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QUICK START

ARMORSTART® DISTRIBUTED MOTOR CONTROLLER WITH ARMORPOINT® BACKPLANE
Getting Started

BULLETIN 280A/281A

Introduction

This guide provides the basic information required to start up your ArmorStart® Distributed Motor Controller. Factory default settings and information regarding installing, programming, and ArmorPoint® Communication Backplane, are described here. For detailed information on specific product features or configurations, refer to the ArmorStart user manual, Publication 280-UM001*-EN-P.

This guide is intended for qualified service personnel responsible for setting up and servicing these devices. You must have previous experience with and a basic understanding of electrical terminology, configuration procedures, required equipment, and safety precautions.

For Bulletin 280A/281A devices, you should understand Bulletin 1738 ArmorPoint adapter and I/O products.

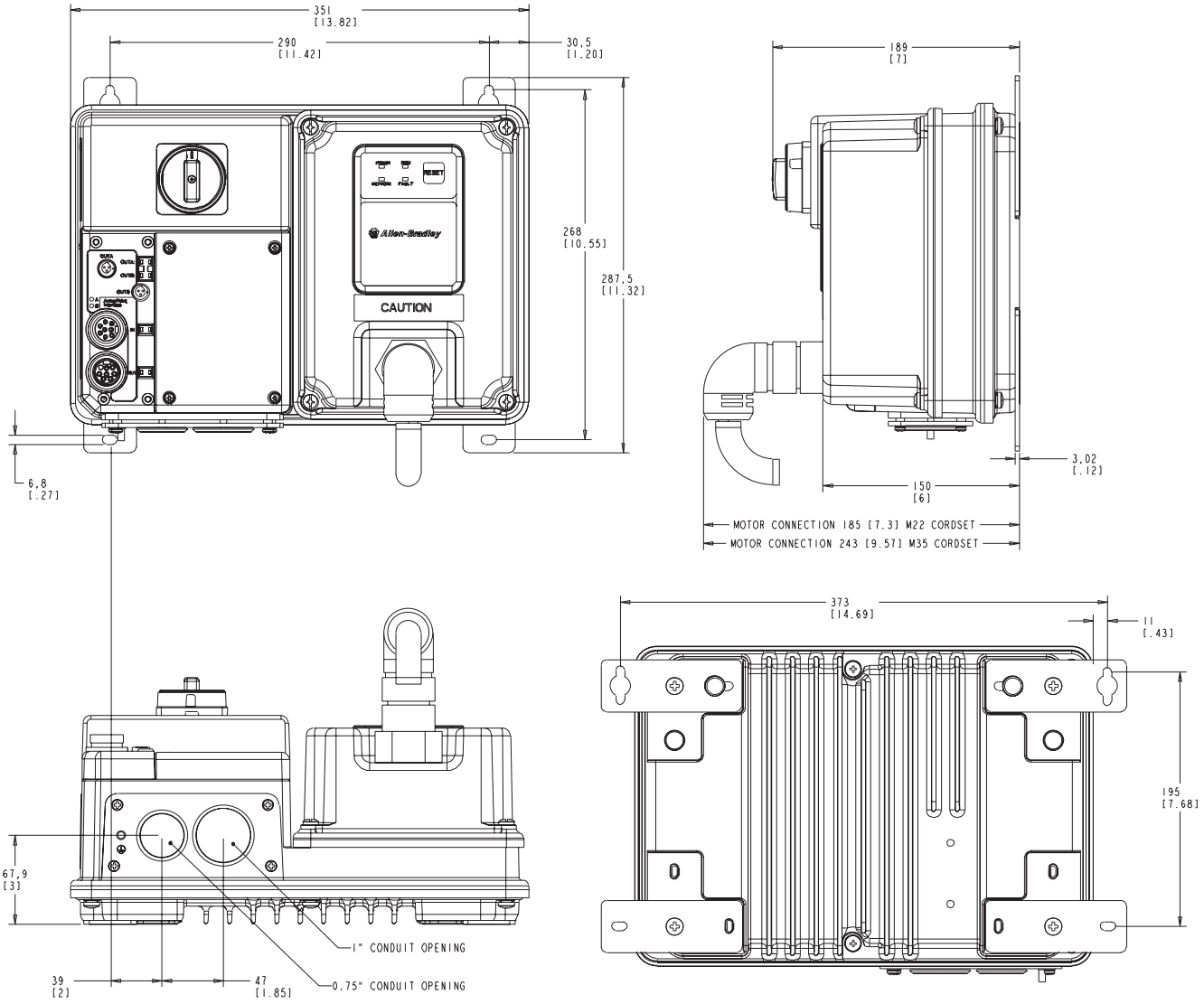
Installation

The ArmorStart Distributed Motor Controller is convection cooled. Operating temperature must be kept between -20…40°C (-4…104°F).

Dimensions

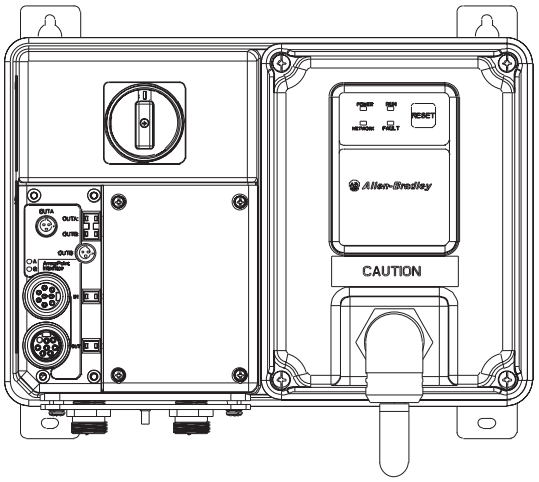
Dimensions are shown in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Figure 1 Dimensions for IP67/NEMA Type 4 with Conduit Entrance

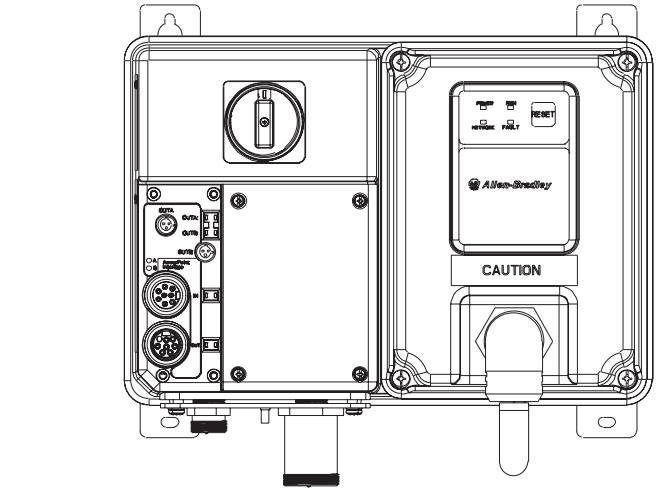


Dimensions are shown in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

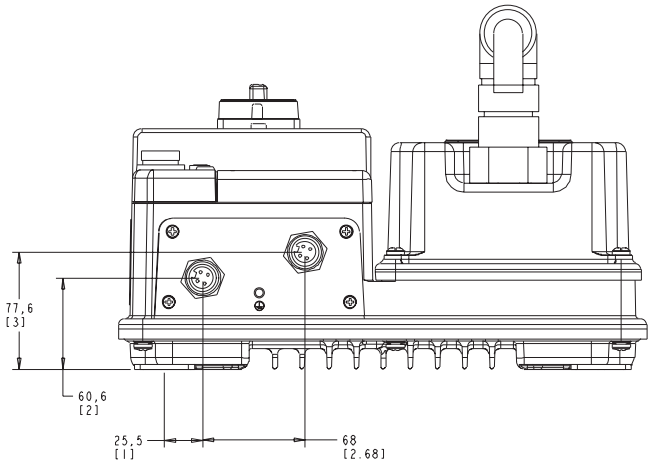
Figure 2 Dimensions for IP67/ NEMA Type 4 with ArmorConnect™ Connectivity

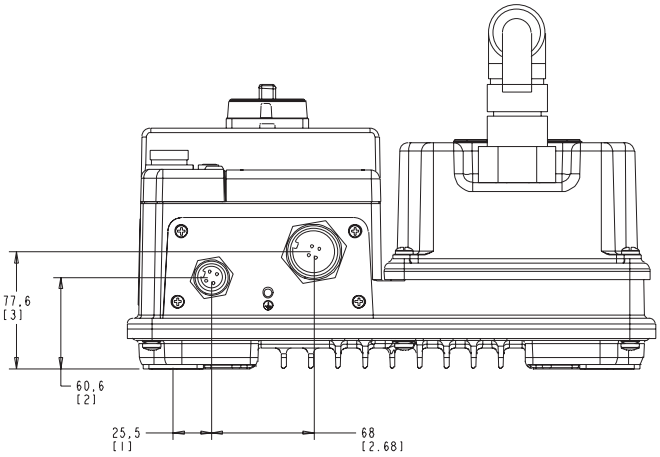


ArmorStart device with a 10 A short circuit protection rating



ArmorStart device with a 25 A short circuit protection rating





Wiring

Power, Control, Safety Monitor Inputs, and Ground Wiring

Table 1 provides the power, control, safety monitor inputs, ground wire capacity and the tightening torque requirements. The power, control, ground, and safety monitor terminals will accept a maximum of two wires per terminal.

