HM-1756-SGI-WM
Strain Gage Input Module

User Manual

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.

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TECHNIQUES USED IN THIS MANUAL

The following conventions are used throughout this manual:

- Bulleted lists such as this one provide 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

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-SGI-PLM 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-SGI-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)**
A/D Conversion Method	**Successive Approximation - 16 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**

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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

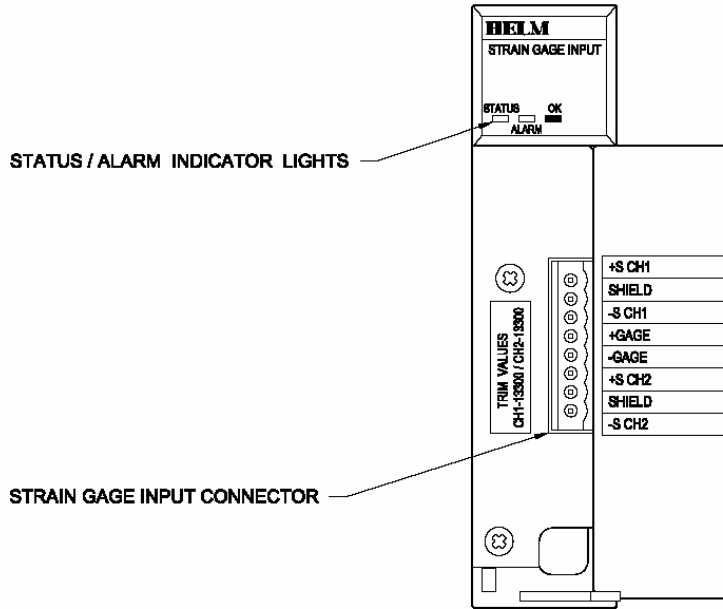Have the following tools and equipment ready:
- small blade screwdriver
- programming equipment (All programming examples shown in this manual demonstrate the use of Rockwell RSLogix 5000 Software).

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

STRAIN GAGE INPUT CONNECTOR

HELM
STRAIN GAGE INPUT

STATUS   OK
ALARM

TRIM VALUES
CH1-13300 / CH2-13300

+S CH1
SHIELD
-S CH1
+GAGE
-GAGE
+S CH2
SHIELD
-S CH2

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
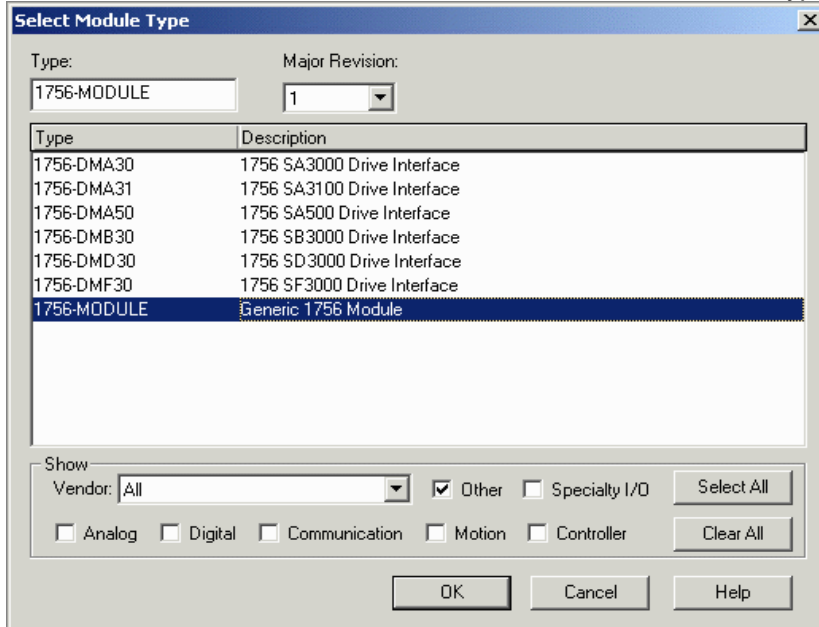
Configuration Module's Properties

