IO-Link Device Library

Release v3.01

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.

Reproduction of the contents of this manual, in whole or in part, without written permission of Rockwell Automation, Inc., is prohibited.

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.

Table of Contents 3

Preface 17
Device Object Libraries Overview 17
Application Code Manager 17
Other Application Code Libraries 18
Software and Firmware Upgrades 19
Rockwell Automation® Services and Support 19

Chapter 1
Rockwell Automation® IO-Link Device Library
Compatibility 21
  Compatible Software 21
  Compatible Hardware 21
Summary of Changes 22
Footprint 22
Additional Resources 23

Chapter 2
Library Components
IO-Link Device Instructions 25
Library Folders and Files 26
Visualization Files 29
  Studio 5000 View Designer Visualization Files 29
Basic Faceplate Attributes 30
  Common Status Banner 30
  Faceplate Navigation 31
Faceplate Revision Notes 31
Launch Buttons 32
Library Versions 33
State Model 34
Interfaces 34
Data Types 35
  raC_UDT_ItfAD_IOLinkSensor_CtrlSet 35
  raC_UDT_ItfAD_IOLinkSensor_CtrlCmd 35
  raC_UDT_ItfAD_IOLinkSensor_CtrlSts 36
  raC_UDT_ItfAD_IOLinkDevices 37
  raC_UDT_ItfAD_IOLinkSensorInf 37
  raC_UDT_Event 37
  raC_UDT_LookupMember_STR0082 38
  raC_UDT_Dropdown 38
  raC_UDT_HEX_Code_LookupMember 38
Application Code Manager 39
  Architectural Overview 39

Chapter 3
Using the Library
Install the Library 41

Download the Library 41
Download & Install Studio 5000® Application Code Manager 41
Register Libraries in Studio 5000® Application Code Manager . . . 42
Importing Logic into Studio 5000® Projects 44
Import Library Objects Wizard 44
Import Rung Logic. 46
Using Studio 5000 View Designer® 51
Using View Designer Project Files 51
Configuring View Designer Objects 52
Using FactoryTalk® View Studio 52
Import FactoryTalk View Visualization Files 52
Configuring FactoryTalk View Objects. 53
Library Upgrades 54
Add-On Instruction Upgrades 54
FactoryTalk View Upgrades. 61
Studio 5000 View Designer® Upgrades 61

Chapter 4

Using Application Code Manager

Overview of Application Code Manager 63
Creating a New Project 63
Adding & Configuring Device Objects. 66
Adding IO-Link Master Module I/O 66
Adding IO-Link Device Instructions 68
Adding IO-Link Master Device Object 70
Configuring Displays. 75
Generating Displays. 77
Importing Displays into FactoryTalk View Studio 77
Generating Controller Files 78
Exporting Attachments. 79

Chapter 5

Using the IO-Link Device Library with Other Application Code Libraries

Application Code Libraries. 81

Chapter 6

42AF - RightSight Photoelectric Sensor (raC_Dvc_42AF_4IOL, raC_Dvc_42AF_8IOL)

Overview. 83
Functional Description 83
Required Files 83
Controller Files. 84
FactoryTalk View HMI Files 84
Studio 5000 View Designer HMI Files 84
Studio 5000 Application Code Manager Files. 85
Device Definition 85
Operations 86
Execution. 86
Add-On Instruction I/O Data. 87
InOut Data. 87
Input Data 87
Output Data. 89

Programming Example 90
Graphic Symbols 91
FactoryTalk View ME/SE Graphic Symbols 91
Studio 5000 View Designer Graphic Symbols 91
Faceplates 91
Home 91
Health Tab 92
Trend Tab 94
Configure Tab 94
Fault Warning Tab 97
Application Code Manager 99
Definition Objects: raC_Dvc_42AF_4IOL, raC_Dvc_42AF_8IOL . . . 99
Implementation Objects: raC_LD_Dvc_42AF_4IOL, raC_LD_Dvc_42AF_8IOL 99
Linked Libraries 99
Configured HMI Content 100
Attachments 100

Chapter 7

42EF - RightSight Photoelectric Sensor (raC_Dvc_42EF_4IOL, raC_Dvc_42EF_8IOL)

Overview 101
Functional Description 101
Required Files 101
Controller Files 102
FactoryTalk View HMI Files 102
Studio 5000 View Designer HMI Files 102
Studio 5000 Application Code Manager Files 103
Device Definition 103
Operations 104
Execution 104
Add-On Instruction I/O Data 105
InOut Data 105
Input Data 105
Output Data 106
Programming Example 108
Graphic Symbols 109
FactoryTalk View ME/SE Graphic Symbols 109
Studio 5000 View Designer Graphic Symbols 109
Faceplates 109
Home 110
Health Tab 111
Trend Tab 112
Configure Tab 112
Fault Warning Tab 114
Application Code Manager 115
Definition Objects: raC_Dvc_42EF_4IOL, raC_Dvc_42EF_8IOL . . 115
Implementation Objects: raC_LD_Dvc_42EF_4IOL, raC_LD_Dvc_42EF_8IOL 115
Linked Libraries 116
Configured HMI Content 116

Attachments 116

Chapter 8

42JT - VisiSight Photoelectric Sensor (raC_Dvc_42JT_4IOL, raC_Dvc_42JT_8IOL)

Overview 117
Functional Description 117
Required Files 117
Controller Files 118
FactoryTalk View HMI Files 118
Studio 5000 View Designer HMI Files 118
Studio 5000 Application Code Manager Files 119
Device Definition 119
Operations 120
Execution 120
Add-On Instruction I/O Data 121
InOut Data 121
Input Data 121
Output Data 122
Programming Example 123
Graphic Symbols 123
FactoryTalk View ME/SE Graphic Symbols 124
Studio 5000 View Designer Graphic Symbols 124
Faceplates 124
Home 124
Configure Tab 125
Fault Warning Tab 128
Application Code Manager 130
Definition Objects: raC_Dvc_42JT_4IOL, raC_Dvc_42JT_8IOL . . . 130
Implementation Objects: raC_LD_Dvc_42JT_4IOL, raC_LD_Dvc_42JT_8IOL 130
Linked Libraries 130
Configured HMI Content 131
Attachments 131

Chapter 9

871FM - Mini Flat Pack Sensor (raC_Dvc_871FM_4IOL, raC_Dvc_871FM_8IOL)

Overview 133
Functional Description 133
Required Files 133
Controller Files 134
FactoryTalk View HMI Files 134
Studio 5000 View Designer HMI Files 134
Studio 5000 Application Code Manager Files 135
Device Definition 135
Operations 136
Execution 136
Add-On Instruction I/O Data 137
InOut Data 137
Input Data 137
Output Data 138
Programming Example 139

Graphic Symbols . . . 139
FactoryTalk View ME/SE Graphic Symbols . . . 140
Studio 5000 View Designer Graphic Symbols. . . . 140
Faceplates . . . 140
Home . . . 140
Health Tab . . . 141
Trend Tab. . . . 143
Configure Tab . . . 143
Fault Warning Tab. . . . 144
Application Code Manager . . . 146
Definition Objects: raC_Dvc_871FM_4IOL, raC_Dvc_871FM_8IOL . . 146
Implementation Objects: raC_LD_Dvc_871FM_4IOL, raC_LD_Dvc_871FM_8IOL. . . . 146
Linked Libraries . . . 147
Configured HMI Content . . . 147
Attachments . . . 147

Chapter 10

871C - Mini Tubular Sensor(raC_Dvc_871C_4IOL, raC_Dvc_871C_8IOL)

Overview . . . 149
Functional Description . . . 149
Required Files . . . 149
Controller Files . . . 149
FactoryTalk View HMI Files . . . 150
Studio 5000 View Designer HMI Files . . . 150
Studio 5000 Application Code Manager Files . . . 151
Device Definition . . . 151
Operations . . . 152
Execution . . . 152
Add-On Instruction I/O Data. . . . 153
InOut Data. . . . 153
Input Data . . . 153
Output Data. . . . 153
Programming Example . . . 155
Graphic Symbols . . . 155
FactoryTalk View ME/SE Graphic Symbols . . . 156
Studio 5000 View Designer Graphic Symbols. . . . 156
Faceplates . . . 156
Home . . . 156
Health Tab . . . 157
Configure Tab . . . 158
Fault Warning Tab. . . . 159
Application Code Manager . . . 160
Definition Objects: raC_Dvc_871C_4IOL, raC_Dvc_871C_8IOL . . 160
Implementation Objects: raC_LD_Dvc_871C_4IOL, raC_LD_Dvc_871C_8IOL . . . 160
Linked Libraries . . . 161
Configured HMI Content . . . 161
Attachments . . . 161

Chapter 11

871TM - Tubular Stainless Steel Sensor (raC_Dvc_871TM_4IOL, raC_Dvc_871TM_8IOL)

Overview 163
Functional Description 163
Required Files 163
Controller Files 163
FactoryTalk View HMI Files 164
Studio 5000 View Designer HMI Files 164
Studio 5000 Application Code Manager Files 165
Device Definition 165
Operations 166
Execution 166
Add-On Instruction I/O Data. 167
InOut Data. 167
Input Data 167
Output Data. 167
Programming Example. 169
Graphic Symbols 169
FactoryTalk View ME/SE Graphic Symbols 170
Studio 5000 View Designer Graphic Symbols. 170
Faceplates 170
Home 170
Configure Tab. 171
Fault Warning Tab. 172
Application Code Manager 173
Definition Objects: raC_Dvc_871TM_4IOL, raC_Dvc_871TM_8IOL. . 173
Implementation Objects: raC_LD_Dvc_871TM_4IOL, raC_LD_Dvc_871TM_8IOL. 173
Linked Libraries 174
Configured HMI Content 174
Attachments 174

Chapter 12

45CRM - Color Registration Mark Sensor (raC_Dvc_45CRM_4IOL, raC_Dvc_45CRM_8IOL)

Overview 175
Functional Description 175
Required Files 175
Controller Files 176
FactoryTalk View HMI Files 176
Studio 5000 View Designer HMI Files 176
Studio 5000 Application Code Manager Files 177
Device Definition 177
Operations 178
Execution 178
Add-On Instruction I/O Data. 179
InOut Data. 179
Input Data 179
Output Data. 180
Programming Example. 181
Graphic Symbols 182

Studio 5000 View Designer Graphic Symbols . . . 182
Faceplates . . . 182
Home . . . 183
Configure Tab . . . 183
Fault Warning Tab . . . 187
Application Code Manager . . . 188
Definition Objects: raC_Dvc_45CRM_4IOL, raC_Dvc_45CRM_8IOL 188
Implementation Objects: raC_LD_Dvc_45CRM_4IOL, raC_LD_Dvc_45CRM_8IOL . . . 188
Linked Libraries . . . 189
Configured HMI Content . . . 189
Attachments . . . 189

Chapter 13

836P - Solid-State Pressure Sensor (raC_Dvc_836P_4IOL, raC_Dvc_836P_8IOL)

Overview . . . 191
Functional Description . . . 191
Required Files . . . 191
Controller Files . . . 192
FactoryTalk View HMI Files . . . 192
Studio 5000 View Designer HMI Files . . . 192
Studio 5000 Application Code Manager Files . . . 193
Device Definition . . . 193
Operations . . . 194
Execution . . . 194
Add-On Instruction I/O Data . . . 195
InOut Data . . . 195
Input Data . . . 195
Output Data . . . 196
Programming Example . . . 198
Graphic Symbols . . . 198
FactoryTalk View ME/SE Graphic Symbols . . . 199
Studio 5000 View Designer Graphic Symbols . . . 199
Faceplates . . . 199
Home . . . 199
Health Tab . . . 200
Trend Tab . . . 202
Configure Tab . . . 202
Fault Warning Tab . . . 205
Application Code Manager . . . 206
Definition Objects: raC_Dvc_836P_4IOL, raC_Dvc_836P_8IOL . . 206
Implementation Objects: raC_LD_Dvc_836P_4IOL, raC_LD_Dvc_836P_8IOL . . . 206
Linked Libraries . . . 207
Configured HMI Content . . . 207
Attachments . . . 207

Chapter 14

837T - Solid-State Temperature Sensor (raC_Dvc_837T_4IOL, raC_Dvc_837T_8IOL)

Overview 209
Functional Description 209
Required Files 209
Controller Files 210
FactoryTalk View HMI Files 210
Studio 5000 View Designer HMI Files 210
Studio 5000 Application Code Manager Files 211
Device Definition 211
Operations 212
Execution 212
Add-On Instruction I/O Data 213
InOut Data 213
Input Data 213
Output Data 214
Programming Example 216
Graphic Symbols 216
FactoryTalk View ME/SE Graphic Symbols 217
Studio 5000 View Designer Graphic Symbols 217
Faceplates 217
Home 217
Health Tab 218
Trend Tab 220
Configure Tab 220
Fault Warning Tab 223
Application Code Manager 224
Definition Objects: raC_Dvc_837T_4IOL, raC_Dvc_837T_8IOL . . 224
Implementation Objects: raC_LD_Dvc_837T_4IOL, raC_LD_Dvc_837T_8IOL 224
Linked Libraries 225
Configured HMI Content 225
Attachments 225

Chapter 15

856T - 856T Control Tower Stack Light (raC_Dvc_856T_4IOL, raC_Dvc_856T_8IOL)

Overview 227
Functional Description 227
Required Files 227
Controller Files 227
FactoryTalk View HMI Files 228
Studio 5000 View Designer HMI Files 228
Studio 5000 Application Code Manager Files 229
Device Definition 229
Operations 230
Execution 230
Add-On Instruction I/O Data 231
InOut Data 231
Input Data 231
Output Data 233
Programming Example 235

Graphic Symbols . . . 235
FactoryTalk View ME/SE Graphic Symbols . . . 236
Studio 5000 View Designer Graphic Symbols . . . 236
Faceplates . . . 236
Home . . . 236
Health Tab . . . 237
Configure Tab . . . 238
Fault Warning Tab . . . 240
Application Code Manager . . . 242
Definition Objects: raC_Dvc_856T_4IOL, raC_Dvc_856T_8IOL . . 242
Implementation Objects: raC_LD_Dvc_856T_4IOL, raC_LD_Dvc_856T_8IOL . . . 242
Linked Libraries . . . 242
Configured HMI Content . . . 243
Attachments . . . 243

Chapter 16

873P - Analog Output Ultrasonic Sensor (raC_Dvc_873P_4IOL, raC_Dvc_873P_8IOL)

Overview . . . 245
Functional Description . . . 245
Required Files . . . 245
Controller Files . . . 246
FactoryTalk View HMI Files . . . 246
Studio 5000 View Designer HMI Files . . . 246
Studio 5000 Application Code Manager Files . . . 247
Device Definition . . . 247
Operations . . . 248
Execution . . . 248
Add-On Instruction I/O Data . . . 249
InOut Data . . . 249
Input Data . . . 249
Output Data . . . 250
Programming Example . . . 253
Graphic Symbols . . . 253
FactoryTalk View ME/SE Graphic Symbols . . . 254
Studio 5000 View Designer Graphic Symbols . . . 254
Faceplates . . . 254
Home . . . 254
Health Tab . . . 255
Trend Tab . . . 256
Configure Tab . . . 257
Fault Warning Tab . . . 259
Application Code Manager . . . 261
Definition Objects: raC_Dvc_873P_4IOL, raC_Dvc_873P_8IOL . . 261
Implementation Objects: raC_LD_Dvc_873P_4IOL, raC_LD_Dvc_873P_8IOL . . . 261
Linked Libraries . . . 261
Configured HMI Content . . . 262
Attachments . . . 262

Chapter 17

1694 - 1694 Modular Electronic Circuit Protector (raC_Dvc_1694_4IOL, raC_Dvc_1694_8IOL)

Overview 263
Functional Description 263
Required Files 263
Controller Files 264
FactoryTalk View HMI Files 264
Studio 5000 View Designer HMI Files 264
Studio 5000 Application Code Manager Files 265
Device Definition 265
Operations 266
Execution 266
Add-On Instruction I/O Data 267
InOut Data 267
Input Data 267
Output Data 268
Programming Example 269
Graphic Symbols 270
FactoryTalk View ME/SE Graphic Symbols 270
Studio 5000 View Designer Graphic Symbols 270
Faceplates 270
Home 271
I/O Tab 271
Configure Tab 272
Fault Warning Tab 274
Application Code Manager 275
Definition Objects: raC_Dvc_1694_4IOL, raC_Dvc_1694_8IOL . . . 275
Implementation Objects: raC_LD_Dvc_1694_4IOL, raC_LD_Dvc_1694_8IOL 275
Linked Libraries 276
Configured HMI Content 276
Attachments 276

Chapter 18

45DMS - Distance Measurement Sensor (raC_Dvc_45DMS_4IOL, raC_Dvc_45DMS_8IOL)

Overview 277
Functional Description 277
Required Files 277
Controller Files 278
FactoryTalk View HMI Files 278
Studio 5000 View Designer HMI Files 278
Studio 5000 Application Code Manager Files 279
Device Definition 279
Operations 280
Execution 280
Add-On Instruction I/O Data 281
InOut Data 281
Input Data 281
Output Data 282
Programming Example 284
Graphic Symbols 284

FactoryTalk View ME/SE Graphic Symbols . . . 285
Studio 5000 View Designer Graphic Symbols . . . 285
Faceplates . . . 285
Home . . . 285
Health Tab . . . 286
Trend Tab . . . 288
Configure Tab . . . 288
Fault Warning Tab . . . 291
Application Code Manager . . . 292
Definition Objects: raC_Dvc_45DMS_4IOL, raC_Dvc_45DMS_8IOL 292
Implementation Objects: raC_LD_Dvc_45DMS_4IOL, raC_LD_Dvc_45DMS_8IOL . . . 292
Linked Libraries . . . 293
Configured HMI Content . . . 293
Attachments . . . 293

Chapter 19

46CLR - ColorSight True Color Sensor (raC_Dvc_46CLR_4IOL, raC_Dvc_46CLR_8IOL)

Overview . . . 295
Functional Description . . . 295
Required Files . . . 295
Controller Files . . . 296
FactoryTalk View HMI Files . . . 296
Studio 5000 View Designer HMI Files . . . 296
Studio 5000 Application Code Manager Files . . . 297
Device Definition . . . 297
Operations . . . 298
Execution . . . 298
Add-On Instruction I/O Data . . . 299
InOut Data . . . 299
Input Data . . . 299
Output Data . . . 302
Programming Example . . . 304
Graphic Symbols . . . 305
FactoryTalk View ME/SE Graphic Symbols . . . 305
Studio 5000 View Designer Graphic Symbols . . . 305
Faceplates . . . 305
Home . . . 306
Health Tab . . . 307
Trend Tab . . . 309
Configure Tab . . . 309
Fault Warning Tab . . . 311
Application Code Manager . . . 312
Definition Objects: raC_Dvc_46CLR_4IOL, raC_Dvc_46CLR_8IOL . . 313
Implementation Objects: raC_LD_Dvc_46CLR_4IOL, raC_LD_Dvc_46CLR_8IOL . . . 313
Linked Libraries . . . 313
Configured HMI Content . . . 314

Attachments . . . 314

Chapter 20

875L - Capacitive Sensors (raC_Dvc_875L_4IOL, raC_Dvc_875L_8IOL)

Overview . . . 315
Functional Description . . . 315
Required Files . . . 315
Controller Files . . . 315
FactoryTalk® View HMI Files . . . 316
Studio 5000 View Designer HMI Files . . . 316
Studio 5000 Application Code Manager Files . . . 317
Device Definition . . . 317
Operations . . . 318
Execution . . . 318
Add-On Instruction I/O Data . . . 319
InOut Data . . . 319
Input Data . . . 319
Output Data . . . 321
Programming Example . . . 324
Graphic Symbols . . . 325
FactoryTalk View ME/SE Graphic Symbols . . . 325
Studio 5000 View Designer Graphic Symbols . . . 325
Faceplates . . . 325
Home . . . 326
Health Tab . . . 327
Trend Tab . . . 328
Configure Tab . . . 329
Fault Warning Tab . . . 334
Application Code Manager . . . 335
Definition Objects: raC_Dvc_875L_4IOL, raC_Dvc_875L_8IOL . . . 335
Implementation Objects: raC_LD_Dvc_875L_4IOL, raC_LD_Dvc_875L_8IOL . . . 335
Linked Libraries . . . 336
Configured HMI Content . . . 336
Attachments . . . 336

Chapter 21

46DFA - Small Aperture Fiber-optic Amplifier (raC_Dvc_46DFA_4IOL, raC_Dvc_46DFA_8IOL)

Overview . . . 337
Functional Description . . . 337
Required Files . . . 337
Controller Files . . . 338
FactoryTalk View HMI Files . . . 338
Studio 5000 View Designer HMI Files . . . 338
Studio 5000 Application Code Manager Files . . . 339
Device Definition . . . 339
Operations . . . 340
Execution . . . 340
Add-On Instruction I/O Data . . . 341
InOut Data . . . 341
Input Data . . . 341

Output Data. 342
Programming Example 345
Graphic Symbols 346
FactoryTalk View ME/SE Graphic Symbols 346
Studio 5000 View Designer Graphic Symbols. 346
Faceplates 346
Home 347
Health Tab 348
. . . . 348
Configure Tab. 350
Application Code Manager 354
Definition Objects: raC_Dvc_46DFA_4IOL, raC_Dvc_46DFA_8IOL . 354
Implementation Objects: raC_LD_Dvc_46DFA_4IOL, raC_LD_Dvc_46DFA_8IOL. 354
Linked Libraries 355
Configured HMI Content 355
Attachments 355

Chapter 22

45PLA - Polarized Light Array Photoelectric Sensor (raC_Dvc_45PLA_4IOL, raC_Dvc_45PLA_8IOL)

Overview 357
Functional Description 357
Required Files 358
Controller Files 358
FactoryTalk View HMI Files 358
Studio 5000 View Designer HMI Files 359
Studio 5000 Application Code Manager Files 359
Device Definition 359
Operations 360
Execution 360
Add-On Instruction I/O Data. 362
InOut Data. 362
Input Data 362
Output Data. 364
Programming Example 366
Graphic Symbols 367
FactoryTalk View ME/SE Graphic Symbols 367
Studio 5000 View Designer Graphic Symbols. 367
Faceplates 367
Home 367
Health Tab 368
Trend Tab. 370
Configure Tab. 370
Fault Warning Tab. 374
Application Code Manager 375
Definition Objects: raC_Dvc_45PLA_4IOL, raC_Dvc_45PLA_8IOL 375
Implementation Objects: raC_LD_Dvc_45PLA_4IOL, raC_LD_Dvc_45PLA_8IOL 376
Linked Libraries 376

Configured HMI Content 376
Attachments 377

Chapter 20

IO-Link HUB

Overview 379
Required Files 379
FactoryTalk View HMI Files 379
Studio 5000 View Designer HMI Files 380
Graphic Symbols 380
FactoryTalk View ME/SE Graphic Symbols 380
Configuring FactoryTalk View Objects 381
Studio 5000 View Designer Graphic Symbols 382
Faceplates 384
1732IL_IB16M12 384
1732IL_10X6M12 385
1732IL-16CFGM12M12L 386

Chapter 21

IO-Link Master (raC_Dvc_1734_4IOLMaster, raC_Dvc_1732E_8IOLMaster)

Overview 389
Functional Description 389
Required Files 389
Controller Files 389
FactoryTalk View HMI Files 390
Studio 5000 View Designer HMI Files 390
Studio 5000 Application Code Manager Files 391
Device Definition 391
Operations 392
Execution 392
Add-On Instruction I/O Data 393
InOut Data (raC_Dvc_1734_4IOLMaster, raC_Dvc_1732E_8IOLMaster) 393
Output Data (raC_Dvc_1734_4IOLMaster, raC_Dvc_1732E_8IOLMaster) 393
Programming Example 394
Graphic Symbols 394
FactoryTalk View ME/SE Graphic Symbols 394
Studio 5000 View Designer Graphic Symbols 395
Faceplates 395
Home 396
Located 397
Fault Warning Tab 398
Application Code Manager 398
Definition Objects: raC_Dvc_1734_4IOLMaster, raC_Dvc_1732E_8IOLMaster 398
Implementation Objects: raC_LD_Dvc_46CLR_4IOL, raC_LD_Dvc_46CLR_8IOL 399
Linked Libraries 399
Configured HMI Content 399
Attachments 400

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 lifecycle-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 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, Power, 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 power monitor 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® IO-Link Device Library

The IO-Link 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® IO-Link Master & Sensors devices. The IO-Link Device Objects may be used with Machine Builder, Process, and Packaged Libraries or as standalone components. IO-Link Device Library add-on instructions objects collect, process, and deliver data between hardware devices and application logic.

The IO-Link Device Library includes Add-On Instructions (AOIs) and HMI Faceplates for Allen-Bradley IO-Link Sensor and Master products.

This document includes the functional requirements of the IO-Link Sensor and IO-Link Master device objects.

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

Compatibility

Compatible Software

- Studio 5000® Logix Designer v30.02.00, v31.02.00, v32.02.01, v33.00.00, v34.01.00 for PAC Application Development
- Studio 5000® Application Code Manager v4.0 and later for bulk code configuration
- Studio 5000 View Designer® v8.00 and later for PanelView 5000 Application Development
- FactoryTalk® View Studio v10.00.01 and later for PanelView Plus Application Development and FactoryTalk® View SE Application Development

Compatible Hardware

- PanelView 5500 with v8 or later firmware
- PanelView Plus with v10 or later firmware
- ControlLogix 5580 or ControlLogix 5570 controller with v30.011 or later firmware
- 1732E-8IOLM12R ArmorBlock 8-Channel IO-Link Master Module with v3.012 or later firmware
- 1734-4IOL/K POINT I/O 4-Channel IO-Link Master Module with v1.011 or later firmware
- 1694 Modular Electronic Circuit Protector

- 42AF Long Range General Purpose Sensor
- 42EF RightSight General Purpose Sensor
- 42JT Visi Sight Sensor
- 45CRM Color Registration Mark Sensor
- 45DMS Distance Measurement Sensor
- 46CLR ColorSight True Color Sensor
- 836P Solid-State Pressure Sensor
- 837T Solid-State Temperature Sensor
- 856T Control Tower Stack Light
- 871C Mini Tubular Sensor
- 871FM Mini Flat Pack Sensor
- 871TM Tubular Stainless Steel Sensor
- 873P Analog Output Ultrasonic Sensor
- 875L Capacitive Sensor
- 46DFA Small Aperture Fiber-Optic Amplifier
- 45PLA Polarized Light Array Photoelectric Sensor

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
Reference manual entirely reformatted and re-written	all
Added new Devices Sensor® 875L, 46DFA, 45PLA	315-378
Added SE faceplates for all Device Objects	all

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 (L85E):** Estimated execution time / scan footprint evaluated in 1756-L85E PAC

Device Object Footprint

Device Object	Defintion (kB)	Instance (kB)	Execution (μs)
raC_Dvc_1734_4IOLMaster	28.14	4.552	52
raC_Dvc_1732E_8IOLMaster	29.5	9.648	61
raC_Dvc_42AF_4IOL	77.612	7.76	58
raC_Dvc_42AF_8IOL	81.628	7.848	69
raC_Dvc_42EF_4IOL	66.328	7.264	96
raC_Dvc_42EF_8IOL	68.808	7.352	96
raC_Dvc_42JT_4IOL	66.612	8.156	94
raC_Dvc_42JT_8IOL	68.912	8.244	97
raC_Dvc_45CRM_4IOL	67.784	7.368	86
raC_Dvc_45CRM_8IOL	69.576	7.444	92
raC_Dvc_45DMS_4IOL	113.684	11.168	81
raC_Dvc_45DMS_8IOL	115.652	11.256	88
raC_Dvc_46CLR_4IOL	173.884	15.42	112
raC_Dvc_46CLR_8IOL	185.268	17.42	118

Device Object Footprint

Device Object	Defintion (kB)	Instance (kB)	Execution (µs)
raC_Dvc_836P_4IOL	127.376	10.512	110
raC_Dvc_836P_8IOL	132.376	10.6	132
raC_Dvc_837T_4IOL	107.56	9.52	104
raC_Dvc_837T_8IOL	113.472	9.608	120
raC_Dvc_856T_4IOL	172.500	19.552	92
raC_Dvc_856T_8IOL	174.476	20.532	98
raC_Dvc_871C_4IOL	54.412	5.92	85
raC_Dvc_871C_8IOL	55.532	7.048	82
raC_Dvc_871FM_4IOL	56.4	6.696	84
raC_Dvc_871FM_8IOL	59.808	6.784	92
raC_Dvc_871TM_4IOL	57.26	7.688	79
raC_Dvc_871TM_8IOL	59.136	7.756	84
raC_Dvc_873P_4IOL	109.148	9.084	97
raC_Dvc_873P_8IOL	112.428	9.26	105
raC_Dvc_1694_4IOL	104.256	9.172	95
raC_Dvc_1694_8IOL	106.684	9.26	98
raC_Dvc_875L_4IOL	149.48	23.496	74
raC_Dvc_875L_8IOL	151.832	23.672	88
raC_Dvc_46DFA_4IOL	93.828	17.944	21
raC_Dvc_46DFA_8IOL	97.56	19.216	49
raC_Dvc_45PLA_4IOL	96.66	16.512	45
raC_Dvc_45PLA_8IOL	101.08	16.6	121

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.
1732E 8IOL IO-Link Master Module User Manual 1732E-UM007B	Provides installation instructions, wiring diagrams, configuration, and specifications.
1734 4IOL IO-Link Master User Manual 1734-UM020B	Provides installation instructions, wiring diagrams, configuration, and specifications.
42AF RightSight Photoelectric Sensors User Manual 42AF-UM001A	Provides installation instructions, wiring diagrams, configuration, and specifications.
42EF RightSight Photoelectric Sensors User Manual 42EF-UM001A	Provides installation instructions, wiring diagrams, configuration, and specifications.
42JT VisiSight Photoelectric Sensors User Manual 42JT-UM001B	Provides installation instructions, wiring diagrams, configuration, and specifications.
45CRM Color Registration Mark Sensors Quick Reference 45CRM-QR001A	Provides quick reference information about feature, IO-Link parameter definition, Teach Procedure.
46CLR ColorSight IO-Link Quick Reference 46CLR-QR001C	Provides quick reference information about feature, IO-Link parameter definition, Teach Procedure.
836P Solid-state Pressure Switches User Manual 836P-UM001A	Provides installation instructions, wiring diagrams, configuration, and specifications.
837T Solid-state Temperature User Manual 837T-UM001A	Provides installation instructions, wiring diagrams, configuration, and specifications.
856T Control Tower IO-Link Class B Light and Sound Module Controller User Manual 856T-UM001C	Provides installation instructions, wiring diagrams, configuration, and specifications.
871C Miniature Inductive Sensors User Manual 871C-UM001A	Provides installation instructions, wiring diagrams, configuration, and specifications.
871FM Miniature Metal Flat Pack Inductive Sensors User Manual 871FM-UM002A	Provides installation instructions, wiring diagrams, configuration, and specifications.
871TM Long-range Inductive Sensors User Manual 871TM-UM002D	Provides installation instructions, wiring diagrams, configuration, and specifications.
873P Ultrasonic Sensors User Manual 873P-UM001B	Provides installation instructions, wiring diagrams, configuration, and specifications.
1694 Electronic Circuit Protection Module Installation Instructions 1694-IN001	Provides installation instructions, wiring diagrams, configuration, and specifications.
1732IL ArmorBlock 16-Channel IO-Link Hub User Manual 1732IL-UM001D	Provides installation instructions, wiring diagrams, configuration, and specifications.
875L Capacitive Sensors User Manual 875-UM001B	Provides installation instructions, wiring diagrams, configuration, and specifications.

Resource	Description
46DFA Small Aperture Fiber Optic Amplifier 46DFA-QR001A	Provides installation instructions, wiring diagrams, configuration, and specifications.
45PLA Polarized Light Array Sensors 45PLA-QR001A	Provides installation instructions, wiring diagrams, configuration, and specifications.
Application Code Manager User Manual LOGIX-UM003	Studio 5000® Application Code Manager user manual.

Library Components

The IO-Link 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 Allen-Bradley IO-Link Sensors and IO-Link Master Modules. The IO-Link Device Objects may be used with Machine Builder, Process, and Packaged Libraries or as standalone components. IO-Link Device Library add-on instructions objects collect, process, and deliver data between hardware devices and application logic.

IO-Link Device Instructions

The IO-Link Device Library includes instructions to interface with IO-Link Sensors and IO-Link Master Modules. Each sensor instruction is provided with variations for use with each master module. For example the 42AF Sensor has instructions raC_Dvc_42AF_4IOL for use with the 1734-4IOL POINT I/O 4-Channel IO-Link Master Module and raC_Dvc_42AF_8IOL for use with the 1732E-8IOLM12R ArmorBlock 8-Channel IO-Link Master Module. The master module instructions and faceplates are optional for module diagnostics and device summary but can be used independently from the sensor instructions and faceplates.

The instructions included are as follows:

IO-Link Master Modules:

- 1732E-8IOLM12R ArmorBlock 8-Channel IO-Link Master Module
- 1734-4IOL/K POINT I/O 4-Channel IO-Link Master Module

IO-Link Sensors:

- 42AF Long Range General Purpose Sensor
- 42EF RightSight General Purpose Sensor
- 42JT Visi Sight Sensor
- 45CRM Color Registration Mark Sensor
- 46CLR ColorSight True Color Sensor
- 871C Mini Tubular Sensor
- 871FM Mini Flat Pack Sensor
- 871TM Tubular Stainless Steel Sensor
- 1694 Modular Electronic Circuit Protector
- 45DMS Distance Measurement Sensor
- 836P Solid-State Pressure Sensor
- 837T Solid-State Temperature Sensor
- 856T Control Tower Stack Light
- 873P Analog Output Ultrasonic Sensor

- 875L Capacitive Sensor
- 46DFA Small Aperture Fiber-Optic Amplifier Sensor
- 45PLA Polarized Light Array Photoelectric Sensor

There is one type of instruction in this library:

- Device (Dvc): instruction used for devices (e.g. 42AF Sensor).

IO-Link Device Instructions

Instruction	Compatible Master	Version	Category	Instruction Description
raC_Dvc_1734_4IOLMaster	POINT I/O 1734-4IOL	3.01	IO-Link Master	POINT I/O 1734-4IOL 4-Channel IO-Link Master Module
raC_Dvc_1732E_8IOLMaster	ArmorBlock 1732E-8IOLM12R	3.01	IO-Link Master	ArmorBlock 1732E-8IOLM12R 8-Channel IO-Link Master Module
raC_Dvc_42AF_4IOL	POINT I/O 1734-4IOL	3.01	IO-Link Sensor	42AF Long Range General Purpose Sensor
raC_Dvc_42AF_8IOL	ArmorBlock 1732E-8IOLM12R	3.01	IO-Link Sensor	42AF Long Range General Purpose Sensor
raC_Dvc_42EF_4IOL	POINT I/O 1734-4IOL	3.01	IO-Link Sensor	42EF RightSight General Purpose Sensor
raC_Dvc_42EF_8IOL	ArmorBlock 1732E-8IOLM12R	3.01	IO-Link Sensor	42EF RightSight General Purpose Sensor
raC_Dvc_42JT_4IOL	POINT I/O 1734-4IOL	3.01	IO-Link Sensor	42JT Visi Sight Sensor
raC_Dvc_42JT_8IOL	ArmorBlock 1732E-8IOLM12R	3.01	IO-Link Sensor	42JT Visi Sight Sensor
raC_Dvc_45CRM_4IOL	POINT I/O 1734-4IOL	3.01	IO-Link Sensor	45C CRM Color Registration Mark Sensor
raC_Dvc_45CRM_8IOL	ArmorBlock 1732E-8IOLM12R	3.01	IO-Link Sensor	45CRM Color Registration Mark Sensor
raC_Dvc_45DMS_4IOL	POINT I/O 1734-4IOL	3.01	IO-Link Sensor	45DMS Distance Measurement Sensor
raC_Dvc_45DMS_8IOL	ArmorBlock 1732E-8IOLM12R	3.01	IO-Link Sensor	45DMS Distance Measurement Sensor
raC_Dvc_46CLR_4IOL	POINT I/O 1734-4IOL	3.01	IO-Link Sensor	46CLR ColorSight True Color Sensor
raC_Dvc_46CLR_8IOL	ArmorBlock 1732E-8IOLM12R	3.01	IO-Link Sensor	46CLR ColorSight True Color Sensor
raC_Dvc_836P_4IOL	POINT I/O 1734-4IOL	3.01	IO-Link Sensor	836P Solid-state pressure sensors
raC_Dvc_836P_8IOL	ArmorBlock 1732E-8IOLM12R	3.01	IO-Link Sensor	836P Solid-state pressure sensors 755
raC_Dvc_837T_4IOL	POINT I/O 1734-4IOL	3.01	IO-Link Sensor	827T Solid-state temperature sensors
raC_Dvc_837T_8IOL	ArmorBlock 1732E-8IOLM12R	3.01	IO-Link Sensor	837T Solid-state temperature sensors
raC_Dvc_856T_4IOL	POINT I/O 1734-4IOL	3.01	IO-Link Sensor	856T Control Tower Stack Light
raC_Dvc_856T_8IOL	ArmorBlock 1732E-8IOLM12R	3.01	IO-Link Sensor	856T Control Tower Stack Light
raC_Dvc_871C_4IOL	POINT I/O 1734-4IOL	3.01	IO-Link Sensor	871C Mini Tubular Sensor
raC_Dvc_871C_8IOL	ArmorBlock 1732E-8IOLM12R	3.01	IO-Link Sensor	871C Mini Tubular Sensor
raC_Dvc_871FM_4IOL	POINT I/O 1734-4IOL	3.01	IO-Link Sensor	871FM Mini Flat Pack Sensor
raC_Dvc_871FM_8IOL	ArmorBlock 1732E-8IOLM12R	3.01	IO-Link Sensor	871FM Mini Flat Pack Sensor
raC_Dvc_871TM_4IOL	POINT I/O 1734-4IOL	3.01	IO-Link Sensor	871TM Tubular Stainless Steel Sensor
raC_Dvc_871TM_8IOL	ArmorBlock 1732E-8IOLM12R	3.01	IO-Link Sensor	871TM Tubular Stainless Steel Sensor
raC_Dvc_873P_4IOL	POINT I/O 1734-4IOL	3.01	IO-Link Sensor	873P Analog Output Ultrasonic Sensors
raC_Dvc_873P_8IOL	ArmorBlock 1732E-8IOLM12R	3.01	IO-Link Sensor	873P Analog Output Ultrasonic Sensors
raC_Dvc_1694_4IOL	POINT I/O 1734-4IOL	3.01	IO-Link ECP	1694 Modular Electronic Circuit Protectors
raC_Dvc_1694_8IOL	ArmorBlock 1732E-8IOLM12R	3.01	IO-Link ECP	1694 Modular Electronic Circuit Protectors
raC_Dvc_875L_4IOL	POINT I/O 1734-4IOL	3.01	IO-Link Sensor	875L Capacitive Sensors
raC_Dvc_875L_8IOL	ArmorBlock 1732E-8IOLM12R	3.01	IO-Link Sensor	875L Capacitive Sensors
raC_Dvc_46DFA_4IOL	POINT I/O 1734-4IOL	3.01	IO-Link Sensor	46DFA Small Aperture Fiber Optic Amplifier Sensors
raC_Dvc_46DFA_8IOL	ArmorBlock 1732E-8IOLM12R	3.01	IO-Link Sensor	46DFA Small Aperture Fiber Optic Amplifier Sensors
raC_Dvc_45PLA_4IOL	POINT I/O 1734-4IOL	3.01	IO-Link Sensor	45PLA Polarized Light Array Sensors
raC_Dvc_45PLA_8IOL	ArmorBlock 1732E-8IOLM12R	3.01	IO-Link Sensor	45PLA Polarized Light Array Sensors

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 *TYPE* (e.g. Dvc, Opr, Tec) and *OBJECT* (e.g. 45DMS, 46CLR, etc). The major and minor versions are represented by X and Y respectively.

Level 1	Level 2	Level 3	File Type	Description
Application Example				
	IOLinkApplication_ACM_v3_01.xlsx		XLXS	Application Code Manager Project
	IOLinkApplication_v3_01.ACD		ACD	Logix Designer Example Project
	IOLinkApplication_ME_v3_01.apa		APA	FT View ME Project Archive
	IOLinkApplication_SE_v3_01.apa		APA	FT View SE Project Archive
	IOLinkApplication_VD_3_01.vpd		VPD	View Designer 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**	**View Designer Files**
	(raC-X_YY-VD) raC_Dvc_IO-Link.vpd		VPD	Object faceplate and graphic symbol/launch buttons
	raC_Dvc_1732IL_Hubs.vpd		VPD	Object faceplate and graphic symbol/launch buttons
HMI FactoryTalk View Images - png			**Folder**	**FT View ME/SE image files**
	images.png		PNG	FTView ME/SE images
Reference Manuals			**Folder**	**Manuals**
	DEVICE-RM300B-EN-P.pdf		PDF	Reference manual
Studio 5000 Logix Designer Files - L5X			**Folder**	**Studio 5000 AOI and RUNG import files**
	raC_*TYPE_OBJECT*_X.YY_RUNG.L5X		L5X	Object rung import
	raC_*TYPE_OBJECT*_X.YY_AOI.L5X		L5X	Object AOI import
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_LogixDesigner.mp4		MP4	How-to Video
	How_To_Configure_*TYPE*_Objects_in_ViewDesigner.mp4		MP4	How-to Video
	How_To_Import_and_Configure_*TYPE*_Objects_in_ACM.mp4		MP4	How-to Video
	Operational_Overview_of_*TYPE*_Objects_Faceplate.mp4		MP4	Operational Overview video
FTViewStudio_IOLinkLibrary_Tags_3_00.CSV			CSV	FTView ME HMI Tags
ReadMe.txt			TXT	Explanation of setup.cmd
SetUp.cmd			CMD	Application Code Manager setup script to register library

See the files in the *Application Example* folder to see a functional application that uses all of the IO-Link 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 FactoryTalk® View ME/SE Local Station and Studio 5000 View Designer®.

Visualization Files

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

- FactoryTalk® View Machine Edition
- FactoryTalk® View Site Edition
- Studio 5000 View Designer®

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 - IO-Link Device.ggfx	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	Graphic symbols or launch buttons used to open faceplate displays from other displays.
	(raC-3-SE) Toolbox - IO-Link Device.ggfx	(raC-3-ME) Toolbox - IO-Link Device.ggfx	Common objects used across multiple device faceplates.
Standard displays (.gfx)	(raC-3_XX-SE) precedes name of the display.	(raC-3_XX-ME) precedes name of the display.	e.g. (raC-3_01-ME) raC_Dvc_45DMS-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

View Designer project files are supplied that contain faceplates and launch buttons for the IO-Link Device Library. The devices are distributed over multiple 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_45DMS_FP

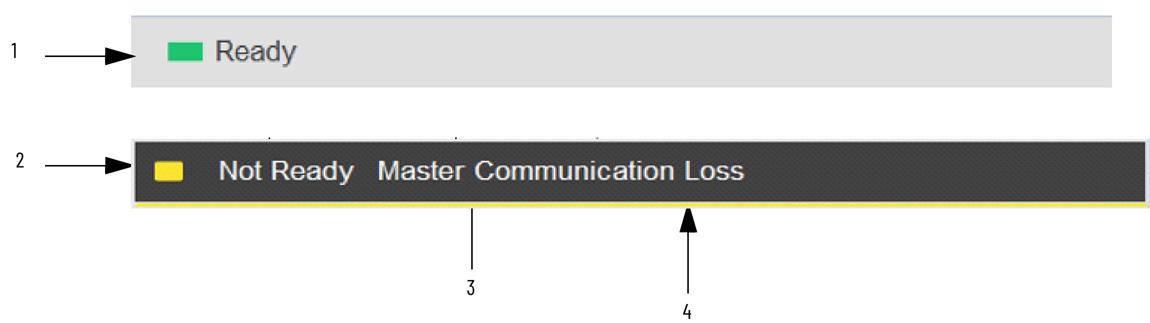
Basic Faceplate Attributes

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.

Common Status Banner

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)
- Communication Loss

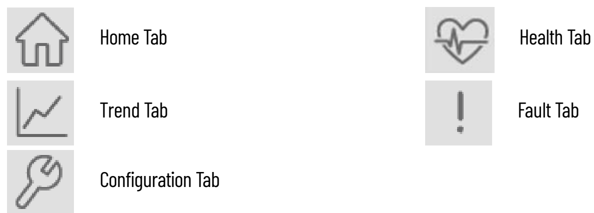


Item	Description
1	Ready state displays green LED icon and grey background.
2	Faulted state shows yellow LED icon and Not Ready status.
3	Fault message for latest fault present. Will also display "Virtual" if virtual mode is enabled.
4	Faulted state shows yellow border around banner.

Faceplate Navigation

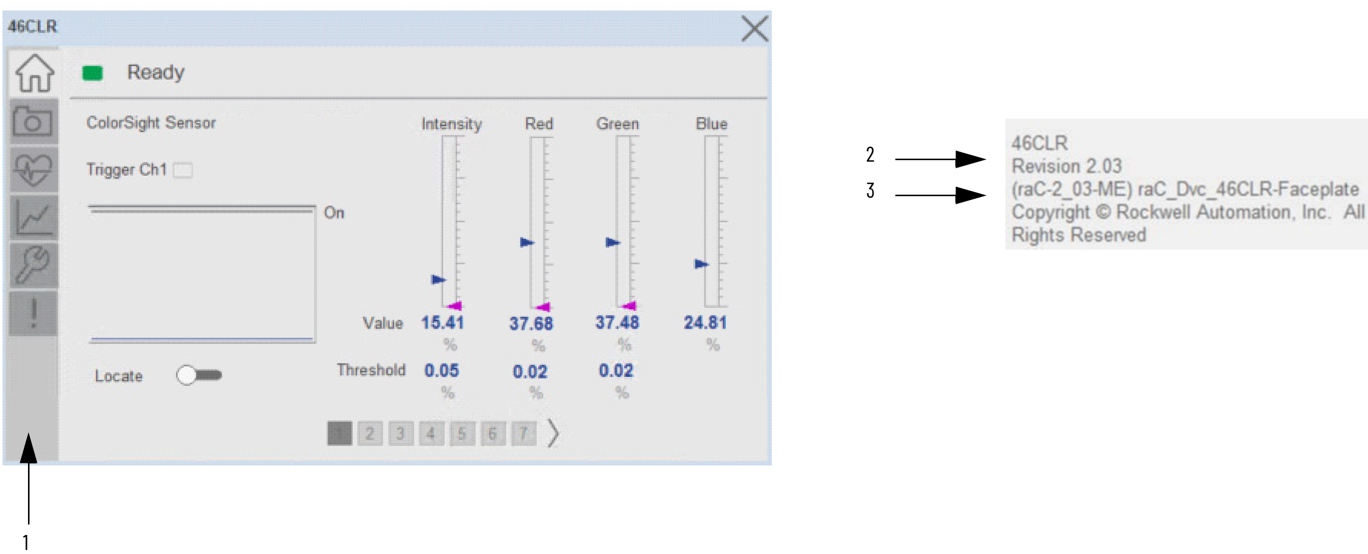
All device object faceplates have navigation tabs on the left side of the faceplate. Navigation tabs may vary based on device type. The active tab will show as a light grey, while an inactive tab will show as a dark grey.

The common tabs are shown below.



Faceplate Revision Notes

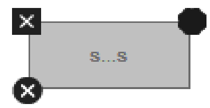
By clicking on the open space near the bottom left corner of the faceplate you can momentarily view revision notes and details of the active faceplate. This may be useful in troubleshooting or when communicating with Rockwell Automation Tech Support.



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

Launch Buttons

Launch buttons are provided in Global Display (GGFX) files for FactoryTalk View® ME/SE projects. These are used to open HMI faceplate displays or pop-ups.

Launch Button Style	Image Examples	Usage
Basic Text Button		Simple launch button with diagnostic information.

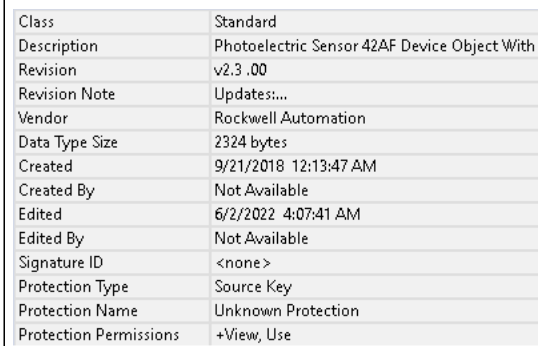
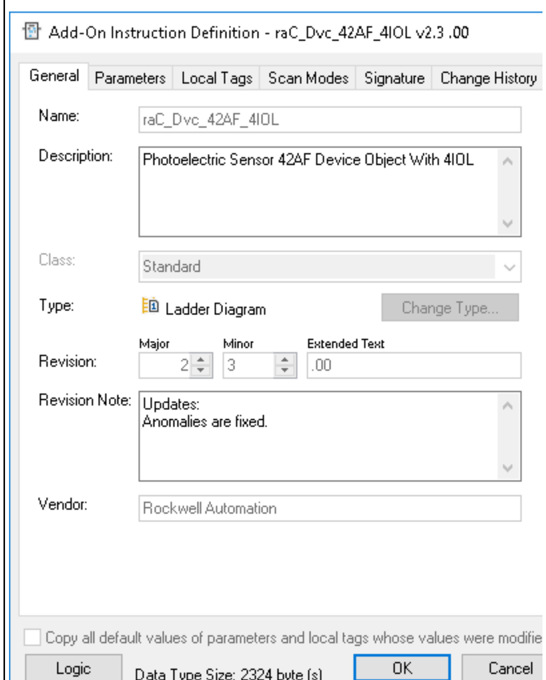
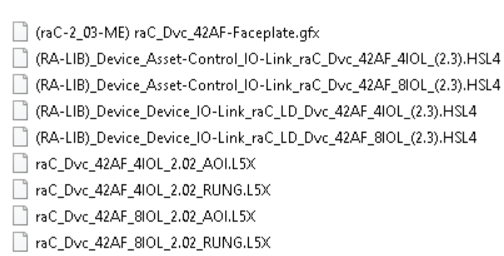
Diagnostic Icons

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

Library Versions

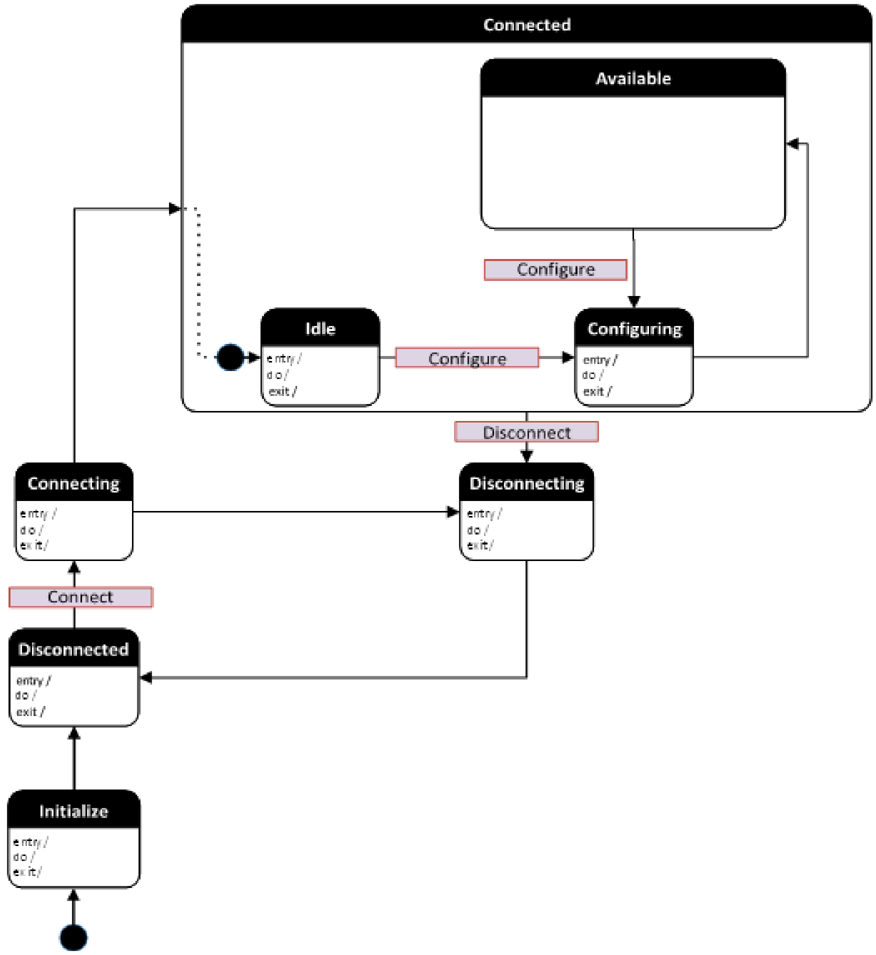
Each library object has a revision x.yy where: x is the Major Revision number and yy is the Minor Revision number. Each release of the library comes with release notes that describe the changes that were made since the last release. You can find the revision number of the object in a number of locations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

<table>
<tr><th>Component</th><th>Example</th></tr>
<tr><td>The Add-On Instruction in Logix Designer application has revision information visible when the instruction is selected in the Controller Organizer.</td><td>
</td></tr>
<tr><td>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.</td><td>
</td></tr>
<tr><td>The faceplate in FactoryTalk View software has revision information visible when the pointer is clicked just inside the lower left corner of the faceplate.</td><td>
</td></tr>
<tr><td>The revision number is shown in the file names for GFX, VPD, ACM.HSL4, AOI.L5X, and RUNG.L5X files.</td><td>
</td></tr>
</table>

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 device inputs (Inp), device configuration (Cfg), Settings (Set), Commands (Cmd) and Status (Sts).

The following IO-Link Common Control Interface tags are the primary device program tags to read and write to when interfacing to IO-Link devices. The value of using these tags in your specific application code is that you may use a number of different IO-Link devices such as 42AF, 45DMS, etc without having to update your application device interface tags.

For detailed information on specific interfaces, please refer to the appropriate section in this manual. A list of interface UDTs used in this library follows. Note that *OBJECT* used in the Inp interfaces is replaced with the specific IO-Link sensor device object (e.g. 42AF).

Interface Class	Object Class	Object Sub-Class	Interface Type	Interface Name (UDT)
Control	IO-Link	IO-Link Devices	Setting	raC_UDT_ItfAD_IOLinkSensor_CtrlSet
			Command	raC_UDT_ItfAD_IOLinkSensor_CtrlCmd
			Status	raC_UDT_ItfAD_IOLinkSensor_CtrlSts
			Information	raC_UDT_ItfAD_IOLinkSensor_Inf
			Interfacing	raC_UDT_ItfAD_IOLinkDevices
		IO-Link Master	Config	raC_UDT_ItfAD_4IOL_Master_Cfg
			Config	raC_UDT_ItfAD_8IOL_Master_Cfg
		IO-Link Device	Input	raC_UDT_ItfAD_*OBJECT*_Inp_4IOL
			Input	raC_UDT_ItfAD_*OBJECT*_Inp_8IOL

Data Types

The following IO-Link Common Control Interface tags are the primary device program tags to read and write to when interfacing to IO-Link devices. The value of using these tags in your specific application code is that you may use a number of different IO-Link devices such as 42EF, 45DMS, etc without having to update your application device interface tags.

raC_UDT_ItfAD_IOLinkSensor_CtrlSet

This is the IO-Link Sensor 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 _InstanceName_CtlrSet.InhibitCmd program tag from your application program. This would prevent a Locate, Reset count, Reset Duration commands from the device faceplate.

Member	Description	Data Type
InhibitCmd	1 = Inhibit user Commands from HMI Faceplate, 0 = Allow Control	BOOL
InhibitSet	1 = Inhibit user Settings from HMI Faceplate, 0 = Allow	BOOL
InhibitCfg	1 = Inhibit user Configuration parameters from HMI Faceplate; 0=Allow	BOOL
Setpoint	Trigger Setpoint	INT

raC_UDT_ItfAD_IOLinkSensor_CtrlCmd

This is the IO-Link Sensor 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.

The table below shows member names, descriptions, and tag data types. Note: Physical & Virtual members are not currently used in the Add-On Instruction and are reserved for future use.

Member	Description	DataType
bCmd	Bir Overlay (Visible) covering all subsequent boolean members.	INT
ResetWarn	Reset device warning [No warning reset]	BOOL
ResetFault	Reset device trip or fault[No Fault reset,- Automatic fault reset only]	BOOL
ResetCounter	Reset counter value [1=Reset]	BOOL
Locate	Flash sensor LEDs [1=flash]	BOOL
Physical	Operate as a physical device	BOOL
Virtual	Virtual mode not implemented - hold for future use	BOOL

raC_UDT_ItfAD_IOLinkSensor_CtrlSts

This is the IO-Link Sensor Common Control interfacing Status tag. By configuring these tags, we can read various status from the device like Ready, Connected, and Available etc. The below table shows detailed information of members used in this UDT tags. Note: Physical & Virtual members are not currently used in the Add-On Instruction and are reserved for future use.

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 Event Data	raC_UDT_Event
FirstFault	First Fault Event Data	raC_UDT_Event
eCmdFail	Enumerated command failure code.	DINT
bSts	Bit overlay (Visible) covering all subsequent boolean members.	DINT
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
Physical	1 = Operating as a physical device	BOOL
Virtual	1 = Operating as a virtual device[Not an output device]	BOOL
Counter	Displays the sensor counter value when enabled	DINT
Data	Primary sensor data value	REAL
EU	Data Engineering Unit	STR0020
Triggered	Bitwise Sensor Trigger Status	INT
Signal_Strength	0-65535 Signal strength value reflected by the target	DINT
AppSensorName	Application Specific Name	STR0032

The *Triggered* INT value is a bitwise representation of the sensors triggered status bits. The number of trigger statuses may vary depending on the sensor type up to 16 statuses. You may reference individual bits by using syntax such as *Triggered.0* for the sensor's connected channel no.*XX* trigger status.

raC_UDT_ItfAD_IOLinkDevices

This is the IO-Link Device/Sensor interfacing data which provide the command and status related information to the IO-Link Master. The members inside are array of 8 elements. First element of array describe the Sensor status & command data which is connected to Channel '0' of Master.

The below table shows detailed information of members used in this UDT tag.

Member	Description	Data Type
Ref_Ctrl_Sts	Status Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSts[8]
Ref_Ctrl_Cmd	Command Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlCmd[8]

raC_UDT_ItfAD_IOLinkSensorInf

This is the IO-Link Device/Sensor interfacing data which provide the Sensor type information to the IO-Link Master. The members inside are array of 8 elements.

The below table shows detailed information of members used in this UDT tag.

Member	Description	Data Type
bTriggerPresent	Bitwise Trigger Availability Status	INT[8]
bDataInfo	Bitwise Data Information Availability Status (0 = Data, 1 = Signal Strength, 2 = Counter, 3 = Locate, 4 = ASN)	SINT[8]
bEnable	IO-Link Sensor present on respective channel e.g. bEnable.0 = 1: IO-Link Sensor present on channel 0	DINT
Inf_Lib	Library identifier for HMI navigation	STR0032[8]
Inf_Type	Type identifier for HMI navigation	STR0032[8]

raC_UDT_Event

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

Member	Description	Data Type
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	Stores the value of device fault code	DINT
Desc	Stores the Messages related to fault code	STRING

raC_UDT_Dropdown

This is the IO-Link Sensor Common Control Interface User-Defined Data Type for dropdown.

The below table shows detailed information of members used in this UDT tag.

Input	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	Slider Value as per Total Count of Dropdown	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[16]

raC_UDT_HEX_Code_LookupMember

Member	Description	Data Type
Time_Base	Time Base Selection: 0.1, 0.4, 1.6 & 6.4	REAL
Multiplier	Multiplier Number: 0 to 63	SINT
Hex_Code	Hex Code	INT

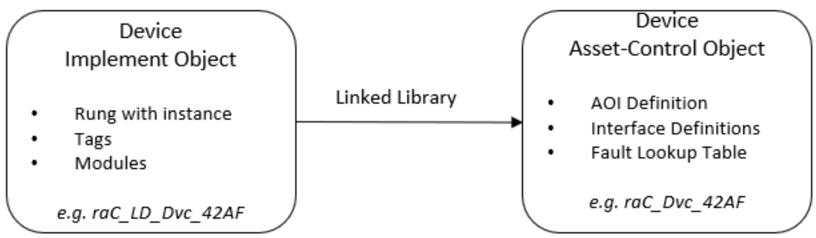
Application Code Manager

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.



Chapter 3

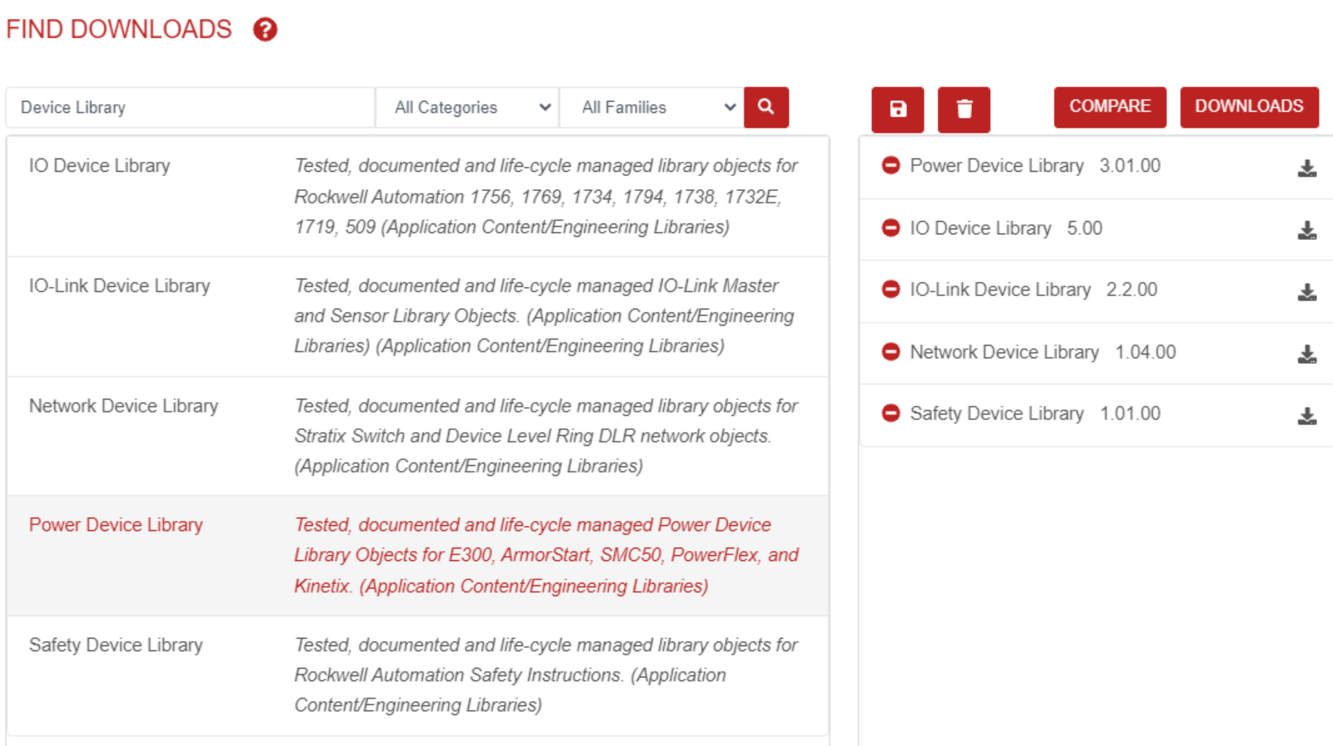
Using the Library

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.

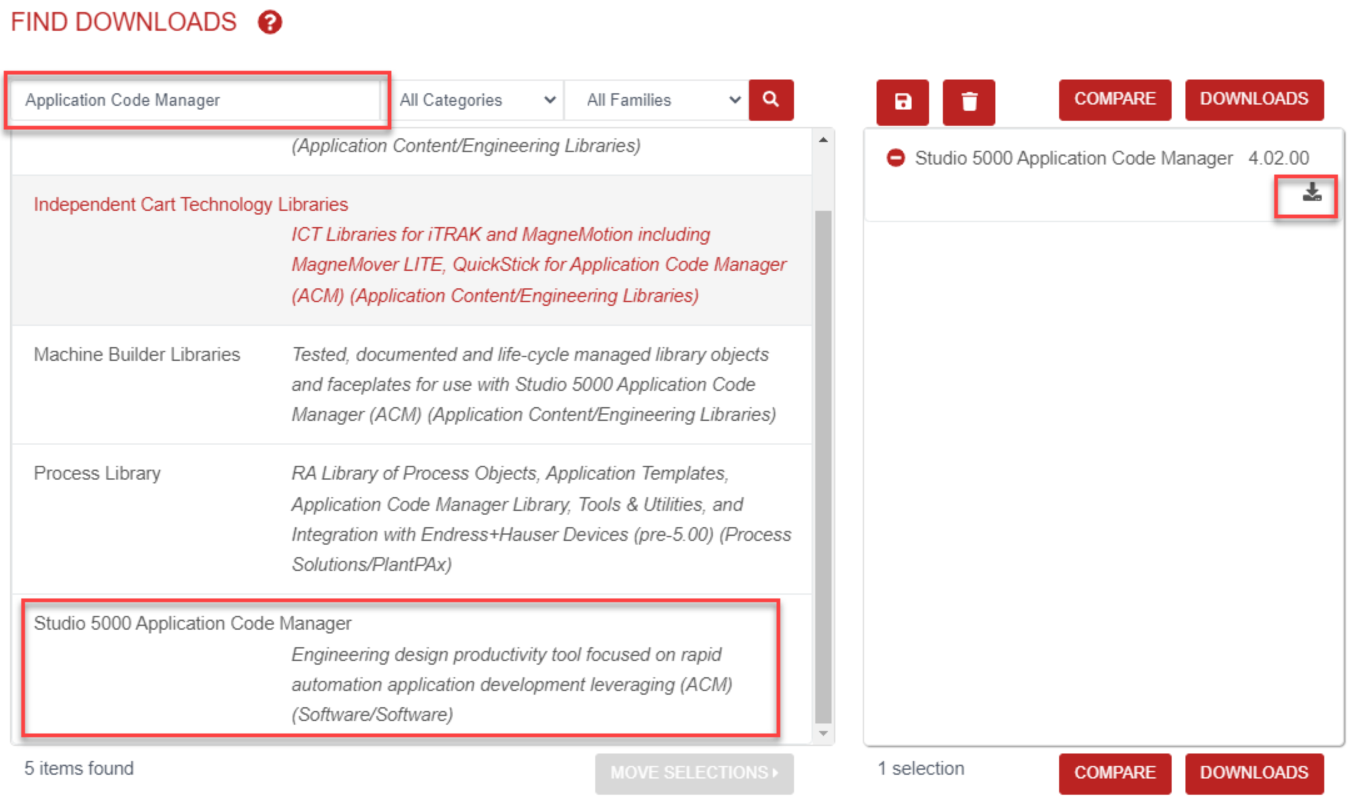
Search “Device Library” or filter on Application Content to quickly find the library.



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

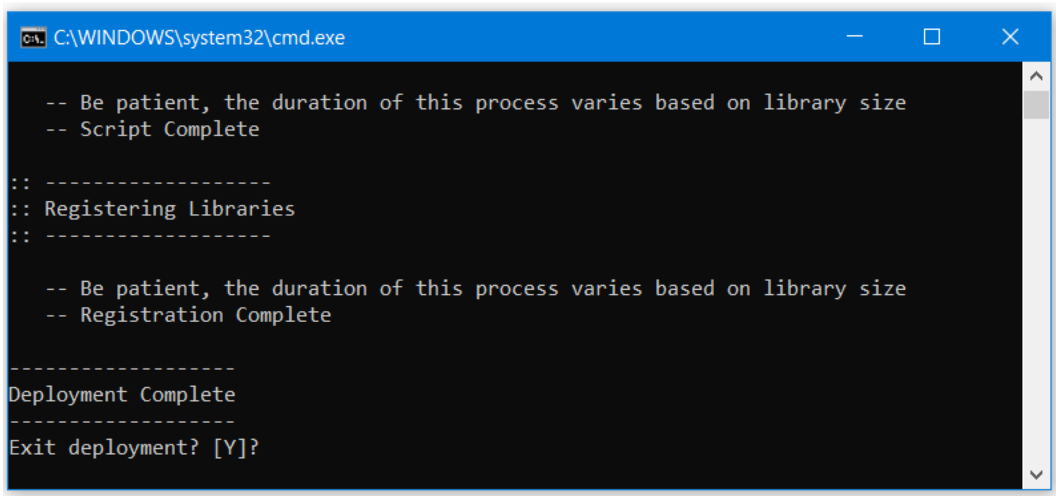
It is recommended that you use Studio 5000® Application Code Manager or the Studio 5000® "Import Library Objects" Plug-In Wizard to import device library objects into a Logix 5000 controller project. To use the library in Application Code Manager you must first register the libraries.

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.

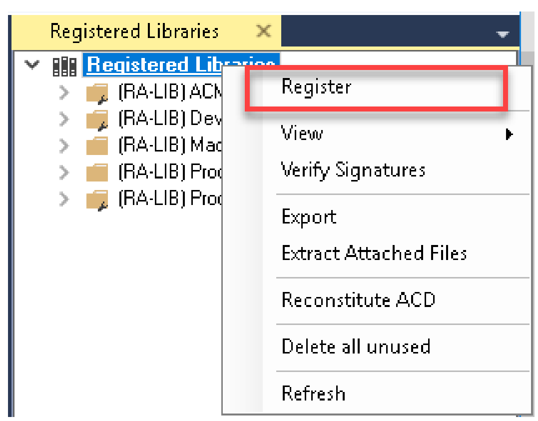
Register Complete Library Automatically

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_*IO-Link_Device*_Objects_in_LogixDesigner.mp4"

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.

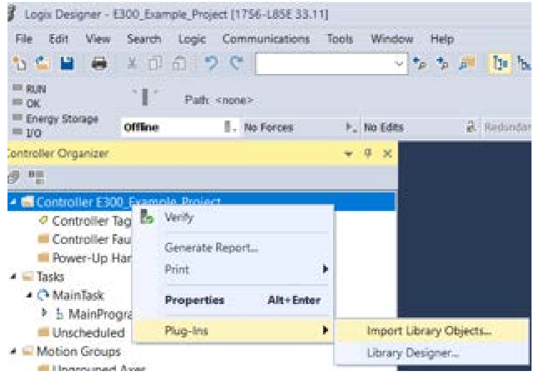
Below is a table to capture recommendations on when to use which tool or workflow when importing and configuring device objects.

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®

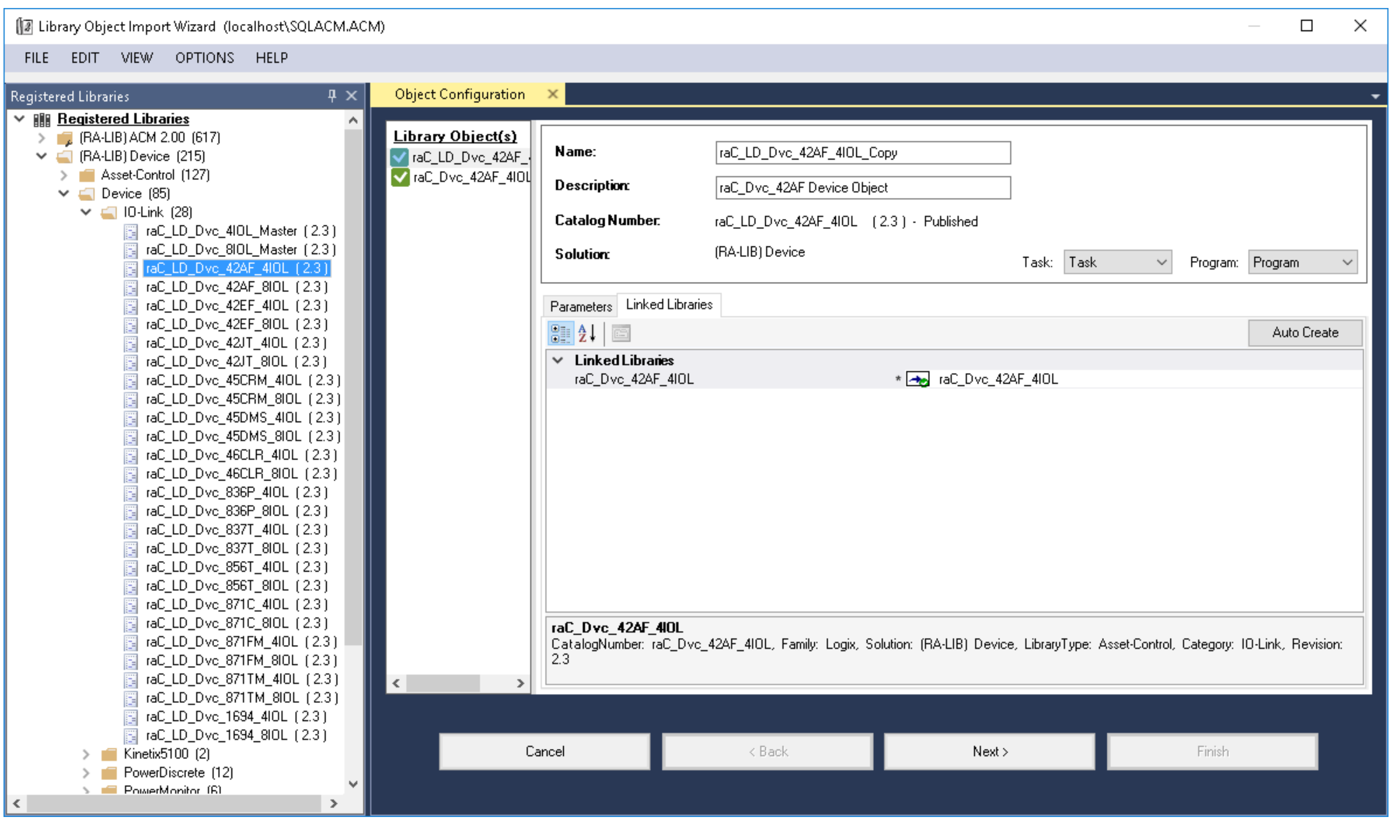
Import Library Objects Wizard

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**.
- Select a **ChannelNumber** which is the IO-Link Master Module channel which the IO-Link sensor or device is connected to.

- Assign the **MasterName** by typing or browsing to the instance of the IO-Link Master Module in the controller project (e.g. 1734-4IOL or 1732E-8IOLM12R)
- 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.

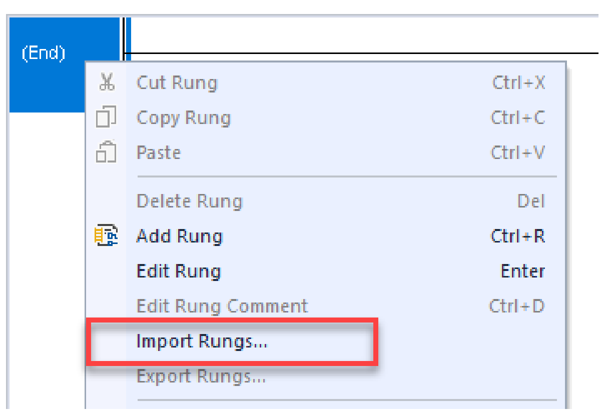
Import Rung Logic

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.

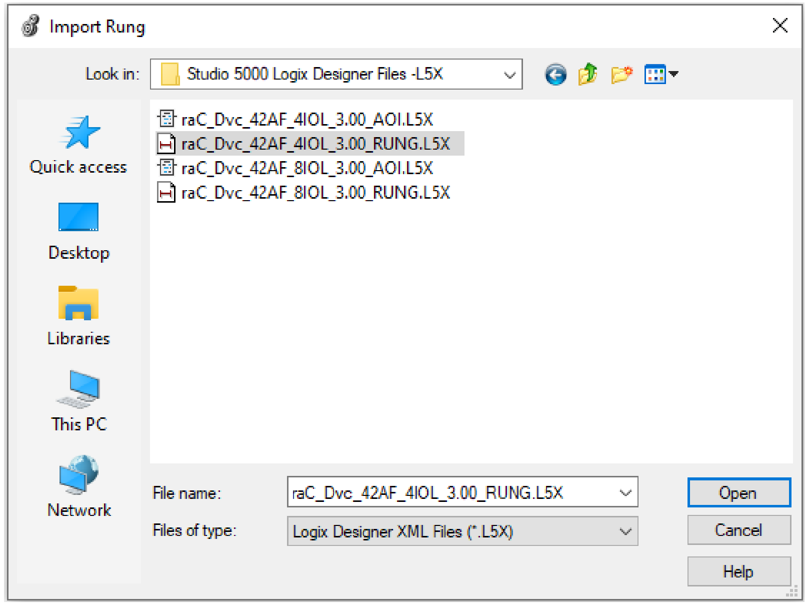
1. In the Studio 5000 Logix Designer® application, open a new or existing project.

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...

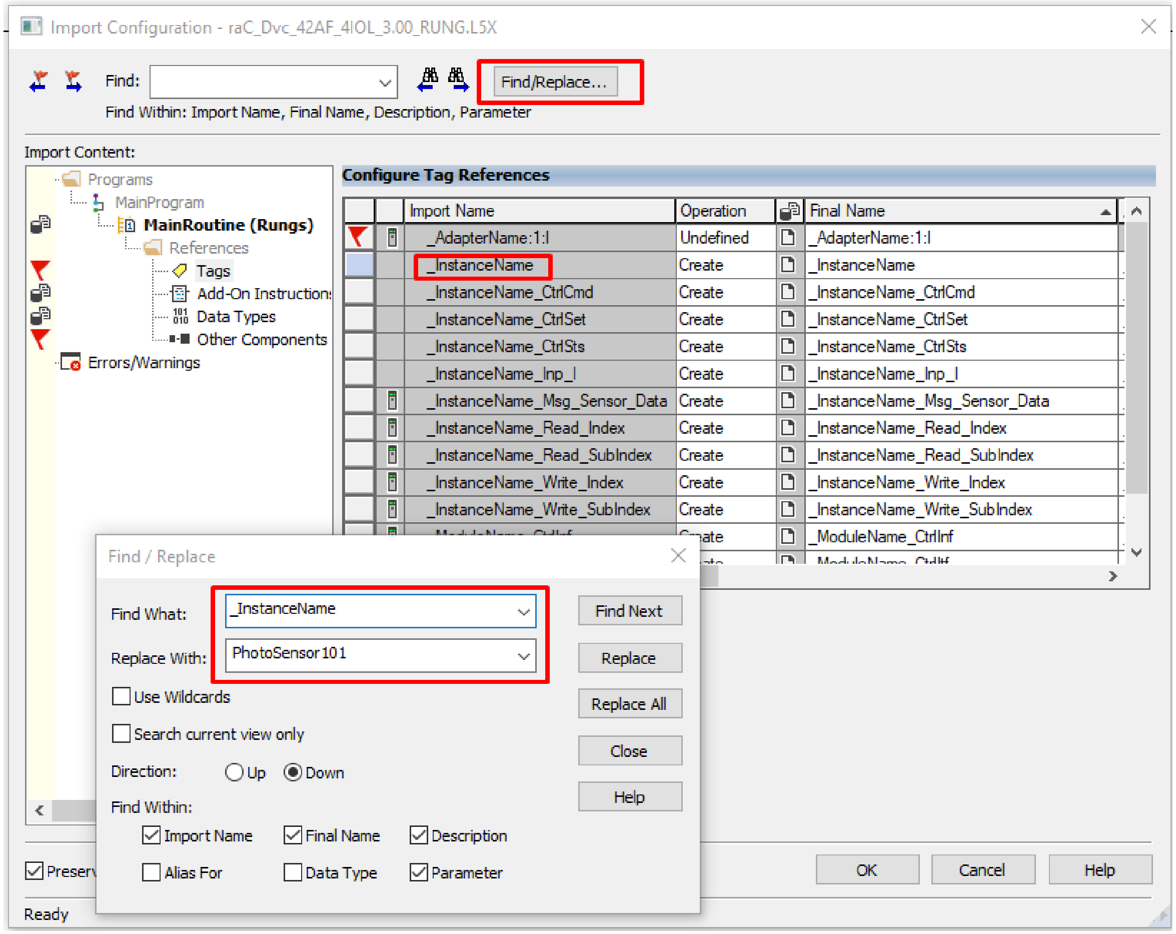


3. Select the desired RUNG and Select Import. The file will have a name like *raC_Dvc_42AF_4IOL_3.01_RUNG.L5X.*

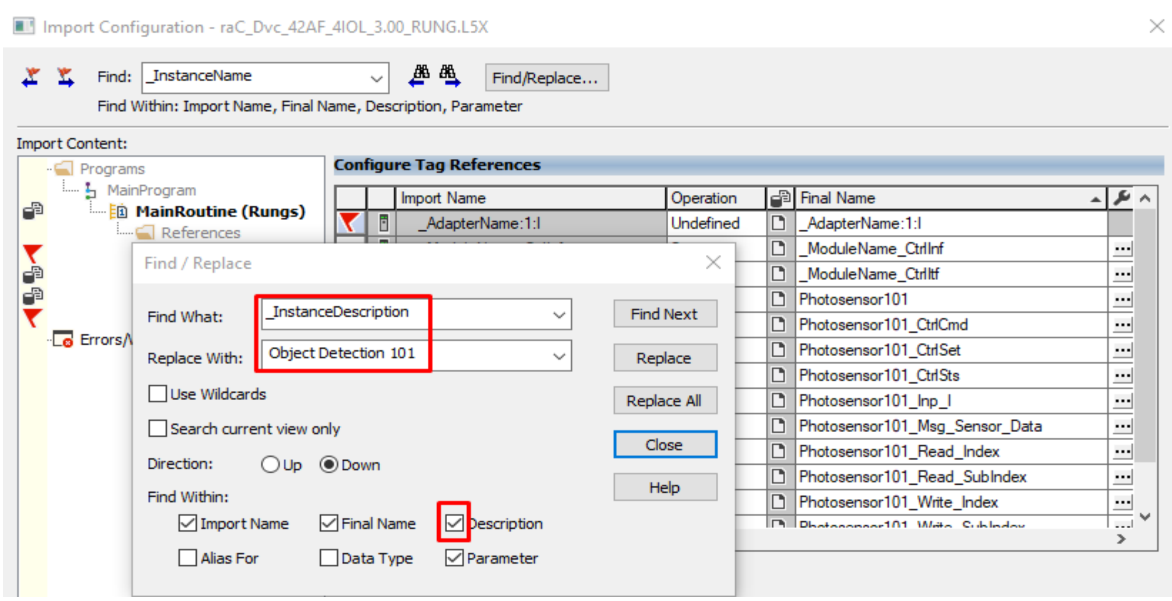


Both “RUNG” and “AOI” .L5X files are provided. Import the RUNG file to get all required additional tags, data types, and message configurations.

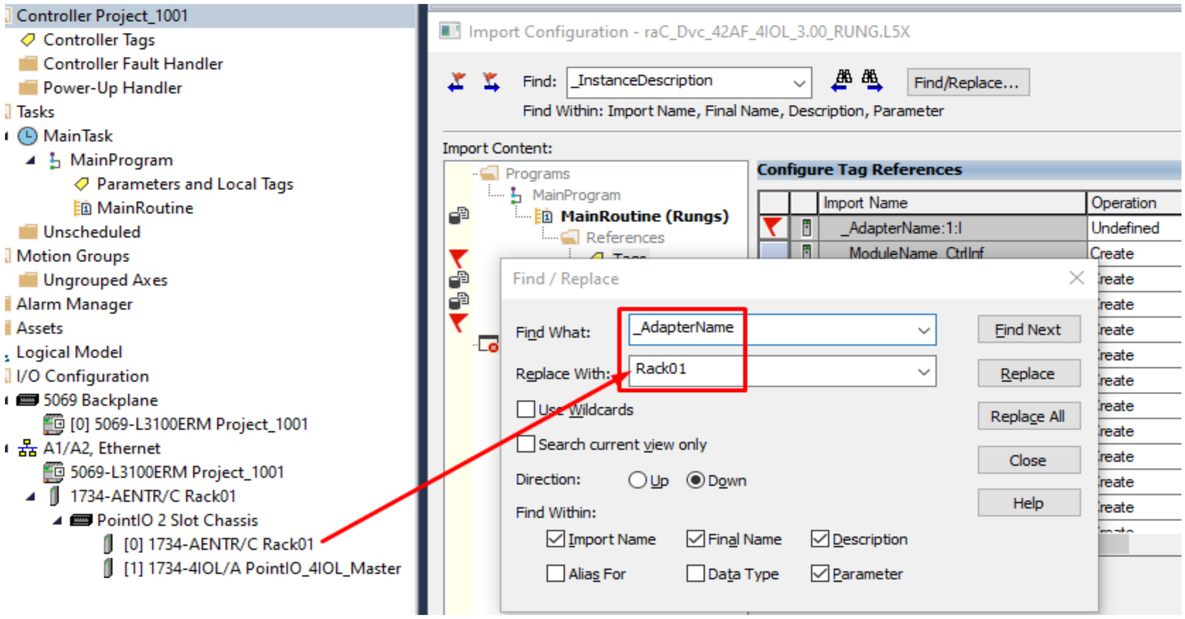
4. An *Import Configuration* dialogue window will open and display generic Import names which include “_InstanceName”. Click the *Find/Replace...* button and replace all instances of “_InstanceName” with your desired device name (e.g. “PhotoSensor101”).



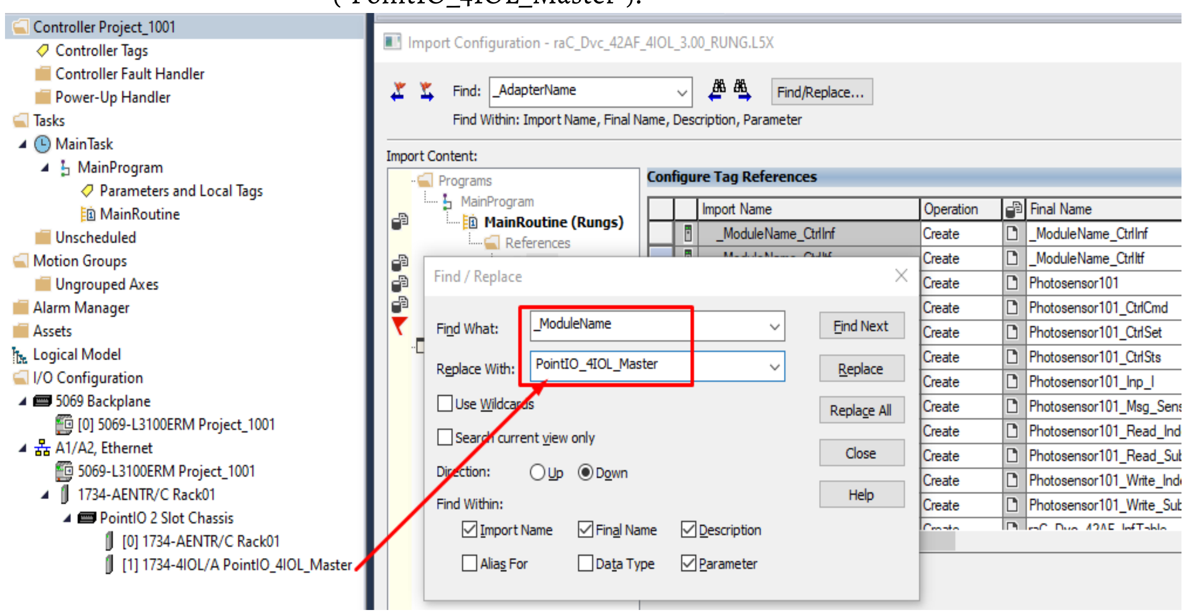
5. Click the *Find/Replace...* button and replace of "Intsnce_Description" with your desired description e.g. "Object Detection 101").



6. Click the *Find/Replace...* button and replace of "_AdapterName" with your desired Adapter Module Name e.g. "Rack01").

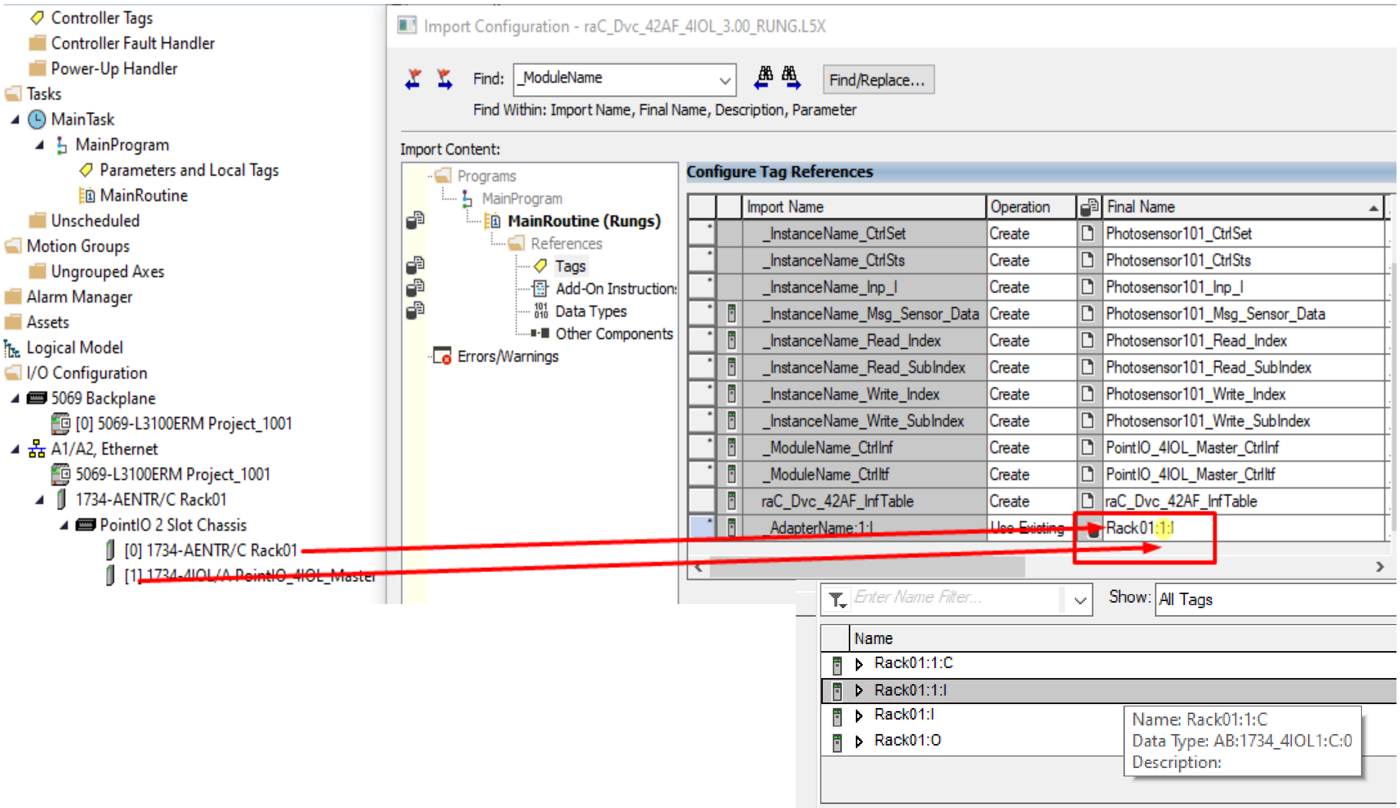


7. Click the *Find/Replace...* button and replace of "_ModuleName" with your desired IO-Link Master Module Name e.g. ("PointIO_4IOL_Master").



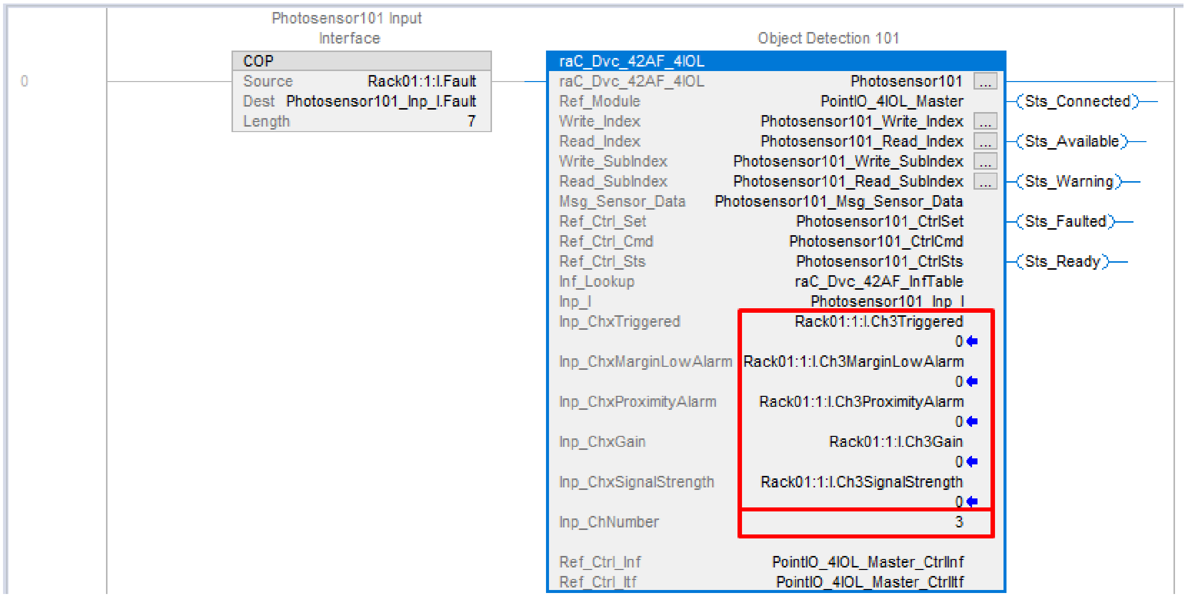
8. You will need to point the new object to the correct AdapterName module in your project. You can type in or browse for the correct input (:I) tags in your project. In this example our module is called Rack01:1:I

which is the 1734-4IOL module installed in slot 1 of a POINT I/O rack called Rack01.



9. Click “OK” on the “Import Configuration dialog box”. The rung will now be imported into your ladder routine.

10. Browse the tags and assign it to the input parameters of the imported AOI Rung. For 'Inp_ChNumber' give the channel no. of Master where sensor is connected.



Using Studio 5000 View Designer®

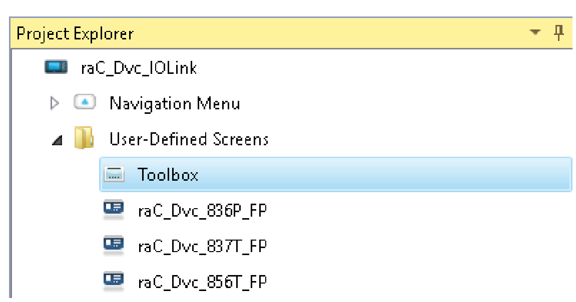
Using View Designer Project Files

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 VSD 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_LogixDesigner"
"How_To_Configure_*IO-Link_Device*_Objects_in_ViewDesigner.MP4"

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:

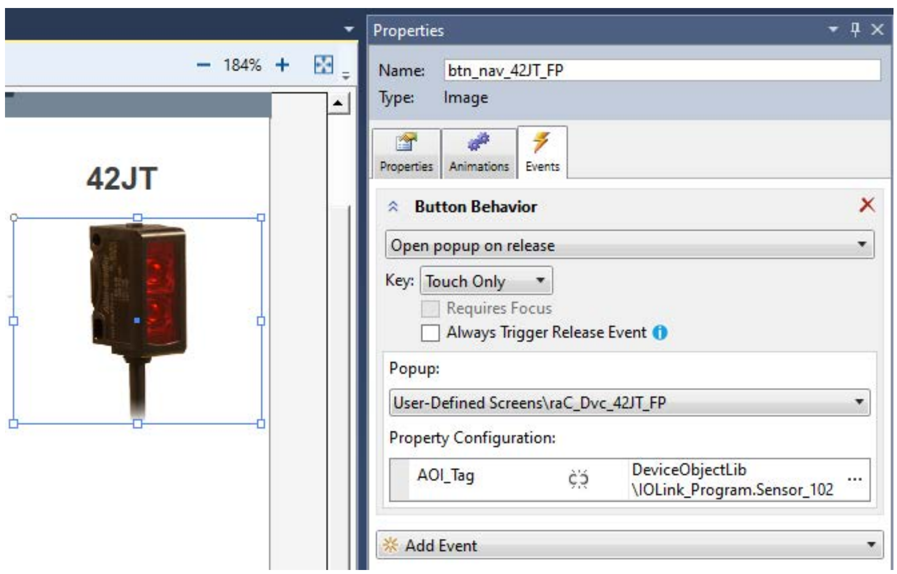
- Copy the entire faceplate _FP screen from the supplied VSD project to your project application.

- 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

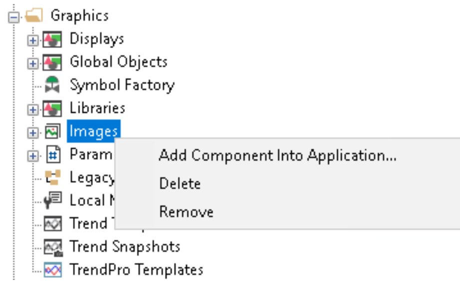


Using FactoryTalk® View Studio

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 ME/SE. 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.

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_*IO-Link_Device*_Objects_in_FTViewME.MP4"



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

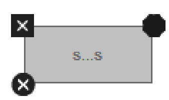
   Select the global object (.ggfx) files from the *\HMI - FactoryTalk View ME\Global Objects - ggfx* folder

3. Import HMI Faceplates

Select the faceplate (.gfx) files from the *\HMI - FactoryTalk View ME\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 - IO-Link 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.



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.

- Launch Button Parameter Configuration e.g. (IO-Link Sensor Faceplate Navigation).

Global Object Parameter Values

	Name	Value	Tag	Description
1	#102	{::[shortcut]Program:IOLink_Program.raC_Dvc_42AF}	•••	Backing Tag
2	#104	raC_Dvc_42AF	•••	Navigation Button Label
3	#120		•••	Display's left position (e.g. 100) (optional)
4	#121		•••	Display's top position (e.g. 100) (optional)

- Launch Button Parameter Configuration e.g. (IO-Link Master Faceplate Navigation).

	Name	Value	Tag	Description
1	#102	{::[PAC]Program:MainProgram.Master8IOL_2}	•••	Add-On Instruction Backing Tag
2	#104	Master	•••	Custom button label. Leave blank to use Tag.@Description
3	#110	{::[PAC]Program:MainProgram._836P_1001}	•••	CH0 AOI Backing Tag (Enter 0, If there is no sensor connected to the channel)
4	#111	0	•••	CH1 AOI Backing Tag (Enter 0, If there is no sensor connected to the channel)
5	#112	{::[PAC]Program:MainProgram._45DMS_1001}	•••	CH2 AOI Backing Tag (Enter 0, If there is no sensor connected to the channel)
6	#113	0	•••	CH3 AOI Backing Tag (Enter 0, If there is no sensor connected to the channel)
7	#114	{::[PAC]Program:MainProgram._871FM_1002}	•••	CH4 AOI Backing Tag (Enter 0, If there is no sensor connected to the channel)
8	#115	0	•••	CH5 AOI Backing Tag (Enter 0, If there is no sensor connected to the channel)
9	#116	{::[PAC]Program:MainProgram._42AF_1001}	•••	CH6 AOI Backing Tag (Enter 0, If there is no sensor connected to the channel)
10	#117	0	•••	CH7 AOI Backing Tag (Enter 0, If there is no sensor connected to the channel)
11	#120		•••	Display's left position (e.g. 100) (optional)
12	#121		•••	Display's top position (e.g. 100) (optional)

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.

Library Upgrades

Add-On Instruction Upgrades

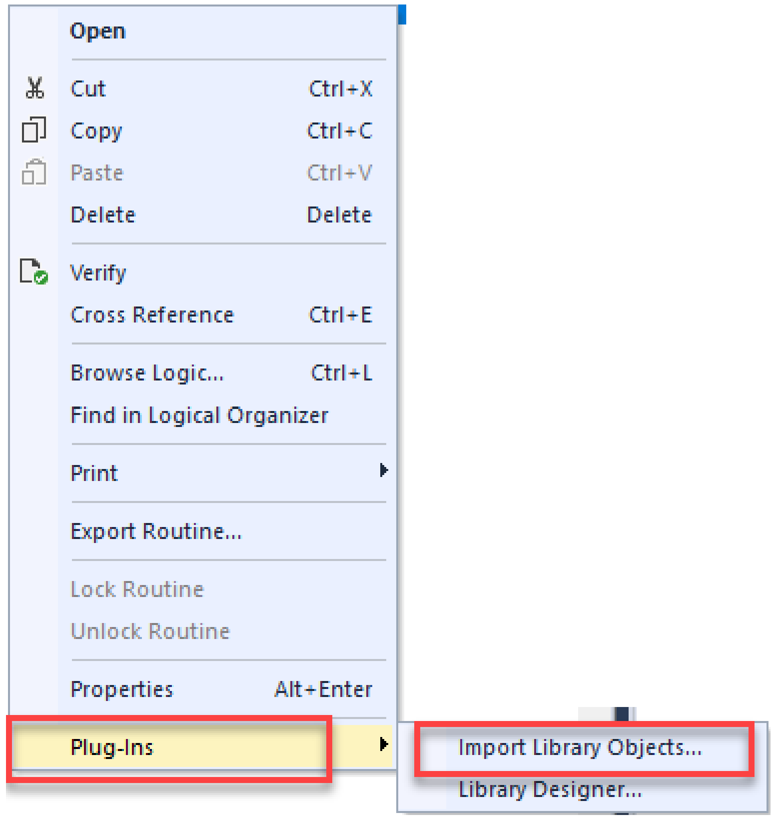
There are two methods to upgrading existing device object add-on instructions in a project. You can do this either by using the Studio 5000 Plug-In *Import Library Objects* Wizard or by importing individual add-on instruction AOI.L5X files. Both methods are described in the following sections.

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.

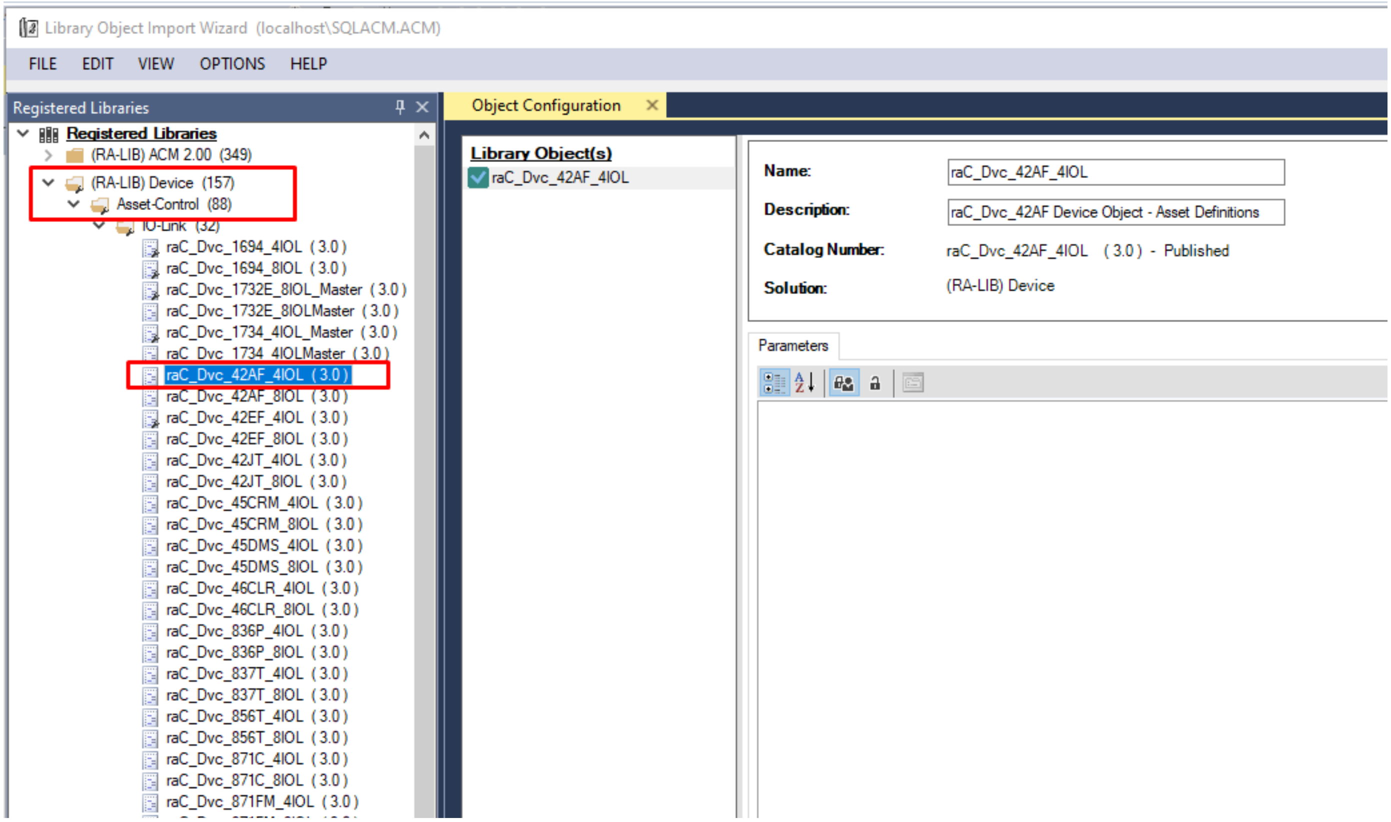
Upgrades Using Studio 5000 Plug-In to Import Library Objects

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.

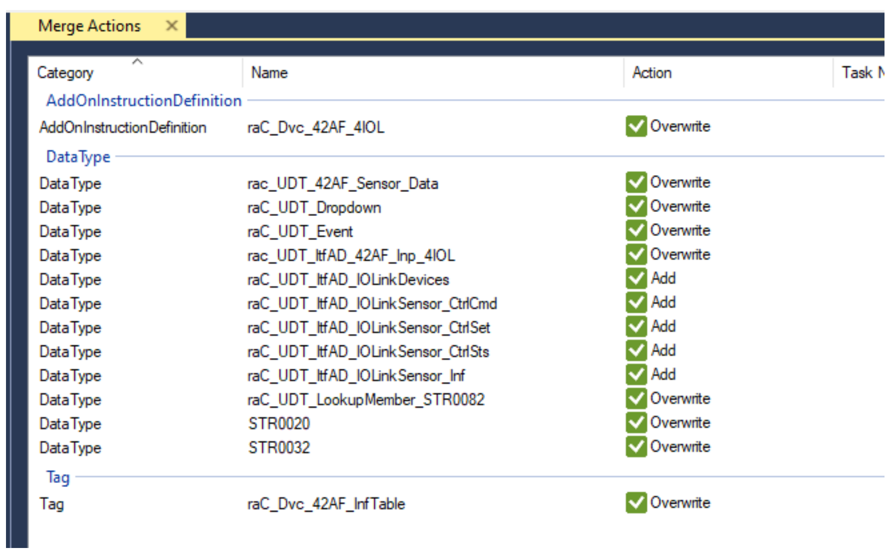
Right-click in your controller organizer or within a routine to access *Plug-Ins > Import Library Objects...*



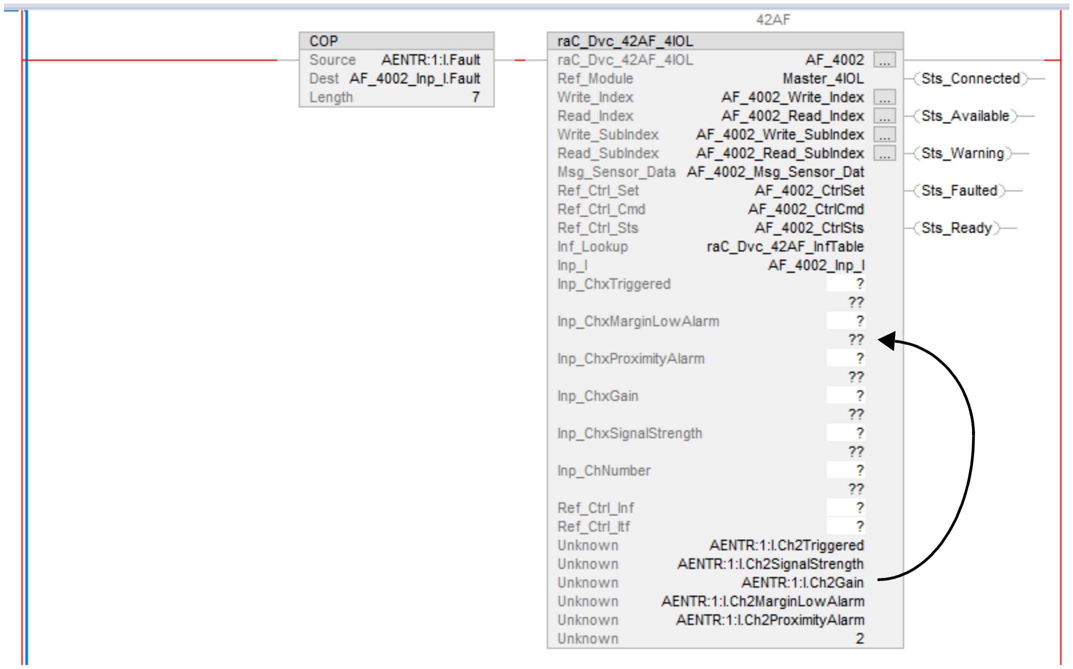
The *Library Object Import Wizard* dialogue window will open. Under *Registered Libraries* expend *(RA-LIB) Device > Asset-Control* and find the desired object and version. Drag the object into the *Object Configuration* window on the right.



