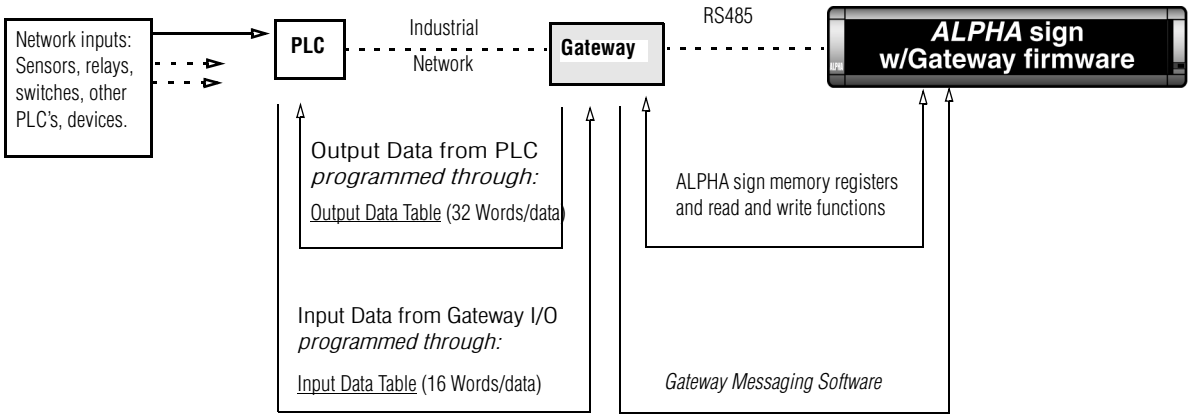
How to connect ALPHA signs to Profibus DP

Technical support

For additional information, programming examples and other data that may be available for your specific network configuration, check the Adaptive website, at: *www.ams-i.com/Pages/techdocs.htm*, in the Support, Technical Documentation area, and in the Gateway Forum section, under Support, Discussion Forums, at: *www.ams-i.com/cgi/wwwthreads/wwwthreads.pl*

Introduction

This document outlines preliminary connection requirements for setting up the Gateway I/O device to act as an interface between a Profibus DP industrial network and an ALPHA sign network (as illustrated below).



INFORMATION FLOW—In a Profibus DP network, a "device" is any point in the information pathway that is capable of sending or receiving a data signal. In the most basic network configuration, above (one input, one PLC, one Gateway interface, one sign), the PLC, Gateway interface, and sign are all capable of both sending and receiving data signals.

NOTE: In the event of a communication failure between any two points of the information pathway (in the flow chart, above) messages may fail to display on a sign. See Related documents in the table, next page, for more information regarding initial setup and installation.

If you are adding ALPHA signs to your network for the first time, it is recommended that you perform this installation sequence in the following order:

- Assemble connections between the ALPHA sign network and Gateway I/O device so that you can begin using the *Gateway Messaging Software* to program your new displays. The basics of this procedure are outlined on Page 2 of the *Gateway Messaging Software* manual. This will allow you, at the same time, to get acquainted with the software before you begin to install the Gateway I/O device and ALPHA signs on your DeviceNet network.
- Depending upon the distances between points of the network and the complexity of your mounting requirements, you might choose to complete full installation of the ALPHA network right away, or you may choose to finish that task in increments, connecting only a few signs at first, so that you can begin to initialize the messaging system to the PLC network.

  NOTE: It is not particularly difficult to add extra signs to a network (see *Gateway Messaging Software* manual, page 4).

- Before you start programming the Profibus DP PLC to control message displays on the ALPHA network, complete the necessary sequence of steps to install the Gateway I/O device on your network. (Refer to the Adaptive website, addresses listed in NOTE, above, for more information and required reference data.)

