BLH Nobel-1756-WM
Plug In Weighing Module

for 1756 ControlLogix® Chassis

Technical Manual

BLH NOBEL
A VPG Brand

CONTENTS

PRECAUTIONS

READ this manual BEFORE operating or servicing this instrument. FOLLOW these instructions carefully. SAVE this manual for future reference.

WARNING

Only permit qualified personnel to install and service this instrument. Exercise care when making checks, tests and adjustments that must be made with power on. Failing to observe these precautions can result in bodily harm.

DO NOT allow untrained personnel to operate, clean, inspect, maintain, service, or tamper with this instrument.

INTENDED USE

The BLH Nobel-1756-WM is a measuring device intended for the Allen-Bradley 1756 ControlLogix® Chassis. Its basic function is to convert the signals from strain gauge transducers to useful information. Transducer excitation is included as well as parameter controlled signal processing.

NOTICE

Change description

Document revision 0: First release of this document.

1. Introduction

General

This manual will help you to get started using the BLH Nobel-1756-WM Strain Gauge 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. You will also need programming equipment (All programming examples shown in this manual demonstrate the use of Rockwell RSLogix 5000® Software).

The BLH Nobel-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. Each input channel can power up to four 350 ohm load cells in parallel.

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

Technical Data

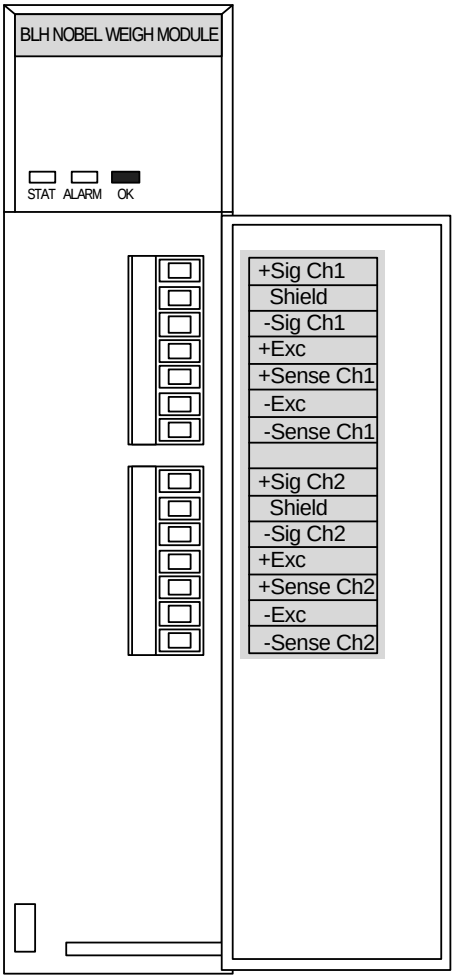
BLH Nobel-1756-WM Specifications

Backplane Power Consumption	24V @ 85 mA 5V @ 40 mA
Type of Input	Strain Gauge (max four 350 ohm load cells)
Input Impedance	10 kohm
Excitation Voltage	Approximately 4.3 VDC
Input Range	Approximately ±5.8 mV/V
Non Linearity	Less than ±0.02% of 2 mV/V within 0 – 2 mV/V
Non Linearity	Less than ±0.06% of 2 mV/V within ±4 mV/V
Number of Channels	2 (isolated)
Module Update Time	1 millisecond
A/D Conversion Method	Successive Approximation - 18 bits
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)
Input Connector	Phoenix Contact MC 1,5 / 7-ST-3,5 Phoenix Contact P/N: 1840418 Screw Connection Plug

2. 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 LED (green)

ON: Module is in run mode status.

OFF: Module is in set or read parameter mode.

ALARM LED (red)

ON: Module fault state and weight is not updating.

OFF: Module is ok and running.

OK LED (green)

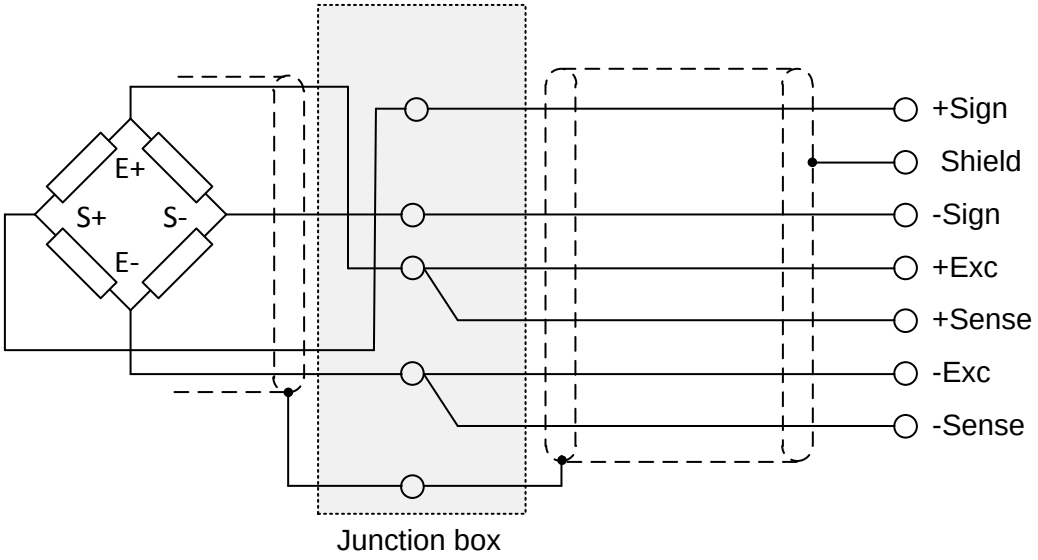
ON: PLC communication is OK.

