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ARMORSTART[®] DISTRIBUTED MOTOR CONTROLLER

Getting Started

BULLETIN 284G



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 DeviceNet[™] Node Commissioning are described here. For detailed information on specific product features or configurations, refer to the ArmorStart user manual, Publication 284G-UM001*.

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. You should understand DeviceNet network operations, including how slave devices operate on a network and communicate with a DeviceNet master. You should also be familiar with RSNetWorx[™] for DeviceNet. **You must use RSNetWorx for DeviceNet revision 3.21 service pack 2 or later.** This software package is referred to often in this manual. Rockwell Automation product EDS files are available on the internet at: <http://www.ab.com/networks/eds>.

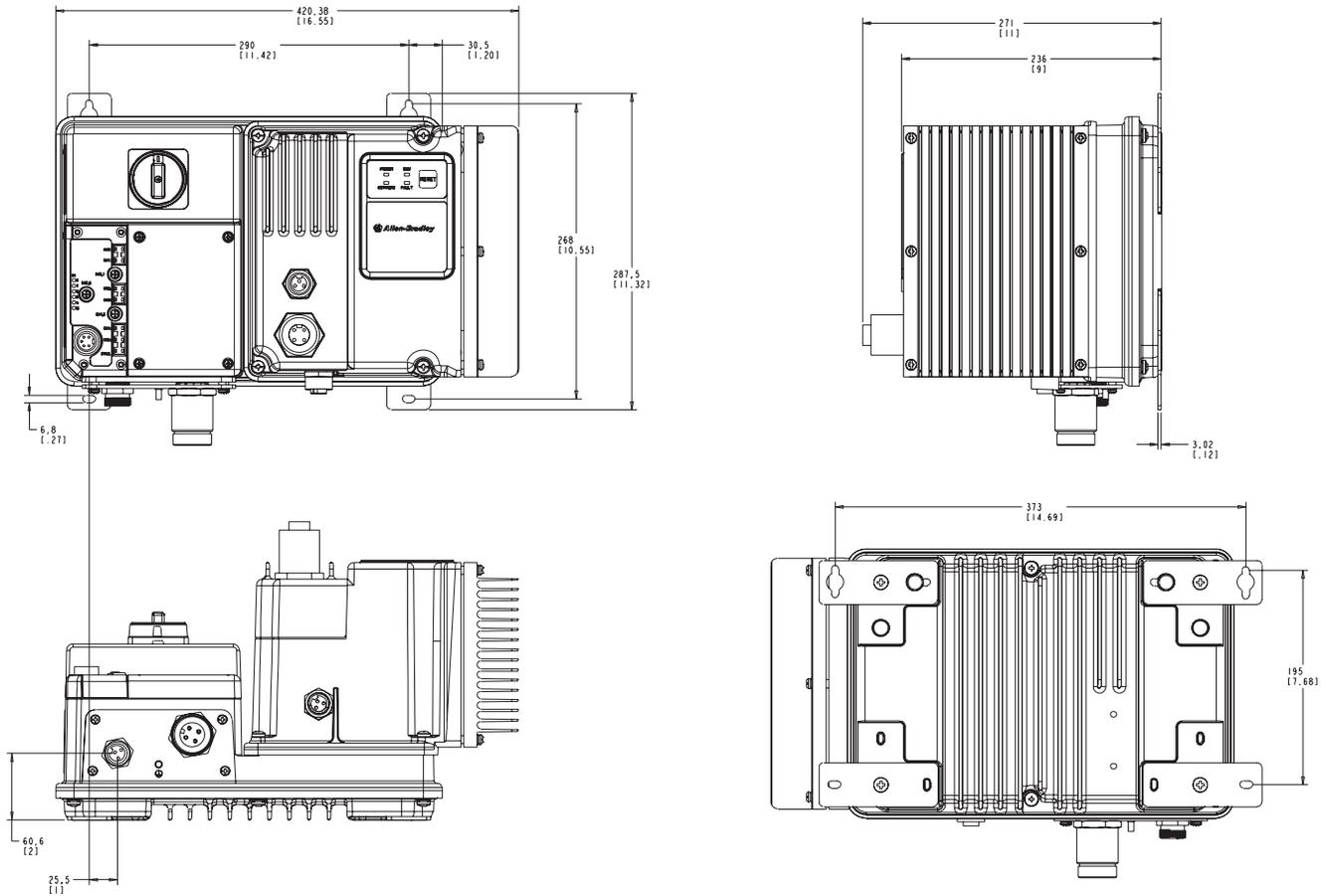
Installation

The ArmorStart Distributed Motor Controller is convection cooled. Operating temperature must be kept between $-20\dots40^{\circ}\text{C}$ ($-4\dots104^{\circ}\text{F}$).