Table 1 Power, Control, Safety Monitor Inputs, Ground Wire Size, and Torque Specifications

Terminals	Wire Size	Torque	Wire Strip Length
Power and Ground	Primary/Secondary Terminal: 1.0…4.0 mm^2 (#18 …#10 AWG)	Primary Terminal: 10.6…21.6 lb.-in. (1.2…2.4 N•m) Secondary Terminal: 5.3…7.3 lb.-in (0.6…0.8 N•m)	0.35 in. (9 mm)
Control and Safety Monitor Inputs	0.34mm^2…4.0 mm^2 (#22…#10 AWG)	5.0…5.6 lb.-in (0.6 N•m)	0.35 in. (9 mm)

Terminal Designations

As shown in Figure 3, the ArmorStart Distributed Motor Controller contains terminals for power, control, safety monitor inputs, and ground wiring. Access can be gained by removing the terminal access cover plate.

Figure 3 ArmorStart Power, Control, and Safety Monitor Terminals

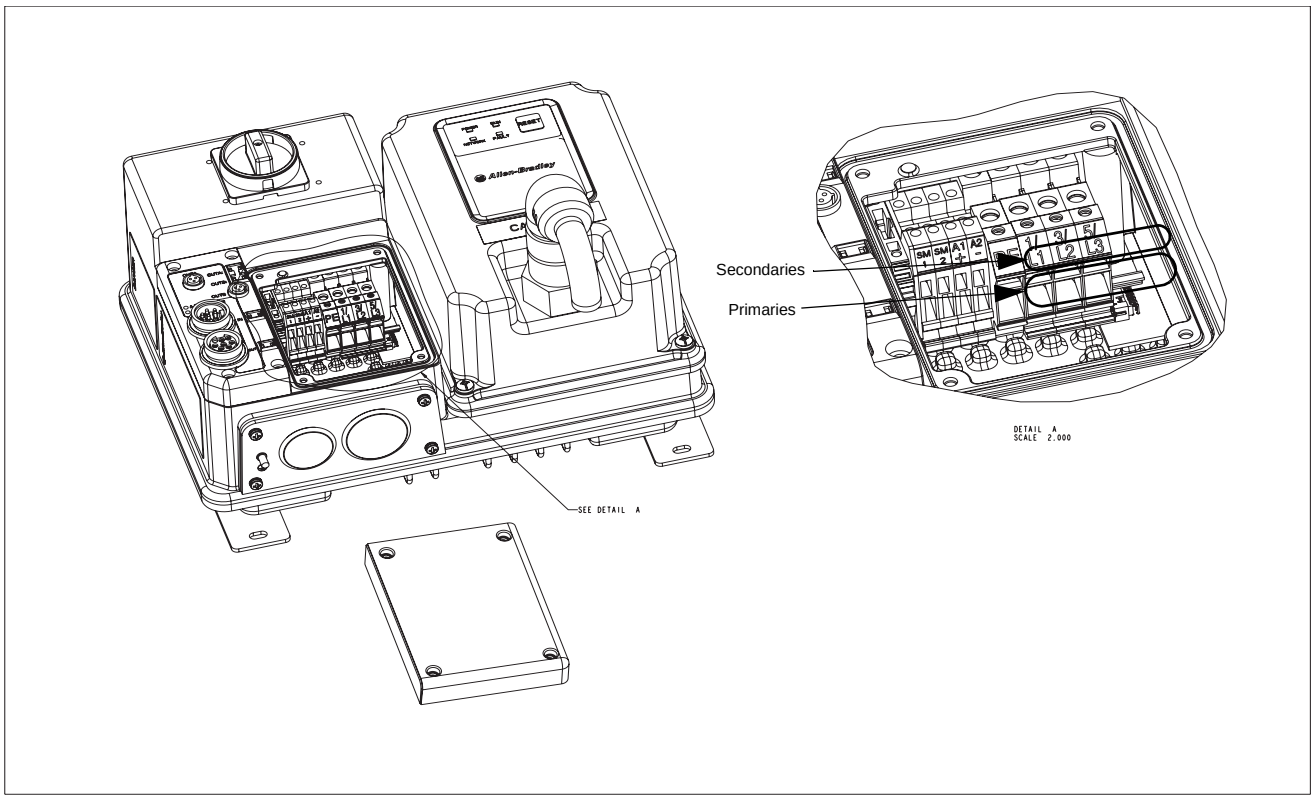


Table 2 Power, Control, and Ground Terminal Designations

Terminal Designations	No. of Poles	Description
SM1 ❶	2	Safety Monitor Input
SM2 ❶	2	Safety Monitor Input
A1 (+)	2	Control Power Input
A2 (-)	2	Control Power Common
PE	2	Ground
1/L1	2	Line Power Phase A
3/L3	2	Line Power Phase B
5/L5	2	Line Power Phase C

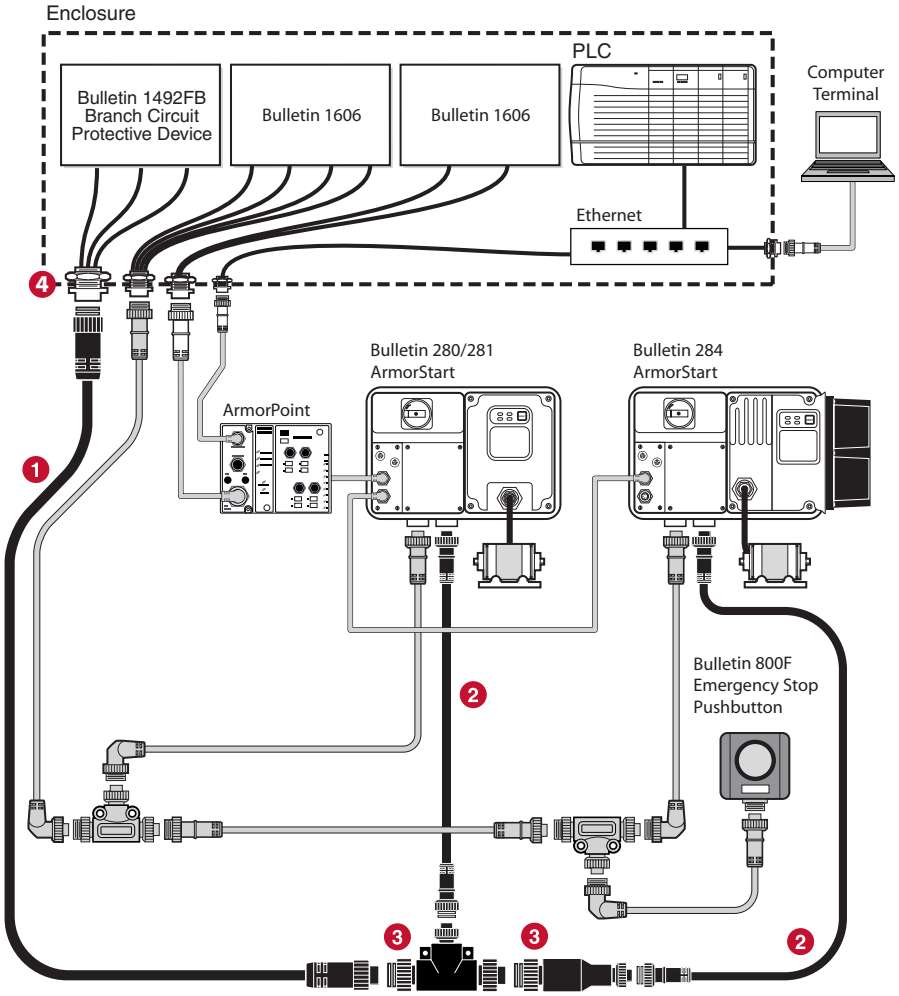
❶ Only available with the Safety Monitor option.

ArmorConnect Power Media

Description

The ArmorStart Power Media offers both three-phase and control power cable system of cordsets, patchcords, receptacles, tees, reducers and accessories to be utilized with the ArmorStart Distributed Motor Controller. These cable system components allow quick connection of ArmorStart Distributed Motor Controllers and reduce installation time. They provide for repeatable, reliable connection of the three-phase and control power to the ArmorStart Distributed Motor Controller and motor by providing a plug and play environment that also avoids system mis-wiring. When specifying power media for use with the ArmorStart Distributed Motor Controllers (Bulletins 280, 281, 283, and 284) use only Bulletin 280 ArmorConnect™ power media.