OFF: PLC communications faulty.

Wiring

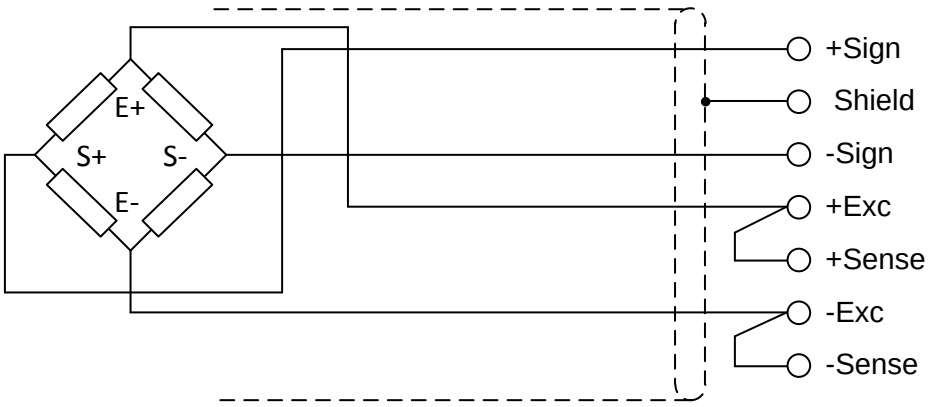
Channel 1 and channel 2 connections are made in the same way. In the pictures below no channel numbers are shown.

A 6 wire cable should always be used to connect a Junction Box to the Weighing module. A Junction Box is used when 2 to 4 load cells are connected and/or the distance between load cell and module is longer than the load cell cable itself.



6–wire connection

When only one load cells is used and the cable doesn't need to be extended a 4-wire connection can be use. In this case must a jumper be placed between Exc+ and Sense+ and another jumper between Exc-+ and Sense-. See below.



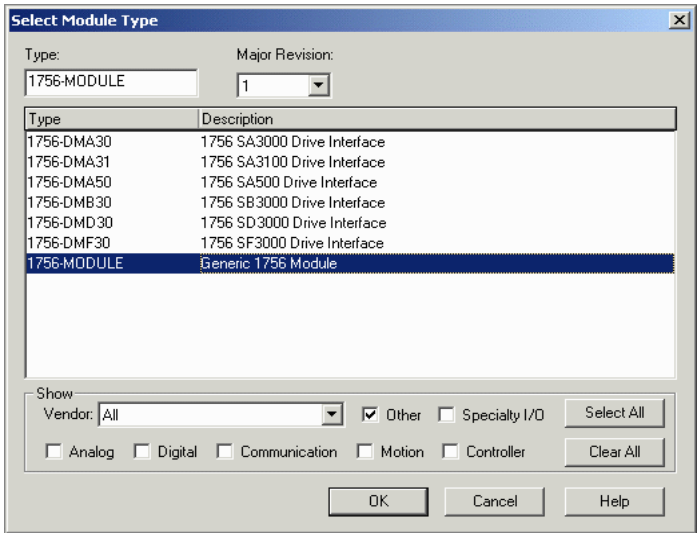
4–wire connection

3. 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 a Module to the I/O Configuration

Select **1756-MODULE Generic Module** from Select Module Type window.

