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HELM MODEL PTM4
STRAIN GAGE I/O MODULE

User Manual

Rev.1.0 06-30-15

Force Measurement and Control Solutions

HELM MODEL PTM4 STRAIN GAGE I/O MODULE
INSTALLATION/OPERATING INSTRUCTIONS

The following provides installation and operating instructions for the Helm Model PTM4 Strain Gage I/O Module, when used with a full-bridge strain gage sensor or load cell.

1.) GENERAL DESCRIPTION

The Helm Model PTM4 Strain Gage I/O Module is shown in Helm drawing E1203M02. It is a compact strain gage signal conditioning module that can support up to 4 Full Bridge strain gage load cells and sensors. The internal circuitry includes signal filtering, amplification, calibration, auto-zero and peak hold functions. Inputs include full-bridge strain gage sensor excitation and signal connections, plus 24 VDC power and external timing. Outputs include a scaled track, peak and reverse peak 0–10 VDC analog voltage signal. The module allows for ease of installation and stable load cell signal output in industrial applications. As the drawing shows, the plastic housing for the module is configured for DIN rail mounting.

2.) MODULE MOUNTING

The Model PTM4 Module should be snapped securely into a DIN mounting rail inside an electrical panel. The module should be located so that it is physically isolated (no closer than 1 foot) from AC power lines, relays, or motors. This is to prevent the possible bad effects of electromagnetic noise generated by such devices. The module should be located close to a power supply of 24 VDC, and also close enough to the sensor or load cell to make proper wiring connections.

3.) ELECTRICAL WIRING AND MODULE SPECIFICATIONS

Electrical wiring connections and specifications for the module are shown in Helm drawing E1203Z05. The various connections are very simple, and are outlined below.

INPUTS

24 VDC Power Input

24 VDC power input is connected at the 5 screw terminals at the bottom of the module.

Strain Gage Sensor Input

The strain gage sensor wires are connected at the orange 5-pole Weidmuller connector at the bottom of the module. Connections include ± Gage, ± Signal, and Shield. For ease of wiring at the connector, it can be removed from the module while making the 5 connections at the screw terminals.

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INSTALLATION/OPERATING INSTRUCTIONS

Please note that for a Helm compression load cell (excluding LC-Series calibration load cells), the + Gage (Green) and - Gage (Black) connections should be reversed from those shown on the drawing. This is in keeping with the Helm load cell wiring convention, and allows for positive output in compression.

External Timing Input (Peak Look Window)

The PTM4 module requires a 24 VDC external timing input (Peak Look Window) for each machine cycle to be monitored. Three main types of external timing input signals can be used, including dry contact, prox probe or PLC output. Wiring connections for the particular timing input device are made at the 5 Cam screw terminals at the bottom of the module.

OUTPUTS

0-10 VDC Signal Output (PEAK and REVERSE PEAK)

The module signal output connections are made at the bottom.

For 0-10 VDC analog voltage Peak output, use the Peak and Gnd connections. This provides a peak output voltage signal for each cycle that is scaled to the sensor input. Based on the external timing function for each machine cycle, the peak signal value is held in memory at the end of each cycle, and then reset to zero at the start of each new cycle.

For 0-10 VDC analog voltage Reverse Peak output, use the Reverse Peak and Gnd connections. This provides a reverse peak output voltage signal for each cycle that is scaled to the sensor input. Based on the external timing function for each machine cycle, the reverse peak signal value is held in memory at the end of each cycle, and then reset to zero at the start of each new cycle.

These output connections typically go to a PLC or similar device, where the conditioned sensor or load cell output signal can be used to drive an operator display or meter to show actual calibrated tonnage. If desired by the user, High/Low Alarm functions can be programmed at the PLC.

TRACK-OUT – Located on 1/8 recorder jacks (REC OUT) on front panel.

4.) INITIAL SET-UP AND CALIBRATION

ZERO BALANCE

After the proper wiring connections are made, the module should be set up by connecting a good quality voltmeter to the 0-10 VDC analog voltage track output jack (REC OUT) on front of module. There should be no load on the sensor, and the external timing input signal should be off (between cycles).

Set the small 3-position calibration (CAL) toggle switch on front of module to the center OFF position. Adjust the small BAL (Balance) pots for each channel so that the voltmeter reads 0.00 volts. This electronically zero balances the sensor or load cell to the module circuit.

