

# **MCU-P500**

## **Portable Motor Control Unit**

### **User's Manual**

Revision A.1

**ATCO**

850-004136

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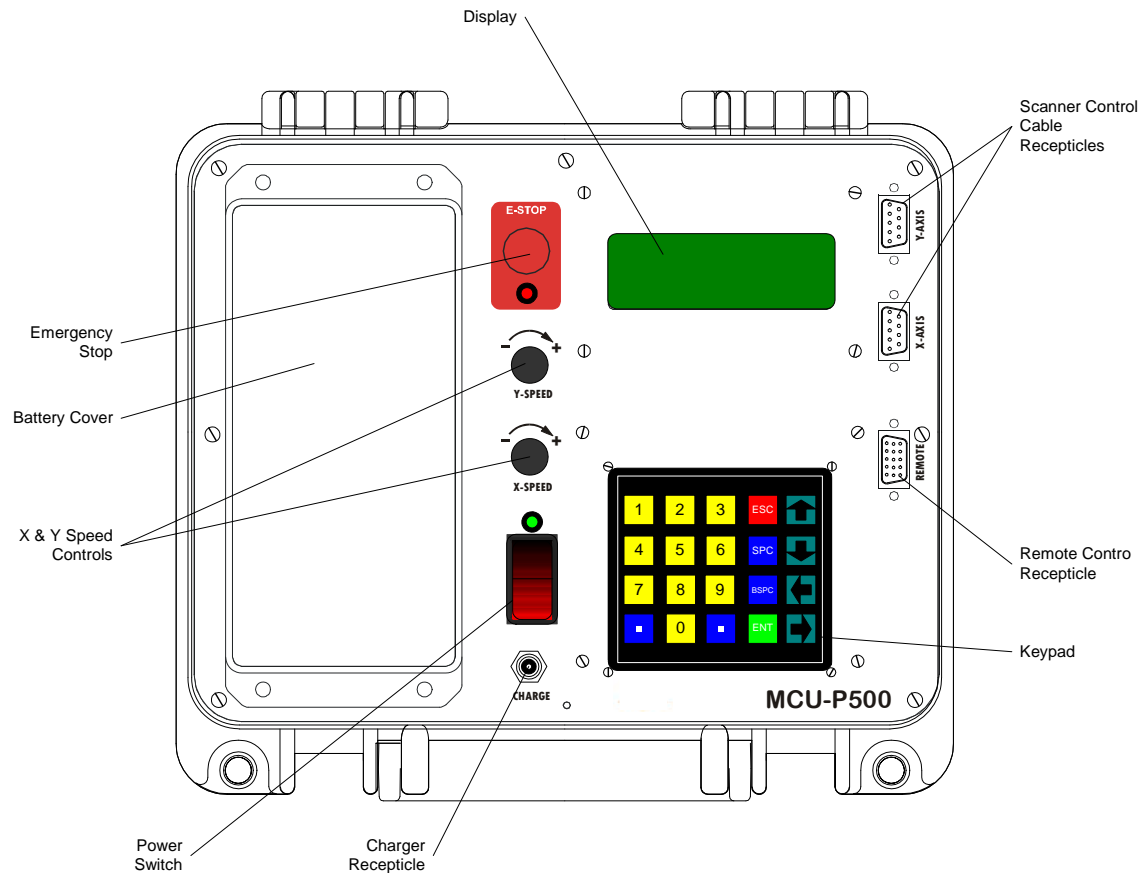
## Appendices

Appendix A <i>Cabling Pinouts &amp; Interface Cables</i>
Appendix B <i>Cable Connections LPX-1000 - Omniscan</i>

## System Introduction

This document is a reference and guide for the MCU-P500 motor control unit. The MCU-P500 is a multi-axis motor control unit which is used with several scanners including the LPX-1000 and Large Bore Wheel scanners.

### Console Panel



**Figure 1** MCU-P500 Control Console

### Emergency Stop Button

The console is equipped with a red **Emergency Stop** button that will stop the scanner when needed. The scanner cannot resume movement until after the console has been reset. This is accomplished by turning the stop button clockwise until it releases and lifts up.

