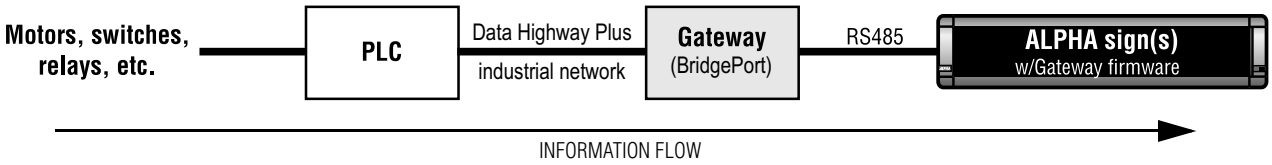
How to connect ALPHA signs to Data Highway Plus using the BridgePort

Introduction

This document explains how to set up the BridgePort to act as an interface between a Data Highway Plus industrial network and an ALPHA sign network, as illustrated below:



NOTE: In the event of a communication failure, caused by any means, messages may not be displayed on a sign.

Specifically, this document describes how to:

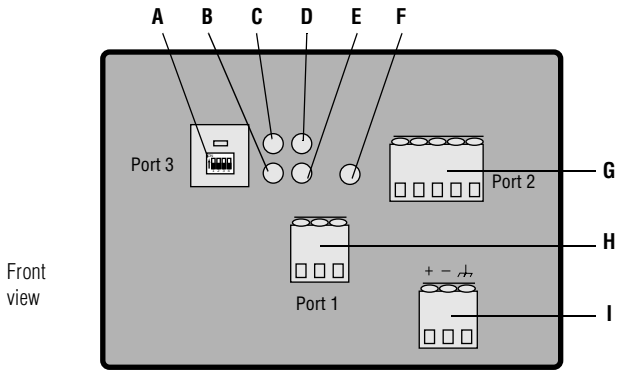
- connect the BridgePort to a Data Highway Plus PLC and to one or more ALPHA signs,
- use **BridgePort Configuration Editor** software to set up the BridgePort so that it interfaces between a Data Highway Plus PLC and an ALPHA sign network,
- use **Gateway Messaging Software** to program messages and variables into ALPHA signs, and
- use **RSLogix 500** software to program a Data Highway Plus PLC to send data to and from the BridgePort and ALPHA signs.

Related documents

Document name	Part number	Description
Gateway Messaging Software User Manual	9703-7004	Describes how to use Adaptive's Gateway Messaging Software to store messages in ALPHA signs.
Network Configurations	9708-8046	Explains how to network ALPHA signs.

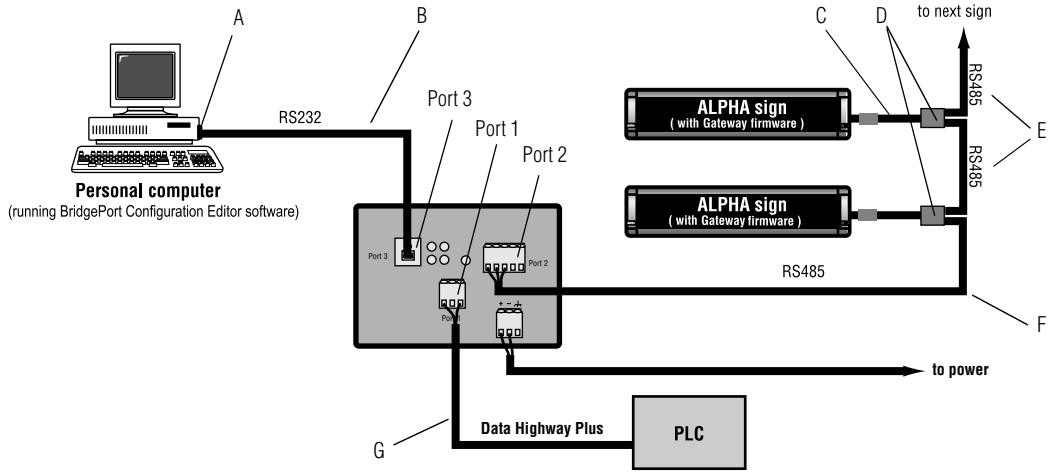
BridgePort description

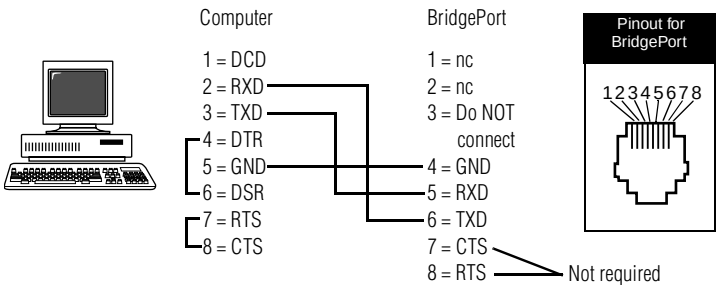
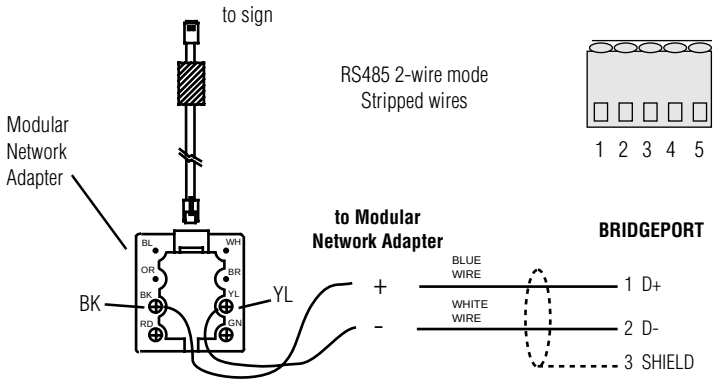
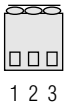
The BridgePort is an intelligent Data Highway Plus-to-serial communications interface unit. It allows data exchange between a Data Highway Plus host PLC and ALPHA signs equipped with the Gateway firmware option.



Item	Name	Description
A	Port 3 ("passthrough port")	Connect to a computer that is running the **BridgePort Configuration Editor** software and the **Gateway Messaging Software**.
B	Status LED	*Slow flash* (on 2 seconds, off 2 seconds) = The BridgePort is in Firmware Download mode, waiting for the Configuration Editor software to download new firmware to it. *Medium flash* (on 1 second, off 1 second) = The BridgePort is in Configuration mode, waiting for the Configuration Editor software to send new configuration data to it. *Fast flash* (on 100 ms, off 100 ms) = The BridgePort is in Run mode, where it will receive Data Highway Plus messages and convert them to Modbus. This is automatically set: 1) on power up, or 2) after downloading the configuration. If configured, data will be passed through from the Passthrough port to the Modbus port. (See "Troubleshooting BridgePort modes" on page 6 for methods to put the BridgePort into normal Run mode.
C	Power LED	*On* = The BridgePort is receiving electrical power *Off* = The BridgePort is *not* receiving electrical power
D	Network 1 LED	*On* = Communication is being received from the Data Highway Plus host. *Off* = No communication is being received from the Data Highway Plus host.
E	Network 2 LED	*On* = Confirmation that communication is being received by the sign or other Modbus device. *Off* = No confirmation that communication is being received by the sign or other Modbus device.
F	Configuration button	Used only when downloading settings to the BridgePort. (See "BridgePort setup instructions" on page 4.) Use a pencil or similar pointed object to press this internal button.
G	Port 2	Data output (RS485) to one or more ALPHA signs.
H	Port 1	Data input from a Data Highway Plus host PLC.
I	Power connector	Connect to a DC power supply of 12 to 28 volts rated at 9 watts.

