TL50 Pro Operational Mode Add-On Instruction Guide
2/20/2020

This document covers the installation and use of an Add-On Instruction (AOI) for the Logix Designer software package from Rockwell Automation. This AOI handles acyclic IO-Link commands from an IO-Link Master to a TL50 Pro IO-Link tower light, allowing for the adjustment of the Operational Mode setting.

Components

Banner _IOLM_TL50.L5X

UDT's Packaged with the AOI

Banner_TL50_MSG_Data

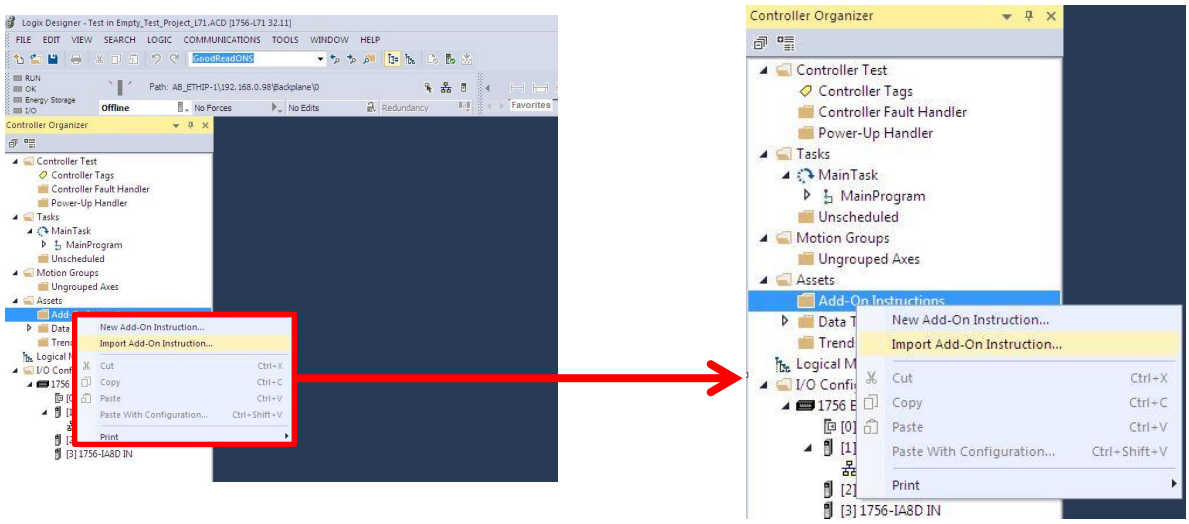
Contents

1. Installation Process

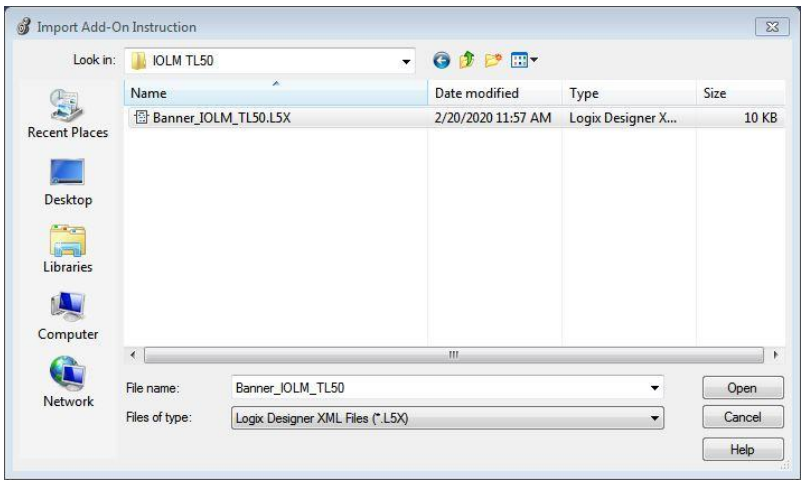
This section describes how to install the AOI in Logix Designer software.

