Power Device Library

Release v3.05

Allen-Bradley

by ROCKWELL AUTOMATION

Reference Manual

Original Instructions

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.

IMPORTANT Identifies information that is critical for successful application and understanding of the product.

These labels may also be on or inside the equipment to provide specific precautions.

SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.

BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

ARC FLASH HAZARD: Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

The following icon may appear in the text of this document.

Identifies information that is useful and can help to make a process easier to do or easier to understand.

Chapter 6

Power Discrete Objects (raC_Dvc_E300, raC_Dvc_AS280E, raC_Dvc_AS281E, raC_Dvc_AS290E, raC_Dvc_AS291E, raC_Dvc_SMC50, raC_Dvc_SMCFlex)

Chapter 7

Power Velocity Objects (raC_Dvc_PFxxx, raC_Dvc_AS2x4E, raC_Dvc_APF35)

Chapter 8

Power Motion Objects (raC_Dvc_Kxxxx, raC_Dvc_PF527, raC_Dvc_PF755CM)

Chapter 9

Kinetix® 5100 Objects (raC_Dvc_K5100)

Chapter 10

PowerMonitor™ Objects (raC_Dvc_PM500, raC_Dvc_PM1000, raC_Dvc_PM5000)

Power State Monitor Extension Objects (raC_Tec_PwrxxxStateMonitor)

Chapter 12

Power Predictive Maintenance Extension Objects (raC_Opr_PF755T_PM, raC_Opr_PF755T_PMv11)

Chapter 13

Predictive Maintenance Object (raC_Opr_Contactor_PM)

Chapter 14

Device Object Libraries Overview

Our Device Object Libraries enable you to easily interface with Rockwell Automation® intelligent devices like drives, motion, network switches, sensors, IO and more. The libraries contain tested, documented, and life-cycle managed objects which can be used with machine builder, process, and packaged libraries or as standalone components. Device objects include HMI faceplates for FactoryTalk® View ME/SE, FactoryTalk® Optix and Studio 5000 View Designer® software and provide a user interface that seamlessly integrates with the products.

HMI faceplates are standard display files that provide a common user interface. These are HMI pop-up screens used to display detailed information related to a specific instruction or device. In systems that follow ISA 101.1 design guidelines, faceplates are often referred to as Level 4 displays.

Pre-configured Device Objects include an Add-On Instruction Rung and an HMI Faceplate providing the following benefits:

- Collect, Process and Deliver Data between Smart Devices and Application Logic
- Detailed Device Data Collection and Delivery
- Enhanced Device Status and Diagnostics
- Common Control Interfaces maximizing Flexible Automation Device Selection & Application Code Reuse

Device Object Use Cases:

- Basic Device Maintenance and Diagnostics
- Virtual Device Operations for Startup and Commissioning
- Operator and Program Control for Velocity Machine and Process Applications

Device Object Libraries may be downloaded from the Product Compatibility and Download Center. Search for “Library”.

Application Code Manager

Studio 5000® Application Code Manager is a tool that can be used with Device Object Libraries to streamline project and machine development. This bulk coding tool allows you to easily design and standardize functionality with reusable application code.

Enable more efficient project development with reusable libraries of code:

- Quickly create and deploy projects through our Application Content Libraries
- Import Rockwell provided application content libraries to expedite system development

- Build your own reusable code that can be managed and deployed across your entire enterprise
- Easily configure objects in bulk with reusable code to increase application development, no additional programming is necessary
- Consolidate content for Studio 5000® Logix Designer, FactoryTalk® View Studio, FactoryTalk® Alarms & Events, FactoryTalk® Historian to configure an object a single time and generate content for each of those software packages.

See the section on Using the Library with Application Code Manager for more details.

Other Application Code Libraries

This Device Object Library may be used in harmony with other Application Code Libraries including other Device Object Libraries (Network, IO, IO-Link, Safety Device Libraries) or Application Libraries (PlantPAx® Process Objects library, Machine Builder Libraries). All libraries are intended to follow similar design philosophies to provide a consistent experience for operators and maintenance staff.

A complete list of Application Code Libraries from Rockwell Automation® follows.

Item	Description
PlantPAx® Process Library	Rockwell Automation® Library of Process Objects provides application templates, Endress + Hauser library objects, Application Code Manager library objects, and tools and utilities for PlantPAx® DCS applications. Includes the following: • Graphics for built-in instructions • HMI images and Help files • Logix diagnostic objects • Process objects • Control strategies • Sequencer objects • PlantPAx® Configuration Tools for Tags, Alarms and Historian • Color Change • Historian -- Asset Framework template and objects
Machine Builder Libraries	Tested, documented and life-cycle managed library objects and faceplates for use with Studio 5000® Application Code Manager for use primarily with OEM and discrete machine applications.
Common Application Libraries	Commonly used application library objects and faceplates for use with Studio 5000® Application Code Manager including basic functions like unit conversion and data collection.
Independent Cart Technology Libraries	ICT Libraries for iTRAK® and MagneMotion® including MagneMover LITE® and QuickStick® for Studio 5000® Application Code Manager
I/O Device Library	Provides objects for Rockwell Automation® 1756, 1769, 1734, 1794, 1738, 1732E, 1719, 5069, 5094 I/O modules including pre-configured status and diagnostic faceplates
IO-Link Device Library	Provides IO-Link master and sensor objects including pre-configured status and diagnostic faceplates
Network Device Library	Provides objects for Stratix® switch and Device Level Ring network objects
Power Device Library	Provides objects for discrete, velocity, motion, and PowerMonitor™ devices
Safety Device Library	Provides safety objects to interface with safety I/O
Condition Monitoring Device Library	Provides Dynamix™ -1444 module and machinery Condition Monitoring applications such as motors and pumps. This includes FactoryTalk View® SE HMI faceplates and Studio 5000® Application Code Manager implementations.
Electrical Protection Device Library	Provides a standard to represent protection devices within your electrical distribution system

Libraries can be accessed from the Product Compatibility and Download Center.

Software and Firmware Upgrades

When you update software or firmware revisions, we recommend that you verify the impact on performance and memory utilization before implementing the upgrade on the production system. For FactoryTalk® View or ControlLogix® platforms, we recommend that you review the release notes and verify the impact of the upgrade on performance and memory utilization.

You can also verify the compatibility of the upgrade with the installed software and operating systems in use on your system. See the Product Compatibility and Download Center.

Rockwell Automation® Services and Support

System Support offers technical assistance that is tailored for control systems. Some of the features include the following:

- Highly experienced team of engineers with training and systems experience
- Use of online remote diagnostic tools
- Access to otherwise restricted TechConnect℠ Knowledgebase content
- 24-hour, 7 days per week, 365 days per year of phone-support coverage upgrade option

For more information, contact your local distributor or Rockwell Automation® representative or see http://www.rockwellautomation.com/support.

You can view or download publications at http://www.rockwellautomation.com/literature. To order paper copies of technical documentation, contact your local Allen-Bradley® distributor or Rockwell Automation® sales representative.

Rockwell Automation® Power Device Library

The Power Device Library is a tested, documented, and life cycle managed object library. The Device Library provides pre-configured status and diagnostic faceplates and AOI sets for Rockwell Automation® discrete, velocity, and motion automation devices. The Power Device Objects may be used with Machine Builder, Process, and Packaged Libraries or as standalone components. Power Device Library add-on instructions objects collect, process, and deliver data between hardware devices and application logic.

The Power Device Library includes Add-On Instructions (AOIs) and HMI Faceplates for Allen-Bradley® Power products including E300™ Electronic Overload Relay, SMC™-50 Soft Starters, ArmorStart®, PowerFlex® Drives, Kinetix® Servo Drives, PowerMonitor™ and Contactor Predictive Maintenance.

This document includes the functional requirements of the Power Discrete, PowerVelocity, PowerMotion, Kinetix5100, and PowerMonitor device objects.

The Power Device Library may be downloaded from the Product Compatibility and Download Center. Search for Power Device Library.

Compatibility

Compatible Software

- Studio 5000 Logix Designer® for PAC Application Development
  - E300, K350/5500/5700/6500, PF527/755CM, PF6000T/7000, PM500/1000/5000 requires v30.01.00 and later
  - AS280E/281E/290E/291E/284E/294E, SMC50, PF525/753/755/755T, requires v31.00.00 and later
  - K5100 requires v32.00.00 or later
  - K5300 requires v33.00.00 or later
- Studio 5000® Application Code Manager and later for bulk code configuration
  - E300, K350/5300/5500/5700/6500, PF525/753/755/755T/527/755CM, PM500/1000/5000, AS280E/281E/290E/291E/284E/294E/SMC50, SMC Flex requires v4.0 or later
  - K5100, PF6000T/7000 requires v4.01 or later
- Studio 5000 View Designer® v5.02 and later for PanelView™ 5000 Application Development
- Studio 5000 View Designer® v8.02 and later for all Velocity Group.
- KNX5100C Software for Kinetix 5100 configuration

- FactoryTalk® View Studio v10 and later for PanelView™ Plus Application Development
- FactoryTalk® Optix 1.4.0 or later

"Feature Preview" must be enabled in settings if any extended tag properties (@.Description) is used.

Compatible Hardware

- PanelView™ 5500 with v5 or later firmware
- PanelView™ Plus with v10 or later firmware
- FactoryTalk® Optix Panel
- ControlLogix® 5570/5580 controller or CompactLogix™ 5370/5380 Controller
  - E300, PM500/1000/5000,PF6000T/7000 requires v30.011 or later firmware
  - AS280E/281E/290E/291E/284E/294E, PF525/753/755/755T/527/755CM, K350/5100/5300/5500/5700/6500/SMC50, SMC Flex requires v31.011 or later firmware
  - K5100 requires v32.00 or later firmware
  - K5300, APF35 requires v33.00 or later firmware
- E300™ Electronic Overload Relay with v5.117 or later firmware
- SMC™-50 Soft Starter with v5.001 or later firmware
- SMC™-Flex Soft Starter with v5.001 or later firmware
- ArmorStart® 280E/281E/284E with v2.003 or later firmware
- ArmorStart® 290E/291E/294E with v1.013 or later firmware
- PowerFlex® 755 drive with v13.002 or later firmware
- PowerFlex® 753 drive with v13.002 or later firmware
- PowerFlex® 523 drive with v5.001 or later firmware and 25-COMM-E2P installed (use with PF525 device object)
- PowerFlex® 525 drive with v5.001 or later firmware
- PowerFlex® 755T drive with v5.002 or later firmware; for PF755T_PM Predictive Maintenance object use v6.xx or v11.xx or later firmware
- Armor PowerFlex® 35E/35S with v1.003 or later firmware
- PowerFlex® 527 drive with v1.08 or later firmware
- PowerFlex® 755CM drive with v13.002 or later firmware
- PowerFlex® 6000T drive with v8.001 or later firmware
- PowerFlex® 7000 drive with v10.002 or later firmware
- Kinetix® 5300 drive with v13.001 or later firmware and Logix controller V33 or later firmware
- Kinetix® 5500 drive with v7.001 or later firmware
- Kinetix® 5700 drive with v7.003 or later firmware
  - For Energy Extension use v11.001 or later firmware
- Kinetix® 6500 drive with v3.001 or later firmware
- Kinetix® 350 drive with v2.002 or later firmware
- Kinetix® 5100 drive with v2.001 or later firmware
- PowerMonitor™ 500 with v5.001 or later firmware
- PowerMonitor™ 1000 with v4.019 or later firmware
- PowerMonitor™ 5000 with v4.010 or later firmware
- 100-E09 … E750 series Contactors

IMPORTANT FactoryTalk View HMI faceplates are not compatibile with FactoryTalk® ViewPoint

Compatible Application Code Libraries

- PlantPAx® Process Objects Library v5.00.00 or later. V5.00.04 recommended if using control strategies.
- Machine Builder Libraries v2.00 or later

Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

Topic	Page
Added new Device AK5700	173
Added FactoryTalk Optix Faceplates for all devices	All
Anomaly Fixes for State Monitor	279
Anomaly Fixes for PF527 Energy object	267
Anomaly Fixes for all Motion devices	173
Anomaly Fixes for Power Monitor 5000	245

Footprint

Each instruction requires memory footprint within the Logix controller. The following characteristics apply:

- **Definition:** Estimated memory required to store the object definition, including all dependents
- **Instance:** Estimated memory required per object instantiated.
- **Execution (L85):** Estimated execution time / scan footprint evaluated in 1756-L85 PAC

Device Object Footprint

Device Object	Defintion (kB)	Instance (kB)	Execution (μs)
raC_Dvc_AS280E	127.000	4.000	110
raC_Dvc_AS281E	127.000	4.000	110
raC_Dvc_AS290E	127.000	4.000	110
raC_Dvc_AS291E	127.000	4.000	110
raC_Dvc_E300	50.784	1.720	95
raC_Opr_E300_Energy	53.748	2.400	95
raC_Dvc_SMC50	46.416	1.512	134
raC_Opr_SMC50_Energy	53.748	2.400	95
raC_Dvc_SMCFlex	49.420	8.800	140
raC_Opr_SMCFlex_Energy	17.400	1.360	40
raC_Tec_PwrDiscreteStateMonitor	0.100	0.140	150
raC_Dvc_APF35	68.160	3.000	62
raC_Dvc_AS284E	173.000	18.000	94
raC_Dvc_AS294E	173.000	18.000	94
raC_Dvc_PF525	78.960	1.496	95
raC_Opr_PF525_Energy	53.748	2.400	95
raC_Dvc_PF753	78.960	1.496	95
raC_Dvc_PF755	78.960	1.496	95
raC_Opr_PF755_Energy	53.748	2.400	95
raC_Dvc_PF755T	78.960	1.496	95

Device Object Footprint

Device Object	Defintion (kB)	Instance (kB)	Execution (µs)
raC_Opr_PF755T_PM	202.884	30.320	69
raC_Opr_PF755T_PMv11	488.044	171.416	118
raC_Dvc_PF6000T	183.00	21.92	102
raC_Dvc_PF7000	95.092	14.484	80
raC_Tec_PwrVeclocityStateMonitor	0.100	0.140	150
raC_Dvc_K350	93.020	1.584	106
raC_Dvc_K5300	93.020	1.584	106
raC_Dvc_K5500	93.020	1.584	106
raC_Opr_K5500_Energy	53.748	2.400	95
raC_Dvc_K5700	93.020	1.584	106
raC_Opr_K5700_Energy	53.748	2.400	95
raC_Dvc_K6500	93.020	1.584	106
raC_Dvc_PF527	93.020	1.584	106
raC_Opr_PF527_Energy	53.748	2.400	95
raC_Dvc_PF755CM	93.020	1.584	106
raC_Tec_PwrMotionStateMonitor	0.100	0.140	150
raC_Dvc_K5100	166.000	3.000	230
raC_Dvc_PM500	43.224	6.169	87
raC_Dvc_PM1000	50.704	1.861	91
raC_Dvc_PM5000	69.080	7.524	95
raC_Opr_Contactor_PM	17.534	2.540	0.042

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
Rockwell Automation Library of Process Objects Reference Manual PROCES-RM200	Describes the Add-On Instructions, PlantPAx instructions, and associated faceplates that are available to develop applications.
PowerFlex Low Voltage Drives Selection Guide PFLEX-SG002	The Allen-Bradley® PowerFlex® family of AC and DC drives provide the benefits that matter most to you. Our focus on delivering a flexible portfolio designed to keep you connected to your operations and ultimately help improve productivity, helps you achieve the positive impact to be successful.
Power Quality and Energy Management Selection Guide 1400-SG001	Which PowerMonitor product suits your application? Are you interested in energy management, power quality management, or both?
Application Code Manager User Manual LOGIX-UM003	Studio 5000® Application Code Manager user manual.
PowerMonitor 500 Unit User Manual, publication 1420-UM001	Provides installation instructions, wiring diagrams, configuration, and specifications for PowerMonitor 500 units
PowerMonitor 1000 Unit User Manual, publication 1408-UM002	Provides installation instructions, wiring diagrams, configuration, and specifications for PowerMonitor 1000 units with catalog numbers 1408-BC3A-485, 1408-BC3A-ENT, 1408-TS3A-485, 1408-TS3A-ENT, 1408-EM3A-485, 1408-EM3A-ENT.
PowerMonitor 5000 Unit User Manual, publication 1426-UM001	Provides installation instructions, wiring diagrams, configuration, and specifications for PowerMonitor 5000 units.
PowerFlex 523 and 525 AC Drives Technical Data, publication 520-TD001	Provides full product selection, accessories, dimensions, and specifications.
PowerFlex 527 AC Drives Technical Data, publication 520-TD002	Provides full product selection, accessories, dimensions, and specifications.
PowerFlex 753 AC Drive Technical Data, publication 750-TD001P	Provides full product selection, accessories, dimensions, and specifications.
PowerFlex 755TL/TR/TM AC Drive Technical Data, publication 750-TD100	Provides full product selection, accessories, dimensions, and specifications.
PowerFlex 755TS AC Drive Technical Data, publication 750-TD104	Provides full product selection, accessories, dimensions, and specifications.
PowerFlex 6000T AC Drives User Manual 6000-um001	This manual describes PowerFlex® 6000T AC drives with EtherNet/IP®. It includes information on installation, configuration, programming, and use.
PowerFlex 7000 AC Drives Technical Data, publication 7000-td002	Provides full product selection, accessories, dimensions, and specifications.
EtherNet/IP Network Devices User Manual, publication ENET-UM006	Describes how to configure and use EtherNet/IP devices to communicate on the EtherNet/IP network.

Resource	Description
Kinetix Motion Control Selection Guide KNX-SG001	Use this publication to help make decisions selecting the motion control products that are best suited for your system requirements.
Kinetix 5700, 5500, 5300, 5100 Servo Drives Specifications, publication KNX-TD003	Provides product specifications for Kinetix Integrated Motion over the EtherNet/IP network and EtherNet/IP networking servo drive families.
Kinetix 5700 Drive Systems Design Guide, publication KNX-RM010	Provides system design guide to determine and select the required (drive specific) drive module, power accessory, connector kit, motor cable, and interface cable catalog numbers for your drive and motor/ actuator motion control system. Included are system performance specifications and torque/speed curves (rotary motion) and force/velocity curves (linear motion) for your motion application.
Kinetix 5500 Drive Systems Design Guide, publication KNX-RM009	
Kinetix 5300 Drive Systems Design Guide, publication KNX-RM012	
Kinetix 5100 Drive Systems Design Guide, publication KNX-RM011	
Kinetix 6000 and Kinetix 6200/6500 Drive Systems Design Guide, publication KNX-RM003	
E300 Electronic Overload Relay User Manual 193-UM015	This manual describes how to install, configure, operate, and troubleshoot the E300™ Electronic Overload Relay.
SMC-50 Soft Starters User Manual 150-UM011	This user manual provides you with the information that is required to program and operate your SMC-50™ soft starter.
SMC-Flex Soft Starters User Manual 150-UM008	This user manual provides you with the information that is required to program and operate your SMC-Flex™ soft starter.
ArmorStart Distributed Motor Controller with EtherNet/IP User Manual 280E-UM001	This manual provides you with information that is required to program and operate ArmorStart® EtherNet/Industrial Protocol (IP) Distributed Motor Controllers, Bulletin 280E, 281E, and 284E.
ArmorStart® LT Distributed Motor Controller User Manual 290E-UM001	This manual provides you with information that is required to program and operate ArmorStart® LT Discributed Motor Controllers Bulletin 290E, 291E, and 294E.
Armor PowerFlex AC Drives User Manual 35-UM001	This manual describes Armor™ PowerFlex® AC drives with EtherNet/IP® and Armor PowerFlex drives with Integrated Safety via EtherNet/IP. It includes information on installation, configuration, programming, and use.

Library Components

The Power Device Library is a tested, documented, and life cycle managed object library. The Device Library provides pre-configured status and diagnostic faceplates and AOI sets for Rockwell Automation® discrete, velocity, and motion automation devices. The Power Device Objects may be used with Machine Builder, Process, and Packaged Libraries or as standalone components. Power Device Library add-on instructions objects collect, process, and deliver data between hardware devices and application logic.

Power Device Instructions

The Power Device Library includes instructions to interface with power control devices such as drives, starters, and power monitors. The instructions are categorized into groups:

- Power Discrete: For use with single-speed starters
- Power Velocity: For use with variable speed drives
- Power Motion: For use with CIP motion drives
- Kinetix5100: For use with Kinetix® 5100 drive
- Power Monitor: For use with Power Monitors

In addition to the base device objects, there are optional extension objects. These extension objects may be added to the base objects to expand functionality and information. The following extension objects are provided:

- Energy Extension: Energy monitoring of real, reactive and apparent energy information, power factor, and voltage/current/frequency data.
- State Monitor Extension: Device activation/run status and network connection counters and accumulators
- Predictive Maintenance Extension (PF755T): Monitoring and configuration of predictive maintenance parameters related to drive components such as IGBTs, fans, capacitors, filters, and temperatures.

There are three types of instructions:

- Device (Dvc): instruction used for devices. The device can be logical (e.g. conveyor) or physical (e.g. PowerFlex® Drive).
- Operation (Opr): instructions used for operation or applied code such as sequencing, operational execution, and general application functions.
- Technology (Tec): Technology objects perform specific algorithms or calculations

Power Device Instructions

Instruction	Version	Category	Instruction Description
raC_Dvc_AS280E	3.03	Power Discrete	ArmorStart® 280E
raC_Dvc_AS281E	3.03	Power Discrete	ArmorStart® 281E
raC_Dvc_AS290E	3.03	Power Discrete	ArmorStart® 290E
raC_Dvc_AS291E	3.03	Power Discrete	ArmorStart® 291E
raC_Dvc_E300	3.03	Power Discrete	E300™ Electronic Overload Relay
raC_Opr_E300_Energy	3.03	Power Discrete	E300™ Electronic Overload Relay Energy Monitor Extension
raC_Dvc_SMC50	3.03	Power Discrete	SMC™-50 Soft Starter
raC_Opr_SMC50_Energy	3.03	Power Discrete	SMC™-50 Soft Starter Energy Monitor Extension
raC_Dvc_SMCFlex	3.04	Power Discrete	SMC™-Flex Soft Starter
raC_Opr_SMCFlex_Energy	3.04	Power Discrete	SMC™-Flex Soft Starter Energy Monitor Extension
raC_Tec_PwrDiscreteStateMonitor	3.03	Power Discrete	Power Discrete State Monitor Extension (all devices)
raC_Dvc_APF35	3.03	Power Velocity	Armor PowerFlex® 35
raC_Dvc_AS284E	3.03	Power Velocity	ArmorStart® 284E
raC_Dvc_AS294E	3.03	Power Velocity	ArmorStart® 294E
raC_Dvc_PF525	3.03	Power Velocity	PowerFlex® 525
raC_Opr_PF525_Energy	3.03	Power Velocity	PowerFlex® 525 Energy Monitor Extension
raC_Dvc_PF753	3.03	Power Velocity	PowerFlex® 753
raC_Dvc_PF755	3.03	Power Velocity	PowerFlex® 755
raC_Opr_PF755_Energy	3.03	Power Velocity	PowerFlex® 755 Energy Monitor Extension
raC_Dvc_PF755T	3.03	Power Velocity	PowerFlex® 755T
raC_Dvc_PF6000T	3.03	Power Velocity	PowerFlex® 6000T
raC_Dvc_PF7000	3.03	Power Velocity	PowerFlex® 7000
raC_Tec_PwrVeclocityStateMonitor	3.03	Power Velocity	Power Velocity State Monitor Extension (all devices)
raC_Opr_PF755T_PM	3.03	Power Velocity	PowerFlex® 755T Predictive Maintenance Extension for device firmware v6.xx
raC_Opr_PF755T_PMv11	3.03	Power Velocity	PowerFlex® 755T Predictive Maintenance Extension for device firmware v11.001+
raC_Opr_Contactor_PM	3.04	-	Contactor Predictive Maintenance
raC_Dvc_K350	3.03	Power Motion	Kinetix® 350
raC_Dvc_K5300	3.03	Power Motion	Kinetix® 5300
raC_Dvc_K5500	3.03	Power Motion	Kinetix® 5500
raC_Opr_K5500_Energy	3.03	Power Motion	Kinetix® 5500 Energy Monitor Extension
raC_Dvc_K5700	3.03	Power Motion	Kinetix® 5700
raC_Opr_K5700_Energy	3.03	Power Motion	Kinetix® 5700 Energy Monitor Extension
raC_Dvc_K6500	3.03	Power Motion	Kinetix® 6500
raC_Dvc_PF527	3.03	Power Motion	PowerFlex® 527
raC_Opr_PF527_Energy	3.03	Power Motion	PowerFlex® 527 Energy Monitor Extension
raC_Dvc_PF755CM	3.03	Power Motion	PowerFlex® 755CM (CIP Motion)
raC_Tec_PwrMotionStateMonitor	3.03	Power Motion	Power Motion State Monitor Extension (all devices)
raC_Dvc_K5100	3.03	Kinetix® 5100	Kinetix® 5100
raC_Opr_K5100_MAFR	3.03	Kinetix® 5100	Kinetix® 5100 Motion Axis Fault Reset
raC_Opr_K5100_MAG	3.03	Kinetix® 5100	Kinetix® 5100 Motion Axis Gear
raC_Opr_K5100_MAH	3.03	Kinetix® 5100	Kinetix® 5100 Motion Axis Home
raC_Opr_K5100_MAI	3.03	Kinetix® 5100	Kinetix® 5100 Motion Axis Index
raC_Opr_K5100_MAJ	3.03	Kinetix® 5100	Kinetix® 5100 Motion Axis Jog
raC_Opr_K5100_MAM	3.03	Kinetix® 5100	Kinetix® 5100 Motion Axis Move
raC_Opr_K5100_MAS	3.03	Kinetix® 5100	Kinetix® 5100 Motion Axis Stop
raC_Opr_K5100_MAT	3.03	Kinetix® 5100	Kinetix® 5100 Motion Axis Torque
raC_Opr_K5100_MSF	3.03	Kinetix® 5100	Kinetix® 5100 Motion Servo Off
raC_Opr_K5100_MSO	3.03	Kinetix® 5100	Kinetix® 5100 Motion Servo On

Power Device Instructions

Instruction	Version	Category	Instruction Description
raC_Dvc_PM500	3.03	Power Monitor	PowerMonitor™ 500
raC_Dvc_PM1000	3.03	Power Monitor	PowerMonitor™ 1000
raC_Dvc_PM5000	3.03	Power Monitor	PowerMonitor™ 5000

Library Folders and Files

When you extract the library from the downloaded .zip folder, you will find the following folder and file structure. Note that some items are generalized with *GROUP* (e.g. PowerDiscrete, PowerMotion, etc), *TYPE* (e.g. Dvc, Opr, Tec) and *OBJECT* (e.g. PF755, E300, etc). The major and minor versions are represented by X and Y respectively.

Level 1	Level 2	Level 3	File Type	Description
Application Example			**Folder**	**Application Example Files**
	PowerApplication_ACM.xlsx		XLSX	Application Code Manager Project
	Project_PowerApplication.ACD		ACD	Logix Designer Example Project
	PowerApplication_SE.apa		APA	FT View SE Project Archive
	PowerApplication_ME.apa		APA	FT View ME Project Archive
	PowerApplication_VD.vpd		VPD	View Designer Project File
	Power_Application.optix.z		Z	FT Optix Project File
ApplicationCodeManagerLibraries			**Folder**	**Application Code Manager files**
	Attachments (.HZ1 and .txt files)		Folder	ACM Object Attachments
	(RA-LIB)_Device_Asset-Control_*GROUP*_raC_Dvc_*OBJECT*_(X.Y).HSL4		HSL4	ACM Asset-Control Object
	(RA-LIB)_Device_Device_*GROUP*_raC_Dvc_*OBJECT*_(X.Y).HSL4		HSL4	ACM Device Object
HMI - FactoryTalk View ME			**Folder**	**FactoryTalk® View ME files**
	Displays - gfx		Folder	FT View ME display files
		(raC-X_YY-ME) raC_*TYPE_OBJECT*-faceplate.gfx	GFX	Object Faceplate display
	Global Objects - ggfx		Folder	FT View ME Global Object files
		(raC-X-ME) Graphic Symbols - LIBRARY.ggfx	GGFX	Graphic Symbol/Launch Button global objects
		(raC-X-ME) Toolbox - LIBRARY.ggfx	GGFX	Toolbox global objects
HMI - FactoryTalk View SE			**Folder**	**FactoryTalk® View SE Files**
	Displays - gfx		Folder	FT View SE display files
		(raC-X_YY-SE) raC_*TYPE_OBJECT*-faceplate.gfx	GFX	Object Faceplate display
	Global Objects - ggfx		Folder	FT View SE Global Object files
		(raC-X-SE) Graphic Symbols - LIBRARY.ggfx	GGFX	Graphic Symbol/Launch Button global objects
		(raC-X-SE) Toolbox - LIBRARY.ggfx	GGFX	Toolbox global objects
HMI - ViewDesigner - vpd			**Folder**	**Studio 5000 View Designer® Files**
	(raC-3_05-VD) raC_*Dvc_PowerDiscrete*.vpd		VPD	Object faceplate and graphic symbol/launch buttons
	(raC-3_03-VD) raC_*Dvc_PowerVelocity*.vpd		VPD	Object faceplate and graphic symbol/launch buttons
	(raC-3_03-VD) raC_*Dvc_PowerMotion*.vpd		VPD	Object faceplate and graphic symbol/launch buttons
	(raC-3_04-VD) raC_*Dvc_PowerMonitor*.vpd		VPD	Object faceplate and graphic symbol/launch buttons
	(raC-3_04-VD) raC_Opr_Contactor_PM.vpd		VPD	Object faceplate and graphic symbol/launch buttons

FactoryTalkOptixLibraries			**Folder**	**FactoryTalk® Optix Library Files**
	PowerDevice_vXR		Folder	Library Folder
		PowerDevice_vXR.optix		FT Optix Library Application
HMI FactoryTalk View Images - png			**Folder**	**FT View ME/SE image files**
	images.png		PNG	FTView ME/SE images
Reference Manuals			**Folder**	**Manuals**
	DEVICE-RM100x-EN-P.pdf		PDF	Reference manual
Studio 5000 Logix Designer Files - L5X			**Folder**	**Studio 5000® AOI and RUNG import files**
	5x80v33 Files - Use with PlantPAx		Folder	L5X files used with PlantPAx® 5.x systems of 5x80 controllers v33+ firmware
		raC_*TYPE_OBJECT*_X.YY_RUNG.L5X	L5X	Object rung import
		raC_*TYPE_OBJECT*_X.YY_AOI.L5X	L5X	Object AOI import
	Standard Files		Folder	L5X files used for applications that are not PlantPAx® 5.x+
		raC_*TYPE_OBJECT*_X.YY_RUNG.L5X	L5X	Object rung import
		raC_*TYPE_OBJECT*_X.YY_AOI.L5X	L5X	Object AOI import
	ReadMe.txt		TXT	Explanation of standard vs PlantPAx® files
Videos			**Folder**	**How-to and Operational Overview Videos**
	How_To_Import_and_Configure_*TYPE*_Objects_in_FTViewME.mp4		MP4	How-to Video
	How_To_Import_and_Configure_*TYPE*_Objects_in_FTViewSE.mp4		MP4	How-to Video
	How_To_Import_and_Configure_*TYPE*_Objects_in_LogixDesigner.mp4		MP4	How-to Video
	How_To_Configure_*TYPE*_Objects_in_ViewDesigner.mp4		MP4	How-to Video
	How_To_Interface_with_Power_Device_Logix.mp4		MP4	How-to Video
	How to Import and Configure Device Objects in FTOptix		MP4	How-to Video
	Operational_Overview_of_*OBJECT*_Faceplate.mp4		MP4	Operational Overview video
LIBRARYDeviceLibrary_ReleaseNotes_vX.YY.pdf			PDF	Release Notes
ReadMe.txt			TXT	Explanation of setup.cmd
SetUp.cmd			CMD	Application Code Manager and FTOptix setup script to register library

See the files in the *Application Example* folder to see a functional application that uses all of the Power Device Library instructions. These files are referenced in the Programming Examples for each instruction. The files include a Studio 5000 Logix Designer® controller file, a Studio 5000® Application Code Manager project back-up, and an HMI projects for Studio 5000 View Designer®, FactoryTalk® View ME, FactoryTalk® View SE, and FactoryTalk® Optix.

Visualization Files

Each Add-On Instruction has associated visualization files that provide a common user interface. The Power Device Library supports four HMI options each with their own files supplied:

- FactoryTalk® View ME (Machine Edition)
- FactoryTalk® View SE (Site Edition)
- Studio 5000 View Designer®
- FactoryTalk® Optix

FactoryTalk® View Visualization Files

You must import these files in the following order:

- Images (.png files)
- Global Objects(.ggfx file type)
- HMI faceplates (.gfx file type)

File Type Abbreviations	FactoryTalk® View SE	FactoryTalk® View ME	Description
Images (.png)	All .png files in the *HMI FactoryTalk® View Images - png* folder. **IMPORTANT:** FactoryTalk® View application renames PNG files when they are imported with a .bmp file extension, but the files retain a .png format.		Common icons that are used in the Global Objects and standard displays for all objects.
Global objects (.ggfx)	(raC-3-SE) Graphic Symbols - Power Device.ggfx	(raC-3-ME) Graphic Symbols - Power Device.ggfx	Graphic symbols or launch buttons used to open faceplate displays from other displays.
	(raC-3-SE) Toolbox - Power Device.ggfx	(raC-3-ME) Toolbox - Power Device.ggfx	Common objects used across multiple device faceplates.
Standard displays (.gfx)	(raC-3_03-SE) precedes name of the display.	(raC-3_03-ME) precedes name of the display.	e.g. (raC-3_03-SE) raC_Dvc_PF755-Faceplate.gfx

Global object files contain Graphic Symbols that are created once and referenced multiple times on multiple displays in an application. When changes are made to a global object, all instances in the application are automatically updated.

Global objects serve two purposes:

- Toolbox files contain common elements that are used to build faceplate displays.
- Graphic Symbols files contain device symbols or launch buttons that you can use to build your application displays. Select the symbol to open the corresponding faceplate display.

Standard display files, commonly called faceplates, provide a common user interface.

Studio 5000 View Designer® Visualization Files

Studio 5000 View Designer® project files are supplied that contain faceplates and launch buttons for the Power Device Library. The devices are distributed over multiple Studio 5000 View Designer® Project files grouped by category for PowerDiscrete, PowerVelocity, PowerMotion, and PowerMonitor devices. These files are found in the *HMI - ViewDesigner - vpd* folder. Inside of the VPD file you will find a the required display files inside of the *User-Defined Screens* folder.

Display Type	View Designer Screen	Description
Screen	Toolbox	Graphic symbols or launch buttons used to open faceplate/pop-up displays from other displays.
Pop-Up	raC_Dvc_ precedes name of the pop-up.	Faceplate display for specific device. e.g. raC_Dvc_PF755_FP

FactoryTalk® Optix Library Objects Visualization Files

Once the library files have been added to the standard library location (C:\Users\Username\Documents\Rockwell Automation\FactoryTalk Optix\Libraries\) using the Setup.cmd script, the following library objects will be available in the PowerDevice_v3R Library:

Note: *xx* may be replaced with the current minor version.

Library Object	Description
raC_3_xx_raC_Dvc_DeviceName_UI	Power Device faceplate user interface components and graphic symbols

raC_3_xx_raC_Dvc_DeviceName_UI

The User Interface (UI) library object folder contains all graphical components for raC_Dvc_DeviceName_UI. This includes:

Level 1	Level 2	Level 3	Type	Description
raC_3_xx_raC_Dvc_DeviceName_UI			Folder	User interface files
	raC_1_xx_raC_Dvc_DeviceName_Faceplate		Dialog Box	Faceplate for Safety Device
	Graphic Symbols		Folder	Graphic symbol launch buttons
		raC_3_xx_raC_Dvc_DeviceName_GS	Button	Graphic symbol launch button used to navigate to raC_3_xx_raC_Dvc_DeviceName_Faceplate.
	<PrivateElements>		Folder	Private elements used in faceplate design. These do not need to be accessed or modified by library users.
		PanelsFaceplate	Folder	Panels used in faceplates
		Widgets	Folder	Widgets used in faceplates

Basic Faceplate Attributes

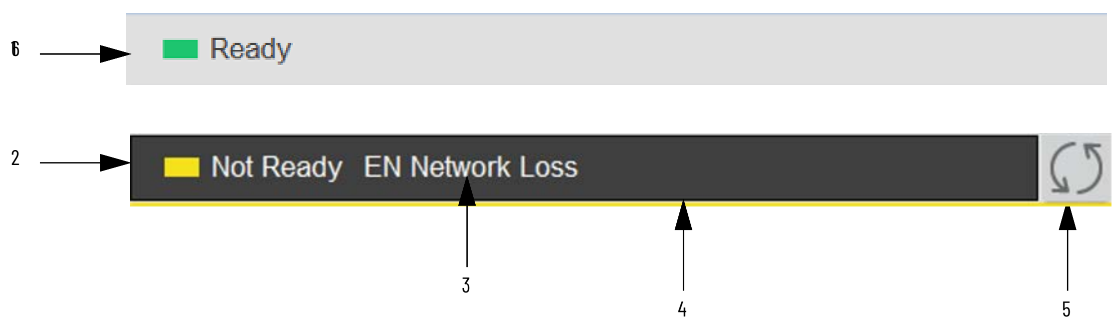
Faceplates consist of tabs, and each tab consists of one or more pages. The Home tab is displayed when the faceplate is initially opened. The faceplate provides the means for operators, maintenance personnel, engineers, and others to interact with a device or instruction instance, which includes a view of its status and values. Faceplates may also manipulate an instruction through its commands and settings. Select the appropriate icon on the left of the faceplate to access a specific tab. This section provides an overview of the faceplate attributes that are common across the objects. More details are supplied in the individual section for each object.

Status Banner for FactoryTalk® View ME/SE and Studio 5000 View Designer®

At the top of all device object faceplates there is a common status banner which provides the following information:

- Ready (green LED icon) or Not Ready (yellow LED icon) status
- Faulted (banner will show Not Ready with fault message)
- Virtualized
- Communication Loss

A fault status may be reset using the Reset button on the right side of the banner if the condition has been cleared.



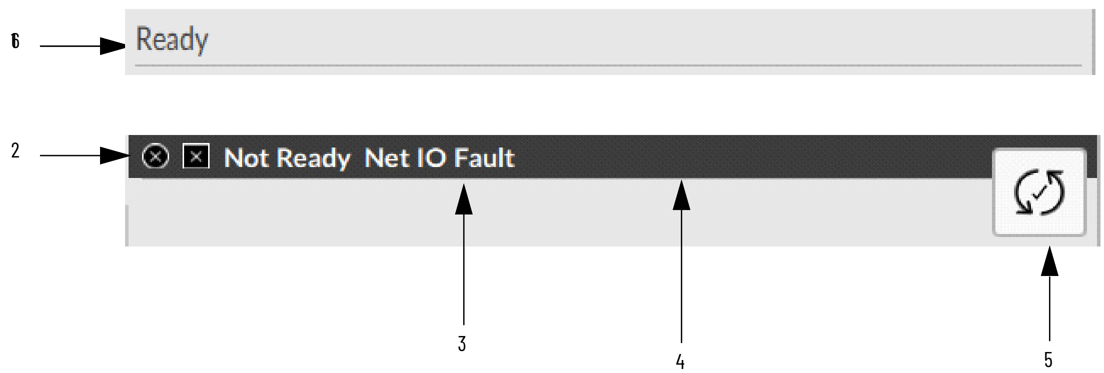
Item	Description
1	Ready state displays green LED icon and grey background.
2	Faulted state shows yellow LED icon and Not Ready status.
3	Fault message for latest fault present. Will also display "Virtual" if virtual mode is enabled.
4	Faulted state shows yellow border around banner.
5	Fault reset button.

Status Banner for FactoryTalk® Optix

At the top of all device object faceplates in FactoryTalk Optix there is a common status banner which provides the following information:

- Ready or Not Ready Status
- Faulted (banner will show Not Ready with fault message)
- Virtualized
- Communication Loss

A fault status may be reset using the Reset button on the right side of the banner if the condition has been cleared.

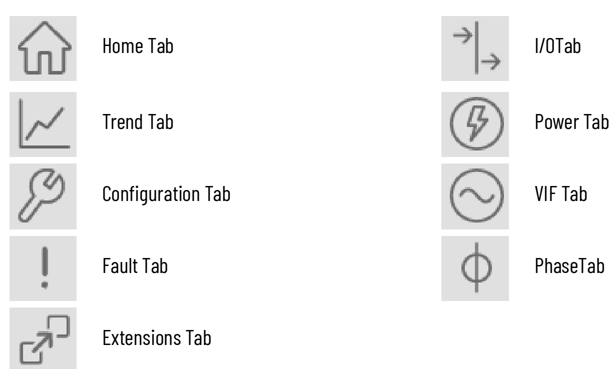


Item	Description
1	Ready state displays Ready Status
2	Faulted state shows Fault and Not Ready status.
3	Fault message for latest fault present. Will also display “Virtual” if virtual mode is enabled.
4	Faulted state shows Black background.
5	Fault reset button.

Faceplate Navigation

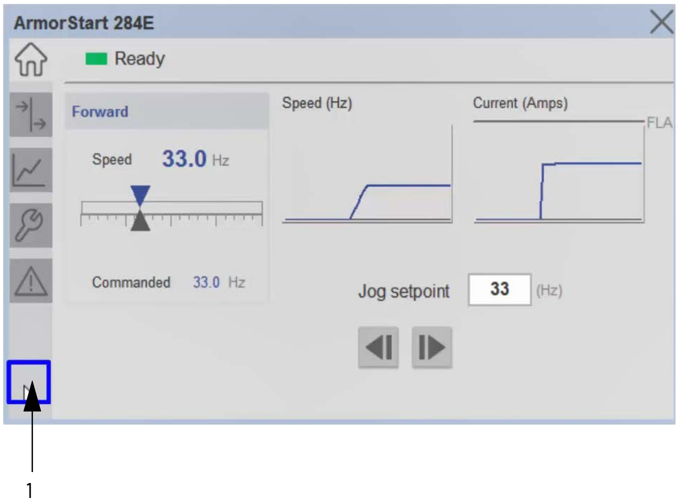
All device object faceplates have navigation tabs on the left side of the faceplate. Navigation tabs may vary based on device type. The active tab will show as a light grey, while an inactive tab will show as a dark grey.

The common tabs are shown below.



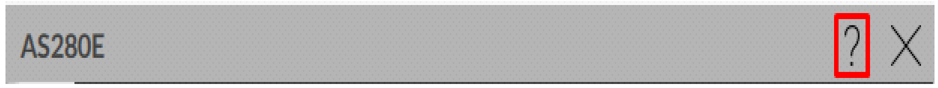
Faceplate Revision Notes

By clicking on the open space near the bottom left corner of the faceplate you can momentarily view revision notes and details of the active faceplate. This may be useful in troubleshooting or when communicating with Rockwell Automation® Tech Support.

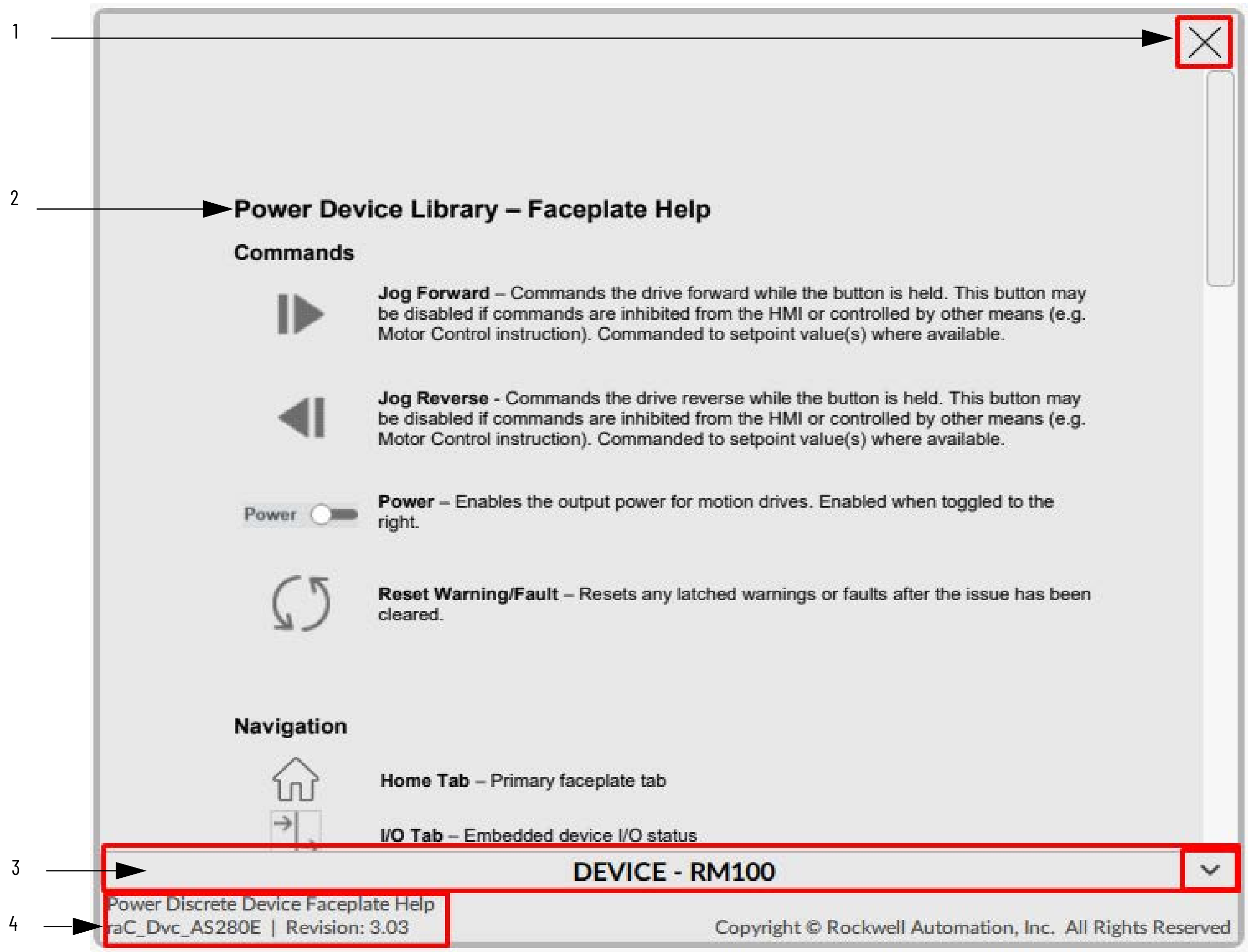


Item	Description
1	Click near the bottom right corner to temporarily open up the revision notes dialogue
2	Revision number
3	Faceplate display name

Additionally, The Optix Faceplates are provided with the Help Button for each faceplates. Help Button is located on the upper right corner of Faceplate frame as shown in image below,

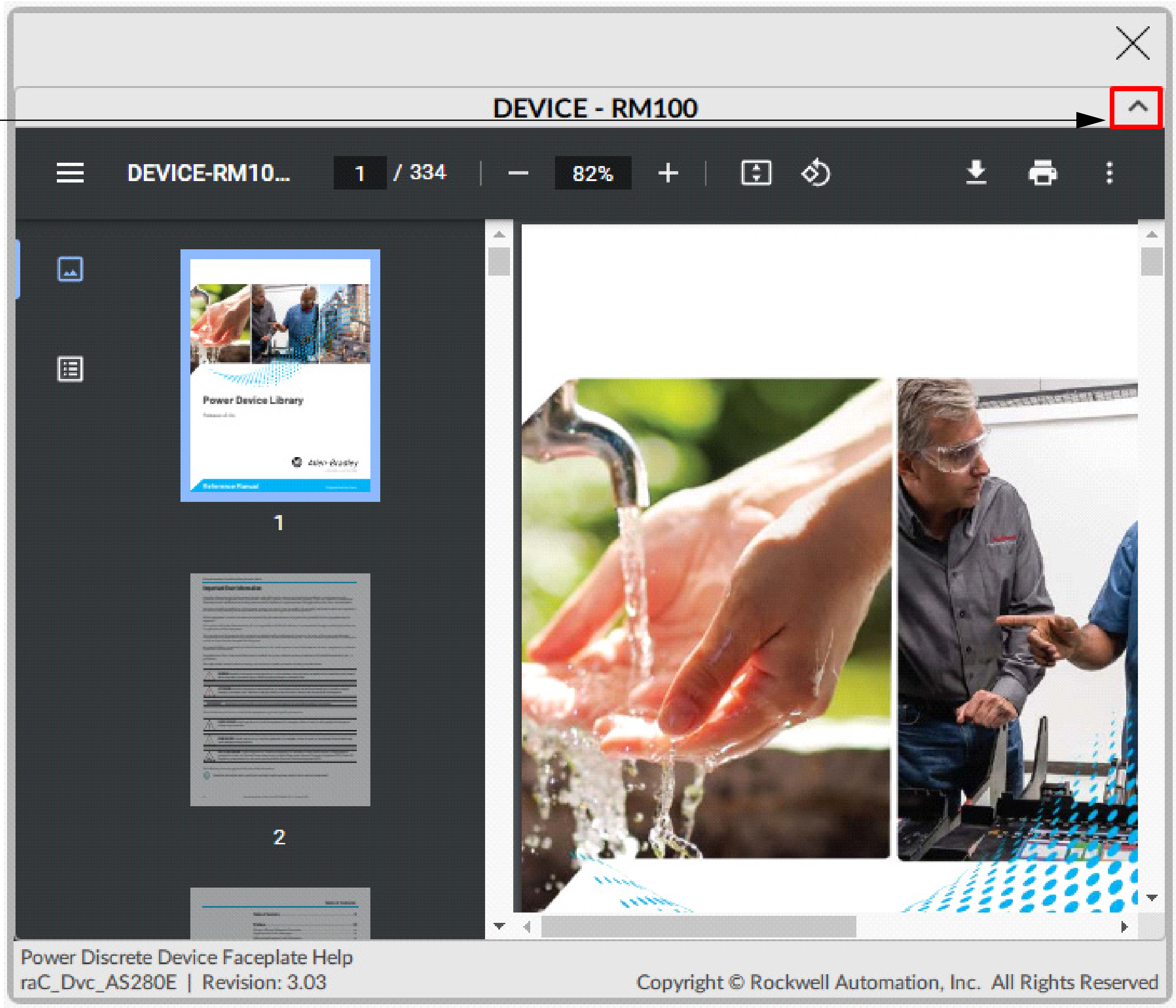


When user click on the Help Button it will open a pop-up display which includes a Help Document and Accordian which contains web browser to access Reference manual from web. See in Image provided below



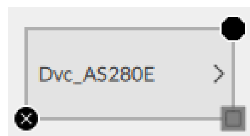
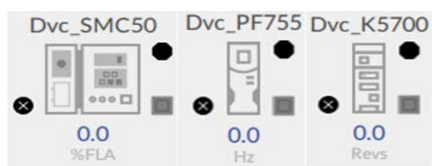
Item	Description
1	Help Pop-Up window with Close button
2	Help Document
3	Accordion which contains Reference Manual web browser (Status: - Not Expanded)
4	Revision Information
5	Accordion which contains Reference Manual web browser (Status: - Expanded) shown in image below. Note: Active Internet connection is required to see Reference Manual.

5



Launch Buttons

Launch buttons are provided in Global Display (GGFX) files for FactoryTalk View® ME/SE as well as in Studio 5000 View Designer® projects. These are used to open HMI faceplate displays or pop-ups. Two types of launch buttons are provided:

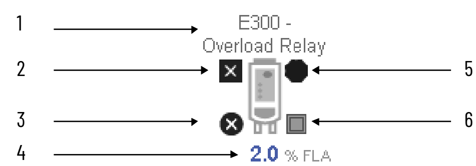
Launch Button Style	Image Examples	Usage
Basic Text Button		Simple launch button with diagnostic information.
Graphical Button		Graphic button can be used in schematic style displays where a system/network diagram is shown. When available, basic module diagnostics and a live value is displayed.
Basic Text Button in FT Optix		Simple launch button with diagnostic information.
Graphical Button in FT Optix		Graphic button can be used in schematic style displays where a system/network diagram is shown. When available, basic module diagnostics and a live value is displayed.

Diagnostic Icons

Diagnostic icons may be displayed on the graphic buttons for compatible modules. Safety modules are designated with a small guard icon.

Icon	Image	Visible Condition
Communications Failure		Connection Faulted
Fault		Any device fault active (module hardware issue)
Warning		Any device warning active (maintenance required)
Not Ready		Device Not Ready

Icon	Image	Visible Condition
Virtual		Device in virtual mode (not physical)
Stopped		Device inactive/stopped
Running		Device active/running



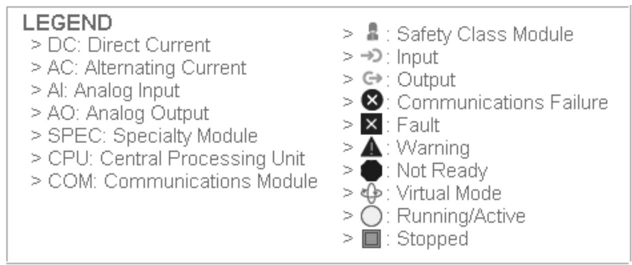
Item	Description	Options
1	Device label. Set to tag.@Description by default. Set to Global Parameter #104 for custom label.	
2	Device Fault/Warning Status	
	Warning	
	Fault	
3	Device communication failure/Virtual Mode status	
	Communication Failure	
	Virtual Mode Active	
4	Device live data variable	- Power Discrete: Motor % FLA - Power Velocity: Motor Speed (Hz) - Power Motion: Configurable as Motor Speed (Hz) or Position - Power Monitor: N/A
5	Device not ready status	
6	Device running (active)/stopped (inactive) status	
	Stopped (inactive)	
	Running (active)	

Schematic Display Configuration

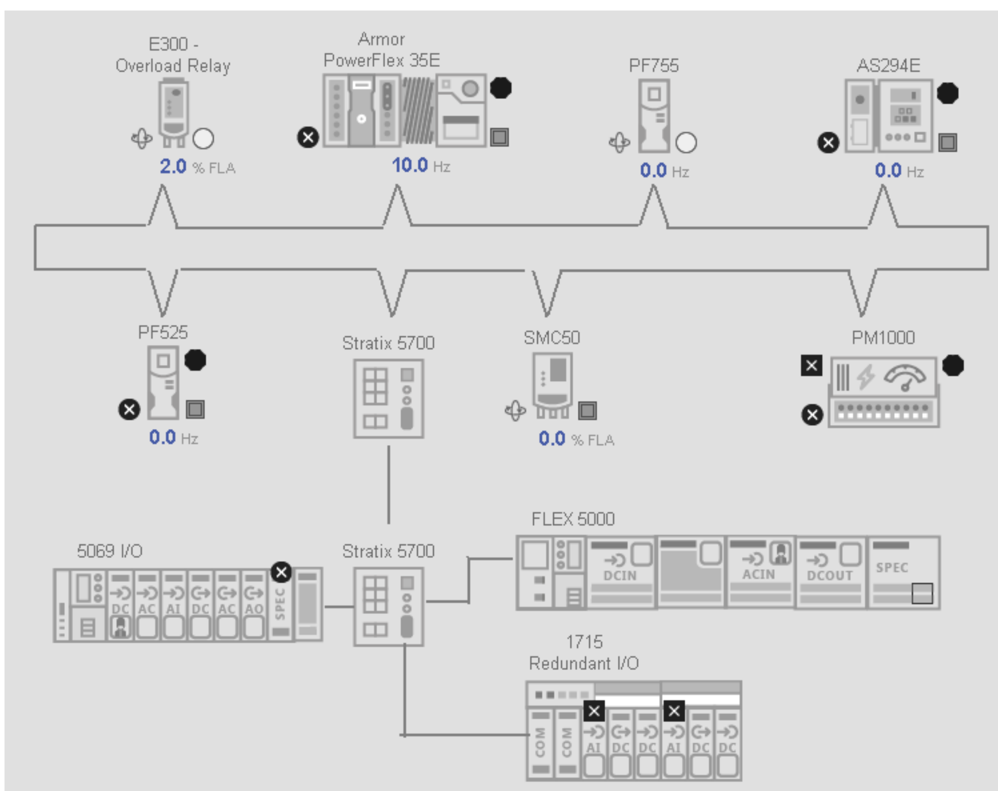
These icons can be used together to allow users to build schematic diagrams. The Power Device Library graphics can also be used along with similar buttons available in the Network Device Library v12.01 and IO Device Library v5.01.

It is recommended set the Grid Snap ON with settings $z = 4$; $y = 4$ when using the graphic symbols in FactoryTalk View® ME/SE. This will make it easier to align modules in a chassis configuration.

A legend is provided in the FactoryTalk View® ME/SE global object displays *(raC-3-ME) Graphic Symbols - Power Device* and *(raC-3-SE) Graphic Symbols - Power Device.*

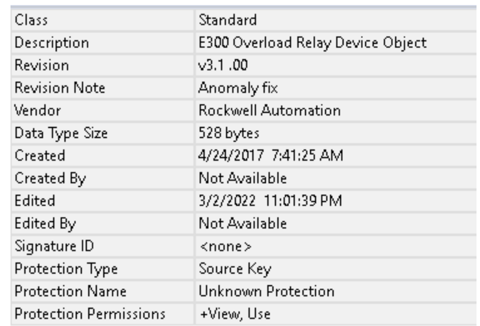
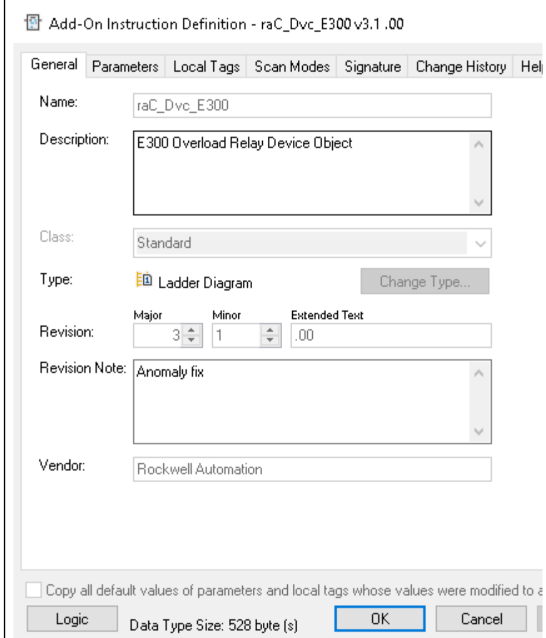


An example of a complete system is shown below. This system includes objects from the IO Device Library, Network Device Library and Power Device Library.



Library Versions

Each library object has a revision x.yy where: x is the Major Revision number and yy is the Minor Revision number. Each release of the library comes with release notes that describe the changes that were made since the last release. You can find the revision number of the object in a number of locations as shown below.

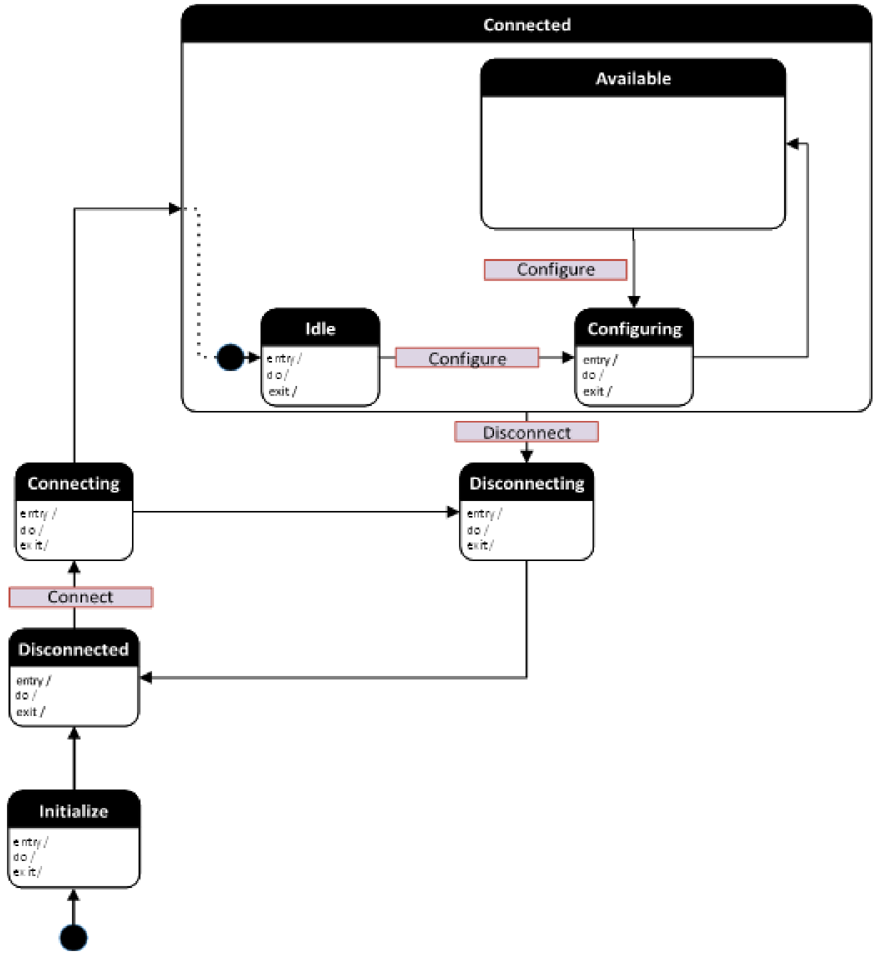
Component	Example
The Add-On Instruction in Logix Designer application has revision information visible when the instruction is selected in the Controller Organizer.	
The Add-On Instruction Definition General tab shows the revision number along with basic revision notes. Refer to the release notes for complete revision notes.	
The faceplate in FactoryTalk® View software has revision information visible when the pointer is clicked just inside the lower left corner of the faceplate.	

Component	Example
The revision number is shown in the file names for GFX, VPD, ACM.HSL4, AOI.L5X, and RUNG.L5X files.	(raC-3_01-ME) raC_Dvc_E300-Faceplate.gfx (raC-3_01-SE) raC_Dvc_E300-Faceplate.gfx (raC-3_01-VD) raC_Dvc_E300.vpd (RA-LIB)_Device_Asset-Control_PowerDiscrete_raC_Dvc_E300_(3.1).HSL4 (RA-LIB)_Device_Device_PowerDiscrete_raC_LD_Dvc_E300_(3.1).HSL4 raC_Dvc_E300_3.01_AOI.L5X raC_Dvc_E300_3.01_RUNG.L5X
Library object folder where the major (x) and minor (y) versions are used in the folder name e.g. raC_x_yy_raC_Dvc_DeviceName_UI	raC_3_03_raC_Dvc_AS280E_UI (raC_Dvc_AS280E)
The major (x) revision number is used in the Library folder and file name e.g. PowerDevice_vxR Note that only major versions are used at the library level and a library may contain multiple minor versions of different objects.	PowerDevice_v3R

State Model

The following section will discuss the state model for Device Object. The figure below shows the core logic states.

By default, each state is active for a minimum of 256us to allow for evaluation of state outside of the ADO instance in the user program



Interfaces

Device object interfaces are intended to provide the application programmer a class based harmonized interface for interacting with the device object from user code. Standard control interfaces are used for passing Information (Inf), Settings (Set), Commands (Cmd) and Status (Sts).

In the Library there is a folder named *Videos* which contains many How-To and Operational Overview Videos which walk step-by-step through each process. You can refer to the following videos for this section:
"How_To_Interface_with_Power_Device_Logix "

These interfaces are commonly used when interfacing with other Rockwell Automation® application code libraries such as the PlantPAx® Process Objects Library or the Machine Builder Library. Note that when using with PlantPAx® 5.x applications predefined data-type (PDT) interfaces are used and required to interact with firmware based instructions (e.g. PMTR, PVSD). PDT interfaces are only available in 5x80 Logix controllers with firmware v33+. Both UDT and PDT variations are shown below.

For detailed information on specific interfaces, please refer to the appropriate section in this manual.

Interface Class	Object Class	Object Sub-Class	Interface Type	Interface Name (UDT)	Interface Name (PDT)
Control	Power Automation	Power Discrete	Information	raC_UDT_ItfAD_PwrDiscrete_Inf	
			Setting	raC_UDT_ItfAD_PwrDiscrete_Set	RAC_ITF_DVC_PWRDISCRETE_SET
			Command	raC_UDT_ItfAD_PwrDiscrete_Cmd	RAC_ITF_DVC_PWRDISCRETE_CMD
			Status	raC_UDT_ItfAD_PwrDiscrete_Sts	RAC_ITF_DVC_PWRDISCRETE_STS
		Power Velocity	Information	raC_UDT_ItfAD_PwrVelocity_Inf	
			Setting	raC_UDT_ItfAD_PwrVelocity_Set	RAC_ITF_DVC_PWRVELOCITY_SET
			Command	raC_UDT_ItfAD_PwrVelocity_Cmd	RAC_ITF_DVC_PWRVELOCITY_CMD
			Status	raC_UDT_ItfAD_PwrVelocity_Sts	RAC_ITF_DVC_PWRVELOCITY_STS
		Power Motion	Information	raC_UDT_ItfAD_PwrMotion_Inf	
			Setting	raC_UDT_ItfAD_PwrMotion_Set	
			Command	raC_UDT_ItfAD_PwrMotion_Cmd	
			Status	raC_UDT_ItfAD_PwrMotion_Sts	
		Kinetix® 5100	Information	raC_UDT_ItfAD_K5100_Inf	
			Setting	raC_UDT_ItfAD_K5100_Set	
			Command	raC_UDT_ItfAD_K5100_Cmd	
			Status	raC_UDT_ItfAD_K5100_Sts	
		Power Monitor	Information	raC_UDT_ItfAD_PwrMonitor_Inf	
			Setting	raC_UDT_ItfAD_PwrMonitor_Set	
			Command	raC_UDT_ItfAD_PwrMonitor_Cmd	
			Status	raC_UDT_ItfAD_PwrMonitor_Sts	

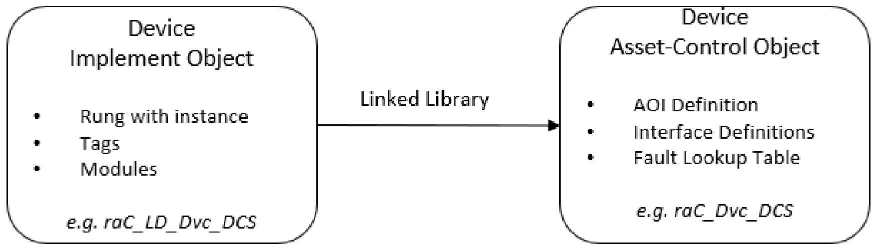
Application Code Manager

Architectural Overview

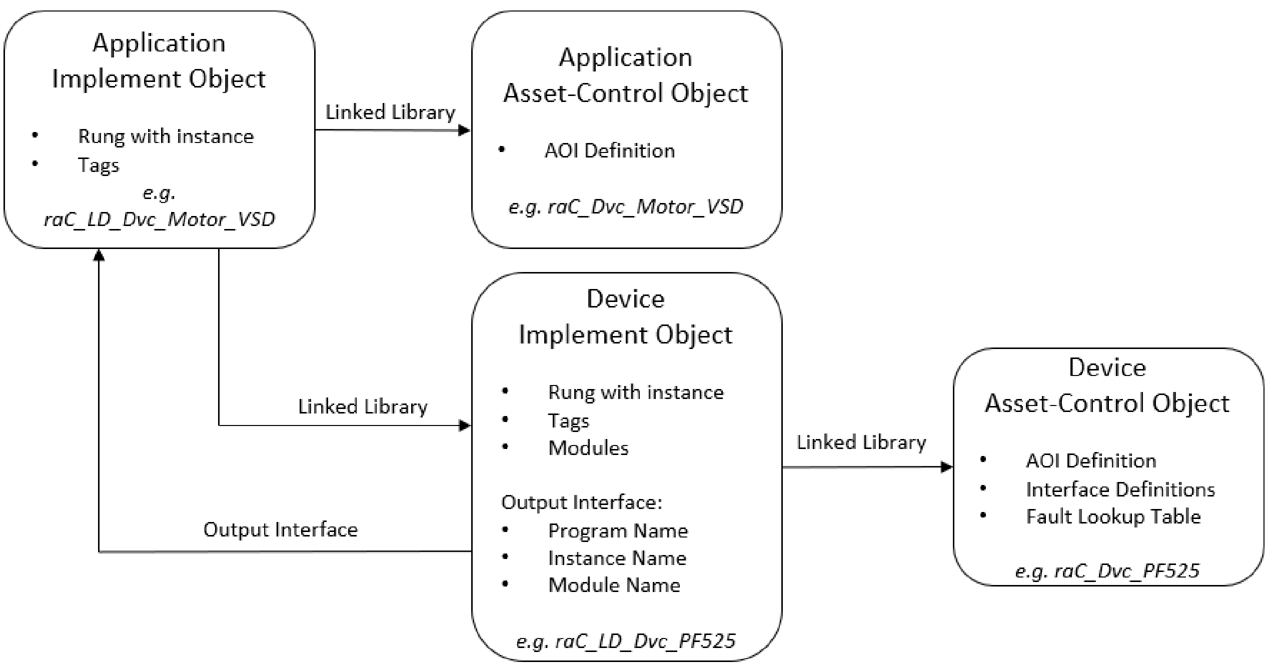
Device libraries, as with most Application Code Libraries are divided into 2 logical groups: either Asset-Control Object or Device Implement Object.

Asset-Control Objects contain the asset definition of an object and any associated content which belongs to the asset. This includes controller tags, add-on instructions, data types, and attachments such as HMI content and documentation. These are found under the *(RA-LIB) Device > Asset-Control* folder and have names like *raC_Dvc_xxxx* where *xxxx* is the device name.

Device Implement Objects contain an instance of an asset-control object and provide all related configuration of the asset. The Device implement type is the application code (e.g. programming rung). This includes the required controller tags, programs, modules, and FactoryTalk® View ME/SE symbols. These are found under the *(RA-LIB) Device > Device* folder and have names like *raC_LD_Dvc_xxxx* where *xxxx* is the device name. LD stands for ladder logic.



It is common for Application Implement Objects to be developed which connect to the interfaces of a Device Object. Examples of Application Objects may include motor or VSD instructions from other application code libraries such as *PMTR* or *PVSD* in the PlantPAx® Process Objects Library *(RA-LIB) Process 5* or *raM_Dvc_Motor_Disc* or *raM_Dvc_Motor_VSD* in the Machine Builder Library *(RA-LIB) Machine*. In this case the same schema applies and it becomes necessary to provide data via the interface to the upstream library object. Note that for the Process Library the Implementation and Asset-Control objects are combined into Control Strategies.



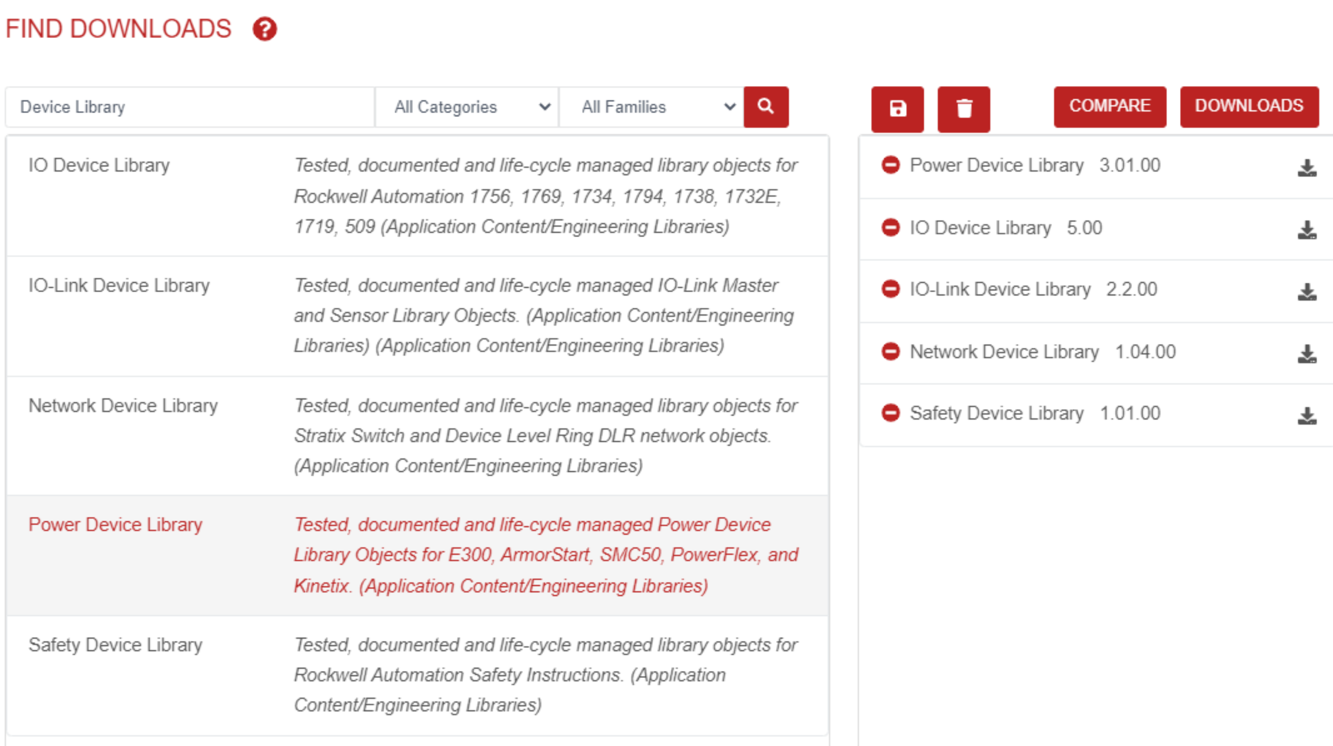
Using the Library

Install the Library

Download the Library

For the latest compatible software information and to download the Rockwell Automation® Library, see the Product Compatibility and Download Center.

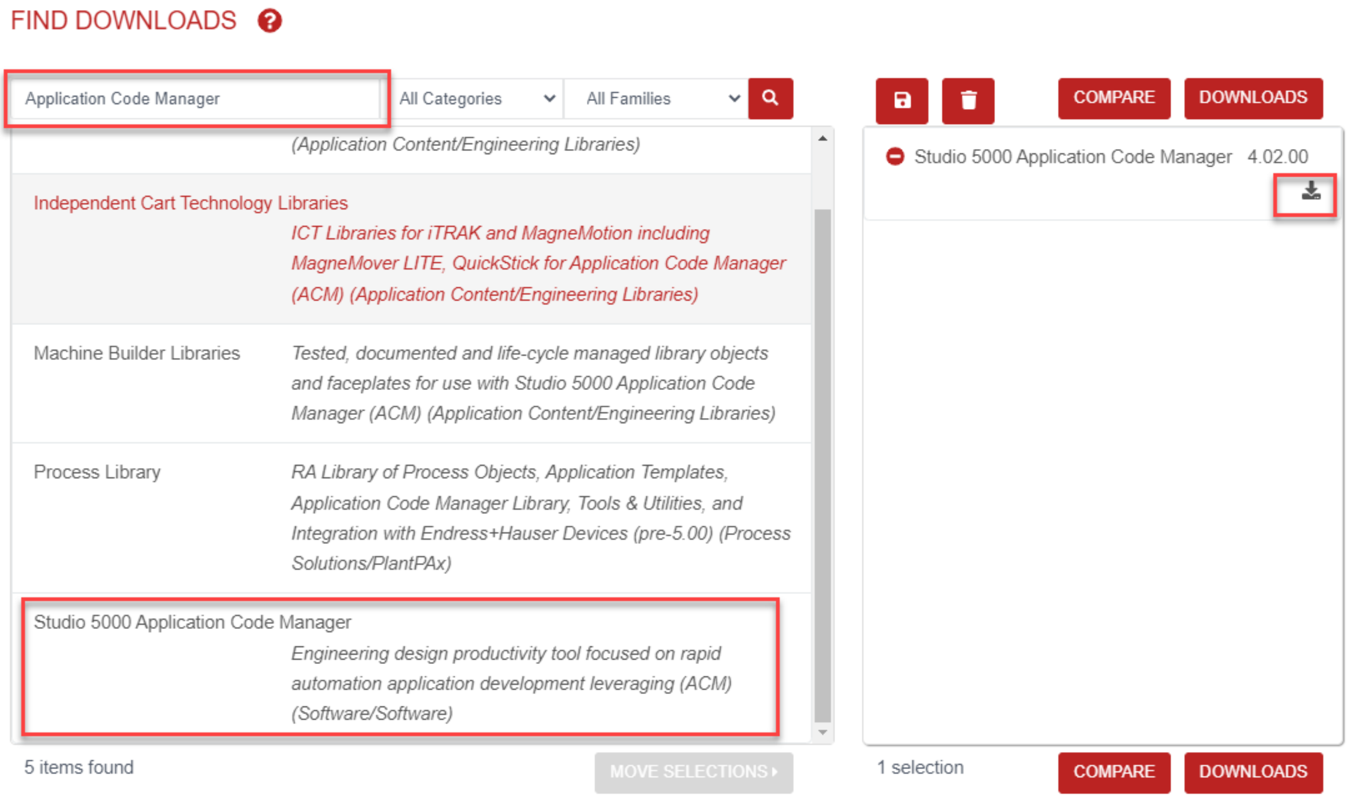
Search "Device Library" or filter on Application Content to quickly find the library.



Download & Install Studio 5000® Application Code Manager

Studio 5000® Application Code Manager is free to install from Rockwell Automation's Product Compatibility and Download Center.

Search "Application Code Manager" and select the item to download.



Extract the downloaded .zip file by running the *4.xx.00-Studio5000_ACM-DVD.exe* executable file. This will extract a new folder containing a *Setup.exe* file which can be run to begin product installation.

Follow the prompts from the splash screen until installation is complete. Note that a SQL server is required for Application Code Manager. SQL Server Express is offered for free and is included in the Application Code Manager installer.

Register Libraries in Studio 5000® Application Code Manager

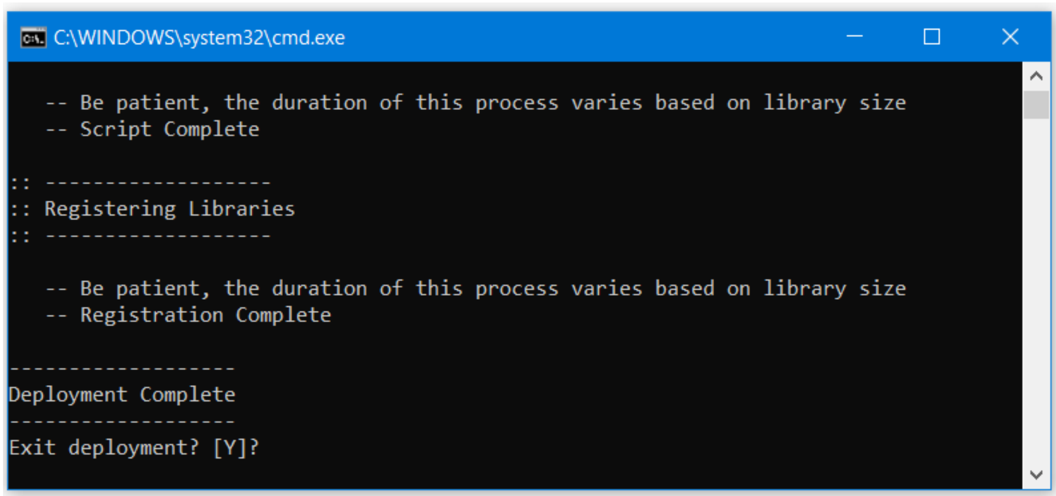
It is recommended that you use Studio 5000® Application Code Manager or the Studio 5000® "Import Library Objects" Plug-In Wizard to import device library objects into a Logix 5000 controller project. To use the library in Application Code Manager you must first register the libraries.

Using Studio 5000® Application Code Manager is not mandatory although it is highly recommended to reduce the likelihood of configuration errors and simplify the workflow. Alternatively, you can import the RUNG.L5X files directly into a Studio 5000® project.

The *Lite* version of Studio 5000® Application Code Manager is free of charge and can be downloaded from the Product Compatibility and Download Centre. None of the features included in the Standard (paid) version are required to use Device Object Libraries.

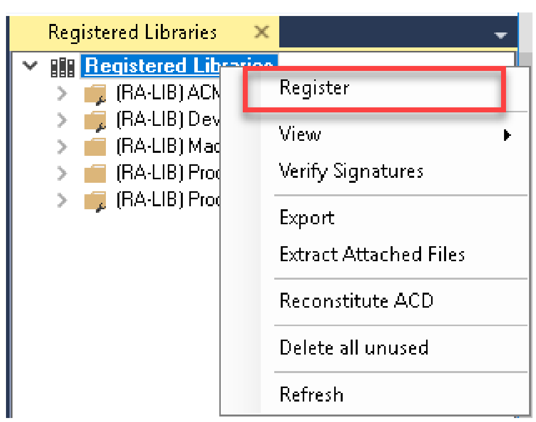
Register Complete Library Automatically

To automatically register the entire library, find and run the *setup.cmd* file in the root folder of the library files. You will see a windows console appear as the script runs. When it is complete it will display “Deployment Complete”. Enter “Y” to exist the console.



Register Individual Library Objects Manually

As an alternative to registering the entire library using the setup.cmd script, you can manually register one or multiple library objects in Studio 5000® Application Code Manager. Open up Application Code Manager and view the Registered Libraries panel on the right. Right-click on *Registered Libraries* and select *Register*. Browse to the *ApplicationCodeManagerLibraries* folder within the library files and select any HSL4 files that you would like to register. Note you may select more than one at a time. Once you complete registering the desired objects they will be shown under the *(RA-LIB) Device* solution folder.



Importing Logic into Studio 5000® Projects

There are multiple methods to using the logic in a Studio 5000® application. For projects that are being developed from scratch using Application Code Manager along with other Application Code Libraries such as the PlantPAx® Process Objects Library or the Machine Builder Library, you can continue to use the Device Object Libraries in Application Code Manager. For existing applications where devices are being added, it is recommended to use the Studio 5000® Plug-In "Import Library Objects" Wizard. Alternatively you can import the RUNG.L5X files into your program and configure them manually.

In the Library there is a folder named *Videos* which contains many How-To and Operational Overview Videos which walk step-by-step through each process. You can refer to the following videos for this section:
"How_To_Import_and_Configure_AS_Starter_Objects_in_LogixDesigner"
"How_To_Import_and_Configure_AS_VFD_Objects_in_LogixDesigner"
"How_To_Import_and_Configure_CIP_Motion_Objects_in_LogixDesigner"
"How_To_Import_and_Configure_E300_Objects_in_LogixDesigner"
"How_To_Import_and_Configure_Energy_Extensions_in_LogixDesigner"
"How_To_Import_and_Configure_Kinetix5100_Device_and Operation_Objects_in_LogixDesigner"
"How_To_Import_and_Configure_PF_Objects_in_LogixDesigner"
"How_To_Import_and_Configure_PF755T_Objects_in_LogixDesigner"
"How_To_Import_and_Configure_PowerMonitor_Device_Objects_ in_LogixDesigner"
"How_To_Import_and_Configure_PowerMonitor_Device_Objects_in_LogixDesigner_Using_ACM_Plug-Ins"
"How_To_Import_and_Configure_Predictive_Maintenance_in_LogixDesigner"
"How_To_Import_and_Configure_SMC50_Objects_in_LogixDesigner"

It is not recommended to simply import the AOI.L5X files and attempt to build your own logic rung. Doing so will increase the likelihood of configuration errors and likely miss logic that is required outside of the Add-On Instruction.

AOI files should only be imported when updating an existing application from a previous version of a Device Object Library to a newer one.

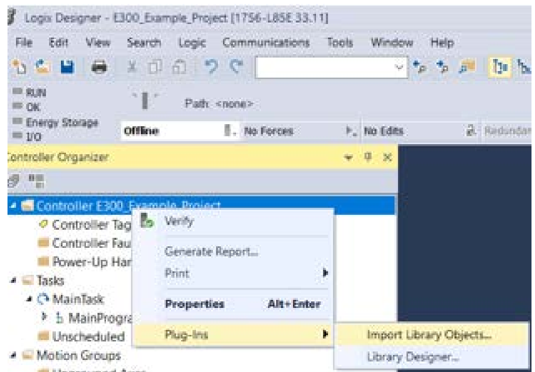
Below is a table to capture recommendations on when to use which tool or workflow when importing and configuring device objects.

Tool/Workflow	Description of when to use	Software Requirements
Application Code Manager (full application)	Project is developped from scratch using Application Code Manager along with PlantPAx® or Machine Builder libraries.	Studio 5000 Logix Designer® Studio 5000® Application Code Manager (Lite)
Studio 5000® Plug-In "Import Library Objects" Wizard	Application Code Manager is installed but not required for the entire project. Application has already been developed but some Device Objects need to be added.	Studio 5000 Logix Designer® Studio 5000® Application Code Manager (Lite)
Import RUNG.L5X File	Application Code Manager is not installed. Application has already been developed but some Device Objects need to be added. Familiar with rung import workflow.	Studio 5000 Logix Designer®
Import AOI.L5X File	Updating existing application that contains an older version of a Device Object AOI.	Studio 5000 Logix Designer®

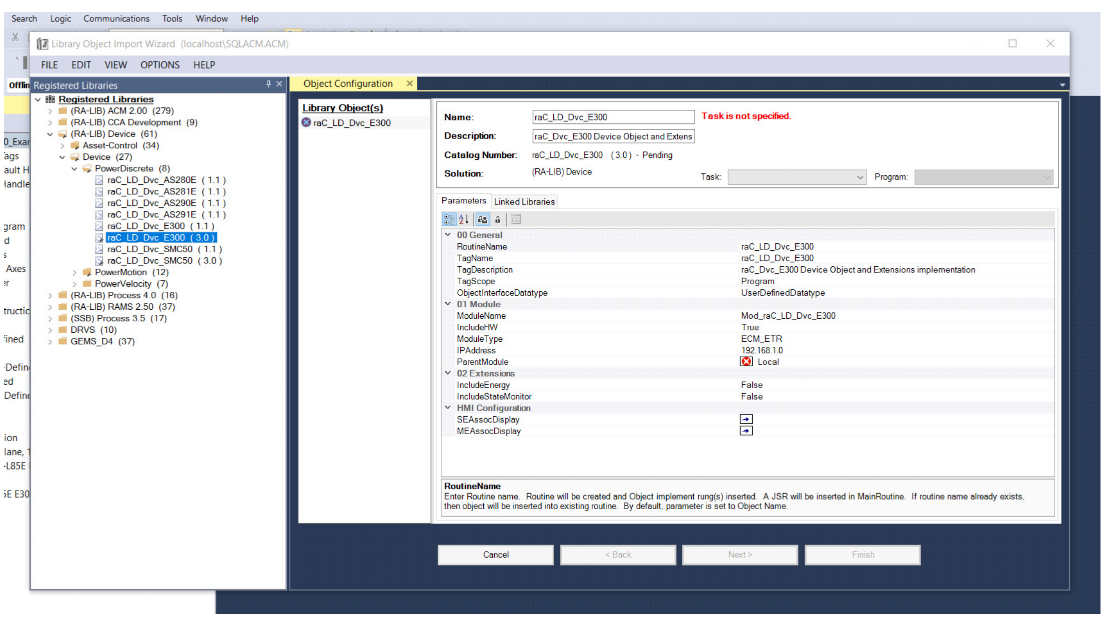
Import Library Objects Wizard

The most simple way to import a Device Object into an existing application is to use the Studio 5000® Plug-In “Import Library Objects” wizard. This plug-in requires Application Code Manager to be installed but does not require it to be open or have a project created.

Right click on an item (e.g. Controller, Task, Program, etc) in the Controller Organizer and select *Plug-Ins* > *Import Library Objects...*



This will launch a small wizard version of Application Code Manager inside of your Studio 5000 Logix Designer® Project. In the Registered Libraries panel on the left, find your desired object under *Registered Libraries* > *(RA-LIB) Device* > *Device* and drag it into the Library Object(s) list in the Object Configuration Tab.

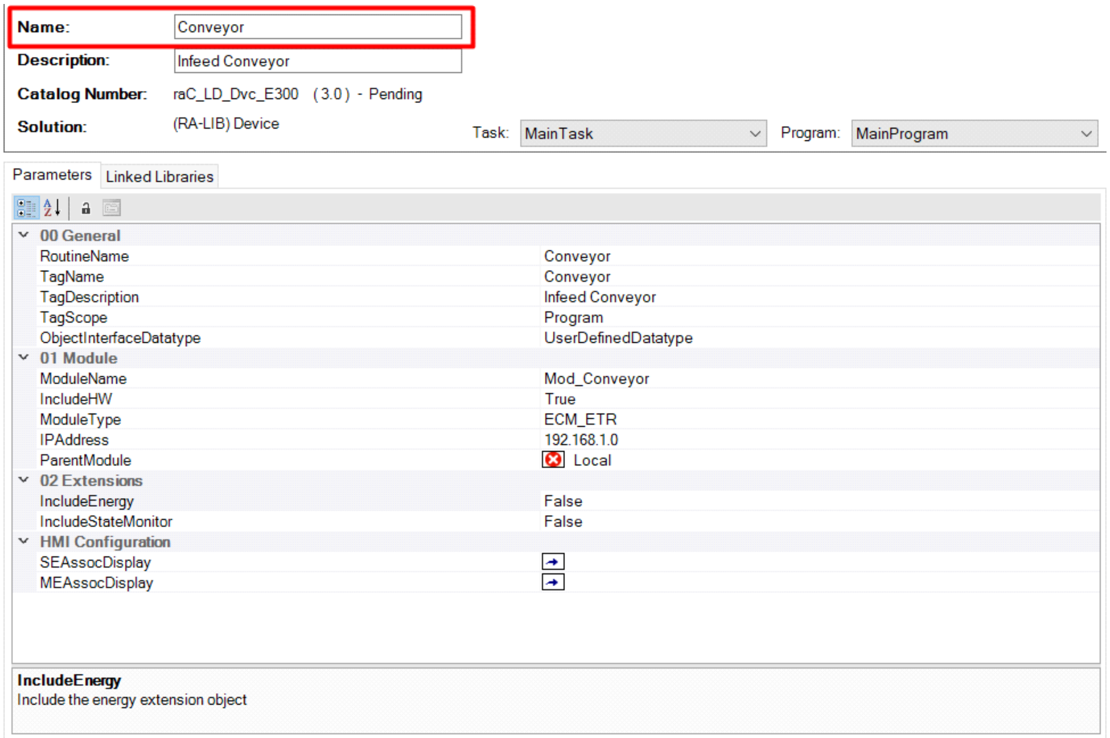


Perform the following configuration:

- Enter a **name** and **description**. Maximum name length can be 22 characters. Note that other parameters such as the RoutineName, TagName, etc will auto-complete based on these fields.
- Assign the **Task** and **Program**.
- Choose the **TagScope**:
    - Program Scoped Tags
    - Controller Scoped Tags
- Choose the **ObjectInterfaceDatatype**:
    - UserDefinedDatatype: Use with standard applications (not PlantPAx® 5.xx)
    - PreDefinedDatatype: Use with PlantPAx® 5.xx applications. Selecting this option will use Revision 10.xx Power Device Library object instructions which reference pre-defined datatypes that are only available in 5580 ControlLogix® and 5380/5480 CompactLogix controllers with firmware version 33+. These pre-defined datatypes are references by PlantPAx® 5.xx instructions such as PVSD and PMTR.
- Assign the Module (associated hardware e.g. PowerFlex® drive)
    - Set **IncludeHW** to True if you would like the wizard to add a new module (e.g. PowerFlex® Drive) to your hardware tree. Set this to False if you already have the module pre-existing in your hardware tree.
    - Set the **ModuleName**. If IncludeHW is false, set this to the name of the existing module. If IncludeHW is true, set this to the desired name of the module that will be created.
    - Select the **ModuleType** and **DriveRating** (if applicable) to the desired model that matches the installed device.
    - Set the **IPAddress** to the IP Address of the device.
    - Set the **ParentModule** to name of the network card that the device is connected to. If using the embedded Ethernet port of the processor module, leave as Local.
- Configure the desired extensions:
    - If **IncludeEnergy** is set to True, the raC_Opr_xxx_Energy object will be added and configured.
    - If **IncludeStateMonitor** is set to True, the raC_Tec_Powerxxx_StateMonitor object will be added and configured. Note that PlantPAx® users should set this to False and instead refer to the PRT (process run time and start counter) instruction.
- The HMI Configuration options are not used in the Plug-In Wizard and can be ignored.
- Click next or click on the *Linked Libraries* tab. Click the *Auto Create* button to automatically create all of the required linked libraries.

You can manually create new linked libraries or point to existing linked libraries if necessary. You may need to do this if you would like to use an older version of library objects when multiple versions are installed in Application Code Manager.

- On the following screen you can select the desired Merge Actions. Generally these can be left with the default actions.
    - Add: used when AOIs don't previously exist in application
    - Overwrite: usually preferred. Used when AOIs previously exist but may or may not be the same revision.
    - Use Existing: used when AOIs previously exist in the application and you do not wish to overwrite the existing items.



- Click next and you can now see any new logic and modules that will be created.
- Click Finish to complete the import.

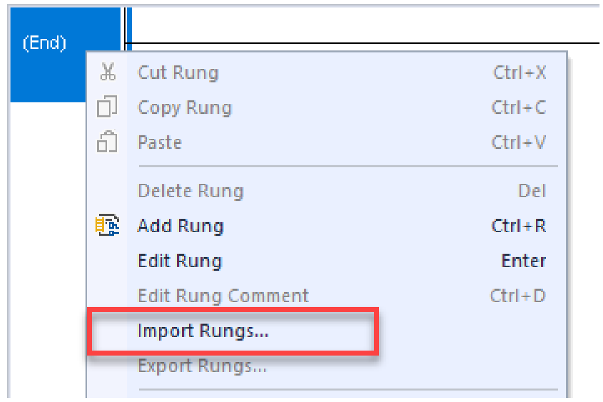
Import Rung Logic

An Add-On Instruction is defined once in each controller project, and can be instantiated multiple times in your application code. To use pre-engineered logic, import each desired RUNG.L5X file into a controller project.

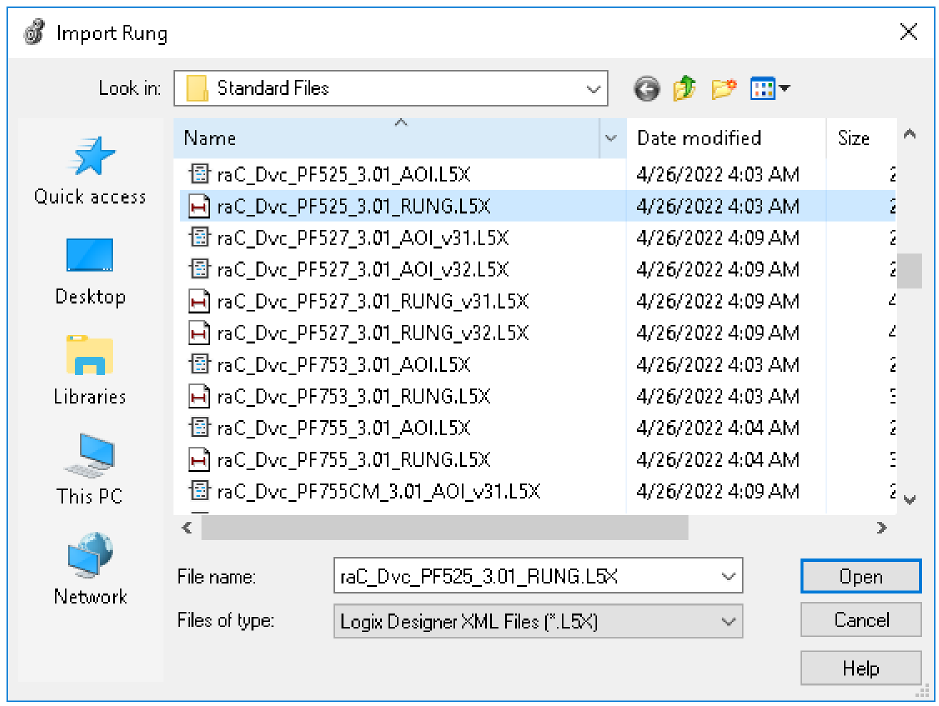
1. In the Studio 5000 Logix Designer® application, open a new or existing project.

IMPORTANT	Add-On Instruction definitions can be imported, but not updated, online.

2. Choose or create a new ladder routine to open. Right-click in the routine ladder and choose Import Rungs...

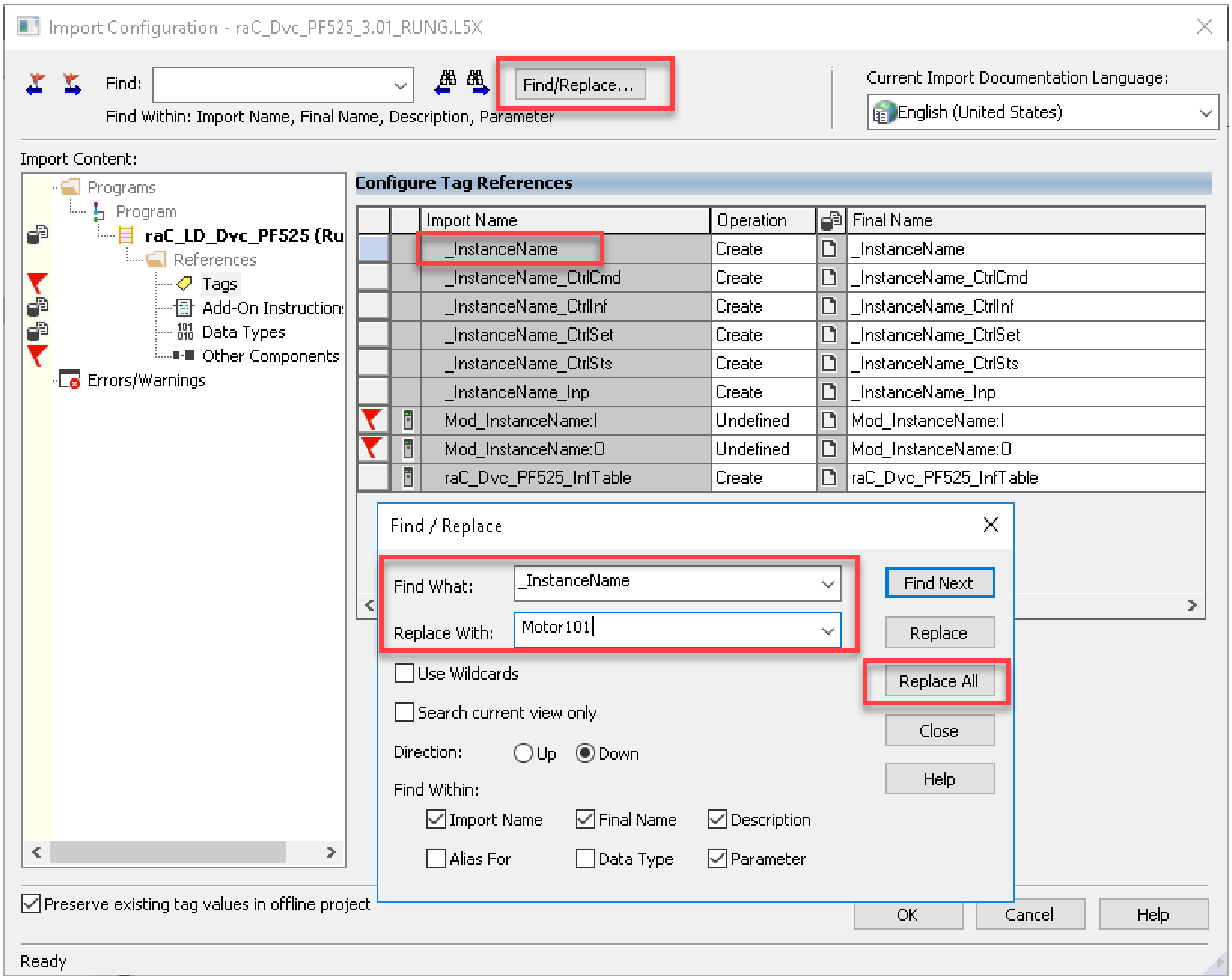


3. Select the desired RUNG and Select Import. The file will have a name like *raC_Dvc_PF525_3.01_RUNG.L5X.*

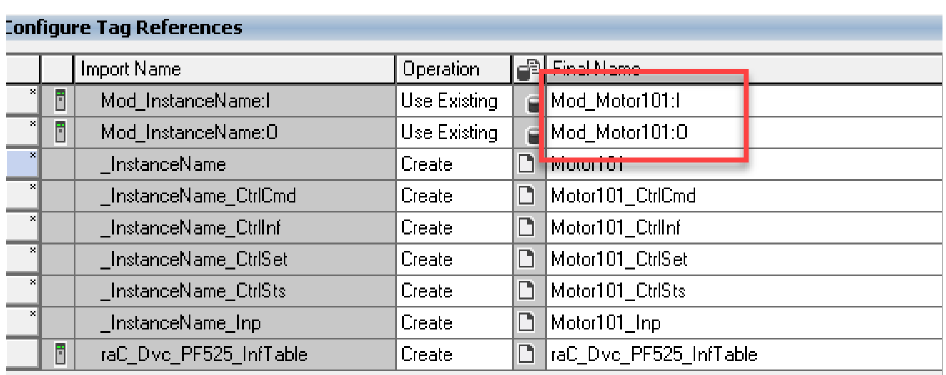


Both "RUNG" and "AOI" .L5X files are provided. Import the RUNG file to get all required additional tags, data types, and message configurations.

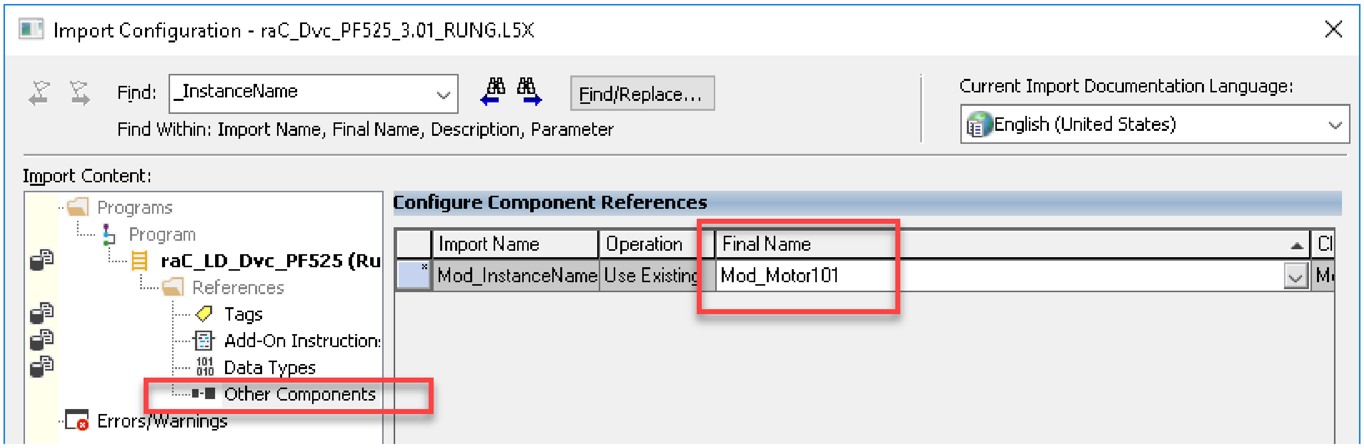
4. An *Import Configuration* dialogue window will open and display generic Import names which include "_InstanceName". Click the *Find/Replace...* button and replace all instances of "_InstanceName" with your desired device name (e.g. "Motor101").



5. You will need to point the new object to the correct module in your project. You can type in or browse for the correct input (:I) and Output (:O) tags in your project. In this example our module is called Mod_Motor101.



6. Click on the *Other Components* section and type or browse to the name of the module. In this example our module is called Mod_Motor101.



7. The rung will now be imported into your ladder routine.

Using Studio 5000 View Designer®

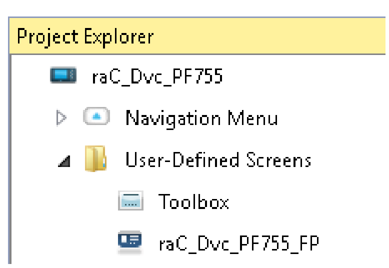
Using View Designer Project Files

Studio 5000 View Designer® may be used for HMI development for PanelView™ 5000 applications. Open up your Studio 5000 View Designer® project alongside a second application instance running the required VPD file in the library folder *HMI - ViewDesigner - vpd*.

In the Library there is a folder named *Videos* which contains many How-To and Operational Overview Videos which walk step-by-step through each process. You can refer to the following videos for this section:
"How_To_Import_and_Configure_AS_Starter_Objects_in_ViewDesigner"
"How_To_Import_and_Configure_AS_VFD_Objects_in_ViewDesigner"
"How_To_Import_and_Configure_CIP_Motion_Objects_in_ViewDesigner"
"How_To_Import_and_Configure_E300_Objects_in_ViewDesigner"
"How_To_Import_and_Configure_PF_Objects_in_ViewDesigner"
"How_To_Import_and_Configure_PowerMonitor_Device_Objects_in_View_Designer"
"How_To_Import_and_Configure_SMC50_Objects_in_ViewDesigner"

You will notice there are two screens available under the *User-Defined Screens* folder:

- Toolbox: This has the graphic symbol launch buttons for the faceplate.
- raC_Dvc_xxxxx_FP: This is a faceplate pop-up screen.



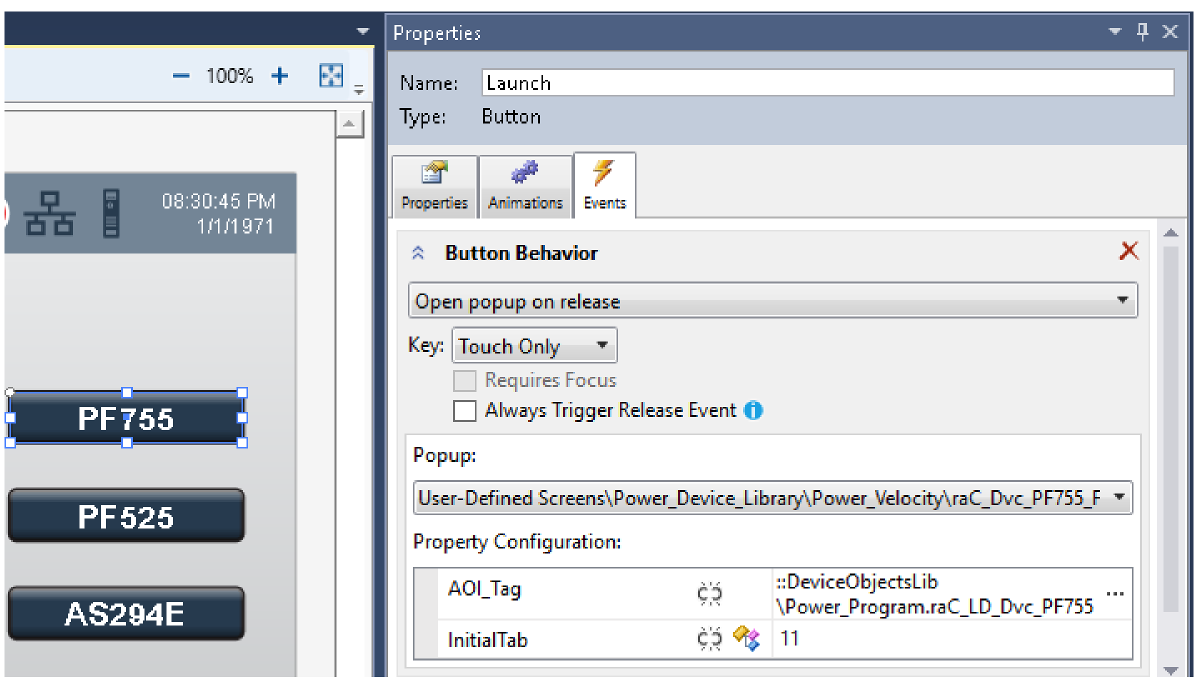
To include these files in your project, perform the following steps:

- Copy the entire faceplate _FP screen from the supplied VPD project to your project application.
- Open the Toolbox screen and copy the desired graphic symbol and paste it into a screen in your project application.

Configuring View Designer Objects

To link the launch button to the faceplate, highlight the button and view the *Events* tab of within the *Properties* pane. Set an Event to *Open popup on release* with the following settings:

- Key: Touch Only
- Popup: Select desired faceplate screen
- AOI_Tag: Browse to AOI backing tag for the device object in your controller file
- InitialTab: 11 (note, faceplate will also function if you leave this as the default of 0)



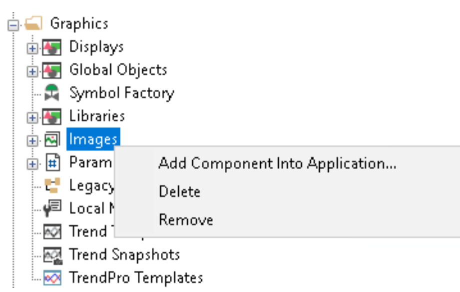
Using FactoryTalk® View Studio

Import FactoryTalk® View Visualization Files

There are several components to import for the visualization files. You import files from the downloaded Rockwell Automation® library files via FactoryTalk® View SE/ME. The workflow is the same for both FactorTalk® View ME and SE.

In the Library there is a folder named *Videos* which contains many How-To and Operational Overview Videos which walk step-by-step through each process. You can refer to the following videos for this section:
"How_To_Import_and_Configure_AS_Starter_Objects_in_FTViewME"
"How_To_Import_and_Configure_AS_Starter_Objects_in_FTViewSE"
"How_To_Import_and_Configure_AS_VFD_Objects_in_FTViewME"
"How_To_Import_and_Configure_AS_VFD_Objects_in_FTViewSE"
"How_To_Import_and_Configure_CIP_Motion_Objects_in_FTViewME"
"How_To_Import_and_Configure_CIP_Motion_Objects_in_FTViewSE"
"How_To_Import_and_Configure_E300_Object_in_FTViewME"
"How_To_Import_and_Configure_E300_Objects_in_FTViewSE"
"How_To_Import_and_Configure_Energy_Extensions_in_FTViewME"
"How_To_Import_and_Configure_Energy_Extensions_in_FTViewSE"
"How_To_Import_and_Configure_PF_Objects_in_FTViewME"
"How_To_Import_and_Configure_PF_Objects_in_FTViewSE"
"How_To_Import_and_Configure_PowerMonitor_Device_Objects_in_FTViewME"
"How_To_Import_and_Configure_PowerMonitor_Device_Objects_in_FTViewSE"
"How_To_Import_and_Configure_Predictive_Maintenance_in_FTViewME"
"How_To_Import_and_Configure_SMC50_ Objects_in_FTViewME"
"How_To_Import_and_Configure_SMC50_Objects_in_FTViewSE"

All image and display items can be imported either by right-clicking in FactoryTalk® View on the Graphic sub-folder (e.g. Displays, Global Objects, Images) or simply dragging and dropping the files into the application.



Import files in this order:

1. Import HMI Images files.

   Select all the images in the *HMI FactoryTalk® View Images - png* folder and Open.

2. Import Global Object files

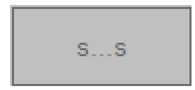
   Select the global object (.ggfx) files from the *HMI - FactoryTalk® View ME\\Global Objects - ggfx* or *HMI - FactoryTalk® View SE\\Global Objects - ggfx* folder

3. Import HMI Faceplates

Select the faceplate (.gfx) files from the *HMI - FactoryTalk® View ME\\Displays - gfx* or *HMI - FactoryTalk® View SE\\Displays - gfx* folder

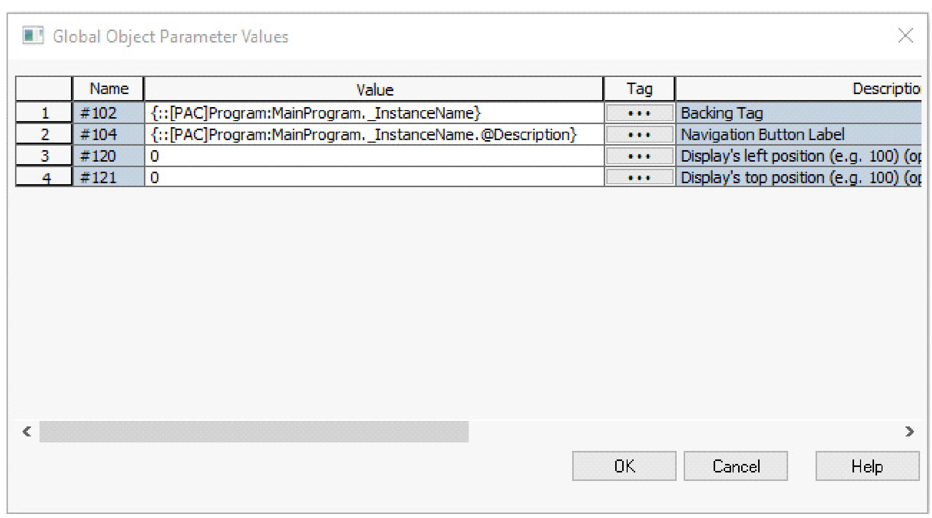
Configuring FactoryTalk® View Objects

Once the files have been imported into the FactoryTalk® View Studio project, you can begin using them in your application. Open the *Global Display (raC-3-ME) Graphic Symbols - Power Device* or *(raC-3-SE) Graphic Symbols - Power Device*. Copy the desired launch button style and paste it into a display in your application where you would like to open the faceplate. For more information on graphic symbols, refer to the Graphic Symbols section of the specific device type chapter in this manual.



Alternatively, faceplates may also be launch from related instructions such as the navigate to device faceplate buttons in the Process Library PVSD faceplate or the Machine Builder Library raM_Dvc_Motor_VSD faceplate. Refer to Using the Power Device Library with PlantPAx® Applications or Using the Power Device Library with Machine Builder Applications for more information.

To configure the graphic symbol launch button, right-click and select *Global Object Parameter Values*. The Global Object Parameter values for the Backing Tag (#102) and Navigation Button Label (#104) are mandatory while the display position values (#120, #121) are optional. You can browse for the tag in your controller project by clicking '...' or manually type them in. These parameters may vary depending on the graphic symbol used, please refer to the Graphic Symbols section of the device type for detailed information.



These Global Object Parameter Values are automatically configured when you use Studio 5000® Application Code Manager to design and configure your project. Refer to Using Studio 5000® Application Code Manager for more information.

Using FactoryTalk® Optix

Download the Library

For the latest compatible software information and to download the Rockwell Automation® Library, see the [Product Compatibility and Download Center](#).

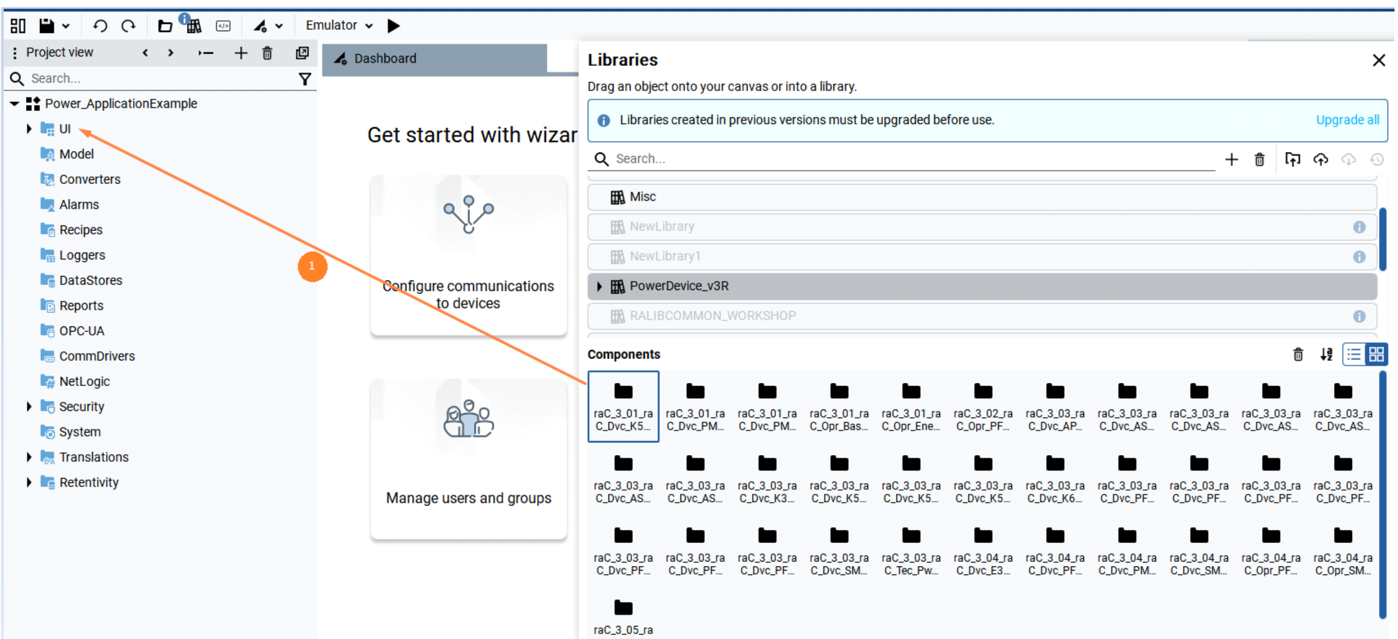
Search “Power Device Library” or filter on Application Content to quickly find the library.

Register FactoryTalk Optix Library

1. Run the provided Setup.cmd script or extract the downloaded zip file to the Windows user’s FactoryTalk Optix library directory, which by default is C:\Users\<UserName>\Documents\Rockwell Automation\FactoryTalk Optix\Libraries.
2. If you have FactoryTalk Optix Studio open on your computer, please close the application and reopen to ensure the library will be visible.

Import Library Objects in FactoryTalk Optix Project

1. Drag and drop the “raC_3_xx_raC_Dvc_ObjectName_UI” object to the UI folder of your project. *Shown as (1) below.*

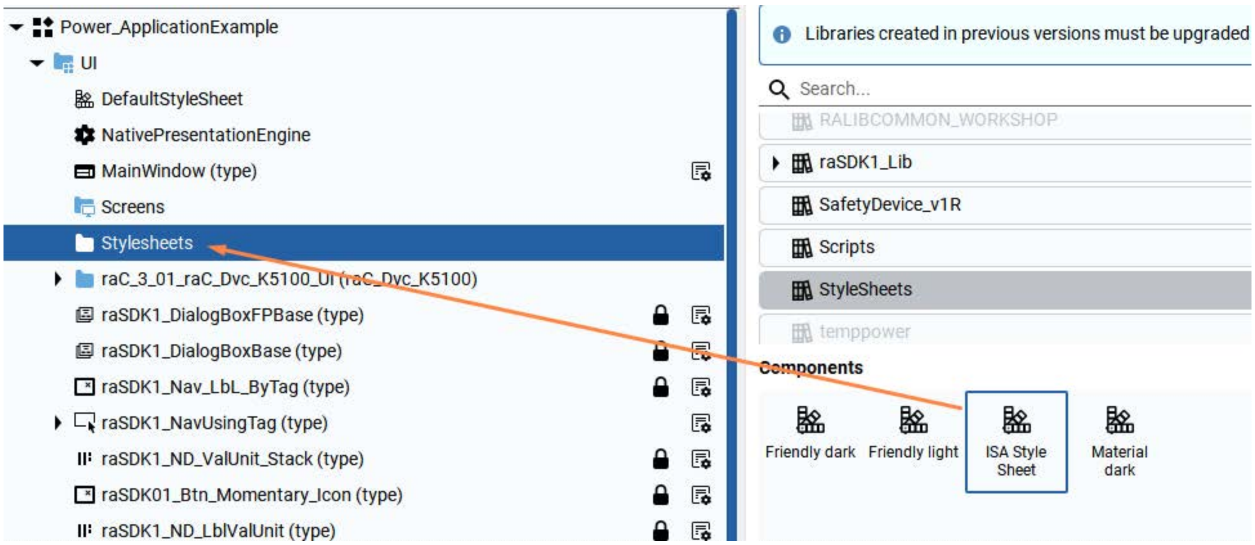


Using Style Sheets

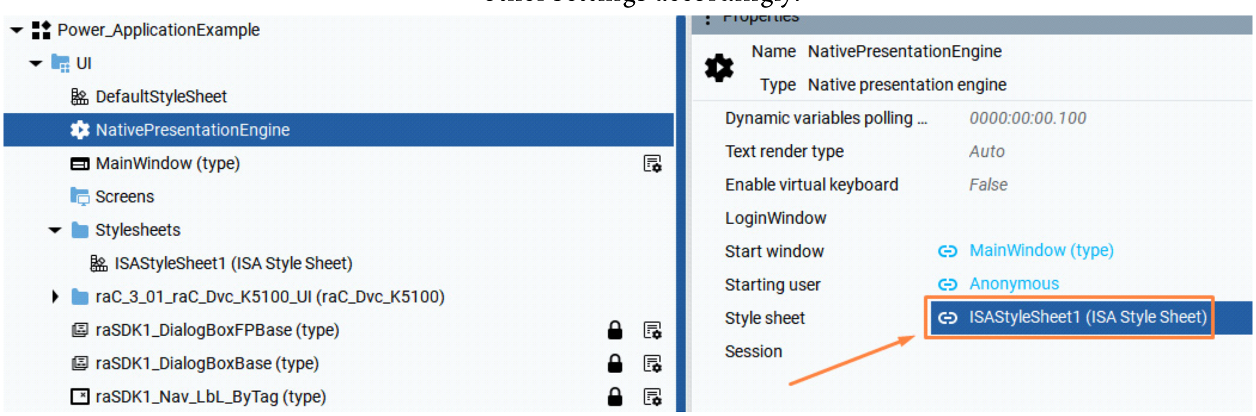
FactoryTalk Optix allows users to define custom style sheets or use ones provided in the Factoryalk Optix Libraries. It is recommended to use the provided “ISA Style Sheet” for a consistent look and feel across all FactoryTalk Optix libraries and displays. All screenshots of faceplates in FactoryTalk Optix contained in this manual use the ISA Style Sheet. Other style sheets may be applied; however, this will cause faceplates to appear differently and usability can be hindered in some cases for example where low-contrast colors or different sizes are chosen.

Use the following steps to import and set the ISA Style Sheet which comes with FactoryTalk Optix Studio in the StyleSheets library.

1. In FactoryTalk Optix Studio, drag and drop the “ISA Style Sheet” component from StyleSheets library to a location in your project.



2. In the PresentationEngine used in the Optix project (e.g. NativePresentationEngine), point the Style sheet property to the ISAStylesheet just imported. Update the Style Sheet’s Font size and other settings accordingly.

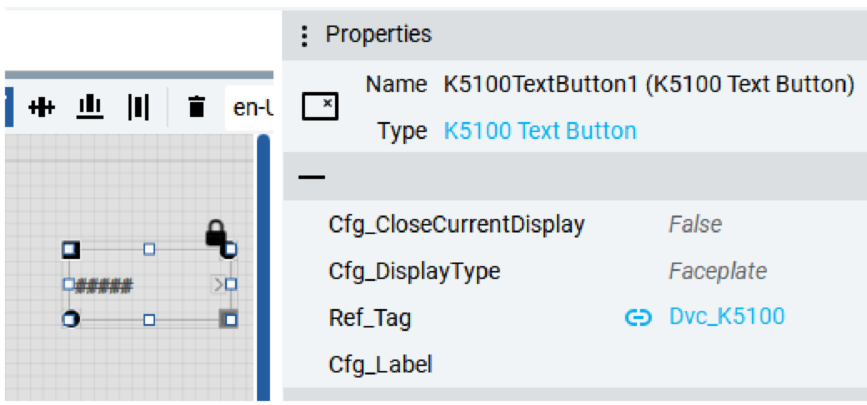


Configuring FactoryTalk Optix Objects

Once the Objects have been imported into the FactoryTalk® Optix Studio project, you can begin using them in your application. To add a new Launch Button to a Main window, navigate to raC_3_xx_raC_Dvc_ObjectName_UI > Graphic Symbols > raC_3_xx_raC_Dvc_ObjectName_GS_NavText Button to insert a navigation launch button with a text label.

After placing the graphic symbol on a UI panel, link the "Ref_Tag" property to the targeted Asset under Asset tag.

Text label shown on button can be configured using "cfg_Label" property, If it is not configured then description of the asset will be shown on the button face.



This is the only step needed to link the UI to the asset data model. For more information on graphic symbols, refer to the Graphic Symbols section of the respective device type in this manual.