BridgePort interconnection diagram



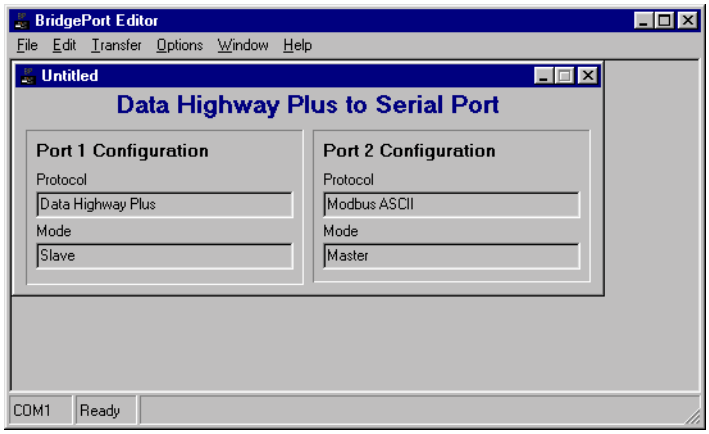
Item	Part #	Description
A	1088-9105A	DB25-to-DB9 adapter (for DB25 computer COM port)
B	1188-0005	DB9-to-RJ45 Configuration Cable to Port 3 
C	1088-8636	1 foot, 4-conductor RS485 cable (NOTE: If the Modular Network Adapter is inside the ALPHA sign, this cable is not necessary.)
D	4331-0602	Modular Network Adapter (NOTE: On some ALPHA signs, this adapter is inside the sign.)
E	1088-8000	RS485 cable
F	Call your Adaptive distributor	Belden shielded cable ("Blue hose") to Port 2 
G	—	Data Highway Plus cable to Port 1  **BRIDGEPORT** 1 = 1 2 = Shield 3 = 2

BridgePort setup instructions

1. Attach a computer to the BridgePort. (See "BridgePort interconnection diagram" on page 3.)
2. If not already installed, install the **BridgePort Configuration Editor** software on the computer that will be used to program the BridgePort.

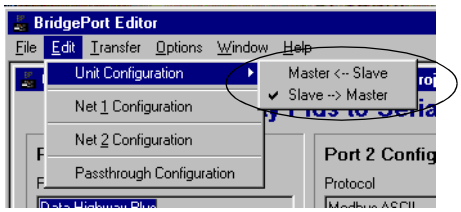
Create the project file

3. Start the **BridgePort Configuration Editor** software. A screen similar to the following will appear.



NOTE: If the **BridgePort Configuration Editor** opens with an empty screen instead of with the "Data Highway Plus to Serial Port" window, you must create a new "project" file by selecting *File* > *New*.

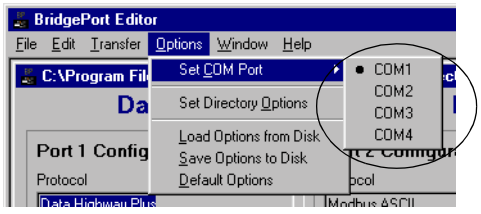
4. Select *Edit* > *Unit Configuration* and make sure that *Slave --> Master* is selected, to set the BridgePort to slave mode.



5. Save the project by selecting *File* > *Save*. If prompted with a "Save As" window, provide an appropriate name and location.

Set up the COM port

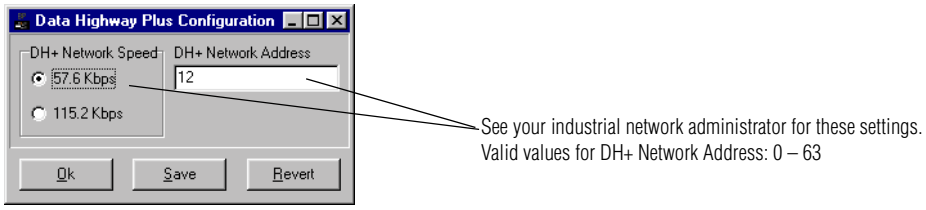
6. Select *Options* > *Set COM Port* and choose the PC COM Port you will use to communicate with the BridgePort. (The default is COM 1.)



7. (Optional) Once a COM Port is selected, you may wish to save this setting by selecting *Options* > *Default Options*. If you do not do this, the COM port setting may revert to a former setting. The COM port setting is not part of the project, so saving the project will not save the COM port setting.

Set up PLC communication (Port 1)

8. Select *Edit* > *Net 1 Configuration* to set up Port 1 on the BridgePort.



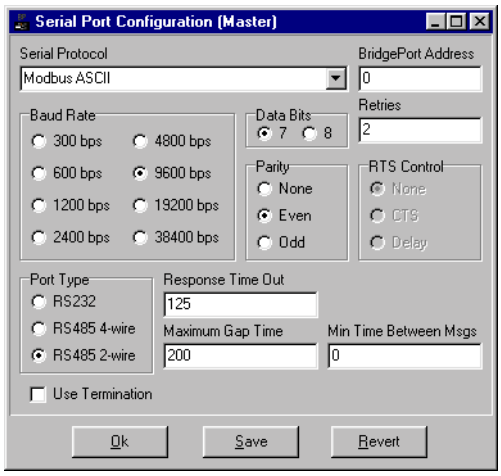
9. Select *Save*. You will be notified that the information was saved. Click ***Ok*** to exit this screen.

Set up ALPHA sign communication (Port 2)

10. Select *Edit* > *Net 2 Configuration* to set up Port 2 on the BridgePort so that it can communicate with ALPHA signs equipped with the Gateway firmware option.

These are the default settings.
Use these settings for Port 2:

- *Serial Protocol* = **Modbus ASCII**
- *BridgePort Address*= **0**
- *Baud Rate*: **9600**
- *Data Bits*: **7**
- *Retries*: **2**
- *Parity*: **Even**
- *RTS Control*: **None** (unavailable)
- *Port Type*: **RS485 2-wire**
- *Response Time-Out*: **125 ms** (recommended)
- *Maximum Gap Time*: **200** (recommended)
- *Min Time Between Msgs*: **0**
- *Use Termination*: **unchecked**



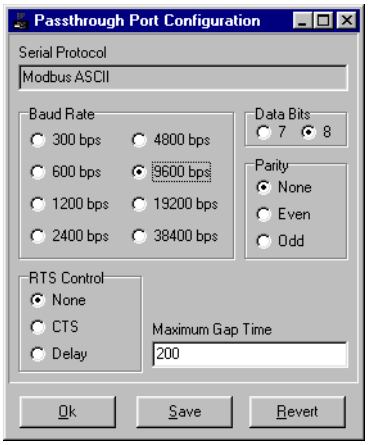
11. Select *Save*. You will be notified that the information was saved. Click ***Ok*** to exit this screen.

