Helm Instrument Company, Inc.
361 West Dussel Drive
Maumee, Ohio 43537 USA
419/ 893-4356
Fax: 419/ 893-1371
www.helminstrument.com

HM-1756-SGI-TSM
Strain Gage Input Module

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.

ATTENTION: Please refer to accompanying manuals
Strain Gage Installation and Helm ControlLogix Navigator Software
for additional information on the application of the Helm HM-1756-SGI-TSM module.

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.

RELATED DOCUMENTATION

Additional documents containing information that may be helpful to you as you use Allen-Bradley ControlLogix products may be found at http://www.ab.com/manuals/cl/ or from your local distributor.

TERMS AND ABBREVIATIONS

The following terms and abbreviations are used throughout this manual. For definitions of terms not listed here refer to *Allen-Bradley's Industrial Automation Glossary*, Publication ICCG-7.1.

Bypass Mode - Enabled to perform calibration and setup procedures.

Calibration - Procedure, performed by trained personnel, where machine or press is dynamically loaded to impact on load cells. A process of linearity measuring to determine the loading capacity of the machine.

Calibration Number - Amplification values established during machine calibration or pre-assigned on force load cells.

Channel - Refers to one of two, strain gage inputs available on the modules terminal block.

Chassis - A hardware assembly that houses devices such as I/O modules, adapter modules, processor modules, and power supplies.

Configuration Word - Contains the channel configuration information needed by the module to configure and operate each channel. Information is written to the configuration word through the logic supplied in your ladder program.

Data Word - A 16-bit integer that represent the value of the analog input channel. The channel data word is valid only when the channel is enabled.

Gain - Amplification of an input signal.

Load/Force - Measurement of impact during a machine cycle. Sensors provide the input for this measurement.

Look Window - Resolver or cam activated window, which allows specific degrees in a machine cycle to be processed.

Low Alarm Inhibit - Number of consecutive machine cycles where low alarm is inhibited. Used in a process where machine cycles several times before running speed is established.

LSB - (Least Significant Bit) Refers to a data increment defined as the full scale range divided by the resolution. The bit that represents the smallest value within a string of bits.

Monitor Parts Mode - Status condition used during production run. Sample and compare logic is enabled. On resolver based systems, tracking alarm limits can be enabled.

Multiplexer - A switching system that allows several input signals to share a common A/D converter.

Peak Mode - Normally enabled during job setup.

TERMS AND ABBREVIATIONS (CONTINUED)

Sampling time - The time required by the A/D converter to sample an input channel.

Scale - Value used to describe the press/machine overall tonnage. Set for maximum value of one channel. For example, settings for a 150 ton press = 75.

Status Word - Contains status information about the channel's current configuration and operational state. You can use this information in your ladder program to determine whether the channel data word is valid.

Strokes per Minute (SPM) - Value calculated when a machine cycles through a complete rotation (0 to 360 degrees).

Update Time - The time required for the module to sample and convert the input signals of all enabled input channels and make the resulting data values available to the controller.

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.

OVERVIEW

You have just purchased the most advanced strain gage input module available. HELM INSTRUMENT COMPANY, INC. manufactures a complete line of monitoring control solutions for use on metal stamping, forging, compaction and assembly presses; cold forming, cold heating, injection molding and die cast machines. Resolvers, standard or custom transducers and load cells are available for in-die monitoring of transfer or progressive tooling.

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 effective.

The Helm Strain Gage combines machine and tooling monitoring with programmable limit switch function. User programmable high and low limits protect the machine and tooling to ensure part quality.

Critical setup information can be stored and uploaded as part of a die recipe program. An optional resolver input module is used to compare machine/press tonnage to crank angle for real time signature analysis.

The Helm Strain Gage module is attached to the controller or to an adjacent I/O module on the din rail. The system is comprised of two parts; the input module and two Helm Strain gage based sensors.

The primary part of the load monitoring system centers around the measurement. The basic function of the Helm Strain Gain sensor is to detect the amount of deflection imposed on the press or die as parts are being formed. All Strain Gain sensors are matched to within 1% and therefore can be replaced without recalibration of the machine.

The Helm Strain Gain sensors can be mounted to strategic high stress areas of the machine frame or strategically located in tooling or applied to stop blocks. Signals from these sensors are routed to the Strain Gage module for processing. The Helm Strain Gage is capable of measuring either a tension or compression signal.

- Sample and Compare Logic - processor memorizes the sample or benchmark load and compares each machine cycle against this sample.
- User programmable Sample Count - selectable number of machine cycles on which to base the sample.
- High and Low Capacity Alarm Sets - a discrete load limit for a maximum allowable load and a minimum allowable load.
- High and Low Trend Alarm Sets - set as a percentage of load change on an established sample.
- Low Alarm Inhibit - User programmable option to disable low alarm during process start-up.

HARDWARE OVERVIEW

The HM-1756-SGI-TSM module fits into any single-slot. It is a Class 1 module (uses eight input words and eight output words).

The can accept 2 channels of strain gage input. Two 700 ohm gages may 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-TSM SPECIFICATIONS

Backplane Power Consumption	10W
Number of Channels	2 (isolated)
I/O Chassis Location	Any I/O module slot except 0
A/D Conversion Method	Successive Approximation - 12 bit
Normal Mode Rejection (between + input and - input)	50 db at 2000 gain
AMP roll-off frequency	650 Hz at 3000 Gain
Calibration	Manual Calibration
Isolation	500 VDC continuous between inputs and chassis ground, and between inputs and backplane
LED Indicators	STATUS, ALARM, OK
Recommended Cable	Strain Gage Cable (Helm part number 6117)

Operating Temperature	0°C to 60°C (32°F to 140°F)
Hazardous Environment Classification	Class 1 Division 2 Hazardous Environment

Type of Input	Strain Gage (350 ohm, 700 ohm)
Input Impedance	1K
Display Resolution	Up to 0.1% of full scale
Overall Module Accuracy	1% of full scale
Requested Packet Interval (RPI)	60.0ms

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 set look windows for resolver input

REQUIRED TOOLS AND EQUIPMENT

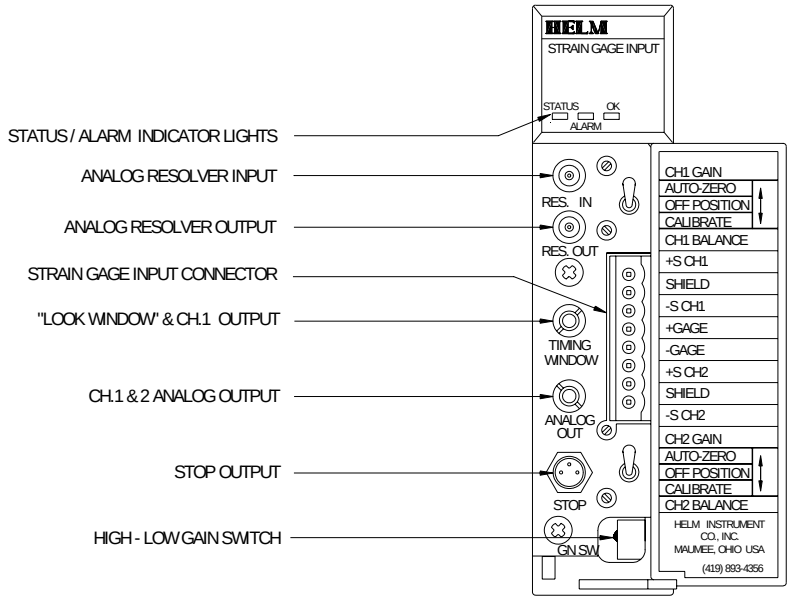
Have the following tools and equipment ready:

- 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

Status light is on (green) when module is in Peak or Monitor Parts Mode.
Status light is off when module is in Calibrate Mode.

Alarm light is off when no tonnage fault is present.
Alarm light is on (red) when tonnage fault is present.

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

Module Setup

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:

- set calibration numbers
- set meter scale
- set capacity (maximum load) alarms
- set minimum load alarms
- set sample count
- set trend alarms

Set the Run mode bit to Bypass

⇒ From your operator interface, put the tonnage module into bypass mode. (The STATUS light on the tonnage module will turn off).

Balance Sensor Input.

1. Set three-position switch to OFF (center) position.
2. Turn balance potentiometer until 0's are all displayed.
3. If two sensors are wired, follow this procedure for both channels

Calibration Numbers

1. Set three-position switch to calibrate (down) position)
2. Turn Gain Potentiometer to dial in calibration numbers.
3. If two sensors are wired, follow this procedure for both channels.

⇒ If you are using Helm Panel Software select the SET CAL NO. Menu. Adjust gain balance pot until calibration numbers are correct for channel 1 and channel 2.

Always make sure that the three-position switch is in ON (top) position for Normal operation.