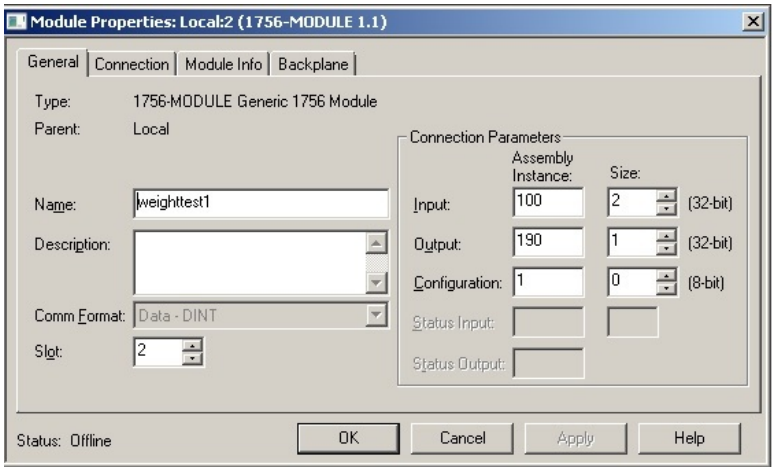


Configuration of Module Properties

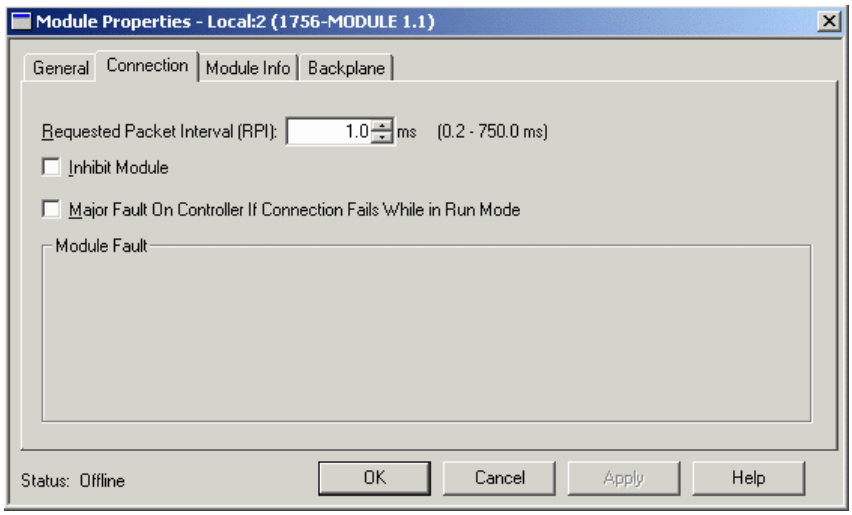
From the Controller Organizer, right click on the added module and open up Module Properties windows.

Under the General tab enter name and possible description for the module, select a slot number and enter the connection parameters.

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



Under the Connection Tab set the RPI to 1 ms. The Requested packet Interval must always be set to 1 ms since it also controls internal timing of the module.



4. Input Data

The 2 x 32-bit input data holds information from the module to the PLC. It will continuously be updated. Data consist of 2 signed integer values each 32 bits. These 2 values will normally hold the weight but can depending on settings also show raw A/D Converter value or other data.

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

X in the data tags is the slot number.

5. Output Data

The 1 x 32-bit output data holds control information from the PLC to the module. It will continuously be sent to the module. Only the 16 lower bits in the output are used and the bits 16 to 31 do not matter. Output data are bit oriented, see the table below for details.

Data Tags	Bit	Description
Local:X:O.Data[0].0	0	Run Mode
Local:X:O.Data[0].1	1	Write Configuration
Local:X:O.Data[0].2	2	Read Configuration
Local:X:O.Data[0].3	3	Enable Filter channel 1
Local:X:O.Data[0].4	4	Enable Filter channel 2
Local:X:O.Data[0].5	5	Save to EEPROM
Local:X:O.Data[0].6	6	Calibration Mode
Local:X:O.Data[0].7	7	Weigh Mode
Local:X:O.Data[0].8	8	Channel 1 Clear Tare
Local:X:O.Data[0].9	9	Channel 1 Set Tare
Local:X:O.Data[0].10	10	Channel 2 Clear Tare
Local:X:O.Data[0].11	11	Channel 2 Set Tare
Local:X:O.Data[0].12	12	Read A/D Trim / Read Cal Factor
Local:X:O.Data[0].13	13	Channel 1 Auto Tune
Local:X:O.Data[0].14	14	Channel 2 Auto Tune
Local:X:O.Data[0].15	15	Cal Factor Mode

X in the data tags is the slot number.

Output Data Bits

Run Mode:

Set this bit to 0 when configuration is to be read or written. When set to 0 weight value updates are inhibited.
When set to 1 the weight value (or ADC value) is continuously updated.

Write Configuration:

Setting this bit will have the downloaded configuration being used by the module. Note that *Run Mode* must be turned off (set bit to 0) to allow reading and writing configuration. The tare value will be cleared when writing or reading the configuration.

Read Configuration:

Setting this bit will have the configuration being read back to the PLC. Note that *Run Mode* must be turned off (set bit to 0) to allow reading and writing configuration. The tare value will be cleared when writing or reading the configuration.

Enable Filter channel 1:

Enable Filter channel 2:

Turn on or off the low pass rolling average filter for the respective channel. Setting the bit to a one will turn on the filter and setting to zero will turn it off. The number of samples is set with configuration parameter *No of Samples Averaging*. Note that there are 2 different modes for the filters which are set with configuration parameter *Standard Average*. See Configuration data chapter.

