




Contents

Section 1	Introduction.....	1
1-1	SimPlex Features	2
1-2	Quick Start	2
Section 2	SimPlex Installation.....	3
2-1	Mounting the H6415-DSP	3
	Surface Mount	3
	Flush Mount	4
2-2	Mounting the H6415-AMP-01	5
2-3	Field Wiring	7
	Power Connections	8
	External Line-Run Relay (Optional)	8
	External Servo Center (Optional)	9
	Alarm Outputs (Optional Fault Relay)	9
2-4	Plug-In Connections	10
	H6415-DSP Wiring	11
	Central Operator Interface Wiring	11
	Remote Contact Closure Wiring	12
	Detector Wiring	12
	Actuator Wiring	12
	Remote Offset Station Wiring	14
Section 3	Setup	15
3-1	Web Setup	15
3-2	Verify Guide Sense	16
3-3	Adjusting Gain	16
3-4	Verify Servo Center Sense	17
3-5	Options	17
	Detector 2 Sense	17
	Auto/Manual Speed Adjust	18
3-6	Setting Up the H6415-AMP-01 for a Network	18
	Setting the Number of Wires	18
	Setting the Biasing	19
	Setting the H6415-AMP-01 Address	19
	Setting the Termination	20
	Setting Communication Speed	20

Contents

Section 4	SimPlex Operation	21
4-1	H6415-AMP-01 Controller	21
	H6415-DSP Remote User Interface	22
	Central Operator Interface	22
	Remote Contact Closures	22
4-2	H6415-AMP-01 Power-Up.....	22
4-3	H6415-DSP Remote User Interface Overview	23
4-4	H6415-AMP-01 Internal Controls	24
4-5	H6415-DSP Internal Controls	26
4-6	Control Modes	26
	 Automatic Control	26
	 Manual Control	27
	 Servo Center Control.....	27
4-7	Detector Selection.....	28
Section 5	Detectors	29
5-1	Edge Detectors	29
	Overview	29
	Mounting	29
	Wiring	29
	Maintenance.....	29
5-2	H3198 Line Follower Detector	30
	Overview	30
	Mounting	31
	Wiring	32
	Line Follow Control Setup	32
	Option A	32
	Option B	34
	Edge Follow Control Setup	35
5-3	H3198 Line Follower Maintenance	36

Section 6	H5530C and H5530D Actuator	37
6-1	Overview	37
6-2	Wiring	37
6-3	Replacement Parts	37
	H5530C and H5530D Belt Replacement Procedure	38
	H5530C and H5530D Motor/Pulley Assembly Replacement Procedure	39
6-4	Maintenance	39
Section 7	Detector Positioners (Optional)	40
7-1	Overview	40
7-2	Manual Detector Positioners	40
7-3	Motorized Detector Positioners	40
Section 8	Troubleshooting	41
8-1	System Status Codes	41
8-2	Problems with Detectors	44
8-3	Problems with the H6415-AMP-01 and H6415-DSP	45
8-4	Problems with H6415-AMP-01 and Central Operator Interface	46
	Changing the Setting of SW101 in the H6415-DSP	46
8-5	Problems with the Actuator	47
8-6	H6415-AMP-01 Main Board Test Points	48
8-7	H6415-AMP-01 Default Settings	49
Appendix A	Specifications	50
A-1	H6415-AMP-01	50
A-2	H6415-DSP	51
A-3	H6415-OFS Remote Offset Station	51
A-4	Actuator H5530C	52
A-5	Actuator H5530D	52
Appendix B	SimPlex Theory of Operation	53
B-1	SimPlex Elements	53
	H6415-AMP-01	53
	Detectors	54
	H5530C and H5530D Actuator (Attached to a North American Guide)	54
	H6415-OFS Remote Offset Station (Optional)	54
B-2	General Operation of the SimPlex System	54
	Line-Run Relay Function	56

Contents

Appendix C	Communications	57
C-1	Overview	57
C-2	H6415-AMP-01 Multi-Drop Serial Communications	57
	Host (Master) Output Format	58
	H6415-AMP-01 Output Format	60
Index		63

2-2 Mounting the H6415-AMP-01

The H6415-AMP-01 can be mounted in any position that allows adequate clearance for electrical connections, plug-in connectors, internal access for servicing, and top cover swing. See Figure 3 for mounting dimensions.