The remaining setup procedures can be accomplished with the Run Mode bit in either Bypass, Peak or Monitor Parts Mode. However, the Bypass Mode should only be used when setting calibration values or zero balancing the sensor input.

Set Machine Capacity Scale

The three position switch should be placed in the ON (top) position.

This setting is based off of one channel. It represents the maximum allowable load or tonnage from one sensor location.

Setting Machine Capacity Scale using (1) two channel module:

If 2 sensors are installed on the left and right sides of a 60 ton press, set the Scale to 30 (maximum capacity of one sensor).

Use the following table as a reference for setting the Machine Capacity Scale for a single force module installation with two sensors. Divide the press/machine capacity by the number of sensors (2) and set Scale to the result.

PRESS CAPACITY	SCALE SETTING	PRESS CAPACITY	SWITCH SETTING	PRESS CAPACITY	SWITCH SETTING
20	10	30	15	40	20
45	22	50	25	60	30
80	40	110	55	150	75
...					
200	100	250	125	300	150

If 2 sensors are installed in the tooling rather than on the press structure, set the Machine Capacity Scale to the highest load/tonnage of one sensor.

Setting Machine Capacity Scale for multiple channel systems.

Divide the Machine capacity by the number of sensors and set Machine Capacity Scale on all modules to the result.

Example: If 2 load modules are used for monitoring a straight side press with 4 sensors mounted on the press columns, set the Machine Capacity Scale on both modules to the highest load/tonnage of one sensor.

Use the following table as a reference for setting the Machine Capacity Scale for a system comprised of (2) force modules and (4) sensors.

PRESS CAPACITY	SWITCH SETTING (same on all modules)	PRESS CAPACITY	SWITCH SETTING (same on all modules)	PRESS CAPACITY	SWITCH SETTING (same on all modules)
100	25	125	31	150	37
175	43	200	50	250	62
275	68	300	75	350	87
400	100	450	112	500	125
...					
800	200	1000	250	1200	300

Set Capacity Alarms

This value is a discrete load/tonnage value, not a percentage.

NOTE: Although the range of values for capacity alarm settings is 0 to 9999, it is recommended that you do not enter values that exceed the capacity rating of the machine/press. A value of 0 disables capacity alarm set.

To determine the maximum rating for each channel, divide the total machine/press capacity by the number of sensor inputs. EXAMPLE: A press or slide rated at 100 tons with a (2) channel force module would have a capacity alarm setting of 50 tons per sensor input.

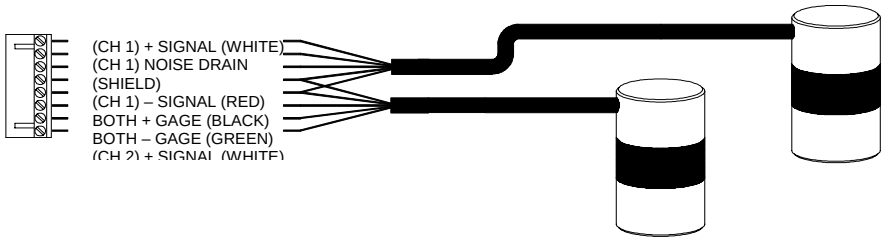
This setting differs from the Scale setting as it can be adjusted up or down depending on the nature of the process. The recommended maximum value is 195% of Machine Capacity Scale.

Set Sample Count

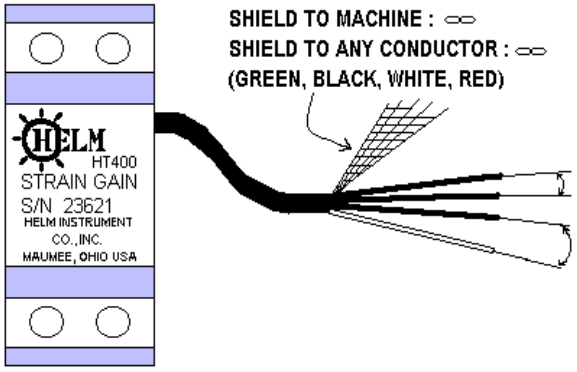
The sample count is a user programmable parameter that tells the processor how many machine strokes are required to establish sample or benchmark load values. The programmable values are 2, 4, 8,or 16. A value of 0 invalidates the Monitor Parts mode. You should set Sample Count to a minimum of 2 to enable Monitor Parts mode.

Note: Each time you change Monitor Parts mode bit from ON to OFF, the sample value is cleared. During normal operations, Monitor Parts mode is enabled when beginning a process run. If the process varies due to change in material thickness, for example, it may be necessary to take a new sample.

SENSOR WIRING



	Tension Operation	Compression Operation
Green (+ Gage)	Green	Black
Black (- Gage)	Black	Green
White (+ Signal)	White	White
Red (- Signal)	Red	Red
Brown (Shield)	Shield	Shield



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.

HT-400 "STRAIN GAIN" SENSOR

HM-1756 SGI-TSM MODULE DATA TAGS

INPUT IMAGE DATA TAGS

INPUT IMAGE DATA TAGS

Data Tags Local:x.I	Data Type	Bit	Description
.Data[0]	INT	-	Update Counter
.Data[1]	INT	-	ASIC Fault Code
.Data[2]	INT	-	Ch1 Peak value in Ton (in PEAK or MONITOR Mode) Ch1 Calibrate number (in CALIBRATE Mode)
.Data[3]	INT	-	Ch2 Peak value in Ton (in PEAK or MONITOR Mode) Ch2 Calibrate number (in CALIBRATE Mode)
.Data[4]	INT	-	Ch1 Trend value in Percent or Ton
.Data[5]	INT	-	Ch2 Trend value in Percent or Ton
.Data[6]	INT	-	Ch1 Sample value in Ton
.Data[7]	INT	-	Ch2 Sample value in Ton
.Data[8]	INT	-	Ch1 Reverse Load in Ton
.Data[9]	INT	-	Ch2 Reverse Load in Ton
.Data[10]	Bit	0	Ch1 High Trend Alarm Indication Bit
		1	Ch1 Low Trend Alarm Indication Bit
		2	Ch2 High Trend Alarm Indication Bit
		3	Ch2 Low Trend Alarm Indication Bit
		4	Ch1 Capacity Alarm Indication Bit
		5	Ch2 Capacity Alarm Indication Bit
		6	-
		7	-
		8	Ch1 High Tracking Alarm Indication Bit
		9	Ch1 Low Tracking Alarm Indication Bit
		10	Ch2 High Tracking Alarm Indication Bit
		11	Ch2 Low Tracking Alarm Indication Bit
		12	Ch1 Press Curve Alarm Indication Bit
		13	Ch2 Press Curve Alarm Indication Bit
		14	
		15	
.Data[11]	Bit	0	Module In Calibrate Mode Indication Bit
		1	Module In Peak Mode Indication Bit
		2	Module In Monitor Mode Indication Bit
		3	Sampling in progress Indication Bit
		4	Sample Ready Indication Bit (stay On until the mode changes)
		5	Alarm Rest in progress bit
		6	
		7	
		-	
.Data[12]	INT	-	Zero calculated value for resolver Offset
.Data[13]	INT	-	Current Module report Angle
.Data[14]	INT	-	Index 1 - Wave Data
.Data[15]	INT	-	Index 2 - Wave Data
.Data[x]	INT	-	Index y - Wave Data
.Data[236]	INT	-	Index 223 - Wave Data
.Data[237]	INT	-	Index 224 - Wave Data
.Data[238]	INT	-	Wave Type Indication 101 = Ch1 Current Wave 102 = Ch2 Current Wave 201 = Ch1 Sample Wave 202 = Ch2 Sample Wave 300 = Press Curve
.Data[239]	INT	-	Update Count
.Data[240]	INT	-	High AD value
.Data[241]	INT	-	Peak value in Ton
.Data[242]	INT	-	Low AD value
.Data[243]	INT	-	Wave data error check sum
.Data[244]	INT	-	Alarm angle value for tracking alarm
.Data[245]	INT	-	Tonnage value at the alarm angle for tracking alarm

