

# MAXnet w/DBnet

## Ethernet 10-Axis Motion Controller

### FEATURES

#### Ethernet or RS232 Communications

- Ethernet utilizes standard TCP/IP protocol.
- RS232 Baud rate = 9600 to 115.2K

#### PID update rate of 122 $\mu$ s on all 10 axes

- Delivers exceptional servo control on multi-axis applications.
- Identical outcomes when utilizing one or all axes of motion.
- Configurable PID filter with feed forward coefficients.

#### 266 MHz, 32-bit RISC processor

- Updates all signals and data points providing superior application control.

#### Controller I/O Capabilities

- Each axis has +Limit, -Limit, Home, Auxiliary out, and axis control out.
- 16 General purpose bi-directional TTL I/O
- 2 General purpose analog output with 16 bit, +/-10 VDC input (in addition to axes output).
- 4 Channels of general purpose analog input with 16-bit (+/-10 VDC)

#### Motion Feedback

- Each axis has an incremental encoder input
- Quadrature Encoder Feed back up to 16 MHz on all encoder inputs.
- Absolute encoder feedback (options for all axes up to 32-bit resolution)

#### Sophisticated Control Functionality

- 16 bit DAC analog resolution.
- Step pulses from 0 to 4,194,176 steps per second (+/- 0 steps).
- Backlash compensation.
- Custom, parabolic, "S"-Curve & linear trajectory profiles.
- Real time encoder position capture.
- S-Curve with 4-quadrant jerk parameters.

#### Control signals

- Two 100-pin SCSI type connectors for high density signal connection.
- 16 "user definable" digital I/O.
- Analog out per each axis can be used as general purpose when axis is configured for Step control.

#### ADDITIONAL FEATURES

- Small form-factor, 4" x 6.5" x 1.64"
- Stand-alone capability
- Custom Power-up Defaults
- Non-Volatile Macro Storage
- Patented technology to minimize torque ripple and velocity modulation
- Internal Watchdog timer for safety
- Slip & Stall detection with encoder feedback
- Linear/Circular interpolation
- Constant and variable velocity contouring (all axes)
- Single-axis, multi-axis and multi-tasking modes
- Output is +/-10V, or Step & Direction per Axis
- Independent home and plus / minus over-travel inputs for each axis
- Auxiliary output per axis for Amp/Drive enable
- Commands are intuitive for programming ease.
- Over 250 ASCII character commands, "universal" to current and previous OMS controllers
- Capable of conversion to "user" defined units i.e. inches/ revolutions if desired.
- Designed for expandability (custom solutions)
- Person to person toll-free tech support: 800-707-8111
- OMS has more than 28 years proven success

## DESCRIPTION

The MAXnet family of Motion Controllers has been expanded to provide up to 10 axis of intelligent motion control. A powerful 266 MHz 32 Bit RISC processor (PowerPC) provides the capability and power for better and more sophisticated application control. This newest generation of motion control products provides up to 10 axes of motion control on a two board stack of 4 x 6.5 x 1.64 inches. Each axis can be selected by the user to be an open or closed stepper or a high capability servo axis. In addition, independent analog inputs are provided to enable integration of analog parameters such as velocity override, temperature, pressure, etc., under the control of the running application. Two additional general purpose analog outputs are also provided.

Outputs are provided for 16 bit analog servo output as well as step and direction for stepper system applications. The servo loop is a PID filter with several coefficients and an update rate of 122  $\mu$ s on all 10 axes. Independent plus and minus limits, a home switch input, and an auxiliary output provided for each of the 10 axes so that the state of any of them can be monitored by the system at any time. An additional 16 User Definable I/O is available for synchronization and control of other events. Incremental encoder feedback, differential or single ended, is used for all servo axes and is available for position feedback and may also be used for slip or stall detection.

## PROGRAMMING

The MAXnet motion controllers are easily programmed with character ASCII commands through an extensive command structure. The commands are combined into character strings to create sophisticated motion profiles, with features such as IO and other functionality. A separate FIFO command queue for each axis is used to store the commands once they are parsed in the MAXnet. These commands are then executed sequentially, allowing the host to send a complex command sequence and attend to other tasks, while the MAXnet manages the motion process. These command queues can store 2559 command values and can include a loop counter that allows multiple execution of any command string.