Save to EEPROM:

Set this bit to save any settings to the EEPROM memory in the module. If settings are not saved they will be lost after a PLC power cycle.

Calibration Mode:

When calibration mode is selected the *Ch1 Weight Value* and *Ch2 Weight Value* will show raw A/D values. This can be useful for diagnostics. Note that also the ADC reading is affected by the Tare function. Only one of calibration mode or Weigh mode may be set at a time.

Weigh Mode:

When calibration mode is selected the *Ch1 Weight Value* and *Ch2 Weight Value* will show weight values. The weight value is affected by the Tare function. Only one of calibration mode or Weigh mode may be set at a time.

Channel 1 Clear Tare:

Channel 1 Set Tare:

The weight value *Ch1 Weight Value* is calculated as raw weight – tare value.

Channel 1 Clear Tare sets the tare value to 0 for channel 1.

Channel 1 Set Tare: The tare value is set to the actual weight value when the tare command is given. The weight value *Ch1 Weight Value* will show zero until the weight input changes.

Channel 2 Clear Tare:

Channel 2 Set Tare:

Same function as described for channel 1 above but for channel 2.

Read A/D Trim / Read Cal Factor

Setting this bit will have the module returning either the Production A/D Trim values or the *Cal Factor Mode* A/D span values. The value for Channel 1 is returned in input data *Ch1 Weight Value* and the value for Channel 2 is returned in input data *Ch2 Weight Value.* As long as this bit is set no weight values will be returned from the module.

The Production A/D Trim values are set during production to adjust the A/D inputs. This value is also printed on the label on the module. This read value can be used to verify that the values are still valid.

The Cal. Factor value is set during auto tuning (see following bits). It correspond to the A/D span value (i.e. reading at tuning minus A/D tare value) that was stored during auto tuning.

Channel 1 Auto-tune:

Channel 2 Auto-tune:

The weight on the scale shall be equal to the value set in *Channel 1 Weight Span* or *Channel 2 Weight Span*. When set the bit for the desired channel the module will automatically store and use the actual input signal instead of the set in *Channel 1 Signal Span* or *Channel 2 Signal Span.* This will improve the measurement accuracy. Also see chapter 9.

Cal Factor Mode:

Set to 1 for using auto-tuning calibration values. Also see chapter 9.

6. Configuration Data

TAG NAME	TYPE
Msgreceive	MESSAGE
Msgsend	MESSAGE
Setup_dataM1	DINT[7]
Status_dataM1	DINT[7]

The following description assumes that the Global Data Tag Setup_dataM1 is defined as a DINT[7]. In this manual and in code examples is Status_dataM1 is used as receiving data structure when reading back the configuration from the module. This way it is possible for the application to verify a correct configuration. The contents of Setup_dataM1 and Status_dataM1 follow the same definition outlined below.

Data Tags	Data Type	Parameter
Setup_dataM1[0]	DINT	Channel1 Weight Span
Setup_dataM1[1]	DINT	Channel 1 Signal Span
Setup_dataM1[2]	DINT	Channel 2 Weight Span
Setup_dataM1[3]	DINT	Channel 2 Signal Span
Setup_dataM1[4]	DINT	No of Samples Averaging
Setup_dataM1[5]	DINT	Bit oriented Parameters
Setup_dataM1[6]	DINT	Filter Time

Channel 1 Weight Span:

Channel 1 Signal Span:

Channel 2 Weight Span:

Channel 2 Signal Span:

Parameters used to define the weight and signal span for each channel. Module span calibration is calculated based on Weight span and signal span. Channel 1 and channel 2 have separate values and independent calibration. Zeroing has to be done as a separate procedure.

The mV/V signal span value format is a 4 digit integer value where 3 digits are regarded as decimals.

Example: 2.034mV/V is entered as 2034.

No of Samples Averaging:

Enter the number of weight readings to average before *Channel 1 Weight Value* and *Channel 2 Weight Value* are updated.

Filter Time:

Allowable range is 0 To 100 Milliseconds. The filters are turned on for each channel by setting bit *Enable Filter channel 1* and *Enable Filter channel 2* respectively. The filter is turned off for the respective channel by turning off the bit. The primary use for this filter is to suppress 50 and 60 Hz power line noise. Set the *Filter Time* to 16 ms in a 60 Hz environment and to 20 ms in a 50 Hz environment.

Bit Oriented Parameters:

Bit oriented parameters are defined within *Setup_dataM1[5].*

MSF Bits – (Motion Stabilization Filter):

Bit no	Description of bit
0	MSF range -1 to +2 weight units
1	MSF range -2 to +4 weight units
2	MSF range -4 to +8 weight units
3	MSF range -5 to +10 weight units
4	MSF range -6 to +12 weight units
5	MSF range -7 to +14 weight units
6	MSF range -8 to +16 weight units
7	MSF range -9 to +18 weight units

Bits 0 to 7. Used for applications with constant or static type loads to keep display value stable. Set only one bit. The range is given in output weight units. The weight will be kept constant until the weight is changes outside of the range when it will update again. The function is somewhat similar to setting the resolution of a scale.