OUTPUT IMAGE TAGS

Data Tags Local:x.O	Data Type	Bit	Description
.Data[0]	Bit	0	Set Resolver Offset
	Bit	1	Alarm Reset
	Bit	2	Reslover Input Calibration Bit (Factory use Only)
	Bit	3	
	Bit	4	
	Bit	5	
	Bit	6	
	Bit	7	
	Bit	8	Set Calibrate mode
	Bit	9	Set Peak mode
	Bit	10	Set Monitor Mode
	Bit	11	
	Bit	12	
	Bit	13	
	Bit	14	
	Bit	15	
.Data[1]	INT	-	Resolver Stored Offset Value
.Data[2]	INT	-	Set Resolver Preset Value
.Data[3]	INT	-	Wave xfer Request 101 = Ch1 Current Wave 102 = Ch2 Current Wave 201 = Ch1 Sample Wave 202 = Ch2 Sample Wave 300 = Press Curve
.Data[4]	INT	-	Set Scale Value
.Data[5]	INT	-	Set Look Window Start Degree Value
.Data[6]	INT	-	Set Look Window Step Value (2, 4, 6, 8, 10, 12)
.Data[7]	INT	-	*SET CH1 HIGH CAPACITY ALARM VALUE*
.Data[8]	INT	-	*SET CH2 HIGH CAPACITY ALARM VALUE*
.Data[9]	Bit	0	Press Curve Alarm On/Off
	Bit	1	Tracking Alarm On/Off
	Bit	2	Trend Alarm On/Off
	Bit	3	Delta Track On/Off
	Bit	4	Alarm Value type (1 = Tolerance in Ton, 0 = Tolerance in Percent)
	Bit	5	AMPTRACK On/Off
	Bit	6	
	Bit	7	8000 DP On/Off
	H Byte	-	
.Data[10]	L Byte	-	Set Sample Count
	H Byte	-	
.Data[11]	L Byte	-	Set Low Alarm Inhibit Count
	H Byte	-	
.Data[12]	INT	-	Alarm Start Degree Value (Tracking alarm only)
.Data[13]	INT	-	Alarm Stop Degree Value (Tracking alarm only)
.Data[14]	L Byte	-	Set Ch1 Low Tolerance value
	H Byte	-	Set Ch1 High Tolerance value
.Data[15]	L Byte	-	Set Ch2 Low Tolerance value
	H Byte	-	Set Ch2 High Tolerance value
.Data[16]	L Byte	-	Set Thresh Hold for Tracking Alarm (In Percent)
	H Byte	-	
.Data[17]	INT	-	Press Curve Input Value in 0 degree
.Data[18]	INT	-	Press Curve Input Value in 10 degree
.Data[x]	INT	-	Press Curve Input Data in y degree
.Data[51]	INT	-	Press Curve Input Value in 340 degree
.Data[52]	INT	-	Press Curve Input Value in 350 degree

TAG “TONCOMMONCONTROL” FORMAT (THRU-STROKE ONLY)

Tag Index	Data Type	Bit	Description
[0]	Bit	0	Set Module to Calibration Mode
	Bit	1	Set Module to Peak Mode
	Bit	2	Set Module to Monitor Part Mode
[1]	INT	-	Alarm Reset (0 = Normal, 1 = Reset)
[2]	INT	-	Set Resolver Offset (0 = Normal, 1 = Set)
[3]	INT	-	Set Resolver Preset Value
[4]	INT	-	Current Mode Reported from Module (1 = Cal, 2 = Peak, 3 = Monitor Parts)
[5]	INT	-	Current Resolver Angle
[6]	INT	-	SPM
[7]	INT	-	SYSTEM SETUP BITS
	Bit	0	Disable Wave Transfer Bit (0 = Enabled, 1 =Disabled)
	Bit	1	Enable Wave Data Checksum (0 = Disabled, 1 = Enabled)
	Bit	2	Reslover Input Calibration Bit (Factory use Only)
	Bit	3	
	Bit	4	
	Bit	5	
	Bit	6	
[8]	INT	-	
[9]	INT	-	
[10]	INT	-	*Stroke Counter
[11]	INT	-	Module Update Counter
[12]	INT	-	
[13]	INT	-	SAMPLING IN PROGRESS BITS
	Bit	0	Module 1 in Sampling Indication Bit
	Bit	1	Module 2 in Sampling Indication Bit
	Bit	2	Module 3 in Sampling Indication Bit
	Bit	3	Module 4 in Sampling Indication Bit
	Bit	4	Module 5 in Sampling Indication Bit
	Bit	5	Module 6 in Sampling Indication Bit
	Bit	6	Module 7 in Sampling Indication Bit
	Bit	7	Module 8 in Sampling Indication Bit
	Bit	8	Module 9 in Sampling Indication Bit
	Bit	9	Module 10 in Sampling Indication Bit
[14]	INT	-	SAMPLE READY BITS (bits stays on until the mode changes to peak or cal)
	Bit	0	Sample Ready for Module 1 Indication Bit
	Bit	1	Sample Ready for Module 2 Indication Bit
	Bit	2	Sample Ready for Module 3 Indication Bit
	Bit	3	Sample Ready for Module 4 Indication Bit
	Bit	4	Sample Ready for Module 5 Indication Bit
	Bit	5	Sample Ready for Module 6 Indication Bit
	Bit	6	Sample Ready for Module 7 Indication Bit
	Bit	7	Sample Ready for Module 8 Indication Bit
	Bit	8	Sample Ready for Module 9 Indication Bit
	Bit	9	Sample Ready for Module 10 Indication Bit
[15]	INT	-	TONNAGE MODULE 1 ALARM BITS
	Bit	0	Ch1 High Trend Alarm Bit for Module 1 Indication Bit
	Bit	1	Ch1 Low Trend Alarm Bit for Module 1 Indication Bit
	Bit	2	Ch2 High Trend Alarm Bit for Module 1 Indication Bit
	Bit	3	Ch2 Low Trend Alarm Bit for Module 1 Indication Bit
	Bit	4	Ch1 Capacity Alarm Bit for Module 1 Indication Bit
	Bit	5	Ch2 Capacity Alarm Bit for Module 1 Indication Bit
	Bit	6	-
	Bit	7	-
	Bit	8	Ch1 High Tracking Alarm Bit for Module 1 Indication Bit
	Bit	9	Ch1 Low Tracking Alarm Bit for Module 1 Indication Bit
	Bit	10	Ch2 High Tracking Alarm Bit for Module 1 Indication Bit
	Bit	11	Ch2 Low Tracking Alarm Bit for Module 1 Indication Bit
	Bit	12	Ch1 Press Curve Alarm Bit for Module 1 Indication Bit
	Bit	13	Ch2 Press Curve Alarm Bit for Module 1 Indication Bit
	Bit	14	
	Bit	15	

[16]	INT	-	TONNAGE MODULE 2 ALARM BITS (use index [15] for bit description)
[17]	INT	-	TONNAGE MODULE 3 ALARM BITS (use index [15] for bit description)
[18]	INT	-	TONNAGE MODULE 4 ALARM BITS (use index [15] for bit description)
[19]	INT	-	TONNAGE MODULE 5 ALARM BITS (use index [15] for bit description)
[20]	INT	-	TONNAGE MODULE 6 ALARM BITS (use index [15] for bit description)
[21]	INT	-	TONNAGE MODULE 7 ALARM BITS (use index [15] for bit description)
[22]	INT	-	TONNAGE MODULE 8 ALARM BITS (use index [15] for bit description)
[23]	INT	-	TONNAGE MODULE 9 ALARM BITS (use index [15] for bit description)
[24]	INT	-	TONNAGE MODULE 10 ALARM BITS (use index [15] for bit description)
[25]	INT	-	
[26]	INT	-	
[27]	INT	-	Ch1 Peak tonnage value for Module 1
[28]	INT	-	Ch2 Peak tonnage value for Module 1
[29]	INT	-	Ch1 Peak tonnage value for Module 2
[30]	INT	-	Ch2 Peak tonnage value for Module 2
[31]	INT	-	Ch1 Peak tonnage value for Module 3
[32]	INT	-	Ch2 Peak tonnage value for Module 3
[33]	INT	-	Ch1 Peak tonnage value for Module 4
[34]	INT	-	Ch2 Peak tonnage value for Module 4
[35]	INT	-	Ch1 Peak tonnage value for Module 5
[36]	INT	-	Ch2 Peak tonnage value for Module 5
[37]	INT	-	Ch1 Peak tonnage value for Module 6
[38]	INT	-	Ch2 Peak tonnage value for Module 6
[39]	INT	-	Ch1 Peak tonnage value for Module 7
[40]	INT	-	Ch2 Peak tonnage value for Module 7
[41]	INT	-	Ch1 Peak tonnage value for Module 8
[42]	INT	-	Ch2 Peak tonnage value for Module 8
[43]	INT	-	Ch1 Peak tonnage value for Module 9
[44]	INT	-	Ch2 Peak tonnage value for Module 9
[45]	INT	-	Ch1 Peak tonnage value for Module 10
[46]	INT	-	Ch2 Peak tonnage value for Module 10
[47]	INT	-	
[48]	INT	-	
[49]	INT	-	