Dimensions

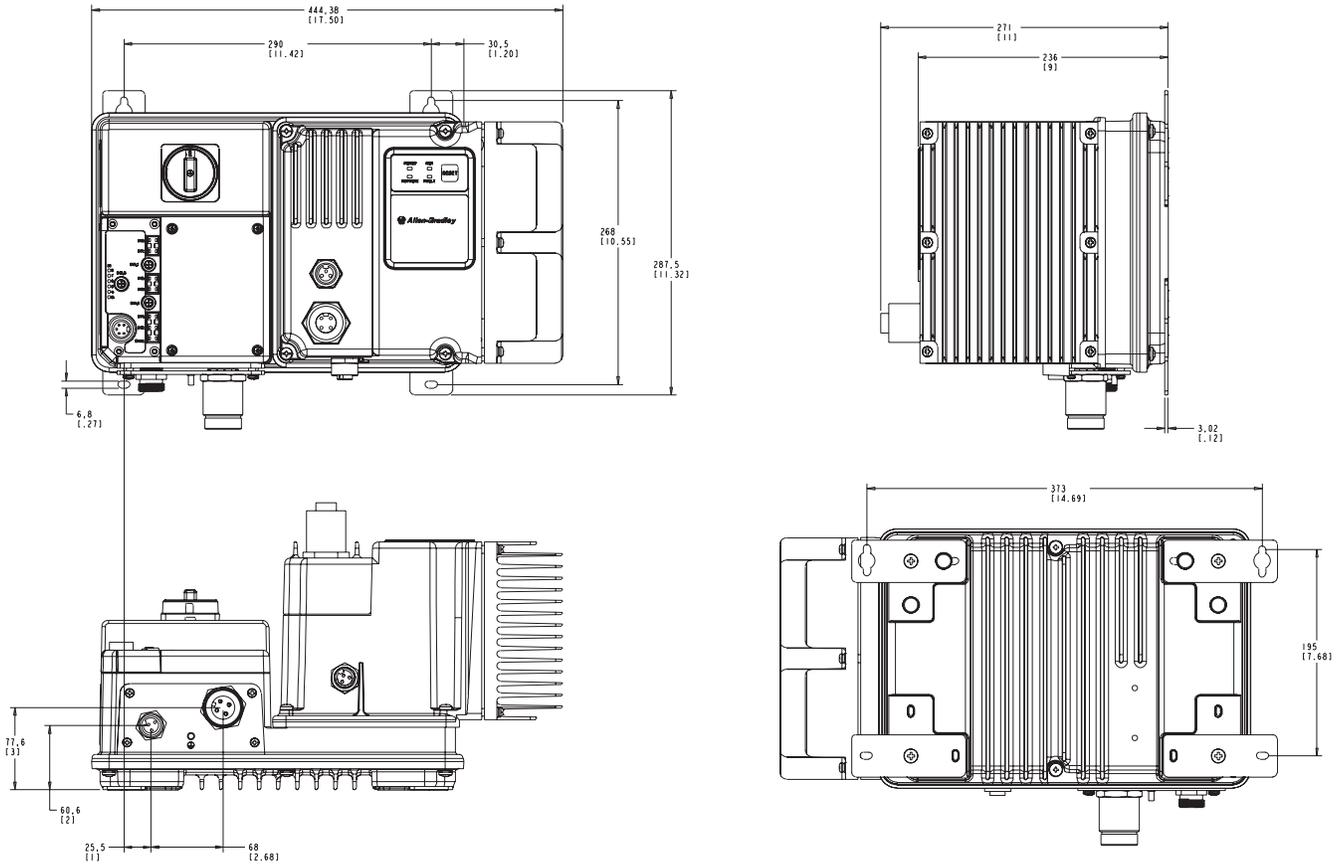
Dimensions are shown in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Figure 1 Dimensions for 2 Hp and below @ 460V AC, IP67/NEMA Type 4



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 3 Hp and above @ 460V AC, IP67/NEMA Type 4



Wiring

Power, Control, and Ground Wiring

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

Table 1 Power, Control, Ground Wire Size, and Torque Specifications

Terminals	Wire Size	Torque	Wire Strip Length
Three-phase Power and Ground	Primary/Secondary Terminal: 1.5...4.0 mm ² (#16 ...#10 AWG)	Primary Terminal: 10.8 lb•in. (1.2 N•m) Secondary Terminal: 4.5 lb•in. (0.5 N•m)	0.35 in. (9 mm)
Control and Power	1.0 mm ² ...4.0 mm ² (#18...#10 AWG)	6.2 lb•in (0.7 N•m)	0.35 in. (9 mm)

