IO-Link Data Reference Guide: LM Series

IO-Link Data Map

This document refers to the following IODD files: Banner_Engineering-LM-20180423-IODD1.1.xml, Banner_Engineering-LM80-20190219-IODD1.1.xml, Banner_Engineering-LM80KU-20200731-IODD1.1.xml, and Banner_Engineering-LM150KU-20200731-IODD1.1.xml. The IODD files and support files can be found on www.bannerengineering.com under the download section of the product family page.

Communication Parameters

The following communication parameters are used.

Parameter	Value
IO-Link revision	V1.1
Process Data In length	32 bits
Process Data Out length	8 bits
Bit Rate	38400 bps
Minimum cycle time	3.6 ms

Parameter	Value
Port class	A
SIO mode	Yes
Smart sensor profile	Yes
Block parameterization	Yes
Data Storage	Yes

IO-Link Process Data In (Device to Master)

Process Data is transmitted cyclically to the IO-Link Master from the IO-Link device.

The LM IO-Link Process Data In is 32 bits in size. There are two modes available for LM Process Data In: depending on whether the Process Data includes binary data. In the default condition, Include Binary Data mode, the 32-bit LM Process Data In includes two measurements values, the stability state of the sensor, the state of the analog output, and the state of the discrete output channel. Do Not Include Binary Data mode uses the 32-bits of LM Process Data In differently; sending only the two measurement values (no output state, analog state, or stability state included).

The user has control over the definitions for Measurement 1 and Measurement 2, as well. Measurement options include Distance Measurement Value, Displayed Distance Measurement Value, Analog Output Value, Dual Mode Percent Match, and/or excess gain, although not all combinations are possible. See Index 64.

Regardless of the Process Data In mode selected, the information is sent to the IO-Link Master every 3.6 ms.

Process Data In, Include Binary Data Mode (default)			
Subindex	**Name**	**Number of bits**	**Data Values**
1	Channel 1 Output State	1	0 = inactive, 1 = active
2	Analog State	1	0 = inactive, 1 = active
3	Stability State	1	0 = no target or marginal, 1 = stable
4	Measurement 1 Value	19	Value depends on "Configuration.Process Data Measurement 1 Selection"
5	Measurement 2 Value	10	Value depends on "Configuration.Process Data Measurement 2 Selection"

Octet 0								
Subindex	5							
Bit offset	31	30	29	28	27	26	25	24
Value	0	0	1	1	1	0	0	1

Octet 1								
Subindex	5		4					
Bit offset	23	22	21	20	19	18	17	16
Value	1	1	0	0	1	0	0	1

ПРОМЭЛЕКТРОНИКА/ sales@prom-elec.com

Octet 2								
Subindex	4							
Bit offset	15	14	13	12	11	10	9	8
Value	0	0	0	1	1	1	0	1

Octet 3								
Subindex	4					3	2	1
Bit offset	7	6	5	4	3	2	1	0
Value	1	0	1	0	0	0	0	0

Based on the values in the example table above:

- Channel 1 Output State: Inactive
- Analog State: Inactive
- Stability State: No target or marginal
- Measurement 1 Value (Distance): 74676 (µm)
- Measurement 2 Value (Excess Gain): 231

IO-Link Process Data Out (Master to Device)

Process Data is transmitted cyclically to the IO-Link Master from the IO-Link device.

The LM IO-Link Process Data Out is 8 bits in size. The LM Process Data Out allows for easily turning the laser emitter on and off. This information is sent to the LM from the IO-Link Master every 3.6 ms.

Process Data Out			
Subindex	**Name**	**Number of bits**	**Data Values**
1	Laser Status	1	0 = Enabled 1 = Disabled

Octet 0								
Subindex								1
Bit offset	7	6	5	4	3	2	1	0
Value	0	0	0	0	0	0	0	1

Based on the values in the example table above: Laser Status: Disabled.

Parameters Set Using IO-Link

These parameters can be read from and/or written to an IO-Link model of the LM Series Laser sensor. Also included is information about whether the variable in question is saved during Data Storage and whether the variable came from the IO-Link Smart Sensor Profile.

Unlike Process Data In, which is transmitted from the IO-Link device to the IO-Link master cyclically, these parameters are read or written acyclically as needed.

Index	Subindex	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile	AOI?
0	1-16	Direct Parameter Page 1 (incl. Vendor ID & Device ID)		ro					
1	1-16	Direct Parameters Page 2				rw			
2		Standard Command		65 = SP1 Single Value Teach, 66 = SP2 Single Value Teach, 75 = Teach Midpoint, 130 = Restore Factory Settings, 162 = Start discovery, 163 = Stop discovery		wo		y	
3		Data Storage Index (device-specific list of parameters to be stored)				rw			
4-11		reserved by IO-Link Specification							