HOW TO IMPLEMENT THE PROGRAM FOR HELM HM-1756-SGI-TSM TONNAGE MODULE TO YOUR PROJECT

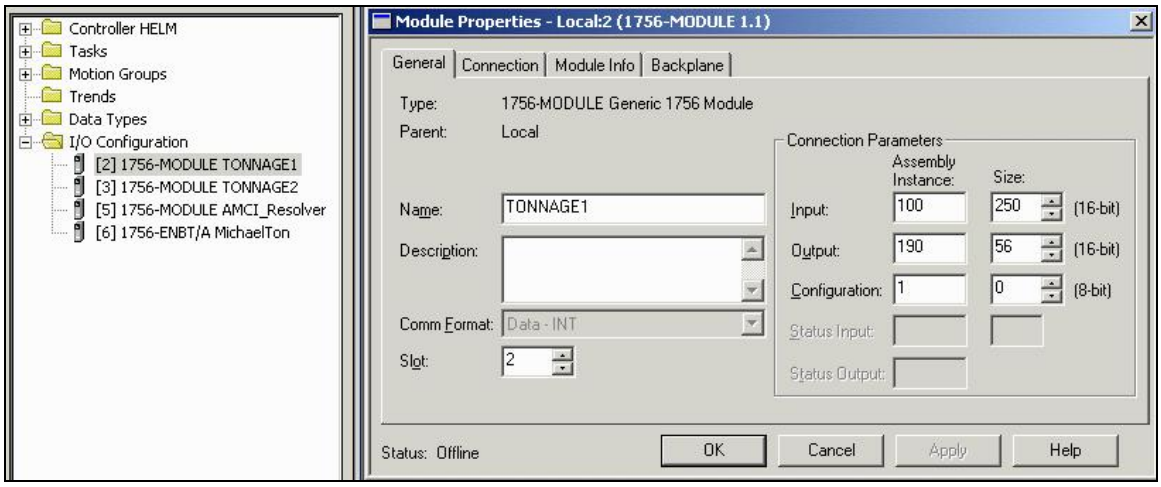
Assuming that HM-1756-SGI-TSM Modules are already located in Slot 2 and 3 of your ControlLogix Rack, follow the steps below to add the HM-1756-SGI-TSM Ladder Program to your existing ControlLogix program.

1. Start RSLogix5000 program and open your Ladder program that you want to import into.

2. Start another copy of RSLogix5000 program and open the HM-1756-SGI-TSM_4CH.ACD file provided with the module.

ADDING HM-1756-SGI-TSM MODULE TO I/O CONFIGURATION

3. Copy "[2] 1756-MODULE TONNAGE1" from I/O Configuration folder from HM-1756-SGI-TSM_4CH.ACD file and paste into I/O Configuration folder of your program.



If the Module is located in another slot, assign proper slot number from the General Tab menu of the Module Properties. Also, make sure other parameters are correct as below.

General: Connection Parameters

	Assembly Instance	Size
Input	100	250
Output	190	56
Configuration	1	0

Connection: Requested Packet Interval(RPI): 60.0ms

4. For 4Channel system, Copy "[2] 1756-MODULE TONNAGE2" from I/O Configuration folder from the HM-1756-SGI-TSM_4CH.ACD file and paste into I/O Configuration folder of your program. Make sure to set correct slot number for the module. Module Properties should be the same as the Module1 above.

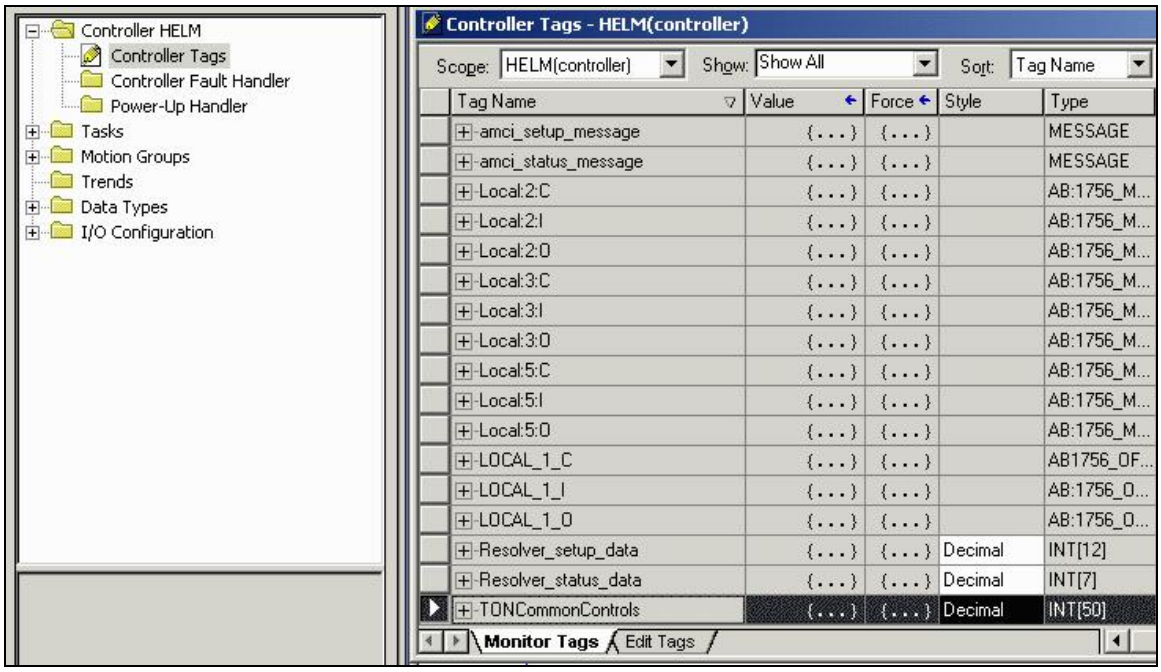
ADDING CONTROLLER SCOPE TAG

Common control tag for all HM-1756-SGI-TSM modules installed in the same rack:

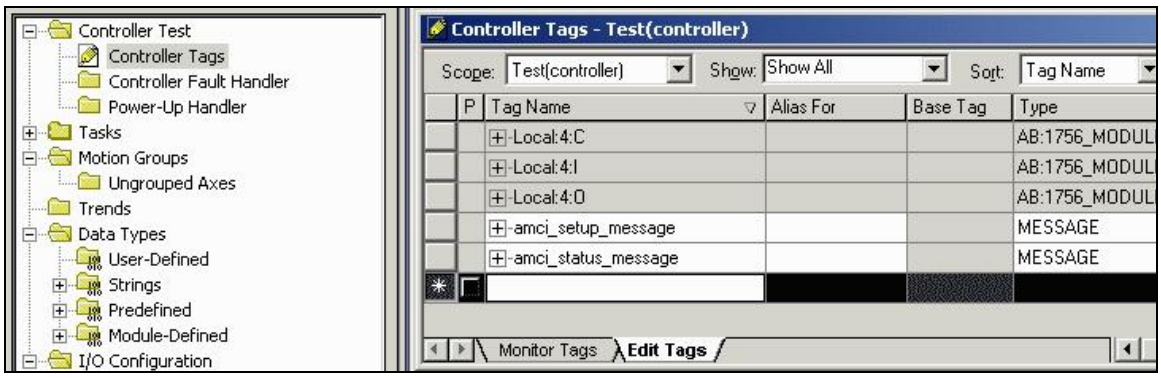
Tag Name	Scope	Type
TONCommonControls	Controller	INT[50]

You can create this tag manually or copy from HM-1756-SGI-TSM_4CH.ACD file. However, we recommend that you copy from the HM-1756-SGI-TSM_4CH.ACD file for the comments

5. To copy **TONCommonControls** tag from the HM-1756-SGI-TSM_4CH.ACD file, highlight the **TONCommonControls** tag from the HM-1756-SGI-TSM_4CH.ACD file, right click on it to bring drop down menu, and click Copy.



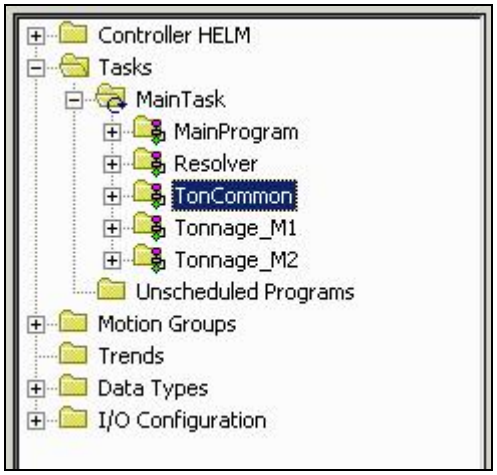
6. To paste the tag, right click on "*" at the bottom of the Edit Tags list of you program and click on Paste.



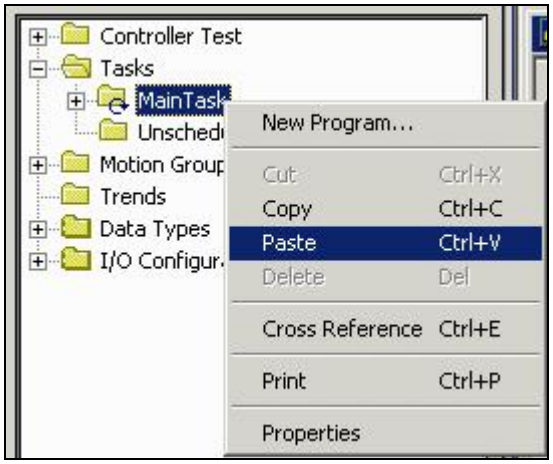
ADDING PROGRAMS TO MAIN TASK FOR EACH TONNAGE MODULE

You need to copy **TonCommon**, **Tonnage_M1**, and **Tonnage_M2** (for 4 channel system) from MainTask folder.

