M91-19-4TC2

12/24 VDC, 11 pnp/npn digital inputs, *2 universal inputs, 2 high-speed counter/shaft encoder inputs, 12 transistor outputs, I/O expansion port, RS232/RS485 port

Power supply	12VDC or 24VDC
Permissible range	10.2VDC to 28.8VDC with less than 10% ripple
Maximum current consumption	80mA@24VDC (pnp inputs) 140mA@12VDC (pnp inputs) 170mA (npn inputs)

Digital inputs	11 pnp (source) or npn (sink) inputs. See Note 1.
Nominal input voltage	12VDC or 24VDC. See Notes 2 and 3.
Input voltages for pnp (source): For 12VDC	0-3VDC for Logic '0' 8-15.6VDC for Logic '1'
For 24VDC	0-5VDC for Logic '0' 17-28.8VDC for Logic '1'
Input voltages for npn (sink): For 12VDC	8-15.6VDC/<1.2mA for Logic '0' 0-3VDC/>3mA for Logic '1'
For 24VDC	17-28.8VDC/<2mA for Logic '0' 0-5VDC/>6mA for Logic '1'
Input current	4mA@12VDC 8mA@24VDC
Input impedance	3KΩ
Response time (except high-speed inputs)	10mS typical
Galvanic isolation	None
Input cable length	Up to 100 meters, unshielded

| High-speed counter	Specifications below apply when inputs are wired for use as a high-speed counter input/shaft encoder. See Notes 4 and 5.
Resolution	16-bit
Input freq.	10kHz max.
Minimum pulse	40µs

Notes:

1. All 11 inputs can be set to pnp (source) or npn (sink) via a single jumper and appropriate wiring.
2. All 11 inputs can function in 12 VDC or 24 VDC; set via a single jumper and appropriate wiring.
3. npn (sink) inputs use voltage supplied from the controller's power supply.
4. Inputs #0 and #2 can each function as either high-speed counter or as part of a shaft encoder. In each case, high-speed input specifications apply. When used as a normal digital input, normal input specifications apply.
5. Inputs #1 and #3 can each function as either counter reset, or as a normal digital input; in either case, specifications are those of a normal digital input.
   These inputs may also be used as part of a shaft encoder.
   In this case, high-speed input specifications apply.

* Certain inputs can function as normal digital inputs, analog inputs or thermocouple inputs, in accordance with jumper settings and wiring connections.

⚠ **Warnings**:

- Unused pins should not be connected. Ignoring this directive may damage the controller.
- Improper use of this product may severely damage the controller.
- Refer to the controller's User Guide regarding wiring considerations.
- Before using this product, it is the responsibility of the user to read the product's User Guide and all accompanying documentation.
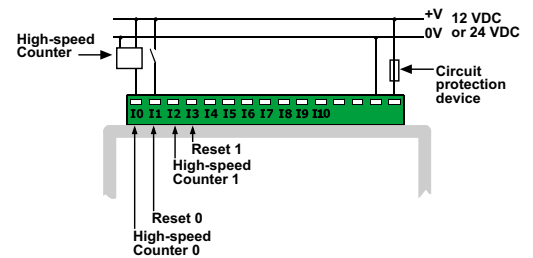
pnp (source) inputs
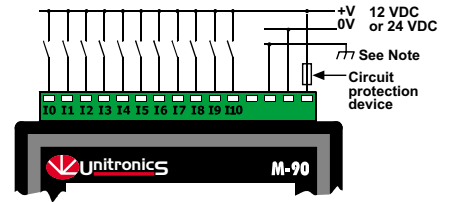
Note:
To avoid electromagnetic interference, mount the controller in a metal panel/cabinet and earth the power supply. Earth the power supply signal to the metal using a wire whose length does not exceed 10cm. If your conditions do not permit this, do not earth the power supply.
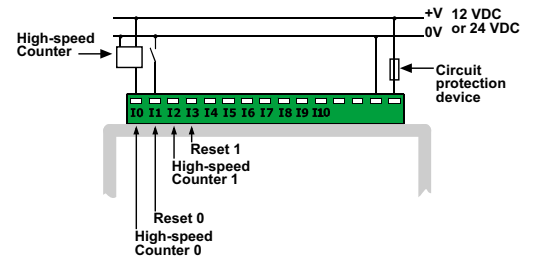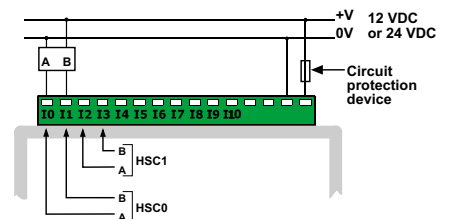
npn (sink) inputs
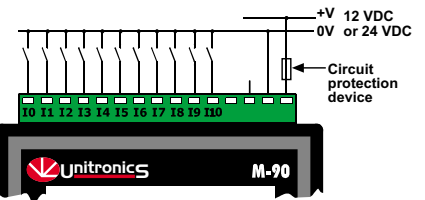
pnp (source) high-speed counter

