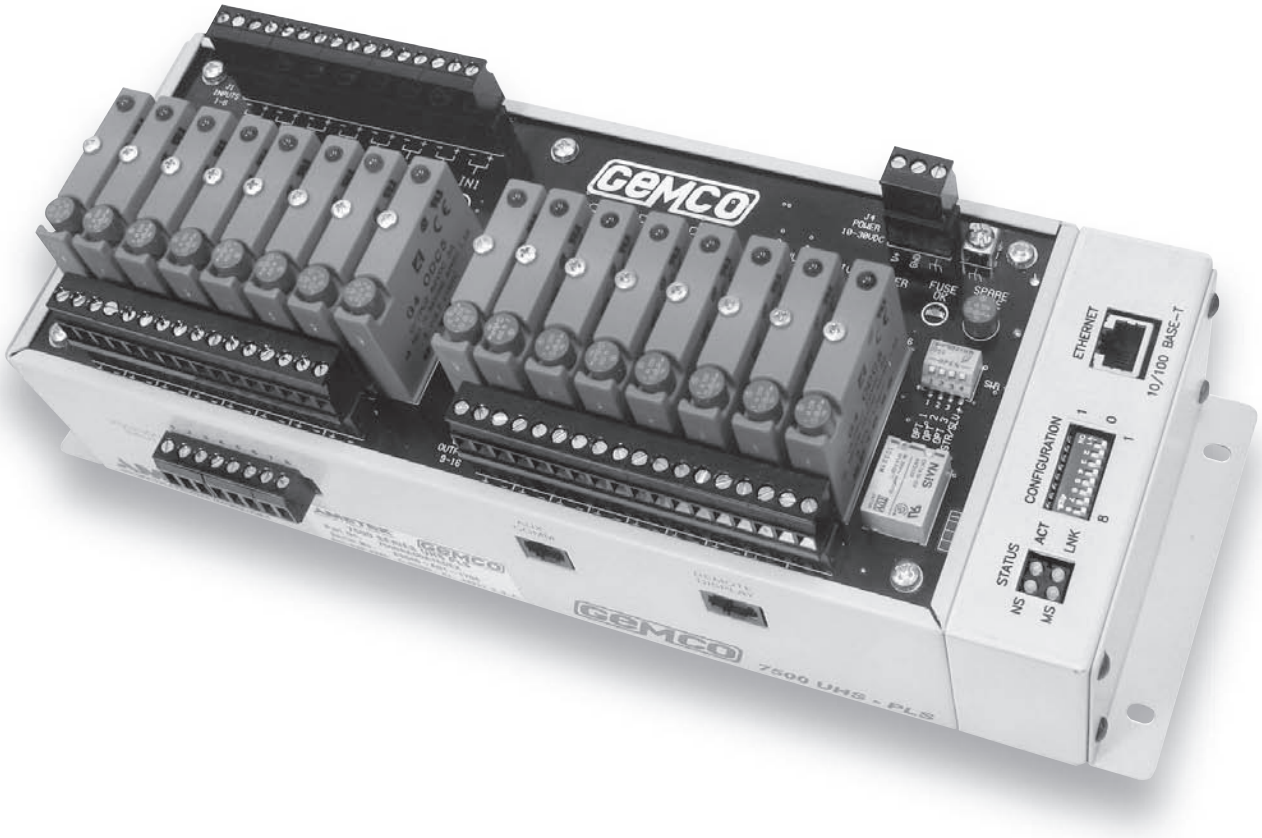
GEMCO®

NETWORK PROGRAMMING MANUAL

Network Ethernet/IP to the 7500 PLS



Spec Tech Industrial 203 Vest Ave. Valley Park, MO 63088 Phone: 888 SPECTECH
Email: sales@spectechind.com www.spectechind.com

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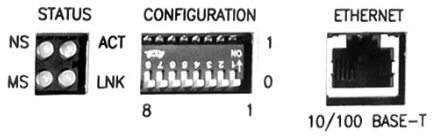
Manual Overview

This manual will describe how data is exchanged
over the Ethernet/IP network to the 7500 UHS PLS.

Contents

Introduction

The 7500 UHS Ethernet module has a standard RJ45 Ethernet connector, four network status LED's and an 8-position dip switch for setting the modules IP address on the network. The IP address can be configured either from the row of dip switches or from your Network. Using the dip switches any address from 192.168.1.1 to 192.168.1.255 can be selected. Note, changing the node address will only take affect on power up. Changing the IP address with power applied to the unit will generate a minor fault. When the dip switches are set to 0 the default programming will be from your Network connection.



LED Number	Indicator	Status
LNK - Link Activity	Green On	The module senses a link.
	Green Off	The module does not sense a link.
MS - Module Status	Off	No power is applied to the module.
	Green On	The module is operating correctly.
	Green Flashing	Standby. The module has not been configured.
	Red Flashing	A minor recoverable fault has been detected.
	Red On	A major internal error has been detected.
	Green/Red Flashing	The module is performing a power on self-test.
NS - Network Status	Off	The module has no power or no IP address is assigned.
	Green On	The module has at least one established Ethernet IP connection.
	Green Flashing	There are no Ethernet/IP connections established to the module.
	Red Flashing	One or more of the connections in which this module is the target has timed out. This state is only left if all timed out connections are re-established or if the module is reset.
	Red On	The module has detected that it's IP address is already in use.
	Green/Red Flashing	The module is performing a power on self-test.
ACT - Activity	Green Flashing	The activity LED flashes each time a packet is received or transmitted.

Figure 1

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Chapter 1 Quick Start

Programming IP Address Overview

This application note will describe how to program the IP address, the subnet mask and the gateway for the 7500 Ethernet PLS.

Description

The 7500 PLS default settings are as follows:

IP Address:	192.168.1.1
Subnet Mask:	255.255.255.0
Gateway:	192.168.1.254

Step 1: Connect the 7500 PLS to your network

Using an Ethernet network cable, connect the 7500 PLS to your computer through the fieldbus connector.

Step 2: Access 7500 PLS

1. Make sure the configuration switch is set to 00000000.

2. Turn on power to the unit.

3. Open a web browser and type in 'HTTP://192.168.1.1' in the address field. The 7500 Configuration page will be displayed

Step 3: Program new IP address

1. Enter in the desired IP address, subnet mask, and gateway.

2. Select 'Store Configuration'.

3. Cycle power to the unit to allow new IP address to be set.

Chapter 2 Network Programming for Ethernet/IP

Description

Data is communicated over Etheret using two types of messaging:

- I/O Data Transfer
- Expicit Messages

I/O Data Transfers are used for time critical data such as position and output status. Explicit messages are used for configuration data such as scale factor and setpoint programming.

2.1 I/O Data Transfer

Input Data Transfer

The following table contains all the data for the input data transfer:

Word	Data	Description	Type
WORD 1	Resolver Data:	Group 1 Scaled Position	UINT
WORD 2		Group 2 Scaled Position	UINT
WORD 3		Group 3 Scaled Position	UINT
WORD 4		Group 4 Scaled Position	UINT
WORD 5		Group 5 Scaled Position	UINT
WORD 6		Group 6 Scaled Position	UINT
WORD 7		Group 7 Scaled Position	UINT
WORD 8		Group 8 Scaled Position	UINT
WORD 9		RPM Value	UINT
WORD 10		Resolver Fault Data	UINT
WORD 11	Output Data:	Output Status (1-16)	UINT
WORD 12		Output Status (17-32)	UINT
WORD 13	Input Data:	Input Status (1-16)	UINT
WORD 14		Input Warning Map	UINT
WORD 15	Configuration Data:	Configuration Error Code	UINT
WORD 16		Error Attribute Number	UINT
WORD 17		Error Word Number	UINT

Scaled Position - The first eight words of the input message contain the scaled position of each PLS group.

RPM - Word 9 contains the current RPM value of the resolver.

Resolver Fault Data - Word 10 contains the resolver fault data.

0 - no resolver fault
1 - resolver fault detected

Output Status - Words 11 and 12 contain the current status of the outputs. These are bit registers with output 1 at bit 0 of word 11 and output 17 at bit 0 of word 12.

Input Status - Word 13 contains the current status of the 8 hardware inputs with input 1 at bit 0 and input 8 at bit 7.

Input Warning Map - Word 14 contains the input warning map for all 16 inputs. Input 1 is assigned to bit 0 and input 16 is assigned to bit 15. If an input is defined as an output enable window and there was no input detected within the window, the corresponding bit for that input will be set to a 1.

Configuration Error Code, Error Attribute Number, and Error Word Number - When an explicit message is received, the data is verified by the 7500. If there is an error in any of the data, it will be reflected in the configuration error code. The Error Attribute Number contains the attribute number the error was found in and the Error Word Number contains the word number that had the invalid data. The following are the error codes:

0 - No error detected
1 - Invalid data value
2 - Conflict in data values
3 - Could not process because of resolver error
4 - Memory error

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These error codes will be describe in detail in the explicit message section.