Figure 4 Three-Phase Power System Overview



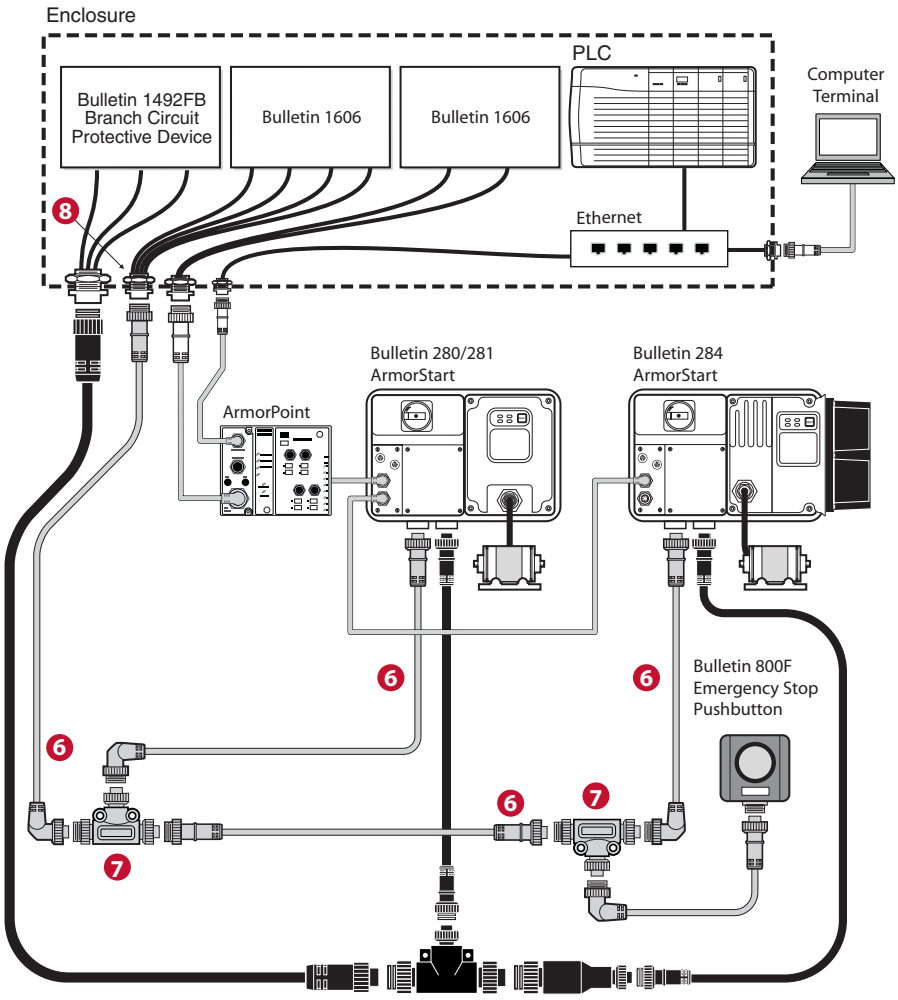
❶ Three-Phase Power Trunk- PatchCord cable with integral female or male connector on each end
Example Part Number: 280-PWR35A-M*

❷ Three-Phase Drop Cable- PatchCord cable with integral female or male connector on each end
Example Part Number: 280-PWR22A-M*

❸ Three-Phase Power Tees and Reducer -
Tee connects to a single drop line to trunk with quick change connectors – Part Number: 280-T35
Reducing Tee connects to a single drop line (Mini) to trunk (Quick change) connector – Part Number: 280-RT35
Reducer connects from quick change male connector to mini female connector– Part Number: 280-RA35

❹ Three-Phase Power Receptacles -
Female receptacles are a panel mount connector with flying leads – Part Number: 280-M35F-M1

Figure 5 Control Power Media System Overview



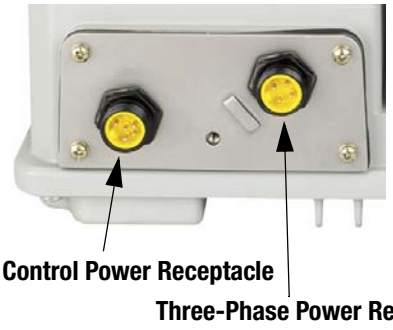
❻ Control Power Media Patchcords - PatchCord cable with integral female or male connector on each end
Example Part Number: 889N-F65GFNM-*

❼ Control Power Tees - The E-stop In Tee (Part Number: 898N-653ES-NKF) is used to connect to the Bulletin 800F On-Machine E-Stop station using a control power media patchcord. The E-stop Out tee (Part Number: 898N-653ST-NKF) is used with cordset or patchcord to connect to the ArmorStart Distributed Motor Controller.

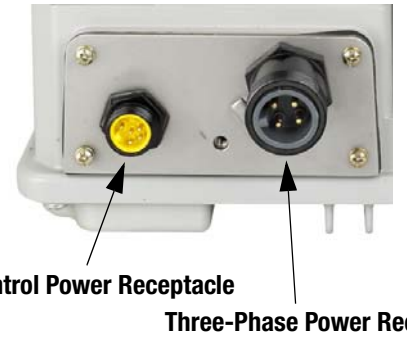
❽ Control Power Receptacles - Female receptacles are a panel mount connector with flying leads –
Part Number: 888N-D65AF1-*

ArmorStart with ArmorConnect Connectivity

ArmorStart devices with 10 A short circuit protection rating



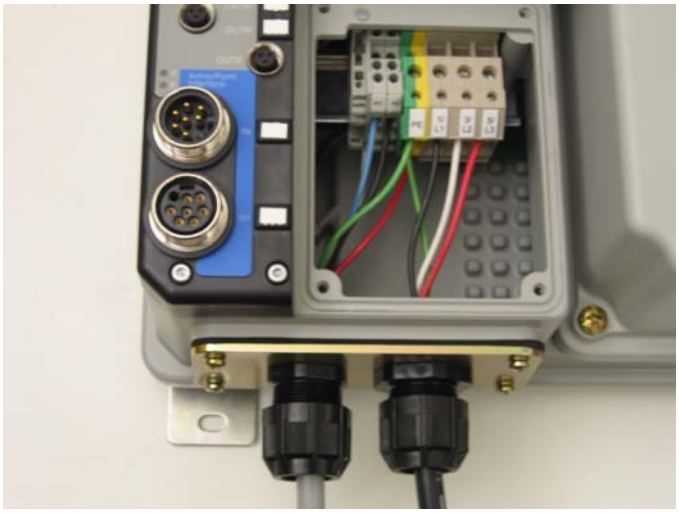
ArmorStart devices with 25 A short circuit protection rating



Installing ArmorConnect Power Media using Cord Grips

Cord Grips for ArmorStart Devices with 10 A short circuit protection rating

Cord Grips for ArmorStart Devices with 25 A short circuit protection rating



Terminal Designations	Description	Color Code
A1 (+)	Control Power Input	Blue
A2 (-)	Control Power Common	Black
PE	Ground	Green/Yellow
1/L1	Line Power - Phase A	Black
2/L2	Line Power - Phase B	White
3/L3	Line Power - Phase C	Red

ArmorConnect Cable Ratings

The ArmorConnect Power Media cables are rated per UL Type TC 600V 90 °C Dry 75 °C Wet, Exposed Run (ER) or MTW 600V 90 °C or STOOW 105 °C 600V - CSA STOOW 600V FT2. For additional information regarding ArmorConnect Power Media see the ArmorStart User Manual.

Branch Circuit Protection Requirements for ArmorConnect™ Three-Phase Power Media

When using ArmorConnect Three-Phase Power Media, only fuses can be used for the motor branch circuit protective device, for the group motor installations. The recommended fuse types are the following: Class CC, T, or J type fuses. For additional information, see the ArmorStart User Manual.

Group Motor Installations for USA and Canada Markets

The ArmorStart Distributed Motor controllers are listed for use with each other in group installations per NFPA 79, Electrical Standard for Industrial Machinery. When applied according to the group motor installation requirements, two or more motors, of any rating or controller type, are permitted on a single branch circuit. Group Motor Installation has been successfully used for many years in the USA and Canada.

Wiring and Workmanship Guidelines

In addition to conduit and seal-tite raceway, it is acceptable to utilize cable that is dual rated Tray Cable, Type TC-ER and Cord, STOOW, for power and control wiring on ArmorStart installations. In the USA and Canada installations, the following guidance is outlined by the NEC and NFPA 79.

In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation, and where the exposed cable is continuously supported and protected against physical damage using mechanical protection, such as struts, angles, or channels, Type TC tray cable that complies with the crush and impact requirements of Type MC (Metal Clad) cable and is identified for such use with the marking Type TC-ER (Exposed Run)* shall be permitted between a cable tray and the utilization equipment or device as open wiring. The cable shall be secured at intervals not exceeding 1.8 m (6 ft) and installed in a “good workman-like” manner. Equipment grounding for the utilization equipment shall be provided by an equipment grounding conductor within the cable.

*Historically cable meeting these crush and impact requirements were designated and marked “Open Wiring”. Cable so marked is equivalent to the present Type TC-ER and can be used.

While the ArmorStart is intended for installation in factory floor environments of industrial establishments, the following must be taken into consideration when locating the ArmorStart in the application: Cables, including those for control voltage including 24V DC and communications, are not to be exposed to an operator or building traffic on a continuous basis. Location of the ArmorStart to minimize exposure to continual traffic is recommended. If location to minimize traffic flow is unavoidable, other barriers to minimize inadvertent exposure to the cabling should be considered. Routing cables should be done in such a manner to minimize inadvertent exposure and/or damage.