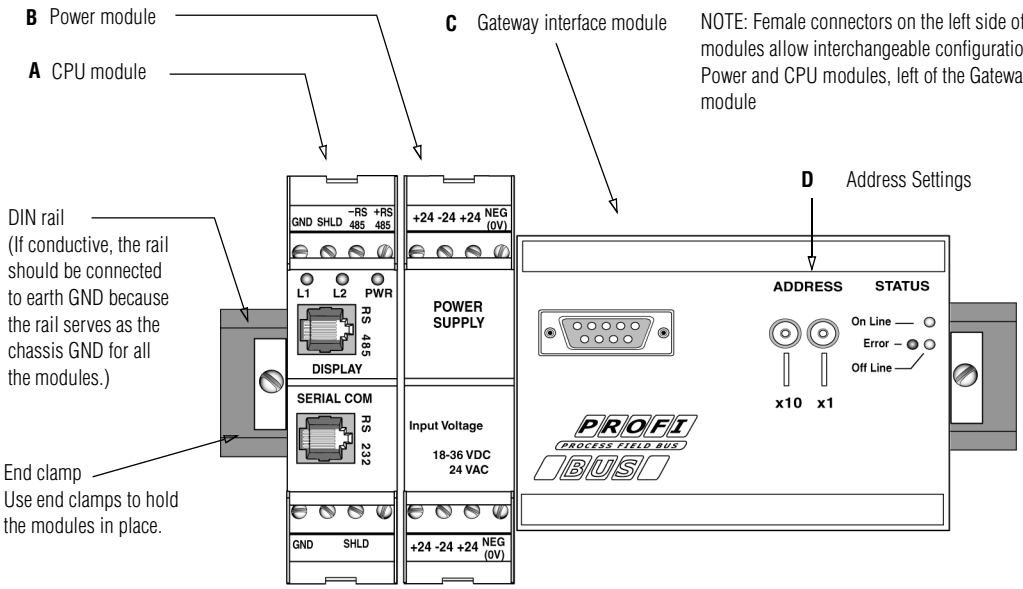
Related documents

Document name	Part number	Description
Gateway Messaging Software User Manual	9711-88Ø8	Describes how to use Adaptive's *Gateway Messaging Software* to store messages in ALPHA signs.
Network Configurations	9708-8Ø46A	Explains how to network ALPHA signs. *NOTE:* For specific information on routing long distance RS-485 network connections, see *Appendix G* of the *Network Configurations* manual.
Also check the Adaptive website, *www.ams-i.com/Pages/techdocs.htm*, in the Support, Technical Documentation area, and in the Gateway Forum section, under Support, Discussion Forums, at: *www.ams-i.com/cgi/wwwthreads/wwwthreads.pl*		

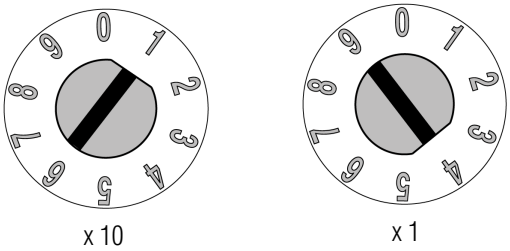
Gateway interface

The Gateway interface is a 3-module unit allowing Profibus DP-to-serial communication interface unit. It allows data exchange between a Profibus DP host and ALPHA signs equipped with the Gateway firmware option.

