IMPORTANT NOTICE

SENSOR SETUP ROUTINE

AND

CALIBRATION VARIABLES

HAVE BEEN CHANGED

FOR

DUAL BR MODE

SEE DOCUMENT 2100029 REV C

NOTE: DURING CALIBRATION BOTH OF THESE VALUES HAVE TO BE THE SAME!

To complete, follow the normal calibration routine for the level one interface or the level four interface.

NOTE: TO BEGIN MEASURING PRODUCT ACCURETLY, THE PRODUCT THICKNESS MUST BE CHANGED TO MATCH THE THICKNESS OF THE PRODUCT TO BE MEASURED.

NOTE: THE THICKNESS OF THE CALIBRATIONS STANDARDS SETTING SHOULD NEVER BE CHANGED UNLESS YOU CALIBRATE WITH A DIFFERENT SET OF STANDARDS.

NOTE: THIS FIRMWARE CHANGE WILL BE INCLUDED IN 2100029 REV. C AND HIGHER E-PROMS LOCATED ON THE 3697172 MICRO BOARD.

2100029 Rev C

Thursday, June 14, 2001

New Features: **On fault (system has not seen 100 continues faults) the system will hold the last good analog value.**

Dual BR Mode:

User must enter the emitter to receiver spacing

***RS xxx.xx ? RS**

CAL 6778 entered after end to end LED spacing

User must enter the thickness of the Cal. Standards

***ST x.xxxx ? ST**

CAL 2001

User must enter the thickness of the product under test

***PT x.xxxx ? PT**

CAL 2002

Set Up Routine for DUAL BR

If using a level one interface enter the following

***RS xxx.xx, where xxx.xx is the distance in inches between the emitter and receiver**

***R4 xxx.xx, where xxx.xx is the distance in inches between the first LED of emitter A, and the last LED of emitter B**

If using a level four interface do the following

Go to CAL screen, enter 6778. Follow the instructions on the screen to enter the end to end LED spacing and the emitter to receiver spacing

Calibration Routine for DUAL BR

Both calibration standards should be of the same thickiness.

If using a level one interface do the following

First enter the thickness of your standards *ST x.xxxx

Next enter the thickness of your product *PT x.xxxx

If using a level four interface do the following

Go to CAL screen, enter 2001. Follow the instruction on the screen to enter the thickness of the calibration standards.

Go to CAL screen, enter 2002. Follow the instructions on the screen to enter the thickness of the product.

Description of changes for MPPU firmware 2100029E.HEX
Thursday, October 16, 2003

Overview: This version of firmware will allow the end user to use either the SPM25, SPM5 or our new SPM-E with new systems.

The user can now set up the SPM functions through the level 3 interface.

The user can now set up the new parameters for a Dual BR through the level 3 interface.

The SPM functions show up on the level one interface help screen.

The answer back function works for the SPM functions through the level one interface.

The current SPM settings show up on the Level 4 interface under the system button.

Operation and Functionality:

Level 3 interface: SPM configuration
Enter setup mode using the keypad
Press the "7" key and enter the passcode
You will first be prompted to enter the configuration for the SPMONE
The choices will scroll by and they are as follows:
0 = Off
1 = Using a model SPM25 or SPM5 display width readings
2 = Using a model SPM25 or SPM5 display deviation readings
3 = Using a model SPM-E display width readings
4 = Using a model SPM-E display deviation readings
After entering your choice you will be prompted for the SPMTWO configuration.
The choices are the same as for the SPMONE.
If a value is entered below 0 or above 4 a warning will be displayed and the setting will default to OFF.

Level 4 interface: SPM configuration
Press the MENU button on the main screen
Press the SETUP button
Press the COMM button and enter the access code "7777"
The following choices will be displayed:
0 = Off
1 = Using a model SPM25 or SPM5 display width readings
2 = Using a model SPM25 or SPM5 display deviation readings
3 = Using a model SPM-E display width readings
4 = Using a model SPM-E display deviation readings
Press the SETUP button to set the SPMONE settings or NEXT to skip
This process is repeated for the SPMTWO settings.
If a value is entered below 0 or above 4 a warning will be displayed and the setting will default to OFF.

Press the MENU button on the main screen
Press the SYSTEM button
The current SPM functions will be displayed on the lower part of the screen.

Level 1 interface: SPM configuration

*SPMONE[x] and *SPMTWO[x] CR LF will configure the SPM output

[x] =

0 = Off

1 = Using a model SPM25 or SPM5 display width readings

2 = Using a model SPM25 or SPM5 display deviation readings

3 = Using a model SPM-E display width readings

4 = Using a model SPM-E display deviation readings

?SPMONE and ?SPMTWO will return the current setting.

Level 3 interface: Dual BR setup

Using the keypad press the “9” key for SENSOR TYPE

You will be prompted to choose the sensor configuration

Choose “3” for Dual BR system

You will then be prompted to enter the end to end LED spacing between emitters

You will then be prompted to enter the distance from the emitter to the receiver

You will then be prompted to enter the thickness of the standards used in calibration

You will then be prompted to enter the thickness of the product being measured

After the initial setup you can change product thickness by pressing the “4” key

Note: during calibration the thickness of the standards and the product thickness must be the same value.

Description of changes for MPPU firmware 2100029I.HEX
Thursday, February 26, 2007

Overview:

Two new functions have been added to the firmware. A jumper can now be installed to determine how the RS232 will function on power up. If the jumper is not installed then it will be set into GET_FAST_OUTPUT mode, if there is a jumper installed then the unit will be set into IDLE mode. GET_FAST_OUTPUT mode will output continuous width readings to the RS232 port. IDLE mode, will wait for a user command before doing anything. A new Level one command has been added to allow the user to get one Width reading.

Map of JP6 jumpers

TOP of CPU board
1 -- 2 = center analog option
3 -- 4 = fault disable
5 -- 6 = SPC-1 on, SPC-2 off
7 -- 8 = stat pack enable
9 -- 10 = CoCen Guide on, Center Guide off
11 -- 12 = RS232 power up mode [used to be used for clear mode]
13 -- 14 = Remote Display
15 -- 16 = Level 3 Display
BOTTOM of CPU board

New Command: “?!” returns a single width reading.

Section Z
Multi-Purpose Processing Unit – Model MPPU
Hardware & RS-232 Customer Interface Operators Manual

Section Table of Contents

Z.1 Introduction

The SCAN-A-LINE™ Multi-Purpose Processing Unit with RS-232 Customer Interface – Model MPPU Level 1 {Figure Z.1-1} is an internally microprocessor-controlled processing device that utilizes up to eight co-processors to perform dimensional measurement in various applications. The Model MPPU also supplies power to the sensors and signal routing as well as basic dimensional measurement. Enclosed in a NEMA-type steel enclosure (standard), the Model MPPU provides power for up to two SCAN-A-LINE™ 10XAS-Series [Section C] or 10XBR-Series [Section G] sensors. The Model MPPU may interconnect with other Harris Instrument Corporation processing units [Model GPU – Section R for example] as well as programmable logic controllers (PLCs) and customer computers. The Model MPPU Level 1has no visual interface (i.e. display, keypad, etc.), but instead interfaces with a host computer (laptop, PC, minicomputer, or mainframe) via terminal emulation software. This section of the manual details the electrical connections, physical specifications and commands, queries and the operation of the RS-232 Customer Interface of the Model MPPU Level 1. Details on other interface system setup and configuration functions can be found in the interface section that is applicable to your unit [Model MPPU Level 2 – Section ZB, Model MPPU Level 3 – Section ZC or Model MPPU Level 4 – Section ZD].

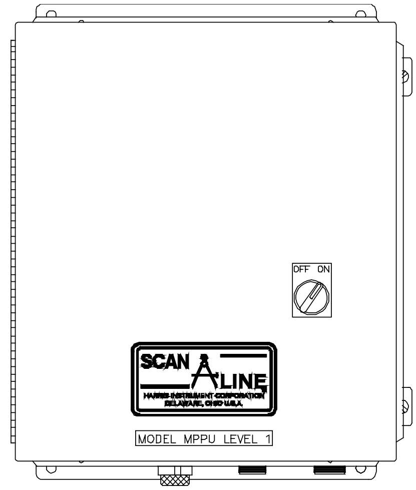


Figure Z.1-1: Model MPPU Level 1

Z.1.a Functional Description

The Model MPPU is designed to provide 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 & Binocular Receiver 10XBR-Series – Section G] are compatible with the Model MPPU. The +12VDC and -12VDC supplies, and an additional +5VDC regulated source, provide power for the on-board micro-controller as well as Harris Instrument Corporation approved optional circuits (such as a line driver or LCD Touchscreen – Level 4 Customer Interface [Section ZD]). Customer and internal connections with the Model MPPU are available on four six-position barrier strips (depending upon the types of options supplied with the Model MPPU) on the main board of the unit. Tags at the barrier strips specify the individual connections. Sensor connections are available on the bottom panel of the unit enclosure.

The Model MPPU RS-232 Customer Interface is connected through the remote interface serial communications port (RS-232-2) located on the micro-controller board inside the Model MPPU enclosure. See Section Z.15 for Drawing # 1398176 for the location of the micro-controller board and Drawing # 3695172 Rev. A for the location of the communications port on the micro-controller board. The Model MPPU RS-232 Customer Interface REQUIRES a host computer for configuration, set-up and output of the measurement readings; though if supplied with another interface, that interface can be used in conjunction with theRS-232 Interface. The computer can be any style from a mainframe to a portable. It must be able to communicate over a serial communications link (RS-232C default). All commands are entered with a terminal emulation software program, such as the Windows® HYPERTERMINAL program or commercial programs such as PROCOMM®. The Level 1 EPROM software ships as standard configuration software for operation with the Level 3 LED Display/Keypad interface [Section ZC] and the Level 4 LCD Touchscreen interface [Section ZD].

Z.1.b Features

The Model MPPU may be directly interfaced with SCAN-A-LINE™ Auto-Sync and Binocular Receiver sensors for real-time measurement and control applications. The micro-controller in the Model MPPU features:

- Battery-backed RAM – holds power for up to thirty days [Section Z.7.a].
- EEPROM memory backup – holds system settings even when battery-backed RAM does not [Section Z.7.a].
- One customer available communications port [Section Z.4.e] that can be formatted for a wide variety of protocols.
- Clock/calendar (displayed on Level 3 & Level 4 Customer Interfaces; Y2K compliant).

The standard Model MPPU contains:

- Three limit-sensing normally-open (*NO*) relays [Section Z.4.d] activated by the microprocessor automatically when an upper limit (HI relay) or lower limit (LO relay) is exceeded. The third relay (GO relay) is activated when measurements are within the upper and lower limits.
- Two analog outputs [Section Z.4.c], one deviation (±10VDC for target measurement) and one absolute (0-10VDC for absolute measurement).
- Two optional analog outputs [Centerline Analog for example MCA Option – Section ZK if applicable] are also available.
- Two optional analog inputs for analog linear position transducer or other analog device.
- One standard digital input for a line speed encoder is also supplied [Section Z.4.g] with digital inputs available [Section ZE if applicable].
- Serial Communications Measurement Output [Sections Z.4.e].
- One open-collector sensor FAULT output available [Sections Z.4.g].
- One of four customer interfaces {Table Z.1-1}.

Level	Description	Manual Section

Level 1	*RS-232 Customer Interface for Width & Passline Independent Width Measurement.*	*Z*
Level 2	*Windows® RS-232 Customer Interface for Width & Passline Independent Width Measurement.*	*ZB*
Level 3	*LED Display/Keypad Customer Interface for Width, Passline Independent Width & Thickness Independent Width Measurement.*	*ZC*
Level 4	*LCD Touchscreen Customer Interface for Width, Passline Independent Width, Thickness Independent Width & Dynamic Cut-to-Length Measurement.*	*ZD*

Table Z.1-1: Model MPPU Customer Interfaces

Z.1.c Manual Conventions

Throughout this manual section, there are many keyboard commands that will be used to signify command sequences. Different fonts will be used for the keyboard commands. The following table describes these commands and keystrokes.

Key	Description
SPACE	*Space Bar on host computer*
ENTER	*Enter Key on host computer*
*	*Command Sequence Start on host computer*
?	*Query Sequence Start on host computer*
←	*Backspace on host computer*
CAPS LOCK	*Caps Lock on host computer*
A	*Keystroke on host computer*
*S	*Communications Software Response*
	Mouse Action on Host Computer

Table Z.1-2: Manual Conventions

Z.1.d System Descriptions

The Model MPPU 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 MPPU 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.

Passline-Independent Width Measurement System

A Passline-Independent Width Measurement System (PIM System) provides accurate and consistent width measurement of opaque materials that have a variable product passline (distance between emitter face changes during operation). Consisting of a single or dual 10XBR-Series sensor system [Section G if applicable], these systems are typically used where strip “flutter” occurs or where the passline varies (on the rewind or payoff mandrel for example).

Thickness-Independent Width Measurement System

The Thickness-Independent Width Measurement System is only slightly different from a “standard” Width Measurement System in that the 10XAS-Series Sensors [Section C] are installed in the End Alignment configuration. This allows the system to ignore variations in product thickness, which normally cause measurement errors with 10XAS-Series sensors.

Multi-Strip Width Measurement System

The Multi-Strip Width Measurement System – MMA Option provides the ability to measure the width of up to four strips simultaneously. This type of system is supplied on an EVO (Engineering Variance Order) basis only because of the wide variations of application for multiple strip width measurement.

Dynamic Cut-Length Measurement System

The Model MPPU, in conjunction with 10XAS-Series sensors, can be applied to dynamic cut-length measurement for on-the-fly measurement of material length (DCLM System). Utilizing a line speed encoder, the Model MPPU can accurately determine the length of materials while they are transported over the sensors.

Z.2 Operational Considerations

The Model MPPU is designed to operate in an industrial environment and can readily tolerate average factory conditions. Commonsense considerations for protection and maintenance of the Model MPPU will ensure it's 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 MPPU, or anywhere on the process line where the Model MPPU is installed, disconnect ALL cables from the Model MPPU ***BEFORE*** *performing those operations. This prevents system overload by the current generated from welding.*

The Model MPPU 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 MPPU 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 MPPU and a line driver (LD Option) mounted in the processing unit used to power the sensors [typically a Model GPU Level 2 – Section R].

NOTE:

The Model MPPU is designed for operation within fifty linear cable feet [15.2m] of the sensors. Operations over fifty feet [15.2m] up to 4000 linear cable feet [1219m] MUST include a line receiver [LR Option – Section OO] in the Model MPPU and line driver [LD Option – Section OO] on the processing unit used to power the sensors [typically a Model GPU Level 2 – Section R].

Z.2.a Temperature Range

Operational temperatures should fall in the range from 32°F to 122°F [0°C 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 MPPU. 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 MPPU 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 MPPU are 85VAC to 264VAC at 47Hz to 440Hz. The power supply will automatically adjust for voltages between 85VAC and 264VAC with no jumpers or switch settings necessary. See Section Z.3.a for more information on system power specifications.

Z.2.d Unit Components

The Model MPPU consists of a minimum of seven (7) main components, with different levels of the processing unit having one or more components. The seven main components for the Model MPPU are:

Component Name	HIC Part Number
Enclosure –	*(depends upon unit level)*
Level 3 & 4	*4097105 Rev. A*
Level 1 & 2	*4097106 Rev. A*
Mounting Panel	*4098218*
Power Supply	*3900004*
Power Supply Fuse	*5500005*
Micro-Controller Board	*3695172 Rev. C*
Main Board	*3695123 Rev. C*
PIC Co-Processor Board	*3695124*
Video Pre-Processor –	*(depends upon application)*
Standard	*3698016*
Clear Materials Option	*3696173 Rev. A*

Table Z.2-1: Model MPPU Standard Components

NOTE:

The video pre-processor board may be different for specific applications (i.e. Clear Materials Measurement). Check the Sales Order and/or Configuration Sheet for more information.

Z.3 Specifications for the Model MPPU

The electronics for the Model MPPU are housed in a NEMA-type steel enclosure. All enclosures are painted with corrosive-resistant polane paint.

Z.3.a Power Supply Specifications

The standard power supply (Harris Instrument Part # 3900004) has UL1950 and CSA C22.2 safety approvals and meets FCC Class B conducted as well as VDE 0878 PT3 Class B EMI conducted noise limits. The power supply will automatically adjust for voltages between 85VAC and 264VAC with no jumpers or switch settings necessary. The power line is filtered to suppress power line transient noise and power line induced RF interference. Quick disconnect power line connections are made directly to the internal power line filter inside the Model MPPU enclosure.

The power supply for the Model MPPU is located under a red warning panel in the top-left corner inside the processing unit enclosure. The input power is fused with a 3.15Amp fuse (Littlefuse® .Part # V2163.15 or equivalent, Harris Instrument Part # 5500005). Short circuits to the regulated supplies will usually cause a thermal shutdown of the regulators without causing the fuse to blow. Some industrial power distribution systems can deliver voltages that fall outside these limits. This situation can be minimized by using a power drop that is separate from those supplying heavy equipment. Where wide fluctuation in power line voltages cannot be avoided, a Sola Line Regulating Transformer can overcome this problem. The CVS (sine wave) resonant types are effective. Most SCAN-A-LINE™s (single or dual) require less than 250VA.

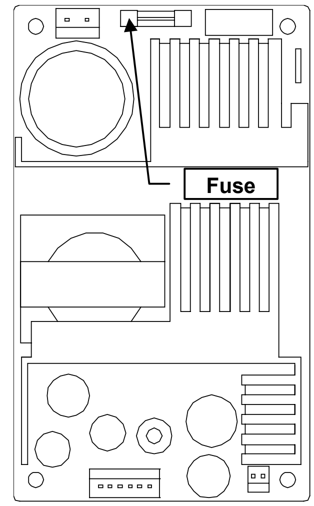


Figure Z.3-1: Power Supply Fuse

NOTE:

A good system earth ground can be helpful in reducing the possibility of interference from other electrical equipment. Care should be taken to insure that the SCAN-A-LINE™ earth ground is separate from the grounds used by other systems. This is most important when high current (ex. Welding, cutting, etc.) and high voltage are involved.

Z.3.b Power Output

All output power specifications are rated at 122°F [50°C] ambient temperature. There are customer connections for these power outputs on the Internal Power Connections power block. These power connections are available ONLY FOR HARRIS INSTRUMENT CORPORATION APPROVED ACCESSORIES (such as line drivers, strip detectors, etc.).

