Model MPX
Multi-Purpose Processing Computer
Operator’s Manual
Level 3 & Level 4
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4/13/2012 Model MPX Level 3 & 120413
Z.1 Introduction

The SCAN-A-LINE™ Model MPX with RS-232 Customer Interface - MPX (Figure Z.1.1) is a universal microprocessor-controlled processing unit for various applications. The Model MPX also supplies power to the sensors and provides signal routing as well as basic dimensional measurement. Enclosed in a NEMA-type steel enclosure (standard), the Model MPX provides power for up to two SCAN-A-LINE™ 10X-Series sensors. The Model MPX may interconnect with other Harris Instrument Corporation processing units [i.e. Model GPU—Section R] as well as programmable logic controllers (PLCs) and customer computers. The Model MPX has a visual display, keyboard, mouse, and touchscreen to interface with the onboard host computer using Windows XP SP3 software.

Z.1.a Functional Description

The Model MPX power supply provides well-regulated +12VDC and –12VDC power for up to two SCAN-A-LINE™ sensors via the MS-Style circular connectors. All SCAN-A-LINE™ 10X-Series measurement and guiding sensors [Auto-Sync 10XAS-Series - Section C] are compatible with the Model MPX. The +12VDC and –12VDC supplies an additional +5VDC regulated source, provide power for the on-board micro-controller as well as Harris Instrument Corporation approved optional circuits (such as line driver and analog/relay board). Customer and internal connections with the Model MPX are available on one 20-position and one 8-position barrier strips (depending upon the types of options supplied with the Model MPX) on the side panel of the unit enclosure. Tags at the barrier strips specify the individual connections. Sensor connections are available on the bottom panel of the unit enclosure.

Z.1.b Features

The Model MPX may be directly interfaced with SCAN-A-LINE™ Auto-Sync for real-time measurement and control applications.

Micro-controller Features:

- Microprocessor based (Harvard Architecture)

   **No Parity, Eight Data Bits and One Stop Bit, No Handshake.**

   The communications will be set by the factory at a rate of: 9600bps.

The standard Model MPX Features:

- Up to six analog outputs depending on application [Section Z.4.a]
  - Four absolute analog outputs (A, B, C, D)
  - Two optional analog outputs This is (A-B) and (D-C). Centerline Deviation Analog.
    
    *Standard Analog Range is 0 - 5VDC (0-10V Available with Relay Card)*
  
- One digital input for a line speed encoder is also supplied [Figure Z.4.5].

Z.1.c System Descriptions

The Model MPX is designed to integrate with several measurement applications. Each system has its own particular variations that makes each unique.

**Standard Width Measurement System**

The “standard” Width Measurement System consists of a single or dual 10XAS-Series sensor system [Section C if applicable] and a Model MPX Levels 1 through 4. These measurement systems are very versatile and can be used to measure opaque materials or clear/translucent materials with the Clear Materials Option. Clear Materials Option available with EVO.

**Single Sensor Multi-Strip Width Measurement System**

The Single Sensor Multi-Strip Width Measurement System provides the ability to measure the width of up to four strips simultaneously.
Passline Independent Width Measurement System

The Passline Independent Width Measurement System consists of a single or dual 10XBR-Series sensor system (Section G) if applicable and a Model MPX Levels 1 through 4. These measurement systems are used when the processing line has a variable product passline.

Z.2 Operational Considerations

The Model MPX is designed to operate in an industrial environment and can readily tolerate average factory conditions. Common-sense considerations for protection and maintenance of the Model MPX will ensure its operation for years to come.

NOTE: If any welding, cutting or other uses of gas or electric torches are to be performed near the Model MPX or anywhere on the process line where the Model MPX is installed, disconnect ALL cables from the Model MPX BEFORE performing those operations. This prevents system overload by the current generated from welding.

The Model MPX is designed to operate with SCAN-A-LINE™ 10X-Series sensors located within fifty linear cable feet [15.2m] of the unit. If the installation requires the Model MPX to be located over fifty linear cable feet [15.2m] (and less than 4000 linear cable feet [1219m]) from the sensors, a line receiver (LR Option) must be installed in the Model MPX and a line driver (LD Option) mounted in the processing unit used to power the sensors (typically a Model GPU Level 2- Section R).

Z.2.a Temperature Range

Operation temperatures should fall in the range from 32°F to 122°F [0° to 50°C]. Temperatures above 140°F [60°C] for prolonged periods of operation or storage can lead to the degradation of the integrated circuits in the Model MPX. If temperatures outside the specified range are expected, special provisions should be made to protect the equipment.

Z.2.b Vibration Considerations

SCAN-A-LINE™ processing units can tolerate reasonable amounts of shock and vibration. The major problem with vibration is the increase in probability of loose hardware and/or connectors. Mount the Model MPX to a solid, fixed mounting where vibration is minimum. When high levels of vibration or shock are likely, shock absorbing mounts may reduce any problems.

Z.2.c Power Requirements

The standard power requirements for the Model MPX are 115VAC to 230VAC at 60/50Hz.

Z.2.d Unit Components

The model MPX consists of a minimum of four (4) main components, with different levels of the processing unit having one or more components. The four main components for the Model MPX are:

<table>
<thead>
<tr>
<th>Component Name</th>
<th>HIC Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enclosure -</td>
<td></td>
</tr>
<tr>
<td>Level 3 &amp; 4</td>
<td>4410015</td>
</tr>
<tr>
<td>Power Supply - Computer</td>
<td>3900112</td>
</tr>
<tr>
<td>Micro-Controller Board</td>
<td>3603010A</td>
</tr>
<tr>
<td>Main Board</td>
<td>3900114</td>
</tr>
</tbody>
</table>

Table Z.2.1: Model MPX Standard Components

Z.3 Installation

Mount the Model MPX vertically, with the cable and power connections pointed towards the floor. The Model MPX requires a good ground, so be sure to use the three-prong power cord for connecting the system.
Z.3.a Analog Outputs

The Model MPX is designed to output up to six various analog signals. These signals are a combination of absolute/deviation voltages.

**Dimensional Control Analog**

The Dimensional Control Deviation Analog Output provides an analog voltage proportional to the actual measurement from center line. The maximum analog output voltage will be ±5 volts (±10 volts optional). Many PLC-based systems can use a deviation analog for closed-loop control applications. The analog outputs supplied with the Model MPX are accessible by the customer. See Figure Z.4.5.

**Analog outputs:**

- Deviation from center (Analog) is outputs: A - B and D - C
- 0 - 5 VDC on analog output terminal strip
- or
- 0 - 10VDC with Analog/Relay Board (also on terminal strip)

**Absolute Measurement Analog - Single Sensor Systems only.**

The Absolute Measurement Analog Output provide the DAC with a digital count representing the absolute measurement of the product. This output is useful in applications where an analog data logger is employed; the main advantage being the lack of need for a target entry to establish the operating point.

Strip-chart recording of absolute measurement is usually not recommended due to the lower (12-bit) resolution of the absolute analog DAC compared to the display (LCD Touchscreen) or RS-232 digital value (optional). Review the following sections for instructions on setting the absolute analog. Customer interface supplied with the unit reflects the exact commands for each operation. The typical absolute analog output supplied with the Model MPX is accessible by the customer at Terminal Strip 1 Pos. 1 - 7. See Figure Z.4.5.