Zero Band:

This is an automatic taring function. Only one bit may be set. Auto tare is activated when *Ch1 Weight Value* or *Ch2 Weight Value* is zero. Note that the auto tare covers the whole input range. It can be used for applications where the weight is regularly zero and there is a possibility of a slow zero drift of the scale. One example may be a platform scale where some material may build-up over time causing the scale zero to change. The range is given in output weight units.

Bit no	Description of bit
8	Zero band is active within +-2.5 weight units
9	Zero band is active within +-5 weight units
10	Zero band is active within +-7.5 weight units

Standard Average:

Bit 11 controls the averaging of weight values. If the bit is cleared a maximum of 500 samples can be averaged. If the bit is set the number of samples can be set to higher than 500. The no of samples to average is set in parameter *Setup_dataM1[4], No of Samples Averaging.*

7. Data Sheet Calibration

All values are 0 (default) on initial start-up. This means that all alarms are disabled.

Input zeroing and a datasheet calibration must be done for proper operation. This should be done for each input channel.

In the procedures below are the parameters for channel 1 shown. Use channel 2 parameters when calibrating channel 2.

Input Zeroing

- Set *Calibration Mode* bit to 1 and clear *Weigh Mode* bit. Module shows raw A/D value instead of weight.
- Set *Channel 1 Clear Tare* bit momentarily (at least one scan cycle). Removes any previous tare value.
- Check that the raw A/D value shown in *Ch1 Weight Value* is about 131000 units.
- Set *Channel 1 Set Tare* bit momentarily (at least one scan cycle). The raw A/D value shown in *Ch1 Weight Value* should now be 0 or close to zero.

Span Adjustment

- Set-up Message data:
  Channel1 Weight Span: Enter the rated capacity from the load cell data sheet. If more than one load cell is used calculate and enter capacity * no of load cells (= total capacity).
  Channel 1 Signal Span: Enter the rated output from the load cell datasheet. If more than one load cell is used calculate and enter the average rated output.

  Example:
  1,000 lb capacity, 2.132 mV/V rated output
  Enter 1000 to *Channel1 Weight Span*
  Enter 2132 to *Channel 1 Signal Span* (note no decimals)
- Clear *Run Mode* bit.
- Set the *Write Configuration* bit.
- Trig a write message. See chapter 9.
- Clear the *Write Configuration* bit.
- Set the *Read Configuration* bit.
- Trig a read message. See chapter 9.
- Clear the *Read Configuration* bit.
- Compare the *Setup_dataM1* and the *Status_dataM1*, they should be equal. Reading the configuration is optional that is used to verify the configuration.
- Set *Run Mode* bit.
- Set **either** *Weigh Mode* or *Calibration Mode* bit.
- Set the *Save to EEPROM* bit to save message data changes after a configuration have been written. Must be on at least one scan cycle.

- Clear the *Save to EEPROM* bit.

Input Zeroing and Span Adjustment are normally handled as manual procedures. A few program instructions will be needed to trig send and receive message instructions.

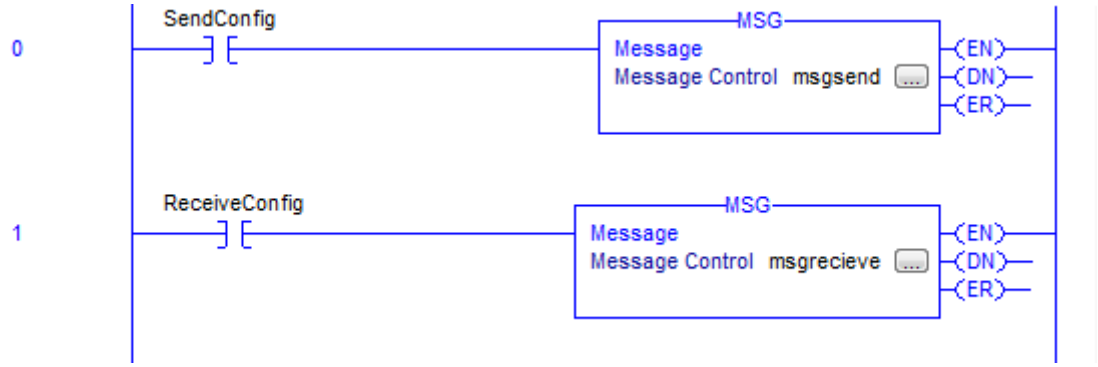
8. Calibrating With Known Weight

To improve the accuracy of the scale it is possible to do a known weight calibration.