Set up the "Passthrough" port (Port 3)

12. Select *Edit* > *Passthrough Configuration* to set up Port 3.

These are the default settings.
Use these settings for Port 3:

- *Serial Protocol* = **Modbus ASCII**
- *Baud Rate*: **9600**
- *Data Bits*: **8**
- *Parity*: **None**
- *RTS Control*: **None**
- *Maximum Gap Time*: **200**

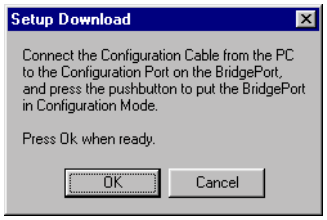


13. Select *Save*. You will be notified that the information was saved. Click ***Ok*** to exit this screen.
14. Select File > *Save* to save all the project settings you just entered.

Download the project settings to the BridgePort

15. After you have completed making changes to the project settings, push the Configuration button on the BridgePort, shown as Item "F" on page 2.
16. Download the project settings to the BridgePort by selecting *Transfer* > *Download project* and follow the prompts, as shown here.

    NOTE: After the download is complete, the BridgePort will go into normal run mode.



Troubleshooting BridgePort modes

There are three options to remove the BridgePort from configuration mode and put it back into normal run mode:

1. Download the project to the BridgePort (See "Download the project settings to the BridgePort" above.)
2. Upload the project from the BridgePort to the PLC. (*Transfer* > *Upload project*.)
3. Cycle the power to the BridgePort off and on again.

Program messages into the ALPHA sign

Using Adaptive's **Gateway Messaging Software**, program messages and variables into any ALPHA signs in your network. Refer to "Related documents" on page 1.

PLC setup instructions

To help you understand how to program a PLC and how it works with the BridgePort and ALPHA signs, this section and the pages that follow cover the basics of 5 different messaging functions. These basic examples are included in the numbered list, below, which also corresponds to the left-most column, "functions", in the table at the bottom of this page.

NOTE: Use **RSLogix 500** software for this setup.

NOTE: You must set up the I/O configuration according to your installation and environment prior to setting up the ladder logic program.

These examples illustrate the following basic messaging functions:

1. Write data to an ALPHA sign in a network…
   a. to activate a message stored in a sign (as described in "Activate a message stored in a sign." on page 8)
   b. to de-activate a message currently running on a sign
   c. to send a variable value to update a message currently running on a sign.
2. Determine which messages are currently running on a sign.
3. Process prior message instructions.
4. Activate a message on all signs in a network.
5. Clear all messages currently running on a sign.

Table 1: Important data for the examples

Function	For more info– See Page :	Location of elements in the PLC table	Address of BridgePort on the PLC network	Address of the sign on the sign network	Sign's register number	Valid values for sign commands	Direction of data flow
Activate a message stored in a sign	8	N7:80	10	20	101	1 - 4000 (dec) 4095 (dec)	PLC to sign
De-activate a message currently running on a sign	11	N7:81	10	20	102	1 - 4000 (dec) 4095 (dec)	PLC to sign
Send a variable value to update a message currently running on a sign	12	N7:82	10	20	1	1 - 100 (dec)	PLC to sign
Read a message currently running on a sign	14	N7:83	10	20	103	1 - 4000 (dec) 4095 (dec)	Sign to PLC
Process prior message instructions	15	—	—	—	—	—	—
Activate a message on all signs in a network	16	N7:84	10	255	101	1 - 4000 (dec) 4095 (dec)	PLC to sign
Clear all messages currently running on a sign	17	N7:85	10	20	102	FFFF (hex) 65,535 (dec)	PLC to sign

NOTE: PLC element locations can be varied according to your needs; however, sign register numbers must be *exactly as stated above*. (See "How data is stored in ALPHA signs" on page 18 for better understanding of sign register numbers.)

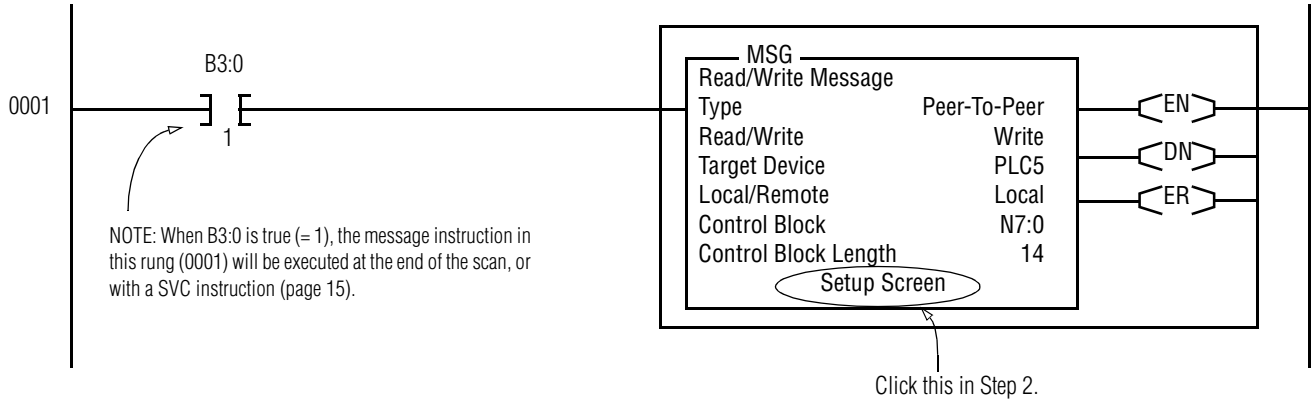
NOTE: For additional information on setting up a multi-sign network refer to ""Messaging options and individual sign addresses" on page 10.

Activate a message stored in a sign.

The number of the message that we want to activate (turn on) in the sign is located at N7:80 in the PLC data table. This data must be stored in register number 101 of sign 20.

1. Set up a message instruction in the ladder logic.

   NOTE: See the table below this ladder logic diagram for explanations of its parameters.