**NOTE:**

Analog outputs for special or custom Model MPXs may have other analog outputs than those listed below.

**Multi-Strip Analog Outputs**

When the Model MPX is used in a Multi-Strip Width Measurement System, up to four absolute analog outputs are available for the analog measurement outputs of the four individual strips. The first strip from the connector end of the sensor is measured at Analog Output A. Second strip is Analog Output B, Third strip is Analog Output C, and Fourth Strip is Analog D. See Figure Z.4.6.

**NOTE:**

The terminal strip tag for this terminal block is located on the interior right side of the enclosure.
Analog Output Cables

The analog outputs are accessible through the spare access hole on the bottom panel of the Model MPX enclosure or with a circular connector included with the enclosure (optional - see Configuration EVO or option section for more information).

### Z.3.b Serial Communications

The Model MPX has one dedicated serial output port on terminal strip 1 (Figure Z.4.5) that will send the width displayed in measurement area to a remote display or PLC.

**SETTINGS: No Parity, Eight Data Bits and One Stop Bit (N, 8, 1) With One Start Bit. NO HANDSHAKING**

The communications will be set by the factory at a rate of:

9600 bps.

Additional serial communications ports are available via an Engineering Variance Order (EVO) or system option for various protocols, output formats and devices (such as a serial printer). Contact Harris Instrument Corporation Sales or Engineering for more information.

**Extended Serial Communications**

Typically, the serial communications output for the Model MPX is limited to a maximum of seventy-five linear cable feet [22.8m]. This is the standard for all RS-232 communications. For operations greater than seventy-five feet [22.8m] up to 4000 linear cable feet [1219m], short-haul modems will need to be installed (MSH Option). Contact Harris Instrument Sales or Service Department for more information.

**NOTE:**

Serial communications for the Model MPX is limited to seventy-five linear cable feet [22.8m]. For operation to 4000 linear cable feet [1219m], the MSH Option short-haul modem is required.
Z.3.c Digital Inputs
There is one digital input for a line speed encoder. See Figure Z.4.6.

Line Speed Encoder (Tachometer) Input
One digital input is designed for a line speed encoder with 5V TTL @ 100kHz. maximum. The suggested Encoder (Tachometer Input Option - MTI Option) coder Products ACCU-CODER™ Model 711-0.

Z.4 Configuring your MPX
All MPX models must be setup using the MPX Setup Wizard. The sensor type and size must be entered and the sensors must be calibrated to the existing product passline. The Analog Output Mode scaling must also be performed manually. The time and date may have to be set if the system has lost power for an extended period of time.

The procedure for setting up your Model MPX depends upon how it was ordered:

For New Systems:
If you ordered your MPX as a system, it has already been configured. The system must be calibrated before valid measurements can be made.

Spare Processing Unit:
If you purchased your MPX as a spare, then you must run the Setup Wizard to configure the MPX Processing Unit before calibrating the system. To open the Setup Wizard from within the MPX User Interface: Click Tools >> Setup Wizard. Make sure to set the emitter size. The default is a 10” emitter.

Replacement Micro Board:
If you ordered a replacement micro/processor board, the Setup Wizard must be run before calibrating the system. The Setup Wizard will automatically start when the MPX Processing Unit is powered on. System must be calibrated before valid measurements can be made.
- To calibrate the system, select Calibrate from the menu bar and follow the on screen instructions. For additional information, see Section Z.10 in the manual.

There is one program you will use to interact with your new measurement system:

MPX User Interface:
This is the program you will use for normal operations and to configure the MPX Processing Unit. It is the Graphical User Interface for the MPX and it starts automatically when you turn on the system. The supported operating modes are listed below. The mode you select in the Setup Wizard will depend on your application.

- Single Sensor Single Width
- Single Sensor Dual Width
- Single Sensor Quad Width
- Single Sensor Passline Independent
- Dual Sensor Single Width
- Dual Sensor Passline Independent
If you did not receive a copy of the MPX User Interface software, you may request your copy from Harris Instrument Corporation directly, your local sales representative or the Harris Instrument Corp. website www.harris-instrument.com. The Setup Wizard features an intuitive interface that provides quick and easy configuration of your MPX system. After you complete this one-time process, you will only need to use the Setup Wizard again if:

- You change applications (i.e. single strip to dual strip)
- OR
- You change the sensors. (Emitter 20" vs. 40”)

**NOTE: Changing the receiver does NOT require you to re-configure the system.**

Once the system is configured, reboot the system. The User Interface software will automatically load the configuration settings you selected and begin displaying data. The initial readings may not represent the actual width/edge position of the material; this is because the system has not been calibrated.

To calibrate the system, select Calibrate from the menu bar and follow the on screen instructions. For additional information, see Section Z.10 in the manual.

**Additional Considerations:**

Certain modes may not be supported by the User Interface software. Edge Guiding and Centerline modes are examples of such. In these modes, analog data is sent to a PLC or Guide controller directly, they do not utilize the graphical user interface. If an unsupported mode is detected, when loading the MPX User Interface software, a message box will inform the User that the mode is not supported and the program will close. If you accidentally configure the MPX in one of these modes, you can always run the Setup Wizard again to configure the intended mode. The Setup Wizard can be used as many times as necessary to configure a system; using the Wizard repeatedly will not hurt the system. It is good practice to reboot the system after the Setup Wizard completes. This allows the MPX to power on with the newly configured settings.

**NOTE:** You should always re-calibrate the system after changing operating modes or changing sensor size(s).

**Z.4.a MPX Quick Setup**

1) Connect the Touchscreen Monitor - **Level 4** (Figure Z.6.1)
   a. Plug Power Cord in to the power connection on the bottom panel of the Touchscreen and then to a 120VAC source.
   b. Plug the USB cable into the USB connection on the bottom of the Touchscreen and then to USB connection on the bottom panel of the MPX.
   c. Plug the VGA cable into the VGA connection on the bottom panel of the Touchscreen and then to the VGA connection on the bottom panel of the MPX.

**NOTE:** If another ELO monitor is used then re-alignment of the touchscreen will need to be done. Mouse is required. See Appendix E.

1) Connect LCD display/mouse - **Level 3** (Figure Z.6.2)
   a. Plug Power Cord in to the power connection on the bottom panel of the LCD Display and then to a 120VAC power source.
   b. Plug the USB cable from the mouse into the USB connection on the bottom panel of the MPX.
c Plug in the VGA cable into the VGA connection on the bottom panel of the LCD Display and then to the VGA connection on the bottom panel of the MPX.

d The included keyboard is not needed for normal operation. It is included for use on an as needed basis. Any of the vacant USB ports inside the MPX can be used to connect the keyboard for temporary use. Cables may be routed through the Access Port on the bottom of the MPX enclosure.

2) Connect the Sensors (Figure Z.6.3)

a. If you are only using one sensor, it must be connected to Sensor A (see Figure Z.6-3)

b If this is a dual sensor system, connect one sensor to Sensor A then connect the other sensor to Sensor B. (see Figure Z.6-3)

c Connect to a 120VAC power source using the included power cable.

3) Press the power button on the front of the MPX enclosure to power up the system.

4) Calibrate the system. See Section Z.10.

