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HM-1756-WM
High Resolution
Strain Gage Input Module
User Manual
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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-1756-WM module fits into any single-slot. It is a Class 1 module (uses eight input words and eight output words).

The module can accept 2 channels of strain gage input. Two 700 ohm gages may be paralleled to one channel.

Module configuration requires manual and user programmable setup. The module receives and stores digitally converted analog data into its image table for retrieval.

HM-1756-WM SPECIFICATIONS

Backplane Power Consumption	**24V @ 84.99mA 5V @ 40mA**
Type of input	**Strain Gage (350 ohm, 700 ohm)**
Input Impedance	**10k**
Display Resolution	**Up to .0025% of full scale**
Overall Module Accuracy	**.01% of full scale**
Number of Channels	**2 (isolated)**
Module Update Time	**1 millisecond**
A/D Conversion Method	**Successive Approximation - 18 bit**
Normal Mode Rejection: (between +/- input)	**116DB CMRR**
Amplifier Bandwidth	**200 kHz**
Calibration	**Software Selectable**
Isolation	**500 VDC continuous between inputs and chassis ground, and between input and backplane**
Operating Temperatures	**0°C to 60°C (32°F to 140°F)**
Hazardous Environment Classification	**Class 1 Division 2 Hazardous Environment**

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

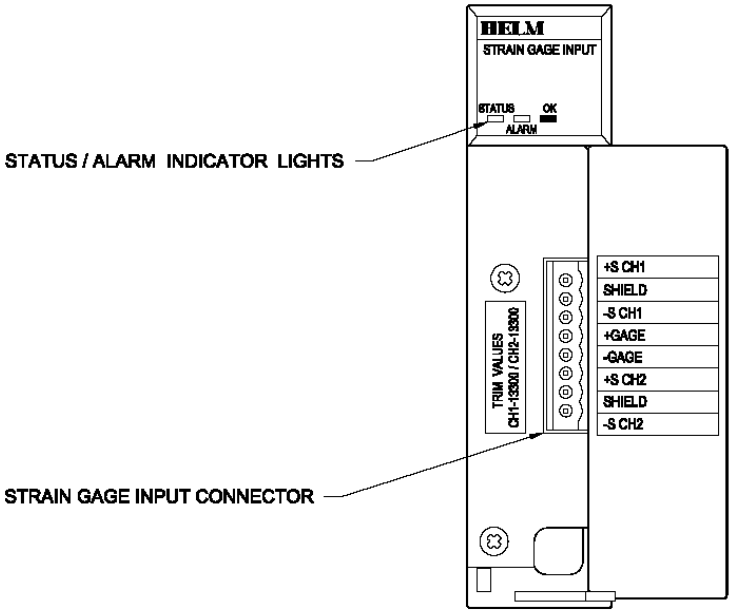
Have the following tools and equipment ready:

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

SYSTEM OPERATION

The module communicates to the controller through the serial backplane interface and receives +5Vdc and +24Vdc power from the controller power supply through the backplane. No external power supply is required. You may install as many modules in your system as the power supply can support.