Output Data Transfer

The following table contains all the data for the output data transfer:

Word	Data	Description	Type
WORD 1	Bit Register:		UINT
	Bit 0	Run Enable Bit	
	Bit 1	Add-On Test Enable Bit	
	Bit 2	Acknowledge Bit	
WORD 2	Force Data:	Force Output Mask 1-8	UINT
WORD 3		Force Output Mask 9-16	UINT
WORD 4		Force Output Mask 17-24	UINT
WORD 5		Force Output Mask 25-32	UINT
WORD 6		Force Group Mask 1-8	UINT
WORD 7	Input Data:	Soft Input States (9-16)	UINT

Run Enable Bit - This bit will enable and disable the outputs on the 7500. When this bit is set, the outputs will operate normally. When this bit is cleared, the outputs will be disabled.

Add-On Test Enable Bit - This bit will enable the add-on test mode on the 7500. When a transition from 0 to 1 is detected, the add-on test will enable the specified outputs to run at the specified RPM value for the specified add-on time. These values are set through the Add-On object.

Acknowledge Bit - This bit is used to acknowledge the configuration error code in the input data transfer. When a transition from 0 to 1 is detected, the configuration error code field, along with the error attribute number and the error word number, will be cleared.

Force Data - The force output masks are used to force an output on or off. Each output is represented by 2 bits in the register as shown below:

Output 8		Output 7		Output 6		Output 5	
15	14	13	12	11	10	9	8

Output 4		Output 3		Output 2		Output 1	
7	6	5	4	3	2	1	0

Where 00 - unforce output
01 - force output on
10 - force output off
11 - reserved

Word 6 is used to force all the outputs of an entire group on or off. The group force mask will override the individual force masks.

Input Data - Word 7 indicates the current state of the software inputs. If the input is designated as active high, a transition from 0 to 1 will trigger the input. If the input is designated as active low, a transition from 1 to 0 will trigger the input.

2.2 Explicit Messages

Configuration data is transferred to the 7500 PLS through explicit messages. The 7500 PLS uses the PLS Status Class 0xC0 (hex) and the PLS Configuration Class 0xC1 (hex) to accomplish this. The PLS Status Class has 3 attributes. These are listed in the table below:

Attribute Number	Attribute Name
1	System Information
2	Input Status Information
3	Offset Information

The PLS Configuration Class has 38 attributes. They are listed in the table below:

Attribute Number	Attribute Name
1	PLS Object
2	High Speed Output Object - Output 1
3	High Speed Output Object - Output 2

4	High Speed Output Object - Output 3
5	High Speed Output Object - Output 4
6	High Speed Output Object - Output 5
7	High Speed Output Object - Output 6
8	High Speed Output Object - Output 7
9	High Speed Output Object - Output 8
10	High Speed Output Object - Output 9
11	High Speed Output Object - Output 10
12	High Speed Output Object - Output 11
13	High Speed Output Object - Output 12
14	High Speed Output Object - Output 13
15	High Speed Output Object - Output 14
16	High Speed Output Object - Output 15
17	High Speed Output Object - Output 16
18	Low Speed Output Object - Output 17
19	Low Speed Output Object - Output 18
20	Low Speed Output Object - Output 19
21	Low Speed Output Object - Output 20
22	Low Speed Output Object - Output 21
23	Low Speed Output Object - Output 22
24	Low Speed Output Object - Output 23
25	Low Speed Output Object - Output 24
26	Low Speed Output Object - Output 25
27	Low Speed Output Object - Output 26
28	Low Speed Output Object - Output 27
29	Low Speed Output Object - Output 28
30	Low Speed Output Object - Output 29
31	Low Speed Output Object - Output 30
32	Low Speed Output Object - Output 31
33	Low Speed Output Object - Output 32
34	Input Configuration Object
35	Add-On Test Configuration Object
36	Offset Configuration Object
37	Program Control Object
38	Encoder Object

The following sections will describe each object in detail.

2.3 PLS Object (Class 0xC1, Attribute 1)

The PLS object contains the configuration data for each group in the PLS. This object should be the first one programmed into the 7500 before any other data. Each PLS object contains the following information:

Word	Data	Description	Type
WORD 1	PLS Data 1:	Scale Factor	UINT
WORD 2		High Speed Output Mask	UINT
WORD 3		Low Speed Output Mask	UINT
WORD 4		Input Mask	UINT
WORD 5		Min. Speed Disable	UINT
WORD 6		Min. Speed Disable Mask	UINT
WORD 7	PLS Data 2:	Scale Factor	UINT
WORD 8		High Speed Output Mask	UINT
WORD 9		Low Speed Output Mask	UINT
WORD 10		Input Mask	UINT
WORD 11		Min. Speed Disable	UINT
WORD 12		Min. Speed Disable Mask	UINT
WORD 13	PLS Data 3:	Scale Factor	UINT
WORD 14		High Speed Output Mask	UINT
WORD 15		Low Speed Output Mask	UINT
WORD 16		Input Mask	UINT
WORD 17		Min. Speed Disable	UINT
WORD 18		Min. Speed Disable Mask	UINT
WORD 19	PLS Data 4:	Scale Factor	UINT
WORD 20		High Speed Output Mask	UINT
WORD 21		Low Speed Output Mask	UINT
WORD 22		Input Mask	UINT
WORD 23		Min. Speed Disable	UINT
WORD 24		Min. Speed Disable Mask	UINT
WORD 25	PLS Data 5:	Scale Factor	UINT
WORD 26		High Speed Output Mask	UINT
WORD 27		Low Speed Output Mask	UINT
WORD 28		Input Mask	UINT
WORD 29		Min. Speed Disable	UINT
WORD 30		Min. Speed Disable Mask	UINT
WORD 31	PLS Data 6:	Scale Factor	UINT
WORD 32		High Speed Output Mask	UINT
WORD 33		Low Speed Output Mask	UINT
WORD 34		Input Mask	UINT
WORD 35		Min. Speed Disable	UINT
WORD 36		Min. Speed Disable Mask	UINT
WORD 37	PLS Data 7:	Scale Factor	UINT
WORD 38		High Speed Output Mask	UINT
WORD 39		Low Speed Output Mask	UINT
WORD 40		Input Mask	UINT
WORD 41		Min. Speed Disable	UINT

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WORD 42		Min. Speed Disable Mask	UINT
WORD 43	PLS Data 8:	Scale Factor	UINT
WORD 44		High Speed Output Mask	UINT
WORD 45		Low Speed Output Mask	UINT
WORD 46		Input Mask	UINT
WORD 47		Min. Speed Disable	UINT
WORD 48		Min. Speed Disable Mask	UINT

Scale Factor - This word is used to program the scale factor for each group. Valid scale factor values range from 2 to 65535.

An invalid scale factor will produce an Invalid Data Value Code (1) in the configuration error word of the input data transfer along with a value of 1 in the error attribute number and the word number that contains the invalid scale factor value.

High Speed Output Mask - This word defines which of the high speed outputs (1-16) are assigned to the group. Each bit in the word represents an output with bit 0 assigned to output 1and bit 15 assigned to output 16. When the bit is set, the output will be assigned to the group.

An output cannot be assigned to multiple groups. If an attempt is made to do this, a Conflict In Data Code (2) will appear in the configuration error word along with a value of 1 in the error attribute number and the word number that contains the conflicting high speed output mask.

Low Speed Output Mask - This word defines which of the low speed outputs (17-32) are assigned to the group. Each bit in the word represents an output with bit 0 assigned to output 17 and bit 15 assigned to output 32. When the bit is set, the output will be assigned to the group.

An output cannot be assigned to multiple groups. If an attempt is made to do this, a Conflict In Data Code (2) will appear in the configuration error word along with a value of 1 in the error attribute number and the word number that contains the conflicting low speed output mask.

Input Mask - This word defines which of the inputs are assigned to the group. Each bit in the word represents an input with bit 0 assigned to input 1 and bit 15 assigned to input 16. When the bit is set, the input will be assigned to the group.

An input cannot be assigned to multiple groups. If an attempt is made to do this, a Conflict In Data Code (2) will appear in the configuration error word along with a value of 1 in the error attribute number and the word number that contains the conflicting input mask.

Minimum Speed Disable - This word contains the RPM value for the minimum speed disable feature. Valid minimum speed values range from 0 to 2048. A value of zero will disable this feature.

An invalid minimum speed disable value will produce an Invalid Data Value Code (1) in the configuration error word of the input data transfer along with a value of 1 in the error attribute number and the word number that contains the invalid minimum speed disable value.

Minimum Speed Disable Mask - This word defines which outputs in the group are affected by the minimum speed disable value. Each bit in the word represents an output with bit 0 assigned to output 1 and bit 15 assigned to output 16.

The output must be assigned to the group in order to be part of the minimum speed disable mask. If an output is assigned to the minimum speed disable mask and it is not assigned to the group, an Invalid Data Value Code (1) will appear in the configuration error word along with a value of 1 in the error attribute number and the word number that contains the invalid minimum speed disable mask.

2.4 High Speed Output Object (Class 0xC1, Attributes 2 - 17)

Each high speed output has a High Speed Output Attribute associated with it. This attribute contains the linear speed compensation data and the setpoint data for the output.

