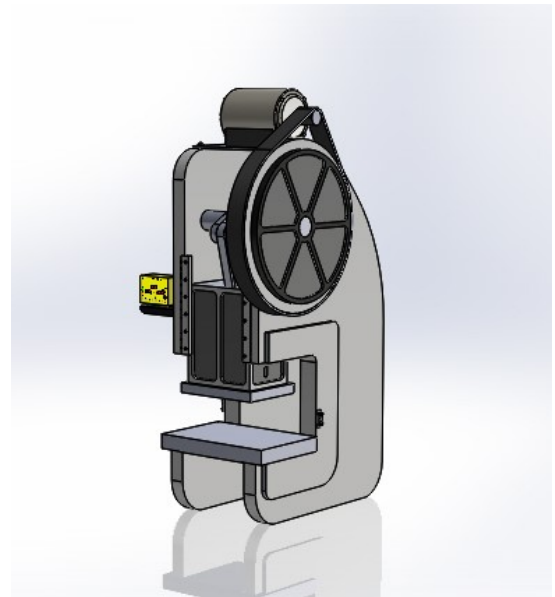
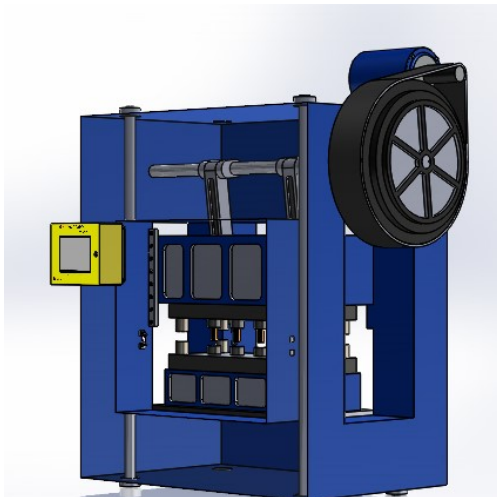


Helm RLG Series Loadgard Manual

Two Channel



Four Channel



Helm Instrument Co., Inc

January, 2024

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

TABLE OF CONTENTS

INTRODUCTION	5
SYSTEM OPERATION OVERVIEW	5
ENHANCED FEATURES	6
EXTERNAL POWER SUPPLY OPTIONS	7
RLG-2 & 4 CHANNEL QUICK SET UP PROCEDURE	8
RLG-2 & 4 CHANNEL QUICK CALIBRATION SET UP PROCEDURE	10
FORCE SENSORS	11
STRAIN GAIN FORCE SENSOR OPERATION	11
STRAIN GAIN FORCE SENSOR INSTALLATION AND WIRING	11
ALTERNATE IN-DIE FORCE SENSOR INSTALLATION AND WIRING	12
EXTERNAL TIMING INPUT REQUIREMENTS	14
FRONT PANEL ILLUSTRATIONS	14
THREE MODE FUNCTION SELECTOR	16
ALARM SETTINGS MODE	16
MONITOR PARTS MODE	16
BYPASS (CLEAR)MODE	17
BASIC MONITOR SET-UP PROCEDURE	17
SETTING CAPACITY ALARMS	18
SETTING CLOCK SET ENABLE	18
SETTING SAMPLE COUNT	23
SETTING LOW ALARM INHIBIT	23
SETTING METER SCALE	24
SETTING DECIMAL POINT	25
SETTING PERCENT OF LOAD CANCEL	26
SETTING ADAPTIVE AREA UNDER CURVE SAMPLE RATE	26
SETTING PEAK LOOK WINDOW SPM	27
SETTING SEQUENCE NUMBER	28
SETTING AUTO-LEARN BYPASS DELAY	29
INSTRUMENT CALIBRATION	30
PRELIMINARY CALIBRATION ADJUSTMENT PROCEDURE	31
INDIVIDUAL CHANNEL CALIBRATION ADJUSTMENTS	31

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

MANUAL ZERO BALANCE ADJUST	31
GAIN ADJUST	32
NORMAL MONITIRING OPERATION	34
PEAK TREND ALARMS MODE	35
ADAPTIVE PEAK TREND ALARMS MODE	35
ADAPTIVE AREA UNDER CURVE ALARM MODE	36
SETTING TREND ALARMS	37
TREND DISPLAYS	37
REVERSE LOAD DISPLAY AND REVERSE LOAD ALARM	38
HARD HIT INITIALIZATION AND STORAGE	39
APPENDIX A: STANDARD 24 VDC RLG-4 LOADGARD	40
24VDC RLG-2DC AND RLG-4DC LOADGARD SPECIFICATIONS	40
24VDC RLG LOADGARD BASE-MOUNT ENCLOSURE MECHANICAL DRAWING	41
24VDC RLG LOADGARD FLANGE-MOUNT ENCLOSURE MECHANICAL DRAWING	42
DRAWING E1062I05: CUSTOMER CONNECTIONS, RLG-2DC & RLG-4DC	43
DRAWING E1062W08A: POWER, STOP & CAM CONNECTIONS, RLG-2AC & RLG-4AC	44
RLG-4AC LOADGARD SPECIFICATIONS WITH 110/220 VAC OPTION	45
DRAWING E1060W03: CUSTOMER CONNECTIONS, RLG-2DC & RLG-4DC	46
DRAWING E1008W16: 24 VDC RLG LOADGARD INPUT/OUTPUT WIRING	47
DRAWING E1062I06: CONNECTIONS, FRONT VIEW: RLG-2AC & RLG-4AC	48
DRAWING E1062I07: CONNECTIONS, REAR VIEW: RLG-2AC & RLG-4AC	49
DRAWING E1062W08: POWER, STOP AND CAM CONNECTIONS, RLG-2AC & RLG-4AC	50
DRAWING E1062W09: SENSOR WIRING & CONNECTIONS, RLG-2AC & RLG-4AC	51
DRAWING E1008W17: 110/220 VAC RLG LOADGARD INPUT/OUTPUT WIRING	52

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

LIMITED WARRANTY

Helm Instrument Co., Inc. (HELM) hereby warrants that the instruments and sensors (collectively the Product) manufactured by it and sold to customer, are free from defects in material and/or workmanship under normal use subject to the following conditions. This warranty shall not apply to any Product which has been subjected to improper installation, misuse, negligence, accident, alteration, where service has been performed by other than an authorized Helm serviceman, or where the serial number has been defaced or altered. This warranty shall extend for the one (1) year period from date of shipment from our factory or authorized dealer, provided that the product is returned, freight prepaid, to Helm within the one (1) year warranty period within specific written authorization to perform repairs. Helm's obligations and the exclusive remedy of customer under this warranty are limited to repairing or replacing any defective Product at no additional charge and returning Product to customer freight paid. Repair parts and replacement Products shall be furnished on an exchange basis and shall be either new or reconditioned. All replaced parts and Products shall become the property of Helm.

EXCEPT AS SPECIFICALLY STATED HEREIN, HELM MAKES NO WARRANTIES EXPRESSED OR IMPLIED, OF THIS PRODUCT INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR AS TO THE QUALITY, UTILITY OR PERFORMANCE, ALL OF WHICH ARE HEREBY EXPRESSLY EXCLUDED. IN NO EVENT SHALL THE LIABILITY OF HELM EXCEED THE PURCHASE PRICE OF THIS PRODUCT. NOR SHALL HELM BE LIABLE FOR ANY DAMAGES WHATSOEVER, INCLUDING BUT NOT LIMITED TO SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL CHARGES, EXPENSE OR DAMAGES, ARISING OUT OF THE USE OR INABILITY TO USE THIS PRODUCT OR FOR ANY CLAIM BY ANY OTHER PARTY.

Should you have any questions concerning this Warranty, you may contact Helm by writing or calling:

**HELM INSTRUMENT COMPANY, INC.
CUSTOMER SERVICE
361 WEST DUSSEL DRIVE
MAUMEE, OHIO 43537
(419) 893-4356**

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

INTRODUCTION

You have just purchased the most advanced load monitoring system available. In addition to this system, HELM INSTRUMENT CO., INC. manufactures a complete line of load monitoring control systems for use on metal stamping, forging, compaction, assembly presses, cold forming, cold heading, injection molding and die cast machines. Standard or custom transducers and load cells are available for in-die monitoring of multi-station transfer or progressive tooling. Easy to use software systems designed for plant-wide SPC programs are also available.

At HELM, quality is inherent not only in the design of our products, but in the attitudes of our employees as well. We're working together to give you the best. After all, that's what our business is all about - providing innovative instrumentation to help make your manufacturing process more productive and your operation more efficient.

SYSTEM OPERATION OVERVIEW

The HELM Model RLG-2 (2 Channel) and RLG-4 (4 channel) LOADGARD monitors provide press overload protection, die protection, and improved part quality, with minimal operator involvement. The Model RLG-2 unit allows for two (2) force sensor inputs and is typically used on OBI or gap-frame presses, with a Helm bolt-on Strain Gain sensor on each side of the press frame. The Model RLG-4 unit allows for four (4) force sensor inputs, and is typically used on straight side presses, with a Helm bolt-on Strain Gain sensor on each of the four press columns. Digital meters on the front panel are used to display updated Peak load values and high/low alarm settings. For the 24 VDC unit, machine stop is initiated by means of two (2) alarm relays (one for CAPACITY ALARMS and one for TREND ALARMS). For the 110/220 VAC unit, machine stop is initiated by means of one alarm relay, which fires when any alarm limit (CAPACITY or TREND ALARM) is exceeded.

Adjustable discreet high-CAPACITY ALARMS are provided for all channels for press overload protection. These are based on normal, positive load. The CAPACITY ALARMS are always active, and fire instantly if a CAPACITY ALARM setting is exceeded.

Adjustable high/low TREND ALARMS are provided for all channels, for die protection and improved part quality. These are also based on normal, positive load. Three different types of TREND ALARMS are included, PEAK TREND ALARMS, ADAPTIVE PEAK TREND ALARMS, and ADAPTIVE AREA UNDER CURVE ALARMS. All TREND ALARMS are based on the monitor taking an initial TREND SAMPLE of Good Part force values, and storing those values in memory. The unit then compares the force values for each subsequent part to the stored Good Part values. The appropriate alarm relay fires in the event of a TREND ALARM on any channel. TREND ALARMS do not fire instantly, but rather, fire at the end of the Timing Window for each machine cycle. Only one of the three modes of TREND ALARMS is active at one time, as selected by the operator. TREND ALARMS are active only when the unit is in MONITOR mode, and not in BYPASS mode.

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

ENHANCED FEATURES

This particular unit is an updated version of the RLG-2 Loadgard (EPROM #RLG2ER115) or the RLG-4 Loadgard (EPROM # RLG4ER115).

INTERNAL WIRING CONNECTIONS

This allows for all wiring connections to the unit to be made internally, by means of electrical knockouts located at the back.

NO EXTERNAL CAM

This allows for proper operation in most cases without an external cam timing input. For those installations where an external cam input is still required that option is still available.

INSTANTANEOUS CAPACITY ALARM FEATURE

This makes the appropriate machine stop alarm relay fire instantly in the event of a high-capacity alarm.

ETHERNET COMMUNICATIONS FEATURE

This is an optional feature which allows for Ethernet 2-way communications between the RLG and a remote PC. On the inside door, there is an optional plug-in Ethernet communications module. This module is purchased separately from the base RLG unit. The communications module, when installed in the unit, and when used in conjunction with FirstMate or RLG WebView Software, allows for 2-way data exchange between the RLG unit and the computer. Load signature data is stored, graphed and presented in a user-friendly format at the computer. Also, the computer can be used to remotely change alarm limits at the unit, and to change the operating mode (Monitor or Standby) and Trend Alarm Modes (Peak, Adaptive Peak, Area under the Curve).

HARD HIT STORAGE FEATURE

This feature allows for the internal storage of the 100 most recent high-capacity alarms with a date and time stamp.

AUTO-LEARN AND AUTO-LEARN BYPASS DELAY FEATURE

The Auto-Learn feature automatically switches an RLG unit that is in Bypass mode to Monitor mode on machine start-up or re-start. This activates the Trend Sample routine and the resulting high/low Trend alarms, providing better monitoring of the process. The Auto-Learn Bypass Delay feature allows for the unit to remain in the Bypass mode on start-up for a selected number of cycles.

REVERSE LOAD ALARM FEATURE

This feature allows for a Reverse Load or negative load alarm, as opposed to the normal alarms that are based on positive load.

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

EXTERNAL POWER SUPPLY OPTIONS

There are two different configurations for the external power supply that feed the RLG-2 and RLG-4 Loadgards. These include the 24 VDC version, designated RLG-2DC and RLG-4DC, and the 110/220 VAC version, designated RLG-2AC and RLG-4AC.

The 24 VDC power supply version is the most basic version. This type should be used when a readily available source of 24 VDC power is close to the unit. Such arrangements include mounting of the RLG monitor close to press controls or PLC's where 24 VDC power is utilized. The 24 VDC power wires enter the unit through a conduit fitting hole in the backplate, and are terminated at an orange Weidmuller connector inside the unit.

The 110/220 VAC power supply version allows for 110/220 VAC power directly connected to the unit. Essentially, this uses a rear shell design, in which a 24 VDC unit has a rear shell enclosure with 110/220 VAC input/24 VDC output power supply. The power supply is a universal AC power supply, which can accommodate input voltages within a range from 90-264 VAC (Note: 110 VAC and 220 VAC are the two most common user sources). Regardless of the actual input voltage used within the allowable 90-264 VAC range, there are no user adjustments to make. This type of unit should be used when 24 VDC power is not available at the unit, and 110/220 VAC power must be used. The 110/220 VAC power wires enter the unit through a conduit fitting hole at the back of the Rear Shell, and are terminated at a small connector inside the shell.

For detailed wiring information on both 24 VDC and 110/220 VAC power supply configurations, refer to the following drawings in Appendix A or Appendix B at the back of this manual:

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

RLG-2 & 4 Channel Quick Set Up Procedure

- 1) Power up unit.
- 2) Make sure the unit is in **BYPASS** mode (on front display).
- 3) Locate the two slide switches (**S1 & S2**) on the inner door.
Please note: for normal operation, switches (**S1 & S2**) should be in the OFF, or left position.
- 4) Slide the bottom switch (**S2**) to the **ON**, or right position.
The unit is now in the main menu procedure.
- 5) The first sequence is **CAPACITY ALARMS**. If using the **RLG-4**, this should be set to $\frac{1}{4}$ of the presses capacity.
If using the **RLG-2** this should be set to $\frac{1}{2}$ the presses capacity.
This can be achieved by using the **UP** and **DOWN** keys on the left of the front display.
Press **CORNER SELECT** to advance to the next channel.
- 6) Pressing **CORNER SELECT** again will display **CLOCK SET ENABLE** setting.
This is factory set from Helm. No need to adjust.
- 7) Pressing **CORNER SELECT** again will display **SAMPLE COUNT** setting.
We typically set this for 10 strokes. This will activate the TREND alarm settings when in **MONITOR PARTS MODE**, after 10 strokes. Adjust by pressing the **UP** and **Down** keys.
- 8) Pressing **CORNER SELECT** again will display **LOW ALARM INHIBIT** setting.
We typically set this to 10 strokes. This will turn off **LOW TREND ALARMS** in **MONITOR PARTS MODE** for 10 strokes, when starting the press back up in **MONITOR PARTS MODE**. Adjust by pressing the **UP** and **DOWN** keys.
- 9) Pressing **CORNER SELECT** again will display the **METER SCALE** setting.
If using the **RLG-4**, this should be set to $\frac{1}{4}$ of the press capacity.
If using the **RLG-2**, this should be set to $\frac{1}{2}$ of the press capacity.
Adjust by pressing the **UP** and **DOWN** keys.
Note: Pressing the **RESET** button will add, or take out the **DECIMAL POINT** in this mode.
- 10) Pressing **CORNER SELECT** again will display **PERCENT OF LOAD CANCEL** setting.
This setting is based on a percentage the **METER SCALE** setting.
RE: a setting of 10 P will ignore any loads below what the RLG **METER SCALE** setting is.
A setting of - - P disables this feature. This feature is only active in **BYPASS MODE**.
- 11) Pressing **CORNER SELECT** again will display **ADAPTIVE AREA UNDER THE CURVE** setting.
Any process running under 200 SPM should be set to the **LO** setting.
Any process running above 200 SPM should be set to the **HI** setting.
- 12) Pressing **CORNER SELECT** again will display **PEAK LOOK WINDOW SPM, OR CAM SETTING**.

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

This setting is typically set to the machines production running Strokes Per Minute speed.
This activates the internal **PEAK LOOK WINDOW**.

When using a Cam, or Proximity probe for a manual **PEAK LOOK WINDOW** this setting must be set to "0". Press the **UP** and **DOWN** keys to adjust to the proper number.

- 13) Pressing **CORNER SELECT** again will display **SEQUENCE NUMBER SETTING**.
This setting is for the optional ethernet communications feature.
(See manual if using this feature).
- 14) Pressing **CORNER SELECT** again will display **AUTO-LEARN BYPASS DELAY SETTING**.
This setting will automatically switch the RLG from **BYPASS MODE**, to **MONITOR PARTS MODE** after the desired number of strokes.
A setting of "0" will bypass this feature. Press the **UP** and **Down** keys to desired strokes.
- 15) Pressing **CORNER SELECT** again will display **COMMUNICATIONS SELECT SETTING**.
P-4 is for the **RLG Smart Phone App**. **E-4** is for the ethernet communications feature.
Press the **UP** and **Down** keys to set.
- 16) Pressing **CORNER SELECT** again will display **CLOCK READ**, or **DATE AND TIME**.
This is factory set to Eastern or NY Time.

This concludes the Main Set-Up Procedure.

Pressing **CORNER SELECT** again will take you back to the initial **CAPACITY ALARM SETTINGS**.

When finished, slide the S-2 Switch back to OFF, or left position.

Please refer to the manual for more in-depth information.

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

RLG-2 & 4 Channel Quick Calibration Set Up Procedure

- 1) Power up unit.
- 2) Make sure the unit is in **BYPASS** mode (on front display).
- 3) Locate the two slide switches (**S1 & S2**) on the inner door.
Please note: for normal operation, switches (**S1 & S2**) should be in the OFF, or left position.
- 4) Slide the top switch (**S1**) to the **ON**, or right position.
The unit is now in Calibrate Mode.
- 5) Locate the 3 position (silver) switches on the back board of the unit.
Put the switches in the middle position for each channel.
This is the **OFF MODE**, or Sensor Balance Mode.
- 6) Using a little screwdriver, turn the **BAL** potentiometer until that corresponding channel reads "0" on the front display. **Do this for each channel.**
- 7) Now put each 3-position switch in the down position for each channel.
This is **CAL (Calibration) MODE**.
- 8) Using a little screwdriver, turn the **CAL** potentiometer to the adequate calibration number, or gain value.
Do this for each channel.
Please note: When doing the initial press calibration, we typically start out with a calibration number of 50 for each channel.
- 9) It's always a good idea to double check steps 5 through 8 for any confusion.
- 10) When finished, flip all of the (silver) switches on the back of the board, for each channel to the most up position. This is **Auto Zero (AZ) On Mode**.
- 11) Slide the top switch (**S1**) on the inner door back to the **Off**, or left position.
The RLG is now set.