7. Right click on **TonCommon** task folder from the HM-1756-SGI-TSM_4CH.ACD file, and click Copy from the drop down menu.



8. Right click on MainTask of your program, and click on Paste from the drop down menu.

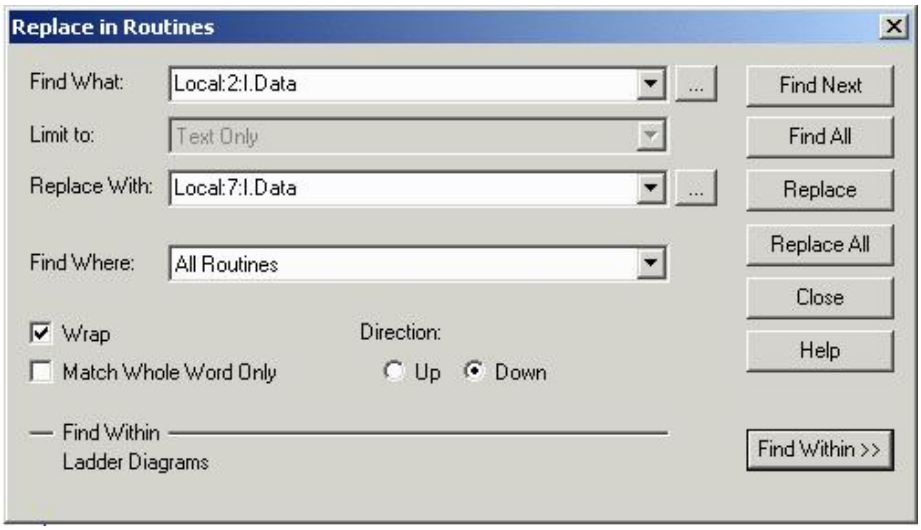


9. Repeat Step 7 – 8 to add **Tonnage_M1** and **Tonnage_M2** (for 4 channel system)

MODIFING TONNAGE LADDER PROGRAM FOR DIFFERENT SLOT CONFIGURATION

Because the HM-1756-SGI-TSM_4CH.ACD file is configured as Tonnage Module1 at slot no.2 and Tonnage Module2 at slot no.3, you must modify your program to work with the new slot configuration you may have changed for your project.
* Note: Before you use Replace option, make sure that the Tonnage module slot numbers (Slot 2, 3) are not already assigned in your program by other Modules.

10. From Search menu on top, click on **Replace** option.



11. Type "**Local:2:I.Data**" for *Find What:* box.
    Type "**Local:X:I.Data**" for *Replace With:* box where "X" is the actual slot number of the tonnage Module 1.
    Select **All Routines** for *Find Where:* box
    Click **Replace All** button.

12. Type "**Local:2:O.Data**" for *Find What:* box.
    Type "**Local:X:O.Data**" for *Replace With:* box where "X" is the actual slot number of the tonnage Module 1.
    Select **All Routines** for *Find Where:* box
    Click **Replace All** button.

13. Do the same steps for Tonnage module 2.
    Type "**Local:3:I.Data**" for *Find What:* box.
    Type "**Local:X:I.Data**" for *Replace With:* box where "X" is the actual slot number of the tonnage Module 2.
    Select **All Routines** for *Find Where:* box
    Click **Replace All** button.

14. Type "**Local:3:O.Data**" for *Find What:* box.
    Type "**Local:X:O.Data**" for *Replace With:* box where "X" is the actual slot number of the tonnage Module 2.
    Select **All Routines** for *Find Where:* box
    Click **Replace All** button.

This will complete the procedure to import the necessary programs and tags for HM-1756-SGI-TSM tonnage module to your existing program. If your Rack requires AMCI Resolver module, please proceed to following steps.

ADDING AMCI RESOLVER MODULE TO I/O CONFIGURATION

15. Copy "[5] 1756-MODULE AMCI_Resolver" from I/O Configuration folder from HM-1756-SGI-TSM_4CH.ACD file and paste into I/O Configuration folder of your program. (refer to Step 3)

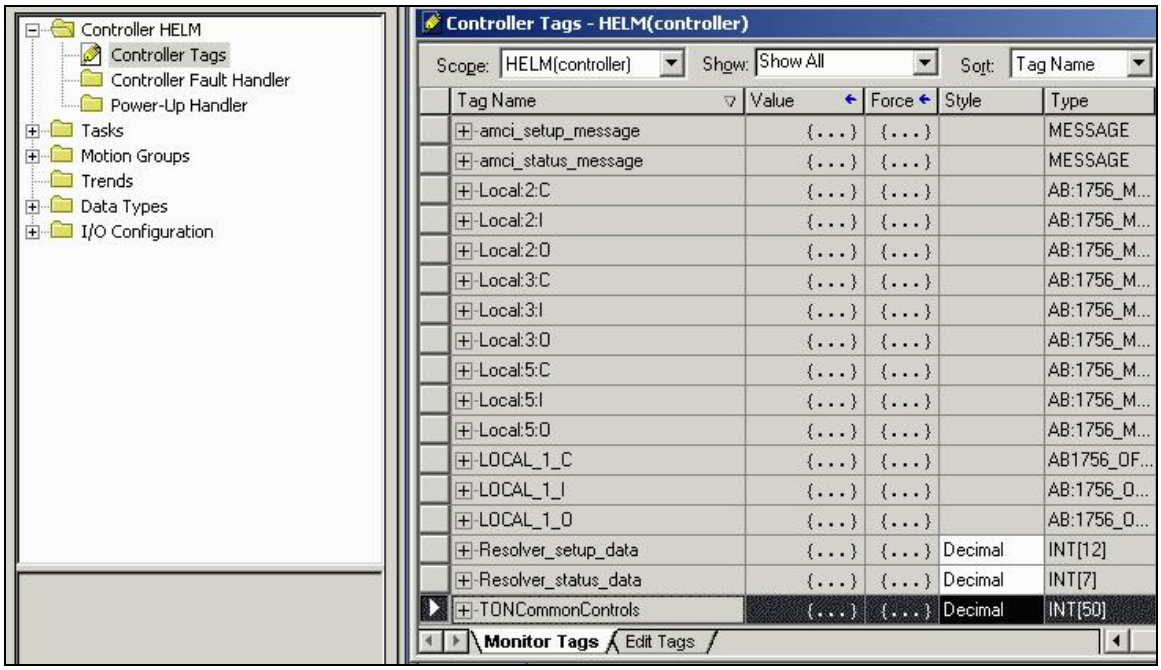
    Normally, you do not need to change any configuration parameters other than the slot number. However, for detail I/O Configuration setup information for this module, please refer to AMCI Resolver Module manual.

ADDING CONTROLLER SCOPE TAG

Control tag for AMCI Resolver module:

Tag Name	Scope	Type
amci_setup_message	Controller	MESSAGE
amci_status_message	Controller	MESSAGE
Resolver_Setup_data	Controller	INT[12]
Resolver_status_data	Controller	INT[7]

16. To copy these tags from the HM-1756-SGI-TSM_4CH.ACD file, highlight one tag at a time from the HM-1756-SGI-TSM_4CH.ACD file, right click on it to bring drop down menu, and click Copy.



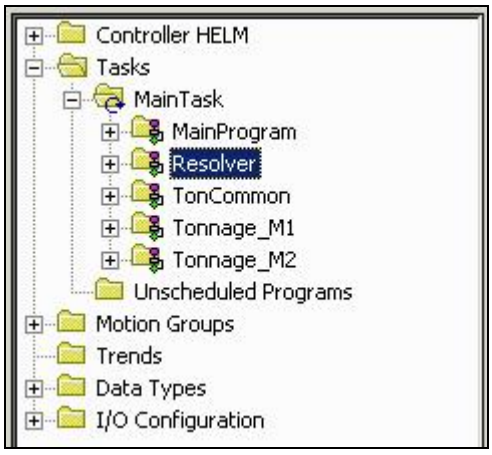
17. To paste copied tag, right click on "*" at the bottom of the Edit Tags list on Controller Tags of you program and click on Paste.