Library Upgrades

Add-On Instruction Upgrades

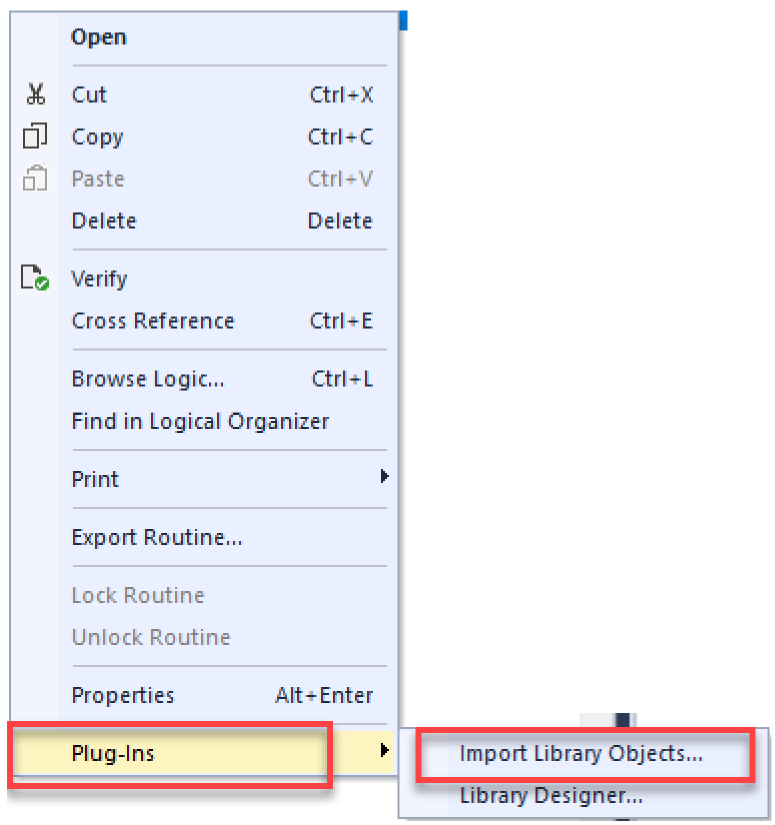
There are two methods to upgrading existing device object add-on instructions in a project. You can do this either by using the Studio 5000® Plug-In *Import Library Objects* Wizard or by importing individual add-on instruction AOI.L5X files. Using the Studio 5000® Plug-In *Import Library Objects* Wizard is the preferred method to reduce the risk of errors or compatibility issues. Both methods are described in the following sections.

Note that all updates to Add-On Instructions must be done with Studio 5000 Logix Designer® in OFFLINE mode and a download to the controller is required.

Upgrades Using Studio 5000® Plug-In to Import Library Objects

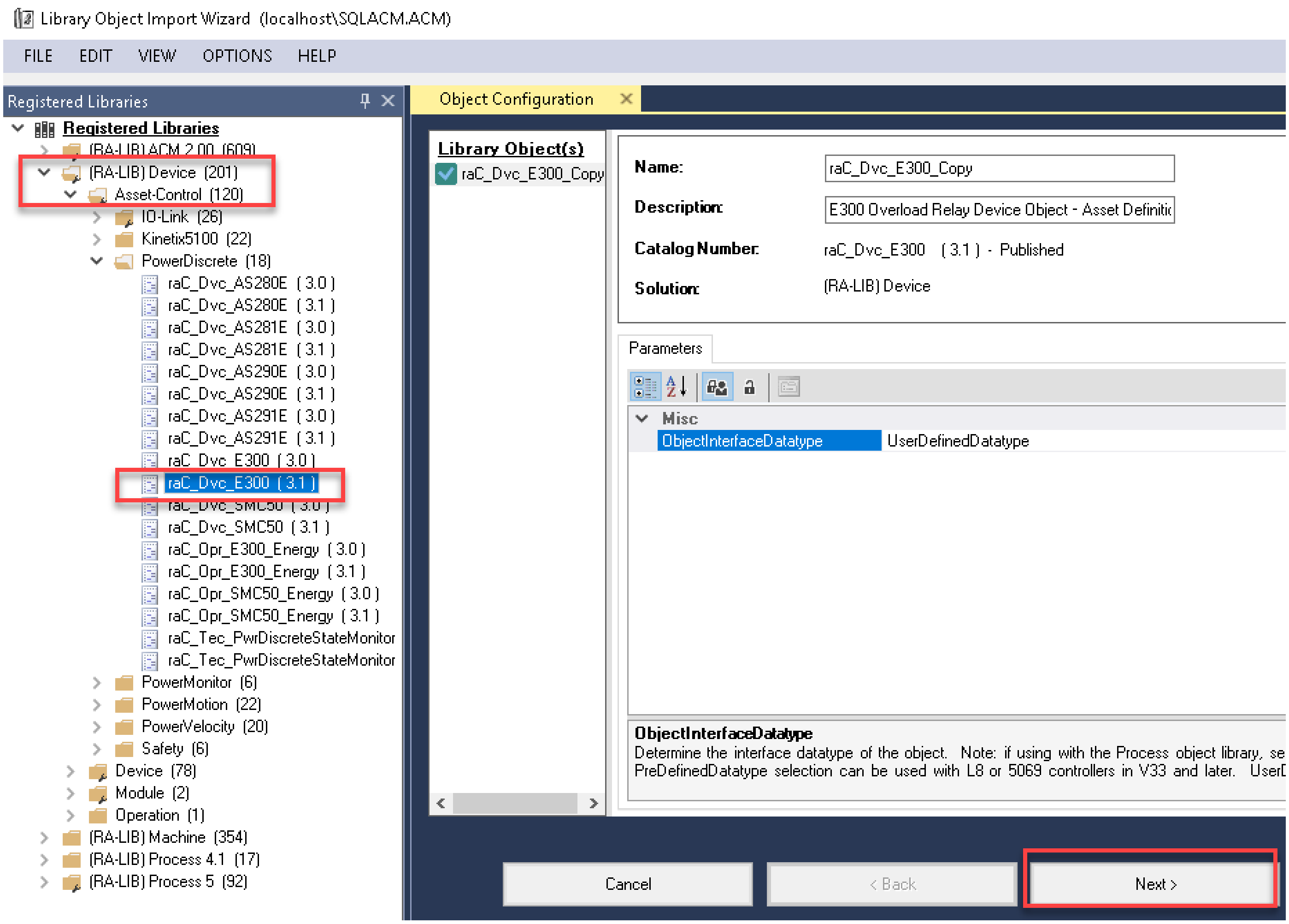
If Studio 5000® Application Code Manager is installed, you can use the Studio 5000® Plug-In *Import Library Objects* Wizard to update existing Add-On Instructions. For complete information on Studio 5000® Application Code Manager, refer to the section Using Application Code Manager.

Right-click in your controller organizer or within a routine to access *Plug-Ins > Import Library Objects...*

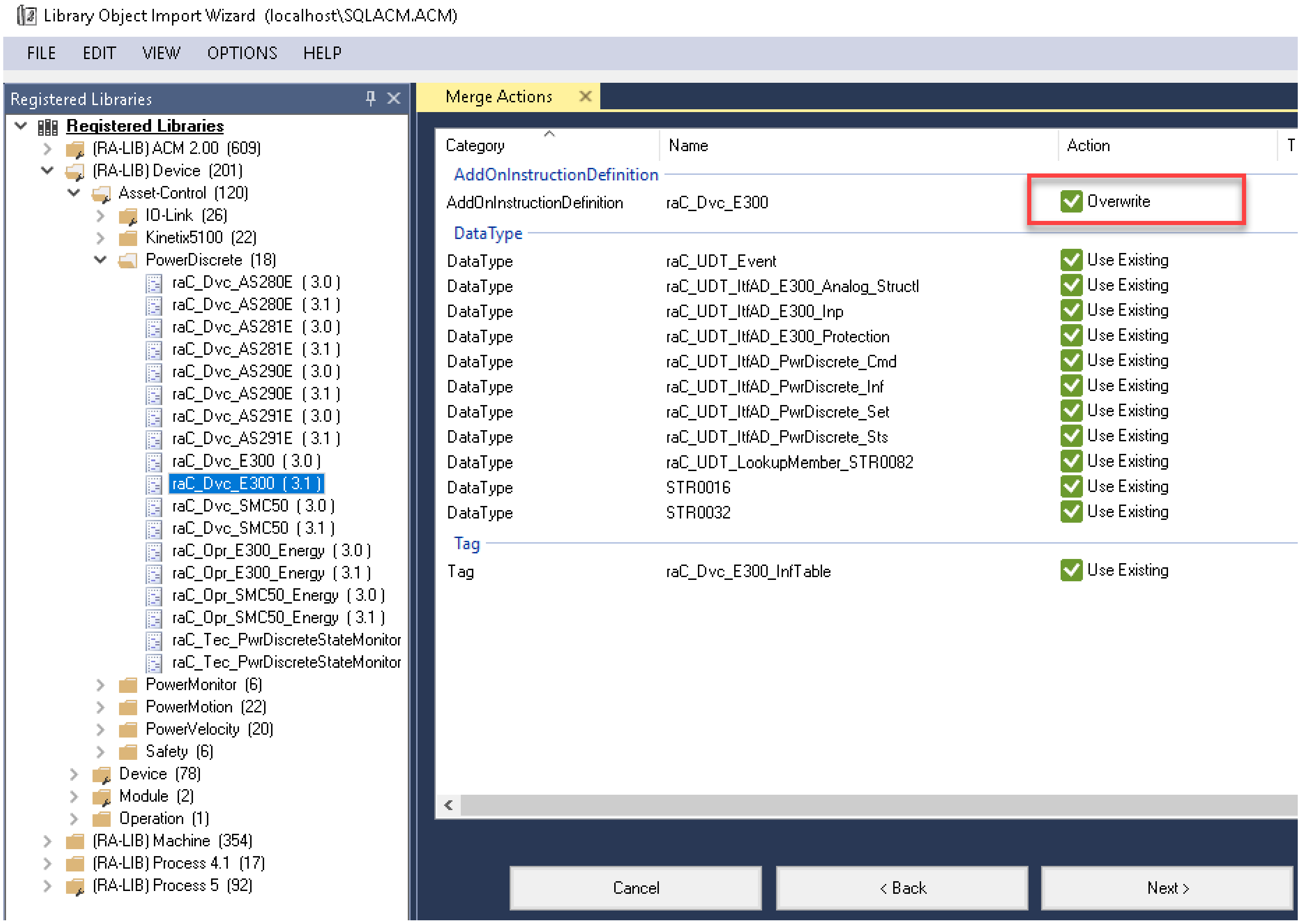


The *Library Object Import Wizard* dialogue window will open. Under *Registered Libraries* expend *(RA-LIB) Device > Asset-Control* and find the desired object and version. Drag the object into the *Object Configuration* window on the right.

Note for PlantPAx® 5.xx systems, ensure that *ObjectInterfaceDatatype* is set to *PreDefinedDatatype*, otherwise leave as *UserDefinedDatatype*. Click Next to continue.



In the *Merge Actions* window, select the *Action* for the *AddOnIntructionDefinition* to *Overwrite*. This will update any existing instance of the object to the newer version. You may also choose to overwrite any other DataTypes or Tags. Review the release notes of the latest library release to understand what may be impacted. Click next and finish to complete the process.



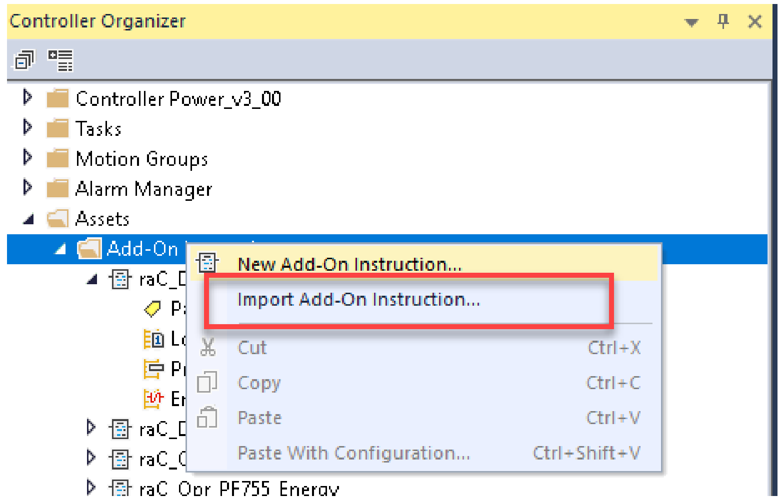
Upgrades by Importing AOI.L5X Files

To upgrade or migrate a project that uses a previous library version to a newer one, the add-on instruction L5X files are supplied.

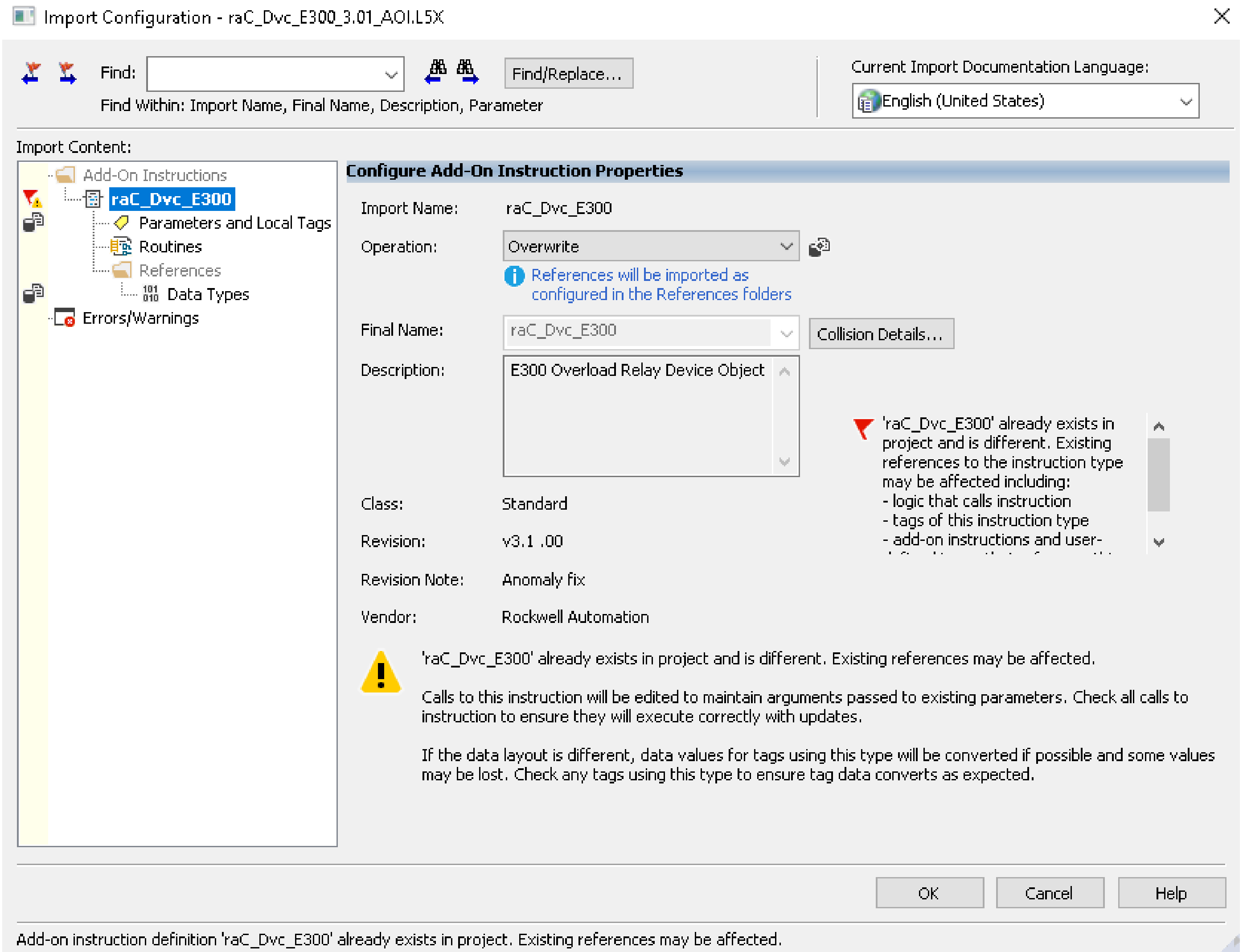
IMPORTANT In newly released versions of this library, it is possible that modifications or improvements have been made to items such as tags, faults tables, etc that are outside of the Add-On Instruction. To ensure all items are updated use the Studio 5000® Import Library Objects plug-in method or import RUNG.L5X files. Read the library release notes to understand what has been updated in the latest version of the library.

To perform an upgrade to an object perform the following steps:

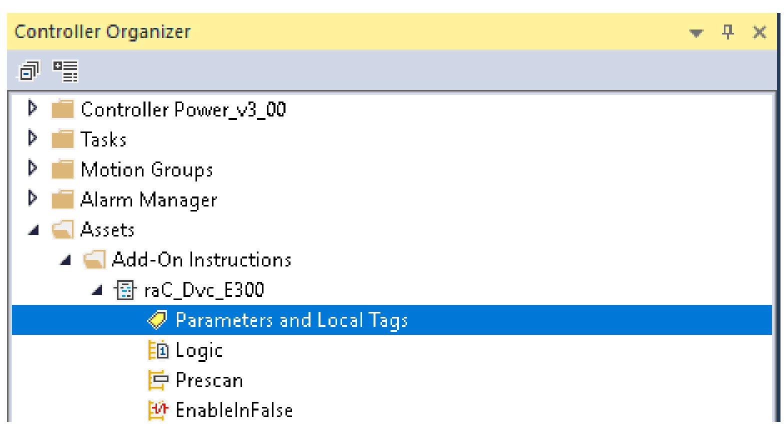
- Open the controller file. Note changes must be done offline.
- In the *Controller Organizer* pane right-click on *Assets > Add-On Instructions* and select *Import Add-On Instruction.* Navigate to the AOI.L5X file in the *Studio 5000 Logix Designer Files - L5X* and Open.



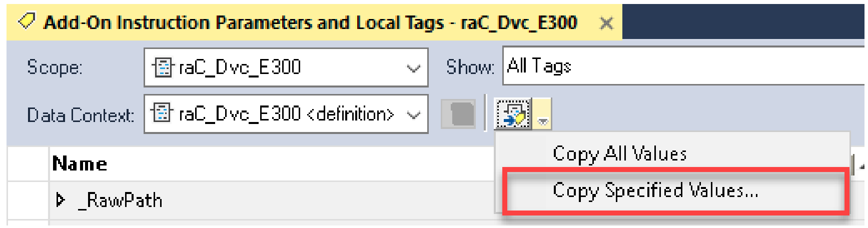
- You will be prompted that there is an existing version of the instruction that is different. Choose *Overwrite* as the operation and select OK once you have read and understood the warnings. Your existing logic will be updated with the new add-on instruction. Verify that your code compiles and test adequately.



- In order to ensure the HMI faceplate still works properly you will need to update the object's library information stored in the Inf_Lib tag. In the *Controller Organizer* pane under *Assets > Add-On Instructions* expend the device object that was updated. Double-click on *Parameters and Local Tags* to open up the instructions tags.



- In the *Add-On Instruction Parameters and Local Tags* window, you may notice that the Inf_Lib tag in the add-on instruction definition matches the new library revision number. Click on the down-arrow to the right of the copy button and select *Copy Specified Values...*



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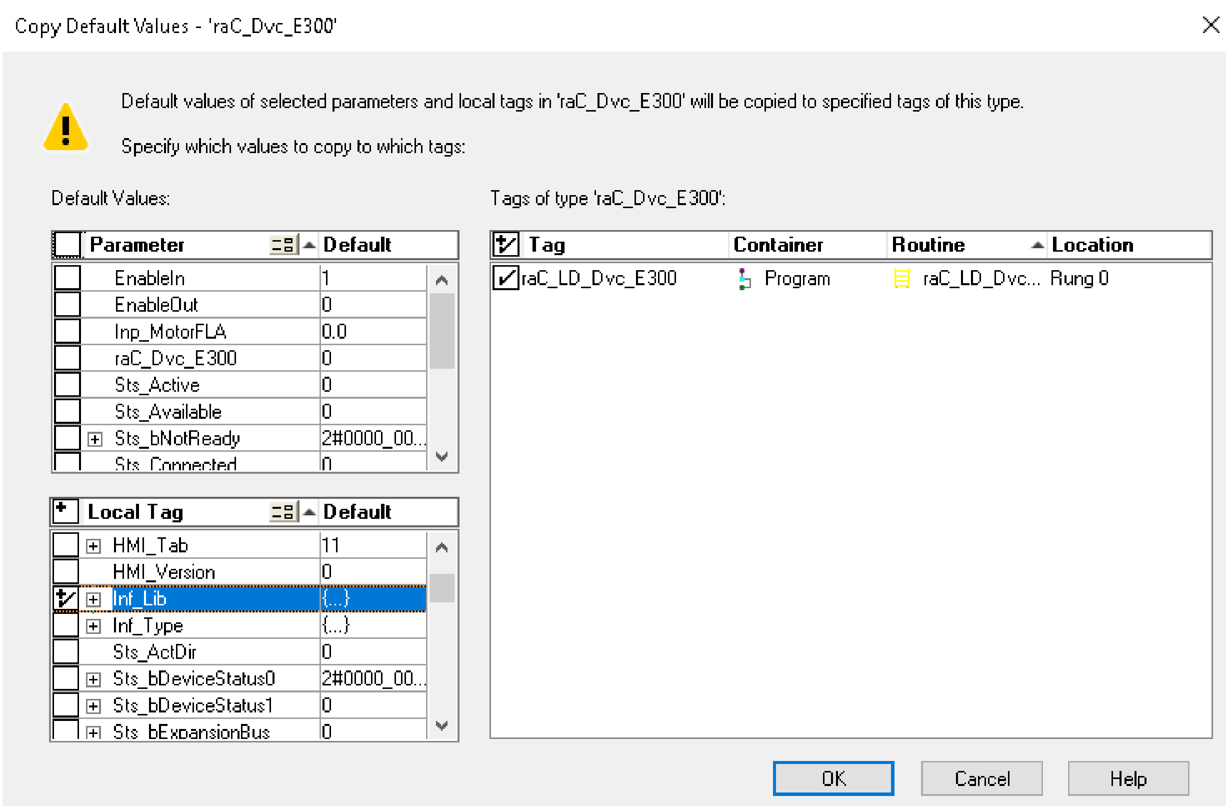
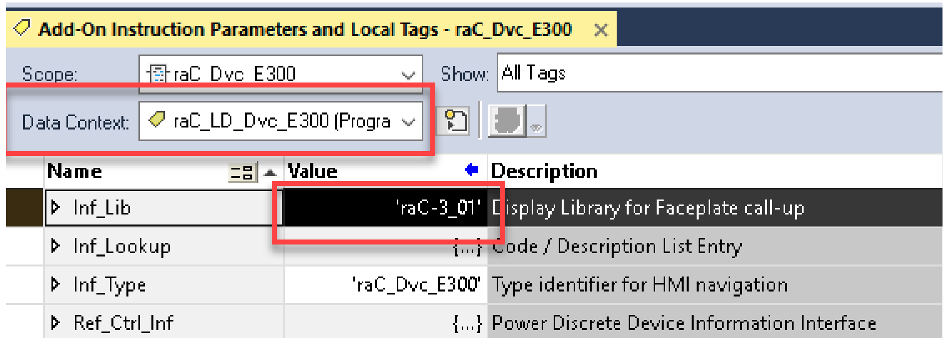


- In the *Copy Default Values* window, be sure to **first uncheck all Parameters and Local Tags** by clicking the +/- box in the top right. Failure to do so may result in overwriting settings in the existing objects.
- Check only *Inf_Lib* in the *Local Tag* area. On the right, all affected objects should be selected. Click OK.
- You can now confirm that the *Inf_Lib* tag has been updated to the current library (e.g. 'raC-3_01') by changing the *Data Context* drop-down to a specific device object.



FactoryTalk® View Upgrades

To upgrade a device object in a FactoryTalk® View ME/SE application, simply import the new faceplate .gfx display file into the application. If any global objects or images have been added or modified, you may need to import these as well. Any unused displays from previous versions may be removed or deleted from the application.

Note that the reference to the faceplate version is set in the Add-On Instruction Local Tag *Inf_Lib* so there does not need to be other modifications to the HMI application.

Studio 5000 View Designer® Upgrades

To upgrade a device object in a Studio 5000 View Designer® application, simply import the open the new View Designer .vpd file and copy the raC_Dvc_xxxxx_FP pop-up screen into the existing application. Find any graphic symbol launch buttons in the application that open the faceplate, and update the Action to open the new pop-up screen. Any unused pop-up screens from previous versions may be removed or deleted from the application.

FactoryTalk® Optix Library Upgrades

To upgrade a library object in a FactoryTalk® Optix application, simply import the new version of the library objects into the application from the template library. In the event that library objects or sub-components (such as used Types) are imported with the same name, choose “Replace All” during the import process to ensure you are using the most current versions of all types.

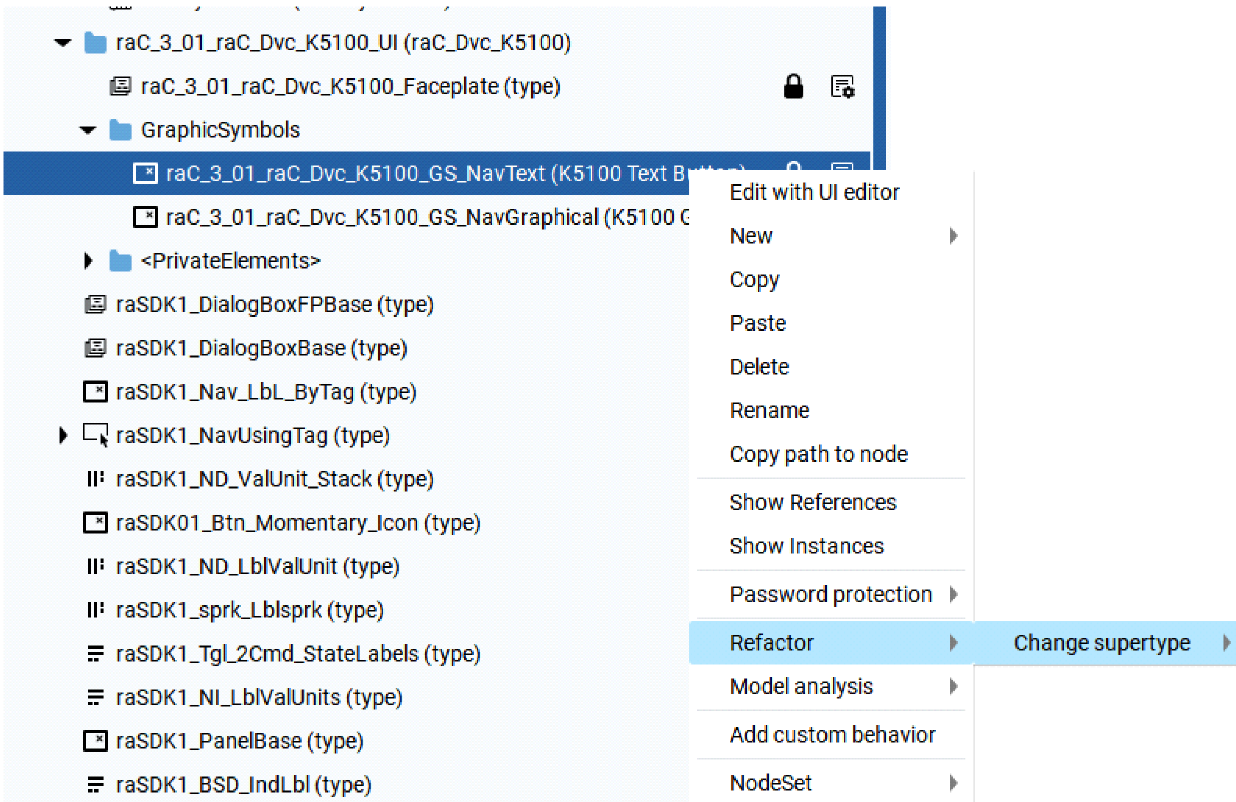
In the event that library objects are updated with a new version number, for example a graphic symbol launch button is updated from raC_3_01_raC_Dvc_ObjectName_GS to raC_3_02_raC_Dvc_ObjectName_GS, then existing instances of the graphic symbol will not be updated by default. Both versions of the object can exist simultaneously in the same application.

To update an object to a new version, you can use the refactor function. In order to use the refactor function, you must be running FactoryTalk Optix

Studio in "Advanced Mode". This can be enabled in FactoryTalk Optix Stuio Options and requires an application restart to take effect.

With Advanced Mode enabled, you can right-click on an object and select Refactor > Change Type. Select the new version of the desired type. Note that this function cannot be undone and should be handled with caution. This process is shown in the following screenshot.

ATTENTION: Refactoring types is irreversible can in some cases can lead to unexpected results. Ensure you create a back-up of your project prior to performing refactoring.



Using Active/Passive Mode

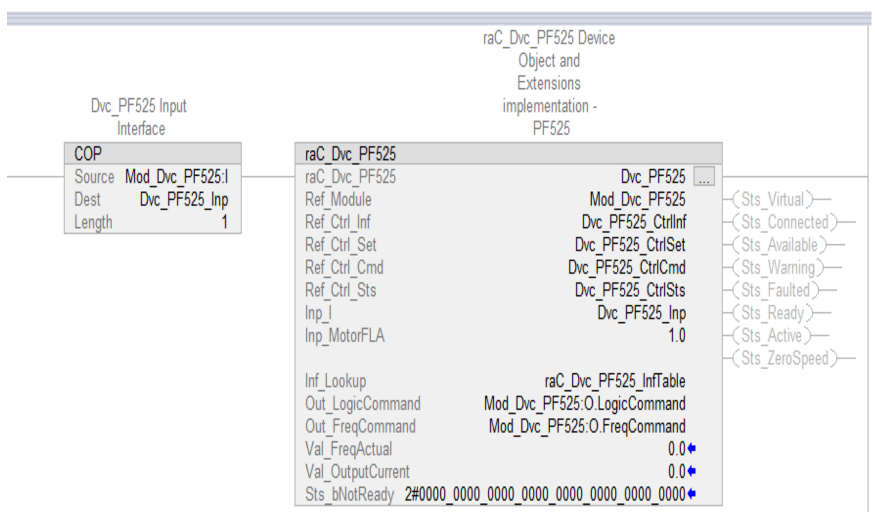
Power devices objects (discrete, velocity, motion) by default operate in Active Mode where they directly control the device module's activation and deactivation.

In some cases, users may want to alternatively use the power device object Add-On Instruction in a Passive Mode; exclusively monitoring the device status without writing to the device module's output tags and controlling the device.

Active Mode Configuration

Active Mode represents the standard operating mode for devices and objects within the system. In Active Mode, users have full control over the device's behavior and functionality. This includes the ability to jog the power device from the HMI faceplate, or activate the power device through the Ref_Ctrl_Cmd interface.

This default configuration is done by connecting the device Add-On Instruction's output tags (e.g. *Out_LogicCommand*, etc) to the device module output tags (e.g. *O.CommandData*, *O.LogicCommand*, *O.FreqCommand*, etc). This connection is done automatically when using Studio 5000 Application Code Manager, the Import Device Objects plug-in, or when importing the rung .L5X files. An example is shown below.



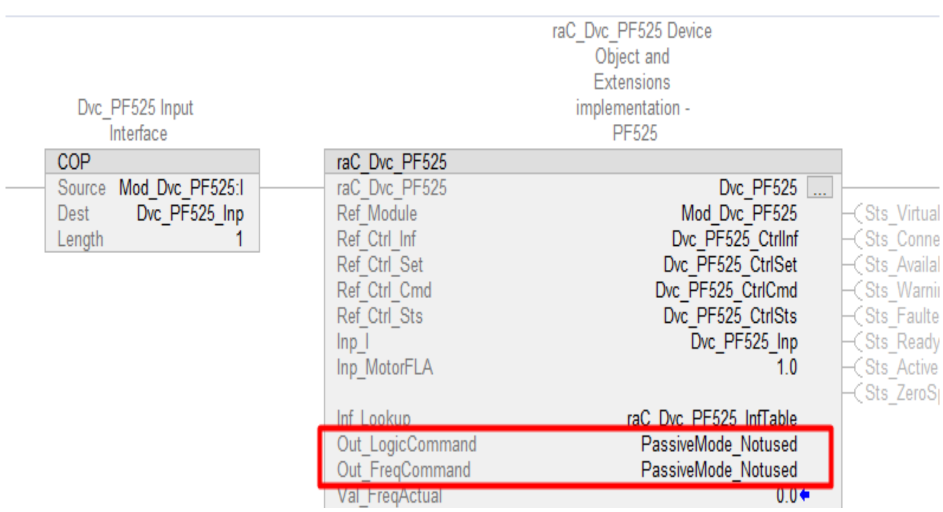
Passive Mode Configuration

Passive Mode is a configuration option designed to allow users to monitor the status and diagnostic information of a device without affecting its operation. This is particularly useful for situations where control is retained by existing systems: Users can leverage existing control strategies while still accessing valuable monitoring data.

In Passive Mode, the object will not actively control any output tags related to its in-out parameters. Instead, unused Placeholder Tags are used in place of the actual output control tags. This effectively removes the Device Object's ability to control the device behavior through these tags.

To configure Passive Mode, users can manually replacing the actual output control tags with unused Placeholder tags in the instance of the Add-on instruction. The following table shows the tags to be replaced for passive mode selection. It is recommended to use a meaningful tag name such as “PassiveMode_NotUsed” as shown in the following example to clarify to future programmers the purpose of the tag.

Device	Tag to be Replaced for Passive Mode Selection	Placeholder Tag
AS280E, AS281E	Out_LogicCommand	PassiveMode_NotUsed
AS290E	Out_LogicCommand_Run_Fwd Out_LogicCommand_ResetFault	PassiveMode_NotUsed
AS291E, E300	Out_LogicCommand_Run_Fwd Out_LogicCommand_Run_Rev Out_LogicCommand_ResetFault	PassiveMode_NotUsed
SMC-50, SMC-Flex	Out_LogicCommand Out_SlowSpeed	PassiveMode_NotUsed
AS284E, APF35, PowerFlex® 525/523[1], PowerFlex® 753, PowerFlex® 755, PowerFlex® 755T, PowerFlex® 6000T, PowerFlex® 7000	Out_LogicCommand Out_FreqCommand	PassiveMode_NotUsed
AS294E	Out_Run_Fwd Out_Run_Rev Out_ResetFault Out_FreqCommand	PassiveMode_NotUsed



Passive Mode restricts user interaction with the device module's output tags.

It is also recommended to set the bit *Inp_Ctrl_Sts.InhibitCmd* to '1' when using passive mode. This disables the Jog command button from the home tab of the faceplate to ensure there is no confusion created by configuring passive mode. An example of this is shown below.

Dvc_PF525_CtrlSet	{...}	{...}		raC_UDT_ItfAD_PwrVelocity_Set
Dvc_PF525_CtrlSet.bInhibit	1		Decimal	DINT
Dvc_PF525_CtrlSet.InhibitCmd	1		Decimal	BOOL
Dvc_PF525_CtrlSet.InhibitSet	0		Decimal	BOOL
Dvc_PF525_CtrlSet.InhibitCfg	0		Decimal	BOOL
Dvc_PF525_CtrlSet.Speed	0.0		Float	REAL

Using Application Code Manager

Overview of Application Code Manager

Studio 5000® Application Code Manager is a tool that enables more efficient project development with libraries of reusable code. Application Code Manager creates modular objects with customizable configuration parameters using the reusable content. Application Code Manager can also create the associated visualization, historical and alarming elements for a project.

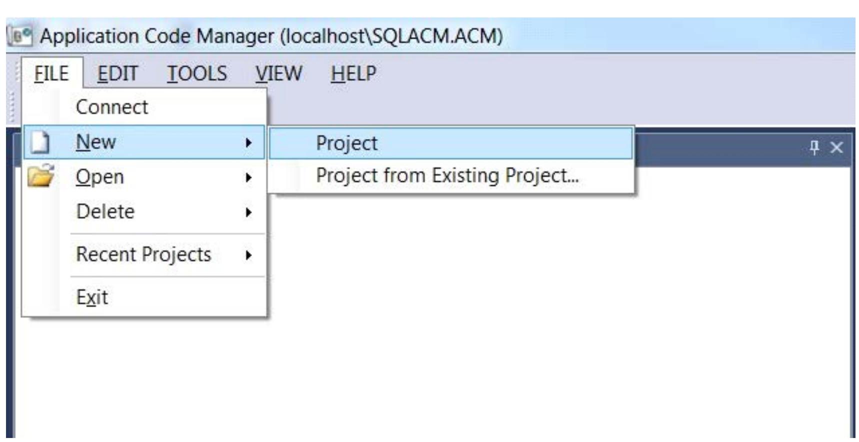
Studio 5000® Application Code Manager can be easily used along with Rockwell Automation® application code libraries such as the PlantPAx® Process Objects Library, Machine Builder Library, and Device Object Libraries. For more information on Studio 5000® Application Code Manager, refer to the Application Code Manager User Manual.

Creating a New Project

Begin by opening Application Code Manager.

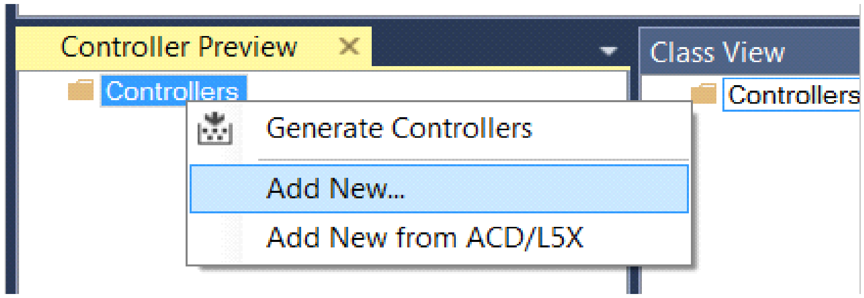
Note: the last project (if any) is opened by default; otherwise a blank screen is displayed.

Create a New Project or open an existing project. Navigate to *File > New > Project*.



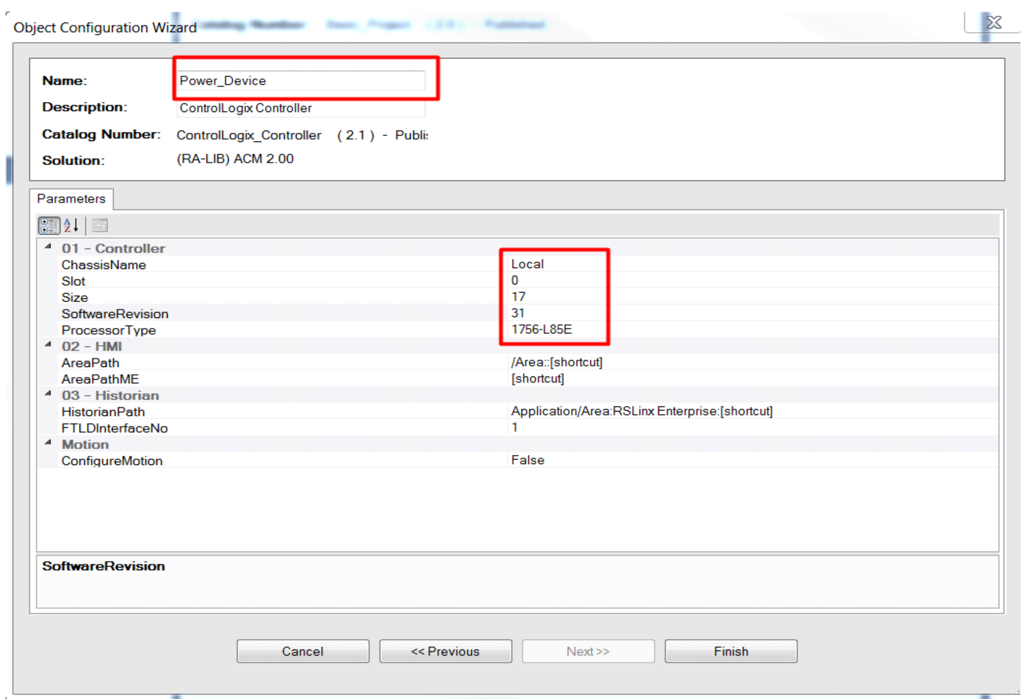
Select the desired project type (e.g. *(RA-LIB) ACM 2.00 Project - Basic_Project*) and fill in the *Name* and *Description*.

To add a new controller to a project, in the *Controller Preview* window, right-click on *Controllers* and select *Add New...*

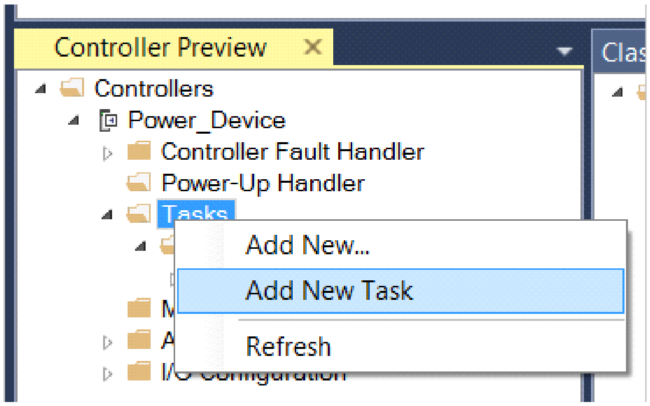


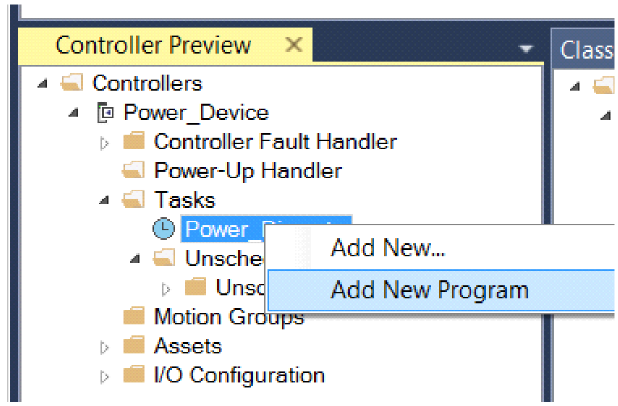
Select the desired controller type (e.g. *ControlLogix_Controller* or *Process_Controller*). Enter a *Name* and *Description* for the controller. Select the appropriate Chassis and Processor configurations.

You can also configure the HMI *AreaPath* and.or *AreaPathME* parameters which will be referenced if you use Application Code Manager to generate FactoryTalk® View ME/SE displays with graphic symbol launch buttons.



You can now add in any desired tasks and programs to your controller. Right-Click on the *Tasks* folder underneath your controller in the *Controller Preview* and *Add New Task*. Similarly, right-click on any Task and select *Add New Program*. Note that if the controller type selected was *Process_Controller* then your project will start with the standard PlantPAx® task model. Complete the desired parameters for Tasks and Programs such as name, type, period, etc.

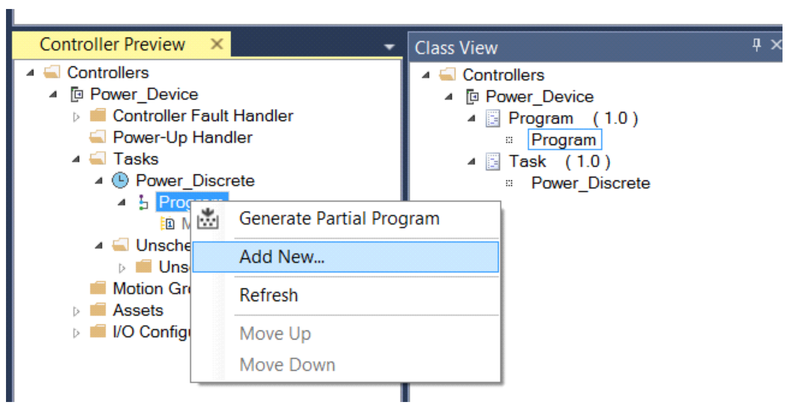




Adding & Configuring Device Objects

Prior to adding in any Device Objects, ensure you have registered the library in Application Code Manager. Refer to [Registering Libraries in Studio 5000® Application Code Manager]() for details.

To add a Device Object into a project, right-click on a Program and *Add New...*

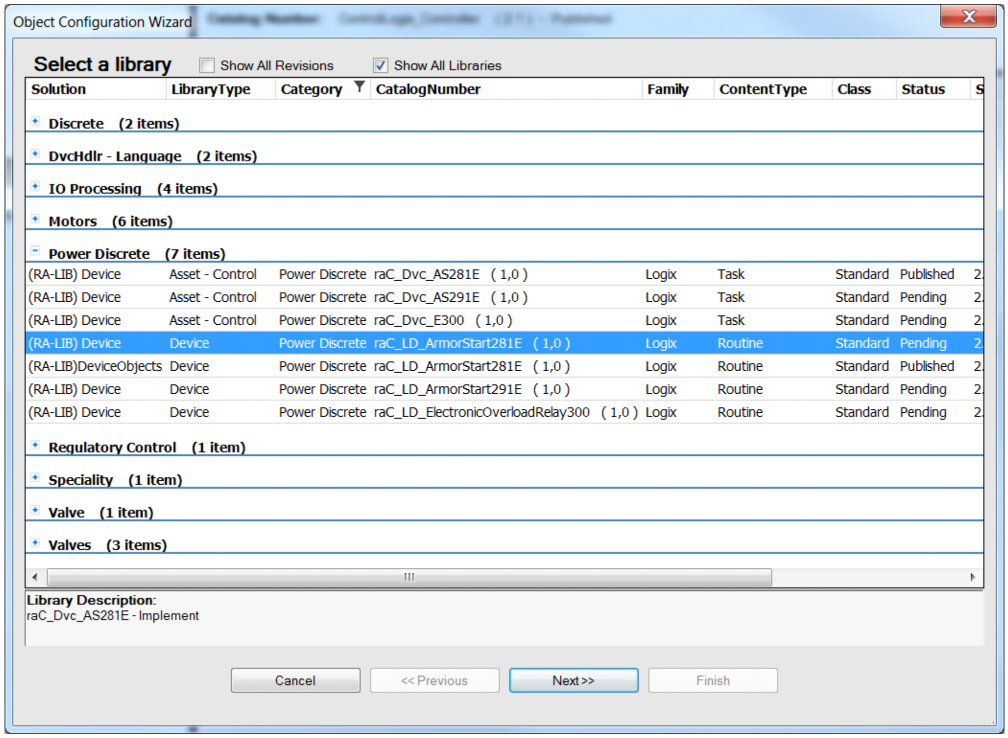


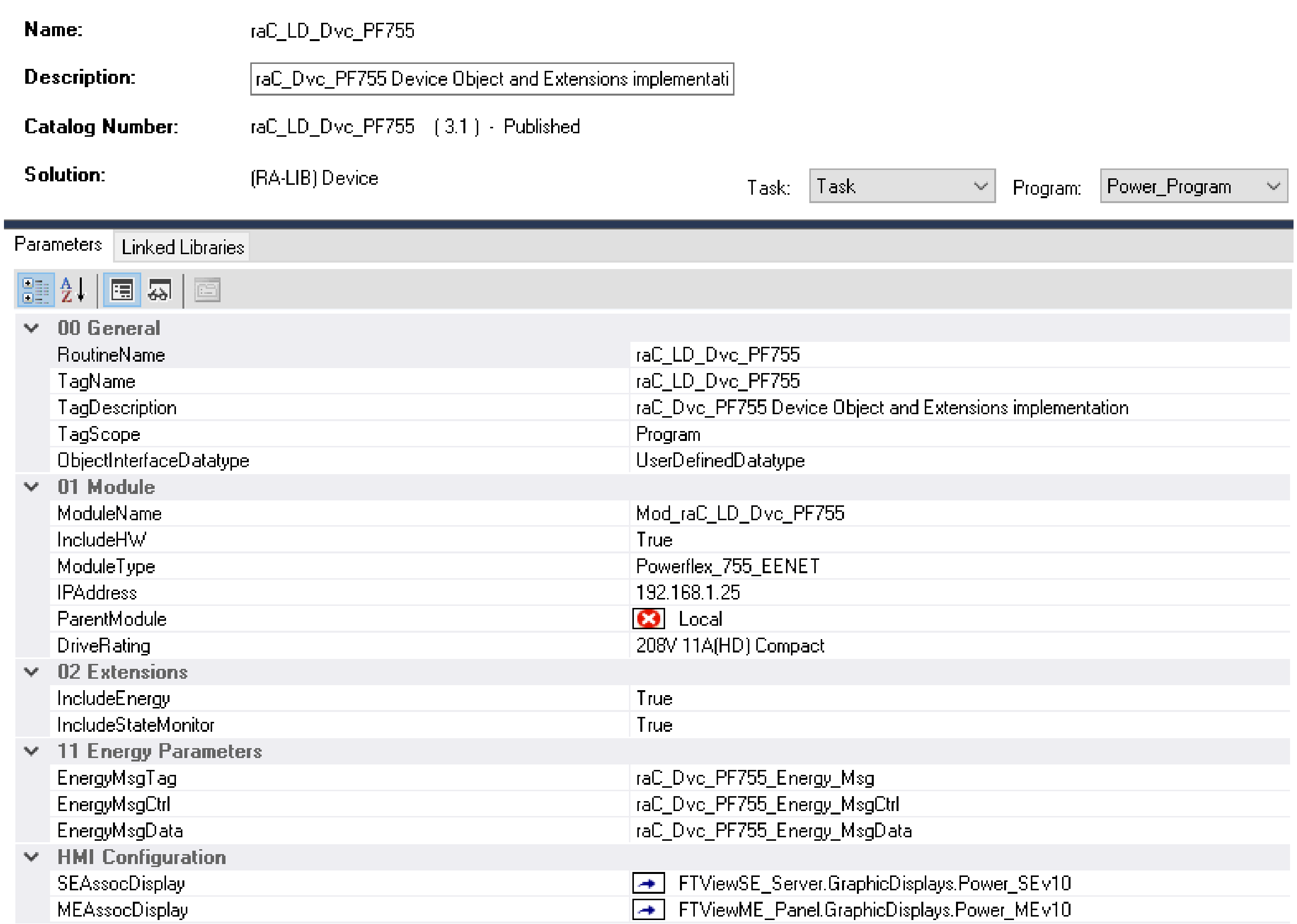
Select the Device Object that you wish to import. Note that you should select the *Device* library type rather than the *Asset - Control* library type (e.g. raC_LD_ArmorState281E) where LD stands for Ladder Logic.

Fill in all of the required configuration parameters for the device object. The following example shows a configuration of the raC_LD_Dvc_PF755 object.

General instructions for power device objects may include:

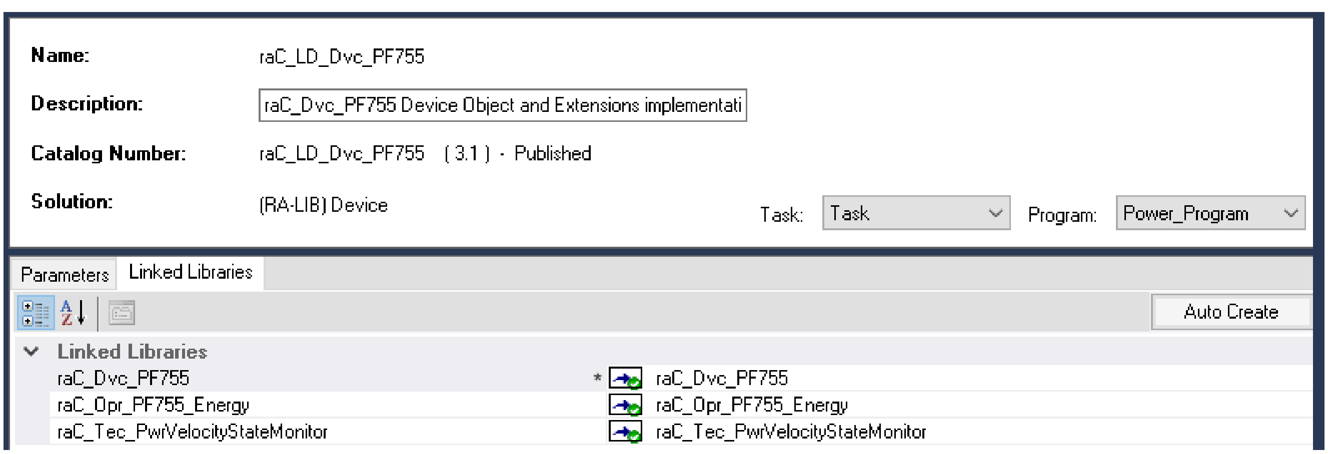
- Enter a **name** and **description**. Maximum name length can be 22 characters. Note that other parameters such as the RoutineName, TagName, etc will auto-complete based on these fields.
- Assign the **Task** and **Program**.





- Choose the **TagScope**:
  - Program Scoped Tags
  - Controller Scoped Tags

- Choose the **ObjectInterfaceDatatype**:
  - UserDefinedDatatype: Use with standard applications (not PlantPAx® 5.xx)
  - PreDefinedDatatype: Use with PlantPAx® 5.xx applications. Selecting this option will use Revision 10.xx Power Device Library object instructions which reference pre-defined datatypes that are only available in 5580 ControlLogix® and 5380/5480 CompactLogix controllers with firmware version 33+. These pre-defined datatypes are references by PlantPAx® 5.xx instructions such as PVSD and PMTR.
- Assign the Module (associated hardware e.g. PowerFlex® drive)
  - Set **IncludeHW** to True if you would like the wizard to add a new module (e.g. PowerFlex® Drive) to your hardware tree. Set this to False if you already have the module pre-existing in your hardware tree.
  - Set the **ModuleName**. If IncludeHW is false, set this to the name of the existing module. If IncludeHW is true, set this to the desired name of the module that will be created.
  - Select the **ModuleType** and **DriveRating** (if applicable) to the desired model that matches the installed device.
  - Set the **IPAddress** to the IP Address of the device.
  - Set the **ParentModule** to name of the network card that the device is connected to. If using the embedded Ethernet port of the processor module, leave as Local.
- Configure the desired extensions:
  - If **IncludeEnergy** is set to True, the raC_Opr_xxx_Energy object will be added and configured.
  - If **IncludeStateMonitor** is set to True, the raC_Tec_Powerxxx_StateMonitor object will be added and configured. Note that PlantPAx® users should set this to False and instead refer to the PRT (process run time and start counter) instruction.
- For HMI Configuration refer to Configuring Displays.



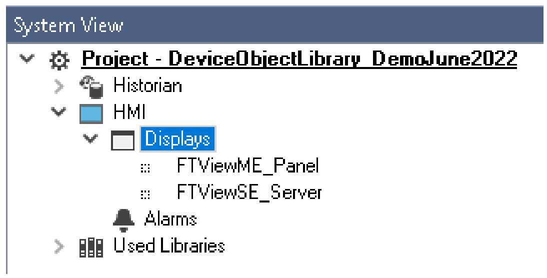
- Click on the *Linked Libraries* tab. Click the *Auto Create* button to automatically create all of the required linked libraries.
- Click Finish to complete the import.

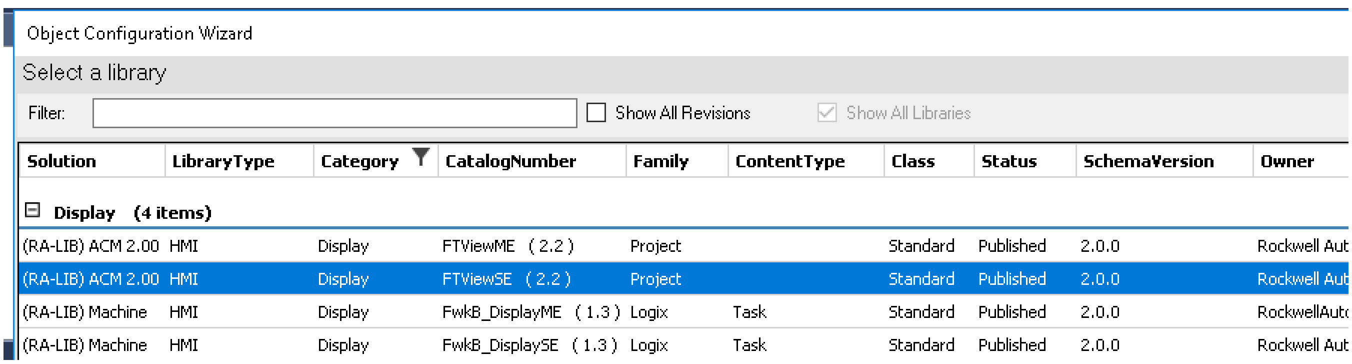
For specific devices details, refer to the appropriate chapter in this manual.

Configuring Displays

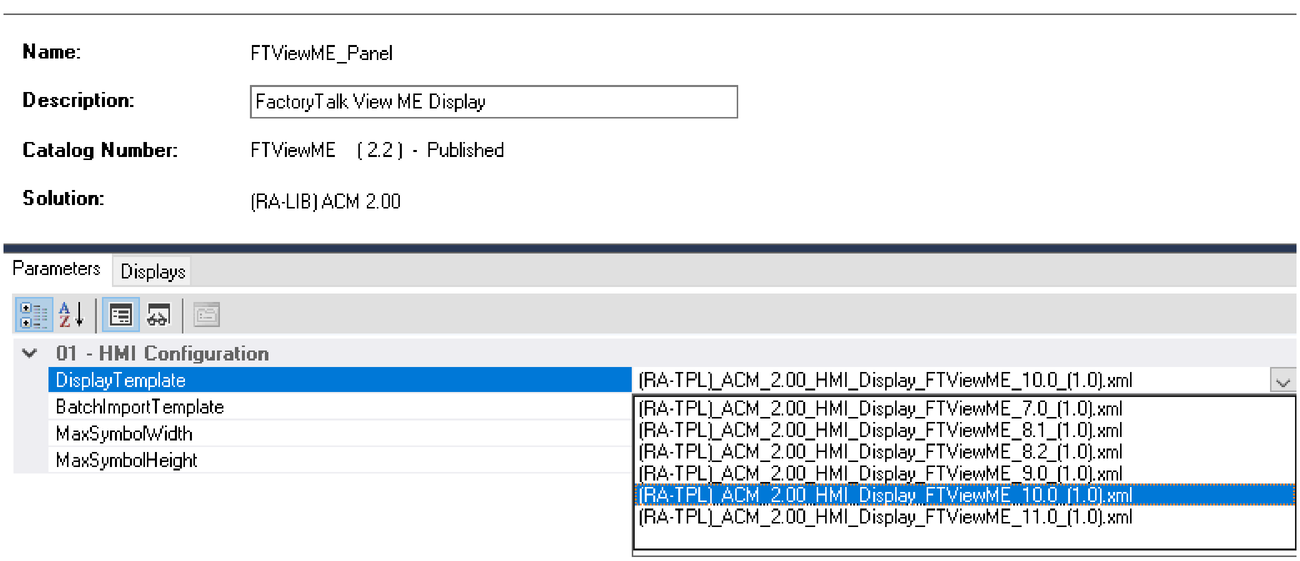
Application Code Manager can be used to automatically configure graphic symbol launch buttons for device objects In FactoryTalk® View ME or SE. Note that Application Code Manager is not compatible with Studio 5000 View Designer® applications.

First you must add Displays to your project. Under the *System View* panel expand *HMI* and right-click on *Displays* to select *Add*. Choose the type of display (e.g. *FTViewME* or *FTViewSE* depending on your project requirements.

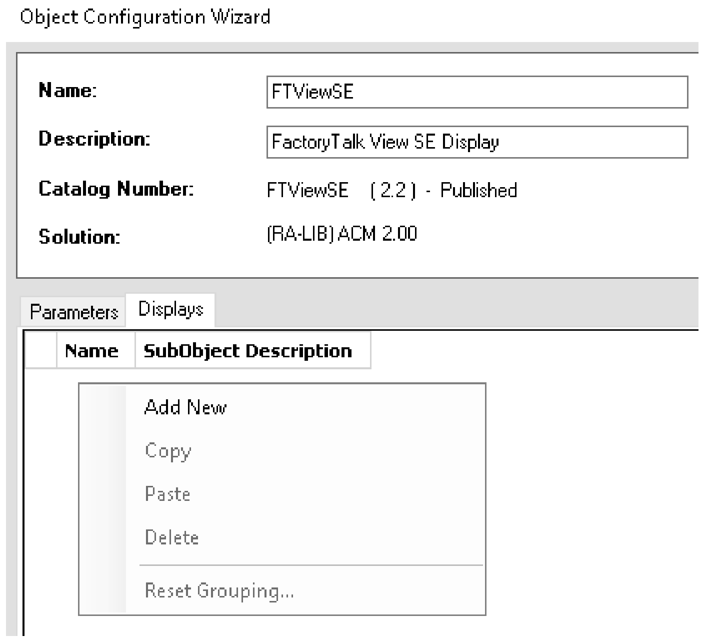




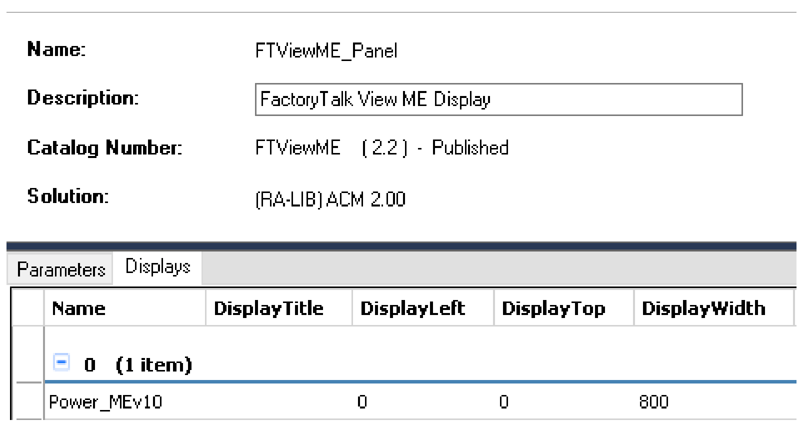
In the display object parameter configuration, you must select the *DisplayTemplate* type to match the version of FactoryTalk® View application that you are using.



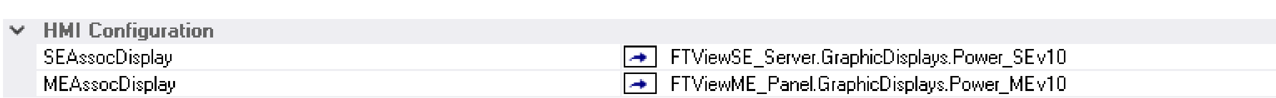
Navigate to the *Displays* tab where you can right-click and *Add New* display.

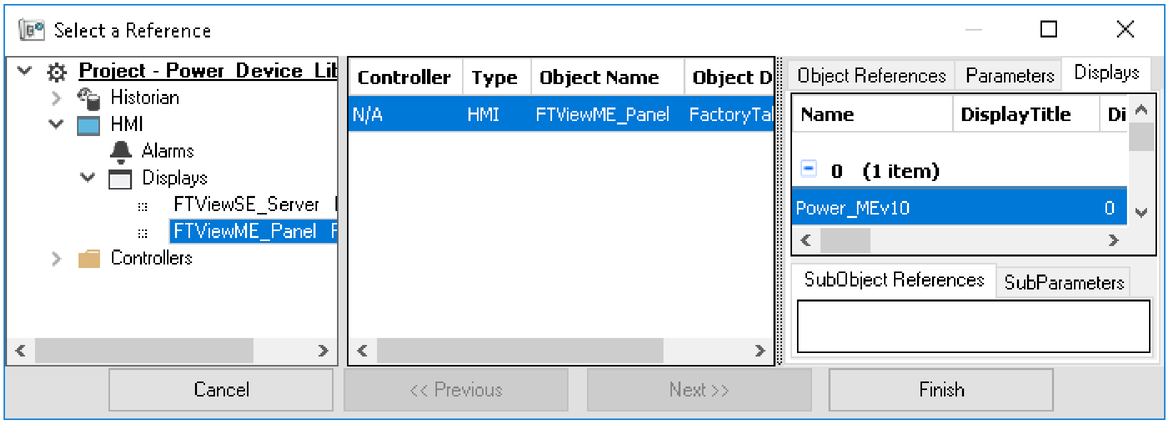


Set the desired name and display parameters. Generally all display parameters aside from *Name* can be left as default since this will often be used as a temporary display where object launch buttons are copied from.



Return to your device object configuration and view the *HMI Configuration* section of the parameters. You can browse or type in the HMI_Server_Name.HMI_Display_Name.



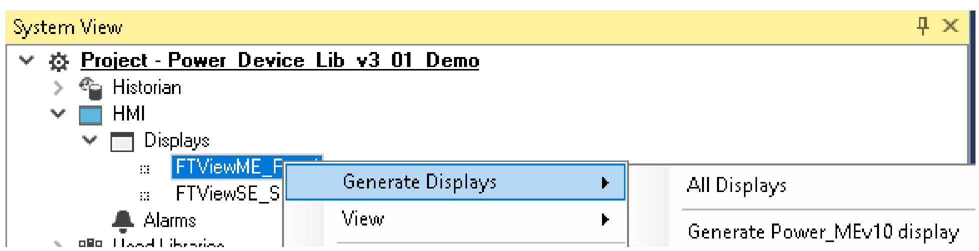


If you browse for the display, select the desired display server in the left panel, then click on the *Display* tab in the right panel and select the specific display. Click finish.

This workflow can be followed for either FactoryTalk® View ME or SE depending on the project requirements.

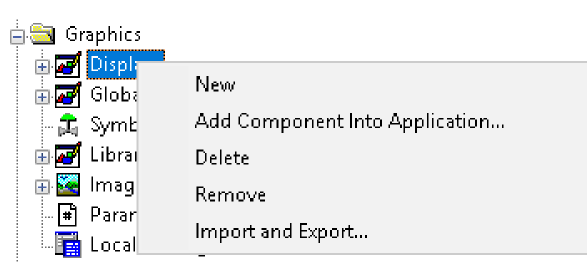
Generating Displays

Once you have assigned displays to all of the device objects, you can generate the displays. In the *System View* highlight the desired display server under *HMI > Display* and right-click to select *Generate Displays > All Displays* or select individual displays. Choose a place to save the generated files and take note of it.



Importing Displays into FactoryTalk® View Studio

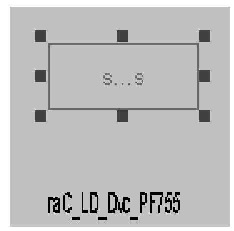
To import the configured displays, open your FactoryTalk® View ME/SE project in FactoryTalk® View Studio. Right-click on *Graphic > Displays* and select *Import and Export...*



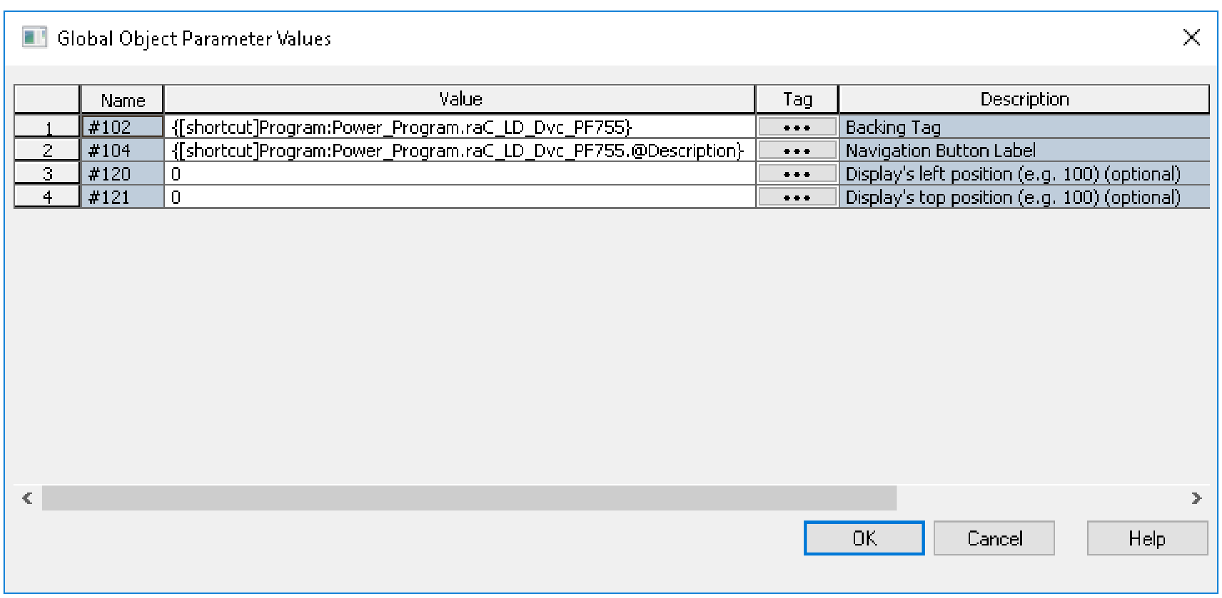
Follow the required prompts:

- Import graphic information into displays
- Choose whether or not to backup displays
- Choose either a *Single display import file* (must have an existing or blank display to import into) or *Multiple displays batch import file* if *All Displays* was used to Generate Displays.
- If this is the first time it is recommended to import *Multiple displays batch import file* and then *Create new objects on the display*.
- If you have done this before and are updating the imported display after modifying your Application Code Manager project, you can choose *Update existing objects on the display*.
- Browse for the BatchImport.xml file or individual display.xml file.

Open up the newly imported display. Notice that there are graphic symbol launch buttons labeled and configured for each item that was configured in Application Code Manager.



Right-click on the object and select *Global Object Parameters* to view that all of the parameters have been pre-configured for you.

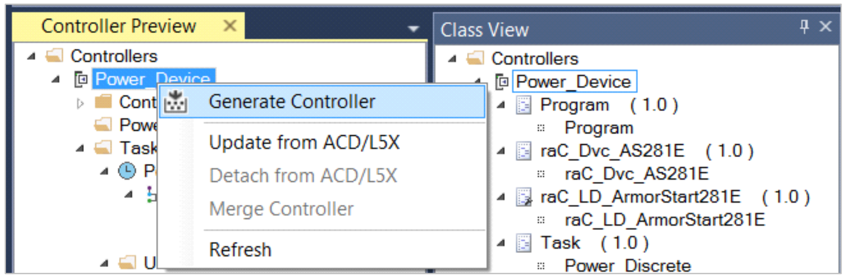


You may not copy and paste this graphic symbol onto any other display in your application.

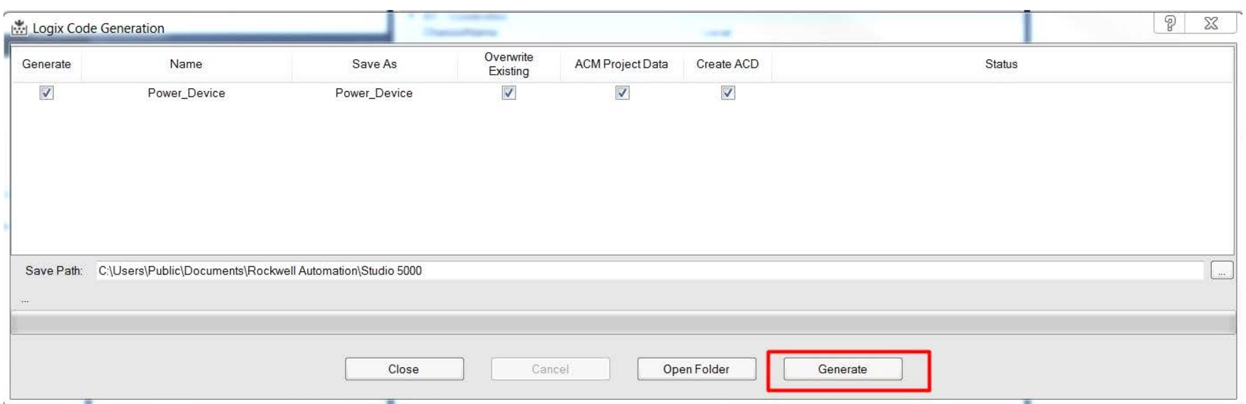
Generating Controller Files

Once you have completed configuring your project in Studio 5000® Application Code Manager, you can generate the controller file for use in Studio 5000 Logix Designer®.

In the *Controller Preview* pane right-click on the controller name within the *Controllers* folder and select *Generate Controller.*



In the *Logix Code Generation* dialogue window you will need to check *Create ACD*. You ma also need to check *Overwrite Existing* if this is not the first time generating the controller code.



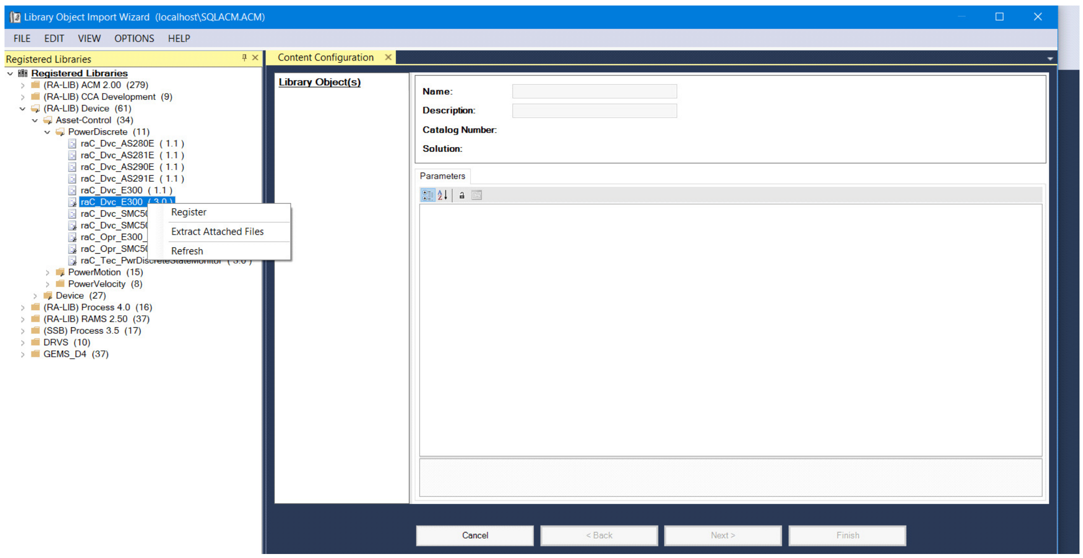
Once the controller file is generated, you can navigate to the location set in *Save Path* and open your file. Note that all of the configuration that was done in Application Code Manager is now shown in your Studio 5000 Logix Designer® ACD file.

Exporting Attachments

Application Code Libraries not only contain Logix code, but also contain Visualization collateral and associated documentation. Every Asset library contains at least a reference manual (RM). Those libraries which have associated Visualization content also have all required global objects (GO), images, static displays and View Designer applications added as attachments. In this manner the user can generate only the necessary visualization and documentation for the objects included in the project.

In Application Code Manager, all of the attachments are associated with the device objects in the *(RA-LIB) Device > Asset-Control* folder. These can be accessed both through the full Application Code Manager software, or via the Studio 5000® Plug-In “Import Library Objects”.

To access the attached files, right click on the objects (e.g. raC_Dvc_E300) and select *Extract Attached Files*.



Select the destination folder on your computer, and select OK. An Extract Attachments dialog will show the extraction status.

The extracted folder will contain the following:

- Reference Manual
- Required Images
- Studio 5000 View Designer® Faceplate Files
- FactoryTalk® View Machine Edition Display
- FactoryTalk® View Machine Edition Global Objects
- FactoryTalk® View Site Edition Display
- FactoryTalk® View Site Edition Global Objects.

Using the Power Device Library with Other Application Code Libraries

Application Code Libraries

The Power Device Library is commonly used alongside other Application Code Libraries. Commonly the Machine Builder Library and PlantPAx® Process Object Library application-level library objects are used interact with the device-level objects in the Power Device Library.

Other libraries utilize the common device interface UDTs to interact with device level objects. This is covered in detail in Interfaces section of this document.

Using Power Device Objects with PlantPAx® Process Objects Library

The Power Device Library is compatible with PlantPAx® v5.xx. Power Discrete and Power Velocity Objects are commonly paired with PMTR (Motor) and PVSD (Variable Speed Drive) instructions respectively. This is beneficial when a PlantPAx® system includes Allen-Bradley® power equipment such as PowerFlex® drives and E300™ Electronic Overload Relays to easily integrate devices and provide detailed device diagnostics to operators and maintenance staff.

To easily integrate Power Device Objects with Process Object instructions you can either use Application Code Manager or import Control Strategies from the Process Library. Control Strategies containing Power Device Objects were introduced in Process Library v5.00.04. Control Strategies are found in the PlantPAx® Process Library under */Process Library/Control Strategies - L5X/* and have folder names like CS_PVSD_PF525. Inside of each Control Strategy folder you will find two routine files:

- FBD Routine for the process object PVSD/PMTR (e.g. (RA-LIB)CS_PVSD_PF525_5_00-03_ROUTINE.L5X)
- LD Routine for the power device object (e.g. (RA-LIB)CS_PVSD_PF525_LD_raC_Dvc_PF525_5_00-03_ROUTINE.L5X)

PlantPAx Process Library v5.10.00 and earlier only support FactoryTalk View SE as an HMI platform. PlantPAx® Process Library v5.10.01 and later includes support for Studio 5000 View Designer®. Note that when using PlantPAx objects with the Power Device Library in Studio 5000 View Designer you cannot navigate directly from Process Library objects faceplates (PMTR, PVSD) to Power Device Library object faceplates. At this time, the PlantPAx Process Library v5.xx is not supported on FactoryTalk View ME or FactoryTalk Optix.

For previous versions of PlantPAx® (e.g. 4.xx) do not use the Power Device Library. Instead use the included objects such as P_E3000vld, P_PF52x, P_PF753, P_PF755, P_SMC50, etc.

The following table shows the compatible PlantPAx® Process Objects and Control Strategies with Power Device Objects.

Power Device Type	Process Object	Process Control Strategies	Compatible Power Device Object	Device	Compatible Extension Objects
Power Discrete	PMTR Motor	CS_PMTR_1S_E300 CS_PMTR_1S_E300_Energy CS_PMTR_2S_E300 CS_PMTR_2S_E300_Energy CS_PMTR_REV_E300 CS_PMTR_REV_E300_Energy	raC_Dvc_E300	E300™ Electronic Overload Relay	raC_Opr_E300_Energy
		CS_PMTR_1S_SMC50 CS_PMTR_1S_SMC50_Energy	raC_Dvc_SMC50	SMC™-50 Soft Starter	raC_Opr_SMC50_Energy
			raC_Dvc_SMCFlex	SMC™-Flex Soft Starter	raC_Opr_SMCFlex_Energy
			raC_Dvc_AS280E	ArmorStart® 280E	
			raC_Dvc_AS281E	ArmorStart® 281E	
			raC_Dvc_AS290E	ArmorStart® 290E	
			raC_Dvc_AS291E	ArmorStart® 291E	
Power Velocity	PVSD Variable Speed Drive	CS_PVSD_PF525 CS_PVSD_PF525_Energy CS_PVSD_PF525_Hand	raC_Dvc_PF525	PowerFlex® 525	raC_Opr_PF525_Energy
		CS_PVSD_PF753 CS_PVSD_PF753_Hand	raC_Dvc_PF753	PowerFlex® 753	
		CS_PVSD_PF755 CS_PVSD_PF755_Energy CS_PVSD_PF755_Hand	raC_Dvc_PF755	PowerFlex® 755	raC_Opr_PF755_Energy
			raC_Dvc_PF755T	PowerFlex® 755T	raC_Opr_PF755T_PM
			raC_Dvc_PF6000T	PowerFlex® 6000T	
			raC_Dvc_PF7000	PowerFlex® 7000	
			raC_Dvc_APF35	Armor PowerFlex® 35	
			raC_Dvc_AS284E	ArmorStart® 284E	
			raC_Dvc_AS294E	ArmorStart® 294E	

Interface UDTs

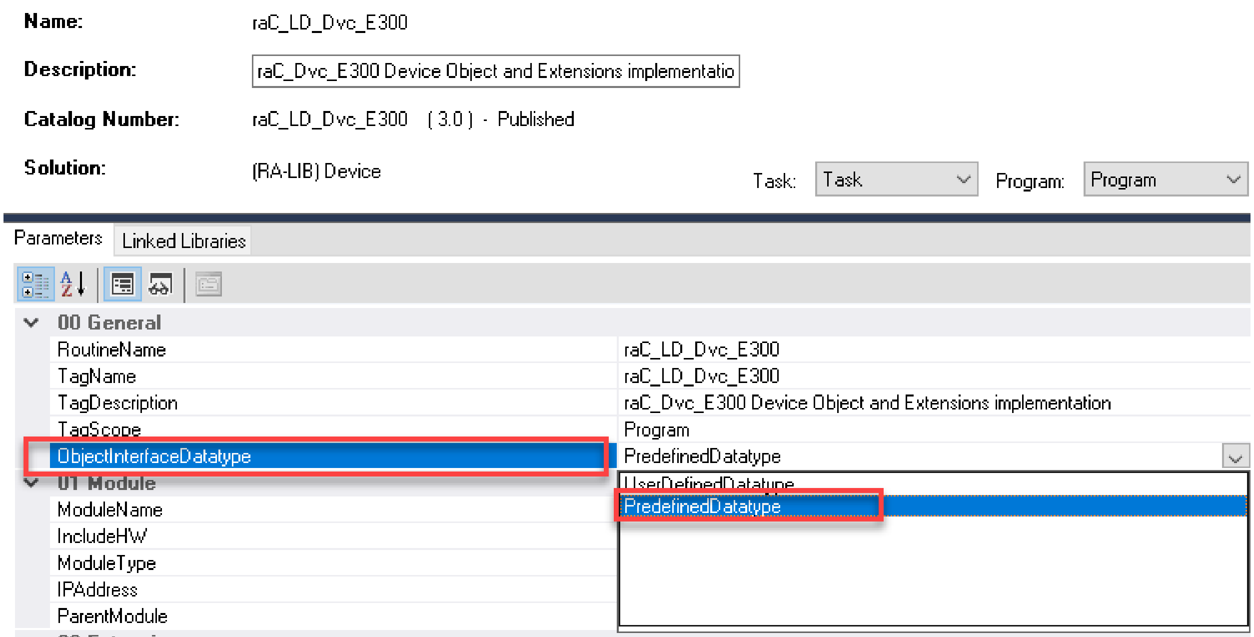
The common interfaces UDTs are commonly used when interfacing with other Rockwell Automation® application code libraries such as the PlantPAx® Process Objects Library. When using with PlantPAx® 5.x applications predefined data-type (PDT) interfaces are used and required to interact with firmware based instructions (e.g. PMTR, PVSD). PDT interfaces are only available in 5x80 Logix controllers with firmware v33+. PDT variations are shown below.

Interface Class	Object Class	Object Sub-Class	Interface Type	Interface Name (PDT)
Control	Power Automation	Power Discrete	Setting	RAC_ITF_DVC_PWRDISCRETE_SET
			Command	RAC_ITF_DVC_PWRDISCRETE_CMD
			Status	RAC_ITF_DVC_PWRDISCRETE_STS
		Power Velocity	Setting	RAC_ITF_DVC_PWRVELOCITY_SET
			Command	RAC_ITF_DVC_PWRVELOCITY_CMD
			Status	RAC_ITF_DVC_PWRVELOCITY_STS

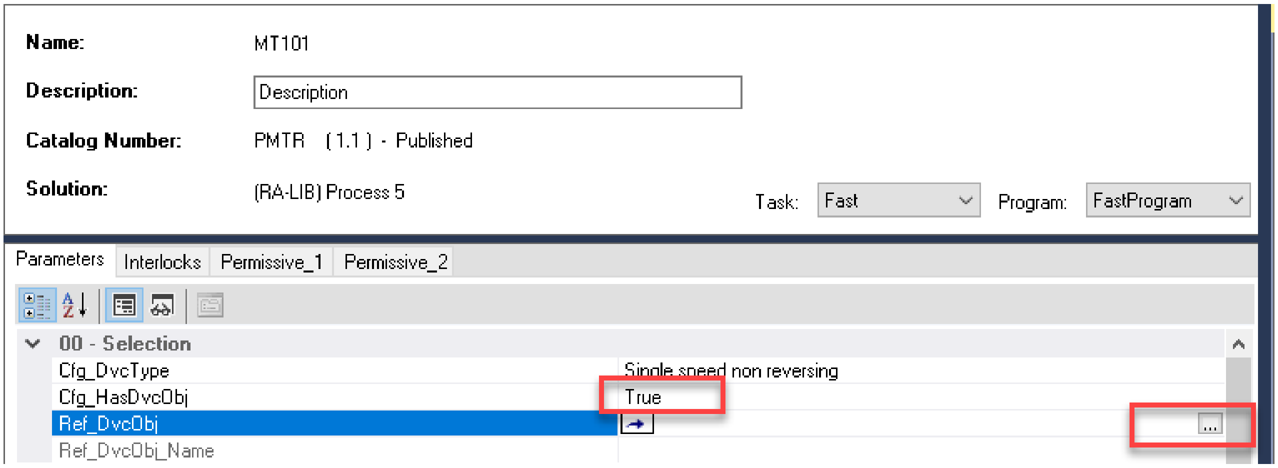
Notes when using Application Code Manager

You can use Studio 5000® Application Code Manager to create both Power Device Objects and Process Objects (PMTR/PVSD) and easily link them together in an application. First create the power device object. Refer to the Using Application Code Manager section of this manual for complete details.

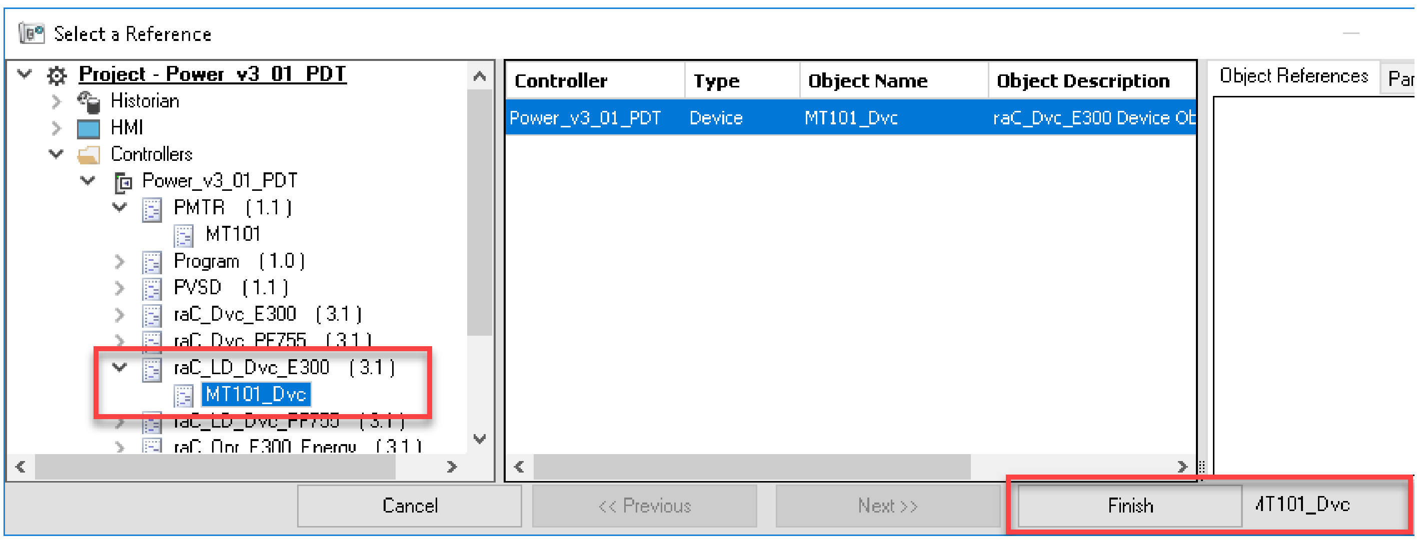
When using Studio 5000® Application Code Manager or the Studio 5000® Plug-In Import Library Objects Wizard, ensure that you set the *ObjectInterfaceDatatype* to *PredefinedDatatype*. This will enforce the use of Pre-defined Datatype (PDT) interfaces which must be used with PMTR or PVSD instructions. PDT variations are for use with PlantPAx® 5.xx applications. Selecting this option will use Revision 10.xx Power Device Library object instructions which reference pre-defined datatypes that are only available in 5580 ControlLogix® and 5380/5480 CompactLogix controllers with firmware version 33+.



Once your Power Discrete and/or Power Velocity objects have been created, you can create the Process Objects (PMTR/PVSD) and link them to the device objects. Configuration is done the same in both PMTR and PVSD objects.

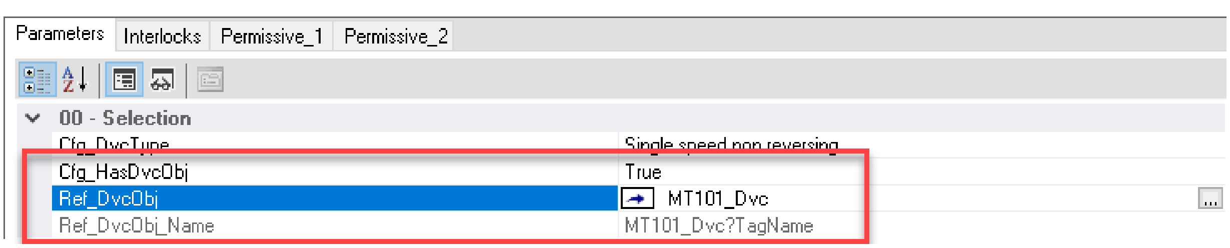


Set *Cfg_HasDvcObj* to True. Click on the browse … button for *Ref_DvcObj*.



In the *Select a Reference* dialogue browse to the Ladder (LD) instance of the Power Device Object (e.g. raC_LD_Dvc_E300) and highlight it then click finish.

You will now see the *Ref_DvcObj* and *Ref_DvcObj_Name* filled out back in the process object configuration.



This completes the link between Process Objects and Power Device Objects in Application Code Manager.

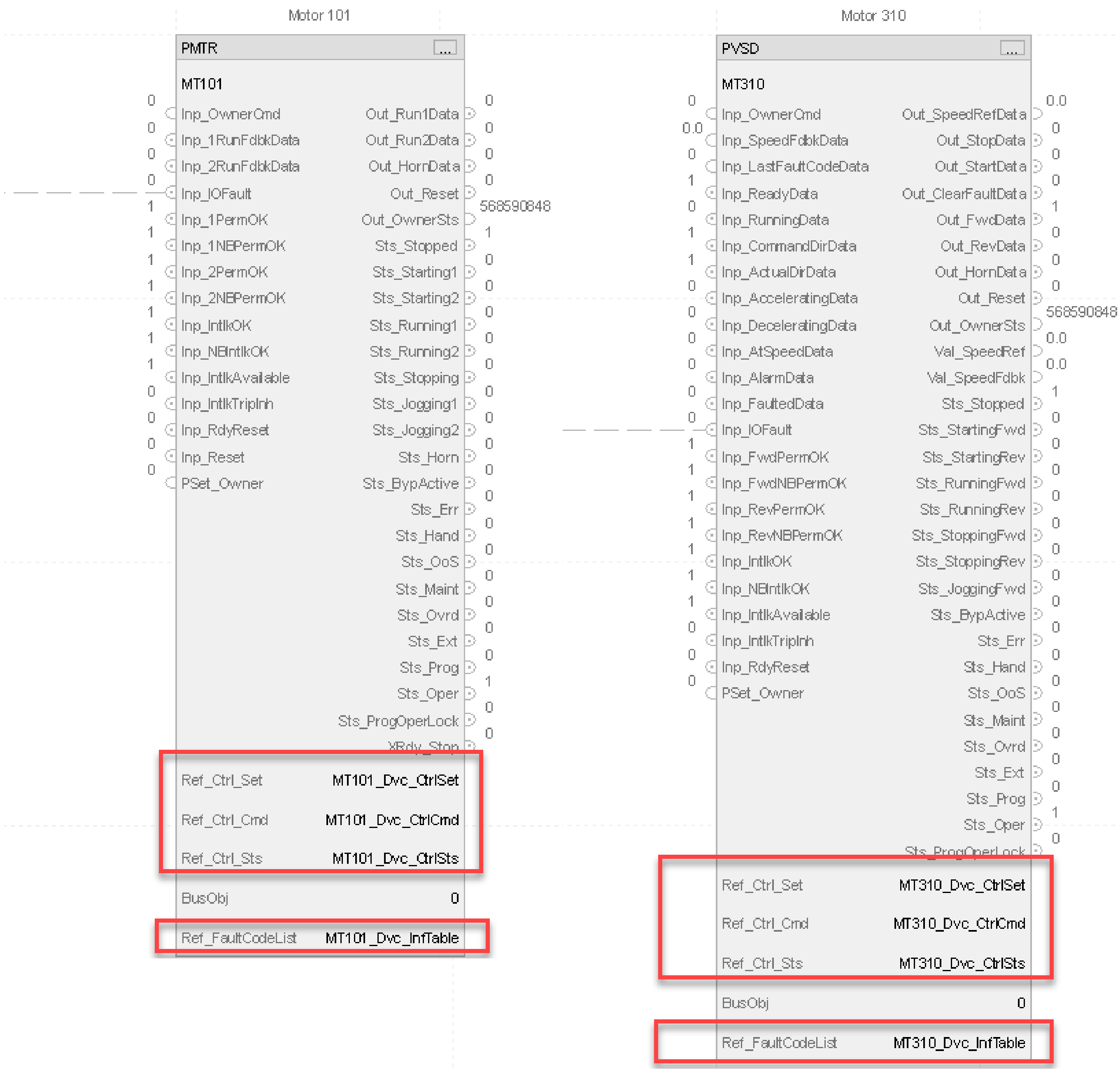
Programming Example

In a PlantPAx® application you must link the Process Object instruction (PMTR/PVSD) to the Power Device Object interface datatypes. This is done by assigning the *Ref* parameters on the instruction block. The following table lists the parameters to link between the process object and the power device object.

Process Object Parameter	Linked Power Device Object Parameter	Datatype	Description
Ref_Ctrl_Set	*Object*_Dvc_CtrlSet	RAC_ITF_DVC_PWRDISCRETESET RAC_ITF_DVC_PWRVELOCITYSET	Common Control Setpoint Interface. Replace *Object* with the name of your device object instance. Use PWRDISCRETE with Power Discrete Objects (e.g. E300/SMC-50) and PWRVELOCITY with Power Velocity Objects (e.g. PowerFlex)
Ref_Ctrl_Cmd	*Object*_Dvc_CtrlCmd	RAC_ITF_DVC_PWRDISCRETECMD RAC_ITF_DVC_PWRVELOCITYCMD	Common Control Command Interface. Replace *Object* with the name of your device object instance. Use PWRDISCRETE with Power Discrete Objects (e.g. E300/SMC-50) and PWRVELOCITY with Power Velocity Objects (e.g. PowerFlex)
Ref_Ctrl_Sts	*Object*_Dvc_CtrlSts	RAC_ITF_DVC_PWRDISCRETESTS RAC_ITF_DVC_PWRVELOCITYSTS	Common Control Status Interface. Replace *Object* with the name of your device object instance. Use PWRDISCRETE with Power Discrete Objects (e.g. E300/SMC-50) and PWRVELOCITY with Power Velocity Objects (e.g. PowerFlex)
Ref_FaultCodeList	*Object*_Dvc_InfTable	RAC_CODE_DESCRIPTION[ ]	Device information table used for storing fault code descriptions. Replace *Object* with the name of your device object instance.

The following images show the object configuration in Studio 5000 Logix Designer® for both PMTR and PVSD. In this example we are using the following variable names:

- PMTR instance: MT101
- E300 Power Discrete Object: MT101_Dvc
- PVSD instance: MT310
- PF755 Power Velocity Object: MT310_Dvc



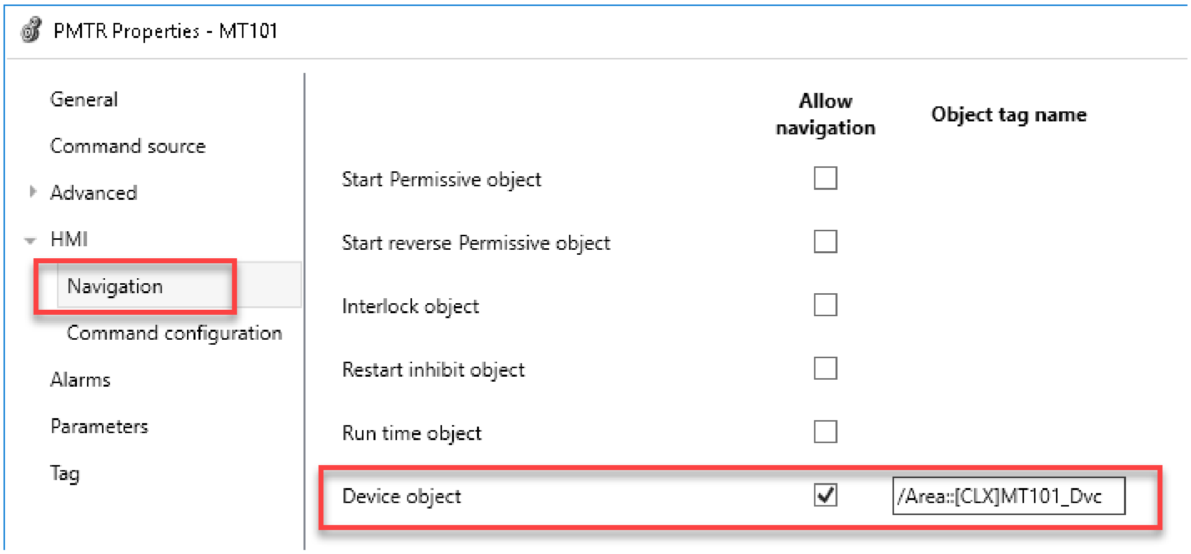
Process Object Navigation Configuration

To enable navigation from the Process Object faceplate to the Power Device Object faceplate, you must configure the HMI Navigation in the Process Object instruction properties.

As shown in the following image, browse to the *HMI > Navigation* tab of the PMTR/PVSD instance properties. Check the *Allow navigation* checkbox and assign the *Object tag name* to the path of the Power Device Object. The path should be from the perspective of the HMI server including the *Area* and *Controller Shortcut*. e.g. /Area::[shortcut]Object_Dvc where:

- Area: HMI area name

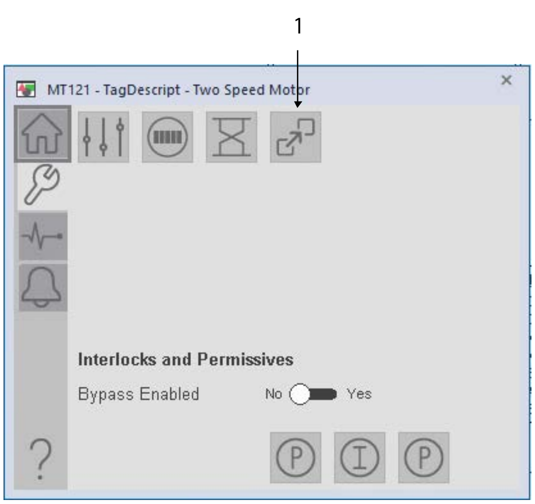
- [shortcut]: HMI communications server controller shortcut name
- Object_Dvc: Device Object name (e.g. MT101_Dvc where the base PMTR object is named MT101)



HMI Faceplate Navigation

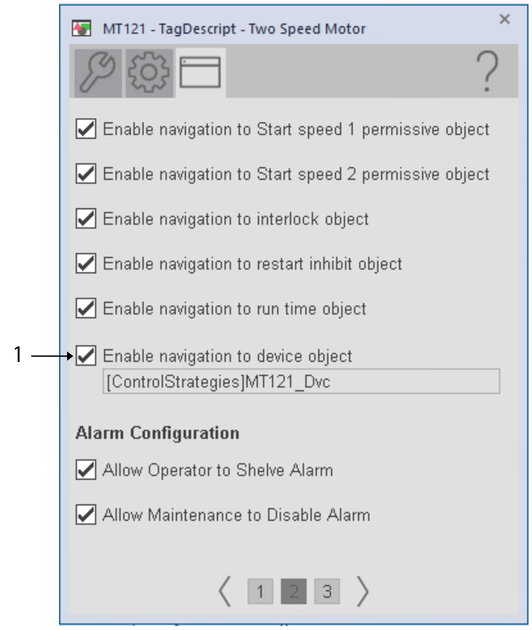
In the FactoryTalk® View SE HMI client you can navigate to the Power Device Object faceplates from the Process Object Faceplate. From the maintenance tab of the PMTR/PVSD faceplate you can navigate to the device by clicking on the Open Device Object Faceplate icon in the top right.

Please refer to the PROCESS-RM200 manual (Chapter 20) for complete details on the Process Objects Library.



Item	Description
1	Select to open the device object faceplate. **IMPORTANT**: This option is only available if 'Enable navigation to device object' on the HMI Configuration tab is checked.

The navigation configuration can also be seen and modified from the Advanced Maintenance faceplate on page 2 of the HMI configuration tab.



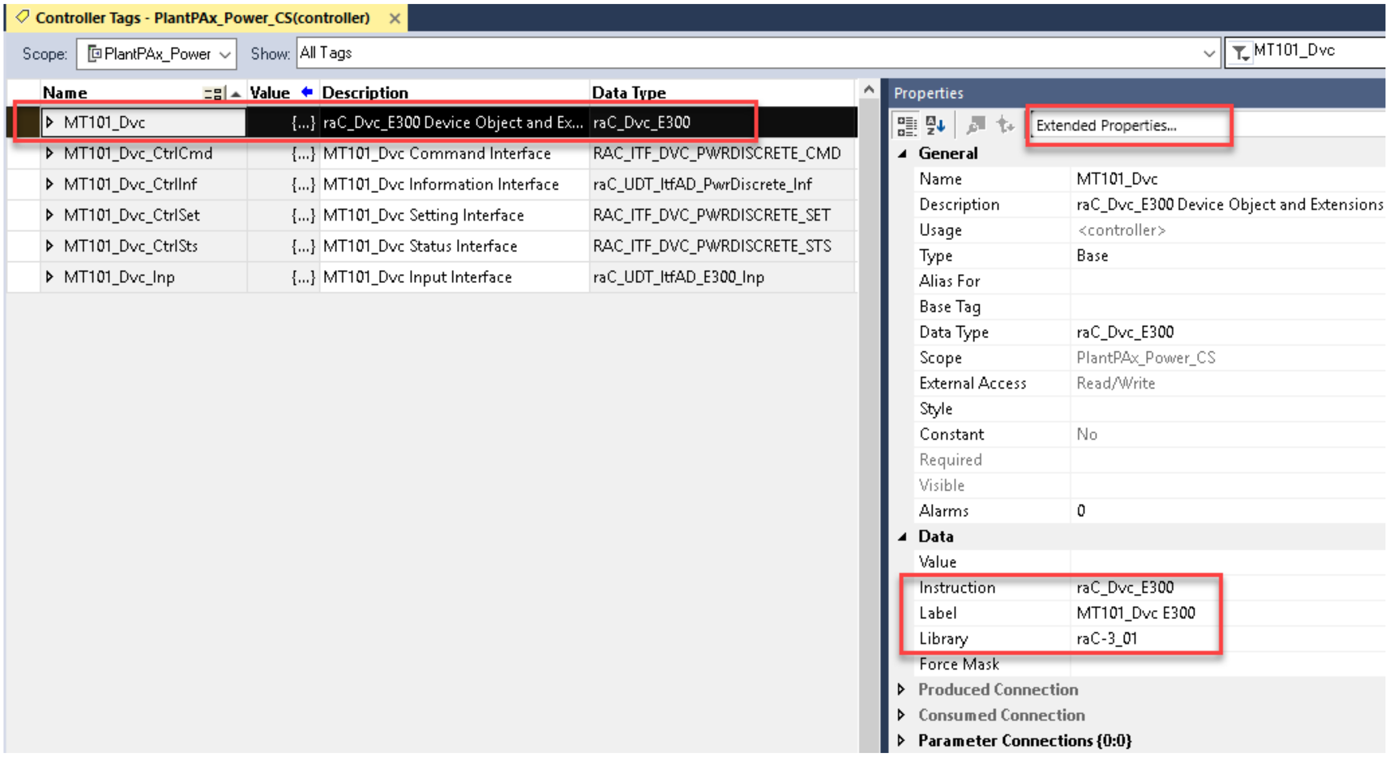
Item	Description
1	Select to allow navigation to the device object.

Extended Properties

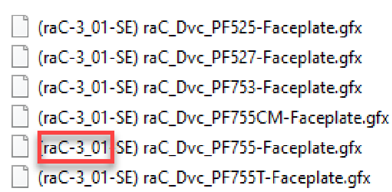
Some extended properties must be configured when used with PlantPAx® applications to allow proper navigation from PVSD and PMTR objects. Note that this is done automatically when using Process Library Control Strategy ROUTINE.L5X files, Power Device Library RUNG.L5X import files or when using Application Code Manager to import Power Device Library objects. In the event that Add-On Instructions are imported on their own, these extended properties will need to be manually filled out.

Use the Studio 5000® Plug-In *Import Library Objects* Wizard or import RUNG.L5X or Process Control Strategy ROUTINE.L5X files to complete this step automatically.

To verify Extended Properties, highlight the instance of the Power Device Object in the *Controller Tags* or Program *Parameters and Local Tags*. The *Properties* window will be visible on the left of the screen. Both the *Instruction* and *Library* parameters must be filled out for the device object navigation to function properly. See the following screenshot for reference.



- **Instruction:** Set to match the instruction Data Type (e.g. raC_Dvc_AS280E)
- **Library**: Set to match the Library and version number of the FactoryTalk® View SE faceplate gfx filename. (e.g. raC-3_01) This is shown in the following example in a selection of display files.



Using Power Device Objects with Machine Builder Library

The Power Device Library is compatible with Machine Builder Libraries. Power Discrete, Power Velocity, and Power Motion Objects are commonly paired with raM_Dvc_Motor and raM_Dvc_Conveyor objects. This is beneficial when an application includes Allen-Bradley® power equipment such as PowerFlex/Kinetix® drives and E300™ Electronic Overload Relays to easily integrate devices and provide detailed device diagnostics to operators and maintenance staff.

The following table shows the compatible Machine Builder Objects with Power Device Objects.

Machine Builder Object	Power Device Type	Compatible Power Device Object	Device	Compatible Energy & PM Extension Objects	Compatible State Monitor Extension Objects
raM_Dvc_Motor_Disc raM_Dvc_Conveyor_Disc	Power Discrete	raC_Dvc_E300	E300™ Electronic Overload Relay	raC_Opr_E300_Energy	raC_Tec_PowerDiscreteStateMonitor
		raC_Dvc_SMC50	SMC™-50 Soft Starter	raC_Opr_SMC50_Energy	
		raC_Dvc_SMCFlex	SMC™-Flex Soft Starter	raC_Opr_SMCFlex_Energy	
		raC_Dvc_AS280E	ArmorStart® 280E		
		raC_Dvc_AS281E	ArmorStart® 281E		
		raC_Dvc_AS290E	ArmorStart® 290E		
		raC_Dvc_AS291E	ArmorStart® 291E		
raM_Dvc_Motor_VSD raM_Dvc_Conveyor_VSD	Power Velocity	raC_Dvc_PF525	PowerFlex® 525	raC_Opr_PF525_Energy	raC_Tec_PowerVelocityStateMonitor
		raC_Dvc_PF753	PowerFlex® 753		
		raC_Dvc_PF755	PowerFlex® 755	raC_Opr_PF755_Energy	
		raC_Dvc_PF755T	PowerFlex® 755T	raC_Opr_PF755T_PM	
		raC_Dvc_PF6000T	PowerFlex® 6000T		
		raC_Dvc_PF7000	PowerFlex® 7000		
		raC_Dvc_APF35	Armor PowerFlex® 35		
		raC_Dvc_AS284E	ArmorStart® 284E		
		raC_Dvc_AS294E	ArmorStart® 294E		
raM_Dvc_Motor_CD raM_Dvc_Conveyor_CD	Power Motion	raC_Dvc_PF527	PowerFlex® 527	raC_Opr_PF527_Energy	raC_Tec_PowerMotionStateMonitor
		raC_Dvc_PF755CM	PowerFlex® 755CM		
		raC_Dvc_K350	Kinetix® 350		
		raC_Dvc_K5300	Kinetix® 5300		
		raC_Dvc_K5500	Kinetix® 5500	raC_Opr_K5500_Energy	
		raC_Dvc_K5700	Kinetix® 5700	raC_Opr_K5700_Energy	
		raC_Dvc_K6500	Kinetix® 6500		

Interface UDTs

The common interfaces UDTs are commonly used when interfacing with other Rockwell Automation® application code libraries such as the Machine Builder Library. When using with Machine Builder applications user data-type (UDT) interfaces are used and required to interact with Machine Builder Library add-on instructions (e.g. raM_Dvc_Motor). A list of interface UDTs used with the Machine Builder Library are shown below.

Interface Class	Object Class	Object Sub-Class	Interface Type	Interface Name (PDT)
Control	Power Automation	Power Discrete	Setting	raC_UDT_ItfAD_PwrDiscrete_Set
			Command	raC_UDT_ItfAD_PwrDiscrete_Cmd
			Status	raC_UDT_ItfAD_PwrDiscrete_Sts
		Power Velocity	Setting	raC_UDT_ItfAD_PwrVelocity_Set
			Command	raC_UDT_ItfAD_PwrVelocity_Cmd
			Status	raC_UDT_ItfAD_PwrVelocity_Sts
		Power Velocity	Setting	raC_UDT_ItfAD_PwrMotion_Set
			Command	raC_UDT_ItfAD_PwrMotion_Cmd
			Status	raC_UDT_ItfAD_PwrMotion_Sts

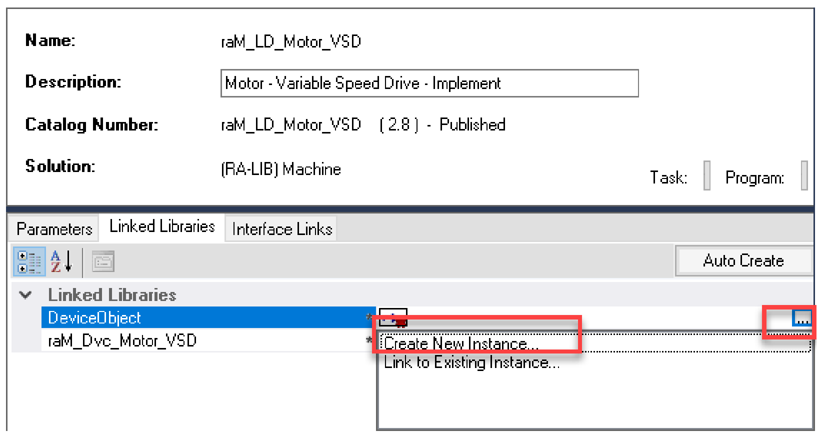
Notes when using Application Code Manager

You can use Studio 5000® Application Code Manager to create both Power Device Objects and Machine Builder Library objects and easily link them together in an application. First create the power device object. Refer to the Using Application Code Manager section of this manual for complete details.

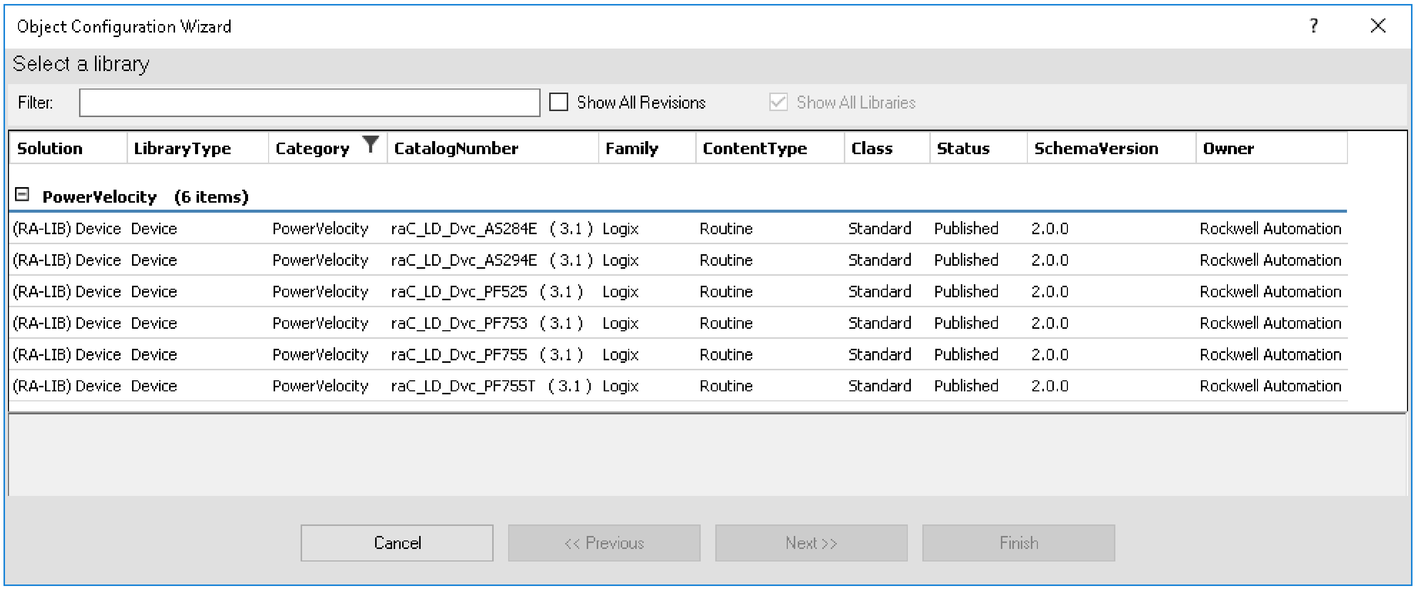
You can run can either create the Machine Builder Library object first, or the Power Device Library object first and then link them. The following two sub-sections cover both orders of operation.

Creating the Machine Builder Library Object First

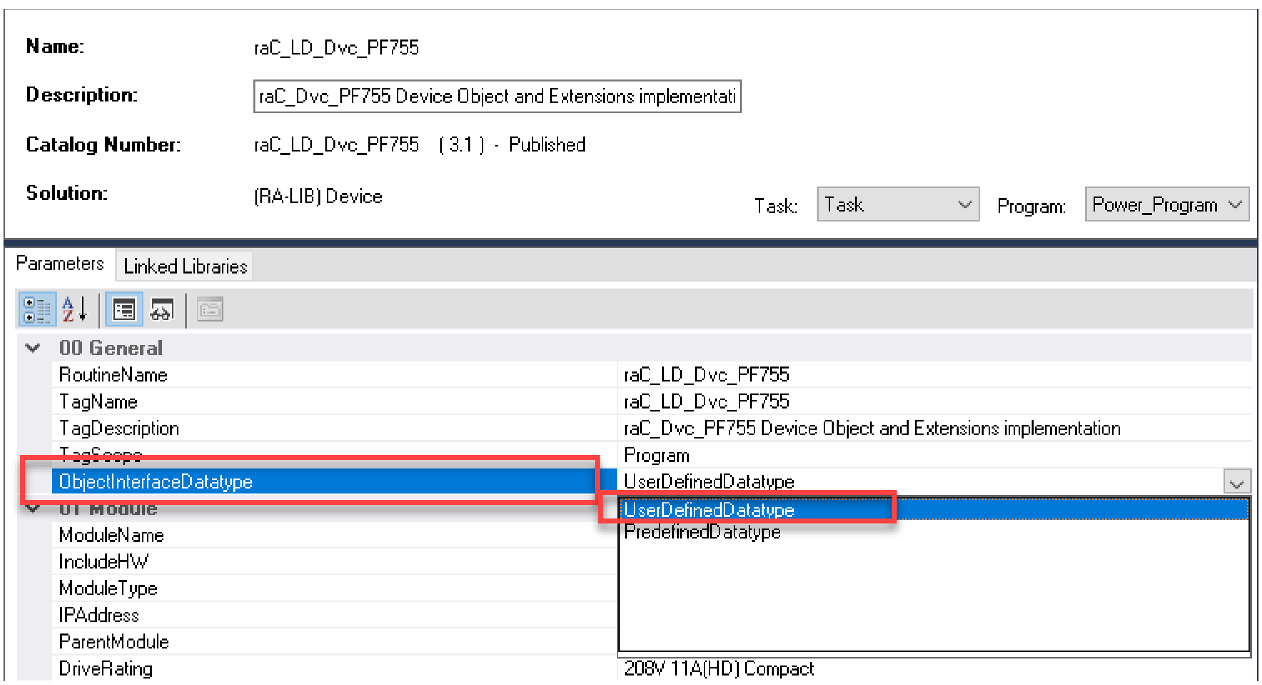
Create a new instance of the desired Machine Builder Library object (Motor/Conveyor). In the example below we are using raM_LD_Motor_VSD. On the *Linked Libraries* tab click on '...' in the *DeviceObject* parameter and choose either to *Create New Instance* or *Link to Existing Instance*.



The *Object Configuration Wizard* prompt will open and you can select the appropriate Power Device Library object of your choice. Note that only applicable device types will be shown. ie: when connecting a Power Device Object to a VSD object, only PowerVelocity objects will be available.

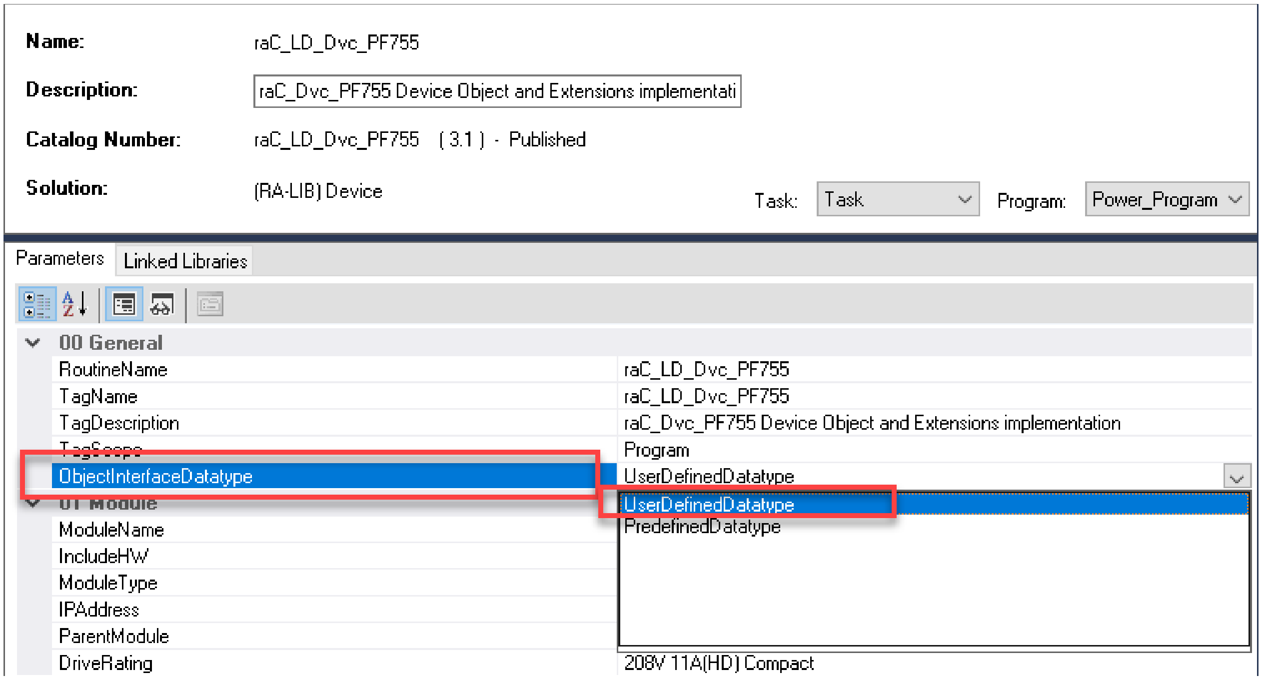


Complete the device configuration as needed and ensure that you set the *ObjectInterfaceDatatype* to *UserDefinedDatatype*.

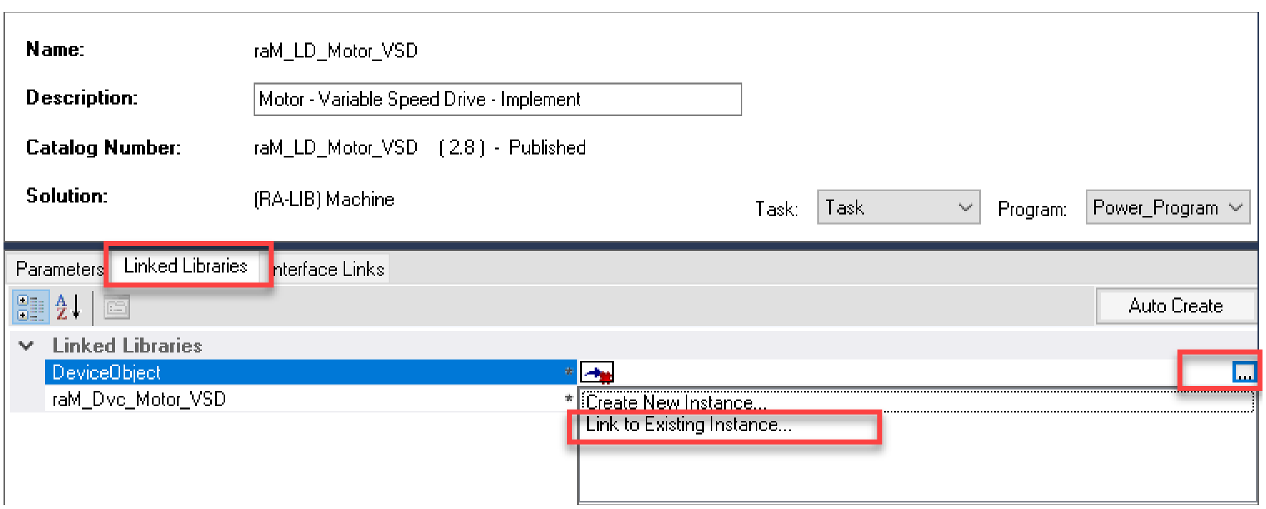


Creating the Power Device Library Object First

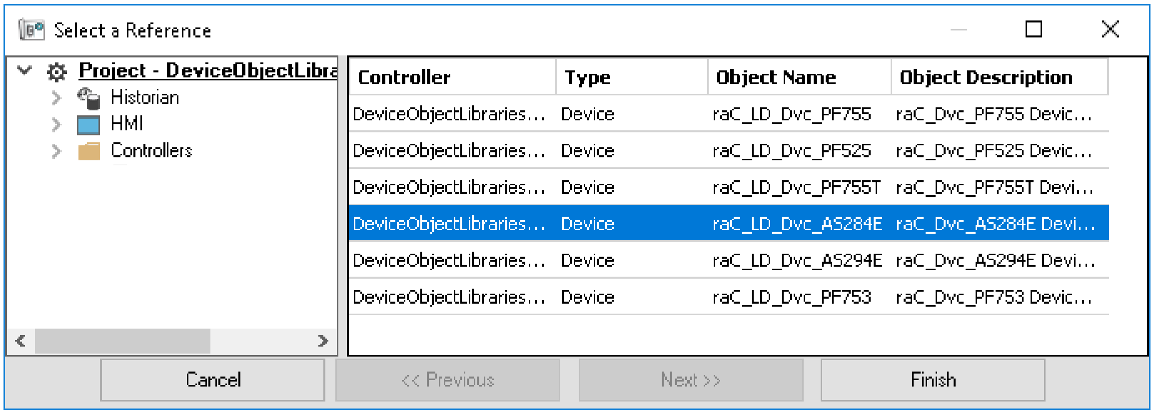
When using Studio 5000® Application Code Manager or the Studio 5000® Plug-In Import Library Objects Wizard, ensure that you set the *ObjectInterfaceDatatype* to *UserDefinedDatatype*. This will enforce the use of UDT interfaces which must be used with raM_Dvc_Motor or raM_Dvc_Conveyor instructions. Selecting this option will use Revision 3.xx Power Device Library object instructions.



Once your Power Discrete and/or Power Velocity objects have been created, you can create the Machine Builder Objects (raM_Dvc_Motor/ raM_Dvc_Conveyor) and link them to the device objects. Configuration is done the same in both Motor and Conveyor objects and regardless of device type (Discrete/Disc, Velocity/VSD, Motion/CD).



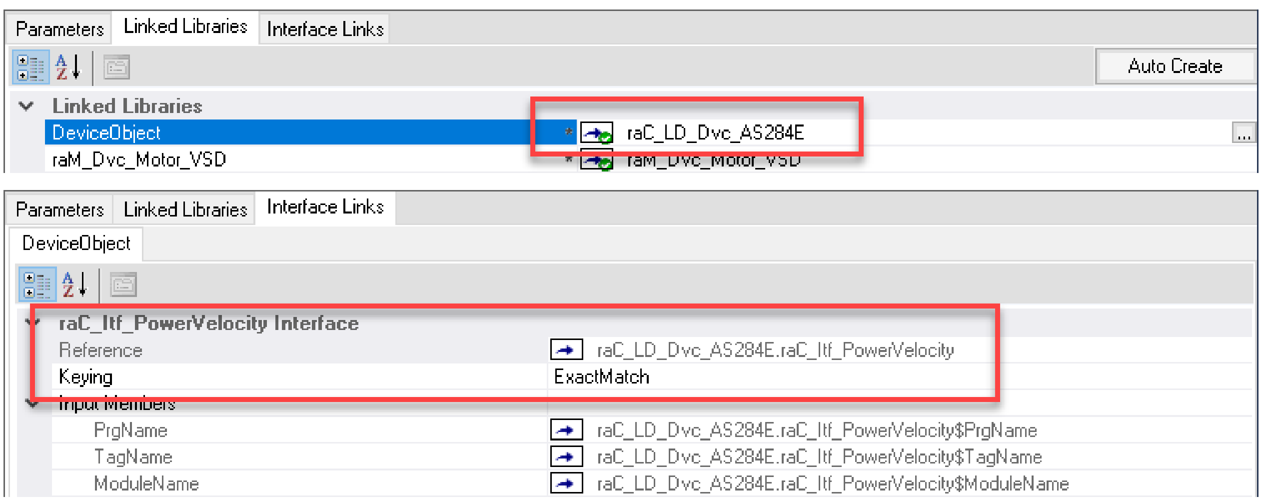
On the *Linked Libraries* tab of the Machine Builder object, click on the browse ... button for *DeviceObject* and select *Link to Existing Instance...*



In the *Select a Reference* dialogue browse to the Ladder (LD) instance of the Power Device Object (e.g. raC_LD_Dvc_AS284E) and highlight it then click finish.

