IO-Link Data Reference Guide: Q90R2 Analog (KI and KU Models)

IO-Link Data Map

This document refers to the following IODD file: Banner_Engineering-Q90R2-Analog-20240517-IODD1.1.xml.

The IODD file 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		Parameter	Value
IO-Link revision	V1.1		Port class	A
Process Data In length	120-bit		SIO mode	Yes
Process Data Out length	N/A		Smart sensor profile	Yes
Bit Rate	38400 bps		Block parameterization	Yes
Minimum cycle time	2.3 ms		Data Storage	Yes
			ISDU Supported	Yes

IO-Link Process Data In (Device to Master)

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

The Q90R2 IO-Link Process Data is 120-bits and can be configured using parameter data to include the measurement distance, the state of the stability indicator, and/or the state of both output channels. This information is sent to the IO-Link master every 2.3 ms.

Process Data Configuration 1: Radial Detection Areas

Subindex	Name	Number of Bits	Data Values
1	Switch Signal Channel 1 State	1	0 = Inactive, 1 = Active
2	Switch Signal Channel 1 Stability	1	0 = no target or marginal, 1 = valid
3	Analog Output 1 State	1	0 = Inactive, 1 = Active
4	Analog Output 1 Stability	1	0 = no target or marginal, 1 = valid
5	Switch Signal Channel 1 Distance (mm)	16	0 to 21000
6	Switch Signal Channel 1 Beam Angle (degrees)	16	–60 to 60
7	Switch Signal Channel 1 Velocity (m/s)	16	–90 to 90 (–9.0 to 9.0 m/s)
8	Switch Signal Channel 1 Signal Strength	8	0 to 255
9	Analog Output 1 Distance (mm)	16	0 to 21000
10	Analog Output 1 Beam Angle (degrees)	16	–60 to 60
11	Analog Output 1 Velocity (m/s)	16	–90 to 90 (–9.0 to 9.0 m/s)
12	Analog Output 1 Signal Strength	8	0 to 255

Octet 0								
Subindex	12							
Bit offset	119	118	117	116	115	114	113	112
Value	0	0	0	1	0	1	0	0

Octet 1								
Subindex	11							
Bit offset	111	110	109	108	107	106	105	104
Value	0	0	0	0	0	0	0	0

Original Instructions
11-Oct-24

© Banner Engineering Corp. All rights reserved.

241634
p/n: 241634 Rev. A

ПРОМЭЛЕКТРОНИКА/ sales@prom-elec.com

Octet 2								
Subindex	11							
Bit offset	103	102	101	100	99	98	97	96
Value	0	0	1	1	0	0	1	0

Octet 3								
Subindex	10							
Bit offset	95	94	93	92	91	90	89	88
Value	0	0	0	0	0	0	0	0

Octet 4								
Subindex	10							
Bit offset	87	86	85	84	83	82	81	80
Value	0	0	1	0	1	0	0	0

Octet 5								
Subindex	9							
Bit offset	79	78	77	76	75	74	73	72
Value	0	0	1	0	0	1	1	1

Octet 6								
Subindex	9							
Bit offset	71	70	69	68	67	66	65	64
Value	0	0	0	1	0	0	0	0

Octet 7								
Subindex	8							
Bit offset	63	62	61	60	59	58	57	56
Value	0	0	0	1	0	1	0	0

Octet 8								
Subindex	7							
Bit offset	55	54	53	52	51	50	49	48
Value	0	0	0	0	0	0	0	0

Octet 9								
Subindex	7							
Bit offset	47	46	45	44	43	42	41	40
Value	0	0	1	1	0	0	1	0

Octet 10								
Subindex	6							
Bit offset	39	38	37	36	35	34	33	32
Value	0	0	0	0	0	0	0	0

Octet 11								
Subindex	6							
Bit offset	31	30	29	28	27	26	25	24
Value	0	0	0	1	0	1	0	0

© Banner Engineering Corp. All rights reserved.