18. Repeat the steps 16-17 above to copy all 4 tags.

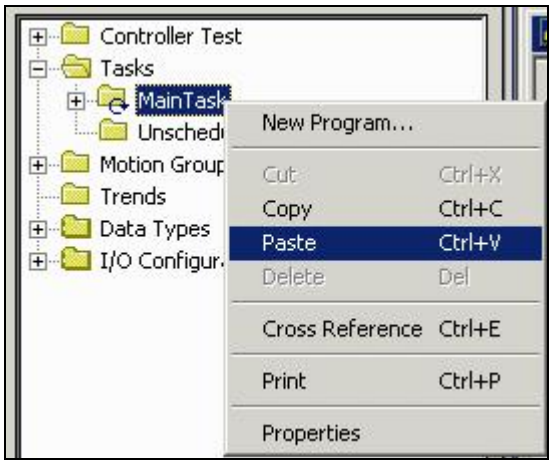
ADDING RESOLVER PROGRAMS TO MAIN TASK

You need to copy **Resolver** from the MainTask folder.

19. Right click on **Resolver** task folder from the HM-1756-SGI-TSM_4CH.ACD file, and click Copy from the drop down menu.

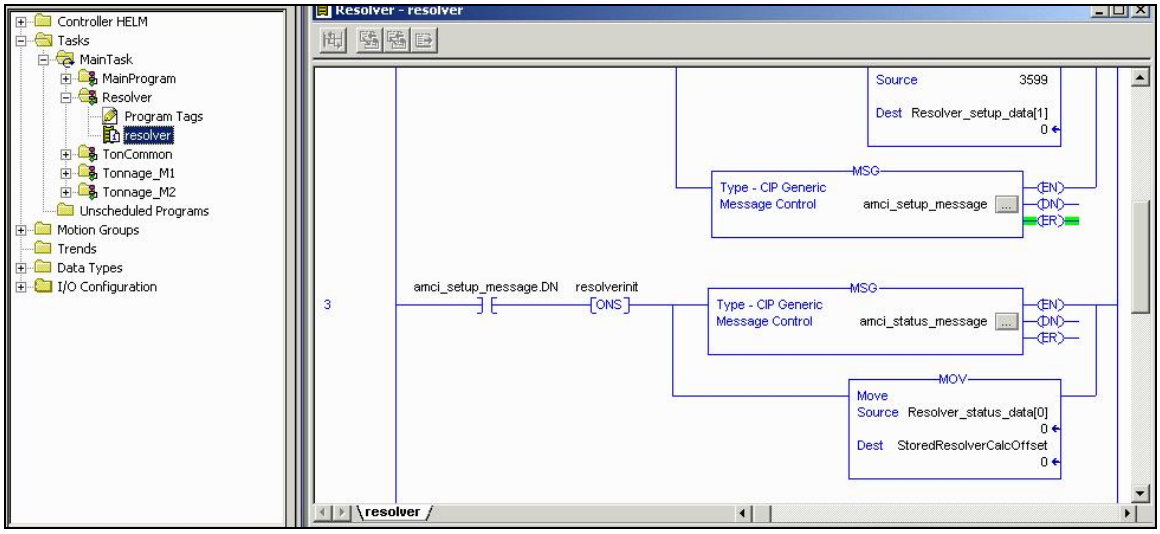


20. Right click on MainTask of your program, and click on Paste from the drop down menu.

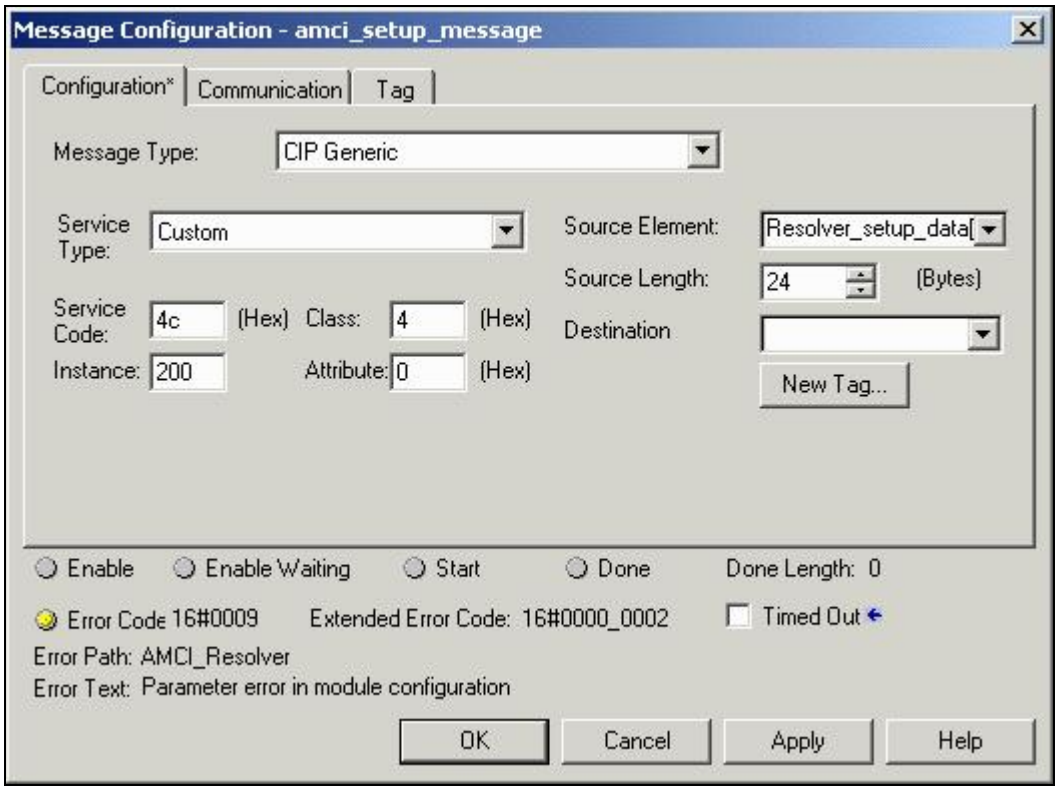


CONFIGURING MESSAGE TAGS: AMCI_SETUP-MESSAGE

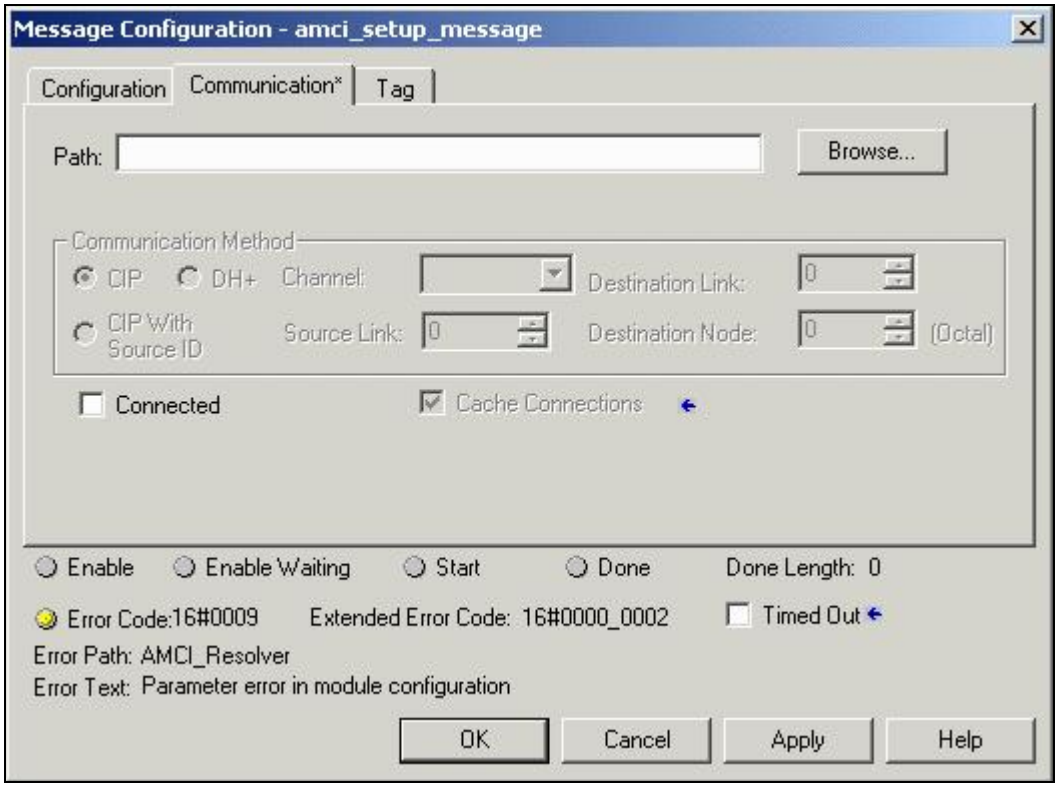
21. Open **Resolver** program window, and go to Rung 2. Click on the button(…) next to **amci_setup_message** tag on Rung 2 to bring Message Configuration screen.