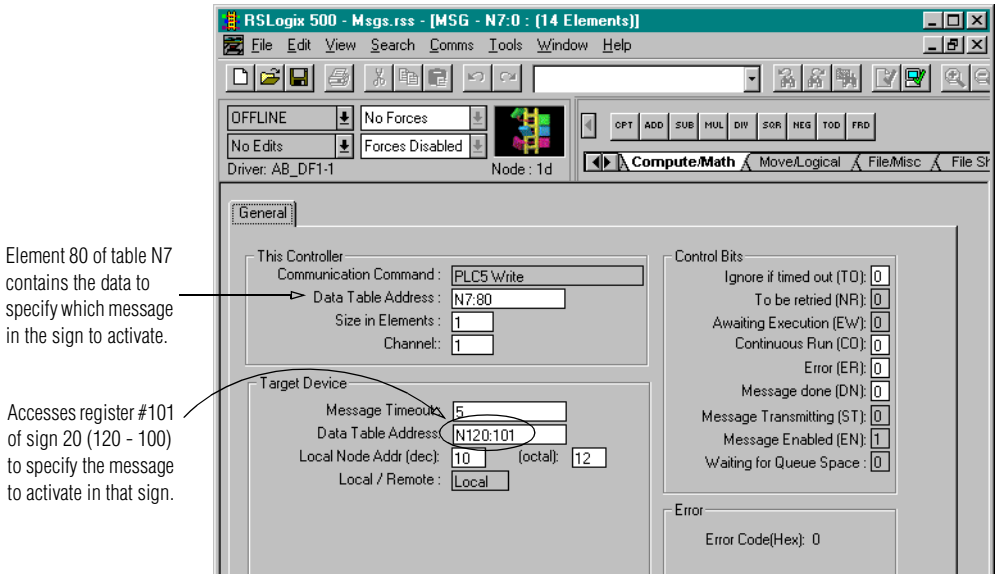


Name	Description	Notes
Type	Will always be *Peer-To-Peer.*	
Read/Write	Function to be performed. *Read:* Reads data from a sign through the BridgePort. *Write:* Sends a message through the BridgePort to a sign.	
Target Device	Type of device for the Read or Write function.	Always use *PLC5* for the BridgePort.
Local/Remote	*Local:* Interfaces directly to a BridgePort. *Remote:* Interfaces to a BridgePort through another device.	
Control Block	Consists of two parameters – the integer file to use and the starting element in that integer file: *Integer File:* A block of data elements that the PLC reserves for message instructions, *N7* in this example. *Starting Element:* The number of the element in the integer file where the reserved block starts.	The Control Block together with Control Block Length are used to reserve elements in the integer file for this message instruction. Use caution when determining these numbers: reserving a block does not prevent any application or instruction from writing over data for another application or instruction.
Control Block Length	The number of elements that will be used for the string of data. Set by the processor. Will always be a fixed block based on the specific type of PLC. In this case, it will be *14* to communicate with the BridgePort.	
Setup Screen	Double-click to access a window to set up the parameters for the specific message.	See Step 2.

2. Click on *Setup Screen* in the message instruction shown above to access a window to set up the parameters for this specific instruction.

3. Set up the message parameters.

NOTE: The two main fields in the table, below ("This Controller", and "Target Device") correspond to the fields for message parameters in the screen shot:



Name		Description	Notes
This Controller		*PLC settings that affect message parameters:*	
Network PLC	Communication Command	Target device and type of instruction (for reference)	
	Data Table Address	Consists of two parameters – the integer file to use and the element number in that integer file: *Integer File:* A block of data elements that the PLC reserves, *N7* in this example. *Element Number:* The number of the element in the integer file which contains the data to specify which message in the sign to use.	The Data Table Address together with Size in Elements are used to set the location of the storage of the data (message number, value of a variable, or a value to cause the sign to clear the message queue.) NOTE: Use caution when determining these numbers: reserving an address does not prevent any application or instruction from writing over data for another application or instruction. Range of valid data for Size in Elements: 1
	Size in Elements	Number of elements of data to be passed to a sign. **Always use *1*.** (The BridgePort only processes one element at a time.)	
	Channel	The port to be used for transmission. Generally, Channel 1 is for Data Highway Plus in local mode.	
Target Device		*Settings for BridgePort network "host" device that affect messaging parameters:*	
Bridgeport Host	Message Timeout	Number of scans (retries)	
	Data Table Address	Consists of three parameters: • N: Denotes an integer file. • Sign address: 100 plus the sign's address (displayed by the sign when it starts.) • Register number: The register number in the sign to be used for the specific processing. (See "How data is stored in ALPHA signs" on page 18.)	Range of valid data: Sign address: 101 - 355 (001 - 255 as interpreted by the sign) Register number: 1 - 167 NOTE: The error control bit (ER) is set when you are using address 355 to transmit to all signs but no sign on the network has been individually assigned address 255. See "Messaging options and individual sign addresses".
	Local Node Addr (dec/octal)	The specific address (node) of the specific BridgePort on the channel, set in either decimal or octal. (See "Set up ALPHA sign communication (Port 2)" on page 5.) When decimal is set, octal changes automatically, and when octal is set, decimal changes automatically.	Range of valid data: Decimal: 0 - 63 Octal: 0 - 77
	Local/Remote	Automatically set when setting up the message instruction. This is based on the setting for the message for this rung of the ladder logic. Shown here for reference.	

Messaging options and individual sign addresses

You can use “address 355” in the messaging instructions to send a “broadcast” message to every one of the signs on your network. (See “Activate a message on all signs in a network” on page 16.)

However, Modbus ASCII protocol uses ‘query and response’ for every exchange of data. If no sign on your network has been assigned an individual address as the sign at “address 255”, to provide the proper response to messaging instruction “355” (100 + 255), an error code is generated by “broadcast” messages.

- If your network is set up so that you have no particular need to avoid extraneous, incidental error codes, you can use the “address 355” broadcast messaging option. Message transmission and display remain unaffected whether or not a ‘response’ is generated from the sign network.
- If you must avoid error bits and at the same time have a need to maintain dedicated, individual communication with each one of your signs, (because each sign location can not appropriately display messages intended for all other locations, every time) assign multiple addresses for each messaging command.
- To avoid error bits you can:

  Select one sign to be the target for messages that will be displayed on the entire network. Set only that sign’s address to “255” so that it can provide the proper query response (100 + 255). All other signs on the network can then be assigned addresses from the valid range 1-254.

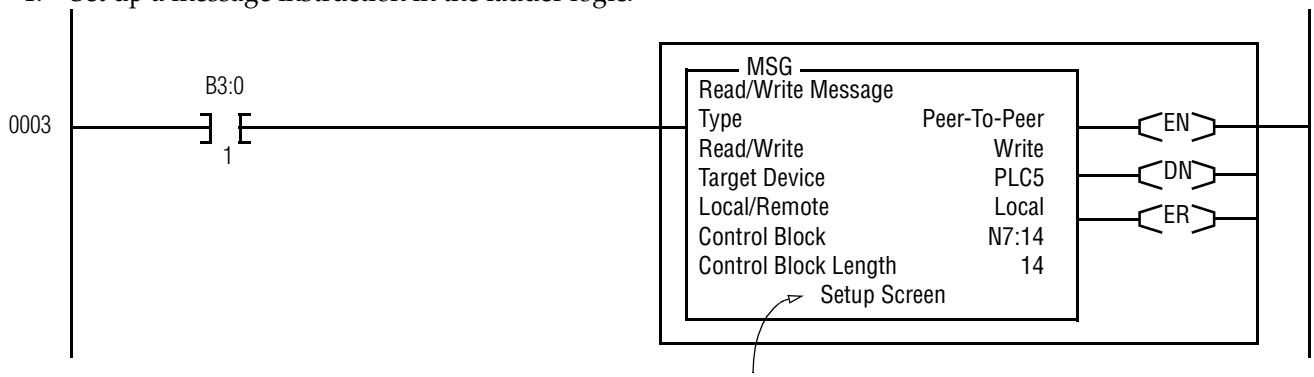
  NOTE: If you ever need to send a message to that particular sign and that sign, only; you will need to change the sign’s address prior to message transmission. The phsical accessibility of the sign addressed as “255” should be taken into account if this addressing option is used.