5) Set Limit Settings. See Section Z.6.d

6) Set Analogs. See Section Z.6.c

Remote Display Setup

TS1 position 8 & 10 are used for connecting the MPX to a Remote Display or PLC Controller. Once connected, go to Tools - Option on the menu bar of the User Interface Software. Click enable Remote Display and Select Com 2. Then Click Save and Close.

Z.4.b FAULT Logic

The Model MPX contains circuitry to sense a sensor VIDEO or SYNC FAULT. With the typical SCAN-A-LINE™ system, the number of edges detected by a SCAN-A-LINE™ sensor are predictable. In a typical dual 10XAS-Series sensor system, each sensor should see one and only one edge, but a single 10XAS-Series sensor system would see two edges on the sensor. More edges in a single scan than is expected by the microprocessor indicates that foreign material may be interfering with the normal edge position detection. Ambient light interference from strobe lights, dirt or heavy dust (debris) can also cause a similar problem.

Serial communications will output a Video FAULT or SYNC FAULT warning.

Single Sensor Configurations

Normal readings will be displayed on your monitor as show in Figure: Z.6.4.
• **Sync Fault**

A Sync Fault occurs when the MPX has lost communication with the sensors. It is indicated in the User Interface by a pop-up message box. (See Figure Z.6.5)

![Figure Z.6.5: SYNC-FAULT popup](image)

To correct a sync fault condition, power down the MPX and check all cables and connections. The emitter-to-processor cable (7-pin circular) may have been cut, shorted, or otherwise severely damaged. A sync fault may also be the result of damaged components inside the emitter or MPX processing unit.

**NOTE:** It is recommended to use a cable tester, available from Harris Instrument Corporation, when verifying cables.
- **Video Fault**

A video fault will occur when the sensor detects too few or too many edges.

The measurement box on the main display will turn red to indicate a video fault. (see picture) This type of fault can occur if the MPX is setup to measure a single object (2 edges) and debris or other objects enter the measurement area.

**NOTE:** The Fault Relay is on the MPX Analog/Relay Board. If no relay card is there, no Fault Relay but Faults are still indicated.

To correct a video fault, ensure the proper number of edges are present over the measurement area. If the problem persists, clean the sensor lens with glass cleaner to remove excess dirt and/or debris. If the glass is cracked, damaged, or dirty enough to attenuate the light passing through, a video fault may occur. The areas where light is blocked are interpreted as edges. Improper receiver alignment may also cause this type of fault.
Z.4.c  Analog Gain Adjustment

Caution: Sensors should not be connected to an energized processing unit/power supply. Connecting sensors while the processing unit/power supply is energized may cause damage to the sensors and or processing unit. It may also lead to incorrect output from the processing unit. Connect sensors to processing unit/power supply only when power is off.

Required equipment:
- Multi-meter
- Small screwdriver (or potentiometer adjustment tool)
- Object of known measurement (Width should be within the normal range of the material to be measured)

The Maximum Analog Output for Each Emitter Size is 5 VDC or 10V with Analog Relay Card.

On a 10 inch emitter, the analog can be adjusted to 0.5VDC per inch
On a 20 inch emitter, the analog can be adjusted to 0.25VDC per inch
On a 30 inch emitter, the analog can be adjusted to 0.166VDC per inch
On a 40 inch emitter, the analog can be adjusted to 0.125VDC per inch

Material Passline:
The material to be measured should maintain a stable distance from the face of the emitter in order to maintain a stable measurement reading. If the material becomes closer to the face of the emitter, the measurement will decrease. Depending on the material being measured, should the material come into any contact with the face of the emitter the emitter could be damaged to the point where it will require repair before it can measure accurately. If the material gets further away from the emitter face, the measurement will increase.

Sensors are configured to match each specific application. The distance from the face of the emitter to the face of the receiver will determine the maximum passline to achieve an easily predictable analog measurement (0.5 Volts per inch for a 10 inch emitter). In order to achieve easily predicted analog outputs, the maximum passline should be no more than 8.3% of the distance from the emitter to the receiver. (Example: for a 40” emitter to receiver configuration, the maximum passline should be 3.3”)

If mounting and operational constraints restrict the passline to a position higher than 8.3% of the emitter to receiver separation, it is still possible to obtain accurate analog measurement. Place a sample of known dimension in the measurement area, at the operational passline. Calculate the volts per inch by dividing the analog voltage by the width of the object. (Example: Due to a higher than normal passline, 8” sample measures 2.24 VDC equates to 0.28 volts per inch)

Procedure to adjust Analog A:
1: Place object at the height above the emitter at which material will pass during normal operation.

2: Connect multimeter leads to terminal strip position 1 (common) and position 2 (analog A) (Figure Z.4.5)

3: Observe voltage (analog representation of measurement)

4: In the top, right corner of the processor board is a row of 4 potentiometers. Counting from the left, the 3rd potentiometer adjusts the gain for Analog A. (Figure Z.6.8) Adjusting this potentiometer will allow adjustment of the analog gain.

5: Verify analog interpretation by PLC.

If this is a single width measurement system, the process is now complete.

Procedure to adjust Analog B:
1: Place object at the height above the emitter at which material will pass during normal operation. A second object must be placed between the 2-connector end of the emitter and the object of known width.

2: Connect multimeter leads to terminal strip position 1 (common) and position 3 (analog B) (Figure Z.4.5)

3: Observe voltage (analog representation of measurement)
4: In the top, right corner of the processor board is a row of 4 potentiometers. Counting from the left, the 4th potentiometer adjusts the gain for Analog B (Figure Z.6.9). Adjusting this potentiometer will allow adjustment of the analog gain.

5: Verify analog interpretation by PLC.

Procedure to adjust Analog C:
1: Place object at the height above the emitter at which material will pass during normal operation.

A second and third object must be placed between the 2-conector end of the emitter and the object of known width. There must also be a 4th item present between the third item and the non-connector end of the emitter.

2: Connect multimeter leads to terminal strip position 1 (common) and position 4 (analog C) (Figure Z.4.5)

3: Observe voltage (analog representation of measurement)

4: In the top, right corner of the processor board is a row of 4 potentiometers. Counting from the left, the 1st potentiometer adjusts the gain for Analog C (Figure Z.6.10). Adjusting this potentiometer will allow adjustment of the analog gain.

5: Verify analog interpretation by PLC.

Procedure to adjust Analog D:
1: Place object at the height above the emitter at which material will pass during normal operation. A second, third and fourth object must be placed between the 2-connector end of the emitter and the object of known width.

2: Connect multimeter leads to terminal strip position 1 (common) and position 5 (analog D) (Figure Z.4.5)

3: Observe voltage (analog representation of measurement)

4: In the top, right corner of the processor board is a row of 4 potentiometers. Counting from the left, the 2nd potentiometer adjusts the gain for Analog D (Figure Z.6.11). Adjusting this potentiometer will allow adjustment of the analog gain.

5: Verify analog interpretation by PLC.

Dual Sensor Analog Width Measurement:

When the system is being used to measure a single width using two sensors, the “A” and “B” analogs must be calibrated individually. In order to calibrate the A and B analogs, there must be an object over the B sensor while the A analog is being adjusted and an object over the A sensor while the B analog is being adjusted.

As previously mentioned, each sensor will provide a maximum analog of 5 volts (10volts with Analog/Relay Board) With the A & B sensor uncovered, the A and B analogs will be 0 volts. As each sensor becomes covered (from connector side of the emitter), the respective analog output of the sensor will increase. When the sensors are almost completely covered (but not faulted), the analogs for A and B will be 5VDC or 10VDC with the Analog/Relay Board.

