

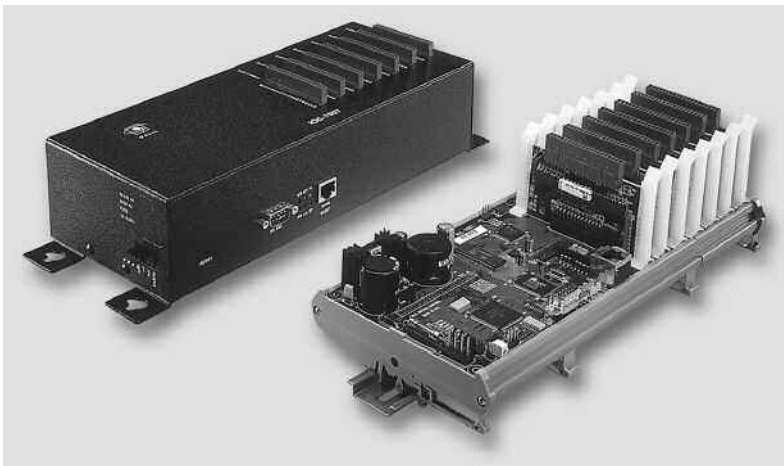
# Ethernet I/O Controller

## IOC-7007

### Product Description

The IOC-7007 I/O logic controller provides an intelligent solution for handling inputs and outputs. The IOC-7007 controller base accepts up to seven Galil I/O IOM modules. IOM modules are available with TTL inputs, optoisolated inputs, optoisolated outputs, high power outputs, dry contact relays, analog inputs and analog outputs.

Galil's IOC-7007 has a 10/100 Base-T auto-negotiable Ethernet port allowing it to communicate with multiple devices in an Ethernet network. This allows easy integration of Galil's Ethernet motion controllers with I/O and eliminates the need for an external PLC.



IOC-7007

The IOC-7007 is programmable and includes 500 lines of non-volatile program memory, variables, arrays and multitasking for concurrent execution of up to eight different programs. The controller also includes 1 PLC thread with deterministic timing. The programming language is similar to Galil's motion controller language allowing seamless integration of motion and I/O.

The IOC-7007 is available as a packaged unit, as a DIN rail mount unit, or as a card-level unit. The box-level version accepts 90–260 VAC or 20–60 VDC. The DIN rail and card-level unit accept 20–60 VDC.

### Features

- *Intelligent Input/Output Controller IOC includes 32-bit microcomputer with memory and multitasking for programming I/O events.*
- *Install up to seven plug-in IOM modules to handle many input and output functions.*
- *"Mix and Match" I/O modules to meet specific requirements. I/O modules for:*
  - 16 TTL Inputs
  - 8 optoisolated inputs
  - 8 optoisolated outputs
  - 8 high power outputs
  - 4 dry contact relays
  - 4 or 8 analog outputs
  - 8 analog inputs
- *Interfaces with other Galil Ethernet motion controllers or Ethernet I/O devices*
- *Ethernet 10/100 Base-T with auto-negotiate function for communicating with 100 Base-T or 10 Base-T devices; One RS232 port up to 19.2 kbaud*
- *Supports Modbus TCP in both master and slave mode for interface to other Modbus devices.*
- *I/O commands and programming are similar to Galil motion controller programming. Additional commands for I/O processing and PLC functions are included. Easy integration of Galil Ethernet motion controller with IOC-7007*
- *8 multitasking threads for simultaneous execution of multiple I/O programs. One additional thread for PLC mode*
- *PLC mode for fast I/O scans with deterministic timing*
- *Fast command processing time—less than 100 microseconds*
- *Non-volatile memory includes 500 line x 80 characters program space; 126 symbolic variables; 2000 elements in up to 14 arrays*
- *Accepts 90–260 VAC 50/60 Hz or 20–60 VDC*
- *Packaging options include: metal enclosure, DIN rail mount, or card-level*
- *20-pin Molex connectors for easy interface to I/O modules*

# Ethernet I/O Controller

## IOC-7007

### Application Programming

The IOC-7007 command language is similar to the command language of Galil motion controllers, but the motion-specific commands are removed and additional I/O and logic commands added. The language is comprised of intuitive, two-letter English-like ASCII commands designed to make programming as quick and easy as possible. For example, the command "SB1" sets output bit 1 and "CB1" clears output bit 1. The complete set of commands is described in the Command Table.