### Keypad and Display

The console is equipped with a keypad and display for basic control of the scanner. Refer to the next section, *MCU-P500 Menu Reference* for more information on the console menu structure and commands.

## *X & Y-Speed Controls*

The X and Y Speed control knobs of the MCU-P500 control the speed of the X and Y axis of the scanner respectively.

## *Scanner Control Cable Receptacles*

The control cabling from the scanner connects to the console using the connectors labeled “X-Axis” and “Y-Axis” on the top right corner of the panel. **ALWAYS** keep this receptacles dry and free of debris.

## *Remote Control Connector*

The DB15 connector provides for remote control of the system. Refer to Appendix A for pinout information.

## MCU-P500 Menu Reference


The MCU-P500 has an integrated servo controller for automatic raster based scanning. This section is a menu option reference for the MCU-P500. Each menu item is explained in detail. The main menu of the MCU-P500 is shown to the right.

```
> SETUP      AUTOSCAN
JOYSTK      XSPD CTRL
A-JOG       M-JOG
SAVE        LOAD
```

Figure 2 MCU-P500 Main Menu

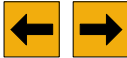
To navigate the menu use the arrow keys on the keypad



Select a menu option by pressing the enter  key.


There are two ways to change a setting on the menu. The method is determined by the menu option type. Some of the options have preset values such as (FORWARD & REVERSE) or (POSITIVE & NEGATIVE) and others are numeric values that you must enter.

### Preset Menu Settings

These menu options are identified by the asterisk \* next to the value. To change the values (like the example to the right), select the option using the arrow keys and then press the left/right arrow keys .

```
> X +/-: *POSITIVE
Y +/-: *POSITIVE
INDEX: *X
IDX H/L: *LOW-HIGH
```

Figure 8 Change Preset Settings

To change other settings such as numeric or string character, select the option using the arrow keys and start typing the changes you want to make. To save the changes press the enter  key. If you do not want to save the changes, simply move to another menu option by pressing the up or down arrow keys.

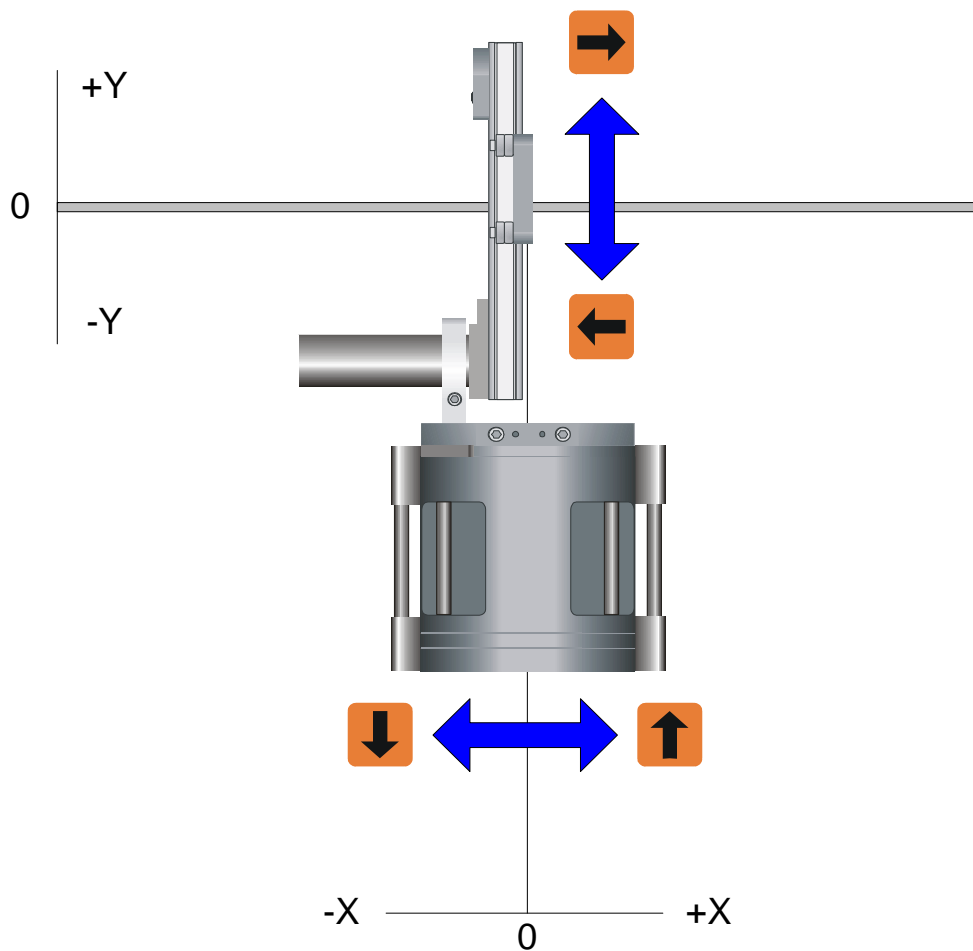
```
> X INDEX: .75_
Y INDEX: .5
X SPEED: 12
Y SPEED: 12
```