1. Open a project.

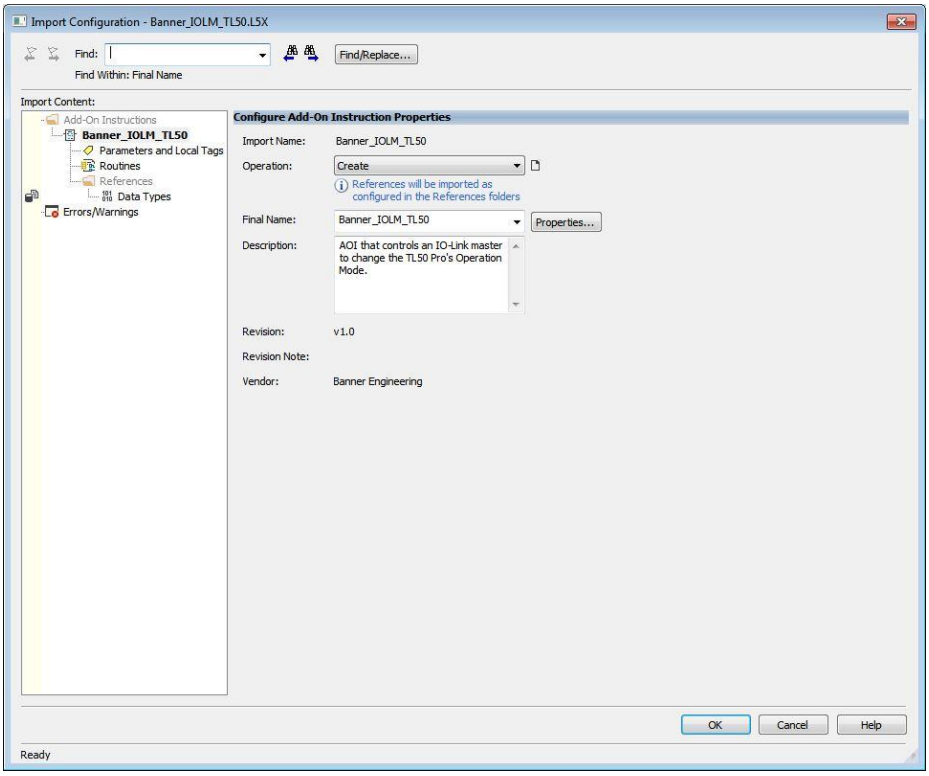
2. In the Controller Organizer window, right-click on the Add-On Instruction folder. Select the Import Add-On Instruction option.

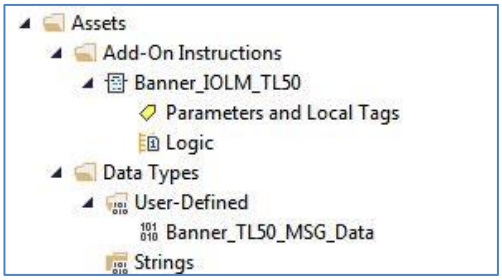


3. Navigate to the correct file location and select the AOI to be installed. In this example the “Banner_ IOLM_TL50.L5X” file will be selected. Click the Open button.



4. The Import Configuration window will pop up. The default selection will create all of the necessary items for the AOI. Click the OK button to complete the import process.





5. The AOI is added to the Controller Organizer window and should look similar to the picture at left.

6. AOI installation into the Logix Designer software complete.

2. Configuring the IO-Link Master

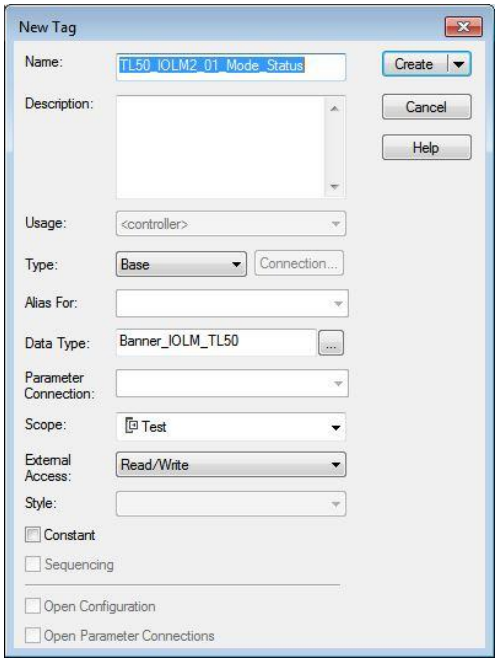
Make an EtherNet/IP connection to the IO-Link Master (Allen Bradley, Balluff, Comtrol, IFM, or Turck).