Maximum Power	*60 Watts*
Adjustment Range	*-5, +10% minimum*
Cross Regulation	*±2% on output 1, ±5% on outputs 2 & 3*
Hold-up Time	*20ms at 60 Watt load & 115VAC nominal line*
Overload Protection	*5.7 to 6.7VDC on main output*
Regulation	*+12VDC = ±5% at 25°C, -12VDC = ±5% at 25°C, +5VDC = ±2% at 25°C*
Maximum Load	*+12VDC = 3 Amp, -12VDC = 0.7 Amp, +5VDC = 7 Amp*
Ripple	*+12VDC = 120mV, -12VDC = 120mV, +5VDC = 50mV*

Table Z.3-1: Power Specifications for Universal Power Supply

NOTE:

All of the regulated supply voltages are momentary short circuit protected in the Model MPPU. Extended short circuit times may cause overheating and damage to the equipment. Input line power should be immediately removed from the Model MPPU when a short circuit is suspected.

Z.3.c Physical Dimensions

The Model MPPU is housed in a NEMA-type steel enclosure measuring 12 inches [305mm] wide by 14 inches [356mm] tall by 6 inches [152mm] deep and painted with corrosive resistant polane paint. The weight of the unit varies slightly with selected options but is approximately 15.5 pounds [7kg]. Sensor connections for 10XAS-Series and 10XBR-Series sensors are located on the bottom panel of the enclosure through 7-pin MS-style circular connectors [Section Z.4.a]. System power is connected through a IMC conduit cord grip located to the left of the sensor connectors on the bottom panel. Power lines attach to a Line Filter mounted on the inside-bottom panel of the unit [Section Z.4.f]. See the 1200000 Series drawings [Section Z.15] for more information on dimensions and connector locations. A four-pin connector [the Feature Connector – Section Z.4.b] on the bottom panel is for connecting a Model MPPU with another processing unit [such as Model PCPU – Section P] in an integrated measurement and control application.

Z.3.d Configurations

Option Name	Option Description	Section #
LD	*Line Driver for sensor signals (Note 1).*	OO
LR	*Line Receiver for sensor signals (Note 1).*	OO
Level 1	*RS-232 Customer Interface for host computer control (supplied at no charge with Level 3 & Level 4 interfaces).*	Z
Level 2	*Microsoft® Windows® software interface for host computer control (supplied only with EVO and customer specified software.*	ZB
Level 3	*LED Display/Keypad interface - installed local (on processing unit).*	ZC
Level 3/50	*LED Display/Keypad interface - installed remote.*	ZC
Level 4	*LCD Touchscreen interface - installed local (on processing unit).*	ZD
Level 4/50	*LCD Touchscreen interface - installed remote.*	ZD
MCI	*Optional Counter Input.*	ZE
MDI	*Optional Digital TTL Input.*	ZE
SPC-1	*Statistical Reporting via serial communications to DEC® LA-30N Serial Dot Matrix Printer (included). Also includes MTI Option.*	ZF
SPC-2	*Statistical Reporting via serial communications to host computer. Includes MTI Option.*	ZF
MSH	*Short-haul modem(s) for extending RS-232 measurement data output from fifty linear [15.2m] cable feet up to 4000 feet [1219m].*	ZG
UVP *EVP*	*Universal Video Pre-Processor Module* *Enhanced Video Pre-Processor Module.*	Z
MTI	*Tachometer input for line speed used in Graph Update - supplied with Harris Instrument Corporation specified tachometer*	ZJ
MCA	*Centerline position analog output (Note 2)*	ZK
MMA	*Multiple-strip measurement analog outputs (4 total) (Note 2)*	ZL
SPM	*RS-232 serial communication to panel meter - software only; For Level 4 interface only (Includes Model SPM-5 or SPM-25)*	EE or FF

Table Z.3-2: Optional Configurations for Model MPPU

NOTE 1:

The LD & LR Options are necessary if the sensors are located over fifty linear cable feet [15.2m] from the Model MPPU. 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 MPPU for receiving the sensor signals driven from the Model GPU.

NOTE 2:

Not all options are available on one unit. Review applicable sections for more information.

Z.3.e Video Pre-Processors

There are currently two Video Pre-Processors available for the Model MPPU, the choice of which is dependent upon the application for the Model MPPU. Single-sensor and dual-sensor systems used with the Model MPPU will utilize the Universal Video Pre-Processor – UVP Module for the initial processing of the incoming video signal from either Auto-Sync 10XAS-Series or Binocular Receiver 10XBR-Series sensors. The other Video Pre-Processor board is the Enhanced Video Pre-Processor – EVP Module for operation with single-sensor or dual-sensor systems that utilize the Clear Materials Option (CLR Option) of the 10XAS-Series sensor, as well as in high light interference environments for suppression of ambient light problems.

A video pre-processor, by its nature, is designed to condition the incoming video signal(s) from the sensor(s) to detect the various edges of the materials as represented in the digital video signal (for more information on video signals, review Section C for 10XAS-Series sensors or Section G for 10XBR-Series sensors). Typically, a 10XAS-Series single-sensor centerline guide system should detect two and only two edges when sensing edges on a single strip (multiple strip systems may detect up to eight edges on a single sensor). Dual-sensor 10XAS-Series systems generally detect one edge per sensor on a single strip, with up to four edges detected on a multiple strip system. Conversely, a single-sensor 10XBR-Series sensor system should detect four edges on a single strip while a dual-sensor 10XBR-Series sensor system would detect two edges per sensor on a single strip (multiple strip sensing is not applicable to the 10XBR-Series sensor). In all of these cases, detecting less edges or more edges than expected by the Video Pre-Processor would cause a sensor video FAULT condition to alert the operator of possible contamination or blockage of the sensor viewing area or the possibility of the strip running outside of the sensor viewing area.

UVP Module

The Universal Video Pre-Processor – UVP Module (Harris Instrument Corporation Part #3698016) operates with either Auto-Sync – 10XAS-Series sensors [Section C] or Binocular-Receiver – 10XBR-Series sensors [Section G]. It will detect the edges of the strip(s) based upon the setup and configuration of the board. The UVP Module has eight two-pin jumpers (Jumpers J1 through J8) for inverting the sensor signals. These settings SHOULD NOT BE CHANGED by the operator unless under specific instructions from Harris Instrument Corporation personnel. Also on the board are two other two-pin jumpers (Jumper Set DUAL/SINGLE) for determining the number of sensor video signals that the Model MPPU is processing. A dual-sensor system is configured with the DUAL jumpers while a single-sensor system is configured with the SINGLE jumper. See drawing # 1498016 in Section Z.15 for additional jumper information.

Sensor Type	Application	#/Edges per Sensor	Sensor Mode Jumper
10XAS	*One Strip Edge Guide*	*1*	*SINGLE*
10XAS	*One Strip Centerline Guide or Measurement on One Sensor*	*2*	*SINGLE*
10XAS	*Two Strip Measurement on One Sensor*	*4*	*SINGLE*
10XAS	*Two Strip Measurement on Two Sensors*	*2*	*DUAL*
10XAS	*Three Strip Measurement on One Sensor*	*6*	*SINGLE*
10XAS	*Three Strip Measurement on Two Sensors*	*3*	*DUAL*
10XAS	*Four Strip Measurement on One Sensor*	*8*	*SINGLE*
10XAS	*Four Strip Measurement on Two Sensors*	*4*	*DUAL*
10XBR	*One Strip Edge Guide*	*2*	*SINGLE*
10XBR	*One Strip Measurement on One Sensor*	*4*	*SINGLE*
10XBR	*One Strip Measurement on Two Sensors*	*2*	*DUAL*

Table Z.3-3: Edges Expected by UVP Module Video-Pre-Processor (See Figure Z.3-2)

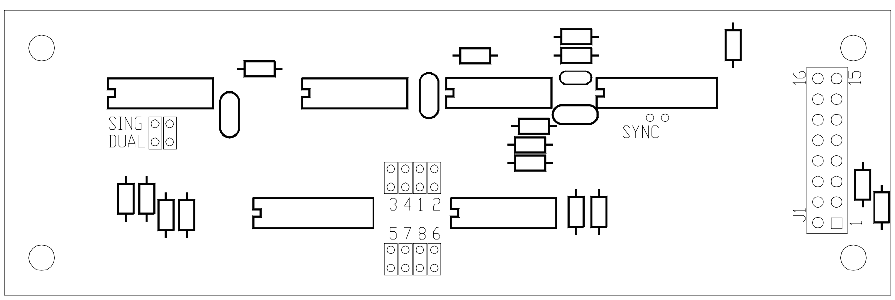


Figure Z.3-2: Universal Video Pre-Processor Board Jumper Locations – Part # 3698016

CAUTION:

Re-configuring this Video Pre-Processor can cause inaccurate measurements and/or gage performance. ANY re-configuring of this module should be performed only by Harris Instrument Corporation approved personnel. Contact Harris Instrument Corporation Service or Engineering for more information.

EVP Module

Many times, the UVP Module is not viable for certain conditions or applications. When the Clear Materials Option – CLR Option of the 10XAS-Series sensor is used with the Model MPPU or when intense ambient light conditions (such as strobe lights too near the sensor) interfere with the SCAN-A-LINE™ sensor, the Enhanced Video Pre-Processor – EVP Module (Harris Instrument Corporation Part # 3696173 Rev. A) is installed to compensate for these non-typical conditions. The special circuitry of the EVP Module allows the Model MPPU to recognize the first and last edge of clear materials as well as filtering out extraneous noise that can be caused by intense ambient light conditions.

The EVP Module has two sets of two three-pin, two-position jumpers, one set for selecting the number of edges detected by the Model MPPU for video FAULT and one set for selecting the fashion in which such edges are detected. Typically, these jumpers are set from the factory and will not need to be changed unless required by Harris Instrument Corporation Service personnel (See drawing # 1496173 Rev. A in Section Z.15 for additional jumper information). There are two operational modes, and one diagnostic mode, for the EVP Option board.

Mode One: Diagnostics

This mode is for diagnostic purposes only and is used for the detection of opaque materials. The video signal output is normal and the sensor FAULTs operate as described in Section Z.4.g except that sensor FAULTs up to 100 will be displayed as transient sensor FAULTs and over 100 will be displayed as a hard sensor FAULT. The RS-232 output will also register a hard sensor FAULT. This is typically the only mode where jumpers JFA & JFB are installed.

Mode Two: First Edge

This is the First Edge video mode of this option for operation with transparent, translucent or loosely-woven materials. It will detect the first detected edge of the material and ignore any other edges (such as would be caused by printing or wrinkles). Sensor FAULT s will be ignored up to 100 (displayed as transient FAULTs) and after 100 FAULTs, the display will update normally, the FAULT open collector will activate and the HI/LO/GO relays will open. The RS-232 output will also register a hard sensor FAULT. This mode will only operate on dual-sensor systems with the 10XAS-Series sensor.

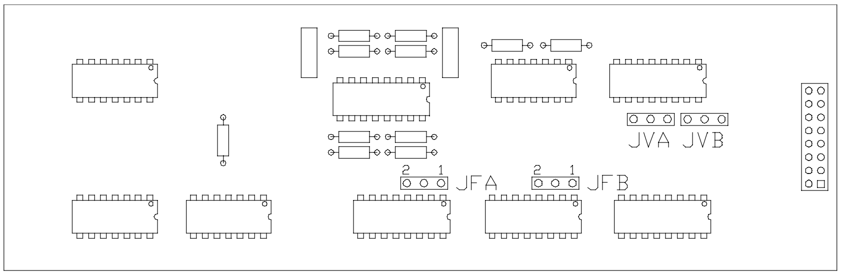


Figure Z.3-3: Enhanced Video Pre-Processor Board Jumper Locations

Mode Three: Filtered Video

This is the Filtered Video mode for operation with transparent, translucent or loosely-woven materials, as well as for high light interference environments. This mode will filter the video signals to ensure that the edges are properly detected. Sensor FAULTs up to 100 will be displayed as transient FAULTs and over 100 will indicate a FAULT on the open collector and will open the GO relay. The display will update normally. The RS-232 output will also register a hard sensor FAULT. This mode operates with single- or dual-sensor systems with the 10XAS-Series sensor (or in some cases, 10XBR-Series sensors for alleviation of light interference).

CAUTION:

Using Model Two or Mode Three in a control application could be hazardous if the relay outputs and open collector FAULT output are not properly monitored.

Mode	Number of Sensors	#/Edges per Sensor	FAULT Jumper
1 – Normal	Single 10XAS-Series Edge Guide	1	JFA-1
	Single 10XAS-Series Centerline Guide or Measurement	2	JFA-2
	Dual 10XAS-Series Centerline Guide or Measurement	1	JFA-1, JFB-1
2 – First Edge	Single 10XAS-Series Edge Guide	1	JFA, JFB Open
	Single 10XAS-Series Centerline Guide or Measurement	2	JFA, JFB Open
	Dual 10XAS-Series Centerline Guide or Measurement	1	JFA, JFB Open
3 – Filtered	Single 10XAS-Series Edge Guide	1	JFA, JFB Open
	Single 10XAS-Series Centerline Guide or Measurement	2	JFA, JFB Open
	Dual 10XAS-Series Centerline Guide or Measurement	1	JFA, JFB Open

Table Z.3-4: JFA & JFB Jumper Settings for the EVP Module

Jumpers JVA & JVB

Sensor Scanning Direction	Sensor System	Direction Jumper
Outside Edges of Material Inwards	Dual 10XAS-Series	JVA-, JVB-
Inside of Material to Outside Edges	Dual 10XAS-Series	JVA+, JVB+

Table Z.3-5: JVA & JVB Jumper Settings for the EVP Module

CAUTION:

Re-configuring this Video Pre-Processor can cause inaccurate measurements and/or gage performance. ANY re-configuring of this module should be performed only by Harris Instrument Corporation approved personnel. Contact Harris Instrument Corporation Service or Engineering for more information.

Z.3.f FAULT Logic

The Model MPPU 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. A typical dual 10XBR-Series sensor system would see two edges per sensor, while a single 10XBR-Series sensor system would see four edges. More edges in a single scan than is expected by the video pre-processor [Section Z.3.e] indicates that foreign material may be interfering with the normal edge position detection. Ambient light interference from strobe lights can also cause a similar problem.

A single (or transient) VIDEO or SYNC FAULT condition on the sensor (or sensor pair in a dual-sensor system) will cause the Level 3 and Level 4 customer interfaces to display a Sensor FAULT (or SYNC FAULT) message on the interface. A series of 100 consecutive VIDEO or SYNC FAULT conditions will cause the all versions of the Model MPPU to hold the last good measurement reading to the customer interface, the limit-sensing relays will open, the serial communications will output a FAULT warning (either sensor A, sensor B, sensor A & B and/or SYNC), the FAULT open collector will switch to ON (open collector switches to GROUND for a FAULT condition) and all analogs will revert to a neutral state (example: Absolute unipolar voltage will go to zero). Review the applicable customer interface sections [RS-232 Customer Interface – Section Z.10, Level 2 Windows® Software – Section ZB, Level 3 LED Display/Keypad – Section ZC, Level 4 LCD Touchscreen – Section ZD] for more information on sensor FAULT display.

Disabling FAULT Logic

The FAULT logic in the Model MPPU can be disabled by the operator. This can be used for many reasons, such as clear material edge detection problems. Disabling the sensor FAULT promotes hazardous conditions and should only be used by experienced, trained operators.

CAUTION:

Disabling the FAULT logic can possibly cause a hazardous steering (for centerline applications – MCA Option) or inaccurate measurement events or control conditions, as the processing unit will never register a sensor FAULT and will continue guiding, controlling and/or measuring on a possibly incorrect sensor signal. Caution should be used when disabling the FAULT logic and all personnel operating the Model MPPU should be made aware of the lack of sensor FAULT warning.

To disable FAULT logic, install a jumper on JP6 – pins 3-4 on the 3695172 Rev. C micro-controller board. With FAULT disabled:

All measurement readings are output (or displayed), whether valid or not;
Limit Relays will NOT change because of a FAULT;
FAULT warnings will NOT be downloaded via the RS-232 communications link;
Analogs will NOT revert to a neutral state during a FAULT condition;
Open Collector FAULT output will NOT switch ON.

Z.4 Installation

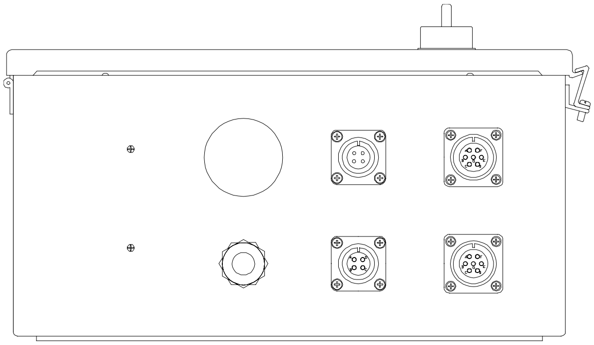


Figure Z.4-2: Typical Model MPPU Level 1 Bottom Panel Connections

The Model MPPU provides up to twenty-four customer connections for power, analog output, limit relay contact closures and digital input/output. Depending upon configuration of the Model MPPU, some or all of these connections may be utilized and many are routed to MS-style circular connectors on the bottom panel of the unit.

Mount the Model MPPU vertically, with the cable and power connections pointed towards the floor. The Model MPPU requires a good ground, so be sure to use the three-prong power cord for connecting system power. If running the power through conduit, ensure that the system power has an adequate ground.

Inspect all cables that will connect with the Model MPPU. Verify that the connectors are free of foreign materials and check the number of pins on each connector. Typically, the Model MPPU will connect seven-pin emitter cables for 10X-Series sensors. Processor interconnection cables, such as used to route the sensor signals from the Model MPPU to another controller (such as a Model GPU), are typically connected through the four-pin or six-pin feature connector on the bottom panel. Connect the proper cable(s) to the appropriate MS-style circular connector(s) on the bottom panel of the Model MPPU {See Figure Z.4-1}. Check the accompanying sensor manual(s) for more information on connecting sensor cables.

Z.4.a Sensor Connection

Inspect all sensor cable(s) that will connect with the Model MPPU. Verify that the connector(s) are free of foreign materials and check the number of pins on each connector. Check the cable(s) for physical damage (cuts or splits in insulation, malformed connectors, etc.).Typically, the Model MPPU will connect male 7-pin MS-style circular connectors on the emitter-to-processing unit cables for 10XAS-Series and 10XBR-Series sensors to the bottom panel of the unit.

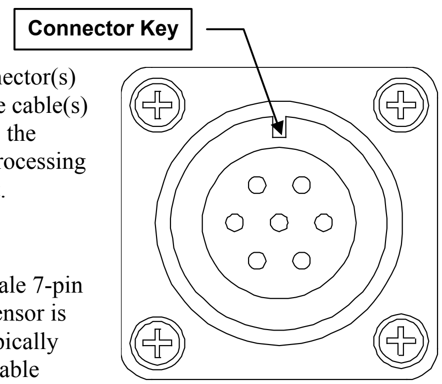


Figure Z.4-2: Typical Emitter Connector

Single-Sensor Systems

A single-sensor 10XAS-Series or 10XBR-Series system attaches to the upper-right female 7-pin circular MS-style connector on the bottom panel of the Model MPPU. Typically, this sensor is called Sensor A. The connector is keyed to insert in only one direction, with the key typically facing toward the front (door) of the processing unit for the processing unit end of the cable {Figure Z.4-2}. The key faces toward the top of the emitter on the emitter end of the cable.

