

Small Aperture Fiber-optic Amplifier

Catalog Numbers 46DFA-L2LBT1-A2, 46DFA-L2LBT1-F4, 46DFA-L2LBT1-Y4

Topic	Page
Process Data In (Continuous Data)	1
Description	1
IO-Link Features	1
Process Data-in Parameter Definitions	3
Process Data Out (Continuous Data)	3
Parameter Data (Asynchronous Data)	3
Identification Tab Definitions	4
Observation Tab Definitions	4
Static Teach Parameter Tab Definitions	6
Precision Teach Parameter Definitions	7
Dynamic Teach Parameter Definitions	7
Maximum Sensitivity Teach Parameter Definitions	7
Window Teach Parameter Definitions	7
Operation Configuration Parameter Definitions	7
Counter	8
Timer	8
Device Access Locks Diagnosis Tab Definitions	10

Table 1 - Communication Parameters

Specifications	Values
IO-Link Revision	V1.1
Process Data In Length	32bits(4bytes)
Process Data Out Length	Not available
Communication Mode	COM2 (38.4 kbps)
Minimum Cycle Time	3.2 ms
Vendor ID	2(0x02)
Device ID	291: 46DFA-L2LBT1-xx
SIO Mode	Supported
Data Storage	Not supported

Process Data In (Continuous Data)

ProcessDataIn transmits cyclically to the IO-Link master from the IO-Link device.

The Bulletin 46DFA small aperture fiber-optic amplifier process data offers 32 bits and includes the measurement distance, the signal strength, and the state of the sensors output.

Description

This publication includes IO-Link parameters that are offered in our Bulletin 46DFA small aperture fiber-optic amplifier sensors. These parameters can be accessed from many IO-Link 1.1 compliant masters.

IO-Link Features

- Sensor heartbeat communicates to the PLC if a sensor loses connectivity due to failure or faulty wiring.
- Challenging reflectivity applications are monitored and solved with signal strength indicators.
- Operators can quickly identify a sensor that needs adjustment in an application.
- Operating voltage display provides feedback on the status of the connected power supply.
- Counters, timers, and monitor frequency parameters enable operators to add ON delay, OFF delay on the output behavior.
- Speed parameters provide information about the speed and target under detection.
- User interface lock prevents unintentional or undesired changes to the sensor setup parameters.
- Adjustable light source parameter dims the LED enabling the detection of clear materials.
- Six process data maps enable operators to use the continuous parameters best suited for the application.

Table 2 - Process Data Map 0 — Triggered, Margin, Proximity, Gain, Signal

Byte 0								Byte 1								Byte 2								Byte 3															
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0								
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0								
MSB D7	D6	D5	D4	D3	D2	D1	LSB D0	MSB D7	D6	D5	D4	D3	D2	D1	LSB D0	MSB D7	D6	D5	D4	D3	D2	D1	LSB D0	MSB D7	D6	D5	D4	D3	D2	D1	LSB D0								
Signal Strength																Gain																							
																																Proximity Alarm							
																																Margin Low Alarm							
																																Triggered							

Table 3 - Process Data Map 1 — Triggered, Margin, Proximity, Gain, Contrast, Temp

Byte 0								Byte 1								Byte 2								Byte 3							
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
MSB D7	D6	D5	D4	D3	D2	D1	LSB D0	MSB D7	D6	D5	D4	D3	D2	D1	LSB D0	MSB D7	D6	D5	D4	D3	D2	D1	LSB D0	MSB D7	D6	D5	D4	D3	D2	D1	LSB D0
Internal Temperature								Contrast								Gain															
																								Proximity Alarm							
																								Margin Low Alarm							
																								Triggered							

Table 4 - Process Data Map 2 — Triggered, Margin, Proximity, Gain, Count

Byte 0								Byte 1								Byte 2								Byte 3							
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
MSB D7	D6	D5	D4	D3	D2	D1	LSB D0	MSB D7	D6	D5	D4	D3	D2	D1	LSB D0	MSB D7	D6	D5	D4	D3	D2	D1	LSB D0	MSB D7	D6	D5	D4	D3	D2	D1	LSB D0
Counter																Gain															
																								Triggered Counter							
																								Proximity Alarm							
																								Margin Low Alarm							
																								Triggered							