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

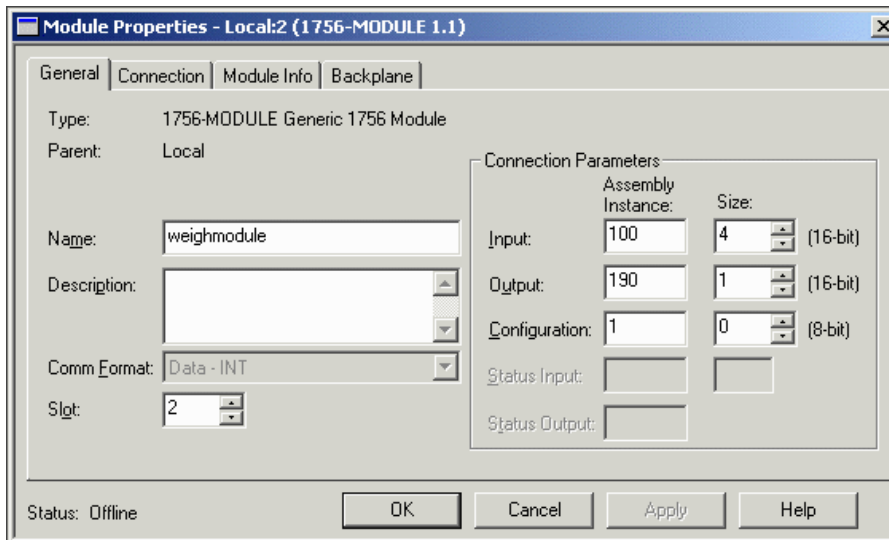|	Assembly Instance	Size
Input	100	4
Output	190	1
Configuration	1	0

Connection: Requested Packet Interval (RPI): 1.0ms
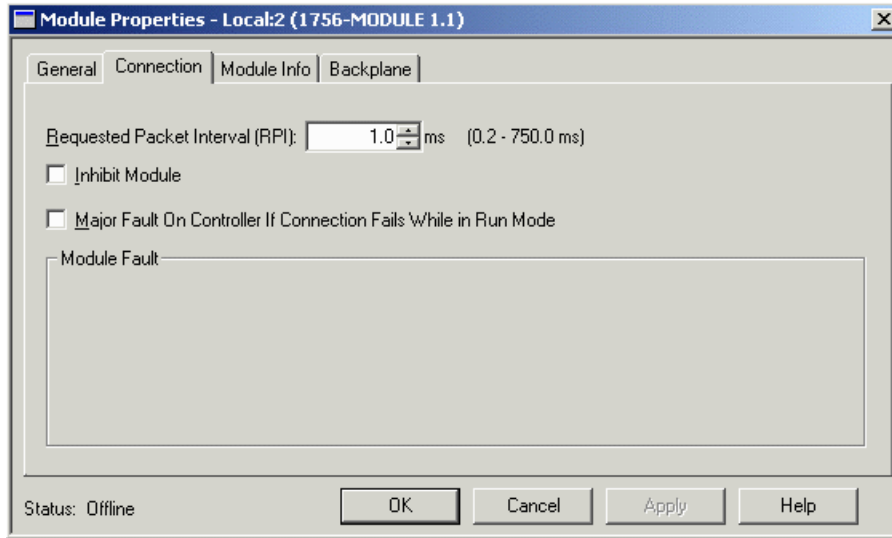
ADDING LADDER PROGRAM

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 *Hm1756Weigh_Module.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[10]
status_dataM1	INT[10]

Also copy *WeighModule1* program into the Main Task section of your program.