Completing the Linked Libraries

You will now see the *DeviceObject* filled out on the *Linked Libraries* tab of the Machine Builder object configuration. If you look at the *Interface Links* tab you will see additional parameters that have been filled out automatically.



This completes the link between Machine Builder Objects and Power Device Objects in Application Code Manager.

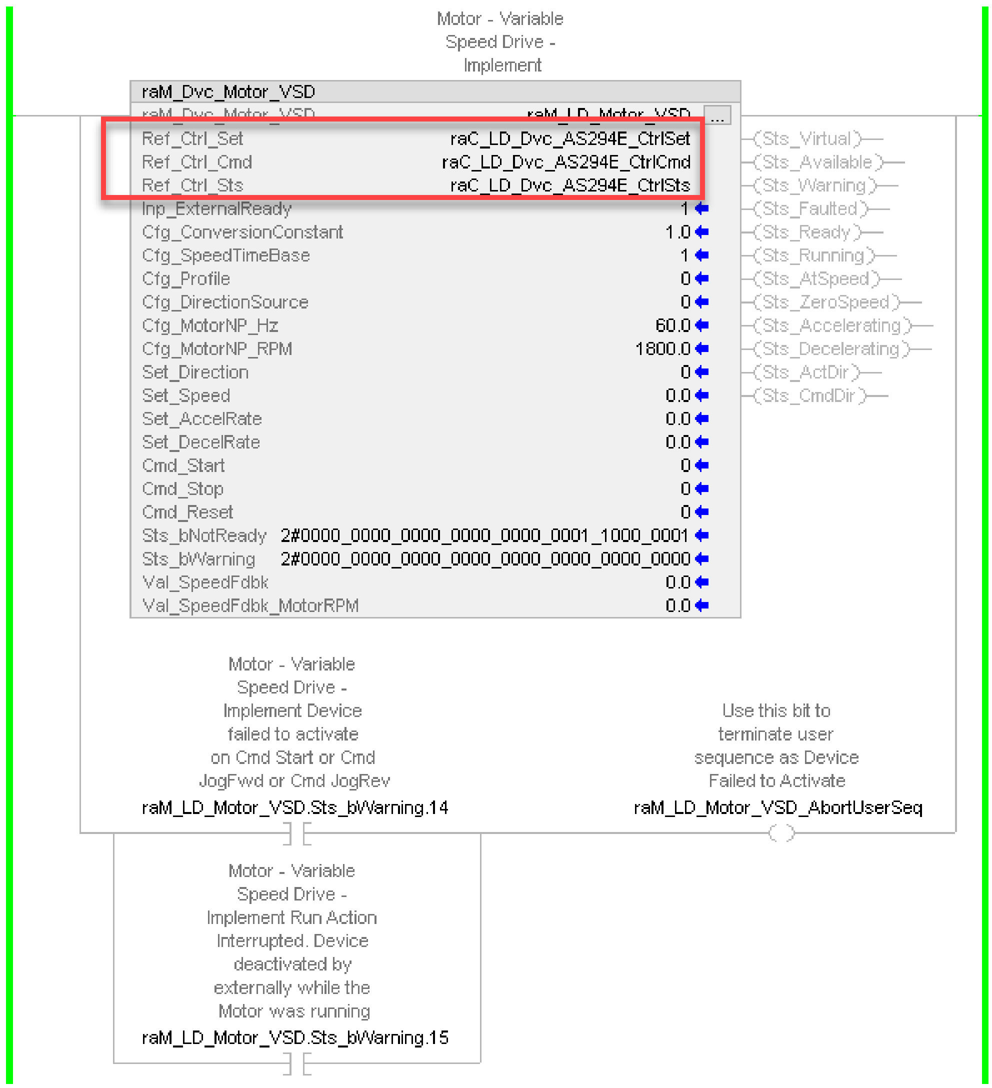
Programming Example

In a Machine Builder application you must link the Machine Builder Object instruction (raM_Dvc_Motor/raM_Dvc_Conveyor) to the Power Device Object interface datatypes. This is done by assigning the *Ref* parameters on the instruction block. The following table lists the parameters to link between the Machine Builder object and the power device object.

Process Object Parameter	Linked Power Device Object Parameter	Datatype	Description
Ref_Ctrl_Set	*Object*_Dvc_CtrlSet	raC_UDT_ItfAD_PwrDiscrete_Set raC_UDT_ItfAD_PwrVelocity_Set raC_UDT_ItfAD_PwrMotion_Set	Common Control Setpoint Interface. Replace *Object* with the name of your device object instance. Use PWRDISCRETE with Power Discrete Objects (e.g. E300/SMC-50) and PWRVELOCITY with Power Velocity Objects (e.g. PowerFlex)
Ref_Ctrl_Cmd	*Object*_Dvc_CtrlCmd	raC_UDT_ItfAD_PwrDiscrete_Cmd raC_UDT_ItfAD_PwrVelocity_Cmd raC_UDT_ItfAD_PwrMotion_Cmd	Common Control Command Interface. Replace *Object* with the name of your device object instance. Use PWRDISCRETE with Power Discrete Objects (e.g. E300/SMC-50) and PWRVELOCITY with Power Velocity Objects (e.g. PowerFlex)
Ref_Ctrl_Sts	*Object*_Dvc_CtrlSts	raC_UDT_ItfAD_PwrDiscrete_Sts raC_UDT_ItfAD_PwrVelocity_Sts raC_UDT_ItfAD_PwrMotion_Sts	Common Control Status Interface. Replace *Object* with the name of your device object instance. Use PWRDISCRETE with Power Discrete Objects (e.g. E300/SMC-50) and PWRVELOCITY with Power Velocity Objects (e.g. PowerFlex)

The following image shows the object configuration in Studio 5000 Logix Designer® for a raM_Dvc_Motor_VSD instruction. The same configuration is done for any other Machine Builder Instruction. In this example we are using the following variable names:

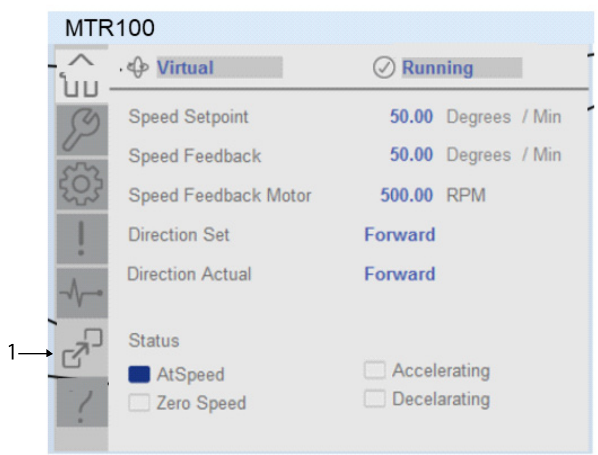
- raM_Dvc_Motor_VSD instance: raM_LD_Motor_VSD
- AS294E Power Velocity Object: raC_LD_Dvc_AS294E



HMI Faceplate Navigation

In the FactoryTalk® View ME/SE HMI client you can navigate to the Power Device Object faceplates from the Machine Builder Object Faceplate. From the any tab of the machine builder object faceplate you can navigate to the device by clicking on the Open Device Object Faceplate icon on the second tab from the bottom on the left side of the faceplate.

Please refer to the Machine Builder Libraries manuals downloaded in the library for complete details on the Machine Builder Objects Library.



Item	Description
1	Select to open the device object faceplate.

Power Discrete Objects (raC_Dvc_E300, raC_Dvc_AS280E, raC_Dvc_AS281E, raC_Dvc_AS290E, raC_Dvc_AS291E, raC_Dvc_SMC50, raC_Dvc_SMCFlex)

Overview

The Power Discrete device objects are a group of objects that include the E300™ Electronic Overload Relay(raC_Dvc_E300), SMC™-50 Soft Starter (raC_Dvc_SMC50), SMC™-Flex Soft Starter (raC_Dvc_SMCFlex) and ArmorStart® (raC_Dvc_AS280E, raC_Dvc_AS290E) starters. In addition to the base device objects, several extension objects are provided which provide additional information as an option.

In the Library there is a folder named *Videos* which contains many How-To and Operational Overview Videos which walk step-by-step through each process. You can refer to the following videos for this section:
"Operational_Overview_of_AS_Starter_Faceplates_in_FTViewME_SE"
"Operational_Overview_of_AS_Starter_Faceplates_in_ViewDesigner"
"Operational_Overview_of_E300_Faceplates_in_FTViewME_SE"
"Operational_Overview_of_E300_Faceplates_in_ViewDesigner"
"Operational_Overview_of_SMC50_Faceplates_in_FTViewME_SE"
"Operational_Overview_of_SMC50_Faceplates_in_ViewDesigner"

Supported devices include:

Device	Object Name	State Monitor Extension	Energy Monitor Extension	Predictive Maintenance Extension
AS280E	raC_Dvc_AS280E	Yes		
AS281E	raC_Dvc_AS281E	Yes		
AS290E	raC_Dvc_AS290E	Yes		
AS291E	raC_Dvc_AS291E	Yes		
E300	raC_Dvc_E300	Yes	Yes	
SMC-50	raC_Dvc_SMC50	Yes	Yes	
SMC-Flex	raC_Dvc_SMCFlex	Yes	Yes	

Functional Description

The E300™ Electronic Overload Relay, SMC™-50, SMC™-Flex Soft Starter and ArmorStart® AS2x0E/2x1E pre-configured Device Objects:

- Collect, Process and Deliver Data between Smart Devices and Application Logic
- Provide Device Status & Diagnostics Faceplates for Machine Startup, Commissioning, Operations, and Maintenance
- Include Common HMI Faceplate Components, Device States, and Control Interfaces providing Application Development and Operation Efficiency

All these features provide quick feedback, shorten recovery time, and simplify implementation.

Required Files

Device Objects include Add-On Instructions (AOIs) and HMI faceplates. The revision number (e.g. 3.01) used in filenames can change as new revisions are created.

Controller Files

Add-On Instructions are reusable code objects that contain encapsulated logic that can streamline implementing your system. This lets you create your own instruction set for programming logic as a supplement to the instruction set provided natively in the ControlLogix® firmware. An Add-On Instruction is defined once in each controller project, and can be instantiated multiple times in your application code as needed.

The Add-On Instruction must be imported into the controller project to be used in the controller configuration. These can be imported as Add-On Instruction files, or as part of the Rung Import or Import Library Objects wizard.

Instructions that are supported by PlantPAx® 5.xx are supplied with two versions of the same instruction. Version 3.xx instructions are for use with standard applications while version 10.xx instructions are for use with PlantPAx® 5.xx applications. These alternate PlantPAx® supported versions use pre-defined data types which are available exclusively in 5x80 series Logix 5000 controllers with firmware v33 or greater. Refer to section Using Power Device Objects with PlantPAx® for more information.

All Add-On Instruction and Rung Import files can be found in the */Studio 5000 Logix Designer Files - L5X/Standard Files/* and */Studio 5000 Logix Designer Files - L5X/5x80v33 Files - Use with PlantPAx® 5.x/* folders in the library. Choose the */5x80v33 Files - Use with PlantPAx® 5.x/* Folder for PlantPAx® 5.x applications; otherwise choose the */Standard Files/* folder.

Device/Item	Application	Add-On Instruction	Rung Import
AS280E	Standard	raC_Dvc_AS280E_3.03_AOI.L5X	raC_Dvc_AS280E_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Dvc_AS280E_10.04_AOI_5x80v33.L5X	raC_Dvc_AS280E_10.04_RUNG_5x80v33.L5X
AS281E	Standard	raC_Dvc_AS281E_3.03_AOI.L5X	raC_Dvc_AS281E_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Dvc_AS281E_10.04_AOI_5x80v33.L5X	raC_Dvc_AS281E_10.04_RUNG_5x80v33.L5X
AS290E	Standard	raC_Dvc_AS290E_3.03_AOI.L5X	raC_Dvc_AS290E_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Dvc_AS290E_10.04_AOI_5x80v33.L5X	raC_Dvc_AS290E_10.04_RUNG_5x80v33.L5X
AS291E	Standard	raC_Dvc_AS291E_3.03_AOI.L5X	raC_Dvc_AS291E_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Dvc_AS291E_10.04_AOI_5x80v33.L5X	raC_Dvc_AS291E_10.04_RUNG_5x80v33.L5X
E300	Standard	raC_Dvc_E300_3.04_AOI.L5X	raC_Dvc_E300_3.04_RUNG.L5X
	PlantPAx® v5.xx	raC_Dvc_E300_10.05_AOI_5x80v33.L5X	raC_Dvc_E300_10.05_RUNG_5x80v33.L5X
E300 Energy Extension	Standard	raC_Opr_E300_Energy_3.03_AOI.L5X	raC_Opr_E300_Energy_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Opr_E300_Energy_10.04_AOI_5x80v33.L5X	raC_Opr_E300_Energy_10.04_RUNG_5x80v33.L5X
SMC50	Standard	raC_Dvc_SMC50_3.05_AOI.L5X	raC_Dvc_SMC50_3.05_RUNG.L5X
	PlantPAx® v5.xx	raC_Dvc_SMC50_10.06_AOI_5x80v33.L5X	raC_Dvc_SMC50_10.06_RUNG_5x80v33.L5X

Device/Item	Application	Add-On Instruction	Rung Import
SMC50 Energy Extension	Standard	raC_Opr_SMC50_Energy_3.03_AOI.L5X	raC_Opr_SMC50_Energy_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Opr_SMC50_Energy_10.04_AOI_5x80v33.L5X	raC_Opr_SMC50_Energy_10.04_RUNG_5x80v33.L5X
SMCFlex	Standard	raC_Dvc_SMCFlex_3.04_AOI.L5X	raC_Dvc_SMCFlex_3.04_RUNG.L5X
	PlantPAx® v5.xx	raC_Dvc_SMCFlex_10.05_AOI_5x80v33.L5X	raC_Dvc_SMCFlex_10.05_RUNG_5x80v33.L5X
SMCFlex Energy Extension	Standard	raC_Opr_SMCFlex_Energy_3.04_AOI.L5X	raC_Opr_SMCFlex_Energy_3.04_RUNG.L5X
	PlantPAx® v5.xx	raC_Opr_SMCFlex_Energy_10.05_AOI_5x80v33.L5X	raC_Opr_SMCFlex_Energy_10.05_RUNG_5x80v33.L5X
State Monitor Extension	Standard	raC_Tec_PwrDiscreteStateMonitor_3.04_AOI.L5X	raC_Tec_PwrDiscreteStateMonitor_3.04_RUNG.L5X
	PlantPAx® v5.xx	raC_Tec_PwrDiscreteStateMonitor_10.05_AOI_5x80v33.L5X	raC_Tec_PwrDiscreteStateMonitor_10.05_RUNG_5x80v33.L5X

FactoryTalk® View HMI Files

FactoryTalk® View ME or SE applications require importing the desired device faceplates in addition to all Global Object (ggfx) files and all images located in the */HMI FactoryTalk® View Images - png/* folder of the library. FactoryTalk® View ME files are stored in the */HMI - FactoryTalk® View ME/* library folder and FactoryTalk® View SE files are stored in the */HMI - FactoryTalk® View SE/* library folder.

Device/Item	Type	FactoryTalk® View ME Faceplate	FactoryTalk® View SE Faceplate
AS280E	Display	(raC-3_03-ME) raC_Dvc_AS280E-Faceplate.gfx	(raC-3_03-SE) raC_Dvc_AS280E-Faceplate.gfx
AS281E	Display	(raC-3_03-ME) raC_Dvc_AS281E-Faceplate.gfx	(raC-3_03-SE) raC_Dvc_AS281E-Faceplate.gfx
AS290E	Display	(raC-3_03-ME) raC_Dvc_AS290E-Faceplate.gfx	(raC-3_03-SE) raC_Dvc_AS290E-Faceplate.gfx
AS291E	Display	(raC-3_03-ME) raC_Dvc_AS291E-Faceplate.gfx	(raC-3_03-SE) raC_Dvc_AS291E-Faceplate.gfx
E300	Display	(raC-3_04-ME) raC_Dvc_E300-Faceplate.gfx	(raC-3_04-SE) raC_Dvc_E300-Faceplate.gfx
SMC-50	Display	(raC-3_03-ME) raC_Dvc_SMC50-Faceplate.gfx	(raC-3_03-SE) raC_Dvc_SMC50-Faceplate.gfx
SMC-Flex	Display	(raC-3_04-ME) raC_Dvc_SMCFlex-Faceplate.gfx	(raC-3_04-SE) raC_Dvc_SMCFlex-Faceplate.gfx
SMC-Flex Energy Electrical Extension	Display	(raC-3_04-ME) raC_Opr_SMCFlex_EnergyElectrical-Faceplate.gfx	(raC-3_04-SE) raC_Opr_SMCFlex_EnergyElectrical-Faceplate.gfx
Energy Base Extension	Display	(raC-3_01-ME) raC_Opr_EnergyBase-Faceplate.gfx	(raC-3_01-SE) raC_Opr_EnergyBase-Faceplate.gfx
Energy Electrical Extension	Display	(raC-3_01-ME) raC_Opr_EnergyElectrical-Faceplate.gfx	(raC-3_01-SE) raC_Opr_EnergyElectrical-Faceplate.gfx
State Monitor Extension	Display	(raC-3_03-ME) raC_Tec_PwrDvcStateMonitor-Faceplate.gfx	(raC-3_03-SE) raC_Tec_PwrDvcStateMonitor-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - Power Device	(raC-3-SE) Graphic Symbols - Power Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - Power Device.ggfx	(raC-3-SE) Toolbox - Power Device.ggfx

Studio 5000 View Designer® HMI Files

All Studio 5000 View Designer® Files can be found in the */HMI - ViewDesigner - vpd/* folder of the library.

Device/Item	Studio 5000 View Designer® Faceplate
AS280E	(raC-3_05-VD) raC_Dvc_PowerDiscrete.vpd
AS281E	
AS290E	
AS291E	
E300	
SMC-50	
SMC-Flex	

FactoryTalk® Optix Library Files

FactoryTalk® View Optix applications require importing the desired library objects located in the PowerDevice_v3R library folder.

Device/Item	FactoryTalk® Optix Library Object
AS280E	raC_3_03_raC_Dvc_AS280E_UI
AS281E	raC_3_03_raC_Dvc_AS281E_UI
AS290E	raC_3_03_raC_Dvc_AS290E_UI
AS291E	raC_3_03_raC_Dvc_AS291E_UI
E300	raC_3_04_raC_Dvc_E300_UI
SMC-50	raC_3_03_raC_Dvc_SMC50_UI
SMC-Flex	raC_3_04_raC_Dvc_SMCFlex_UI

Studio 5000® Application Code Manager Files

Studio 5000® Application Code Manager (ACM) can be optionally used if it is installed. All devices can be easily registered in the ACM repositories by running the *setup.cmd* file located in the root folder of the library.

Individual HSL4 files are provided as an alternative to running the setup.cmd to allow users to manually register specific implementation objects. Each object has two files - an Asset Control file and a Device file. The Asset Control files include attachments of all required files for that object. The Device files are used to actually add that device into a Studio 5000® project and these reference the Asset Control files.

All Studio 5000® Application Code Manager files can be found in the */ApplicationCodeManagerLibraries/* folder of the library. The files included are as follows:

Implementation Object	Asset Control File (.HSL4)	Device File (.HSL4)
AS280E	(RA-LIB)_Device_Asset-Control_PowerDiscrete_raC_Dvc_AS280E_(3.3)	(RA-LIB)_Device_Device_PowerDiscrete_raC_LD_Dvc_AS280E_(3.4)
AS281E	(RA-LIB)_Device_Asset-Control_PowerDiscrete_raC_Dvc_AS281E_(3.3)	(RA-LIB)_Device_Device_PowerDiscrete_raC_LD_Dvc_AS281E_(3.4)
AS290E	(RA-LIB)_Device_Asset-Control_PowerDiscrete_raC_Dvc_AS290E_(3.3)	(RA-LIB)_Device_Device_PowerDiscrete_raC_LD_Dvc_AS290E_(3.4)
AS291E	(RA-LIB)_Device_Asset-Control_PowerDiscrete_raC_Dvc_AS291E_(3.3)	(RA-LIB)_Device_Device_PowerDiscrete_raC_LD_Dvc_AS291E_(3.4)
E300	(RA-LIB)_Device_Asset-Control_PowerDiscrete_raC_Dvc_E300_(3.4)	(RA-LIB)_Device_Device_PowerDiscrete_raC_LD_Dvc_E300_(3.4)

Implementation Object	Asset Control File (.HSL4)	Device File (.HSL4)
SMC-50	(RA-LIB)_Device_Asset-Control_PowerDiscrete_raC_Dvc_SMC50_(3.5)	(RA-LIB)_Device_Device_PowerDiscrete_raC_LD_Dvc_SMC50_(3.5)
SMC-Flex	(RA-LIB)_Device_Asset-Control_PowerDiscrete_raC_Dvc_SMCFlex_(3.4)	(RA-LIB)_Device_Device_PowerDiscrete_raC_LD_Dvc_SMCFlex_(3.5)
E300 Energy Extension	(RA-LIB)_Device_Asset-Control_PowerDiscrete_raC_Opr_E300_Energy_(3.3)	
SMC-50 Energy Extension	(RA-LIB)_Device_Asset-Control_PowerDiscrete_raC_Opr_SMC50_Energy_(3.3)	
SMC-Flex Energy Extension	(RA-LIB)_Device_Asset-Control_PowerDiscrete_raC_Opr_SMCFlex_Energy_(3.4)	
State Monitor Extension	(RA-LIB)_Device_Asset-Control_PowerDiscrete_raC_Tec_PwrDiscreteStateMonitor_(3.4)	

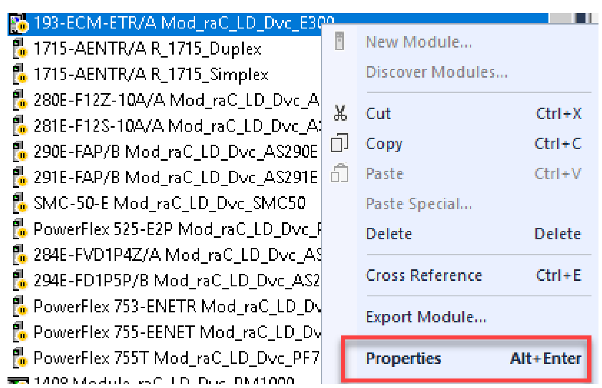
Device Definition

The device (ie: E300, SMC-50, SMC-Flex, ArmorStart) must be configured with the correct device definition. Proper device configuration enables the required datalinks to pass information from the device into the add-on instruction.

Note that this configuration is completed automatically when using Application Code Manager or the Studio 5000® Import Library Objects wizard plug-in.

To verify the device definition:

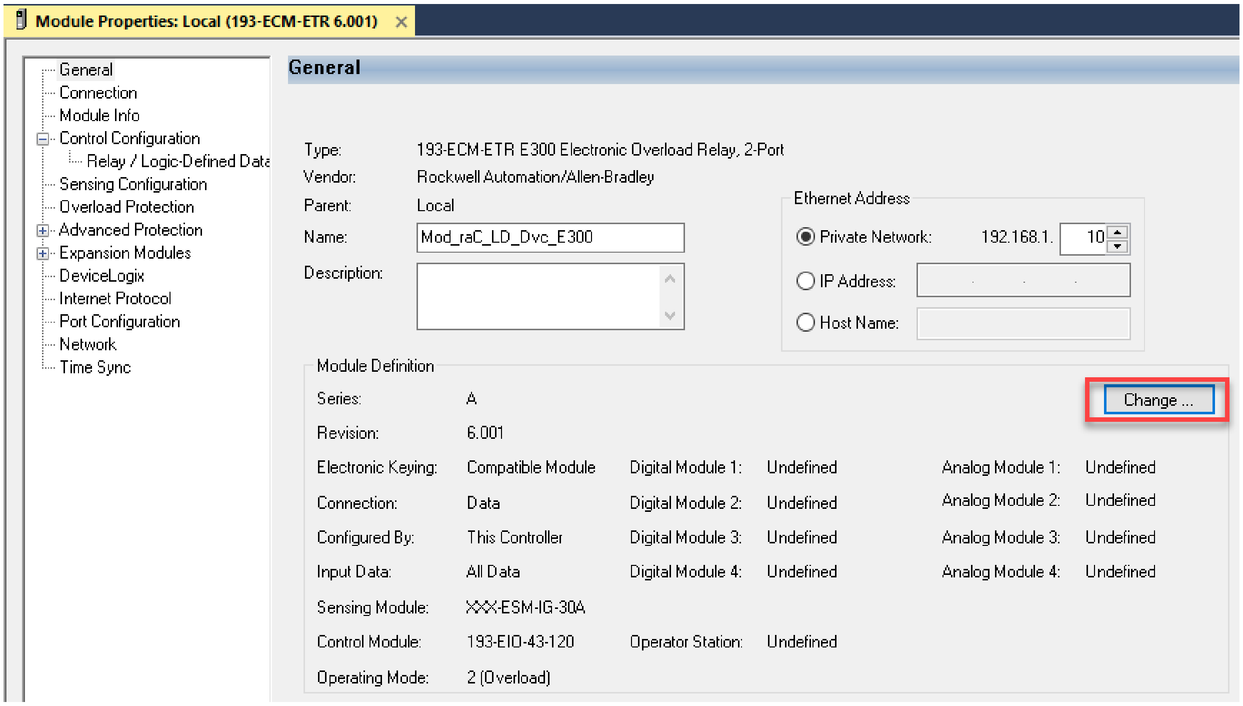
- Find the device in the *Controller Organizer* pane in Studio 5000 Logix Designer® and open the *Module Properties* by double-clicking or right-click and select *Properties*.



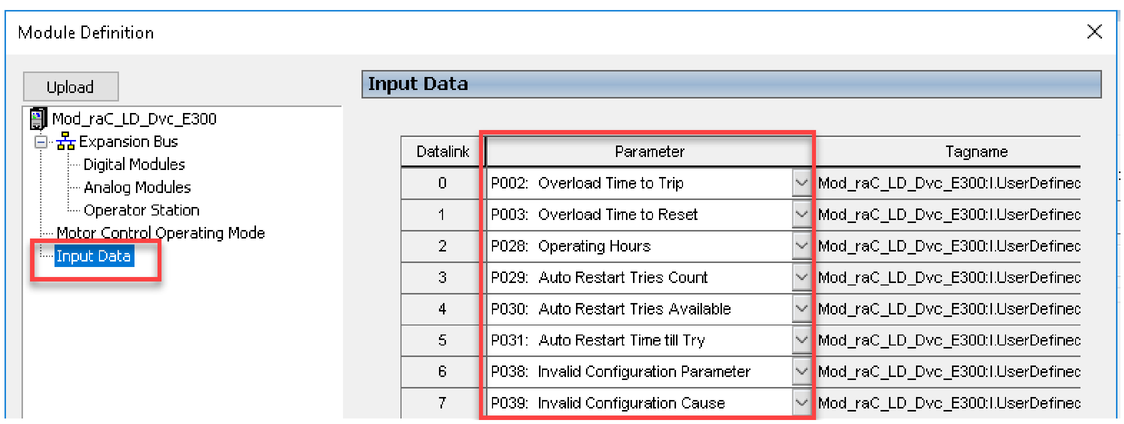
- Refer to the following sections for specific device configuration.

E300 Definition

- On the *General* tab click on the *Change...* button.



- Select the *Input Data* dialogue and add in any missing members by clicking the *Parameter* drop-down menu and choosing the required parameters.



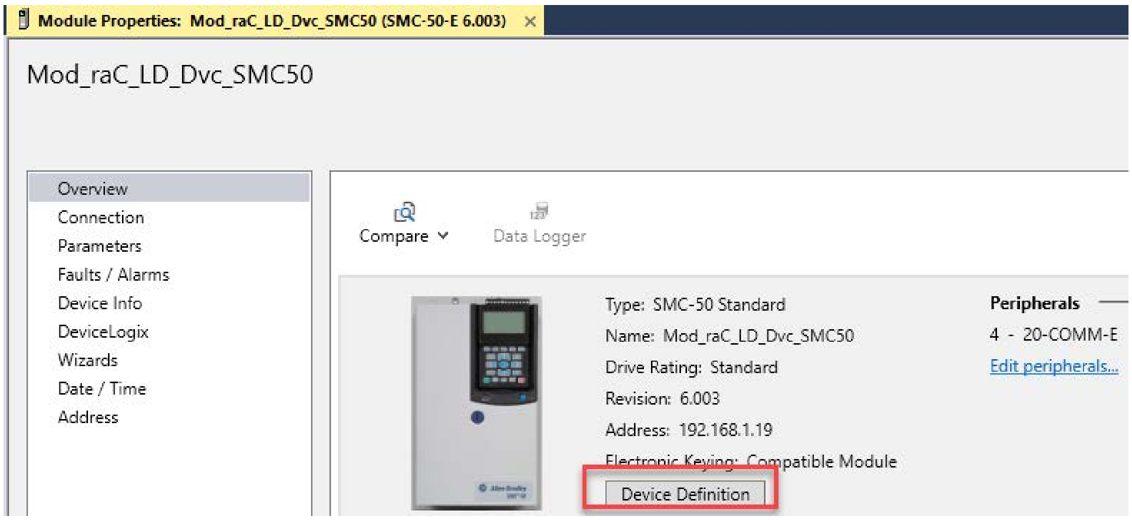
The device's connection format members must be configured as follows:

E300 Drive Configuration

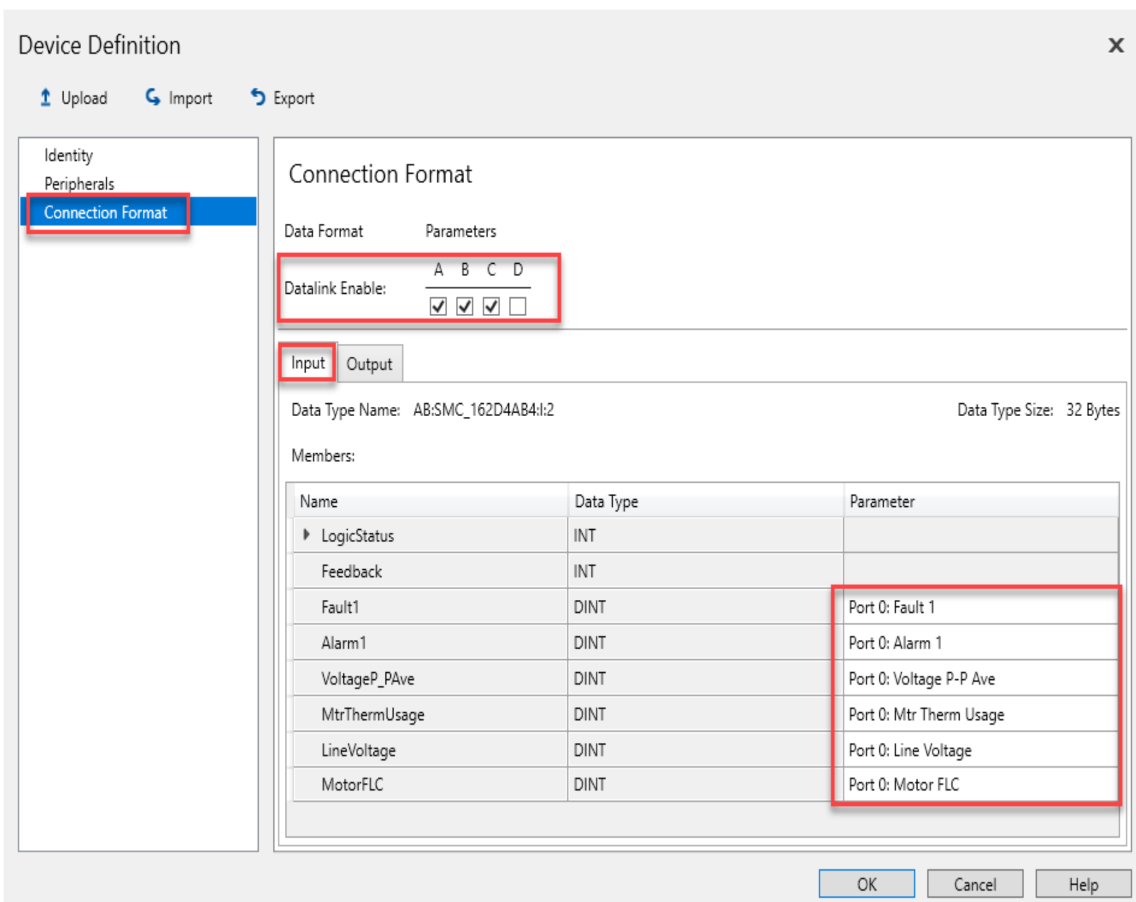
DataLink	Parameter	Tagname
0	P002: Overload Time to Trip	ModuleTag:I.UserDefinedData[0]
1	P003: Overload Time to Reset	ModuleTag:I.UserDefinedData[1]
2	P028: Operating Hours	ModuleTag:I.UserDefinedData[2]
3	P029: Auto Restart Tries Count	ModuleTag:I.UserDefinedData[3]
4	P030: Auto Restart Tries Available	ModuleTag:I.UserDefinedData[4]
5	P031: Auto Restart Time till Try	ModuleTag:I.UserDefinedData[5]
6	P038: Invalid Configuration Parameter	ModuleTag:I.UserDefinedData[6]
7	P039: Invalid Configuration Cause	ModuleTag:I.UserDefinedData[7]

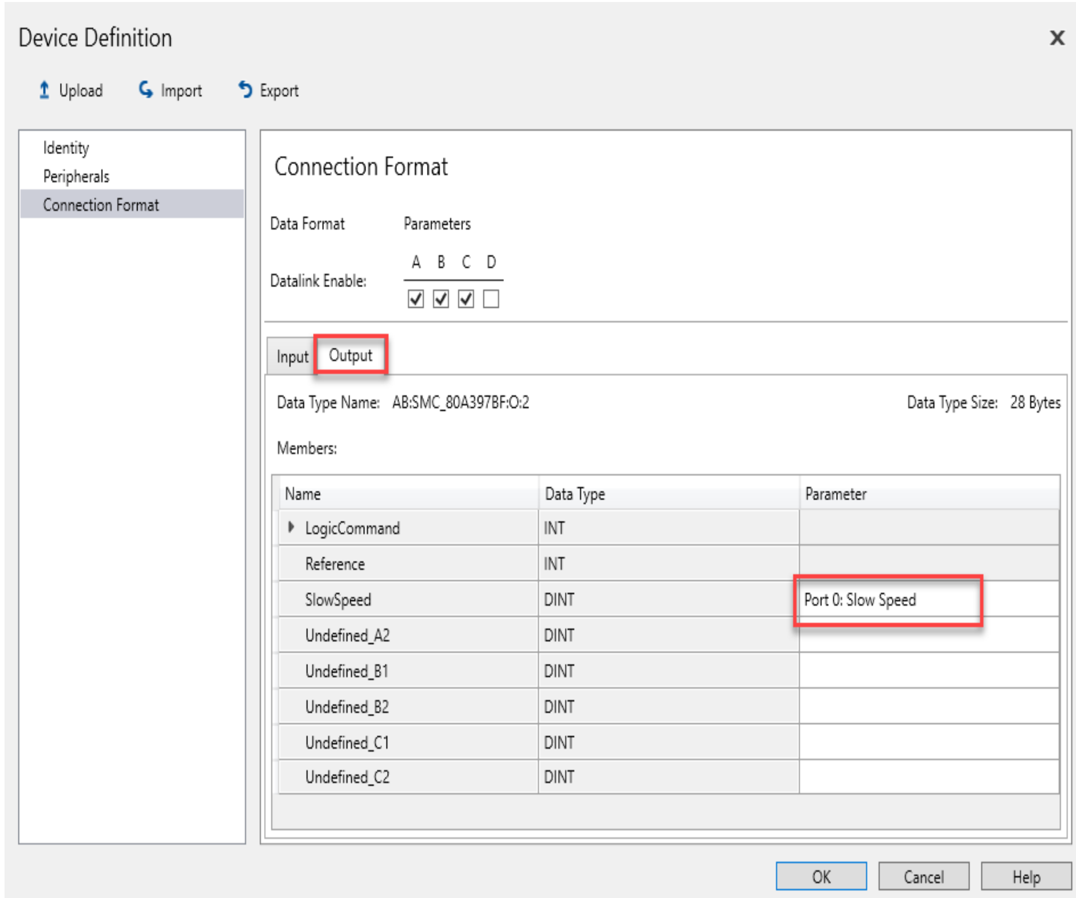
SMC™-50 Definition

- On the *Overview* tab click on the *Device Definition* button.



- Select the *Connection Format* tab and add in any missing members on the *Input* and *Output* tabs by clicking the *Parameter* drop-down menu and choosing the required parameters. Ensure Datalinks A, B, C are enabled.





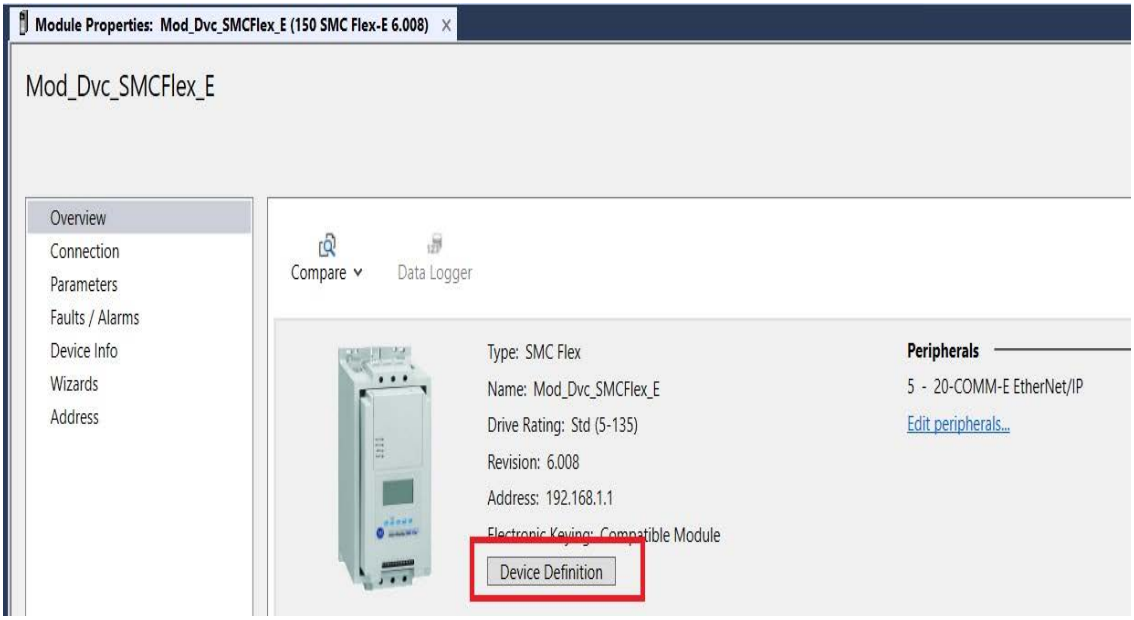
The device's connection format members must be configured as follows:

SMC™-50 Configuration

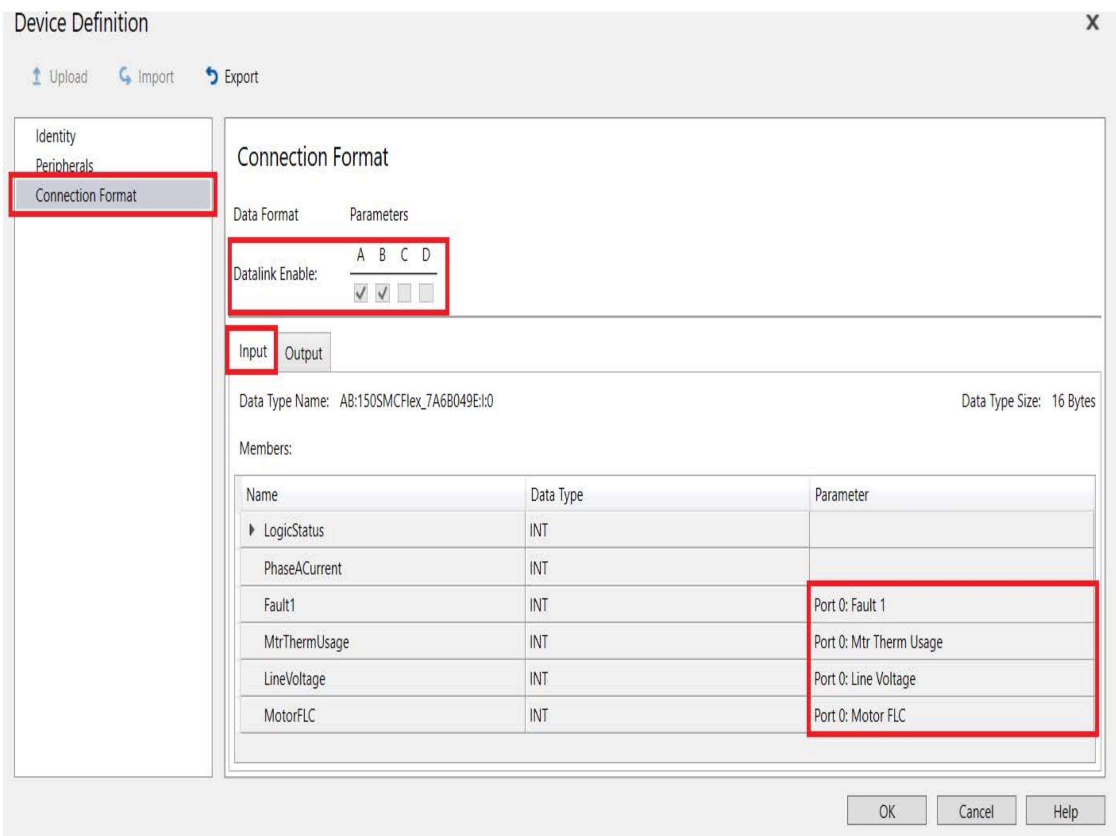
Type	Name	Data Type	Parameter
Input	LogicStatus	INT	
Input	Feedback	INT	
Input	Fault1	DINT	Port 0: Fault 1
Input	Alarm1	DINT	Port 0: Alarm 1
Input	VoltageP_PAve	DINT	Port 0: Voltage P-P Ave
Input	MtrThermUsage	DINT	Port 0: Mtr Therm Usage
Input	LineVoltage	DINT	Port 0: Line Voltage
Input	MotorFLC	DINT	Port 0: Motor FLC
Output	LogicCommand	INT	
Output	Reference	INT	
Output	SlowSpeed	DINT	Port 0: Slow Speed

SMC™-Flex Definition

- On the *Overview* tab click on the *Device Definition* button.



- Select the *Connection Format* tab and add in any missing members on the *Input* and *Output* tabs by clicking the *Parameter* drop-down menu and choosing the required parameters. Ensure Datalinks A, B are enabled.



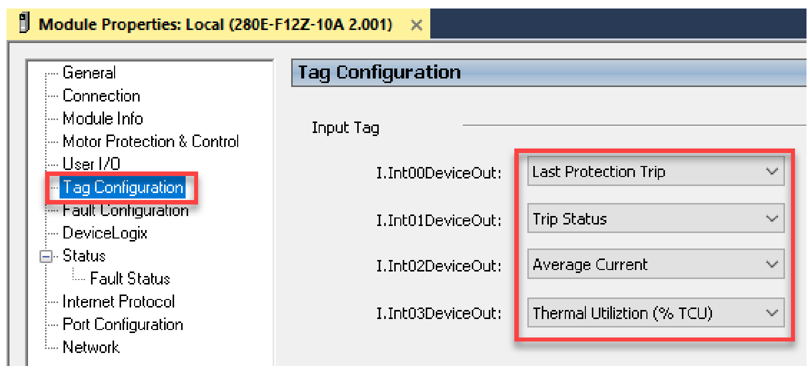
The device's connection format members must be configured as follows:

SMC™-Flex Configuration

Type	Name	Data Type	Parameter
Input	LogicStatus	INT	
Input	Feedback	INT	
Input	Fault1	INT	Port 0: Fault 1
Input	MtrThermUsage	INT	Port 0: Mtr Therm Usage
Input	LineVoltage	INT	Port 0: Line Voltage
Input	MotorFLC	INT	Port 0: Motor FLC
Output	LogicCommand	INT	
Output	SlowSpeedSel	INT	Port 0: Slow Speed Sel

ArmorStart® 28xE Definition

- On the *Tag Configuration* tab set the Input Tag drop-down selectors to the required tags..



The device's connection format members must be configured as follows:

ArmorStart® 280E, 281E Drive Configuration

Input Tag	Parameter
I.Int00DeviceOut	Last Protection Trip
I.Int01DeviceOut	Trip Status
I.Int02DeviceOut	Average Current
I.Int03DeviceOut	Thermal Utilization(% TCU)

ArmorStart® 291E Defintion

There is no special configuration required for the AS290E and AS291E.

Operations

The Power Discrete objects provide two modes of operation - physical and virtual.

Physical Device Operation

The following functions are applied when device object is selected as physical.

- **Activate:** Activate the device power structure. Device will follow the direction from control interface.
- **Deactivate:** Deactivate the device power structure by issuing Stop command. Reset active status.
- **Jog:** This function is possible from HMI faceplate only. When Jog command is 1, Activate device power structure. Once the command is 0, deactivate the device power structure by issuing stop command. Individual Jog forward and Jog reverse command are used to jog in either direction. Unlike other command bits, this command should not be unlatched by the device object.
- **Fault Reset:** Command to fault reset the device and also reset remove this status bits in device object. Command can be initiated from control interface and also HMI interface.

Virtual Device Operation

The following functions are applied when device object is selected as virtual.

- **Activate:** Set status to reflect successful activate command, Device related signals like Logic command and Out Reference should not be altered.
- **Deactivate:** Reset the active status.
- **Jog:** This function is possible from HMI faceplate only. When Jog command is 1, set status to reflect successful jog command. Once the command is 0, reset the active status. Individual Jog forward and Jog reverse command are used to jog in either direction. Update the direction status based on jog forward and jog reverse.
- **Fault Reset:** Command to reset status bits in device object. Command can be initiated from control interface and also HMI interface.

Faults & Warnings

- **First Warning:** This function helps in capturing the first warning triggered in the device. Display the respective description in faceplate.
- **First Fault:** Capture the first fault from device. Display the respective description in faceplate.
- **Event log:** Log Warning and Fault the last 4 events in a log queue. The queue contains fault code, description, and time stamp. Display the same in faceplate.

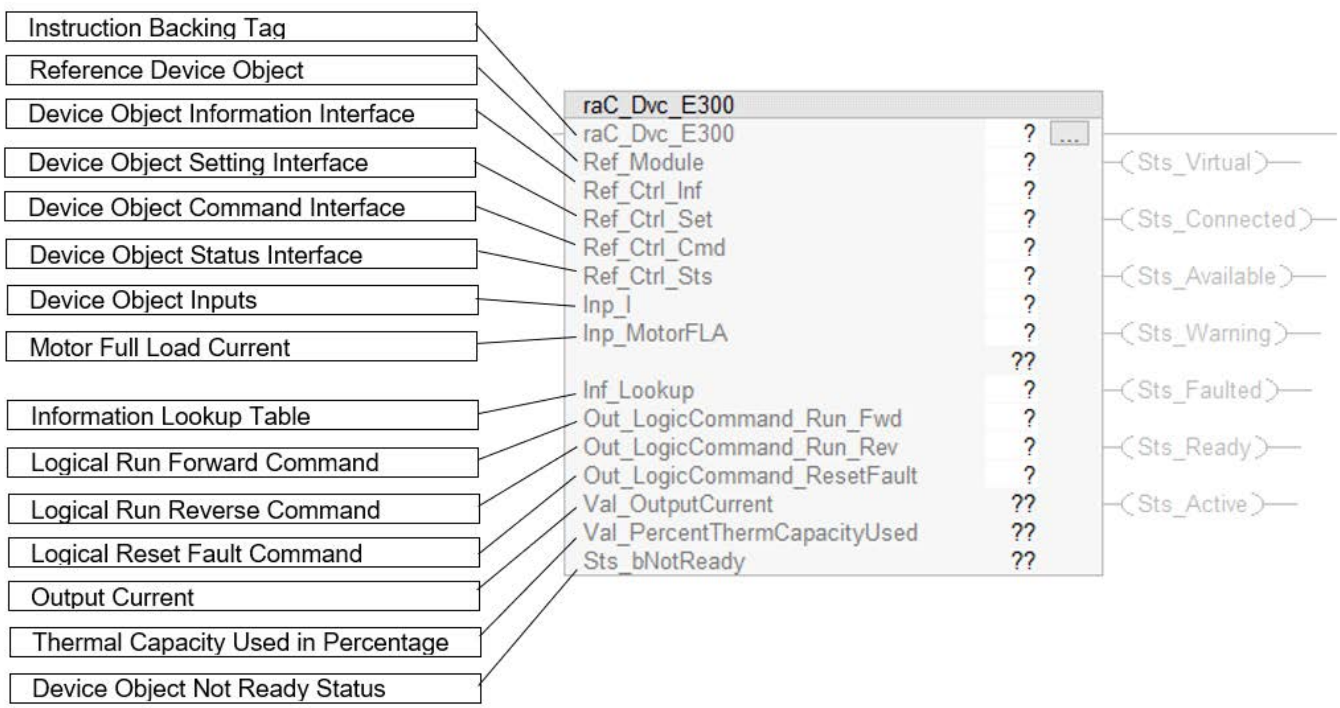
Execution

The following table explains the handling of instruction execution conditions.

Condition	Description
EnableIn False (false rung)	Processing for EnableIn False (false rung) is handled the same as if the device were taken out of service by Command. The device outputs are de-energized and the device is shown as Program Out of Service on the HMI. All alarms are cleared.
Powerup (prescan, first scan)	On prescan, any commands that are received before first scan are discarded. The device is de-energized. On first scan, the device is treated as if it were returning from Hand command source: the instruction state is set based on the position feedback that is received from the device. If the feedback is valid for one position, the device is set to that position. If the device does not have position feedback or the position feedback is invalid, the device is set to the 'unknown/powerup' state. The command source is set to its default, either Operator or Program (unlocked).
Postscan	No SFC Postscan logic is provided.

Add-On Instruction I/O Data

Add-On Instruction Ladder Implementation



InOut Data

InOut	Function / Description	DataType
Ref_Module	Reference to module in I/O tree	MODULE
Ref_Ctrl_Cmd	Power Discrete Device Command Interface	raC_UDT_ItfAD_PwrDiscrete_Cmd
Ref_Ctrl_Set	Power Discrete Device Setting Interface	raC_UDT_ItfAD_PwrDiscrete_Set
Ref_Ctrl_Sts	Power Discrete Device Status Interface	raC_UDT_ItfAD_PwrDiscrete_Sts
Ref_Ctrl_Inf	Power Discrete Device Information Interface	raC_UDT_ItfAD_PwrDiscrete_Inf
Out_LogicCommand_Run_Rev	Device Run Reverse Output Command	BOOL
Out_LogicCommand_Run_Fwd	Device Run Forward Output Command	BOOL
Out_LogicCommand_ResetFault	Device Clear Faults Output Command	BOOL
Inp_I	Input Interface - E300	raC_UDT_ItfAD_E300_Inp
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[2]

Input Data

Input	Function/Description	DataType
Inp_MotorFLA	Motor full load current	REAL
EnableIn	Enable Input - System Defined Parameter	BOOL
Cfg_FailDelayTime	Feedback Fail Delay Time in Miliseconds. Default Value - 1000	DINT

Output Data

Output	Function/Description	DataType
Val_PercentThermCapacityUsed	Thermal capacity used in percentage	REAL
Val_OutputCurrent	Device output current	REAL
Val_MotorFLA	Motor FLA Current (E300 only)	REAL
Val_PercentFLA	Motor % FLA Current (E300 only)	REAL
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Sts_Virtual	Virtual device status: 1 = Device is operating as a 'virtual' device	BOOL
Sts_Ready	Device ready status: 1 = ready to activate power structure	BOOL
Sts_Faulted	Device faulted status: 1 = an active fault exists	BOOL
Sts_Connected	Device is connected to the Programmable Controller	BOOL
Sts_bNotReady	Bitwise device 'not ready' reason 0 = Reserved 1 = Device not connected 2 = Device not available 3 = Device Faulted 4 - 31 = Reserved	DINT
Sts_Available	Device is available for interaction with user code	BOOL
Sts_Active	Device active status: 1 = output power structure is active	BOOL
raC_Dvc_E300	Unique Parameter Name for auto - discovery	BOOL
EnableOut	Enable Output - System Defined Parameter	BOOL

Data Types

The following Power Discrete Common Control Interface tags are the primary device program tags to read and write to when interfacing to power Discrete devices. The value of using these tags in your specific application code is that you may use a number of different power Discrete devices such as E300™ Electronic Overload Relays, SMC™-50 Soft Starters and ArmorStarts without having to update your application device interface tags.

Refer to the Interfaces section for detailed information on interfaces. Refer to the Using Power Device Objects with PlantPAx® or Using Power Device Objects with Machine Builder Libraries for more information on interfacing with other Rockwell Automation® application code libraries.

For further information and examples on how to interface the power device objects with your specific application code refer to the "How_To_Interface_with_Power_Device_Logix.mp4" video within the Videos folder of the Power Device Library Download files.

raC_UDT_ItfAD_PwrDiscrete_Inf

Member	Description	Data Type
ModulePath	Module CIP Path.	STR0032
bExtensionEnabled	Object extension is present in the controller. Bitwise representation: 0 = False, 1 = True.	DINT
bExtensionAlert	Object extension alert/notification is present. Bitwise representation: 0 = False, 1 = True.	DINT

raC_UDT_ItfAD_PwrDiscrete_Set

This is the Power Discrete Common Control Interface User-Defined Data Type for device settings. Its members provide application program access to allow or inhibit commands and settings from the device faceplate or other external sources. The table below shows member names, descriptions, and tag data types.

For example, to inhibit write commands from the device faceplate or other external sources write a 1 to the ModuleName_AOI_CtlrSet.InhibitCmd program tag from your application program. This would prevent a jog command from the device faceplate. You may also set the speed for the device.

Member	Description	Data Type
bInhibit	Inhibits (Bit Overlay).	DINT
InhibitCmd	1 = Inhibit user Commands from external sources, 0 = Allow.	BOOL
InhibitSet	1 = Inhibit user Settings from external sources, 0 = Allow.	BOOL
InhibitCfg	1 = Inhibit user Configuration from external sources, 0 = Allow.	BOOL

raC_UDT_ItfAD_ PwrDiscrete _Cmd

This is the Power Discrete Common Control Interface User-Defined Data Type for device commands. Its members provide application program access to common device commands.

Only write to these common command members to control the device. If you write directly to the device's output command tags directly unexpected device operation could occur.

For example, to start or activate the device write a 1 to the ModuleName_AOI_CtlrCmd.Activate tag. Do not write to the ModuleName:O.LogicCommand_Start tag. Although, you can write to the uncommon command tags in the device's output tag if a specific common control interface tag does not exist.

The table below shows member names, descriptions, and tag data types.

All the commands are available whether operating the device physically or virtually. Virtual Operation allows you to test your application code without activating the device's physical outputs.

Member	Description	Data Type
bCmd	Commands (Bit Overlay).	DINT
Physical	1 = Operate as Physical Device.	BOOL
Virtual	1 = Operate as Virtual Device.	BOOL
ResetWarn	1 = Reset device warning.	BOOL
ResetFault	1 = Reset device trip or fault.	BOOL
Activate	1 = Activate output power structure.	BOOL
Deactivate	1 = Deactivate output power structure.	BOOL
CmdDir	Command Direction: 0 = Forward, 1 = Reverse.	BOOL
Jog	1 = Jog command.	BOOL
Fast	1 = Fast speed of a 2 speed device.	BOOL
Slow	1 = Slow Speed of a 2 speed device.	BOOL

raC_UDT_ItfAD_PwrDiscrete_Sts

This is the Power Discrete Common Control Interface User-Defined Data Type for device status. Its members provide application program access to device states, status, and diagnostic data. The table below shows member names, descriptions, and tag data types.

Input	Description	Data Type
eState	Enumerated state value: 0 = Unused, 1 = Initializing, 2 = Disconnected, 3 = Disconnecting, 4 = Connecting, 5 = Idle, 6 = Configuring, 7 = Available.	DINT
FirstWarning	First Warning.	raC_UDT_Event
FirstFault	First Fault.	raC_UDT_Event
eCmdFail	Enumerated command failure code. 0= No Command Failure, 1= Virtual Command Fail, 2= Physical Command Fail, 3= Start Command Fail, 4= Stop Command Fail, 5= Fault Reset Command Fail,6= Operator Start Command Fail.	DINT
bSts	Status (Bit Overlay). 0 = Connected, 1 = Available, 2 = Warning, 3 = Faulted, 4 = Ready, 5 = Active.	DINT
Physical	1 = Controlling physical device.	BOOL
Virtual	1 = Controlling virtual device.	BOOL
Connected	1 = PAC to device connection has been established.	BOOL
Available	1 = The device is available for interaction with the user program.	BOOL
Warning	1 = A warning is active on the device.	BOOL
Faulted	1 = A fault is active on the device.	BOOL

Input	Description	Data Type
Ready	1 = Device is ready to be activated.	BOOL
Active	1 = Device power structure is active.	BOOL
CmdDir	Command direction: 0 = Forward, 1 = Reverse.	BOOL
ActDir	Actual direction: 0 = Forward, 1 = Reverse.	BOOL
Cmdspd	Command speed: 0 = Slow, 1 = Fast	BOOL
Fast	Fast speed selected (2-speed device)	BOOL
Slow	Slow speed selected (2-speed device)	BOOL

raC_UDT_Event

An array of size 4 is to be used to log the FirstWarning and FirstFault capture. The data should be FIFO order. The same should be displayed on the Faceplate.

Member	Description	Data Type
Type	Event type: 1 = Status, 2 = Warning, 3 = Fault, 4…n = User.	DINT
ID	User definable event ID.	DINT
Category	User definable category (Electrical,Mechanical,Materials,Utility,etc.).	DINT
Action	User definable event action code.	DINT
Value	User definable event value or fault code.	DINT
Message	Event message text.	STRING
EventTime_L	Timestamp (Date/Time format).	LINT
EventTime_D	Timestamp (Y,M,D,h,m,s,us).	DINT[7]

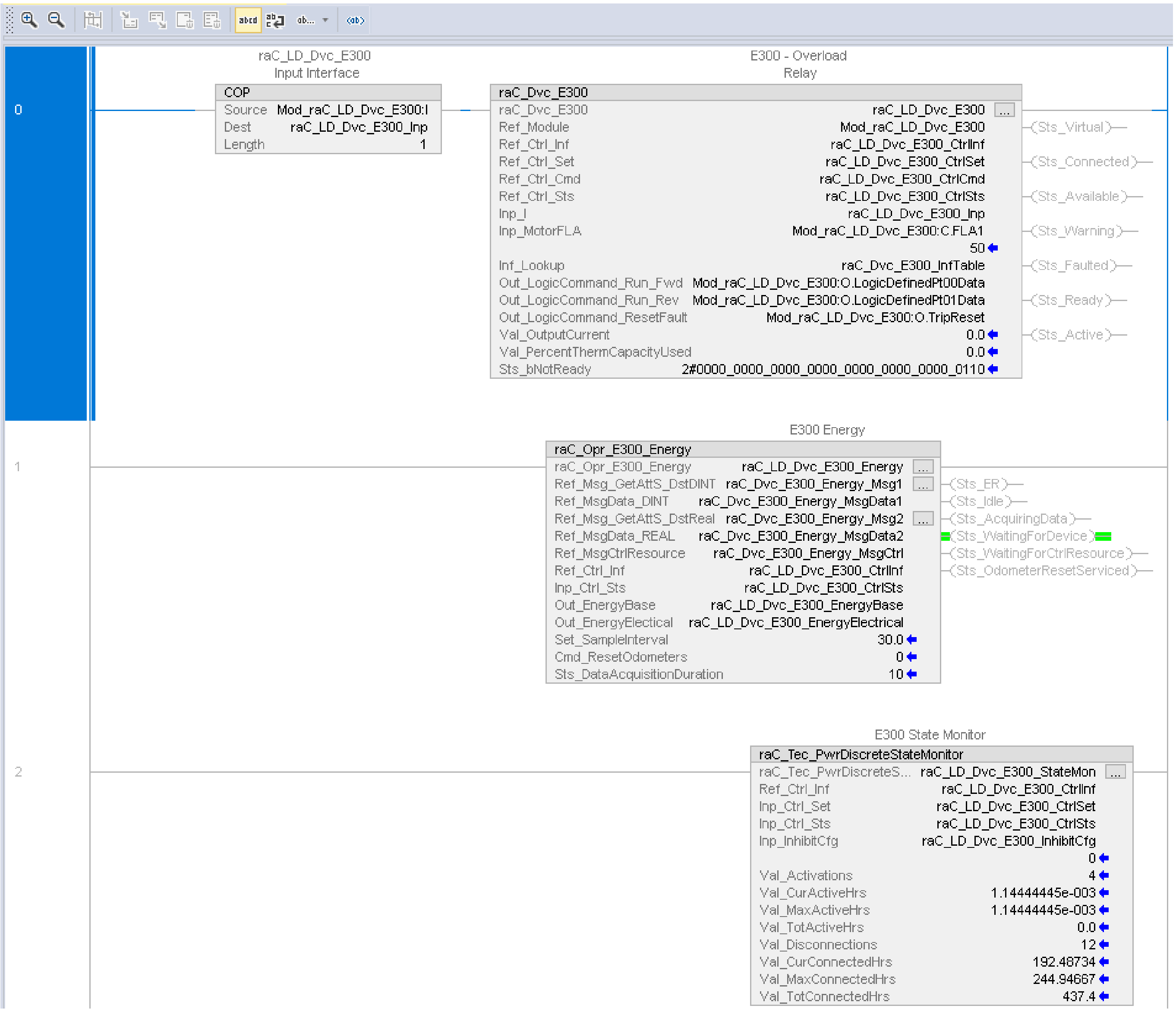
raC_UDT_LookupMember_STR0082

Member	Description	Data Type
Code	Code	DINT
Desc	Code Description	STRING

Programming Example

Fully configured device on a rung is provided below for reference. The first rung is required and the others are optional. This example includes the device and extensions objects for a E300 (raC_Dvc_E300).

Note that this programming example is the same code that is imported when either importing the supplied rung .L5X files or when using Application Code Manager or the Studio 5000® Import Library Objects wizard plug-in.



The device (ie: E300) must also be configured with the correct device definition. Note that this configuration is completed automatically when using Application Code Manager or the Studio 5000® Import Library Objects wizard plug-in. For details on setting up the device, refer to the Device Definition section.

Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. Alternatively, faceplates may also be launch from related instructions such as the navigate to device faceplate buttons in the Process Library PMTR faceplate or the Machine Builder Library raM_Dvc_Motor_Disc faceplate.

All icons display the following information:

- - Device label (Tag.@Description or custom label entered in parameter #104)
- - Motor % FLA
- - Connection Fault/Virtual Indication
- - Device Warning/Fault Indication
- - Device not ready indication
- - Device Active (running)/Inactive (stopped) indication

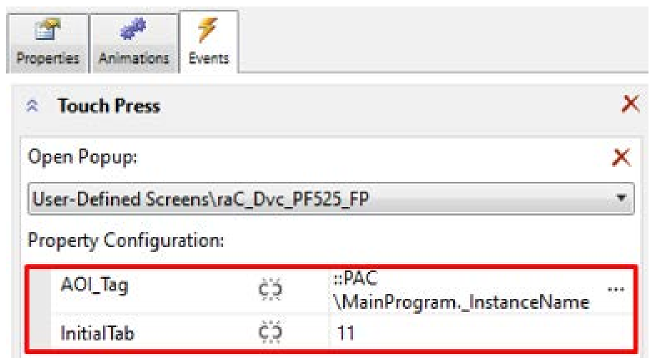
See Launch Buttons for more general information on launch button diagnostics and usage.

FactoryTalk® View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GOLaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate.	#102: Backing Tag (e.g. {::[PAC]Program::Program._InstanceName}) #104: Custom button label. Leave blank to use Tag.@Description #120: Display's left position (e.g. 100, optional) #121: Display's top position (e.g. 100, optional)
GO_LaunchE300_TagString		Use with E300 Overload Relays Motor % FLA Shown as live value.	
GO_LaunchSMC50_TagString		Use with SMC-50, SMC-Flex Soft Starters Motor % FLA Shown as live value	
GO_LaunchArmorStartDisc_TagString		Use with ArmorStart 280E/281E/290E/291E Discrete Starters Motor % FLA Shown as live value	

Studio 5000 View Designer® Graphic Symbols

All Studio 5000 View Designer® graphic symbols must be configured with an *Event* to open up the appropriate Popup screen. Select the graphic symbol and in the *Properties* window navigate to the *Events* tab. Assign a *Button Behavior* event to *Open popup on release*. Assign the required Popup screen (e.g. User-Defined Screens\raC_Dvc_E300_FP). The required *Property Configurations* are found in the following table where you may assign the *AOI_Tag* to the object's Add-On Instruction tag.



Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		Faceplate navigation button with string tag label. Use Properties > General > Text to modify the button label text.	AOI_Tag: Object's Add-On Instruction Tag
GO_LaunchE300_TagString		Use with E300 Overload Relays Motor % FLA Shown as live value.	
GO_LaunchSMC50_TagString		Use with SMC-50, SMC-Flex Soft Starters Motor % FLA Shown as live value	
GO_LaunchArmorStartDisc_TagString		Use with ArmorStart 280E/281E/290E/291E Discrete Starters Motor % FLA Shown as live value	

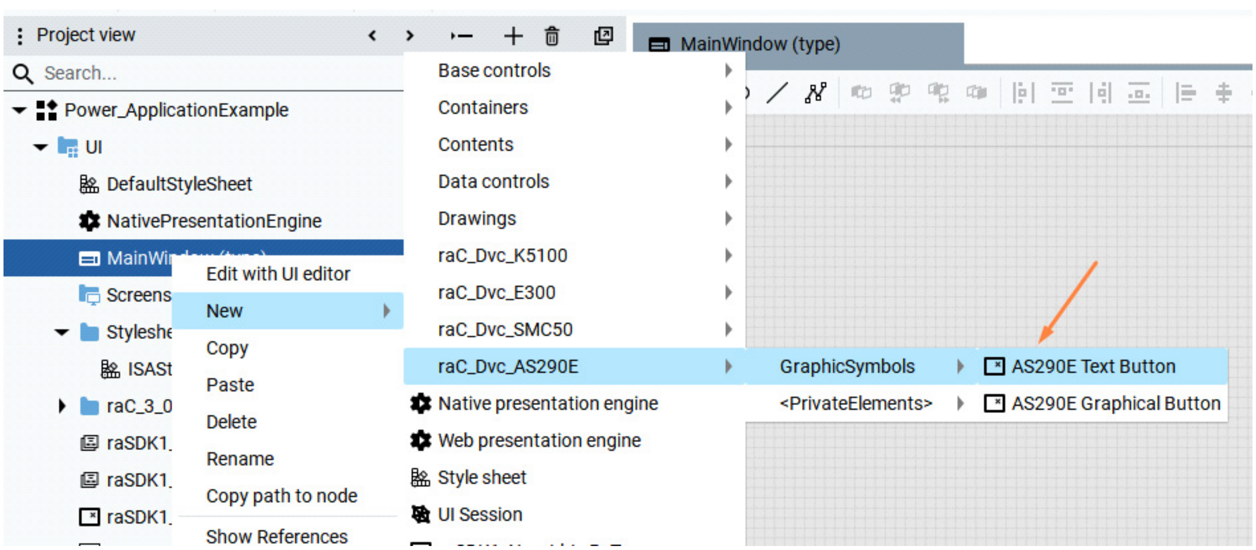
FactoryTalk® Optix Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. All graphical symbols for Power Devices display the following information:

- - Device label (Tag.@Description or custom label)
- - Motor % FLA
- - Connection Fault/Virtual Indication
- - Device Warning/Fault Indication
- - Device not ready indication
- - Device Active (running)/Inactive (stopped) indication

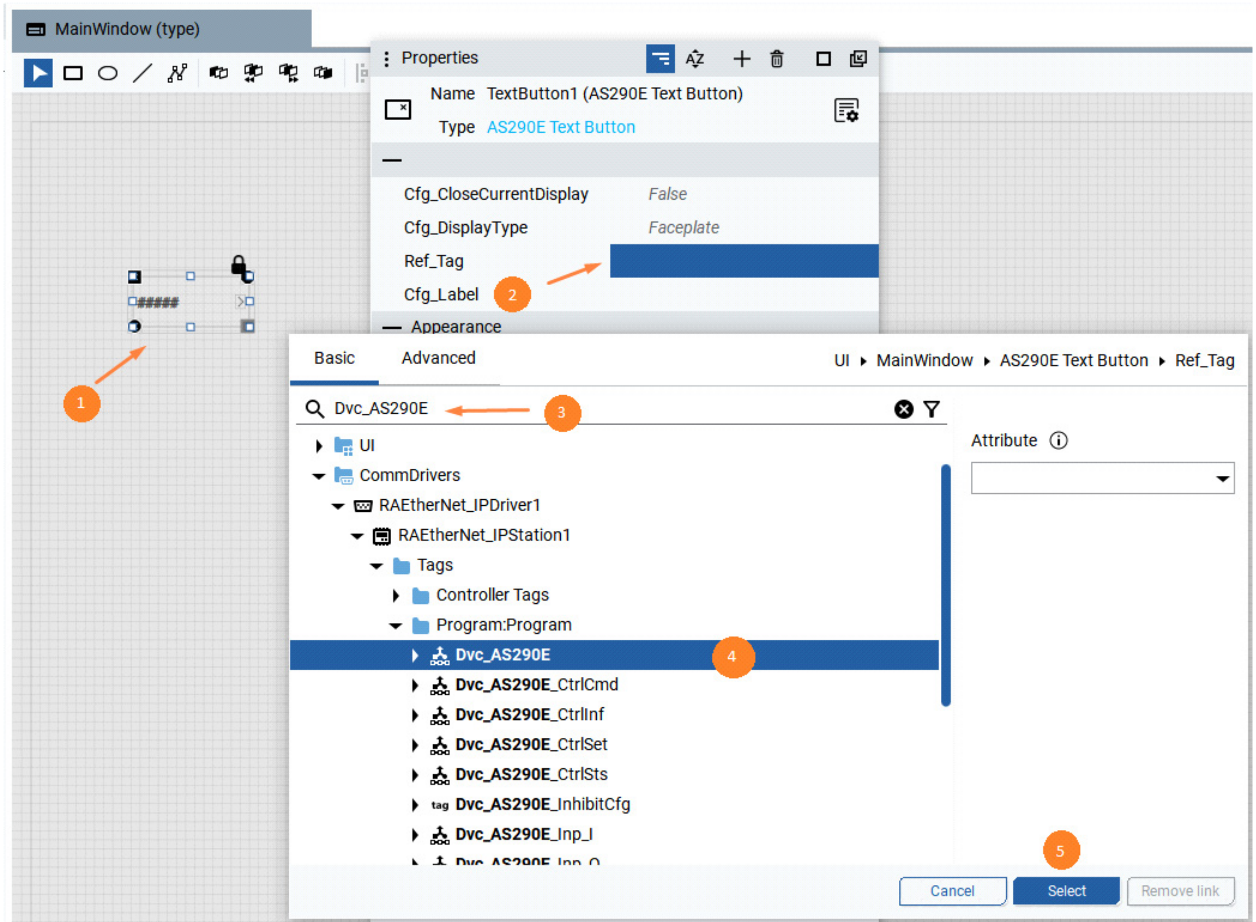
See Basic Launch Button Attributes section for more general information on launch button diagnostics and usage.

Once the Objects have been imported into the FactoryTalk® Optix Studio project, you can begin using them in your application. To add a new Launch Button to a Main window, navigate to raC_3_xx_raC_Dvc_ObjectName_UI > Graphic Symbols > raC_3_xx_raC_Dvc_ObjectName_GS_NavText Button to insert a navigation launch button with a text label.



After placing the graphic symbol on a UI panel, link the “Ref_Tag” property to the targeted Asset under Asset tag.

Text label shown on button can be configured using “cfg_Label” property, If it is not configured then description of the asset will be shown on the button face.



This is the only step needed to link the UI to the asset data model. For more information on graphic symbols, refer to the Graphic Symbols section of the Power Discrete device type in this manual.

<table>
<tr><th>Graphic Symbol Name</th><th>Graphic Symbol</th><th>Description</th><th>Property Configuration</th></tr>
<tr><td>raC_3_xx_raC_Dvc_Devicename_GS_NavText</td><td>
</td><td>Faceplate navigation button. Use Cfg_Label Variable to modify the button label text.</td><td rowspan="4">Cfg_CloseCurrentDisplay: Set to ‘True’ to close the previously open display when launching the object faceplate

Cfg_DisplayType: Faceplate to be opened on button click. This should not be modified.

Ref_Tag: Object’s Add-On Instruction Tag

Cfg_Label: Text label shown on the button face</td></tr>
<tr><td>raC_3_xx_raC_Dvc_Devicename_GS_NavGraphical</td><td>
</td><td>Use with E300 Overload Relays

Motor % FLA Shown as live value.</td></tr>
<tr><td>raC_3_xx_raC_Dvc_Devicename_GS_NavGraphical</td><td>
</td><td>Use with SMC-50, SMC-Flex Soft Starters

Motor % FLA Shown as live value</td></tr>
<tr><td>raC_3_xx_raC_Dvc_Devicename_GS_NavGraphical</td><td>
</td><td>Use with ArmorStart 280E/281E/290E/291E Discrete Starters

Motor % FLA Shown as live value</td></tr>
</table>

Graphic Symbol Button Configuration Variables

Variable Name	Description	Default Value
Cfg_CloseCurrentDisplay	Set to ‘True’ to close the previously open display when launching the object faceplate	False
Cfg_DisplayType	Faceplate to be opened on button click. This should not be modified.	Faceplate
Ref_Tag	Link to instance of desired target Asset model found in Model > Asset folder.	N/A - User must configure
Cfg_Label	Text label shown on the button face. Defaults to the description of the asset but users may replace in instances with other desired text.	../Ref_Tag@Description

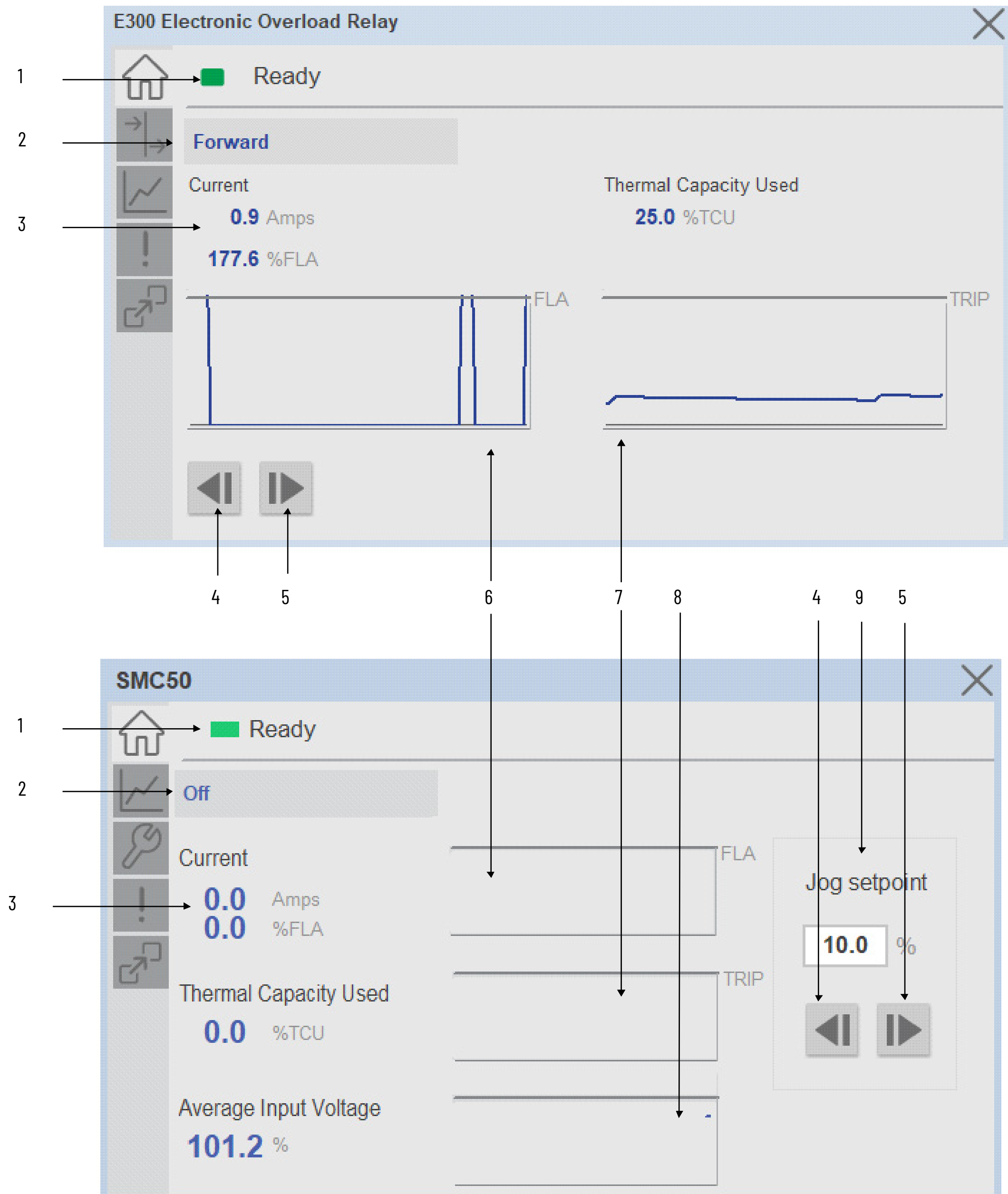
Faceplates

There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 28.

Home

The Home tab is the main tab of the faceplate. It contains small trends called sparklines and a jog control object. Note that the SMC™-50 Home tab is slightly different from the E300 and ArmorStart® 2x0E/2x1E faceplates.

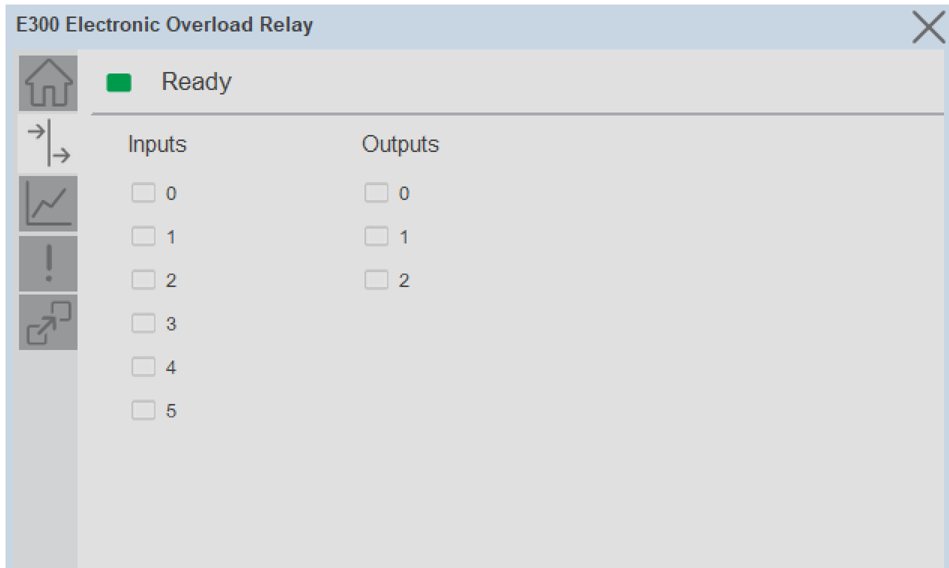
On the top left is a Forward speed indicator that is a multi-state indicator and changes text based on the device state. Other text for state changes includes, “Reverse”, “Zero Speed”, and “Off”. The current, thermal capacity used and average input voltage (SMC™-50 only) numeric displays are read-only. There are spark lines for % FLA, % Thermal Capacity Used, and Average Input Voltage (SMC™-50 only). There are two command buttons for Jog Forward and Jog Reverse. The SMC™-50 also has a speed setpoint which can be modified from the faceplate.



Item	Description
1	Banner
2	Device Action Forward/Reverse/Off
3	Device values: current, % FLA, Thermal Capacity Used
4	Jog reverse
5	Jog forward
6	%FLA sparkline trend
7	Thermal Capacity Used %TCU sparkline trend
8	Average Input Voltage % sparkline trend (SMC™-50 only)
9	Jog speed setpoint (SMC™-50 only)

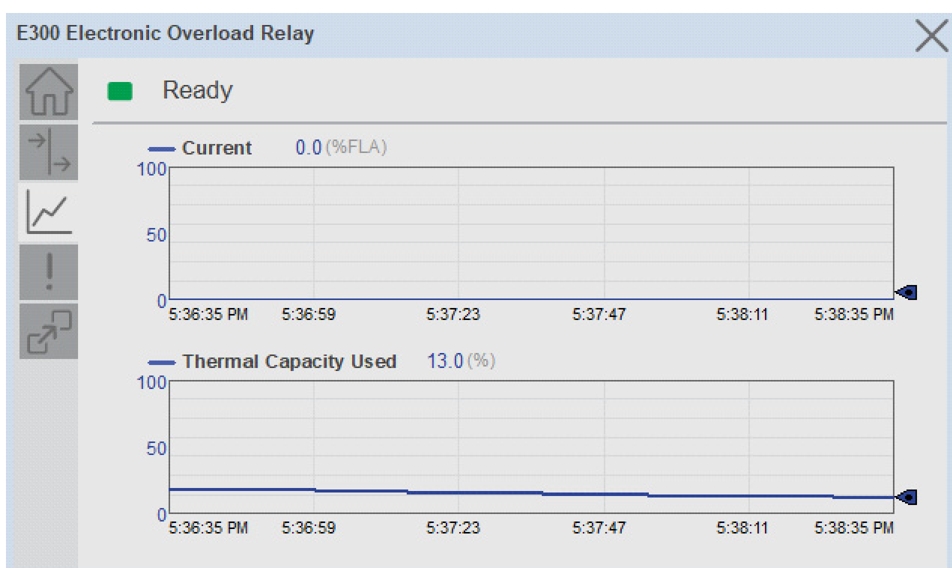
I/O Tab

The I/O tab is available on the E300, AS280E, AS281E, AS290E, and AS291E devices only. This tab shows the status of Inputs 0-5 and Outputs 0-2. LED shows no color when they are in the OFF position and shows blue when they are in the ON position.



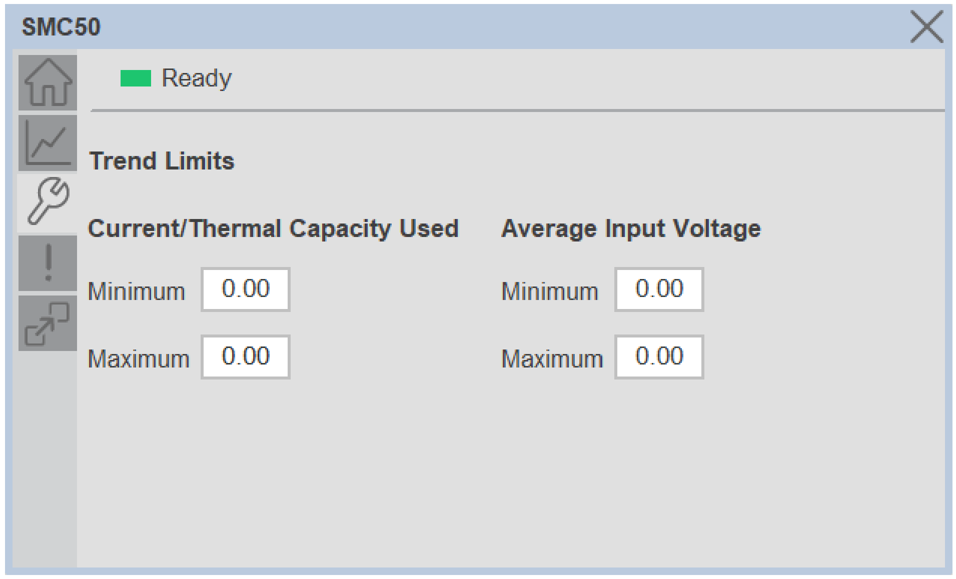
Trend Tab

Trends display values over time, often used to compare similar or related values and to allow operators to predict future states to make control action decisions. Two trends are displayed - Current and Thermal Capacity used. The SMC™-50 device also has a trend for Average Input Voltage.



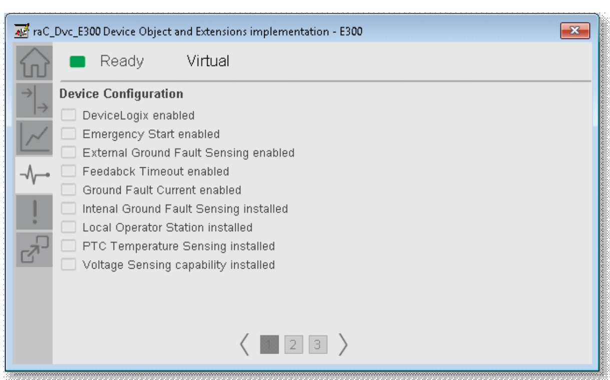
Configure Tab

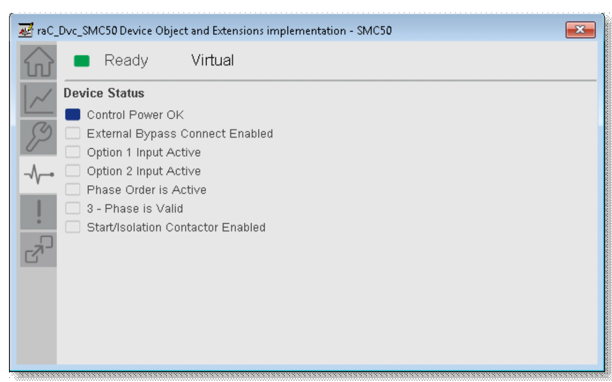
The Configure tab contains configuration elements that a maintenance technician would need to troubleshoot and adjust for an object on another tab, i.e., numeric inputs to adjust trend min and max values.



Diagnostics Tab

The device diagnostics tab includes a list of information available in the drive for troubleshooting. This tab is available on E300 and SMC50 devices only. The amount and type of diagnostics included is dependent on the specific device model. These diagnostics may include drive start inhibits and drive status.





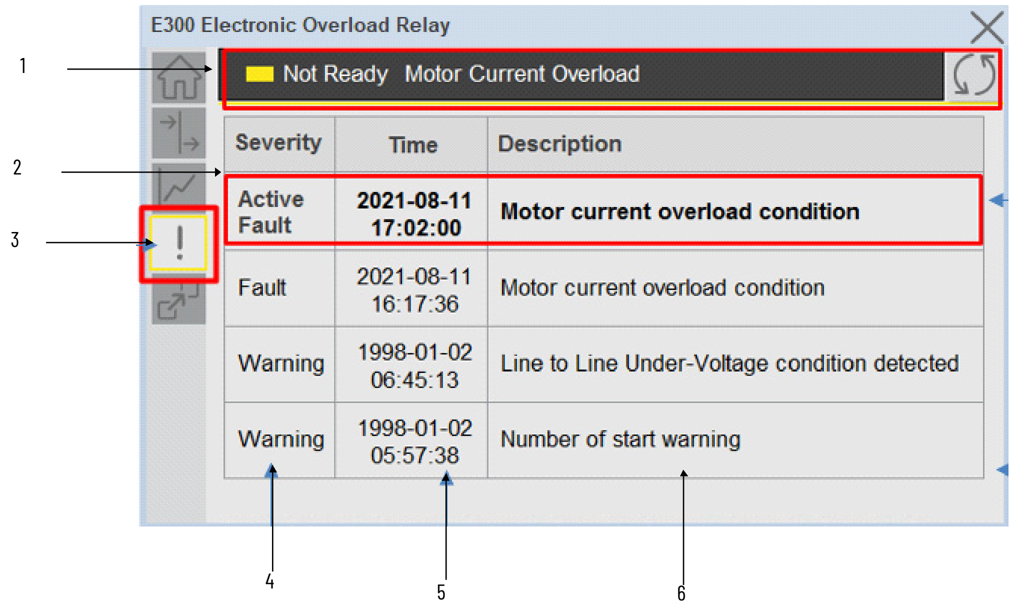
Diagnostic	Type	E300	SMC50	SMCFlex	AS280E	AS281E	AS290E	AS291E
DeviceLogix Enabled	Device Configuration	Yes						
Emergency Start enabled	Device Configuration	Yes						
External Ground Fault Sensing enabled	Device Configuration	Yes						
Feedback Timeout Enabled	Device Configuration	Yes						
Ground Fault Current Enabled	Device Configuration	Yes						
Internal Ground Fault Sensing installed	Device Configuration	Yes						
Local Operator Station installed	Device Configuration	Yes						
PTC Temperature Sensing installed	Device Configuration	Yes						
Voltage Sensing capability installed	Device Configuration	Yes						
Module 1 - Input 0/1/2/3	Inputs/Outputs	Yes						
Module 1 - Output 0/1	Inputs/Outputs	Yes						
Module 2- Input 0/1/2/3	Inputs/Outputs	Yes						
Module 2- Output 0/1	Inputs/Outputs	Yes						
Module 3- Input 0/1/2/3	Inputs/Outputs	Yes						
Module 3- Output 0/1	Inputs/Outputs	Yes						
Module 4- Input 0/1/2/3	Inputs/Outputs	Yes						
Module 4- Output 0/1	Inputs/Outputs	Yes						
DeviceLogix Output Status Pt00 - Pt15	Device Logix Output Status	Yes						
Control Power OK	Device Status		Yes	Yes				
External Bypass Connect Enabled	Device Status		Yes	Yes				
Option 1 Input Active	Device Status		Yes	Yes				
Option 2 Input Active	Device Status		Yes	Yes				
Phase Order is Active	Device Status		Yes	Yes				
3-Phase is valid	Device Status		Yes	Yes				
Start/Isolation Contactor Enabled	Device Status		Yes	Yes				

Note: additional diagnostics for the PF755T are available through the Predictive Maintenance Extension object.

Fault Warning Tab

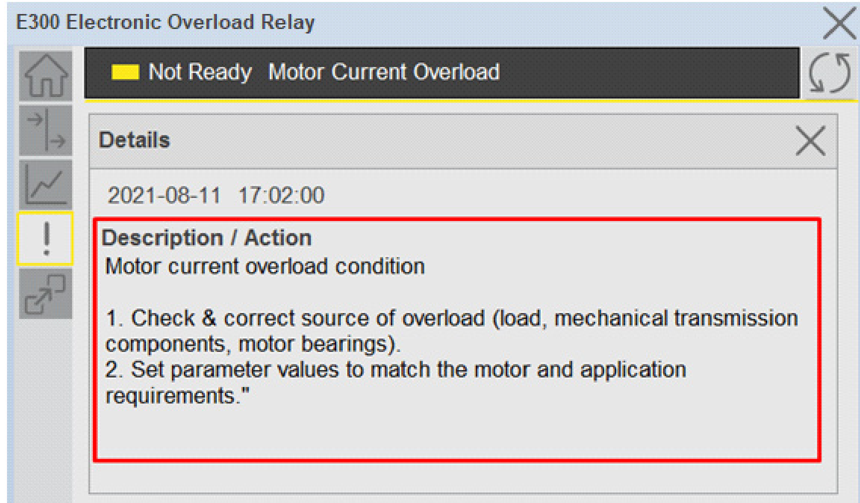
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

Note, only row 1 will display the “Active Fault” in the severity column if there is a current active fault, else it will display the last fault. Rows 2-4 only display past faults and warnings, not an active fault.



Item	Description
1	Banner
2	Last fault is in first row and show in bold if active
3	Yellow border visible when a fault is active
4	Fault severity
5	Fault event time
6	4 most recent fault/warning event messages

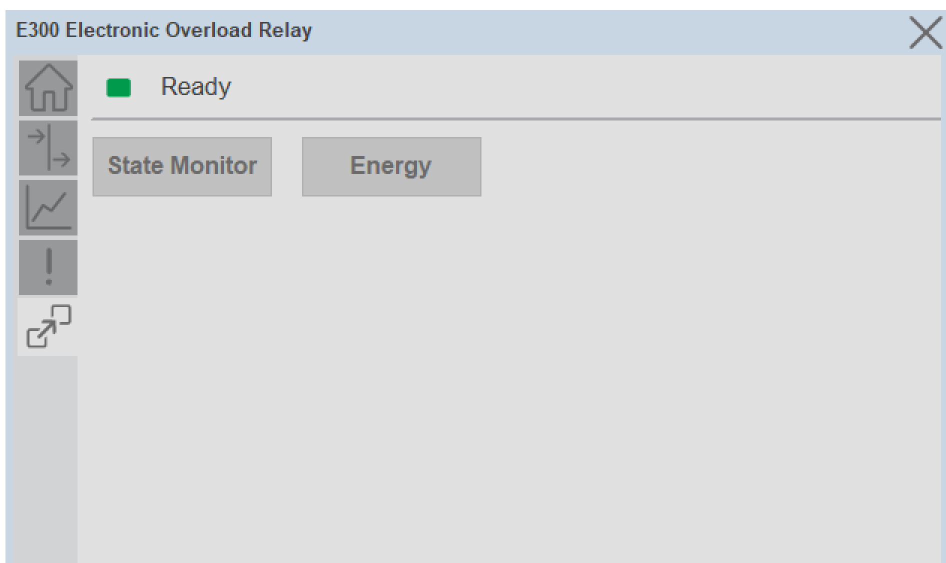
Click on any row in the fault table to view fault details. The details window provides a more detailed description and possible action steps to remedy condition.



Extension Tab

The Extension tab provides a navigation button to open Extension faceplates. Extension faceplates are optional and may include:

- State Monitor Extension
- Energy Extension
- Predictive Maintenance Extension



Note that extensions are currently only available in FactoryTalk® View Studio and are not supported in Studio 5000 View Designer®.

For complete details on extensions, refer to the related sections of this manual:

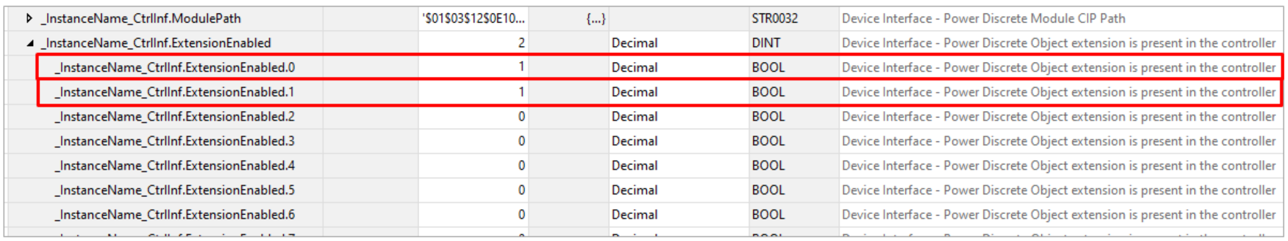
- State Monitor Extension
- Energy Extension

- Predictive Maintenance Extension

Extensions will be enabled through the device object's Information interface. The interface contains a DINT member entitled ExtensionEnabled. Each bit of ExtensionEnabled represents an extension location, thus a device object can theoretically support 32 extensions.

Currently, extension names are reserved for the following locations:

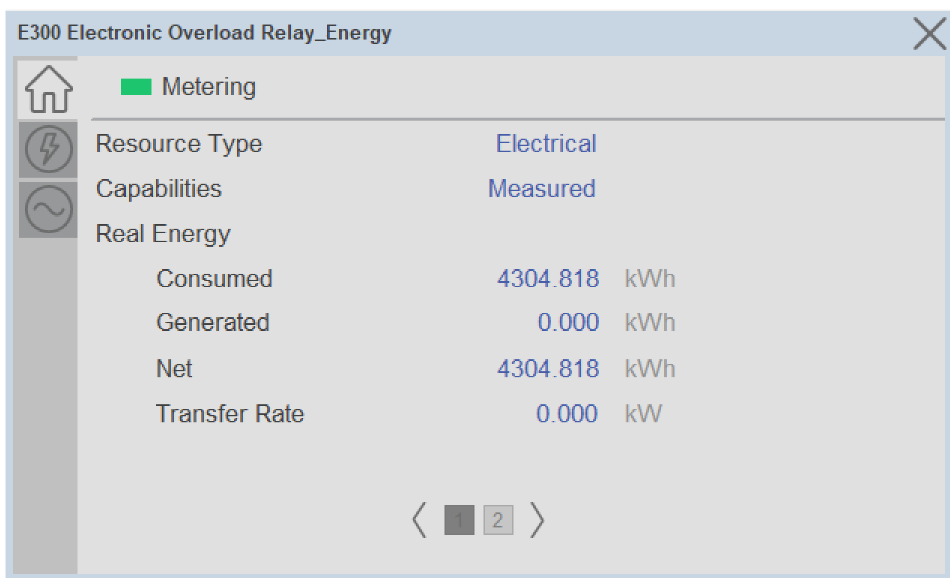
Extension Name	Location	Tag Suffix
State Monitor	Bit 0	_StateMon
Energy	Bit 1	_Energy
Predictive Maintenance	Bit 2	_PredMaint
Reserved	Bits3-31	



Extension Objects

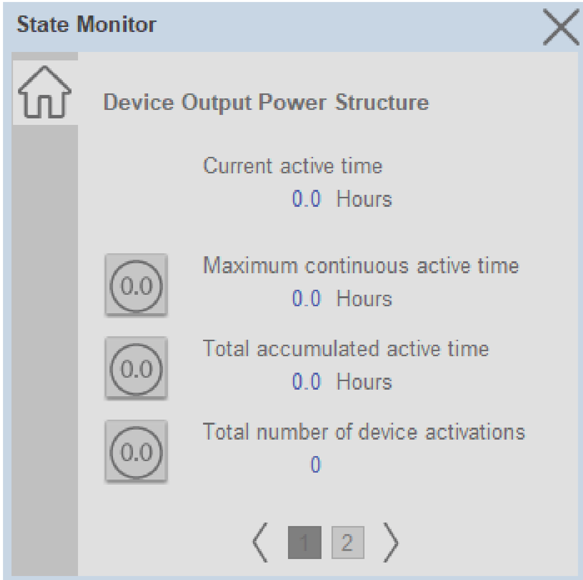
Energy Extension

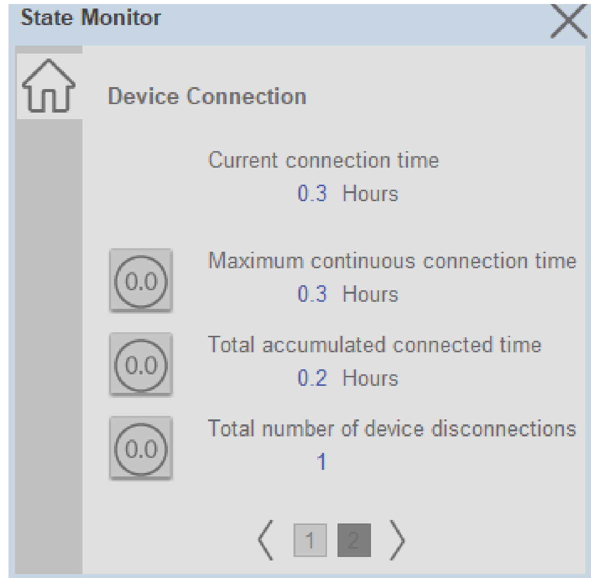
Energy extension faceplates are available for compatible objects. Refer to the raC_Opr_xxx_Energy section of this manual for more information.



State Monitor Extension

State Monitor extension faceplates are available for all objects. Refer to the raC_Tec_PwrxxxStateMonitor section of this manual for more information.





Application Code Manager

All Power Discrete device objects have similar configuration parameters in Application Code Manager. The following section defines the common parameters. "xxxxx" is used in place of the specific device name (e.g. E300).

Refer to the section Using Application Code Manager for complete details.

Definition Object: raC_Dvc_xxxxx

This object contains the AOI definition and used as linked library to implement object. This gives flexibility to choose to instantiate only definition and create custom implement code. User may also create their own implement library and link with this definition library object.

Parameter Name	Default Value	Instance Name	Definition	Description
ObjectInterfaceDatatype	UserDefinedDatatype			Determine the interface datatype of the object. Note: if using with the Process object library, select PreDefinedDatatype. PreDefinedDatatype selection can be used with L8 or 5069 controllers in V33 and later. UserDefinedDatatype selection can used in any application that does not utilize the Process object library.

Implementation Object: raC_LD_Dvc_xxxxx

Parameter Name	Default Value	Instance Name	Definition	Description
RoutineName	{ObjectName}	{RoutineName}	Routine	Enter Routine name. Routine will be created and Object implement rung(s) inserted. A JSR will be inserted in MainRoutine. If routine name already exists, then object will be inserted into existing routine. By default, parameter is set to Object Name.
TagName	{ObjectName}	{TagName}	Backing Tag	Enter the backing tag of the main AOI. This will serve as the base tag name for other tags in this object that are derived from the base.
TagDescription	{ObjectDescription}	{TagDescription}		Tag Description of the main AOI backing tag
TagScope	Program		Input Parameter	Tags will be created at the assigned scope
ObjectInterfaceDatatype	UserDefinedDatatype		Input Parameter	Determine the interface datatype of the object. Note: if using with the Process object library, select PreDefinedDatatype. PreDefinedDatatype selection can be used with L8 or 5069 controllers in V33 and later. UserDefinedDatatype selection can used in any application that does not utilize the Process object library.
ModuleName	Mod_{ObjectName}	{ModuleName}	Input Parameter	Enter the Module Name. This is the name for the module that appears in the Controller Organizer tree.
ModuleType	Device Dependent			Select hardware module type. e.g. ECM_ETR. See Module Options for full details.
MotorFLA	1.0			Applicable to ArmorStart® 280E/281E only. Enter motor full load amps
IncludeHW	1			Allow ACM to create the Hardware Module. If the module already exists in the Controller Organizer, select False or existing module properties will be overwritten.
IPAddress	192.168.1.1		Input Parameter	Enter a valid network address for the hardware module. It must be of form X.X.X.X
ParentModule	Local		Input Parameter	Select the Parent Module. This represents the name of the communication adapter this module will communicate through. If connecting to a non-library object module, enter the name of the module only. If the module is connected directly to the controller ethernet port, enter "Local". Note: entering non-library object modules will result in the parameter displaying a red X. This will still generate properly as long as the entered name exists in the project.
ChassisName	{ParentModule}			Warning removal
IncludeEnergy	0		Input Parameter	Include the energy extension object
IncludeStateMonitor	0		Input Parameter	Include the State Monitor extension object
EnergyMsgTag	raC_Dvc_xxxxx_Energy_Msg	{EnergyMsgTag}		Enter Tag name for Msg Services. This tag should be unique for Msg Service class. Multiple objects can share the tag.

Parameter Name	Default Value	Instance Name	Definition	Description
EnergyMsgCtrl	raC_Dvc_xxxxx_Energy_MsgCtrl	{EnergyMsgCtrl}		Message Services Control Tag. This tag provides the control interface for the messaging services. This should be unique per class. Multiple objects can share the tag.
EnergyMsgData	raC_Dvc_xxxxx_Energy_MsgData	{EnergyMsgData}		Data tag for Messaging Services. This tag should be unique per class. Multiple objects can share the tag.
SymbolStyle	Icon			HMI launch button symbol style. Icon/Text
SEAssocDisplay			HMI Display	FactoryTalk View SE Display reference. Launch button will be generated on this display.
MEAssocDisplay			HMI Display	FactoryTalk View ME Display reference. Launch button will be generated on this display.

Module Options

A detailed list of available DriveRatings and ModuleTypes is below:

Device	ModuleType Options
raC_Dvc_AS280E	280E-F12Z-10A 280E-F12Z-10B 280E-F12Z-10C 280E-F23Z-25D
raC_Dvc_AS281E	281E-F12S-10A 281E-F12S-10B 281E-F12S-10C 281E-F12Z-10A 281E-F12Z-10B 281E-F12Z-10C 281E-F23S-25D 281E-F23Z-25D
raC_Dvc_AS290E	290E-FAP 290E-FAZ 290E-FBP 290E-FBZ
raC_Dvc_AS291E	291E-FAP 291E-FAZ 291E-FBP 291E-FBZ
raC_Dvc_E300	ECM-ETR
raC_Dvc_SMC50	SMC50-E SMC50-ER SMC50-MV-E SMC50-MV-ER SMC50-MVSS-E SMC50-MVSS-ER
raC_Dvc_SMCFlex	SMCFlex-E SMCFlex-ER SMC Dialog Plus

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category

raC_Dvc_xxxxx	raC_Dvc_xxxxx	3	(RA-LIB) Device	PowerDiscrete
raC_Opr_xxxxx_Energy	raC_Opr_xxxxx_Energy	3	(RA-LIB) Device	PowerDiscrete
raC_Tec_PwrDiscreteStateMonitor	raC_Tec_PwrDiscreteStateMonitor	3	(RA-LIB) Device	PowerDiscrete

Configured HMI Content

HMI Content	Instance Name	Description
Launch Button	{ObjectName}_GO_LaunchFP	Global Object configured callout instance

Output Interface

Output Interface	Linked Library	Revision
raC_Itf_PowerDiscrete	-	1.0

raC_Itf_PowerDiscrete

Member Name	Description
PrgName	Program Name
TagName	Tag Name
ModuleName	Module Name
TagScope	Tag Scope

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - Power Device.ggfx	{ProjectName}\Visualization\FTViewSE\GlobalObjects
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - Power Device.ggfx	{ProjectName}\Visualization\FTViewME\GlobalObjects
V3_raC_Dvc_Global	Toolbox SE	(raC-3-SE) Toolbox - Power Device.ggfx	{ProjectName}\Visualization\FTViewSE\GlobalObjects
V3_raC_Dvc_Global	Toolbox ME	(raC-3-ME) Toolbox - Power Device.ggfx	{ProjectName}\Visualization\FTViewME\GlobalObjects
V3_raC_Dvc_xxxxx	Faceplate SE	(raC-3_xx-SE) raC_Dvc_xxxxx-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays
V3_raC_Dvc_xxxxx	Faceplate ME	(raC-3_xx-ME) raC_Dvc_xxxxx-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays
V3_raC_Dvc_PowerDiscrete	View Designer	(raC-3_xx-VD) raC_Dvc_PowerDiscrete.vpd	{ProjectName}\Visualization\ViewDesigner
V3_Power_Manual	Reference Manual	DEVICE-RM100x-EN-P.pdf	{ProjectName}\Documentation
V3_Power_Images	HMI Image Set	Power_Images.zip	{ProjectName}\Visualization\Images

Power Velocity Objects (raC_Dvc_PFxxx, raC_Dvc_AS2x4E, raC_Dvc_APF35)

Overview

The Power Velocity device objects are a group of objects that include PowerFlex® (raC_Dvc_PFxxx), Armor PowerFlex® (raC_Dvc_APF35), and ArmorStart® variable speed drives (raC_Dvc_AS2x4E). In addition to the base device objects, several extension objects are provided which provide additional information as an option.

In the Library there is a folder named *Videos* which contains many How-To and Operational Overview Videos which walk step-by-step through each process. You can refer to the following videos for this section:
"Operational_Overview_of_AS_VFD_Faceplates_in_FTViewME_SE"
"Operational_Overview_of_AS_VFD_Faceplates_in_ViewDesigner"
"Operational_Overview_of_PF_Faceplates_in_FTViewME_SE"
"Operational_Overview_of_PF_Faceplates_in_ViewDesigner"

Supported devices include:

Device	Object Name	State Monitor Extension	Energy Monitor Extension	Predictive Maintenance Extension
AS284E	raC_Dvc_AS284E	Yes		
AS294E	raC_Dvc_AS294E	Yes		
APF35	raC_Dvc_APF35	Yes		
PowerFlex® 525/523[1]	raC_Dvc_PF525	Yes	Yes	
PowerFlex® 753	raC_Dvc_PF53	Yes		
PowerFlex® 755	raC_Dvc_PF755	Yes	Yes	
PowerFlex® 755T	raC_Dvc_PF755T	Yes		Yes
PowerFlex® 6000T	raC_Dvc_PF6000T	Yes		
PowerFlex® 7000	raC_Dvc_PF7000	Yes		

[1] The raC_Dvc_PF525 object can also be used with a PowerFlex® 523 device which has a 25-COMM-E2P communications adapter installed.

Functional Description

The PowerFlex® 755, 753, 525, 755T, 6000T, 7000, Armor PowerFlex® 35, ArmorStart® 284E and 294E pre-configured Device Objects:

- Collect, Process and Deliver Data between Smart Devices and Application Logic
- Provide Device Status & Diagnostics Faceplates for Machine Startup, Commissioning, Operations, and Maintenance
- Include Common HMI Faceplate Components, Device States, and Control Interfaces providing Application Development and Operation Efficiency

All these features provide quick feedback, shorten recovery time, and simplify implementation.

Required Files

Device Objects include Add-On Instructions (AOIs) and HMI faceplates. The revision number (e.g. 3.01) used in filenames can change as new revisions are created.

Controller Files

Add-On Instructions are reusable code objects that contain encapsulated logic that can streamline implementing your system. This lets you create your own instruction set for programming logic as a supplement to the instruction set provided natively in the ControlLogix® firmware. An Add-On Instruction is defined once in each controller project, and can be instantiated multiple times in your application code as needed.

The Add-On Instruction must be imported into the controller project to be used in the controller configuration. These can be imported as Add-On Instruction files, or as part of the Rung Import or Import Library Objects wizard.

Instructions that are supported by PlantPAx® 5.xx are supplied with two versions of the same instruction. Version 3.xx instructions are for use with standard applications while version 10.xx instructions are for use with PlantPAx® 5.xx applications. These alternate PlantPAx® supported versions use pre-defined data types which are available exclusively in 5x80 series Logix 5000 controllers with firmware v33 or greater. Refer to section Using Power Device Objects with PlantPAx® for more information.

All Add-On Instruction and Rung Import files can be found in the */Studio 5000 Logix Designer Files - L5X/Standard Files/* and */Studio 5000 Logix Designer Files - L5X/5x80v33 Files - Use with PlantPAx® 5.x/* folders in the library. Choose the */5x80v33 Files - Use with PlantPAx® 5.x/* Folder for PlantPAx® 5.x applications; otherwise choose the */Standard Files/* folder.

Device/Item	Application	Add-On Instruction	Rung Import
AS284E	Standard	raC_Dvc_AS284E_3.03_AOI.L5X	raC_Dvc_AS284E_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Dvc_AS284E_10.04_AOI_5x80v33.L5X	raC_Dvc_AS284E_10.04_RUNG_5x80v33.L5X
AS294E	Standard	raC_Dvc_AS294E_3.03_AOI.L5X	raC_Dvc_AS294E_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Dvc_AS294E_10.04_AOI_5x80v33.L5X	raC_Dvc_AS294E_10.04_RUNG_5x80v33.L5X
Armor PowerFlex® 35	Standard	raC_Dvc_APF35_3.03_AOI.L5X	raC_Dvc_APF35_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Dvc_APF35_10.04_AOI_5x80v33.L5X	raC_Dvc_APF35_10.04_RUNG_5x80v33.L5X
PowerFlex® 525	Standard	raC_Dvc_PF525_3.03_AOI.L5X	raC_Dvc_PF525_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Dvc_PF525_10.04_AOI_5x80v33.L5X	raC_Dvc_PF525_10.04_RUNG_5x80v33.L5X
PowerFlex® 753	Standard	raC_Dvc_PF753_3.03_AOI.L5X	raC_Dvc_PF753_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Dvc_PF753_10.04_AOI_5x80v33.L5X	raC_Dvc_PF753_10.04_RUNG_5x80v33.L5X
PowerFlex® 755	Standard	raC_Dvc_PF755_3.03_AOI.L5X	raC_Dvc_PF755_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Dvc_PF755_10.04_AOI_5x80v33.L5X	raC_Dvc_PF755_10.04_RUNG_5x80v33.L5X
PowerFlex® 755T	Standard	raC_Dvc_PF755T_3.04_AOI.L5X	raC_Dvc_PF755T_3.04_RUNG.L5X
	PlantPAx® v5.xx	raC_Dvc_PF755T_10.05_AOI_5x80v33.L5X	raC_Dvc_PF755T_10.05_RUNG_5x80v33.L5X

Device/Item	Application	Add-On Instruction	Rung Import
PowerFlex® 6000T	Standard	raC_Dvc_PF6000T_3.03_AOI.L5X	raC_Dvc_PF6000T_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Dvc_PF6000T_10.04_AOI_5x80v33.L5X	raC_Dvc_PF6000T_10.04_RUNG_5x80v33.L5X
PowerFlex® 7000	Standard	raC_Dvc_PF7000_3.03_AOI.L5X	raC_Dvc_PF7000_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Dvc_PF7000_10.04_AOI_5x80v33.L5X	raC_Dvc_PF7000_10.04_RUNG_5x80v33.L5X
PowerFlex® 525 Energy Extension	Standard	raC_Opr_PF525_Energy_3.03_AOI.L5X	raC_Opr_PF525_Energy_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Opr_PF525_Energy_10.04_AOI_5x80v33.L5X	raC_Opr_PF525_Energy_10.04_RUNG_5x80v33.L5X
PowerFlex® 755 Energy Extension	Standard	raC_Opr_PF755_Energy_3.03_AOI.L5X	raC_Opr_PF755_Energy_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Opr_PF755_Energy_10.04_AOI_5x80v33.L5X	raC_Opr_PF755_Energy_10.04_RUNG_5x80v33.L5X
PowerFlex® 755T Predictive Maintenance Extension	Standard	raC_Opr_PF755T_PM_3.03_AOI.L5X	raC_Opr_PF755T_PM_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Opr_PF755T_PM_10.04_AOI_5x80v33.L5X	raC_Opr_PF755T_PM_10.04_RUNG_5x80v33.L5X
PowerFlex® 755T Predictive Maintenance Extension v11	Standard	raC_Opr_PF755T_PMv11_3.04_AOI.L5X	raC_Opr_PF755T_PMv11_3.04_RUNG.L5X
	PlantPAx® v5.xx	raC_Opr_PF755T_PMv11_10.05_AOI_5x80v33.L5X	raC_Opr_PF755T_PMv11_10.05_RUNG_5x80v33.L5X
State Monitor Extension	Standard	raC_Tec_PwrVelocityStateMonitor_3.04_AOI.L5X	raC_Tec_PwrVelocityStateMonitor_3.04_RUNG.L5X
	PlantPAx® v5.xx	raC_Tec_PwrVelocityStateMonitor_10.05_AOI_5x80v33.L5X	raC_Tec_PwrVelocityStateMonitor_10.05_RUNG_5x80v33.L5X

FactoryTalk® View HMI Files

FactoryTalk® View ME or SE applications require importing the desired device faceplates in addition to all Global Object (ggfx) files and all images located in the */HMI FactoryTalk® View Images - png/* folder of the library. FactoryTalk® View ME files are stored in the */HMI - FactoryTalk® View ME/* library folder and FactoryTalk® View SE files are stored in the */HMI - FactoryTalk® View SE/* library folder.

Device/Item	Type	FactoryTalk® View ME Faceplate	FactoryTalk® View SE Faceplate
AS284E	Display	(raC-3_03-ME) raC_Dvc_AS284E-Faceplate.gfx	(raC-3_03-SE) raC_Dvc_AS284E-Faceplate.gfx
AS294E	Display	(raC-3_03-ME) raC_Dvc_AS294E-Faceplate.gfx	(raC-3_03-SE) raC_Dvc_AS294E-Faceplate.gfx
APF35	Display	(raC-3_03-ME) raC_Dvc_APF35-Faceplate	(raC-3_03-SE) raC_Dvc_APF35-Faceplate
PowerFlex® 525	Display	(raC-3_03-ME) raC_Dvc_PF525-Faceplate.gfx	(raC-3_03-SE) raC_Dvc_PF525-Faceplate.gfx
PowerFlex® 753	Display	(raC-3_03-ME) raC_Dvc_PF753-Faceplate.gfx	(raC-3_03-SE) raC_Dvc_PF753-Faceplate.gfx
PowerFlex® 755	Display	(raC-3_03-ME) raC_Dvc_PF755-Faceplate.gfx	(raC-3_03-SE) raC_Dvc_PF755-Faceplate.gfx
PowerFlex® 755T	Display	(raC-3_04-ME) raC_Dvc_PF755T-Faceplate.gfx	(raC-3_04-SE) raC_Dvc_PF755T-Faceplate.gfx
PowerFlex® 6000T	Display	(raC-3_03-ME) raC_Dvc_PF6000T-Faceplate.gfx	(raC-3_03-SE) raC_Dvc_PF6000T-Faceplate.gfx
PowerFlex® 7000	Display	(raC-3_03-ME) raC_Dvc_PF7000-Faceplate.gfx	(raC-3_03-SE) raC_Dvc_PF7000-Faceplate.gfx
PowerFlex® 755T PM	Display	(raC-3_02-ME) raC_Opr_PF755T_PM-Faceplate.gfx	(raC-3_02-SE) raC_Opr_PF755T_PM-Faceplate.gfx
PowerFlex® 755T PMv11	Display	(raC-3_04-ME) raC_Opr_PF755T_PMv11-Faceplate.gfx	(raC-3_04-SE) raC_Opr_PF755T_PMv11-Faceplate.gfx
Energy Base Extension	Display	(raC-3_01-ME) raC_Opr_EnergyBase-Faceplate.gfx	(raC-3_01-SE) raC_Opr_EnergyBase-Faceplate.gfx
Energy Electrical Extension	Display	(raC-3_01-ME) raC_Opr_EnergyElectrical-Faceplate.gfx	(raC-3_01-SE) raC_Opr_EnergyElectrical-Faceplate.gfx
State Monitor Extension	Display	(raC-3_03-ME) raC_Tec_PwrDvcStateMonitor-Faceplate.gfx	(raC-3_03-SE) raC_Tec_PwrDvcStateMonitor-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - Power Device	(raC-3-SE) Graphic Symbols - Power Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - Power Device.ggfx	(raC-3-SE) Toolbox - Power Device.ggfx

Studio 5000 View Designer® HMI Files

All Studio 5000 View Designer® Files can be found in the */HMI - ViewDesigner - vpd/* folder of the library.

Device/Item	Studio 5000 View Designer® Faceplate
AS284E	(raC-3_03-VD) raC_Dvc_PowerVelocity.vpd
AS294E	
APF35	
PowerFlex® 525	
PowerFlex® 753	
PowerFlex® 755	
PowerFlex® 755T	
PowerFlex® 6000T	
PowerFlex® 7000	

FactoryTalk® Optix Library Files

FactoryTalk® View Optix applications require importing the desired library objects located in the PowerDevice_v3R library folder.

Device/Item	FactoryTalk® Optix Library Object
AS284E	raC_3_03_raC_Dvc_AS284E_UI
AS294E	raC_3_03_raC_Dvc_AS294E_UI
APF35	raC_3_03_raC_Dvc_APF35_UI
PowerFlex® 525	raC_3_03_raC_Dvc_PF525_UI
PowerFlex® 753	raC_3_03_raC_Dvc_PF753_UI
PowerFlex® 755	raC_3_03_raC_Dvc_PF755_UI
PowerFlex® 755T	raC_3_04_raC_Dvc_PF755T_UI
PowerFlex® 6000T	raC_3_03_raC_Dvc_PF6000T_UI
PowerFlex® 7000	raC_3_03_raC_Dvc_PF7000_UI

Studio 5000® Application Code Manager Files

Studio 5000® Application Code Manager (ACM) can be optionally used if it is installed. All devices can be easily registered in the ACM repositories by running the *setup.cmd* file located in the root folder of the library.

Individual HSL4 files are provided as an alternative to running the setup.cmd to allow users to manually register specific implementation objects. Each object has two files - an Asset Control file and a Device file. The Asset Control files include attachments of all required files for that object. The Device files are used to actually add that device into a Studio 5000 project and these reference the Asset Control files.

All Studio 5000® Application Code Manager files can be found in the /*ApplicationCodeManagerLibraries*/ folder of the library. The files included are as follows:

Implementation Object	Asset Control File (.HSL4)	Device File (.HSL4)
AS284E	(RA-LIB)_Device_Asset-Control_PowerVelocity_raC_Dvc_AS284E_(3.3)	(RA-LIB)_Device_Device_PowerVelocity_raC_LD_Dvc_AS284E_(3.4)
AS294E	(RA-LIB)_Device_Asset-Control_PowerVelocity_raC_Dvc_AS294E_(3.3)	(RA-LIB)_Device_Device_PowerVelocity_raC_LD_Dvc_AS294E_(3.4)
APF35E	(RA-LIB)_Device_Asset-Control_PowerVelocity_raC_Dvc_APF35_(3.3)	(RA-LIB)_Device_Device_PowerVelocity_raC_LD_Dvc_APF35E_(3.4)
APF35S		(RA-LIB)_Device_Device_PowerVelocity_raC_LD_Dvc_APF35S_(3.4)
PowerFlex® 525	(RA-LIB)_Device_Asset-Control_PowerVelocity_raC_Dvc_PF525_(3.3)	(RA-LIB)_Device_Device_PowerVelocity_raC_LD_Dvc_PF525_(3.4)
PowerFlex® 753	(RA-LIB)_Device_Asset-Control_PowerVelocity_raC_Dvc_PF753_(3.3)	(RA-LIB)_Device_Device_PowerVelocity_raC_LD_Dvc_PF753_(3.4)
PowerFlex® 755	(RA-LIB)_Device_Asset-Control_PowerVelocity_raC_Dvc_PF755_(3.3)	(RA-LIB)_Device_Device_PowerVelocity_raC_LD_Dvc_PF755_(3.4)
PowerFlex® 755T	(RA-LIB)_Device_Asset-Control_PowerVelocity_raC_Dvc_PF755T_(3.4)	(RA-LIB)_Device_Device_PowerVelocity_raC_LD_Dvc_PF755T_(3.5)
PowerFlex® 6000T	(RA-LIB)_Device_Asset-Control_PowerVelocity_raC_Dvc_PF6000T_(3.3)	(RA-LIB)_Device_Device_PowerVelocity_raC_LD_Dvc_PF6000T_(3.5)
PowerFlex® 7000	(RA-LIB)_Device_Asset-Control_PowerVelocity_raC_Dvc_PF7000_(3.3)	(RA-LIB)_Device_Device_PowerVelocity_raC_LD_Dvc_PF7000_(3.5)
PowerFlex® 525 Energy Extension	(RA-LIB)_Device_Asset-Control_PowerVelocity_raC_Opr_PF525_Energy_(3.3)	
PowerFlex® 755 Energy Extension	(RA-LIB)_Device_Asset-Control_PowerVelocity_raC_Opr_PF755_Energy_(3.3)	
PowerFlex® 755T Predictive Maintenance Extension	(RA-LIB)_Device_Asset-Control_PowerVelocity_raC_Opr_PF755T_PM_(3.4)	
State Monitor Extension	(RA-LIB)_Device_Asset-Control_PowerVelocity_raC_Tec_PwrVelocityStateMonitor_(3.4)	

Note that when using the Armor PowerFlex® 35 the object supports both standard (E) and safety (S) versions of the device. A single asset control file is provided; however, two unique device files are required to accommodate differences between standard and safety class modules and tags. Use raC_LD_Dvc_APF35S for safety modules and raC_LD_Dvc_APF35E for standard modules.

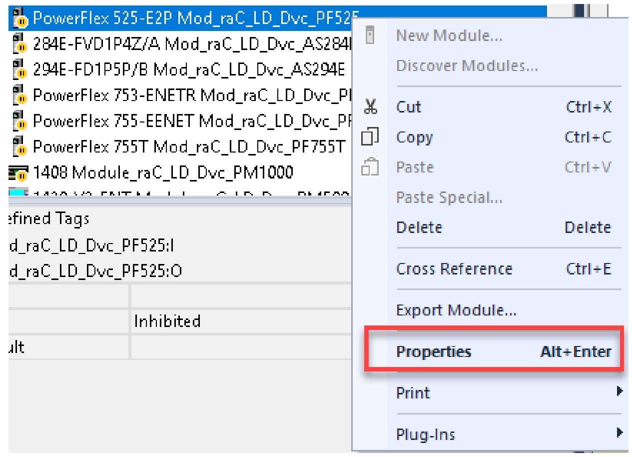
Device Definition

The device (ie: PowerFlex® drive, ArmorStart) must be configured with the correct device definition. Proper device configuration enables the required datalinks to pass information from the device into the add-on instruction.