Octet 12								
Subindex	5							
Bit offset	23	22	21	20	19	18	17	16
Value	0	0	1	1	1	0	1	0

Octet 13								
Subindex	5							
Bit offset	15	14	13	12	11	10	9	8
Value	1	0	0	1	1	0	0	0

Octet 14								
Subindex					4	3	2	1
Bit offset	7	6	5	4	3	2	1	0
Value					1	1	1	1

Example with Process Data Configuration 1

Based on the values in the example data above:

Switch Signal Channel 1 State	Active
Switch Signal Channel 1 Stability	Valid
Analog Output 1 State	Active
Analog Output 1 Stability	Valid
Switch Signal Channel 1 Distance	15000 mm
Switch Signal Channel 1 Beam Angle	20 degrees
Switch Signal Channel 1 Velocity	50 = 5.0 m/s
Switch Signal Channel 1 Signal Strength	20
Analog Output 1 Distance	10000 mm
Analog Output 1 Beam Angle	40 degrees
Analog Output 1 Velocity	50 = 5.0 m/s
Analog Output 1 Signal Strength	20

Process Data Configuration 2: Rectangular Detection Areas

Subindex	Name	Number of Bits	Data Values
1	Switch Signal Channel 1 State	1	0 = Inactive, 1 = Active
2	Switch Signal Channel 1 Stability	1	0 = no target or marginal, 1 = valid
3	Analog Output 1 State	1	0 = Inactive, 1 = Active
4	Analog Output 1 Stability	1	0 = no target or marginal, 1 = valid
5	Switch Signal Channel 1 X (mm)	16	0 to 21000
6	Switch Signal Channel 1 Y (mm)	16	0 to 21000
7	Switch Signal Channel 1 Velocity (m/s)	16	–90 to 90 (–9.0 to 9.0 m/s)
8	Switch Signal Channel 1 Signal Strength	8	0 to 255
9	Analog Output 1 X (mm)	16	0 to 21000
10	Analog Output 1 Y (mm)	16	0 to 21000
11	Analog Output 1 Velocity (m/s)	16	–90 to 90 (–9.0 to 9.0 m/s)
12	Analog Output 1 Signal Strength	8	0 to 255

Octet 0								
Subindex	12							
Bit offset	119	118	117	116	115	114	113	112

Continued on page 4

© Banner Engineering Corp. All rights reserved.

Continued from page 3

Octet 0								
Value	0	0	0	1	0	1	0	0

Octet 1								
Subindex	11							
Bit offset	111	110	109	108	107	106	105	104
Value	0	0	0	0	0	0	0	0

Octet 2								
Subindex	11							
Bit offset	103	102	101	100	99	98	97	96
Value	0	0	1	1	0	0	1	0

Octet 3								
Subindex	10							
Bit offset	95	94	93	92	91	90	89	88
Value	0	0	1	1	1	0	1	0

Octet 4								
Subindex	10							
Bit offset	87	86	85	84	83	82	81	80
Value	1	0	0	1	1	0	0	0

Octet 5								
Subindex	9							
Bit offset	79	78	77	76	75	74	73	72
Value	0	0	1	0	0	1	1	1

Octet 6								
Subindex	9							
Bit offset	71	70	69	68	67	66	65	64
Value	0	0	0	1	0	0	0	0

Octet 7								
Subindex	8							
Bit offset	63	62	61	60	59	58	57	56
Value	0	0	0	1	0	1	0	0

Octet 8								
Subindex	7							
Bit offset	55	54	53	52	51	50	49	48
Value	0	0	0	0	0	0	0	0

Octet 9								
Subindex	7							
Bit offset	47	46	45	44	43	42	41	40
Value	0	0	1	1	0	0	1	0

Octet 10								
Subindex	6							

Continued on page 5

© Banner Engineering Corp. All rights reserved.

Continued from page 4

Octet 10								
Bit offset	39	38	37	36	35	34	33	32
Value	0	0	1	0	0	1	1	1

Octet 11								
Subindex	6							
Bit offset	31	30	29	28	27	26	25	24
Value	0	0	0	1	0	0	0	0

Octet 12								
Subindex	5							
Bit offset	23	22	21	20	19	18	17	16
Value	0	0	1	1	1	0	1	0

Octet 13								
Subindex	5							
Bit offset	15	14	13	12	11	10	9	8
Value	1	0	0	1	1	0	0	0

Octet 14								
Subindex					4	3	2	1
Bit offset	7	6	5	4	3	2	1	0
Value					1	1	1	1

Example with Process Data Configuration 2

Based on the values in the example data above:

Switch Signal Channel 1 State	Active
Switch Signal Channel 1 Stability	Valid
Analog Output 1 State	Active
Analog Output 1 Stability	Valid
Switch Signal Channel 1 X	15000 mm
Switch Signal Channel 1 Y	10000 mm
Switch Signal Channel 1 Velocity	50 = 5 m/s
Switch Signal Channel 1 Signal Strength	20
Analog Output 1 X	10000 mm
Analog Output 1 Y	15000 mm
Analog Output 1 Velocity	50 = 5 m/s
Analog Output 1 Signal Strength	12

IO-Link Process Data Out (Master to Device)

Not applicable.

