PiC900 CONTROLS

# MOTION SOLUTIONS PRODUCT GUIDE

Part Number M.1301.4204
Version 1.0

Giddings & Lewis

# PiC900 Controls

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Version 1.0

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# Introduction

Giddings & Lewis

# The PiC™ System

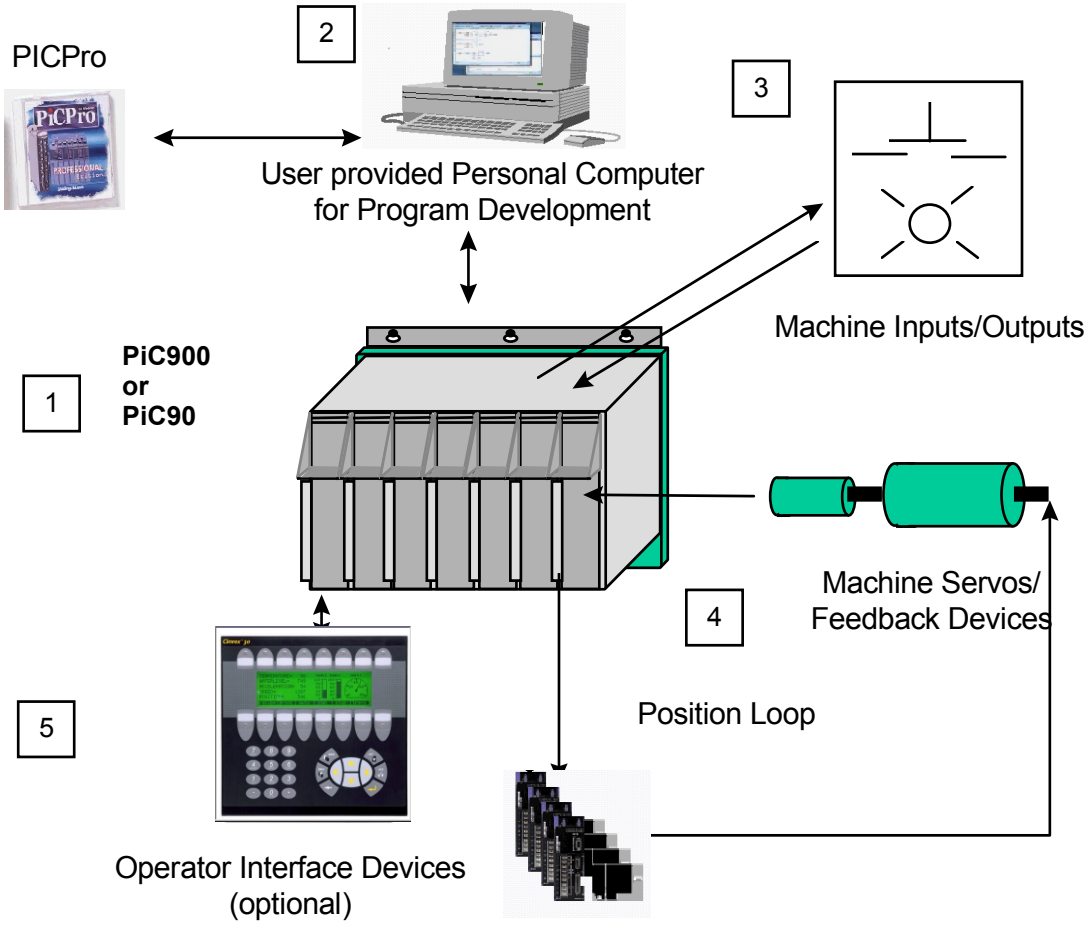
The PiC is more than just a motion control. It's a *machine* control. The PiC combines motion, logic, and process control all in a single programming environment. Programmed with IEC1131 ladder logic and function block language using our powerful PiCPro for Windows software, the PiC provides a close coupled, integrated solution to the logic, motion, process, operator interface, and communications requirements found in today's industrial automation applications.

A PiC *system* consists of the components found in the following illustration. Motion control is accomplished through the use of encoder/resolver feedback modules and analog output modules, or by using the SERCOS module. The machine inputs and outputs (logic and process control) are handled with a wide variety of rack I/O or distributed block I/O modules. All I/O modules can be used across the PiC90 and PiC900 product lines interchangeably. Serial communications modules and application-specific software functions allow the PiC to communicate to a wide variety of operator interface devices.

PiCPro is the machine control software that ties it all together. Application programs developed for any PiC solution are 100% software compatible with one another. Motion, logic, operator interface, and process control are all performed in a single programming environment, simplifying development, maintenance, and troubleshooting of the application program.

Generally throughout this guide, the PiC refers to the PiC family of *Programmable industrial Computer*s and includes the PiC90.

## PiC System




**1 PiC900/90**

The PiC900/90 is comprised of a system rack, a CSM module and a CPU module for the PiC900 or a CSM/CPU module for the PiC90, and I/O modules.

**System rack** - available in 7, 10, or 13 slots for the PiC900 and 3 or 5 slots for the PiC90.

**2 PiCPro for Windows Software and Workstation**

The software and computer which are used to develop application programs.

**3 Machine Inputs/Outputs**

The physical inputs to and outputs from the machine(s) that are controlled by the PiC.

**4 Position Loop**

The physical elements that provide closed loop control over axial positions - the feedback device(s) of the machines and the analog output module of the PiC.

**5 Operator Interface Devices**

A terminal, touch screen, or PC which can optionally be used by operators to interface with the system.

# System Racks

The *system rack* has four functions:

1. It provides physical support for the top and bottom of each hardware module.
2. It passes power from the CSM (or CSM/CPU) to each of the other modules.
3. It contains a data bus, address bus and control lines. These lines allow data to pass between the CPU (or CSM/CPU) module and each of the other modules.
4. It has a 64-pin female connector at each slot position which allows communication between modules.

### Dimensions of the racks

PiC system racks differ only in length and the number of hardware modules they can contain. A dimensional diagram of each rack is shown on the following pages.

**System Racks**

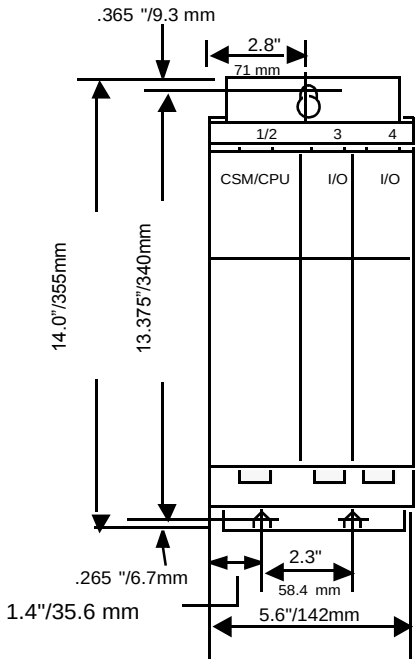
| | Number of actual slots | Number of modules | Length | Height | Depth (with modules) | Part Number |
|---|---|---|---|---|---|---|
| **PiC900** | 13 | CSM, CPU, 11 I/O | 21.6" | 14.0" | 9.0" | M.1017.1606 (old # 503-18011-03) |
| | 10 | CSM, CPU, 8 I/O | 16.8" | 14.0" | 9.0" | M.1017.1600) (old # 503-18010-03) |
| | 7 | CSM, CPU, 5 I/O | 12.0" | 14.0" | 9.0" | (M.1017.1594 (old # 503-18009-03) |
| **PiC90** | 5* | CSM/CPU, 4 I/O | 8.8" | 14.0" | 9.0" | M.1017.2284 (old # 503-19184-02) |
| | 3* | CSM/CPU, 2 I/O | 5.6" | 14.0" | 9.0" | M.1017.2288 (old # 503-19185-02) |

*The PiC90 retaining bar labels the CSM/CPU module slot as 1/2, leaving 2 or 4 slots available for I/O modules.

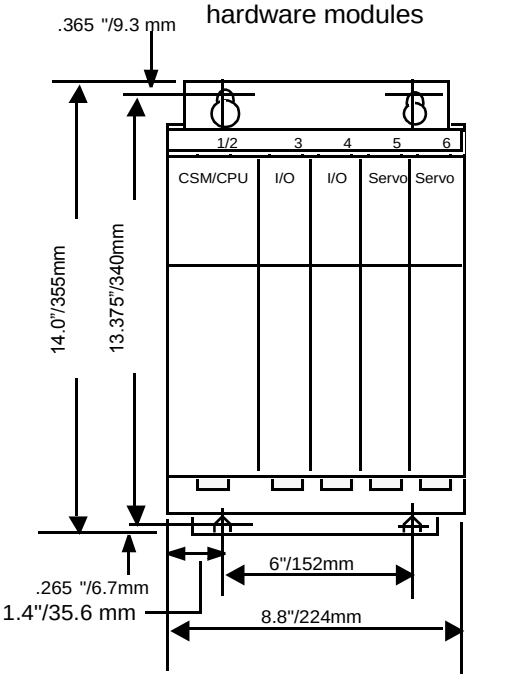
In the illustrations that follow, racks with 3, 5, and 7 slots are shown with modules inserted. All racks are the same height and have the same profile. The next two rack sizes are shown empty.

## System Racks with Modules Installed

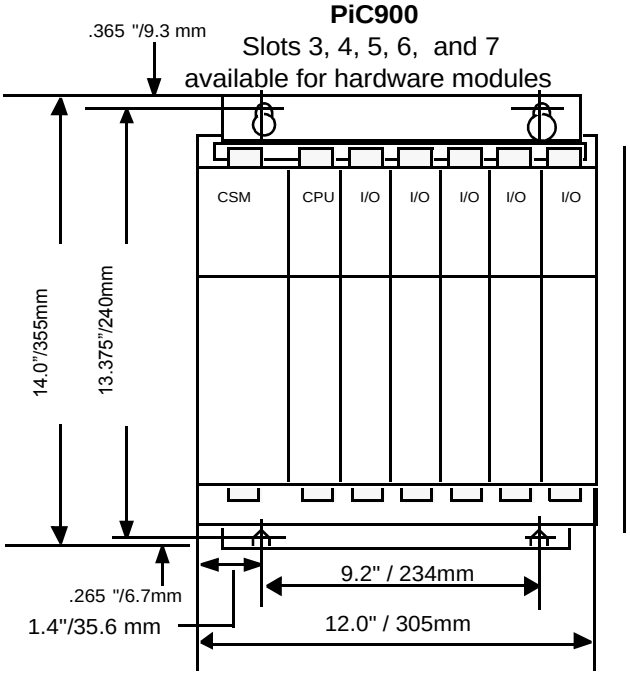
**PiC90**
Slots 3 and 4 available for hardware modules

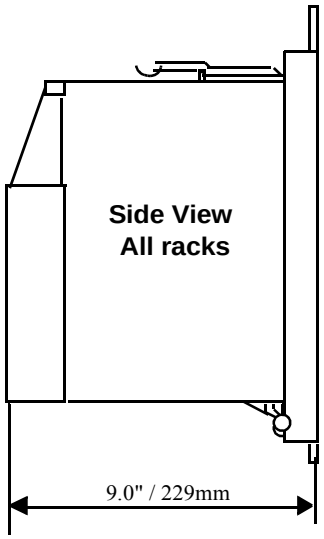



**PiC90**
Slots 3, 4, 5, and 6 available for hardware modules

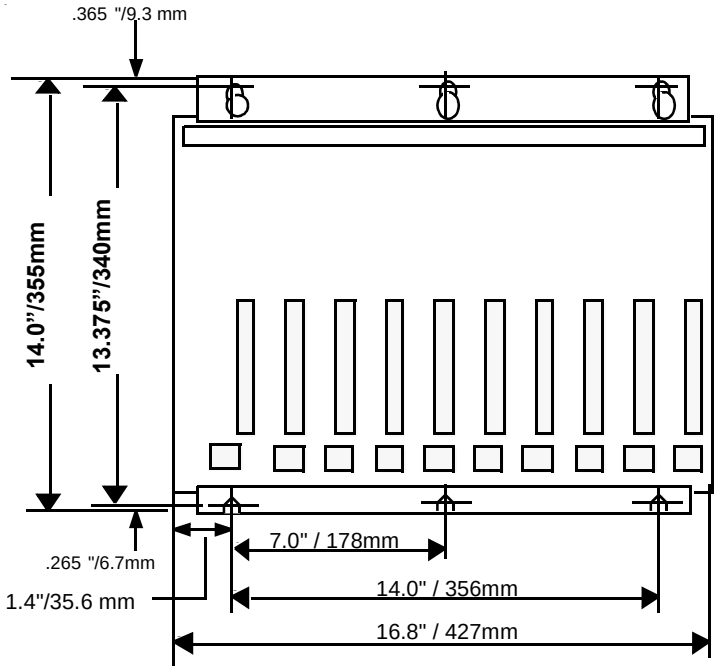



**PiC900**
Slots 3, 4, 5, 6, and 7 available for hardware modules

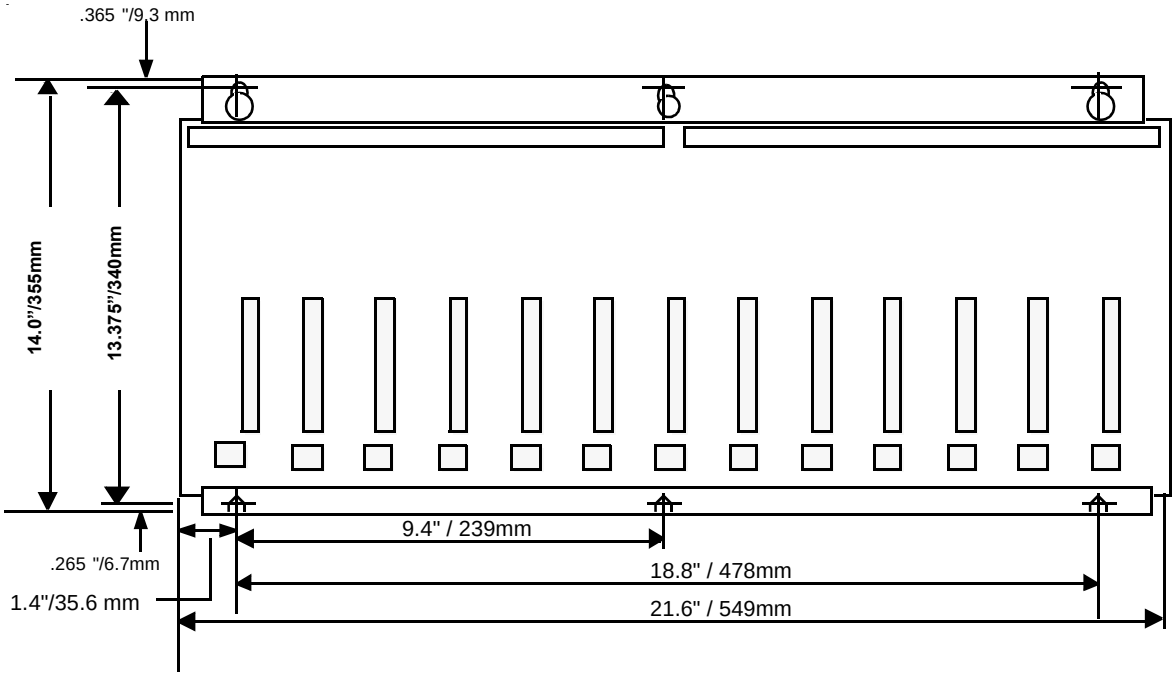


## The 10-slot System Rack




## The 13-slot System Rack



**PiC900 CONTROLS**
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# PiC Family CSM/ RSM Modules

Giddings & Lewis

# CSM Module/RSM Module

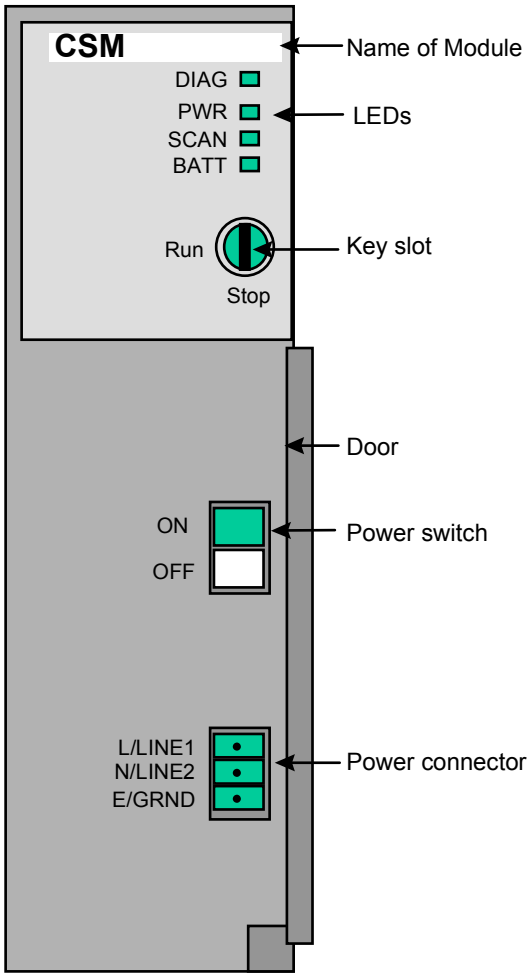
The Central Service Module (CSM) and the Remote Service Module (RSM) convert incoming power to regulated DC power. Through the bus, the CSM supplies this power to the modules in the master rack and the RSM supplies this power to the modules in an expansion rack.

The CSM has the following additional features:

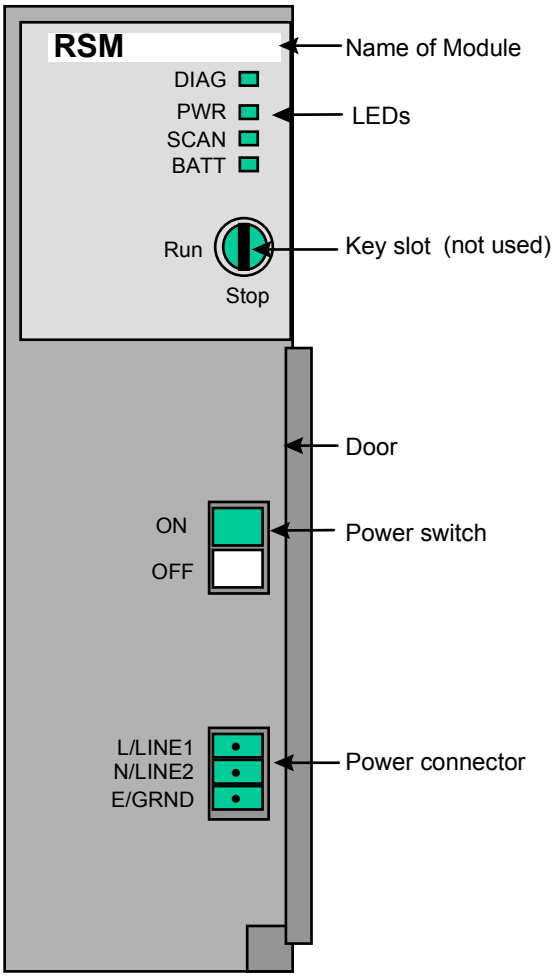
- Scan control which includes a key switch to run/stop the scan when power is on.
- A lithium battery to back up such items as non-volatile RAM in the CPU module and the time-of-day clock on the CSM module when power is turned off.
- An internal clock to provide time of day and date when needed by the software.

The CSM and the RSM must always be located in the first slot on the left in the master rack and expansion rack respectively.