Terminal Designations for Conduit Entrance

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

Figure 3 ArmorStart Power, Control, and Ground Terminals

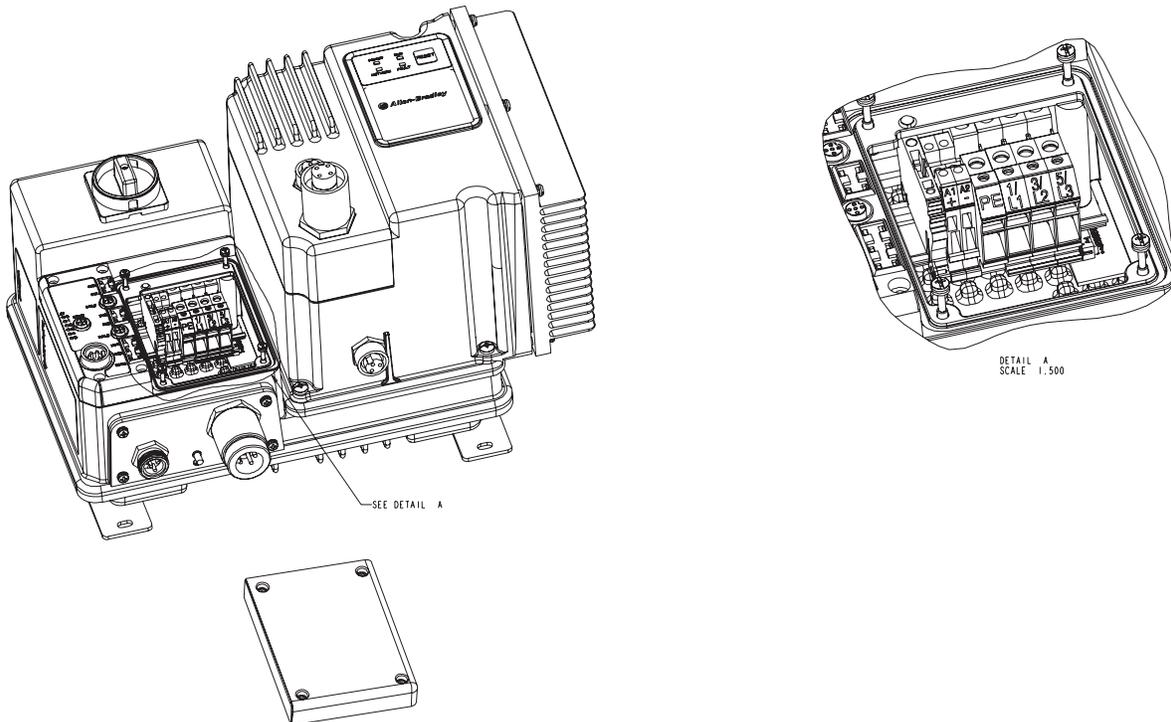


Table 2 Power, Control, Safety Monitor, and Ground Terminal Designations

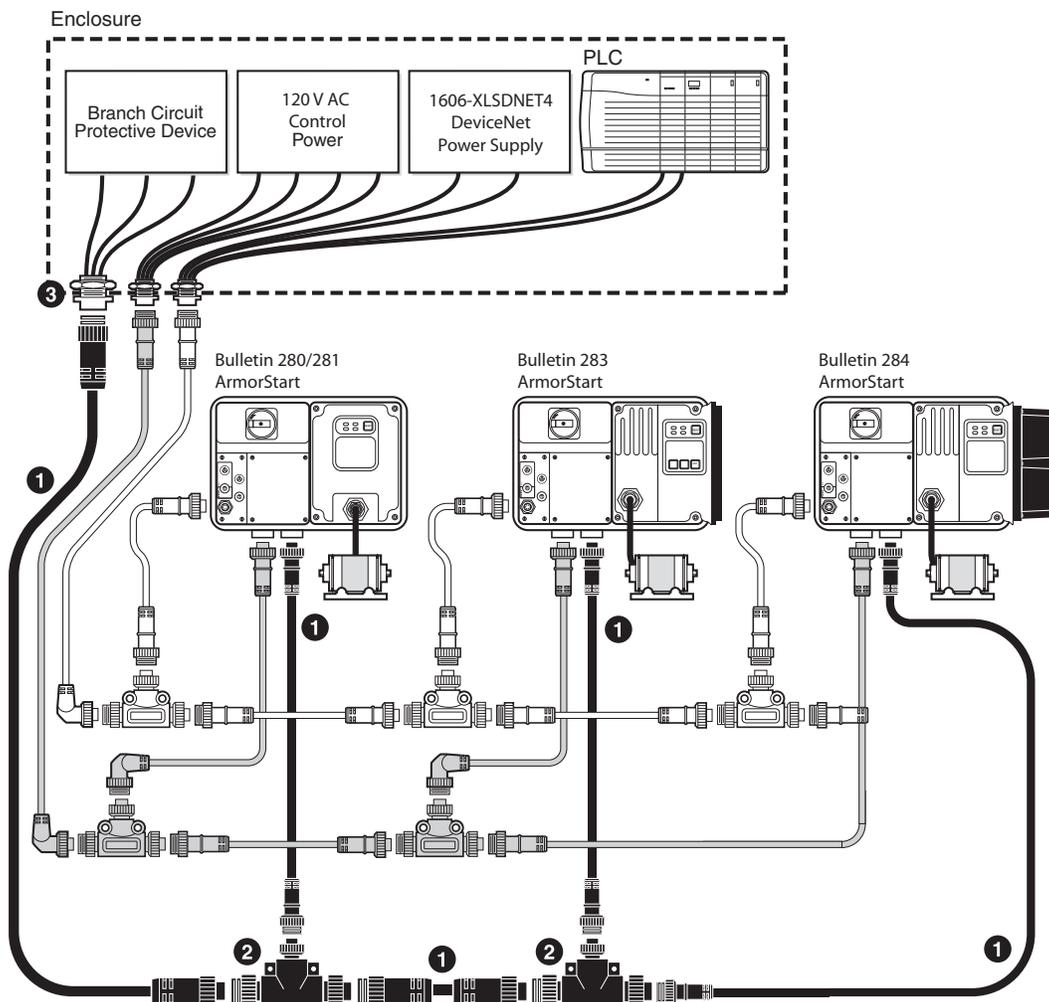
Terminal Designations	No. of Poles	Description
A1 (+)	2	Control Power Input
A2 (-)	2	Control Power Common
PE	2	Ground
1/L1	2	Line Power Phase A
3/L3	2	Line Power Phase B
5/L5	2	Line Power Phase C

ArmorConnect Power Media

Description

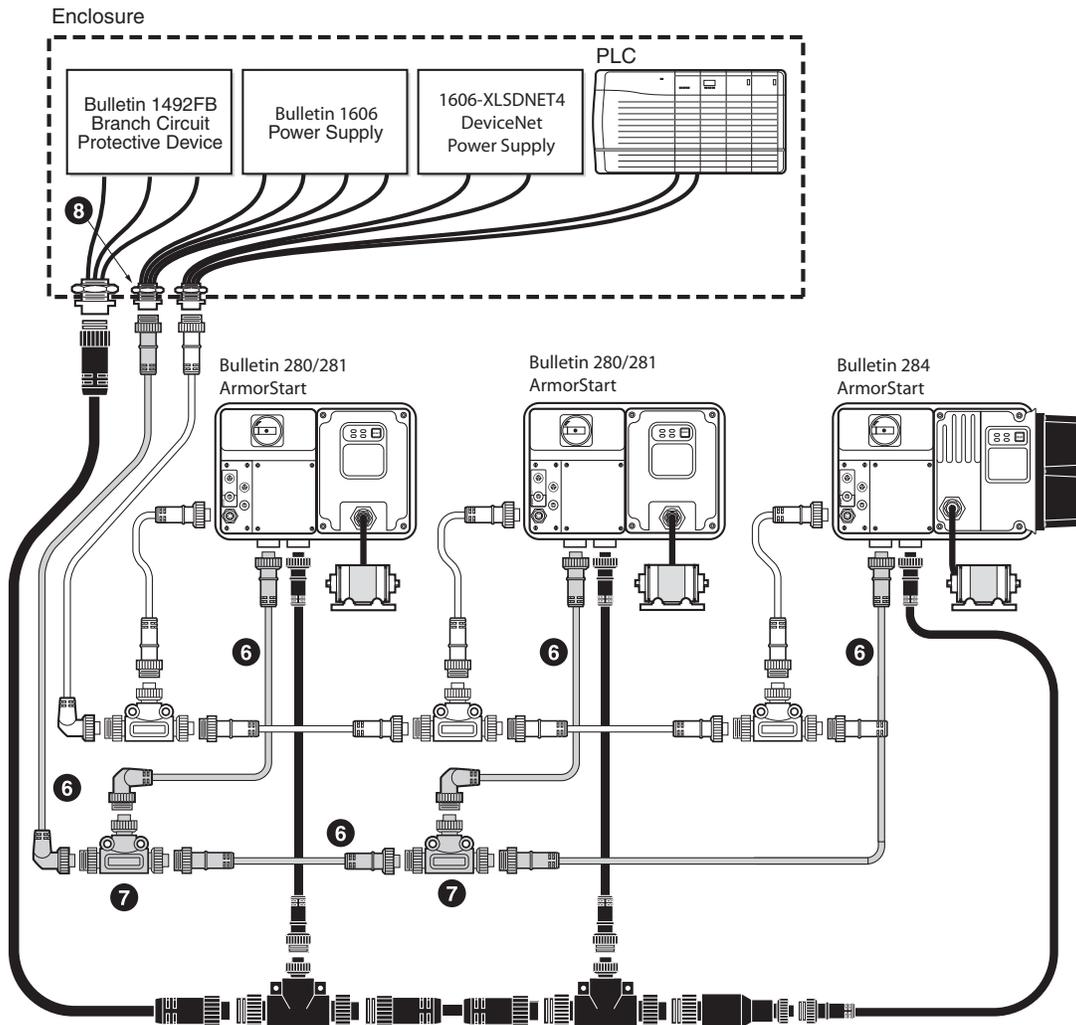
The ArmorStart Power Media offers both three-phase and control power cable system of cordsets, patchcords, receptacles, tees, reducers and accessories to be utilized with the ArmorStart Distributed Motor Controller. These cable system components allow quick connection of ArmorStart Distributed Motor 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 280G/281G and 284G) use only Bulletin 280 ArmorConnect™ power media.