  Refer to the section on “Using the Remote Control” near the end of your *Gateway Messaging Software* manual for an explanation of how a handheld remote keypad can be used to quickly change a sign’s serial address. (Note–not all Gateway-compatible signs accept infrared commands.)

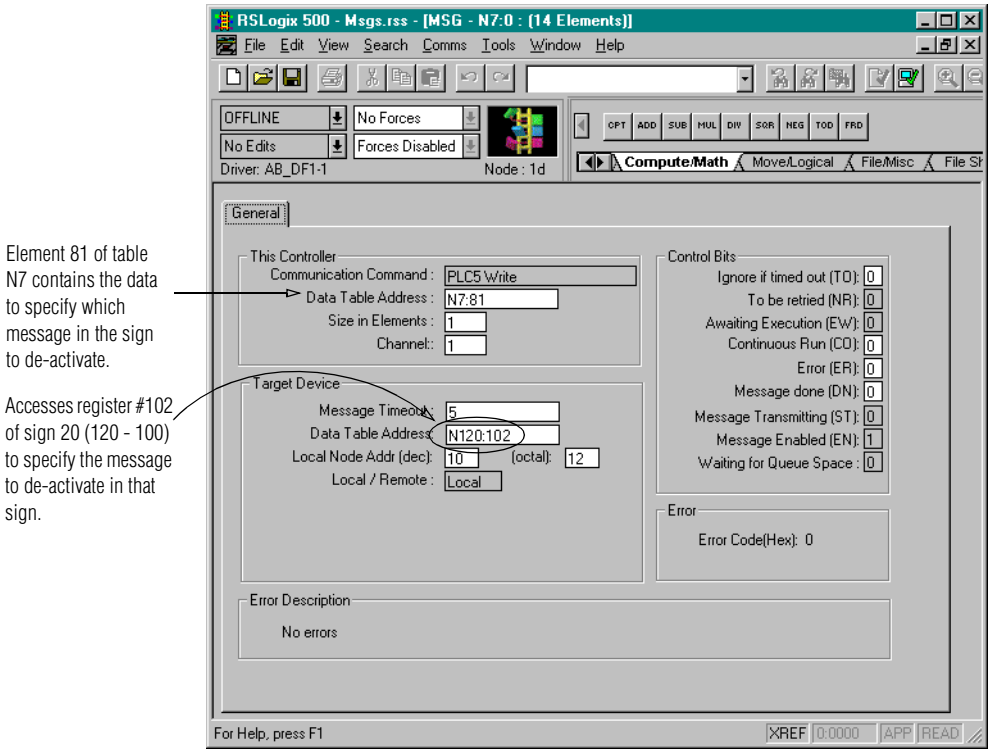
De-activate a message stored in a sign.

The number of the message that we want to de-activate (turn off) in the sign is located at N7:81 in the PLC data table. This data must be stored in register number 102 of sign 20.

1. Set up a message instruction in the ladder logic.



2. Click on *Setup Screen* in the message instruction shown above.
3. Set up the message parameters.

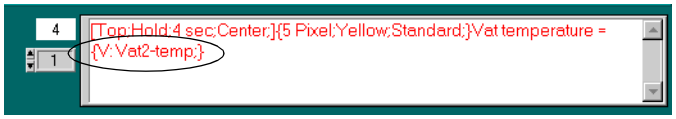


Send a variable value to update a message currently running on a sign

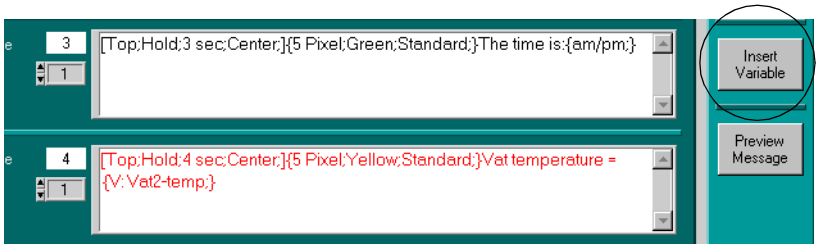
The value of the variable data that we want to send to sign 20 is located at N7:82 in the PLC data table. This data may be stored in any register number of the sign as needed from 1 to 100, which is the range of registers reserved for variable data. We'll store it in register #1, as determined in Step 1 below.

1. Determine the variable register number using *Gateway Messaging Software* if you don't already know it. (Refer to the **Gateway Messaging Software User Manual**, P/N 9703-7004, for more information on using the software.)

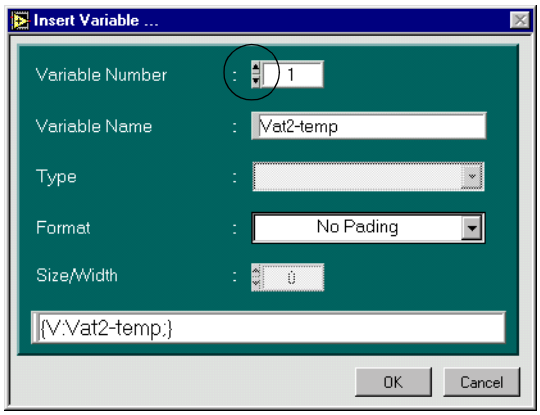
A. Find the message with the variable, Vat2-temp in this example.



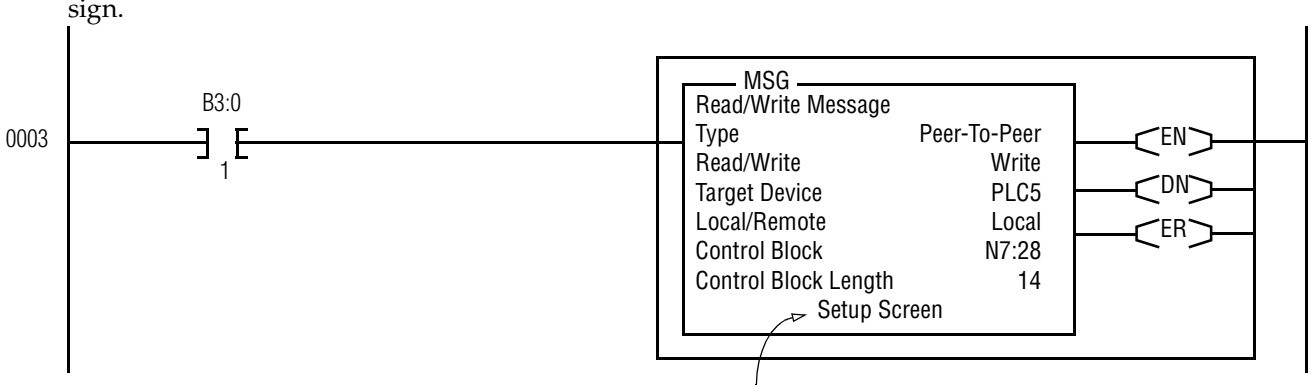
B. Click on *Insert Variable*.