The linear speed compensation is calculated using a minimum RPM, or starting point, and a maximum RPM, or stopping point. The starting point consists of the RPM value that the linear speed compensation is suppose to begin with and the starting on counts and off counts the setpoints are to be shifted by. The stopping point consists of the RPM value that the linear speed compensation is suppose to stop at and the ending on counts and off counts the setpoints are to be shifted by.

Each output can be programmed as a standard output, a time-based output, or a motion control output. This is done through first setpoint definition. If the output is defined as a time-based output or a motion control output, no other setpoints can be programmed. If the output is defined as a standard output, the first setpoint can be a standard setpoint or a stitching setpoint. The other seven setpoints are standard setpoints.

Word	Data	Description	Type
WORD 1	Linear Speed Data:	Linear Speed RPM Start	UINT
WORD 2		Linear Speed Start On Counts	UINT
WORD 3		Linear Speed Start Off Counts	UINT
WORD 4		Linear Speed RPM End	UINT
WORD 5		Linear Speed End On Counts	UINT
WORD 6		Linear Speed End Off Counts	UINT
WORD 7		Number of Setpoints	UINT
WORD 8	Setpoint 1:	Type	UINT
WORD 9		Parameter 1	UINT
WORD 10		Parameter 2	UINT
WORD 11		Parameter 3	UINT
WORD 12		Parameter 4	UINT
WORD 13	Setpoint 2:	On Position	UINT
WORD 14		Off Position	UINT
WORD 15	Setpoint 3:	On Position	UINT
WORD 16		Off Position	UINT
WORD 17	Setpoint 4:	On Position	UINT
WORD 18		Off Position	UINT
WORD 19	Setpoint 5:	On Position	UINT
WORD 20		Off Position	UINT
WORD 21	Setpoint 6:	On Position	UINT
WORD 22		Off Position	UINT
WORD 23	Setpoint 7:	On Position	UINT
WORD 24		Off Position	UINT
WORD 25	Setpoint 8:	On Position	UINT
WORD 26		Off Position	UINT

Linear Speed RPM Start - This word contains the RPM value that the linear speed compensation should start at. Valid RPM values range from 0 to 2048.

An invalid rpm value will produce an Invalid Data Value Code (1) in the configuration error word of the input data transfer along with the error attribute number and the word number that contains the invalid RPM value.

The RPM start value must be less than the RPM end value. If the RPM start value is greater than the stop value, a Conflict in Data Code (2) will appear in the configuration error word of the input data transfer along with the error attribute number and the word number that contains the invalid RPM value.

Linear Speed Start On Counts - This word contains the count value that the leading edge of the setpoint should be shifted by at the start RPM value.

The linear speed start on counts must be less than the linear speed end on counts. If the start on counts are greater than the end on counts, a Conflict in Data Code (2) will appear in the configuration error word of the input data transfer along with the error attribute number and the word number that contains the invalid start on counts.

Linear Speed Start Off Counts - This word contains the count value that the trailing edge of the setpoint should be shifted by at the start RPM value.

The linear speed start off counts must be less than the linear speed end off counts. If the start off counts are greater than the end off counts, a Conflict in Data Code (2) will appear in the configuration error word of the input data transfer along with the error attribute number and the word number that contains the invalid start off counts.

Linear Speed RPM End - This word contains the RPM value that the linear speed compensation should end at. Value RPM values range from 0 to 2048.

An invalid rpm value will produce an Invalid Data Value Code (1) in the configuration error word of the input data transfer along with the error attribute number and the word number that contains the invalid RPM value.

The RPM end value must be greater than the RPM start value. If the RPM end value is less than the start value, a Conflict in Data Code (2) will appear in the configuration error word of the input data transfer along with the error attribute number and the word number that contains the invalid RPM value.

Linear Speed End On Counts - This word contains the count value that the leading edge of the setpoint should be shifted by at the end RPM value.

The linear speed end on counts must be greater than the linear speed start on counts. If the end on counts are less than the start on counts, a Conflict in Data Code (2) will appear in the configuration error word of the input data transfer along with the error attribute number and the word number that contains the invalid end on counts.

Linear Speed End Off Counts - This word contains the count value that the trailing edge of the setpoint should be shifted by at the end RPM value.

The linear speed end off counts must be greater than the linear speed start off counts. If the end off counts are less than the start off counts, a Conflict in Data Code (2) will appear in the configuration error word of the input data transfer along with the error attribute number and the word number that contains the invalid end off counts.

NOTE: If all the above parameters are set to zero, there will be no linear speed compensation performed on the output.

Number of Setpoints - This word contains the number of setpoints that are to be programmed for this output. This number can range from 0 to 8. This number is used to determine which setpoints in the attribute to look at. For example, if the number of setpoints is 5, the 7500 will only process the data located in setpoints 1-5 of the attribute. The data in setpoints 6-8 are ignored.

An Invalid Data Value Code (1) will be produced in the configuration error word of the input data transfer along with the attribute number and the word number if the number of setpoints is greater than 8.

Setpoint 1 Type - This word contains the setpoint type for the first setpoint. There are 4 types of setpoints that can be programmed into the 7500.

1 - Standard
2 - Stitching
3 - Time-based
4 - Motion Detect

A value of 0 in the setpoint type indicates no setpoint programmed.

Parameters 1,2,3,4 - The values in these words depend on the setpoint type chosen in the Setpoint 1 Type word. The table below shows what values are stored in each parameter:

	Parameter 1	Parameter 2	Parameter 3	Parameter 4
Standard Setpoint	On Position	Off Position	--	--
Stitching Setpoint	On Position	Off Position	Counts High	Counts Low
Time Based Setpoint	On Position	Time in ms	--	--
Motion Detect	RPM Value	--	--	--

Setpoint On Position - This word contains the position value that the setpoint will activate. Valid positions range from zero to a value one less than the scale factor.

An invalid position value will produce an Invalid Data Value Code (1) in the configuration error word of the input data transfer along with the attribute number and the word number containing the invalid on position.

Setpoint Off Position - This word contains the position value that the setpoint will deactivate. Valid positions range from zero to a value one less than the scale factor.

An invalid position value will produce an Invalid Data Value Code (1) in the configuration error word of the input data transfer along with the attribute number and the word number containing the invalid off position.

Counts High - In a stitching setpoint, this is the stitch count that the setpoint will be activated.

Counts Low - In a stitching setpoint, this is the stitch count that the setpoint will be deactivated.

Time in ms - This is the time in milliseconds that the setpoint will remain on.

2.5 Low Speed Output Object (Class 0xC1, Attributes 18 - 33)

Each low speed output has a Low Speed Output Attribute associated with it. This attribute contains the setpoint data for the output.

Each output can be programmed as a standard output, a time-based output, or a motion control output. This is done through first setpoint definition. If the output is defined as a time-based output or a motion control output, no other setpoints can be programmed. If the output is defined as a standard output, the first setpoint can be a standard setpoint or a stitching setpoint. The other seven setpoints are standard setpoints.

Word	Data	Description	Type
WORD 1		Number of Setpoints	UINT
WORD 2	Setpoint 1:	Type	UINT
WORD 3		Parameter 1	UINT
WORD 4		Parameter 2	UINT
WORD 5		Parameter 3	UINT
WORD 6		Parameter 4	UINT
WORD 7	Setpoint 2:	On Position	UINT
WORD 8		Off Position	UINT
WORD 9	Setpoint 3:	On Position	UINT
WORD 10		Off Position	UINT
WORD 11	Setpoint 4:	On Position	UINT
WORD 12		Off Position	UINT
WORD 13	Setpoint 5:	On Position	UINT
WORD 14		Off Position	UINT
WORD 15	Setpoint 6:	On Position	UINT
WORD 16		Off Position	UINT
WORD 17	Setpoint 7:	On Position	UINT
WORD 18		Off Position	UINT
WORD 19	Setpoint 8:	On Position	UINT
WORD 20		Off Position	UINT

Number of Setpoints - This word contains the number of setpoints that are to be programmed for this output. This number can range from 0 to 8. This number is used to determine which setpoints in the attribute to look at. For example, if the number of setpoints is 5, the 7500 will only process the data located in setpoints 1-5 of the attribute. The data in setpoints 6-8 are ignored.

An Invalid Data Value Code (1) will be produced in the configuration error word of the input data transfer along with the attribute number and the word number if the number of setpoints is greater than 8.

Setpoint 1 Type - This word contains the setpoint type for the first setpoint. There are 4 types of setpoints that can be programmed into the 7500.

1 - Standard
2 - Stitching
3 - Time-based
4 - Motion Detect

A value of 0 in the setpoint type indicates no setpoint programmed.

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Parameters 1,2,3,4 - The values in these words depend on the setpoint type chosen in the Setpoint 1 Type word. The table below shows what values are stored in each parameter:

	Parameter 1	Parameter 2	Parameter 3	Parameter 4
Standard Setpoint	On Position	Off Position	--	--
Stitching Setpoint	On Position	Off Position	High Stitch Count	Low Stitch Count
Time Based Setpoint	On Position	Time in ms	--	--
Motion Detect	RPM Value	--	--	--

Setpoint On Position - This word contains the position value that the setpoint will activate. Valid positions range from zero to a value one less than the scale factor.