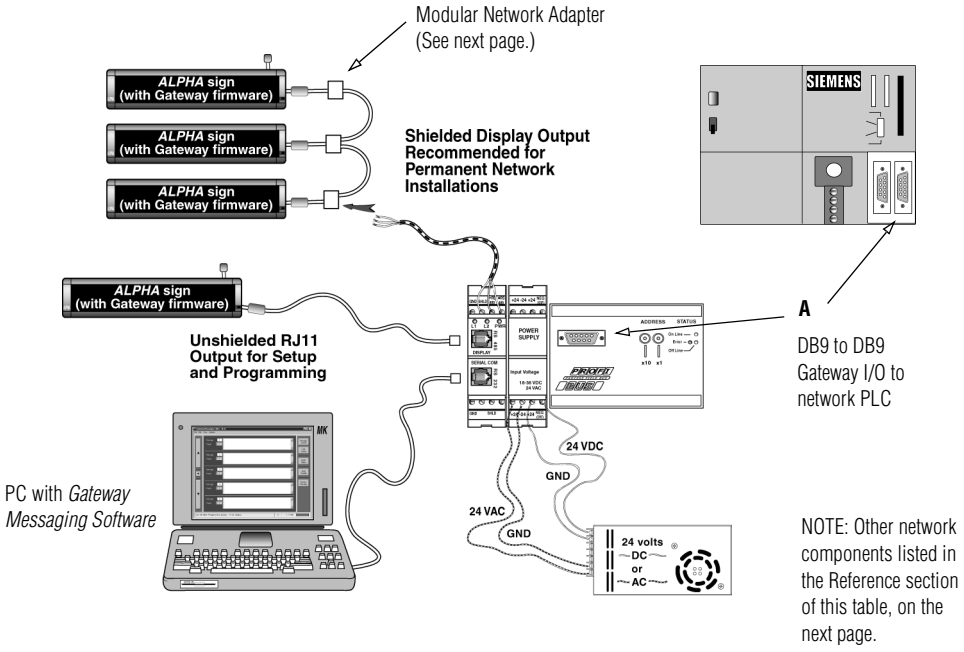
- *Configuration*—CPU and power supply modules configured interchangeably, always on the left side of the Interface module.
- *Set up*—Address dial switches set specific node addresses (1 to 99). See drawing (Item D, following page), for a close up view of the rotary dials and address numbering protocol.
- *Status indicators*—Network and Module LEDs on the front panel of the Gateway Interface module provide status and diagnostic information. See LED status information in "Safety and troubleshooting" on page 9.



Item	Name	Description
A	CPU Module	Serial RS232 PC input to hardwired or standard RJ11 jack RS485 output
B	Power Supply Module	Accepts 24 VAC or 18 to 36 VDC power input
C	Gateway Interface Module	Connects ALPHA sign network to PC for message programing and provides interface between PLC Profibus DP data signals and the ALPHA sign network, to trigger message displays

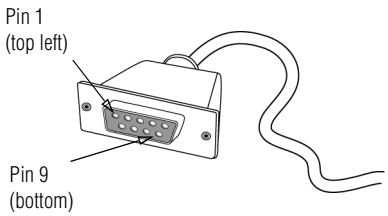
Item	Name	Description
D	Address Dial	Set the flat part of the dial screw on the number corresponding to the address you wish to select. For example, the example below shows an address set to the number “14”. Permitted range:1 to 99. 

Gateway Profibus DP ALPHA network interconnection diagram

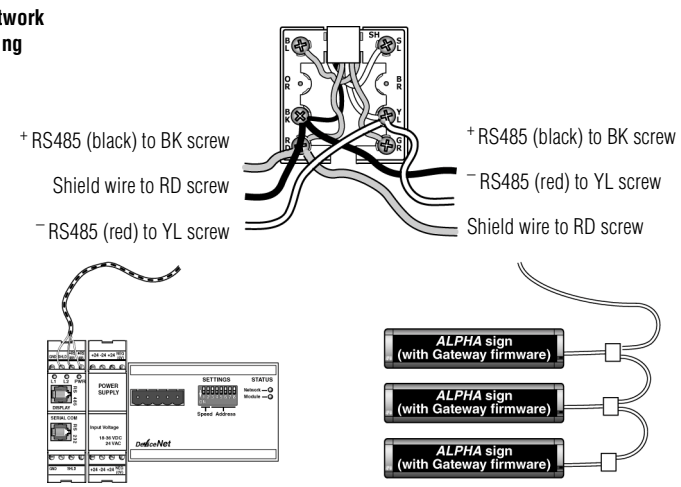


A
DB9 connection

The Profibus DP DB9 serial interface configuration EN50170/DIN19245. Recommended for any data transfer rate *above* 1500 kbit/s