There are approximately 250 commands available. All commands are sent to the controller as two or three character strings. Some of these commands expect one or more numerical operands to follow. These commands are identified with “#” after the command in the description. The “#” indicates a signed integer input parameter, or a signed fixed point number of the format ##.# when User Units are enabled. User Units define distances, Velocity and Acceleration parameters, and represent the input in Inches, millimeters, revolution, etc.

Synchronized moves may be made by entering the AA or AM command mode. This form of the command performs a context switch that allows entering commands in the format MRx#,y#,z#,t#,u#,v#,r#,s#,w#,k#; Numbers are entered for each axis commanded to move. An axis may be skipped by entering a comma {,} at the appropriate axis position with no value parameter. The command may be prematurely terminated with a semicolon (;) i.e. a move requiring only the X and Y axes to move would use the command MRx#,y#; followed by the GO command. Each axis programmed to move will start together upon execution of the GO command. The MAXnet can be switched back to independent-axis mode by entering the desire single axis command, such as AX.

## PROGRAMMING EXAMPLES

In a typical move requirement where it is desired to home the stage and then move to a specified position, the following will demonstrate the programming for a single axis:

Initialize the velocity and acceleration parameters to a suitable value. Set the PID filter gain values. Perform the homing operation initializing the position counter to zero. Perform a motion to the absolute position of 10,000 and set the done flag for that axis when the move is finished.

```
AX;
VL5000;
AC50000;
KP20;
KI1;
KD45;
HN;
HM0;
MA10000;
GO;
ID;
```

In a move requiring a three axis coordinated move to a position, the following could be used:

```
AX;
KP2;
KD6;
HN;
AY;
KP2;
KD6;
HN;
AZ;
KP2;
KD6;
HN;
AM;
VL5000,5000,5000;
AC50000,50000,50000;
MA1000,2000,3000;
GO;
ID;
```

The controller would calculate the relative velocities required to perform a straight line move from the current position to the desired position.

## **SPECIFICATIONS**

### **Velocity**

0 to 4,194,176 pulses per second simultaneous on each axis

### **Acceleration**

0 to 8,000,000 pulses per second per second

### **Position range**

$\pm 2,147,487,647$

### **Accuracy**

Position accuracy and repeatability  $\pm 0$  counts for point to point moves

Velocity accuracy  $\pm 0.01\%$  of peak velocity in jog mode.

### **Environmental**

Operating temperature range: 0 to 50 degrees centigrade

Storage temperature range: -20 to 85 degrees centigrade

Humidity: 0 to 90% non-condensing

### **Power**

+5VDC  $\pm 5\%$  at 1.5 amp typical  
+12VDC at 0.2 amp typical =  $\pm 5\%$   
-12VDC at 0.2 amp typical =  $\pm 5\%$

### **Dimensions**

4" x 6.5" x 1.67"

### **Limit switch inputs**

TTL input signals  
Active low or high, selectable by command input for each axis (active low is default)

### **Connector**

Two shielded 100-Pin SCSI type connectors for all signals (motor control, I/O, Limits, etc). Breakout board available for ease of cabling.

### **Home switch inputs**

TTL input signals  
Active low or high, selectable by command input for each axis (active low is default)

### **User definable I/O**

Up to 16 bits of user definable digital I/O. The 16 bits are user configurable and are configured as 4 inputs and 4 outputs on each of the two boards for a total of 16 I/O as defaults from the factory.

### **Analog inputs**

Up to four independent analog inputs, 16-Bit resolution,  $\pm 10V$ .

### **Analog outputs (servo)**

$\pm 10V$  and 0 to  $+10V$ , max. One per axis plus two general purpose, all are 16 Bit resolution

### **Step pulse output**

Pulse width 50% duty cycle. Open collector level signal (TTL).

### **Direction output**

Open collector level signal (TTL).

### **Encoder feedback**

Maximum 16 MHz after 4x quadrature detection. Differential signal.

Two 12-bit Absolute (SSI) encoder channels by default (optional 32-bit absolute encoders available for all axes).