CALIBRATION

With the voltmeter still connected to the module, move the small 3-postion calibration (CAL) toggle switch to the upper ON position. The voltmeter will now show the Shunt Calibration Number as a voltage, based on the setting of the High/Low Gain jumper inside module (Drawing E1203Z04). There are two available calibration resistor values (listed below), depending upon the application and how much gain (signal amplification factor) is needed. The voltage Calibration Number can be adjusted up or down, if needed, by turning the small Gain (GAIN) pot.

The two available calibration resistor values available for the PTM4 module are:

HIGH GAIN (1 MEGOHM CAL RESISTOR):
This is for use typically with HT-400 Strain Gain sensors or other sensor types where the deflection and signal output is low.
FACTORY SETTING IS FOR HIGH GAIN.

LOW GAIN (140K OHM CAL RESISTOR):
This can be used with HT-400 Strain Gain sensors, in press load monitoring applications where high deflection and signal output is present. It should also be used with load cells having mid-range output (approx. 0.50-1.00 mV/V) or having high output (greater than 1.00 mV/V).

For some applications, such as the case with a pre-calibrated load cell, the proper Calibration Number is known in advance. Typically, such a value is expressed in percent, i.e., for example, 50% at 140K shunt cal resistance at rated capacity. For this load cell, which was calibrated at a shunt cal resistance of 140K, the High/Low Gain jumper should be removed on pins as indicated on drawing E1203Z04. In order to enter such a percent Calibration Number, first convert it from percent to voltage. This is done by multiplying the percent value times the Helm standard of 2.667 volts Track Output at 100% full scale. For this example, that would be 50% x 2.667 V = 1.333V.

The Gain pot should then properly be adjusted so that the voltmeter reads 1.333V. In that condition, and with the module running in normal mode, the Track Output and Peak Output sensor signals will be scaled at 2.667 V = 100% full scale. If a different analog voltage output scaling is desired, the Gain pot can simply be adjusted up or down, to achieve the proper full scale output value up to a maximum of 10 VDC.

It should be noted that the Calibration Number for a load cell is always based on a particular shunt cal resistance value. For a Helm load cell calibrated at a 140K shunt cal resistance, the percent Calibration Number can be directly converted to the voltage value (per above example) with the PTM4 module set to the LOW GAIN 140K position. If the load cell was calibrated at a shunt cal resistance that does not match either of the High/Low Gain Toggle Switch settings (LOW GAIN 140K or HIGH GAIN 1 Megohm), another conversion to the percent calibration number must be done. This is shown below.

Example:

Load Cell Cal Number = 50% @ **56.2K** Shunt Cal. Resistance

PTM4 Module Cal Resistor Value (lower LOW GAIN switch position) = 140K (LOW GAIN)

NEW LC Cal Number =
(Orig. Cal. Num.)(Orig. Shunt Cal Resistance / New Shunt Cal Resistance)

NEW LC Cal Number =(50%)(56.2K/140K)
=20.07% @ 140K Shunt Cal Resistance (LOW GAIN)

PTM4 Voltage Cal = (20.07%)(2.667V)= .535 V

For this example, the voltage Cal value of 0.535V should be entered with the module set to LOW GAIN 140K.

For other applications, such as the case with bolt-on strain gage sensors (Helm Model HT-400 Strain Gain), the proper Calibration Number may not necessarily be known in advance. For that case, the machine to which the sensors are mounted should be field calibrated, using portable calibration load cells and instrumentation to verify the actual developed tonnages. During that procedure, the Gain pot on the module should be adjusted as needed to achieve the desired Track Output and Peak Output scaled values to drive the display meter. If there is not enough gain with the toggle switch at the tower LOW GAIN 140K position, move it to the upper HIGH GAIN 1 Megohm position. The corresponding voltage Calibration Number can be read on the voltmeter with the 3-postion calibration toggle switch in the Cal position.

When the Zero Balance and Calibration procedures are completed, the toggle switch should be set to the lower AZ (Auto-Zero) position for normal operation.