Note: If you are not getting enough signal from the sensors, double check the High/Low Gain setting. Press frame mounted sensors typically require High Gain. Direct in-line sensors RE: pitman, link, or in-line load cells typically requires Low Gain.
Check the High/Low speed switch. 200 SPM or higher should be in the High speed position, when running below 200 SPM the switch should be in the low speed position.

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

FORCE SENSORS

STRAIN GAIN FORCE SENSOR OPERATION

The basic function of the Helm Model HT-400 Strain Gain bolt-on force sensor is to detect the amount of deflection imposed on the press as parts are being formed. All Strain Gain sensors are matched to within 1%, and therefore can be replaced without re-calibration of the machine.

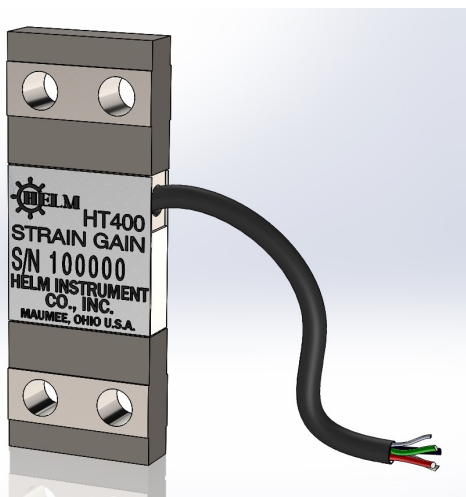
The HT-400 Strain Gain sensors are mounted in a very simple bolt-on fashion to strategic high stress areas of the machine frame. They form the basis of a Frame-Mount sensor monitoring system, in which deflections of the machine frame are used to generate the force output signals to be monitored.

Force output signals from the sensors are routed to the RLG-2 or RLG-4 Loadgard for processing. The HT-400 Strain Gain is capable of measuring either a tension or a compression deflection.

STRAIN GAIN FORCE SENSOR INSTALLATION AND WIRING

Specific sensor location and mounting instructions for Strain Gain sensors are described in the Installing Strain Gain Transducers manual. Generally speaking, the RLG-2 Loadgard with two (2) sensor inputs is used on OBI or gap-frame presses, where a Strain Gain sensor is mounted to each side of the press frame. The RLG-4 Loadgard with four (4) sensor inputs is used on straight side or 4-column presses, where a Strain Gain sensor is mounted to each of the press columns.

Sensor nominal resistance values should check out as shown below. For proper wiring, use separate conduit or Sealtight for sensor cables, and avoid running these cables with any press control or high-power motor circuits. Sensor cables should never be run near high voltage (220VAC, 440VAC) circuits.



GREEN — BLACK: 350 OHMS
WHITE — RED: 350 OHMS
GREEN — RED: 263 OHMS
GREEN — WHITE: 263 OHMS
WHITE — BLACK: 263 OHMS
BLACK — RED: 263 OHMS

NOTE:
ABOVE RESISTANCE VALUES SHOULD
MEASURE WITHIN +10 OHMS FOR CABLE
LENGTHS UP TO STANDARD 35 FT.

HT400 "STRAIN GAIN" SENSOR

For the 24 VDC units (RLG-2DC & RLG-4DC), the force sensor cables enter the back of the unit through the right-hand conduit fitting hole. The individual sensor wires are then terminated at orange Weidmuller screw terminal connector(s) inside the unit. The backplate with the conduit fitting holes may be temporarily removed to assist during wiring. Refer to drawing E1062i05 and drawing E1060W03 at the back of this manual.

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

For the 110/220 VAC units (RLG-2AC & RLG-4AC), the force sensor cables enter the Rear Shell through the two-conduit fitting knockout holes at the right-hand Low Voltage (Sensor) side. This is separated from the Power Supply side by a divider plate in the shell. The individual sensor wires are then terminated at orange Weidmuller screw terminal connector(s) inside the unit. The Rear Shell may be temporarily removed to assist during wiring. Refer to drawing E1062I06, drawing E1062I07, drawing E1062W08A, and drawing E1062W09 at the back of this manual.

Proper wiring polarity for the bolt-on Strain Gain force sensors is shown below.

<u>RLG Sensor Connector Terminal Identification</u>	<u>Strain Gain Cable Wires</u>	
	<u>Tension Operation</u>	<u>Compression Operation</u>
+ Gage	Green	Black
- Gage	Black	Green
+ Signal	White	White
- Signal	Red	Red
Shield	Shield	Shield

ALTERNATE IN-DIE FORCE SENSOR INSTALLATION AND WIRING

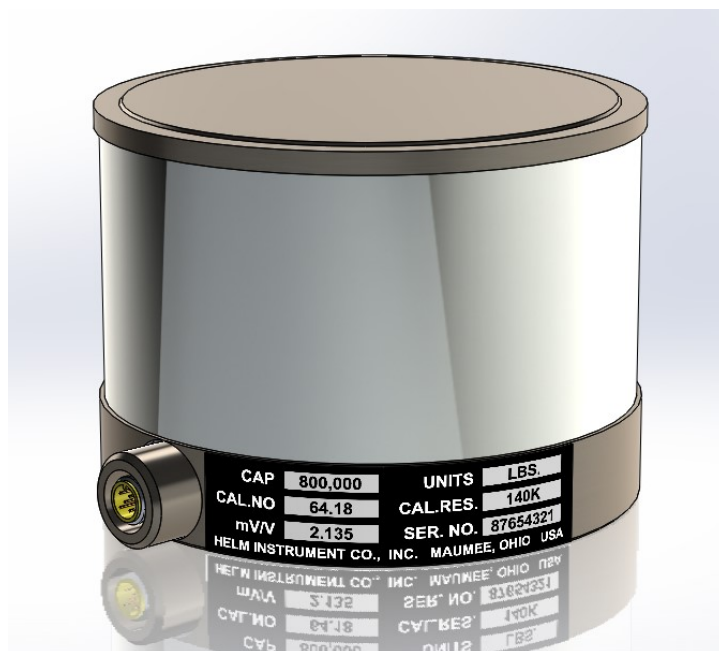
As an alternate to the simple bolt-on Strain Gain sensors, In-Die strain gage force sensors can be used with the RLG-2 and RLG-4 Loadgards. In-Die force sensors are typically used on multi-station tools, where a higher degree of die protection and part quality control are desired. Detailed information on the proper application of these In-Die force sensors is available from Helm on request. Wiring connection of In-Die force sensors to the RLG unit is similar to the wiring method used for the bolt-on Strain Gain sensors.

Wiring polarity for In-Die strain gage force sensors is shown below.

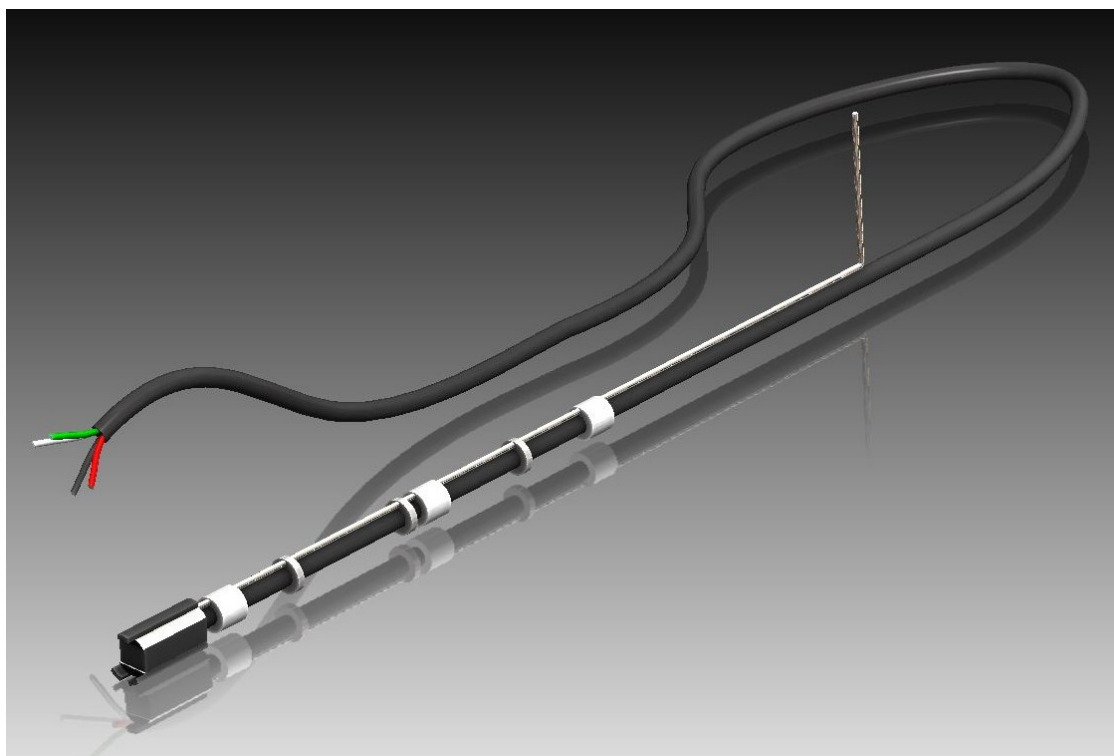
<u>RLG Sensor Connector Terminal Identification</u>	<u>In-Die Force Sensor Cable Wires (Compression Operation)</u>
+ Gage	Black
- Gage	Green
+ Signal	White
- Signal	Red
Shield	Shield

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

HCS05-400T; HIGH CAPACITY LOAD CELL



STRAIN GAGE “DIE PLUG” SENSOR



RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

EXTERNAL TIMING INPUT REQUIREMENTS

The RLG-2 or RLG-4 Loadgard does not require an external timing input signal for proper operation. For some field installations, the RLG Loadgard monitor does require an external timing input signal for each machine cycle to be monitored. Those installations include variable speed machines that change speeds within a big range on the fly, machines that operate below 10% of press capacity, and single stroke hand-fed machines that run faster than 30 SPM or run with intermittent timing.

The timing input signal should start shortly before the forming load begins for the new cycle, and should end shortly after the forming load is finished. The unit actively monitors the forming process when the external timing input signal is On, and ignores what occurs when the signal is Off between machine cycles.

Three main types of external timing input signals can be used with the RLG unit. These include conventional dry contact cam switch, 24 VDC proximity switch, and 24 VDC PLC input.

For the 24VDC unit, the timing input wires are terminated inside the unit at the designated +CAM and -CAM connections on the orange Weidmuller connectors. Refer to drawing E1060W03 and drawing E1008W16 at the back of this manual.

For the 110/220 VAC unit, the timing input wires are terminated inside the Rear Shell at the designated CAM INPUT and CAM (+V connections on the orange Weidmuller connector. Refer to drawing E1062W08 and drawing E1008W17 at the back of this manual.

Note: After all wiring connections have been made, and in preparation to set up the unit, locate the main power toggle switch inside the RLG cabinet. Turn the power switch On.

FRONT PANEL ILLUSTRATIONS

The front panels for the RLG-2 Loadgard and for the RLG-4 Loadgard are similar to each other. The main difference between the two is the number of digital display meters and vertical TREND DISPLAYS.

The following illustration shows the front panel tonnage meter details and the various function selector buttons for the RLG-2 Loadgard.

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS



The following illustration shows the front panel tonnage meter details and the various function selector buttons for the RLG-4 Loadgard



RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

THREE MODE FUNCTION SELECTOR

The MODE SELECT button at the bottom of the front panel is a THREE MODE FUNCTION SELECTOR. It is used to place the unit into one of three possible operating modes, including:

- ALARM SETTINGS mode
- MONITOR PARTS (RESET BUTTON ACTIVE) monitoring mode
- BYPASS (CLEAR) mode

Pressing the MODE SELECT button will toggle the unit from one mode to another, with the active mode indicated by the corresponding illuminated LED.

ALARM SETTINGS MODE

Use this position for setting the high and low TREND ALARMS.

MONITOR PARTS MODE

During parts production, the instrument should be in the MONITOR PARTS mode.

Once the machine is properly set up and producing good parts, press the MODE SELECT button and set the RLG unit in the MONITOR PARTS mode. The instrument will then take a TREND SAMPLE of Good Part forming load values, and store this sample in memory. The forming loads for each subsequent part are compared to this sample. For each channel, a digital meter and vertical LED array TREND DISPLAY are included on the front panel. The digital meters show the continuously updated peak force values from hit to hit. The TREND DISPLAYS use illuminated LED's in either an up or down direction, to show change in the current force values compared to the initial learned TREND SAMPLE values.

TREND ALARMS are automatically activated when the TREND Good Part force sample is taken in MONITOR PARTS mode. The TREND DISPLAYS show the force value deviation for the particular active mode of TREND ALARM. For the 24 VDC unit, a high or low force change on any channel that exceeds the TREND ALARM setting will fire the dedicated TREND ALARM relay (TREND STOP) for machine stop. For the 110/220 VAC unit, a TREND ALARM condition will fire the single ALARM relay (MACHINE STOP) for machine stop. For all units, a TREND ALARM does not fire instantaneously, but rather fires at the end of the timing window for the particular cycle.

The following conditions are present in MONITOR PARTS operation:

- Press overload CAPACITY ALARMS are active.
- The TREND DISPLAYS and the TREND ALARMS are On.

NOTE: The TREND SAMPLE load values are erased whenever the RLG unit is placed in the BYPASS mode of operation, or, when power is turned off. To stop the machine for a break, leave the instrument in MONITOR PARTS mode.

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

BYPASS (CLEAR) MODE

Use this mode of operation for setting high-CAPACITY ALARM, METER SCALE, and DECIMAL POINT values.

NOTE: After power down and power up, press the MODE SELECT button and set the instrument in BYPASS mode. If the instrument remains in the MONITOR PARTS mode during power down/power up, the machine stop relay will prevent the machine from running, and the digital display will flash zeroes. In such a case, press the MODE SELECT button and set the instrument to BYPASS mode to reset the machine stop relay.

BASIC MONITOR SET-UP PROCEDURES

During initial set-up of the monitor, various settings or values should be entered for the unit in order for proper operation. These values are set in a particular sequence and include the following in order:

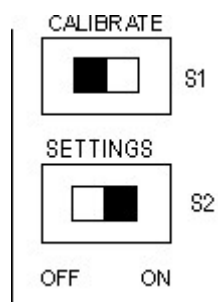
CAPACITY ALARMS
CLOCK SET ENABLE
SAMPLE COUNT
LOW ALARM INHIBIT
METER SCALE
DECIMAL POINT

(Note: Press the reset button to activate or deactivate the decimal point)

PERCENT OF LOAD CANCEL
ADAPTIVE AREA UNDER THE CURVE
PEAK LOOK WINDOW SPM
SEQUENCE NUMBER
AUTO-LEARN BYPASS DELAY
COMMUNICATIONS SELECT
CLOCK READ

In order to initiate entering the settings, starting with the Capacity Alarms, the following procedure should be used:

1. Press the MODE SELECT button and select BYPASS mode.
2. Open enclosure door and locate slide switches on inside door.
3. Move the lower settings switch (S2) to the right-hand ON position.



Note: After all of the settings have been properly entered; return the setting switch (S2) to the left-hand OFF position.

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

SETTING CAPACITY ALARMS

CAPACITY ALARMS are adjustable discreet high alarms, based on normal positive load. They are provided for all channels for press overload protection, and are always active. For the 24 VDC unit, a CAPACITY ALARM on any channel will fire the dedicated CAPACITY ALARM relay (CAPACITY STOP) to stop the press. For the 110/220 VAC unit, a CAPACITY ALARM will fire the single ALARM relay (MACHINE STOP) to stop the press. For all units, a CAPACITY ALARM condition fires the particular relay instantaneously. Also, a fault condition with any of the strain gage sensors (shorted or broken wires) will fire a CAPACITY ALARM.

For a given press, CAPACITY ALARMS are typically set as a one-time adjustment. To set the CAPACITY ALARMS, the following procedure should be used:

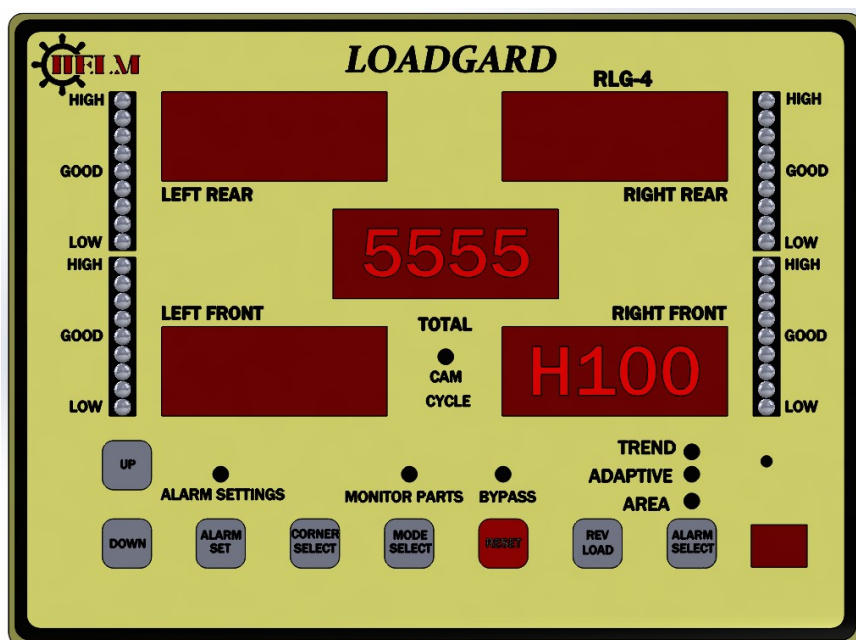
1. The CORNER SELECT button will allow you to set the high-CAPACITY ALARMS for all channels on a One-by-one basis (for the RLG-2, LEFT, and RIGHT; for the RLG-4, LEFT FRONT, LEFT REAR, RIGHT FRONT, and RIGHT REAR). By toggling the button on and off, those values will be shown in sequence on the individual channel display meters. At the same time, the center TOTAL display meter will be blank.
2. To set a CAPACITY ALARM, select the channel by pressing the CORNER SELECT button. Calculate the proper CAPACITY ALARM value for each channel by dividing the total press capacity by the number of channels on the instrument. For the RLG-2 Loadgard with 2 channels, the total press capacity should be divided by 2. Example: for a press with a total rated capacity of 100 tons, the per channel capacity and CAPACITY ALARM value would be $100 \text{ tons} / 2 = 50 \text{ tons per channel}$. For the RLG-4 Loadgard with 4 channels, the total press capacity should be divided by 4. Example: for a press with a total rated capacity of 100 tons, the per channel capacity and CAPACITY ALARM value would be $100 \text{ tons} / 4 = 25 \text{ tons per channel}$.
3. Watching the associated digital meter, adjust the CAPACITY ALARM for each channel by using the UP and/or DOWN buttons located on the front panel, until the desired tonnage is displayed. Note: *when adjusting alarm values up or down on the instrument display, first use the RESET button simultaneously with the UP or DOWN button to acquire the rough value range. Then, use the UP or DOWN button alone to fine adjust the value.*
4. Repeat for all channels.
5. An entered value of 0 for the CAPACITY ALARM on any channel turns off that channel and will make the associated display meter always read zero.