Note that this configuration is completed automatically when using Application Code Manager or the Studio 5000® Import Library Objects wizard plug-in.

To verify the device definition:

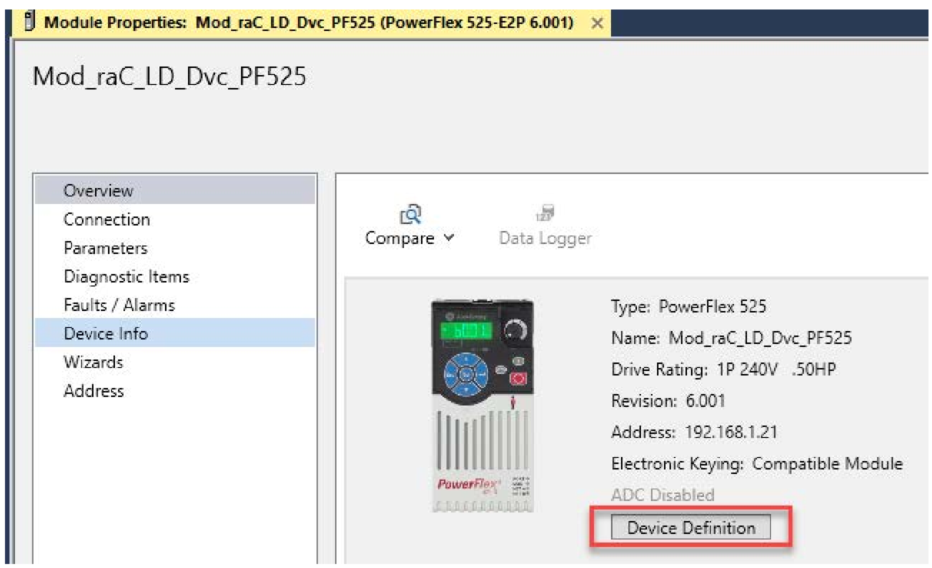
- Find the device in the *Controller Organizer* pane in Studio 5000 Logix Designer® and open the *Module Properties* by double-clicking or right-click and select *Properties*.



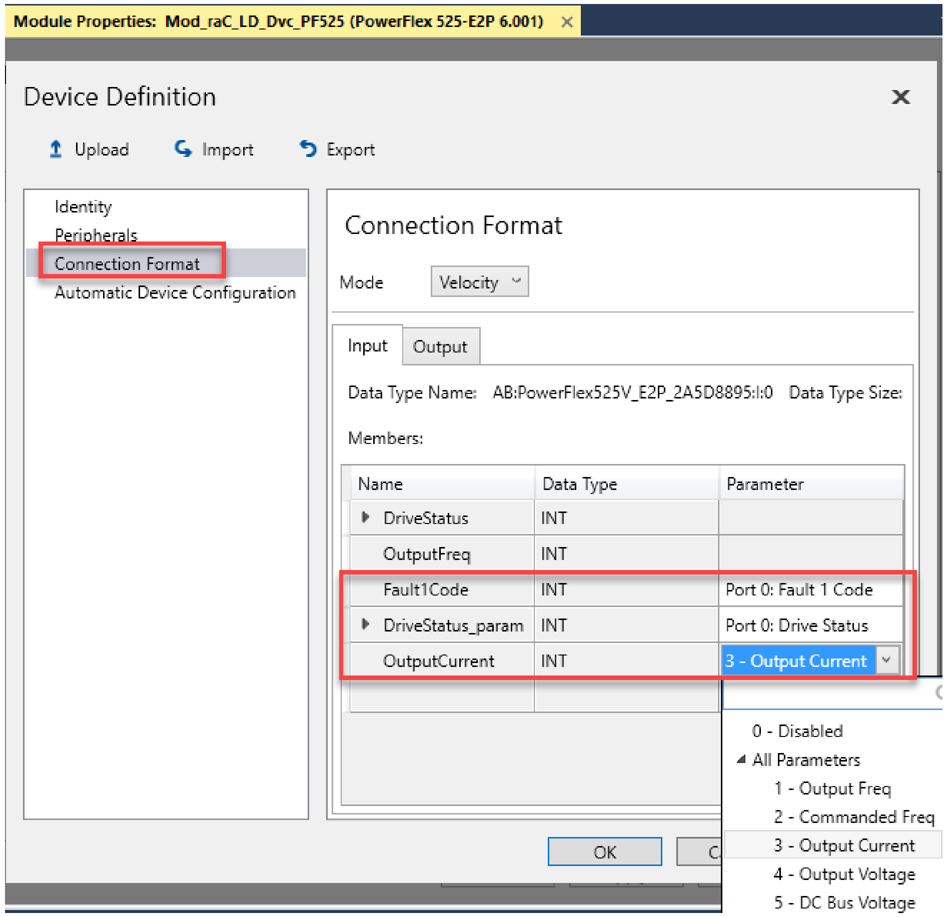
Refer to the following sections for specific device configuration.

PowerFlex® Definition

- On the *Overview* tab click on the *Device Definition* button.



- Select the *Connect Format* dialogue and add in any missing members by clicking the *Parameter* drop-down menu and choosing the required parameters.



The device's connection format members must be configured as follows:

PowerFlex® 525/523 Drive Configuration

Name	Data Type	Parameter
DriveStatus	INT	
OutputFreq	INT	
Fault1Code	INT	Port 0: Fault 1 Code
DriveStatus_param	INT	Port 0: Drive Status
OutputCurrent	INT	Port 0: Output Current

PowerFlex® 753, 755, 755T Drive Configuration

Name	Data Type	Parameter
DriveStatus	INT	
Feedback	REAL	
LastFaultCode	INT	Port 0: Last Fault Code
StartInhibits	DINT	Port 0: Start Inhibits
OutputCurrent	REAL	Port 0: Output Current
MotorNPAmps	REAL	Port 0: Motor NP Amps
AlarmStatusA	DINT	Port 0: Alarm Status A
AlarmStatusB	DINT	Port 0: Alarm Status B

PowerFlex® 6000T Drive Configuration

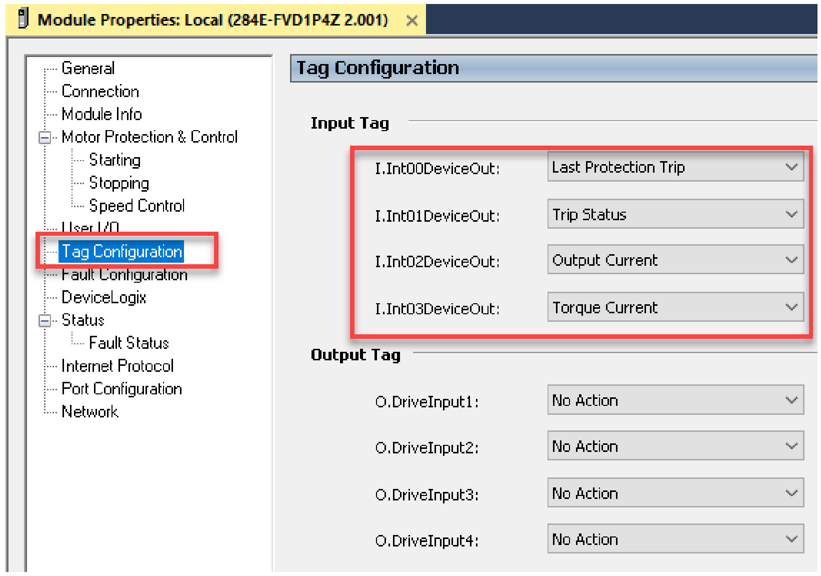
Name	Data Type	Parameter
DriveStatus	INT	
Feedback	REAL	
LastFaultCode	INT	Port 0: Last Fault Code
StartInhibits	DINT	Port 0: Start Inhibits
P10_OutputCurrent	REAL	Port 10: Output Current
P10_MotorNPAmps	REAL	Port 10: Motor NP Amps
P10_AlarmStatusA	DINT	Port 10: Alarm Status A
P10_AlarmStatusB	DINT	Port 10: Alarm Status B
P10_MotorNPPower	REAL	Port 10: Motor NP Power
P10_MotorNPVolts	REAL	Port 10: Motor NP Volts
DCBusVolts	REAL	Port 0: DC Bus Volts
ElapsedMWH	DINT	Port 0: Elapsed MWH
AveragePower	REAL	Port 0: Average Power
CtrlPodTemp	REAL	Port 0: Ctrl Pod Temp
P10_OutputFrequency	REAL	Port10: Output Frequency
P10_OutputVoltage	REAL	Port10: Output Voltage
P10_OutputPower	REAL	Port10: Output Power

PowerFlex® 7000 Drive Configuration

Name	Data Type	Parameter
LogicStatus	INT	
OutputFreq	REAL	
TorqueUnfiltered	INT	Port 0: TorqueUnfiltered
StatorCurrent	INT	Port 0: Stator Current
MotorSpeedRPM	INT	Port 0: Motor Speed RPM
MotorVoltage	INT	Port 0: Motor Voltage
MtrAirGapPower	INT	Port 0: Mtr AirGap Power
Unidentified C2	INT	

ArmorStart® 284E Definition

- On the *Tag Configuration* tab set the Input Tag drop-down selectors to the required tags..



The device's connection format members must be configured as follows:

ArmorStart® 284E Drive Configuration

Input Tag	Parameter
I.Int00DeviceOut	Last Protection Trip
I.Int01DeviceOut	Trip Status
I.Int02DeviceOut	Output Current
I.Int03DeviceOut	Torque Current

ArmorStart® 284E Definition

There is no special configuration required for the AS294E device.

Armor PowerFlex® 35 Definition

There is no special configuration required for the APF35 device. Note that both standard and safety versions of the product are supported. Safety modules require safety rated GuardLogix or Compact GuardLogix controllers.

Operations

The Power Velocity objects provide two modes of operation - physical and virtual.

Physical Device Operation

The following functions are applied when device object is selected as physical.

- **Activate:** Activate the drive power structure. Drive will follow the speed and direction set points from control interface.
- **Deactivate:** Deactivate the drive power structure by issuing Stop command. Reset active status.

- **Jog:** This function is possible from HMI faceplate only. When Jog command is 1, Activate drive power structure and speed reference will follow Jog set point. Once the command is 0, deactivate the drive power structure by issuing stop command. Individual Jog forward and Jog reverse command are used to jog in either direction. Unlike other command bits, this command should not be unlatched by the device object.
- **Fault Reset:** Command to fault reset the device and also reset remove this status bits in device object. Command can be initiated from control interface and also HMI interface.

Virtual Device Operation

The following functions are applied when drive object is selected as virtual.

- **Activate:** Set status to reflect successful activate command. Set status output to reflect frequency set point, drive related signals like Logic command and Out Reference should not be altered.
- **Deactivate:** Reset the active status and actual speed status.
- **Jog:** This function is possible from HMI faceplate only. When Jog command is 1, set status to reflect successful jog command. Set status output to reflect jog speed set point. Once the command is 0, reset the active status and actual speed status. Individual Jog forward and Jog reverse command are used to jog in either direction. Update the direction status based on jog forward and jog reverse.
- **Fault Reset:** Command to reset status bits in device object. Command can be initiated from control interface and also HMI interface.

Faults & Warnings

- **First Warning:** This function helps in capturing the first warning triggered in the device. Display the respective description in faceplate.
- **First Fault:** Capture the first fault from device. Display the respective description in faceplate.
- **Event log:** Log Warning and Fault the last 4 events in a log queue. The queue contains fault code, description, and time stamp. Display the same in faceplate.

Execution

The following table explains the handling of instruction execution conditions.

Condition	Description
EnableIn False (false rung)	Processing for EnableIn False (false rung) is handled the same as if the device were taken out of service by Command. The device outputs are de-energized and the device is shown as Program Out of Service on the HMI. All alarms are cleared.
Powerup (prescan, first scan)	On prescan, any commands that are received before first scan are discarded. The device is de-energized. On first scan, the device is treated as if it were returning from Hand command source: the instruction state is set based on the position feedback that is received from the device. If the feedback is valid for one position, the device is set to that position. If the device does not have position feedback or the position feedback is invalid, the device is set to the 'unknown/powerup' state. The command source is set to its default, either Operator or Program (unlocked).

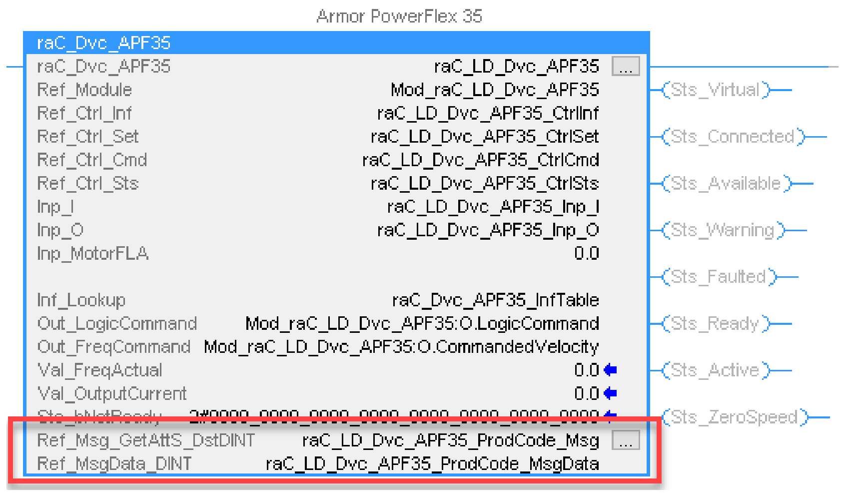
Condition	Description
Postscan	No SFC Postscan logic is provided.

Add-On Instruction I/O Data

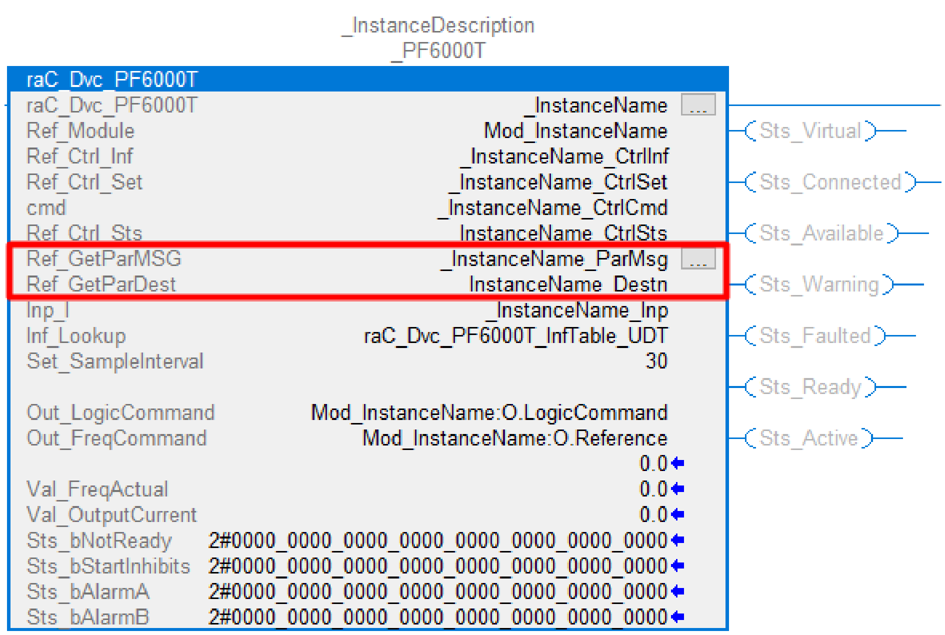
InOut Data

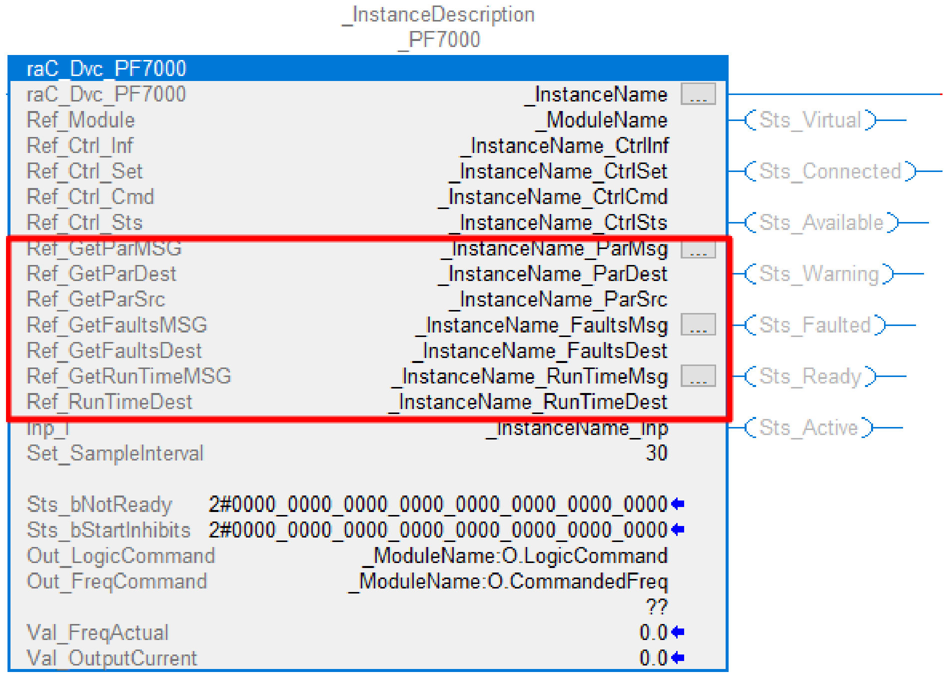
InOut	Function / Description	DataType
Ref_Module	Reference to module in I/O tree	MODULE
Ref_Ctrl_Cmd	Power Velocity Device Command Interface	raC_UDT_ItfAD_PwrVelocity_Cmd
Ref_Ctrl_Set	Power Velocity Device Setting Interface	raC_UDT_ItfAD_PwrVelocity_Set
Ref_Ctrl_Sts	Power Velocity Device Status Interface	raC_UDT_ItfAD_PwrVelocity_Sts
Ref_Ctrl_Inf	Power Velocity Device Information Interface	raC_UDT_ItfAD_PwrVelocity_Inf
Out_LogicCommand	Output Interface - Drive logic command	INT
Out_FreqCommand	Output Interface - Drive frequency command	INT
Inp_I	Input Interface - PowerFlex525	raC_UDT_ItfAD_PF525_Inp
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[2]
Ref_Msg_GetAttS_DstDINT	APF35 Only. Get Message data DINT.	MESSAGE
Ref_MsgData_DINT	APF35 Only. Message data DINT	DINT[1]
Ref_GetParMSG	PowerFlex6000T and PowerFlex7000 Only. Message to get drive parameters.	MESSAGE
Ref_GetParDest	PowerFlex6000T and PowerFlex7000 Only.. Message data destination.	DINT
Ref_GetParSrc	PowerFlex7000T only. Source data to get drive parameters.	DINT
Ref_GetFaultsMSG	PowerFlex7000T only. Message to get drive Fault and warning data.	MESSAGE
Ref_GetFaultsDest	PowerFlex7000 Only.. Message data destination.	DINT
Ref_GetRunTimeMSG	PowerFlex7000T only. Message to get elapsed runtime data.	MESSAGE
Ref_GetRunTimeDest	PowerFlex7000 Only.. Message data destination.	DINT

Note that the APF35 device object has two unique InOut Parameters *Ref_Msg_GetAttS_DstDINT* and *Ref_MsgData_DINT* which are required to determine whether or not the device is a safety class device (e.g. Armor PowerFlex® 35S). These controller scoped tags are automatically imported when using Application Code Manager or importing the RUNG.L5X file. These tags are shown in the following screenshot.



Note that the PowerFlex6000T device object has two unique InOut Parameters & PowerFlex7000 has seven unique InOut Parameters Ref_GetParMSG (for both PF6000T and PF7000), Ref_GetParDest (for both PF6000T and PF7000), Ref_GetParSrc, Ref_GetFaultsMSG, Ref_GetFaultsDest, Ref_GetRunTimeMSG, Ref_GetRunTimeDest. All these parameters are required to get Parameters, Fault and Runtime data of the device through CIP messaging. These tags are shown in the following screenshot.




_InstanceDescription
_PF7000
raC_Dvc_PF7000
raC_Dvc_PF7000 _InstanceName
Ref_Module _ModuleName
Ref_Ctrl_Inf _InstanceName_CtrlInf
Ref_Ctrl_Set _InstanceName_CtrlSet
Ref_Ctrl_Cmd _InstanceName_CtrlCmd
Ref_Ctrl_Sts _InstanceName_CtrlSts
Ref_GetParMSG _InstanceName_ParMsg
Ref_GetParDest _InstanceName_ParDest
Ref_GetParSrc _InstanceName_ParSrc
Ref_GetFaultsMSG _InstanceName_FaultsMsg
Ref_GetFaultsDest _InstanceName_FaultsDest
Ref_GetRunTimeMSG _InstanceName_RunTimeMsg
Ref_RunTimeDest _InstanceName_RunTimeDest
Inp_I _InstanceName_Inp
Set_SampleInterval 30
Sts_bNotReady 2#0000_0000_0000_0000_0000_0000_0000_0000
Sts_bStartInhibits 2#0000_0000_0000_0000_0000_0000_0000_0000
Out_LogicCommand _ModuleName:O.LogicCommand
Out_FreqCommand _ModuleName:O.CommandedFreq
??
Val_FreqActual 0.0
Val_OutputCurrent 0.0
Sts_Virtual
Sts_Connected
Sts_Available
Sts_Warning
Sts_Faulted
Sts_Ready
Sts_Active

Input Data

Input	Function/Description	DataType
Inp_MotorFLA	Motor full load current	REAL
EnableIn	Enable Input - System Defined Parameter	BOOL

Input Data for PF6000T and PF7000

Input	Function/Description	DataType
Cmd_JogFwd	Operator Command to jog drive forward	BOOL
Cmd_JogRev	Operator Command to jog drive reverse	BOOL
Cmd_ResetFault	Command to reset fault	BOOL
Set_JogSpeed	Operator Setting of Speed Reference (Hz)	REAL
Set_SampleInterval	Set sampling interval (Sec)	REAL
Cfg_PercentFLATrendMax	FLA Maximum for Trend Display	REAL
Cfg_PercentFLATrendMin	FLA Minimum for Trend Display	REAL
Cfg_SpeedTrendMax	Speed Maximum for Trend Display	REAL
Cfg_SpeedTrendMin	Speed Minimum for Trend Display	REAL

Output Data

Output	Function/Description	DataType
Val_FreqActual	Device output frequency	REAL
Val_OutputCurrent	Device output current	REAL
Sts_ZeroSpeed	Device zero speed status: 1 = device is within zero speed tolerance	BOOL
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Sts_Virtual	Virtual device status: 1 = Device is operating	BOOL
Sts_Ready	Device ready status: 1 = ready to activate power structure	BOOL
Sts_Faulted	Device faulted status: 1 = an active fault exists	BOOL
Sts_Connected	Device is connected to the Programmable Controller	BOOL
Sts_bNotReady	Bitwise device 'not ready' reason 0 = Reserved 1 = Device not connected 2 = Device not available 3 = Device Faulted 4 - 31 = Reserved	DINT
Sts_Available	Device is available for interaction with user code	BOOL
Sts_Active	Device active status: 1 = output power structure is active	BOOL
raC_Dvc_PF525	Unique Parameter Name for auto - discovery	BOOL
EnableOut	Enable Output - System Defined Parameter	BOOL

Output Data for PF7000

Output	Function/Description	DataType
Out_FreqCommand	Output Interface - Drive frequency command	REAL
Sts_ActDir	1=Drive Actual direction is Reverse, 0=Forward	BOOL
Sts_bContactors	Contactor Status (par 506)	INT
Sts_bDriveNotRdy1	Drive Not Ready Flag Word #1 (par 262)	INT
Sts_bDriveNotRdy2	Drive Not Ready Flag Word #2 (par 699)	INT
Sts_bDriveSts1	Drive Status Flag Word #1 (par 569)	INT
Sts_bDriveSts2	Drive Status Flag Word #2 (par 238)	INT
Sts_bHdwOpts	Hardware Options (par 141)	INT
Sts_bSpecialFeat1	Special Features 1 (par 99)	INT
Sts_bStartInhibits	Bitwise device Start Inhibits	DINT
Sts_CmdDir	Device Direction Command: 0 = Forward, 1 = Reverse.	BOOL
Sts_eDvcAction	Device Action States Status	DINT
Sts_eNotReady	Device not ready status	DINT
Sts_ExtensionEnabled	Device Extension Enabled Status	DINT
Sts_InhibitCmd	Device Inhibit Command Status, 1 = Inhibit user Commands from external sources, 0 = Allow.	BOOL
Sts_InhibitSet	Device Inhibit Setting Status, 1 = Inhibit user Settings from external sources, 0 = Allow.	BOOL
Sts_MsgErr	1=Message Error, unable to read at least one non-RPI drive parameter	BOOL
Val_CmdSpeed	Commanded Speed Reference to drive (Hz)	REAL
Val_DataAcquisitionDuration	Data Acquisition duration	DINT
Val_DriveOvldPct	Drive Overload Count (%) (par 551)	REAL
Val_InvTemp	Inverter Heatsink Temperature (C) (par 252)	REAL
Val_LineCurrent	Measured Drive Input Current (A) (par 500)	REAL
Val_LineFreq	Line Frequency (Hz) (par 657)	REAL
Val_LinePower	Real Power Consumption by the Drive (kW) (par 753)	REAL
Val_LinePowerPct	Real (Active) Power at Input of the Drive (%) (par 902)	REAL
Val_LineVolts	Measured Voltage at Input of Rectifier Bridge (Volts) (par 324)	REAL
Val_LineVoltsPct	Estimated Line Input Voltage (before inductor) (%) (par 135)	REAL
Val_MotorCurrent	Motor Current (Amps) (par 361)	REAL
Val_MotorCurrentPct	Motor Current (% FLA) (par 340) (datalink)	REAL
Val_MotorOvldPct	Motor Overload Count (%) (par 550)	REAL
Val_MotorPower	Drive Output Power, filtered (kW) (par 364)	REAL
Val_MotorPowerPct	Motor Air-Gap Power (%) (par 346) (datalink)	REAL
Val_MotorTorquePct	Motor Torque (%) (par 345)	REAL

Output	Function/Description	DataType
Val_MotorVolts	Motor Voltage, filtered (Volts) (par 362) (datalink)	REAL
Val_MotorVoltsPct	Motor Voltage (% of NP Volts) (par 344)	REAL
Val_PercentFLA	Percent FLA (%)	REAL
Val_RectTemp	Rectifier Heatsink Temperature (C) (par 254)	REAL
Val_RectVoltsPct	Measured Voltage at Input of Rectifier Bridge (%) (par 696)	REAL
Val_SpeedFdbkRPM	Motor Speed Feedback (RPM) (par 363) (datalink)	REAL
Val_TorquePctUnfilt	Motor Torque Feedback, unfiltered (%) (par 489) (datalink)	REAL
Val_TotRunTime	Total Drive Elapsed Run Time (hr)	REAL

Output Data for PF6000T

Output	Function/Description	DataType
Out_FreqCommand	Output Interface - Drive frequency command	REAL
Sts_ActDir	1=Drive Actual direction is Reverse, 0=Forward	BOOL
Sts_bAlarmA	Bitwise device Alarm Status	DINT
Sts_bAlarmB	Bitwise device Alarm Status	DINT
Sts_bStartInhibits	Bitwise device Start Inhibits	DINT
Sts_CmdDir	Device Direction Command: 0 = Forward, 1 = Reverse.	BOOL
Sts_eDvcAction	Device Action States Status	DINT
Sts_eNotReady	Device not ready status	DINT
Sts_ExtensionEnabled	Device Extension Enabled Status	DINT
Sts_InhibitCmd	Device Inhibit Command Status, 1 = Inhibit user Commands from external sources, 0 = Allow.	BOOL
Sts_InhibitSet	Device Inhibit Setting Status, 1 = Inhibit user Settings from external sources, 0 = Allow.	BOOL
Val_ACLineCurrent	AC Line Current (Amps), Displays the average measured RMS AC phase current.	REAL
Val_ACLineFreq	AC Line Frequency (Hz), Displays the measured AC line frequency.	REAL
Val_ACLineKVA	Measured Apparent Power kVA. Displays the measured apparent AC Line power.	REAL
Val_ACLineKVAR	Measured Reactive Power kVAR (kVAR), Displays the measured reactive power. Negative values display a leading power factor and positive values display a lagging power factor.	REAL
Val_ACLineKW	Measured Real Power (kw), Displays the real total AC line power. The value is positive for comsumed power and a negative for produced power.	REAL
Val_ACLineVoltage	AC Line Voltage (VAC), Displays total 3-phase average AC voltage.	REAL
Val_ActiveCurLim	Active Current Limit (A), Displays the Active Current Limit.	REAL
Val_ActiveCurrent	Active Current (A), Displays the active current. The value is negative during regeneration or producing current and positive during motoring or consuming current.	REAL
Val_ActPowerCells	Active Number of Power Cells, Displays the total number of Power Cells detected after login of Power Cell Control Boards (PCCBs).	INT
Val_AlarmStatusA	Alarm Status A, Displays the status of conditions that can be configured.	DINT
Val_AlarmStatusB	Alarm Status B, Displays the status of conditions that can be configured.	INT
Val_ApparentPower	Apparent Power (kVA), Displays the instantaneous apparent power in kVA measured using Line side voltage and current feedbacks.	REAL
Val_AveragePower	Average Power (kW), Displays the Average Power in Kilowatts.	REAL
Val_AverageTruePF	Average True Power Factor (%), Displays the measured average true input power factor.	REAL

Output	Function/Description	DataType
Val_CellBypassEnable	Power Cell Bypass Enable. This parameter is used to Enable or Disable Cell Bypass feature in drives with a Cell Bypass Option.	DINT
Val_CellBypassOption	Power Cell Bypass. Hardware Option Indicates whether the Power Cell has been equipped with the hardware necessary for Power Cell Bypass features.	DINT
Val_CmdSpeed	Commanded Speed Reference to drive (Hz)	REAL
Val_CommonLogicCmd	Device Diagnostics Common Logic Command	DINT
Val_CommonLogicSts	Device Diagnostics Common Logic Satus	DINT
Val_ConditionStsA	Condition Status A, Displays the status of conditions that can be configured.	DINT
Val_DCBusPhaseU	DC Bus Voltage Phase U (VDC), Displays total DC Bus Voltage from all Power Cells in Phase U.	REAL
Val_DCBusPhaseV	DC Bus Voltage Phase V (VDC), Displays total DC Bus Voltage from all Power Cells in Phase V.	REAL
Val_DCBusPhaseW	DC Bus Voltage Phase W (VDC), Displays total DC Bus Voltage from all Power Cells in Phase W.	REAL
Val_DCBusVolts	DC Bus Voltage (VDC), Displays the filtered measurement of DC bus voltage.	REAL
Val_DemandPF	Demand Power Factor(%), Displays the demand input power factor defined as the ratio of active power over apparent power.	REAL
Val_DiagCtrlPodTemp	Device Diagnostics Control Pod Temp (°C)	REAL
Val_DirectionMode	Direction Mode, Enter a value to select the method used to change direction.	INT
Val_DriveOLCount	Drive Overload Count (%), Displays the overload count for the motor side inverter in percentage.	REAL
Val_DrivePowerCfg	Drive Power Configuration, Displays the Power Configuration the drive is engineered with and the value is read from the Drive Hardware Configuration File (DHCF).	DINT
Val_DSPTempC	Device Diagnostics DSP Temperature C (°C).	REAL
Val_ElapsedMWH	Elapsed Megawatt Hours (MWh), Displays the accumulated measurement of Elapsed energy in Megawatt Hours.	DINT
Val_ElapsedRunTime	Elapsed Run Time (h), Displays the accumulated measurement of Runtime in Hours.	REAL
Val_FaultStatusA	Fault Status A, Displays the status of conditions that can be configured.	INT
Val_FaultStatusB	Fault Status B, Displays the status of conditions that can be configured.	DINT
Val_Feedback	Device Diagnostics Feedback	REAL
Val_FilterCabTemp	Filter Fan Temperature (°C), Displays temperature feedback in the Filter cabinet and is used for Predicitive Life estimation of FIlter cabinet fans.	REAL
Val_Ground_Current	Ground Current (A), Displays the sum of the AC phase currents.	REAL

Output	Function/Description	DataType
Val_L1TruePF	Line 1 True Power Factor (%), Displays the measured Line 1 true input power factor defined as the product of Distortion Factor and Displacement Power Factor.	REAL
Val_L2TruePF	Line 2 True Power Factor (%), Displays the measured Line 2 true input power factor defined as the product of Distortion Factor and Displacement Power Factor.	REAL
Val_L3TruePF	Line 3 True Power Factor (%), Displays the measured Line 3 true input power factor defined as the product of Distortion Factor and Displacement Power Factor.	REAL
Val_LineSideSts1	Line Side Converter Status 1, Displays the status of the line side converter.	DINT
Val_LineSideSts2	Line Side Converter Status 2, Displays the status of the line side converter.	DINT
Val_LineStatus1	Device Diagnostics Line Status1	DINT
Val_LineStatus2	Device Diagnostics Line Status2	DINT
Val_LogicCommand	Device Diagnostics Logic Command	DINT
Val_ModIndexPhaseU	Modulation Index Phase U, Displays the Modulation Index from the Phase U Gating modulator.	REAL
Val_ModIndexPhaseV	Modulation Index Phase V, Displays the Modulation Index from the Phase V Gating modulator.	REAL
Val_ModIndexPhaseW	Modulation Index Phase W, Displays the Modulation Index from the Phase W Gating modulator.	REAL
Val_Motor_Voltage_Fb	Motor Voltage Feedback (VAC), Displays the Motor Voltage that is measured by the Voltage Sensing Board (VSB), in Volts RMS.	REAL
Val_MotorCtrlSel	Motor Control Select, Enter a value to switch between primary and secondary motor control modes.	DINT
Val_MotorCtrlSelAct	Motor Control Select Active, Displays the active motor control mode selection.	DINT
Val_MotorNPPower	Device Motor Name Plate Power (HP).	REAL
Val_MotorNPVoltage	Device Motor Name Plate Voltage (Volts).	REAL
Val_MotorSideSts1	Motor Side Status 1, Displays the operating condition of the motor side inverter.	DINT
Val_MotorSideSts2	Motor Side Status 2, Displays the operating condition of the motor side inverter.	DINT
Val_MotorVelFb	Motor Velocity Feedback (Hz), Displays the active motor velocity feedback, filtered for display.	REAL
Val_MPUTempC	Device Diagnostics MPU Temperature C (C)	REAL
Val_MtrOLCounts	Displays the Motor Overload count.(%), The Motor Overload counter increments if motor current is above the threshold.	REAL
Val_MtrOLTripTime	Motor Overload Trip Time (Secs), Displays the time it will take to for the Motor Overload count to reach 100% under the current operating conditions.	DINT
Val_NumFilterFans	Device Diagnostics Filter Fans Number.	DINT

Output	Function/Description	DataType
Val_NumPowerCells	Number of Power Cells, Displays the total number of Power Cells in the drive, as per design. This data is read from the Drive Hardware Configuration File (DHCF).	INT
Val_NumPwrCellFans	Device Diagnostics Power Cell Fans Number.	DINT
Val_NumPwrCellsOnByp	Number of Power Cells per Phase Bypassed, Displays the number of power cells per phase that have been successfully bypassed.	INT
Val_NumPwrCellsPhs	Number of Power Cells per Phase, Displays the number of Power cells per phase in the drive as per design and is read for the Drive Hardware Configuration File (DHCF).	INT
Val_NumVFDFans	Device Diagnostics VFD Fans Number.	DINT
Val_NumXfrmr1Fans	Device Diagnostics Transformer1 Fans number.	DINT
Val_NumXfrmr2Fans	Device Diagnostics Transformer2 Fans number.	DINT
Val_OnlineStatus	Power Cell Online Status, Displays the Login status of Power Cells in Phase U, V and W.	DINT
Val_OutputPwrFactr	Output Power Factor (%), Displays output power factor of the motor side inverter.	REAL
Val_P10_OutputFrequency	Port 10 Output Frequency (Hz), Displays output frequency of the motor side inverter.	REAL
Val_P10_OutputPower	Port 10 Output Power (Kw), Displays output power of the motor side inverter.	REAL
Val_P10_OutputVoltage	Port 10 Output Voltage (Hz), Displays the motor voltage at the motor side inverter terminals, in Volts RMS.	REAL
Val_ParCtrlPodTemp	Control Pod Temperature (°C), Displays the temperature measurement, from the Control Pod, in degrees Celsius.	REAL
Val_PercentFLA	Percent FLA (%)	REAL
Val_PFLagLead	Power Factor Lag Lead Indicator, Displays whether the power factor is lagging or leading.	DINT
Val_Port10MotorStatus1	Device Diagnostics Port10 Motor Status1	DINT
Val_Port10MotorStatus2	Device Diagnostics Port10 Motor Status2	DINT
Val_Port10OutVltgCmdTrim	Device Diagnostics Port10 Output Voltage Command Trim (V)	REAL
Val_Port10OutVltgTrimValue	Device Diagnostics Port10 Output Voltage Trim Value (%)	REAL
Val_Port11MotorStatus1	Device Diagnostics Port11 Motor Status1	DINT
Val_Port11MotorStatus2	Device Diagnostics Port11 Motor Status2	DINT
Val_Port11OutVltgCmdTrim	Device Diagnostics Port11 Output Voltage Command Trim (V)	REAL
Val_Port11OutVltgTrimValue	Device Diagnostics Port11 Output Voltage Trim Value (%)	REAL
Val_PowerFactor	Power Factor, Displays the measured input power factor defined as the ratio of active power over apparent power.	REAL
Val_PrchrgCycLimTmr	Pre Charge Cycle Limit Timer (S), Displays the remaining time before the next precharge cycle can be initiated by the user. If this value is non-zero, the precharge function is inhibited.	REAL
Val_PrchrgDutyCycle	Device Diagnostics Precharge Duty Cycle (S).	DINT

Output	Function/Description	DataType
Val_PrchrgOpenLvlAct	Device Diagnostics Pre charge Open Level Act (VDC).	REAL
Val_PrchrgOption	Pre charge Option, Indicates if the drive has been engineered with the Precharge Option.	DINT
Val_PriMtrCtrlAct	Primary Motor Control Mode Actual, Displays the actual motor control mode in the primary motor control port.	DINT
Val_PriMtrCtrlMode	Primary Motor Control Mode, Enter a value to select the mode for the primary motor side inverter control.	DINT
Val_ProdLogicCmd	Device Diagnostics Prod Logic Command.	DINT
Val_ProdLogicSts	Device Diagnostics Prod Logic Status.	DINT
Val_PwrCellCabTemp	Power Cell Fan Temperature (°C), Displays temperature feedback in the Power Cell cabinet and is used for Predicitive Life estimation of Power Cell cabinet fans.	REAL
Val_PwrCellFanCtctr	Power Cell Cabinet Fan Contactor Command, Displays the status of the command to start the power cell cabinet fan VFD.	INT
Val_PwrCellFanFdbk	Power Cell Fan Feedback, Displays the status of the power cell cabinet fan contactor/VFD.	DINT
Val_PwrConfigStatus	Power Configuration Status, Indicates the status of the Power Configuration function.	DINT
Val_PwrConfigSts	Device Diagnostics Power Configuration Status	DINT
Val_PwrDeviceCmd	Device Diagnostics Power Device Command	DINT
Val_PwrDeviceSts	Device Diagnostics Power Device Status	DINT
Val_PwrDvcCmdPIOB	Device Diagnostics Power Device Command PIOB	DINT
Val_PwrDvcStsPIOB	Device Diagnostics Power Device Status PIOB	DINT
Val_ReactiveCurrent	Reactive Current (A), Displays the measured reactive current.	REAL
Val_ReactivePower	Reactive Power (kVar), Displays the instantaneous reactive power in kVAR measured using Line side voltage and current feedbacks.	REAL
Val_RealPower	Real Power (kw), Displays the instantaneous real power in kW measured using Line side voltage and current feedbacks.	REAL
Val_RednFanCtrlMode	Redundant Fan Control Mode, This parameter defines the behavior of the redundant fan.	INT
Val_RednFanOption	Redundant Fan Option, Displays whether the redundant fan option is supplied in the drive and is read from the Drive Hardware Configuration File (DHCF).	INT
Val_Reference	Device Diagnostics Reference	REAL
Val_RPhaseCurrent	R (L1) Phase Current (A), Displays the R (L1) Input phase current for the entire line side converter in Amperes RMS.	REAL
Val_RSLineVolts	R (L1) - S (L2) Line Voltage (VAC), Displays the measured line-to-line voltage between phase R (L1) and phase S (L2).	REAL
Val_SecMtrCtrlAct	Secondary Motor Control Mode Actual, Displays the actual motor control mode in the secondary motor control port.	DINT

Output	Function/Description	DataType
Val_SecMtrCtrlMode	Secondary Motor Control Mode, Enter a value to select the mode for the secondary motor side inverter control.	DINT
Val_SFIBBoardTemp	Device Diagnostics SFIB Board Temperature (C).	REAL
Val_SPhaseCurrent	S (L2) Phase Current (A), Displays the S (L2) Input phase current for the entire line side converter in Amperes RMS.	REAL
Val_STLineVolts	S (L2) - T (L3) Line Voltage (VAC), Displays the measured line-to-line voltage between phase S (L2) and phase T (L3).	REAL
Val_TorqueStep	Torque Step (%), Enter a value to determine the amount of Step change in the Torque Reference.	REAL
Val_TPhaseCurrent	T (L3) Phase Current (A), Displays the T (L3) Input phase current for the entire line side converter in Amperes RMS.	REAL
Val_TRLineVolts	T (L3) - R (L1) Line Voltage (VAC), Displays the measured line-to-line voltage between phase T (L3) and phase R (L1).	REAL
Val_TrqCommanded	Torque Commanded (%), Displays the external Torque Reference. The value of this parameter is the output of the logic that selects and calculates the Torque Reference.	REAL
Val_TrqRefFiltered	Torque Reference Filtered (%), Displays the output of the torque filters.	REAL
Val_TrqRefLimited	Torque Reference Limited (%), Displays the Torque Reference Limiting function.	REAL
Val_TrqRefOut	Torque Reference Output (%), Displays the product of the limited Acceleration Reference and the Torque Scalar.	REAL
Val_TrqRefSelected	Torque Reference Selected (%), Displays the dynamic selected Torque Reference.	REAL
Val_U0DCBusVoltage	U0 Power Cell DC Bus Voltage (VDC), Displays in real time, the measured DC Bus Voltage read from Power Cell U0.	REAL
Val_U0FWBuild	U0 Power Cell Firmware Build, Displays the Build number of the Power Cell Control Board (PCCB) firmware in Power Cell U0.	INT
Val_U0MajrMinrFWRev	U0 Power Cell Firmware MajorMinorRev, Displays the Major and Minor revision of the Power Cell Control Board (PCCB) firmware in Power Cell U0.	REAL
Val_U0Status_Word	U0 Power Cell Status, Displays the Online status word read from Power Cell U0.	INT
Val_U1DCBusVoltage	U1 Power Cell DC Bus Voltage (VDC), Displays in real time, the measured DC Bus Voltage read from Power Cell U1.	REAL
Val_U1FWBuild	U1 Power Cell Firmware Build, Displays the Build number of the Power Cell Control Board (PCCB) firmware in Power Cell U1.	INT
Val_U1MajrMinrFWRev	U1 Power Cell Firmware MajorMinorRev, Displays the Major and Minor revision of the Power Cell Control Board (PCCB) firmware in Power Cell U1.	REAL
Val_U1StatusWord	U1 Power Cell Status, Displays the Online status word read from Power Cell U1.	INT
Val_U2DCBusVoltage	U2 Power Cell DC Bus Voltage (VDC), Displays in real time, the measured DC Bus Voltage read from Power Cell U2.	REAL
Val_U2FWBuild	U2 Power Cell Firmware Build, Displays the Build number of the Power Cell Control Board (PCCB) firmware in Power Cell U2.	INT
Val_U2MajrMinrFWRev	U2 Power Cell Firmware MajorMinorRev, Displays the Major and Minor revision of the Power Cell Control Board (PCCB) firmware in Power Cell U2.	REAL

Output	Function/Description	DataType
Val_U2StatusWord	U2 Power Cell Status, Displays the Online status word read from Power Cell U2.	INT
Val_V0DCBusVoltage	V0 Power Cell DC Bus Voltage (VDC), Displays in real time, the measured DC Bus Voltage read from Power Cell V0.	REAL
Val_V0FWBuild	V0 Power Cell Firmware Build, Displays the Build number of the Power Cell Control Board (PCCB) firmware in Power Cell V0.	INT
Val_V0MajrMinrFWRev	V0 Power Cell Firmware MajorMinorRev, Displays the Major and Minor revision of the Power Cell Control Board (PCCB) firmware in Power Cell V0.	REAL
Val_V0StatusWord	V0 Power Cell Status, Displays the Online status word read from Power Cell V0.	INT
Val_V1DCBusVoltage	V1 Power Cell DC Bus Voltage (VDC), Displays in real time, the measured DC Bus Voltage read from Power Cell V1.	REAL
Val_V1FWBuild	V1 Power Cell Firmware Build, Displays the Build number of the Power Cell Control Board (PCCB) firmware in Power Cell V1.	INT
Val_V1MajrMinrFWRev	V1 Power Cell Firmware MajorMinorRev, Displays the Major and Minor revision of the Power Cell Control Board (PCCB) firmware in Power Cell V1.	REAL
Val_V1StatusWord	V1 Power Cell Status, Displays the Online status word read from Power Cell V1.	INT
Val_V2DCBusVoltage	V2 Power Cell DC Bus Voltage (VDC), Displays in real time, the measured DC Bus Voltage read from Power Cell V2.	REAL
Val_V2FWBuild	V2 Power Cell Firmware Build, Displays the Build number of the Power Cell Control Board (PCCB) firmware in Power Cell V2.	INT
Val_V2MajrMinrFWRev	V2 Power Cell Firmware MajorMinorRev, Displays the Major and Minor revision of the Power Cell Control Board (PCCB) firmware in Power Cell V2.	REAL
Val_V2StatusWord	V2 Power Cell Status, Displays the Online status word read from Power Cell V2.	INT
Val_VelFbActive	Velocity Feedback Active (Hz, RPM), Displays the unfiltered active motor velocity feedback.	REAL
Val_VelocityError	Velocity Error (Hz, RPM), Displays the velocity error signal.	REAL
Val_VFDCabinetTemp	VFD Cabinet Temperature (°C), Displays temperature feedback in the VFD cabinet and is used for Predicitive Life estimation of VFD cabinet fans.	REAL
Val_VFDFanCtctr	VFD Cabinet Fan Contactor Command, Displays the status of the command to start the VFD cabinet fan VFD.	INT
Val_VFDFanFdbk	VFD Cabinet Fan Feedback, Displays the status of the VFD cabinet fan contactor/ VFD.	INT
Val_VRefCommanded	Velocity Reference Commanded (Hz, RPM), Displays the value of the Velocity Reference after the Skip Speed function.	REAL
Val_VRefFinal	Velocity Reference Final (Hz, RPM), Displays the final Velocity Reference, after all the modifications, to be used by the Velocity Regulator.	REAL
Val_VRefSource	Velocity Reference Source, Displays the port number and parameter number of the source of the present velocity reference.	DINT
Val_VRegIntOut	Velocity Regulator Integrator Output (R/s2), Displays the contribution of the Integral Gain to the Velocity Regulator output.	REAL

Output	Function/Description	DataType
Val_VRegOutput	Velocity Regulator Output (R/s2), Displays the output of the Velocity Regulator.	REAL
Val_W0DCBusVoltage	W0 Power Cell DC Bus Voltage (VDC), Displays in real time, the measured DC Bus Voltage read from Power Cell W0.	REAL
Val_W0FWBuild	W0 Power Cell Firmware Build, Displays the Build number of the Power Cell Control Board (PCCB) firmware in Power Cell W0.	INT
Val_W0MajrMinrFWRev	W0 Power Cell Firmware MajorMinorRev, Displays the Major and Minor revision of the Power Cell Control Board (PCCB) firmware in Power Cell W0.	REAL
Val_W0StatusWord	W0 Power Cell Status, Displays the Online status word read from Power Cell W0.	INT
Val_W1DCBusVoltage	W1 Power Cell DC Bus Voltage (VDC), Displays in real time, the measured DC Bus Voltage read from Power Cell W1.	REAL
Val_W1FWBuild	W1 Power Cell Firmware Build, Displays the Build number of the Power Cell Control Board (PCCB) firmware in Power Cell W1.	INT
Val_W1MajrMinrFWRev	W1 Power Cell Firmware MajorMinorRev, Displays the Major and Minor revision of the Power Cell Control Board (PCCB) firmware in Power Cell W1.	REAL
Val_W1StatusWord	W1 Power Cell Status, Displays the Online status word read from Power Cell W1.	INT
Val_W2DCBusVoltage	W2 Power Cell DC Bus Voltage (VDC), Displays in real time, the measured DC Bus Voltage read from Power Cell W2.	REAL
Val_W2FWBuild	W2 Power Cell Firmware Build, Displays the Build number of the Power Cell Control Board (PCCB) firmware in Power Cell W2.	INT
Val_W2MajrMinrFWRev	W2 Power Cell Firmware MajorMinorRev, Displays the Major and Minor revision of the Power Cell Control Board (PCCB) firmware in Power Cell W2.	REAL
Val_W2StatusWord	W2 Power Cell Status, Displays the Online status word read from Power Cell W2.	INT
Val_Xfrmr1CabTemp	Transformer 1 Fan Temperature (°C), Displays temperature feedback in the Transformer 1 cabinet and is used for Predicitive Life estimation of Transformer 1 cabinet fans.	REAL
Val_Xfrmr1RTD1Fdbk	Transformer1 RTD1 Feedback (°C), Displays temperature feedback from transformer 1 RTD#1.	REAL
Val_Xfrmr1RTD2Fdbk	Transformer1 RTD2 Feedback (°C), Displays temperature feedback from transformer 1 RTD#2.	REAL
Val_Xfrmr1RTD3Fdbk	Transformer1 RTD3 Feedback (°C), Displays temperature feedback from transformer 1 RTD#3.	REAL
Val_XfrmrFanCtctr	Transformer Fan Contactor Command, Displays the status of the command to start the transformer cabinet fan VFD.	INT
Val_XfrmrFanFdbk	Transformer Fan Feedback, Displays the status of the transformer cabinet fan contactor/VFD.	INT

Data Types

The following Power Velocity Common Control Interface tags are the primary device program tags to read and write to when interfacing to power velocity devices. The value of using these tags in your specific application code is that you may use a number of different power velocity devices such as ArmorStart® and PowerFlex® drives without having to update your application device interface tags.

Refer to the Interfaces section for detailed information on interfaces. Refer to the Using Power Device Objects with PlantPAx® or Using Power Device Objects with Machine Builder Libraries for more information on interfacing with other Rockwell Automation® application code libraries.

For further information and examples on how to interface the power device objects with your specific application code refer to the "How_To_Interface_with_Power_Device_Logix.mp4" video within the Videos folder of the Power Device Library Download files.

raC_UDT_ItfAD_PwrVelocity_Inf

Member	Description	Data Type
ModulePath	Module CIP Path.	STR0032
bExtensionEnabled	Object extension is present in the controller. Bitwise representation: 0 = False, 1 = True.	DINT
bExtensionAlert	Object extension alert/notification is present. Bitwise representation: 0 = False, 1 = True.	DINT

raC_UDT_ItfAD_PwrVelocity_Set

This is the Power Velocity Common Control Interface User-Defined Data Type for device settings. Its members provide application program access to allow or inhibit commands and settings from the device faceplate or other external sources. The table below shows member names, descriptions, and tag data types.

For example, to inhibit write commands from the device faceplate or other external sources write a 1 to the ModuleName_AOI_CtlrSet.InhibitCmd program tag from your application program. This would prevent a jog command from the device faceplate. You may also set the speed for the device.

Member	Description	Data Type
bInhibit	Inhibits (Bit Overlay).	DINT
InhibitCmd	1 = Inhibit user Commands from external sources, 0 = Allow.	BOOL
InhibitSet	1 = Inhibit user Settings from external sources, 0 = Allow.	BOOL
InhibitCfg	1 = Inhibit user Configuration from external sources, 0 = Allow.	BOOL
Speed	Speed reference (Hz).	REAL

raC_UDT_ItfAD_ PwrVelocity _Cmd

This is the Power Velocity Common Control Interface User-Defined Data Type for device commands. Its members provide application program access to common device commands.

Only write to these common command members to control the device. If you write directly to the device's output command tags directly unexpected device operation could occur.

For example, to start or activate the device write a 1 to the ModuleName_AOI_CtlrCmd.Activate tag. Do not write to the ModuleName:O.LogicCommand_Start tag. Although, you can write to the uncommon command tags in the device's output tag if a specific common control interface tag does not exist.

The table below shows member names, descriptions, and tag data types.

All the commands are available whether operating the device physically or virtually. Virtual Operation allows you to test your application code without activating the device's physical outputs.

Member	Description	Data Type
bCmd	Commands (Bit Overlay).	DINT
Physical	1 = Operate as Physical Device.	BOOL
Virtual	1 = Operate as Virtual Device.	BOOL
ResetWarn	1 = Reset device warning.	BOOL
ResetFault	1 = Reset device trip or fault.	BOOL
Activate	1 = Activate output power structure.	BOOL
Deactivate	1 = Deactivate output power structure.	BOOL
CmdDir	Command Direction: 0 = Forward, 1 = Reverse.	BOOL

raC_UDT_ItfAD_PwrVelocity_Sts

This is the Power Velocity Common Control Interface User-Defined Data Type for device status. Its members provide application program access to device states, status, and diagnostic data. The table below shows member names, descriptions, and tag data types.

Input	Description	Data Type
eState	Enumerated state value: 0 = Unused, 1 = Initializing, 2 = Disconnected, 3 = Disconnecting, 4 = Connecting, 5 = Idle, 6 = Configuring, 7 = Available.	DINT
FirstWarning	First Warning.	raC_UDT_Event
FirstFault	First Fault.	raC_UDT_Event
eCmdFail	Enumerated command failure code. 0= No Command Failure, 1= Virtual Command Fail, 2= Physical Command Fail, 3= Start Command Fail, 4= Stop Command Fail, 5= Fault Reset Command Fail,6= Operator Start Command Fail.	DINT

Input	Description	Data Type
bSts	Status (Bit Overlay). 0 = Connected, 1 = Available, 2 = Warning, 3 = Faulted, 4 = Ready, 5 = Active, 6 = Zero Speed, 7 = Virtual.	DINT
Physical	1 = Controlling physical device.	BOOL
Virtual	1 = Controlling virtual device.	BOOL
Connected	1 = PAC to device connection has been established.	BOOL
Available	1 = The device is available for interaction with the user program.	BOOL
Warning	1 = A warning is active on the device.	BOOL
Faulted	1 = A fault is active on the device.	BOOL
Ready	1 = Device is ready to be activated.	BOOL
Active	1 = Device power structure is active.	BOOL
ZeroSpeed	1 = Motor is at zero speed (not rotating).	BOOL
ObjCtrl	0 = Object has control of this device, 1 = Object does not have control of this device. I.E. HIM or I/O control.	BOOL
CmdDir	Command direction: 0 = Forward, 1 = Reverse.	BOOL
ActDir	Actual direction: 0 = Forward, 1 = Reverse.	BOOL
Accelerating	1 = Motor is accelerating.	BOOL
Decelerating	1 = Motor is decelerating.	BOOL
AtSpeed	1 = Motor is At Speed.	BOOL
Speed	Actual Speed (Hz).	REAL

raC_UDT_Event

An array of size 4 is to be used to log the FirstWarning and FirstFault capture. The data should be FIFO order. The same should be displayed on the Faceplate.

Member	Description	Data Type
Type	Event type: 1 = Status, 2 = Warning, 3 = Fault, 4…n = User.	DINT
ID	User definable event ID.	DINT
Category	User definable category (Electrical,Mechanical,Materials,Utility,etc.).	DINT
Action	User definable event action code.	DINT
Value	User definable event value or fault code.	DINT
Message	Event message text.	STRING
EventTime_L	Timestamp (Date/Time format).	LINT
EventTime_D	Timestamp (Y,M,D,h,m,s,us).	DINT[7]

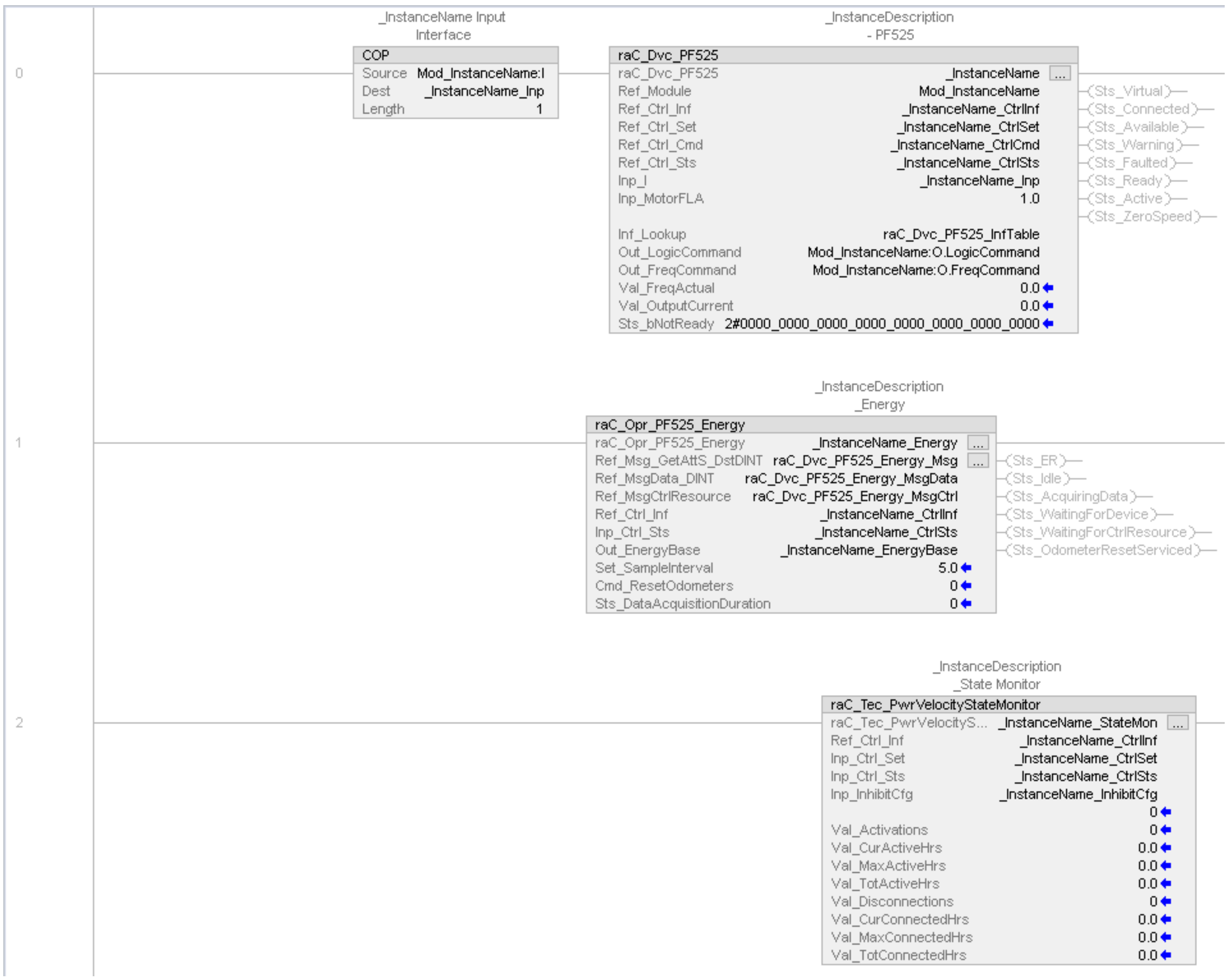
raC_UDT_LookupMember_STR0082

Member	Description	Data Type
Code	Code	DINT
Desc	Code Description	STRING

Programming Example

Fully configured device on a rung is provided below for reference. The first rung is required and the others are optional. This example includes the device and extensions objects for a PowerFlex® 525 (raC_Dvc_PF525).

Note that this programming example is the same code that is imported when either importing the supplied rung .L5X files or when using Application Code Manager or the Studio 5000® Import Library Objects wizard plug-in.



The device (ie: PowerFlex® drive) must also be configured with the correct device definition. Note that this configuration is completed automatically when using Application Code Manager or the Studio 5000® Import Library Objects wizard plug-in. For details on setting up the device, refer to the Device Definition section.

Graphic Symbols

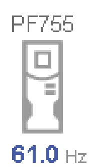
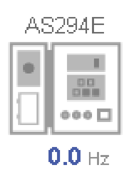
Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. Alternatively, faceplates may also be launch from related instructions such as the navigate to device faceplate buttons in the Process Library PVSD faceplate or the Machine Builder Library raM_Dvc_Motor_VSD faceplate.

All icons display the following information:

- - Device label (Tag.@Description or custom label entered in parameter #104)
- - Motor Speed (Hz)
- - Connection Fault/Virtual Indication
- - Device Warning/Fault Indication
- - Device not ready indication
- - Device Active (running)/Inactive (stopped) indication

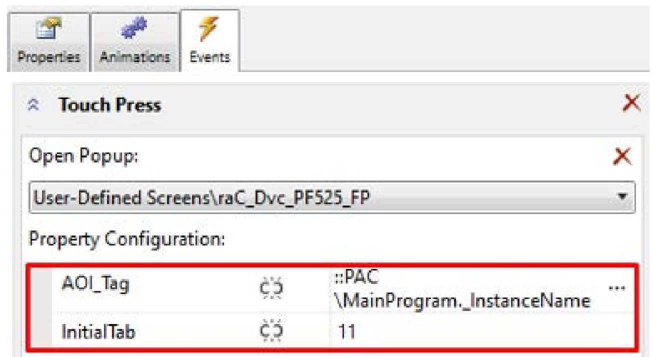
See Launch Buttons for more general information on launch button diagnostics and usage.

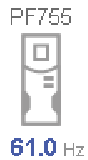
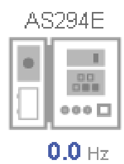
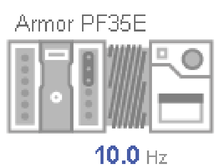
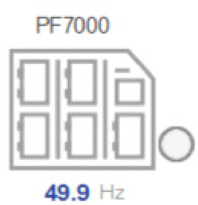
FactoryTalk® View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GOLaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate.	#102: Backing Tag (e.g. {::[PAC]Program::Program._InstanceName}) #104: Custom button label. Leave blank to use Tag.@Description #120: Display's left position (e.g. 100, optional) #121: Display's top position (e.g. 100, optional)
GO_LaunchPowerFlexVel_TagString		Use with PowerFlex 525/753/755/755T Velocity drives Motor Speed (Hz) Shown as live value.	
GO_LaunchArmorStartVel_TagString		Use with ArmorStart 284E/294E Velocity Drives Motor Speed (Hz) Shown as live value.	
GO_LaunchArmorPowerFlex_TagString		Use with Armor PowerFlex 35E/S Drives Motor Speed (Hz) Shown as live value.	
GO_LaunchMVPowerFlex_TagString		Use with PowerFlex 6000T/ 7000 Velocity drives. Motor Speed (Hz) Shown as live value.	

Studio 5000 View Designer® Graphic Symbols

All Studio 5000 View Designer® graphic symbols must be configured with an *Event* to open up the appropriate Popup screen. Select the graphic symbol and in the *Properties* window navigate to the *Events* tab. Assign a *Button Behavior* event to *Open popup on release*. Assign the required Popup screen (e.g. User-Defined Screens\raC_Dvc_PF525_FP). The required *Property Configurations* are found in the following table where you may assign the *AOI_Tag* to the object's Add-On Instruction tag.



Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		Faceplate navigation button with string tag label. Use Properties > General > Text to modify the button label text.	AOI_Tag: Object's Add-On Instruction Tag
GO_LaunchPowerFlexVel_TagString		Use with PowerFlex 525/753/755/755T Velocity drives Motor Speed (Hz) Shown as live value.	
GO_LaunchArmorStartVel_TagString		Use with ArmorStart 284E/294E Velocity Drives Motor Speed (Hz) Shown as live value.	
GO_LaunchArmorPowerFlex_TagString		Use with Armor PowerFlex 35E/S Drives Motor Speed (Hz) Shown as live value.	
GO_LaunchMVPowerFlex_TagString		Use with PowerFlex 6000T/ 7000 Velocity drives. Motor Speed (Hz) Shown as live value.	

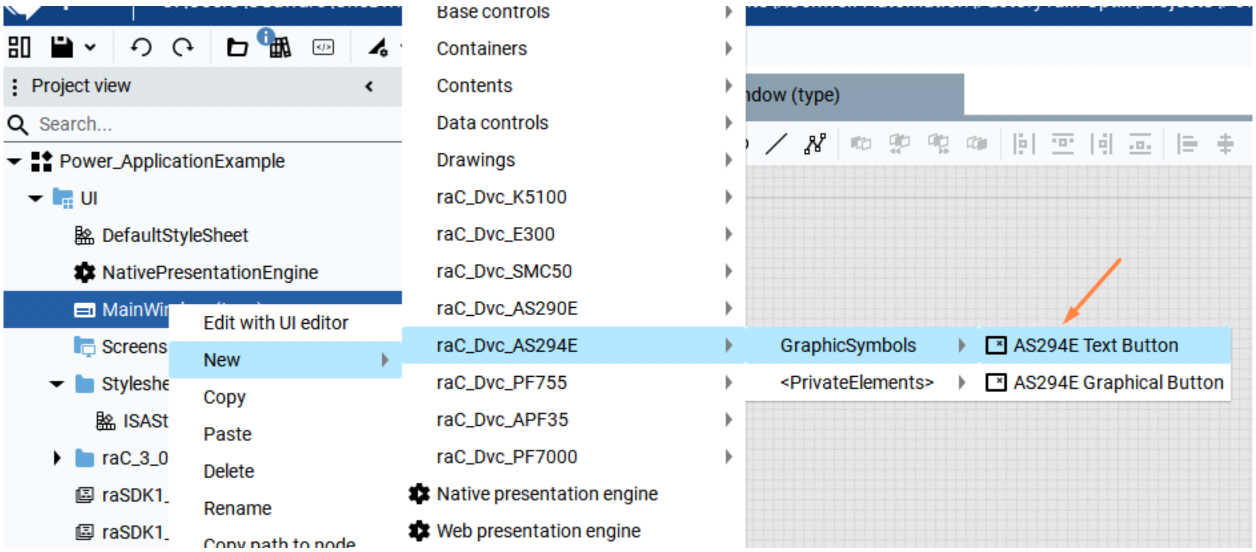
FactoryTalk® Optix Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. All graphical symbols for Power Devices display the following information:

- - Device label (Tag.@Description or custom label)
- - Motor Speed (Hz)
- - Connection Fault/Virtual Indication
- - Device Warning/Fault Indication
- - Device not ready indication
- - Device Active (running)/Inactive (stopped) indication

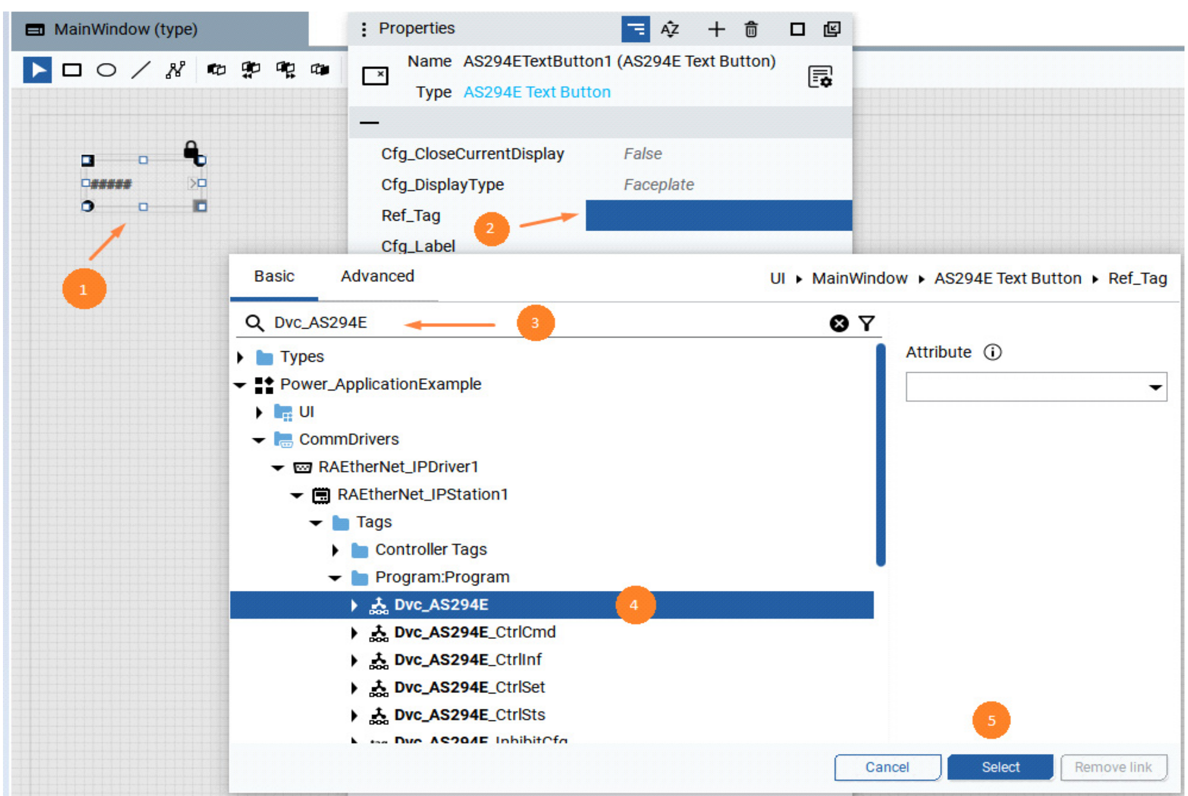
See Basic Launch Button Attributes section for more general information on launch button diagnostics and usage.

Once the Objects have been imported into the FactoryTalk® Optix Studio project, you can begin using them in your application. To add a new Launch Button to a Main window, navigate to raC_3_xx_raC_Dvc_ObjectName_UI > Graphic Symbols > raC_3_xx_raC_Dvc_ObjectName_GS_NavText Button to insert a navigation launch button with a text label.

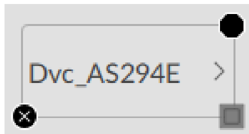
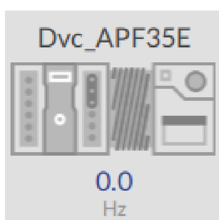
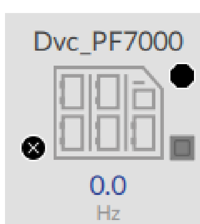


After placing the graphic symbol on a UI panel, link the “Ref_Tag” property to the targeted Asset under Asset tag.

Text label shown on button can be configured using “cfg_Label” property, If it is not configured then description of the asset will be shown on the button face.



This is the only step needed to link the UI to the asset data model.For more information on graphic symbols, refer to the Graphic Symbols section of the Power Velocity device type in this manual.

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
raC_3_xx_raC_Dvc_Devicename_GS_NavText		Faceplate navigation button. Use Cfg_Label Variable to modify the button label text.	Cfg_CloseCurrentDisplay: Set to 'True' to close the previously open display when launching the object faceplate Cfg_DisplayType: Faceplate to be opened on button click. This should not be modified. Ref_Tag: Object's Add-On Instruction Tag Cfg_Label: Text label shown on the button face
raC_3_xx_raC_Dvc_Devicename_GS_NavGraphical		Use with PowerFlex 525/753/755/755T Velocity drives Motor Speed (Hz) Shown as live value.	
raC_3_xx_raC_Dvc_Devicename_GS_NavGraphical		Use with ArmorStart 284E/294E Velocity Drives Motor Speed (Hz) Shown as live value.	
raC_3_xx_raC_Dvc_Devicename_GS_NavGraphical		Use with Armor PowerFlex 35E/S Drives Motor Speed (Hz) Shown as live value.	
raC_3_xx_raC_Dvc_Devicename_GS_NavGraphical		Use with PowerFlex 6000T/ 7000 Velocity drives. Motor Speed (Hz) Shown as live value.	

Graphic Symbol Button Configuration Variables

Variable Name	Description	Default Value
Cfg_CloseCurrentDisplay	Set to 'True' to close the previously open display when launching the object faceplate	False
Cfg_DisplayType	Faceplate to be opened on button click. This should not be modified.	Faceplate
Ref_Tag	Link to instance of desired target Asset model found in Model > Asset folder.	N/A - User must configure
Cfg_Label	Text label shown on the button face. Defaults to the description of the asset but users may replace in instances with other desired text.	../Ref_Tag@Description

Faceplates

There are basic faceplate attributes that are common across all instructions.

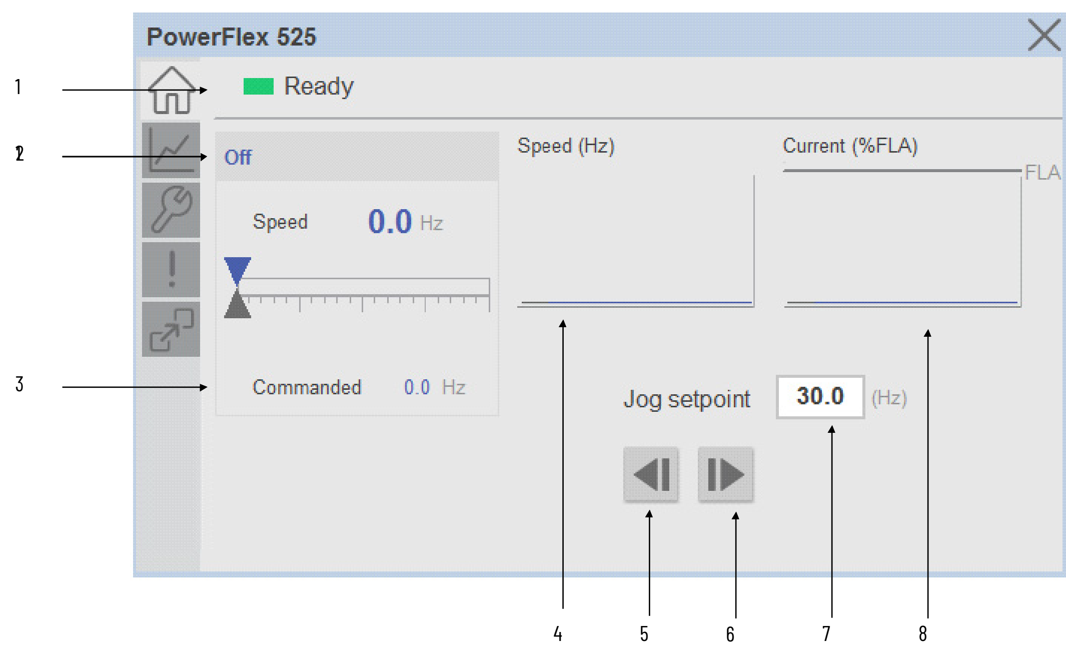
Home

The Home tab is the main tab of the faceplate. It contains two small trends called sparklines and a jog control object.

On the top left is a Forward speed indicator that is a multi-state indicator and changes text based on the device state. Other text for state changes includes, “Reverse”, “Zero Speed”, and “Off”. The speed feedback is a large blue numeric display that is read-only. The Gauge shows the actual speed of the device and a numeric display showing Commanded frequency.

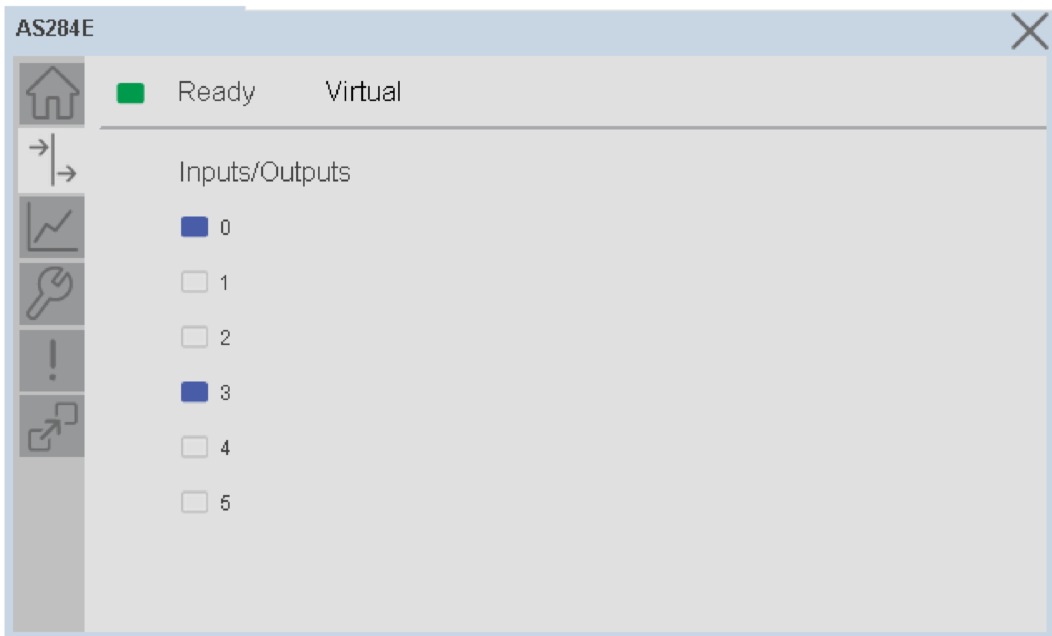
There are two spark lines to the right of the display for Speed and Current. Below the spark lines is a numeric input for the user to set the Jog setpoint, and two command buttons for Jog Forward and Jog Reverse.

Item	Description
1	Banner
2	Device Action Forward/Reverse/Off
3	Set and commanded speed on gauge
4	Actual speed sparkline trend
5	Jog reverse
6	Jog forward
7	Jog speed setpoint (Hz)
8	Actual current sparkline trend



I/O Tab

The I/O tab is available on the APF35 Armor PowerFlex® and AS284E/AS294E ArmorStart® devices only. This tab shows the status of inputs 0-5. Exclusive to the Armor PowerFlex® 35, if the product is a Safety model (e.g. Armor PowerFlex® 35S) the I/O tab will additional show safety inputs 0-3. LED shows no color when they are in the OFF position and shows blue when they are in the ON position.



Trend Tab

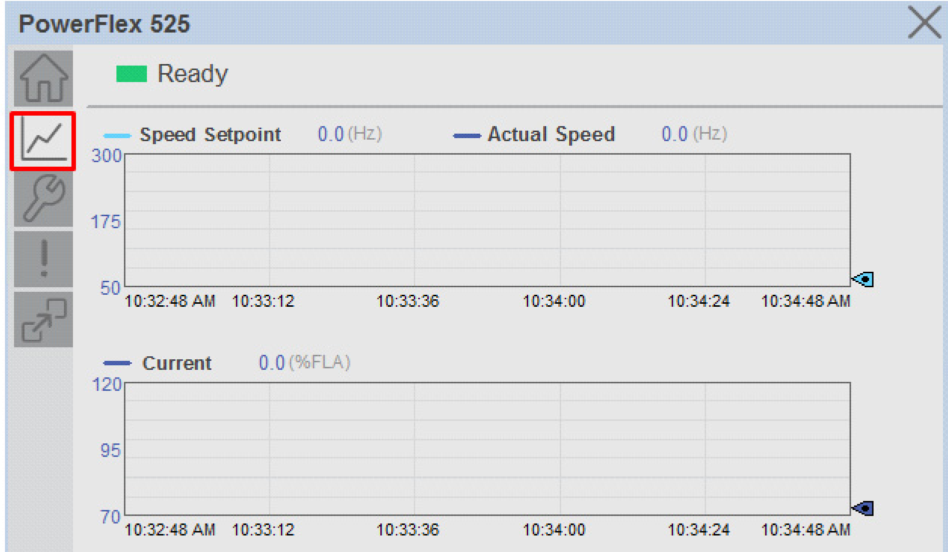
Trends display values over time, often used to compare similar or related values and to allow operators to predict future states to make control action decisions. Two trends are displayed - Speed (Setpoint and Actual are traced) and Current.

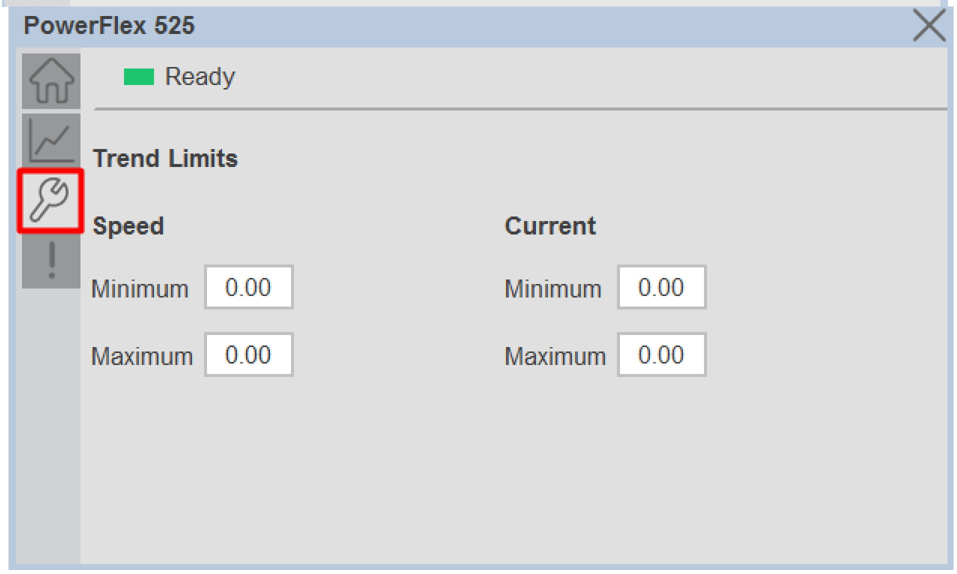
Configure Tab

The Configure tab contains configuration elements that a maintenance technician would need to troubleshoot and adjust for an object on another tab, i.e., numeric inputs to adjust trend min and max values.

Diagnostics Tab

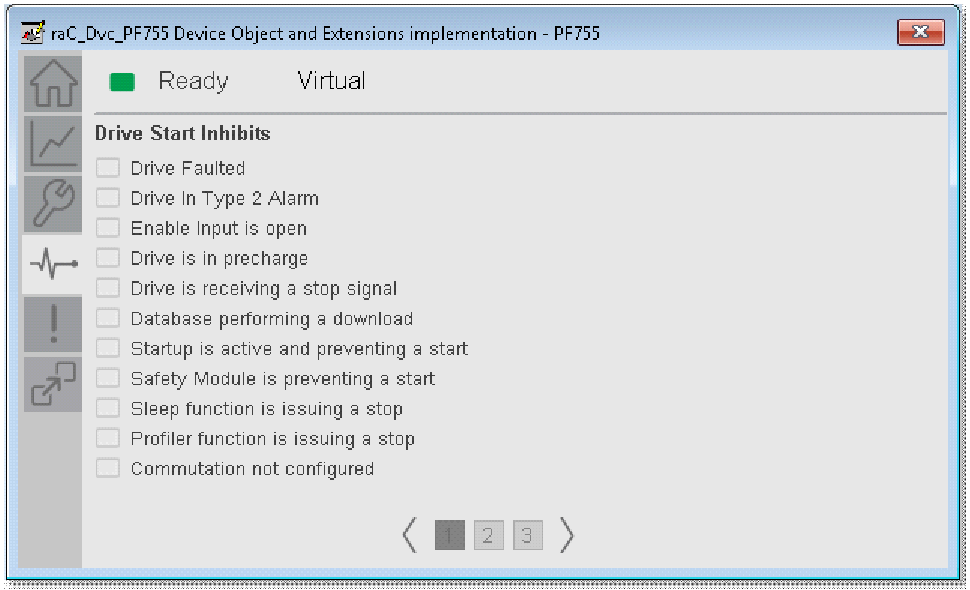
The device diagnostics tab includes a list of information available in the drive for troubleshooting. This tab is available on PF525, PF753 and PF755 drives only. The amount and type of diagnostics included is dependent on the specific





device model. These diagnostics may include drive start inhibits and drive status.

Diagnostic	Type	AS284E	AS294E	APF35	PF525	PF753	PF755	PF755T	PF6000T	PF7000
Drive Faulted	Drive Start Inhibits					Yes	Yes			
Drive in Type 2 Alarm	Drive Start Inhibits					Yes	Yes			
Enable Input is open	Drive Start Inhibits					Yes	Yes			
Drive is in precharge	Drive Start Inhibits					Yes	Yes			
Drive is receiving a stop signal	Drive Start Inhibits					Yes	Yes			
Database performing a download	Drive Start Inhibits					Yes	Yes			
Startup is active and preventing a start	Drive Start Inhibits					Yes	Yes			
Safety module is preventing a start	Drive Start Inhibits					Yes	Yes			
Sleep function is issuing a stop	Drive Start Inhibits					Yes	Yes			
Profiler function is issuing a stop	Drive Start Inhibits					Yes	Yes			
Commutation not configured	Drive Start Inhibits					Yes	Yes			
Ready	Drive Status					Yes	Yes			
Active	Drive Status					Yes	Yes			
Command Direction	Drive Status					Yes	Yes			
Actual Direction	Drive Status					Yes	Yes			



Diagnostic	Type	AS284E	AS294E	APF35	PF525	PF753	PF755	PF755T	PF6000T	PF7000
Accelerating	Drive Status					Yes	Yes			
Decelerating	Drive Status					Yes	Yes			
Alarm	Drive Status					Yes	Yes			
Faulted	Drive Status					Yes	Yes			
At Speed	Drive Status					Yes	Yes			
Manual	Drive Status					Yes	Yes			
Running	Drive Status					Yes	Yes			
Jogging	Drive Status					Yes	Yes			
Stopping	Drive Status					Yes	Yes			
DC Braking	Drive Status					Yes	Yes			
DB Active	Drive Status					Yes	Yes			
Speed Mode	Drive Status					Yes	Yes			
Position Mode	Drive Status					Yes	Yes			
Torque Mode	Drive Status					Yes	Yes			
At Speed	Drive Status					Yes	Yes			
At Home	Drive Status					Yes	Yes			
At Limit	Drive Status					Yes	Yes			
Current Limit	Drive Status					Yes	Yes			
Bus Freq Regulation	Drive Status					Yes	Yes			
Enable On	Drive Status					Yes	Yes			
Motor Overload	Drive Status					Yes	Yes			
Drive Regen	Drive Status					Yes	Yes			
Digital Input 1	Drive Input Status				Yes					
Digital Input 2	Drive Input Status				Yes					
Digital Input 3	Drive Input Status				Yes					
Digital Input 4	Drive Input Status				Yes					
Common Logic Cmd	Drive Status (Port0)								Yes	
Prod Logic Cmd	Drive Status (Port0)								Yes	
Reference	Drive Status (Port0)								Yes	
Common Logic Sts	Drive Status (Port0)								Yes	
Prod Logic Sts	Drive Status (Port0)								Yes	
Feedback	Drive Status (Port0)								Yes	
Ctrl Pod Temp	Drive Status (Port0)								Yes	
MPU Temp C	Drive Status (Port0)								Yes	
DSP Temp C	Drive Status (Port0)								Yes	

Diagnostic	Type	AS284E	AS294E	APF35	PF525	PF753	PF755	PF755T	PF6000T	PF7000
SFIB Board Temp	Drive Status (Port0)								Yes	
Pwr Dvc Cmd PIOB	Drive Status (Port0)								Yes	
Pwr Dvc Sts PIOB	Drive Status (Port0)								Yes	
Pwr Dvc Cmd	Drive Status (Port0)								Yes	
Pwr Dvc Sts	Drive Status (Port0)								Yes	
Pwr Config Sts	Drive Status (Port0)								Yes	
Logic Cmd	Drive Status (Port0)								Yes	
Out Vltg Trim Value	Drive Status (Port10)								Yes	
Out Vltg Cmd Trim	Drive Status (Port10)								Yes	
Motor Status 1	Drive Status (Port10)								Yes	
Motor Status 2	Drive Status (Port10)								Yes	
Out Vltg Trim Value	Drive Status (Port11)								Yes	
Out Vltg Cmd Trim	Drive Status (Port11)								Yes	
Motor Status 1	Drive Status (Port11)								Yes	
Motor Status 2	Drive Status (Port11)								Yes	
Prchrg Duty Cycle	Drive Status (Port13)								Yes	
Prchrg Open Lvl Act	Drive Status (Port13)								Yes	
Line Status 1	Drive Status (Port13)								Yes	
Line Status 2	Drive Status (Port13)								Yes	
Num Xfrmr 1 Fans	Drive Status (Port14)								Yes	
Num Xfrmr 2 Fans	Drive Status (Port14)								Yes	
Num Pwr Cell Fans	Drive Status (Port14)								Yes	
Num Filter Fans	Drive Status (Port14)								Yes	
Num VFD Fans	Drive Status (Port14)								Yes	
Drive not Synched with Line Voltage	Drive Start Inhibits									Yes
Rectified Phase Check not Passed	Drive Start Inhibits									Yes
Line Filter Capacitor not Discharged	Drive Start Inhibits									Yes
Drive Input Isolation Switch OK	Drive Start Inhibits									Yes
Drive Output Isolation Switch OK	Drive Start Inhibits									Yes
Drive Bypass Isolation Switch OK	Drive Start Inhibits									Yes
Open Circuit Mode does not has Output Contactor	Drive Start Inhibits									Yes
Motor Filter Capacitor not Discharged after Synch	Drive Start Inhibits									Yes
Loss of Medium Voltage	Drive Start Inhibits									Yes
Loss of Control Power	Drive Start Inhibits									Yes
SCR Gate Boards not Charged	Drive Start Inhibits									Yes
Drive Input Contactor Open	Drive Start Inhibits									Yes
Rectified Self Powered Gate Supply OK	Drive Start Inhibits									Yes
Fans ON	Drive Status									Yes
Input Closed	Drive Status									Yes
Output Closed	Drive Status									Yes
Jog	Drive Status									Yes
Restart Required	Drive Status									Yes
Converter Fan 2 ON	Drive Status									Yes
Drive Message Error	Drive Status									Yes
Input Isolation Switch	Contactor Status									Yes
Input Contactor	Contactor Status									Yes
Output Isolation Switch	Contactor Status									Yes
Output Contactor	Contactor Status									Yes
Bypass Isolation Switch	Contactor Status									Yes
Bypass Contactor	Contactor Status									Yes

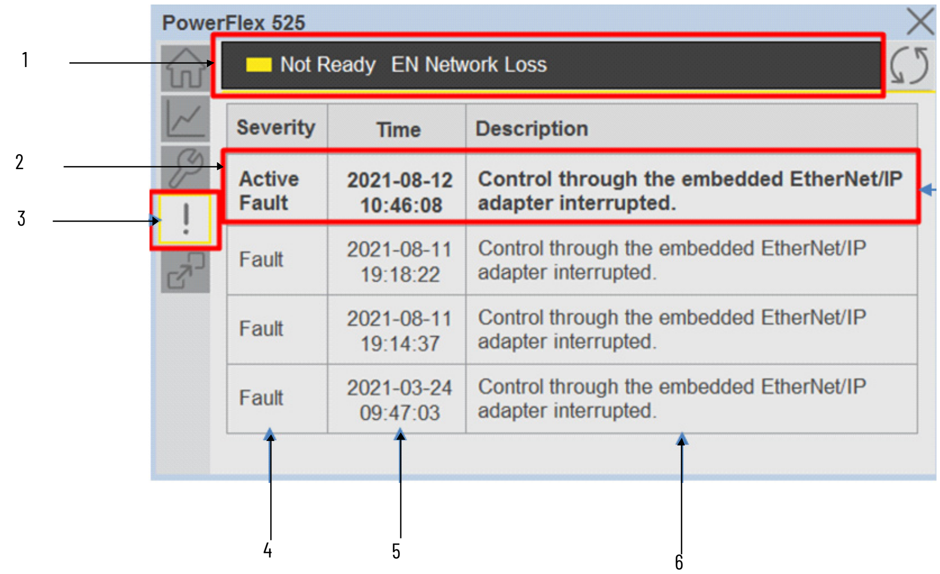
Diagnostic	Type	AS284E	AS294E	APF35	PF525	PF753	PF755	PF755T	PF6000T	PF7000
Line Frequency (Hz)	Diagnostics Process Data									Yes
Line Current (Amps)	Diagnostics Process Data									Yes
Line Power (kW)	Diagnostics Process Data									Yes
Line Power (%)	Diagnostics Process Data									Yes
Line Voltage (V)	Diagnostics Process Data									Yes
Line Voltage (%)	Diagnostics Process Data									Yes
Drive Overload Count (%)	Diagnostics Process Data									Yes
Rectifier Voltage (%)	Diagnostics Process Data									Yes
Motor Torque (%)	Diagnostics Process Data									Yes
Motor Current (Amps)	Diagnostics Process Data									Yes
Motor Current (%)	Diagnostics Process Data									Yes
Motor Power (kW)	Diagnostics Process Data									Yes
Motor Power (%)	Diagnostics Process Data									Yes
Motor Voltage (V)	Diagnostics Process Data									Yes
Motor Voltage (%)	Diagnostics Process Data									Yes
Motor Overload Count (%)	Diagnostics Process Data									Yes
Inverter Temperature (deg C)	Diagnostics Process Data									Yes
Rectifier Temperature (deg C)	Diagnostics Process Data									Yes
Input Isolation Switch	Hardware options									Yes
Output Isolation Switch	Hardware options									Yes
Bypass Isolation Switch	Hardware options									Yes
Output Contactor Installed	Hardware options									Yes
Bypass Contactor Installed	Hardware options									Yes

Note: additional diagnostics for the PF755T are available through the Predictive Maintenance Extension object.

Fault Warning Tab

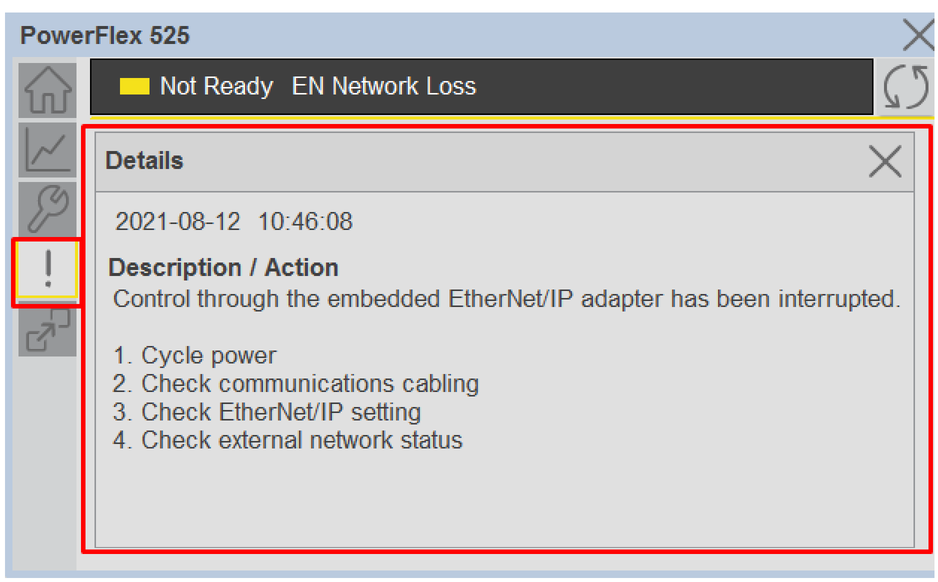
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

Note, only row 1 will display the "Active Fault" in the severity column if there is a current active fault, else it will display the last fault. Rows 2-4 only display past faults and warnings, not an active fault.



Item	Description
1	Banner
2	Last fault is in first row and show in bold if active
3	Yellow border visible when a fault is active
4	Fault severity
5	Fault event time
6	4 most recent fault/warning event messages

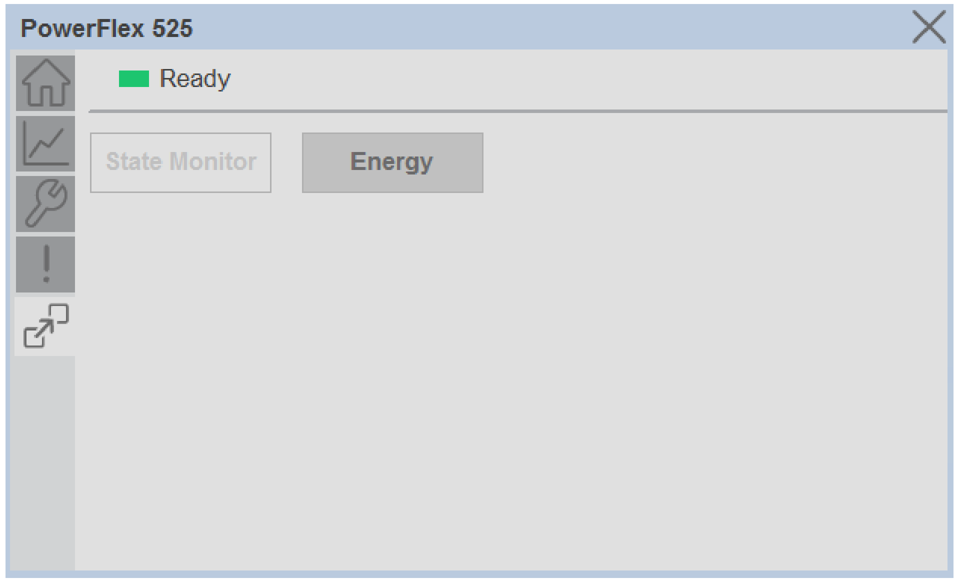
Click on any row in the fault table to view fault details. The details window provides a more detailed description and possible action steps to remedy condition.



Extension Tab

The Extension tab provides a navigation button to open Extension faceplates. Extension faceplates are optional and may include:

- State Monitor Extension
- Energy Extension
- Predictive Maintenance Extension



Note that extensions are currently only available in FactoryTalk® View Studio and are not supported in Studio 5000 View Designer®.

For complete details on extensions, refer to the related sections of this manual:

- State Monitor Extension
- Energy Extension
- Predictive Maintenance Extension

Extensions will be enabled through the device object's Information interface. The interface contains a DINT member entitled ExtensionEnabled. Each bit of ExtensionEnabled represents an extension location, thus a device object can theoretically support 32 extensions.

Currently, extension names are reserved for the following locations:

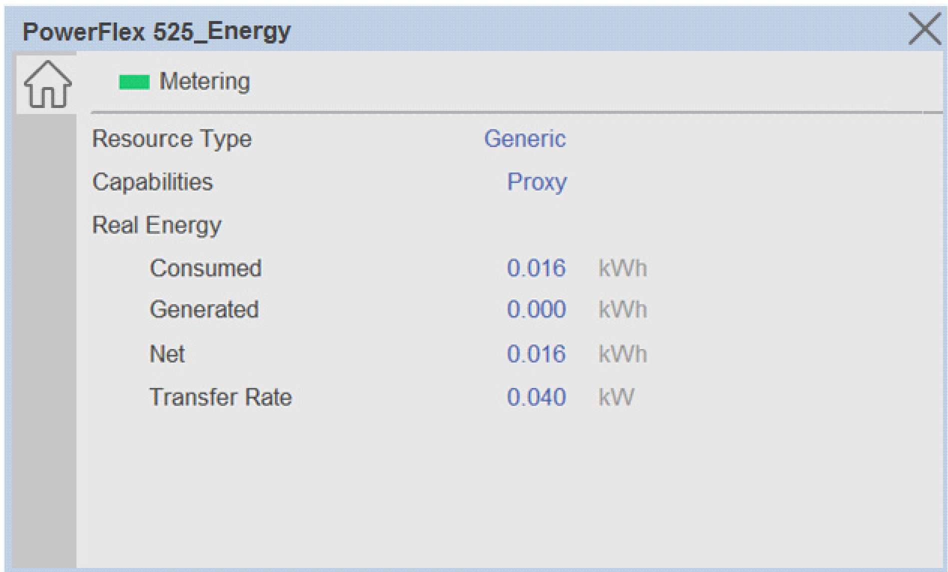
Extension Name	Location	Tag Suffix
State Monitor	Bit 0	_StateMon
Energy	Bit 1	_Energy
Predictive Maintenance	Bit 2	_PredMaint
Reserved	Bits3-31	

▸ Instance_Name_CtrlInf.ModulePath	'$01$03$12$0E1...	{...}		STR0032	Device Interface - Power Velocity Module CIP Path
◢ Instance_Name_CtrlInf.ExtensionEnabled	2		Decimal	DINT	Device Interface - Power Velocity Object extension is present in the controller
Instance_Name_CtrlInf.ExtensionEnabled.0	0		Decimal	BOOL	Device Interface - Power Velocity Object extension is present in the controller
Instance_Name_CtrlInf.ExtensionEnabled.1	1		Decimal	BOOL	Device Interface - Power Velocity Object extension is present in the controller
Instance_Name_CtrlInf.ExtensionEnabled.2	0		Decimal	BOOL	Device Interface - Power Velocity Object extension is present in the controller
Instance_Name_CtrlInf.ExtensionEnabled.3	0		Decimal	BOOL	Device Interface - Power Velocity Object extension is present in the controller

Extension Objects

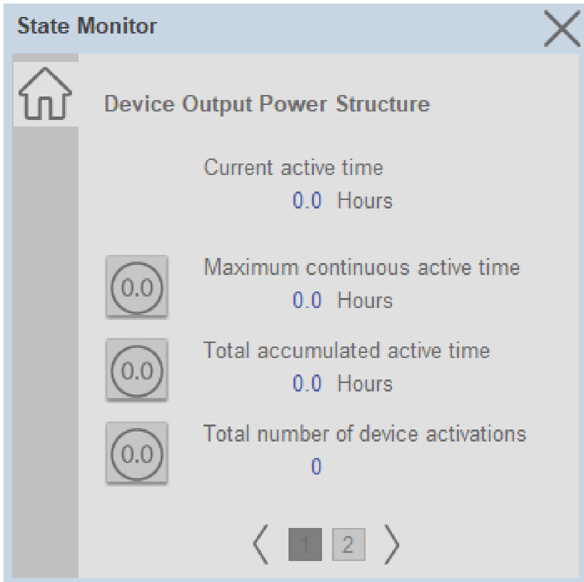
Energy Extension

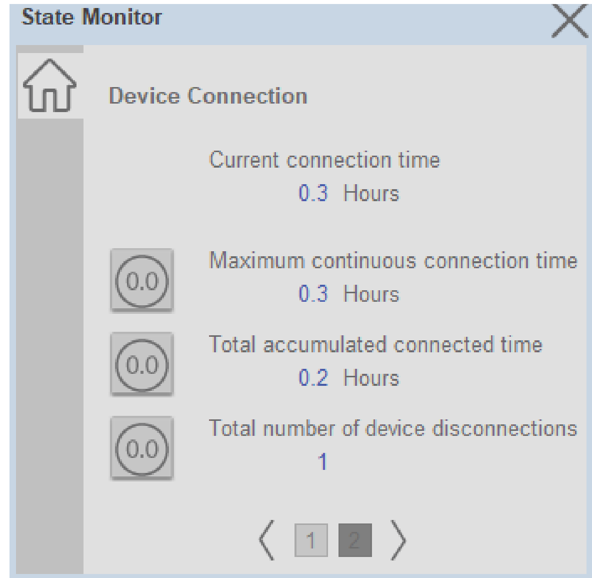
Energy extension faceplates are available for compatible objects. Refer to the raC_Opr_xxx_Energy section of this manual for more information.



State Monitor Extension

State Monitor extension faceplates are available for all objects. Refer to the raC_Tec_PwrxxxStateMonitor section of this manual for more information.





Application Code Manager

All Power Velocity device objects have similar configuration parameters in Application Code Manager. The following section defines the common parameters. “xxxxx” is used in place of the specific device name (e.g. PF525).

Refer to the section Using Application Code Manager for complete details.

Definition Object: raC_Dvc_xxxxx

This object contains the AOI definition and used as linked library to implement object. This gives flexibility to choose to instantiate only definition and create custom implement code. User may also create their own implement library and link with this definition library object.

Parameter Name	Default Value	Instance Name	Definition	Description
ObjectInterfaceDatatype	UserDefinedDatatype			Determine the interface datatype of the object. Note: if using with the Process object library, select PreDefinedDatatype. PreDefinedDatatype selection can be used with L8 or 5069 controllers in V33 and later. UserDefinedDatatype selection can used in any application that does not utilize the Process object library.

Implementation Object: raC_LD_Dvc_xxxxx

Parameter Name	Default Value	Instance Name	Definition	Description
RoutineName	{ObjectName}	{RoutineName}	Routine	Enter Routine name. Routine will be created and Object implement rung(s) inserted. A JSR will be inserted in MainRoutine. If routine name already exists, then object will be inserted into existing routine. By default, parameter is set to Object Name.
TagName	{ObjectName}	{TagName}	Backing Tag	Enter the backing tag of the main AOI. This will serve as the base tag name for other tags in this object that are derived from the base.
TagDescription	{ObjectDescription}	{TagDescription}		Tag Description of the main AOI backing tag
TagScope	Program		Input Parameter	Tags will be created at the assigned scope
ObjectInterfaceDatatype	UserDefinedDatatype		Input Parameter	Determine the interface datatype of the object. Note: if using with the Process object library, select PreDefinedDatatype. PreDefinedDatatype selection can be used with L8 or 5069 controllers in V33 and later. UserDefinedDatatype selection can used in any application that does not utilize the Process object library.
Ref_DvcObj_Type	{ModuleName}			Reference for PlantPAx objects.
ModuleName	Mod_{ObjectName}	{ModuleName}	Input Parameter	Enter the Module Name. This is the name for the module that appears in the Controller Organizer tree.
ModuleType	Device Dependent			Select hardware module type. e.g. PowerFlex525-E2P. See Module Options for full details.
DriveRating	Device Dependent			Applicable to PowerFlex® drives. Select drive size rating. e.g. 208V 11A(HD) Compact. See Module Options for full details.
MotorFLA	1.0			Applicable to PowerFlex® drives. Enter motor full load amps
IncludeHW	1			Allow ACM to create the Hardware Module. If the module already exists in the Controller Organizer, select False or existing module properties will be overwritten.
ModuleType	PowerFlex525-E2P		Input Parameter	Select hardware module type
IPAddress	192.168.1.0		Input Parameter	Enter a valid network address for the hardware module. It must be of form X.X.X.X
ParentModule	Local		Input Parameter	Select the Parent Module. This represents the name of the communication adapter this module will communicate through. If connecting to a non-library object module, enter the name of the module only. If the module is connected directly to the controller ethernet port, enter "Local". Note: entering non-library object modules will result in the parameter displaying a red X. This will still generate properly as long as the entered name exists in the project.
ChassisName	{ParentModule}			Warning removal

Parameter Name	Default Value	Instance Name	Definition	Description
IncludeEnergy	0		Input Parameter	Include the energy extension object
IncludeStateMonitor	0		Input Parameter	Include the State Monitor extension object
IncludePredictiveMaintenance	0		Input Parameters	Include the Predictive Maintenance extension object. Applicable to PF755T only.
Drive_Firmware	Greater than or Equal to V11			Applicable to PF755T with Predictive Maintenance extension only. Greater than or Equal to V11/V6.
EnergyMsgTag	raC_Dvc_xxxxx_Energy_Msg	{EnergyMsgTag}		Enter Tag name for Msg Services. This tag should be unique for Msg Service class. Multiple objects can share the tag.
EnergyMsgCtrl	raC_Dvc_xxxxx_Energy_MsgCtrl	{EnergyMsgCtrl}		Message Services Control Tag. This tag provides the control interface for the messaging services. This should be unique per class. Multiple objects can share the tag.
EnergyMsgData	raC_Dvc_xxxxx_Energy_MsgData	{EnergyMsgData}		Data tag for Messaging Services. This tag should be unique per class. Multiple objects can share the tag.
SymbolStyle	Icon			HMI launch button symbol style. Icon/Text
SEAssocDisplay			HMI Display	FactoryTalk View SE Display reference. Launch button will be generated on this display.
MEAssocDisplay			HMI Display	FactoryTalk View ME Display reference. Launch button will be generated on this display.