Table 5 - Process Data Map 3 — Triggered, Margin, Proximity, Duration

Byte 0								Byte 1								Byte 2								Byte 3							
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
MSB D7	D6	D5	D4	D3	D2	D1	LSB D0	MSB D7	D6	D5	D4	D3	D2	D1	LSB D0	MSB D7	D6	D5	D4	D3	D2	D1	LSB D0	MSB D7	D6	D5	D4	D3	D2	D1	LSB D0
Duration Triggered								Duration Not Triggered																							
																								Proximity Alarm							
																								Margin Low Alarm							
																								Triggered							

Table 6 - Process Data Map 4 — Triggered, Margin, Proximity, Voltage, Voltage Noise

Byte 0								Byte 1								Byte 2								Byte 3											
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0				
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0				
MSB D7	D6	D5	D4	D3	D2	D1	LSB D0	MSB D7	D6	D5	D4	D3	D2	D1	LSB D0	MSB D7	D6	D5	D4	D3	D2	D1	LSB D0	MSB D7	D6	D5	D4	D3	D2	D1	LSB D0				
Operating Voltage																Voltage Noise																Voltage Noise Level			
																																Proximity Alarm			
																																Margin Low Alarm			
																																Triggered			

Table 7 - Process Data Map 5 — Triggered, Margin, Proximity, Gain, Speed

Byte 0								Byte 1								Byte 2								Byte 3											
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0				
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0				
MSB D7	D6	D5	D4	D3	D2	D1	LSB D0	MSB D7	D6	D5	D4	D3	D2	D1	LSB D0	MSB D7	D6	D5	D4	D3	D2	D1	LSB D0	MSB D7	D6	D5	D4	D3	D2	D1	LSB D0				
Speed																Gain																Proximity Alarm			
																																Margin Low Alarm			
																																Triggered			

Process Data-in Parameter Definitions

Triggered: This parameter performs the same operation as the discrete output when operating in IO-Link.

ProximityAlarm: In Light Operate (L.O.) mode, this parameter is ON when the average amount of light received by all active light sources is lower than the Margin Level High Multiplier

MarginLowAlarm: In Dark Operate (D.O.) mode, this parameter is ON when the average amount of light received by all active light sources is higher than the Margin Level Low Multiplier

Gain: Displays the excess gain above the sensor threshold to be sure of reliable detection of the target. This is calculated as signal strength divided by the set threshold.

SignalStrength: Provides the raw measurement value of the amount of light reflected from the reflector.

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.

DurationTriggered: Displays the amount of time the target was detected. The maximum value that this parameter displays 4095 ms.

DurationNotTriggered: Displays the amount of time the target was not detected. The maximum value that this parameter displays 4095 ms.

Operating Voltage: Displays the operating voltage supplied to the sensor.

Voltage Noise: Displays the peak to peak voltage noise up to 1 kHz (for example, a 3.5 V p-p value is displayed as 35). This parameter is an experimental feature intended to aid in the detection of unintended noise in the power lines.

Voltage Noise Level: This parameter turns ON if the voltage noise levels goes above 3 Vpp.

Speed: Displays the speed of the object under detection. This parameter is intended to help operators determine how fast the object under detection is moving.

Triggered (Counter): This parameter indicates when the target count has been reached.

Process Data Out (Continuous Data)

Not applicable.

Parameter Data (Asynchronous Data)

These parameters can be read from and/or written to an IO-Link device. Unlike Process Data In, which is transmitted from the IO-Link device to the IO-Link master cyclically, these parameters are read or written on request with the use of message instructions.

Table 8 - Identification Tab

Index (Dec/Hex)	Access	Data	Length	Sub-Index	Description	Information
Device Information						
16/ 0x10	Read Only	String	64 bytes		Vendor Name	Allen-Bradley
17/ 0x11	Read Only	String	64 Bytes		Vendor Text	Visit our website.
18/ 0x12	Read Only	String	64 Bytes		Product Name	46DFA-L
19/ 0x13	Read Only	String	64 Bytes		Product Text	46DFA-L2LBT1-A2
21/ 0x15	Read Only	String	64 Bytes		Serial Number	46**WWYYZZZ **A2 or F4 WW: week YY: year ZZZZ: unit number
User Specific Information						
24/ 0x18	Read/Write	String	32 Bytes		Application Specific Tag	
194/0xC2	Read/Write	String	32 Bytes		User Tag 1	
195/0xC3	Read/Write	String	32 Bytes		User Tag 2	
Revision Information						
22/x016	Read/Write	String	32 Bytes		Hardware Revision	1.0
23/0x17	Read/Write	String	32 Bytes		Firmware Revision	1.0

Identification Tab Definitions

Vendor Name: Provides the vendor name of the product.