- Start with doing a Datasheet Calibration (See chapter 7).
- Set *Cal Factor Mode* bit to 1.
- Apply known load to the scale. The load on the scale should be as entered in the Datasheet Calibration step above.
- Toggle the *Channel 1 Auto Tune* bit if channel 1 is calibrated with a known load.
- Toggle the *Channel 2 Auto Tune* bit if channel 2 is calibrated with a known load.
- Set the *Save to EEPROM* bit while keeping the *Run Mode* bit set to have the calibration values power fail safe.
- Keep the *Cal Factor Mode* bit set to use known weight calibration values. If the bit is 0 the module will use the datasheet calibration values. It is possible to change between known load and datasheet calibration values by setting or resetting the *Cal Factor Mode* bit.

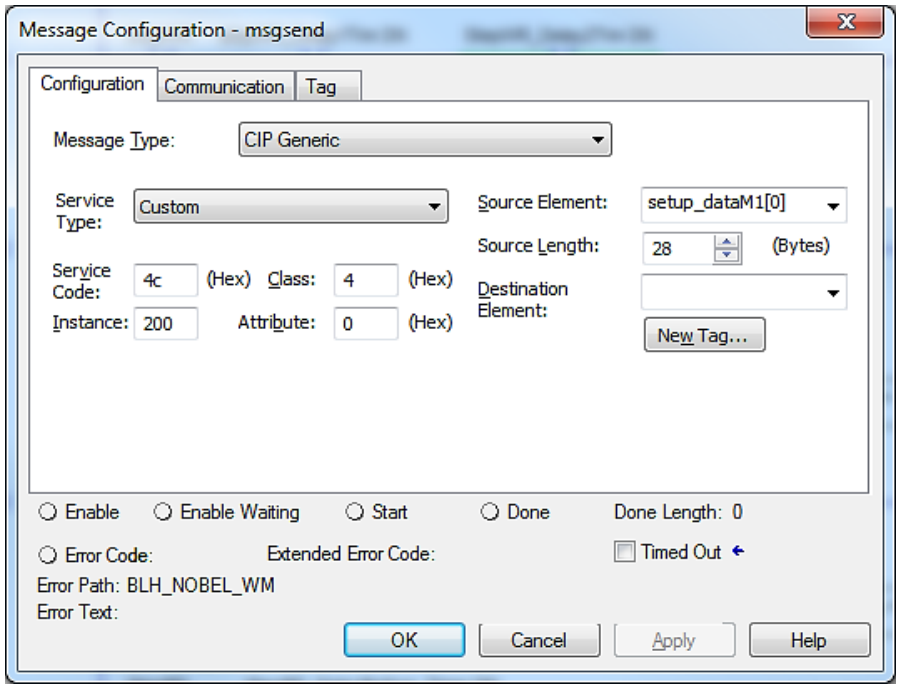
9. Ladder Program

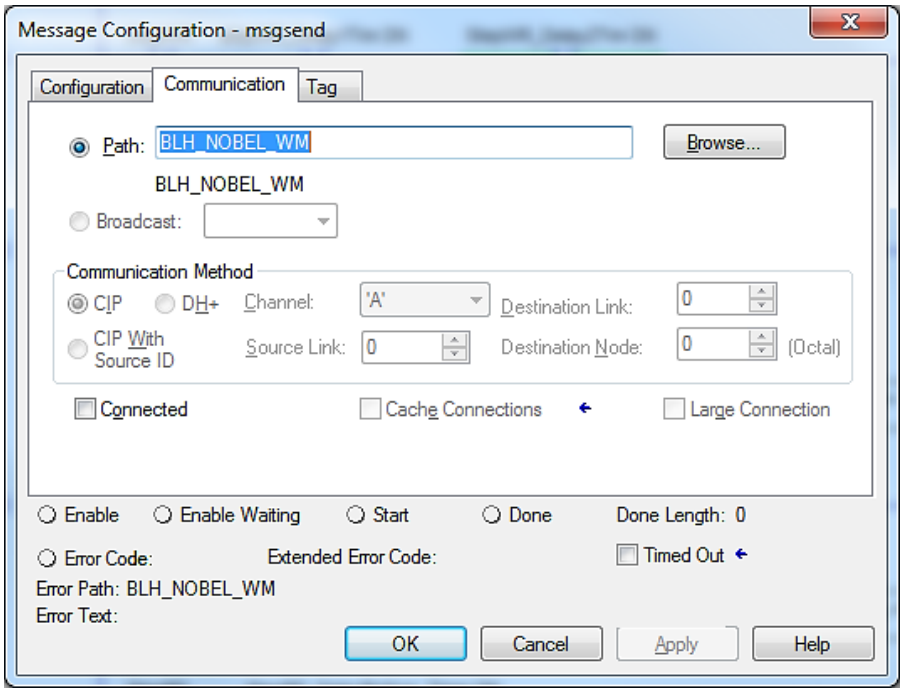
Below is shown the most simple ladder logic needed to send and receive the configuration of the BLH Nobel-1756-WM module. By toggling the Boolean variable SendConfig it will trig the MSG instruction to send the configuration data to the module. By toggling the Boolean variable ReceiveConfig it will trig the MSG instruction to read the configuration data from the module.