Additionally, if conduit or other raceways are not used, it is recommended that strain relief fittings be utilized when installing the cables for the control and power wiring through the conduit openings.

The working space around the ArmorStart may be minimized as the ArmorStart does not require examination, adjustment, servicing or maintenance while energized. In lieu of this service, the ArmorStart is meant to be unplugged and replaced after proper lockout/tag-out procedures have been employed.

Since the ArmorStart is available with a factory installed HOA keypad option this may require the ArmorStart to be selected and installed as follows if the application requires frequent use of the hand operated interface by the equipment operator:

1. They are not less than 0.6 m (2 ft) above the servicing level and are within easy reach of the normal working position of the operator.
2. The operator is not placed in a hazardous situation when operating them.
3. The possibility of inadvertent operation is minimized.

If the operated interface is used in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons operate and service the ArmorStart's operator interface, and the installation is located so that inadvertent operation is minimized then other installation locations with acceptable access can be provided.

LED Status Indication

The LED Status Indication provides 4 status LEDs and a Reset button. The LEDs provide status indication for the following:

- POWER LED
  The LED is illuminated solid green when control power is present and with the proper polarity
- RUN LED
  This LED is illuminated solid green when a start command and control power are present
- NETWORK LED
  This bi-color (red/green) LED indicates the status of the communication link
- FAULT LED
  Indicates Controller Fault (trip) condition

The “Reset Button” as a local trip reset.

Figure 6 LED Status Indication and Reset

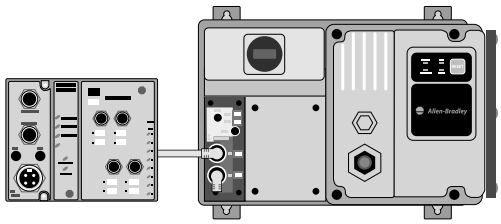
ArmorStart with ArmorPoint

ArmorStart for the ArmorPoint Backplane

The Bulletin 280/281A ArmorStart Distributed Motor Controller allows connectivity to the ArmorPoint backplane. The ArmorPoint I/O system can communicate using DeviceNet™, ControlNet™, or EtherNet communication protocols. In addition to the other network communication protocols; the ArmorPoint Distributed I/O products allow the I/O capability to be expanded beyond the standard two outputs. Two dual-key relay output connectors are provided as standard. The outputs are sourced from control voltage power (A1 and A2). LED status indication is also provided, as standard with the ArmorPoint. When using ArmorPoint, a maximum of two ArmorStart Distributed Motor Controllers can be connected to the ArmorPoint Distributed I/O products.

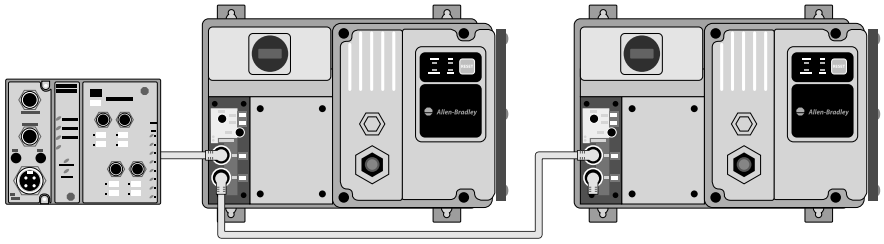
ArmorStart to ArmorPoint Connectivity

Figure 7 Connectivity Diagram for one ArmorStart Distributed Motor Controller



When connecting to the Bulletin 1738 ArmorPoint Distributed I/O product, a network adapter and at least one ArmorPoint Digital Output, Digital Input, Analog, AC and Relay product, or Specialty product must be selected. The ArmorPoint Distributed I/O product can accommodate up to 63 modules per network node. The cable that connects the ArmorPoint Distributed I/O to the ArmorStart Distributed Motor Controller is the Bulletin 280A-EXT1. The 280A-EXT1 includes an ArmorPoint bus extension cable and a network terminating resistor. The network terminating resistor must be connected to the “ArmorPoint Interface Out” connector.

Figure 8 Connectivity Diagram for two ArmorStart Distributed Motor Controllers



If an additional ArmorStart Distributed Motor Controller is to be connected, the Bulletin 280A-EXTCABLE will be required. A maximum of two ArmorStart Distributed Motor Controllers can be connected to the Bulletin 1738 Distributed I/O. The Bulletin 280A-EXTCABLE is connected from the “ArmorPoint Interface Out” on the first unit, to the “ArmorPoint Interface In” on the second unit. The network terminating resistor is connected to the “ArmorPoint Interface Out” on the second unit.

ArmorPoint Backplane Commissioning

Establishing a Backplane Node Address

Backplane node addresses are established automatically by the ArmorPoint system on power up. Node addresses for the backplane modules are allocated from left to right, starting at address 1.

Note: The rotary address switches on the starter module are ignored when using the ArmorPoint backplane.

Note: When using RSNetWorx for DeviceNet with the 280A/281A ArmorStart Distributed Motor Controllers, DO NOT use the node commissioning outlined in Chapter 5 of the User Manual.

Details on Using the "ArmorStart Ladder Logic Configurator"

The ArmorStart Ladder Logic Configurator is a ladder logic routine (File Name: *ArmorStart_Configurator.ACD*) designed so that under program control, the entire product family of the ArmorStart Distributed Motor Controllers can be configured easily from a Logix based controller. The family of ArmorStart Distributed Motor Controllers includes the following Bulletin Numbers: 280A, 281A, 283A and 284A. The ArmorStart Distributed Motor Controllers can be networked over ControlNet or EtherNetIP, when on the appropriate ArmorPoint backplane. The ladder logic file is designed to be merged into an existing ladder logic file or it can be used as the basic program and other logic can be added to it. This document assumes that the reader has an average knowledge of the use of RSLogix™5000 and Logix based controllers. Device configuration is done inside the Controller tag editor under the ***Monitor Tags*** tab.

Note: The ArmorStart Ladder Logic Configurator (File Name: *ArmorStart_Configurator.ACD*) is provided on the CD shipped with every ArmorStart product with the ArmorPoint Communications protocol.

Theory of Operation

It is possible to connect an ArmorStart product to the Point I/O based subnet of the ArmorPoint I/O system. This allows the ArmorStart to be connected to EtherNetIP and ControlNet, along with the original DeviceNet. **The easiest way to program these ArmorStarts is to use RSNetWorx for DeviceNet software, bridging through the appropriate network.** This ladder logic has been developed as an alternate method of configuration.

Once the appropriate device configuration is done to a User Defined Structure in the ladder logic file, a bit will need to be turned on in the logic to trigger a system wide read of the system. This system wide read, goes out and reads certain attributes of every parameter of every ArmorStart in the system and stores the information into a large data array. The first attribute

is a flag word that tells the ladder logic if the parameter is read only. If the read only bit is set, then the ladder logic will skip the additional attribute reads and will go to the next parameter. If the parameter is writable, then the logic will read the size, min. allowed value, max. allowed value, the parameter name, help string and the raw data of each parameter. These attributes are stored in the data array for use later when the configuration is written to each ArmorStart. The logic requires that a system wide read function be completed prior to a system wide write function being requested.

Note: A system wide read function should be done anytime that a new ArmorStart is added to the system or an ArmorStart is updated with a more recent version. This assures that the data array in the logic matches the total system.

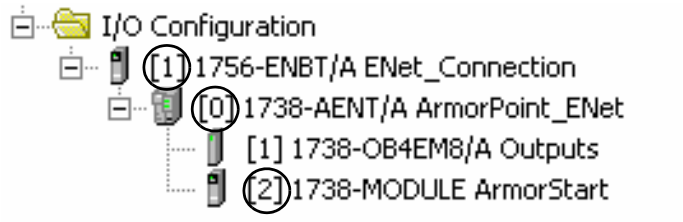
Once a system wide read is done, the raw data of the individual parameters in the data array can be modified and a system wide write function activated from a bit in the ladder logic. Only parameters that changed will be written to the ArmorStart devices, and after a write is done the parameter is read back and stored in the data array for comparison. If the write and reread value do not match, an Error Report is generated.

If an error occurs for any reason, during a system wide read or write, an error report will be logged, containing the device and parameter it occurred on. Also the status and extended status of the message block is logged in case the error originated there.

I/O Tree Overview

In order to transfer I/O information, the ArmorStart needs to be added to the I/O tree of the Logix processor. The details of doing this are outside of the scope of these instructions, but screen captures of the completed configuration are included below for reference. The configuration below shows the EtherNetIP card in the Logix chassis slot 1. The 1738-AENT module is always located at slot zero in the subnet and the ArmorStart device is located in slot 2 on the subnet. These slots are circled below for you reference.

