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HM-SCM4-WM
High Resolution
Strain Gage Input Module
User Manual
3/10/2021

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Force Measurement and Control Solutions

IMPORTANT USER INFORMATION

Solid state equipment has operational characteristics differing from those of electromechanical equipment. "Safety Guidelines for the Application, Installation and Maintenance of Solid-State Controls" (Allen-Bradley Publication SGI-1.1) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will the Helm Instrument Company be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, the Helm Instrument Company cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Helm Instrument Company with respect to use of information, circuits, equipment, or software described in this manual.

Throughout this manual we use notes to make you aware of safety considerations.

PREFACE

Read this preface to become familiar with the rest of this manual. This preface covers the following topics:

- Who should use this manual
- The purpose of this manual
- Terms and abbreviations
- Conventions used in this manual
- Helm Instrument support

WHO SHOULD USE?

Use this manual if you are responsible for the design, installation, programming, or maintenance of an automation control system that uses Allen-Bradley small logic controllers.

You should have a basic understanding of ControlLogix products. You should understand electronic process control and be able to interpret the ladder logic instructions required to generate the electronic signals that control your application. If you do not, contact your local Helm representative for the proper training before using this product.

PURPOSE OF THIS MANUAL

This manual is a learning and reference guide for the Helm ControlLogix Strain Gage Input Module. It contains the information you need to install, wire, and use the module.

TECHNIQUES USED IN THIS MANUAL

The following conventions are used throughout this manual:

- Bulleted lists such as this one provides information, not procedural steps.
- Numbered lists provide sequential steps or hierarchical information.

PRODUCT SUPPORT

Contact your Helm representative or call Helm direct at 419-893-4356:

- sales and order support
- product technical training
- warranty support
- support service agreements

Download up to date manuals and ladder logic files at
http;//www.helminstrument.com/manuals-and-downloads/

Your Questions or Comments on this Manual

If you have any suggestions for how this manual could be made more useful to you, please send us your ideas.

HARDWARE OVERVIEW

The HM-SCM4-WM module fits into any single-slot. It is a Class 1 module.

The module can accept 4 channels of strain gage input. Maximum of 4 load cells at 350 ohms Module configuration requires manual and user programmable setup. The module receives and stores digitally converted analog data into its image table for retrieval.

HM-SCM4-WM SPECIFICATIONS

Type of input	**Strain Gage (350-ohm, 700-ohm, 1100-ohm)**
Input Impedance	**10k**
Display Resolution	**Up to .0025% of full scale**
Overall Module Accuracy	**.01% of full scale**
Number of Channels	**4 (isolated)**
Module Update Time	**2 millisecond**
A/D Conversion Method	**Successive Approximation - 18 bit**
Normal Mode Rejection: (between +/- input)	**116DB CMRR**
Amplifier Bandwidth	**200 kHz**

GETTING STARTED

This chapter can help you to get started using the Helm Strain Gage module. The procedures included here assume that you have a basic understanding of ControlLogix products. You should understand electronic process control and be able to interpret the ladder logic instructions required to generate the electronic signals that control your application.

Because it is a start-up guide, this chapter does not contain detailed explanations about the procedures listed. It does, however, reference other chapters in this book where you can get more information about applying the procedures described in each step. It also references other documentation that may be helpful if you are unfamiliar with programming techniques or system installation requirements. If you have any questions or are unfamiliar with the terms used or concepts presented in the procedural steps, always read the referenced chapters and other recommended documentation before trying to apply the information.

This chapter will:

- tell you what equipment you need
- explain how to install and wire the module
- show you how to calibrate the module

REQUIRED TOOLS AND EQUIPMENT

Have the following tools and equipment ready:

- small blade screwdriver
- programming equipment (All programming examples shown in this manual demonstrate the use of Rockwell RSLogix 5000 Software).

GETTING STARTED CONT.