Be sure that the power to the processing unit is OFF. Insert the female 7-pin end of the emitter-to-processing unit cable into the emitter male 7-pin circular connector on Sensor A and tighten securely. Insert the emitter-to-processing unit cable into the top-right female 7-pin circular MS-style connector (Figure Z.4-3) on the bottom panel of the processing unit, in the proper orientation, and tighten securely.

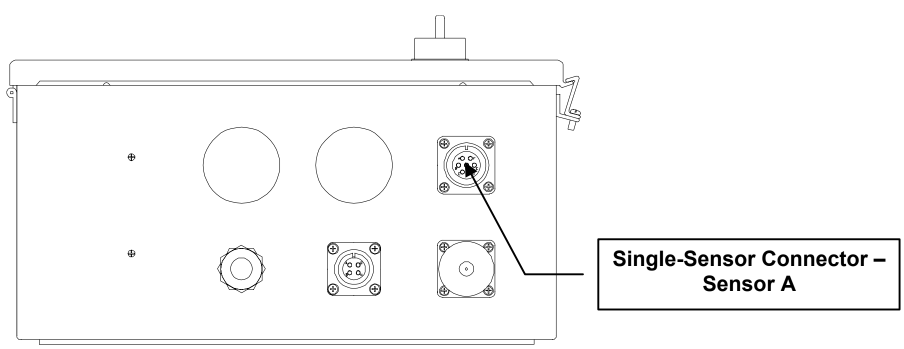


Figure Z.4-3: Model MPPU Level 1 Single Sensor Connection

Dual-Sensor Systems

With a dual-sensor 10XAS-Series or 10XBR-Series, one sensor is designated as Sensor A and one sensor is Sensor B. These sensors attach to the female 7-pin circular MS-style connector son the bottom panel of the Model MPPU {Figure Z.4-4}. Sensor A attaches to the upper-right connector. Sensor B attaches to the lower-right connector. Both connectors are keyed to insert in only one direction, with the key typically facing toward the front (door) of the processing unit on the processing unit end of the cable {Figure Z.4-2}. The key faces toward the top of the emitter on the emitter end of the cable.

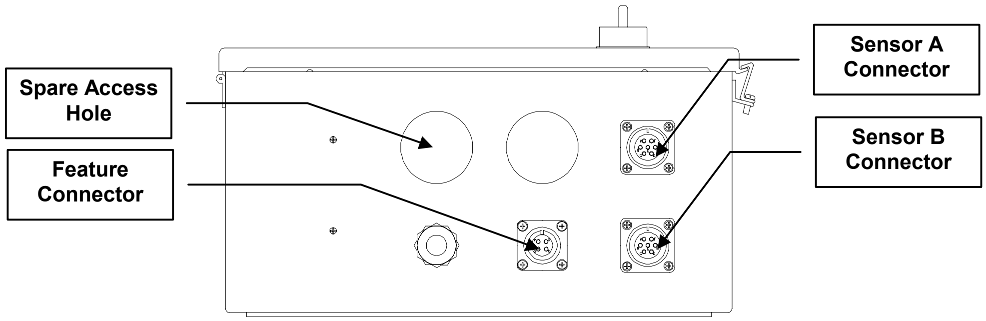


Figure Z.4-4: Model MPPU Level 1 Dual-Sensor Connections

Be sure that the power to the processing unit is OFF. Insert the female 7-pin end of the emitter-to-processing unit cable for Sensor A into the emitter male 7-pin circular connector on Sensor A and tighten securely. Insert the Sensor A emitter-to-processing unit cable into the upper-right female 7-pin circular MS-style connector on the bottom panel of the processing unit, in the proper orientation, and tighten securely. Repeat this for Sensor B, except to connect the processing unit end of the cable into the lower-right connector.

Remote Sensor Mounting

In some instances, the Model MPPU must be located over fifty feet [15.2m] from the sensors. For these applications, the General Processing Unit – Model GPU Level 2 is used with a Line Receiver (LR Option) in the Model MPPU to drive the sensor signals over long distances. In these cases, sensor connections are made to the line receiver board. See Section OO for more information on the Line Driver/Line Receiver Options.

Z.4.b Processor Interconnection – Feature Connector

Processor interconnection cables (or Feature Connector), used to route the sensor signals from the Model MPPU to another processing unit (such as a Model GPU or a Model MPPU), are typically connected through the female 4-pin MS-style circular Feature Connector on the bottom panel of the Model MPPU {Figure Z.4-4}.

Z.4.c Analog Outputs

The Model MPPU is designed to output up to four various analog signals {Figure Z.4-5 on next page}. These signals can be either deviation or absolute analog (bipolar or unipolar) voltages.

Dimensional Control Analog

The Dimensional Control Deviation Analog Output provides an bipolar analog voltage proportional to the deviation of the actual measurement from the target value. The target is entered by the operator with the applicable customer interface. Optionally, the target can be set from a host computer via RS-232-2 communication port in the Model MPPU. In either case, the maximum analog output voltage will be ±10 volts for a deviation of X inches (operator entered value) from the target value. Deviation analogs are useful for strip-chart recording of a process variation. Many PLC-based systems can use a deviation analog for closed-loop control applications. Review the individual interface sections [Sections Z.10, ZB, ZC & ZD] for instructions on setting the deviation analog. Once those procedure is followed, it may be necessary to fine tune the deviation analog output with the main board potentiometer R5 to achieve an accurate deviation analog output. The typical deviation analog output supplied with the Model MPPU is accessible by the customer at the Customer Connections Terminal Strip TB4 (Tag Y4) at position Y4-2.

Absolute Measurement Analog

The Absolute Measurement Analog Output provides 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. The absolute analog settings have a zero point and a span setting so the operator may define the 0VDC measurement and the 10VDC measurement. 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 individual interface sections [Sections Z.10 ZB, ZC & ZD] for instructions on setting the absolute analog. Depending upon the customer interface supplied with the unit reflects the exact commands for each operation. The typical absolute analog output supplied with the Model MPPU is accessible by the customer at the Customer Connections Terminal

Strip TB4 (Tag Y4) at position Y4-5.

NOTE:

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

Optional Analog Outputs

There are two optional analog outputs on the Model MPPU. The output at terminal block Y4-3 (TB4-3) is typically a ±10VDC deviation (bipolar) analog and is available as a Centerline Position Analog (MCA Option) or via an Engineering Variance Order (EVO). Refer to any accompanying EVO documentation for more information on this output.

The output at terminal block Y4-4 (TB4-4) is typically an optional 0-10VDC absolute (unipolar) analog and is only available via an EVO or custom system. Refer to any accompanying EVO documentation for more information on this output.

Multi-Strip Analog Outputs

When the Model MPPU is used in a Multi-Strip Width Measurement System, up to four absolute analog outputs are required for the analog measurement outputs of the four individual strips. Refer to any EVO documentation for multi-strip measurement that accompanies this manual.

NOTE:

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

Pin #	Tag #	Typical Usage	Typical Designation
TB4-1	*Y4-1*	***COM:*** *COMMON*	*COMMON*
TB4-2	*Y4-2*	***ANALOG OUT 1:*** *Deviation Analog-Bipolar (±10VDC @ 10mA max) Output*	*Dimensional Control*
TB4-3	*Y4-3*	***ANALOG OUT 2:*** *Custom Analog Output*	*Optional*
TB4-4	*Y4-4*	***ANALOG OUT 3:*** *Custom Analog Output*	*Optional*
TB4-5	*Y4-5*	***ANALOG OUT 4:*** *Absolute Analog-Unipolar (0VDC - 10VDC @ 10mA max) Output*	*Absolute Measurement*
TB4-6	*Y4-6*	***COM:*** *COMMON*	*COMMON*

Table Z.4-1: Analog Output Customer Internal Connections

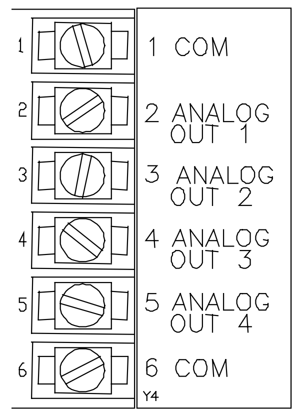


Figure Z.4-5: Customer Analog Output Connections

Analog Output Cables

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

Z.4.d Limit Relays

There are three sets of relay contact closures located on the main board inside of the Model MPPU enclosure {Figure Z.4-6}. These relay contacts rated at 230VAC 5Amp (100VDC) each into a resistive load. *No internal snubbing circuitry is provided for these connections*. It is suggested that any switching be done with shielded low voltage lines inside the Model MPPU with the higher voltage relays located external to the processing unit.

NOTE:

The use of high voltage to the relays inside the Model MPPU can cause high amounts of Radio Frequency Interference (RFI). It is recommended that low voltage lines be used with an external high voltage relay.

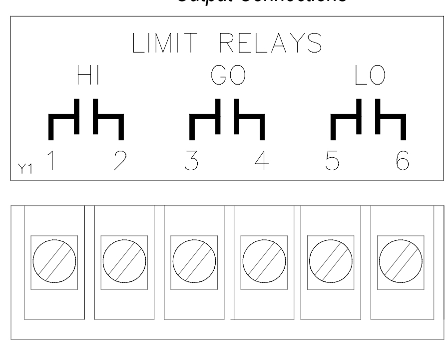


Figure Z.4-6: Customer Relay Connections

Pin #	Tag #	Description
TB2-1	*Y1-1*	*Upper Limit (HI) Normally Open [N.O.] Relay Contact, 230VAC @ 5AMP Max, 100VDC*
TB2-2	*Y1-2*	*Upper Limit (HI) N.O. Relay Contact, 230VAC @ 5AMP Max, 100VDC*
TB2-3	*Y1-3*	*GO N.O. Relay Contact, 230VAC @ 5AMP Max, 100VDC*
TB2-4	*Y1-4*	*GO N.O. Relay Contact, 230VAC @ 5AMP Max, 100VDC*
TB2-5	*Y1-5*	*Lower Limit (LO) N.O. Relay Contact, 230VAC @ 5AMP Max, 100VDC*
TB2-6	*Y1-6*	*Lower Limit (LO) N.O. Relay Contact, 230VAC @ 5AMP Max, 100VDC*

Table Z.4-2: Limit-Sensing Relay Internal Connections

HI/GO/LO Relays

These relays are Normally-Open (NO) contact closures. The HI (upper) and LO (lower) relays will *CLOSE* when either limit is reached. Limits are set with the applicable customer interface. The GO (within limits) relay is also a Normally-Open (NO) contact closure, also open during normal operation.

Limit Relay Cables

Access to the limit relay cables are on the internal barrier strip with the label RELAYs. The HI (upper) relay is on Y5-1 & Y5-2. The LO (lower) relay is accessed on Y5-5 & Y5-6. The GO (within limits) relay is on Y5-3 & Y5-4. These connections can be accessed through the spare access hole on the bottom panel of the Model DCPU enclosure {Figure Z.4-4}. Cables for the limit relays are not supplied with the unit.

Z.4.e Serial Communications

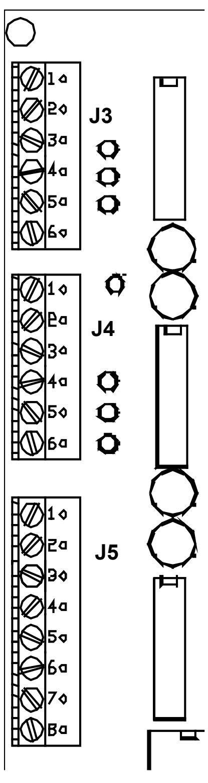


Figure Z.4-7: Model MPPU Serial Communications Ports

The Model MPPU is designed with three serial communications ports. Connections for all three is located on the micro-controller board (Part # 3695172 Rev. C). Access to these connections can be made via the spare access holes on the bottom panel of the processing unit. See Section Z.11 for RS-232 Customer Interface commands, queries and functions.

The Model MPPU has one dedicated serial communications output port (RS-232-2 or J3 in Figure Z.4-7) for measurement data output. In RS-232 and Level 2 Windows® Software Customer Interfaces, this port is also used for control of the unit by a host computer. On Level 3 and Level 4 customer interfaces, this port is utilized to output the measurement data from the Model MPPU.

The Level 3 and Level 4 Model MPPUs can also be interfaced via terminal emulation (RS-232 commands on communications port RS-232-2) in addition to the LCD Touchscreen or LED Display/Keypad interface on RS-232-0 (J5 in Figure Z.4-7). Note that multiple interfaces can also be run from the Model MPPU, with the ***local interface always taking precedence while in SETUP mode***. The Model MPPU can also be optionally configured for extended RS-232 communications with short-haul modems [Section ZG].

The serial communications for the Model MPPU terminal emulation is based upon the *DEC VT-100 (ANSI) terminal emulation for the IBM PC®* for RS-232 communications. The RS-232 output communications port operates as the DCE, with the host computer as the DTE. Any ANSI terminal emulator will probably function with the Model MPPU as a terminal emulator, as well as many commercial communications software packages (such as PROCOMM®).

Communications protocol for the serial output are RS-232C ASCII, six-characters with a decimal point, space padded with a carriage-return and line feed in a **10-bit frame** running:

No Parity, Eight Data Bits and One Stop Bit (N,8,1)
with One Start Bit.

The communications can be set for a baud rates of (underlined is factory default):

1200bps, 2400bps, 4800bps, <u>9600bps</u>, 19200bps.

Serial communications port RS-232-1 (J4 in Figure Z.4-7) and RS-232-2 (J5 in Figure Z.4-7) 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.

RS-232 Communications Jumper

The Model MPPU requires a jumper wire to be run from J4-4 (DTR) to J5-4 (CTS) on the Micro-Controller Board (Refer to Drawing # 1495172 Rev. C in Section Z.15) for the operation of RS-232 [Section Z.10] and Level 2 [Section ZB] Customer Interfaces. This jumper should be installed from the factory on all Model MPPU Level Ones & Twos. If a communication problem is experienced with the operation of these Customer Interfaces, verify that this jumper is in place.

Extended Serial Communications

Typically, the serial communications output for the Model MPPU 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). See Section ZG for more information.

NOTE:

Serial communications for the Model MPPU is limited to seventy-five linear cable feet [22.8m]. For operation to 4000 linear cable feet [1219m], the MSH Option [Section ZG] short-haul modem is required.

Communications Cable – RS-232-2

The RS-232-2 output communications port operates as a DCE, with the host computer as the DTE. This port is typically used with the RS-232 Customer Interface or Level 2 Customer Interface for connection to a host computer. It is also used for data output from a Level 3 or Level 3 Customer Interface. The pin configuration for the Model MPPU end of a remote connection cable are:

Position #	Description	Code	Notes
1	Ground	GND	Data COMMON
2	Receive	RX	TX connection on host computer
3	Transmit	TX	RX connection on host computer
4	Data-Terminal Ready	DTR	High Level when power is applied to unit
5	RS-485-A	N/A	Only used with 485 Option
6	RS-485-B	N/A	Only used with 485 Option

Table Z.4-3: Pinouts for Model MPPU RS-232-2 (J3 in Figure Z.4-7) Connector

Communications Cable – RS-232-1

The RS-232-1 output communications port operates as a DCE, with the host computer as the DTE. This port is typically utilized for the SPC Options [Section Z.F], Serial Panel Meters (SPM Options) or for a secondary customer interface. The pin configuration for the Model MPPU end of a remote connection cable are:

Position #	Description	Code	Notes
1	Ground	GND	Data COMMON
2	Receive	RX	TX connection on host computer
3	Transmit	TX	RX connection on host computer
4	Data-Terminal Ready	DTR	High Level when power is applied to unit
5	RS-485-A	N/A	Only used with 485 Option
6	RS-485-B	N/A	Only used with 485 Option

Table Z.4-4: Pinouts for Model MPPU RS-232-1 (J4 in Figure Z.4-7) Connector

Communications Cable – RS-232-0

The RS-232-0 output communications port operates as a DCE, with the host computer as the DTE. The pin configuration for the Model MPPU end of a remote connection cable are:

Position #	Description	Code	Notes
1	Ground	GND	Data COMMON
2	Receive	RX	TX connection on host computer
3	Transmit	TX	RX connection on host computer
4	Clear-to-Send	CTS	High Level when power is applied to unit
5	RS-485-A	N/A	Only used with 485 Option
6	RS-485-B	N/A	Only used with 485 Option
7	Data-Terminal Ready	DTR	Used with Level 3 & Level 4 Customer Interfaces
8	Ground	GND	COMMON

Table Z.4-5: Pinouts for Model MPPU RS-232-0 (J5 in Figure Z.4-7) Connector

Z.4.f AC Power

Information on the AC Power requirements for the Model MPPU can be found in Section Z.3.a of this manual. This section deals with internal AC Power connections and the power cable (cord).

Internal AC Power

Internal power connections are available for +12VDC, -12VDC and +5VDC on a barrier strip located on the top of the main board inside the Model MPPU enclosure {Figure Z.4-9}. These connections are available for HARRIS INSTRUMENT CORPORATION APPROVED ACCESSORIES ONLY. Short-haul modems, line speed encoders and sensor signal line drivers are a few of the possible accessories. Please contact Harris Instrument Corporation for more information on approved accessories.

AC Power Cable

The Model MPPU comes standard with an three-prong AC power cord for 115VAC operation. The internal power supply is capable of operating with voltages ranging from 85VAC to 264VAC. Figure Z.4-8 shows the wire connections to the line filter located on the inside-bottom panel of the Model MPPU enclosure. If replacing the standard 115VAC three-prong power cord with conduit or a 220VAC power cord, BE SURE THAT THE LINE AND NEUTRAL CONNECTIONS MATCH FROM THE POWER SOURCE SIDE TO THE POWER SUPPLY SIDE OF THE LINE FILTER!