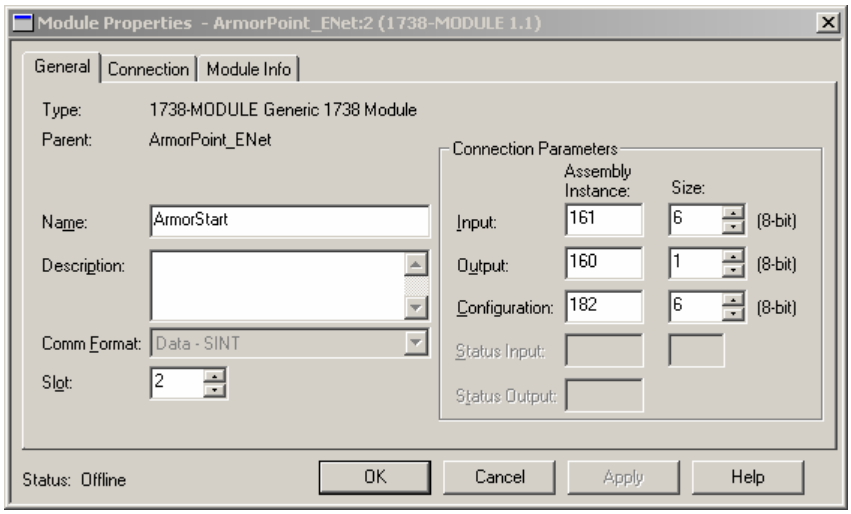
Figure 9 Logix Processor I/O Tree



The only configuration that the user needs to be concerned with for the ArmorPoint communication adapter is either the EtherNet IP address or the ControlNet node address.

Since there currently is no profile for an ArmorStart device in the I\O Tree, the 1738-MODULE profile needs to be used as a generic profile. The standard configuration for an ArmorStart 280A/281A, using this profile is shown below.

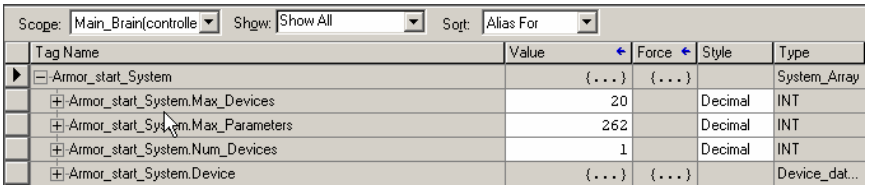
Figure 10 ArmorStart Configuration using 1738-MODULE Profile



Logic Configuration Details

Inside the Configurator file is a large User Defined structure called *Armor_Start_System*, which contains all of the data for both the configuration of the routine, and also storage space for all of the ArmorStart parameters. With 20 devices, the total memory needed to hold this structure in the Logix controller is **195K bytes**. The diagram below shows the upper part of the structure and 3 important elements.

Figure 11 Configurator File — *Armor_Start_System*

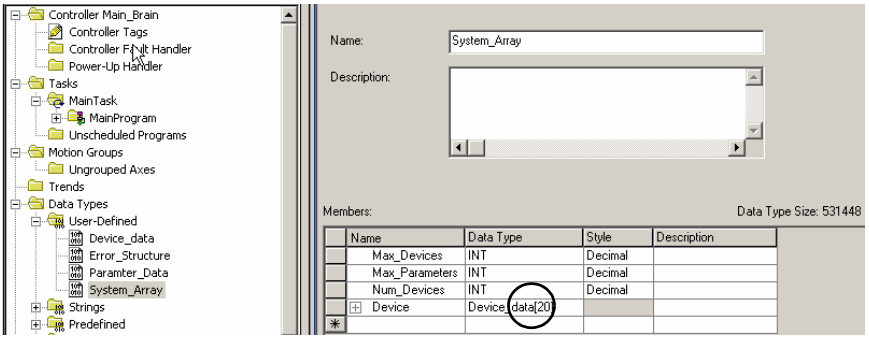


Armor_Start_System.Max_Devices defaults to 20; because the total number of devices that the structure is designed to hold initially, is 20. **This amount can be easily changed, but doing so will also necessitate a change to the size of the System Array structure to match exactly.**

Note: The Logix memory that contains the structure will also change size proportionally.

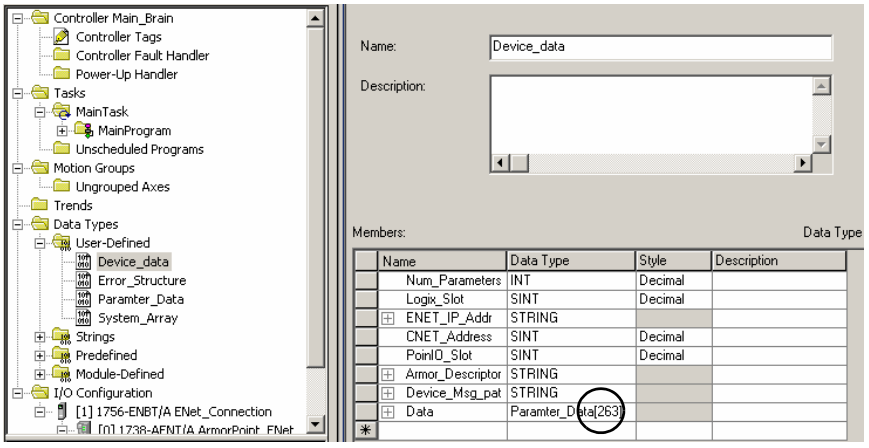
Shown below is the array size that will also need to be changed to match the *Armor_Start_System.Max_Devices* value.

Figure 12 System Array Size



Armor_Start_System.Max_Parameters defaults to 262, because the maximum number of parameters in any existing ArmorStart product is 262 or less. This amount can be easily be changed, and doing so will also proportionally change the size of the System Array structure and the Logix memory that holds it. **Shown below is the array size that will also need to be changed to be 1 greater than the *Armor_Start_System.Max_Parameters* value.** This is because the parameters are stored by parameter number, and since there is no parameter 0, that storage location is unused.

Figure 13 Array Size Parameter



Armor_Start_System.Num_Devices defaults to zero and is defined as the total number of ArmorStart products connected to the control system that need to be configured. **It is important that this value be set before the configuration routine is executed.**

It is to the users best advantage to trim the structures down to the minimum values that match their system because this will save a considerable amount of Logix processor memory. However, some room should be left in the structures to handle any future additions of ArmorStart devices to the system.

Adding Devices to the Configuration Structure

Once the three major System level parameters are entered, it is up to the user to enter in, each of the ArmorStart devices configuration information. These parameters are defined by the slot in the Logix chassis where the EtherNetIP or ControlNet communication card resides. The next parameter is the EtherNetIP IP or ControlNet node address of the 1738 communication adapter containing the ArmorStart. Lastly, the slot number on the ArmorPoint subnet where the ArmorStart is connected also needs to be entered. An optional parameter is a string that can be entered with a description of the function of the ArmorStart device. Each device will be configured by entering its data into a different block of the *Armor_Start_System.Device*[] array.

The Following shows the configuration for a communication card in the Logix chassis 2, AENT IP address 192.168.1.10 and Point I/O slot 3. The logic determines whether the network is EtherNetIP or ControlNet depending on whether the *ENET_IP_Addr* field is blank or the *CNET_Address* is zero. **One of these two fields must be filled out for the logic to work correctly.** The *Armor_Descriptor* field is optional and is used to more easily identify the ArmorStart as to its function in the system.

Figure 14 Communication Card Configuration

Scope: Main_Brain(controlle Show: Show All Sort: Alias For

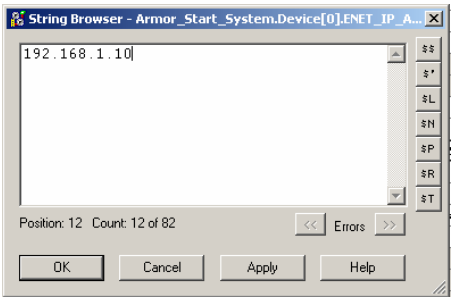
Tag Name	Value	Force	Style
Armor_start_System	{...}	{...}	
Armor_start_System.Max_Devices	20		Decimal
Armor_start_System.Max_Parameters	262		Decimal
Armor_start_System.Num_Devices	1		Decimal
Armor_start_System.Device	{...}	{...}	
Armor_start_System.Device[0]	{...}	{...}	
Armor_start_System.Device[0].Num_Parameters	108		Decimal
Armor_start_System.Device[0].Logix_Slot	1		Decimal
Armor_start_System.Device[0].ENET_IP_Addr	'192.168.1...	{...}	
Armor_start_System.Device[0].CNET_Address	0		Decimal
Armor_start_System.Device[0].PointIO_Slot	2		Decimal
Armor_start_System.Device[0].Armor_Descriptor	'First Arm...	{...}	
Armor_start_System.Device[0].Device_Msg_path	''	{...}	
Armor_start_System.Device[0].Data	{...}	{...}	

Note: To easily edit an ASCII string, click on the string value field and a small icon with three dots appears.

Figure 15 String Browser Box

Click on the three dots icon and a String Browser box appears. Modify the text to what is desired and click on **Apply**, then click on **OK**. This works for ALL strings throughout the entire data array.