Pin	Name	Function
Housing	Shield	Connected to PE
Pin 1	No connection	
Pin 2	No connection	
Pin 3	B-Line	+ RxD/TxD, RS485
Pin 4	RTS	Request to Send
Pin 5	GND BUS	Isolated GND/RS485
Pin 6	+ 5V BUS	Isolated + 5/RS485
Pin 7	No connection	
Pin 8	A-Line	– RxD/TxD/RS485
Pin 9	No connection	

Reference	**Modular Network Adapter wiring connections**  	
	1088-8000	RS485 cable (bulk)
	4331-0602	Modular Network Adapter (NOTE: On some ALPHA signs, this adapter is inside the sign.)
	1088-8636	1 foot, 4-conductor RS485 cable (NOTE: If the Modular Network Adapter is inside the ALPHA sign, this cable is not necessary.)
	1088-9105A	DB25-to-DB9 adapter (for DB25 computer COM port)

Component modules

The ALPHA Gateway I/O interface is built with three distinct modules that are described in the tables that follow. Note that the CPU module and Power module are physically interchangeable. Either of them can be mounted next to the Gateway Interface Module.

- CPU Module — serves as an interface between the Gateway Module and ALPHA signs
- Power Module — supplies power to the CPU Module and Gateway Modules
- Gateway Interface Module — I/O interface between the PLC and ALPHA network.

Technical specifications

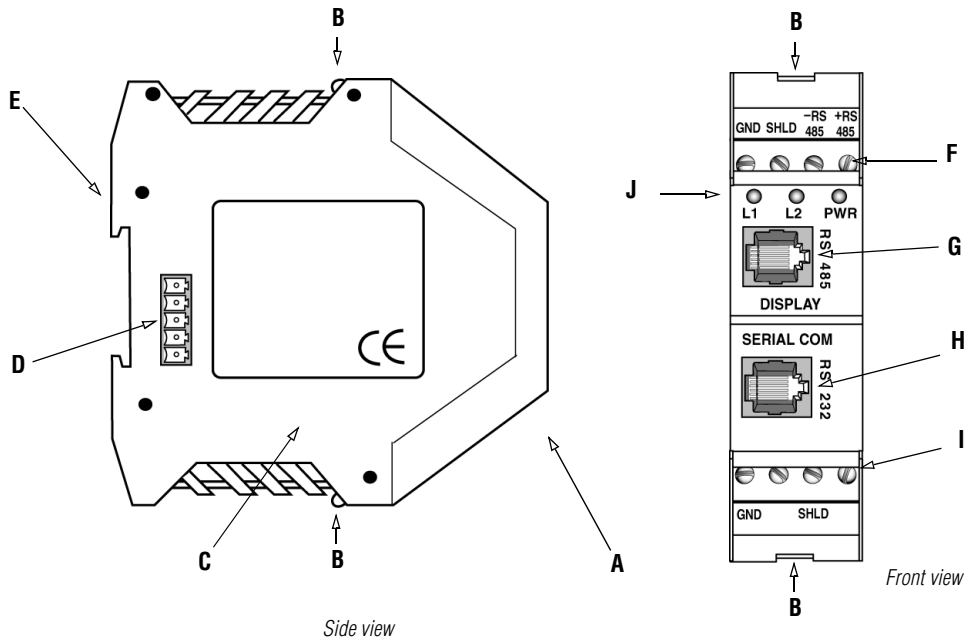
CPU and Power Modules Physical Data	
Dimensions:	2.75"W x 4.25"H x 1"D
Weight:	4 oz per module
Operating temperature:	60°C
Humidity range:	10 – 95% non-condensing
Mounting:	DIN rail 35 x 7 mm
Power Module Operating Specifications	
AC input voltage[1]	
Max. AC voltage:	25 Vrms
Min. AC voltage:	14 Vrms
Power consumption:	15W @ 24 Vrms
DC input voltage	
Max. DC voltage:	36 VDC