FRONT PANEL



Status / Alarm Indicator Lights

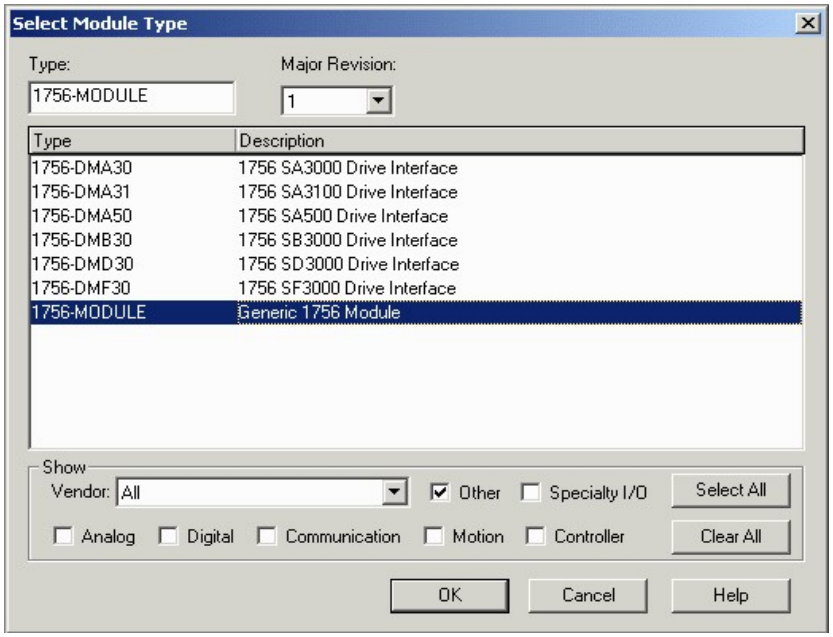
OK light is on (green) when PLC communication is OK.

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

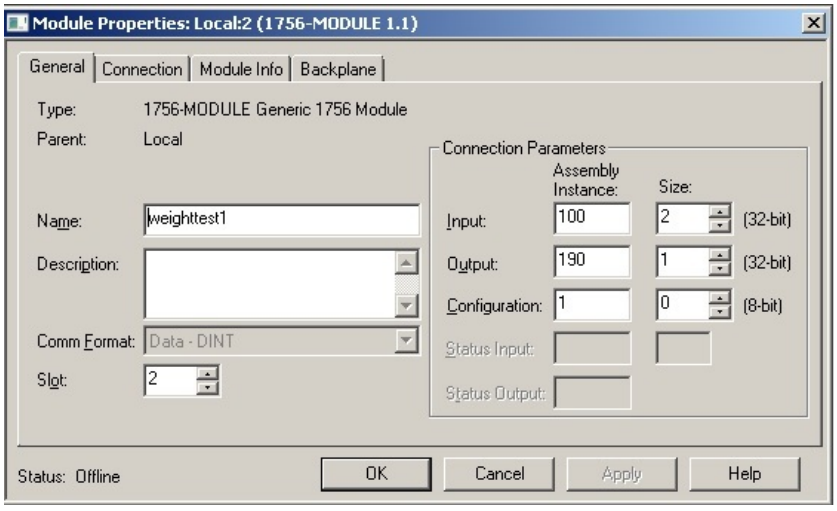
Adding Module to I/O Configuration

Select **1756-MODULE Generic 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

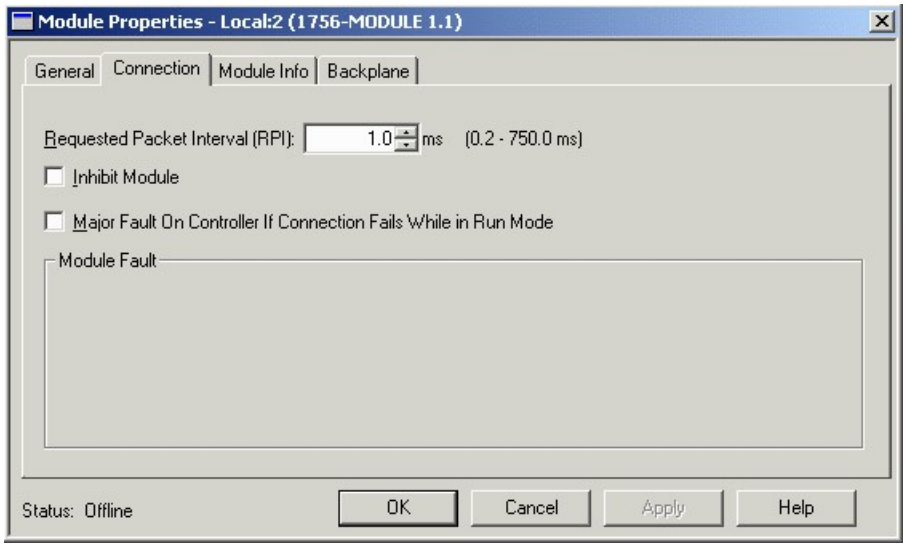


Type in a name for the module, select a slot number.