An invalid position value will produce an Invalid Data Value Code (1) in the configuration error word of the input data transfer along with the attribute number and the word number containing the invalid on position.

Setpoint Off Position - This word contains the position value that the setpoint will deactivate. Valid positions range from zero to a value one less than the scale factor.

An invalid position value will produce an Invalid Data Value Code (1) in the configuration error word of the input data transfer along with the attribute number and the word number containing the invalid off position.

High Stitch Count - In a stitching setpoint, this is the stitch count that the setpoint will be activated.

Low Stitch Count - In a stitching setpoint, this is the stitch count that the setpoint will be deactivated.

Time in ms - This is the time in milliseconds that the setpoint will remain on.

2.6 Input Configuration Object (Class 0xC1, Attribute 34)

The Input Configuration Object is used to define the functionality of each input and define the parameters associated with that function.

There are 16 different types of functions that can be assigned to an input:

- Remote Setpoint Tune
- Reset to Preset - standard
- Reset to Preset - single shot
- Reset to Preset - average
- Reset to Preset - window
- Output Enable - level
- Output Enable - single shot
- Output Enable - advanced mode
- Output Force
- Remote Offset Tune
- Reset to Preset Group - standard
- Reset to Preset Group - single shot
- Reset to Preset Group - average
- Reset to Preset Group - window
- Output Enable Group - level
- Output Enable Group - single shot
- Output Enable Group - advanced mode
- Force Group

Remote Setpoint Tune - This input type is used to advance or retard a given group of setpoints by a specified amount of counts.

Reset to Preset (standard) - This input type is used to reset the position of a PLS group to a preset value. If the output mask of the input is a subset of the outputs in the PLS group, only the outputs associated with the input will be reset. The outputs will then fire according to the new preset position until another input occurs.

Reset to Preset (single-shot) - This input type is used to reset the position of a PLS group to a preset value and fire the outputs for one revolution of the resolver. If no other input is seen within that revolution, the outputs will be forced off until another input is detected. If the output mask of the input is a subset of the outputs in the PLS group, only the outputs associated with the input will be reset.

Reset to Preset (average) - This input type is used to reset the position of a PLS group to an average position value. When the input is detected, the current position is recorded and added to the list of past input positions. This list can range in size from 1 to 32. The list of positions are averaged together to become the “preset” value that the outputs will operate from.

Reset to Preset (window) - This input acts as a reset to preset single-shot with the exception that the user can program a specific window for the input to be detected in. If an input is detected outside the window, the reset to preset input will be ignored.

Output Enable (level) - This input will act as a simple AND input. The output pattern associated with the input will only operate as long as the output enable input is active.

Output Enable (single-shot) - For this input type, the user must program a window in which the input is supposed to fire. If the input fires in the window, the outputs associated with the input will be enabled when the input is detected and are enabled until the beginning of the window. If the input fires outside the window or doesn’t fire at all, the outputs will be forced off.

Output Enable (advanced mode) - This input type is similar to the output enable single-shot mode. The user must program a window in which the input is supposed to fire. The user must also program a position value that the outputs will be enabled for one revolution. For example, the user has programmed the window begin at position 100 and end at position 200 and the enable position value is set at 150. If the input is detected at position 120, the outputs will not be enabled until position 150 and then they will stay enabled for one full revolution of the resolver.

Output Force - This input acts the same as the group force input except the user can define a subset of outputs associated with a PLS group.

Remote Offset Tune - This input type is used to advance or retard a given offset of a PLS group.

Reset to Preset Group (standard) - This input type acts just like the reset to preset standard input described above except that it resets all the outputs associated with the group. The high output mask and low output mask are ignored.

Reset to Preset Group (single shot) - This input type acts just like the reset to preset single shot input described above except that it resets all the outputs associated with the group. The high output mask and low output mask are ignored.

Reset to Preset Group (average) - This input type acts just like the reset to preset average input described above except that it resets all the outputs associated with the group. The high output mask and low output mask are ignored.

Reset to Preset Group (window) - This input type acts just like the reset to preset window input described above except that it resets all the outputs associated with the group. The high output mask and low output mask are ignored.

Output Enable Group (level) - This input type acts just like the output enable level input described above except that it will enable all the outputs associated with the group. The high output mask and low output mask are ignored.

Output Enable Group (single shot) - This input type acts just like the output enable single shot input described above except that it will enable all the outputs associated with the group. The high output mask and low output mask are ignored.

Output Enable Group (advanced mode) - This input type acts just like the output enable advanced input described above except that it will enable all the outputs associated with the group. The high output mask and low output mask are ignored.

Force Group - This input type is used to force a PLS group's outputs to a specified state. When the input is activated, the outputs can be forced on, forced off or unforced depending on how the input is defined. The user can also define the state the outputs are to go to when the input is deactivated.

Word	Data	Description	Type
WORD 1	Input 1:	Bit Register	UINT
WORD 2		High Output Mask	UINT
WORD 3		Low Output Mask	UINT
WORD 4		Input Type	UINT
WORD 5		Parameter 1	UINT
WORD 6		Parameter 2	UINT
WORD 7		Parameter 3	UINT
WORD 8	Input 2:	Bit Register	UINT
WORD 9		High Output Mask	UINT
WORD 10		Low Output Mask	UINT
WORD 11		Input Type	UINT
WORD 12		Parameter 1	UINT
WORD 13		Parameter 2	UINT
WORD 14		Parameter 3	UINT
WORD 15	Input 3:	Bit Register	UINT
WORD 16		High Output Mask	UINT
WORD 17		Low Output Mask	UINT
WORD 18		Input Type	UINT
WORD 19		Parameter 1	UINT
WORD 20		Parameter 2	UINT
WORD 21		Parameter 3	UINT
WORD 22	Input 4:	Bit Register	UINT
WORD 23		High Output Mask	UINT
WORD 24		Low Output Mask	UINT
WORD 25		Input Type	UINT
WORD 26		Parameter 1	UINT
WORD 27		Parameter 2	UINT
WORD 28		Parameter 3	UINT
WORD 29	Input 5:	Bit Register	UINT
WORD 30		High Output Mask	UINT
WORD 31		Low Output Mask	UINT
WORD 32		Input Type	UINT
WORD 33		Parameter 1	UINT
WORD 34		Parameter 2	UINT
WORD 35		Parameter 3	UINT
WORD 36	Input 6:	Bit Register	UINT
WORD 37		High Output Mask	UINT
WORD 38		Low Output Mask	UINT
WORD 39		Input Type	UINT
WORD 40		Parameter 1	UINT
WORD 41		Parameter 2	UINT
WORD 42		Parameter 3	UINT
WORD 43	Input 7:	Bit Register	UINT
WORD 44		High Output Mask	UINT
WORD 45		Low Output Mask	UINT
WORD 46		Input Type	UINT
WORD 47		Parameter 1	UINT
WORD 48		Parameter 2	UINT
WORD 49		Parameter 3	UINT
WORD 50	Input 8:	Bit Register	UINT
WORD 51		High Output Mask	UINT
WORD 52		Low Output Mask	UINT
WORD 53		Input Type	UINT
WORD 54		Parameter 1	UINT
WORD 55		Parameter 2	UINT
WORD 56		Parameter 3	UINT
WORD 57	Input 9:	Bit Register	UINT
WORD 58		High Output Mask	UINT
WORD 59		Low Output Mask	UINT
WORD 60		Input Type	UINT
WORD 61		Parameter 1	UINT
WORD 62		Parameter 2	UINT
WORD 63		Parameter 3	UINT

WORD 64	Input 10:	Bit Register	UINT
WORD 65		High Output Mask	UINT
WORD 66		Low Output Mask	UINT
WORD 67		Input Type	UINT
WORD 68		Parameter 1	UINT
WORD 69		Parameter 2	UINT
WORD 70		Parameter 3	UINT
WORD 71	Input 11:	Bit Register	UINT
WORD 72		High Output Mask	UINT
WORD 73		Low Output Mask	UINT
WORD 74		Input Type	UINT
WORD 75		Parameter 1	UINT
WORD 76		Parameter 2	UINT
WORD 77		Parameter 3	UINT
WORD 78	Input 12:	Bit Register	UINT
WORD 79		High Output Mask	UINT
WORD 80		Low Output Mask	UINT
WORD 81		Input Type	UINT
WORD 82		Parameter 1	UINT
WORD 83		Parameter 2	UINT
WORD 84		Parameter 3	UINT
WORD 85	Input 13:	Bit Register	UINT
WORD 86		High Output Mask	UINT
WORD 87		Low Output Mask	UINT
WORD 88		Input Type	UINT
WORD 89		Parameter 1	UINT
WORD 90		Parameter 2	UINT
WORD 91		Parameter 3	UINT
WORD 92	Input 14:	Bit Register	UINT
WORD 93		High Output Mask	UINT
WORD 94		Low Output Mask	UINT
WORD 95		Input Type	UINT
WORD 96		Parameter 1	UINT
WORD 97		Parameter 2	UINT
WORD 98		Parameter 3	UINT
WORD 99	Input 15:	Bit Register	UINT
WORD 100		High Output Mask	UINT
WORD 101		Low Output Mask	UINT
WORD 102		Input Type	UINT
WORD 103		Parameter 1	UINT
WORD 104		Parameter 2	UINT
WORD 105		Parameter 3	UINT
WORD 106	Input 16:	Bit Register	UINT
WORD 107		High Output Mask	UINT
WORD 108		Low Output Mask	UINT
WORD 109		Input Type	UINT
WORD 110		Parameter 1	UINT
WORD 111		Parameter 2	UINT
WORD 112		Parameter 3	UINT

Bit Register - This word is a bit register that defines the active state of the output and the update capture value. The register is defined below

Bit 0: Active State - This bit defines the active state of the input. A value of zero indicates an active low state in which the input is triggered by a falling edge. A value of one indicates an active high state in which the input is triggered by a rising edge.