Vendor Text: Provides the vendor specific text of the product.

Product Name: Displays the product catalog number.

Product Text: Provides a brief description of the sensor.

Product ID: Provides the ordering catalog number of the sensor.

Serial Number: Displays the serial number of the unit.

Application Specific Tag: This parameter allows operators to assign a value to describe the sensor in the application. For example, roll level sensor.

User Tag 1: This parameter allows operators to assign a value to describe additional information about the application where the sensor is installed.

User Tag 2: This parameter allows operators to assign a value to describe

Observation Tab Definitions

Table 9 - Observation Tab

Index (Dec/Hex)	Access	Data	Length	Sub-Index	Description	Range (?UOM?)	Default Value
Device Monitoring							
80/0x50	Read Only	UInteger	16 bits	1	SignalStrength On	0...65535	
80/0x50	Read Only	UInteger	16 bits	2	SignalStrength Off	0...65535	
81/0x51	Read Only	UInteger	8 bits		Contrast	0...255	
82/0x52	Read Only	UInteger	8 bits	1	Gain	0...255	
82/0x52	Read/Write	UInteger	8 bits	2	Excess Gain Resolution	0...1	0 – 1x Resolution 1 – 10x Resolution

SignalStrength On: Displays the amount of light that was reflected back to the sensor the last time a target was detected.

SignalStrength Off: Displays the amount of light that was reflected back to the sensor the last time a target was not detected.

Contrast: Displays the difference between the light signal levels that the sensor read the last time that the output was ON versus the last time the output was OFF. The IO-Link parameter contrast levels help identify enough difference between the target and the background.

Gain: Displays the excess gain above the sensor threshold to be sure of reliable detection of the target.

Excess Gain Resolution: Allows operators to change the display range of the resolution of the Gain parameter. If the excess gain is selected to be 1.0x Resolution, the gain parameter range goes from 0...255. If the excess gain is selected as 10 x Resolution, the gain parameter range operates from 0...25.

Table 10 - Parameter Tab

Index (Dec/Hex)	Access	Data	Length	Subindex	Description	Range	Default Value/Description
Teach-in Operation — Static Teach							
2/0x02	Write Only	UInteger	8 bits		Static Teach – Show Target	67/0x43	Learn threshold while target is present
2/0x02	Write Only	UInteger	8 bits		Static Teach – Show Background	68/0x44	Learn signal level while target is not present
Precision Teach							
2/0x02	Write Only	UInteger	8 bits		Standard Teach – Show Target	65/0x41	Teaches the desired set point to ensure detection
Dynamic Teach							
2/0x02	Write Only	UInteger	8 bits		Dynamic Teach – Start	71/0x47	Starts the Dynamic Teach Mode
2/0x02	Write Only	UInteger	8 bits		Dynamic Teach – Stop	72/0x42	Stops de Dynamic Teach Mode
Maximum Sensitivity Teach							
2/0x02	Write Only	UInteger	8 bits		Maximum Sensitivity	75 / 0x4B	Teaches the maximum sensitivity of the sensor
Window Teach							
2/0x02	Write Only	UInteger	8 bits		Window Mode – Start	76/0x4C	Teaches SP1 when operating in Window Mode
2/0x02	Write Only	UInteger	8 bits		Window Mode – Stop	77/0x4D	Teaches SP2 when operating in Window Mode
Teach							
2/0x02	Write Only	UInteger	8 bits		Teach Cancel	79/0x4F	Cancels the Teach Process
59/0x3B	Read Only	UInteger	8 bits		Teach-in Status	0,1,2,3,4,5,7	0 – Status Idle 1 – Teach SP1 Success 2 – Teach SP2 Success 3 – SP1 and SP2 Success 4 – Wait for Command 5 – Busy 7 – Error
Operation Configuration — Triggerred							
60/0x3C	Read/Write	RecordT	32 Bits				
Offset: 16	Read/Write	UInteger	16 bits	1	Set Point – Threshold 1	0...9999	1000
Offset: 0	Read/Write	UInteger	16 bits	2	Set Point – Threshold 2	0...9999	300
64/0x40	Read/Write	UInteger	8 bits		Pin 4 Type	0 or 1	0 – PNP 1 – NPN
61/0x3d	Read/Write	UInteger	8 bits	1	Polarity	0 or 1	0 – Not Inverted (Default) 1 – Inverted
61/0x3D	Read/Write	UInteger	8 bits	2	Function	0 or 1	0 – Single Point 1 – Window Mode
61/0x3D	Read/Write	UInteger	16 bits	3	Hysteresis	50	1 – 2000
65/0x3E	Read/Write	UInteger	8 bits		Pin 2 type	0...2	0 – Disabled 1 – PNP 2 – NPN
Sensor Configuration							
76/0x4C	Read/Write	UInteger	8 bits	1	Margin Level – Low Multiplier	0...3	0 – 0.5 X (Default) 1 – 0.6 X 2 – 0.7 X 3 – 0.8 X
76/0x4C	Read/Write	UInteger	8 bits	2	Margin Level – High Multiplier	0...5	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
67/0x43	Read/Write	UInteger	8 bits		Response Time	0...3	0 – 50 μ S 1 – 500 μ s (Default) 2 – 4 mS 3 – 32 ms