Like all Galil motion controllers, the IOC-7007 has the ability to store and execute complex application programs designed by the user. Such application programs can be downloaded directly to the controller and executed without host intervention. Special commands are available for application programming including event triggers, conditional jumps, IF/THEN/ELSE statements, subroutines, symbolic variables and arrays.

The IOC-7007 permits multitasking, which allows up to eight application programs to execute simultaneously. An additional task can be executed in a special PLC mode which is described in the next section.

#### Example

| INSTRUCTION | INTERPRETATION   |
|-------------|--|
| #TASK1      | <i>Task1 label</i>   |
| XQ #TASK2,1 | <i>Execute Task2 in thread 1</i>                                   |
| WT20000     | <i>Wait for 20 seconds</i>   |
| HX1         | <i>Stop thread 1</i>   |
| MG"DONE"    | <i>Print Message</i>   |
| EN          | <i>End of Program</i>  |
| #TASK2      | <i>Task2 label</i>   |
| AT0         | <i>Initialize reference time</i>                                   |
| CB1         | <i>Clear Output 1</i>  |
| #LOOP       | <i>Loop label</i>  |
| AT 10       | <i>Wait 10 msec from reference time</i>                            |
| SB1         | <i>Set Output 1</i>  |
| AT -40      | <i>Wait 40 msec from reference time, then initialize reference</i> |
| CB1         | <i>Clear Output 1</i>  |
| JP #LOOP    | <i>Repeat Loop</i>   |
| EN          | <i>End task</i>  |

### PLC Mode

The PLC Mode (Programmable Logic Controller) is a special mode of operation that allows fast execution of an application program. The program is compiled into optimized code for faster execution with deterministic timing. This feature provides quick and accurate I/O scans.

The special PLC application program is designated with the label #PLCSCAN. All commands following the #PLCSCAN label are part of the program. A subset of Galil commands that are available for use in the PLC mode are designated in bold in the command list. Variables

and arrays are also available in the PLC mode. The CP command compiles the PLC program and the PLC program is executed with the XP command. Precisely the same number of PLC commands are executed per update period which allows for deterministic timing.

#### Example

| INSTRUCTION   | INTERPRETATION                |
|---------------|-------------------------------|
| #PLCSCAN      | <i>PLC special label</i>      |
| IF (@IN[5]=1) | <i>If Input 5 equals one</i>  |
| CB1           | <i>Clear Output 1</i>         |
| ELSE          | <i>If Input 5 equals 0</i>    |
| SB1           | <i>Set Output 1</i>           |
| ENDIF         | <i>Terminate IF statement</i> |
| EN            | <i>End PLC program</i>        |

### Specifications

#### System Processor

- Motorola 32-bit microcomputer

#### Communications Interface

- Ethernet 10/100BASE-T and RS232 port up to 19.2 kbaud

#### Memory

- Program—500 lines × 80 characters
- Variables—126
- Array—2000 array elements in up to 14 arrays

#### Power Requirements

- AC option (BOX version only): 90–260 VAC 50/60 Hz
- DC option (BOX, DIN, CARD): 20–60 VDC input

#### Mechanical

- IOC-7007 board: 10.75" × 4.25"
- IOC-7007-box: 10.8" × 4.5" × 2.6"
- IOC-7007-DIN: fits standard DIN mount
- IOM modules: 1.8" × 3.2"