Bits 1,2: Update Capture Registers - These two bits define when the Input Capture Registers in the Input Status Attribute of the PLS Status Class (0xC0) are updated. These registers are updated in pairs. A value of zero in these bits indicates that the registers will be updated when the resolver position goes through zero. A value of one indicates that the registers will be updated when the leading edge of the input is detected. A value of two indicates that the registers will be updated when the trailing edge of the input is detected. This is defined in the table below:

Update Capture Bit Values	Description
0	Update registers through zero cross
1	Update registers at leading edge
2	Update registers at trailing edge

High Output Mask - This word defines which outputs are assigned to the input. Each bit in the word represents an output with bit 0 assigned to output 1 and bit 15 assigned to output 16. In order for an output to be assigned to an input, both the input and the output must belong to the same group. This word is ignored if the input type is associated with the PLS group.

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Low Output Mask - This word defines which outputs are assigned to the input. Each bit in the word represents an output with bit 0 assigned to output 17 and bit 15 assigned to output 32. In order for an output to be assigned to an input, both the input and the output must belong to the same group. This word is ignored if the input type is associated with the PLS group.

Input Type - This word defines the input type for the specified input. The input type codes are as follows:

Input Type	Input Type Code
No Input Type	0
Remote Setpoint Tuning	10
Reset to Preset (standard)	20
Reset to Preset (single shot)	21
Reset to Preset (average)	22
Reset to Preset (window)	23
Output Enable (level)	30
Output Enable (single shot)	31
Output Enable (advanced mode)	32
Force Outputs	40
Remote Offset Tune	110
Reset to Preset Group (standard)	120
Reset to Preset Group (single shot)	121
Reset to Preset Group (average)	122
Reset to Preset Group (window)	123
Output Enable Group (level)	130
Output Enable Group (single shot)	131
Output Enable Group (advanced mode)	132
Force Group	140

Parameters 1, 2, 3 - The values in these words depends on the input type. The table below defines what each parameter is based on the input type:

Input Type	Parameter 1	Parameter 2	Parameter 3
Remote Setpoint Tune Remote Offset Tune	Counts to advance or retard	--	--
Reset to Preset (standard) Reset to Preset Group (standard)	Preset value	--	--
Reset to Preset (single-shot) Reset to Preset Group (single-shot)	Preset value	--	--
Reset to Preset (average) Reset to Preset Group (average)	Number of positions to average together	--	--
Reset to Preset (window) Reset to Preset Group (window)	Preset value	Window On Position	Window Off Position
Output Enable (level) Output Enable Group (level)	--	--	--
Output Enable (single-shot) Output Enable Group (single-shot)	Window On Position	Window Off Position	--
Force Output Force Group	Unforce, force on, or force off in active state*	Unforce, force on, or force off in inactive state*	--
* This value should be a 0 to unforce the outputs, 1 to force the outputs on, and 2 to force the outputs off.			

2.7 Add-On Test Object (Class 0xC1, Attribute 35)

The add-on test was designed to fire the outputs as if the machine was operating at a specified RPM value. The simulated RPM and time duration is programmed into the 7500 along with the outputs that are to be operational during the test. The test is enabled by the add-on test enable bit in the output data transfer. The test would run for the time duration specified and then automatically stop. If a time duration of zero is entered, the test will run until the add-on test enable bit is cleared.

Word	Data	Description	Type
WORD 1	Add-On Parameters:	Simulate RPM Value	UINT
WORD 2		Simulate Time Value	UINT
WORD 3		Simulate Output Mask	UINT

Simulate RPM Value - This word contains the simulated RPM value that the test is to run at. Valid RPM values range from 0 to 2048.

Simulate Time Value - This word contains the time duration the test is to run in milliseconds. Values range from 0 to 65535ms. If the time is set to zero, the duration of the test is directly controlled by the add-on enable bit in the output data transfer.

Simulate Output Mask - This word defines which outputs are affected by the add-on test. Each bit in the word represents an output with bit 0 assigned to output 1 and bit 15 assigned to output 16.

2.8 Offset Object (Class 0xC1, Attribute 36)

The offset object is used to set an offset for a PLS group. There are three different ways to set an offset for a group: home, absolute, and relative.

The home offset is used to send the position value that the resolver is supposed to be set to. For example, if the current resolver position is at 10 and the desired position is to be at position 100, the user would send a home offset value of 100.

The absolute offset is used to set the offset value relative to the absolute resolver position. For example, the absolute resolver position is at 10 and an absolute offset of 80 is sent, the new position value would be 90.

The relative offset is used to add or subtract from the current offset. For example, if the current position value is at 50 and a relative offset of -10 is sent, the new position value would be 40.

Word	Data	Description	Type
WORD 1	Offset Bit Mask	Offset Bit Register	INT
WORD 2	Group 1 Offset:	Offset Value	INT
WORD 3	Group 2 Offset:	Offset Value	INT
WORD 4	Group 3 Offset:	Offset Value	INT
WORD 5	Group 4 Offset:	Offset Value	INT
WORD 6	Group 5 Offset:	Offset Value	INT
WORD 7	Group 6 Offset:	Offset Value	INT
WORD 8	Group 7 Offset:	Offset Value	INT
WORD 9	Group 8 Offset:	Offset Value	INT

Offset Bit Mask - This register is used to indicate which offset values are to be set in the PLS groups. The register is shown below:

Group 8		Group 7		Group 6		Group 5	
15	14	13	12	11	10	9	8

Group 4		Group 3		Group 2		Group 1	
7	6	5	4	3	2	1	0

The following table contains the bit patterns to indicate which offset value is contained in the group offset word:

Bit Pattern	Offset Type
00	No offset
01	Home offset
10	Absolute offset
11	Relative Offset

In order to set an offset for a group, put the appropriate offset type in the bit register and place the offset value in the group offset word.

Group Offset - The group offset word contains the offset value for the specified group. This value depends upon what type of offset is indicated in the bit register.

2.9 Program Control Object (Class 0xC1, Attribute 37)

The program control object is used to initialize the 7500, save the current settings to NVRAM, or restore settings from NVRAM.

Word	Data	Description	Type
WORD 1	Program Control Data	Control Code	UINT
WORD 2		Control Data	UINT

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Program Control Code - This word determines which operation will be performed by the 7500. The table below contains the valid control codes:

Control Code	Program operation
1	No offset
2	Save current settings
3	Restore settings from NVRAM

Program Control Data - This word is reserved for future expansion.

2.10 Encoder Object (Class 0xC1, Attribute 38)

The encoder object is used to configure the type of encoder that is attached to the 7500. This attribute is valid on the 7500 encoder version only. Attempting to write to this attribute on the 7500 resolver version will produce an error.

Word	Data	Description	Type
WORD 1	Encoder Data	Maximum Counts	UINT
WORD 2		Encoder Type	UINT

Maximum Counts - This word contains the number of pulses that are in one revolution of the encoder. This number can range from 2 to 16384.

Encoder Type - The encoder can be configured as a X1 or X4 encoder. When this word is set to a 1, the encoder is a type X4 encoder where every edge will increment the encoder position by 1. When this word is set to 0, the encoder type is X1 where one full quadrature cycle will increment the encoder position by 1.

2.11 System Information Object (Class 0xC0, Attribute 1)

The system information object contains general information about the 7500 PLS.

Word	Data	Description	Type
WORD 1	Software Version:	Major Version Number	UINT
WORD 2		Minor Version Number	UINT

Software Version - These words contain the major and minor version number of the software that is being used in the 7500 PLS.

2.12 Input Status Object (Class 0xC0, Attribute 2)

The input status object is used to retrieve the input capture registers. It also contains the current status of the input.