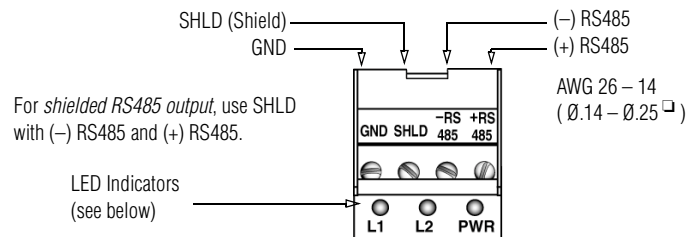
Power Module Operating Specifications (continued)	
Min. DC voltage:	18 VDC
Output voltage 24 VDC	
Max. voltage:	36 VDC
Min. voltage:	18 VDC
Max. current:	700 mA
Bus output voltage 5 VDC	
Max. voltage:	5.05 V
Min. voltage:	4.95 V
Max. current:	500 mA
Protection	
Type:	Poly switch
Self-resetting:	Yes
Terminals	
Type:	Screw
Wire size:	US spec—AWG 26 - 14/Euro spec—0, 14-2, 5^2
CPU Module Operating Specifications	
Operating voltage:	5 V
Current draw:	150 mA
Power consumption:	0.75 W
Communications	
Serial (in):	Communication type: RS232 Terminal type: RJ11 Protocol: EZ95
Display (out):	Communication type: RS485 Terminal type: RJ11 Protocol: EZ95
Terminals (out):	Communication type: RS485 Terminal type: Screw Wire size: AWG 26 - 14 [US]/0, 14-2, 5^2 [Euro] Protocol: EZ95 Max. number of drops: 32 Max. distance: 4000 ft (1200 m)
[1]Only one power supply, 18 – 36 VDC or 24 VAC, can be used to power this product.	
NOTE: Parts are not serviceable on any of the modules. In case of malfunction, return to the manufacturer.	

Module descriptions

CPU Module

NOTE: Only one CPU Module can be used at a time.