Table 10 - Parameter Tab

Index (Dec/Hex)	Access	Data	Length	Subindex	Description	Range	Default Value/Description
70/0x46	Read/Write	UInteger	8 bits		Light Source	0 or 1	0 – Light Source ON (Default) 1 – Light Source OFF
68/0x44	Read/Write	UInteger	8 bits		Light Source Mode	0 or 1	0 – Auto (Default) 1 – Manual
71/0x47	Read/Write	UInteger	8 bits		Light Source Adjustment	0...15	1 – 12...50 µs Settings 1 – 5...500 µs – 32 ms Settings
101/0x65	Read/Write	UInteger	8 bits		Display Indication	0...3	0 – Standard Indication (Default) 1 – Percentage Indication 2 – Zero Offset Indication 3 – Counter Mode Indication
102/0x62	Read/Write	UInteger	8 bits		Display Rotation	0 or 1	0 – Normal 1 – Rotate 180°
Counter/Timer — Counter							
72/0x48	Read/Write	UInteger	8 bits		Counter Enabled	0 or 1	0 – Disabled 1 – Enabled
2/0x02	Write Only	UInteger	8 bits		Counter Reset	160/0xA0	
73/0x49	Read Only	UInteger	16 bits		Counter	0...9999	
Timer							
74/0x4A	Read/Write	RecordT	56 bits				
Offset: 48	Read/Write	UInteger	8 bits	1	Timer Mode		0 – Timer OFF 1 – On Delay 2 – Off Delay 3 – One-Shot (Re-triggered) 4 – On-Off Delay
Offset:32	Read/Write	UInteger	16 bits	2	On Delay	1...9999 ms	
Offset:16	Read/Write	UInteger	16 bits	3	Off Delay	1...9999 ms	
Offset:0	Read/Write	UInteger	16 bits	4	One-Shot	1...9999 ms	
75/0x4B	Read/Write	UInteger	8 bits		Duration Enable	0 or 1	0 – Disabled 1 – Enabled
					Duration Reset		
76/0x4C	Read Only	RecordT	32 bits				
Offset: 16	Read Only	UInteger	16 bits	1	On Duration	0...4095	
Offset: 16	Read Only	UInteger	16 bits	2	Off Duration	0...4095	
Data Mapping Configuration							
77/0x4D	Read/Write	UInteger	8 bits		Mode	0...5	0 – Triggered, Margin, Proximity, Gain, Signal 1 – Triggered, Margin, Proximity, Gain, Contrast, Temp 2 – Triggered, Margin, Proximity, Gain, Count 3 – Triggered, Margin, Proximity, Duration 4 – Triggered, Margin, Proximity, Voltage, Voltage Noise 5 – Triggered, Margin, Proximity, Gain, Speed

Static Teach Parameter Tab Definitions

This section captures the static teach procedure of Bulletin 46DFA. The following steps show you how to teach the sensor in the static teach mode.

1. Place the target in front of the sensor and between the reflectors. Send the command Static Teach – Show Target (index: 67). Remove the target blocking the reflector.
2. Show the reflector where the target is present and then send the command Static Teach – Show Background (index: 68).
3. The teach process is complete.

When using the Allen-Bradley Add-on Profile (AOP) for the Bulletin 46DFA, you must click on the refresh button for the beam set points to be updated in the AOP. The Apply in the AOP should be pressed to save these settings.

Precision Teach Parameter Definitions

This section captures the precision teach procedure of Bulletin 46DFA. The following steps show you how to teach the sensor in precision mode.

1. Place the target in front of the field of view of the sensor and send the command Precision Teach – Show Target (index: 65).
2. The teach process is complete.

When using the Allen-Bradley Add-on Profile (AOP) for the Bulletin 46DFA, you must click on the refresh button for the threshold set points to be updated in the AOP. The Apply on the AOP should be pressed to save these settings before closing the AOP.

