



Rieker Inc.

Multi-Output Precision Inclinometer

Touch Screen
User Programmable
Dual & Single Axis
Multi-Mount

2021

Flex Series MPI User Guide



PRODUCT SAFETY GUIDE FOR RIEKER MPI DIGITAL GRAPHIC DISPLAY

Important safety, health, and regulatory info that applies to the Rieker MPI Digital Graphic Display.



WARNING: Outdoor and Wet Conditions Use

The Rieker MPI device is rugged and dust tight - it is NOT waterproof and is not impervious to water damage in wet environments. To avoid damaging this device, do not submerge it or expose it to excessive rain or moisture. To reduce the risk of fire or shock, do not attempt to change batteries in rain or excessive moisture conditions.



WARNING: Do Not Attempt Repairs

Do not attempt to take apart, open, service, or modify the product, accessories, or power supply. Doing so could present the risk of electric shock or other hazard. Any evidence of any attempt to open and/ or modify this device, including any peeling, puncturing, or removal of any of the labels, will void the Limited Warranty.



WARNING: Battery Safety

This device contains a lithium ion battery, improper use of which may result in fire or explosion. To reduce the risk of fire or explosion, do not heat, open, puncture, mutilate, or dispose of the product in fire.

Do not leave the device in direct sunlight, such as on the dash of a car in the summer, for an extended period of time. Product contains rechargeable batteries do not recharge your device near a fire or in extremely hot conditions.



WARNING: Proper Storage - Extreme Environmental Conditions

Only store your Rieker graphic display device in a clean, dry environment. Do not store your Rieker MPI device where the ambient temperature is above 158°F (70°C) or below -4°F (-20°C). Do not store your Rieker device where it is exposed to strong electromagnetic fields or where it may be exposed to direct electrical current. Using or storing the Rieker MPI device in an environment where the external temperature varies widely and quickly might damage the display. When moved to a location with a temperature difference of 20°F (11°C) or more from the previous location, allow the device to come to room temperature before turning it on.



WARNING: Potentially Explosive Atmospheres

Areas with potentially explosive atmospheres are often, but not always, posted and can include fueling areas, such as below decks on boats, fuel or chemical transfer or storage facilities, or areas where the air contains chemicals or particles, such as grain dust, or metal powders. The Rieker MPI device is NOT rated for hazardous locations. When you are in such an area, turn off the device, and do not remove or install battery chargers, AC adapters, or any other accessory. In such areas, sparks can occur and cause an explosion or fire.



CAUTION:

This MPI has been manufactured to allow for trip angle adjustment. Purchaser assumes the responsibility of ensuring that the settings are appropriate for their specific application. **IN NO EVENT WILL RIEKER BE LIABLE FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES OF ANY KIND.**



CALIBRATION NOTES:

This instrument has been calibrated to perform to precise specifications. Any tampering or reconfiguration of this instrument may change the properties of the product, and will therefore void the warranty. All sensors are sealed. If the seal is broken the calibration and warranty is void.

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The MPI is a High-Accuracy Digital Inclinometer with Sunlight Readable Touch Screen & Adjustable Output Parameters for Precision Angle Measurements.

Description

The MPI provides accurate and precise single or dual axis inclination sensing in a rugged machined Aluminum housing - the anodized finish protects the surface from wear. The design is well suited for hand-held use; each side is a machined flat reference surface.

The MPI offers multiple configurable outputs: Graphic Touch-Screen Sunlight-readable Display, Digital RS232 & RS485, Analog Voltage, and multiple Relay Switches providing maximum functionality.

The display shows angle in degrees (°), percent grade (%), or inch per foot rise (“) with either 1, 0.1- or 0.01-degree resolution. The display provides graphical axis level indicators in green, yellow, and red, which can be activated to trip at predefined angles within the specified measuring range - providing the operator a bright visual alert of changed condition. These can be coordinated with the built in Relay outputs - each with field adjustable trip angle settings.

The MPI also has a Bulls-Eye Bubble Level mode for precise leveling applications.

Mounting options include machined plates for permanent installation or with heavy duty magnets added, temporary hands-free placement.

Updates & Revision History

The information in this guide may be subject to change. Please visit www.riekerinc.com for latest version of this document.

TABLE 1: REVISION HISTORY

REV	DATE	DESCRIPTION
A	12/24/19	Initial Release
B	08/12/21	CN 21-08-003
C	05/17/24	CN 23-01-001

MPI Installation

FIGURE 1: MPI Dimensions and Mounting (Inches [Mm])

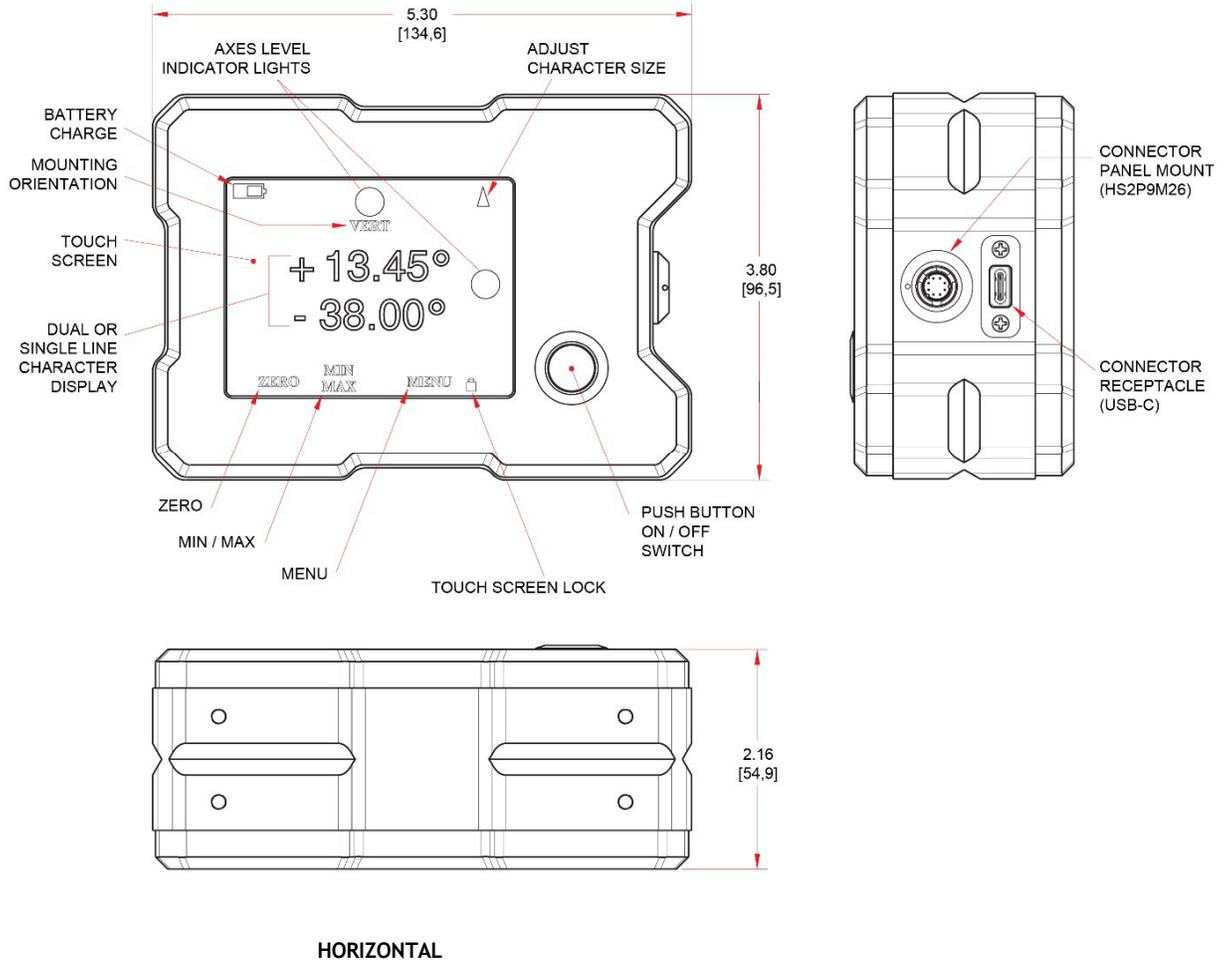


FIGURE 2: Mounting Positions

Horizontal Mount Axis Orientations

As shown in the bottom drawing of *Figure 2*, the 0° orientation for a horizontal mount MPI is a desktop level position.