**CSM - the Central Service Module (for master rack)**




**RSM - the Remote Service Module (for expansion rack)**



### Specification Table

<table>
<tr><th>Characteristic</th><th>CSM/RSM specifications</th></tr>
<tr><td>Functions</td><td>Supplies regulated DC power to the hardware modules installed in the rack</td></tr>
<tr><td>AC power source</td><td>
<table>
<tr><th colspan="2">110-230 VAC, 47-63 Hz, 2 A</th></tr>
<tr><th>Model</th><th>Part Number</th></tr>
<tr><td>CSM-50</td><td>M.1016.8879 (old # 502-03512-03)</td></tr>
<tr><td>CSM-60</td><td>M.1016.9294 (old # 502-03813-03)</td></tr>
<tr><td>RSM-50</td><td>M.1016.9243 (old # 502-03732-03)</td></tr>
<tr><td>RSM-60</td><td>M.1016.9308 (old # 502-03817-03)</td></tr>
</table>
</td></tr>
<tr><td>DC power source</td><td>
<table>
<tr><th colspan="2">20 - 60 VDC, 3 A</th></tr>
<tr><th>Model</th><th>Part Number</th></tr>
<tr><td>CSM-50 (24 VDC)</td><td>M.1016.9475 (old # 502-03973-00)</td></tr>
</table>
</td></tr>
<tr><td>Input connector</td><td>3-terminal plug connector, meets all specifications for touch safety in accordance with IEC 529 and DIN VDE 0470 part 1</td></tr>
<tr><td>Power output, total</td><td>
<table>
<tr><th>Model</th><th>Power</th></tr>
<tr><td>CSM/RSM-50</td><td>50 W</td></tr>
<tr><td>CSM/RSM-60</td><td>60 W</td></tr>
<tr><td>CSM 24 VDC</td><td>50 W</td></tr>
</table>
</td></tr>
<tr><td>Individual outputs</td><td>
<table>
<tr><td>+5 V @ 4.0 A</td><td>+5 V @ 8.5 A</td><td>+5 V @ 4.0 A</td></tr>
<tr><td>+15 V @ 2.0 A</td><td>+15 V @ 1.5 A</td><td>+ 15 V @ 1.0 A</td></tr>
<tr><td>-15 V @ .5 A</td><td>-15 V @ 1.5 A</td><td>-15 V @ .5 A</td></tr>
</table>
</td></tr>
</table>

| | |
|---|---|
| Battery (CSM only)<br>Part number | 1.2 Ah 3 V, 2/3 A lithium battery<br>M.1015.9316 (old # 401-52446-00) |
| + 5 V supply monitor | Trip points ± 5% ± .5%:<br>4.725 to 4.775 V and 5.225 to 5.275 V<br>PWR LED goes off and PiC shuts down |
| ± 15 V supply monitor | Trip points ± 8% ± 2%:<br>13.5 to 14.1 V and 15.9 to 16.5 V |
| Time-of-day clock (CSM only) | Access via PiCPro or application program. |
| Clock tolerance (CSM only) | At 25°C, ±1 second per day<br>Over temperature, voltage and aging variation,<br>+2/-12 seconds per day |
| Logic side power requirements (typical) | 25 mA @ +5 V<br>2 mA @ +15 V<br>2 mA @ - 15 V<br>2 µA @ +3 V (from battery during power down on CSM) |
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br>Emissions<br>Noise immunity | Refer to the EMC Guidelines for more information.<br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines |

| | |
|---|---|
| CE Marked | Conforms to Directives 73/23/EEC, 89/336/EEC, 92/31/EEC, 93/68/EEC by conforming to the following standards:<br>EN 50081-2:1993 EMC Generic Industrial Emissions<br>EN 50082-2:1995 EMC Generic Industrial Immunity<br>EN 61131-2:1994/A11:1996 Low voltage directive requirements for programmable controllers<br>Operates with emissions below EN5501/CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per EN61000-4-2<br>• RF electromagnetic fields per EN61100-4-3, ENV50141, and ENV50204 |
| UL and C/UL Listed (CSM/RSM-50) | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 2.4" wide x 12" high x 8.4" deep (including latch)<br>61 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-7) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000Hz (acceleration 2 g |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

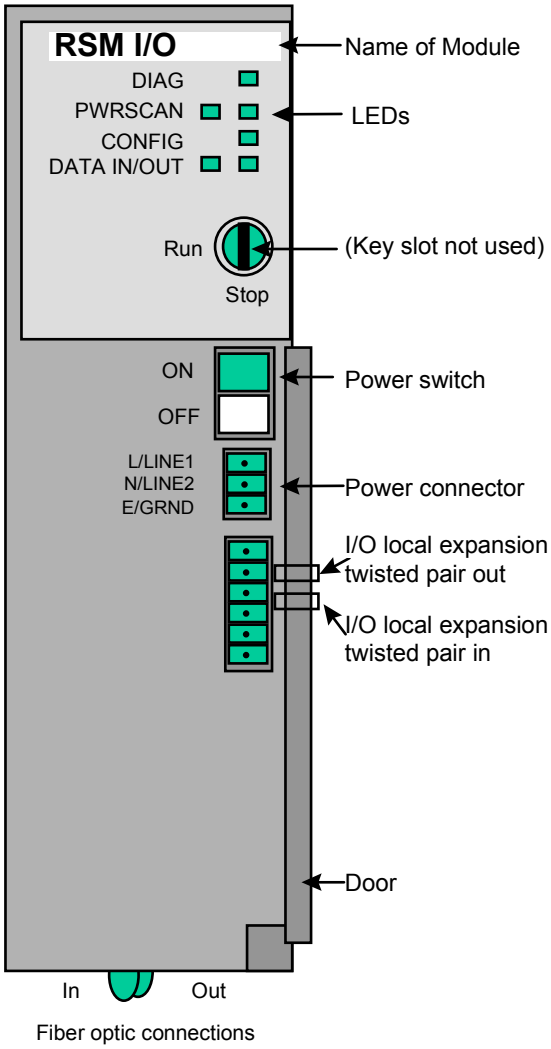
# PiC90 RSM I/O Module

When a PiC90 3- or 5-slot rack is used as a remote or local expansion rack for a PiC900 master rack, an RSM I/O driver module is required in slot 1/2 of the PiC90 rack.

The RSM I/O driver module converts AC power to regulated DC power. Through the bus, the RSM supplies this power to the modules in an expansion rack.

A PiC900 system may include up to eight expansion racks containing I/O modules. The RSM I/O driver module must be installed in each PiC90 3- or 5-slot expansion rack and an RSM module and an I/O driver module must be installed in each PiC900 7-, 10-, or 13-slot expansion rack.
The DIAG LED turns on briefly while the diagnostic tests are running.

**RSM I/O - the Remote Service Module I/O Driver**
**(for 3- or 5- slot PiC90 expansion rack)**



## Specification Table

| Characteristic | RSM I/O driver specifications |
|---|---|
| Functions | Supplies regulated DC power to hardware modules installed in the rack and allows additional racks of I/O modules to be connected to a PiC900 master rack |
| Part number | M.1016.9385 (old # 502-03876-02) |
| AC power source | 120-230 V AC, 47-63 Hz |
| Input connector | 3-terminal plug connector, meets all specifications for touch safety in accordance with IEC 529 and DIN VDE 0470 part 1 |
| Power output, total | 40 W |
| Individual outputs | + 5 V @ 5.0 A<br>+ 15 V @ 2.0 A<br>-15 V @ .5 A |
| + 5 V supply monitor | Trip points ± 5% ± .5%:<br>4.725 to 4.775V and 5.225 to 5.275 V<br>PWR LED goes off and PiC900 shuts down |
| Logic side power requirements (typical) | 510 mA @ +5V |
| Operating temperature range | 7° C to 55° C (45° F to 131° F) |
| Storage temperature range | -40° C to 85° C (-40° F to 185° F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br>Emissions<br><br>Noise immunity | Refer to the EMC Guidelines for more information.<br>Operates with emissions below EN55011/ CISPR 11Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 2.4" wide x 12" high x 8.4" deep (including latch)<br>61 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11msec) |

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# PiC Family CPU Modules

Giddings & Lewis

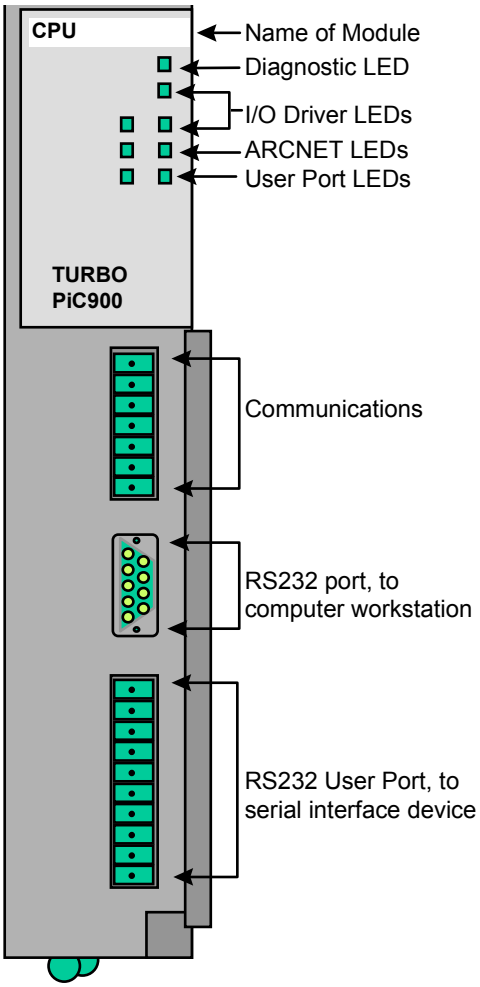
# PiC94X CPU Module

The PiC94X Turbo CPU module controls the PiC900 system and executes the application program. It contains:

- A processor IC providing overall control
- A math coprocessor
- Eight LEDs
- RAM (EPROM optional) memory for the application program and for RAMDISK
- RAM memory for data storage as the system runs
- FLASH memory for the system software
- RS232 ports to communicate with the computer workstation and with a serial interface device
- Optional communication (ARCNET, I/O, and Block I/O expansion) capability
- Optional flash memory for storing things like application source modules

The CPU module must always be in the second slot from the left in the system rack.

**PiC94X Turbo CPU Module**



## Specification Table

| Characterisitcs | CPU 94X module specifications |
|---|---|
| Function | Executes the application program.<br>Executes Diagnostics on the system and it's modules.<br>Communicates through RS232 port to external devices.<br>Can provide ARCNET and I/O expansion from module. |

| CPUs | | | | | | | Number of servo axes available at five update rates ** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Model** | **CPU** | **Part Number** | **Speed** | **App Mem** | **RAM Mem** | **User Mem** | **8 ms** | **4 ms** | **2 ms** | **1 ms** | **.5 ms** |
| 941 | 80486DX2 | M.1016.9626<br>(old # 502-04111-01) | 16 MHz | 512K | 256K | 64K | 16 | 8 | 4 | 2 | 1 |
| Turbo2 | 80486DX2 | M.1016.9627<br>(old # 502-04111-11)* | 16 MHz | 512K | 256K | 64K | 16 | 8 | 4 | 2 | 1 |
| 943 | 80486DX2 | M.1016.9508)<br>(old # 502-04011-01) | 32 MHz | 512K | 256K | 64K | 32 | 16 | 8 | 4 | 2 |
| Turbo2 | 80486DX2 | M.1016.9510<br>(old # 502-04011-11)* | 32 MHz | 512K | 256K | 64K | 32 | 16 | 8 | 4 | 2 |
| 945 | | | | | | | | | | | |
| Turbo3 | 80486DX2 | M.1016.9491<br>(old # 502-03994-11)* | 50 MHz | 512K | 256K | 64K | 32 | 32 | 16 | 8 | 4 |
| 947 | | | | | | | | | | | |
| Turbo3 | 80486DX4 | M.1016.9629<br>(old # 502-04112-11)* | 100MHz | 512K | 256K | 64K | 32 | 32 | 24 | 12 | 8 |

*ARCNET and I/O expansion communications are standard on these modules.
**The number of axes listed is typical for RATIO_GR, RATIOCAM, VEL_STRT, POSITION and DISTANCE move types. Applications which use time axes, servo tasks, RATIO_RL, M_LINCIR, or M_SCRVLC moves require more CPU time. Consult Giddings & Lewis for assistance if you want to exceed the number of axes in this chart.

<table>
<tr><td>Flash memory system board (optional)</td><td>8 Megabyte FMS Board<br>M.1016.9390 (old # 502-03882-20)</td></tr>
<tr><td>Memory</td><td>1 Megabyte max.</td></tr>
<tr><td>PiCPro Port (to workstation)</td><td>RS232 serial port, secured protocol<br>Software selectable baud rate to 115.2K</td></tr>
<tr><td>User Port (to serial interface device)</td><td>RS232 serial port<br>Supports RTS/CTS hardware handshaking<br>Software selectable baud rate to 19.2K</td></tr>
<tr><td>Logic side power requirements (typical)</td><td>
<table>
<tr><th>Part Number</th><th>+5 V</th><th>+ 15 V</th><th>-15 V</th></tr>
<tr><td>M.1016.9626<br>(old # 502-04111-01)</td><td>700 mA</td><td>4 mA</td><td>10 mA</td></tr>
<tr><td>M.1016.9508<br>(old # 502-04011-01)</td><td>800 mA</td><td>4 mA</td><td>10 mA</td></tr>
<tr><td>M.1016.9627<br>(old # 502-04111-11)*</td><td>900 mA</td><td>4 mA</td><td>39 mA</td></tr>
<tr><td>M.1016.9510<br>(old # 502-04011-11)*</td><td>1000 mA</td><td>4 mA</td><td>39 mA</td></tr>
<tr><td>M.1016.9491<br>(old # 502-03994-11)*</td><td>1400 mA</td><td>4 mA</td><td>39 mA</td></tr>
<tr><td>M.1016.9629<br>(old # 502-04112-11)*</td><td>1100 mA</td><td>4 mA</td><td>39 mA</td></tr>
</table>
All CPUs draw 15 µA from the battery during power down.<br>* CPUs with ARCNET and I/O capabilities on board.</td></tr>
<tr><td>Operating temperature range</td><td>7°C to 55°C (45°F to 131°F)</td></tr>
<tr><td>Storage temperature range</td><td>-40°C to 85°C (-40°F to 185°F)</td></tr>
<tr><td>Humidity</td><td>0 to 95%, non-condensing</td></tr>
</table>

| | |
|---|---|
| EMC Compliant<br>Emissions<br><br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15mm)<br>57-2000 Hz (acceleration 2g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

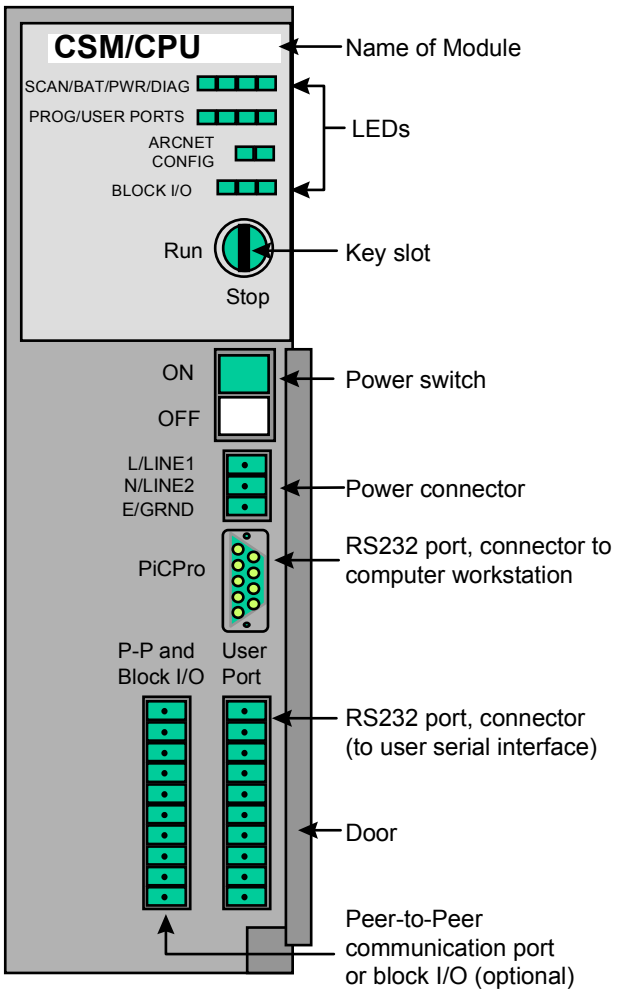
**NOTES**

# PiC904X- CSM/CPU Central Service Module/Central Processing Unit

The PiC9041 or 9043 CSM/CPU module occupies the 1/2 slot in the rack.

The CSM/CPU converts AC or DC power to regulated DC power. It supplies this power to the modules in the rack through the bus. The CSM/CPU controls the PiC90 system and executes the application program.

**PiC904X CSM/CPU Module**



## Specification Table

| Characterisitcs | CSM/CPU specifications |
|---|---|
| Functions | Supplies regulated DC power to the hardware modules installed in the rack.<br>Executes the application program.<br>Executes Diagnostics on the system and it's modules.<br>Communicates through RS232 port to external devices.<br>Peer -to-peer communications with PiC family of controls (optional). |

| Models available | | | | | | Number of servo axes available at six update rates * | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **PiC90 Model (with AC Power Source)** | **Part Number** | **Speed** | **App Mem** | **RAM Mem** | **User Mem** | **8 ms** | **4 ms** | **2 ms** | **1 ms** | **.5 ms** | **.25 ms** |
| 9041 Standard w/o comm | M.1016.9615 (old # 502-04104-01) | 16 MHz | 256K | 128K | 64K | 12 | 6 | 4 | 2 | 1 | 0 |
| 9041 Standard w/ comm | M.1016.9617 (old # 502-04104-11) | 16 MHz | 256K | 128K | 64K | 12 | 6 | 4 | 2 | 1 | 0 |
| 9043 Turbo w/o comm | M.1016.9677) (old # 502-04125-01) | 32 MHz | 256K | 128K | 64K | 12 | 12 | 8 | 4 | 2 | 1 |
| 9043 Turbo w/ comm | M.1016.9679 (old # 502-04125-11) | 32 MHz | 256K | 128K | 64K | 12 | 12 | 8 | 4 | 2 | 1 |
| **PiC90 Model (with DC Power Source)** | | | | | | | | | | | |
| 9043Turbo w/ comm | M.1016.9682 (old # 502-04126-10) | 32 MHz | 256K | 128K | 64K | 12 | 12 | 8 | 4 | 2 | 1 |

*The number of axes listed is typical for RATIO_GR, RATIOCAM, VEL_STRT, POSITION and DISTANCE move types. Applications which use time axes, servo tasks, RATIO_RL, M_LINCIR, or M_SCRVLC moves require more CPU time. Consult Giddings & Lewis for assistance if you want to exceed the number of axes in this chart.

| | |
|---|---|
| AC power source | 110-230 V AC, 47-63 Hz, 1A |
| DC power source | 20 -30V DC, 3 A |
| Input connector | 3-terminal plug connector, meets all specifications for touch safety in accordance with IEC 529 and DIN VDE 0470 part 1 |
| Power output, total | CSM/CPU<br>40 W (for AC power source)<br>30 W (for DC power source) |
| Individual outputs | **AC Power Source** **DC Power Source**<br>+ 5V @ 5.0 A 3 A<br>+ 15V @ 2.0 A 1 A<br>-15V @ .5 A .5 A |
| Battery | 1.2 Ah 3V, 2/3A lithium battery |
| + 5 V supply monitor | Low trip point 4.50V min 4.75V max<br>High trip point 5.50V min 5.94V max<br>PWR LED goes off and PiC9041 shuts down |
| Flash memory system board (optional) | 8 Megabyte FMS Board M.1016.9390 (old # 502-03882-20) |
| PiCPro port | Used to connect to the work station<br>RS232 serial port, secured protocol<br>Software selectable baud rate (300 to 57600 baud) |
| User port | Used to connect to a serial interface device<br>RS232 serial port<br>Supports RTS/CTS hardware handshaking<br>Baud rates to 19.2 K |
| Peer-to-peer communications (optional) | Allows for communication between PiC90s and/or PiC900s (up to 255)<br>A dedicated network controller supports peer-to-peer communications. Provides a twisted pair wire interface that is transformer isolated. Data is transferred serially at a rate of 2.5 megabits per second. |
| Block I/O expansion (optional) | Allows for communication between the PiC90 and block I/O modules (up to 77)<br>The maximum distance between modules is 200 feet using shielded twisted pair wire |
| Time-of-day clock | Access via PiCPro or application program. |
| Clock tolerance | At 25° C, ±1 second per day<br>Over temperature, voltage and aging variation,<br>+2/-12 seconds per day |

| | |
|---|---|
| Logic side power requirements (typical) | 450 mA @ +5V M.1016.9615 (old # 502-04104-01)<br>650 mA @ +5V M.1016.9617 (old # 502-04104-11)<br>600 mA @ +5V M.1016.9677 (old # 502-04125-01)<br>800 mA @ +5V M.1016.9679 (old # 502-04125-11), M.1016.9682 (old # 502-04126-10)<br>5 mA @ +15V all<br>10 mA @ -15V M.1016.9615 (old # 502-04104-01), M.1016.9677 (old # 502-04125-01)<br>40 mA @ -15V M.1016.9617 (old # 502-04104-11), M.1016.9678 (old # 502-04125-10), M.1016.9682 (old # 502-04126-10)<br>5 µA @ +3V (all) From the battery during power down |
| Operating temperature range | 7° C to 55° C (45° F to 131° F) |
| Storage temperature range | -40° C to 85° C (-40° F to 185° F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant | In progress |
| CE Marked | Conforms to Directives 73/23/EEC, 89/336/EEC, 92/31/EEC, 93/68/EEC by conforming to the following standards:<br>EN 50081-2:1993 EMC Generic Industrial Emissions<br>EN 50082-2:1995 EMC Generic Industrial Immunity<br>EN 61131-2:1994/A11:1996 Low voltage directive requirements for programmable controllers<br>Operates with emissions below EN5501/CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per EN61000-4-2<br>• RF electromagnetic fields per EN61100-4-3, ENV50141, and ENV50204<br>• Electrical fast transients per EN61000-4-4<br>• Magnetic fields per EN61000-40 |
| UL and C/UL Listed | File No. E1226417 NRAQ Programmable Controllers |
| Physical size | 2.4" wide x 12" high x 8.4" deep (including latch)<br>61 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11msec) |

**PiC900 CONTROLS**
**MOTION SOLUTIONS PRODUCT GUIDE**

# PiC 900 Communications Modules

Giddings & Lewis

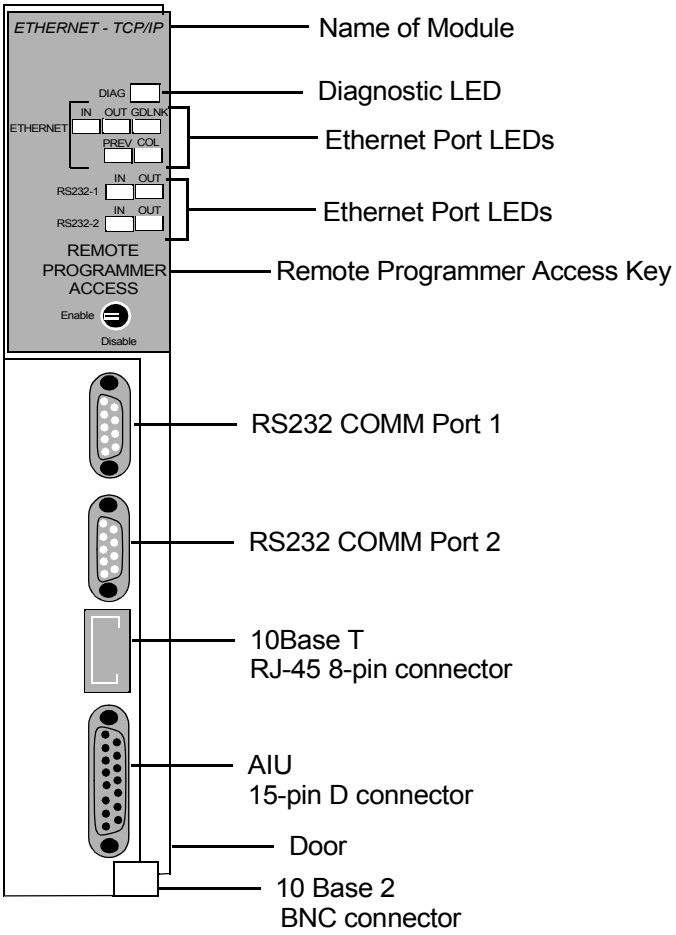
# Ethernet - TCP/IP Module

The Ethernet - TCP/IP module provides the PiC with Ethernet access and Internet connectivity. Connections for 10Base T, 10Base 2, and AUI (Attachment Unit Interface) are provided following the IEEE 802.3 specification. The data transfer rate is 10 Mbps. Applications can range from connecting several PiCs, connecting groups of PiCs and PCs, or connecting to a system that includes Internet access.

The Remote Programmer Access key will allow you to enable/disable PiCPro for Windows running over Ethernet. The DIAG LED goes on briefly while the diagnostic tests are running shortly after power is applied.

NOTE: The Ethernet module must be used with an EMC-compliant or CE-marked rack.