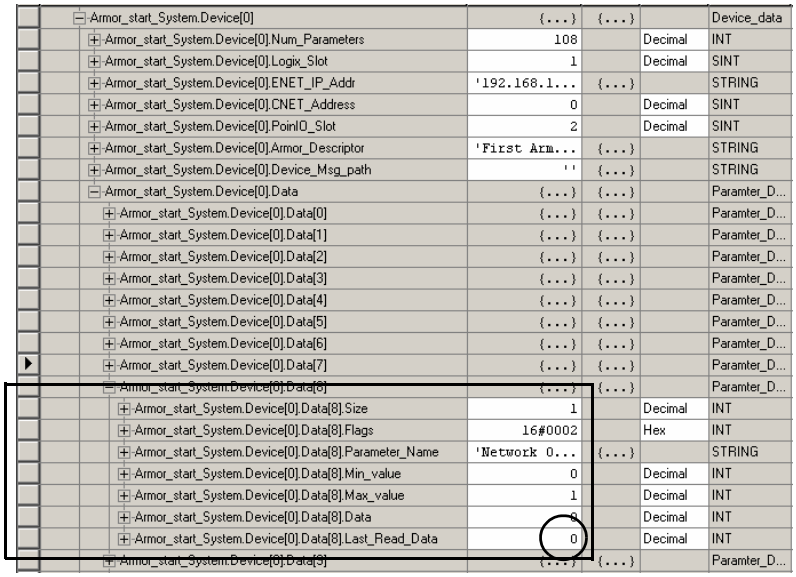
Figure 16 String Browser Box



Modifying Parameter Data for an ArmorStart

The last configuration that will need to be done eventually, is the writing of a parameter configuration change for an ArmorStart. This is done by first equating a particular ArmorStart to a device number in the data array. Again, this device number is determined by the Logix slot of the communication card, ETherNetIP or CNet address of the communication adapter and subnet slot of ArmorStart. The optional, *Armor_Descriptor* field is extremely handy for doing a functional lookup of the device number. Once the device number is determined, the parameter number to be modified, must be obtained. The best way to do this, is to go to the ArmorStart user manual and get the parameter number of the value to be modified. The parameter numbers all start with 1 and are numbered sequentially to the last parameter number. The user manual is important because it will thoroughly describe each parameter, for example, whether or not a parameter is writable and what the parameter limits/interpretation are. Once the device and parameter number is obtained, the next step is to modify the configuration data for that parameter. The following screen capture shows the data array and particularly, the parameter 8 for Device 0.

Figure 17 Data Array



Armor_start_System.Device[0]	{...}	{...}		Device_data
Armor_start_System.Device[0].Num_Parameters	108		Decimal	INT
Armor_start_System.Device[0].Logix_Slot	1		Decimal	SINT
Armor_start_System.Device[0].ENET_IP_Addr	'192.168.1...	{...}		STRING
Armor_start_System.Device[0].CNET_Address	0		Decimal	SINT
Armor_start_System.Device[0].PoinIO_Slot	2		Decimal	SINT
Armor_start_System.Device[0].Armor_Descriptor	'First Arm...	{...}		STRING
Armor_start_System.Device[0].Device_Msg_path	''	{...}		STRING
Armor_start_System.Device[0].Data	{...}	{...}		Paramter_D...
Armor_start_System.Device[0].Data[0]	{...}	{...}		Paramter_D...
Armor_start_System.Device[0].Data[1]	{...}	{...}		Paramter_D...
Armor_start_System.Device[0].Data[2]	{...}	{...}		Paramter_D...
Armor_start_System.Device[0].Data[3]	{...}	{...}		Paramter_D...
Armor_start_System.Device[0].Data[4]	{...}	{...}		Paramter_D...
Armor_start_System.Device[0].Data[5]	{...}	{...}		Paramter_D...
Armor_start_System.Device[0].Data[6]	{...}	{...}		Paramter_D...
Armor_start_System.Device[0].Data[7]	{...}	{...}		Paramter_D...
Armor_start_System.Device[0].Data[8]	{...}	{...}		Paramter_D...
Armor_start_System.Device[0].Data[8].Size	1		Decimal	INT
Armor_start_System.Device[0].Data[8].Flags	16#0002		Hex	INT
Armor_start_System.Device[0].Data[8].Parameter_Name	'Network 0...	{...}		STRING
Armor_start_System.Device[0].Data[8].Min_value	0		Decimal	INT
Armor_start_System.Device[0].Data[8].Max_value	1		Decimal	INT
Armor_start_System.Device[0].Data[8].Data	0		Decimal	INT
Armor_start_System.Device[0].Data[8].Last_Read_Data	0		Decimal	INT
Armor_start_System.Device[0].Data[9]	{...}	{...}		Paramter_D...

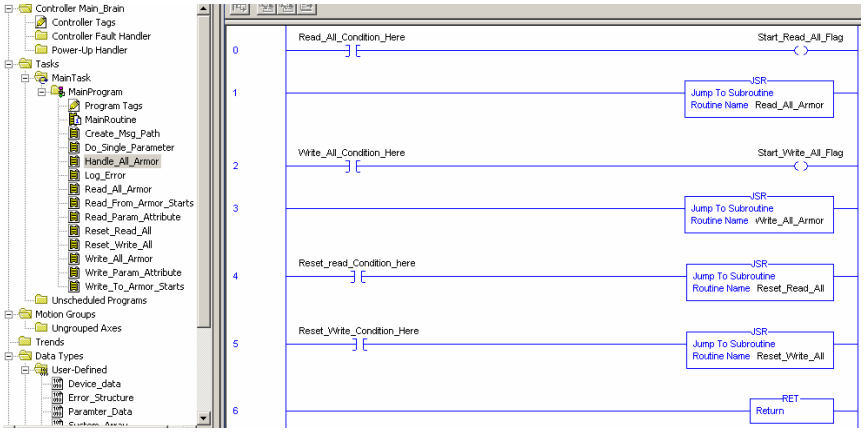
The value to be modified is the ***.data*** element of the structure. For reference, the ***Min_value*****,** ***Max_value,*** **and** ***Name_String*** for the parameter is also in the structure, so that the user knows what the minimum and maximum allowable values are for the data. It is important to realize that the data is in a raw format. In other words, this data could be considered a Boolean, a bit mask, an ASCII string, an integer, a byte, etc., depending on the definition of the parameter in the ArmorStart. Also, there could be an implied decimal point, scaling, and different units involved. **It is important that the user fully understand and verify the raw data value being modified with the user manual, so that it is correctly interpreted by the ArmorStart or undesired operation in the ArmorStart may occur.**

Once the data is written, during a System Wide Write function, the ladder logic will read it back and put into the ***.Last_Read_Value*** of the structure. This will be a handy visual verification that the data was written correctly.

Triggering a System Wide Read

Once the system configuration has been done, a System Wide Read must be initiated. The logic to trigger both a System Wide Read and Write is contained in a subroutine called ***Handle_All_Armor***. The rungs are shown below for reference.

Figure 18 *Handle_All_Armor* **Rungs**



To trigger the system wide read, the contact ***Read_All_Condition_Here*** needs to be energized in the ladder logic. This can be done through additional logic or simply by energizing the bit, on-line, in the RSLogix™5000 software, Controller Tag monitor screen. The ***Read_All_Condition_Here*** is handled as a one shot inside the logic, but should be de-energized at a later time. This is so a system wide read is not triggered after every Logix power cycle or for each transition from Program to RUN mode. When the read finishes successfully, the ***Read_All_System_Done_Flag*** bit energizes in the logic. However, if an error occurs during the read, the ***Read_All_System_Error_Flag*** bit energizes and the error will be logged into the structure called ***Error_Report***.

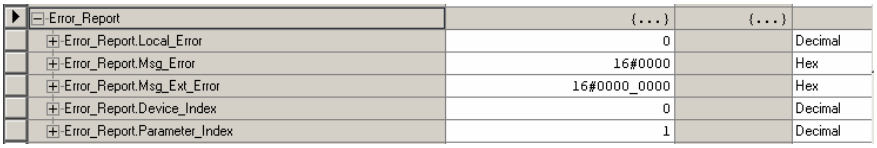
Triggering a System Wide Write

Once a successful System Wide Read has been initiated and the ***Read_All_System_Done_Flag*** bit is energized, a System Wide Write can be triggered. To trigger the system wide write, the contact ***Write_All_Condition_Here*** needs to be energized in the ladder logic. This can be done through additional logic or simply by energizing the bit on-line, in the RSLogix™5000 software, Controller Tag monitor screen. The ***Write_All_Condition_Here*** is handled as a one shot inside the logic, but should be de-energized at a later time. This is so a System Wide Write is not triggered after every Logix power cycle or for each transition from *Program* to *RUN* mode. When the write finishes successfully, the ***Write_All_System_Done_Flag*** bit energizes in the logic. If an error occurs during the write, the ***Write_All_System_Error_Flag*** bit energizes and the error will be logged into the structure called ***Error_Report***.

Interpreting the Error Report

If an error occurs during the operation of the ladder logic, either the ***Write_All_System_Error_Flag*** **or** ***Read_All_System_Error_Flag*** bits will energize depending on which function was being triggered. Information will be logged inside the data structure ***Error_Report***, that will aid in troubleshooting the problem. The format of this structure is shown below.