npn (sink) high-speed counter

Shaft encoder

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Universal Inputs

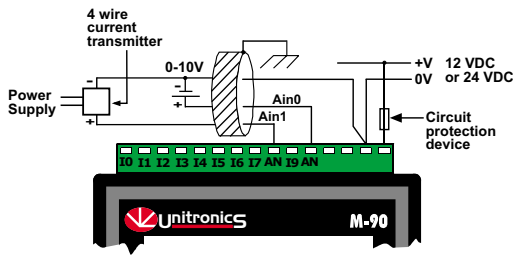| Analog Inputs	
	Two 14-bit, multi-range inputs: 0-10V, 0-20mA, 4-20mA See Note 1
Conversion method	Voltage to Frequency
Input impedance	>400KΩ for voltage 500Ω for current
Isolation	None
Resolution (except 4-20mA)	14-bit (16384 units)
Resolution at 4-20mA	3277 to 16383 (13107 units)
Conversion time	100mSec minimum (according to filter type)
Absolute max. rating	±15V for voltage ±30mA for current
Linearity error	0.04% max. of full scale
Error limit	0.4% of input value
Status indication	Yes, see Note 2

Notes:
1. Input #8 and input #10 can be used as analog inputs, related to signal 0V, in accordance with jumper settings and wiring connections.

2. The analog value can also indicate faults, as shown below:

Value	Possible Cause
-1	Input value deviates **slightly below** the input range.
16384	Input value deviates **slightly above** the input range
32767	Input value deviates **greatly above or below** the input range.

Voltage / Current connection

Notes:
a. Shields should be connected at the signals' source.
b. The 0V signal of the analog input must be connected to the controller's 0V.
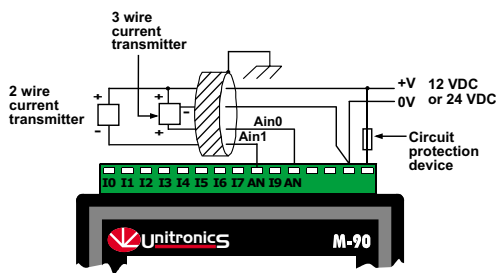
Notes:
a. Shields should be connected at the signals' source.
b. The 0V signal of the analog input must be connected to the controller's 0V.

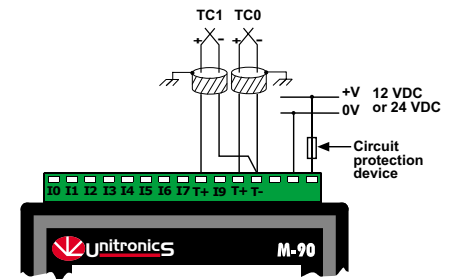| Thermocouple inputs	
	2 inputs. See Note 1.
Input type	Isolated thermocouple
Input ranges	As shown in the table below
Isolation	None
Conversion method	Voltage to Frequency
Resolution	0.1°C / 0.1°F
Conversion time	100mSec minimum (according to filter type)
Input impedance	>10MΩ
Cold junction compensation	local, automatic
Cold junction compensation error	±1.5°C / ±2.7°F maximum
Absolute maximum rating	±0.6 VDC
Linearity error	0.04% max. of full scale
Error limit	0.4% of input value
Status indication	Yes, see Note 2
Warm-up time	½ hour typically, ±1°C / ±1.8°F repeatability

Notes:
1. Thermocouple #0: use Input #10 related to T- signal.
   Thermocouple #1: use Input #8 related to T- signal.
   To use inputs as thermocouple, set the relevant jumpers and use appropriate wiring.
2. The analog value may also indicate when the sensor is not connected to input or when the value exceeds the permissible range. In these cases its value will be 32767.