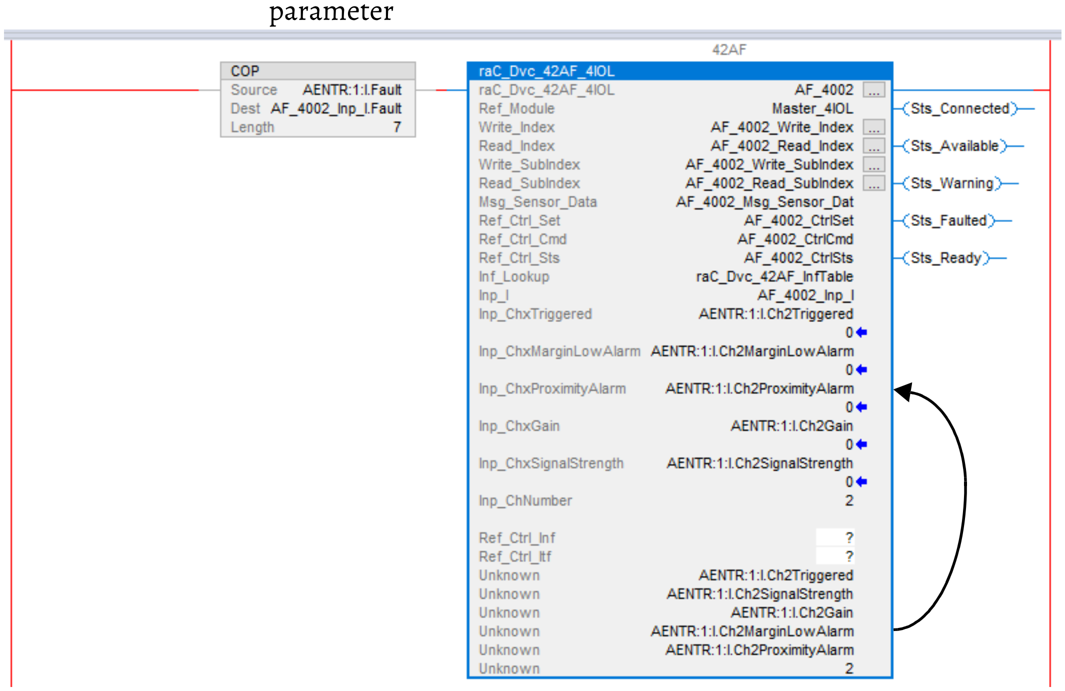
In the *Merge Actions* window, select the *Action* for the *AddOnIntructionDefinition* to *Overwrite*. This will update any existing instance of the object to the newer version. You may also choose to overwrite any other DataTypes or Tags. Review the release notes of the latest library release to understand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



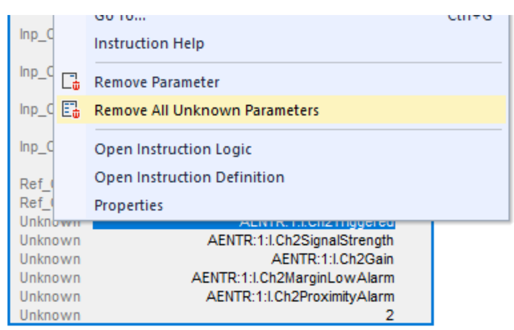
- After Importing the AOI. The AOI references in the routine are affected and need to reconfigure it.



a. Drag and drop the tags from Unknown parameter to specific parameter

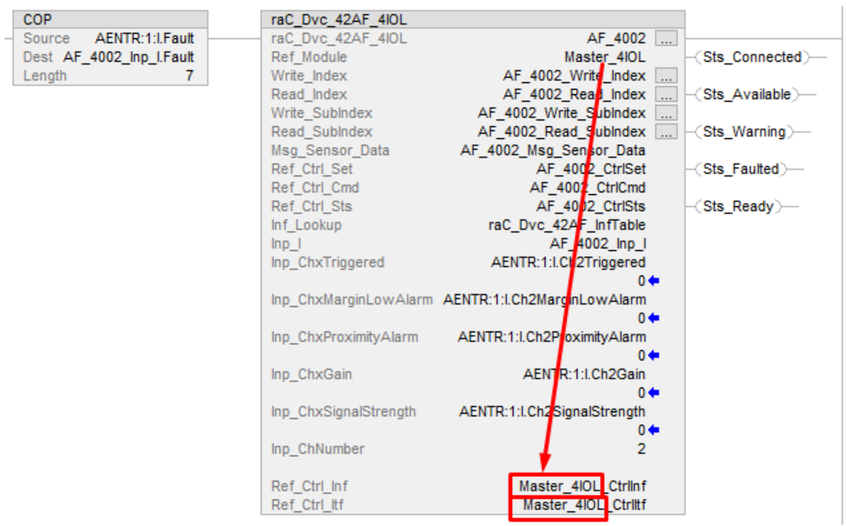


b. Right click on AOI definition and Remove all unknown parameter.



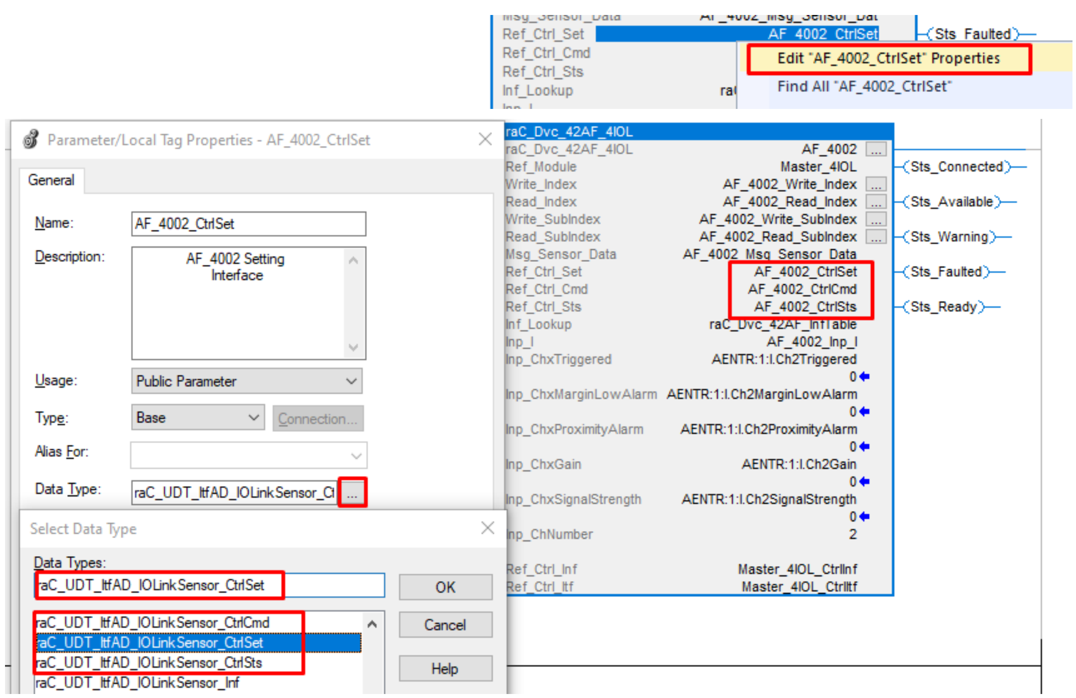
c. Assign and create new tags for Ref_Ctrl_Inf & Ref_Ctrl_Itf. The tag name, data type and scope should be

Tag Name	Data Type	Scope
Master_4IOL_CtrlInf	raC_UDT_ItfAD_IOLinkSensor_Inf	Controller
Master_4IOL_CtrlItf	raC_UDT_ItfAD_IOLinkDevices	Controller

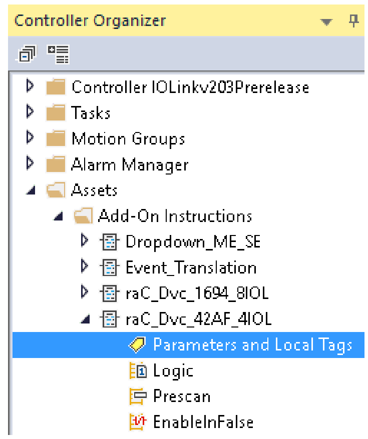


d. Change the Data type for Ref_Ctrl_Set, Ref_Ctrl_Cmd and Ref_Ctrl_Sts parameter Tags using Right Click and select Edit tag properties. The tag data type should be

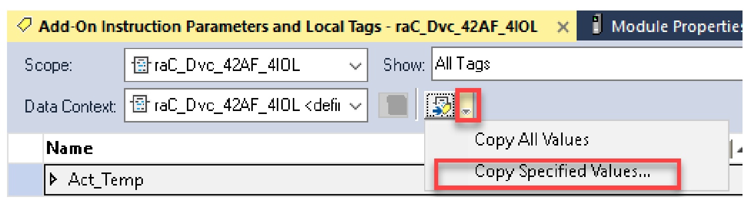
Tag Name	Required Data Type
AF_4002_CtrlSet	raC_UDT_ItfAD_IOLinkSensor_CtrlSet
AF_4002_CtrlCmd	raC_UDT_ItfAD_IOLinkSensor_CtrlCmd
AF_4002_CtrlSts	raC_UDT_ItfAD_IOLinkSensor_CtrlSts

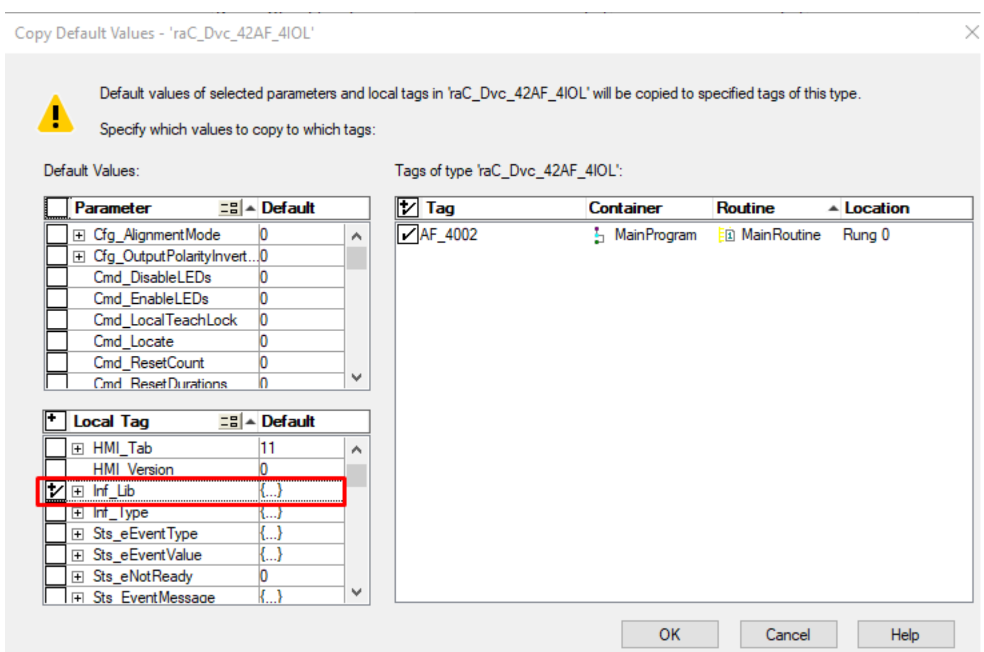


- In order to ensure the HMI faceplate still works properly you will need to update the object's library information stored in the Inf_Lib tag. In the *Controller Organizer* pane under *Assets > Add-On Instructions* expand the device object that was updated. Double-click on *Parameters and Local Tags*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

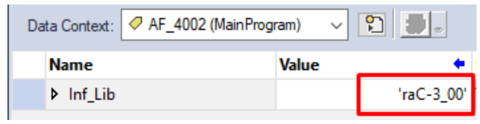


- In the *Add-On Instruction Parameters and Local Tags* window, you may notice that the Inf_Lib tag in the add-on instruction definition matches the new library revision number. Click on the down-arrow to the right of the copy button and select *Copy Specified Values...*





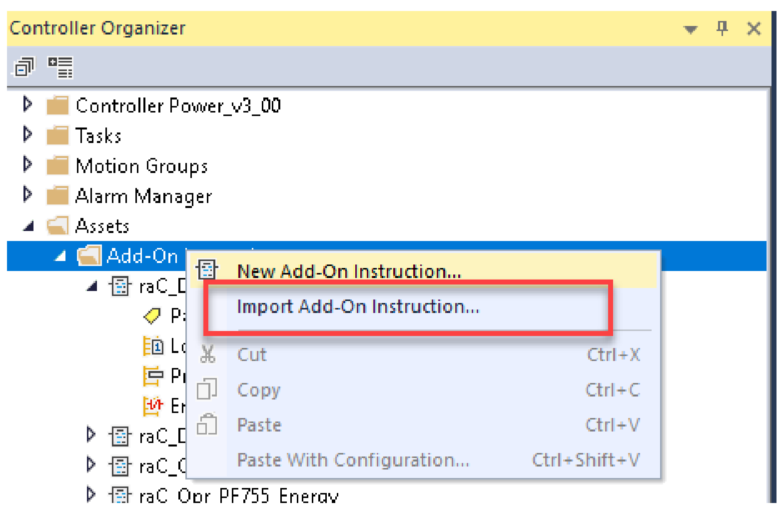
- In the *Copy Default Values* window, be sure to **first uncheck all Parameters and Local Tags** by clicking the +/- box in the top right. Failure to do so may result in overwriting settings in the existing objects.
- Check only *Inf_Lib* in the *Local Tag* area. On the right, all affected objects should be selected. Click OK.
- You can now confirm that the *Inf_Lib* tag has been updated to the current library (e.g. 'raC-3_00') by changing the *Data Context* drop-down to a specific device object.



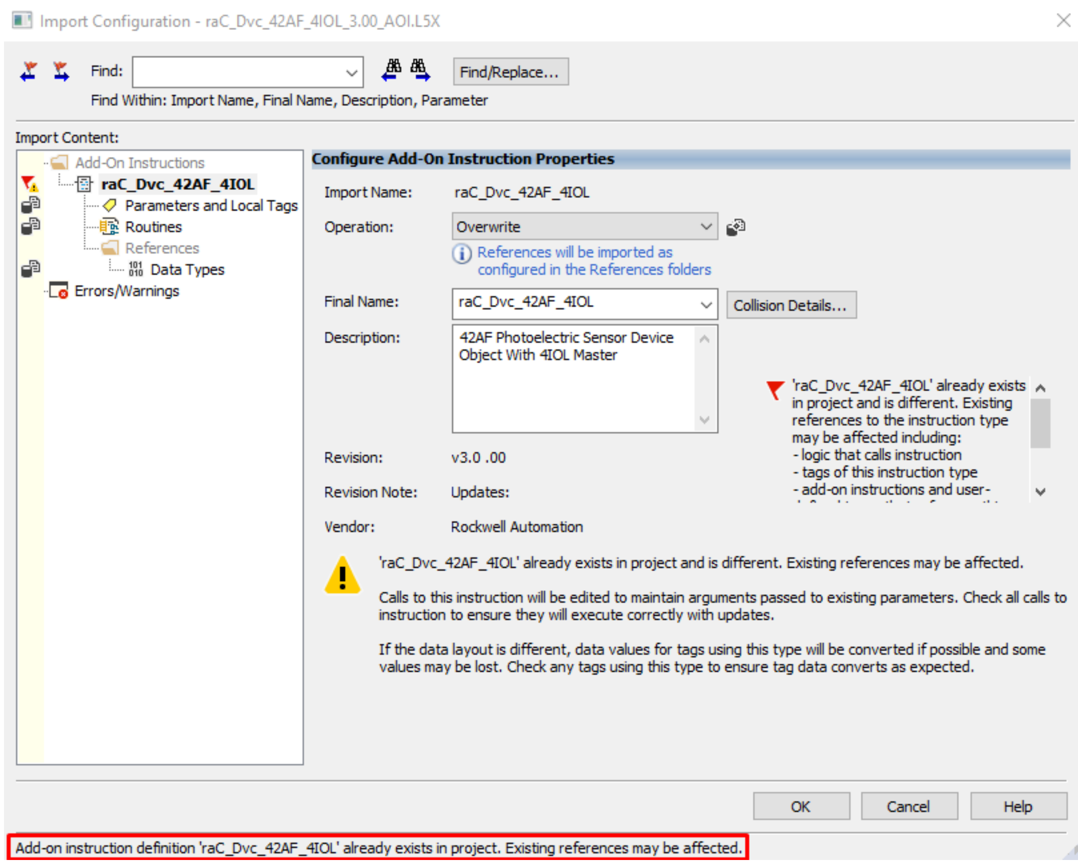
Upgrades by Importing AOI.L5X Files

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



- After Importing the AOI. The AOI references in the routine are affected and need to reconfigure it. Follow the steps from Link

FactoryTalk View Upgrades

To upgrade a device object in a FactoryTalk View ME 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.

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.

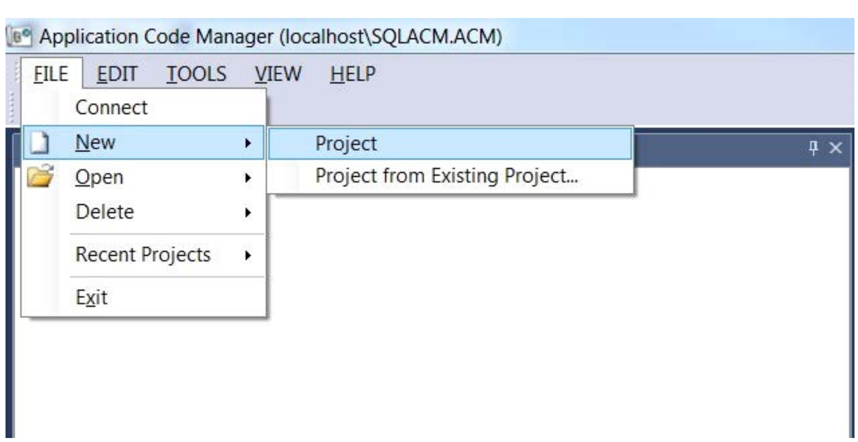
Studio 5000 Application Code Manager can be easily used along with Rockwell Automation application code libraries such as the PlantPAx Process Objects Library, Machine Builder Library, and Device Object Libraries. For more information on Studio 5000 Application Code Manager, refer to the Application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

Creating a New Project

Begin by opening Application Code Manager.

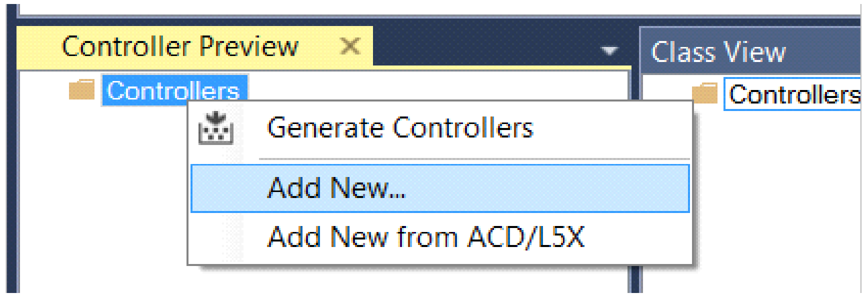
Note: the last project (if any) is opened by default; otherwise a blank screen is displayed.

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



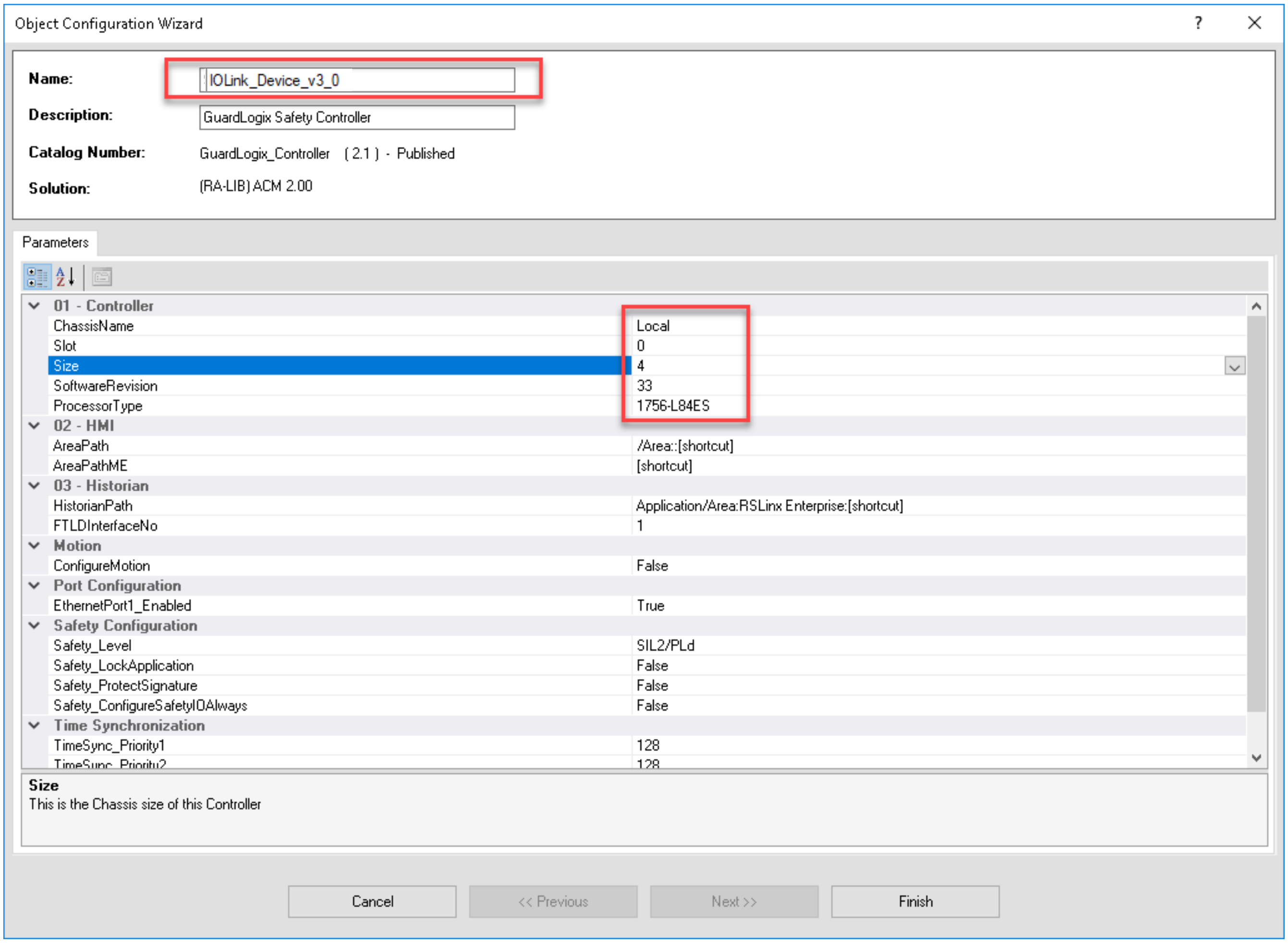
Select the desired project type (e.g. (*RA-LIB) ACM 2.00 Project - Basic_Project*) and fill in the *Name* and *Description*.

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

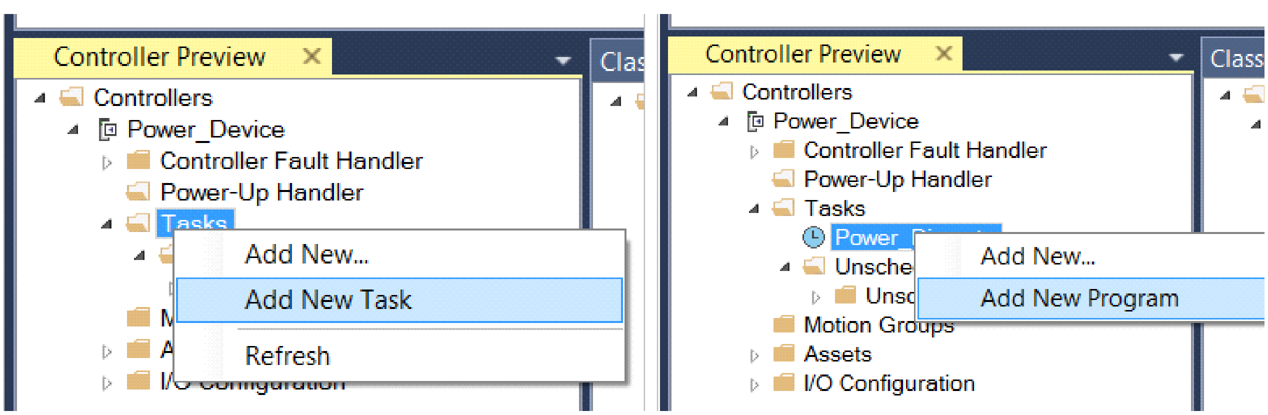


Select the desired controller type (e.g. *ControlLogix_Controller, GuardLogix_Controller, CompactLogix_Controller, etc*). Enter a *Name* and *Description* for the controller. Select the appropriate Chassis and Processor configurations.

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 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*. Complete the desired parameters for Tasks and Programs such as name, type, period, etc.



Adding & Configuring Device Objects

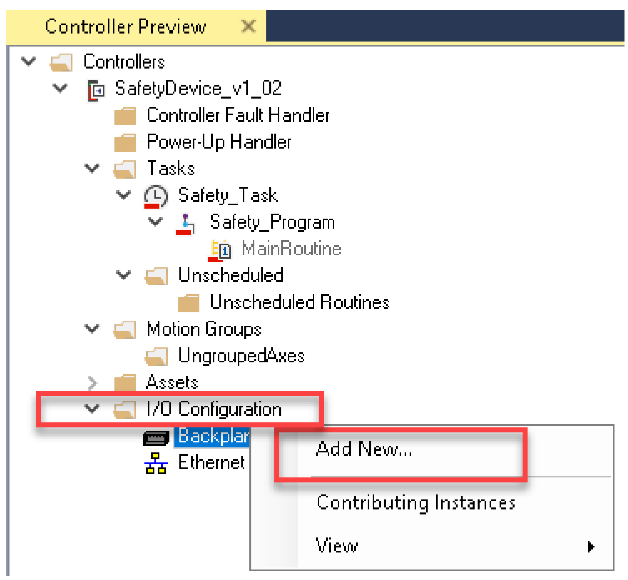
Prior to adding in any Device Objects, ensure you have registered the library in Application Code Manager. Refer to Registering Libraries in Studio 5000 Application Code Manager for details.

When using Studio 5000 Application Code Manager with the IO-Link Device Library, note that you can add IO-Link master module hardware and IO-Link Device Objects; however you must manually add IO-Link sensors/devices to the IO-Link Master Modules after generating the controller code.

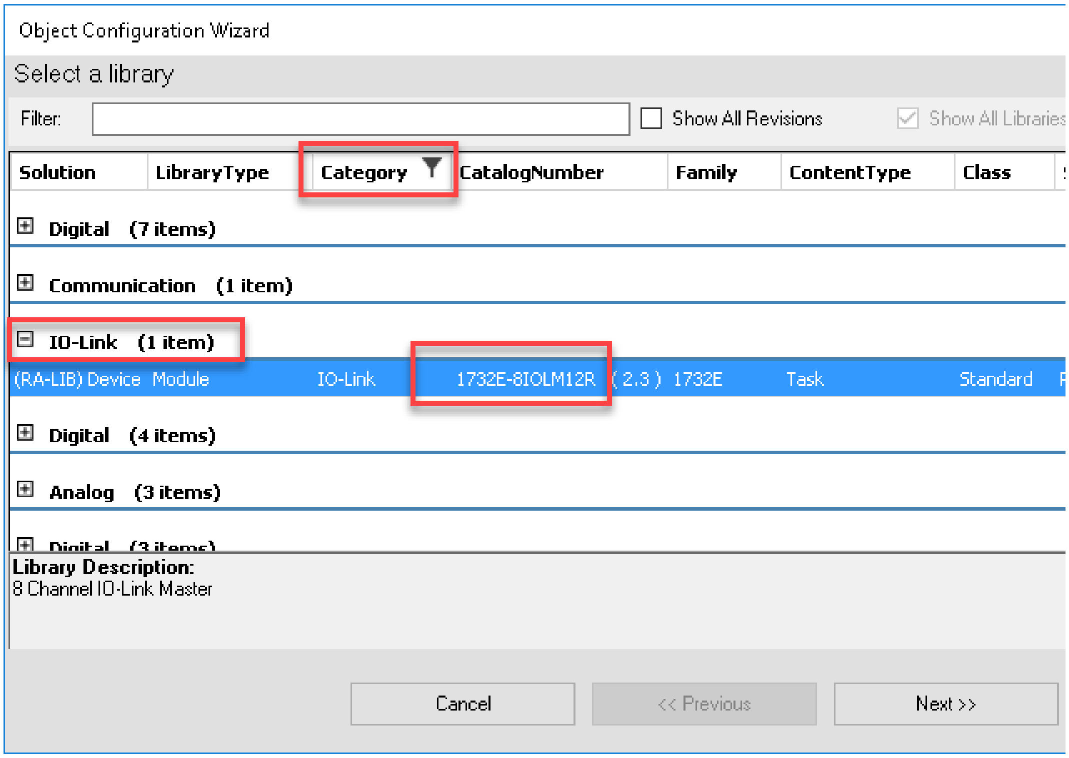
Adding IO-Link Master Module I/O

If not already done you may need to add IO-Link Master I/O modules to you Controller I/O Configuration. This will allow you to link tags in the IO-Link Device Library objects to IO-Link Master Module hardware. Alternatively, you can replace or link these at a later time.

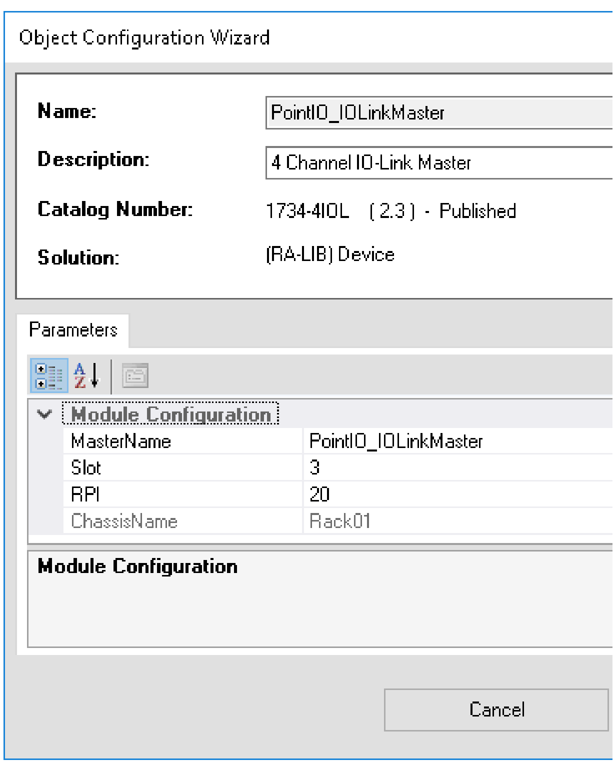
In the *Controller Preview* pane you find the *I/O Configuration* folder underneath your controller. You may add 1732E ArmorBlock IO-Link Master modules directly to the *Ethernet* network or add a remote 1734 POINT I/O rack with a 1734-4IOL IO-Link Master module in the desired slot. Right-click the desired location and select *Add New*.

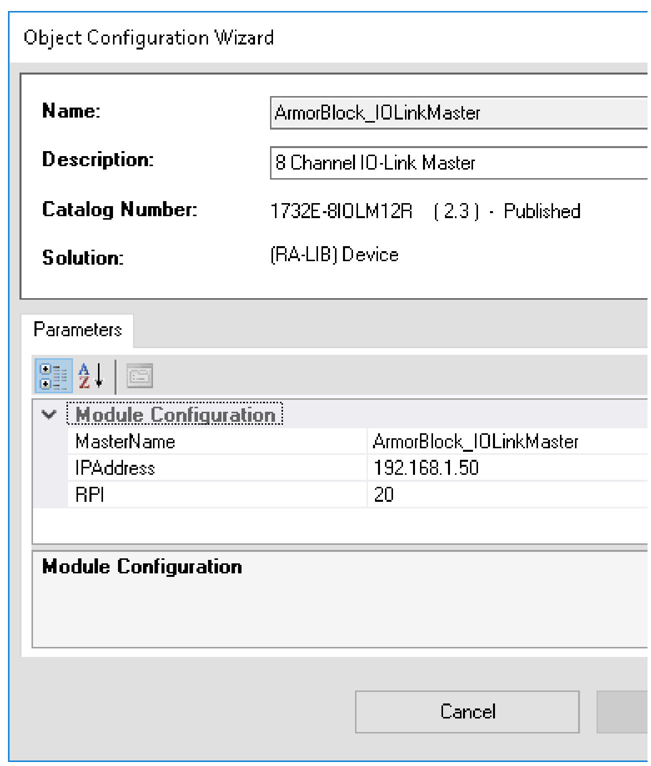


You may choose to click on the *Category* filter to easily sort and find *IO-Link* I/O. Selected the desired IO-Link I/O module and click *Next*.



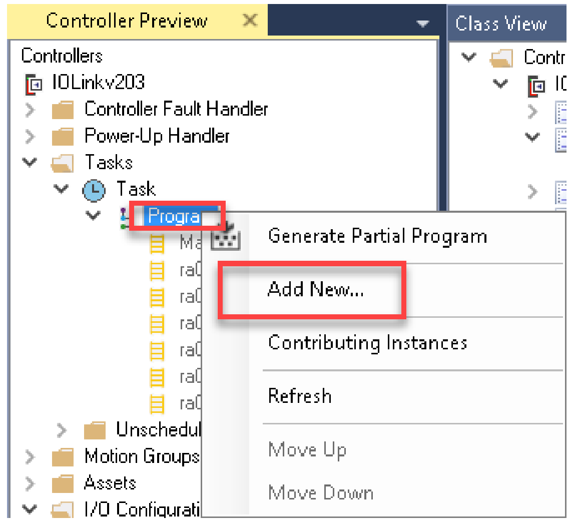
For ArmorBlock modules assign a *Name, IPAddress,* and *RPI*. For POINT I/O modules assign the desired *MasterName, Slot* and *RPI* parameters for the module. Click *Finish* to complete.



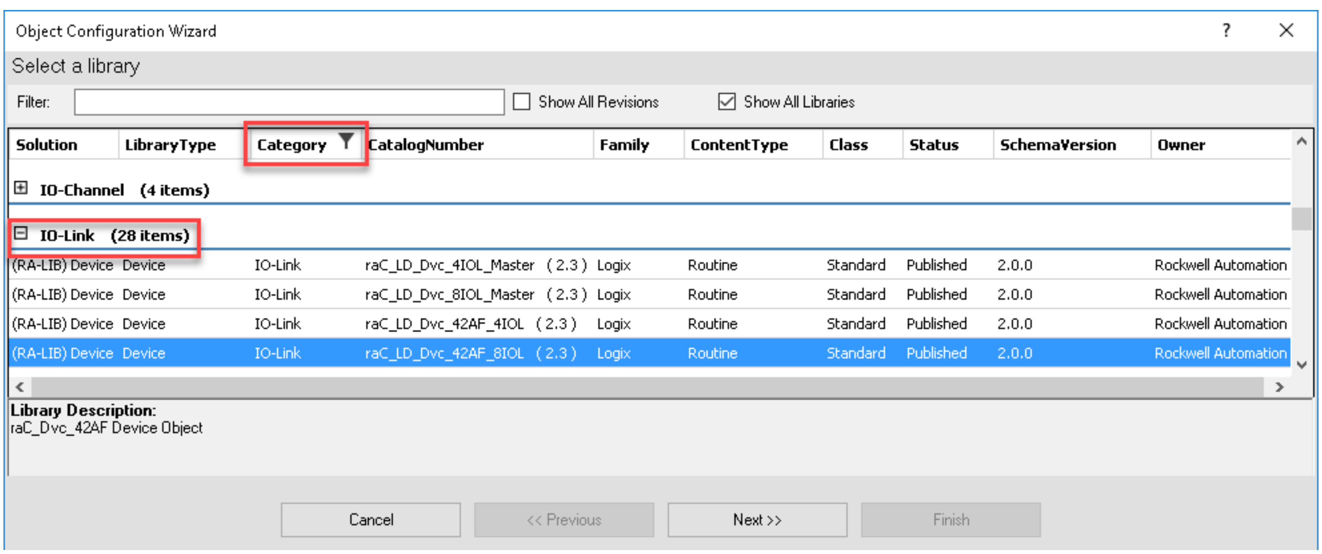


Adding IO-Link Device Instructions

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



- In the *Object Configuration Wizard* dialogue window you can click on the *Category* heading to group objects by category and find *IO-Link*. Select the desired IO-Link Device object (e.g. *raC_Dvc_42AF_8IOL)* and click *Next*. Note that 8IOL device objects (e.g. raC_LD_Dvc_42AF_8IOL) must be paired with the 8IOL Master, and 4IOL objects (e.g. raC_LD_Dvc_42AF_4IOL) must be paired with the 4IOL Master.

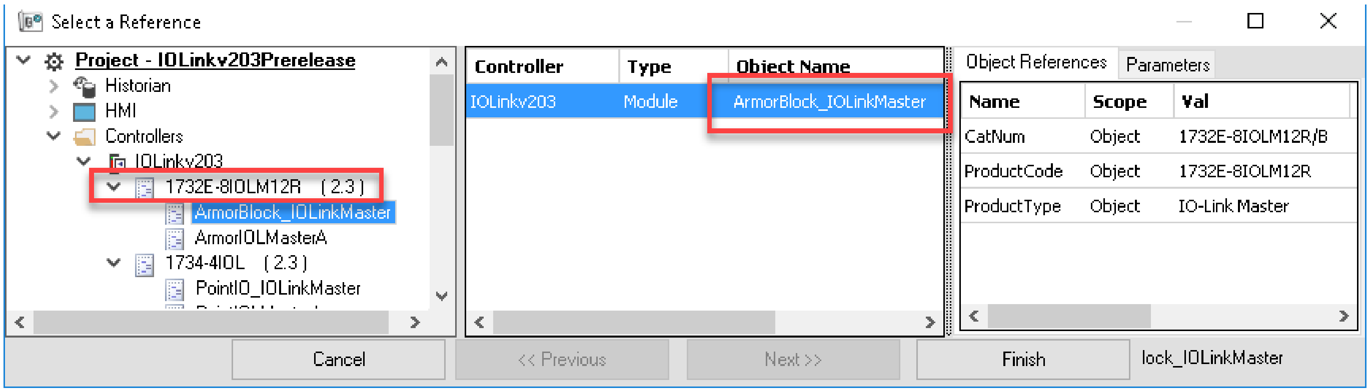


- Fill in all of the required configuration parameters for the device object. The following example shows a configuration of the raC_LD_42AF_8IOL object.

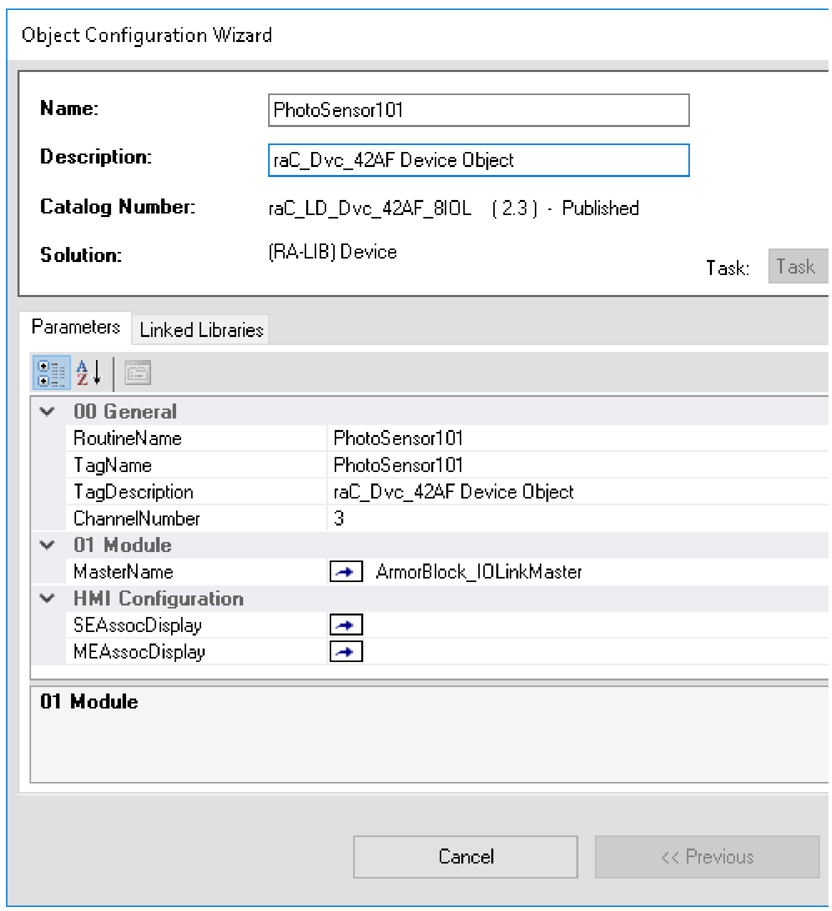
Perform the following configuration:

- 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**.

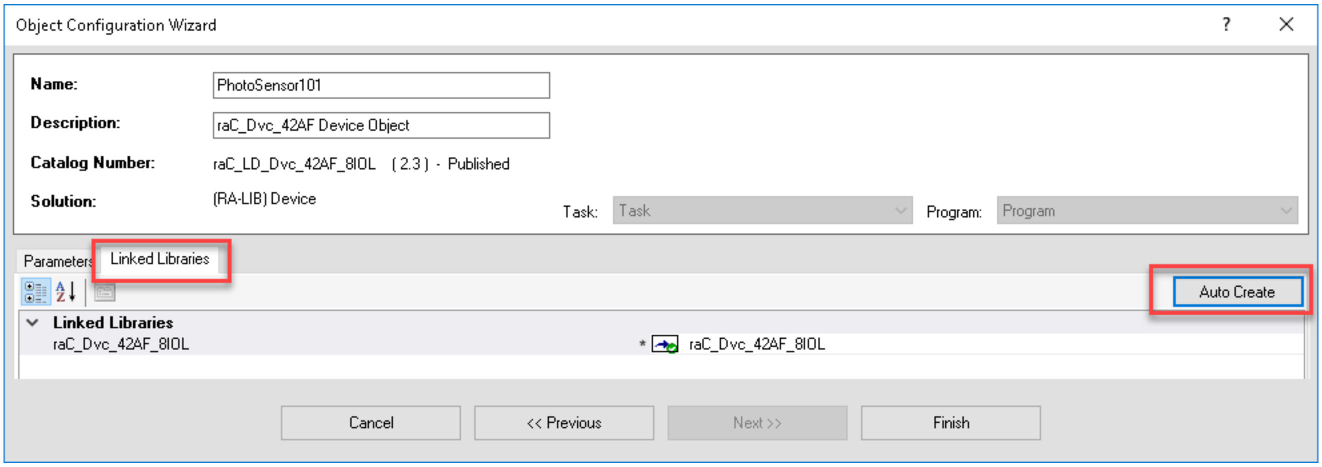
- Select a **ChannelNumber** which is the IO-Link Master Module channel that the IO-Link sensor or device is connected to.
- Assign the **MasterName** by typing or browsing to the instance of the IO-Link Master Module in the controller project (e.g. 1734-4IOL or 1732E-8IOLM12R)



- The configuration should now be complete with no red X's.



- 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.

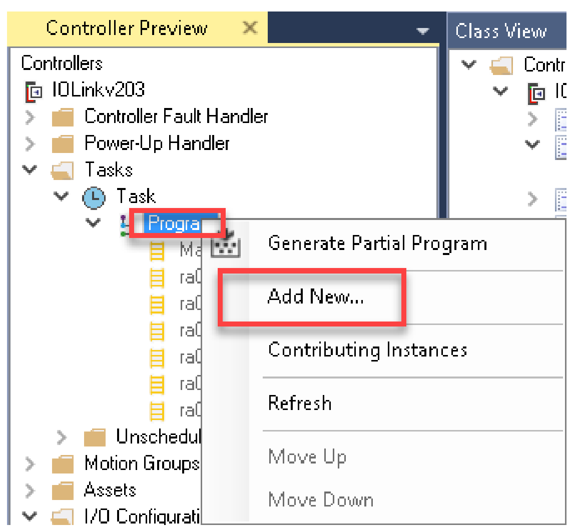


- Click Finish to complete the object configuration.

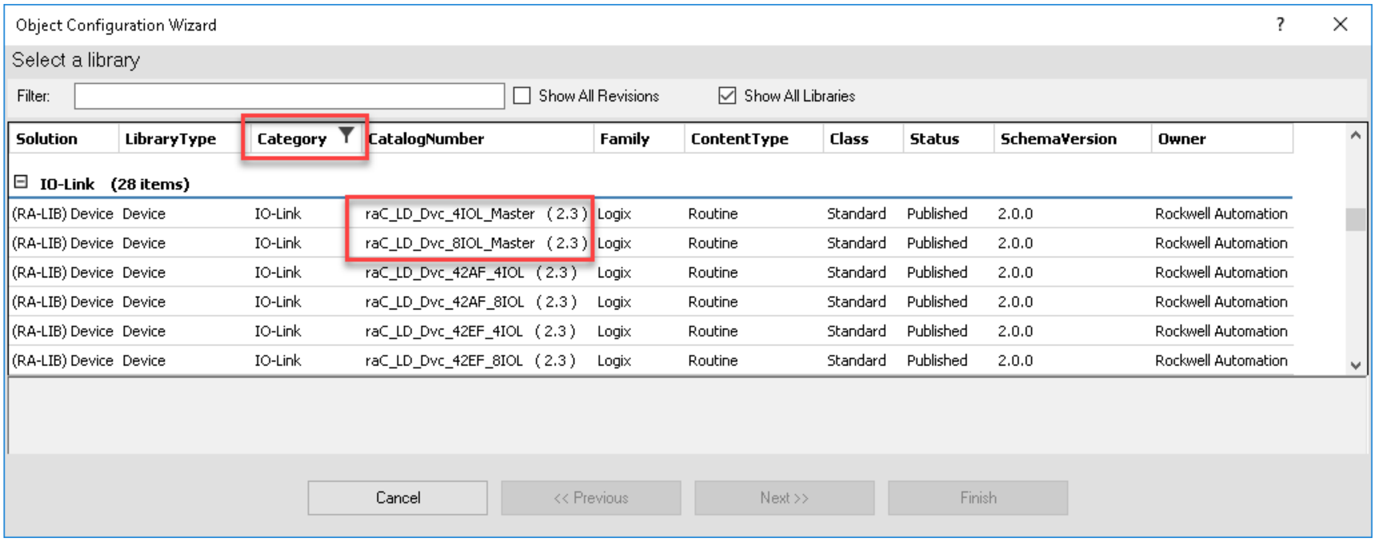
For specific devices details, refer to the appropriate chapter in this manual.

Adding IO-Link Master Device Object

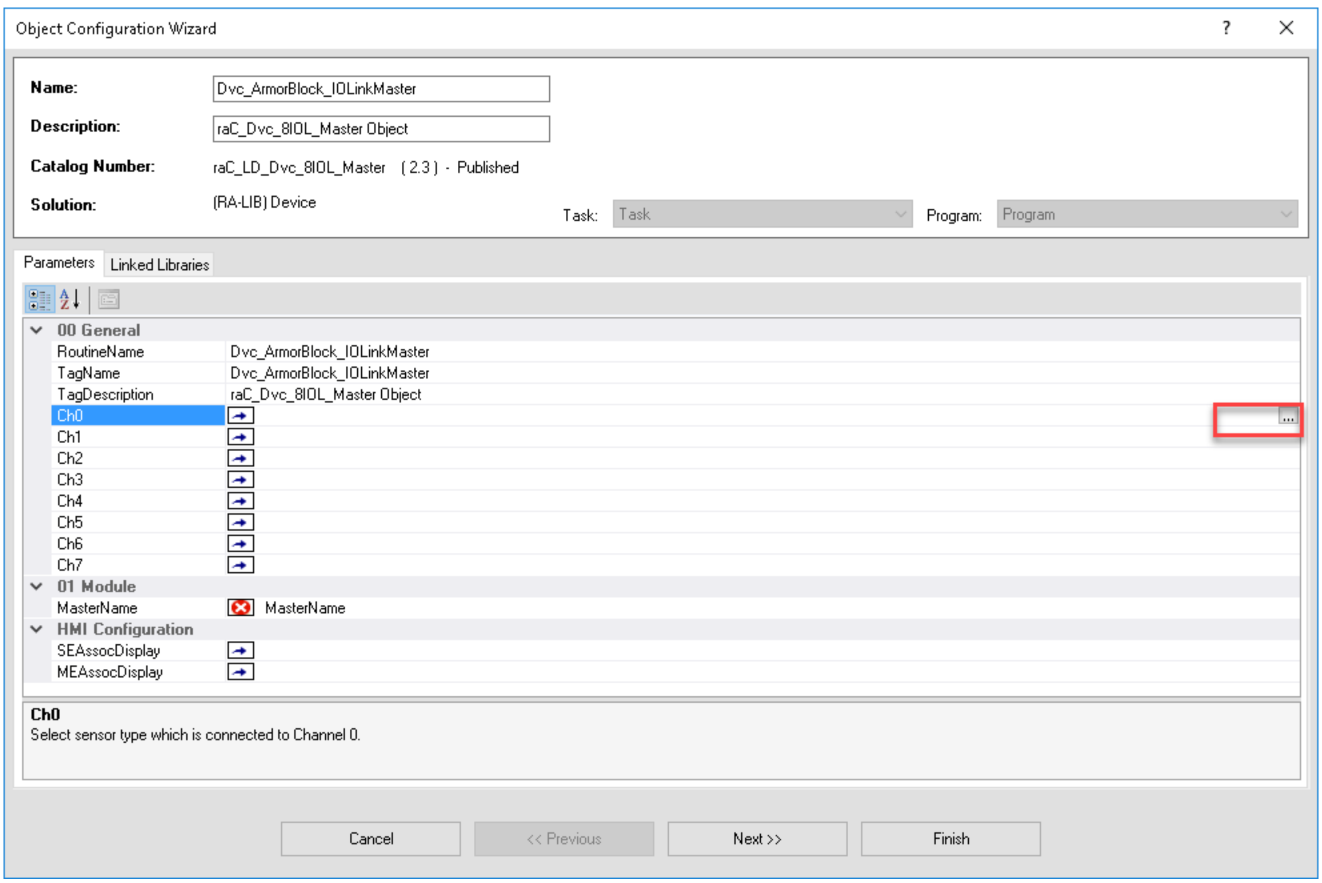
You can optionally add an IO-Link Master Module device object (e.g. raC_Dvc_8IOL_Master, raC_Dvc_4IOL_Master) to your project. This provides hardware diagnostic information for the master and includes an HMI faceplate to summarize data from each connected sensor. To add an IO-Link Master Object into a project, right-click on a Program and *Add New...*



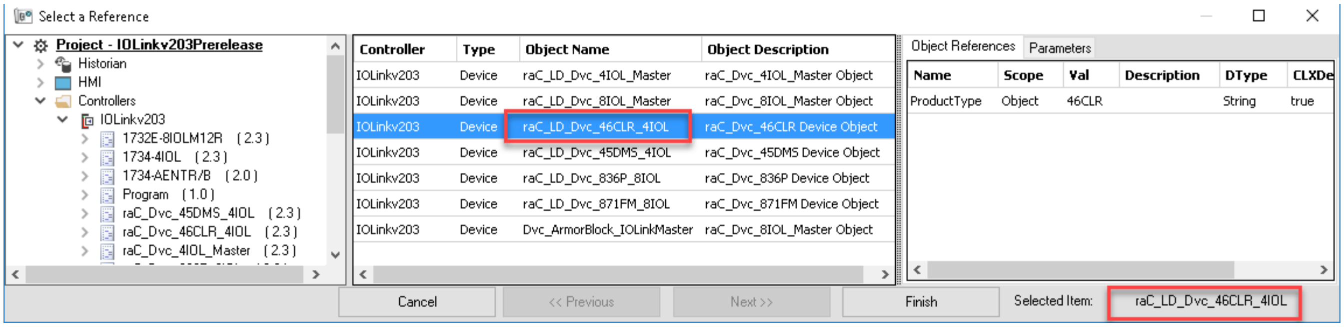
In the *Object Configuration Wizard* dialogue window you can click on the *Category* heading to group objects by category and find *IO-Link*. Select the desired IO-Link Master object (e.g. *raC_Dvc_1732E_8IOL_Master* or *raC_Dvc_1734_4IOL_Master*) and click *Next*.



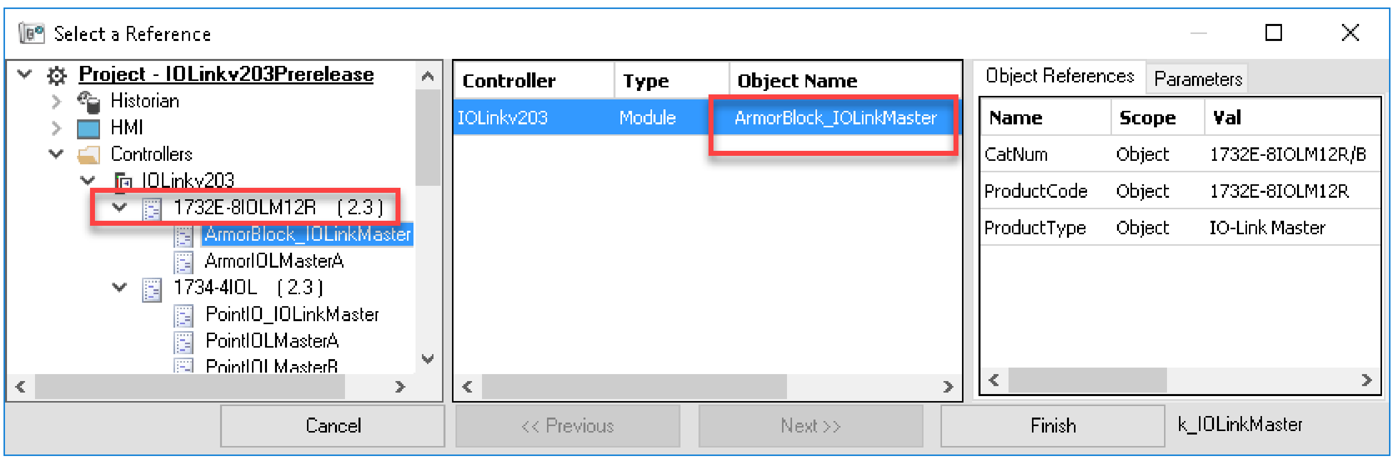
- Assign your desired *Name* and *Description* fields.



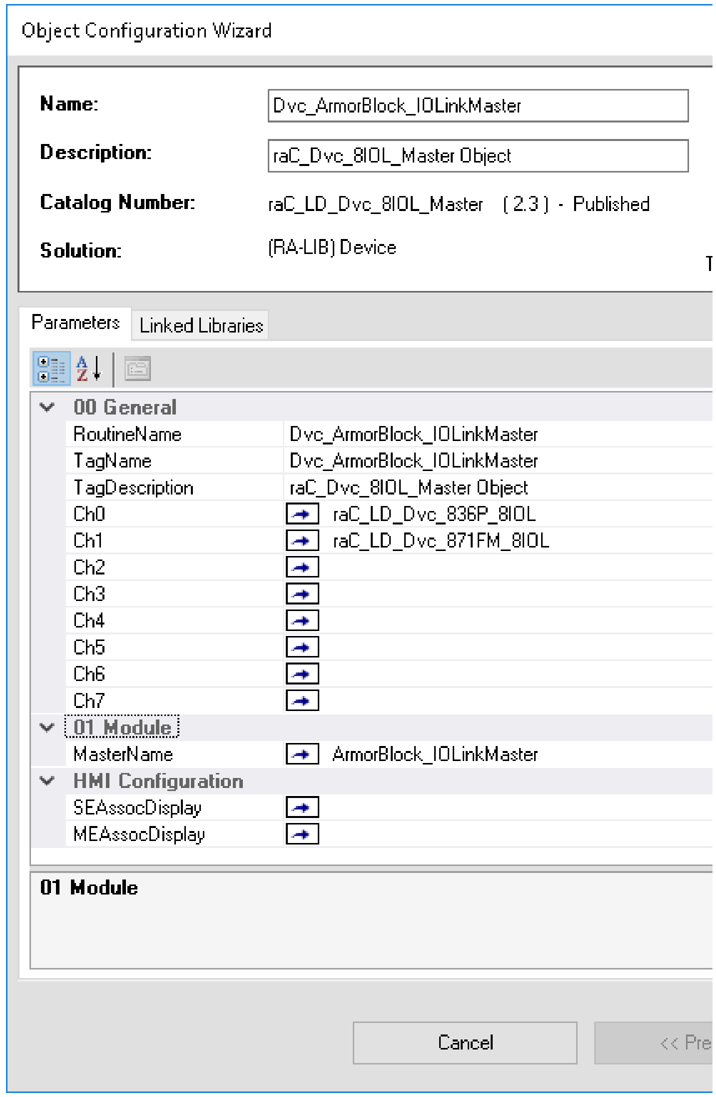
- Type in or browse for the IO-Link Sensor/Device objects that are connected to any applicable channels (*Ch0, Ch1, etc*). Browse by clicking the ellipses '…' to open the *Select a Reference* window. The center pane will list all IO-Link category objects in your project. Double-click or highlight the desired device and click *Finish*. Continue to process until you have completed all applicable channels. Note that 8IOL device objects (e.g. raC_LD_Dvc_42AF_8IOL) must be paired with the 8IOL Master, and 4IOL objects (e.g. raC_LD_Dvc_42AF_4IOL) must be paired with the 4IOL Master.



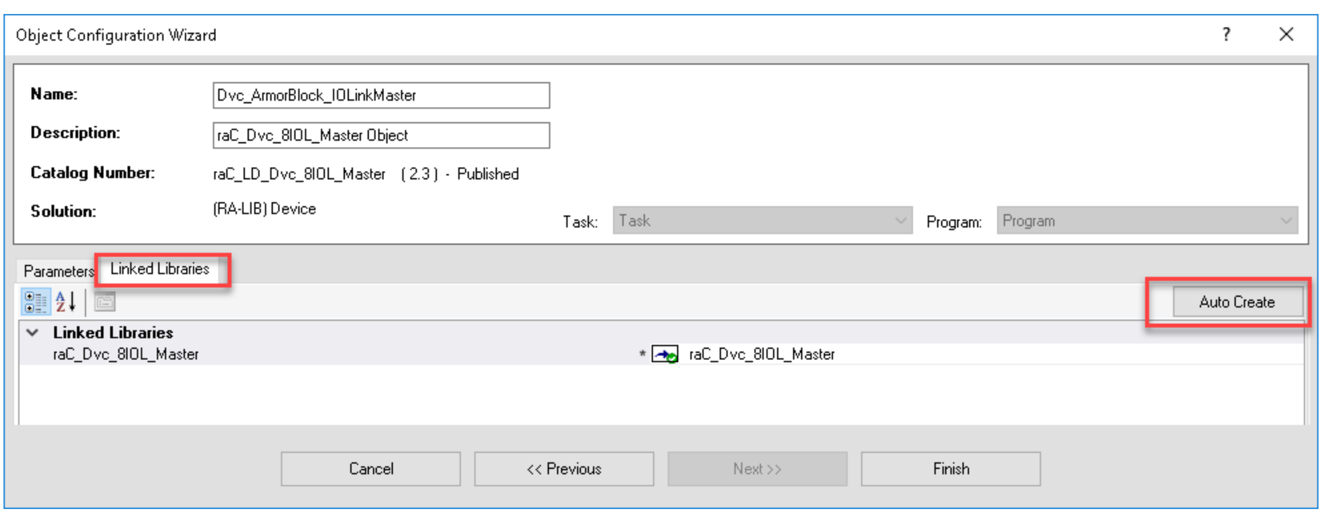
- Type in or browse for the *MasterName*. This is the I/O module (e.g. 1734-4IOL or 1732E-8IOLM12R) instance that was previously created in the I/O configuration. Browse by clicking the ellipses '…' to open the *Select a Reference* window. In the left window pane, select the instance of the I/O module. Double-click or highlight the desired device and click *Finish*.



- For HMI Configuration refer to Configuring Displays.
- Once you have completed all sections you can continue.



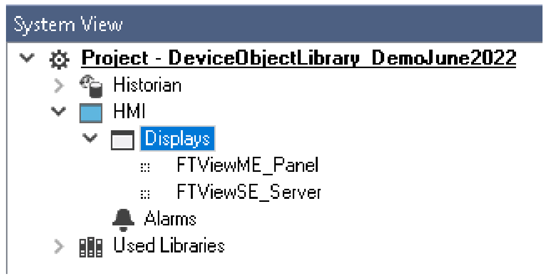
- Click on the *Linked Libraries* tab and click *Auto Create*. Complete by clicking *Finish*.

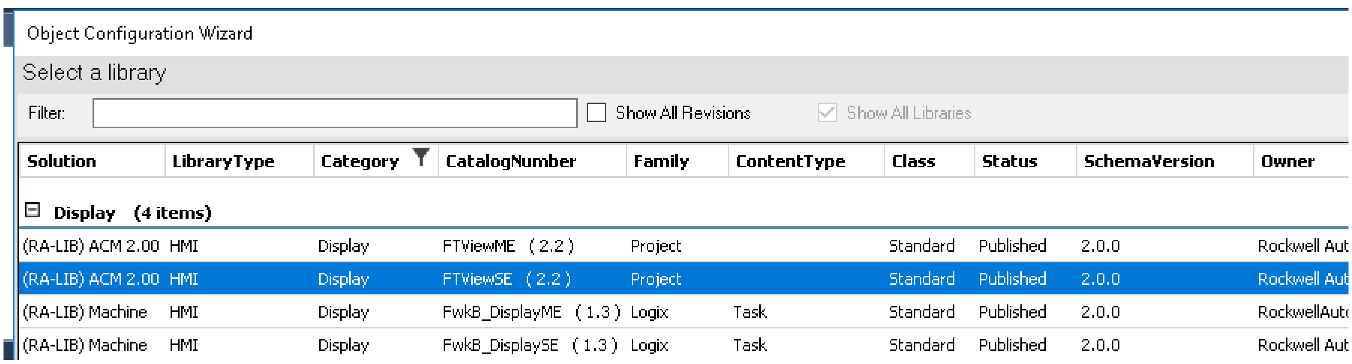


Configuring Displays

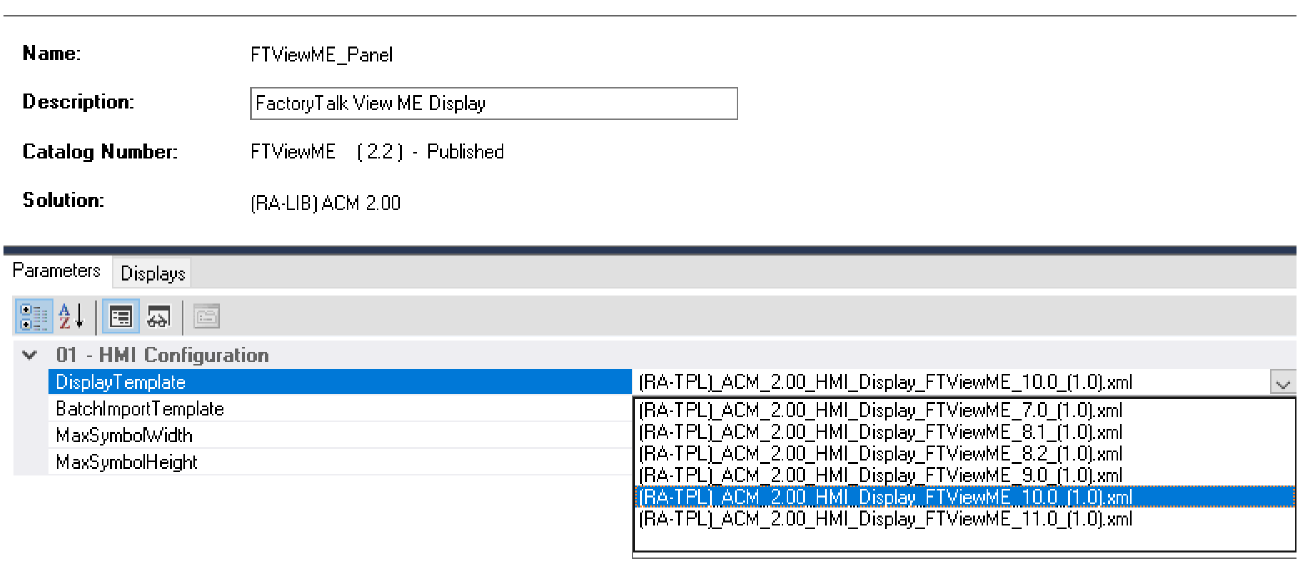
Application Code Manager can be used to automatically configure graphic symbol launch buttons for device objects In FactoryTalk View ME or SE. Note that Application Code Manager is not compatible with Studio 5000 View Designer applications.

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.

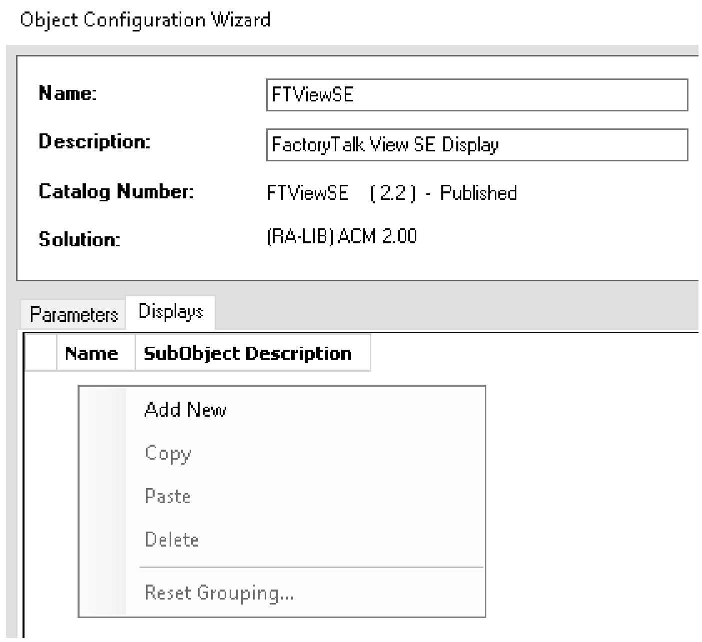




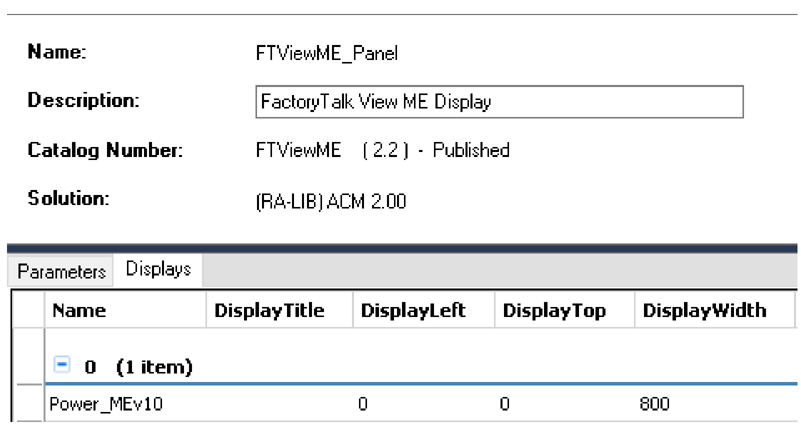
In the display object parameter configuration, you must select the *DisplayTemplate* type to match the version of FactoryTalk View application that you are using.



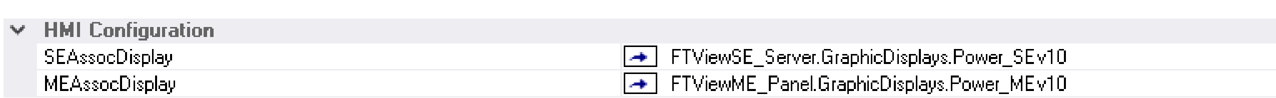
Navigate to the *Displays* tab where you can right-click and *Add New* display.

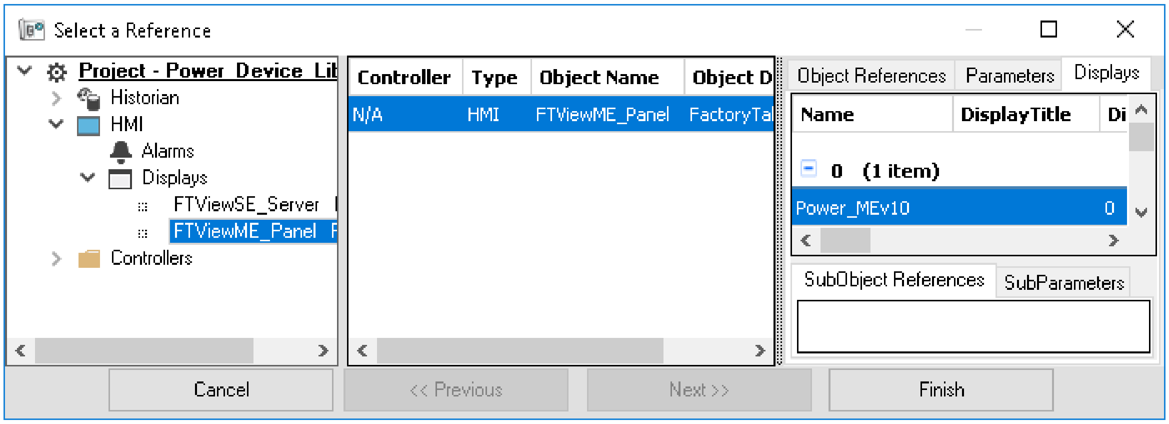


Set the desired name and display parameters. Generally all display parameters aside from *Name* can be left as default since this will often be used as a temporary display where object launch buttons are copied from.



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.



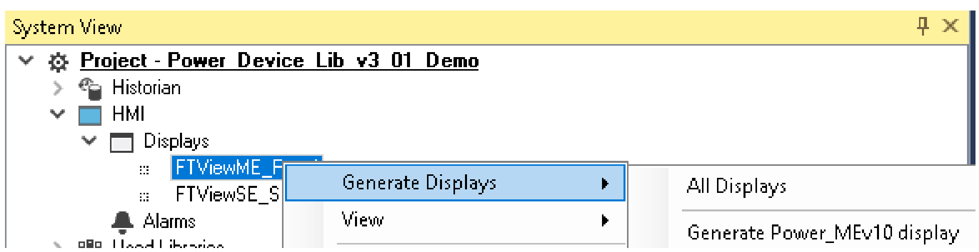


If you browse for the display, select the desired display server in the left panel, then click on the *Display* tab in the right panel and select the specific display. Click finish.

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

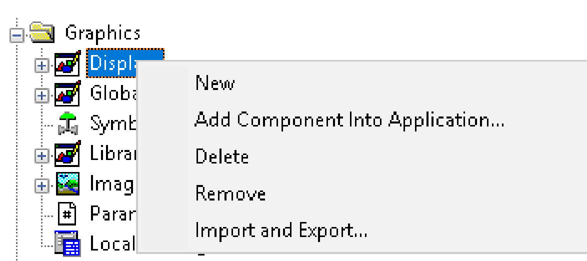
Generating Displays

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

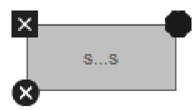
To import the configured displays, open your FactoryTalk View ME/SE project in FactoryTalk View Studio. Right-click on *Graphic > Displays* and select *Import and Export...*



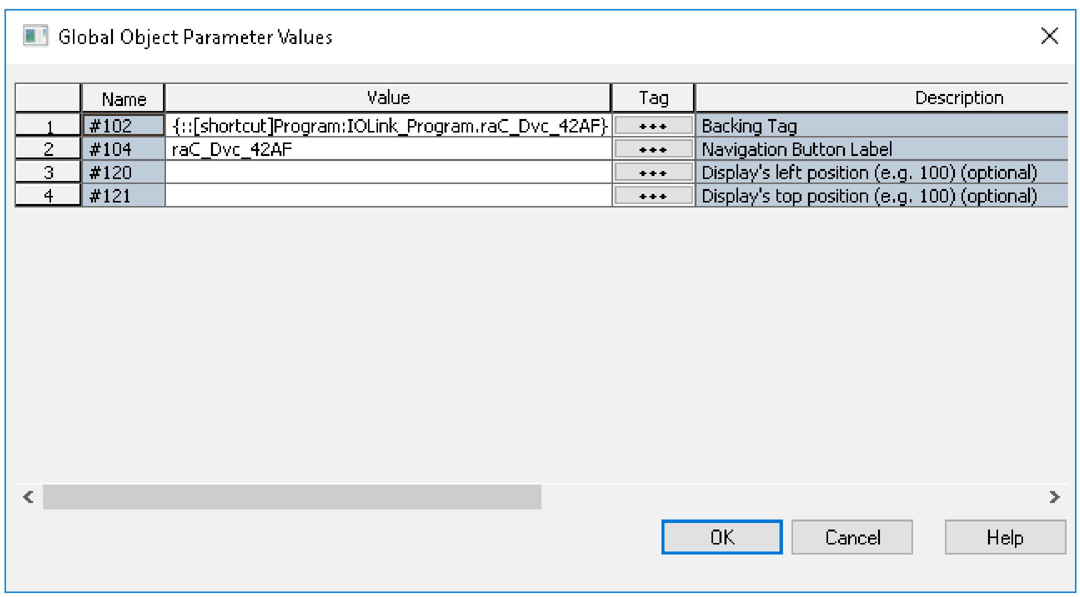
Follow the required prompts:

- 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.

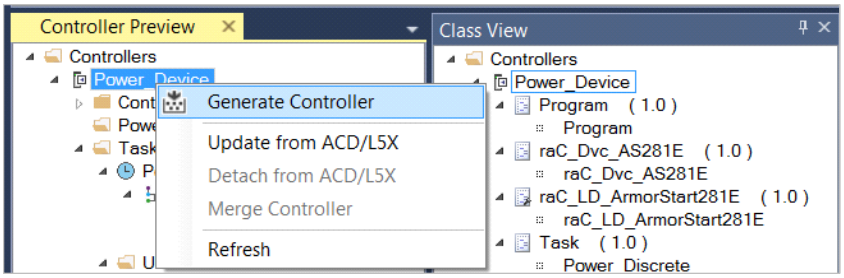


You may not copy and paste this graphic symbol onto any other display in your application.

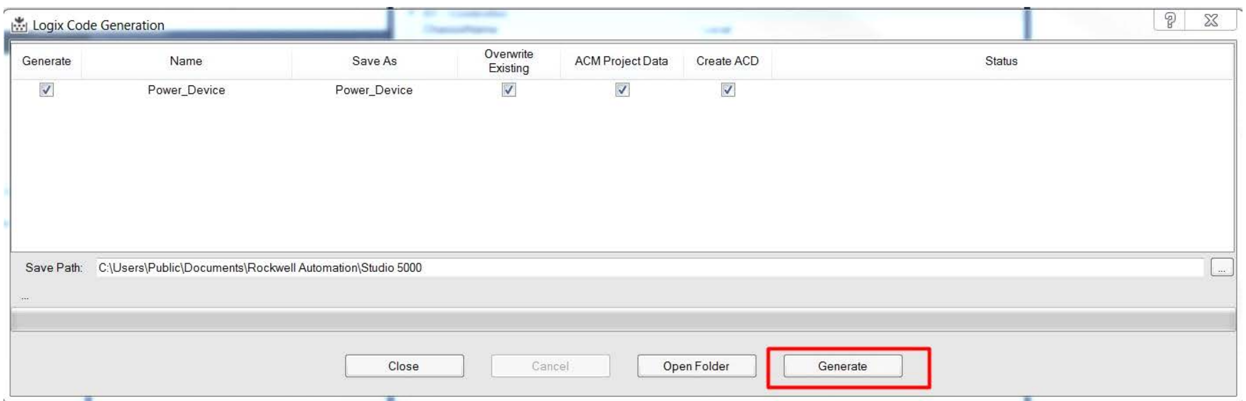
Generating Controller Files

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.



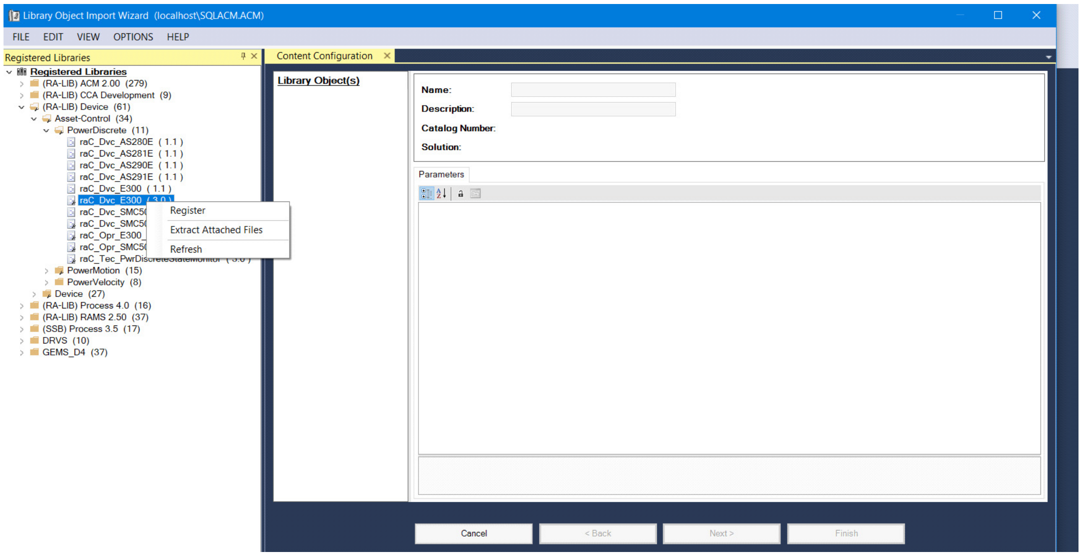
Once the controller file is generated, you can navigate to the location set in *Save Path* and open your file. Note that all of the configuration that was done in Application Code Manager is now shown in your Logix Designer ACD file.

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_42AF_8IOL) 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
- 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 IO-Link Device Library with Other Application Code Libraries

Application Code Libraries

The IO-Link Device Library is can be used alongside other Application Code Libraries.

The IO Device Library is recommended to be used along with the IO-Link Device Library if Studio 5000 Application Code Manager is used for project development. This will allow you to add IO-Link Master modules to the controller I/O Configuration..

The Machine Builder Library and PlantPAx Process Object Library application-level library objects may be used in the same applications with the device-level objects in the IO-Link Device Library. At this time there are no direct dependencies or interaction points between these libraries. They may be used independently from one another but within the same application.

Other libraries utilize the common device interface UDTs to interact with device level objects. In the case of the IO-Link Device Library you may programmatically reference the Status (Sts), Command (Cmd), and Setting (set) interfaces of the instructions. This is covered in detail in Interfaces section of this document.

42AF - RightSight Photoelectric Sensor (raC_Dvc_42AF_4IOL, raC_Dvc_42AF_8IOL)

Overview

The 42AF RightSight Photoelectric Sensor device object (raC_Dvc_42AF_4IOL, raC_Dvc_42AF_8IOL) includes HMI faceplates which displays device information including:

- Sensor data
- Sensor diagnostics
- Sensor configuration and parameters
- Process data trending
- Device Fault log

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_*42AF*_Objects_Faceplate.MP4"

Primary device object configuration functions include:

- **Locate:** This function helps to locate the sensors using the device's LED in large machines where there are several sensors close to each other.
- **Setpoint:** Setpoint will allow the operators to enter the signal value required for the sensor output to turn ON upon target detection.
- **Polarity:** This function changes the sensor output to operate as Not-Inverted (Light Operate) and Inverted (Dark Operate).
- **Teach:** Offers the different teach functions.

Functional Description

The 42AF RightSight Photoelectric Sensor 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. 1.01) 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/* folder in the library. Each device is supplied with two versions of Add-On Instructions (AOI) and Rung import files - one for compatibility with each IO-Link Master Module. You must select the appropriate AOI for the master module being used.

Device/Item	Compatible IO-Link Master	Add-On Instruction	Rung Import
42AF	POINT I/O 1734-4IOL	raC_Dvc_42AF_4IOL_3.01_AOI.L5X	raC_Dvc_42AF_4IOL_3.01_RUNG.L5X
	ArmorBlock 1732E-8IOLM12R	raC_Dvc_42AF_8IOL_3.01_AOI.L5X	raC_Dvc_42AF_8IOL_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.

Note that a single faceplate is used for either the 4IOL or 8IOL versions of the Add-On Instruction.

Device/Item	Type	FactoryTalk View ME Faceplate	FactoryTalk View SE Faceplate
42AF	Display	(raC-3_01-ME) raC_Dvc_42AF-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_42AF-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - IO-Link Device.ggfx	(raC-3-SE) Toolbox - IO-Link 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
42AF	(raC-3_01-VD) raC_Dvc_IOLink.vpd

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.

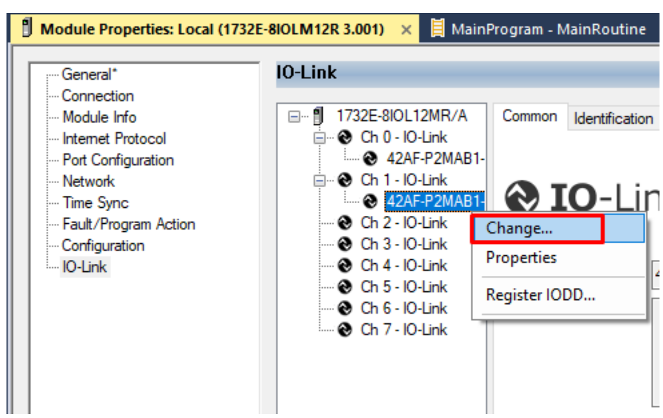
All Studio 5000 Application Code Manager files can be found in the / *ApplicationCodeManagerLibraries/* folder of the library. The files included are as follows:

Implementation Object	Compatible IO-Link Master	Asset Control File (.HSL4)	Device File (.HSL4)
42AF	POINT I/O 1734-4IOL	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_42AF_4IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_42AF_4IOL_(3.1)
	ArmorBlock 1732E-8IOLM12R	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_42AF_8IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_42AF_8IOL_(3.1)

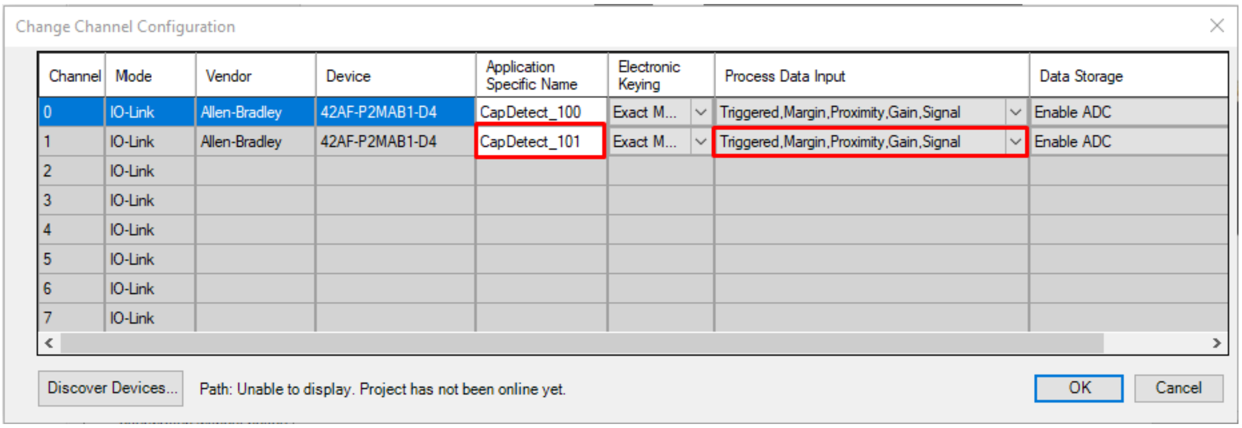
Device Definition

The device must be configured with the correct device definition. Proper device configuration enables the required cyclic device data to pass information from the device into the add-on instruction.

1. Click on Change...



2. Specify the Application Specific Name e.g. *CapDetect_101*
3. Select the Process Data Input as *Triggered, Margin, Proximity, Gain, Signal.*



Operations

The IO-Link Device objects provide only physical operation mode. There is no virtual device mode offered.

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
Write_Index	Message Configuration Write	MESSAGE
Read_Index	Message Configuration Read	MESSAGE
Write_SubIndex	Message Configuration Write	MESSAGE
Read_SubIndex	Message Configuration Read	MESSAGE
Msg_Sensor_Data	Messaging Data	raC_UDT_42AF_Sensor_Data
Ref_Ctrl_Set	IO-Link Device Setting Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSet
Ref_Ctrl_Cmd	IO-Link Device Command Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlCmd
Ref_Ctrl_Sts	IO-Link Device Status Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSts
Ref_Ctrl_Inf	IO-Link Device Type Information Interface	raC_UDT_ItfAD_IOLinkSensor_Inf
Ref_Ctrl_Itf	IO-Link Device Command, Status Interface	raC_UDT_ItfAD_IOLinkDevices
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[20]
Inp_I	Device Object Inputs	raC_UDT_ItfAD_42AF_Inp_4IOL Or raC_UDT_ItfAD_42AF_Inp_8IOL

Input Data

Input	Function/Description	DataType
Cfg_AlignmentMode	Alignment Mode; 0 = Disabled, 1 = Enabled, 2 = Enabled for 120s, 3 = Enabled for 240s	SINT
Cfg_OutputPolarityInverted	Output Polarity; 0 = Not Inverted, 1 = Inverted	SINT
Cmd_DisableLEDs	Indicator Disabled Command	BOOL
Cmd_EnableLEDs	Indicator Enabled Command	BOOL
Cmd_LocalTeachLock	Parameters Unlock/Lock Cmd	BOOL
Cmd_Locate	Locator Disable/Enable Command	SINT
Cmd_ResetCount	Counter Reset Command	BOOL
Cmd_ResetDurations	Duration Reset Command	BOOL
Cmd_TeachCancel	Duration Reset Command	BOOL
Cmd_TeachPrecision_ShowTarget	Teach Precision Show Target Command	BOOL
Cmd_TeachStatic_Background	Teach Static Background Command	BOOL
Cmd_TeachStatic_ShowTarget	Teach Static Show Target Command	BOOL
Inp_ChNumber	Configured Channel number for Master	SINT
Inp_ChxGain	Gain of Sensor	INT
Inp_ChxMarginLowAlarm	Margin Low Alarm of Sensor	BOOL
Inp_ChxProximityAlarm	Proximity Alarm of Senor	BOOL
Inp_ChxSignalStrength	Signal Strength of Sensor	DINT

Input	Function/Description	DataType
Inp_ChxTriggered	Triggered Status of Sensor	BOOL
Set_Setpoint	Enter Setpoint Value To Turn ON Sensor Output	DINT
Set_TrendMaxValue	Trend Tab Max value for VD/ME/SE faceplate	DINT
Set_TrendMinValue	Trend Tab Min value for VD/ME/SE faceplate	DINT

Output Data

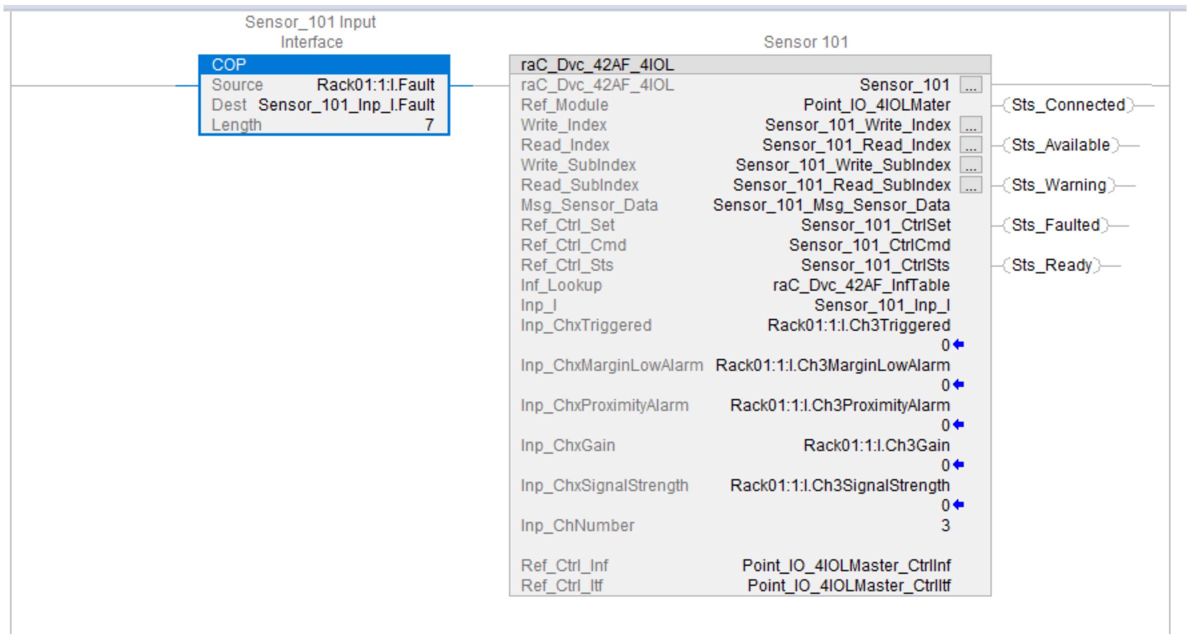
Output	Function/Descritpion	DataType
Sts_Active	Device active status: 1 = output power structure is active	BOOL
Sts_Available	Device is available for interaction with user code	BOOL
Sts_bNotReady	Bitwise device 'not ready' reason	
Sts_Connected	Device is connected to the Programmable Automation Controller	BOOL
Sts_EnableLEDs	LED Indicator; 0= Disable, 1= Enable	BOOL
Sts_Faulted	Device faulted status: 1 = an active fault exists	BOOL
Sts_InhibitCfg	1=Inhibit user Configuration Parameters from HMI Faceplate; 0=Allow	BOOL
Sts_InhibitCmd	1=Inhibit user Commands from HMI Faceplate; 0=Allow Control	BOOL
Sts_InhibitSet	1=Inhibit user Settings from HMI Faceplate; 0=Allow	BOOL
Sts_LocalTeachLock	Local Parameterization; 0= Unlock, 1= Locked	BOOL
Sts_Located	Locator Indicator; 1= Located	BOOL
Sts_Ready	Device is ready to perform primary function	BOOL
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Val_AlignmentModeEnable	Alignment Mode Status; 0 = Disabled, 1 = Enabled, 2 = Enabled for 120s, 3 = Enabled for 240s	INT
Val_Contrast	Sensor Contrast Level	INT
Val_NotTriggeredDuration	Sensor Output OFF Duration	INT
Val_OperatingHrsSinceInception	Operating Hours Since Inception	DINT
Val_OperatingHrsSincePowerUp	Operating Hours Since Power Up	DINT
Val_OutputPolarityInverted	Output Polarity Status, 0 = Not Inverted, 1 = Inverted	INT
Val_PercentSP	Setpoint in Percent	INT
Val_RangeMax	Sensor Maximum Range in Trend	DINT
Val_RangeMin	Sensor Minimum Range in Trend	DINT
Val_Setpoint	Setpoint Value To Turn ON Sensor Output	DINT
Val_TeachStep	Teach Step	INT
Val_TemperatureCurrent	Internal Temperature Of Sensor	SINT
Val_TemperatureMaxSinceInception	Maximum Temperature Since Inception	SINT
Val_TemperatureMaxSincePowerUp	Maximum Temperature Since Power Up	SINT
Val_TemperatureMinSinceInception	Minimum Temperature Since Inception	SINT
Val_TemperatureMinSincePowerUp	Minimum Temperature Since Power Up	SINT
Val_Trigger_Counter	Sensor Counter Value	SINT
Val_TriggeredDuration	Sensor Output ON Duration	INT

Programming Example

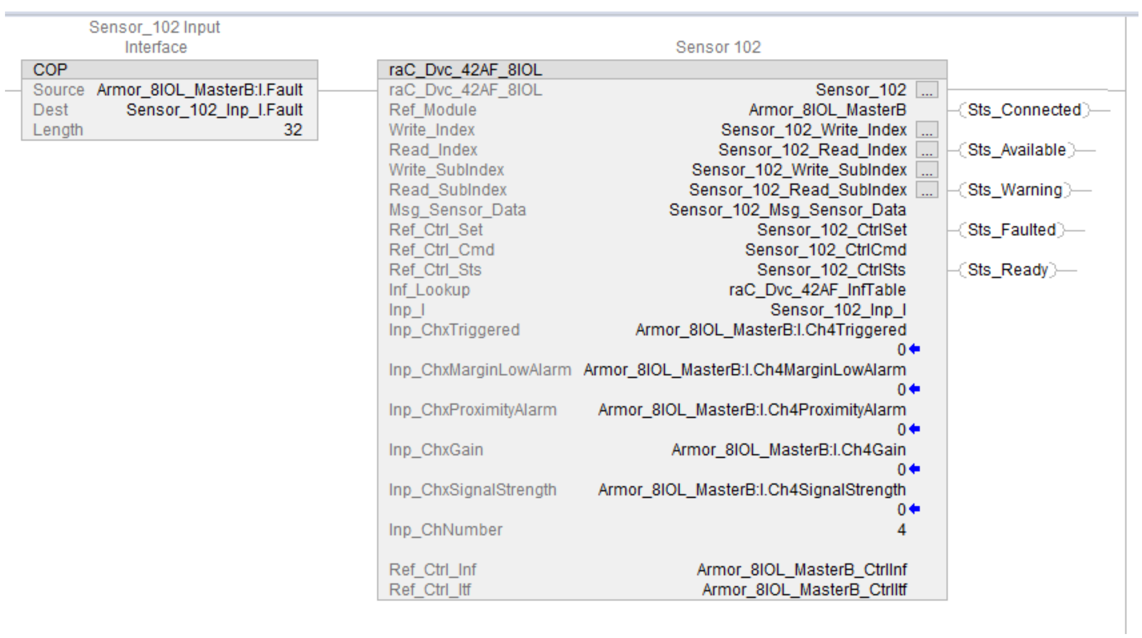
Fully configured device on a rung is provided below for reference.

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 following example uses the 42AF device object connected to channel #3 of a POINT I/O 1734-4IOL IO-Link Master module named *Point_IO_4IOLMater* in slot #1 of a POINT I/O adapter named *Rack01*.



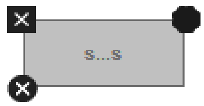
The following example uses the 42AF device object connected to channel #4 of a ArmorBlock 1732E-8IOLM12R IO-Link Master module in named *Armor_8IOL_MasterB*



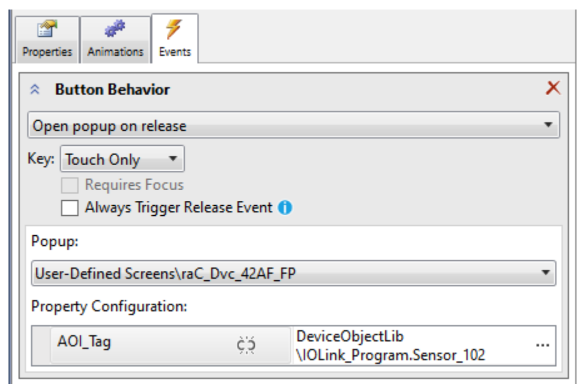
Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. See Basic Launch Button Attributes section for details on configuration and indicators.

FactoryTalk View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GO_LaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #104.	#102: AOI Backing Tag Instance (e.g. {::[PAC]Program::IOLinkProgram._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)

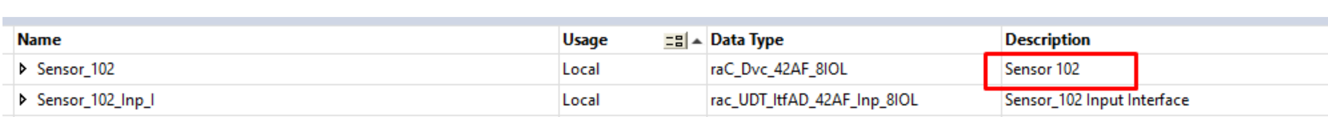
Studio 5000 View Designer Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	

Faceplates

There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 30.

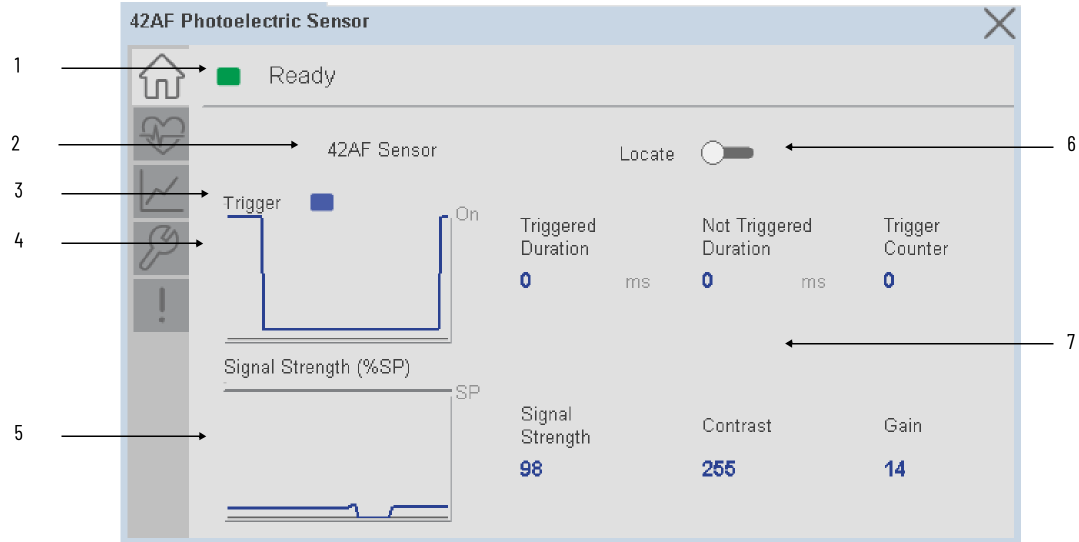
The faceplate title is linked to *_InstanceName.@description*, the *.@description* extended tag property of the Add-On Instruction instance. This is user-configurable from controller/program tags in Studio 5000 Logix Designer.



Name	Usage	Data Type	Description
Sensor_102	Local	raC_Dvc_42AF_8IOL	Sensor 102
Sensor_102_Inp_I	Local	rac_UDT_ItfAD_42AF_Inp_8IOL	Sensor_102 Input Interface

Home

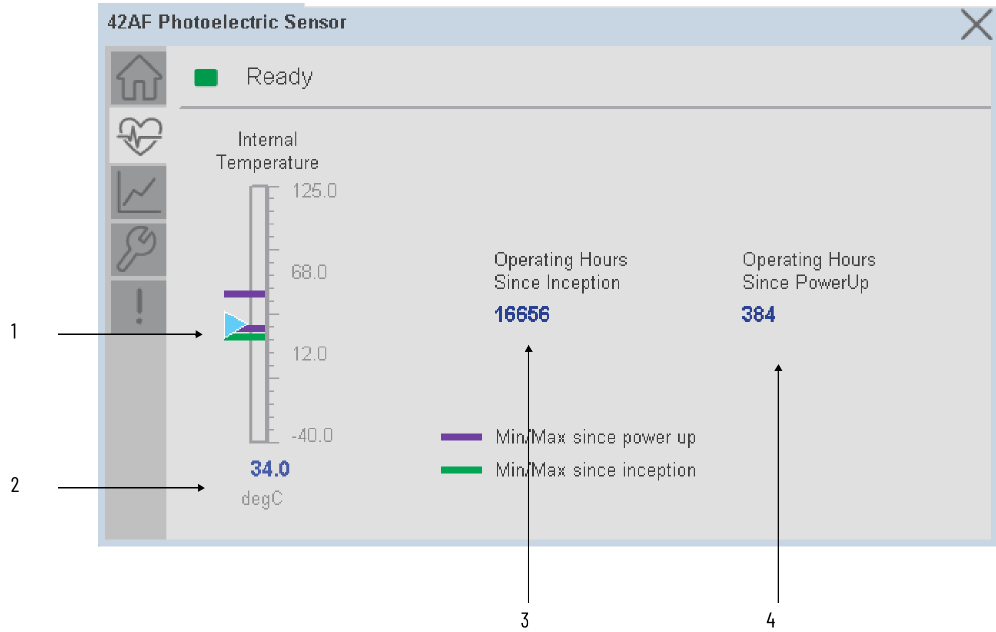
The Home tab is the main tab of the faceplate. It provides the status of the IO-Link device along with sensor process data and the Locate button.



Item	Description
1	Banner- Ready Status
2	Application Specific Name - Read from device
3	Trigger Status OFF (0) = Gray LED ON (1) = Blue LED
4	Trigger Sparkline Trend The spark line shows trigger ON/OFF status over last 30 seconds
5	Signal Strength (%) Sparkline Trend The spark line shows the signal strength value over last 30 seconds
6	Locate toggle switch Locate the sensor in large machines where there are several sensors close to each other. When Located, the sensor user interface (green and orange LEDs) start flashing synchronously until the operator disables this function
7	Process Data - Triggered Duration (ms): Displays the amount of time that the sensor output has been ON. To show the trigger duration on faceplate, required to make Timer Mode Enabled setting in AOP in Logix Designer. - Not Triggered Duration (ms): Displays the amount of time that the sensor output has been OFF. To show the trigger duration on faceplate, required to make Timer Mode Enabled setting in AOP in Logix Designer. - Trigger Counter: Displays the sensor counter value when enabled. The counter value increments every time the sensor is triggered this process data element can count up to 65535 and can be reset via reset count button from config tab. Refer to Appendix B for additional information about index. To show the trigger count on faceplate, required to make Counter Mode Enabled setting in AOP in Logix Designer. - Signal Strength (%): Signal Strength provides the raw measurement value of the amount of light reflected from the target. - Contrast: Displays the difference between the light signal levels that the sensor read the last time the output was ON versus the last time the output was OFF. - Gain: Displays the excess gain above the sensor threshold to ensure reliable detection of the target.

Health Tab

Health tab provides different diagnostic information of sensor which helps ensure that sensors are operating correctly.



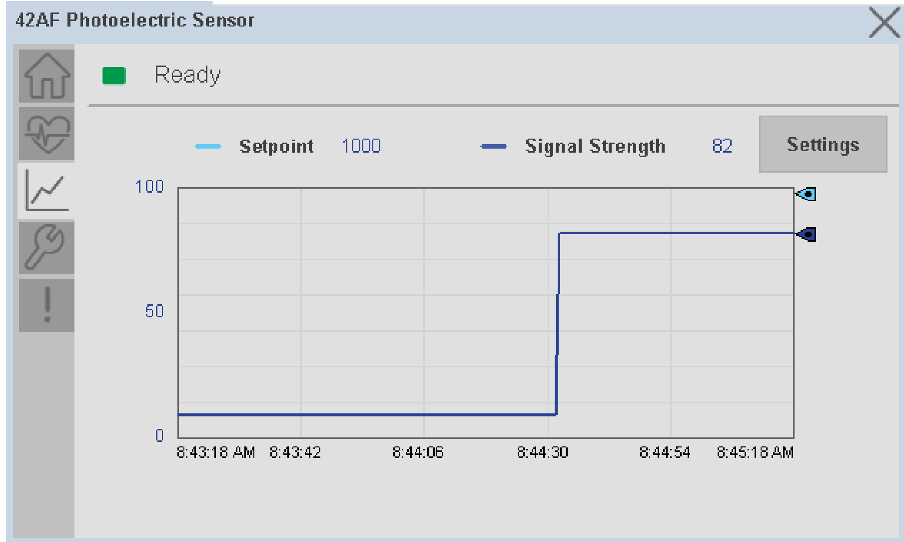
Item	Description
1	Internal Temperature Bar Graph Green Indicators: Min/Max since inception (lifetime) Purple Indicators: Min/Max since power up Light Blue Triangle Indicator: Current value
2	Internal Temperature Current Value
3	Operating Hours Since Inception (lifetime)
4	Operating Hours Since Power Up

Inception/Lifetime values are recorded since the first time the sensor was ever powered ON. These value are retained and not reset during default factory reset.

Power Up values are reset to zero and recorded new each time the sensor is power cycled.

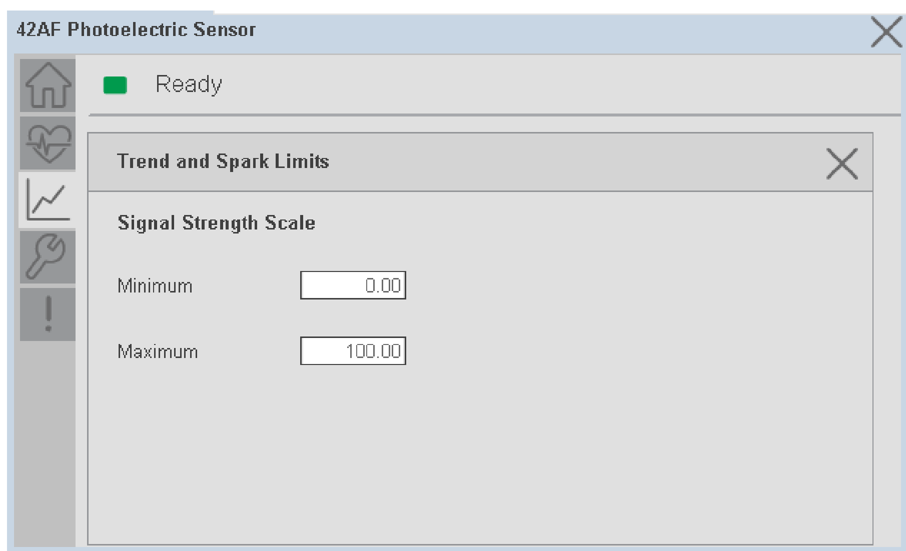
Trend Tab

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. One trend is displayed for Setpoint and Signal Strength.



Trend Settings Screen

We can set trend limits using configuration tab by clicking on the *Settings* button present on trend screen. This sub screen display contains two numeric input elements that allow the user to enter the minimum and maximum values to be used on the Trend screen for Setpoint & Signal strength.