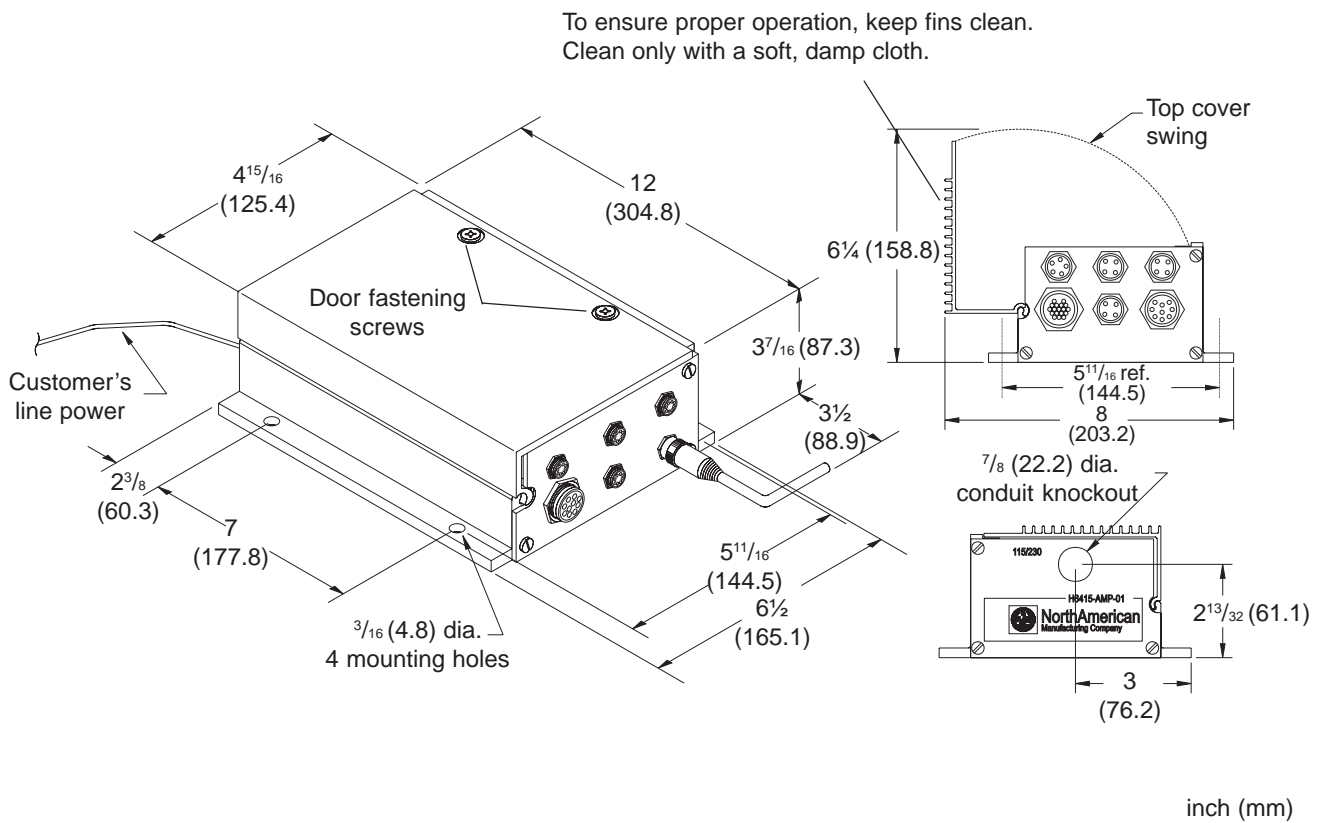


Figure 3. H6415-AMP-01 Mounting Dimensions

Power Connections



WARNING

AVOID PERSONAL INJURY. Do not supply power to the H6415-AMP-01 until wiring is complete and all covers are in place.



WARNING

PREVENT H6415-AMP-01 DAMAGE. Make sure the Input Voltage Select switch setting (SW201) matches the supply voltage before applying power.



