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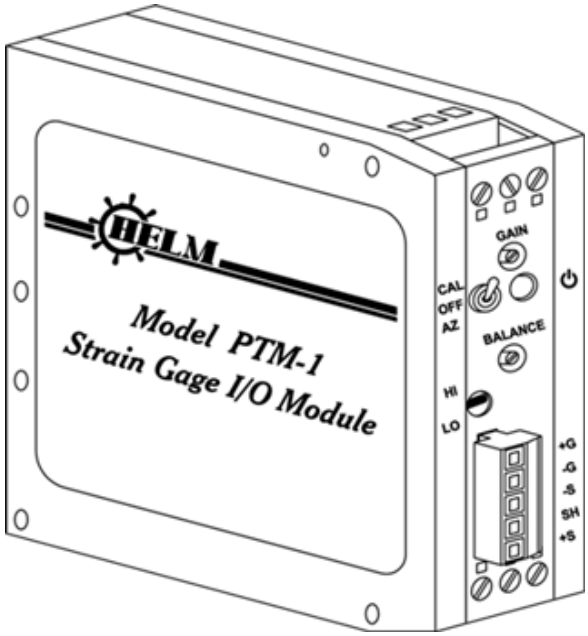
HELM MODEL PTM-1
STRAIN GAGE I/O MODULE

User Manual



Revised 4-7-08

Force Measurement and Control Solutions

HELM MODEL PTM-1 STRAIN GAGE I/O MODULE
INSTALLATION/OPERATING INSTRUCTIONS

The following provides installation and operating instructions for the Helm Model PTM-1 Strain Gage I/O Module, when used with a full-bridge strain gage sensor or load cell.

1.) General Description

The Helm Model PTM-1 Strain Gage I/O Module is shown in Helm drawing E1096i01. It is a compact 1-channel strain gage signal conditioning module, for use with "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 and 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 PTM-1 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 E1096w03. The various connections are very simple, and are outlined below.

INPUTS

24 VDC Power Input

24 VDC power input is connected at the 3 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.

HELM MODEL PTM-1 STRAIN GAGE I/O MODULE
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 PTM-1 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 3 "Cam" screw terminals at the bottom of the module.

OUTPUTS

0-10 VDC Signal Output ("Track and Peak")

The module signal output connections are made at the 3 screw terminals at the top. For 0-10 VDC analog voltage "Track" output, use the "Track" and "Acom" connections. This provides an instantaneous output voltage signal scaled to the sensor input. For 0-10 VDC analog voltage "Peak" output, use the "Peak" and "Acom" 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.

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.

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 terminals ("Track" and "Acom"). 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 toggle switch at the top of the module to the center "Off" position. Adjust the small "Bal" (Balance) pot below the switch so that the voltmeter reads 0.00 volts. This electronically "zero balances" the sensor or load cell to the module circuit.

HELM MODEL PTM-1 STRAIN GAGE I/O MODULE
INSTALLATION/OPERATING INSTRUCTIONS

Calibration

With the voltmeter still connected to the module, move the small 3-postion calibration toggle switch to the upper "Cal" (Calibration) position. The voltmeter will now show the "Shunt Calibration Number" as a voltage, based on the setting of the "High/Low Gain Toggle Switch" on the front of the module. 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" pot above the switch.

The two available calibration resistor values available for the PTM-1 module are:

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

LOW GAIN (140K OHM CAL RESISTOR): LOWER SWITCH POSTION
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 Toggle Switch should be set to the lower (LOW GAIN) 140K position. 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 PTM-1 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

PTM-1 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)

PTM-1 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 "A/Z" (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, prox 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 "A/Z" (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.