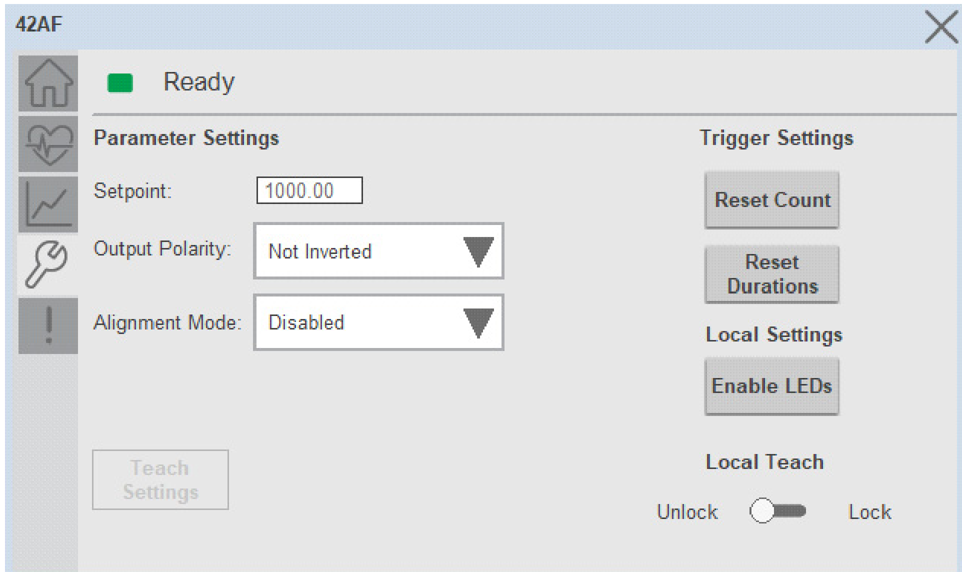


Configure Tab

The configuration tab displays the sensor parameter settings, as well as enabling the user to read data from the sensor.

The configuration section is divided into sections:

- Parameter Settings
- Trigger Settings
- Local Settings
- Teach Settings



Parameter Settings

Setpoint - Allows operators to enter the signal value required for the sensor output to turn ON (threshold) upon target detection. That means that the sensor signal level must be higher than the threshold for the output to turn ON. The default value for this parameter is 1000 with acceptable values between 1000 and 65535.

Output Polarity - Polarity changes the sensor output to operate as Not Inverted (Light Operate) and Inverted (Dark Operate). Click on output polarity drop-down selector object to switch between Light On & Dark On.

Alignment Mode - This parameter changes the sensor user interface to operate in alignment mode. The alignment mode uses the green and orange LEDs of the sensor to visually indicate the strength of the light signal that is reflected back from the object. Click on alignment mode drop-down selector object to switch between Enable & Disable

Trigger Settings

Reset Count - Allows users to reset the counter function, it will reset the sensor counts to zero.

Reset Duration - Allows users to reset the timer function, it will reset Duration Triggered & Duration Not Triggered time.

Local Settings

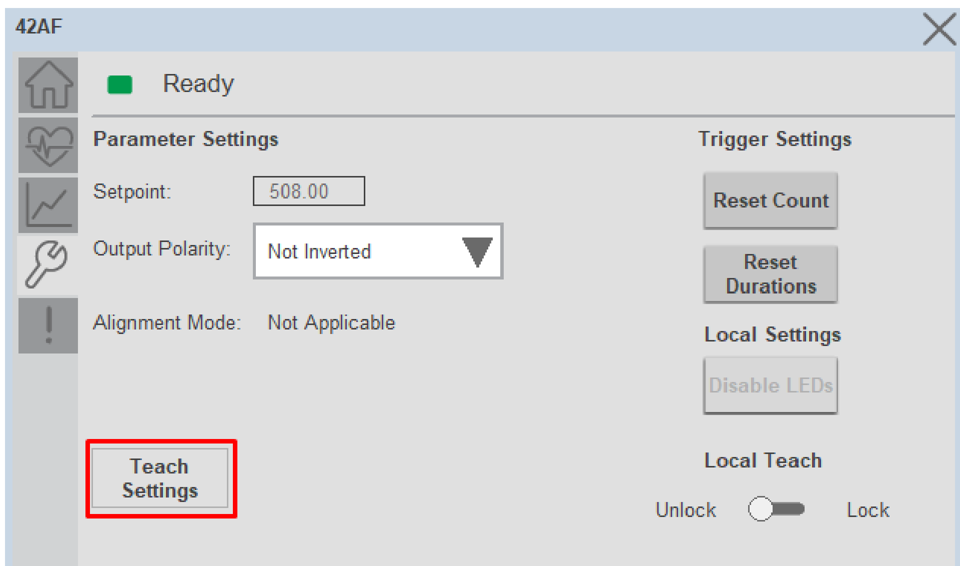
Disable/Enable LEDs - This parameter allows operators to turn OFF or turn ON the User Interface LEDs (green and orange LEDs). This parameter is ideal for applications where turning OFF the LEDs is desired to accommodate the application.

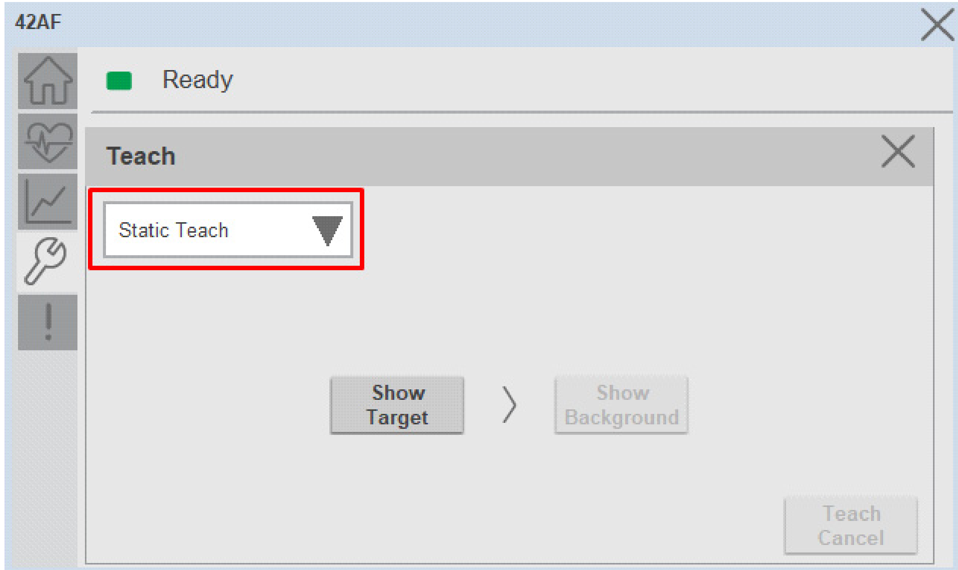
Local Teach Parameters - This section allow user to lock / unlock device local parameterization. Touch Lock/Unlock Toggle switch to Lock Local Parameterization

Teach Settings

Teach Settings display includes the Teach Methods, Teach Command & Teach Cancel buttons. Touch on the Teach Settings navigation button to access the Teach Settings tab.

- Teach tab includes the following functions.
- Teach mode selection dropdown menu
- Teach procedure flow buttons
- Teach cancel button





Teach mode - This parameter selects the desired mode.

Static Teach - The first method is Static Teach, which is intended for applications where the web can be stopped, or for more challenging applications.

4. Place the target in front of the sensor and send the command to **"Static Teach - Show Target"**.
5. Show the background where the target will be present and then send the command **"Static Teach - Show Background"**.
6. To cancel the procedure, you can send the **"Teach Cancel"** command at any point.

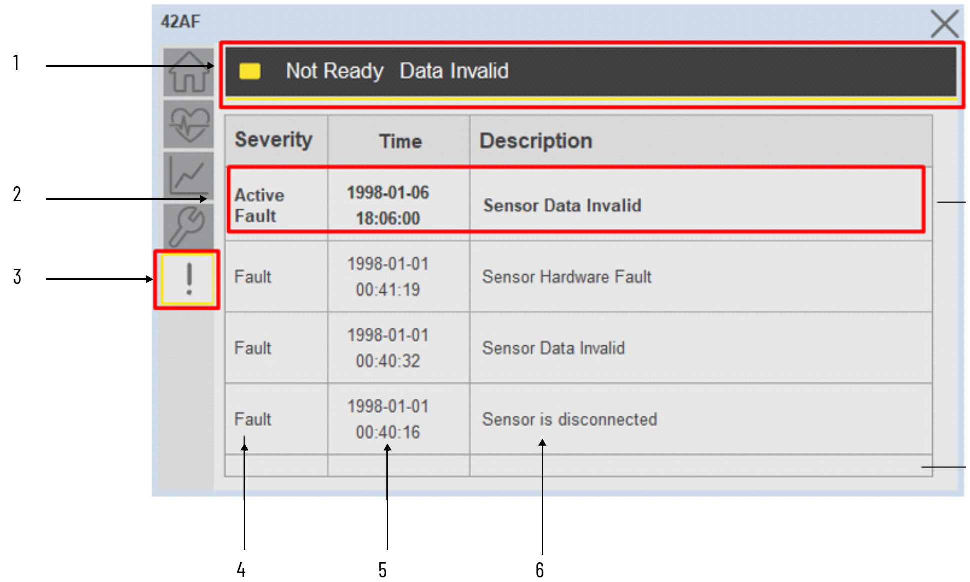
Precision Teach - The Precision Teach is intended for applications where the precise setting of the distance is more critical. This teach method is also recommended for contrast applications.

1. Place the target in front of the sensor and send the command to **"Precision Teach – Show Target"**.

Fault Warning Tab

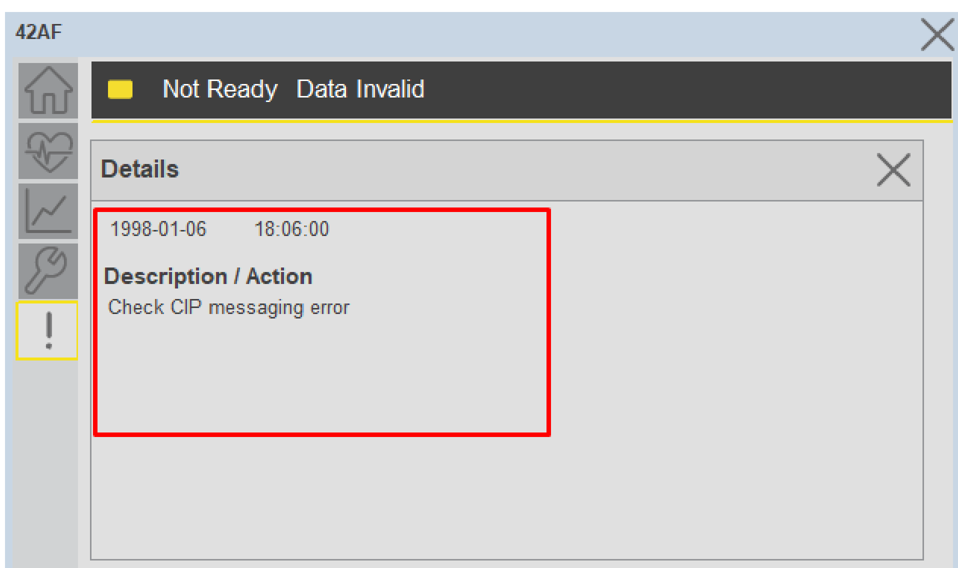
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

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.



Application Code Manager

IO-Link Device Library objects can be set-up and configured using Studio 5000 Application Code Manager.

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

Definition Objects: raC_Dvc_42AF_4IOL, raC_Dvc_42AF_8IOL

This object contains the AOI definition and used as linked library to implement object. There is one definition and per add-on instruction to support each IO-Link Master Module. 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 Objects: raC_LD_Dvc_42AF_4IOL, raC_LD_Dvc_42AF_8IOL

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
ChannelNumber				Select the Channel Number where the sensor is connected.
MasterName	MasterName	[MasterName]	Module	Select the IO-Link master module. If connecting to a non-library object module, enter the name of the master only. 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.

Note that if the tag names are manually entered or not linked to input channel tags a red 'X' will be shown beside the parameter. This is acceptable and the program can still be generated.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_42AF_4IOL	raC_Dvc_42AF_4IOL	3.1	(RA-LIB) Device	IO-Link
raC_Dvc_42AF_8IOL	raC_Dvc_42AF_8IOL	3.1	(RA-LIB) Device	IO-Link

Configured HMI Content

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

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewME\Global Object - ggfx
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewSE\Global Object - ggfx
V3_raC_Dvc_42AF	Faceplate ME	(raC-3_xx-ME) raC_Dvc_42AF-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_raC_Dvc_42AF	Faceplate SE	(raC-3_xx-SE) raC_Dvc_42AF-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_raC_Dvc_IOLink	View Designer	(raC-3_xx-VD) raC_Dvc_IOLink.vpd	{ProjectName}\Visualization\ViewDesigner - vpd
V3_RM_raC_Dvc_IO_Link	Reference Manual	DEVICE-RM300B-EN-P.pdf	{ProjectName}\Documentation
V3_IO_Link_Images	HMI Image Set	HMI FactoryTalk View Images - png.zip	{ProjectName}\Visualization\Images - png

42EF - RightSight Photoelectric Sensor (raC_Dvc_42EF_4IOL, raC_Dvc_42EF_8IOL)

Overview

The 42EF RightSight Photoelectric Sensor device object (raC_Dvc_42EF_4IOL, raC_Dvc_42EF_8IOL) includes HMI faceplates which displays device information including:

- Sensor data
- Sensor diagnostics
- Sensor configuration and parameters
- Process data trending
- Device Fault log

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_*42EF*_Objects_Faceplate.MP4"

Primary device object configuration functions include:

- **Locate:** This function helps to locate the sensors using the device's LED in large machines where there are several sensors close to each other.
- **Setpoint:** Setpoint will allow the operators to enter the signal value required for the sensor output to turn ON upon target detection.
- **Polarity:** This function changes the sensor output to operate as Not-Inverted (Light Operate) and Inverted (Dark Operate).

Functional Description

The 42EF RightSight Photoelectric Sensor 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. 1.01) 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/* folder in the library. Each device is supplied with two versions of Add-On Instructions (AOI) and Rung import files - one for compatibility with each IO-Link Master Module. You must select the appropriate AOI for the master module being used.

Device/Item	Compatible IO-Link Master	Add-On Instruction	Rung Import
42EF	POINT I/O 1734-4IOL	raC_Dvc_42EF_4IOL_3.01_AOI.L5X	raC_Dvc_42EF_4IOL_3.01_RUNG.L5X
	ArmorBlock 1732E-8IOLM12R	raC_Dvc_42EF_8IOL_3.01_AOI.L5X	raC_Dvc_42EF_8IOL_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.

Note that a single faceplate is used for either the 4IOL or 8IOL versions of the Add-On Instruction.

Device/Item	Type	FactoryTalk View ME Faceplate	FactoryTalk View SE Faceplate
42EF	Display	(raC-3_01-ME) raC_Dvc_42EF-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_42EF-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - IO-Link Device.ggfx	(raC-3-SE) Toolbox - IO-Link 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
42EF	(raC-3_01-VD) raC_Dvc_IOLink.vpd

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.

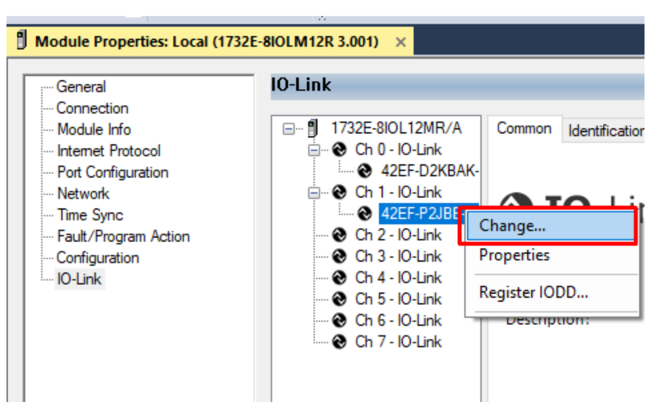
All Studio 5000 Application Code Manager files can be found in the /*ApplicationCodeManagerLibraries*/ folder of the library. The files included are as follows:

Implementation Object	Compatible IO-Link Master	Asset Control File (.HSL4)	Device File (.HSL4)
42EF	POINT I/O 1734-4IOL	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_42EF_4IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_42EF_4IOL_(3.1)
	ArmorBlock 1732E-8IOLM12R	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_42EF_8IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_42EF_8IOL_(3.1)

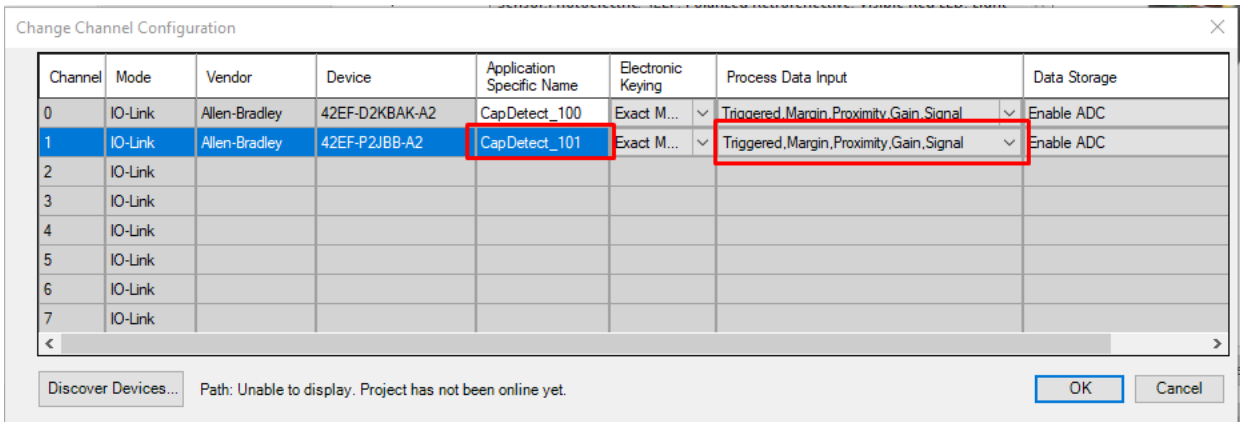
Device Definition

The device must be configured with the correct device definition. Proper device configuration enables the required cyclic device data to pass information from the device into the add-on instruction.

1. Click on Change...



2. Specify the Application Specific Name e.g. *CapDetect_101*
3. Select the Process Data Input as *Triggered, Margin, Proximity, Gain, Signal.*



Operations

The IO-Link Device objects provide only physical operation mode. There is no virtual device mode offered.

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
Write_Index	Message Configuration Write	MESSAGE
Read_Index	Message Configuration Read	MESSAGE
Write_SubIndex	Message Configuration Write	MESSAGE
Read_SubIndex	Message Configuration Read	MESSAGE
Msg_Sensor_Data	Messaging Data	raC_UDT_42EF_Sensor_Data
Ref_Ctrl_Set	IO-Link Device Setting Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSet
Ref_Ctrl_Cmd	IO-Link Device Command Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlCmd
Ref_Ctrl_Sts	IO-Link Device Status Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSts
Ref_Ctrl_Inf	IO-Link Device Type Information Interface	raC_UDT_ItfAD_IOLinkSensor_Inf
Ref_Ctrl_Itf	IO-Link Device Command, Status Interface	raC_UDT_ItfAD_IOLinkDevices
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[20]
Inp_I	Device Object Inputs	raC_UDT_ItfAD_42EF_Inp_4IOL Or raC_UDT_ItfAD_42EF_Inp_8IOL

Input Data

Input	Function/Description	DataType
Cfg_AlignmentMode	Alignment Mode; 0 = Disabled, 1 = Enabled, 2 = Enabled for 120s, 3 = Enabled for 240s	SINT
Cfg_OutputPolarityInverted	Output Polarity; 0 = Not Inverted, 1 = Inverted	SINT
Cmd_DisableLEDs	Indicator Disabled Command	BOOL
Cmd_EnableLEDs	Indicator Enabled Command	BOOL
Cmd_LocalTeachLock	Parameters Unlock/Lock Cmd	BOOL
Cmd_Locate	Locator Disable/Enable Command	SINT
Cmd_ResetCount	Counter Reset Command	BOOL
Cmd_ResetDurations	Duration Reset Command	BOOL
Cmd_TeachCancel	Duration Reset Command	BOOL
Cmd_TeachPrecision_ShowTarget	Teach Precision Show Target Command	BOOL
Cmd_TeachStatic_Background	Teach Static Background Command	BOOL
Cmd_TeachStatic_ShowTarget	Teach Static Show Target Command	BOOL
Inp_ChNumber	Configured Channel number for Master	SINT
Inp_ChxGain	Gain of Sensor	INT
Inp_ChxMarginLowAlarm	Margin Low Alarm of Sensor	BOOL
Inp_ChxProximityAlarm	Proximity Alarm of Senor	BOOL
Inp_ChxSignalStrength	Signal Strength of Sensor	DINT

Input	Function/Description	DataType
Inp_ChxTriggered	Triggered Status of Sensor	BOOL
Set_Setpoint	Enter Setpoint Value To Turn ON Sensor Output	DINT
Set_TrendMaxValue	Trend Tab Max value for VD/ME/SE faceplate	DINT
Set_TrendMinValue	Trend Tab Min value for VD/ME/SE faceplate	DINT

Output Data

Output	Function/Descritpion	DataType
Sts_Active	Device active status: 1 = output power structure is active	BOOL
Sts_Available	Device is available for interaction with user code	BOOL
Sts_bNotReady	Bitwise device 'not ready' reason	
Sts_Connected	Device is connected to the Programmable Automation Controller	BOOL
Sts_EnableLEDs	LED Indicator; 0= Disable, 1= Enable	BOOL
Sts_Faulted	Device faulted status: 1 = an active fault exists	BOOL
Sts_InhibitCfg	1=Inhibit user Configuration Parameters from HMI Faceplate; 0=Allow	BOOL
Sts_InhibitCmd	1=Inhibit user Commands from HMI Faceplate; 0=Allow Control	BOOL
Sts_InhibitSet	1=Inhibit user Settings from HMI Faceplate; 0=Allow	BOOL
Sts_LocalTeachLock	Local Parameterization; 0= Unlock, 1= Locked	BOOL
Sts_Located	Locator Indicator; 1= Located	BOOL
Sts_Ready	Device is ready to perform primary function	BOOL
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Val_AlignmentModeEnable	Alignment Mode Status; 0 = Disabled, 1 = Enabled, 2 = Enabled for 120s, 3 = Enabled for 240s	INT
Val_Contrast	Sensor Contrast Level	INT
Val_NotTriggeredDuration	Sensor Output OFF Duration	INT
Val_OperatingHrsSinceInception	Operating Hours Since Inception	DINT
Val_OperatingHrsSincePowerUp	Operating Hours Since Power Up	DINT
Val_OutputPolarityInverted	Output Polarity Status, 0 = Not Inverted, 1 = Inverted	INT
Val_PercentSP	Setpoint in Percent	INT
Val_RangeMax	Sensor Maximum Range in Trend	DINT
Val_RangeMin	Sensor Minimum Range in Trend	DINT
Val_Setpoint	Setpoint Value To Turn ON Sensor Output	DINT
Val_TeachStep	Teach Step	INT
Val_TemperatureCurrent	Internal Temperature Of Sensor	SINT
Val_TemperatureMaxSinceInception	Maximum Temperature Since Inception	SINT
Val_TemperatureMaxSincePowerUp	Maximum Temperature Since Power Up	SINT
Val_TemperatureMinSinceInception	Minimum Temperature Since Inception	SINT

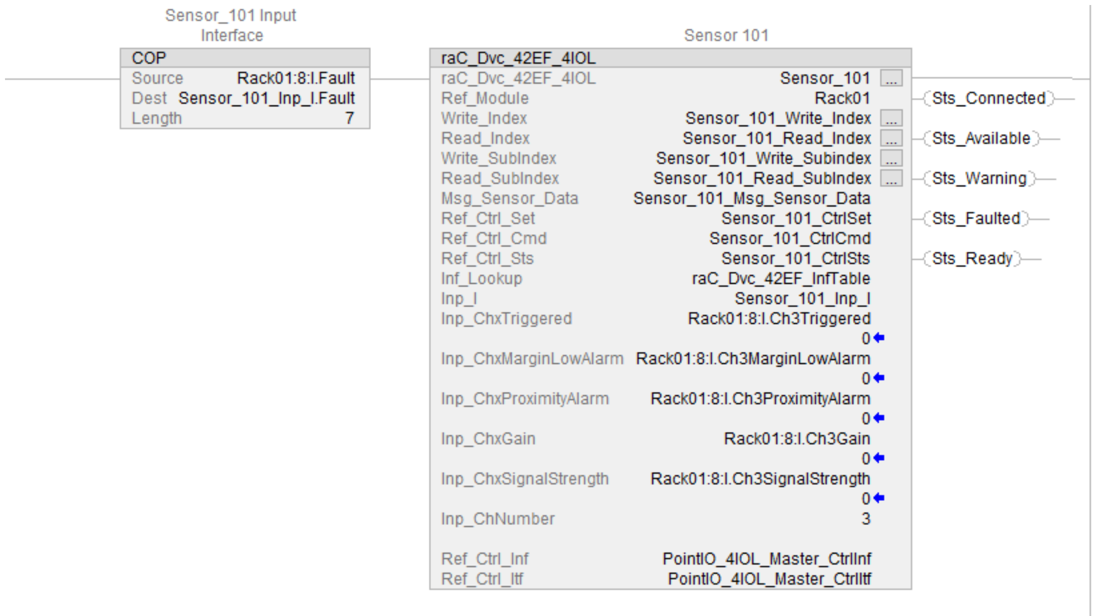
Output	Function/Descritpion	DataType
Val_TemperatureMinSincePowerUp	Minimum Temperature Since Power Up	SINT
Val_Trigger_Counter	Sensor Counter Value	SINT
Val_TriggeredDuration	Sensor Output ON Duration	INT

Programming Example

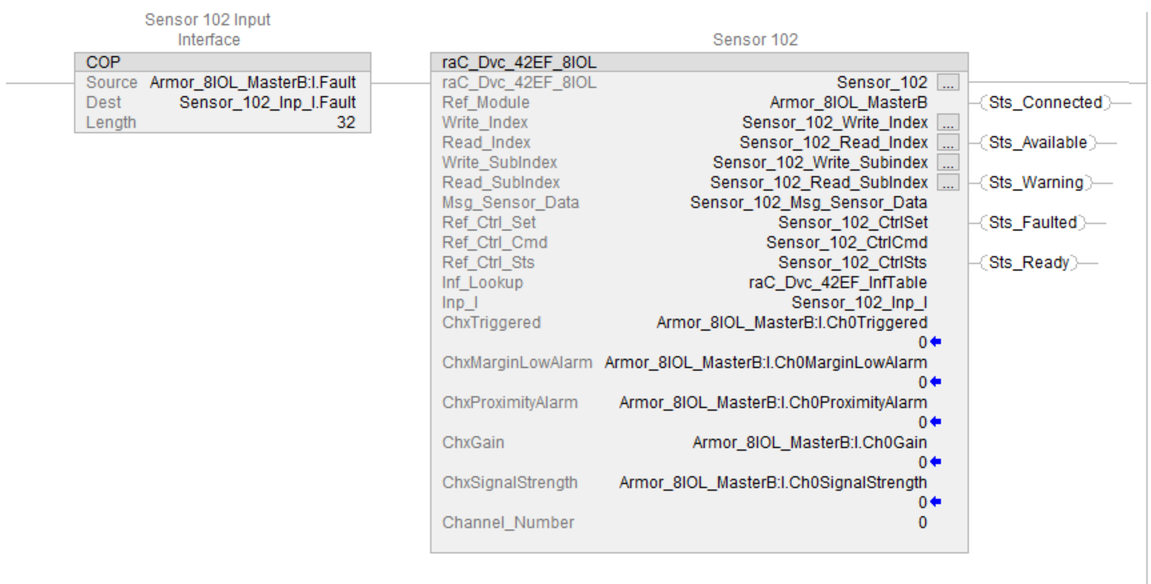
Fully configured device on a rung is provided below for reference.

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 following example uses the 42EF device object connected to channel #3 of a POINT I/O 1734-4IOL IO-Link Master module named *PointIO_4IOL_Master* in slot #8 of a POINT I/O adapter named *Rack01*.



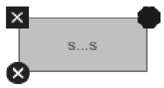
The following example uses the 42EF device object connected to channel #0 of a ArmorBlock 1732E-8IOLM12R IO-Link Master module in named *Armor_8IOL_MasterB*.



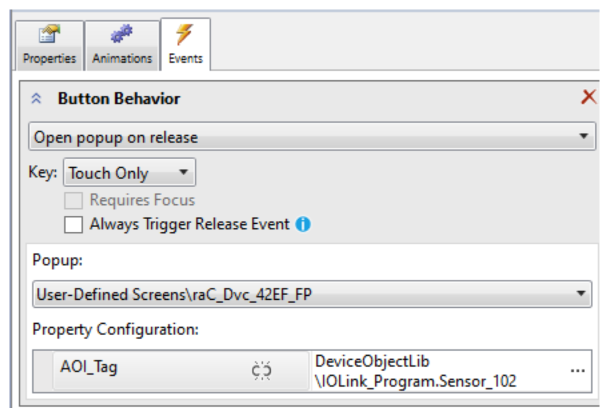
Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. See Basic Launch Button Attributes section for details on configuration and indicators.

FactoryTalk View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GO_LaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #104.	#102: AOI Backing Tag Instance (e.g. {::[PAC]Program::IOLinkProgram._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)

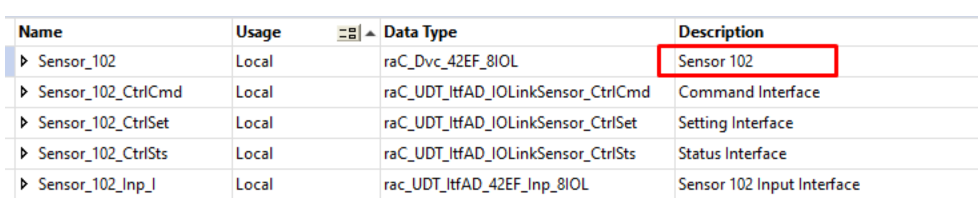
Studio 5000 View Designer Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	

Faceplates

There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 30.

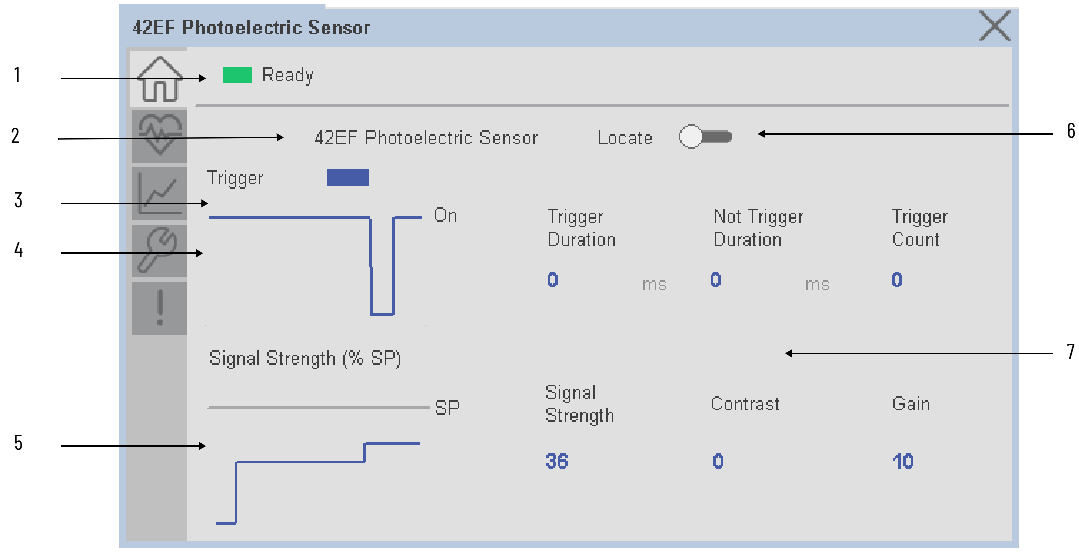
The faceplate title is linked to *_InstanceName.@description*, the *.@description* extended tag property of the Add-On Instruction instance. This is user-configurable from controller/program tags in Studio 5000 Logix Designer.



Name	Usage	Data Type	Description
Sensor_102	Local	raC_Dvc_42EF_8IOL	Sensor 102
Sensor_102_CtrlCmd	Local	raC_UDT_ItfAD_IOLinkSensor_CtrlCmd	Command Interface
Sensor_102_CtrlSet	Local	raC_UDT_ItfAD_IOLinkSensor_CtrlSet	Setting Interface
Sensor_102_CtrlSts	Local	raC_UDT_ItfAD_IOLinkSensor_CtrlSts	Status Interface
Sensor_102_Inp_I	Local	rac_UDT_ItfAD_42EF_Inp_8IOL	Sensor 102 Input Interface

Home

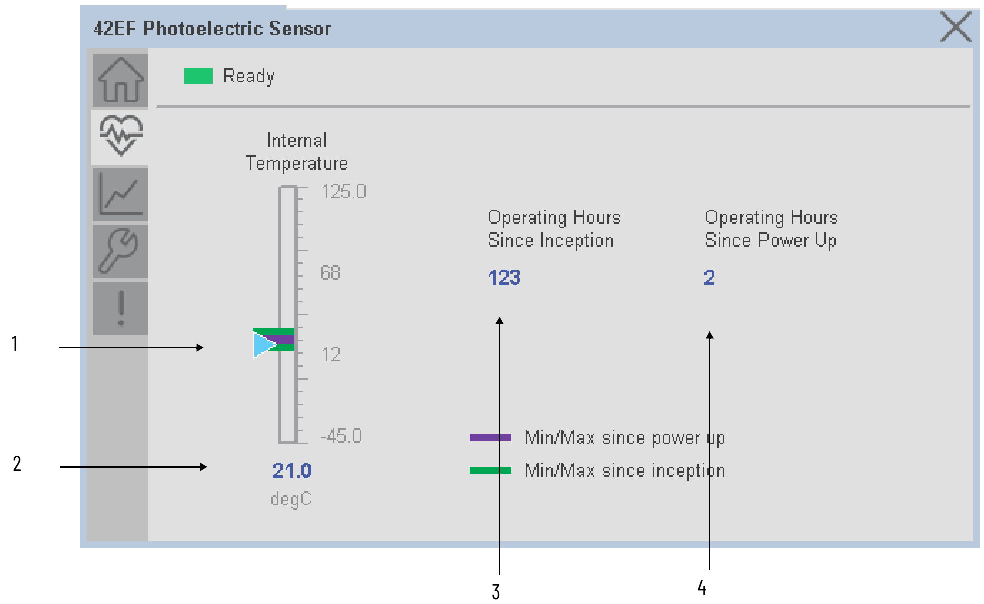
The Home tab is the main tab of the faceplate. It provides the status of the IO-Link device along with sensor process data and the Locate button.



Item	Description
1	Banner- Ready Status
2	Application Specific Name - Read from device
3	Trigger Status OFF (0) = Gray LED ON (1) = Blue LED
4	Trigger Sparkline Trend The spark line shows trigger ON/OFF status over last 30 seconds
5	Signal Strength (%) Sparkline Trend The spark line shows the signal strength value over last 30 seconds
6	Locate toggle switch Locate the sensor in large machines where there are several sensors close to each other. When Located, the sensor user interface (green and orange LEDs) start flashing synchronously until the operator disables this function
7	Process Data - Triggered Duration (ms): Displays the amount of time that the sensor output has been ON. To show the trigger duration on faceplate, required to make Timer Mode Enabled setting in AOP in Logix Designer. - Not Triggered Duration (ms): Displays the amount of time that the sensor output has been OFF. To show the trigger duration on faceplate, required to make Timer Mode Enabled setting in AOP in Logix Designer. - Trigger Counter: Displays the sensor counter value when enabled. The counter value increments every time the sensor is triggered this process data element can count up to 65535 and can be reset via reset count button from config tab. Refer to Appendix B for additional information about index. To show the trigger count on faceplate, required to make Counter Mode Enabled setting in AOP in Logix Designer. - Signal Strength (%): Signal Strength provides the raw measurement value of the amount of light reflected from the target. - Contrast: Displays the difference between the light signal levels that the sensor read the last time the output was ON versus the last time the output was OFF. - Gain: Displays the excess gain above the sensor threshold to ensure reliable detection of the target.

Health Tab

Health tab provides different diagnostic information of sensor which helps ensure that sensors are operating correctly.



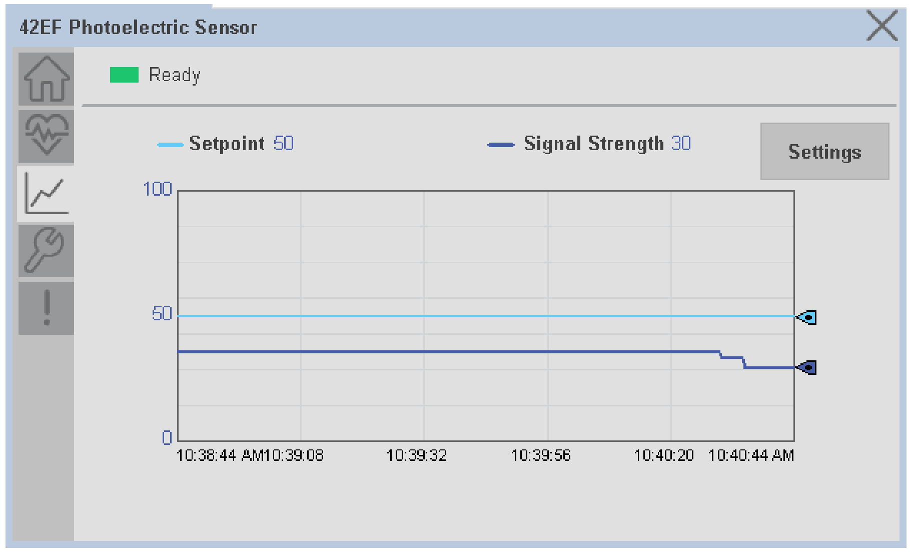
Item	Description
1	Internal Temperature Bar Graph Green Indicators: Min/Max since inception (lifetime) Purple Indicators: Min/Max since power up Light Blue Triangle Indicator: Current value
2	Internal Temperature Current Value
3	Operating Hours Since Inception (lifetime)
4	Operating Hours Since Power Up

Inception/Lifetime values are recorded since the first time the sensor was ever powered ON. These value are retained and not reset during default factory reset.

Power Up values are reset to zero and recorded new each time the sensor is power cycled.

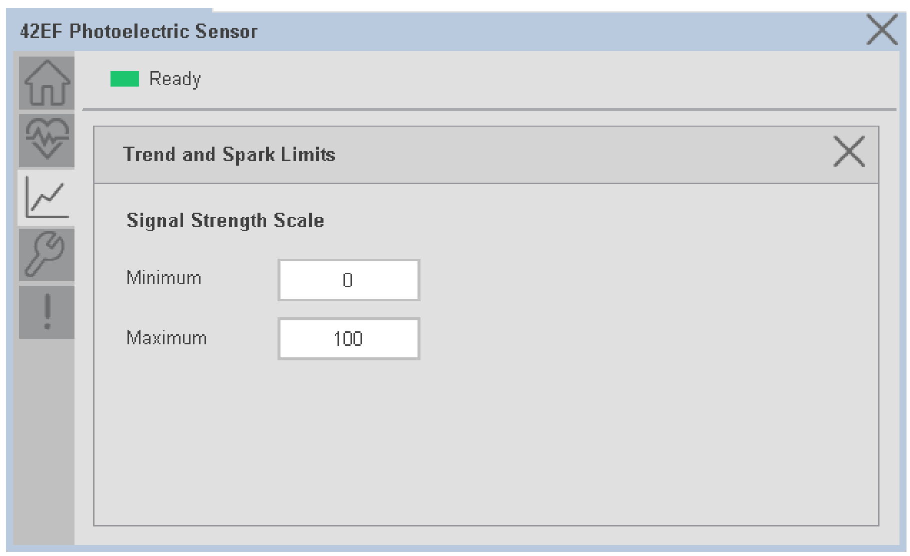
Trend Tab

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. One trend is displayed for Setpoint and Signal Strength.



Trend Settings Screen

We can set trend limits using configuration tab by clicking on the *Settings* button present on trend screen. This sub screen display contains two numeric input elements that allow the user to enter the minimum and maximum values to be used on the Trend screen for Setpoint & Signal strength.

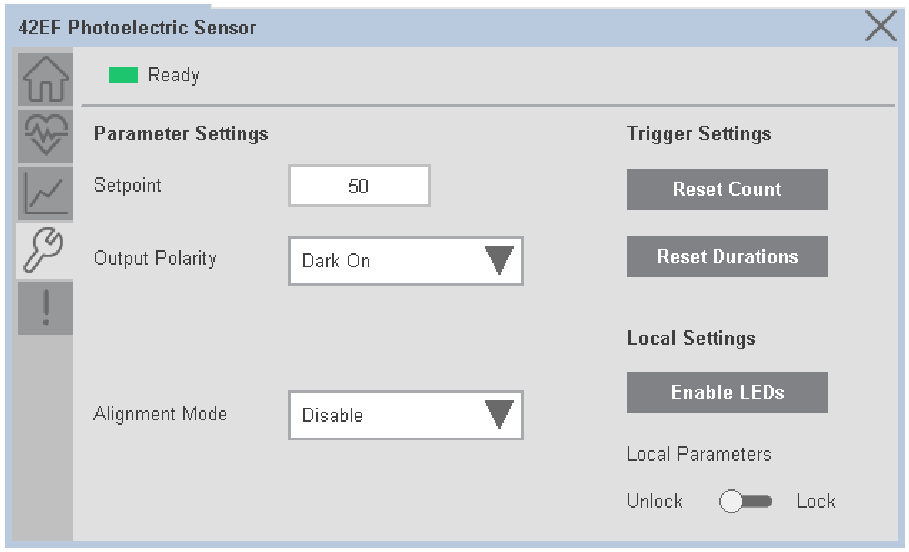


Configure Tab

The configuration tab displays the sensor parameter settings, as well as enabling the user to read data from the sensor.

The configuration section is divided into sections:

- Parameter Settings
- Trigger Settings
- Local Settings



Parameter Settings

Setpoint - Allows operators to enter the signal value required for the sensor output to turn ON (threshold) upon target detection. That means that the sensor signal level must be higher than the threshold for the output to turn ON. The default value for this parameter is 1000 with acceptable values between 1000 and 65535.

Output Polarity - Polarity changes the sensor output to operate as Not Inverted (Light On) and Inverted (Dark On). Click on output polarity drop-down selector object to switch between Light On & Dark On.

Alignment Mode - This parameter changes the sensor user interface to operate in alignment mode. The alignment mode uses the green and orange LEDs of the sensor to visually indicate the strength of the light signal that is reflected back from the object. Click on alignment mode drop-down selector object to switch between Enable & Disable

Trigger Settings

Reset Count - Allows users to reset the counter function, it will reset the sensor counts to zero.

Reset Duration - Allows users to reset the timer function, it will reset Duration Triggered & Duration Not Triggered time.

Local Settings

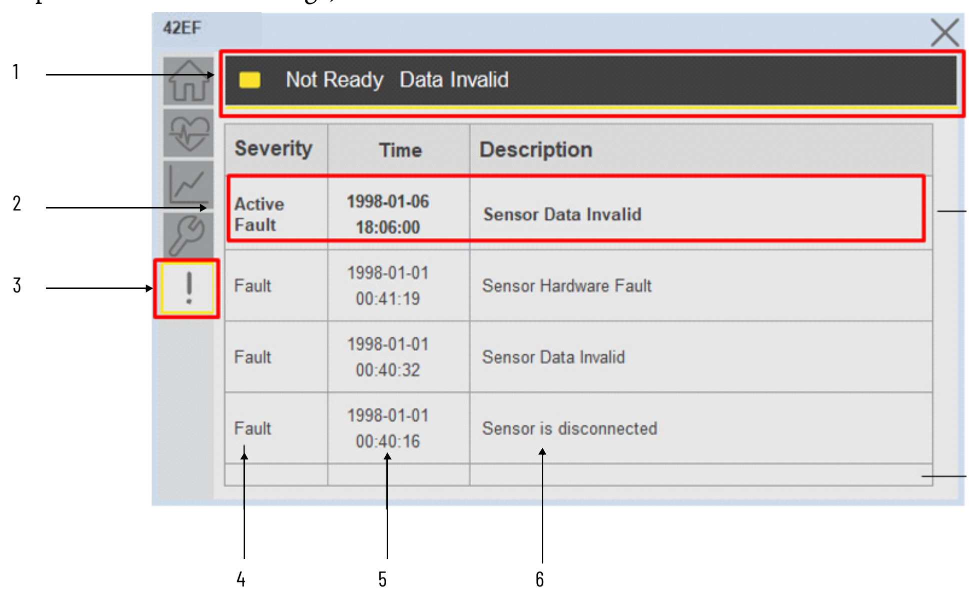
Disable/Enable LEDs - This parameter allows operators to turn OFF or turn ON the User Interface LEDs (green and orange LEDs). This parameter is ideal for applications where turning OFF the LEDs is desired to accommodate the application.

Local Teach Parameters - This section allow user to lock / unlock device local parameterization. Touch Lock/Unlock Toggle switch to Lock Local Parameterization

Fault Warning Tab

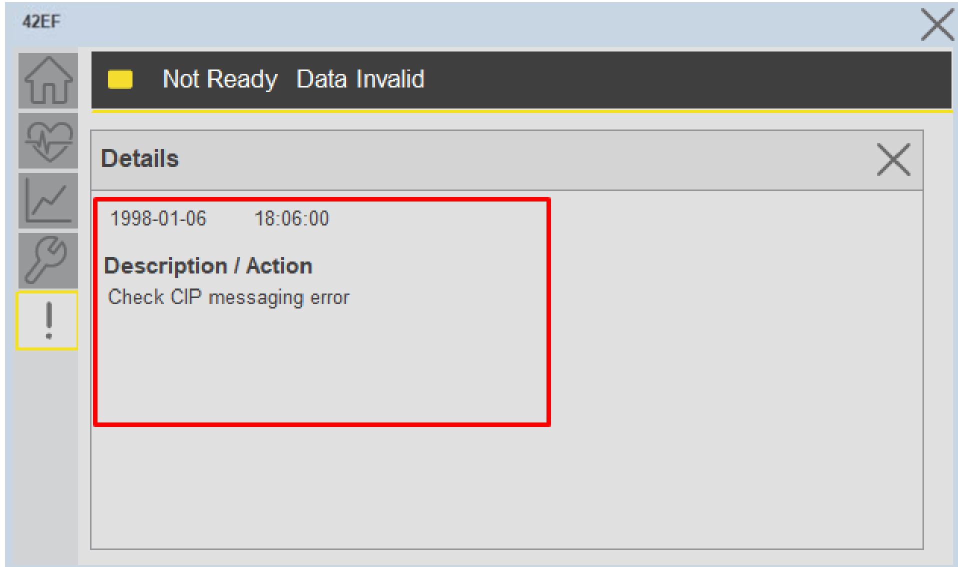
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

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.



Application Code Manager

IO-Link Device Library objects can be set-up and configured using Studio 5000 Application Code Manager.

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

Definition Objects: raC_Dvc_42EF_4IOL, raC_Dvc_42EF_8IOL

This object contains the AOI definition and used as linked library to implement object. There is one definition and per add-on instruction to support each IO-Link Master Module. 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 Objects: raC_LD_Dvc_42EF_4IOL, raC_LD_Dvc_42EF_8IOL

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.

Parameter Name	Default Value	Instance Name	Definition	Description
TagDescription	{ObjectDescription}	{TagDescription}		Tag Description of the main AOI backing tag
ChannelNumber				Select the Channel Number where the sensor is connected.
MasterName	MasterName	[MasterName]	Module	Select the IO-Link master module. If connecting to a non-library object module, enter the name of the master only. 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.

Note that if the tag names are manually entered or not linked to input channel tags a red 'X' will be shown beside the parameter. This is acceptable and the program can still be generated.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_42EF_4IOL	raC_Dvc_42EF_4IOL	3.1	(RA-LIB) Device	IO-Link
raC_Dvc_42EF_8IOL	raC_Dvc_42EF_8IOL	3.1	(RA-LIB) Device	IO-Link

Configured HMI Content

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

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - Io-link Device.ggfx	{ProjectName}\Visualization\FTViewME\Global Object - ggfx
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - Io-link Device.ggfx	{ProjectName}\Visualization\FTViewSE\Global Object - ggfx
V3_raC_Dvc_42EF	Faceplate ME	(raC-3_xx-ME) raC_Dvc_42EF-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_raC_Dvc_42EF	Faceplate SE	(raC-3_xx-SE) raC_Dvc_42EF-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_raC_Dvc_IOLink	View Designer	(raC-3_xx-VD) raC_Dvc_IOLink.vpd	{ProjectName}\Visualization\ViewDesigner - vpd
V3_RM_raC_Dvc_IO_Link	Reference Manual	DEVICE-RM300B-EN-P.pdf	{ProjectName}\Documentation
V3_IO_Link_Images	HMI Image Set	HMI FactoryTalk View Images - png.zip	{ProjectName}\Visualization\Images - png

42JT - VisiSight Photoelectric Sensor (raC_Dvc_42JT_4IOL, raC_Dvc_42JT_8IOL)

Overview

The 42JT VisiSight Photoelectric Sensor device object (raC_Dvc_42JT_4IOL, raC_Dvc_42JT_8IOL) includes HMI faceplates which displays device information including:

- Sensor data
- Sensor diagnostics
- Sensor configuration and parameters
- Device Fault log

Primary device object configuration functions include:

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_42*JT*_Objects_Faceplate.MP4"

- **Setpoint:** Setpoint will allow the operators to enter the signal value required for the sensor output to turn ON upon target detection.
- **Polarity:** This function changes the sensor output to operate as Not-Inverted (Light Operate) and Inverted (Dark Operate).
- **Teach:** Offers the different teach functions.

Functional Description

The 42JT VisiSight Photoelectric Sensor 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. 1.01) 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/* folder in the library. Each device is supplied with two versions of Add-On Instructions (AOI) and Rung import files - one for compatibility with each IO-Link Master Module. You must select the appropriate AOI for the master module being used.

Device/Item	Compatible IO-Link Master	Add-On Instruction	Rung Import
42JT	POINT I/O 1734-4IOL	raC_Dvc_42JT_4IOL_3.01_AOI.L5X	raC_Dvc_42JT_4IOL_3.01_RUNG.L5X
	ArmorBlock 1732E-8IOLM12R	raC_Dvc_42JT_8IOL_3.01_AOI.L5X	raC_Dvc_42JT_8IOL_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.

Note that a single faceplate is used for either the 4IOL or 8IOL versions of the Add-On Instruction.

Device/Item	Type	FactoryTalk View ME Faceplate	FactoryTalk View SE Faceplate
42JT	Display	(raC-3_01-ME) raC_Dvc_42JT-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_42JT-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - IO-Link Device.ggfx	(raC-3-SE) Toolbox - IO-Link 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
42JT	(raC-3_01-VD) raC_Dvc_IOLink.vpd

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.

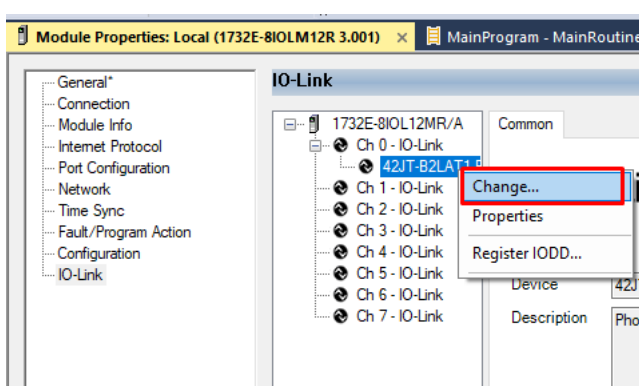
All Studio 5000 Application Code Manager files can be found in the /*ApplicationCodeManagerLibraries*/ folder of the library. The files included are as follows:

Implementation Object	Compatible IO-Link Master	Asset Control File (.HSL4)	Device File (.HSL4)
42JT	POINT I/O 1734-4IOL	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_42JT_4IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_42JT_4IOL_(3.1)
	ArmorBlock 1732E-8IOLM12R	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_42JT_8IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_42JT_8IOL_(3.1)

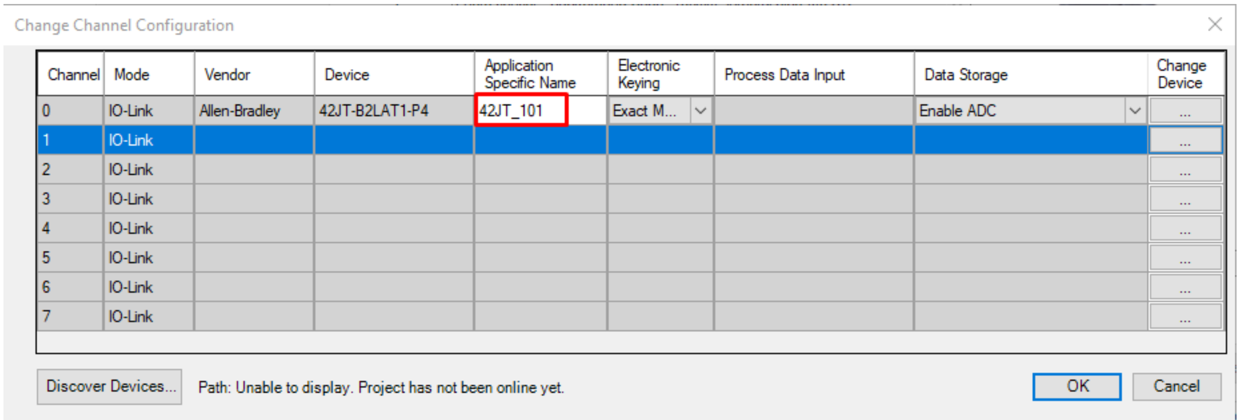
Device Definition

The device must be configured with the correct device definition. Proper device configuration enables the required cyclic device data to pass information from the device into the add-on instruction.

1. Click on Change...



2. Specify the Application Specific Name e.g. *42JT_101*



Operations

The IO-Link Device objects provide only physical operation mode. There is no virtual device mode offered.

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
Write_Index	Message Configuration Write	MESSAGE
Read_Index	Message Configuration Read	MESSAGE
Write_SubIndex	Message Configuration Write	MESSAGE
Read_SubIndex	Message Configuration Read	MESSAGE
Msg_Sensor_Data	Messaging Data	raC_UDT_42JT_Sensor_Data
Ref_Ctrl_Set	IO-Link Device Setting Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSet
Ref_Ctrl_Cmd	IO-Link Device Command Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlCmd
Ref_Ctrl_Sts	IO-Link Device Status Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSts
Ref_Ctrl_Inf	IO-Link Device Type Information Interface	raC_UDT_ItfAD_IOLinkSensor_Inf
Ref_Ctrl_Itf	IO-Link Device Command, Status Interface	raC_UDT_ItfAD_IOLinkDevices
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[20]
Inp_I	Device Object Inputs	raC_UDT_ItfAD_42JT_Inp_4IOL Or raC_UDT_ItfAD_42JT_Inp_8IOL

Input Data

Input	Function/Description	DataType
Cfg_Gain	Gain; 0 = Low, 1 = High	SINT
Cfg_LightSource	Light Source; 0 = OFF, 1 = ON	SINT
Cfg_OutputPolarityInverted	Polarity; 0 = Inverted, 1 = Not Inverted	SINT
Cmd_DynamicTeachStart	Dynamic Teach Start Command	BOOL
Cmd_DynamicTeachStop	Dynamic Teach Stop Command	BOOL
Cmd_LocalTeachLock	Parameters Unlock/Lock Cmd	BOOL
Cmd_PrecisionTeach	Precision Teach Command	BOOL
Cmd_StaticTeachShowBackground	Static Teach Background Command	BOOL
Cmd_StaticTeachShowTarget	Static Teach Mark Command	BOOL
Cmd_TeachApply	Teach Apply Command	BOOL
Cmd_TeachCancel	Teach Cancel Command	BOOL
Cmd_TeachModeStart	Teach Mode Start Command	BOOL
Set_Setpoint	Enter Setpoint Value To Turn ON Sensor Output	BOOL
Inp_ChxTriggered	Triggered Status of Sensor	BOOL
Inp_ChxMarginLowAlarm	Margin Low Alarm of Sensor	BOOL
Inp_ChNumber	Configured Channel number for Master	SINT

Output Data

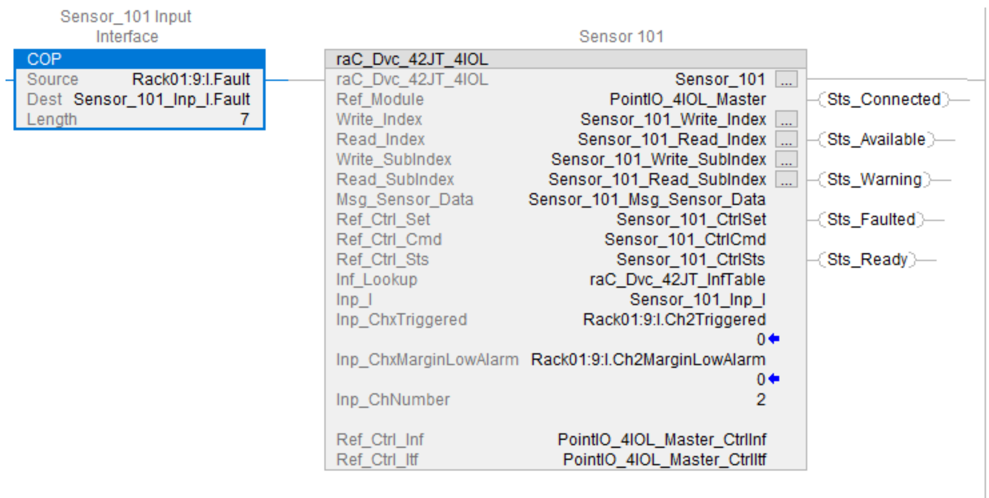
Output	Function/Descritpion	DataType
Sts_Active	Device active status: 1 = output power structure is active	BOOL
Sts_Available	Device is available for interaction with user code	BOOL
Sts_bNotReady	Bitwise device 'not ready' reason	DINT
Sts_Connected	Device is connected to the Programmable Automation Controller	BOOL
Sts_Faulted	Device faulted status: 1 = an active fault exists	BOOL
Sts_Ready	Device is ready to perform primary function	BOOL
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Sts_InhibitCfg	1=Inhibit user Configuration Parameters from HMI Faceplate; 0=Allow	BOOL
Sts_InhibitCmd	1=Inhibit user Commands from HMI Faceplate; 0=Allow Control	BOOL
Sts_InhibitSet	1=Inhibit user Settings from HMI Faceplate; 0=Allow	BOOL
Sts_LocalTeachLock	Local Parameterization; 0= Unlock, 1= Locked	BOOL
Val_Gain	Gain Status; 0 = Low, 1 = High	INT
Val_LightSource	Light Source Status; 0 = OFF, 1 = ON	DINT
Val_OutputPolarityInverted	Polarity Status; 0 = Inverted, 1 = Not Inverted	INT
Val_RangeMax	Sensor Maximum Range in Trend	DINT
Val_RangeMin	Sensor Minimum Range in Trend	DINT
Val_Setpoint	Setpoint Value To Turn ON Sensor Output	DINT
Val_TeachMode	Teach Mode Status; 0 = Static, 1 = Dynamic, 2 = Precision	INT
Val_TeachStep	Teach Step	INT

Programming Example

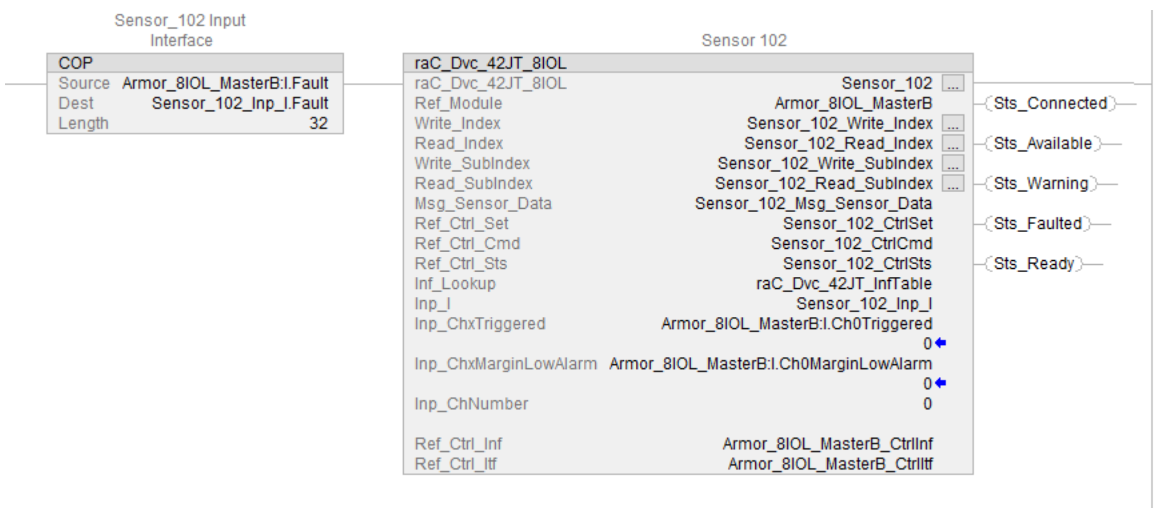
Fully configured device on a rung is provided below for reference.

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 following example uses the 42JT device object connected to channel #9 of a POINT I/O 1734-4IOL IO-Link Master module in slot #1 of a POINT I/O adapter named *_AdapterName*.



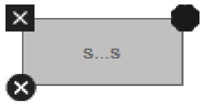
The following example uses the 42JT device object connected to channel #2 of a ArmorBlock 1732E-8IOLM12R IO-Link Master module in named *Armor_8IOL_MasterB*.



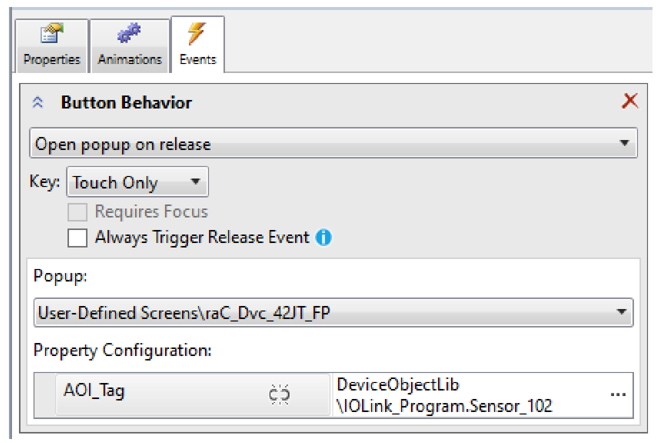
Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. See Basic Launch Button Attributes section for details on configuration and indicators.

FactoryTalk View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GO_LaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #104.	#102: AOI Backing Tag Instance (e.g. {::[PAC]Program::IOLinkProgram._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)

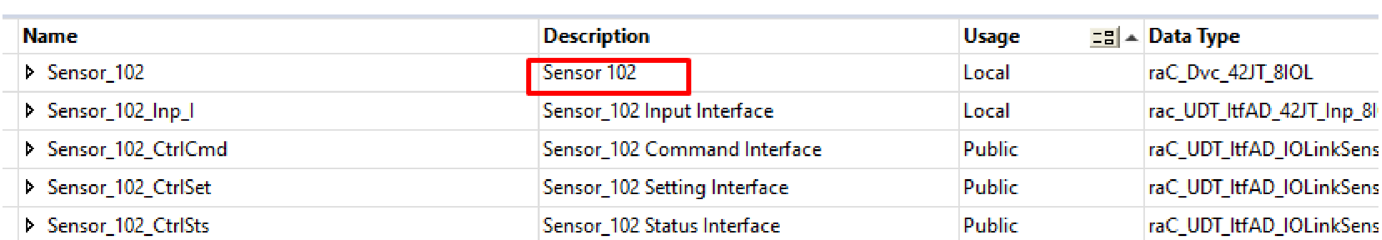
Studio 5000 View Designer Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	

Faceplates

There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 30

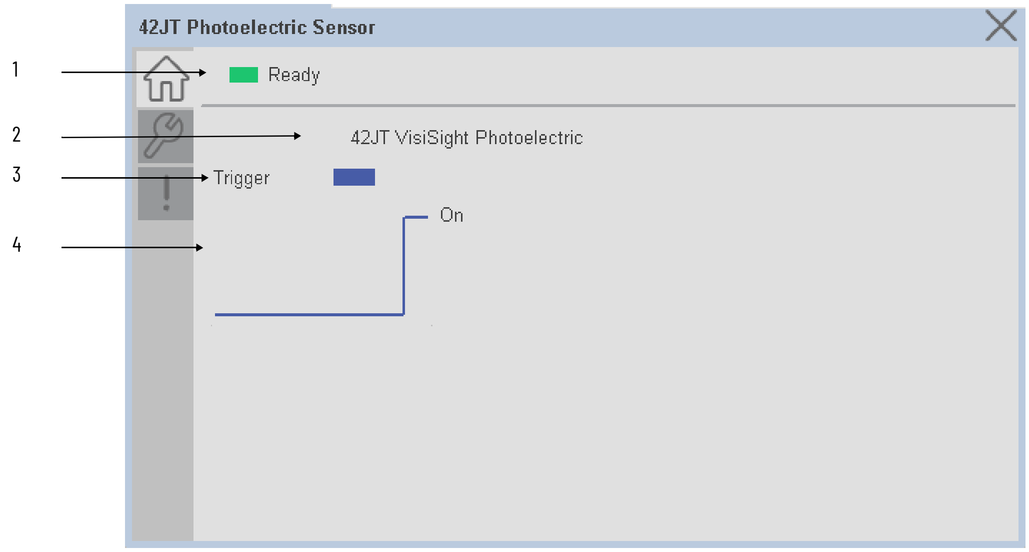
The faceplate title is linked to *_InstanceName.@description*, the *.@description* extended tag property of the Add-On Instruction instance. This is user-configurable from controller/program tags in Studio 5000 Logix Designer.



Name	Description	Usage	Data Type
Sensor_102	Sensor 102	Local	raC_Dvc_42JT_8IOL
Sensor_102_Inp_I	Sensor_102 Input Interface	Local	rac_UDT_ItfAD_42JT_Inp_8I
Sensor_102_CtrlCmd	Sensor_102 Command Interface	Public	raC_UDT_ItfAD_IOLinkSens
Sensor_102_CtrlSet	Sensor_102 Setting Interface	Public	raC_UDT_ItfAD_IOLinkSens
Sensor_102_CtrlSts	Sensor_102 Status Interface	Public	raC_UDT_ItfAD_IOLinkSens

Home

The Home tab is the main tab of the faceplate. It provides the status of the IO-Link device along with sensor process data and the Locate button.



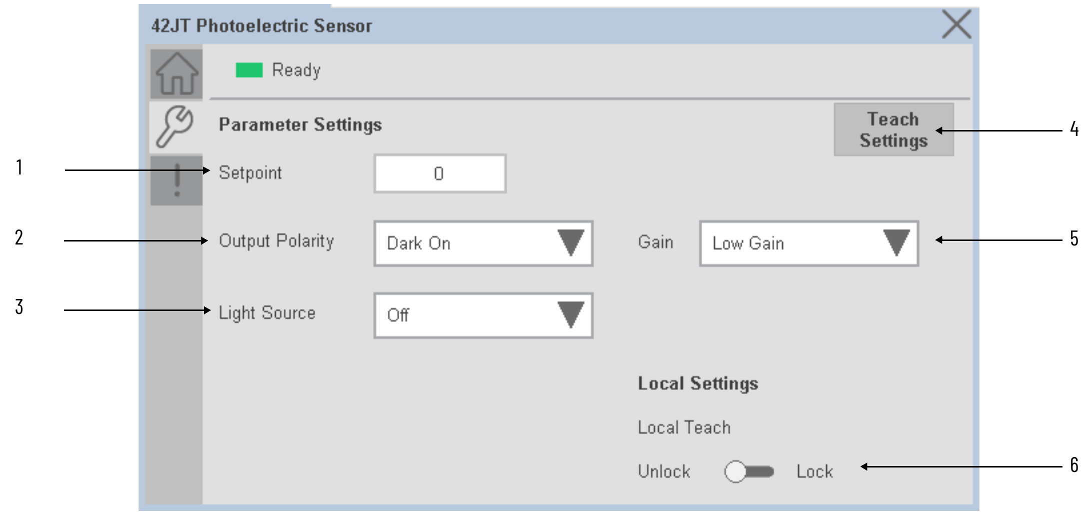
Item	Description
1	Banner- Ready Status
2	Application Specific Name - Read from device
3	Trigger Status OFF (0) = Gray LED ON (1) = Blue LED
4	Trigger Sparkline Trend The spark line shows trigger ON/OFF status over last 30 seconds

Configure Tab

The configuration tab displays the sensor parameter settings, as well as enabling the user to read data from the sensor.

The configuration section is divided into sections:

- Parameter Settings
- Local Settings
- Teach Settings



Item	Description
1	Setpoint: This parameter allows you to enter the threshold of when the sensor output turns ON. Valid setpoint ranges vary by specific sensor type: 42JT-D2x: 20…1000 42JT-P2x: 60…1000 42JT-B2LAT2x: 0…25000 42JT-B2LAT1x: 0…28000 42JT-B8LAT1x: 0…31700
2	Output Polarity: Polarity changes the sensor output to operate as Light On (Non Inverted) and Dark On (Inverted).
3	Light Source: Turn the sensor Light Source ON or OFF.
4	Teach Settings: Launch the teach settings window.
5	Gain: Current gain level of the sensor to operate in high or low conditions. A high gain helps ensure that the sensor is able to detect targets with good reflectivity at longer ranges or verify that targets with low reflectivity are also detected at shorter ranges.
6	Local Teach Unlock/Lock Toggle Switch: Locks unauthorized people from changing the sensor settings using the local device push buttons.Toggle the lock/unlock button to prevent parameterization using local push buttons.

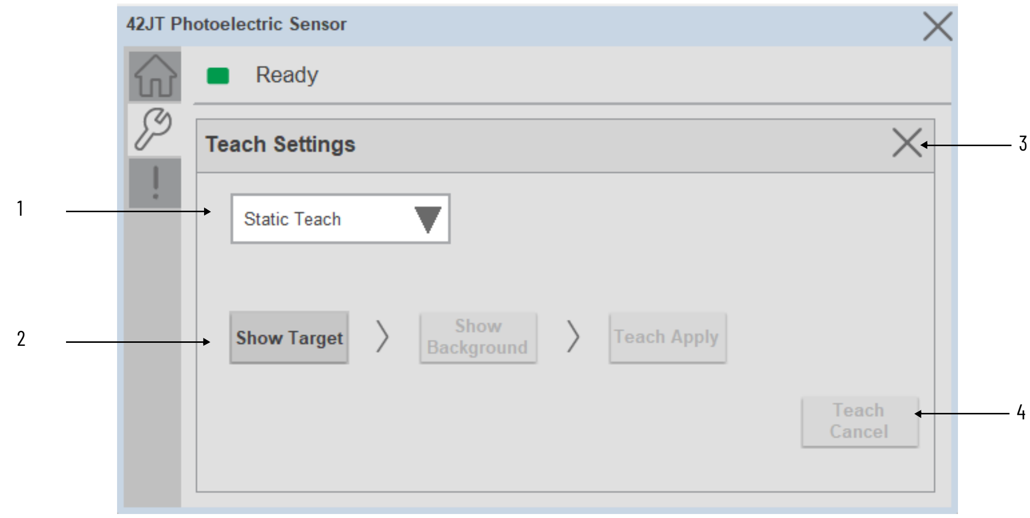
Teach Settings

Teach Settings display includes the Teach Methods, Teach Command & Teach Cancel buttons. Touch on the Teach Settings navigation button to access the Teach Settings tab.

Teach tab includes the following functions:

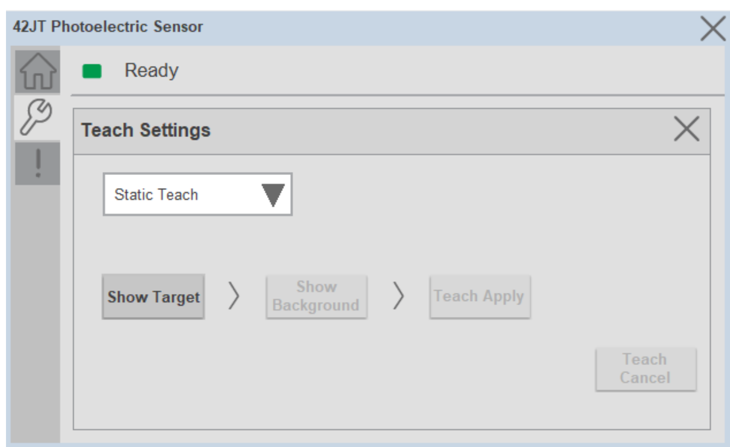
- Teach mode selection drop-down menu (Static/Dynamic/Precision)
- Teach procedure flow buttons
- Teach cancel button

The operator must complete each stage to teach sensor successfully. During the teach process the operator must complete the current stage prior to the next stage being made available to operator. At any stage of teaching, the process can be canceled by pressing cancel button. When operator cancels the teach process, all completed stages are cleared and the teach process will restart from initial stage.



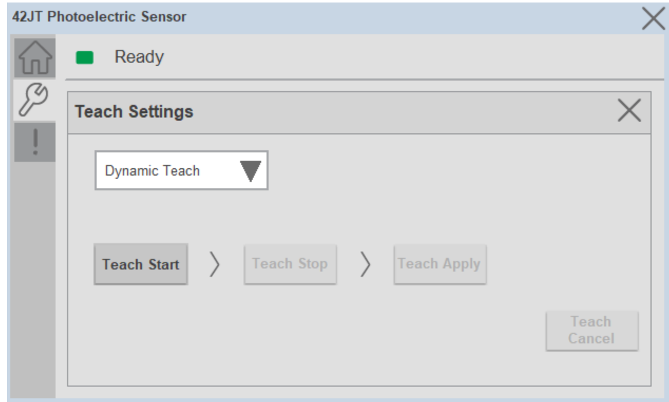
Item	Description
1	Teach Mode: - Static - Dynamic - Precision Teach
2	Teach procedure flow buttons
3	Teach setting window close button
4	Cancel: To cancel the procedure, you can send the "Teach Cancel" command at any point.

Teach mode - This parameter selects the desired mode.

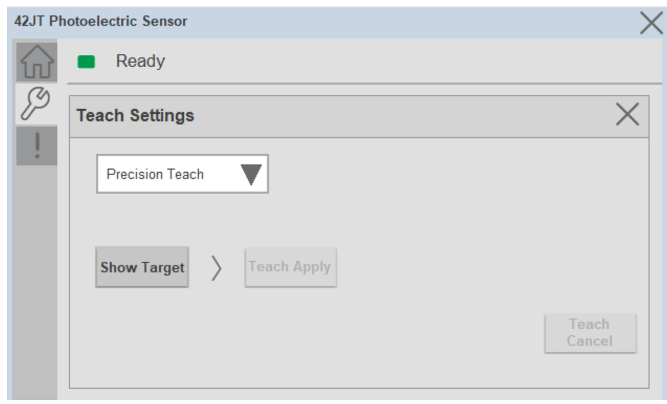


Static Teach - The first method is Static Teach, which is intended for applications where the web can be stopped, or for more challenging applications.

1. Place the target in front of the sensor and send the command to **"Static Teach - Show Target"**.
2. Show the background where the target will be present and then send the command **"Static Teach - Show Background"**.
3. To cancel the procedure, you can send the **"Teach Cancel"** command at any point.



Dynamic Teach - The second method is Dynamic Teach, which is intended for applications where the web can be Running.



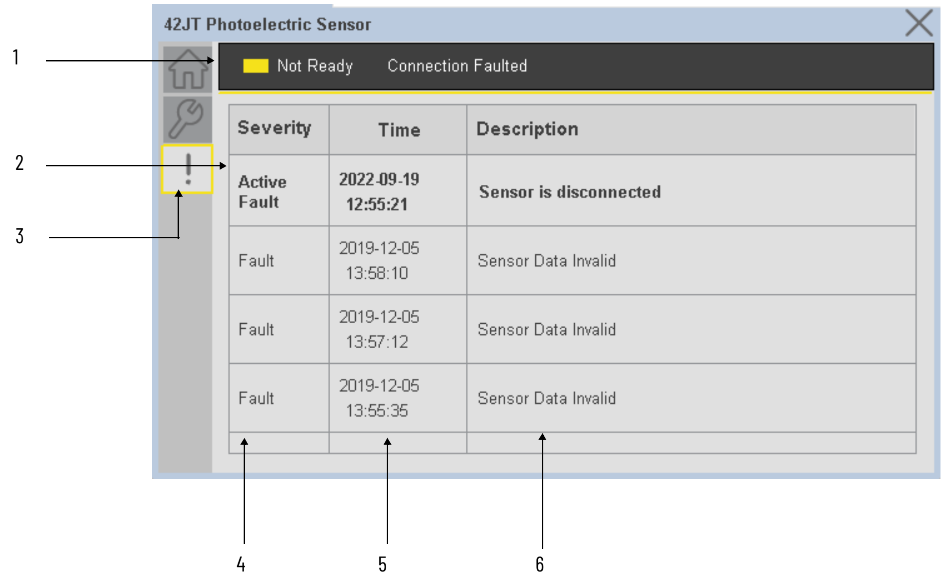
Precision Teach - The Precision Teach is intended for applications where the precise setting of the distance is more critical. This teach method is also recommended for contrast applications.

1. Place the target in front of the sensor and send the command to **"Precision Teach – Show Target"**.

Fault Warning Tab

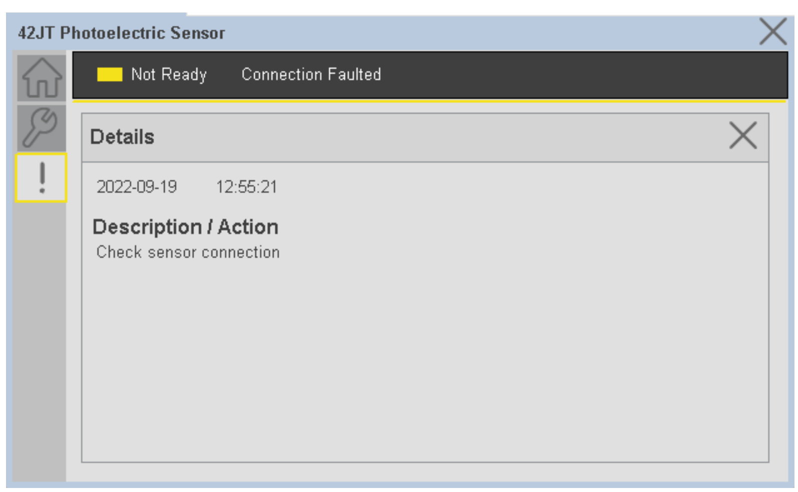
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

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.



Application Code Manager

IO-Link Device Library objects can be set-up and configured using Studio 5000 Application Code Manager.

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

Definition Objects: raC_Dvc_42JT_4IOL, raC_Dvc_42JT_8IOL

This object contains the AOI definition and used as linked library to implement object. There is one definition and per add-on instruction to support each IO-Link Master Module. 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 Objects: raC_LD_Dvc_42JT_4IOL, raC_LD_Dvc_42JT_8IOL

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
ChannelNumber				Select the Channel Number where the sensor is connected.
MasterName	MasterName	[MasterName]	Module	Select the IO-Link master module. If connecting to a non-library object module, enter the name of the master only. 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.

Note that if the tag names are manually entered or not linked to input channel tags a red 'X' will be shown beside the parameter. This is acceptable and the program can still be generated.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_42JT_4IOL	raC_Dvc_42JT_4IOL	3.1	(RA-LIB) Device	IO-Link
raC_Dvc_42JT_8IOL	raC_Dvc_42JT_8IOL	3.1	(RA-LIB) Device	IO-Link

Configured HMI Content

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

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewME\Global Object - ggfx
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewSE\Global Object - ggfx
V3_raC_Dvc_42JT	Faceplate ME	(raC-3_xx-ME) raC_Dvc_42JT-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_raC_Dvc_42JT	Faceplate SE	(raC-3_xx-SE) raC_Dvc_42JT-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_raC_Dvc_IOLink	View Designer	(raC-3_xx-VD) raC_Dvc_IOLink.vpd	{ProjectName}\Visualization\ViewDesigner - vpd
V3_RM_raC_Dvc_IO_Link	Reference Manual	DEVICE-RM300B-EN-P.pdf	{ProjectName}\Documentation
V3_IO_Link_Images	HMI Image Set	HMI FactoryTalk View Images - png.zip	{ProjectName}\Visualization\Images - png

871FM - Mini Flat Pack Sensor (raC_Dvc_871FM_4IOL, raC_Dvc_871FM_8IOL)

Overview

The 871FM Mini Flat Pack Sensor device object (raC_Dvc_871FM_4IOL, raC_Dvc_871FM_8IOL) includes HMI faceplates which displays device information including:

- Sensor data
- Sensor diagnostics
- Sensor configuration and parameters
- Process data trending
- Device Fault log

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_871FM_Objects_Faceplate.MP4"

Primary device object configuration functions include:

- **Locate:** This function helps to locate the sensors using the device's LED in large machines where there are several sensors close to each other.
- **Polarity:** This function changes the sensor output to operate as Not-Inverted (Light Operate) and Inverted (Dark Operate).

Functional Description

The 871FM Mini Flat Pack Sensor Sensor 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. 1.01) 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/* folder in the library. Each device is supplied with two versions of Add-On Instructions (AOI) and Rung import files - one for compatibility with each IO-Link Master Module. You must select the appropriate AOI for the master module being used.

Device/Item	Compatible IO-Link Master	Add-On Instruction	Rung Import
871FM	POINT I/O 1734-4IOL	raC_Dvc_871FM_4IOL_3.01_AOI.L5X	raC_Dvc_871FM_4IOL_3.01_RUNG.L5X
	ArmorBlock 1732E-8IOLM12R	raC_Dvc_871FM_8IOL_3.01_AOI.L5X	raC_Dvc_871FM_8IOL_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.

Note that a single faceplate is used for either the 4IOL or 8IOL versions of the Add-On Instruction.

Device/Item	Type	FactoryTalk View ME Faceplate	FactoryTalk View SE Faceplate
871FM	Display	(raC-3_01-ME) raC_Dvc_871FM-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_871FM-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - IO-Link Device.ggfx	(raC-3-SE) Toolbox - IO-Link 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
871FM	(raC-3_01-VD) raC_Dvc_IOLink.vpd

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.

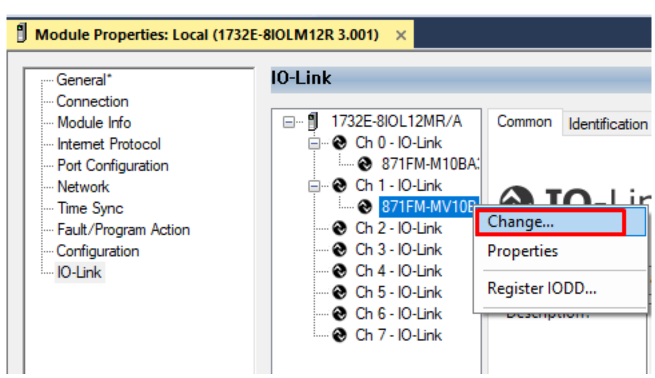
All Studio 5000 Application Code Manager files can be found in the */ApplicationCodeManagerLibraries/* folder of the library. The files included are as follows:

Implementation Object	Compatible IO-Link Master	Asset Control File (.HSL4)	Device File (.HSL4)
871FM	POINT I/O 1734-4IOL	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_871FM_4IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_871FM_4IOL_(3.1)
	ArmorBlock 1732E-8IOLM12R	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_871FM_8IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_871FM_8IOL_(3.1)

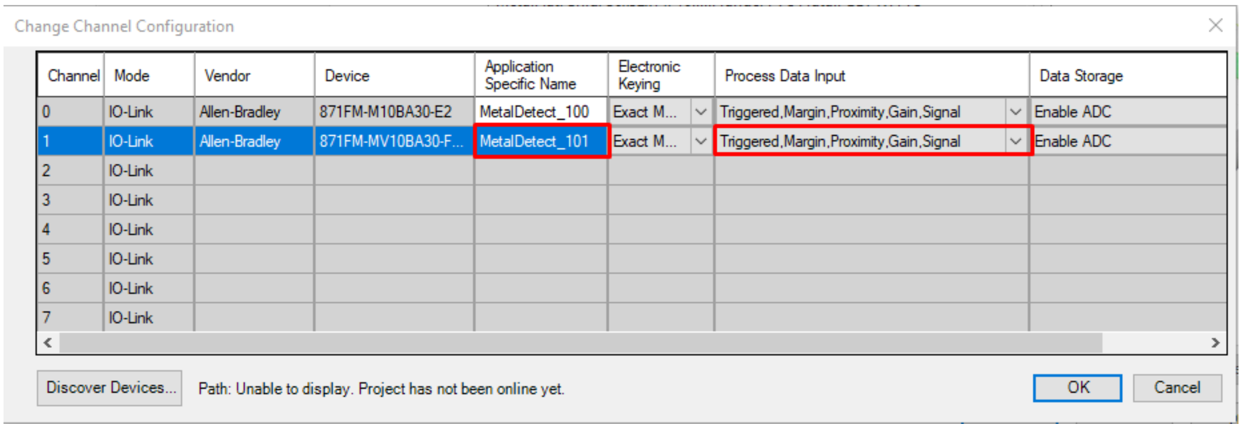
Device Definition

The device must be configured with the correct device definition. Proper device configuration enables the required cyclic device data to pass information from the device into the add-on instruction.

1. Click on Change...



2. Specify the Application Specific Name e.g. *MetalDetect_101*
3. Select the Process Data Input as *Triggered, Margin, Proximity, Gain, Signal.*



Operations

The IO-Link Device objects provide only physical operation mode. There is no virtual device mode offered.

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
Write_Index	Message Configuration Write	MESSAGE
Read_Index	Message Configuration Read	MESSAGE
Write_SubIndex	Message Configuration Write	MESSAGE
Read_SubIndex	Message Configuration Read	MESSAGE
Msg_Sensor_Data	Messaging Data	raC_UDT_871FM_Sensor_Data
Ref_Ctrl_Set	IO-Link Device Setting Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Set
Ref_Ctrl_Cmd	IO-Link Device Command Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Cmd
Ref_Ctrl_Sts	IO-Link Device Status Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSts
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[2]
Inp_I	Device Object Inputs	raC_UDT_ItfAD_871FM_Inp_4IOL Or raC_UDT_ItfAD_871FM_Inp_8IOL
Ref_Ctrl_Inf	Sensor Type Information Interface	raC_UDT_ItfAD_IOLinkSensor_Inf
Ref_Ctrl_Itf	Device Command, Status Information Interface	raC_UDT_ItfAD_IOLinkDevices

Input Data

Input	Function/Description	DataType
Inp_ChxTriggered	Triggered Status of Sensor	BOOL
Inp_ChXMarginLowAlarm	Margin Low Alarm of Sensor	BOOL
Inp_ChxProximityAlarm	Proximity Alarm of Senor	BOOL
Inp_ChxGain	Gain of Sensor	INT
Inp_ChxSiganalStrength	Signal Strength of Sensor	DINT
Inp_ChNumber	Configured Channel number for Master	SINT
Cfg_OutputPolarity	Set Output Polarity; 0 = Not Inverted, 1 = Inverted	SINT
Cmd_DisableLEDs	Indicator Disabled Command	BOOL
Cmd_EnableLEDs	Indicator Enabled Command	BOOL
Cmd_Locate	Locator Disable/Enable Command	BOOL
Cmd_ResetCount	Counter Reset Command	BOOL
Cmd_ResetDurations	Duration Reset Command	BOOL
Set_TrendMaxValue	Trend Tab Max value for VD/ME/SE faceplate	DINT
Set_TrendMinValue	Trend Tab Min value for VD/ME/SE faceplate	DINT

Output Data

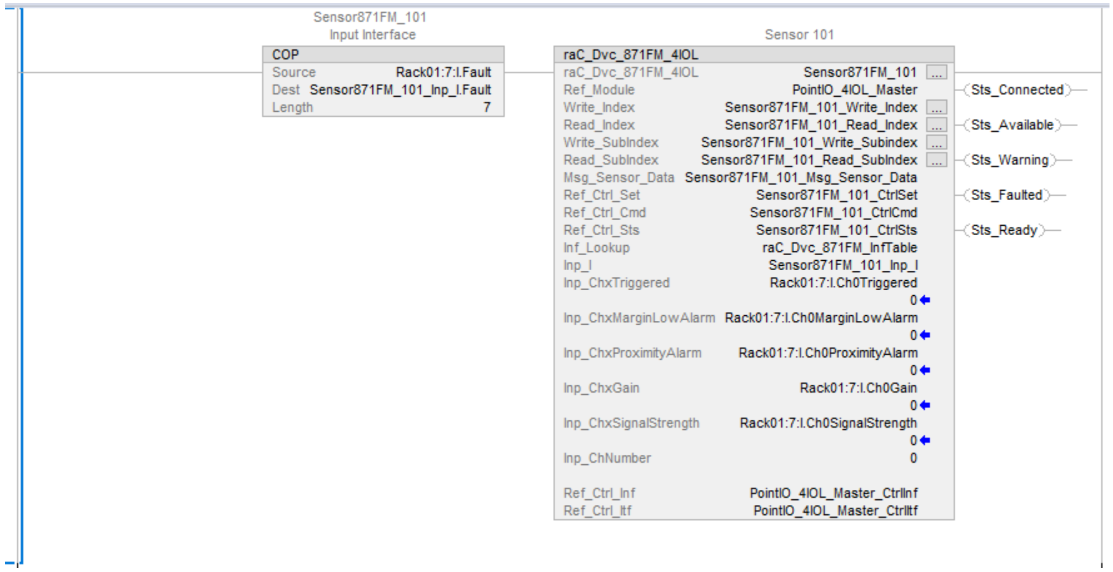
Output	Function/Descritpion	DataType
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Sts_Ready	Device is Ready	BOOL
Sts_Faulted	Device faulted status: 1 = an active fault exists	BOOL
Sts_Connected	Device is connected to the Programmable Controller	BOOL
Sts_bNotReady	Bitwise device 'not ready' reason 0: Reserved 1: Master Communication Loss 2: Master Not Available 3: 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
Sts_EnableLEDs	LED Indicator; 0= Disable, 1= Enable	BOOL
Sts_InhibitCfg	1=Inhibit user Configuration Parameters from HMI Faceplate; 0=Allow	BOOL
Sts_InhibitCmd	1=Inhibit user Configuration Parameters from HMI Faceplate; 0=Allow	BOOL
Sts_InhibitSet	1=Inhibit user Settings from HMI Faceplate; 0=Allow	BOOL
Sts_Located	Locator Indicator; 1= Located	BOOL
Val_Contrast	Sensor Contrast Level	INT
Val_NotTriggeredDuration	Sensor Output OFF Duration	DINT
Val_OperatingHrsSinceInception	Operating Hours Since Inception	DINT
Val_OperatingHrsSincePowerUp	Operating Hours Since Power Up	DINT
Val_OutputPolarity	Output Polarity Status, 0 = Not Inverted, 1 = Inverted	SINT
Val_PercentSP	Setpoint in Percent	DINT
Val_RangeMax	Sensor Maximum Range in Trend	DINT
Val_RangeMin	Sensor Minimum Range in Trend	DINT
Val_Setpoint	Setpoint Value To Turn ON Sensor Output	INT
Val_TemperatureCurrent	Internal Temperature Of Sensor	INT
Val_TemperatureMaxSinceInception	Maximum Temperature Since Inception	INT
Val_TemperatureMaxSincePowerUp	Maximum Temperature Since Power Up	INT
Val_TemperatureMinSinceInception	Minimum Temperature Since Inception	SINT
Val_TemperatureMinSincePowerUp	Minimum Temperature Since Power Up	INT
Val_Trigger_Counter	Sensor Counter Value	DINT
Val_TriggeredDuration	Sensor Output ON Duration	DINT

Programming Example

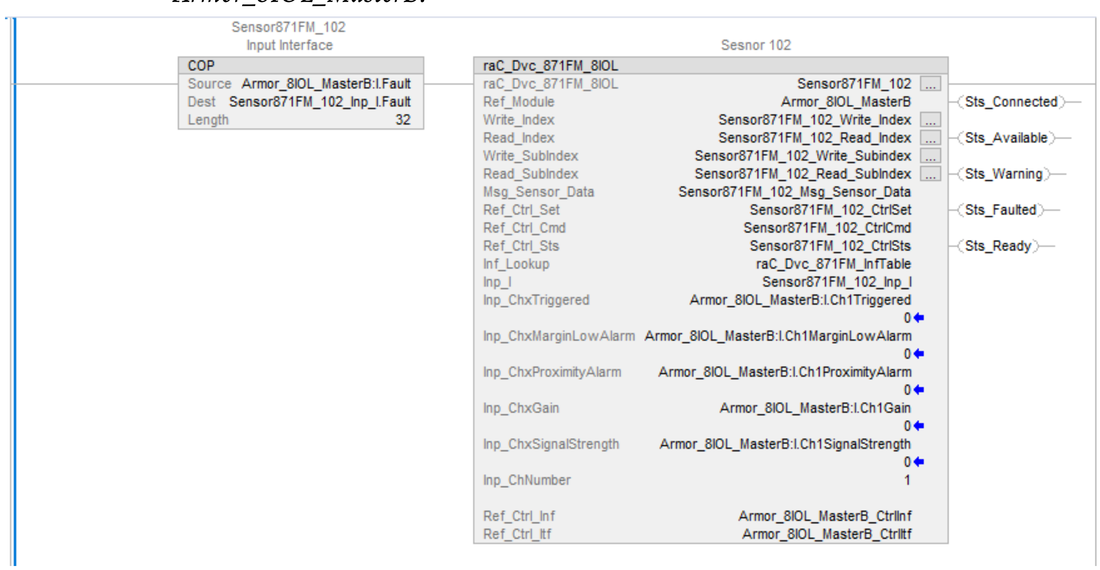
Fully configured device on a rung is provided below for reference.

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 following example uses the 871FM device object connected to channel #0 of a POINT I/O 1734-4IOL IO-Link Master module in slot #7 of a POINT I/O adapter named *Rack01*.



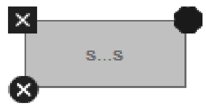
The following example uses the 871FM device object connected to channel #1 of a ArmorBlock 1732E-8IOLM12R IO-Link Master module in named *Armor_8IOL_MasterB*.



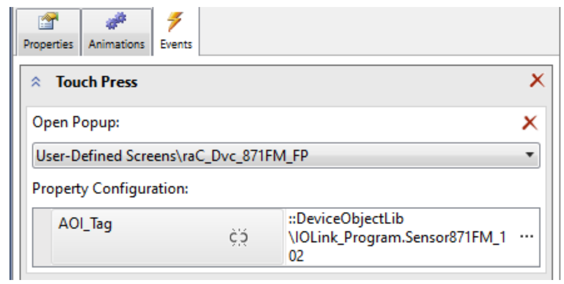
Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. See Basic Launch Button Attributes section for details on configuration and indicators.

FactoryTalk View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GO_LaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #104.	#102: AOI Backing Tag Instance (e.g. {::[PAC]Program::IOLinkProgram._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)

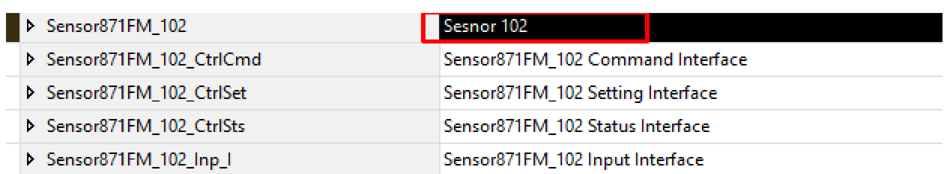
Studio 5000 View Designer Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	

Faceplates

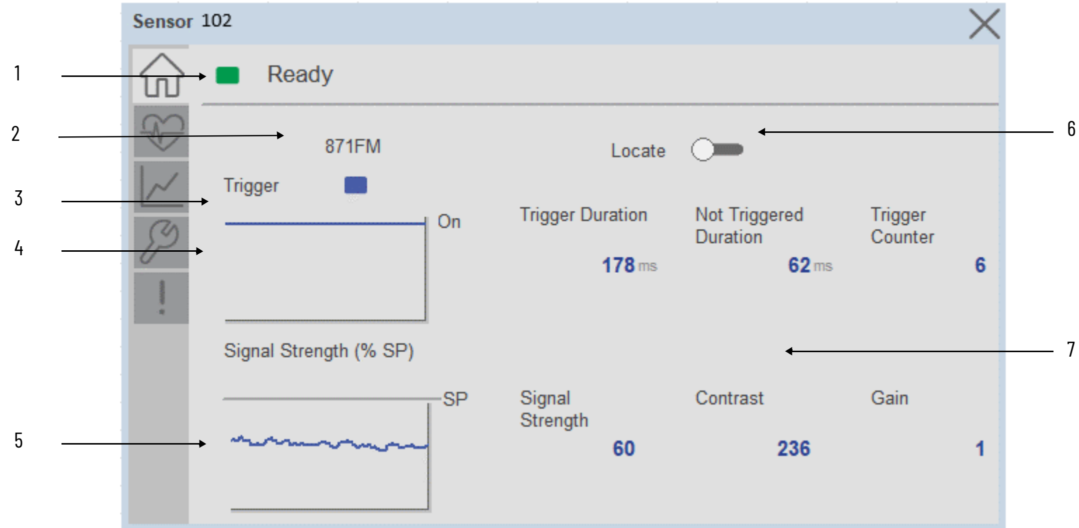
There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 30.

The faceplate title is linked to *_InstanceName.@description*, the *.@description* extended tag property of the Add-On Instruction instance. This is user-configurable from controller/program tags in Studio 5000 Logix Designer.



Home

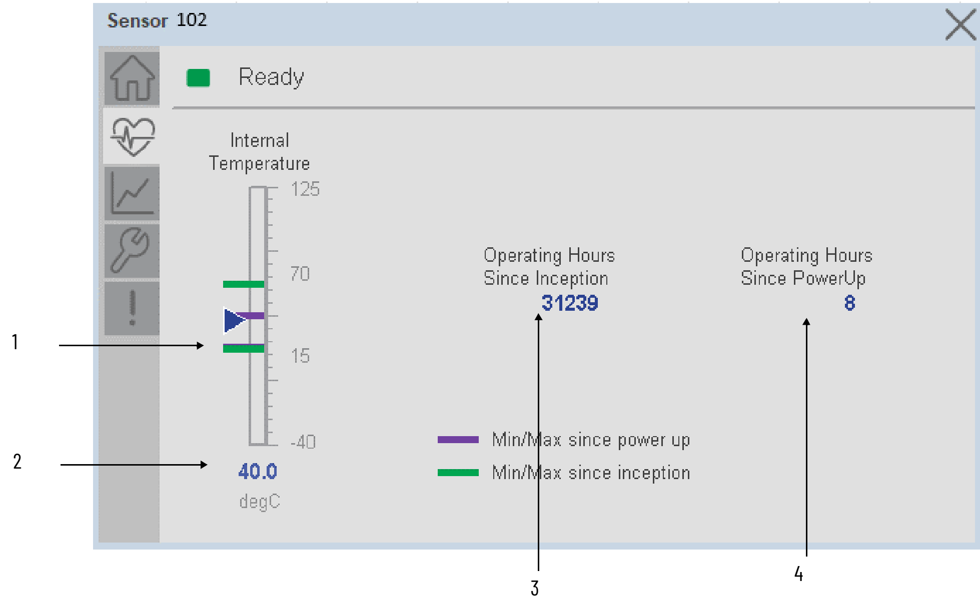
The Home tab is the main tab of the faceplate. It provides the status of the IO-Link device along with sensor process data and the Locate button.



Item	Description
1	Banner- Ready Status
2	Application Specific Name - Read from device
3	Trigger Status OFF (0) = Gray LED ON (1) = Blue LED
4	Trigger Sparkline Trend The spark line shows trigger ON/OFF status over last 30 seconds
5	Signal Strength (%) Sparkline Trend The spark line shows the signal strength value over last 30 seconds
6	Locate toggle switch Locate the sensor in large machines where there are several sensors close to each other. When Located, the sensor user interface (green and orange LEDs) start flashing synchronously until the operator disables this function
7	Process Data - Triggered Duration (ms): Displays the amount of time that the sensor output has been ON. To show the trigger duration on faceplate, required to make Timer Mode Enabled setting in AOP in Logix Designer. - Not Triggered Duration (ms): Displays the amount of time that the sensor output has been OFF. To show the trigger duration on faceplate, required to make Timer Mode Enabled setting in AOP in Logix Designer. - Trigger Counter: Displays the sensor counter value when enabled. The counter value increments every time the sensor is triggered this process data element can count up to 65535 and can be reset via reset count button from config tab. Refer to Appendix B for additional information about index. To show the trigger count on faceplate, required to make Counter Mode Enabled setting in AOP in Logix Designer. - Signal Strength (%): Signal Strength provides the raw measurement value of the amount of light reflected from the target. - Contrast: Displays the difference between the light signal levels that the sensor read the last time the output was ON versus the last time the output was OFF. - Gain: Displays the excess gain above the sensor threshold to ensure reliable detection of the target.

Health Tab

Health tab provides different diagnostic information of sensor which helps ensure that sensors are operating correctly.



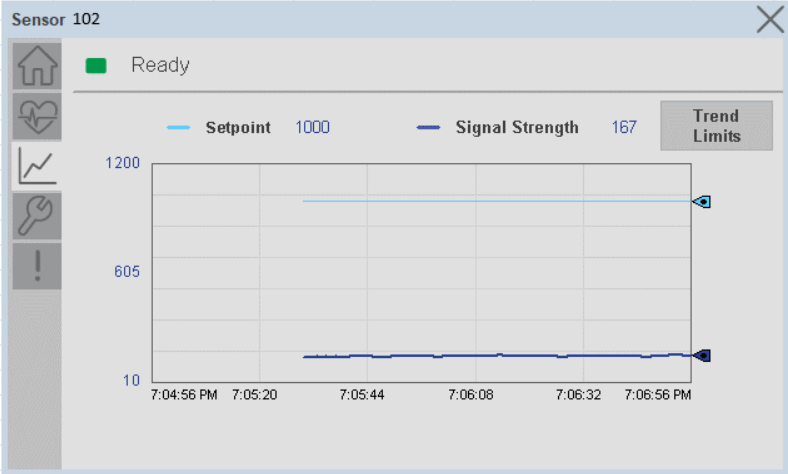
Item	Description
1	Internal Temperature Bar Graph Green Indicators: Min/Max since inception (lifetime) Purple Indicators: Min/Max since power up Light Blue Triangle Indicator: Current value
2	Internal Temperature Current Value
3	Operating Hours Since Inception (lifetime)
4	Operating Hours Since Power Up

Inception/Lifetime values are recorded since the first time the sensor was ever powered ON. These value are retained and not reset during default factory reset.

Power Up values are reset to zero and recorded new each time the sensor is power cycled.

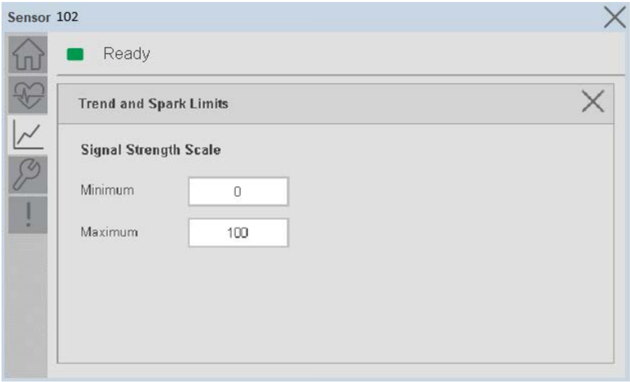
Trend Tab

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. One trend is displayed for Setpoint and Signal Strength.



Trend Settings Screen

We can set trend limits using configuration tab by clicking on the *Settings* button present on trend screen. This sub screen display contains two numeric input elements that allow the user to enter the minimum and maximum values to be used on the Trend screen for Setpoint & Signal strength.

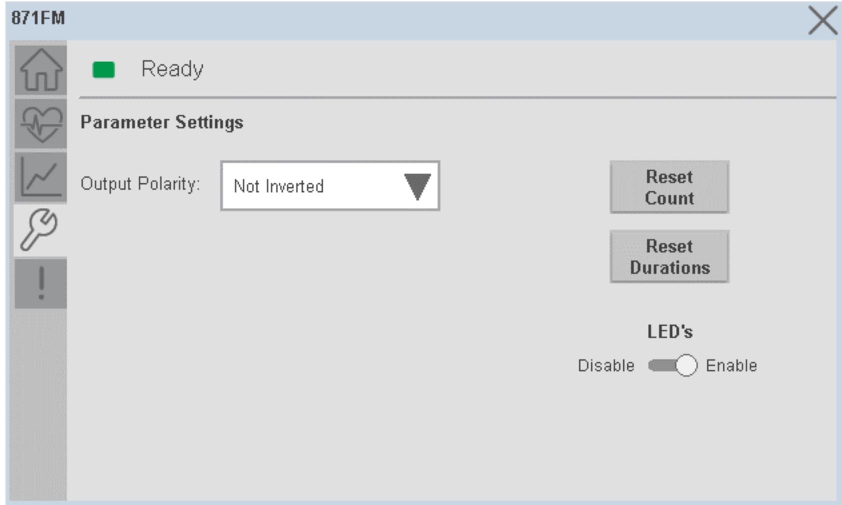


Configure Tab

The configuration tab displays the sensor parameter settings, as well as enabling the user to read data from the sensor.

The configuration section is divided into sections:

- Parameter Settings
- Local Settings



Parameter Settings

Output Polarity - Polarity changes the sensor output to operate as Not Inverted (Light On) and Inverted (Dark On). Click on output polarity drop-down selector object to switch between Light On & Dark On.

Trigger Settings

Reset Count - Allows users to reset the counter function, it will reset the sensor counts to zero.

Reset Duration - Allows users to reset the timer function, it will reset Duration Triggered & Duration Not Triggered time.

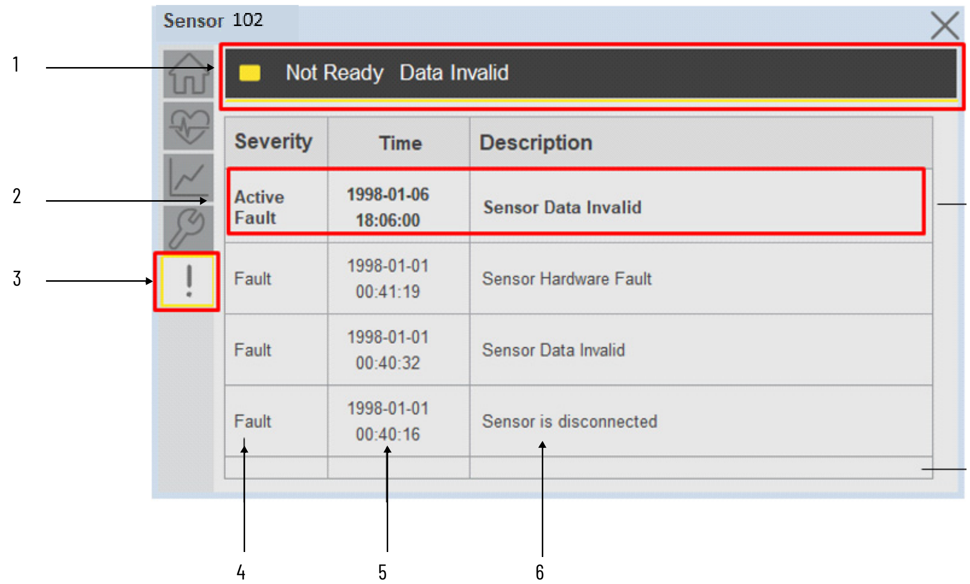
Local Settings

Disable/Enable LEDs - This parameter allows operators to turn OFF or turn ON the User Interface LEDs (green and orange LEDs). This parameter is ideal for applications where turning OFF the LEDs is desired to accommodate the application.