C. Using the scrolling arrows for the Variable Number, scroll through the list of variables available until you locate the correct one. In this case, for Vat2-temp, it is Variable Number 1, therefore the register number is 1.



2. Set up a message instruction in the ladder logic to send the value of a variable to update a message in the sign.

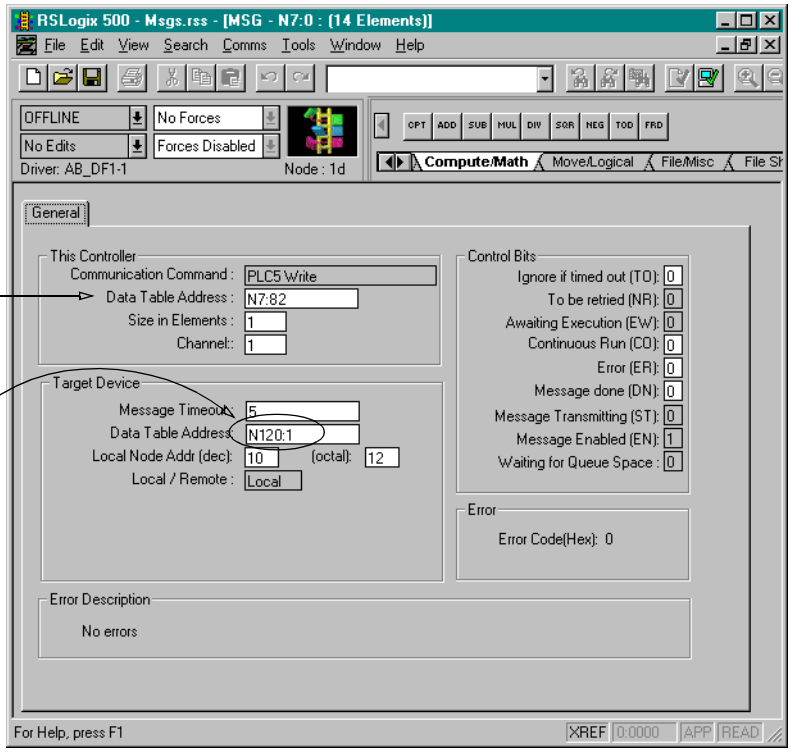


3. Click on *Setup Screen* in the message instruction shown above.

4. Set up the message parameters.

Element 82 of table N7 contains the data to specify the value of the variable.

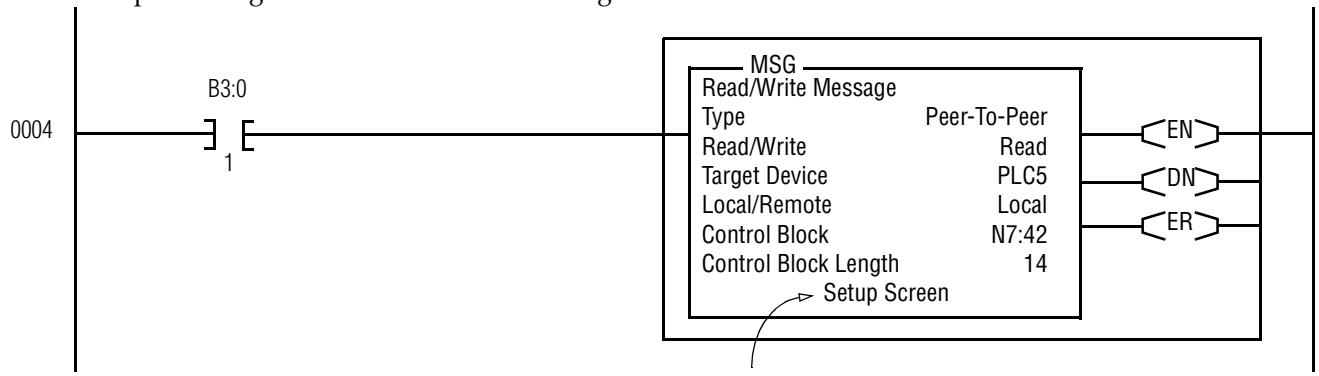
Accesses register #1 of sign 20 (120 - 100). Register #1 is for the variable we want to update.



Read a message currently running on a sign

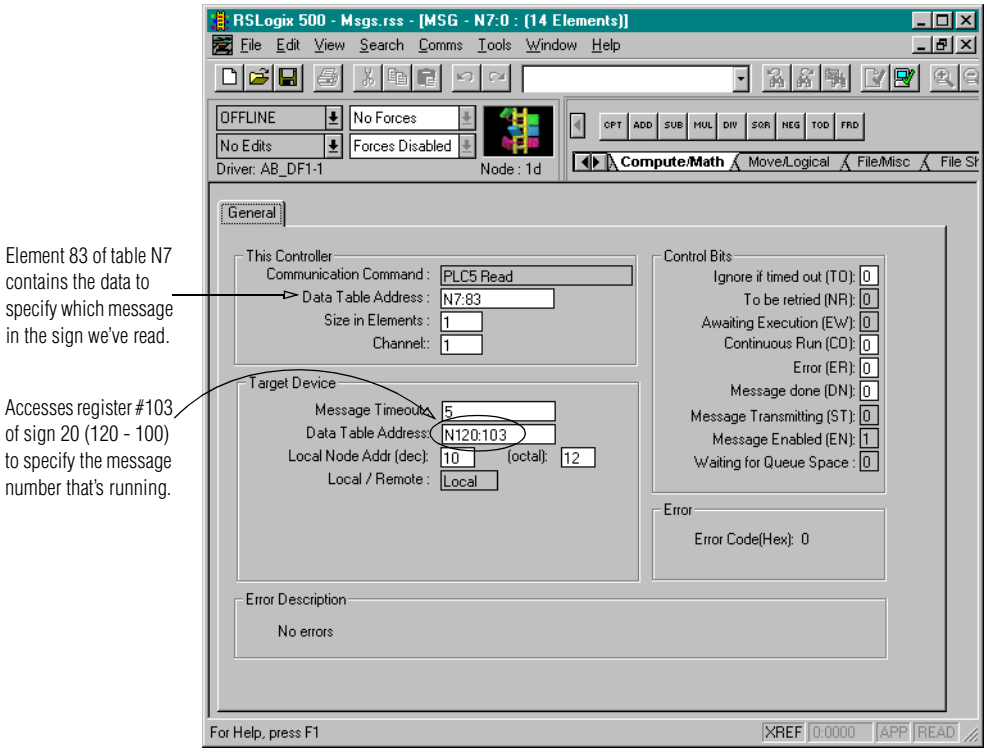
We want to determine the number of the message that's first (if any) in the message queue for currently-running messages in sign 20. The message queue consists of the sign's register numbers 103 to 167. The data for the first message in the message queue is located in register number 103. We'll store the number of the sign's first message at N7:83 in the PLC data table.