Figure 4 Three-Phase Power System Overview



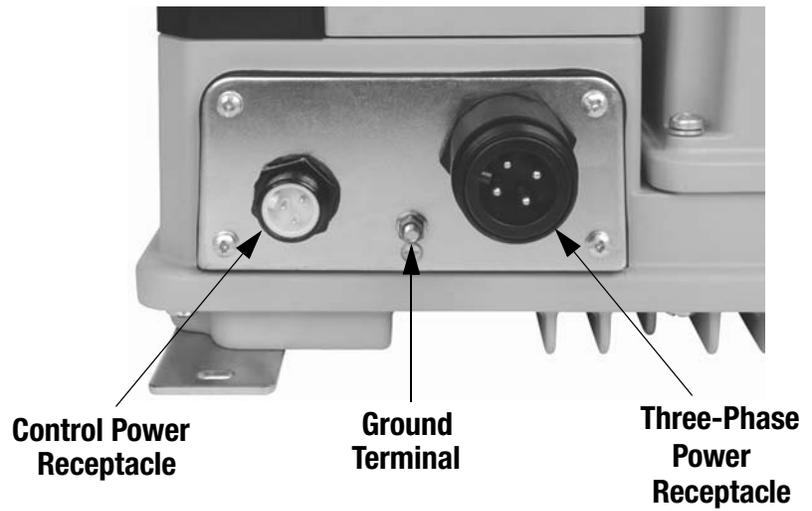
- ❶ Three-Phase Power Trunk- PatchCord cable with integral female or male connector on each end. (Example Part Number: 280-PWR35A-M*)
- ❷ Three-Phase Drop Cable- PatchCord cable with integral female or male connector on each end. (Example Part Number: 280-PWR35A-M*)
- ❸ Three-Phase Power -
Tee connects to a single drop line to trunk with quick change connectors – Part Number: 280-T35
- 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



- ⑥ Control Power Media Patchcords - PatchCord cable with integral female or male connector on each end
Example Part Number: 889N-F3AFNU-*F
- ⑦ Control Power Tees - The control power tee (Part Number: 898N-33PB-N4KF) is used to connect to the ArmorStart Distributed Motor Controller using a control power media patchcord.
- ⑧ Control Power Receptacles - Female receptacles are a panel mount connector with flying leads –
Part Number: 888N-D3AF1-*F

ArmorStart with ArmorConnect Connectivity



Terminal Designations



Terminal Designations	Description	Color Code
A1 (+)	Control Power Input	Black
A2 (-)	Control Power Common	White
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. A 100 A circuit breaker can be used for the motor branch protective device, for the group motor installations when using **only** the following ArmorConnect power media components: 280-M35M-M1, 280-M35F-M1, 280-T35, and 280-PWRM35*-M*. 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.

DeviceNet Network Installation

The ArmorStart Distributed Motor Controller contains the equivalent of 30 in. (0.76 m) of Device Net drop cable's electrical characteristics and therefore 30 in. of drop cable must be included in the DeviceNet drop cable budget for each ArmorStart in addition to actual drop cable required for the installation.

Other DeviceNet System Design Considerations

The separation of the control power and DeviceNet power is recommended as a good design practice. This minimizes the load on the DeviceNet supply, and prevents transients which may be present on the control power system from influencing the communication controls.

Electromagnetic Compatibility (EMC)

The following guidelines are provided for EMC installation compliance.

General Notes

- The motor Cable should be kept as short as possible in order to avoid electromagnetic emission as well as capacitive currents
- Conformity of the drive with CE EMC requirements does not guarantee an entire machine installation complies with CE EMC requirements. Many factors can influence total machine/installation compliance.

- Using an EMI filter with any drive rating, may result in relatively high ground leakage currents. Therefore, the filter must only be used in installations and solidly grounded (bonded) to the building power distribution ground. Grounding must not rely on flexible cables and should not include any form of plug or socket that would permit inadvertent disconnection. Some local codes may require redundant ground connections. The integrity of all connections should be periodically checked.

Grounding

Connect a grounding conductor to the terminal provided as standard on each ArmorStart Distributed Motor Controller. Refer to Table 2 for grounding provision location. There is also an externally available ground terminal. Refer to Figure 9.

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



DeviceNet Node Commissioning

ATTENTION

Three-phase power must be applied to the Bulletin 284G Distributed Motor Controller to gain access to drive parameters.

Establishing a DeviceNet Node Address

The ArmorStart is shipped with a default node address of 63 and Autobaud enabled. Each device on a DeviceNet network must have a unique node address or MAC ID which can be set to a value from 0...63. Keep in mind that most DeviceNet systems use address 0 for the master device (Scanner) and node address 63 should be left vacant for introduction of new slave devices. The ArmorStart offers two methods for node commissioning as shown in the following pages.

Node Commissioning using Software

To set the node address of the ArmorStart using software or other handheld tools, leave the hardware rotary switches in their default position (99) or insure that they are set to something greater than (63). With the hardware switches set, use the software or handheld tool to change the address.