EXTERNAL PEAK LOOK WINDOW TIMING

As stated above, an external timing signal input (Peak Look Window) is required for each machine cycle to be monitored. This 24 VDC signal can be generated by a dry contact, proximity probe, or PLC output. In general, the timing signal should start shortly before the forming load begins for the new cycle, and should end shortly after the forming load is finished. In effect, the timing signal tells the module when to look at the forming signal for each cycle, and to capture the Peak load value within that time frame. This occurs when the timing signal is On. When the timing signal is Off, and provided that the toggle switch is set to the lower AZ (Auto-Zero) position, the Auto-Zero Balance function is turned on to maintain a proper zero balance reference. Auto-Zero is turned off when the timing signal is on, and load is occurring. At the start of each new timing signal, a Peak Reset function happens to reset the previous peak value, and to start the Peak Capture for the new machine cycle.

5.) NORMAL OPERATION

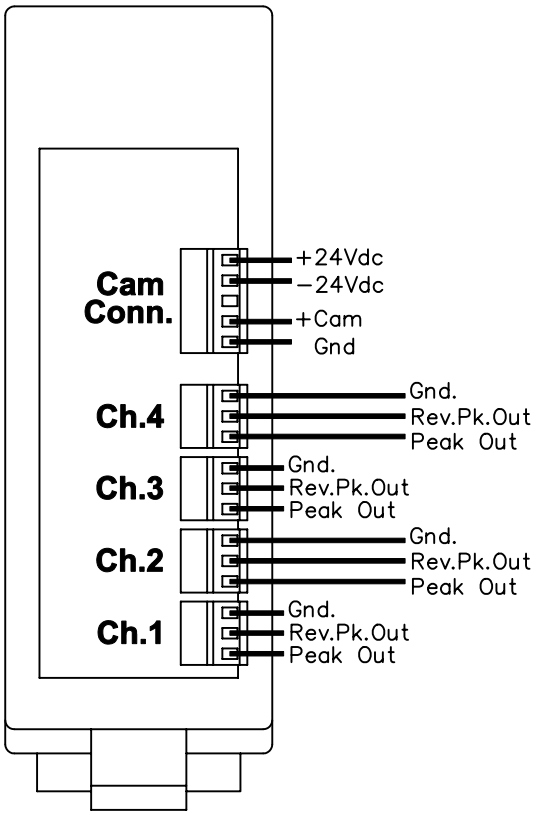
After the set-up and calibration have been completed, the 3-position calibration toggle switch should be set to the lower AZ (Auto-Zero) position for normal operation. This allows the Auto-Zero Balance function to operate between active load cycles, maintaining a proper zero reference for accurate signal output values.

As the machine is cycled and load is placed on the sensor or load cell, the module will generate scaled Track Output and Peak Output analog DC voltage signals. The Track Output is simply the instantaneous signal output from the sensor, and is always on. The Peak Output is controlled by the external timing signal with a Peak Capture function, and is the overall peak signal output from the sensor for a current cycle. It is held in memory at the end of each timing signal (Peak Look Window), and reset to zero by a Peak Reset function at the start of the next timing signal for the new cycle.

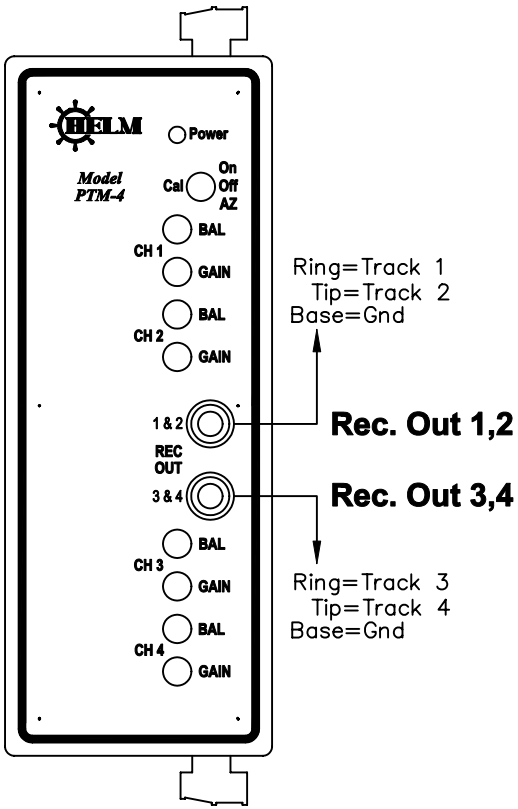
In terms of signal output scaling, the Helm standard is 2.667 VDC = 100% full scale capacity. Load values between no load and 100% capacity will yield a proportional output signal between the particular minimum and maximum output points. As stated above, if desired, the signal output scaling can be adjusted to any value up to 10 VDC = 100% full scale by means of the Gain pot.