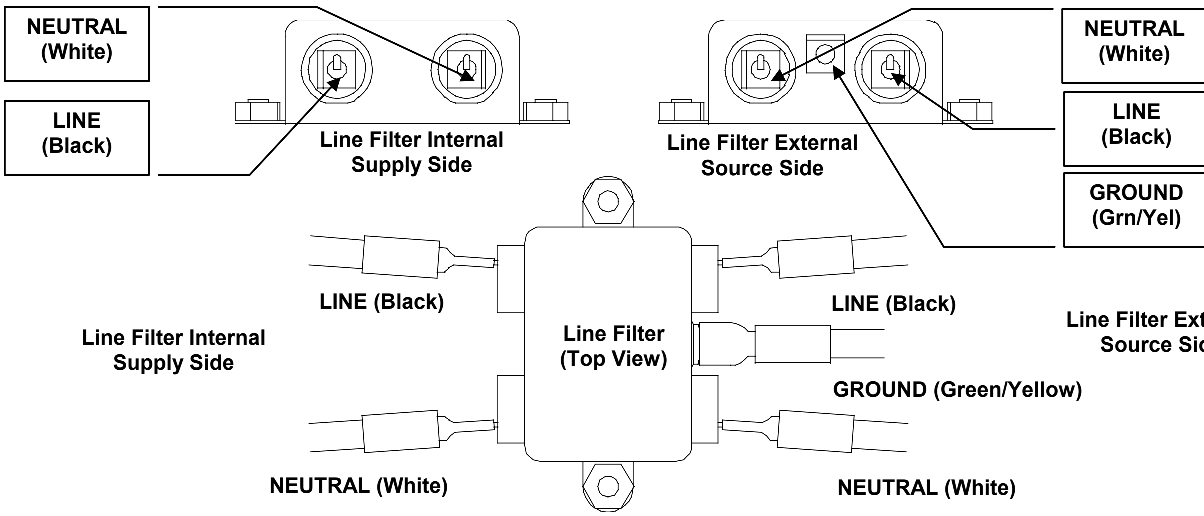


Figure Z.4-8: Line Filter for AC Power Connection in Model MPPU

Pin #	Tag #	Description
TB1-1	*Y2-1*	*COMMON*
TB1-2	*Y2-2*	*-12VDC @ 0.7Amp Max*
TB1-3	*Y2-3*	*+12VDC @ 3Amp Max*
TB1-4	*Y2-4*	*+5VDC @ 7Amp Max*
TB1-5	*Y2-5*	*+5VDC @ 7Amp Max*
TB1-6	*Y2-6*	*COMMON*

Table Z.4-6: Internal Power Connections

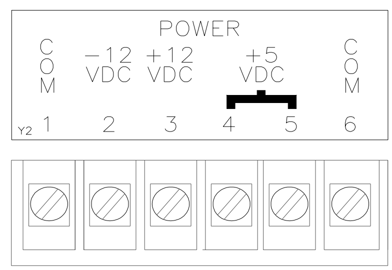


Figure Z.4-9: Internal Power Connections

Z.4.g Digital Inputs & Open-Collector Output

There is one digital input for a line speed encoder, three optional digital input connections and one open collector output available on the main board inside the Model MPPU enclosure {Figure Z.4-10 next page}. The optional digital inputs are available for product detectors, digital linear transducers, or other digital input devices as configuration options. Depending upon configuration of the Model MPPU, some or all of these inputs may be used.

NOTE:

Open-Collector Inputs for special or custom Model MPPUs may have inputs other than those listed.

FAULT Open-Collector Output

The open collector output for the Model MPPU is designed to sink up to 500mA and is rated at 50VDC. If the Model MPPU is used in any type of control system, it is highly recommended that the FAULT open-collector output is constantly monitored to inform the operators of a sensor FAULT incident.

Line Speed Encoder (Tachometer) Input

One digital input (Y3-4) is designed for a line speed encoder with 5V TTL @ 100kHz. maximum. The suggested Line Speed Encoder (Tachometer Input Option – MTI Option) is the Encoder Products ACCU-CODER™ Model 711-0. See Section ZJ for more information on the attachment of the line speed encoder.

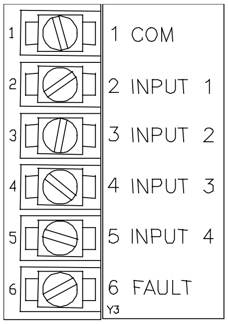


Figure Z.4-10: Customer Digital Input Connections

NOTE:

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

Pin #	Tag #	Typical Usage	Typical Designation
TB3-1	*Y3-1*	***COM:*** *COMMON*	*COMMON*
TB3-2	*Y3-2*	***INPUT 1*** *- 5VDC TTL*	*Optional Level Input 1*
TB3-3	*Y3-3*	***INPUT 2*** *- 5VDC TTL*	*Optional Counter 1*
TB3-4	*Y3-4*	***INPUT 3*** *- 5VDC TTL @ 100kHz Max.*	*Line Speed Encoder Input*
TB3-5	*Y3-5*	***INPUT 4*** *- 5VDC TTL*	*Optional Level Input 2*
TB3-6	*Y3-6*	*FAULT - Open Collector rated at 50VDC, sink up to 500mA (switches to GROUND to signal sensor FAULT condition)*	*Sensor VIDEO & SYNC FAULT Digital Output*

Table Z.4-7: Open Collector Customer Internal Connections

Optional Digital Inputs

The two other optional digital inputs (Y3-2 & Y3-5) can be digital linear encoders, material detectors, etc. All of the digital inputs are 5Volt TTL compatible.

Optional Open-Collector Outputs

There are two optional open-collector outputs on the Model MPPU Main Board that are available by an Engineering Variance Order (EVO). These open-collectors, labeled J6 & J7 on the Model MPPU Main Board {Figure Z.4-11}, are rated at 50VDC and sink up to 500mA when activated. These outputs can be utilized for optional sensor FAULT output, for example.

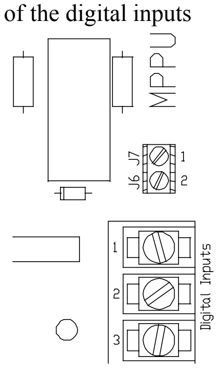


Figure Z.4-11: Model MPPU Optional Open-Collector Outputs

Input/Output Cables

All of the previous connections can be accessed through the spare access hole on the bottom panel of the Model MPPU enclosure or with a circular connector included with the enclosure (optional connector – see Configuration EVO or option section for more information). Cables are provided by the customer.

Z.4.h Analog Inputs

With the release of the new Model MPPU Main Board (Part # 3695123 Rev. C) analog inputs are now available. There are two "channels" of analog input on connector J33 {Figure Z.4-12}.

Position #	Name	Description
J33-1	*CH2 -*	*Channel Two Negative Input – 400kOhm*
J33-2	*CH2 +*	*Channel Two Positive Input – 400kOhm*
J33-3	*CH1 -*	*Channel One Negative Input – 400kOhm*
J33-4	*CH1+*	*Channel One Positive Input – 400kOhm*

Table Z.4-8: Model MPPU Analog Input Descriptions

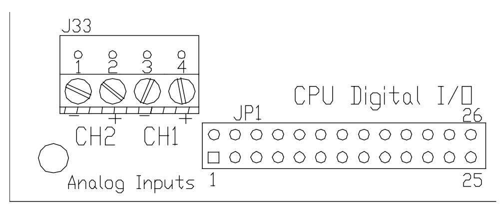


Figure Z.4-12: Model MPPU Analog Inputs

The analog inputs to the Main Board can be set for absolute analog (0-10VDC) or deviation analog (±10VDC). See Section Z.5.d for information on activating and configuring the analog inputs for absolute or deviation analog input. The input impedance for both inputs is rated at 400kOhm and both inputs are protected up to 120VAC. With an Engineering Variance Order (EVO), these inputs can also be configured for 4/20ma Current Loop input. When attaching an analog input device (such as an analog linear position transducer) to these inputs, the negative (-) output of the analog device should be attached to the negative input on the J33 connector (either J33-1 for Channel 2 or J33-3 for Channel 1) and the positive (+) output of the analog device should be attached to the positive input on the J33 connector (either J33-2 for Channel 2 or J33-4 Channel 1).

NOTE:

Be sure to contact Harris Instrument Corporation Engineering BEFORE attempting to attach ANY device to the optional inputs on the Model MPPU Main Board. Attaching non-approved devices to these inputs may void the unit warranty and/or cause damage to the unit.

Z.5 System Adjustments

The Model MPPU has several sets of jumpers for setting different configurations and functions. These jumpers are usually pre-set from the factory, though sometimes field maintenance will require the resetting of the jumpers. There are also two potentiometers located on the main board for adjusting the Digital-to-Analog Converters (DACs). The following sections will discuss the jumper settings and how they affect the Model MPPU processing unit.

Z.5.a Micro-Controller Board Jumpers

The micro-controller board (Part #3695172 Rev. C) has one individual three-pin, two position jumper (JP2) and one 16-pin, eight-position jumper block (JP6). Jumper locations are shown in Drawing # 1495172 Rev. C. The three-pin jumper (JP2) selects 32K RAM or 8K RAM for the on-board RAM memory. It is typically set from factory for 32K RAM. Check the Configuration EVO (if applicable) if the jumper is not factory set for 32K RAM.

Jumper JP6 is for selecting the interface style and many other options available to the Model MPPU. The following table describes the standard jumper configuration for this jumper block.

Jumper	Setting
JP6 1 & 2	*OPEN (Standard)* *CLOSED for option – See Section ZK*
JP6 3 & 4	*OPEN – Sensor FAULT detection (Standard)* *CLOSED – Disable all sensor FAULT detection*
JP6 5 & 6	*OPEN for Option – See Section ZF (Standard)* *CLOSED for option – See Section ZF*
JP6 7 & 8	*OPEN (Standard)* *CLOSED for option – See Section ZF*
JP6 9 & 10	*OPEN (Standard)* *CLOSED – No Function*
JP6 11 & 12	*OPEN – For use with UVP Module* *CLOSED – For use with EVP Module*
JP6 13 & 14	*OPEN – No Remote Display (Standard)* *CLOSED – Remote Display enabled*
JP6-15 & 16	*OPEN – Level 1, 2 or 4 Customer Interface* *CLOSED – Level 3 Customer Interface*
JP2	*Top CLOSED – 8K RAM Installed* *Bottom CLOSED – 32K RAM Installed (Standard)*

Table Z.5-1: Micro-Controller Board Jumper Settings

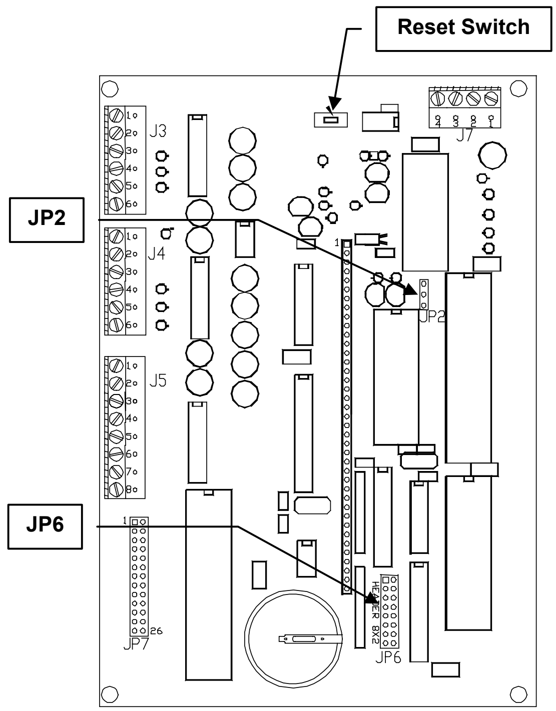


Figure Z.5-1: Micro-Controller Board – Part # 3695172 Rev. C

Z.5.b Micro-Controller Board Reset Switch

A reset switch is supplied for the micro-controller that will re-initialize the processor {Figure Z.5-1}. This is typically done when there is a system malfunction. Malfunctions can be caused by a power shortage or spike. Resetting the micro-controller will cause the Model MPPU to restart. If power has not been shut off to the system for more than thirty days, the system configuration variables should be loaded into memory and the unit will restart. Please contact Harris Instrument Corporation Service if resetting the micro-controller does not solve a malfunction.

Z.5.c Video Pre-Processors

The Model MPPU has so many operational variations that pre-processing of the video signals from the sensors is required to handle the many disparate applications. Section Z.2.e of this manual covers the various video pre-processors that may be installed in the Model MPPU.

Typically, a measurement system will use the Universal Video Pre-Processor Module – UVP Module (Part #3698016). Other applications, such as Clear Materials measurement or in high-light intensity environments, a different video pre-processor board may be installed, the Enhanced Video Pre-Processor – EVP Module (Part # 3696173 Rev. A).

NOTE:

All versions of the Model MPPU Video Pre-Processors are discussed in Section Z.3.e of this manual.

Z.5.d Main Board Settings

There are eight two-pin jumpers and two top-adjust DAC potentiometers on the Model MPPU main board (Part # 3695123 Rev. C). These are used to activate, adjust and/or control the units analog inputs and outputs.

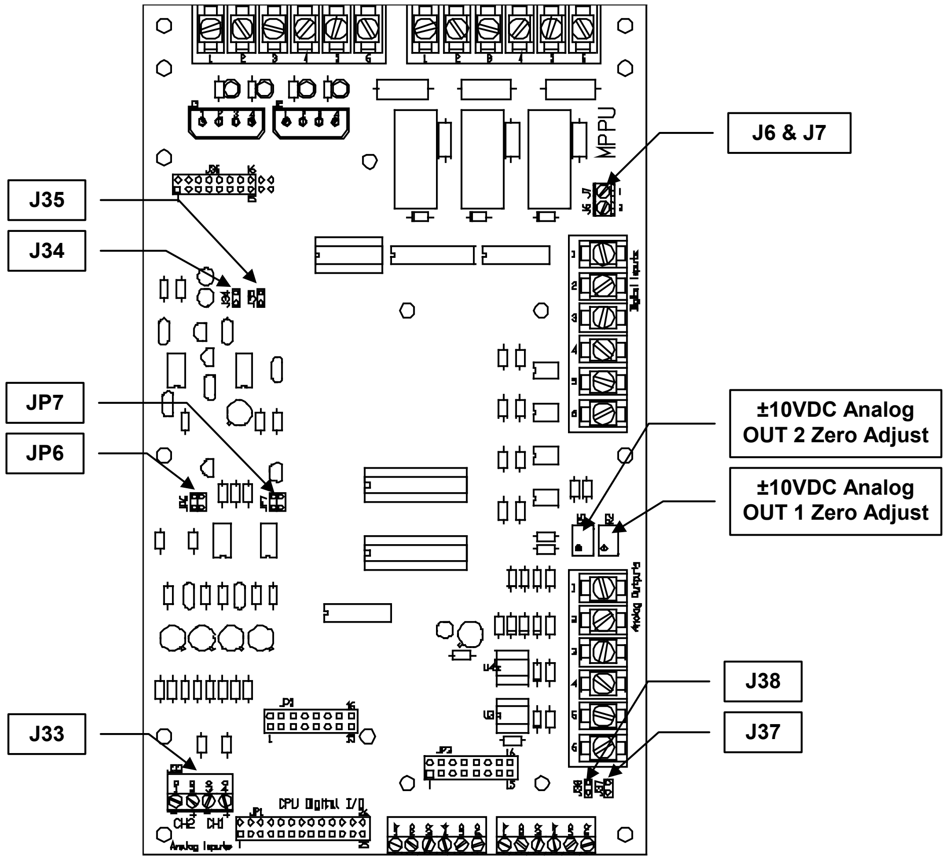


Figure Z.5-2: Jumper Positions, Inputs & Potentiometers on Main Board – Part # 3695123 Rev. C

Jumper Settings

The jumpers on the Main Board are used to control the analog inputs (jumpers J34, JP6, J35, JP6) as well as the format of the analog outputs (jumpers J38 and J37). These jumpers should be set from the factory and should not be changed expect under instructions from Harris Instrument Corporation Engineering or Service personnel.

Jumper	Setting
J34	*OPEN – Deactivate Analog Input Channel One (CH1) ** *CLOSED – Activate Analog Input Channel One (CH1)*
JP7	*Top Two CLOSED – 0 - 10VDC IN ** *Bottom Two CLOSED – ±10VDC IN*
J35	*OPEN – Deactivate Analog Input Channel Two (CH2)* *CLOSED – Activate Analog Input Channel Two (CH2) **
JP6	*Top Two CLOSED – 0 - 10VDC IN ** *Bottom Two CLOSED – ±10VDC IN*
J37	*OPEN – ±10VDC Output on TB4-2 ** *CLOSED – 0 - 10VDC Analog Output on TB4-2* [1]
J38	*OPEN – ±10VDC Output on TB4-3 ** *CLOSED – 0 - 10VDC Analog Output on TB4-3* [2]
	** = Standard Factory Default Configuration* [1] *= Chip U3 must be removed* [2] *= Chip U4 must be removed*

Table Z.5-2: Jumper Settings for Model MPPU Main Board – Part # 3695123 Rev. C

Zero Adjust Potentiometers

The Main Board (Part #3695123 Rev. C) in the Model MPPU has two top-adjust potentiometers. The potentiometer locations are shown in drawing # 1495123 in Section Z.15. These potentiometers are used to set the bipolar DACs. Be sure to have the entire measurement system completely installed and operational BEFORE adjusting these potentiometers.

Potentiometer R2 is for setting the deviation bipolar analog for target and deviation gain. Refer to the Dimensional Control Analog section [Section Z.4.c] and in the applicable customer interface section of this manual [Sections Z-ZD, with some references to EVO custom configurations].

Potentiometer R5 for setting the deviation bipolar analog on the optional second deviation analog output. Refer to the deviation analog section [Section Z.4.c] and in the applicable customer interface section of this manual [Sections Z-ZD, with some references to EVO custom configurations].

Z.6 System Setup

Setting up the Model MPPU requires approximately one hour. The communications ports must be set and the communications port baud must be specified for the RS-232 Customer Interface or for communications to a data logger (optional). 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 as well as setting the Digital Filter Snap. Even the time and date may have to be set if the system has lost power for an extended period of time. The procedures for adjusting or modifying these settings is dependent upon the type of customer interface that was selected. Refer to Section ZB, ZC or ZD for more information on system setup.

Z.6.a Digital Filter Snap

The Model MPPU contains a display resolution-enhancing feature called a Digital Filter Snap. The Digital Filter Snap is a adjusting tolerance system that takes exponential averages of the sensor readings and creates a tolerance factor for the sensor video signals. This helps the system *display a steady output* on the LCD Touchscreen [Level 4 – Section ZD] or LED Display/Keypad [Level 3 – Section ZC] interfaces and on the serial communications outputs with Level 3 and Level 4 as well as the RS-232 [Section Z] and Windows® Software [Level 2 – Section ZB] interfaces. The Digital Filter Snap is useful to *fine-tune the system display performance*. The Digital Filter Snap utilizes a First-In, First Out (FIFO) buffer that holds fifty readings (factory default) within a pre-determined and adjustable tolerance. Whenever a reading falls outside that tolerance, the buffer is flushed and that reading is used to fill the buffer (i.e. it “snaps” to that reading and uses it as the center of the tolerance band).

NOTE:

The Digital Filter Snap should be adjusted when the Model MPPU is dithering measurement readings of a known size material. Adjusting the Digital Filter Snap too low may cause fluctuating measurements on materials. Setting the Filter Snap too high will possible cause the system to ignore small size fluctuations of the material. Care should be taken in adjusting the Digital Filter Snap. Please contact Harris Instrument Service for assistance in setting the Digital Filter Snap.