To calibrate or “scale” the analog outputs on a Dual Sensor Width system,
1. Place an object over the A and B sensors, at the product pass-line, such that half of each sensor is covered.
2. Adjust the Analog A and B potentiometer until the output at the terminal strip is half the maximum output voltage. Analog outputs A and B should be adjusted to 2.5 volts or 5 volts with the Analog/Relay Board.

Analog output A-B would be 0 volts, this represents the centerline. Any deviation from this “centerline” can be monitored on the Analog A-B output.

The range of the A-B output is: -5VDC to +5VDC or -10VDC to +10VDC with Analog/Relay Board. This output is typically to in guiding applications.

When using two sensor to measure a single width, analog outputs A and B will be monitored, with an offset added in the customer’s PLC, to calculate width.
Z.4.d Limit Settings

The MPX 3 & 4 are available with a relay option to indicate material that is out of tolerance based on the high & low limit values.

To enable the Limit Relay option, Click on Tools > Options and select Enable Limit Relay. Then Click Save and Close.

With these values established, the MPX will close the GO relay when the strip is within tolerance. When the strip is above or below tolerance, the GO relay will be opened and the HIGH or LOW limit relay will close. If the strip goes back with in tolerance, the GO relay will be closed again.

Z.4.e Edit Limit Settings

Limit checking is a standard MPX feature. The “Relay” part is the option and it includes the Fault Relay.

Setting/Changing Limit Settings

1. To change a limit, double click on the limit you want to change. In the picture below, the area to click is outlined in yellow.

NOTE: The “Target” area will be non-responsive if the Auto-Target Option is enabled. In this configuration, the target width is really the midpoint between the upper and lower limits.
2. After double-clicking one of the fields, the Limit Settings window will open and displays settings for selected strip #.

3. Select a field and use the keypad to enter the new value. Clicking ENTER will update the selected text box in the New Values column. When finished, click Save Settings and then Close Window. See below.
Z.4.f  Connecting your EDI Remote Display

1) **Connect the EDI Remote Display**
   
a) Connect the data cable to your MPX via the customer access hole on the bottom panel of your MPX to Terminal Strip 1 Pin 8 (Com) and Pin 10 (TX).
   
   Pin 8 (COM) = Black Wire  
   Pin 10 (Tx) = Brown Wire  
   
a) Plug the power cord into a 120VAC power source.

2) Enable your EDI Remote Display
   
a) From the MPX User Interface, Click/Touch Tools > Options > select Enable Remote Display and select Com 2. Click Save and Close.

Z.4.g  Connecting to PLC Controller

1) Connect the PLC Controller
   
a) Connect the cable to your MPX via the customer access hole on the bottom panel of your MPX to Terminal Strip 1 Pin 8 (Com) and Pin 10 (TX).
   
   Pin 8 (COM) = Black Wire  
   Pin 10 (Tx) = Brown Wire  
   
a) Plug the power cord into a 120VAC power source.

2) Enable your EDI Remote Display
   
a) From the MPX User Interface, Click/Touch Tools > Options > select Enable Serial Output and select Com 2. Click Save and Close.
Z.4.h  Checking the MPX Digital Output (RS-232)

Step 1: Open Realterm by double clicking the shortcut on the Desktop.
Step 2: Select Port and Baud rate. Open the Port if not already open.

( The MPX is connected on COM Port 1 @ 57600bps. No Parity, 8 data bits, 1 stop bit) NOHANDSHAKING

NOTE: Connection on Com Port 1 could be different is your system has an EVO.

Step 3: If your MPX is not displaying data, the data stream may be stopped. Send “?G” followed by a Carriage Return character. Omit the quotation marks. See picture on next page.
agraphic

Step 4: You should see a data stream similar to the picture below, “AO” means there are no Faults.

Step 5: Close the port/terminal program and restart the MPX User Interface Software.
Z.4.i MPX RS-232 Commands/Queries (Not EDI/PLC Serial port)

These are commands the MPX MicroBoard understands (i.e. for Troubleshooting)

All transmissions must end with Carriage Return <CR> character. (No Line Feed)

Commands

*! Stop data stream (issue this command before sending queries)

?G Start data stream (technically a command, but we’re querying the data stream)

System Configurations

*0 Single sensor single edge

*1 Single sensor dual edge

*2 Single sensor single width

*3 Single sensor dual width

*4 Single sensor quad width

*5 Single sensor passline independent (also known as “BR” mode)

*6 Dual sensor Centerline

*7 Dual sensor single width

*8 Dual sensor passline independent (also known as “BR” mode)

Emitter Size

*E1 10 inch emitter

*E1D Double speed 10 inch emitter

*E2 20 inch emitter

*E2D Double speed 20 inch emitter

*E3 30 inch emitter

*E3D Double speed 30 inch emitter

*E4 40 inch emitter

*E4D Double speed 40 inch emitter

Queries

Note: All replies are terminated with Carriage Return <CR> and Line Feed <LF>

?C Returns the current System Configuration
Example reply: C7D. (Dual Sensor Single Width - Decimal Output)

?E Returns the current Emitter Size
Example reply: E30. (30 inch Emitter/s)

?S Returns the Scan Size (This is maximum range of the emitter in digital counts.)
Example reply: S18395. (Emitter with a range of 0 to 18,395 counts)

Note: This value is specific to the emitter attached to the system.
Z.5 General Maintenance

Maintenance of the Model MPX is relatively limited. Periodically check the cable connections for tightness. Check the power cable for cuts or splits. Regularly check the front panel latches for tightness to ensure the door stays closed. Contact Harris Instrument Corp. Service department for more information.

Z.5.a Upgrades

The Model MPX, because of its power and versatility, is a constantly evolving processing unit. Upgrades for both hardware and software are available from Harris Instrument Corporation Service and Engineering Departments. Enhancements of customer interfaces, inputs, outputs and other features are continually updated and improved. Contact Harris Instrument Corporation Service Department for more information on updating the software and/or hardware in your Model MPX.

Z.6 Hardware Trouble Shooting

CAUTION:

Hazardous voltages are present within the Model MPX enclosure. Care should be taken when making any of the tests in this manual.

Board level maintenance is NOT RECOMMENDED for the Model MPX. If a problem is experienced with the Model MPX, in most cases contact Harris Instrument Corporation Service Department for technical support or to obtain an RMA to return the unit. Check all cable and power connections to the Model MPX. Make sure they are clean and free of contaminants. Reattach the cables and tighten securely. If system fails when replacing a cable/internal connection/customer connection, a short circuit may have occurred. If the +/-12VDC indicator lamps are out on the microprocessor board, (Figure Z.8.1) the short circuit may be in the cable, replace the cable with a spare. If changing the cable fails to fix the problem, contact Harris Instrument Corporation Service Department for technical support or to obtain and RMA #. If the short circuit occurs when reattaching a custom connection, check the cable for that connection, check the device using the cable, or replace the cable/device. If this fails to solve the short circuit, contact Harris Instrument Service Department for technical assistance.