SETTING CLOCK SET ENABLE

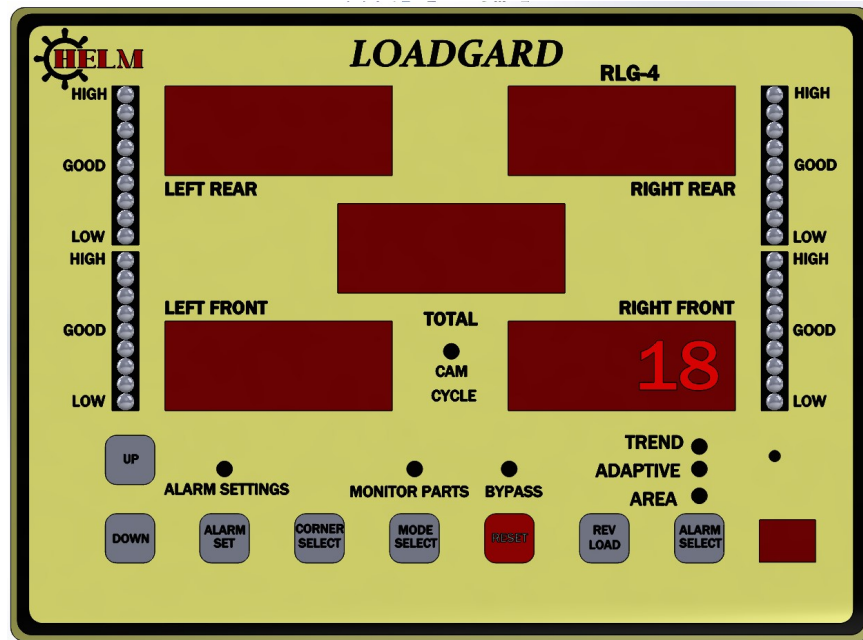
The clock set enable establishes the correct desired current date and time for the RLG unit internal clock. This allows the unit to keep the updated date and time and assign as needed to correspond Hard Hit or Ethernet communication load values (date and time stamped). For the sake of simplicity, the example below shows a 4-channel RLG unit. The 2-channel unit is similar, except the top two meters are not present. To set the CLOCK SET ENABLE, use the method as shown below.

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

1. Use the UP/DOWN buttons to make the TOTAL meter read 5555.

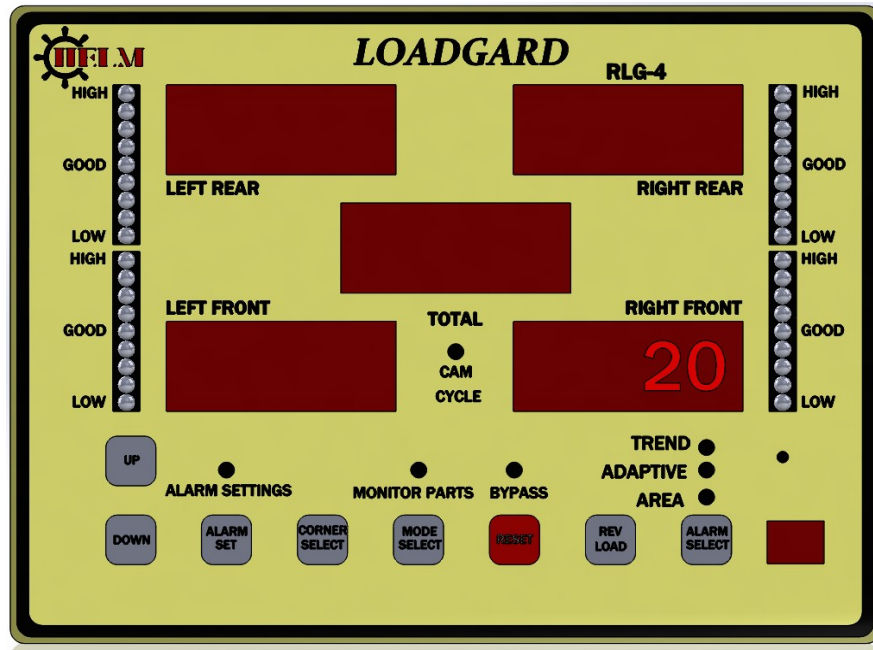


2. Push CORNER SELECT. Year shows in Right Front meter. Change with UP/DOWN buttons.

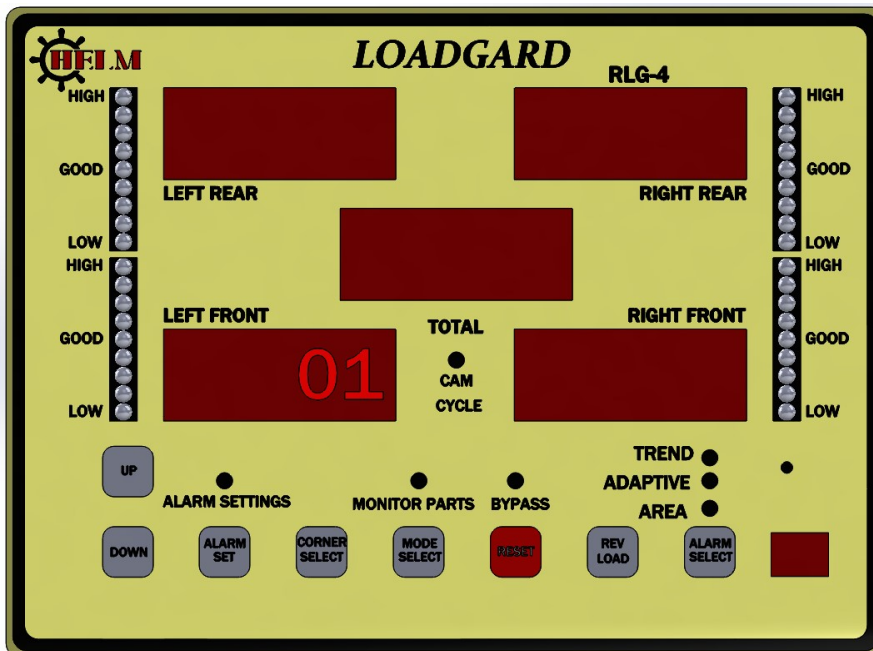


RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

3. Push CORNER SELECT again. Century shows in Right Front meter. Change with UP/DOWN buttons.

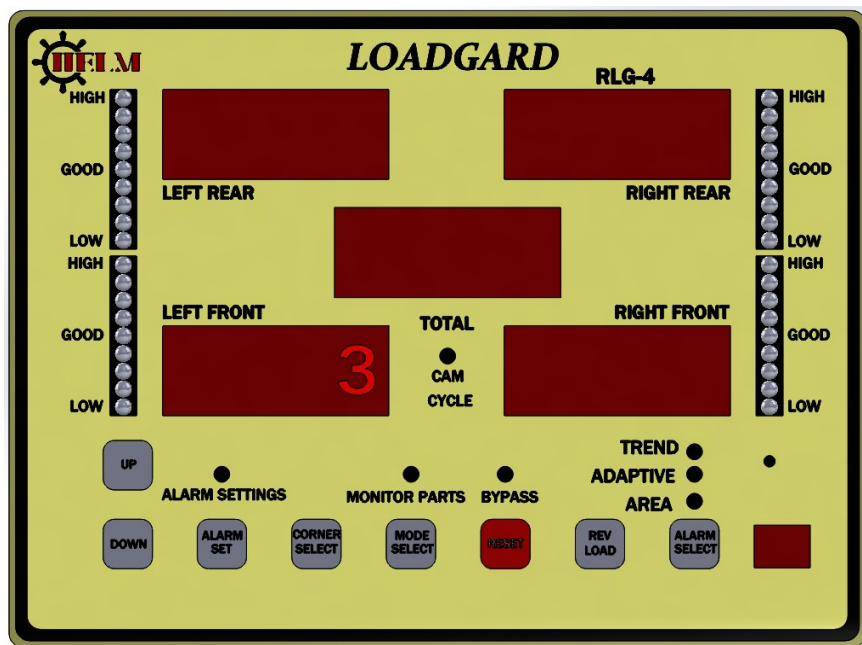


4. Push CORNER SELECT. Day shows in Left Front meter. Change with UP/DOWN buttons.

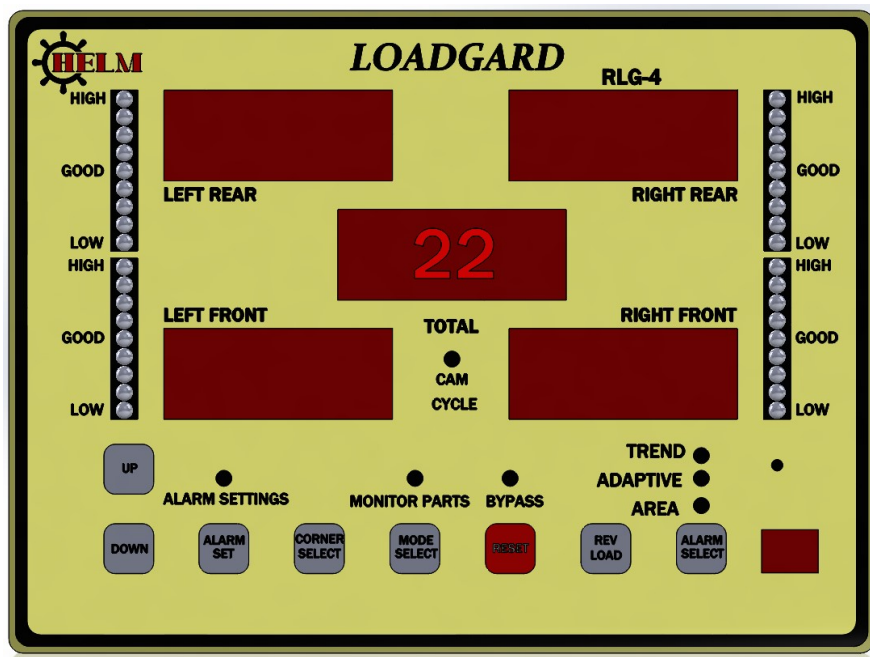


RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

5. Push CORNER SELECT. Month shows in Right Front meter. Change with UP/DOWN buttons.

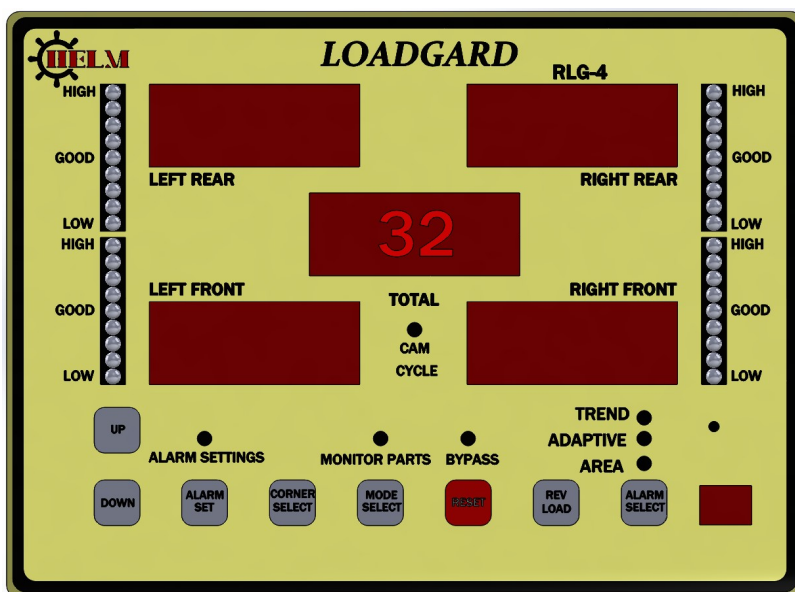


6. Push CORNER SELECT. Hour shows in Total meter as Military time. Change with UP/DOWN buttons.

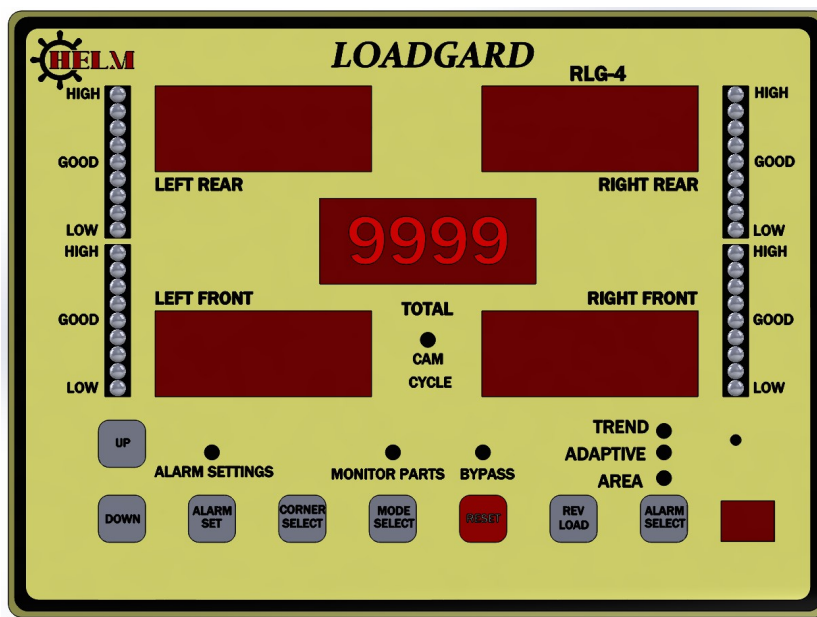


RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

7. Push CORNER SELECT. Minutes are shown in Total meter. Change with UP/DOWN buttons.



8. After clock is properly set, turn power OFF and then ON. The value 9999 will appear in Total meter. This disables the CLOCK SET ENABLE function and allows the current clock values to stay unchanged in memory. The clock values can then only be changed if 5555 is entered on the TOTAL meter.

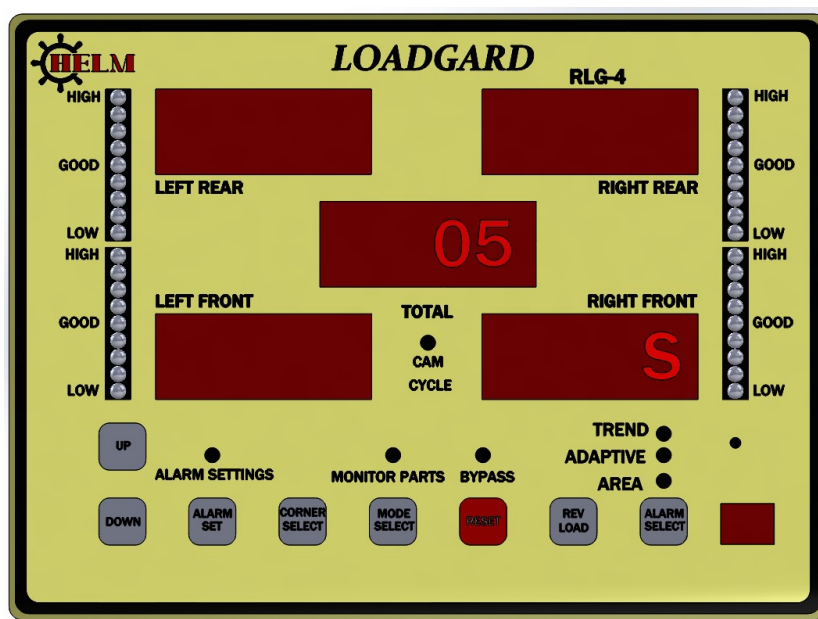


RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

SETTING SAMPLE COUNT

The SAMPLE COUNT relates to the Good Part TREND SAMPLE taken when MONITOR PARTS operating mode is initiated. The SAMPLE COUNT is the number of machine strokes used to establish the Good Part TREND SAMPLE or benchmark values. Once the TREND SAMPLE is taken, the high and low TREND ALARMS based on that sample become active. A valid setting is between one (1) and ninety-nine (99) on the TOTAL display. To set the SAMPLE COUNT, use the following procedure:

1. Press the CORNER SELECT button until the first value appears on the TOTAL display meter. The SAMPLE COUNT value appears in the TOTAL meter.
2. Adjust the meter display between 1 and 99, using the UP/DOWN buttons on front panel.



SETTING LOW ALARM INHIBIT

In some processes it may be necessary to inhibit or turn off the low TREND ALARMS during machine ramp-up after starting the press. This is because the forming loads for a stamped part are typically lower when the press is ramping up from a stopped condition to its normal speed. The forming loads reach their normal higher values after the press speed and the tool operation have stabilized.