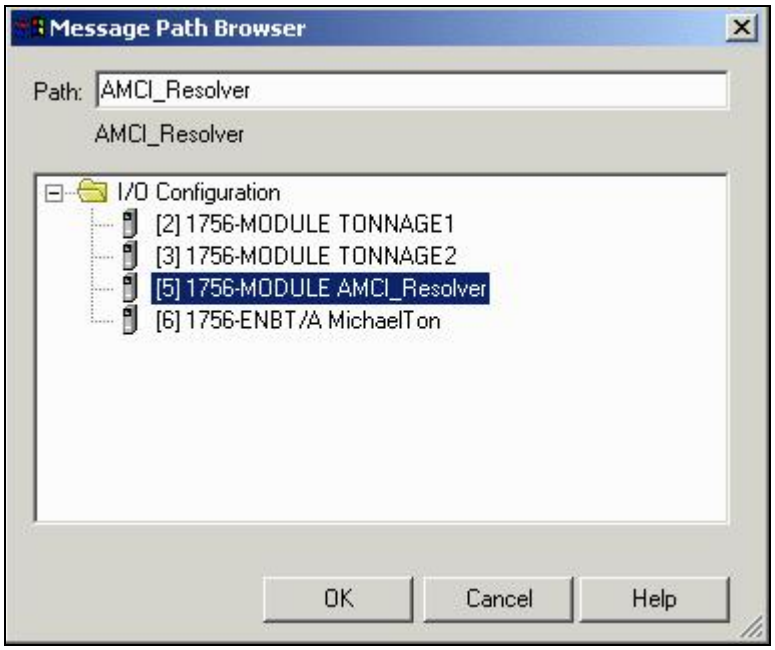
22. From *Configuration* tab screen, Select **Resolver_setup_data[0]** for *Source Element*. Also, make sure all other parameters are the same as below



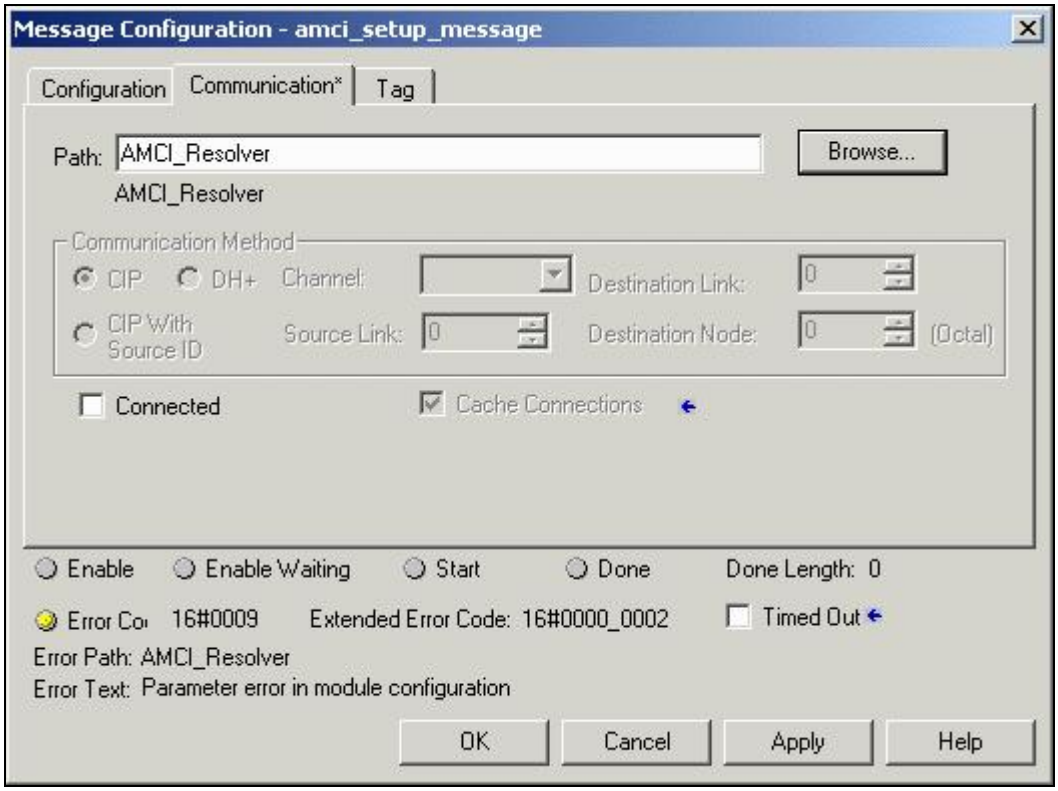
23. Go to *Communication* tab screen, and click on **Browse** button to select the path.