The Digital Filter Snap is customer adjustable as either on or off. It can be set as zero (0) for no filtering or any inch or millimeter tolerance band for filtering. Depending upon the type of interface chosen for the Model MPPU [RS-232 Customer Interface, Level 2 Windows® Software – Section ZB, Level 3 Keypad/LED Display – Section ZC or Level 4 LCD Touchscreen Display – Section ZD], the setting of the Digital Filter Snap varies. Refer to the sections of this manual that deal with the customer interface for more information on the procedure for setting the Digital Filter Snap.

Exponential Averaging

The Digital Filter Snap is based on an exponential averaging formula:

$$\mathbf{k = T / (T + \tau)}$$

k = Constant (entered adjustment) **T** = Filter Period (filter snap value) τ = RC Constant

The Exponential Averaging value (k constant) allows for a small Filter Snap tolerance band while maintaining a stable, non-fluctuating display. Typically, a moving average filter system is not a smooth routine, causing a fair amount of fluctuation in the output unless a large tolerance is provided. These fluctuations are factored out with averaging by the k Constant entered with the Exponential Averaging routine {Figure Z.6-1}, even when a small filter tolerance value is used.

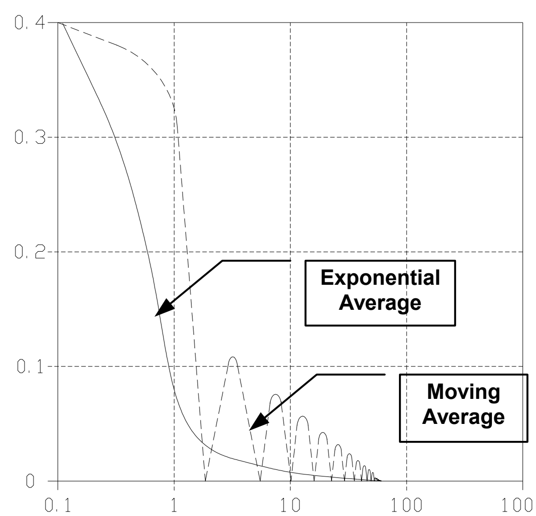


Figure Z.6-1: Exponential Average Vs. Moving Average

Filter Snap Examples

The best way to describe the operation of the Filter Snap and Exponential Averaging routines is by demonstration. Be sure to have the Model MPPU fully operational and functioning with the sensors. Perform all other set-up and configuration functions for full operation of the system. Have a known size (premeasured) sample of material in the sensor viewing area for complete functionality of these examples. The Filter Snap and Exponential Averaging value affect the measurement readings *for display ONLY* on Level 3 [Section ZC] and Level 4 [Section ZD] customer interfaces, as well as the serial communications output and relay closures for all levels of the Model MPPU.

Example One: View the measurement readings on the current interface. Observe the fluctuations of the readings (if any). Using the current interface routine, set the filter snap to zero. Return to the measurement readings function and view the output on the display. Notice the fluctuating display of the measurement readings. This is the “raw” measurement data displayed without any averaging or filtering. This is caused by the manner which SCAN-A-LINE™ sensors detects edge positions. Instead of a constant position, the SCAN-A-LINE™ sensor is detecting the edge positions at a fifty percent trigger point. This point can change slightly, depending upon many factors (see the sensors section of this manual for more information).

Example Two: Now set the Filter Snap to a higher value than the default (greater than 0.05, such as 0.1). Return to the measurement display and notice the fluctuations (if any). The measurement display fluctuations have lessened, if not completely disappeared. Setting a higher Filter Snap value broadens the tolerance band of the filter, providing a smoother display but averaging out small fluctuations of the material. Caution should be taken by setting the Filter Snap too high (0.1 or greater), as this will cause the system to possibly average out small fluctuations of the material being measured. This is where the Exponential Averaging becomes critical.

Example Three: Set the Filter Snap to the default value (0.05). Return to the measurement readings and observe the measurement fluctuations (if any). Now set the Exponential Averaging value lower. Return to the measurement readings and observe the measurement fluctuations (if any). Setting the Exponential Averaging value lower allows the Filter Snap to exponentially average the measurement readings without resorting to a large tolerance band. This provides for the display of small fluctuations in the material – while maintaining a readable, non-fluctuating measurement display. The following chart shows an example of the Snap Filter and how it operates. This example assumes that the Filter Snap is set to 0.05 inches and Exponential Averaging to 0.025 (factory defaults).

The readings (solid meandering line) are filtered with the Exponential Averaging of the Snap Filter function. It will average out the bumps and gouges that are less than the Snap Filter Setting (in this example, ±0.05 inches). When the readings exceed the Snap Filter setting (in either direction, i.e. ±0.05 inches), the filter snaps to that reading point as the mid-point of the tolerance band (with a snap of ±0.05 inches, the total snap tolerance band is 0.1 inches). Setting a small Snap Filter will show smaller fluctuations in the material, but this will show on the display with an unstable, ever-changing measurement reading output. The Exponential Averaging value can then be used to smooth the unstable measurement display for small Snap Filter settings.

Z.6.b Multiple Interfaces

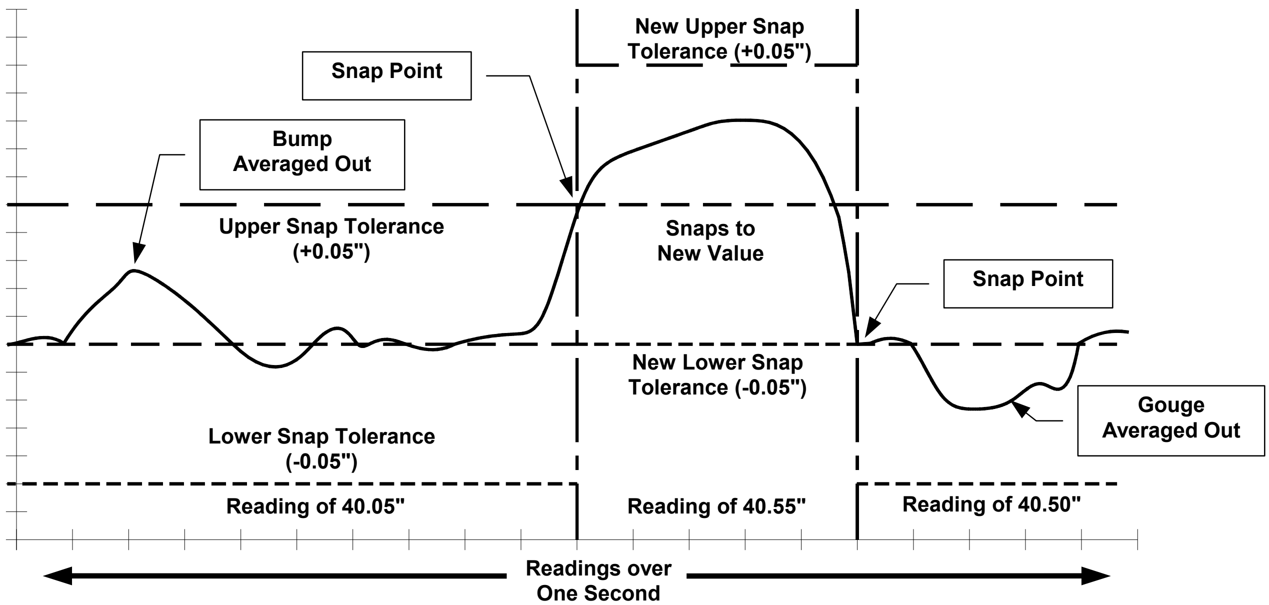


Figure Z.6-2: Example Filter Snap Exponential Averaging of Readings

The Model MPPU is versatile enough that multiple interfaces may be operated through the same unit. An LCD Touchscreen interface can be installed on the processing unit for direct, on-line operation as well as a remote interface with RS-232 Customer Interface located on a remote host computer. RS-232 commands are not processed when a Level 3 LED Display/Keypad or Level 4 LCD Touchscreen are in SETUP mode. Up to ten RS-232 Customer Interface commands entered while the Level 3 or Level 4 interfaces are in SETUP mode will be processed upon exiting SETUP mode.

Both RS-232-0 and RS-232-1 MUST communicate with the same type of customer interface hardware (i.e. both are LCD Touchscreens or LED Displays) as the LCD Touchscreen [Level 4 – Section ZD] and the LED Display/Keypad [Level 3 – Section ZC] function with different software. Please refer to the appropriate section(s) of this manual [Section ZB through ZD] for more information on the interface(s) supplied with the particular processing unit.

Z.7 General Maintenance

Maintenance of the Model MPPU 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. Check Sections ZB through ZD for information on maintenance of the various interfaces of the Model MPPU.

Z.7.a Battery-backed RAM

The Model MPPU contains a battery for continuous power to the on-board random access memory (RAM). The battery-backed RAM contains many of the system variable settings that are configured under System Setup [Section Z.9, ZB, ZC & ZD]. This RAM is viable with the battery backup for approximately thirty (30) days. If at any time the Model MPPU is detached from main power for more than thirty days, the settings stored in the battery-backed RAM may be lost and the system may have to be set up again when main system power is restored. In many cases, the EEPROM Memory Backup will restore the previously saved system settings to battery-backed RAM. The Model MPPU will trickle-charge the battery for the battery-backed RAM when AC power is supplied to the system.

Please refer to Sections ZB, ZC, & ZD (as applicable) for more information on resetting the Model MPPU system variables. Also, review Section Z.9 for the previous system settings (if recorded) of the Model MPPU.

EEPROM Memory Backup

The Model MPPU retains the factory default systems settings in the on-board EPROM. These are the default settings for all Model MPPUs and may not reflect your particular configuration or application. When system setup is performed, all configuration settings are stored in the on-board battery-backed RAM. This RAM will store the configuration settings for up to thirty days. Sometimes, this is not long enough. As an extra-added precaution, the current Model MPPU Micro-Controller Board (Part # 3695172 Rev. C) has an additional EEPROM Memory Backup Module. This unit stores the current system configuration settings whenever leaving the set-up routines (for more information on set-up routines, refer to the customer interface sections of this manual). Whenever the Model MPPU is powered down or reset (using the micro-controller reset switch), the system configuration stored in the EEPROM Memory Backup Module is loaded into system RAM.

Z.7.b Upgrades

The Model MPPU, 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 for more information on updating the software and/or hardware in your Model MPPU.

On units built after 15 December, 1996 with Level 4 interfaces, the system settings for the Model MPPU should be recorded BEFORE replacing the EPROM. Once the EPROM is replaced, the Factory Default System Setting must be restored to clear the RAM and prepare the memory for the loading of the new EPROM software. System settings can then be re-entered to restore the system to full operation.

Z.8 Hardware Trouble Shooting

CAUTION:

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

Board level maintenance is NOT RECOMMENDED for the Model MPPU. If a problem is experienced with the Model MPPU, in most cases contact Harris Instrument Corporation Service for an RMA to return the unit. If the Model MPPU contains an LCD Touchscreen [Level 4 –Section ZD] or LED Display/Keypad [Level 3 – Section ZC], refer to those sections of this manual for trouble shooting information on those components. Refer to the applicable customer interface for info on verifying the analog voltages. Check all cable and power connections to the Model MPPU. 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 is indicated on the cable/connection just attached. If the short circuit is in a cable, replace the cable with a spare. If the short circuit is in a module, obtain a Return Authorization Number from Harris Instrument Corporation Service and return the module to the Harris Instrument Corporation Factory. If the short circuit occurs when reattaching a customer 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 for technical assistance.

After all cables/internal connections/customer connections check good, the Model MPPU is possibly experiencing a component level failure. Check the various sections of this manual for trouble shooting information on other included options. Also perform any of the calibration and/or setup procedures in the accompanying customer interface sections [Section Z.10, ZB, ZC or ZD]. Component level trouble shooting of the Model MPPU is not covered in this manual. Please obtain a Return Authorization Number from Harris Instrument Corporation Service and return the Model MPPU to the Harris Instrument Corporation Factory for maintenance.

NOTE:

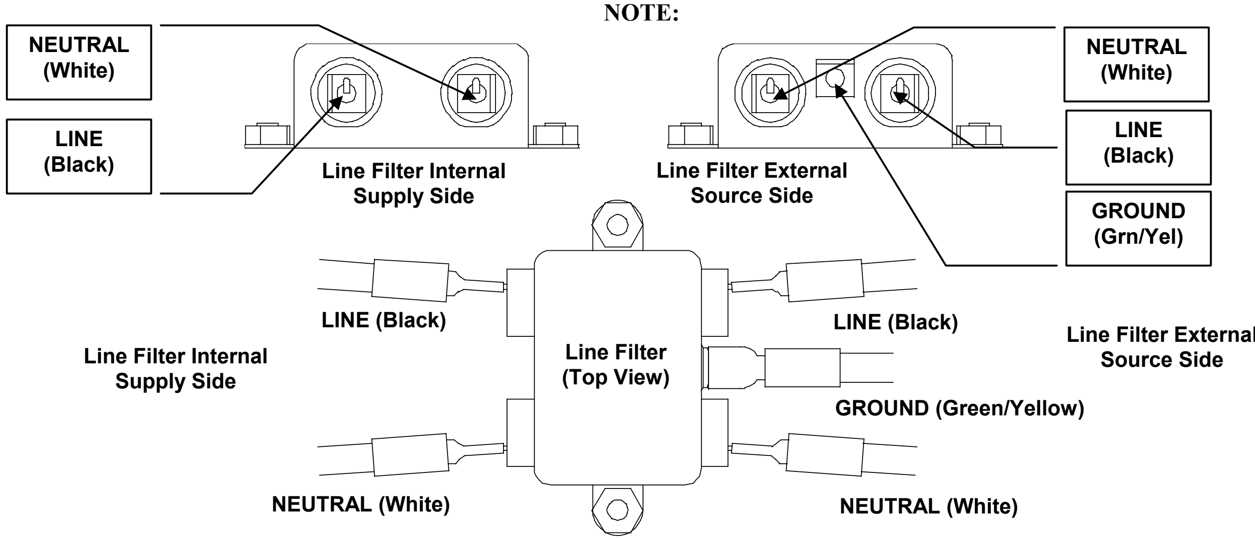


Figure Z.8-1: Line Filter in Model MPPU

Procedures in this section will assist in determining whether or not the Model MPPU 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 MPPU, 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 MPPU. 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.8-1 previous page}.

a) Range meter for 300VAC or greater.

b) Connect negative lead (-) to Line Filter External Source Side **NEUTRAL** and positive lead (+) to Line Filter External Source Side **LINE**.

c) Voltage should read between *85VAC and 264VAC.*

If AC Line Voltage does not fall between *85VAC and 264VAC* from the external source, modify your power for this unit to fall within these voltages.

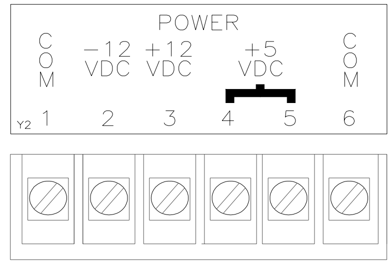


Figure Z.8-2: Internal Power Connections

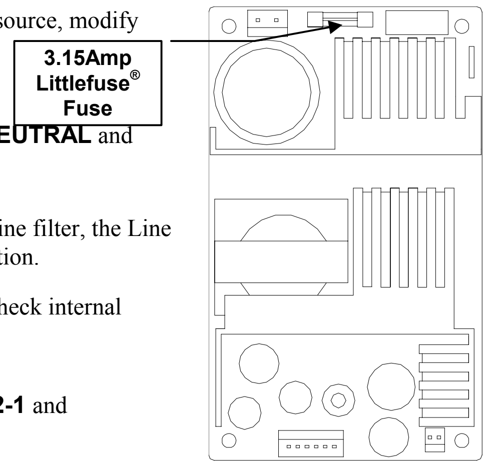


Figure Z.8-3: Fuse Location on Universal Power Supply

Test 3: Verify the operation of the Line Filter.

a) Connect negative lead (-) to Line Filter Internal Supply Side **NEUTRAL** and positive lead (+) to Line Filter Internal Supply Side **LINE**.

b) Voltage should read between *85VAC and 264VAC.*

If AC Line Voltage does not fall between *85VAC and 264VAC* from the internal line filter, the Line Filter is malfunctioning. Contact Harris Instrument Corporation for more information.

Test 4: If unit is plugged in and has appropriate power (Tests 1, 2 & 3), check internal DC voltages at test points {Figure Z.8-2} on the Main Board.

a) Range meter to +20VDC.

b) Connect negative lead (-) to Power Terminal Block position **Y2-1** and positive lead (+) to Power Terminal Block position **Y2-4**.

c) Voltage should read *5.00VDC ±0.10VDC.*

d) Connect negative lead (-) to Power Terminal Block position **Y2-1** and positive lead (+) to Power Terminal Block position **Y2-3**.

e) Voltage should read *+12.00VDC ±0.25VDC.*

f) Connect negative lead (-) to Power Terminal Block Position **Y2-1** and positive lead (+) to Power Terminal Block position **Y2-2**.

g) Voltage should read *-12.00VDC ±0.25VDC.*

Test 5: If voltages at test points are not appropriate (or non-existent) and unit has proper AC power (Test 1, 2 & 3), remove power from the Model MPPU and test the 3.15Amp Littlefuse® fuse under the universal power supply protective panel {Figure R.8-3}. Replace fuse if bad.

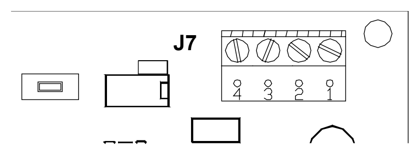


Figure Z.8-4: Power Connector for Micro-Controller

Test 6: If fuse is good, system has proper power, and test points have appropriate voltage, test the power to the micro-controller board {Figure Z.8-4}.

a) Range meter to +20VDC.

b) Connect negative lead (-) to Connector position **J7-4** and positive lead (+) to Connector position **J7-3**.

c) Voltage should read *5.00VDC ±0.10VDC.*

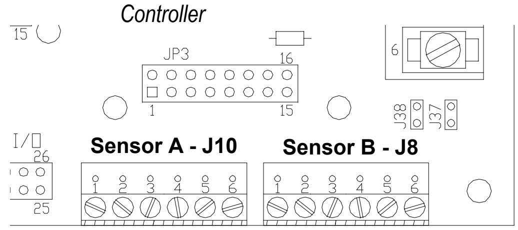


Figure Z.8-5: Sensor Connectors on Main Board

Test 7: If fuse is good, system has proper power, test points have appropriate voltage and the micro-controller is receiving proper power, test the power connections to the sensor MS-style connectors {Figure Z.8-5}.

a) Verify meter range to +20VDC.

b) Locate the Sensor A connector on the Main Board (J10).

c) Connect negative lead (-) to Sensor A Connector position **J10-1** and the positive lead (+) to Connector position
J10-2.

d) Voltage should read *-12VDC ±0.25VDC.*

e) Connect the negative (-) lead to Sensor A Connector position **J10-1** and the positive lead (+) to Connector position **J10-3**.

f) Voltage should read *+12VDC ±0.25VDC.*

g) Connect the negative (-) lead to Sensor A Connector position **J10-1** and the positive lead (+) to Connector position **J10-5**.

h) Voltage should read *+12VDC ±0.2VDC* when emitter is completely *uncovered* or *0VDC ±0.2VDC* when emitter is completely *covered.*

i) If dual-sensor system, repeat previous steps for the Sensor B Connector (J8).

