point.

#2: Life curves



[ Figure 2 ]

#3: Load = 0.5A

## ■ Model Name & I/O Configuration

Standard functional ELC

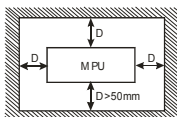
Model	Input		Output		I/O Configuration	
	Point	Type	Point	Type	Relay	Transistor
ELC2-PC12NNDR	8	DC (Sink or source)	4	Relay	S/ S X0 X1 X2 X3 X4 X5 X6 X7	S/ S X0 X1 X2 X3 X4 X5 X6 X7
ELC2-PC12NNDT				Transistor	C0 Y0 Y1 Y2 Y3 ● SG COM3+ COM3-	Y0 Y1 Y2 Y3 UP ZP SG COM3+ COM3-

## ■ Dimension & Installation

Please install the ELC2 in an enclosure with sufficient space around it to allow heat dissipation. See [Figure 3].

• **Direct Mounting:** Use M4 screw according to the dimension of the product.

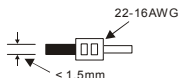
• **DIN Rail Mounting:** When mounting the ELC2 to 35mm DIN rail, be sure to use the retaining clip to stop any side-to-side movement of the ELC2 and reduce the chance of wires being loose. The retaining clip is at the bottom of the ELC2. To secure the ELC2 to DIN rail, pull down the clip, place it onto the rail and gently push it up. To remove the ELC2, pull the retaining clip down with a flat screwdriver and gently remove the ELC2 from DIN rail.



[Figure 3]

## ■ Wiring

1. Use 22-16AWG (1.5mm) single or multiple core wire on I/O wiring terminals. See the figure in the right hand side for its specification. ELC2 terminal screws should be tightened to 1.90 kg-cm (1.65 in-lbs) and please use only 60/75°C copper conductor.
2. DO NOT wire empty terminal. DO NOT place the I/O signal cable in the same wiring circuit.
3. DO NOT drop tiny metallic conductors into the ELC2 while screwing and wiring terminals. When finished wiring, remove off the protective sticker on the heat dissipation opening to ensure normal heat dissipation of the ELC2.



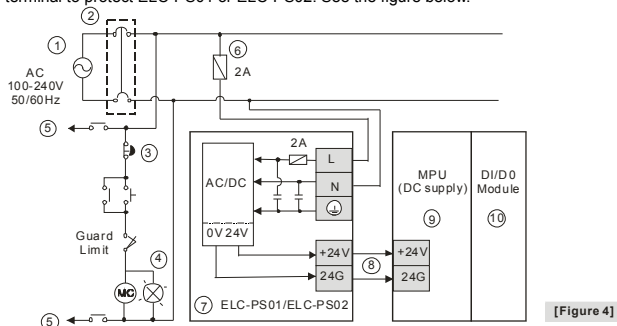
## ◆ Power Supply

The power input of ELC2-PC is DC. When operating ELC2-PC, please note the following points:

1. The power is connected to two terminals, 24 Vdc and 0 V, and the range of power is 20.4 to 28.8 Vdc. If the power voltage is less than 17.5 Vdc, the ELC2 will stop running, all outputs will go off, and the ERROR indicator will start to blink continuously.
2. A power shutdown for less than 10ms will not affect the operation of the ELC2. However, a shutdown time that is too long or a drop of power voltage will stop the operation of the ELC2, and all outputs will go off. When the power returns to normal status, the ELC2 will automatically resume the operation. (Please take care of the latched auxiliary relays and registers inside the ELC2 when doing the programming).

## ◆ Safety Wiring

Eaton's power supply modules ELC-PS01 or ELC-PS02 are the suitable 24Vdc power supplies for ELC2-PC. We suggest you install a protective circuit at the power supply terminal to protect ELC-PS01 or ELC-PS02. See the figure below.