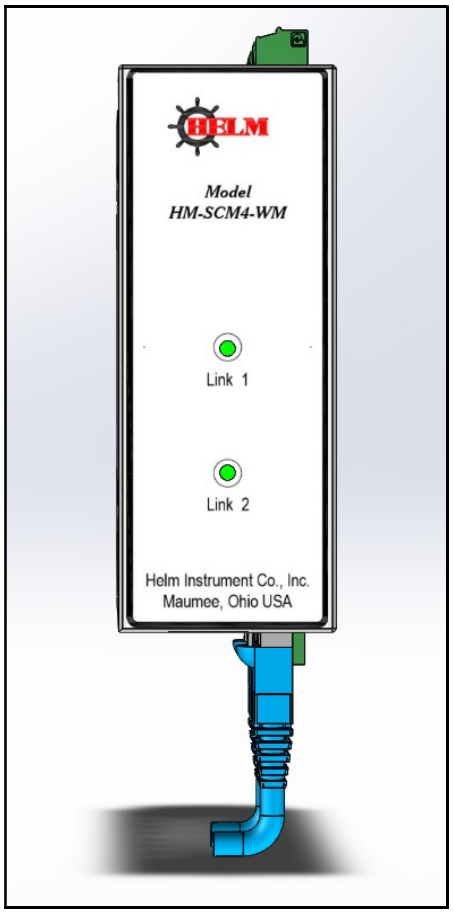
Use power supply supplied with module. Refer to wiring drawing for connections.

SETTING IP ADDRESS

Unzip hms-ip config tool
Install utility
Run utility to change IP address

Open Ladder Logic file
- copy all controller tags into project
- copy ladder logic routine "Main Program"

FRONT PANEL



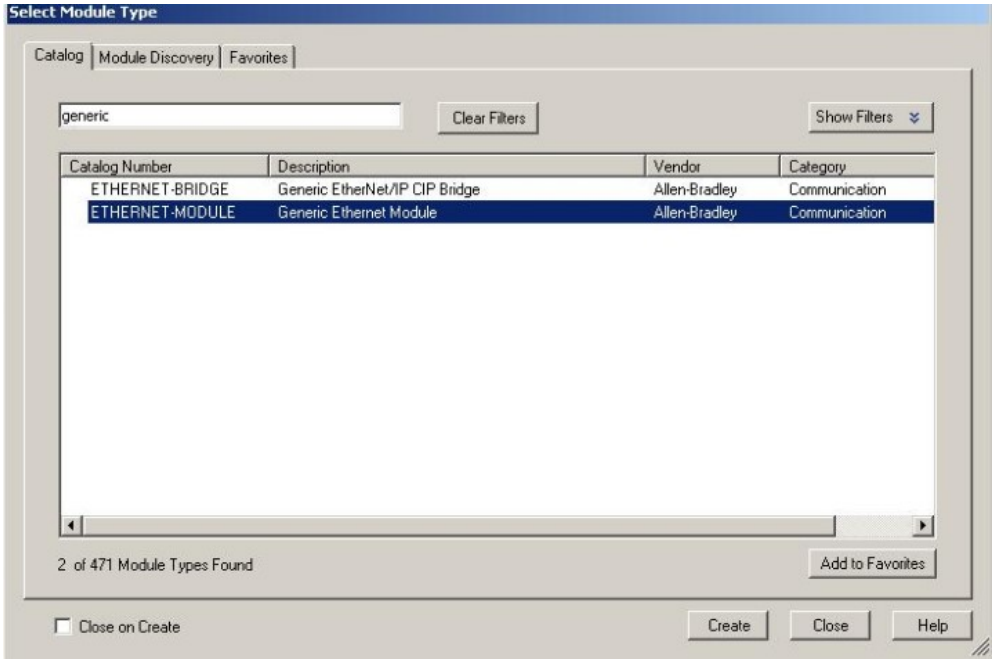
Link Status Indicator Lights
OK light is on (green) when PLC communication is OK.

MODULE I/O CONFIGURATION

This shows the preliminary setup and operation required before the module can function in a 1756 I/O system using RSLogix5000