Figure 11 Changing Numeric Settings

## Scanner Axis and Increments

Before discussing the menu options of the MCU-P500 you must first be familiar with the coordinate system the controller and scanner use. There are two axis' controlled by the MCU-P500 controller, X and Y.

<i>X Axis</i>	Parallel with the drive or circ axis of the scanner
<i>Y Axis</i>	Perpendicular to the drive or circ axis of the scanner (second axis arm)
<i>Increments</i>	The X & Y increments are the distances between the points being tested on each axis.
<i>Scanning</i>	When scanning it will automatically move forward or backward to the next increment. This behavior is determined by the parameters you set under the Setup option of the main menu. The scanner can increment in either axis (X or Y) and in either direction. The numbers used by the controller are always positive.



## Setup Menu

The setup menu sets the parameters for scan operations as well as setting position calibration. There are several pages of settings that will determine the behavior of the scanner when scanning begins.

<b>X START</b>	Defines the starting point for the scanner motion on the component (expressed in the units used to calibrate the encoders, typically "inches").	<b>&gt; X START: 0</b>
<b>X END</b>	Defines the ending point for the scanner motion on the component (expressed in the units used to calibrate the encoders, typically "inches").	<b>X END: 96</b>
<b>Y START</b>	Defines the starting point for the Y axis motion on the component (expressed in the units used to calibrate the encoders, typically "inches").	<b>Y START: 9</b>
<b>Y END</b>	Defines the ending point for the Y axis motion on the component (expressed in the units used to calibrate the encoders, typically "inches").	<b>Y END: 12</b>
<b>X INDEX</b>	Defines the index between pulses (if the X axis is defined as the scan axis) or between scan lines (if the X axis is defined as the index axis).	<b>&gt; X INDEX: .5</b>
<b>Y INDEX</b>	Defines the index between pulses (if the Y axis is defined as the scan axis) or between scan lines (if the Y axis is defined as the index axis).	<b>Y INDEX: .5</b>
<b>X SPEED</b>	Speed of the scanner on the component (expressed in the units used to calibrate the encoders, typically "inches/second").	<b>X SPEED: 12</b>
<b>Y SPEED</b>	Speed of the Y axis on the component (expressed in the units used to calibrate the encoders, typically "inches/second").	<b>Y SPEED: 12</b>
<b>X POS(ITION)</b>	Used to define the present location of the scanner on the component (expressed in the units used to calibrate the encoders, typically "inches").	<b>&gt; X POS: 0</b>
<b>Y POS(ITION)</b>	Used to define the present location of the Y axis on the component (expressed in the units used to calibrate the encoders, typically "inches").	<b>Y POS: 0</b>
<b>X CT/IN</b>	(Counts per Inch) This is the encoder calibration that converts encoder counts for the scanner motion on the component to travel dimension. This number is calibrated to read linear dimension in the selected units (typically "inches").	<b>X CT/IN: 61817.33</b>
<b>Y CT/IN</b>	(Counts per Inch) This is the encoder calibration that converts encoder counts for the Y axis motion on the component to travel dimension. This number is calibrated to read linear dimension in the selected units (typically "inches").	<b>Y CT/IN: 15130.58</b>
<b>X +/-</b>	This sets the directional sense of the motion of the scanner on the component. Positive (+) puts the positive scan direction in the direction away from the cable. Negative (-) puts the positive scan direction in the direction towards the cable.	<b>&gt; X +/-: *POSITIVE</b>
<b>Y +/-</b>	This sets the directional sense of the motion of the Y axis on the component. Positive (+) puts the positive scan direction from left to right, viewing down on to the scanner from the cable side of the scanner. Negative (-) puts the positive scan direction from right to left, viewing down on to the scanner from the cable side of the scanner.	<b>Y +/-: *POSITIVE</b>
<b>INDEX</b>	This defines which of the motion axes will be the index direction. By default, the other axis becomes the scan direction.	<b>INDEX: *X</b>
<b>IDX H/L</b>	(Index High/Low) This reverses the index direction, and can be used for example at the end of a scan to repeat the scan in the opposite direction without resetting scan parameters. 'Low-High' indicates scanning from index low input position toward index high position, and 'High-Low' indicates scanning from index high input position toward index low position	<b>IDX H/L: *LOW-HIGH</b>
		<b>&gt; X ON/OFF: *ON</b>
		<b>Y ON/OFF: *ON</b>
		<b>AUTO HD: *ON</b>
		<b>XY STEP: *OFF</b>
		<b>&gt; OVERLAP: 1</b>
		<b>A POS: 0</b>
		<b>A CT/IN: 1000</b>