HELM MODEL PTM-1 STRAIN GAGE I/O MODULE
INSTALLATION/OPERATING INSTRUCTIONS

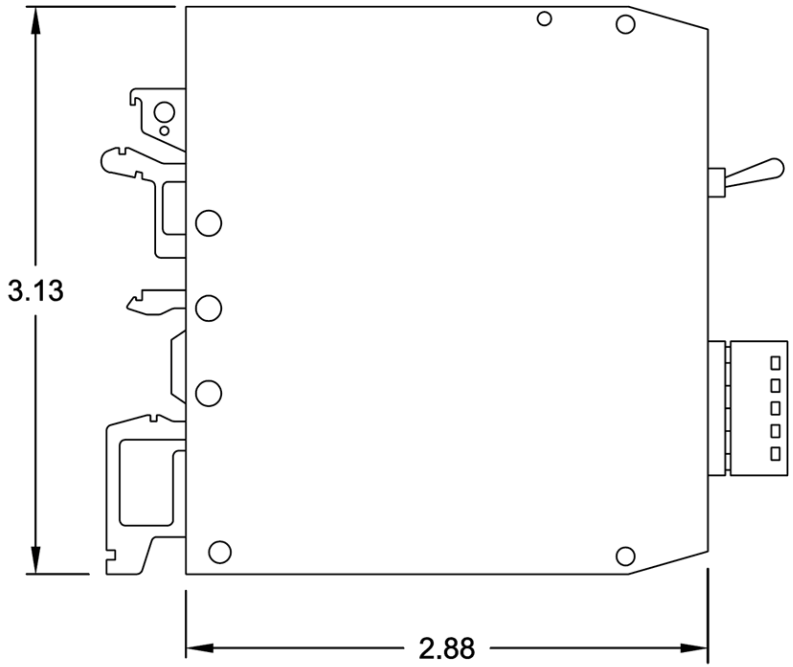
5.) Normal Operation

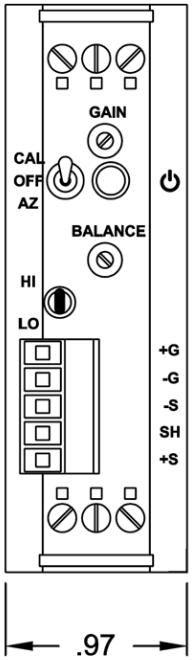
After the set-up and calibration have been completed, the 3-position calibration toggle switch should be set to the lower "A/Z" (Auto-Zero) position for normal operation. This allows the "Auto-Zero Balance" function to operate between active load cycles, maintaining a proper zero reference for accurate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

HELM Model "PTM-1" Peak-track Strain Gage I/O Module





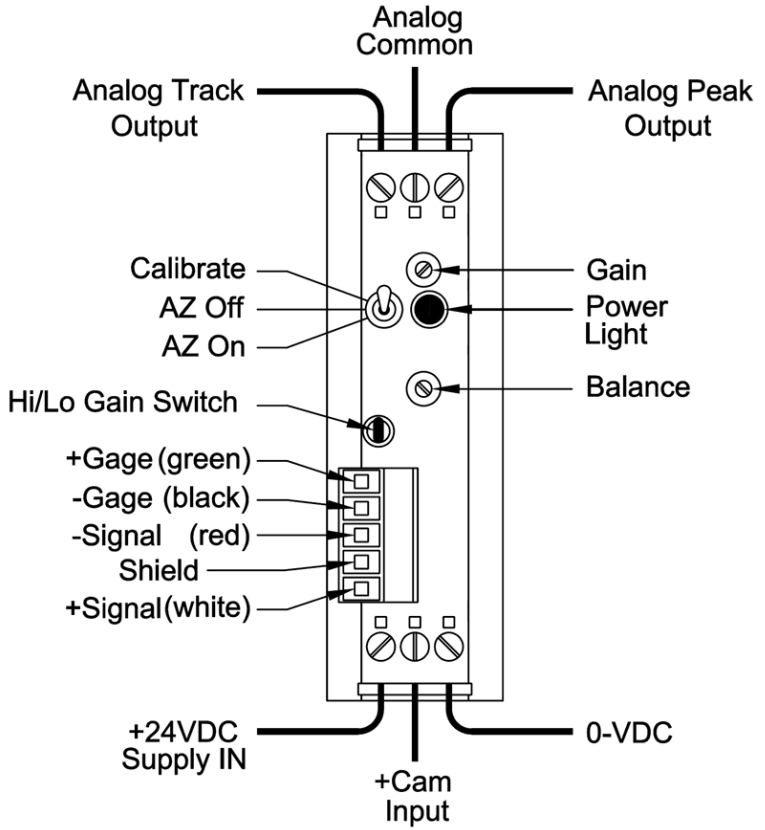
REV.	DESCRIPTION	BY	DATE
A	1.) UPDATE DRAWING TO SHOW NEW HIGH/LOW GAIN SWITCH.	M.H.L.	04/21/08