- The top line of the display is the X-Axis measurement. Looking at the display with the connector facing to the right, rotate the display side to side for the X axis.
- The bottom line of the display is the Y-Axis measurement. Looking at the display with the connector facing to the right, rotate the display front to back for the Y axis.

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Vertical Mount Axis Orientations

As shown in the top drawing of *Figure 2*, the 0° orientation for a vertical mount MPI is with the connector to the right.

- The top line of the display is the X-Axis measurement. Looking at the display with the connector facing to the right, rotate the display clockwise or counterclockwise for the X axis.
- The bottom line of the display is the Y-Axis measurement. Looking at the display with the connector facing to the right, rotate the display front to back for the Y axis.

Main Screen Adjustments

NOTE: The screen must be unlocked before any adjustments can be made.

What is displayed on the Main Touch Screen?

- Vertical or Horizontal Device Orientation Adjust
- Character Height Adjust
- Single or Dual Axis Display Adjust
 - Units of Measure
- Angles in Degrees
- Percent grade
- Inch Per Foot Rise
- Degrees / Minutes
 - Trip angle indicator lights
- Relative or Permanent Zero Adjust
- Minimum and Maximum Angle Recall
- Battery Level Indicator Graphic
- Main Menu Button
- Lock or unlock the Touch Screen

1.1 Adjust Vertical or Horizontal Device Orientation

The Device can be used to measure either Horizontally (lying flat with the display facing up) or Vertically (on one of the machined sides with the display facing the user).

The Horizontal “HORZ” or Vertical “VERT” device orientation can be set simply by touching the “HORZ” or VERT” on the screen.

1.2 Change the Character Height of the Displayed Angle

The Character Height of the displayed angle is changed by touching the arrow in the upper right-hand corner of the screen. The height is either 0.31” [8.13mm] or 0.5” [12.7mm].

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1.3 Change from Dual to Single Axis Display

The device can indicate either a dual or single axis. The top line is the X axis or side to side angle indication and the bottom line is the Y axis or front to back angle indication.

1.3.1 Select the X axis, single angle indication:

Touch the top line angle, in the center slightly above the decimal point. The bottom line will go away and the X axis will be displayed in the center of the screen. To set the device back to dual axis indication touch the screen just above the displayed X axis indication. The dual axis will again be displayed.

1.3.2 Select the Y axis, single angle indication:

Touch the bottom line, angle indication, in the center slightly above the decimal point. The top line will go away and the Y axis will be displayed in the center of the screen. To set the device back to dual axis indication touch the screen just below the displayed Y axis indication. The dual axis will again be displayed.

1.4 Zero the Display Indication

The display has two options for zeroing the device:

- **Relative Zero** is a temporary setting that can be set anywhere within the operating range of the device but will not be saved when the power is cycled.
- **Permanent Zero** is a (semi) permanent setting that can be set anywhere in the operating range of the device and will be saved when the power is cycled but can be reset through the menu. The device must be fixed in the desired zero positioned during the zeroing process. NOTE: If the device is tilted in an orientation that is in an indeterminate range, **OVERRANGE** will be displayed and the device will have to be repositioned before zeroing can be achieved.

1.4.1 Set the Relative Zero

Touch "ZERO" on the main screen and a new screen "ZERO" will appear. The current state of the RELATIVE Zero will be displayed in blue "OFF". Touch the arrow to the right of the RELATIVE OFF to set Relative zero. "RELATIVE ON" will be displayed. An (*) will appear the left of the newly zeroed angle(s) indication. In dual axis mode both X and Y axis will be zeroed. In single axis mode only, the active axis will be zeroed.

1.4.2 Remove the Relative Zero

Cycle the power or touch "ZERO" on the screen to return to the ZERO screen. Touch the arrow to the left of the RELATIVE blue "ON" indication and RELATIVE OFF will be displayed. The Relative zero will be removed and the factory calibrated zero will be restored.

1.4.3 Set the Permanent Zero

Touch "ZERO" on the main screen and a new screen "ZERO" will appear. The current state of the PERMANENT Zero will be displayed in blue "OFF". Touch the arrow to the right of the PERMANENT OFF to set Permanent zero. "PERMANENT ON" will be displayed. The newly zeroed angle(s) are displayed. In dual axis mode both X and Y axis will be zeroed. In single axis mode only, the active axis will be zeroed.

1.4.4 Remove the Permanent Zero

Touch “ZERO” on the screen to return to the ZERO screen. Touch the arrow to the left of the PERMANENT blue “ON” indication and PERMANENT OFF will be displayed. The Permanent zero will be removed and the factory calibrated zero will be restored.

1.5 Min/Max Angles

The Minimum and Maximum angles that are achieved during a new measuring session are stored temporarily to be viewed at the completion of the measuring session. A new session starts after the power is cycled or the MIN/MAX indicator is touched on the main screen. If a Single axis is selected only that axis’s MIN and MAX angles will be displayed.

1.5.1 Viewing MIX/MAX Angles

To View the MIN and MAX angles achieved during a measuring session touch the MIN/MAX indicator on the main screen and the MIN X and MIN Y will appear followed by the minimum angles achieved. Touch the MIN/MAX indicator again and the MAX X and MAX Y will appear followed by the maximum angles achieved. Touch the MIN/MAX indicator again and the device will return to normal operation and a new MIN/MAX session will start.

1.6 Battery Charge Level Indicator

The Battery Charge Level Indicator is located at the upper left-hand corner of the screen showing the charge level of the Lithium Ion battery. When the indicator is WHITE, the battery is operating at an optimum performance level. When the indicator is YELLOW, the battery is approaching a discharged state; there is a 15-minute window to connect the charger. When the indicator turns RED, the battery is nearly discharged and will automatically turn off.

NOTE: the device may be used while charging.

1.6.1 Charge the Battery

The Battery is charged using a Lithium Ion battery charger with a USB-C connector included in the kit. **WARNING:** Using another type of charger not specifically designed for Lithium Ion batteries can cause damage to the device and the battery and cause a fire.

The charger can be plugged into a 110-240VAC supply using the wall wart adapter or a USB Type A port that supplies power. The Battery indicator will indicate charging when the battery begins to charge.

NOTE: It may take up to 30 seconds before the indicator shows it is charging. A depleted battery may take several minutes before the device will operate.

1.7. Lock and Unlock the Touch Screen

The Touch Screen is Default Locked to prevent inadvertent touches. It must be Unlocked to activate the user interface.

The Touch Screen Lock symbol is located at the bottom right hand corner of the display and indicates the current state of the Touch Screen. A closed lock indicates a locked or inactive touch screen and an open lock indicates an active touch screen.

To change the current state and indication of the touch screen touch the lock on the screen until it indicates the desired state.

While the Touch Screen is locked only the lock portion of the screen is active. To change any features of the device, the Touch screen must be unlocked.

The MENU Indicator

The menu indicator allows for adjustment of the device's parameters. By touching this on the main screen new menus will appear to set individual parameters available to the device. Arrows are used to navigate through the adjustment screens and to set parameters.

2.1 Rules for the Arrows

-  Touching a LEFT-FACING ARROW at the upper-left of the screen returns to the previous menu screen.
-  Touching a RIGHT-FACING ARROW advances to the next screen, which will be either a submenu of the current menu screen or the current parameter setting screen. Touching the RIGHT-FACING ARROW in the last mode settings screen returns to the previous mode setting screen.
-  Touching an UP-FACING ARROW increases or changes the value of the setting shown.
-  Touching a DOWN-FACING ARROW decreases or changes the value of the setting shown.