**Ethernet - TCP/IP Module**



**Specification Table**

| Characteristics | Ethernet - TCP/IP Module Specifications |
|---|---|
| Function | Provides the PiC with Ethernet access and Internet connectivity |
| Part number | M.1016.9694 (old # 502-04137-00) |
| RS232 Port 1 | Com Port 1 modem (future) |
| RS232 Port 2 | Com Port 2 (for firmware and configuration loading) |
| 10Base T | RJ-45 8-pin connector<br>Maximum twisted pair length is 100 m (328 ft.). |
| AUI | 15-pin D connector<br>Maximum twisted pair length is 50 m (164 ft.). |
| 10Base 2 | BNC connector<br>Maximum coax cable length is 185 m (607 ft.). |
| Logic side power requirements (typical) | +5V @ 1250 mA<br>+15V @ 30 mA maximum<br>-15V @ 30 mA maximum |
| Operating temperature range | 7° C to 55° C (45° F to 131° F) |
| Storage temperature range | -40° C to 85° C (-40° F to 185° F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br><br>Emissions<br><br>Noise immunity | <br><br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8KV air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |

| | |
|---|---|
| CE Marked | Conforms to Directives 73/23/EEC, 89/336/EEC, 92/31/EEC, 93/68/EEC by conforming to the following standards:<br>EN 50081-2:1993 EMC Generic Industrial Emissions<br>EN 50082-2:1995 EMC Generic Industrial Immunity<br>EN 61131-2:1994/A11:1996 Low voltage directive requirements for programmable controllers<br>Operates with emissions below EN5501/CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per EN61000-4-2<br>• RF electromagnetic fields per EN61100-4-3, ENV50141, and ENV50204 |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57 - 2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

# DeviceNet Module

The DeviceNet scanner module is an interface between the PiC and a DeviceNet network. The module contains an on-board processor, a DeviceNet compliant interface, and firmware that makes it act as the master to all other nodes on the network.

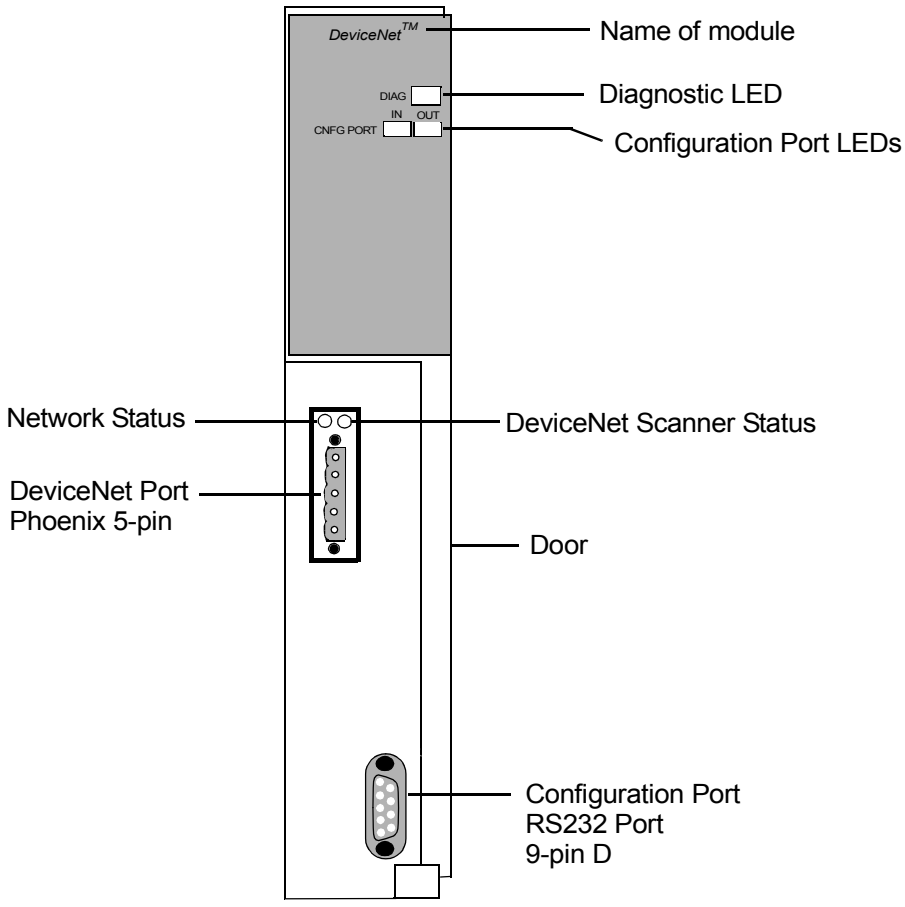
Prior to initial operation, a file is generated with specific configuration software in an external PC. This file must be downloaded via the RS232 configuration port to the DeviceNet module prior to initial operation. Two indicator LEDs (IN/OUT) are connected to this configuration port.

Directly above the DeviceNet port are two LEDs that provide operation information: Network Status and DeviceNet Scanner Status.

The DIAG LED goes on briefly while the diagnostics tests are running.

NOTE: The DeviceNet module must be used with an EMC-compliant or CE-marked rack.

**DeviceNet Module**



**Specification Table**

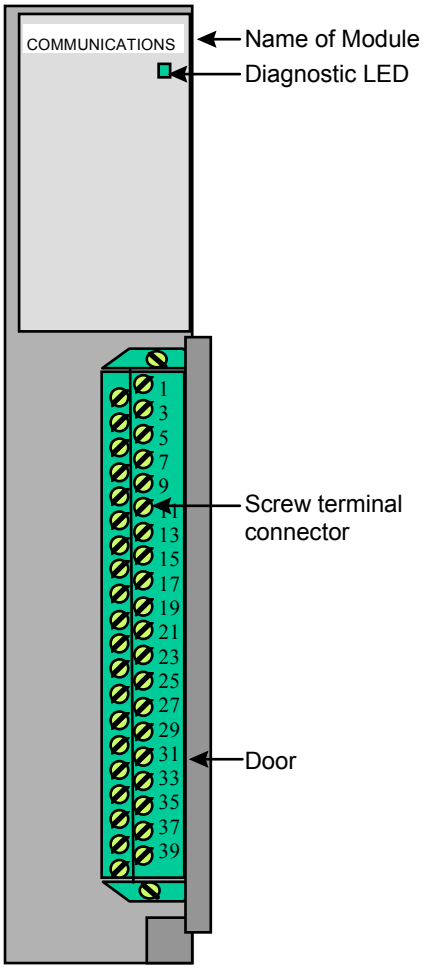
| Characteristics | DeviceNet Module Specifications |
|---|---|
| Function | Interfaces to a DeviceNet network with up to 63 other nodes |
| Part number | M.1016.9719 (old # 502-04157-00) |
| DeviceNet Port | Phoenix style 5-pin male connector |
| Configuration Port | RS232 interface |
| Logic side power requirements (typical) | 275 mA @ 5 V |
| Operating temperature range | 7° C to 55° C (45° F to 131° F) |
| Storage temperature range | -40° C to 85° C (-40° F to 185° F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br><br>Emissions<br><br>Noise immunity | <br><br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8KV air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57 - 2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

# Serial Communications Module (2, 4 channel)

The serial communications module provides two or four channels to be used for asynchronous serial communication with external devices such as computers, operator interface devices, etc. For each channel, RS232 electrical interface is provided for data and control lines; RS422/485 electrical interface is provided for data lines.

The DIAG LED goes on briefly while the diagnostic tests are running

**Serial COMMUNICATIONS Module (2, 4 ch)**



**Specification Table**

| Characteristics | Communications Module Specifications |
|---|---|
| Function | Provides 2 or 4 asynchronous serial communication channels to be used with serial interface devices |
| Part number | 2 channel - M.1016.9143 (old # 502-03676-23)<br>4 channel - M.1016-9140 (old # 502-03676-03) |
| Dedicated processor | 80C186, 8 MHz, 32K x 16 EPROM, 8K x 16 RAM |
| Ports 1, 2, 3, and 4 | RS232 or RS422/485 electrical interface<br>Supports RTS/CTS hardware handshaking<br>Baud rates to 19.2 Kbps |
| Logic side power requirements (typical) | 420 mA @ +5V (2 ch)<br>450 mA @ +5V (4 ch)<br>5 mA @ +15V<br>5 mA @ -15V<br>50 mA per terminated RS422/485 channel @ +5V<br>5 mA per active RS232 channel @ +15V<br>6 mA per active RS232 channel @ -15V |
| Operating temperature range | 7° C to 55° C (45° F to 131° F) |
| Storage temperature range | -40° C to 85° C (-40° F to 185° F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br>Emissions<br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |

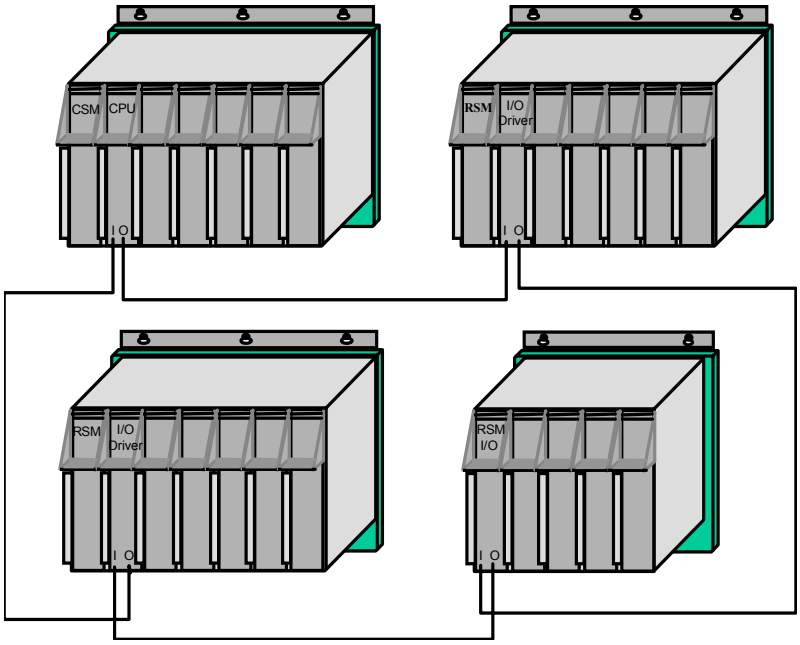
| | |
|---|---|
| CE Marked | Conforms to Directives 73/23/EEC, 89/336/EEC, 92/31/EEC, 93/68/EEC by conforming to the following standards:<br>EN 50081-2:1993 EMC Generic Industrial Emissions<br>EN 50082-2:1995 EMC Generic Industrial Immunity<br>EN 61131-2:1994/A11:1996 Low voltage directive requirements for programmable controllers<br>Operates with emissions below EN5501/CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per EN61000-4-2<br>• RF electromagnetic fields per EN61100-4-3, ENV50141, and ENV50204 |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15mm)<br>57-2000 Hz (acceleration 2g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11msec) |

# I/O Expansion

### Local I/O Expansion

*Local I/O Expansion* allows additional PiC900 or PiC90 racks of input/output modules to be connected to a PiC900 master rack within the same cabinet. The diagram below shows three expansion racks connected to a master rack.

**Local I/O Expansion**




NOTE: When a PiC900 rack is used for expansion, an RSM (or CSM) module is placed in slot 1 and the I/O driver module is placed in slot 2. When a PiC90 rack is used for expansion, the RSM I/O driver module is placed in slot 1/2.

### Expansion Modules

Expansion is accomplished with a PiC9XX CPU module with communication capabilities in the master rack and an I/O expansion driver for each additional rack. Up to seven expansion drivers with the PiC9XX can be linked to a master rack.

### Wiring

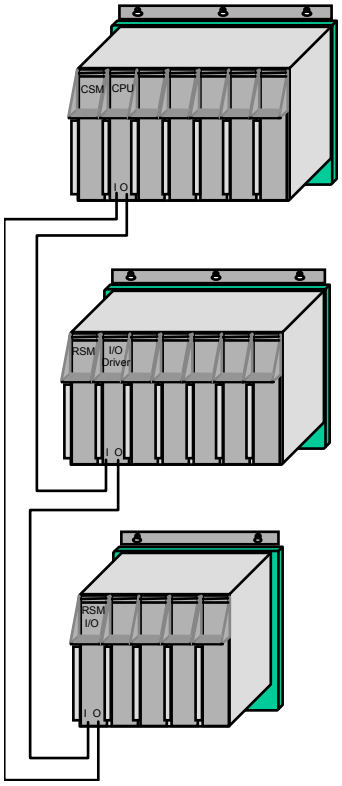
All cables are twisted pairs of wires. The maximum distance (from rack to rack) is 40 feet.

### Addressing

All addressing of modules is software defined - no address switches are required.

## Remote I/O Expansion

*Remote I/O Expansion* allows for additional racks of input/output module in remote cabinets to be connected to the PiC900 master rack. The diagram below shows two expansion racks. NOTE: It is possible to combine local and remote expansion racks in the same system. Use twisted pair wiring to connect racks that are in the same cabinet (local) as the master rack and use fiber optic cable to connect racks that are up to 2000 feet apart (remote).




### Expansion Modules

Communication with expansion is accomplished by using the following:

- For the PiC900 Master Rack, a PiC9XX CPU module with communication capabilities.
- For a PiC900 Expansion Rack, a RSM or CSM module in slot 1 *and* an I/O driver module in slot 2.
- For a PiC90 Expansion Rack, an RSM I/O module in slot 1/2.

  Seven (with the PiC9XX) expansion drivers can be linked to a master rack.

### Wiring

All cables are fiber optic. The maximum distance (rack to rack) is 2000 feet. (The maximum loop distance is 4000 feet.)

### Circuitry

Expansion circuitry on the I/O driver modules provides for parallel to serial and serial to parallel conversions.

### Addressing

All addressing of modules is software defined - no address switches are required.

# Block I/O Expansion

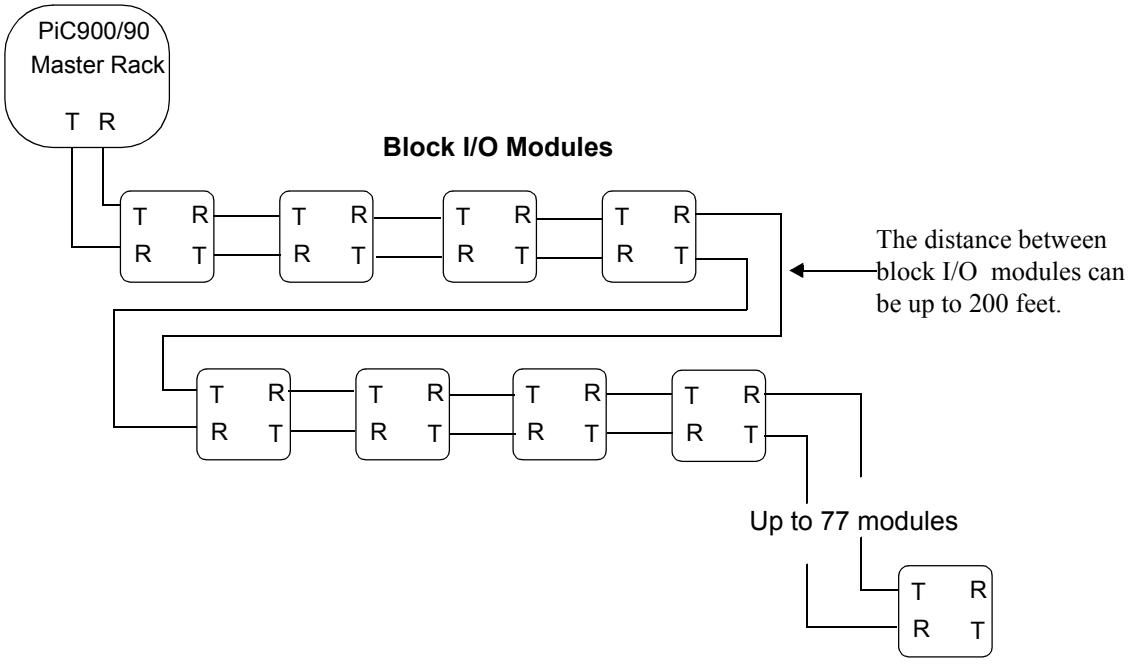
Block I/O is a self-contained I/O interface with its own logic power supply derived from an external 24V DC source. Each block has a communication interface that includes two transmitters (RS485) and two receivers (optically isolated). Blocks differ as to the type of I/O interface (analog or digital) provided.

Block I/O is an alternative to PiC900 rack I/O expansion. It is used to distribute small groups of interface logic close to the actual location of I/O devices. It allows you to replace long runs of I/O cables with twisted pairs of communication wires. The Block I/O footprint has been minimized for easy installation into small enclosures or junction boxes.

NOTE: Block I/O cannot be intermixed within a rack I/O expansion loop. Block I/O uses a slower data rate and optical isolation to accommodate longer distances between modules. Block I/O can be used with MMCs, PiC900s and PiC90s.

One possible layout for PiC expansion using block I/O modules is shown below. There can be up to 200 feet between block I/O modules. The recommended wire is Belden 9729, 24 AWG stranded conductors, twisted pair (100Ω characteristic impedance) with shield.

**Block I/O Layout for PiC90/900 Expansion**




NOTE: Unlike wiring for I/O expansion racks, it is not necessary to return the last block I/O module back to the PiC. The interconnecting cable between block I/O modules contains both a forward and a return communication path.

### Ordering Information

I/O expansion requires a PiC9XX CPU or a PiC904X CSM/CPU module with communication capabilities. Also required is an RSM (or CSM) module and an I/O driver module installed in PiC900 expansion racks and an RSM I/O driver module installed in PiC90 expansion racks.

| | Part number | Description |
|---|---|---|
| PiC94X master rack | M.1016.9627 (old # 502-04111-11)<br>M.1016.9510 (old # 502-04011-11)<br>M.1016.9491 (old # 502-03994-11)<br>M.1016.9629 (old # 502-04112-11) | CPUs with<br>Communication Capabilities on Board |
| PiC904X master rack | M1016.9617 (old # 502-04104-11)<br>M.1016.9679 (old # 502-04125-11)<br>M.1016.9682 (old # 502-04126-10) | CSM/CPUs with<br>Communication Capabilities on Board |
| PiC900 expansion rack | M.1016.9243 (old # 502-03732-03)<br>M.1016.9308 (old # 502-03817-03) | RSM-50W Module *or*<br>RSM-60W Module<br>***or*** |
| | M.1016.8879 (old # 502-03512-03)<br>M.1016.9294 (old # 502-03813-03) | CSM-50W Module *or*<br>CSM-60W Module<br>***and*** |
| | M.1016.9105 (old # 502-03657-03) | I/O driver Module |
| PiC90 expansion rack | M.1016.9385 (old # 502-03876-02) | RSM I/O driver Module |

Remote I/O requires fiber optic cable:

| Length of Fiber Optic Cable for Above | Part Number |
|---|---|
| 10’ | M.1016.9210 (old # 502-03700-10) |
| 25’ | M.1016.9215 (old # 502-03700-25) |
| 50’ | M.1016.9217 (old # 502-03700-50) |
| 75’ | M.1016.9219 (old # 502- 03700-75) |
| 100’ | M.1016.9222 (old # 502-03701-00) |
| 125’ | M.1016.9225 (old # 502-03701-25) |
| 150’ | M.1016.9227 (old # 502-03701-50) |
| 175’ | M.1016.9228 (old # 502-03701-75) |

*Refer to the I/O expansion section of the Product Guide to determine the number of fiber optic cables required for your application.

**PiC900 CONTROLS**
**MOTION SOLUTIONS PRODUCT GUIDE**

# PiC 900 Discrete I/O Modules

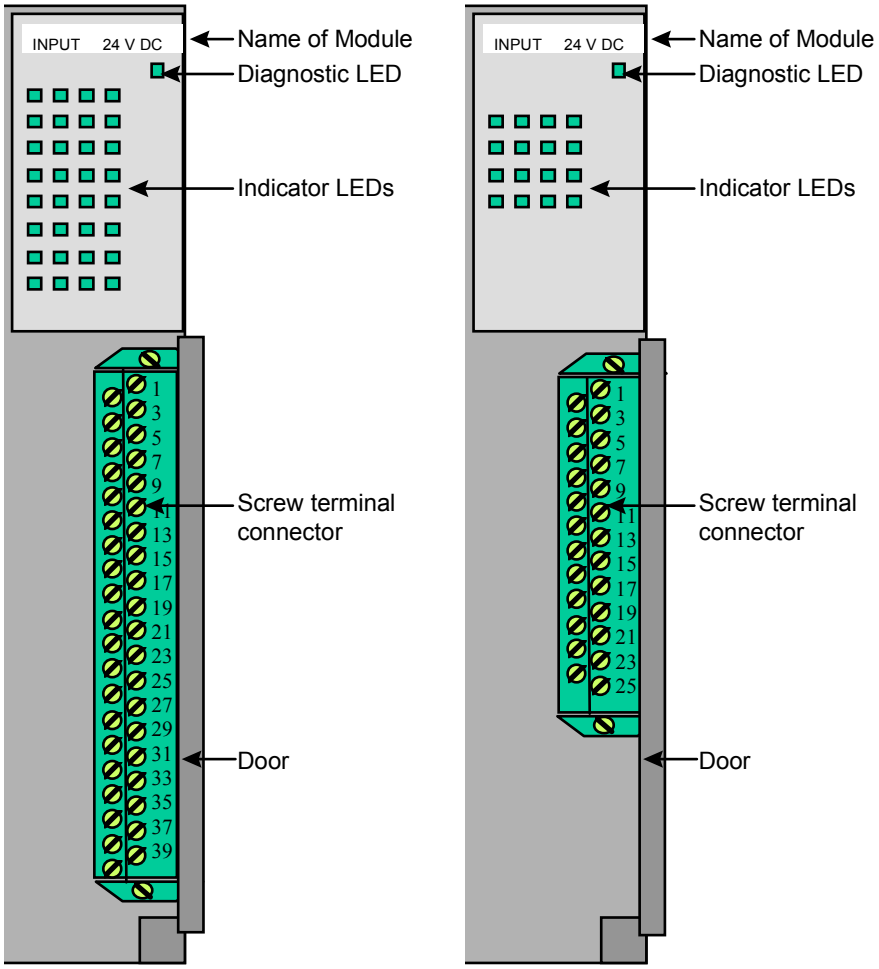
Giddings & Lewis

# Input 24V DC Module (32 or 16 points)

The 24V DC input module converts DC signals from 32 or 16 devices into logic levels that the CPU can use. Each signal is converted into a corresponding logic 1 or 0 which is transmitted through the system bus to the CPU module. An "on" signal is nominally 24 V DC, but can be any level between 14 and 30 volts. An "off" signal is any level below 5V. The wiring configurations may be sink or source.