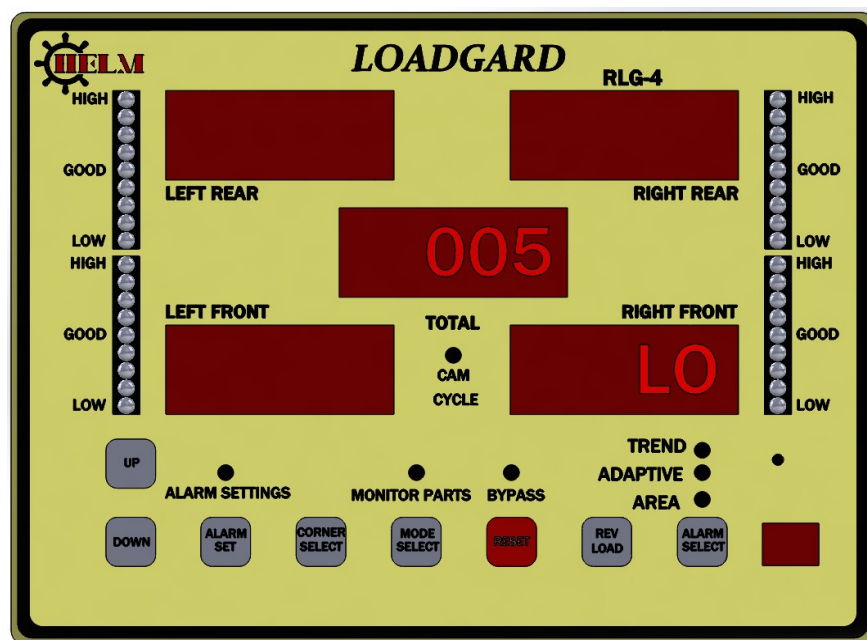
If the low TREND ALARMS were not inhibited during ramp-up, nuisance low alarms could result from the low tonnage levels. The LOW ALARM INHIBIT setting establishes the number of machine strokes at press start during which the low TREND ALARMS are inhibited. A valid setting is between 0-250 on the TOTAL display meter.

It should be noted that the LOW ALARM INHIBIT value also determines the TREND SAMPLE DELAY value. The TREND SAMPLE DELAY is a feature whereby the TREND SAMPLE routine is delayed for a certain number of machine strokes at the start of MONITOR PARTS operation. This delay is to allow the process to stabilize during machine start-up, so that a valid Good Part TREND SAMPLE is taken of the forming force values.

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

To set the LOW ALARM INHIBIT, use the following procedure:

1. Press the CORNER SELECT button. The LOW ALARM INHIBIT value appears on the TOTAL meter.
2. Adjust the meter value between 0 and 250, using the UP/DOWN buttons.



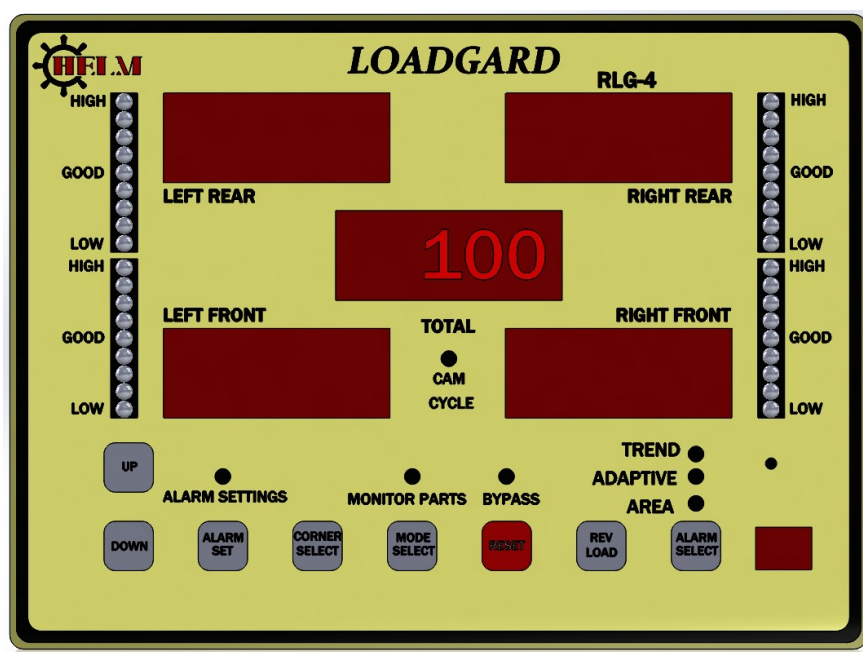
SETTING METER SCALE

The METER SCALE value represents the per channel 100% capacity on which the calibrated tonnage values are based for the display meters. For the RLG-2 Loadgard with 2 channels, this is done by dividing the total rated press capacity by 2 to arrive at the per channel capacity. For the RLG-4 Loadgard with 4 channels, this is done by dividing the total rated press capacity by 4 to arrive at the per channel capacity. A valid setting is between 0 and 9999.

To set the METER SCALE, use the following procedure:

1. Press the CORNER SELECT button. The METER SCALE value appears on the TOTAL meter.
2. Adjust the meter value between 0 and 9999, using the UP/ DOWN buttons.

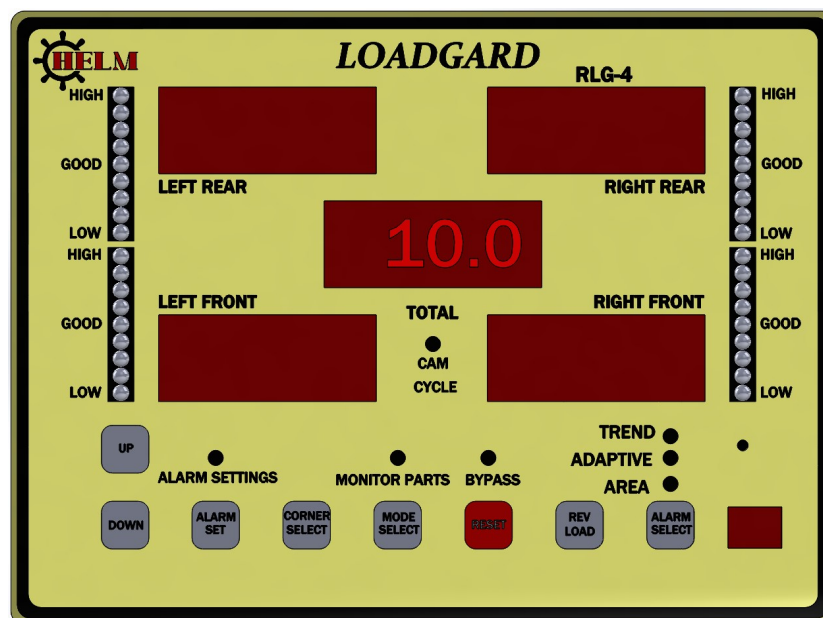
RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS



SETTING DECIMAL POINT

The DECIMAL POINT function allows for the optional presence of a decimal point between the 3rd and 4th digits of the individual channel display meters. It has the effect of dividing the normal tonnage values by a factor of 10. To activate the DECIMAL POINT, use the following procedure:

1. With the METER SCALE value shown on the TOTAL meter, press the RESET button to add or remove the DECIMAL POINT. This feature divides the normal tonnage by a factor of 10.



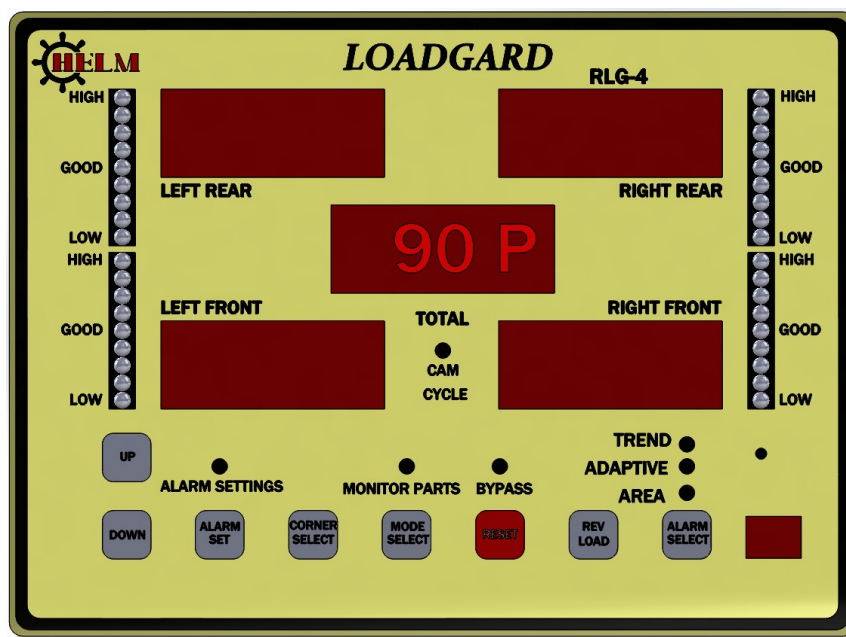
RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

SETTING PERCENT OF LOAD CANCEL

The PERCENT OF LOAD CANCEL value represents the load on any channel below which the corresponding display meter will show 0 in lieu of the actual load. The value is based upon a percent of the METER SCALE value, and can range from 10% to 90% in 10% increments (i.e., 10 P, 20 P, 30 P...90 P). An entered value of --P represents 0% and disables the feature.

To set the PERCENT OF LOAD CANCEL value, use the following procedure:

1. Press the CORNER SELECT button. The PERCENT OF LOAD CANCEL value appears on the TOTAL meter.
2. Adjust the meter value between -P (0%) and 90 P (90%).



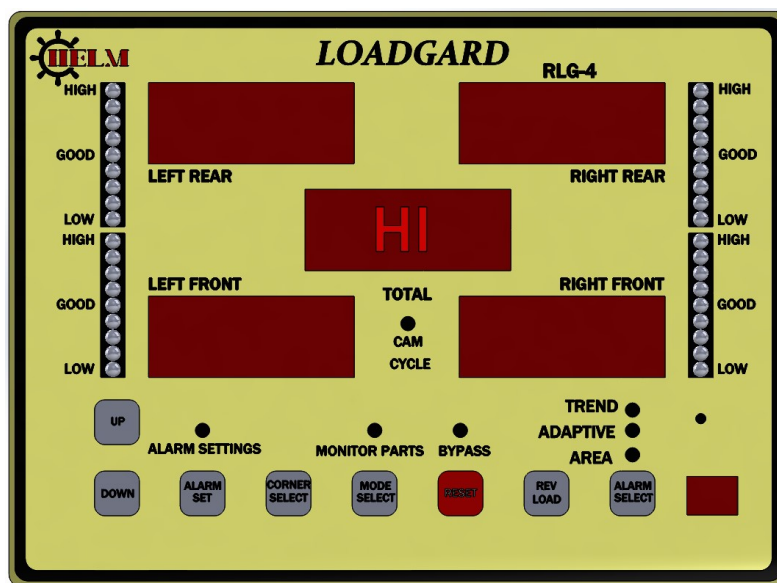
SETTING ADAPTIVE AREA UNDER CURVE SAMPLE RATE

The ADAPTIVE AREA UNDER CURVE SAMPLE RATE represents the number of sample load points taken for each Load Signature during the ADAPTIVE AREA UNDER CURVE ALARMS monitoring mode. An entered value of LO is for slow speed and has an associated sample rate of 1 millisecond per point. An entered value of HI is for high speed and has an associated sample rate of 100 microseconds per point.

To set the ADAPTIVE AREA UNDER CURVE SAMPLE RATE value, use the following procedure:

1. Press the CORNER SELECT button. The ADAPTIVE AREA UNDER CURVE SAMPLE RATE value appears on the TOTAL meter.
2. Adjust the meter value to LO or HI, using the UP/DOWN buttons on the front panel.
Note: An indicated value of 1111 means that no LO or HI value has been entered yet.

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS



SETTING PEAK LOOK WINDOW SPM

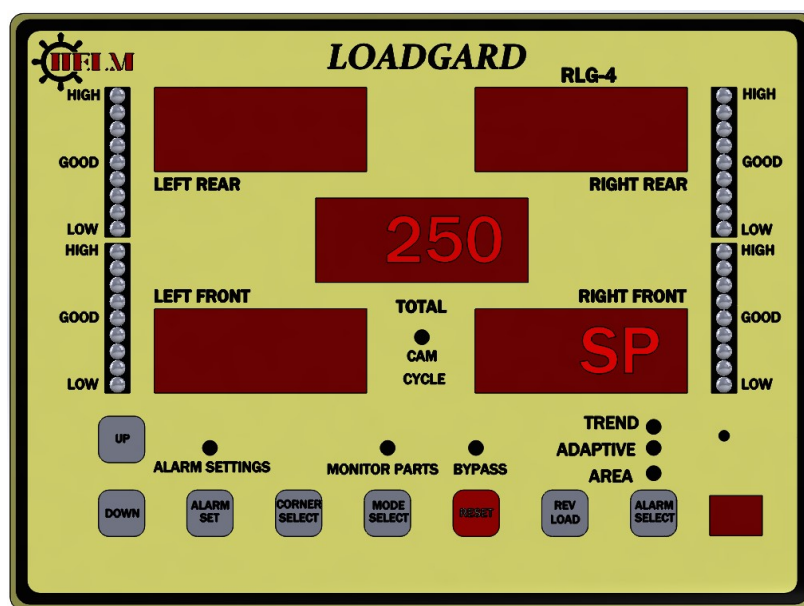
The PEAK LOOK WINDOW SPM value represents the actual approximate machine running speed in strokes per minute for continuous operations. This entered value between 2 and 999 works in conjunction with a force signal threshold feature. This allows the monitor to internally generate a Peak Look Window timing signal based on machine speed without an external timing device like a cam switch, proximity switch, or PLC signal. Since the unit can tolerate a certain speed range around the entered SPM value, a reasonable approximation within $\pm 10\%$ of actual machine speed is sufficient. This SPM-based internally generated timing window feature can be used for most applications, except where the actual load is less than 10% of the METER SCALE value, or as noted below.

It should be noted that entered values of 0 and 1 can also be used for PEAK LOOK WINDOW SPM. A value of 0 represents external cam operation for the timing window in lieu of the normal No External Cam feature. This should be used for those applications where the No External Cam internal timing window mode will not run successfully without nuisance alarms. In addition to the entered value of 0, this mode also requires the external timing signal from a cam switch, proximity switch, or PLC. A value of 1 represents single stroke or hand fed operations. This incorporates a fixed internal Peak Look Window time of 1 second per cycle, and should only be used for 30 SPM (2 seconds per cycle) or slower operations. Single stroke operations that exceed 30 SPM should use the external cam timing window with the value of 0 entered.

To set the PEAK LOOK WINDOW SPM, use the following procedure:

1. Press the CORNER SELECT button. The PEAK LOOK WINDOW SPM value appears on the TOTAL meter.
2. Adjust the meter value between 0 and 999, using the UP/DOWN buttons on the front panel.

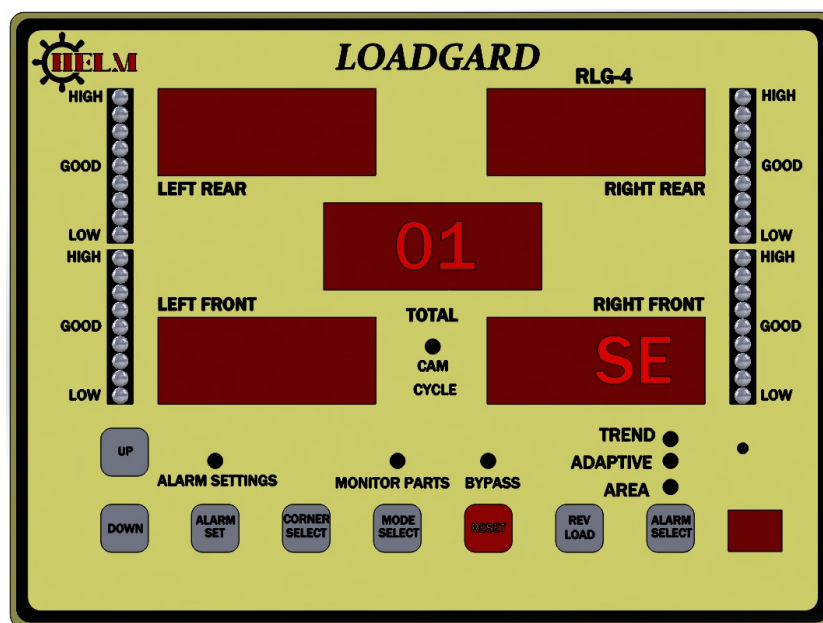
RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS



SETTING SEQUENCE NUMBER

The sequence number is a value from 1-99 and is used to identify the particular monitor for the optional Ethernet communications feature. To set the sequence number, use the following procedure.

1. Press the CORNER SELECT button. The Sequence Number value appears on the TOTAL meter.
2. Adjust the meter value as desired between 1 and 99 using the UP/DOWN buttons.

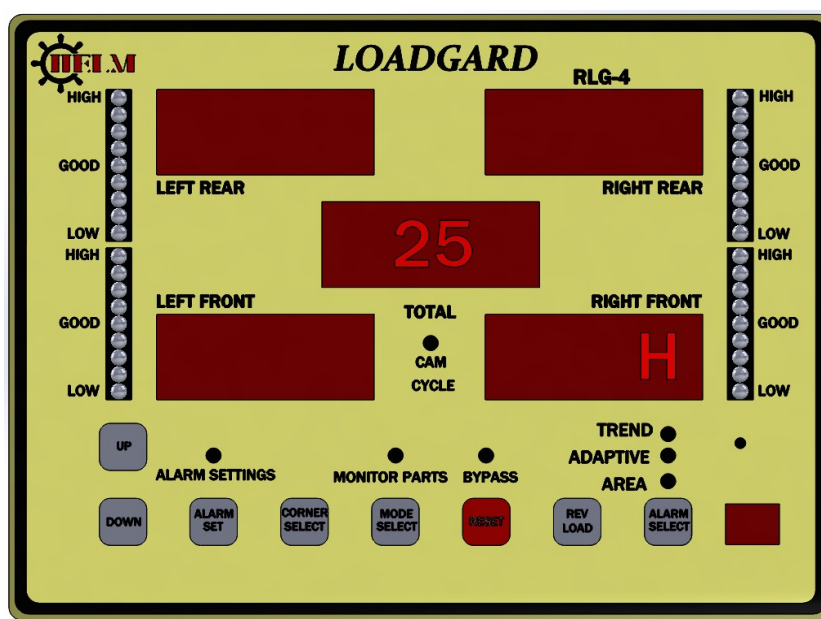


RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

SETTING AUTO-LEARN BYPASS DELAY

Under normal operation, the RLG unit AUTO-LEARN feature automatically switches a unit that is in BYPASS mode to MONITOR mode on machine start-up or re-start. This activates the TREND SAMPLE routine and the resulting high/low TREND ALARMS, providing better monitoring of the process. The AUTO-LEARN BYPASS DELAY value is a number from 0-9999 that establishes the number of machine cycles on start-up during which the unit will remain in BYPASS mode. After the selected number of cycles is completed, the unit will then switch from BYPASS to MONITOR mode. To set AUTO-LEARN BYPASS DELAY, use the following procedure:

1. Press the CORNER SELECT button. The AUTO-LEARN BYPASS DELAY value appears on the TOTAL meter.
2. Use the UP/SDOWN buttons to adjust the value as desired.
3. An entered value of 0 disables the feature, which means that there will be no BYPASS delay on start-up.