OUTPUT MENU

The Output Menu is the main screen that appears after touching the MENU indicator. From this menu the Display, Analog, RS232, RS485, and Switches sub-menus are accessed. Each Sub-Menu has its own set of parameter adjustments based on the output type:

- Display
 - Power Save
 - Angle Display Resolution
 - Brightness
 - Filter
 - Units of Measure
- Display > Display Submenu
 - Polarity
 - Bulls-Eye Level Mode
 - Factory Defaults Reset
- Analog
 - Output enable/disable

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- X and Y axis MIN/MAX settings
- RS232
 - Output enable/disable
 - Baud Rate adjust
- RS485
 - Output enable/disable
 - Baud Rate adjust
- Switches
 - Multiple Relay output enable/disable
 - Trip Point adjust
 - Trip angle indicator lights

3.1 Display Adjustments

The display parameters are adjusted within the DISPLAY ADJUST Menu. From this screen the user will be able to set POWER SAVE, RESOLUTION, BRIGHTNESS, FILTER, and UNITS of Measure.

- Touch “MENU” on the Main Screen to bring up the OUTPUT MENU
- Then select “MENU” to the right of DISPLAY to access DISPLAY ADJUST.

NOTE: FACTORY DEFAULTS restore, POLARITY orientation, and BULLS EYE LEVEL mode are accessed in the DISPLAY ADJUST submenu (see 3.2 below).

3.1.1 Adjust the Power Save Feature

The POWER SAVE function is a 2-part feature allowing the user to set the idle time limit to dim the display and/or shut down the device completely to save battery power.

POWER SAVE DIMMER: The current setting for the dimmer limit is shown to the right of “POWER SAVE”. If the device is sitting idle with the angle changing less the $\pm 1^\circ$ for a time that is greater than the calibrated dimmer time limit, the screen will dim to save power. The device will return to the current display brightness if the device is tilted beyond $\pm 1^\circ$. NOTE: this does not affect the function of the other outputs.

POWER SAVE SHUT DOWN: This allows the user to set the idle time limit to turn off the device including any other outputs. NOTE: Press the ON/OFF switch to restart the device.

- Touch the arrow to the right of POWERSAVE.
- The current setting will be displayed. Touch the up- or down-facing arrows to set the Dimmer time.
 - Time limit in minutes: 10, 20, 30, 40, 50, 60, 120, 180, OFF
- To return to the DISPLAY ADJUST Menu, touch the left-facing arrow or.
- To set the POWER SAVE SHUT DOWN, touch the right-facing arrow.
- The current setting will be displayed. Use the up- and down-facing arrows to set the Shut Down time.
 - Time limit in minutes: 10, 20, 30, 40, 50, 60, 120, 180, OFF

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- When finished, touch the left-facing arrow to return to the Display Adjust Menu.

3.1.2 Adjust the Resolution

The RESOLUTION function allows the user to set the precision of the angle displayed. The current setting is shown to the right of “RESOLUTION”.

- Touch the arrow to the right of RESOLUTION.
- The current setting will be displayed. Touch up- or down-facing arrow to cycle through the resolution settings.
 - 0.01, 0.1, 1
- When finished, touch the left-facing arrow to return to the DISPLAY ADJUST Menu.
- Touch the arrow in the upper left corner to return to the previous menu screen.

3.1.3 Adjust the Brightness

The BRIGHTNESS function allows the user to set the brightness of the touch screen. The current setting is shown to the right of “BRIGHTNESS”.

- Touch the arrow to the right of BRIGHTNESS.
- The current setting will be displayed. Touch the up- and down-facing arrows to set the desired brightness.
 - 1 - 8
- When finished, touch the left-facing arrow to return to the DISPLAY ADJUST Menu.
- Touch the arrow in the upper left corner to return to the previous menu screen.

NOTE: The default setting is “3”; increasing the brightness level will increase the power required, shortening the time between recharges.

3.1.4 Adjust the Filter

The FILTER function allows the user to set the response time of the device. The current setting is shown to the right of “FILTER”.

- Touch the arrow to the right of FILTER.
- The current frequency response will be displayed in Hz. Touch the up- and down-facing arrows to set the desired response.
 - Frequency response in Hertz (Hz): 4, 8, 16, 31, 63, 125, 250, 500
- When finished, touch the left-facing arrow to return to the DISPLAY ADJUST Menu.
- Touch the arrow in the upper left corner to return to the previous menu screen.

3.1.5 Adjust the Display UNITS of Measure

The UNITS function allows the user to set the Units of Measure for how the measured angle is displayed. The current setting is shown to the right of “UNITS”.

- Touch the arrow to the right of UNITS.
- The current setting will be displayed. Touch up- or down-facing arrow to set the desired UoM.

- UoM: Degrees (°), Percent Grade (%), Inch Per Foot Rise (“), Degree/Minutes
- When finished, touch the left-facing arrow to return to the DISPLAY ADJUST Menu.
- Touch the arrow in the upper left corner to return to the previous menu screen.

3.2 DISPLAY ADJUST MENU 2

Additional device functions can be adjusted with the DISPLAY ADJUST Submenu. This menu allows for resetting to FACTORY DEFAULTS, setting the POLARITY of clockwise rotation of the device to either increasing (+) or decreasing (-), and activation of a BULLS EYE LEVEL function.

- Touch “MENU” on the main screen, which brings up the OUTPUT MENU.
- Then touch the arrow to the right of “DISPLAY” to bring up the DISPLAY ADJUST Menu.
- Touch the arrow to the right of “DISPLAY ADJUST” to bring up the DISPLAY ADJUST Submenu.

3.2.1 Set the Factory Defaults

The FACTORY DEFAULTS function allows the user to reset all parameters back to the original factory calibrated settings, including any user-set parameters.

- Touch the arrow to the right of FACTORY DEFAULTS.
- The current setting “NO” will be displayed. Touch the up-facing or down facing arrow to select YES. NOTE: A WARNING message stating, “CHANGES WILL BE LOST”, will appear.
- To accept the factory default reset, touch the arrow in the lower left corner. The Display will go black while the unit resets, then restart; the main screen will display dual axis mode, horizontal orientation.

3.2.2 Set the Clockwise Polarity

The POLARITY function allows the user to change the polarity of the Units of Measure during clockwise (CW) rotation. The current setting is shown to the right of “UNITS”.

- Increasing view when the display is rotated clockwise (+ CW)
- Decreasing view when the display is rotated clockwise (- CW)

NOTE: The Switch Outputs and Trip Angle Indicator Light settings will physically remain at the same location but the trip angle polarities will change.

Example:

If the yellow to red transition color indicators for SWITCH OUTPUT 1 were set at +10 and -15 for - CW rotation, the yellow to red transition color indicators for SWITCH OUTPUT 1 would be -10 and +15 for +CW rotation. The switches would not move, only the displayed polarity would change. The polarity will also be changed in the LED ADJUST MENU.

- Touch the arrow to the right of “POLARITY”.
- The current polarity setting “DECREASING” or “INCREASING” will be displayed. Touch the up-facing arrow to set INCREASING and the down-facing arrow to set DECREASING.

- Touch the arrow in the lower left corner to return back to the DISPLAY ADJUST Submenu. The current polarity will be displayed next to POLARITY.
- Touch the arrow in the upper left corner to return to the previous menu screen.

3.2.3 Activate the Bulls Eye Level

The BULLS EYE LEVEL function allows the user to select a precision digital circular bubble level (bulls eye) as the device’s display option.

Once activated, the Bulls Eye Level can only be turned off using the “BULLS EYE LEVEL” item in the “DISPAY ADJUST screen.

The Range is adjustable from 0.5° to 3° max in 0.5° steps. The rings divide the Range by 3 with the outer ring equal to range that is selected during calibration. The X and Y coordinates are displayed in the upper corners and the Range is indicated on the outer ring.

The “Units” selected will be displayed while calibrating the Range and during Normal Operation. The three adjustable Switches (Relays) can be set after the Bulls Eye Level is tuned “ON” and the Range is set. The three Relays correspond to the three ball colors and can be OPEN or CLOSED while the associated Ball color is displayed.