Dynamic Teach Parameter Definitions

This section captures the dynamic teach procedure of Bulletin 46DFA. In this mode, the threshold is automatically set as the average of the maximum and minimum received light levels while the process is running. For example, if the maximum light level is 8000 and the minimum received light is 1000, the threshold is automatically set to 4500.

The following steps show you how to initiate the dynamic teach mode.

1. While the object is moving in front of the field of view of the sensor, the command Dynamic Teach – Start (index 71). This command changes the green seven-segment LED display to Full indicating that the dynamic teach process has started.
2. Wait for at least three seconds and then send the command Dynamic Teach – Stop (index: 72).
3. The dynamic teach process is complete.

When using the Allen-Bradley Add-on Profile (AOP) for the Bulletin 46DFA, you must click on the refresh button for the threshold set points to be updated in the AOP. The Apply button in the AOP should be pressed to save these settings before closing the AOP.

Maximum Sensitivity Teach Parameter Definitions

This section defines the maximum sensitivity teach of the Bulletin 46DFA. In this mode, the threshold is automatically set to a value larger than the maximum received light level while the target is present. For example, if the received light level is 1000 then the threshold is automatically set to 200. This setting is ideal to be sure that the low light reflectivity does not trigger the output ON while ensuring.

The following steps show you how to initiate the maximum sensitivity teach mode.

1. Place the target in front of the field of view of the sensor and send the command Maximum Security (index: 75). This changes the green seven-segment LED display to high indicating that the maximum sensitivity teach process has started.
2. The word high will stay on the display for about five seconds and then displays the new threshold. If the sensor LED display shows ERR 1 or ERR 2, the received signal is either too high or too low for a successful teach.
3. The maximum sensitivity teach process is now complete.

When using the Allen-Bradley AOP for the Bulletin 46DFA, you must click on Refresh for the threshold set points to be updated in the AOP. Press Apply in the AOP to save these settings before closing the AOP.

Window Teach Parameter Definitions

This section defines the window teach of Bulletin 46DFA. In this mode, the operator sets the specific threshold for the low window and the high window based on the received light levels.

The following steps show you how to initiate the window teach mode.

1. Place the target in front of the field of view of the sensor and send the command Window Mode – Start (index: 76). This changes the green seven-segment LED to state 1Pnt and Wind, indicating the first threshold.
2. Keep the target from the field of view of the sensor and send the command Window Mode –Stop (index: 77). After the command has been sent, the sensor learns the second window threshold. If the teach process is successful, the sensor LED displays the received light indication. If the sensor LED shows Err 1 or Err 2, the received signal is either too high or too low for a successful teach.
3. The window teach process is complete.

When using the Allen-Bradley AOP for the Bulletin 46DFA, you must click Refresh for the threshold set points to be updated in the AOP. Press the Apply in AOP to save the settings before closing the AOP.

Teach Cancel: Cancels the Static and Dynamic Teach process after it has been initiated. The sensor will not learn any new threshold after the cancel command has been executed.

Teach-in Status: Displays the status of the teach process for the Static and Dynamic Teach.

Operation Configuration Parameter Definitions

These parameters describe critical set points for the Bulletin 46DFA.

Set Point – Threshold 1 (60/0x3C): Sets the LED sensor threshold 1 as a subindex. The value range is 0...9999. This parameter is updated when any of the teach procedures are executed.

Set Point – Threshold 1 (60/0x3C): Sets the LED sensor threshold 1 as a subindex. The value range is 0...9999. This parameter is updated when the window teach procedures are executed. The default value for this parameter is 300.

Pin 4 Type (64/0x40): Sets the output mode of Pin 4 top operate as PNP or NPN only. The default value is PNP.

Polarity (61/0x3D): Changes the sensor output to operate as Light Operate (non-inverted) and Dark Operate (inverted) in relation to Pin 4. The default setting is Not Inverted (0) when using the AOP. This parameter is a subindex.

Function (61/03D): Changes the operation mode of the sensor output and the available options are Single Point or Window. Single Point mode turns the sensor output ON after the received signal level is higher than the Threshold 1 parameter. Window mode turns the output ON while the received signal level is between Threshold 1 and Threshold 2. The default value is Single Point. This parameter is a subindex.

Hysteresis (61/0x3D): Enables the operator to change the sensor output hysteresis value. The minimum value allowable is 10 and the maximum is 2000. This parameter is a subindex.