Fault Warning Tab

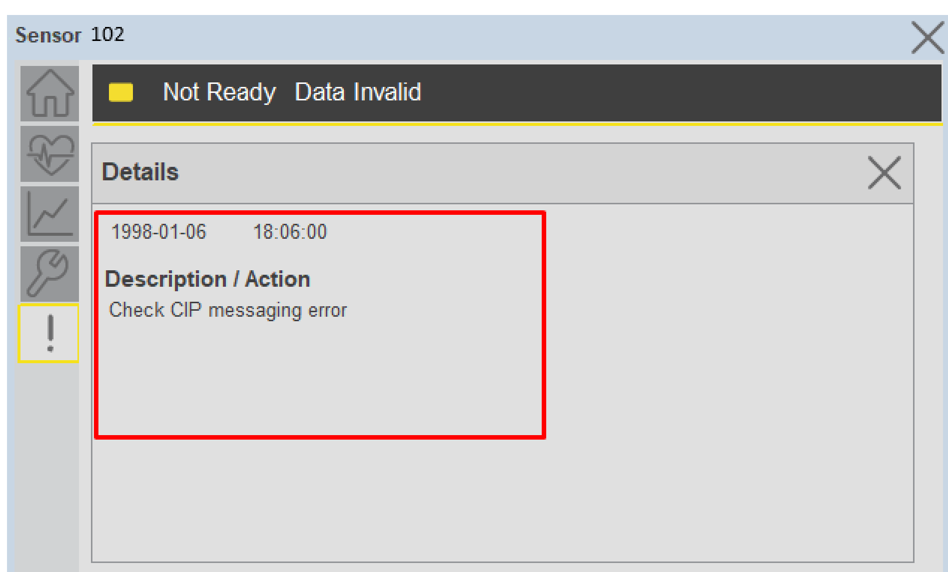
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

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.



Application Code Manager

IO-Link Device Library objects can be set-up and configured using Studio 5000 Application Code Manager.

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

Definition Objects: raC_Dvc_871FM_4IOL, raC_Dvc_871FM_8IOL

This object contains the AOI definition and used as linked library to implement object. There is one definition and per add-on instruction to support each IO-Link Master Module. 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 Objects: raC_LD_Dvc_871FM_4IOL, raC_LD_Dvc_871FM_8IOL

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
ChannelNumber				Select the Channel Number where the sensor is connected.
SensorType				Select the sensor type as per version of the device.
MasterName	MasterName	[MasterName]	Module	Select the IO-Link master module. If connecting to a non-library object module, enter the name of the master only. 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.

Note that if the tag names are manually entered or not linked to input channel tags a red 'X' will be shown beside the parameter. This is acceptable and the program can still be generated.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_871FM_4IOL	raC_Dvc_871FM_4IOL	3.1	(RA-LIB) Device	IO-Link
raC_Dvc_871FM_8IOL	raC_Dvc_871FM_8IOL	3.1	(RA-LIB) Device	IO-Link

Configured HMI Content

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

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewME\Global Object - ggfx
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewSE\Global Object - ggfx
V3_raC_Dvc_871FM	Faceplate ME	(raC-3_xx-ME) raC_Dvc_871FM-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_raC_Dvc_871FM	Faceplate SE	(raC-3_xx-SE) raC_Dvc_871FM-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_raC_Dvc_IOLink	View Designer	(raC-3_xx-VD) raC_Dvc_IOLink.vpd	{ProjectName}\Visualization\ViewDesigner - vpd
V3_RM_raC_Dvc_IO_Link	Reference Manual	DEVICE-RM300B-EN-P.pdf	{ProjectName}\Documentation
V3_IO_Link_Images	HMI Image Set	HMI FactoryTalk View Images - png.zip	{ProjectName}\Visualization\Images - png

871C - Mini Tubular Sensor(raC_Dvc_871C_4IOL, raC_Dvc_871C_8IOL)

Overview

The 871C Mini Tubular Sensor device object (raC_Dvc_871C_4IOL, raC_Dvc_871C_8IOL) includes HMI faceplates which displays device information including:

- Sensor data
- Diagnostic Data
- Sensor configuration and parameters
- Device Fault log

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_*871C*_Objects_Faceplate.MP4"

Primary device object configuration functions include:

- **Timer Settings:** This function helps to manipulating the output of the sensor in relation to timing. It is useful for precision applications where the output of the sensor must be precisely triggered at a certain time.

Functional Description

The 871C Mini Tubular Sensor pre-configured Device Objects:

- Collect, Process and Deliver Data between Smart Devices and Application Logic
- Provide Device Status 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. 1.01) 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/* folder in the library. Each device is supplied with two versions of Add-On Instructions (AOI) and Rung import files - one for compatibility with each IO-Link Master Module. You must select the appropriate AOI for the master module being used.

Device/Item	Compatible IO-Link Master	Add-On Instruction	Rung Import
871C	POINT I/O 1734-4IOL	raC_Dvc_871C_4IOL_3.01_AOI.L5X	raC_Dvc_871C_4IOL_3.01_RUNG.L5X
	ArmorBlock 1732E-8IOLM12R	raC_Dvc_871C_8IOL_3.01_AOI.L5X	raC_Dvc_871C_8IOL_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.

Note that a single faceplate is used for either the 4IOL or 8IOL versions of the Add-On Instruction.

Device/Item	Type	FactoryTalk View ME Faceplate	FactoryTalk View SE Faceplate
871C	Display	(raC-3_01-ME) raC_Dvc_871C-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_871C-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - IO-Link Device.ggfx	(raC-3-SE) Toolbox - IO-Link 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
871C	(raC-3_01-VD) raC_Dvc_IOLink.vpd

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.

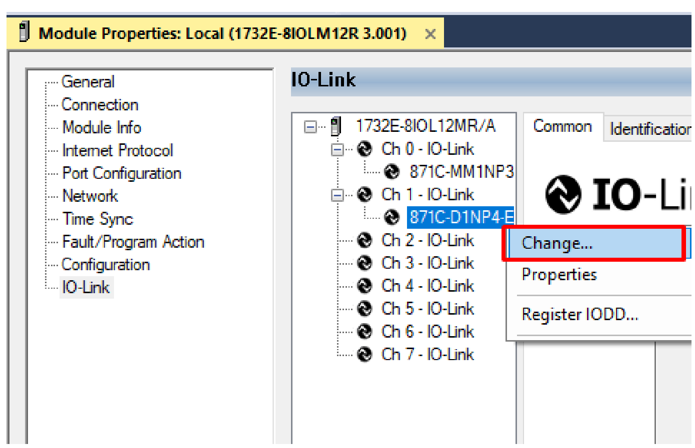
All Studio 5000 Application Code Manager files can be found in the /*ApplicationCodeManagerLibraries*/ folder of the library. The files included are as follows:

Implementation Object	Compatible IO-Link Master	Asset Control File (.HSL4)	Device File (.HSL4)
871C	POINT I/O 1734-4IOL	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_871C_4IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_871C_4IOL_(3.1)
	ArmorBlock 1732E-8IOLM12R	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_871C_8IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_871C_8IOL_(3.1)

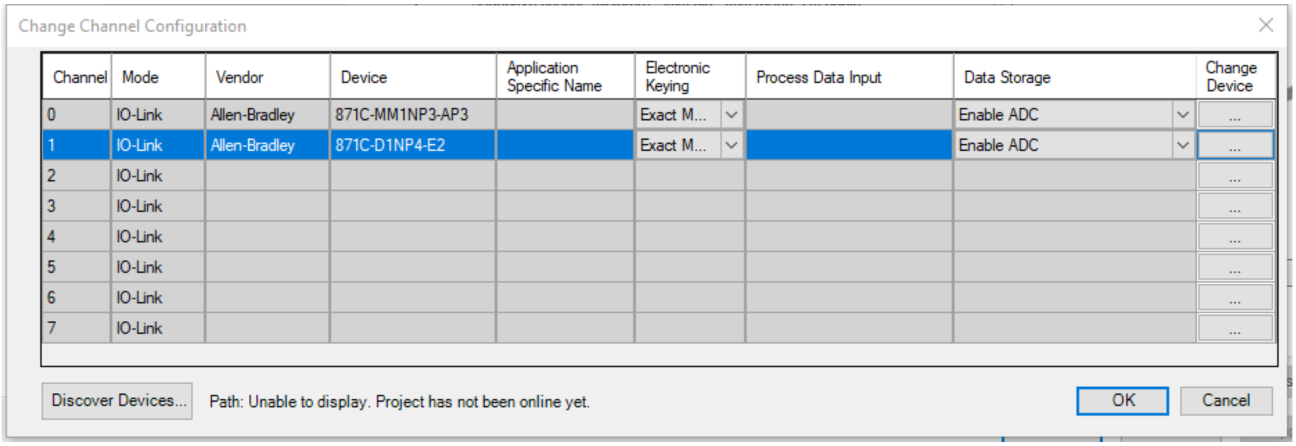
Device Definition

The device must be configured with the correct device definition. Proper device configuration enables the required cyclic device data to pass information from the device into the add-on instruction.

1. Click on Change...



2. Apply the following Channel Configuration for 871C.



Operations

The IO-Link Device objects provide only physical operation mode. There is no virtual device mode offered.

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
Write_Index	Message Configuration Write	MESSAGE
Read_Index	Message Configuration Read	MESSAGE
Write_SubIndex	Message Configuration Write	MESSAGE
Read_SubIndex	Message Configuration Read	MESSAGE
Msg_Sensor_Data	Messaging Data	raC_UDT_871C_Sensor_Data
Ref_Ctrl_Set	IO-Link Device Setting Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Set
Ref_Ctrl_Cmd	IO-Link Device Command Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Cmd
Ref_Ctrl_Sts	IO-Link Device Status Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSts
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[2]
Inp_I	Device Object Inputs	raC_UDT_ItfAD_871C_Inp_4IOL Or raC_UDT_ItfAD_871C_Inp_8IOL
Ref_Ctrl_Inf	Sensor Type Information Interface	raC_UDT_ItfAD_IOLinkSensor_Inf
Ref_Ctrl_Itf	Device Command, Status Information Interface	raC_UDT_ItfAD_IOLinkDevices

Input Data

Input	Function/Description	DataType
Inp_ChXTriggered	Triggered Status of Sensor	BOOL
Inp_ChNumber	Configured Channel number for Master	SINT
Cfg_BaseTime	Set Time Base for setting delay; 0= 0.1 ms, 1 = 0.4 ms, 2 = 1.6 ms, 3 = 6.4 ms	DINT
Cfg_TimerMode	Set the Timer Mode; 0 = No Timer, 1 = Off Delay, 2 = On Delay, 3 = On Delay and Off Delay	DINT
Set_Multiplier	Set Multiplier for setting delay; 0 to 63	INT
Cmd_ResetCount	Counter Reset Command	BOOL

Output Data

Output	Function/Descritpion	DataType
Sts_Connected	Device is connected to the Programmable Controller	BOOL
Sts_Available	Device is available for interaction with user code	BOOL
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Sts_Faulted	Device faulted status: 1 = an active fault exists	BOOL
Sts_Ready	Device is Ready	BOOL
Sts_Active	Device active status: 1 = output power structure is active	BOOL

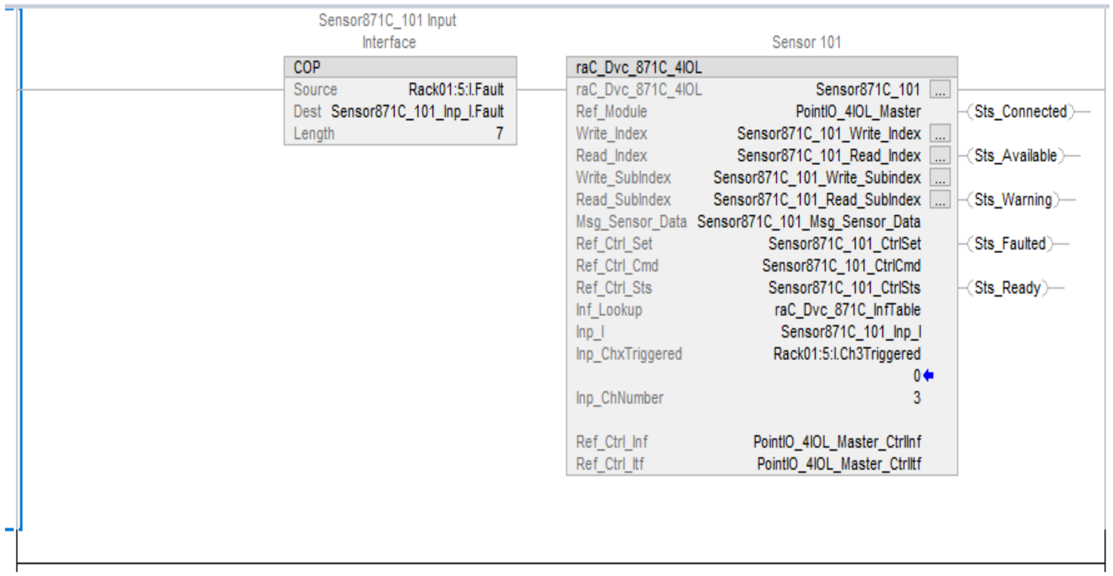
Output	Function/Descritpion	DataType
Sts_bNotReady	Bitwise device 'not ready' reason 0: Reserved 1: Master Communication Loss 2: Master Not Available 3: Faulted 4 - 31: Reserved	DINT
Sts_InhibitCfg	1=Inhibit user Configuration Parameters from HMI Faceplate; 0=Allow	BOOL
Sts_InhibitCmd	1=Inhibit user Configuration Parameters from HMI Faceplate; 0=Allow	BOOL
Sts_InhibitSet	1=Inhibit user Settings from HMI Faceplate; 0=Allow	BOOL
Val_BaseTime	Value for Time Base for setting delay; 0= 0.1 ms, 1 = 0.4 ms, 2 = 1.6 ms, 3 = 6.4 ms	INT
Val_Counter	Sensor Counter Value	INT
Val_Multiplier	Value of Multiplier for setting delay; 0 to 255	INT
Val_TimerMode	Value of the Timer Mode; 0 = No Timer, 1 = Off Delay, 2 = On Delay, 3 = On Delay and Off Delay	INT
Val_TemperatureCurrent	Actual internal Sensor Temperature	REAL
Val_TemperatureMaxSinceInception	Maximum internal sensor temperature over whole sensor lifetime	REAL

Programming Example

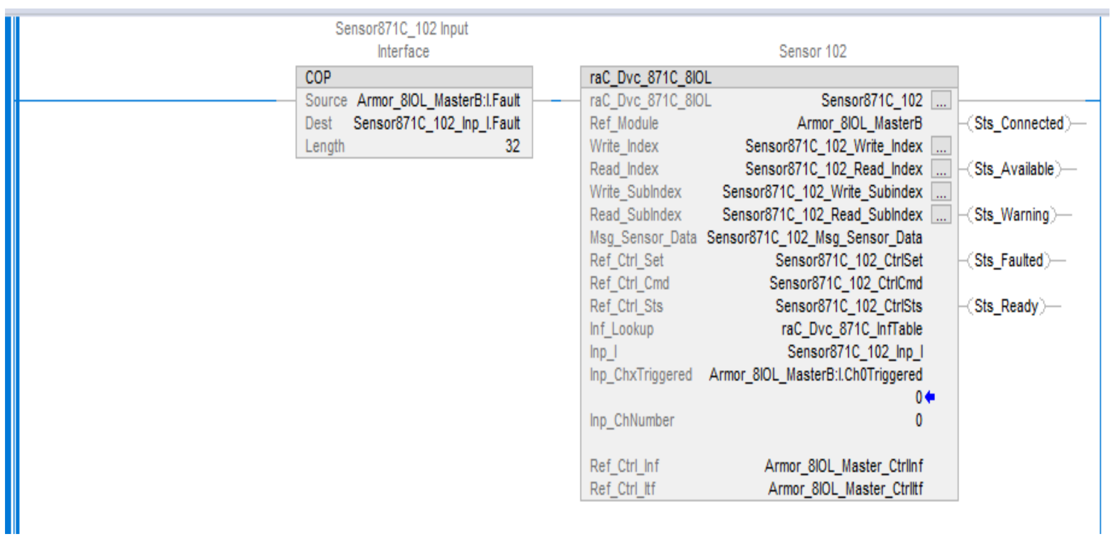
Fully configured device on a rung is provided below for reference.

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 following example uses the 871C device object connected to channel #3 of a POINT I/O 1734-4IOL IO-Link Master module in slot #5 of a POINT I/O adapter named *Rack01*.



The following example uses the 871C device object connected to channel #0 of a ArmorBlock 1732E-8IOLM12R IO-Link Master module in named *Armor_8IOL_MasterB*.



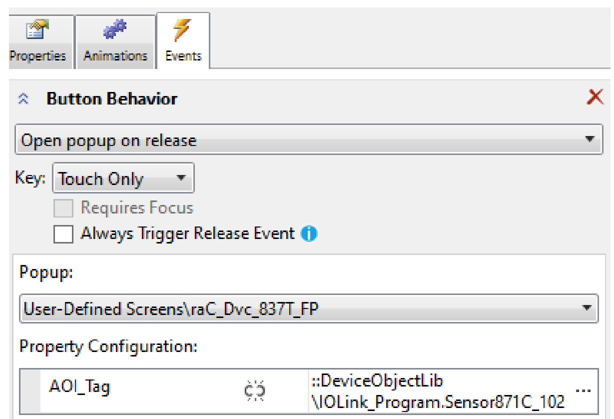
Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. See Basic Launch Button Attributes section for details on configuration and indicators.

FactoryTalk View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GO_LaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #104.	#102: AOI Backing Tag Instance (e.g. {::[PAC]Program::IOLinkProgram._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)

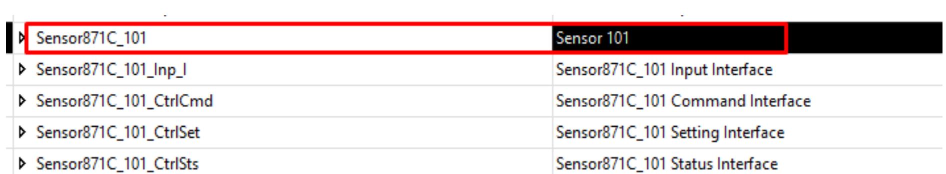
Studio 5000 View Designer Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	

Faceplates

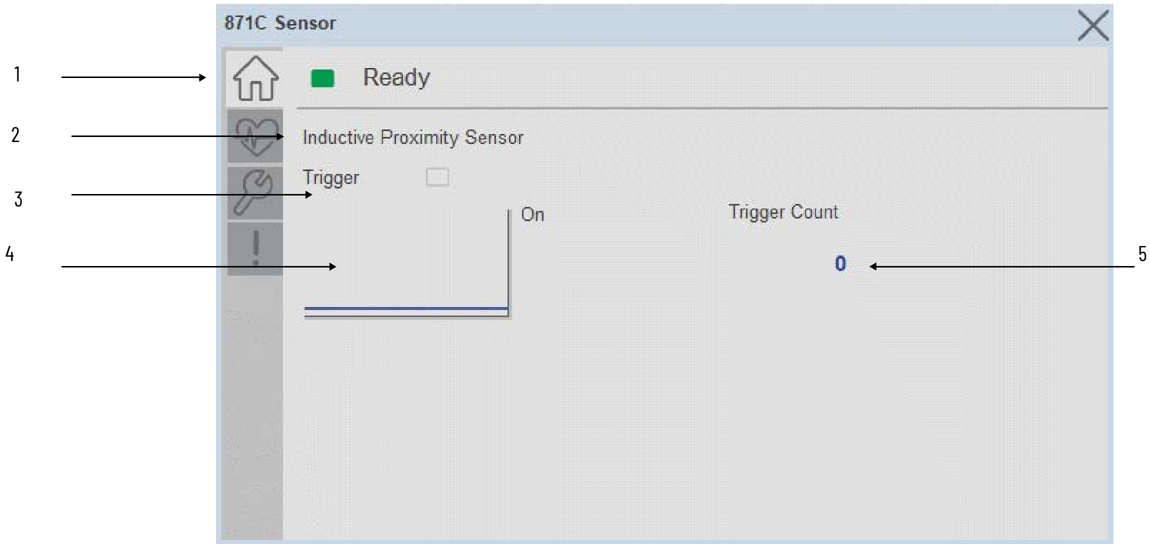
There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 30.

The faceplate title is linked to *_InstanceName.@description*, the *.@description* extended tag property of the Add-On Instruction instance. This is user-configurable from controller/program tags in Studio 5000 Logix Designer.



Home

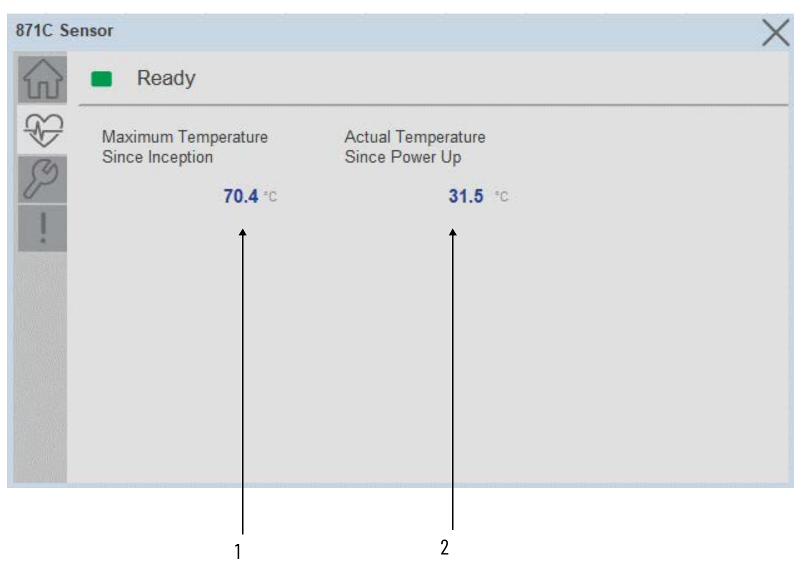
The Home tab is the main tab of the faceplate. It provides the status of the IO-Link device along with sensor process data.



Item	Description
1	Banner- Ready Status
2	Sensor Name
3	Trigger Status OFF (0) = Gray LED ON (1) = Blue LED
4	Trigger Sparkline Trend The spark line shows trigger ON/OFF status over last 30 seconds
5	Trigger Counter

Health Tab

Health tab provides different diagnostic information of sensor which helps ensure that sensors are operating correctly.



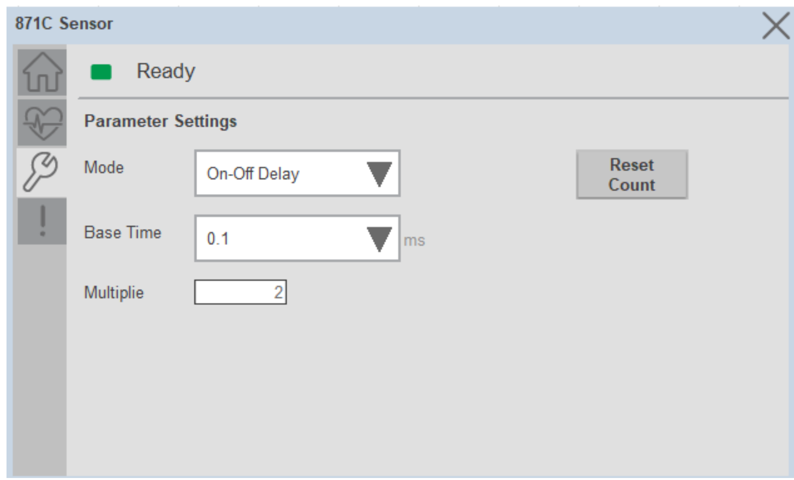
Item	Description
1	Provides maximum internal sensor temperature over the sensor lifetime.
2	Live internal sensor temperature when read.

Configure Tab

The configuration tab displays the sensor parameter settings, as well as enabling the user to read data from the sensor.

The configuration section include

- Parameter Settings



Base Time- While sensing the Target if user wants to add Time delay, it is added with combination of base time and multiplier. Here unit of Base time is milliseconds. Click on Base Time drop-down selector object to select different Base times like 0.1, 0.4, 1.6 and 6.4

Multiplier- While counting the object if user wants to add Time delay, it is added with combination of base time and multiplier. This parameter allows you to enter the Multiplier values.

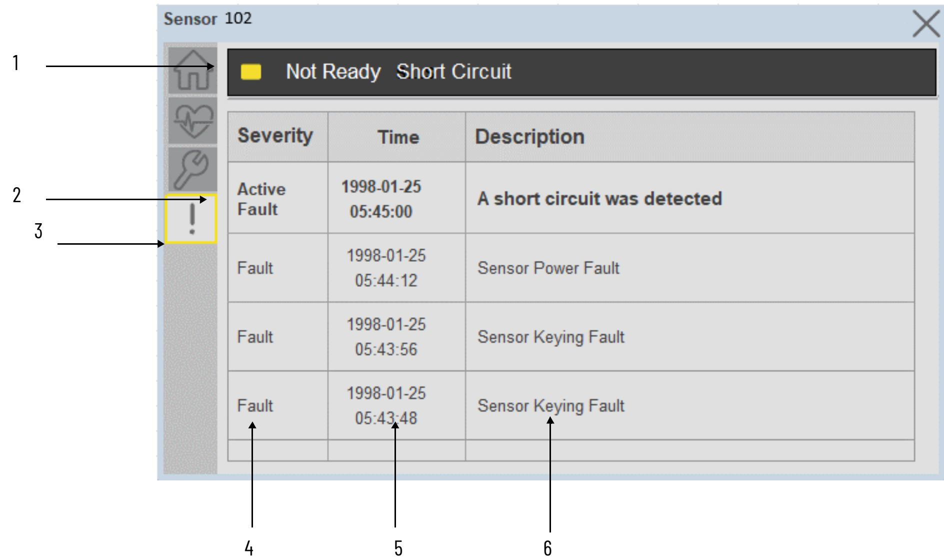
Mode- The switching timer is a useful function for manipulating the output of the sensor in relation to timing. It is useful for precision applications where the output of the sensor must be precisely triggered at a certain time. Click on Mode drop-down selector object to select different Timer modes like No Timer, Off Delay, On Delay and On Delay and Off Delay

Reset Count - Allows users to reset the counter function, it will reset the sensor counts to zero

Fault Warning Tab

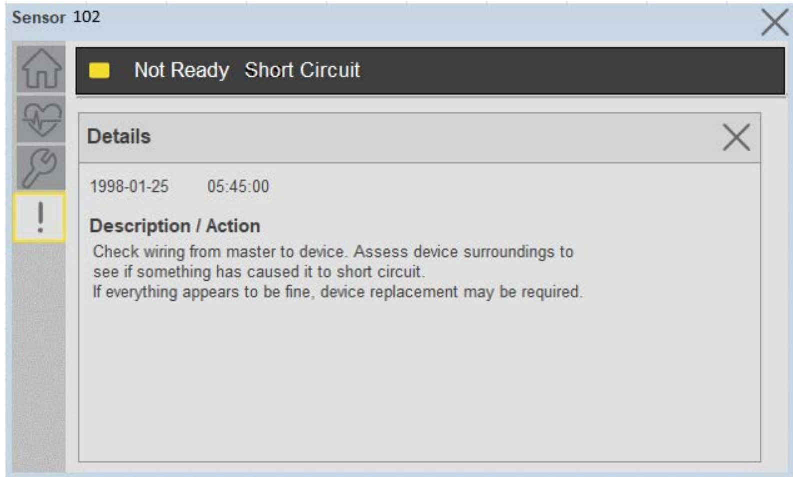
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

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.



Application Code Manager

IO-Link Device Library objects can be set-up and configured using Studio 5000 Application Code Manager.

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

Definition Objects: raC_Dvc_871C_4IOL, raC_Dvc_871C_8IOL

This object contains the AOI definition and used as linked library to implement object. There is one definition and per add-on instruction to support each IO-Link Master Module. 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 Objects: raC_LD_Dvc_871C_4IOL, raC_LD_Dvc_871C_8IOL

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
ChannelNumber				Select the Channel Number where the sensor is connected.

Parameter Name	Default Value	Instance Name	Definition	Description
MasterName	MasterName	[MasterName]	Module	Select the IO-Link master module. If connecting to a non-library object module, enter the name of the master only. 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.

Note that if the tag names are manually entered or not linked to input channel tags a red 'X' will be shown beside the parameter. This is acceptable and the program can still be generated.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_871C_4IOL	raC_Dvc_871C_4IOL	3.1	(RA-LIB) Device	IO-Link
raC_Dvc_871C_8IOL	raC_Dvc_871C_8IOL	3.1	(RA-LIB) Device	IO-Link

Configured HMI Content

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

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewME\Global Object - ggfx
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewSE\Global Object - ggfx
V3_raC_Dvc_871C	Faceplate ME	(raC-3_xx-ME) raC_Dvc_871C-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_raC_Dvc_871C	Faceplate SE	(raC-3_xx-SE) raC_Dvc_871C-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_raC_Dvc_IOLink	View Designer	(raC-3_xx-VD) raC_Dvc_IOLink.vpd	{ProjectName}\Visualization\ViewDesigner - vpd
V3_RM_raC_Dvc_IO_Link	Reference Manual	DEVICE-RM300B-EN-P.pdf	{ProjectName}\Documentation
V3_IO_Link_Images	HMI Image Set	HMI FactoryTalk View Images - png.zip	{ProjectName}\Visualization\Images - png

871TM - Tubular Stainless Steel Sensor (raC_Dvc_871TM_4IOL, raC_Dvc_871TM_8IOL)

Overview

The 871TM Tubular Stainless Steel Sensor device object (raC_Dvc_871TM_4IOL, raC_Dvc_871TM_8IOL) includes HMI faceplates which displays device information including:

- Sensor data
- Sensor configuration and parameters
- Device Fault log

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_*871TM*_Objects_Faceplate.MP4"

Primary device object configuration functions include:

- **Timer Settings:** This function helps to manipulating the output of the sensor in relation to timing. It is useful for precision applications where the output of the sensor must be precisely triggered at a certain time.

Functional Description

The 871TM Tubular Stainless Steel Sensor Sensor pre-configured Device Objects:

- Collect, Process and Deliver Data between Smart Devices and Application Logic
- Provide Device Status 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. 1.01) 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/* folder in the library. Each device is supplied with two versions of Add-On Instructions (AOI) and Rung import files - one for compatibility with each IO-Link Master Module. You must select the appropriate AOI for the master module being used.

Device/Item	Compatible IO-Link Master	Add-On Instruction	Rung Import
871TM	POINT I/O 1734-4IOL	raC_Dvc_871TM_4IOL_3.01_AOI.L5X	raC_Dvc_871TM_4IOL_3.01_RUNG.L5X
	ArmorBlock 1732E-8IOLM12R	raC_Dvc_871TM_8IOL_3.01_AOI.L5X	raC_Dvc_871TM_8IOL_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.

Note that a single faceplate is used for either the 4IOL or 8IOL versions of the Add-On Instruction.

Device/Item	Type	FactoryTalk View ME Faceplate	FactoryTalk View SE Faceplate
871TM	Display	(raC-3_01-ME) raC_Dvc_871TM-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_871TM-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - IO-Link Device.ggfx	(raC-3-SE) Toolbox - IO-Link 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
871TM	(raC-3_01-VD) raC_Dvc_IOLink.vpd

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.

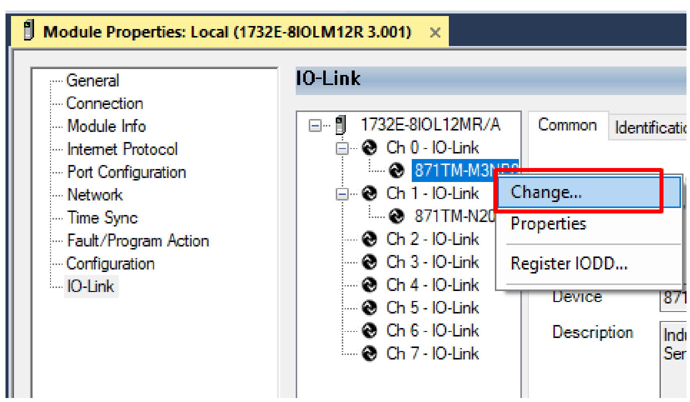
All Studio 5000 Application Code Manager files can be found in the */ApplicationCodeManagerLibraries/* folder of the library. The files included are as follows:

Implementation Object	Compatible IO-Link Master	Asset Control File (.HSL4)	Device File (.HSL4)
871TM	POINT I/O 1734-4IOL	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_871TM_4IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_871TM_4IOL_(3.1)
	ArmorBlock 1732E-8IOLM12R	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_871TM_8IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_871TM_8IOL_(3.1)

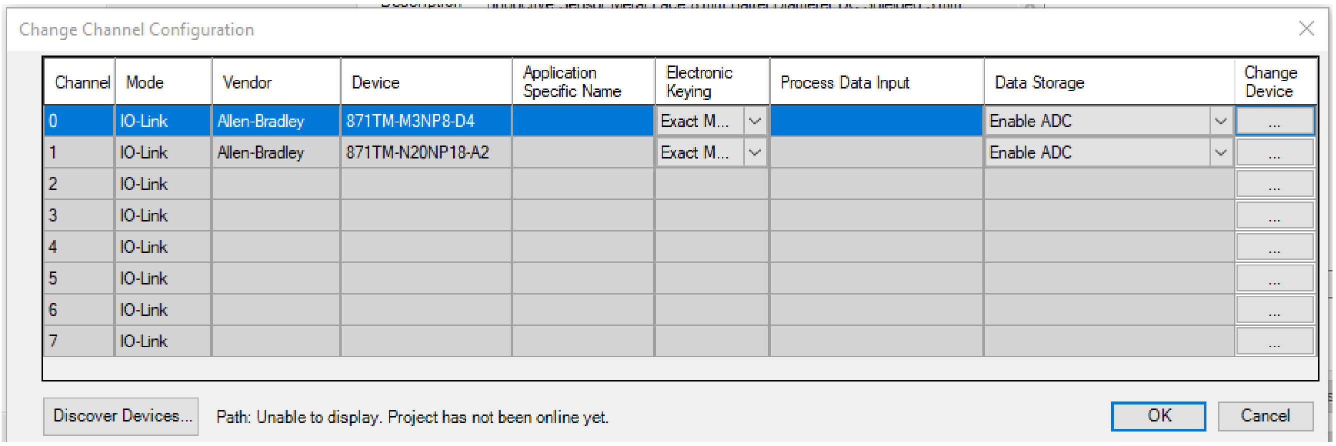
Device Definition

The device must be configured with the correct device definition. Proper device configuration enables the required cyclic device data to pass information from the device into the add-on instruction.

1. Click on Change…



2. Apply the following Channel Configuration for 871TM.



Operations

The IO-Link Device objects provide only physical operation mode. There is no virtual device mode offered.

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
Write_Index	Message Configuration Write	MESSAGE
Read_Index	Message Configuration Read	MESSAGE
Write_SubIndex	Message Configuration Write	MESSAGE
Read_SubIndex	Message Configuration Read	MESSAGE
Msg_Sensor_Data	Messaging Data	raC_UDT_871TM_Sensor_Data
Ref_Ctrl_Set	IO-Link Device Setting Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Set
Ref_Ctrl_Cmd	IO-Link Device Command Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Cmd
Ref_Ctrl_Sts	IO-Link Device Status Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSts
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[2]
Inf_Lookup_HEX	List Entry for Timer and Multiplier Selection	raC_UDT_Hex_Code_LookupMember[2]
Inp_I	Device Object Inputs	raC_UDT_ItfAD_871TM_Inp_4IOL Or raC_UDT_ItfAD_871TM_Inp_8IOL
Ref_Ctrl_Inf	Sensor Type Information Interface	raC_UDT_ItfAD_IOLinkSensor_Inf
Ref_Ctrl_Itf	Device Command, Status Information Interface	raC_UDT_ItfAD_IOLinkDevices

Input Data

Input	Function/Description	DataType
Inp_ChXTriggered	Triggered Status of Sensor	BOOL
Inp_ChNumber	Configured Channel number for Master	SINT
Cfg_BaseTime	Set Time Base for setting delay; 0= 0.1 ms, 1 = 0.4 ms, 2 = 1.6 ms, 3 = 6.4 ms	INT
Cfg_Enable	Set for Enabling Timer Modes; 0 = ON, 1 = OFF	DINT
Cfg_TimerMode	Set the Timer Mode; 0 = No Timer, 1 = Off Delay, 2 = On Delay, 3 = On Delay and Off Delay	SINT
Set_Multiplier	Set Multiplier for setting delay; 0 to 63	INT
Cmd_ResetDurations	Duration Reset Command	BOOL

Output Data

Output	Function/Descritpion	DataType
Sts_Connected	Device is connected to the Programmable Controller	BOOL
Sts_Available	Device is available for interaction with user code	BOOL
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Sts_Faulted	Device faulted status: 1 = an active fault exists	BOOL

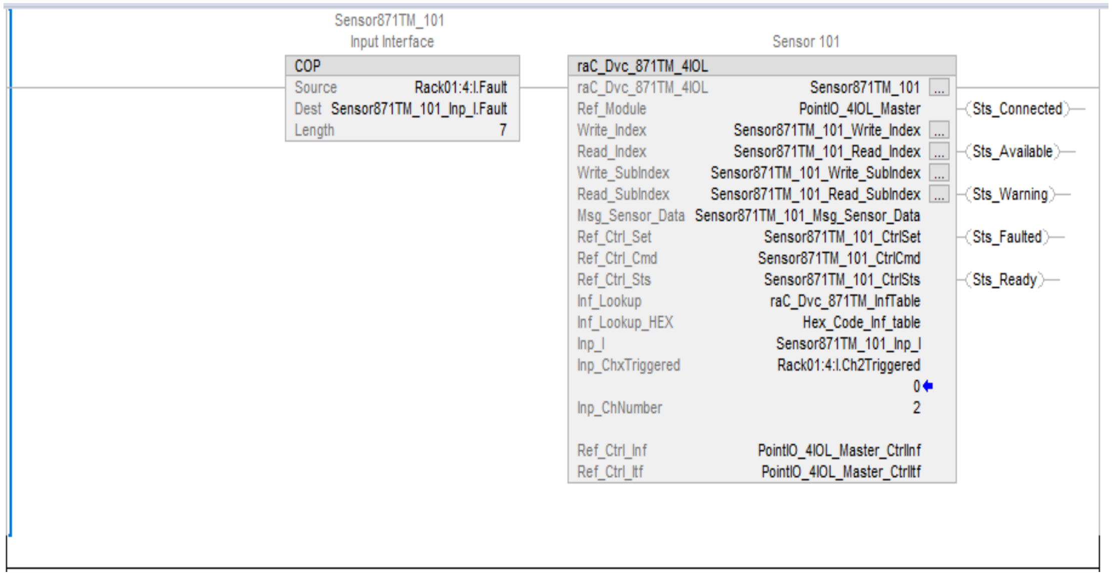
Output	Function/Descritpion	DataType
Sts_Ready	Device is Ready	BOOL
Sts_bNotReady	Bitwise device 'not ready' reason 0: Reserved 1: Master Communication Loss 2: Master Not Available 3: Faulted 4 - 31: Reserved	DINT
Sts_InhibitCfg	1=Inhibit user Configuration Parameters from HMI Faceplate; 0=Allow	BOOL
Sts_InhibitCmd	1=Inhibit user Configuration Parameters from HMI Faceplate; 0=Allow	BOOL
Sts_InhibitSet	1=Inhibit user Settings from HMI Faceplate; 0=Allow	BOOL
Val_BaseTime	Value for Time Base for setting delay; 0= 0.1 ms, 1 = 0.4 ms, 2 = 1.6 ms, 3 = 6.4 ms	INT
Val_Enable	Value for Enabling Timer Modes; 0 = ON, 1 = OFF	DINT
Val_Counter	Sensor Counter Value	INT
Val_TimerMode	Value of the Timer Mode; 0 = No Timer, 1 = Off Delay, 2 = On Delay, 3 = On Delay and Off Delay	INT
Val_TemperatureCurrent	Actual internal Sensor Temperature	REAL
Val_TemperatureMaxSinceInception	Maximum internal sensor temperature over whole sensor lifetime	REAL

Programming Example

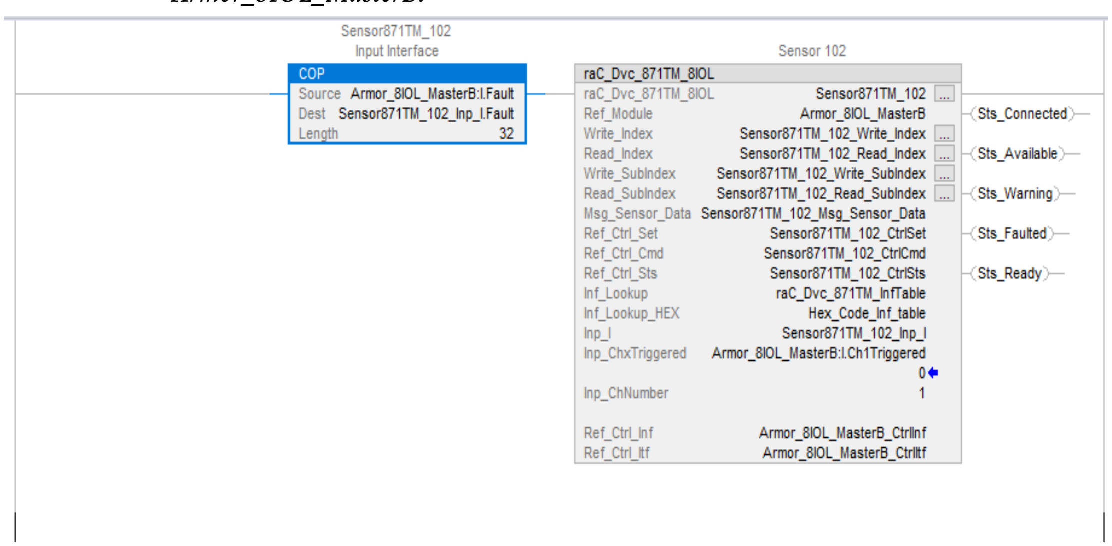
Fully configured device on a rung is provided below for reference.

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 following example uses the 871TM device object connected to channel #3 of a POINT I/O 1734-4IOL IO-Link Master module in slot #5 of a POINT I/O adapter named *Rack01*.



The following example uses the 871TM device object connected to channel #1 of a ArmorBlock 1732E-8IOLM12R IO-Link Master module in named *Armor_8IOL_MasterB*.



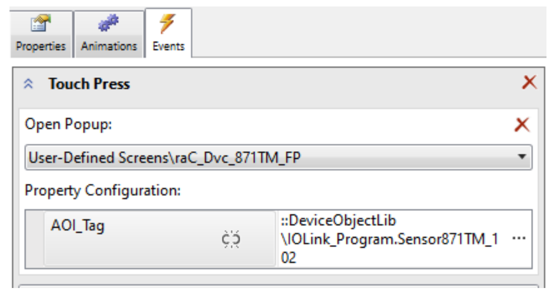
Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. See Basic Launch Button Attributes section for details on configuration and indicators.

FactoryTalk View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GO_LaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #104.	#102: AOI Backing Tag Instance (e.g. {::[PAC]Program::IOLinkProgram._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)

Studio 5000 View Designer Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	

Faceplates

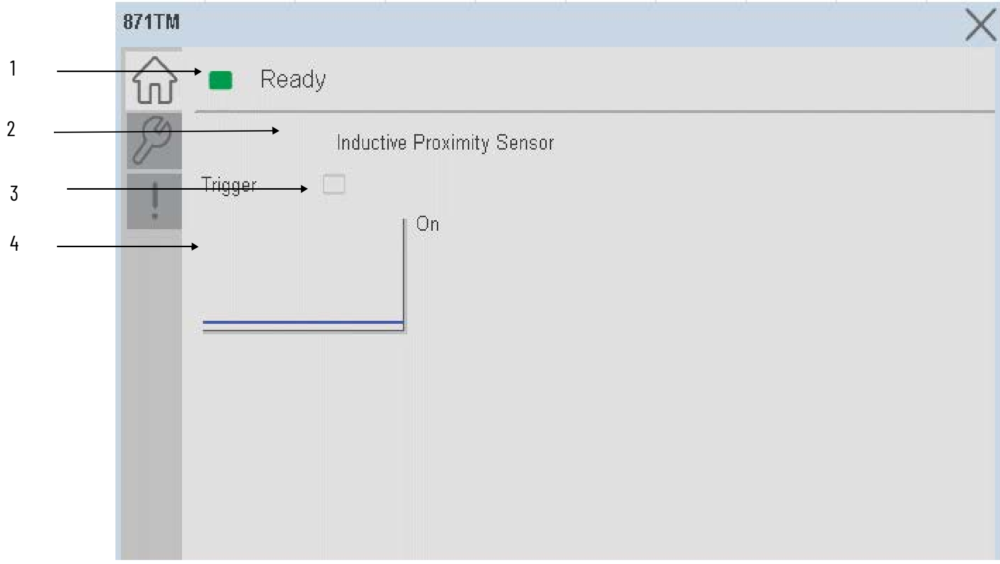
There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 30.

The faceplate title is linked to *_InstanceName.@description*, the *.@description* extended tag property of the Add-On Instruction instance. This is user-configurable from controller/program tags in Studio 5000 Logix Designer.

Sensor871TM_102	Sensor 102
Sensor871TM_102_CtrlCmd	Sensor871TM_102 Command Interface
Sensor871TM_102_CtrlSet	Sensor871TM_102 Setting Interface
Sensor871TM_102_CtrlSts	Sensor871TM_102 Status Interface
Sensor871TM_102_Inp_I	Sensor871TM_102 Input Interface

Home

The Home tab is the main tab of the faceplate. It provides the status of the IO-Link device along with sensor process data.

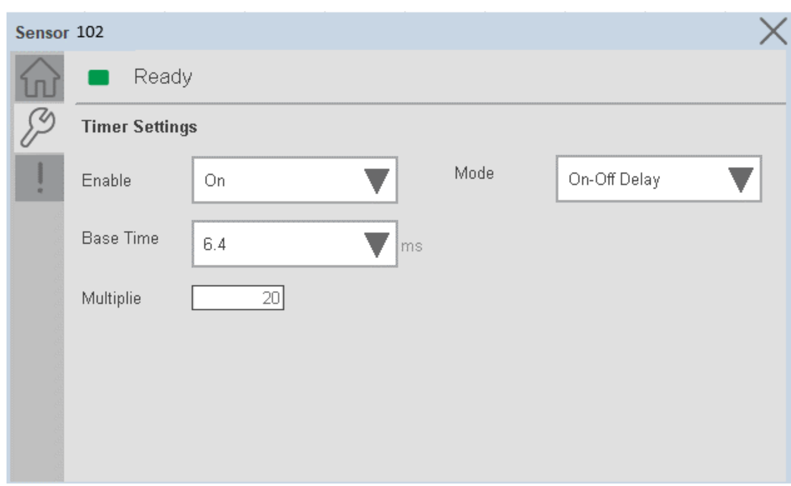


Item	Description
1	Banner- Ready Status
2	Sensor Name
3	Trigger Status OFF (0) = Gray LED ON (1) = Blue LED
4	Trigger Sparkline Trend The spark line shows trigger ON/OFF status over last 30 seconds

Configure Tab

The configuration tab displays the sensor parameter settings, as well as enabling the user to read data from the sensor.

The configuration section include Timer Settings.



Enable- The enable parameter must be ON to enable the switching timer mode. In Off mode the timer setting parameters are disable.

Base Time- While sensing the Target if user wants to add Time delay, it is added with combination of base time and multiplier. Here unit of Base time is milliseconds. Click on Base Time dropdown selector object to select different Base times like 0.1, 0.4, 1.6 and 6.4

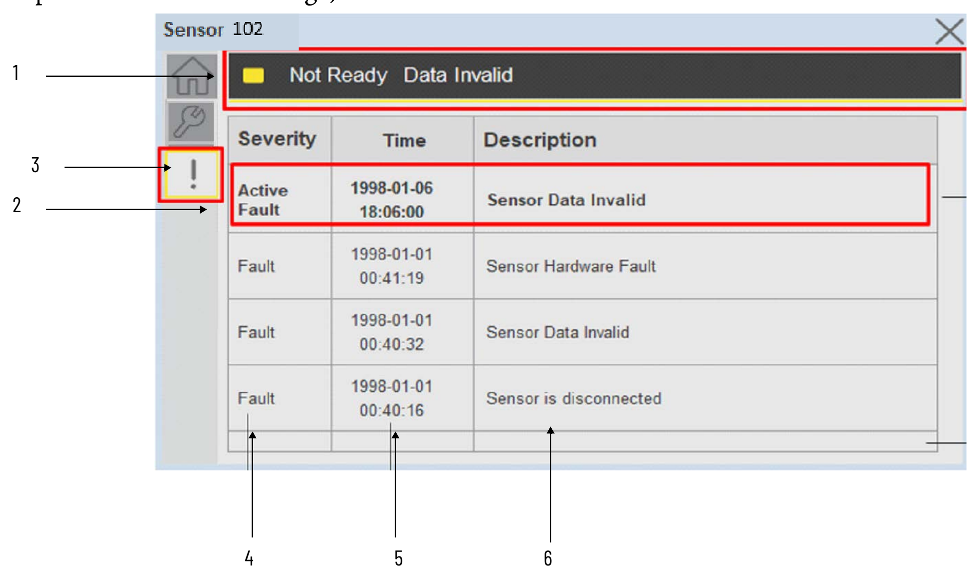
Multiplier- While counting the object if user wants to add Time delay, it is added with combination of base time and multiplier. This parameter allows you to enter the Multiplier values.

Mode- The switching timer is a useful function for manipulating the output of the sensor in relation to timing. It is useful for precision applications where the output of the sensor must be precisely triggered at a certain time. Click on Mode drop-down selector object to select different Timer modes like No Timer, Off Delay, On Delay and On Delay and Off Delay

Fault Warning Tab

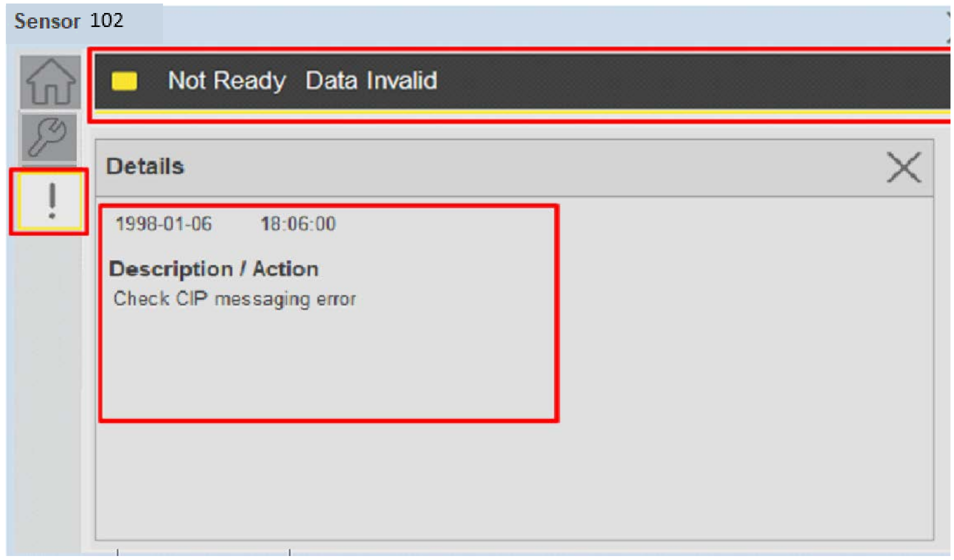
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

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.



Application Code Manager

IO-Link Device Library objects can be set-up and configured using Studio 5000 Application Code Manager.

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

Definition Objects: raC_Dvc_871TM_4IOL, raC_Dvc_871TM_8IOL

This object contains the AOI definition and used as linked library to implement object. There is one definition and per add-on instruction to support each IO-Link Master Module. 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 Objects: raC_LD_Dvc_871TM_4IOL, raC_LD_Dvc_871TM_8IOL

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.

Parameter Name	Default Value	Instance Name	Definition	Description
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
ChannelNumber				Select the Channel Number where the sensor is connected.
MasterName	MasterName	[MasterName]	Module	Select the IO-Link master module. If connecting to a non-library object module, enter the name of the master only. 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.

Note that if the tag names are manually entered or not linked to input channel tags a red 'X' will be shown beside the parameter. This is acceptable and the program can still be generated.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_871TM_4IOL	raC_Dvc_871TM_4IOL	3.1	(RA-LIB) Device	IO-Link
raC_Dvc_871TM_8IOL	raC_Dvc_871TM_8IOL	3.1	(RA-LIB) Device	IO-Link

Configured HMI Content

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

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewME\Global Object - ggfx
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewSE\Global Object - ggfx
V3_raC_Dvc_871TM	Faceplate ME	(raC-3_xx-ME) raC_Dvc_871TM-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_raC_Dvc_871TM	Faceplate SE	(raC-3_xx-SE) raC_Dvc_871TM-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_raC_Dvc_IOLink	View Designer	(raC-3_xx-VD) raC_Dvc_IOLink.vpd	{ProjectName}\Visualization\ViewDesigner - vpd
V3_RM_raC_Dvc_IO_Link	Reference Manual	DEVICE-RM300B-EN-P.pdf	{ProjectName}\Documentation
V3_IO_Link_Images	HMI Image Set	HMI FactoryTalk View Images - png.zip	{ProjectName}\Visualization\Images - png

45CRM - Color Registration Mark Sensor (raC_Dvc_45CRM_4IOL, raC_Dvc_45CRM_8IOL)

Overview

The 45CRM Color Registration Mark Sensor device object (raC_Dvc_45CRM_4IOL, raC_Dvc_45CRM_8IOL) includes HMI faceplates which displays device information including:

- Sensor data
- Sensor diagnostics
- Sensor configuration and parameters
- Device Fault log

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_*45CRM*_Objects_Faceplate.MP4"

Primary device object configuration functions include:

- **Profile selection:** Profile setup will allow the operators to set the one of the profile from five. Each profile contains the Mark & Background Color value required for the sensor output to turn ON upon target detection.
- **Polarity:** This function changes the sensor output to operate as Not-Inverted (Light Operate) and Inverted (Dark Operate).
- **Teach:** Offers the different teach functions.

Functional Description

The 45CRM Color Registration Mark Sensor pre-configured Device Objects:

- Collect, Process and Deliver Data between Smart Devices and Application Logic
- Provide Device Status & Diagnostics Faceplate's 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. 1.01) 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/* folder in the library. Each device is supplied with two versions of Add-On Instructions (AOI) and Rung import files - one for compatibility with each IO-Link Master Module. You must select the appropriate AOI for the master module being used.

Device/Item	Compatible IO-Link Master	Add-On Instruction	Rung Import
45CRM	POINT I/O 1734-4IOL	raC_Dvc_45CRM_4IOL_3.01_AOI.L5X	raC_Dvc_45CRM_4IOL_3.01_RUNG.L5X
	ArmorBlock 1732E-8IOLM12R	raC_Dvc_45CRM_8IOL_3.01_AOI.L5X	raC_Dvc_45CRM_8IOL_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.

Note that a single faceplate is used for either the 4IOL or 8IOL versions of the Add-On Instruction.

Device/Item	Type	FactoryTalk View ME Faceplate	FactoryTalk View SE Faceplate
45CRM	Display	(raC-3_01-ME) raC_Dvc_45CRM-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_45CRM-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - IO-Link Device.ggfx	(raC-3-SE) Toolbox - IO-Link 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
45CRM	(raC-3_01-VD) raC_Dvc_IOLink.vpd

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.

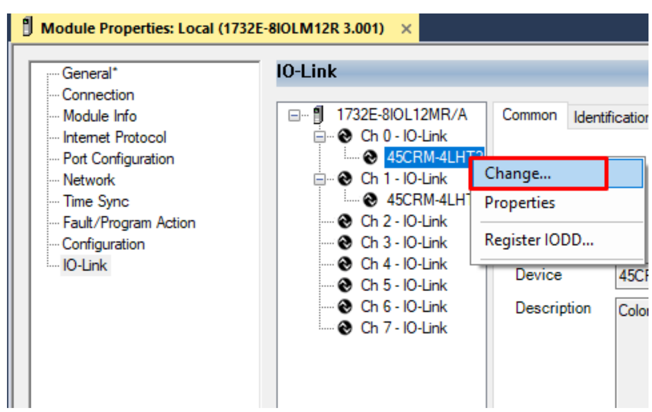
All Studio 5000 Application Code Manager files can be found in the */ApplicationCodeManagerLibraries/* folder of the library. The files included are as follows:

Implementation Object	Compatible IO-Link Master	Asset Control File (.HSL4)	Device File (.HSL4)
45CRM	POINT I/O 1734-4IOL	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_45CRM_4IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_45CRM_4IOL_(3.1)
	ArmorBlock 1732E-8IOLM12R	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_45CRM_8IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_45CRM_8IOL_(3.1)

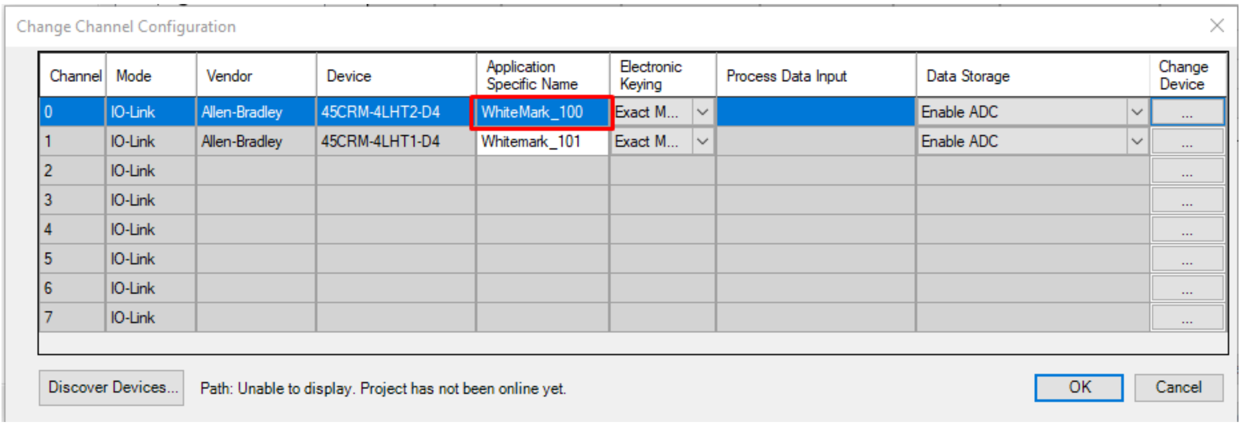
Device Definition

The device must be configured with the correct device definition. Proper device configuration enables the required cyclic device data to pass information from the device into the add-on instruction.

1. Click on Change...



2. Specify the Application Specific Name e.g. *WhiteMark_100*.



Operations

The IO-Link Device objects provide only physical operation mode. There is no virtual device mode offered.

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
Write_Index	Message Configuration Write	MESSAGE
Read_Index	Message Configuration Read	MESSAGE
Write_SubIndex	Message Configuration Write	MESSAGE
Read_SubIndex	Message Configuration Read	MESSAGE
Msg_Sensor_Data	Messaging Data	raC_UDT_45CRM_Sensor_Data
Ref_Ctrl_Set	IO-Link Device Setting Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Set
Ref_Ctrl_Cmd	IO-Link Device Command Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Cmd
Ref_Ctrl_Sts	IO-Link Device Status Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSts
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[20]
Inp_I	Device Object Inputs	raC_UDT_ItfAD_45CRM_Inp_4IOL Or raC_UDT_ItfAD_45CRM_Inp_8IOL
Ref_Ctrl_Inf	Interfacing Data from Configured Sensors	raC_UDT_ItfAD_IOLinkSensor_Inf
Ref_Ctrl_Itf	Information Data from Configured Sensors	raC_UDT_ItfAD_IOLinkDevices

Input Data

Input	Function/Description	DataType
ChXTriggered	Triggered Status of Sensor	BOOL
Inp_ChNumber	Configured Channel number for Master	SINT
Cfg_OutputPolarityInverted	Output Polarity; 0 = Not Inverted, 1 = Inverted	SINT
Cfg_ProfileSelection	Set value for Profile Selection	SINT
Cmd_DynamicTeach	Dynamic Teach Command	BOOL
Cmd_LocalTeachLock	Parameters Unlock/Lock Cmd	BOOL
Cmd_Locate	Locator Disable/Enable Command	BOOL
Cmd_ReadAndStoreSettings	Read and Store Settings Command	BOOL
Cmd_ReadAndStoreSettings	Static Teach Background Command	BOOL
Cmd_ReadAndStoreSettings	Static Teach Mark Command	BOOL
Cmd_ReadAndStoreSettings	Teach Evaluate Command	BOOL
Cmd_ReadAndStoreSettings	Start Teach Mode Button Command	BOOL

Output Data

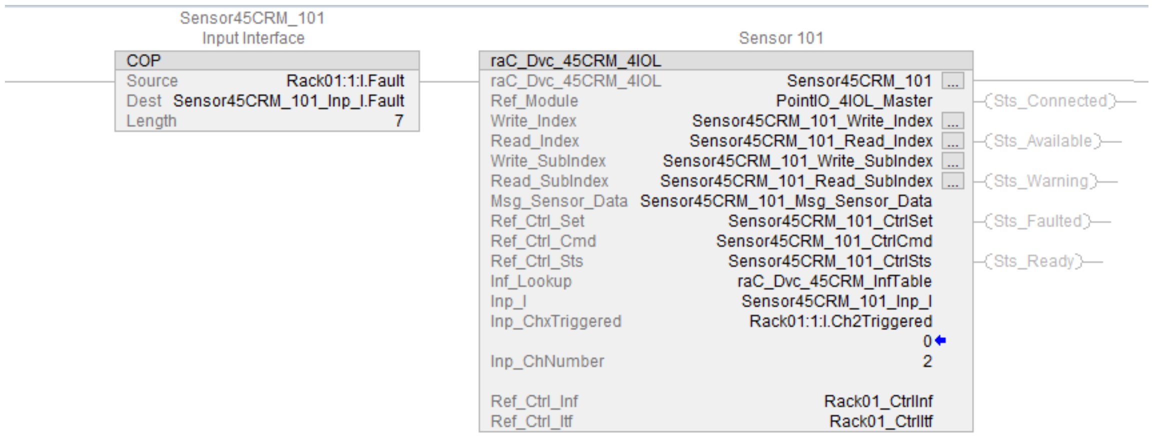
Output	Function/Descritpion	DataType
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Sts_Ready	Device is Ready	BOOL
Sts_Faulted	Device faulted status: 1 = an active fault exists	BOOL
Sts_Connected	Device is connected to the Programmable Controller	BOOL
Sts_bNotReady	Bitwise device 'not ready' reason 0: Reserved 1: Master Communication Loss 2: Master Not Available 3: 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
Sts_InhibitCfg	1=Inhibit user Configuration Parameters from HMI Faceplate; 0=Allow	BOOL
Sts_InhibitSet	1=Inhibit user Settings from HMI Faceplate; 0=Allow	BOOL
Sts_InhibitCmd	1=Inhibit user Commands from HMI Faceplate; 0=Allow Control	BOOL
Sts_LocalTeachLock	Local Parameterization; 0= Unlock, 1= Locked	BOOL
Sts_Located	Locator Indicator; 1= Located	BOOL
Val_CurrProfile	Displays the Current Profile	SINT
Val_CurrTeachMode	Unique Parameter Name for auto - discovery	INT
Val_OutputPolarityInverted	Displays the Current Profile	INT
Val_ProfileSelection	Displays Teach Mode	INT
Val_TeachStep	Teach Step Value	INT

Programming Example

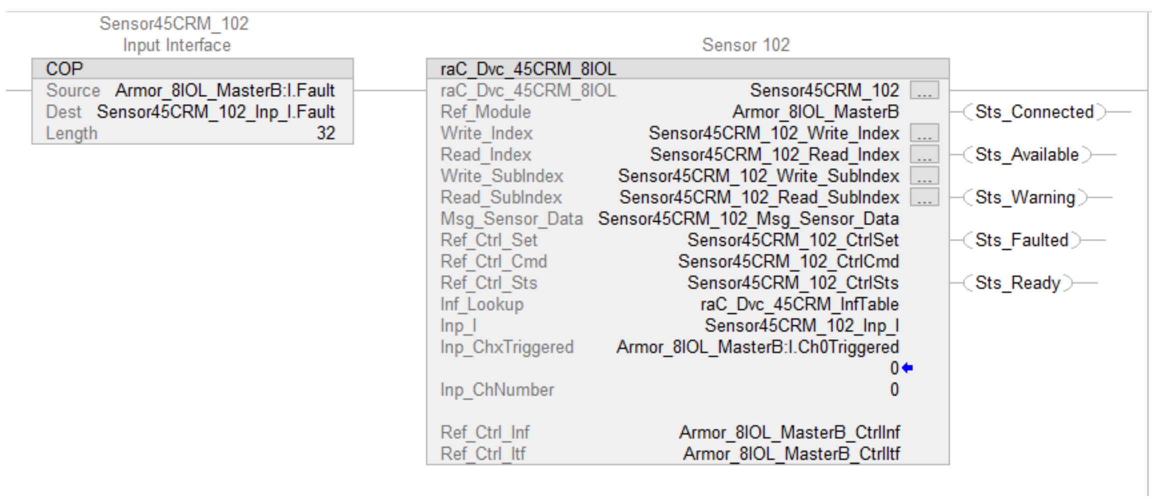
Fully configured device on a rung is provided below for reference.

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 following example uses the 45CRM device object connected to channel #3 of a POINT I/O 1734-4IOL IO-Link Master module named *Point_IO_4IOLMater* in slot #1 of a POINT I/O adapter named *Rack01*.



The following example uses the 45CRM device object connected to channel #0 of a ArmorBlock 1732E-8IOLM12R IO-Link Master module in named *Armor_8IOL_MasterB*



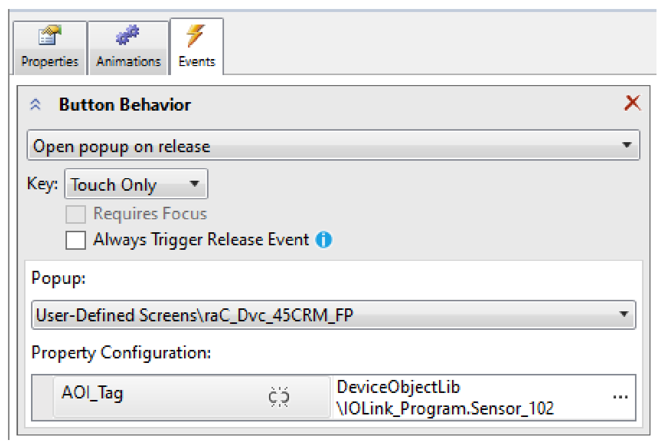
Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. See Basic Launch Button Attributes section for details on configuration and indicators.

FactoryTalk View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GO_LaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #104.	#102: AOI Backing Tag Instance (e.g. {::[PAC]Program::IOLinkProgram._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)

Studio 5000 View Designer Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	

Faceplates

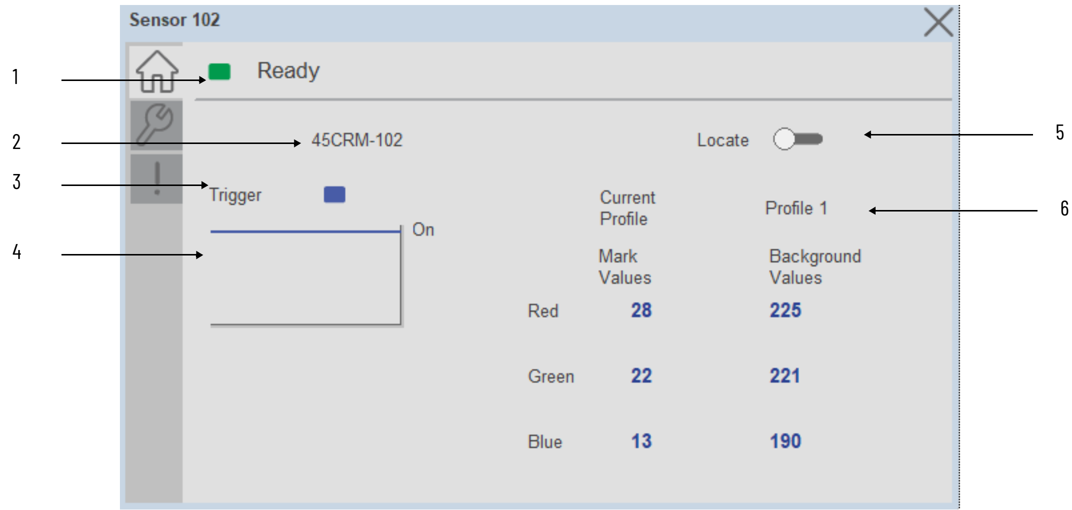
There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 30.

The faceplate title is linked to *_InstanceName.@description*, the *.@description* extended tag property of the Add-On Instruction instance. This is user-configurable from controller/program tags in Studio 5000 Logix Designer.

Name	Description	Usage	Data Type
Sensor45CRM_102	Sensor 102	Local	raC_Dvc_45CRM_8IOL
Sensor45CRM_102_Inp_I	Sensor45CRM_102 Input Interface	Local	raC_UDT_ItfAD_45CRM_Inp_8IOL
Sensor45CRM_102_CtrlCmd	Sensor45CRM_102 Command Interface	Public	raC_UDT_ItfAD_IOLinkSensor_CtrlCmd
Sensor45CRM_102_CtrlSet	Sensor45CRM_102 Setting Interface	Public	raC_UDT_ItfAD_IOLinkSensor_CtrlSet
Sensor45CRM_102_CtrlSts	Sensor45CRM_102 Status Interface	Public	raC_UDT_ItfAD_IOLinkSensor_CtrlSts

Home

The Home tab is the main tab of the faceplate. It provides the status of the IO-Link device along with sensor process data and the Locate button.



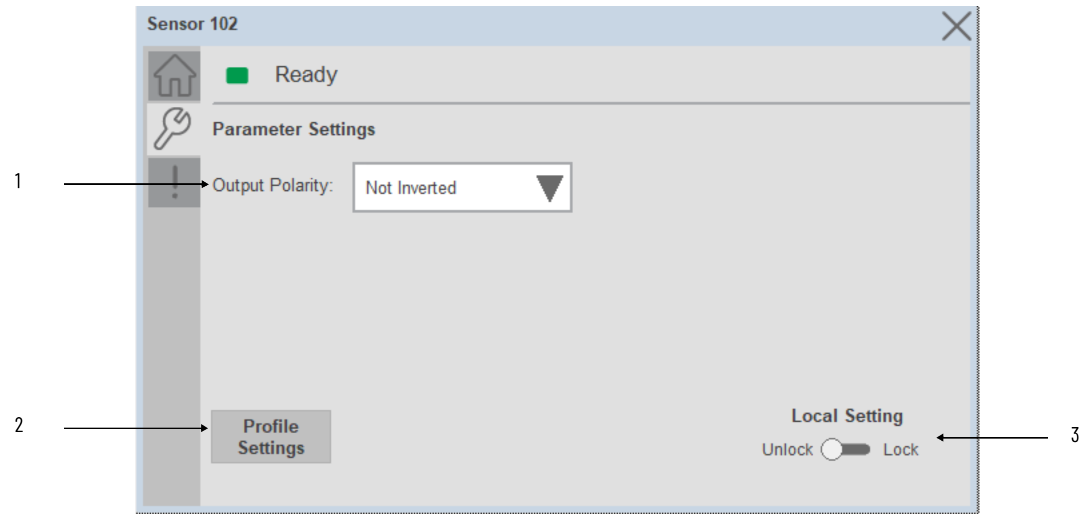
Item	Description
1	Banner- Ready Status
2	Application Specific Name - Read from device
3	Trigger Status OFF (0) = Gray LED ON (1) = Blue LED
4	Trigger Sparkling Trend The spark line shows trigger ON/OFF status over last 30 seconds
5	Locate toggle switch Locate the sensor in large machines where there are several sensors close to each other. When Located, the sensor user interface (green and orange LEDs) start flashing synchronously until the operator disables this function
6	Current Profile Current Profile displays the Current Profile Name and their Mark & Background color code values which is downloaded/read from/to Sensor

Configure Tab

The configuration tab displays the sensor parameter settings, as well as enabling the user to read data from the sensor.

The configuration section is divided into sections:

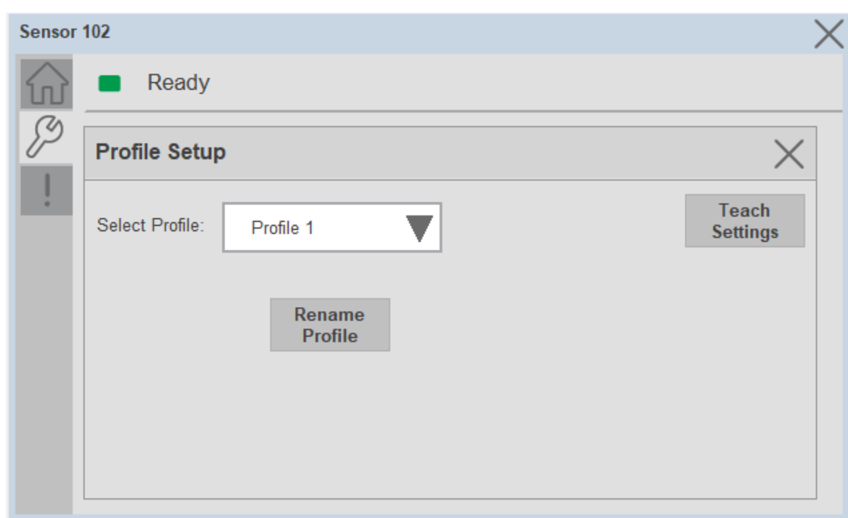
- Parameter Settings
- Local Settings
- Profile Settings



Item	Description
1	Output Polarity: Polarity changes the sensor output to operate as Light On (Non Inverted) and Dark On (Inverted).
2	Profile Settings: Launch the Profile settings window.
3	Local Teach Unlock/Lock Toggle Switch: Locks unauthorized people from changing the sensor settings using the local device push buttons.Toggle the lock/unlock button to prevent parameterization using local push buttons.

Profile Settings

Profile Settings display includes the Select Profile dropdown menu to select up to 5 profiles, Rename Profile and Teach Settings buttons. Touch on the Rename Profile button to change the profile name e.g. Profile 1- Candy Green.



Note: Profiles are Stored in the Logix Designer and user can select and download the Profile to the sensor whenever needed.

**** All Profiles values are stored by teaching the Mark and Background color of that profile using Teach Settings.

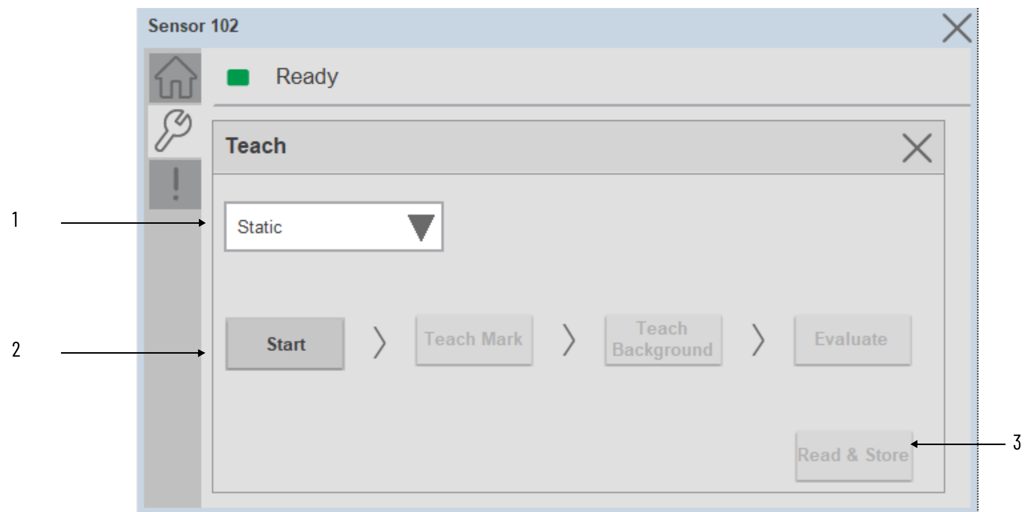
Teach Settings

Teach Settings display includes the Teach Methods, Teach Commands & Teach Read & Store buttons. Touch on the Teach Settings navigation button to access the Teach Settings tab.

Teach tab includes the following functions:

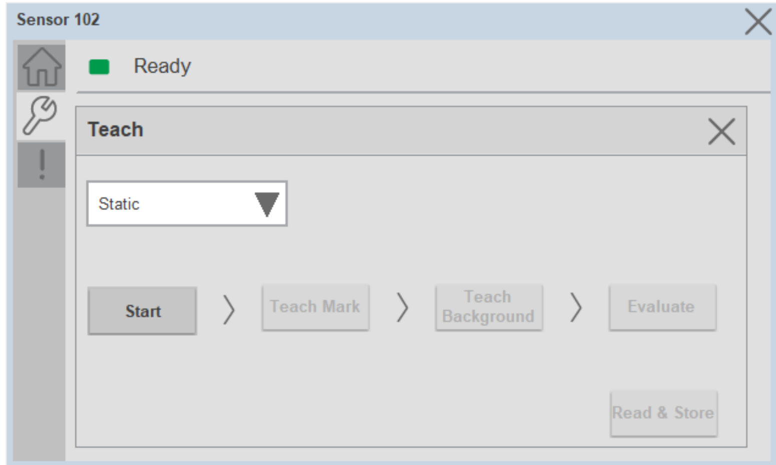
- Teach mode selection drop-down menu (Static/Dynamic)
- Teach procedure flow buttons
- Teach values Read & Store button

The operator must complete each stage to teach sensor successfully. During the teach process the operator must complete the current stage prior to the next stage being made available to operator.



Item	Description
1	Teach Mode: - Static - Dynamic
2	Teach procedure flow buttons
3	Read & Store: Stored the Mark & background values to the Selected Profile.

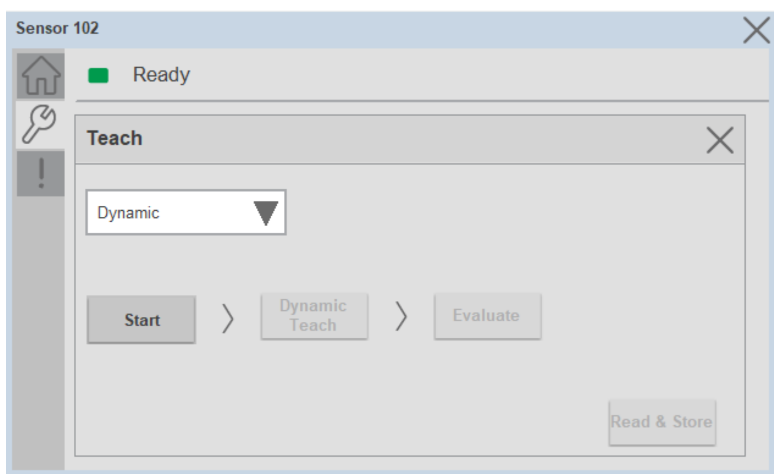
Static Teach



The first method is Static Teach, which is intended for applications where the web can be stopped, or for more challenging applications.

1. Click on Start Button to Start the Procedure.
2. Place the Mark under the sensor light Spot to teach the color of the Mark.
3. Click on Teach Mark Button.
4. Place the Background under the sensor light Spot to teach the color of the Background.
5. Click on Teach Background Button.
6. Click on Evaluate Button.
7. Click on Read and Store Colors Button to store Mark and Background color values into Profile which is selected in the Profile Setup window.

Dynamic Teach



The Second method is Dynamic Teach, which is intended for applications where the web can be Running.

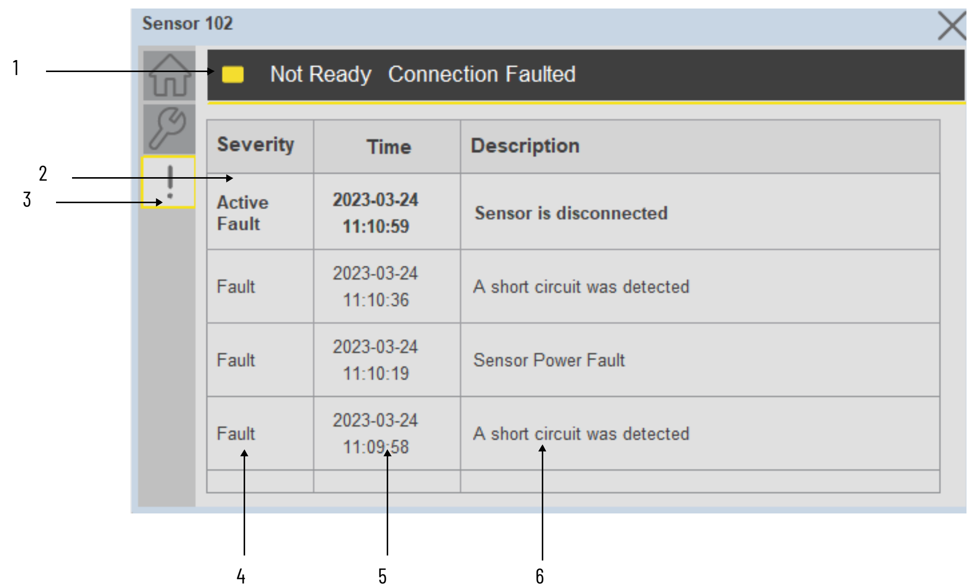
1. Click on Start button to Start the procedure.

2. Place the target and background in front of the sensor at the speed of the application.
3. Click on Dynamic Teach button
4. Click on Evaluate button
5. Click on Read and Store Colors Button to store Mark and Background color values into Profile which is selected in the Profile Setup window.

Fault Warning Tab

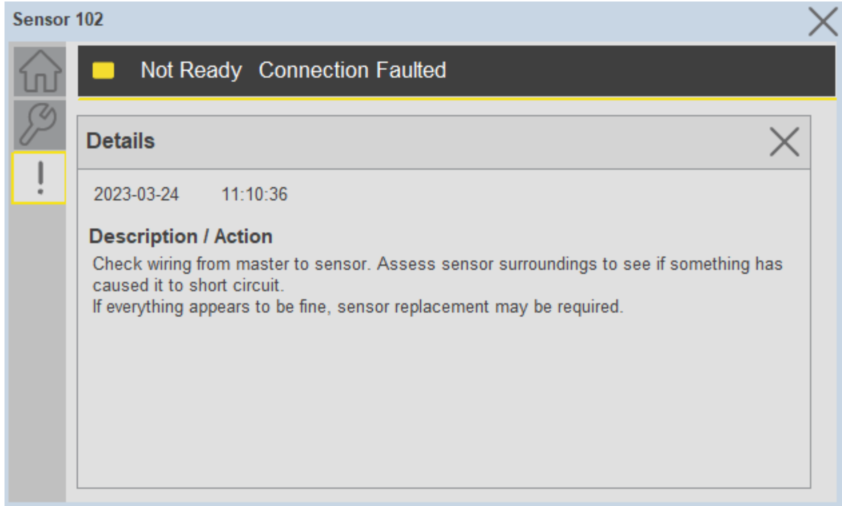
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

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.



Application Code Manager

IO-Link Device Library objects can be set-up and configured using Studio 5000 Application Code Manager.

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

Definition Objects: raC_Dvc_45CRM_4IOL, raC_Dvc_45CRM_8IOL

This object contains the AOI definition and used as linked library to implement object. There is one definition and per add-on instruction to support each IO-Link Master Module. 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 Objects: raC_LD_Dvc_45CRM_4IOL, raC_LD_Dvc_45CRM_8IOL

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

Parameter Name	Default Value	Instance Name	Definition	Description
ChannelNumber				Select the Channel Number where the sensor is connected.
MasterName	MasterName	[MasterName]	Module	Select the IO-Link master module. If connecting to a non-library object module, enter the name of the master only. 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.

Note that if the tag names are manually entered or not linked to input channel tags a red 'X' will be shown beside the parameter. This is acceptable and the program can still be generated.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_45CRM_4IOL	raC_Dvc_45CRM_4IOL	3.1	(RA-LIB) Device	IO-Link
raC_Dvc_45CRM_8IOL	raC_Dvc_45CRM_8IOL	3.1	(RA-LIB) Device	IO-Link

Configured HMI Content

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

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewME\Global Object - ggfx
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewSE\Global Object - ggfx
V3_raC_Dvc_45CRM	Faceplate ME	(raC-3_xx-ME) raC_Dvc_45CRM-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_raC_Dvc_45CRM	Faceplate SE	(raC-3_xx-SE) raC_Dvc_45CRM-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_raC_Dvc_IOLink	View Designer	(raC-3_xx-VD) raC_Dvc_IOLink.vpd	{ProjectName}\Visualization\ViewDesigner - vpd
V3_RM_raC_Dvc_IO_Link	Reference Manual	DEVICE-RM300B-EN-P.pdf	{ProjectName}\Documentation
V3_IO_Link_Images	HMI Image Set	HMI FactoryTalk View Images - png.zip	{ProjectName}\Visualization\Images - png

836P - Solid-State Pressure Sensor (raC_Dvc_836P_4IOL, raC_Dvc_836P_8IOL)

Overview

The 836P Solid-State Pressure Sensor device object (raC_Dvc_836P_4IOL, raC_Dvc_836P_8IOL) includes HMI faceplates which displays device information including:

- Sensor data
- Sensor diagnostics
- Process data trending
- Sensor configuration and parameters
- Device Fault log

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_*836P*_Objects_Faceplate.MP4"

Primary device object configuration functions include:

- **Locate:** This function helps to locate the sensors using the device's LED in large machines where there are several sensors close to each other.
- **Polarity:** This function changes the sensor output to operate as Not-Inverted (Light Operate) and Inverted (Dark Operate).

Functional Description

The 836P Solid-State Pressure Sensor Sensor 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. 1.01) 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/* folder in the library. Each device is supplied with two versions of Add-On Instructions (AOI) and Rung import files - one for compatibility with each IO-Link Master Module. You must select the appropriate AOI for the master module being used.

Device/Item	Compatible IO-Link Master	Add-On Instruction	Rung Import
836P	POINT I/O 1734-4IOL	raC_Dvc_836P_4IOL_3.01_AOI.L5X	raC_Dvc_836P_4IOL_3.01_RUNG.L5X
	ArmorBlock 1732E-8IOLM12R	raC_Dvc_836P_8IOL_3.01_AOI.L5X	raC_Dvc_836P_8IOL_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.

Note that a single faceplate is used for either the 4IOL or 8IOL versions of the Add-On Instruction.

Device/Item	Type	FactoryTalk View ME Faceplate	FactoryTalk View SE Faceplate
836P	Display	(raC-3_01-ME) raC_Dvc_836P-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_836P-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - IO-Link Device.ggfx	(raC-3-SE) Toolbox - IO-Link 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
836P	(raC-3_01-VD) raC_Dvc_IOLink.vpd

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.

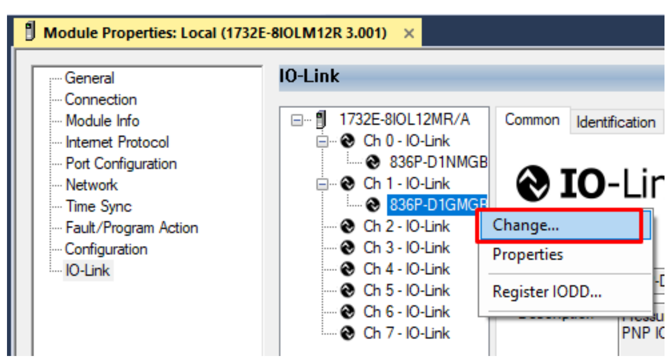
All Studio 5000 Application Code Manager files can be found in the /*ApplicationCodeManagerLibraries*/ folder of the library. The files included are as follows:

Implementation Object	Compatible IO-Link Master	Asset Control File (.HSL4)	Device File (.HSL4)
836P	POINT I/O 1734-4IOL	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_836P_4IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_836P_4IOL_(3.1)
	ArmorBlock 1732E-8IOLM12R	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_836P_8IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_836P_8IOL_(3.1)

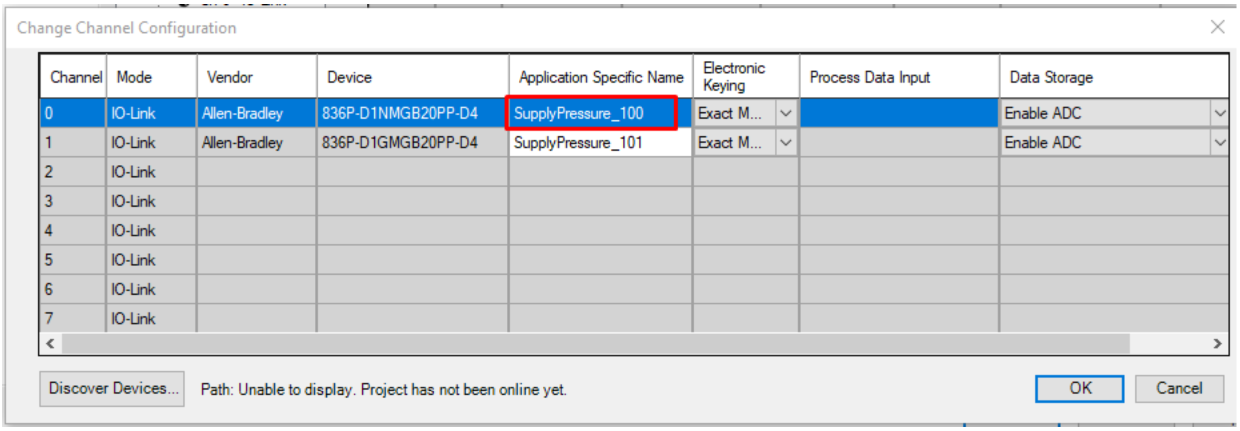
Device Definition

The device must be configured with the correct device definition. Proper device configuration enables the required cyclic device data to pass information from the device into the add-on instruction.

1. Click on Change...



2. Specify the Application Specific Name e.g. *SupplyPressure_100*



Operations

The IO-Link Device objects provide only physical operation mode. There is no virtual device mode offered.

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
Write_Index	Message Configuration Write	MESSAGE
Read_Index	Message Configuration Read	MESSAGE
Write_SubIndex	Message Configuration Write	MESSAGE
Read_SubIndex	Message Configuration Read	MESSAGE
Msg_Sensor_Data	Messaging Data	raC_UDT_836P_Sensor_Data
Ref_Ctrl_Set	IO-Link Device Setting Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Set
Ref_Ctrl_Cmd	IO-Link Device Command Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Cmd
Ref_Ctrl_Sts	IO-Link Device Status Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSts
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[2]
Inp_I	Device Object Inputs	raC_UDT_ItfAD_836P_Inp_4IOL Or raC_UDT_ItfAD_836P_Inp_8IOL
Ref_Ctrl_Inf	Sensor Type Information Interface	raC_UDT_ItfAD_IOLinkSensor_Inf
Ref_Ctrl_Itf	Device Command, Status Information Interface	raC_UDT_ItfAD_IOLinkDevices

Input Data

Input	Function/Description	DataType
Inp_ChxTriggered1	Triggered Status When the Pressure is equal to Defined Pressure Set for Trigger1	BOOL
Inp_ChxTriggered2	Triggered Status When the Pressure is equal to Defined Pressure Set for Trigger2	BOOL
Inp_ChxPressure	Displays Pressure Value of the Sensor	INT
Inp_ChNumber	Configured Channel number for Master	SINT
Cfg_DisplayModePA	Set type of Information shown on Unit Display; 0=Current Pressure, 1=Highest Pressure, 2=Low Pressure, 3=Triggered1 Set Pressure, 4=Triggered1 Reset Pressure, 7=Display OFF	DINT
Cfg_DisplayModePP	Set type of Information shown on Unit Display; 0=Current Pressure, 1=Highest Pressure, 2=Low Pressure, 3=Triggered1 Set Pressure, 4=Triggered1 Reset Pressure, 5=Triggered2 Set Pressure, 6=Triggered2 Reset Pressure, 7=Display OFF	DINT
Cfg_DisplayRotation	Set the change of orientation of the status indicator by 180°; 0=Default, 1=Rotate 180 Degrees	DINT
Cfg_MeasuringtUnit	Set Measuring Unit; 0=Bar, 1=Mpa, 2=kPa, 3=psi, 4= kg/cm^2	DINT
Cfg_OperatingModeTrig1	Set Operating Modes for Triggered1 Output; 0=Hysteresis, 1=Window	INT
Cfg_OperatingModeTrig2	Set Operating Modes for Triggered2 Output; 0=Hysteresis, 1=Window	INT
Cfg_UpdateRate	Set Sensor Display Update Rate; 0=1Hz, 1=2Hz, 2=5 Hz, 3=10Hz	SINT
Cmd_LocalTeachLock	Parameters Unlock/Lock Cmd	BOOL
Cmd_Locate	Locator Disable/Enable Command	BOOL
Set_TrendPressMaxValue	Trend Tab Max value for VD/ME/SE faceplate	REAL

Input	Function/Description	DataType
Set_TrendPressMinValue	Trend Tab Min value for VD/ME/SE faceplate	REAL
Set_Trig1OffDelay	Set the Delay Value for the change of state from ON to OFF for the Triggered1	DINT
Set_Trig1OnDelay	Set the Delay Value for the change of state from OFF to ON for the Triggered1	DINT
Set_Trig1RP	Set the value of system pressure that turns the sensor output OFF for Trigger1	REAL
Set_Trig1SP	Set the value of system pressure that turns the sensor output ON for Trigger1	REAL
Set_Trig2OffDelay	Set the Delay Value for the change of state from ON to OFF for the Triggered2	DINT
Set_Trig2OnDelay	Set the Delay Value for the change of state from OFF to ON for the Triggered2	DINT
Set_Trig2RP	Set the value of system pressure that turns the sensor output OFF for Trigger2	REAL
Set_Trig2SP	Set the value of system pressure that turns the sensor output ON for Trigger2	REAL

Output Data

Output	Function/Descritpion	DataType
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Sts_Ready	Device is Ready	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: Master Communication Loss 2: Master Not Available 3: Faulted 4 - 31: Reserved	DINT
Sts_Available	Device is available for interaction with user code	BOOL
Sts_CatPA	Catalog of Connected Sensor; 0=PP, 1=PA	BOOL
Sts_InhibitCfg	1=Inhibit user Configuration Parameters from HMI Faceplate; 0=Allow	BOOL
Sts_InhibitCmd	1=Inhibit user Commands from HMI Faceplate; 0=Allow Control	BOOL
Sts_InhibitSet	1=Inhibit user Settings from HMI Faceplate; 0=Allow	BOOL
Sts_LocalTeachLock	Local Parameterization; 0= Unlock, 1= Locked	BOOL
Sts_Located	Locator Indicator; 1= Located	BOOL
Val_MeasuringUnit	Displays the Pressure Measurement Unit; 0=Bar, 1=Mpa, 2=kPa, 3=psi, 4= kg/cm^2	INT
Val_Mode	As per Connected Sensor Catalog	INT
Val_OperatingHrsSinceInception	Displays the Total Sensor Operating Hours since the sensor was first powered ON	DINT
Val_OperatingModeTrig1	Displays Operating Modes for Triggered1 Output; 0=Hysteresis, 1=Window	INT
Val_OperatingModeTrig2	Displays Operating Modes for Triggered2 Output; 0=Hysteresis, 1=Window	INT
Val_Pressure	Displays Pressure Value of the Sensor	REAL
Val_PressureConverted	Displays Converted Pressure Value of the Sensor	REAL

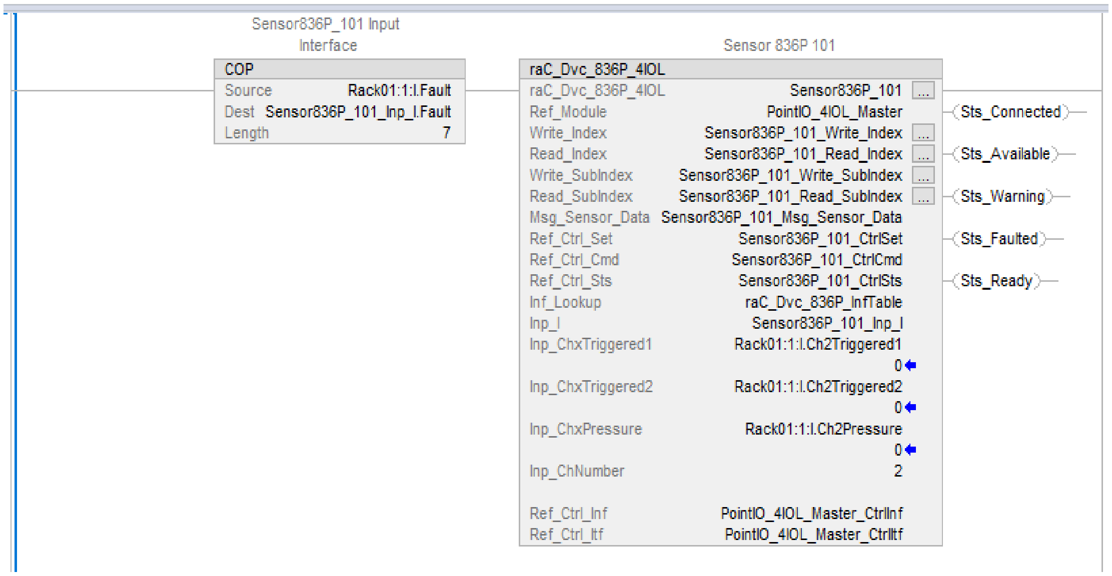
Output	Function/Descritpion	DataType
Val_PressureMaxSinceReset	Displays Highest Recorded Pressure Value since the last pressure reset	REAL
Val_PressureMinSinceReset	Displays Lowest Recorded Pressure Value since the last pressure reset	REAL
Val_Rotation	Displays the change of orientation of the status indicator by 180°; 0=0 Deg, 1=Rotate 180 Degrees	INT
Val_RPRangeMax	Sensor ResetPoint Maximum Range in Trend	REAL
Val_RPRangeMaxUnit	Sensor ResetPoint Unitwise Maximum Range in Trend	REAL
Val_RPRangeMin	Sensor ResetPoint Minimum Range in Trend	REAL
Val_RPRangeMinUnit	Sensor ResetPoint Unitwise Minimum Range in Trend	REAL
Val_SPRangeMax	Sensor SwitchPoint Maximum Range in Trend	REAL
Val_SPRangeMaxUnit	Sensor SwitchPoint Unitwise Maximum Range in Trend	REAL
Val_SPRangeMin	Sensor SwitchPoint Minimum Range in Trend	REAL
Val_SPRangeMinUnit	Sensor SwitchPoint Unitwise Minimum Range in Trend	REAL
Val_Trig1OffDelay	Displays the Delay Value for the change of state from ON to OFF for the Triggered1	DINT
Val_Trig1OnDelay	Displays the Delay Value for the change of state from OFF to ON for the Triggered1	DINT
Val_Trig1RP	Displays the value of system pressure that turns the sensor output OFF for Trigger1	REAL
Val_Trig1SP	Display the value of system pressure that turns the sensor output OFF for Trigger1	REAL
Val_Trig2OffDelay	Displays the Delay Value for the change of state from ON to OFF for the Triggered2	DINT
Val_Trig2OnDelay	Displays the Delay Value for the change of state from OFF to ON for the Triggered2	DINT
Val_Trig2RP	Displays the value of system pressure that turns the sensor output OFF for Trigger2	REAL
Val_Trig2SP	Display the value of system pressure that turns the sensor output OFF for Trigger2	REAL
Val_UpdateRate	Displays Sensor Display Update Rate; 0=1Hz, 1=2Hz, 2=5 Hz, 3=10Hz	INT

Programming Example

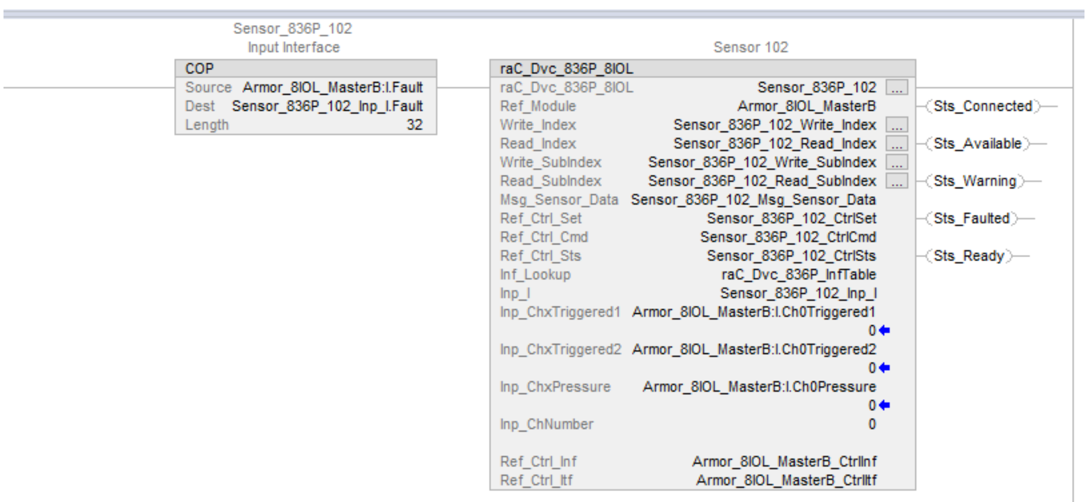
Fully configured device on a rung is provided below for reference.

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 following example uses the 836P device object connected to channel #2 of a POINT I/O 1734-4IOL IO-Link Master module in slot #1 of a POINT I/O adapter named *Rack01*.



The following example uses the 836P device object connected to channel #0 of a ArmorBlock 1732E-8IOLM12R IO-Link Master module in named *Armor_8IOL_MasterB*.



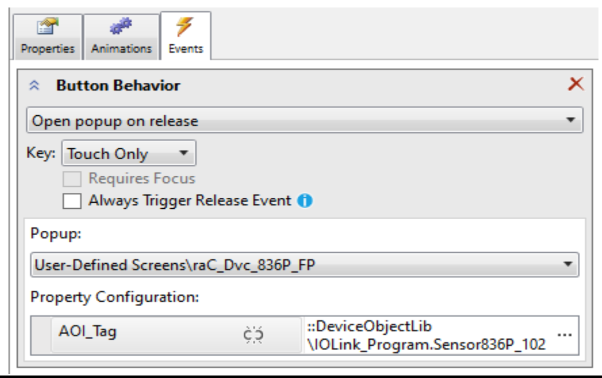
Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. See Basic Launch Button Attributes section for details on configuration and indicators.

FactoryTalk View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GO_LaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #104.	#102: AOI Backing Tag Instance (e.g. {::[PAC]Program::IOLinkProgram._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)

Studio 5000 View Designer Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	

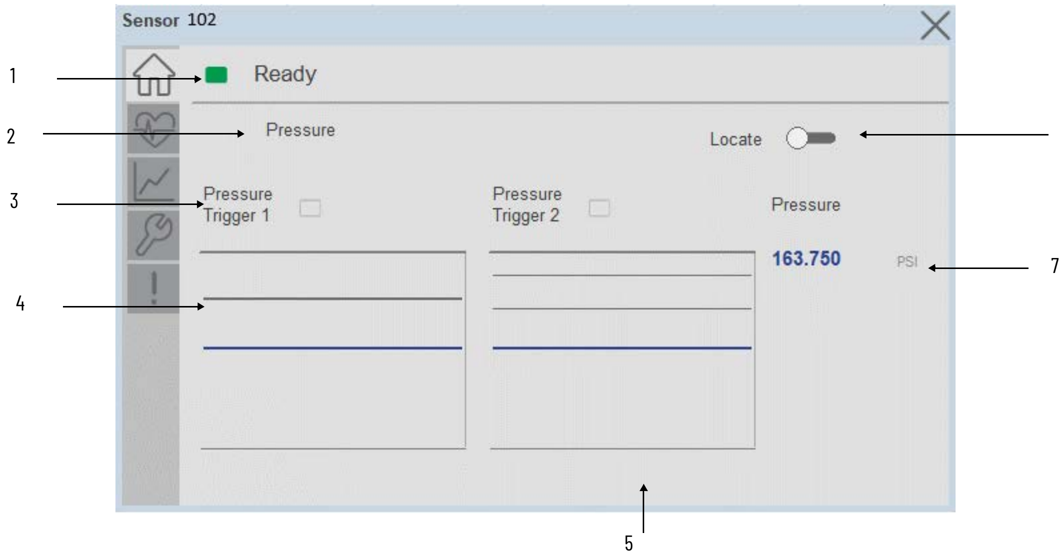
Faceplates

There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 30.

The faceplate title is linked to *_InstanceName.@description*, the *.@description* extended tag property of the Add-On Instruction instance. This is user-configurable from controller/program tags in Studio 5000 Logix Designer.

Home

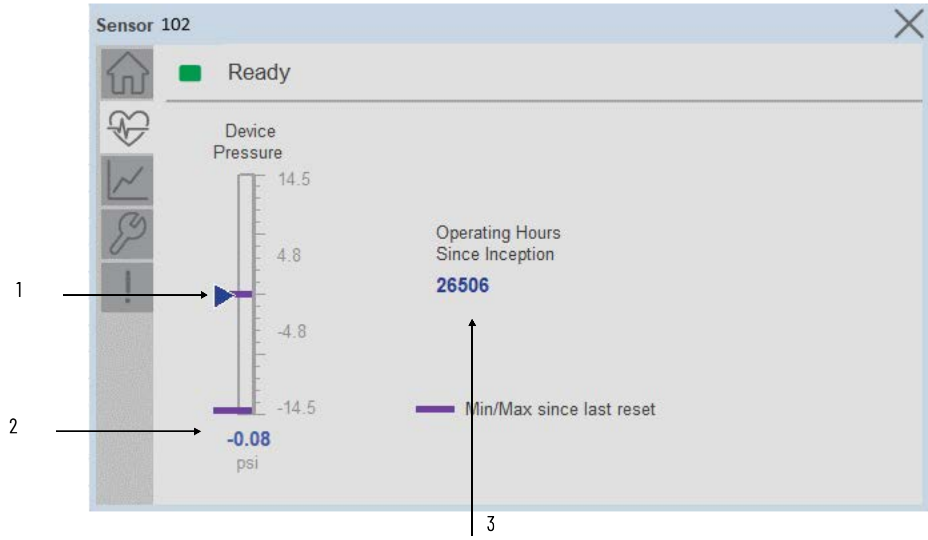
The Home tab is the main tab of the faceplate. It provides the status of the IO-Link device along with sensor process data and the Locate button.



Item	Description
1	Banner- Ready Status
2	Application Specific Name - Read from device
3	Trigger Status OFF (0) = Gray LED ON (1) = Blue LED
4	Trigger1 Sparkline Trend The spark line shows trigger ON/OFF status over last 30 seconds
5	Trigger2 Sparkline Trend The spark line shows trigger ON/OFF status over last 30 seconds
6	Locate toggle switch Locate the sensor in large machines where there are several sensors close to each other. When Located, the sensor user interface (green and orange LEDs) start flashing synchronously until the operator disables this function
7	Process Data - Pressure: Displays the current pressure value along with unit.

Health Tab

Health tab provides different diagnostic information of sensor which helps ensure that sensors are operating correctly.