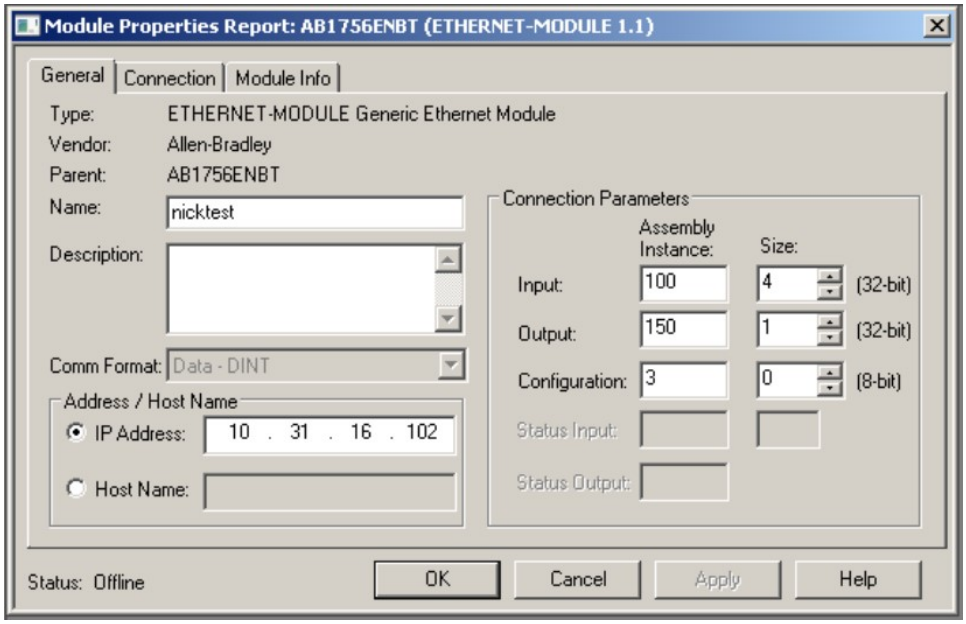
Adding Module to I/O Configuration

Select **Generic Ethernet Module** from *Select Module Type* window.



Configuration Module's Properties

From the Controller Organizer, right click on the added module and open up Module Properties windows

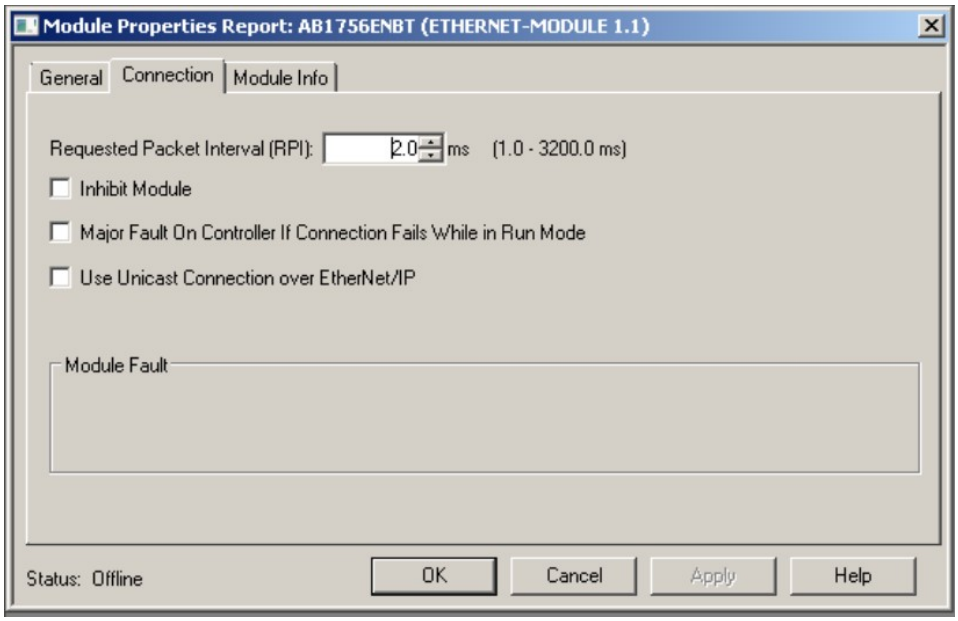


Type in a name for the module, select a slot number.