Create an Ethernet communications module for the IO-Link Master device. In this example the EDS file was used, and the connection was named “IOLM2”. The controller tags include Input (I) and Output (O) Assembly Instances. Each Assembly has a corresponding tag array. Creating this Class 1 EtherNet/IP implicit IO connection will provide the PLC access to the IO-Link sensor Process Data. Each port on the IO-Link Master is given a dedicated group of I and O registers. See the relevant IO-Link Master User’s Guide for more information. This connection will also provide a communications pathway for the explicit messages used by the AOI to send IO-Link information to and from the Banner devices.

3. Configuring the Banner IO-Link TL50 AOI

1. Add the “Banner_IOLM_TL50_v2” AOI to your ladder logic program on the same rung as an “Examine On” instruction. For each of the question marks shown in the instruction we need to create and link a new tag array. The AOI includes a new type of User Defined Tag (UDT): a custom array of tags meant specifically for this AOI.

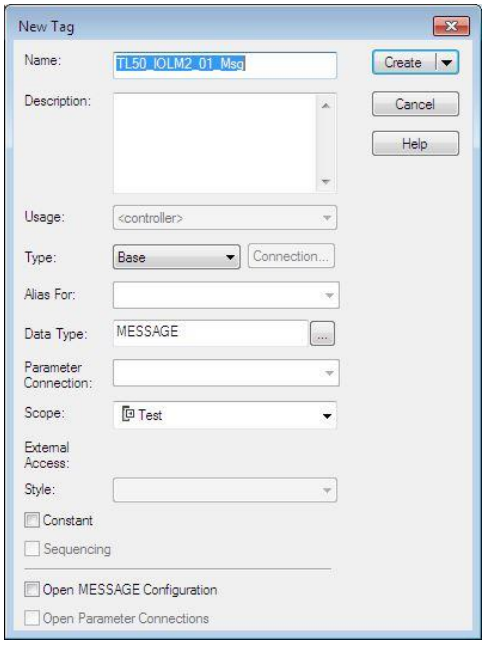
2. In the AOI, right-click on the question mark on the line labeled “Banner_IOLM_TL50_v2”. Click New Tag. In this example, we’ll use the name “IOLM2_Status”. The example naming convention accounts for this being the #2 IO-Link Master in our program. More masters could be named IOLM1, IOLM3, etc.



The “EnableIn” and “EnableOut” variables are ladder logic rung status bits automatically added to all AOIs.

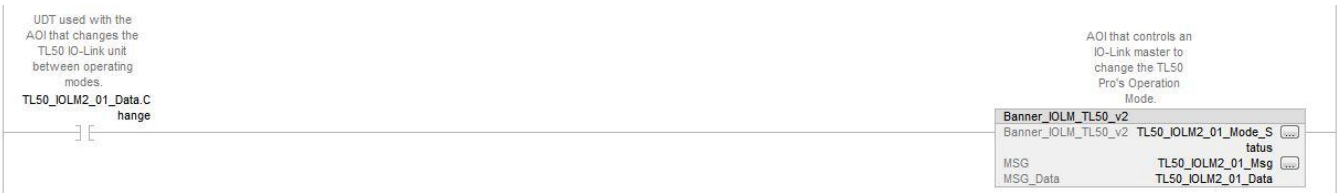
TL50_IOLM2_01_Mode_Status	{...}
TL50_IOLM2_01_Mode_Status.EnableIn	0
TL50_IOLM2_01_Mode_Status.EnableOut	0
TL50_IOLM2_01_Mode_Status.Port	0
TL50_IOLM2_01_Mode_Status.Mode	0
TL50_IOLM2_01_Mode_Status.IOL_Master	0
TL50_IOLM2_01_Mode_Status.Pass	0
TL50_IOLM2_01_Mode_Status.Fail	0
TL50_IOLM2_01_Mode_Status.Error	0

3. Now we set up the Message used to read and write to devices connected to this IO-Link Master. Right click on the question mark for the “MSG” line in the AOI and choose New Tag. In this example we’ll use the tag name “TL50_IOLM2_01_Msg”. Click Create.