32 or 16 LEDs in the upper section of the module indicate the logic state of each input. The DIAG LED goes on briefly while the diagnostics tests are running.

**Input 24V DC Module (32 and 16 Points)**



**Specification Table**

| Characteristic | Input 24V DC module specifications |
|---|---|
| Function | Monitors on/off states from DC voltage inputs |
| Part number | 32 point M.1016.9010 (old # 502-03605-00))<br>16 point M.1016.8929 (old # 502-03548-00) |
| Field side connector | 32 point 40-pin card edge connector, screw terminals<br>16 point 25-pin card edge connector, screw terminals |
| Input signals (exceed IEC standards) | Nominal 24V DC on, 0V DC off |
| UH Max (max. allowed voltage) | 30V DC |
| IH Max (max. current @ 30V DC) | 7.5 mA |
| UL Min | Polarity independent |
| Guaranteed on | 14V DC |
| IH Min (min. current @ UH Min) | 2.8 mA |
| Guaranteed off | 5V DC |
| IT Min (current allowed when off) | .75 mA |
| Time delay on | 1 ms max. |
| Time delay off | 1 ms max. |
| Protection of logic circuits | Optical isolation between the logic and field sides, 4000V peak |
| Input groups | Four groups of 8 or 4 IEC Type 1 inputs per NEMA Standard, ICS 3-1983, Table 3-304-2. UL 508 spacing |
| Indicator lights, input circuits | An LED indicates the logic state of each input |
| Indicator light, module | The DIAG LED goes OFF when the module passes power-on diagnostic tests |
| Logic side power requirements (typical) | 32 point 29 mA @+5 V<br>7 mA per energized input @+5 V<br>16 point 2 mA @+5 V<br>7 mA per energized input @+5 V |
| Field side power dissipation, worst case | 32 point 7.2 W<br>16 point 3.6 W |
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |

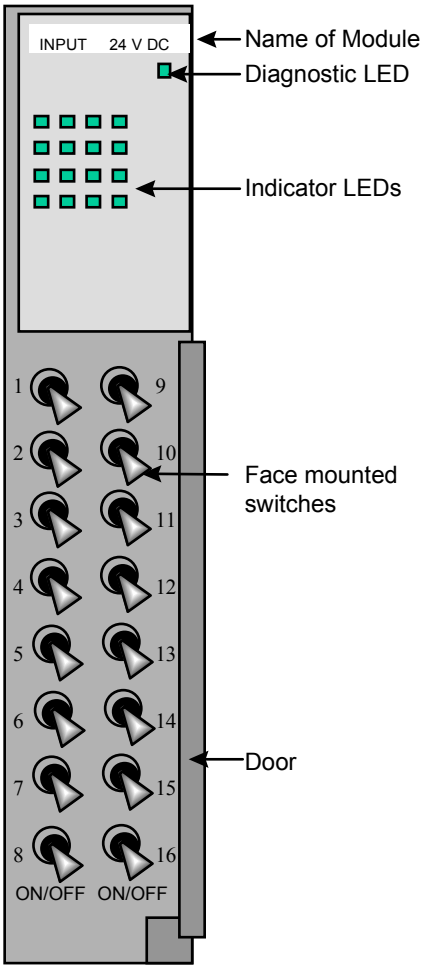
| | |
|---|---|
| EMC Compliant<br>Emissions<br><br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge(4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| CE Marked | Conforms to Directives 73/23/EEC, 89/336/EEC, 92/31/EEC, 93/68/EEC by conforming to the following standards:<br>EN 50081-2:1993 EMC Generic Industrial Emissions<br>EN 50082-2:1995 EMC Generic Industrial Immunity<br>EN 61131-2:1994/A11:1996 Low voltage directive requirements for programmable controllers<br>Operates with emissions below EN5501/CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per EN61000-4-2<br>• RF electromagnetic fields per EN61100-4-3, ENV50141, and ENV50204 |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

# Input 24V DC Module (16 switch)

The input switch module converts the position status of 16 on/off switches mounted on the faceplate into logic levels that the CPU can use. The on/off position status of each switch is converted into a corresponding logic 1 or 0 which is transmitted through the system bus to the CPU module.

16 LEDs in the upper section of the module indicate the logic state of each switch input. The DIAG LED goes on briefly while the diagnostic tests are running.

**INPUT Switch Module (16)**



**Specification Table**

| Characteristic | Input switch (16) module specifications |
|---|---|
| Function | Monitors on/off states from up to 16 face mounted switches |
| Part number | M.1016.9095 (old # 502-03651-00) |
| Field side connector | 25-pin card edge connector, face plate, switches |
| Protection of logic circuits | Optical isolation between the logic and field sides |
| Indicator lights, input circuits | An LED indicates the logic state of each switch |
| Indicator light, module | The DIAG LED goes OFF when the module passes power-on diagnostic tests |
| Logic side power requirements (typical) | 2 mA @ +5 V<br>11mA per energized input @ +5 V |
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br>Emissions<br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |

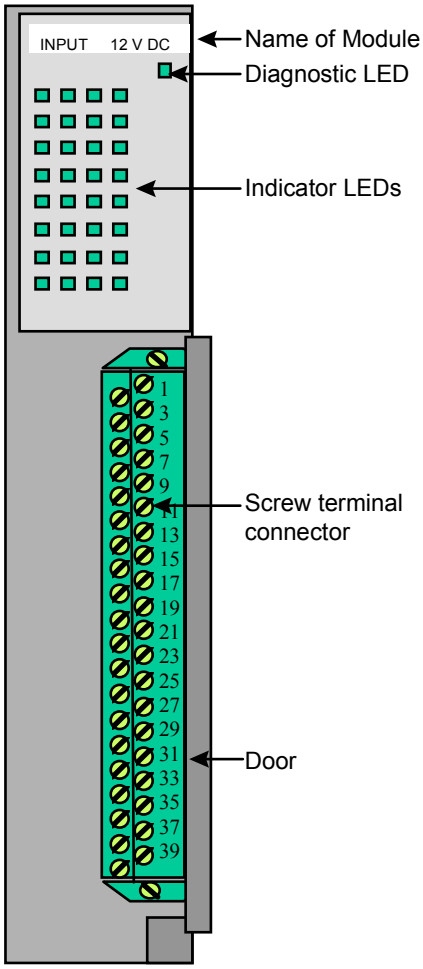
| | |
|---|---|
| CE Marked | Conforms to Directives 73/23/EEC, 89/336/EEC, 92/31/EEC, 93/68/EEC by conforming to the following standards:<br>EN 50081-2:1993 EMC Generic Industrial Emissions<br>EN 50082-2:1995 EMC Generic Industrial Immunity<br>EN 61131-2:1994/A11:1996 Low voltage directive requirements for programmable controllers<br>Operates with emissions below EN5501/CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per EN61000-4-2<br>• RF electromagnetic fields per EN61100-4-3, ENV50141, and ENV50204 |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm. |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

# Input 12V DC Module (32 points)

The input 12V DC module converts DC signals from 32 devices into logic levels that the CPU can use. Each signal is converted into a corresponding logic 1 or 0 which is transmitted through the system bus to the CPU module. An "on" signal is nominally 12 VDC, but can be any level between 10 and 14 volts. An "off" signal is any level below 5V. The wiring configurations may be sink or source.

32 LEDs in the upper section of the module indicate the logic state of each input. The DIAG LED goes on briefly while the diagnostics tests are running.

**INPUT 12V DC Module (32 PT)**



### Specification Table

| Characteristic | Input 12V DC (32 pt) module specifications |
|---|---|
| Function | Monitors on/off states from up to 32 DC voltage inputs |
| Part number | M.1016.9085 (old #502-03643-00) |
| Field side connector | 40-pin card edge connector, screw terminals |
| Input signals | Nominal 12V DC on, 0V DC off |
| Maximum allowed voltage | 14V DC |
| Maximum current @ 14V DC | 8.5 mA |
| Guaranteed on | 10V DC |
| Minimum current @ 10V DC | 5 mA |
| Guaranteed off | 5V DC |
| Current allowed when off | 2 mA |
| Time delay on | 1 ms max. |
| Time delay off | 1 ms max. |
| Protection of logic circuits | Optical isolation between the logic and field sides, 4000 V peak |
| Input groups | Four groups of 8 inputs<br>UL 508 spacing |
| Indicator lights, input circuits | An LED indicates the logic state of each input |
| Indicator light, module | The DIAG LED goes OFF when the module passes power-on diagnostic tests |
| Logic side power requirements (typical) | 29 mA @ +5V<br>7 mA per energized input @ +5V |
| Field side power dissipation, worst case | 3.8 W |
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |

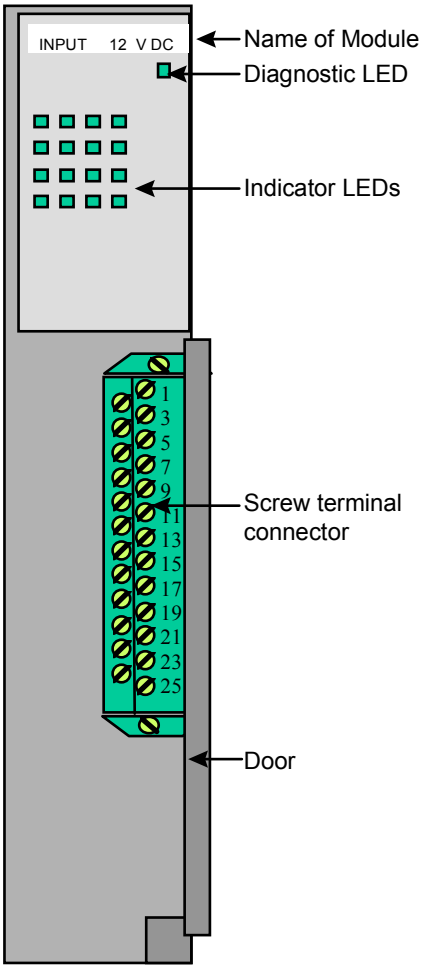
| | |
|---|---|
| EMC Compliant<br>Emissions<br><br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge(4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

# Input 120V AC Module (16 points)

The 120V AC input module converts AC signals from 16 devices into logic levels that the CPU can use. Each signal is converted into a corresponding logic 1 or 0 which is transmitted through the system bus to the CPU module. An “on” signal is nominally 120V AC, but can be any level between 79 and 132 volts. An “off” signal is any level below 20 A C. The wiring configurations may be sink or source.

16 LEDs in the upper section of the module indicate the logic state of each input. The DIAG LED goes on briefly while the diagnostics tests are running.

**INPUT 120V AC Module (16 PT)**



**Specification Table**

| Characteristic | Input 120V AC (16 pt) Module Specifications |
|---|---|
| Function | Monitors on/off states from up to 16 AC voltage inputs |
| Part number | M.1016.8937 (old # 502-03550-02) |
| Field side connector | 25-pin card edge connector, screw terminals |
| Input signals | Nominal 120V AC on, 0V AC off |
| UH Max (max. allowed voltage) | 132V AC |
| IH Max (max. current @ 132V AC) | 8.7 mA |
| UL Min | 0V |
| Guaranteed on | 79V AC |
| IH Min (min. current @ UH Min) | 4.6 mA |
| Guaranteed off | 20V AC |
| IT Min (current allowed when off) | 1 mA |
| Frequency | 50/60 Hz ± 5% |
| Time delay on, max. | 14 ms |
| Time delay off, max. | 20 ms |
| Protection of logic circuits | Optical isolation between the logic and field sides, 1780 VAC. |
| Arrangement of inputs | Four groups of 4 IEC Type 1 inputs per NEMA Standard, ICS 3-1983, Table 3-304-2. UL 508 spacing |
| Indicator lights, circuits | An LED indicates its logic state of each input |
| Indicator light, module | The DIAG LED goes off after the module passes its diagnostic tests at power-on. |
| Logic side power requirements (typical) | 1 mA @ +5V<br>11 mA per energized input @ +5V |
| Field side power dissipation, worst case | 18.4 W |
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |

| | |
|---|---|
| EMC Compliant<br>Emissions<br><br>Noise immunity | Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

# Output 24V DC Source Module (32 or 16 points)

The output 24V DC module sources voltage for individual loads from one or more DC power supplies. Each external supply is nominally 24 volts, but can be between 5 and 32 volts. It is available in the following configurations.

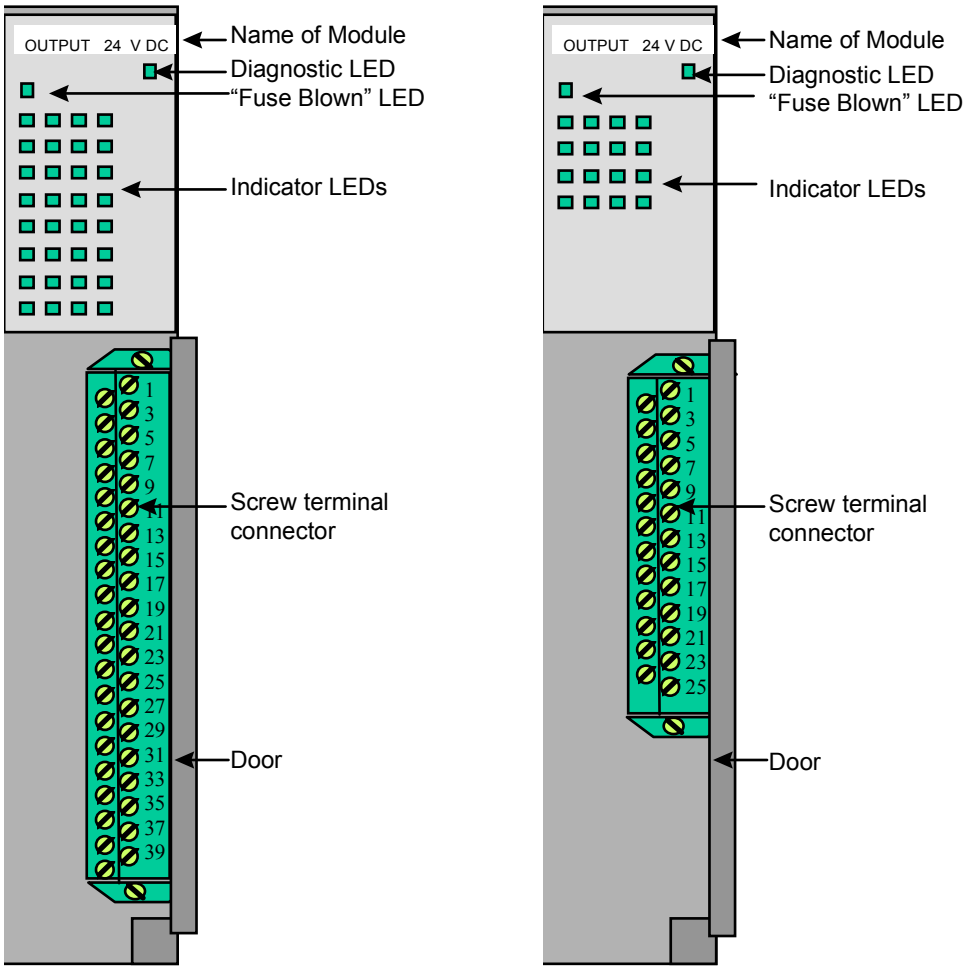
- 32 point 24V DC output module
- 16 point 24V DC output module

32 or 16 LEDs in the upper section of the module indicate the logic state that drives each output. Another LED labeled FB turns on if the fuse in any active circuit is open or missing.

The DIAG LED goes on briefly while the diagnostic tests are running.

**OUTPUT 24V DC Source Module**

**32 point** **16 point**



**Specification Table**

| Characteristic | Output 24V DC module specifications |
|---|---|
| Function | Sources an external DC supply to 16/32 loads |
| Part number | 32 point M.1016.9070 (old # 502-03640-02<br>16 point M.1016.8933 (old # 502-03549-02) |
| DC source requirements | Nominal 24V DC; range 5 to 32V DC |
| Field side connector | 32 point 40-pin card edge connector, screw terminals<br>16 point 25-pin card edge connector, screw terminals |
| Protection of logic circuits | Optical isolation between the logic and field side |
| Grouping of outputs | Four groups of 8 or 4 solid-state switches. Each group may use its own DC supply, or one supply may be daisy-chained. UL 508 spacing |
| Fuse per group of 8 switches | Fast-acting, UL rated 3 A 250V AC metric fuse, 5 x 20 mm |
| Maximum current per group | 2 A of continuous current for the group;<br>32-point - each switch is rated at .4 A continuous<br>16 point - each switch is rated at .75 A continuous |
| Indicator lights, output circuits | An LED for each output |
| Indicator light, module | A DIAG LED turns OFF when the module passes its diagnostic tests at power-on |
| Indicator light, fuses | A logic side LED lights to indicate a "blown fuse" condition when power is on to a group with missing or open fuse |
| Switch characteristics | Solid-state switches |
| Time delay on for resistive loads | 30 µsec max |
| Time delay off for resistive loads | 300 µsec max |
| Leakage current in off state | 0.5 mA max |
| Switch voltage, maximum ON | 32 point 1.8V DC @ .4 A<br>16 point 1.6V DC @ .75 A |
| Surge current, maximum | 32 point 2.5 A for 40 msec., every 2 seconds<br>16 point 5 A for 40 msec, every 2 seconds; fuse blows if this is exceeded |
| Response to scan loss (present) | All outputs are reset to the OFF state |
| Logic side power requirements (typical) | 1 mA @ +5V<br>32 point25 mA per energized output@ +5V<br>16 point23 mA per energized output @ +5V |
| Field side power dissipation, worst case (at 32 VDC) | 15.8 W |
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |

| | |
|---|---|
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br>Emissions<br><br>Noise immunity | Refer to the EMC Guidelines for more information.<br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>•Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>•RF electromagnetic fields per IEC 1000-4-3<br>•Electrical fast transients per IEC 1000-4-4 on incoming power lines |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch).<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

# Output 24V DC Sink Module (3 versions)

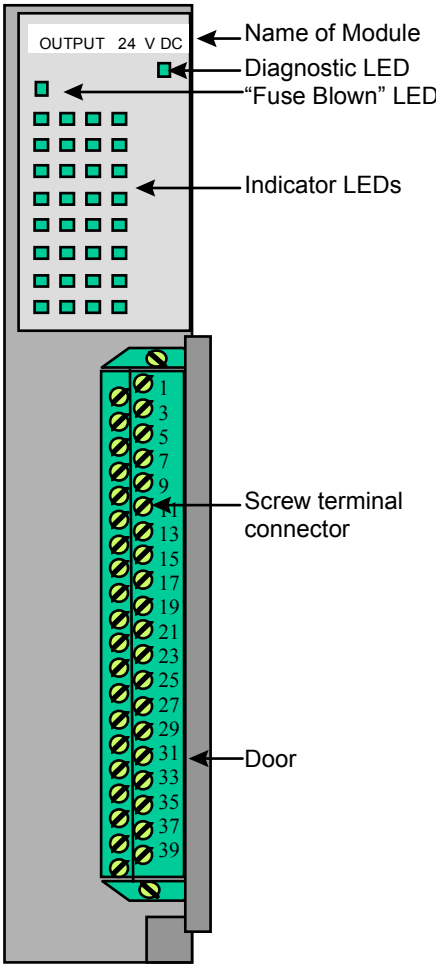
The output 24V DC module sinks voltage for 32 individual loads from one or more DC power supplies. Each external supply is nominally 24 volts, but can be between 5 and 32 volts. It is available in three configurations:

- 32 point, all diode protected
- 32 point, 16 diode protected/16 unprotected
- 32 point, all unprotected

32 LEDs in the upper section of the module indicate the logic state that drives each output. Another LED labeled FB turns on if the fuse in any active circuit is open or missing.

The DIAG LED goes on briefly while the diagnostic tests are running.

**OUTPUT 24V DC Source Module (32 pt)**



**Specification Table**

| Characteristic | Output 24V DC module (32 pt sink) specifications |
|---|---|
| Function | Sinks an external DC source to 32 loads |
| Part number | 16 protected/16 unprotected<br>M.1016.9127 (old # 50203674-02)<br>All diode protected<br>M.1016.9130 (old # 502-03674-22)<br>All unprotected<br>M.1016.9133 (old # 502-03674-42) |
| DC source requirements | Nominal 24V DC; range 5 to 32V DC |
| Field side connector | 40-pin card edge connector, screw terminals |
| Protection of logic circuits | Optical isolation between the logic and field side |
| Grouping of outputs | Four groups of 8 solid-state switches. Two groups share a DC supply. Two DC supplies are allowed per module. (One supply may be daisy chained.) UL 508 spacing |
| Fuse per group of 8 switches | Fast-acting, UL rated 3A 250V AC metric fuse, 5 x 20 mm |
| Maximum current per group | 2 A of continuous current for the group; each switch is rated at .4 A continuous |
| Indicator lights, output circuits | An LED for each output |
| Indicator light, module | A DIAG LED turns OFF when the module passes its diagnostic tests at power-on |
| Indicator light, fuses | A logic side LED lights to indicate a "blown fuse" condition when power is on to a group with missing or open fuse |
| Switch characteristics | Solid-state switches |
| Time delay on for resistive loads | 30 µsec max |
| Time delay off for resistive loads | 300 µsec max |
| Leakage current in off state | 0.5 mA max |
| Switch voltage, maximum ON | 1.8V DC @ .4 A |
| Surge current, maximum | 2.5 A for 40 msec., every 2 seconds |
| Response to scan loss (present) | All outputs are reset to the OFF state. |
| Logic side power requirements (typical) | 1 mA @+5V<br>25 mA per energized output @ +5V |
| Field side power dissipation, worst case (at 32 VDC) | 15.8 W |

| | |
|---|---|
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br>Emissions<br><br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch).<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

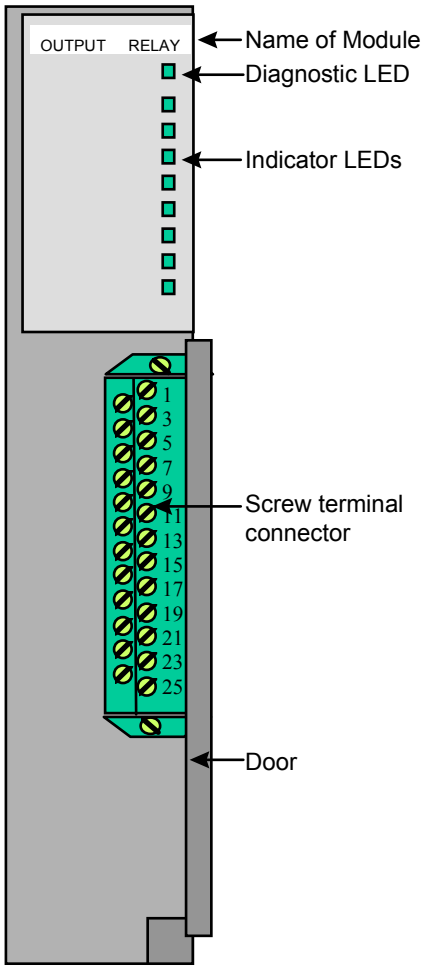
# Output Relay Module (8 points)

The relay output module can switch eight relay contacts. Four relays are normally open(NO)/ normally closed(NC) form C type and four are normally open (NO) form A type.