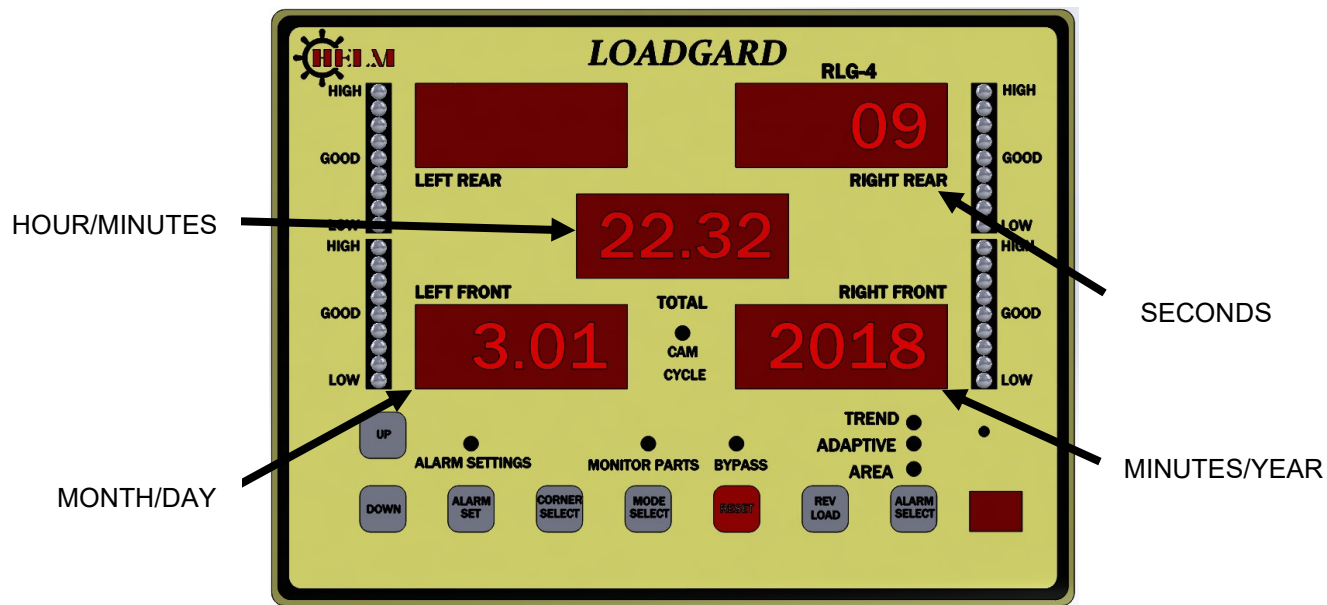


RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

VIEWING CLOCK READ

The CLOCK READ feature allows the user to view the internal current clock values as set during the CLOCK SET ENABLE function. No clock values can be changed during the CLOCK READ. To view the CLOCK READ values use the following procedure:

1. Press the CORNER SELECT button.
2. The CLOCK READ values appear on the meters as shown below.
3. For the RLG-4 unit, the decimal point between Month and Day (3.01) flashes with updated seconds.
4. For the RLG-2 unit, seconds are not displayed.



RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

INSTRUMENT CALIBRATION

The Calibration procedure is used to adjust the monitor for proper tonnage readout values. If this system has been calibrated by a HELM Field Service Technician or by the machine manufacturer, the calibration numbers will be noted on a tag inside the instrument. Once calibrated, it is not necessary to re-calibrate unless the machine is moved, dismantled or otherwise structurally changed. If you have any questions or need a HELM Field Service Technician for calibration, please contact our Field Service Department at 419-893-4356. If this system has not yet been calibrated, refer to the CALIBRATION ADJUSTMENT PROCEDURES outlined below.

PRELIMINARY CALIBRATION ADJUSTMENT PROCEDURES

1. Open enclosure door.
2. Turn power ON.
3. Press MODE SELECT button and, select BYPASS mode.
4. Locate slide switches on inside door.
5. In normal monitoring operations, the CALIBRATE (S1) and SETTINGS (S2) switches (located in the inside of the front panel door) are set to the left-hand position, as shown in the illustration.
6. For calibration adjustments, move the CALIBRATE switch S1 on the inside door to the right-hand CALIBRATE position.



INDIVIDUAL CHANNEL CALIBRATION ADJUSTMENTS

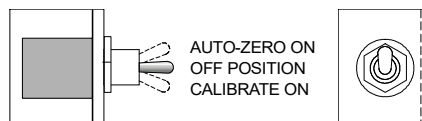
MANUAL ZERO BALANCE ADJUST

For the MANUAL ZERO BALANCE ADJUST procedure, refer to both illustrations on the next page that show the inside circuit board and the AUTO ZERO/CAL switch for each channel. Please note that the large illustration for the inside circuit board is for the RLG-4 unit with 4 channels, and therefore shows 4 sets of switches and adjustment pots (one set per channel). The channel designations in sequence include Channel 1 (Left Front), Channel 2 (Left Rear), Channel 3 (Right Front), and Channel 4 (Right Rear).

The inside circuit board for the RLG-2 unit with 2 channels is similar, except that only 2 sets of switches and adjustment pots are included. The channel designations in sequence include Channel 1 (Left) and Channel 2 (Right).

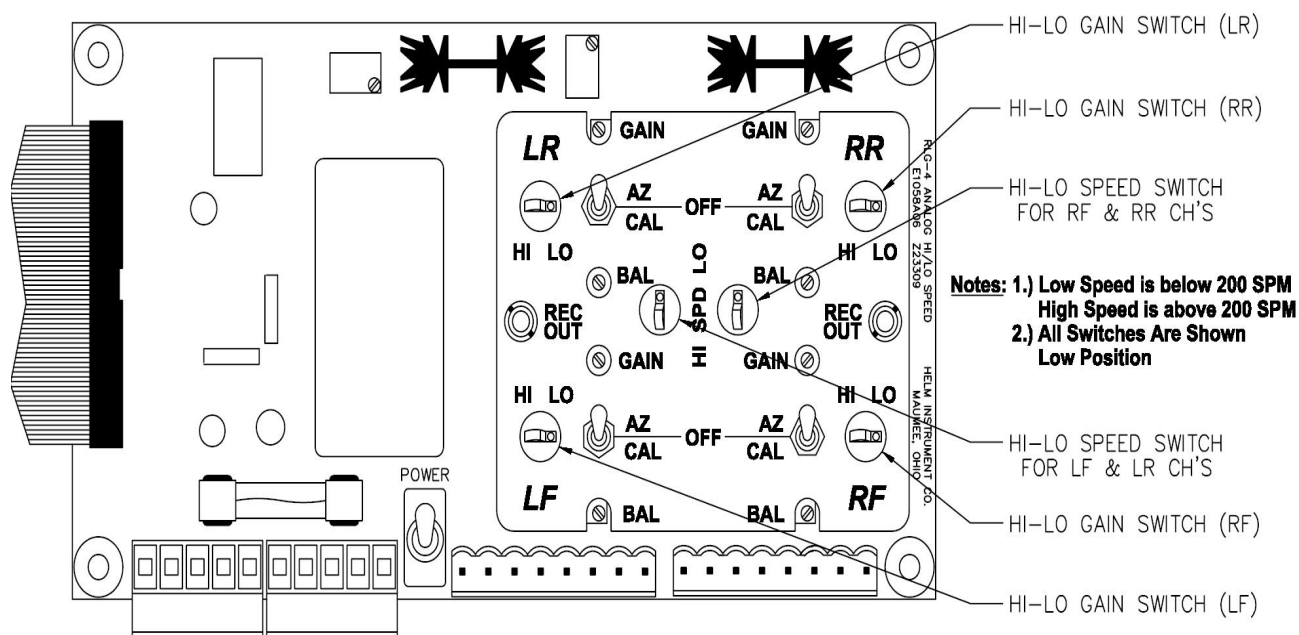
RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

1. Push the AUTO ZERO/CAL switch on the inside main circuit board to the center Off position.



2. Adjust the ZERO BALANCE

The ZERO BALANCE controls are the small multi-turn potentiometers designated BAL on the inside main circuit board. For Channel 1 (Left for the RLG-2, Left Front for the RLG-4), observe the front panel digital meter, and turn the ZERO BALANCE potentiometer until the meter displays all zeroes. Repeat this procedure for all channels.



GAIN ADJUST

The GAIN ADJUST controls are the small multi-turn potentiometers designated GAIN on the inside main circuit board. These controls are used to adjust the force sensor signal amplification or GAIN for each channel. The GAIN is represented by a digital value called a CALIBRATION NUMBER or CAL NUMBER. Setting the GAIN ADJUST controls establish the proper CAL NUMBERS, and allow the RLG unit to display correct calibrated force values (tonnage) on the front panel meters.

For proper GAIN ADJUST, the following procedure should be used for each channel:

1. Perform MANUAL ZERO BALANCE ADJUST as outlined above.
2. Push the AUTO ZERO/CAL switch to the bottom CALIBRATE ON position. This puts the CALIBRATION SHUNT RESISTOR (simulated load) across the sensor input for that channel.
3. Observe the front panel digital meter, and turn the GAIN potentiometer until the meter displays the correct value. If the press has been previously calibrated, enter the CAL

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

NUMBER recorded on the calibration tag inside the unit. If the press has not yet been calibrated, enter an initial CAL NUMBER of 50. Use calibration load cells and a portable monitor to load the press to rated capacity. Adjust the CAL NUMBER as needed, so that the RLG unit meters display the correct load cell tonnage with the unit in normal monitoring mode.

4. Each channel has a HIGH/LOW CALIBRATION SHUNT RESISTOR dip switch, designated as HI LO on the inside main circuit board. That switch controls the value of the CALIBRATION SHUNT RESISTOR (simulated load) used during calibration. The LO switch setting (low GAIN) represents a resistor value of 140K ohms, and should be the initial setting tried. If the proper CAL NUMBER cannot be entered with the LO 140K setting, the HI setting should be used. The HI switch setting (high GAIN) represents a resistor value of 1000K ohms, and allows for GAIN values that are 7.14 times greater than for the LO 140K setting with the same CAL NUMBER. In this way, a particular CAL NUMBER is always associated with the proper CALIBRATION SHUNT RESISTOR value (140K or 1000K ohms).
5. Push the AUTO ZERO/CAL switch to the top AUTO ZERO ON position. This removes the CALIBRATION SHUNT RESISTOR (simulated load) from the sensor input. It also turns the AUTO ZERO function on for normal monitoring operation. AUTO ZERO provides for a stable monitoring baseline during temperature changes and resulting thermal expansion/contraction in the press and the force sensors.
6. Return the CALIBRATE switch S1 on the inside door to the left-hand normal monitoring position.

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

NORMAL MONITORING OPERATION

For normal monitoring operation, and to utilize the full benefits of press overload protection (CAPACITY ALARMS) and die protection/part quality control (TREND ALARMS), the RLG unit should be put in the MONITOR PARTS mode. This is one of three possible modes that can be selected by pressing the MODE SELECT button.

As stated previously, the discreet high-CAPACITY ALARMS for press overload protection are active at all times, including in the MONITOR PARTS mode. A CAPACITY ALARM condition fires the associated relay instantaneously. TREND ALARMS, based on a learned Good Part TREND SAMPLE of force values, are active only in MONITOR PARTS mode. The TREND ALARMS are adjustable high/low % deviation values from the stored Good Part force values. A TREND ALARM condition fires the associated relay at the end of the Timing Window for the particular machine cycle. Because they are based on a learned Good Part condition, TREND ALARMS primarily provide die protection and part quality control. For the best results, TREND ALARMS should be set wide enough to allow for normal process variation, and close enough to detect the desired faults. This is often a Trial-and-Error process. The TREND SAMPLE and TREND ALARMS are described in greater detail below.

TREND SAMPLE

When the RLG Loadgard is put in MONITOR PARTS mode by pressing the MODE SELECT button, the unit takes a TREND SAMPLE of Good Part force values for all channels. Those learned benchmark values are stored in memory, and then compared to the force values for all subsequent parts. Three different types or modes of TREND ALARMS are associated with the Good Part TREND SAMPLE values. Those include PEAK TREND ALARMS, ADAPTIVE PEAK TREND ALARMS, and ADAPTIVE AREA UNDER CURVE ALARMS. When the TREND SAMPLE is taken at the start of MONITOR PARTS mode, the benchmark Good Part force values are captured for all three types of TREND ALARMS. As noted below, the unit establishes different TREND SAMPLE values for each of the three types of TREND ALARMS. Only one type of TREND ALARM is active at one time in MONITOR PARTS mode, as selected by the operator with the ALARM SELECT button.

TREND SAMPLE DELAY

The TREND SAMPLE DELAY is a feature whereby the TREND SAMPLE routine is delayed for a certain number of machine strokes at the start of MONITOR PARTS operation. This delay is to allow the process to stabilize during machine start-up, so that a valid Good Part TREND SAMPLE is taken of the forming force values. The TREND SAMPLE DELAY value is established when the LOW ALARM INHIBIT value is entered during unit set-up. Both values are the same.

TREND ALARMS

TREND ALARMS are based on the learned Good Part TREND SAMPLE values, and are active only in MONITOR PARTS mode. For the 24 VDC unit, any TREND ALARM (high or low), will fire the dedicated TREND ALARM RELAY (TREND STOP) to stop the press. For the 110/220VAC unit, any TREND ALARM will fire the single ALARM relay (MACHINE STOP). In order to re-start the press, the RESET button must be pressed to clear the alarm.

ALARM SELECT BUTTON

The ALARM SELECT BUTTON is used to select one of three types of TREND ALARMS. The type selected (PEAK TREND ALARMS, ADAPTIVE PEAK TREND ALARMS, or ADAPTIVE AREA UNDER CURVE ALARMS) is the only one active at that time. If desired, the type of TREND ALARMS can be changed On the Fly during normal monitoring by pressing the ALARM

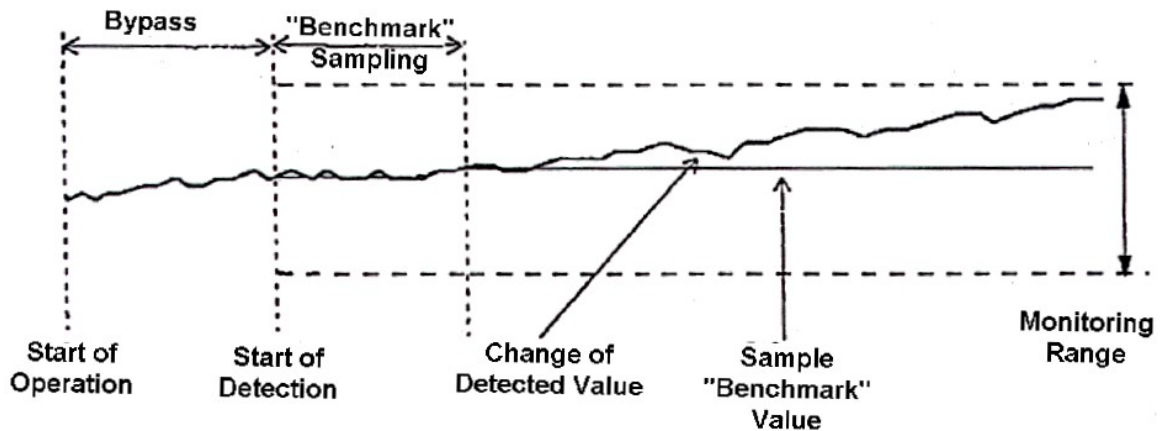
RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

SELECT button. This is because the Good Part TREND SAMPLE values are captured and stored in memory for all three types of alarms when the unit is put in MONITOR PARTS mode. The sample values remain in memory until they are cleared by putting the unit into BYPASS mode or by turning power off. If the sample values are cleared, new TREND SAMPLE values will be captured when the unit is put into MONITOR PARTS mode again.

PEAK TREND ALARMS MODE

The PEAK TREND ALARMS represent the simplest and most basic type of TREND ALARMS. For this mode, the ALARM SELECT button should be pressed so that the TREND LED is illuminated. The TREND SAMPLE method and TREND ALARMS operation are shown in the illustration below. At the start of MONITOR PARTS, the Good Part TREND SAMPLE values are taken during the number of SAMPLE COUNT machine strokes (0-99). The Peak tonnage values for those strokes are averaged, and those average values are stored in memory as the TREND SAMPLE values. At that point, the PEAK TREND ALARMS become active, and the fixed sample values are compared to the high/low alarm limits.

It is important to note that PEAK TREND ALARMS are based on Peak tonnage values. Also, the TREND SAMPLE values are fixed absolute values, and do not change unless a new sample is taken. PEAK TREND ALARMS can be used to detect instantaneous faults such as broken punches and scrap-in-die, and can also be used to detect small changes over time such as material thickness and hardness. In general, because the TREND SAMPLE values are fixed, the alarm limits for PEAK TREND ALARMS must be set wider to prevent nuisance alarms.

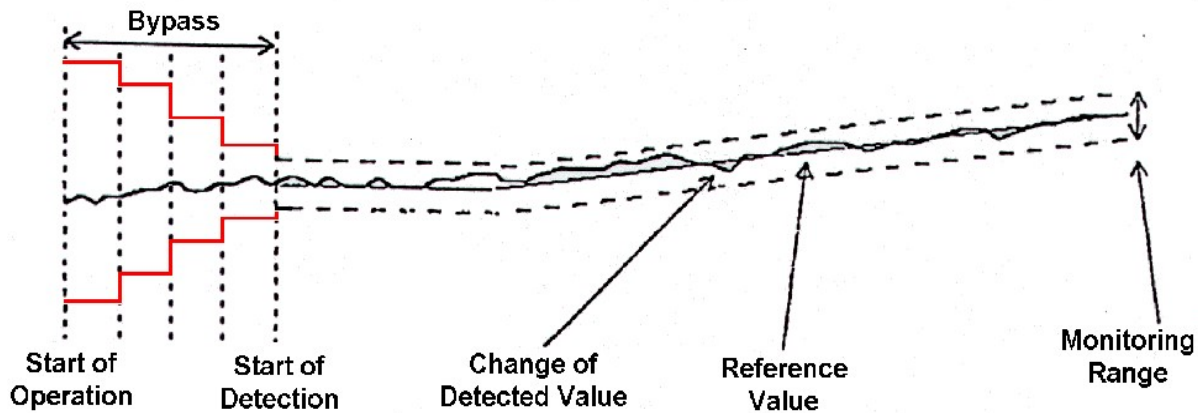


ADAPTIVE PEAK TREND ALARMS MODE

The ADAPTIVE PEAK TREND ALARMS are selected by pressing the ALARM SELECT button so that the ADAPTIVE LED is illuminated. They are the same as the simple PEAK TREND ALARMS, except that the TREND SAMPLE values are not fixed or absolute. Rather, the TREND SAMPLE values are continuously updated using a rolling average of Peak tonnage values. In this way, the TREND SAMPLE adapts to the process, canceling the effects of slow changes over time, such as material thickness and hardness changes. As result, the alarm limits can be set closer without nuisance alarms. Although slow changes over time would not be detected, ADAPTIVE PEAK TREND ALARMS with alarm limits set closer do allow for greater sensitivity to subtle faults (smaller broken punches, smaller scrap-in-die, etc.). This is shown in the illustration below.