1. Set up a message instruction in the ladder logic.



2. Click on *Setup Screen* in the message instruction shown above.

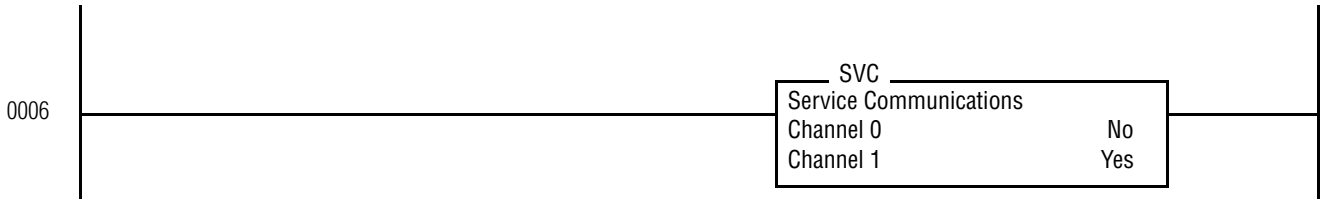
3. Set up the message parameters.



4. To read other messages in the message queue, specify the desired register number in the sign – any number from 103 to 167. Be sure to store the results at different element locations in the PLC data table.

Process prior message instructions

1. (Optional: If you are using multiple message instructions in your program, you may need to use the SVC Instruction to properly transmit the message instructions.) Set the SVC channel: There is a maximum of 4 message instructions which can be active at the same time, although more can be available in the ladder logic file. Therefore, to process any set of message instructions (up to 4), the Service Communications instruction is set up, as shown here. This will stop the PLC scan processing, send instructions, and then resume processing.

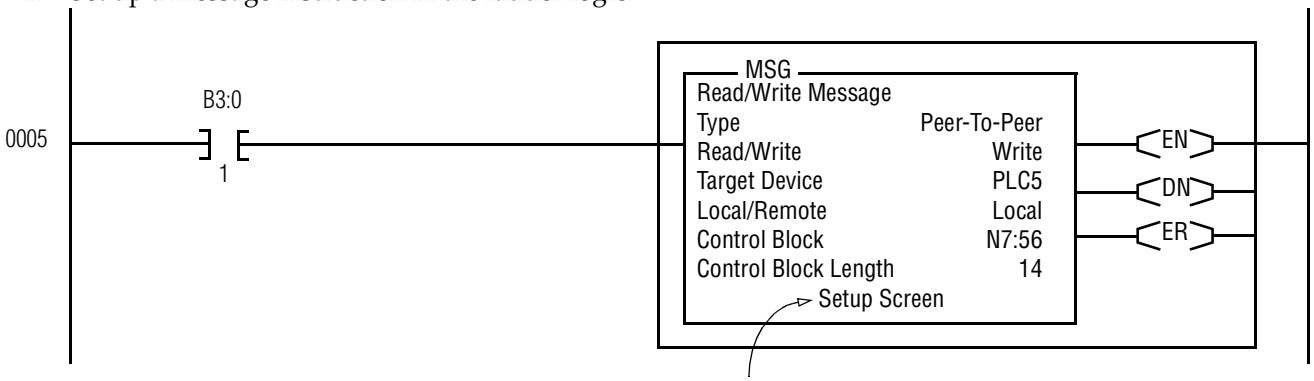


Name	Description
Channel 0	May be set as needed for other applications.
Channel 1	The Data Highway Plus channel. Set to *Yes*.

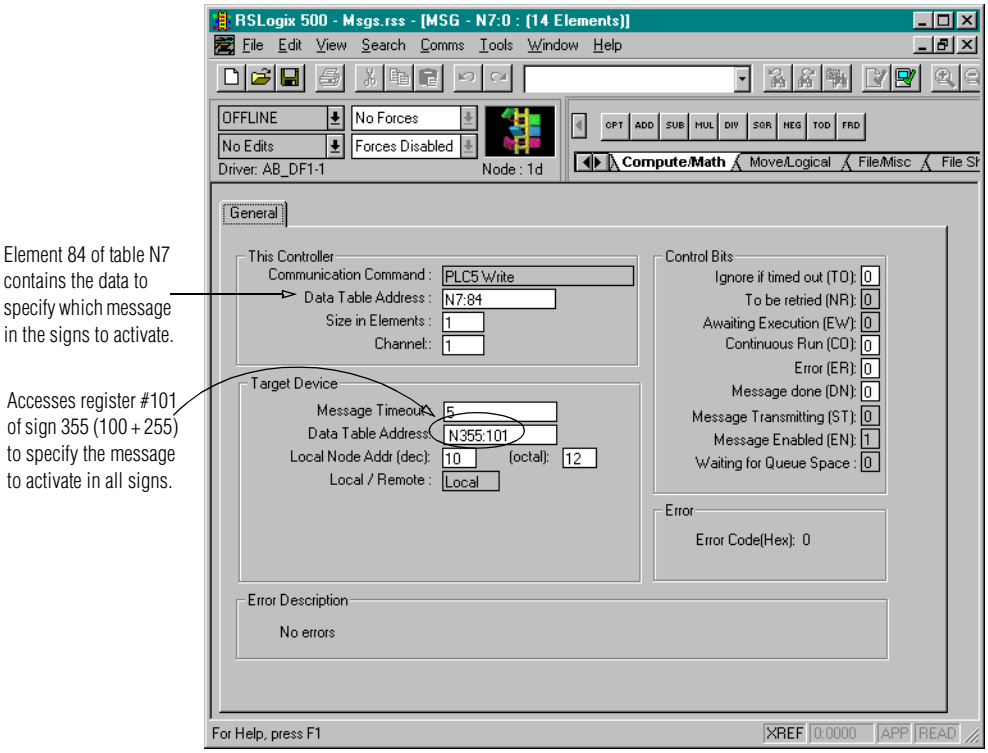
Activate a message on all signs in a network

Here, we want to activate a specific message that is stored on all signs in the sign network. The number of the message to activate is located at N7:84 in the PLC data table. This data must be stored in register number 101 of all signs. The way to designate "all signs" is to specify "255" for the sign address. This will be received and calculated by each sign as "255 + 100" or "355". Designating sign address "355" is interpreted to mean "all signs", and therefore, the message will be activated on all signs. (This is also referred to as sending a "broadcast" message.)