CAUTION

System ground is required in all installations and must be connected to a low impedance control equipment ground. Improper grounding severely degrades system noise immunity and may impair the safety of the equipment.

Power connections are made to terminal block TB201. Connect L1 (HOT) and L2 to the corresponding terminals. Connect earth ground to the terminal labeled GND.

Before supplying power to the H6415-AMP-01, select the proper input voltage by sliding switch SW201 until it clicks into place with the correct voltage shown (115 V ac or 230 V ac). See Figure 5 on page 7 for switch location.

External Line-Run Relay (Optional)

Note: This section describes use of high voltage external logic for the line-run relay. If low voltage external logic is required, see the remote contact closure wiring section on page 12.

The external line-run relay allows the actuator to be inhibited (locked) from an external source when the system is in automatic. Servo center and manual are not affected by the external line-run relay. Typically, a line-run relay is used to inhibit guide operation when the line is shut down. This prevents the guide frame from moving and possibly tearing the web.

The external line-run relay source can be a mechanical relay contact or a solid state output device. It does not require an external snubber with most standard solid state output modules. However, if the leakage of a solid state output device is greater than 2.5 mA in the off state, the ac input might not turn off. In this case, a snubber across the line-run relay input and L2 is recommended.

Connect the 102-132 V ac or 204-264 V ac line-run relay signal to the terminal labeled Line-Run Relay on terminal block TB201. Energize this input to inhibit the amplifier output. See Figure 5 for terminal location.

H6415-DSP Remote User Interface

The H6415-DSP remote user interface is a display and keypad containing international operating symbols. Operating commands are entered by the user using the keypad or a communications terminal.

During operation, the remote user interface (H6415-DSP) shows a symbolic representation of the present operating mode (manual, automatic, detector setup, or servo center) and type of control (edge 1, edge 2, or center guide). When in gain adjust mode, the gain symbol displays and three digits appear. The display also includes a bar graph that indicates the relative web position in the field of view of the detector. The center bar graph block shows the ideal control point: zero deviation from the control point. The arrows to either side of center block indicate the relative web shift from this control point. If there are no arrows, the web is at the ideal control point.

If the H6415-AMP-01 detects a problem, the H6415-DSP displays a system status code. If multiple system status codes occur, the one with the highest priority is displayed (F1 is the lowest priority, F99 the highest). When the system status code condition is resolved, the remote shows the subsequent system status code.

When the system is in Gain Adjust Mode, system status codes are not displayed. See Section 8, Troubleshooting, for more information on system status codes.

Central Operator Interface

A central operator interface allows you to network up to 31 H6415-AMP-01s. This allows you to use one PC to control multiple H6415-AMP-01s. Actual operation of the central operator interface depends on the setup created by the customer.

Remote Contact Closures

Remote contact closures can also be used to control the H6415-AMP-01. Operation depends on the number of contacts wired. If full control is provided through the remote contact closures, the user enters operating commands using external switches. If the H6415-AMP-01 detects a problem, one of the fault light outputs will activate (see Section 8, Troubleshooting, for detail).

If remote contacts closures are used at the same time as an H6415-DSP or central operator interface, remote contact closure states will always take precedence over commands from the serial interface. This prevents the potentially confusing situation of a mechanical switch showing an incorrect state.

4-2 H6415-AMP-01 Power-Up

The H6415-AMP-01 powers up in the mode it was last powered down in or changes state to match the remote contact closure inputs.

On power-up and during stall conditions, the H6415-AMP-01 checks the motor connection status. If the amplifier detects an open or shorted motor condition, it activates the actuator fault output and lights LED202 on the H6415-AMP-01 Main Board. If an H6415-DSP or central operator station is used, it also displays a system status code (F8 or F9). See Section 8 for troubleshooting system status codes.

4-3 H6415-DSP Remote User Interface Overview

The H6415-DSP interface (display/keypad) and definitions of its display are shown in Figure 11. Table 1 reviews the functions of the H6415-DSP keys.