### **Reference**

IEEE 802

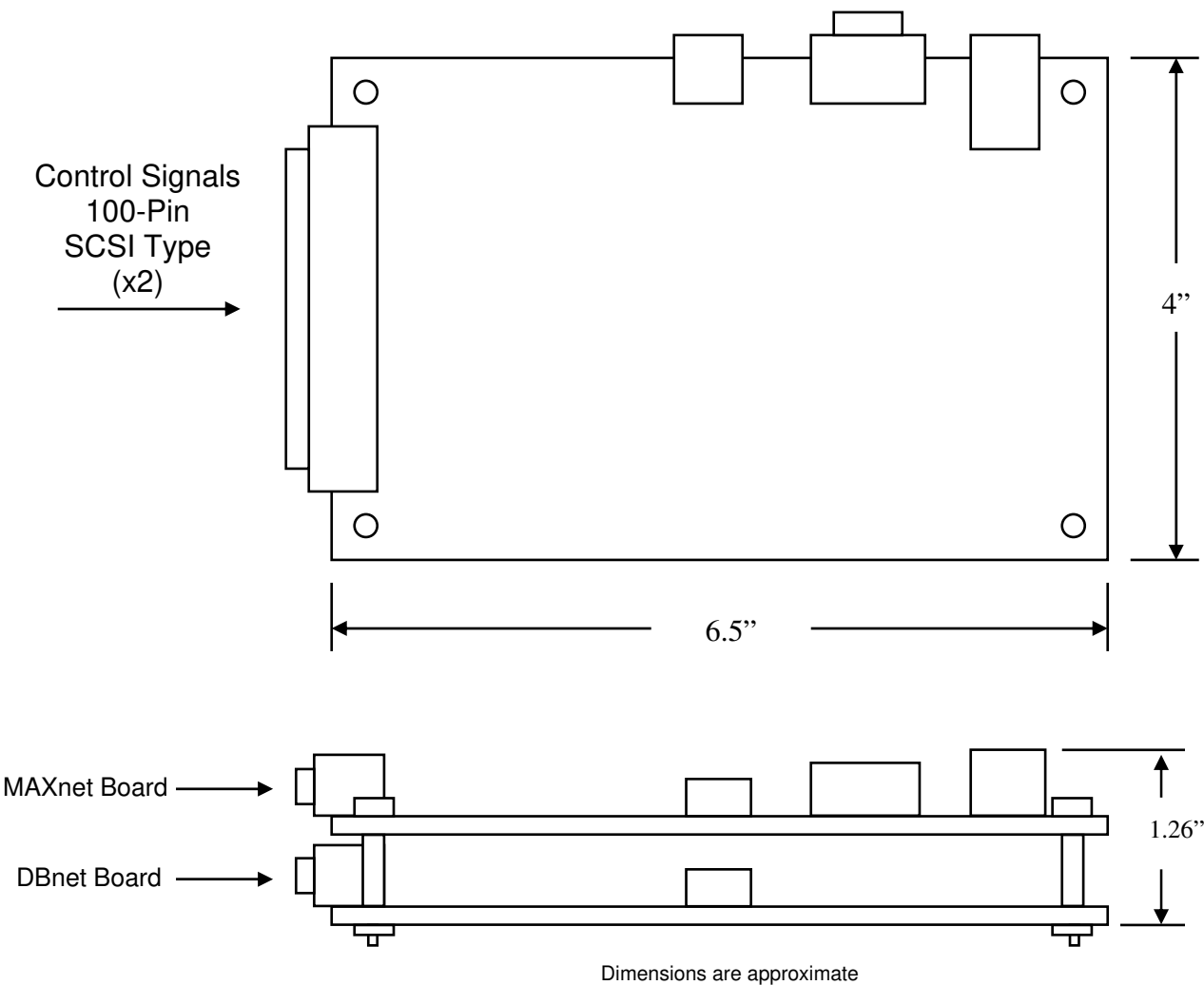
### **Software**

Software interface utilities provided.  
High level expertise not required.  
Over 250 ASCII character commands, expanded from current OMS command set while backwards compatible.



*"The Company in Motion"*

[www.Pro-DexOMS.com](http://www.Pro-DexOMS.com) (800) 707-8111



Ordering Information	
Model	No. of Axes
MAXnet-1000	1
MAXnet-2000	2
MAXnet-3000	3
MAXnet-4000	4
MAXnet-5000	5
MAXnet-6000	6
MAXnet-7000	7
MAXnet-8000	8
MAXnet-9000	9
MAXnet-A000	10

ACCESSORIES	
IOMAXnet	I/O Breakout Board for MAXnet
CBL58-3M	I/O cable for MAXnet to IOMAXnet, 3 meters
CBLMAX-12	I/O cable for MAXnet to IOMAXnet, 12 inches



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