#### IOM Electrical Specifications

- IOM-70016: 16 buffered inputs, 2.2 K ohm pull-up
- IOM-70108: 8 optoisolated inputs, 2.2 K pull-up for 5 V in, 10k for 24 V in
- IOM-70208: 8 optoisolated outputs, 24 V @ 25 mA each
- IOM-70308: 8 low-side, high-power outputs, 24 V @ 100 mA each
- IOM-70404: 4 dry contact relays, 150 V @ 250 mA each
- IOM-70508: 8 high-side, high-power outputs, 30 V @ 500 mA each
- IOM-70808: 8 analog inputs\*, 12-bits standard, 16-bit option
- IOM-70904: 4 analog outputs, 12-bits standard, 16-bit option
- IOM-70908: 8 analog outputs, 12-bits standard, 16-bit option

\*Analog inputs ( $\pm 10 V, 0-10 V, \pm 5 V, 0-5 V$ )

# Ethernet I/O Controller

## IOC-7007

### Instruction Set

#### Ethernet

|    |                 |
|----|-----------------|
| IA | Set IP address  |
| IH | Internet handle |
| MB | ModBus          |
| MW | ModBus wait     |

#### I/O

|           |                                  |
|-----------|----------------------------------|
| <b>AO</b> | <b>Analog output voltage</b>     |
| <b>CB</b> | <b>Clear bit</b>                 |
| II        | Input interrupt                  |
| <b>OB</b> | <b>Define output bit</b>         |
| <b>OQ</b> | <b>Output port</b>               |
| <b>SB</b> | <b>Set bit</b>                   |
| @AO[x]    | <b>State of analog output x</b>  |
| @IN[x]    | <b>State of digital input x</b>  |
| @OUT[x]   | <b>State of digital output x</b> |
| @AN[x]    | <b>Value of analog input x</b>   |

#### Interrogation

|             |                                     |
|-------------|-------------------------------------|
| LA          | List arrays                         |
| LL          | List labels                         |
| LR          | Launch slave record                 |
| LS          | List program                        |
| LV          | List variables                      |
| MG          | Message command                     |
| QR          | Data record                         |
| QZ          | Return data record information      |
| ^R^V        | Revision                            |
| TB          | Tell status                         |
| TC          | Tell error code                     |
| TH          | Tell Ethernet handle                |
| TI          | Tell input                          |
| <b>TIME</b> | <b>Time operand, internal clock</b> |
| TQ          | Tell thread execution               |
| TR          | Trace program                       |
| TZ          | Tell I/O configuration              |
| WH          | Ethernet Handle                     |

#### Math Functions

|                     |                            |
|---------------------|----------------------------|
| @SIN[x]             | Sine of x                  |
| @COS[x]             | Cosine of x                |
| @COM[x]             | 1's compliment of x        |
| @ASIN[x]            | Arc sine of x              |
| @ACOS[x]            | Arc cosine of x            |
| @ATAN[x]            | Arc tangent of x           |
| @ABS[x]             | Absolute value of x        |
| @FRAC[x]            | Fraction portion of x      |
| @INT[x]             | Integer portion of x       |
| @RND[x]             | Round of x                 |
| @SQR[x]             | Square root of x           |
| +, -, *, /          | <b>Arithmetic commands</b> |
| >, <, =, >=, <=, <> | <b>Logical operators</b>   |
| &                   | <b>Logical AND</b>         |
|                     | <b>Logical OR</b>          |

#### Programming

|              |                                      |
|--------------|--------------------------------------|
| AB           | Abort program                        |
| DA           | Deallocate variables/arrays          |
| DL           | Download program                     |
| DM           | Dimension arrays                     |
| ED           | Edit program                         |
| <b>ELSE</b>  | <b>Conditional statement</b>         |
| <b>EN</b>    | <b>End program</b>                   |
| <b>ENDIF</b> | <b>End of conditional statement</b>  |
| <b>HX</b>    | <b>Halt execution</b>                |
| <b>IF</b>    | <b>If statement</b>                  |
| IN           | Input variable                       |
| <b>JP</b>    | <b>Jump</b>                          |
| JS           | Jump to subroutine                   |
| <b>NO</b>    | <b>No-operation — for remarks</b>    |
| RA           | Record array, automatic data capture |
| RC           | Record interval for RA               |
| RD           | Record data for RA                   |
| RE           | Return from Error                    |
| RI           | Return from interrupt routine        |
| SA           | Send command                         |
| UL           | Upload program                       |
| <b>XQ</b>    | <b>Execute program</b>               |
| ZC           | User variable                        |
| ZD           | User variable                        |
| ZS           | Zero stack                           |