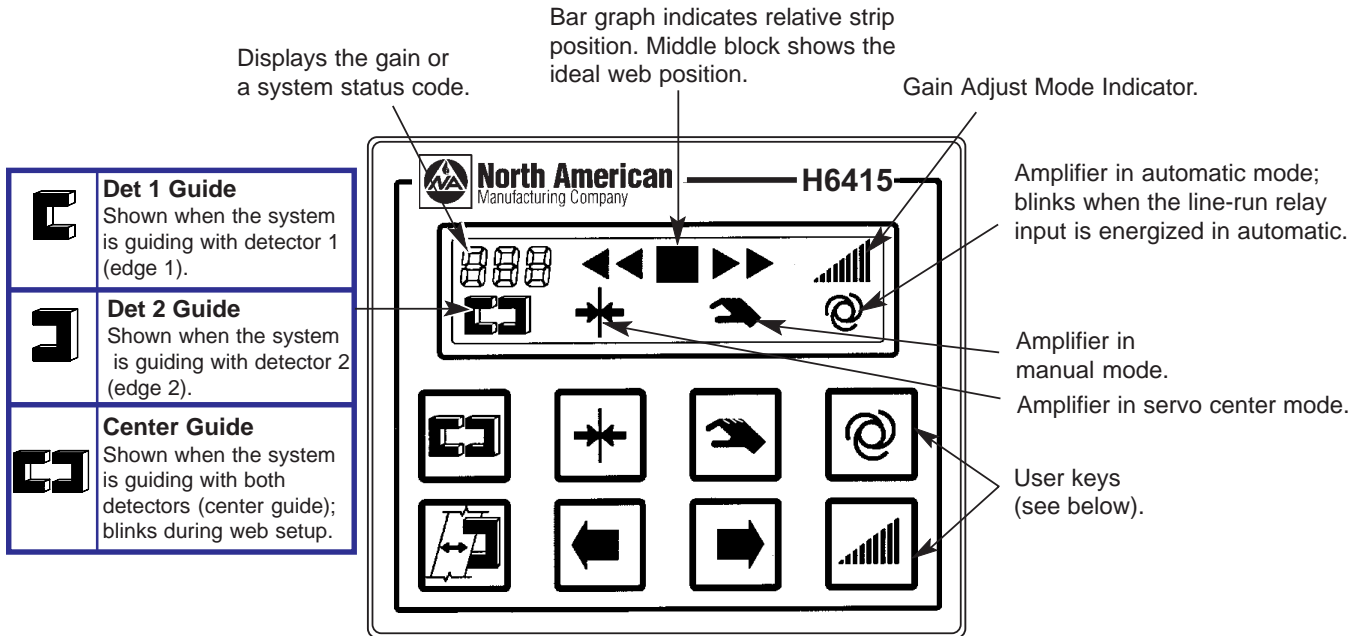















Figure 11. H6415-DSP Display/Keypad

	Detector Select: Selects the detector or detectors used for control. Edge 1 allows guiding from detector 1 only, edge 2 from detector 2 only, and center guide from both detectors.		Automatic Control: Switches control to automatic. Exit automatic by pressing either manual or servo center.
	Servo Center: Switches control to servo center (the actuator travels to a preset center position). Exit servo center control by pressing either manual or automatic.		Web Setup: Sets the detector and web characteristics in the amplifier.
	Manual Control: Switches control to manual, allowing the operator to jog (reposition) the actuator. Jog using the arrow keys. Exit manual by pressing automatic or servo center.		Left Jog Key: In manual, jogs the actuator left. In Gain Adjust Mode, decreases the gain.
			Right Jog Key: In manual, jogs the actuator right. In Gain Adjust Mode, increases the gain.
			Gain: Adjusts the control response (gain). Press this key, then use the arrow keys to increase or decrease the gain (0-999). Press again to accept the value and exit this mode.

Table 1. H6415-DSP Key Functions

4-7 Detector Selection

Use these steps to select the detectors for automatic control.