General: Connection Parameters

	Assembly Instance	Size
Input	100	2
Output	190	1
Configuration	1	0

Connection: Requested Packet Interval (RPI): 1.0ms



ADDING LADDER PROGRAM

HM1756 Weigh Module requires the ladder program that comes with the module. You need to copy the Tags and programs to your existing ladder program.
Open *HM1756_hiresWeighModule_2CH_V16.ACD* file using RSLogix5000 program and copy the tags below from the Controller Tags section into your program.

TAG NAME	TYPE
msgreceive	MESSAGE
msgsend	MESSAGE
setup_dataM1	INT[7]
status_dataM1	INT[7]

MODULE INPUT /OUTPUT

INPUT IMAGE DATA TAGS

Data Tags Local:x.I	Data Type	Bit	Description
.Data[0]	DINT	-	Ch1 Weight Value
.Data[1]	DINT	-	Ch2 Weight Value

Ch1, 2 Weight Value: Displays the actual weigh read from sensor as an unsigned word (0 – 65535). Proper scale and mV/V settings are required for the accurate reading,

OUTPUT IMAGE TAGS

Data Tags Local:x.O	Data Type	Bit	Description
Local:2:.Data[0]	Bit	0	Run Mode
Local:2:.Data[1]	Bit	1	Write Config
Local:2:.Data[2]	Bit	2	Read Config
Local:2:.Data[3]	Bit	3	Set Trim CH1 (Factory Setting Only)
Local:2:.Data[4]	Bit	4	Set Trim CH2 (Factory Setting Only)
Local:2:.Data[5]	Bit	5	Save to Eeprom
Local:2:.Data[6]	Bit	6	Calibration Mode
Local:2:.Data[7]	Bit	7	Weigh Mode
Local:2:.Data[8]	Bit	8	CH1 Clear Tare
Local:2:.Data[9]	Bit	9	CH1 Set Tare
Local:2:.Data[10]	Bit	10	CH2 Clear Tare
Local:2:.Data[11]	Bit	11	CH2 Set Tare
Local:2:.Data[12]	Bit	12	Read A/D Trim / Read Cal Factor
Local:2:.Data[13]	Bit	13	CH1 Auto Tune
Local:2:.Data[14]	Bit	14	CH2 Auto Tune
Local:2:.Data[15]	Bit	15	Cal Factor Mode

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.

Write Config Data Bit:
Toggle this bit to download *CONFIGURATION DATA* to EEPROM of the module. This is required for the module to take on any changes you made from the *CONFIGURATION DATA* tags. This bit must stay on for at least 100ms and .Data[0].1 bit needs to be at 0 during this operation.

Read Config Data Bit:
Toggle this bit to read current configuration values from the module's memory into STATUS REPORT DATA tags. This bit must stay on for at least 100ms and **.Data[0].1** bit needs to be at 0 during this operation.

Save to Eeprom: Toggle bit to save any settings.

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.

Cal Factor Mode: Set to 1 for auto-tuning calibration.

CONFIGURATION DATA TAG

Data Tags setup_dataM1	Data Type	Bit	Description
setup_dataM1[0]	DINT	-	CH1 Scale Set – Reference Weight
setup_dataM1[1]	DINT	-	CH1 mv/v Set
setup_dataM1[2]	DINT	-	CH2 Scale Set – Reference Weight
setup_dataM1[3]	DINT	-	CH2 mv/v Set
setup_dataM1[4]	DINT	-	Samples
setup_dataM1[5]	DINT	-	Parameters
Setup_dataM1[5].0		Bit	MSF range -0.002% to +0.001%
Setup_dataM1[5].1		Bit	MSF range -0.004% to +0.002%
Setup_dataM1[5].2		Bit	MSF range -0.008% to +0.004%
Setup_dataM1[5].3		Bit	MSF range -0.010% to +0.005%
Setup_dataM1[5].4		Bit	MSF range -0.012% to +0.006%
Setup_dataM1[5].5		Bit	MSF range -0.014% to +0.007%
Setup_dataM1[5].6		Bit	MSF range -0.016% to +0.008%
Setup_dataM1[5].7		Bit	MSF range -0.018% to +0.009%
Setup_dataM1[5].8		Bit	Zero band .0025% of full scale
Setup_dataM1[5].9		Bit	Zero band .0050% of full scale
Setup_dataM1[5].10		Bit	Zero band .0075% of full scale
Setup_dataM1[5].11		Bit	60hz filter
setup_dataM1[6]]	DINT	-	Extra