General: Connection Parameters

	Assembly Instance	Size
Input	100	4
Output	150	1
Configuration	3	0

Connection: Requested Packet Interval (RPI): 2.0ms



ADDING LADDER PROGRAM

OUTPUT BIT TAGS

Bit Tags Output	Data Type	Description
output_bits	INT	
output_bits.0	BOOL	cal mode
output_bits.1	BOOL	run mode
output_bits.2	BOOL	reset average
output_bits.3	BOOL	ch1 clear tare
output_bits.4	BOOL	ch1 tare
output_bits.5	BOOL	ch2 clear tare
output_bits.6	BOOL	ch2 tare
output_bits.7	BOOL	ch3 clear tare
output_bits.8	BOOL	ch3 tare
output_bits.9	BOOL	ch4 clear tare
output_bits.10	BOOL	ch4 tare
output_bits.11	BOOL	autocal enable ch1
output_bits.12	BOOL	autocal enable ch2
output_bits.13	BOOL	autocal enable ch3
output_bits.14	BOOL	autocal enable ch4
output_bits.15	BOOL	
set_average_count	DINT	limit 1 to 500

Run Mode Bit: When reading or downloading the module's configuration data using. Data**[0].0** and **.Data[0].2**, this bit needs to be at 0. For any other operation, such as reading weigh value, leave the bit at 1.

Cal Mode: Use for diagnostics, no scale, raw A/D values.

Weigh Mode: Scaled value.

Clear Tare Offset Bit: Resets or removes tare value from module for the channel selected.

Set Tare: Set tare values.

CH1 Auto-tune: Set to known weight.

CH2 Auto-tune: Set to known weight.

CONTROLLER TAGS

Controller Tags	
auto_tare	INT
ch1_autocal_mv_v	REAL
ch1_known_weight	DINT
ch1_scale_set	DINT
ch1adtrimset	DINT
ch1average	DINT
ch1weigh	DINT
ch2_autocal_mv_v	REAL
ch2_known_weight	DINT
ch2_scale_set	DINT
ch2adtrimset	DINT
ch2average	DINT
ch2weigh	DINT
ch3_autocal_mv_v	REAL
ch3_known_weight	DINT
ch3_scale_set	DINT
ch3adtrimset	DINT
ch3average	DINT
ch3weigh	DINT
ch4_autocal_mv_v	REAL
ch4_known_weight	DINT
ch4_scale_set	DINT
ch4adtrimset	DINT
ch4average	DINT
ch4weigh	DINT
MSF1	INT
MSF2	INT
MSF3	INT
MSF4	INT
set_mv_v_ch1	REAL
set_mv_v_ch2	REAL
set_mv_v_ch3	REAL
set_mv_v_ch4	REAL


0
[NOP]
1
SCM4_WM_DINT
SCM4_WM_DINT SCM4WM1
SetCalMode output_bits.0 0
SetRunMode output_bits.1 1
SetScaleChx ch1_scale_set 100000
Set_mV_V_Chx set_mv_v_ch1 2.0
SetRefChx ch1_known_weight 100000
AutoCalEnChx output_bits.11 0
Sample_Set set_average_count 1
Chx_mV_V_Out ch1_autocal_mv_v 2.0172822
set_ch_adtrim ch1adtrimset 108000
resetaverage output_bits.2 0
chx_tare output_bits.4 0
chx_cleartare output_bits.3 0
sample_rpi sample_rate 1
auto_tare_band auto_tare 0
getvaluein nicktest:I.Data[0] 0
msf msf1 0
getvalueout ch1weigh -46
2
SCM4_WM_DINT
SCM4_WM_DINT SCM4WM2
SetCalMode output_bits.0 0
SetRunMode output_bits.1 1
SetScaleChx ch2_scale_set 100000
Set_mV_V_Chx set_mv_v_ch2 2.0
SetRefChx ch2_known_weight 100000
AutoCalEnChx output_bits.12 0
Sample_Set set_average_count 1
Chx_mV_V_Out ch2_autocal_mv_v 2.0172822
set_ch_adtrim ch2adtrimset 108000
resetaverage output_bits.2 0
chx_tare output_bits.6 0
chx_cleartare output_bits.5 0
sample_rpi sample_rate 1
auto_tare_band auto_tare 0
getvaluein nicktest:I.Data[1] 0
msf msf2 0
getvalueout ch2weigh 8