Parameters Set Using IO-Link

Index	Subindex	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile
0	1-16	Direct Parameter Page 1 (incl. Vendor ID & Device ID)				ro		

Continued on page 6

© Banner Engineering Corp. All rights reserved.

Continued from page 5

Index	Subindex	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile
2		Standard Command	8-bit Uinteger	64 = Teach Apply 65 = SP1 Single Value Teach 66 = SP2 Single Value Teach 67 = SP1 Two Value Teach TP1 68 = SP1 Two Value Teach TP2 75 = Window Set 79 = Teach Cancel 126 = Locator Start 127 = Locator Stop 129 = Application Reset 131 = Back-to-box		wo		y
16		Vendor Name string	64-octet string	Banner Engineering Corporation		ro		
17		Vendor Text string	64-octet string	More Sensors. More Solutions		ro		
18		Product Name string	64-octet string	Q90R2		ro		
19		Product ID string	64-octet string			ro		
20		Product Text string	64-octet string	More Sensors. More Solutions		ro		y
21		Serial Number	16-octet string			ro		
22		Hardware Version	64-octet string			ro		
23		Firmware Version	64-octet string			ro		y
24		App Specific Tag (user defined)	32-octet string			rw	y	y
25		Function Tag	32-octet String					
26		Location Tag	32-octet String					
32		Error Count	16-bit Uinteger			ro		
36		Device Status	8-bit Uinteger	0=Device is OK 4=Failure		ro		
37		Detailed Device Status	Array[6] of 3-octet			ro		
40		Process Data Input		see Process Data In		ro		
58		Teach-in Channel	8-bit Uinteger	0 = Default, 1 = SSC.1, 2 = AO.1		ro		
59		**Teach Status**						
59	1	Teach State: 4-bit Integer	4-bit Uinteger	0 = Idle 1 = SP1 Success 2 = SP2 Success 3 = SP1 SP2 Success 4 = Wait for Command 5 = Busy 7 = Error				
59	2	SP1 TP1	1-bit integer	0 = not taught or unsuccessful 1 = successfully taught		ro		y
59	3	SP1 TP2	1-bit integer	0 = not taught or unsuccessful 1 = successfully taught		ro		y
59	4	SP2 TP1	1-bit integer	0 = not taught or unsuccessful 1 = successfully taught		ro		y
59	5	SP2 TP2	1-bit integer	0 = not taught or unsuccessful 1 = successfully taught		ro		y
64		**General Configuration**						
64	1	Response Speed	8-bit UInteger	0 = Fast, 1 = Medium, 2 = Slow		rw	y	y
64	2	Detection Sensitivity	8-bit UInteger	0 = High, 1 = Standard		rw	y	y
64	3	LEDs Disabled	8-bit UInteger	0 = Enabled, 1 = Disabled		rw	y	y
64	4	Output Polarity	8-bit UInteger	0 = NPN, 1 = PNP		rw	y	y
64	5	Process Data Measurement	8-bit UInteger	0 = Radial, 1 = Rectangular		rw	y	y
64	6	Remote Input Mode	8-bit UInteger	0 = Disabled, 1 = Teach		rw	y	y
64	7	Amplitude Threshold	32-bit Integer	100..100000		rw	y	y
64	8	Limit Filter Enabled	8-bit UInteger	0 = Disabled, 1 = Enabled		rw	y	y
64	9	Limit Filter Positive Hold Time	32-bit Integer	50..3600000		rw	y	y
64	10	Limit Filter Negative Hold Time	32-bit Integer	50..3600000		rw	y	y
64	11	Limit Filter Positive Distance	32-bit Integer	0..1000		rw	y	y
64	12	Limit Filter Negative Distance	32-bit Integer	0..1000		rw	y	y
64	13	Primary Output Mode	8-bit UInteger	0 = Independent Output, 1 = Complementary Output, 2 = Pulse Frequency Output		rw	y	y
65		**Switch Signal Channel 1 Detection Area Configuration**						

Continued on page 7

© Banner Engineering Corp. All rights reserved.