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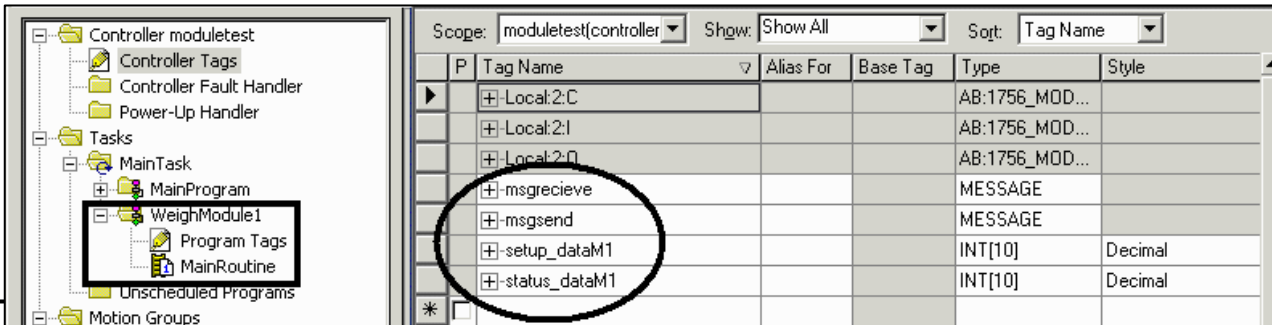
MODULE INPUT /OUTPUT

INPUT IMAGE DATA TAGS

Data Tags Local:x.I	Data Type	Bit	Description
.Data[0]	INT	-	ASIC Scan Update Counter
.Data[1]	INT	-	Ch1 Weight Value
.Data[2]	INT	-	Ch2 Weight Value
.Data[3]	Bit	0 1 2 3	Ch1 Sign Bit (0 = positive, 1 = negative) Ch2 Sign Bit (0 = positive, 1 = negative) AD Trim Mode Bit (0 = Run Mode, 1 = Trim Mode, Factory Use only) Sample Complete Bit

ASIC Scan Update Counter: Updates every RPI to show the Module is working properly.

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,

Ch1, 2 Sign Bit: Indicates the polarity of the weigh value in .Data[1], .Data[2].   (0 = Positive, 1 = negative)

Sample Complete Bit: indicates the sampling (averaging) of the Weigh value has been completed since the Clear Average Bit (**Local:x.O.Data[0].9)** has been toggled. The number of samples to average can be set at CONFIGURATION DATA tags.

OUTPUT IMAGE TAGS

Data Tags Local:x.O	Data Type	Bit	Description
.Data[0]	Bit Bit Bit Bit Bit Bit Bit Bit Bit Bit Bit Bit Bit Bit Bit Bit	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	Write Config Data Bit Run Mode Bit (1 = Run Mode, 0 = Config Data Mode) Read Config Data Bit Zero Stabilize On Bit (1 = On, 0 = Off, in Run Mode Only) No Flicker On Bit (1 = On, 0 = Off, in Run Mode Only) Vibration Filter On Bit (1 = On, 0 = Off, in Run Mode Only) - Up Course Zero Bit (Use Bit 15 for channel select in Run Mode) - Clear Average Bit (in Run Mode) - - Down Course Zero Bit (Use Bit 15 for channel select in Run Mode) Clear Tare Offset Bit (Use Bit 15 for channel select in Run Mode) Set Tare Offset Bit (Use Bit 15 for channel select in Run Mode) Channel Select Bit (0 = Ch1, 1 = Ch2, in Run Mode only)

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.

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.

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.

Zero Stabilize On Bit: Enables module feature to display "0" when Weigh scale is empty.

No Flicker On Bit: When On, it masks the LSB (least significant bit) of the weigh value to reduce any flickering of the value. This feature is useful for low speed application.

Vibration Filter Bit: Enables vibration filter to cancel out load variation due to vibration of the product weighted.

Up Course Zero Bit: Used to increase the offset range of the A/D for the channel selected.

Down Course Zero Bit: Used to decrease the offset range of the A/D for the channel selected.