Module Options

A detailed list of available DriveRatings and ModuleTypes is below:

Device	ModuleType Options	DriveRating Options
raC_Dvc_AS284E	284E-FVD1P4Z 284E-FVD2P3S 284E-FVD2P3Z 284E-FVD4P0S 284E-FVD4P0Z 284E-FVD6P0S 284E-FVD6P0Z 284E-FVD7P6S 284E-FVD7P6Z	N/A
raC_Dvc_AS294E	294E-FD1P5P 294E-FD1P5Z 294E-FD2P5P 294E-FD2P5Z 294E-FD4P2P 294E-FD4P2Z	N/A
raC_Dvc_APF35	Armor PowerFlex® 35E Armor PowerFlex® 35S	1HP (0.75kW), 2HP (1.5kW), 3HP (2.2kW)
raC_Dvc_PF525	PowerFlex525-E2P PowerFlex525-EENET	1P 110V 1.0HP, 1P 110V 1.5HP, 1P 110V .50HP, 1P 240V 1.0HP, 1P 240V 2.0HP, 1P 240V 3.0HP, 1P 240V .50HP, 3P 230V 1.0HP, 3P 230V 2.0HP, 3P 230V 3.0HP, 3P 230V 5.0HP, 3P 230V 7.5HP, 3P 230V 10HP, 3P 230V 15HP, 3P 230V 20HP, 3P 230V .50HP, 3P 460V 1.0HP, 3P 460V 2.0HP, 3P 460V 3.0HP, 3P 460V 5.0HP, 3P 460V 7.5HP, 3P 460V 10HP, 3P 460V 15HP, 3P 460V 20HP, 3P 460V 25HP, 3P 460V 30HP, 3P 460V .50HP, 3P 600V 1.0HP, 3P 600V 2.0HP, 3P 600V 3.0HP, 3P 600V 5.0HP, 3P 600V 7.5HP, 3P 600V 10HP, 3P 600V 15HP, 3P 600V 20HP, 3P 600V 25HP, 3P 600V 30HP, 3P 600V .50HP

Device	ModuleType Options	DriveRating Options
raC_Dvc_PF753	Powerflex_753_ENETR	200V 4.8A(ND) Compact, 200V 4.8A(HD) Compact, 200V 4.8A(ND) Standard, 200V 4.8A(HD) Standard, 208V 11A(ND) Standard, 208V 11A(HD) Standard, 208V 11A(ND) Compact, 208V 7.8A(HD) Compact, 208V 120A(ND) Standard, 208V 92A(HD) Standard, 208V 15.3A(ND) Compact, 208V 11A(HD) Compact, 208V 150A(ND) Standard, 208V 120A(HD) Standard, 208V 17.5A(ND) Standard, 208V 11A(HD) Standard, 208V 177A(ND) Standard, 208V 150A(HD) Standard, 208V 2.5A(ND) Compact, 208V 2.5A(HD) Compact, 208V 2.5A(ND) Standard, 208V 2.5A(HD) Standard, 208V 22A(ND) Standard, 208V 17.5A(HD) Standard, 208V 221A(ND) Standard, 208V 177A(HD) Standard, 208V 260A(ND) Standard, 208V 221A(HD) Standard, 208V 260A(ND) NEMA 12, 208V 221A(HD) NEMA 12, 208V 32.2A(ND) Standard, 208V 22A(HD) Standard, 208V 359A(ND) Standard, 208V 260A(HD) Standard, 208V 4.8A(ND) Compact, 208V 2.5A(HD) Compact, 208V 4.8A(ND) Standard, 208V 4.8A(HD) Standard, 208V 414A(ND) Standard, 208V 359A(HD) Standard, 208V 43A(ND) Standard, 208V 32.2A(HD) Standard, 208V 477A(ND) Standard, 208V 359A(HD) Standard, 208V 60A(ND) Standard, 208V 43A(HD) Standard, 208V 7.8A(ND) Compact, 208V 4.8A(HD) Compact, 208V 7.8A(ND) Standard, 208V 7.8A(HD) Standard, 208V 78.2A(ND) Standard, 208V 60A(HD) Standard, 208V 92A(ND) Standard, 208V 78.2A(HD) Standard, 208V 92A(ND) NEMA 12, 208V 78.2A(HD) NEMA 12, 240V 104A(ND) Standard, 240V 80A(HD) Standard, 240V 130A(ND) Standard, 240V 104A(HD) Standard, 240V 15.3A(ND) Compact, 240V 9.6A(HD) Compact, 240V 15.3A(ND) Standard, 240V 9.6A(HD) Standard, 240V 154A(ND) Standard, 240V 130A(HD) Standard, 240V 192A(ND) Standard, 240V 154A(HD) Standard, 240V 2.2A(ND) Compact, 240V 2.2A(HD) Compact, 240V 2.2A(ND) Standard, 240V 2.2A(HD) Standard, 240V 22A(ND) Standard, 240V 15.3A(HD) Standard, 240V 260A(ND) Standard, 240V 192A(HD) Standard, 240V 260A(ND) NEMA 12, 240V 192A(HD) NEMA 12, 240V 28A(ND) Standard, 240V 22A(HD) Standard, 240V 312A(ND) Standard, 240V 260A(HD) Standard, 240V 360A(ND) Standard, 240V 312A(HD) Standard, 240V 4.2A(ND) Compact, 240V 2.2A(HD) Compact, 240V 4.2A(ND) Compact, 240V 4.2A(HD) Compact, 240V 4.2A(ND) Standard, 240V 4.2A(HD) Standard, 240V 4.2A(ND) Standard, 240V 4.2A(HD) Standard, 240V 42A(ND) Standard, 240V 28A(HD) Standard, 240V 477A(ND) Standard, 240V 312A(HD) Standard, 240V 54A(ND) Standard, 240V 42A(HD) Standard, 240V 6.8A(ND) Compact, 240V 4.2A(HD) Compact, 240V 6.8A(ND) Standard, 240V 6.8A(HD) Standard, 240V 70A(ND) Standard, 240V 54A(HD) Standard, 240V 80A(ND) Standard, 240V 70A(HD) Standard, 240V 80A(ND) NEMA 12, 240V 70A(HD) NEMA 12, 240V 9.6A(ND) Compact, 240V 6.8A(HD) Compact, 240V 9.6A(ND) Standard, 240V 9.6A(HD) Standard, 400V 104A(ND) Standard, 400V 85A(HD) Standard, 400V 104A(ND) NEMA 12, 400V 85A(HD) NEMA 12, 400V 11.5A(ND) Standard, 400V 11.5A(HD) Standard, 400V 11.5A(ND) Compact, 400V 8.7A(HD) Compact, 400V 140A(ND) Standard, 400V 104A(HD) Standard, 400V 15.4A(ND) Compact, 400V 11.5A(HD) Compact, 400V 15.4A(ND) Standard, 400V 11.5A(HD) Standard, 400V 170A(ND) Standard, 400V 140A(HD) Standard, 400V 2.1A(ND) Compact, 400V 1.3A(HD) Compact, 400V 2.1A(ND) Standard, 400V 2.1A(HD) Standard, 400V 205A(ND) Standard, 400V 170A(HD) Standard, 400V 22A(ND) Standard, 400V 15.4A(HD) Standard, 400V 260A(ND) Standard, 400V 205A(HD) Standard, 400V 260A(ND) NEMA 12, 400V 205A(HD) NEMA 12, 400V 3.5A(ND) Compact, 400V 2.1A(HD) Compact, 400V 3.5A(ND) Standard, 400V 3.5A(HD) Standard, 400V 30A(ND) Standard, 400V 22A(HD) Standard, 400V 302A(ND) Standard, 400V 260A(HD) Standard, 400V 367A(ND) Standard, 400V 302A(HD) Standard, 400V 37A(ND) Standard, 400V 30A(HD) Standard, 400V 43A(ND) Standard, 400V 37A(HD) Standard, 400V 456A(ND) Standard, 400V 367A(HD) Standard, 400V 477A(ND) Standard, 400V 367A(HD) Standard, 400V 5A(ND) Compact, 400V 3.5A(HD) Compact, 400V 5A(ND) Standard, 400V 5A(HD) Standard, 400V 60A(ND) Standard, 400V 43A(HD) Standard, 400V 72A(ND) Standard, 400V 60A(HD) Standard, 400V 72A(ND) NEMA 12, 400V 60A(HD) NEMA 12, 400V 8.7A(ND) Compact, 400V 5A(HD) Compact, 400V 8.7A(ND) Standard, 400V 8.7A(HD) Standard, 400V 85A(ND) Standard, 400V 72A(HD) Standard, 480V 11A(ND) Standard, 480V 11A(HD) Standard, 480V 11A(ND) Compact, 480V 8A(HD) Compact, 480V 125A(ND) Standard, 480V 96A(HD) Standard, 480V 14A(ND) Compact, 480V 11A(HD) Compact, 480V 14A(ND) Standard, 480V 11A(HD) Standard, 480V 156A(ND) Standard, 480V 125A(HD) Standard, 480V 186A(ND) Standard, 480V 156A(HD) Standard, 480V 2.1A(ND) Compact, 480V 1.1A(HD) Compact, 480V 2.1A(ND) Standard, 480V 2.1A(HD) Standard, 480V 22A(ND) Standard, 480V 14A(HD) Standard, 480V 248A(ND) Standard, 480V 186A(HD) Standard, 480V 248A(ND) NEMA 12, 480V 186A(HD) NEMA 12, 480V 27A(ND) Standard, 480V 22A(HD) Standard, 480V 3.4A(ND) Compact, 480V 2.8A(HD) Compact, 480V 3.4A(ND) Standard, 480V 3.4A(HD) Standard, 480V 302A(ND) Standard, 480V 248A(HD) Standard, 480V 34A(ND) Standard, 480V 27A(HD) Standard, 480V 361A(ND) Standard, 480V 302A(HD) Standard, 480V 40A(ND) Standard, 480V 34A(HD) Standard, 480V 415A(ND) Standard, 480V 361A(HD) Standard, 480V 477A(ND) Standard, 480V 361A(HD) Standard, 480V 5A(ND) Compact, 480V 3.4A(HD) Compact, 480V 5A(ND) Standard, 480V 5A(HD) Standard, 480V 52A(ND) Standard, 480V 40A(HD) Standard, 480V 65A(ND) Standard, 480V 52A(HD) Standard, 480V 65A(ND) NEMA 12, 480V 52A(HD) NEMA 12, 480V 77A(ND) Standard, 480V 65A(HD) Standard, 480V 8A(ND) Compact, 480V 5A(HD) Compact, 480V 8A(ND) Standard, 480V 8A(HD) Standard, 480V 96A(ND) Standard, 480V 77A(HD) Standard, 480V 96A(ND) NEMA 12, 480V 77A(HD) NEMA 12, 600V 0.9A(HD) Standard, 600V 0.9A(HD) Standard, 600V 0.9A(HD) Standard, 600V 0.9A(HD) Standard, 600V 9A(HD) Standard, 600V 9A(HD) Standard, 600V 9A(HD) Standard, 600V 9A(HD) Standard, 600V 12A(ND) Standard, 600V 9.1A(HD) Standard, 600V 125A(ND) Standard, 600V 99A(HD) Standard, 600V 144A(ND) Standard, 600V 125A(HD) Standard, 600V 11A(HD) Standard, 600V 11A(HD) Standard, 600V 11A(HD) Standard, 600V 11A(HD) Standard, 600V 18A(ND) Standard, 600V 11.1A(HD) Standard, 600V 192A(ND) Standard, 600V 144A(HD) Standard, 600V 1.7A(HD) Standard, 600V 1.7A(HD) Standard, 600V 1.7A(HD) Standard, 600V 1.7A(HD) Standard, 600V 17A(HD) Standard, 600V 17A(HD) Standard, 600V 17A(HD) Standard, 600V 17A(HD) Standard, 600V 23A(ND) Standard, 600V 18A(HD) Standard, 600V 24A(ND) Standard, 600V 22A(HD) Standard, 600V 242A(ND) Standard, 600V 192A(HD) Standard, 600V 22A(HD) Standard, 600V 22A(HD) Standard, 600V 22A(HD) Standard, 600V 22A(HD) Standard, 600V 28A(ND) Standard, 600V 23A(HD) Standard, 600V 289A(ND) Standard, 600V 242A(HD) Standard, 600V 2.7A(HD) Standard, 600V 2.7A(HD) Standard, 600V 2.7A(HD) Standard, 600V 2.7A(HD) Standard, 600V 27A(HD) Standard, 600V 27A(HD) Standard, 600V 27A(HD) Standard, 600V 27A(HD) Standard, 600V 33A(ND) Standard, 600V 28A(HD) Standard, 600V 32A(HD) Standard, 600V 32A(HD) Standard, 600V 32A(HD) Standard, 600V 32A(HD) Standard, 600V 42A(ND) Standard, 600V 33A(HD) Standard, 600V 41A(HD) Standard, 600V 41A(HD) Standard, 600V 41A(HD) Standard, 600V 41A(HD) Standard, 600V 53A(ND) Standard, 600V 42A(HD) Standard, 600V 3.9A(HD) Standard, 600V 3.9A(HD) Standard, 600V 3.9A(HD) Standard, 600V 3.9A(HD) Standard, 600V 63A(ND) Standard, 600V 52A(HD) Standard, 600V 77A(ND) Standard, 600V 63A(HD) Standard, 600V 6.1A(HD) Standard, 600V 6.1A(HD) Standard, 600V 6.1A(HD) Standard, 600V 6.1A(HD) Standard, 600V 99A(ND) Standard, 600V 77A(HD) Standard, 690V 119A(ND) Standard, 690V 98A(HD) Standard, 690V 12A(ND) Standard, 690V 9A(HD) Standard, 690V 142A(ND) Standard, 690V 119A(HD) Standard, 690V 15A(ND) Standard, 690V 12A(HD) Standard, 690V 171A(ND) Standard, 690V 142A(HD) Standard, 690V 20A(ND) Standard, 690V 15A(HD) Standard, 690V 212A(ND) Standard, 690V 171A(HD) Standard, 690V 23A(ND) Standard, 690V 20A(HD) Standard, 690V 263A(ND) Standard, 690V 212A(HD) Standard, 690V 30A(ND) Standard, 690V 23A(HD) Standard, 690V 34A(ND) Standard, 690V 30A(HD) Standard, 690V 46A(ND) Standard, 690V 34A(HD) Standard, 690V 50A(ND) Standard, 690V 46A(HD) Standard, 690V 61A(ND) Standard, 690V 50A(HD) Standard, 690V 82A(ND) Standard, 690V 61A(HD) Standard, 690V 98A(ND) Standard, 690V 82A(HD) Standard

Device	ModuleType Options	DriveRating Options
raC_Dvc_PF755	Powerflex_755_EENET Powerflex_755_ENETR	200V 4.8A(HD) Compact, 200V 4.8A(HD) Standard, 200V 4.8A(ND) Compact, 200V 4.8A(ND) Standard, 208V 11A(HD) Compact, 208V 11A(HD) Standard, 208V 11A(HD) Standard, 208V 11A(ND) Compact, 208V 11A(ND) Standard, 208V 120A(HD) Standard, 208V 120A(ND) Standard, 208V 15.3A(ND) Compact, 208V 150A(HD) Standard, 208V 150A(ND) Standard, 208V 17.5A(HD) Standard, 208V 17.5A(ND) Standard, 208V 177A(HD) Standard, 208V 177A(ND) Standard, 208V 2.5A(HD) Compact, 208V 2.5A(HD) Compact, 208V 2.5A(HD) Standard, 208V 2.5A(ND) Compact, 208V 2.5A(ND) Standard, 208V 221A(HD) NEMA 12, 208V 221A(HD) Standard, 208V 221A(ND) Standard, 208V 22A(HD) Standard, 208V 22A(ND) Standard, 208V 260A(HD) Standard, 208V 260A(ND) NEMA 12, 208V 260A(ND) Standard, 208V 32.2A(HD) Standard, 208V 32.2A(ND) Standard, 208V 359A(HD) Standard, 208V 359A(HD) Standard, 208V 359A(ND) Standard, 208V 4.8A(HD) Compact, 208V 4.8A(HD) Standard, 208V 4.8A(ND) Compact, 208V 4.8A(ND) Standard, 208V 414A(ND) Standard, 208V 43A(HD) Standard, 208V 43A(ND) Standard, 208V 477A(ND) Standard, 208V 60A(HD) Standard, 208V 60A(ND) Standard, 208V 7.8A(HD) Compact, 208V 7.8A(HD) Standard, 208V 7.8A(ND) Compact, 208V 7.8A(ND) Standard, 208V 78.2A(HD) NEMA 12, 208V 78.2A(HD) Standard, 208V 78.2A(ND) Standard, 208V 92A(HD) Standard, 208V 92A(ND) NEMA 12, 208V 92A(ND) Standard, 240V 104A(HD) Standard, 240V 104A(ND) Standard, 240V 130A(HD) Standard, 240V 130A(ND) Standard, 240V 15.3A(HD) Standard, 240V 15.3A(ND) Compact, 240V 15.3A(ND) Standard, 240V 154A(HD) Standard, 240V 154A(ND) Standard, 240V 192A(HD) NEMA 12, 240V 192A(HD) Standard, 240V 192A(ND) Standard, 240V 2.2A(HD) Compact, 240V 2.2A(HD) Compact, 240V 2.2A(HD) Standard, 240V 2.2A(ND) Compact, 240V 2.2A(ND) Standard, 240V 22A(HD) Standard, 240V 22A(ND) Standard, 240V 260A(HD) Standard, 240V 260A(ND) NEMA 12, 240V 260A(ND) Standard, 240V 28A(HD) Standard, 240V 28A(ND) Standard, 240V 312A(HD) Standard, 240V 312A(HD) Standard, 240V 312A(ND) Standard, 240V 360A(ND) Standard, 240V 4.2A(HD) Compact, 240V 4.2A(HD) Compact, 240V 4.2A(HD) Standard, 240V 4.2A(HD) Standard, 240V 4.2A(ND) Compact, 240V 4.2A(ND) Compact, 240V 4.2A(ND) Standard, 240V 4.2A(ND) Standard, 240V 42A(HD) Standard, 240V 42A(ND) Standard, 240V 477A(ND) Standard, 240V 54A(HD) Standard, 240V 54A(ND) Standard, 240V 6.8A(HD) Compact, 240V 6.8A(HD) Standard, 240V 6.8A(ND) Compact, 240V 6.8A(ND) Standard, 240V 70A(HD) NEMA 12, 240V 70A(HD) Standard, 240V 70A(ND) Standard, 240V 80A(HD) Standard, 240V 80A(ND) NEMA 12, 240V 80A(ND) Standard, 240V 9.6A(HD) Compact, 240V 9.6A(HD) Standard, 240V 9.6A(HD) Standard, 240V 9.6A(ND) Compact, 240V 9.6A(ND) Standard, 400V 1.3A(HD) Compact, 400V 104A(HD) Standard, 400V 104A(ND) NEMA 12, 400V 104A(ND) Standard, 400V 11.5A(HD) Compact, 400V 11.5A(HD) Standard, 400V 11.5A(HD) Standard, 400V 11.5A(ND) Compact, 400V 11.5A(ND) Standard, 400V 140A(HD) Standard, 400V 140A(ND) Standard, 400V 15.4A(HD) Standard, 400V 15.4A(ND) 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	Powerflex_755_HiPwr_EENET Powerflex_755_HiPwr_ENETR	400V 385A(HD) Standard, 400V 456A(HD) Standard, 400V 460A(ND) Standard, 400V 472A(HD) Standard, 400V 540A(HD) Standard, 400V 540A(LD) Standard, 400V 540A(ND) Standard, 400V 567A(ND) Standard, 400V 585A(HD) Standard, 400V 585A(LD) Standard, 400V 612A(LD) Standard, 400V 642A(HD) Standard, 400V 650A(ND) Standard, 400V 750A(HD) Standard, 400V 750A(LD) Standard, 400V 750A(ND) Standard, 400V 770A(ND) Standard, 400V 796A(LD) Standard, 400V 832A(LD) Standard, 400V 880A(HD) Standard, 400V 910A(HD) Standard, 400V 910A(ND) Standard, 400V 1040A(HD) Standard, 400V 1040A(LD) Standard, 400V 1040A(ND) Standard, 400V 1090A(HD) Standard, 400V 1090A(LD) Standard, 400V 1090A(ND) Standard, 400V 1175A(HD) Standard, 400V 1175A(LD) Standard, 400V 1175A(ND) Standard, 400V 1325A(HD) Standard, 400V 1465A(LD) Standard, 400V 1465A(ND) Standard, 400V 1480A(LD) Standard, 400V 1480A(ND) Standard, 400V 1590A(ND) Standard, 400V 1600A(LD) Standard, 400V 1715A(LD) Standard, 400V 1800A(HD) Standard, 400V 2150A(ND) Standard, 400V 2330A(LD) Standard, 480V 370A(HD) Standard, 480V 414A(HD) Standard, 480V 430A(ND) Standard, 480V 454A(HD) Standard, 480V 485A(HD) Standard, 480V 485A(LD) Standard, 480V 485A(ND) Standard, 480V 545A(HD) Standard, 480V 545A(LD) Standard, 480V 545A(ND) Standard, 480V 590A(LD) Standard, 480V 617A(HD) Standard, 480V 617A(ND) Standard, 480V 710A(HD) Standard, 480V 710A(LD) Standard, 480V 710A(ND) Standard, 480V 740A(ND) Standard, 480V 765A(LD) Standard, 480V 795A(HD) Standard, 480V 800A(HD) Standard, 480V 800A(LD) Standard, 480V 800A(ND) Standard, 480V 960A(HD) Standard, 480V 960A(LD) Standard, 480V 960A(ND) Standard, 480V 1045A(HD) Standard, 480V 1045A(LD) Standard, 480V 1045A(ND) Standard, 480V 1135A(HD) Standard, 480V 1135A(LD) Standard, 480V 1135A(ND) Standard, 480V 1270A(HD) Standard, 480V 1365A(LD) Standard, 480V 1365A(ND) Standard, 480V 1420A(LD) Standard, 480V 1420A(ND) Standard, 480V 1525A(ND) Standard, 480V 1540A(LD) Standard, 480V 1655A(LD) Standard, 480V 1730A(HD) Standard, 480V 2070A(ND) Standard, 480V 2240A(LD) Standard, 600V 272A(HD) Standard, 600V 295A(HD) Standard, 600V 295A(ND) Standard, 600V 329A(HD) Standard, 600V 355A(HD) Standard, 600V 355A(LD) Standard, 600V 355A(ND) Standard, 600V 395A(HD) Standard, 600V 395A(LD) Standard, 600V 395A(ND) Standard, 600V 425A(HD) Standard, 600V 435A(LD) Standard, 600V 435A(ND) Standard, 600V 460A(LD) Standard, 600V 460A(ND) Standard, 600V 510A(HD) Standard, 600V 510A(LD) Standard, 600V 510A(ND) Standard, 600V 545A(LD) Standard, 600V 595A(HD) Standard, 600V 595A(ND) Standard, 600V 630A(HD) Standard, 600V 630A(ND) Standard, 600V 690A(LD) Standard, 600V 700A(HD) Standard, 600V 760A(HD) Standard, 600V 760A(LD) Standard, 600V 760A(ND) Standard, 600V 815A(HD) Standard, 600V 825A(ND) Standard, 600V 835A(LD) Standard, 600V 900A(LD) Standard, 600V 900A(ND) Standard, 600V 920A(HD) Standard, 600V 980A(LD) Standard, 600V 980A(ND) Standard, 600V 1045A(LD) Standard, 600V 1110A(ND) Standard, 600V 1190A(HD) Standard, 600V 1220A(LD) Standard, 600V 1430A(ND) Standard, 600V 1530A(LD) Standard, 690V 215A(HD) Standard, 690V 265A(HD) Standard, 690V 265A(ND) Standard, 690V 308A(HD) Standard, 690V 330A(LD) Standard, 690V 330A(ND) Standard, 690V 370A(HD) Standard, 690V 370A(LD) Standard, 690V 370A(ND) Standard, 690V 390A(HD) Standard, 690V 410A(LD) Standard, 690V 413A(HD) Standard, 690V 415A(ND) Standard, 690V 460A(HD) Standard, 690V 460A(LD) Standard, 690V 460A(ND) Standard, 690V 500A(HD) Standard, 690V 500A(LD) Standard, 690V 500A(ND) Standard, 690V 530A(LD) Standard, 690V 590A(HD) Standard, 690V 590A(ND) Standard, 690V 650A(HD) Standard, 690V 650A(LD) Standard, 690V 650A(ND) Standard, 690V 710A(LD) Standard, 690V 710A(ND) Standard, 690V 750A(HD) Standard, 690V 765A(ND) Standard, 690V 790A(LD) Standard, 690V 795A(HD) Standard, 690V 795A(ND) Standard, 690V 860A(LD) Standard, 690V 865A(HD) Standard, 690V 960A(LD) Standard, 690V 960A(ND) Standard, 690V 1020A(LD) Standard, 690V 1040A(ND) Standard, 690V 1150A(LD) Standard, 690V 1160A(HD) Standard, 690V 1400A(ND) Standard, 690V 1485A(LD) Standard

Device	ModuleType Options	DriveRating Options
raC_Dvc_PF755T	PowerFlex755TR	400V 260A Heavy Duty, 400V 367A Light Duty, 400V 302A Normal Duty, 400V 302A Heavy Duty, 400V 460A Light Duty, 400V 367A Normal Duty, 400V 367A Heavy Duty, 400V 540A Light Duty, 400V 460A Normal Duty, 400V 460A Heavy Duty, 400V 585A Light Duty, 400V 540A Normal Duty, 400V 500A Heavy Duty, 400V 617A Light Duty, 400V 600A Normal Duty, 480V 248A Heavy Duty, 480V 361A Light Duty, 480V 302A Normal Duty, 480V 302A Heavy Duty, 480V 430A Light Duty, 480V 361A Normal Duty, 480V 361A Heavy Duty, 480V 485A Light Duty, 480V 430A Normal Duty, 480V 430A Heavy Duty, 480V 545A Light Duty, 480V 505A Normal Duty, 480V 500A Heavy Duty, 480V 617A Light Duty, 480V 600A Normal Duty, 600V 144A Heavy Duty, 600V 242A Light Duty, 600V 192A Normal Duty, 600V 192A Heavy Duty, 600V 295A Light Duty, 600V 242A Normal Duty, 600V 242A Heavy Duty, 600V 355A Light Duty, 600V 295A Normal Duty, 600V 295A Heavy Duty, 600V 395A Light Duty, 600V 355A Normal Duty, 600V 355A Heavy Duty, 600V 435A Light Duty, 600V 395A Normal Duty, 690V 142A Heavy Duty, 690V 215A Light Duty, 690V 171A Normal Duty, 690V 171A Heavy Duty, 690V 265A Light Duty, 690V 215A Normal Duty, 690V 215A Heavy Duty, 690V 330A Light Duty, 690V 265A Normal Duty, 690V 265A Heavy Duty, 690V 370A Light Duty, 690V 330A Normal Duty, 690V 330A Heavy Duty, 690V 415A Light Duty, 690V 370A Normal Duty, 400V 11.5A Heavy Duty, 400V 22A Light Duty, 400V 15.4A Normal Duty, 480V 11A Heavy Duty, 480V 22A Light Duty, 480V 14A Normal Duty, 400V 15.4A Heavy Duty, 400V 30A Light Duty, 400V 22A Normal Duty, 480V 14A Heavy Duty, 480V 27A Light Duty, 480V 22A Normal Duty, 400V 22A Heavy Duty, 400V 37A Light Duty, 400V 30A Normal Duty, 480V 22A Heavy Duty, 480V 34A Light Duty, 480V 27A Normal Duty, 400V 30A Heavy Duty, 400V 43A Light Duty, 400V 37A Normal Duty, 480V 27A Heavy Duty, 480V 40A Light Duty, 480V 34A Normal Duty, 400V 37A Heavy Duty, 400V 60A Light Duty, 400V 43A Normal Duty, 480V 34A Heavy Duty, 480V 52A Light Duty, 480V 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690V 119A Light Duty, 690V 98A Normal Duty, 600V 99A Heavy Duty, 600V 144A Light Duty, 600V 125A Normal Duty, 690V 98A Heavy Duty, 690V 142A Light Duty, 690V 119A Normal Duty, 600V 125A Heavy Duty, 600V 192A Light Duty, 600V 144A Normal Duty, 690V 119A Heavy Duty, 690V 171A Light Duty, 690V 142A Normal Duty, 600V 9A Heavy Duty, 600V 17A Light Duty, 600V 11A Normal Duty, 690V 12A Heavy Duty, 690V 20A Light Duty, 690V 15A Normal Duty, 600V 11A Heavy Duty, 600V 22A Light Duty, 600V 17A Normal Duty, 690V 15A Heavy Duty, 690V 23A Light Duty, 690V 20A Normal Duty, 600V 17A Heavy Duty, 600V 27A Light Duty, 600V 22A Normal Duty, 690V 20A Heavy Duty, 690V 30A Light Duty, 690V 23A Normal Duty, 600V 22A Heavy Duty, 600V 32A Light Duty, 600V 27A Normal Duty, 690V 23A Heavy Duty, 690V 34A Light Duty, 690V 30A Normal Duty, 600V 27A Heavy Duty, 600V 41A Light Duty, 600V 32A Normal Duty, 690V 30A Heavy Duty, 690V 46A Light Duty, 690V 34A Normal Duty, 600V 32A Heavy Duty, 600V 52A Light Duty, 600V 41A Normal Duty, 690V 34A Heavy Duty, 690V 50A Light Duty, 690V 46A Normal Duty, 600V 41A Heavy Duty, 600V 62A Light Duty, 600V 52A Normal Duty, 690V 46A Heavy Duty, 690V 61A Light Duty, 690V 50A Normal Duty, 600V 52A Heavy Duty, 600V 77A Light Duty, 600V 62A Normal Duty, 690V 50A Heavy Duty, 690V 82A Light Duty, 690V 61A Normal Duty, 600V 62A Heavy Duty, 600V 99A Light Duty, 600V 77A Normal Duty, 690V 61A Heavy Duty, 690V 98A Light Duty, 690V 82A Normal Duty, 600V 77A Heavy Duty, 600V 125A Light Duty, 600V 99A Normal Duty, 690V 82A Heavy Duty, 690V 119A Light Duty, 690V 98A Normal Duty, 600V 99A Heavy Duty, 600V 144A Light Duty, 600V 125A Normal Duty, 690V 98A Heavy Duty, 690V 142A Light Duty, 690V 119A Normal Duty, 600V 125A Heavy Duty, 600V 192A Light Duty, 600V 144A Normal Duty, 690V 119A Heavy Duty, 690V 171A Light Duty, 690V 142A Normal Duty, 400V 920A Heavy Duty, 400V 1090A Light Duty, 400V 1040A Normal Duty, 400V 1040A Heavy Duty, 400V 1182A Light Duty, 400V 1112A Normal Duty, 400V 1090A Heavy Duty, 400V 1465A Light Duty, 400V 1175A Normal Duty, 400V 1175A Heavy Duty, 400V 1581A Light Duty, 400V 1465A Normal Duty, 400V 1465A Heavy Duty, 400V 1715A Light Duty, 400V 1590A Normal Duty, 400V 1480A Heavy Duty, 400V 2150A Light Duty, 400V 1715A Normal Duty, 400V 1715A Heavy Duty, 400V 2330A Light Duty, 400V 2156A Normal Duty, 400V 2330A Heavy Duty, 400V 3078A Light Duty, 400V 2849A Normal Duty, 400V 260A Heavy Duty, 400V 367A Light Duty, 400V 302A Normal Duty, 400V 302A Heavy Duty, 400V 460A Light Duty, 400V 367A Normal Duty, 400V 3032A Heavy Duty, 400V 3846A Light Duty, 400V 3542A Normal Duty, 400V 367A Heavy Duty, 400V 540A Light Duty, 400V 460A Normal Duty, 400V 3575A Heavy Duty, 400V 4576A Light Duty, 400V 4235A Normal Duty, 400V 460A Heavy Duty, 400V 585A Light Duty, 400V 540A Normal Duty, 400V 472A Heavy Duty, 400V 650A Light Duty, 400V 585A Normal Duty, 400V 4745A Heavy Duty, 400V 6074A Light Duty, 400V 5621A Normal Duty, 400V 540A Heavy Duty, 400V 750A Light Duty, 400V 650A Normal Duty, 400V 585A Heavy Duty, 400V 796A Light Duty, 400V 750A Normal Duty, 400V 650A Heavy Duty, 400V 832A Light Duty, 400V 770A Normal Duty, 400V 5915A Heavy Duty, 400V 7571A Light Duty, 400V 7007A Normal Duty, 400V 770A Heavy Duty, 400V 1040A Light Duty, 400V 920A Normal Duty, 480V 960A Heavy Duty, 480V 1135A Light Duty, 480V 1045A Normal Duty, 480V 1045A Heavy Duty, 480V 1365A Light Duty, 480V 1135A Normal Duty, 480V 1135A Heavy Duty, 480V 1520A Light Duty, 480V 1365A Normal Duty, 480V 1365A Heavy Duty, 480V 1655A Light Duty, 480V 1420A Normal Duty, 480V 1420A Heavy Duty, 480V 2070A Light Duty, 480V 1655A Normal Duty, 480V 1655A Heavy Duty, 480V 2240A Light Duty, 480V 2072A Normal Duty, 480V 2240A Heavy Duty, 480V 2960A Light Duty, 480V 2738A Normal Duty, 480V 248A Heavy Duty, 480V 361A Light Duty, 480V 302A Normal Duty, 480V 302A Heavy Duty, 480V 430A Light Duty, 480V 361A Normal Duty, 480V 2980A Heavy Duty, 480V 3696A Light Duty, 480V 3404A Normal Duty, 480V 361A Heavy Duty, 480V 485A Light Duty, 480V 430A Normal Duty, 480V 3394A Heavy Duty, 480V 4400A Light Duty, 480V 4070A Normal Duty, 480V 430A Heavy Duty, 480V 545A Light Duty, 480V 505A Normal Duty, 480V 454A Heavy Duty, 480V 617A Light Duty, 480V 545A Normal Duty, 480V 4504A Heavy Duty, 480V 5840A Light Duty, 480V 5402A Normal Duty, 480V 485A Heavy Duty, 480V 710A Light Duty, 480V 617A Normal Duty, 480V 5615A Heavy Duty, 480V 7280A Light Duty, 480V 6734A Normal Duty, 480V 545A Heavy Duty, 480V 765A Light Duty, 480V 710A Normal Duty, 480V 617A Heavy Duty, 480V 800A Light Duty, 480V 740A Normal Duty, 480V 740A Heavy Duty, 480V 960A Light Duty, 480V 800A Normal Duty, 480V 800A Heavy Duty, 480V 1045A Light Duty, 480V 960A Normal Duty, 600V 980A Heavy Duty, 600V 1220A Light Duty, 600V 1045A Normal Duty, 600V 1045A Heavy Duty, 600V 1430A Light Duty, 600V 1220A Normal Duty, 600V 1220A Heavy Duty, 600V 1624A Light Duty, 600V 1430A Normal Duty, 600V 192A Heavy Duty, 600V 295A Light Duty, 600V 242A Normal Duty, 600V 242A Heavy Duty, 600V 355A Light Duty, 600V 295A Normal Duty, 600V 1700A Heavy Duty, 600V 2146A Light Duty, 600V 1946A Normal Duty, 600V 2070A Heavy Duty, 600V 2668A Light Duty, 600V 2420A Normal Duty, 600V 2475A Heavy Duty, 600V 3190A Light Duty, 600V 2998A Normal Duty, 600V 295A Heavy Duty, 600V 395A Light Duty, 600V 355A Normal Duty, 600V 355A Heavy Duty, 600V 435A Light Duty, 600V 395A Normal Duty, 600V 3285A Heavy Duty, 600V 4234A Light Duty, 600V 3979A Normal Duty, 600V 395A Heavy Duty, 600V 510A Light Duty, 600V 435A Normal Duty, 600V 4095A Heavy Duty, 600V 5278A Light Duty, 600V 4960A Normal Duty, 600V 450A Heavy Duty, 600V 580A Light Duty, 600V 545A Normal Duty, 600V 545A Heavy Duty, 600V 690A Light Duty, 600V 580A Normal Duty, 600V 595A Heavy Duty, 600V 760A Light Duty, 600V 690A Normal Duty, 600V 690A Heavy Duty, 600V 825A Light Duty, 600V 760A Normal Duty, 600V 760A Heavy Duty, 600V 980A Light Duty, 600V 825A Normal Duty, 600V 825A Heavy Duty, 600V 1102A Light Duty, 600V 980A Normal Duty, 690V 920A Heavy Duty, 690V 1150A Light Duty, 690V 1030A Normal Duty, 690V 1030A Heavy Duty, 690V 1344A Light Duty, 690V 1150A Normal Duty, 690V 1162A Heavy Duty, 690V 1582A Light Duty, 690V 1419A Normal Duty, 690V 1535A Heavy Duty, 690V 2091A Light Duty, 690V 1865A Normal Duty, 690V 171A Heavy Duty, 690V 265A Light Duty, 690V 215A Normal Duty, 690V 215A Heavy Duty, 690V 330A Light Duty, 690V 265A Normal Duty, 690V 2020A Heavy Duty, 690V 2599A Light Duty, 690V 2318A Normal Duty, 690V 2283A Heavy Duty, 690V 3108A Light Duty, 690V 2778A Normal Duty, 690V 265A Heavy Duty, 690V 370A Light Duty, 690V 330A Normal Duty, 690V 330A Heavy Duty, 690V 415A Light Duty, 690V 370A Normal Duty, 690V 3030A Heavy Duty, 690V 4125A Light Duty, 690V 3687A Normal Duty, 690V 370A Heavy Duty, 690V 460A Light Duty, 690V 415A Normal Duty, 690V 3777A Heavy Duty, 690V 5142A Light Duty, 690V 4596A Normal Duty, 690V 415A Heavy Duty, 690V 565A Light Duty, 690V 505A Normal Duty, 690V 505A Heavy Duty, 690V 650A Light Duty, 690V 565A Normal Duty, 690V 565A Heavy Duty, 690V 735A Light Duty, 690V 650A Normal Duty, 690V 650A Heavy Duty, 690V 820A Light Duty, 690V 735A Normal Duty, 690V 735A Heavy Duty, 690V 920A Light Duty, 690V 820A Normal Duty, 690V 820A Heavy Duty, 690V 1074A Light Duty, 690V 920A Normal Duty

Device	ModuleType Options	DriveRating Options
	PowerFlex755TL	400V 104A Normal Duty, 400V 85A Heavy Duty, 400V 104A Light Duty, 400V 104A Normal Duty, 400V 85A Heavy Duty, 400V 104A Light Duty, 400V 85A Normal Duty, 400V 72A Heavy Duty, 400V 104A Light Duty, 400V 85A Normal Duty, 400V 72A Heavy Duty, 400V 104A Light Duty, 400V 920A Normal Duty, 400V 770A Heavy Duty, 400V 1040A Light Duty, 400V 1040A Normal Duty, 400V 920A Heavy Duty, 400V 1090A Light Duty, 400V 1112A Normal Duty, 400V 1040A Heavy Duty, 400V 1182A Light Duty, 400V 1175A Normal Duty, 400V 1090A Heavy Duty, 400V 1465A Light Duty, 400V 1465A Normal Duty, 400V 1175A Heavy Duty, 400V 1581A Light Duty, 400V 140A Normal Duty, 400V 104A Heavy Duty, 400V 170A Light Duty, 400V 140A Normal Duty, 400V 104A Heavy Duty, 400V 170A Light Duty, 400V 1590A Normal Duty, 400V 1465A Heavy Duty, 400V 1715A Light Duty, 400V 170A Normal Duty, 400V 140A Heavy Duty, 400V 205A Light Duty, 400V 170A Normal Duty, 400V 140A Heavy Duty, 400V 205A Light Duty, 400V 1715A Normal Duty, 400V 1480A Heavy Duty, 400V 2150A Light Duty, 400V 15.4A Normal Duty, 400V 11.5A Heavy Duty, 400V 22A Light Duty, 400V 15.4A Normal Duty, 400V 11.5A Heavy Duty, 400V 22A Light Duty, 400V 2156A Normal Duty, 400V 1715A Heavy Duty, 400V 2330A Light Duty, 400V 205A Normal Duty, 400V 170A Heavy Duty, 400V 260A Light Duty, 400V 205A Normal Duty, 400V 170A Heavy Duty, 400V 260A Light Duty, 400V 22A Normal Duty, 400V 15.4A Heavy Duty, 400V 30A Light Duty, 400V 22A Normal Duty, 400V 15.4A Heavy Duty, 400V 30A Light Duty, 400V 260A Normal Duty, 400V 205A Heavy Duty, 400V 302A Light Duty, 400V 260A Normal Duty, 400V 205A Heavy Duty, 400V 302A Light Duty, 400V 302A Normal Duty, 400V 260A Heavy Duty, 400V 367A Light Duty, 400V 302A Normal Duty, 400V 260A Heavy Duty, 400V 367A Light Duty, 400V 30A Normal Duty, 400V 22A Heavy Duty, 400V 37A Light Duty, 400V 30A Normal Duty, 400V 22A Heavy Duty, 400V 37A Light Duty, 400V 37A Normal Duty, 400V 30A Heavy Duty, 400V 43A Light Duty, 400V 37A Normal Duty, 400V 30A Heavy Duty, 400V 43A Light Duty, 400V 367A Normal Duty, 400V 302A Heavy Duty, 400V 460A Light Duty, 400V 367A Normal Duty, 400V 302A Heavy Duty, 400V 460A Light Duty, 400V 460A Normal Duty, 400V 367A Heavy Duty, 400V 540A Light Duty, 400V 460A Normal Duty, 400V 367A Heavy Duty, 400V 540A Light Duty, 400V 540A Normal Duty, 400V 460A Heavy Duty, 400V 585A Light Duty, 400V 540A Normal Duty, 400V 460A Heavy Duty, 400V 585A Light Duty, 400V 43A Normal Duty, 400V 37A Heavy Duty, 400V 60A Light Duty, 400V 43A Normal Duty, 400V 37A Heavy Duty, 400V 60A Light Duty, 400V 600A Normal Duty, 400V 500A Heavy Duty, 400V 617A Light Duty, 400V 585A Normal Duty, 400V 472A Heavy Duty, 400V 650A Light Duty, 400V 60A Normal Duty, 400V 43A Heavy Duty, 400V 72A Light Duty, 400V 60A Normal Duty, 400V 43A Heavy Duty, 400V 72A Light Duty, 400V 650A Normal Duty, 400V 540A Heavy Duty, 400V 750A Light Duty, 400V 750A Normal Duty, 400V 585A Heavy Duty, 400V 796A Light Duty, 400V 770A Normal Duty, 400V 650A Heavy Duty, 400V 832A Light Duty, 400V 72A Normal Duty, 400V 60A Heavy Duty, 400V 85A Light Duty, 400V 72A Normal Duty, 400V 60A Heavy Duty, 400V 85A Light Duty, 480V 960A Normal Duty, 480V 800A Heavy Duty, 480V 1045A Light Duty, 480V 1045A Normal Duty, 480V 960A Heavy Duty, 480V 1135A Light Duty, 480V 1135A Normal Duty, 480V 1045A Heavy Duty, 480V 1365A Light Duty, 480V 1365A Normal Duty, 480V 1135A Heavy Duty, 480V 1520A Light Duty, 480V 125A Normal Duty, 480V 96A Heavy Duty, 480V 156A Light Duty, 480V 125A Normal Duty, 480V 96A Heavy Duty, 480V 156A Light Duty, 480V 1420A Normal Duty, 480V 1365A Heavy Duty, 480V 1655A Light Duty, 480V 156A Normal Duty, 480V 125A Heavy Duty, 480V 186A Light Duty, 480V 156A Normal Duty, 480V 125A Heavy Duty, 480V 186A Light Duty, 480V 1655A Normal Duty, 480V 1420A Heavy Duty, 480V 2070A Light Duty, 480V 14A Normal Duty, 480V 11A Heavy Duty, 480V 22A Light Duty, 480V 14A Normal Duty, 480V 11A Heavy Duty, 480V 22A Light Duty, 480V 2072A Normal Duty, 480V 1655A Heavy Duty, 480V 2240A Light Duty, 480V 186A Normal Duty, 480V 156A Heavy Duty, 480V 248A Light Duty, 480V 186A Normal Duty, 480V 156A Heavy Duty, 480V 248A Light Duty, 480V 22A Normal Duty, 480V 14A Heavy Duty, 480V 27A Light Duty, 480V 22A Normal Duty, 480V 14A Heavy Duty, 480V 27A Light Duty, 480V 248A Normal Duty, 480V 186A Heavy Duty, 480V 302A Light Duty, 480V 248A Normal Duty, 480V 186A Heavy Duty, 480V 302A Light Duty, 480V 27A Normal Duty, 480V 22A Heavy Duty, 480V 34A Light Duty, 480V 27A Normal Duty, 480V 22A Heavy Duty, 480V 34A Light Duty, 480V 302A Normal Duty, 480V 248A Heavy Duty, 480V 361A Light Duty, 480V 302A Normal Duty, 480V 248A Heavy Duty, 480V 361A Light Duty, 480V 34A Normal Duty, 480V 27A Heavy Duty, 480V 40A Light Duty, 480V 34A Normal Duty, 480V 27A Heavy Duty, 480V 40A Light Duty, 480V 361A Normal Duty, 480V 302A Heavy Duty, 480V 430A Light Duty, 480V 361A Normal Duty, 480V 302A Heavy Duty, 480V 430A Light Duty, 480V 430A Normal Duty, 480V 361A Heavy Duty, 480V 485A Light Duty, 480V 430A Normal Duty, 480V 361A Heavy Duty, 480V 485A Light Duty, 480V 40A Normal Duty, 480V 34A Heavy Duty, 480V 52A Light Duty, 480V 40A Normal Duty, 480V 34A Heavy Duty, 480V 52A Light Duty, 480V 505A Normal Duty, 480V 430A Heavy Duty, 480V 545A Light Duty, 480V 505A Normal Duty, 480V 430A Heavy Duty, 480V 545A Light Duty, 480V 545A Normal Duty, 480V 454A Heavy Duty, 480V 617A Light Duty, 480V 600A Normal Duty, 480V 500A Heavy Duty, 480V 617A Light Duty, 480V 52A Normal Duty, 480V 40A Heavy Duty, 480V 65A Light Duty, 480V 52A Normal Duty, 480V 40A Heavy Duty, 480V 65A Light Duty, 480V 617A Normal Duty, 480V 485A Heavy Duty, 480V 710A Light Duty, 480V 710A Normal Duty, 480V 545A Heavy Duty, 480V 765A Light Duty, 480V 65A Normal Duty, 480V 52A Heavy Duty, 480V 77A Light Duty, 480V 65A Normal Duty, 480V 52A Heavy Duty, 480V 77A Light Duty, 480V 740A Normal Duty, 480V 617A Heavy Duty, 480V 800A Light Duty, 480V 77A Normal Duty, 480V 65A Heavy Duty, 480V 96A Light Duty, 480V 77A Normal Duty, 480V 65A Heavy Duty, 480V 96A Light Duty, 480V 96A Normal Duty, 480V 77A Heavy Duty, 480V 96A Light Duty, 480V 96A Normal Duty, 480V 77A Heavy Duty, 480V 96A Light Duty, 480V 800A Normal Duty, 480V 740A Heavy Duty, 480V 960A Light Duty, 600V 980A Normal Duty, 600V 825A Heavy Duty, 600V 1102A Light Duty, 600V 1045A Normal Duty, 600V 980A Heavy Duty, 600V 1220A Light Duty, 600V 99A Normal Duty, 600V 77A Heavy Duty, 600V 125A Light Duty, 600V 99A Normal Duty, 600V 77A Heavy Duty, 600V 125A Light Duty, 600V 1220A Normal Duty, 600V 1045A Heavy Duty, 600V 1430A Light Duty, 600V 125A Normal Duty, 600V 99A Heavy Duty, 600V 144A Light Duty, 600V 125A Normal Duty, 600V 99A Heavy Duty, 600V 144A Light Duty, 600V 1430A Normal Duty, 600V 1220A Heavy Duty, 600V 1624A Light Duty, 600V 11A Normal Duty, 600V 9A Heavy Duty, 600V 17A Light Duty, 600V 11A Normal Duty, 600V 9A Heavy Duty, 600V 17A Light Duty, 600V 144A Normal Duty, 600V 125A Heavy Duty, 600V 192A Light Duty, 600V 144A Normal Duty, 600V 125A Heavy Duty, 600V 192A Light Duty, 600V 17A Normal Duty, 600V 11A Heavy Duty, 600V 22A Light Duty, 600V 17A Normal Duty, 600V 11A Heavy Duty, 600V 22A Light Duty, 600V 192A Normal Duty, 600V 144A Heavy Duty, 600V 242A Light Duty, 600V 22A Normal Duty, 600V 17A Heavy Duty, 600V 27A Light Duty, 600V 22A Normal Duty, 600V 17A Heavy Duty, 600V 27A Light Duty, 600V 242A Normal Duty, 600V 192A Heavy Duty, 600V 295A Light Duty, 600V 242A Normal Duty, 600V 192A Heavy Duty, 600V 295A Light Duty, 600V 27A Normal Duty, 600V 22A Heavy Duty, 600V 32A Light Duty, 600V 27A Normal Duty, 600V 22A Heavy Duty, 600V 32A Light Duty, 600V 295A Normal Duty, 600V 242A Heavy Duty, 600V 355A Light Duty, 600V 295A Normal Duty, 600V 242A Heavy Duty, 600V 355A Light Duty, 600V 355A Normal Duty, 600V 295A Heavy Duty, 600V 395A Light Duty, 600V 355A Normal Duty, 600V 295A Heavy Duty, 600V 395A Light Duty, 600V 32A Normal Duty, 600V 27A Heavy Duty, 600V 41A Light Duty, 600V 32A Normal Duty, 600V 27A Heavy Duty, 600V 41A Light Duty, 600V 395A Normal Duty, 600V 355A Heavy Duty, 600V 435A Light Duty, 600V 395A Normal Duty, 600V 355A Heavy Duty, 600V 435A Light Duty, 600V 435A Normal Duty, 600V 395A Heavy Duty, 600V 510A Light Duty, 600V 41A Normal Duty, 600V 32A Heavy Duty, 600V 52A Light Duty, 600V 41A Normal Duty, 600V 32A Heavy Duty, 600V 52A Light Duty, 600V 545A Normal Duty, 600V 450A Heavy Duty, 600V 580A Light Duty, 600V 52A Normal Duty, 600V 41A Heavy Duty, 600V 62A Light Duty, 600V 52A Normal Duty, 600V 41A Heavy Duty, 600V 62A Light Duty, 600V 580A Normal Duty, 600V 545A Heavy Duty, 600V 690A Light Duty, 600V 690A Normal Duty, 600V 595A Heavy Duty, 600V 760A Light Duty, 600V 62A Normal Duty, 600V 52A Heavy Duty, 600V 77A Light Duty, 600V 62A Normal Duty, 600V 52A Heavy Duty, 600V 77A Light Duty, 600V 760A Normal Duty, 600V 690A Heavy Duty, 600V 825A Light Duty, 600V 825A Normal Duty, 600V 760A Heavy Duty, 600V 980A Light Duty, 600V 77A Normal Duty, 600V 62A Heavy Duty, 600V 99A Light Duty, 600V 77A Normal Duty, 600V 62A Heavy Duty, 600V 99A Light Duty, 690V 920A Normal Duty, 690V 820A Heavy Duty, 690V 1074A Light Duty, 690V 1030A Normal Duty, 690V 920A Heavy Duty, 690V 1150A Light Duty, 690V 98A Normal Duty, 690V 82A Heavy Duty, 690V 119A Light Duty, 690V 98A Normal Duty, 690V 82A Heavy Duty, 690V 119A Light Duty, 690V 1150A Normal Duty, 690V 1030A Heavy Duty, 690V 1344A Light Duty, 690V 119A Normal Duty, 690V 98A Heavy Duty, 690V 142A Light Duty, 690V 119A Normal Duty, 690V 98A Heavy Duty, 690V 142A Light Duty, 690V 1419A Normal Duty, 690V 1162A Heavy Duty, 690V 1582A Light Duty, 690V 142A Normal Duty, 690V 119A Heavy Duty, 690V 171A Light Duty, 690V 142A Normal Duty, 690V 119A Heavy Duty, 690V 171A Light Duty, 690V 15A Normal Duty, 690V 12A Heavy Duty, 690V 20A Light Duty, 690V 15A Normal Duty, 690V 12A Heavy Duty, 690V 20A Light Duty, 690V 171A Normal Duty, 690V 142A Heavy Duty, 690V 215A Light Duty, 690V 20A Normal Duty, 690V 15A Heavy Duty, 690V 23A Light Duty, 690V 20A Normal Duty, 690V 15A Heavy Duty, 690V 23A Light Duty, 690V 215A Normal Duty, 690V 171A Heavy Duty, 690V 265A Light Duty, 690V 215A Normal Duty, 690V 171A Heavy Duty, 690V 265A Light Duty, 690V 23A Normal Duty, 690V 20A Heavy Duty, 690V 30A Light Duty, 690V 23A Normal Duty, 690V 20A Heavy Duty, 690V 30A Light Duty, 690V 265A Normal Duty, 690V 215A Heavy Duty, 690V 330A Light Duty, 690V 265A Normal Duty, 690V 215A Heavy Duty, 690V 330A Light Duty, 690V 30A Normal Duty, 690V 23A Heavy Duty, 690V 34A Light Duty, 690V 30A Normal Duty, 690V 23A Heavy Duty, 690V 34A Light Duty, 690V 330A Normal Duty, 690V 265A Heavy Duty, 690V 370A Light Duty, 690V 330A Normal Duty, 690V 265A Heavy Duty, 690V 370A Light Duty, 690V 370A Normal Duty, 690V 330A Heavy Duty, 690V 415A Light Duty, 690V 370A Normal Duty, 690V 330A Heavy Duty, 690V 415A Light Duty, 690V 34A Normal Duty, 690V 30A Heavy Duty, 690V 46A Light Duty, 690V 34A Normal Duty, 690V 30A Heavy Duty, 690V 46A Light Duty, 690V 415A Normal Duty, 690V 370A Heavy Duty, 690V 460A Light Duty, 690V 46A Normal Duty, 690V 34A Heavy Duty, 690V 50A Light Duty, 690V 46A Normal Duty, 690V 34A Heavy Duty, 690V 50A Light Duty, 690V 505A Normal Duty, 690V 415A Heavy Duty, 690V 565A Light Duty, 690V 50A Normal Duty, 690V 46A Heavy Duty, 690V 61A Light Duty, 690V 50A Normal Duty, 690V 46A Heavy Duty, 690V 61A Light Duty, 690V 565A Normal Duty, 690V 505A Heavy Duty, 690V 650A Light Duty, 690V 650A Normal Duty, 690V 565A Heavy Duty, 690V 735A Light Duty, 690V 61A Normal Duty, 690V 50A Heavy Duty, 690V 82A Light Duty, 690V 61A Normal Duty, 690V 50A Heavy Duty, 690V 82A Light Duty, 690V 735A Normal Duty, 690V 650A Heavy Duty, 690V 820A Light Duty, 690V 820A Normal Duty, 690V 735A Heavy Duty, 690V 920A Light Duty, 690V 82A Normal Duty, 690V 61A Heavy Duty, 690V 98A Light Duty, 690V 82A Normal Duty, 690V 61A Heavy Duty, 690V 98A Light Duty
raC_Dvc_PF6000T	PowerFlex6000T	N/A
raC_Dvc_PF7000	PowerFlex7000-E PowerFlex7000-ER PowerFlex7000 2-E PowerFlex7000 2-ER	N/A

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_xxxxx	raC_Dvc_xxxxx	3	(RA-LIB) Device	PowerVelocity
raC_Opr_xxxxx_Energy	raC_Opr_xxxxx_Energy	3	(RA-LIB) Device	PowerVelocity

raC_Tec_PwrVelocityStateMonitor	raC_Tec_PwrVelocityStateMonitor	3	(RA-LIB) Device	PowerVelocity
raC_Opr_PF755T_PM	raC_Opr_PF755T_PM	3	(RA-LIB) Device	PowerVelocity

Configured HMI Content

HMI Content	Instance Name	Description
Launch Button	{ObjectName}_GO_LaunchFP	Global Object configured callout instance

Output Interface

Output Interface	Linked Library	Revision
raC_Itf_PowerVelocity	-	1.0

raC_Itf_PowerVelocity

Member Name	Description
PrgName	Program Name
TagName	Tag Name
ModuleName	Module Name
TagScope	Tag Scope

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - Power Device.ggfx	{ProjectName}\Visualization\FTViewSE\GlobalObjects
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - Power Device.ggfx	{ProjectName}\Visualization\FTViewME\GlobalObjects
V3_raC_Dvc_Global	Toolbox SE	(raC-3-SE) Toolbox - Power Device.ggfx	{ProjectName}\Visualization\FTViewSE\GlobalObjects
V3_raC_Dvc_Global	Toolbox ME	(raC-3-ME) Toolbox - Power Device.ggfx	{ProjectName}\Visualization\FTViewME\GlobalObjects
V3_raC_Dvc_xxxxx	Faceplate SE	(raC-3_xx-SE) raC_Dvc_xxxxx-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays
V3_raC_Dvc_xxxxx	Faceplate ME	(raC-3_xx-ME) raC_Dvc_xxxxx-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays
V3_raC_Dvc_PowerVelocity	View Designer	(raC-3_xx-VD) raC_Dvc_PowerVelocity.vpd	{ProjectName}\Visualization\ViewDesigner
V3_Power_Manual	Reference Manual	DEVICE-RM100x-EN-P.pdf	{ProjectName}\Documentation
V3_Power_Images	HMI Image Set	Power_Images.zip	{ProjectName}\Visualization\Images

Power Motion Objects (raC_Dvc_Kxxxx, raC_Dvc_PF527, raC_Dvc_PF755CM)

Overview

The Power Motion device objects are a group of objects that include Kinetix® CIP Motion Drives (raC_Dvc_Kxxxx), and PowerFlex® CIP Motion Drives(raC_Dvc_PF527, raC_Dvc_K350CM). In addition to the base device objects, several extension objects are provided which provide additional information as an option.

In the Library there is a folder named *Videos* which contains many How-To and Operational Overview Videos which walk step-by-step through each process. You can refer to the following videos for this section:
"Operational_Overview_of_CIP_Motion_Faceplates_in_FTViewME_SE"
"Operational_Overview_of_CIP_Motion_Faceplates_in_ViewDesigner"

Supported devices include:

Device	Object Name	State Monitor Extension	Energy Monitor Extension	Predictive Maintenance Extension
Kinetix® 5300	raC_Dvc_K5300	Yes		
Kinetix® 5500	raC_Dvc_K5500	Yes	Yes	
Kinetix® 5700	raC_Dvc_K5700	Yes	Yes	
Kinetix® 6500	raC_Dvc_K6500	Yes		
Kinetix® 350	raC_Dvc_K350	Yes		
PowerFlex® 527	raC_Dvc_PF527	Yes	Yes	
PowerFlex® 755CM	raC_Dvc_PF755CM	Yes		

Functional Description

The Kinetix® 5300/5500/5700/6500/350 and PowerFlex® 527/755CM pre-configured Device Objects:

- Collect, Process and Deliver Data between Smart Devices and Application Logic
- Provide Device Status & Diagnostics Faceplates for Machine Startup, Commissioning, Operations, and Maintenance
- Include Common HMI Faceplate Components, Device States, and Control Interfaces providing Application Development and Operation Efficiency

All these features provide quick feedback, shorten recovery time, and simplify implementation.

Required Files

Device Objects include Add-On Instructions (AOIs) and HMI faceplates. The revision number (e.g. 3.01) used in filenames can change as new revisions are created.

Controller Files

Add-On Instructions are reusable code objects that contain encapsulated logic that can streamline implementing your system. This lets you create your own instruction set for programming logic as a supplement to the instruction set provided natively in the ControlLogix® firmware. An Add-On Instruction is defined once in each controller project, and can be instantiated multiple times in your application code as needed.

The Add-On Instruction must be imported into the controller project to be used in the controller configuration. These can be imported as Add-On Instruction files, or as part of the Rung Import or Import Library Objects wizard.

All Add-On Instruction and Rung Import files can be found in the */Studio 5000 Logix Designer Files - L5X/Standard Files/* folder in the library.

Device/Item	Application	Add-On Instruction	Rung Import
K5300	Standard	raC_Dvc_K5300_3.04_AOI.L5X	raC_Dvc_K5300_3.04_RUNG.L5X
K5500	Standard	raC_Dvc_K5500_3.04_AOI.L5X	raC_Dvc_K5500_3.04_RUNG.L5X
K5700	Standard	raC_Dvc_K5700_3.04_AOI.L5X	raC_Dvc_K5700_3.04_RUNG.L5X
K6500	Standard	raC_Dvc_K6500_3.04_AOI.L5X	raC_Dvc_K6500_3.04_RUNG.L5X
K350	Standard	raC_Dvc_K350_3.04_AOI.L5X	raC_Dvc_K350_3.04_RUNG.L5X
PF527	Standard	raC_Dvc_PF527_3.04_AOI.L5X	raC_Dvc_PF527_3.04_RUNG.L5X
PF755CM	Standard	raC_Dvc_PF755CM_3.04_AOI.L5X	raC_Dvc_PF755CM_3.04_RUNG.L5X
AK5700	Standard	raC_Dvc_AK5700_3.05_AOI.L5X	raC_Dvc_AK5700_3.05_RUNG.L5X
K5700 Energy Extension	Standard	raC_Opr_K5700_Energy_3.03_AOI.L5X	raC_Opr_K5700_Energy_3.03_RUNG.L5X
K5500 Energy Extension	Standard	raC_Opr_K5500_Energy_3.03_AOI.L5X	raC_Opr_K5500_Energy_3.03_RUNG.L5X
PF527 Energy Extension	Standard	raC_Opr_PF527_Energy_3.04_AOI.L5X	raC_Opr_PF527_Energy_3.04_RUNG.L5X
AK5700 Energy Extension	Standard	raC_Opr_AK5700_Energy_3.05_AOI.L5X	raC_Opr_AK5700_Energy_3.05_RUNG.L5X
State Monitor Extension	Standard	raC_Tec_PwrMotionStateMonitor_3.04_AOI.L5X	raC_Tec_PwrMotionStateMonitor_3.04_RUNG.L5X

FactoryTalk® View HMI Files

FactoryTalk® View ME or SE applications require importing the desired device faceplates in addition to all Global Object (ggfx) files and all images located in the */HMI FactoryTalk® View Images - png/* folder of the library. FactoryTalk® View ME files are stored in the */HMI - FactoryTalk® View ME/* library folder and FactoryTalk® View SE files are stored in the */HMI - FactoryTalk® View SE/* library folder.

Device/Item	Type	FactoryTalk® View ME Faceplate	FactoryTalk® View SE Faceplate
K5300	Display	(raC-3_03-ME) raC_Dvc_K5300-Faceplate.gfx	(raC-3_03-SE) raC_Dvc_K5300-Faceplate.gfx
K5500	Display	(raC-3_03-ME) raC_Dvc_K5500-Faceplate.gfx	(raC-3_03-SE) raC_Dvc_K5500-Faceplate.gfx
K5700	Display	(raC-3_03-ME) raC_Dvc_K5700-Faceplate.gfx	(raC-3_03-SE) raC_Dvc_K5700-Faceplate.gfx

Device/Item	Type	FactoryTalk® View ME Faceplate	FactoryTalk® View SE Faceplate
K6500	Display	(raC-3_03-ME) raC_Dvc_K6500-Faceplate.gfx	(raC-3_03-SE) raC_Dvc_K6500-Faceplate.gfx
K350	Display	(raC-3_03-ME) raC_Dvc_K350-Faceplate.gfx	(raC-3_03-SE) raC_Dvc_K350-Faceplate.gfx
PF527	Display	(raC-3_03-ME) raC_Dvc_PF527-Faceplate.gfx	(raC-3_03-SE) raC_Dvc_PF527-Faceplate.gfx
PF755CM	Display	(raC-3_03-ME) raC_Dvc_PF755CMFaceplate.gfx	(raC-3_03-SE) raC_Dvc_PF755CM-Faceplate.gfx
AK5700	Display	(raC-3_05-ME) raC_Dvc_AK5700-Faceplate.gfx	(raC-3_05-SE) raC_Dvc_AK5700-Faceplate.gfx
Energy Base Extension	Display	(raC-3_01-ME) raC_Opr_EnergyBase-Faceplate.gfx	(raC-3_01-SE) raC_Opr_EnergyBase-Faceplate.gfx
Energy Electrical Extension	Display	(raC-3_01-ME) raC_Opr_EnergyElectrical-Faceplate.gfx	(raC-3_01-SE) raC_Opr_EnergyElectrical-Faceplate.gfx
State Monitor Extension	Display	(raC-3_03-ME) raC_Tec_PwrDvcStateMonitor-Faceplate.gfx	(raC-3_03-SE) raC_Tec_PwrDvcStateMonitor-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - Power Device	(raC-3-SE) Graphic Symbols - Power Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - Power Device.ggfx	(raC-3-SE) Toolbox - Power Device.ggfx

Studio 5000 View Designer® HMI Files

All Studio 5000 View Designer® Files can be found in the */HMI - ViewDesigner - vpd/* folder of the library.

Device/Item	Studio 5000 View Designer® Faceplate
K5300	(raC-3_03-VD) raC_Dvc_PowerMotion.vpd
K5500	
K5700	
K6500	
K350	
PF527	
PF755CM	
AK5700	

FactoryTalk® Optix Library Files

FactoryTalk® View Optix applications require importing the desired library objects located in the PowerDevice_v3R library folder.

Device/Item	FactoryTalk® Optix Library Object
K5300	raC_3_03_raC_Dvc_K5300_UI
K5500	raC_3_03_raC_Dvc_K5500_UI
K5700	raC_3_03_raC_Dvc_K5700_UI
K6500	raC_3_03_raC_Dvc_K6500_UI
K350	raC_3_03_raC_Dvc_K350_UI
PF527	raC_3_03_raC_Dvc_PF527_UI
PF755CM	raC_3_03_raC_Dvc_PF755CM_UI
AK5700	raC_3_05_raC_Dvc_AK5700_UI

Studio 5000® Application Code Manager Files

Studio 5000® Application Code Manager (ACM) can be optionally used if it is installed. All devices can be easily registered in the ACM repositories by running the *setup.cmd* file located in the root folder of the library.

Individual HSL4 files are provided as an alternative to running the setup.cmd to allow users to manually register specific implementation objects. Each object has two files - an Asset Control file and a Device file. The Asset Control files include attachments of all required files for that object. The Device files are used to actually add that device into a Studio 5000® project and these reference the Asset Control files.

All Studio 5000® Application Code Manager files can be found in the /*ApplicationCodeManagerLibraries*/ folder of the library. The files included are as follows:

Implementation Object	Asset Control File (.HSL4)	Device File (.HSL4)
K5300	(RA-LIB)_Device_Asset-Control_PowerMotion_raC_Dvc_K5300_(3.4)	(RA-LIB)_Device_Device_PowerMotion_raC_LD_Dvc_K5300_(3.4)
K5500	(RA-LIB)_Device_Asset-Control_PowerMotion_raC_Dvc_K5500_(3.4)	(RA-LIB)_Device_Device_PowerMotion_raC_LD_Dvc_K5500_(3.4)
K5700	(RA-LIB)_Device_Asset-Control_PowerMotion_raC_Dvc_K5700_(3.4)	(RA-LIB)_Device_Device_PowerMotion_raC_LD_Dvc_K5700_(3.4)
K6500	(RA-LIB)_Device_Asset-Control_PowerMotion_raC_Dvc_K6500_(3.4)	(RA-LIB)_Device_Device_PowerMotion_raC_LD_Dvc_K6500_(3.4)
K350	(RA-LIB)_Device_Asset-Control_PowerMotion_raC_Dvc_K350_(3.4)	(RA-LIB)_Device_Device_PowerMotion_raC_LD_Dvc_K350_(3.4)
PF527	(RA-LIB)_Device_Asset-Control_PowerMotion_raC_Dvc_PF527_(3.4)	(RA-LIB)_Device_Device_PowerMotion_raC_LD_Dvc_PF527_(3.4)
PF755CM	(RA-LIB)_Device_Asset-Control_PowerMotion_raC_Dvc_PF755CM_(3.4)	(RA-LIB)_Device_Device_PowerMotion_raC_LD_Dvc_PF755CM_(3.4)
AK5700	(RA-LIB)_Device_Asset-Control_PowerMotion_raC_Dvc_AK5700_(3.5)	(RA-LIB)_Device_Device_PowerMotion_raC_LD_Dvc_AK5700_(3.5)
K5700 Energy Extension	(RA-LIB)_Device_Asset-Control_PowerMotion_raC_Opr_K5700_Energy_(3.3)	
K5500 Energy Extension	(RA-LIB)_Device_Asset-Control_PowerMotion_raC_Opr_K5500_Energy_(3.3)	
PF527 Energy Extension	(RA-LIB)_Device_Asset-Control_PowerMotion_raC_Opr_PF527_Energy_(3.4)	
AK5700 Energy Extension	(RA-LIB)_Device_Asset-Control_PowerMotion_raC_Opr_AK5700_Energy_(3.5)	
State Monitor Extension	(RA-LIB)_Device_Asset-Control_PowerMotion_raC_Tec_PwrMotionStateMonitor_(3.4)	

Device Definition

Power Motion devices do not require specific device definition configuration to work with the Power Motion add-on instructions. Additionally, using Application Code Manager or the Studio 5000® Import Library Objects Wizard does not import hardware modules into an application. It is the responsibility of the user to create the correct Power Motion device (e.g. K5700, PF755CM) in their application.

Operations

The Power Motion objects provide two modes of operation - physical and virtual.

Physical Device Operation

The following functions are applied when device object is selected as physical.

- **Activate:** Activate the drive power structure. Drive will follow the speed and direction setpoints from control interface.
- **Deactivate:** Deactivate the drive power structure by issuing Stop command. Reset active status.
- **Jog:** This function is possible from HMI faceplate only. When Jog command is 1, Activate drive power structure and speed reference will follow Jog set point. Once the command is 0, deactivate the drive power structure by issuing stop command. Individual Jog forward and Jog reverse command are used to jog in either direction. Unlike other command bits, this command should not be unlatched by the device object.
- **Fault Reset:** Command to fault reset the device and also reset remove this status bits in device object. Command can be initiated from control interface and also HMI interface.

Virtual Device Operation

The following functions are applied when drive object is selected as virtual.

- **Activate:** Set status to reflect successful activate command. Set status output to reflect frequency set point, drive related signals like Logic command and Speed Reference should not be altered.
- **Deactivate:** Reset the active status and actual speed status.
- **Jog:** This function is possible from HMI faceplate only. When Jog command is 1, set status to reflect successful jog command. Set status output to reflect jog speed set point. Once the command is 0, reset the active status and actual speed status. Individual Jog forward and Jog reverse command are used to jog in either direction. Update the direction status based on jog forward and jog reverse.
- **Fault Reset:** Command to reset status bits in device object. Command can be initiated from control interface and also HMI interface.

Faults & Warnings

- **First Warning:** This function helps in capturing the first warning triggered in the device. Display the respective description in faceplate.
- **First Fault:** Capture the first fault from device. Display the respective description in faceplate.
- **Event log:** Log Warning and Fault the last 4 events in a log queue. The queue contains fault code, description, and time stamp. Display the same in faceplate.

Execution

The following table explains the handling of instruction execution conditions.

Condition	Description
EnableIn False (false rung)	Processing for EnableIn False (false rung) is handled the same as if the device were taken out of service by Command. The device outputs are de-energized and the device is shown as Program Out of Service on the HMI. All alarms are cleared.

Condition	Description
Powerup (prescan, first scan)	On prescan, any commands that are received before first scan are discarded. The device is de-energized. On first scan, the device is treated as if it were returning from Hand command source: the instruction state is set based on the position feedback that is received from the device. If the feedback is valid for one position, the device is set to that position. If the device does not have position feedback or the position feedback is invalid, the device is set to the 'unknown/powerup' state. The command source is set to its default, either Operator or Program (unlocked).
Postscan	No SFC Postscan logic is provided.

Add-On Instruction I/O Data

InOut Data

InOut	Function / Description	DataType
Ref_MotionGroup	Reference to Motion Group in project	MOTION_GROUP
Ref_Module	Reference to module in I/O tree	MODULE
Ref_Ctrl_Cmd	Power Motion Device Command Interface	raC_UDT_ItfAD_PwrMotion_Cmd
Ref_Ctrl_Set	Power Motion Device Setting Interface	raC_UDT_ItfAD_PwrMotion_Set
Ref_Ctrl_Sts	Power Motion Device Status Interface	raC_UDT_ItfAD_PwrMotion_Sts
Ref_Ctrl_Inf	Power Motion Device Information Interface	raC_UDT_ItfAD_PwrMotion_Inf
Ref_Axis	Reference to CIP Axis in Motion Group	AXIS_CIP_DRIVE
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[2]

Input Data

Input	Function/Description	DataType
EnableIn	Enable Input - System Defined Parameter	BOOL
Cfg_ZeroVLimLO	Low tolerance limit for No Motion or ZeroSpeed	REAL
Cfg_ZeroVLimHI	High tolerance limit for No Motion or ZeroSpeed	REAL

Output Data

Output	Function/Descritpion	DataType
Val_ActualVelocity	Device Actual Velocity	REAL
Val_ActualPosition	Device Actual Position	REAL
Sts_ZeroSpeed	Device zero speed status: 1 = device is within zero speed tolerance	BOOL
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Sts_Virtual	Virtual device status: 1 = Device is operating	BOOL
Sts_Ready	Device ready status: 1 = ready to activate power structure	BOOL
Sts_NoMotion	Device is Active with no active motion instructions	BOOL
Sts_Faulted	Device faulted status: 1 = an active fault exists	BOOL
Sts_Connected	Device is connected to the Programmable Controller	BOOL
Sts_bNotReady	Bitwise device 'not ready' reason 0 = Reserved 1 = Device not connected 2 = Device not available 3 = Device Faulted 4 = Safety Demand 5 = Motion Group is not synchronized 6 = DC bus power not up 7 = Axis is shutdown 8 = Axis is faulted 9 = Axis start inbihited 10- 15= Reserved 16 = Missing enable input 17 = Motor not configured 18 = Feedback not configured 19 = Commutation not configured 20 = Safety demand 21 = Volts Hz curve definition 22 = Motor feedback required 23 = Speed limit configuration 24 = Torque prove configuration 25 = Safety demand 26 = Safety reset required 27 = Safety not configured 28 = Stop command active 29 = Feedback device reset 30 = Brake malfunction 31 = Reserved	DINT
Sts_Available	Device is available for interaction with user code	BOOL
Sts_Active	Device active status: 1 = output power structure is active	BOOL
raC_Dvc_xxxx	Unique Parameter Name for auto - discovery	BOOL
EnableOut	Enable Output - System Defined Parameter	BOOL

Data Types

The following Power Motion Common Control Interface tags are the primary device program tags to read and write to when interfacing to power Motion devices. The value of using these tags in your specific application code is that you may use a number of different power motion devices such as Kinetix® 5300, 5500, 5700, 6500, 350 and PowerFlex® 527 & PowerFlex® 755CM without having to update your application device interface tags.

Refer to the Interfaces section for detailed information on interfaces. Refer to the Using Power Device Objects with Machine Builder Libraries for more information on interfacing with other Rockwell Automation® application code libraries.

For further information and examples on how to interface the power device objects with your specific application code refer to the "How_To_Interface_with_Power_Device_Logix.mp4" video within the Videos folder of the Power Device Library Download files.

raC_UDT_ItfAD_PwrMotion_Inf

Member	Description	Data Type
ModulePath	Module CIP Path.	STR0032
bExtensionEnabled	Object extension is present in the controller. Bitwise representation: 0 = False, 1 = True.	DINT
bExtensionAlert	Object extension alert/notification is present. Bitwise representation: 0 = False, 1 = True.	DINT
AxisID	Axis identification unique with a controller	DINT

raC_UDT_ItfAD_PwrMotion_Set

This is the Power Motion Common Control Interface User-Defined Data Type for device settings. Its members provide application program access to allow or inhibit commands and settings from the device faceplate or other external sources. The table below shows member names, descriptions, and tag data types.

For example, to inhibit write commands from the device faceplate or other external sources write a 1 to the ModuleName_AOI_CtlrSet.InhibitCmd program tag from your application program. This would prevent a jog command from the device faceplate.

Member	Description	Data Type
bInhibit	Inhibits (Bit Overlay).	DINT
InhibitCmd	1 = Inhibit user Commands from external sources, 0 = Allow.	BOOL
InhibitSet	1 = Inhibit user Settings from external sources, 0 = Allow.	BOOL
InhibitCfg	1 = Inhibit user Configuration from external sources, 0 = Allow.	BOOL

raC_UDT_ItfAD_ PwrMotion _Cmd

This is the Power Motion Common Control Interface User-Defined Data Type for device commands. Its members provide application program access to common device commands.

Only write to these common command members to control the device. If you write directly to the device's output command tags directly unexpected device operation could occur.

For example, to start or activate the device write a 1 to the ModuleName_AOI_CtlrCmd.Activate tag. Do not write to the ModuleName:O.LogicCommand_Start tag. Although, you can write to the uncommon command tags in the device's output tag if a specific common control interface tag does not exist.

The table below shows member names, descriptions, and tag data types.

All the commands are available whether operating the device physically or virtually. Virtual Operation allows you to test your application code without activating the device's physical outputs.

Member	Description	Data Type
bCmd	Commands (Bit Overlay).	DINT
Physical	1 = Operate as Physical Device.	BOOL
Virtual	1 = Operate as Virtual Device.	BOOL
ResetWarn	1 = Reset device warning.	BOOL
ResetFault	1 = Reset device trip or fault.	BOOL
Activate	1 = Activate output power structure.	BOOL
Deactivate	1 = Deactivate output power structure.	BOOL

raC_UDT_ItfAD_PwrMotion_Sts

This is the Power Motion Common Control Interface User-Defined Data Type for device status. Its members provide application program access to device states, status, and diagnostic data. The table below shows member names, descriptions, and tag data types.

Input	Description	Data Type
eState	Enumerated state value: 0 = Unused, 1 = Initializing, 2 = Disconnected, 3 = Disconnecting, 4 = Connecting, 5 = Idle, 6 = Configuring, 7 = Available.	DINT
FirstWarning	First Warning.	raC_UDT_Event
FirstFault	First Fault.	raC_UDT_Event
eCmdFail	Enumerated command failure code. See extended help for enumeration values.	DINT
bSts	Status (Bit Overlay).	DINT
Physical	1 = Controlling physical device.	BOOL
Virtual	1 = Controlling virtual device.	BOOL
Connected	1 = PAC to device connection has been established.	BOOL
Available	1 = The device is available for interaction with the user program.	BOOL
Warning	1 = A warning is active on the device.	BOOL
Faulted	1 = A fault is active on the device.	BOOL
Ready	1 = Device is ready to be activated.	BOOL

Input	Description	Data Type
Active	1 = Device power structure is active.	BOOL
ZeroSpeed	1 = Motor is at zero speed (not rotating).	BOOL
NoMotion	1 = Axis has no active motion instructions in the planner.	BOOL

raC_UDT_Event

An array of size 4 is to be used to log the FirstWarning and FirstFault capture. The data should be FIFO order. The same should be displayed on the Faceplate.

Member	Description	Data Type
Type	Event type: 1 = Status, 2 = Warning, 3 = Fault, 4…n = User.	DINT
ID	User definable event ID.	DINT
Category	User definable category (Electrical,Mechanical,Materials,Utility,etc.).	DINT
Action	User definable event action code.	DINT
Value	User definable event value or fault code.	DINT
Message	Event message text.	STRING
EventTime_L	Timestamp (Date/Time format).	LINT
EventTime_D	Timestamp (Y,M,D,h,m,s,us).	DINT[7]

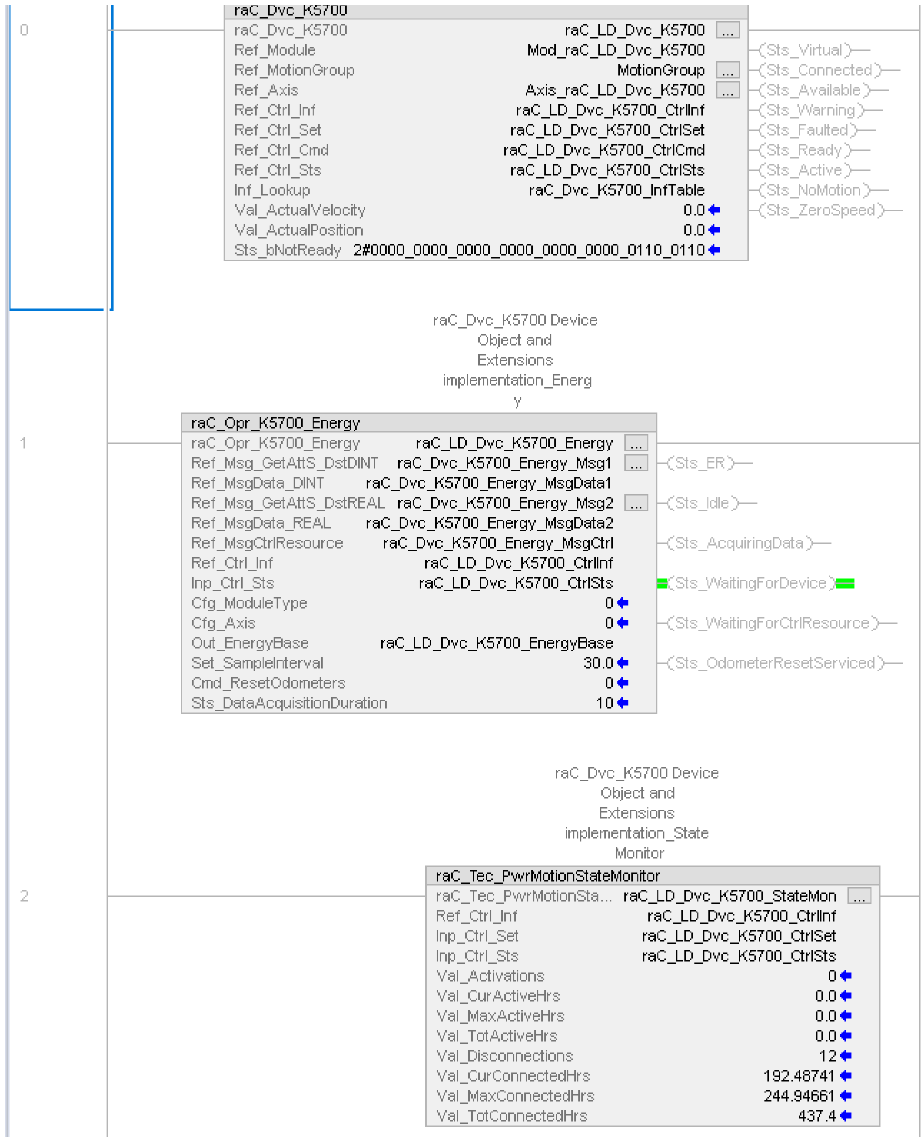
raC_UDT_LookupMember_STR0082

Member	Description	Data Type
Code	Code	DINT
Desc	Code Description	STRING

Programming Example

Fully configured device on a rung is provided below for reference. The first rung is required and the others are optional. This example includes the device and extensions objects for a K5700 (raC_Dvc_K5700).

Note that this programming example is the same code that is imported when either importing the supplied rung .L5X files or when using Application Code Manager or the Studio 5000® Import Library Objects wizard plug-in.



The device (ie: Kinetix® drive), Motion Group, and Motion Axis must be configured to ensure this code works. In this example the device module is called *Mod_raC_LD_Dvc_K5700* and the Motion Group is called *MotionGroup* and the Motion Axis is called *Axis_raC_LD_Dvc_K5700*.

Graphic Symbols

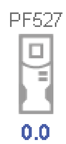
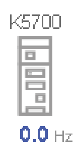
Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. Alternatively, faceplates may also be launch from related instructions such as the navigate to device faceplate buttons in the Machine Builder Library raM_Motor_CD or raM_Conveyor_CD faceplates.

All icons display the following information:

- - Device label (Tag.@Description or custom label entered in parameter #104)
- - Motor Speed (Hz) or Position - selectable using global parameter #105
- - Connection Fault/Virtual Indication
- - Device Warning/Fault Indication
- - Device not ready indication
- - Device Active (running)/Inactive (stopped) indication

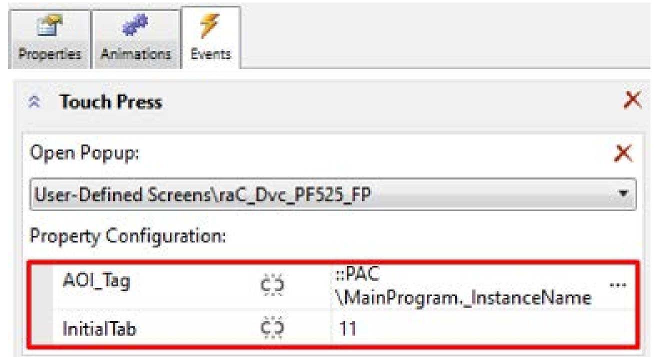
See Launch Buttons for more general information on launch button diagnostics and usage.

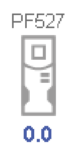
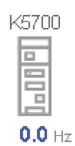
FactoryTalk® View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GOLaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate.	#102: Backing Tag (e.g. {::[PAC]Program::Program_InstanceName}) #104: Custom button label. Leave blank to use Tag.@Description #105: Button value display; 0=Velocity; 1=Position #120: Display's left position (e.g. 100, optional) #121: Display's top position (e.g. 100, optional)
GO_LaunchPowerFlexVMot_TagString		Use with PowerFlex 527/755CM Motion drives Motor Speed (Hz) or Position selectable Shown as live value.	
GO_LaunchKinetix_TagString		Use with Kinetix 350/5100/5300/5500/5700/6500 Motion Drives Motor Speed (Hz) or Position selectable Shown as live value.	

Studio 5000 View Designer® Graphic Symbols

All Studio 5000 View Designer® graphic symbols must be configured with an *Event* to open up the appropriate Popup screen. Select the graphic symbol and in the *Properties* window navigate to the *Events* tab. Assign a *Button Behavior* event to *Open popup on release*. Assign the required Popup screen (e.g. User-Defined Screens\raC_Dvc_K5700_FP). The required *Property Configurations* are found in the following table where you may assign the *AOI_Tag* to the object's Add-On Instruction tag.



Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		Faceplate navigation button with string tag label. Use Properties > General > Text to modify the button label text.	
GO_LaunchPowerFlexVMot_TagString		Use with PowerFlex 527/755CM Motion drives Motor Speed (Hz) or Position selectable Shown as live value.	AOI_Tag: Object's Add-On Instruction Tag
GO_LaunchKinetix_TagString		Use with Kinetix 350/5100/5300/5500/5700/6500 Motion Drives Motor Speed (Hz) or Position selectable Shown as live value.	

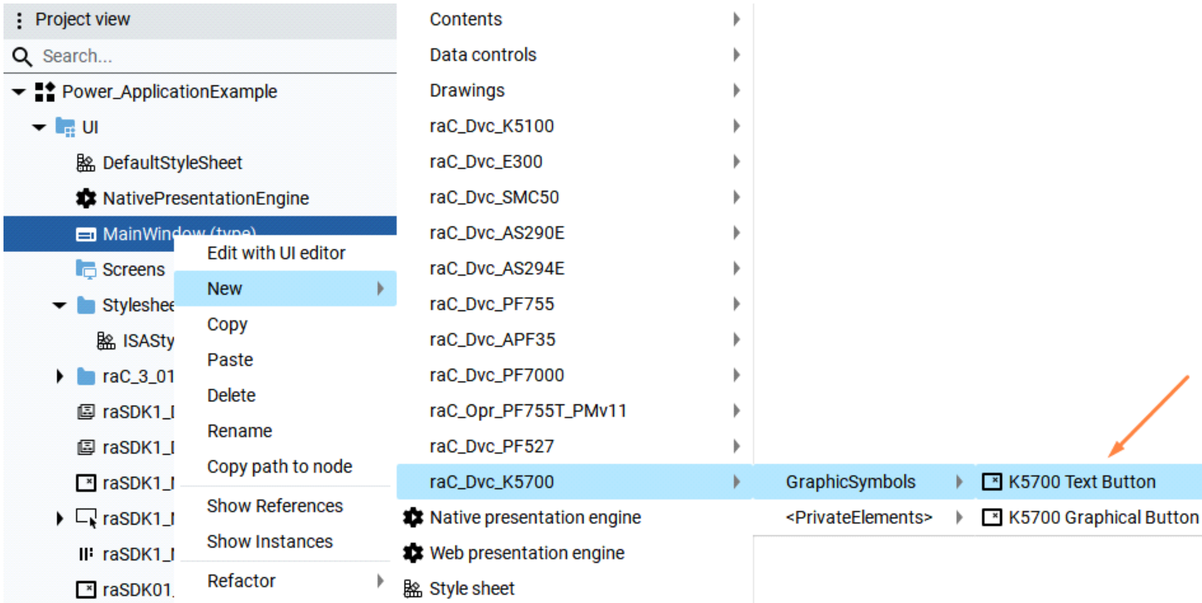
FactoryTalk® Optix Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. All graphical symbols for Power Devices display the following information:

- - Device label (Tag.@Description or custom label)
- - Position
- - Connection Fault/Virtual Indication
- - Device Warning/Fault Indication
- - Device not ready indication
- - Device Active (running)/Inactive (stopped) indication

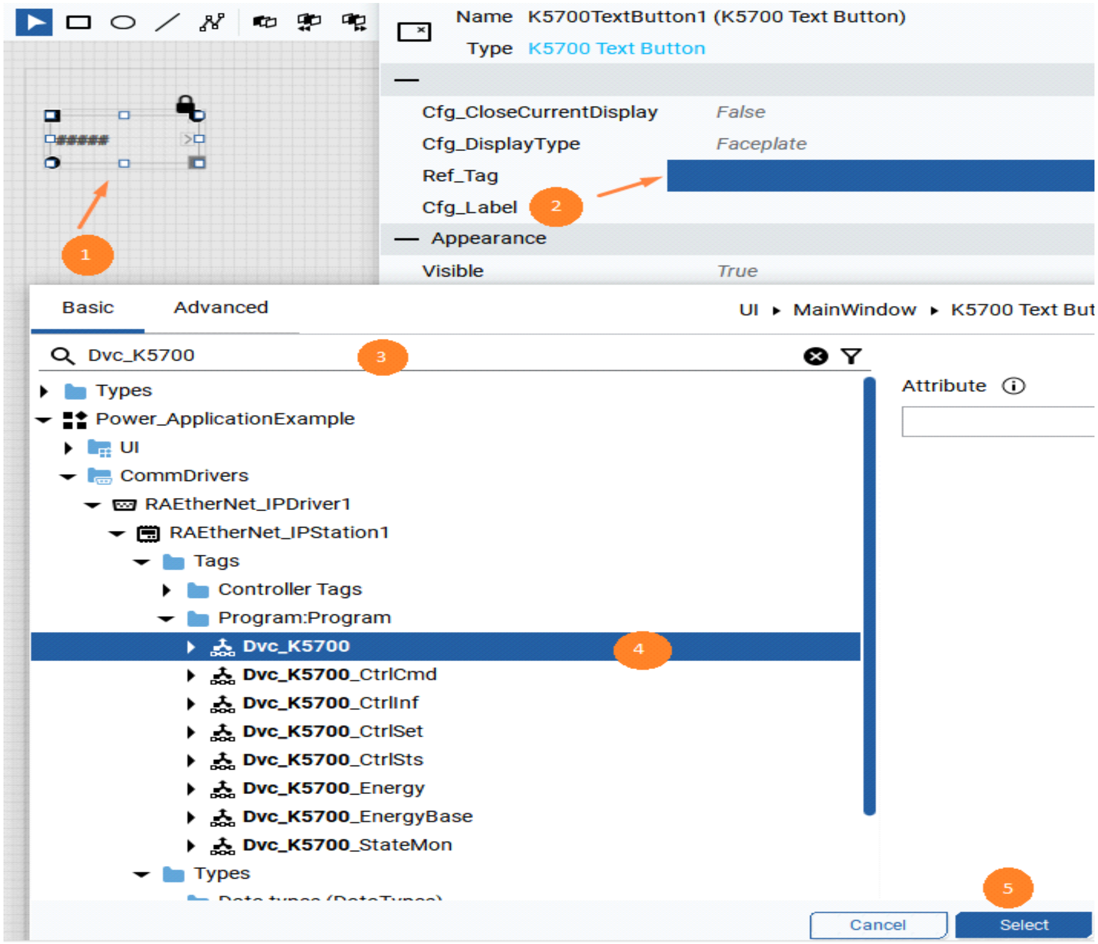
See Basic Launch Button Attributes section for more general information on launch button diagnostics and usage.

Once the Objects have been imported into the FactoryTalk® Optix Studio project, you can begin using them in your application. To add a new Launch Button to a Main window, navigate to raC_3_xx_raC_Dvc_ObjectName_UI > Graphic Symbols > raC_3_xx_raC_Dvc_ObjectName_GS_NavText Button to insert a navigation launch button with a text label.

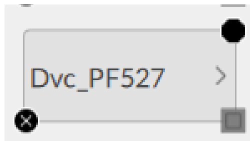
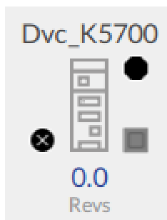


After placing the graphic symbol on a UI panel, link the "Ref_Tag" property to the targeted Asset under Asset tag

Text label shown on button can be configured using "cfg_Label" property, If it is not configured then description of the asset will be shown on the button face.



This is the only step needed to link the UI to the asset data model. For more information on graphic symbols, refer to the Graphic Symbols section of the Power Motion device type in this manual.

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
raC_3_xx_raC_Dvc_Devicename_GS_NavText		Faceplate navigation button. Use Cfg_Label Variable to modify the button label text.	Cfg_CloseCurrentDisplay: Set to 'True' to close the previously open display when launching the object faceplate Cfg_DisplayType: Faceplate to be opened on button click. This should not be modified. Ref_Tag: Object's Add-On Instruction Tag Cfg_Label: Text label shown on the button face
raC_3_xx_raC_Dvc_Devicename_GS_NavGraphical		Use with PowerFlex 527/755CM Motion drives	
raC_3_xx_raC_Dvc_Devicename_GS_NavGraphical		Use with Kinetix 350/5100/5300/5500/5700/6500 Motion Drives	

Graphic Symbol Button Configuration Variables

Variable Name	Description	Default Value
Cfg_CloseCurrentDisplay	Set to 'True' to close the previously open display when launching the object faceplate	False
Cfg_DisplayType	Faceplate to be opened on button click. This should not be modified.	Faceplate
Ref_Tag	Link to instance of desired target Asset model found in Model > Asset folder.	N/A - User must configure
Cfg_Label	Text label shown on the button face. Defaults to the description of the asset but users may replace in instances with other desired text.	../Ref_Tag@Description

Faceplates

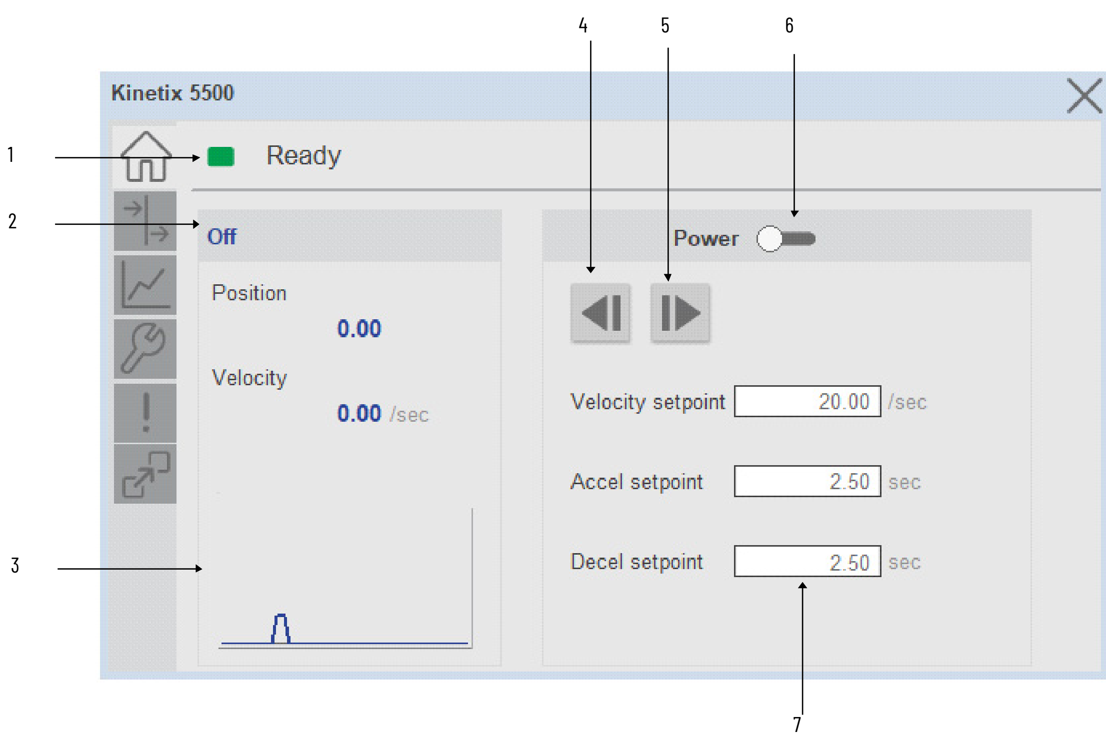
There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 28.

Home

The Home screen is visible when the Home tab button is selected in the tab control object on the left side of the screen.

The Home screen is the main screen for the faceplate. It contains a Power Group switch object, Group direction indication object, small trends called spark, Position and velocity indication, Jog control object and Velocity, Accel, Decel Set point.

On the top left is a speed multi-state indicator that changes text based on the device state. Other text for state changes include, "Forward", "Reverse", "Zero Speed", and "Off". The Position and Velocity feedback is a large blue numeric display that is read-only. Below the numeric display is a Spark line to display velocity. Here are two push buttons and one toggle button to the right of the display for Power on/off and Jog forward and reverse. Below that three numeric input for the user to set the Jog set point, Accel set point and Decel set point

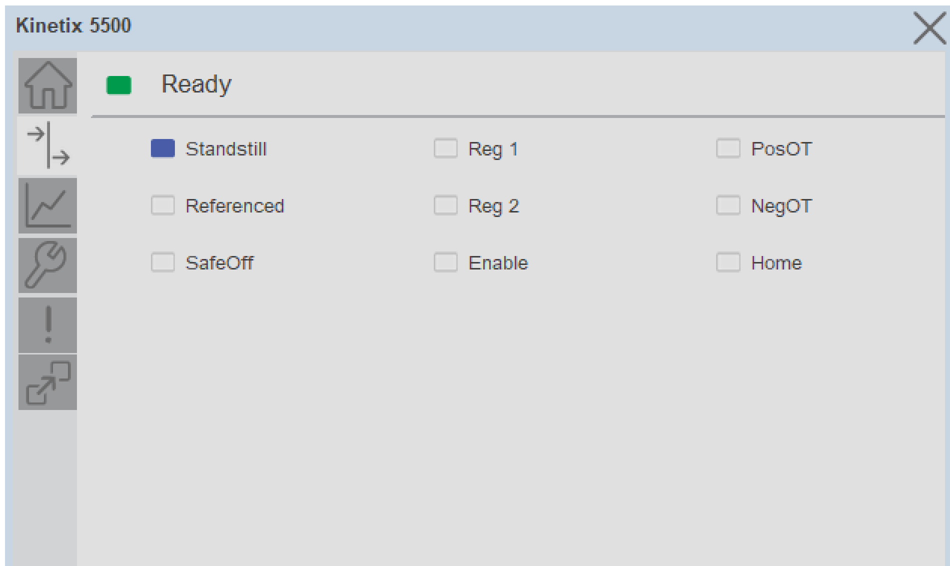


Item	Description
1	Banner
2	Device Action Forward/Reverse/Off
3	Velocity sparkline trend
4	Jog reverse

Item	Description
5	Jog forward
6	Toggle button for Power ON/OFF
7	Velocity (/sec), Accel (sec) and Decel (sec) setpoints

I/O Tab

The I/O tab shows the ON/OFF status of the device's I/O including Standstill, Referenced, SafeOff, Reg 1, Reg 2, Enable, PosOT, NegOT, and Home. LED shows no color when they are in the OFF position and shows blue when they are in the ON position.



Trend Tab

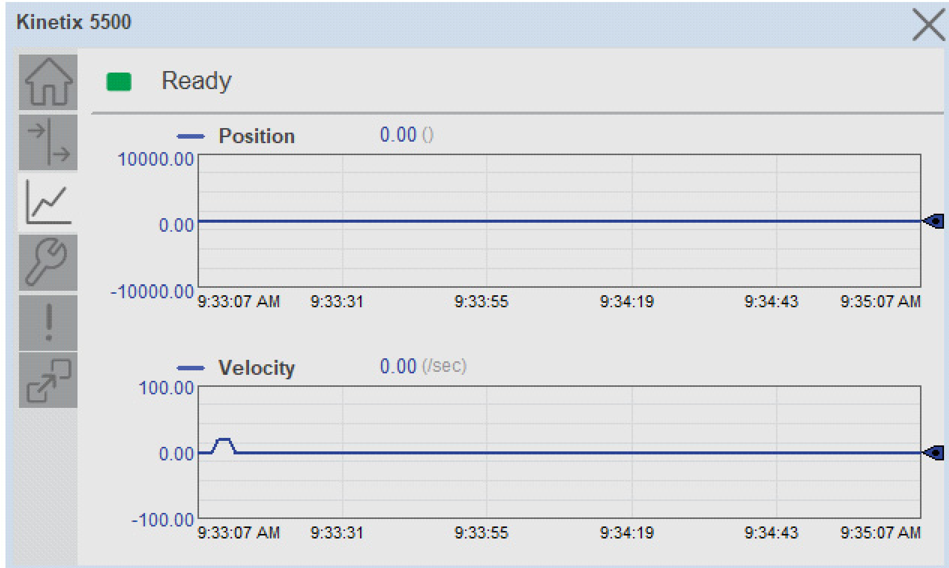
Trends display values over time, often used to compare similar or related values and to allow operators to predict future states to make control action decisions. Two trends are displayed - Position and Velocity.

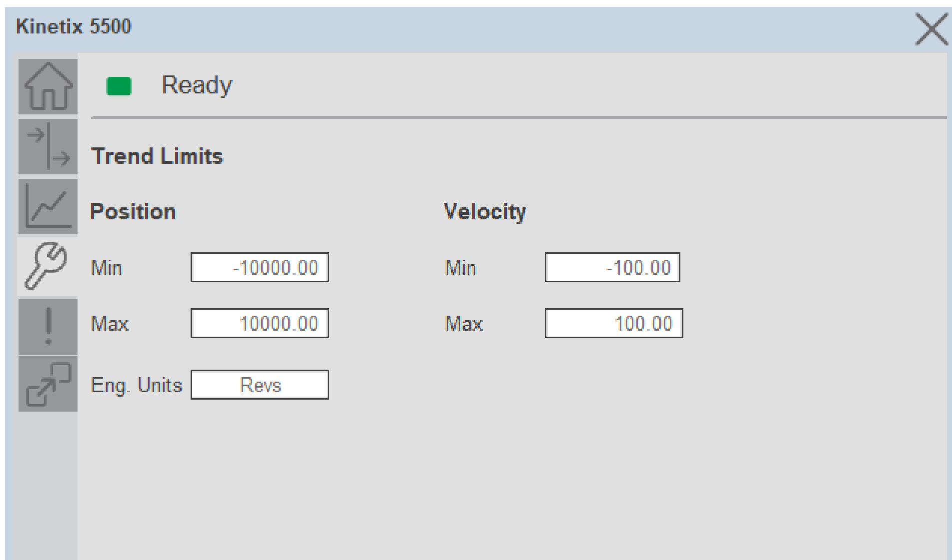
Configure Tab

The Configure tab contains configuration elements that a maintenance technician would need to troubleshoot and adjust for an object on another tab, i.e., numeric inputs to adjust trend min and max values.

Fault Warning Tab

The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

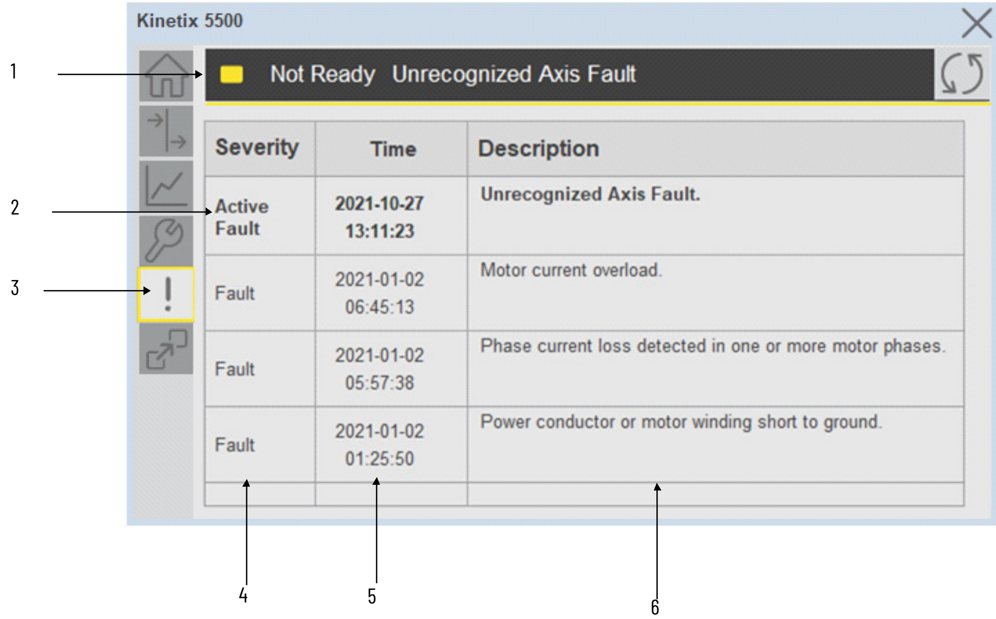




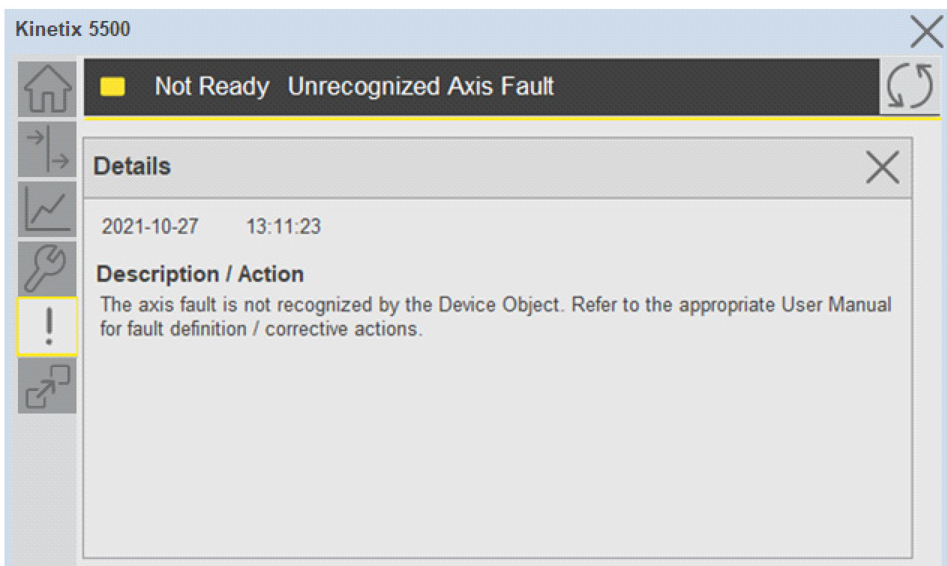
Note, only row 1 will display the "Active Fault" in the severity column if there is a current active fault, else it will display the last fault. Rows 2-4 only display past faults and warnings, not an active fault.

Item	Description
1	Banner
2	Last fault is in first row and show in bold if active
3	Yellow border visible when a fault is active
4	Fault severity
5	Fault event time
6	4 most recent fault/warning event messages

Click on any row in the fault table to view fault details. The details window provides a more detailed description and possible action steps to remedy condition.



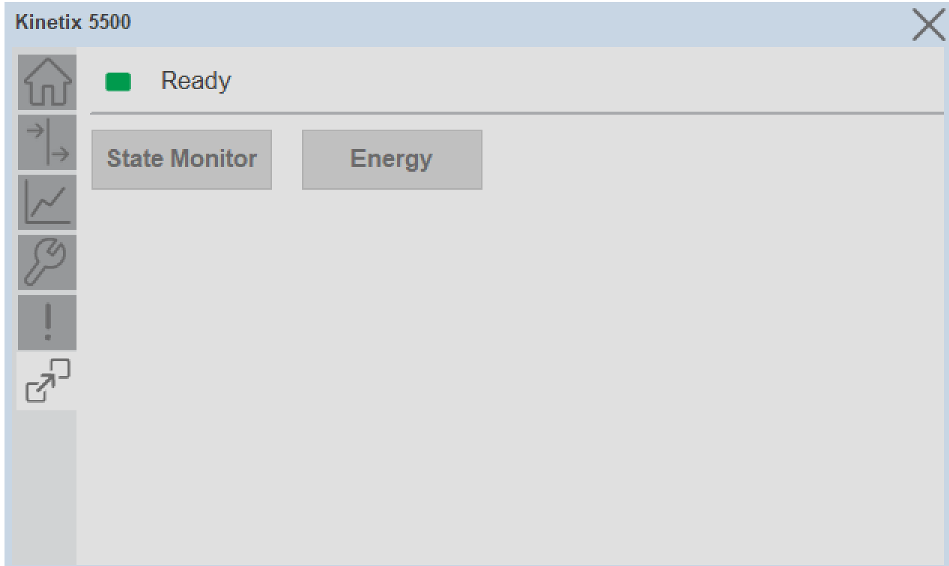
8



Extension Tab

The Extension tab provides a navigation button to open Extension faceplates. Extension faceplates are optional and may include:

- State Monitor Extension
- Energy Extension



Note that extensions are currently only available in FactoryTalk® View Studio and are not supported in Studio 5000 View Designer®.

For complete details on extensions, refer to the related sections of this manual:

- State Monitor Extension
- Energy Extension
- Predictive Maintenance Extension

Extensions will be enabled through the device object's Information interface. The interface contains a DINT member entitled ExtensionEnabled. Each bit of ExtensionEnabled represents an extension location, thus a device object can theoretically support 32 extensions.

Currently, extension names are reserved for the following locations:

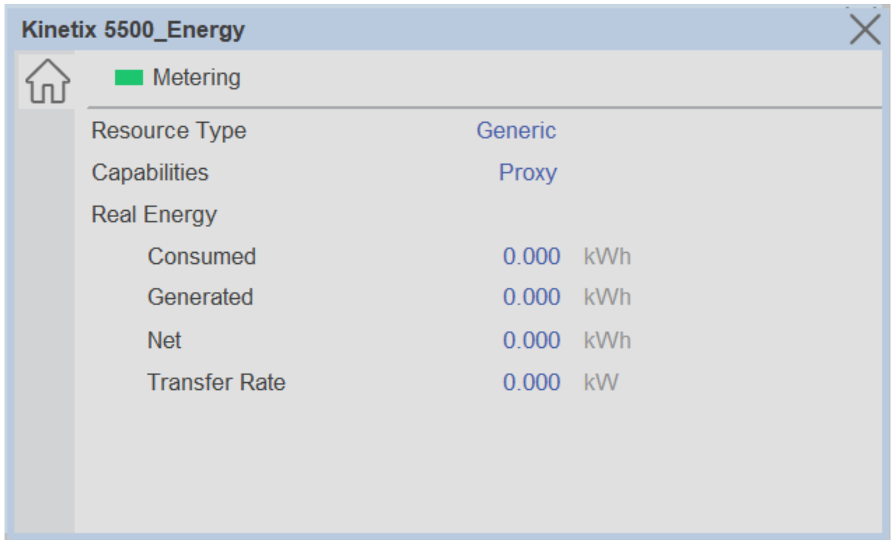
Extension Name	Location	Tag Suffix
State Monitor	Bit 0	_StateMon
Energy	Bit 1	_Energy
Predictive Maintenance	Bit 2	_PredMaint
Reserved	Bits3-31	

Instance_Name_CtrlInf.ModulePath	'$01$03$12$0E1...	{...}		STR0032	Device Interface - Power Velocity Module CIP Path
Instance_Name_CtrlInf.ExtensionEnabled	2		Decimal	DINT	Device Interface - Power Velocity Object extension is present in the controller
Instance_Name_CtrlInf.ExtensionEnabled.0	0		Decimal	BOOL	Device Interface - Power Velocity Object extension is present in the controller
Instance_Name_CtrlInf.ExtensionEnabled.1	1		Decimal	BOOL	Device Interface - Power Velocity Object extension is present in the controller
Instance_Name_CtrlInf.ExtensionEnabled.2	0		Decimal	BOOL	Device Interface - Power Velocity Object extension is present in the controller
Instance_Name_CtrlInf.ExtensionEnabled.3	0		Decimal	BOOL	Device Interface - Power Velocity Object extension is present in the controller

Extension Objects

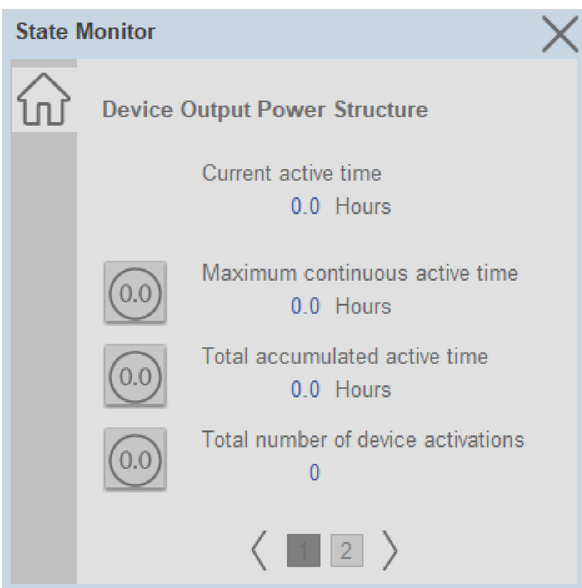
Energy Extension

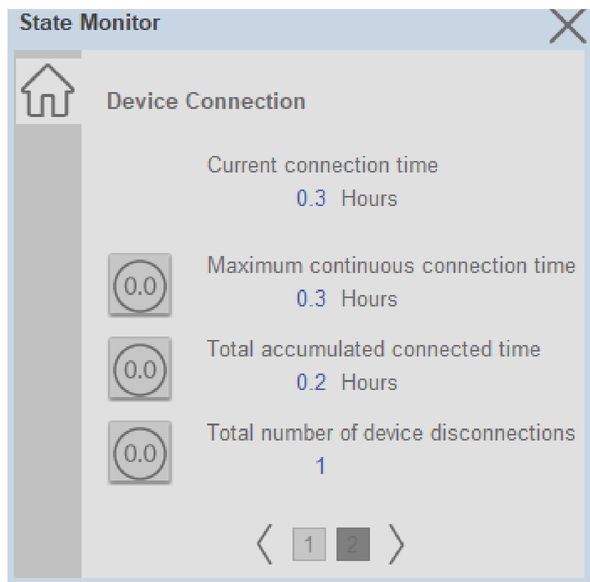
Energy extension faceplates are available for compatible objects. Refer to the raC_Opr_xxx_Energy section of this manual for more information.



State Monitor Extension

State Monitor extension faceplates are available for all objects. Refer to the raC_Tec_PwrxxxStateMonitor section of this manual for more information.





Application Code Manager

All Power Motion device objects have similar configuration parameters in Application Code Manager. The following section defines the common parameters. “xxxxx” is used in place of the specific device name (e.g. K5700).

Refer to the section Using Application Code Manager for complete details.

Definition Object: raC_Dvc_xxxxx

This object contains the AOI definition and used as linked library to implement object. This gives flexibility to choose to instantiate only definition and create custom implement code. User may also create their own implement library and link with this definition library object.

Implementation Object: raC_LD_Dvc_xxxxx

Parameter Name	Default Value	Instance Name	Definition	Description
RoutineName	{ObjectName}	{RoutineName}	Routine	Enter Routine name. Routine will be created and Object implement rung(s) inserted. A JSR will be inserted in MainRoutine. If routine name already exists, then object will be inserted into existing routine. By default, parameter is set to Object Name.
TagName	{ObjectName}	{TagName}	Backing Tag	Enter the backing tag of the main AOI. This will serve as the base tag name for other tags in this object that are derived from the base.
TagDescription	{ObjectDescription}	{TagDescription}		Tag Description of the main AOI backing tag
TagScope	Program		Input Parameter	Tags will be created at the assigned scope
ModuleName	Mod_{ObjectName}	{ModuleName}	Input Parameter	Enter the Module Name. This is the name for the module that appears in the Controller Organizer tree.
MotionGroup	{MotionGroupName}			Enter the motion group name.
AxisName	Axis_{ObjectName}			Enter the Axis Name.
CreatePhysicalAxis	0			Create physical axis in project.
IncludeEnergy	0		Input Parameter	Include the energy extension object
IncludeStateMonitor	0		Input Parameter	Include the State Monitor extension object
EnergyMsgTag	raC_Dvc_xxxxx_Energy_Msg	{EnergyMsgTag}		Enter Tag name for Msg Services. This tag should be unique for Msg Service class. Multiple objects can share the tag.
EnergyMsgCtrl	raC_Dvc_xxxxx_Energy_MsgCtrl	{EnergyMsgCtrl}		Message Services Control Tag. This tag provides the control interface for the messaging services. This should be unique per class. Multiple objects can share the tag.
EnergyMsgData	raC_Dvc_xxxxx_Energy_MsgData	{EnergyMsgData}		Data tag for Messaging Services. This tag should be unique per class. Multiple objects can share the tag.
SymbolStyle	Icon			HMI launch button symbol style. Icon/Text
SEAssocDisplay			HMI Display	FactoryTalk View SE Display reference. Launch button will be generated on this display.
MEAssocDisplay			HMI Display	FactoryTalk View ME Display reference. Launch button will be generated on this display.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_xxxxx	raC_Dvc_xxxxx	3	(RA-LIB) Device	PowerMotion
raC_Opr_xxxxx_Energy	raC_Opr_xxxxx_Energy	3	(RA-LIB) Device	PowerMotion
raC_Tec_PwrMotionStateMonitor	raC_Tec_PwrMotionStateMonitor	3	(RA-LIB) Device	PowerMotion

Configured HMI Content

HMI Content	Instance Name	Description
Launch Button	{ObjectName}_GO_LaunchFP	Global Object configured callout instance

Output Interface

Output Interface	Linked Library	Revision
raC_Itf_PowerMotion	-	1.0

raC_Itf_PowerMotion

Member Name	Description
PrgName	Program Name
TagName	Tag Name
ModuleName	Module Name
TagScope	Tag Scope

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - Power Device.ggfx	{ProjectName}\Visualization\FTViewSE\GlobalObjects
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - Power Device.ggfx	{ProjectName}\Visualization\FTViewME\GlobalObjects
V3_raC_Dvc_Global	Toolbox SE	(raC-3-SE) Toolbox - Power Device.ggfx	{ProjectName}\Visualization\FTViewSE\GlobalObjects
V3_raC_Dvc_Global	Toolbox ME	(raC-3-ME) Toolbox - Power Device.ggfx	{ProjectName}\Visualization\FTViewME\GlobalObjects
V3_raC_Dvc_xxxxx	Faceplate SE	(raC-3_xx-SE) raC_Dvc_xxxxx-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays
V3_raC_Dvc_xxxxx	Faceplate ME	(raC-3_xx-ME) raC_Dvc_xxxxx-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays

V3_raC_Dvc_PowerMotion	View Designer	(raC-3_xx-VD) raC_Dvc_PowerMotion.vpd	{ProjectName}\Visualization\ViewDesigner
V3_Power_Manual	Reference Manual	DEVICE-RM100x-EN-P.pdf	{ProjectName}\Documentation
V3_Power_Images	HMI Image Set	Power_Images.zip	{ProjectName}\Visualization\Images

Kinetix® 5100 Objects (raC_Dvc_K5100)

Overview

The Kinetix® 5100 device objects are a group of objects that include the Kinetix® 5100 EtherNet/IP Indexing Servo Drives (raC_Dvc_K5100) device and associated operational motion instructions (MSO, MSF, MAJ, MAT, MAM, MAH, MAG, MAS, MAFR, MAI).

Device/Instruction	Object Name	Description
Kinetix® 5100	raC_Dvc_K5100	Kinetix® 5100 Device Base Object
Kinetix® 5100 Motion Axis Servo On	raC_Opr_K5100_MSO	Use the Motion Servo On instruction to activate the motor.
Kinetix® 5100 Motion Axis Servo Off	raC_Opr_K5100_MSF	Use the Motion Servo Off instruction to deactivate the drive output for the specified axis and to deactivate the axis servo loop
Kinetix® 5100 Motion Axis Jog	raC_Opr_K5100_MAJ	Use the Motion Axis Jog instruction to move an axis at a constant speed until you tell it to stop.
Kinetix® 5100 Motion Axis Torque	raC_Opr_K5100_MAT	Use the Motion Axis Torque instruction to move an axis at a constant torque with the speed limit.
Kinetix® 5100 Motion Axis Move	raC_Opr_K5100_MAM	Use the Motion Axis Move instruction to move an axis to a specified position.
Kinetix® 5100 Motion Axis Home	raC_Opr_K5100_MAH	Use the Motion Axis Home instruction to home an axis.
Kinetix® 5100 Motion Axis Gear	raC_Opr_K5100_MAG	Use the Motion Axis Gear instruction to set the gear ratio between the PUU (Position of User Unit) and encoder counts and specify the acceleration rate during gear ratio change for the position control in the Kinetix® 5100 drive.
Kinetix® 5100 Motion Axis Stop	raC_Opr_K5100_MAS	Use the Motion Axis Stop instruction to stop a specific motion process on an axis or to stop the axis completely.
Kinetix® 5100 Motion Axis Fault Reset	raC_Opr_K5100_MAFR	Use the Motion Axis Fault Reset instruction to clear some motion faults for an axis. Other faults cannot be cleared until you power cycle the drive. The faults, which can be cleared by raC_Opr_K5100_MAFR, are listed in Fault list section.
Kinetix® 5100 Motion Axis Index	raC_Opr_K5100_MAI	Use the Motion Axis Index instruction to execute the index (PR) function of the drive. This can be a Position Index or one of the other PR types available in the drive.

Functional Description

The Kinetix® 5100 pre-configured Device Objects provide the following advantages:

- Eliminating the need for synchronous copy and other correctly placed interlocks, which were sometimes not obvious, to make the Motion Operation Add-On Instructions operate as intended.
- Robust operation that includes the interface of drive command/status within the Motion Operation Add-On Instructions
- Designed for integration with the Power Device Library and Machine Builder Libraries and its framework for programming.
- An HMI faceplate (optional) that is used with the Device Object Add-On Instruction (required) to provide the status information as well as simple control of the drive using View Designer or FactoryTalk® View for programming.
- The creation of Position Units. This allows the Kinetix® 5100 to use native units of drive counts or to use Position units using a Conversion Constant and Motion Resolution.

All these features provide quick feedback, shorten recovery time, and simplify implementation.

The table below shows the differences between the Add-On Instruction libraries and the use of the Device Object Add-On Instruction. The Device Object Add-On Instruction (the unique instance of the K5100) will use the Dvc tag naming (raC_Dvc_K5100); however the Add-On Instruction library will change its naming as shown here.

Kinetix® Firmware Major Rev	Device Object AOI used	AOI Library Naming
1.xxx	NO	raC_**Dvc**_K5100_xxx
2.xxx (or later)	YES	raC_**Opr**_K5100_xxx

If using the Kinetix® 5100 with major revision 2.xxx (or later), the Device Object and Motion Operation Add-On Instructions must be used. Add-On Instructions Versions 1.xxx and 2.xxx (or later) are not interchangeable and cannot be combined to perform motion control. The Add-On Instruction library containing raC_Dvc instructions will continue to be available for legacy applications. They can be downloaded from the Product Compatibility and Download Centre (PCDC).

Any new applications that will be using the Kinetix® 5100 with major revision 2.002 or later should use the Device Object Add-On Instruction and the new motion operation Add-On Instructions described in this document. Each Kinetix® 5100 drive will require a unique instance of the Device Object Add-On Instruction.

The Kinetix® 5100 Kinetix® 5100 Device Objects include Add-On Instruction definitions, rung instances, and an HMI faceplate providing:

- Detailed Device Data Collection and Delivery
- Enhanced Device Status and Diagnostics
- Common Control Interfaces maximizing flexible Automation Device selection & application code reuse

Device Object Use Cases:

- Basic Device Maintenance and Diagnostics
- Virtual Device Operations for startup and commissioning

Required Files

Device Objects include Add-On Instructions (AOIs) and HMI faceplates. The revision number (e.g. 3.01) used in filenames can change as new revisions are created.

Controller Files

Add-On Instructions are reusable code objects that contain encapsulated logic that can streamline implementing your system. This lets you create your own instruction set for programming logic as a supplement to the instruction set provided natively in the ControlLogix® firmware. An Add-On Instruction is defined once in each controller project, and can be instantiated multiple times in your application code as needed.

The Add-On Instruction must be imported into the controller project to be used in the controller configuration. These can be imported as Add-On Instruction files, or as part of the Rung Import or Import Library Objects wizard.

All Add-On Instruction and Rung Import files can be found in the */Studio 5000 Logix Designer Files - L5X/Standard Files/* folder in the library.

Device/Item	Application	Add-On Instruction	Rung Import
Kinetix® 5100	Standard	raC_Dvc_K5100_3.03_AOI.L5X	raC_Dvc_K5100_3.03_RUNG.L5X
Kinetix® 5100 Motion Axis Servo On	Standard	raC_Opr_K5100_MSO_3.01_AOI.L5X	raC_Opr_K5100_MSO_3.01_RUNG.L5X
Kinetix® 5100 Motion Axis Servo Off	Standard	raC_Opr_K5100_MSF_3.01_AOI.L5X	raC_Opr_K5100_MSF_3.01_RUNG.L5X
Kinetix® 5100 Motion Axis Jog	Standard	raC_Opr_K5100_MAJ_3.02_AOI.L5X	raC_Opr_K5100_MAJ_3.02_RUNG.L5X
Kinetix® 5100 Motion Axis Torque	Standard	raC_Opr_K5100_MAT_3.01_AOI.L5X	raC_Opr_K5100_MAT_3.01_RUNG.L5X
Kinetix® 5100 Motion Axis Move	Standard	raC_Opr_K5100_MAM_3.02_AOI.L5X	raC_Opr_K5100_MAM_3.02_RUNG.L5X
Kinetix® 5100 Motion Axis Home	Standard	raC_Opr_K5100_MAH_3.02_AOI.L5X	raC_Opr_K5100_MAH_3.02_RUNG.L5X
Kinetix® 5100 Motion Axis Gear	Standard	raC_Opr_K5100_MAG_3.01_AOI.L5X	raC_Opr_K5100_MAG_3.01_RUNG.L5X
Kinetix® 5100 Motion Axis Stop	Standard	raC_Opr_K5100_MAS_3.01_AOI.L5X	raC_Opr_K5100_MAS_3.01_RUNG.L5X
Kinetix® 5100 Motion Axis Fault Reset	Standard	raC_Opr_K5100_MAFR_3.01_AOI.L5X	raC_Opr_K5100_MAFR_3.01_RUNG.L5X
Kinetix® 5100 Motion Axis Index	Standard	raC_Opr_K5100_MAI_3.01_AOI.L5X	raC_Opr_K5100_MAI_3.01_RUNG.L5X

FactoryTalk® View HMI Files

FactoryTalk® View ME or SE applications require importing the desired device faceplates in addition to all Global Object (ggfx) files and all images located in the */HMI FactoryTalk® View Images - png/* folder of the library. FactoryTalk® View ME files are stored in the */HMI - FactoryTalk® View ME/* library folder and FactoryTalk® View SE files are stored in the */HMI - FactoryTalk® View SE/* library folder.

Device/Item	Type	FactoryTalk® View ME Faceplate	FactoryTalk® View SE Faceplate
K5100	Display	(raC-3_01-ME) raC_Dvc_K5100-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_K5100-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - Power Device	(raC-3-SE) Graphic Symbols - Power Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - Power Device.ggfx	(raC-3-SE) Toolbox - Power Device.ggfx

Studio 5000 View Designer® HMI Files

All Studio 5000 View Designer® Files can be found in the */HMI - ViewDesigner - vpd/* folder of the library.

Device/Item	Studio 5000 View Designer® Faceplate
K5100	(raC-3_03-VD) raC_Dvc_PowerMotion.vpd

FactoryTalk® Optix Library Files

FactoryTalk® View Optix applications require importing the desired library objects located in the PowerDevice_v3R library folder.

Device/Item	FactoryTalk® Optix Library Object
K5100	raC_3_01_raC_Dvc_K5100_UI

Studio 5000® Application Code Manager Files

Studio 5000® Application Code Manager (ACM) can be optionally used if it is installed. All devices can be easily registered in the ACM repositories by running the *setup.cmd* file located in the root folder of the library.

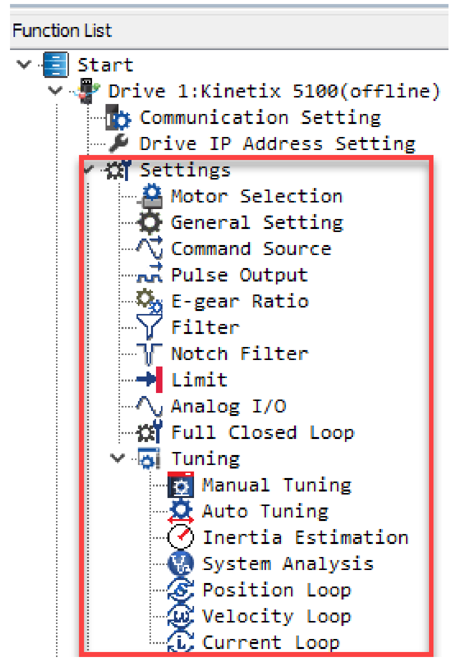
Individual HSL4 files are provided as an alternative to running the setup.cmd to allow users to manually register specific implementation objects. Each object has two files - an Asset Control file and a Device file. The Asset Control files include attachments of all required files for that object. The Device files are used to actually add that device into a Studio 5000® project and these reference the Asset Control files.

All Studio 5000 Application® Code Manager files can be found in the */ ApplicationCodeManagerLibraries/* folder of the library. The files included are as follows:

Implementation Object	Asset Control File (.HSL4)	Device File (.HSL4)
K5100	(RA-LIB)_Device_Asset-Control_Kinetix5100_raC_Dvc_K5100_(3.3)	(RA-LIB)_Device_Device_Kinetix5100_raC_LD_Dvc_K5100_(3.3)
K5100 Motion Axis Servo On	(RA-LIB)_Device_Asset-Control_Kinetix5100_raC_Opr_K5100_MSO_(3.1)	
K5100 Motion Axis Servo Off	(RA-LIB)_Device_Asset-Control_Kinetix5100_raC_Opr_K5100_MSF_(3.1)	
K5100 Motion Axis Jog	(RA-LIB)_Device_Asset-Control_Kinetix5100_raC_Opr_K5100_MAJ_(3.2)	
K5100 Motion Axis Torque	(RA-LIB)_Device_Asset-Control_Kinetix5100_raC_Opr_K5100_MAT_(3.1)	
K5100 Motion Axis Move	(RA-LIB)_Device_Asset-Control_Kinetix5100_raC_Opr_K5100_MAM_(3.2)	
K5100 Motion Axis Home	(RA-LIB)_Device_Asset-Control_Kinetix5100_raC_Opr_K5100_MAH_(3.2)	
K5100 Motion Axis Gear	(RA-LIB)_Device_Asset-Control_Kinetix5100_raC_Opr_K5100_MAG_(3.1)	
K5100 Motion Axis Stop	(RA-LIB)_Device_Asset-Control_Kinetix5100_raC_Opr_K5100_MAS_(3.1)	
K5100 Motion Axis Fault Reset	(RA-LIB)_Device_Asset-Control_Kinetix5100_raC_Opr_K5100_MAFR_(3.1)	
K5100 Motion Axis Index	(RA-LIB)_Device_Asset-Control_Kinetix5100_raC_Opr_K5100_MAI_(3.1)	

Device Definition

The Kinetix® 5100 requires initial configuration of the drive using KNX5100C software. Besides changing the drive's IP address and operation mode, this initial configuration includes a review of the Function List>Settings. The settings within these categories will need to be modified depending on your hardware and your application. The categories that require attention are shown below:



A minimal configuration is shown in the 'How To' video that came with this package. KNX5100C software may be downloaded from the Product Compatibility and Download Center. Search for "Kinetix® 5100".

The device (ie: Kinetix® 5100) must be configured in the Studio 5000 Logix Designer® project.

Note that module configuration is completed automatically when using Application Code Manager or the Studio 5000® Import Library Objects wizard plug-in.

Operations

The Kinetix® 5100 objects provide two modes of operation - physical and virtual.

Physical Device Operation

The following functions are applied when device object is selected as physical.

- **Activate:** Activate the drive power structure. This means the motor is energized. The Kinetix® 5100 can perform motion when the drive state is Active.
- **Deactivate:** This command will deactivate the drive power structure. This means the motor is disabled. The motor cannot perform motion when the drive is state is not Active.
- **Start Motion:** A zero-to-one transition means the motion command is issued from the external controller. There are additional settings that

must be made in conjunction with this bit. These settings are embedded in the Add-On Instruction Objects.

- **Stop Motion**: A zero-to-one transition will stop any currently executing motion and leave the drive activated.
- **Fault Reset:** Command to fault reset the device and also reset remove this status bits in device object. Command can be initiated from control interface and also HMI interface.

Virtual Device Operation

The following functions are applied when drive object is selected as virtual.

- **Activate:** Set status to reflect successful activate command. Set status output to reflect frequency set point, drive related signals like Logic command and Speed Reference should not be altered.
- **Deactivate:** Reset the active status and actual speed status.
- **Jog:** This function is possible from HMI faceplate only. When Jog command is 1, set status to reflect successful jog command. Set status output to reflect jog speed set point. Once the command is 0, reset the active status and actual speed status. Individual Jog forward and Jog reverse command are used to jog in either direction. Update the direction status based on jog forward and jog reverse.
- **Fault Reset:** Command to reset status bits in device object. Command can be initiated from control interface and also HMI interface.

Faults & Warnings

- **First Warning:** This function helps in capturing the first warning triggered in the device. Display the respective description in faceplate.
- **First Fault:** Capture the first fault from device. Display the respective description in faceplate.
- **Event log:** Log Warning and Fault the last 4 events in a log queue. The queue contains fault code, description, and time stamp. Display the same in faceplate.

Execution

The following table explains the handling of instruction execution conditions.

Condition	Description
EnableIn False (false rung)	Processing for EnableIn False (false rung) is handled the same as if the device were taken out of service by Command. The device outputs are de-energized and the device is shown as Program Out of Service on the HMI. All alarms are cleared.
Powerup (prescan, first scan)	On prescan, any commands that are received before first scan are discarded. The device is de-energized. On first scan, the device is treated as if it were returning from Hand command source: the instruction state is set based on the position feedback that is received from the device. If the feedback is valid for one position, the device is set to that position. If the device does not have position feedback or the position feedback is invalid, the device is set to the 'unknown/powerup' state. The command source is set to its default, either Operator or Program (unlocked).
Postscan	No SFC Postscan logic is provided.

Add-On Instruction I/O Data

InOut Data

InOut	Function / Description	DataType
Ref_Module	Reference to module in I/O tree	MODULE
Ref_Ctrl_Cmd	Kinetix® 5100 Device Command Interface	raC_UDT_Itf_K5100_Cmd
Ref_Ctrl_Set	Kinetix® 5100 Device Setting Interface	raC_UDT_Itf_K5100_Set
Ref_Ctrl_Sts	Kinetix® 5100 Device Status Interface	raC_UDT_Itf_K5100_Sts
Ref_Ctrl_Inf	Kinetix® 5100 Device Information Interface	raC_UDT_Itf_K5100_Inf
Ref_Ctrl_Cfg	Kinetix® 5100 Device Configuration Interface	raC_UDT_Itf_K5100_Cfg
Ref_Axis	Reference to CIP Axis in Motion Group	AXIS_CIP_DRIVE
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[2]
Ref_I	Reference to K5100 module input assembly	AB:2198_K51000_ERS:I:0
Ref_O	Reference to K5100 module output assembly	AB:2198_K51000_CAM_ERS:I:0

Input Data

Input	Function/Description	DataType
EnableIn	Enable Input - System Defined Parameter	BOOL

Output Data

Output	Function/Description	DataType
Val_ActualVelocity	Device Actual Velocity	REAL
Val_ActualPosition	Device Actual Position	REAL
Sts_ZeroSpeed	Device zero speed status: 1 = device is within zero speed tolerance	BOOL
Sts_DriveUnits	Position, velocity, acceleration, and deceleration member data is provided in native drive units	BOOL
Sts_UserUnits	Position, velocity, acceleration, and deceleration member data is provided in user configured units. (MAG supports ONLY drive	BOOL
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Sts_Virtual	Virtual device status: 1 = Device is operating as a 'virtual' device	BOOL
Sts_Ready	Device ready status: 1 = ready to activate power structure	BOOL
Sts_NoMotion	Device is Active with no active motion instructions	BOOL
Sts_Faulted	Device faulted status: 1 = an active fault exists	BOOL
Sts_Connected	Device is connected to the Programmable Controller	BOOL
Sts_bNotReady	Bitwise device 'not ready' reason 0 = Reserved 1 = Device not connected 2 = Device not available 3 = Device Faulted 4 = Safety Demand 5 = Motion Group is not synchronized 6 - 31 = Reserved	DINT
Sts_Available	Device is available for interaction with user code	BOOL
Sts_Active	Device active status: 1 = output power structure is active	BOOL
raC_Dvc_K5100	Unique Parameter Name for auto - discovery	BOOL
EnableOut	Enable Output - System Defined Parameter	BOOL

Data Types

The following Kinetix® 5100 Common Control Interface tags are the primary device program tags to read from and write to when interfacing to Kinetix® 5100 devices.

Refer to the Interfaces section for detailed information on interfaces.

For further information and examples on how to interface the power device objects with your specific application code refer to the "How_To_Interface_with_Power_Device_Logix.mp4" video within the Videos folder of the Power Device Library Download files.

raC_UDT_ItfAD_K5100_Inf

Member	Description	Data Type
ModulePath	Module CIP Path.	STR0032
bExtensionEnabled	Object extension is present in the controller. Bitwise representation: 0 = False, 1 = True.	DINT
bExtensionAlert	Object extension alert/notification is present. Bitwise representation: 0 = False, 1 = True.	DINT
AxisID	Axis identification unique with a controller	DINT

raC_UDT_ItfAD_K5100_Set

This is the Kinetix® 5100 Common Control Interface User-Defined Data Type for device settings. Its members provide application program access to allow or inhibit commands and settings from the device faceplate or other external sources. The table below shows member names, descriptions, and tag data types.

For example, to inhibit write commands from the device faceplate or other external sources write a 1 to the ModuleName_AOI_CtlrSet.InhibitCmd program tag from your application program. This would prevent a move command from the device faceplate.

Member	Description	Data Type
bInhibit	Inhibits (Bit Overlay).	DINT
InhibitCmd	1 = Inhibit user Commands from external sources, 0 = Allow.	BOOL
InhibitSet	1 = Inhibit user Settings from external sources, 0 = Allow.	BOOL
OperatingMode	Determines the drive operating mode when "Start Motion" has a zero-to-one transition. 1 - Position mode 2 - Speed mode 3 - Home mode 4 - Torque mode 5 - Gear mode (Fixed Ratio, based on present E-Gear ratio) 6 - Index mode 7 – Reserved 8 – Gear Mode (Variable Ratio, based on Master/Slave tag values) 9 – Enhanced MAT mode	DINT
MoveType	Specify the type of move. 0 = Absolute 1 = Incremental 2 = Rotary Shortest Path 3 = Rotary Positive 4 = Rotary Negative 7 = Relative 8 = Capture	DINT
PositionCommandOverlap	Allows overlapping of successive movements.	BOOL
PositionCommandOverride	Allows interruption of current movement, replacing it with a new movement.	BOOL
CapturedPositionSelect	Capture position selection (First capture or second capture).	BOOL
Position	Determines the command position.	REAL
Velocity	Determines the command speed.	REAL
Accel	Determines the command acceleration.	REAL
Decel	Determines the command deceleration.	REAL
Torque	Determines the command torque.	DINT

Member	Description	Data Type
TorqueRampTime	Determines the command torque ramp time.	DINT
StartingIndex	This entry is the PR (Position Register) the drive should execute.	DINT
HomingMethod	Homing Method.	DINT
HomeReturnSpeed	Determines the command home return speed.	REAL
CamMasterReference	Future: Determines the master position reference of CAM.	DINT
CamExecutionSchedule	Future: Determines the method used to execute the CAM profile.	DINT
CamExecutionMode	Future: Determines if the cam profile is executed only one time or repeatedly.	DINT
CamStopMode	Future: Determines the stop mode of CAM.	BOOL
CamSlaveScaling	Future: Scales the total distance covered by the slave axis through the cam profile.	DINT
CamLockPosition	Future: Determines the starting location in the cam profile	DINT
CamMasterLockPosition	Future: Determines the master location where the slave axis locks to the mater axis.	DINT
CamMasterLeadingCounts	Future: Determines the leading counts (master axis) before the cam profile is executed.	DINT
CamMasterUnlockCounts	Future: Determines the unlock counts (master axis) when the cam profile is executed.	DINT
CamMasterCyclicLeadingCounts	Future: Determines the cyclic leading counts (master axis) during the cam profile is executed.	DINT
GearRatioSlaveCounts	Integer value representing slave counts. This value is P1.044 Gear Ratio Follower Counts from the E-Gear ratio in KNX5100C software.	DINT
GearRatioMasterCounts	Integer value representing master counts. This value is P1.045 Gear Ratio Master Counts from the E-Gear ratio in KNX5100C software.	DINT

raC_UDT_ItfAD_ K5100 _Cmd

This is the Kinetix® 5100 Common Control Interface User-Defined Data Type for device commands. Its members provide application program access to common device commands.