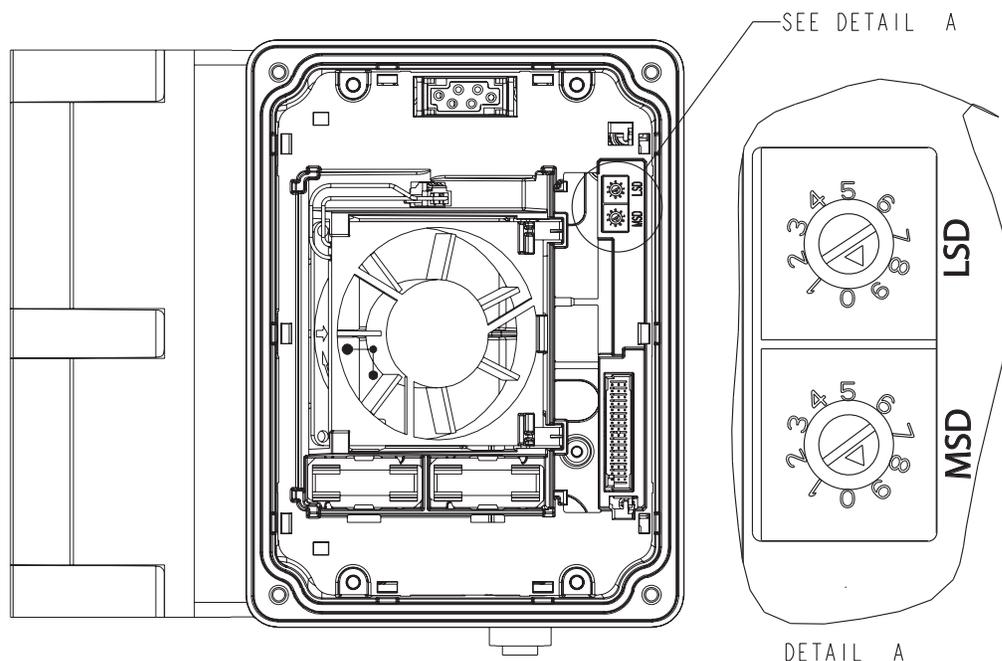
When using software to node commission a device, it may be necessary to have the EDS file stored on the computer. The EDS file defines how the software such as RSNetWorx for DeviceNet will communicate to the ArmorStart. Rockwell Automation product EDS files are available on the internet at: <http://www.ab.com/networks/eds>. **You must use RSNetWorx for DeviceNet Revision 3.21 Service Pack 2 or later.**

Node Commissioning using Hardware

The ArmorStart is shipped with the hardware rotary switches set to a value of (99). If the switches are set to a value of (64) or above, the device will automatically configure itself to the software node address. If the switches are set to a value of (63) or less, the device will be at the node address designated by the switch configuration.

To set an address using the hardware rotary switches, simply set the switches to the desired node address. To access the node address rotary switches, three-phase and control power should be turned off. Then remove the starter module from the base unit. The rotary node address switches are located on the back side of the starter module. Change the switches to the desired node address. Re-install the starter module to the base unit. Reapply power and the device will re-start at the new address.

Figure 7 Rotary Node Address Configuration



System Configuration Information

The following information is provided to identify the default method for setting up communication to the ArmorStart. Additional configuration information and advanced settings help can be found in the ArmorStart User Manual, Publication 284G-UM001*.

Using Automap Feature with Default Input and Output (I/O) Assemblies

The Automap feature available in all Rockwell Automation scanners will automatically map the information as shown below. If manual mapping is required, the information below can be used to map a device based on the default configuration.

Table 3 Default I/O Messaging Data

	Default
Message type	Polled
Consumed data size	4 byte (Rx)
Produced data size	4 bytes (Tx)

Default Input and Output (I/O) Assembly Formats

The I/O assembly formats for the ArmorStart are identified by the value in Parameter 11 (Consumed IO Assy.) and Parameter 12 (Produced IO Assy.). These values determine the amount and arrangement of the information communicated to the master scanner. The tables below identify the default information produced and consumed by Bulletin 284G devices. For additional formats and advance configurations please reference the user manual:

Defaults for Bulletin 284G Distributed Motor Controllers

Table 4 Instance 164 — Default Consumed Inverter Type Distributed Starter (4 bytes)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Not Used	Not Used	Not Used	Jog Rev	Jog Fwd	Fault Reset	Run Rev	Run Fwd
1	Drive In 4	Drive In 3	Drive In 2	Drive In 1	Decel Rate 2 Enable	Decel Rate 1 Enable	Accel Rate 2 Enable	Accel Rate 1 Enable
2	Comm Frequency Command (Low) (xxx.x Hz)							
3	Comm Frequency Command (High) (xxx.x Hz)							

Table 5 Instance 165 — Default Produced Inverter Type Distributed Starter (4 bytes)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	At Reference	140M On	Net Ctl Status	Ready	Running Rev	Running Fwd	Warning	Tripped
1	Reserved	Contactor 1 ❶	Input 5	Input 4	Input 3	Input 2	Input 1	Input 0
2	Output Frequency (Low) (xxx.x Hz)							
3	Output Frequency (High) (xxx.x Hz)							

❶ Refers to control brake contactor status..

Setting the Motor OL Current

The product should now be configured and communicating on the network. The last step is to program the proper motor OL current setting (Parameter 133). This can be accomplished by using software such as RSNetWorx for DeviceNet or a handheld DeviceNet tool.

Use the software to access the device parameters screen. By default the motor OL current is set to the minimum motor OL current setting for the device. Set this parameter to the desired value and download to the device.

Select **Motor OL Current** (Parameter 133) and enter a value that corresponds to the FLA of the motor connected to the ArmorStart. Make sure the **Single** radio button is selected and then select **Download to Device**.

The proper motor protection is now in place.