Eight LEDs in the upper section of the module indicate the logic state that drives each relay.

The DIAG LED goes on briefly while the diagnostic tests are running.

**OUTPUT RELAY Module (8 PT)**



**Specification Table**

| Characteristic | Output relay (8) module specification |
|---|---|
| Function | Switches eight relay contacts |
| Part number | M.1016.9089 (old # 502-03644-03) |
| Field side connector | 25 pin card edge connector, screw terminals |
| Output channels | 8 |
| Relay characteristics<br>Contact types | Four form C (NO/NC)<br>Four form A (NO) |
| Maximum switching voltage | 280V AC resistive load; 50V DC resistive load |
| Minimum switching current | 100 mA |
| Maximum switching current (DC) | 0-24V DC @ 3 A 30 VDC @ 2.5 A<br>40V DC @ 1.5 A 50 VDC @ 1.0 A |
| Maximum switching current (AC) | 0-120V AC @ 3 A 280V AC @ 2.5 A |
| Initial contact resistance | 100 m¾ |
| Turn on time (resistive load) | 10 msec maximum |
| Turn off time (resistive load) | 10 msec maximum |
| Expected life, electrical | $10^5$ operations minimum |
| Expected life, mechanical | $10^7$ operations minimum |
| Breakdown voltage between contacts | 750 $V_{rms}$ for 1 minute |
| Breakdown voltage between contacts and coil | 1500 $V_{rms}$ for 1 minute |
| Maximum switching frequency | 20 energize/deenergize cycles/min.<br>(to satisfy expected life ratings) |
| Indicator light, module | DIAG LED turns off after the module passes its diagnostic tests.<br>A logic side LED for each relay turns on when the logic side energizes the relay. |
| Isolation | Electromechanical relay provides protection between logic and field side |
| Logic side power require-ments (typical) | 1 mA @ 5V 5 mA @ +15V<br>39 mA per energized output @ +15V (Pt 1-4)<br>24 mA per energized output @ +15V (Pt 5-8) |

| | |
|---|---|
| Operating temperature range | 7°C to 55 C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br>Emissions<br><br>Noise immunity | Refer to the EMC Guidelines for more information.<br>Operates with emissions below EN55011/ CISPR 11<br>Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

# Output 120/240V AC Module (32 or 16 points)

The 120/240V output module switches voltage for individual loads from one or more AC power sources. Each external AC source is nominally 115 VAC, but can be between 48 and 240 volts. It is available in the following configurations:

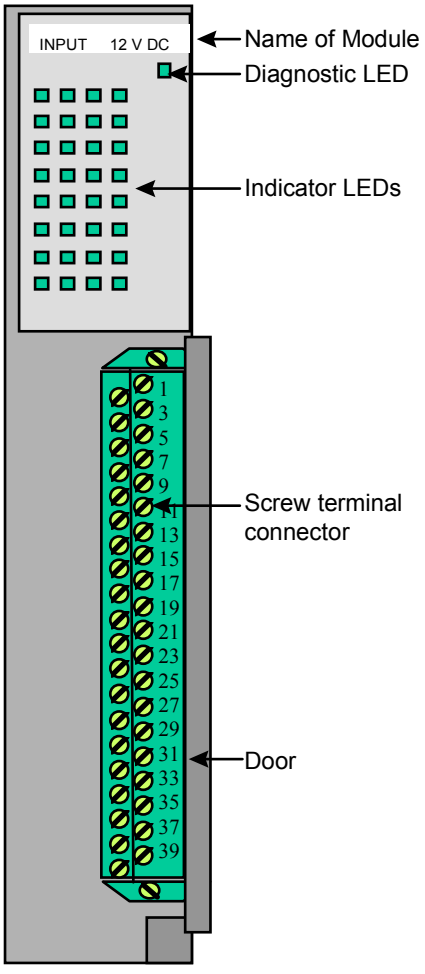
- 32 point 120/240V AC output module
- 16 point 120/240V AC output module

32 or 16 LEDs in the upper section of the module indicate the logic state that drives each output. Another LED labeled FB turns on if the fuse in any active circuit is open or missing.

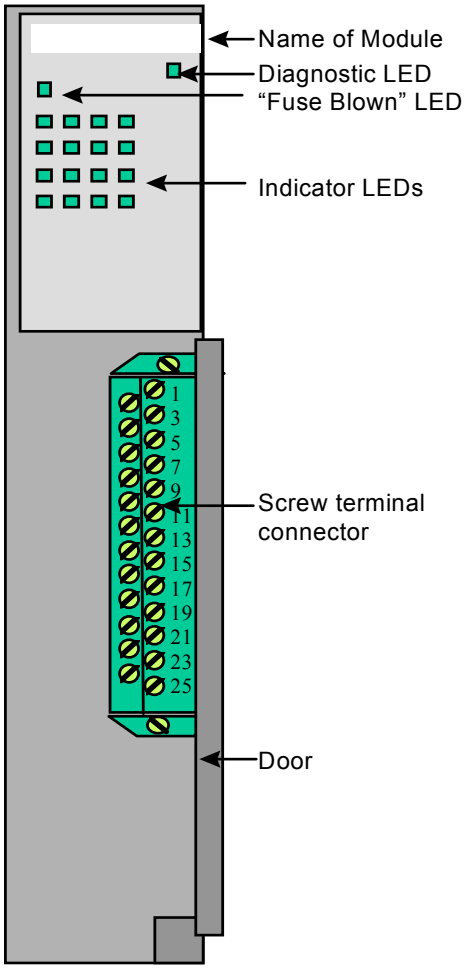
The DIAG LED goes on briefly while the diagnostic tests are running.

**OUTPUT 120/240 VAC Module**

32 point




16 point



**Specification Table**

| Characteristic | Output 120/240V AC module specifications |
|---|---|
| Function | Switches an external AC source to 32 or 16 loads |
| Part number | 32 point M.1016.9076 (old # 502-03641-03)<br>16 point M.1016.8943 (old # 502-03551-03) |
| AC source requirements | Nominal 115 VAC, range 48 to 240V AC |
| Field side connector | 32 point 40-pin card edge connector, screw terminals<br>16 point 25-pin card edge connector, screw terminals |
| Protection of logic circuits | Optical isolation between the logic and field side, 2830 V AC |
| Arrangement of outputs | Four groups of 8 or 4 solid-state switches. Each group can use its own AC source, or one source can be daisy-chained. UL 508 spacing |
| Fuse per group of 8 | Fast-acting, UL rated 3A 250V AC metric fuse, 5 x 20 mm |
| Maximum current per group | 2 A of continuous current for the group;<br>32 point each switch is rated at .75 A continuous<br>16 point each switch is rated at 2 A continuous |
| Indicator lights, output circuits | An LED for each output |
| Indicator light, module | A DIAG LED turns OFF when the module passes its diagnostic tests at power-on. |
| Indicator light, fuses | A logic side LED lights to indicate a "blown fuse" condition when power is on to a group with a missing or open fuse. |
| Switch characteristics | Solid-state switches. |
| Switch voltage, maximum ON | 32 point 1V AC @ .75A RMS<br>16 point 1.2V AC @ 2A RMS |
| Surge current, maximum | 20 A for 2 cycles, every 2 seconds; fuse blows if this is exceeded. |
| Frequency | 50 / 60 Hz. ± 5% |
| Time delay on, maximum | 1/2 cycle (turns on at zero voltage) |
| Time delay off, maximum | 1/2 cycle (turns off at zero voltage) |
| Minimum load current | 50 mA |
| Leakage current in OFF state, max | 4 mA @ 120 VAC 6 mA @ 240V AC |
| Response to scan loss (present) | All outputs are reset to the OFF state |
| Logic side power requirements (typical) | 32 point 1 mA @ +5V<br>7 mA per energized output @ +5V<br>16 point 1 mA @ +5V<br>23 mA per energized output @ +5V |

| | |
|---|---|
| Field side power dissipation, worst case | 32 point 11.0 W<br>16 point 12.0 W |
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40° C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br>Emissions<br><br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

# Input/Output TTL Module (24 inputs/8 outputs)

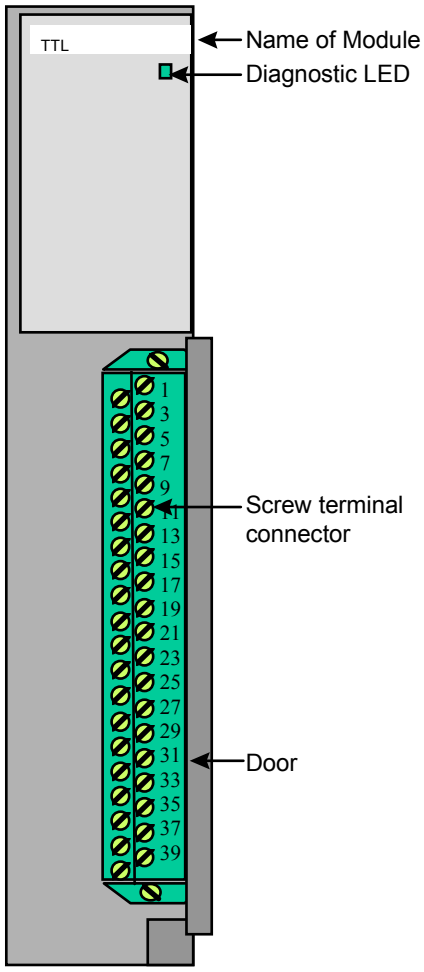
The TTL (Transistor-Transistor Logic) module provides 24 optically isolated input points to monitor the status of TTL devices and 8 optically isolated output points to interface with TTL devices (or other 5V DC devices such as photoelectric sensors).

The module can also be used as a feedback module to read devices like linear displacement transducers (TEMPOSONICS™, BALLUFF) or absolute encoders. These devices provide high speed, low voltage, low noise parallel digital signals.

An external +5V DC is required for operation.

The DIAG LED goes on briefly while the diagnostic tests are running.

**TTL (24 inputs/8 outputs)**



### Specification Table

| Characteristics | TTL module specifications |
|---|---|
| Function | Monitors on/off states of 24 TTL inputs and controls on/off state of 8 TTL outputs. |
| Part number | M.1016.9291 (old # 502-03810-03) |
| Field side connector | 40 pin card edge connector, screw terminals |
| External power supply | +5V ±5% 450 mA |
| Isolation | 2500 VRMS between field side and logic side |
| Input characteristics | $V_{in}$ high- 2.0 V minimum<br>$V_{in}$ low- 0.8 V maximum<br>$I_{in}$ high - 1µA maximum<br>$I_{in}$ low - -0.65 mA maximum<br>Minimum input pulse width1 µsec |
| Output characteristics | $V_{ol}$ -0.8V maximum @ $I_o$ = 10 mA (sinking)<br>$V_{oh}$ -4.0V minimum @ $I_o$ = -10 mA (sourcing)<br><br>Output turn on/off time - 300 nano sec<br>Maximum cable length - 3 meters (approximately 10 feet) |
| Logic side power requirements (typical) | +5V @ 450 mA |
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |

| | |
|---|---|
| EMC Compliant<br>Emissions<br><br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

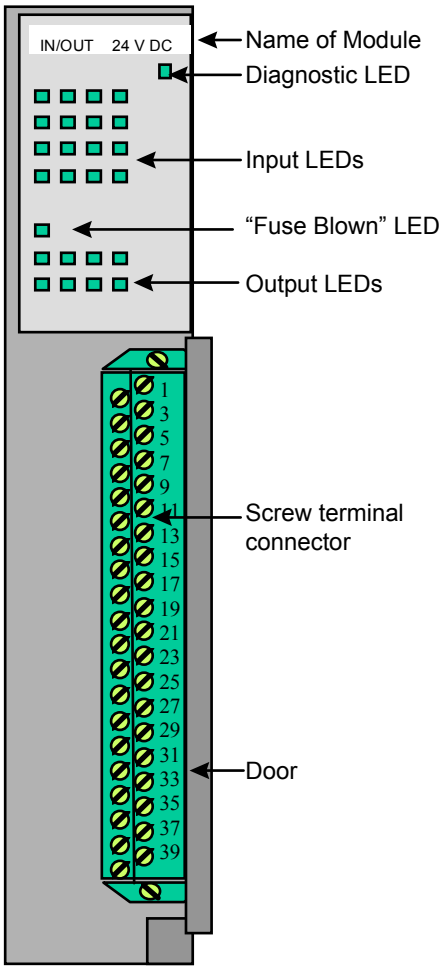
# Input/Output 24V DC Sink Module (16/8 points)

The input section of the 24V DC I/O module converts DC signals from 16 devices into logic levels that the CPU can use. Each signal is converted into a corresponding logic 1 or 0 which is transmitted through the system bus to the CPU. An "on" signal is nominally 24 VDC, but can be any level between 14 and 30 volts. An "off" signal is any level below 5V. The wiring configurations may be sink or source. 16 LEDs indicate the logic state of each input.

The output section of the module sinks voltage for eight individual loads from one DC power supply. The external supply is nominally 24 volts, but can be between 5 and 32 volts. Eight LEDs on the module indicate the logic state that drives each output. Another LED labeled FB turns on if the fuse in the active circuit is open or missing.

The DIAG LED goes on briefly while the diagnostics tests are running.

**24V DC Input/Output Module (16/8 sink pt)**



**Specification Table**

| Characteristic | Module specifications |
|---|---|
| Function | Monitors on/off states from up to 16 DC voltage inputs<br>Sinks an external DC source to eight loads |
| Part number | M.1016.9350 (old # 502-03843-02) |
| Field side connector | 40-pin card edge connector, screw terminals |
| Logic side power requirements (typical) | 30 mA @ 5 V<br>7 mA per energized input @ +5 V<br>25 mA per energized output @ +5 V |
| Field side power dissipation (worst case at 32V DC) | 3.6 W for inputs<br>4.0 W for outputs |
| Indicator lights, input/output circuits | An LED for each input/output |
| Indicator light, module | A DIAG LED turns OFF when the module passes its diagnostic tests at power-on |
| Indicator light, fuses | A logic side LED lights to indicate a "blown fuse" condition when power is on to the eight outputs when a fuse is missing or open |
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br>Emissions<br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch).<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

| **Input section(16 pt)** | |
|---|---|
| Input signals (exceed IEC standards) | Nominal 24V DC on, 0V DC off |
| UH Max (max. allowed voltage) | 30V DC |
| IH Max (max. current @ 30 VDC) | 7.5 mA |
| UL Min | Polarity independent |
| Guaranteed on | 14V DC |
| IH Min (min. current @ UH Min) | 2.8 mA |
| Guaranteed off | 5V DC |
| IT Min (current allowed when off) | .75 mA |
| Time delay on | .75 mA |
| Time delay off | 1 ms max |
| Protection of logic circuits | Optical isolation between the logic and field sides 4000 V peak |
| Input groups | Two groups of 8 IEC Type 1 inputs per NEMA Standard, ICS 3-1983, Table 3-304-2. UL 508 spacing |
| **Output section (8 pt sink)** | |
| DC source requirements | Nominal 24V DC; range 5 to 32V DC |
| Protection of logic circuits | Optical isolation between the logic and field side |
| Grouping of output | One grup of 8 solid-state switches UL 508 spacing |
| Fuse per group of 8 switches | Fast-acting UL rated 3 A 250V AC metric fuse, 5 x 20 mm |
| Maxiumum current per group | 2 A of continuous current for the group; each switch is rated at .4 A continuous |
| Switch characteristics | Solid-state switches |
| Time delay on for resistive loads | 30 µsec max |
| Time delay off for resistive loads | 300 µsec max |
| Leakage current in off state | 0.5 mA max |
| Switch voltage, maxiumum ON | 1.8 VDC@ .4A |
| Surge current, maxiumum | 2.5 A for 40 msec., every 2 seconds |
| Response to scan loss (present) | All outputs are reset to the OFF state |

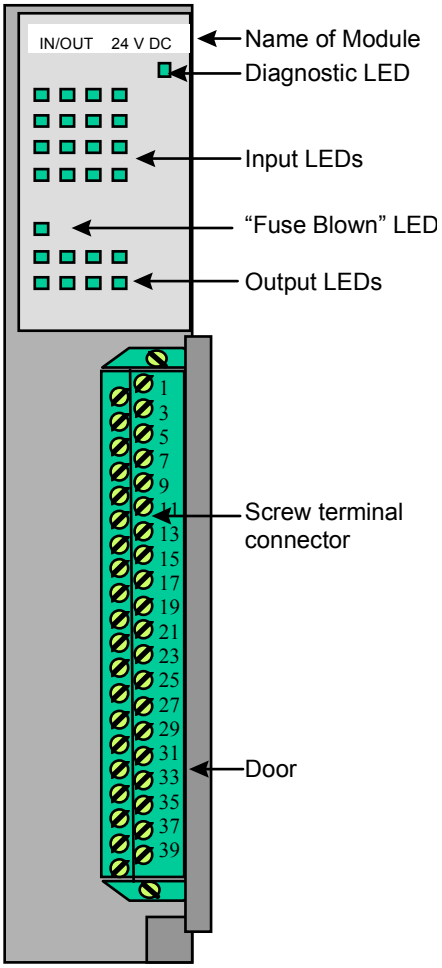
# Input/Output 24V DC Source Module (16/8 points)

The input section of the 24V DC I/O module converts DC signals from 16 devices into logic levels that the CPU can use. Each signal is converted into a corresponding logic 1 or 0 which is transmitted through the system bus to the CPU. An "on" signal is nominally 24V DC, but can be any level between 14 and 30 volts. An "off" signal is any level below 5V. The wiring configurations may be sink or source. 16 LEDs on the module indicate the logic state of each input.

The output section of the module sources voltage for eight individual loads from one or two DC power supplies. Each external supply is nominally 24 volts, but can be between 5 and 32 volts. Eight LEDs indicate the logic state that drives each output. Another LED labeled FB turns on if the fuse in any active circuit is open or missing.

The DIAG LED goes on briefly while the diagnostics tests are running.

**24V DC input/output module (16/8 source PT)**



### Specification Table

| Characteristic | Input/Output module specifications |
|---|---|
| Function | Monitors on/off states from up to 16 DC voltage inputs<br>Sources an external DC source to 8 loads |
| New Part number | M.1016.9348 (old # 502-03842-02) |
| Field side connector | 40-pin card edge connector, screw terminals |
| Logic side power requirements (typical) | 30 mA @ +5V<br>7 mA per energized input @ +5V<br>23 mA per energized output @ +5V for outputs |
| Field side power dissipation<br>worst case (at 32V DC) | 3.6 W for inputs<br>6.4 W for outputs |
| Indicator lights, input/output circuits | An LED indicates the logic state of each input/output |
| Indicator light, module | The DIAG LED goes OFF when the module passes power-on diagnostic tests |
| Indicator light, fuses | A logic side LED lights to indicate a "blown fuse" condition when power is on to a group with missing or open fuse |
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br>Emissions<br><br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch).<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

| **Input section(16 pt)** | |
|---|---|
| Input signals (exceed IEC standards) | Nominal 24 VDC on, 0 VDC off |
| UH Max (max. allowed voltage) | 30V DC |
| IH Max (max. current @ 30 VDC) | 7.5 mA |
| UL Min | Polarity independent |
| Guaranteed on | 14V DC |
| IH Min (min. current @ UH Min) | 2.8 mA |
| Guaranteed off | 5V DC |
| IT Min (current allowed when off) | .75 mA |
| Time delay on | 1 ms max. |
| Time delay off | 1 ms max. |
| Protection of logic circuits | Optical isolation between the logic and field sides, 4000 V peak |
| Input groups | Two groups of 8 IEC Type 1 inputs per NEMA Standard, ICS 3-1983, Table 3-304-2. UL 508 spacing |
| **Output section (8 pt source)** | |
| DC source requirements | Nominal 24V DC; range 5 to 32 VDC |
| Protection of logic circuits | Optical isolation between the logic and field side |
| Grouping of outputs | Two groups of four solid-state switches. UL 508 spacing |
| Fuse per group of 8 switches | Fast-acting, UL rated 3A 250 VAC metric fuse, 5 x 20 mm |
| Maximum current per group | 2 A of continuous current for the group; each switch is rated at .75 A continuous |
| Switch characteristics | Solid-state switches |
| Time delay on for resistive loads | 30 µsec max |
| Time delay off for resistive loads | 300 µsec max |
| Leakage current in off state | 0.5 mA max |
| Switch voltage, maximum ON | 1.8V DC @ .4 A |
| Surge current, maximum | 2.5 A for 40 msec., every 2 seconds |
| Response to scan loss (present) | All outputs are reset to the OFF state |

**PiC900 CONTROLS**
**MOTION SOLUTIONS PRODUCT GUIDE**

# PiC 900 Analog Modules

Giddings & Lewis

# Analog Input Module (8 channel)

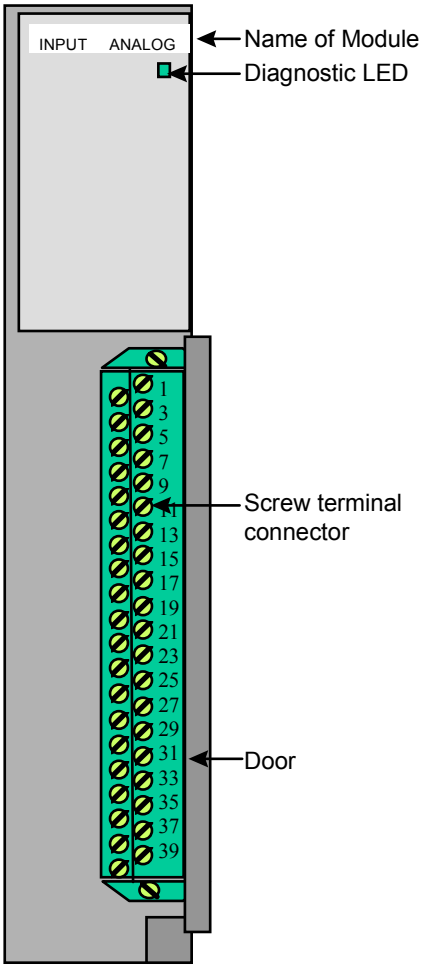
The analog input module is designed to interface the PiC with voltage or current output devices to monitor such things as pressure, flow, speed, position, or temperature. There are two versions of the analog input module available. One has 12-bit resolution and the other has 14-bit resolution.