Figure 19 Error Report



The first element of this structure is ***.Local_Error*** and will contain a number corresponding to an error interpretation. The error numbers are described in the next table.

Table 3 Error Definitions

Error No.	Error Description
0	Success. Function completed successfully.
1	Read Number Parameter Error. ***Num_Devices*** element in the configuration is either 0 or greater than the ***Max_Devices*** element.
2	Read Message Block Error. The Message block doing the data reads returned back an error. Look at the ***Msg_Error*** and ***Msg_Ext_Error*** fields for the errors reported by the message.
3	Write Data out of Limits. The value of the data to be written is either less than the ***Min_value*** or greater than the ***Max_value***.
4	Write Message Block Error. The Message block doing the data writes returned back an error. Look at the ***Msg_Error*** and ***Msg_Ext_Error*** fields for the errors reported by the message.
5	Write Disallowed. The System Wide Write attempted without a successful System Wide Read done first.
6	Data Write Error. The data read back after a parameter write, does not match.
7	Number of Parameters Error. The number of parameters read from an ArmorStart is greater than the ***Max_Devices*** element in the structure.

Quick Reference Troubleshooting

There are four LEDs on the front of the ArmorStart that can provide an indication as to the health of the device. The following is a brief explanation of the operation of each LED.

Table 4 LED Status Indication

LED	Definition
Power	This LED will be illuminated solid green when control power is present and with the proper polarity.
Run	This LED will be illuminated solid green when a start command and control power are present.
Network	This bi-color LED is used to indicate the status of the communications network. See the Network Status LED table below for additional information.
Fault	This LED is used to indicate the fault status of the ArmorStart. When the unit is faulted, the unit will respond with a specific blink pattern to identify the fault. See the Fault LED table below for additional information.

Table 5 Network LED Status Indication

Network Status LED	Definition	Possible Causes
Off	The device has not completed the initialization, is not on an active network, or may not be powered up.	Check to make sure the product is properly wired and configured on the network.
Flashes green-red-off	While waiting to detect the network baud rate, the LED will flash this pattern about every 3 seconds.	If the product stays in this state, it means that there is no set baud rate. Insure that at least one device on the network has a set baud rate.
Solid Green	The device is operating in a normal condition, and is communicating to another device on the network.	No action required.
Flashing Green	The ArmorPoint module cannot successfully establish a connection on the backplane.	The wrong connection parameter for the ArmorStart was entered in the “Module Properties” page in RSLogix™5000 or the I/O Tree was not properly configured.
Flashing Red	The ArmorPoint module has stopped communicating over the backplane with ArmorStart.	Check control power connections to the ArmorPoint Module and ArmorStart.
Solid Red	Backplane media issue.	Check backplane media and ArmorStart backplane cable connections.
Flashing Red and Green	The device is in a communication faulted state.	Power cycling the device may resolve the problem; however, if the problem continues, it may be necessary to contact Technical Support.

Fault LED indications for Bulletin 280A and 281A ArmorStart Distributed Motor Controllers

Table 6 Controller Fault LED Definitions

Blink Pattern	Definitions	Possible Causes or Remedies
1	Short Circuit	The motor circuit protector has tripped, or the internal wiring protection algorithm has detected an unsafe current range. Try to reset the protector if tripped. If the condition continues, check the power wiring. This fault cannot be disabled.
2	Overload trip	The load has drawn excessive current and based on the trip class selected, the device has tripped. Verify that the load is operating correctly and the ArmorStart is properly set-up. This fault cannot be disabled.
3	Phase Loss	The ArmorStart has detected a missing phase. Verify that three-phase voltage is present at the line side connections. This fault can be disabled and *is* disabled by default.
4	Reserved	Not Used
5	Reserved	Not Used
6	Control Power	The ArmorStart has detected a loss of the control power voltage. Check control voltage, wiring, and proper polarity. Also check and replace the control voltage fuse if necessary. This fault can be disabled and *is* disabled by default.
7	I/O Fault	This error indicates a blown output fuse.
8	Over Temperature	This fault is generated when the operating temperature has been exceeded. This fault cannot be disabled.
9	Phase Imbalance	The ArmorStart has detected a voltage imbalance. Check the power system and correct if necessary. This fault can be disabled and *is* disabled by default.
10	Reserved	Not Used
11	Reserved	Not Used
12	Reserved	Not Used
13	EEPROM Fault	This is a major fault, which renders the ArmorStart inoperable. Possible causes of this fault are transients induced during EEprom storage routines. If the fault was, initiated by a transient, power cycling should clear the problem otherwise replacement of the ArmorStart may be required. This fault cannot be disabled.
14	Hardware Fault	This fault indicates that a serious hardware problem exists. Check for a base/starter module mismatch. If no mismatch exists, the ArmorStart may need to be replaced. (Hdw Flt is the factory-enabled default setting.) This fault cannot be disabled.

Bulletin 280/281 Parameters

Table 7 Starter Display and Parameter Settings

Parameter	Name String	Path (hex)	Min	Max	Dflt	Type	Value
Starter Display							
101	Phase A Current	002C – 01 – 08	0	32767	—	INT	xxx.x Amps
102	Phase B Current	002C – 01 – 09	0	32767	—	INT	xxx.x Amps
103	Phase C Current	002C – 01 – 0A	0	32767	—	INT	xxx.x Amps
104	Average Current	002C – 01 – 05	0	32767	—	INT	xxx.x Amps
105	% Therm Utilized	002C – 01 – 07	0	100	—	USINT	xxx %
Starter Settings							
106	FLA Setting	002C – 01 – 03	See Table 8 below		Min I	INT	xxx.x Amps
107	OL Trip Class	002C – 01 – 04	0	3	1	BYTE	1 = 10 2 = 15 3 = 20
108	OL Reset Level	0029 – 01 – 131	0	100	75	BYTE	xxx %

Table 8 FLA Setting Ranges and Default Values (with indicated setting precision)

FLA Current Range (A)		Default Value
Minimum Value	Maximum Value	
0.24	1.2	0.24
0.5	2.5	0.5
1.1	5.5	1.1
3.2	16.0	3.2

Figure 20 Bulletin 280/281 ArmorStart

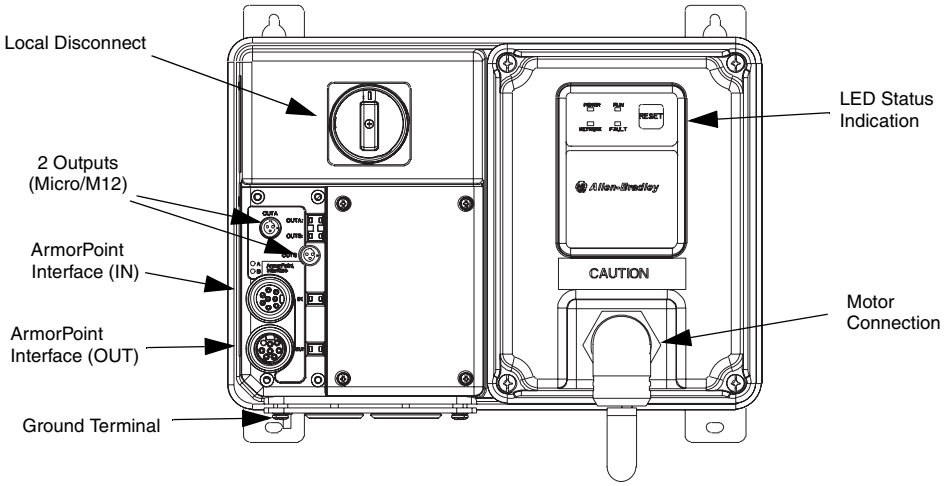
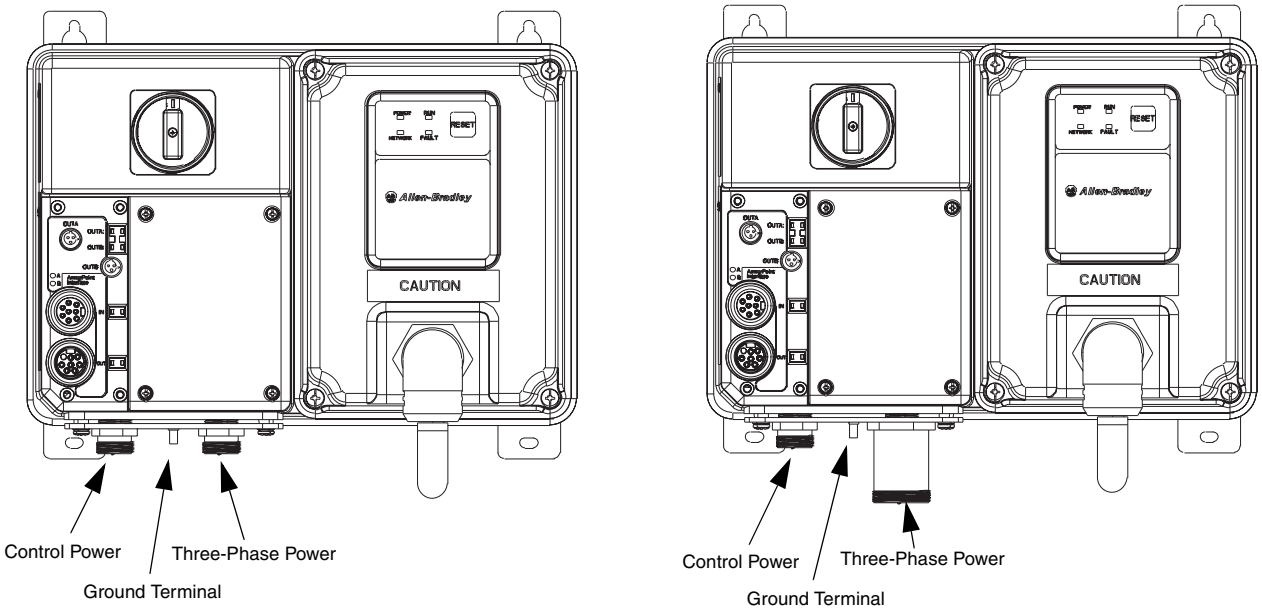