CUSTOMER CONNECTIONS

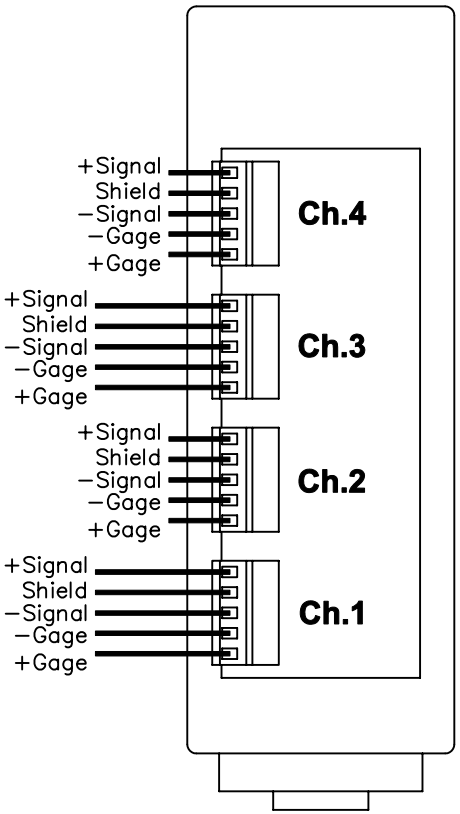
BOTTOM VIEW



FRONT VIEW



TOP VIEW



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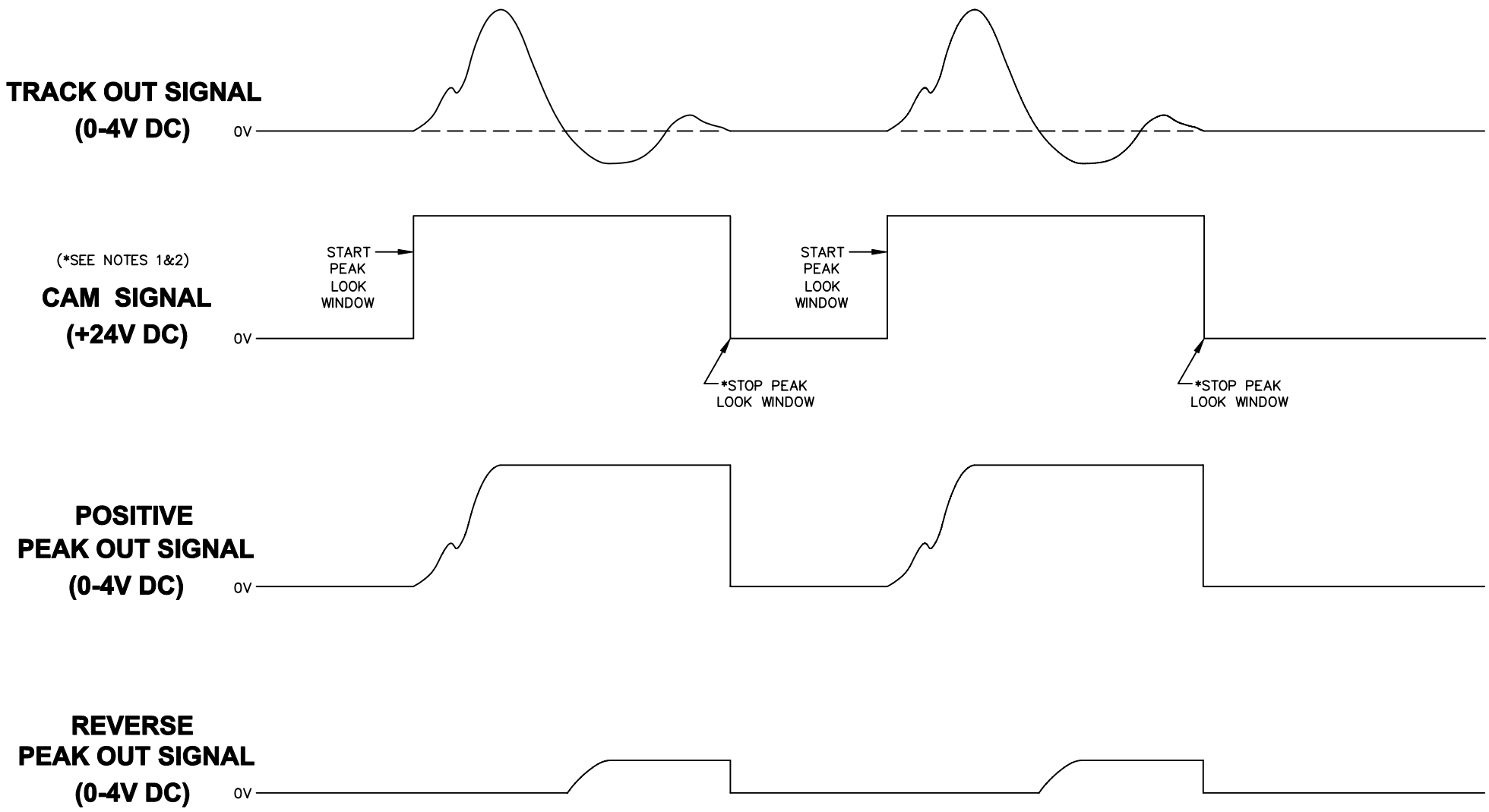
MAUMEE, OHIO USA