#### System Configuration

|      |                           |
|------|---------------------------|
| BN   | Burn parameters           |
| BP   | Burn program              |
| BV   | Burn variables and arrays |
| CF   | Configure default port    |
| CW   | Data adjustment bit       |
| EO   | Echo off                  |
| HS   | Handle Assignment         |
| IK   | Ethernet port blocking    |
| LZ   | Leading zeros format      |
| QD   | Download array            |
| QU   | Upload array              |
| RS   | Reset                     |
| ^R^S | Master reset              |
| VF   | Variable format           |

#### Trippoint

|    |                    |
|----|--------------------|
| AA | After analog input |
| AI | After input        |
| AT | At time            |
| WT | Wait for time      |

#### PLC Mode

|           |                                |
|-----------|--------------------------------|
| <b>CP</b> | <b>Compile PLC thread</b>      |
| <b>HP</b> | <b>Halt PLC thread</b>         |
| <b>TX</b> | <b>Tell PLC execution time</b> |
| <b>XP</b> | <b>Execute PLC thread</b>      |

**Note: Commands in bold designate commands available for the PLC mode**

# Ethernet I/O Controller

## IOC-7007

### Connectors

20-pin molex for each IOM module

#### IOM-70016 16-TTL input module

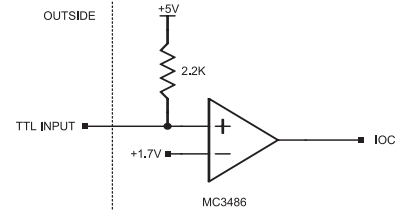
|    |                                 |
|----|---------------------------------|
| 1  | 5 VDC supply output (50 mA max) |
| 2  | Ground reference for TTL inputs |
| 3  | TTL Input 1                     |
| 4  | TTL Input 2                     |
| 5  | TTL Input 3                     |
| 6  | TTL Input 4                     |
| 7  | TTL Input 5                     |
| 8  | TTL Input 6                     |
| 9  | TTL Input 7                     |
| 10 | TTL Input 8                     |
| 11 | TTL Input 9                     |
| 12 | TTL Input 10                    |
| 13 | TTL Input 11                    |
| 14 | TTL Input 12                    |
| 15 | TTL Input 13                    |
| 16 | TTL Input 14                    |
| 17 | TTL Input 15                    |
| 18 | TTL Input 16                    |
| 19 | NC                              |
| 20 | NC                              |

#### IOM-70208 8 Opto-isolated output module

|    |                           |
|----|---------------------------|
| 1  | NC                        |
| 2  | NC                        |
| 3  | Opto Output 1 (Collector) |
| 4  | Opto Output 1 (Emitter)   |
| 5  | Opto Output 2 (Collector) |
| 6  | Opto Output 2 (Emitter)   |
| 7  | Opto Output 3 (Collector) |
| 8  | Opto Output 3 (Emitter)   |
| 9  | Opto Output 4 (Collector) |
| 10 | Opto Output 4 (Emitter)   |
| 11 | Opto Output 5 (Collector) |
| 12 | Opto Output 5 (Emitter)   |
| 13 | Opto Output 6 (Collector) |
| 14 | Opto Output 6 (Emitter)   |
| 15 | Opto Output 7 (Collector) |
| 16 | Opto Output 7 (Emitter)   |
| 17 | Opto Output 8 (Collector) |
| 18 | Opto Output 8 (Emitter)   |
| 19 | NC                        |
| 20 | NC                        |