Figure 8 RSNetWorx Parameter Screen

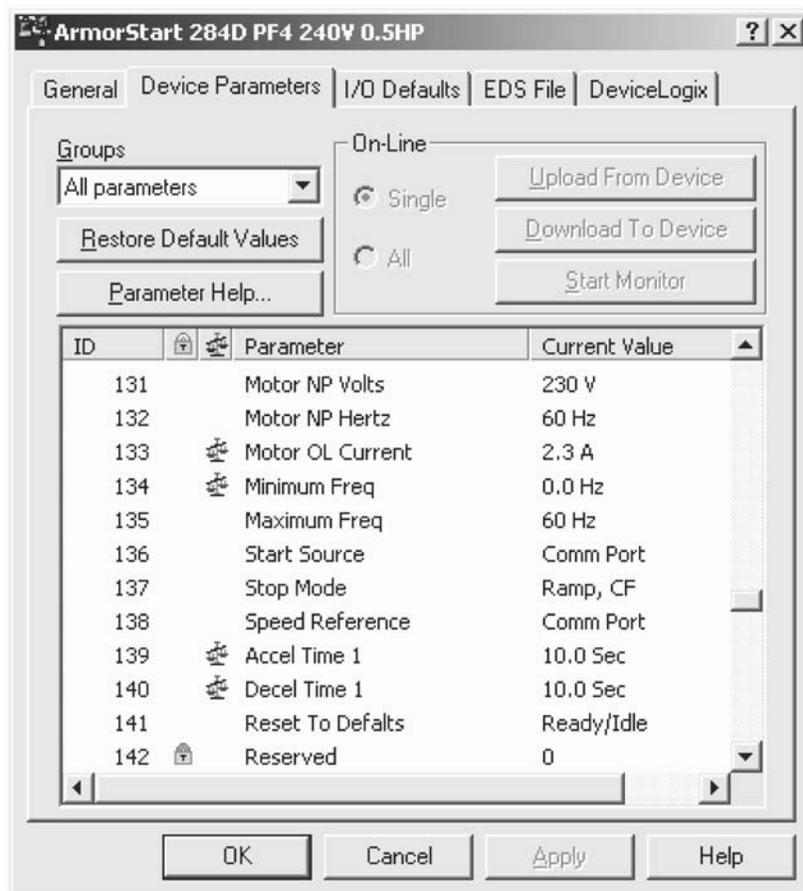


Table 6 Basic Program Group for Sensorless Vector Control

Parameter Number	Parameter Description	Display/Options	Min./Max.	Defaults Settings
131 ❶	Motor NP Volts	1 VAC	20/Drive Rated Volts	Based on Driving Rating
132 ❶	Motor NP Hz	1 Hz	15/400 Hz	60 Hz
133	Motor OL Current	0.1 A	0.0/(Drive Rated Amps x 2)	Based on Driving Rating
134	Minimum Freq.	0.1 Hz	0.0/400 Hz	0.0 Hz
135 ❶	Maximum Freq.	0.1 Hz	0.0/400 Hz	60 Hz
136 ❶	Start Source	0 = Keypad ❷ 1 = 3-Wire ❷ 2 = 2-Wire 3 = 2-W Lvl Sens 4 = 2-W Hi Speed 5 = Comm Port	0/5	5
137	Stop Mode	0 = Ramp, CF 1 = Coast, CF 2 = DC Brake, CF 3 = DCBrkAuto, CF 4 = Ramp 5 = Coast 6 = DC Brake 7 = DC BrakeAuto 8 = Ramp + EM B, CF 9 = Ramp + EM Brk	0/9	9
138	Speed Reference	0 = Drive Pot ❷ 1 = InternalFreq 2 = 0...10V Input ❷ 3 = 4...20 mA Input ❷ 4 = Preset Freq 5 = Comm Port 6 = Stp Logic 7 = Anlg in Mult ❷	0/7	5
139	Accel Time 1	0.1 Secs	0.0/600.0 Secs	10.0 Secs
140	Decel Time 1	0.1 Secs	0.0/600.0 Secs	10.0 Secs
141 ❶	Reset to Default	0 = Ready/Idle 1 = FactoryRset	0/1	0

❶ Stop drive before changing this parameter.

❷ See Important below:

IMPORTANT

These drive parameters options will cause the Bulletin 284G ArmorStart Distributed Motor Controller to become disabled.

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 7 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 DeviceNet 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 8 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 device is operating in a normal condition, is on-line, but with no connection to another device. This is the typical state for new devices.	The device may need to be mapped to a master scanner, placed in a scanlist, or have another device communicate to it.
Flashing Red	Recoverable fault has occurred.	Check to make sure the PLC™ and scanner are operating correctly and that there are no media/cabling issues. Check to see if other networked devices are in a similar state.
Solid Red	The device has detected a major error that has rendered it incapable of communicating on the network (Duplicate MAC ID, Bus-off, media issue).	Troubleshooting should be done to ensure that the network is correct (terminators, lengths, etc.) and there is not a duplicate node problem. If other devices on the network appear to be operating fine and power cycling the device does not work, contact Technical Support.
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 Definitions

Some of the Bulletin 284G ArmorStart Distributed Motor Controller faults are detected by the internal hardware of the ArmorStart, while others are detected by the internal drive. For internal drive faults, the internal hardware of the ArmorStart simply polls the drive for the existence of faults and reports the fault state. No fault latching is done by the internal hardware of the ArmorStart for these faults. The Pr FltReset Mode parameter (Parameter 23) determines the Auto Resetability of only the faults that are detected on the main control board. These faults are listed as “param 23” autoresettable in Table 9. The Auto Resetability of the faults that are detected in the internal drive is controlled by internal drive parameters. These faults are listed as drive controlled in Table 9.