After all cables/internal connections/customer connections check good, the Model MPX is possibly experiencing a component level failure. Perform the calibration in Section Z.10 and/or setup procedures in Section Z.6. Component level trouble shooting of the Model MPX is not covered in this manual. Please obtain an RMA Number from Harris Instrument Corporation Service Department and return the Model MPX to the factory for maintenance.

NOTE:

Procedures in this section will assist in determining whether or not the Model MPX is operating within specifications. Always follow the instructions before replacing inoperative equipment. Installing a good spare part (sensor or other processing unit) in a defective system may cause unnecessary damage to the spare part.

If a problem is experienced with the Model MPX, a few simple checks with a DC voltmeter can verify proper circuit function. A voltmeter with a 20VDC and/or 300VAC range is required. The meter should be able to measure within 1% and may be either analog or digital.

No power to the Model MPX. Sensors do not light.

Test 1: Check for AC power line input voltage - external system power may be off or unit may be unplugged.

Test 2: Verify AC power voltage (Figure Z.8.2)
   a) Range meter for 300VAC or greater.
   b) Connect negative lead (-) to NEUTRAL (N) and positive lead (Figure Z.8.3) (+) to LINE (L).

Voltage should read between 115VAC and 230VAC. If AC Line Voltage does not fall between 115VAC and 230VAC from the external source, modify your power for this unit to fall within these voltages.
Test 3: If the system has proper power, test points have appropriate voltage, motherboard is receiving proper voltage and sensor MS-style connectors are properly powered, remove all external sensor cables and any unpluggable customer connections (on inside back panel). Check voltages at test points.

1) Place Negative (black) probe on connector P3, pin 3 (Common)
2) Place Positive (red) probe on connector P3, pin 1 (+12VDC)
   a) Your meter should read +12VDC (11.4V to 12.6V is within tolerance)
3) Take Positive probe (red) and place on connector P3, pin 2 (-12VDC)
   a) Your meter should read –12VDC (-10.8V to –13.2V is within toler-ance)
4) Take Positive probe (red) and place on connector P3, pin 4 (5VDC)
   a) Your meter should read +5VDC (4.75V to 5.25V is within tolerance)

If voltages test appropriately with all cables disconnected, connect cables one at a time and check voltages as each cable, internal connection, and customer connection are completed.

Z.6.a Diagnostics Lamps

There are four diagnostic lamps located inside the Model MPX (Figure Z.8.5 & Z.8.6) to assist in determining possible problems that may occur in the operation of the unit.

Voltage Lamps

Three of the diagnostic lamps on the Model MPX main board light when the system voltages are correct. System voltages include +12VDC (+12 lamp), -12VDC (-12 lamp) and +5VDC (+5 lamp). The +12VDC and -12VDC voltages are for powering the sensors. If either of these lamps is not lit, the sensors are probably not receiving power. If either of these lamps is only dimly lit, the sensor cable may have a short circuit or the sensor itself may be experiencing a malfunction. The +5VDC voltage powers the micro-controller. If this lamp is not lit, the entire Model MPX will not function. Please contact Harris Instrument Corporation Service Department for technical assistance with restarting the system.

Motherboard Lamp

The forth lamp is on the CPU Motherboard. The motherboard lamp is lit when the motherboard has power. If this lamp is not lit the Model MPX will not function. Please contact Harris Instrument Corporation Service Department for technical assistance.

CAUTION:

Sensors should not be connected to an energized processing unit/power supply. Connecting sensors while the processing unit/power supply is energized may cause damage to the sensors and or processing unit. It may also lead to incorrect output from the processing unit. Connect sensors to the processing unit/power supply only when power is off.
Z.7 Ethernet Setup (uses 10/100 RJ-45 Ethernet Cable)

NOTE: You will need the IP Address of the Remote Server and the Port # of the Listening Port for Steps 3 & 4.

1. Select Ethernet from the context menu.

2. The Ethernet Settings window will open. To change a setting, select its field (text box) by clicking/touching and enter the new value with the keypad. Then click/touch Enter. The “<” button on the keypad performs the “backspace” function. The CLEAR button will delete every character entered.
3. Select the “Remote "IPv4" text field. Enter the IP address of the remote Server. This server is where the measurement data will be sent to.

4. Select “Remote Port” and enter the port number of the Listening Server, then click Enter.
5. Check the option boxes “Enable Ethernet Output” and “Stream MPX Data”. Only check the “Stream MPX Data” if you want the width readings sent automatically.

6. Click Save Settings

7. Click Connect. You should see a screen similar to the picture below.

8. Click Close Window.
Z.7.a Ethernet Commands/Queries

- All transmissions must begin with <STX> and end with <ETX>.
- The X’s in Upper, Lower, and Target commands contain a floating decimal.
  Example: <STX>*L, 1, 12,000<ETX> set the lower limit of strip 1 to 12 inches.

**Commands:**
- *ID, XXXX = Coil ID (the coil id is a variable length string)
- *P = Print Coil Report. (only pints if coil report option is enabled)
- *SP = Start Plot
- *EP = End Plot
- *U, #, XXXXXX = Set Upper Limit (# is the strip)
- *L, #, XXXXXX = Set Lower Limit (# is the strip)
- *T, #, XXXXXX = Set Target Width (# is the strip)

**Queries:**
- ?ID = Returns the coil id.
- ?U, # = Returns upper limit value for strip #
- ?L, # = Returns lower limit value for strip #
- ?T, # = Returns target value for strip #
- ?E = Return Emitter Size
- ?C = Return Configuration Mode
- ?S = Returns Scan Size (this is the max number of counts for the sensor)
- ?R = Returns Current Width Reading (with timestamp)
Z.8 Calibrating the System

Single Sensor Width System Calibration Procedure.

NOTE: The calibration procedure may differ among system configurations. This is not a problem however, because the software will guide you through the appropriate calibration process. The following procedures show how to calibrate a Single Sensor Passline Independent System.

One certified standard is REQUIRED.

1. Click Calibrate from the context menu on the main display. See below.

2. The Sensor Calibration window will now open. See below.
3. Click Next.

NOTE: ALL MEASUREMENTS ARE TO BE ENTERED IN INCHES.

4. Place a certified standard over the measurement area, at the operating pass-line.
   
a. If the material you are measuring normally passes over the system at a height of 6 inches, then you must also calibrate at that height.

   If you do not calibrate from the operating pass-line, width readings may be invalid.
5. Ensure the calibration standard is in place and all debris is clear of the measurement area.
6. Click Next.
7. Enter the width of the certified standard and click enter.

8. Calibration is finished. Click SAVE CAL to save settings and complete calibration.
9. If the calibration was successful, the main screen will now display correct values.

10. In the picture above, notice the HIGH limit box is now colored red. This is because the certified standard used for calibration is greater than the current High limit. To change this limit, double click it and follow the on-screen instructions. For more information, see Section Z.4.d Limit Settings to change limits.
Single Sensor Dual Width System Calibration Procedure.

NOTE: The calibration procedure may differ among system configurations. This is not a problem however, because the software will guide you through the appropriate calibration process.

One certified standard is REQUIRED.

1. Click Calibrate from the context menu on the main display. See below.

2. The Sensor Calibration window will now open. See below.
3. Click Next.

NOTE: ALL MEASUREMENTS ARE TO BE ENTERED IN INCHES.

4. Place a certified standard over the measurement area, at the operating pass-line.
   a. If the material you are measuring normally passes over the system at a height of 6 inches, then you must also calibrate at that height.