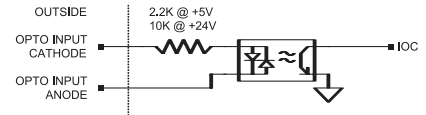
#### IOM-70016

##### 16 TTL Input Module for IOC-7007



#### IOM-70108

##### 8 Opto-isolated Inputs



#### IOM-70108 8 Opto-isolated input module

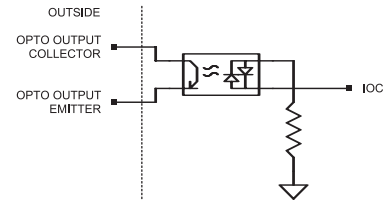
|    |                        |
|----|------------------------|
| 1  | NC                     |
| 2  | NC                     |
| 3  | Opto Input 1 (Anode)   |
| 4  | Opto Input 1 (Cathode) |
| 5  | Opto Input 2 (Anode)   |
| 6  | Opto Input 2 (Cathode) |
| 7  | Opto Input 3 (Anode)   |
| 8  | Opto Input 3 (Cathode) |
| 9  | Opto Input 4 (Anode)   |
| 10 | Opto Input 4 (Cathode) |
| 11 | Opto Input 5 (Anode)   |
| 12 | Opto Input 5 (Cathode) |
| 13 | Opto Input 6 (Anode)   |
| 14 | Opto Input 6 (Cathode) |
| 15 | Opto Input 7 (Anode)   |
| 16 | Opto Input 7 (Cathode) |
| 17 | Opto Input 8 (Anode)   |
| 18 | Opto Input 8 (Cathode) |
| 19 | NC                     |
| 20 | NC                     |

#### IOM-70308 8 Opto-isolated high power output module

|    |   |
|----|---|
| 1  | NC                                      |
| 2  | NC                                      |
| 3  | Power Output 1                          |
| 4  | Power Output 2                          |
| 5  | Power Output 3                          |
| 6  | Power Output 4                          |
| 7  | Power Output 5                          |
| 8  | Power Output 6                          |
| 9  | Power Output 7                          |
| 10 | Power Output 8                          |
| 11 | NC                                      |
| 12 | NC                                      |
| 13 | NC                                      |
| 14 | NC                                      |
| 15 | NC                                      |
| 16 | NC                                      |
| 17 | NC                                      |
| 18 | NC                                      |
| 19 | VIN_ISO, Input for Power supply (+)     |
| 20 | Ground_ISO, Input for Return supply (-) |

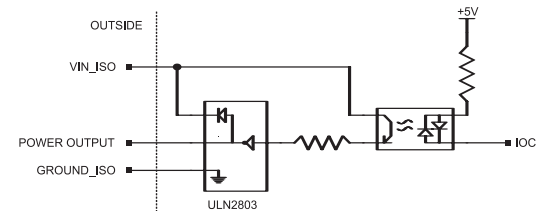
#### IOM-70208

##### 8 Opto-isolated Outputs



#### IOM-70308

##### 8 Opto-isolated High Power Outputs



# Ethernet I/O Controller

## IOC-7007

### Connectors

20-pin molex for each IOM module

#### IOM-70508 8 Opto-isolated high power output module

|    |   |
|----|---|
| 1  | NC                                      |
| 2  | NC                                      |
| 3  | Power Output 1 (+)                      |
| 4  | Power Output 2 (+)                      |
| 5  | Power Output 3 (+)                      |
| 6  | Power Output 4 (+)                      |
| 7  | Power Output 5 (+)                      |
| 8  | Power Output 6 (+)                      |
| 9  | Power Output 7 (+)                      |
| 10 | Power Output 8 (+)                      |
| 11 | NC                                      |
| 12 | NC                                      |
| 13 | NC                                      |
| 14 | NC                                      |
| 15 | VIN_ISO, Input for Power supply (+)     |
| 16 | VIN_ISO, Input for Power supply (+)     |
| 17 | VIN_ISO, Input for Power supply (+)     |
| 18 | VIN_ISO, Input for Power supply (+)     |
| 19 | VIN_ISO, Input for Power supply (+)     |
| 20 | Ground_ISO, Input for Return supply (-) |