Table 1: Input Ranges

| Type	Temperature range	Wire color	
		ANSI (USA)	BS 1843 (UK)
mV	-5 to 56mV	-	-
B	200 to 1820°C (300 to 3276°F)	+ Grey - Red	+ None - Blue
E	-200 to 750°C (-328 to 1382°F)	+ Violet - Red	+ Brown - Blue
J	-200 to 760°C (-328 to 1400°F)	+ White - Red	+ Yellow - Blue
K	-200 to 1250°C (-328 to 2282°F)	+ Yellow - Red	+ Brown - Blue
N	-200 to 1300°C (-328 to 2372°F)	+ Orange - Red	+ Orange - Blue
R	0 to 1768°C (32 to 3214°F)	+ Black - Red	+ White - Blue
S	0 to 1768°C (32 to 3214°F)	+ Black - Red	+ White - Blue
T	-200 to 400°C (-328 to 752°F)	+ Blue - Red	+ White - Blue

Thermocouple connection

Note:
Shields should be connected at the signals' source.

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Digital outputs	12 pnp (source) outputs 12VDC or 24VDC
Output type	P-MOSFET (open drain)
Isolation	None
Output current	0.5A max. Total current: 3A max.
Max. frequency for normal outputs	50Hz (resistive load) 0.5Hz (inductive load)
High speed output maximum frequency	2kHz (resistive load) See Note 1.
Short circuit protection	Yes
Short indication	by software
On voltage drop	0.5VDC maximum
Power supply for outputs	
Operating voltage	10.2 to 28.8VDC
Nominal operating voltage	12VDC or 24VDC

Note:
1. Output #0 and Output #1 may be used as high-speed outputs.

Outputs connection
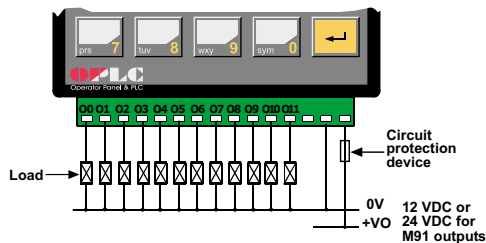
Display	STN, LCD display
Illumination	LED yellow-green backlight
Display size	1 line, 16 characters long
Character size	5 x 7 matrix, 3.07 x 5.73mm

Keypad	Sealed membrane
Number of keys	15

PLC program	
Ladder Code Memory (virtual)	24K
Memory Bits (coils)	256
Memory Integers (Registers)	256
Timers	64
Execution time	12µsec. for bit operations
Database	1024 integers (indirect access)
HMI displays	80 user-designed displays
HMI variables	50 HMI variables are available to conditionally display and modify text, numbers, dates, times & timer values. The user can also create a list of up to 120 variable text displays, totaling up to 2K.

RS232/RS485 serial port	Used for: ● Application Download/Upload ● Application Testing (Debug) mode ● Connect to GSM or standard telephone modem: - Send/receive SMS messages - Remote access programming ● RS485 Networking
RS232 (see note)	1 port
Galvanic isolation	None
Voltage limits	±20V
RS485 (see note)	1 port
Input voltage	-7 to +12V differential max.
Cable type	Shielded twisted pair, in compliance with EIA RS485
Galvanic isolation	None
Baud rate	110 – 57600 bps
Nodes	Up to 32

Note:
RS232/RS485 is determined by jumper settings and wiring as described in the document "M91 RS485 Port Settings" packaged with the controller.

I/O expansion port	Up to 64 additional I/Os, including digital & analog I/Os, RTD and more.

Miscellaneous	
Clock (RTC)	Date and time-year 2000 compliant.
Battery back-up	7 years typical battery back-up for RTC and system data.
Weight	266g (9.37 oz.)
Operational temperature	0 to 50°C (32 to 122°F)
Storage temperature	-20 to 60°C (-4 to 140°F)
Relative Humidity (RH)	5% to 95% (non-condensing)
Mounting method	DIN-rail mounted (IP20/NEMA1) Panel mounted (IP65/NEMA4X)

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The tables below show how to set a specific jumper to change the functionality of a specific input.
To open the controller and access the jumpers, refer to the directions at the end of these specifications.