Set Ch1 Scale Value: Enter a scale value of load cell for channel 1.

Set Ch2 Scale Value: Enter a scale value of load cell for channel 2.

Set Ch1 mV/V Value: Enter 4 digit mV/V setting from load cell mV/V specification for channel1.
Example) If 2.034mV/V, then enter 2034
Set Ch2 mV/V Value: Enter 4 digit mV/V setting from load cell mV/V specification for channel2.

Samples: Enter the number of weigh readings to average before it updates to INPUT IMAGE DATA TAG

PARAMETERS:

MSF Bits – (Motion Stabilization Filter):
Used for applications with constant or static type loads to keep display value stable.
Set one bit only.

Zero Band: Useful for Auto-Tare functions with production runs.
Set only one bit.
Auto tare occurs when load cell weight is at bit level or lower.

60hz Filter: Set to 0 = Filter Off
Set to 1 = Filter On

Note: Toggle Write *Config Data Bit* (Local:x.O.Data[0].1) in Config Data Mode to download the new configuration values to the module.

STATUS REPORT DATA TAGS

Data Tags status_dataM1	Data Type	Bit	Description
status_dataM1[0]	DINT	-	CH1 Scale – Reference Weight
status_dataM1[1]	DINT	-	CH1 mv/v
status_dataM1[2]	DINT	-	CH2 Scale – Reference Weight
status_dataM1[3]	DINT	-	CH2 mv/v
status_dataM1[4]	DINT	-	Samples
status_dataM1[5]	DINT	-	Parameter Bits
status_dataM1[6]	DINT	-	Extra
status_dataM1[5].0		Bit	MSF range -0.002% to +0.001%
status_dataM1[5].1		Bit	MSF range -0.004% to +0.002%
status_dataM1[5].2		Bit	MSF range -0.008% to +0.004%
status_dataM1[5].3		Bit	MSF range -0.010% to +0.005%
status_dataM1[5].4		Bit	MSF range -0.012% to +0.006%
status_dataM1[5].5		Bit	MSF range -0.014% to +0.007%
status_dataM1[5].6		Bit	MSF range -0.016% to +0.008%
status_dataM1[5].7		Bit	MSF range -0.018% to +0.009%
status_dataM1[5].8		Bit	Zero band .0025% of full scale
status_dataM1[5].9		Bit	Zero band .0050% of full scale
status_dataM1[5].10		Bit	Zero band .0075% of full scale
status_dataM1[5].11		Bit	60hz filter
status_dataM1[6]	DINT	-	Extra

This is an image of the CONFIGURATION DATA tag values stored in the module's internal memory. Toggle *Read Config Data Bit* (Local:x.O.Data[0].2) in Config Data Mode to update the latest configuration values from module.

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. (Range 6000 to 7000)
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. Download the values to module.
4. Set to RUN mode.

CALIBRATING WITH KNOWN LOAD (AUTO-CAL)

1) Set known weight for channel at scale parameter.
2) Set mV/V.
3) Tare-0 (with no weight on cell/scale).
4) Set module to AUTOCAL mode (BIT).
5) Apply known load (test weight) to load cells/ scale.
6) Set AUTOCAL bit on for CH1 (CH2 if applicable).
7) To ensure accuracy repeat the steps above.
8) Toggle "SAVE TO EEPROM" (BIT).
9) MAKE SURE AUTOCAL MODE BIT STAYS ON.