<b>X ON/OF(F)</b>	This parameter is used to turn the scanner motor off or on. If this is turned off and any motion control option is elected, a message will be displayed advising that the motor 'On' should be checked.
<b>Y ON/OF(F)</b>	This parameter is used to turn the Y axis motor off or on. If this is turned off and any motion control option is elected, a message will be displayed advising that the motor 'On' should be checked.
<b>AUTO HD</b>	(Auto Hold) Auto hold applies a holding voltage to both scan axes. It is controlled by turning it on or off. 'On' indicates that a holding voltage is on, and 'Off' indicates that no holding voltage is applied, in which case the motion can drift due to its weight, e.g. if oriented vertically.
<b>BY STEP</b>	is not implemented at this time. Default is OFF.
<b>OVERLAP</b>	Sets the amount of overlap one scan to the next. When subsequent scans are initiated, the scanner moves this amount in reverse and then initiates the next scan.
<b>A POS(ITION)</b>	Used if and only if a remote encoder is used, for example for the primary motion of the scanner, rather than the internal encoder (which is coupled to the motor and therefore will not correct for wheel slippage). This is used to set the position if read by the external encoder.
<b>A CT/IN</b>	(Counts per Inch) Calibration of the remote encoder that converts encoder counts for the scanner motion on the component to travel dimension. This number is calibrated to read linear dimension in the selected units, typically 'inches'.

#### CAL X ENCODER CAL Y ENCODER CAL A ENCODER

These options allow you to calibrate each of the encoders on the scanner. The standard procedure for calibration is shown below for the X axis, but all calibration procedures work the same for each axis.

> CAL X ENCODER  
CAL Y ENCODER  
CAL A ENCODER


To calibrate:

**Step 1** select the **CAL X ENCODER** option. The screen shown to the right will appear.

Move X Axis to End  
Pos; Press Enter Key

X Pos: 0


**Step 2** On a suitable magnetic, flat surface, mark out an accurate calibration distance (such as 6" or 12"). Position the scanner to one of the marks and prepare it to move along that distance.

**Step 3** Press the enter  key and the screen to the right will appear.

Move X Axis to Start  
Pos; Press Enter Key

X Pos: 0

**Step 4** Move the scanner along the measured path you marked to the ending mark.

**Step 5** Press the enter  key and the screen to the right will appear.

Enter Dis: 6

**Step 6** Enter the distance traveled (i.e. 6", 12")

This procedure should be repeated for the Y or A axis encoders.