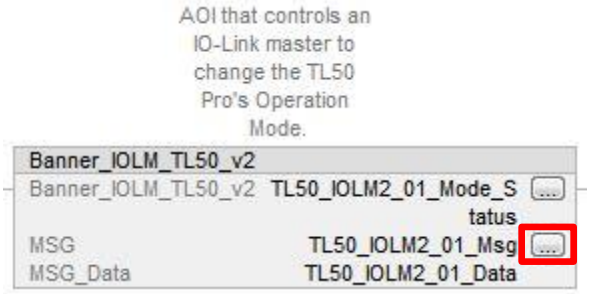


4. Now create a new tag array for the “MSG_Data” line in the AOI. Here we used the name “TL50_IOLM2_01_Data”. The tags created here will store the data being transferred back and forth between the IO-Link Master and the PLC.

5. Next link the “TL50_IOLM2_01_Data.Change” tag to the “Examine On” instruction. This is the control bit that activates the AOI. After the AOI has completed its operation this bit will be automatically turned off.



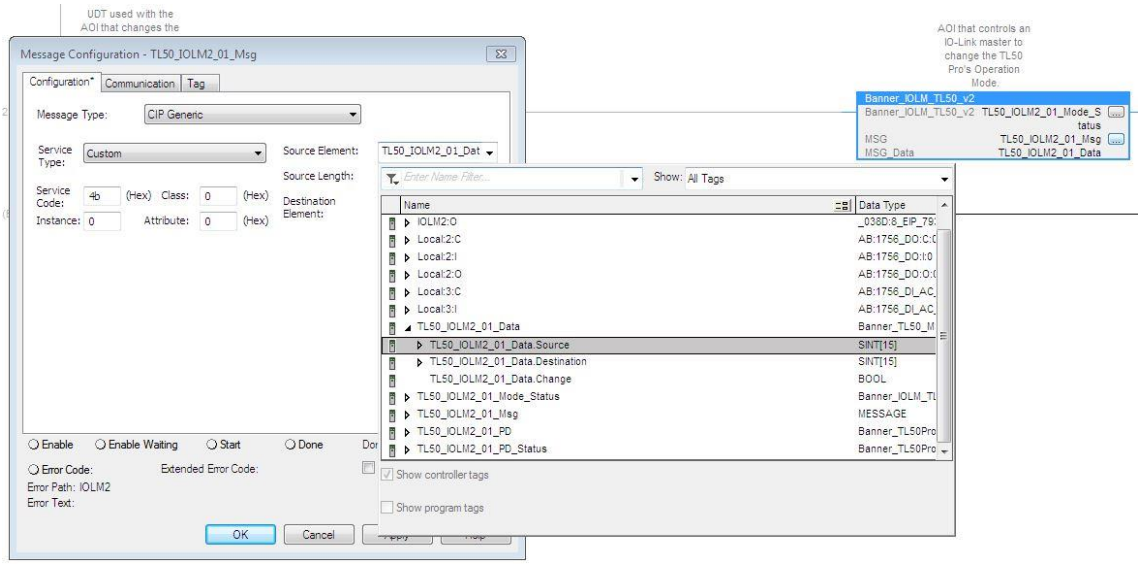
6. Now configure “MSG”, setting up the Explicit Message that will handle communications between the PLC and the IO-Link Master. Click on the “…” button at the far right of the “MSG” line.



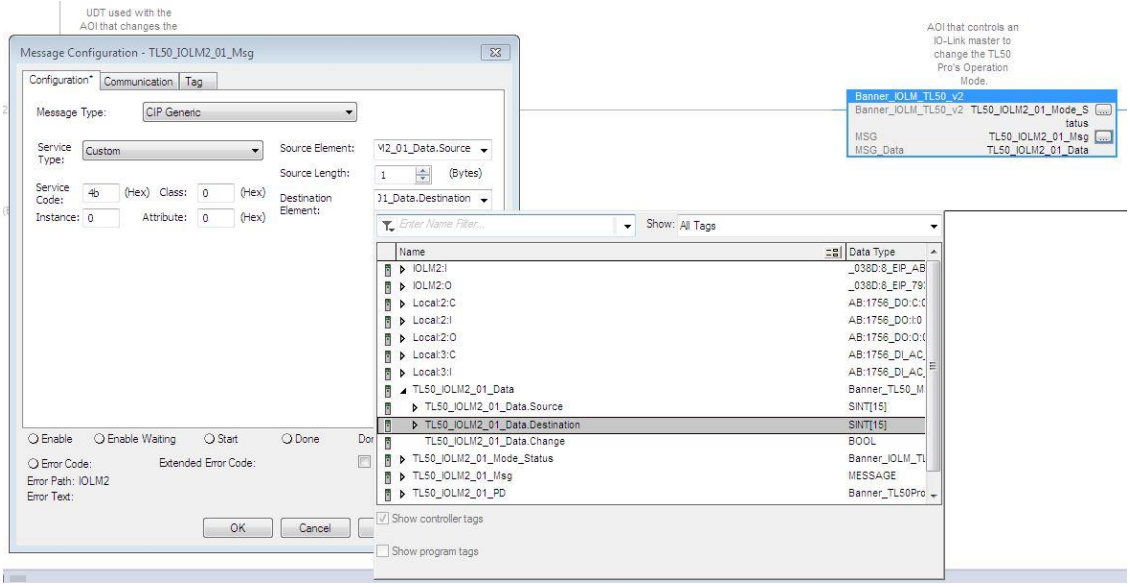
7. In the Message Configuration window, keep the Message Type “CIP Generic” and the Service Type “Custom” for Allen-Bradley, Balluff, Comtrol, and IFM IO-Link Masters. Change the Service Type to “Set Attribute Single” for Turck IO-Link Masters. Enter a Service Code for the IO-Link Master as shown in the table below.