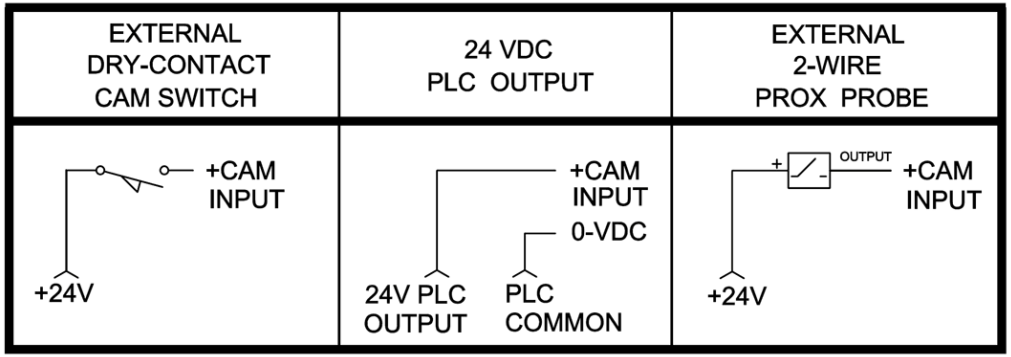
HELM INSTRUMENT CO., INC.
MAUMEE, OHIO USA

SCALE:	FULL	DESIGNED BY:	M.H.L.	DRAWN BY:	M.H.L.
DATE:	09/17/04	CHECKED BY:	R.J.G.	APPROVED BY:	R.J.G.
TITLE:	"PTM-1" PEAK-TRACK STRAIN GAGE I/O MODULE DIMENSIONS (HELM)				
DRAWER:		DRAWING NUMBER:	E1096i01A		

HELM Model "PTM-1" Peak-Track Module

SPECIFICATIONS	
Power Input	**24 VDC**
Power Consumption	**100 ma**
Sensor Input	**Full Bridge Strain Gage 175-700 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**