The module has eight independent analog conversion channels. Each channel converts a unipolar or bipolar analog input voltage or current into a 12- or 14- bit digital value. This data is transmitted to the PiCs CPU for processing.

There is an internal current sense resistor for each channel for use with 0 to 20 mA or 4 to 20 mA devices. This module contains no user adjustable potentiometers or hardware switches. All necessary gain adjustments are done in software. The analog module can be configured as a feedback module using the Servosetup software.

The DIAG LED goes on briefly while the diagnostics tests are running.

**INPUT ANALOG Module (8 CH)**



### Specification Table

| Characteristic | Input Analog (8 ch) module specification |
|---|---|
| Function | Converts an analog input signal into a 12- or 14-bit digital word for each of eight channels. |
| Part number | **12-bit** M.1016.9081 (old # 502-03642-03)<br>**14-bit** M.1016.9544 (old # 502-04050-00) |
| Field side connector | 40 pin card edge connector, screw terminals |
| Input channels | 8 |
| Resolution | 12 bits, or 4096 steps over the full input range<br>14 bits, or 16384 steps over the full input range |
| Input sensitivity (software selectable) | |
| Voltage ranges | Unipolar / Bipolar<br>0 to 10V / ±10V<br>0 to 5V / ±5V<br>0 to 2.5V / ±2.5V<br>0 to 1.25V / ±1.25V<br>0 to 1V / ±1V<br>0 to .5V / ±.5V<br>0 to .25V / ±.25V<br>0 to .125V / ±.125V |
| Current range | 0 to 20 mA, 4 to 20 mA |
| Common mode maximum voltage (The maximum voltage that can safely be applied between either input terminal and circuit common.) | ±40V |
| Common mode operating voltage (The maximum voltage that can be applied between either input terminal and circuit common with inputs still operating properly.) | ±11V |
| Internal current sense resistor | 250 ohms |
| Maximum current sense resistor power | .12 W |
| Differential input resistance (each input to ground) | 1 M Ohms |
| Filter time constant - software selection | 1 ms, 10 ms, 100 ms |

| | |
|---|---|
| Accuracy of 4-20 mA range | 12-bit - .2% of FSR at 25$^{O}$C<br>14-bit - .15% of FSR at 25$^{O}$C<br>± 100 PPM /$^{O}$C |
| Accuracy of all other ranges | 12-bit - .5% of FSR at 25$^{O}$C<br>14-bit - .2% of FSR at 25$^{O}$C<br>± 100 PPM /$^{O}$C |
| 0 Offset | 12-bit-from ±2 counts @ 10 V to ±8 counts @ .125<br>14-bit-from ±5 counts @ 10 V to ±40 counts @ .125 |
| Logic side power requirements (typical) | 120 mA @ +5 V<br>112 mA @ +15 V |
| Indicator light, module | DIAG LED goes off after the module passes its diagnostic tests |
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br>Emissions<br><br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

## NOTES

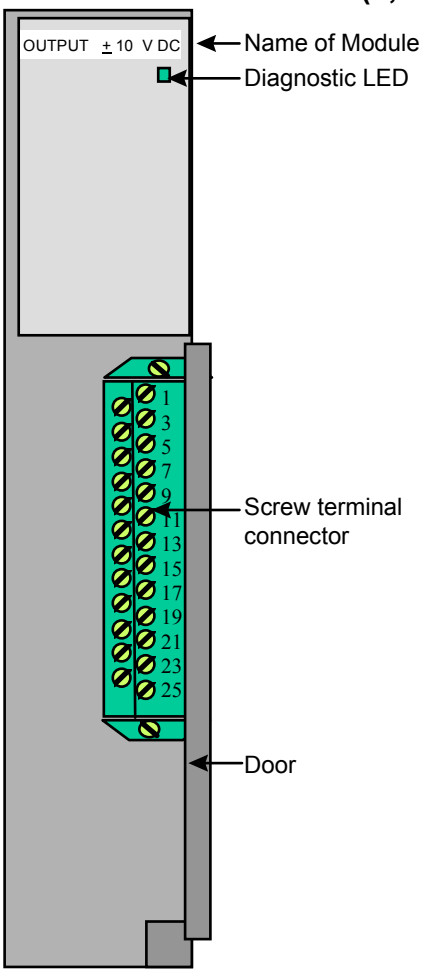
# Analog Output ±10V DC Module (8, 4 channel)

The ±10V DC output module has eight or four independent D/A conversion channels. It is also called a D/A or Analog Output module. Each channel converts a 16-bit digital word into a differential type analog output signal. The full range of the output signal is -11 V to +11 V, with a resolution of 1 part in 65,536.

A typical use for this module is to supply the velocity command to a servo drive. This module contains no potentiometers or hardware switches. All necessary adjustments are done using PiCServoPro/PiCPro commands.

The DIAG LED goes on briefly while the diagnostics tests are running.

**OUTPUT ±10V DC Module (8, 4 CH)**



## Specification Table

| Characteristic | Output ±10 VDC module specification |
|---|---|
| Function | Converts a 16-bit digital word into a +/- 11 V analog signal for each of eight or four channels. |
| Part number | **8 ch** M.1016.8892 (old # 502-03518-03)<br>**4 ch** M.1016.8897 (old # 502-03518-23) |
| Field side connector | 25 pin card edge connector, screw terminals |
| Output channels | 8<br>4 |
| Resolution | 16 bits, or 65536 steps over the full output range |
| Output voltage characteristics | |
| Nominal voltage range | ± 11V DC |
| Voltage accuracy @ 11 V | ± 5% |
| Output current, max. @ ±10V | ± 10 mA |
| Output update time increment | 32 µs |
| Output voltage after power up | 0 V ± 20 mV |
| Response to scan loss | All outputs reset to 0V ± 20 mV |
| Output ripple | < 10 $mV_{RMS}$ at 30 KHz |
| Short circuit protection | Current limited outputs |
| Indicator light, module | DIAG LED goes off after the module passes its diagnostic tests |
| Logic side power requirements (typical) | For 8 channel module;<br>43 mA @ +5V<br>11 mA @ +15V<br>6 mA @ -15V<br>2 mA per energized output @ +5 V<br>12 mA per energized output @ +15V<br>12 mA per energized output @ -15V<br>For 4 channel module;<br>37 mA @ +5V<br>5 mA @ +15V<br>3 mA @ -15V<br>1 mA per energized output @ +5V<br>11 mA per energized output @+15V |

| | |
|---|---|
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br>Emissions<br><br>Noise immunity | <br><br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

## NOTES

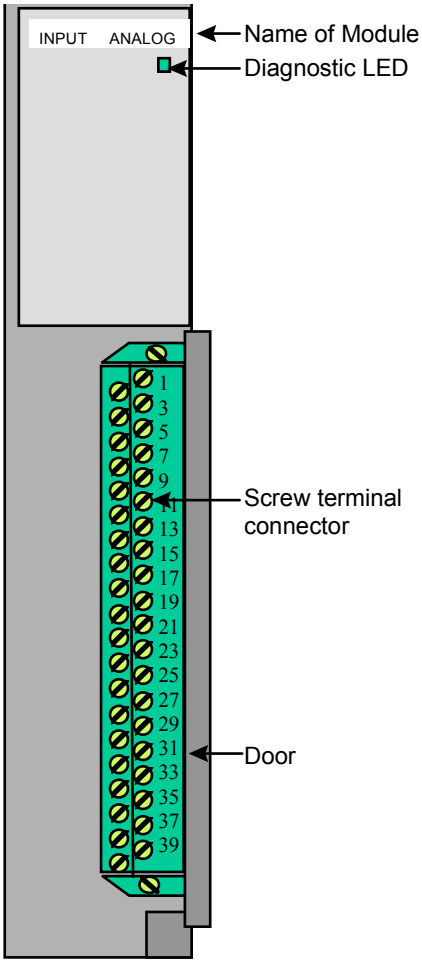
# Analog Input ±10V Output (4 Channel)

The module provides:

- Four analog input channels
- Four analog output channels

The DIAG LED goes on briefly while the diagnostic tests are running.

**Analog In/± 10V Out module**



**Specification Table**

| Characteristic | Analog In/±10V Out module specifications |
|---|---|
| Function | Converts a 16-bit digital word into a ±11V analog output signal for each of four channels<br>Converts an analog input signal into a 12-bit digital word for each of four channels. |
| New Part number | M.1016.9408 (old # 502-03907-03) |
| Logic side power requirements (typical) | 192 mA @ +5V<br>70 mA @ +15V<br>53 mA @ -15V<br>Analog Output<br>1 mA per energized output @ +5V<br>11 mA per energized output @ +15V<br>11 mA per energized output @ -15V |
| Field side connection | 40 pin card edge connector, screw terminals |
| Indicator light, module | DIAG LED goes off after the module passes its diagnostic tests |
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br>Emissions<br>Noise immunity | Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

| **Analog Output section (4 ch)** | |
|---|---|
| Output channels | 4 |
| Resolution | 16 bits, or 65536 steps over the full output range |
| **Output voltage characteristics** | |
| Nominal voltage range | ± 11V DC |
| Voltage accuracy @ 11 V | ± 5% |
| Output current, max. @ ±10 V | ± 10 mA |
| Output update time increment | 32 µsec |
| Output voltage after power up | 0 V ± 20 mV |
| Response to scan loss | All outputs reset to 0 V ± 20 mV |
| Output ripple | < 10 $mV_{RMS}$ at 30 KHz |
| Short circuit protection | Current limited outputs |
| **Analog Input section (4 ch)** | |
| Input channels | 4 |
| Resolution | 12 bits, or 4096 steps over the full input range |
| Input sensitivity (software selectable) | |
| Voltage ranges | Unipolar / Bipolar<br>0 to 10 V / ±10V<br>0 to 5 V / ±5V<br>0 to 2.5 V / ±2.5V<br>0 to 1.25 V / ±1.25V<br>0 to 1 V / ±1V<br>0 to .5 V / ±.5V<br>0 to .25 V / ±.25V<br>0 to .125 V / ±.125V |
| Current range | 0 to 20 mA, 4 to 20 mA |
| Common mode maximum voltage (The maximum voltage that can safely be applied between either input terminal and circuit common.) | ±40V |
| Common mode operating voltage (The maximum voltage that can be applied between either input terminal and circuit common with inputs still operating properly.) | ±11V |

| | |
|---|---|
| Internal current sense resistor | 250 ohms |
| Maximum current sense resistor power | .12 W |
| Differential input resistance (each input to ground) | 1 M Ohms |
| Filter time constant - software selection | 1 ms, 10 ms, 100 ms |
| Accuracy | .5% of FSR at 25$^{o}$C<br>± 100 PPM /$^{o}$C |
| 0 Offset | From ±2 counts @ 10 V<br>to ±8 counts @ .125 V |

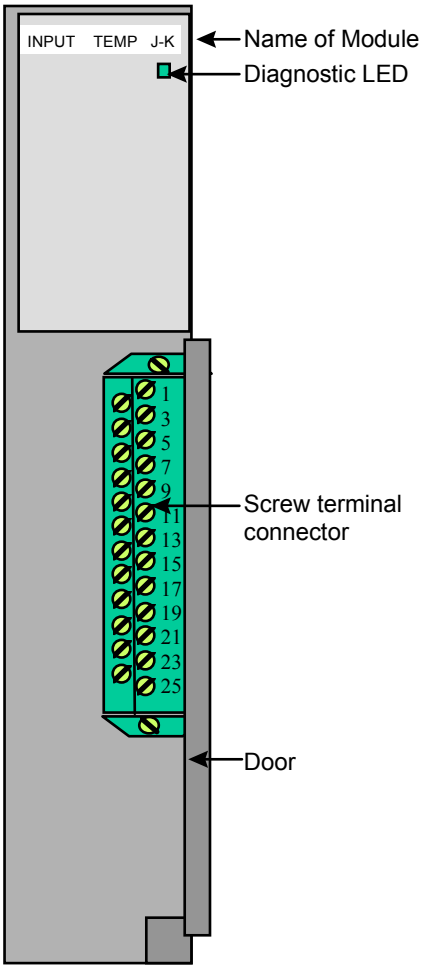
# TEMP J-K Thermocouple Module (12 channel)

The input temp J-K thermocouple modules (one for use with grounded thermocouples and one for use with ungrounded thermocouples) has 12 independent thermocouple or analog conversion channels which receive signals from J or K type thermocouples or from a voltage source. Each channel converts an analog signal into a 12-bit digital word which is processed by the PiC.

This module requires no hardware adjustments. All adjustments such as Fahrenheit or Celsius scaling and thermocouple ranges are software selectable.

The DIAG LED turns on briefly while the diagnostic tests are running.

**INPUT TEMP J-K Module (12 CH)**



## Specification Table

| Characteristic | Thermocouple module specification |
|---|---|
| Function | Measure J or K type thermocouple wire inputs<br>or ± 100 mV analog inputs |
| Part Number | **Ungrounded** M.1016.9108 (old # 502-03658-02)<br>**Grounded** M.1016.9289 (old # 502-03809-02) |
| Field side connector | 25-pin card edge connector, screw terminals |
| Input channels | 12 |
| Resolution | 12 bits |
| Input voltage sensitivity (software selectable) | ±100 mV |
| J type thermocouple temperature ranges (at 25°C) | -150°C to 1200°C (-238°F to 2192° F)<br>-35°C to 620°C (-31°F to 1148° F)<br>-10°C to 280°C (+14°F to 536° F) |
| K type thermocouple temperature ranges (at 25°C) | -200°C to 1300°C (-328°F to 2372° F)<br>-80°C to 820°C (-112°F to 1508° F)<br>-35°C to 415°C (-31°F to 779° F) |
| J or K type accuracy | J type .37% of the 1350°C span<br>K type .36% of the 1500°C span |
| ±100 mV accuracy | ± (50 µV + 1 count + input x 1%) |
| Time between samples (software selectable) | 5000 to 65,535 µsec |
| Filter time constant | 120 ms |
| Cold junction compensation | 0 to 80°C ± 1°C at the sensor |
| Open thermocouple detection | Indicated by software<br>(No detection for grounded thermocouples) |
| Logic side power requirements (typical) | 80 mA @ +5V<br>112 mA @ +15V |
| Indicator light, module | DIAG LED goes off after the module passes its diagnostic tests |
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |

| | |
|---|---|
| EMC Compliant<br>Emissions<br><br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

## NOTES

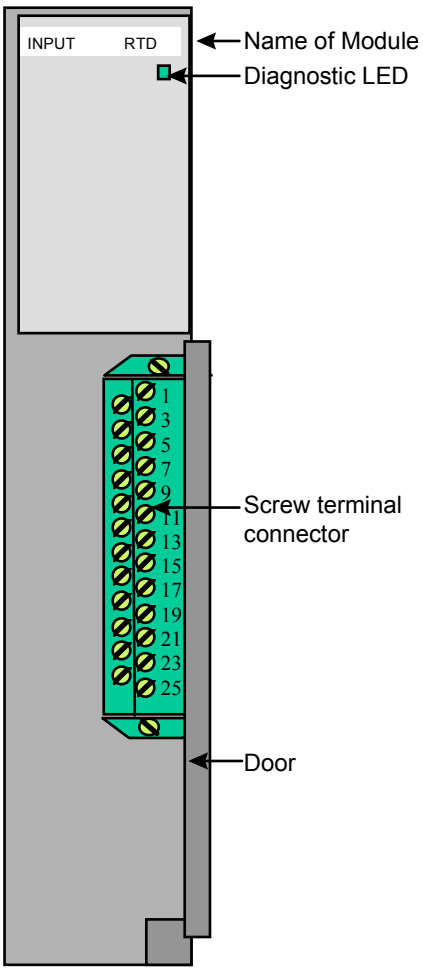
# RTD Module (6 channel)

The input RTD (resistance temperature detector) module has 6 independent RTD conversion channels which receive signals from 50 ¾ or 100 ¾ RTDs. Each channel converts a resistance into a 12-bit digital word which is processed by the PiC.

This module requires no hardware adjustments. All adjustments such as Fahrenheit or Celsius scaling and temperature ranges are software selectable.

The DIAG LED turns on briefly while the diagnostic tests are running.

**INPUT RTD Module (6 ch)**



**Specification Table**

| Characteristic | RTD module specification |
|---|---|
| Function | Measures 50 ¾ and 100 ¾ RTD inputs |
| Part Number | (M.1016.9154) (old # 502-03679-02) |
| Field side connector | 25-pin card edge connector, screw terminals |
| Input channels | 6 |
| Resolution | 12 bits |
| RTD types | European curve (Alpha = .00385) for 50 ¾ and 100 ¾ two and three wire RTDs |
| 50 ¾ temperature ranges | -200°C to 850°C (-328°F to 1562° F)<br>-200°C to 266°C (-328°F to 510.8° F) |
| 100 ¾ temperature ranges | -200°C to 850°C (-328°F to 1562° F)<br>-200°C to 266°C (-328°F to 510.8° F)<br>-200°C to 0°C (-328°F to 32° F) |
| Maximum RTD lead wire length | |
| 24 AWG or smaller | < 20 feet |
| 20 AWG or larger | 2-wire RTD - under 20 feet without lead compensation<br>NOTE: Lead length can affect accuracy of 2-wire RTDs with lengths over 20 feet.<br>2-wire RTD - up to 5000 feet with lead compensation<br>3-wire RTD - up to 1000 feet without lead compensation<br>3-wire RTD - up to 5000 feet with lead compensation |
| Accuracy | .6% FSR @ 25°C<br>Temperature coefficient of 75 PPM/°C |
| Time between samples (software selectable) | 2000 to 65,535 µsec |
| Filter time constant | 120 ms |
| Open RTD detection | Indicated by software |
| Logic side power requirements (typical) | 80 mA @ +5 V<br>112 mA @ +15 V |
| Indicator light, module | DIAG LED goes off after the module passes its diagnostic tests |
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |

| | |
|---|---|
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br>Emissions<br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

## NOTES

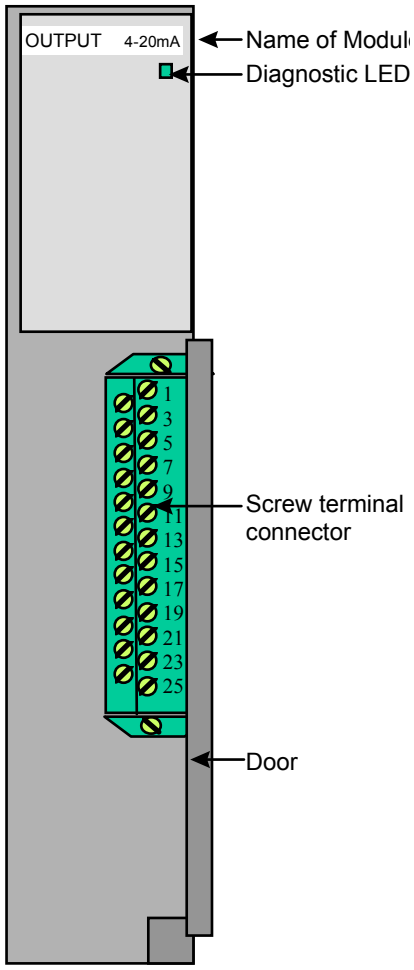
# Output 4-20mA Module (6 channel)

The 4-20mA output module has six independent 4-20mA conversion channels. Each channel converts a 15-bit digital value into a single ended type 4-20mA analog current output signal. The full range of the output signal is 4mA to 20mA, with a 15-bit resolution of one part in 32,768.

A typical use for this module is to supply a control signal to valves. This module contains no user adjusted potentiometers or hardware switches. All necessary adjustments are done in software.

The DIAG LED goes on briefly while the diagnostic tests are running.

**OUTPUT 4-20mA Module (6 CH)**



**Specification Table**

| Characteristic | Output 4-20mA (6 ch) specification |
|---|---|
| Function | Converts a 15-bit digital value into a 4-20mA analog current signal for each of six channels |
| New Part number | M.1016.9160 (old # 502-03681-02) |
| Field side connector | 25-pin card edge connector, screw terminals |
| Output channels | 6 |
| Resolution | 15 bits, or 32,768 steps over the full output range |
| Zero Offset | .1% FSR (Full Scale Range) over full temperature range |
| Accuracy | .1% FSR (Full Scale Range) over full temperature range |
| Output current, max. | 20 mA |
| Output update time increment | 100 µsec |
| Output voltage after power up | $V_{OUT} = I_{OUT} * R_{LOAD}$ |
| Response to scan loss | All outputs reset to 4mA |
| Short circuit protection | Current is limited to:<br>$I_{OUT}$ = where $I_{OUT}$ = 4 to 20mA |
| Indicator light, module | DIAG LED goes off after module passes its diagnostic tests |
| External power supply<br>+V and current<br>Line and load regulation<br>Maximum noise | <br>+15 V to +24 V: Š 250 mA<br>.5%<br>100 mV pk-pk |
| Isolation | Field side has differential isolation via Op Amp buffer between logic and field side<br>The open alarm flag is optically isolated between field and logic side |
| Logic side power requirements (typical) | 125 mA @ +5 V<br>30 mA @+15 V<br>18 mA @-15 V |
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |

| | |
|---|---|
| EMC Compliant<br>Emissions<br><br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

## NOTES

**MOTION SOLUTIONS PRODUCT GUIDE**

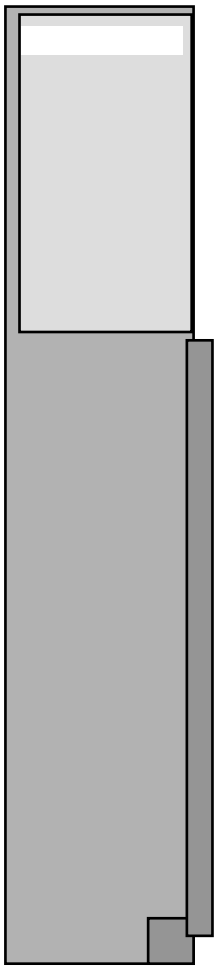
# PiC Family Miscellaneous Modules

Giddings & Lewis

# Barrier Module

A Barrier module is available for any empty slot in the system rack. The part number for the barrier module is M.1016.9125 (new) and 502-03673-00 (old).