The “Ball” changes to GREEN (RELAY 1) when it is less than the lower transition (trip) setting, YELLOW (RELAY2) when greater than the lower trip and less than the upper trip setting, and RED (RELAY 3) when it is greater than the upper trip setting. The user may also set the ZERO in BULLS EYE mode, either Relative or Permanent.

NOTE: The Bulls Eye Level is used in a horizontal orientation only (Lying flat on a desktop, screen facing up).

3.2.3.1 Set the Transition (Trip) points for the Relays and Ball colors

- Touch the arrow to the right of “BULLS EYE LEVEL” in the DISPLAY ADJUST MENU 2.
- The current setting “ON/OFF” will be displayed. Touch “ON” to activate or “OFF” to deactivate the level.
- Touch ‘Range” in the same menu to set the range for the level.
- The current Range will be displayed in the units that have been selected previously in the “UNITS” menu item. Use the up or down arrows to adjust the range to the desired setting. Now the Relay and BALL trip points can be set.
- Touch the lower left arrow to return to the DISPLAY ADJUST Submenu.
- Touch the arrow in the upper left corner and enter “OUTPUT MENU”.
- Touch the arrow to the right of the SWITCHES item in the OUTPUT MENU to enter the BULLS EYE LEVEL SWITCH ANGLE ADJUST SCREEN. The trip point for the transition from a Green to Yellow Ball and Relay 1 (SW1) to Relay 2 (SW2) is displayed. Use the Up and Down arrows to set the desired trip point for this transition.
- Touch the arrow in the lower right corner to proceed to the next trip point adjustment.

- The trip point for the transition from a Yellow to Red Ball and Relay 2 (SW2) to Relay 3 (SW2) is displayed. Use the Up and Down arrows to set the desired trip point for this transition.
- Touch the Arrow in the lower right corner to enter the RELAY STATE screen.

3.2.3.2 Set the Initial State of the Relays

- The RELAY STATE screen is in the BULLS EYE LEVEL Menu after the SWITCH ANGLE ADJUST SCREEN
- The first setting is for RELAY 1, the GREEN BALL and the current state of the relay is displayed.
- Touch the up down arrows to select the desired Relay state “OPEN or “CLOSED”.
- Touch the lower right arrow to proceed to the RELAY 2 state adjustment.
- Touch the up down arrows to select the desired Relay state “OPEN or “CLOSED”.
- Touch the lower right arrow to proceed to the RELAY 3 state adjustment.
- Touch the up down arrows to select the desired Relay state “OPEN or “CLOSED”.
- Touch the lower right arrow to proceed to the RELAY DELAY adjustment screen.

3.2.3.3 Set the Delay Time for the Relays to Transition from their current State

- The transition delay for the Relays can be set in the RELAY DELAY menu located in the BULLS EYE LEVEL menu, after the RELAY STATE screen. This delay only applies to the Relays and not the Ball colors. The delay setting is the same for all the Relays. The range of settings is 0.1 to 2 seconds.
- Touch the up down arrows to change the delay setting to the desired level.
- Touch the arrow in the lower right to return to the “OUTPUT MENU”
- The calibration is complete, Touch the arrow in the upper left of the OUTPUT MENU to enter to the BULLS EYE LEVEL
- The Level is now indicating the current tilt of the MPI

3.2.3.4 Deactivate the Bulls Eye Level and to return to normal display operation:

- Touch “MENU”.
- Touch the arrow to the right of “DISPLAY”.
- Touch the arrow to the right of “DISPLAY ADJUST”.
- Touch the arrow to the right “BULLS EYE LEVEL”.
- Select “OFF”.
- Touch the lower left arrow to exit the BULLS EYE LEVEL ADJUST screen and return to the DISPLAY ADJUST Submenu.
- Touch the arrow in the upper left corner to return to the previous menu screen. Exit all screens to return to normal operation.

3.3 ANALOG OUTPUT

The ANALOG function allows the user to set the parameters of the (2) analog outputs, one for the X axis and one for the Y axis.

If the device is in Vertical mode, the vertical parameters will be set. If in Horizontal mode the horizontal parameters will be set.

If in single axis mode only the active axis will be set.

Depending on the Units selected the limits for the analog outputs are $\pm 80^\circ$ dual, $\pm 180^\circ$ single, $\pm 100\%$ grade and $\pm 12"$ for inch per foot rise.

3.3.1 Set the Analog Output

The analog outputs can be turned on or off from the first Analog Output screen.

- Touch "MENU" for the OUTPUT MENU. The current setting is shown to the right of "ANALOG".
- Touch the arrow to the right of "ANALOG".
- Touch the up- and down-facing arrow to select ON or OFF. If ON is selected, the user can now set the X and Y axis minimum and maximum output parameters.
- Touch the right-facing arrow for the next screen.
- Touch the up- and down-facing arrows to select the **MINIMUM RANGE (-X)** angle for the X axis analog output.
- Touch the right-facing arrow for the next screen.
- Touch the up- and down-facing arrows to select the **MINIMUM RANGE (+X)** angle for the X axis analog output.
- Touch the right-facing arrow for the next screen.
- Touch the up- and down-facing arrows to select the **MINIMUM RANGE (-Y)** angle for the X axis analog output.
- Touch the right-facing arrow for the next screen.
- Touch the up- and down-facing arrows to select the **MINIMUM RANGE (+Y)** angle for the X axis analog output.
- To modify the X and Y parameters, touch the left-facing arrow for the previous screen.
- When finished, touch the right-facing arrow to return to the OUTPUT MENU
- Touch the upper left-facing arrow of the OUTPUT MENU to return to normal operation.

3.4 RS232 OUTPUT

The RS232 function allows the user to set the parameters for transmitting and receiving TXD and RXD communication. The output data will first present the X axis followed by a comma then the Y axis. If the device is in single axis mode only the active axis will be displayed. If in Horizontal Mode, the horizontal axis will be communicated. If in Vertical mode, the Vertical axis will be communicated.

3.4.1 Set the RS232 Output

The RS232 output can be turned ON or OFF from the first RS232 Output screen

- Touch “MENU” for the OUTPUT MENU. The current setting is shown to the right of “RS232”.
- Touch the arrow to the right of “RS232”.
- Touch the up- or down-facing arrow to select ON or OFF. If ON is selected, the user can now set the Baud Rate output parameters.
- Touch the right-facing arrow for the next screen.
- Touch the up- and down-facing arrows to select the BAUD RATE.
 - Baud Rate selections: 9.6K, 19.2K, 38.4K, 65.2K, 115.2K, 125K, 128K, 250K
 - All other parameters are factory set 8 bit, no parity, 1 stop bit, no flow control
- When finished, touch the left-facing arrow to return to the OUTPUT MENU.
- Touch the upper left-facing arrow of the OUTPUT MENU to return to normal operation.

3.5 RS485 OUTPUT

The RS485 function allows the user to set the parameters for the RS485 communication. The output will first present the X axis followed by a comma then the Y axis. If the device is in single axis mode only the active axis will be displayed. If the device is in Horizontal Mode, the horizontal axis will be communicated. If the device is in Vertical mode, the Vertical axis will be communicated.

3.5.1 Set the RS485 Output

The RS485 output can be turned ON or OFF from the first RS485 Output screen

- Touch “MENU” for the OUTPUT MENU. The current setting is shown to the right of “RS485”.
- Touch the arrow to the right of “RS485”.
- Touch the up- or down-facing arrow to select ON or OFF. If ON is selected, the user can now set the Baud Rate output parameters.
- Touch the right-facing arrow for the next screen.
- Touch the up- and down-facing arrows to select the BAUD RATE.
 - Baud Rate selections: 9.6K, 19.2K, 38.4K, 65.2K, 115.2K, 125K, 128K, 250K
 - All other parameters are factory set 8 bit, no parity, 1 stop bit, no flow control

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- When finished, touch the left-facing arrow to return to the OUTPUT MENU.

Touch the upper left-facing arrow of the OUTPUT MENU to return to normal operation.