24. Select **1756-MODULE AMCI_Resolver** from Message Path Browser screen, and click Ok

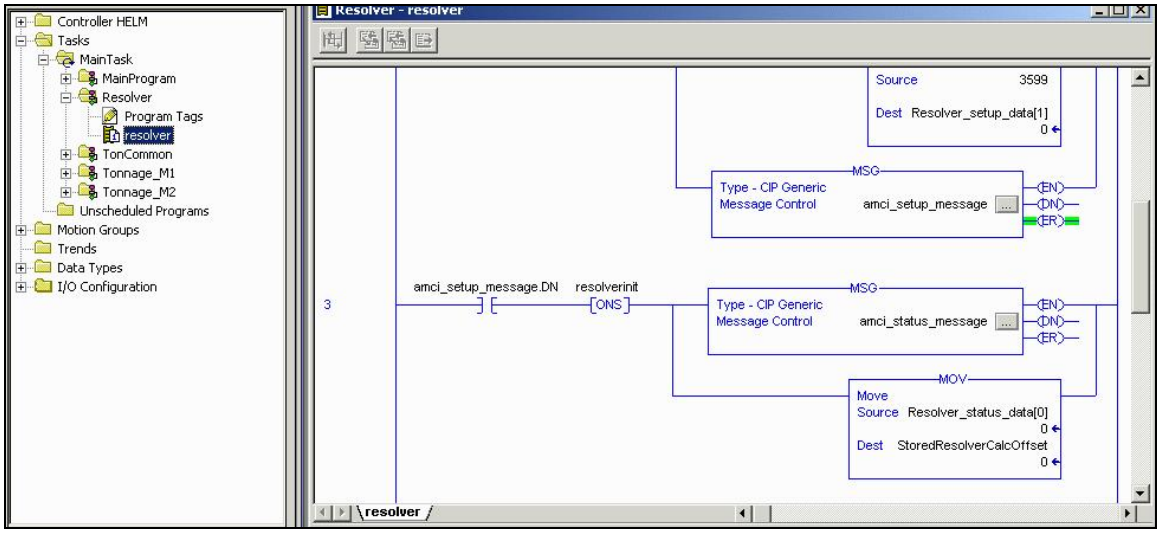


25. Click Apply button at the bottom. and click Ok button to exit the Message Configuration screen.

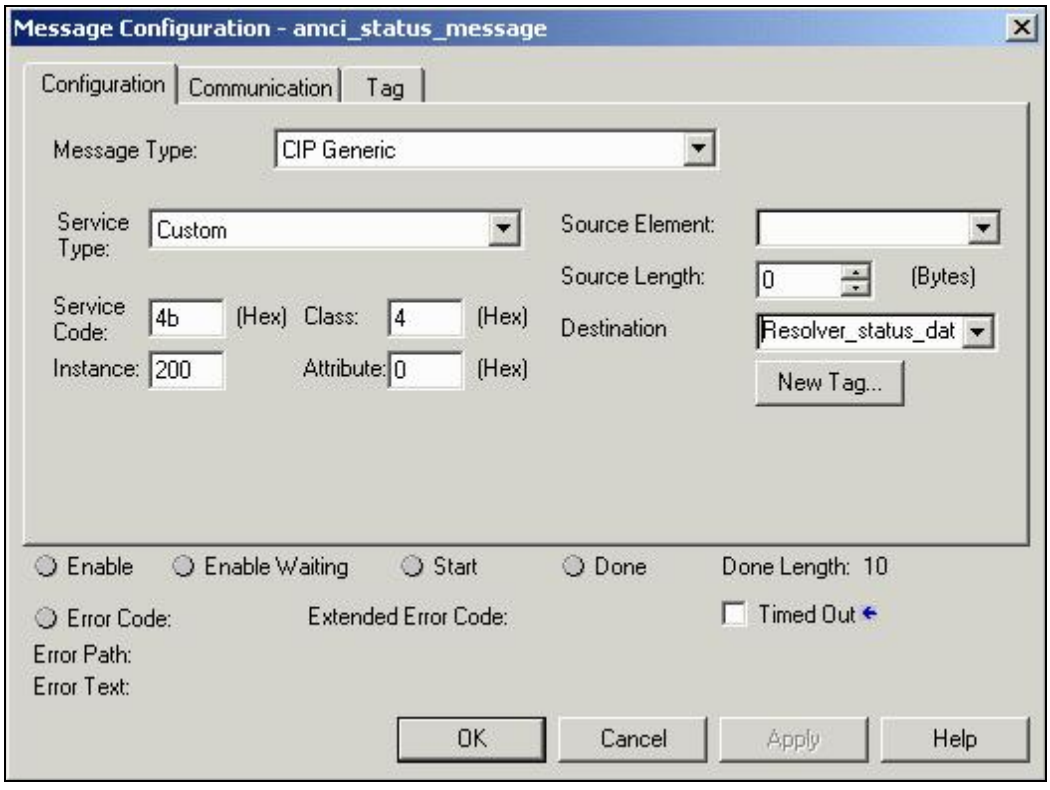


CONFIGURING MESSAGE TAGS: AMCI_STATUS_MESSAGE

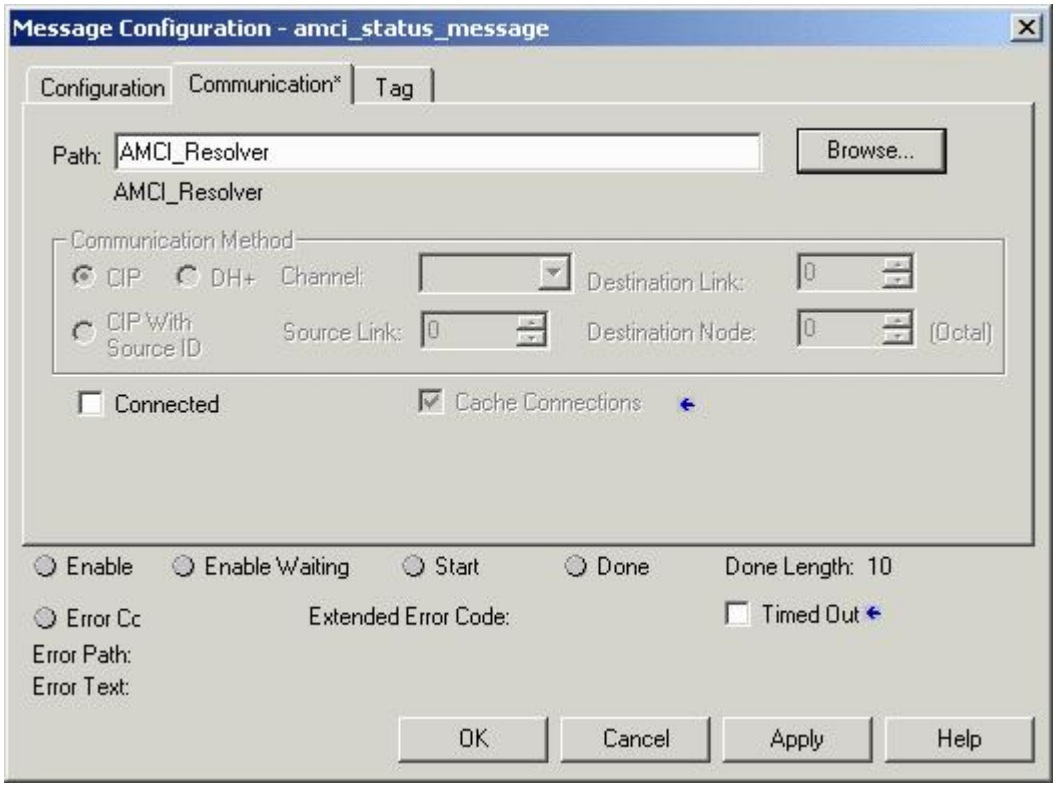
26. Open **Resolver** program window, and go to Rung 3. Click on the button(…) next to **amci_status_message** tag on Rung 3 to bring Message Configuration screen.



27. From *Configuration* tab screen, Select **Resolver_status_data[0]** for *Destination*:. Also, make sure all other parameters are the same as below



28. From *Communication* tab, type “AMCI_Resolver” for *Path* input box, or click on **Browse** button to select **1756-MODULE AMCI_Resolver** from Message Path Browser screen.



Click Apply button at the bottom, and click Ok button to exit the Message Configuration screen.

MODIFING RESOLVER LADDER PROGRAM FOR DIFFERENT SLOT CONFIGURATION

Because the HM-1756-SGI-TSM_4CH.ACD file is configured as AMCI Module at slot no.5, you must modify your program to work with the new slot configuration you may have changed for your project.
* Note: Before you use Replace option, make sure that original AMCI Resolver module slot number (Slot 5) is not already assigned in your program by other Modules.

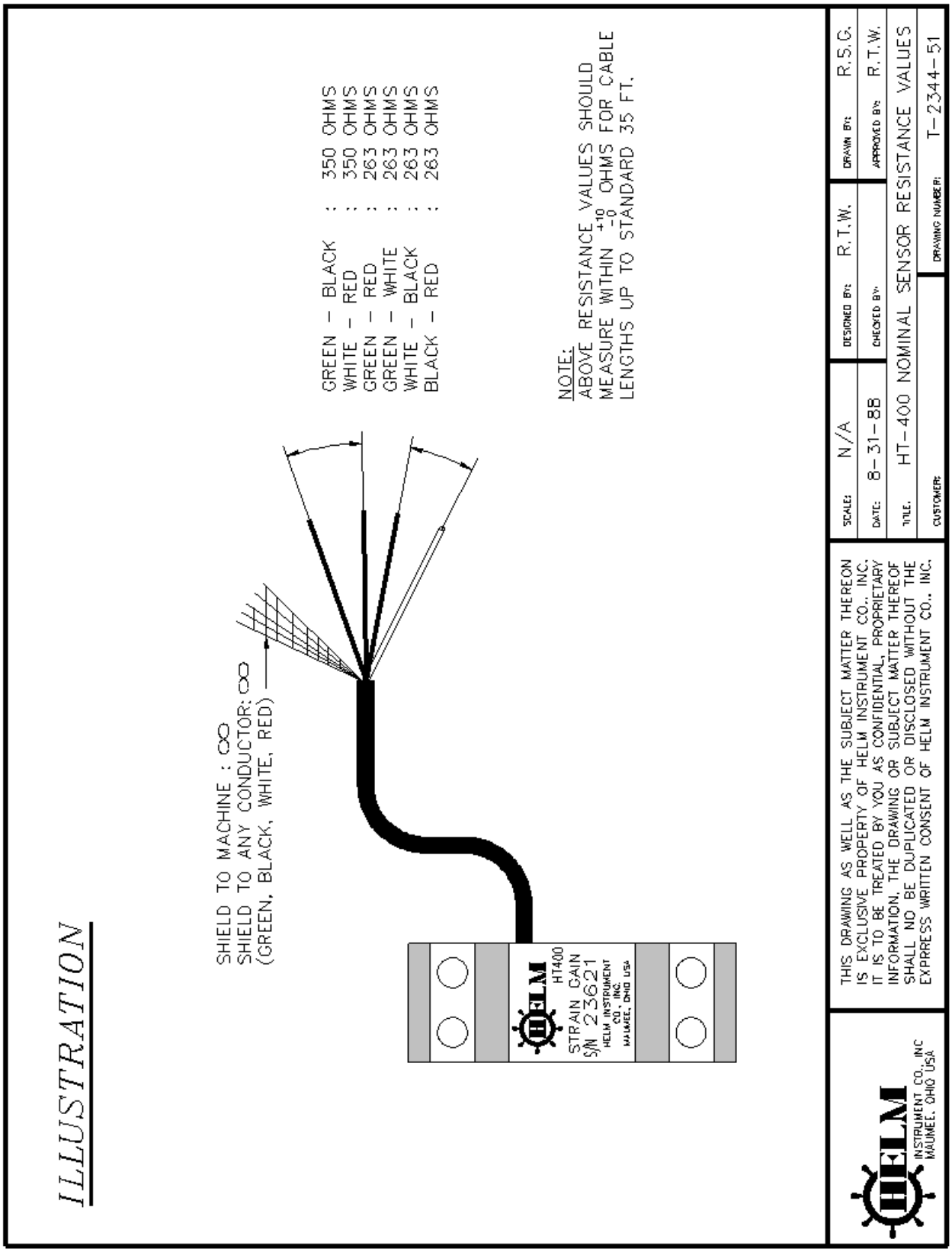
29. From Search menu on top, click on **Replace** option.

30. Type “**Local:5:I.Data**” for *Find What:* box.
    Type “**Local:X:I.Data**” for *Replace With:* box where “X” is the actual slot number of the AMCI Resolver Module.
    Select **All Routines** for *Find Where:* box
    Click **Replace All** button.

31. Type “**Local:5:O.Data**” for *Find What:* box.
    Type “**Local:X:O.Data**” for *Replace With:* box where “X” is the actual slot number of the AMCI Resolver Module.
    Select **All Routines** for *Find Where:* box
    Click **Replace All** button.

This will complete the procedure to import the necessary programs and tags for AMCI Resolver module to your existing program.

Appendix A
Sensor Wiring



Appendix B
System Wiring Overview