3
SCM4_WM_DINT
SCM4_WM_DINT SCM4WM3
SetCalMode output_bits.0 0
SetRunMode output_bits.1 1
SetScaleChx ch3_scale_set 100000
Set_mV_V_Chx set_mv_v_ch3 2.0
SetRefChx ch3_known_weight 100000
AutoCalEnChx output_bits.13 0
Sample_Set set_average_count 1
Chx_mV_V_Out ch3_autocal_mv_v 2.016583
set_ch_adtrim ch3adtrimset 108000
resetaverage output_bits.2 0
chx_tare output_bits.8 0
chx_cleartare output_bits.7 0
sample_rpi sample_rate 1
auto_tare_band auto_tare 0
getvaluein nicktest:I.Data[2] 0
msf msf3 0
getvalueout ch3weigh -4
4
SCM4_WM_DINT
SCM4_WM_DINT SCM4WM4
SetCalMode output_bits.0 0
SetRunMode output_bits.1 1
SetScaleChx ch4_scale_set 100000
Set_mV_V_Chx set_mv_v_ch4 2.0
SetRefChx ch4_known_weight 100000
AutoCalEnChx output_bits.14 0
Sample_Set set_average_count 1
Chx_mV_V_Out ch4_autocal_mv_v 2.0186808
set_ch_adtrim ch4adtrimset 108000
resetaverage output_bits.2 0
chx_tare output_bits.10 0
chx_cleartare output_bits.9 0
sample_rpi sample_rate 1
auto_tare_band auto_tare 0
getvaluein nicktest:I.Data[3] 0
msf msf4 0
getvalueout ch4weigh -8
(End)

MODULE INITIAL SETUP PROCEDURE

A complete listing of a sample ladder logic program is included at the back of this manual. Examples shown here are for reference.

All values are 0 (default) on initial start-up. This means that all alarms are disabled. You must make the following adjustments for proper operation:

- **Balance sensor input(s)**
- **Set Calibration numbers**

Follow Steps 1 and 2 for each channel.

Step 1. Balance Sensor Input

1. Set to CAL mode.
2. Set Clear Tare bit momentarily.
3. Check Raw A/D value. (131,000)
4. Set Zero Tare bit momentarily.

Step 2. Set Calibration Numbers

1. Set Scale to capacity of load cell.
2. Set mV/V to load cell specification.

   Example:

   100 ton load cell, 2.025 mV/V

   For scale set, enter 100

   For mV/V set, enter 2.025

3. Set to RUN mode.

OUTPUT BITS

CAL-MODE
All scale parameters are bypassed, raw a/d values, use full diagnostics

RUN MODE
Weigh values are scaled based upon scale set parameters.

RESET AVERAGE
Toggle bit, needed for first run, initializes values in memory for average.

CLEAR TARE
Toggle bit to remove offset calc. used for diagnostics.

TARE
Toggle bit to set weigh value to zero

AUTOCAL ENABLE
Set bit to run auto-cal

CONTROLLER TAGS

AUTO TARE
Used to set weigh values to zero when weigh station is at rest or idle condition (no-weight)
Set to value in counts, if weigh is with in band set by counts, weigh will be set to zero
Set to zero to bypass this function
Normal setting <2> counts

AUTOCAL MV_V
Value that is updated when auto cal is used

KNOWN WEIGHT
Enter value for known weight when using auto cal

SCALE SET
Set to capacity of load cell

ADTRIMSET
Set to value on cal sticker on the side of the module

CH1-CH4 WEIGH
Current weigh value

MSF1-MSF2
Meter stabilization filter
Set value in counts, keeps weigh value from changing if weight is not moving
Normal setting 1 or 2 set to zero to bypass

SAMPLE RATE
Set to module RPI setting
Normal setting <2>

SET AVERAGE COUNT
Number of samples for average
Normal setting <100>
Set to 0 or 1 for no average

SET MV-V CH1-CH4
Set to values on load cell or on cal. cell certificate

NORMAL CALIBRATION PROCEDURE

1. Enter mV/V from load (set mV/V)
2. Enter capacity from load (set scale)
3. Resolution determined by scale set

EXAMPLE:

1. Enter 1,000 = 1 gram / count
2. Enter 10,000 = .1 gram / count

AUTO CALIBRATION PROCEDURE

Before running, weight must be stable and weight returns to zero when weight is removed