IO-Link Master	Service Code
Allen-Bradley	16#4E
Balluff	16#32
Comtrol	16#4B
IFM	16#4C
Turck	16#10

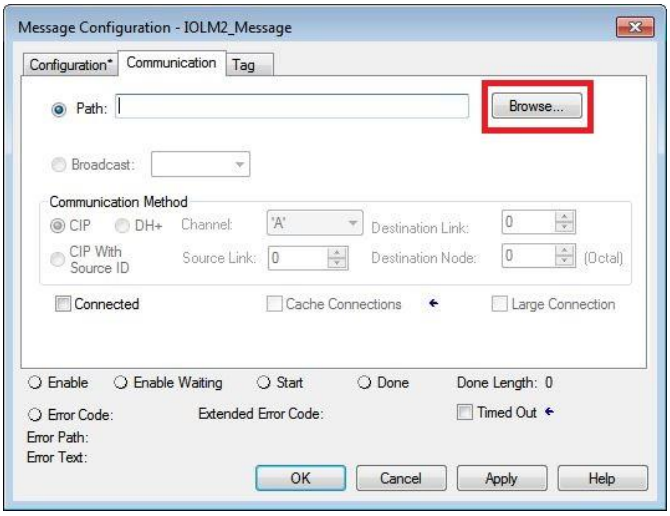
8. For the Source Element field, select “TL50_IOLM2_01_Data.Source”.

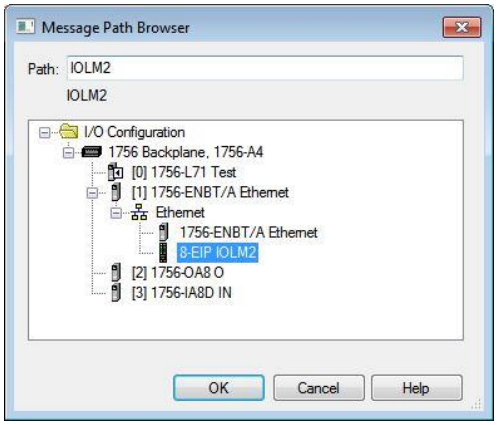


9. For Destination Element, select “TL50_IOLM2_01_Data.Destination”.



10. Now click on the Communication tab, then click the Browse button.





11. Select the IO-Link Master, then click OK to close the Message Path Browser window, then click OK again to close the Message Configuration window.

4. Using the AOI to Change the Operational Mode of the TL50 Pro

With the AOI installed and configured it is now possible to adjust the Operational Mode. The sequence required to change the Operational Mode is given below.

Start by finding the tags created in the previous section. These tags are “TL50_IOLM2_01_Data” and “TL50_IOM2_01_Mode_Status”.

1. Enter in the number of the **Port** on the IO-Link Master where the TL50 Pro is connected.
2. Set the **Mode** to the desired Operational Mode for the TL50 Pro. See Appendix A for more information.
3. Set the **IOL_Master** parameter to indicate the brand of IO-Link Master being used. See table below.