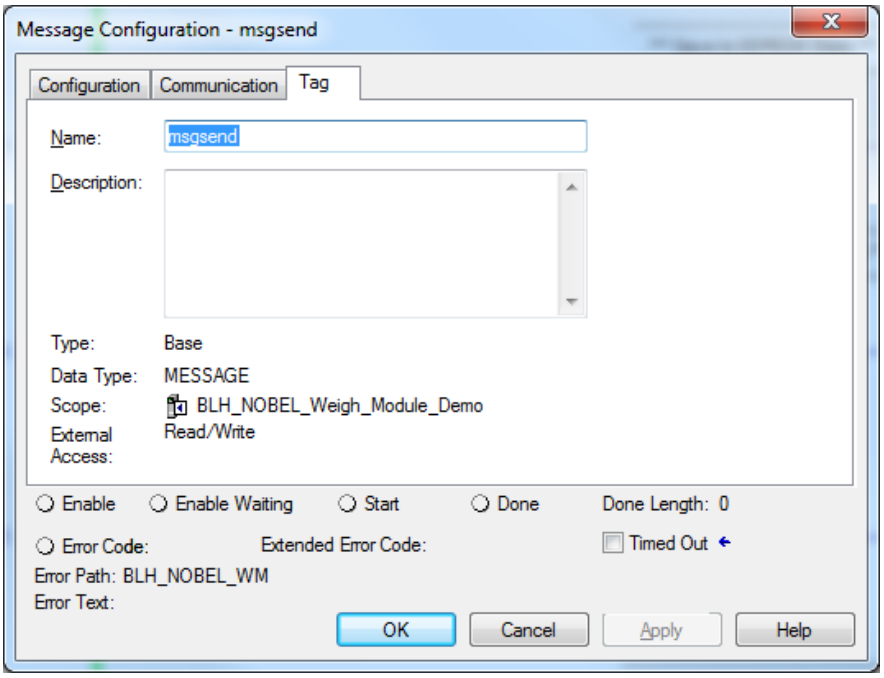


Send Message Configuration

The following 3 pictures exemplify how to configure the MSG instruction that is used to send the configuration to the module. The MSG is fetching the data to send from the setup_dataM1 array.