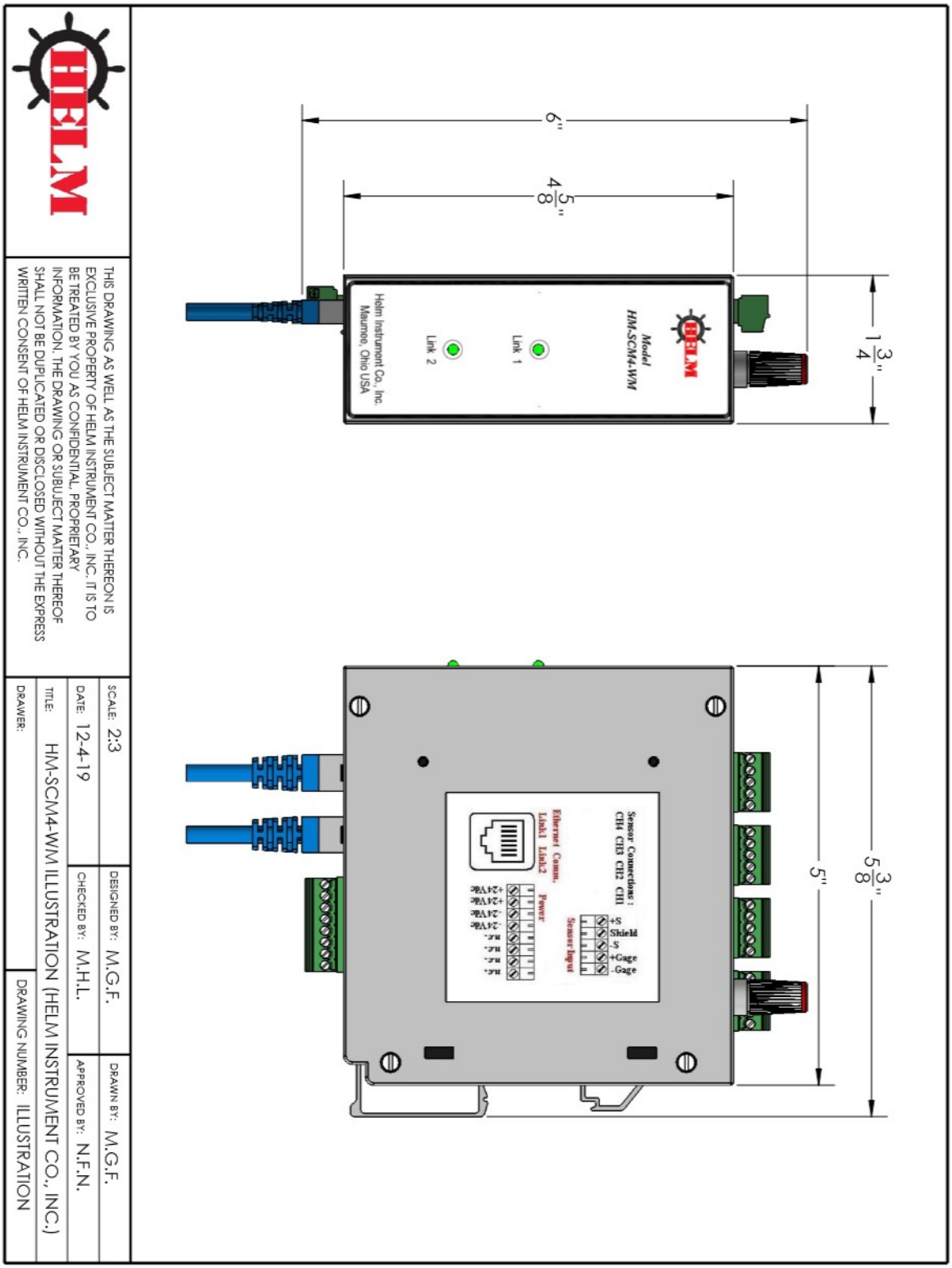
1. Enter known weight at chx_known_wei
2. Enter load cell capacity at scale
3. Enter 2.000 at set mv_v_chx

EXAMPLE:

1kg load cell, 500 gram known weight, for 1-gram resolution

1. Enter 1,000 at scale set
2. Enter 500 at known_weight
3. Enter 2.000 at set mv_v_chx

Toggle tare bit (no weight at start)
Apply known weight
Set autocal_enable_chx
Auto cal mv_v_v will change to correct value and weigh value will update to known weight
Clear auto cal enable
Enter auto cal mV/V at set mv_v_chx