Word	Data	Description	Type
WORD 1	Input 1 Information:	Input Leading Position	UINT
WORD 2		Input Trailing Position	UINT
WORD 3		Transition Status	UINT
WORD 4	Input 2 Information:	Input Leading Position	UINT
WORD 5		Input Trailing Position	UINT
WORD 6		Transition Status	UINT
WORD 7	Input 3 Information:	Input Leading Position	UINT
WORD 8		Input Trailing Position	UINT
WORD 9		Transition Status	UINT
WORD 10	Input 4 Information:	Input Leading Position	UINT
WORD 11		Input Trailing Position	UINT
WORD 12		Transition Status	UINT
WORD 13	Input 5 Information:	Input Leading Position	UINT
WORD 14		Input Trailing Position	UINT
WORD 15		Transition Status	UINT
WORD 16	Input 6 Information:	Input Leading Position	UINT
WORD 17		Input Trailing Position	UINT
WORD 18		Transition Status	UINT
WORD 19	Input 7 Information:	Input Leading Position	UINT
WORD 20		Input Trailing Position	UINT
WORD 21		Transition Status	UINT
WORD 22	Input 8 Information:	Input Leading Position	UINT
WORD 23		Input Trailing Position	UINT
WORD 24		Transition Status	UINT
WORD 25	Input 9 Information:	Input Leading Position	UINT
WORD 26		Input Trailing Position	UINT
WORD 27		Transition Status	UINT
WORD 28	Input 10 Information:	Input Leading Position	UINT
WORD 29		Input Trailing Position	UINT

WORD 30		Transition Status	UINT
WORD 31	Input 11 Information:	Input Leading Position	UINT
WORD 32		Input Trailing Position	UINT
WORD 33		Transition Status	UINT
WORD 34	Input 12 Information:	Input Leading Position	UINT
WORD 35		Input Trailing Position	UINT
WORD 36		Transition Status	UINT
WORD 37	Input 13 Information:	Input Leading Position	UINT
WORD 38		Input Trailing Position	UINT
WORD 39		Transition Status	UINT
WORD 40	Input 14 Information:	Input Leading Position	UINT
WORD 41		Input Trailing Position	UINT
WORD 42		Transition Status	UINT
WORD 43	Input 15 Information:	Input Leading Position	UINT
WORD 44		Input Trailing Position	UINT
WORD 45		Transition Status	UINT
WORD 46	Input 16 Information:	Input Leading Position	UINT
WORD 47		Input Trailing Position	UINT
WORD 48		Transition Status	UINT

Input Leading Position - This word contains the position that the last leading edge of the input was detected at.

Input Trailing Position - This word contains the position that the last trailing edge of the input was detected at.

Transition Status - This word contains the current transition status of the input for this revolution. The following table contains the codes returned:

Transition Code	Transition State
0	Input Not Detected
1	Leading Edge Detected
2	Trailing Edge Detected
3	Leading and Trailing Edges Detected

2.13 Offset Information Object (Class 0xC0, Attribute 3)

This object is used to retrieve the current offset values that are used for each group and input.

Word	Data	Description	Type
WORD 1	Group Offsets:	Group 1 Offset Value	UINT
WORD 2		Group 2 Offset Value	UINT
WORD 3		Group 3 Offset Value	UINT
WORD 4		Group 4 Offset Value	UINT
WORD 5		Group 5 Offset Value	UINT
WORD 6		Group 6 Offset Value	UINT
WORD 7		Group 7 Offset Value	UINT
WORD 8		Group 8 Offset Value	UINT
WORD 9	Input Offsets:	Input 1 Offset Value	UINT
WORD 10		Input 2 Offset Value	UINT
WORD 11		Input 3 Offset Value	UINT
WORD 12		Input 4 Offset Value	UINT
WORD 13		Input 5 Offset Value	UINT
WORD 14		Input 6 Offset Value	UINT
WORD 15		Input 7 Offset Value	UINT
WORD 16		Input 8 Offset Value	UINT
WORD 17		Input 9 Offset Value	UINT
WORD 18		Input 10 Offset Value	UINT
WORD 19		Input 11 Offset Value	UINT
WORD 20		Input 12 Offset Value	UINT
WORD 21		Input 13 Offset Value	UINT
WORD 22		Input 14 Offset Value	UINT
WORD 23		Input 15 Offset Value	UINT
WORD 24		Input 16 Offset Value	UINT

Group Offset Value - These words contain the current offset values that are added to the resolver position to create the current group position.

Input Offset Value - These words contain the current offset values tat are used to generate the reset to preset values for the inputs. If the input is not a reset to preset input, the value will be zero.

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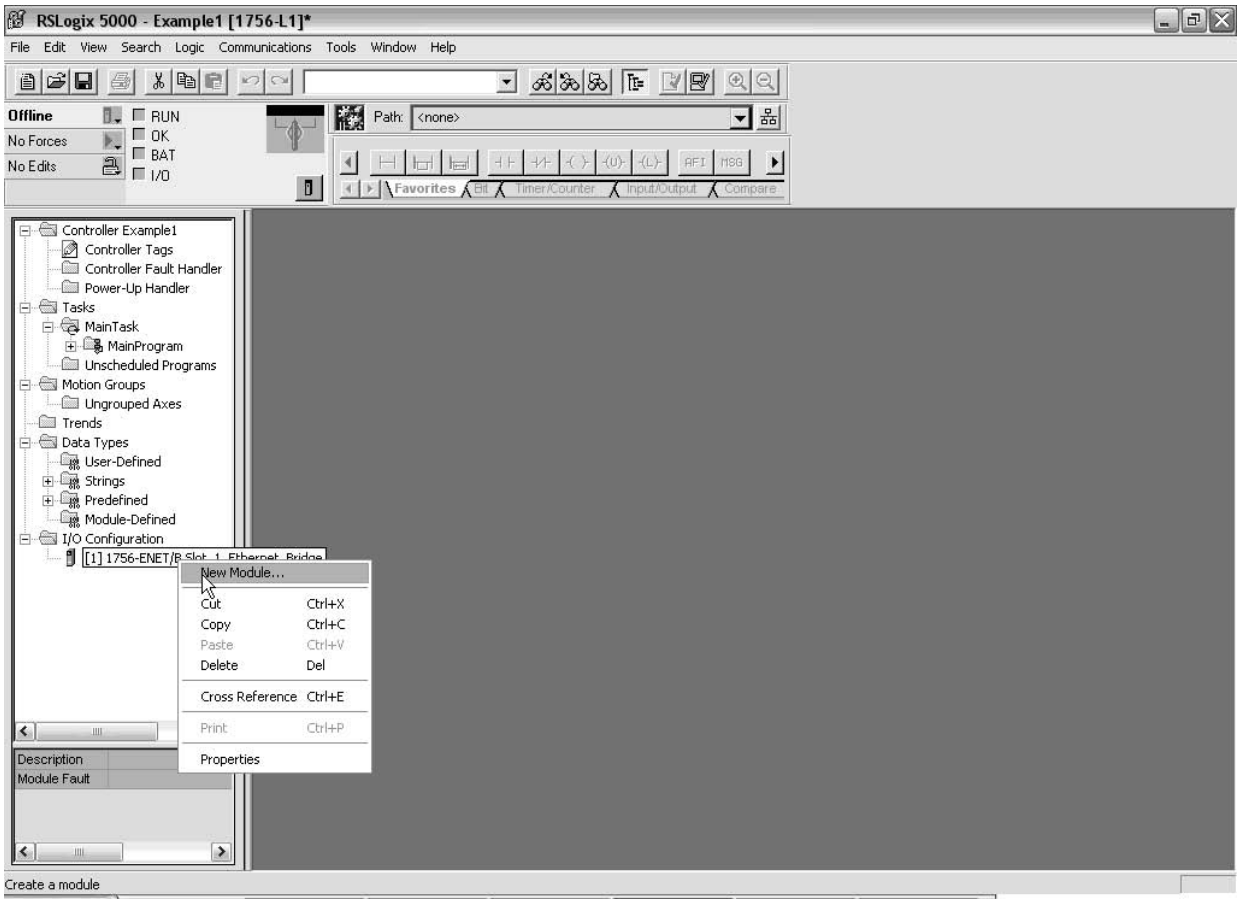
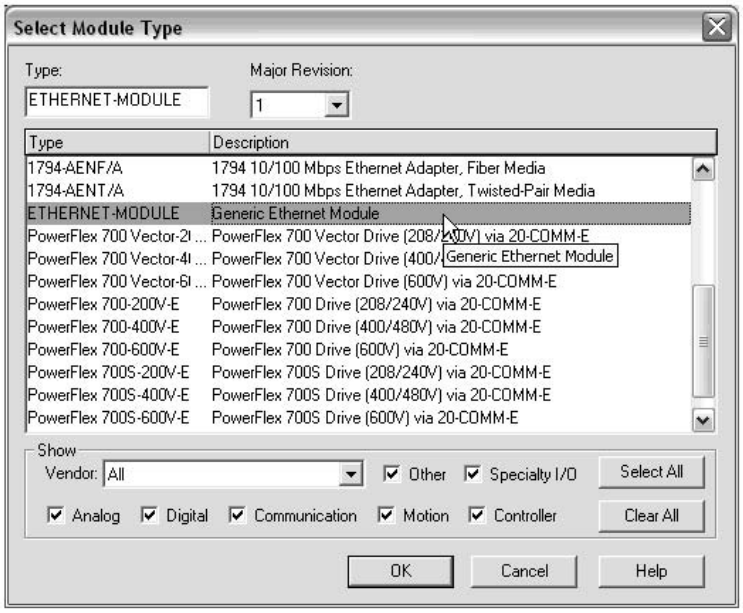
Chapter 3 Configuring RSLogix 5000 to Communicate with a 7500 PLS