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

The number of machine strokes included in the rolling average is equal to the SAMPLE COUNT value (0-99). Unlike PEAK TREND ALARMS, where the TREND SAMPLE must be complete for all hits before the alarms are active, ADAPTIVE PEAK TREND ALARMS become active after the first machine stroke. Thus, the alarms become active much more quickly after the TREND SAMPLE is initiated in MONITOR PARTS.



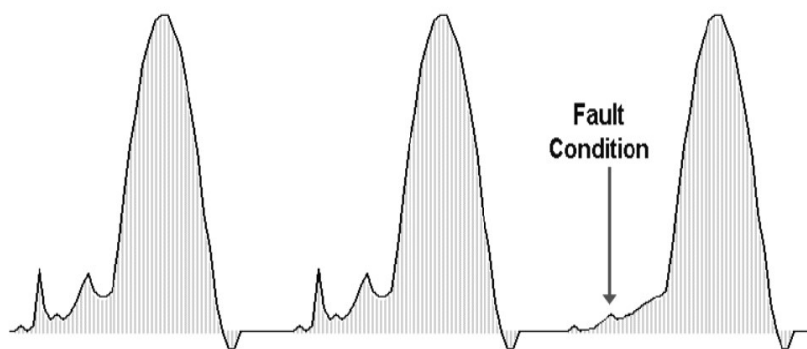
ADAPTIVE AREA UNDER CURVE ALARMS MODE

The ADAPTIVE AREA UNDER CURVE ALARMS are selected by pressing the ALARM SELECT button so that the AREA LED is illuminated. They are very similar to the ADAPTIVE PEAK TREND ALARMS, except that the TREND SAMPLE is based on load signature Area values, rather than Peak tonnage values. The load signature Area, or integration of the force curve, represents the forming work done for a particular machine stroke. The Area calculation itself is done by digitizing the load signature, summing all of the point force values above zero, and dividing by the total number of points.

By using the load signature Area values to establish the Good Part TREND SAMPLE, ADAPTIVE AREA UNDER CURVE ALARMS can provide greater sensitivity to certain fault conditions than a Peak force monitoring method. This would apply to processes involving an extended load time (draw operations, assembly, orbital riveting, etc.), where the fault does not always produce a change in Peak force, but does change the load signature. This is shown in the illustration below.

Like ADAPTIVE PEAK TREND ALARMS, ADAPTIVE AREA UNDER CURVE ALARMS use a continuously updated rolling average of values for the TREND SAMPLE. The number of machine strokes included in the rolling average is equal to the SAMPLE COUNT value (0-99). Also, ADAPTIVE AREA UNDER CURVE ALARMS become active after the first machine stroke.

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS



Sample Time = 100 μ sec.

For ADAPTIVE AREA UNDER CURVE ALARMS, the ground noise threshold for the Load Signature area calculations is established at 5% of the METER SCALE value. This means that any low signal value below 5% of the METER SCALE is ignored by the unit. This feature prevents nuisance erroneous load readings that could otherwise be caused by electromagnetic ground noise in the unit.

SETTING TREND ALARMS

As described above, TREND ALARMS can be any one of three different types (PEAK TREND ALARMS, ADAPTIVE PEAK TREND ALARMS, or ADAPTIVE AREA UNDER CURVE ALARMS). Although only one type of TREND ALARM is active at one time, the alarm limits are set for all three types at once. The alarm settings for TREND ALARMS are digital values from 0-99. They can be independently adjusted high and low for each channel. The TREND ALARM setting is a percentage value, which represents the percent deviation of the force from the learned Good Part TREND SAMPLE value. To set TREND ALARMS, use the following procedure.

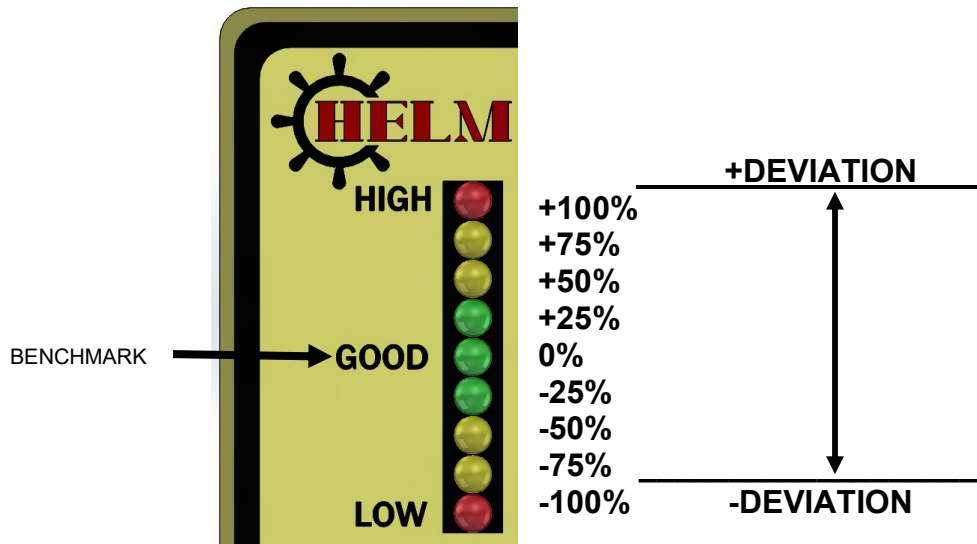
1. Press the ALARM SET button.
2. Press the CORNER SELECT button to select the proper channel and alarm setting. For the RLG-2 with 2 channels, the sequence is Channel 1 (Left) – Lo/Hi and Channel 2 (Right) – Lo/Hi. For the RLG-4 with 4 channels, the sequence is Channel 1 (Left Front) – Lo/Hi, Channel 2 (Left Rear) – Lo/Hi, Channel 3 (Right Front) – Lo/Hi, and Channel 4 (Right Rear) – Lo/Hi. Please note that during this process, the CORNER SELECT button is used to toggle through the alarm settings for all channels. Also, the particular channel meter shows the alarm setting (0-99), while the TOTAL meter shows whether the alarm is low or high.
3. Press the UP or DOWN button until the desired low and high TREND ALARM percentage (0-99) is displayed. An entered value of 0 for any particular alarm turns off that alarm. Note: *when adjusting alarm values up or down on the instrument display, use the RESET BUTTON simultaneously with the UP or DOWN button to acquire the coarse value range. Then, use the UP or DOWN button to fine adjust the value.*
4. Repeat this procedure for all channels.

TREND DISPLAYS

The RLG Loadgard front panel includes a TREND DISPLAY next to the digital meter for each channel. The digital meter shows the continuously updated peak tonnage value. The TREND DISPLAY is a vertical array or column of colored LED's, which depict the load deviation from the TREND SAMPLE in a graphical format. In this way, the TREND DISPLAY shows the consistency or variation of the load values, which relate to the quality of the parts being produced.

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

Each vertical TREND DISPLAY column of LED's represents one channel of monitoring. At the start of MONITOR PARTS operating mode, the unit takes a sample of Good Part force values for all channels and puts those learned sample values into memory as the benchmark TREND SAMPLE. At that time, the high and low TREND ALARMS, as adjusted by the operator, become active. Initially, only the center green GOOD LED on the TREND DISPLAY is illuminated. This represents the Good Part TREND SAMPLE value. As each subsequent part is formed, the load deviation from the TREND SAMPLE value is shown on the TREND DISPLAY.



When only the center green GOOD LED is on, the last part was formed at the same load as the Good Part TREND SAMPLE (no deviation in load). If load deviation from the TREND SAMPLE does occur, the TREND DISPLAY LED's will illuminate in a corresponding up or down (high or low) pattern. The green LED's above and below the center, plus the adjacent yellow LED's, represent caution. They indicate that the last part was formed at a force level higher or lower than the Good Part TREND SAMPLE, but that that force was still within the TREND ALARM settings. Such an indication means that something is changing in the forming process.

The top red HIGH LED of each TREND DISPLAY represents the high TREND ALARM setting. If this LED is on along with the other green and yellow LEDs in the high direction, it shows that the last part was formed at a force higher than the high TREND ALARM setting. At that point, the TREND ALARM would fire the appropriate relay to stop the press. If the top red HIGH LED is on by itself, it shows that a high-CAPACITY ALARM has occurred. At that point, the CAPACITY ALARM would fire the appropriate relay to stop the press.

The bottom red LOW LED of each TREND DISPLAY represents the low TREND ALARM setting. If this LED is on, along with the other green and yellow LEDs in the low direction, it shows that the last part was formed at a force lower than the low TREND ALARM SETTING. At that point, the TREND ALARM would fire the appropriate relay to stop the press.

REVERSE LOAD DISPLAY AND REVERSE LOAD ALARM

Reverse Load or snap-thru load can be displayed on the front panel meters by pressing the REV LOAD button. This display function is operational only when the unit is in MONITOR mode or in BYPASS mode. Reverse load, as opposed to positive, normal load typically occurs in metal stamping operations where considerable blanking or hole piercing is involved. Snap-Thru occurs after the initial blank or pierce, resulting in negative or reverse load after the initial positive load. Such reverse load, in excess, can be very damaging to the machine and tooling

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

The REVERSE LOAD ALARM, by placing a limit on the allowable reverse load, can help prevent machine and tooling damage that might otherwise occur. The REVERSE LOAD ALARM value is fixed at 20% of the METER SCALE setting and is active in both BYPASS and MONITOR modes. If a REVERSE LOAD ALARM happened, it will appear as a low alarm with all of the lower Trend display lights illuminated. To distinguish this from a normal low Trend alarm which has the same type of Trend display indication, press the REV LOAD button. If the reverse load value shown exceeds the REVERSE LOAD ALARM setting, the alarm is a reverse load alarm and not a normal Trend alarm.

HARD HIT INITIALIZATION AND STORAGE

The stored values are continuously updated, such that when 100 hard hits have been accumulated additional ones are added and the initial old ones deleted. The stored hard hit values can be viewed in sequence on the RLG unit front panel. As stated previously, those values can also be extracted from the unit and view elsewhere by using the optional Ethernet Communications.

To view the stored hard hit high-Capacity alarm values, use the method as shown below.

1. Open enclosure door and locate slide switches on inside door.
2. Move the CALIBRATE switch (S1) and the SETTINGS switch (S2) to the right-hand ON position.

Note that this can be done with the RLG unit in BYPASS or MONITOR mode and with the machine running or stopped. When both switches are moved to the right, this will automatically place the unit in BYPASS mode.

3. The hard hit values are now displayed in sequence on the front panel, starting with the first record as shown. The RLG-4 and RLG-2 display format is the same. Only the RLG-4 is shown for simplicity.
4. Press the UP button to display the date and time stamp for the particular hard hit.

Note: For the RLG-2 unit, century and year are not displayed.

5. Additional hard with date and time stamp can be displayed by pressing the UP button. If desired, the user can go backwards through the information by using the DOWN button.
6. If desired, the stored hard hit data can be cleared from memory by entering 000 on the TOTAL meter. This is done by using the UP/DOWN buttons. This procedure should be done during the initial set-up of the unit to initialize the HARD HIT STORAGE, and to delete any possible erroneous values in memory.

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

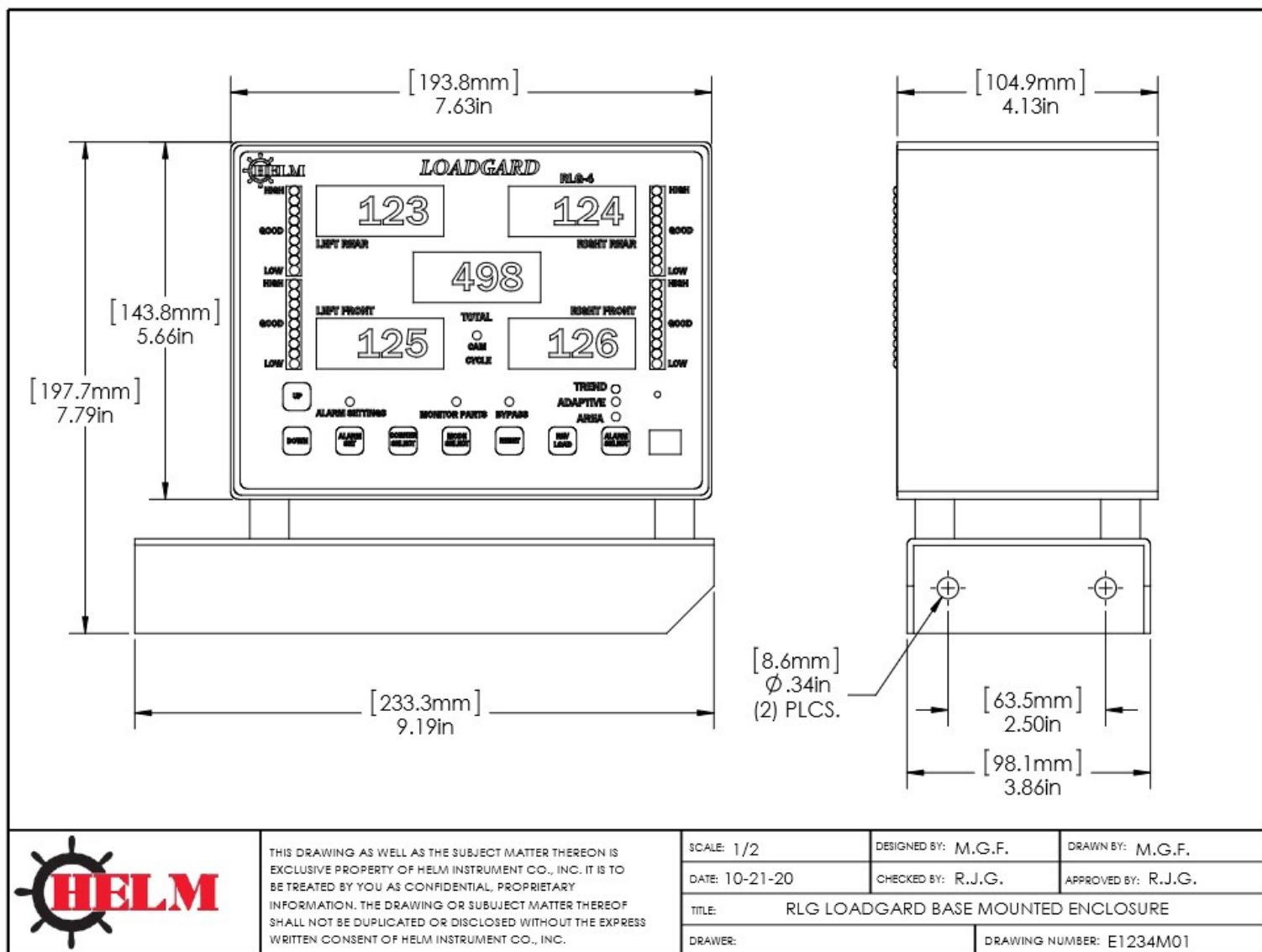
APPENDIX A: STANDARD 24 VDC RLG-4 LOADGARD

STANDARD 24 VDC RLG-4DC LOADGARD SPECIFICATIONS

Electrical Specifications:	Current Consumption	500 mA at 24vdc
	Number of Channels	4 (isolated)
	A/D Conversion Method	Successive Approximation - 12 bit
	Normal Mode Rejection (between + input and - input)	50 db at 2000 gain
	Amp Roll-off Frequency	650hz at 3000 gain
	Calibration	Manual Calibration
	Isolation	500VDC continuous between inputs and chassis ground
Environmental Specifications:	Operating Temperature	0° C to 60° C (32°F to 140°F)
	Hazardous Environment Classification	Class 1 Division 2 Hazardous Environment
Input Specifications:	Type of Input	Strain Gauge (350 ohm, 700 ohm)
	Input Impedance	1K
	Low Range Gain Cal. Resistor (140k-ohm)	Maximum Gain 1176 Minimum Gain 54
	High Range Gain Cal. Resistor (1meg-ohm)	Maximum Gain 6959 Minimum Gain 347
	Display Resolution	Up to 0.1% of Full Scale
	Overall Unit Accuracy	Within 1% of Full Scale
	A/D Sample Rate	100 microseconds
Output Specifications:	ALARM RELAY	2 SOLID STATE RELAYS (.5A AT 24VDC)

RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

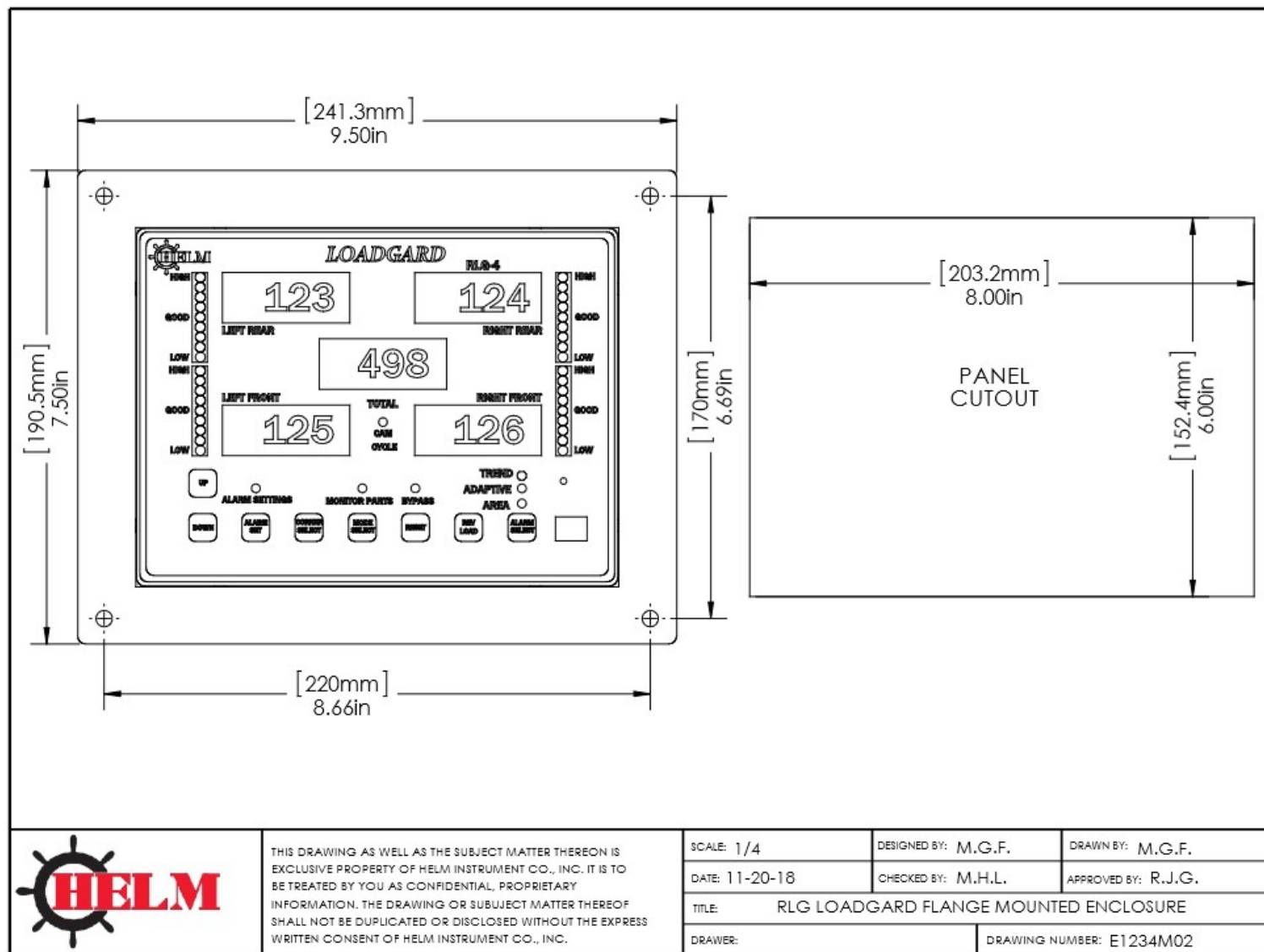
24 VDC RLG Loadgard is typically shipped as a base-mount instrument. A 24 Volt D.C. power supply is required.



RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

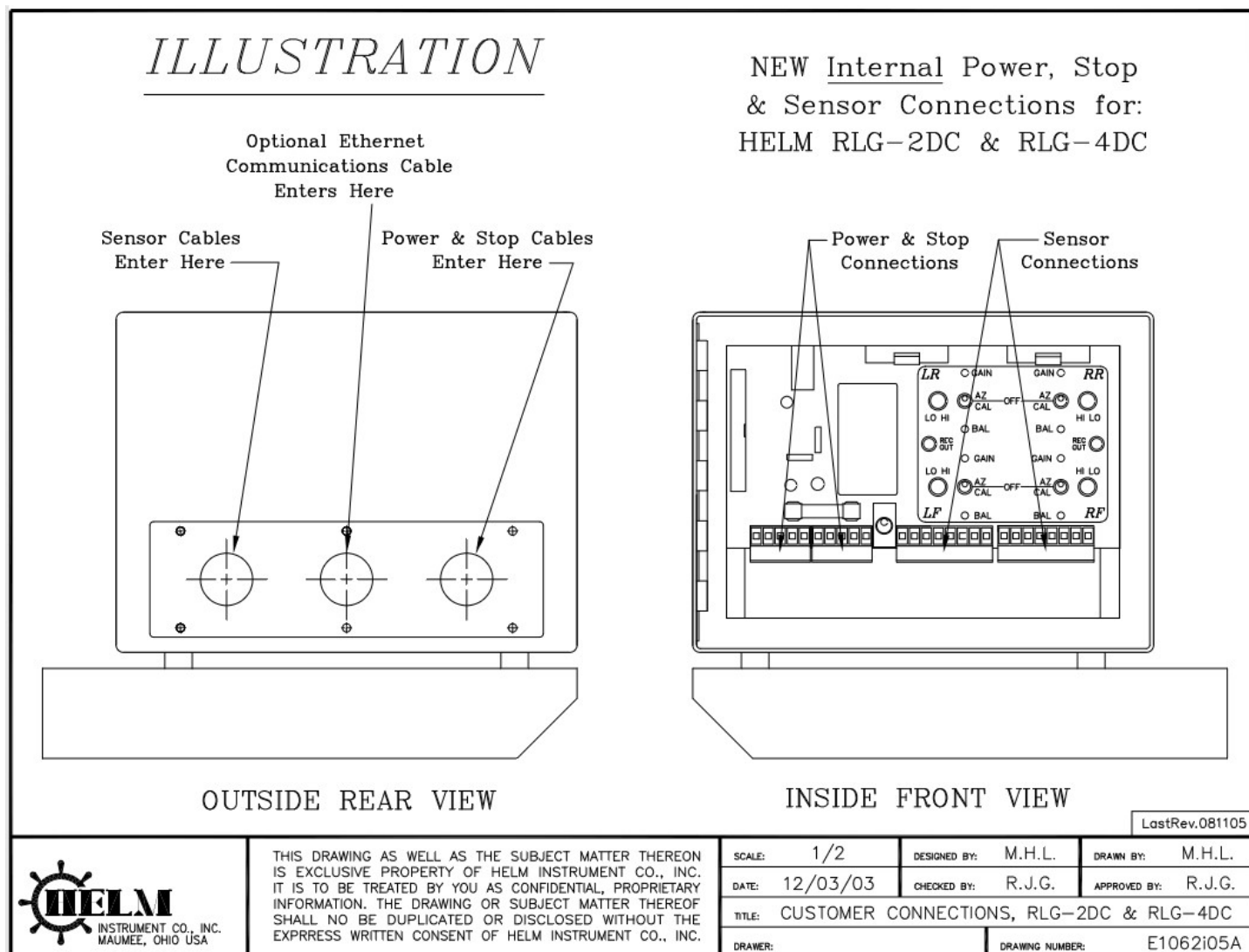
OPTIONAL 24 VDC RLG LOADGARD FLANGE-MOUNT ENCLOSURE MECHANICAL DRAWING

As an option, the 24 VDC RLG-4 Loadgard can be shipped as a flange-mount instrument. It has been designed to fit within a 150 mm x 200 mm opening and requires 150 mm depth for installation. A 24 Volt D.C. power source is required.



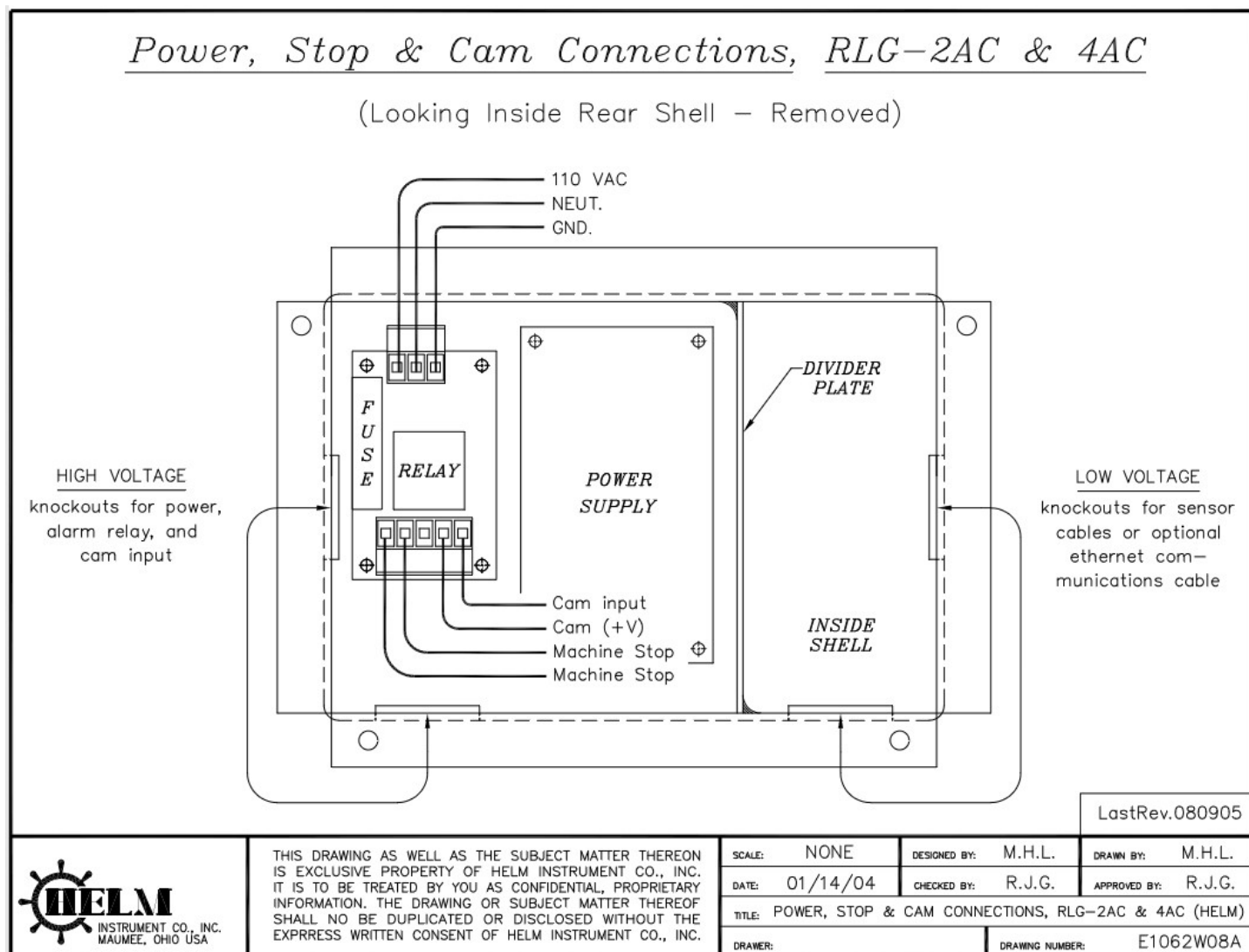
RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

DRAWING E1062I05: CUSTOMER CONNECTIONS, RLG-2DC & RLG-4DC



RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

DRAWING E1062W08A: POWER, STOP AND CAM CONNECTIONS, RLG-2AC AND 4AC



RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

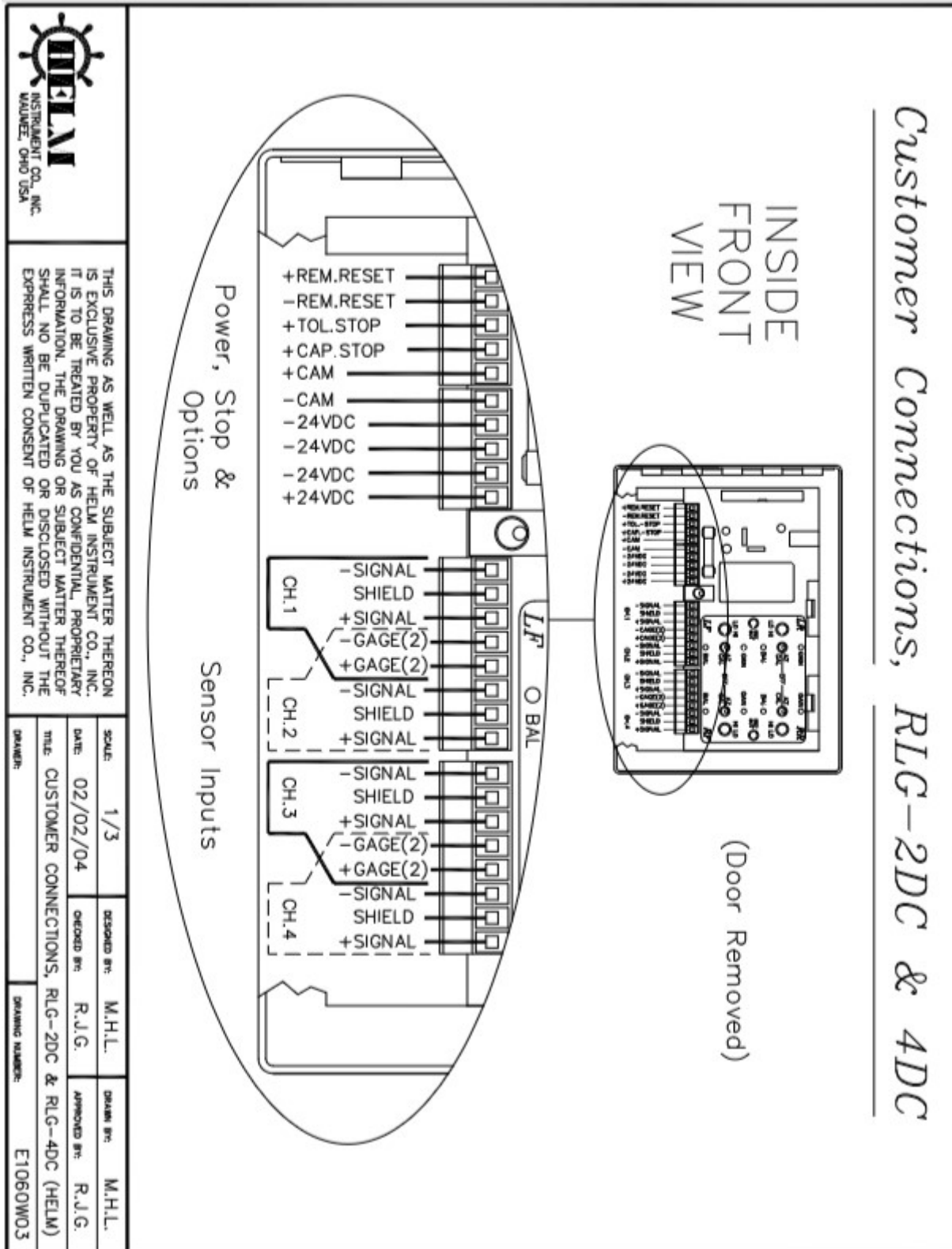
APPENDIX B: RLG-4 LOADGARD WITH 110/220 VAC OPTION

RLG-4AC LOADGARD WITH 110/220 VAC OPTION SPECIFICATIONS

Electrical Specifications:	Power Input Range	90-264 VAC
	Current Consumption	100mA at 120 VAC 115mA at 220 VAC
	Number of Channels	4 (isolated)
	A/D Conversion Method	Successive Approximation - 12 bit
	Normal Mode Rejection (between + input and - input)	50 db at 2000 gain
	Amp Roll-off Frequency	650hz at 3000 gain
	Calibration	Manual Calibration
Environmental Specifications :	Isolation	500VDC continuous between inputs and chassis ground
	Operating Temperature	0° C to 60° C (32° F to 140° F)
Input Specifications :	Hazardous Environment Classification	Class 1 Division 2 Hazardous Environment
	Type of Input	Strain Gauge (350 ohm, 700 ohm)
	Input Impedance	1K
	Low Range Gain Cal. Resistor (140k-ohm)	Maximum Gain 1176 Minimum Gain 54
	High Range Gain Cal. Resistor (1meg-ohm)	Maximum Gain 6959 Minimum Gain 347
	Display Resolution	Up to 0.1% of Full Scale
	Overall Unit Accuracy	Within 1% of Full Scale
	A/D Sample Rate	100 microseconds
Output Specifications:	ALARM RELAY	DRY CONTACT RELAYS (10A at 240 VAC)

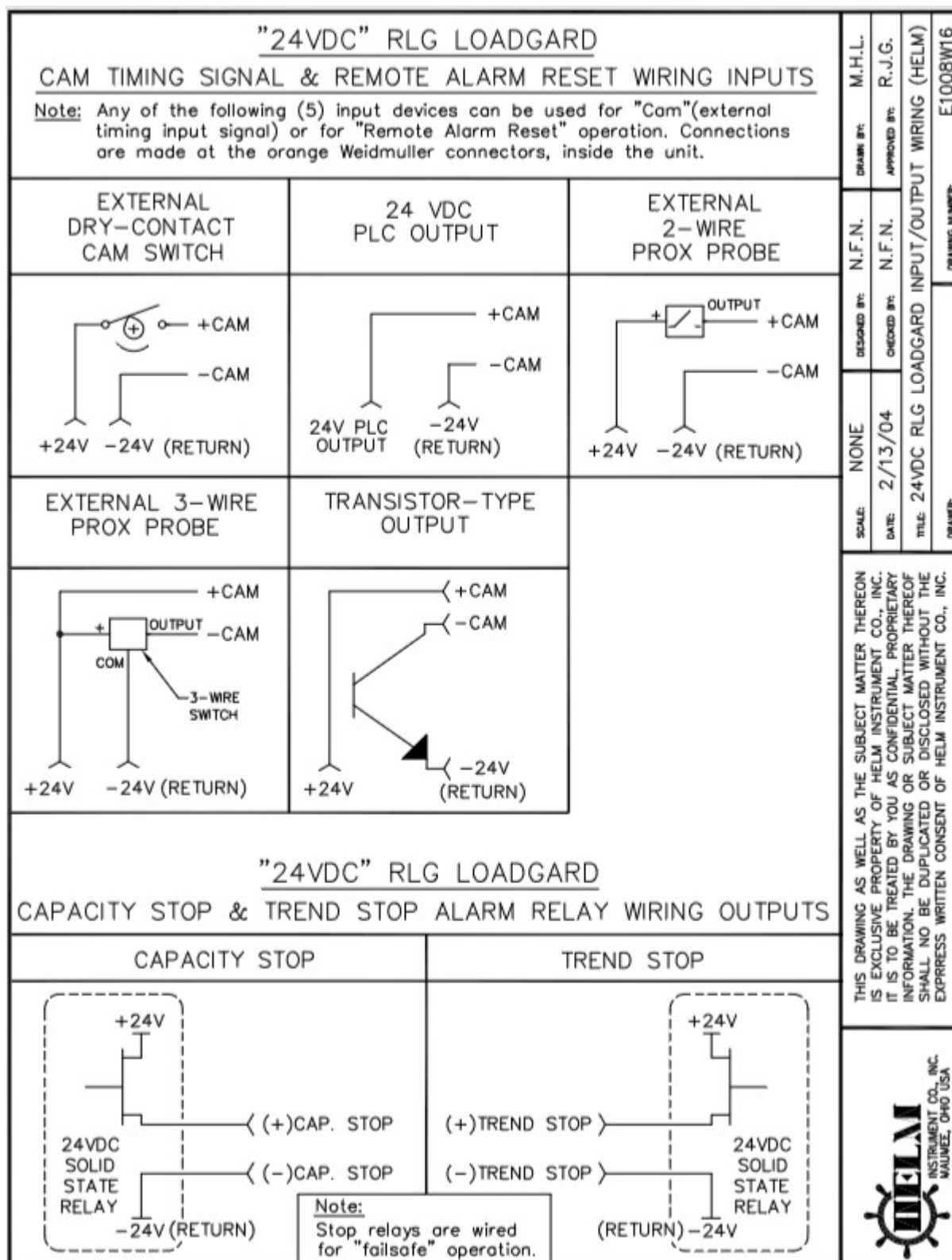
RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

