Quick Reference

MDrive® 23 Ethernet

INTELLIGENT MOTION SYSTEMS, INC.

⚠ DANGER

UNINTENDED CONSEQUENCES OF EQUIPMENT OPERATION

When the system is started, the drives are usually out of the operator's view and cannot be visually monitored.

- Only start the system if there are no persons in the hazardous area.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop, overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical functions.
- System control paths may include communication links. Consideration must be given to the implication of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines. (1)
- Each implementation of the product must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death or serious injury.

(1) For USA: Additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems".

Product manuals

The following product manuals are applicable to this device:

- Hardware manual applicable to the product
- EtherNet/IP Fieldbus manual
- MODBUS/TCP Fieldbus manual
- MCode Programming and Software Reference manual

These documents are available online at www.imshome.com/downloads/manuals.html.

Required for Setup*

- PC running Microsoft® Windows XP Service Pack 2 or greater.
- TCP/IP Configuration Utility (available online).
- +12 to +75 VDC (+12 to +60 VDC if using an MDrive Hybrid or quad stack motor) unregulated linear or switching power supply.
- Power interface to 2-pin wire crimp connector (recommended: PD02-2300-FL3 prototype development cable).
- Ethernet CAT5/6 cable with RJ45 connectors.
- I/O interface to 14-pin wire crimp connector (recommended: PD14-2334-FL3 prototype development cable).

** If you purchased your MDrive with a QuickStart Kit, you have received all of the connecting cables needed for initial functional setup and system testing.*

Getting Started

Connecting Power and I/O

Your MDrive product is configured with power and I/O on separate connectors. Please refer to the opposite side of this document for connecting details and available connectivity options including Prototype Development Cables and Mating Connector Kits.

Connecting Communication — Ethernet

Connect the MDrive to either your PC or your network Ethernet switch using a CAT5/6 cable with RJ45 connectors.

Configuring the device

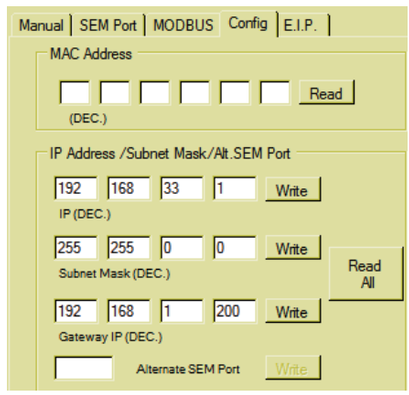


Figure 1: TCP/Configuration Utility configuration tab showing defaults

Before using the device in a network, basic parameters must be configured such as the IP address and subnet mask.

This is done using the TCP/IP Configuration Utility via the configuration/programming port 503.

- Download and install the TCP/IP Configuration Utility from http://www.imshome.com/downloads/software_interfaces.html

Basic configuration

The basic configuration involves setting the IP address and subnet mask.

NOTE: Depending on your network, open IP addresses and subnet mask may need to be obtained from your IT department.

1. Apply power to the device.
2. Open the TCP/IP Configuration Utility, click the tab marked "Config".
3. In the Connection frame at the upper right of the utility screen, enter the default IP address 192.168.33.1 in the IP address dropdown.
4. Click the connect button.
5. The status bar at the bottom of the utility screen will give connection status messages.
6. Set the IP address to one appropriate for your network, click write.
7. Set the Subnet mask to one appropriate for your network, click write.
8. Power cycle and reconnect to the device using the IP address set.

EtherNet/IP - *MDrive EtherNet/IP products only*

MDrive Ethernet products supporting the EtherNet/IP industrial protocol feature advanced configuration option for the Assembly Object 0x04 instances 100 (input) and 112 (output). This allows dynamic mapping of parameters for implicit messaging.

This allows the user to monitor only the parameters or variables desired.