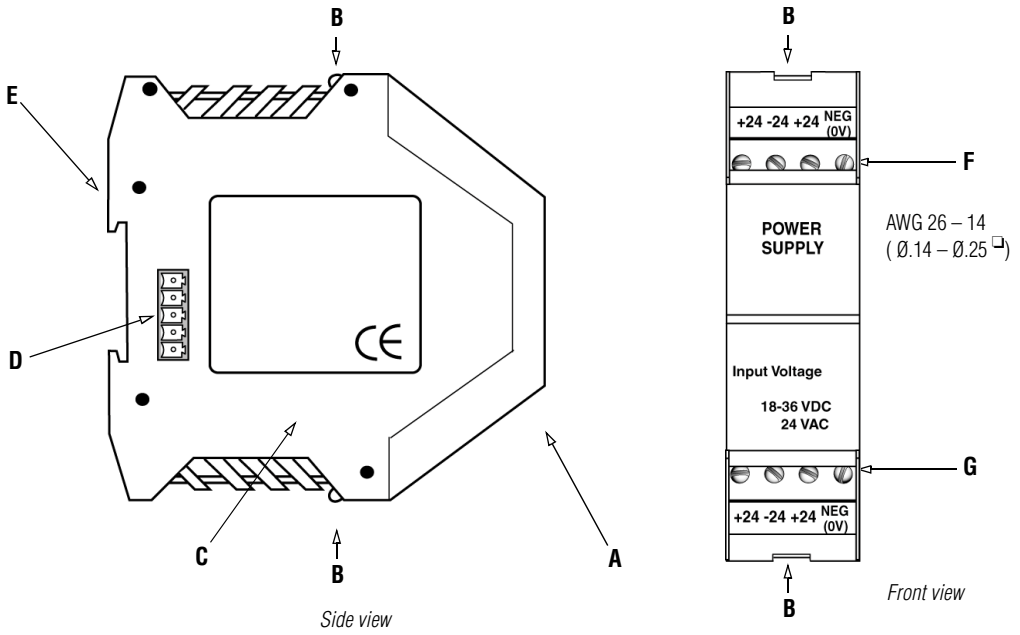


Item	Name	Description
A	Module Top	The internal PCB is attached to the Module Top.
B	Release Button	Depress each Release Button to remove the Module Bottom.
C	Module Bottom	Can be removed to expose internal PCB.
D	Intermodule Connector	Used to pass power and signals between modules. When attached to a conductive DIN rail, the rail serves as the CHASSIS GND for all modules connected to the DIN rail.
E	DIN rail latch	Used to attach the module to a DIN EN 5Ø Ø22 mounting rail.
F	Serial Output	*Shielded RS485 output* to one or more ALPHA signs. **Because of the signal protection afforded by shielding, this is the recommended way of connecting ALPHA signs to the CPU Module.** 
G	DISPLAY	*Unshielded RS485 output* to a *single* ALPHA sign or display. Quick-connect jack is used to: • program messages into a sign • trigger messages already in a sign **NOTE–See connection diagram on Page 3. (This is not a telephone connector.)**

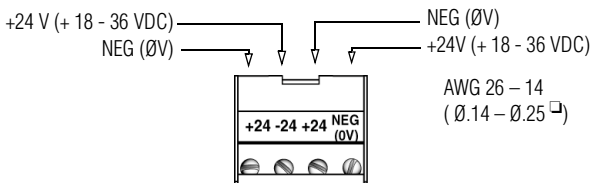
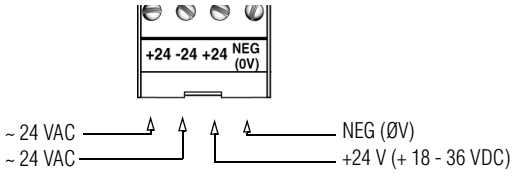
H	SERIAL COM	*RS232 input* from a PC. Used to program messages and send them to a CPU Module that is *up to 5Ø feet from the PC.* **NOTE–See connection diagram on Page 3. (This is not a telephone connector.)**
I	Serial Input	Unused.
J	LED FUNCTIONS	Description:
L1 (Red)	Passthrough mode	Flashes once a second while downloading data to the Alpha sign network.
	Receiving data	Flashes briefly when receiving data from an Alpha sign
	Fault indication	Flashes when the Gateway encounters a fault.
L2 (Yellow)	Clearing variable data	Flashes continuously after power is cycled, clearing variable data/Alpha sign registers.
	Heartbeat	Flashes once every 500 ms to indicate that the Heartbeat is enabled.
	Transmitting data	Flashes when transmitting data to an Alpha display.
Power/L3 (Green)	Power Indicator	Always green while unit has power

Power Module

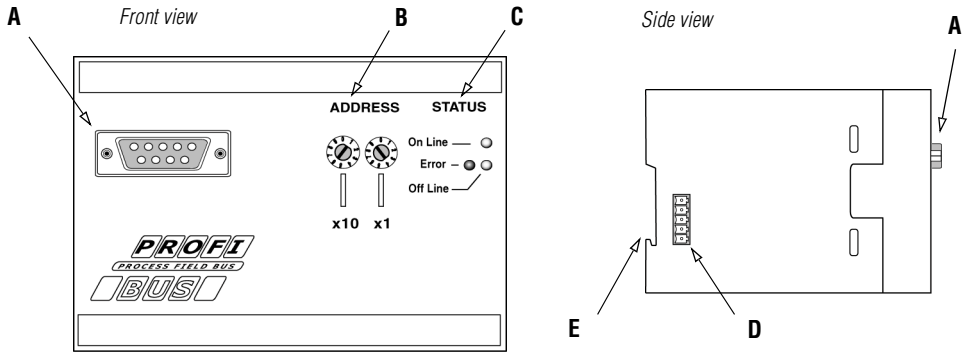
NOTE: Only one Power Module can be used at a time.



Item	Name	Description
A	Module Top	The internal PCB is attached to the Module Top.
B	Release Button	Depress each Release Button to remove the Module Bottom.
C	Module Bottom	Can be removed to expose the internal PCB.
D	Intermodule Connector	Used to pass power and signals between modules.
E	DIN rail latch	Used to attach the module to a DIN EN 5Ø Ø22 mounting rail.