The table below shows member names, descriptions, and tag data types. All the commands are available whether operating the device physically or virtually.

While it is possible, it is not typical to modify any of these UDT values directly. The motion operation add on instructions will manipulate these values as a result of their operation.

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Member	Description	Data Type
bCmd	Commands (Bit Overlay).	DINT
Physical	1 = Operate as Physical Device.	BOOL
Virtual	1 = Operate as Virtual Device.	BOOL
ResetWarn	1 = Reset device warning.	BOOL
ResetFault	1 = Reset device trip or fault.	BOOL
Activate	1 = Activate output power structure.	BOOL

Member	Description	Data Type
Deactivate	1 = Deactivate output power structure.	BOOL
StartMotion	A zero-to-one transition means the motion command is issued from the external controller.	BOOL
StopMotion	A zero-to-one transition will stop any active motion command in the drive.	BOOL

raC_UDT_ItfAD_K5100_Sts

This is the Kinetix® 5100 Common Control Interface User-Defined Data Type for device status. Its members provide application program access to device states, status, and diagnostic data. The table below shows member names, descriptions, and tag data types.

Input	Description	Data Type
eState	Enumerated state value: 0 = Unused, 1 = Initializing, 2 = Disconnected, 3 = Disconnecting, 4 = Connecting, 5 = Idle, 6 = Configuring, 7 = Available.	DINT
FirstWarning	First Warning.	raC_UDT_Event
FirstFault	First Fault.	raC_UDT_Event
eCmdFail	Enumerated command failure code. See extended help for enumeration values.	DINT
bSts	Status (Bit Overlay).	DINT
Physical	1 = Controlling physical device.	BOOL
Virtual	1 = Controlling virtual device.	BOOL
Connected	1 = PAC to device connection has been established.	BOOL
Available	1 = The device is available for interaction with the user program.	BOOL
Warning	1 = A warning is active on the device.	BOOL
Faulted	1 = A fault is active on the device.	BOOL
Ready	1 = Device is ready to be activated.	BOOL
Active	1 = Device power structure is active.	BOOL
ZeroSpeed	1 = Motor is at zero speed (not rotating).	BOOL
Homed	Indicate whether the drive completed the home operation.	BOOL
AtReference	Depending on the motion command (position, speed, torque), AtReference will be 1 when the actual reference = command reference	BOOL
CommandInProgress	Toggles state when a motion command is active in the drive. This bit changes state (toggles between 0 & 1) when a new command is executed from the drive. **IMPORTANT:** once this bit changes state, it remains in that state for the duration of the command; it will toggle to the opposite state (and remain in that state) once a new command is received.	BOOL
FaultCode	Active Fault Code in the drive	DINT
WarningCode	Active Warning Code in the drive	DINT
OperatingMode	Indicate which operating mode is currently used.	DINT
MotorType	Indicate which type of motor is connected to the drive. Rotary Motor = 1, Linear Motor =2 (Future)	DINT
ActualPosition	Actual position of the motor. Units depend on the Cfg settings. These can be drive counts or Position Units.	REAL
ActualVelocity	Actual speed of the motor. Units depend on the Cfg settings. These can be 0.1 RPM/sec or Position Units.	REAL
ActualTorque	When the operating mode is 4, Torque Mode, this represents the % motor torque.	REAL

Input	Description	Data Type
ActiveIndex	Indicates the currently executing Position Register PR)	DINT
ParameterMonitor1Value	Parameter monitor variable 1 value. These are Parameter ID's mapped using Function List>Parameter Editor>Status Monitor in KNX5100C software	DINT
ParameterMonitor2Value	Parameter monitor variable 2 value. These are Parameter ID's mapped using Function List>Parameter Editor>Status Monitor in KNX5100C software	DINT
ParameterMonitor3Value	Parameter monitor variable 3 value. These are Parameter ID's mapped using Function List>Parameter Editor>Status Monitor in KNX5100C software	DINT
ParameterMonitor4Value	Parameter monitor variable 4 value. These are Parameter ID's mapped using Function List>Parameter Editor>Status Monitor in KNX5100C software	DINT
ParameterMonitor5Value	Parameter monitor variable 5 value. These are Parameter ID's mapped using Function List>Parameter Editor>Status Monitor in KNX5100C software	DINT

raC_UDT_Itf_K5100_Cfg

raC_UDT_Itf_K5100_Cfg is the Power Motion Common Control Interface User-Defined Data Type for device configuration. Its members provide selection between Drive units (counts) or User units with settings for user units.

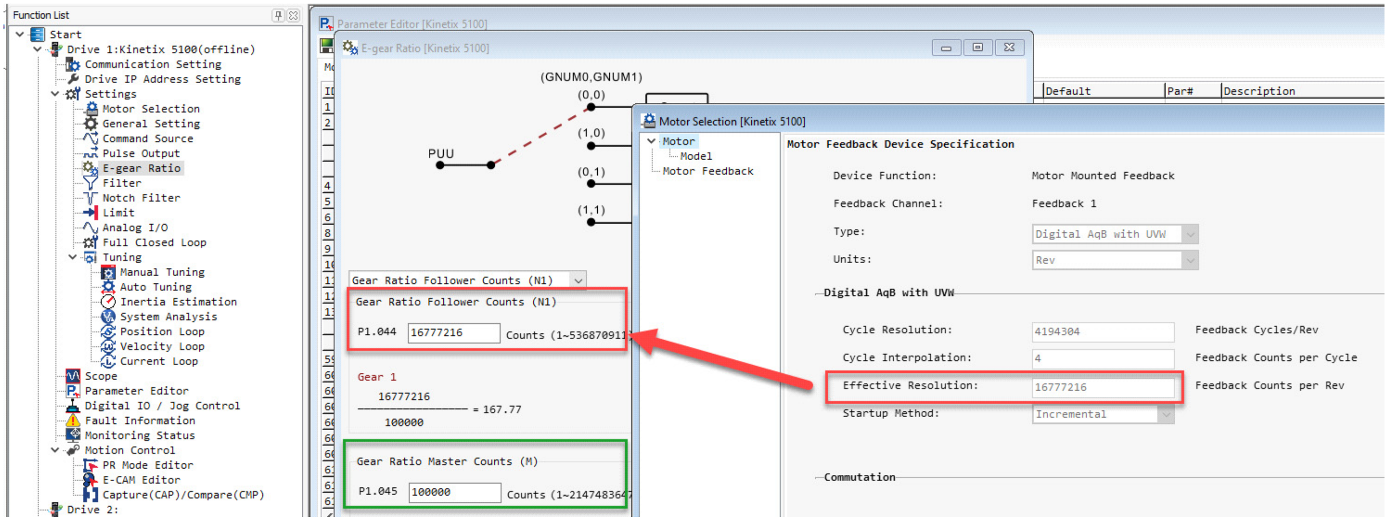
This is very useful because the Kinetix® 5100 natively supports only drive units. When the Operating Units = 1, the Motion Resolution and ConversionConstant values are used. Position Scaling originates from the KNX5100C software and is used together with the Cfg tags here to derive user scaling units.

Member	Description	Data Type
OperatingUnits	0 = Drive Units; 1 = UserUnits	DINT
MotionResolution	Motion Counts per Motor Revolution	DINT
ConversionConstant	Motion Counts per Position Unit	REAL

Example Configuration with Position Units

The E-Gear ratio (KNX5100C>Function List>E-Gear Ratio) is always used to provide a representation of positioning (units or counts) or to define a Pulse-Pulse Following relationship (MAG/PT). When the E-Gear ratio is changed, the positioning of the axis is changed. When not using the MAG Add-On Instruction, the E-Gear ratio is used to define position scaling.

When Operating Units =1, Position Units are used, and we can define application units instead of using drive counts. In KNX5100C software, the E-Gear ratio is defined to provide Position Scaling. This is encoder counts (or pulses) / motor rotation.



All Position Unit configurations must:

- Configure P1.044 Gear Ratio Follower Counts to be the same as the motor feedback resolution.
- Configure P1.045 Gear Ratio Master Counts to provide motor feedback counts / motor rotation.
- This value is user defined and can be any count value, default values with high-resolution encoders are 100,000 counts/motor rotation. The E-Gear configuration is used with the Device Object Cfg tags.

K5100_NodeXXX_CtrlCfg	{...}	{...}	Automation Device Interface
K5100_NodeXXX_CtrlCfg.OperatingUnits	1		Automation Device Interface 0 = Drive Units; 1 = UserUnits
K5100_NodeXXX_CtrlCfg.MotionResolution	100000		Automation Device Interface Motion Counts per Motor Revolution
K5100_NodeXXX_CtrlCfg.ConversionConstant	100000.0		Automation Device Interface Motion Counts per Position Unit

The Device Object Cfg values must:

- Set Cfg.MotionResolution = P1.045 Gear Ratio Master Counts -> Motion Counts / Motor Revolution
- Set Cfg.ConversionConstant based on the Counts/Position Unit -> Motion Counts / Position Unit that is required for your application.

The example above will result in Position Units = motor rotations. Now, entry values that originally used drive counts can be entered as motor rotations.

raC_UDT_Event

An array of size 4 is to be used to log the FirstWarning and FirstFault capture. The data should be FIFO order. The same should be displayed on the Faceplate.

Member	Description	Data Type
Type	Event type: 1 = Status, 2 = Warning, 3 = Fault, 4...n = User.	DINT
ID	User definable event ID.	DINT
Category	User definable category (Electrical,Mechanical,Materials,Utility,etc.).	DINT
Action	User definable event action code.	DINT
Value	User definable event value or fault code.	DINT
Message	Event message text.	STRING
EventTime_L	Timestamp (Date/Time format).	LINT
EventTime_D	Timestamp (Y,M,D,h,m,s,us).	DINT[7]

raC_UDT_LookupMember_STR0082

Member	Description	Data Type
Code	Code	DINT
Desc	Code Description	STRING

Motion Operation Instructions

These Motion Operation add-on instructions are designed to simplify the programming for your motion application. Consider that the Kinetix® 5100 is not an Integrated Motion on Ethernet/IP (CIP) drive and is not part of the Motion Group. The drive communication (Class 1 Ethernet/IP) for these instructions is based on the RPI of your Kinetix® 5100 in the Add-On Profile. Typical values for this communication rate are 20ms with a maximum of 100ms.

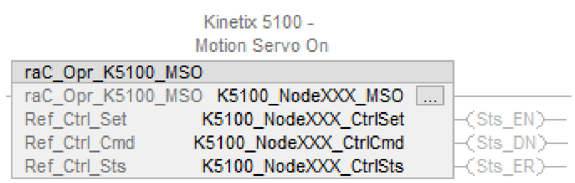
IMPORTANT: While these add-on instructions were developed to look and operate similarly to CIP motion instructions, they do not behave the same as instructions from the CIP Motion Library. The Kinetix® 5100 is not an Integrated Motion on Ethernet/IP (CIP) motion drive.

Member	Description
raC_Opr_K5100_MSO	Motion Axis Servo On. Use the Motion Servo On instruction to activate the motor.
raC_Opr_K5100_MSF	Motion Axis Servo Off. Use the Motion Servo Off instruction to deactivate the drive output for the specified axis and to deactivate the axis servo loop
raC_Opr_K5100_MAJ	Motion Axis Jog Use the Motion Axis Jog instruction to move an axis at a constant speed until you tell it to stop.
raC_Opr_K5100_MAT	Motion Axis Torque Use the Motion Axis Torque instruction to move an axis at a constant torque with the speed limit.
raC_Opr_K5100_MAM	Motion Axis Move Use the Motion Axis Move instruction to move an axis to a specified position.

raC_Opr_K5100_MAH	Motion Axis Home Use the Motion Axis Home instruction to home an axis.
raC_Opr_K5100_MAG	Motion Axis Gear Use the Motion Axis Gear instruction to set the gear ratio between the PUU (Position of User Unit) and encoder counts and specify the acceleration rate during gear ratio change for the position control in the Kinetix® 5100 drive.
raC_Opr_K5100_MAS	Motion Axis Stop Use the Motion Axis Stop instruction to stop a specific motion process on an axis or to stop the axis completely.
raC_Opr_K5100_MAFR	Motion Axis Fault Reset Use the Motion Axis Fault Reset instruction to clear some motion faults for an axis. Other faults cannot be cleared until you power cycle the drive. The faults, which can be cleared by raC_Opr_K5100_MAFR, are listed in Fault list section.
raC_Opr_K5100_MAI	Motion Axis Index Use the Motion Axis Index instruction to execute the index (PR) function of the drive. This can be a Position Index or one of the other PR types available in the drive.

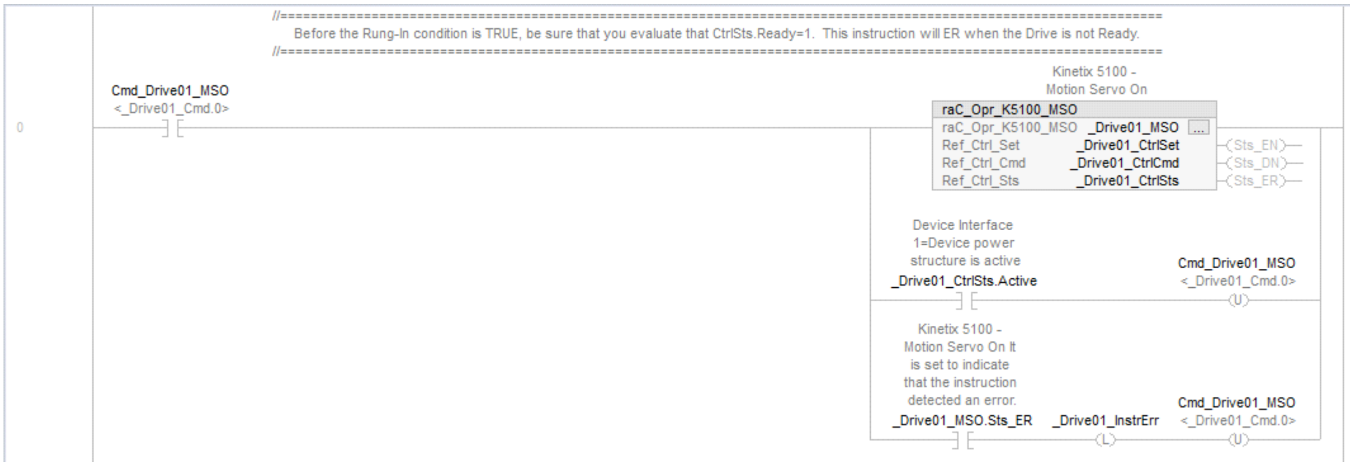
raC_Opr_K5100_MSO - Motion Axis Servo On

Use the Motion Servo On instruction to activate the motor. This instruction must be used while there are no active faults on the drive and the drive is in a Ready State.



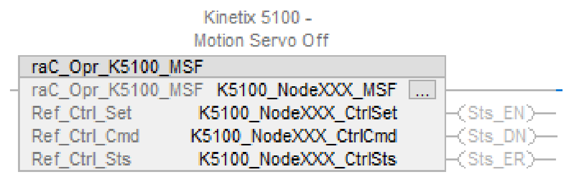
Status Bit	Tag Type	Description
Sts_EN	BOOL	Enable. This bit is set when the rung makes a false-to-true transition and remains set as the message transaction to activate the drive is initiated and in process. It remains set while the rung-in condition is true and no faults are active.
Sts_DN	BOOL	Done. This bit is set when the rung makes a false-to-true transition and the cmd to activate the drive is being acknowledge.
Sts_ER	BOOL	Error. This bit is set when the rung makes a false-to-true transition and there is an error that has occurred with the instruction. (This instruction error can be as a result of a fault on the drive itself). See Sts_ERR for details on the cause of the error.
Ref_Ctrl_Set	raC_UDT_Itf_K5100_Set	Use the associated Device Object Settings control interface for this AOI
Reg_Ctrl_Cmd	raC_UDT_Itf_K5100_Cmd	Use the associated Device Object Command control interface for this AOI
Ref_Ctrl_Sts	raC_UDT_Itf_K5100_Sts	Use the associated Device Object Status control interface for this AOI

This example shows the Motion Operation Add-On Instruction (raC_Opr_K5100_MSO). The Device Object status bits should be used in your application logic, when possible, for Kinetix® 5100 status instead of using the specific instance bits: in this case Sts_EN/DN. The Device Object Sts.Ready state checks additional states like valid Ethernet/IP communication with the drive.



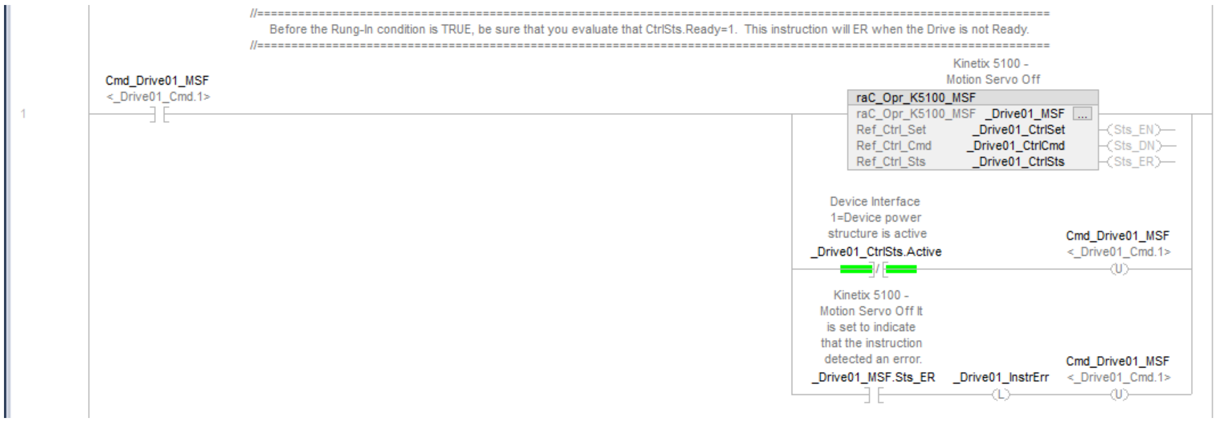
raC_Opr_K5100_MSF - Motion Axis Servo OFF

Use the Motion Servo Off instruction to de-activate the motor. This instruction must be used while there are no active faults on the drive and the drive is in a Ready state.



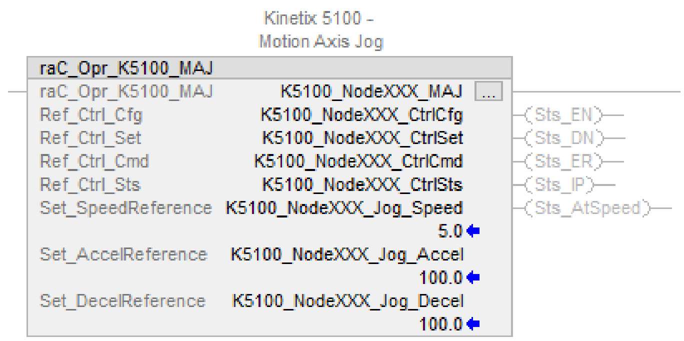
Status Bit	Tag Type	Description
Sts_EN	BOOL	Enable. This bit is set when the rung makes a false-to-true transition and remains set as the message transaction to de-activate the drive is initiated and in process. It remains set while the rung-in condition is true and no faults are active.
Sts_DN	BOOL	Done. This bit is set when the rung makes a false-to-true transition and the message transaction to de-activate the drive (Sts_EN) is complete.
Sts_ER	BOOL	Error. This bit is set when the rung makes a false-to-true transition and there is an error that has occurred with the instruction. (This instruction error can be as a result of a fault on the drive itself). See Sts_ERR for details on the cause of the error.
Ref_Ctrl_Set	raC_UDT_Itf_K5100_Set	Use the associated Device Object Settings control interface for this AOI
Reg_Ctrl_Cmd	raC_UDT_Itf_K5100_Cmd	Use the associated Device Object Command control interface for this AOI
Ref_Ctrl_Sts	raC_UDT_Itf_K5100_Sts	Use the associated Device Object Status control interface for this AOI

This example shows the Motion Operation Add-On Instruction (raC_Opr_K5100_MSF).



raC_Opr_K5100_MAJ - Motion Axis Jog

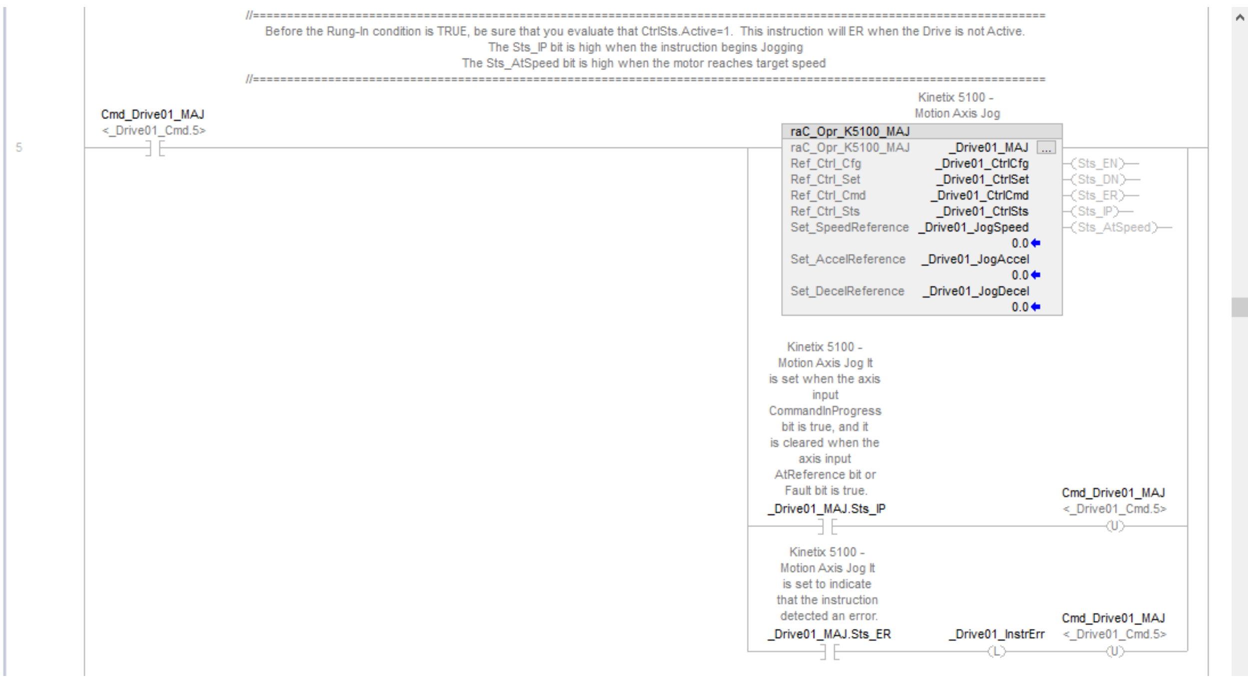
Use the Motion Axis Jog to accelerate or decelerate the motor to a constant speed without termination.



Status Bit	Tag Type	Description
Sts_EN	BOOL	Enable. This bit is set when the rung makes a false-to-true transition and the message transaction to Jog is initiated and in process. It remains set while the rung-in condition is true and no faults are active.
Sts_DN	BOOL	Done. This bit is set when the rung makes a false-to-true transition and the message transaction to Jog the drive (Sts_EN) is complete.
Sts_ER	BOOL	Error. This bit is set when the rung makes a false-to-true transition and there is an error that has occurred with the instruction. (This instruction error can be as a result of a fault on the drive itself). See Sts_ERR for details on the cause of the error.
Sts_IP	BOOL	In Process. This bit is set when the rung makes a false-to-true transition, the Jog message transaction is successful, and the motor begins to move. This bit will remain set as the motor is moving towards the target speed (Accel or Decel). It remains set while the Jog is active, regardless of the rung-in condition
Sts_AtSpeed	BOOL	This bit is set when the rung makes a false-to-true transition, the Sts_IP is set, and the Target Speed is reached. This bit will remain set while the Jog is active and AtSpeed condition is true.
Ref_Ctrl_Cfg	raC_UDT_Ift_K5100_Cfg	Use the associated Device Object Configuration control interface for this AOI
Ref_Ctrl_Set	raC_UDT_Itf_K5100_Set	Use the associated Device Object Settings control interface for this AOI
Reg_Ctrl_Cmd	raC_UDT_Itf_K5100_Cmd	Use the associated Device Object Command control interface for this AOI
Ref_Ctrl_Sts	raC_UDT_Itf_K5100_Sts	Use the associated Device Object Status control interface for this AOI

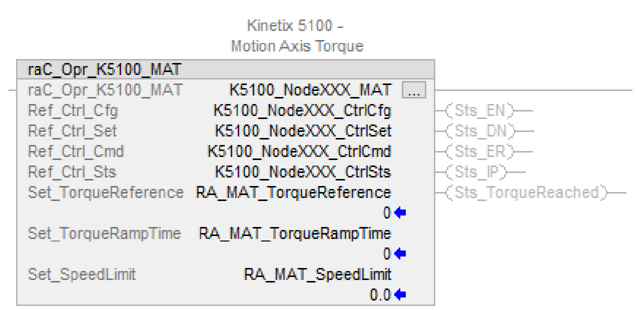
Set_SpeedReference	REAL	Target speed for the jog. Units: 0.1 RPM, Range: +/-80,000
Set_AccelReference	REAL	Accel rate used for the jog. Units: 0.1 RPM/s, Range:458...30,000,000
Set_DecelReference	REAL	Decel rate used for the jog. Units: 0.1 RPM/s, Range:458...30,000,000

This example shows the Motion Operation Add-On Instruction (raC_Opr_K5100_MAJ). The rung-in condition is reset once the motor is moving.



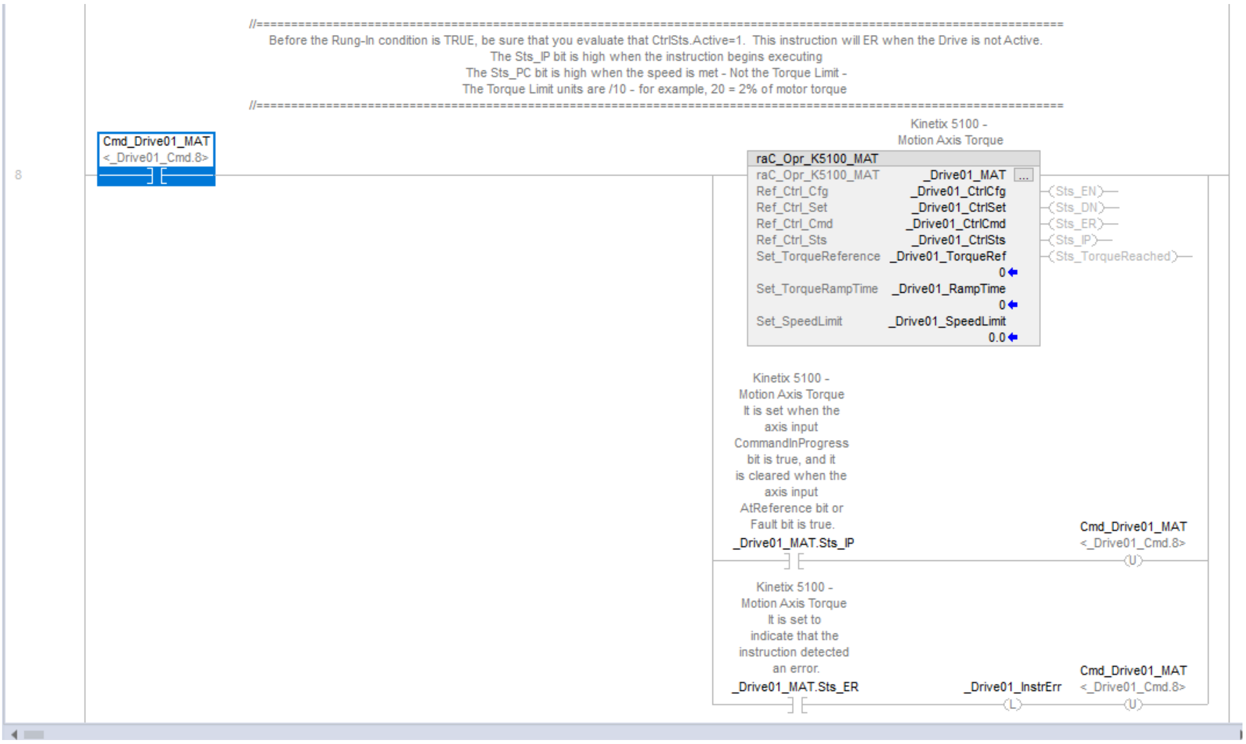
raC_Opr_K5100_MAT - Motion Axis Torque

The Motion Axis Torque instruction allows you to use torque limiting while a pre-defined speed is used to move the motor. The first time the pre-defined torque limit is reached, the Sts_TorqueReached bit is set. While the Sts_TorqueReached bit is set, the MAT operation remains active until it is terminated by an raC_Opr_K5100_MAS (Motion Axis Stop)/MSF (Motion Axis Servo Off), or fault of some kind. The torque and speed entries are bi-directional.



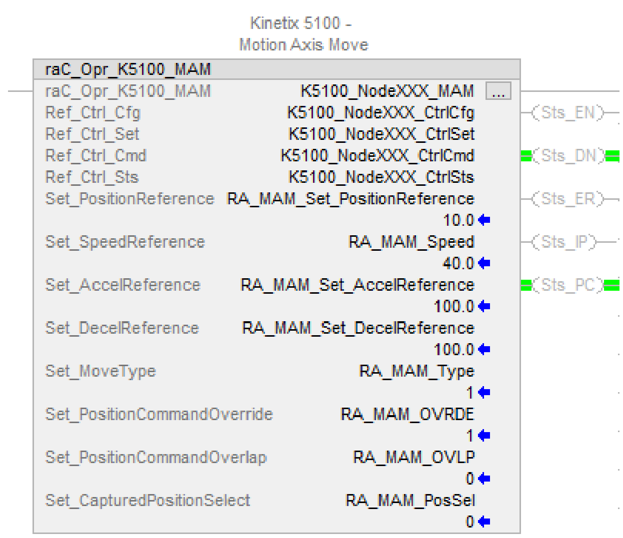
Status Bit	Tag Type	Description
Sts_EN	BOOL	Enable. This bit is set when the rung makes a false-to-true transition and remains set as the message transaction to execute the MAT is initiated and in process. It remains high until the rung-in condition is false and no faults are active.
Sts_DN	BOOL	Done. This bit is set when the rung makes a false-to-true transition and the message transaction to the drive (Sts_EN) is complete.
Sts_ER	BOOL	Error. This bit is set when the rung makes a false-to-true transition and there is an error that has occurred with the instruction. (This instruction error can be as a result of a fault on the drive itself). See Sts_ERR for details on the cause of the error.
Sts_IP	BOOL	In Process. This bit is set when the rung makes a false-to-true transition, the MAT message transaction is successful, and the motor begins to move. This bit remains set while the MAT operation is active.
Sts_TorqueReached	BOOL	This bit is set when the rung makes a false-to-true transition, the Sts_IP is set, and the Set_TorqueReference value is reached. This bit is set (and remains set) on the first occurrence of this condition.
Ref_Ctrl_Cfg	raC_UDT_Ift_K5100_Cfg	Use the associated Device Object Configuration control interface for this AOI
Ref_Ctrl_Set	raC_UDT_Itf_K5100_Set	Use the associated Device Object Settings control interface for this AOI
Reg_Ctrl_Cmd	raC_UDT_Itf_K5100_Cmd	Use the associated Device Object Command control interface for this AOI
Ref_Ctrl_Sts	raC_UDT_Itf_K5100_Sts	Use the associated Device Object Status control interface for this AOI
Set_SpeedReference	REAL	Target speed for the jog. Units: 0.1 RPM, Range: +/-80,000
Set_TorqueReference	DINT	Torque Limit used. Units: 0.1 % motor torque, Range: +/-4,000
Set_TorqueRampTime	DINT	The time to reach the Torque Limit. Units: ms; Range: 1…65,500
Set_SpeedLimit	REAL	Speed Limit during the MAT operation. Units: 0.1 RPM. Range:=/-80,000

This example shows the Motion Operation add-on instruction (raC_Opr_K5100_MAT). Once Sts_IP is set, the rung-in condition is reset.



raC_Opr_K5100_MAM - Motion Axis Move

Use the Motion Axis Move to execute an index based on the instruction's configuration.

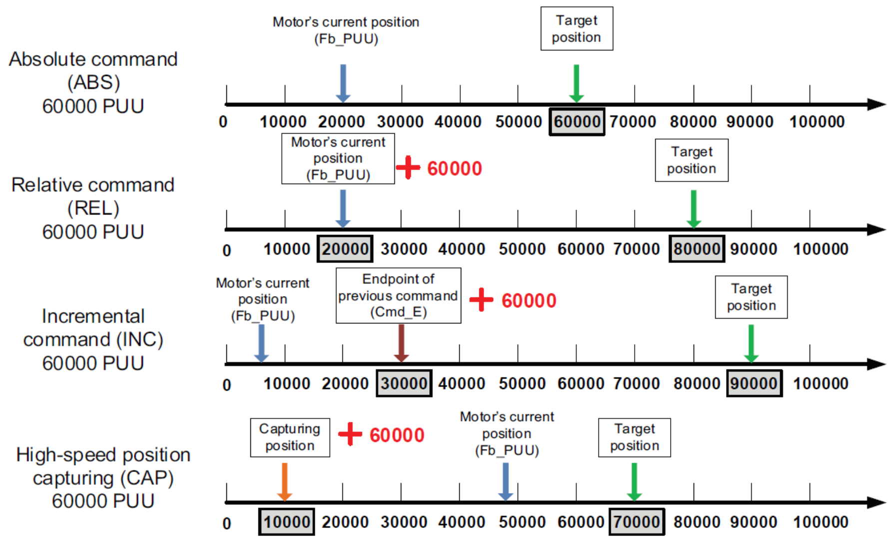


Status Bit	Tag Type	Description
Sts_EN	BOOL	Enable. This bit is set when the rung makes a false-to-true transition and the message transaction to Index is initiated and in process. It remains high until the rung-in condition is false and no faults are active.
Sts_DN	BOOL	Done. This bit is set when the rung makes a false-to-true transition and the message transaction to Index the drive (Sts_EN) is complete.

Sts_ER	BOOL	Error. This bit is set when the rung makes a false-to-true transition and there is an error that has occurred with the instruction. (This instruction error can be as a result of a fault on the drive itself). See Sts_ERR for details on the cause of the error.
Sts_IP	BOOL	In Process. This bit is set when the rung makes a false-to-true transition, the Index message transaction is successful, and the motor begins to move. This bit will remain set as the motor is executing the index.
Sts_PC	BOOL	Process Complete. This bit is set when the rung makes a false-to-true transition, the Sts_IP is set, and the Target Position is reached.
Ref_Ctrl_Cfg	raC_UDT_Ift_K5100_Cfg	Use the associated Device Object Configuration control interface for this AOI
Ref_Ctrl_Set	raC_UDT_Itf_K5100_Set	Use the associated Device Object Settings control interface for this AOI
Reg_Ctrl_Cmd	raC_UDT_Itf_K5100_Cmd	Use the associated Device Object Command control interface for this AOI
Ref_Ctrl_Sts	raC_UDT_Itf_K5100_Sts	Use the associated Device Object Status control interface for this AOI
Set_SpeedReference	REAL	Target speed for the MAM. Units: 0.1 RPM, Range: +/-80,000; Position Units are converted into RPM using the Device Object AOI
Set_AccelReference	REAL	Accel rate used for the Index. Units: 0.1 RPM/s, Range:458…30,000,000; Position Units are converted into RPM/s using the Device Object AOI
Set_DecelReference	REAL	Decel rate used for the Index. Units: 0.1 RPM/s, Range:458…30,000,000; Position Units are converted into RPM/s using the Device Object AOI
Set_MoveType	INT	Specify the type of index. 0=Absolute 1=Incremental 2=Rotary Shortest Path 3=Rotary Positive 4=Rotary Negative 7=Relative 8=Capture
Set_PositionCommandOverride	BOOL	0=Feature not used 1=Any index executing is terminated and the current index is executed.
Set_PositionCommandOverlap	BOOL	0=Feature not used 1=This index is overlapped (or blended) with an executing index at the end of that executing index (during the deceleration portion)
Set_CapturedPositionSelect	BOOL	This is used with the Capture (CAP) MoveType and specifies which High Speed input is used. 0=DI9 1=DI10

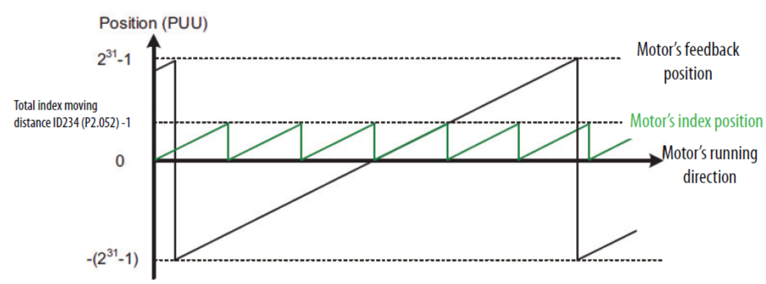
Set_MoveType

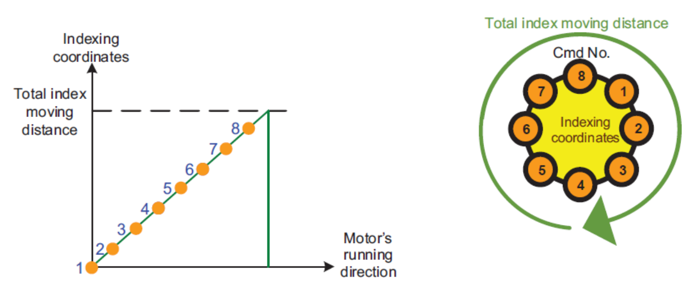
Below is an example of the move types. This entry specifies the index type to be executed. In this example, 60,000 is used as *Set_PositionReference*.



The Rotary move types are used to provide a way to index while observing the natural rollover of the feedback device. For example, if the motor could only index positive, the Rotary Positive is used. When the feedback device transitions through its natural unwind (typically 2.1billion counts), the movements will always index positive.

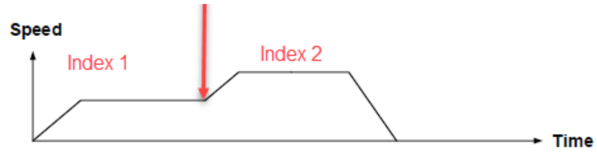
IMPORTANT	At this time, the Kinetix® 5100 does not have an Unwind function. The rotary selections in this AOI do not refer to rotary axis types.





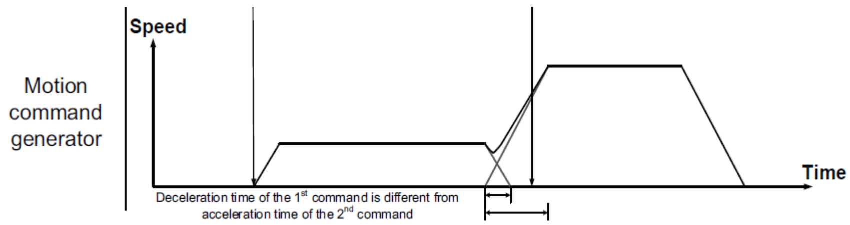
Set_PositionOverride

The executing index (Index 1) is terminated. The new index (Index 2) is executed using its dynamics. This is shown in the graphic below. The red arrow is the point where the command for Index 2 is received by the drive.

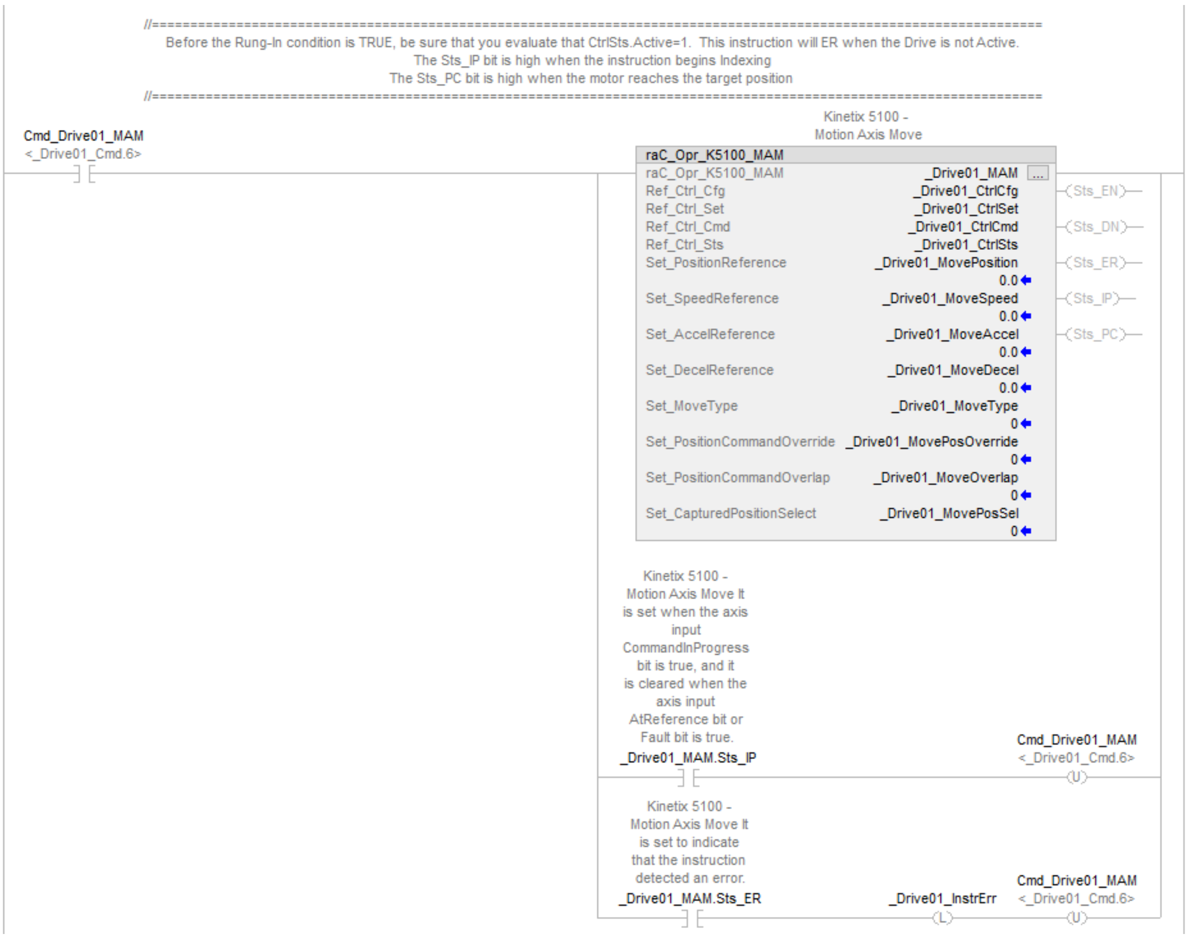


Set_PositionCommandOverlap

The executing index is interrupted during its deceleration. The new index is started before the deceleration is complete.

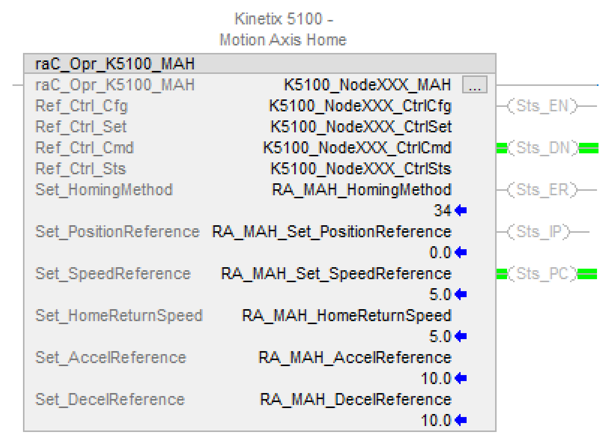


This example shows the Motion Operation Add-On Instruction (raC_Opr_K5100_MAM). The rung-in condition is reset once the motor is moving to its target position.



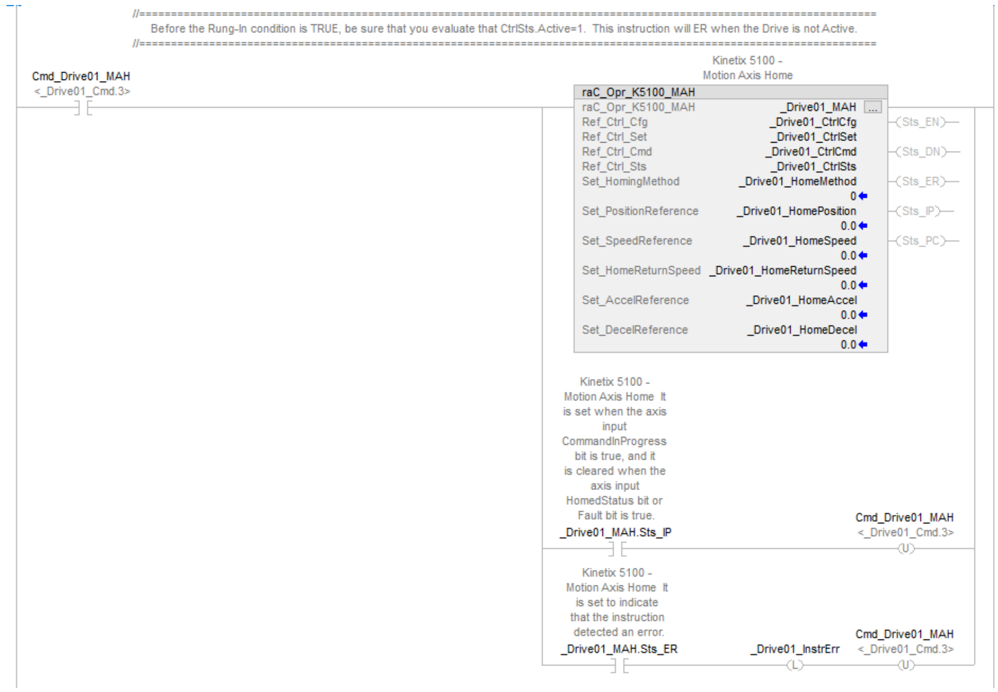
raC_Opr_K5100_MAH - Motion Axis Home

Use the Motion Axis Home Add-On Instruction to command a Homing Procedure in the drive. Homing is used to define an origin for your motor and to establish an absolute positioning reference for the motor. Once homing is complete, the *Sts.Homed* bit in the CtrlSts UDT is set.



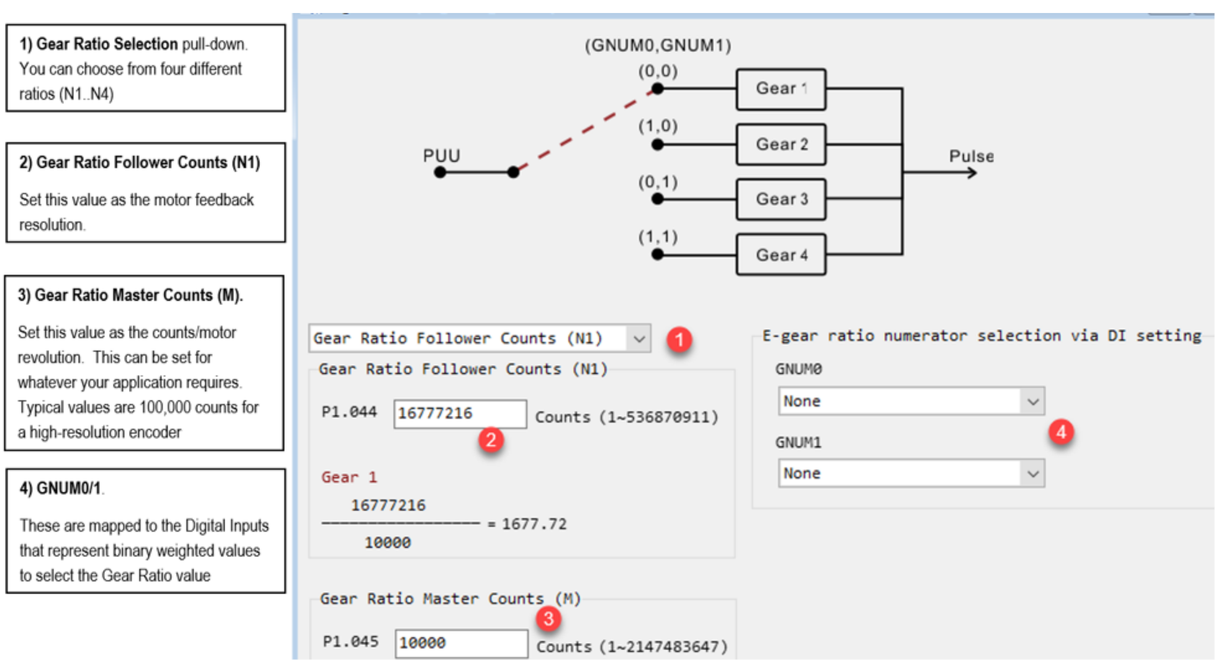
Status Bit	Tag Type	Description
Sts_EN	BOOL	Enable. This bit is set when the rung makes a false-to-true transition and the message transaction to Home is initiated and in process. It remains high until the rung-in condition is false and no faults are active.
Sts_DN	BOOL	Done. This bit is set when the rung makes a false-to-true transition and the message transaction to Home the drive (Sts_EN) is complete.
Sts_ER	BOOL	Error. This bit is set when the rung makes a false-to-true transition and there is an error that has occurred with the instruction. (This instruction error can be as a result of a fault on the drive itself). See Sts_ERR for details on the cause of the error.
Sts_IP	BOOL	In Process. This bit is set when the rung makes a false-to-true transition, the Home message transaction is successful, and the homing begins. This bit will remain set if the homing is executing.
Sts_PC	BOOL	Process Complete. This bit is set when the rung makes a false-to-true transition and the Homing Sequence is completed.
Ref_Ctrl_Cfg	raC_UDT_Ift_K5100_Cfg	Use the associated Device Object Configuration control interface for this AOI
Ref_Ctrl_Set	raC_UDT_Itf_K5100_Set	Use the associated Device Object Settings control interface for this AOI
Reg_Ctrl_Cmd	raC_UDT_Itf_K5100_Cmd	Use the associated Device Object Command control interface for this AOI
Ref_Ctrl_Sts	raC_UDT_Itf_K5100_Sts	Use the associated Device Object Status control interface for this AOI
Set_HomingMethod	SINT	Set this value for the Homing Method used with your drive. These entries can be found in the Kinetix® 5100 User Manual, Appendix C. They are also listed when you use F1 on the MAH_AOI.
Set_PositionReference	REAL	The home position the drive will use.
Set_SpeedReference	REAL	The Homing Speed used with the MAH (when required by the HomingMethod). Units: 0.1 RPM, Range: 1…20,000; Position Units are converted into RPM using the Device Object AOI
SetHomeReturnSpeed	REAL	The Low-Speed homing setting (when required by HomingMethod) Units: 0.1 RPM; Range: 1…5000; Position Units are converted into RPM using the Device Object AOI
Set_AccelReference	REAL	Accel rate used by HomingMethod. Units: 0.1 RPM/s, Range:458…30,000,000; Position Units are converted into RPM/s using the Device Object AOI
Set_DecelReference	REAL	Decel rate used by HomingMethod. Units: 0.1 RPM/s, Range:458…30,000,000; Position Units are converted into RPM/s using the Device Object AOI

This example shows the Motion Operation Add-On Instruction (raC_Opr_K5100_MAH). The rung-in condition is reset once the Homing Sequence is in process. Depending on the Homing Method, the homing sequence may complete away from the Home Position specified. This is because of the Homing Deceleration. You may need to execute a raC_Opr_K5100_MAM Absolute type back to the Home Position.



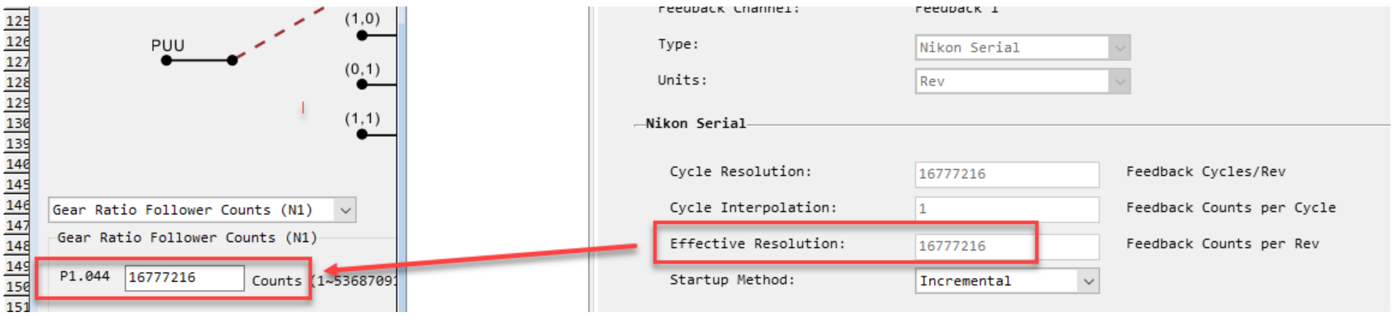
raC_Opr_K5100_MAG - Motion Axis Gear and E-Gear Ratio

Use the Motion Axis Gear Add-On Instruction to execute a pulse-pulse relationship with the drive. The MAG Add-On Instruction uses the E-Gear ratio configured in the KNX5100C software. The E-Gear ratio window is shown below. When the MAG Add-On Instruction is used, the drive behaves like it is in PT (Position Terminal – or Pulse Train) mode and the drive will use the E-Gear ratio to respond to master pulses.



The PT Mode is a pulse-pulse relationship. When the variable ratio is used and the ratio is changed, there is NO positioning ability. This means when you are finished using the MAG Add-On Instruction, your position scaling (which also uses the E-Gear ratio) may have changed if you used variable GearingMode and changed the Master ratio because of your application requirements.

The MAG **SetSlaveCounts** is sometimes called the numerator (Shown as 2 above). This is because when you look at how it is used in the drive, it is used to determine the drive's internal 'ratio' (shown as 1677.72 above). For our purposes**, the E-Gear ratio Follower = MAG SetSlaveCounts = motor feedback resolution** (from the KNX5100C>Function List>Motor Selection>Feedback window).



The MAG **Set_MasterCounts** is sometimes called the denominator (shown as 3 above). Any gearing relationship must consider the actual motor mechanics, like a gearbox, actuator pitch, etc. and use this to relate back to a motor rotation. Gear Ratio Master counts is ***desired counts* / motor rotation.** *Desired counts* are not used for positioning; but defines how many counts your motor will move in one rotation based on the number of feedback pulses you expect to receive from the source input; this is used to determine your gearing relationship. So, this Master counts value is used to define the pulse-pulse relationship.

IMPORTANT The MAG AOI can affect your positioning. The issuing Kinetix® 5100 (slave) uses the E-Gear ratio to define how it follows pulses from a source (a master). While the result is that the issuing Kinetix® 5100 (slave) follows pulses from another source (master), the way the function operates can affect positioning of the drive. Regardless of Operation Mode, the E-Gear ratio is always used to provide a representation of positioning (units or counts) or to define a Pulse-Pulse Following relationship (MAG/PT). When the E-Gear ratio is changed, the positioning of the axis is changed.

Gearing Example:

The master in our system is a 4000 ppr encoder. This means, when the encoder makes one revolution, we expect the Slave1 drive to see: 4000 pulses.

Our application requirement is that we want to follow this encoder at a 1:2 relationship. This means when the master encoder moves 1 encoder revolution, the motor rotates 2 times.

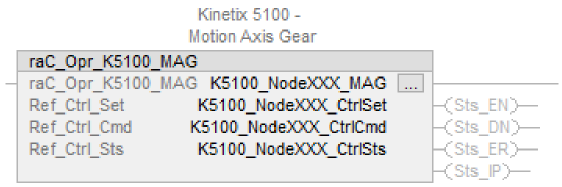
The Master PPR is not entered anywhere, but is required that we know this value. We calculate the MAG SetMasterCounts value knowing the Master PPR counts and the relationship we want in Slave1's motor.

We set the MAG **SetSlaveCounts = Motor Feedback Resolution =16,777,216**

When we set MAG **Set_MasterCounts = 2,000**, this means as the Slave1 drive sees 2000 master pulses, the motor moves 1 rotation, and thus, as the Master encoder moves 4,000 pulses, Slave1 would have moved 2 rotations.

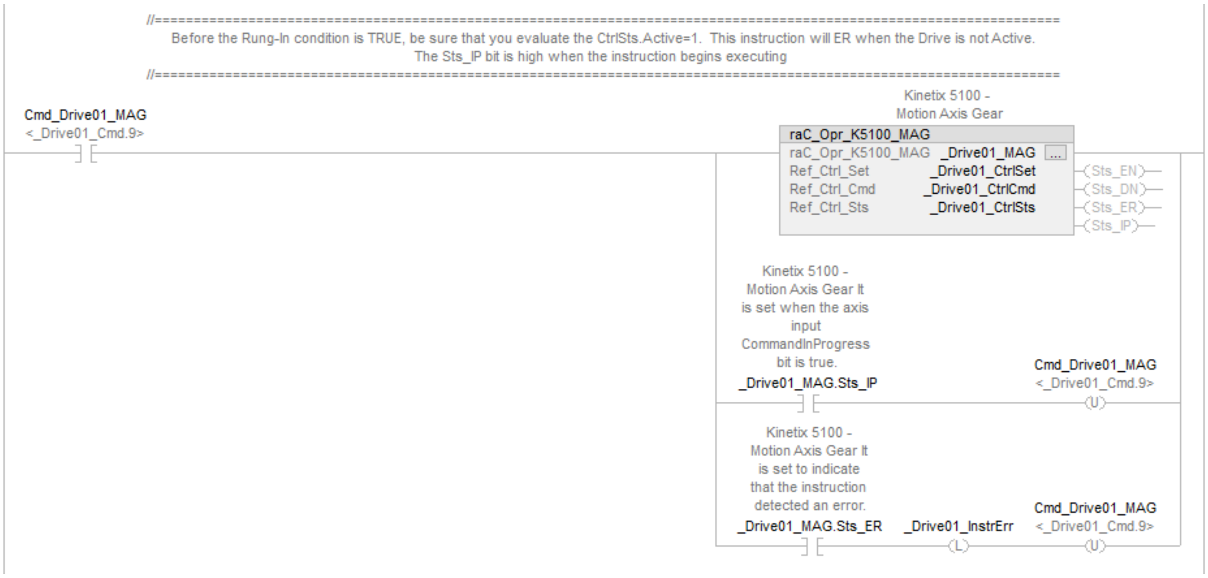
There are two modes of the MAG function that can be used. These are defined by the Cfg_GearingMode entry. This is not visible and is set for Fixed initially. The user must intentionally change this setting. Fixed mode will not impact positioning since it uses the existing E-Gear ratio in the Kinetix® 5100. This means that we can follow a master source at this fixed ratio and when gearing is disabled, we can continue positioning without losing the position scaling for the drive.

Variable mode means we can change the E-Gear ratio by manipulating the master/slave counts values. This changes the ratio which the issuing drive (slave) follows the master. However, the positioning is affected since the E-Gear ratio defines the position scaling. This is the same as using the Kinetix® 5100 PT sub mode of operation. This mode is useful when your application must follow a Master with different ratios and positioning is not important; or if you can issue a Homing Sequence to re-establish an origin when gearing is completed.



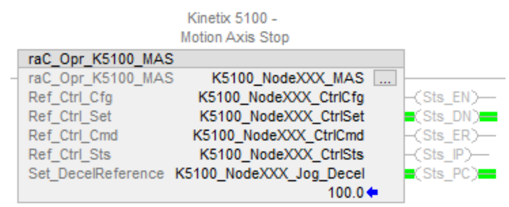
Status Bit	Tag Type	Description
Sts_EN	BOOL	Enable. This bit is set when the rung makes a false-to-true transition and the message transaction to MAG is initiated and in process. It remains high until the rung-in condition is false and no faults are active.
Sts_DN	BOOL	Done. This bit is set when the rung makes a false-to-true transition and the message transaction to MAG (Sts_EN) is complete.
Sts_ER	BOOL	Error. This bit is set when the rung makes a false-to-true transition and there is an error that has occurred with the instruction. (This instruction error can be as a result of a fault on the drive itself). See Sts_ERR for details on the cause of the error.
Sts_IP	BOOL	In Process. This bit is set when the rung makes a false-to-true transition, the MAG message transaction is successful, and the drive begins following. This bit will remain set as the motor is executing the gearing. It remains set while the MAG is active, regardless of the rung-in condition
Ref_Ctrl_Set	raC_UDT_Itf_K5100_Set	Use the associated Device Object Settings control interface for this AOI
Reg_Ctrl_Cmd	raC_UDT_Itf_K5100_Cmd	Use the associated Device Object Command control interface for this AOI
Ref_Ctrl_Sts	raC_UDT_Itf_K5100_Sts	Use the associated Device Object Status control interface for this AOI
Cfg_GearingMode	BOOL (Not visible)	0=Fixed 1=Variable
Set_AccelReference	REAL (Not visible)	Accel rate used for the MAG. Units: 0.1 RPM/s, Range:458...30,000,000; Position Units are converted into RPM/s using the Device Object AOI
Set_MasterCounts	DINT (Not visible)	the ***desired counts /* motor rotation.** *Desired counts* are not used for positioning; but defines how many counts your motor will move in one rotation based on the number of feedback pulses you expect to receive from the source input. Range:1-536870911 counts
Set_SlaveCounts	DINT (Not visible)	Set to the motor feedback resolution. Range:1-2147483647

This example shows the Motion Operation Add-On Instruction (raC_Opr_K5100_MAG). The rung-in condition is reset once the Gearing is in process.



raC_Opr_K5100_MAS - Motion Axis Stop

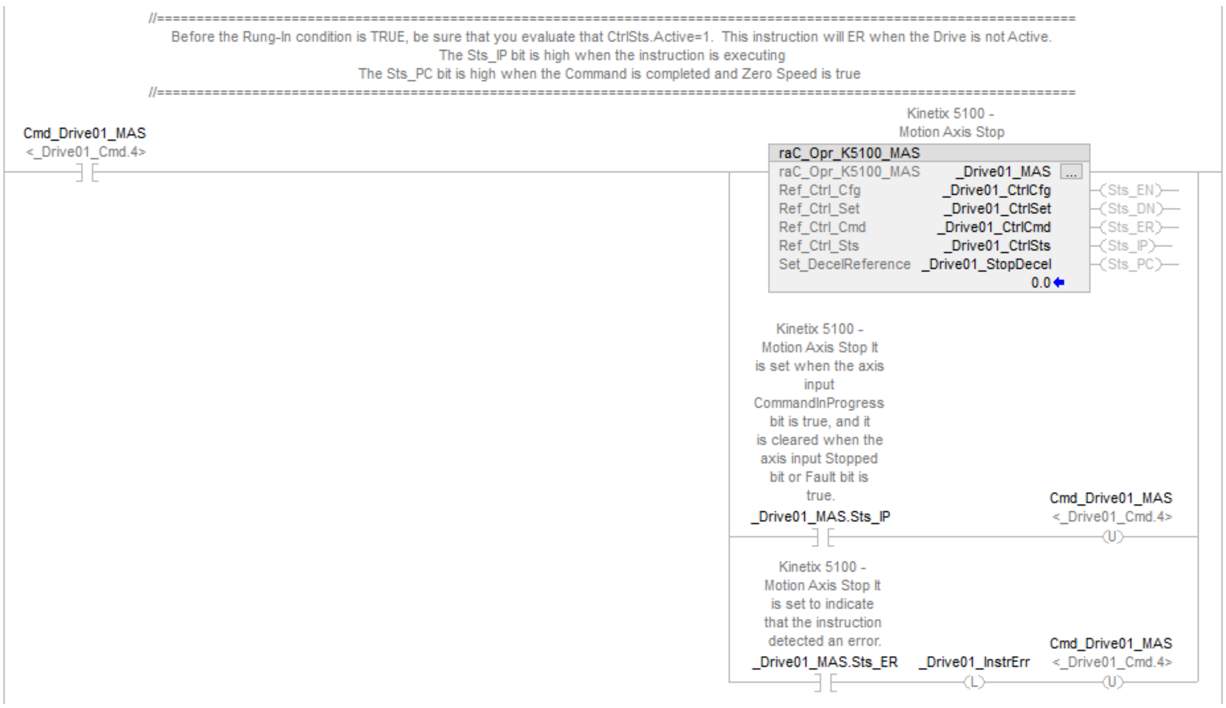
Use the Motion Axis Stop to command the drive to stop any motion. The drive remains active when the stop function is complete.



Status Bit	Tag Type	Description
Sts_EN	BOOL	Enable. This bit is set when the rung makes a false-to-true transition and the message transaction to Stop is initiated and in process. It remains high until the rung-in condition is false and no faults are active.
Sts_DN	BOOL	Done. This bit is set when the rung makes a false-to-true transition and the message transaction to Stop the drive (Sts_EN) is complete.
Sts_ER	BOOL	Error. This bit is set when the rung makes a false-to-true transition and there is an error that has occurred with the instruction. (This instruction error can be as a result of a fault on the drive itself). See Sts_ERR for details on the cause of the error.
Sts_IP	BOOL	In Process. This bit is set when the rung makes a false-to-true transition, the Stop message transaction is successful, and the motor begins to decelerate. This bit will remain set as the motor is executing the stop.
Sts_PC	BOOL	Process Complete. This bit is set when the rung makes a false-to-true transition, the Sts_IP is set, and Zero Speed is reached. Zero Speed is defined using KNX5100C software>General Setting
Ref_Ctrl_Cfg	raC_UDT_Ift_K5100_Cfg	Use the associated Device Object Configuration control interface for this AOI
Ref_Ctrl_Set	raC_UDT_Itf_K5100_Set	Use the associated Device Object Settings control interface for this AOI

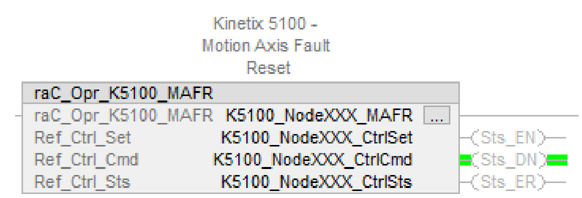
Reg_Ctrl_Cmd	raC_UDT_Itf_K5100_Cmd	Use the associated Device Object Command control interface for this AOI
Ref_Ctrl_Sts	raC_UDT_Itf_K5100_Sts	Use the associated Device Object Status control interface for this AOI
Set_DecelReference	REAL	Decel rate used for the jog. Units: 0.1 RPM/s, Range:458…30,000,000; Position Units are converted into RPM/s using the Device Object AOI

This example shows the Motion Operation Add-On Instruction (raC_Opr_K5100_MAS). The rung-in condition is reset once the Stop is in process.



raC_Opr_K5100_MAFR - Motion Axis Fault Reset

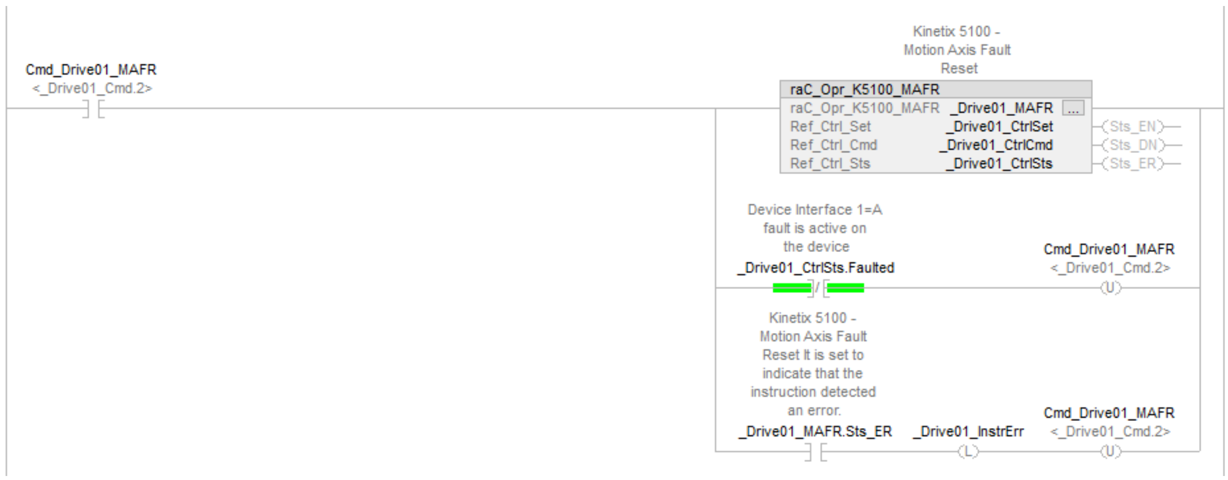
Use the Motion Axis Fault Reset to clear drive faults. When the fault is no longer active in the drive, this instruction will clear the fault. This will not clear any active alarms.



Status Bit	Tag Type	Description
Sts_EN	BOOL	Enable. This bit is set when the rung makes a false-to-true transition and the message transaction to Reset is initiated and in process. It remains high until the rung-in condition is false and no faults are active.
Sts_DN	BOOL	Done. This bit is set when the rung makes a false-to-true transition and the message transaction to Reset the drive (Sts_EN) is complete.

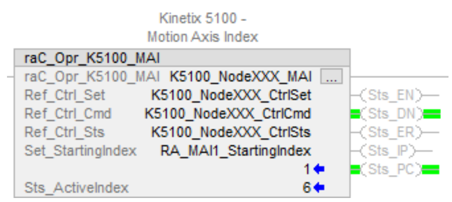
Sts_ER	BOOL	Error. This bit is set when the rung makes a false-to-true transition and there is an error that has occurred with the instruction. (This instruction error can be as a result of a fault on the drive itself). See Sts_ERR for details on the cause of the error.
Ref_Ctrl_Set	raC_UDT_Itf_K5100_Set	Use the associated Device Object Settings control interface for this AOI
Reg_Ctrl_Cmd	raC_UDT_Itf_K5100_Cmd	Use the associated Device Object Command control interface for this AOI
Ref_Ctrl_Sts	raC_UDT_Itf_K5100_Sts	Use the associated Device Object Status control interface for this AOI

This example shows the Add-On Instruction for clearing faults. The rung-in condition is reset once the fault is cleared.



raC_Opr_K5100_MAI - Motion Axis Index

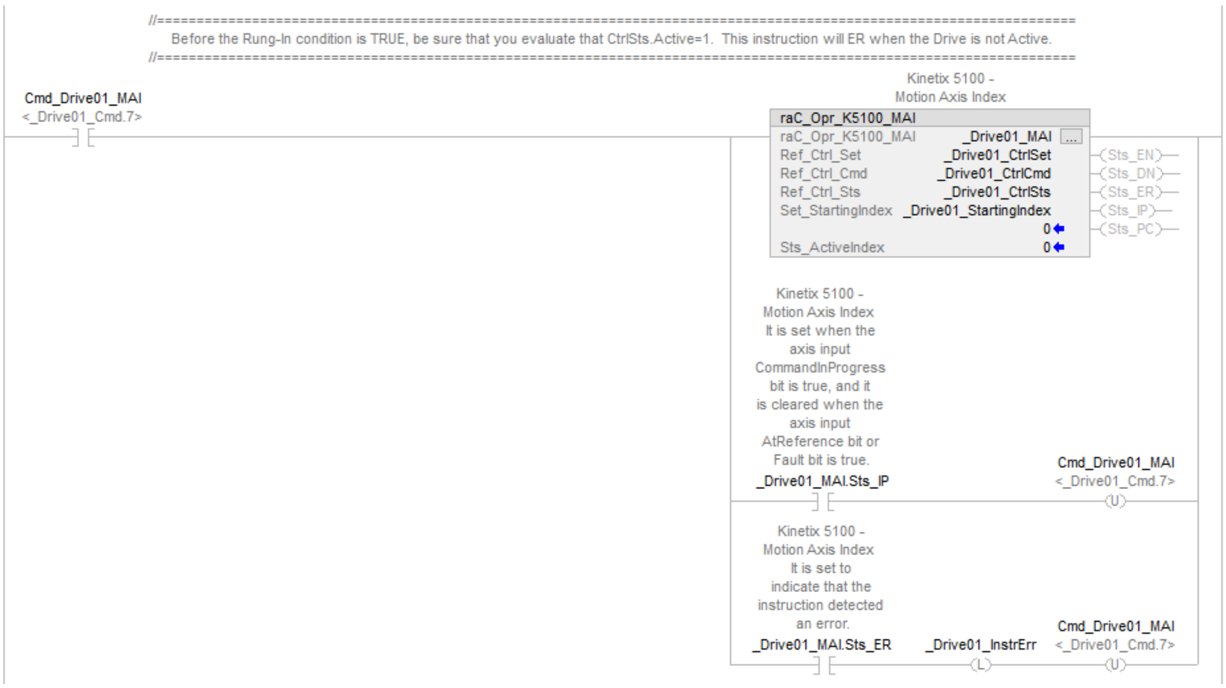
Use the Motion Axis Index Add-On Instruction to execute a pre-defined PR (Position Register) in the drive. This Motion Operation Add-On Instruction will execute any PR type, including indexes, statements, or Parameter read/ writes.



Status Bit	Tag Type	Description
Sts_EN	BOOL	Enable. This bit is set when the rung makes a false-to-true transition and the message transaction to MAI is initiated and in process. It remains high until the rung-in condition is false and no faults are active.
Sts_DN	BOOL	Done. This bit is set when the rung makes a false-to-true transition and the message transaction to MAI the drive (Sts_EN) is complete.
Sts_ER	BOOL	Error. This bit is set when the rung makes a false-to-true transition and there is an error that has occurred with the instruction. (This instruction error can be as a result of a fault on the drive itself). See Sts_ERR for details on the cause of the error.
Sts_IP	BOOL	In Process. This bit is set when the rung makes a false-to-true transition, the MAI message transaction is successful, and the PR command has been sent to the drive. This bit will remain set until the AtReference bit is set.

Sts_PC	BOOL	Process Complete. This bit is set when the rung makes a false-to-true transition, the Sts_IP is set, and the MAI has sent the PR execution and the AtReference bit is set.
Ref_Ctrl_Set	raC_UDT_Itf_K5100_Set	Use the associated Device Object Settings control interface for this AOI
Reg_Ctrl_Cmd	raC_UDT_Itf_K5100_Cmd	Use the associated Device Object Command control interface for this AOI
Ref_Ctrl_Sts	raC_UDT_Itf_K5100_Sts	Use the associated Device Object Status control interface for this AOI
Set_Starting_Index	INT	The PR selection to execute in the drive
Sts_Active_Index	INT	Shows the recently executed PR in the drive

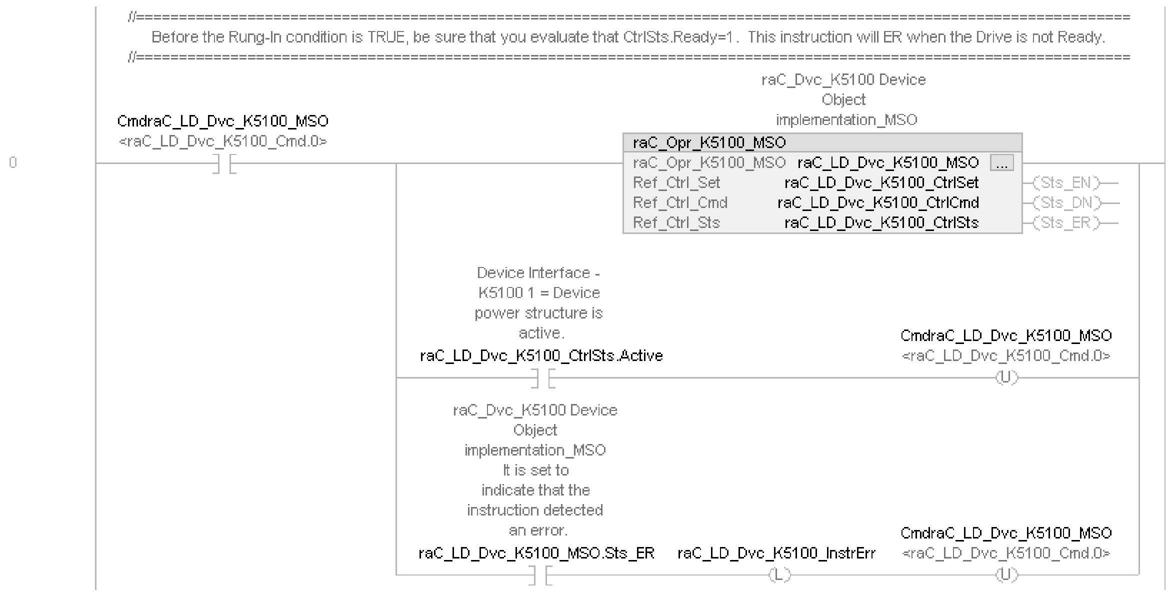
This example shows the Motion Operation Add-On Instruction (raC_Opr_K5100_MAI). The rung-in condition is reset once the MAI is in process.

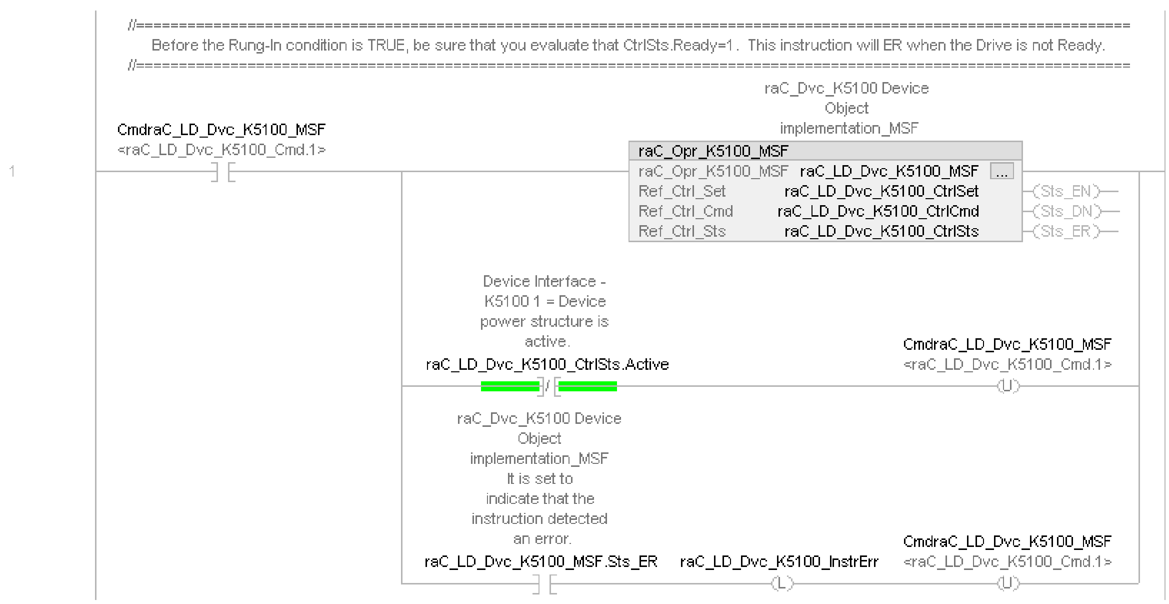


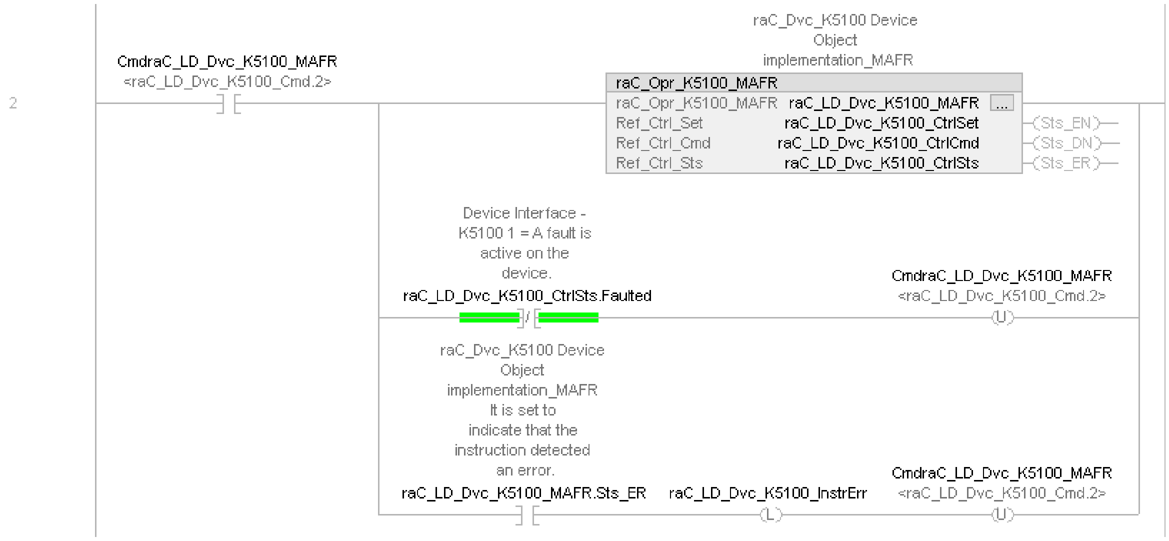
Programming Example

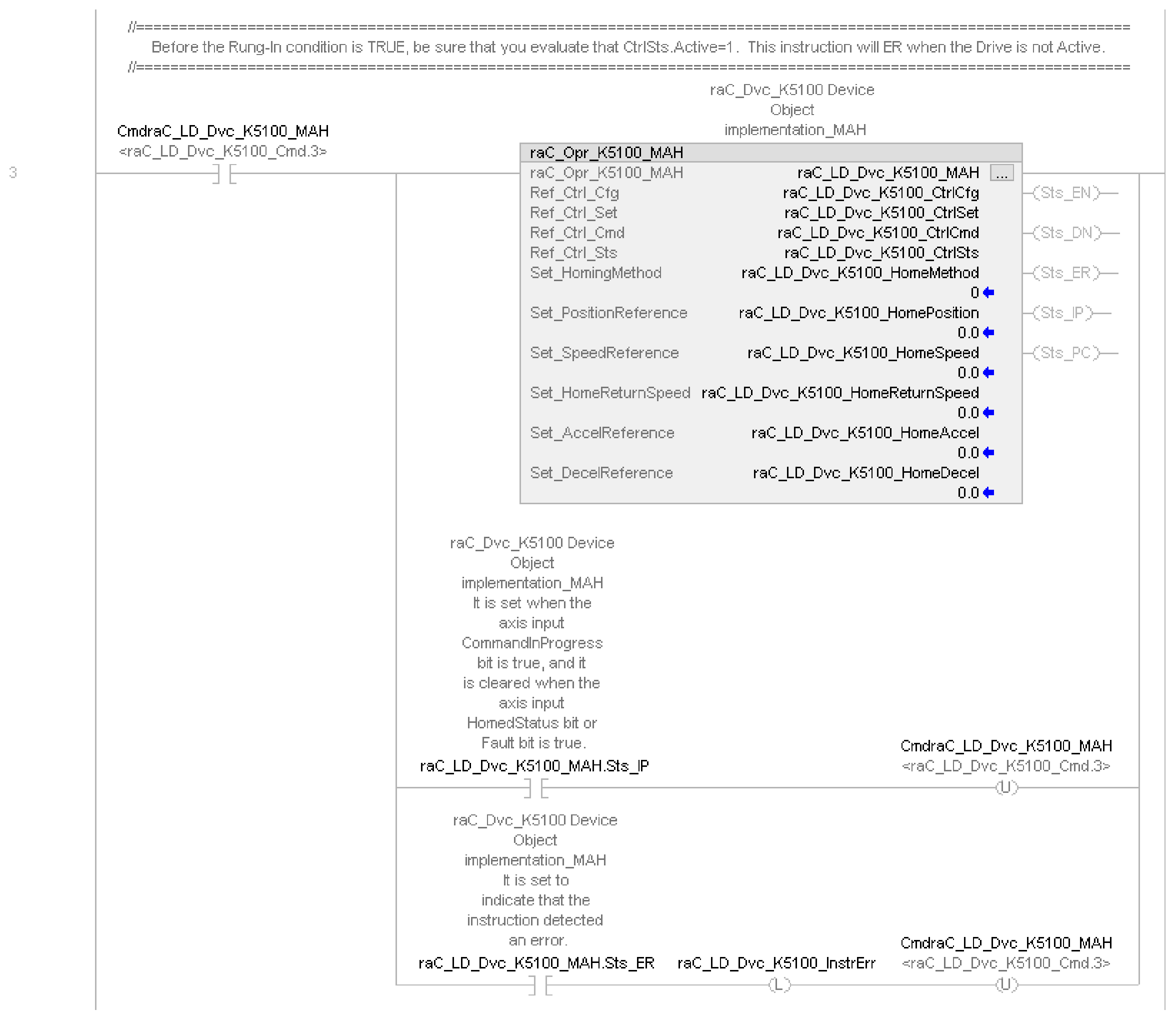
Fully configured device on a rung is provided below for reference. The base raC_Dvc_K5100 instruction is required along with mandatory instructions for MSO, MSF, MAFR, MAH, MAS, MAJ. Additional instructions for MAM, MAI, MAT and MAG are optional. This example includes the device and all additional motion instructions.

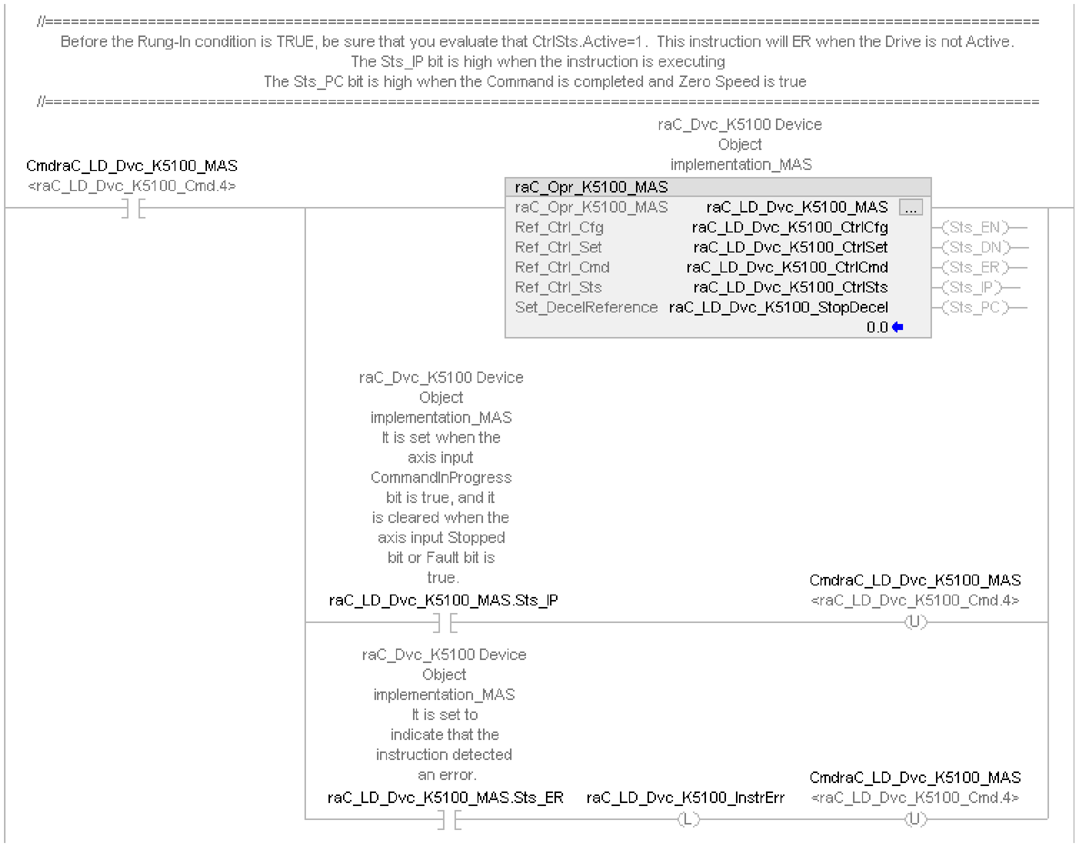
Note that this programming example is the same code that is imported when either importing the supplied rung .L5X files or when using Application Code Manager or the Studio 5000® Import Library Objects wizard plug-in.

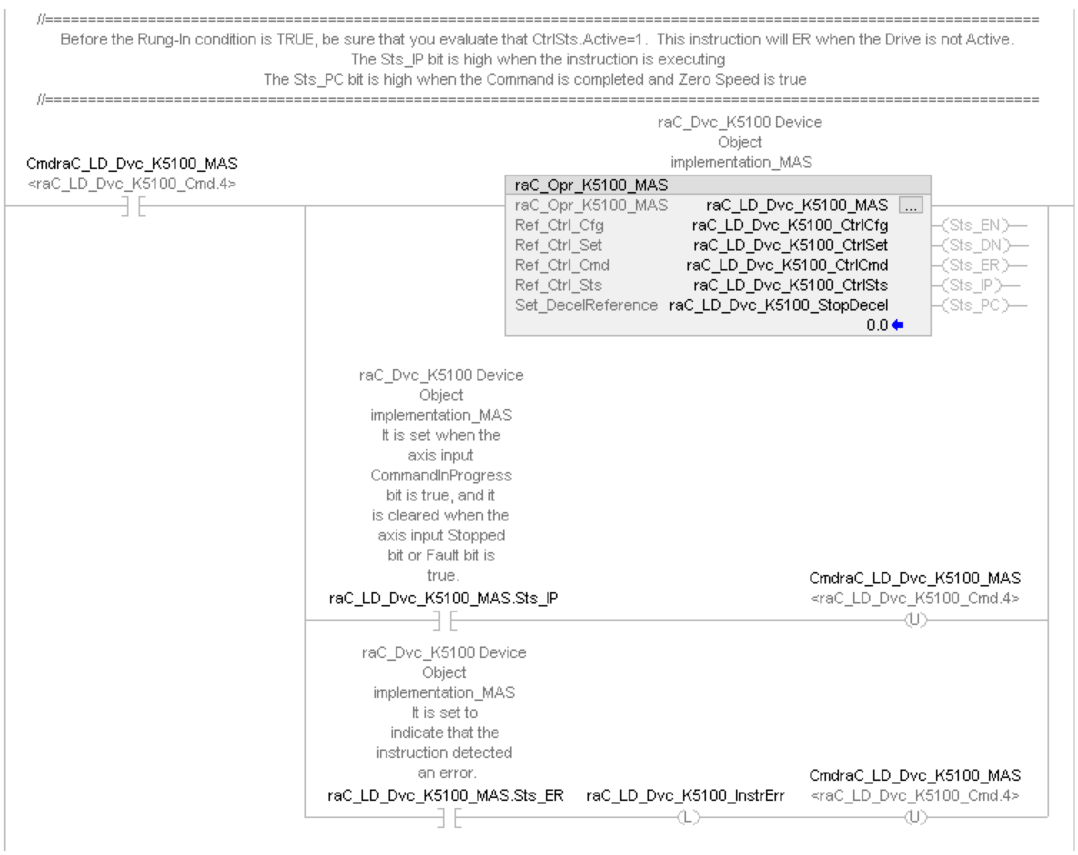


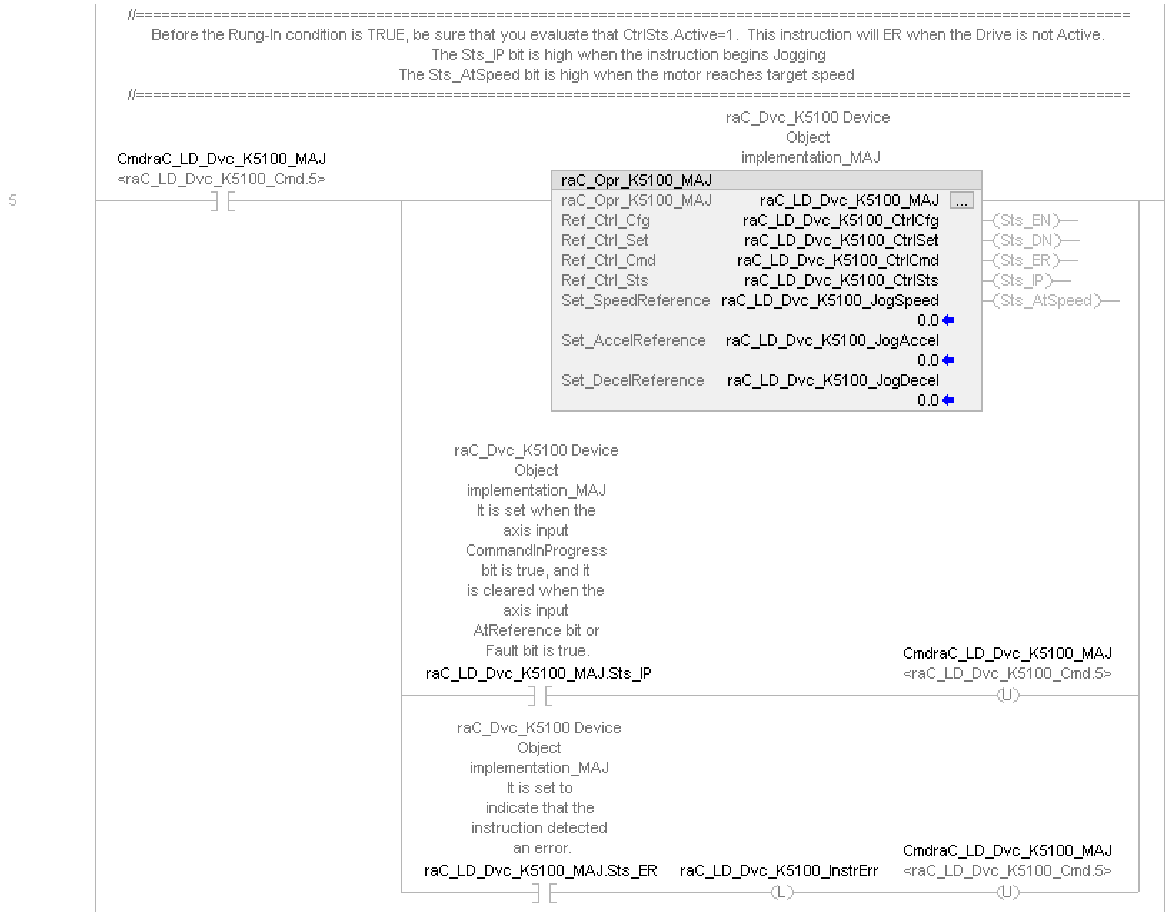



2
CmdraC_LD_Dvc_K5100_MAFR
<raC_LD_Dvc_K5100_Cmd.2>
raC_Dvc_K5100 Device Object implementation_MAFR
raC_Opr_K5100_MAFR
raC_Opr_K5100_MAFR raC_LD_Dvc_K5100_MAFR
Ref_Ctrl_Set raC_LD_Dvc_K5100_CtrlSet
Ref_Ctrl_Cmd raC_LD_Dvc_K5100_CtrlCmd
Ref_Ctrl_Sts raC_LD_Dvc_K5100_CtrlSts
Sts_EN
Sts_DN
Sts_ER
Device Interface - K5100 1 = A fault is active on the device.
raC_LD_Dvc_K5100_CtrlSts.Faulted
CmdraC_LD_Dvc_K5100_MAFR
<raC_LD_Dvc_K5100_Cmd.2>
U
raC_Dvc_K5100 Device Object implementation_MAFR It is set to indicate that the instruction detected an error.
raC_LD_Dvc_K5100_MAFR.Sts_ER
raC_LD_Dvc_K5100_InstrErr
L
CmdraC_LD_Dvc_K5100_MAFR
<raC_LD_Dvc_K5100_Cmd.2>
U

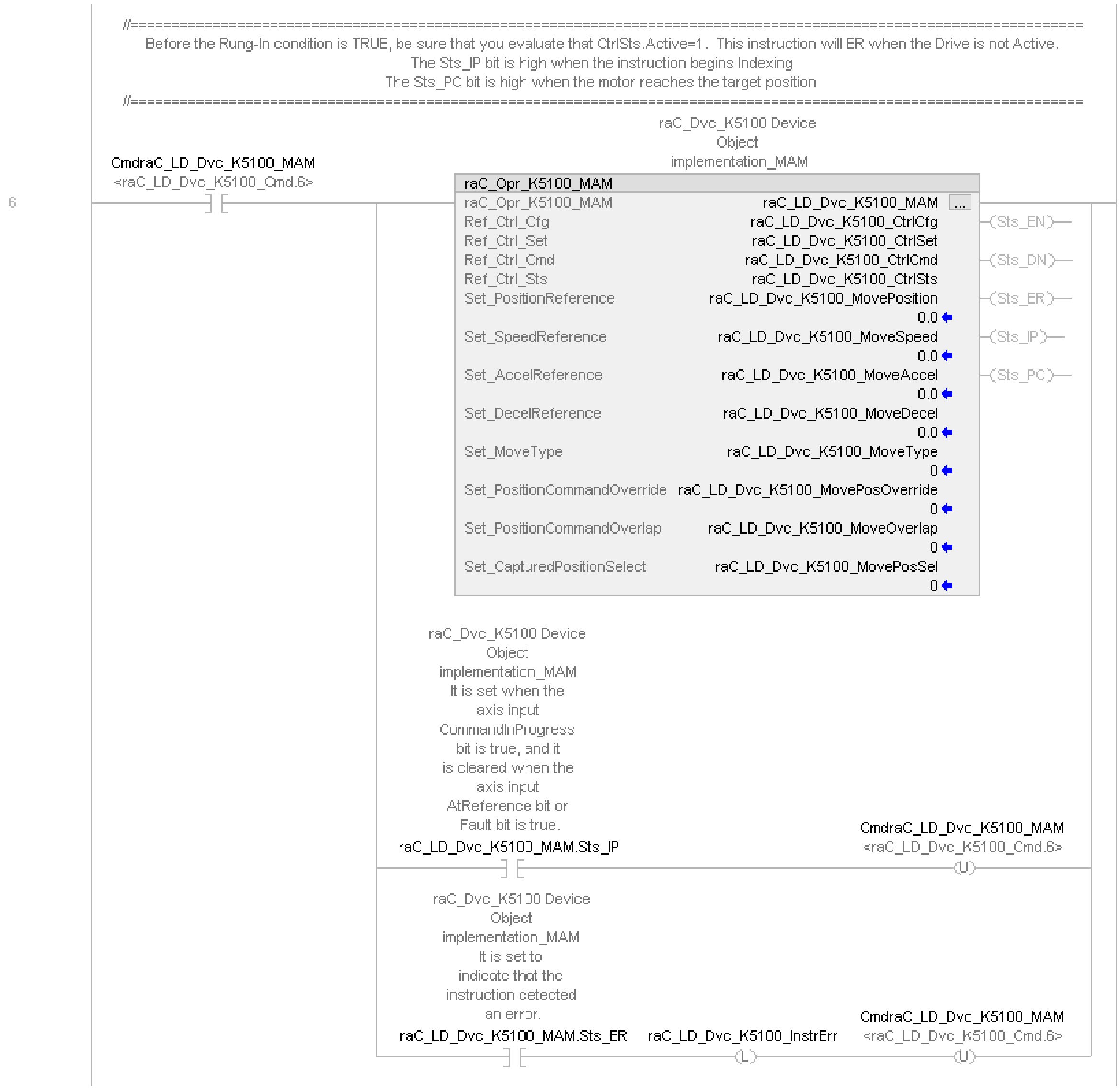

//===
Before the Rung-In condition is TRUE, be sure that you evaluate that CtrlSts.Active=1. This instruction will ER when the Drive is not Active.
//===
3
CmdraC_LD_Dvc_K5100_MAH
<raC_LD_Dvc_K5100_Cmd.3>
raC_Dvc_K5100 Device Object implementation_MAH
raC_Opr_K5100_MAH
raC_Opr_K5100_MAH raC_LD_Dvc_K5100_MAH
Ref_Ctrl_Cfg raC_LD_Dvc_K5100_CtrlCfg
Ref_Ctrl_Set raC_LD_Dvc_K5100_CtrlSet
Ref_Ctrl_Cmd raC_LD_Dvc_K5100_CtrlCmd
Ref_Ctrl_Sts raC_LD_Dvc_K5100_CtrlSts
Set_HomingMethod raC_LD_Dvc_K5100_HomeMethod 0
Set_PositionReference raC_LD_Dvc_K5100_HomePosition 0.0
Set_SpeedReference raC_LD_Dvc_K5100_HomeSpeed 0.0
Set_HomeReturnSpeed raC_LD_Dvc_K5100_HomeReturnSpeed 0.0
Set_AccelReference raC_LD_Dvc_K5100_HomeAccel 0.0
Set_DecelReference raC_LD_Dvc_K5100_HomeDecel 0.0
Sts_EN
Sts_DN
Sts_ER
Sts_IP
Sts_PC
raC_Dvc_K5100 Device Object implementation_MAH It is set when the axis input CommandInProgress bit is true, and it is cleared when the axis input HomedStatus bit or Fault bit is true.
raC_LD_Dvc_K5100_MAH.Sts_IP
CmdraC_LD_Dvc_K5100_MAH
<raC_LD_Dvc_K5100_Cmd.3>
U
raC_Dvc_K5100 Device Object implementation_MAH It is set to indicate that the instruction detected an error.
raC_LD_Dvc_K5100_MAH.Sts_ER
raC_LD_Dvc_K5100_InstrErr
L
CmdraC_LD_Dvc_K5100_MAH
<raC_LD_Dvc_K5100_Cmd.3>
U

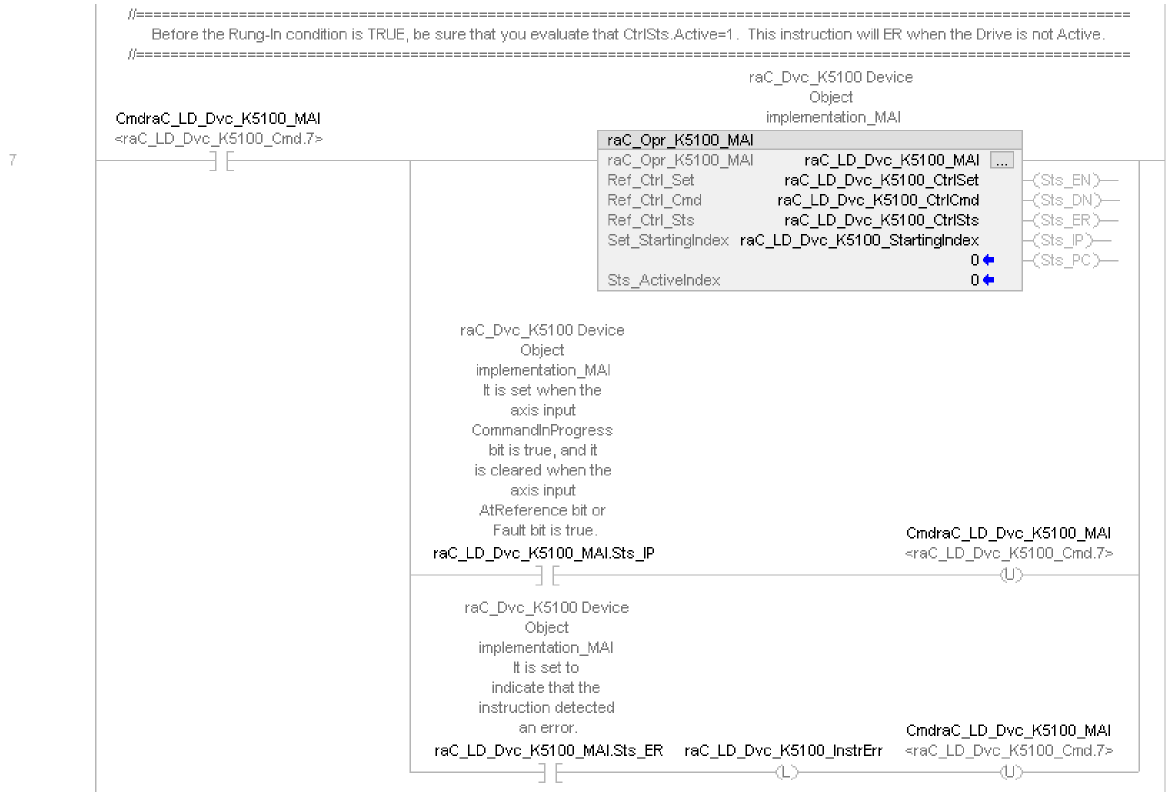

//===
Before the Rung-In condition is TRUE, be sure that you evaluate that CtrlSts.Active=1. This instruction will ER when the Drive is not Active.
The Sts_IP bit is high when the instruction is executing
The Sts_PC bit is high when the Command is completed and Zero Speed is true
//===
4
CmdraC_LD_Dvc_K5100_MAS
<raC_LD_Dvc_K5100_Cmd.4>
raC_Dvc_K5100 Device Object implementation_MAS
raC_Opr_K5100_MAS
raC_Opr_K5100_MAS raC_LD_Dvc_K5100_MAS
Ref_Ctrl_Cfg raC_LD_Dvc_K5100_CtrlCfg
Ref_Ctrl_Set raC_LD_Dvc_K5100_CtrlSet
Ref_Ctrl_Cmd raC_LD_Dvc_K5100_CtrlCmd
Ref_Ctrl_Sts raC_LD_Dvc_K5100_CtrlSts
Set_DecelReference raC_LD_Dvc_K5100_StopDecel
0.0
Sts_EN
Sts_DN
Sts_ER
Sts_IP
Sts_PC
raC_Dvc_K5100 Device Object implementation_MAS It is set when the axis input CommandInProgress bit is true, and it is cleared when the axis input Stopped bit or Fault bit is true.
raC_LD_Dvc_K5100_MAS.Sts_IP
CmdraC_LD_Dvc_K5100_MAS
<raC_LD_Dvc_K5100_Cmd.4>
U
raC_Dvc_K5100 Device Object implementation_MAS It is set to indicate that the instruction detected an error.
raC_LD_Dvc_K5100_MAS.Sts_ER
raC_LD_Dvc_K5100_InstrErr
L
CmdraC_LD_Dvc_K5100_MAS
<raC_LD_Dvc_K5100_Cmd.4>
U

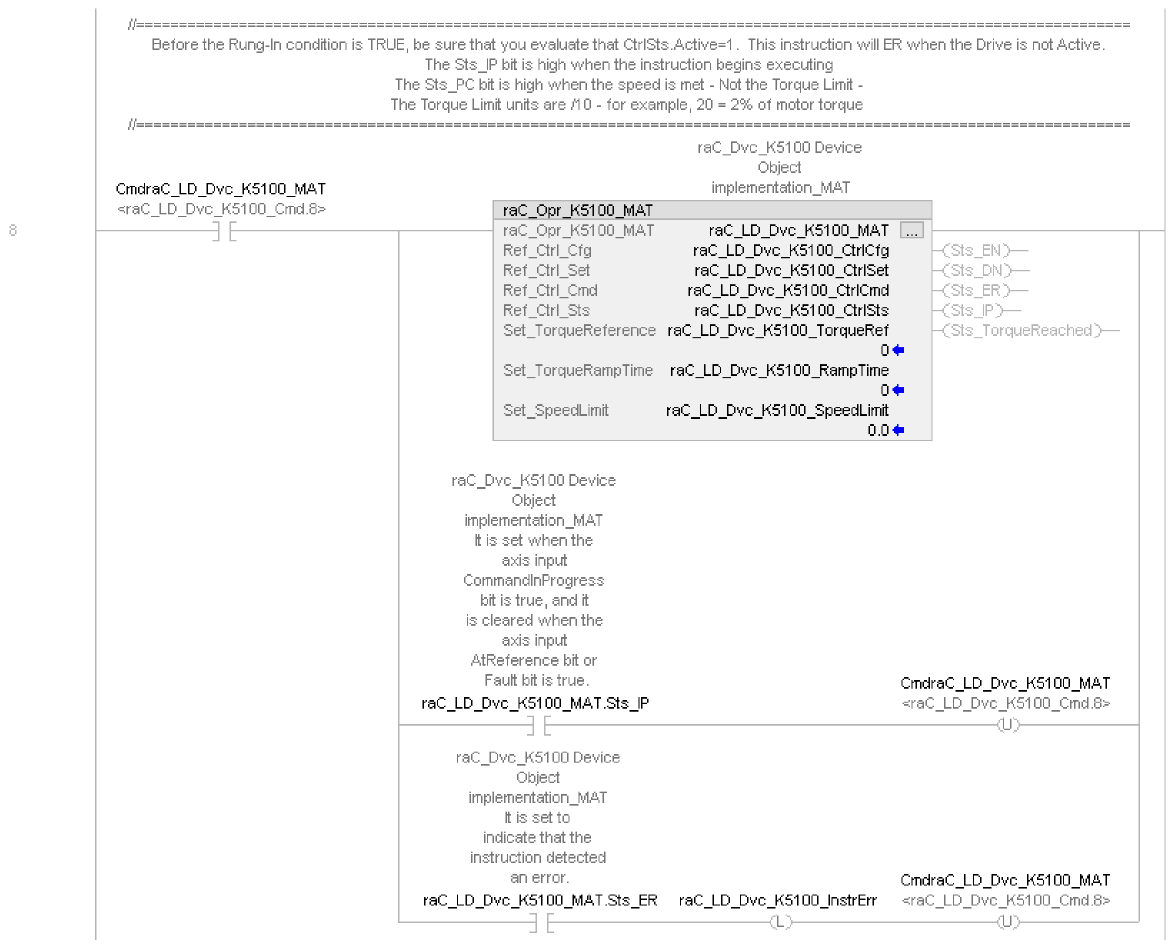

//===
Before the Rung-In condition is TRUE, be sure that you evaluate that CtrlSts.Active=1. This instruction will ER when the Drive is not Active.
The Sts_IP bit is high when the instruction is executing
The Sts_PC bit is high when the Command is completed and Zero Speed is true
//===
4
CmdraC_LD_Dvc_K5100_MAS
<raC_LD_Dvc_K5100_Cmd.4>
raC_Dvc_K5100 Device Object implementation_MAS
raC_Opr_K5100_MAS
raC_Opr_K5100_MAS raC_LD_Dvc_K5100_MAS
Ref_Ctrl_Cfg raC_LD_Dvc_K5100_CtrlCfg
Ref_Ctrl_Set raC_LD_Dvc_K5100_CtrlSet
Ref_Ctrl_Cmd raC_LD_Dvc_K5100_CtrlCmd
Ref_Ctrl_Sts raC_LD_Dvc_K5100_CtrlSts
Set_DecelReference raC_LD_Dvc_K5100_StopDecel
0.0
Sts_EN
Sts_DN
Sts_ER
Sts_IP
Sts_PC
raC_Dvc_K5100 Device Object implementation_MAS It is set when the axis input CommandInProgress bit is true, and it is cleared when the axis input Stopped bit or Fault bit is true.
raC_LD_Dvc_K5100_MAS.Sts_IP
CmdraC_LD_Dvc_K5100_MAS
<raC_LD_Dvc_K5100_Cmd.4>
U
raC_Dvc_K5100 Device Object implementation_MAS It is set to indicate that the instruction detected an error.
raC_LD_Dvc_K5100_MAS.Sts_ER
raC_LD_Dvc_K5100_InstrErr
L
CmdraC_LD_Dvc_K5100_MAS
<raC_LD_Dvc_K5100_Cmd.4>
U

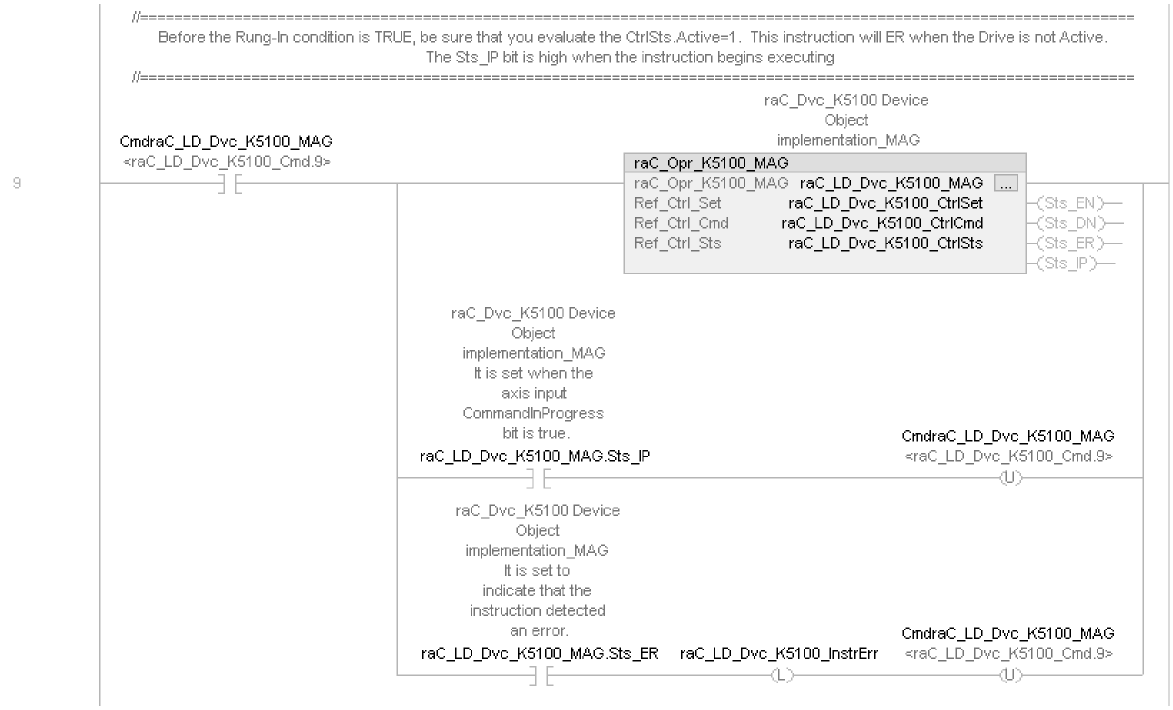


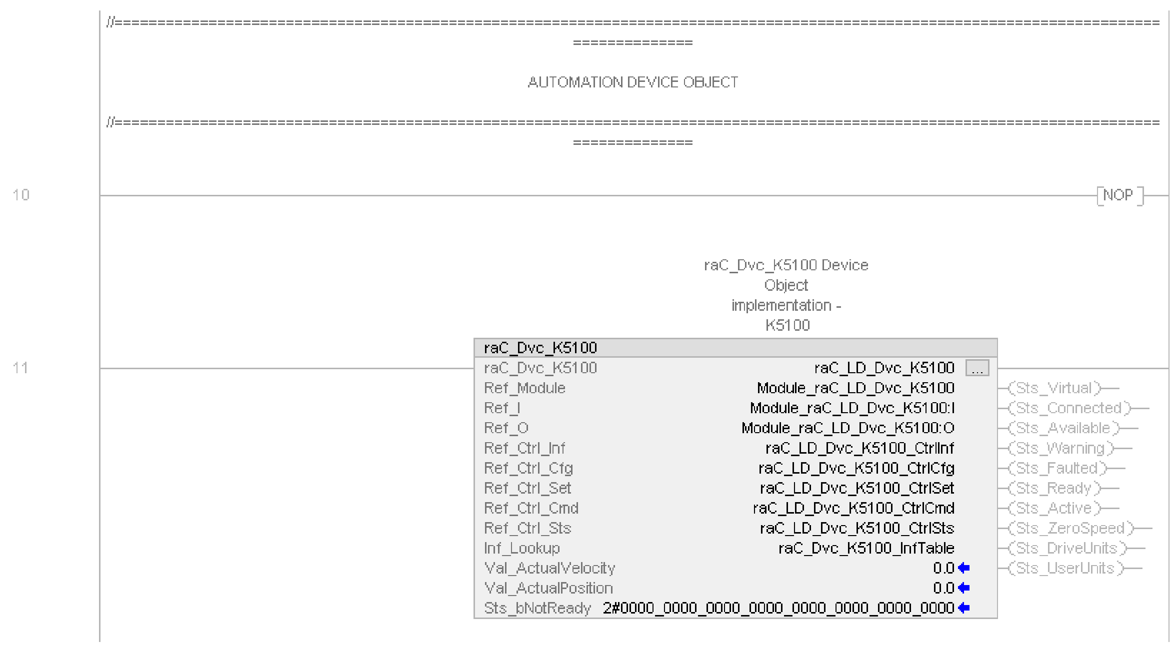
Before the Rung-In condition is TRUE, be sure that you evaluate that CtrlSts.Active=1. This instruction will ER when the Drive is not Active.
The Sts_IP bit is high when the instruction begins Jogging
The Sts_AtSpeed bit is high when the motor reaches target speed
5
CmdraC_LD_Dvc_K5100_MAJ
<raC_LD_Dvc_K5100_Cmd.5>
raC_Dvc_K5100 Device Object implementation_MAJ
raC_Opr_K5100_MAJ
raC_Opr_K5100_MAJ raC_LD_Dvc_K5100_MAJ
Ref_Ctrl_Cfg raC_LD_Dvc_K5100_CtrlCfg
Ref_Ctrl_Set raC_LD_Dvc_K5100_CtrlSet
Ref_Ctrl_Cmd raC_LD_Dvc_K5100_CtrlCmd
Ref_Ctrl_Sts raC_LD_Dvc_K5100_CtrlSts
Set_SpeedReference raC_LD_Dvc_K5100_JogSpeed 0.0
Set_AccelReference raC_LD_Dvc_K5100_JogAccel 0.0
Set_DecelReference raC_LD_Dvc_K5100_JogDecel 0.0
Sts_EN
Sts_DN
Sts_ER
Sts_IP
Sts_AtSpeed
raC_Dvc_K5100 Device Object implementation_MAJ It is set when the axis input CommandInProgress bit is true, and it is cleared when the axis input AtReference bit or Fault bit is true.
raC_LD_Dvc_K5100_MAJ.Sts_IP
CmdraC_LD_Dvc_K5100_MAJ
<raC_LD_Dvc_K5100_Cmd.5>
U
raC_Dvc_K5100 Device Object implementation_MAJ It is set to indicate that the instruction detected an error.
raC_LD_Dvc_K5100_MAJ.Sts_ER
raC_LD_Dvc_K5100_InstrErr
L
CmdraC_LD_Dvc_K5100_MAJ
<raC_LD_Dvc_K5100_Cmd.5>
U


//===
Before the Rung-In condition is TRUE, be sure that you evaluate that CtrlSts.Active=1. This instruction will ER when the Drive is not Active.
The Sts_IP bit is high when the instruction begins Indexing
The Sts_PC bit is high when the motor reaches the target position
//===
6
CmdraC_LD_Dvc_K5100_MAM
<raC_LD_Dvc_K5100_Cmd.6>
raC_Dvc_K5100 Device Object implementation_MAM
raC_Opr_K5100_MAM
raC_Opr_K5100_MAM raC_LD_Dvc_K5100_MAM
Ref_Ctrl_Cfg raC_LD_Dvc_K5100_CtrlCfg
Ref_Ctrl_Set raC_LD_Dvc_K5100_CtrlSet
Ref_Ctrl_Cmd raC_LD_Dvc_K5100_CtrlCmd
Ref_Ctrl_Sts raC_LD_Dvc_K5100_CtrlSts
Set_PositionReference raC_LD_Dvc_K5100_MovePosition 0.0
Set_SpeedReference raC_LD_Dvc_K5100_MoveSpeed 0.0
Set_AccelReference raC_LD_Dvc_K5100_MoveAccel 0.0
Set_DecelReference raC_LD_Dvc_K5100_MoveDecel 0.0
Set_MoveType raC_LD_Dvc_K5100_MoveType 0
Set_PositionCommandOverride raC_LD_Dvc_K5100_MovePosOverride 0
Set_PositionCommandOverlap raC_LD_Dvc_K5100_MoveOverlap 0
Set_CapturedPositionSelect raC_LD_Dvc_K5100_MovePosSel 0
Sts_EN
Sts_DN
Sts_ER
Sts_IP
Sts_PC
raC_Dvc_K5100 Device Object implementation_MAM It is set when the axis input CommandInProgress bit is true, and it is cleared when the axis input AtReference bit or Fault bit is true.
raC_LD_Dvc_K5100_MAM.Sts_IP
CmdraC_LD_Dvc_K5100_MAM
<raC_LD_Dvc_K5100_Cmd.6>
U
raC_Dvc_K5100 Device Object implementation_MAM It is set to indicate that the instruction detected an error.
raC_LD_Dvc_K5100_MAM.Sts_ER
raC_LD_Dvc_K5100_InstrErr
L
CmdraC_LD_Dvc_K5100_MAM
<raC_LD_Dvc_K5100_Cmd.6>
U


//==========
Before the Rung-In condition is TRUE, be sure that you evaluate that CtrlSts.Active=1. This instruction will ER when the Drive is not Active.
//==========
7
CmdraC_LD_Dvc_K5100_MAI
<raC_LD_Dvc_K5100_Cmd.7>
raC_Dvc_K5100 Device Object implementation_MAI
raC_Opr_K5100_MAI
raC_Opr_K5100_MAI raC_LD_Dvc_K5100_MAI
Ref_Ctrl_Set raC_LD_Dvc_K5100_CtrlSet
Ref_Ctrl_Cmd raC_LD_Dvc_K5100_CtrlCmd
Ref_Ctrl_Sts raC_LD_Dvc_K5100_CtrlSts
Set_StartingIndex raC_LD_Dvc_K5100_StartingIndex
0
Sts_ActiveIndex 0
Sts_EN
Sts_DN
Sts_ER
Sts_IP
Sts_PC
raC_Dvc_K5100 Device Object implementation_MAI It is set when the axis input CommandInProgress bit is true, and it is cleared when the axis input AtReference bit or Fault bit is true.
raC_LD_Dvc_K5100_MAI.Sts_IP
CmdraC_LD_Dvc_K5100_MAI
<raC_LD_Dvc_K5100_Cmd.7>
U
raC_Dvc_K5100 Device Object implementation_MAI It is set to indicate that the instruction detected an error.
raC_LD_Dvc_K5100_MAI.Sts_ER
raC_LD_Dvc_K5100_InstrErr
L
CmdraC_LD_Dvc_K5100_MAI
<raC_LD_Dvc_K5100_Cmd.7>
U


//==========
Before the Rung-In condition is TRUE, be sure that you evaluate that CtrlSts.Active=1. This instruction will ER when the Drive is not Active.
The Sts_IP bit is high when the instruction begins executing
The Sts_PC bit is high when the speed is met - Not the Torque Limit -
The Torque Limit units are /10 - for example, 20 = 2% of motor torque
//==========
8
CmdraC_LD_Dvc_K5100_MAT
<raC_LD_Dvc_K5100_Cmd.8>
raC_Dvc_K5100 Device Object implementation_MAT
raC_Opr_K5100_MAT
raC_Opr_K5100_MAT raC_LD_Dvc_K5100_MAT
Ref_Ctrl_Cfg raC_LD_Dvc_K5100_CtrlCfg
Ref_Ctrl_Set raC_LD_Dvc_K5100_CtrlSet
Ref_Ctrl_Cmd raC_LD_Dvc_K5100_CtrlCmd
Ref_Ctrl_Sts raC_LD_Dvc_K5100_CtrlSts
Set_TorqueReference raC_LD_Dvc_K5100_TorqueRef
0
Set_TorqueRampTime raC_LD_Dvc_K5100_RampTime
0
Set_SpeedLimit raC_LD_Dvc_K5100_SpeedLimit
0.0
Sts_EN
Sts_DN
Sts_ER
Sts_IP
Sts_TorqueReached
raC_Dvc_K5100 Device Object implementation_MAT It is set when the axis input CommandInProgress bit is true, and it is cleared when the axis input AtReference bit or Fault bit is true.
raC_LD_Dvc_K5100_MAT.Sts_IP
CmdraC_LD_Dvc_K5100_MAT
<raC_LD_Dvc_K5100_Cmd.8>
U
raC_Dvc_K5100 Device Object implementation_MAT It is set to indicate that the instruction detected an error.
raC_LD_Dvc_K5100_MAT.Sts_ER
raC_LD_Dvc_K5100_InstrErr
L
CmdraC_LD_Dvc_K5100_MAT
<raC_LD_Dvc_K5100_Cmd.8>
U





Common Error Codes

The Add-On Instructions use common error codes as much as possible.