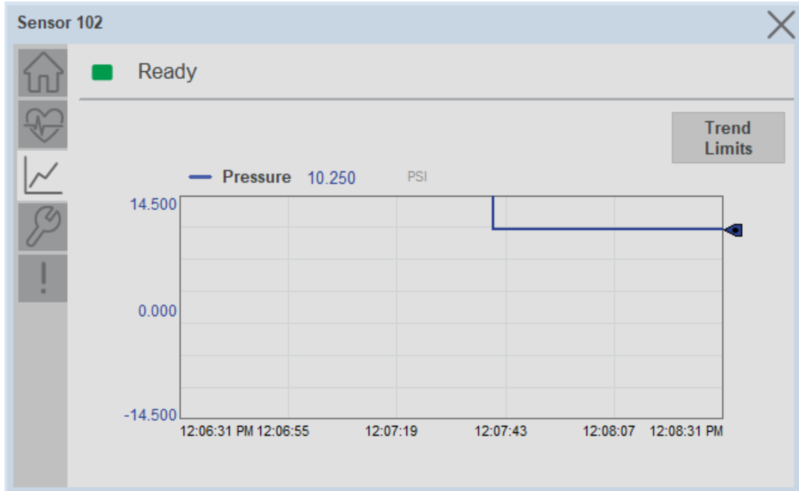
Item	Description
1	Pressure Bar Graph Purple Indicators: Min/Max since power up Light Blue Triangle Indicator: Current value
2	Pressure Current Value
3	Operating Hours Since Inception

Inception/Lifetime values are recorded since the first time the sensor was ever powered ON. These value are retained and not reset during default factory reset.

Power Up values are reset to zero and recorded new each time the sensor is power cycled.

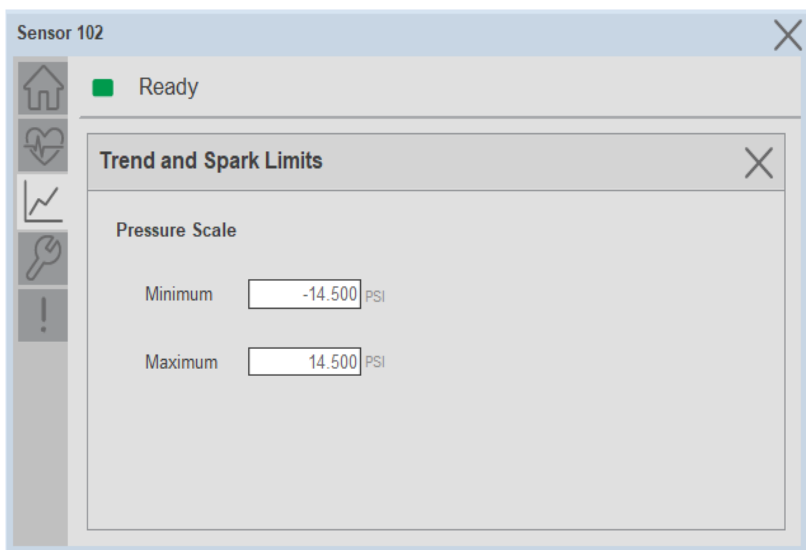
Trend Tab

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. One trend is displayed for Pressure.



Trend Settings Screen

We can set trend limits using configuration tab by clicking on the *Settings* button present on trend screen. This sub screen display contains two numeric input elements that allow the user to enter the minimum and maximum values to be used on the Trend screen for Pressure.

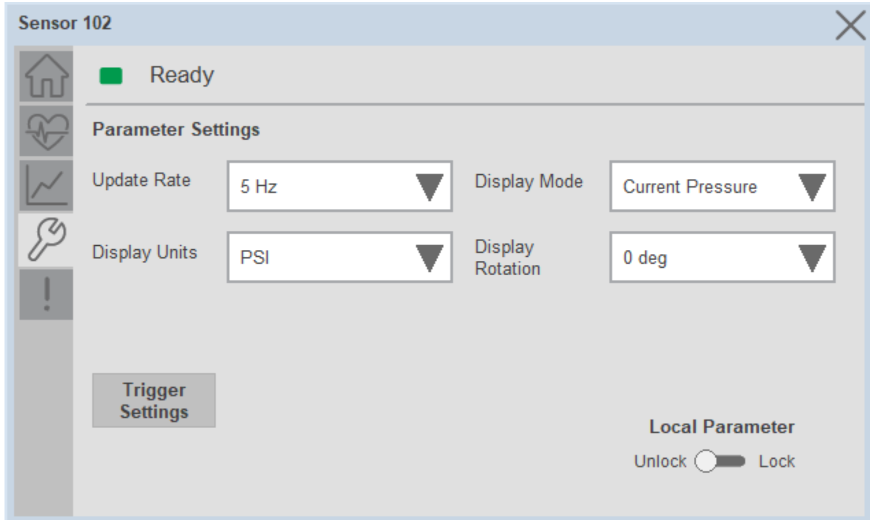


Configure Tab

The configuration tab displays the sensor parameter settings, as well as enabling the user to read data from the sensor.

The configuration section is divided into sections:

- Parameter Settings
- Trigger Settings



Parameter Settings

Update Rate- The Update rate will allow the operators to change how often the sensor display is updated. Available options are 1 Hz, 2 Hz, 5 Hz, and 10 Hz. The default rate is 5 Hz.

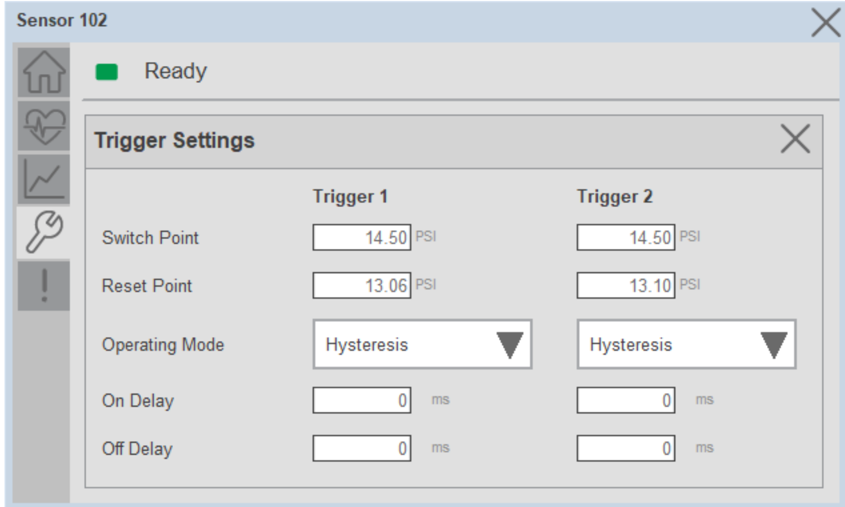
Display Mode- The Display Mode will allow the operators to change the type of information that should be shown on the unit display. Operators can select – Current Pressure, Highest Pressure, Lowest Pressure, Triggered 1 Set Pressure, Triggered 1 Reset Pressure, Triggered2 Set Pressure (only available in 2 PNP models), Triggered2 Reset Pressure (only available in 2 x PNP models) and Display OFF.

Display Units- This parameter allows you to change the pressure measurement that is shown in the sensor display. Acceptable units are psi, bar, MPa, kPa, and kg/cm2. The default display unit for these sensors is psi.

Display Rotation- This parameter allows operators to change the orientation of the status indicator by 180°. This feature is deal for applications where the display may be in a direction that's not visible to the operator and needs to be rotated for ease of use

Lock/Unlock- This parameter keeps unauthorized people from changing the sensor settings when using the local push buttons. Toggle the lock/unlock button to prevent parameterization using local push buttons.

Trigger Settings



The Trigger settings divided into sections:

- Trigger 1 - Visible for Single output sensor
- Trigger 2 - Visible for two output sensor

Switch Point- Triggered1 Switch Point/Window High-Condition 1: Sets the system Pressure that turns the sensor output ON when operating in Hysteresis Mode. Or turns the sensor output OFF when the system Pressure exceeds the set value in Window Mode. The operating mode for Triggered1 can be changed by modifying the Function parameter.

To set the desired Set-point value please refer the pressure range of the 836P pressure sensor from the user manual

Reset Point- Triggered1 Reset Point/Window Low-Condition 2: Sets the system Pressure that turns the sensor output OFF when operating in Hysteresis Mode. Or it turns the sensor output ON when the system Pressure exceeds the set value in Window Mode. The operating mode for Triggered1 can be changed by modifying the Function parameter. Touch within the Reset Point window to change the value. To set the desired Reset point value please refer the pressure range of the 836P pressure sensor from the user manual**.**

On Delay- Delays the change of state from OFF to ON for the Triggered1 parameter (Output1 in SIO) for up to 32 seconds when the polarity is defined as Normally Open. This parameter helps operators filter out unwanted Pressure peaks in their systems.

Off Delay- Delays the change of state from ON to OFF for the Triggered1 parameter (Output1 in SIO) for up to 32 seconds when the polarity is defined as Normally Open. This parameter helps operators filter out unwanted Pressure peaks in their systems.

Operating Mode- This parameter defines the operating mode for Triggered1 sensor output. The output can be configured to operate in the following modes.

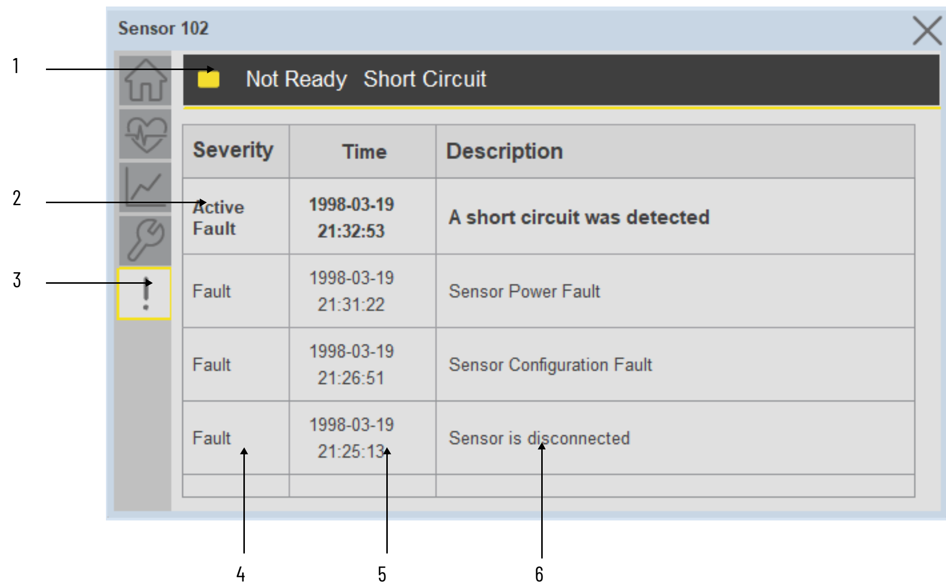
• Hysteresis Mode: Output1 and the Triggered1 process data parameter turn ON when the Pressure value is higher than the Switch Point. And turns OFF when the Pressure value is lower than the reset point.

• Window Mode: Output1 and the Triggered1 process data parameter turn ON when the Pressure value is between the Switch Point and the Reset Point. It turns OFF when the Pressure value is higher than the Switch Point or lower than the Reset Point.

Fault Warning Tab

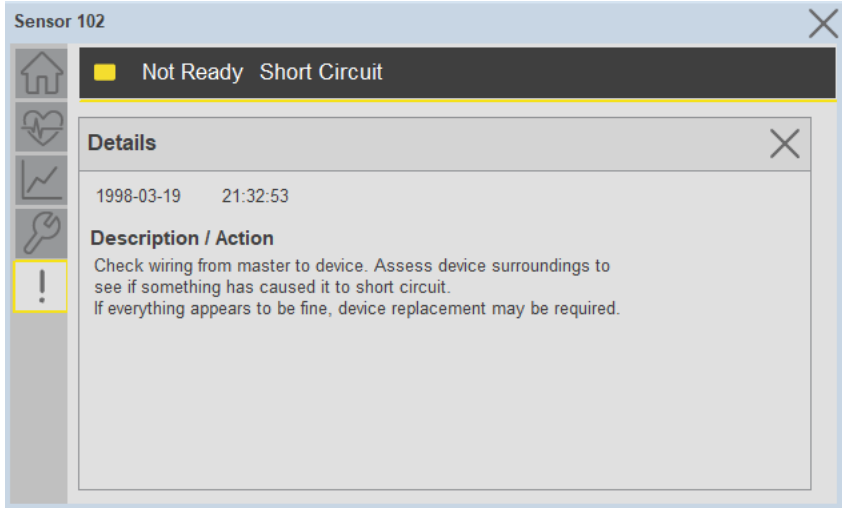
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

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.



Application Code Manager

IO-Link Device Library objects can be set-up and configured using Studio 5000 Application Code Manager.

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

Definition Objects: raC_Dvc_836P_4IOL, raC_Dvc_836P_8IOL

This object contains the AOI definition and used as linked library to implement object. There is one definition and per add-on instruction to support each IO-Link Master Module. 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 Objects: raC_LD_Dvc_836P_4IOL, raC_LD_Dvc_836P_8IOL

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

Parameter Name	Default Value	Instance Name	Definition	Description
ChannelNumber				Select the Channel Number where the sensor is connected.
MasterName	MasterName	[MasterName]	Module	Select the IO-Link master module. If connecting to a non-library object module, enter the name of the master only. 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.

Note that if the tag names are manually entered or not linked to input channel tags a red 'X' will be shown beside the parameter. This is acceptable and the program can still be generated.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_836P_4IOL	raC_Dvc_836P_4IOL	3.1	(RA-LIB) Device	IO-Link
raC_Dvc_836P_8IOL	raC_Dvc_836P_8IOL	3.1	(RA-LIB) Device	IO-Link

Configured HMI Content

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

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewME\Global Object - ggfx
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewSE\Global Object - ggfx
V3_raC_Dvc_836P	Faceplate ME	(raC-3_xx-ME) raC_Dvc_836P-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_raC_Dvc_836P	Faceplate SE	(raC-3_xx-SE) raC_Dvc_836P-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_raC_Dvc_IOLink	View Designer	(raC-3_xx-VD) raC_Dvc_IOLink.vpd	{ProjectName}\Visualization\ViewDesigner - vpd
V3_RM_raC_Dvc_IO_Link	Reference Manual	DEVICE-RM300B-EN-P.pdf	{ProjectName}\Documentation
V3_IO_Link_Images	HMI Image Set	HMI FactoryTalk View Images - png.zip	{ProjectName}\Visualization\Images - png

Chapter 14

837T - Solid-State Temperature Sensor (raC_Dvc_837T_4IOL, raC_Dvc_837T_8IOL)

Overview

The 837T Solid-State Temperature Sensor device object (raC_Dvc_837T_4IOL, raC_Dvc_837T_8IOL) includes HMI faceplate's which displays device information including:

- Sensor data
- Sensor diagnostics
- Process data trending
- Sensor configuration and parameters
- Device Fault log

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_*837T*_Objects_Faceplate.MP4"

Primary device object configuration functions include:

- **Locate:** This function helps to locate the sensors using the device's LED in large machines where there are several sensors close to each other.
- **Polarity:** This function changes the sensor output to operate as Not-Inverted (Light Operate) and Inverted (Dark Operate).

Functional Description

The 837T Solid-State Temperature Sensor Sensor 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. 1.01) 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/* folder in the library. Each device is supplied with two versions of Add-On Instructions (AOI) and Rung import files - one for compatibility with each IO-Link Master Module. You must select the appropriate AOI for the master module being used.

Device/Item	Compatible IO-Link Master	Add-On Instruction	Rung Import
837T	POINT I/O 1734-4IOL	raC_Dvc_837T_4IOL_3.01_AOI.L5X	raC_Dvc_837T_4IOL_3.01_RUNG.L5X
	ArmorBlock 1732E-8IOLM12R	raC_Dvc_837T_8IOL_3.01_AOI.L5X	raC_Dvc_837T_8IOL_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.

Note that a single faceplate is used for either the 4IOL or 8IOL versions of the Add-On Instruction.

Device/Item	Type	FactoryTalk View ME Faceplate	FactoryTalk View SE Faceplate
837T	Display	(raC-3_01-ME) raC_Dvc_837T-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_837T-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - IO-Link Device.ggfx	(raC-3-SE) Toolbox - IO-Link 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
837T	(raC-3_01-VD) raC_Dvc_IOLink.vpd

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.

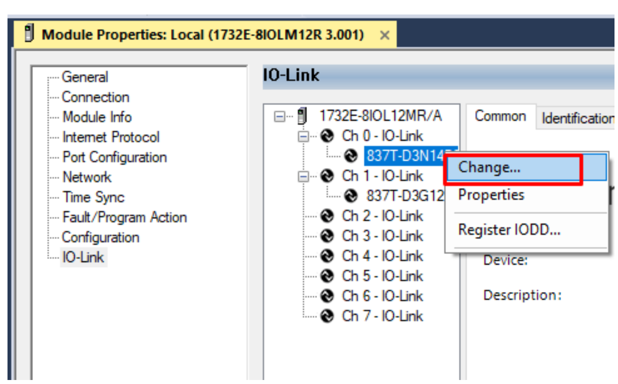
All Studio 5000 Application Code Manager files can be found in the / *ApplicationCodeManagerLibraries/* folder of the library. The files included are as follows:

Implementation Object	Compatible IO-Link Master	Asset Control File (.HSL4)	Device File (.HSL4)
837T	POINT I/O 1734-4IOL	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_837T_4IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_837T_4IOL_(3.1)
	ArmorBlock 1732E-8IOLM12R	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_837T_8IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_837T_8IOL_(3.1)

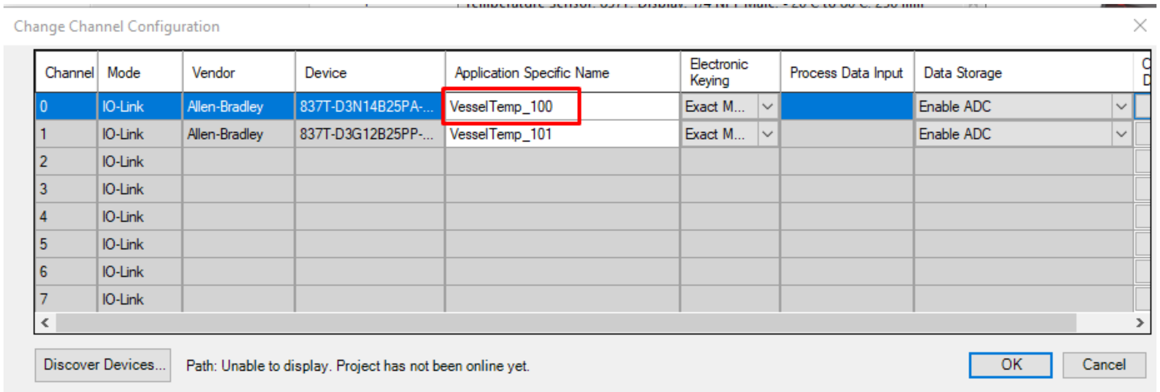
Device Definition

The device must be configured with the correct device definition. Proper device configuration enables the required cyclic device data to pass information from the device into the add-on instruction.

1. Click on Change...



2. Specify the Application Specific Name e.g. *VesselTemp_100*



Operations

The IO-Link Device objects provide only physical operation mode. There is no virtual device mode offered.

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
Write_Index	Message Configuration Write	MESSAGE
Read_Index	Message Configuration Read	MESSAGE
Write_SubIndex	Message Configuration Write	MESSAGE
Read_SubIndex	Message Configuration Read	MESSAGE
Msg_Sensor_Data	Messaging Data	raC_UDT_837T_Sensor_Data
Ref_Ctrl_Set	IO-Link Device Setting Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Set
Ref_Ctrl_Cmd	IO-Link Device Command Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Cmd
Ref_Ctrl_Sts	IO-Link Device Status Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSts
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[2]
Inp_I	Device Object Inputs	raC_UDT_ItfAD_837T_Inp_4IOL Or raC_UDT_ItfAD_837T_Inp_8IOL
Ref_Ctrl_Inf	Sensor Type Information Interface	raC_UDT_ItfAD_IOLinkSensor_Inf
Ref_Ctrl_Itf	Device Command, Status Information Interface	raC_UDT_ItfAD_IOLinkDevices

Input Data

Input	Function/Description	DataType
Inp_ChxTriggered1	Triggered Status When the Temprature is equal to Defined Temperature Set for Trigger1	BOOL
Inp_ChxTriggered2	Triggered Status When the Temperature is equal to Defined Temperature Set for Trigger2	BOOL
Inp_ChxTemperature	Displays Temperature Value of the Sensor	INT
Inp_ChNumber	Configured Channel number for Master	SINT
Cfg_DisplayModePA	Set type of Information shown on Unit Display; 0=Current Temperature, 1=Highest Temperature, 2=Low Temperature, 3=Triggered1 Set Temperature, 4=Triggered1 Reset Temperature, 5=Display OFF	DINT
Cfg_DisplayModePP	Set type of Information shown on Unit Display; 0=Current Temperature, 1=High Temperature, 2=Low Temperature, 3=Triggered1 Set Temperature, 4=Triggered1 Reset Temperature, 5=Triggered2 Set Temperature, 6=Triggered2 Reset Temperature, 7=Display OFF	DINT
Cfg_DisplayRotation	Set the change of orientation of the status indicator by 180°; 0=Default, 1=Rotate 180 Degrees	DINT
Cfg_MeasuringtUnit	Set Measuring Unit; 0=Celsius, 1=Fahrenheit	DINT
Cfg_OperatingModeTrig1	Set Operating Modes for Triggered1 Output; 0=Hysteresis, 1=Window	INT
Cfg_OperatingModeTrig2	Set Operating Modes for Triggered2 Output; 0=Hysteresis, 1=Window	INT
Cmd_LocalTeachLock	Parameters Unlock/Lock Cmd	BOOL
Cmd_Locate	Locator Disable/Enable Command	BOOL
Cmd_ResetTemp	Reset Command for Temperature	BBOL
Set_TrendTempMaxValue	Trend Tab Max value for VD/ME/SE faceplate	DINT

Input	Function/Description	DataType
Set_TrendTempMinValue	Trend Tab Min value for VD/ME/SE faceplate	DINT
Set_Trig1OffDelay	Set the Delay Value for the change of state from ON to OFF for the Triggered1	DINT
Set_Trig1OnDelay	Set the Delay Value for the change of state from OFF to ON for the Triggered1	DINT
Set_Trig1RP	Set the value of system Temperature that turns the sensor output OFF for Trigger1	REAL
Set_Trig1SP	Set the value of system Temperature that turns the sensor output ON for Trigger1	REAL
Set_Trig2OffDelay	Set the Delay Value for the change of state from ON to OFF for the Triggered2	DINT
Set_Trig2OnDelay	Set the Delay Value for the change of state from OFF to ON for the Triggered2	DINT
Set_Trig2RP	Set the value of system Temperature that turns the sensor output OFF for Trigger2	REAL
Set_Trig2SP	Set the value of system Temperature that turns the sensor output ON for Trigger2	REAL

Output Data

Output	Function/Descritpion	DataType
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Sts_Ready	Device is Ready	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: Master Communication Loss 2: Master Not Available 3: Faulted 4 - 31: Reserved	DINT
Sts_Available	Device is available for interaction with user code	BOOL
Sts_CatPA	Catalog of Connected Sensor; 0=PP, 1=PA	BOOL
Sts_InhibitCfg	1=Inhibit user Configuration Parameters from HMI Faceplate; 0=Allow	BOOL
Sts_InhibitCmd	1=Inhibit user Commands from HMI Faceplate; 0=Allow Control	BOOL
Sts_InhibitSet	1=Inhibit user Settings from HMI Faceplate; 0=Allow	BOOL
Sts_LocalTeachLock	Local Parameterization; 0= Unlock, 1= Locked	BOOL
Sts_Located	Locator Indicator; 1= Located	BOOL
Val_MeasuringUnit	Displays the Temperature Measurement Unit; 0=Celsius, 1=Fahrenheit	INT
Val_Mode	As per Connected Sensor Catalog	INT
Val_OperatingHrsSinceInception	Displays the Total Sensor Operating Hours since the sensor was first powered ON	DINT
Val_OperatingModeTrig1	Displays Operating Modes for Triggered1 Output; 0=Hysteresis, 1=Window	INT
Val_OperatingModeTrig2	Displays Operating Modes for Triggered2 Output; 0=Hysteresis, 1=Window	INT
Val_Temperature	Displays Temperature Value of the Sensor	REAL
Val_ChTemprature	Displays Converted Temperature Value of the Sensor	REAL

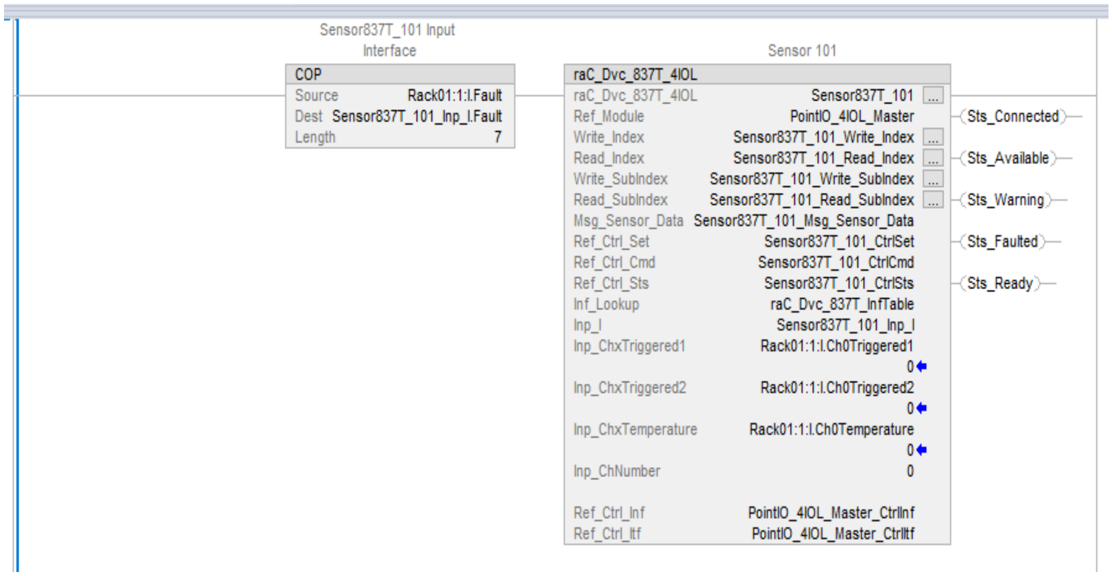
Output	Function/Descritpion	DataType
Val_TemperatureMaxSinceReset	Displays Highest Recorded Temperature Value since the last Temperature reset	REAL
Val_TemperatureMinSinceReset	Displays Lowest Recorded Temperature Value since the last Temperature reset	REAL
Val_Rotation	Displays the change of orientation of the status indicator by 180°; 0=0 Deg, 1=Rotate 180 Degrees	INT
Val_RPRangeMax	Sensor ResetPoint Maximum Range in Trend	REAL
Val_RPRangeMaxUnit	Sensor ResetPoint Unitwise Maximum Range in Trend	REAL
Val_RPRangeMin	Sensor ResetPoint Minimum Range in Trend	REAL
Val_RPRangeMinUnit	Sensor ResetPoint Unitwise Minimum Range in Trend	REAL
Val_SPRangeMax	Sensor SwitchPoint Maximum Range in Trend	REAL
Val_SPRangeMaxUnit	Sensor SwitchPoint Unitwise Maximum Range in Trend	REAL
Val_SPRangeMin	Sensor SwitchPoint Minimum Range in Trend	REAL
Val_SPRangeMinUnit	Sensor SwitchPoint Unitwise Minimum Range in Trend	REAL
Val_Trig1OffDelay	Displays the Delay Value for the change of state from ON to OFF for the Triggered1	DINT
Val_Trig1OnDelay	Displays the Delay Value for the change of state from OFF to ON for the Triggered1	DINT
Val_Trig1RP	Displays the value of system Temperature that turns the sensor output OFF for Trigger1	REAL
Val_Trig1SP	Display the value of system Temperature that turns the sensor output OFF for Trigger1	REAL
Val_Trig2OffDelay	Displays the Delay Value for the change of state from ON to OFF for the Triggered2	DINT
Val_Trig2OnDelay	Displays the Delay Value for the change of state from OFF to ON for the Triggered2	DINT
Val_Trig2RP	Displays the value of system Temperature that turns the sensor output OFF for Trigger2	REAL
Val_Trig2SP	Display the value of system Temperature that turns the sensor output OFF for Trigger2	REAL
Val_UpdateRate	Displays Sensor Display Update Rate; 0=1Hz, 1=2Hz, 2=5 Hz, 3=10Hz	INT

Programming Example

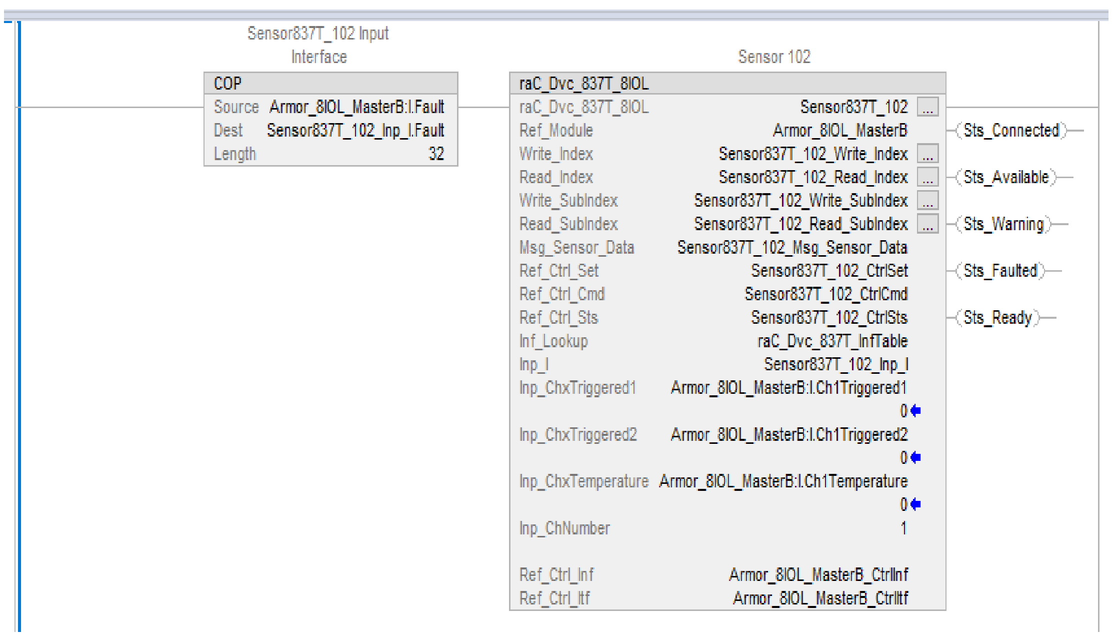
Fully configured device on a rung is provided below for reference.

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 following example uses the 837T device object connected to channel #0 of a POINT I/O 1734-4IOL IO-Link Master module in slot #1 of a POINT I/O adapter named *Rack01*.



The following example uses the 837T device object connected to channel #1 of a ArmorBlock 1732E-8IOLM12R IO-Link Master module in named *Armor_8IOL_MasterB*.



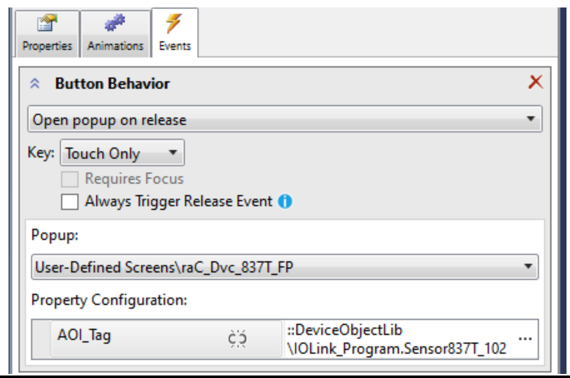
Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. See Basic Launch Button Attributes section for details on configuration and indicators.

FactoryTalk View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GO_LaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #104.	#102: AOI Backing Tag Instance (e.g. {::[PAC]Program::IOLinkProgram._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)

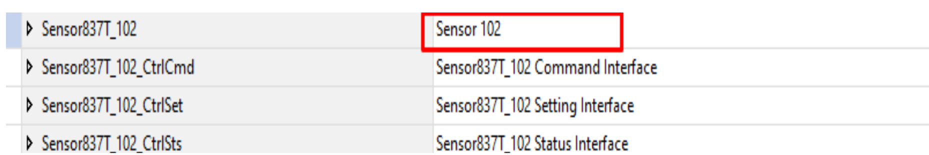
Studio 5000 View Designer Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	

Faceplates

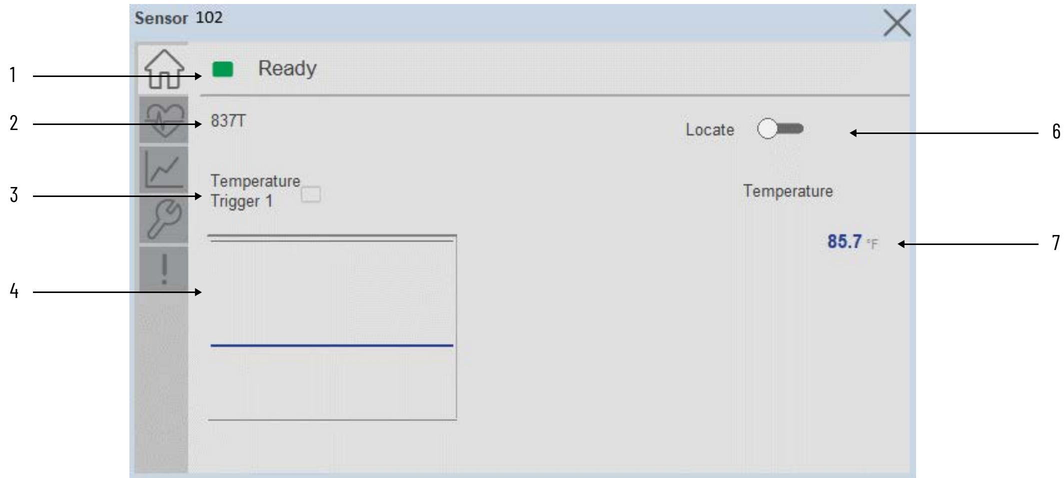
There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 30.

The faceplate title is linked to *_InstanceName.@description*, the *.@description* extended tag property of the Add-On Instruction instance. This is user-configurable from controller/program tags in Studio 5000 Logix Designer.



Home

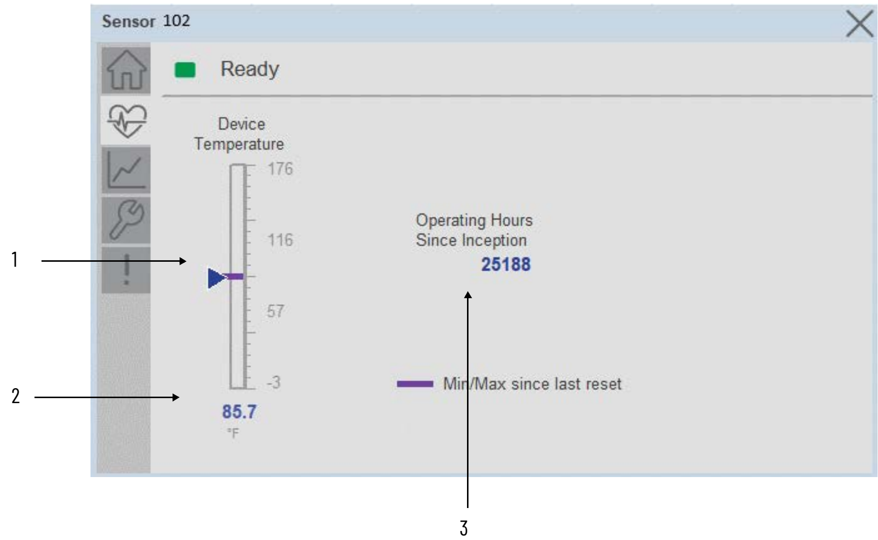
The Home tab is the main tab of the faceplate. It provides the status of the IO-Link device along with sensor process data and the Locate button.



Item	Description
1	Banner- Ready Status
2	Application Specific Name - Read from device
3	Trigger Status OFF (0) = Gray LED ON (1) = Blue LED
4	Trigger1 Sparkline Trend The spark line shows trigger ON/OFF status over last 30 seconds
5	Locate toggle switch Locate the sensor in large machines where there are several sensors close to each other. When Located, the sensor user interface (green and orange LEDs) start flashing synchronously until the operator disables this function
6	Process Data - Temperature: Displays the current Temperature value along with unit.

Health Tab

Health tab provides different diagnostic information of sensor which helps ensure that sensors are operating correctly.



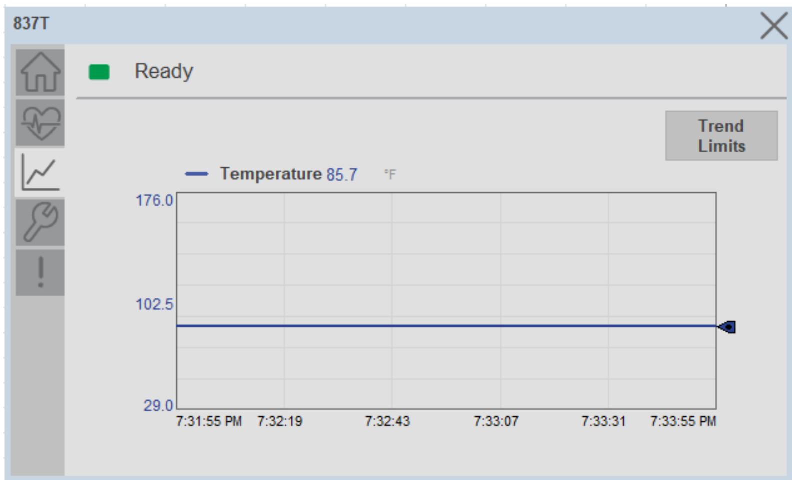
Item	Description
1	Temperature Bar Graph Purple Indicators: Min/Max since power up Light Blue Triangle Indicator: Current value
2	Temperature Current Value
3	Operating Hours Since Inception

Inception/Lifetime values are recorded since the first time the sensor was ever powered ON. These value are retained and not reset during default factory reset.

Power Up values are reset to zero and recorded new each time the sensor is power cycled.

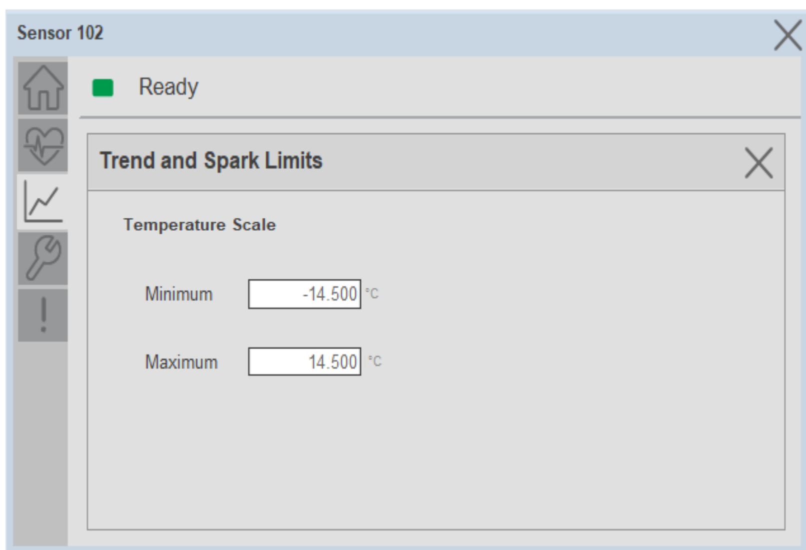
Trend Tab

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. One trend is displayed for Temperature.



Trend Settings Screen

We can set trend limits using configuration tab by clicking on the *Settings* button present on trend screen. This sub screen display contains two numeric input elements that allow the user to enter the minimum and maximum values to be used on the Trend screen for Temperature.

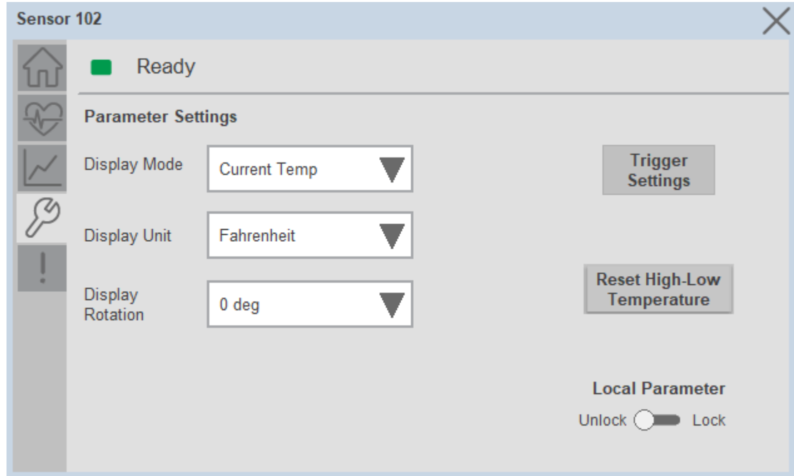


Configure Tab

The configuration tab displays the sensor parameter settings, as well as enabling the user to read data from the sensor.

The configuration section is divided into sections:

- Parameter Settings
- Trigger Settings



Parameter Settings

Display Mode- The Display Mode will allow the operators to change the type of information that should be shown on the unit display. Operators can select – Current Temperature, Highest Temperature, Lowest Temperature, Triggered 1 Set Temperature, Triggered 1 Reset Temperature, Triggered2 Set Temperature (only available in 2 PNP models), Triggered2 Reset Temperature (only available in 2 x PNP models) and Display OFF.

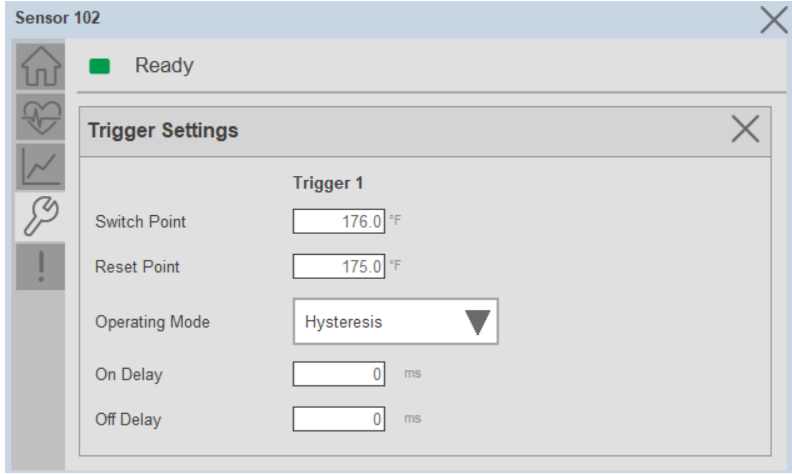
Display Units- This parameter allows you to change the Temperature measurement that is shown in the sensor display. Acceptable units are psi, bar, MPa, kPa, and kg/cm2. The default display unit for these sensors is psi.

Display Rotation- This parameter allows operators to change the orientation of the status indicator by 180°. This feature is deal for applications where the display may be in a direction that's not visible to the operator and needs to be rotated for ease of use

Lock/Unlock- This parameter keeps unauthorized people from changing the sensor settings when using the local push buttons. Toggle the lock/unlock button to prevent parameterization using local push buttons.

Reset High-Low Temperature- This parameter resets the high and low temperature values stored in the sensor since the last device Reset

Trigger Settings



The Trigger settings divided into sections:

- Trigger 1 - Visible for Single output sensor
- Trigger 2 - Visible for two output sensor

Switch Point- Triggered1 Switch Point/Window High-Condition 1: Sets the system Temperature that turns the sensor output ON when operating in Hysteresis Mode. Or turns the sensor output OFF when the system Temperature exceeds the set value in Window Mode. The operating mode for Triggered1 can be changed by modifying the Function parameter.

To set the desired Set-point value please refer the Temperature range of the 837T Temperature sensor from the user manual

Reset Point- Triggered1 Reset Point/Window Low-Condition 2: Sets the system Temperature that turns the sensor output OFF when operating in Hysteresis Mode. Or it turns the sensor output ON when the system Temperature exceeds the set value in Window Mode. The operating mode for Triggered1 can be changed by modifying the Function parameter. Touch within the Reset Point window to change the value. To set the desired Reset point value please refer the Temperature range of the 837T Temperature sensor from the user manual**.**

On Delay- Delays the change of state from OFF to ON for the Triggered1 parameter (Output1 in SIO) for up to 32 seconds when the polarity is defined as Normally Open. This parameter helps operators filter out unwanted Temperature peaks in their systems.

Off Delay- Delays the change of state from ON to OFF for the Triggered1 parameter (Output1 in SIO) for up to 32 seconds when the polarity is defined as Normally Open. This parameter helps operators filter out unwanted Temperature peaks in their systems.

Operating Mode- This parameter defines the operating mode for Triggered1 sensor output. The output can be configured to operate in the following modes.

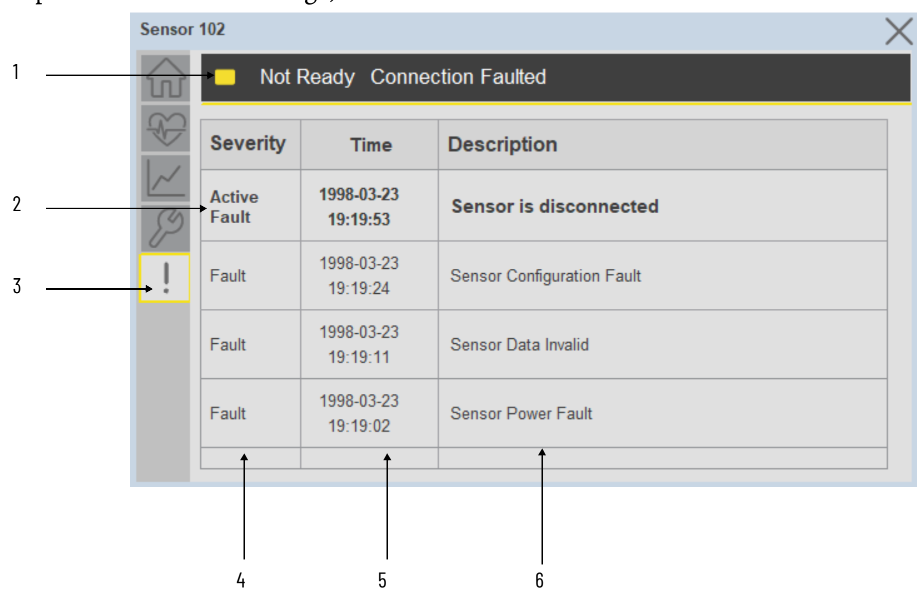
• Hysteresis Mode: Output1 and the Triggered1 process data parameter turn ON when the Temperature value is higher than the Switch Point. And turns OFF when the Temperature value is lower than the reset point.

• Window Mode: Output1 and the Triggered1 process data parameter turn ON when the Temperature value is between the Switch Point and the Reset Point. It turns OFF when the Temperature value is higher than the Switch Point or lower than the Reset Point.

Fault Warning Tab

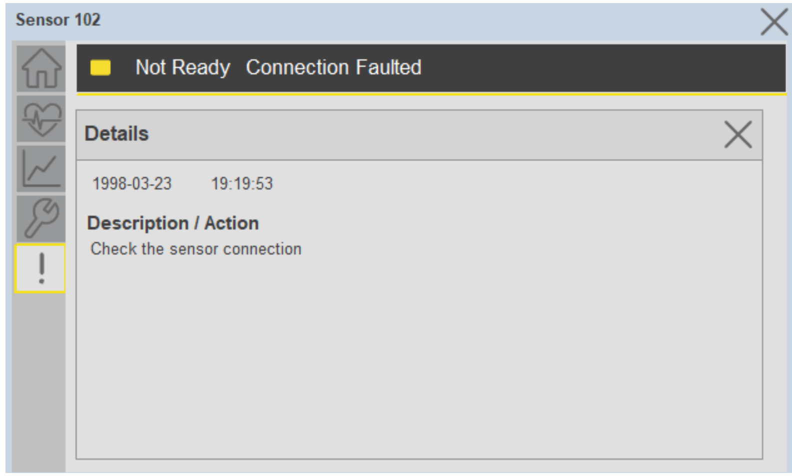
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

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.



Application Code Manager

IO-Link Device Library objects can be set-up and configured using Studio 5000 Application Code Manager.

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

Definition Objects: raC_Dvc_837T_4IOL, raC_Dvc_837T_8IOL

This object contains the AOI definition and used as linked library to implement object. There is one definition and per add-on instruction to support each IO-Link Master Module. 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 Objects: raC_LD_Dvc_837T_4IOL, raC_LD_Dvc_837T_8IOL

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
ChannelNumber				Select the Channel Number where the sensor is connected.

Parameter Name	Default Value	Instance Name	Definition	Description
MasterName	MasterName	[MasterName]	Module	Select the IO-Link master module. If connecting to a non-library object module, enter the name of the master only. 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.

Note that if the tag names are manually entered or not linked to input channel tags a red 'X' will be shown beside the parameter. This is acceptable and the program can still be generated.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_837T_4IOL	raC_Dvc_837T_4IOL	3.1	(RA-LIB) Device	IO-Link
raC_Dvc_837T_8IOL	raC_Dvc_837T_8IOL	3.1	(RA-LIB) Device	IO-Link

Configured HMI Content

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

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewME\Global Object - ggfx
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewSE\Global Object - ggfx
V3_raC_Dvc_837T	Faceplate ME	(raC-3_xx-ME) raC_Dvc_837T-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_raC_Dvc_837T	Faceplate SE	(raC-3_xx-SE) raC_Dvc_837T-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_raC_Dvc_IOLink	View Designer	(raC-3_xx-VD) raC_Dvc_IOLink.vpd	{ProjectName}\Visualization\ViewDesigner - vpd
V3_RM_raC_Dvc_IO_Link	Reference Manual	DEVICE-RM300B-EN-P.pdf	{ProjectName}\Documentation
V3_IO_Link_Images	HMI Image Set	HMI FactoryTalk View Images - png.zip	{ProjectName}\Visualization\Images - png

856T - 856T Control Tower Stack Light (raC_Dvc_856T_4IOL, raC_Dvc_856T_8IOL)

Overview

The 856T Control Tower Stack Light device object (raC_Dvc_856T_4IOL, raC_Dvc_856T_8IOL) includes HMI faceplate's which displays device information including:

- Sensor data
- Sensor diagnostics
- Sensor configuration and parameters
- Device Fault log

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_*856T*_Objects_Faceplate.MP4"

Primary device object configuration functions include:

Functional Description

The 856T Control Tower Stack Light Sensor pre-configured Device Objects:

- Collect, Process and Deliver Data between Smart Devices and Application Logic
- Provide Device Status & Diagnostics Faceplate's 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. 1.01) 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/* folder in the library. Each device is supplied with two versions of Add-On Instructions (AOI) and Rung import files - one for compatibility with each IO-Link Master Module. You must select the appropriate AOI for the master module being used.

Device/Item	Compatible IO-Link Master	Add-On Instruction	Rung Import
856T	POINT I/O 1734-4IOL	raC_Dvc_856T_4IOL_3.01_AOI.L5X	raC_Dvc_856T_4IOL_3.01_RUNG.L5X
	ArmorBlock 1732E-8IOLM12R	raC_Dvc_856T_8IOL_3.01_AOI.L5X	raC_Dvc_856T_8IOL_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.

Note that a single faceplate is used for either the 4IOL or 8IOL versions of the Add-On Instruction.

Device/Item	Type	FactoryTalk View ME Faceplate	FactoryTalk View SE Faceplate
856T	Display	(raC-3_01-ME) raC_Dvc_856T-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_856T-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - IO-Link Device.ggfx	(raC-3-SE) Toolbox - IO-Link 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
856T	(raC-3_01-VD) raC_Dvc_IOLink.vpd

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.

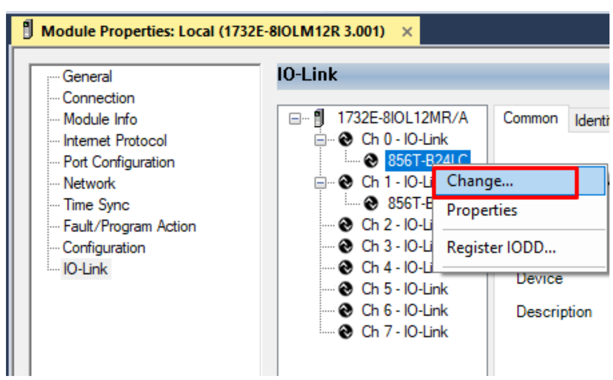
All Studio 5000 Application Code Manager files can be found in the /*ApplicationCodeManagerLibraries/* folder of the library. The files included are as follows:

Implementation Object	Compatible IO-Link Master	Asset Control File (.HSL4)	Device File (.HSL4)
856T	POINT I/O 1734-4IOL	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_856T_4IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_856T_4IOL_(3.1)
	ArmorBlock 1732E-8IOLM12R	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_856T_8IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_856T_8IOL_(3.1)

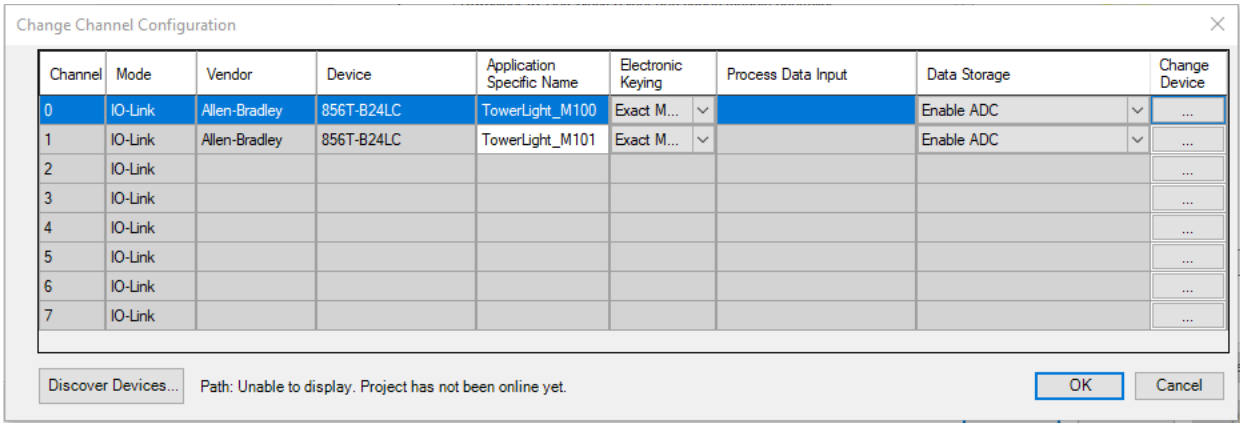
Device Definition

The device must be configured with the correct device definition. Proper device configuration enables the required cyclic device data to pass information from the device into the add-on instruction.

1. Click on Change...



2. Specify the Application Specific Name e.g. *TowerLight_M100*



Operations

The IO-Link Device objects provide only physical operation mode. There is no virtual device mode offered.

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
Write_Index	Message Configuration Write	MESSAGE
Read_Index	Message Configuration Read	MESSAGE
Write_SubIndex	Message Configuration Write	MESSAGE
Read_SubIndex	Message Configuration Read	MESSAGE
Msg_Sensor_Data	Messaging Data	raC_UDT_856T_Sensor_Data
Ref_Ctrl_Set	IO-Link Device Setting Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Set
Ref_Ctrl_Cmd	IO-Link Device Command Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Cmd
Ref_Ctrl_Sts	IO-Link Device Status Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSts
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[2]
Inp_I	Device Object Inputs	raC_UDT_ItfAD_856T_Inp_4IOL Or raC_UDT_ItfAD_856T_Inp_8IOL
Ref_Ctrl_Inf	Sensor Type Information Interface	raC_UDT_ItfAD_IOLinkSensor_Inf
Ref_Ctrl_Itf	Device Command, Status Information Interface	raC_UDT_ItfAD_IOLinkDevices
Out_ChxControlModule1	Control Module1; Bit 0 = Behaviour, Bit 1 = Behaviour, Bit 2 = Behaviour, Bit 3 = Color/ Sound, Bit 4 = Color/Sound, Bit 5 = Color/ Sound	SINT
Out_ChxControlModule2	Control Module2; Bit 0 = Behaviour, Bit 1 = Behaviour, Bit 2 = Behaviour, Bit 3 = Color/ Sound, Bit 4 = Color/Sound, Bit 5 = Color/ Sound	SINT
Out_ChxControlModule3	Control Module3; Bit 0 = Behaviour, Bit 1 = Behaviour, Bit 2 = Behaviour, Bit 3 = Color/ Sound, Bit 4 = Color/Sound, Bit 5 = Color/ Sound	SINT
Out_ChxControlModule4	Control Module4; Bit 0 = Behaviour, Bit 1 = Behaviour, Bit 2 = Behaviour, Bit 3 = Color/ Sound, Bit 4 = Color/Sound, Bit 5 = Color/ Sound	SINT
Out_ChxControlModule5	Control Module5; Bit 0 = Behaviour, Bit 1 = Behaviour, Bit 2 = Behaviour, Bit 3 = Color/ Sound, Bit 4 = Color/Sound, Bit 5 = Color/ Sound	SINT
Out_ChxControlModule6	Control Module6; Bit 0 = Behaviour, Bit 1 = Behaviour, Bit 2 = Behaviour, Bit 3 = Color/ Sound, Bit 4 = Color/Sound, Bit 5 = Color/ Sound	SINT
Out_ChxControlModule7	Control Module7; Bit 0 = Behaviour, Bit 1 = Behaviour, Bit 2 = Behaviour, Bit 3 = Color/ Sound, Bit 4 = Color/Sound, Bit 5 = Color/ Sound	SINT

Input Data

Input	Function/Description	DataType
Inp_ChNumber	Configured Channel number for Master	SINT
Inp_ChxAlarmStatus	Configure Device Object Input Alarm Status	INT
Set_VibCalibPeriod	Vibration Calibration Period Set Value	REAL

Input	Function/Description	DataType
Set_VibWarningLimitX	Vibration X-axis Warning Limit Set Value	REAL
Set_VibWarningLimitY	Vibration Y-axis Warning Limit Set Value	REAL
Set_VibWarningLimitZ	Vibration Z-axis Warning Limit Set Value	REAL
Cfg_DD1ControlOutput1	Control Output1 Module Behaviors; 0 = OFF, 1 = ON Steady, 2 = Slow Flash, 3 = Fast Flash	INT
Cfg_DD1ControlOutput2	Control Output2 Module Behaviors; 0 = OFF, 1 = ON Steady, 2 = Slow Flash, 3 = Fast Flash	INT
Cfg_DD1ControlOutput3	Control Output3 Module Behaviors; 0 = OFF, 1 = ON Steady, 2 = Slow Flash, 3 = Fast Flash	INT
Cfg_DD1ControlOutput4	Control Output4 Module Behaviors; 0 = OFF, 1 = ON Steady, 2 = Slow Flash, 3 = Fast Flash	INT
Cfg_DD1ControlOutput5	Control Output5 Module Behaviors; 0 = OFF, 1 = ON Steady, 2 = Slow Flash, 3 = Fast Flash	INT
Cfg_DD1ControlOutput6	Control Output6 Module Behaviors; 0 = OFF, 1 = ON Steady, 2 = Slow Flash, 3 = Fast Flash	INT
Cfg_DD1ControlOutput7	Control Output7 Module Behaviors; 0 = OFF, 1 = ON Steady, 2 = Slow Flash, 3 = Fast Flash	INT
Cfg_DD2ControlOutput1	Control Output1 Color or Sound; 0 = Red, 1 = Reserved, 2 = Yellow, 3 = Green, 4 = Blue, 5 = Cyan (Turquoise), 6 = Magenta, 7 = White, 8 = Sound1, 9 = Sound2, 10 = Sound3, 11 = Sound4, 12 = Sound5, 13 = Sound6, 14 = Sound7, 15 = Reserved	INT
Cfg_DD2ControlOutput2	Control Output2 Color or Sound; 0 = Red, 1 = Reserved, 2 = Yellow, 3 = Green, 4 = Blue, 5 = Cyan (Turquoise), 6 = Magenta, 7 = White, 8 = Sound1, 9 = Sound2, 10 = Sound3, 11 = Sound4, 12 = Sound5, 13 = Sound6, 14 = Sound7, 15 = Reserved	INT
Cfg_DD2ControlOutput3	Control Output3 Color or Sound; 0 = Red, 1 = Reserved, 2 = Yellow, 3 = Green, 4 = Blue, 5 = Cyan (Turquoise), 6 = Magenta, 7 = White, 8 = Sound1, 9 = Sound2, 10 = Sound3, 11 = Sound4, 12 = Sound5, 13 = Sound6, 14 = Sound7, 15 = Reserved	INT
Cfg_DD2ControlOutput4	Control Output4 Color or Sound; 0 = Red, 1 = Reserved, 2 = Yellow, 3 = Green, 4 = Blue, 5 = Cyan (Turquoise), 6 = Magenta, 7 = White, 8 = Sound1, 9 = Sound2, 10 = Sound3, 11 = Sound4, 12 = Sound5, 13 = Sound6, 14 = Sound7, 15 = Reserved	INT
Cfg_DD2ControlOutput5	Control Output5 Color or Sound; 0 = Red, 1 = Reserved, 2 = Yellow, 3 = Green, 4 = Blue, 5 = Cyan (Turquoise), 6 = Magenta, 7 = White, 8 = Sound1, 9 = Sound2, 10 = Sound3, 11 = Sound4, 12 = Sound5, 13 = Sound6, 14 = Sound7, 15 = Reserved	INT
Cfg_DD2ControlOutput6	Control Output6 Color or Sound; 0 = Red, 1 = Reserved, 2 = Yellow, 3 = Green, 4 = Blue, 5 = Cyan (Turquoise), 6 = Magenta, 7 = White, 8 = Sound1, 9 = Sound2, 10 = Sound3, 11 = Sound4, 12 = Sound5, 13 = Sound6, 14 = Sound7, 15 = Reserved	INT
Cfg_DD2ControlOutput7	Control Output7 Color or Sound; 0 = Red, 1 = Reserved, 2 = Yellow, 3 = Green, 4 = Blue, 5 = Cyan (Turquoise), 6 = Magenta, 7 = White, 8 = Sound1, 9 = Sound2, 10 = Sound3, 11 = Sound4, 12 = Sound5, 13 = Sound6, 14 = Sound7, 15 = Reserved	INT
Cfg_ModuleType1	Module Type1; 0 = No Module, 1 = Steady Light, 2 = Multi-function Light, 3 = Rotating Light, 4 = Multi-color Light, 5 = Steady/Flash beacon, 6 = Strobe beacon, 7 = Rotating beacon, 8 = Multi-color beacon, 9 = Piezo Electric Sound, 10 = Transducer Sound, 11 = Recordable Sound	INT
Cfg_ModuleType2	Module Type2; 0 = No Module, 1 = Steady Light, 2 = Multi-function Light, 3 = Rotating Light, 4 = Multi-color Light, 5 = Steady/Flash beacon, 6 = Strobe beacon, 7 = Rotating beacon, 8 = Multi-color beacon, 9 = Piezo Electric Sound, 10 = Transducer Sound, 11 = Recordable Sound	INT
Cfg_ModuleType3	Module Type3; 0 = No Module, 1 = Steady Light, 2 = Multi-function Light, 3 = Rotating Light, 4 = Multi-color Light, 5 = Steady/Flash beacon, 6 = Strobe beacon, 7 = Rotating beacon, 8 = Multi-color beacon, 9 = Piezo Electric Sound, 10 = Transducer Sound, 11 = Recordable Sound	INT
Cfg_ModuleType4	Module Type4; 0 = No Module, 1 = Steady Light, 2 = Multi-function Light, 3 = Rotating Light, 4 = Multi-color Light, 5 = Steady/Flash beacon, 6 = Strobe beacon, 7 = Rotating beacon, 8 = Multi-color beacon, 9 = Piezo Electric Sound, 10 = Transducer Sound, 11 = Recordable Sound	INT

Input	Function/Description	DataType
Cfg_ModuleType5	Module Type5; 0 = No Module, 1 = Steady Light, 2 = Multi-function Light, 3 = Rotating Light, 4 = Multi-color Light, 5 = Steady/Flash beacon, 6 = Strobe beacon, 7 = Rotating beacon, 8 = Multi-color beacon, 9 = Piezo Electric Sound, 10 = Transducer Sound, 11 = Recordable Sound	INT
Cfg_ModuleType6	Module Type6; 0 = No Module, 1 = Steady Light, 2 = Multi-function Light, 3 = Rotating Light, 4 = Multi-color Light, 5 = Steady/Flash beacon, 6 = Strobe beacon, 7 = Rotating beacon, 8 = Multi-color beacon, 9 = Piezo Electric Sound, 10 = Transducer Sound, 11 = Recordable Sound	INT
Cfg_ModuleType7	Module Type7; 0 = No Module, 1 = Steady Light, 2 = Multi-function Light, 3 = Rotating Light, 4 = Multi-color Light, 5 = Steady/Flash beacon, 6 = Strobe beacon, 7 = Rotating beacon, 8 = Multi-color beacon, 9 = Piezo Electric Sound, 10 = Transducer Sound, 11 = Recordable Sound	INT
Cfg_VibCalibStartStop	Vibration calibration Start/Stop Command	INT
Cmd_LocalTeachLock	Local Parameterization; 0= Unlock, 1= Locked	BOOL

Output Data

Output	Function/Descritpion	DataType
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Sts_Ready	Device is Ready	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: Master Communication Loss 2: Master Not Available 3: Faulted 4 - 31: Reserved	DINT
Sts_Available	Device is available for interaction with user code	BOOL
Sts_InhibitCfg	Disable Configuration inputs from external sources	BOOL
Sts_InhibitCmd	Disable Command inputs from external sources	BOOL
Sts_InhibitSet	Disable Setting inputs from external sources	BOOL
Val_ClassAVoltage	Class A power supply voltage	REAL
Val_ClassBVoltage	Class B (auxiliary) power supply voltage	REAL
Val_CurrentModuleType1	Module Type1; 0 = No Module, 1 = Steady Light, 2 = Multi-function Light, 3 = Rotating Light, 4 = Multi-color Light, 5 = Steady/Flash beacon, 6 = Strobe beacon, 7 = Rotating beacon, 8 = Multi-color beacon, 9 = Piezo Electric Sound, 10 = Transducer Sound, 11 = Recordable Sound	INT
Val_CurrentModuleType2	Module Type2; 0 = No Module, 1 = Steady Light, 2 = Multi-function Light, 3 = Rotating Light, 4 = Multi-color Light, 5 = Steady/Flash beacon, 6 = Strobe beacon, 7 = Rotating beacon, 8 = Multi-color beacon, 9 = Piezo Electric Sound, 10 = Transducer Sound, 11 = Recordable Sound	INT
Val_CurrentModuleType3	Module Type3; 0 = No Module, 1 = Steady Light, 2 = Multi-function Light, 3 = Rotating Light, 4 = Multi-color Light, 5 = Steady/Flash beacon, 6 = Strobe beacon, 7 = Rotating beacon, 8 = Multi-color beacon, 9 = Piezo Electric Sound, 10 = Transducer Sound, 11 = Recordable Sound	INT
Val_CurrentModuleType4	Module Type4; 0 = No Module, 1 = Steady Light, 2 = Multi-function Light, 3 = Rotating Light, 4 = Multi-color Light, 5 = Steady/Flash beacon, 6 = Strobe beacon, 7 = Rotating beacon, 8 = Multi-color beacon, 9 = Piezo Electric Sound, 10 = Transducer Sound, 11 = Recordable Sound	INT

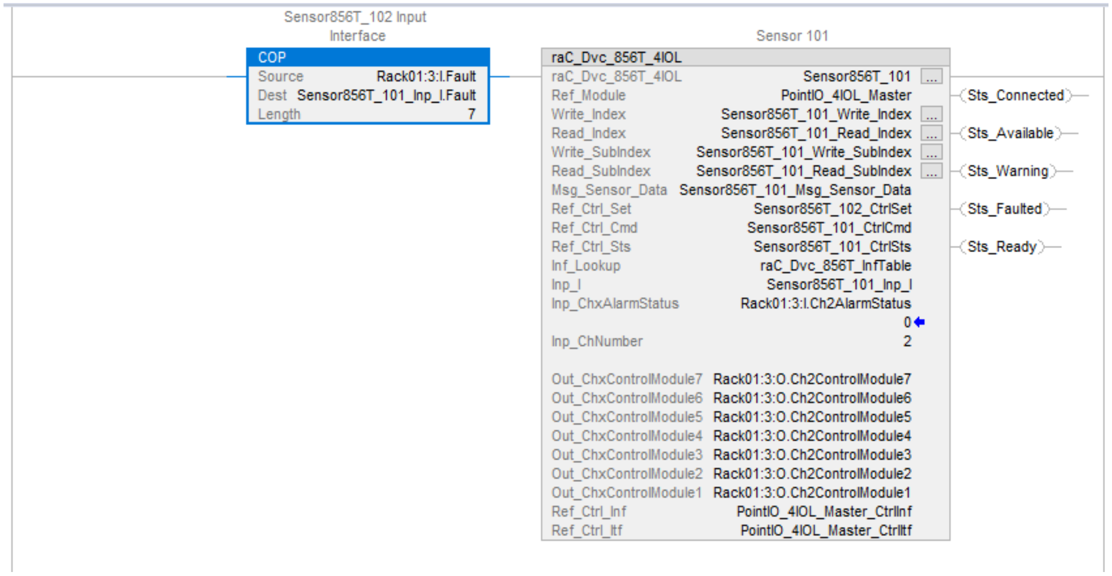
Output	Function/Descritpion	DataType
Val_CurrentModuleType5	Module Type5; 0 = No Module, 1 = Steady Light, 2 = Multi-function Light, 3 = Rotating Light, 4 = Multi-color Light, 5 = Steady/Flash beacon, 6 = Strobe beacon, 7 = Rotating beacon, 8 = Multi-color beacon, 9 = Piezo Electric Sound, 10 = Transducer Sound, 11 = Recordable Sound	INT
Val_CurrentModuleType6	Module Type6; 0 = No Module, 1 = Steady Light, 2 = Multi-function Light, 3 = Rotating Light, 4 = Multi-color Light, 5 = Steady/Flash beacon, 6 = Strobe beacon, 7 = Rotating beacon, 8 = Multi-color beacon, 9 = Piezo Electric Sound, 10 = Transducer Sound, 11 = Recordable Sound	INT
Val_CurrentModuleType7	Module Type7; 0 = No Module, 1 = Steady Light, 2 = Multi-function Light, 3 = Rotating Light, 4 = Multi-color Light, 5 = Steady/Flash beacon, 6 = Strobe beacon, 7 = Rotating beacon, 8 = Multi-color beacon, 9 = Piezo Electric Sound, 10 = Transducer Sound, 11 = Recordable Sound	INT
Val_OperatingHrsSinceInception	Indicates the time the IO-link module has been functional since first powered	DINT
Val_OperatingHrsSincePowerUp	Indicates the amount of time the IO-link module has been functional since last power cycle	DINT
Val_TemperatureCurrent	Current internal temperature of the IO-Link module since powerup or last power cycle	INT
Val_TemperatureMaxSincePowerUp	Maximum internal temperature of the IO-Link module since powerup or last power cycle	INT
Val_TemperatureMinSincePowerUp	Minimum internal temperature of the IO-Link module since powerup or last power cycle	INT
Val_VibAvgXAxis	The average vibration value for X-axis	REAL
Val_VibAvgYAxis	The average vibration value for Y-axis	REAL
Val_VibAvgZAxis	The average vibration value for Z-axis	REAL
Val_VibCalibPeriod	Vibration Calibration Period	REAL
Val_VibCalibStatusData	The functional state of the calibration process once activated	SINT
Val_VibMaxLifetimeXAxis	The average vibration value for X-axis	REAL
Val_VibMaxLifetimeYAxis	The average vibration value for Y-axis	REAL
Val_VibMaxLifetimeZAxis	The average vibration value for Z-axis	REAL
Val_VibMaxSPUXAxis	The maximum vibration value for X-axis since powerup	REAL
Val_VibMaxSPUYAxis	The maximum vibration value for Y-axis since powerup	REAL
Val_VibMaxSPUZAxis	The maximum vibration value for Z-axis since powerup	REAL
Val_VibWarningLimitX	Vibration threshold limit value of X-axis	REAL
Val_VibWarningLimitY	Vibration threshold limit value of Y-axis	REAL
Val_VibWarningLimitZ	Vibration threshold limit value of Z-axis	REAL

Programming Example

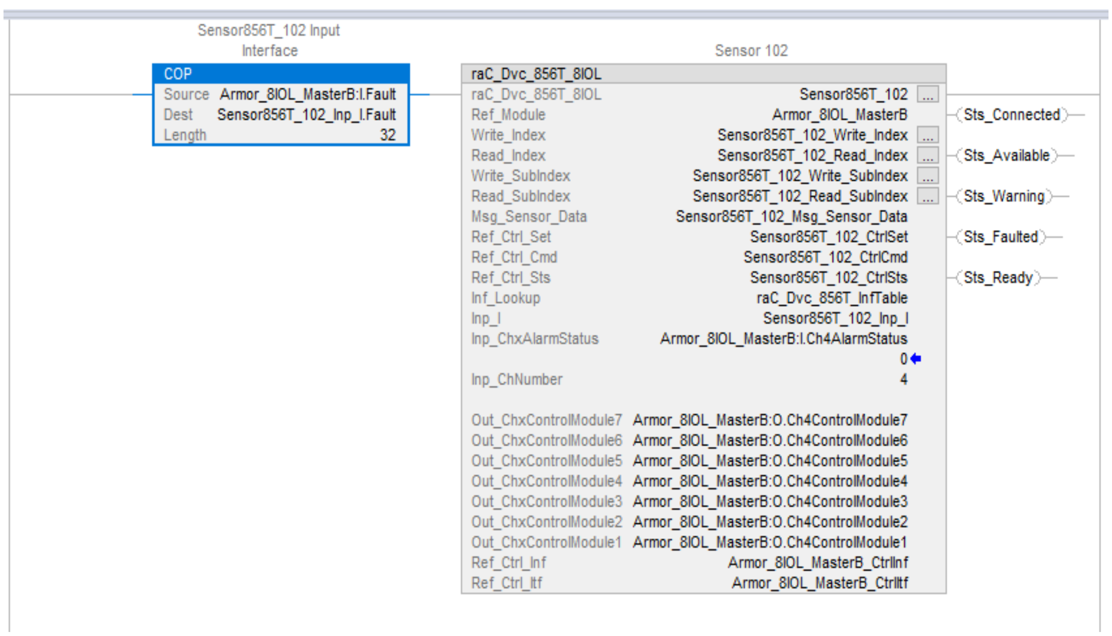
Fully configured device on a rung is provided below for reference.

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 following example uses the 856T device object connected to channel #2 of a POINT I/O 1734-4IOL IO-Link Master module in slot #3 of a POINT I/O adapter named *Rack01*.



The following example uses the 856T device object connected to channel #4 of a ArmorBlock 1732E-8IOLM12R IO-Link Master module in named *Armor_8IOL_MasterB*.



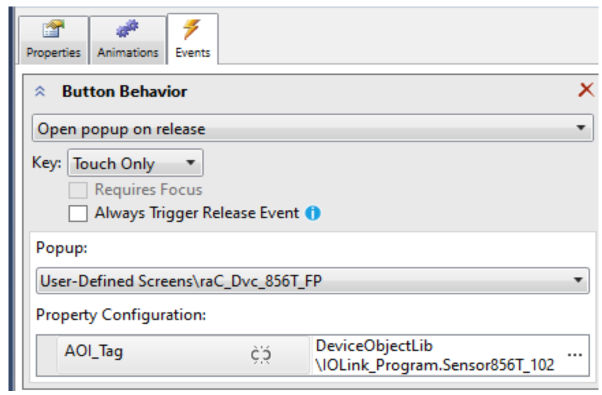
Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. See Basic Launch Button Attributes section for details on configuration and indicators.

FactoryTalk View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GO_LaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #104.	#102: AOI Backing Tag Instance (e.g. {::[PAC]Program::IOLinkProgram._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)

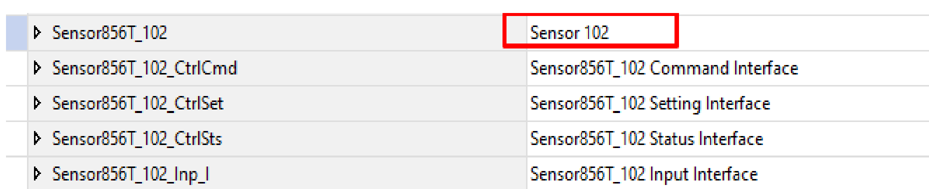
Studio 5000 View Designer Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	

Faceplates

There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 30.

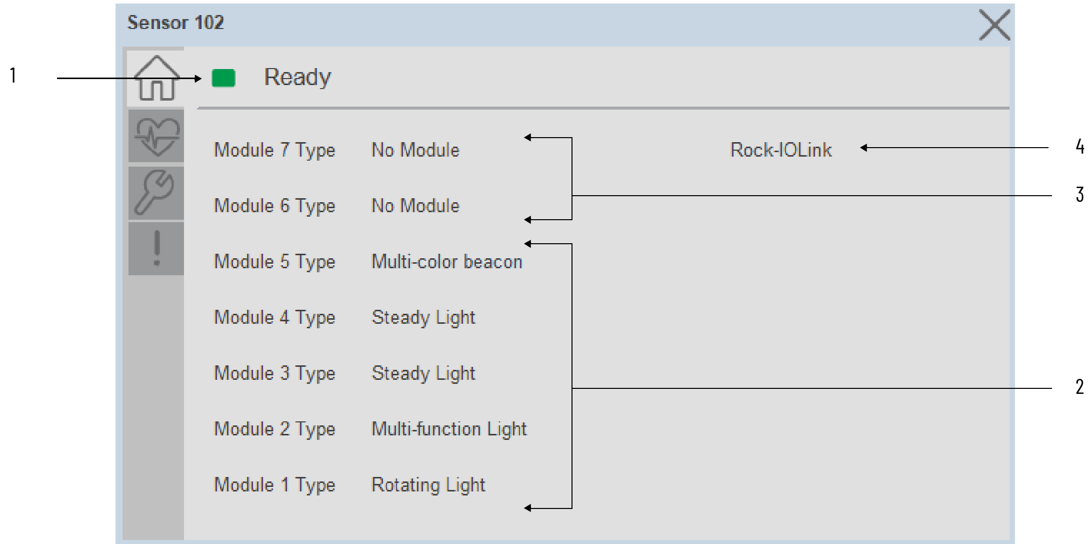
The faceplate title is linked to *_InstanceName.@description*, the *.@description* extended tag property of the Add-On Instruction instance. This is user-configurable from controller/program tags in Studio 5000 Logix Designer.



Sensor856T_102	Sensor 102
Sensor856T_102_CtrlCmd	Sensor856T_102 Command Interface
Sensor856T_102_CtrlSet	Sensor856T_102 Setting Interface
Sensor856T_102_CtrlSts	Sensor856T_102 Status Interface
Sensor856T_102_Inp_I	Sensor856T_102 Input Interface

Home

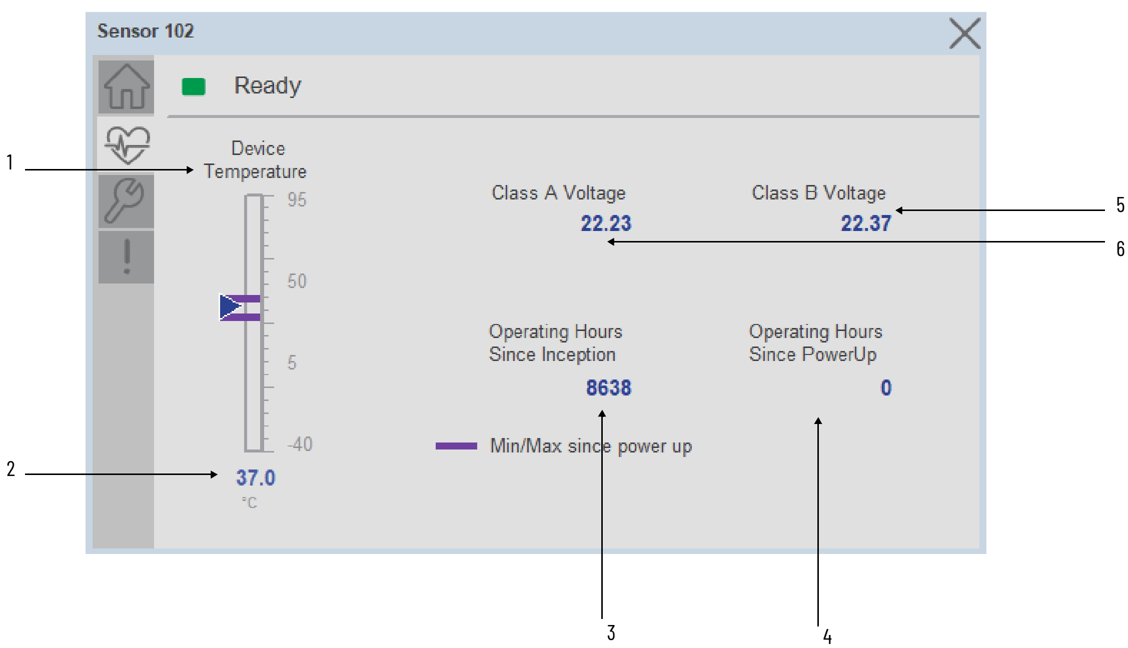
The Home tab is the main tab of the faceplate. It provides the status of the IO-Link device along with sensor process data.



Item	Description
1	Banner- Ready Status
2	Configured module type on Tower Light
3	Non Configured module type on Tower Light
4	Application Specific Name - Read from device

Health Tab

Health tab provides different diagnostic information of sensor which helps ensure that sensors are operating correctly.



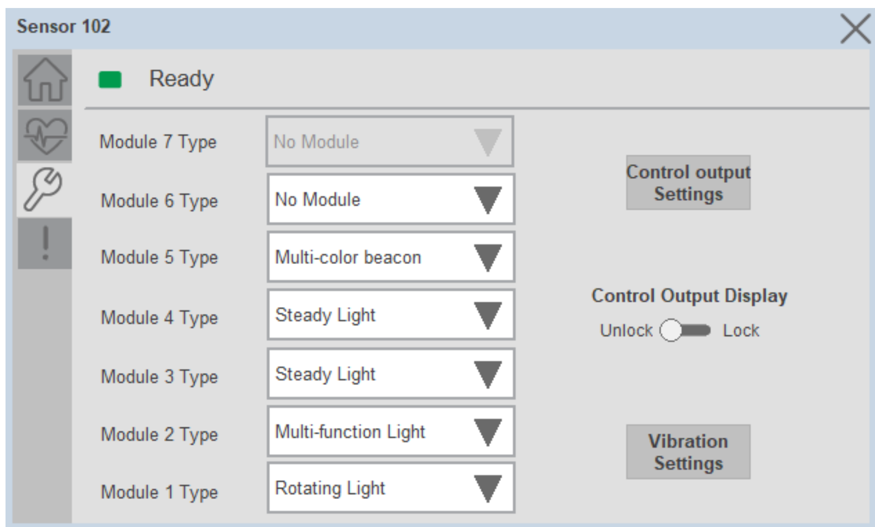
Item	Description
1	Temperature Bar Graph Purple Indicators: Min/Max since power up Light Blue Triangle Indicator: Current value
2	Temperature Current Value
3	Operating Hours Since Inception
4	Operating Hours Since PowerUp
5	Class A Voltage
6	Class B Voltage

Inception/Lifetime values are recorded since the first time the sensor was ever powered ON. These value are retained and not reset during default factory reset.

Power Up values are reset to zero and recorded new each time the sensor is power cycled.

Configure Tab

The configuration tab displays the sensor parameter settings, as well as enabling the user to read data from the sensor.



Parameter Settings

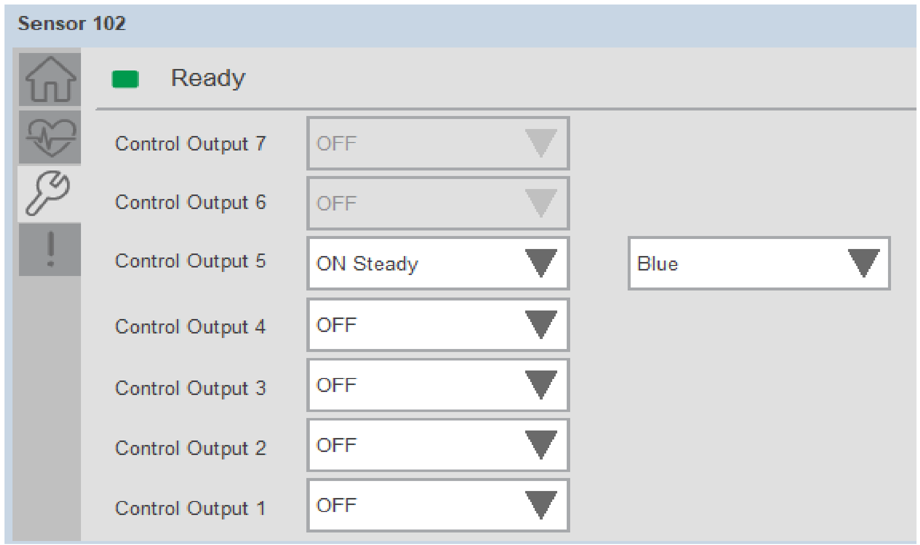
Module Type- Based on installed module on Tower light user can configure the module using module type selection. The following options list is available.

1. Steady Light
2. Multi-function Light
3. Rotating Light
4. Multi-color Light
5. Steady/Flashing beacon
6. Strobe beacon
7. Rotating beacon
8. Multi-color beacon

9. Piezo Electric Sounder
10. Transducer Sounder
11. Recordable Sound

Control Output Display Lock/Unlock- The Toggle button is used to Lock and Unlock the Control Output Display settings. If it is Unlock, then it will allow the user to choose the Control Output function from the HMI.

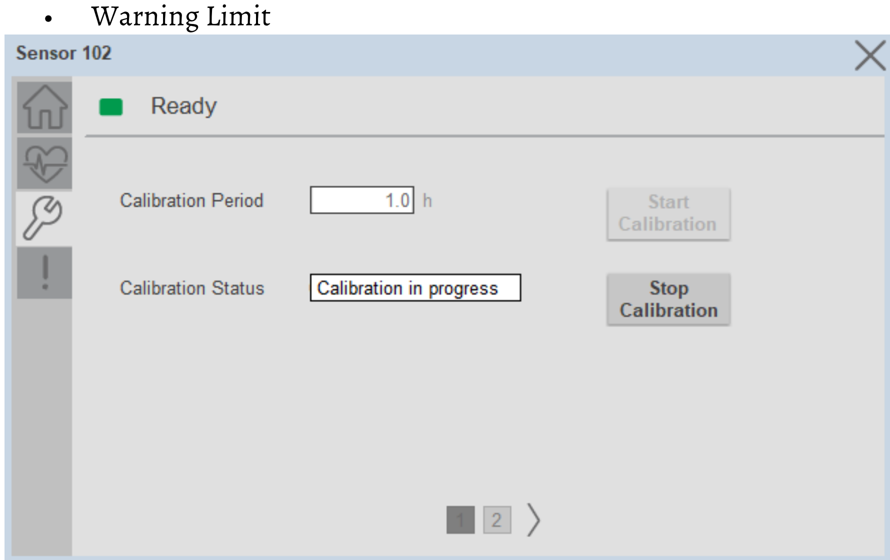
Control Output Settings- Based on the light or Sound module connected in each circuit, the output color and sound can also be configured.



Vibration Setting- To set Vibration indication which used to alert about unusual mechanical behavior when the IO-Link module detects vibration above certain threshold values.

Vibration settings divided into sections:

- Calibration
- Warning Limit



Calibration Period- The Calibration Period allows you to enter the time in which the IO-Link module gathers vibration samples to compute and obtain the vibration thresholds per axis.

Calibration Status- Calibration Status shows the functional state of the calibration process once activated.

Start, Stop Calibration - To start & Stop the calibration click the button

Warning Limit- The Warning Limit for X-axis, Y-axis, Z-axis allows you to enter a desired vibration threshold.

Average- Provides the average vibration value for each X, Y and Z axis.

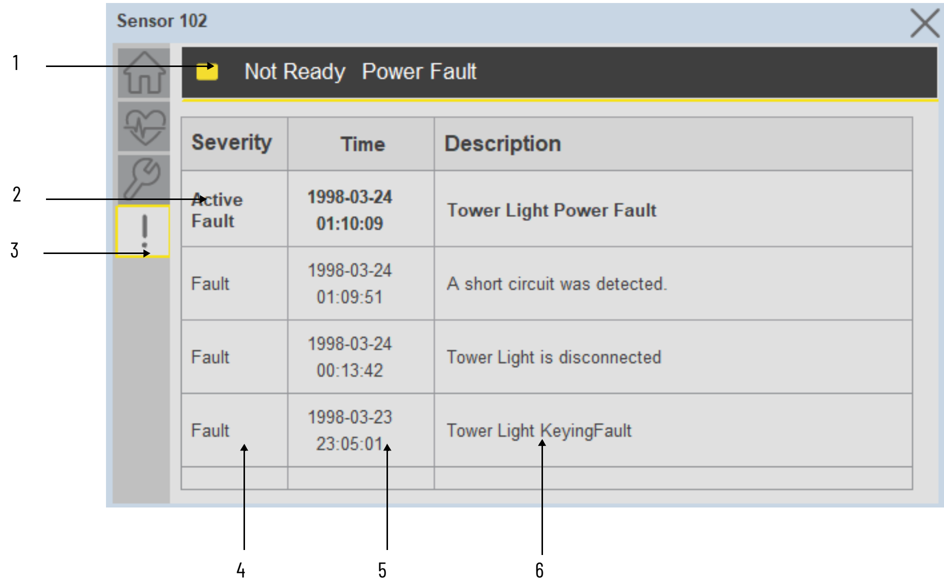
Maximum Since Power Up- Provides the maximum vibration value for each X, Y and Z axis, since power up.

Maximum Lifetime- Provides the maximum vibration value for each X, Y and Z axis, since inception.

Fault Warning Tab

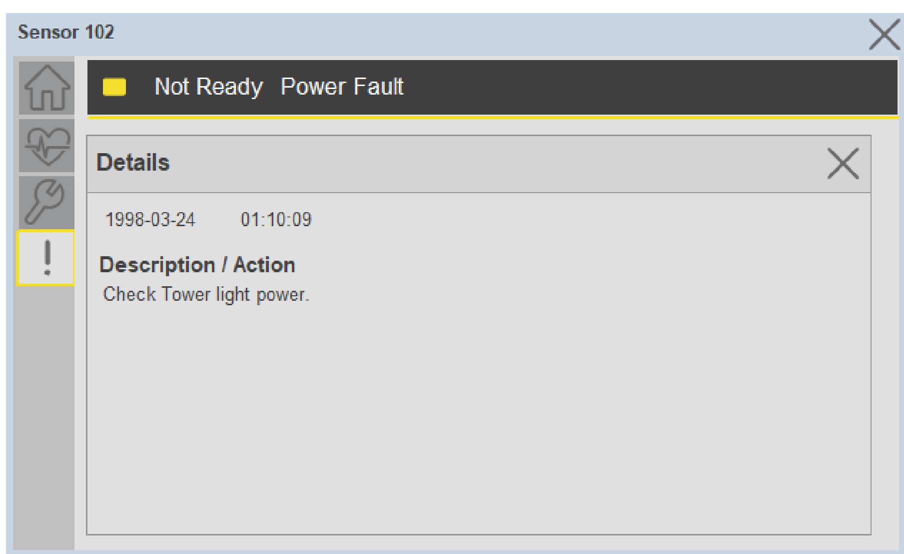
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

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.



Application Code Manager

IO-Link Device Library objects can be set-up and configured using Studio 5000 Application Code Manager.

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

Definition Objects: raC_Dvc_856T_4IOL, raC_Dvc_856T_8IOL

This object contains the AOI definition and used as linked library to implement object. There is one definition and per add-on instruction to support each IO-Link Master Module. 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 Objects: raC_LD_Dvc_856T_4IOL, raC_LD_Dvc_856T_8IOL

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
ChannelNumber				Select the Channel Number where the sensor is connected.
MasterName	MasterName	[MasterName]	Module	Select the IO-Link master module. If connecting to a non-library object module, enter the name of the master only. 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.

Note that if the tag names are manually entered or not linked to input channel tags a red 'X' will be shown beside the parameter. This is acceptable and the program can still be generated.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_856T_4IOL	raC_Dvc_856T_4IOL	3.1	(RA-LIB) Device	IO-Link
raC_Dvc_856T_8IOL	raC_Dvc_856T_8IOL	3.1	(RA-LIB) Device	IO-Link

Configured HMI Content

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

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewME\Global Object - ggfx
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewSE\Global Object - ggfx
V3_raC_Dvc_856T	Faceplate ME	(raC-3_xx-ME) raC_Dvc_856T-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_raC_Dvc_856T	Faceplate SE	(raC-3_xx-SE) raC_Dvc_856T-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_raC_Dvc_IOLink	View Designer	(raC-3_xx-VD) raC_Dvc_IOLink.vpd	{ProjectName}\Visualization\ViewDesigner - vpd
V3_RM_raC_Dvc_IO_Link	Reference Manual	DEVICE-RM300B-EN-P.pdf	{ProjectName}\Documentation
V3_IO_Link_Images	HMI Image Set	HMI FactoryTalk View Images - png.zip	{ProjectName}\Visualization\Images - png

Chapter 16

873P - Analog Output Ultrasonic Sensor (raC_Dvc_873P_4IOL, raC_Dvc_873P_8IOL)

Overview

The 873P Analog Output Ultrasonic Sensor device object (raC_Dvc_873P_4IOL, raC_Dvc_873P_8IOL) includes HMI faceplate's which displays device information including:

- Sensor data
- Sensor diagnostics
- Process data trending
- Sensor configuration and parameters
- Device Fault log

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_*873P*_Objects_Faceplate.MP4"

Primary device object configuration functions include:

- **Locate:** This function helps to locate the sensors using the device's LED in large machines where there are several sensors close to each other.
- **Polarity:** This function changes the sensor output to operate as Not-Inverted (Light Operate) and Inverted (Dark Operate).

Functional Description

The 873P Analog Output Ultrasonic Sensor pre-configured Device Objects:

- Collect, Process and Deliver Data between Smart Devices and Application Logic
- Provide Device Status & Diagnostics Faceplate's 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 faceplate's. The revision number (e.g. 1.01) 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/* folder in the library. Each device is supplied with two versions of Add-On Instructions (AOI) and Rung import files - one for compatibility with each IO-Link Master Module. You must select the appropriate AOI for the master module being used.

Device/Item	Compatible IO-Link Master	Add-On Instruction	Rung Import
873P	POINT I/O 1734-4IOL	raC_Dvc_873P_4IOL_3.01_AOI.L5X	raC_Dvc_873P_4IOL_3.01_RUNG.L5X
	ArmorBlock 1732E-8IOLM12R	raC_Dvc_873P_8IOL_3.01_AOI.L5X	raC_Dvc_873P_8IOL_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.

Note that a single faceplate is used for either the 4IOL or 8IOL versions of the Add-On Instruction.

Device/Item	Type	FactoryTalk View ME Faceplate	FactoryTalk View SE Faceplate
873P	Display	(raC-3_01-ME) raC_Dvc_873P-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_873P-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - IO-Link Device.ggfx	(raC-3-SE) Toolbox - IO-Link 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
873P	(raC-3_01-VD) raC_Dvc_IOLink.vpd

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.

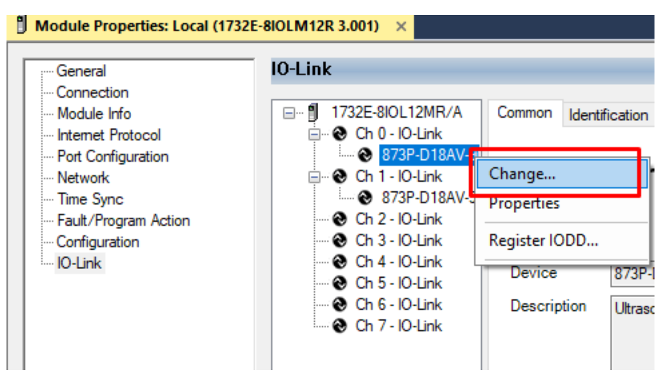
All Studio 5000 Application Code Manager files can be found in the /*ApplicationCodeManagerLibraries*/ folder of the library. The files included are as follows:

Implementation Object	Compatible IO-Link Master	Asset Control File (.HSL4)	Device File (.HSL4)
873P	POINT I/O 1734-4IOL	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_873P_4IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_873P_4IOL_(3.1)
	ArmorBlock 1732E-8IOLM12R	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_873P_8IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_873P_8IOL_(3.1)

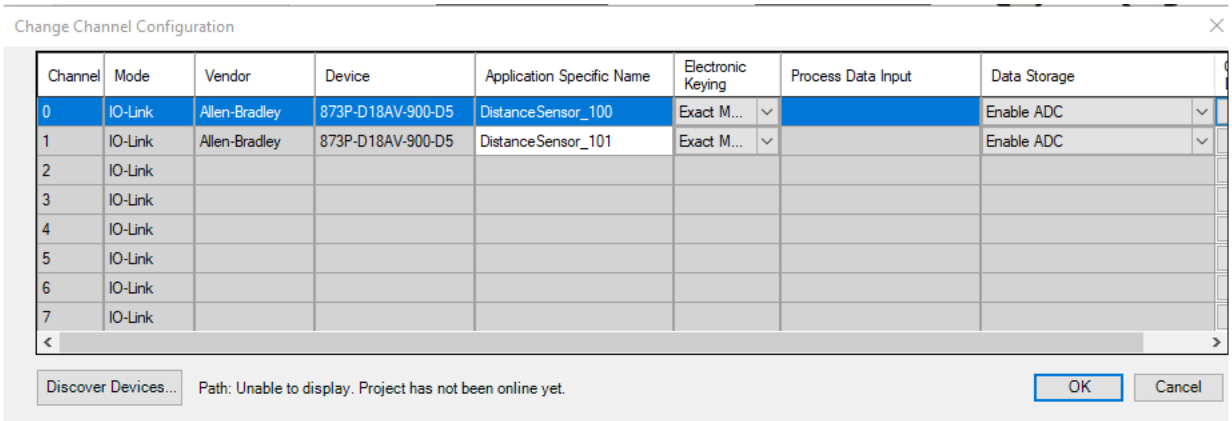
Device Definition

The device must be configured with the correct device definition. Proper device configuration enables the required cyclic device data to pass information from the device into the add-on instruction.

1. Click on Change...



2. Specify the Application Specific Name e.g. *DistanceSensor_100*



Operations

The IO-Link Device objects provide only physical operation mode. There is no virtual device mode offered.

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
Write_Index	Message Configuration Write	MESSAGE
Read_Index	Message Configuration Read	MESSAGE
Write_SubIndex	Message Configuration Write	MESSAGE
Read_SubIndex	Message Configuration Read	MESSAGE
Msg_Sensor_Data	Messaging Data	raC_UDT_873P_Sensor_Data
Ref_Ctrl_Set	IO-Link Device Setting Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Set
Ref_Ctrl_Cmd	IO-Link Device Command Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Cmd
Ref_Ctrl_Sts	IO-Link Device Status Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSts
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[2]
Inp_I	Device Object Inputs	raC_UDT_ItfAD_873P_Inp_4IOL Or raC_UDT_ItfAD_873P_Inp_8IOL
Ref_Ctrl_Inf	Sensor Type Information Interface	raC_UDT_ItfAD_IOLinkSensor_Inf
Ref_Ctrl_Itf	Device Command, Status Information Interface	raC_UDT_ItfAD_IOLinkDevices

Input Data

Input	Function/Description	DataType
Inp_ChxTriggered1	Triggered Status When the Temprature is equal to Defined Temperature Set for Trigger1	BOOL
Inp_ChxTriggered2	Triggered Status When the Temperature is equal to Defined Temperature Set for Trigger2	BOOL
Inp_ChxDistance	Displays Distance in mm – non-adjustable	DINT
Inp_ChNumber	Configured Channel Number for Master	SINT
Inp_ChxTemperature	Current Internal Temperature	DINT
Cfg_Filter	Filter; 0= Off, 1= Low, 2= Medium, 3= High	INT
Cfg_T1Mode	Trigger1 Mode; 0= Deactivated, 1= Single Point, 2= Window, 3= Two Point	INT
Cfg_T2Mode	Trigger2 Mode; 0= Deactivated, 1= Single Point, 2= Window, 3= Two Point	INT
Cfg_TeachSp	Teach Setpoint; 0= Set Point1, 1= Set Point2	INT
Cfg_TeachTrigCh	Teach Triggered Channel; 0= Triggered1, 1= Triggered2	SINT
Cmd_AnalogSlope	Analog Output Slope Rising/Falling Cmd	BOOL
Cmd_BGMode	Suppression Mode Reflect/Suppress Cmd	BOOL
Cmd_EnableCounter	Counter Disabled/Enabled Cmd	BOOL
Cmd_EnableLEDs	Indicator Disabled/Enabled Cmd	BOOL
Cmd_LocalTeachLock	Parameters Unlock/Lock Cmd	BOOL

Input	Function/Description	DataType
Cmd_Locate	Locator Disable/Enable Cmd	BOOL
Cmd_ResetCount	Counter Reset Cmd	BOOL
Cmd_SoundCone	Sound Cone Width Narrow/Normal Cmd	BOOL
Cmd_T1ActiveLow	Trigger1 Logic High/Low Active Cmd	BOOL
Cmd_T2ActiveLow	Trigger2 Logic High/Low Active Cmd	BOOL
Cmd_TeachApply	Teach Apply Cmd	BOOL
Set_AnalogEnd	Analog End Point Set Value	INT
Set_AnalogStart	Analog Start Point Set Value	INT
Set_Suppression	Suppression Mode Set Value	INT
Set_T1Hysteresis	Trigger1 Hysteresis Set Value	INT
Set_T1OffDelay	Trigger1 Switch-Off delay Set Value	INT
Set_T1OnDelay	Trigger1 Switch-On delay Set Value	INT
Set_T1Sp1	Trigger1 SetPoint1 Set Value	INT
Set_T1Sp2	Trigger1 SetPoint2 Set Value	INT
Set_T2Hysteresis	Trigger2 Hysteresis Set Value	INT
Set_T2OffDelay	Trigger2 Switch-Off delay Set Value	INT
Set_T2OnDelay	Trigger2 Switch-On delay Set Value	INT
Set_T2Sp1	Trigger2 SetPoint1 Set Value	INT
Set_T2Sp2	Trigger2 SetPoint2 Set Value	INT
Set_TrendDistMaxValue	Trend Tab Distance Max for VD/ME/SE Faceplate (Below Val_RangeMax)	DINT
Set_TrendDistMinValue	Trend Tab Distance Min for VD/ME/SE Faceplate (Above Val_RangeMin)	DINT
Set_TrendTempMaxValue	Trend Tab Temperature Max for VD/ME/SE Faceplate (-20 To 70)	DINT
Set_TrendTempMinValue	Trend Tab Temperature Min for VD/ME/SE Faceplate (-20 To 70)	DINT

Output Data

Output	Function/Descritpion	DataType
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Sts_Ready	Device is Ready	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: Master Communication Loss 2: Master Not Available 3: Faulted 4 - 31: Reserved	DINT
Sts_Available	Device is available for interaction with user code	BOOL

Output	Function/Descritpion	DataType
Sts_InhibitCfg	1=Inhibit user Configuration Parameters from HMI Faceplate; 0=Allow	BOOL
Sts_InhibitCmd	1=Inhibit user Commands from HMI Faceplate; 0=Allow Control	BOOL
Sts_InhibitSet	1=Inhibit user Settings from HMI Faceplate; 0=Allow	BOOL
Sts_LocalTeachLock	Local Parameterization; 0= Unlock, 1= Locked	BOOL
Sts_Located	Locator Indicator; 1= Located	BOOL
Sts_AnalogSlope	Analog Output Slope; 0= Rising, 1= Falling	BOOL
Sts_BGMode	Suppression Mode; 0= Reflection, 1= Suppression	BOOL
Sts_EnableCounter	Counter Enable; 0= Disable, 1= Enable	BOOL
Sts_EnableLEDs	LED Indicator; 0= Disable, 1= Enable	BOOL
Sts_SoundCone	Sound Cone; 0= Normal, 1= Narrow	BOOL
Sts_T1ActiveLow	Trigger1 Logic Active; 0= Low, 1=High	BOOL
Sts_T2ActiveLow	Trigger2 Logic Active; 0= Low, 1=High	BOOL
Val_AnalogEnd	Analog End Point	INT
Val_AnalogStart	Analog Start Point	INT
Val_Filter	Filter Selected	INT
Val_HysteresisMax	Hysteresis Maximum Selected	DINT
Val_OperatingHours	Operating Hours	INT
Val_PowerCycles	Number of Power Cycle	INT
Val_RangeMax	Sensor Maximum Range in Trend	DINT
Val_RangeMin	Sensor Minimum Range in Trend	DINT
Val_Suppression	Suppression Distance	INT
Val_T1Hysteresis	Trigger1 Hysteresis	INT
Val_T1Mode	Trigger1 Operating Mode Selected	INT
Val_T1OffDelay	Trigger1 Switch-Off Delay	INT
Val_T1OnDelay	Trigger1 Switch-On Delay	INT
Val_T1Sp1	Trigger1 Setpoint1	INT
Val_T1Sp2	Trigger1 Setpoint2	INT
Val_T2Hysteresis	Trigger2 Hysteresis	INT
Val_T2Mode	Trigger2 Operating Mode Selected	INT
Val_T2OffDelay	Trigger2 Switch-Off Delay	INT
Val_T2OnDelay	Trigger2 Switch-On Delay	INT
Val_T2Sp1	Trigger2 Setpoint1	INT
Val_T2Sp2	Trigger2 Setpoint2	INT
Val_TeachTrig	Teach Trigger Channel Selected	INT
Val_TemperatureMaxSinceInception	Maximum Temperature Since Inception	DINT

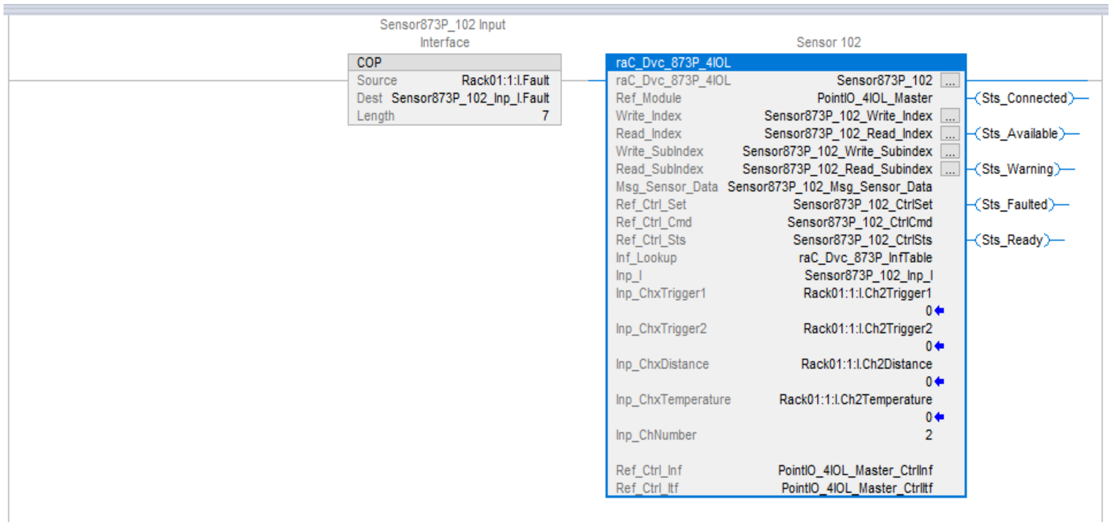
Output	Function/Descritpion	DataType
Val_TemperatureMaxSincePowerUp	Maximum Temperature Since Power Up	DINT
Val_TemperatureMinSinceInception	Minimum Temperature Since Inception	DINT
Val_TemperatureMinSincePowerUp	Minimum Temperature Since Power Up	DINT
Val_TriggerCount	Trigger Counter	INT

Programming Example

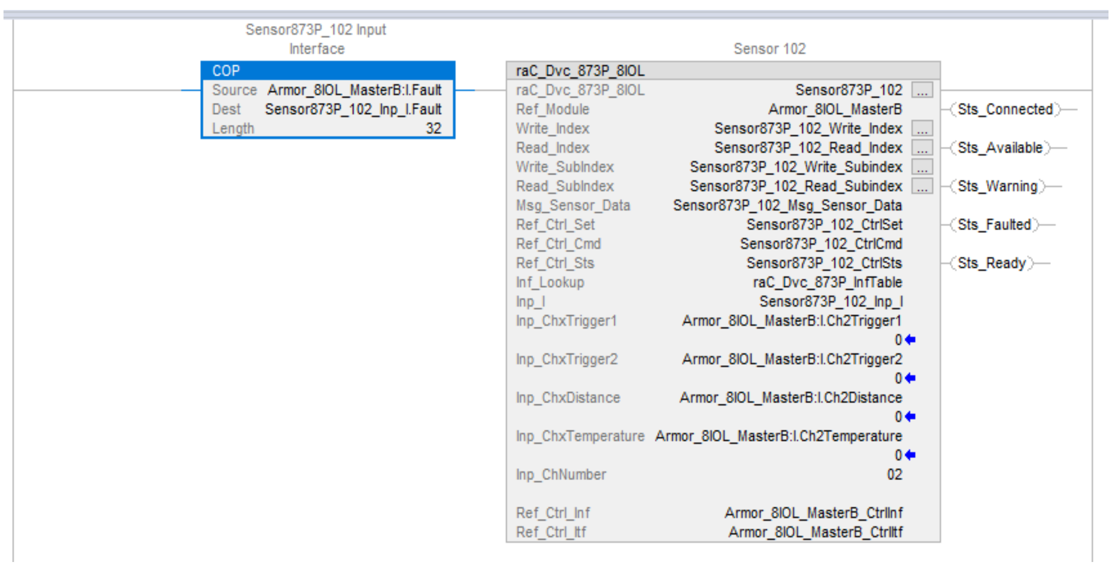
Fully configured device on a rung is provided below for reference. The first rung is required and the others are optional.