F	Power Output	
G	Power Input	

Gateway interface module



Item	Name	Description
A	DB9 female port	Connecting point to the PLC network
B	Address	Sets unit address in range between 1 and 99. NOTE: See Address Configuration Info, item D in the description of the “Gateway interface” on page 2
C	Status	Online, offline and error indicators provide system status information. See LED status table in the section marked “Safety and troubleshooting” on page 9
D	Intermodule Connector	Used to pass power and signals between modules.
E	DIN rail latch	Used to attach the module to a DIN EN 5Ø Ø22 mounting rail.

Spec. Table

Specification	Description
Dimensions	Width = 90mm x Height = 75mm x Depth = 105mm
Weight	190 grams
Voltage	Min = 4.75Volts; Typical = 5.00Volts; Max = 5.25Volts
Current	Min = 300mA; Typical = 350 mA; Max = 450 mA
Ambient Environmental Conditions	Temperature Range: 5° C– 60° C Humidity: 10%–95% (No condensation)
Protection	In accordance with Profibus–DP standards
Profibus:	• Profibus–DP certification • Bus powered by embedded +5V supply
EMC Compliance	CE compliant

Data Transfer	Baud rates supported by Profibus DP: 9.6 kbit/s, 19.2 kbit/s, 93.75 kbit/s, 187.5 kbit/s, 500 kbit/s, 1.5 Mbit/s, 3 Mbit/s, 6 Mbit/s, 12 Mbit/s

Safety and troubleshooting

When successfully connected to a Profibus DP 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	Message Error–Specific message number is displayed, for example "Message # 0024"
Possible Causes	• Network wiring fault • PLC 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 • Not switched on/plugged • The only character programmed into the message is a "space".	• Network wiring fault • PLC fault • ALPHA sign fault • ALPHA sign timeout because there was no network activity for at least 3 seconds • Gateway offline	• 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. • Sign has not received any valid serial data	• "Blank message": Either this message was never edited and never downloaded to the display, or • Messages that are invalid (with *Gateway Messaging Software* syntax errors) never make it to the display, they can not be downloaded with invalid content. NOTE: The sign does not display "blank message" error ("Message # 0024", for example), if another, valid message is already running. The sign will only display the "blank message" error code when display memory has no other valid content.