1. Set up a message instruction in the ladder logic.



2. Click on *Setup Screen* in the message instruction shown above.
3. Set up the message parameters.

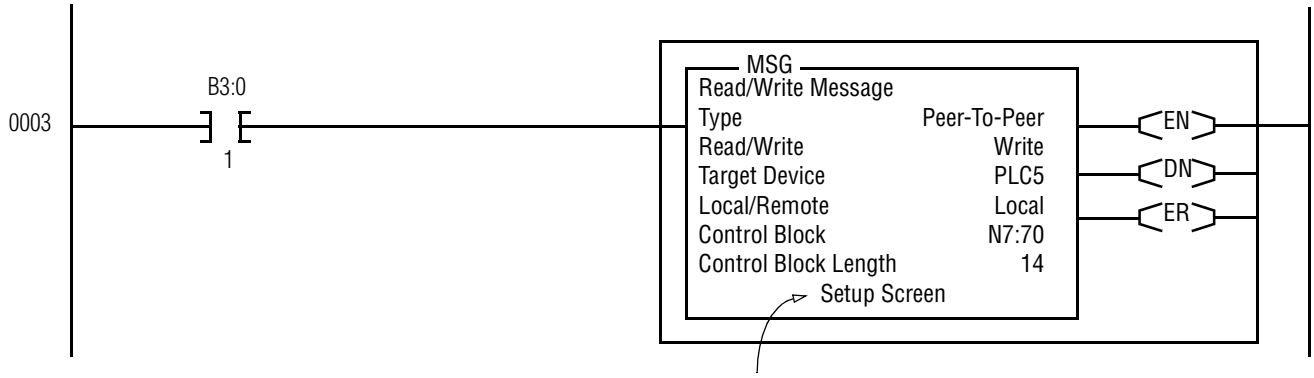


NOTE: The error control bit (ER) is set when you are using messaging instruction "address 355" to transmit a "broadcast message" to all signs but no sign on the network has been individually assigned address 255 (100 + 255 = 355). See "Messaging options and individual sign addresses" on page 10.

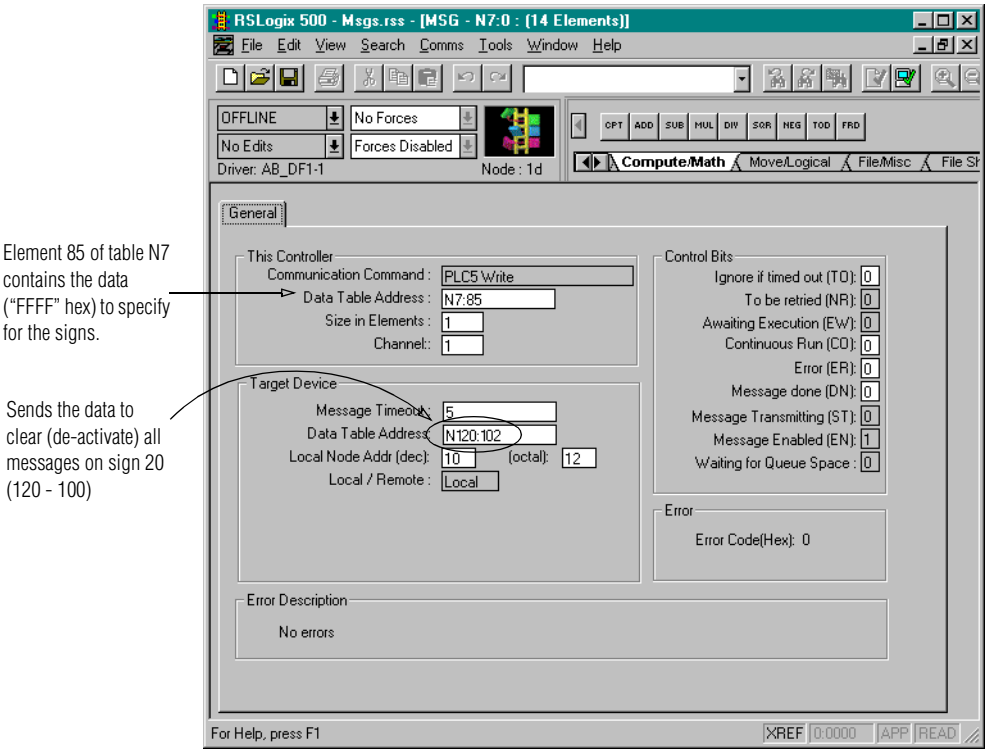
Clear all messages currently running on a sign

We want to clear (de-activate) all active messages in sign 20. The way to do this is to send "FFFF" hexadecimal ("65535" decimal) to the sign. This value is located at N7:85 in the PLC data table. This data must be stored in register number 102 of the sign. "FFFF" hexadecimal is interpreted by the sign to mean "all messages".

1. Set up a message instruction in the ladder logic.



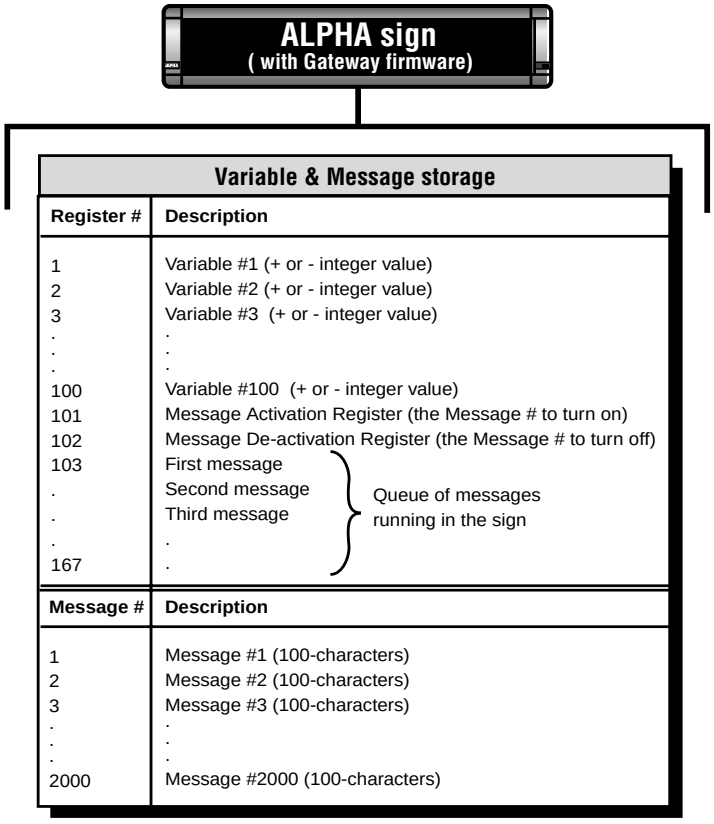
2. Click on *Setup Screen* in the message instruction shown above.
3. Set up the message parameters.



How data is stored in ALPHA signs

The illustration below represents the type of information stored in each sign.

How messages and variables are stored inside ALPHA signs



Safety and troubleshooting

When successfully connected to a Data Highway Plus industrial network, there should **always** be some type of message on each ALPHA sign connected to this network.

PROBLEM:	No message appears on ALPHA sign	"No Network Activity" message appears on ALPHA sign	"NO BACKGROUND MESSAGE"[1] appears on ALPHA sign
POSSIBLE CAUSE:	• Network wiring fault • PLC fault • BridgePort fault • ALPHA sign fault (possible sign hardware failure or a PLC is trying to display a message that was not programmed into the sign) • Message(s) too long for preset file size • Sign not plugged in or turned on	• Network wiring fault • PLC fault • BridgePort fault • ALPHA sign fault • ALPHA sign timeout because there was no network activity for at least 3 seconds	• Sign address not correct. • The sign has not received any message to display. (This is not an error condition.) • Sign is receiving information, but the information is not for this sign. (This is not an error condition.)

[1] This is called the "background message". The Gateway Messaging Software can be used to change the wording of this message.