Step	Action								
1	Select manual control. On the H6415-DSP, press the MANUAL  key.								
2	<p>Select edge 1, edge 2, or center guide. On the H6415-DSP, toggle the DETECTOR SELECT  key until desired control type symbol displays, as shown here.</p> <table border="0" data-bbox="375 600 922 785"> <thead> <tr> <th data-bbox="472 600 634 632">Control Type</th> <th data-bbox="821 600 922 632">Symbol</th> </tr> </thead> <tbody> <tr> <td data-bbox="435 648 672 680">Edge 1 (detector 1):</td> <td data-bbox="854 648 889 680"></td> </tr> <tr> <td data-bbox="435 697 672 728">Edge 2 (detector 2):</td> <td data-bbox="854 697 889 728"></td> </tr> <tr> <td data-bbox="375 745 732 777">Center guide (both detectors):</td> <td data-bbox="842 745 901 777"></td> </tr> </tbody> </table>	Control Type	Symbol	Edge 1 (detector 1):		Edge 2 (detector 2):		Center guide (both detectors):	
Control Type	Symbol								
Edge 1 (detector 1):									
Edge 2 (detector 2):									
Center guide (both detectors):									
	<p>Note: After selecting the detectors, an F 3 or F 4 system status code may occur (Detector Fault). If so, the corresponding detector was not calibrated during the Web Setup Procedure. Perform the Web Setup Procedure (see Section 3, Setup) on the corresponding detector to select the desired detector and to remove the status code.</p>								
3	Select Automatic control. On the H6415-DSP, press the AUTOMATIC  key.								
	<p>Note: If only one detector is connected to the system, the H6415-AMP-01 forces you to use the input with a detector connected to it. On the H6415-DSP, DETECTOR SELECT  will not work in this situation.</p>								

Section 8 Troubleshooting

Before troubleshooting, make sure the setup procedure has been followed correctly (see Section 3, Setup). The locations of the test points, LEDs, terminals, switches, and other controls are shown in Figure 19 on page 48.



WARNING Disconnect power before removing the H6415-AMP-01 cover.

8-1 System Status Codes

When the H6415-AMP-01 detects a problem, the H6415-DSP or central operator interface displays a system status code. If multiple system status codes occur, the one with the highest priority displays. Once that condition is resolved, the H6415-DSP or central operator interface displays the subsequent system status code. F1 is the lowest priority, F99 the highest. The system status codes are described in the table below.





Note: Gain Adjust Mode overrides system status code display on the H6415-DSP. System status codes redisplay after exiting Gain Adjust Mode.

If remote contact closures are used for control, system status codes activate the fault light outputs (see Figure 8 on page 13 for more detail). The outputs that are activated by the system status codes are:

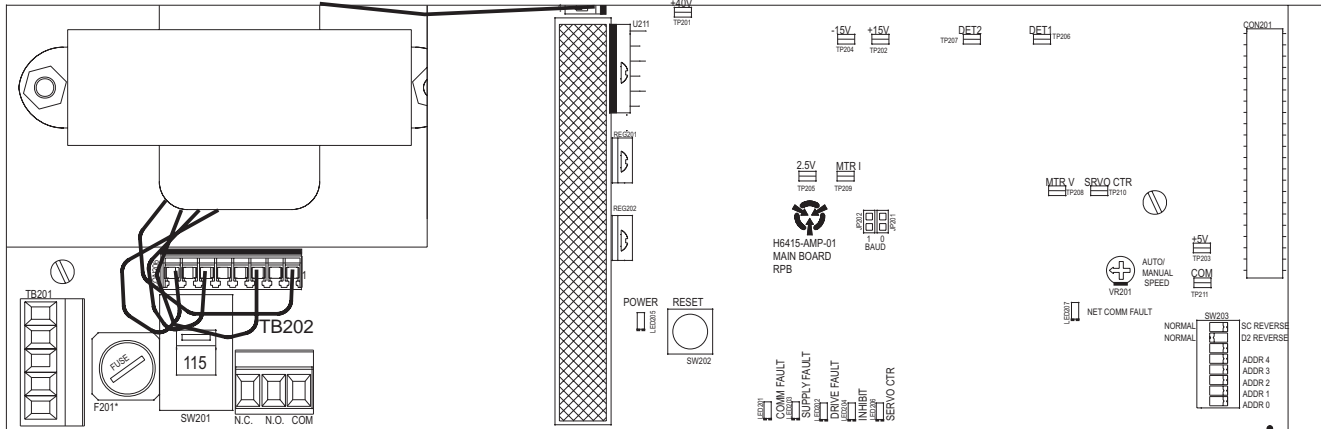
- Detector Fault: F1, F2, F3, F4
- Actuator Fault: F7, F8, F9
- Amplifier Fault: F5, F6, F10, F98, F99 (F10 also lights LED203, Supply Fault)