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

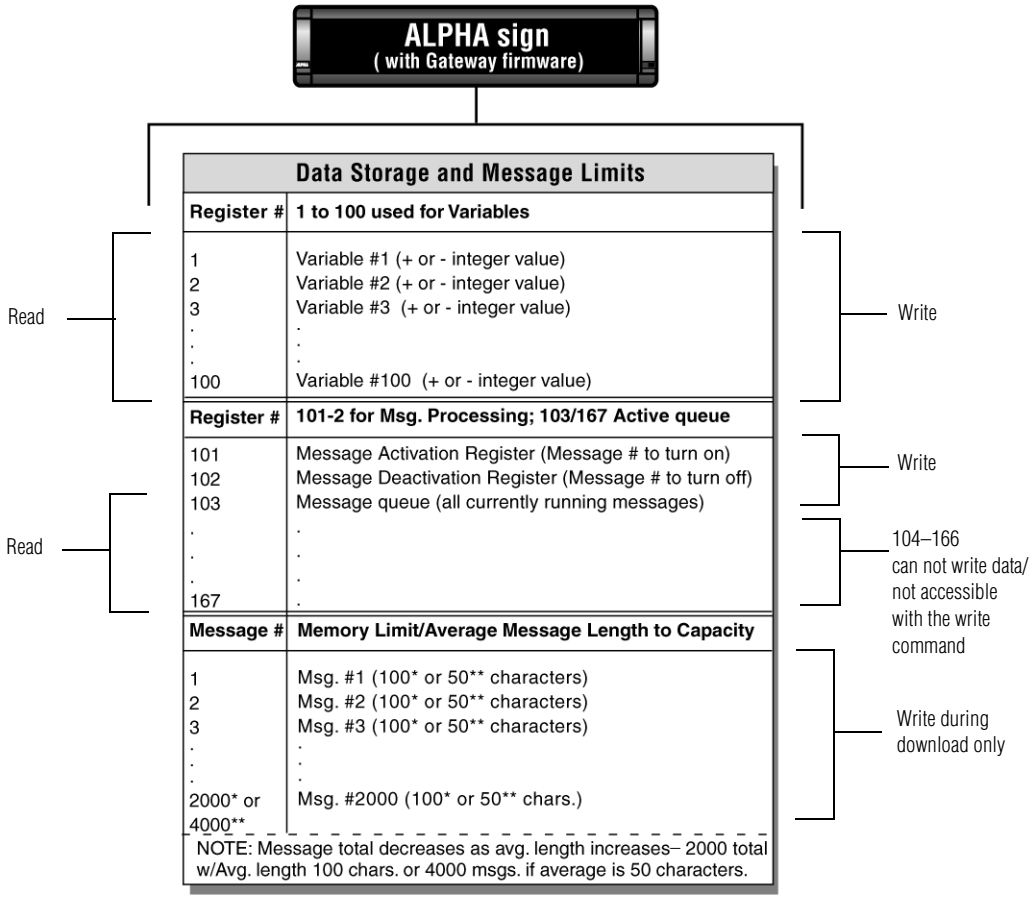
Status Information (Front Panel LEDs)	LED Color	Message
Error	Red (If this LED is turned off, diagnostic functions are unavailable.)	Flashing Red, 1 pulse per second: Configuration Error–IN and/or OUT length set during initialisation of the module is not equal to the length set during configuration of the network. Flashing Red, 2 pulses per second: Error in User Parameter data set during initialization of the module is not equal to the length/contents set during configuration of the network. Flashing Red, 4 pulses per second: Error in initialization of the Profibus communication ASIC.
On-Line	Green If this LED is turned off, the Gateway Module is not On-Line.	Module is On-Line on the fieldbus and data exchange is possible
OFF-Line	Red If this LED is turned off, Module is not Off-Line	Module is Off-Line on the fieldbus and data exchange is not possible.

NOTE: For CPU module self-diagnostic information, see LED Function table, page 7,

Network/Gateway data pathway

The Adaptive Gateway allows for the exchange of data between a PLC and an ALPHA sign(s) to activate messages and show real-time data on a system. The Gateway is connected to the ALPHA signs via a multi-drop (RS485) network. This network will support up to 32 drops before requiring a repeater. These displays can be addressed from 001 to 255 by using the handheld remote control. (See the *Gateway Messaging Software* manual; messages are created in *Gateway Messaging Software*, then they are stored in the sign(s) memory.) The ALPHA sign can store up to 4000 messages (1-4000) and can support up to 100 variables (1-100). The roller coaster link following table shows signs memory allocations and meaning.

How messages and variables are stored inside ALPHA signs



Installing the Gateway I/O interface

Before you configure the Gateway on the network, set the node address with the two rotary switches on the face of the module (available addresses from 1 to 99; 0 is not a valid address for the Gateway interface module.) Once the Gateway is configured, the node address can't be changed during operation.

Profibus DP GSD file.

Each device on a Profibus-DP network is associated with a GSD file, which contains all the necessary information about the Gateway. This file is used when configuring the Gateway on a Profibus-DP network. After the *Gateway Messaging Software* is installed on your system (for example, to your c: drive), the file can be located under C:\Program Files\Adaptive Micro Systems\Gateway Messaging Software\hms_1003.gsd.When loading the.GSD file to your system, set the input and output parameters as follows:

32 Words (64 Bytes) out for the PLC Output Data table from the PLC to the Gateway.

16 Words (32 Bytes) in for the PLC Input Data table from the Gateway to the PLC.