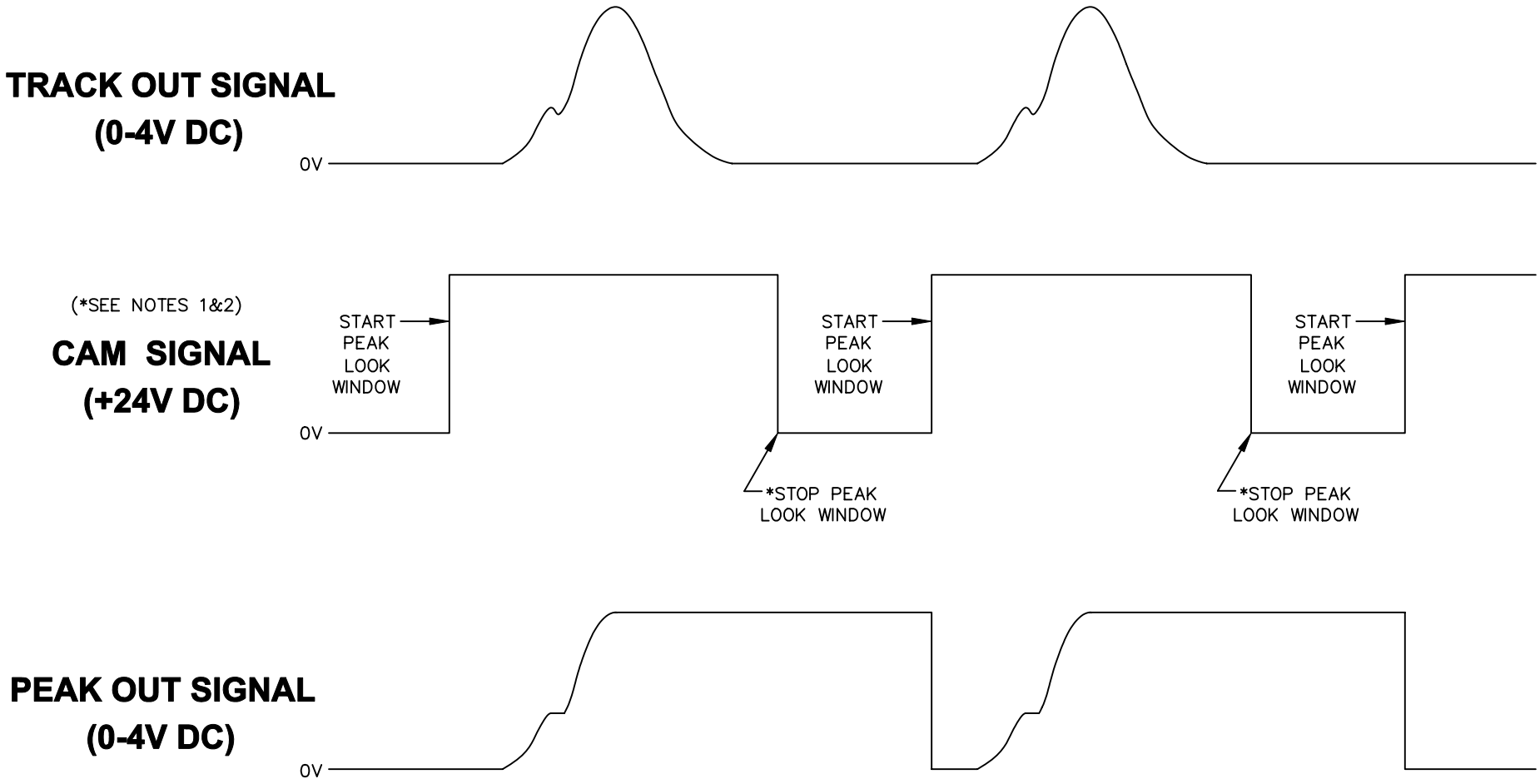


REV.	DESCRIPTION	BY	DATE
C	1.) UPDATE WITH NEW Hi-Lo GAIN SWITCH.	M.H.L.	04/21/08

HELM INSTRUMENT CO., INC.
MAUMEE, OHIO USA

SCALE:	FULL	DESIGNED BY:	M.H.L.	DRAWN BY:	M.H.L.
DATE:	09/17/04	CHECKED BY:	R.J.G.	APPROVED BY:	R.J.G.
TITLE:	"PTM-1" PEAK-TRACK MODULE SPECIFICATIONS & WIRING (HELM)				
DRAWER:		DRAWING NUMBER:	E1096W03C		

TIMING DIAGRAM - STAMPING



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.

REV.	DESCRIPTION	BY	DATE
A	1.) ADD TIMING NOTATIONS.	M.H.L.	02/22/11

HELM
INSTRUMENT CO., INC.
MAUMEE, OHIO USA

SCALE: NONE	DESIGNED BY: N.F.N.	DRAWN BY: M.H.L.
DATE: 5/29/97	CHECKED BY: N.F.N.	APPROVED BY: R.J.G.
TITLE: TYPICAL TIMING DIAGRAM, STAMPING (HELM)		
DRAWER:	DRAWING NUMBER: T-3097-11A	