Fault LED Indications for Bulletin 284G ArmorStart

Distributed Motor Controllers **Table 9** **Controller Fault LED Definitions**

Blink Pattern	Fault Definitions		Possible Causes or Remedies
	ArmorStart	Drive Controlled	
1	Short (140M)	—	The circuit breaker has tripped. Try to reset the breaker. If the condition continues check the power wiring. This fault cannot be disabled.
2	—	Overload Fault (Drive Error Codes 7 and 64)	An excessive motor load exists. Reduce load so drive output current does not exceed the current set by Parameter 133 (Motor OL Current) and verify Parameter 184 (Boost Select) setting. Reduce load or extend Accel Time. This fault cannot be disabled.
3	—	Phase Short (Drive Error Codes 41...43)	The ArmorStart has detected a phase short. Excessive current has been detected between two of the output terminals. Check the motor for a shorted condition. Replace starter module if fault cannot be cleared. This fault cannot be disabled.
4	—	Ground Fault (Drive Error Codes 13, 38...40)	A current path to earth has been detected at or more of the drive output terminals or a phase to ground fault has been detected between the drive and motor in this phase. Check the motor for a grounded condition. Replace starter module if fault cannot be cleared. This fault cannot be disabled.
5	—	Motor Stalled (Drive Error Code 6)	Drive is unable to accelerate motor. Increase Parameter 139 and/or 167 (Accel Time x) or reduce load so drive output current does not exceed the current by Parameter 189. This fault cannot be disabled.
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 control voltage fuse, if necessary. This fault can be disabled and <i>is</i> disabled by default.
7	I/O Fault	—	Depending on the types of modules in the configuration this error could be generated by a shorted sensor, shorted input device, wiring mistakes, or a blown output fuse. If this fault occurs, the offending problem should be isolated or removed prior to restarting the system. This fault can be disabled and <i>is</i> disabled by default.
8	—	Heatsink Overtemperature (Drive Error Code 8)	Heatsink temperature exceeds a predefined value. Verify that ambient temperature has not exceeded. This fault cannot be disabled. Replace internal fan.
9	—	Over-Current (Drive Error Codes 12 and 63)	The ArmorStart has detected a voltage imbalance. Check the power system and correct if necessary. This fault cannot be disabled.
10	DNet Power Loss	—	DeviceNet power has been lost or has dropped below the 12V threshold. Check the state of the network power supply and look for DeviceNet media problems. This fault can be disabled and <i>is</i> disabled by default.
11	Internal Comm	—	This fault occurs when communications between the main board the drive is lost. This fault cannot be disabled.
12	—	DC Bus Fault (Drive Error Codes 3, 4, and 5)	DC bus voltage remained below 85% of nominal. DC bus voltage fell below the minimum value. DC bus voltage exceeded maximum value. Monitor the incoming AC line for low voltage or line power interruption. Check input fuses. Monitor the AC line for high line voltage or transient conditions. Bus overvoltage can also be caused by motor regeneration. Extend the decel time or install a starter module with the dynamic brake option. This fault cannot be disabled.
13	—	EEPROM Fault/Internal Comm Flt (Drive Error Codes 81 and 100)	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 starter module may be required. This fault cannot be disabled.
14	—	Hardware Fault (Drive Error Codes 2, 70, and 122)	This fault indicates that a serious hardware problem exists. Check for a base/starter module mismatch. Auxiliary input interlock is open. Failure has been detected in the drive power section. Failure has been detected in the Drive control and I/O section. Cycle power and replace drive if fault cannot be cleared. This fault cannot be disabled.
15	—	Auto Restart Tries (Drive Error Code 33)	Drive unsuccessfully attempted to reset a fault and resume running for the programmed number of Parameter 192 (Auto RstrTries). Correct the cause of the fault. This fault cannot be disabled.
16	—	Miscellaneous Fault	This fault is actually the logical OR of the drive's Auxiliary Input fault (Fault Code 2), Heatsink Overtemperature fault (Fault Code 8), Parameter Defaulted fault (Fault Code 48), and SVC Autotune fault (Fault Code 80). This fault cannot be disabled.

Internal Drive Faults

A fault is a condition that stops the drive. There are two fault types.

Table 10 Internal Drive Fault Types

Type	Description
1	<p>Auto-Reset/Run When this type of fault occurs, and Parameter 192 (Auto Rstrt Tries) Related Parameter(s): 155, 158, 161, 193 is set to a value greater than 0, a user-configurable timer, Parameter 193 (AutoRstrt Delay) Related Parameter(s): 192, begins. When the timer reaches zero, the drive attempts to automatically reset the fault. If the condition that caused the fault is no longer present, the fault will be reset and the drive will be restarted.</p>
2	<p>Non-Resettable This type of fault may require drive or motor repair, or is caused by wiring or programming errors. The cause of the fault must be corrected before the fault can be cleared.</p>

Automatically Clearing Faults (Option/Step)

Clear a Type 1 fault and restart the drive.

1. Set Parameter 192 (Auto Rstrt Tries) to a value other than 0.
2. Set Parameter 193 (Auto Rstrt Delay) to a value other than 0.

Clear an OverVoltage, UnderVoltage or Heatsink OvrTmp fault without restarting the drive.

1. Set 192 [Auto Rstrt Tries] to a value other than 0.
2. Set 193 [Auto Rstrt Delay] to 0.

Auto Restart (Reset/Run)

The Auto Restart feature provides the ability of the drive to automatically perform a fault reset followed by a start attempt without user or application intervention. This allows remote or unattended operation. Only certain faults are allowed to be reset. Certain faults (Type 2) that indicate possible drive component malfunction are not resettable.

Caution should be used when enabling this feature, since the drive will attempt to issue its own start command based on user selected programming.

Table 11 Fault Types, Descriptions, and Actions

No.	Fault	Type ❶	Description	Action
F2	Auxiliary Input	1	Auxiliary input interlock is open.	1. Check remote wiring. 2. Verify communications.
F3	Power Loss	2	DC bus voltage remained below 85% of nominal.	1. Monitor the incoming AC line for low voltage or line power interruption. 2. Check input fuses.
F4	UnderVoltage	1	DC bus voltage fell below the minimum value.	Monitor the incoming AC line for low voltage or line power interruption.
F5	OverVoltage	1	DC bus voltage exceeded maximum value.	Monitor the AC line for high line voltage or transient conditions. Bus overvoltage can also be caused by motor regeneration. Extend the decel time or install dynamic brake option.
F6	Motor Stalled	1	Drive is unable to accelerate motor.	Increase Parameter 139...167 (Accel Time x) or reduce load so drive output current does not exceed the current set by Parameter 189 (Current Limit 1).
F7	Motor Overload	1	Internal electronic overload trip	1. An excessive motor load exists. Reduce load so drive output current does not exceed the current set by Parameter 133 (Motor OL Current). 2. Verify Parameter 184 (Boost Select) setting
F8	Heatsink OvrTmp	1	Heatsink temperature exceeds a predefined value.	1. Check for blocked or dirty heat sink fins. Verify that ambient temperature has not exceeded 40°C. 2. Replace internal fan.
F12	HW OverCurrent	2	The drive output current has exceeded the hardware current limit.	Check programming. Check for excess load, improper programming of Parameter 184 (Boost Select), DC brake volts set too high, or other causes of excess current.
F13	Ground Fault	2	A current path to earth ground has been detected at one or more of the drive output terminals.	Check the motor and external wiring to the drive output terminals for a grounded condition.
F33	Auto Rstrt Tries		Drive unsuccessfully attempted to reset a fault and resume running for the programmed number of Parameter 192 (Auto Rstrt Tries).	Correct the cause of the fault and manually clear.
F38 F39 F40	Phase U to Gnd Phase V to Gnd Phase W to Gnd	2	A phase to ground fault has been detected between the drive and motor in this phase.	1. Check the wiring between the drive and motor. 2. Check motor for grounded phase. 3. Replace starter module if fault cannot be cleared.
F41 F42 F43	Phase UV Short Phase UW Short Phase VW Short	2	Excessive current has been detected between these two output terminals.	1. Check the motor and drive output terminal wiring for a shorted condition. 2. Replace starter module if fault cannot be cleared.