Clear Average Bit: Toggle this bit to clear the previous sample (average) weigh value and read a new sample (average) weigh value. If this bit stays 0 all the time, the weigh value (**Local:x.I.Data[1], Local:x.I.Data[1]**) will continually update a new sampled weigh value in every given sample count, set at *setup_dataM1.data[6]*

*Note: When you toggle this bit, the bit must be off before the sampling is completed.
For example, if the sample count is set to 100, then the time that takes to complete sampling is 100ms (1ms RPI x 100). Therefore, the interval of the toggle has to be less than 100 ms. If the bit stays on longer than the actual sampling time, the weigh value will display 0.

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

Set Tare Offset Bit: Sets current weight reading to zero for the channel selected.

Channel Select Bit : Use this bit to select between Channel 1 and Channel 2 for the following functions - *Up Course Zero Bit, Down Course Zero Bit, Clear Tare Offset Bit, Set Tare Offset Bit*

CONFIGURATION DATA TAG

Data Tags setup_dataM1	Data Type	Bit	Description
.Data[0]	INT	-	-
.Data[1]	INT	-	Set Ch1 Scale value
.Data[2]	INT	-	Set Ch1 mV/V value (mV/V x 1000)
.Data[3]	INT	-	Set Ch1 AD Trim value (Factory use only)
.Data[4]	INT	-	Set Ch2 mV/V value (mV/V x 1000)
.Data[5]	INT	-	Set Ch2 AD Trim value
.Data[6]	INT	-	Set Sample Count
.Data[7]	INT	-	Set Ch2 Scale value
.Data[8]	INT	-	-
.Data[9]	INT	-	-

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.

Set Ch1 AD Trim Value: This is only used for factory setting. Leave it as 0.

Set Ch2 AD Trim Value: This is only used for factory setting. Leave it as 0.

Set Sample Count: Enter the number of weigh readings you wish to average before it updates to INPUT IMAGE DATA TAG

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 TAG

Data Tags status_dataM1	Data Type	Bit	Description
.Data[0]	INT	-	-
.Data[1]	INT	-	Current Ch1 Scale value
.Data[2]	INT	-	Current Ch1 mV/V value (mV/V x 1000)
.Data[3]	INT	-	Current Ch1 AD Trim Value (Factory Use Only)
.Data[4]	INT	-	Current Ch2 mV/V value (mV/V x 1000)
.Data[5]	INT	-	Current Ch2 AD Trim value (Factory Use Only)
.Data[6]	INT	-	Current samples count
.Data[7]	INT	-	Current Ch2 Scale value
.Data[8]	INT	-	-
.Data[9]	INT	-	-

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 INITAIL SETUP PROCEDURE

You must make the following adjustments for proper operation:

Balance sensor input(s)
Set Calibration numbers

Step 1. Balance Sensor Input.

1. Set mV/V to 2000.

2. Set Scale to 10000.

3. Download the values to module.

4. Toggle Tare Offset bit to clear any offset value stored in memory.

5. Toggle Up and Down Course Zero bit to set amplifier to low range of A/D (20,000   counts)

6. Toggle Set Tare Offset bit to zero the balance.

Step 2. Set Calibration Numbers

1. Change the 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 2025

3. Download the values to module.

HM-1756 WEIGH MODULE DATA TAGS

INPUT IMAGE DATA TAGS

Data Tags Local:x.I	Data Type	Bit	Description
.Data[0]	INT	-	ASIC Scan Update Counter
.Data[1]	INT	-	Ch1 Weight Value
.Data[2]	INT	-	Ch2 Weight Value
.Data[3]	Bit	0	Ch1 Sign Bit (0 = positive, 1 = negative)
		1	Ch2 Sign Bit (0 = positive, 1 = negative)
		2	AD Trim Mode Bit (0 = Run Mode, 1 = Trim Mode)
		3	Average Complete Bit