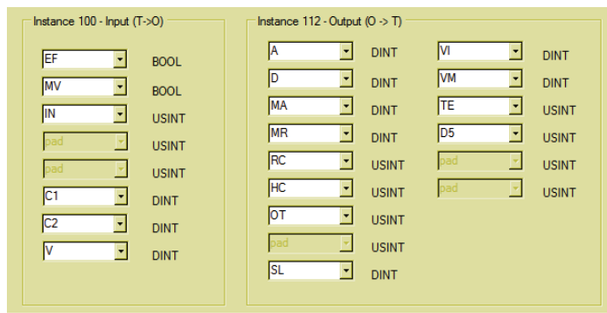


Figure 2: E.I.P. tab, dynamic mapping of the Assembly object 0x04

To set up:

1. Open the TCP/IP Configuration Utility and connect to the device on Port 503 (SEM port).
2. Click the tab marked E.I.P.
3. In the provided drop downs for each attribute, select the desired variables, parameters or commands you wish to scan. The selections are shown as the MCode mnemonic available for each attribute and matching the attribute data type.
4. Click set to write Assembly object parameters.

For more information and details on supported objects please refer to the ***EtherNet/IP Fieldbus manual*** available online at www.imshome.com/downloads/manuals.html

MCode/TCP or SEM port (503) - *All MDrive Ethernet products*

Any MDrive Ethernet device may be utilized as a programmable controller over the the SEM port, 503 using the standard IMS Terminal software available at www.imshome.com/downloads/software_interfaces.html.

By connecting to the device to port 503 using IMS Terminal the device may be operated in either program or immediate mode.

For instructions and details on MCode/TCP programming and use, please refer to the the ***MCode Programming and Reference manual*** available online at www.imshome.com/downloads/manuals.html.

MODBUS/TCP port (502) - *All MDrive Ethernet products*

MODBUS/TCP functions may be addressed using port 502

The MODBUS tab on the TCP/IP Configuration Utility may be used to read device ID information and read/set motion and I/O parameters.

Please refer to the ***MODBUS/TCP Fieldbus manual*** available online at www.imshome.com/downloads/manuals.html for a complete description of the MODBUS/TCP protocol and available functions.

Note that MODBUS/TCP and MCode/TCP may be used interchangeably as stored MCode programs may be executed and controlled over MODBUS/TCP using manufacturer specific registers.

General Specifications

Electrical Specifications		
Input Voltage (+V) *	Single, Double and Triple Length	+12 to +75 VDC
	Quad Length or Hybrid version	+12 to +60 VDC
Max Power Supply Current (Per MDrive 23)*	Single, Double and Triple Length	2 A
	Quad Length or Hybrid version	3.5 A
Aux-Logic Input Voltage**		+12 to +24 VDC
Aux-Logic Input Current**		161 mA Max

*Actual Power Supply Current will depend on voltage and load.

**Used to power logic circuitry in the absence of +V.

Environmental Specifications		
Operating Temperature (non-condensing)	Heat Sink	-40°C to +85°C
	Motor	-40°C to +100°C

I/O Specifications	
General Purpose I/O - Number and Type	
I/O Points	4 I/O programmable as inputs or outputs (sinking or sourcing)
General Purpose I/O - Electrical	
Inputs	TTL up to +24 VDC
Sinking Outputs	Up to +24 VDC
Sourcing Outputs	+12 to +24 VDC
Output Sink Current	up to 600 mA (one channel)
Output Sink Current	up to 600 mA (one channel in each I/O bank)
Logic Threshold (Logic 0)	< 0.8 VDC
Logic Threshold (Logic 1)	> 2.2 VDC
Protection (Sinking)	Over Temp, Short Circuit
Protection (Sourcing)	Transient Over Voltage, Inductive Clamp
Analog Input	
Resolution	10 Bit
Range (Voltage Mode)	0 to +5 VDC, 0 to +10 VDC
Range (Current Mode)	4 to 20 mA, 0 to 20mA
Clock I/O	
Types	Step/Direction, Up/Down, Quadrature
Logic Threshold	+5V TTL Input, TTL Output (with 2 kΩ load to ground)
Trip Output/Capture Input	
Logic Threshold	+5V TTL Input, TTL Output (with 2 kΩ load to ground)

Communications protocols	
MDrive Motion Control with MODBUS/TCP (P/N: MxI3CER23xx)	
Protocols	MODBUS/TCP, MCode/TCP
MDrive EtherNet/IP (P/N: MxI3CIR23xx)	
Protocols	EtherNet/IP, MODBUS/TCP, MCode/TCP

Motion Specifications	
Microstep Resolution - Open Loop	
Number of Resolutions	20