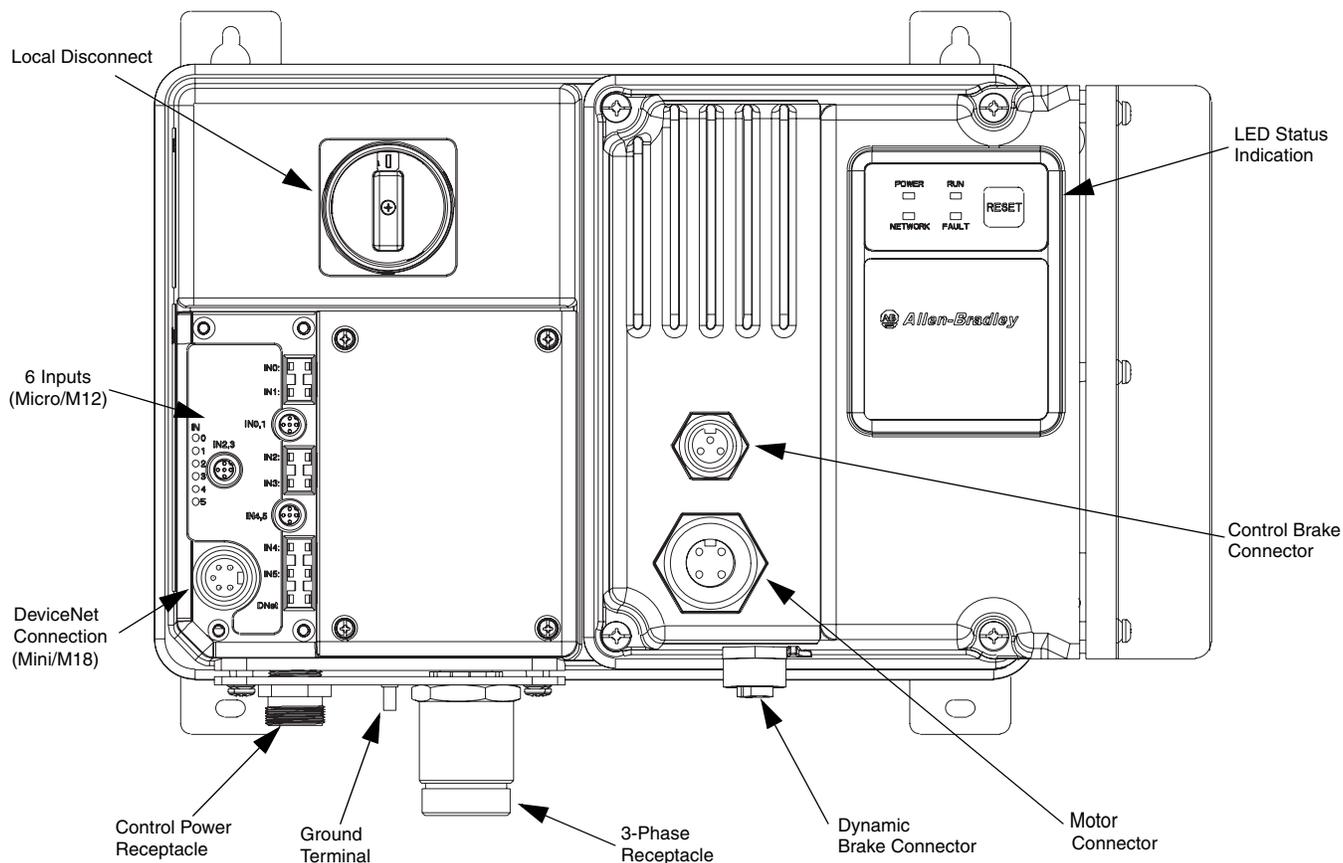
❶ See Table 10 for internal drive fault types.

Table 12 Fault Types, Descriptions, and Actions (Continued)

No.	Fault	Type ❶	Description	Action
F48	Params Defaulted	2	The drive was commanded to write default values to EEPROM.	1. Clear the fault or cycle power to the drive. 2. Program the drive parameters as needed.
F63	SW OverCurrent	2	Programmed Parameter 198 [SW Current Trip] has been exceeded.	Check load requirements and Parameter 198 (SW Current Trip) setting.
F64	Drive Overload	2	Drive rating of 150% for 1 min. or 200% for 3 sec. has been exceeded.	Reduce load or extend Accel Time.
F70	Power Unit	2	Failure has been detected in the drive power section.	1. Cycle power. 2. Replace starter module if fault cannot be cleared.
F80	SVC Autotune		The autotune function was either cancelled by the user or failed.	Restart procedure.
F81	Comm Loss	2	RS485 (DSI) port stopped communicating.	1. Turn off using Parameter 205 (Comm Loss Action). 2. Replace starter module if fault cannot be cleared.
F100	Parameter Checksum	2	The checksum read from the board does not match the checksum calculated.	Set Parameter 141 (Reset To Defaults) to option 1 Reset Defaults .
F122	I/O Board Fail	2	Failure has been detected in the drive control and I/O section.	1. Cycle power. 2. Replace starter module if fault cannot be cleared.

❶ See Table 10 for internal drive fault types.

Figure 9 Bulletin 284G ArmorStart



Accessories

Table 12 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-P ^❷ N5-M5
		Mini Straight Female Mini Right Angle Male	1485G-P ^❷ W5-N5
		Mini Right Angle Female Mini Straight Male	1485G-P ^❷ M5-Z5
		Mini Right Angle Female Mini Straight Male	1485G-P ^❷ W5-Z5
	Thick Cable	Mini Straight Female Mini Straight Male	1485C-P ^❸ N5-M5
		Mini Straight Female Mini Right Angle Male	1485C-P ^❸ W5-N5
		Mini Right Angle Female Mini Straight Male	1485C-P ^❸ M5-Z5
		Mini Right Angle Female Mini Straight Male	1485C-P ^❸ W5-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.

Table 13 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

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.

Table 14 Sealing Caps ^③

Description	Used on I/O Connection	Cat. No.
Plastic Sealing Cap (M12)	Input	1485A-M12

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

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