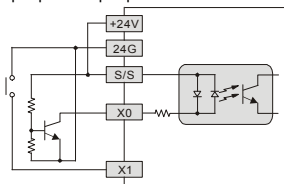
- |   |                              |
|---|------------------------------|
| ① AC power supply: 100 ~ 240VAC, 50/60Hz  | ② Breaker                    |
| ③ Emergency stop: This button cuts off the system power supply when accidental emergency takes place. |                              |
| ④ Power indicator   | ⑤ AC power supply load       |
| ⑥ Power supply circuit protection fuse (2A)   | ⑦ ELC-PS01/ELC-PS02          |
| ⑧ DC power supply output: 24 VDC, 500 mA  | ⑨ MPU (main processing unit) |
| ⑩ Digital I/O module  |                              |

## ◆ Input Point Wiring

There are two types of DC inputs, SINK and SOURCE. (See the example below. For detailed point configuration, please refer to the specification of each model.)

### • DC Signal IN – SINK mode

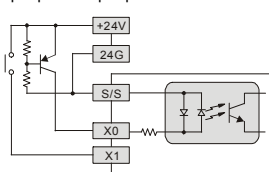
Input point loop equivalent circuit



[Figure 5]

### • DC Signal IN – SOURCE mode

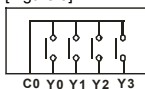
Input point loop equivalent circuit



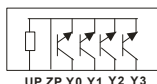
[Figure 6]

## ◆ Output Point Wiring

- ELC2-PC series controllers have either relay or transistor outputs. Please note the connection of shared terminals when wiring output terminals.
- Relay output terminals, Y0 to Y3 of relay models use C0 common port. See [Figure 7]. When the output points are enabled, their corresponding indicators on the front panel will be on.
- Transistor output terminals, Y0 to Y3 of transistor models use UP, ZP common port. See [Figure 8].



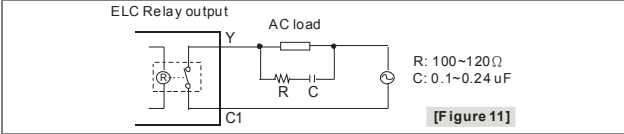
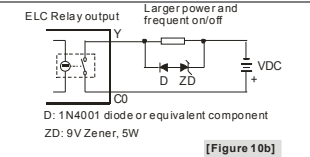
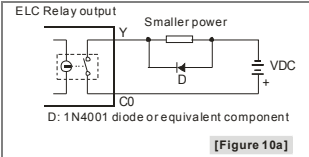
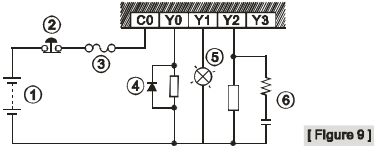
[Figure 7]



[Figure 8]

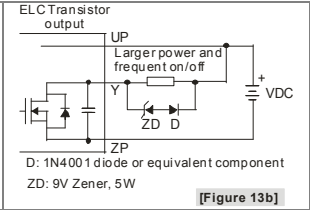
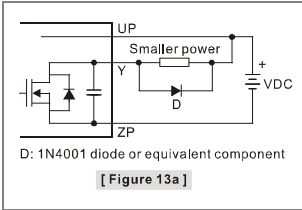
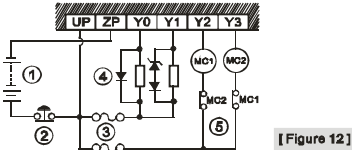
4. Isolation circuit: The optical coupler is used to isolate signals between the circuit inside ELC and input modules.

• Relay (R) output circuit wiring



- ① DC power supply
- ② Emergency stop: Uses external switch
- ③ Fuse: 5 to10A fuse at the shared terminal of output contacts to protect the output circuit
- ④ Transient voltage suppressor (SB360 3A 60V): Extends the life span of contact.
  - 1. Diode suppression of DC load: Used when in smaller power [Figure 10a]
  - 2. Diode + Zener suppression of DC load: Used when in larger power and frequent On/Off [Figure 10b]
- ⑤ Incandescent light (resistive load)
- ⑥ Absorber: Reduces the interference on AC load [Figure 11]