Pin 2 Type (65/0x41): Enables the operator to change the sensor output hysteresis value. The minimum value allowable is 10 and the maximum is 2000. This parameter is a subindex.

Pin 2 Type (65/0x41): 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.

Margin Level – Low Multiplier (76/0x4C): 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 0.1X.

Margin Level – High Multiplier (76/0x4C): 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. This value means that the sensor must have at least 20 times the amount of light for the green LED to stop flashing.

Response Time (67/0x43): Changes the sensor response time to increase or decrease the amount of light received by the sensor. The default response time is 500 μ s.

Light Source (70/0x46): Enables or disables the light source of the sensor. The default value is ON.

Light Source Mode (68/0x44): Enables automatic or manual operation of the sensor LED intensity. The default parameter is Auto.

Light Source Adjustment (71/0x4F): Changes the LED intensity. When operating in 50 μ s Response Time, the maximum intensity that can be set is 12. Operation on response times higher than 50 μ s, can be set up to 15.

Display Indication (101/0x65): Changes how the received light information is displayed in the sensor LED and received signal strength process data parameter. The default indication is displaying the raw signal level value up to 9999. The sensor can also be set to display the received light as a percentage or based on a zero offset parameter. The Percentage indication on the sensor makes it easy for the operators to determine light degradation over time.

Display Rotation (102/0x62): Changes the orientation of the LED display. The default setting is standard orientation.

Counter

Counter Enabled (72/0x48): Enables the counter feature of the sensor. The default value of this parameter is disabled.

Counter Reset: This parameter resets the count already stored under index 160(0xA0).

Counter Value (73/0x49): When the counter is enabled, this parameter reflects the sensor count amount. This value resets to zero when the counter reset command is executed.

Timer

Timer Mode (74/0x4A): This parameter enables operators to select the desired operation for the timer. The following selections are available:

Timer OFF: Indicates that the timer is disabled.

On Delay: Defines the desired delay for the output to turn ON once a target has been detected. For example, if the ON Delay value is 5000 ms (5 seconds), the sensor output will turn ON after 5 seconds have passed.

Off Delay: Defines the desired delay for the output to turn OFF once a target has left the detection area. For example, if the OFF Delay value is 5000 ms (5 seconds), the sensor output will turn ON immediately and then it will turn OFF after 5 seconds have passed.

One-shot: Defines the width of the pulse of the output. For example, if the One Shot value is set to 5000 ms (5 seconds), the output will turn ON immediately after the target has been detected and remain on for 5 seconds. This value is reset when a new target is detected.

On-Off Delay: Allows the operator to set an On Delay and an Off Delay timing for the sensor output.

Duration Enable: Enables the On Duration and Off Duration. The default value for this parameter is disabled.

Timer Duration: Measures the amount of time the output is present and absent up to a maximum period of four seconds

On Duration (76/0x4C): Displays the amount of time the target was detected. The maximum value that this parameter will display is 4095 ms.

Off Duration (76/0x4C): Displays the amount of time the target was not detected. The maximum value that this parameter will display is 4095 ms.

Data Mapping Configuration: In this section, the operator is able to configure the combination of parameters that must be displayed as process data. The Bulletin 46DFA process data consists of five bytes of data with multiple parameters to be presented to the operator.

The following process data maps are offered in the Bulletin 46PLA:

- Data Map 0 (Default): Triggered, Margin, Proximity, Gain, Signal
- Data Map 1: Triggered, Margin, Proximity, Gain, Contrast, Temp
- Data Map 2: Triggered, Margin, Proximity, Gain, Count
- Data Map 3: Triggered, Margin, Proximity, Gain, Duration
- Data Map 4: Triggered, Margin, Proximity, Voltage, Voltage Noise
- Data Map 5: Triggered, Margin, Proximity, Gain, Speed