Important:
Incompatible jumper settings and wiring connections may severely damage the controller.

JP2, JP3, JP10
Input #10 (universal input no. 0)

For use as	JP2	JP3	JP10
Normal digital inputs	A	A	B
Thermocouple input* (See note 1)	B	A	B
Analog input - voltage (see note 2)	B	B	A
Analog input - current (see note 2)	B	B	B

JP5, JP6, JP9
Input #8 (universal input no. 1)

For use as	JP5	JP6	JP9
Normal digital inputs	A	A	B
Thermocouple input* (See note 1)	B	A	B
Analog input - voltage (see note 2)	B	B	A
Analog input - current (see note 2)	B	B	B

Notes:

1. Thermocouple input is related to T- signal.

2. Analog inputs are related signal 0V.

JP7
Inputs type (for all digital inputs) -
see note 3

To use as	JP7
npn (sink)	A
pnp (source)*	B

JP8
Inputs voltage (for all digital inputs) -
see note 3

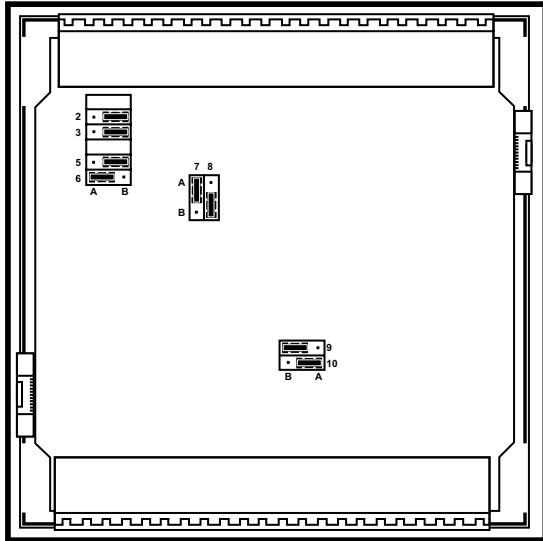| To use as	JP8
12VDC	A
24VDC*	B

Note:

3. Refers to Inputs #0-7 and #9.
   Refers to Inputs #8 and #10 when these are set as normal
   digital inputs.

*Default factory setting

M91-19-4TC2

Jumper Settings

**In this figure, the jumper settings will cause
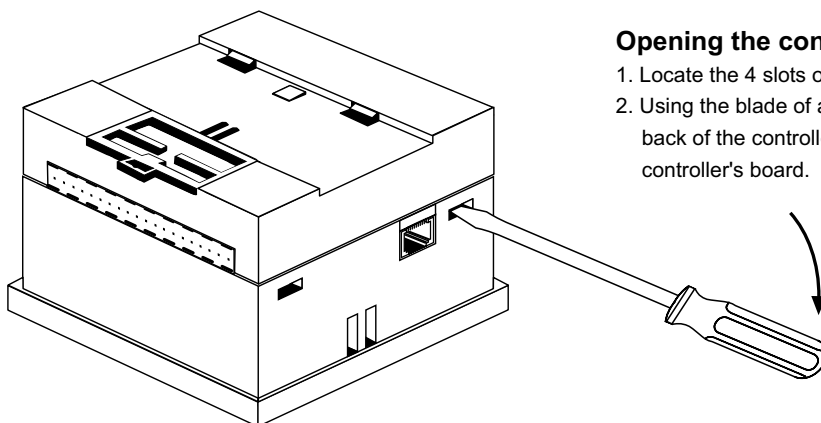the inputs to function as follows:**

Universal Input #0 (Input #10): Voltage input, related to 0V

Universal Input #1 (Input #8): TC input, related to the T- signal

Input #9: Normal npn, 24VDC digital input

Input #0 to Input #7: npn, 24VDC digital inputs.

   (Note that these inputs can only function as normal digital inputs).

Opening the controller enclosure

1. Locate the 4 slots on the sides of the enclosure
2. Using the blade of a flat-bladed screwdriver, gently pry off the
   back of the controller as shown in the figure below, exposing the
   controller's board.

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