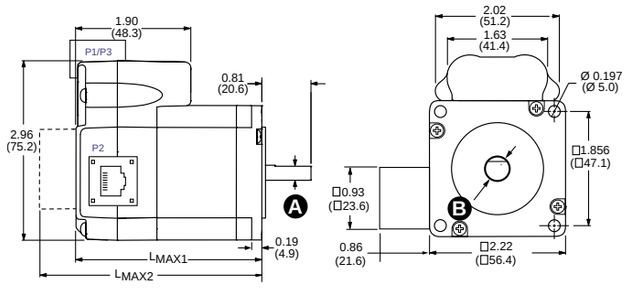
Available Microsteps Per Revolution									
200	400	800	1000	1600	2000	3200	5000	6400	10000
12800	20000	25000	25600	40000	50000	51200	36000[1]	21600[2]	25400[3]

1=0.01 deg/µstep 2=1 arc minute/µstep 3=0.001 mm/µstep

Software Specifications	
Program Storage Type/Size	Flash/6384 Bytes
User Program Labels and Variables	192
Party Mode Addresses	62

Mechanical Specifications

NOTE: For linear actuator products, see manual for screw specifications



A Single, Double & Triple Length Motors:
0.230 ±0.004
(5.8 ±0.1)

Quad Length Motor:
0.2756 ±0.004
(7.0 ±0.1)

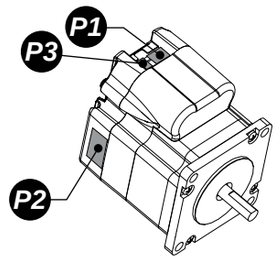
B Single, Double & Triple Length Motors:
Ø 0.2500 +0/-0.0005
(Ø 6.350 +0/-0.013)

Quad Length Motor:
Ø 0.315 +0/-0.0005
(Ø 8.0 +0/-0.013)

Motor stack length	Lmax *(1)*	Lmax2 *(2)*
Single	2.65 (67.31)	3.36 (85.34)
Double	3.02 (76.71)	4.59 (116.59)
Triple	3.88 (98.55)	4.59 (116.59)
Quad	5.28 (134.15)	5.99 (152.19)

(1) Single shaft. (2) Control knob available on MDrive Hybrid products only.

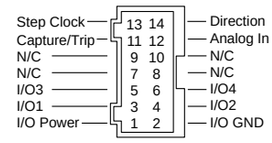
MDrive 23 Ethernet Connectivity Options



	Connector Style	Function
P1	14-pin Wire Crimp.....	I/O
P2	RJ45.....	Communications
P3	2-pin Wire Crimp.....	Power

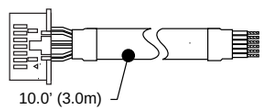
P1 I/O

14-pin wire crimp



Prototype Development Cable p/n: PD14-2334-FL3

Speed test and development with pre-wired mating connector.



Pair	Wire Colors	Function
1	White	Step Clock
	Black	Direction
2	Green	Capt/Trip
	Black	Analog In
3	Blue	N/C
	Black	N/C
4	Yellow	N/C
	Black	N/C
5	Brown	I/O3
	Black	I/O4
6	Orange	I/O1
	Black	I/O2
7	Red	I/O Power
	Black	Aux Power

Mating Connector Kit p/n: CK-09

Use to make your own cables, kit contains 5 mating connector shells with crimp pins. JST crimp tool recommended.

JST Parts Shell: PADP-14V-1-S
Pins: SPH-001T-P0.5L

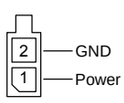
P2 Communications — Ethernet

RJ45

MDrive Ethernet models use standard RJ45 connectors with CAT5/CAT6 cabling wired to network cable standards.

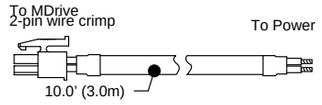
P3 Power

2-pin wire crimp



Prototype Development Cable p/n: PD02-2300-FL3

Function: Power Interface



Wire Colors	Function
Black	Power Ground
Red	+V

Mating Connector Kit p/n: CK-04

Use to make your own cables, kit contains 5 mating connector shells with crimp pins. Tyco crimp tool recommended.

Tyco Parts Shell: 794617-2
Pins: 794610-1