Table 11 - Diagnosis Tab

Index (Dec/Hex)	Access	Data	Length	Subindex	Description	Range	Default Value/Description
Device Access Locks							
12/0x0C	Read Only	Boolean	1 bit	3	Device Access Locks. Data Storage Lock	0 or 1	0x00
12/0x0C	Read / Write	Boolean	1 bit	4	Device Access Locks. Local User Interface Lock	0 or 1	0x00
79/0x4F	Read /Write	Boolean	1 bit		Local Push Button Lock	0 or 1	0x00
Service Function							
0x02	Write Only	UInteger	8 bits		Device Reset	128/0x80	
0x02	Write Only	UInteger	8 bits		Restore Factory Settings	130/0x82	
100/0x64	Read/Write	UInteger	8 bits		Location Indication		0 – Enabled 1 – Disabled
69/0x45	Read/Write	UInteger	8 bits		ECO Mode	0 or 1	0 – Off 1 – On
36/ 0x24	Read Only	UInteger	8 bits		Device Status		
Operation Information							
103/0x67	Read Only	RecordT	64 bits				
Offset: 32	Read Only	UInteger	32 bits		Operation Hours – Since Inception	0...876000	Hours
Offset: 0	Read Only	UInteger	32 bits		Operation Hours – Since Power-Up	0...876000	Hours
Internal Temperature							
104/0x68	Read Only	RecordT	40 bits				
Offset: 32	Read Only	Integer	8 bits	1	Actual – Since Power Up	-40...+127	
Offset: 24	Read Only	Integer	8 bits	2	Maximum – Since Power Up	-40...+127	
Offset: 16	Read Only	Integer	8 bits	3	Maximum – Since Inception	-40...+127	
Offset: 8	Read Only	Integer	8 bits	4	Minimum – Since Power-Up	-40...+127	
Offset: 0	Read Only	Integer	8 bits	5	Minimum – Since Inception	-40...+127	
Voltage							
105/0x69	Read Only	RecordT	56 bits				
Offset: 40	Read Only	UInteger	16 bits	1	Actual	0...300	
Offset: 24	Read Only	UInteger	16 bits	2	Maximum – Since Power Up	0...300	
Offset: 8	Read Only	UInteger	16 bits	3	Minimum – Since Power Up	0...300	
Offset:0	Read Only	UInteger	8 bits	4	Voltage Noise Value Vpp	0...200	
Speed							
106/0x6A	Read Only	RecordT	32 bits				
Offset: 32	Read Only	UInteger	16 bits	1	Actual – Since Power Up	0...9999	
Offset: 0	Read Only	UInteger	16 bits	2	Maximum – Since Power Up	0...9999	
Event Configuration							
107/0x6B	Read/Write	Boolean	1 bit		Local Threshold Change – Event	0 or 1	0 – Disabled 1 – Enabled
108/0x6C	Read/Write	UInteger	1 bit		Low Margin- Event Enable	0 or 1	0 – Disabled 1 – Enabled
Counter Event							
116/0x74	Read/Write	RecordT	17 bits				
Offset: 16	Read/Write	Boolean	1 bit	1	Counter Event	0 or 1	0 – Disabled 1 – Enabled
Offset: 0	Read/Write	Integer	16 bits	2	Target Count	1...9999	

Table 11 - Diagnosis Tab

Index (Dec/Hex)	Access	Data	Length	Subindex	Description	Range	Default Value/Description
Internal Temperature Event							
110/0x6E	Read/Write	RecordT	17 bits				
Offset: 16	Read/Write	Boolean	1 bit	1	Temperature – Event	0 or 1	0 – Disabled (Disabled) 1 – Enabled
Offset: 8	Read/Write	Integer	8 bits	2	Low Temperature	10	-30...+80 °C
Offset: 0	Read/Write	Integer	8 bits	3	High Temperature	30	-30...+80 °C
Voltage Event							
115/0x73	Read/Write	RecordT	17 bits				
Offset: 16	Read/Write	Boolean	1 bit		Voltage – Event	0 or 1	0 – Disabled 1 – Enabled
Offset: 8	Read/Write	UInteger	8 bits		Low Voltage	10...30	
Offset: 0	Read/Write	UInteger	8 bits		High Voltage	10...30	
Communications Characteristics							
		RecordT	128 bits				
Offset: 104	Read Only	UInteger	8 bits	3	Direct Parameters. Min Cycle Time		Ms
Offset: 112	Read Only	UInteger	8 bits	2	Direct Parameters. Master Cycle Time		Ms
Offset: 88	Read Only	UInteger	8 bits	5	Direct Parameters.IO-Link Version ID		

Device Access Locks Diagnosis Tab Definitions

Local 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. The sensor will display the word iLoc when a push button is pressed.

Local Push Button Lock: Locks the local push button on the sensor. The push button can be unlocked locally following the unlock procedure.

Service Function

Device Reset: Parameter performs a soft reset of the sensor (similar to powering the sensor ON or OFF).

Restore Factory Settings: Is a write-only command and sets the current sensor settings to their factory default values.

Location Indication (100/0x64): Activates the location indication sensor functionality. When enabled, the sensor user interface (green and orange LEDs) starts flashing synchronously until the operator disables this function. This parameter is ideal for applications where the operator must locate a sensor in the application where there must be multiple sensors in close proximity.