SCALE:	3/4	DESIGNED BY:	F.J.P.	DRAWN BY:	M.H.L.
DATE:	07/14/15	CHECKED BY:	F.J.P.	APPROVED BY:	F.J.P.
TITLE:	CUSTOMER CONNECTIONS, MODEL PTM−4 (HELM)				
DRAWER:		DRAWING NUMBER:	E1203M02		

TIMING DIAGRAM



NOTES:
1.) PEAK VALUE SHOULD BE CAPTURED ON FALLING EDGE OF CAM SIGNAL.
2.) THIS IS TYPICALLY DONE WITH A "ONE-SHOT FALLING" COMMAND IN THE PLC.

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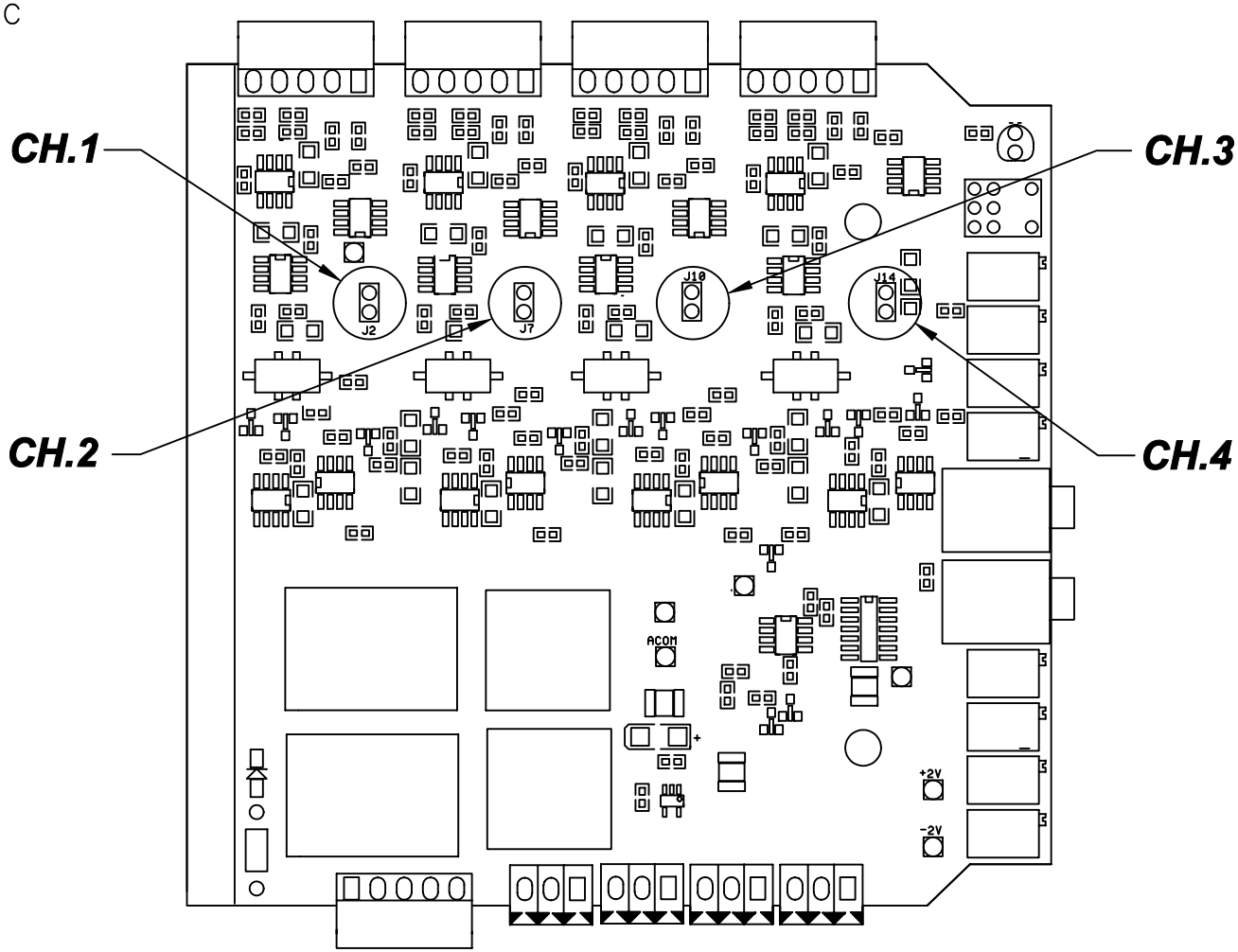
SCALE:	NONE	DESIGNED BY:	N.F.N.	DRAWN BY:	M.H.L.
DATE:	06/26/15	CHECKED BY:	N.F.N.	APPROVED BY:	R.J.G.
TITLE:	TIMING DIAGRAM, PTM-4 (HELM)				
DRAWER:		DRAWING NUMBER:	E1203Z03		