HM-1756 WEIGH MODULE DATA TAGS

INPUT IMAGE DATA TAGS

Data Tags Local:x.I	Data Type	Bit	Description
.Data[0]	DINT	-	Ch1 Weight Value
.Data[1]	DINT	-	Ch2 Weight Value

OUTPUT IMAGE TAGS

Data Tags Local:x.O	Data Type	Bit	Description
Local:2:.Data[0]	Bit	0	Run Mode
Local:2:.Data[1]	Bit	1	Write Config
Local:2:.Data[2]	Bit	2	Read Config
Local:2:.Data[3]	Bit	3	Set Trim CH1
Local:2:.Data[4]	Bit	4	Set Trim CH2
Local:2:.Data[5]	Bit	5	Save to Eeprom
Local:2:.Data[6]	Bit	6	Calibration Mode
Local:2:.Data[7]	Bit	7	Weigh Mode
Local:2:.Data[8]	Bit	8	CH1 Clear Tare
Local:2:.Data[9]	Bit	9	CH1 Set Tare
Local:2:.Data[10]	Bit	10	CH2 Clear Tare
Local:2:.Data[11]	Bit	11	CH2 Set Tare
Local:2:.Data[12]	Bit	12	Read A/D Trim / Read Cal Factor
Local:2:.Data[13]	Bit	13	CH1 Auto Tune
Local:2:.Data[14]	Bit	14	CH2 Auto Tune
Local:2:.Data[15]	Bit	15	Cal Factor Mode

CONFIGURATION DATA

Data Tags setup_dataM1	Data Type	Bit	Description
setup_dataM1[0]	DINT	-	CH1 Scale Set – Reference Weight
setup_dataM1[1]	DINT	-	CH1 mv/v Set
setup_dataM1[2]	DINT	-	CH2 Scale Set – Reference Weight
setup_dataM1[3]	DINT	-	CH2 mv/v Set
setup_dataM1[4]	DINT	-	Samples
setup_dataM1[5]	DINT	-	Parameters
Setup_dataM1[5].0		Bit	MSF range -0.002% to +0.001%
Setup_dataM1[5].1		Bit	MSF range -0.004% to +0.002%
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Setup_dataM1[5].3		Bit	MSF range -0.010% to +0.005%
Setup_dataM1[5].4		Bit	MSF range -0.012% to +0.006%
Setup_dataM1[5].5		Bit	MSF range -0.014% to +0.007%
Setup_dataM1[5].6		Bit	MSF range -0.016% to +0.008%
Setup_dataM1[5].7		Bit	MSF range -0.018% to +0.009%
Setup_dataM1[5].8		Bit	Zero band .0025% of full scale
Setup_dataM1[5].9		Bit	Zero band .0050% of full scale
Setup_dataM1[5].10		Bit	Zero band .0075% of full scale
Setup_dataM1[5].11		Bit	60hz filter
setup_dataM1[6]]	DINT	-	Extra