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 following example uses the 873P device object connected to channel #2 of a POINT I/O 1734-4IOL IO-Link Master module in slot #1 of a POINT I/O adapter named *Rack01*.



The following example uses the 873P device object connected to channel #2 of a ArmorBlock 1732E-8IOLM12R IO-Link Master module in named *Armor_8IOL_Master.*



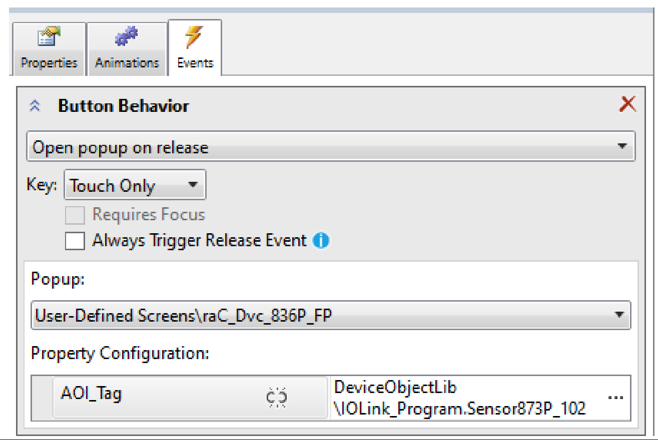
Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. See Basic Launch Button Attributes section for details on configuration and indicators.

FactoryTalk View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GO_LaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #104.	#102: AOI Backing Tag Instance (e.g. {::[PAC]Program::IOLinkProgram._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)

Studio 5000 View Designer Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	

Faceplates

There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 30.

The faceplate title is linked to *_InstanceName.@description*, the *.@description* extended tag property of the Add-On Instruction instance. This is user-configurable from controller/program tags in Studio 5000 Logix Designer.

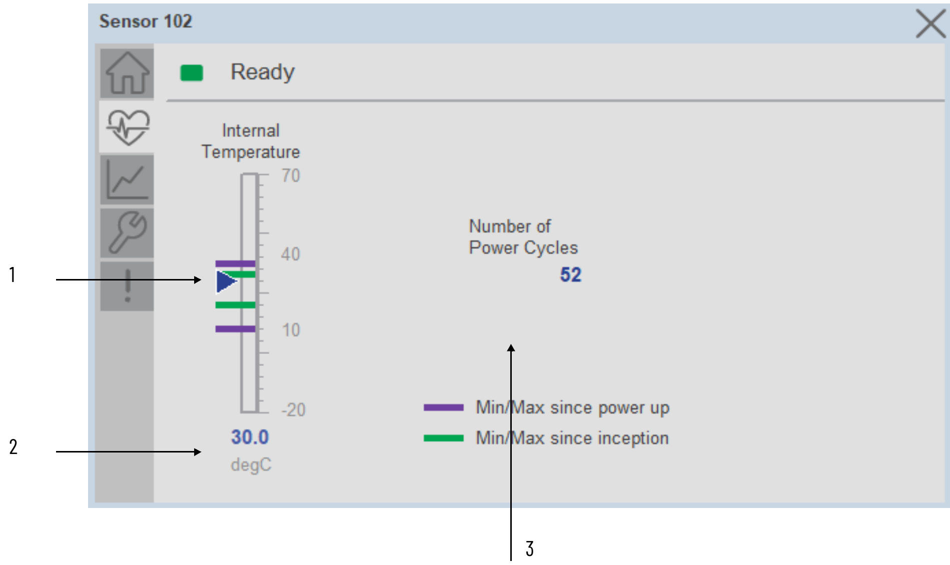
Home

The Home tab is the main tab of the faceplate. It provides the status of the IO-Link device along with sensor process data and the Locate button.

Item	Description
1	Banner- Ready Status
2	Application Specific Name - Read from device
3	Trigger Status 1 & 2 OFF (0) = Gray LED ON (1) = Blue LED
4	Trigger1 & 2 Sparkline Trend The spark line shows trigger ON/OFF status over last 30 seconds
5	Locate toggle switch Locate the sensor in large machines where there are several sensors close to each other. When Located, the sensor user interface (green and orange LEDs) start flashing synchronously until the operator disables this function
6	Process Data: Displays the Distance value along with unit.
7	Process Data: Displays the Temperature value along with unit.
8	Process Data: Displays the Trigger Count value.

Health Tab

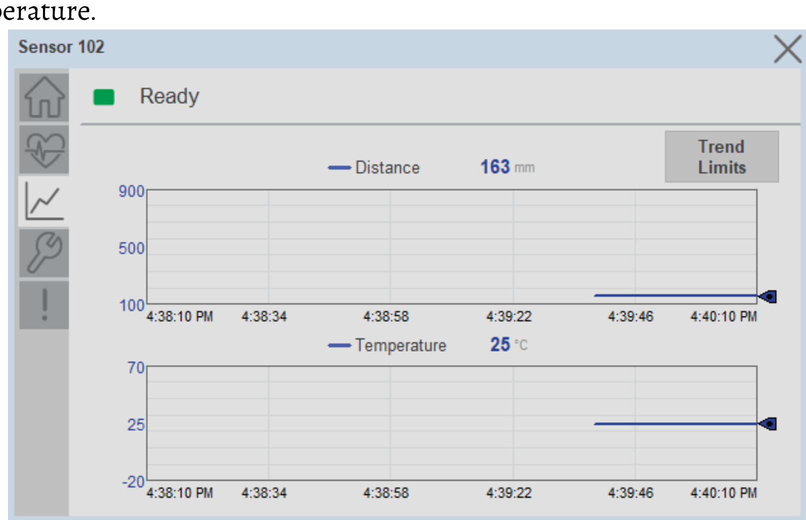
Health tab provides different diagnostic information of sensor which helps ensure that sensors are operating correctly.



Item	Description
1	Device Temperature Bar Graph Purple Indicators: Min/Max since power up Light Blue Triangle Indicator: Current value
2	Device Temperature Current Value
3	Number of Power Cycle

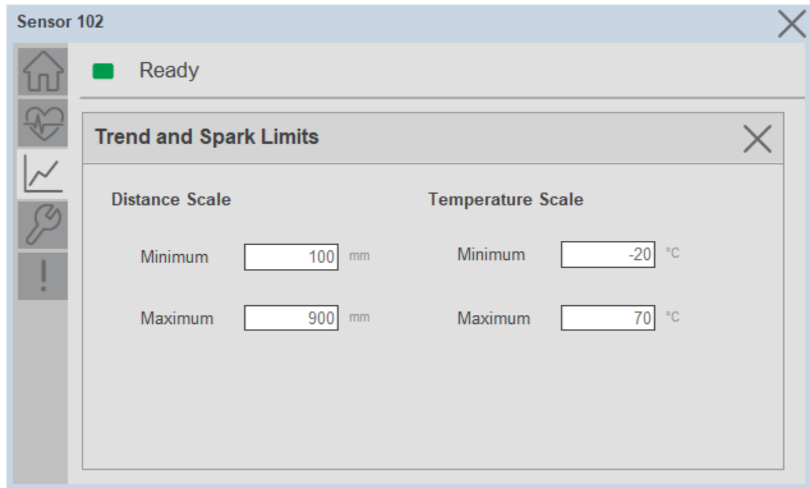
Trend Tab

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. One for Distance and the other for temperature.



Trend Settings Screen

We can set trend limits using configuration tab by clicking on the *Settings* button present on trend screen. This sub screen display contains two numeric input elements that allow the user to enter the minimum and maximum values to be used on the Trend screen for Scaling.

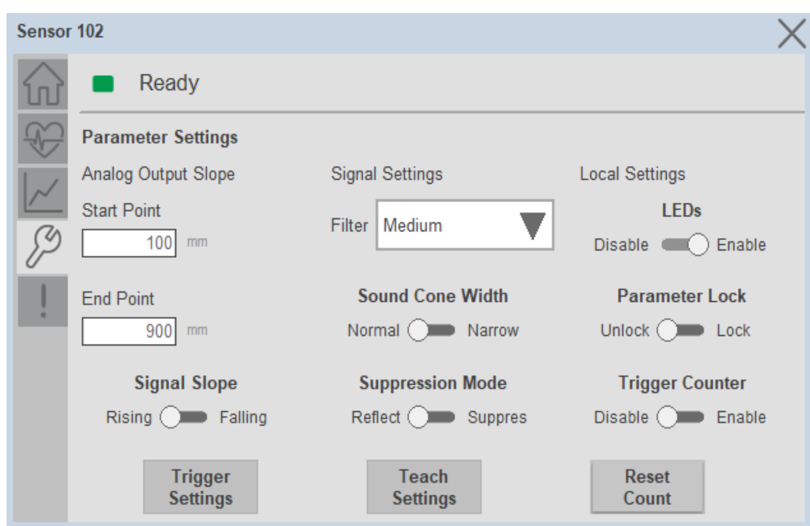


Configure Tab

The configuration tab displays the sensor parameter settings, as well as enabling the user to read data from the sensor.

The configuration section is divided into sections:

- Parameter Settings
- Trigger Settings
- Teach Settings
- Reset Counts



Parameter Settings

Analog Output Slope- Applied to configure an analog output when the sensor is operated in the Standard I/O (SIO) mode.

Item	Description
Signal Slope	Use toggle button to select Rising / Falling of Analog signal slope. •Rising- Analog value increases with increasing distance. •Falling- Analog value decreases with increasing distance.
Start Point	Set the Analog Starting Point (ASP) value to define an analog range.
End Point	Set the Analog Ending Point (AEP) value to define an analog range.

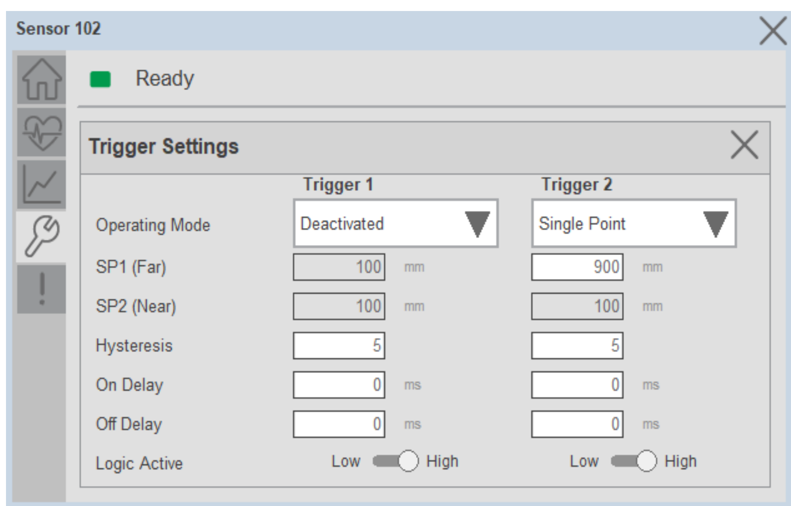
Signal Setting-

Item	Description
Filter	Click the Filter Dropdown object & choose one of the filter. The filter feature is applied for non-static objects such as liquid with a turbulent surface.
Suppression Mode	Use toggle button to select the Background reflection / Background Suppression
Sound Cone Width	Allows for the adjustment of the acoustic beam width. A narrow sound cone has around 10% beam width reduction compared to the normal sound cone.

Local Setting-

Item	Description
LED's	Allows you to turn off or disable indicators at operation. Default is 'enabled.'
Parameter Lock	Applied to Lock or Unlock the teach button. • Lock: Teach button which is mounted on device is disabled/locked. • Unlock: Teach button which is mounted on device is enabled.
Trigger Counter	Use toggle button to Enable or disable this function. Default is 'disabled'

Trigger Settings



Operating Mode- There are four operation modes for each trigger/output

- Single Point
- Window
- Two Point
- Deactivated

SP1 (Far)- To set Switching point 1 click on input field and enter the value.

SP2 (Near)- To set Switching point 2 click on input field and enter the value.

Hysteresis- To set Hysteresis click on input field and enter the value.

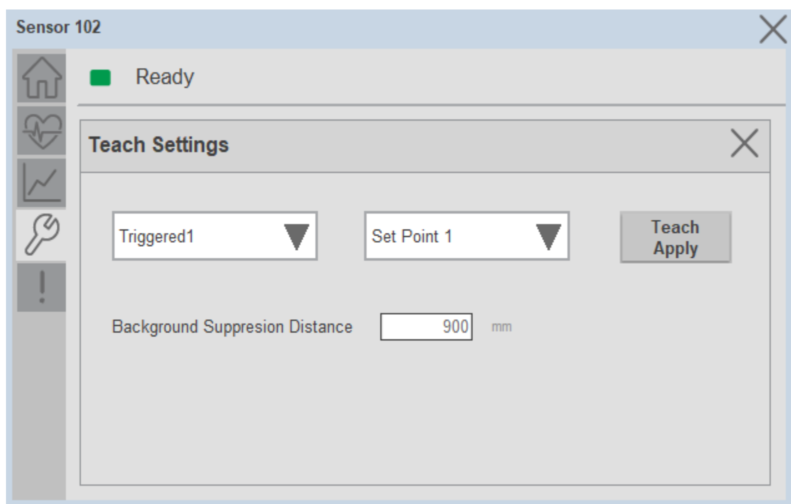
On Delay- The On Delay defines the desired delay for the output to turn ON once a target has been detected.

Off Delay- The Off Delay defines the desired delay for the output to turn OFF once a target has left the detection area.

Logic Active- Use the toggle button to select the High Active (Normally Open) / Low Active (Normally Closed).

Teach Settings-

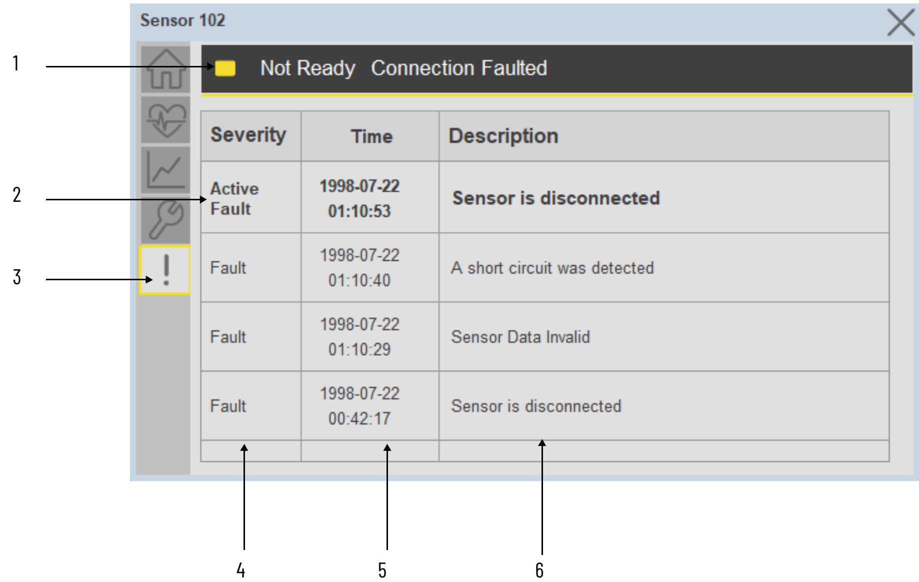
1. Choose Trigger 1 or 2
2. Select Set Point 1 or 2
3. Set Background Suppression Distance Value
4. Press Teach Apply Button



Fault Warning Tab

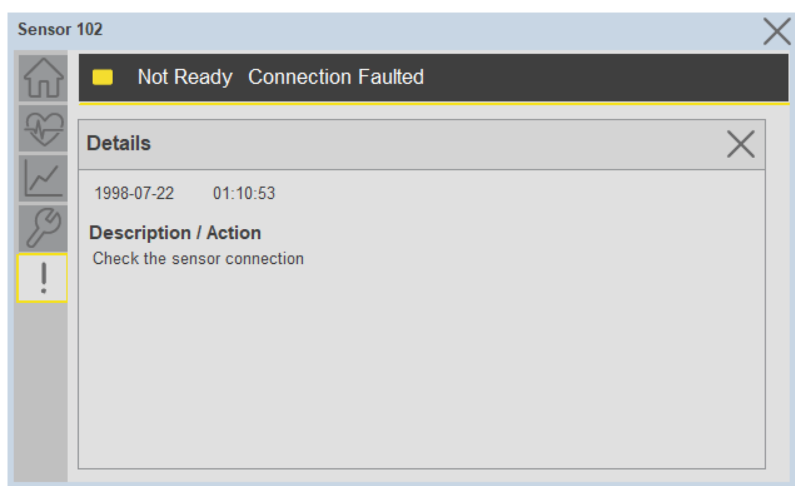
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

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.



Application Code Manager

IO-Link Device Library objects can be set-up and configured using Studio 5000 Application Code Manager.

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

Definition Objects: raC_Dvc_873P_4IOL, raC_Dvc_873P_8IOL

This object contains the AOI definition and used as linked library to implement object. There is one definition and per add-on instruction to support each IO-Link Master Module. 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 Objects: raC_LD_Dvc_873P_4IOL, raC_LD_Dvc_873P_8IOL

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
ChannelNumber				Select the Channel Number where the sensor is connected.
MasterName	MasterName	[MasterName]	Module	Select the IO-Link master module. If connecting to a non-library object module, enter the name of the master only. 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.

Note that if the tag names are manually entered or not linked to input channel tags a red 'X' will be shown beside the parameter. This is acceptable and the program can still be generated.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_873P_4IOL	raC_Dvc_873P_4IOL	3.1	(RA-LIB) Device	IO-Link
raC_Dvc_873P_8IOL	raC_Dvc_873P_8IOL	3.1	(RA-LIB) Device	IO-Link

Configured HMI Content

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

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewME\Global Object - ggfx
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewSE\Global Object - ggfx
V3_raC_Dvc_873P	Faceplate ME	(raC-3_xx-ME) raC_Dvc_873P-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_raC_Dvc_873P	Faceplate SE	(raC-3_xx-SE) raC_Dvc_873P-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_raC_Dvc_IOLink	View Designer	(raC-3_xx-VD) raC_Dvc_IOLink.vpd	{ProjectName}\Visualization\ViewDesigner - vpd
V3_RM_raC_Dvc_IO_Link	Reference Manual	DEVICE-RM300B-EN-P.pdf	{ProjectName}\Documentation
V3_IO_Link_Images	HMI Image Set	HMI FactoryTalk View Images - png.zip	{ProjectName}\Visualization\Images - png

1694 - 1694 Modular Electronic Circuit Protector (raC_Dvc_1694_4IOL, raC_Dvc_1694_8IOL)

Overview

The 1694 Modular Electronic Circuit Protector device object (raC_Dvc_1694_4IOL, raC_Dvc_1694_8IOL) includes HMI faceplate's which displays device information including:

- Sensor data
- Sensor I/O
- Sensor configuration and parameters
- Device Fault log

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_*1694*_Objects_Faceplate.MP4"

Primary device object configuration functions include:

- Provides overall status and device monitoring parameters for power feed 1694-PMD and each channel controlled by Electronic Circuit Protection device.
- Allows you to change the device parameters offered by 1694 Electronic Circuit Protection system.
- Provides diagnostics parameter information, those parameters facilitate troubleshooting if device does not work correctly.

Functional Description

The 1694 Modular Electronic Circuit Protector Sensor pre-configured Device Objects:

- Collect, Process and Deliver Data between Smart Devices and Application Logic
- Provide Device Status & Diagnostics Faceplate's 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. 1.01) 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/* folder in the library. Each device is supplied with two versions of Add-On Instructions (AOI) and Rung import files - one for compatibility with each IO-Link Master Module. You must select the appropriate AOI for the master module being used.

Device/Item	Compatible IO-Link Master	Add-On Instruction	Rung Import
1694	POINT I/O 1734-4IOL	raC_Dvc_1694_4IOL_3.01_AOI.L5X	raC_Dvc_1694_4IOL_3.01_RUNG.L5X
	ArmorBlock 1732E-8IOLM12R	raC_Dvc_1694_8IOL_3.01_AOI.L5X	raC_Dvc_1694_8IOL_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.

Note that a single faceplate is used for either the 4IOL or 8IOL versions of the Add-On Instruction.

Device/Item	Type	FactoryTalk View ME Faceplate	FactoryTalk View SE Faceplate
1694	Display	(raC-3_01-ME) raC_Dvc_1694-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_1694-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - IO-Link Device.ggfx	(raC-3-SE) Toolbox - IO-Link 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
1694	(raC-3_01-VD) raC_Dvc_IOLink.vpd

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.

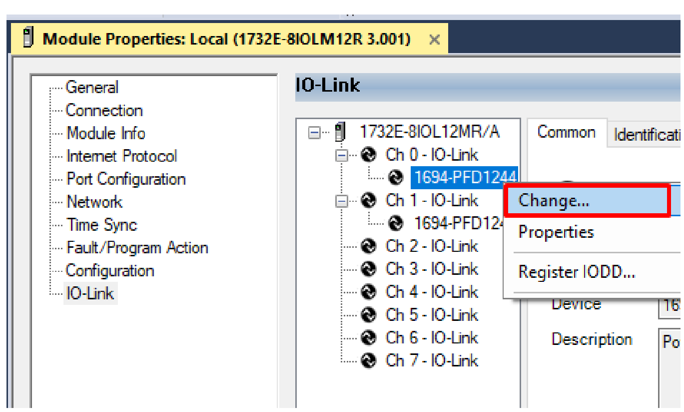
All Studio 5000 Application Code Manager files can be found in the */ApplicationCodeManagerLibraries/* folder of the library. The files included are as follows:

Implementation Object	Compatible IO-Link Master	Asset Control File (.HSL4)	Device File (.HSL4)
1694	POINT I/O 1734-4IOL	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_1694_4IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_1694_4IOL_(3.1)
	ArmorBlock 1732E-8IOLM12R	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_1694_8IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_1694_8IOL_(3.1)

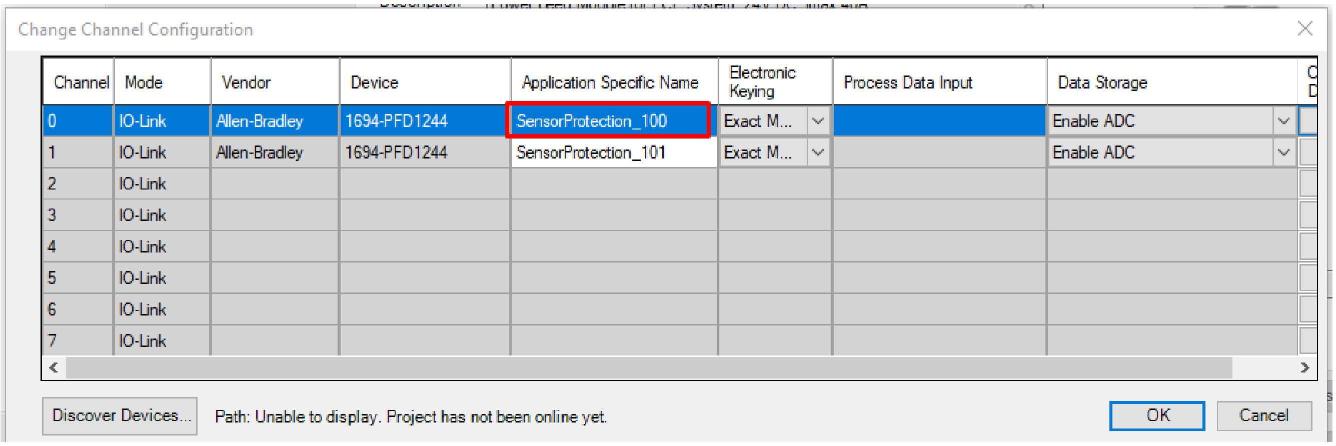
Device Definition

The device must be configured with the correct device definition. Proper device configuration enables the required cyclic device data to pass information from the device into the add-on instruction.

1. Click on Change...



2. Specify the Application Specific Name e.g. *SensorProtection_100*



Operations

The IO-Link Device objects provide only physical operation mode. There is no virtual device mode offered.

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
Write_Index	Message Configuration Write	MESSAGE
Read_Index	Message Configuration Read	MESSAGE
Write_SubIndex	Message Configuration Write	MESSAGE
Read_SubIndex	Message Configuration Read	MESSAGE
Ref_Msg_Read_Index_Sync	Message Configuration Read	MESSAGE
Ref_Msg_Data	Message Configuration Data	raC_UDT_1694_Msg_Data
Ref_Ctrl_Set	IO-Link Device Setting Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSet
Ref_Ctrl_Cmd	IO-Link Device Command Interface	aC_UDT_ItfAD_IOLinkSensor_CtrlCmd
Ref_Ctrl_Sts	IO-Link Device Status Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSts
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[2]
Inp_I	Device Object Inputs	raC_UDT_ItfAD_1694_Inp_4IOL Or raC_UDT_ItfAD_1694_Inp_8IOL
Ref_Ctrl_Inf	Sensor Type Information Interface	raC_UDT_ItfAD_IOLinkSensor_Inf
Ref_Ctrl_Itf	Device Command, Status Information Interface	raC_UDT_ItfAD_IOLinkDevices
Out_O	1694_4IOL Out Data	raC_UDT_ItfAD_1694_Out_4IOL

Input Data

Input	Function/Description	DataType
Cfg_ChannelSelection	Select Channel Number	DINT
Cfg_ResetTrip	Trip Reset Alarm	INT
Cmd_PLCControlTrigger	Allows user to define if a particular channel can be controlled by PLC	BOOL
Cmd_Refresh	Allows user to update values	BOOL
Cmd_ResetAvgMemory	Average Memory Reset Command	BOOL
Cmd_ResetFault	Update Channel Values	BOOL
Cmd_ResetMaxMemory	Maximum Memory Reset Command	BOOL
Cmd_ResetMinMemory	Minimum Memory Reset Command	BOOL
Cmd_ResetTripCounter	Trip Counter Reset Command	BOOL
Inp_ChNumber	Configured Channel number for Master	SINT
Set_Triplimit	Allows user to define Current Trip Limit value for adjustable Electronic Over-current Protection module	SINT
Set_WarningLimit	Allows user to define current value (warning limit) for the channel	SINT

Output Data

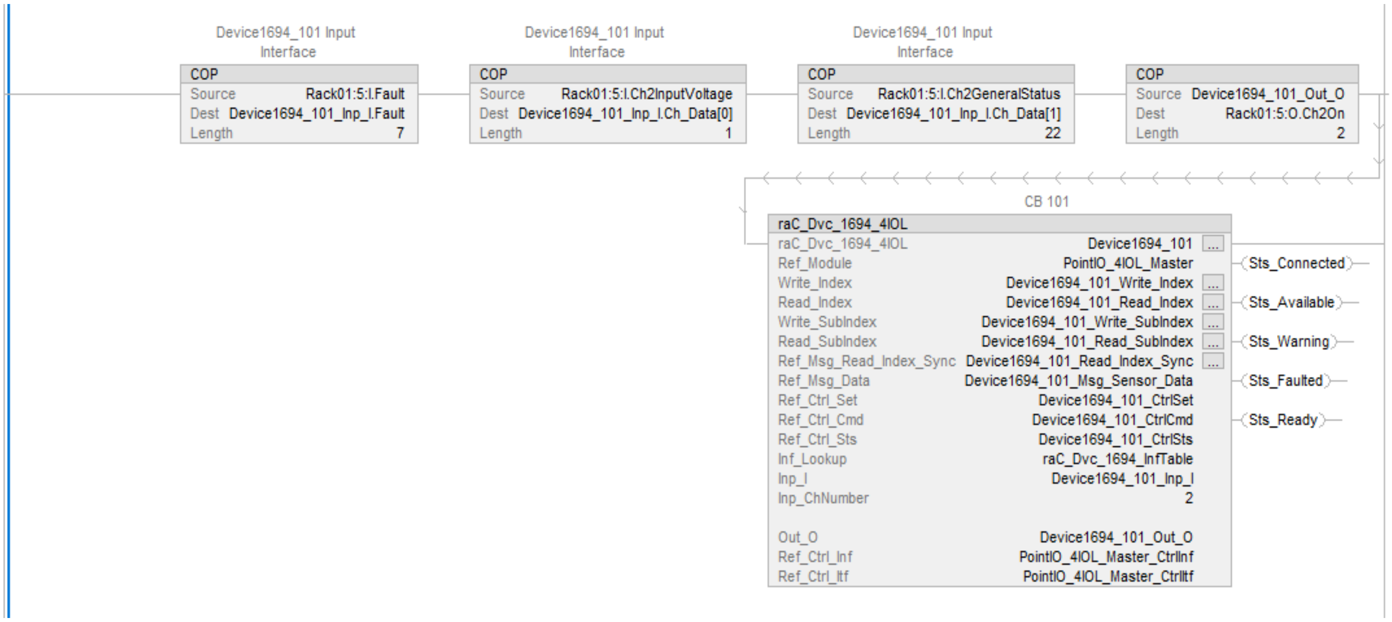
Output	Function/Descritpion	DataType
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Sts_Ready	Device is Ready	BOOL
Sts_Faulted	Device faulted status: 1 = an active fault exists	BOOL
Sts_Connected	Device is connected to the Programmable Controller	BOOL
Sts_bNotReady	Bitwise device 'not ready' reason 0: Reserved 1: Master Communication Loss 2: Master Not Available 3: 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
Sts_InhibitCfg	Disable Configuration inputs from external sources	BOOL
Sts_InhibitCmd	Disable Command inputs from external sources	BOOL
Sts_InhibitSet	Disable Setting inputs from external sources	BOOL
Sts_PLCControlTrigger	Displays if a particular channel is controlled by PLC	BOOL
Val_AvgCurrent	Provides value of average measured current for particular channel since first power ON or last device reset	REAL
Val_DeviceType	Provides type of each type of Electronic Overcurrent Protection Module attached to Power Feed	DINT
Val_LastTripType	Provides reason of last trip for particular channel	SINT
Val_MaxCurrent	Provides value of highest measured current for particular channel since first power ON or last device reset	REAL
Val_MaxVoltage	Provides value of highest measured voltage for particular channel since first power ON or last device reset	REAL
Val_MinCurrent	Provides value of lowest measured current for particular channel since first power ON or last device reset	REAL
Val_MinVoltage	Provides value of lowest measured voltage for particular channel since first power ON or last device reset	REAL
Val_PLCControl	PLC Control Status for particular channel	INT
Val_ReqStep	Step Update	INT
Val_TripCounter	Counter Value	DINT
Val_Triplimit	Displays Current Trip Limit value for adjustable Electronic Overcurrent Protection module	SINT
Val_WarningLimit	Displays current value (warning limit) for particular channel when the LED starts blinking	SINT

Programming Example

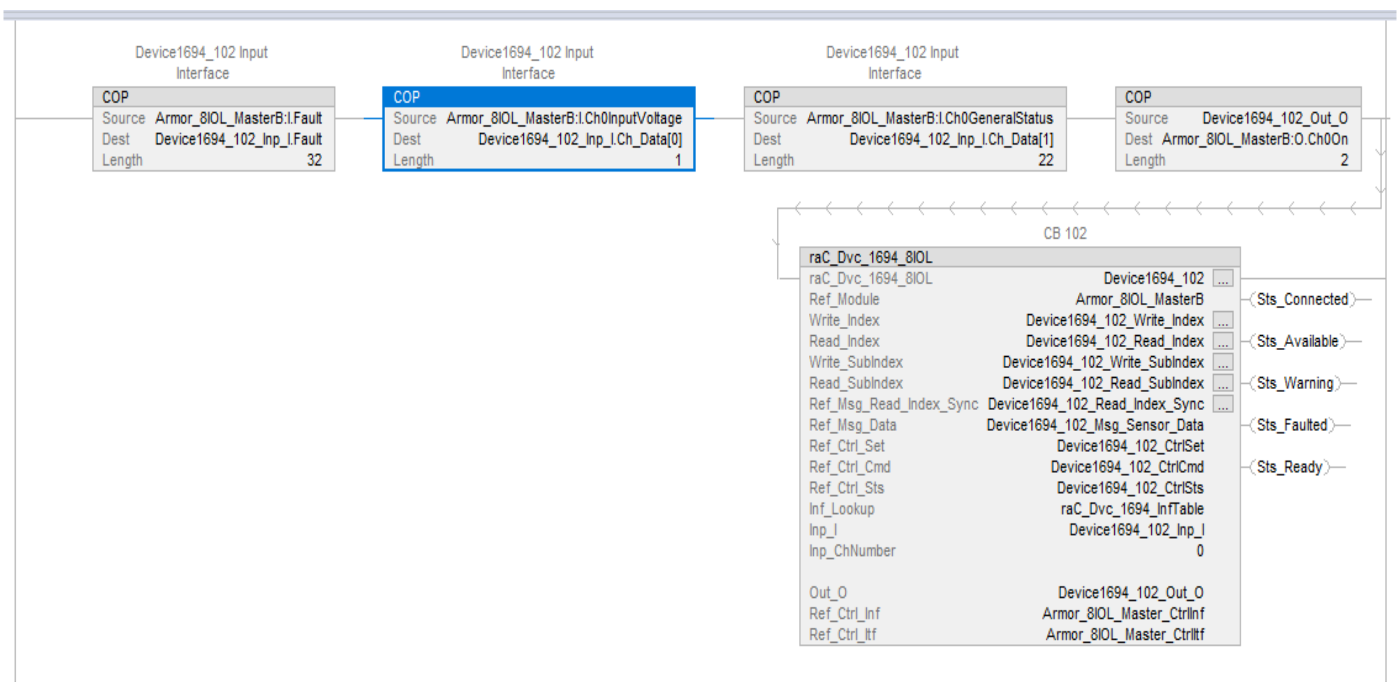
Fully configured device on a rung is provided below for reference. The first rung is required and the others are optional.

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 following example uses the 1694 device object connected to channel #2 of a POINT I/O 1734-4IOL IO-Link Master module in slot #5 of a POINT I/O adapter named *Rack01*.



The following example uses the 1694 device object connected to channel #0 of a ArmorBlock 1732E-8IOLM12R IO-Link Master module in named *Armor_8IOL_MasterB*.



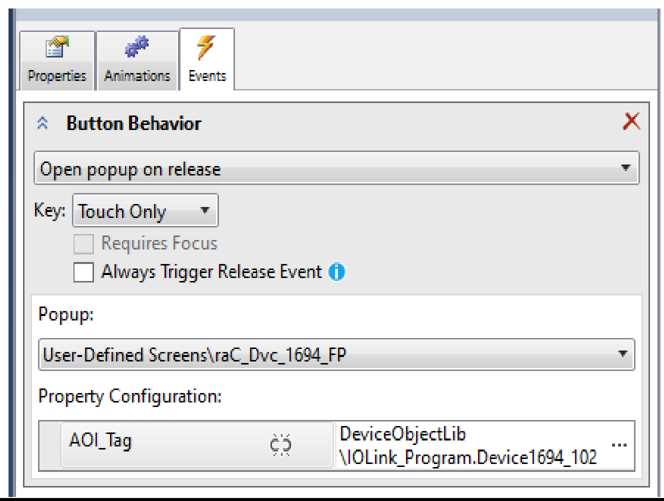
Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. See Basic Launch Button Attributes section for details on configuration and indicators.

FactoryTalk View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GO_LaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #104.	#102: AOI Backing Tag Instance (e.g. {::[PAC]Program::IOLinkProgram._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)

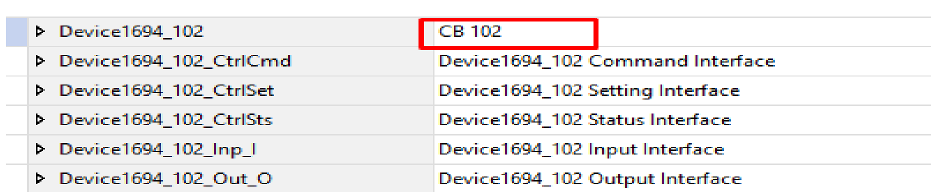
Studio 5000 View Designer Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	

Faceplates

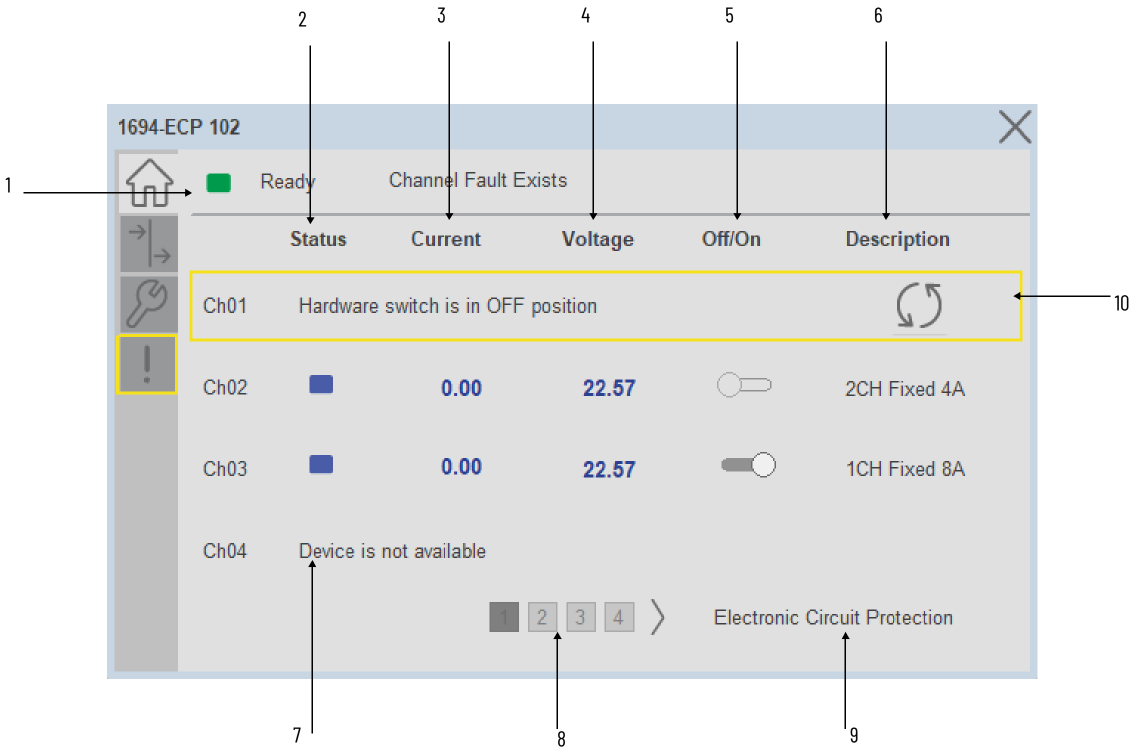
There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 30.

The faceplate title is linked to *_InstanceName.@description*, the *.@description* extended tag property of the Add-On Instruction instance. This is user-configurable from controller/program tags in Studio 5000 Logix Designer.



Home

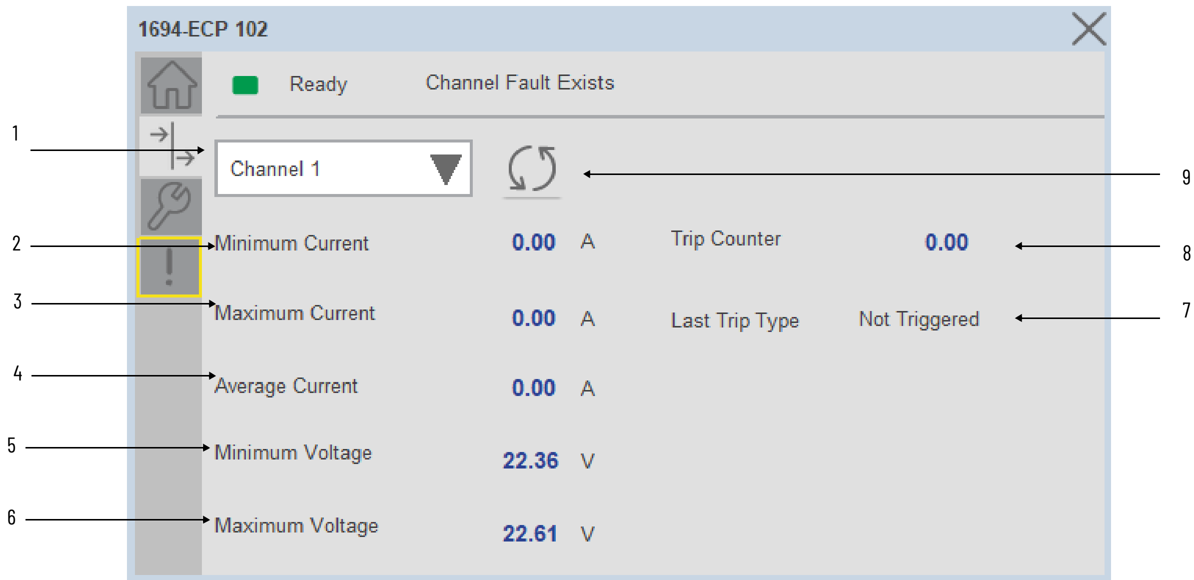
The Home tab is the main tab of the faceplate. It provides the status of the IO-Link device along with sensor process data and the basic control functions.



Item	Description
1	Banner- Ready Status
2	Channel Status- Based on the status of channel, the status indicator changes its color. If the Channel 01 is ON, the indicator turns from gray to blue.
3	Current- The Current field provides the channel XX current value. Unit 'A'
4	Voltage- The Voltage field provides the channel XX voltage value. Unit 'V'
5	PLC Control- The Off-On toggle button is used to switch the respective channel On or Off, depending on the PLC Control mode.
6	Channel Description- Description field provides feasibility for operator to enter (input field) the channel descriptions, based on the device connected to respective channel
7	Channel is not configured (Device is not connected)
8	Page 1 to 4- The page buttons allow to toggle back and forth between 1 to 16 channel status information
9	Application Specific Name - Read from device
10	Channel Faulted- Channel Faulted Description with yellow rectangle highlighted & Reset button

I/O Tab

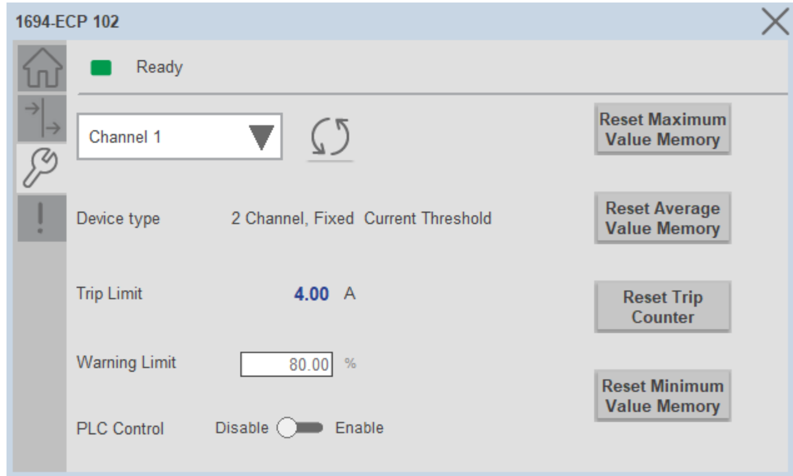
I/O tab provides the Current and Average voltage value of the each channel. which helps ensure that sensors are operating correctly. It displays the Trip counter & Last trip type.



Item	Description
1	Channel number- Dropdown selector object to select different channels
2	Minimum Current- Provides value of lowest measured current for channel since first power ON or last device/statistics reset.
3	Maximum Current- Provides value of highest measured current for channel since first power ON or last device reset.
4	Average Current- Provides value of average measured current for channel since first power ON or last device reset.
5	Minimum Voltage- Provides value of lowest measured voltage for channel since first power ON or last device reset.
6	Maximum Voltage- Provides value of highest measured voltage for channel since first power ON or last device reset
7	Last Trip Type- Last Trip Type provides reason of device trip for each channel, below are the different reasons: • Not Triggered • Channel Short Circuit • Channel Overload • Device Internal Fault
8	Trip Counter- Provides number of trips for channel counted since first device use or last reset
9	Refresh- Refresh Button to update the values.

Configure Tab

The configuration tab displays the Device parameter settings, Reset buttons as well as enabling the user to read data from the Device.



Parameter Settings

Channel Selection- Used to select different Channel.

Device Type- The Device Type provides information about Electronic Overcurrent Protection Module type attached to the Power Feed module:

- 1694 IO-Link With 1 Channel, Fixed Current Threshold
- 1694 IO-Link With 2 Channel, Fixed Current Threshold
- 1694 IO-Link With 4 Channel, Fixed Current Threshold
- 1694 IO-Link With 2 Channels, Adjustable Current Threshold

Trip Limit- Trip Limit allows user to define Current Trip Limit value for adjustable Electronic Overcurrent Protection module. When this value exceeds in the circuit of each channel, then device will go into trip state.

- For fixed protection modules, this value is read only.
- For Adjustable Protection Modules, the trip limit value can be set from the faceplate.

Warning Limit- Warning Limit allows user to define current value (warning limit) for the channel.

PLC Control- PLC Control mode allows user to define if a particular channel can be controlled by PLC.

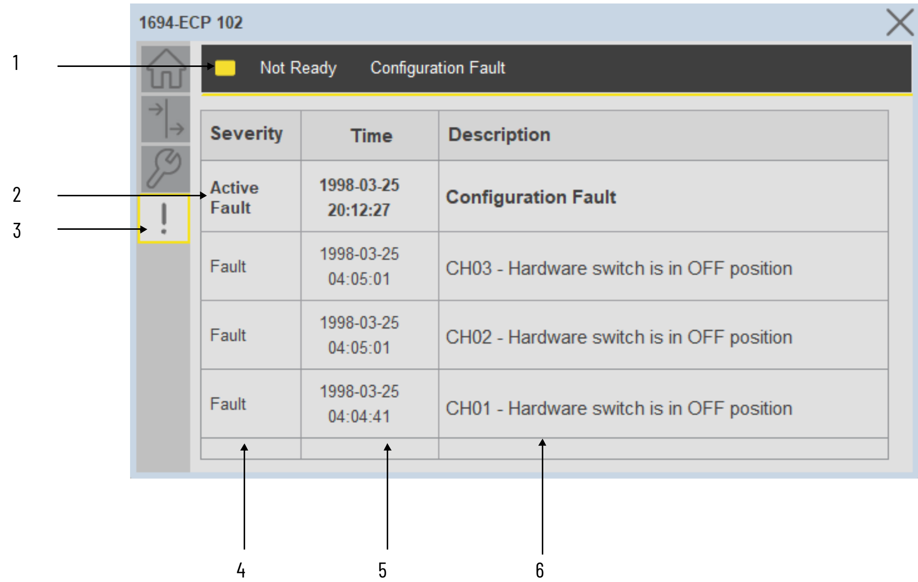
Reset Button- The Reset Buttons are used to reset the Minimum, Maximum, Average Value Memory and Trip Counter.

Button	Description
Reset Maximum Value Memory	Allows user to reset maximum value memory of voltage and current statistics for channel. If channel is controlled by 2-channels module then both channels will be reset
Reset Minimum Value Memory	Allows user to reset minimum value memory of voltage and current statistics for channel. If channel is controlled by 2-channels module then both channels will be reset
Reset Average Value Memory	Allows user to reset average value memory of voltage and current statistics for channel. If channel is controlled by 2-channels module then both channels will be reset.
Reset Trip Counter	Allows user to reset trip counter for channel. If channel is controlled by 2-channels module then both channels will be reset

Fault Warning Tab

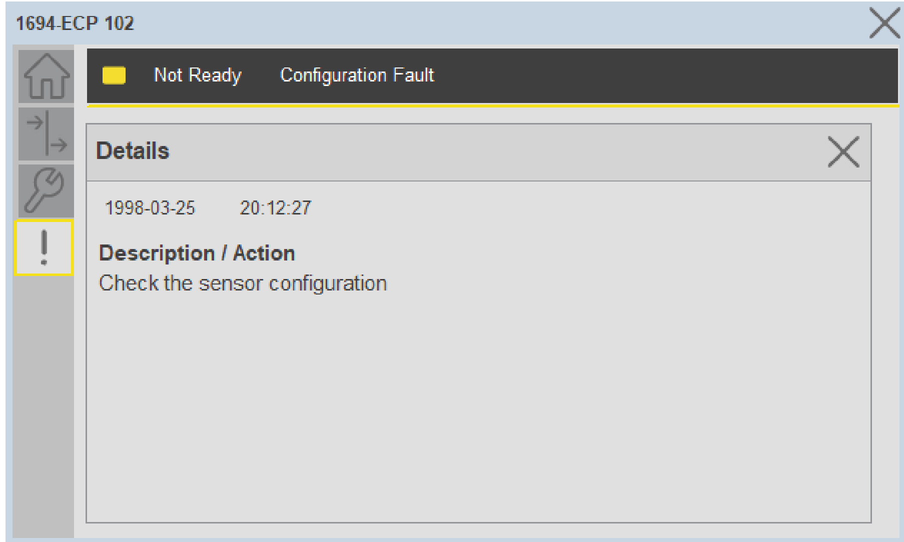
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

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.



Application Code Manager

IO-Link Device Library objects can be set-up and configured using Studio 5000 Application Code Manager.

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

Definition Objects: raC_Dvc_1694_4IOL, raC_Dvc_1694_8IOL

This object contains the AOI definition and used as linked library to implement object. There is one definition and per add-on instruction to support each IO-Link Master Module. 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 Objects: raC_LD_Dvc_1694_4IOL, raC_LD_Dvc_1694_8IOL

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

Parameter Name	Default Value	Instance Name	Definition	Description
ChannelNumber				Select the Channel Number where the sensor is connected.
MasterName	MasterName	[MasterName]	Module	Select the IO-Link master module. If connecting to a non-library object module, enter the name of the master only. 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.

Note that if the tag names are manually entered or not linked to input channel tags a red 'X' will be shown beside the parameter. This is acceptable and the program can still be generated.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_1694_4IOL	raC_Dvc_1694_4IOL	3.1	(RA-LIB) Device	IO-Link
raC_Dvc_1694_8IOL	raC_Dvc_1694_8IOL	3.1	(RA-LIB) Device	IO-Link

Configured HMI Content

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

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewME\Global Object - ggfx
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewSE\Global Object - ggfx
V3_raC_Dvc_1694	Faceplate ME	(raC-3_xx-ME) raC_Dvc_1694-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_raC_Dvc_1694	Faceplate SE	(raC-3_xx-SE) raC_Dvc_1694-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_raC_Dvc_IOLink	View Designer	(raC-3_xx-VD) raC_Dvc_IOLink.vpd	{ProjectName}\Visualization\ViewDesigner - vpd
V3_RM_raC_Dvc_IO_Link	Reference Manual	DEVICE-RM300B-EN-P.pdf	{ProjectName}\Documentation
V3_IO_Link_Images	HMI Image Set	HMI FactoryTalk View Images - png.zip	{ProjectName}\Visualization\Images - png

45DMS - Distance Measurement Sensor (raC_Dvc_45DMS_4IOL, raC_Dvc_45DMS_8IOL)

Overview

The 45DMS Distance Measurement Sensor device object (raC_Dvc_45DMS_4IOL, raC_Dvc_45DMS_8IOL) includes HMI faceplate's which displays device information including:

- Sensor data
- Sensor diagnostics
- Process data trending
- Sensor configuration and parameters
- Device Fault log

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_*45DMS*_Objects_Faceplate.MP4"

Primary device object configuration functions include:

- **Locate:** This function helps to locate the sensors using the device's LED in large machines where there are several sensors close to each other.
- **Polarity:** This function changes the sensor output to operate as Not-Inverted (Light Operate) and Inverted (Dark Operate).

Functional Description

The 45DMS Distance Measurement Sensor 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. 1.01) 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/* folder in the library. Each device is supplied with two versions of Add-On Instructions (AOI) and Rung import files - one for compatibility with each IO-Link Master Module. You must select the appropriate AOI for the master module being used.

Device/Item	Compatible IO-Link Master	Add-On Instruction	Rung Import
45DMS	POINT I/O 1734-4IOL	raC_Dvc_45DMS_4IOL_3.01_AOI.L5X	raC_Dvc_45DMS_4IOL_3.01_RUNG.L5X
	ArmorBlock 1732E-8IOLM12R	raC_Dvc_45DMS_8IOL_3.01_AOI.L5X	raC_Dvc_45DMS_8IOL_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.

Note that a single faceplate is used for either the 4IOL or 8IOL versions of the Add-On Instruction.

Device/Item	Type	FactoryTalk View ME Faceplate	FactoryTalk View SE Faceplate
45DMS	Display	(raC-3_01-ME) raC_Dvc_45DMS-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_45DMS-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - IO-Link Device.ggfx	(raC-3-SE) Toolbox - IO-Link 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
45DMS	(raC-3_01-VD) raC_Dvc_IOLink.vpd

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.

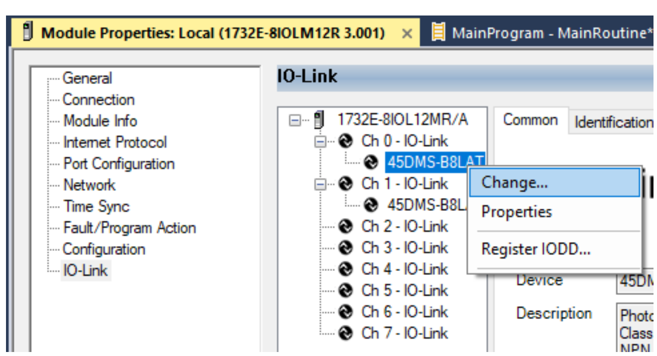
All Studio 5000 Application Code Manager files can be found in the */ApplicationCodeManagerLibraries/* folder of the library. The files included are as follows:

Implementation Object	Compatible IO-Link Master	Asset Control File (.HSL4)	Device File (.HSL4)
45DMS	POINT I/O 1734-4IOL	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_45DMS_4IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_45DMS_4IOL_(3.1)
	ArmorBlock 1732E-8IOLM12R	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_45DMS_8IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_45DMS_8IOL_(3.1)

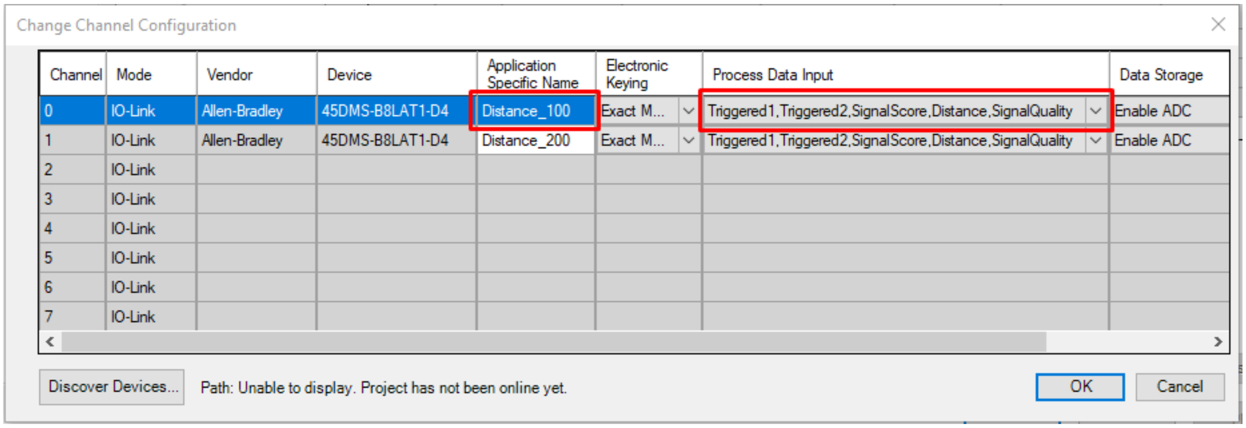
Device Definition

The device must be configured with the correct device definition. Proper device configuration enables the required cyclic device data to pass information from the device into the add-on instruction.

1. Click on Change...



2. Specify the Application Specific Name e.g. *Distance_100*
3. Select the Process Data Input as *Triggered1, Triggered2, SignalScore, Distance, SignalQuality*.



Operations

The IO-Link Device objects provide only physical operation mode. There is no virtual device mode offered.

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
Write_Index	Message Configuration Write	MESSAGE
Read_Index	Message Configuration Read	MESSAGE
Write_SubIndex	Message Configuration Write	MESSAGE
Read_SubIndex	Message Configuration Read	MESSAGE
Msg_Sensor_Data	Messaging Data	raC_UDT_45DMS_Sensor_Data
Ref_Ctrl_Set	IO-Link Device Setting Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Set
Ref_Ctrl_Cmd	IO-Link Device Command Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Cmd
Ref_Ctrl_Sts	IO-Link Device Status Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSts
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[2]
Inp_I	Device Object Inputs	raC_UDT_ItfAD_45DMS_Inp_4IOL Or raC_UDT_ItfAD_45DMS_Inp_8IOL
Ref_Ctrl_Inf	Sensor Type Information Interface	raC_UDT_ItfAD_IOLinkSensor_Inf
Ref_Ctrl_Itf	Device Command, Status Information Interface	raC_UDT_ItfAD_IOLinkDevices

Input Data

Input	Function/Description	DataType
Inp_ChxTriggered1	Triggered Status When the Temprature is equal to Defined Temperature Set for Trigger1	BOOL
Inp_ChxTriggered2	Triggered Status When the Temperature is equal to Defined Temperature Set for Trigger2	BOOL
Inp_ChxDistance	Displays Distance in mm – non-adjustable	INT
Inp_ChxSignalQuality	Signal Quality 0…100%	SINT
Inp_ChxSignalQualityScore	adjustable via index 196(0xC4)	BOOL
Inp_ChNumber	Configured Channel number for Master	SINT
Cfg_AveragingFilter	Averaging Filter; 0 = Disabled, 1…10 = 10…100 Measurements	SINT
Cfg_MeasurementMode	Measurement Mode; 0 = Negative Slope, 1 = Positive Slope	SINT
Cfg_Pin2Input	Pin 2 Input; 0 = Disabled, 1 = Enabled	SINT
Cfg_TeachChannel	Teach Channel; 0 or 1 = Triggered 1, 2 = Triggered2	SINT
Cfg_Trig1_OperMode	Trigger1 Operation Mode; 0 = Off, 1 = Hysteresis, 2 = Window, 3 = Adjustable Hysteresis	SINT
Cfg_Trig1_Polarity	Trigger 1 Polarity; 0 = Not Inverted, 1 = Inverted	SINT
Cfg_Trig2_OperMode	Trigger2 Operation Mode Status; 0 = Off, 1 = Hysteresis, 2 = Window, 3 = Adjustable Hysteresis	SINT
Cfg_Trig2_Polarity	Trigger 2 Polarity; 0 = Not Inverted, 1 = Inverted	SINT
Cmd_LocalTeachLock	Parameters Unlock/Lock Cmd	BOOL

Input	Function/Description	DataType
Cmd_Locate	Locator Disable/Enable Command	BOOL
Cmd_TeachApply	Teach Apply Command	BOOL
Cmd_TeachCancel	Teach Cancel Command	BOOL
Cmd_TeachDynamic_Start	Teach Dynamic Start Command	BOOL
Cmd_TeachDynamic_Stop	Teach Dynamic Stop Command	BOOL
Cmd_TeachPrecision_ShowTarget	Teach Precision Show Target Command	BOOL
Cmd_TeachStatic_Background	Teach Static Background Command	BOOL
Cmd_TeachStatic_ShowTarget	Teach Static Show Target Command	BOOL
Set_Offset	Enter Offset to define an offset from the current measured value	INT
Set_SignalQualityLev	Enter Signal Quality to define level of reflectivity	INT
Set_TrendDistMaxValue	Trend Tab Distance Max for VD/ME/SE Faceplate	INT
Set_TrendDistMinValue	Trend Tab Distance Min for VD/ME/SE Faceplate	INT
Set_Trig1_OFFDelay	Enter Trigger1 OFF delay for the Output to turn OFF after target left Detection Area	DINT
Set_Trig1_ONDelay	Enter Trigger1 ON delay for the Output to turn ON, once target has been detected	DINT
Set_Trig1_SP1	Enter First SetPoint For Triggered1	INT
Set_Trig1_SP2	Enter Second SetPoint For Triggered1	INT
Set_Trig2_OFFDelay	Enter Trigger2 OFF delay for the Output to turn OFF after target left Detection Area	DINT
Set_Trig2_ONDelay	Enter Trigger2 ON delay for the Output to turn ON, once target has been detected	DINT
Set_Trig2_SP1	Enter First SetPoint For Triggered2	INT
Set_Trig2_SP2	Enter Second SetPoint For Triggered2	INT

Output Data

Output	Function/Descritpion	DataType
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Sts_Ready	Device is Ready	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: Master Communication Loss 2: Master Not Available 3: Faulted 4 - 31: Reserved	DINT
Sts_Available	Device is available for interaction with user code	BOOL
Sts_InhibitCfg	1=Inhibit user Configuration Parameters from HMI Faceplate; 0=Allow	BOOL
Sts_InhibitCmd	1=Inhibit user Commands from HMI Faceplate; 0=Allow Control	BOOL
Sts_InhibitSet	1=Inhibit user Settings from HMI Faceplate; 0=Allow	BOOL

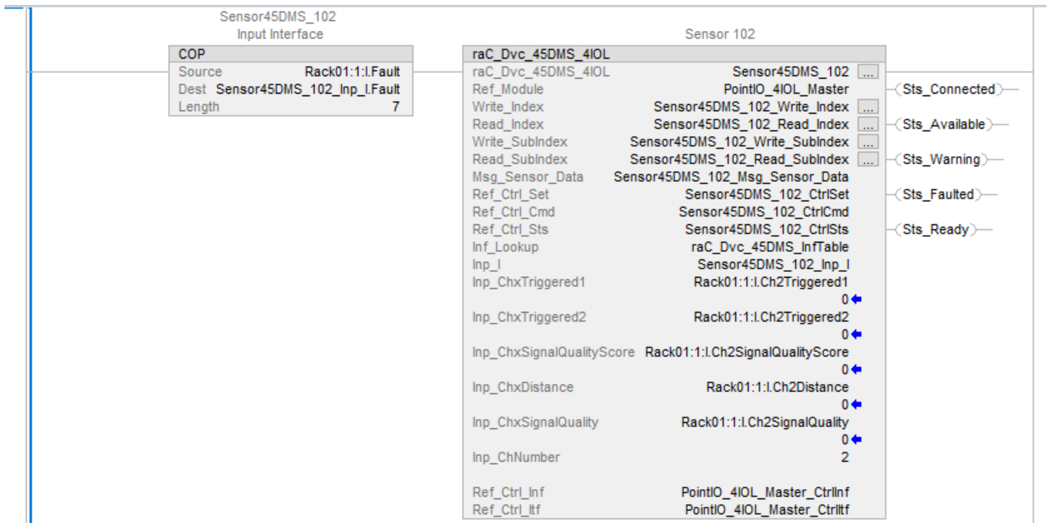
Output	Function/Descritpion	DataType
Sts_LocalTeachLock	Local Parameterization; 0= Unlock, 1= Locked	BOOL
Sts_Located	Locator Indicator; 1= Located	BOOL
Val_AveragingFilter	Averaging Filter Status; 0 = Disabled, 1...10 = 10...100 Measurements	INT
Val_MeasurementMode	Measurement Mode Status; 0 = Negative Slope, 1 = Positive Slope	INT
Val_Offset	Offset Value to define an offset from the current measured value	INT
Val_OperatingHrsSinceInception	Operating Hours Since Inception	DINT
Val_Pin2Input	Pin 2 Input Status; 0 = Disabled, 1 = Enabled	INT
Val_RangeMax	Sensor Maximum Range in Trend	INT
Val_RangeMin	Sensor Minimum Range in Trend	INT
Val_SignalQualityLev	Signal Quality Level Value defines level of Reflectivity	INT
Val_TeachChannel	Teach Channel Value; 0 or 1 = Triggered 1, 2 = Triggered2	INT
Val_TeachStep	Teach Step	INT
Val_TemperatureCurrent	Internal Temperature Of Sensor	INT
Val_TemperatureMaxSinceInception	Maximum Temperature Since Inception	INT
Val_TemperatureMaxSincePowerUp	Maximum Temperature Since Power Up	INT
Val_TemperatureMinSinceInception	Minimum Temperature Since Inception	INT
Val_TemperatureMinSincePowerUp	Minimum Temperature Since Power Up	INT
Val_Trig1_Mode	Trigger1 Operation Mode Status; 0 = Off, 1 = Hysteresis, 2 = Window, 3 = Adjustable Hysteresis	INT
Val_Trig1_OFFDelay	Trigger1 OFF delay Value for the Output to turn OFF after target left Detection Area	DINT
Val_Trig1_ONDelay	Trigger1 ON delay Value for the Output to turn ON, once target has been detected	DINT
Val_Trig1_Polarity	Trigger 1 Polarity; 0 = Not Inverted, 1 = Inverted	INT
Val_Trig1_SP1	First SetPoint Value For Triggered1	INT
Val_Trig1_SP2	Second SetPoint Value for Triggered1	INT
Val_Trig2_Mode	Trigger2 Operation Mode Status; 0 = Off, 1 = Hysteresis, 2 = Window, 3 = Adjustable Hysteresis	INT
Val_Trig2_OFFDelay	Trigger2 OFF delay Value for the Output to turn OFF after target left Detection Area	DINT
Val_Trig2_ONDelay	Trigger2 ON delay Value for the Output to turn ON, once target has been detected	DINT
Val_Trig2_Polarity	Trigger 2 Polarity; 0 = Not Inverted, 1 = Inverted	INT
Val_Trig2_SP1	First SetPoint Value For Triggered2	INT
Val_Trig2_SP2	Second SetPoint Value for Triggered2	INT

Programming Example

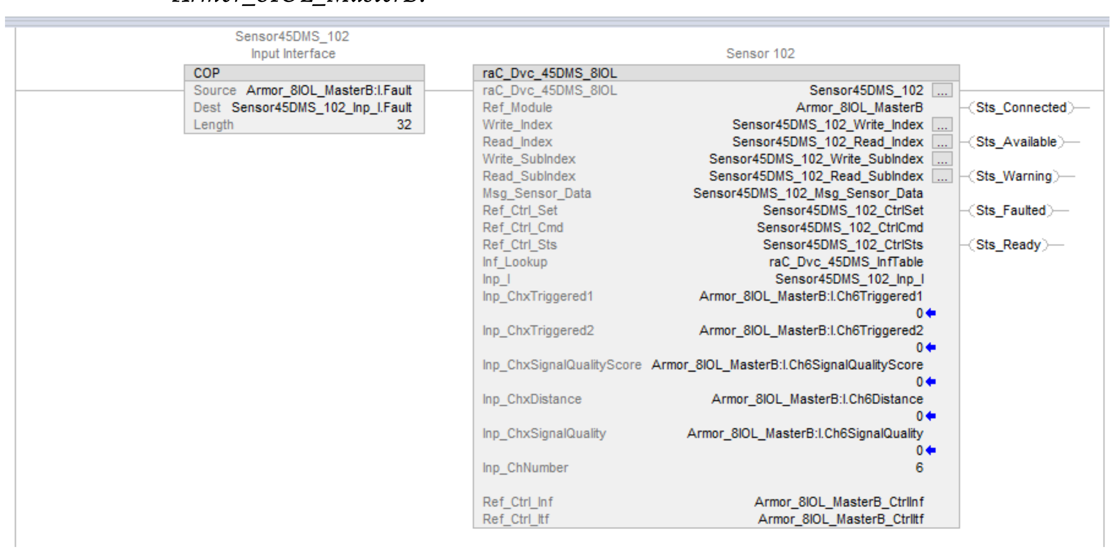
Fully configured device on a rung is provided below for reference.

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 following example uses the 45DMS device object connected to channel #2 of a POINT I/O 1734-4IOL IO-Link Master module in slot #1 of a POINT I/O adapter named *Rack01*.



The following example uses the 45DMS device object connected to channel #6 of a ArmorBlock 1732E-8IOLM12R IO-Link Master module in named *Armor_8IOL_MasterB*.



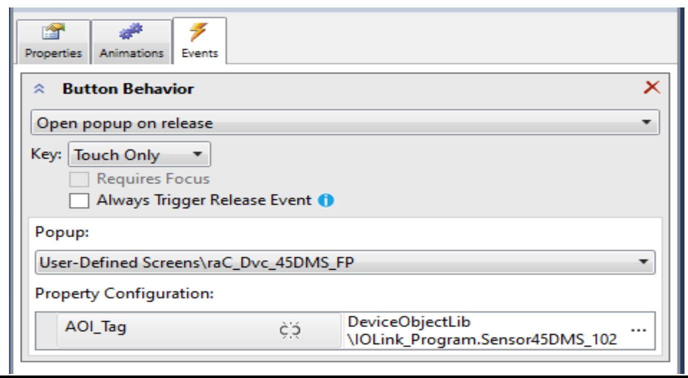
Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. See Basic Launch Button Attributes section for details on configuration and indicators.

FactoryTalk View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GO_LaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #104.	#102: AOI Backing Tag Instance (e.g. {::[PAC]Program::IOLinkProgram._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)

Studio 5000 View Designer Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	

Faceplates

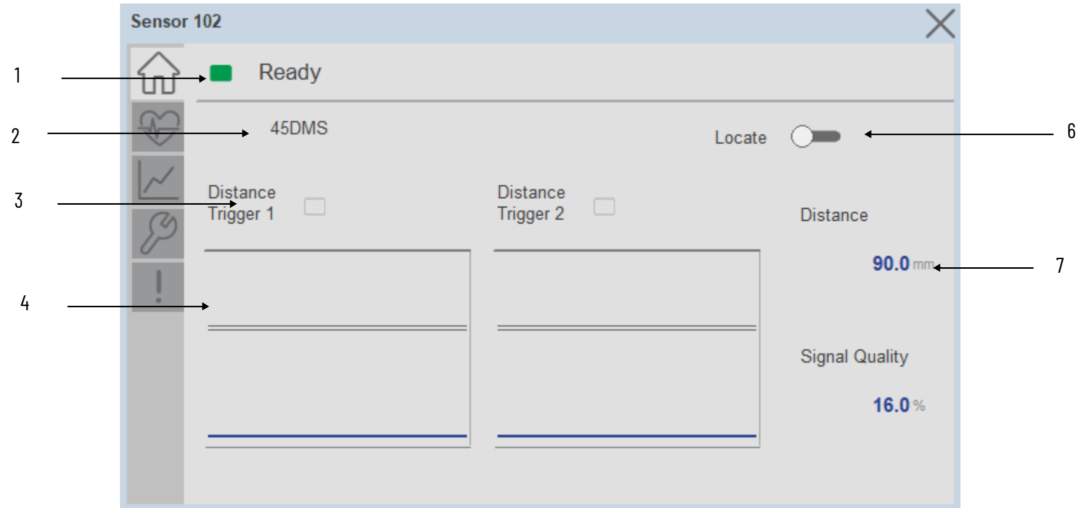
There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 30.

The faceplate title is linked to *_InstanceName.@description*, the *.@description* extended tag property of the Add-On Instruction instance. This is user-configurable from controller/program tags in Studio 5000 Logix Designer.

Sensor45DMS_102	Sensor 102
Sensor45DMS_102_CtrlCmd	Sensor45DMS_102 Command Interface
Sensor45DMS_102_CtrlSet	Sensor45DMS_102 Setting Interface
Sensor45DMS_102_CtrlSts	Sensor45DMS_102 Status Interface
Sensor45DMS_102_Inp_I	Sensor45DMS_102 Input Interface

Home

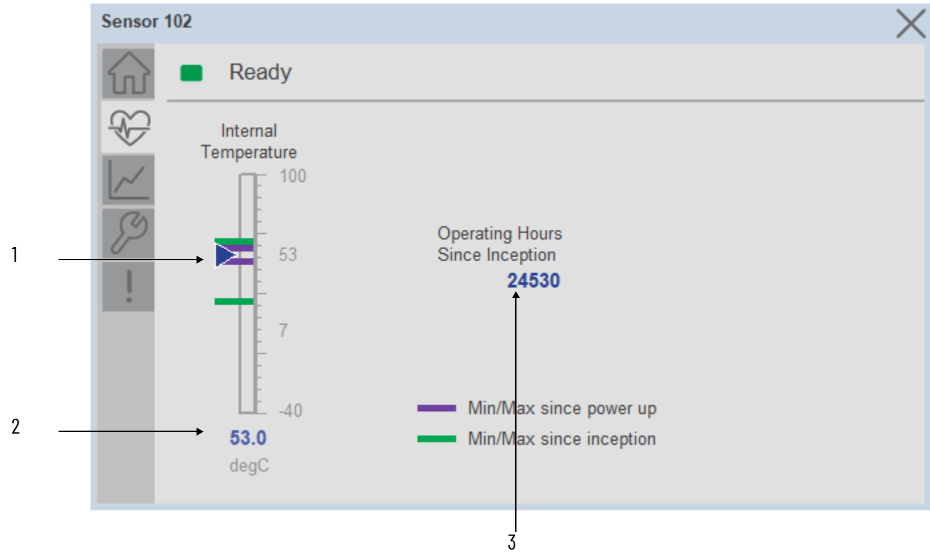
The Home tab is the main tab of the faceplate. It provides the status of the IO-Link device along with sensor process data and the Locate button.



Item	Description
1	Banner- Ready Status
2	Application Specific Name - Read from device
3	Trigger Status 1 & 2 OFF (0) = Gray LED ON (1) = Blue LED
4	Trigger1 Sparkline Trend The spark line shows trigger ON/OFF status over last 30 seconds
5	Locate toggle switch Locate the sensor in large machines where there are several sensors close to each other. When Located, the sensor user interface (green and orange LEDs) start flashing synchronously until the operator disables this function
6	Process Data: Displays the current Temperature value along with unit.

Health Tab

Health tab provides different diagnostic information of sensor which helps ensure that sensors are operating correctly.



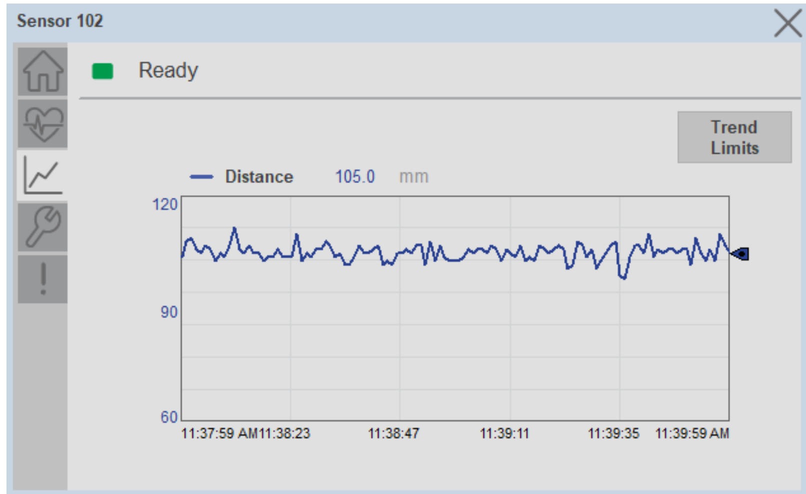
Item	Description
1	Device Temperature Bar Graph Purple Indicators: Min/Max since power up Light Blue Triangle Indicator: Current value
2	Device Temperature Current Value
3	Operating Hours Since Inception

Inception/Lifetime values are recorded since the first time the sensor was ever powered ON. These value are retained and not reset during default factory reset.

Power Up values are reset to zero and recorded new each time the sensor is power cycled.

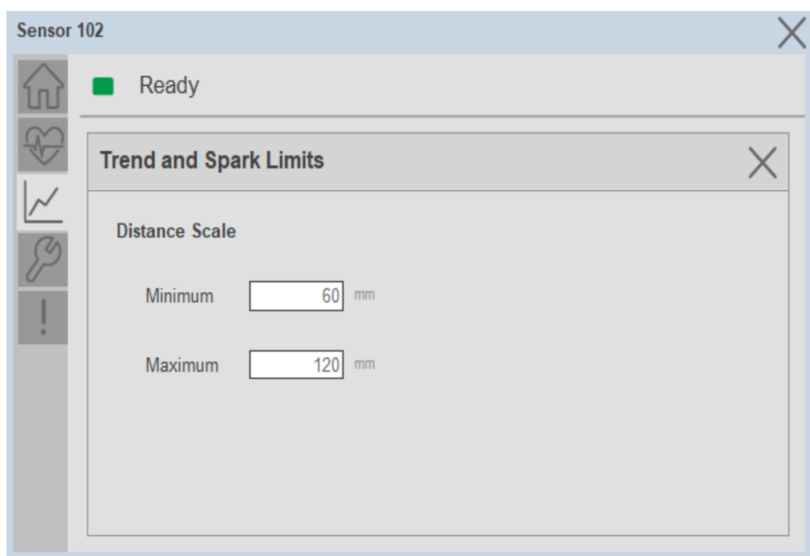
Trend Tab

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. One trend is displayed for Distance.



Trend Settings Screen

We can set trend limits using configuration tab by clicking on the *Settings* button present on trend screen. This sub screen display contains two numeric input elements that allow the user to enter the minimum and maximum values to be used on the Trend screen for Distance.

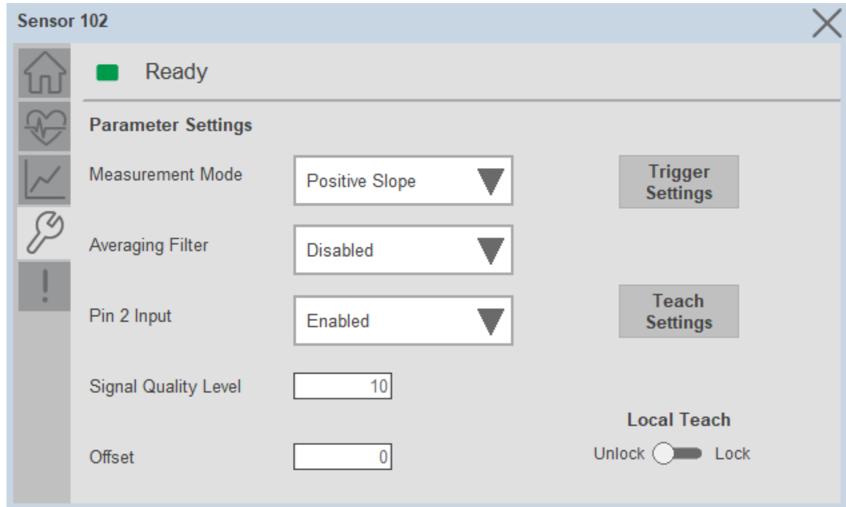


Configure Tab

The configuration tab displays the sensor parameter settings, as well as enabling the user to read data from the sensor.

The configuration section is divided into sections:

- Parameter Settings
- Trigger Settings
- Teach Settings



Parameter Settings

Measurement Mode- The Measurement Mode parameter enables operators to invert the measurement from Positive slope to Negative Slope.

Averaging Filter- The Averaging Filter parameter allows operators to average multiple measurements, inside of the sensor with the goal of providing a more stable measurement.

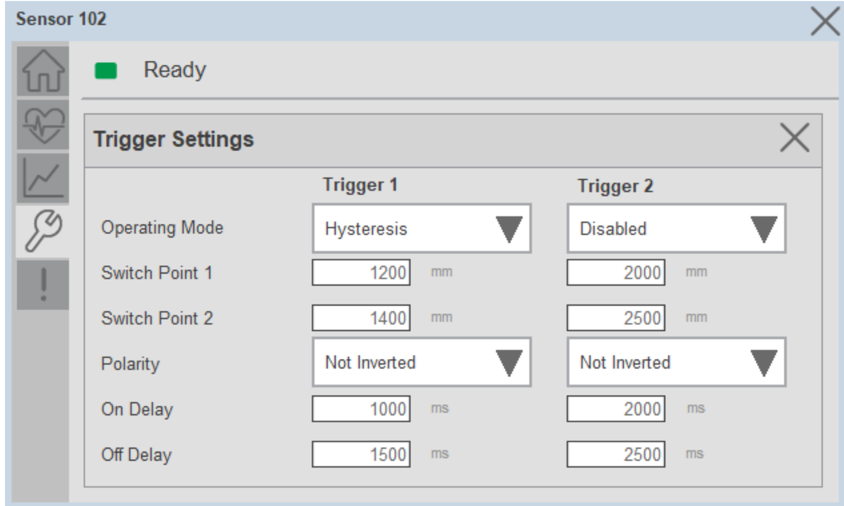
Pin 2 Input- The pin two Input parameter allows operators to enable or disable the pin two Input available on catalog number, 45DMS-B8LAT1-D4.

Signal Quality Level- Signal Quality Level accepts values from 10 to 90% and can help operators understand the level of reflectivity, which may be acceptable or could affect your application.

Offset- - The Offset parameter allows operators to define an offset from the current measured value. Operators can choose between -5000 to +5000 as an offset.

Local Teach- The Local Teach toggle button is used to Enable or disable the local push button to prevent undesired teach on the sensors.

Trigger Settings



The Trigger settings divided into sections:

- Trigger 1
- Trigger 2

Operating Mode- The operating mode parameter enables operators to define the desired output mode for Trigger 1 & Trigger 2. These modes can be Hysteresis, Window & Adjustable Hysteresis.

Switch Point 1- Switch point 1 defines the first set point value for Trigger 1 & Trigger 2. The Hysteresis mode uses the value of switch point 1 to determine when the output will be ON or OFF depending on the Polarity setting. For this setting, the sensor will only detect objects between the minimum distance and the set point distance. Any higher reflectivity objects will be ignored beyond this point.

Switch Point 2- - Switch point 2 defines the second set point value for Trigger 1 & Trigger 2. Switch Point1 & Switch Point2 parameter can accept values between 60 and 5000 and is expressed in mm. The Window mode uses the values of switch point 1 and switch point 2 to determine when the output will be ON or OFF depending on the polarity settings. Only objects between switch point 1 and switch point 2 will be detected while objects outside of these distances will be ignored.

Polarity value- The Polarity value can either be Not-Inverted or Inverted. Not-Inverted means that the output will turn ON when the target is within the expected set points. Inverted means that the output will turn OFF when the target is within the expected set points.

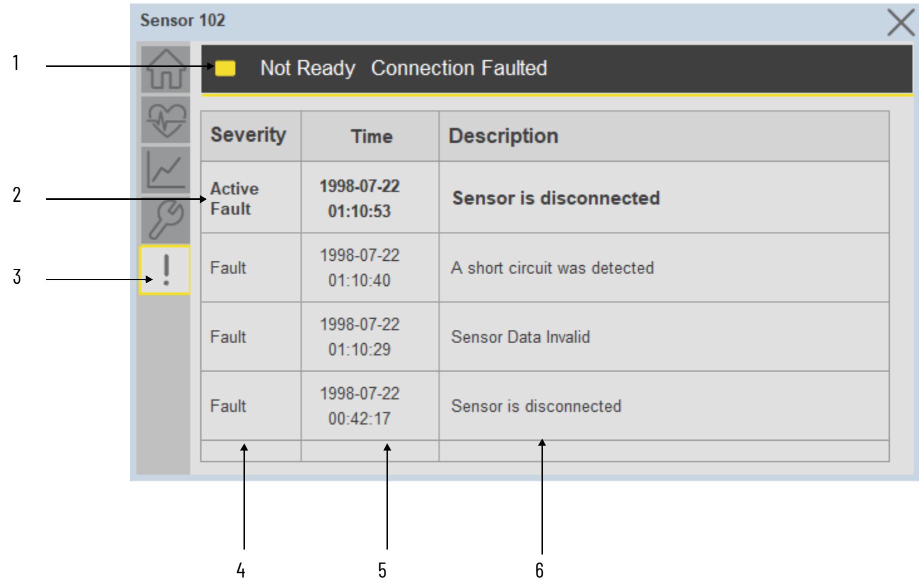
On Delay- The On Delay defines the desired delay for the output to turn ON once a target has been detected.

Off Delay- The Off Delay defines the desired delay for the output to turn OFF once a target has left the detection area.

Fault Warning Tab

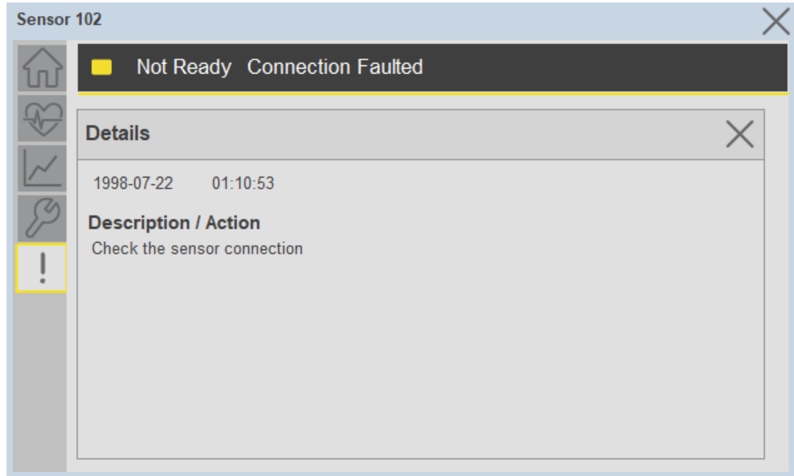
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

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.



Application Code Manager

IO-Link Device Library objects can be set-up and configured using Studio 5000 Application Code Manager.

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

Definition Objects: raC_Dvc_45DMS_4IOL, raC_Dvc_45DMS_8IOL

This object contains the AOI definition and used as linked library to implement object. There is one definition and per add-on instruction to support each IO-Link Master Module. 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 Objects: raC_LD_Dvc_45DMS_4IOL, raC_LD_Dvc_45DMS_8IOL

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
ChannelNumber				Select the Channel Number where the sensor is connected.

Parameter Name	Default Value	Instance Name	Definition	Description
Sensor Type				Select sensor type of 45DMS as per device catalog no.
MasterName	MasterName	[MasterName]	Module	Select the IO-Link master module. If connecting to a non-library object module, enter the name of the master only. 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.

Note that if the tag names are manually entered or not linked to input channel tags a red 'X' will be shown beside the parameter. This is acceptable and the program can still be generated.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_45DMS_4IOL	raC_Dvc_45DMS_4IOL	3.1	(RA-LIB) Device	IO-Link
raC_Dvc_45DMS_8IOL	raC_Dvc_45DMS_8IOL	3.1	(RA-LIB) Device	IO-Link

Configured HMI Content

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

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewME\Global Object - ggfx
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewSE\Global Object - ggfx
V3_raC_Dvc_45DMS	Faceplate ME	(raC-3_xx-ME) raC_Dvc_45DMS-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_raC_Dvc_45DMS	Faceplate SE	(raC-3_xx-SE) raC_Dvc_45DMS-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_raC_Dvc_IOLink	View Designer	(raC-3_xx-VD) raC_Dvc_IOLink.vpd	{ProjectName}\Visualization\ViewDesigner - vpd
V3_RM_raC_Dvc_IO_Link	Reference Manual	DEVICE-RM300B-EN-P.pdf	{ProjectName}\Documentation
V3_IO_Link_Images	HMI Image Set	HMI FactoryTalk View Images - png.zip	{ProjectName}\Visualization\Images - png

46CLR - ColorSight True Color Sensor (raC_Dvc_46CLR_4IOL, raC_Dvc_46CLR_8IOL)

Overview

The 46CLR ColorSight True Color Sensor device object (raC_Dvc_46CLR_4IOL, raC_Dvc_46CLR_8IOL) includes HMI faceplate's which displays device information including:

- Sensor data
- Snapshots of Sensor Parameter
- Sensor diagnostics
- Process data trending
- Sensor configuration and parameters
- Device Fault log

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_*46CLR*_Objects_Faceplate.MP4"

Primary device object configuration functions include:

- **Locate:** This function helps to locate the sensors using the device's LED in large machines where there are several sensors close to each other.
- **Polarity:** This function changes the sensor output to operate as Not-Inverted (Light Operate) and Inverted (Dark Operate).

Functional Description

The 46CLR ColorSight True Color Sensor pre-configured Device Objects:

- Collect, Process and Deliver Data between Smart Devices and Application Logic
- Provide Device Status & Diagnostics Faceplate's 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 faceplate's. The revision number (e.g. 1.01) 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/* folder in the library. Each device is supplied with two versions of Add-On Instructions (AOI) and Rung import files - one for compatibility with each IO-Link Master Module. You must select the appropriate AOI for the master module being used.

Device/Item	Compatible IO-Link Master	Add-On Instruction	Rung Import
46CLR	POINT I/O 1734-4IOL	raC_Dvc_46CLR_4IOL_3.01_AOI.L5X	raC_Dvc_46CLR_4IOL_3.01_RUNG.L5X
	ArmorBlock 1732E-8IOLM12R	raC_Dvc_46CLR_8IOL_3.01_AOI.L5X	raC_Dvc_46CLR_8IOL_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.

Note that a single faceplate is used for either the 4IOL or 8IOL versions of the Add-On Instruction.

Device/Item	Type	FactoryTalk View ME Faceplate	FactoryTalk View SE Faceplate
46CLR	Display	(raC-3_01-ME) raC_Dvc_46CLR-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_46CLR-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - IO-Link Device.ggfx	(raC-3-SE) Toolbox - IO-Link 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
46CLR	(raC-3_01-VD) raC_Dvc_IOLink.vpd

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.

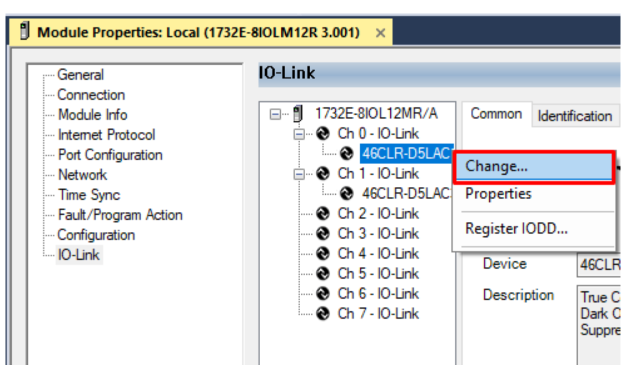
All Studio 5000 Application Code Manager files can be found in the */ApplicationCodeManagerLibraries/* folder of the library. The files included are as follows:

Implementation Object	Compatible IO-Link Master	Asset Control File (.HSL4)	Device File (.HSL4)
46CLR	POINT I/O 1734-4IOL	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_46CLR_4IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_46CLR_4IOL_(3.1)
	ArmorBlock 1732E-8IOLM12R	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_46CLR_8IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_46CLR_8IOL_(3.1)

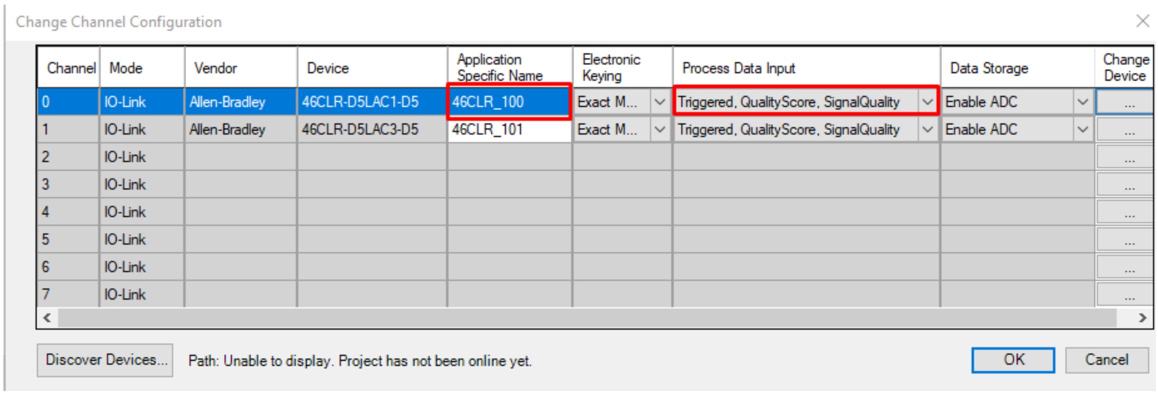
Device Definition

The device must be configured with the correct device definition. Proper device configuration enables the required cyclic device data to pass information from the device into the add-on instruction.

1. Click on Change...



2. Specify the Application Specific Name e.g.
3. Select the Process Data Input as *Triggered, QualityScore, SignalQuality*.



Operations

The IO-Link Device objects provide only physical operation mode. There is no virtual device mode offered.

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
Write_Index	Message Configuration Write	MESSAGE
Read_Index	Message Configuration Read	MESSAGE
Write_SubIndex	Message Configuration Write	MESSAGE
Read_SubIndex	Message Configuration Read	MESSAGE
Msg_Sensor_Data	Messaging Data	raC_UDT_46CLR_Sensor_Data
Ref_Ctrl_Set	IO-Link Device Setting Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Set
Ref_Ctrl_Cmd	IO-Link Device Command Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Cmd
Ref_Ctrl_Sts	IO-Link Device Status Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSts
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[2]
Inp_I	Device Object Inputs	raC_UDT_ItfAD_46CLR_Inp_4IOL Or raC_UDT_ItfAD_46CLR_Inp_8IOL
Ref_Ctrl_Inf	Sensor Type Information Interface	raC_UDT_ItfAD_IOLinkSensor_Inf
Ref_Ctrl_Itf	Device Command, Status Information Interface	raC_UDT_ItfAD_IOLinkDevices

Input Data

Input	Function/Description	DataType
Cfg_DetectionMode	Set the detection mode; 0=Colour Mode, 1=Best Fit Mode	SINT
Cfg_Snapshot	Snapshot Command Storing for Signal Values	SINT
Cmd_DisableLEDs	Indicator Disabled Command	BOOL
Cmd_EnableLEDs	Indicator Enabled Command	BOOL
Cmd_IntensityEvaluationCh1	Allows the sensor to consider evaluating the intensity of the color as part of the color detection for Channel1; 0=Off, 1=On	BOOL
Cmd_IntensityEvaluationCh2	Allows the sensor to consider evaluating the intensity of the color as part of the color detection for Channel2; 0=Off, 1=On	BOOL
Cmd_IntensityEvaluationCh3	Allows the sensor to consider evaluating the intensity of the color as part of the color detection for Channel3; 0=Off, 1=On	BOOL
Cmd_IntensityEvaluationCh4	Allows the sensor to consider evaluating the intensity of the color as part of the color detection for Channel4; 0=Off, 1=On	BOOL
Cmd_IntensityEvaluationCh5	Allows the sensor to consider evaluating the intensity of the color as part of the color detection for Channel5; 0=Off, 1=On	BOOL
Cmd_IntensityEvaluationCh6	Allows the sensor to consider evaluating the intensity of the color as part of the color detection for Channel6; 0=Off, 1=On	BOOL
Cmd_IntensityEvaluationCh7	Allows the sensor to consider evaluating the intensity of the color as part of the color detection for Channel7; 0=Off, 1=On	BOOL
Cmd_LocalTeachLock	Parameters Unlock/Lock Cmd	BOOL
Cmd_Locate	Locator Disable/Enable Command	BOOL
Cmd_OperationCh1	Enables or disables the operation of Channel 1; 0=Disabled, 1=Enabled	BOOL
Cmd_OperationCh2	Enables or disables the operation of Channel 2; 0=Disabled, 1=Enabled	BOOL

Input	Function/Description	DataType
Cmd_OperationCh3	Enables or disables the operation of Channel 3; 0=Disabled, 1=Enabled	BOOL
Cmd_OperationCh4	Enables or disables the operation of Channel 4; 0=Disabled, 1=Enabled	BOOL
Cmd_OperationCh5	Enables or disables the operation of Channel 5; 0=Disabled, 1=Enabled	BOOL
Cmd_OperationCh6	Enables or disables the operation of Channel 6; 0=Disabled, 1=Enabled	BOOL
Cmd_OperationCh7	Enables or disables the operation of Channel 7; 0=Disabled, 1=Enabled	BOOL
Cmd_PolarityCh1	Set the Polarity of Channel 1; 0=Not Inverted, 1=Inverted	BOOL
Cmd_PolarityCh2	Set the Polarity of Channel 2; 0=Not Inverted, 1=Inverted	BOOL
Cmd_PolarityCh3	Set the Polarity of Channel 3; 0=Not Inverted, 1=Inverted	BOOL
Cmd_PolarityCh4	Set the Polarity of Channel 4; 0=Not Inverted, 1=Inverted	BOOL
Cmd_PolarityCh5	Set the Polarity of Channel 5; 0=Not Inverted, 1=Inverted	BOOL
Cmd_PolarityCh6	Set the Polarity of Channel 6; 0=Not Inverted, 1=Inverted	BOOL
Cmd_PolarityCh7	Set the Polarity of Channel 7; 0=Not Inverted, 1=Inverted	BOOL
Cmd_ResetCountCh1	Counter Reset Command for Channel1	BOOL
Cmd_ResetCountCh2	Counter Reset Command for Channel2	BOOL
Cmd_ResetCountCh3	Counter Reset Command for Channel3	BOOL
Cmd_ResetDurationsCh1	Duration Reset Command for Channel1	BOOL
Cmd_ResetDurationsCh2	Duration Reset Command for Channel2	BOOL
Cmd_ResetDurationsCh3	Duration Reset Command for Channel3	BOOL
Cmd_TeachApply	Teach Apply Command	BOOL
Cmd_TeachCancel	Teach Cancel Command	BOOL
Cmd_TeachColorScanStart	Teach Color Scan Start Command	BOOL
Cmd_TeachColorScanStop	Teach Color Scan Stop Command	BOOL
Cmd_TeachStandard	Teach Standard Command	BOOL
Inp_ChNumber	Configured Channel number for Master	SINT
Inp_ChxSignalQuality	Reflects the strength of the return signal reflected from the target	INT
Inp_ChxSignalQualityScore	Indicate if the signal strength is higher or lower than a defined threshold	BOOL
Inp_ChxTriggered1	Triggered Status of channel 1 of Sensor	BOOL
Inp_ChxTriggered2	Triggered Status of channel 2 of Sensor	BOOL
Inp_ChxTriggered3	Triggered Status of channel 3 of Sensor	BOOL
Inp_ChxTriggered4	Triggered Status of channel 4 of Sensor	BOOL
Inp_ChxTriggered5	Triggered Status of channel 5 of Sensor	BOOL
Inp_ChxTriggered6	Triggered Status of channel 6 of Sensor	BOOL
Inp_ChxTriggered7	Triggered Status of channel 7of Sensor	BOOL
Set_CounterCh1	Defines the desired number of counts for the discrete output to turn ON for Ch 01	DINT
Set_CounterCh2	Defines the desired number of counts for the discrete output to turn ON for Ch 02	DINT

Input	Function/Description	DataType
Set_CounterCh3	Defines the desired number of counts for the discrete output to turn ON for Ch 03	DINT
Set_GreenToleranceCh1	Sets the color threshold tolerance for the green color for channel 1	REAL
Set_GreenToleranceCh2	Sets the color threshold tolerance for the green color for channel 2	REAL
Set_GreenToleranceCh3	Sets the color threshold tolerance for the green color for channel 3	REAL
Set_GreenToleranceCh4	Sets the color threshold tolerance for the green color for channel 4	REAL
Set_GreenToleranceCh5	Sets the color threshold tolerance for the green color for channel 5	REAL
Set_GreenToleranceCh6	Sets the color threshold tolerance for the green color for channel 6	REAL
Set_GreenToleranceCh7	Sets the color threshold tolerance for the green color for channel 7	REAL
Set_IntensityToleranceCh1	Sets the color threshold tolerance for the intensity for channel 1	REAL
Set_IntensityToleranceCh2	Sets the color threshold tolerance for the intensity for channel 2	REAL
Set_IntensityToleranceCh3	Sets the color threshold tolerance for the intensity for channel 3	REAL
Set_IntensityToleranceCh4	Sets the color threshold tolerance for the intensity for channel 4	REAL
Set_IntensityToleranceCh5	Sets the color threshold tolerance for the intensity for channel 5	REAL
Set_IntensityToleranceCh6	Sets the color threshold tolerance for the intensity for channel 6	REAL
Set_IntensityToleranceCh7	Sets the color threshold tolerance for the intensity for channel 7	REAL
Set_RedToleranceCh1	Sets the color threshold tolerance for the red color for channel 1	REAL
Set_RedToleranceCh2	Sets the color threshold tolerance for the red color for channel 2	REAL
Set_RedToleranceCh3	Sets the color threshold tolerance for the red color for channel 3	REAL
Set_RedToleranceCh4	Sets the color threshold tolerance for the red color for channel 4	REAL
Set_RedToleranceCh5	Sets the color threshold tolerance for the red color for channel 5	REAL
Set_RedToleranceCh6	Sets the color threshold tolerance for the red color for channel 6	REAL
Set_RedToleranceCh7	Sets the color threshold tolerance for the red color for channel 7	REAL
Set_TeachChannel	Select Teach Channel	INT
Set_ToleranceCh1	Sets the color tolerance levels for Channel 1	INT
Set_ToleranceCh2	Sets the color tolerance levels for Channel 2	INT
Set_ToleranceCh3	Sets the color tolerance levels for Channel 3	INT
Set_ToleranceCh4	Sets the color tolerance levels for Channel 4	INT
Set_ToleranceCh5	Sets the color tolerance levels for Channel 5	INT
Set_ToleranceCh6	Sets the color tolerance levels for Channel 6	INT
Set_ToleranceCh7	Sets the color tolerance levels for Channel 7	INT

Output Data

Output	Function/Descritpion	DataType
Sts_Active	Device active status: 1 = output power structure is active	BOOL
Sts_Available	Device is available for interaction with user code	BOOL
Sts_bNotReady	Bitwise device 'not ready' reason	BOOL
Sts_Connected	Device is connected to the Programmable Automation Controller	BOOL
Sts_Faulted	Device faulted status: 1 = an active fault exists	BOOL
Sts_InhibitCfg	1=Inhibit user Configuration Parameters from HMI Faceplate; 0=Allow	BOOL
Sts_InhibitCmd	1=Inhibit user Commands from HMI Faceplate; 0=Allow Control	BOOL
Sts_InhibitSet	1=Inhibit user Settings from HMI Faceplate; 0=Allow	BOOL
Sts_LocalTeachLock	Local Parameterization; 0= Unlock, 1= Locked	BOOL
Sts_Located	Locator Indicator; 1= Located	BOOL
Sts_Ready	Device is ready to perform primary function	BOOL
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Val_Blue	Displays the blue component of the color under detection	REAL
Val_BlueSnapshot1	Used for Storing Blue parameter value for snapshot 1	REAL
Val_BlueSnapshot2	Used for Storing Blue parameter value for snapshot 2	REAL
Val_BlueSnapshot3	Used for Storing Blue parameter value for snapshot 3	REAL
Val_Counter	Counter Value	DINT
Val_DetectionCounterSinceInception	Displays the number of targets that have been detected since the sensor has been in operation	DINT
Val_DetectionMode	Displays the detection mode; 0=Colour Mode, 1=Best Fit Mode	SINT
Val_EnableLEDs	LED Indicator; 0= Disable, 1= Enable	SINT
Val_Green	Displays the green component of the color under detection	REAL
Val_GreenSnapshot1	Used for Storing Green parameter value for snapshot 1	REAL
Val_GreenSnapshot2	Used for Storing Green parameter value for snapshot 2	REAL
Val_GreenSnapshot3	Used for Storing Green parameter value for snapshot 3	REAL
Val_GreenTolerance	Display the color threshold tolerance for the green color	REAL
Val_Intensity	Displays the intensity of the color under detection	REAL
Val_IntensityEvaluation	Display value of the sensor to consider evaluating the intensity of the color as part of the color detection ; 0=Off, 1=On	INT
Val_IntensitySnapshot1	Used for Storing intensity parameter value for snapshot 1	REAL
Val_IntensitySnapshot2	Used for Storing intensity parameter value for snapshot 2	REAL
Val_IntensitySnapshot3	Used for Storing intensity parameter value for snapshot 3	REAL
Val_IntensityTolerance	Display the value of color threshold tolerance for the intensity	REAL
Val_OperatingHrsSinceInception	Displays the number of hours that the sensor has been continuously in operation	DINT
Val_Operation	Display the operation state of channel; 0=Disabled, 1=Enabled	INT

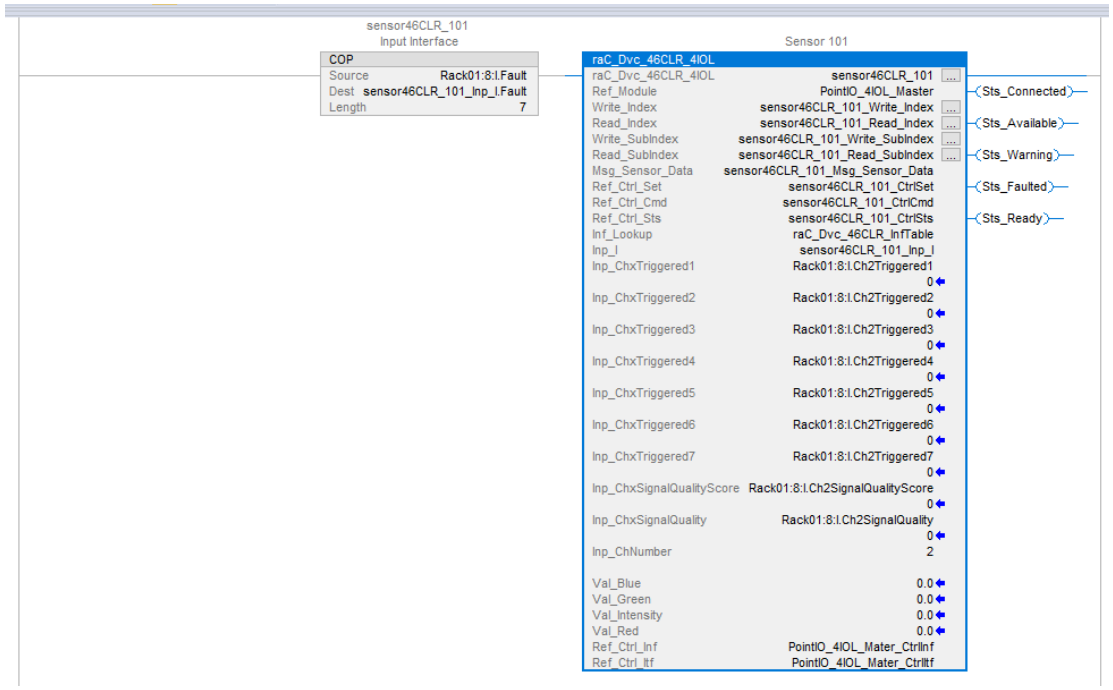
Output	Function/Descritpion	DataType
Val_Polarity	Displays the polarity of channel; 0 = Not Inverted, 1=Inverted	INT
Val_RangeMax	Sensor Maximum Range in Trend	DINT
Val_RangeMin	Sensor Minimum Range in Trend	DINT
Val_Red	Displays the red component of the color under detection	REAL
Val_RedSnapshot1	Used for Storing Red parameter value for snapshot 1	REAL
Val_RedSnapshot2	Used for Storing Red parameter value for snapshot 2	REAL
Val_RedSnapshot3	Used for Storing Red parameter value for snapshot 3	REAL
Val_RedTolerance	Display the value of color threshold tolerance for the respective color	REAL
Val_TeachChannel	Displays the number of channel selected	INT
Val_TeachStatus	Displays the status of Teach mode	INT
Val_TeachStep	Teach Step	INT
Val_TemperatureCurrent	Displays the internal temperature information available in the sensor	SINT
Val_TemperatureMaxSinceInception	Reflects the maximum temperature inside of the microprocessor die of the Sensor since inception	SINT
Val_TemperatureMaxSincePowerUp	Reflects the maximum temperature inside of the microprocessor die of the sensor since the last power up	SINT
Val_TemperatureMinSinceInception	Reflects the minimum temperature inside of the microprocessor die of the sensor since inception	SINT
Val_TemperatureMinSincePowerUp	Reflects the minimum temperature inside of the microprocessor die of the sensor since the last power up	SINT
Val_Tolerance	Displays the color tolerance levels for Channel	INT

Programming Example

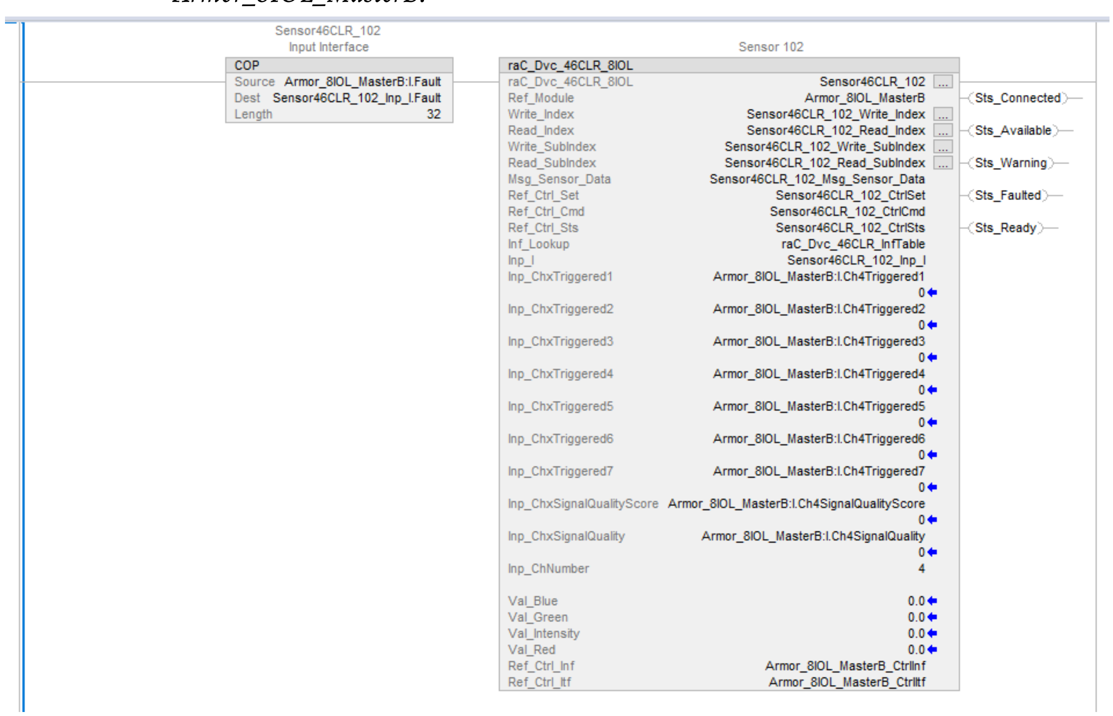
Fully configured device on a rung is provided below for reference. The first rung is required and the others are optional.