NOTES:

1.) PTM–4 CIRCUIT BOARD IS LOCATED INSIDE THE GREY ENCLOSURE.
2.) UNIT IS SHIPPED WITH HIGH GAIN JUMPERS INSTALLED. IF NEEDED, REMOVE JUMPERS TO ACTIVATE LOW GAIN FOR A SPECIFIC CHANNEL.

HIGH GAIN JUMPER LOCATION



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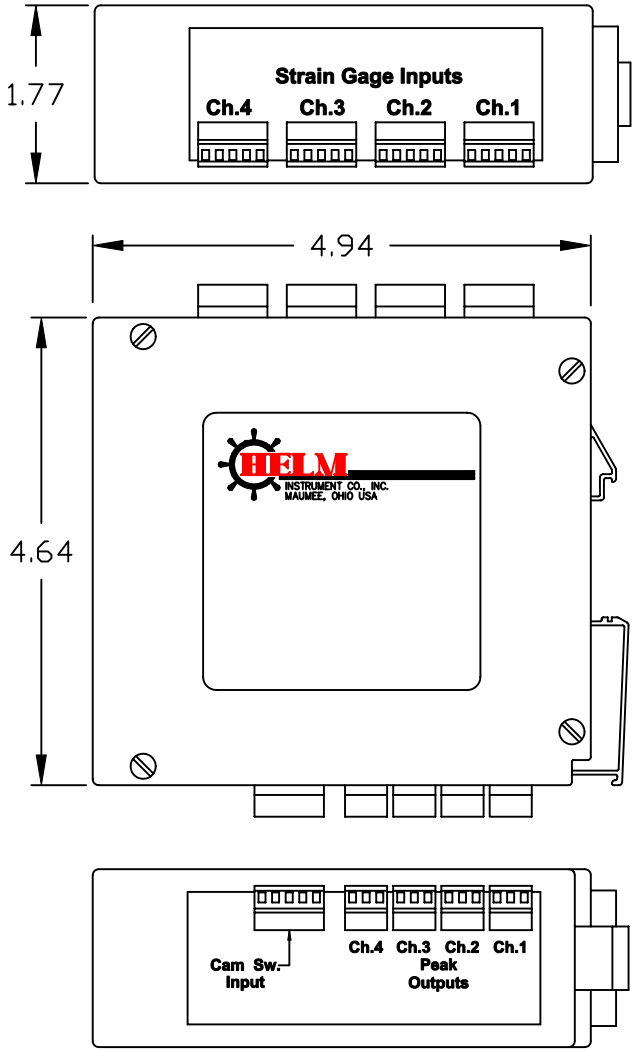
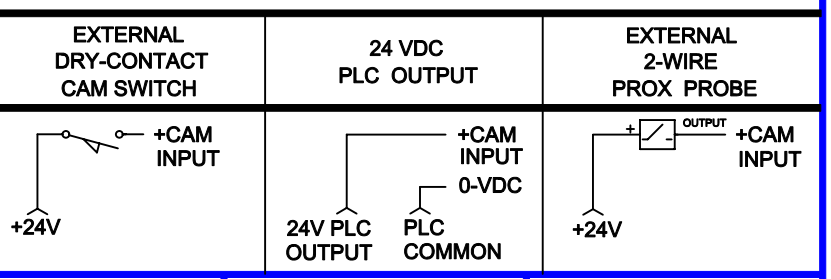
SCALE:	FULL	DESIGNED BY:	N.F.N.	DRAWN BY:	M.H.L.
DATE:	07/14/15	CHECKED BY:	F.J.P.	APPROVED BY:	N.F.N.
TITLE:	HIGH GAIN JUMPER LOCATION, PTM–4 (HELM)				
DRAWER:		DRAWING NUMBER:	E1203Z04		