Status Code	Definition	Solution(s)
F 1	Detector 1 signal lost or overrange (voltage less than -0.9 V or more than 5.0 V).	<p>Verify detector plugged in.</p> <p>Measure detector output at TP206. Full light value should be approximately 2.5 V dc ($1.0\text{ to }5.0\text{ V dc}$ is acceptable).</p> <p>This system status code remains until the problem is corrected and the amplifier is switched to Automatic control.</p> <p>H3198 only: If the material is highly reflective, tilt the detector 15° from vertical.</p>
F 2	Detector 2 signal lost or overrange (voltage less than -0.9 V or more than 5.0 V).	Same as F 1, but measure detector output at TP207.

8-3 Problems with the H6415-AMP-01 and H6415-DSP

Problem	Possible Cause	Solution
No display.	Blown fuse or severed cable.	<p>Check the Power light (LED205) in the H6415-AMP-01.</p> <p>Check the H6415-DSP cable.</p> <p>Check continuity of the fuse (F201 on H6415-AMP-01 Main Board). The fuse is a 1A Slo-Blo (Littelfuse #313001; NA #EHF-1-S). If the replacement also blows, there is likely to be internal damage; contact North American.</p>
Drive output inhibited for no apparent reason (F 7 on the H6415-DSP display).	Actuator stalled.	Make sure the actuator is operating smoothly and is mechanically free.
Auto  indicator blinking, guide stopped.	External line-run relay energized.	Remove the source of ac power from this input. If input does not turn off, see page 8 for information on input leakage.
	Remote contact closure inhibit closed.	Open inhibit contact.
SERVO CENTER  , MANUAL  , and AUTO  keys not working.	External servo center input energized.	Remove the source of ac power from this input. If input does not turn off, see page 9 for information on input leakage.
	Remote contact closure servo center input closed.	Open servo center contact.
The H6415-AMP-01 does not react to changes set from the H6415-DSP.	Communications speed incorrect.	Communications speed set incorrectly. Speed must be 9600 bits per second. See page 20 for instructions on setting.
	Remote contact closure settings are overriding H6415-DSP commands.	Disconnect remote contact closure switches for functions you want to set from the H6415-DSP.

8-6 H6415-AMP-01 Main Board Test Points



*Fuse: 1 amp Slo-Blo
Littlefuse#313001; NA#EHF-1-S

Figure 19. H6415-AMP-01 Main Board Components

Test Point	Reading
+40V (TP201)	35 to 45 V dc.
+15V (TP202)	14 to 16 V dc.
+5V (TP203)	4.75 to 5.25 V dc.
-15V (TP204)	-14 to -16 V dc.
2.5V (TP205)	2.4 to 2.6 V dc.
DET1 (TP206)	0 to 5 V dc depending on detector; -1.5 to -0.5 if no detector connected.
DET2 (TP207)	0 to 5 V dc depending on detector; -1.5 to -0.5 if no detector connected.
MTR V (TP208)	3.4 to 4.6 V dc
MTR I (TP209)	<p>2.5 V dc \pm 0.25 V per amp of motor current (2.5 V dc with no output to the motor). This test point indicates the torque being exerted by the motor and It can be used to estimate the load on the actuator. Voltages above 2.5 indicate force in the positive direction and below 2.5 indicate negative direction.</p> <p>The normal operating range is shown in Figure 20. Voltages between minimum heavily loaded and maximum heavily loaded are acceptable. However, operation at either heavily loaded limit for more than a short duration indicates loading is at or near capacity and a stall condition may result. Operation at maximums is normal for brief periods of starts, stops, and reversals (acceleration/deceleration).</p> <p>The system will be inhibited and the F7 code will display if maximum current is commanded for greater than 1 second.</p>
SRVO CTR (TP210)	0 V dc or 1 V dc, depending on state of servo center sensor.