Error	Description	Instruction Name									
		MSO	MSF	MAFR	MAS	MAJ	MAT	MAI	MAM	MAH	MAG
100	Drive is not ready	X	X	X	X	X	X	X	X	X	X
101	Drive is faulted	X	X	X	X	X	X	X	X	X	X
102	raC_Opr_K5100_MSO is executing	X									
103	raC_Opr_K5100_MSF is executing	X			X	X	X	X	X	X	X
104	Another raC_Opr_K5100_MSF is executing		X								
105	Drive is disabled				X	X	X	X	X	X	X
106	Another raC_Opr_K5100_MAFR message is executing			X							
107	raC_Opr_K5100_MAS is executing				X	X	X	X	X	X	X
108	Another RA motion Add-On Instructions is sending the command.					X	X	X	X	X	X
111	SpeedReference is out of range					X			X	X	
112	AccelReference is out of range					X			X	X	X
113	DecelReference is out of range				X	X			X	X	
115	StartingIndex is higher than 99							X			
116	Torque is out of range						X				
117	NonCyclicMoveType is higher than 3								X		
118	CyclicMoveType is higher than 2								X		
119	TravelMode is not either 2 or 10								X		
122	HomingMethod is out of range									X	
125	TorqueRampTime is out of range						X				
126	Homing is not completed								X		
127	Previous command has not completed				X	X	X	X	X	X	X
129	Motor is not connected	X	X	X	X	X	X	X	X	X	X
131	Gear slave counts is out of range										X
132	Gear master count is out of range										X
133	Gear ratio is out of range										X
140	Operation is not supported when device is virtual				X	X	X	X	X	X	X
141	Motor type not supported (Linear)				X	X	X	X	X	X	X

Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. Alternatively, faceplates may also be launch from related instructions such as the navigate to device faceplate buttons in the Machine Builder Library raM_Motor_CD or raM_Conveyor_CD faceplates.

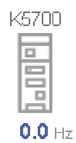
All icons display the following information:

- - Device label (Tag.@Description or custom label entered in parameter #104)
- - Motor Speed (Hz) or Position - selectable using global parameter #105

- - Connection Fault/Virtual Indication
- - Device Warning/Fault Indication
- - Device not ready indication
- - Device Active (running)/Inactive (stopped) indication

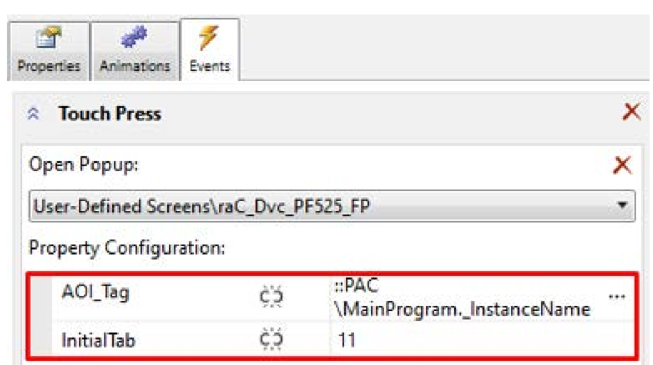
See Launch Buttons for more general information on launch button diagnostics and usage.

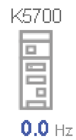
FactoryTalk® View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GOLaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate.	#102: Backing Tag (e.g. {::[PAC]Program::Program._InstanceName}) #104: Custom button label. Leave blank to use Tag.@Description #105: Button value display; 0=Velocity; 1=Position #120: Display's left position (e.g. 100, optional) #121: Display's top position (e.g. 100, optional)
GO_LaunchKinetix_TagString		Use with Kinetix 350/5100/5300/5500/5700/6500 Motion Drives Motor Speed (Hz) or Position selectable Shown as live value.	

Studio 5000 View Designer® Graphic Symbols

All Studio 5000 View Designer® graphic symbols must be configured with an *Event* to open up the appropriate Popup screen. Select the graphic symbol and in the *Properties* window navigate to the *Events* tab. Assign a *Button Behavior* event to *Open popup on release*. Assign the required Popup screen (e.g. User-Defined Screens\raC_Dvc_K5100_FP). The required *Property Configurations* are found in the following table where you may assign the *AOI_Tag* to the object's Add-On Instruction tag.



Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		Faceplate navigation button with string tag label. Use Properties > General > Text to modify the button label text.	AOI_Tag: Object's Add-On Instruction Tag
GO_LaunchKinetix_TagString		Use with Kinetix 350/5100/5300/5500/5700/6500 Motion Drives Motor Speed (Hz) or Position selectable Shown as live value.	

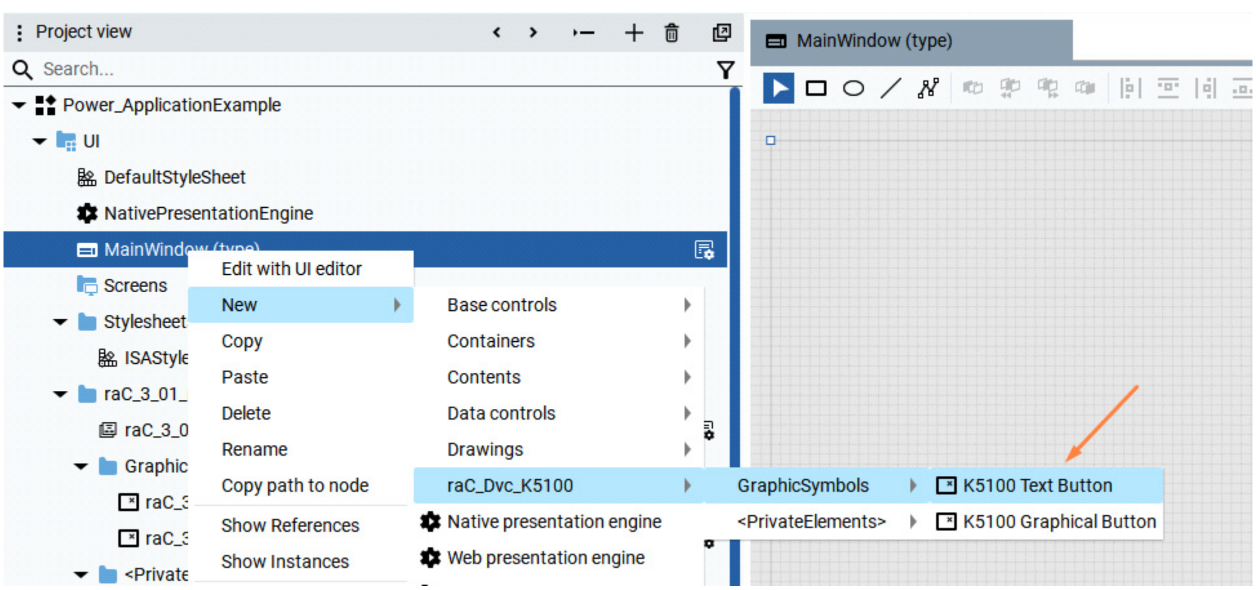
FactoryTalk® Optix Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. All graphical symbols for Power Devices display the following information:

- - Device label (Tag.@Description or custom label)
- - Position
- - Connection Fault/Virtual Indication
- - Device Warning/Fault Indication
- - Device not ready indication
- - Device Active (running)/Inactive (stopped) indication

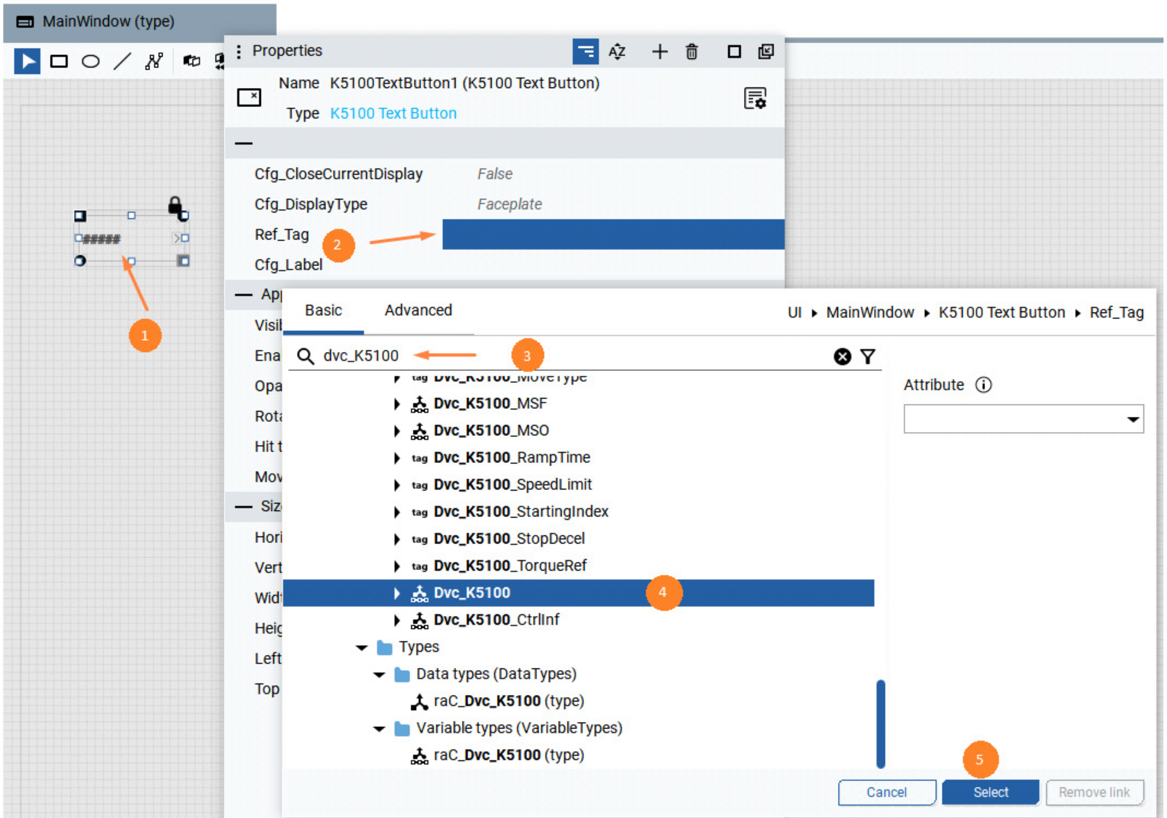
See Basic Launch Button Attributes section for more general information on launch button diagnostics and usage.

Once the Objects have been imported into the FactoryTalk® Optix Studio project, you can begin using them in your application. To add a new Launch Button to a Main window, navigate to raC_3_xx_raC_Dvc_ObjectName_UI > Graphic Symbols > raC_3_xx_raC_Dvc_ObjectName_GS_NavText Button to insert a navigation launch button with a text label.

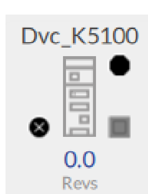


After placing the graphic symbol on a UI panel, link the “Ref_Tag” property to the targeted Asset under Asset tag.

Text label shown on button can be configured using “cfg_Label” property, If it is not configured then description of the asset will be shown on the button face.



This is the only step needed to link the UI to the asset data model. For more information on graphic symbols, refer to the Graphic Symbols section of the Kinetix 5100 device type in this manual.

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
raC_3_xx_raC_Dvc_Devicename_GS_NavText		Faceplate navigation button. Use Cfg_Label Variable to modify the button label text.	Cfg_CloseCurrentDisplay: Set to ‘True’ to close the previously open display when launching the object faceplate Cfg_DisplayType: Faceplate to be opened on button click. This should not be modified. Ref_Tag: Object’s Add-On Instruction Tag Cfg_Label: Text label shown on the button face
raC_3_xx_raC_Dvc_Devicename_GS_NavGraphical		Use with Kinetix 350/5100/5300/5500/5700/6500 Motion Drives	

Graphic Symbol Button Configuration Variables

Variable Name	Description	Default Value
Cfg_CloseCurrentDisplay	Set to 'True' to close the previously open display when launching the object faceplate	False
Cfg_DisplayType	Faceplate to be opened on button click. This should not be modified.	Faceplate
Ref_Tag	Link to instance of desired target Asset model found in Model > Asset folder.	N/A - User must configure
Cfg_Label	Text label shown on the button face. Defaults to the description of the asset but users may replace in instances with other desired text.	../Ref_Tag@Description

Faceplates

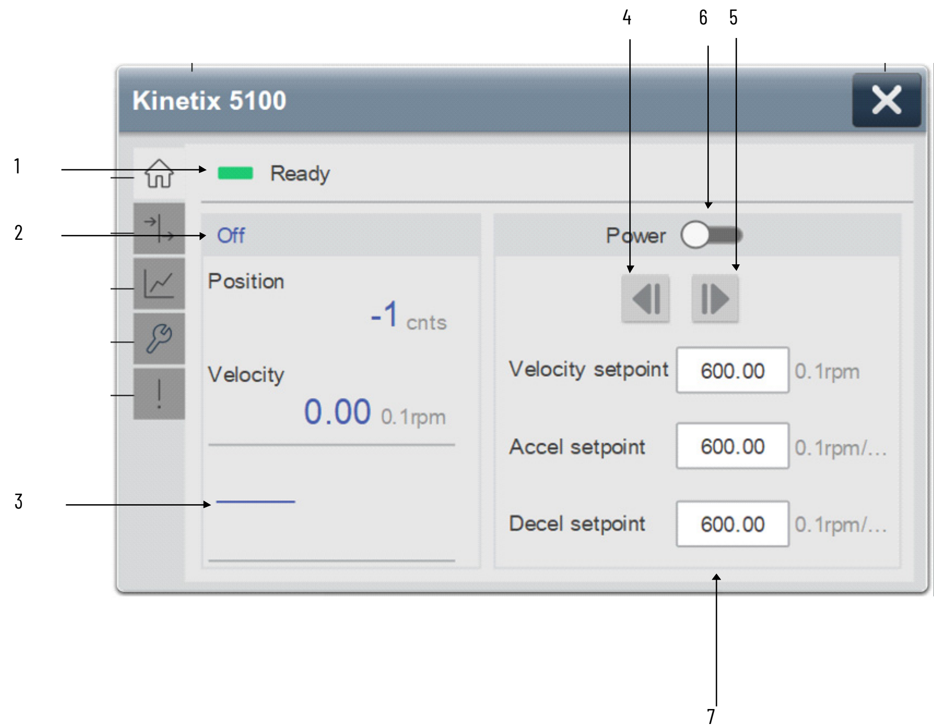
There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 28.

Home

The Home screen is visible when the Home tab button is selected in the tab control object on the left side of the screen.

The Home screen is the main screen for the faceplate. It contains a Power Group switch object, Group direction indication object, small trends called spark, Position and velocity indication, Jog control object and Velocity, Accel, Decel Set point.

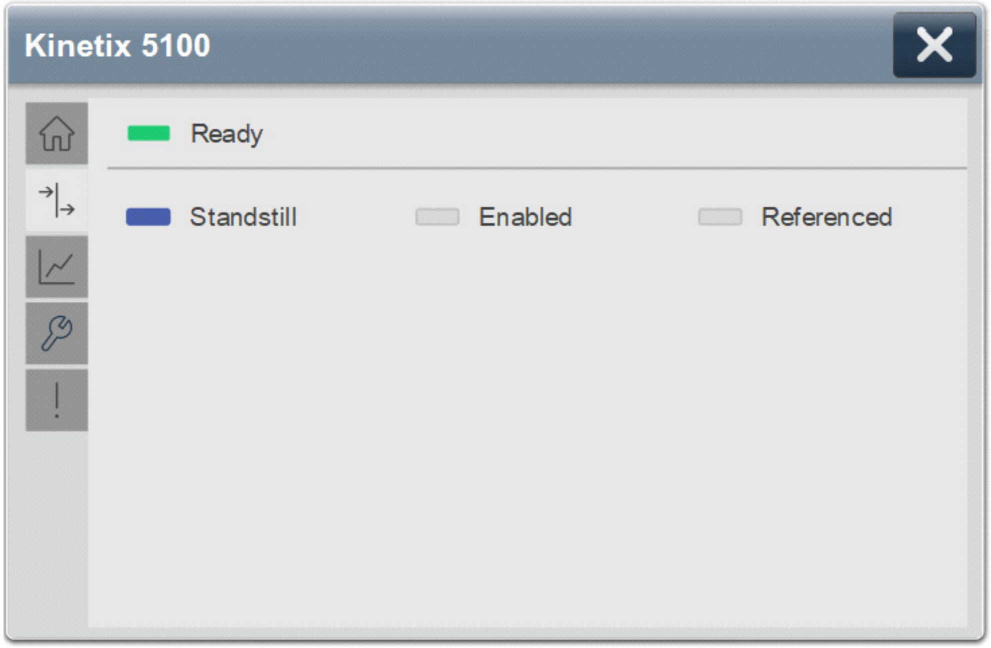
On the top left is a speed multi-state indicator that changes text based on the device state. Other text for state changes include, "Forward", "Reverse", "Zero Speed", and "Off". The Position and Velocity feedback is a large blue numeric display that is read-only. Below the numeric display is a Spark line to display velocity. Here are two push buttons and one toggle button to the right of the display for Power on/off and Jog forward and reverse. Below that three numeric input for the user to set the Jog set point, Accel set point and Decel set point



Item	Description
1	Banner
2	Device Action Forward/Reverse/Off
3	Velocity sparkline trend
4	Jog reverse
5	Jog forward
6	Toggle button for Power ON/OFF
7	Velocity (/sec), Accel (sec) and Decel (sec) setpoints

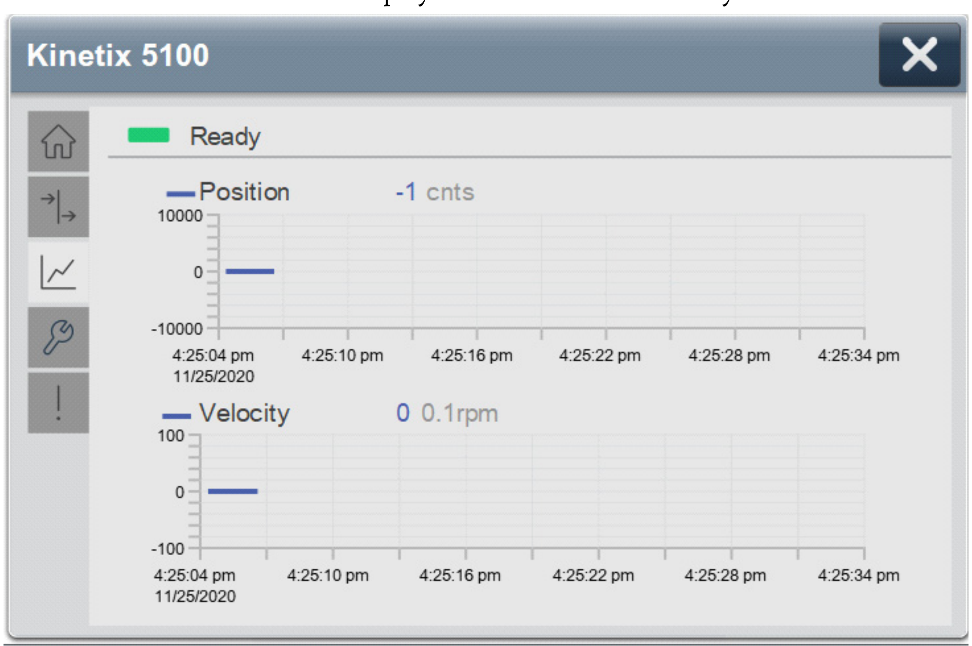
I/O Tab

The I/O tab shows the ON/OFF status of the device's I/O including Standstill, Referenced, and Enabled. LED shows no color when they are in the OFF position and shows blue when they are in the ON position.



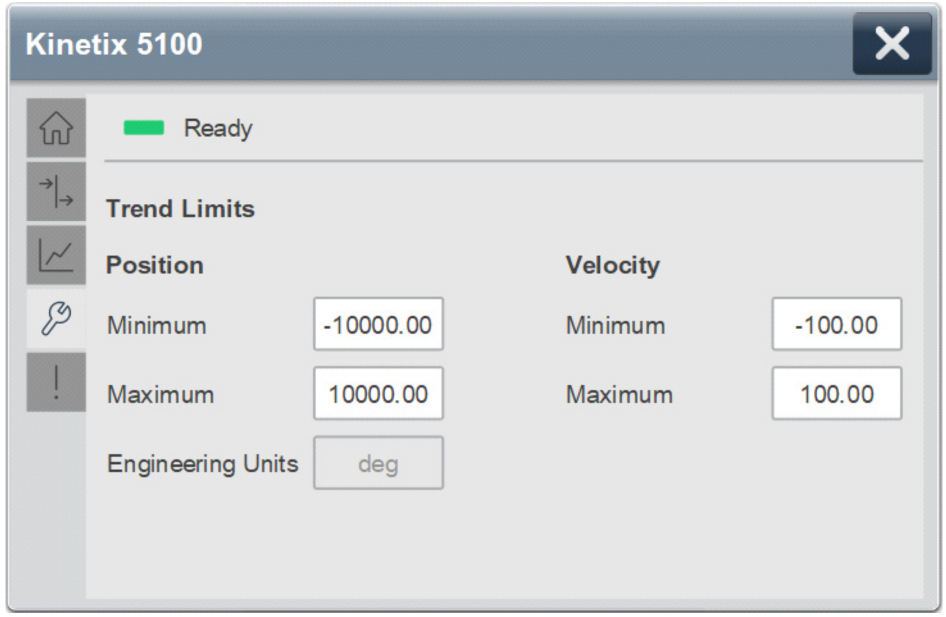
Trend Tab

Trends display values over time, often used to compare similar or related values and to allow operators to predict future states to make control action decisions. Two trends are displayed - Position and Velocity.



Configure Tab

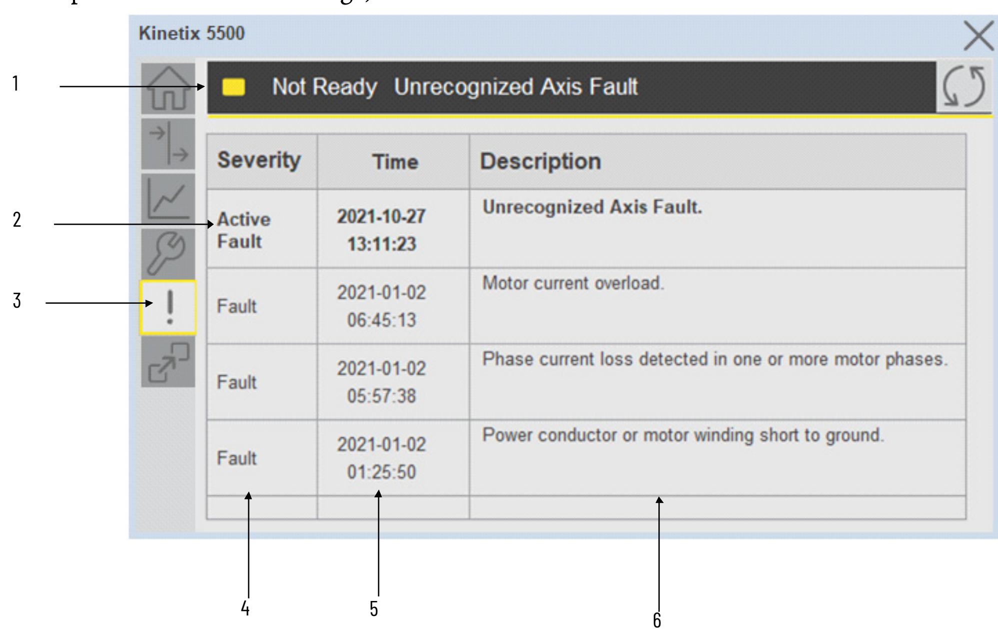
The Configure tab contains configuration elements that a maintenance technician would need to troubleshoot and adjust for an object on another tab, i.e., numeric inputs to adjust trend min and max values.



Fault Warning Tab

The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

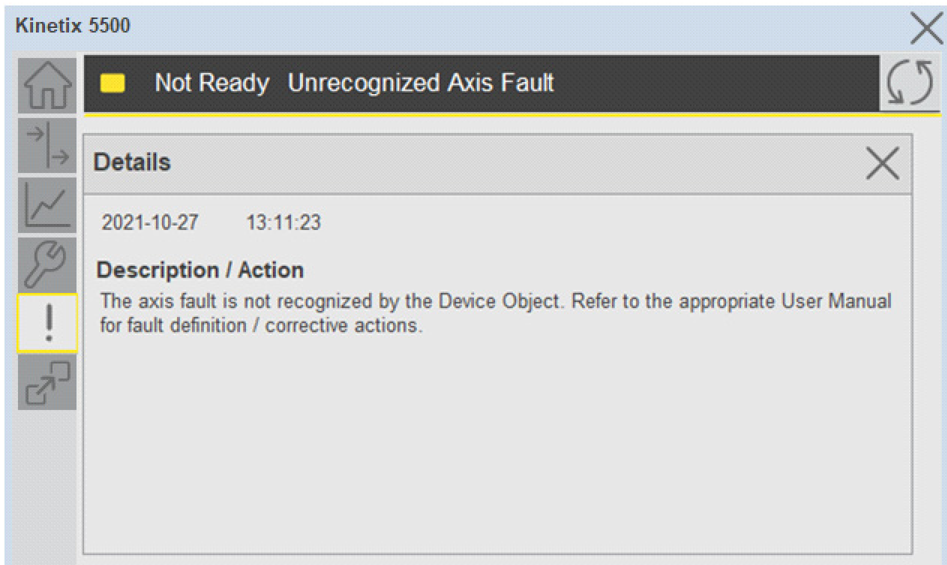
Note, only row 1 will display the "Active Fault" in the severity column if there is a current active fault, else it will display the last fault. Rows 2-4 only display past faults and warnings, not an active fault.



8

Item	Description
1	Banner
2	Last fault is in first row and show in bold if active
3	Yellow border visible when a fault is active
4	Fault severity
5	Fault event time
6	4 most recent fault/warning event messages

Click on any row in the fault table to view fault details. The details window provides a more detailed description and possible action steps to remedy condition.



Application Code Manager

This section explains the use of the Kinetix® 5100 device object and associated move instructions in Studio 5000® Application Code Manager.

Refer to the section Using Application Code Manager for complete details.

Definition Object: raC_Dvc_K5100

This object contains the Add-On Instruction definition and used as linked library to implement object. This gives flexibility to choose to instantiate only definition and create custom implement code. User may also create their own implement library and link with this definition library object.

Implementation Object: raC_LD_Dvc_K5100

Parameter Name	Default Value	Instance Name	Definition	Description
RoutineName	{ObjectName}	{RoutineName}	Routine	Enter Routine name. Routine will be created and Object implement rung(s) inserted. A JSR will be inserted in MainRoutine. If routine name already exists, then object will be inserted into existing routine. By default, parameter is set to Object Name.
TagName	{ObjectName}	{TagName}	Backing Tag	Enter the backing tag of the main AOI. This will serve as the base tag name for other tags in this object that are derived from the base.
TagDescription	{ObjectDescription}	{TagDescription}		Tag Description of the main AOI backing tag
TagScope	Program		Input Parameter	Tags will be created at the assigned scope
ModuleName	Mod_{ObjectName}	{ModuleName}	Input Parameter	Enter the Module Name. This is the name for the module that appears in the Controller Organizer tree.
IncludeMAM	1			Select this parameter to include Move (MAM) operation
IncludeMAI	1			Select this parameter to include Index (MAI) operation
IncludeMAT	1			Select this parameter to include Torque (MAT) operation
IncludeMAG	1			Select this parameter to include Gear (MAG) operation
IncludeHardware	1			Allow ACM to create the Hardware Module. If the module already exists in the Controller Organizer, select False or existing module properties will be overwritten.
ModuleType	2198-E1004-ERS/A			Select hardware module type
IPAddress	192.168.1.0			Enter a valid network address for the hardware module. It must be of form X.X.X.X
ChassisName	Local			Warning Removal
ParentModule	{ChassisName}			Enter Communication adapter name from Controller Organizer that this module resides under. If it resides directly under controller, enter "Local".
SymbolStyle	Icon			HMI launch button symbol style. Icon/Text
SEAssocDisplay			HMI Display	FactoryTalk View SE Display reference. Launch button will be generated on this display.
MEAssocDisplay			HMI Display	FactoryTalk View ME Display reference. Launch button will be generated on this display.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_K5100	raC_Dvc_K5100	3	(RA-LIB) Device	Kinetix5100
raC_Opr_K5100_MSO	raC_Opr_K5100_MSO	3	(RA-LIB) Device	Kinetix5100
raC_Opr_K5100_MSF	raC_Opr_K5100_MSF	3	(RA-LIB) Device	Kinetix5100
raC_Opr_K5100_MAFR	raC_Opr_K5100_MAFR	3	(RA-LIB) Device	Kinetix5100
raC_Opr_K5100_MAH	raC_Opr_K5100_MAH	3	(RA-LIB) Device	Kinetix5100

raC_Opr_K5100_MAS	raC_Opr_K5100_MAS	3	(RA-LIB) Device	Kinetix5100
raC_Opr_K5100_MAJ	raC_Opr_K5100_MAJ	3	(RA-LIB) Device	Kinetix5100
raC_Opr_K5100_MAM	raC_Opr_K5100_MAM	3	(RA-LIB) Device	Kinetix5100
raC_Opr_K5100_MAI	raC_Opr_K5100_MAI	3	(RA-LIB) Device	Kinetix5100
raC_Opr_K5100_MAT	raC_Opr_K5100_MAT	3	(RA-LIB) Device	Kinetix5100
raC_Opr_K5100_MAG	raC_Opr_K5100_MAG	3	(RA-LIB) Device	Kinetix5100

Configured HMI Content

HMI Content	Instance Name	Description
Launch Button	{ObjectName}_GO_LaunchFP	Global Object configured callout instance

Output Interface

Output Interface	Linked Library	Revision
raC_Itf_Kinetix5100_SA	raC_Dvc_K5100	1.0

raC_Itf_Kinetix5100

Member Name	Description
PrgName	Program Name
TagName	Tag Name
ModuleName	Module Name
TagScope	Tag Scope

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_PowerMotion	View Designer	(raC-3_xx-VD) raC_Dvc_PowerMotion.vpd	{ProjectName}\Visualization\FTViewSE\GlobalObjects
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - Power Device.ggfx	{ProjectName}\Visualization\FTViewME\GlobalObjects
V3_raC_Dvc_Global	Toolbox ME	(raC-3-ME) Toolbox - Power Device.ggfx	{ProjectName}\Visualization\FTViewSE\GlobalObjects
V3_raC_Dvc_K5100	Faceplate ME	(raC-3_xx-ME) raC_Dvc_K5100-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\GlobalObjects
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - Power Device.ggfx	{ProjectName}\Visualization\FTViewSE\Displays
V3_raC_Dvc_Global	Toolbox SE	(raC-3-SE) Toolbox - Power Device.ggfx	{ProjectName}\Visualization\FTViewME\Displays
V3_raC_Dvc_K5100	Faceplate SE	(raC-3_xx-SE) raC_Dvc_K5100-Faceplate.gfx	{ProjectName}\Visualization\ViewDesigner
V3_Power_Manual	Reference Manual	DEVICE-RM100x-EN-P.pdf	{ProjectName}\Documentation
V3_Power_Images	HMI Image Set	Power_Images.zip	{ProjectName}\Visualization\Images

PowerMonitor™ Objects (raC_Dvc_PM500, raC_Dvc_PM1000, raC_Dvc_PM5000)

Overview

The PowerMonitor device objects are a group of objects that include the PowerMonitor™ 500, 1000, and 5000 (raC_Dvc_PM500, raC_Dvc_PM1000, raC_Dvc_PM5000).

In the Library there is a folder named *Videos* which contains many How-To and Operational Overview Videos which walk step-by-step through each process. You can refer to the following videos for this section:
"Operational_Overview_of_PowerMonitor_Device_Object_Faceplates"

Supported devices include:

Device	Object Name
PM500	raC_Dvc_PM500
PM1000	raC_Dvc_PM1000
PM5000	raC_Dvc_PM5000

Functional Description

The PowerMonitor™ is a compact, cost-effective, electric power, and energy metering device intended for use in industrial control applications, such as distribution centers, industrial control panels, and motor control centers. It measures Voltage and Current in an electrical circuit, meeting revenue accuracy standards. The PowerMonitor™ converts instantaneous Voltage and Current values to digital values and uses the resulting digital values in calculations of Voltage, Current, power, and energy.

The PowerMonitor™ 500/1000/5000 pre-configured Device Objects provide the following benefits:

- Detailed calculations of Voltage, Current, Power, Energy and Frequency
- Text based status and diagnostics
- Common Control Interfaces maximizing Flexible Device Selection & Application Code Reuse

All these features provide quick feedback, shorten recovery time, and simplify implementation.

Required Files

Device Objects include Add-On Instructions (AOIs) and HMI faceplates. The revision number (e.g. 3.01) used in filenames can change as new revisions are created.

Controller Files

Add-On Instructions are reusable code objects that contain encapsulated logic that can streamline implementing your system. This lets you create your own instruction set for programming logic as a supplement to the instruction set provided natively in the ControlLogix® firmware. An Add-On Instruction is defined once in each controller project, and can be instantiated multiple times in your application code as needed.

The Add-On Instruction must be imported into the controller project to be used in the controller configuration. These can be imported as Add-On Instruction files, or as part of the Rung Import or Import Library Objects wizard.

All Add-On Instruction and Rung Import files can be found in the */Studio 5000 Logix Designer Files - L5X/Standard Files/* folder in the library.

Device/Item	Application	Add-On Instruction	Rung Import
PM500	Standard	raC_Dvc_PM500_3.04_AOI.L5X	raC_Dvc_PM500_3.04_RUNG.L5X
PM1000	Standard	raC_Dvc_PM1000_3.04_AOI.L5X	raC_Dvc_PM1000_3.04_RUNG.L5X
PM5000	Standard	raC_Dvc_PM5000_3.05_AOI.L5X	raC_Dvc_PM5000_3.05_RUNG.L5X

FactoryTalk® View HMI Files

FactoryTalk® View ME or SE applications require importing the desired device faceplates in addition to all Global Object (ggfx) files and all images located in the */HMI FactoryTalk® View Images - png/* folder of the library. FactoryTalk® View ME files are stored in the */HMI - FactoryTalk® View ME/* library folder and FactoryTalk® View SE files are stored in the */HMI - FactoryTalk® View SE/* library folder.

Device/Item	Type	FactoryTalk® View ME Faceplate	FactoryTalk® View SE Faceplate
PM500	Display	(raC-3_01-ME) raC_Dvc_PM500-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_PM500-Faceplate.gfx
PM1000	Display	(raC-3_01-ME) raC_Dvc_PM1000-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_PM1000-Faceplate.gfx
PM5000	Display	(raC-3_04-ME) raC_Dvc_PM5000-Faceplate.gfx	(raC-3_04-SE) raC_Dvc_PM5000-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - Power Device	(raC-3-SE) Graphic Symbols - Power Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - Power Device.ggfx	(raC-3-SE) Toolbox - Power Device.ggfx

Studio 5000 View Designer® HMI Files

All Studio 5000 View Designer® Files can be found in the */HMI - ViewDesigner - vpd/* folder of the library.

Device/Item	Studio 5000 View Designer® Faceplate
PM500	(raC-3_04-VD) raC_Dvc_PowerMonitor.vpd
PM1000	
PM5000	

FactoryTalk® Optix Library Files

FactoryTalk® View Optix applications require importing the desired library objects located in the PowerDevice_v3R library folder.

Device/Item	FactoryTalk® Optix Library Object
PM500	raC_3_01_raC_Dvc_PM500_UI
PM1000	raC_3_01_raC_Dvc_PM1000_UI
PM5000	raC_3_04_raC_Dvc_PM5000_UI

Studio 5000® Application Code Manager Files

Studio 5000® Application Code Manager (ACM) can be optionally used if it is installed. All devices can be easily registered in the ACM repositories by running the *setup.cmd* file located in the root folder of the library.

Individual HSL4 files are provided as an alternative to running the setup.cmd to allow users to manually register specific implementation objects. Each object has two files - an Asset Control file and a Device file. The Asset Control files include attachments of all required files for that object. The Device files are used to actually add that device into a Studio 5000® project and these reference the Asset Control files.

All Studio 5000® Application Code Manager files can be found in the /*ApplicationCodeManagerLibraries*/ folder of the library. The files included are as follows:

Implementation Object	Asset Control File (.HSL4)	Device File (.HSL4)
PM500	(RA-LIB)_Device_Asset-Control_PowerMonitor_raC_Dvc_PM500_(3.4)	(RA-LIB)_Device_Device_PowerMonitor_raC_LD_Dvc_PM500_(3.3)
PM1000	(RA-LIB)_Device_Asset-Control_PowerMonitor_raC_Dvc_PM1000_(3.4)	(RA-LIB)_Device_Device_PowerMonitor_raC_LD_Dvc_PM1000_(3.3)
PM5000	(RA-LIB)_Device_Asset-Control_PowerMonitor_raC_Dvc_PM5000_(3.5)	(RA-LIB)_Device_Device_PowerMonitor_raC_LD_Dvc_PM5000_(3.4)

Device Definition

PowerMonitor™ devices do not require specific device definition configuration to work with the Power Motion add-on instructions. However, using Application Code Manager or the Studio 5000® Import Library Objects Wizard you can easily import hardware modules into an application.

Note module import can be completed automatically when using Application Code Manager or the Studio 5000® Import Library Objects wizard plug-in.

Operations

The PowerMonitor™ objects provide a single mode of operation - physical device operation. At this time there is no virtual mode and there are no commands or device configurations available from the instruction or faceplate.

Faults & Warnings

- **First Warning:** This function helps in capturing the first warning triggered in the device. Display the respective description in faceplate.
- **First Fault:** Capture the first fault from device. Display the respective description in faceplate.
- **Event log:** Log Warning and Fault the last 4 events in a log queue. The queue contains fault code, description, and time stamp. Display the same in faceplate.

Execution

The following table explains the handling of instruction execution conditions.

Condition	Description
EnableIn False (false rung)	Processing for EnableIn False (false rung) is handled the same as if the device were taken out of service by Command. The device outputs are de-energized and the device is shown as Program Out of Service on the HMI. All alarms are cleared.
Powerup (prescan, first scan)	On prescan, any commands that are received before first scan are discarded. The device is de-energized. On first scan, the device is treated as if it were returning from Hand command source: the instruction state is set based on the position feedback that is received from the device. If the feedback is valid for one position, the device is set to that position. If the device does not have position feedback or the position feedback is invalid, the device is set to the 'unknown/powerup' state. The command source is set to its default, either Operator or Program (unlocked).
Postscan	No SFC Postscan logic is provided.

Add-On Instruction I/O Data

InOut Data

InOut	Function / Description	DataType
Ref_Module	Reference to module in I/O tree	MODULE
Ref_Ctrl_Cmd	PowerMonitor™ Device Command Interface	raC_UDT_ItfAD_PwrMonitor_Cmd
Ref_Ctrl_Set	PowerMonitor™ Device Setting Interface	raC_UDT_ItfAD_PwrMonitor_Set
Ref_Ctrl_Sts	PowerMonitor™ Device Status Interface	raC_UDT_ItfAD_PwrMonitor_Sts
Ref_Msg_GetAttS_DstINT	Message used for device integer data	MESSAGE
Ref_MsgData_Int	Energy Object type used in integer messages	INT[40]
Ref_Msg_GetAttS_DstReal	Message used for device real data	MESSAGE
Ref_MsgData_Real	Energy Object type used in real messages	REAL[40]
Ref_MsgCtrlResource	Message Control Resource	raC_UDT_ControlResource_Message
Inf_Lookup	Code/Description List Entry	raC_UDT_LookupMember_STR0082[2]
Out_EnergyBase	Base Energy Object	raC_UDT_EnergyBaseObject
Out_EnergyElectrical	Electrical Energy Object	raC_UDT_EnergyElectricalObject

Input Data

Input	Function/Description	DataType
EnableIn	Enable Input - System Defined Parameter	BOOL

Output Data

Output	Function/Descritpion	DataType
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Sts_Ready	Device ready status: 1 = ready to activate power structure	BOOL
Sts_Faulted	Device faulted status: 1 = an active fault exists	BOOL
Sts_Connected	Device is connected to the Programmable Controller	BOOL
Sts_Available	Device is available for interaction with user code	BOOL
Sts_ER	Instruction is in Error - See Sts_ERR/Sts_EXERR for Addition Error Information	BOOL
Sts_Idle	Device connected but idle	BOOL
Sts_AcquiringData	Device connected and acquiring data	BOOL
Sts_WaitingForCtrlResource	Message control resource is being used by another instruction	BOOL
Sts_DataAcquisitionDuration	Scan time used for totalizing and rate functions	DINT

Output	Function/Descritpion	DataType
Sts_bNotReady	Bitwise device 'not ready' reason 0 = Reserver 1 = Device not connected 2 = Device not available 4 = Device faulted 4 - 31 = Reserved	DINT
Sts_Val_Voltage_Phase_1_Angle	Voltage Phase 1 Angle	REAL
Sts_Val_Voltage_Phase_2_Angle	Voltage Phase 2 Angle	REAL
Sts_Val_Voltage_Phase_3_Angle	Voltage Phase 3 Angle	REAL
Sts_Val_Current_Phase_1_Angle	Current Phase 1 Angle	REAL
Sts_Val_Current_Phase_2_Angle	Current Phase 2 Angle	REAL
Sts_Val_Current_Phase_3_Angle	Current Phase 3 Angle	REAL
Sts_Val_Status_1_Count_x1	Count x1 1	REAL
Sts_Val_Status_2_Count_x1	Count x1 2	REAL
Sts_Val_kWh_Net	kWh Net	REAL
Sts_Val_kVARh_Net	kVARh Net	REAL
Sts_Val_kVAh_Net	kVAh Net	REAL
Sts_Val_kW_Demand	kW Demand	REAL
Sts_Val_kVAR_Demand	kVAR Demand	REAL
Sts_Val_kVA_Demand	kVA Demand	REAL
Sts_Val_Projected_kW_Demand	Projected kW Demand	REAL
Sts_Val_Projected_kVAR_Demand	Projected kVAR Demand	REAL
Sts_Val_Projected_kVA_Demand	Projected kVA Demand	REAL
Sts_OdometerResetServiced	Odometers reset on intitialization	BOOL
Sts_ERR	Instruction Error Code - See Instruction Help for Code Definition	DINT
Sts_EXERR	Instruction Extended Error Code - See Instruction Help for Code Definition	DINT
raC_Dvc_PMxxxx	Unique Parameter Name for auto - discovery	BOOL
Val_SampleInterval	Sample Interval time to access data, it can be adjusted using Ref_MsgCtrlResource.SampleInterval	REAL
EnableOut	Enable Output - System Defined Parameter	BOOL

Data Types

The following PowerMonitor™ Common Control Interface tags are the primary device program tags to read and write to when interfacing to PowerMonitor™ devices. The value of using these tags in your specific application code is that you may use a number of different PowerMonitor™ devices such as PM500/1000/5000 without having to update your application device interface tags.

Refer to the Interfaces section for detailed information on interfaces.

For further information and examples on how to interface the power device objects with your specific application code refer to the "How_To_Interface_with_Power_Device_Logix.mp4" video within the Videos folder of the Power Device Library Download files.

raC_UDT_ItfAD_PwrMonitor_Set

This is the PowerMonitor™ Common Control Interface User-Defined Data Type for device settings.

This is reserved for future use and currently has no functionality.

Member	Description	Data Type
InhibitCmd	1 = Inhibit user Commands from external sources, 0 = Allow.	BOOL
InhibitSet	1 = Inhibit user Settings from external sources, 0 = Allow.	BOOL
InhibitCfg	1 = Inhibit user Configuration from external sources, 0 = Allow.	BOOL

raC_UDT_ItfAD_ PwrMonitor _Cmd

This is the PowerMonitor™ Common Control Interface User-Defined Data Type for device commands.

This is reserved for future use and currently has no functionality.

Member	Description	Data Type
bCmd	Commands (Bit Overlay).	DINT
Physical	1 = Operate as Physical Device.	BOOL
Virtual	1 = Operate as Virtual Device.	BOOL

raC_UDT_ItfAD_PwrMonitor_Sts

This is the PowerMonitor™ Common Control Interface User-Defined Data Type for device status. Its members provide application program access to device states, status, and diagnostic data. The table below shows member names, descriptions, and tag data types.

Input	Description	Data Type
eState	Enumerated state value: 0 = Unused, 1 = Initializing, 2 = Disconnected, 3 = Disconnecting, 4 = Connecting, 5 = Idle, 6 = Configuring, 7 = Available.	DINT
FirstWarning	First Warning.	raC_UDT_Event
FirstFault	First Fault.	raC_UDT_Event
eCmdFail	Enumerated command failure code. See extended help for enumeration values.	DINT
bSts	Status (Bit Overlay).	DINT

Input	Description	Data Type
Physical	1 = Controlling physical device.	BOOL
Virtual	1 = Controlling virtual device. (Not in use at this time)	BOOL
Connected	1 = PAC to device connection has been established.	BOOL
Available	1 = The device is available for interaction with the user program.	BOOL
Warning	1 = A warning is active on the device.	BOOL
Faulted	1 = A fault is active on the device.	BOOL
Ready	1 = Device is ready to be activated.	BOOL
Active	1 = Device power structure is active.	BOOL

raC_UDT_Event

An array of size 4 is to be used to log the FirstWarning and FirstFault capture. The data should be FIFO order. The same should be displayed on the Faceplate.

Member	Description	Data Type
Type	Event type: 1 = Status, 2 = Warning, 3 = Fault, 4...n = User.	DINT
ID	User definable event ID.	DINT
Category	User definable category (Electrical,Mechanical,Materials,Utility,etc.).	DINT
Action	User definable event action code.	DINT
Value	User definable event value or fault code.	DINT
Message	Event message text.	STRING
EventTime_L	Timestamp (Date/Time format).	LINT
EventTime_D	Timestamp (Y,M,D,h,m,s,us).	DINT[7]

raC_UDT_LookupMember_STR0082

Member	Description	Data Type
Code	Code	DINT
Desc	Code Description	STRING

raC_UDT_ControlResource_Message

Member	Description	Data Type
ResourceInUse	Resource in Use	BOOL
SampleInterval	Sample Interval is adjustable as per user requirement	REAL

raC_UDT_EnergyElectricalObject

Member	Description	Data Type
RealEnergyConsumedOdo	Total real energy consumed.	INT[5]
RealEnergyGeneratedOdo	Total real energy generated.	INT[5]
RealEnergyNetOdo	Total Real energy	INT[5]
ReactiveEnergyConsumedOdo	Total Reactive energy consumed.	INT[5]
ReactiveEnergyGeneratedOdo	Total Reactive energy generated.	INT[5]
ReactiveEnergyNetOdo	Total Reactive energy.	INT[5]
ApparentEnergyOdo	Total Apparent energy.	INT[5]
KiloampereHours	Kiloampere-Hours Odometer	INT[5]
LineFrequency	Last Frequency reading.	REAL
CurrentL1	Phase 1 scaled RMS Current	REAL
CurrentL2	Phase 2 scaled RMS Current	REAL
CurrentL3	Phase 3 scaled RMS Current	REAL
AverageCurrent	Average RMS Current	REAL
CurrentPercentUnbalanced	Percent maximum deviation from Ave. / Ave.	REAL
VoltageL1N	Phase 1 scaled RMS Voltage	REAL
VoltageL2N	Phase 2 scaled RMS Voltage	REAL
VoltageL3N	Phase 3 scaled RMS Voltage	REAL
VoltageAverageLN	Averaged RMS Voltage	REAL
VoltageL1L2	Line 1 to Line 2 Volts	REAL
VoltageL2L3	Line 2 to Line 3 Volts	REAL
VoltageL3L1	Line 3 to Line 1 Volts	REAL
VoltageAverageLL	Average Line to Line Volts	REAL
VoltagePercentUnbalanced	Percent Maximum deviation from Ave. / Ave.	REAL
RealPowerL1	Line 1 kW	REAL
RealPowerL2	Line 2 kW	REAL
RealPowerL3	Line 3 kW	REAL
RealPowerTotal	Total kW	REAL
ReactivePowerL1	Line 1 kVAR	REAL
ReactivePowerL2	Line 2 kVAR	REAL
ReactivePowerL3	Line 3 kVAR	REAL
ReactivePowerTotal	Total kVAR	REAL
ApparentPowerL1	Line 1 kVA	REAL
ApparentPowerL2	Line 2 kVA	REAL
ApparentPowerL3	Line 3 kVA	REAL
ApparentPowerTotal	Total kVA	REAL
TruePowerFactorL1	Percent ratio between power and apparent power.	REAL
TruePowerFactorL2	Percent ratio between power and apparent power.	REAL
TruePowerFactorL3	Percent ratio between power and apparent power.	REAL
TruePowerFactorThreePhase	Percent ratio between power and apparent power.	REAL
PhaseRotation	0 = None, 1 = ABC, 2 = ACB	DINT

Note:

- For PowerMonitor 1000: KiloampereHours member is not applicable
- For PowerMonitor 500: PhaseRotation member is not applicable

raC_UDT_EnergyBaseObject

Member	Description	Data Type
ResourceType	0 = Generic, 1 = Electrical, 2 = Non-Electrical,	INT
Capabilities	0 = Energy Measured,1 = Energy Derived, 2 = Energy Proxy, 3 = Energy Aggregated, 4 = Energy Rate Fixed	INT
Accuracy	Specifies the accuracy of power and energy metering results.	INT
AccuracyBasis	Basis of the Energy Accuracy Attribute. 0 = Per Cent of Reading, 1 = Per Cent of Full-Scale Reading, 2 = Absolute Error in kW	INT
FullScaleReading	Full Scale Energy Transfer Rate, e.g., Power (kW)	REAL
DataStatus	Status of the Device or Aggregation Data. 0 = No Errors, 1 = Not Metering	INT
ConsumedEnergyOdo	The consumed energy value in kWh. Array Elements: 0 = kWH *10^-3, 1 = kWH, 2 = kWH *10^3, 3 = kWH *10^6, 4 = kWH *10^9	INT[5]
GeneratedEnergyOdo	The generated energy value in kWh. Array Elements: 0 = kWH *10^-3, 1 = kWH, 2 = kWH *10^3, 3 = kWH *10^6, 4 = kWH *10^9	INT[5]
TotalEnergyOdo	The total energy value in kWh. Array Elements: 0 = kWH *10^-3, 1 = kWH, 2 = kWH *10^3, 3 = kWH *10^6, 4 = kWH *10^9	INT[5]
EnergyTransferRate	The time rate of energy consumption or production, e.g., power, in kW	REAL

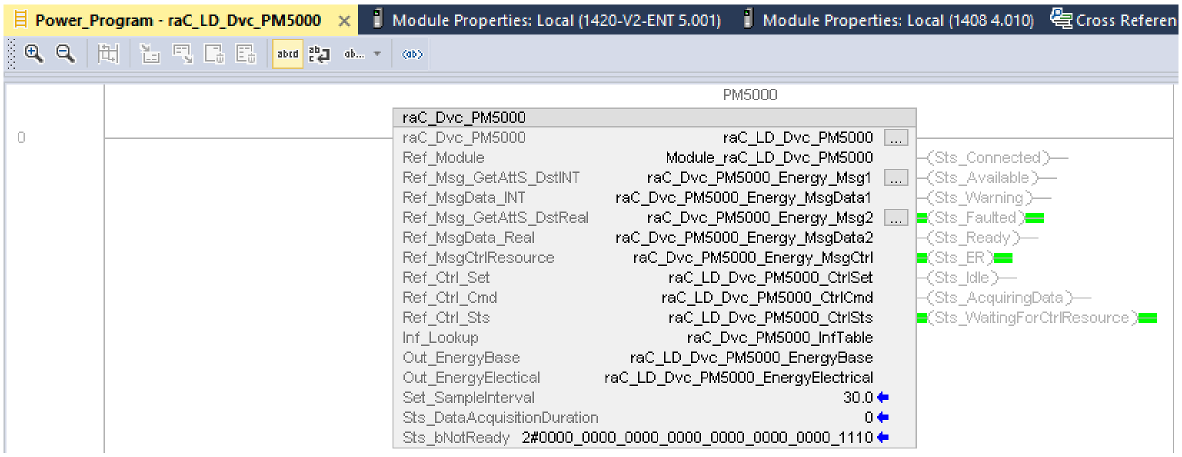
Note:

- For PowerMonitor 5000: *AccuracyBasis* member is not applicable
- For PowerMonitor 1000: *AccuracyBasis* member is not applicable
- For PowerMonitor 500: *ResourceType* member's Default value is 1
- *Capabilities* member's Default value is 0
- *Accuracy, AccuracyBasis, Full Scale Reading,* DataStatus members are not applicable

Programming Example

Fully configured device on a rung is provided below for reference. The first rung is required and the others are optional. This example includes the device and extensions objects for a PowerMonitor™ 5000 (raC_Dvc_PM5000).

Note that this programming example is the same code that is imported when either importing the supplied rung .L5X files or when using Application Code Manager or the Studio 5000® Import Library Objects wizard plug-in.



The device (ie: PM5000) must also be configured in the controller I/O Configuration. Note that this configuration is completed automatically when using Application Code Manager or the Studio 5000® Import Library Objects wizard plug-in. For details on setting up the device, refer to the Device Definition section.

Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. FactoryTalk® View ME/SE Graphic Symbols

All icons display the following information:

- - Device label (Tag.@Description or custom label entered in parameter #104)
- - Connection Fault/Virtual Indication
- - Device Warning/Fault Indication
- - Device not ready indication

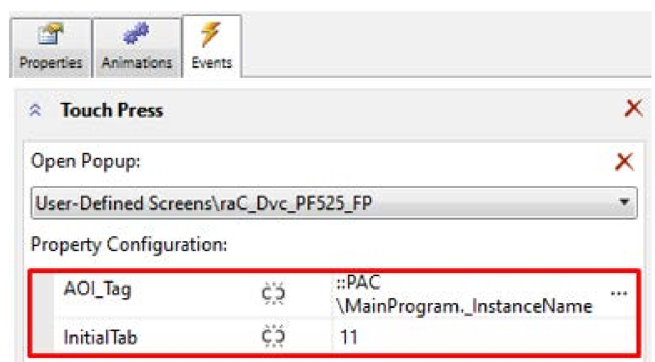
See Launch Buttons for more general information on launch button diagnostics and usage.

FactoryTalk® View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GOLaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate.	#102: Backing Tag (e.g. {::[PAC]Program::Program._InstanceName}) #104: Custom button label. Leave blank to use Tag.@Description #120: Display's left position (e.g. 100, optional) #121: Display's top position (e.g. 100, optional)
GO_LaunchPowerMonitor_TagString		Use with Power Monitor 500/1000/5000 Devices	

Studio 5000 View Designer® Graphic Symbols

All Studio 5000 View Designer® graphic symbols must be configured with an *Event* to open up the appropriate Popup screen. Select the graphic symbol and in the *Properties* window navigate to the *Events* tab. Assign a *Button Behavior* event to *Open popup on release*. Assign the required Popup screen (e.g. User-Defined Screens\raC_Dvc_PM5000_FP). The required *Property Configurations* are found in the following table where you may assign the *AOI_Tag* to the object's Add-On Instruction tag.



Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		Faceplate navigation button with string tag label. Use Properties > General > Text to modify the button label text.	AOI_Tag: Object's Add-On Instruction Tag
GO_LaunchPowerMonitor_TagString		Use with Power Monitor 500/1000/5000 Devices	

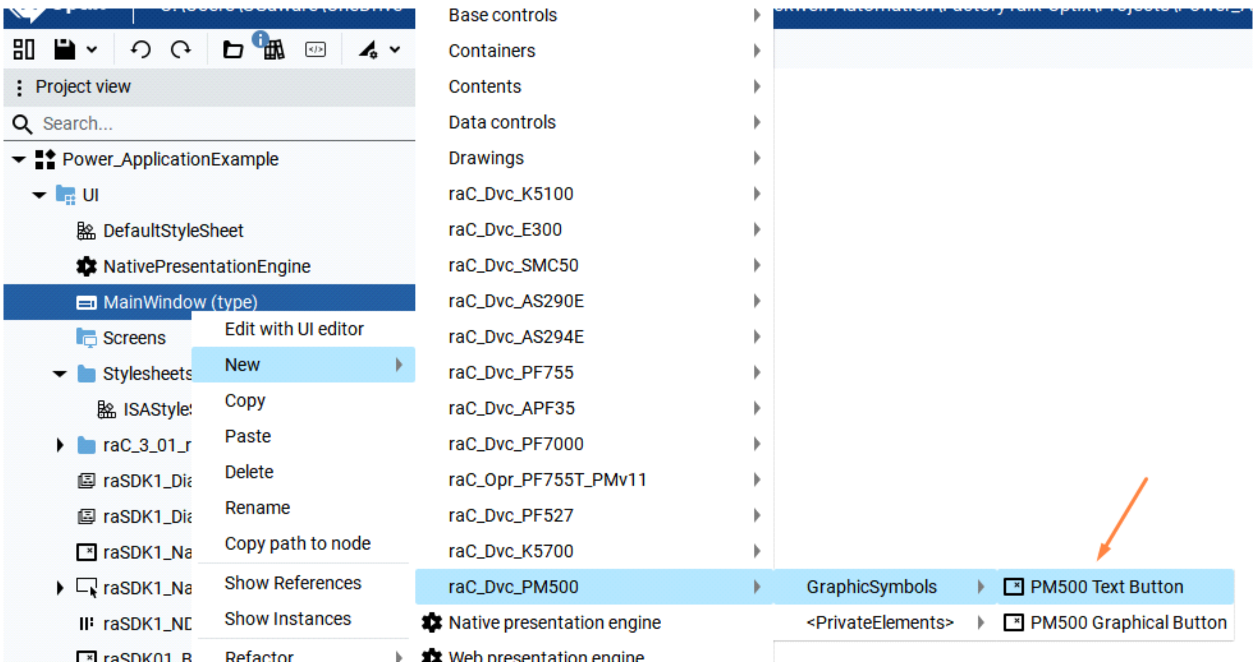
FactoryTalk® Optix Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. All graphical symbols for Power Devices display the following information:

- - Device label (Tag.@Description or custom label)
- - Connection Fault/Virtual Indication
- - Device Warning/Fault Indication
- - Device not ready indication

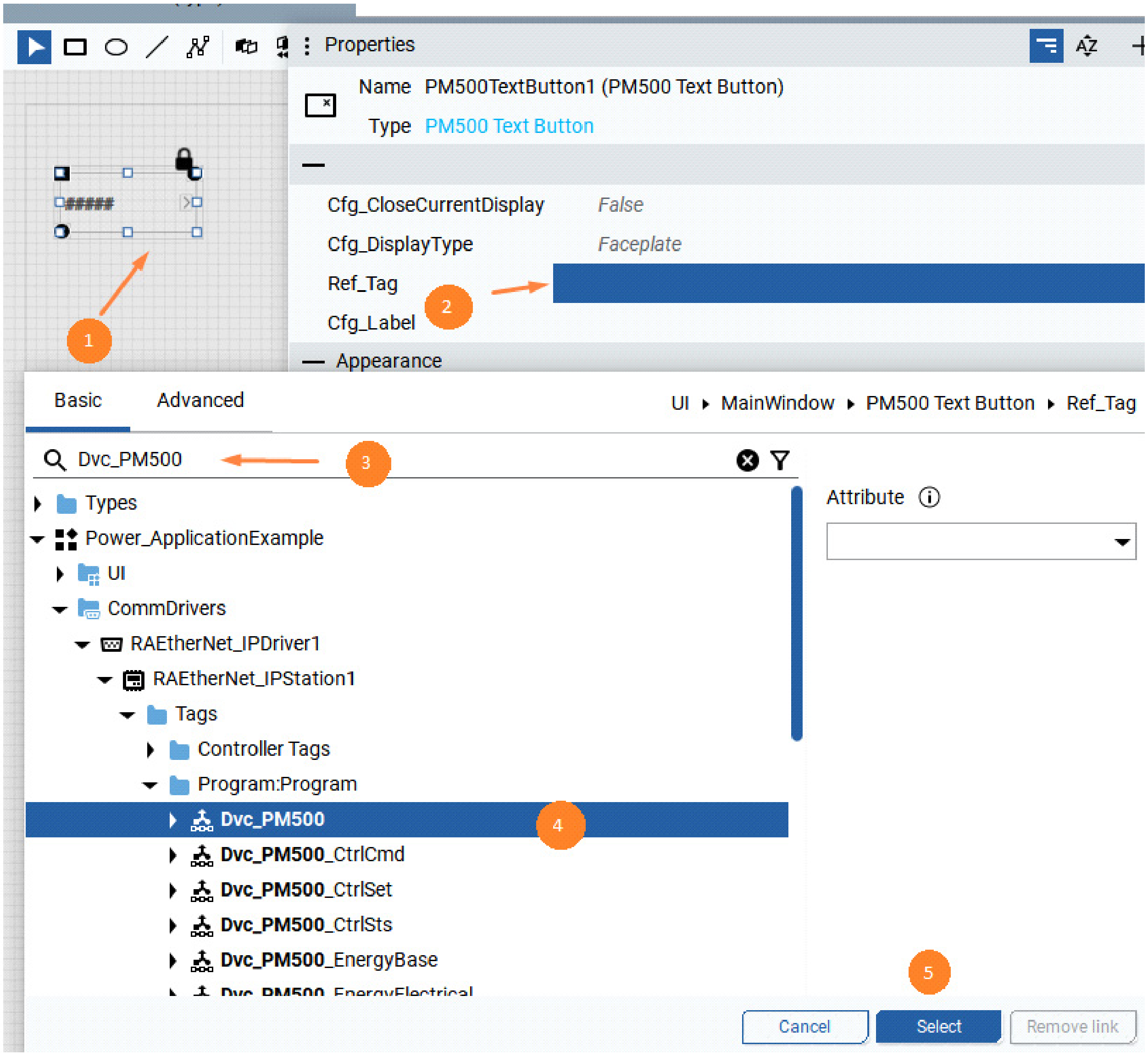
See Basic Launch Button Attributes section for more general information on launch button diagnostics and usage.

Once the Objects have been imported into the FactoryTalk® Optix Studio project, you can begin using them in your application. To add a new Launch Button to a Main window, navigate to raC_3_xx_raC_Dvc_ObjectName_UI > Graphic Symbols > raC_3_xx_raC_Dvc_ObjectName_GS_NavText Button to insert a navigation launch button with a text label.

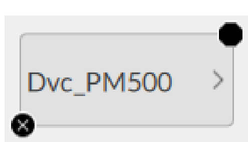


After placing the graphic symbol on a UI panel, link the “Ref_Tag” property to the targeted Asset under Asset tag.

Text label shown on button can be configured using “cfg_Label” property, If it is not configured then description of the asset will be shown on the button face.



This is the only step needed to link the UI to the asset data model. For more information on graphic symbols, refer to the Graphic Symbols section of the Power Monitor device type in this manual.

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
raC_3_xx_raC_Dvc_Devicename_GS_NavText		Faceplate navigation button. Use Cfg_Label Variable to modify the button label text.	Cfg_CloseCurrentDisplay: Set to 'True' to close the previously open display when launching the object faceplate Cfg_DisplayType: Faceplate to be opened on button click. This should not be modified. Ref_Tag: Object's Add-On Instruction Tag Cfg_Label: Text label shown on the button face
raC_3_xx_raC_Dvc_Devicename_GS_NavGraphical		Use with Power Monitor 500/1000/5000 Devices	

Graphic Symbol Button Configuration Variables

Variable Name	Description	Default Value
Cfg_CloseCurrentDisplay	Set to 'True' to close the previously open display when launching the object faceplate	False
Cfg_DisplayType	Faceplate to be opened on button click. This should not be modified.	Faceplate
Ref_Tag	Link to instance of desired target Asset model found in Model > Asset folder.	N/A - User must configure
Cfg_Label	Text label shown on the button face. Defaults to the description of the asset but users may replace in instances with other desired text.	../Ref_Tag@Description

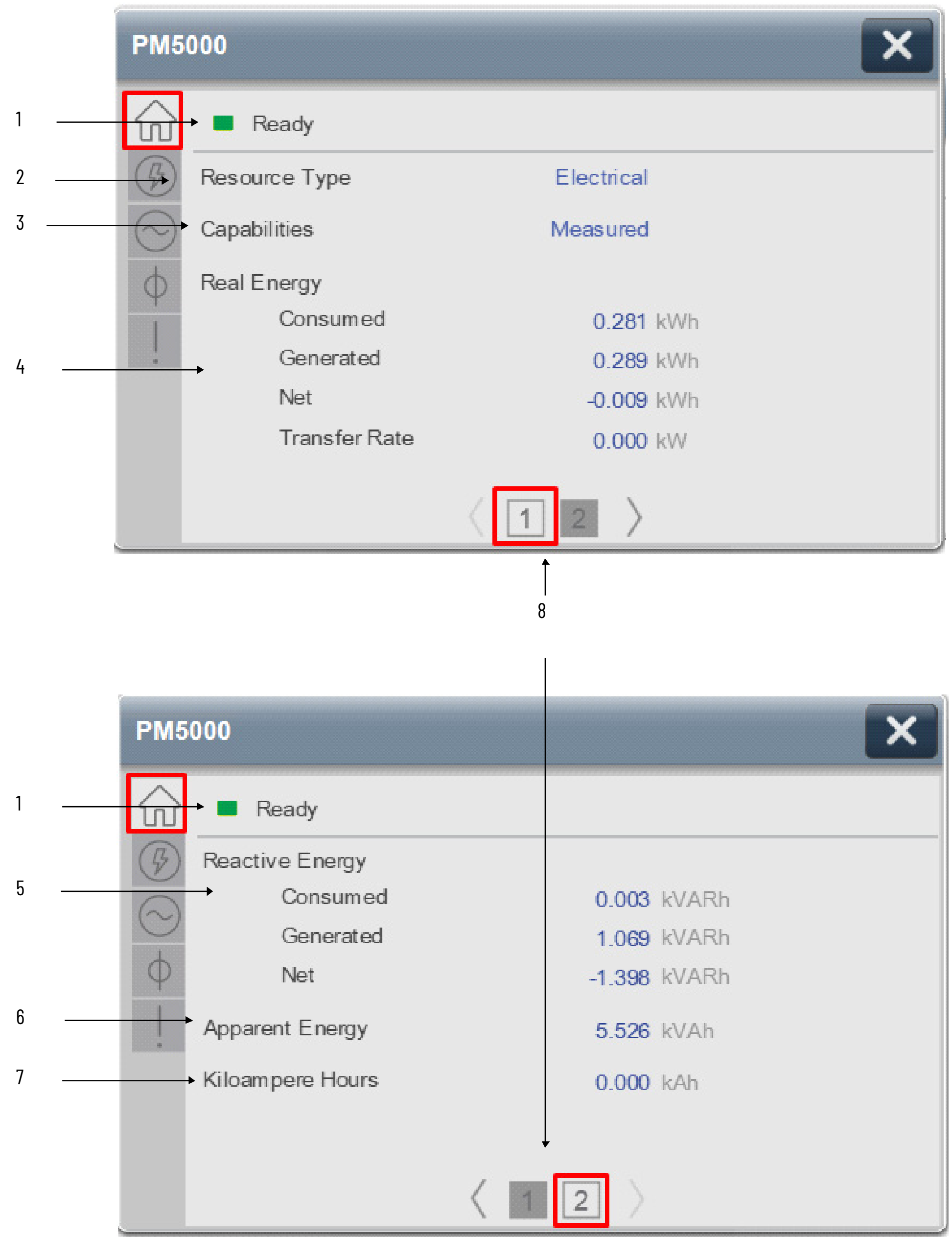
Faceplates

There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 28.

Home

The Home tab is the main tab of the faceplate. The Home Tab Display consist of 2 pages:

- Page 1 displays the Base energy object parameters like resource type, capabilities, and real energy values in kilowatt hour.
- Page 2 displays the electrical energy object parameters that is Reactive Energy in kilowatt amperes reactive hours and net Apparent energy in kilo volt ampere hours.



Item	Description
1	Banner
2	Resource Type (Generic, Electrical, Non-Electrical, Other)
3	Capabilities (Measured, Derived, Proxy, Aggregated, Energy Rate Fixed)
4	Real Energy Data
5	Reactive Energy Data
6	Apparent Energy Data
7	Kiloampere Hours Data
8	Page navigation Data

Power Tab

Power Screen provides the power status of the connected device. Real Power, Reactive Power, Apparent Power and Power Factor for individual phase L1, L2, L3 & sum of phases.

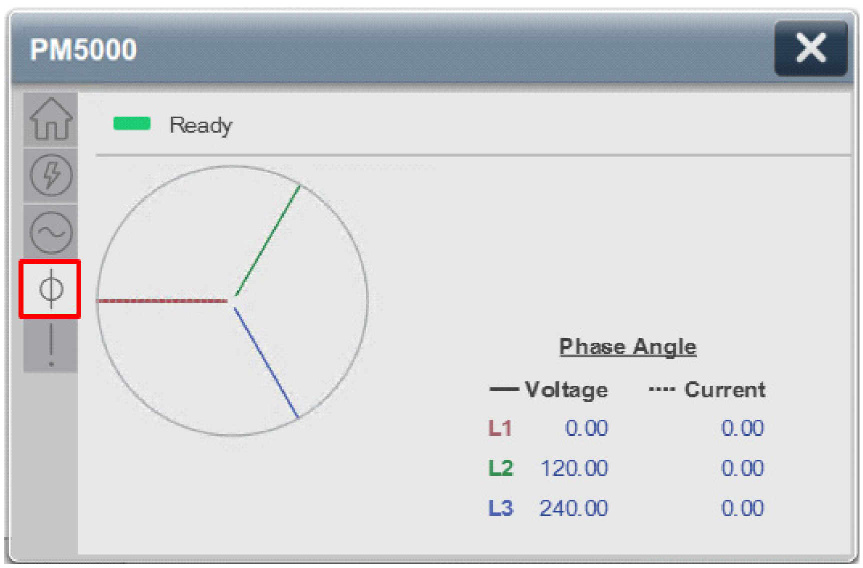
Voltage, Current, Frequency (VIF) Tab

The VIF tab provides a Voltage, Current, Frequency and Phase Rotation related information.

- Voltage parameter Displays the RMS line to Line Voltage of individual phase & average of L1-L2, L2-L3, L3-L1 in Volts.
- Current parameter Displays the RMS line Current of individual phase & average of L1, L2, L3 in amps.
- % Unbalance parameters is the ratio of Negative Sequence by Positive Sequence of Voltage and Current.
- Frequency Parameter displays the Frequency of Voltage in Hertz.
- Phase rotation can be either clockwise or counterclockwise rotation. which is determined by A-B-C or A-C-B, respectively. If load is not connected it will show as None.

Phase Angle (PA) Tab

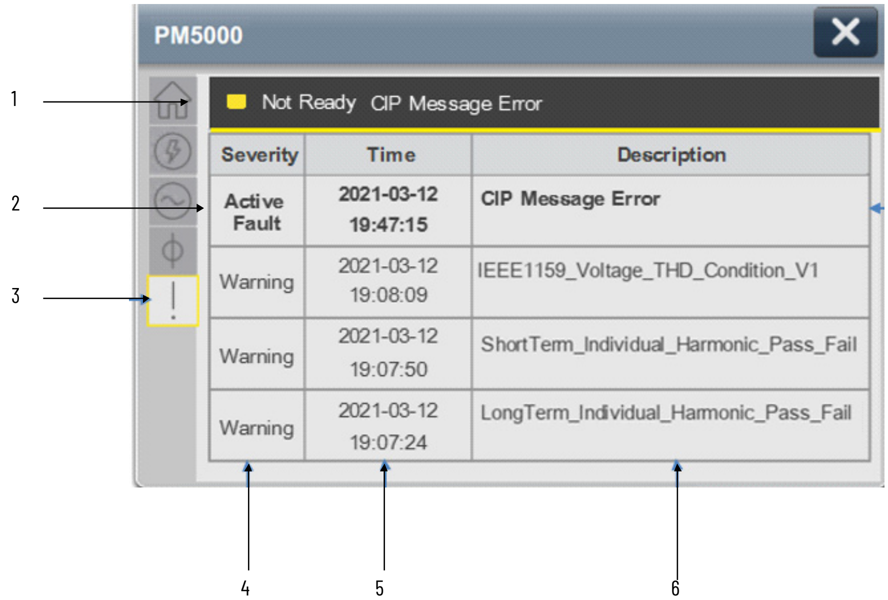
The Phase Angle tab provides Voltage and Current phase angle related information. The Phase angle tab is available in PowerMonitor 5000 and 1000 faceplate but not available in PowerMonitor 500. The PowerMonitor unit calculates phase angles of Voltage and Current. Which are represented in different colors with respect to individual phase L1, L2 & L3.



Fault Warning Tab

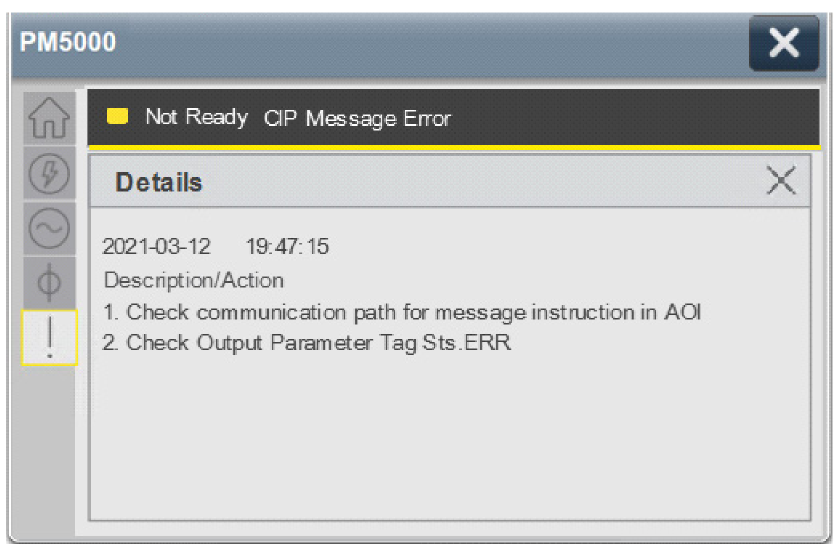
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

Note, only row 1 will display the "Active Fault" in the severity column if there is a current active fault, else it will display the last fault. Rows 2-4 only display past faults and warnings, not an active fault.



Item	Description
1	Banner
2	Last fault is in first row and show in bold if active
3	Yellow border visible when a fault is active
4	Fault severity
5	Fault event time
6	4 most recent fault/warning event messages

Click on any row in the fault table to view fault details. The details window provides a more detailed description and possible action steps to remedy condition.

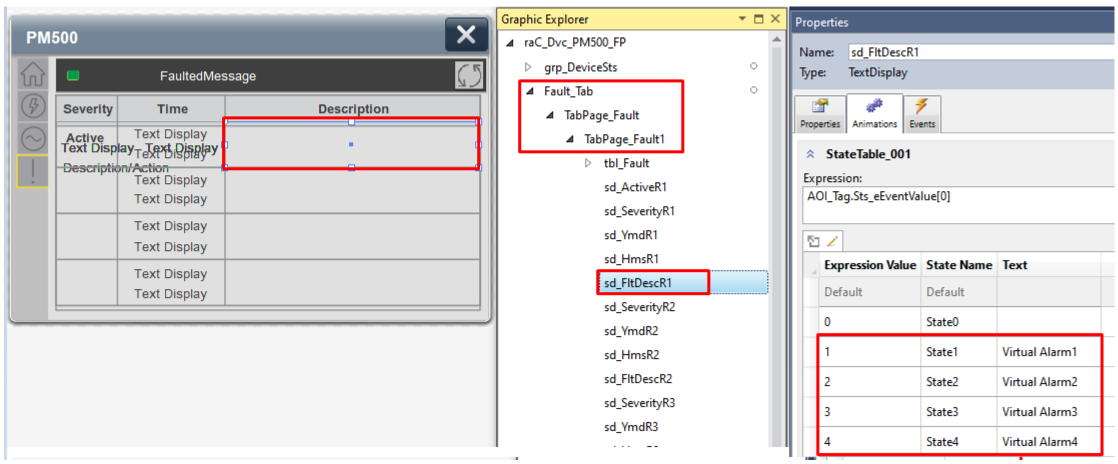


Configurable Virtual Alarms in PowerMonitor 500

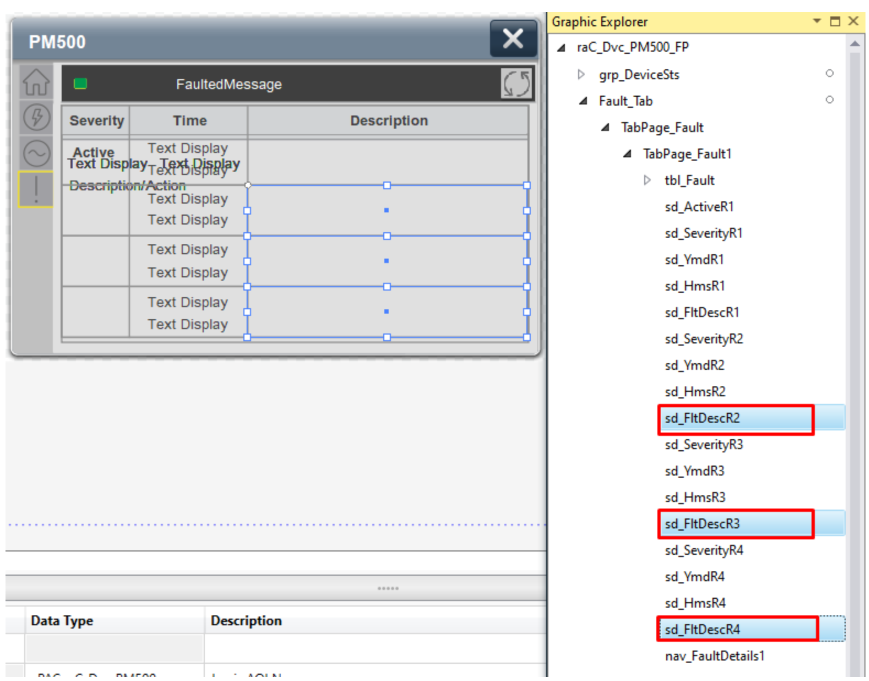
For PowerMonitor 500 the following steps needs to be considered for configuring Virtual Alarms.

In TabPage_Fault, Expand TabPage_Fault1 in that select sd_FltDescR1, go to its State table and you can configure Virtual Alarm1 to Virtual Alarm4 as per user Alarms.

This configuration is for row 1 of fault table.

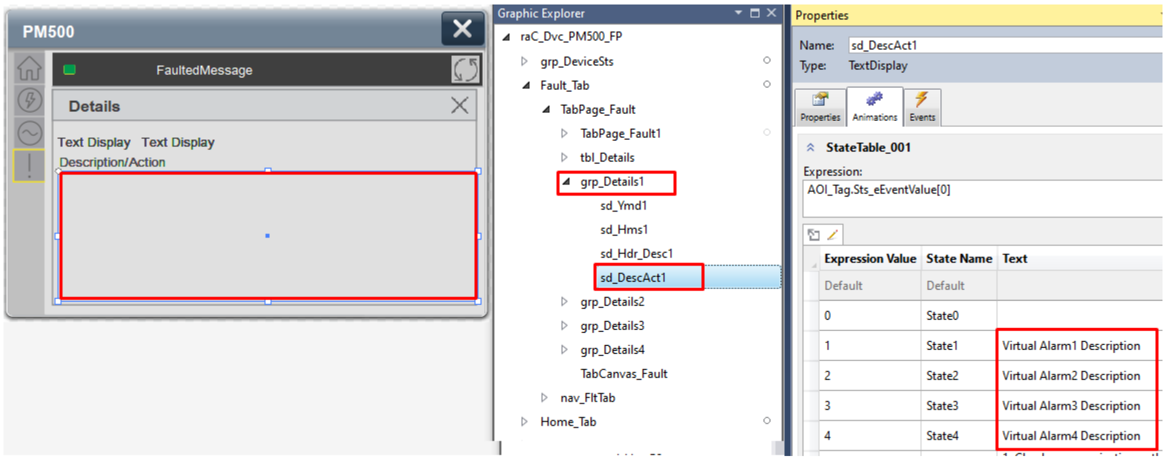


So, Copy the States text and paste it on the sd_FltDescR2, sd_FltDescR3 and sd_FltDescR4 State tables.

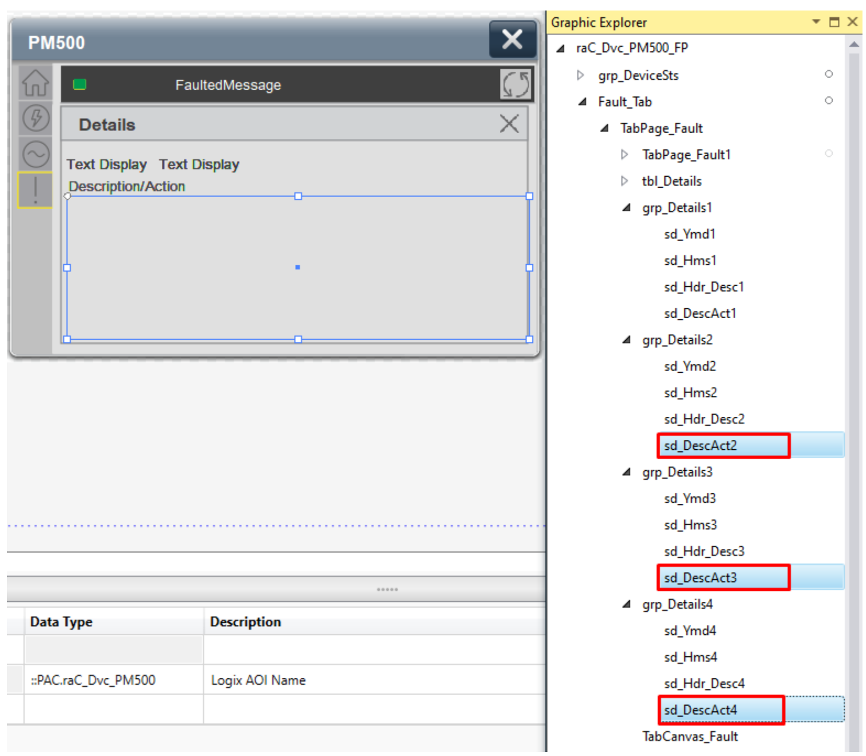


For Alarm Description/Action, expand the grp_Details1 and then grp_Details1 and then select sd_DescAct1.

User can configure Virtual Alarm1 Description to Virtual Alarm4 Description as per your Alarm's Description/Action. This configuration is for row 1 fault's Detail screen description.



For Alarm Description/Action configuration for Row 2 to 4, copy the states text and paste it on the sd_DescAct2, sd_DescAct3 and sd_DescAct4 State tables. So, fault Details configuration will get complete for Row 2, Row 3 and Row 4.



Application Code Manager

All PowerMonitor™ device objects have similar configuration parameters in Application Code Manager. The following section defines the common parameters. "xxx" is used in place of the specific device name (e.g. PM500).

Refer to the section Using Application Code Manager for complete details.

Definition Object: raC_Dvc_PMxxx

This object contains the AOI definition and used as linked library to implement object. This gives flexibility to choose to instantiate only definition and create custom implement code. User may also create their own implement library and link with this definition library object.

Implementation Object: raC_LD_Dvc_PMxxx

Parameter Name	Default Value	Instance Name	Definition	Description
RoutineName	{ObjectName}	{RoutineName}	Routine	Enter Routine name. Routine will be created and Object implement rung(s) inserted. A JSR will be inserted in MainRoutine. If routine name already exists, then object will be inserted into existing routine. By default, parameter is set to Object Name.
TagName	{ObjectName}	{TagName}	Backing Tag	Enter the backing tag of the main AOI. This will serve as the base tag name for other tags in this object that are derived from the base.
TagDescription	{ObjectDescription}	{TagDescription}		Tag Description of the main AOI backing tag
TagScope	Program		Input Parameter	Tags will be created at the assigned scope
ModuleName	Mod_{ObjectName}	{ModuleName}	Input Parameter	Enter the Module Name. This is the name for the module that appears in the Controller Organizer tree.
ModuleType	Device Dependent			Select hardware module type. e.g. 1426-M5E-A. See Module Options for full details.
IncludeHW	1			Allow ACM to create the Hardware Module. If the module already exists in the Controller Organizer, select False or existing module properties will be overwritten.
IPAddress	192.168.1.0		Input Parameter	Enter a valid network address for the hardware module. It must be of form X.X.X.X
ParentModule	Local		Input Parameter	Select the Parent Module. This represents the name of the communication adapter this module will communicate through. If connecting to a non-library object module, enter the name of the module only. If the module is connected directly to the controller ethernet port, enter "Local". Note: entering non-library object modules will result in the parameter displaying a red X. This will still generate properly as long as the entered name exists in the project.

Parameter Name	Default Value	Instance Name	Definition	Description
ChassisName	{ParentModule}			Warning removal
EnergyMsg1Tag	raC_Dvc_PMxxx_Energy_Msg1			Enter Tag name for Msg1 Services. This tag should be unique for Msg Service class. Multiple objects can share the tag.
EnergyMsg2Tag	raC_Dvc_PMxxx_Energy_Msg2			Enter Tag name for Msg2 Services. This tag should be unique for Msg Service class. Multiple objects can share the tag.
EnergyMsg1Data	raC_Dvc_PMxxx_Energy_Msg1Data			Data tag for Messaging Services. This tag should be unique per class. Multiple objects can share the tag.
EnergyMsg2Data	raC_Dvc_PMxxx_Energy_Msg2Data			Data tag for Messaging Services. This tag should be unique per class. Multiple objects can share the tag.
EnergyMsgCtrl	raC_Dvc_PMxxx_Energy_MsgCtrl			Message services control tag. This tag provides the control interface for the messaging services.This should be unique per class. Multiple objects can share the tag.
SymbolStyle	Icon			HMI launch button symbol style. Icon/Text
SEAssocDisplay			HMI Display	FactoryTalk View SE Display reference. Launch button will be generated on this display.
MEAssocDisplay			HMI Display	FactoryTalk View ME Display reference. Launch button will be generated on this display.

Module Options

A detailed list of available ModuleTypes is below:

Device	ModuleType Options
raC_Dvc_PM500	1420-V2-ENT 1420-V1-ENT 1420-V1P-ENT 1420-V2P-ENT 1420-V1A-ENT 1420-V2A-ENT
raC_Dvc_PM1000	1408
raC_Dvc_PM5000	1426-M5E-A 1426-M6E-A 1426-M8E-A

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_PM500	raC_Dvc_PM500	3	(RA-LIB) Device	PowerMonitor
raC_Dvc_PM1000	raC_Dvc_PM1000	3	(RA-LIB) Device	PowerMonitor
raC_Dvc_PM5000	raC_Dvc_PM5000	3	(RA-LIB) Device	PowerMonitor

Configured HMI Content

HMI Content	Instance Name	Description
Launch Button	{ObjectName}_GO_LaunchFP	Global Object configured callout instance

Output Interface

Output Interface	Linked Library	Revision
raC_Itf_PM500_SA	-	1.0
raC_Itf_PM1000_SA	-	1.0
raC_Itf_PM5000_SA	-	1.0

raC_Itf_PMxxx_SA

Member Name	Description
PrgName	Program Name
TagName	Tag Name
ModuleName	Module Name
TagScope	Tag Scope

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - Power Device.ggfx	{ProjectName}\Visualization\FTViewSE\GlobalObjects
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - Power Device.ggfx	{ProjectName}\Visualization\FTViewME\GlobalObjects
V3_raC_Dvc_Global	Toolbox SE	(raC-3-SE) Toolbox - Power Device.ggfx	{ProjectName}\Visualization\FTViewSE\GlobalObjects
V3_raC_Dvc_Global	Toolbox ME	(raC-3-ME) Toolbox - Power Device.ggfx	{ProjectName}\Visualization\FTViewME\GlobalObjects
V3_raC_Dvc_PMxxx	Faceplate SE	(raC-3_xx-SE) raC_Dvc_PMxxx-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays
V3_raC_Dvc_PMxxx	Faceplate ME	(raC-3_xx-ME) raC_Dvc_PMxxx-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays
V3_raC_Dvc_PowerMonitor	View Designer	(raC-3_xx-VD) raC_Dvc_PowerMonitor.vpd	{ProjectName}\Visualization\ViewDesigner
V3_Power_Manual	Reference Manual	DEVICE-RM100x-EN-P.pdf	{ProjectName}\Documentation
V3_Power_Images	HMI Image Set	Power_Images.zip	{ProjectName}\Visualization\Images

Power Energy Extension Objects (raC_Opr_xxx_Energy)

Overview

The Power Energy Extension device objects are a group of objects that include the energy extensions for base power device objects. Energy Extensions enables the user to monitor the Overall status of Voltage, Current, Power, Energy and Frequency. The energy extension faceplates are only supported in FactoryTalk® View ME/SE and not Studio 5000 View Designer.

In the Library there is a folder named *Videos* which contains many How-To and Operational Overview Videos which walk step-by-step through each process. You can refer to the following videos for this section:
"Operational_Overview_of_Energy_Extensions_Faceplates"

The Power Device Library includes the following energy extension objects:

Device	Base Device Object Name	Object Group	Energy Monitor Extension Object Name
E300	raC_Dvc_E300	PowerDiscrete	raC_Opr_E300_Energy
SMC-50	raC_Dvc_SMC50	PowerDiscrete	raC_Opr_SMC50_Energy
SMC-Flex	raC_Dvc_SMCFlex	PowerDiscrete	raC_Opr_SMCFlex_Energy
PF525	raC_Dvc_PF525	PowerVelocity	raC_Opr_PF525_Energy
PF755	raC_Dvc_PF755	PowerVelocity	raC_Opr_PF755_Energy
PF527	raC_Dvc_PF527	PowerMotion	raC_Opr_PF527_Energy
K5500 [1]	raC_Dvc_K5500	PowerMotion	raC_Opr_K5500_Energy
K5700	raC_Dvc_K5700	PowerMotion	raC_Opr_K5700_Energy

[1] Note that the Kinetix® 5500 does not support Generate Real Energy at this time.

Functional Description

The Preconfigured Energy Extension include an Add-On Instruction Rung and FactoryTalk® View ME/SE HMI Faceplate provide the following benefits:

- Detailed calculations of Voltage, Current, Power, Energy and Frequency
- Text based status and diagnostics

Use when:

- Using a Power Device object.
- Require application access to extended diagnostics for energy consumption
- Require visualization access to extended diagnostics for activations and connections with FactoryTalk® View ME/SE

Do NOT use when:

- Not using Power Device object
- Utilizing Studio 5000 View Designer® (PanelView™ 5000 HMI) for visualization

Required Files

Device Objects include Add-On Instructions (AOIs) and HMI faceplates. The revision number (e.g. 3.01) used in filenames can change as new revisions are created.

Use of the Energy Extension objects requires the base device object as well. Note that the Energy Extension object tag name is required to be named as DeviceObjectTagName_Energy, where DeviceObjectTagName is the base tag name for the associated Device Object.

e.g. If a base device object raC_Dvc_E300 named “MT100_Dvc” is used then the Energy Extension object raC_Opr_E300_Energy should be named “MT100_Dvc_Energy”.

Controller Files

Add-On Instructions are reusable code objects that contain encapsulated logic that can streamline implementing your system. This lets you create your own instruction set for programming logic as a supplement to the instruction set provided natively in the ControlLogix® firmware. An Add-On Instruction is defined once in each controller project, and can be instantiated multiple times in your application code as needed.

The Add-On Instruction must be imported into the controller project to be used in the controller configuration. These can be imported as Add-On Instruction files, or as part of the Rung Import or Import Library Objects wizard.

Instructions that are supported by PlantPAx® 5.xx are supplied with two versions of the same instruction. Version 3.xx instructions are for use with standard applications while version 10.xx instructions are for use with PlantPAx® 5.xx applications. These alternate PlantPAx® supported versions use pre-defined data types which are available exclusively in 5x80 series Logix 5000 controllers with firmware v33 or greater.

All Add-On Instruction and Rung Import files can be found in the */Studio 5000 Logix Designer Files - L5X/Standard Files/* and */Studio 5000 Logix Designer Files - L5X/5x80v33 Files - Use with PlantPAx® 5.x/* folders in the library. Choose the */5x80v33 Files - Use with PlantPAx® 5.x/* Folder for PlantPAx® 5.x applications; otherwise choose the */Standard Files/* folder.

Device/Item	Application	Add-On Instruction	Rung Import
E300 Energy Extension	Standard	raC_Opr_E300_Energy_3.03_AOI.L5X	raC_Opr_E300_Energy_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Opr_E300_Energy_10.04_AOI_5x80v33.L5X	raC_Opr_E300_Energy_10.04_RUNG_5x80v33.L5X
SMC50 Energy Extension	Standard	raC_Opr_SMC50_Energy_3.03_AOI.L5X	raC_Opr_SMC50_Energy_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Opr_SMC50_Energy_10.04_AOI_5x80v33.L5X	raC_Opr_SMC50_Energy_10.04_RUNG_5x80v33.L5X

Device/Item	Application	Add-On Instruction	Rung Import
SMCFlex Energy Extension	Standard	raC_Opr_SMCFlex_Energy_3.04_AOI.L5X	raC_Opr_SMCFlex_Energy_3.04_RUNG.L5X
	PlantPAx® v5.xx	raC_Opr_SMCFlex_Energy_10.05_AOI_5x80v33.L5X	raC_Opr_SMCFlex_Energy_10.05_RUNG_5x80v33.L5X
PF525 Energy Extension	Standard	raC_Opr_PF525_Energy_3.03_AOI.L5X	raC_Opr_PF525_Energy_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Opr_PF525_Energy_10.04_AOI_5x80v33.L5X	raC_Opr_PF525_Energy_10.04_RUNG_5x80v33.L5X
PF755 Energy Extension	Standard	raC_Opr_PF755_Energy_3.03_AOI.L5X	raC_Opr_PF755_Energy_3.03_RUNG.L5X
	PlantPAx® v5.xx	raC_Opr_PF755_Energy_10.04_AOI_5x80v33.L5X	raC_Opr_PF755_Energy_10.04_RUNG_5x80v33.L5X
PF527 Energy Extension	Standard	raC_Opr_PF527_Energy_3.04_AOI.L5X	raC_Opr_PF527_Energy_3.04_RUNG.L5X
K5500 Energy Extension	Standard	raC_Opr_K5500_Energy_3.03_AOI.L5X	raC_Opr_K5500_Energy_3.03_RUNG.L5X
K5700 Energy Extension	Standard	raC_Opr_K5700_Energy_3.03_AOI.L5X	raC_Opr_K5700_Energy_3.03_RUNG.L5X
AK5700 Energy Extension	Standard	raC_Opr_AK5700_Energy_3.05_AOI.L5X	raC_Opr_AK5700_Energy_3.05_RUNG.L5X

FactoryTalk® View HMI Files

FactoryTalk® View ME or SE applications require importing the desired device faceplates in addition to all Global Object (ggfx) files and all images located in the */HMI FactoryTalk® View Images - png/* folder of the library. FactoryTalk® View ME files are stored in the */HMI - FactoryTalk® View ME/* library folder and FactoryTalk® View SE files are stored in the */HMI - FactoryTalk® View SE/* library folder.

Device/Item	Type	FactoryTalk® View ME Faceplate	FactoryTalk® View SE Faceplate
Energy Base Extension	Display	(raC-3_01-ME) raC_Opr_EnergyBase-Faceplate.gfx	(raC-3_01-SE) raC_Opr_EnergyBase-Faceplate.gfx
Energy Electrical Extension	Display	(raC-3_01-ME) raC_Opr_EnergyElectrical-Faceplate.gfx	(raC-3_01-SE) raC_Opr_EnergyElectrical-Faceplate.gfx
SMC Flex Energy Electrical Extension	Display	(raC-3_04-ME) raC_Opr_SMCFlex_EnergyElectrical-Faceplate.gfx	(raC-3_04-SE) raC_Opr_SMCFlex_EnergyElectrical-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - Power Device	(raC-3-SE) Graphic Symbols - Power Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - Power Device.ggfx	(raC-3-SE) Toolbox - Power Device.ggfx

FactoryTalk® Optix Library Files

FactoryTalk® View Optix applications require importing the desired library objects located in the PowerDevice_v3R library folder.

Device/Item	FactoryTalk® Optix Library Object
Energy Base Extension	raC_3_01_raC_Opr_BaseEnergy_UI
Energy Electrical Extension	raC_3_01_raC_Opr_EnergyElectrical_UI
SMC Flex Energy Electrical Extension	raC_3_04_raC_Opr_SMCFlex_EnergyElectrical_UI

Studio 5000® Application Code Manager Files

Studio 5000® Application Code Manager (ACM) can be optionally used if it is installed. All devices can be easily registered in the ACM repositories by running the *setup.cmd* file located in the root folder of the library.

Individual HSL4 files are provided as an alternative to running the setup.cmd to allow users to manually register specific implementation objects. Each object has two files - an Asset Control file and a Device file. The Asset Control files include attachments of all required files for that object. The Device files are used to actually add that device into a Studio 5000 project and these reference the Asset Control files.

All Studio 5000® Application Code Manager files can be found in the */ApplicationCodeManagerLibraries/* folder of the library. The files included are as follows:

Implementation Object	Asset Control File (.HSL4)
E300 Energy Extension	(RA-LIB)_Device_Asset-Control_PoweDiscrete_raC_Opr_E300_Energy_(3.3)
SMC-50 Energy Extension	(RA-LIB)_Device_Asset-Control_PowerDiscrete_raC_Opr_SMC50_Energy_(3.3)
SMC-Flex Energy Extension	(RA-LIB)_Device_Asset-Control_PowerDiscrete_raC_Opr_SMCFlex_Energy_(3.4)
PF525 Energy Extension	(RA-LIB)_Device_Asset-Control_PowerVelocity_raC_Opr_PF525_Energy_(3.3)
PF755 Energy Extension	(RA-LIB)_Device_Asset-Control_PowerVelocity_raC_Opr_PF755_Energy_(3.3)
PF527 Energy Extension	(RA-LIB)_Device_Asset-Control_PowerMotion_raC_Opr_PF527_Energy_(3.4)
K5500 Energy Extension	(RA-LIB)_Device_Asset-Control_PowerMotion_raC_Opr_K5500_Energy_(3.3)
K5700 Energy Extension	(RA-LIB)_Device_Asset-Control_PowerMotion_raC_Opr_K5700_Energy_(3.3)
AK5700 Energy Extension	(RA-LIB)_Device_Asset-Control_PowerMotion_raC_Opr_AK5700_Energy_(3.5)

Operations

Execution

Rung in condition transition response:

False ->True

- Energy related parameters are monitored and updated
- Reset commands are accepted from application and HMI

True ->False

- Energy related parameters are not monitored and updated
- Reset commands are not accepted from application and HMI

Affected Device Object Inf (information) Interface

Ref_Ctrl_Inf	Value
bExtensionEnabled.1	1
bExtensionAlert.1	0

Add-On Instruction I/O Data

InOut Data

InOut	Function / Description	DataType
Ref_Ctrl_Inf	Power Energy Device Information Interface Datatype Depends on object group	raC_UDT_ItfAD_PwrDiscrete_Inf raC_UDT_ItfAD_PwrVelocity_Inf raC_UDT_ItfAD_PwrMotion_Inf
Ref_MsgData_REAL	Message data REAL	REAL
Ref_MsgData_DINT	Message data DINT	DINT[5]
Ref_MsgCtrlResource	Message Control Resource	raC_UDT_ControlResource_Message
Ref_Msg_GetAttS_DstReal	Get Message data REAL	MESSAGE
Ref_Msg_GetAttS_DstDINT	Get Message data DINT	MESSAGE
Out_EnergyElectical	Output Interface - Energy Electrical	raC_UDT_EnergyElectricalObject
Out_EnergyBase	Output Interface - Energy Base	raC_UDT_EnergyBaseObject
Inp_Ctrl_Sts	Input Interface - Device control status Datatype Depends on object group	raC_UDT_ItfAD_PwrDiscrete_Inf raC_UDT_ItfAD_PwrVelocity_Inf raC_UDT_ItfAD_PwrMotion_Inf

Input Data

Input	Function/Description	DataType
Set_SampleInterval	Set sampling interval	REAL
Set_PowerNominal_RPM	Set Power Nominal RPM	REAL
Set_PowerNominal_kW	Set Power Nominal KW	REAL
Set_Inertia	Set Inertia	REAL
Inp_Speed_RPM	Input Speed RPM	REAL
EnableIn	Enable Input - System Defined Parameter	BOOL
Cmd_ResetOdometers	Command Reset Odometers	BOOL

Output Data

Output	Function/Descritpion	DataType
Sts_WaitingForDevice	Waiting status for Device	BOOL
Sts_WaitingForCtrlResource	Waiting Status for control Resource	BOOL
Sts_OdometerResetServiced	Status for Odometer Reset service	BOOL
Sts_Idle	Status Idle	BOOL
Sts_EXERR	Instruction Extended Error Code - See Instruction Help for Code Definition	DINT
Sts_ERR	Instruction Error Code - See Instruction Help for Code Definition	DINT
Sts_ER	Instruction is in Error - See Sts_ERR / Sts_EXERR for Additional Error Information	BOOL
Sts_DataAcquisitionDuration	Data Acquisition duration	DINT
Sts_AcquiringData	Status Acquiring data	BOOL
raC_Opr_E300_Energy	Instruction Identification Bit	BOOL
EnableOut	Enable Output - System Defined Parameter	BOOL

Data Types

The following Power Energy Extension Common Control Interface tags are the primary device program tags to read and write to when interfacing to power Energy devices.

For further information and examples on how to interface the power device objects with your specific application code refer to the "How_To_Interface_with_Power_Device_Logix.mp4" video within the Videos folder of the Power Device Library Download files.

raC_UDT_ControlResource_Message

Member	Description	Data Type
ResourceInUse	Message control resource is being used by another instruction.	BOOL
SampleInterval	Message sample interval (sec).	REAL

raC_UDT_EnergyElectricalObject

Member	Description	Data Type
RealEnergyConsumedOdo	Total real energy consumed.	INT[5]
RealEnergyGeneratedOdo	Total real energy generated.	INT[5]
RealEnergyNetOdo	Total real energy.	INT[5]
ReactiveEnergyConsumedOdo	Total reactive power consumed.	INT[5]
ReactiveEnergyGeneratedOdo	Total reactive power generated.	INT[5]
ReactiveEnergyNetOdo	Total reactive power.	INT[5]
ApparentEnergyOdo	Total apparent energy consumed.	INT[5]
KiloampereHoursOdo	Total accumulated current hours.	INT[5]
LineFrequency	Line frequency (Hz).	REAL
CurrentL1	L1 RMS line current (A).	REAL
CurrentL2	L2 RMS line current (A).	REAL
CurrentL3	L3 RMS line current (A).	REAL
AverageCurrent	RMS line current of 3-phase average (A).	REAL
CurrentPercentUnbalanced	Current deviation between phases (Pct).	REAL
VoltageL1N	L1 RMS line to neutral voltage (V).	REAL
VoltageL2N	L2 RMS line to neutral voltage (V).	REAL
VoltageL3N	L3 RMS line to neutral voltage (V).	REAL
VoltageAverageLN	RMS line to neutral voltage of three-phase average (V).	REAL
VoltageL1L2	L1 to L2 RMS voltage (V).	REAL
VoltageL2L3	L2 to L3 RMS voltage (V).	REAL
VoltageL3L1	L3 to L1 RMS voltage (V).	REAL
VoltageAverageLL	RMS line to line voltage, 3-phase average (V).	REAL
VoltagePercentUnbalanced	Voltage deviation between phases (Pct).	REAL
RealPowerL1	L1 real power, signed to show direction (W).	REAL
RealPowerL2	L2 real power, signed to show direction (W).	REAL
RealPowerL3	L3 real power, signed to show direction (W).	REAL
RealPowerTotal	Total real power (W)	REAL
ReactivePowerL1	L1 reactive power, signed to show direction (VAR).	REAL
ReactivePowerL2	L2 reactive power, signed to show direction (VAR).	REAL
ReactivePowerL3	L3 reactive power, signed to show direction (VAR).	REAL
ReactivePowerTotal	Total reactive power (VAR).	REAL
ApparentPowerL1	L1 apparent power (VA).	REAL
ApparentPowerL2	L2 apparent power (VA).	REAL
ApparentPowerL3	L3 apparent power (VA).	REAL
ApparentPowerTotal	Total apparent power (VA)	REAL
TruePowerFactorL1	L1 ratio between power and apparent power (Pct). The value is signed to (+) leading and (-) lagging.	REAL
TruePowerFactorL2	L2 ratio between power and apparent power (Pct). The value is signed to (+) leading and (-) lagging.	REAL
TruePowerFactorL3	L3 ratio between power and apparent power (Pct). The value is signed to (+) leading and (-) lagging.	REAL
TruePowerFactorThreePhase	Ratio between power and apparent power (Pct). The value is signed to (+) leading and (-) lagging.	REAL
PhaseRotation	Phase rotation of a 3-phase system: 0 = None, 1 = ABC, 2 = ACB.	DINT

raC_UDT_EnergyBaseObject

Member	Description	Data Type
ResourceType	0 = Generic, 1 = Electrical, 2 = Non-Electrical, 3-99 = Reserved, 100-199 - Vendor Specific, 200-65535 = Reserved.	INT
Capabilities	0 = Energy Measured, 1 = Energy Derived, 2 = Energy Proxy, 3 = Energy Aggregated, 4 = Energy Rate Fixed.	INT
Accuracy	Specifies the accuracy of power and energy metering results in .01 percent of reading or .01 of units as specified by accuracy basis: 0 = Unknown.	INT
AccuracyBasis	Basis of the Energy Accuracy Attribute: 0 = Percent of Reading, 1 = Percent of Full Scale Reading, 2 = Absolute Error in kW.	INT
FullScaleReading	Full Scale Energy Transfer Rate; Power (kW).	REAL
DataStatus	Status of the Device or Aggregation Data: 0 = No Errors, 1 = Not Metering.	INT
ConsumedEnergyOdo	The consumed energy value in kWh. Array Elements: 0 = kWH *10^-3, 1 = kWH, 2 = kWH *10^3, 3 = kWH *10^6, 4 = kWH *10^9.	INT[5]
GeneratedEnergyOdo	The consumed energy value in kWh. Array Elements: 0 = kWH *10^-3, 1 = kWH, 2 = kWH *10^3, 3 = kWH *10^6, 4 = kWH *10^9.	INT[5]
TotalEnergyOdo	The consumed energy value in kWh. Array Elements: 0 = kWH *10^-3, 1 = kWH, 2 = kWH *10^3, 3 = kWH *10^6, 4 = kWH *10^9.	INT[5]
EnergyTransferRate	The time rate of energy consumption or production; Power (kW).	REAL

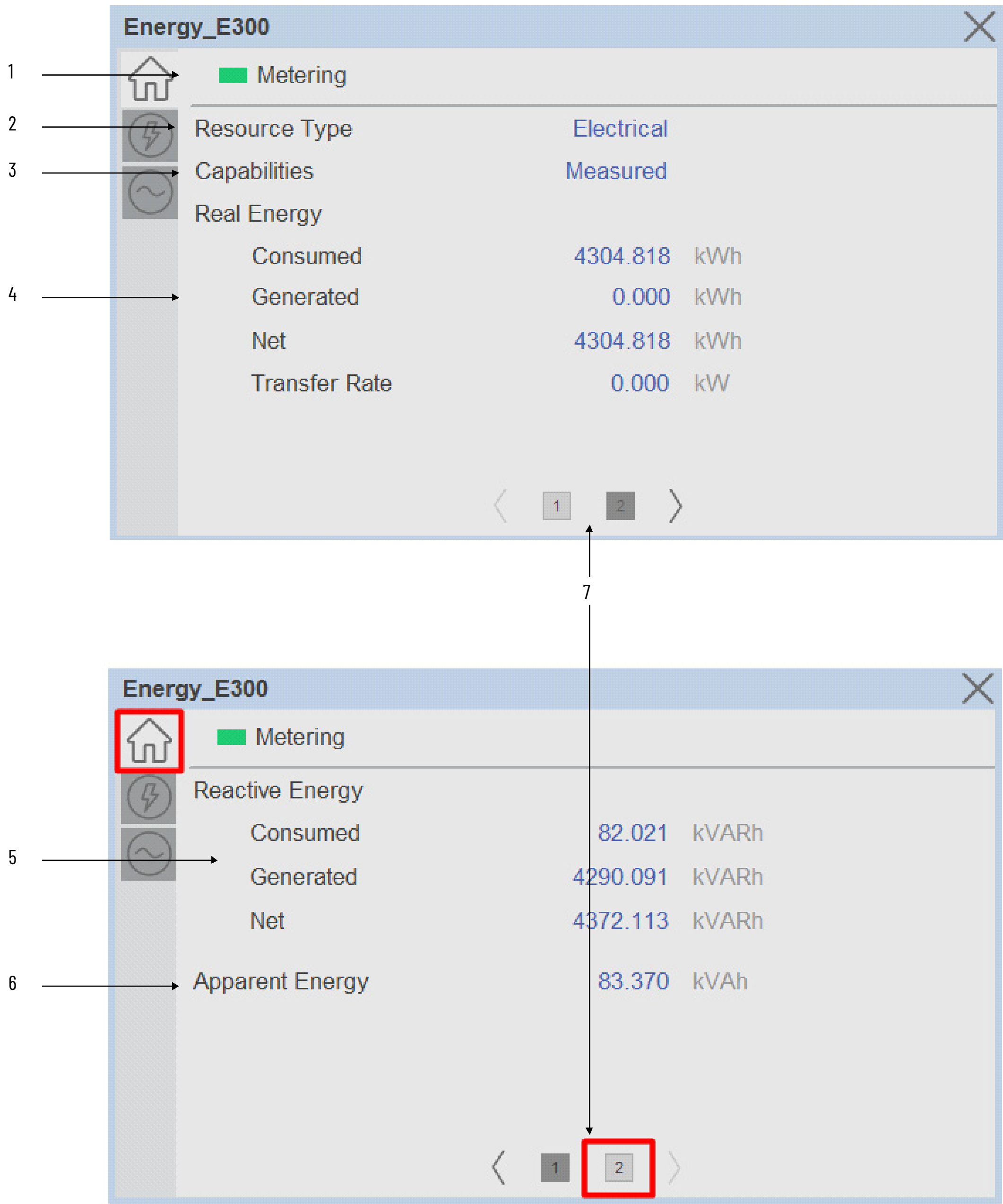
Faceplates

There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 28.

Home

The Home tab is the main tab of the faceplate and includes two pages.

- Page 1: Displays the base energy object parameters including resource type (Generic/Electrical/Non-Electric), capabilities (Energy Measured/ Energy Derived/Energy Proxy/Energy Aggregated/Energy Rate Fixed), and real energy values in kilowatt-hours (kWh).
- Page 2: Displays the electrical energy object parameters including reactive energy in kilowatt-amperes-reactive-hours (kVARh) and net apparent energy in kilovolt-ampere-hours (kVAh).

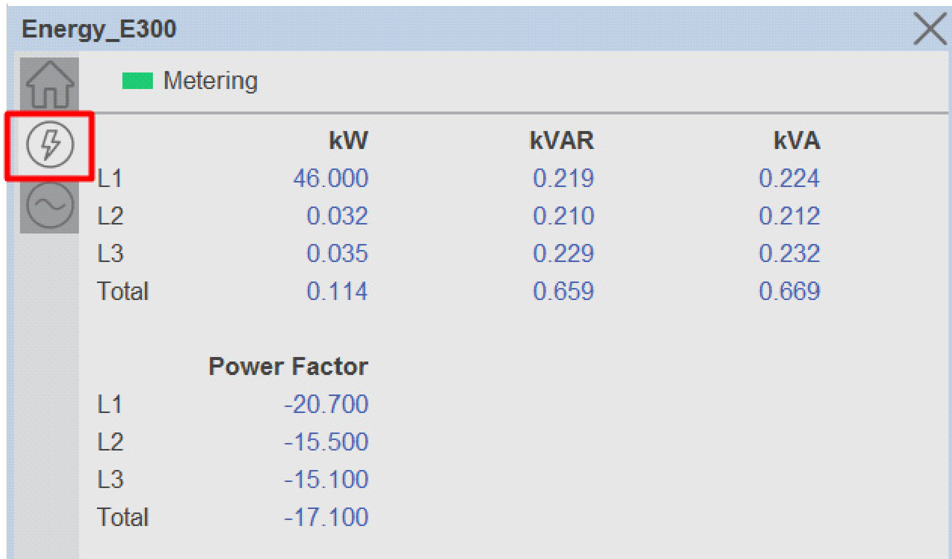


Item	Description
1	Banner
2	Resource Type (Generic/Electrical/Non-Electric)
3	Capabilities (Energy Measured/Energy Derived/Energy Proxy/Energy Aggregated/Energy Rate Fixed)
4	Real Energy data - Consumed, Generated, Net, Transfer Rate
5	Reactive Energy data - Consumed, Generated, Net
6	Apparent Energy
7	Page navigation buttons

In case of SMC Flex Energy Extension home tab is not available.

Power Tab

Power Tab provides the power status of the connected device. Real Power, Reactive Power, Apparent Power and Power Factor for individual phase L1, L2, L3 & sum of phases.



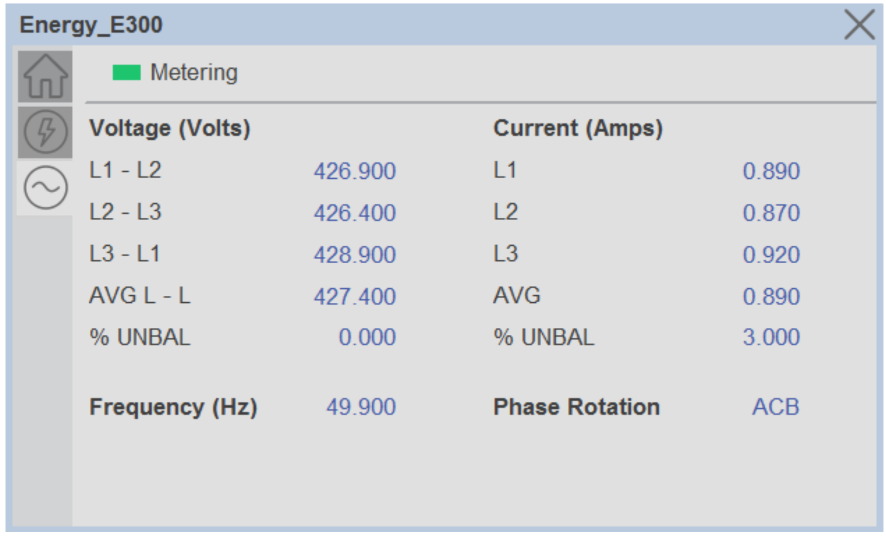
In case of SMC Flex Energy Extension Power tab is not available.

Voltage, Current, Frequency (VIF) Tab

The VIF tab provides a Voltage, Current, Frequency and Phase Rotation related information.

- Voltage: RMS line to Line Voltage of individual phase & average of L1-L2, L2-L3, L3-L1 in Volts.
- Current: RMS line Current of individual phase & average of L1, L2, L3 in amps.
- % Unbalance: Ratio of Negative Sequence by Positive Sequence of Voltage and Current.
- Frequency: Frequency of Voltage in Hertz.

- Phase rotation: Clockwise or counterclockwise rotation determined by A-B-C or A-C-B, respectively. If load is not connected phase rotation will display None.



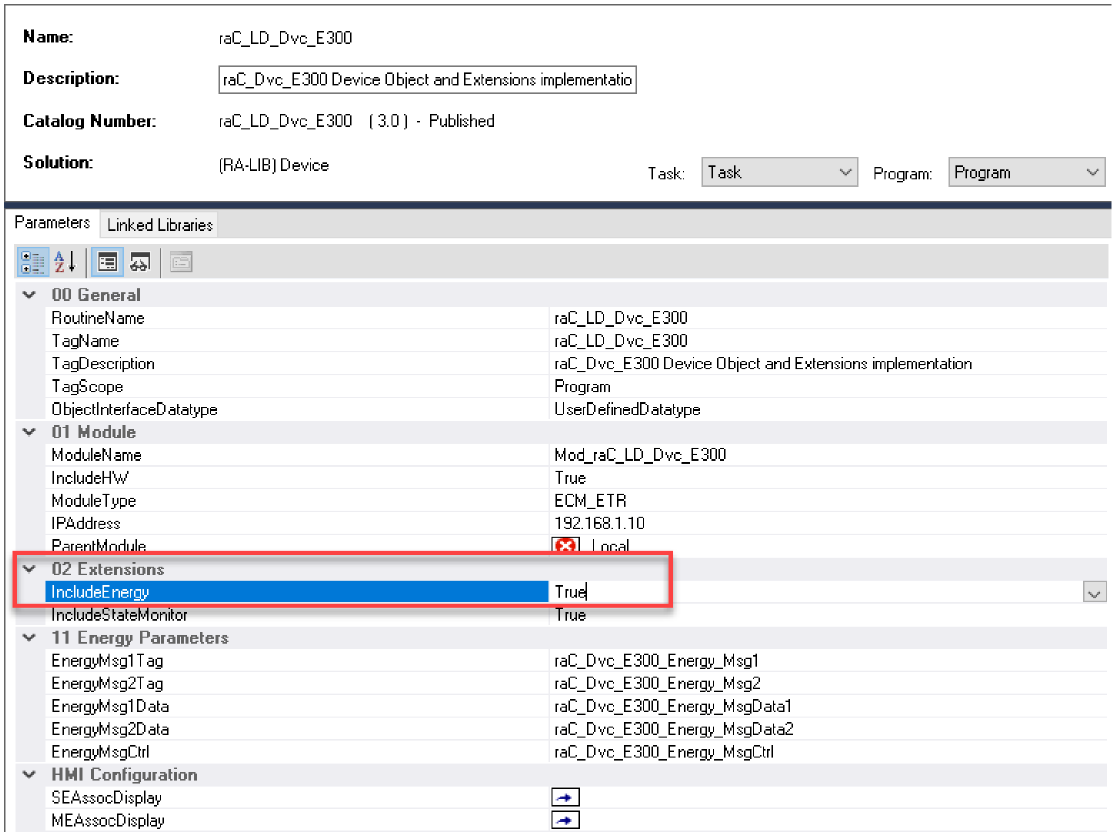
In case of SMC Flex following parameters are monitored into this tab.

- Voltage: RMS line to Line Voltage of individual phase & average of L1-L2, L2-L3, L3-L1 in Volts.
- Current: RMS line Current of individual phase & average of L1, L2, L3 in amps.
- Power Factor: Overall Power Factor of the Motor.

Application Code Manager

All Power Energy Extension device objects have similar configuration parameters in Application Code Manager. These parameters are configured as part of the base object and do not need to be added directly to a project. The following section defines the common parameters. “xxx” is used in place of the specific device name (e.g. E300).

The enable an Energy Extension Object on a base object, simply set the *IncludeEnergy* parameter in the 02 *Extensions* category to *True*. This is shown in the example using an E300 base device below.



Attachments

Name	Description	File Name	Extraction Path
V3_Power_Manual	Reference Manual	DEVICE-RM100x-EN-P.pdf	{ProjectName}\Documentation
V3_raC_Opr_xxx_Energy	Faceplate ME	(raC-3_01-ME) raC_Opr_xxx_Energy-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays
V3_raC_Opr_xxx_Energy	Faceplate SE	(raC-3_01-SE) raC_Opr_xxx_Energy-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays
V3_Power_Images	HMI Image set	Power_Images.zip	{ProjectName}\Visualization\Images

Power State Monitor Extension Objects (raC_Tec_PwrxxxStateMonitor)

Overview

The Power State Monitor Extension device objects are a group of objects that include the State Monitor extensions for base power device objects. State Monitor Extensions enables the user track, view, and reset activations and network connections of a device. This information is available as visualization in the HMI or for programmatic access in user applications.. The State Monitor extension faceplates are only supported in FactoryTalk® View ME/SE and not Studio 5000 View Designer®.

There are three different State Monitor extension objects - Discrete, Velocity, and Motion. These are to be used with their respective base power device object types. In this manual, the instruction name *raC_Tec_PwrxxxStateMonitor* may be used where *xxx* represents either Discrete, Velocity, or Motion.

The Power Device Library includes the following State Monitor extension objects:

Base Device Object Name	Object Group	State Monitor Extension Object Name
All Power Discrete Objects	PowerDiscrete	raC_Tec_PwrDiscreteStateMonitor
All Power Velocity Objects	PowerVelocity	raC_Tec_PwrVelocityStateMonitor
All Power Motion Objects	PowerMotion	raC_Tec_PwrMotionStateMonitor

Functional Description

State monitor instructions will monitor a corresponding Power Device object for connections and activations. This will include logging for event counts, current duration, max duration, and cumulative duration. The pre-configured State Monitor Extensions include an Add-On Instruction Rung and FactoryTalk® View ME/SE HMI Faceplate provide the following benefits:

Track device activations (power structure on):

- Activation count
- Current time activated
- Maximum time activated
- Cumulative time activated

Track device network connections:

- Connection count
- Current time connected
- Maximum time connected
- Cumulative time connected

Use when:

- Using a Power Device object.
- Require application access to extended diagnostics for activations and connections
- Require visualization access to extended diagnostics for activations and connections with FactoryTalk® View ME/SE

Do NOT use when:

- Not using Power Device object
- Utilizing Studio 5000 View Designer® (PanelView™ 5000 HMI) for visualization
- Using the PlantPAx® library (e.g. PMTR/PVSD) instructions. In this case use the PRT (process run time and start counter) instruction.

Required Files

Device Objects include Add-On Instructions (AOIs) and HMI faceplates. The revision number (e.g. 3.01) used in filenames can change as new revisions are created.

Use of the State Monitor Extension objects requires the base device object as well. Note that the State Monitor Extension object tag name is required to be named as DeviceObjectTagName_StateMon, where DeviceObjectTagName is the base tag name for the associated Device Object.

e.g. If a base device object raC_Dvc_E300 named "MT100_Dvc" is used then the StateMonitor Extension object raC_Tec_E300_StateMon should be named "MT100_Dvc_StateMon".

Controller Files

Add-On Instructions are reusable code objects that contain encapsulated logic that can streamline implementing your system. This lets you create your own instruction set for programming logic as a supplement to the instruction set provided natively in the ControlLogix® firmware. An Add-On Instruction is defined once in each controller project, and can be instantiated multiple times in your application code as needed.

The Add-On Instruction must be imported into the controller project to be used in the controller configuration. These can be imported as Add-On Instruction files, or as part of the Rung Import or Import Library Objects wizard.

Instructions that are supported by PlantPAx® 5.xx are supplied with two versions of the same instruction. Version 3.xx instructions are for use with standard applications while version 10.xx instructions are for use with PlantPAx® 5.xx applications. These alternate PlantPAx® supported versions use pre-defined data types which are available exclusively in 5x80 series Logix 5000 controllers with firmware v33 or greater.

All Add-On Instruction and Rung Import files can be found in the */Studio 5000 Logix Designer Files - L5X/Standard Files/* folder in the library.

Although PlantPAx® v5.xx versions of the State Monitor Extension are supplied, it is encourage to instead use the PRT instruction in PlantPAx® applications. These versions are included in the Power Device Library for special use cases.

Device/Item	Application	Add-On Instruction	Rung Import
Power Discrete StateMonitor Extension	Standard	raC_Tec_PwrDiscreteStateMonitor_3.04_AOI.L5X	raC_Tec_PwrDiscreteStateMonitor_3.04_RUNG.L5X
	PlantPAx® v5.xx	raC_Tec_PwrDiscreteStateMonitor_10.05_AOI_5x80v33.L5X	raC_Tec_PwrDiscreteStateMonitor_10.05_RUNG_5x80v33.L5X
Power Velocity StateMonitor Extension	Standard	raC_Tec_PwrVelocityStateMonitor_3.04_AOI.L5X	raC_Tec_PwrVelocityStateMonitor_3.04_RUNG.L5X
	PlantPAx® v5.xx	raC_Tec_PwrVelocityStateMonitor_10.05_AOI_5x80v33.L5X	raC_Tec_PwrVelocityStateMonitor_10.05_RUNG_5x80v33.L5X
Power Motion StateMonitor Extension	Standard	raC_Tec_PwrMotionStateMonitor_3.04_AOI.L5X	raC_Tec_PwrMotionStateMonitor_3.04_RUNG.L5X

FactoryTalk® View HMI Files

FactoryTalk® View ME or SE applications require importing the desired device faceplates in addition to all Global Object (ggfx) files and all images located in the */HMI FactoryTalk® View Images - png/* folder of the library. FactoryTalk® View ME files are stored in the */HMI - FactoryTalk® View ME/* library folder and FactoryTalk® View SE files are stored in the */HMI - FactoryTalk® View SE/* library folder.

Device/Item	Type	FactoryTalk® View ME Faceplate	FactoryTalk® View SE Faceplate
State Monitor Extension Faceplate	Display	(raC-3_03-ME) raC_Tec_PwrDvcStateMonitor-Faceplate.gfx	(raC-3_03-SE) raC_Tec_PwrDvcStateMonitor-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - Power Device	(raC-3-SE) Graphic Symbols - Power Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - Power Device.ggfx	(raC-3-SE) Toolbox - Power Device.ggfx

FactoryTalk® Optix Library Files

FactoryTalk® View Optix applications require importing the desired library objects located in the PowerDevice_v3R library folder.