WIRING DRAWING E1060W03: INTERNAL "CUSTOMER CONNECTIONS"



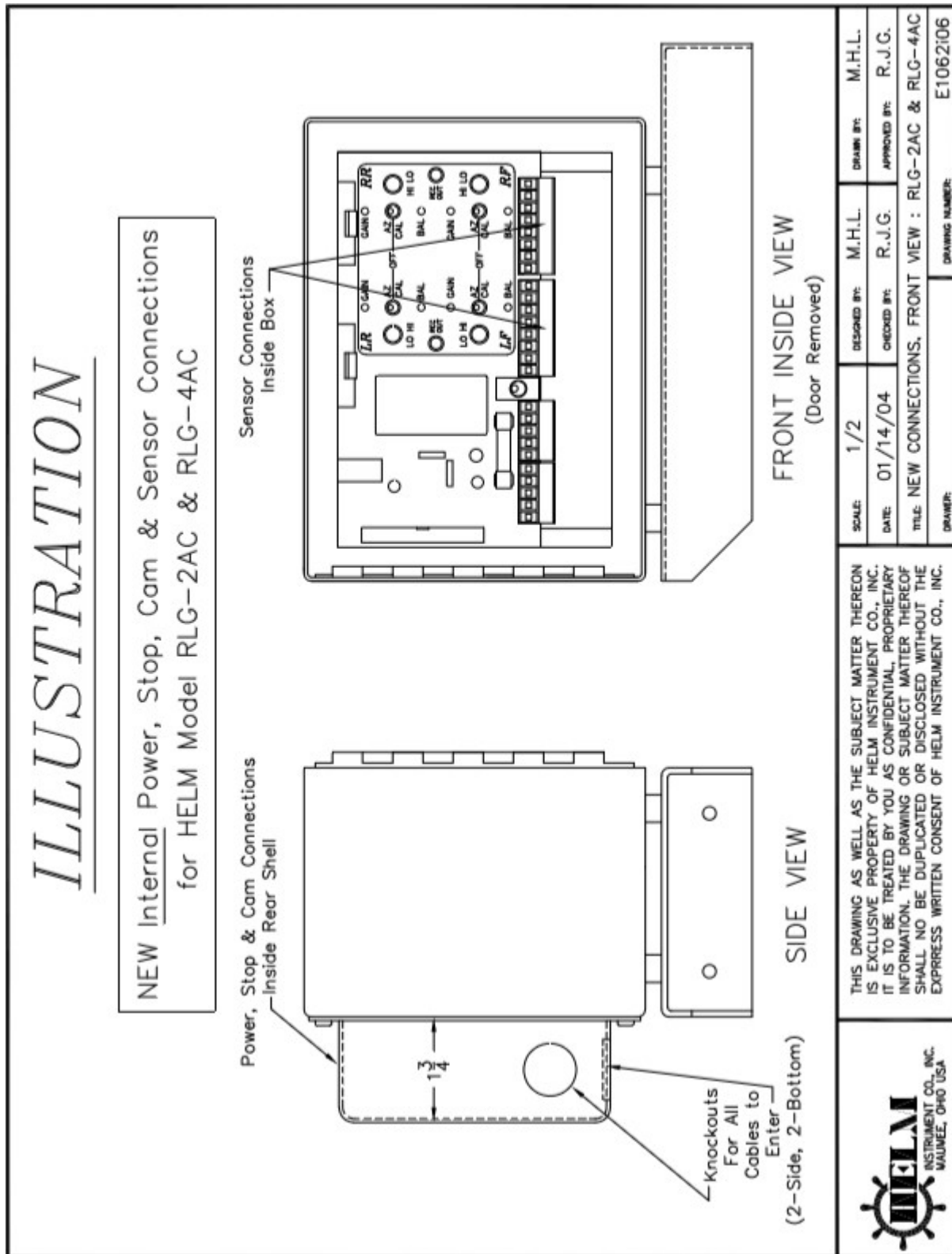
RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

DRAWING E1008W16: 24VDC RLG LOADGARD INPUT/OUTPUT WIRING



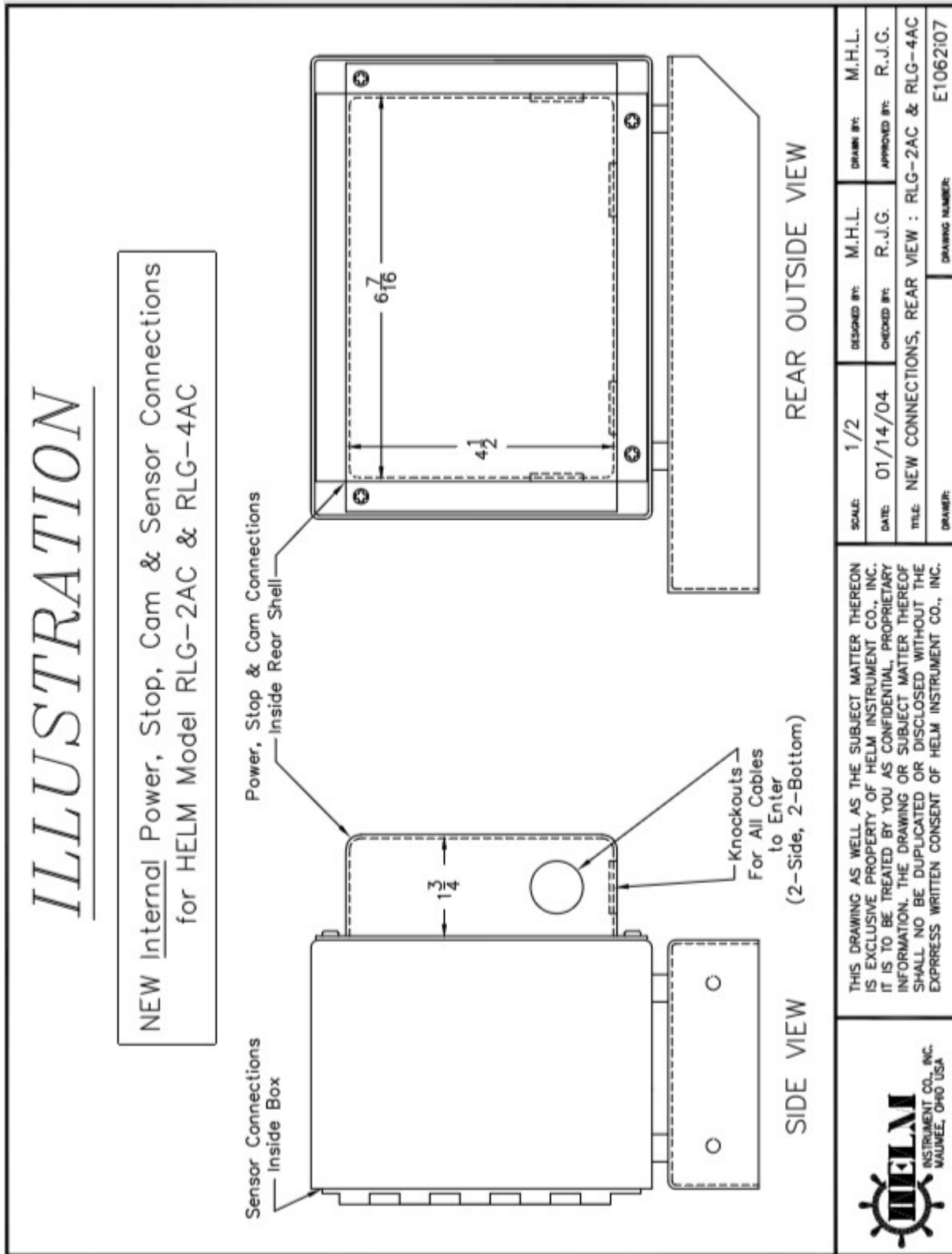
RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

DRAWING E1062i06: "110/220" RLG LOADGARD BASE MOUNT ENCLOSURE



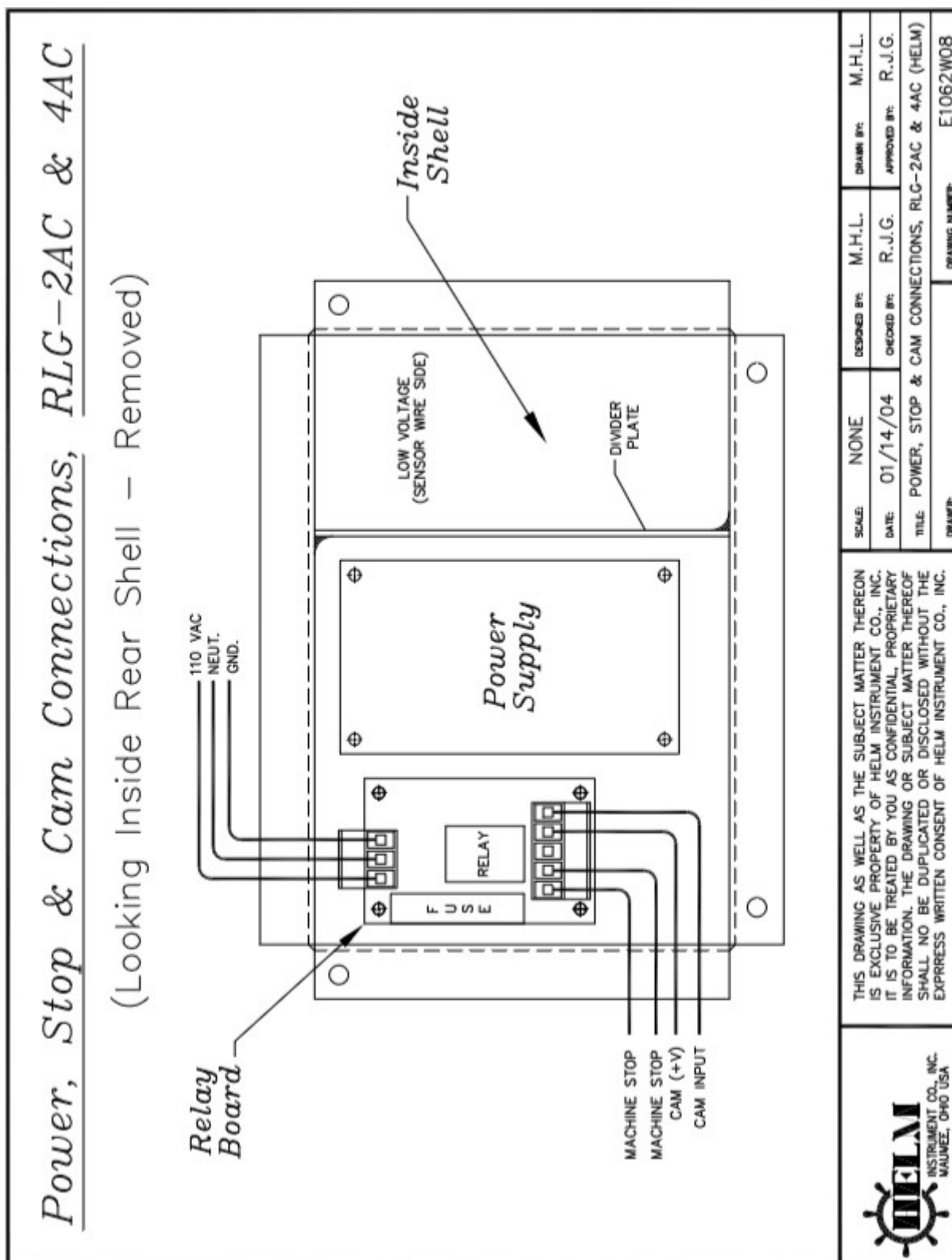
RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

ILLUSTRATION DRAWING E1062107: NEW "CUSTOMER CONNECTIONS" FOR RLG-2AC & 4AC, REAR VIEW



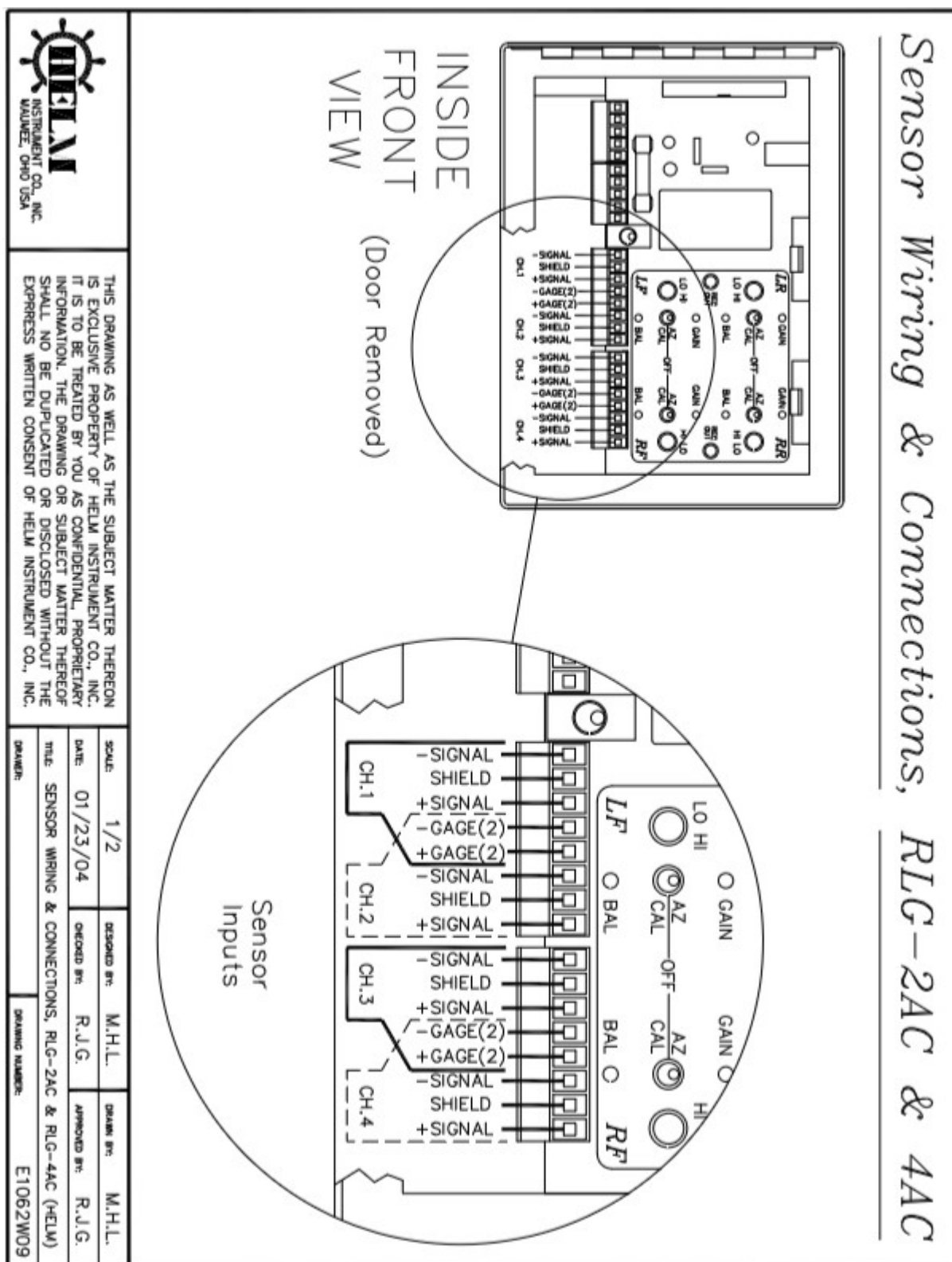
RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

WIRING DRAWING E1062W08: POWER, STOP & CAM CONNECTIONS, RLG-2AC & 4AC



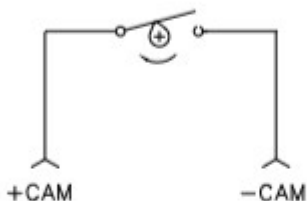
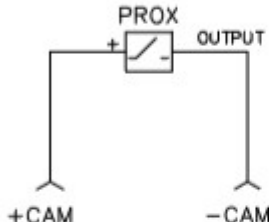

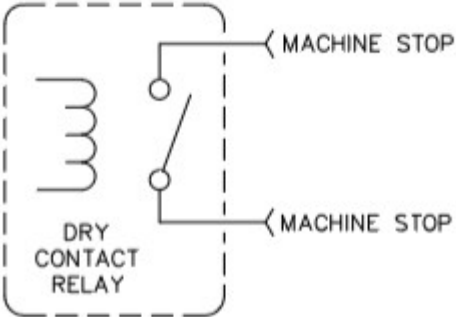
RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

WIRING DRAWING E1062W09: SENSOR WIRING & CONNECTIONS, RLG-2AC & 4AC



RLG-2 AND RLG-4 LOADGARD OPERATING INSTRUCTIONS

WIRING DRAWING E1008W17: INPUT/OUTPUT WIRING, RLG-2AC & 4AC

<p align="center"><u>"110/220 VAC" RLG LOADGARD</u> <u>CAM TIMING SIGNAL WIRING INPUT</u></p> <p><u>Note:</u> Either of the following (2) input devices can be used for external "cam" timing input signal. Connections are made inside the "Rear Shell".</p>		DESIGNED BY: N.F.N. CHECKED BY: N.F.N. SCALE: NONE DATE: 2/16/04 TITLE: "110/220 VAC" RLG LOADGARD INPUT/OUTPUT WIRING (HELM) DRAWING NUMBER: E1008W17
EXTERNAL DRY-CONTACT CAM SWITCH	EXTERNAL 24VDC PROX PROBE 2-WIRE SWITCH	THIS DRAWING AS WELL AS THE SUBJECT MATTER THEREON IS EXCLUSIVE PROPERTY OF HELM INSTRUMENT CO., INC. IT IS TO BE TREATED BY YOU AS CONFIDENTIAL, PROPRIETARY INFORMATION. THE DRAWING OR SUBJECT MATTER THEREOF SHALL NOT BE DUPLICATED OR DISCLOSED WITHOUT THE EXPRESS WRITTEN CONSENT OF HELM INSTRUMENT CO., INC.
		
<p align="center"><u>"110/220 VAC" RLG LOADGARD</u> <u>SINGLE ALARM RELAY WIRING OUTPUT</u></p>		
CAPACITY/TREND STOP	 <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><u>Note:</u> Stop relays are wired for "failsafe" operation, so that if power is interrupted, the machine will stop.</p> </div>	