STATUS REPORT DATA

Data Tags status_dataM1	Data Type	Bit	Description
status_dataM1[0]	DINT	-	CH1 Scale – Reference weight
status_dataM1[1]	DINT	-	CH1 mv/v
status_dataM1[2]	DINT	-	CH2 Scale – Reference Weight
status_dataM1[3]	DINT	-	CH2 mv/v
status_dataM1[4]	DINT	-	Samples
status_dataM1[5]	DINT	-	Parameter Bits
status_dataM1[6]	DINT	-	Extra
status_dataM1[5].0		Bit	MSF range -0.002% to +0.001%
status_dataM1[5].1		Bit	MSF range -0.004% to +0.002%
status_dataM1[5].2		Bit	MSF range -0.008% to +0.004%
status_dataM1[5].3		Bit	MSF range -0.010% to +0.005%
status_dataM1[5].4		Bit	MSF range -0.012% to +0.006%
status_dataM1[5].5		Bit	MSF range -0.014% to +0.007%
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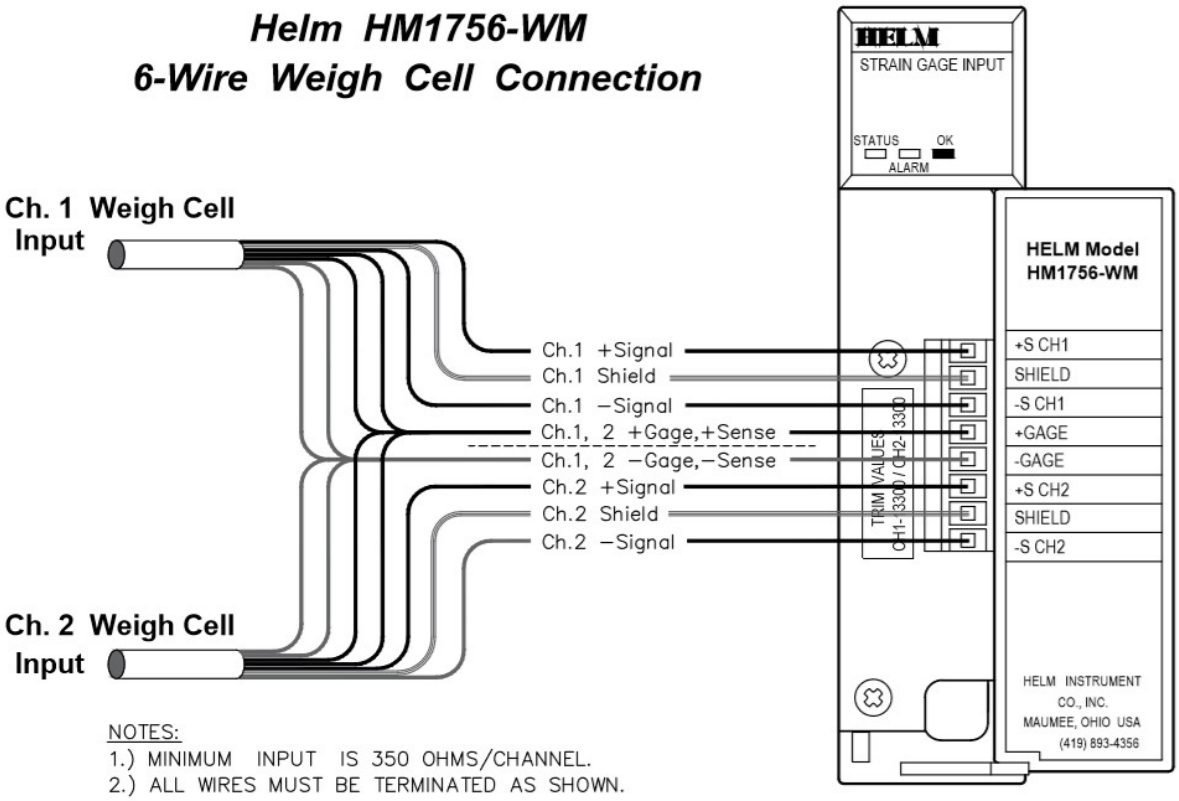
status_dataM1[5].7		Bit	MSF range -0.018% to +0.009%
status_dataM1[5].8		Bit	Zero band .0025% of full scale
status_dataM1[5].9		Bit	Zero band .0050% of full scale
status_dataM1[5].10		Bit	Zero band .0075% of full scale
status_dataM1[5].11		Bit	60hz filter
status_dataM1[6]	DINT	-	Extra

Helm HM1756-WM
6-Wire Weigh Cell Connection



NOTES:
1.) MINIMUM INPUT IS 350 OHMS/CHANNEL.
2.) ALL WIRES MUST BE TERMINATED AS SHOWN. NONE CAN BE LEFT OPEN AS ELECTRICAL NOISE PROBLEMS COULD DEVELOP.

Helm Model HM 1756-WM