Test 8: If fuse is good, system has proper power, test points have appropriate voltage, micro-controller 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 again (Test 4). 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.

If system fails when replacing a cable/internal connection/customer connection, a short circuit is indicated on the cable/connection just attached. If the short circuit is in a cable, replace the cable with a spare. If the short circuit is in a module, obtain a Return Authorization Number from Harris Instrument Corporation Service and return the module to the Harris Instrument Corporation Factory. If the short circuit occurs when reattaching a customer 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 Corporation for technical assistance. After all cables, internal connections and customer connections check good and the other tests check positive, the Model MPPU is probably experiencing a component level failure. Component level trouble shooting of the Model MPPU is not covered in this manual. Please obtain a Return Authorization Number from Harris Instrument Corporation Service and return unit to the Harris Instrument Corporation Factory.

Z.8.a Diagnostic Lamps

There are four diagnostic lamps located inside the Model MPPU {Figure Z.8-6} to assist in determining possible problems that may occur in the operation of the unit.

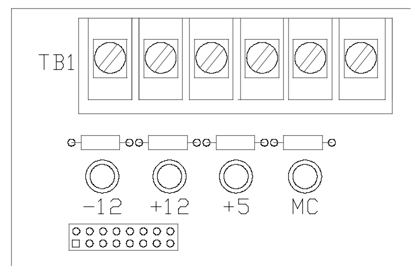


Figure Z.8-6: Diagnostic Lamp Locations

Voltage Lamps

Three of the diagnostic lamps on the Model MPPU 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 and the display (if applicable). If this lamp is not lit, the entire Model MPPU will not function. Please contact Harris Instrument Corporation for assistance in restarting the system.

Micro-Controller Lamp

The forth lamp on the main board is the micro-controller operation lamp (MC lamp). It is the “heartbeat” of the Model MPPU as it flashes at each update of the display. If, while in measurement mode, this lamp is completely off, or the lamp stays lit, the micro-controller may be experiencing a malfunction. Attempt to restart the micro-controller by resetting the system [Section Z.6.c] with the reset switch. If the reset does not help, please contact Harris Instrument Corporation Service for more information. Note that when the Model MPPU is not in a measurement mode, the MC lamp will remain off (i.e. during setup).

Z.9 Communications Specifications & Commands

Before applying power to the Model MPPU, set up the communications software that will be used to interface with the Model MPPU. Also be sure that the communications lines are installed and attached between the Model MPPU and the host computer.

Z.9.a System Start-up

For this manual, the Windows® HYPERTERMINAL program will be used as an example communications program for interfacing with the Model MPPU. The Windows® HYPERTERMINAL communications program must be configured to operate with the Model MPPU Level 1.

Configuring Windows® HYPERTERMINAL

The following example on the next page is based upon the Microsoft® Windows® 95 HYPERTERMINAL software program. This program is used because of the commonplace occurrence of it on most IBM-compatible personal computers today. Any DEC VT-100 (ANSI) compatible terminal emulation program can be used to communicate with the Model MPPU Level 1 interface.

HyperTerminal	*Start HYPERTERMINAL.EXE (located in the START menu under Accessories).*
M P P U ENTER	*Enter MPPU in the Name: entry.*
Icon	*Select an Icon to represent the MPPU connection and click OK.*
Phone Number Menu	*DO NOT SELECT a phone number or modem. Pick the particular Direct to COM port in the Connect Using: List box (typically COM2 is used since COM1 is sometimes used for a mouse interface).*
Port Settings	*Select 9600 in the Bits per Second drop-down list. Verify that data is set to 8, parity to None and Stop Bits to 1. Flow Control Should be set to None.*
Advanced…	*Click on Advanced… to set the Advanced Port Settings. Verify that the Transmit buffer is set HIGH and the Receive buffer is set to Medium-High.*
File… Properties	*Set the properties of the MPPU HyperTerminal session.*
MPPU Properties	*Select the Settings Tab at the top of the MPPU Properties window.*
Emulation	*Change the Emulation to VT100 to communicate with the MPPU.*
ASCII Set-up…	*Select the ASCII Set-up button to set the ASCII Text. Select Echo Typed characters locally check box.*
File…Save As...	*Save file as MPPU.HT for future use.*
OK	*Click on OK to close the File dialog box.*

Now, whenever starting HPYERTERMINAL to operate the Model MPPU Level 1, load the file MPPU.HT and the settings for the Model MPPU communication defaults will be available.

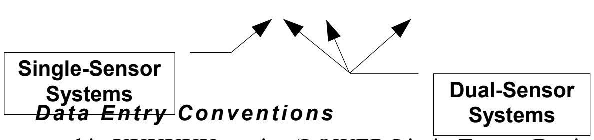
Verify Communications

If the Model MPPU is connected correctly to the host computer and the HYPERTERMINAL or other communications software is configured properly, when power is applied to the Model MPPU the communications software should respond with:

```
Power up!
```

The Model MPPU Level 1 will then start displaying measurement readings in the communications software, though these readings may not be valid as the system has not been configured completely. If there is no material in the sensor window, the Model MPPU will output via the RS-232-2 communications port:

```
Sensor Fault: A, B or A&B
```



Z.9.b Data Entry Conventions

All data entered in XXXXXX entries (LOWER Limit, Target, Deviation Analog, etc.) may be entered as 1 to 10 digits with a decimal point if necessary. The decimal point position on all measurement variables matches current customer selected decimal point position. Up to ten command sequences may be sent in rapid succession by the terminal device EXCEPT the Sensor Calibration command sequence [Section Z.5.b] and the Restore Factory Default System Settings command sequence [Section Z.11.e].

Z.9.c Data Entry & Data Output Resolution

When outputting data on the RS-232 Customer Interface, the resolution of the data output or display is set by the Set Decimal Point Position function [Section Z.11]. This does not mean that the data entered has to have the same decimal point position. The serial communications output will be rounded from four down and from five up to the output set with the Decimal Point Position. The data entered, no matter what the resolution (number of decimal places), is left intact. This means that if the Decimal Point Position is set to two places (XX.XX), the output of the value 12.345 would be 12.35 but the entry of the value 12.345 would remain constant. This allows for greater resolution to be entered while maintaining the output characteristics defined by the operator.

Z.9.d Commands & Queries

There are two types of input for the Level 1 interface, **commands** and **queries**. Commands for the Level 1 interface set the functions of the processing unit. Queries return (via RS-232) the current settings of the particular function previously set with a command.

All Level 1 **commands** to the Model MPPU must be entered in *FULL CAPITAL LETTERS* proceeded with an asterisk (*). The command sequencer is case sensitive, so setting the CAPS LOCK button ON with the host computer keyboard is suggested. All Level 1 **queries** data entry is the same as the commands.

Commands Listing

The Model MPPU Level 1 interface **commands** are as follows:

Command Sequence	Description	Section
* A H SPACE X X X X X X ENTER	*XXXXXX = 10VDC Absolute Analog Output Strip Size*	Z.12.d
* A L SPACE X X X X X X ENTER	*XXXXXX = 0VDC Absolute Analog Output Strip Size.*	Z.12.d
* B SPACE X X X X ENTER	*Communications Port Two (RS-232-2) Baud Rate.*	Z.9.f
* C 1 SPACE X X X X X X ENTER	*Calibrate First Standard at XXXXXX by required units of measure.*	Z.12.b
* C 2 SPACE X X X X X X ENTER	*Calibrate Second Standard at XXXXXX by required units of measure.*	Z.12.b
* E SPACE X X . X X ENTER	*Tolerance at XXX.XXX (inches or millimeters).*	Z.12.c
* F SPACE X X X X X X ENTER	*Snap Filter.*	Z.12.h
* J X SPACE X X X X X X ENTER	*Input calibration values. X=1 – 4: 1 = First raw count, 2 = First calibration standard, 3 = Second raw count, 4 = Second calibration standard; XXXXXX is value for 1 - 4.*	Z.12.b
* J 5 ENTER	*Re-calculates calibration coefficients from current settings.*	Z.12.b
* K X ENTER	*Decimal Point Position: 0 = x, 1 = x.x, 2 = x.xx, 3 = x.xxx, 4 = x.xxxx.*	Z.11.c
* L SPACE X X X X X X ENTER	*LOWER (LO) Limit at XXXXXX.*	Z.12.d
* M SPACE X X / X X / X X ENTER	*Date (Month/Day/Year).*	Z.11.c
* N SPACE X X : X X : X X ENTER	*Time (Military format HH:MM:SS).*	Z.11.c
* P SPACE X X X X X X ENTER	*Pulses per Unit for Line Speed Encoder (Tachometer) Input.*	ZJ
* Q SPACE X X X X X X ENTER	*Set Exponential Averaging Value.*	Z.12.h
* R X ENTER	*Sensor Designation (1 = Single 10XBR-Series, 2 = Single 10XAS-Series, 4 = Dual 10XAS-Series).**	Z.11.g
* R 3 SPACE X X X X X X ENTER	*Dual 10XBR-Series Sensor Designation with LED spacing value.*	Z.11.g
* S ENTER	*Stop output of measurement readings.*	Z.10.b
* T SPACE X X X X X X ENTER	*Set Deviation Target to XXXXXX.*	Z.12.f
* U SPACE X X X X X X ENTER	*UPPER (HI) Limit at XXXXXX.*	Z.12.d
* V SPACE X X X X X X ENTER	*Deviation Analog Maximum Output.*	Z.12.f
* W SPACE X X X X X X ENTER	*Units of Measure (Inches [IN], Millimeters [MM]).*	Z.11.d
* X X ENTER	*Set EVP Module Mode – 1 = Normal (Diagnostics) Mode, 2 = First Edge Mode, 3 = Filtered Video Mode. **	Z.11.f
* F A C T O R Y ENTER	*Resets ALL Selectable Variables to Factory defaults.*	Z.11.e

Table Z.9-1: Command Sequence Listing for Model MPPU Level 1 RS-232 Customer Interface

* Jumpers may have be set on Video Pre-Processor for proper operation [Section Z.3.e].

Queries Listing

The Model MPPU Level 1 interface **queries** are as follows:

Query	Description	Section
? A H ENTER	*Returns current setting for Absolute High analog output.*	Z.12.d
? A L ENTER	*Returns current setting for Absolute Low analog output.*	Z.12.d
? D ENTER	*Output Diagnostic Data.*	Z.10.c
? E ENTER	*Returns current Tolerance setting.*	Z.12.c
? F ENTER	*Returns current Snap Filter setting.*	Z.12.h
? G ENTER	*Start output of measurement readings.*	Z.10.a
? H ENTER	*Output Help Screen.*	Z.11.a
? J X ENTER	*Returns current calibration settings. X=1 – 4: 1 = First raw count, 2 = First calibration standard measurement, 3 = Second raw count, 4 = Second calibration standard measurement.*	Z.12.b
? K ENTER	*Returns current Decimal Point Position: 0 = x, 1 = x.x, 2 = x.xx, 3 = x.xxx, 4 = x.xxxx.*	Z.11.c
? L ENTER	*Returns current LOWER (LO) Limit.*	Z.12.d
? M ENTER	*Returns current Date (Month/Day/Year) setting.*	Z.11.c
? N ENTER	*Returns current Time (Military format HH:MM:SS) setting.*	Z.11.c
? P ENTER	*Returns current Pulses per Unit setting for Line Speed Encoder (Tachometer) Input.*	ZJ
? Q ENTER	*Returns current Exponential Averaging Value.*	Z.12.h
? R ENTER	*Returns current Sensor Designation (1 = Single 10XBR-Series, 2 = Single 10XAS-Series, 4 = Dual 10XAS-Series) [NOTE: Designation 3 does not return spacing value).*	Z.11.g
? T ENTER	*Returns current Deviation Target setting.*	Z.12.f
? U ENTER	*Returns current UPPER (HI) Limit.*	Z.12.d
? V ENTER	*Returns current Deviation Analog Maximum Output setting.*	Z.12.f
? W ENTER	*Returns current Units of Measure setting (Inches [IN], Millimeters [MM]).*	Z.11.d
? X ENTER	*Returns EVP Module Mode – 1 = Normal (Diagnostics) Mode, 2 = First Edge Mode, 3 = Filtered Video Mode. **	Z.11.f

Table Z.9-2: Query Sequence Listing for Model MPPU Level 1 RS-232 Customer Interface

* Jumpers may have be set on Video Pre-Processor for proper operation [Section Z.3.e].

Z.9.e Invalid Command Response

Any time an invalid command is sent via the RS-232 Customer Interface to the Model MPPU, the system will respond with a "What?" statement. The following shows the Set Date command being used with the time command sequence.

* M SPACE 1 0 : 0 0 : 0 0 ENTER

```
Command> *M 10:00:00
What?
```

Any time a "What?" response is received in the communications terminal software, check the command sequence that was previously entered and re-enter the command sequence properly.

Z.9.f Setting System Baud Rate

The Model MPPU can communicate with the host computer at several baud rates, ranging from 1200bps to 19200bps, with the communications port (RS-232-2). To set the system baud rate:

* B SPACE X X X X X ENTER

```
Command> *B XXXXX
```

Note that changing this baud rate will not affect the two other communications ports (RS-232-0 & -1). See Section Z.10 for more information on the RS-232 communications in the Model MPPU Level 1.

Z.10 RS-232-Operational Commands

There are two operational commands and one system restoration command for the Level 1 interface as well as a sensor FAULT warning and diagnostic display.

Z.10.a Stop Measurement Readings

Typically, the Model MPPU will begin displaying readings immediately after power-up [Section Z.9.a]. To configure the system it is generally acceptable to stop the readings to continue with the configuration. To stop the readings, enter the following:

[*] [S] [ENTER]

The Model MPPU will display:

`Command> *S`

The Model MPPU is now ready to receive commands for system settings and configuration.

Z.10.b Start Measurement Readings

To start the measurement readings again, enter the following:

[?] [G] [ENTER]

The Model MPPU responds with:

`Command> ?G`

`xxxx` (Readings)

Z.10.c Diagnostics Display

There are up to eight co-processors in the Model MPPU to store, hold and calculate readings from the sensors. These co-processor readings can be displayed for diagnostic purposes with the following query (only after stopping the readings output [Section Z.10.a]):

[?] [D] [ENTER]

The Model MPPU responds with:

```
Command> ?D
0CNT,  1CNT,  2CNT,  3CNT,  4CNT,  5CNT,  6CNT,  7CNT,  MIN,    WIDTH,  MAX
xxx.,  xxx.,  xxx.,  xxx.,  xxx.,  xxx.,  xxx.,  xxx.,  x.xx,   x.xx,   x.xx
```

This display will show up to eight counters, depending upon the configuration of the Model MPPU, and how many co-processors are installed in the processing unit.

The diagnostic display is a valuable tool in determining if the sensors are correctly set (type, and video pre-processor settings [Section Z.11.f] for the sensor type).

Z.10.d Sensor FAULT Warnings

Any time there is a SENSOR or SYNC FAULT condition in the system, the Level 1 interface will display a FAULT warning in the terminal software. Typical FAULT warnings are:

`Sensor Fault: A`	Sensor A is experiencing a sensor FAULT,
`Sensor Fault: B`	Sensor B is experiencing a sensor FAULT
`Sensor Fault: SYNC`	Either Sensor is experiencing a SYNC FAULT.

A sensor FAULT in either sensor A or sensor B means that the sensor is detecting more or less edges than is expected by the Model MPPU. Review Section Z.3.f in this manual for more information.

A SYNC FAULT on either sensor probably means that the cables to the sensor have been disconnected or broken, or that the sensor is experiencing a malfunction. Review sensor manual for more information (10XAS-Series – Section C, 10XBR-Series – Section G).

If the condition lasts for up to 100 sensor updates, the HI, LO and GO relays will all open to announce a continuing sensor FAULT. Also, the FAULT open collector (Terminal Tag Y3-6) will switch to positive.

NOTE:

Sensor FAULT warnings WILL NOT be output if jumper JP6 pins 3-4 are closed [Section Z.3.f].

Z.11 RS-232 System Settings

There are many customer selectable settings for the Model MPPU Level 1 for such features as baud, upper and lower limits, analog outputs and sensor types. The following sub-sections show how to select these settings and a quick example for each setting.

All the procedures in this sub-section require that the terminal emulation software is operational and the host computer is communicating with the Model MPPU.

Z.11.a Help Screen Output

The command sequences and current system settings for the Model MPPU Level 1 can be displayed with the Help Screen command. It also shows the syntax and inputs for setting the system command sequence variables. The listing shown below also includes the settings and syntax for the EVP Module [Section Z.3.e & Z.11.f].

```
*AH XXXXXX[CR] Set Absolute analog high, ?AH[CR] returns current setting.
*AL XXXXXX[CR] Set Absolute analog low; ?AH[CR] returns current setting.
*B XXXXX[CR] Set baud rate.
*C1 XXXXXX[CR] - Calibrate to current standard at XXXXXX (inches).
*C2 XXXXXX[CR] - Calibrate to current standard at XXXXXX (inches).
?D[CR] - Output diagnostic.
*E XXXXXX[CR] - Sets the tolerance, ?E[CR] returns current setting.
*F XXXXXX[CR] - Sets snap filter, ?F[CR] returns current setting.
?G[CR] - Output measurement readings, *S[CR] Stop sending readings.
?H[CR] - (Help) Sends this output.
*Jx XXXXXX[CR] – Sets calibration values, x = 1-4, ?Jx[CR] returns current setting.
*J5[CR] – Re-calculates calibration coefficients from current settings.
*Kx[CR] – Sets decimal point, ?K[CR] returns current setting.
*L XXXXXX[CR] - Sets the low Limit, ?L[CR] returns current setting.
*M xx/xx/xx[CR] - Sets date, ?M[CR] returns current setting.
*N xx:xx:xx[CR] - Sets time, ?N[CR] returns current setting.
*P XXXXXX[CR] - Sets pulses per unit for tach, ?P returns current setting.
*Q XXXXXX[CR] - Set K factor for display averaging.
*Rx[CR] – Sets sensor configuration, ?R[CR] returns current setting.
*T XXXXXX[CR] - Sets target, ?T[CR] returns current setting.
*U XXXXXX[CR] - Sets the upper limit, ?U[CR] returns current setting.
*V XXXXXX[CR] - Sets deviation analog scaling, ?V[CR] returns current setting.
*W XXXXXX[CR] - Set unit of measure, ?W[CR] returns current setting.
*Xx[CR] – Sets video pre-processor mode, ?X[CR] returns current setting.
*FACTORY[CR] - Sets all selectable variables to default.
Command>
```

NOTE:

There are NO LOCKOUT CODES for system settings with the Model MPPU Level 1. ALL SYSTEM SETTINGS ARE AVAILABLE through the host computer. If necessary, restricted access to the host computer can prevent unauthorized adjustment of the Model MPPU Level 1.