HELM Model PTM-4
Peak-Track Module

SPECIFICATIONS	
Power Input	24 VDC
Power Consumption	400 ma
Sensor Input	Full Bridge Strain Gage 175-1100 Ohm
Signal Output, Track	0-10 VDC
Signal Output, Peak	0-10 VDC
Input Impedance	1k Ohms
Accuracy	1% Full Scale Accuracy
Normal Mode Rejection (between +Input & -Input)	50dB at 2000 Gain
Amplifier Roll-Off Frequency	650 Hz at 3000 Gain
Calibration	Manual Adjustment
Operating Temperature	0°C-60°C (32°F-140° F)
Hazardous Environmental Classification	Class 1, Div. 2 Hazardous Environment
Recommended Cable	4-Condutor Shielded HELM Stock No. 25198
Mounting Configuration	DIN Rail





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SCALE:	1/2	DESIGNED BY:	N.F.N.	DRAWN BY:	M.H.L.
DATE:	07/08/15	CHECKED BY:	N.F.N.	APPROVED BY:	R.J.G.
TITLE:	PTM-4 PEAK-TRACK MODULE SPECIFICATIONS (HELM)				
DRAWER:		DRAWING NUMBER:	E1203Z05		

PRESS MENU

EDIT RECIPE TONNAGE

05/30/14 10:49:46

HELM

RECIPE SELECTED

Die # 0

PART #

	CHANNEL 1 LEFT FRONT	CHANNEL 2 LEFT REAR	CHANNEL 3 RIGHT FRONT	CHANNEL 4 RIGHT REAR
HIGH CAPACITY	0	0	0	0
HIGH TREND %	0	0	0	0
TARGET	0	0	0	0
LOW TREND %	0	0	0	0
LOW CAPACITY	0	0	0	0