OUTPUT IMAGE TAGS

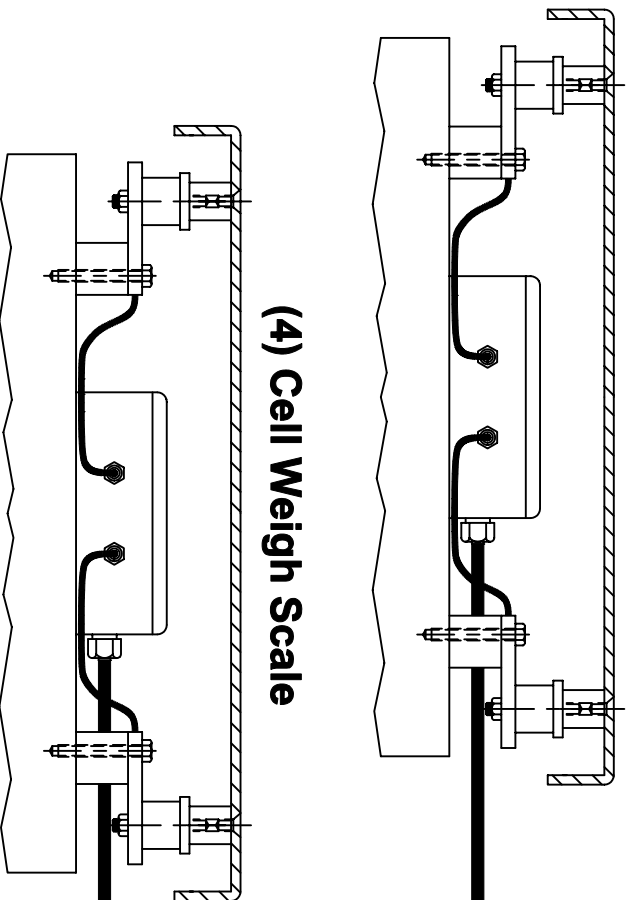| Data Tags Local:x.O	Data Type	Bit	Description
.Data[0]	Bit	0	Write Config Data Bit
	Bit	1	Run Mode Bit (1 = Run Mode, 0 = Config Data Mode)
	Bit	2	Read Config Data Bit
	Bit	3	Zero Stabilize On Bit (in Run Mode)
	Bit	4	No Flicker On Bit (in Run Mode)
	Bit	5	Vibration Filter On Bit (in Run Mode)
	Bit	6	-
	Bit	7	Up Course Zero Bit (Use Bit 15 for channel select) (in Run Mode)
	Bit	8	-
	Bit	9	Clear Average Bit (in Run Mode)
	Bit	10	-
	Bit	11	-
	Bit	12	Down Course Zero Bit (Use Bit 15 for channel select) (in Run Mode)
	Bit	13	Clear Tare Offset Bit (Use Bit 15 for channel select) (in Run Mode)
	Bit	14	Set Tare Offset Bit (Use Bit 15 for channel select) (in Run Mode)
	Bit	15	Channel Select Bit (0 = Ch1, 1 = Ch2) (in Run Mode)

CONFIGURATION DATA

Data Tags Message	Data Type	Bit	Description
.Data[0]	INT	-	-
.Data[1]	INT	-	Set Ch1 Scale value
.Data[2]	INT	-	Set Ch1 mV/V value (mV/V x 1000)
.Data[3]	INT	-	Set Ch1 AD Trim value
.Data[4]	INT	-	Set Ch2 mV/V value(mV/V x 1000)
.Data[5]	INT	-	Set Ch2 AD Trim value
.Data[6]	INT	-	Set Samples count
.Data[7]	INT	-	Set Ch2 Scale value
.Data[8]	INT	-	-
.Data[9]	INT	-	-

STATUS REPORT DATA

Data Tags Message	Data Type	Bit	Description
.Data[0]	INT	-	-
.Data[1]	INT	-	Current Ch1 Scale value
.Data[2]	INT	-	Current Ch1 mV/V value (mV/V x 1000)
.Data[3]	INT	-	Current Ch1 AD Trim value (Factory Use Only)
.Data[4]	INT	-	Current Ch2 mV/V value(mV/V x 1000)
.Data[5]	INT	-	Current Ch2 AD Trim value (Factory Use Only)
.Data[6]	INT	-	Current Samples count
.Data[7]	INT	-	Current Ch2 Scale value
.Data[8]	INT	-	-
.Data[9]	INT	-	-