Z.11.b System Date & Time

The system date and time may have to be set when the Model MPPU first arrives. The date and time are usually set at the factory, but if the processing unit is not powered for over thirty days, the battery-backed RAM may not be valid because of current drain. The time is kept and displayed in military standard time (i.e. 15:00:00 is 3:00PM).

Setting System Date & Time

To set the system date:

[*] [M] [SPACE] [M] [M] [/] [D] [D] [/] [Y] [Y] [ENTER]

```
Command> *M MM/DD/YY
```

To set the system time:

[*] [N] [SPACE] [H] [H] [:] [M] [M] [:] [S] [S] [ENTER]

```
Command> *N HH:MM:SS
```

NOTE:

The Model MPPU Level 3 LED Display/Keypad Customer Interface currently must have the date & time set via the Level 1 interface.

Retrieving System Date & Time

The Model MPPU internal clock/calendar values can be retrieved with the Get Date or Get Time query.
To retrieve the current date:

[?] [M] [ENTER]

`Command> ?M MM/DD/YY`

To retrieve the current time:

[?] [N] [ENTER]

`Command> ?N HH:MM:SSXM`

Z.11.c Decimal Point Position

The decimal point position for the measurement readings is customer selectable. Note that the position of the decimal point for the measurement readings is the same position for all customer selectable variables (i.e. analog output, calibration, etc.).

Setting Decimal Point Position

To set the decimal point position:

[*] [K] [X] [ENTER]

`Command> *KX`

The decimal point position values are:

0 = xxxxxx (no decimal point), 1 = xxxxx.x, 2 = xxxxx.xx, 3 = xxx.xxx and 4 = xx.xxxx

Retrieving Decimal Point Position

To retrieve the decimal point position:

[?] [K] [ENTER]

`Command> ?K X`

Z.11.d Units of Measure

The Units of Measure that the serial communications will output is operator customizable to the application with the Units of Measure Command. Since the basic measurement unit for all Model MPPUs is in mils (0.001 inch = 1 mil inch), any other type of measurement unit must be converted. All Model MPPUs have a built-in conversion system to convert from mils to the customer selected unit of measure. The applicable units of measure are (terms in parentheses are the abbreviations for the particular measurement units):

Inches (IN), Millimeters (MM).

Setting Units of Measure

To set the Unit of Measure to inches:

[*] [W] [SPACE] [I] [N] [C] [H] [E] [S] [ENTER]

`Command> *W INCHES`

To set the Unit of Measure to abbreviated millimeters (mm):

[*] [W] [SPACE] [M] [M] [ENTER]

`Command> *W MM`

Typically, setting the units of measure is performed immediately after the calibration of the unit, as the calibration routine can affect the units of measure. The default units of measure stored in the Factory Default System Settings is INCHES.

Retrieving Units of Measure

To retrieve the Unit of Measure:

[?] [W] [ENTER]

`Command> ?W XX`

Z.11.e Factory Default System Settings

The Model MPPU contains a set of default system settings in the on-board EPROM for restoring the Factory Default System Settings. The factory default settings are restored to all system setting variables with the Factory Default System Settings command.

NOTE:

It is generally not necessary to restore factory default system settings unless the EPROM has been replaced.

The factory default system settings for the Model MPPU (with UVP Module and no options installed) are as follows:

```
Baud rate: 9600.00  The filter snap is set to: 0.05
Upper Limit:  80.00  Target:  50.00  Lower Limit:  20.00
Absolute Analog: 10.00=10 volts   Target Deviation:   4.00=10 volts
Sensor setup is:  Single Sensor Auto-Sync  Emitter size is: 10000.00
Command>
```

Current system settings can be viewed with the individual queries.

Restoring Factory Default System Settings

The Factory Default System Settings can be retrieved from the EPROM and loaded into system battery-backed RAM with the following command:

[*] [F] [A] [C] [T] [O] [R] [Y] [ENTER]

NOTE:

It is generally not necessary to restore Factory Default System Settings unless the EPROMS have been replaced.

The following message will be displayed after the Reset Factory Default System Settings command is entered:

```
The MPPU is now clearing memory, please wait....
Power up!
```

Z.11.f Video Pre-Processor Set-up with RS-232 Interface

Section Z.3.e details the jumper settings for the two available video pre-processors. Typically, the Universal Video Pre-Processor – UVP Module is used and this module requires no settings with the Level 1 Interface.

But the Enhanced Video Pre-Processor – EVP Module requires a software set-up routine to set the unit for one of three operational modes. The operational modes for the EVP Module are (Note: Jumpers may have to be set on the EVP Module and/or the micro-processor board for the proper operation of the video pre-processor. Refer to Section Z.3.e of this manual):

NOTE:

Changing the operational mode of the EVP Module may cause improper operation of the Model MPPU. Contact Harris Instrument Corporation Service or Engineering for additional information.

Mode One: Diagnostics

This mode is for diagnostic purposes only and is used for the detection of opaque materials. Activate this mode with the following:

[*] [X] [1] [ENTER]

```
Command> *X1
```

Mode Two: First Edge

This is the First Edge video mode of this option for operation with transparent, translucent or loosely-woven materials. It will detect the first detected edge of the material and ignore any other edges (such as would be caused by printing or wrinkles). Activate this mode with the following command:

[*] [X] [2] [ENTER]

```
Command> *X2
```

Mode Three: Filtered Video

This is the Filtered Video mode for operation with transparent, translucent or loosely-woven materials, as well as for high light interference environments. This mode will filter the video signals to ensure that the edges are properly detected. Activate this mode with the following command:

[*] [X] [3] [ENTER]

```
Command> *X3
```

Retrieving Current EVP Module Mode

To retrieve the current EVP Module mode setting:

[?] [X] [ENTER]

```
Command> ?X X
```

Z.11.g Sensor Set-up

The Model MPPU can operate with either 10XAS-Series or 10XBR-Series sensors in sizes ranging from the ten inch [254mm] 10X-10 to the forty-inch [1016mm] 10X-40.

Setting Sensor Type

Both the 10XAS-Series or 10XBR-Series sensor types can be used singly (single-sensor) or doubly (dual-sensor). Note that single Model 10XABR-10 sensor systems are not recommended. To set the sensor type:

[*] [R] [X] [ENTER]

`Command> *RX`

[X] variable for setting sensor type:
1 = Single 10XBR-Series, 2 = Single 10XAS-Series, 3 = Dual 10XBR-Series and 4 = Dual 10XAS-Series.

NOTE:

When setting the Model MPPU Level 1 for operation with dual 10XBR-Series sensors, an extra variable of the separation between the outside-end LEDs of the emitters {Figure Z.11-1}.

The Factory Default System Setting for sensor type is for a single 10XAS-Series sensor.

Setting Dual-Sensor 10XBR-Series Type

The 10XBR-Series sensor for dual-sensor operation requires the entering of an extra variable for the separation between the outside-end LEDs on the emitter {Figure Z.11-1}. This separation value ***MUST BE IN INCHES***, no matter what unit of measure is used for calibration and display/output. The native spacing of the LEDs in the emitters is one-tenth of an inch, so the basic separations must be entered in inches.

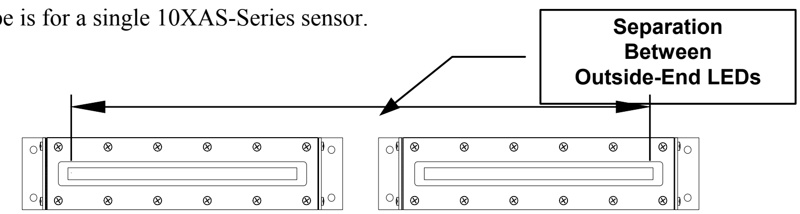


Figure Z.11-1: Outside-End Emitter LED Separation

To set the dual 10XABR sensor separation with the sensor type:

[*] [R] [3] [SPACE] [X] [X] [X] [.] [X] [X] [X] [ENTER]

`Command> *R3 XXX.XXX`

XXX.XXX is the separation between the outside-end emitter LEDs as shown in Figure Z.11-1.

Retrieving Sensor Type

To retrieve the sensor type on all but dual-sensor 10XBR-Series sensors:

[?] [R] [ENTER]

`Command> ?R X`

To retrieve the sensor type on dual-sensor 10XBR-Series sensors:

[?] [R] [ENTER]

`Command> ?R X`

Z.12 RS-232 System Calibration

The following calibration procedures varies for the Model MPPU depending upon which configuration level was purchased (Level 1, 3 or 4). These calibration procedures pertain only to the Model MPPU Level 1 RS-232 Customer Interface. For information on calibrating the other Model MPPU levels, please refer to Sections ZB, ZC and ZD.

Z.12.a Why Calibrate the Sensors?

Calibration of the Model MPPU determines the sensor height correction factor (HCF) and the sensor offset (SO). Generally, two "standards", of which the width (or length) is known, are used to calculate the HCF and SO. These standards are typically samples of nearly the widest and the narrowest (or longest and shortest) materials that will be run on the process line where the Model MPPU is installed. These samples should be carefully and as accurately measured as possible in inches for the calibration routine.

When measuring materials with SCAN-A-LINE™ 10XAS-Series sensors, the emitter-to-product spacing (product passline) *will* affect the detected measurement value. The greater the product is spaced from the calibrated position, the greater the detected measurement appears from the actual measurement {Figure Z.12-1}.

NOTE:

If the emitter-to-receiver spacing (10XAS-Series and 10XBR-Series) or the emitter-to-product spacing (product passline with 10XAS-Series) changes anytime after calibration, calibration must be performed again to take into account the changes in spacing.

With 10XAS-Series single sensor systems, the calibration routine detects and calculates the height correction factor (HCF – sometimes referred to as sensor gain). The HCF is calculated from the results of the detected measurement of the sample materials and the actual measurement values (in inches) entered during calibration of the sensor with those materials.

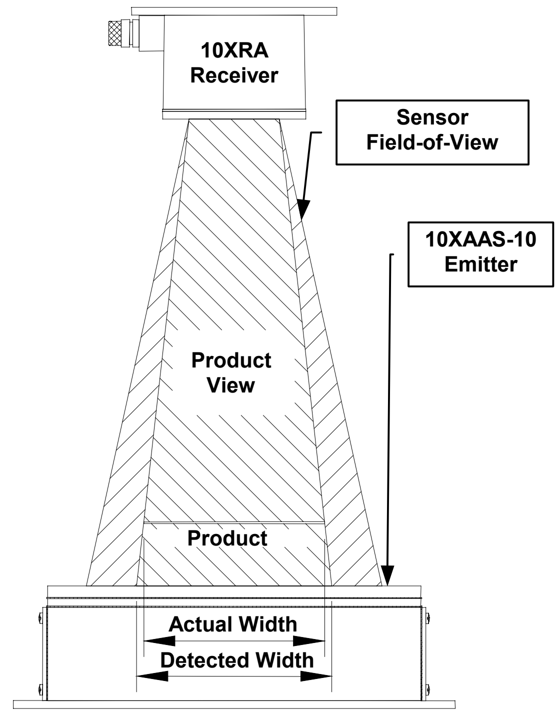


Figure Z.12-1: Sensor and Product Views with Model 10XAAS-10 Sensor

Especially with 10XAS-Series dual-sensor systems, the calibration routine not only determines the HCF but also calculates the sensor offset (SO). This is the value, calculated from the sample material dimensions and the sensor positioning determined by the calibration scans, that the Model MPPU uses to determine the actual material size.

NOTE:

The accurate measurement of the sample materials and the steady position of the product passline ensures the accuracy of the Model MPPU height correction factor (HCF) and sensor offset (SO).

Measurement Calibration standards are available from Harris Instrument Corporation (CS Option) that are traceable for the National Bureau of Standards.

See the Sensor Section of this manual [Section C for 10XAS-Series sensors or Section G for 10XBR-Series sensors] for more information on the product passline and it's effect on the whole sensor system.

Z.12.b Automatic Sensor Calibration Procedure

Prepare for the calibration of the sensor(s) by obtaining two material samples (or calibration standards) that closely represent the maximum and minimum dimensions of the materials that will be measured by the SCAN-A-LINE™ system. These two samples should be premeasured in inches as accurately as possible for the Model MPPU Level 1 calibration.

Be sure to have the SCAN-A-LINE™ system completely installed, fully fixtured on-line and operational up to the point of calibration (sensors and processing unit functioning properly, power on to the system, etc.). All system and sensor set-up procedures except Analog Scaling [Sections Z.12.f & Z.12.g] and Limit Sensing [Section Z.12.d] should be finished before calibrating the Model MPPU (i.e. setting the sensor type, decimal point position and date & time should all be performed prior to system calibration).

1) Start the terminal software that will be used to operate the Model MPPU and apply power to the Model MPPU.
   `Power Up!`
   `XX.XX`
2) Stop readings from the Model MPPU [Section Z.10.a].
   [*] [S] [ENTER]
   `Command> *S`
3) Place the maximum material sample in the sensor viewing area.

4) Begin the first phase of the calibration routine. Enter the actual pre-measured size (in inches) of the current standard with the Calibrate 1st Standard command. Include a decimal point as necessary.

[*] [C] [1] [SPACE] [X] [X] [.] [X] [X] [ENTER]

Command> *C1 XX.XX

The Model MPPU will process the entry of the C1 variable and display:

1st CALIBRATION COMPLETE

Calibration to the first standard is complete.

5) Place the minimum material sample in the sensor viewing area.

6) Begin the second phase of the calibration routine. Enter the actual pre-measured size (in inches) of the current standard with the Calibrate 2nd Standard command. Include a decimal point as necessary.

[*] [C] [2] [SPACE] [X] [X] [.] [X] [X] [ENTER]

Command> *C2 XX.XX

The Model MPPU will process the entry of the C2 variable and display:

2nd CALIBRATION COMPLETE

7) Calibration to the second standard is complete.

8) Begin readings again [Section Z.10.b].

[?] [G] [ENTER]

Command> ?G

The Model MPPU is now calibrated for measurement with the product passline of the current sensors. Any change in product passline (or the sensors position) may affect the calibration (except with 10XBR-Series sensors, where up to a fourteen inch [35.6cm] passline change may be allowable).

Retrieving the Calibration Values

The values stored during the Calibration Procedure can be accessed and recorded to perform a manual calibration [Section Z.12.c]. The values stored are:

1) First raw count
2) First calibration standard measurement
3) Second raw count
4) Second calibration standard measurement

The raw counts, which are the sensor counts of the calibration standard, are stored during the Automatic Calibration Procedure. The calibration standard measurement is entered during the Automatic Calibration Procedure. The first raw count and first calibration standard measurement are for the first calibration standard and the second for the second calibration standard. To view the Calibration Values, perform the following procedure:

1) Start the terminal software that will be used to operate the Model MPPU and apply power to the Model MPPU.

Power Up!
XX.XX

2) Stop readings from the Model MPPU [Section Z.10.a].

[*] [S] [ENTER]

Command> *S

3) View the first raw count value.

[?] [J] [1] [ENTER]

Command> ?J1 XXXXXX

Record first raw count HERE:____

4) View the first calibration standard measurement.

[?] [J] [2] [ENTER]

Command> ?J2 XXX.XXX

Record first calibration standard measurement HERE:__________________________________

5) View the second raw count value.

[?] [J] [3] [ENTER]

Command> ?J3 XXXXXX

Record second raw count HERE:____

4) View the second calibration standard measurement.

[?] [J] [4] [ENTER]

Command> ?J4 XXX.XXX

Record second calibration standard measurement HERE:_________________________________

By recording these values, you can manually calibrate your sensor system [Section Z.12.c].

Z.12.c Manual Sensor Calibration

The values stored during Automatic Sensor Calibration can be entered manually for the recalibration of the Model MPPU with the system sensors. Recalibration should be performed when:

1) The EPROM has been replaced;

2) Any other components of the Model MPPU have been replaced.

These value are derived from the initial Model MPPU calibration with calibration standards.

Warning:

DO NOT MANUALLY CALIBRATE THE MODEL MPPU IF THE SENSORS HAVE BEEN REPOSITIONED OR MOVED. The calibration values will not be valid for the repositioned sensors and the system will not operate properly.

1) Start the terminal software that will be used to operate the Model MPPU and apply power to the Model MPPU.
   `Power Up!`
   `XX.XX`
2) Stop readings from the Model MPPU [Section Z.10.a].
   [*] [S] [ENTER]
   `Command> *S`
3) Enter the first raw count value:
   [*] [J] [1] [SPACE] [X] [X] [X] [X] [X] [X] [ENTER]
   `Command> *J1 XXXXXX`
4) Enter the first calibration standard measurement:
   [*] [J] [2] [SPACE] [X] [X] [X] [.] [X] [X] [X] [ENTER]
   `Command> *J2 XXX.XXX`
5) Enter the second raw count value:
   [*] [J] [3] [SPACE] [X] [X] [X] [X] [X] [X] [ENTER]
   `Command> *J3 XXXXXX`
5) Enter the second calibration standard measurement:
   [*] [J] [4] [SPACE] [X] [X] [X] [.] [X] [X] [X] [ENTER]
   `Command> *J4 XXX.XXX`
6) Calibrate the system based on the previous *J entries:
   [*] [J] [5] [ENTER]
   `Command> *J5 XXX.XXX`

The Model MPPU has been manually calibrated.

Z.12.d Absolute Limit Sensing Calibration

Once the system has been calibrated, the measurements limits can be set. There are two different way in which the limits can be set, either by an absolute value as described in this section or by a tolerance from target [Section Z.12.e]. There are two measurement limit settings for the Model MPPU (UPPER – HI and LOWER – LO). These settings tell the Model MPPU when to activate the HI and LO relay contact closures.

NOTE:

Setting an Absolute Limit will override any current Tolerance Limit [Section Z.12.e] value setting. Setting the Absolute UPPER Limit value will override the UPPER limit value set with a previous Tolerance Limit setting (but not the LOWER limit setting).

Setting the UPPER (HI) Limit

To set the upper (HI) measurement limit:

[*] [U] [SPACE] [X] [X] [.] [X] [X] [ENTER]

`Command> *U XX.XX`

The Factory Default System Setting for the upper limit is 80.00.

Retrieving the UPPER (HI) Limit Setting

To view the current upper (HI) measurement limit setting:

[?] [U] [ENTER]

`Command> ?U XX.XX`

Setting the LOWER (LO) Limit

To set the lower (LO) measurement limit:

[*] [L] [SPACE] [X] [X] [.] [X] [X] [ENTER]

`Command> *L XX.XX`

The Factory Default System Setting for the lower limit is 20.00.