**The Barrier Module**



| UL and C/UL Listed File No. E126417 NRAQ Programmable Controllers |
|---|

**PiC900 CONTROLS**
**MOTION SOLUTIONS PRODUCT GUIDE**

# PiC 900 Servo/ Feedback Modules

Giddings & Lewis

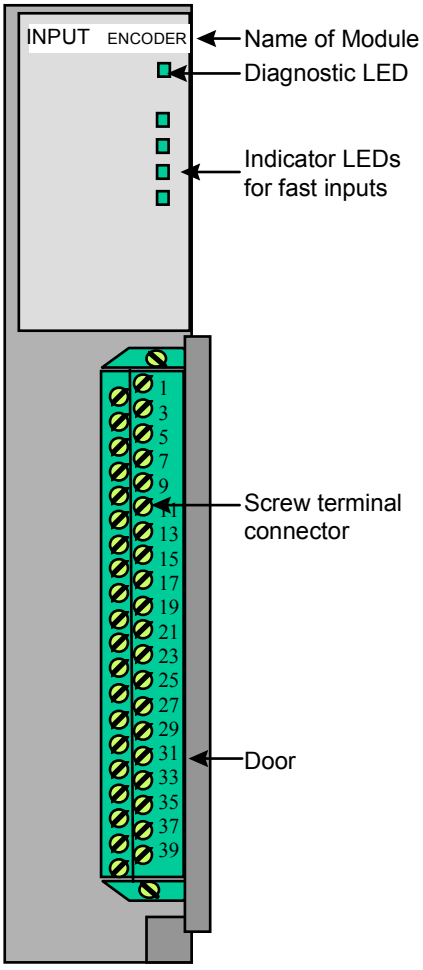
# Encoder Module (2, 4, High Speed 4 channel)

The encoder module can interface to four or two independent incremental encoders or equivalent devices. Information from the encoders is used to update four or two separate position counters and latches within the module

For each channel, a 24-bit counter is incremented or decremented based on signals it receives from the A and B outputs of an encoder. The counter value can be latched (stored) if the module receives either an "index" signal from the encoder or a 24V DC "fast" input signal.

An LED in the upper section of the module goes on when the fast input for each channel is energized. The DIAG LED goes on briefly while the diagnostics tests are running.

**INPUT ENCODER Module (4 CH)**



**Specification table**

<table>
<tr><th>Characteristic</th><th>Input Encoder module (2, 4, HS) specifications</th></tr>
<tr><td>Function</td><td>Counts pulses from up to 4 encoders<br>Latches the counter value at an index or 24 VDC input event</td></tr>
<tr><td>Part number</td><td>
<table>
<tr><td>4 ch</td><td>2.5 VDC - 7 VDC<br>M.1016.9260<br>(old # 502-03782-02)</td><td>3.5 VDC - 16.5 VDC<br>M.1016.9264<br>(old # 502-03786-02)</td></tr>
<tr><td>2 ch</td><td>2.5 VDC - 7 VDC<br>M.1016.9261<br>(old # 502-03782-22)</td><td>N/A</td></tr>
<tr><td>high speed</td><td>M.1016.9433<br>(old # 502-03947-00)</td><td>N/A</td></tr>
</table>
</td></tr>
<tr><td>2,4 Ch Encoder (A, B, and index)<br><br>High-speed Encoder</td><td>Differential or single ended; differential recommended<br>2632 differential receiver</td></tr>
<tr><td>Guaranteed on, min.(2, 4 ch)</td><td>2.5V DC @ 2.5 mA 3.5V DC @ 7.3 mA</td></tr>
<tr><td>Input voltage, max. (2, 4 ch)<br>(high speed)</td><td>7V DC16.5V DC<br>5V DC</td></tr>
<tr><td>Input current, max. (2, 4 ch)</td><td>22 mA @ 7V DC30 mA @ 16.5V DC</td></tr>
<tr><td>Input voltage, threshold (high-speed)<br>Input termination (high-speed)</td><td>±200 mV<br><br>120 ¾</td></tr>
<tr><td>Signal pulse width, min. (2, 4 ch)<br>(high-speed)</td><td>.6 µs(600 ns)<br>75 ns</td></tr>
<tr><td>Quad signal freq, max. (2, 4 ch)<br>(high-speed)</td><td>250 KHz for A or B input (1 M FU count rate)<br>2.5 MHz (10M FU count rate)</td></tr>
<tr><td>Pulse signal freq, max. (2, 4 ch)<br>(high-speed)</td><td>500 KHz for A or B input (500 KFU count rate)<br>5 MHz (5M FU count rate)</td></tr>
<tr><td>Field side connection</td><td>40 pin card edge connector, screw terminals</td></tr>
<tr><td>Encoder device</td><td>1. Quadrature type incremental encoder (recommended)<br>2. Pulse type incremental encoder</td></tr>
</table>

| | |
|---|---|
| Stored position value range | 24-bit up/down counter<br>24-bit latch |
| Fast input | Nominal 24V DC, switched externally to the module<br>Active high or low<br>Reverse polarity protected |
| Voltage max. | 30V DC |
| Guaranteed on | 15V DC |
| Guaranteed off | 5V DC |
| Input impedance | 2.7 K |
| On/off time, max. | 50 µs |
| Indicator light | LED is lit when current flows into the input |
| Indicator light, module | DIAG LED goes off after the module passes its diagnostic tests |
| Cable length, max. (2, 4 ch)<br><br>Cable length, max. (high speed) | 200 ft. @ 250 KHz and 45° quad error (with differential driver)<br>50 ft. @ 2.5 MHz with 100 ns minimum separation between A and B |
| Logic side power requirements (typical for 2, 4 ch) | 572 mA @ +5V<br>1 mA @ +15V<br>1 mA @ -15V<br>21 mA per energized input @ +5V<br>12 mA per fast input @ +5V |
| Logic side power requirements (typical for high-speed) | 370 mA @ +5V<br>12 mA per fast input @ +5V |
| Field side power dissipation, worst case (2, 4 ch) | 7.4 W |
| Field side power dissipation, worst case (high speed) | 1.5 W from encoder +5 V supply<br>1.6 W from fast input supply |
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |

| | |
|---|---|
| EMC Compliant<br>Emissions<br><br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

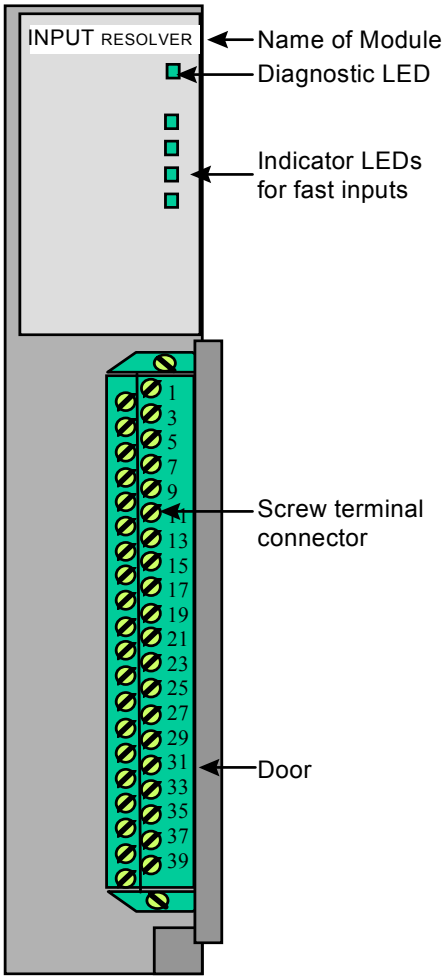
# Resolver Module (4, 2 channel)

The resolver module can interface to four or two independent resolvers (or equivalent transducers). Information from the resolvers is used to update four or two separate position counters and latches within the module.

For each channel, the module sends out two sine waves 90° out of phase with each other and receives a signal whose phase represents the angular position of the resolver. This input signal is used to update a 24-bit counter. This module can be programmed to "latch" (store) the counter value when a signal is received by the fast input for that channel.

An LED in the upper section of the module goes on when the fast input for each channel is energized. The DIAG LED goes on briefly while the diagnostics tests are running.

**INPUT RESOLVER Module (4 CH)**



### Specification Table

| Characteristic | Input Resolver module specifications |
|---|---|
| Function | Measures the position of a transducer that accepts a 2-phase quadrature excitation, such as a resolver or potentiometer |
| Part number | **4 ch** M.1016.8949 (old # 502-03552-02)<br>**2 ch** M.1016.8951 (old # 502-03552-22) |
| Field side connector | 40 pin card edge connector, screw terminals |
| Excitation method | 2-phase quadrature for control transformer type of resolver |
| Excitation frequency | 2 KHz |
| RPO and QPO outputs | |
| Output voltage | 16V P-P (5.7V RMS) |
| Current per output channel, max. | **4ch** 5mA RMS (14 mA P-P)<br>**2 ch** 10mA RMS (20 mA P-P) |
| Resolver transformer ratio | .5 to 1.0 |
| Resolution, resolver | 4000 Feedback Units (FUs) per electrical revolution |
| Resolution, potentiometer | 1000 Feedback Units (FUs) per electrical revolution |
| Accuracy at constant temperature | ± 20 arc minutes |
| Accuracy over temperature range | ± 45 arc minutes |
| Electrical velocity, max. | 15000 RPM (1M FU/Sec.) |
| Cable length, max. | 200 ft. |
| Stored position value range | 24-bit up/down counter<br>24-bit latch |
| Fast input | Nominal 24V DC |
| Reverse polarity protection | YES |
| Voltage max. | 30V DC |
| Guaranteed on | 15V DC |
| Guaranteed off | 5V DC |
| Input impedance | 2.7 K |
| On/off time, max. | 50 µs |
| Indicator lights, fast inputs | LED is lit when current flows into the input. |

| | |
|---|---|
| Indicator light, module | DIAG LED goes off when the module passes its diagnostic tests |
| Logic side power requirements (typical for 4 ch) | 473 mA @ 5V<br>133 mA @+15V<br>20 mA @ -15V<br>14 mA per energized input @ +15V<br>14 mA per energized input @ -15V<br>12 mA per fast input |
| Logic side power requirements (typical for 2 ch) | 296 mA @ 5V<br>105 mA @ +15V<br>16 mA @ -15V<br>14 mA per energized input @ +15V<br>14 mA per energized input @ -15V<br>13 mA per fast input |
| Field side power dissipation, worst case | 4 ch 1.4 W 2 ch .7 W |
| Recommended resolver | Part number M.1200.0399 (old # 501-98409-00)<br>Harowe 11BRW 300-F-1/10 |
| Other suggested resolvers | Clifton 11BHW-0IE/A004<br>Kearfott CR41095050 |
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br>Emissions<br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge e(4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

## NOTES

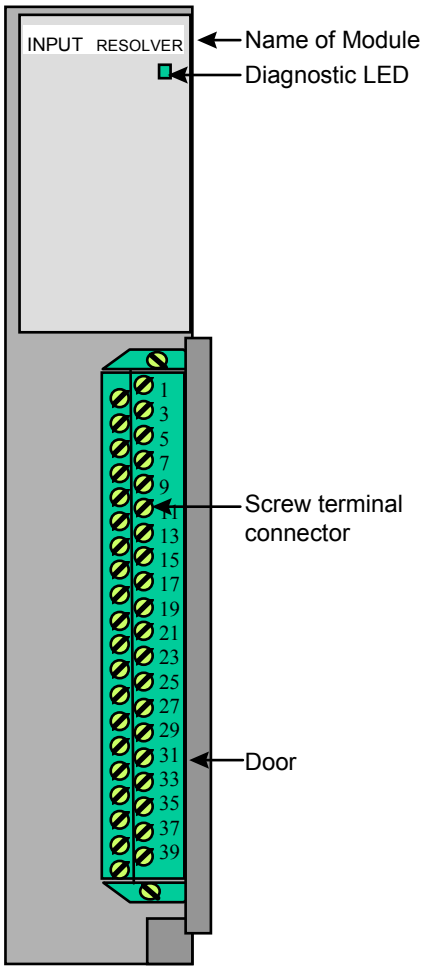
# Multi-Channel Resolver Module (12 channel)

The input multi-channel resolver module can interface to 12 independent resolvers (or equivalent transducers). Feedback information from the resolvers is used to update the on-board memory. The position of each resolver can be read at any time by the PiC.

For each channel, the module sends out two sine waves 90° out of phase with each other and receives a signal whose phase represents the angular position of the resolver. The resolution of the angular position is 4000 counts per revolution or 0.09 degrees.

The DIAG LED goes on briefly while the diagnostic tests are running.

**INPUT RESOLVER (Multi-Channel) Module (12 CH)**



## Specification Table

| Characteristic | Input Resolver (12 ch) Module Specifications |
|---|---|
| Function | Measures the position of a transducer that accepts a 2-phase quadrature excitation, such as a resolver or potentiometer |
| Part number | M.1016.9231 (old # 502-03722-02) |
| Field side connector | 40 pin card edge connector, screw terminals |
| Excitation method | 2-phase quadrature for control transformer type of resolver |
| Excitation frequency | 4KHz |
| RPO and QPO outputs | |
| Output voltage | 15V P-P (5.3V RMS) |
| Current per output channel, max. | 100 mA |
| Resolver transformer ratio | .5 to 1.0 |
| Resolution, resolver | 4000 Feedback Units (FUs) per electrical revolution |
| Resolution, potentiometer | 1000 Feedback Units (FUs) per electrical revolution |
| Accuracy at constant temperature | ± 12 arc minutes |
| Accuracy over temperature range | ± 5.4 arc minutes /10°F |
| Velocity, max. | 15000 electrical RPM (1M FU/Sec.) |
| Cable length, max. | 6 ft. from module to terminal block (18 AWG)<br>100 ft. from terminal block to resolvers (twisted pair) |
| Stored position value range | 0-3999 |
| Indicator light, module | DIAG LED goes off when the module passes its power-on diagnostic tests |
| Logic side power requirements (typical) | 200 mA @ +5V<br>60 mA @ +15V<br>60 mA @ -15V |
| Recommended resolver | Giddings & Lewis part number 501-98409-00<br>Harowe 11BRW 300-F-1/10 |
| Other suggested resolvers | Clifton 11BHW-0IE/A004<br>Kearfott CR410959 |
| Operating temperature range | 7° C to 55° C (45° F to 131° F) |
| Storage temperature range | -40° C to 85° C (-40° F to 185° F) |
| Humidity | 5 to 95%, non-condensing |

| | |
|---|---|
| EMC Compliant<br>Emissions<br><br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

# Servo Encoder with Analog I/O Module

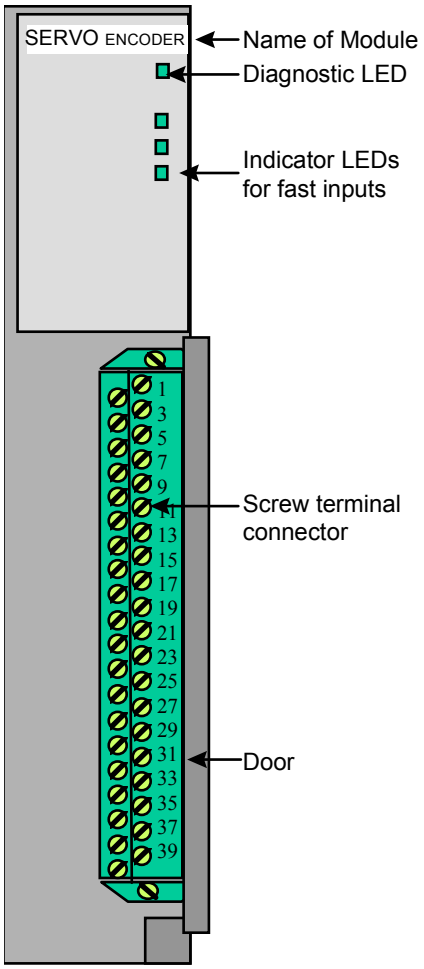
The servo encoder with analog I/O module provides:

- Two analog output channels
- Four analog input channels
- Three encoder input channels
- Three fast inputs

An LED goes on when the fast input for each encoder channel is energized.

The DIAG LED goes on briefly while the diagnostic tests are running.

**Servo Module Encoder with Analog Inputs**



## Specification Table

| Characteristic | Servo Encoder module specifications |
|---|---|
| Function | Converts a 16-bit digital word into a ±11V analog output signal for each of two channels<br>Converts an analog input signal into a 12-bit digital word for each of four channels.<br>Counts pulses from up to three encoders<br>Latches the counter value at an index or 24 VDC fast input event |
| Part number | M.1016.9329 (old # 502-03839-04) |
| Logic side power requirements (typical) | 482 mA @ +5V<br>42 mA @ +15V<br>62 mA @ -15V<br>Analog Output<br>1 mA per energized output @ +5V<br>11 mA per energized output @ +15V<br>11 mA per energized output @ -15V<br>Analog Input<br>120 mA @ +5V<br>112 mA @ +15V<br>Encoder<br>21 mA per energized input @ +5V<br>12 mA per fast input @ +5V |
| Field side connection | 40 pin card edge connector, screw terminals |
| Field side power dissipation, worst case | 7.4 W |
| Indicator light, module | DIAG LED goes off after the module passes its diagnostic tests |
| Indicator light | LED is lit when current flows into the fast input |
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br>Emissions<br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |

| | |
|---|---|
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |
| **Analog Output section (2 ch)** | |
| Output channels | 2 |
| Resolution | 16 bits, or 65536 steps over the full output range |
| Output voltage characteristics | |
| Nominal voltage range | ± 11V DC |
| Voltage accuracy @ 11 V | ± 5% |
| Output current, max. @ ±10V | ± 10 mA |
| Output update time increment | 32 µsec |
| Output voltage after power up | 0V ± 20 mV |
| Response to scan loss | All outputs reset to 0V ± 20 mV |
| Output ripple | < 10 $mV_{RMS}$ at 30 KHz |
| Short circuit protection | Current limited outputs |
| **Analog Input section (4 ch)** | |
| Input channels | 4 |
| Resolution | 12 bits, or 4096 steps over the full input range |
| Input sensitivity (software selectable) | |
| Voltage ranges | Unipolar / Bipolar<br>0 to 10V / ±10V<br>0 to 5V / ±5V<br>0 to 2.5V / ±2.5V<br>0 to 1.25V / ±1.25V<br>0 to 1V / ±1V<br>0 to .5V / ±.5V<br>0 to .25V / ±.25V |
| Current range | 0 to 20 mA, 4 to 20 mA |
| Common mode maximum voltage (The maximum voltage that can safely be applied between either input terminal and circuit common.) | ±40V |
| Common mode operating voltage (The maximum voltage that can be applied between either input terminal and circuit common with inputs still operating properly.) | ±11V |
| Internal current sense resistor | 250 ohms |
| Maximum current sense resistor power | .12 W |

| | |
|---|---|
| Differential input resistance (each input to ground) | 1 M Ohms |
| Filter time constant - software selection | 1 ms, 10 ms, 100 ms |
| Accuracy | .5% of FSR at 25$^{o}$C<br>± 100 PPM /$^{o}$C |
| 0 Offset | From ±2 counts @ 10 V<br>to ±8 counts @ .125 V |
| **Encoder Input section (3 ch)** | |
| Input Encoder (3 ch) (A, B, and index) | Differential or single ended; differential recommended |
| Guaranteed on, min. | 2.5V DC @ 2.5 mA |
| Input voltage, max. | 7V DC |
| Input current, max. | 22 mA @ 7V DC |
| Signal pulse width, min. | .6 µs(600 ns) |
| Quadrature signal frequency, max. | 250 KHz for A or B input (1 M FU count rate) |
| Pulse encoder signal frequency, max. | 500 KHz for A or B input (500 KFU count rate) |
| Encoder device | 1. Quadrature type incremental encoder (recommended)<br>2. Pulse type incremental encoder |
| Stored position value range | 24-bit up/down counter<br>24-bit latch |
| Fast input | Nominal 24V DC, switched externally to the module<br>Active high or low<br>Reverse polarity protected |
| Voltage max. | 30V DC |
| Guaranteed on | 15V DC |
| Guaranteed off | 5V DC |
| Input impedance | 2.7 K |
| On/off time, max. | 50 µs |
| Cable length, max. | 200 ft. @ 250 KHz and 45° quad error<br>(with differential driver) |

# Servo Encoder with Analog Output Module

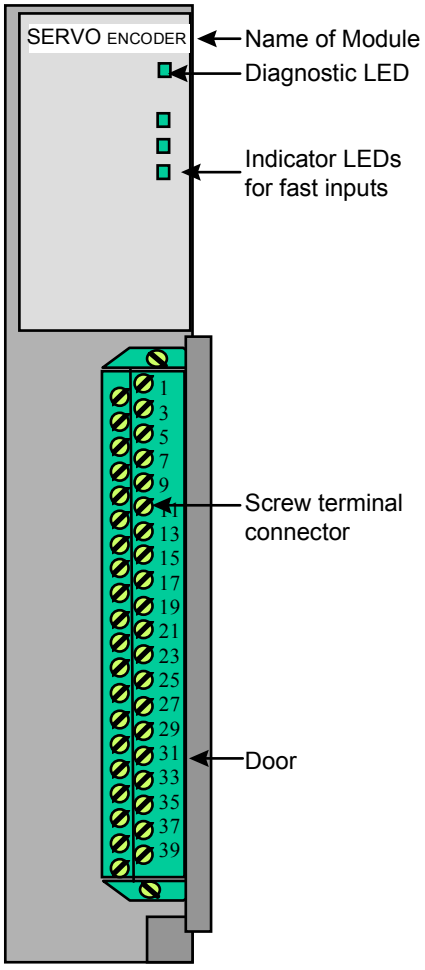
Depending on the model you have, the Servo encoder with analog output module provides:

- Four, three, or two analog output channels
- Three, two or one encoder input channels
- Three, two, or one fast inputs

An LED goes on when the fast input for each encoder channel is energized.

The DIAG LED goes on briefly while the diagnostic tests are running.