• Transistor (T) output circuit wiring

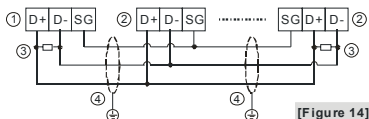


- ① DC power supply
- ② Emergency stop
- ③ Circuit protection fuse



- ④ The output of the transistor model is "open collector". If Y0/Y1 is set to pulse output, the output current has to be bigger than 0.1 A to ensure normal operation of the model.
1. Diode suppression: Used when in smaller power [Figure 13a]
  2. Diode + Zener suppression: Used when in larger power and frequent On/Off [Figure 13b]
- ⑤ Manually exclusive output: For example, Y2 and Y3 control the forward running and reverse running of the motor, forming an interlock for the external circuit, together with the ELC internal program, to ensure safe protection in case of any unexpected errors.

## ◆ RS-485 Wiring



[Figure 14]

- |                     |                  |
|---------------------|------------------|
| ① Client node       | ② Server node    |
| ③ Terminal resistor | ④ Shielded cable |

### Note:

1. Terminal resistors are suggested to be connected to client node and the last server node with resistor value of 120Ω.
2. To ensure communication quality, please apply double shielded twisted pair cable (20AWG) for wiring.

## ■ Precision of the RTC (Second/Month)

Temperature (°C/°F)	0/32	25/77	55/131
Maximum error (Second)	-117	52	-132

Duration in which the RTC is latched: One week

## ■ Troubleshooting & Indicator Description

Based on the indicators on the front panel, please check the following for errors:

- POWER indicator**
- When ELC2 is powered, the POWER LED indicator on the front panel will be on (in green). If this indicator is not on or the ERROR indicator keeps flashing when ELC2 is powered indicates that the power supply +24V are insufficient or DC power supply 24V is overloaded. In this case, change another 24V DC power supply. If the indicator is still off at this time, your ELC2 is malfunctioned. Send your ELC2 back to your distributor for repair.
- RUN indicator**
- Check your ELC2 status. When ELC2 is running, this indicator will be on. You can use ELC-HHP, the ladder diagram editing program or the switch on the panel to RUN or STOP ELC2.
- ERROR indicator**
- If you enter an incorrect program into ELC2 or use instructions or devices that exceed their range, this indicator will flash (approx. every 1 second). When this happens, you have to obtain the error code from D1004 and save the address where the error occurs in register D1137 (if the error is a general circuit error, the address of D1137 will be invalid). Find out the cause of the error, amend the program and resend the program to ELC2. If you cannot connect to ELC2 and this indicator keeps flashing quickly (approx. every 0.2 second), it means that the 24Vdc power voltage is insufficient. Please check if the 24V DC power supply is overloaded.
- If the ERROR indicator is on, you have to check the special relay M1008. If M1008 is on, it indicates that the execution time of program loop exceeds the preset time-out (in D1000). In this case, turn the RUN/STOP switch to STOP, check the special register D1008 and obtain the location in the program where the time-out takes place. Please refer to the WDT instruction to solve this problem. After amending the program, you only need to resend the program to stop the indicator from flashing. If the indicator still keeps flashing at this time, switch off the power and check if there is any interference existing or conductive matter

inside ELC2.

For details of error codes (in D1004, hex coding), see “ELC System Manual: Programming”.



#### Input indicator

On/Off of input point is indicated by input indicator or monitored by ELC-HHP. When the action condition of the input point is true, this indicator will be on. If abnormality is identified, check if the indicator and input circuit are normal. Use of electronic switch with too much electricity leakage often results in unexpected actions of the input point.



#### Output indicator

On/Off of output point is indicated by the output indicator. When the output indicator (On/Off) does not correspond to the action of its load, please be aware of the following:

1. The output contact may be melted or blocked due to an over loaded or short-circuited load, which will result in poor contact.
2. If you are suspicious that the output point may execute an undesired action, check the output wiring circuit and whether the screw is properly tightened.



#### COM1, COM2, and COM3 indicators

If the COM1 LED indicator is On, it means that COM1 port is receiving data.

If the COM2/COM3 LED indicator is On, it means that COM2/COM3 is sending data.