3.6 SWITCHES

The SWITCHES function allows the user to adjust the 4 single-pole, single-throw Relays along with the coordinated Trip Angle Indicator Lights (green, yellow, red circles), each with adjustable trip angle settings.

Each Relay can be set as OPEN or CLOSED for a selected angle range. The DELAY for the transition of the relay from OPEN to CLOSED or CLOSED to OPEN can also be selected. The relays all share the same input, SWITCH INPUT but have 4 individual output lines to transfer whatever is on the input line, SWITCH 1, SWITCH 2, SWITCH 3, SWITCH 4.

Horizontal and Vertical modes of operation have different functions for the color indicators and relays and are set separately. If in single axis mode only the active axis will be set.

Horizontal mode: In Horizontal mode the X axis has two dedicated relays SWITCH 1 and SWITCH 3 and each has 3 Trip Angle Indicator Lights (green, yellow, red circles), located at the left and right sides of the screen. The Y axis has two dedicated relays SWITCH 2 and SWITCH 4 and each has 3 Trip Angle Indicator Lights (green, yellow, red circles), located at the top and bottom of the screen.

The transition angles from green to yellow and yellow to red have a negative and positive angle adjustment. The negative transition angle adjustment is 0 to -180° and the positive transition angle adjustment is 0 to $+180^\circ$.

The relays will always change from OPEN to CLOSED or CLOSED TO OPEN on the YELLOW TO RED trip angle setting.

Vertical mode: In Vertical mode the X and Y axes have their own Trip Angle Indicator Lights (green, yellow, red circles) but share the 4 relays or SWITCH OUTPUTS. Any time either the X or Y axis angle reaches a transition angle, for the relay associated with that angle, the relay will change state even though the other axis may still be in a non-alarmed state.

The Trip Angle Indicator Lights (green, yellow, red circles) for X are displayed across the top of the screen and the Trip Angle Indicator Lights (green, yellow, red circles) for Y are displayed along the right side of the screen. The Trip Angle Indicator Lights starting from the top left for the X axis and the top right side for Y axis are RED, YELLOW, GREEN, YELLOW and RED.

Relay 1 (SWITCH 1) is dedicated to the RED indicator for X and Y axes and Relay 2 (SWITCH 2) is dedicated to the YELLOW indicator. The indicator lights are located at the top of the screen. Relay 3 (SWITCH 3) is dedicated to the next X and Y axis YELLOW indicators and Relay 4 (SWITCH 4) is dedicated to the next RED color indicators.

The GREEN indicator in the center has no Relays or switches associated with it but will only appear if all switches for that axis are in a non-alarmed state.

3.6.1 Set the Alarm angles in Horizontal Mode

Touch the Menu indicator on the main screen; then touch the arrow next to the OUTPUT MENU item SWITCHES HORZ to enter the LED ADJUST HORZ adjustment screen. If the item is SWITCH VERT return to the main screen and select HORZ before proceeding. If the desired angles are set and the user wishes to move on, the left arrow at the top of the screen will return to the previous menu. The right arrow at the top of the screen will move on to the next switch adjustment mode.

GRN to YEL, X AXIS, SW1 and the current trip angle will be displayed. Use the up and down arrows to set the desired green to yellow positive transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

GRN to YEL, X AXIS, SW1 and the current trip angle will be displayed. Use the up and down arrows to set the desired green to yellow negative transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

GRN to YEL, Y AXIS, SW2 and the current trip angle will be displayed. Use the up and down arrows to set the desired green to yellow positive transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

GRN to YEL, Y AXIS, SW2 and the current trip angle will be displayed. Use the up and down arrows to set the desired green to yellow negative transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

GRN to YEL, X AXIS, SW3 and the current trip angle will be displayed. Use the up and down arrows to set the desired green to yellow positive transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

GRN to YEL, X AXIS, SW3 and the current trip angle will be displayed. Use the up and down arrows to set the desired green to yellow negative transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

GRN to YEL, Y AXIS, SW4 and the current trip angle will be displayed. Use the up and down arrows to set the desired green to yellow positive transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

GRN to YEL, Y AXIS, SW4 and the current trip angle will be displayed. Use the up and down arrows to set the desired green to yellow negative transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

The YELLOW to RED transition angles also sets the relay transition angle SWITCH 1 = SW1

YEL to RED, X AXIS, SW1 and the current trip angle will be displayed. Use the up and down arrows to set the desired yellow to red positive transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

YEL to RED, X AXIS, SW1 and the current trip angle will be displayed. Use the up and down arrows to set the desired yellow to red negative transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

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YEL to RED, Y AXIS, SW2 and the current trip angle will be displayed. Use the up and down arrows to set the desired yellow to red positive transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

YEL to RED, Y AXIS, SW2 and the current trip angle will be displayed. Use the up and down arrows to set the desired yellow to red negative transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

YEL to RED, X AXIS, SW3 and the current trip angle will be displayed. Use the up and down arrows to set the desired yellow to red positive transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

YEL to RED, X AXIS, SW3 and the current trip angle will be displayed. Use the up and down arrows to set the desired yellow to red negative transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

YEL to RED, Y AXIS, SW4 and the current trip angle will be displayed. Use the up and down arrows to set the desired yellow to red positive transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

YEL to RED, Y AXIS, SW4 and the current trip angle will be displayed. Use the up and down arrows to set the desired yellow to red negative transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment, the INITIAL STATE of the RELAY OPEN or CLOSED.

3.6.2 Set the initial State of the Relays in Horizontal Mode (See Figure 3)

The relays can be set to be either OPEN or CLOSED when in a non-alarmed state. This adjustment is in the OUPUT MENU item SWITCHES HORZ in the SWITCH ADJUST screen. To get there from the main screen touch MENU, then touch the arrow to the right of SWITCHES HORZ in the OUTPUT MENU screen, then touch the top right arrow in the LED ADJUST HORZ screen to arrive at the SWITCH ADJUST screen.

SW1, RELAY, INITIAL STATE, and the current state of the Relay OPEN or CLOSED will be displayed. Use the up arrows to set the desired OPEN or CLOSED state. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

SW2, RELAY, INITIAL STATE, and the current state of the Relay OPEN or CLOSED will be displayed. Use the up arrows to set the desired OPEN or CLOSED state. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

SW3, RELAY, INITIAL STATE, and the current state of the Relay OPEN or CLOSED will be displayed. Use the up arrows to set the desired OPEN or CLOSED state. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

SW4, RELAY, INITIAL STATE, and the current state of the Relay OPEN or CLOSED will be displayed. Use the up arrows to set the desired OPEN or CLOSED state. When finished, touch the arrow in the lower right corner to proceed to the next adjustment. SWITCH ADJUST DELAY