   If you do not calibrate from the operating pass-line, width readings may be invalid.
5. Ensure the calibration standard is in place and all debris is clear of the measurement area.
6. Click Next.
7. Enter the width of the certified standard and click enter.

8. Calibration is finished. Click SAVE CAL to save settings and complete calibration.
9. If the calibration was successful, the main screen will now display correct values.

10. In the picture above, notice the HIGH limit box is now colored red. This is because the width reading (Plot 8) is greater than the current High limit for Strip # 2. To change this limit, double click it and follow the on-screen instructions. For more information, see Section Z.4.d Limit Settings to change limits.
Single Sensor Quad Width System Calibration Procedure.

NOTE: The calibration procedure may differ among system configurations. This is not a problem however, because the software will guide you through the appropriate calibration process.

One certified standard is REQUIRED.

1. Click Calibrate from the context menu on the main display. See below.

2. The Sensor Calibration window will now open. See below.
3. Click Next.

**NOTE: ALL MEASUREMENTS ARE TO BE ENTERED IN INCHES.**

4. Place a certified standard over the measurement area, at the operating pass-line.
   
   a. If the material you are measuring normally passes over the system at a height of 6 inches, then you must also calibrate at that height.

   If you do not calibrate from the operating pass-line, width readings may be invalid.
5. Ensure the calibration standard is in place and all debris is clear of the measurement area.
6. Click Next.
7. Enter the width of the certified standard and click enter.

8. Calibration is finished. Click SAVE CAL to save settings and complete calibration.
9. If the calibration was successful, the main screen will now display correct values.

10. In the picture above, notice the LOW limit box is now colored red. This is because the certified standard used for calibration is below the current LOW limit. To change this limit, double click it and follow the on-screen instructions. For more information, see Section Z.4.d Limit Settings to change limits.
Dual Sensor Width System Calibration Procedure

NOTE: The calibration procedure may differ among system configurations. This is not a problem however, because the software will guide the user through the process.

Two certified standards are REQUIRED.

1. Click Calibrate from the context menu on the main display. See below.

2. The Sensor Calibration window will now open. See below.
3. Click Next.

**NOTE: ALL MEASUREMENTS ARE TO BE ENTERED IN INCHES.**

4. Place the first certified standard over the measurement area, at the operating pass-line.
   
a. If the material you are measuring normally passes over the system at a height of 6 inches, then you must also calibrate at that height.

   **If you do not calibrate from the operating pass-line, width readings may be invalid.**
5. Ensure the calibration standard is in place and all debris is clear of the measurement area.
6. Click Next.
7. Enter the width of the first certified standard and click enter.

8. Place the second certified standard over the measurement area.
9. Click Next.
10. Enter the width of the second certified standard and click enter.

11. Calibration is finished. Click SAVE CAL to save settings and complete calibration.
12. If the calibration was successful, the main screen will now display correct values.

13. In the picture above, notice the HIGH limit box is now colored red. This is because the certified standard used for calibration is greater than the current HIGH limit. To change this limit, double click it and follow the on-screen instructions. For more information, see Section Z.4.d Limit Settings to change limits.

NOTE: The calibration procedure may differ among system configurations. This is not a problem however, because the software will guide you through the appropriate calibration process.

One certified standard is REQUIRED.

1. Click Calibrate from the context menu on the main display. See below.

2. The Sensor Calibration window will now open. See below.
3. Click Next.

NOTE: ALL MEASUREMENTS ARE TO BE ENTERED IN INCHES.

4. Enter the emitter to receiver (Separation) distance, in inches. The separation is a measure of the distance from the top of the emitter to the face of the receiver as shown in illustration below.

![Separation Illustration]

= Separation in Inches

Single Sensor Passline Independent Width System.
5. After entering the separation distance, click Enter. (See below)
   a. From the picture below, you can see this system has receivers located 62 inches above the emitters.

![Image of sensor calibration interface]

6. Place a certified standard over the measurement area, at the operating pass-line.
   a. If the material you are measuring normally passes over the system at a height of 6 inches, then you must also calibrate at that height.

   If you do not calibrate from the operating pass-line, width readings may be invalid.

![Image of sensor calibration interface]
7. Ensure the calibration standard is in place and all debris is clear of the measurement area.
8. Click Next.
9. Enter the width of the certified standard and click enter.

10. Calibration is finished. Click **SAVE CAL** to save settings and complete calibration.
11. If the calibration was successful, the main screen will now display correct values.

12. In the picture above, notice the HIGH limit box is now colored red. This is because the certified standard used for calibration is greater than the current HIGH limit. To change this limit, double click it and follow the on-screen instructions. For more information, see Section Z.4.d Limit Settings to change limits.
**Dual Sensor Passline Independent Width System Calibration Procedure**

**NOTE:** The calibration procedure may differ among system configurations. This is not a problem however, because the software will guide the user through the process.

Two certified standards are REQUIRED.

1. Click Calibrate from the context menu on the main display. See below.

![Image of calibration interface](image1)

2. The Sensor Calibration window will now open. See below.

![Image of sensor calibration interface](image2)
3. Click Next.

NOTE: ALL MEASUREMENTS ARE TO BE ENTERED IN INCHES.

4. Enter the emitter to receiver (Separation) distance, in inches. The separation is a measure of the distance from the top of the emitter to the face of the receiver as shown in illustration below.
5. After entering the separation distance, click Enter. (See below)
   a. From the picture below, you can see this system has receivers located 60 inches above the emitters.

   ![Image of sensor calibration with 60.00 display]

6. Place the first certified standard over the measurement area, at the operating pass-line.
   a. If the material you are measuring normally passes over the system at a height of 6 inches, then you must also calibrate at that height.

   **If you do not calibrate from the operating pass-line, width readings may be invalid.**

   ![Image of sensor calibration with 48.005 display]
7. Ensure the calibration standard is in place and all debris is clear of the measurement area.
8. Click Next.
9. Enter the width of the first certified standard and click enter.

10. Place the second certified standard over the measurement area.
11. Click Next.
12. Enter the width of the second certified standard and click enter.

13. Calibration is finished. Click SAVE CAL to save settings and complete calibration.
14. If the calibration was successful, the main screen will now display correct values.

15. In the picture above, notice the LOW limit box is now colored red. This is because the second certified standard used for calibration is below the current LOW limit. To change this limit, double click it and follow the on-screen instructions. For more information, see Section Z.4.d Limit Settings to change limits.
Z.9 Coil Report Definitions

1. The Width Deviation Trend is a graphic display of the captured measurement data.
   a. Note: The X-Axis represents the number of readings.
2. The Plot command buttons are visible on multi strip applications only. Click on the Plot 1, 2, 3, or 4 button to view the data for that strip or object.
   a. Example: The Coil Report loads with the data for strip #1. Click Plot 2 to view the data for strip 2.
   b. Note: Printing and saving only affect the current selected strip/part.
3. This is the time data capture started.
4. This is the time data capture stopped.
5. The Customer’s company name and logo can be inserted here.
   a. Note: This field is left blank intentionally.
6. The Coil ID field: Displays the selected strip/part name.
7. Length: This is the total length of the plot. It will be in Seconds if using a Time Base or Feet/Meters if using a Tachometer Base.
8. Average Width: This represents the average width of the selected strip/part.
9. Standard Deviation: This represents the std. deviation of the selected strip/part. (1 sigma)
10. Target: The target width of the selected part.
11. Upper: the maximum allowed width of the selected part.
12. Lower: The minimum allowed width of the selected part.
15. Cp is a unit-less number which measures how close a process is running to its specification limits, relative to the natural variability of the process.
16. Cpk measures how close you are to your target and how consistent you are to around your average performance.
17. Number Of Sample: This is the number of samples captured.
18. Within Tolerance: This is the number of captured readings within the Upper and Lower Limits.
19. This is the time and date the report was generated.
20. Units: The unit of measure for the width data.
Z.10 Related Drawings

The following pages contain various drawings for the Model MPX. For drawings of other configurations, please contact Harris Instrument Corporation.