HELM Model *HM-1756-WM* Transducer Connections

(4) Cell Weigh Scale

(4) Cell Weigh Scale

STRAIN GAGE INPUT

STATUS
ALARM
OK

TRIM VALUES
CH1-13300 / CH2-13300

-S CH2
SHIELD
+S CH2
-GAGE
+GAGE
-S CH1
SHIELD
+S CH1
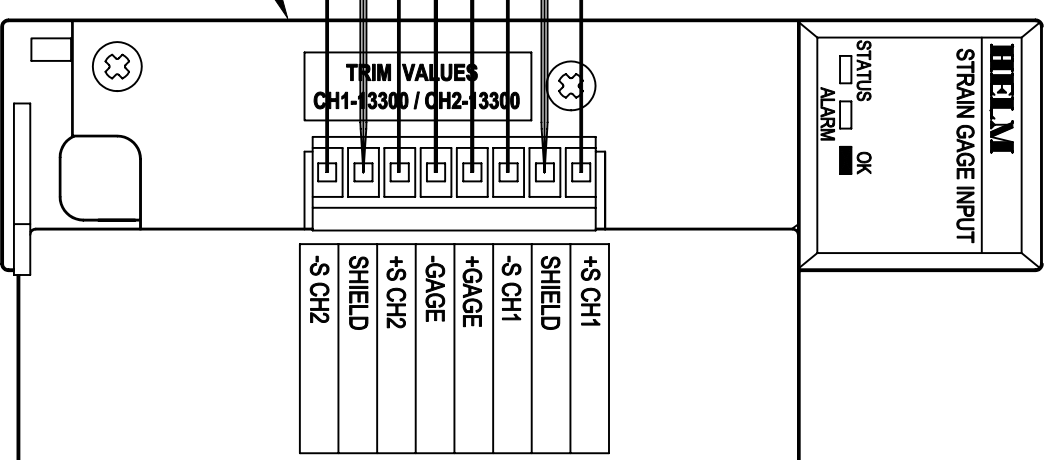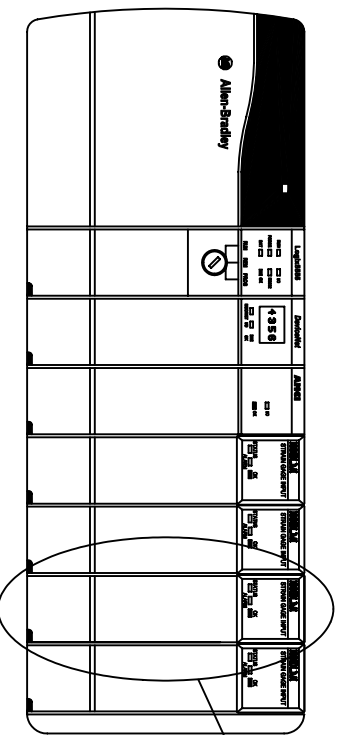
NOTES:

1.) 1756 MODULES CAN ACCEPT STRAIN GAGE INPUTS FROM 175 OHMS/CHANNEL TO 1200 OHMS/CHANNEL.
2.) THIS EXAMPLE SHOWS (4) 1100 OHM CELLS WIRED IN PARALLEL, FOR A FINAL INPUT OF 275 OHMS.

SCALE:	NONE	
DATE: 07/16/09	DESIGNED BY: N.F.N.	DRAWN BY: M.H.L.
TITLE: HM-1756-WM	CHECKED BY: N.F.N.	DRAWN BY: R.J.G.
DRAWER:	HM-1756-WM TRANSDUCER CONNECTIONS (HELM)	APPROVED BY:
		DRAWING NUMBER: E1103W02