IO-Link Master	Value
Allen-Bradley	1
Balluff	2
Comtrol	3
IFM	4
Turck	5

4. Now set the **Change** tag to a value of 1. This will start the AOIs Operational Mode change sequence. The Pass or Fail tags turn on depending on if the process was completed successfully. The Change tag will be automatically set back to 0 at the end of the process. Whenever the error bit is activated the IO-Link Master value has been entered incorrectly.

Appendix A TL50 Pro Operational Modes and Process Data

The TL50 Pro has 30 bytes of Process Data Out, mapped into 4 different Operational Modes, as shown below.

First is the Basic mode (**mode 0**). This controls the basic on/off/flash/animation state of each segment and the off/on/pulse/sos state of the audible (if present).

ProcessDataOut "Process Data Out Basic" id=V_Pd_OutBasic

bit length: 248
data type: 248-bit Record

subindex	bit offset	data type	allowed values	default value	acc. restr.	mod. other var.	excl. from DS	name	description
1	200	2-bit UInteger	0 = Off, 1 = On, 2 = Pulsed, 3 = SOS Pulse					Audible State	The state of the audible segment
2	216	2-bit UInteger	0 = Off, 1 = On, 2 = Flash, 3 = Animation					Segment 1	The state of the segment. Related parameters defined in Basic Segment Parameter Data
3	218	2-bit UInteger	0 = Off, 1 = On, 2 = Flash, 3 = Animation					Segment 2	The state of the segment. Related parameters defined in Basic Segment Parameter Data
4	220	2-bit UInteger	0 = Off, 1 = On, 2 = Flash, 3 = Animation					Segment 3	The state of the segment. Related parameters defined in Basic Segment Parameter Data
5	222	2-bit UInteger	0 = Off, 1 = On, 2 = Flash, 3 = Animation					Segment 4	The state of the segment. Related parameters defined in Basic Segment Parameter Data
6	224	2-bit UInteger	0 = Off, 1 = On, 2 = Flash, 3 = Animation					Segment 5	The state of the segment. Related parameters defined in Basic Segment Parameter Data
7	226	2-bit UInteger	0 = Off, 1 = On, 2 = Flash, 3 = Animation					Segment 6	The state of the segment. Related parameters defined in Basic Segment Parameter Data
8	228	2-bit UInteger	0 = Off, 1 = On, 2 = Flash, 3 = Animation					Segment 7	The state of the segment. Related parameters defined in Basic Segment Parameter Data
9	230	2-bit UInteger	0 = Off, 1 = On, 2 = Flash, 3 = Animation					Segment 8	The state of the segment. Related parameters defined in Basic Segment Parameter Data
10	232	2-bit UInteger	0 = Off, 1 = On, 2 = Flash, 3 = Animation					Segment 9	The state of the segment. Related parameters defined in Basic Segment Parameter Data
11	234	2-bit UInteger	0 = Off, 1 = On, 2 = Flash, 3 = Animation					Segment 10	The state of the segment. Related parameters defined in Basic Segment Parameter Data

Here is the information for 1 segment (out of 10) for Advanced mode (**mode 1**). This mode grants the user full control over every segment of the TL50 Pro.

ProcessDataOut "Process Data Out Advanced" id=V_Pd_OutAdvanced

bit length: 248
data type: 248-bit Record

subindex	bit offset	data type	allowed values	default value	acc. restr.	mod. other var.	excl. from DS	name	description
1	0	4-bit UInteger	0 = Green, 1 = Red, 2 = Orange, 3 = Amber, 4 = Yellow, 5 = Lime Green, 6 = Spring Green, 7 = Cyan, 8 = Sky Blue, 9 = Blue, 10 = Violet, 11 = Magenta, 12 = Rose, 13 = White, 14 = Custom 1, 15 = Custom 2					Segment 1 Color 1	The main color of the Animation. Custom Colors are defined in Parameter data
2	4	3-bit UInteger	0 = High, 1 = Low, 2 = Medium, 3 = Off, 4 = Custom					Segment 1 Color 1 Intensity	The Intensity of Color 1, Custom Intensity defined in Parameter Data
3	8	3-bit UInteger	0 = Off, 1 = Steady, 2 = Flash, 3 = Two Color Flash, 4 = 50/50, 5 = 50/50 Rotate, 6 = Chase, 7 = Intensity Sweep					Segment 1 Animation Type	The Animation type
4	11	2-bit UInteger	0 = Medium, 1 = Fast, 2 = Slow, 3 = Custom					Segment 1 Speed	The speed of the Animation
5	13	3-bit UInteger	0 = Normal, 1 = Strobe, 2 = Three Pulse, 3 = SOS, 4 = Random					Segment 1 Pulse Pattern	The pattern of Animation
6	16	4-bit UInteger	0 = Green, 1 = Red, 2 = Orange, 3 = Amber, 4 = Yellow, 5 = Lime Green, 6 = Spring Green, 7 = Cyan, 8 = Sky Blue, 9 = Blue, 10 = Violet, 11 = Magenta, 12 = Rose, 13 = White, 14 = Custom 1, 15 = Custom 2					Segment 1 Color 2	The secondary color of the Animation. Only used if Animation has two colors. Custom Colors are defined in Parameter data
7	20	3-bit UInteger	0 = High, 1 = Low, 2 = Medium, 3 = Off, 4 = Custom					Segment 1 Color 2 Intensity	The Intensity of Color 2, Custom Intensity defined in Parameter Data
8	23	Boolean	false = Counter Clockwise, true = Clockwise					Segment 1 Rotational Direction	The Direction of Animation rotation