to proceed to the next adjustment. SWITCH ADJUST DELAY

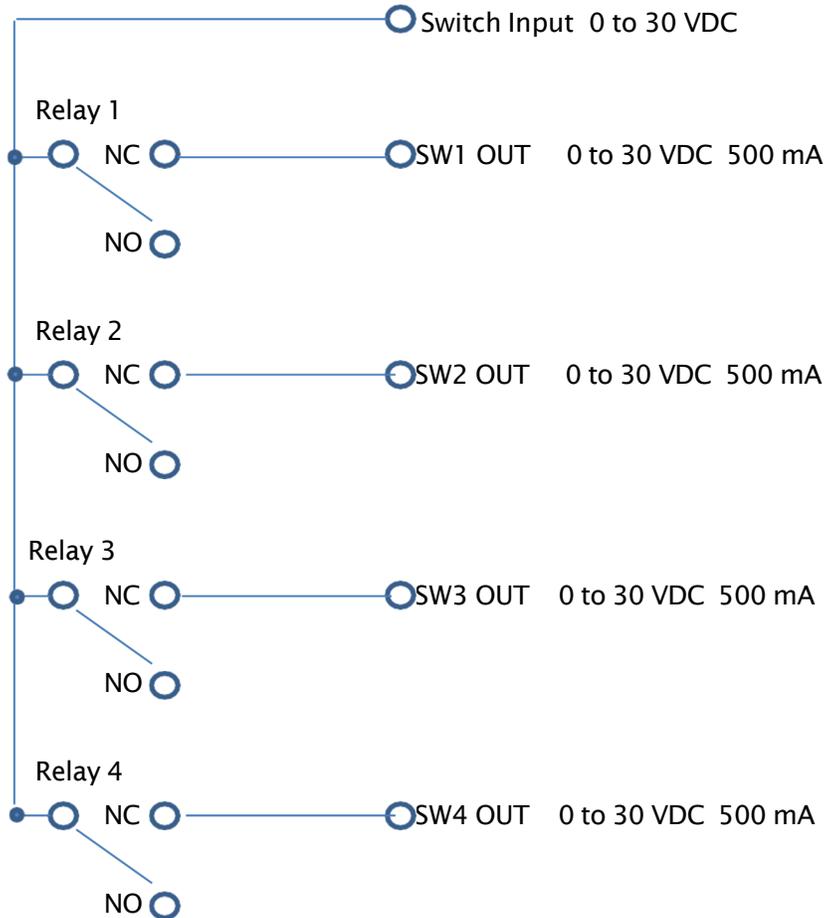


FIGURE 3. SWITCH WIRING DIAGRAM

3.6.3 Set the Relay Switch Delay in Horizontal Mode

The delay for the relays state transition can be adjusted from 0.1 to 2 seconds. . This adjustment is located in the OUPUT MENU item SWITCHES HORZ in the second SWITCH ADJUST screen. To get there from the main screen touch MENU, then touch the arrow to the right of SWITCHES HORZ in the OUTPUT MENU screen, then touch the top right arrow in the LED ADJUST HORZ screen to arrive at the first SWITCH ADJUST screen, touch the top right arrow in the first SWITCH ADJUST screen to arrive at the second SWITCH ADJUST screen for delays.

SW1, DELAY, and the current delay time will be displayed. Use the up and down arrows to set the delay time. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

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SW2, DELAY, and the current delay time will be displayed. Use the up and down arrows to set the delay time. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

SW3, DELAY, and the current delay time will be displayed. Use the up and down arrows to set the delay time. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

SW4, DELAY, and the current delay time will be displayed. Use the up and down arrows to set the delay time. When finished, touch the arrow in the lower right corner to return to the OUTPUT MENU and then the main menu.

3.6.4 Set the Alarm angles in Vertical Mode

Touch the arrow next to the OUTPUT MENU item SWITCHES VERT to enter the LED ADJUST VERT adjustment screen. If the item is SWITCH HORZ return to the main screen and select VERT before proceeding. If the desired angles are set and the user wishes to move on, the left arrow at the top of the screen will return to the previous menu. The right arrow at the top of the screen will move on to the next switch adjustment mode.

YEL to RED, X AXIS, SW1 and the current trip angle will be displayed. Use the up and down arrows to set the desired yellow to red negative transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

GRN to YEL, X AXIS, SW2 and the current trip angle will be displayed. Use the up and down arrows to set the desired green to yellow negative transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

GRN to YEL, X AXIS, SW3 and the current trip angle will be displayed. Use the up and down arrows to set the desired green to yellow positive transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

YEL to RED, X AXIS, SW4 and the current trip angle will be displayed. Use the up and down arrows to set the desired yellow to red positive transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

YEL to RED, Y AXIS, SW1 and the current trip angle will be displayed. Use the up and down arrows to set the desired yellow to red negative transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

GRN to YEL, Y AXIS, SW2 and the current trip angle will be displayed. Use the up and down arrows to set the desired green to yellow negative transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

GRN to YEL, Y AXIS, SW3 and the current trip angle will be displayed. Use the up and down arrows to set the desired green to yellow positive transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment.

YEL to RED, Y AXIS, SW4 and the current trip angle will be displayed. Use the up and down arrows to set the desired yellow to red positive transition angle. When finished, touch the arrow in the lower right corner to proceed to the next adjustment, the INITIAL STATE of the RELAY, OPEN or CLOSED.

3.6.5 Set the initial State of the Relays in Vertical Mode

The relays can be set to be either OPEN or CLOSED when in a non-alarmed state. All relays are set to the same state. This adjustment is located in the OUPUT MENU item SWITCHES VERT in the SWITCH ADJUST screen. To get there from the main screen touch MENU; then touch the arrow to the right of SWITCHES VERT in the OUTPUT MENU screen, then touch the top right arrow in the LED ADJUST VERT screen to arrive at the SWITCH ADJUST screen.

SWT, RELAY, INITIAL STATE, and the current state of the Relays OPEN or CLOSED will be displayed. Use the up arrows to set the desired OPEN or CLOSED state. When finished, touch the arrow in the lower right corner to proceed to the next adjustment. SWITCH ADJUST DELAY

3.6.6 Set the Relay Switch Delay in Vertical Mode

The delay for the relays state transition can be adjusted from 0.1 to 2 seconds. All relays have the same delay. This adjustment is located in the OUPUT MENU item SWITCHES VERT in the second SWITCH ADJUST screen. To get there from the main screen touch MENU, then touch the arrow to the right of SWITCHES VERT in the OUTPUT MENU screen, then touch the top right arrow in the LED ADJUST VERT screen to arrive at the first SWITCH ADJUST screen, touch the top right arrow in the first SWITCH ADJUST screen to arrive at the second SWITCH ADJUST screen for delays.

SWT, DELAY, and the current delay time will be displayed. Use the up and down arrows to set the delay time. When finished, touch the arrow in the lower right corner to return to the OUTPUT MENU and then the main menu.

Sensitivity & Zero Angle Calculation (Voltage Outputs Only)

The output sensitivity is calculated as follows:
$$\frac{[MMMMM \text{ AAAAMMAAAAA} - MMMMA \text{ AAAAMMAAAAA}]}{[MMMMM \text{ AAAAAAAAA} - MMMMA \text{ AAAAAAAAA}]}$$

For **Symmetrical** input ranges (i.e. $\pm 60^\circ$), the zero degree angle output is at the midpoint of the input analog range: $[MMMMM \text{ AAAAMMAAAAA} + MMMMA \text{ AAAAMMAAAAA}]/2$. For **Non-symmetrical** input ranges (i.e. -10 to $+90^\circ$), the zero degree angle output is calculated as follows: $MMMMMA \text{ AAAAMMAAAAA} + \diamond(0^\circ - MMMMA \text{ AAAAAAAAA}) * SSAAAASMMSSMSSMSSSt\diamond$

- **Examples**

- Output with a $\pm 90^\circ$ range (symmetrical) with a 0 to 5V output:

- Sensitivity = $\frac{(4.5VV - 0.5VV)}{90^\circ - (-90^\circ)} = \frac{4VV}{180^\circ} = 0.0222 \text{ } VV \diamond$

- Zero Degree Angle Output = 2.5VV

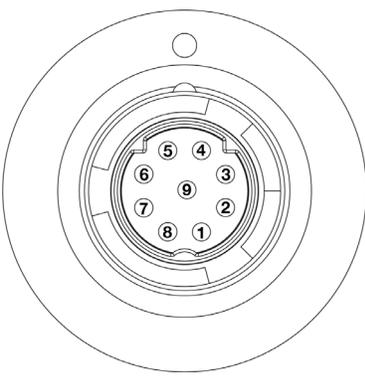
- Output with a -30 to $+70^\circ$ range (non-symmetrical) with a 0 to 5V output:

- Sensitivity = $\frac{(4.5VV - 0.5VV)}{70^\circ - (-30^\circ)} = \frac{4VV}{100^\circ} = 0.040 \text{ } VV \diamond$

- Zero Degree Angle Output = $0VV + \diamond\diamond 0^\circ - (-30^\circ) \diamond * 0.040 \text{ } VV \diamond \diamond = 1.2VV$

Wiring Diagrams and Connection Procedures

TABLE 2: HS2P9M26 9-PIN INPUT/OUTPUT CONNECTOR WIRING	
PIN	FUNCTION
1	RELAY 1 OUTPUT
2	RELAY 2 OUTPUT
3	RELAY 3 OUTPUT
4	RELAY 4 OUTPUT
5	RELAY INPUT
6	OUTPUT 1*
7	OUTPUT 2*
8	SIGNAL COMMON
9	NO CONNECTION



NOTES

*Output may be Analog Voltage, RS232 TXD/RXD or RS485 A/B depending on what output is selected in the menu.