Appendix A Specifications

A-1 H6415-AMP-01

Power output to H5530C: 50 watts continuous. Pulse-width modulated. Output is shut off if motor stalls for more than 1 second.

Power requirements: 115 or 230 V ac $\pm 10\%$ (switch selectable). 50/60 Hz, 100 VA max.

Operating environment:

- 0 to 50°C (32 to 122°F).
- Indoor use.
- Altitude up to 2187 yards (2000 meters).
- Maximum relative humidity 80% for temperatures up to 31°C, decreasing linearly to 50% at 40°C.
- Overvoltage Category II.
- Pollution Degree 2.

Frequency response: -3 dB @ 20 Hz.

Fault/alarm contacts: Normally Open (N.O.) and Normally Closed (N.C.). 1 A @ 230 V ac max.

Overload protection: An internal current limiter protects the amplifier from overloads.

AC inputs (line-run relay, servo center):

- Input: 102 to 264 V ac.
- Input Allowed for No Output: 70 V ac, 2.5 mA.
- Input Impedance: 28 K.

Communications between H6415-AMP-01 and H6415-DSP: 9600 bits per second, 8 data bits, no parity, one stop bit.

Communications between H6415-AMP-01 and central operator interface: Bits per second: 9600, 19200, 38400, or 57600, as set by JP201 and JP202 on the H6415-AMP-01 Main Board.

Power output to detectors: 15 V dc @ 150 mA per detector.

Detector input: 0 to 2.5 V dc typical. 0 to 5.0 V dc maximum.

Size: 3⁷/₁₆" (87.0 mm) H x 6¹/₂" (165.1 mm) W x 12¹/₂" (311.1 mm) D.

Weight: 6.6 lb (3 kilograms).

Housing material: Anodized aluminum.

Appendix C Communications

C-1 Overview

The H6415-AMP-01 can communicate over an EIA-485 serial link with a remote device such as an H6415-DSP or a central operator interface.

Each communication cycle is initiated by the remote device. At the end of the remote device's transmission, there is a 25-millisecond delay before the H6415-AMP-01 transmits back to the remote device. After the amplifier's transmission is complete, the remote device can begin another transmission.

C-2 H6415-AMP-01 Multi-Drop Serial Communications

This section describes the communications between the H6415-AMP-01 Controller and a central operator interface (typically an industrial PC) in a multi-drop environment. If using the H6415-ACTX-00 SimPlex ActiveX Control (a Microsoft Windows-based DSP emulator), the host device emulates the H6415-DSP display.

EIA-485 signal levels are used at jumper-selectable rates of 9600, 19200, 38400 or 57600 bits per second with eight data bits, one stop bit and no parity (4-wire full duplex). Speed is set by JP201 and JP202 on the H6415-AMP-01 Main Board (see Section 3 for instructions). The H6415-AMP-01 and the H6415-DSP remote interface communicate at 9600 bits per second, eight data bits, no parity, one stop bit.

It is assumed that there will be a single master central operator interface. Each of the control H6415-AMP-01s is a slave device. A maximum of 31 slaves can be addressed. As this is an EIA-485 based network, attention must be paid to proper termination. Each H6415-AMP-01 is equipped with a switch-selectable termination resistor. The units at the physical ends of the network wiring must have their termination resistors enabled. In the H6415-AMP-01, this is accomplished by toggling a DIP switch. See page 20 for instructions.

A communications cycle begins with the host emitting a six-byte query to one of the H6415-AMP-01s on the network. The H6415-AMP-01 being addressed is specified by the second byte in the stream. If there is an H6415-AMP-01 with a matching address, it responds with a string whose second byte is its own address. H6415-AMP-01s will not autonomously transmit data; they only speak when spoken to.

Normally, addresses range from 0x01 to 0x1F, allowing up to 31 H6415-AMP-01s to reside on a single bus. A broadcast address of 0xFF has been set aside for instances where all H6415-AMP-01s on a network need to simultaneously be given the same command. Broadcast commands are limited to switching between Manual (0x02), Auto (0x08), and Servo Center (0x04) modes of operation. After a broadcast command is issued, each H6415-AMP-01 should be individually queried to confirm receipt of the command.

Note: Address 0 is reserved for the H6415-DSP.