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 following example uses the 46CLR device object connected to channel #2 of a POINT I/O 1734-4IOL IO-Link Master module in slot #8 of a POINT I/O adapter named *Rack01*.



The following example uses the 46CLR device object connected to channel #4 of a ArmorBlock 1732E-8IOLM12R IO-Link Master module in named *Armor_8IOL_MasterB*.



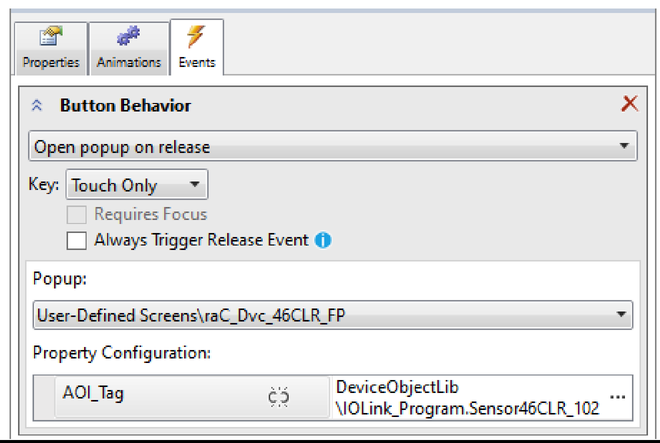
Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. See Basic Launch Button Attributes section for details on configuration and indicators.

FactoryTalk View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GO_LaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #104.	#102: AOI Backing Tag Instance (e.g. {::[PAC]Program::IOLinkProgram._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)

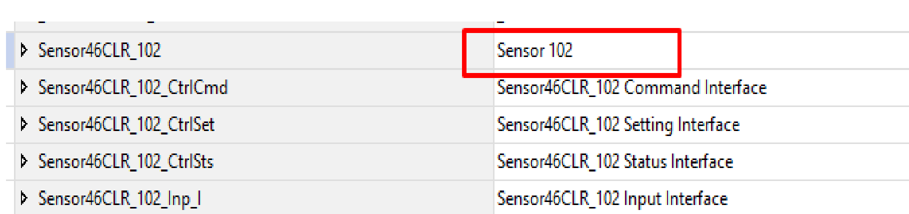
Studio 5000 View Designer Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	

Faceplates

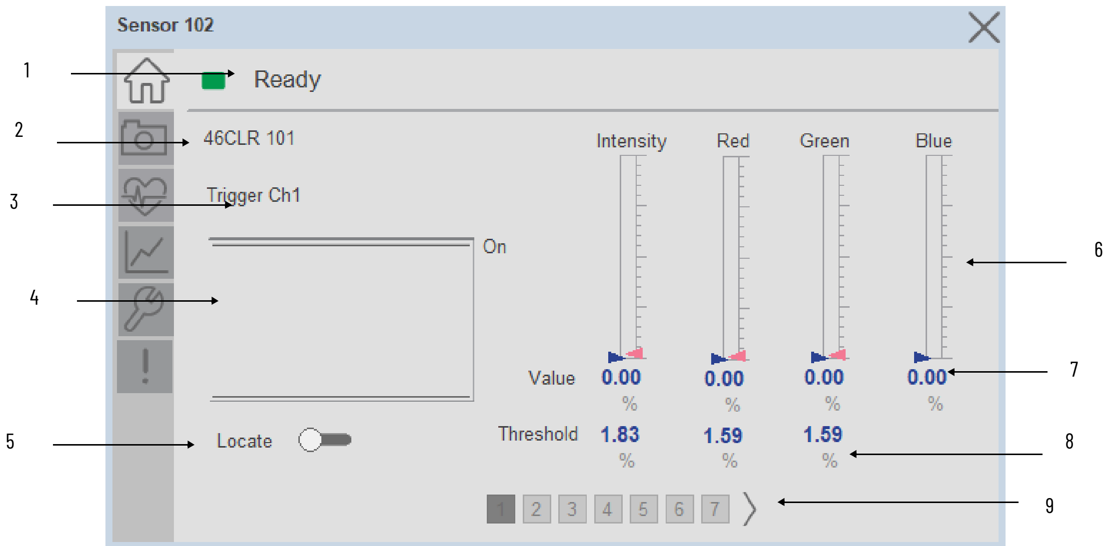
There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 30.

The faceplate title is linked to *_InstanceName.@description*, the *.@description* extended tag property of the Add-On Instruction instance. This is user-configurable from controller/program tags in Studio 5000 Logix Designer.



Home

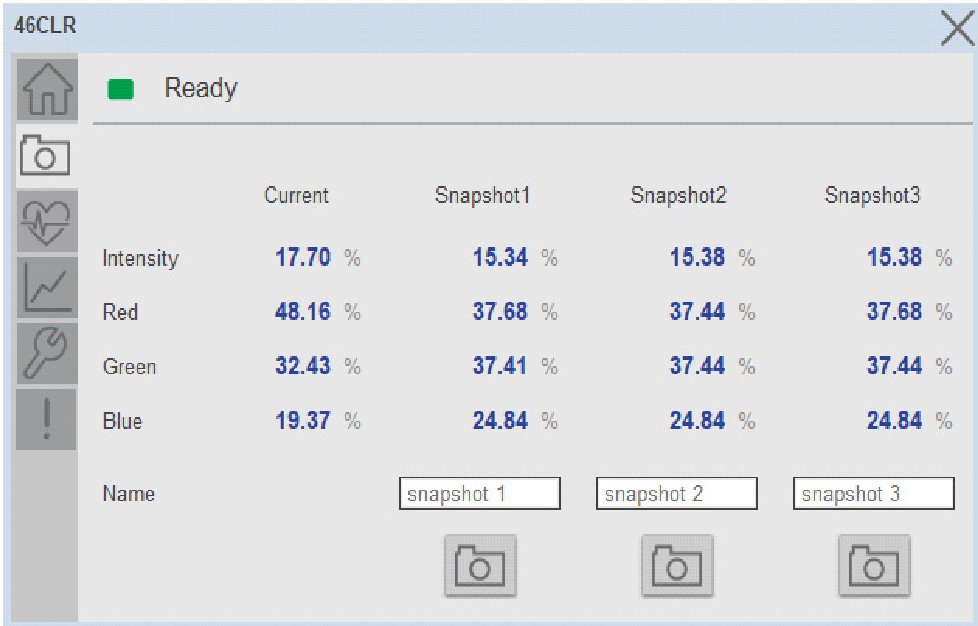
The Home tab is the main tab of the faceplate. It provides the status of the IO-Link device along with sensor process data and the Locate button.



Item	Description
1	Banner- Ready Status
2	Application Specific Name - Read from device
3	Trigger Status Channel 1 to 7
4	Trigger1 to 7 Sparkline Trend The spark line shows trigger ON/OFF status over last 30 seconds
5	Locate toggle switch Locate the sensor in large machines where there are several sensors close to each other. When Located, the sensor user interface (green and orange LEDs) start flashing synchronously until the operator disables this function
6	Process Data: Displays the Bar graph of Red, Green, Blue and Intensity.
7	Process Data: Displays the value of Red, Green, Blue and Intensity.
8	Process Data: Displays the threshold value of Red, Green, Blue and Intensity.
9	Channel selection 1 to 7

Snapshot

The Snapshot tab is used to save up to three independent snapshots of the color profile. This can be used during commissioning, configuration, or troubleshooting as a method of saving a color reference of a particular object. Each snapshot can be assigned a short name using a string entry.



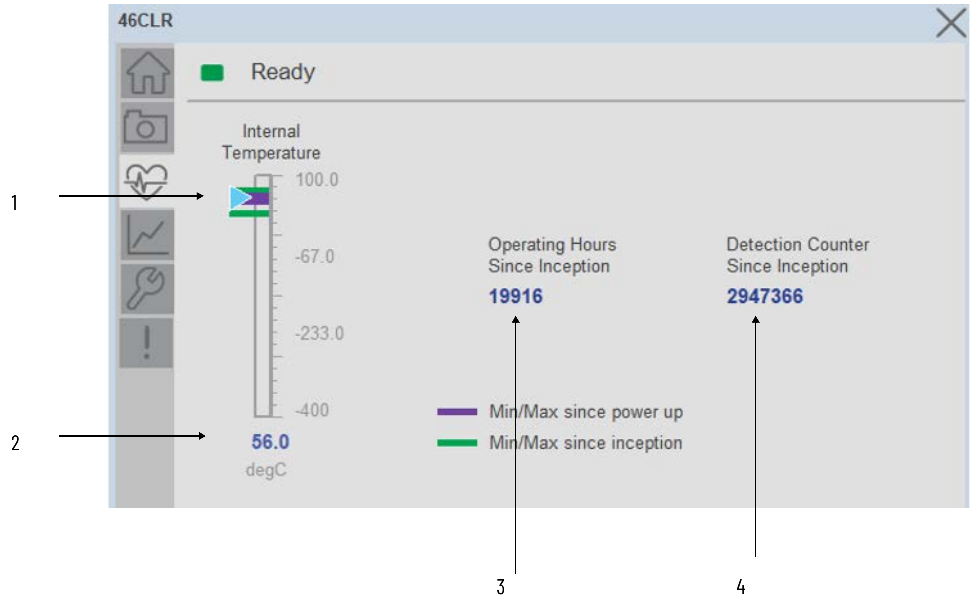
Snapshot 1- Once you click on button under Snapshot1, the value is captured and stored in the Snapshot1 displays.

Snapshot 2- Once you click on button under Snapshot1, the value is captured and stored in the Snapshot2 displays.

Snapshot 3- Once you click on button under Snapshot1, the value is captured and stored in the Snapshot1 displays.

Health Tab

Health tab provides different diagnostic information of sensor which helps ensure that sensors are operating correctly.



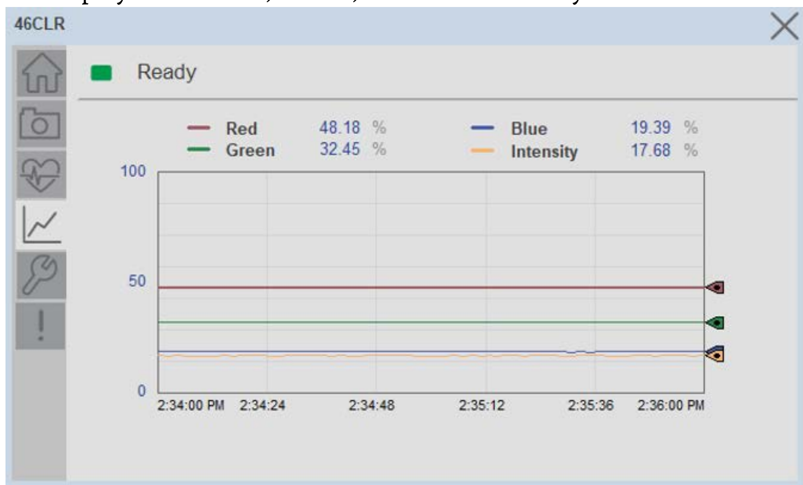
Item	Description
1	Internal Temperature Bar Graph Green Indicators: Min/Max since inception (lifetime) Purple Indicators: Min/Max since power up Light Blue Triangle Indicator: Current value
2	Internal Temperature Current Value
3	Operating Hours Since Inception (lifetime)
4	Detection Counter Since Inception

Inception/Lifetime values are recorded since the first time the sensor was ever powered ON. These value are retained and not reset during default factory reset.

Power Up values are reset to zero and recorded new each time the sensor is power cycled.

Trend Tab

This tab shows trend of Red, Green, Blue and Intensity Values. Also it contains numeric displays for of Red, Green, Blue and Intensity Values.

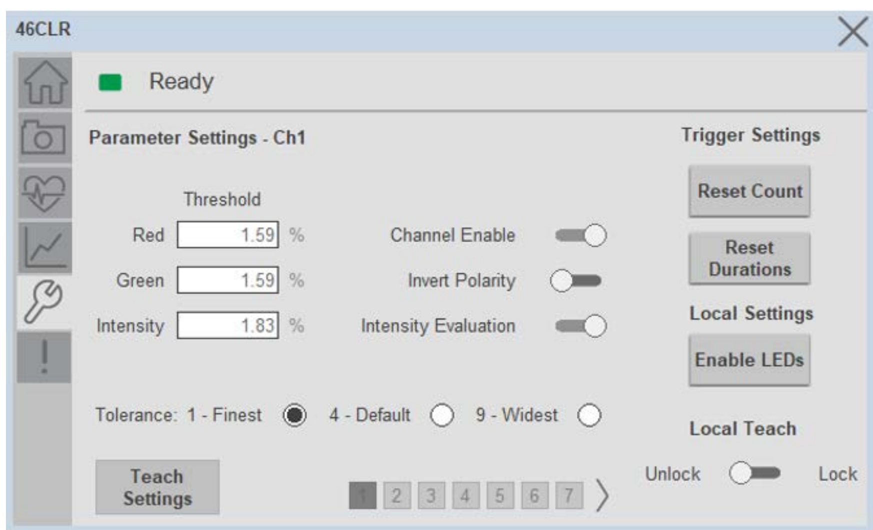


Configure Tab

The configuration tab displays the sensor parameter settings, as well as enabling the user to read data from the sensor.

The configuration section is divided into sections:

- Parameter Settings
- Trigger Settings
- Local Settings
- Teach settings



Parameter Settings

We can set the Parameter Settings for each channel separately. Each page corresponds to each channel 1 through 7. For accessing individual channel, user need to use the page navigation button.

Analog Output Slope- Applied to configure an analog output when the sensor is operated in the Standard I/O (SIO) mode. Trigger Settings

Red Threshold- Sets the color threshold tolerance for the respective color. The default value for this parameter is 1.59 with acceptable values between 0 and 100.

Green Threshold- Sets the color threshold tolerance for the respective color. The default value for this parameter is 1.59 with acceptable values between 0 and 100.

Intensity Threshold- Sets the color threshold for the intensity. The default value for this parameter is 1.83 with acceptable values between 0 and 100.

Channel Enable- Enables or disables the operation of the selected channel.

Invert Polarity- Sets the polarity of the of the selected channel. The polarity could be either not inverted or inverted.

Intensity Evaluation- Enables or disables the sensor to consider evaluating the intensity of the color as part of the color detection.

Tolerance- Sets the color tolerance levels of the selected channel. The operator can set zero as the finest tolerance while level nine is the widest tolerance.

Trigger Settings

We can set the Trigger Settings for each channel separately. For accessing individual channel, user need to use the page navigation button.

Disable/Enable LEDs- This parameter allows operators to turn OFF or turn ON the User Interface LEDs (green and orange LEDs). This parameter is ideal for applications where turning OFF the LEDs is desired to accommodate the application.

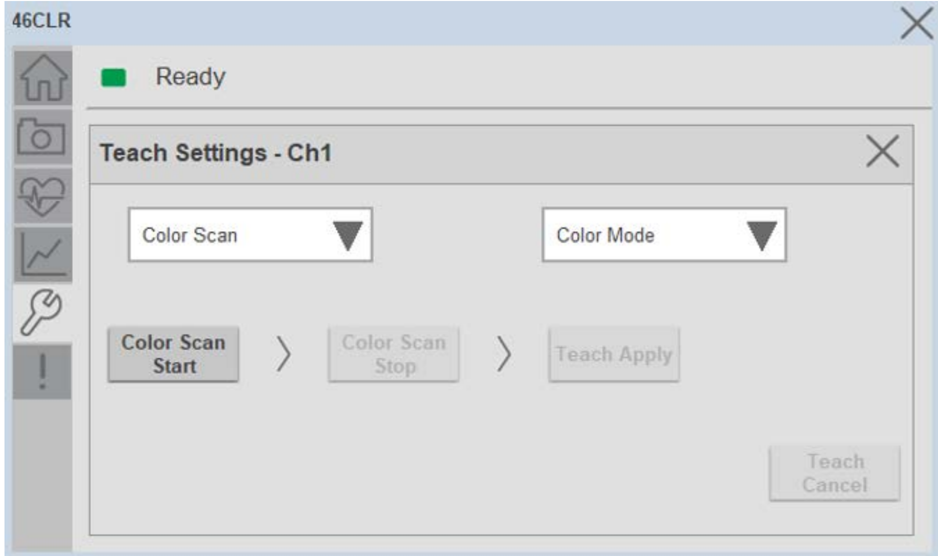
Local Teach Parameters - This section allow user to lock / unlock device local parameterization. Touch Lock/Unlock Toggle switch to Lock Local Parameterization.

Teach Settings.

Teach Settings display includes the Teach Methods, Teach Command & Teach Cancel buttons. Touch on the Teach Settings navigation button to access the Teach Settings tab. We can teach each channel separately. For accessing individual channel, user need to use the page navigation button.

Teach Tab include the following functions:

- Teach mode selection and Teach Detection mode Dropdown menu
- Teach procedure flow buttons
- Teach Apply and Cancel Button.



Teach mode- This parameter selects the desired mode.

Color Scan Teach - The first method is Color Scan Teach, enables you to teach and detect objects with various colors and individual colors to each channel.

4. Place the target in front of the field of view of the sensor and send the command **"Color Scan - Start"**. Move the color targets that you want to teach as needed until all desired colors are presented in the field of view of the sensor.
5. Send the command **"Color Scan - Stop"** to stop the color scan process.
6. Send the command **"Teach - Apply"** to finalize the teach process.
7. To cancel the procedure, you can send the **"Teach Cancel"** command at any point.

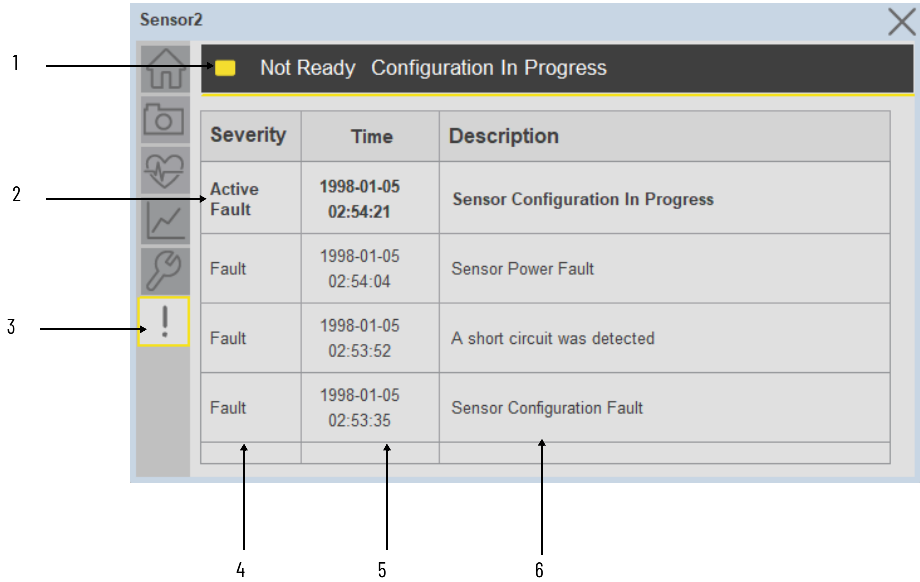
Standard Teach - The second method is Standard Teach.

8. Place the target in front of the sensor. Send the command **"Standard Teach - Show Color"** to start the teach process.
9. Send the command **"Teach - Apply"** to finalize the teach process
10. To cancel the procedure, you can send the **"Teach Cancel"** command at any point.

Fault Warning Tab

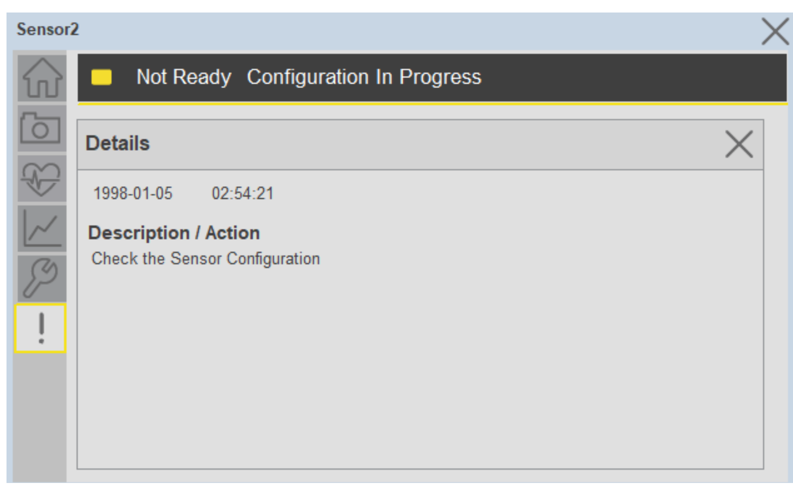
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

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.



Application Code Manager

IO-Link Device Library objects can be set-up and configured using Studio 5000 Application Code Manager.

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

Definition Objects: raC_Dvc_46CLR_4IOL, raC_Dvc_46CLR_8IOL

This object contains the AOI definition and used as linked library to implement object. There is one definition and per add-on instruction to support each IO-Link Master Module. 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 Objects: raC_LD_Dvc_46CLR_4IOL, raC_LD_Dvc_46CLR_8IOL

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
ChannelNumber				Select the Channel Number where the sensor is connected.
MasterName	MasterName	[MasterName]	Module	Select the IO-Link master module. If connecting to a non-library object module, enter the name of the master only. 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.

Note that if the tag names are manually entered or not linked to input channel tags a red 'X' will be shown beside the parameter. This is acceptable and the program can still be generated.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_46CLR_4IOL	raC_Dvc_46CLR_4IOL	3.1	(RA-LIB) Device	IO-Link
raC_Dvc_46CLR_8IOL	raC_Dvc_46CLR_8IOL	3.1	(RA-LIB) Device	IO-Link

Configured HMI Content

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

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewME\Global Object - ggfx
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewSE\Global Object - ggfx
V3_raC_Dvc_46CLR	Faceplate ME	(raC-3_xx-ME) raC_Dvc_46CLR-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_raC_Dvc_46CLR	Faceplate SE	(raC-3_xx-SE) raC_Dvc_46CLR-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_raC_Dvc_IOLink	View Designer	(raC-3_xx-VD) raC_Dvc_IOLink.vpd	{ProjectName}\Visualization\ViewDesigner - vpd
V3_RM_raC_Dvc_IO_Link	Reference Manual	DEVICE-RM300B-EN-P.pdf	{ProjectName}\Documentation
V3_IO_Link_Images	HMI Image Set	HMI FactoryTalk View Images - png.zip	{ProjectName}\Visualization\Images - png

875L - Capacitive Sensors (raC_Dvc_875L_4IOL, raC_Dvc_875L_8IOL)

Overview

The 875L Capacitive Sensor device object (raC_Dvc_875L_4IOL, raC_Dvc_875L_8IOL) includes HMI faceplate's which displays device information including:

- Sensor data
- Sensor diagnostics
- Process data trending
- Sensor configuration and parameters
- Device Fault log

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_*875L*_Objects_Faceplate.MP4"

Primary device object configuration functions include:

- **Locate:** This function helps to locate the sensors using the device's LED in large machines where there are several sensors close to each other.

Functional Description

The 875L Capacitive Sensor 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. 1.01) 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/* folder in the library. Each device is supplied with two versions of Add-On Instructions (AOI) and Rung import files - one for compatibility with each IO-Link Master Module. You must select the appropriate AOI for the master module being used.

Device/Item	Compatible IO-Link Master	Add-On Instruction	Rung Import
875L	POINT I/O 1734-4IOL	raC_Dvc_875L_4IOL_3.01_AOI.L5X	raC_Dvc_875L_4IOL_3.01_RUNG.L5X
	ArmorBlock 1732E-8IOLM12R	raC_Dvc_875L_8IOL_3.01_AOI.L5X	raC_Dvc_875L_8IOL_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.

Note that a single faceplate is used for either the 4IOL or 8IOL versions of the Add-On Instruction.

Device/Item	Type	FactoryTalk® View ME Faceplate	FactoryTalk® View SE Faceplate
875L	Display	(raC-3_01-ME) raC_Dvc_875L-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_875L-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - IO-Link Device.ggfx	(raC-3-SE) Toolbox - IO-Link 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
875L	(raC-3_01-VD) raC_Dvc_IOLink.vpd

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.

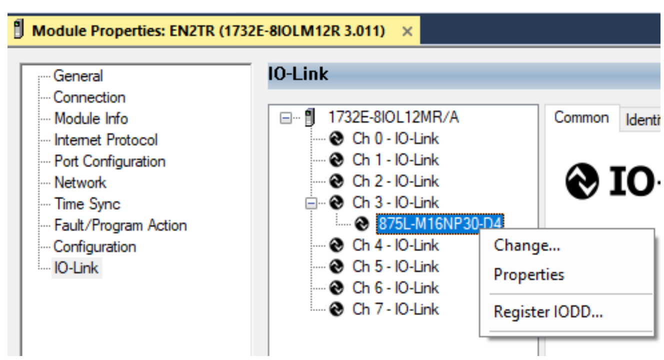
All Studio 5000 Application Code Manager files can be found in the /*ApplicationCodeManagerLibraries*/ folder of the library. The files included are as follows:

Implementation Object	Compatible IO-Link Master	Asset Control File (.HSL4)	Device File (.HSL4)
875L	POINT I/O 1734-4IOL	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_875L_4IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_875L_4IOL_(3.1)
	ArmorBlock 1732E-8IOLM12R	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_875L_8IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_875L_8IOL_(3.1)

Device Definition

The device must be configured with the correct device definition. Proper device configuration enables the required cyclic device data to pass information from the device into the add-on instruction.

1. Click on Change…



2. Specify the Application Specific Name e.g. Tank Level 1001

Operations

The IO-Link Device objects provide only physical operation mode. There is no virtual device mode offered.

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_MsgCustSetIdx	Message Configuration Write	MESSAGE
Ref_MsgCustGetIdx	Message Configuration Read	MESSAGE
Ref_MsgCustSetSubIdx	Message Configuration Write	MESSAGE
Ref_MsgCustGetSubIdx	Message Configuration Read	MESSAGE
Ref_MsgData	Messaging Data	raC_UDT_875L_Sensor_Data
Ref_Ctrl_Set	IO-Link Device Setting Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Set
Ref_Ctrl_Cmd	IO-Link Device Command Interface	raC_UDT_ItfAD_IOLinkSensorDiscrete_Cmd
Ref_Ctrl_Sts	IO-Link Device Status Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSts
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[2]
Inp_I	Device Object Inputs	raC_UDT_ItfAD_875L_Inp_4IOL Or raC_UDT_ItfAD_875L_Inp_8IOL
Ref_Ctrl_Inf	Sensor Type Information Interface	raC_UDT_ItfAD_IOLinkSensor_Inf
Ref_Ctrl_Itf	Device Command, Status Information Interface	raC_UDT_ItfAD_IOLinkDevices

Input Data

Input	Function/Description	DataType
Inp_ChxTriggered1	Status Triggered 1 Sensor	BOOL
Inp_ChxTriggered2	Status Triggered 2 Sensor	BOOL
Inp_ChxAnalogValue	Analog Value Dielectric Data	INT
Inp_ChxSwitchingSignalChannel1	Status Switching Signal Channel 1Status Switching Signal Channel 1	BOOL
Inp_ChxSwitchingSignalChannel2	Status Switching Signal Channel 2	BOOL
Inp_ChNumber	Configured Channel number for Master	SINT
Inp_ChxTemperatureAlarm	Status Temperature Alarm	BOOL
Inp_ChxMarginAlarm1	Status Margin Alarm 1	BOOL
Inp_ChxMarginAlarm2	Status Margin Alarm 2	BOOL
Inp_ChxShortCircuit	Status Short Circuit	BOOL
Cfg_AdjustmentMode	Adjustment MethodDrop-Down; 0= Disabled, 1= Trimmer Input, 2= Teach By Wire	INT
Cfg_SensorApplication	Sensor Application Drop-Down: 0= Full Scale Range 1= Liquid Level 2= Plastic Pellets	INT
Cfg_SSC1_Mode	SSC1Mode; 0= Deactivated, 1= Single Point, 2= Window, 3= Two Point	INT
Cfg_SSC1_SwitchingLogic	SSC1 Switching Logic; 0= High Active 1= Low Active	INT
Cfg_SSC2_SwitchingLogic	SSC1 Switching Logic; 0= High Active 1= Low Active	INT

Input	Function/Description	DataType
Cfg_T1_InputSelector	Trigger1 InputSelector; 0= Deactivated, 1= SSC1, 2= SSC2, 3= Margin Alarm 1 4= Margin Alarm 2 5= Temp Alarm 6= Ext Logic Input	INT
Cfg_T1_LogicalFunction	0= Direct 1= AND 2= OR 3= XOR	INT
Cfg_T1_PhysicalMode	Trigger1 Mode; 0= Disabled Output, 1= PNP, 2= NPN, 3= Push-Pull	INT
Cfg_T1_Polarity	Trigger1 Polarity Mode; 0= Not Inverted (N.O.) 1= Inverted (N.C.)	INT
Cfg_T1_TimerMode	Trigger1 Timer Mode; 0= Disabled, 1= T-On Delay, 2= T-Off Delay, 3= T-On/T-Off Delay 4= One-Shot Leading 5= One-Shot Trailing	INT
Cfg_T1_TimerScale	Trigger 1 Timer Scale: 0= Milliseconds 1= Seconds 2= Minutes	INT
Cfg_T2_InputSelector	Trigger2 InputSelector; 0= Deactivated, 1= SSC1, 2= SSC2, 3= Margin Alarm 1 4= Margin Alarm 2 5= Temp Alarm 6= Ext Logic Input	INT
Cfg_T2_LogicalFunction	0= Direct 1= AND 2= OR 3= XOR	INT
Cfg_T2_PhysicalMode	Trigger2 Mode; 0= Disabled Output, 1= PNP, 2= NPN, 3= Push-Pull	INT
Cfg_T2_Polarity	Trigger2 Polarity Mode; 0= Not Inverted (N.O.) 1= Inverted (N.C.)	SINT
Cfg_T2_TimerMode	Trigger2 Timer Mode; 0= Disabled, 1= T-On Delay, 2= T-Off Delay, 3= T-On/T-Off Delay 4= One-Shot Leading 5= One-Shot Trailing	INT
Cfg_T2_TimerScale	Trigger 2 Timer Scale: 0= Milliseconds 1= Seconds 2= Minutes	INT
Cfg_Teach_SSC	Teach SSC Mode; 1= SSC 1 2= SSC 2	INT
Cmd_EnableLED	LED Disable/Enable Command	BOOL
Cmd_Locate	Locator Disable/Enable Command	BOOL
Cmd_SP1_DTStart	SP1 - Dynamic Taech Start Command	BOOL
Cmd_SP1_DTStop	SP1 - Dynamic Taech Stop Command	BOOL
Cmd_SP1_SingleVal	SP1 - Single Value Teach Command	BOOL
Cmd_SP1_TwoVal_TP1	SP1 - Two Value Trigger Point 1 Teach Command	BOOL
Cmd_SP1_TwoVal_TP2	SP1 - Two Value Trigger Point 2 Teach Command	BOOL
Cmd_SP2_DTStart	SP2 - Dynamic Taech Start Command	BOOL
Cmd_SP2_DTStop	SP2 - Dynamic Taech Stop Command	BOOL
Cmd_SP2_SingleVal	SP2 - Single Value Teach Command	BOOL
Cmd_SP2_TwoVal_TP1	SP2 - Two Value Trigger Point 1 Teach Command	BOOL
Cmd_SP2_TwoVal_TP2	SP2 - Two Value Trigger Point 2 Teach Command	BOOL
Cmd_TeachApply	Teach Apply Command	BOOL
Cmd_TeachCancel	Teach Cancel Command	BOOL
Set_FilterScaler_SP	Filter Scaler Setpoint 1…255	INT
Set_PDC_Data	Process Data Enable Disable Settings	DINT
Set_PDC_EnableDisable_SP	Process data configuration disable enable settings	DINT
Set_SafeLimitSSC1	Safe Limit SSC1 Setpoint 0…100	INT
Set_SafeLimitSSC2	Safe Limit SSC2 Set point 0…100	INT
Set_SparkMaxValueT1	Spark T1 Max value for VD/ME/SE Faceplate	INT
Set_SparkMaxValueT2	Spark T2 Max value for VD/ME/SE Faceplate	INT

Input	Function/Description	DataType
Set_SparkMinValueT1	Spark T1 Min value for VD/ME/SE Faceplate	INT
Set_SparkMinValueT2	Spark T2 Min value for VD/ME/SE Faceplate	INT
Set_SSC_CH1_Hyst_SP	SSC Channel 1 Hysteresis Setpoint 1…100	INT
Set_SSC_CH1_SP1	SSC Channel 1 Setpoint 1 0…10000	INT
Set_SSC_CH1_SP2	SSC Channel 1 Setpoint 2 0…10000	INT
Set_SSC_CH2_Hyst_SP	SSC Channel 2 Hysteresis Set point 1…100	INT
Set_SSC_CH2_SP1	SSC Channel 2 Setpoint 1 0…10000	INT
Set_SSC_CH2_SP2	SSC Channel 2 Setpoint 2 0…10000	INT
Set_TempHighThreshold	Temperature Threshold High -50…150	INT
Set_TempLowThreshold	Temperature Threshold Low -50…150	INT
Set_TrendMaxValue	Trend max value for VD/ME/SE Faceplate	INT
Set_TrendMinValue	Trend min value for VD/ME/SE Faceplate	INT
Set_Trig1_SP1	SP1 value for trigger 1 Spark trend VD/ME/SE Faceplate	INT
Set_Trig1_SP2	SP2 value for trigger 1 Spark trend VD/ME/SE Faceplate	INT
Set_Trig1_TimerValue	Timer value 1 setpoint0…32,767	INT
Set_Trig2_SP1	SP1 value for trigger 2 Spark trend VD/ME/SE Faceplate	INT
Set_Trig2_SP2	SP1 value for trigger 2 Spark trend VD/ME/SE Faceplate	INT
Set_Trig2_TimerValue	Timer value 2 setpoint0…32,767	INT

Output Data

Output	Function/Descritpion	DataType
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Sts_Ready	Device is Ready	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: Master Communication Loss 2: Master Not Available 3: Faulted 4 - 31: Reserved	DINT
Sts_Available	Device is available for interaction with user code	BOOL
Sts_InhibitCfg	1=Inhibit user Configuration Parameters from HMI Faceplate; 0=Allow	BOOL
Sts_InhibitCmd	1=Inhibit user Commands from HMI Faceplate; 0=Allow Control	BOOL
Sts_InhibitSet	1=Inhibit user Settings from HMI Faceplate; 0=Allow	BOOL
Sts_EnableLED	LED Status, 0=Disable, 1=Enable	BOOL
Sts_Located	Locator Indicator; 1= Located	BOOL

Output	Function/Descritpion	DataType
Val_AdjustmentModeEnable	Adjustment Method; 0= Disabled, 1= Trimmer Input, 2= Teach By Wire	SINT
Val_AnalogValueT1	Spark Trigger 1 Analog Value	INT
Val_AnalogValueT2	Spark Trigger 2 Analog Value	INT
Val_FilterScaler_SP	Filter Scaler value	INT
Val_MinutesAbvMaxTemp	Minutes above Maximum Temperature	DINT
Val_MinutesBelMinTemp	Minutes below Minimum Temperature	DINT
Val_NumberPowerCycles	Number of Power Cycles	DINT
Val_OperatingHrsSinceInception	Operating Hours Since Inception	DINT
Val_RangeMax	Sensor Maximum Range in Trend	INT
Val_RangeMin	Sensor Minimum Range in Trend	INT
Val_SafeLimitSSC1_SP	Safe limit SSC1	SINT
Val_SafeLimitSSC2_SP	Safe limit SSC2	SINT
Val_SensorApplicationEnable	Sensor Application; 0= Full Scale Range 1= Liquid Level 2= Plastic Pellets	SINT
Val_SSC_CH1_Hyst	SSC Channel 1 Hysteresis	INT
Val_SSC_CH1_SP1	SSC Channel 1 SP1	INT
Val_SSC_CH1_SP2	SSC Channel 1 SP2	INT
Val_SSC_CH2_Hyst	SSC Channel 2 Hysteresis	INT
Val_SSC_CH2_SP1	SSC Channel 2 SP1	INT
Val_SSC_CH2_SP2	SSC Channel 2 SP2	INT
Val_SSC1_Mode	SSC1 Mode; 0= Deactivated, 1= Single Point, 2= Window, 3= Two Point	SINT
Val_SSC1_SwitchingLogic	SSC1 Switching Logic; 0= High Active 1= Low Active	SINT
Val_SSC2_Mode	SSC2 Mode; 0= Deactivated, 1= Single Point, 2= Window, 3= Two Point	SINT
Val_SSC2_SwitchingLogic	SSC2 Switching Logic; 0= High Active 1= Low Active	SINT
Val_T1_InputSelector	Trigger1 InputSelector; 0= Deactivated, 1= SSC1, 2= SSC2, 3= Margin Alarm 1 4= Margin Alarm 2 5= Temp Alarm 6= Ext Logic Input	SINT
Val_T1_LogicalFunction	Logical Function T1; 0= Direct 1= AND 2= OR 3= XOR	SINT
Val_T1_PhysicalMode	Trigger1 Physical Mode; 0= Disabled Output, 1= PNP, 2= NPN, 3= Push-Pull	SINT
Val_T1_Polarity	Trigger1 Polarity Mode Selected	SINT
Val_T1_Timer	Trigger 1 Timer value	INT
Val_T1_TimerMode	Trigger1 Timer Mode; 0= Disabled, 1= T-On Delay, 2= T-Off Delay, 3= T-On/T-Off Delay 4= One-Shot Leading 5= One-Shot Trailing	SINT
Val_T1_TimerScale	Trigger1 Timer Scale Mode Selected	SINT
Val_T2_InputSelector	Trigger2 InputSelector; 0= Deactivated, 1= SSC1, 2= SSC2, 3= Margin Alarm 1 4= Margin Alarm 2 5= Temp Alarm 6= Ext Logic Input	SINT
Val_T2_LogicalFunction	Logical Function T2; 0= Direct 1= AND 2= OR 3= XOR	SINT
Val_T2_PhysicalMode	Trigger2 Physical Mode; 0= Disabled Output, 1= PNP, 2= NPN, 3= Push-Pull	SINT
Val_T2_Polarity	Trigger2 Polarity Mode Selected	SINT

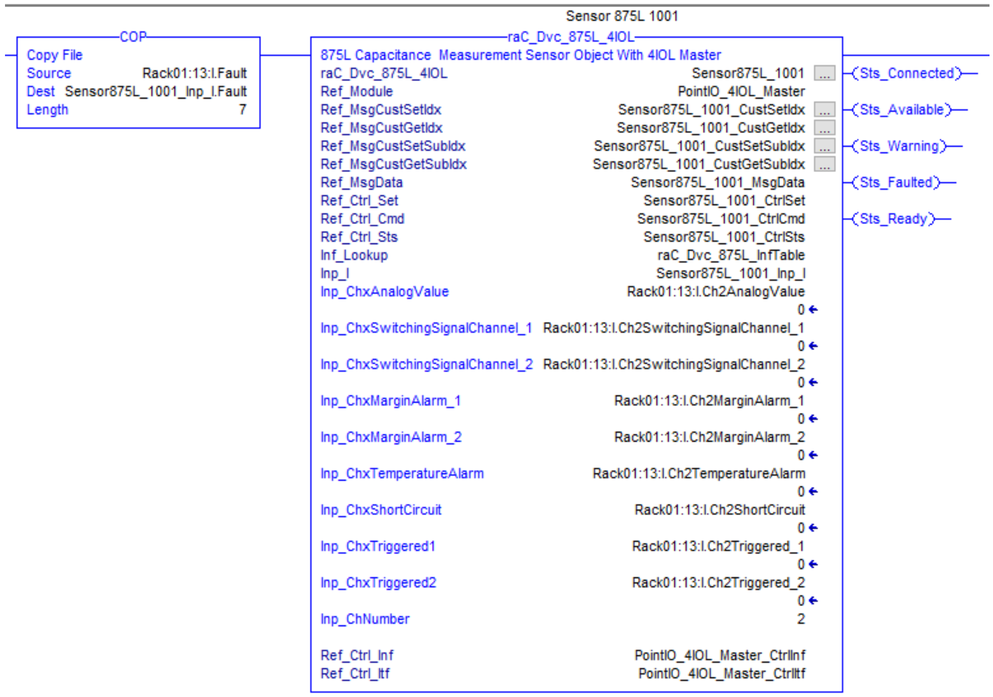
Output	Function/Descritpion	DataType
Val_T2_Timer	Trigger 2 Timer value	INT
Val_T2_TimerMode	Trigger 2 Timer Mode; 0= Disabled, 1= T-On Delay, 2= T-Off Delay, 3= T-On/T-Off Delay 4= One-Shot Leading 5= One-Shot Trailing	SINT
Val_T2_TimerScale	Trigger2 Timer Scale Mode Selected	SINT
Val_Teach_SSC	Teach SSC Mode Selected	INT
Val_TeachStep	Teach Step Value	INT
Val_TemperatureCurrent	Current temperature	INT
Val_TemperatureMaxSinceInception	Maximum temperature - All time high	INT
Val_TemperatureMaxSincePowerUp	Maximum temperature since power up	INT
Val_TemperatureMinSinceInception	Minimum temperature - All time low	INT
Val_TemperatureMinSincePowerUp	Minimum temperature since power up	INT
Val_TempHighThreshold	Temperature high threshold	INT
Val_TempLowThreshold	Temperature low threshold	INT
Val_Trig1_SP1	First SetPoint Value For Triggered1	INT
Val_Trig1_SP2	Second SetPoint Value for Triggered1	INT
Val_Trig2_SP1	First SetPoint Value For Triggered2	INT
Val_Trig2_SP2	Second SetPoint Value for Triggered2	INT

Programming Example

Fully configured device on a rung is provided below for reference.

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 following example uses the 875L device object connected to channel #2 of a POINT I/O 1734-4IOL IO-Link Master module in slot #13 of a POINT I/O adapter named *Rack01*.



The following example uses the 875L device object connected to channel #6 of a ArmorBlock 1732E-8IOLM12R IO-Link Master module in named *Armor_8IOL_MasterB*.

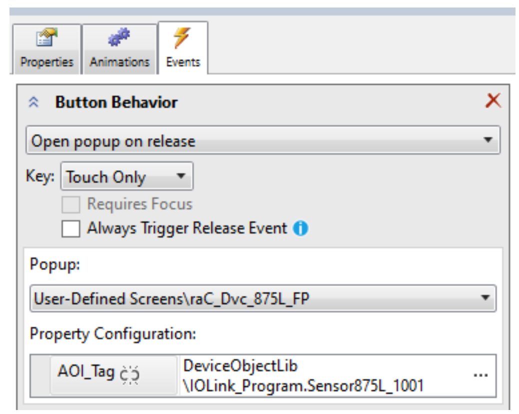
Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. See Basic Launch Button Attributes section for details on configuration and indicators.

FactoryTalk View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GO_LaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #104.	#102: AOI Backing Tag Instance (e.g. {::[PAC]Program::IOLinkProgram._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)

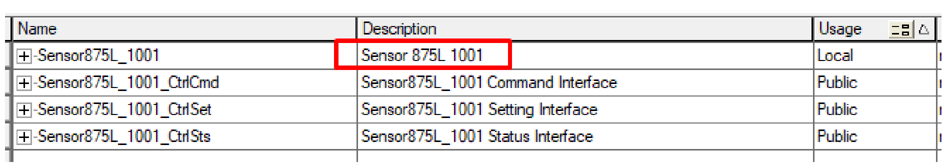
Studio 5000 View Designer Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	

Faceplates

There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 30.

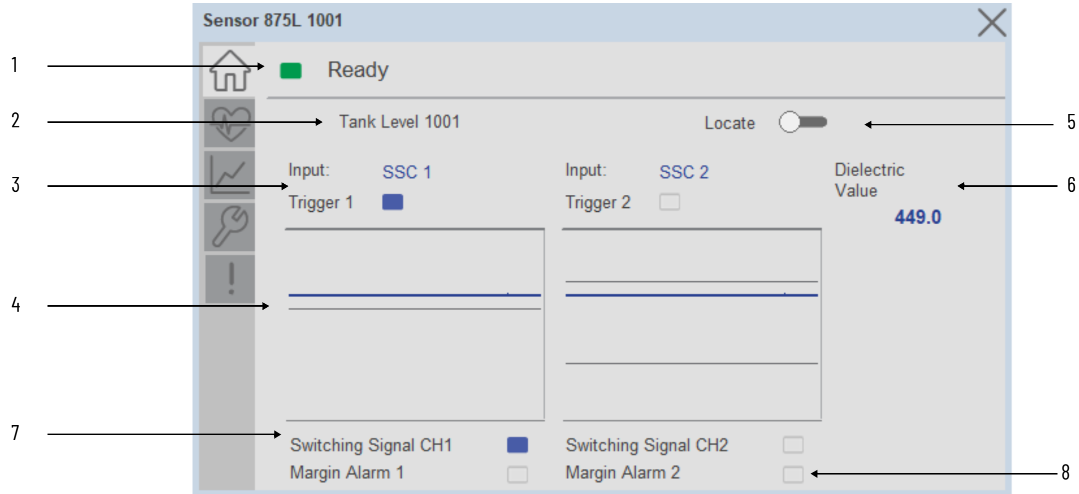
The faceplate title is linked to *_InstanceName.@description*, the *.@description* extended tag property of the Add-On Instruction instance. This is user-configurable from controller/program tags in Studio 5000 Logix Designer.



Name	Description	Usage
Sensor875L_1001	Sensor 875L 1001	Local
Sensor875L_1001_CtrlCmd	Sensor875L_1001 Command Interface	Public
Sensor875L_1001_CtrlSet	Sensor875L_1001 Setting Interface	Public
Sensor875L_1001_CtrlSts	Sensor875L_1001 Status Interface	Public

Home

The Home tab is the main tab of the faceplate. It provides the status of the IO-Link device along with sensor process data and the Locate button.

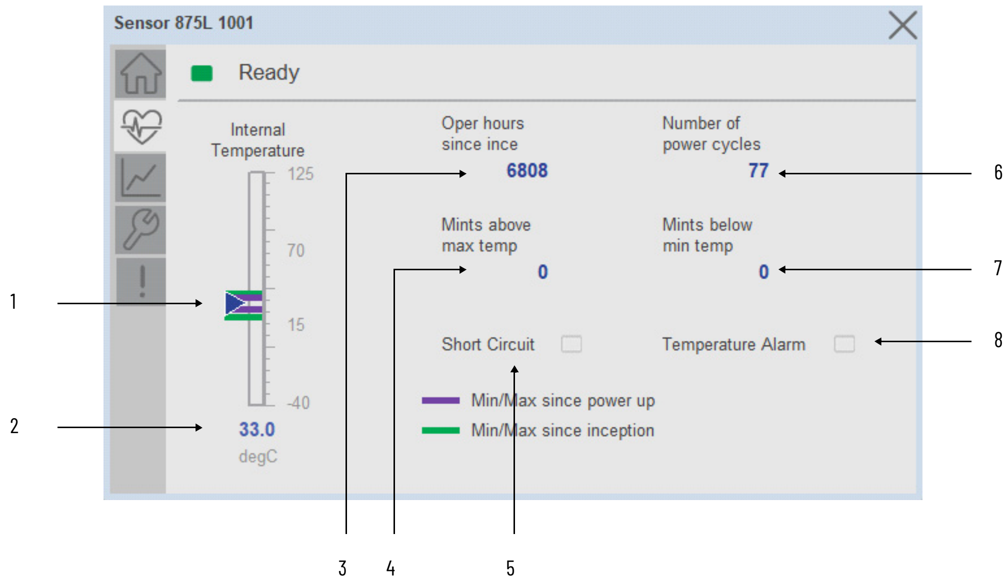


Item	Description
1	Banner- Ready Status
2	Application Specific Name - Read from device
3	Trigger Status 1 & 2 OFF (0) = Gray LED ON (1) = Blue LED Input Depending on Input Selector 1 & 2 for Trigger 1 & 2 settings it will displays the Deactivated, SSC1, SSC2, Margin Alarm 1, Margin Alarm 2, Temperature Alarm, External Logic Input.
4	Trigger1 & 2 Sparkline Trend The spark line shows dielectric values (blue) and set-points (gray) over last 30 seconds.
5	Locate toggle switch Locate the sensor in large machines where there are several sensors close to each other. When Located, the sensor user interface (green and orange LEDs) start flashing synchronously until the operator disables this function
6	Process Data: Displays the current Dielectric value.
7	Switching Signal CH 1 & 2 OFF (0) = Gray LED ON (1) = Blue LED
8	Margin Alarm 1 & 2 OFF (0) = Gray LED ON (1) = Blue LED

Trend Spark 1 & 2 changed its Spark line (blue) parameter depending on input selector of trigger 1 & 2. Input selector is selected as a Temperature then Spark Line (blue) incorporate with current temperature value and Set-points (gray) incorporate with High & Low threshold value.

Health Tab

Health tab provides different diagnostic information of sensor which helps ensure that sensors are operating correctly.



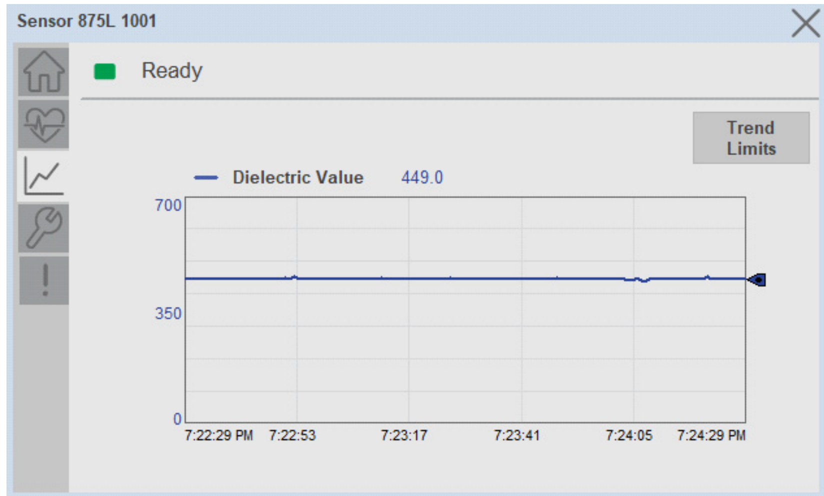
Item	Description
1	Device Temperature Bar Graph Purple Indicators: Min/Max since power up Green Indicators: Min/Max since inception Light Blue Triangle Indicator: Current value
2	Device Temperature Current Value
3	Operating Hours Since Inception
4	Minutes above maximum temperature
5	Short Circuit OFF (0) = Gray LED ON (1) = Blue LED
6	Number of Power Cycle
7	Minutes below minimum temperature
8	Temperature Alarm OFF (0) = Gray LED ON (1) = Blue LED

Inception/Lifetime values are recorded since the first time the sensor was ever powered ON. These value are retained and not reset during default factory reset.

Power Up values are reset to zero and recorded new each time the sensor is power cycled.

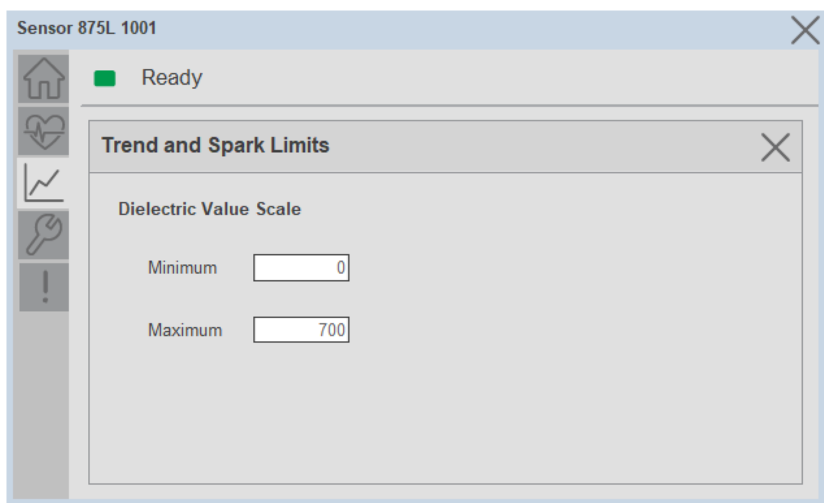
Trend Tab

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. One trend is displayed for Distance.



Trend Settings Screen

We can set trend limits using configuration tab by clicking on the *Settings* button present on trend screen. This sub screen display contains two numeric input elements that allow the user to enter the minimum and maximum values to be used on the Trend screen for Distance.

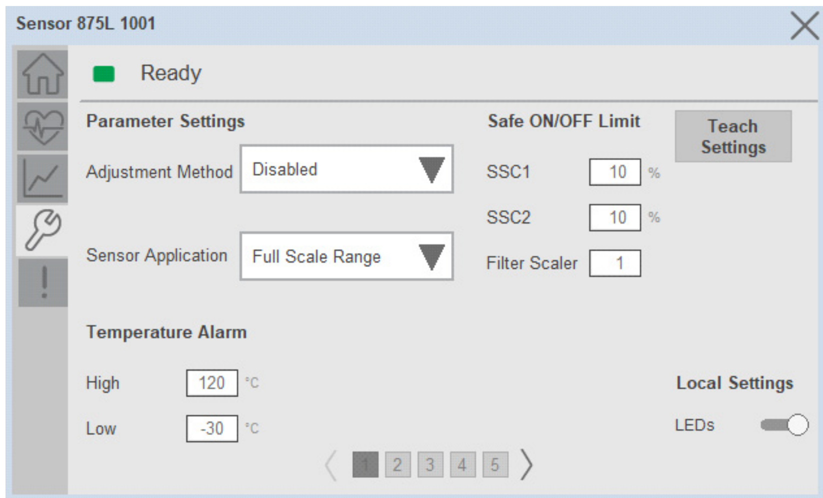


Configure Tab

The configuration tab displays the sensor parameter settings, as well as enabling the user to read data from the sensor.

The configuration section is divided into five pages with Teach Settings:

- Parameter Settings
- Process Data Enable Settings
- Switching Signal Channel Settings
- Trigger Settings 1
- Trigger Settings 2
- Teach Settings



Parameter Settings

Adjustment Method- The Adjustment Method parameter enables operators to select local/remote adjustment of Teach sensor. To enable teach from IO-Link choose it to Disabled.

Sensor Application- Depending on the application operator may select one of the three presets.

Temperature Alarm- This setting means that the sensor gives an alarm in the maximum or minimum temperature is exceeded.

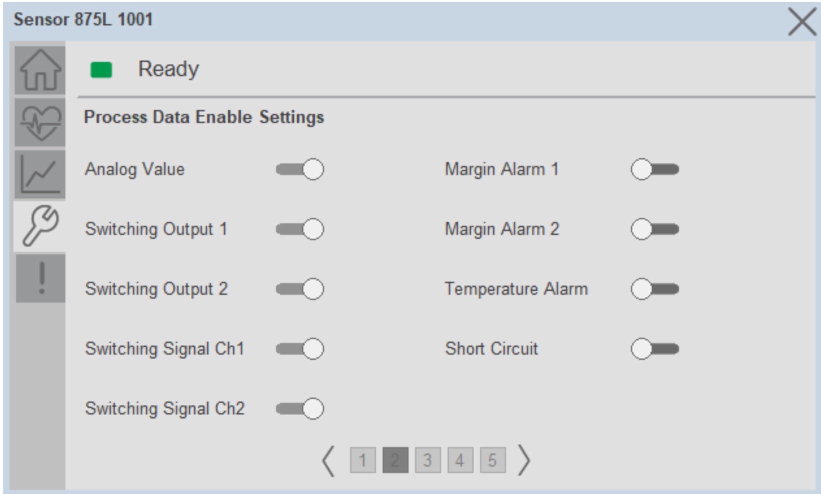
Safe ON/OFF Limit- The sensor has a built-in safety margin that helps adjust the sensing up to the set-points with an additional safe margin. The factory settings are set to two times the standard hysteresis of the sensor.

Local Settings LEDs- The Local Settings LEDs toggle button is used to Enable or disable the LED of the device.

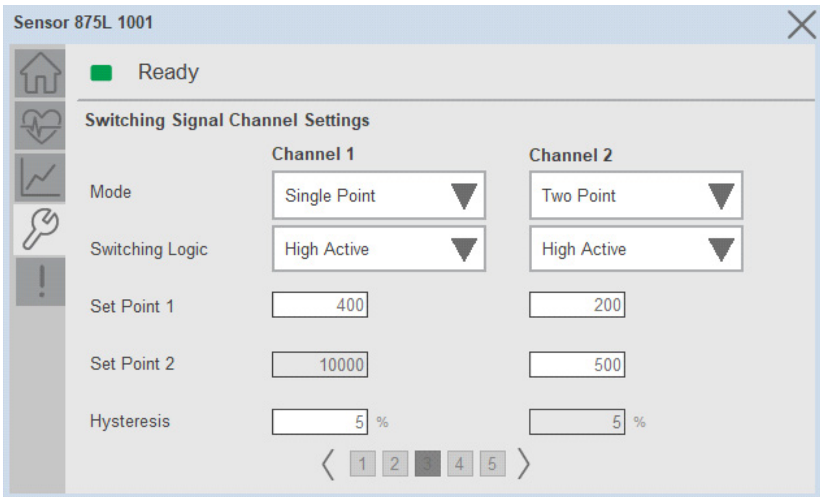
Teach Settings- To navigate the Teach Settings operation.

Process Data Enable Settings

Toggle buttons used to enable or access the cyclic process data variable



Switching Signal Channel Settings



Mode- Operator selects the switching behavior used to create more advanced output.

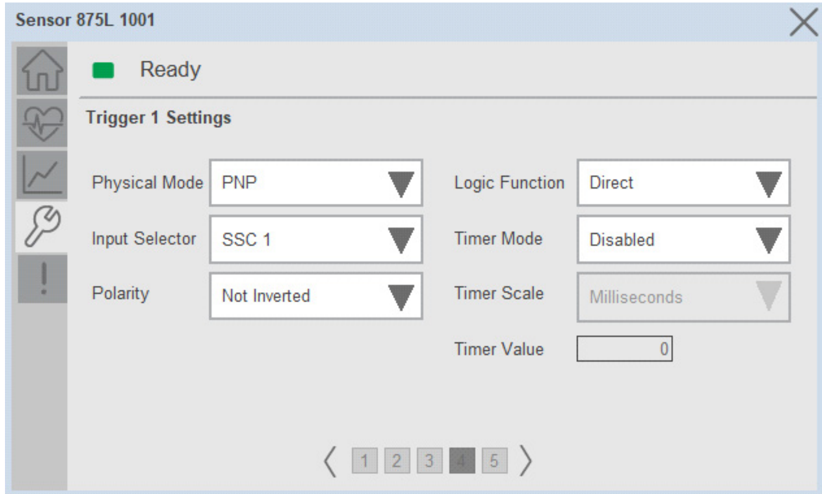
Switching Logic- High Active or Low active output switching logic.

Set Point 1- Set point 1 defines the first set point value for SSC.

Set Point 2- Set point 2 defines the second set point value for SSC. Its disabled when Mode is selected as Single Point.

Hysteresis- In SSC1 and SSC2 - single point mode and in windows mode the hysteresis can be set 1…100% of the actual switching value.

Trigger 1 settings



Physical Mode- Physical mode has various settings like Deactivated, PNP, NPN, Push-Pull. It decides the switching outputs operate.

Input Selector- This function block allows you to select any of the signals from the sensor front to the Channel A or B. Channel A and B: Can select between SSC1, SSC2, margin alarm 1, margin alarm 2, temperature alarm, and external input.

Polarity- The Polarity value can either be Not-Inverted or Inverted. Not-Inverted means that the output will turn ON when the target is within the expected set points. Inverted means that the output will turn OFF when the target is within the expected set points.

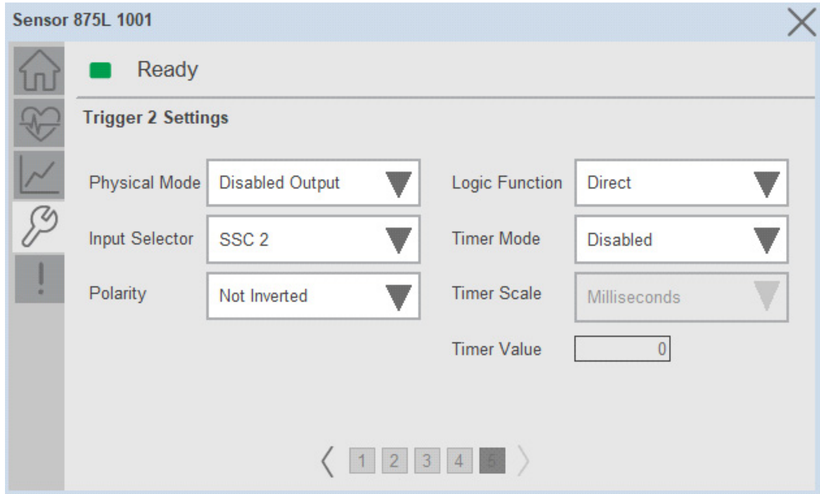
Logic Function-In the logic function block, the selected signals from the input selector can be added a logic function directly without using a PLC - which makes decentralize decisions possible. The logic functions available are AND, OR, XOR, and gated SR-FF.

Timer Mode- Selects which type of timer function is introduced on the Switching Output. Any one of the following is possible: T-On Delay, T-Off Delay, T-On/T-Off Delay, One-Shot Leading, One-Shot Trailing.

Timer Scale- Parameter defines if the delay specified in the Timer delay should be in milliseconds, seconds, or minutes.

Timer Value- Parameter defines the actual duration of the delay. The delay can be set to any integer value from 1… 32,767.

Trigger 2 settings



Physical Mode- Physical mode has various settings like Deactivated, PNP, NPN, Push-Pull, External input (Active high/Pull-down), External input (Active low/pull up), or External Teach input. It decides the switching outputs operate.

Input Selector- This function block allows you to select any of the signals from the sensor front to the Channel A or B. Channel A and B: Can select between SSC1, SSC2, margin alarm 1, margin alarm 2, temperature alarm, and external input.

Polarity- The Polarity value can either be Not-Inverted or Inverted. Not-Inverted means that the output will turn ON when the target is within the expected set points. Inverted means that the output will turn OFF when the target is within the expected set points.

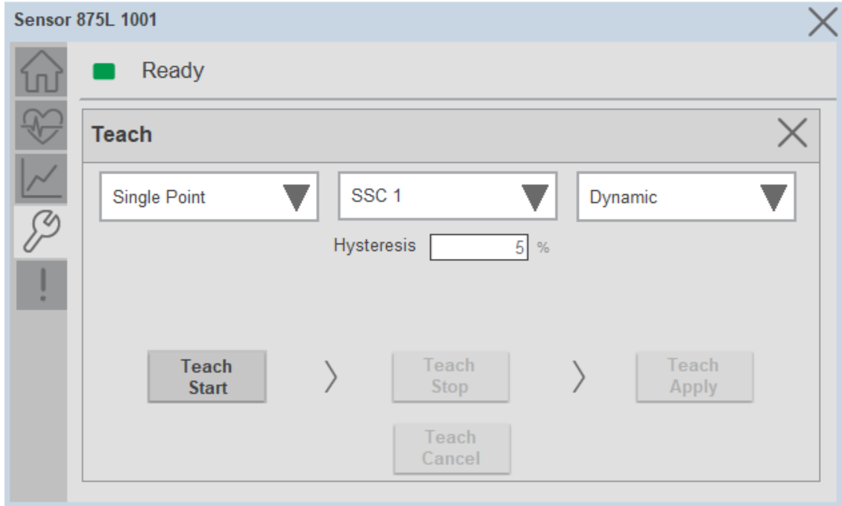
Logic Function-In the logic function block, the selected signals from the input selector can be added a logic function directly without using a PLC - which makes decentralize decisions possible. The logic functions available are AND, OR, XOR, and gated SR-FF.

Timer Mode- Selects which type of timer function is introduced on the Switching Output. Any one of the following is possible: T-On Delay, T-Off Delay, T-On/T-Off Delay, One-Shot Leading, One-Shot Trailing.

Timer Scale- Parameter defines if the delay specified in the Timer delay should be in milliseconds, seconds, or minutes.

Timer Value- Parameter defines the actual duration of the delay. The delay can be set to any integer value from 1… 32,767.

Teach settings

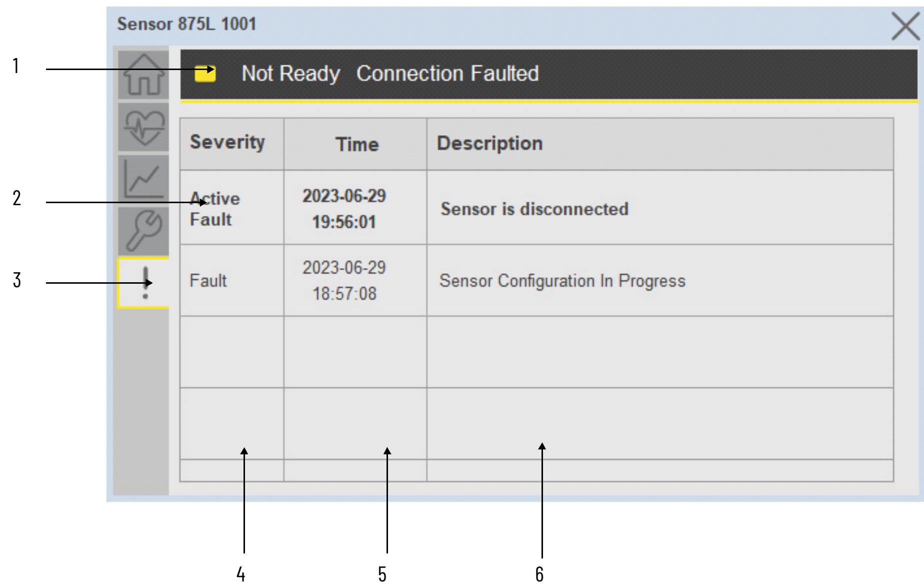


In order to configure the window for teaching operations effectively, there are several options available. The window encompasses three drop-down menus that provide users with the flexibility to select the desired configuration for their specific teaching requirements. Based on the chosen configuration settings, relevant Teach command buttons are dynamically displayed, empowering users to initiate the teaching process. It's important to note that only one button or command remains active at any given time during the teach operation. Additionally, users have the option to interrupt the teach operation and cancel the settings by utilizing the dedicated cancel button/command.

Fault Warning Tab

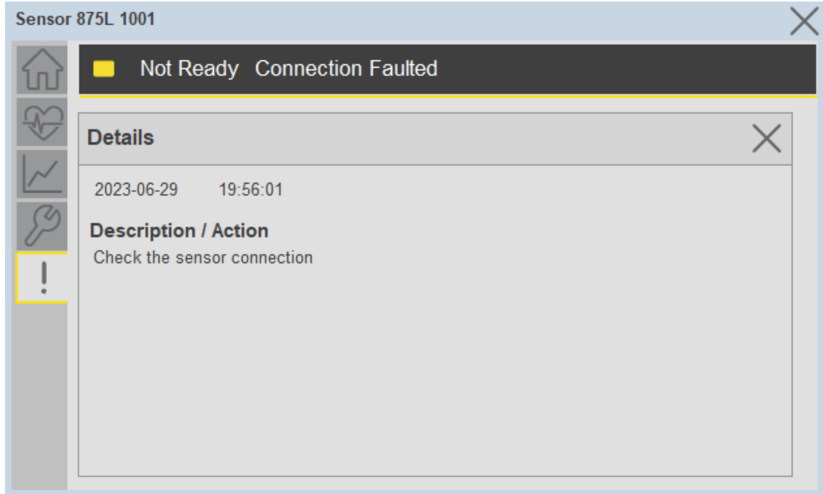
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

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.



Application Code Manager

IO-Link Device Library objects can be set-up and configured using Studio 5000 Application Code Manager.

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

Definition Objects: raC_Dvc_875L_4IOL, raC_Dvc_875L_8IOL

This object contains the AOI definition and used as linked library to implement object. There is one definition and per add-on instruction to support each IO-Link Master Module. 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 Objects: raC_LD_Dvc_875L_4IOL, raC_LD_Dvc_875L_8IOL

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
ChannelNumber				Select the Channel Number where the sensor is connected.

Parameter Name	Default Value	Instance Name	Definition	Description
Sensor Type				Select sensor type of 875L as per device catalog no.
MasterName	MasterName	[MasterName]	Module	Select the IO-Link master module. If connecting to a non-library object module, enter the name of the master only. 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.

Note that if the tag names are manually entered or not linked to input channel tags a red 'X' will be shown beside the parameter. This is acceptable and the program can still be generated.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_875L_4IOL	raC_Dvc_875L_4IOL	3.1	(RA-LIB) Device	IO-Link
raC_Dvc_875L_8IOL	raC_Dvc_875L_8IOL	3.1	(RA-LIB) Device	IO-Link

Configured HMI Content

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

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewME\Global Object - ggfx
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewSE\Global Object - ggfx
V3_raC_Dvc_875L	Faceplate ME	(raC-3_xx-ME) raC_Dvc_875L-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_raC_Dvc_875L	Faceplate SE	(raC-3_xx-SE) raC_Dvc_875L-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_raC_Dvc_IOLink	View Designer	(raC-3_xx-VD) raC_Dvc_IOLink.vpd	{ProjectName}\Visualization\ViewDesigner - vpd
V3_RM_raC_Dvc_IO_Link	Reference Manual	DEVICE-RM300B-EN-P.pdf	{ProjectName}\Documentation
V3_IO_Link_Images	HMI Image Set	HMI FactoryTalk View Images - png.zip	{ProjectName}\Visualization\Images - png

46DFA - Small Aperture Fiber-optic Amplifier (raC_Dvc_46DFA_4IOL, raC_Dvc_46DFA_8IOL)

Overview

The 46DFA small aperture fiber-optic amplifier sensor device object (raC_Dvc_46DFA_4IOL, raC_Dvc_46DFA_8IOL) includes HMI faceplates which displays device information including:

- Sensor data
- Sensor diagnostics
- Sensor configuration and parameters
- Process data trending
- Device Fault log

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_*46DFA*_Objects_Faceplate.MP4"

Primary device object configuration functions include:

- **Locate:** This function helps to locate the sensors using the device's LED in large machines where there are several sensors close to each other.
- **Setpoint:** Setpoint will allow the operators to enter the signal value required for the sensor output to turn ON upon target detection.
- **Polarity:** This function changes the sensor output to operate as Not-Inverted (Light Operate) and Inverted (Dark Operate).

Functional Description

The 46DFA small aperture fiber-optic amplifier sensor 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. 1.01) 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/* folder in the library. Each device is supplied with two versions of Add-On Instructions (AOI) and Rung import files - one for compatibility with each IO-Link Master Module. You must select the appropriate AOI for the master module being used.

Device/Item	Compatible IO-Link Master	Add-On Instruction	Rung Import
46DFA	POINT I/O 1734-4IOL	raC_Dvc_46DFA_4IOL_3.01_AOI.L5X	raC_Dvc_46DFA_4IOL_3.01_RUNG.L5X
	ArmorBlock 1732E-8IOLM12R	raC_Dvc_46DFA_8IOL_3.01_AOI.L5X	raC_Dvc_46DFA_8IOL_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.

Note that a single faceplate is used for either the 4IOL or 8IOL versions of the Add-On Instruction.

Device/Item	Type	FactoryTalk View ME Faceplate	FactoryTalk View SE Faceplate
46DFA	Display	(raC-3_01-ME) raC_Dvc_46DFA-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_46DFA-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - IO-Link Device.ggfx	(raC-3-SE) Toolbox - IO-Link 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
46DFA	(raC-3_01-VD) raC_Dvc_IOLink.vpd

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.

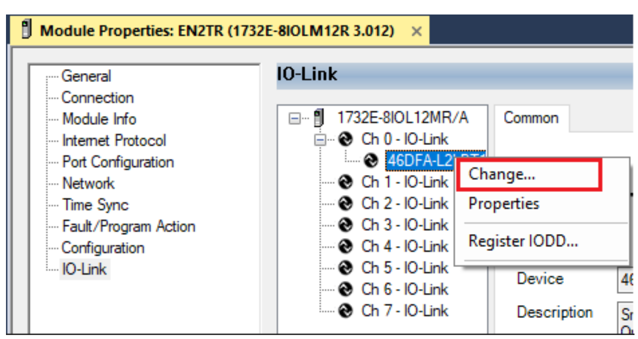
All Studio 5000 Application Code Manager files can be found in the /*ApplicationCodeManagerLibraries*/ folder of the library. The files included are as follows:

Implementation Object	Compatible IO-Link Master	Asset Control File (.HSL4)	Device File (.HSL4)
46DFA	POINT I/O 1734-4IOL	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_46DFA_4IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_46DFA_4IOL_(3.1)
	ArmorBlock 1732E-8IOLM12R	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_46DFA_8IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_46DFA_8IOL_(3.1)

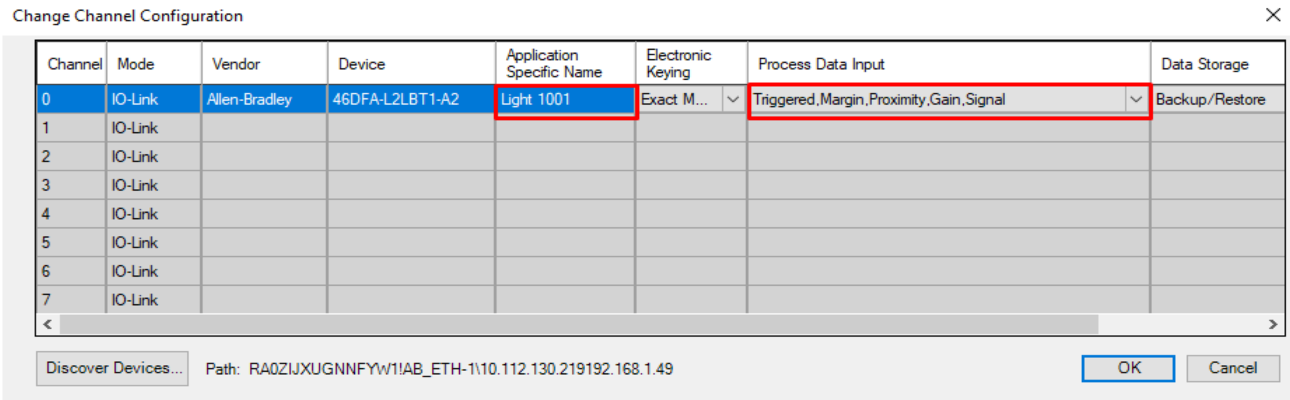
Device Definition

The device must be configured with the correct device definition. Proper device configuration enables the required cyclic device data to pass information from the device into the add-on instruction.

1. Click on Change...



2. Specify the Application Specific Name e.g. *Light 1001*
3. Select the Process Data Input as *Triggered, Margin, Proximity, Gain, Signal*.



Operations

The IO-Link Device objects provide only physical operation mode. There is no virtual device mode offered.

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_MsgCustSetIdx	Message Configuration Write	MESSAGE
Ref_MsgCustGetIdx	Message Configuration Read	MESSAGE
Ref_MsgCustSetSubIdx	Message Configuration Write	MESSAGE
Ref_MsgCustGetSubIdx	Message Configuration Read	MESSAGE
Ref_MsgData	Messaging Data	raC_UDT_46DFA_Sensor_Data
Ref_Ctrl_Set	IO-Link Device Setting Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSet
Ref_Ctrl_Cmd	IO-Link Device Command Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlCmd
Ref_Ctrl_Sts	IO-Link Device Status Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSts
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[20]
Inp_I	Device Object Inputs	raC_UDT_ItfAD_46DFA_Inp_4IOL Or raC_UDT_ItfAD_46DFA_Inp_8IOL
Ref_Ctrl_Inf	Sensor Type Information Interface	raC_UDT_ItfAD_IOLinkSensor_Inf
Ref_Ctrl_Itf	Device Command, Status Information Interface	raC_UDT_ItfAD_IOLinkDevices

Input Data

Input	Function/Description	DataType
Cfg_DisplayIndication	Display Indication;0 – Standard Indication (Default),1 – Percentage Indication, 2 – Zero Offset Indication, 3 – Counter Mode Indication	SINT
Cfg_DisplayRotation	Display Rotation; 0 – Normal 1 – Rotate 180°	SINT
Cfg_Function	Function; 1 – Hysteresis, 2 – Window Mode	SINT
Cfg_LightSource	Light Source; 0 – Light Source ON (Default) 1 – Light Source OFF	SINT
Cfg_LightSourceAdj	Light Source Adjustment; 1 – 12…50 µs Settings 1 – 5…500 µs – 32 ms Settings	SINT
Cfg_LightSourceMode	Light Source Mode; 0 – Auto (Default) 1 - Manual	SINT
Cfg_MarginLevelHM	Margin Level – High Multiplier; 0 – 1.2 X (Default), 1 – 1.5 X, 2 – 2.0 X, 3 – 3.0 X, 4 – 4.0 X, 5 – 5.0 X	SINT
Cfg_MarginLevelLM	Margin Level – Low Multiplier; 0 – 0.5 X (Default), 1 – 0.6 X, 2 – 0.7 X, 3 – 0.8 X	SINT
Cfg_OutputPolarityInverted	Output Polarity; 0 – Not Inverted (Default) 1 – Inverted	SINT
Cfg_Pin2Type	Pin 2 type; 0 – Disabled, 1 – PNP, 2 – NPN	SINT
Cfg_ResponseTime	Response Time; 0 – 50 µS, 1 – 500 µs (Default), 2 – 4 mS, 3 – 32 ms	SINT

Input	Function/Description	DataType
Cmd_Cancel	Teach Cancel - Cancels the Teach Process Command	BOOL
Cmd_CountReset	Count Reset	BOOL
Cmd_DynamicTeachStart	Dynamic Teach Start Command	BOOL
Cmd_DynamicTeachStop	Dynamic Teach Stop Command	BOOL
Cmd_LocalInterfaceLock	Device Access Locks. Local User Interface Lock; 1 = Locked	BOOL
Cmd_Locate	Locator Disable/Enable Command	BOOL
Cmd_MaxSensitivityTeach	Teach the maximum sensitivity of the sensor Command	BOOL
Cmd_PBLock	Local Push Button Lock Command	BOOL
Cmd_PrecisionTeachStart	Teach the desired set point to ensure detection Command	BOOL
Cmd_StaticTeachBackground	Learn signal level while target is not present Command	BOOL
Cmd_StaticTeachTarget	Learn threshold while target is present Command	BOOL
Cmd_TeachStartButton	Start Teach command	BOOL
Cmd_WindowStartTeach	Teach SP1 when operating in Window Mode Command	BOOL
Cmd_WindowStopTeach	Teach SP2 when operating in Window Mode Command	BOOL
EnableIn	Enable Input - System Defined Parameter	BOOL
Inp_ChNumber	Configured Channel Number for Master	SINT
Inp_ChxGain	Gain of Sensor	INT
Inp_ChxMarginLowAlarm	Margin Low alarm of Sensor	BOOL
Inp_ChxProximityAlarm	Proximity alarm of Sensor	BOOL
Inp_ChxSignalStrength	Signal Strength of Sensor	INT
Inp_ChxTriggered	Triggered status of Sensor	BOOL
Set_Threshold1SP	Set Point – Threshold 1	INT
Set_Threshold2SP	Set Point – Threshold 2	INT
Set_TrendMaxValue	Trend Tab Max value for VD/ME/SE faceplate	DINT
Set_TrendMinValue	Trend Tab Min value for VD/ME/SE faceplate	DINT

Output Data

Output	Function/Descritpion	DataType
Sts_Active	Device active status: 1 = output power structure is active	BOOL
Sts_Available	Device is available for interaction with user code	BOOL
Sts_bNotReady	Bitwise device 'not ready' reason	DINT
Sts_Connected	Device is connected to the Programmable Automation Controller	BOOL
Sts_EnableLEDs	LED Indicator; 0= Disable, 1= Enable	BOOL
Sts_Faulted	Device faulted status: 1 = an active fault exists	BOOL
Sts_InhibitCfg	1=Inhibit user Configuration Parameters from HMI Faceplate; 0=Allow	BOOL

Output	Function/Descritpion	DataType
Sts_InhibitCmd	1=Inhibit user Commands from HMI Faceplate; 0=Allow Control	BOOL
Sts_InhibitSet	1=Inhibit user Settings from HMI Faceplate; 0=Allow	BOOL
Sts_Located	Locator Indicator; 1= Located	BOOL
Sts_PBLock	Local Push Button Lock; 1= Locked	BOOL
Sts_Ready	Device is ready to perform primary function	BOOL
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Val_Count	Sensor Count Value	INT
Val_CounterEN	Counter Enable; 0= Disabled, 1= Enabled	SINT
Val_Display_Ind	Display Indicatio; 0 – Standard Indication (Default) 1 – Percentage Indication	SINT
Val_Display_Rot	Display Rotation; 0 – Normal 1 – Rotate 180°	SINT
Val_Function	Function; 1 –Hysteresis 2 – Window Mode	SINT
Val_LightSource	Light Source; 0 – Light Source ON (Default) 1 – Light Source OFF	SINT
Val_LightSourceAdj	Light Source Adjustment; 1 – 12…50 µs Settings 1 – 5…500 µs – 32 ms Settings	SINT
Val_LightSourceMode	Light Source Mode; 0 – Auto (Default) 1 – Manual	SINT
Val_MarginLevelHigh	Margin Level – High Multiplier; 0 – 1.2 X (Default), 1 – 1.5 X, 2 – 2.0 X, 3 – 3.0 X, 4 – 4.0 X, 5 – 5.0 X	SINT
Val_MarginLevelLow	Margin Level – Low Multiplier; 0 – 0.5 X (Default), 1 – 0.6 X, 2 – 0.7 X, 3 – 0.8 X	SINT
Val_OperatingHours_Inception	Operation Hours – Since Inception	DINT
Val_OperatingHours_PowerUp	Operation Hours – Since Power-Up	DINT
Val_OutputPolarityInverted	Polarity; 0 – Not Inverted (Default) 1 – Inverted	SINT
Val_Pin2Type	Pin 2 type; 0 – Disabled, 1 – PNP, 2 – NPN	SINT
Val_ResponseTime	Response Time; 0 – 50 µS, 1 – 500 µs (Default), 2 – 4 mS, 3 – 32 ms	SINT
Val_SpeedActual	Speed Actual – Since Power Up	DINT
Val_SpeedMax	Speed Maximum – Since Power Up	DINT
Val_Teach_Status	Teach-in Status	SINT
Val_TeachSelection	Teach type selection	SINT
Val_TeachStep	Teach Step Value	DINT
Val_TempActual	Actual Temperature – Since Power Up	SINT
Val_TempMax_SinceInception	Maximum Temperature Since Inception	SINT
Val_TempMax_SincePowerUp	Maximum Temperature Since Power Up	SINT
Val_TempMin_SinceInception	Minimum Temperature Since Inception	SINT

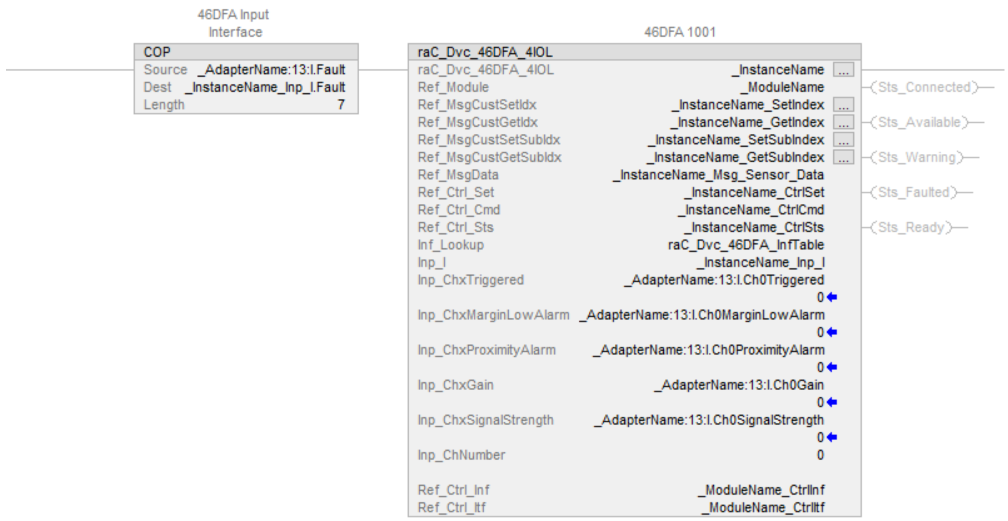
Output	Function/Descritpion	DataType
Val_TempMin_SincePowerUp	Minimum Temperature Since Power Up	SINT
Val_Threshold1	Set Point – Threshold 1	INT
Val_Threshold2	Set Point – Threshold 2	INT
Val_Trigger_Counter	Trigger count	DINT
Val_Voltage_MaxPowerUp	Voltage Maximum – Since Power Up	REAL
Val_Voltage_MinPowerUp	Voltage Minimum – Since Power Up	REAL
Val_VoltageActual	Voltage Actual	REAL

Programming Example

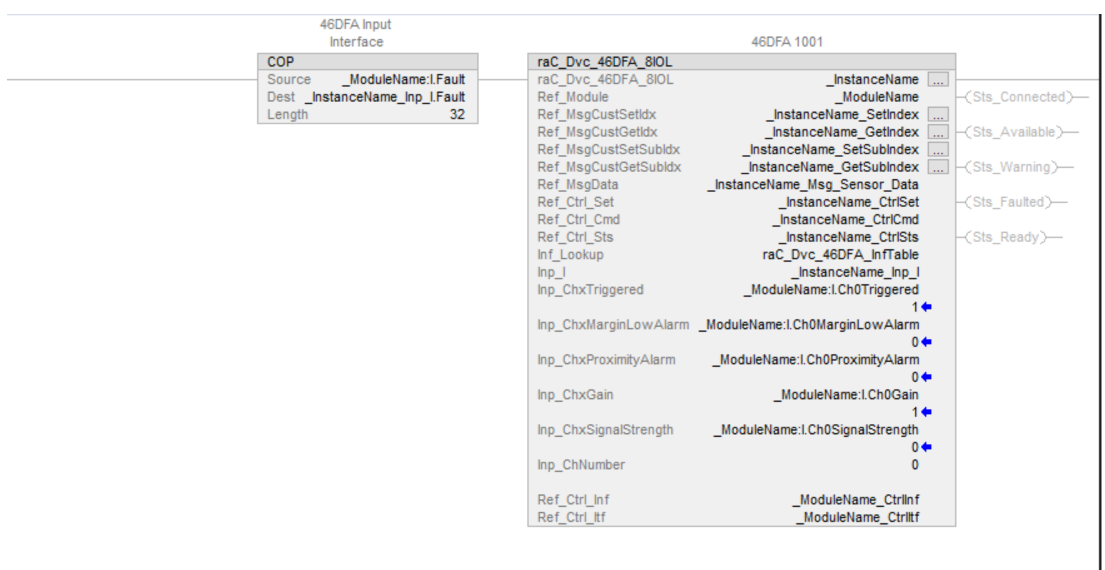
Fully configured device on a rung is provided below for reference.

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 following example uses the 46DFA device object connected to channel #0 of a POINT I/O1734-4IOLM IO-Link Master module in slot #13 of a POINT I/O adapter.



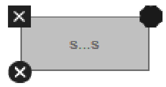
The following example uses the 46DFA device object connected to channel #0 of a ArmorBlock 1732E-8IOLM12R IO-Link Master module.



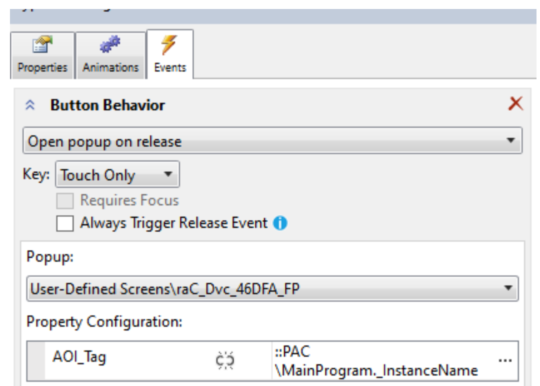
Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. See Basic Launch Button Attributes section for details on configuration and indicators.

FactoryTalk View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GO_LaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #104.	#102: AOI Backing Tag Instance (e.g. {::[PAC]Program::IOLinkProgram._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)

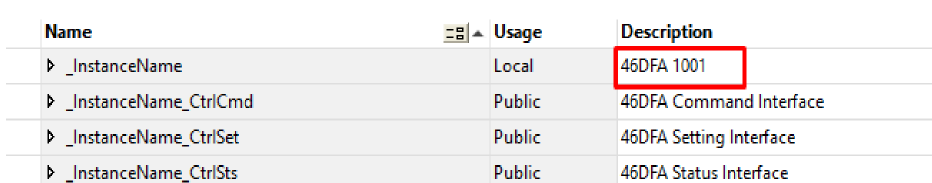
Studio 5000 View Designer Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	

Faceplates

There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 30.

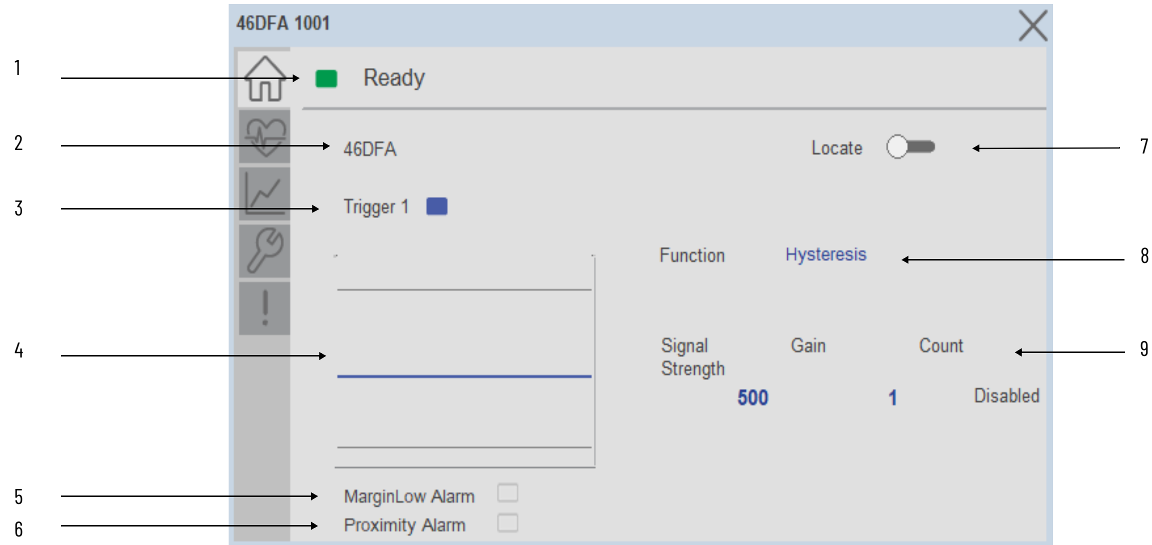
The faceplate title is linked to *_InstanceName.@description*, the *.@description* extended tag property of the Add-On Instruction instance. This is user-configurable from controller/program tags in Studio 5000 Logix Designer.



Name	Usage	Description
_InstanceName	Local	46DFA 1001
_InstanceName_CtrlCmd	Public	46DFA Command Interface
_InstanceName_CtrlSet	Public	46DFA Setting Interface
_InstanceName_CtrlSts	Public	46DFA Status Interface

Home

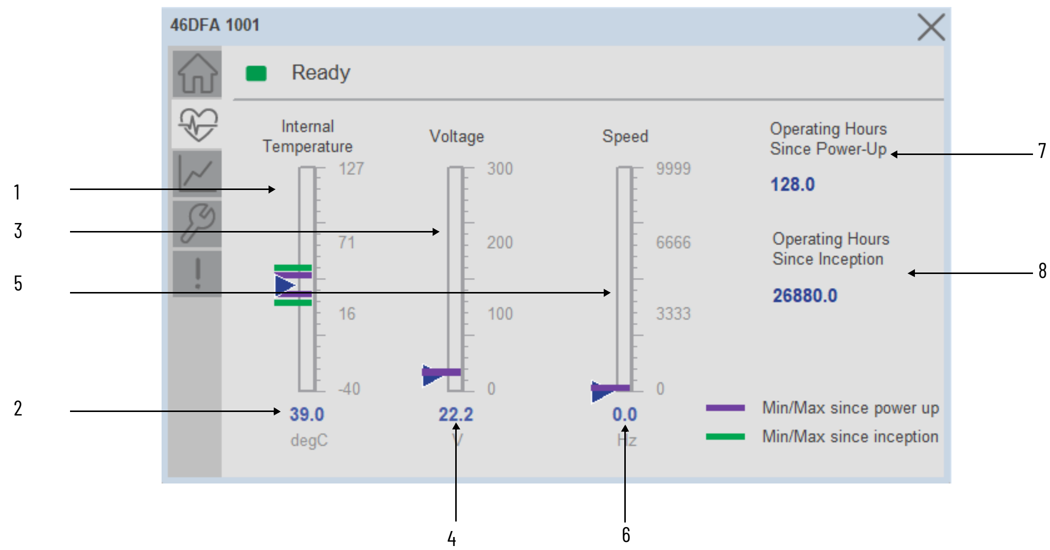
The Home tab is the main tab of the faceplate. It provides the status of the IO-Link device along with sensor process data and the Locate button.



Item	Description
1	Banner- Ready Status
2	Application Specific Name - Read from device
3	Trigger Status OFF (0) = Gray LED ON (1) = Blue LED
4	Threshold Sparkline Trend The spark line shows Signal Strength, threshold 1 and threshold 2 values over last 30 seconds
5	Margin low alarm status OFF (0) = Gray LED ON (1) = Blue LED
6	Proximity alarm status OFF (0) = Gray LED ON (1) = Blue LED
7	Locate toggle switch Locate the sensor in large machines where there are several sensors close to each other. When Located, the sensor user interface (green and orange LEDs) start flashing synchronously until the operator disables this function
8	- Function: Displays the operation mode of the sensor output and the available options are “Hysteresis” or “Window”.
9	Process Data - Signal Strength (%): Signal Strength provides the raw measurement value of the amount of light reflected from the target. - Gain: Displays the excess gain above the sensor threshold to ensure reliable detection of the target. - When the Counter Value is enabled, the parameter reflects the sensor count amount. If the counter functionality is disabled, then “Disabled” text is seen.

Health Tab

Health tab provides different diagnostic information of sensor which helps ensure that sensors are operating correctly.



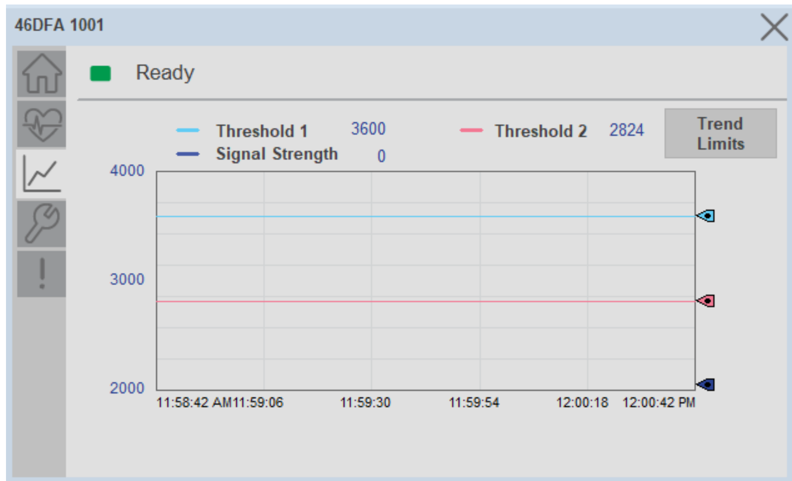
Item	Description
1	Internal Temperature Bar Graph
2	Internal Temperature Current Value
3	Voltage Bar Graph
4	Voltage Current Value
5	Speed Bar Graph
6	Speed Current Value
7	Operating Hours Since Power Up
8	Operating Hours Since Inception (lifetime)

Inception/Lifetime values are recorded since the first time the sensor was ever powered ON. These value are retained and not reset during default factory reset.

Power Up values are reset to zero and recorded new each time the sensor is power cycled.

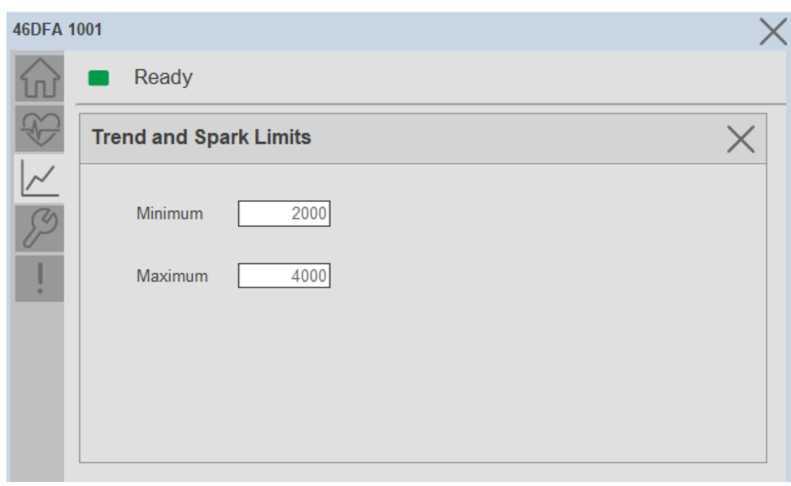
Trend Tab

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. One trend is displayed for Signal Strength, Threshold 1 and Threshold 2.



Trend Settings Screen

We can set trend limits using configuration tab by clicking on the *Settings* button present on trend screen. This sub screen display contains two numeric input elements that allow the user to enter the minimum and maximum values to be used on the Trend screen for Threshold Setpoints & Signal strength.

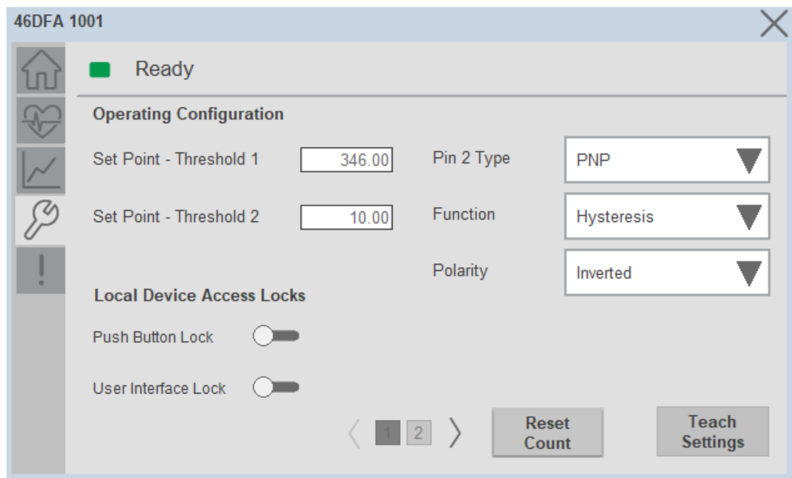


Configure Tab

The configuration tab displays the sensor parameter settings, as well as enabling the user to read data from the sensor.

The configuration section is divided into :

- Operating Configuration
- Local device access Locks
- Reset Count
- Teach Settings
- Sensor Configuration (Page 2)



Operating Configuration

Setpoint Threshold 1 - Allows operators to enter the signal value required for the sensor output to turn ON (threshold) upon target detection. That means that the sensor signal level must be higher than the threshold for the output to turn ON.

Setpoint Threshold 2 - This parameter is updated when the window teach procedures are executed. The default value for this parameter is 300.

Pin 2 Type- Changes the output type on pin 2. The sensor default when connected using the AOP is disabled and the output can be changed to operate as PNP only or NPN only.

Function - Allows operator to change the operation mode of the sensor output to 'Hysteresis' or 'Window'. Hysteresis mode turns the sensor output ON after the received signal level is higher than the Threshold 1 parameter, while Window mode turns the output ON while the received signal level is between Threshold 1 and Threshold 2.

Polarity - This parameter allows the user to change the sensor output to operate as non-inverted or inverted.

Local Device access Locks

Push Button Lock- This parameter allows operators to Lock the local push button on the sensor. The push button can be unlocked locally following the unlock procedure.

User Interface Lock- This parameter locks the local user interface and implements an IO-Link controlled lock. This means that the operator cannot unlock the sensor locally even if the unlock procedure is implemented using the push button.

Reset Count

This button allows user to reset the count value already stored in sensor.

Teach Settings

This button navigates to teach settings screen. The available teach methods are:

Static Teach- Press the 'Teach Start' button to initiate the Teach Process.

Place the target in front of the sensor and between the reflectors. Send the 'Teach Target' Command, then remove the target blocking the reflector.

The Teach in status will update to 'wait for command'.

Show the reflector where the target is present and then send 'Teach Background' Command.

The 'Static teach' process is complete and 'Teach in status' will be displayed as 'Idle'.

Dynamic Teach- Press the 'Teach Start' button to begin the Teach Process.

While the object is moving in front of the field of view of the sensor, send 'Dynamic Start' command.

The Teach in status will be displayed as 'Wait for Command' for few seconds.

Send the 'Dynamic Stop' command.

The dynamic teach process is completed.

Precision Teach- Place the target in front of the field of view of the sensor and then send 'Precision Start' command.

The 'Teach in status' will be displayed as 'Teach SP1 success' for few seconds.

The 'Precision teach' process is complete.

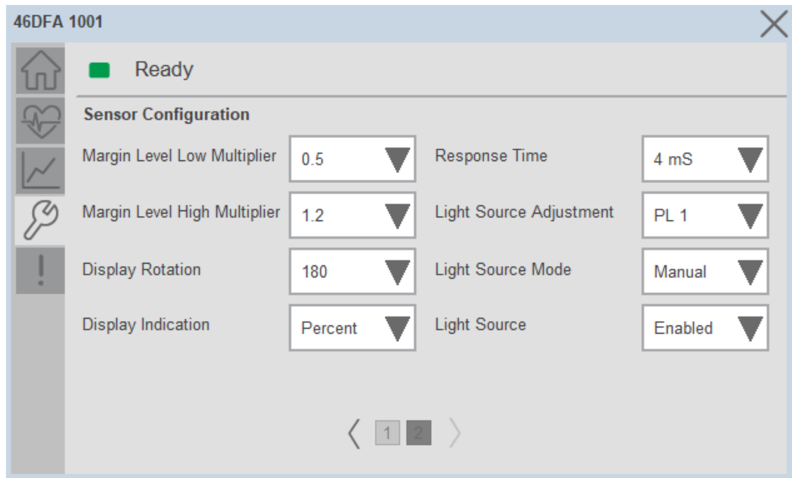
Max Sensitivity- Place the target in front of the field of view of the sensor and then send 'Max Sensitivity' command.

The 'Teach in status' will be displayed as 'Busy' for few seconds.The 'Maximum sensitivity' teach process is now complete.

Window Teach- Place the target in front of the field of view of the sensor and send 'Window Start' command. The 'Teach in status' will be displayed as 'Wait for Command' for few seconds.

Keep the target from the field of view of the sensor and send 'Window Stop' command.The 'Window Teach' teach process is now complete.

Sensor Configuration



Margin Level Low Multiplier- Allows you to define when the green LED should start flashing to reflect a signal level that is below the threshold. The default value for this parameter is 0.8 with multiple selection options from 0.5…0.8 in increments of 01X.

Margin Level High Multiplier- Allows you to define when the green LED can stop flashing to reflect a signal level that is higher than the threshold. The default value for this parameter is 1.5 with multiple selections that could reach a maximum of 5X.

Display Rotation- Changes the orientation of the LED display. The default setting is standard orientation.

Display Indication- Changes how the received light information is displayed in the sensor LED and received signal strength process data parameter.

Response Time- Changes the sensor response time to increase or decrease the amount of light received by the sensor. The default response time is 500 µs.

Light Source Adjustment- Changes the LED intensity. When operating in 50 µs Response Time, the maximum intensity that can be set is 12. Operation on response times higher than 50 µs, can be set up to 15.