#### IOM-70404 4 Dry contact relay output module

|    |                               |
|----|-------------------------------|
| 1  | NC                            |
| 2  | NC                            |
| 3  | Relay Output Common 1         |
| 4  | Relay Output Normally Open 1  |
| 5  | Relay Output Normally Close 1 |
| 6  | Relay Output Common 2         |
| 7  | Relay Output Normally Open 2  |
| 8  | Relay Output Normally Close 2 |
| 9  | Relay Output Common 3         |
| 10 | Relay Output Normally Open 3  |
| 11 | Relay Output Normally Close 3 |
| 12 | Relay Output Common 4         |
| 13 | Relay Output Normally Open 4  |
| 14 | Relay Output Normally Close 4 |
| 15 | NC                            |
| 16 | NC                            |
| 17 | NC                            |
| 18 | NC                            |
| 19 | NC                            |
| 20 | NC                            |

#### IOM-70808 8 Analog input module

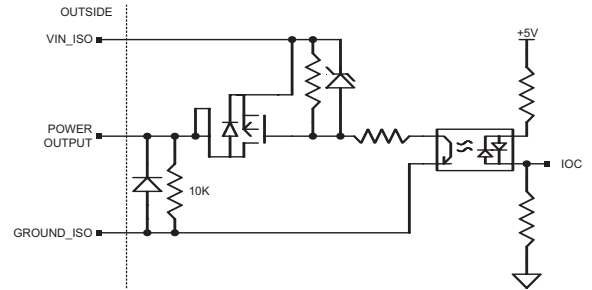
|    |                |
|----|----------------|
| 1  | +5V            |
| 2  | Ground         |
| 3  | Analog Input 1 |
| 4  | Analog Ground  |
| 5  | Analog Input 2 |
| 6  | Analog Ground  |
| 7  | Analog Input 3 |
| 8  | Analog Ground  |
| 9  | Analog Input 4 |
| 10 | Analog Ground  |
| 11 | Analog Input 5 |
| 12 | Analog Ground  |
| 13 | Analog Input 6 |
| 14 | Analog Ground  |
| 15 | Analog Input 7 |
| 16 | Analog Ground  |
| 17 | Analog Input 8 |
| 18 | Analog Ground  |
| 19 | NC             |
| 20 | NC             |

#### IOM-70908 8 Analog output module

|    |                 |
|----|-----------------|
| 1  | +5V             |
| 2  | Ground          |
| 3  | Analog Output 1 |
| 4  | Analog Ground   |
| 5  | Analog Output 2 |
| 6  | Analog Ground   |
| 7  | Analog Output 3 |
| 8  | Analog Ground   |
| 9  | Analog Output 4 |
| 10 | Analog Ground   |
| 11 | Analog Output 5 |
| 12 | Analog Ground   |
| 13 | Analog Output 6 |
| 14 | Analog Ground   |
| 15 | Analog Output 7 |
| 16 | Analog Ground   |
| 17 | Analog Output 8 |
| 18 | Analog Ground   |
| 19 | NC              |
| 20 | NC              |