3.1 Setting Up an I/O Data Transfer

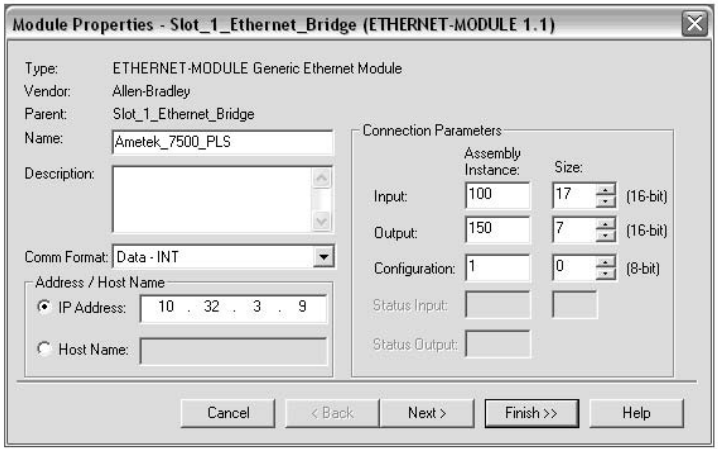
To communicate to the 7500 PLS through RSLogix 5000, add a new module to the EthernetNet bridge:



The following screen will appear:



Select a Generic Ethernet Module from the list and hit OK. The Module Properties box will appear. Set the module up as follows:



This will create three controller tags for the 7500 PLS. The Ametek_7500_PLS:I file contains the data from the input data transfer. The Ametek_7500_PLS:O file contains the data for the output data transfer. The Ametek_7500_PLS:C file is not used. The Comm Format is set for Data-INT (16 bits). Set the IP address to the IP address that was programmed into the Ametek 7500 PLS (see App. Note “Programming IP Address for Ametek 7500 PLS”).

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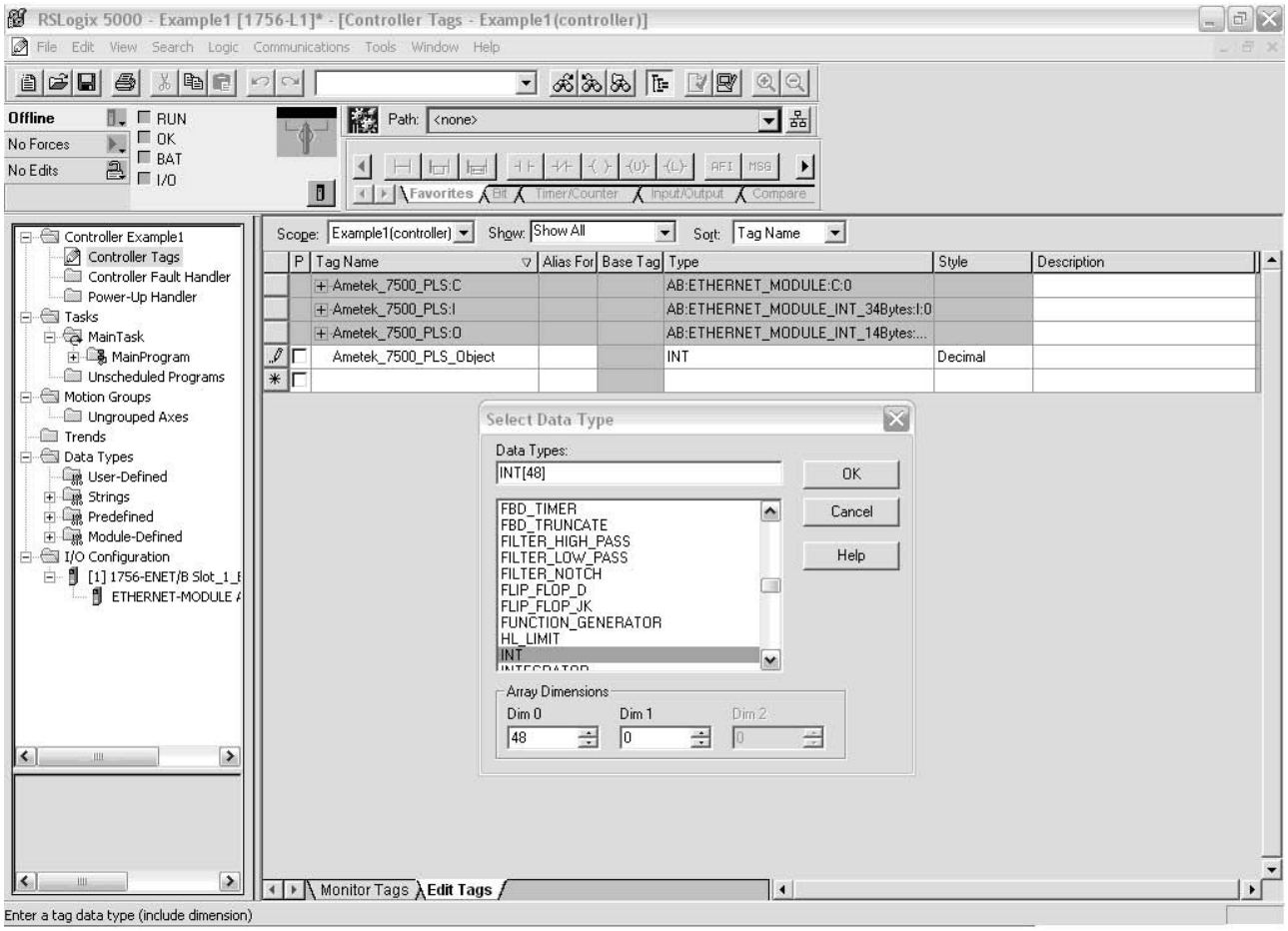
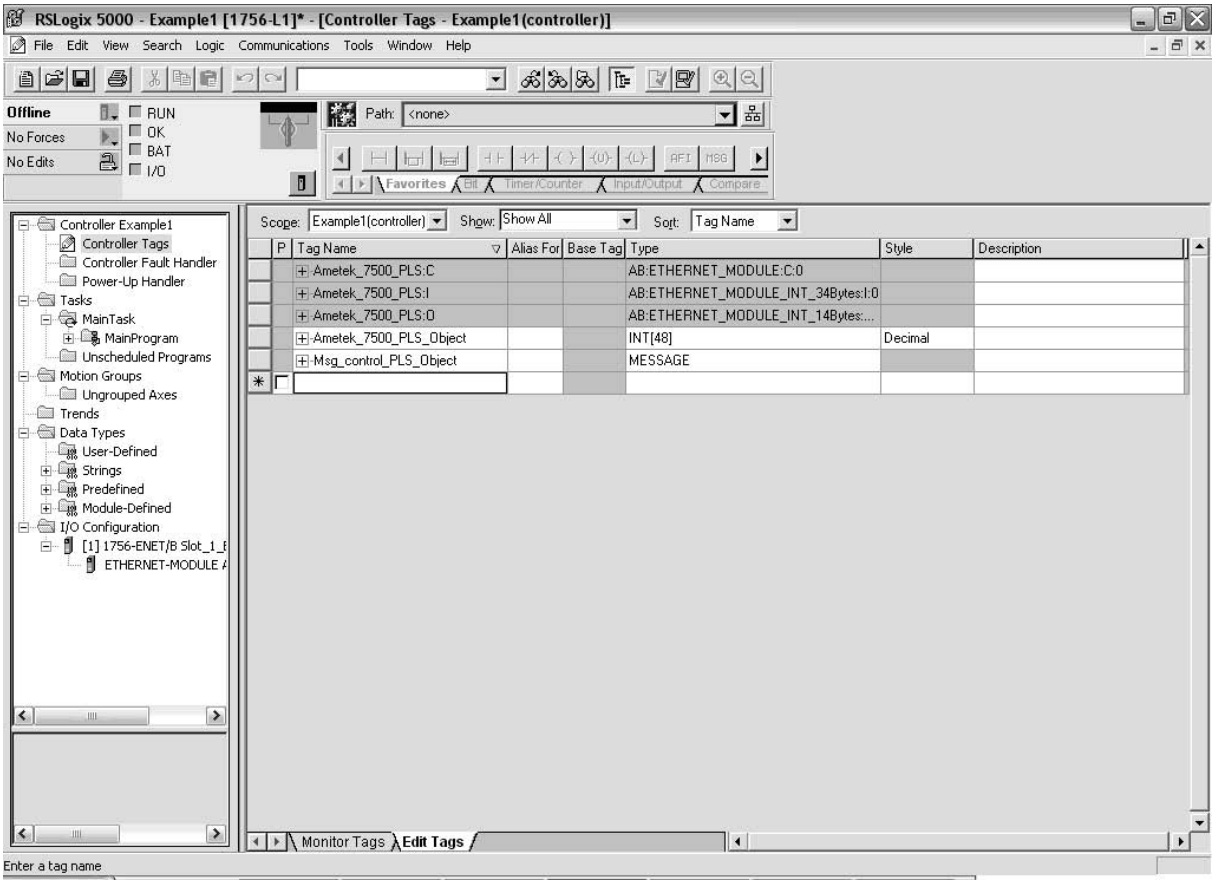
3.2 Setting Up An Explicit Message

The following describes how to send an explicit message to the 7500 PLS. In the example, we will use the PLS object (see “Network Programming Manual for Ethernet/IP” for details about PLS Object).