Continued from page 6

Index	Subindex	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile
65	1	Delay On	32-bit UInteger	0..60000		rw	y	y
65	2	Delay Off	32-bit UInteger	0..60000		rw	y	y
65	3	Distance Window Size (Radial)	16-bit UInteger	50..9950		rw	y	y
65	4	Distance User Teach Offset (Radial)	16-bit Integer	–20000..20000		rw	y	y
65	9	Y Window Size (Rectangular)	16-bit UInteger	50..9950		rw	y	y
65	10	Y User Teach Offset Y User Teach Offset (Rectangular)	16-bit Integer	–20000..20000		rw	y	y
67		**Status**						
67	1	SSC.1 State	8-bit UInteger	0 = Inactive, 1 = Active		ro		
67	2	SSC.1 Stability	8-bit UInteger	0 = No Target, 1 = Marginal Target, 2 = Strong Target		ro		
67	3	SSC.1 Distance or X	16-bit Integer	0 to 21000		ro		
67	4	SSC.1 Beam Angle or Y	16-bit Integer	–60 to 60		ro		
67	5	SSC.1 Velocity	16-bit Integer	See response speed table		ro		
67	6	SSC.1 Signal Strength	8-bit UInteger	0 to 255		ro		
67	7	AO.1 State	8-bit UInteger	0 = Inactive, 1 = Active		ro		
67	8	AO.1 Stability	8-bit UInteger	0 = No Target, 1 = Marginal Target, 2 = Strong Target		ro		
67	9	AO.1 Distance or X	16-bit Integer	0 to 21000		ro		
67	10	AO.1 Beam Angle or Y	16-bit Integer	–60 to 60		ro		
67	11	AO.1 Velocity	16-bit Integer	See response speed table		ro		
67	12	AO.1 Signal Strength	8-bit UInteger	0 to 255		ro		
67	13	Fault Status	8-bit UInteger	0 = No Fault Present, 1 = Fault Present		ro		
67	14	Analog Output Value	32-bit Integer			ro		
67	15	Temperature	32-bit Integer			ro		
67	16	Last Taught Temperature	32-bit Integer			ro		
69		All Time Runtime	32-bit UInteger	0–4294967295		ro		
70		Resettable Runtime	32-bit UInteger	0–4294967295		rw		
74		**Analog Output 1 Setpoints**						
74	1	Distance Setpoint SP1 (Radial)	16-bit Integer	100..20000		rw		
74	2	Distance Setpoint SP2 (Radial)	16-bit Integer	0, 100..20000		rw		
74	3	Y Setpoint SP1 (Rectangular)	16-bit Integer	100..20000		rw		
74	4	Y Setpoint SP2 (Rectangular)	16-bit Integer	0, 100..20000		rw		
74	5	Velocity Setpoint SP1	16-bit Integer	–90..90		rw		
74	6	Velocity Setpoint SP2	16-bit Integer	–90..90		rw		
75		**Analog Output 1 Configuration**						
75	1	Output Type	8-bit UInteger	0 = 4-20mA , 128 = 0-10V, 129 = 0.5-4.5V (129)		rw		
75	2	Measurement	8-bit UInteger	0 = Distance or Y , 1 = Velocity		rw		
75	3	Loss of Signal	8-bit UInteger	0 =-Hold , 1 = Low, 2 = High		rw		
75	4	Average	8-bit UInteger	0 = 1x , 1 = 2x , 2 = 4x , 3 = 8x , 4 = 16x , 5 = 32x , 6 = 64x , 7 = 128x		rw		
76		All Time Runtime Event Time	32-bit UInteger	0–4294967295		rw		
77		Resettable Runtime Event Time	32-bit UInteger	0–4294967295		rw		
78		**Active Sensing Range**						
78	1	Detection Area	8-bit UInteger	0 = Radial, 1 = Rectangular		rw		
78	2	Minimum Active Sensing Distance (Radial)	16-bit Integer	0…21000		rw		
78	3	Maximum Active Sensing Distance (Radial)	16-bit Integer	0…21000		rw		
78	4	Minimum Active Sensing Y (Rectangular)	16-bit Integer	0…21000		rw		
78	5	Maximum Active Sensing Y (Rectangular)	16-bit Integer	0…21000		rw		

Continued on page 8

© Banner Engineering Corp. All rights reserved.