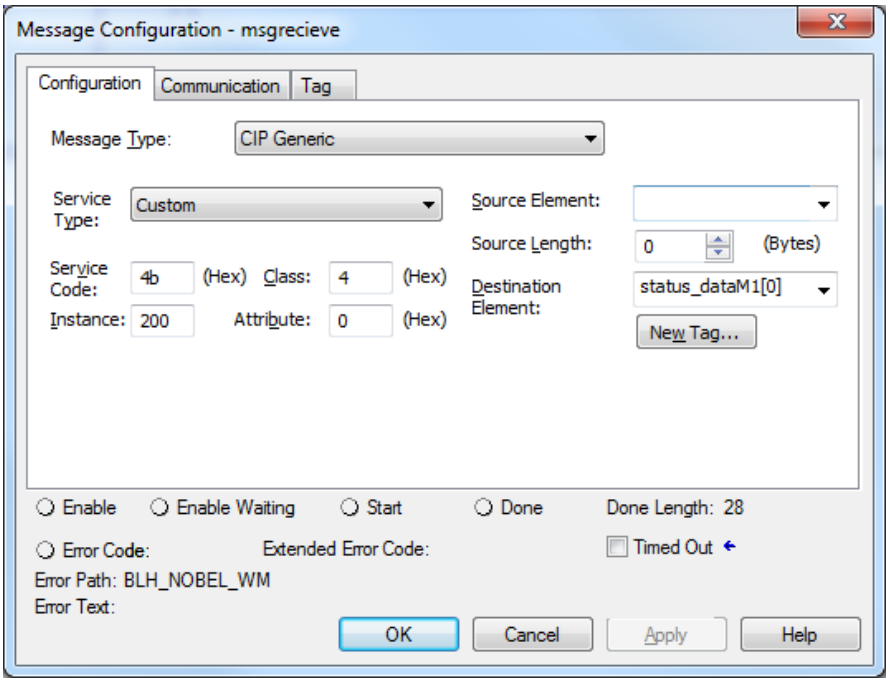


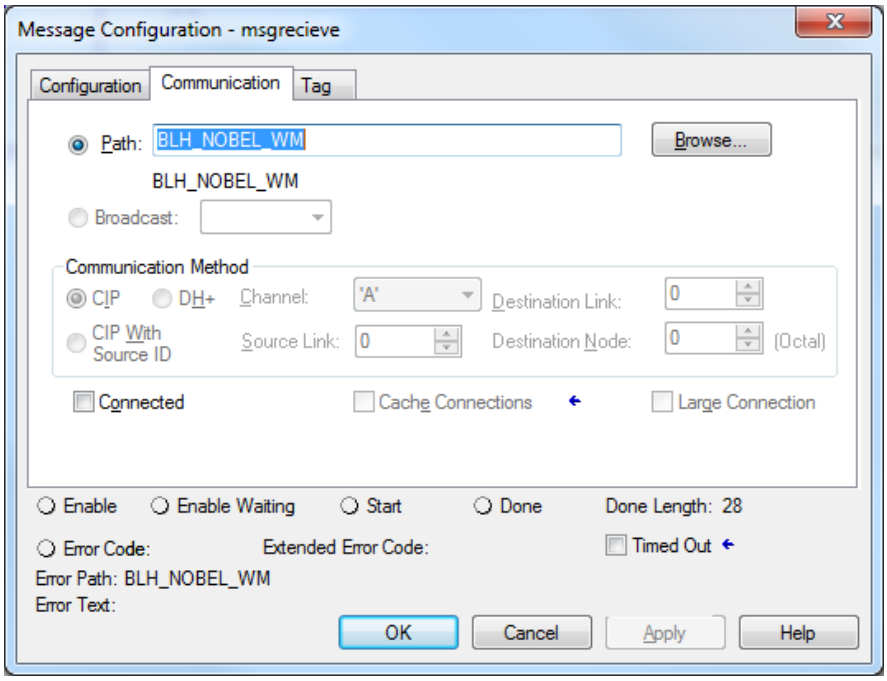


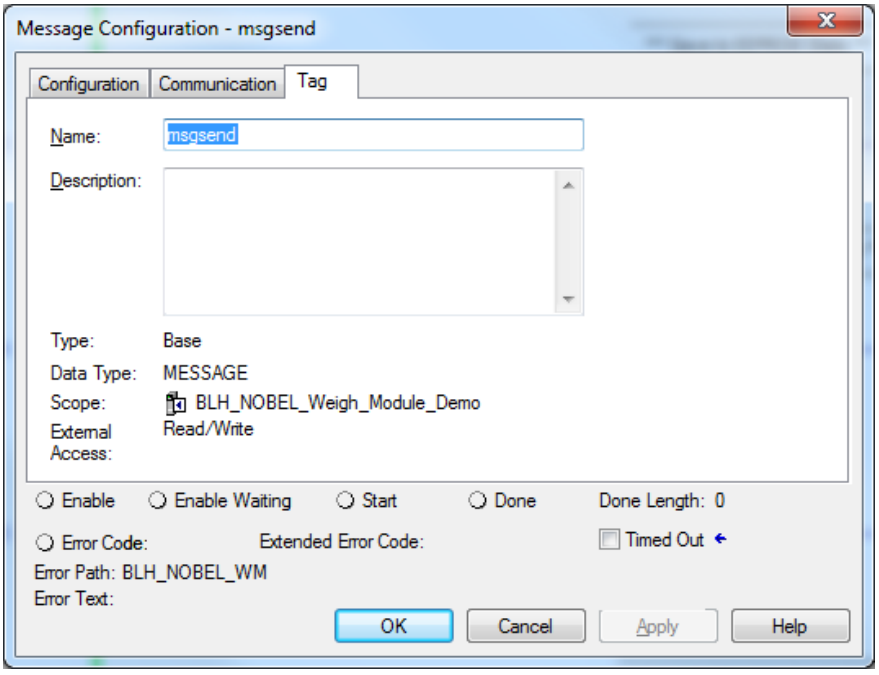


Receive Message Configuration

The following 3 pictures exemplify how to configure the MSG instruction that is used to receive the configuration from the module. The MSG is placing the received data in the status_dataM1 array.




Message Configuration - msgrecieve
Configuration
Communication
Tag
Path: BLH_NOBEL_WM
Browse...
BLH_NOBEL_WM
Broadcast:
Communication Method
CIP
DH+
Channel: 'A'
Destination Link: 0
CIP With Source ID
Source Link: 0
Destination Node: 0
(Octal)
Connected
Cache Connections
Large Connection
Enable
Enable Waiting
Start
Done
Done Length: 28
Error Code:
Extended Error Code:
Timed Out
Error Path: BLH_NOBEL_WM
Error Text:
OK
Cancel
Apply
Help


Message Configuration - msgsend
Configuration
Communication
Tag
Name: msgsend
Description:
Type: Base
Data Type: MESSAGE
Scope: BLH_NOBEL_Weigh_Module_Demo
External Access: Read/Write
Enable
Enable Waiting
Start
Done
Done Length: 0
Error Code:
Extended Error Code:
Timed Out
Error Path: BLH_NOBEL_WM
Error Text:
OK
Cancel
Apply
Help

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