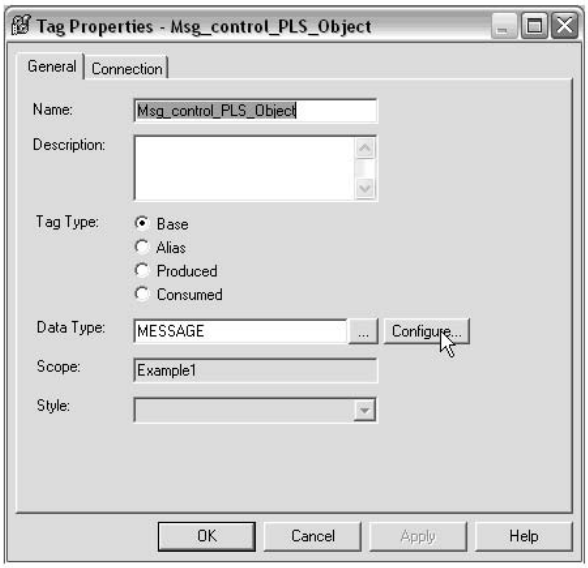
Create a tag of type INT that is 48 words in size:



Next, create a tag of type MESSAGE. This will be used to link the PLS Object tag to the explicit message.



After the message tag is created, edit the tag properties of the MESSAGE tag and click on the configure button next to the data type:



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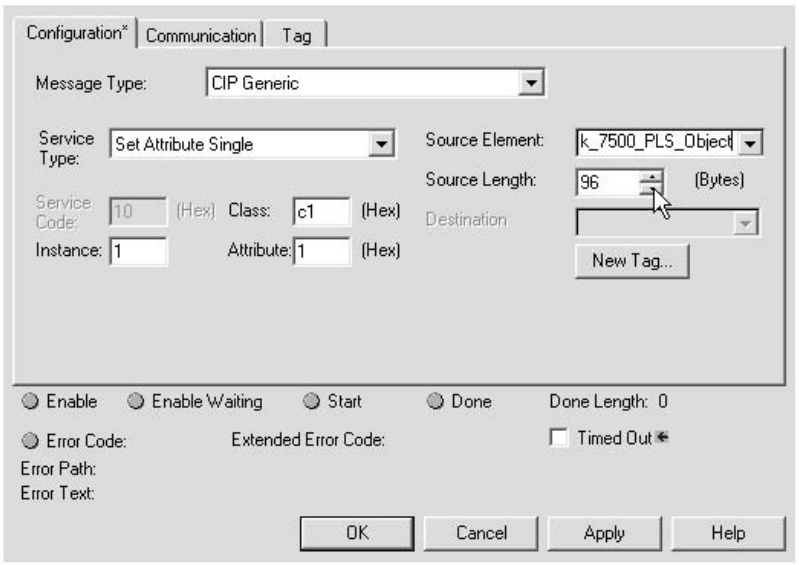
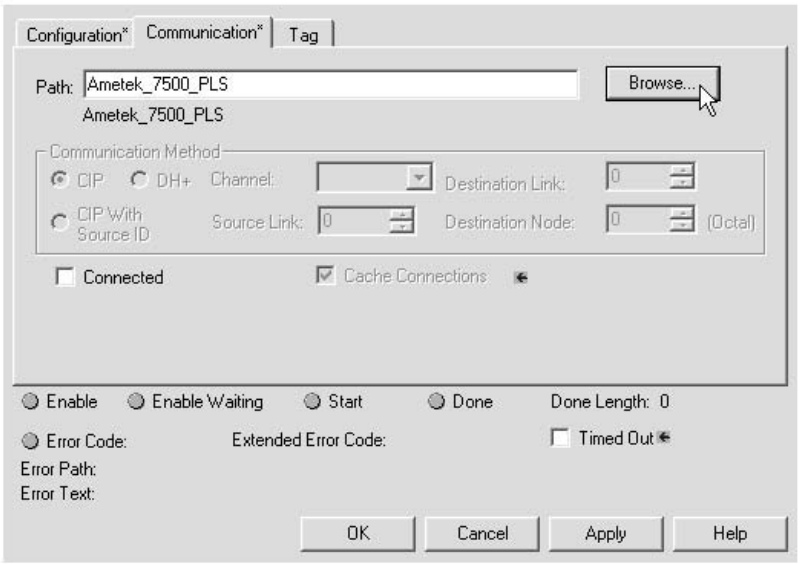
The following window will appear. Fill in the appropriate data in each field.



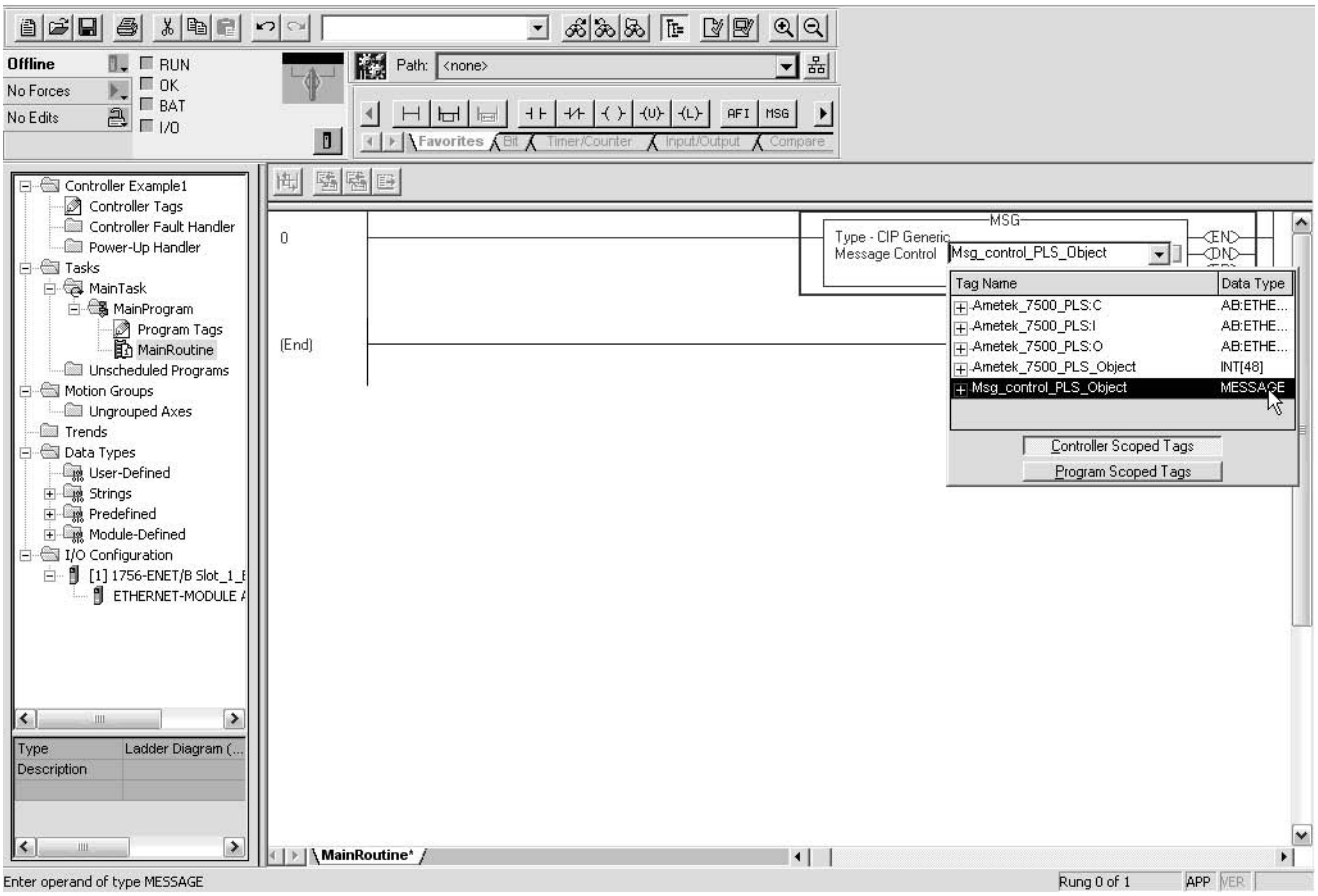
Select CIP Generic for the message type. Service type should be a set attribute single type (Note: in order to retrieve status data, the service type would be set to get attribute single) The class number is 0xc1 for the PLS configuration class. The instance number is always set to 1. The attribute number is set to 1 for the PLS object. The source element points to Ametek_7500_PLS_Object tag that was created in the previous step. The source length is in bytes. Since the PLS object is 48 words, the source length is 96 bytes.

Click on the communication tab and select the communication path to the Ametek_7500_PLS.



Click OK to save the MESSAGE data.

In order to send the PLS data to the Ametek 7500 PLS, a MSG instruction must be added to the ladder logic.



For the Message Control, select the tag that was just created in tag that was just created as its control file.

When the ladder logic is run, an explicit message containing the PLS data will be sent to the Ametek 7500 PLS.

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