Continued from page 7

Index	Subindex	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile
78	6	Velocity Filter	8-bit UInteger	0 = All Target Velocities 1 = Dynamic Targets Only 2 = Approaching Targets Only 3 = Receding Targets Only 4 = Custom		rw		
78	7	Minimum Velocity	16-bit Integer	–90..90		rw		
78	8	Maximum Velocity	16-bit Integer	–90..90		rw		
78	9	Velocity Hysteresis	16-bit UInteger	0..180		rw		
128		**Switch Signal Channel 1 Configuration**						
128	1	Switch point logic	8-bit Uinteger	0 = Light Operate (LO) - Discrete output is On while target is detected. 1 = Dark Operate (DO) - Discrete output is Off while target is detected.		rw		
128	2	Distance/Y Setpoint Mode	8-bit Uinteger	1 = Switch Mode/Single Point Mode 2 = Window Mode		rw		
130		**Switch Signal Channel 1 Setpoints**						
130	1	Distance Setpoint SP1 (Radial)	16-bit Integer	100..20000		rw		
130	2	Distance Setpoint SP2 (Radial)	16-bit Integer	0, 100..20000		rw		
130	3	Distance Hysteresis (Radial)	16-bit UInteger	0…20000		rw		
130	4	Y Setpoint SP1 (Rectangular)	16-bit Integer	100..20000		rw		
130	5	Y Setpoint SP2 (Rectangular)	16-bit Integer	0, 100..20000		rw		
130	6	Y Hysteresis (Rectangular)	16-bit UInteger	0…20000		rw		
132		**Switch Signal Channel 1 Active Sensing Range**						
132	1	Peak Select Mode	8-bit UInteger	0 = First Peak, 1 = Strongest Peak		rw		
132	2	Beam Angle Setpoint SP1 (Radial)	8-bit Integer	–60..60		rw		
132	3	Beam Angle Setpoint SP2 (Radial)	8-bit Integer	–60..60		rw		
132	4	Beam Angle Hysteresis (Radial)	8-bit UInteger	0..120		rw		
132	5	X Setpoint SP1 (Rectangular)	16-bit Integer	–20000..20000		rw		
132	6	X Setpoint SP2 (Rectangular)	16-bit Integer	–20000..20000		rw		
132	7	X Hysteresis (Rectangular)	16-bit UInteger	0..40000		rw		
133		**Analog Output 1 Detection Area Configuration**						
133	1	Peak Select Mode	8-bit UInteger	0 = First Peak, 1 = Strongest Peak		rw		
133	2	Beam Angle Setpoint SP1 (Radial)	8-bit Integer	–60..60		rw		
133	3	Beam Angle Setpoint SP2 (Radial)	8-bit Integer	–60..60		rw		
133	4	Beam Angle Hysteresis (Radial)	8-bit UInteger	0..120		rw		
133	5	X Setpoint SP1 (Rectangular)	16-bit Integer	–20000..20000		rw		
133	6	X Setpoint SP2 (Rectangular)	16-bit Integer	–20000..20000		rw		
133	7	X Hysteresis (Rectangular)	16-bit UInteger	0..40000		rw		
134		**Switch Signal Channel 1 PFM Configuration**						
134	1	Measurement	8-bit UInteger	0 = Distance or Y, 1 = Velocity		rw		
134	2	Frequency Setpoint SP1	16-bit UInteger	100..600		rw		
134	3	Frequency Setpoint SP2	16-bit UInteger	100..600		rw		
134	4	Loss of Signal	8-bit UInteger	0 = Hold, 1 = Low, 2 = High		rw		
136		**Switch Signal Channel 1 PFM Setpoints**						
136	1	Distance Setpoint SP1 (Radial)	16-bit Integer	100..20000		rw		
136	2	Distance Setpoint SP2 (Radial)	16-bit Integer	100..20000		rw		
136	3	Y Setpoint SP1 (Rectangular)	16-bit Integer	100..20000		rw		
136	4	Y Setpoint SP2 (Rectangular)	16-bit Integer	100..20000		rw		
136	5	Velocity Setpoint SP1	16-bit Integer	–90..90		rw		
136	6	Velocity Setpoint SP2	16-bit Integer	–90..90		rw		

© Banner Engineering Corp. All rights reserved.

IO-Link Events

Events are acyclic transmissions from the IO-Link device to the IO-Link master. Events can be error messages and/or warning or maintenance data.

Code	Type	Name	Description
6200 (0x1838)	Error	Event 1	Test Events for IO-Link Conformance
6201 (0x1839)	Error	Event 2	Test Events for IO-Link Conformance
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
36005 (0x8ca5)	Notification	Teach Coerced Event	Event indicating a taught condition resulting in a setpoint being coerced; taught setpoint 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	Transceiver Fault Event	Event indicating that an error has occurred with the radar transceiver
36097 (0x8d01)	Error	System Fault Event	Contact Banner Engineering to resolve

© Banner Engineering Corp. All rights reserved.