91-2-T1
12/24 VDC, 12 pnp/npn digital inputs, 2 high-speed counter/ shaft encoder inputs, 12 transistor outputs, I/O expansion port, RS232/RS485 port

<table>
<thead>
<tr>
<th>Power supply</th>
<th>12VDC or 24VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permissible range</td>
<td>10.2VDC to 28.8VDC with less than 10% ripple</td>
</tr>
<tr>
<td>Maximum current consumption</td>
<td>80mA@24VDC (pnp inputs) 140mA@12VDC (pnp inputs) 170mA (nnp inputs)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital inputs</th>
<th>12 pnp (source) or nnp (sink) inputs. See Note 1.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal input voltage</td>
<td>12VDC or 24VDC. See Notes 2 and 3.</td>
</tr>
<tr>
<td>Input voltages for pnp (source):</td>
<td>0-3VDC for Logic ‘0’ 8-15.6VDC for Logic ‘1’</td>
</tr>
<tr>
<td>For 12VDC</td>
<td>0-5VDC for Logic ‘0’ 17-28.8VDC for Logic ‘1’</td>
</tr>
<tr>
<td>For 24VDC</td>
<td></td>
</tr>
<tr>
<td>Input voltages for nnp (sink):</td>
<td>8-15.6VDC&lt;1.2mA for Logic ‘0’ 0-3VDC&gt;3mA for Logic ‘1’</td>
</tr>
<tr>
<td>For 12VDC</td>
<td>17-28.8VDC&lt;2mA for Logic ‘0’ 0-5VDC&gt;8mA for Logic ‘1’</td>
</tr>
<tr>
<td>For 24VDC</td>
<td></td>
</tr>
<tr>
<td>Input current</td>
<td>4mA@12VDC 8mA@24VDC</td>
</tr>
<tr>
<td>Input impedance</td>
<td>3kΩ</td>
</tr>
<tr>
<td>Response time (except high-speed inputs)</td>
<td>10mS typical</td>
</tr>
<tr>
<td>Galvanic isolation</td>
<td>None</td>
</tr>
<tr>
<td>Input cable length</td>
<td>Up to 100 meters, unshielded</td>
</tr>
</tbody>
</table>

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

### 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.
### Digital outputs
- 12 npn (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
- 0.8VDC 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.

### RS232/RS485 serial port
- **Used for:**
  - Application Download/Upload
  - Application Testing (Debug)
  - 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)
- Real-time clock functions (Date and Time).

#### 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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### Display
- STN, LCD display

### Illumination
- LED yellow-green backlight

### Display size
- 2 lines, 16 characters long

### Character size
- 5 x 8 matrix, 2.95 x 5.55mm

### Keypad
- Sealed membrane
- **Number of keys**: 15

### PLC program
- **Ladder Code Memory (virtual)**: 36K
- **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**: 64 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.
The tables below show how to set a specific jumper to change the functionality of the inputs. 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.

**JP8**

**Input type (for all digital inputs)**

<table>
<thead>
<tr>
<th>To use as</th>
<th>JP8</th>
</tr>
</thead>
<tbody>
<tr>
<td>npn (sink)</td>
<td>A</td>
</tr>
<tr>
<td>pnp (source)*</td>
<td>B</td>
</tr>
</tbody>
</table>

**JP9**

**Input voltage (for all digital inputs)**

<table>
<thead>
<tr>
<th>To use as</th>
<th>JP9</th>
</tr>
</thead>
<tbody>
<tr>
<td>12VDC</td>
<td>A</td>
</tr>
<tr>
<td>24VDC*</td>
<td>B</td>
</tr>
</tbody>
</table>

*Default factory setting

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In this figure, the jumper settings will cause the inputs to function as npn, 24VDC digital inputs

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**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.