Index	Subindex	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile	AOI?
12		**Device Access Locks**							
12	1	Parameter Write Access Lock		0 = off 1 = on	0	rw	y		y
12	2	Data Storage Lock		0 = off, 1 = on	0	rw	y		y
12	3	Local Parameterization Lock		0 = off, 1 = on	0	rw	y		y
12	4	Local User Interface Lock		0 = off, 1 = on	0	rw	y		y
13		Profile Characteristic				ro			
14		PDInput Descriptor				ro			
15		PDOutput Descriptor				ro			
16		Vendor Name string		Banner Engineering Corp		ro			y
17		Vendor Text string		More Sensors. More Solutions.		ro			y
18		Product Name string		LM80 Current: LM80KI LM150 Current: LM150KI LM80 Voltage: LM80KU LM150 Voltage: LM150KU		ro			y
19		Product ID string		LM80 Current: LM80KIQP LM150 Current: LM150KIQP LM80 Voltage: LM80KUQP LM150 Voltage: LM150KUQP		ro			y
20		Product Text string		Laser Measurement Sensor		ro		y	y
21		Serial Number				ro			y
22		unused/reserved				ro			
23		Firmware Version				ro		y	y
24		App Specific Tag (user defined)				rw	y	y	
25-35		reserved							
36		Device Status	8-bit integer	0=Device is OK, 4=Failure		ro			
37		Detailed Device Status	Array[6] of 3-octet			ro			
38-39		reserved							
40		Process Data Input				ro			
41		Process Data Output				ro			
42-57		unused/reserved							
58		Teach-in Channel		0 = Default, 1 = BDC1, 192 = AO1	0	rw		y	y
59		**Teach-In Status**							
59	1	Teach State	4-bit integer	0 = Idle, 1 = SP1 Success, 4 = Wait for Command, 5 = Busy, 7 = Error		ro		y	y
59	2	SP1 TP1	1-bit integer	0 = not taught or unsuccessful, 1 = successfully taught		ro		y	y
59	3	SP1 TP2	1-bit integer	0 = not taught or unsuccessful, 1 = successfully taught		ro		y	y
60		**BDC1 Setpoints**							
60	1	BDC1 Setpoint SP1 (SP1 switch point in Switch or Window mode)	32-bit integer	LM80: 40,000 µm–80,000 µm LM150: 50,000 µm–150,000 µm	LM80: 40,000 µm LM150: 50,000 µm	rw	y	y	y
60	2	BDC1 Setpoint SP2 (SP2 switch point in Window Mode only)	32-bit integer	In Window mode: LM80: 40,000 µm–80,000 µm LM150: 50,000 µm–150,000 µm Not in Window mode: 0	LM80: 80,000 µm LM150: 150,000 µm	rw	y	y	y
61		**BDC1 Configuration**							
61	1	BDC1 Switchpoint Logic	8-bit integer	0 = LO, 1 = DO	0	rw	y	y	
61	2	BDC1 Mode	8-bit integer	1=Switch Mode/Single Point Mode, 2=Window Mode, 132=Health/Alarm Mode	2	rw	y	y	
61	3	Hysteresis	16-bit integer	0=Automatically set by the sensor	0	rw	y	y	
62-63		unused/reserved							

Index	Subindex	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile	AOI?
64		**Configuration**							
64	1	Response Speed	8-bit integer	0 = 0.25 ms, 1 = 1 ms, 2 = 2 ms, 3 = 4 ms	1	rw	y		
64	2	Zero Reference Location	8-bit integer	0 = Near, 1 = Far	0	rw	y		
64	3	Shift Zero Reference After Teach	8-bit integer	0=Off, 1=AutoSet, 2=SetZero	0	rw	y		
64	4	Sensor Lockout	8-bit integer	0=No Lockout, 1=Sensor Locked	0	rw	y		
64	5	Output Polarity	8-bit integer	0=PNP,1=NPN					
64	6	IOL Filter Time (ms)	16-bit integer	0–65535	0	rw	y		
64	7	Display Units	2-bit integer	0=mm, 1=inches	0	rw	y		
64	8	Remote Input Type	4-bit integer	0=Teach, 1=Laser Enable, 2=Trigger, 3=Sync Master, 4=Sync Slave, 5=Disabled	5	rw	y		
64	9	Process Data Measurement 1 Selection	8-bit integer	0 = Disabled, 1 = Distance Measurement Value (µm), 2 = Displayed Distance Measurement Value (µm), 3 = Analog Output Value (µA or mV), 4 = BDC1 Dual Mode Percent	1	rw	y		
64	10	Process Data Measurement 2 Selection	8-bit integer	0 = Disabled, 1 = Excess Gain, 2 = Excess Gain/10, 3 = BDC1 Dual Mode Percent	0	rw	y		
64	11	Include Binary Data in Process Data	8-bit integer	0 = Don't Include, 1 = Include	1	rw	y		
65		**BDC1 Vendor Specific Configuration**							
65	1	BDC1 Delay Mode	8-bit integer	0=Delay Timer Disabled, 1=On + Off Delay, 2=Off One-Shot Timer, 3=On One-Shot Timer	0	rw	y		
65	2	BDC1 Delay On/One-Shot Delay (ms)	32-bit integer	0–9999	0	rw	y		
65	3	BDC1 Delay Off/One-Shot Timer (ms)	32-bit integer	0–9999	0	rw	y		
65	4	BDC1 Switch Point Reference	8-bit integer	0=Object, 1=Background, 2=Custom	0	rw	y		
65	5	BDC1 User Teach Offset (µm)	32-bit integer	-90000–+90000 (µm)	0	rw	y		
65	6	BDC1 Midpoint Teach Window Size (µm)	32-bit integer	LM80: 24–90000 (µm) LM150: 100–90000 (µm)	30,000	rw	y		
65	7	BDC1 Midpoint Teach Offset Size (µm)	32-bit integer	-90000–+90000 (µm)	0	rw	y		
65	8	BDC1 Auto-Thresholding	8-bit integer	0=On, 1=Off, 2=High Speed	1	rw	y		
66		unused/reserved							
67		**Status**							
67	1	Measurement Distance: (distance in µm)	32-bit integer			ro			
67	2	Excess Gain	32-bit integer			ro			
67	3	Stability	8-bit integer	0=No target, 1=Marginal, 2=Stable		ro			
67	4	Laser Fault Status	8-bit integer	0=No Fault, 1=Fault Present		ro			
67	5	Analog Output Value (µA or mV)	32-bit integer			ro			
67	6	BDC1 Dual Mode Percent	32-bit integer			ro			
67	7	Temperature (in .1°C)	16-bit integer			ro			y
67	8	Last Taught Temperature (in .1°C)	16-bit integer			ro			y
67	9	Transducer Disable Status	8-bit integer	0 = Active, 1 = Inactive		ro			y
68		unused/reserved							
69		**All-Time Run Time**							