<table>
<thead>
<tr>
<th>Drawing #</th>
<th>Description</th>
<th>Drawing Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>4010015 REV. A</td>
<td>MPX 3 &amp; 4 Processing Unit Enclosure Layout</td>
<td>AutoCAD LT Rel. 3</td>
</tr>
</tbody>
</table>

*Table Z.12.1: Drawing Information*
APPENDIX
Appendix A

MPX Level 3 Monitor Specifications

Display
Diagonal Viewable Size: 17 inches
Aspect Ratio: 5:4
Panel Type: TN - Twisted Nematic
Max Resolution: 1280 x 1024 at 60Hz
Contrast Ratio: 800:1 (typical)
Brightness: 250cd/m² (typical)
Response Time: 5 ms (typical)
Viewing Angle: 160° / 160° (typical)
Color Support: 16.7 million colors
Pixel Pitch: 0.264 mm
Display Type: Thin film transistor (TFT) active matrix liquid crystal display (LCD)
Device Type: Flat Panel Monitor

Stand
Tilt and built-in cable management

Connectivity
Video Graphics Array (VGA)

Color, Size and Weight
Dimensions with stand (H x W x D):
374.5 mm (14.74 inches) x 136.9 mm (14.98 inches)
Dimensions without stand (H x W x D):
307.0 mm (12.09 inches) x 374.5 mm (2.32 inches)
Preset Display Area (H x V):
337.9 mm (13.3 inches) x 270.3 mm (10.6 inches)
Weight (panel only - for VESA mount): 6.7 lbs (3.04 kg)
Weight (with packaging): 11.5 lbs (5.21 kg)

Electrical
Voltage Required: AC 100 to 240 VAC / 50 or 60 Hz + 3 Hz / 2.0A (Maximum)
Power Consumption: 17W (typical)
Power Consumption Stand by / Sleep: Less than 1 Watts
Audio Output: None

Environmental
Temperature Range Operating: 5° to 35°C (41° to 95° F)
Temperature Range Non-Operating:
Storage: -20° to 60° C (-4° to 140° F)
Shipping: -20° to 60° C (-4° to 140° F)
Humidity Range Operating: 10 - 80% (non-condensing)
Humidity Range Non-Operating:
Storage: 5% to 90% (non-condensing)
Shipping: 5% to 90% (non-condensing)
Altitude Operating: 3,048.0 m (12,000 ft) max
Altitude Non-Operating: 9,144 m (40,000 ft) max
Appendix B

**MPX Level 4 Touchscreen Specifications**

<table>
<thead>
<tr>
<th><strong>Model:</strong></th>
<th>ET1715L</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LCD Display:</strong></td>
<td>17” TFT Active Matrix Panel</td>
</tr>
<tr>
<td><strong>Display Size:</strong></td>
<td>337.9(H) x 270.33(V) mm</td>
</tr>
<tr>
<td><strong>Pixel Pitch:</strong></td>
<td>0.264(H) x 0.264(V) mm</td>
</tr>
</tbody>
</table>
| **Display Mode:** | VGA 640 x 350 (70Hz)  
VGA 720 x 400 (70Hz)  
VGA 640 x 480 (60 / 72 / 75Hz)  
SVGA 800 x 600 (56 / 60 / 72 / 75Hz)  
XGA 1024 x 768 (60 / 70 / 75Hz) |
| **Max. Resolution:** | SXGA 1280 x 1024 (60 / 70 / 75Hz)  
SXGA (1280 x 1024) at 75Hz maximum |
| **Contrast Ratio:** | 800 : 1 (typical) |
| **Brightness:** | NonTouch: typical 280 Cd/m²; Min 240 Cd/m²  
IntelliTouch: typical 258 Cd/m²; Min 221 Cd/m²  
AccuTouch: typical 230 Cd/m²; Min 197 Cd/m²  
Surface Capacitive Touch: typical 238 Cd/m²; Min 204 Cd/m²  
Acoustic Pulse Recognition: typical 258 Cd/m²; Min 221 Cd/m² |
| **Response Time:** | Tr: 15 ms Tf: 10 ms (Typ.) |
| **Display Color:** | 16.7M |
| **Viewing Angle:** | Vertical –80° ~ +80° (Typ.)  
Horizontal –80° ~ +80° (Typ.) |
| **Input Signal:** | Video R.G.B. Analog 0.7Vp-p, 75 ohm  
Sync TTL Positive or Negative |
| **Signal Connector:** | Mini D-Sub 15 pin |
| **Front Control:** | Menu, ▲, ▼, Select, Power |
| **OSD:** | Contrast, Brightness, H-Position, V-Position, Color Temperature, Phase, Clock, OSD Time, Recall, Language: English, French, German, Spanish, Japanese |
| **Plug & Play:** | DDC1 / 2B |
| **Touch Panel (optional):** | IntelliTouch, AccuTouch, Surface Capacitive Touch, APR |
| **Power Adapter:** | Input AC 100 - 240V, 50/60Hz |
| **Operating Conditions:** | Temperature 0 °C ~ 40 °C (32 °F ~ 104 °F)  
Humidity 20% ~ 80% (Non-Condensation)  
Altitude To 12,000 Feet |
| **Storage Conditions:** | Temperature -20 °C ~ 60 °C (-4 °F ~ 140 °F)  
Humidity 10% ~ 90% (Non-Condensation) |
| **Dimensions (HxWxD):** | 391 x 366 x 203mm |
| **Weight:** | 7Kg |
| **Certifications:** | UL, C-UL, FCC-B, CE, VCCI, C-Tick, MPRII, S(Semko) |
Appendix C

AccuTouch Touchscreen Specifications

Mechanical Construction: Top: Polyester with outside hard-surface coating with clear or antiglare finish

Inside: Transparent conductive coating.

Bottom: Glass substrate with uniform resistive coating. Top and bottom layers separated by Elo-patented separator dots.

Positional Accuracy: Standard deviation of error is less than 0.080 in. (2.03 mm). This equates to less than ±1%.

Touchpoint Density: More than 100,000 touchpoints/in^2 (15,500 touchpoints/cm^2).

Touch Activation Force: Typically less than 4 ounces (113 grams).

Surface Durability: Meets Taber Abrasion Test (ASTM D1044), CS-10F wheel, 500 g. Meets pencil hardness 3H.

Expected Life Performance: AccuTouch technology has been operationally tested to greater than 35 million touches in one location without failure, using a stylus similar to a finger.

Optical Light Transmission: Typically 80% at 550-nm wavelength (visible light spectrum).