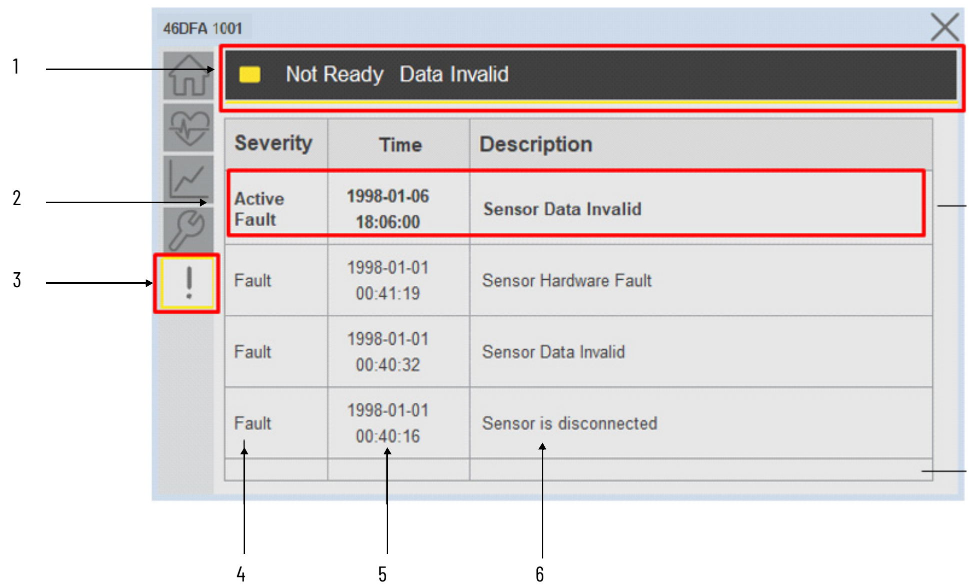
Light Source Mode-Enables automatic or manual operation of the sensor LED intensity. The default parameter is Auto.

Light Source- Enables or disables the light source of the sensor. The default value is ON.

Fault Warning Tab

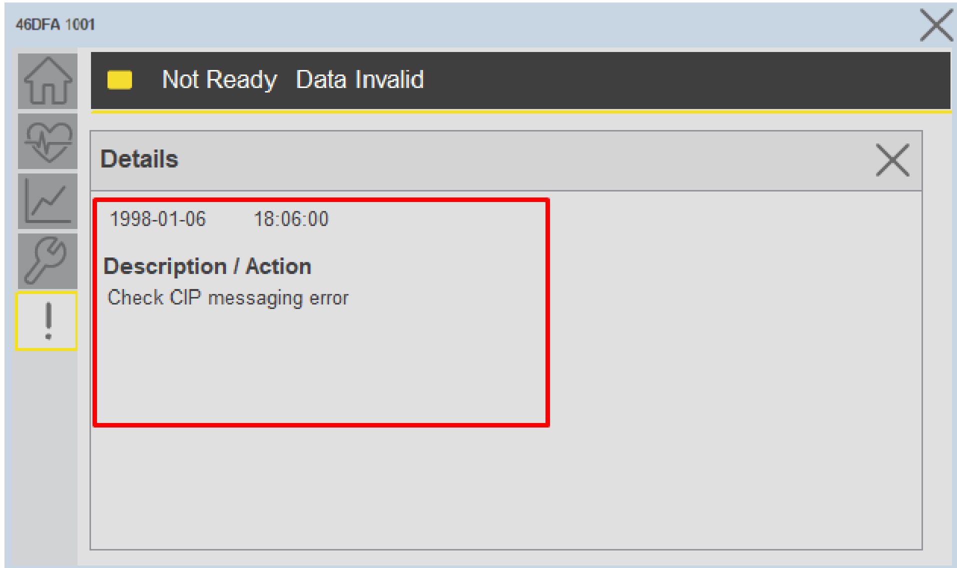
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

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.



Application Code Manager

IO-Link Device Library objects can be set-up and configured using Studio 5000 Application Code Manager.

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

Definition Objects: raC_Dvc_46DFA_4IOL, raC_Dvc_46DFA_8IOL

This object contains the AOI definition and used as linked library to implement object. There is one definition and per add-on instruction to support each IO-Link Master Module. 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 Objects: raC_LD_Dvc_46DFA_4IOL, raC_LD_Dvc_46DFA_8IOL

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.

Parameter Name	Default Value	Instance Name	Definition	Description
TagDescription	{ObjectDescription}	{TagDescription}		Tag Description of the main AOI backing tag
ChannelNumber				Select the Channel Number where the sensor is connected.
Sensor Type				Select sensor type of 46DFA as per device catalog no.
MasterName	MasterName	[MasterName]	Module	Select the IO-Link master module. If connecting to a non-library object module, enter the name of the master only. 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.

Note that if the tag names are manually entered or not linked to input channel tags a red 'X' will be shown beside the parameter. This is acceptable and the program can still be generated.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_46DFA_4IOL	raC_Dvc_46DFA_4IOL	3.1	(RA-LIB) Device	IO-Link
raC_Dvc_46DFA_8IOL	raC_Dvc_46DFA_8IOL	3.1	(RA-LIB) Device	IO-Link

Configured HMI Content

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

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - Io-link Device.ggfx	{ProjectName}\Visualization\FTViewME\Global Object - ggfx
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - Io-link Device.ggfx	{ProjectName}\Visualization\FTViewSE\Global Object - ggfx
V3_raC_Dvc_46DFA	Faceplate ME	(raC-3_xx-ME) raC_Dvc_46DFA-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_raC_Dvc_46DFA	Faceplate SE	(raC-3_xx-SE) raC_Dvc_46DFA-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_raC_Dvc_IOLink	View Designer	(raC-3_xx-VD) raC_Dvc_IOLink.vpd	{ProjectName}\Visualization\ViewDesigner - vpd
V3_RM_raC_Dvc_IO_Link	Reference Manual	DEVICE-RM300B-EN-P.pdf	{ProjectName}\Documentation
V3_IO_Link_Images	HMI Image Set	HMI FactoryTalk View Images - png.zip	{ProjectName}\Visualization\Images - png

45PLA - Polarized Light Array Photoelectric Sensor (raC_Dvc_45PLA_4IOL, raC_Dvc_45PLA_8IOL)

Overview

The 45PLA Polarized Light Array Photoelectric Sensor device object (raC_Dvc_45PLA_4IOL, raC_Dvc_45PLA_8IOL) includes HMI faceplates which displays device information including:

- Sensor data
- Sensor diagnostics
- Sensor configuration and parameters
- Process data trending
- Device Fault log

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_*45PLA*_Objects_Faceplate.MP4"

Primary device object configuration functions include:

- **Locate:** This function helps to locate the sensors using the device's LED in large machines where there are several sensors close to each other.
- **Health:** View device health such as run-hours and temperature.
- **Sensor Configuration:** Configure general sensor parameters including local LED and lock settings, process data enable/disable, and adjustment method & sensor application.
- **Teach:** Offers the different teach functions.

Functional Description

The 45PLA Polarized Light Array Photoelectric Sensor 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. 1.01) 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/* folder in the library. Each device is supplied with two versions of Add-On Instructions (AOI) and Rung import files - one for compatibility with each IO-Link Master Module. You must select the appropriate AOI for the master module being used.

Device/Item	Compatible IO-Link Master	Add-On Instruction	Rung Import
45PLA	POINT I/O 1734-4IOL	raC_Dvc_45PLA_4IOL_3.01_AOI.L5X	raC_Dvc_45PLA_4IOL_3.01_RUNG.L5X
	ArmorBlock 1732E-8IOLM12R	raC_Dvc_45PLA_8IOL_3.01_AOI.L5X	raC_Dvc_45PLA_8IOL_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

Note that a single faceplate is used for either the 4IOL or 8IOL versions of the Add-On Instruction.

Device/Item	Type	FactoryTalk® View ME Faceplate	FactoryTalk® View SE Faceplate
45PLA	Display	(raC-3_01-ME) raC_Dvc_45PLA-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_45PLA-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - IO-Link Device.ggfx	(raC-3-SE) Toolbox - IO-Link 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
45PLA	(raC-3_01-VD) raC_Dvc_IOLink.vpd

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.

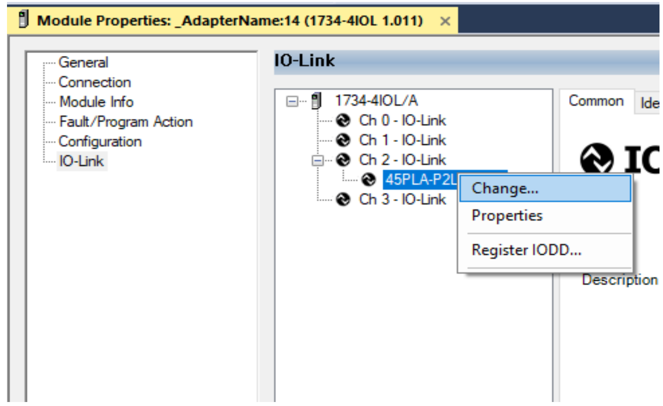
All Studio 5000 Application Code Manager files can be found in the */ApplicationCodeManagerLibraries/* folder of the library. The files included are as follows:

Implementation Object	Compatible IO-Link Master	Asset Control File (.HSL4)	Device File (.HSL4)
45PLA	POINT I/O 1734-4IOL	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_45PLA_4IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_45PLA_4IOL_(3.1)
	ArmorBlock 1732E-8IOLM12R	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_45PLA_8IOL_(3.1)	(RA-LIB)_Device_Device_IO-Link_raC_LD_Dvc_45PLA_8IOL_(3.1)

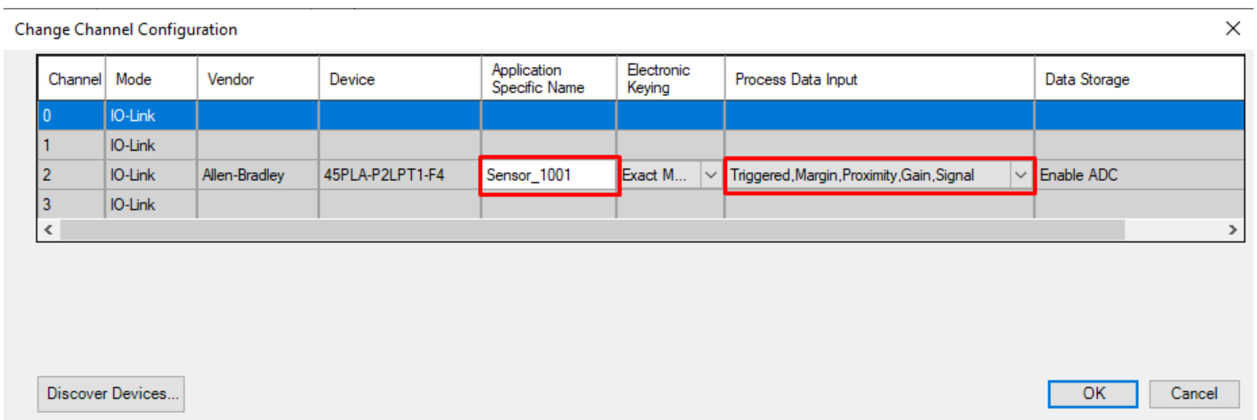
Device Definition

The device must be configured with the correct device definition. Proper device configuration enables the required cyclic device data to pass information from the device into the add-on instruction.

1. Click on Change…



2. Specify the Application Specific Name e.g. *Sensor_1001*
3. Select the Process Data Input as *Triggered, Margin, Proximity, Gain, Signal.*



Operations

The IO-Link Device objects provide only physical operation mode. There is no virtual device mode offered.

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_Module	Reference to module in I/O tree	MODULE
Ref_MsgCustSetIdx	Message Configuration Write	MESSAGE
Ref_MsgCustGetIdx	Message Configuration Read	MESSAGE
Ref_MsgCustSetSubIdx	Message Configuration Write	MESSAGE
Ref_MsgCustGetSubIdx	Message Configuration Read	MESSAGE
Ref_MsgData	Messaging Data	raC_UDT_45PLA_Sensor_Data
Ref_Ctrl_Set	IO-Link Device Setting Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSet
Ref_Ctrl_Cmd	IO-Link Device Command Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlCmd
Ref_Ctrl_Sts	IO-Link Device Status Interface	raC_UDT_ItfAD_IOLinkSensor_CtrlSts
Ref_Ctrl_Inf	IO-Link Device Type Information Interface	raC_UDT_ItfAD_IOLinkSensor_Inf
Ref_Ctrl_Itf	IO-Link Device Command, Status Interface	raC_UDT_ItfAD_IOLinkDevices
Inf_Lookup	Code / Description List Entry	raC_UDT_LookupMember_STR0082[20]
Inp_I	Device Object Inputs	raC_UDT_ItfAD_45PLA_Inp_4IOL Or raC_UDT_ItfAD_45PLA_Inp_8IOL

Input Data

Input	Function/Description	DataType
Cfg_BeamMode	Beam Mode; 0 - Object Detection - Six Beams, 1 - Object Detection - Five Beams, 2 - Object Detection - Four Beams, 3 - Object Detection - Three Beams, 4 - Object Detection - Two Beams, 5 - Object Detection - One Beam, 8 - Gap Detection - Six Beams, 9 - Gap Detection - Five Beams, 10 - Gap Detection - Four Beams, 11 - Gap Detection - Three Beams, 12 - Gap Detection - Two Beams, 13 - Gap Detection - One Beam	DINT
Cfg_MarginLevelHighIMultiplier	Margin Level-High Multiplier; 10 - 1.0, 11 - 1.1, 12 - 1.2, 15 - 1.5, 20 - 2.0, 50 - 5.0, 100 - 10.0, 150 - 15.0	DINT
Cfg_MarginLevelLowMultiplier	Margin Level-Low Multiplier; 0 - 0.8, 1 - 0.7, 2 - 0.6, 3 - 0.5	SINT
Cfg_Mode	Mode; 0 - PNP, 1 - NPN	SINT
Cfg_OperatingFrequency	Operating Frequency; 0 - 1 (800 uS), 1 - 2 (860 uS)	SINT
Cfg_Pin2Mode	Pin 2 Mode; 0 - Disable, 1 - PNP-Not Inverted, 2 - PNP-Inverted, 3 - NPN-Not Inverted, 4 - NPN-Inverted, 5 - Remote Teach Input, 6 - Independent Control PNP, 7 - Independent Control NPN	DINT
Cfg_Polarity	Polarity; 0 - Not Inverted, 1 - Inverted	SINT
Cmd_DisableLEDs	Indicator Disabled Command	BOOL
Cmd_EnableLEDs	Indicator Enabled Command	BOOL
Cmd_LocalTeachLock	Parameters Unlock/Lock Cmd	BOOL
Cmd_Locate	Locator Disable/Enable Command	BOOL
Cmd_ResetCount	Counter Reset Command	BOOL
Cmd_TeachApply	Teach Apply Command	BOOL

Input	Function/Description	DataType
Cmd_TeachPrecisionShowReflector	Teach Precision Show Reflector Command	BOOL
Cmd_TeachStandardShowReflector	Teach Standard Show Reflector Command	BOOL
Cmd_TeachStart	Teach Start Command	BOOL
Cmd_TeachStaticShowReflector	Teach Static Show Reflector Command	BOOL
Cmd_TeachStaticShowTarget	Teach Static Show Target Command	BOOL
Inp_ChNumber	Configured Channel number for Master	SINT
Inp_ChxGain	Gain of Sensor	INT
Inp_ChxMarginLowAlarm	Margin Low Alarm of Sensor	BOOL
Inp_ChxProximityAlarm	Proximity Alarm of Senor	BOOL
Inp_ChxSignalStrength	Indicates the reflectivity level of the reflector	DINT
Inp_ChxTriggered	Triggered Status of Sensor	BOOL
Set_Beam1Emitter1LEDIntensity	Set the LED Intensity for Beam One for Emitter1	DINT
Set_Beam1Receiver1ThresholdEmitter1	Set the Threshold for Beam One Receiver1 for Emitter1	DINT
Set_Beam2Emitter2LEDIntensity	Set the LED Intensity for Beam Two and Three for Emitter2	DINT
Set_Beam2Receiver1ThresholdEmitter2	Set the Threshold for Beam Two Receiver1 for Emitter2	DINT
Set_Beam3Receiver2ThresholdEmitter2	Set the Threshold for Beam Three Receiver2 for Emitter2	DINT
Set_Beam4Emitter3LEDIntensity	Set the LED Intensity for Beam Four and Five for Emitter3	DINT
Set_Beam4Receiver2ThresholdEmitter3	Set the Threshold for Beam Four Receiver2 for Emitter3	DINT
Set_Beam5Receiver3ThresholdEmitter3	Set the Threshold for Beam Five Receiver3 for Emitter3	DINT
Set_Beam6Emitter4LEDIntensity	Set the LED Intensity for Beam Six for Emitter4	DINT
Set_Beam6Receiver3ThresholdEmitter4	Set the Threshold for Beam Six Receiver3 for Emitter4	DINT
Set_MarginBooster	Set the multiplier factor that applies to the LEDs current value	DINT
Set_TrendMaxValue	Trend Tab Max value for VD/ME/SE faceplate	DINT
Set_TrendMinValue	Trend Tab Min value for VD/ME/SE faceplate	DINT

Output Data

Output	Function/Descritpion	DataType
Sts_Active	Device active status: 1 = output power structure is active	BOOL
Sts_Available	Device is available for interaction with user code	BOOL
Sts_bNotReady	Bitwise device 'not ready' reason	DINT
Sts_Connected	Device is connected to the Programmable Automation Controller	BOOL
Sts_CounterEnabled	Counter Enabled Indication; 0= Disable, 1= Enable	BOOL
Sts_EnableLEDs	LED Indicator; 0= Disable, 1= Enable	BOOL
Sts_Faulted	Device faulted status: 1 = an active fault exists	BOOL
Sts_InhibitCfg	1=Inhibit user Configuration Parameters from HMI Faceplate; 0=Allow	BOOL
Sts_InhibitCmd	1=Inhibit user Commands from HMI Faceplate; 0=Allow Control	BOOL
Sts_InhibitSet	1=Inhibit user Settings from HMI Faceplate; 0=Allow	BOOL
Sts_LocalTeachLock	Local Parameterization; 0= Unlock, 1= Locked	BOOL
Sts_Located	Locator Indicator; 1= Located	BOOL
Sts_Ready	Device is ready to perform primary function	BOOL
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL
Val_Beam1Emitter1LEDIntensity	Displays the LED intensity for Emitter1 for Beam One	DINT
Val_Beam1Receiver1ThresholdEmitter1	Display the Threshold for Beam One Receiver1 for Emitter1	DINT
Val_Beam2Emitter2LEDIntensity	Display the LED Intensity for Beam Two and Three for Emitter2	DINT
Val_Beam2Receiver1ThresholdEmitter2	Display the Threshold for Beam Two Receiver1 for Emitter2	DINT
Val_Beam3Receiver2ThresholdEmitter2	Display the Threshold for Beam Three Receiver2 for Emitter2	DINT
Val_Beam4Emitter3LEDIntensity	Display the LED Intensity for Beam Four and Five for Emitter3	DINT
Val_Beam4Receiver2ThresholdEmitter3	Display the Threshold for Beam Four Receiver2 for Emitter3	DINT
Val_Beam5Receiver3ThresholdEmitter3	Display the Threshold for Beam Five Receiver3 for Emitter3	DINT
Val_Beam6Emitter4LEDIntensity	Display the LED Intensity for Beam Six for Emitter4	DINT
Val_Beam6Receiver3ThresholdEmitter4	Display the Threshold for Beam Six Receiver3 for Emitter4	DINT
Val_BeamMode	Beam Mode Status; 0 - Object Detection - Six Beams, 1 - Object Detection - Five Beams, 2 - Object Detection - Four Beams, 3 - Object Detection - Three Beams, 4 - Object Detection - Two Beams, 5 - Object Detection - One Beam, 8 - Gap Detection - Six Beams, 9 - Gap Detection - Five Beams, 10 - Gap Detection - Four Beams, 11 - Gap Detection - Three Beams, 12 - Gap Detection - Two Beams, 13 - Gap Detection - One Beam	DINT
Val_Counter	Display Counter Value	DINT
Val_EnableLEDs	LED Indicator; 0= Disable, 1= Enable	SINT
Val_MarginBooster	Display the multiplier factor that applies to the LEDs current value	DINT
Val_MarginLevelHighMultiplier	Margin Level-High Multiplier Status; 10 - 1.0, 11 - 1.1, 12 - 1.2, 15 - 1.5, 20 - 2.0, 50 - 5.0, 100 - 10.0, 150 - 15.0	INT
Val_MarginLevelLowMultiplier	Margin Level-Low Multiplier Status; 0 - 0.8, 1 - 0.7, 2 - 0.6, 3 - 0.5	INT
Val_Mode	Mode Status; 0 - PNP, 1 - NPN	INT

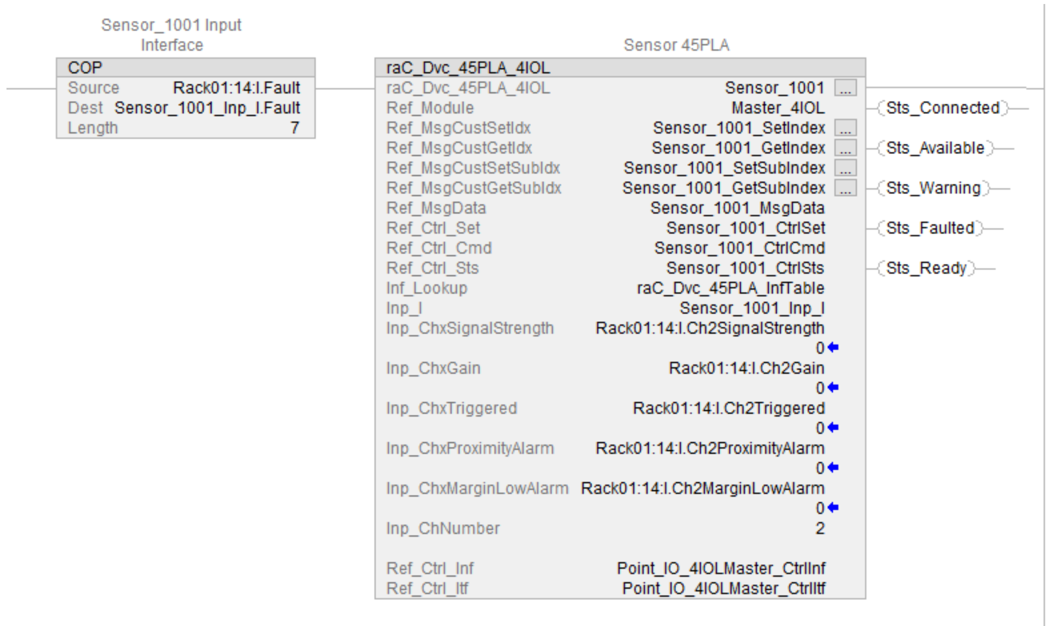
Output	Function/Descritpion	DataType
Val_OperatingFrequency	Operating Frequency Satus; 0 - 1 (800 uS), 1 - 2 (860 uS)	INT
Val_OperatingHrsSinceInception	Displays the number of hours that the sensor has been continuously in operation	DINT
Val_OperatingHrsSincePowerUp	Displays the number of targets that have been detected since the sensor has been in operation	DINT
Val_Pin2Mode	Pin 2 Mode Status; 0 - Disable, 1 - PNP-Not Inverted, 2 - PNP-Inverted, 3 - NPN-Not Inverted, 4 - NPN-Inverted, 5 - Remote Teach Input, 6 - Independent Control PNP, 7 - Independent Control	DINT
Val_Polarity	Displays the polarity of channel; 0 = Not Inverted, 1=Inverted	INT
Val_RangeMax	Sensor Maximum Range in Trend	DINT
Val_RangeMin	Sensor Minimum Range in Trend	DINT
Val_Speed	Display the the actual frequency of detection in Hertz	DINT
Val_TeachStep	Teach Step	INT
Val_Temperature	Displays the internal temperature information available in the sensor	SINT
Val_TemperatureMaxSinceInception	Reflects the maximum temperature inside of the microprocessor die of the sensor since inception	SINT
Val_TemperatureMaxSincePowerUp	Reflects the maximum temperature inside of the microprocessor die of the sensor since the last power up	SINT
Val_TemperatureMinSinceInception	Reflects the minimum temperature inside of the microprocessor die of the sensor since inception	SINT
Val_TemperatureMinSincePowerUp	Reflects the minimum temperature inside of the microprocessor die of the sensor since the last power up	SINT

Programming Example

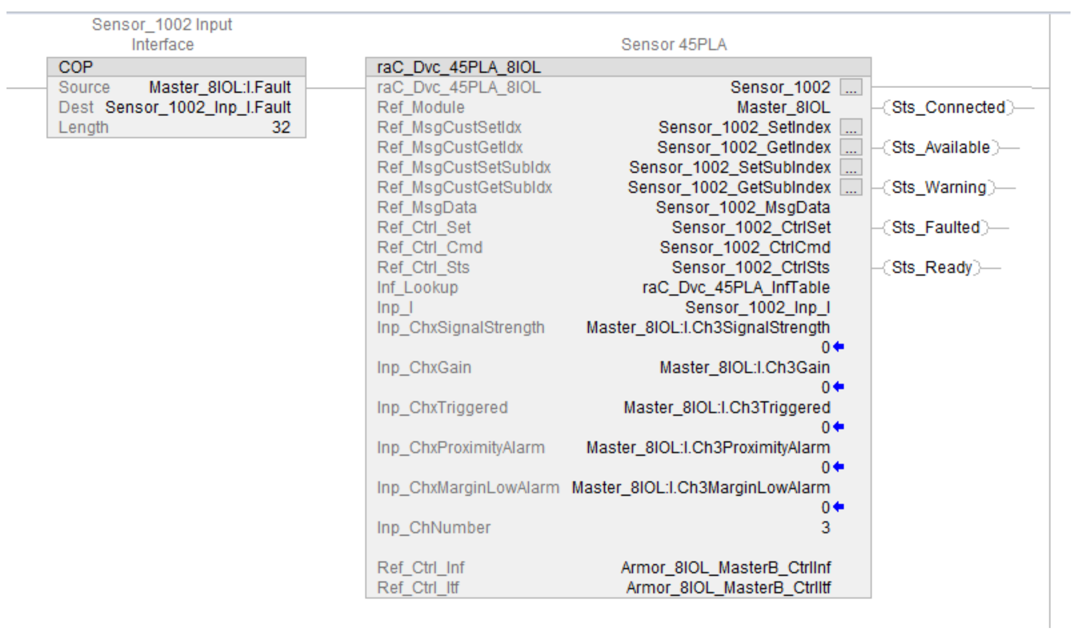
Fully configured device on a rung is provided below for reference.

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 following example uses the 45PLA device object connected to channel #2 of a POINT I/O 1734-4IOL IO-Link Master module named *Point_IO_4IOLMaster* in slot #14 of a POINT I/O adapter named *Rack01*.



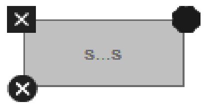
The following example uses the 45PLA device object connected to channel #3 of a ArmorBlock 1732E-8IOLM12R IO-Link Master module in named *Armor_8IOL_MasterB*



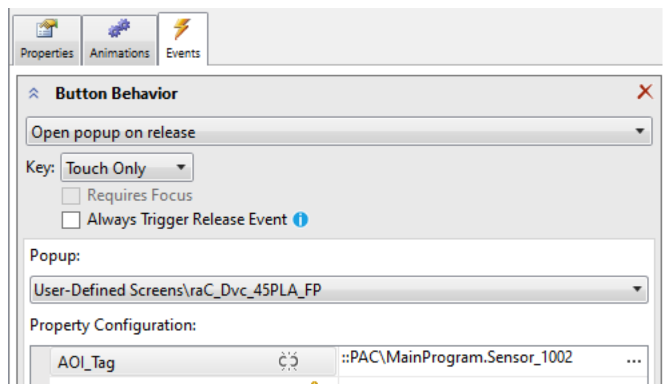
Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. See Basic Launch Button Attributes section for details on configuration and indicators.

FactoryTalk View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GO_LaunchFP		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #104.	#102: AOI Backing Tag Instance (e.g. {::[PAC]Program::IOLinkProgram._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)

Studio 5000 View Designer Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	

Faceplates

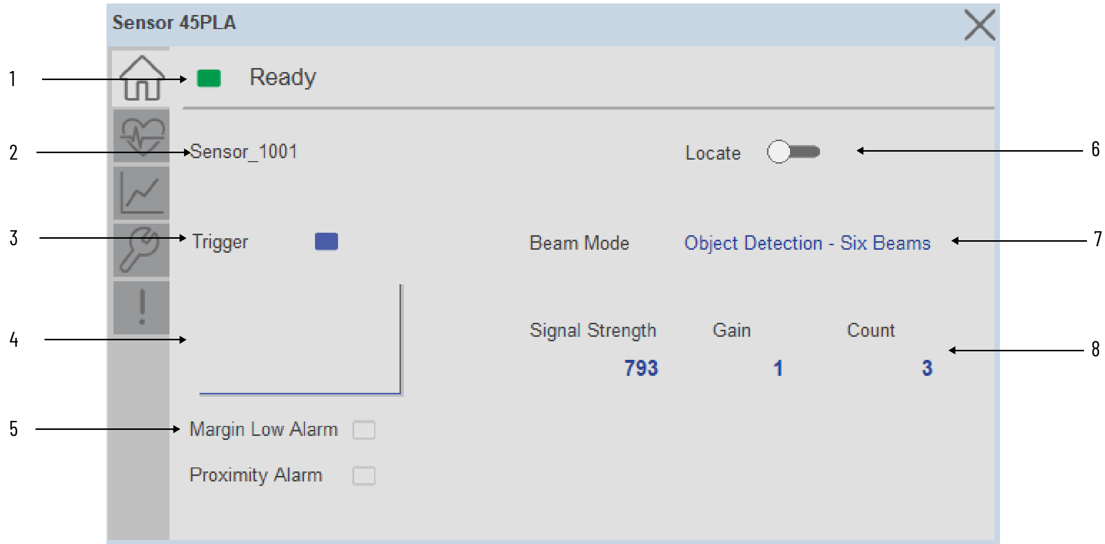
There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 30.

The faceplate title is linked to *_InstanceName.@description*, the *.@description* extended tag property of the Add-On Instruction instance. This is user-configurable from controller/program tags in Studio 5000 Logix Designer.

Name	Usage	Data Type	Description
Sensor_1002	Local	raC_Dvc_45PLA_8IOL	Sensor 45PLA
Sensor_1002_CtrlCmd	Public	raC_UDT_ItfAD_IOLinkSensor_CtrlCmd	_InstanceName Command Interface

Home

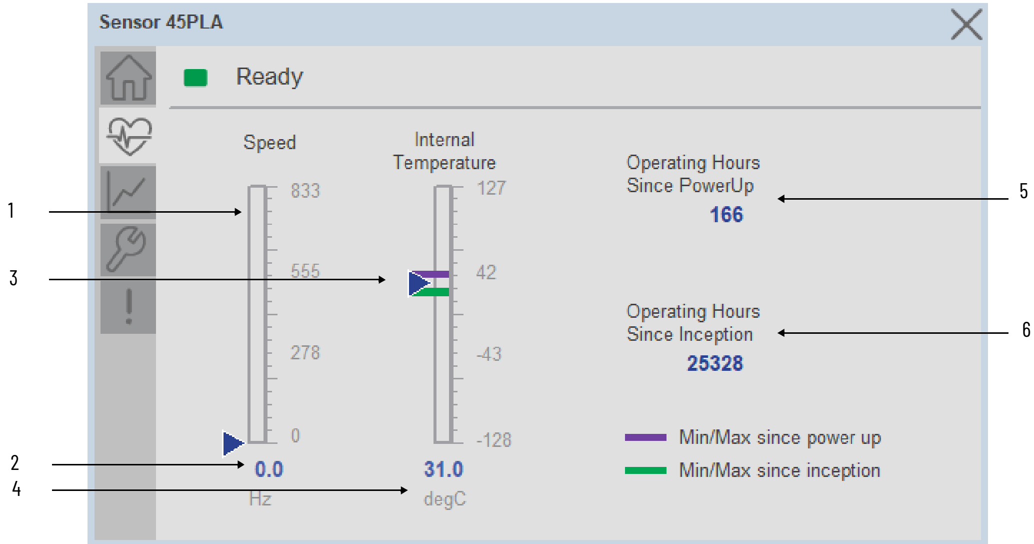
The Home tab is the main tab of the faceplate. It provides the status of the IO-Link device along with sensor process data and the Locate button.



Item	Description
1	Banner- Ready Status
2	Application Specific Name - Read from device
3	Trigger Status OFF (0) = Gray LED ON (1) = Blue LED
4	Signal Strength Sparkline Trend The spark line shows the signal strength value.
5	Margin Low Alarm indicates, when the target Signal is marginal and about to fail. Proximity Alarm indicates, if there is a target in the background that may be in close proximity to the threshold.
6	Locate toggle switch Locate the sensor in large machines where there are several sensors close to each other. When Located, the sensor user interface (green and orange LEDs) start flashing synchronously until the operator disables this function
7	The Beam Mode defines the number of active beams and operation logic that is applied to the state of the beams.
8	Process Data - Signal strength indicates the reflectivity level of the reflector, which makes this feature ideal for continuous monitoring. - Gain displays the excess gain above the sensor threshold to confirm reliable detection of the target. - When the Counter Value is enabled, the parameter reflects the sensor count amount. If the counter functionality is disabled, then “Disabled” text is seen.

Health Tab

Health tab provides different diagnostic information of sensor which helps ensure that sensors are operating correctly.



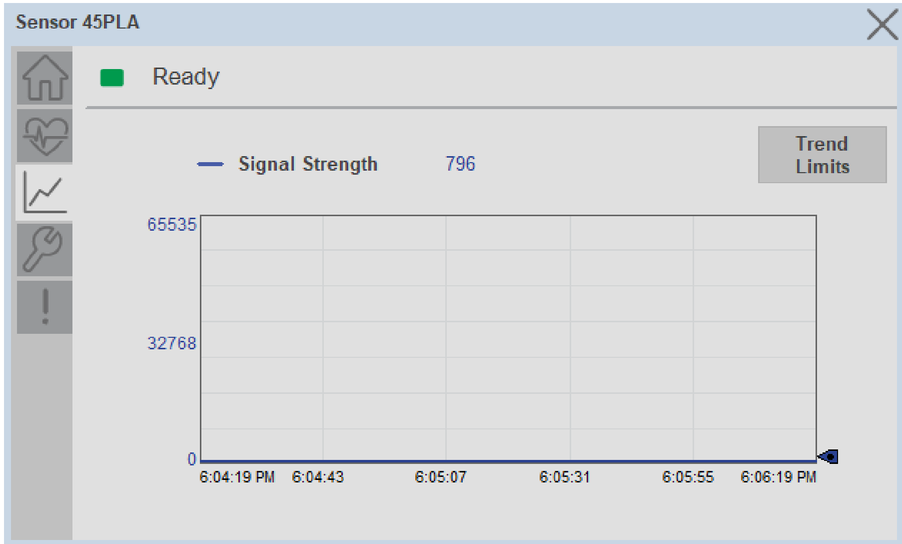
Item	Description
1	Speed Bar Graph Blue Triangle Indicator: Current value
2	Speed Current Value
3	Internal Temperature Bar Graph Green Indicators: Min/Max since inception (lifetime) Purple Indicators: Min/Max since power up Blue Triangle Indicator: Current value
4	Internal Temperature Current Value
5	Operating Hours Since Power Up
6	Operating Hours Since Inception (lifetime)

Inception/Lifetime values are recorded since the first time the sensor was ever powered ON. These value are retained and not reset during default factory reset.

Power Up values are reset to zero and recorded new each time the sensor is power cycled.

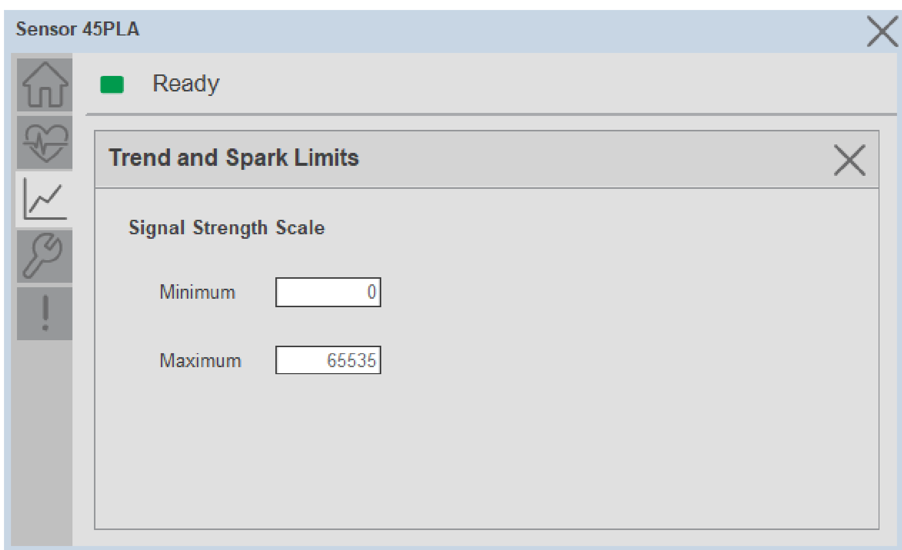
Trend Tab

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. Trend is displayed for Signal Strength.



Trend Settings Screen

We can set trend limits using configuration tab by clicking on the *Settings* button present on trend screen. This sub screen display contains two numeric input elements that allow the user to enter the minimum and maximum values to be used on the Trend screen for Signal strength.

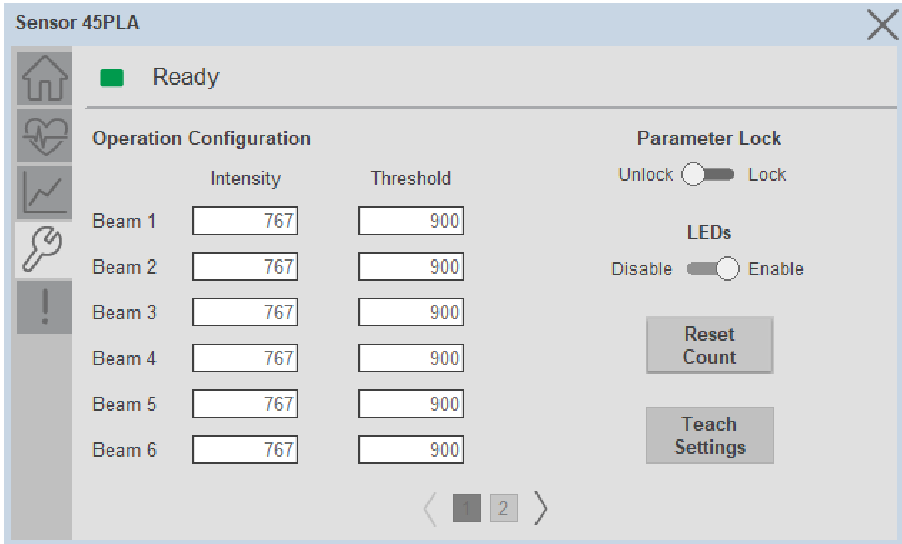


Configure Tab

The configuration tab displays the various parameter settings and options, as well as enabling the user to read data from the sensor.

The configuration section is divided into sections:

- Operation Configuration
- Sensor Configuration
- Teach Settings



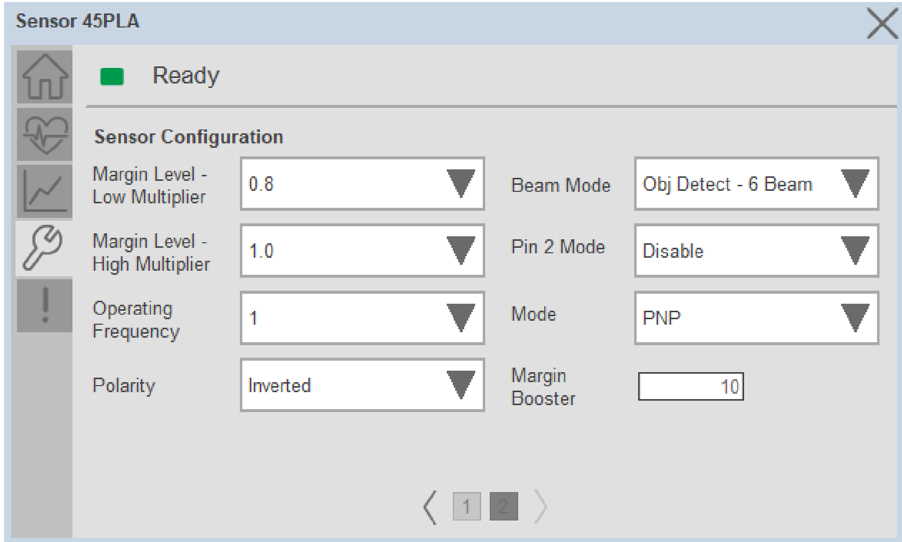
Operation Configuration

Intensity and Threshold - Allows the user to set the LED intensity and Threshold for Beam-1 to Beam-6.

Local Teach Parameters - This section allow user to lock / unlock device local parameterization. Touch Lock/Unlock Toggle switch to Lock Local Parameterization

Disable/Enable LEDs - This parameter allows operators to turn OFF or turn ON the User Interface LEDs (green and orange LEDs). This parameter is ideal for applications where turning OFF the LEDs is desired to accommodate the application.

Reset Count - Allows users to reset the counter function, it will reset the sensor counts to zero.



Sensor Configuration

Margin Level- Low Multiplier - Allows the user to defines the signal level at which the green LED starts flashing, indicating it is below the threshold.

Margin Level- High Multiplier - Allows the user to determines when the green LED can stop flashing, indicating a signal level higher than the threshold.

Operating Frequency - In certain applications, where it's necessary to place two 45PLA sensors in close proximity, their emission may interfere with each other. Adjusting the operating frequency helps mitigate such interference.

Polarity - Allows the user to change the sensor output to operate as Non-Inverted or Inverted.

Beam Mode - Allows the user to define the number of active beams and operation logic that is applied to the state of the beams.

Pin2 Mode - Allows the user to enables the operation of the output on pin 2 in IO-Link Mode.

Mode - Allows the user to change the output mode to operate as PNP or NPN.

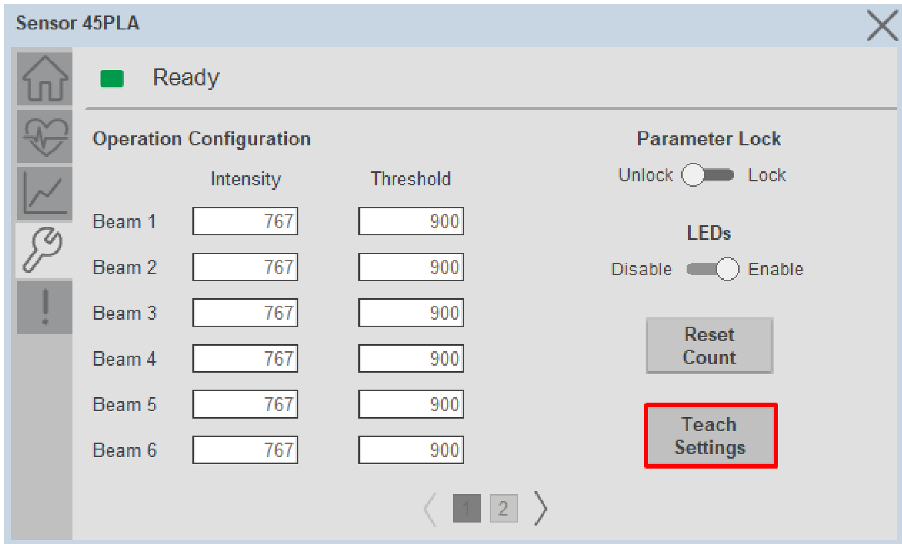
Margin Booster - Allows the user to indicate the multiplier factor that applies to the current value of the LEDs.

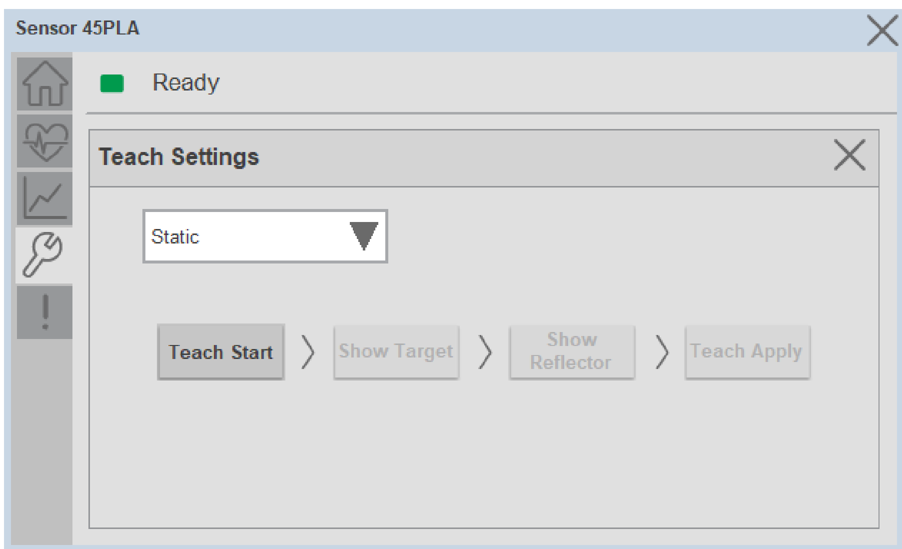
Teach Settings

Teach Settings display includes the Teach Mode, Teach procedure flow buttons, and Teach Apply button. Touch on the Teach Settings navigation button to access the Teach Settings tab.

Teach tab includes the following functions.

- Teach mode selection dropdown menu
- Teach procedure flow buttons





Teach mode - This parameter selects the desired mode.

Static Teach - The first method is Static Teach.

1. Press the **"Teach Start"** button to initiate the Teach Process
2. Place the target in front of the sensor while ensuring it is placed in between the reflector. Press the **"Show Target"** command button. Once the target has been displayed, remove it from obstructing the reflector.

3. Show the reflector where the target is present and then press the **"Show Reflector"** button.
4. Send the **"Teach Apply"** command to finalize the teach process.

Standard Teach - The second method is Standard Teach.

1. Press the **"Teach Start"** button to begin the Teach Process.
2. Place the reflector in front of the sensor's field of view and send **"Show Reflector"** command.
3. Press the **"Teach Apply"** button to finalize the teach process.

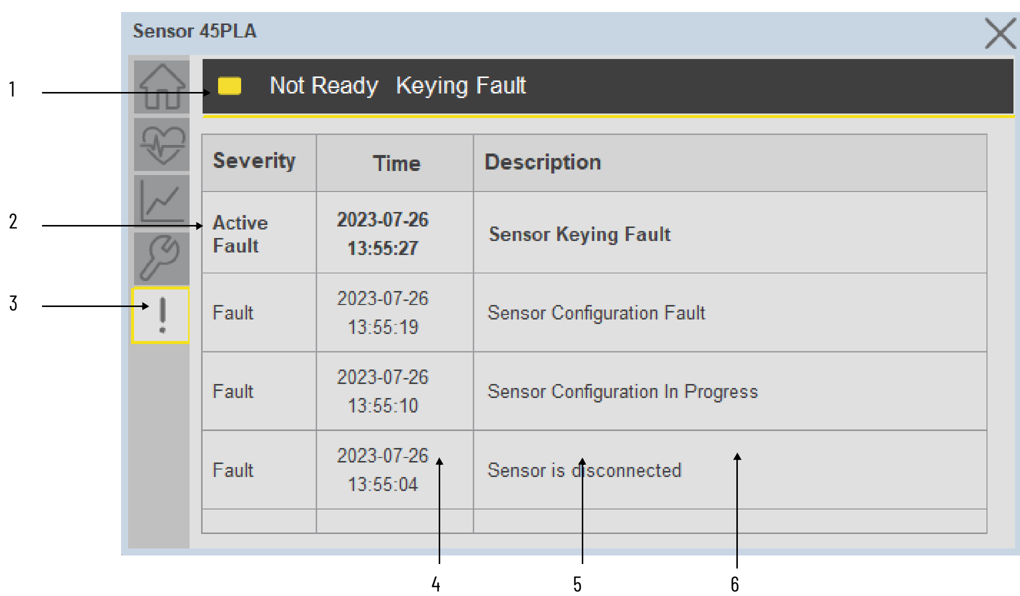
Precision Teach - The third method is Precision Teach.

1. Press the **"Teach Start"** button to begin the Teach Process.
2. Place the reflector in front of the sensor's field of view and send the **"Show Reflector"** command.
3. Send the **"Teach Apply"** command to finalize the teach process.

Fault Warning Tab

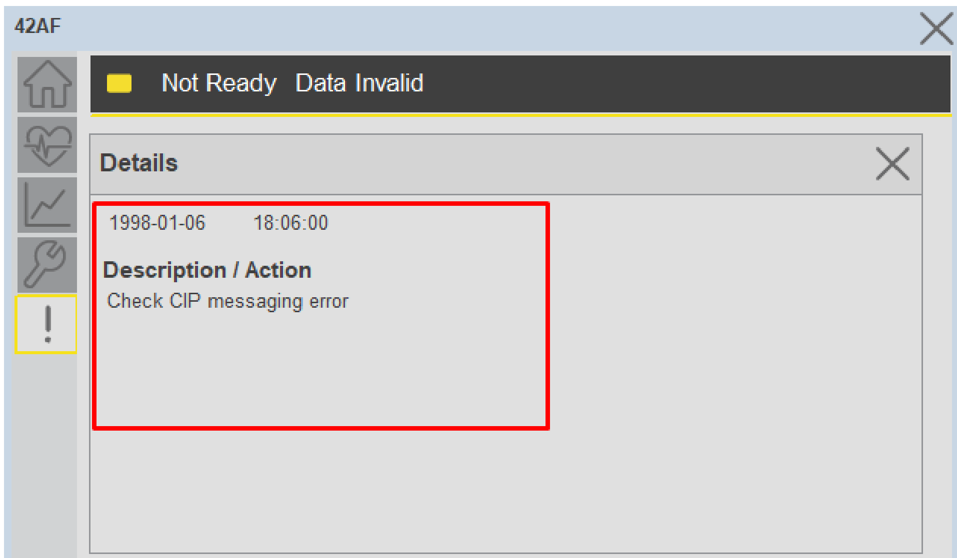
The Fault Warning tab displays information for up to four faults for the device. The fault table displays the Severity level (Fault, Warning or Active Fault), time (and date) and a description of the fault.

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.



Application Code Manager

IO-Link Device Library objects can be set-up and configured using Studio 5000 Application Code Manager.

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

Definition Objects: raC_Dvc_45PLA_4IOL, raC_Dvc_45PLA_8IOL

This object contains the AOI definition and used as linked library to implement object. There is one definition and per add-on instruction to support each IO-Link Master Module. 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 Objects: raC_LD_Dvc_45PLA_4IOL, raC_LD_Dvc_45PLA_8IOL

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
ChannelNumber				Select the Channel Number where the sensor is connected.
MasterName	MasterName	[MasterName]	Module	Select the IO-Link master module. If connecting to a non-library object module, enter the name of the master only. 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.

Note that if the tag names are manually entered or not linked to input channel tags a red 'X' will be shown beside the parameter. This is acceptable and the program can still be generated.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_45PLA_4IOL	raC_Dvc_45PLA_4IOL	3.1	(RA-LIB) Device	IO-Link
raC_Dvc_45PLA_8IOL	raC_Dvc_45PLA_8IOL	3.1	(RA-LIB) Device	IO-Link

Configured HMI Content

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

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewME\Global Object - ggfx
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewSE\Global Object - ggfx
V3_raC_Dvc_45PLA	Faceplate ME	(raC-3_xx-ME) raC_Dvc_45PLA-Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_raC_Dvc_45PLA	Faceplate SE	(raC-3_xx-SE) raC_Dvc_45PLA-Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_raC_Dvc_IOLink	View Designer	(raC-3_xx-VD) raC_Dvc_IOLink.vpd	{ProjectName}\Visualization\ViewDesigner - vpd
V3_RM_raC_Dvc_IO_Link	Reference Manual	DEVICE-RM300B-EN-P.pdf	{ProjectName}\Documentation
V3_IO_Link_Images	HMI Image Set	HMI FactoryTalk View Images - png.zip	{ProjectName}\Visualization\Images - png

Chapter 20

IO-Link HUB

Overview

The IO-Link HUB device object (raC_Dvc_1732IL_10X6M12, raC_Dvc_1732IL_16CFGM12M12L, raC_Dvc_1732IL_IB16M12_8IOL) includes HMI faceplate's which displays device information including:

- Module description, status, and faults
- Channel description, status

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_*IO-Link_HUB*_Objects_Faceplate.MP4"

Required Files

IO Device Objects include HMI faceplates. There is no controller programming required other than the creation of the I/O module in the project. If using FactoryTalk® View ME/SE you must also import the tag import file *FTViewStudio_IOLinkLibrary_Tags_3_00.CSV* to support navigation on faceplates.

FactoryTalk View HMI Files

FactoryTalk View ME/SE applications require importing the desired device faceplates in addition to 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
1732IL_10X6M12	Display	(raC-3_01-ME) raC_Dvc_1732IL_10X6M12-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_1732IL_10X6M12-Faceplate.gfx
1732IL_16CFGM12M12L	Display	(raC-3_01-ME) raC_Dvc_1732IL_16CFGM12M12-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_1732IL_16CFGM12M12-Faceplate.gfx
1732IL_IB16M12	Display	(raC-3_01-ME) raC_Dvc_1732IL_IB16M12-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_1732IL_IB16M12-Faceplate.gfx

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
IO-Link HUB	raC_Dvc_1732IL_Hubs.vpd

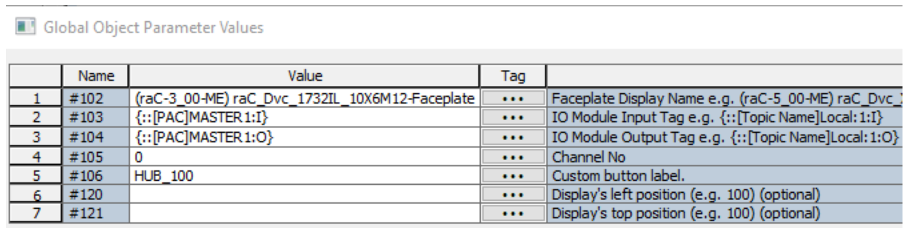
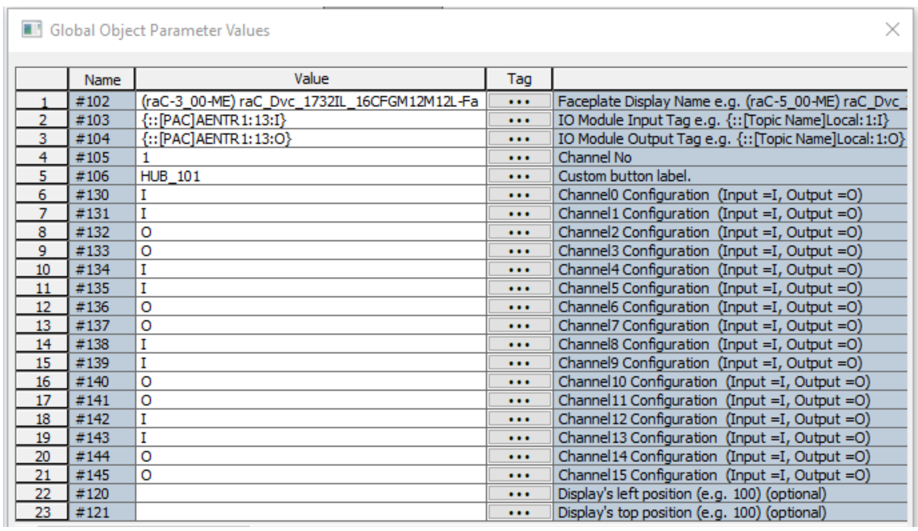
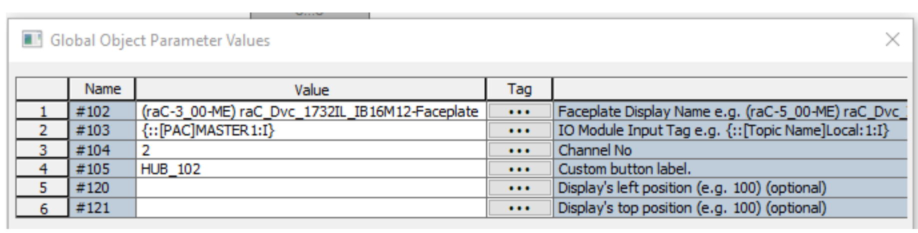
Graphic Symbols

Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays.

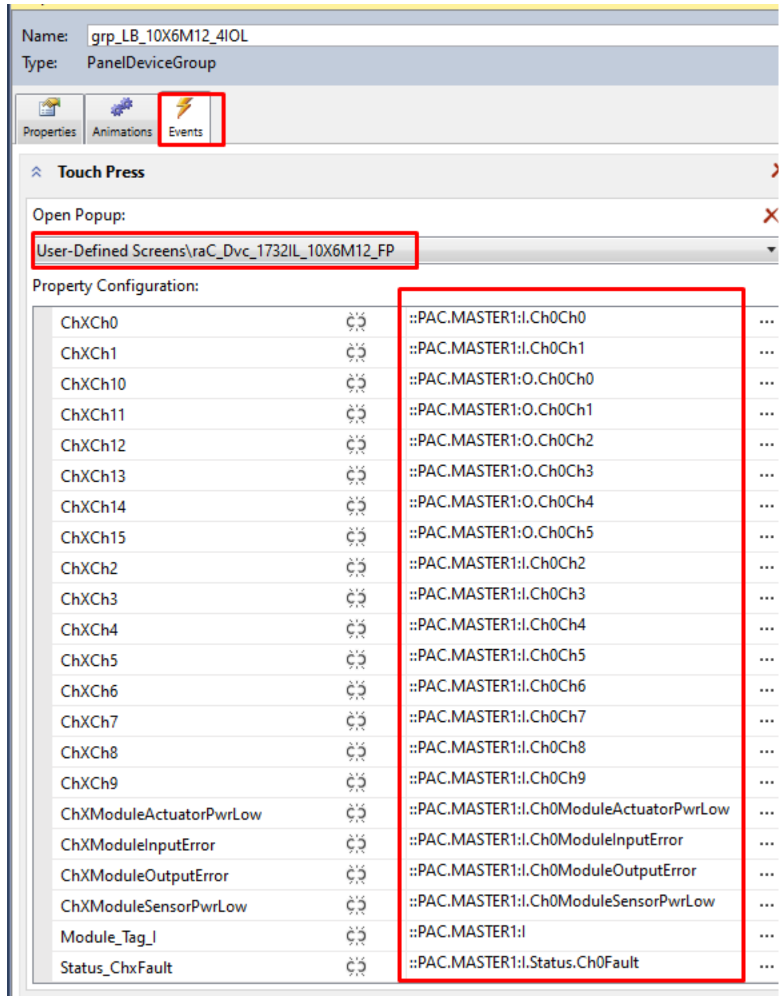
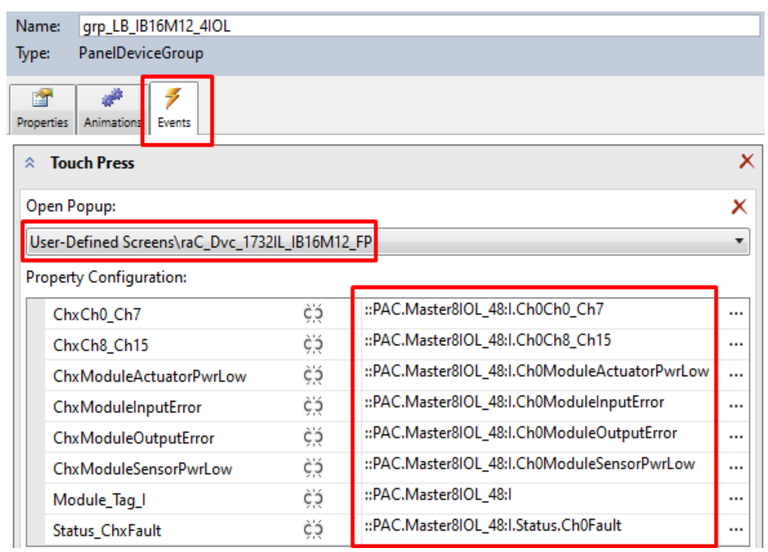
FactoryTalk View ME/SE Graphic Symbols

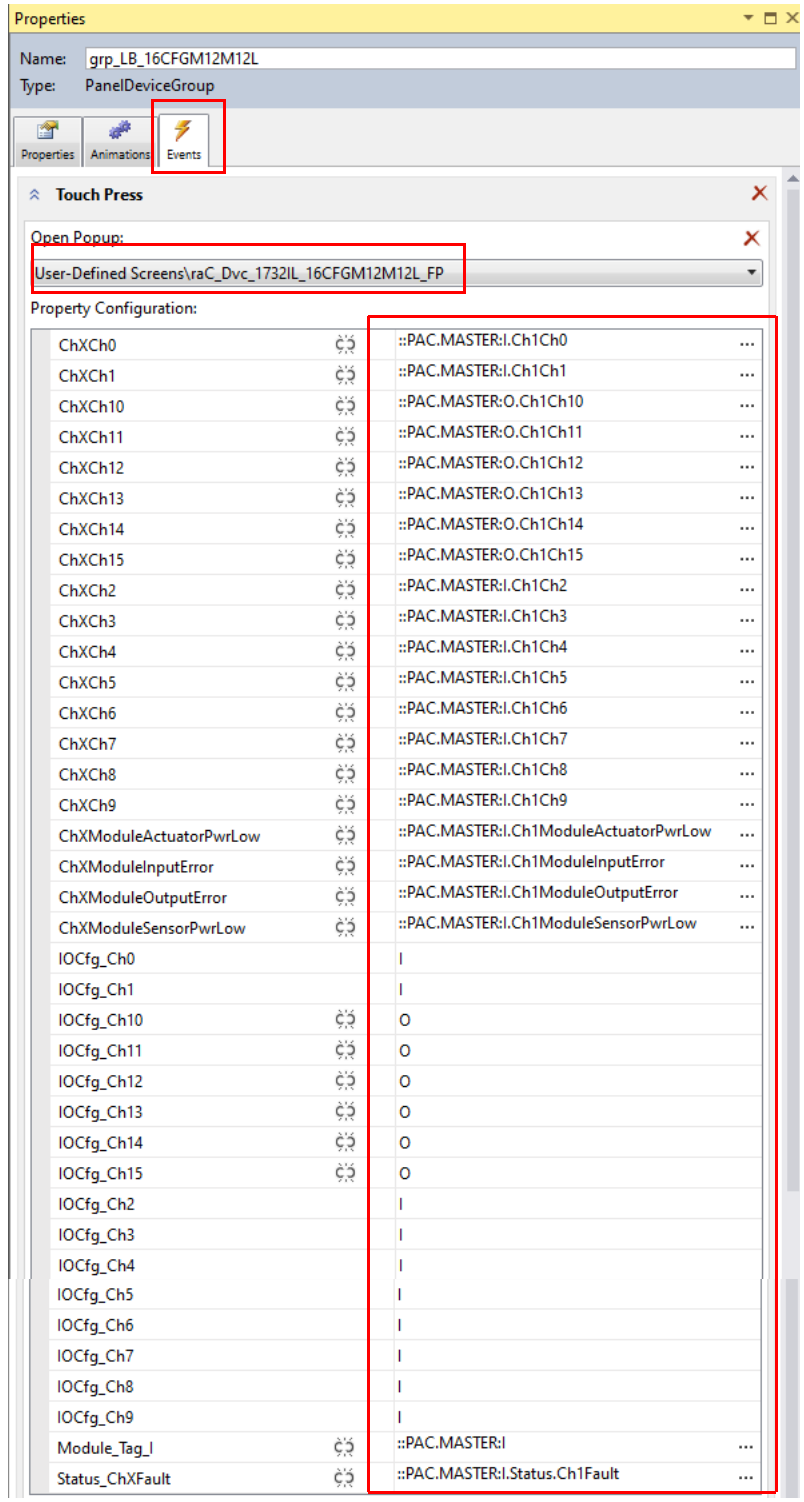
Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GO_LaunchFP10X6HUB		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #106.	#102: Faceplate Display Name e.g. (raC-3_00-ME) raC_Dvc_XXXX_XXXX-Faceplate or (raC-3_00-SE) raC_Dvc_XXXX_XXXX-Faceplate #103: IO Module Input Tag e.g. {::[Topic Name]Local:1:I} #104: IO Module Output Tag e.g. {::[Topic Name]Local:1:O} #105: Channel No e.g. (0….7) #106: Custom button label e.g.g (HUB_100) #120: Display's left position (e.g. 100) (optional) #121: Display's top position (e.g. 100) (optional)
GO_LaunchFP16CFGHUB		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #106.	#102: Faceplate Display Name e.g. (raC-3_00-ME) raC_Dvc_XXXX_XXXX-Faceplate or (raC-3_00-SE) raC_Dvc_XXXX_XXXX-Faceplate #103: IO Module Input Tag e.g. {::[Topic Name]Local:1:I} #104: IO Module Output Tag e.g. {::[Topic Name]Local:1:O} #105: Channel No e.g. (0….7) #106: Custom button label e.g.g (HUB_101) #130: Channel0 Configuration (Input =I, Output =O) #131: Channel1 Configuration (Input =I, Output =O) #132: Channel2 Configuration (Input =I, Output =O) #133: Channel3 Configuration (Input =I, Output =O) #134: Channel4 Configuration (Input =I, Output =O) #135: Channel5 Configuration (Input =I, Output =O) #136: Channel6 Configuration (Input =I, Output =O) #137: Channel7 Configuration (Input =I, Output =O) #138: Channel8 Configuration (Input =I, Output =O) #139: Channel9 Configuration (Input =I, Output =O) #140: Channel10 Configuration (Input =I, Output =O) #141: Channel11 Configuration (Input =I, Output =O) #142: Channel12 Configuration (Input =I, Output =O) #143: Channel13 Configuration (Input =I, Output =O) #144: Channel14 Configuration (Input =I, Output =O) #145: Channel15 Configuration (Input =I, Output =O) #120: Display's left position (e.g. 100) (optional) #121: Display's top position (e.g. 100) (optional)
GO_LaunchFPIB16HUB		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #104.	#102: Faceplate Display Name e.g. (raC-3_00-ME) raC_Dvc_XXXX_XXXX-Faceplate or raC-3_00-SE) raC_Dvc_XXXX_XXXX-Faceplate #103: IO Module Input Tag e.g. {::[Topic Name]Local:1:I} #104: Channel No e.g. (0….7) #105: Custom button label e.g.g (HUB_102) #120: Display's left position (e.g. 100) (optional) #121: Display's top position (e.g. 100) (optional)

Configuring FactoryTalk View Objects

<table>
<tr><th>Graphic Symbol Name</th><th>Graphic Symbol</th><th>Configured Parameter</th></tr>
<tr><td>GO_LaunchFP10X6HUB</td><td></td><td>This IO-Link Hub is connected to the Channel 0 of 1732E-8IOL Master module named "MASTER1"

Global Object Parameter Values
<table>
<tr><th></th><th>Name</th><th>Value</th><th>Tag</th><th></th></tr>
<tr><td>1</td><td>#102</td><td>(raC-3_00-ME) raC_Dvc_1732IL_10X6M12-Faceplate</td><td>...</td><td>Faceplate Display Name e.g. (raC-5_00-ME) raC_Dvc_</td></tr>
<tr><td>2</td><td>#103</td><td>{::[PAC]MASTER1:I}</td><td>...</td><td>IO Module Input Tag e.g. {::[Topic Name]Local:1:I}</td></tr>
<tr><td>3</td><td>#104</td><td>{::[PAC]MASTER1:O}</td><td>...</td><td>IO Module Output Tag e.g. {::[Topic Name]Local:1:O}</td></tr>
<tr><td>4</td><td>#105</td><td>0</td><td>...</td><td>Channel No</td></tr>
<tr><td>5</td><td>#106</td><td>HUB_100</td><td>...</td><td>Custom button label.</td></tr>
<tr><td>6</td><td>#120</td><td></td><td>...</td><td>Display's left position (e.g. 100) (optional)</td></tr>
<tr><td>7</td><td>#121</td><td></td><td>...</td><td>Display's top position (e.g. 100) (optional)</td></tr>
</table></td></tr>
<tr><td>GO_LaunchFP16CFGHUB</td><td></td><td>This IO-Link Hub is connected to the Channel 1 of 1734-4IOL Master module installed in the "Slot 13" of the communication adapter module named "AENTR1"

Global Object Parameter Values
<table>
<tr><th></th><th>Name</th><th>Value</th><th>Tag</th><th></th></tr>
<tr><td>1</td><td>#102</td><td>(raC-3_00-ME) raC_Dvc_1732IL_16CFGM12M12L-Fa</td><td>...</td><td>Faceplate Display Name e.g. (raC-5_00-ME) raC_Dvc_</td></tr>
<tr><td>2</td><td>#103</td><td>{::[PAC]AENTR1:13:I}</td><td>...</td><td>IO Module Input Tag e.g. {::[Topic Name]Local:1:I}</td></tr>
<tr><td>3</td><td>#104</td><td>{::[PAC]AENTR1:13:O}</td><td>...</td><td>IO Module Output Tag e.g. {::[Topic Name]Local:1:O}</td></tr>
<tr><td>4</td><td>#105</td><td>1</td><td>...</td><td>Channel No</td></tr>
<tr><td>5</td><td>#106</td><td>HUB_101</td><td>...</td><td>Custom button label.</td></tr>
<tr><td>6</td><td>#130</td><td>I</td><td>...</td><td>Channel0 Configuration (Input =I, Output =O)</td></tr>
<tr><td>7</td><td>#131</td><td>I</td><td>...</td><td>Channel1 Configuration (Input =I, Output =O)</td></tr>
<tr><td>8</td><td>#132</td><td>O</td><td>...</td><td>Channel2 Configuration (Input =I, Output =O)</td></tr>
<tr><td>9</td><td>#133</td><td>O</td><td>...</td><td>Channel3 Configuration (Input =I, Output =O)</td></tr>
<tr><td>10</td><td>#134</td><td>I</td><td>...</td><td>Channel4 Configuration (Input =I, Output =O)</td></tr>
<tr><td>11</td><td>#135</td><td>I</td><td>...</td><td>Channel5 Configuration (Input =I, Output =O)</td></tr>
<tr><td>12</td><td>#136</td><td>O</td><td>...</td><td>Channel6 Configuration (Input =I, Output =O)</td></tr>
<tr><td>13</td><td>#137</td><td>O</td><td>...</td><td>Channel7 Configuration (Input =I, Output =O)</td></tr>
<tr><td>14</td><td>#138</td><td>I</td><td>...</td><td>Channel8 Configuration (Input =I, Output =O)</td></tr>
<tr><td>15</td><td>#139</td><td>I</td><td>...</td><td>Channel9 Configuration (Input =I, Output =O)</td></tr>
<tr><td>16</td><td>#140</td><td>O</td><td>...</td><td>Channel10 Configuration (Input =I, Output =O)</td></tr>
<tr><td>17</td><td>#141</td><td>O</td><td>...</td><td>Channel11 Configuration (Input =I, Output =O)</td></tr>
<tr><td>18</td><td>#142</td><td>I</td><td>...</td><td>Channel12 Configuration (Input =I, Output =O)</td></tr>
<tr><td>19</td><td>#143</td><td>I</td><td>...</td><td>Channel13 Configuration (Input =I, Output =O)</td></tr>
<tr><td>20</td><td>#144</td><td>O</td><td>...</td><td>Channel14 Configuration (Input =I, Output =O)</td></tr>
<tr><td>21</td><td>#145</td><td>O</td><td>...</td><td>Channel15 Configuration (Input =I, Output =O)</td></tr>
<tr><td>22</td><td>#120</td><td></td><td>...</td><td>Display's left position (e.g. 100) (optional)</td></tr>
<tr><td>23</td><td>#121</td><td></td><td>...</td><td>Display's top position (e.g. 100) (optional)</td></tr>
</table></td></tr>
<tr><td>GO_LaunchFPIB16HUB</td><td></td><td>This IO-Link Hub is connected to the Channel 2 of 1732E-8IOL Master module named "MASTER1"

Global Object Parameter Values
<table>
<tr><th></th><th>Name</th><th>Value</th><th>Tag</th><th></th></tr>
<tr><td>1</td><td>#102</td><td>(raC-3_00-ME) raC_Dvc_1732IL_IB16M12-Faceplate</td><td>...</td><td>Faceplate Display Name e.g. (raC-5_00-ME) raC_Dvc_</td></tr>
<tr><td>2</td><td>#103</td><td>{::[PAC]MASTER1:I}</td><td>...</td><td>IO Module Input Tag e.g. {::[Topic Name]Local:1:I}</td></tr>
<tr><td>3</td><td>#104</td><td>2</td><td>...</td><td>Channel No</td></tr>
<tr><td>4</td><td>#105</td><td>HUB_102</td><td>...</td><td>Custom button label.</td></tr>
<tr><td>5</td><td>#120</td><td></td><td>...</td><td>Display's left position (e.g. 100) (optional)</td></tr>
<tr><td>6</td><td>#121</td><td></td><td>...</td><td>Display's top position (e.g. 100) (optional)</td></tr>
</table></td></tr>
</table>

Studio 5000 View Designer Graphic Symbols

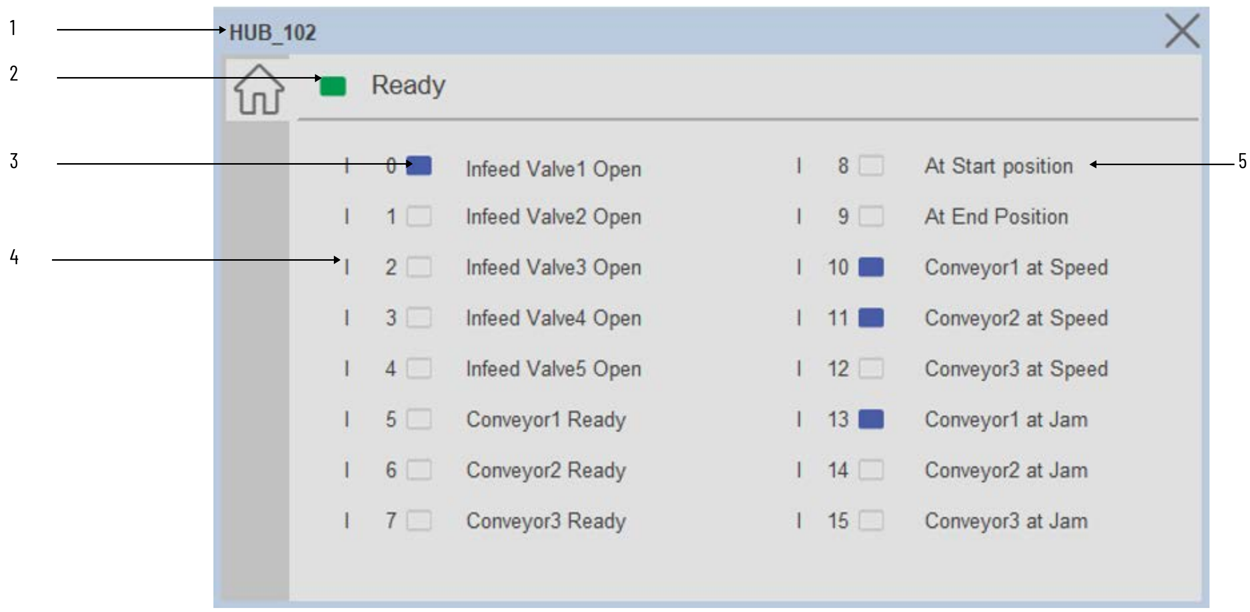
Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
10X6M12		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	This IO-Link Hub is connected to the Channel 0 of 1732E-8IOL Master module named *"MASTER1"* 
IB16M12		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	This IO-Link Hub is connected to the Channel 0 of 1732E-8IOL Master module named *"Master8IOL_48"* 

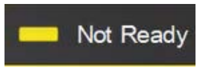
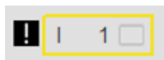
Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
16CFGM12M12L		The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	This IO-Link Hub is connected to the Channel 1 of 1732E-8IOL Master module named *"MASTER"* 

Faceplates

1732IL_IB16M12

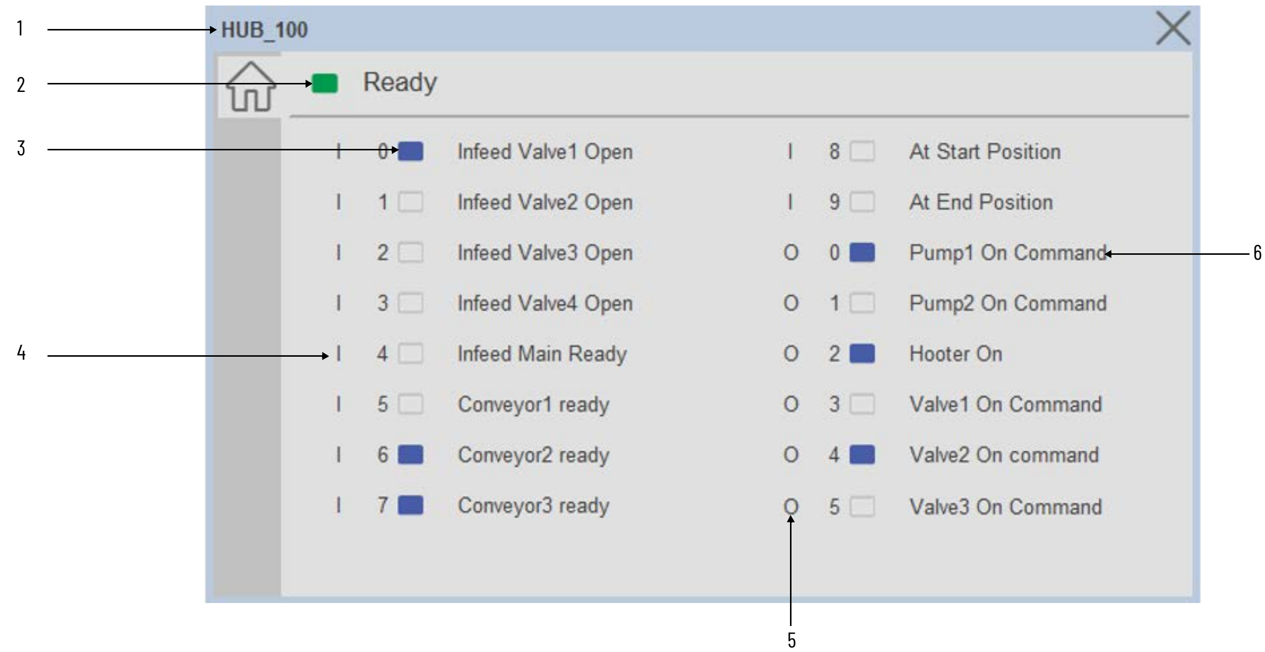
The 1732IL_IB16 is the 16 Channel Digital Input IO-Link Hub. The main tab of the faceplate is the Home tab, which displays information regarding the Input channels. The banner at the top of the faceplate displays module status and fault information.

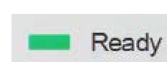
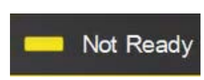


Item	Description	
1	Faceplate title bar	#106: Custom button label e.g. (HUB_100)
2	Module ready status.	
	GREEN = Ready	
	YELLOW = Module Fault/Not Ready	
3	Channel Status	
	BLUE = Active/High	
	GREY = Inactive/Low	
	Faulted Condition	
4	I: Digital Input Channel	
6	Channel description: Ch.@Description	

1732IL_10X6M12

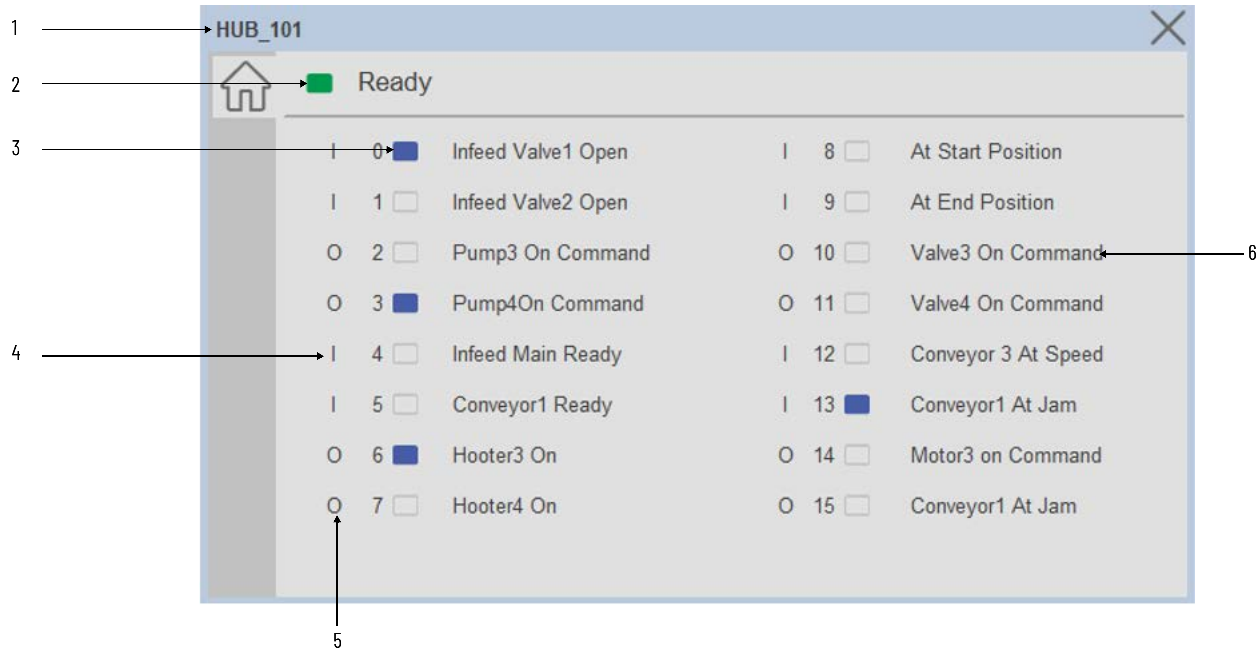
The 1732IL_10X6M12 is the 10 Channel Digital Input, 6 Channel Digital Output IO-Link Hub. The main tab of the faceplate is the Home tab, which displays information regarding the I/O channels. The banner at the top of the faceplate displays module status and fault information.

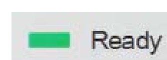
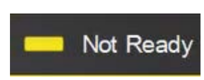


Item	Description	
1	Faceplate title bar	
2	Module ready status.	
	GREEN = Ready	
	YELLOW = Module Fault/Not Ready	
3	Channel Status	
	BLUE = Active/High	
	GREY = Inactive/Low	
	Faulted Condition	
4	I: Digital Input Channel	
5	O: Digital Output Channel	
6	Channel description: Ch.@Description	

1732IL-16CFGM12M12L

The 1732IL-16CFGM12M12L is the 16 Channel Configurable Digital Input / Output IO-Link Hub. The main tab of the faceplate is the Home tab, which displays information regarding the I/O channels. The banner at the top of the faceplate displays module status and fault information.



Item	Description	
1	Faceplate title bar	
2	Module ready status.	
	GREEN = Ready	
	YELLOW = Module Fault/Not Ready	
3	Channel Status	
	BLUE = Active/High	
	GREY = Inactive/Low	
	Faulted Condition	
4	I: Digital Input Channel	
5	O: Digital Output Channel	
6	Channel description: Ch.@Description	

IO-Link Master (raC_Dvc_1734_4IOLMaster, raC_Dvc_1732E_8IOLMaster)

Overview

The IO-Link Master device object (raC_Dvc_1734_4IOLMaster, raC_Dvc_1732E_8IOLMaster) includes HMI faceplate's which displays device information including:

- Sensor Trigger data
- Sensor Locate & Navigation
- Event & Time

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_*IO-Link_Master*_Objects_Faceplate.MP4"

Primary device object configuration functions include:

- **Locate:** This function helps to locate the sensors using the device's LED in large machines where there are several sensors close to each other.
- **Navigation:** This is used to Navigate the sensor object with respective to that channel.(Applicable for FTView ME/SE Faceplate & Not for View Designer Faceplate)

Functional Description

The IO-Link Master Device Objects:

- Collect, Process and Deliver Data between Smart Devices and Application Logic
- Provide Device Status & Diagnostics Faceplate's 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 faceplate's. The revision number (e.g. 1.01) 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/* folder in the library. IO-Link Master device is supplied with two versions of Add-On Instructions (AOI) and Rung import files - one for compatibility with 1734-4IOL Master Module and another for compatibility with 1732E-8IOL Master Module. You must select the appropriate AOI for the master module being used.

Device/Item	Compatible IO-Link Master	Add-On Instruction	Rung Import
IO-Link Master	POINT I/O 1734-4IOL	raC_Dvc_1734_4IOLMaster_3.01_AOI.L5X	raC_Dvc_1734_4IOLMaster_3.01_RUNG.L5X
	ArmorBlock 1732E-8IOLM12R	raC_Dvc_1732E_8IOLMaster_3.01_AOI.L5X	raC_Dvc_1732E_8IOLMaster_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
1734-4IOL	Display	(raC-3_01-ME) raC_Dvc_1734_4IOL-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_1734_4IOL-Faceplate.gfx
1732E-8IOL	Display	(raC-3_01-ME) raC_Dvc_1732E_8IOL-Faceplate.gfx	(raC-3_01-SE) raC_Dvc_1732E_8IOL-Faceplate.gfx
Graphic Symbols	Global Object	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx
Toolbox	Global Object	(raC-3-ME) Toolbox - IO-Link Device.ggfx	(raC-3-SE) Toolbox - IO-Link 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
IO-Link Master	(raC-3_01-VD) raC_Dvc_IOLink.vpd

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:

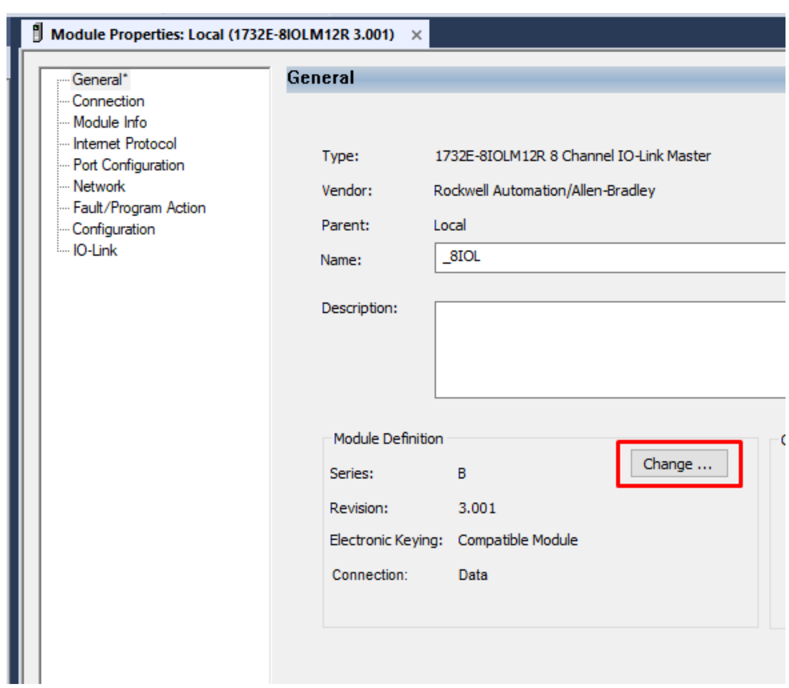
Implementation Object	Compatible IO-Link Master	Asset Control File (.HSL4)	Device File (.HSL4)
IO-Link Master	POINT I/O 1734-4IOL	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_1734_4IOL_Master_(3.1)	(RA-LIB)_Device_Module_IO-Link_1734-4IOL_(3.1)
	ArmorBlock 1732E-8IOLM12R	(RA-LIB)_Device_Asset-Control_IO-Link_raC_Dvc_1732E_8IOL_Master_(3.1)	(RA-LIB)_Device_Module_IO-Link_1732E-8IOLM12R_(3.1)

Device Definition

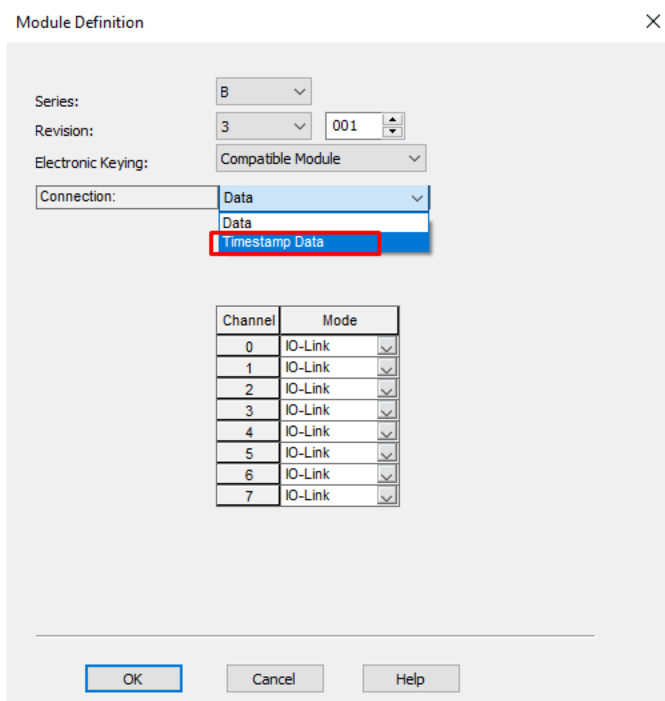
The device must be configured with the correct device definition. Proper device configuration enables the required device data to pass information from the device into the add-on instruction.

- When using 1732E-8IOLM12R/B 8 Channel IO-Link Master, its required to change Data Connection in the Module Definition.

1. Click on Change...



2. Click on *Connection* and select the *Timestamp Data*



Operations

The IO-Link Device objects provide only physical operation mode. There is no virtual device mode offered.

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 (raC_Dvc_1734_4IOLMaster, raC_Dvc_1732E_8IOLMaster)

InOut	Function / Description	DataType
Cfg_C	Device Object Configuration	raC_UDT_ItfAD_4IOL_Master_Cfg / raC_UDT_ItfAD_8IOL_Master_Cfg
Inp_I	Device Object Inputs	raC_UDT_ItfAD_4IOL_Master_Inp / raC_UDT_ItfAD_4IOL_Master_Inp
Ref_Ctrl_Inf	Sensor Type Information Interface	raC_UDT_ItfAD_IOLinkSensor_Inf
Ref_Ctrl_Itf	Device Command, Status Information Interface	raC_UDT_ItfAD_IOLinkDevices
Ref_Module	Reference to module in I/O tree	MODULE

Output Data (raC_Dvc_1734_4IOLMaster, raC_Dvc_1732E_8IOLMaster)

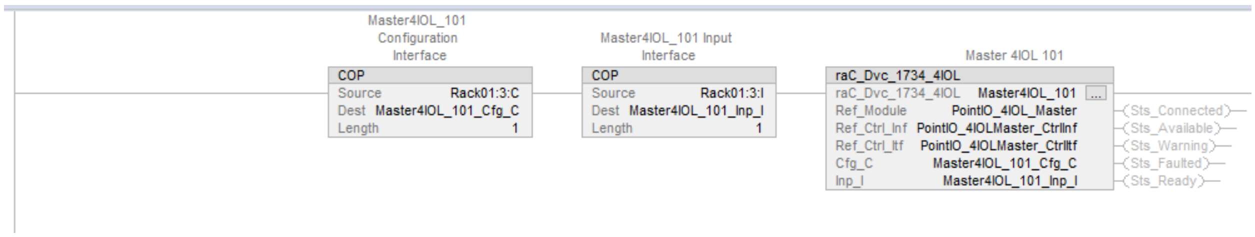
Output	Function/Descritpion	DataType
Sts_Active	Device active status: 1 = output power structure is active	BOOL
Sts_Available	Device is available for interaction with user code	BOOL
Sts_Connected	Device is connected to the Programmable Automation Controller	BOOL
Sts_Faulted	Device faulted status: 1 = an active fault exists	BOOL
Sts_Ready	Device is ready to perform primary function	BOOL
Sts_Warning	Device warning status: 1 = an active alarm or warning exists	BOOL

Programming Example

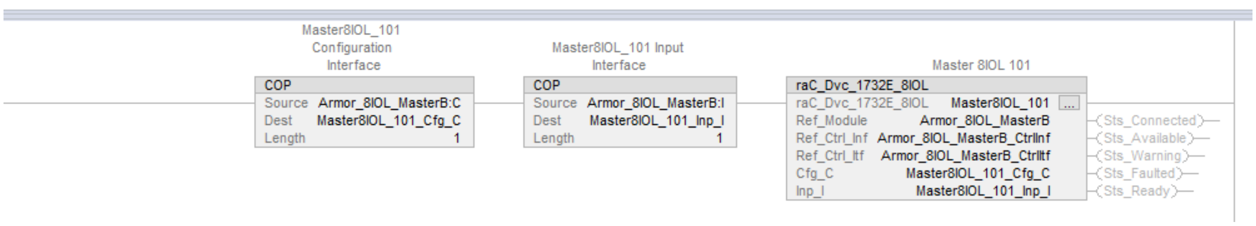
Fully configured device on a rung is provided below for reference.

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 following example uses the 4IOL IO-Link Master device object connected with the module POINT I/O 1734-4IOL IO-Link Master module named *PointIO_4IOL_Master* in slot #3 of a POINT I/O adapter named *Rack01*.



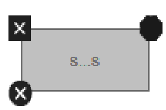
The following example uses the IO-Link Master device object connected to ArmorBlock 1732E-8IOLM12R IO-Link Master module in named *Armor_8IOL_MasterB*.



Graphic Symbols

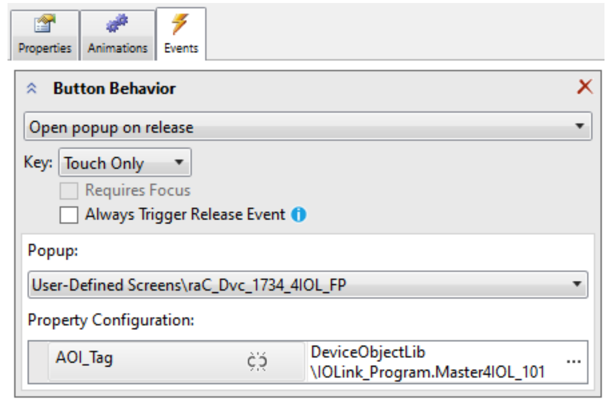
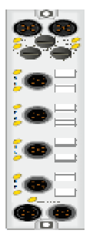
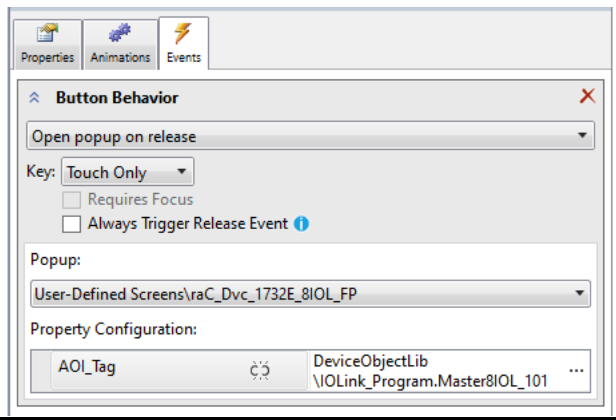
Graphic Symbols are used as launch buttons within HMI applications to open up faceplate displays. See Basic Launch Button Attributes section for details on configuration and indicators.

FactoryTalk View ME/SE Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Global Object Parameter Values
GO_LaunchFPMaster		Faceplate navigation button with string tag label. This launch button graphic object allows the user to navigate to the device object faceplate. The text on the button face is set to the parameter #104.	#102: AOI Backing Tag Instance (e.g.{::[PAC]Program::IOLinkProgram._InstanceName}) #104: Custom button label. Leave blank to use Tag.@Description #110: CH0 AOI Backing Tag (Enter 0, If there is no sensor connected to the channel) #111: CH1 AOI Backing Tag (Enter 0, If there is no sensor connected to the channel) #112: CH2 AOI Backing Tag (Enter 0, If there is no sensor connected to the channel) #113: CH3 AOI Backing Tag (Enter 0, If there is no sensor connected to the channel) #114: CH4 AOI Backing Tag (Enter 0, If there is no sensor connected to the channel) #115: CH5 AOI Backing Tag (Enter 0, If there is no sensor connected to the channel) #116: CH6 AOI Backing Tag (Enter 0, If there is no sensor connected to the channel) #117: CH7 AOI Backing Tag (Enter 0, If there is no sensor connected to the channel) #120: Display's left position (e.g. 100) (optional) #121: Display's top position (e.g. 100) (optional)

Note that for unused channels enter 0 value.

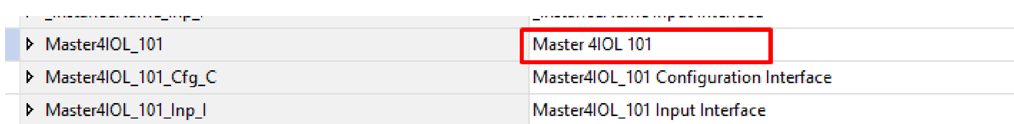
Studio 5000 View Designer Graphic Symbols

Graphic Symbol Name	Graphic Symbol	Description	Property Configuration
Launch 4IOL	4IOL 	The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	
Launch 8IOL	8IOL 	The supplied launch button in View Designer is used to navigate to the faceplate in a user application.	

Faceplates

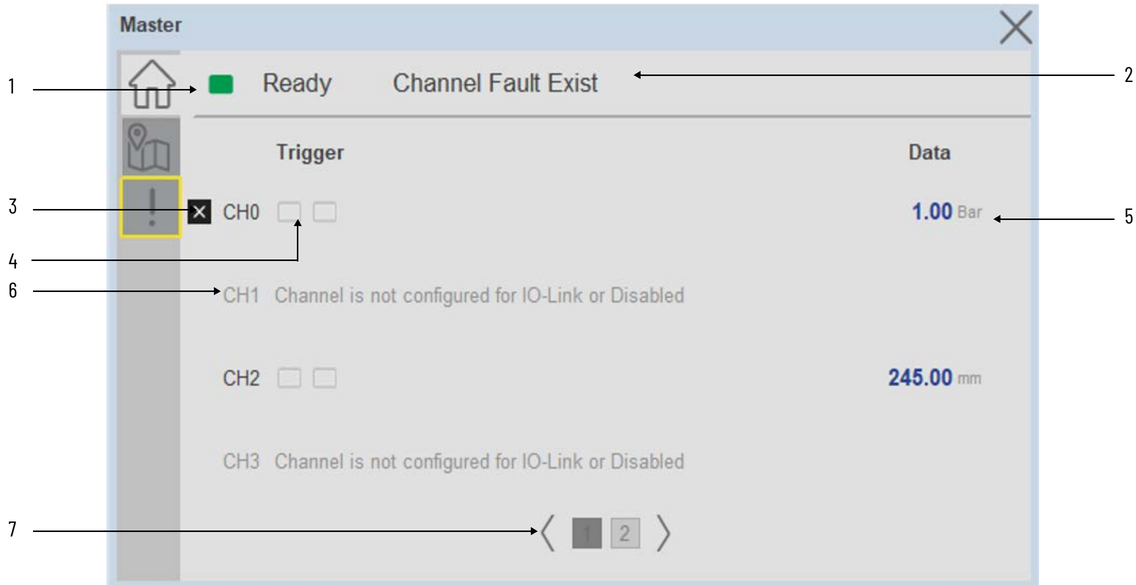
There are basic faceplate attributes that are common across all instructions. See Basic Faceplate Attributes on page 30.

The faceplate title is linked to *_InstanceName.@description*, the *.@description* extended tag property of the Add-On Instruction instance. This is user-configurable from controller/program tags in Studio 5000 Logix Designer.



Home

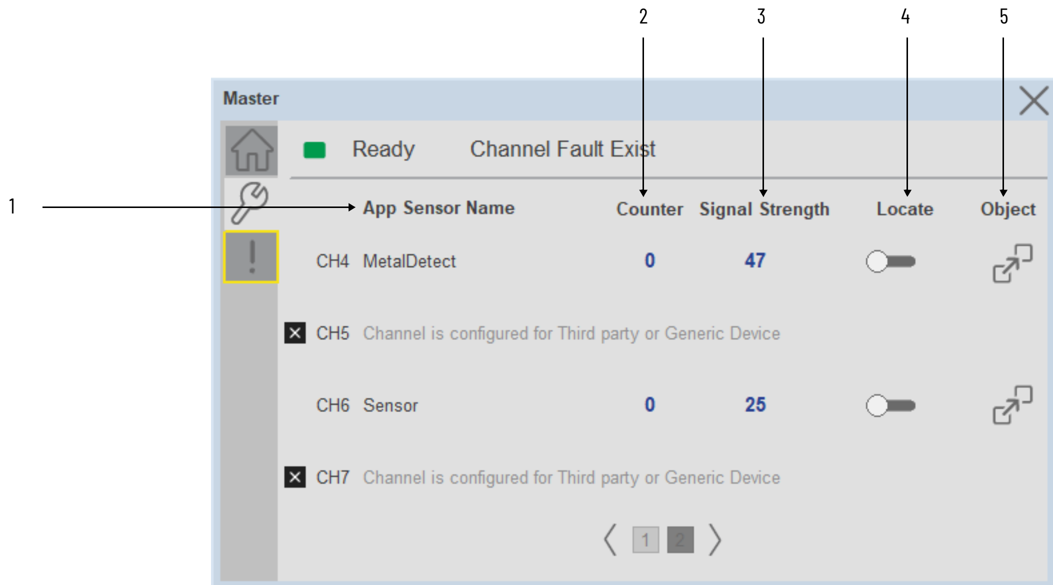
The Home tab is the main tab of the faceplate. It provides the status of the IO-Link device along with sensor process data.



Item	Description
1	Banner- Ready Status
2	Channel Fault - There is a fault one or more channel
3	Channel Faulted
4	Trigger Status OFF (0) = Gray LED ON (1) = Blue LED Depending on type of sensor connected to channel the no. of trigger signal are appear. Total 16 Trigger available on display.
5	Process Data: Displays the process value and its units.
6	Channel is not configured for IO-Link or Disabled
7	Navigation Page 1- Ch0 to Ch3. Page 2- Ch4 to Ch7

Located

The Locate tab is the second tab of the faceplate. It provides the each channels App Sensor Name, Counter, Signal Strength, Location and Navigation to the respective IO-Link device object.

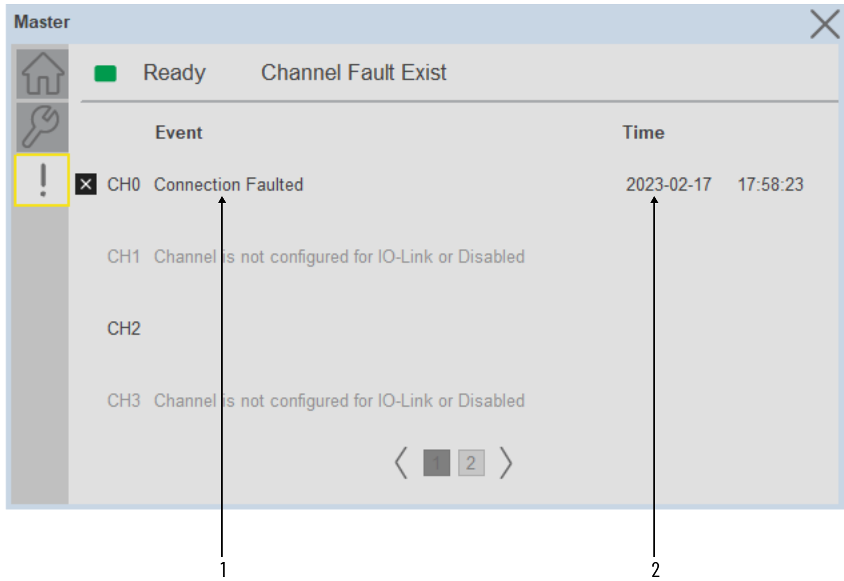


Item	Description
1	Application Specific Name - Read from device
2	Counter- Displays the sensor counter value
3	Signal Strength- Displays the Signal Strength Value
4	Locate toggle switch Locate the sensor in large machines where there are several sensors close to each other. When Located, the sensor user interface (green and orange LEDs) start flashing synchronously until the operator disables this function
5	Object: Navigate to the Sensor Object for more detailed information

The View Designer faceplate object lacks the capability of Object Navigation.

Fault Warning Tab

The Fault Warning tab displays information of first fault with time stamp captured for each IO-Link Channel device.



Item	Description
1	Last fault description
2	Last fault Time captured

Application Code Manager

IO-Link Device Library objects can be set-up and configured using Studio 5000 Application Code Manager.

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

Definition Objects: raC_Dvc_1734_4IOLMaster, raC_Dvc_1732E_8IOLMaster

This object contains the AOI definition and used as linked library to implement object. There is one definition and per add-on instruction to support each IO-Link Master Module. 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 Objects: raC_LD_Dvc_46CLR_4IOL, raC_LD_Dvc_46CLR_8IOL

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
MasterName	MasterName	[MasterName]	Module	Select the IO-Link master module. If connecting to a non-library object module, enter the name of the master only. 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.

Note that if the tag names are manually entered or not linked to input channel tags a red 'X' will be shown beside the parameter. This is acceptable and the program can still be generated.

Linked Libraries

Link Name	Catalog Number	Revision	Solution	Category
raC_Dvc_1734_4IOLMater	raC_Dvc_1734_4IOLMaster	3.1	(RA-LIB) Device	IO-Link
raC_Dvc_1732E_8IOLMaster	raC_Dvc_1732E_8IOLMaster	3.1	(RA-LIB) Device	IO-Link

Configured HMI Content

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

Attachments

Name	Description	File Name	Extraction Path
V3_raC_Dvc_Global	Graphic Symbols ME	(raC-3-ME) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewME\Global Object - ggfx
V3_raC_Dvc_Global	Graphic Symbols SE	(raC-3-SE) Graphic Symbols - IO-Link Device.ggfx	{ProjectName}\Visualization\FTViewSE\Global Object - ggfx
V3_raC_Dvc_1734_4IOLMaster	Faceplate ME	(raC-3_xx-ME) raC_Dvc_1734-4IOLMaster_Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_raC_Dvc_1734_4IOLMaster	Faceplate SE	(raC-3_xx-SE) raC_Dvc_1734-4IOLMaster_Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_raC_Dvc_1732E_8IOLMaster	Faceplate ME	(raC-3_xx-ME) raC_Dvc_1732E-8IOLMaster_Faceplate.gfx	{ProjectName}\Visualization\FTViewME\Displays - gfx
V3_raC_Dvc_1732E_8IOLMaster	Faceplate SE	(raC-3_xx-SE) raC_Dvc_1732E-8IOLMaster_Faceplate.gfx	{ProjectName}\Visualization\FTViewSE\Displays - gfx
V3_raC_Dvc_IOLink	View Designer	(raC-3_xx-VD) raC_Dvc_IOLink.vpd	{ProjectName}\Visualization\ViewDesigner - vpd
V3_RM_raC_Dvc_IO_Link	Reference Manual	DEVICE-RM300B-EN-P.pdf	{ProjectName}\Documentation
V3_IO_Link_Images	HMI Image Set	HMI FactoryTalk View Images - png.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, and product notification updates.	rok.auto/support
Knowledgebase	Access Knowledgebase articles.	rok.auto/knowledgebase
Local Technical Support Phone Numbers	Locate the telephone number for your country.	rok.auto/phonesupport
Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	rok.auto/pcdc

Documentation Feedback

Your comments help us serve your documentation needs better. If you have any suggestions on how to improve our content, complete the form at rok.auto/docfeedback.

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 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 Uygundur

Connect with us.

rockwellautomation.com — expanding **human possibility**™

AMERICAS: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
EUROPE/MIDDLE EAST/AFRICA: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
ASIA PACIFIC: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Publication DEVICE-RM300B-EN-P - August 2023
Supersedes Publication RAC-RM300A-EN-P - August 2023