Wiring for a Voltage Output

1. Connect the corresponding output (PIN 6 for output 1, PIN 7 for output 2) to the positive terminal of the measurement device, and the sensor ground (PIN 8) to the negative terminal/common of the measurement device.

RS485 Bus Wiring Configurations

When using the digital output, the MPI can be connected to a bus configuration.

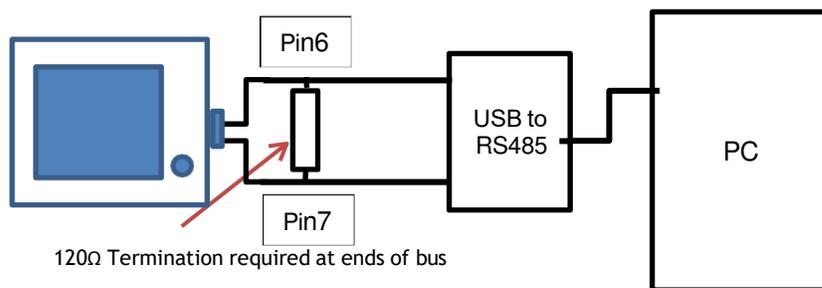


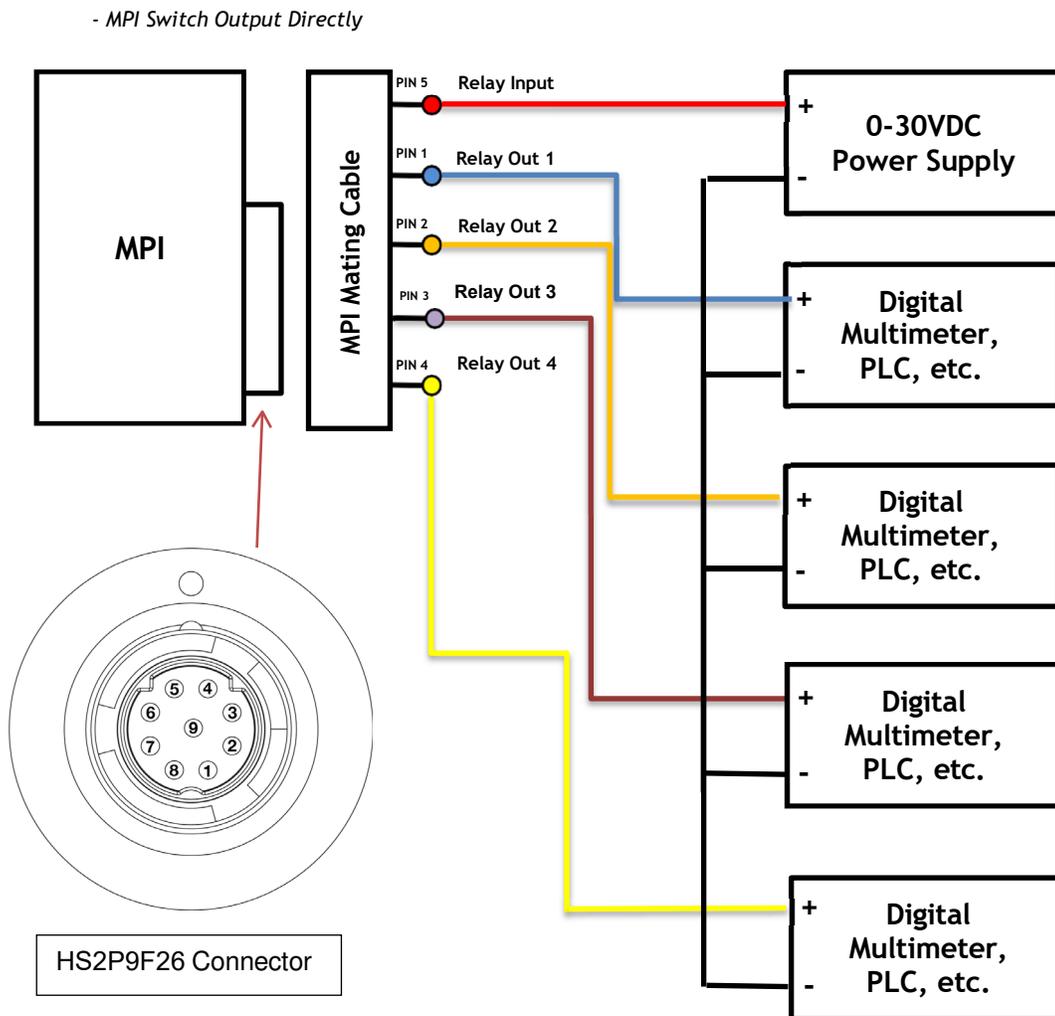
FIGURE 4: RS485 TO BUS CONNECTION

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Wiring for the Relay Outputs

1. Connect 0-30VDC, maximum 500mA per relay, to Relay Input Pin 5 and connect Relay Outputs 1-4 as needed. The relays share the same input pin but have independent output control.

FIGURE 5: SWITCH WIRING DIAGRAMS



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Digital RS485 Communications

The MPI inclinometer communicates over a RS485 half-duplex communication bus using a Rieker-specific packet format which is described in this section. This communication can be used to read inclination angles from the device, as well as configure the various device settings.

The sensors are initially configured for RS485 communications at a baud rate of 125,000bps. The protocol is fixed at 8 data bits, No parity, 1 Stop bit, and No Flow Control. Each device has an address, and only responds to commands sent to that address, or to the BROADCAST address (0xFFFC). The BROADCAST address is used to send a single command to every sensor on the bus. The sensor address is initially set to 225 (0xE1) but can be configured to any number from 1-65000. Every sensor on the same RS485 bus must have a unique address.

RS485 Protocol

The protocol is set up in a Master/Slave configuration, where the sensors will not respond unless they are commanded to by a master device. The packets sent by the master are called commands. Sensors will respond to all commands that are specifically addressed to that sensor.

Packet Format

Commands and responses are sent in the following form: [DEST][SRC][FUNCT][DL][DATA][CRC] where:

- [DEST] 2-byte destination address. The address of the device to be communicated with.
- [SRC] 2-byte source address. The address of the device sending the command.
- [FUNCT] 2 byte command function ID. Refer to RS485 Command Functions for a list of functions.
- [DL] 1 byte number of DATA bytes.
- [DATA] Data of length [DL] bytes.
- [CRC] 16 bit checksum outputted in bytes.

Commands in this guide, unless otherwise stated, are displayed as a series of hexadecimal bytes.

CRC16

The sensor uses a 16-bit cyclic redundancy check in order to be sure a command was sent correctly and did not lose information on the way to the sensor. The polynomial and initial value for the CRC used are as follows:

Polynomial: $x^{16} + x^{15} + x^2 + 1$

Initial Value: 0x0000

- *Example CRC values for given input values:*

Input (hex)	Output (hex)
00	0000
FF	4040
ABCD	A5BE
123456	FB36
9876543210	E86E

For more information on the CRC and for a calculator visit:
<http://www.lammertbies.nl/comm/info/crc-calculation.html>

Packet Timing

Bytes in a packet must be less than 125 microseconds apart. Packets originating from the master must be separated by at least 1 millisecond. Sensors will respond to the master as fast as possible.

Protection Levels (lock)

The sensor has two lock levels (0 and 1) to protect against unwanted modifications to the sensor. Some functions work at all lock levels, while others will only work if the sensor is put into lock level 1 (Unlocked). Functions that modify sensor settings require lock level 1, while functions that are only reading data will work at either lock level 0 or 1.

When plugged in or reset, the sensor will always be at lock level 0 (Locked). The sensor will stay at a given lock level until the Change Lock command is sent or the sensor is reset or unplugged.