Device/Item	FactoryTalk® Optix Library Object
State Monitor Extension Faceplate	raC_3_03_raC_Tec_PwrDvcStateMonitor_UI

Studio 5000® Application Code Manager Files

Studio 5000® Application Code Manager (ACM) can be optionally used if it is installed. All devices can be easily registered in the ACM repositories by running the *setup.cmd* file located in the root folder of the library.

Individual HSL4 files are provided as an alternative to running the setup.cmd to allow users to manually register specific implementation objects. Each object has two files - an Asset Control file and a Device file. The Asset Control files include attachments of all required files for that object. The Device files are used to actually add that device into a Studio 5000® project and these reference the Asset Control files.

All Studio 5000® Application Code Manager files can be found in the /*ApplicationCodeManagerLibraries/* folder of the library. The files included are as follows:

Implementation Object	Asset Control File (.HSL4)
Power Discrete State Monitor Extension	(RA-LIB)_Device_Asset-Control_PoweDiscrete_raC_Tec_PwrDiscreteStateMonitor_(3.4)
Power Velocity StateMonitor Extension	(RA-LIB)_Device_Asset-Control_PowerVelocity_raC_Tec_PwrVelocityStateMonitor_(3.4)
Power Motion StateMonitor Extension	(RA-LIB)_Device_Asset-Control_PwrMotion_raC_Tec_PwrMotionStateMonitor_(3.4)

Operations

Execution

Rung in condition transition response:

False ->True

- Connections and Activations are monitored and updated
- Reset commands are accepted from application and HMI

True ->False

- Connections and Activations are not monitored and updated
- Reset commands are not accepted from application and HMI

Affected Device Object Inf (information) Interface

Ref_Ctrl_Inf	Value
bExtensionEnabled.0	1
bExtensionAlert.0	0

Add-On Instruction I/O Data

InOut Data

InOut	Function / Description	DataType
Ref_Ctrl_Inf	Power State Monitor Device Information Interface Datatype Depends on object group	raC_UDT_ItfAD_PwrDiscrete_Inf raC_UDT_ItfAD_PwrVelocity_Inf raC_UDT_ItfAD_PwrMotion_Inf
Inp_Ctrl_Sts	Input Interface - Device control status Datatype Depends on object group	raC_UDT_ItfAD_PwrDiscrete_Inf raC_UDT_ItfAD_PwrVelocity_Inf raC_UDT_ItfAD_PwrMotion_Inf
Inp_Ctrl_Set	Input Interface - Device control set Datatype Depends on object group	raC_UDT_ItfAD_PwrDiscrete_Set raC_UDT_ItfAD_PwrVelocity_Set raC_UDT_ItfAD_PwrMotion_Set

Input Data

Input	Function/Description	DataType
Ref_Ctrl_Inf	Power Device Information Interface	raC_UDT_ItfAD_PwrDiscrete_Inf raC_UDT_ItfAD_PwrVelocity_Inf raC_UDT_ItfAD_PwrMotion_Inf
Inp_Ctrl_Set	Power Device Settings Interface	raC_UDT_ItfAD_PwrDiscrete_Set raC_UDT_ItfAD_PwrVelocity_Set raC_UDT_ItfAD_PwrMotion_Set
Inp_Ctrl_Sts	Power Device Status Interface	raC_UDT_ItfAD_PwrDiscrete_Sts raC_UDT_ItfAD_PwrVelocity_Sts raC_UDT_ItfAD_PwrMotion_Sts
Cmd_ClearCntActivation	Command to reset Activation counts	BOOL
Cmd_ClearMaxHrsActive	Command to reset maximum activation duration	BOOL
Cmd_ClearTotHrsActive	Command to reset accumulated activation duration	BOOL
Cmd_ClearCntDisconnect	Command to reset Disconnection count	BOOL
Cmd_ClearMaxHrsConnected	Command to reset maximum connected duration	BOOL
Cmd_ClearTotHrsConneced	Command to reset accumulates connected duration	BOOL

Output Data

Output	Function/Descritpion	DataType
raM_Tec_*XXX*StateMonitor	Instruction Identification Bit	BOOL
Val_Activations	Number of activations since last reset	DINT
Val_CurActiveHrs	Duration of Current activated state	REAL
Val_MaxActiveHrs	Duration of longest activated state since last reset	REAL
Val_TotActiveHrs	Duration of accumulated activated time since last reset	REAL
Val_Disconnections	Number of disconnections since last reset	DINT
Val_CurConnectedHrs	Duration of current connected state	REAL
Val_MaxConnectedHrs	Duration of longest connected state since last reset	REAL
Val_TotConnectedHrs	Duration of accumulated connected state since last reset	REAL

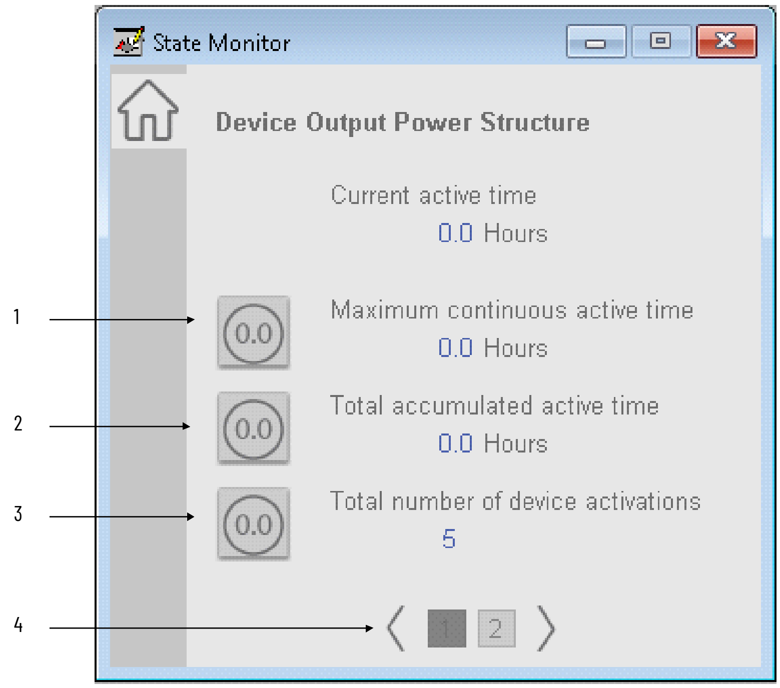
Faceplates

There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 28.

Home

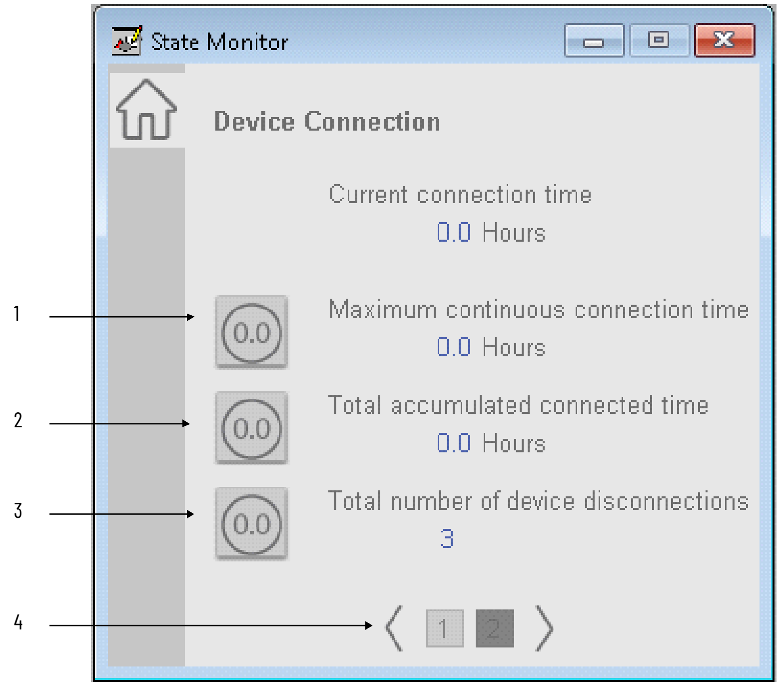
The Home tab is the only tab of the faceplate and includes two pages.

- Page 1: Displays information related to Device Output Power Structure (e.g. device activations/runtime). This includes current active time, maximum continuous active time, total accumulated active time and total number of device activations. The latter three parameters include an accumulator reset button on the left.



Item	Description
1	Accumulator reset button - maximum continuous active time (hrs)
2	Accumulator reset button - total accumulated active time (hrs)
3	Accumulator reset button - total number of device activations
4	Page navigation buttons

Page 2: Displays information related to Device Connection (e.g. network status). This includes current connection time, maximum continuous connection time, total accumulated connection time and total number of device disconnections. The latter three parameters include an accumulator reset button on the left.

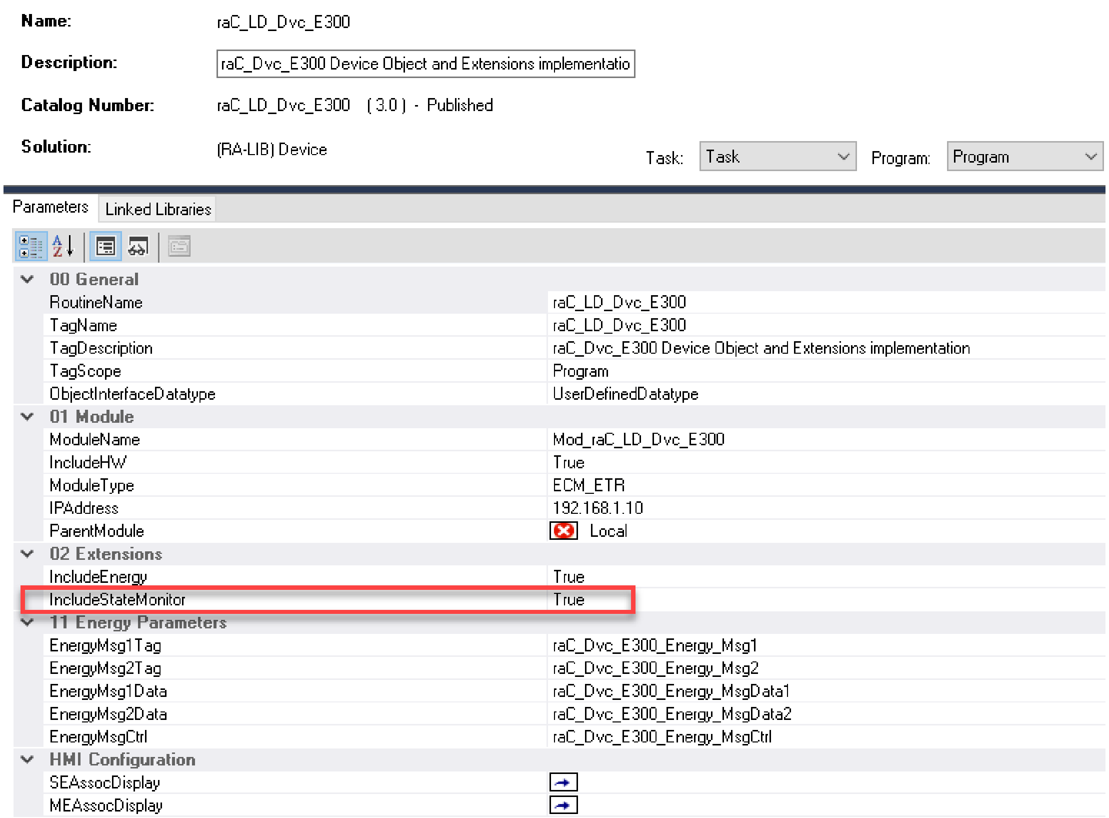


Item	Description
1	Accumulator reset button - maximum continuous connection time (hrs)
2	Accumulator reset button - total accumulated connection time (hrs)
3	Accumulator reset button - total number of device disconnections
4	Page navigation buttons

Application Code Manager

All Power State Monitor Extension device objects have similar configuration parameters in Application Code Manager. These parameters are configured as part of the base object and do not need to be added directly to a project. The following section defines the common parameters. "xxx" is used in place of the specific device type (e.g. Discrete/Velocity/Motion).

The enable an State Monitor Extension Object on a base object, simply set the *IncludeStateMonitor* parameter in the *02 Extensions* category to *True*. This is shown in the example using an E300 base device below.



Attachments

Name	Description	File Name	Extraction Path
V3_Power_Manual	Reference Manual	DEVICE-RM100x-EN-P.pdf	{ProjectName}\Documentation
V3_raC_Tec_Pwr_xxx_StateMonitor	Faceplate ME	(raC-3_03-ME) raC_Tec_PwrxxxStateMonitor-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays
V3_raC_Tec_Pwr_xxx_StateMonitor	Faceplate SE	(raC-3_03-SE) raC_Tec_PwrxxxStateMonitor-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays
V3_Power_Images	HMI Image set	Power_Images.zip	{ProjectName}\Visualization\Images

Power Predictive Maintenance Extension Objects (raC_Opr_PF755T_PM, raC_Opr_PF755T_PMv11)

Overview

The Power Predictive Maintenance Extension object is an optional extension of the PF755T (raC_Dvc_PF755T) that offers predictive maintenance related parameters and diagnostics. The Predictive Maintenance Extension faceplates are only supported in FactoryTalk® View ME/SE and not Studio 5000 View Designer®.

There are two variations of the device object. raC_Opr_PF755T_PM is compatible with PowerFlex 755TL/M/R drives with device firmware v6. For PowerFlex 755TL/M/R/S drives using device firmware v11 or greater please use the raC_Opr_PF755T_PMv11 object variation.

In the Library there is a folder named *Videos* which contains many How-To and Operational Overview Videos which walk step-by-step through each process. You can refer to the following videos for this section:
"How_To_Import_and_Configure_Predictive_Maintenance_in_FTViewME"
"Operational Overview_PF755T_Predictive_Maintenance_Extension_Object_Faceplates"
"Operational Overview_PF755T-v11_Predictive_Maintenance_Extension_Object_Faceplate"

The Power Device Library includes the following Predictive Maintenance Extension objects

Device	Device Firmware	Base Device Object Name	Object Group	Predictive Maintenance Extension Object Name
PowerFlex 755TL PowerFlex 755TM PowerFlex 755TR	5.xx	raC_Dvc_PF755T	PowerVelocity	Not available
PowerFlex 755TL PowerFlex 755TM PowerFlex 755TR	6.xx	raC_Dvc_PF755T	PowerVelocity	raC_Opr_PF755T_PM
PowerFlex 755TL PowerFlex 755TM PowerFlex 755TR	10.xx	raC_Dvc_PF755T	PowerVelocity	Not available
PowerFlex 755TL PowerFlex 755TM PowerFlex 755TR PowerFlex 755TS	11.xx or greater	raC_Dvc_PF755T	PowerVelocity	raC_Opr_PF755T_PMv11

Functional Description

The PowerFlex® 755T Predictive Maintenance Extensions enable users to monitor and configure all Predictive Maintenance parameters for the different ports on the drive. Additionally, it maintains a list of recent alarms.

Predictive maintenance models are built around a common framework where the amount of life consumed by each component or component group is tracked by the drive. Advanced physics-of-failure models are incorporated into the drive to convert actual stressors (e.g., voltage, current, speed, switching frequency, and temperature) into life consumption for critical components like fans, power semiconductors, capacitors, and breakers.

When the consumed life exceeds the user-defined event level which is user configurable (default is 80%), an alarm is generated indicating that preventative maintenance is required for the specific component.

Predictive Maintenance Extensions Object provides:

- Monitoring of all Predictive Maintenance parameters
- Configuration of all Predictive Maintenance parameters
- Maintains a log of several alarms/events that have occurred recently.
- The user can select an event and launch the "Event Detail overlay". The overlay displays information about the selected event.

This object can be used to alert personnel when the components are nearing the end of their lifespan so the components can be replaced before they fail. For an overview of predictive maintenance, see the Predictive Maintenance section in the PowerFlex® 750-Series Products with TotalFORCE Control Reference Manual, publication 750-RM100.

Use when:

- Using the PF755T Power Device object (raC_Dvc_PF755T)
- Using A PowerFlex 755T Drive with firmware v6 or v11+.
- Require application access to extended diagnostics for predictive maintenance.
- Require visualization access to extended diagnostics for predictive maintenance parameters with FactoryTalk® View ME/SE

Do NOT use when:

- Not using PF755T Power Device object
- Using PowerFlex 755T Drive with firmware v10 or v5 or less.
- Utilizing Studio 5000 View Designer® (PanelView™ 5000 HMI) for visualization

Required Files

Device Objects include Add-On Instructions (AOIs) and HMI faceplates. The revision number (e.g. 3.01) used in filenames can change as new revisions are created.

Use of the Predictive Maintenance Extension objects requires the base device object as well. Note that the Predictive Maintenance Extension object tag name is required to be named as DeviceObjectTagName_PM, where DeviceObjectTagName is the base tag name for the associated Device Object.

e.g. If a base device object raC_Dvc_PF755T named "MT100_Dvc" is used then the Predictive Maintenance Extension object raC_Opr_PF755T_PM should be named "MT100_Dvc_PM".

Controller Files

Add-On Instructions are reusable code objects that contain encapsulated logic that can streamline implementing your system. This lets you create your own instruction set for programming logic as a supplement to the instruction set provided natively in the ControlLogix® firmware. An Add-On Instruction is defined once in each controller project, and can be instantiated multiple times in your application code as needed.

The Add-On Instruction must be imported into the controller project to be used in the controller configuration. These can be imported as Add-On Instruction files, or as part of the Rung Import or Import Library Objects wizard.

Instructions that are supported by PlantPAx® 5.xx are supplied with two versions of the same instruction. Version 3.xx instructions are for use with standard applications while version 10.xx instructions are for use with PlantPAx® 5.xx applications. These alternate PlantPAx® supported versions use pre-defined data types which are available exclusively in 5x80 series Logix 5000 controllers with firmware v33 or greater.

All Add-On Instruction and Rung Import files can be found in the */Studio 5000 Logix Designer Files - L5X/Standard Files/* and */Studio 5000 Logix Designer Files - L5X/5x80v33 Files - Use with PlantPAx® 5.x/* folders in the library. Choose the */5x80v33 Files - Use with PlantPAx® 5.x/* Folder for PlantPAx® 5.x applications; otherwise choose the */Standard Files/* folder.

ATTENTION: The add-on instruction can be imported into a continuous or periodic task; however, if it is used in a periodic task then it is recommended to set the periodic task time to a minimum time of 100 ms.

Device/Item	Device Firmware	Application	Add-On Instruction	Rung Import
PF755T Predictive Maintenance Extension	v6	Standard	raC_Opr_PF755T_PM_3.03_AOI.L5X	raC_Opr_PF755T_PM_3.03_RUNG.L5X
		PlantPAx® v5.xx	raC_Opr_PF755T_PM_10.04_AOI_5x80v33.L5X	raC_Opr_PF755T_PM_10.04_RUNG_5x80v33.L5X
	v11+	Standard	raC_Opr_PF755T_PMv11_3.04_AOI.L5X	raC_Opr_PF755T_PMv11_3.04_RUNG.L5X
		PlantPAx® v5.xx	raC_Opr_PF755T_PMv11_10.05_AOI_5x80v33.L5X	raC_Opr_PF755T_PMv11_10.05_RUNG_5x80v33.L5X

FactoryTalk® View HMI Files

FactoryTalk® View ME or SE applications require importing the desired device faceplates in addition to all Global Object (ggfx) files and all images located in the */HMI FactoryTalk® View Images - png/* folder of the library. FactoryTalk® View ME files are stored in the */HMI - FactoryTalk® View ME/* library folder and

FactoryTalk® View SE files are stored in the */HMI - FactoryTalk® View SE/* library folder.

Device/Item	Type	FactoryTalk® View ME Faceplate	FactoryTalk® View SE Faceplate
Predictive Maintenance Extension Firmware v6	Display	(raC-3_02-ME) raC_Opr_PF755T_PM-Faceplate.gfx	(raC-3_02-SE) raC_Opr_PF755T_PM-Faceplate.gfx
Predictive Maintenance Extension Firmware v11+	Display	(raC-3_04-ME) raC_Opr_PF755T_PMv11-Faceplate.gfx	(raC-3_04-SE) raC_Opr_PF755T_PMv11-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - Power Device	(raC-3-SE) Graphic Symbols - Power Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - Power Device.ggfx	(raC-3-SE) Toolbox - Power Device.ggfx

FactoryTalk® Optix Library Files

FactoryTalk® View Optix applications require importing the desired library objects located in the PowerDevice_v3R library folder.

Device/Item	FactoryTalk® Optix Library Object
Predictive Maintenance Extension Firmware v6	raC_3_02_raC_Opr_PF755T_PM_UI
Predictive Maintenance Extension Firmware v11+	raC_3_04_raC_Opr_PF755T_PMv11_UI

Studio 5000® Application Code Manager Files

Studio 5000® Application Code Manager (ACM) can be optionally used if it is installed. All devices can be easily registered in the ACM repositories by running the *setup.cmd* file located in the root folder of the library.

Individual HSL4 files are provided as an alternative to running the setup.cmd to allow users to manually register specific implementation objects. Each object has two files - an Asset Control file and a Device file. The Asset Control files include attachments of all required files for that object. The Device files are used to actually add that device into a Studio 5000® project and these reference the Asset Control files.

All Studio 5000® Application Code Manager files can be found in the */ApplicationCodeManagerLibraries/* folder of the library. A single object is used in Studio 5000® Application Code Manager to handle both device firmware variations of the object. The files included are as follows:

Implementation Object	Asset Control File (.HSL4)
PF755T Predictive Maintenance Extension	(RA-LIB)_Device_Asset-Control_PowerVelocity_raC_Opr_PF755T_PM_(3.4)

Operations

Execution

Rung in condition transition response:

False ->True

- Predictive Maintenance related parameters are monitored and updated
- Reset commands are accepted from application and HMI

True ->False

- Predictive Maintenance related parameters are not monitored and updated
- Reset commands are not accepted from application and HMI

Affected Device Object Inf (information) Interface

Ref_Ctrl_Inf	Value
bExtensionEnabled.2	1
bExtensionAlert.2	0

Add-On Instruction I/O Data - raC_Opr_PF755T_PM

InOut Data

InOut	Function / Description	DataType
Inp_Ctrl_Sts	Power Device control status	raC_UDT_ItfAD_PwrVelocity_Sts
Inf_Lookup	Parameter Information List Entry	raC_UDT_PF755T_PM_Par_Info[605]
Out_Eventlist	Output Interface – Event List	raC_UDT_Event_PF755_PM[10]
Ref_Ctrl_Inf	Power Device Information Interface	raC_UDT_ItfAD_PwrVelocity_Inf
Ref_Msg_Data	Messaging Data	raC_UDT_PF755T_PM_Msg_Data
Ref_Msg_GetSingle	Get Single Message Data	MESSAGE
Ref_Msg_Scat_Read	Get Message Data	MESSAGE
Ref_Msg_Scat_Write	Set Message Data	MESSAGE
Ref_MsgCtrlResource	Message Control Resource	raC_UDT_ControlResource_Message

Input Data

Input	Function/Description	DataType
EnableIn	Enable Input - System Defined Parameter	BOOL
Set_SampleInterval	Set sampling interval (seconds)	REAL

Output Data

Output	Function/Descritpion	DataType
EnableOut	Enable Output - System Defined Parameter	BOOL
raC_Opr_PF755_PM	Instruction Identification Bit	BOOL
Sts_AcquiringData	Data Acquiring Status; 1=Data ACquiring, 0=Idle	BOOL
Sts_Alarm_Port	Bitwise Port Alarms: 1=Active Alarm, 0=No Alarm	DINT
Sts_Alarm_Port0	Port 0 Control Alarm Status: 1=Active Alarm, 0=No Alarm	DINT
Sts_Alarm_Port10	Port 10 Motor Side Control Alarm Status: 1=Active Alarm, 0=No Alarm	DINT
Sts_AlarmPort12	Port 12 Motor Side Alarm Status: 1=Active Alarm, 0=No Alarm	DINT
Sts_Alarm_Port14	Port 14 Line Side Alarm Status: 1=Active Alarm, 0=No Alarm	DINT
Sts_ER	Message Instruction Error: 1=CIP Error on Message Instruction, 0=No Error on Message Instruction	BOOL
Sts_Idle	Idle Status	BOOL
Sts_WaitingForDevice	Waiting status for Device	BOOL
Sts_WaitingForCtrlResource	Waiting Status for control Resource	BOOL

Add-On Instruction I/O Data - raC_Opr_PF755T_PMv11

InOut Data

InOut	Function / Description	DataType
Inp_Ctrl_Sts	Device Interface - Power Velocity	raC_UDT_ItfAD_PwrVelocity_Sts
Ref_Ctrl_Inf	Power Device Information Interface	raC_UDT_ItfAD_PwrVelocity_Inf
Ref_Msg_Get_PMC_Data	Get Predictive Maintenance Message	MESSAGE
Ref_Msg_Get_PMCG_Data	Get Predictive Maintenance Group Message	MESSAGE
Ref_Msg_Set_PMCG_Data	Set Predictive Maintenance Group Message	MESSAGE
Ref_MsgData_PMC	Get Predictive Maintenance Message Data	DINT[20]
Ref_MsgData_PMCG	Get Predictive Maintenance Group Message Data	DINT[50]
Ref_PMCG_WriteData	Set Predictive Maintenance Group Message Data	DIN[5]
Ref_MsgCtrlResource	Message Control Resource	raC_UDT_ControlResource_Message
Out_Eventlist	Output Interface – Event List	raC_UDT_Event_PF755_PMv11[10]

Input Data

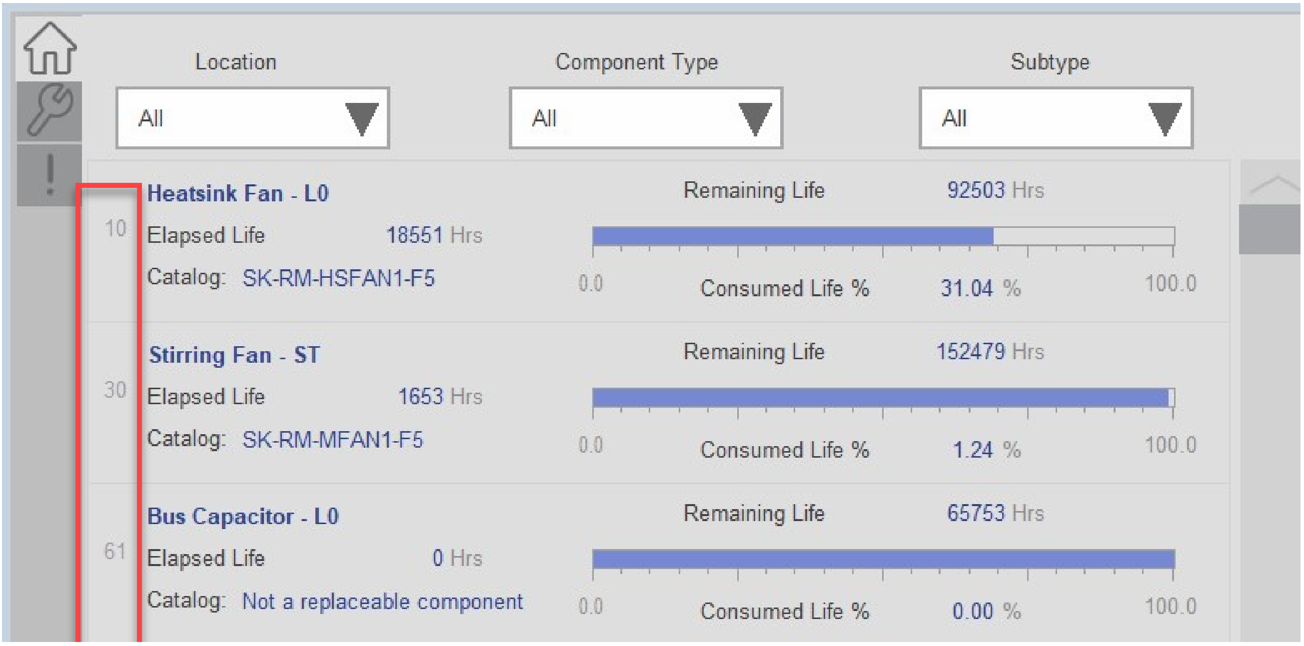
Input	Function/Description	DataType
Set_SampleInterval	Set sampling interval (seconds)	REAL
EnableIn	Enable Input - System Defined Parameter	BOOL

Output Data

Output	Function/Descritpion	DataType
Sts_Idle	Status Idle	BOOL
Sts_ER	Instruction is in Error - See Sts_ERR / Sts_EXERR for Additional Error Information	BOOL
Sts_AcquiringData	Status Acquiring data	BOOL
Sts_WaitingForDevice	Waiting status for Device	BOOL
Sts_WaitingForCtrlResource	Waiting Status for control Resource	BOOL
EnableOut	Enable Output - System Defined Parameter	BOOL
Sts_DataAcquisitionDuration	Data Acquisition Duration	DINT
bSts_ComponentPMEvent0	Bitwise Component # Predictive Maintenance Event 0-31	DINT
bSts_ComponentPMEvent32	Bitwise Component # Predictive Maintenance Event 32-63	DINT
bSts_ComponentPMEvent64	Bitwise Component # Predictive Maintenance Event 64-95	DINT
bSts_ComponentPMEvent96	Bitwise Component # Predictive Maintenance Event 96-127	DINT
Sts_AnyComponentPMEvent	Any Component Predictive Maintenance Event Active (1=Active)	BOOL

The bSts_ComponentPMEvent0/32/64/96 DINT variables are used to represent components 0 through 127. The component numbers vary depending on the exact model and configuration of the drive. You can correlate these numbers to the numbers shown to the left of each component on the Home Tab of the HMI faceplate.

Examples of component numbers are shown circled below:



Data Types

The following Power Predictive Maintenance Extension Common Control Interface tags are the primary device program tags to read and write to when interfacing to power Energy devices.

For further information and examples on how to interface the power device objects with your specific application code refer to the "How_To_Interface_with_Power_Device_Logix.mp4" video within the Videos folder of the Power Device Library Download files.

raC_UDT_ControlResource_Message

Member	Description	Data Type
ResourceInUse	Message control resource is being used by another instruction.	BOOL
SampleInterval	Message sample interval (sec).	REAL

raC_UDT_ItfAD_PwrVelocity_Inf

Member	Description	Data Type
ModulePath	Module CIP Path.	STR0032
bExtensionEnabled	Object extension is present in the controller. Bitwise representation: 0 = False, 1 = True.	DINT
bExtensionAlert	Object extension alert/notification is present. Bitwise representation: 0 = False, 1 = True.	DINT

raC_UDT_ItfAD_PwrVelocity_Sts

This is the Power Velocity Common Control Interface User-Defined Data Type for device status. Its members provide application program access to device states, status, and diagnostic data. The table below shows member names, descriptions, and tag data types.

Input	Description	Data Type
eState	Enumerated state value: 0 = Unused, 1 = Initializing, 2 = Disconnected, 3 = Disconnecting, 4 = Connecting, 5 = Idle, 6 = Configuring, 7 = Available.	DINT
FirstWarning	First Warning.	raC_UDT_Event
FirstFault	First Fault.	raC_UDT_Event
eCmdFail	Enumerated command failure code. See extended help for enumeration values.	DINT
bSts	Status (Bit Overlay).	DINT
Physical	1 = Controlling physical device.	BOOL
Virtual	1 = Controlling virtual device.	BOOL
Connected	1 = PAC to device connection has been established.	BOOL
Available	1 = The device is available for interaction with the user program.	BOOL
Warning	1 = A warning is active on the device.	BOOL
Faulted	1 = A fault is active on the device.	BOOL
Ready	1 = Device is ready to be activated.	BOOL
Active	1 = Device power structure is active.	BOOL
ZeroSpeed	1 = Motor is at zero speed (not rotating).	BOOL
ObjCtrl	0 = Object has control of this device, 1 = Object does not have control of this device. I.E. HIM or I/O control.	BOOL
CmdDir	Command direction: 0 = Forward, 1 = Reverse.	BOOL
ActDir	Actual direction: 0 = Forward, 1 = Reverse.	BOOL
Accelerating	1 = Motor is accelerating.	BOOL
Decelerating	1 = Motor is decelerating.	BOOL
AtSpeed	1 = Motor is At Speed.	BOOL
Speed	Actual Speed (Hz).	REAL

raC_UDT_PF755T_PM_Par_Data

Member	Description	Data Type
Par_No	Predictive Maintenance Parameter Number	DINT
Par_Val	Predictive Maintenance Parameter Value	REAL
Alarm_Code	Parameter Alarm Code 0: No Alarm 4: Event Level Alarm 5: Temperature Over Alarm 6: Temperature Under Alarm 7: Temperature Over Fault 8: Temperature Under Fault 9: Temperature NTC Short Fault 10: Temperature NTC Open Fault	SINT

raC_UDT_PF755T_PM_Par_Info

Member	Description	Data Type
Par_Identifier	Parameter Identifier: Bits: 0 to 3: Port Categorization 4 to 9: Parameters Categorization 10 to 15: Parameters section 16 to 20: Parameter Type 21: Parameter Datatype - 0: DWORD 1: Real 22 to 31: Reserved	DINT
Par_No	Predictive Maintenance Parameter Number for scattered read messaging	DINT

raC_UDT_Event_PF755T_PM

Member	Description	Data Type
Type	Event type: 1 = Status 2 = Warning 3 = Fault 4…n = User	DINT
ID	User definable event ID.	DINT
Category	User definable category (Electrical,Mechanical,Materials,Utility,etc.).	DINT
Action	User definable event action code.	DINT
Value	User definable event value or fault code.	DINT
Elapsed_Life	Elapsed Life in Hrs	REAL
Remaining_Life	Remaining Life in Hrs	REAL
Message	Event message text.	STRING
EventTime_L	Timestamp (Date/Time format).	LINT
EventTime_D	Timestamp (Y,M,D,h,m,s,us).	DINT[7]

raC_UDT_Event_PF755T_PMv11

Member	Description	Data Type
Elapsed_Life	Elapsed Life in Hrs	DINT
Remaining_Life	Remaining Life in Hrs	DINT
EventTime_L	Timestamp (Date/Time format).	LINT
EventTime_D	Timestamp (Y,M,D,h,m,s,us).	DINT[7]
Location	Location of the component	STRING
Sort_Location	Location of the component for sorting	INT
Component_Type	Type of physical component	INT

raC_UDT_LookupMember_STR_0082

Member	Description	Data Type
Code	Stores the value of device fault code	DINT
Desc	Stores the Messages related to fault code	STRING

raC_UDT_Dropdown_PF755T_PM

This is the Common Control User-Defined Data Type for drop-downs menus. The below table shows detailed information of members used in this UDT tag.

Member	Description	Data Type
Slider_Min	Slider Minimum	SINT
Slider_Max	Slider Maximum	SINT
Total_Item_Count	Total Length of Dropdown	SINT
List_Shift	Slider Value for Total Length of Dropdown	SINT
List_Select	Slider Value for Visible rows of Dropdown	SINT
Selected	Selected Value	SINT
Selected_Item	Selected Item from Dropdown	INT
Animation_Active	Dropdown List Visible	INT
Set_Up	Slider Up Command	BOOL
Set_Down	Slider Down Command	BOOL
Trigger_Tag	After Selection Trigger Bit	BOOL
List_Display	Dropdown List Item	STR0020[5]
List_Item	Enter Dropdown item names. e.g. Option0, Option1...etc	STR0020[22]
Sel_Button_EN	List selection button enable/disable bit: 1: Button Enabled 0: Button Disabled	DINT
Alarm	Dropdown item alarm status e.g. Alarm.0 = 1: Active Alarm on Item 1 Alarm.1 = 0: No Alarm on Item 1	DINT

raC_UDT_PF755T_PMC

This UDT is used to store the Predictive Maintenance Component data available in device firmware v11+.

Member	Description	Data Type
Instance_No	Instance Number of component	INT
Array_IDNo	ID number of Data array	INT
Sort_Location	Location sort Identification	INT
Sort_Type	Type sort Identification	INT
Sort_SubType	SubType sort Identification	INT
Component_Type	Type of physical component	INT
Predicted_Remaining_Life	Predicted remaining life of the component	DINT
Predicted_Remaining_Life_Units	Predicted remaining life of the component unit	INT
Elapsed_Life	Life of the component that has been in operation	DINT
Elpased_Life_Units	Unit to define the elapsed life of the component	INT
Consumed_Life_Percentage	Percentage of the total life of the component	REAL
Remaining_Life_Below_Threshold	Indicates whether the remaining life of the component has fallen below threshold	BOOL
Operating	Indicates whether the associated physical component is operating	BOOL
Reset_Count	Indicates the number of times the component has been reset	DINT
Identity_Instance	Instance number of the identity object instance that represents the device containing the physical component	DINT
Component_Number_Reference	Differentiates between components when multiple components are associated with one identity instance	INT
Location	Identifies the location of the component within a device	STRING
Replacement_Catalog_Number	Catalog number of the part that can be ordered to replace	STRING

raC_UDT_PF755T_PMC_Group

This UDT is used to store the Predictive Maintenance Component Group data available in device firmware v11+.

Member	Description	Data Type
Instance_No	Instance number of the component group	INT
Component_Group_Type	Specificities the type of components in the component group	INT
Number_Of_Components	Number of components include in this component group	INT
Component_Instance_List	List of Predictive Maintenance Components in group	INT[50]
Enabled	Enable or disable the component group	BOOL
Remaining_Life_Threshold	Select a remaining life level below which components in this group report an event	DINT
Remaining_Life_Threshold_Action	Select the action that components in this group take when their remaining life falls below the configured threshold: 0=Ignore, 1=Event.	INT

Member	Description	Data Type
Remaining_Life_Threshold_Units	Indicates the engineering units being used for the remaining life threshold attribute Specifies a user defined maximum life for all components in the group	INT
User_Maintenance_Maximum_Life	Specifies a user defined maximum life for all components in the group	DINT
User_Maintenance_Maximum_Life_Units	Indicates the engineering units being used for the user maintenance maximum life attribute	INT

raC_UDT_PF755T_PM_Msg_Data

This UDT is used to store the Predictive Maintenance message configuration data used with device firmware v11+.

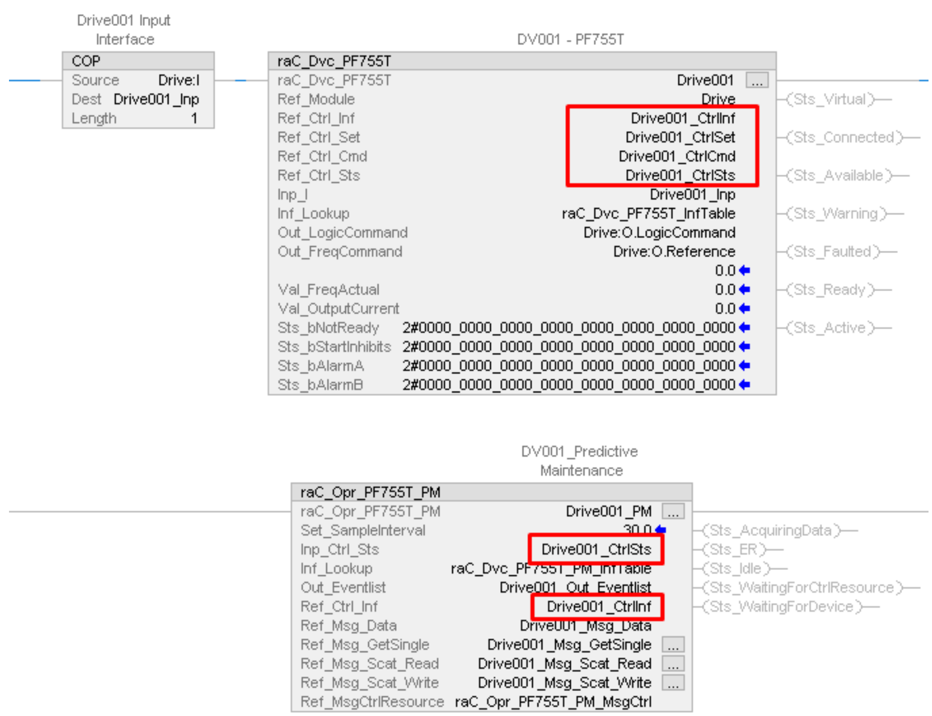
Member	Description	Data Type
Read_SCR		DINT[2]
Read_DST		DINT[2]
Write_SCR		DINT[2]
Write_RES		DINT[2]

Programming Example

Fully configured device on a rung is provided below for reference. This example includes the device and extensions objects for a PF755T (raC_Dvc_PF755T & raC_Opr_PF755T_PM).

Note that this programming example is the same code that is imported when either importing the supplied rung .L5X files or when using Application Code Manager or the Studio 5000® Import Library Objects wizard plug-in.

- PF755T Device Object Tag name = Drive001
- PF755T Device Object Interface tags
  - Drive001_CtrlInf
  - Drive001_CtrlSts
- Predictive maintenance tag name is derived from Device Object: Drive001_PM



Faceplates - raC_Opr_PF755T_PM (Device Firmware v6.xx)

There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 28.

Home

The Home tab is the main tab of the faceplate and displays various predictive maintenance related parameters with respect to different components and port selections. The user can select the desired Port and Section to view the relevant data. There is also an active event bell icon next to each port in the drop-down menu that has an active event.

PowerFlex® 755T drive extension object automatically checks which sections are available in different drive sizes and gives selection options in the second drop-down. When a section is not present in the list, it will not be available for selection and it will be grayed out.

Ports may include:

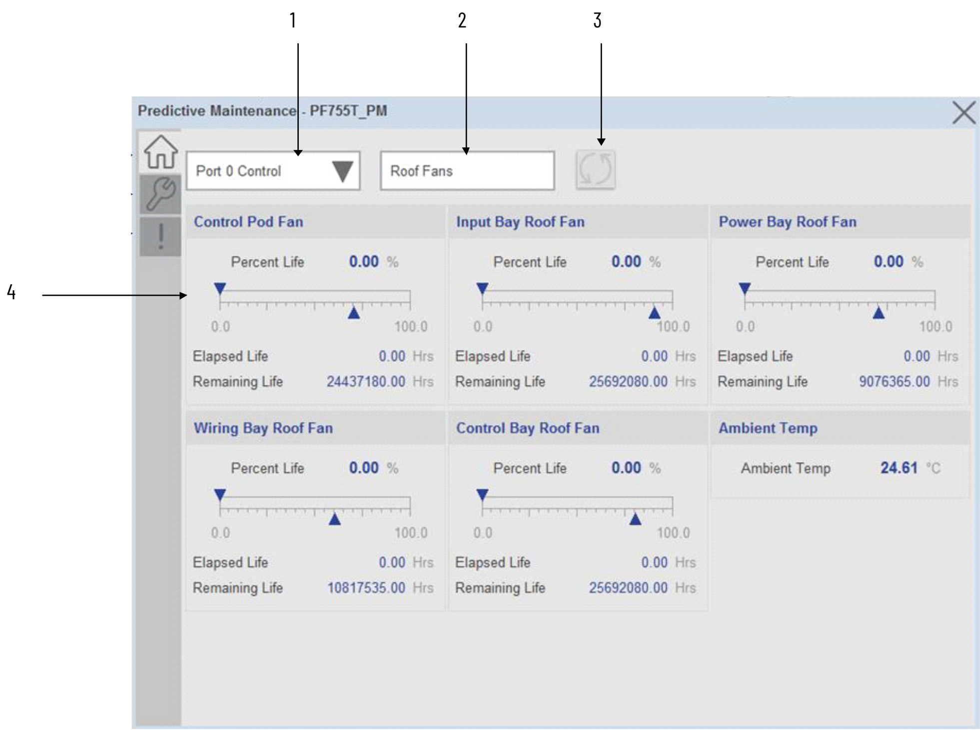
- Port 0 Controler
- Port 10 Motor Side Control
- Port 12 Motor Side
- Port 14 Line Side

The section drop-down menu selections will vary depending on the port selection type. The table below shows the section selection options based on the port selection.

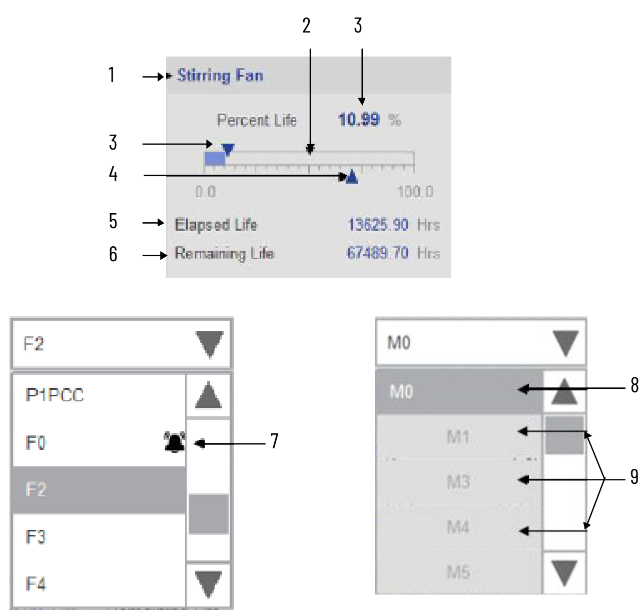
Port Selection Drop-down	Section Selection Drop-down
Port 0 Control	Roof Fans
Port 10 Motor Side Control	Bearing / Lubrication
Port 12 Motor side	M0, M1, M2, M3, M4, M5, M6, M7, M8, M9
Port 14 Line Side	L0, L1, L2, L3, L4, L5, L6, L7, L8, L9, P0MCB, P1MCB,

Components for each section may include:

- Fans and Blowers
- Insulated-Gate Bipoler Transistors (IGBT)
- DC Bus Capacitors
- Circuit Breakers
- LCL Capacitors
- Filters (airflow health)
- Temperature.



Item	Description
1	Port Selection drop-down menu
2	Section Selection drop-down menu
3	Data refresh button
4	Component predictive maintenance data includes component name, percent life, elapsed life, and remaining life. Bar graph indicates percent life value (0-100%)



Item	Description
1	Component name
2	Percent life bargraph
3	Percent life elapsed (%) shown on bargraph and as numeric value
4	Event level (%) shown on bargraph
5	Elapsed life (Hrs or Cycles)
6	Remaining life (Hrs or Cycles)
7	Event bell icon shown on section drop down
8	Section is present and available for selection
9	Section is not present and not available for selection (greyed out)

Predictive Maintenance Parameters:

In each of the predictive maintenance functions, there are several parameters that are used to configure levels, actions, inputs, and outputs. The following sections describe those functions and parameters. The following descriptions are the same for all parameters. For example, Event Level functions are the same for all parameters, in that it determines when the event that it is monitoring occurs based on percentage of life used.

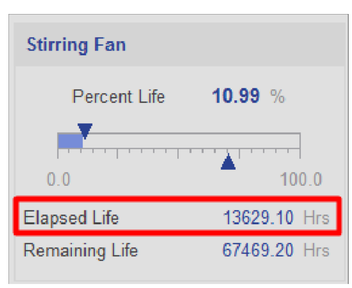
There is an elapsed life, remaining life, percent life parameter for each component that is covered by predictive maintenance home tab display.

Elapsed Life:

The elapsed life value displays the accumulated elapsed life of the component (e.g. fan). The values of these parameters represent the accumulated damage that the components experience.

The unit of measure is unique for each type of component.

- Hours for fans, bus capacitors, and filter capacitors.
- Cycles for relay contacts, IGBTs, precharge contactors, switches, and breakers.

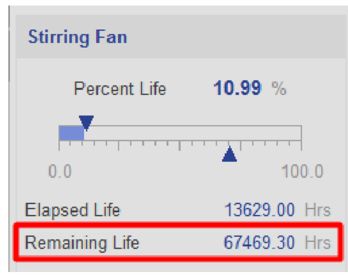


The values reflect the runtime on the components and the running conditions. For example, elapsed life values for fans increment faster when the temperature is higher and the fan speed is higher. Elapsed life values for IGBTs increment faster when temperature, load, and carrier frequency are higher.

Elapsed life values for bus capacitors increment faster when temperature, load, and DC bus ripple are higher.

Remaining Life

The remaining life value displays the remaining life for the component (e.g. fan). The value of this parameter represents a prediction of how much life is remaining in the component. Changes you make to the event level for each predictive maintenance function directly affect this value.

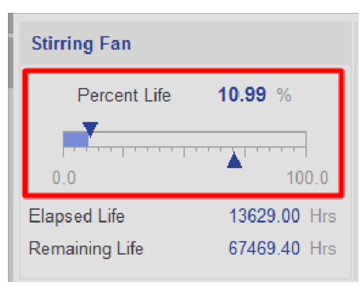


The unit of measure for these parameters is always hours, regardless of the component type. Measuring time in hours helps you schedule replacement during planned downtime.

Predicted values are based on the rate of change of accumulated damage. For example, remaining life values for fans are lower when recent temperature and speed are higher. Remaining life values for IGBTs are lower when recent temperature, load, and carrier frequency are higher. Remaining life values for bus capacitors are lower when recent temperature, load, and DC bus ripple are higher.

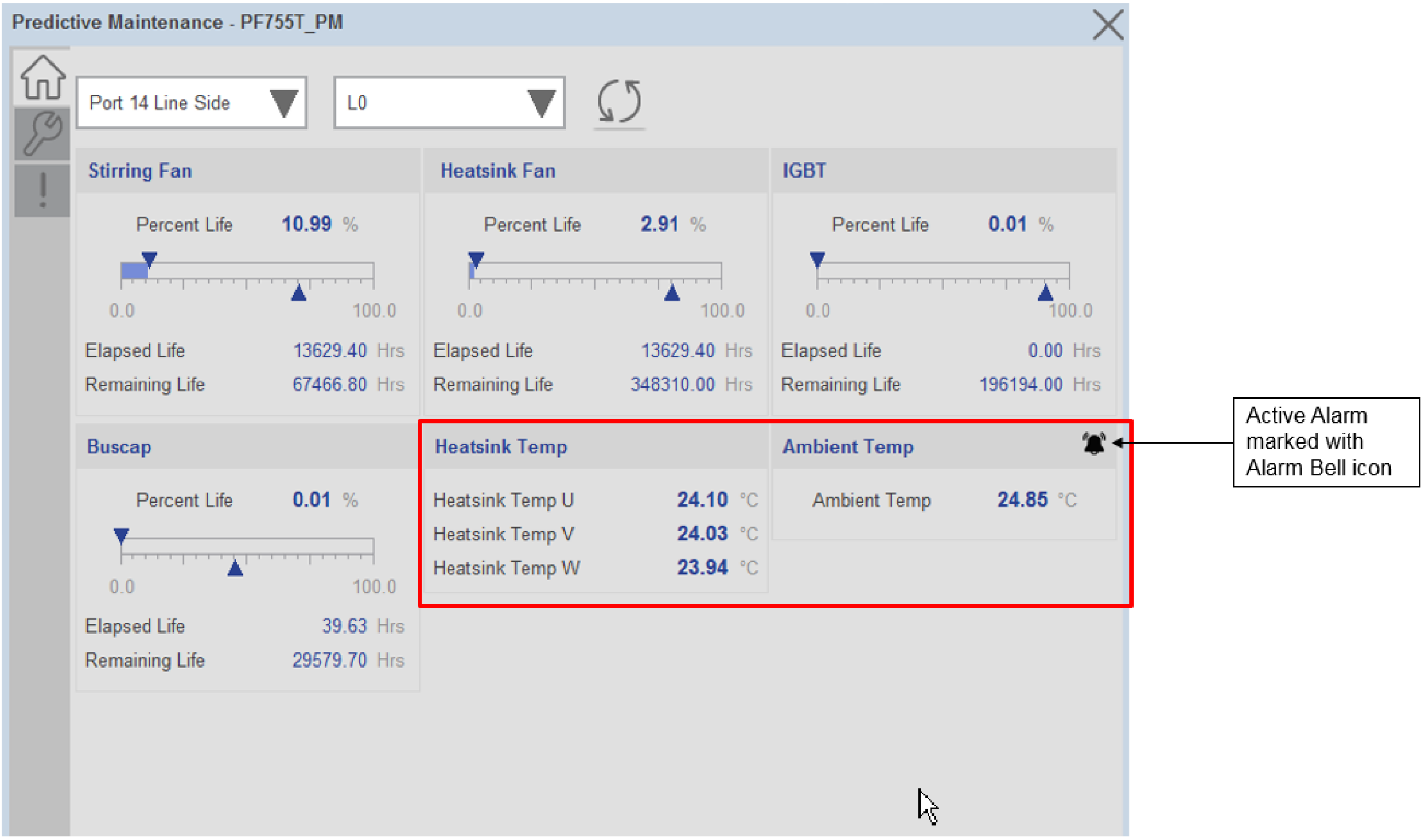
Percent Life:

The percent life value displays the consumed life of the component (e.g. Power module heatsink fan) as a percentage of its total life. Same value I also shown by bar graph from 0 to 100%.



Temperature

There are five types of temperatures parameters displayed, if there is any type of active event present, it will be highlighted by active event bell icon



Ambient Temperature: Displays the measured temperature of the air entering the power module, in degrees Celsius.

- An over temperature fault occurs if the value goes above 70 °C.
- An over temperature alarm occurs if the value goes above 60 °C.
- An under temperature fault occurs if the value falls below -30 °C.
- An under temperature fault occurs if the value falls below -25 °C.

HeatsinkTempU: Displays the temperature of the heatsink in degrees Celsius. This is measured by the Negative Temperature Coefficient (NTC) device on the U (T1) phase.

- If the temperature rises to 108 °C, an over-temperature alarm occurs.
- If the heatsink temperature rises to 118 °C, an over-temperature fault occurs.
- If the heatsink temperature falls to -25 °C, an under-temperature alarm occurs.
- If the heatsink temperature falls to -30 °C, an under-temperature fault occurs.
- If the heatsink temperature rises above 150 °C, an NTC short fault occurs.
- If the heatsink temperature falls below -40 °C, an NTC open fault occurs.

HeatsinkTempV: Displays the temperature of the heatsink in degrees Celsius. This is measured by the Negative Temperature Coefficient (NTC) device on the V (T2) phase.

- If the temperature rises to 108 °C, an over-temperature alarm occurs.
- If the heatsink temperature rises to 118 °C, an over-temperature fault occurs.
- If the heatsink temperature falls to -25 °C, an under-temperature alarm occurs.
- If the heatsink temperature falls to -30 °C, an under-temperature fault occurs.
- If the heatsink temperature rises above 150 °C, an NTC short fault occurs.
- If the heatsink temperature falls below -40 °C, an NTC open fault occurs.

HeatsinkTempW: Displays the temperature of the heatsink in degrees Celsius. This is measured by the Negative Temperature Coefficient (NTC) device on the W (T3) phase.

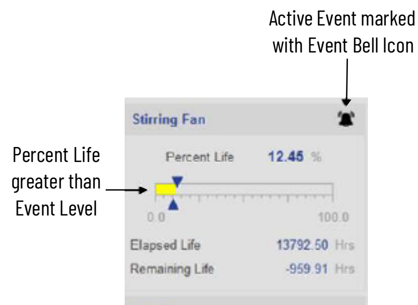
- If the temperature rises to 108 °C, an over-temperature alarm occurs.
- If the heatsink temperature rises to 118 °C, an over-temperature fault occurs.
- If the heatsink temperature falls to -25 °C, an under-temperature alarm occurs.
- If the heatsink temperature falls to -30 °C, an under-temperature fault occurs.
- If the heatsink temperature rises above 150 °C, an NTC short fault occurs.
- If the heatsink temperature falls below -40 °C, an NTC open fault occurs.

Events

Each component on the home screen is highlighted with an active event icon if an active event is present.

In the case of the following components, the Percent life must be greater than or equal to Event Level for an active event to be generated. The event will be shown by the active event bell icon and the event will be recorded in the event queue and visible on the event list tab.

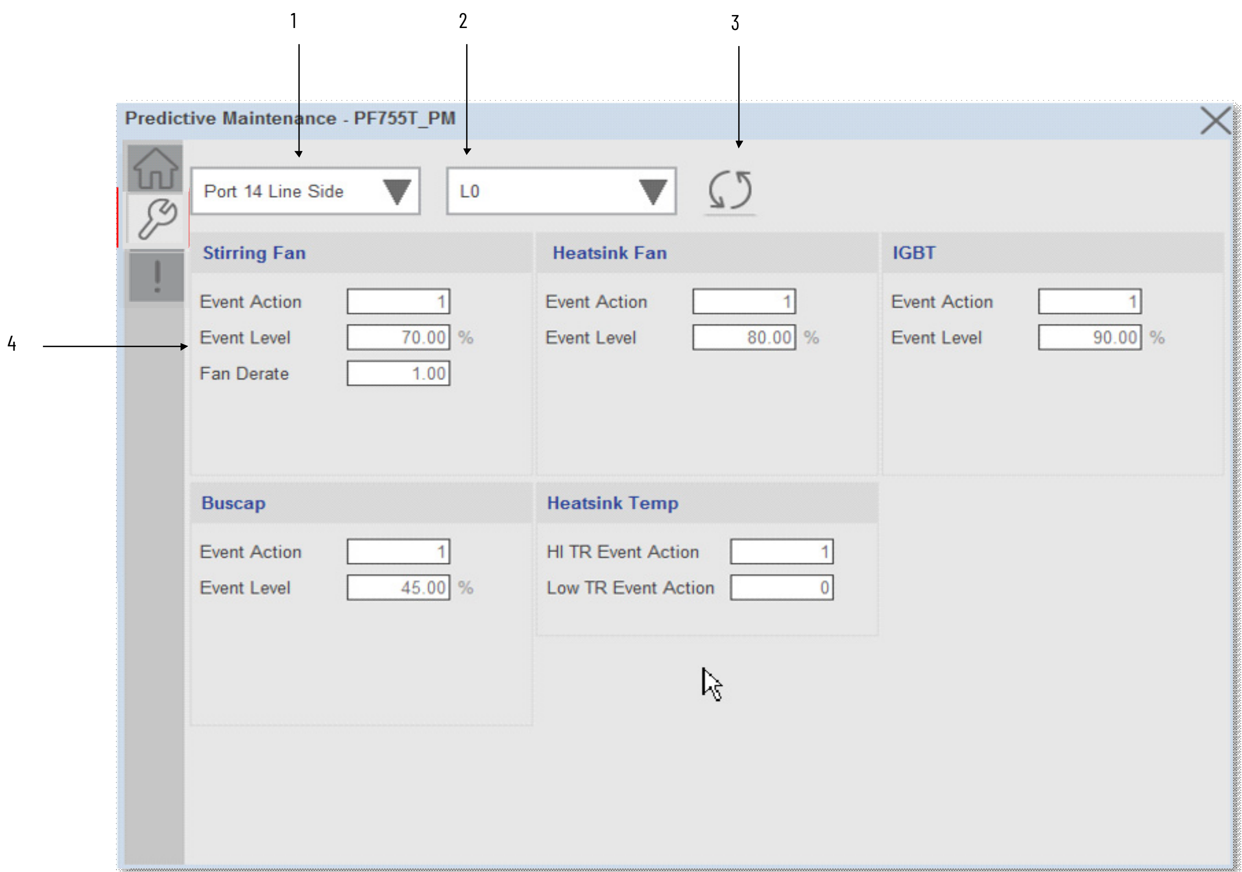
- Roof Fans
- Pod Fans
- Heatsink Fans
- Stirring Fans
- Motor Bearings
- IGBT
- Buscap
- DCPMCS
- MCB
- Precharge Contactor
- Filter Capacitor



Configuration Tab

The configuration screen is visible when the Config tab button is selected in the tab control object on the left side of the screen.

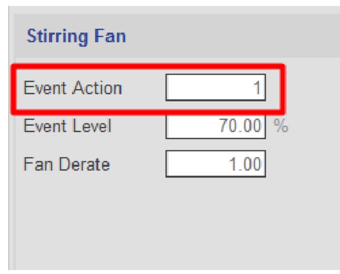
The configuration screen is the 2nd screen for the faceplate. It displays configuration parameters of Predictive Maintenance functions of various components that are used in PowerFlex® 755T products with respect to different Port selection.



Item	Description
1	Port Selection drop-down menu
2	Section Selection drop-down menu
3	Data refresh button
4	Component event configuration settings including event action (1 = event), event level, and fan derate if applicable.

Event Parameter Configuration

Event Action: The event action determines what happens when the event occurs. There are two choices: Ignore and Event.

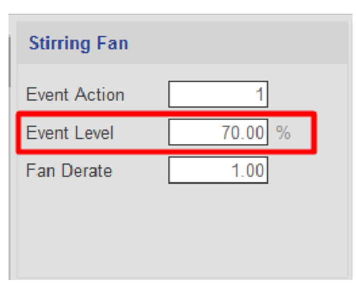


• Ignore (0) – causes the drive or bus supply to do nothing when the event occurs: No event shown on component

• Event (1) – causes the drive or bus supply to produce an event when the event occurs: Active event shown on component and same will be logged in event queue.

The event notification occurs on component and event information appears on the event log. They are also recorded in the event queue. Default Value: 1 = 'event'

Event Level: The event level determines when the event occurs. The level is expressed in percent of life used.



The event occurs when the component has used up this amount of predicted life. The default is 80%. If you leave it at the default setting, the event occurs when 80% of the component life is used. If you change a level to 50%, the event occurs when half of the component life is used.

You can change these values to almost any level. Select a level that is appropriate for your application and drive section. If the drive section is critical or the application cannot tolerate unplanned downtime, you can use lower event level values.

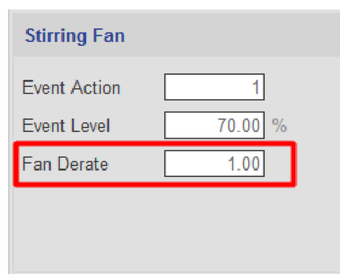
- Default Value: 80
- Min/Max: 0.000/100.000
- Unit: %

Note: For Motor Lubrication & Machine Lubrication components, Event Level should be entered in hours, not in percentages.

For Motor Lubrication & Machine Lubrication components, Event Level should be entered in hours, not in percentages.

- Default Value: 000
- Min/Max: 0.000/220000000.000
- Unit: Hrs

Fan Derating Factor: Enter a value to derate the model of fan for all the fans in the drive or bus supply. This includes heatsink fans, pod fans, door fans and roof fans. This parameter is only available for heatsink fans, pod fans, door fans and roof fans. If the environment is clean and there is no adverse vibration, enter a value of one, which leads to a prediction for maximum life.



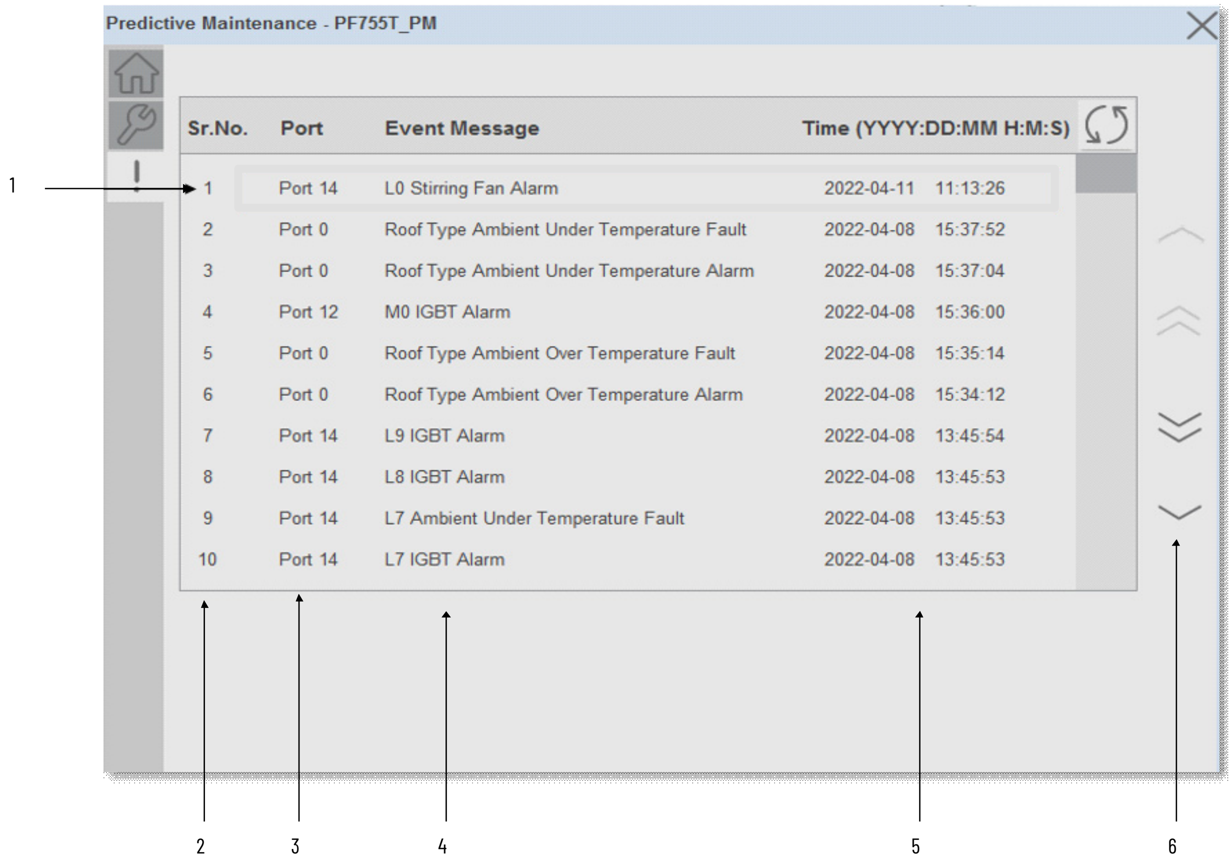
If there are factors like vibration or air contamination that will reduce fan life, enter a value less than one.

A value of 0.75 leads to a prediction of 75% of maximum life. A value of 0.50 leads to a prediction of 50% of maximum life.

- Default Value: 1.00
- Min/Max: 0.01/1.00

Event Log Tab

The event log screen displays event information that recently occurred also it maintains a log of several events that have occurred recently, and the size of event list is user configurable. The queue contains Port type, event description, and time stamp information.



Item	Description
1	Most recent event
2	Event Numer
3	Event Port
4	Event Message
5	Event Timestamp (YYYY-DD-MM hh:mm:ss)
6	Page up/page down navigation

Navigation buttons are available on the alarm list. You can navigate through the historical alarms by using these buttons. When you open the alarm list, it shows 10 recent alarm rows. If you want to view historical alarms, you can click on the navigation button.

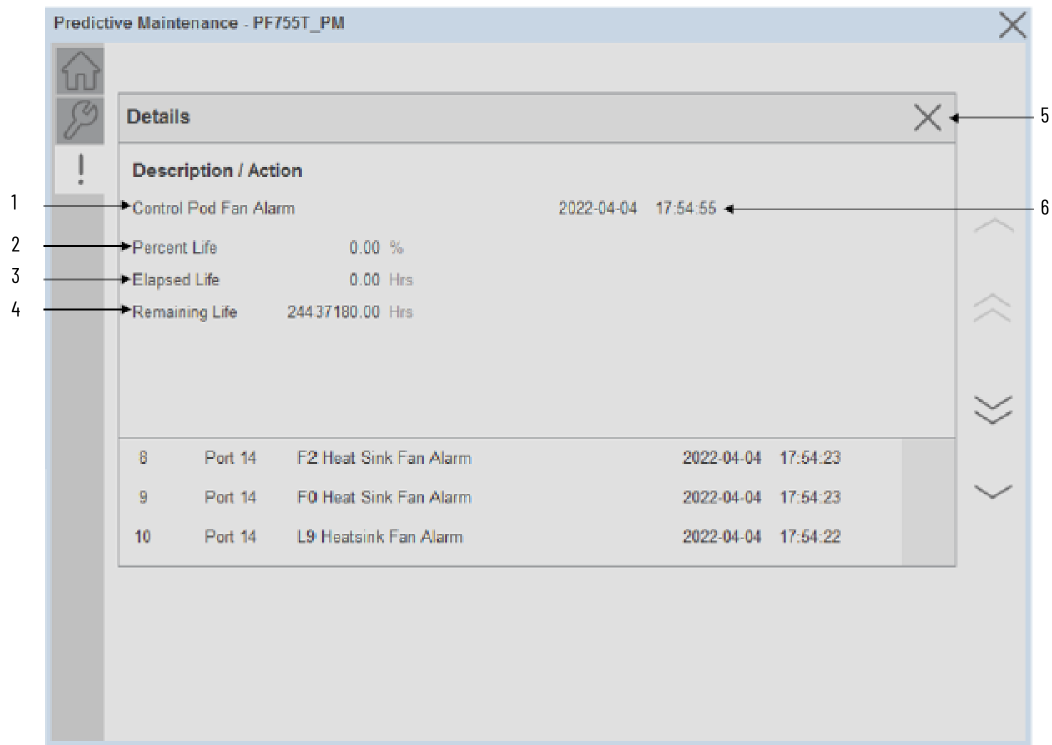
- First Page: To jump to the first page of the alarm list, click this button
- Page Up: The previous page can be accessed by clicking this button
- Page Down: The next page can be accessed by clicking this button
- Last Page: To jump to the last page of the alarm list, click this button

Note: The size of alarm list is user configurable, by default the minimum size is kept to 10 alarms. User can define this size in AOI inout parameter **"Out_Eventlist"**

Out_Eventlist	Output Interface - Event List	raC_UDT_Event_PF755_PM[10]

Event Details Screen

To view more details about an event, click on the particular row to launch the detailed display. The Details Screen provides a more detailed description or possible action steps to remedy condition with timestamp. In addition, it displays snapshot values of Percent Life, Elapsed Life, and Remaining Life at the time when the event was triggered.



Item	Description
1	Event description
2	Snapshot value at time of event - percent life
3	Snapshot value at time of event - elapsed life
4	Snapshot value at time of event - remaining life
5	Close details window button
6	Event Timestamp (YYYY-DD-MM hh:mm:ss)

Faceplates - raC_Opr_PF755T_PMv11 (Device Firmware v11.001+)

There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 28.

Home

The Home tab is the main tab of the faceplate and displays various predictive maintenance related parameters with respect to different components and location selections. The user can select the desired location, component type and component sub-type to view the relevant data. Active events are showing using an alarm bell icon and filling the bar graph in yellow.

PowerFlex® 755T drive extension object automatically checks which locations and components are available in different drive sizes and gives selection options in the drop-down menus accordingly.

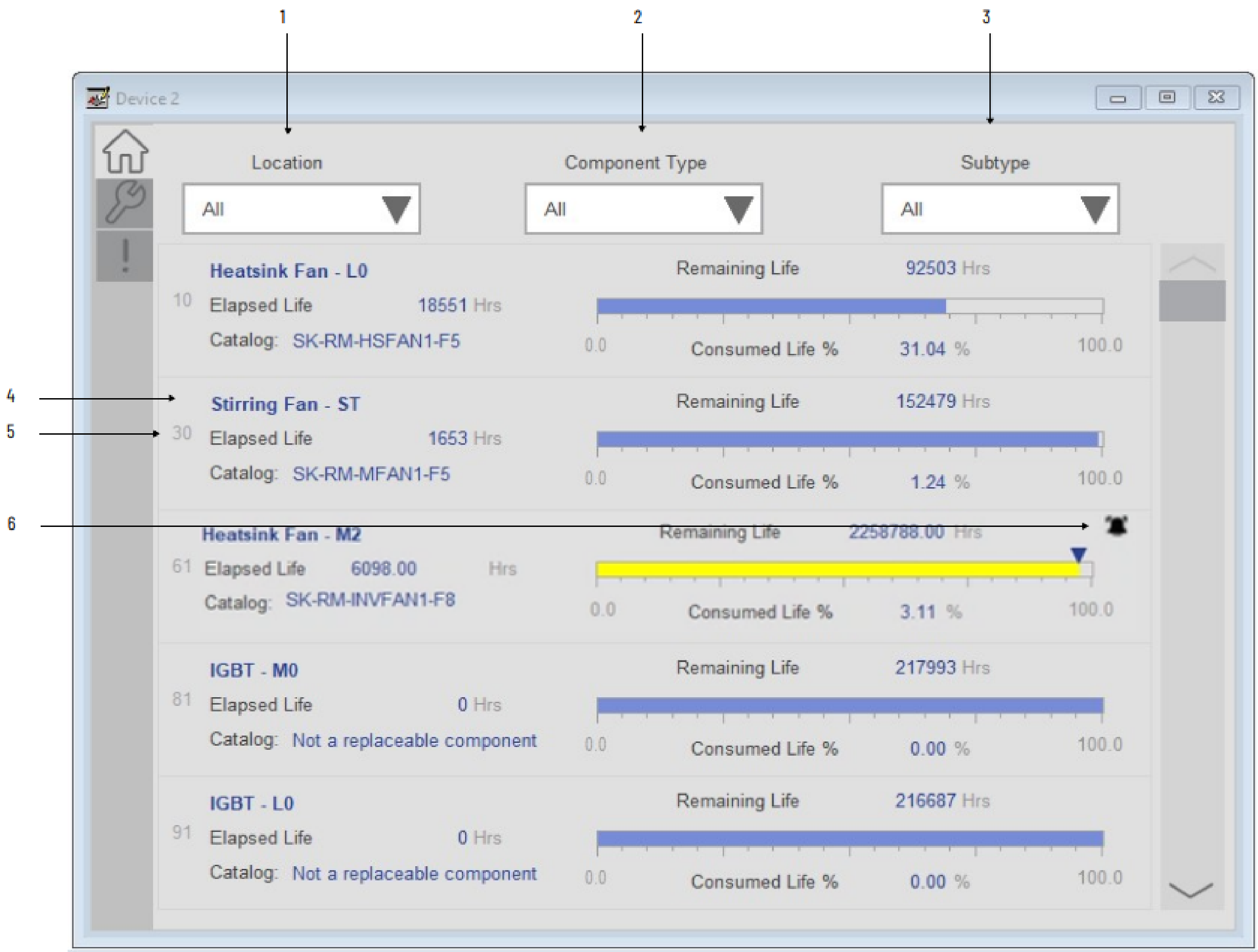
Locations include:

- Inverter
- Converter
- LCL Filter
- Power Bay
- Input Bay
- Control Bay
- Wiring Bay
- Control Pod
- AC Precharge
- Primary Motor
- Secondary Motor
- Stirring Fan

Component Type and Sub-Types Include:

- Fans:
  - Heatsink Fans
  - Roof Fans
  - Door Fans
  - PCB Fans
- Capacitors:
  - Bus Capacitors
  - Filter Capacitors
- Power Devices
  - IGBT
- Switching Devices:
  - Cont. S/W Device
  - Circuit B S/W Device
- Bearings:
  - Motor Bearings
  - Machine Bearings
- Lubrications:

- Motor Lubricants
- Machine Lubricants



Item	Description
1	Location Selection drop-down menu. - Inverter - Converter - LCL Filter - Power Bay - Input Bay - Control Bay - Wiring Bay - Control Pod - AC Precharge - Primary Motor - Secondary Motor - Stirring Fan
2	Component Type Selection drop-down menu - Fans - Capacitors - Power Devices - Switching Devices - Bearings - Lubrications
3	Component Subtype Selection drop-down menu Fans: - Heatsink Fans - Roof Fans - Door Fans - PCB Fans Capacitors: - Bus Capacitors - Filter Capacitors Power Devices - IGBT Switching Devices: - Cont. S/W Device - Circuit B S/W Device Bearings: - Motor Bearings - Machine Bearings Lubrications: - Motor Lubricants - Machine Lubricants
4	Component predictive maintenance data includes: - Component name - Elapsed Life (Hrs) - Catalog Number - Remaining Life (Hrs) - Consumed Life (%) Bar graph indicates consumed life value (0-100%)
5	Component number. This correlates the the Add-On Instruction output parameters bSts_ComponentPMEvent0/32/64/96.
6	Components exceeding the component event limit show an alarm icon and the bar graph is filled in yellow.

Predictive Maintenance Parameters:

In each of the predictive maintenance functions, there are several parameters that are used to configure levels, actions, inputs, and outputs. The following sections describe those functions and parameters. The following descriptions are the same for all parameters. For example, Event Level functions are the same for all parameters, in that it determines when the event that it is monitoring occurs based on percentage of life used.

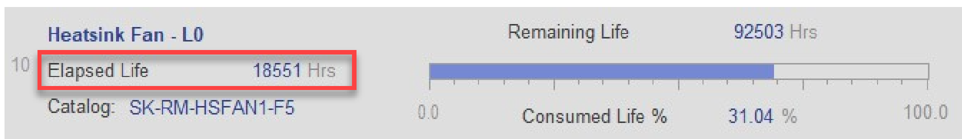
There is an elapsed life, remaining life, percent life parameter for each component that is covered by predictive maintenance home tab display.

Elapsed Life:

The elapsed life value displays the accumulated elapsed life of the component (e.g. fan). The values of these parameters represent the accumulated damage that the components experience.

The unit of measure is unique for each type of component.

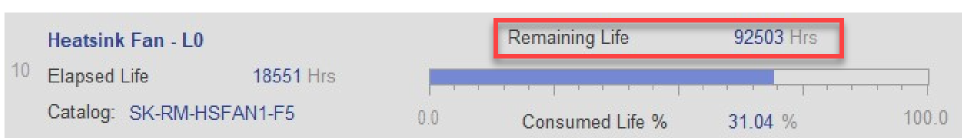
- Hours for fans, bus capacitors, and filter capacitors.
- Cycles for relay contacts, IGBTs, precharge contactors, switches, and breakers.



The values reflect the runtime on the components and the running conditions. For example, elapsed life values for fans increment faster when the temperature is higher and the fan speed is higher. Elapsed life values for IGBTs increment faster when temperature, load, and carrier frequency are higher. Elapsed life values for bus capacitors increment faster when temperature, load, and DC bus ripple are higher.

Remaining Life

The remaining life value displays the remaining life for the component (e.g. fan). The value of this parameter represents a prediction of how much life is remaining in the component. Changes you make to the event level for each predictive maintenance function directly affect this value.

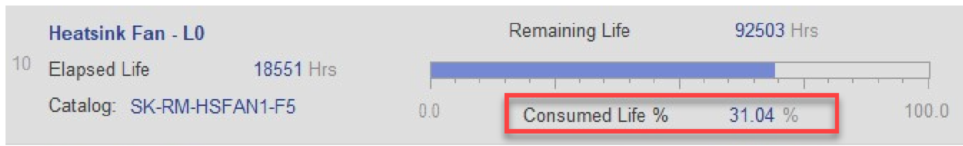


The unit of measure for these parameters is always hours, regardless of the component type. Measuring time in hours helps you schedule replacement during planned downtime.

Predicted values are based on the rate of change of accumulated damage. For example, remaining life values for fans are lower when recent temperature and speed are higher. Remaining life values for IGBTs are lower when recent temperature, load, and carrier frequency are higher. Remaining life values for bus capacitors are lower when recent temperature, load, and DC bus ripple are higher.

Consumed Life:

The percent life value displays the consumed life of the component (e.g. Power module heatsink fan) as a percentage of its total life. Same value I also shown by bar graph from 0 to 100%.



Events

Each component on the home screen is highlighted with an active event icon and a bar graph filled in yellow if an active event is present.

In the case of the following components, the consumed life must be greater than or equal to Event Level for an active event to be generated. The event will be shown by the active event bell icon and the event will be recorded in the event queue and visible on the event list tab.

Configuration Tab

The configuration screen is visible when the Config tab button is selected in the tab control object on the left side of the screen.

There are three pages within the configuration tab. These pages display configuration parameters of Predictive Maintenance functions of various components that are used in PowerFlex® 755T products.

Page 1 Configurations - Component Notification Settings:

- Fans
- Bus Capacitors
- Filter Capacitors
- IGBT
- Contactor

- Circuit Breaker

Page 2 Configurations - Motor & Machine Notification Settings:

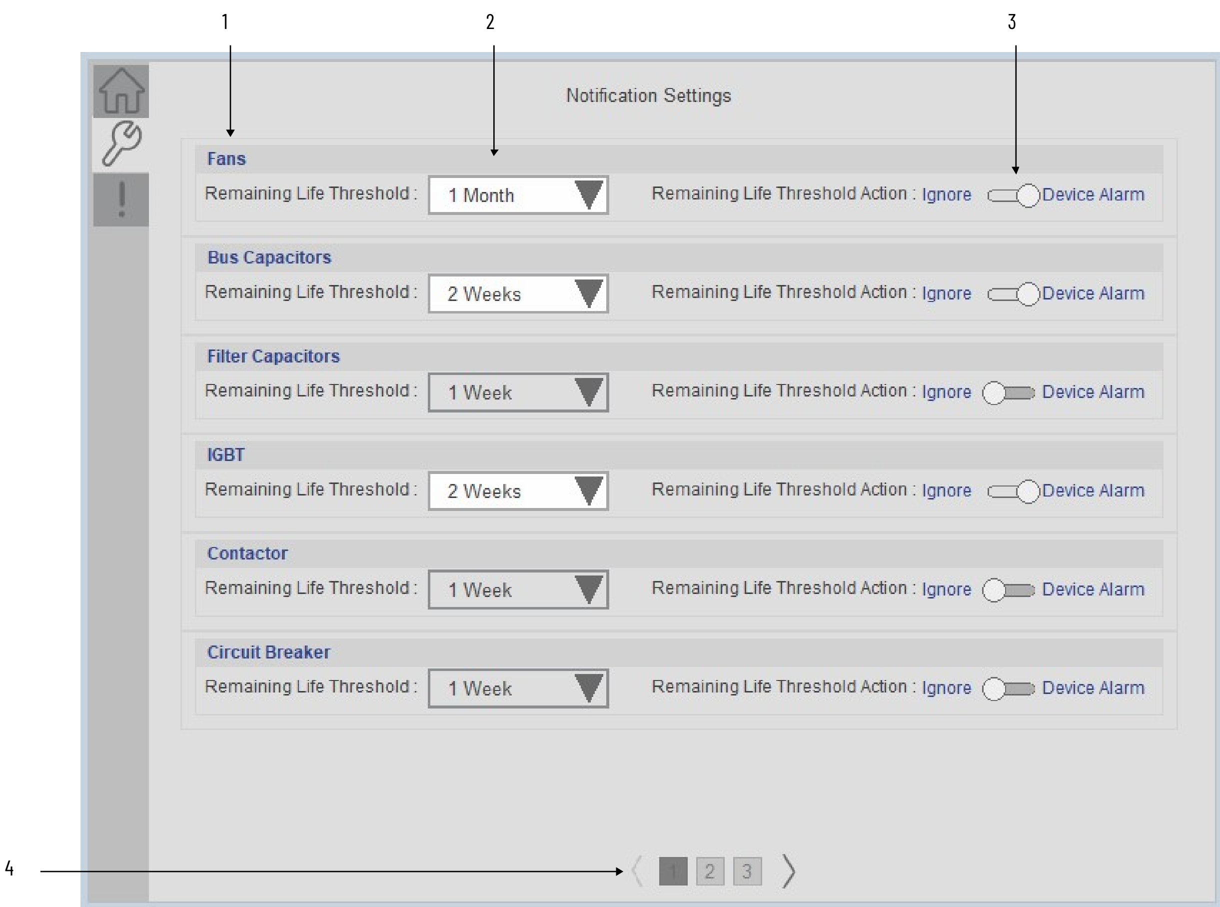
- Motor Bearing
- Machine Bearing
- Motor Lubrication
- Machine Lubrication

Page 3 Configurations - Environmental Settings:

- Enclosure Type
- Airborne Contaminants

Page 1 Configurations - Component Notification Settings

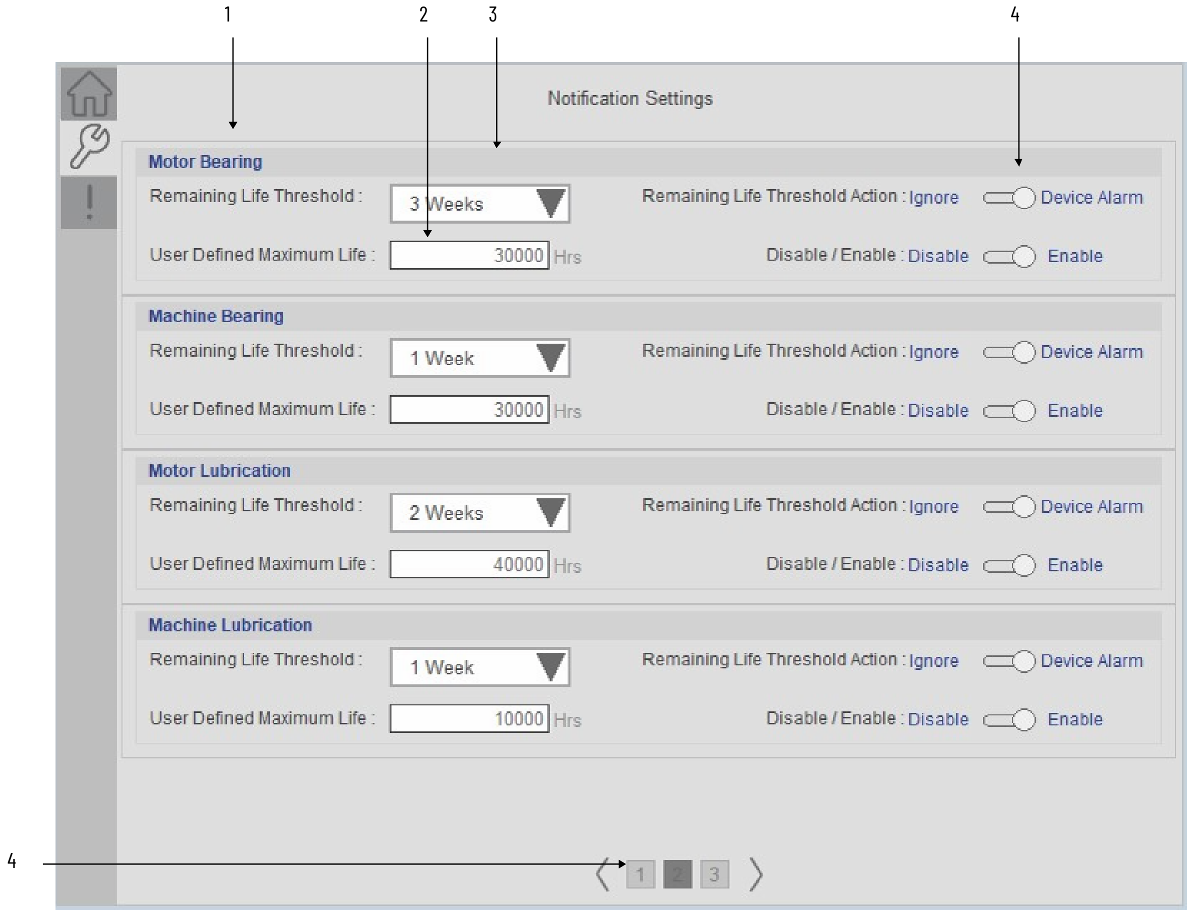
The first page allows users to set the remaining life threshold setpoint for each component group and ignore or enable the alarm.



Item	Description
1	Component Group: - Fans - Bus Capacitors - Filter Capacitors - IGBT - Contractor - Circuit Breaker
2	Remaining Life Notification Setting Drop-down selector. Set to the desired remaining life to trip an event. - 1 Week - 2 Weeks - 3 Weeks - 1 Month - 3 Months - 6 Months - 9 Months - 1 Year
3	Remaining Life Threshold Action. Use to enable/disable predictive maintenance events for each component group. - Ignore - Device Alarm (Enabled)
4	Page Select Navigation

Page 2 Configurations - Motor/Machine Notification Settings

The second configuration page allows users to set the remaining life threshold setpoint for motor and machine bearings and lubrication, and ignore or enable the alarm. Users may additional set a user defined maximum life (hrs) setpoint and enable or disable this alarm.

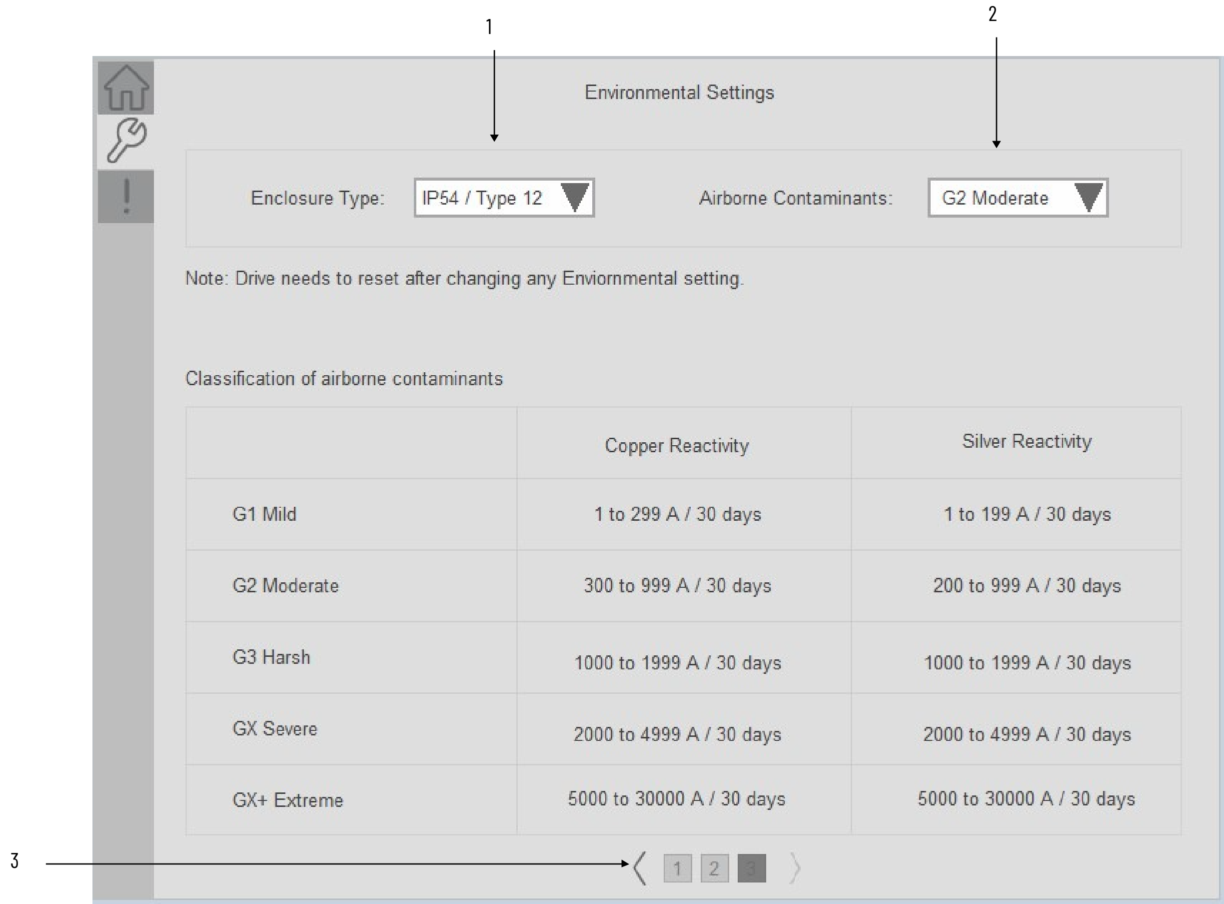


Item	Description
1	Component Group: - Motor Bearing - Machine Bearing - Motor Lubrication - Machine Lubrication
2	User defined maximum life (hrs). Use this setpoint along with the Disable/Enable toggle to set an additional maximum life alarm.
3	Remaining Life Notification Setting Drop-down selector. Set to the desired remaining life to trip an event. - 1 Week - 2 Weeks - 3 Weeks - 1 Month - 3 Months - 6 Months - 9 Months - 1 Year
4	Remaining Life Threshold Action. Use to enable/disable predictive maintenance events for each component group. - Ignore - Device Alarm (Enabled)
4	Page Select Navigation

Page 3 Configurations - Environmental Settings

The third configuration page allows users to set the environmental settings of the drive. Users may set the enclosure type and airborne contaminants rating.

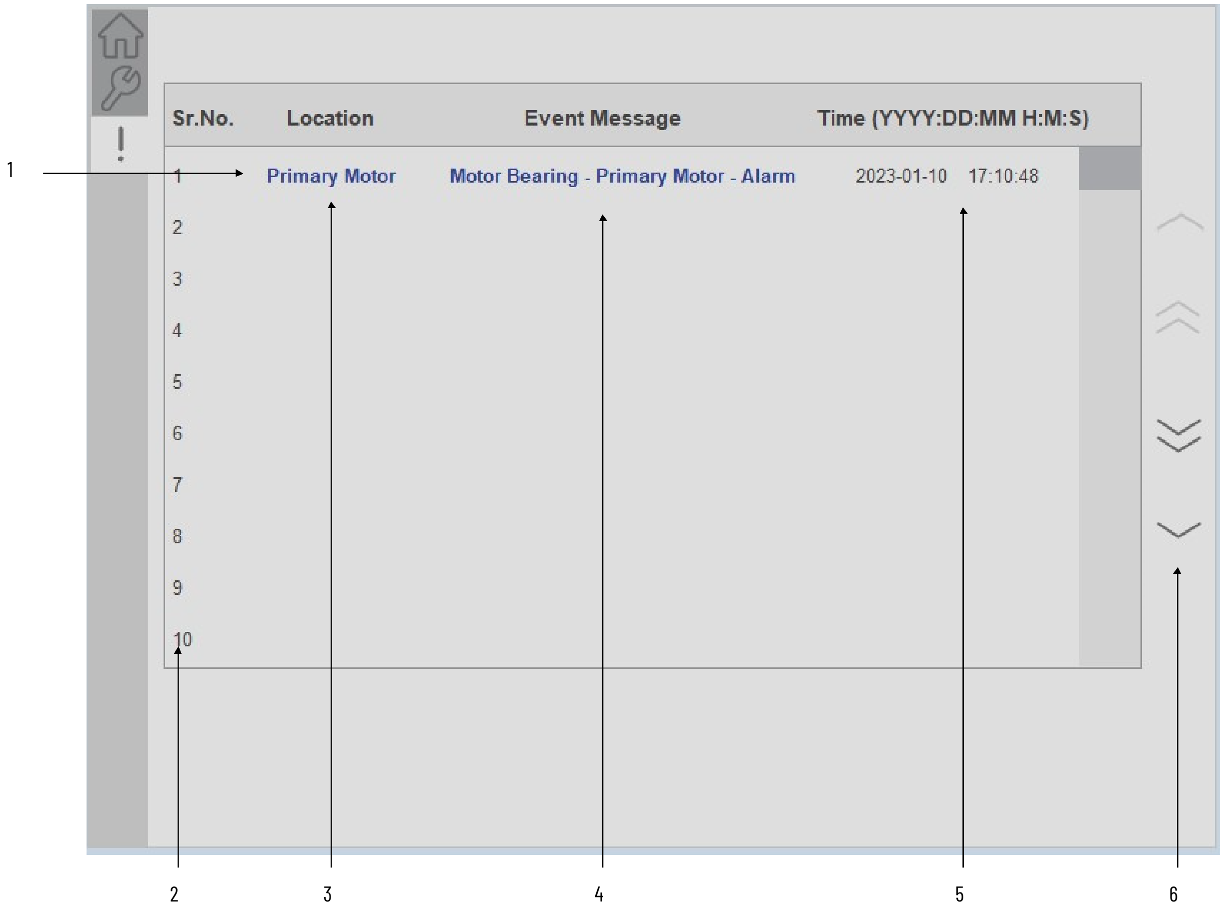
Note that a drive reset is required for any changes to take effect. Refer to the classification table on the display for more information on classification of airborne contaminants.



Item	Description
1	Enclosure Type Selection: - IP00/Open - IP20-21/Type 1 - IP54/Type 12 - IP65/Type 4x
2	Airborne Contaminants Selection: - G1 Mild - G2 Moderate - G3 Harsh - GX Severe - GX+ Extreme
3	Page Select Navigation

Event Log Tab

The event log screen displays event information that recently occurred also it maintains a log of several events that have occurred recently, and the size of event list is user configurable. The queue contains Port type, event description, and time stamp information.



Item	Description
1	Most recent event
2	Event Numer
3	Event Component Location
4	Event Message
5	Event Timestamp (YYYY-DD-MM hh:mm:ss)
6	Page up/page down navigation

Navigation buttons are available on the alarm list. You can navigate through the historical alarms by using these buttons. When you open the alarm list, it shows 10 recent alarm rows. If you want to view historical alarms, you can click on the navigation button.

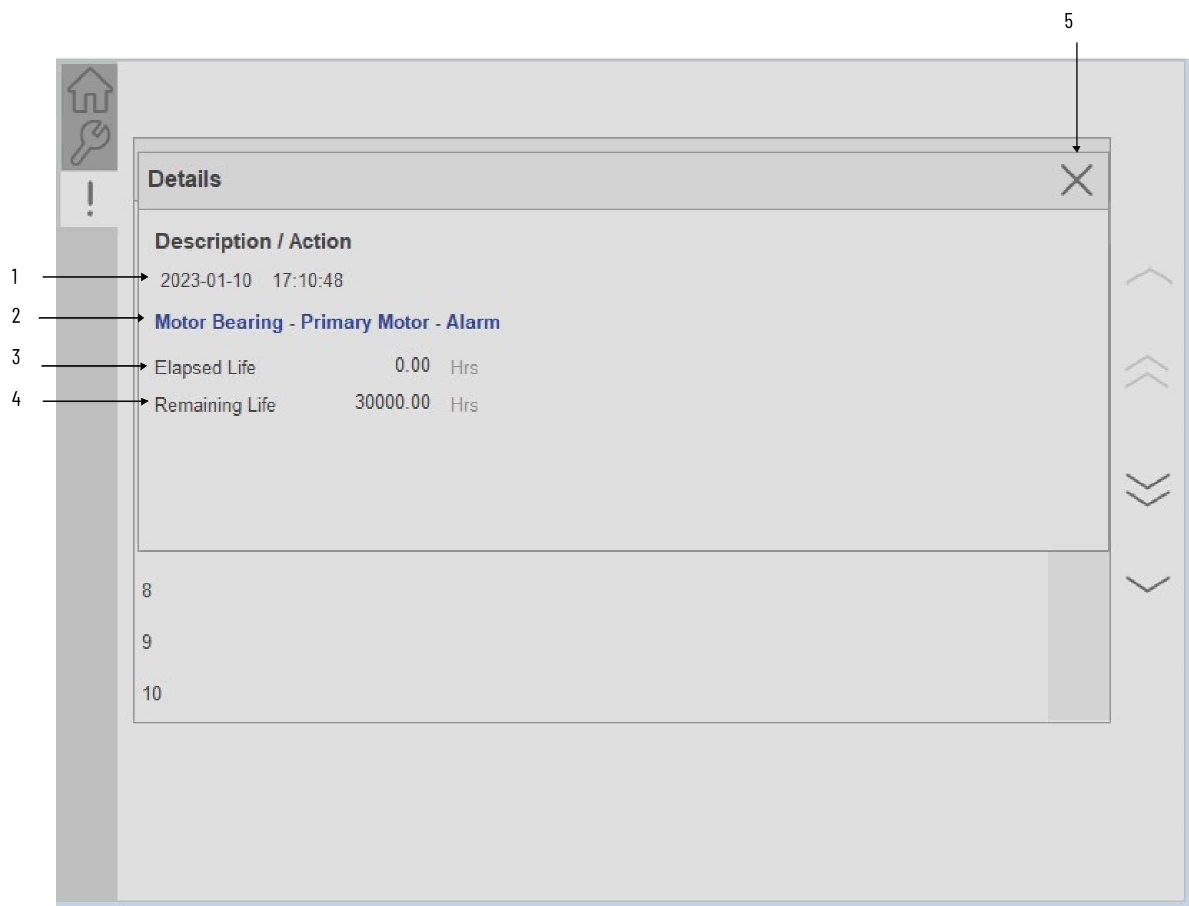
- First Page: To jump to the first page of the alarm list, click this button
- Page Up: The previous page can be accessed by clicking this button
- Page Down: The next page can be accessed by clicking this button
- Last Page: To jump to the last page of the alarm list, click this button

Note: The size of alarm list is user configurable, by default the minimum size is kept to 10 alarms. User can define this size in AOI inout parameter **"Out_Eventlist"**

Out_Eventlist	Output Interface - Event List	raC_UDT_Event_PF755_PM[10]

Event Details Screen

To view more details about an event, click on the particular row to launch the detailed display. The Details Screen provides a more detailed description or possible action steps to remedy condition with timestamp. In addition, it displays snapshot values of Percent Life, Elapsed Life, and Remaining Life at the time when the event was triggered.

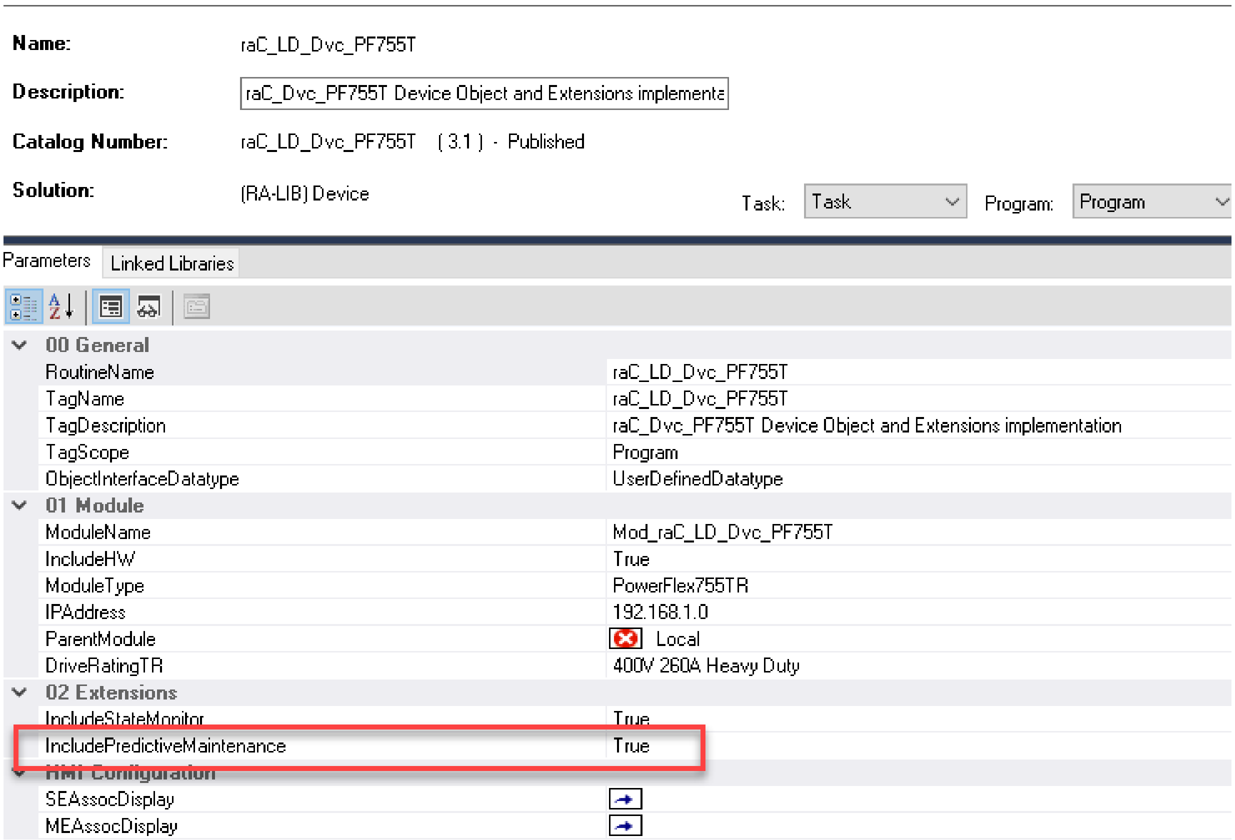


Item	Description
1	Event Timestamp (YYYY-DD-MM hh:mm:ss)
2	Event description
3	Snapshot value at time of event - elapsed life
4	Snapshot value at time of event - remaining life
5	Close details window button

Application Code Manager

The PowerFlex® 755T Predictive Maintenance Extension device objects can be configured using Application Code Manager. These parameters are configured as part of the base object and do not need to be added directly to a project. The following section defines the parameters. "

The enable an Predictive Maintenance Extension Object on a PF755T base object, simply set the *IncludePredictiveMaintenance* parameter in the 02 *Extensions* category to *True*. This is shown in the example below.



Attachments

Name	Description	File Name	Extraction Path
V3_Power_Manual	Reference Manual	DEVICE-RM100x-EN-P.pdf	{ProjectName}\Documentation
V3_raC_Opr_PF755T_PM	Faceplate ME	(raC-3_02-ME) raC_Opr_PF755T_PM-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays
V3_raC_Opr_PF755T_PM	Faceplate SE	(raC-3_02-SE) raC_Opr_PF755T_PM-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays
V3_raC_Opr_PF755T_PM	Faceplate ME	(raC-3_02-ME) raC_Opr_PF755T_PMv11-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays
V3_raC_Opr_PF755T_PM	Faceplate SE	(raC-3_02-SE) raC_Opr_PF755T_PMv11-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays
V3_raC_Opr_Contactor_PM	Faceplate ME	(raC-3_04-ME) raC_Opr_Contactor-PM-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays
V3_raC_Opr_Contactor_PM	Faceplate SE	(raC-3_04-SE) raC_Opr_Contactor-PM-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays
V3_raC_Opr_Contactor_PM	Faceplate VD	(raC-3_04-VD) raC_Opr_Contactor_PM-.vpd	{ProjectName}\Visualization\ViewDesigner
V3_Power_Images	HMI Image set	Power_Images.zip	{ProjectName}\Visualization\Images

Predictive Maintenance Object (raC_Opr_Contactor_PM)

Overview

The Contactor Predictive Maintenance object offers predictive maintenance related parameters and diagnostics for 100-E series contactors. This device object is compatible with 100-E09 through E750 contactors.

The Power Device Library includes the following Contactor Predictive Maintenance object:

Device	Device Firmware	Base Device Object Name	Object Group	Predictive Maintenance Extension Object Name
100-E contactors	-	raC_Opr_Contactor_PM	Contactor	Not available

Functional Description

The Contactor Predictive Maintenance object performs cycle counting and predictive maintenance indications for contactors based on hardware type selection. The device object provides:

- Configuration based on contactor hardware selection
- Contactor cycle counts
- Indication of contactor maximum cycle counts exceeded
- Contactor fault (command/status mismatch)

Use when:

- Installed 100-E series contactors
- Need to monitor to cycle counts for predictive maintenance.

Do NOT use when:

- Not using 100-E series contactors

For more information on maximum cycle count ratings for 100-E series contactors, refer to the IEC Contactor Specifications Technical Data instructions 100-TD013 and see pages 58-60 for contactor selection and pages 98-104 for Life-Load Curves and electrical durability.

Required Files

Device Objects include Add-On Instructions (AOIs) and HMI faceplates. The revision number (e.g. 3.04) used in filenames can change as new revisions are created.

Controller Files

Add-On Instructions are reusable code objects that contain encapsulated logic that can streamline implementing your system. This lets you create your own instruction set for programming logic as a supplement to the instruction set provided natively in the ControlLogix® firmware. An Add-On Instruction is defined once in each controller project, and can be instantiated multiple times in your application code as needed.

The Add-On Instruction must be imported into the controller project to be used in the controller configuration. These can be imported as Add-On Instruction files, or as part of the Rung Import or Import Library Objects wizard.

All Add-On Instruction and Rung Import files can be found in the */Studio 5000 Logix Designer Files - L5X/Standard Files/* folder in the library.

ATTENTION: The add-on instruction can be imported into a continuous or periodic task; however, if it is used in a periodic task then it is recommended to set the periodic task time to a minimum time of 100 ms.

Device/Item	Application	Add-On Instruction	Rung Import
100-E contactors	Standard	raC_Opr_Contactor_PM_3.04_AOI.L5X	raC_Opr_Contactor_PM_3.04_RUNG.L5X

FactoryTalk® View HMI Files

FactoryTalk® View ME or SE applications require importing the desired device faceplates in addition to all Global Object (ggfx) files and all images located in the */HMI FactoryTalk® View Images - png/* folder of the library. FactoryTalk® View ME files are stored in the */HMI - FactoryTalk® View ME/* library folder and FactoryTalk® View SE files are stored in the */HMI - FactoryTalk® View SE/* library folder.

Device/Item	Type	FactoryTalk® View ME Faceplate	FactoryTalk® View SE Faceplate
100-E/104-E contactors	Display	(raC-3_04-SE) raC_Opr_Contactor_PM-Faceplate.gfx	(raC-3_04-ME) raC_Opr_Contactor_PM-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - Power Device	(raC-3-SE) Graphic Symbols - Power Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - Power Device.ggfx	(raC-3-SE) Toolbox - Power Device.ggfx

Studio 5000® Application Code Manager Files

Studio 5000® Application Code Manager (ACM) can be optionally used if it is installed. All devices can be easily registered in the ACM repositories by running the *setup.cmd* file located in the root folder of the library.

Individual HSL4 files are provided as an alternative to running the setup.cmd to allow users to manually register specific implementation objects. Each object has two files - an Asset Control file and a Device file. The Asset Control files include attachments of all required files for that object. The Device files are used to actually add that device into a Studio 5000® project and these reference the Asset Control files.

All Studio 5000® Application Code Manager files can be found in the /*ApplicationCodeManagerLibraries*/ folder of the library. The files included are as follows:

Implementation Object	Asset Control File (.HSL4)	Device File (.HSL4)
100-E contactors	(RA-LIB)_Device_Asset-Control_Contactor_raC_Opr_Contactor_PM_(3.4)	(RA-LIB)_Device_Device_Contactor_raC_LD_Opr_Contactor_PM_(3.4)

Operations

Execution

Rung in condition transition response:

False ->True

- Predictive Maintenance related parameters are monitored and updated
- Reset commands are accepted from application and HMI

True ->False

- Predictive Maintenance related parameters are not monitored and updated
- Reset commands are not accepted from application and HMI

Add-On Instruction I/O Data

Input Data

Input	Function/Description	DataType
Cfg_ContactorType	Selecting the contactor series 100-EXX. e.g. Set to '750' for 100-E750	REAL
Cfg_Voltage	0 - Less than or equal to 440V 1 - Greater than 440V AND less than or equal to 690V(this selection is applicable from Application code manager)	BOOL
EnableIn	Enable Input - System Defined Parameter	BOOL
Inp_MotorCmd	Motor On cmd	BOOL
Inp_MotorSts	Motor On Feedback	BOOL

Output Data

Output	Function/Descritpion	DataType
EnableOut	Enable Output - System Defined Parameter	BOOL
Sts_LifetimeExceeded	0 - Healthy 1 - Lifetime Exceeded	BOOL
Sts_MotorFault	Command/Status mismatch Motor Fault. 1=Faulted	BOOL
Val_CurrentCycles	Current number of cycles	DINT
Val_LifetimeThreshold	Lifetime threshold	REAL
Val_PercentElapsed	Elapsed life used in percent	REAL
Val_PercentRemaining	Remaining life in percent	REAL
Val_RemainingLifecycles	Remaining Life Cycle	DINT

Data Types

The following Predictive Maintenance Common Control Interface tags are the primary device program tags to read and write to when interfacing to contactor devices.

For further information and examples on how to interface the power device objects with your specific application code refer to the "How_To_Interface_with_Power_Device_Logix.mp4" video within the Videos folder of the Power Device Library Download files.

raC_UDT_Event_Contactor_PM

Member	Description	Data Type
Type	Event type: 1 = Status 2 = Warning 3 = Fault 4…n = User	DINT
ID	User definable event ID.	DINT
Category	User definable category (Electrical, Mechanical, Materials, Utility, etc.).	DINT
Action	User definable event action code.	DINT
Value	User definable event value or fault code.	DINT
Elapsed_Life	Elapsed Life in Hrs	REAL
Remaining_Life	Remaining Life in Hrs	REAL

Member	Description	Data Type
Message	Event message text.	STRING
EventTime_L	Timestamp (Date/Time format).	LINT
EventTime_D	Timestamp (Y,M,D,h,m,s,us).	DINT[7]

raC_UDT_LookupMember_STR_0082

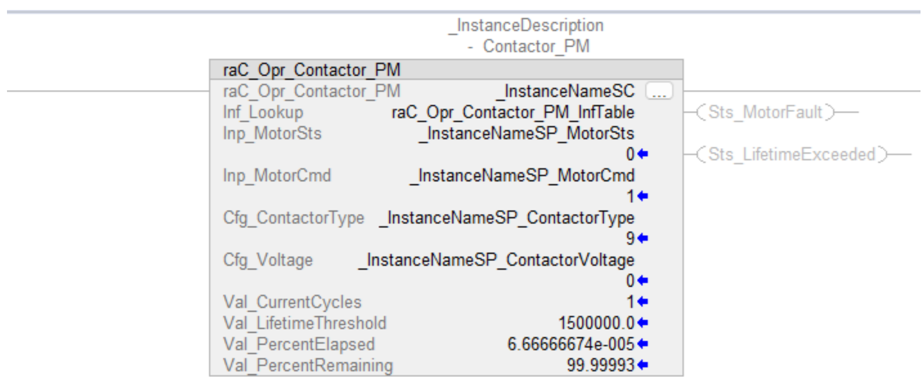
Member	Description	Data Type
Code	Stores the value of device fault code	DINT
Desc	Stores the Messages related to fault code	STRING

Programming Example

A fully configured device on a rung is provided below for reference. This example includes the device objects for Contactor Predictive Maintenance (raC_Opr_Contactor_PM).

Note that this programming example is the same code that is imported when either importing the supplied rung .L5X files or when using Application Code Manager or the Studio 5000® Import Library Objects wizard plug-in.

- Contactor PM Device Object Tag name: _InstanceNameSC
- Contactor type used: 100-E09
- Contactor Voltage: < 440V
- Contactor Device Object Interface tags
  - Inp_MotorSts
  - Inp_MotorCmd



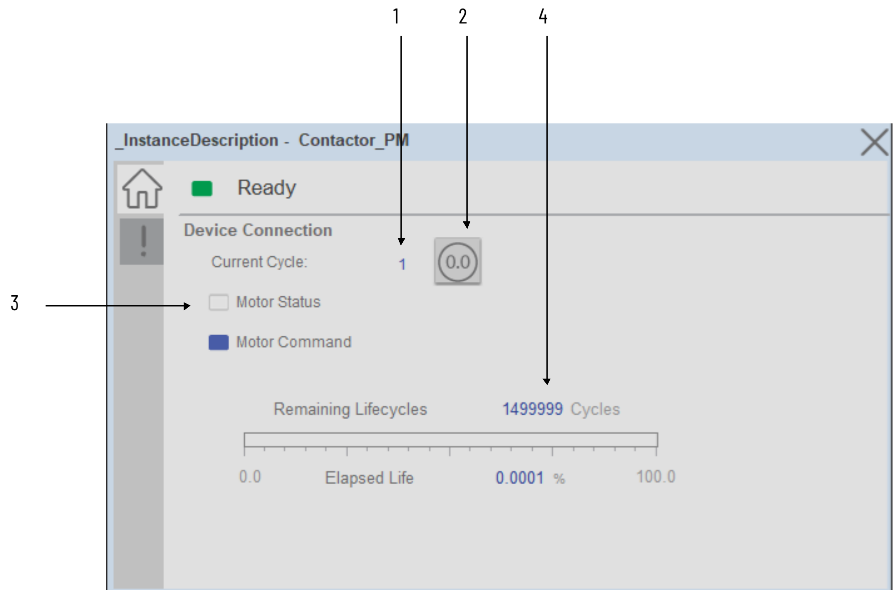
Faceplates

There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 28.

Home

The Home tab is the main tab of the faceplate and displays various predictive maintenance related parameters with respect to different components and location selections. Home screen for the Contactor Predictive Maintenance device object includes following information:

- Current Cycle Count
- Reset Cycle counts Button
- Motor Run Status
- Motor Command
- Remaining Lifecycle
- Elapsed Lifecycle %



Item	Description
1	Contactor operating Cycles
2	Contactor operating Cycles reset
3	Motor status
4	Remaining operating cycle of Contactor

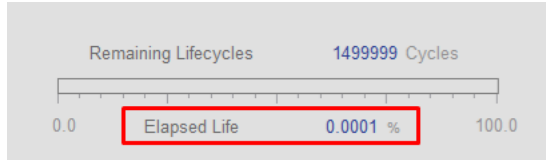
Predictive Maintenance Parameters:

In each of the predictive maintenance functions, there are several parameters that are used to configure contactor type and voltage. The following sections describe those functions and parameters. The following descriptions are the same for all parameters. For example, Event Level functions are the same for all parameters, in that it determines when the event that it is monitoring occurs based on percentage of life used.

There is an elapsed life, remaining life, percent life parameter for each component that is covered by predictive maintenance home tab display.

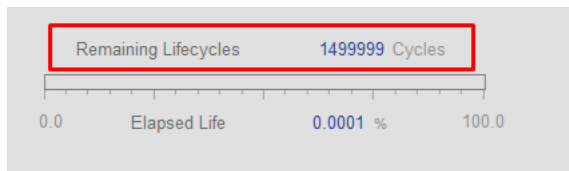
Elapsed Life:

The elapsed life value displays the accumulated elapsed life of the component (e.g. Contactor). The values of these parameters represent the accumulated damage that the components experience based on the number of executed cycles.



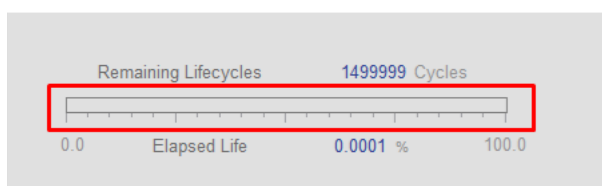
Remaining Life

The remaining life value displays the remaining life for the component (e.g. Contactor). The value of this parameter represents a prediction of how much life is remaining in the component. This is based on the specific contactor model maximum cycle count rating.



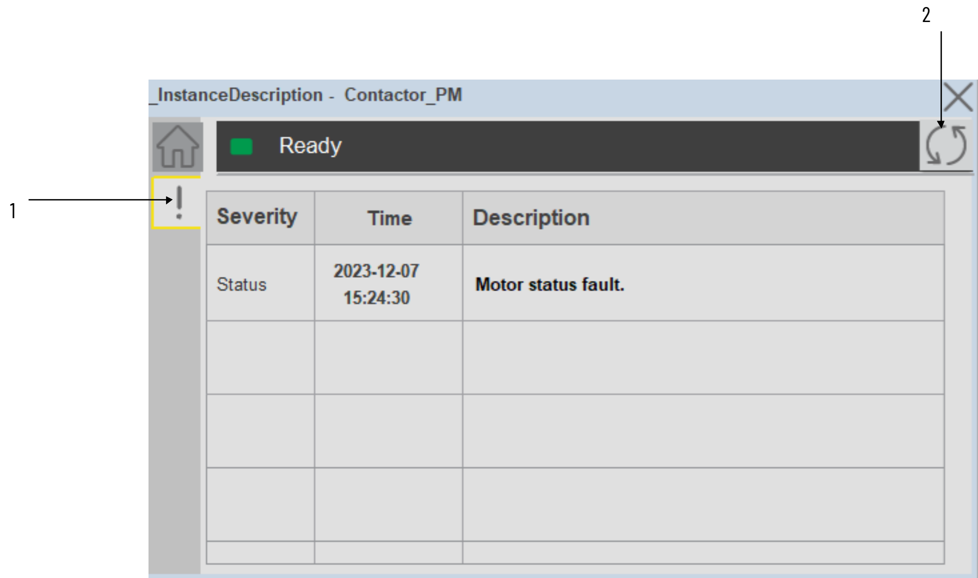
Elapsed Life (%):

The Elapsed Life % value displays the consumed life of the component (e.g. Contactor) as a percentage of its total expected life. This percentage is also displayed on the bar graph.



Event Log Tab

The event log screen displays event information that recently occurred also it maintains a log of several events that have occurred recently. including motor faults and lifetime exceeded events.

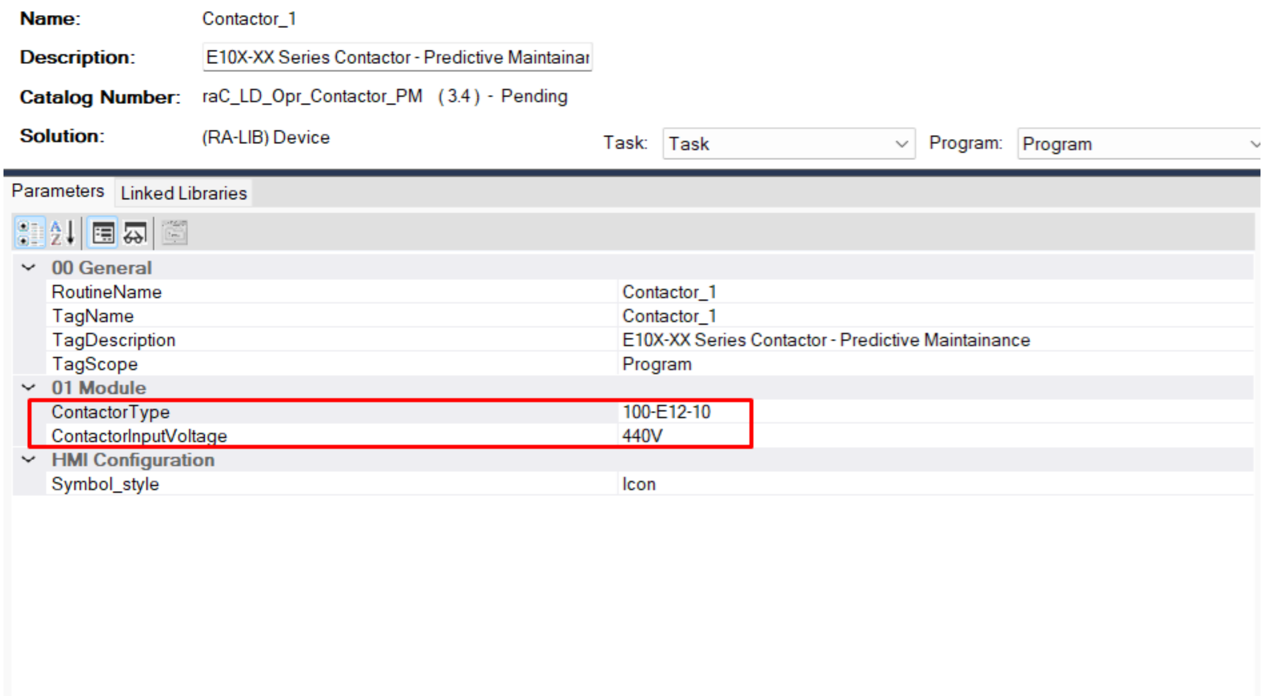


Item	Description
1	Event Description
2	Fault Reset

Application Code Manager

The Contactor Predictive Maintenance device objects can be configured using Application Code Manager. These parameters are configured as part of the base object and do not need to be added directly to a project. The following section defines the parameters.

Contactor type and Contactor input voltage should be configured by user as shown in the following screenshot. The type and voltage rating will affect the maximum cycle counts that is used in the device object for predictive maintenance notifications.



Attachments

Name	Description	File Name	Extraction Path
V3_{LibraryName}	Reference Manual	RAC-RM100x-EN.pdf	{ProjectName}\Visualization\Reference Manuals
V3_{LibraryName}	Faceplate ME	(raC-3_04-ME) raC_Opr_Contactor_PM-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_{LibraryName}	Faceplate SE	(raC-3_04-SE) raC_Opr_Contactor_PM-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_{LibraryName}	HMI Image set	Power_Images.zip	{ProjectName}\Visualization\Images - png

Rockwell Automation Support

Use these resources to access support information.

Technical Support Center	Find help with how-to videos, FAQs, chat, user forums, Knowledgebase, and product notification updates.	rok.auto/support
Local Technical Support Phone Numbers	Locate the telephone number for your country.	rok.auto/phonesupport
Technical Documentation Center	Quickly access and download technical specifications, installation instructions, and user manuals.	rok.auto/techdocs
Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
Product Compatibility and Download Center (PCDC)	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	rok.auto/pcdc

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Waste Electrical and Electronic Equipment (WEEE)

At the end of life, this equipment should be collected separately from any unsorted municipal waste.

Rockwell Automation maintains current product environmental compliance information on its website at rok.auto/pec.

Rockwell Otomasyon Ticaret A.Ş. Kar Plaza İş Merkezi E Blok Kat:6 34752, İçerenkÖy, İstanbul, Tel: +90 (216) 5698400 EEE YÖnetmeliğine UygundurPublication DEVICE-RM100D-EN-P - December

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AMERICAS: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000
EUROPE/MIDDLE EAST/AFRICA: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2663 0600
ASIA PACIFIC: Rockwell Automation SEA Pte Ltd, 2 Corporation Road, #04-05, Main Lobby, Corporation Place, Singapore 618494, Tel: (65) 6510 6608
UNITED KINGDOM: Rockwell Automation Ltd., Pitfield, Kiln Farm, Milton Keynes, MK11 3DR, United Kingdom, Tel: (44)(1908) 838-800

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