SAMPLES 0

LOW ALARM INHIBIT 0

MANAGE RECIPES

SAVE ALL CHANGES TO RECIPE

BACK

NEXT

TONNAGE CALIBRATION

05/30/14 10:45:59

HELM

CURRENT ANGLE

0

TONNAGE LOOK WINDOW

ON ANGLE 0

OFF ANGLE 0

TONNAGE CAM

	mV/V	mV/V	TONNAGE
CH 1 LEFT FRONT	0	0	0
CH2 LEFT REAR	0	0	0
CH3 RIGHT FRONT	0	0	0
CH4 RIGHT REAR	0	0	0

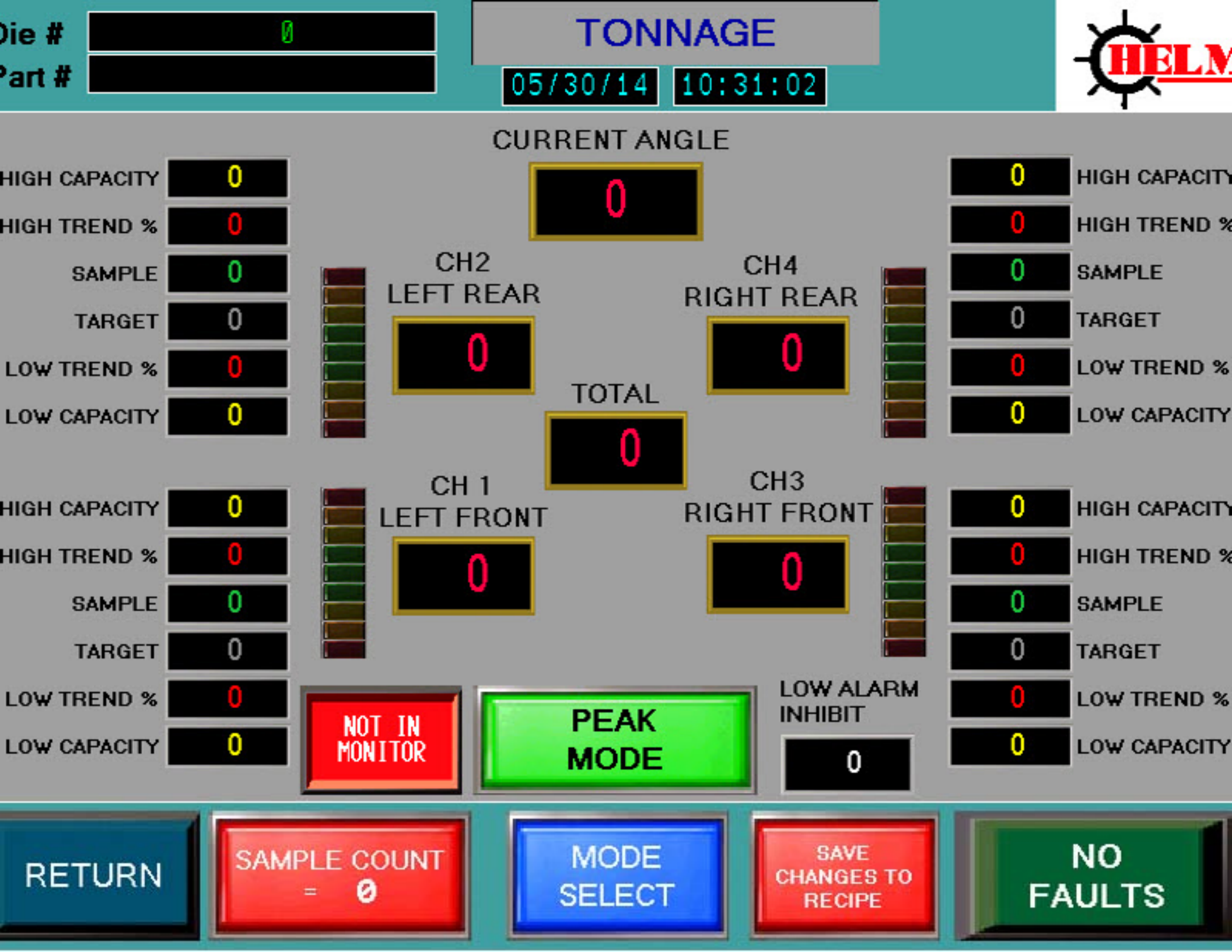
WRITE TO MODULE | SAVE TO EEPROM | ZERO BALANCE | AUTO ZERO ENABLE

PEAK MODE

SCALE PER CHANNEL 0

RETURN

MODE SELECT


Die #
0
Part #
TONNAGE
05/30/14
10:31:02
HELM
CURRENT ANGLE
0
HIGH CAPACITY
0
HIGH TREND %
0
SAMPLE
0
TARGET
0
LOW TREND %
0
LOW CAPACITY
0
CH2
LEFT REAR
0
CH4
RIGHT REAR
0
TOTAL
0
HIGH CAPACITY
0
HIGH TREND %
0
SAMPLE
0
TARGET
0
LOW TREND %
0
LOW CAPACITY
0
HIGH CAPACITY
0
HIGH TREND %
0
SAMPLE
0
TARGET
0
LOW TREND %
0
LOW CAPACITY
0
CH 1
LEFT FRONT
0
CH3
RIGHT FRONT
0
HIGH CAPACITY
0
HIGH TREND %
0
SAMPLE
0
TARGET
0
LOW TREND %
0
LOW CAPACITY
0
NOT IN MONITOR
PEAK MODE
LOW ALARM INHIBIT
0
RETURN
SAMPLE COUNT = 0
MODE SELECT
SAVE CHANGES TO RECIPE
NO FAULTS