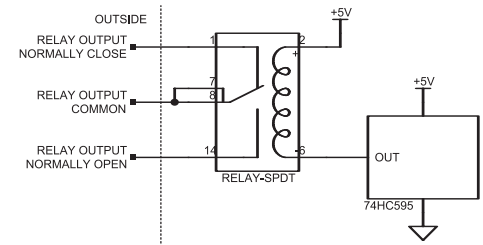
#### IOM-70508

##### 8 Opto-isolated High Power Outputs

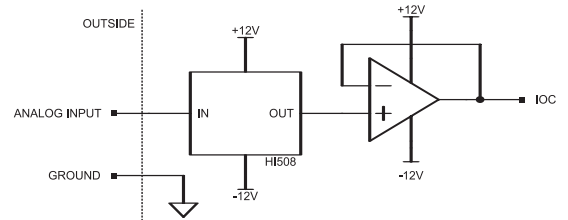


#### IOM-70404

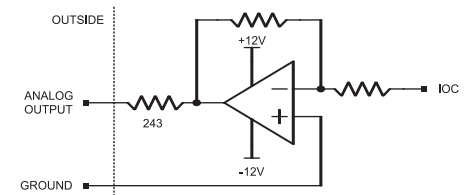
##### 4 Dry Contact Relay Outputs



#### IOM-70808-12 8 Analog Inputs



#### IOM-70908 8 Analog Outputs



OTHER

# Ethernet I/O Controller

## IOC-7007

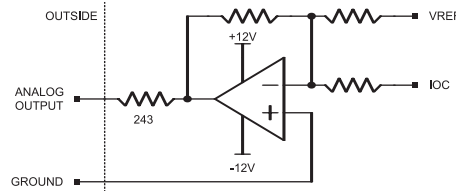
### Connectors

20-pin molex for each IOM module

#### IOM-70904 4 Analog output module

|    |                 |    |    |
|----|-----------------|----|----|
| 1  | +5 V            | 11 | NC |
| 2  | Ground          | 12 | NC |
| 3  | Analog Output 1 | 13 | NC |
| 4  | Analog Ground   | 14 | NC |
| 5  | Analog Output 2 | 15 | NC |
| 6  | Analog Ground   | 16 | NC |
| 7  | Analog Output 3 | 17 | NC |
| 8  | Analog Ground   | 18 | NC |
| 9  | Analog Output 4 | 19 | NC |
| 10 | Analog Ground   | 20 | NC |

#### IOM-70904 4 Analog Outputs



### Ordering Information

| PART NUMBER             | DESCRIPTION  | QUANTITY 1 | QUANTITY 100 |
|-------------------------|--|------------|--------------|
| <b>IOC-7007-BOX-AC</b>  | I/O Controller Base; BOX; 90–260 AC                                | \$ 595     | \$ 495       |
| <b>IOC-7007-BOX-DC</b>  | I/O Controller Base; BOX; 20–60 VDC                                | \$ 595     | \$ 495       |
| <b>IOC-7007-DIN-DC</b>  | I/O Controller Base; DIN; 20–60 VDC                                | \$ 595     | \$ 495       |
| <b>IOC-7007-CARD-DC</b> | I/O Controller Base; CARD; 20–60 VDC                               | \$ 545     | \$ 445       |
| <b>IOC-7007-CARD-NS</b> | I/O Controller Base; CARD; no supply (requires +5 V, ±12 V inputs) | \$ 495     | \$ 395       |
| <b>IOM-70016</b>        | I/O Module— 16 TTL inputs  | \$ 30      | \$ 20        |
| <b>IOM-70108</b>        | I/O Module— 8 optoisolated inputs                                  | \$ 30      | \$ 20        |
| <b>IOM-70208</b>        | I/O Module— 8 optoisolated outputs (24 V @ 25 mA)                  | \$ 30      | \$ 20        |
| <b>IOM-70308</b>        | I/O Module— 8 low-side, high-power outputs (24 V @ 100 mA)         | \$ 30      | \$ 20        |
| <b>IOM-70404</b>        | I/O Module— 4 dry contact relays (150 V @ 250 mA)                  | \$ 55      | \$ 40        |
| <b>IOM-70508</b>        | I/O Module— 8 high-side, high-power outputs (30 V @ 500 mA)        | \$ 45      | \$ 30        |
| <b>IOM-70808</b>        | I/O Module— 8 analog inputs (12-bits)                              | \$ 60      | \$ 45        |
| <b>IOM-70904</b>        | I/O Module— 4 analog outputs (12-bits)                             | \$ 30      | \$ 20        |
| <b>IOM-70908</b>        | I/O Module— 8 analog outputs (12-bits)                             | \$ 60      | \$ 45        |

Note: One IOC-7007 controller base accepts up to seven (7) IOM modules

*Galil offers additional quantity discounts for purchases between 1 and 100. Consult Galil for a quotation.*