Index	Subindex	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile	AOI?
69	1	Run counter (0.25 hr)	32-bit integer			ro			
70		**Resettable Run Time**							
70	1	Run counter (0.25 hr)			0	rw			
71		unused/reserved							
72		**Display String**							
72	1	Line 1	8-octet String US_ASCII		ro				y
72	2	Line 2	8-octet String US_ASCII		ro				y
73		unused/reserved							
74		**AO1 Setpoints**							
74	1	Setpoint SP1 (µm)	32-bit integer	LM80: 40,000–80,000 (µm) LM150: 50,000–150,000 (µm)	LM80: 40000 LM150: 50000	rw	y		
74	2	Setpoint SP2 (µm)	32-bit integer	LM80: 40,000–80,000 (µm) LM150: 50,000–150,000 (µm)	LM80: 80000 LM150: 150000	rw	y		
75		AO1 Configuration							
75	1	Output Type	8-bit integer	0 = 4–20 mA, 1 = 0-10 V	0	ro	y		
75	2	Slope	8-bit integer	0 = Positive, 1 = Negative	0	rw	y		
75	3	Loss Of Signal	8-bit integer	0 = Hold, 1 = Low, 2 = High	1	rw	y		
75	4	Midpoint Teach Window Size (µm)	32-bit integer	1000–90000 (µm)	30000	rw	y		
75	5	Midpoint Teach Offset Size (µm)	32-bit integer	-90000–+90000 (µm)	0	rw	y		
75	6	Trigger	8-bit integer	0 = Trigger Sample, 1 = Trigger Average, 2 = Trigger Max, 3 = Trigger Min, 4 = Trigger Range, 5 = Trigger Track Max, 6 = Trigger Track Min	0	rw	y		
75	7	Average	8-bit integer	0 = 1, 1 = 2, 2 = 4, 3 = 8, 4 = 16, 5 = 32, 6 = 64, 7 = 128, 8 = 256, 9 = 512	4	rw	y		
76-77		unused/reserved							
78		**All-Time Run Time Event Time**							
78	1	Event Time (0.25 hr)	32-bit integer	0–2147483647	0	rw	y		
79		Resettable Run Time Event Time							
79	1	Event Time (0.25 hr)	32-bit integer	0–2147483647	0	rw	y		

Events

Events are acyclic transmissions from the IO-Link device to the IO-Link master. In general events can be error messages and/or warning or maintenance data. The LM has nine events defined.

Code	Type	Description
25376 (0x6320)	Error	Parameter error (check datasheet and values)
36000 (0x8CA0)	Warning	All-time Run Time Event (Event indicating the corresponding configured running time has elapsed.)
36001 (0x8CA1)	Warning	Resettable Run Time Event (Event indicating the corresponding configured running time has elapsed.)
36003 (0x8CA3)	Notification	Teach Completed Event (Event indicating a teach has been completed.)
36004 (0x8CA4)	Notification	Factory Settings Restored Event (Event indicating that the factory settings have been restored.)

Code	Type	Description
36005 (0x8CA5)	Notification	Teach Coerced Event (Event indicating a taught condition resulting in a setpoint being coerced. Taught was updated.)
36007 (0x8CA7)	Notification	Teach Failed Event (Event indicating an invalid target condition was attempted to be taught. Taught setpoint was not updated.)
36096 (0x8d00)	Error	Laser fault event (laser shut down for safety)
36097 (0x8D01)	Error	System Fault Event (Contact Banner Engineering to resolve.)

© Banner Engineering Corp. All rights reserved