Figure 21 Bulletin 280/281 ArmorStart with ArmorConnect



Accessories

Table 9 DeviceNet Media ❶

Description		Length m (ft)	Cat. No.
	KwikLink pigtail drops are Insulation Displacement Connector (IDC) with integral Class 1 round cables for interfacing devices or power supplies to flat cable		Sealed
		1 m (3.3)	1485P-P1E4-B1-N5
		2 m (6.5)	1485P-P1E4-B2-N5
		3 m (9.8)	1485P-P1E4-B3-N5
		6 m (19.8)	1485P-P1E4-B6-N5
	DeviceNet Mini- T-Port Tap	Right Keyway Left Keyway	1485P-P1N5-MN5NF 1485P-P1N5-MN5KM
	Gray PVC Thin Cable	**Connector**	**Cat. No.**
		Mini Straight Female Mini Straight Male	1485G-P❷N5-M5
		Mini Straight Female Mini Right Angle Male	1485G-P❷W5-N5
		Mini Right Angle Female Mini Straight Male	1485G-P❷M5-Z5
		Mini Right Angle Female Mini Straight Male	1485G-P❷W5-Z5
	Thick Cable	Mini Straight Female Mini Straight Male	1485C-P❸N5-M5
		Mini Straight Female Mini Right Angle Male	1485C-P❸W5-N5
		Mini Right Angle Female Mini Straight Male	1485C-P❸M5-Z5
		Mini Right Angle Female Mini Straight Male	1485C-P❸W5-Z5

❶ See publication M116-CA001A-EN-P for complete cable selection information.

❷ Replace symbol with desired length in meters (Example: 1485G-P1N5-M5 for a 1 m cable). Standard cable lengths: 1 m, 2 m, 3 m, 4 m, 5 m, and 6 m.

❸ Replace symbol with desired length in meters (Example: 1485C-P1N5-M5 for a 1 m cable). Standard cable lengths: 1 m, 2 m, 3 m, 4 m, 5 m, 6 m, 8 m, 10 m, 12 m, 18 m, 24 m, and 30 m

.

NOTE: Stainless steel versions may be ordered by adding an "S" to the cat. no. (Example: 1485CS-P1N5-M5)

Table 10 ArmorPoint Media

Description		Length m (ft)	Cat. No.
	ArmorPoint Bus Extension Cable including Terminating Resistor	1 (3.3)	280A-EXT1
	Extension Cable to connect two ArmorStart Distributed Motor Controllers to ArmorPoint communication protocol	1 (3.3)	280A-EXTCABLE

Table 11 Sensor Media [1]

Description	ArmorStart I/O Connection	Pin Count	Connector	Cat. No.
 DC Micro Patchcord	Input	5-Pin	Straight Female Straight Male	889D-F4ACDM-[2]
			Straight Female Right Angle Male	889D-F4AACDE-[2]
 DC Micro V-Cable	Input	5-pin	Straight Female	879D-F4ACDM-[2]
			Right Angle Male	879D-R4ACM-[2]
DC Micro Y-Cable	Input	5-pin	Straight Female Right Angle Male	879D-F4ACTE-[2]
 AC Micro Patchcord	Output	3-pin	Straight Female Straight Male	889R-F3AERM-[2]
			Straight Female Right Angle Male	899R-F3AERE-[2]

[1] See Publication M116-CA001A-EN-P for complete cable selection information.

[2] Replace symbol with desired length in meters (Example: 889D-F4ACDM-1 for a 1 m cable). Standard cable lengths: 1 m, 2 m, 5 m, and 10 m.

NOTE: Stainless steel versions may be ordered by adding an “S” to the cat. no. (Example: 889DS-F4ACDM-1)

Table 12 Sealing Caps [3]

Description	Used on I/O Connection	Catalog Number
Plastic Sealing Cap (M12)	Input	1485A-M12
Aluminum Sealing Cap	Output	889A-RMCAP

[3] To achieve IP67 rating, sealing caps must be installed on all unused I/O connections.

Bulletin 1738 ArmorPoint Distributed I/O Products

Table 13 Digital I/O Products

	Description	Cat. No.
	24V DC 8 Source Output w/ 8 M12 connectors	1738-OB8EM12
	24V DC 8 Source Output w/ 8 M8 connectors	1738-OB8EM8
	24V DC 4 Source Output w/ 4 M12 connectors	1738-OB4EM12
	24V DC 4 Source Output w/ 4 M8 connectors	1738-OB4EM8
	24V DC 2 Source Output w/ 2 M12 connectors	1738-OB2EM12
	24V DC 2 Source Output - 2 A Prot. w/ 2 M12 connectors	1738-OB2EPM12
	24V DC 4 Sink Output w/ 4 M12 connectors	1738-OV4EM12

Table 14 Digital Input Products

	Description	Cat. No.
	24V DC 8 Sink Input w/ 4 M12 connectors, 2 points per connector	1738-IB8M12
	24V DC 8 Sink Input w/ 8 M8 connectors	1738-IB8M8
	24V DC 8 Sink Input w/ 1 M23 connector	1738-IB8M23
	24V DC 4 Sink Input w/ 4 M12 connectors	1738-IB4M12
	24V DC 4 Sink Input w/ 4 M8 connectors	1738-IB4M8
	24V DC 2 Sink Input w/ 2 M12 connectors	1738-IB2M12
	24V DC 4 Source Input w/ 4 M12 connectors	1738-IV4M12

Table 15 Analog Products

	Description	Cat. No.
	24V DC Analog Current Input w/ 2 M12 connectors	1738-IE2CM12
	24V DC Analog Voltage Input w/ 2 M12 connectors	1738-IE2VM12
	24V DC Analog Current Output w/ 2 M12 connectors	1738-OE2CM12
	24V DC Analog Voltage Output w/ 2 M12 connectors	1738-OE2VM12
	24V DC 2 Thermocouple Input	1738-IT2IM12
	24V DC 2 RTD Input	1738-IR2M12

Table 16 Power Supply Products

	Description	Cat. No.
	POINT I/O Field Potential Distributor Module	1738-FPD
	24V DC Expansion Power Supply	1738-EP24DC

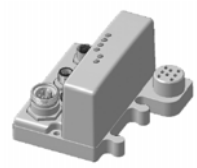
Table 17 AC and Relay Products

Description		Cat. No.
	24V DC Coil N.O. DPST Relay w/ 2 M12 connectors	1738-OW4M12
	24V DC Coil N.O. DPST Relay w/ 2 AC M12 connectors	1738-OW4M12AC4
	120V AC 2 Input w/ 2 AC 4 pin M12 connectors	1738-IA2M12AC4
	120V AC 2 Input w/ 2 AC 3 pin M12 connectors	1738-IA2M12AC3
	120/230V AC 2 Output w/ 2 AC 3 pin M12 connectors	1738-OA2M12AC3

Table 18 Specialty Products

Description		Cat. No.
	ArmorPoint I/O RS-232 ASCII Serial Interface Module	1738-232ASCM12
	ArmorPoint I/O RS-485 ASCII Serial Interface Module	1738-485ASCM12
	24V DC Very High Speed Counter Module	1738-VHSC24M23
	ArmorPoint 5V Encoder/Counter Module	1738-IJM23
	ArmorPoint Synchronous Serial Interface Module with Absolute Encoder	1738-SSIM23

Table 19 Adapter Products

Description		Cat. No.
	ArmorPoint DeviceNet Adapter Module, Drop or Pass-through, with male and female M12 connectors	1738-ADN12
	ArmorPoint DeviceNet Adapter Module, Drop only, with male M18 connector	1738-ADN18
	ArmorPoint DeviceNet Adapter Module, Drop or Pass-through, with male and female M18 connectors	1738-ADN18P
	ArmorPoint DeviceNet 24V DC Adapter Module with subnet expansion	1738-ADNX
	ArmorPoint Redundant ControlNet Adapter Module	1738-ACNR
	ArmorPoint Ethernet/IP 10/100 Mbps Adapter Module	1738-AENT

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe/Middle East/Africa: Rockwell Automation, Vorstlaan/Boulevard du Souverain 36, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

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