Retrieving the LOWER (LO) Limit Setting

To view the current lower (LO) measurement limit setting:

[?] [L] [ENTER]

Command> ?L XX.XX

Z.12.e Tolerance Limit Sensing Calibration

The Tolerance Limit Sensing must first have the Target value set. This is the "median" or required measurement value for the measured material. A tolerance value can then be set as a "plus-or-minus" value that will activate the UPPER limit relay when the target plus the tolerance value is measured (or will activate the LOWER limit when target minus tolerance value is measured).

NOTE:

Setting the Tolerance Limit Sensing will override both the Absolute UPPER and LOWER Limit settings [Section Z.12.d].

Set the Target Value

To set the target value:

1) Apply power to the measurement system.

Power up!
XX.XX

2) Stop readings from the system.

[*] [S] [ENTER]

Command> *S

3) Set the target size value of the target material sample with the Set Target command.

[*] [T] [SPACE] [X] [X] [.] [X] [X] [ENTER]

Command> *T XX.XX

The target is now set. The Factory Default System Setting for the target is 50.00. Continue with setting of the limit tolerance value.

Retrieving the Target Value Setting

To view the current target size value:

[?] [T] [ENTER]

Command> ?T XX.XX

Set Limit Tolerance

To set the limit tolerance value:

1) Set the limit tolerance value with the Set Tolerance command.

[*] [E] [SPACE] [X] [X] [X] [X] [X] [X] [ENTER]

Command> *E XXXX

The target is now set. The Factory Default System Setting for the limit tolerance is 1.

Retrieving the Limit Tolerance Setting

To view the current limit tolerance value:

[?] [E] [ENTER]

Command> ?E XXXX

Z.12.f Scaling the Deviation Analog Output

The Model MPPU has two analog outputs available as standard. One is absolute unipolar [Section Z.4.c] and one is deviation bipolar. These outputs must be "scaled" to reflect customer materials and voltage output preferences. Refer to Section Z.4.c and Z.8 in this manual for more information on the analog outputs of the Model MPPU and any EVO documentation for specific configuration information on the other types of outputs optionally available with this processing unit.

The Deviation Analog Output provides a bipolar analog voltage (-10VDC to +10VDC) proportional to the deviation of the detected measurement from the target measurement. The target and scaling factor are set with the Level 1 RS-232 Customer Interface from the host computer. The maximum analog output voltage will be ±10 volts for a deviation of X inches (user entered value) from the target value.

The following instructions are a basic guide for scaling the deviation analog to the target value and the deviation from target value. The values entered are not constant, but are dependent upon the application. Size values and voltages will vary from application to application. Be sure that the entire SCAN-A-LINE™ system (sensors and Model MPPU) is completely installed and fully functioning. Perform the set-up routines for sensor type [Section Z.11.g] and decimal point position [Section Z.11.c] BEFORE beginning the setting of the deviation analog scaling value. Also perform system calibration [Section Z.12] BEFORE setting the deviation analog scaling value.

Set the Target Value

The first procedure in scaling the deviation analog is to set the target value. The target value is the size value of the target material that the deviation analog function uses as a base point to determine the deviation value. Note that this value may already be set if using the Limit Tolerance as described in Section Z.12.e.

To set the target value:

1) Apply power to the measurement system.

    Power up!
    XX.XX

2) Stop readings from the system.

    [*] [S] [ENTER]
    Command> *S

3) Set the target size value of the target material sample with the Set Target command.

    [*] [T] [SPACE] [X] [X] [.] [X] [X] [ENTER]
    Command> *T XX.XX

The target is now set. The Factory Default System Setting for the target is 50.00. Continue with the scaling of the deviation analog output scaling routine.

Retrieving the Target Value

To view the current target value:

[?] [T] [ENTER]
Command> ?T XX.XX

Set the Deviation Analog Scaling

Once the target value is set, the scaling of the deviation analog output can be performed.

1) Enter the deviation value (the value that represents the difference between the target value and the maximum size material - i.e. four inches of deviation from target equals 10VDC). This value corresponds to the maximum deviation analog output (10VDC) for that difference. Use the Deviation Scaling command.

    [*] [V] [SPACE] [X] [X] [.] [X] [X] [ENTER]
    Command> *V XX.XX

Retrieving the Deviation Analog Scaling Value

To view the current deviation analog scaling value:

[?] [V] [ENTER]
Command> ?V XX.XX

The Factory Default System Setting for the deviation output is 4.00 = 10 volts.

Z.12.g Scaling the Absolute Analog Output

The Model MPPU has two analog outputs available as standard. One is deviation bipolar [Section Z.4.c] and one is absolute unipolar. These outputs must be “scaled” to reflect customer material and voltage output preferences. Refer to Section Z.4.c and Z.8 in this manual for more information on the analog outputs of the Model MPPU and any EVO documentation for specific configuration information on the other types of outputs optionally available with this processing unit. The Absolute Analog Output provides an unipolar analog voltage (0VDC to 10VDC at 10mA) of the absolute measurement of the strip material. The following instructions are a basic guide for scaling the absolute analog output.

Set the Absolute Analog Scaling

Be sure that the entire SCAN-A-LINE™ system (sensors and Model MPPU) is installed and fully functioning. Perform the set-up routines for sensor type [Section Z.11.g] and decimal position [Section Z.11.c] before beginning the scaling of the absolute analog. Perform the system calibration in Section Z.12 BEFORE proceeding with the absolute analog scaling routine.

1) Apply power to the measurement system.

    Power up!
    XX.XX

2) Stop readings from the system.

[*] [S] [ENTER]
Command> *S

3) Enter the minimum size value to be represented by 0VDC with the Set Low Absolute Output command.

[*] [A] [L] [SPACE] [X] [X] [.] [X] [X] [ENTER]
Command> *AL XX.XX

4) Enter the maximum size value to be represented by +10VDC with the Set High Absolute Output command.

[*] [A] [H] [SPACE] [X] [X] [.] [X] [X] [ENTER]
Command> *AH XX.XX

The absolute analog has been scaled. The Factory Default System Settings for the analog is 0.00 = 0VDC and 100.00 = 10VDC.

Retrieving the Absolute Analog Scaling Value

To view the current low absolute scaling value:

[?] [A] [L] [ENTER]
Command> ?AL XX.XX

To view the current high absolute scaling value:

[?] [A] [H] [ENTER]
Command> ?AH XX.XX

Z.12.h Digital Filter Snap & Exponential Averaging

The Model MPPU contains a resolution enhancing feature called a Digital Filter Snap. The Digital Filter Snap is a self-adjusting, exponential averaging tolerance system that takes averages of the sensor readings and creates a tolerance factor for the sensor video signals. This helps the system display a steady output on the LCD Touchscreen [Level 4 – Section ZD] or LED Display/Keypad [Level 3 – Section ZC] and the Level 1 measurement readings serial output. The Filter Snap is a useful tool to fine-tune the system performance.

NOTE:

The Digital Filter Snap should be adjusted when the Model MPPU is dithering measurement readings of a known size material. Adjusting the Filter Snap too low may cause fluctuating measurements on materials. Care should be taken in adjusting the Filter Snap. Please contact Harris Instrument Service for assistance in setting the Filter Snap.

The Filter Snap and Exponential Averaging value are customer adjustable. The Filter Snap can be set as zero (0) for no filtering or any inch or millimeter tolerance band for fifty readings filtering. The Exponential Averaging value must be a positive number. Refer to Section Z.6.a in this manual for information on functionality and requirements for the Filter Snap and Exponential Averaging value.

Set the Digital Filter Snap

To set the Filter Snap, use the Set Filter Snap command:

[*] [F] [SPACE] [X] [ENTER]

Example: To set the Filter Snap for no filtering, enter the following:

[*] [F] [SPACE] [0] [ENTER]

The Model MPPU responds with:

***F 0**

Example to set the Filter Snap On with the value of 0.05 inches [1.7mm], enter the following:

[*] [F] [SPACE] [0] [.] [0] [5] [ENTER]

The Model MPPU responds with:

***F 0.05**

The setting of the Snap Filter is dependent upon the display requirements of the system operators. The Factory Default System Settings for the Snap Filter is 0.05 inches [1.3mm].

Retrieving the Digital Snap Filter Value

To view the current digital snap filter value:

[?] [F] [ENTER]

Command> ?F XX.XX

Set the Exponential Averaging Value

The Exponential Averaging value is the second step in setting the Snap Filter.

To set the Exponential Averaging value, use the Set Exponential Averaging value command:

[*] [Q] [SPACE] [X] [X] [X] [X] [X] [X] [ENTER]

Example: To set the Exponential Averaging value for a Filter Snap with no filtering, enter the following:

[*] [Q] [SPACE] [0] [ENTER]

The Model MPPU responds with:

***Q 0**

Example to set the Exponential Averaging value to 0.01 inches [0.25mm], enter the following:

[*] [Q] [SPACE] [0] [.] [0] [1] [ENTER]

The Model MPPU responds with:

***Q 0.01**

The setting of the Snap Filter and the associated Exponential Averaging value are dependent upon the display requirements of the system operators. The Factory Default System Settings for the Snap Filter is 0.05 inches [1.3mm] and for the Exponential Averaging value is 0.025 (may be displayed as 0.03 for units that have the decimal point position set to two places – XX.XX).

Retrieving the Exponential Averaging Value

[?] [Q] [ENTER]

Command> ?Q XX.XX

This completes all the functions available from the standard Model MPPU Level 1. Custom configurations of the Model MPPU Level 1 may apply and would be detailed in any accompanying EVO documentation, if applicable.

Z.13 Analog Outputs Trouble Shooting

The Model MPPU Level 1 interface has two routines for verifying the analog outputs.

Z.13.a Verify the Deviation Analog Output

To verify the deviation analog output, be sure that the entire SCAN-A-LINE™ system (sensors and Model MPPU) is completely installed, fully functioning and powered on. Perform the set-up routines for sensor type [Section Z.11.g] and system calibration [Section Z.12] BEFORE beginning the verification of the deviation analog output voltage.

Make sure the material currently on the line is at full line tension and at the proper product passline for the system calibration [Section Z.12]. Be sure that the unit is fully operational and powered on with the RS-232 Customer Interface taking readings from the sensor system.

To verify the deviation analog output:

1) Attach the digital voltmeter PLUS VOLTS lead to the ANALOG OUTPUT 1 terminal (Y4-2) and the COMMON lead to the COM terminal (Y4-1).

2) Check the measurement of the material currently on the line using the Model MPPU measurements in the communications software. For this example, the material on the line measures 14.5 inches.

14.5

3) Stop the readings from the Model MPPU.

[*] [S] [ENTER]

COMMAND> *S

4) Set the target size value to the measurement of the material currently on the line (for this example, 14.5) with the Set Target command.

[*] [T] [SPACE] [1] [4] [.] [5] [ENTER]

Command> *T 14.5

The target is now set.

5) Start readings from the Model MPPU.

[?] [G] [ENTER]

COMMAND >?G
14.5
14.5

6) Check the voltmeter for its current reading. The voltmeter should read 0VDC ±0.025VDC. If the voltmeter is off more than ±0.025VDC, the bipolar DAC must be adjusted:

a) Locate potentiometer R5 on the main board inside the Model MPPU [Section Z..5.d].

b) With a small blade screwdriver, turn the potentiometer adjustment screw clockwise and view the reading on the voltmeter. Adjust the screw in the direction necessary to cause the bipolar analog voltage to read 0VDC with the target material.

Once the voltmeter reads 0VDC ±0.025VDC, set the deviation scaling value.

7) Stop readings from the Model MPPU.

[*] [S] [ENTER]

COMMAND> *S

8) Enter the deviation value, the value that represents the difference between the target value and the maximum size material (for this example, 4.5 inches of deviation from target equals 10VDC). This value corresponds to the maximum deviation analog output (10VDC) for that difference. Use the Deviation Scaling command.

[*] [V] [SPACE] [4] [.] [5] [ENTER]

Command> *V 4.5

9) Reset the Target value at 15.5 to verify the full operation of the deviation analog output.

[*] [T] [SPACE] [1] [5] [.] [5] [ENTER]

Command> *T 15.5

The target is now set at 15.5.

10) Start readings from the Model MPPU.

[?] [G] [ENTER]

```
COMMAND >?G
14.5
```

11) Check the voltmeter for a change in reading from 0VDC. The reading should be lower by a value equal to the volts per inch of deviation (For example, since the current material on the line is 14.5 inches and the deviation scaling value is 4.5 inches equals 10VDC and the current target value is 15.5 inches, the current material deviates from target minus one inch or -2.2VDC.).

Repeat this procedure with a target value smaller than the current material on the line to verify operation if necessary.

If the voltages are correct, the deviation analog is verified. If the voltages are not correct, repeat the set-up procedure and re-verify the voltages. If the voltages are still not correct, contact Harris Instrument Corporation Service for assistance.

Z.13.b Verify the Absolute Analog Output

To verify the absolute analog output, be sure that the entire SCAN-A-LINE™ system (sensors and Model MPPU) is completely installed, fully functioning and powered on. Perform the set-up routines for sensor type [Section Z.11.g] and system calibration [Section Z.12] BEFORE beginning the verification of the absolute analog output voltage. Make sure the material currently on the line is at full line tension and at the proper product passline for the system calibration [Section Z.12] and that power is on to the unit and the communications software is communicating correctly with the processing unit. To verify the absolute analog output voltages:

1) Attach the digital voltmeter PLUS VOLTS lead to the ANALOG OUTPUT 4 ABS terminal (Y4-5) and the COMMON lead to the COM terminal (Y4-6).

2) Check the measurement from the Model MPPU for the current measurement of the material on the line.

Use the current measurement value of the material on the line as a basis for verifying the scaling of the absolute analog (for example, the current measurement of the material on the line is 14.5 inches).

```
14.5
```

3) Stop the readings from the Model MPPU.

[*] [S] [ENTER]

```
COMMAND> *S
```

Since the absolute analog output is 0VDC to 10VDC, the maximum size to be run on the line should be used to scale the high absolute analog (for example, the maximum material to be run on this line is 19 inches and the analog should read 10VDC).

4) Enter the minimum size value to be represented by 0VDC with the Set Low Absolute Output command (0VDC equals 9 inches).

[*] [A] [L] [SPACE] [9] [.] [0] [0] [ENTER]

```
Command> *AL 9.00
```

5) Enter the maximum size value to be represented by 10VDC with the Set High Absolute Output command (10VDC equals 19 inches).

[*] [A] [H] [SPACE] [1] [9] [.] [0] [0] [ENTER]

```
Command> *AH 19.00
```

5) Start readings from the Model MPPU.

[?] [G] [ENTER]

```
COMMAND> ?G
14.5
```

6) Check the voltmeter for its current reading. The voltmeter should read the result of the volts per unit multiplied by the size of the current material on the line (For example, since 19 inches equals 10VDC and 9 inches equals 0VDC, absolute voltage output is 1VDC per inch. Since the current material on the line is 14.5 inches, the absolute voltage output should be 5.5VDC±0.025VDC.).

If the voltages are correct, the absolute analog is verified. If the voltages are not correct, repeat the set-up procedure and re-verify the voltages. If the voltages are still not correct, contact Harris Instrument Corporation Service for any further assistance.

Z.14 Set-up Procedure Sequence

The set-up of the Model MPPU with a sensor system is fairly straight forward. The following listing shows the suggested sequence of events for setting up the system. Note that the sensors must be installed on-line and functioning properly and that power must be applied to the Model MPPU. A host computer is also necessary for communication with the Model MPPU.

1) Verify all jumper settings for the Main Board [Section Z.5.d], Micro-Controller Board [Section Z.5.a] and Video Pre-Processor [Section Z.3.e] before performing any set-up functions.
2) Set Communications [Section Z.9].
3) Set Decimal Point Position for data output [Section Z.11.c].
4) Set Units of Measure [Section Z.11.d].
5) Set the type of sensor [Section Z.11.g].
6) Calibrate the sensor system [Section Z.12.b].
7) Set the Limit Sensing – either Absolute Limit Sensing [Section Z.12.d] or Tolerance Limit Sensing [Section Z.12.e].
8) Scale the Deviation Analog Output, if required [Section Z.12.f].
9) Scale the Absolute Analog Output, if required [Section Z.12.g].
10) Set the Digital Filter Snap [Section Z.12.h].
11) Record System Settings in Section Z.14.a for future use.
12) Review any other manual sections (such as Centerline Analog Output – Section ZK) for other information pertaining to system set-up.
13) Review any included Engineering Variance Order (EVO) documentation for other information pertaining to system set-up.

Z.14.a Configuration Form

This form is to be filled out by the operator to record the system settings for the Model MPPU, no matter which customer interface is installed. Many of the system settings of the Model MPPU can be entered manually, bypassing the need for re-calibration of the system.

Once a complete installation of the Model MPPU is performed and the unit is functioning properly, record here the system settings as found in the Diagnostic Screen available via the Level 1 RS-232 Customer Interface or the Level 4 LCD Touchscreen interface (currently, the Level 3 LED Display/Keypad does not display diagnostic information, use the Level 1 interface to view the Diagnostic Output). Note that the values in parentheses is the Factory Default System Settings that are stored in the EPROM.

Units of Measure (INCHES):________ Decimal Point Position (XX.XX):________.

Baud Rate (9600bps):____________ Filter Snap (0.05):_______ Exponent Average (0.025): ________.

Upper Limit (80):________ Lower Limit (20):________ Target (50):_______.

Absolute Analog (100=10VDC):_________ Deviation Analog (4 = 10VDC):_______.

Sensor Type (AS):_____ Single (X):_____ Dual:_____.

Z.15 Related Drawings

The following pages contain various drawings for the components used in and with the Model MPPU. For drawings of other configurations, please contact Harris Instrument Corporation Engineering. All mechanical drawings are available as AutoCAD® .DWG files for a minimal charge. Please contact Harris Instrument Corporation Sales.

Drawing #	Description	Drawing Format
1298176	*Model MPPU Level 1 Dimensions*	*AutoCAD LT Rel. 3*
1398176 Rev. D Pg. 1	*Model MPPU Level 1 Interior View*	*AutoCAD LT Rel. 3*
1398176 Rev. D Pg. 2	*Interior View Legend*	*AutoCAD LT Rel. 3*
1495123 Rev. A	*Model MPPU Main Board Assembly*	*AutoCAD LT Rel. 3*
1495124	*Model MPPU Co-Processor Board Assembly*	*AutoCAD LT Rel. 3*
1495172 Rev. C Pg. 1	*Model MPPU Micro-Controller Board Assembly*	*AutoCAD LT Rel. 3*
1496173 Rev. A	*EVP Module – Enhanced Video-Preprocessor Board Assembly*	*AutoCAD LT Rel. 3*
1498016	*UVP Module – Universal Video Pre-Processor Board Assembly*	*AutoCAD LT Rel. 3*

Table Z.15-1: Drawing Packet Information