**Servo Module (Encoder)**



**Specification Table**

| Characteristic | Servo module encoder specifications |
|---|---|
| Function | Converts a 16-bit digital word into a ±11V analog output signal for each of two channels<br>Counts pulses from up to three encoders<br>Latches the counter value at an index or 24 VDC input event |
| Part number | 4 Analog Outputs/3 Encoder Inputs<br>M.1016.9333 (old # 502-03840-24)<br>3 Analog Outputs/2 Encoder Input<br>M.1016.9338 (old # 502-03840-44)<br>2 Analog Outputs/1 Encoder Input<br>M.1016.9343 (old # 502-03840-24) |
| Logic side power requirements (typical) | 413 mA @ +5V<br>55 mA @ +15V<br>51 mA @ -15V<br>Analog Output<br>1 mA per energized output @ +5V<br>11 mA per energized output @ +15V<br>11 mA per energized output @ -15V<br>Encoder<br>21 mA per energized input @ +5V<br>12 mA per fast input @ +5V |
| Field side connection | 40 pin card edge connector, screw terminals |
| Field side power dissipation, worst case | 7.4 W |
| Indicator light, module | DIAG LED goes off after the module passes its diagnostic tests |
| Indicator light, fast inputs | LED is lit when current flows into the fast input |
| Operating temperature range | 7°C to 55°C (45°F to 131°F) |
| Storage temperature range | -40°C to 85°C (-40°F to 185°F) |
| Humidity | 5 to 95%, non-condensing |

| | |
|---|---|
| EMC Compliant<br>Emissions<br><br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |
| **Analog Output section (4, 3, or 2 ch)** | |
| Resolution | 16 bits, or 65536 steps over the full output range |
| Output voltage characteristics | |
| Nominal voltage range | ± 11V DC |
| Voltage accuracy @ 11 V | ± 5% |
| Output current, max. @ ±10V | ± 10 mA |
| Output update time increment | 32 µsec |
| Output voltage after power up | 0V ± 20 mV |
| Response to scan loss | All outputs reset to 0V ± 20 mV |
| Output ripple | < 10 $mV_{RMS}$ at 30 KHz |
| Short circuit protection | Current limited outputs |
| Response to scan loss | All outputs are reset to the OFF state |
| **Encoder Input section (3, 2, or 1 ch)** | |
| Input Encoder (A, B, and index) | Differential or single ended; differential recommended |
| Guaranteed on, min | 2.5V DC @ 2.5 mA |
| Input voltage, max | 7V DC |

| | |
|---|---|
| Input current, max | 22 mA @ 7V DC |
| Signal pulse width, min | .6 µs (600 ns) |
| Quadrature signal frequency, max | 250 KHz for A or B input (1 M FU count rate) |
| Pulse encoder signal frequency, max | 500 KHz for A or B input (500 K FU count rate) |
| Encoder device | 1. Quadrature type incremental encoder (recommended)<br>2. Pulse type incremental encoder |
| Stored position value range | 24-bit up/down counter<br>24-bit latch |
| Fast input | Nominal 24V DC, switched externally to the module<br>Active high or low<br>Reverse polarity protected |
| Voltage max | 30V DC |
| Guaranteed on | 15V DC |
| Guaranteed off | 5V DC |
| Input impedance | 2.7 K |
| On/off time, max | 50 µs |
| Cable length, max | 200 ft. @ 250 KHz and 45° quad error (with differential driver) |

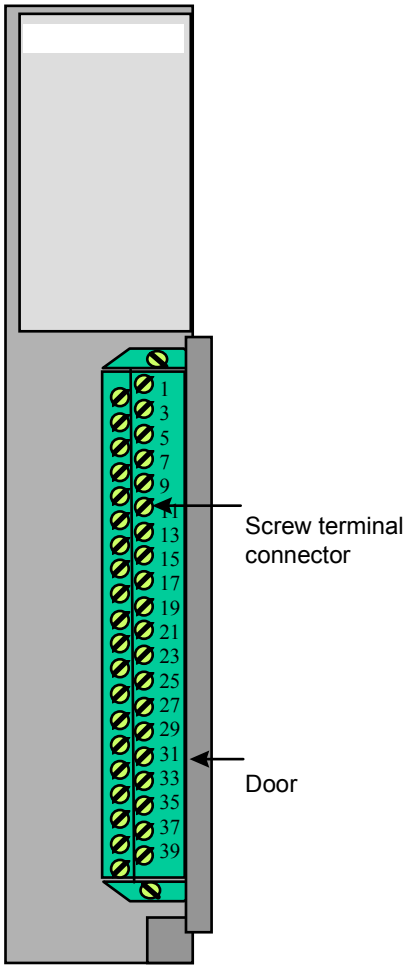
# Slider Driver Module

The Slider Driver module is an interface between the PiC Resolver module and up to two independent Inductosyn systems.

For each Inductosyn system, the Slider Driver module accepts two sinusoidal signals from the Resolver module and applies them to the slider of the Inductosyn system. The Slider Driver module then accepts feedback from the scale amplifier of the Inductosyn system, conditions the signal, and passes this information to the Resolver module. The Resolver module uses the feedback signal to determine position information.

Refer to the Input Resolver Module for additional information.

**Slider Driver Module**



**Specification Table**

| Characteristic | Slider Driver Module Specifications |
|---|---|
| Function | Drives up to two Inductosyn sliders |
| Part number | M.1016.9443 (old # 502-03956-02) |
| Field side connector | 40 pin card edge connector, screw terminals |
| External Supply | |
| Input Voltage range | +18 to 30V DC |
| Nominal input | +24V DC |
| Input current (max) | 1Amp |
| Output Voltages | ±12V DC current limited |
| Scale Amplifier | Part Number M.1200.2894 (old # 503-13704-00)<br>NOTE: If the Inductosyn scales and sliders are purchased from Giddings & Lewis, this is the required scale amplifier. |
| Operating temperature range | 7° C to 55° C (45° F to 131° F) |
| Storage temperature range | -40° C to 85° C (-40° F to 185° F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br>Emissions<br><br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

# Output Stepper Module (8 channel)

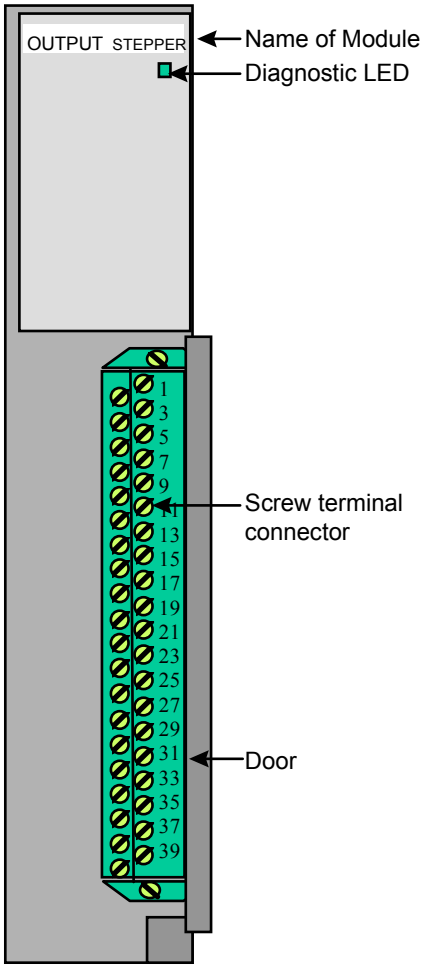
The output stepper motor control module (SMCM) can control up to eight stepper drives. The maximum step rate is one million steps per second.

An external power supply is required for operation.

Commands and control data are sent to the module and status and position information are received from the module via software.

The DIAG LED goes on briefly while the diagnostic tests are running.

**OUTPUT STEPPER Module (8 ch)**



## Specification Table

| Characteristic | Output stepper module (8 ch) specifications |
|---|---|
| Function | Controls up to eight stepper drives |
| Part Number | M.1016.9146 (old # 502-03677-02 8 channel) |
| +V input (from external supply) | 4.5V DC to 20V DC, 45 mA per connected channel |
| Step/CW output rating<br>Direction/CCW output rating | Totem pole, 15 mA sink, 5 mA source |
| Field side connector | 40-pin card edge connector, screw terminals |
| Protection of logic circuits | Optical isolation between the logic and field side |
| Indicator light, module | A DIAG LED turns OFF when the module passes its diagnostic tests at power-on |
| Position range | ±2,147,352,575 steps |
| Step rate | 0 to 1,000,000 steps/sec |
| Step rate accuracy | $ActualRate = \frac{10 \times 10^6}{X}$<br>where X is the integer quotient of $\frac{10 \times 10^6}{ProgrammedRate}$ |
| Acceleration/deceleration rate | 1 to 16,777,215 steps/sec/sec |
| Reference range | ±2,147,352,575 steps |
| Response to scan loss | Pulse output halted |
| Logic side power requirements (typical) | 404 mA @ +5V 8 channel<br>6 mA per active channel @ +5V |
| Operating temperature range | 7° C to 55° C (45° F to 131° F) |
| Storage temperature range | -40° C to 85° C (-40° F to 185° F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br>Emissions<br><br>Noise immunity | Refer to the EMC Guidelines for more information.<br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines |

| | |
|---|---|
| UL and C/UL Listed | File No. E126417  NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

# Output Stepper Axis Module (8 channel)

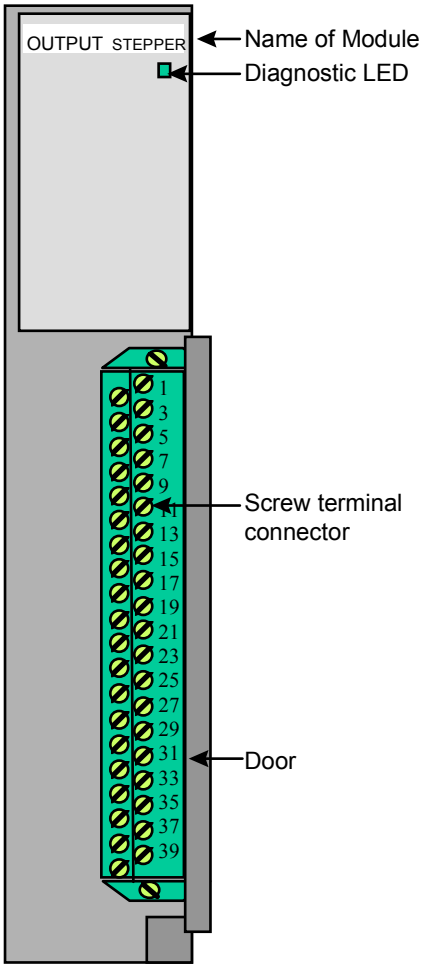
The output stepper axis module (SAM) can control up to eight stepper drives. The maximum step rate is ten million steps per second.

An external power supply (4.75V DC to 5.25V DC) is required for operation.

Commands and control data are sent to the module and status information is received from the module via the motion.lib software in PiCServoPro.

The DIAG LED goes on briefly while the diagnostic tests are running.

**OUTPUT STEPPER Axis Module (8 ch)**



**Specification Table**

| Characteristic | Output stepper module (8 ch) specifications |
|---|---|
| Function | Controls up to eight stepper drives |
| Part number | M.1016.9582 (old # 502-04077-00 8 channel) |
| +V input (from external supply) | 4.75V DC to 5.25V DC, 45 mA per connected channel |
| Step/CW output rating<br>Direction/CCW output rating | Totem pole, 15 mA sink, 5 mA source |
| Field side connector | 40-pin card edge connector, screw terminals |
| Protection of logic circuits | Optical isolation between the logic and field side |
| Indicator light, module | A DIAG LED turns OFF when the module passes its diagnostic tests at power-on |
| Step rate | 0 to 10,000,000 steps/sec |
| Step rate accuracy | $ValidRate = \frac{10 \times 10^6}{X}$<br>where X is any integer from 1 to 8,388,609 |
| Response to scan loss | Pulse output halted |
| Logic side power requirements (typical) | 120 mA @ +5V 8 channel |
| Operating temperature range | 7° C to 55° C (45° F to 131° F) |
| Storage temperature range | -40° C to 85° C (-40° F to 185° F) |
| Humidity | 5 to 95%, non-condensing |

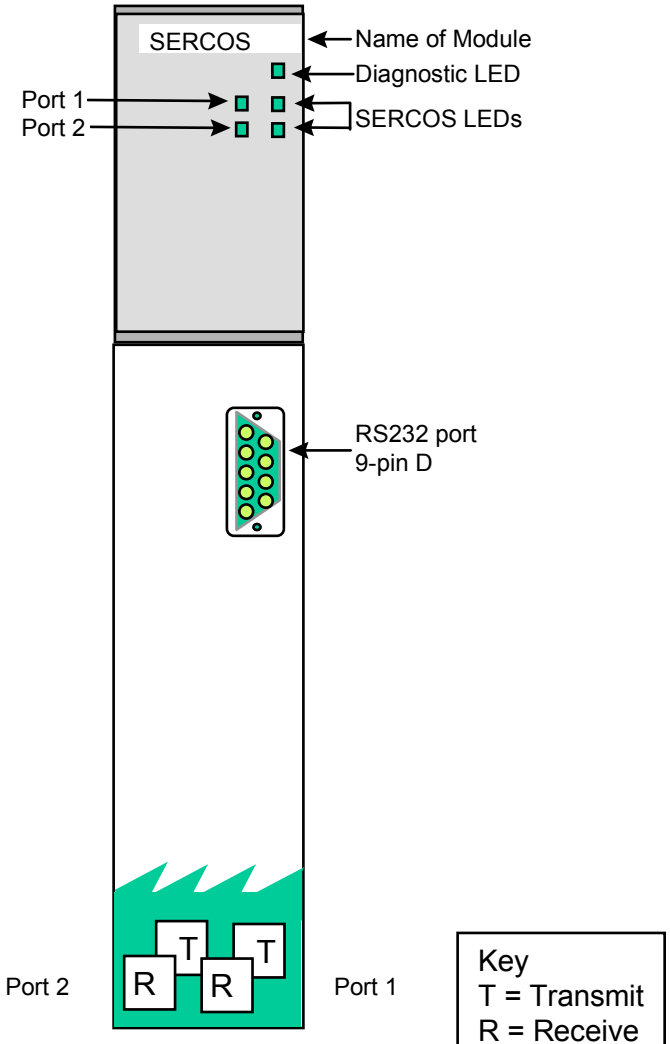
| | |
|---|---|
| EMC Compliant<br>Emissions<br><br>Noise immunity | <br>Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

# SERCOS Module for PiC

The SERCOS module is an interface between the PiC and up to two fiber optic rings of from one to eight SERCOS slaves. The module contains an on-board processor. Five LEDs provide diagnostic information and transmit and receive status for the SERCOS ports. There are two SERCOS ports located at the bottom of the module. Each port has a receive and a transmit fiber optic connector. There is also an RS232 port used for loading FLASH memory updates.

NOTE: The SERCOS module must be used with an EMC-compliant or CE-marked rack.

**SERCOS Module**




SERCOS Ports
Fiber Optic Connections

**Specification Table**

| Characteristic | SERCOS Module Specifications |
|---|---|
| Function | Interfaces with up to two rings with from one to eight digital drives |
| Part number | One-Ring Module M.1016.9429 (old # 502-03944-10)<br>Two-Ring Module M.1016.9428 (old # 502-03944-00) |
| SERCOS port | SMA female connectors for interfacing to 1000 µ meter plastic fiber optic cable with SMA male connectors |
| Update port | RS232 interface<br>Fiber optic receiver specifications:<br>Peak input power (optical level low) -31.2 dBm max<br>Peak input power (optical level high -20.0 dBm min<br>-5 .0 dBm max<br>Fiber optic transmitter specifications:<br>Peak output power (optical level high) -10.5 dBm min<br>-5.5 dBm max |
| Logic side power require. | 575 mA @ 5V |
| Operating temperature range | 7° C to 55° C (45° F to 131° F) |
| Storage temperature range | -40° C to 85° C (-40° F to 185° F) |
| Humidity | 5 to 95%, non-condensing |
| EMC Compliant<br>Emissions<br>Noise immunity | Operates with emissions below EN55011/ CISPR 11 Class A limits<br>Immune to:<br>• Electrostatic discharge (4K V contact mode, 8K V air discharge) per IEC 1000-4-2<br>• RF electromagnetic fields per IEC 1000-4-3<br>• Electrical fast transients per IEC 1000-4-4 on incoming power lines<br>Refer to the EMC Guidelines for more information. |
| UL and C/UL Listed | File No. E126417 NRAQ Programmable Controllers |
| Physical size | 1.6" wide x 12" high x 8.4" deep (including latch)<br>41 mm x 305 mm x 213 mm |
| Vibration (per IEC 68-2-6) | 10-57 Hz (constant amplitude .15 mm)<br>57-2000 Hz (acceleration 2 g) |
| Shock (per IEC 68-2-27) | Four shocks per axis (15g/11 msec) |

**Specification Table for the Fiber Optic Cable**

| Characteristics | Fiber optic cable specifications |
|---|---|
| Function | For use with SERCOS rings with segments from 0 to 30 meters (98 feet) |
| Type | Plastic with step index profile |
| Core diameter<br>Fiber diameter | 980µm ±60µm<br>1000µm ±60µm |
| Operating temperature | 0° C to 55° C (32° F to 131° F) |
| Minimum bend radius | One time: 30mm Continuous: 80mm |
| Tensile strength | One time: 250N Continuous: 100N |
| Connectors | SMA style which accommodates 1000µm size cable |

**PiC900 CONTROLS**
**MOTION SOLUTIONS PRODUCT GUIDE**

# PiC 900 Options and Accessories

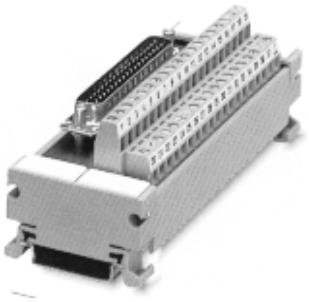
Giddings & Lewis

# PiC Options and Accessories

## I/O Wiring Harness

There is an optional wiring harness available which can be used to replace the discrete wiring from some of the PiC input and output modules (see table below) to field side terminal blocks. It consists of a cable and a terminal strip interface connector as shown below. The pinouts on the terminal strip interface replicate the pinouts for the hardware module as depicted in the Hardware Manual; i.e., pin 1 on the connector is pin 1 on the module.

**Cable**



**Terminal Strip Interface**

*Cables are 5' in length. Other lengths are available. Consult factory for information.

| OPTIONS FOR OUTPUT MODULES | | | | |
|---|---|---|---|---|
| **Voltage** | **No. of Points** | **Module Part No.** | **Order Cable Part No.** | **Order Terminal Block Interface Part No.** |
| 24 VDC Source | 32 | M.1016.9070 (old # 502-03640-02) | M.1016.9537 (old # 502-04046-05) | M.1016.1595 (old # 401-56417-00) |
| | 16 | M.1016.8933 (old # 502-03640-02) | M.1016.9542 (old # 502-04048-05)* | M.1016.1597 (old # 401-56419-00) |
| 24 VDC Sink | 16 Clamped 16 Unclamped | M.1016.9127 (old # 502-03674-02) | M.1016.9537 (old # 502-04046-05)* | M.1016.9537 (old # 401-56417-00) |
| | 32 Clamped | M.1016.9130 (old # 502-03674-22) | M.1016.9537 (old # 502-04046-05) | M.1016.9537 (old # 502-056417-00) |
| | 32 Unclamped | M.1016..9133 (old # 502-03674-42) | M.1016.9537 (old # 502-04046-05) | M.1016.9537 (old # 502-056417-00) |
| 120/240 VAC | 32 | M.1016.9076 (old # 502-03641-03) | M.1016.9537 (old # 502-04046-05) | M.1016.9537 (old # 502-056417-00) |
| | 16 | M.1016.8943 (old # 502-03551-03) | M.1016.9542 (old # 502-04048-05)* | M.1016.1597 (old # 401-56419-00) |

*This part number is for a 5-foot cable. Other lengths are available. Please consult the factory for information

| OPTIONS FOR INPUT MODULES | | | | |
|---|---|---|---|---|
| **Voltage** | **No. of Points** | **Module Part No.** | **Order Cable Part No.** | **Order Terminal Block Interface Part No.** |
| 24 VDC | 32 (Sink or Soucrce) | M.1016.9010 (old # 502-03605-00) | M.1016.9532 (old # 502-04043-05)* | M.1016.1596 (old # 401-56418-00) |
| | 16 (Sink or Soucrce) | M.1016.8929 (old # 502-03548-00) | M.1016.9540 (old # 502-04047-05)* | M.1016.1598 (old # 401-56419-01) |
| 12 VDC | 32 (Sink or Source) | M.1016.9085 (old # 502-03643-02) | M.1016.9532 (old # 502-04043-05)* | M.1016.1596 (old # 401-56418-00) |
| 120 VAC | 16 | M.1016.9076 (old # 502-03550-02)) | M.1016.9540 (old # 502-04047-05)* | M.1016.1598 (old # 401-56419-01) |

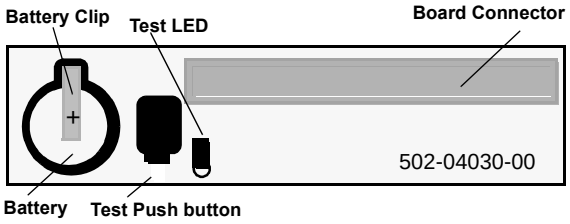
*This part number is for a 5-foot cable. Other lengths are available. Please consult the factory for information

| Description | New Part Number | Old Part Number |
|---|---|---|
| Discrete I/O Wiring Harness Cable for 16DC and 16 AC Inputs | M.1016.9540* | 502-04047-05* |
| Discrete I/O Wiring Harness Cable for 16 DC and 16 AC Outputs | M.1016.9542* | 502-04048-05* |
| Discrete I/O Wiring Harness Cable for 32 DC Inputs | M.1016.9532* | 502-04043-05* |
| Discrete I/O Wiring Harness Cable for 32 DC and 16 AC Outputs | M.1016.9537* | 502-04046-05* |
| Terminal Block for 16-Point Input Modules | M.1016.1598 | 401-56419-01 |
| Terminal Block for 16-Point Output Modules | M.1016.1597 | 401-56419-00 |
| Terminal Block for 32-Point Input Modules | M.1016.1596 | 401-56418-00 |
| Terminal Block for 32-Point Output Modules | M.1016.1595 | 401-56417-00 |
| PiC900 CPU Battery Backup Module with Battery Test | M.1016.9521 | 502-04030-00 |

*This part number is for a 5-foot cable. Other lengths are available. Please consult the factory for information

## Battery Backup Board

There is a battery backup board available to use with PiC CPUs. It maintains the memory contents when the CPU is not in a rack; i. e., when it is in transit.




| Item | Battery Backup Board Part Number | Replacement Battery |
|---|---|---|
| Battery Backup Board with LED and Test Push Button | M.1016.9521<br>(old # 502-04030-00) | 3V Panasonic BR2330<br>or equivalent |

## NOTES