X Pos: 0

**A-JOG Menu Option**

Manual jog mode in which the holding voltages are applied when not in motion. Scanner motion is controlled by the up, down, left, and right toggle arrow switches. In this operational mode, the up and down toggles control the X axis (scanner forward and reverse) and the left and right toggles control the bridge motion (Y). Speeds are controlled by the Speed controls on the front of the controller. Speed adjustments made while in motion will not be recognized until the motion control toggle is released and then re-engaged, i.e., speed is constant as long as the toggle is held. The Up and Down arrow keys move the scanner forward and backward. The Left and Right arrow keys move the Y axis left and right.

<b>SETUP</b>	<b>AUTOSCAN</b>
<b>JOYSTK</b>	<b>XSPD CTRL</b>
<b>&gt; A-JOG</b>	<b>M-JOG</b>
<b>SAVE</b>	<b>LOAD</b>

**SAVE Menu Option**

Saves the setup. If the system is powered down and then restarted, the setup parameters will be reset to the last saved values. This option currently has the capability to save only a single setup. When revised, this will provide a secondary option (which will become available when Save is invoked) to save a number of named (or numbered) setups.

<b>SETUP</b>	<b>AUTOSCAN</b>
<b>JOYSTK</b>	<b>XSPD CTRL</b>
<b>A-JOG</b>	<b>M-JOG</b>
<b>&gt; SAVE</b>	<b>LOAD</b>

**AUTOSCAN Menu Option**

This option is used to run the scanner in the automated scan mode based on the parameters that have been set in the Setup menu. When this option is selected, the following options will appear:

<b>SETUP</b>	<b>&gt; AUTOSCAN</b>
<b>JOYSTK</b>	<b>XSPD CTRL</b>
<b>A-JOG</b>	<b>M-JOG</b>
<b>SAVE</b>	<b>LOAD</b>

- |                    |   |
|--------------------|---|
| <b>BEGIN</b>       | This option initiates automatic scanning. The behavior of the scanner will be determined by the parameters set in the Setup menu.   |
| <b>NEXT</b>        | This command is used to identify that the next scan to be conducted is one of a sequence of scans along a component with some overlap scan-to-scan. If this command is invoked and then a scan is initiated using Begin, the scanner will backup by the dimension specified using Overlap under Setup, and the scan will start at this point. |
| <b>ALL0</b>        | This option will set all encoders to the zero position.   |
| <b>XPOS(ITION)</b> | This provides a readout of the current scanner position per the internal encoder. If the current position of the scanner on the component is known but not the displayed value, the value can be changed at the displayed entry point by toggling to it and changing the position to agree with the true position.                            |
| <b>YPOS(ITION)</b> | This provides a readout of the current Y axis position on the scanner. If the current position of the Y axis on the scanner is known but not the displayed value, the value can be changed at the displayed entry point by toggling to it and changing the position to agree with the true position.  |
| <b>APOS(ITION)</b> | This provides a readout of the current scanner position per the external encoder. If the current position of the scanner on the component is known but not the displayed value, the value can be changed at the displayed entry point by toggling to it and changing the position to agree with the true position.                            |

**XSPD CTRL Menu Option**

This option allows a constant voltage to be applied to the X axis motors based on the position of the XSPD control knob. Forward/Reverse motion is toggled using the left/right arrow key. A warning is issued to "Check X-Speed, the Press Enter". Pressing enter will drive the scanner at current X-SPD setting. X-SPD & Forward/Reverse can be changed during motion.

<b>SETUP</b>	<b>AUTOSCAN</b>
<b>JOYSTK</b>	<b>&gt; XSPD CTRL</b>
<b>A-JOG</b>	<b>M-JOG</b>
<b>SAVE</b>	<b>LOAD</b>

## M-JOG Menu Option

This option allows you to move the scanner using the arrow keys. The scanner will NOT (unlike the A-JOG option) automatically hold position. Select this option and the Up and Down arrow keys move the scanner forward and backward. The Left and Right arrow keys move the Y axis left and right. X and Y speed are determined by their respective control knob positions.

<b>SETUP</b>	<b>AUTOSCAN</b>
<b>JOYSTK</b>	<b>XSPD CTRL</b>
<b>A-JOG</b>	<b>&gt; M-JOG</b>
<b>SAVE</b>	<b>LOAD</b>

## LOAD Menu Option

This option loads the last saved settings.