Visual Resolution: All measurements made using USAF 1951 Resolution Chart, under 30 X magnification, with test unit located approximately 1.5 in. (38 mm) from surface of resolution chart.

Antiglare surface: 6:1 minimum

Haze (per ASTM D10030): Antiglare surface: Less than 15%

Gloss (per ASTM D2457): Antiglare surface: 90±20 gloss units tested on a hard-coated front surface.
# Appendix D

## Configurations

<table>
<thead>
<tr>
<th>Option Name</th>
<th>Option Description</th>
<th>Manual Section #</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD</td>
<td>Line Driver for sensor signals (Note 1).</td>
<td>OO</td>
</tr>
<tr>
<td>LR</td>
<td>Line Receiver for sensor signals (Note 1).</td>
<td>OO</td>
</tr>
<tr>
<td>Level 1</td>
<td>RS-232 Customer Interface for host computer control</td>
<td>Z</td>
</tr>
<tr>
<td>MSH</td>
<td>Short-haul Modem(s) for extending RS-232 measurement data output from fifty linear [15.2m] cable feet up to 4000 feet [1219m].</td>
<td>ZG</td>
</tr>
<tr>
<td>MTI</td>
<td>Tachometer input for line speed used in Graph Update - supplied with Harris Instrument Corporation specified tachometer.</td>
<td>ZJ</td>
</tr>
<tr>
<td>MCA</td>
<td>Centerline position analog output.</td>
<td>ZK</td>
</tr>
<tr>
<td>MMA</td>
<td>Multi-strip measurement analog outputs (4 total).</td>
<td>ZL</td>
</tr>
<tr>
<td>SPM</td>
<td>Serial Panel Meter</td>
<td>EE</td>
</tr>
</tbody>
</table>

**NOTE 1:** The LD & LR Options are necessary if the sensors are located over fifty linear cable feet [15.2m] from the Model MPX. The LD Option will be required in the processing unit that powers the sensors [typically a Model GPU - Section R] and LR Option will be required in the Model MPX for receiving the sensor signals driven from...
Appendix E

ELO Re-alignment

(Mouse Required)

1. Close the MPX User Interface program.
2. At the bottom right corner of your screen, right click on the ELO symbol.
3. Click align.
4. Touch targets from position of normal use and follow remaining instructions.

5. Double tap the MPX User Interface short cut on the desktop to reload the program.
Appendix F

Configuring your EDI Display

NOTE: Follow this procedure if you are using your EDI Display with another system, setting up a new EDI display or to change the address.

You will need:
¼” nut driver
Small flat head screw driver

1. Remove the 2 outer most screws from the data cable end of the EDI display enclosure.

![Figure: F.1 Data Cable End](image1)

2. Remove small screw inside of the display enclosure.

![Figure: F.2 Internal Screw](image2)

3. Remove the LED Board from the display enclosure by pulling it out.
4. Set jumpers as specified in the tables below.

**ADDRESS DIP SWITCH:**

**SW1-SW6:** The first six switches indicate the binary address of the display.

<table>
<thead>
<tr>
<th>SW6 (MSB)</th>
<th>SW5</th>
<th>SW4</th>
<th>SW3</th>
<th>SW2</th>
<th>SW1 (LSB)</th>
<th>ADDRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>01</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>02</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>03</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>04</td>
</tr>
</tbody>
</table>

*EDI displays used with Model MPX must be addressed by strip number (Address 01 = Strip 1, etc...)*

**SW7-8:** The last two switches indicate the BAUD.

<table>
<thead>
<tr>
<th>SW8</th>
<th>SW7</th>
<th>BAUD</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>ON</td>
<td>9600</td>
</tr>
</tbody>
</table>

**FUNCTION DIP SWITCH:**

The function DIP SWITCH defines the Display Protocol, set by factory, and should not be changed.

<table>
<thead>
<tr>
<th>SW8</th>
<th>SW7</th>
<th>SW6</th>
<th>SW5</th>
<th>SW4</th>
<th>SW3</th>
<th>SW2</th>
<th>SW1</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
</tr>
</tbody>
</table>

5. Put LED board back in enclosure.

6. Put small screw back inside enclosure - See Figure F.1

7. Reattach data cable end back on the display enclosure and put the 2 outside screws back in. - See Figure F.2
Appendix G

Absolute Analog Calibration

The Analog outputs for your MPX unit are generated by four separate 12 bit resolution Digital to Analog Converters. This offers many possible output combinations, depending on the sensor configuration you have chosen.

Single Sensor Options:
1) A Single Sensor Width will be output on Analog A
2) A Single Sensor Dual Width system will be output on Analog A and Analog B
3) A Single Sensor Quad Width system will send outputs to Analog A, B, C, and D

Dual Sensor Options:
Dual Sensor, Single Width system will send outputs to Analog A (representing the portion of Sensor A that is covered; and Analog B to represent the portion of Sensor B that is covered.

NOTE: 0 represents sensor uncovered and 5V is fully covered. See Figure F.1.

Analog Output Voltage Gain:
Each Sensor will output approximately 5 Volts or (10 Volts with Analog Relay Card) when fully covered. The analog output of a sensor with one half of the emitter covered will produce a 2.5 Volt output. Notice that the size of the emitter will determine how many volts per inch of width you will get. Also the passline (distance from object to emitter face) and separation distance (distance from the receiver face to the emitter face) will affect sensitivity. Once the physical configuration of the sensors and measurement pass line is established your analog output will be very repeatable and accurate to (12 bits) 1 part in 4096.

Single Sensor Width Calibration Using Analogs (Optional):
You will need two samples of certified width between 60% and 80% of the maximum measurement range. A digital voltmeter with an accuracy of at least .2%.
1) Place a single sample of certified width in the measurement area of the sensor to be calibrated. Be sure to position the sample at the normal operating production pass line. (The distance from the emitter face will affect your calibration)
2) Measure the analog voltage produced by the certified sample and calculate the gain factor as follows: \[ \text{Gain} = \frac{\text{Certified Width}}{\text{Analog Volts}} \]
3) Enter this Gain Factor into your PLC with the formula, \[ \text{Width} = \text{Gain} \times \text{Analog} \]

Note: When calibrating for multiple strip widths, simply calibrate for one strip and use the same gain factor for all four. You can use a certified width sample near the average width you will be measuring.

Dual Sensor Width Calibration Using Analogs (Optional):
You will need two samples of certified width. One sample should be near the narrowest production expects to measure and the other near the maximum production width. You will also need a digital voltmeter with an accuracy of at least .2%.
1) Place your narrow sample in the measurement range between the two emitters at the production pass line position
2) Measure the voltage for Analog A and Analog B and add them together. Call this number ‘Analog Narrow’ aN
3) Place the wide sample into the measurement position.
4) Again measure Analog A and Analog B, and add them together. Call this number ‘Analog Wide’ aW
5) Calculate the Gain as follows: \[ \text{Gain} = \frac{(\text{Max Width} - \text{Min Width})}{(\text{aW} - \text{aN})} \]
6) Again place the Wide sample in the measurement position to determine the Offset (optical distance between the two Emitters).
7) Actual width = [Analog (Gain)] + Offset

8) Strip Centerline is available from A and B as: Centerline = (Analog A - B) x Gain

These formulae can easily be programmed into your PLC to simplify the calibration procedure. Calibration will not drift or change in any way unless the sensors are physically moved or the product pass line changes.