Here is Run mode (**mode 2**).

ProcessDataOut "Process Data Out Run Mode" id=V_Pd_OutRunMode

bit length: 248
data type: 248-bit Record

subindex	bit offset	data type	allowed values	default value	acc. restr.	mod. other var.	excl. from DS	name	description
1	168	4-bit UInteger	0 = Off, 1 = Steady, 2 = Flash, 3 = Two Color Flash, 4 = 50/50, 5 = 50/50 Rotate, 6 = Chase, 7 = Intensity Sweep, 8 = Scroll, 9 = Bounce, 10 = Color Spectrum, 11 = Demo					Animation	The Animation type
2	176	4-bit UInteger	0 = Green, 1 = Red, 2 = Orange, 3 = Amber, 4 = Yellow, 5 = Lime Green, 6 = Spring Green, 7 = Cyan, 8 = Sky Blue, 9 = Blue, 10 = Violet, 11 = Magenta, 12 = Rose, 13 = White, 14 = Custom 1, 15 = Custom 2					Color 1	The main color of the Animation. Custom Colors are defined in Parameter data
3	184	3-bit UInteger	0 = High, 1 = Low, 2 = Medium, 3 = Off, 4 = Custom					Color 1 Intensity	The Intensity of Color 1, Custom Intensity defined in Parameter Data
4	192	2-bit UInteger	0 = Medium, 1 = Fast, 2 = Slow					Speed	The speed of the Animation
5	200	3-bit UInteger	0 = Normal, 1 = Strobe, 2 = Three Pulse, 3 = SOS, 4 = Random					Pulse Pattern	The pattern of Animation
6	208	4-bit UInteger	0 = Green, 1 = Red, 2 = Orange, 3 = Amber, 4 = Yellow, 5 = Lime Green, 6 = Spring Green, 7 = Cyan, 8 = Sky Blue, 9 = Blue, 10 = Violet, 11 = Magenta, 12 = Rose, 13 = White, 14 = Custom 1, 15 = Custom 2					Color 2	The secondary color of the Animation. Only used if Animation has two colors. Custom Colors are defined in Parameter data
7	216	3-bit UInteger	0 = High, 1 = Low, 2 = Medium, 3 = Off, 4 = Custom					Color 2 Intensity	The Intensity of Color 2, Custom Intensity defined in Parameter Data
8	224	Boolean	false = No Shift, true = Shift Enabled					Segment Shift	When enabled, rotational animations will not line up, creating a different visual effect
9	232	Boolean	false = Counter Clockwise, true = Clockwise					Rotational Direction	The Direction of Animation rotation
10	240	2-bit UInteger	0 = Off, 1 = On, 2 = Pulsed, 3 = SOS Pulse					Audible State	The state of the audible segment

Here is Level mode (**mode 3**).

ProcessDataOut "Process Data Out Level Mode" id=V_Pd_OutLevelMode

bit length: 248
data type: 248-bit Record

subindex	bit offset	data type	allowed values	default value	acc. restr.	mod. other var.	excl. from DS	name	description
1	216	2-bit UInteger	0 = Off, 1 = On, 2 = Pulsed, 3 = SOS Pulse					Audible State	The state of the audible segment
2	232	16-bit UInteger						Level Mode Value	Value describing the level of the device, range determined in Level Mode Parameter Data