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DATE: 12-4-19	CHECKED BY: M.H.L.		APPROVED BY: N.F.N.
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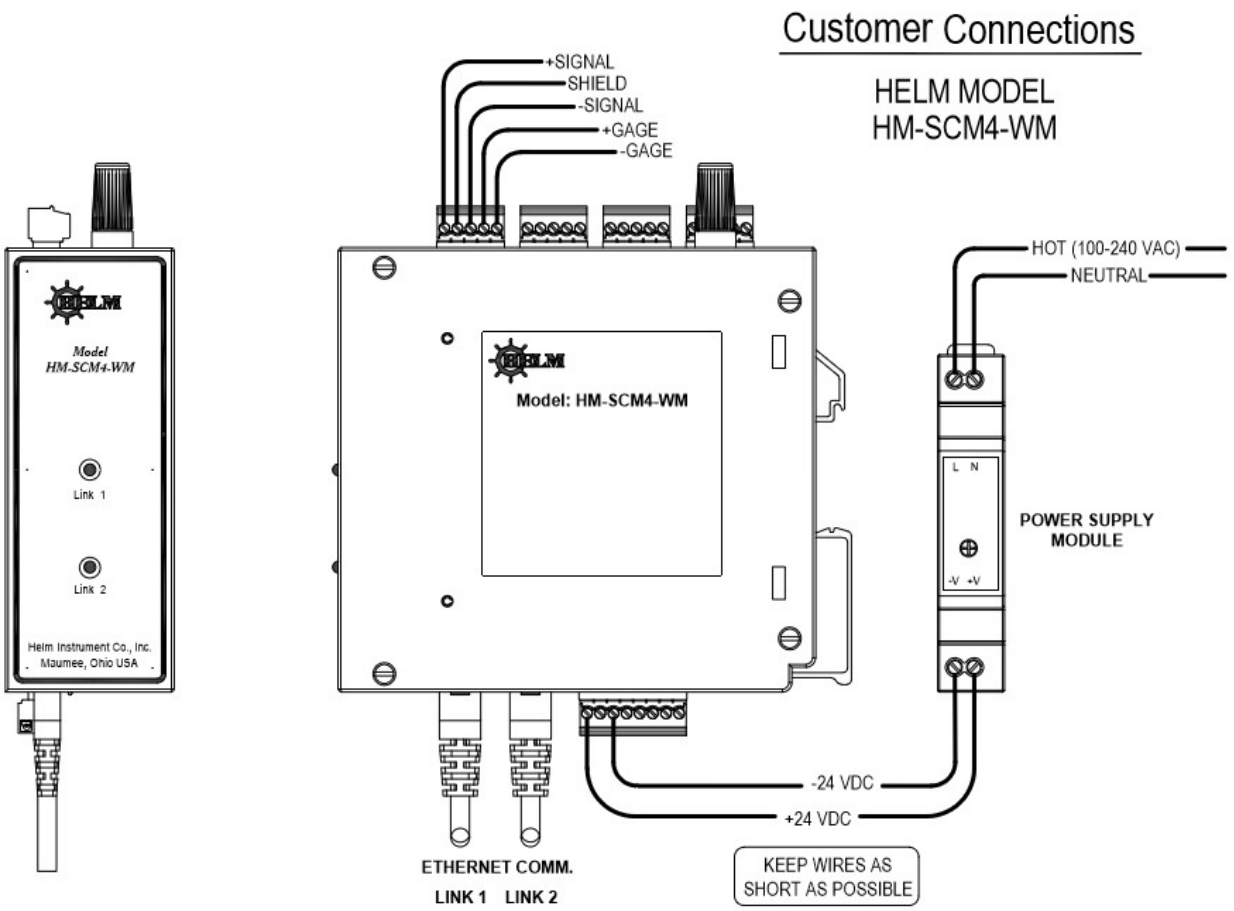
Customer Connections
HELM MODEL
HM-SCM4-WM
+SIGNAL
SHIELD
-SIGNAL
+GAGE
-GAGE
HOT (100-240 VAC)
NEUTRAL
Model
HM-SCM4-WM
Link 1
Link 2
Helm Instrument Co., Inc.
Maumee, Ohio USA
Model: HM-SCM4-WM
L N
-V +V
POWER SUPPLY
MODULE
-24 VDC
+24 VDC
ETHERNET COMM.
LINK 1 LINK 2
KEEP WIRES AS
SHORT AS POSSIBLE