ECO Mode (100/0x64): Allows operators to turn OFF or turn ON the ECO power savings mode.

Device Status: Displays the status of the device.

Operating Hours - since Inception (103/0x67): Displays the total operating hours that the sensor has been running since the first time it was powered ON. This value is not lost during factory reset. The information that is displayed in this parameter is represented in hours.

Operating Hours - since Power-Up (103/0x67): Displays the total operating hours that the sensor has been running since the last time the

sensor power was cycled. This value is reset to zero every time the sensor loses power.

Internal Temperature

In this section, the operator is able to monitor the actual, minimum, and maximum internal temperature of the sensor.

Actual – Since Power Up: Displays the current internal temperature of the sensor.

Maximum – Since Power Up: Displays the maximum sensor internal temperature since the last time the sensor power was cycled.

Maximum: Since Inception: Displays the maximum internal temperature of the sensor since the first time the sensor was ever powered ON. This value is retained and not lost during default factory reset.

Minimum: Since Power Up: Displays the minimum internal temperature of the sensor since the last time the sensor was power cycled.

Minimum: Since Inception: Displays the maximum internal temperature of the sensor since the first time the sensor was ever powered ON. This value is retained and not lost during default factory reset.

Voltage

In this section, the operator is able to monitor the actual, minimum, and maximum voltage.

Actual – Since Power Up: Displays the current voltage powering the sensor.

Maximum – Since Power Up: Displays the maximum sensor operating voltage since the last time the sensor was power cycled.

Minimum - Since Power Up: Displays the minimum operating voltage of the sensor since the last time the sensor was power cycled.

Voltage Noise Value Vpp: Displays the peak to peak voltage noise up to 1 kHz (for example, a 3.5 V p-p value is displayed as 35). This parameter is an experimental feature intended to aid in the detection of unintended noise in the power lines.

Speed

In this section, the operator is able to monitor the actual and maximum switches per second.

Actual – Since Power Up: Shows the actual frequency of detection in Hertz.

Maximum – Since Power Up: Shows the maximum frequency for detection in Hertz.

Event Configuration

Local Threshold Change – Event Enabled (107/0x6B): Enables or disables the local threshold change event on the sensor. This event is a notification with the value 0x1800.

Low Margin – Event Enable (108/0x6C): Enables or disables the low margin event on the sensor. This event is a warning with the value of 0x1820 and it appears if the low margin indication is present.

Internal Temperature Event

Temperature – Event Enable (111/0x6F): Enables or disables the internal temperature event. This event is a warning with the values 0x4220 (high temperature) or 0x4210 (low temperature).

Low Temperature (110/0x6E): Sets the low temperature threshold that will trigger a low temperature event.

High Temperature (110/0x6E): Sets the high temperature threshold that will trigger a high temperature event.

Counter Event

Counter Event (116 / 0x74): Enables or disables the event indicating that the target count has been reached. This event is a notification with the value 0x1840.

Target Count (115/0x73): Sets the target count that will trigger the counter event. The value can be anywhere between 0 to 65535.

Communication Characteristics: In this section of the Diagnosis Tab, you can see read-only (ro) values for the Minimum Cycle Time (response time of the sensor). You can also visualize the IO-Link Revision of the sensor in this section.

Table 12 - Events

Event(Dec/	Value	Event Type	Description	Range
6144/0x1800		Error	Notification	
6176/0x1820		Notification	Low Margin	
6192/0x1830		Notification	Teach Error	
16928/0x4220		Warning	Low	
16912/0x4210		Warning	High	
6208/0x1840		Notification	Target Count	

Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	https://rockwellautomation.custhelp.com/
Local Technical Support Phone Numbers	Locate the phone number for your country.	http://www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	http://www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	http://www.rockwellautomation.com/global/literature-library/overview.page
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	http://www.rockwellautomation.com/global/support/pcdc.page

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Waste Electrical and Electronic Equipment (WEEE)



At the end of life, this equipment should be collected separately from any unsorted municipal waste.

Rockwell Automation maintains current product environmental information on its website at <http://www.rockwellautomation.com/rockwellautomation/about-us/sustainability-ethics/product-environmental-compliance.page>.

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Rockwell Otomasyon Ticaret A.Ş., Kar Plaza İş Merkezi E Blok Kat:6 34752 İçerenköy, İstanbul, Tel: +90 (216) 5698400

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe/Middle East/Africa: Rockwell Automation 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