RS485 Command Functions

Table 5 shows a list of all the user functions for the MPI, including the function ID, name, description of the function, and the lock level required to use that function.

The following pages give more details on each function, its format, expected response, and its use.

IDs not shown here are reserved for factory use only.

TABLE 3: RS485 FUNCTION LIST			
<i>ID</i>	<i>Name</i>	<i>Description</i>	<i>Lock Required</i>
2	Set Address	Set sensor address	1
3	Get Address	Returns the sensor address	0
5	Get Angle	Returns the angle	0
10	Change Lock	Change lock level to 0 or 1	0

Function Descriptions

2	SET ADDRESS	SET SENSOR ADDRESS
----------	--------------------	---------------------------

Length: 2 bytes

Data: Address (Unsigned 16-bit Integer)

Lock Level Required: 1

Immediate Response: Yes

Expected Response from sensor: ACK

Info: This function is used to change the sensor address. After sending this command, wait 50 milliseconds before issuing further commands.

Example Command Send/Receive:

Sent Command: FFFC 0000 0002 02 00E1 D52A
 [DEST] [SRC] [FUNCT] [DL] [DATA] [CRC]

Set address of sensor at address 101 (0x0065) to 225 (0x00E1)

Received Command: 0000 00E1 0000 00 CC1E
 [DEST] [SRC] [FUNCT] [DL] [DATA] [CRC]

ACK

3	GET ADDRESS	GET SENSOR'S ADDRESS
----------	--------------------	-----------------------------

Length: 0 bytes

Data: None

Lock Level Required: 0 or 1

Immediate Response: Yes

Expected Response from sensor: Packet with the sensor's address in 2 data bytes, as an Unsigned 16-bit Integer.

Info: This function is useful when a sensor address is unknown and it is the only sensor on the bus. By issuing 'Get Address' to a broadcast address (0xFFFC), the sensor will respond with its address in the data field.

CAUTION: Do not issue broadcast commands with multiple sensors on a bus. Their packets will collide, which can usually be detected by a failed CRC check (but not always).

Example Command Send/Receive:

Sent Command: FFFC 0000 0003 00 C31B
 [DEST] [SRC] [FUNCT] [DL] [DATA] [CRC]

Get address of sensor (broadcast command)

Received Command: 0000 00E1 0003 02 00E1 7D76
 [DEST] [SRC] [FUNCT] [DL] [DATA] [CRC]

Sensor address is 225 (0x00E1)

5	GET ANGLE	GET THE ANGLE OF A SENSOR
----------	------------------	----------------------------------

Length: 1 byte

Data: Type Code (Unsigned 8-bit Integer)

Lock Level Required: 0 or 1

Immediate Response: Yes

Expected Response from sensor: Packet with the sensor's measured angle(s) in 8 bytes, as an IEEE-754 single precision floating point number, based on the sent type code.

NOTE: A change in angle will not display instantly due to filtering and smoothing in the sensor.

Type Code	Description
4	Dual X and Y axis angles (8 bytes)

Example Command Send/Receive:

Sent Command: 00E1 0000 0005 01 04 5CE1
 [DEST] [SRC] [FUNCT] [DL] [DATA] [CRC]

Get X and Y axis angles from sensor at address 225 (0x00E1)

Received Command: 0000 00E1 0005 08 BF4B 1C00 4193 8D00 C03B
 [DEST] [SRC] [FUNCT] [DL] [DATA] [CRC]

X-axis = (0xBF4B1C00) -0.79339599609375°; Y-axis = (0x41938D00) 18.44384765625°

10	CHANGE LOCK	CHANGE LOCK LEVEL
-----------	--------------------	--------------------------

Length: 5 bytes

Data: Lock Level (Unsigned 8-bit Integer)

Lock Level Required: 0 or 1

Immediate Response: Yes

Expected Response from sensor: ACK

Info: This function is used to change the lock level of the sensor. Can be changed to 0 (locked) or 1 (unlocked).

Lock level 1 allows various sensor settings to be changed, while lock level 0 prevents changes to the sensor settings.

Example Command Send/Receive:

Sent Command: 00E1 0000 000A 05 0100000000 AAC4
 [DEST] [SRC] [FUNCT] [DL] [DATA] [CRC]

Change lock level to 1

Received Command: 0000 00E1 0000 00 00 CC1E
 [DEST] [SRC] [FUNCT] [DL] [DATA] [CRC]

ACK

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Mounting Plates

The MPI comes with three Mounting plates and the hardware to attach the mounting plates to the MPI.

Mounting plates have magnets for temporary mounting but also have mounting holes for permanent installations.

One Mounting plate is V cut for pipe measuring applications.

Installing the Mounting Plates

The Magnetic mounting plates have very strong magnets installed in them and care must be exercised while storing or installing them to the MPI.

The Mounting plates are installed to the back or bottom of the MPI with four 8/32 - 3/8" long counter cut flat head screws, included in the MPI Kit.

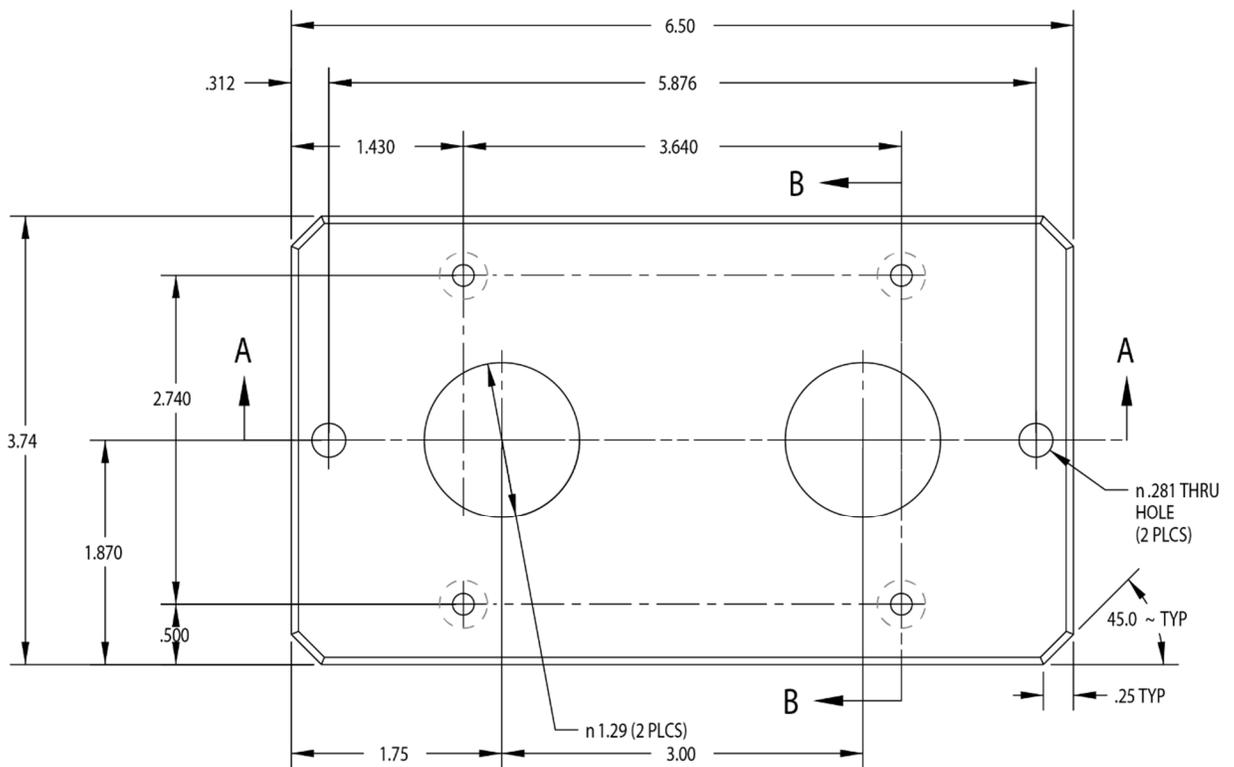


FIGURE 6: BACK MOUNTING PLATE DIMENSIONAL DRAWING

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