<b>SETUP</b>	<b>AUTOSCAN</b>
<b>JOYSTK</b>	<b>XSPD CTRL</b>
<b>A-JOG</b>	<b>M-JOG</b>
<b>SAVE</b>	<b>&gt; LOAD</b>

## Scanner Control Cable Receptacles

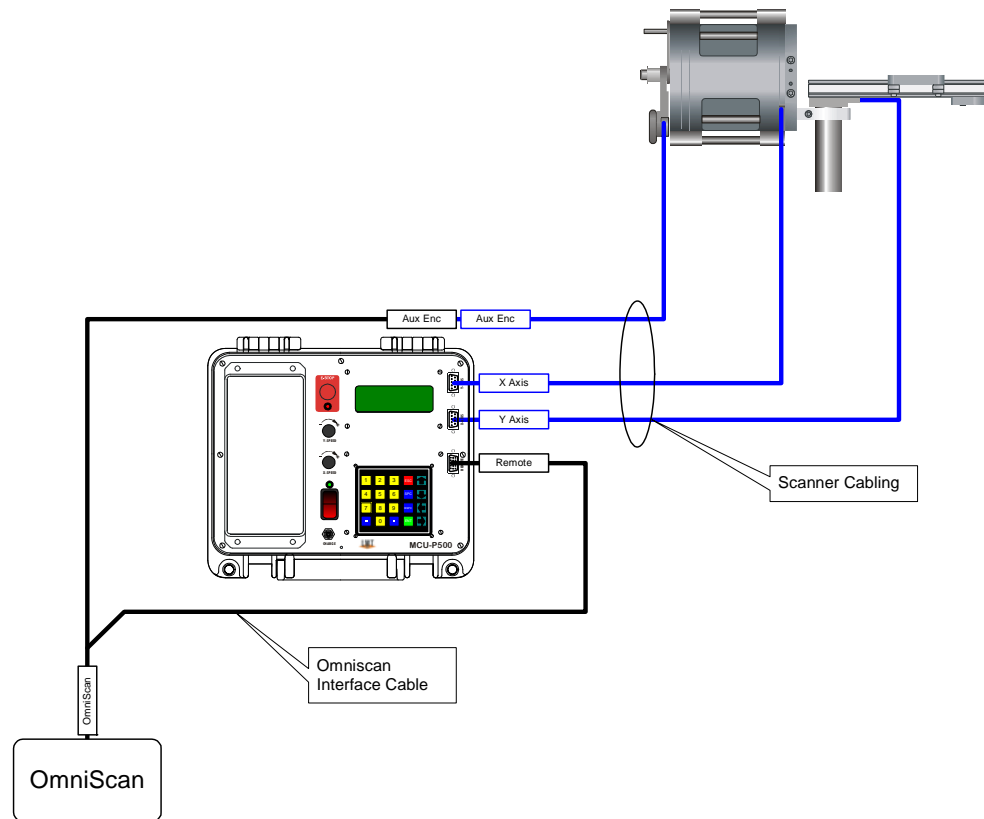
The scanner control cable receptacles are located on the top right corner of the front panel of the MCU-P500 and are used to connect the MCU-P500 to the scanner. Each axis is connected to its own receptacle. The X and Y axis pinouts are identical.

Scanner Control Cable Receptacle (DB9F)	
PIN #	Description
1	MTR +
2	MTR -
3	ENC A -
4	ENC A +
5	ENC B -
6	ENC B +
7	+5V
8	GND
9	NC

The Remote Control connector can be used by other systems to control the scanner and monitor encoder output.

MCU-P500 DB15M	
PIN #	Description
1	ENC1A
2	ENC1B
3	ENC GND
4	ENC2A
5	ENC2B
6	ENC GND
7	Remote Safety
8	Joystick X
9	Joystick Y
10	GND
11	Joystick +5V
12	Abort A
13	Abort B

The diagram below shows the connections required for the Omniscan / LPX-1000 / MCU-P500 arrangement. The Omniscan interface cable is required. All Omniscan and scanner connectors are labeled and are shown in the diagram below.



Wiring Diagram for the LPX-1000 / MCU-P500 / Omniscan