

# S15C Modbus Converter (GPS) - IO-Link Data Reference Guide



## IO-Link Data Map

This document refers to the following IODD file: Banner\_Engineering-S15C-MGP-KQ-20200715-IODD1.1.xml. The IODD file and support files can be found on [www.bannerengineering.com](http://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	256 bits	SIO mode	No
Process Data Out length	8 bits	Smart Sensor Profile	No
Bit Rate	38400 bps	Block parameterization	Yes
Minimum cycle time	14 ms	Data Storage	Yes
Device ID	659461		

## 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 read register values match the raw values of the sensor. For information on converting raw values, see Banner P/N 178135 *GPS Module*.

RegSet = 0

Subindex	Name	Number of Bits	Data Values	Modbus Register Address	Description
1	Register Set To Read	4-bit Uinteger	0..2		Register Set To Read - Value set via Process Data Out
2	Register Read Successful	Boolean	0=false, 1=true		Register Read Successful
5	Counter Value	8-bit Uinteger	0..255		Counter increments upon the completion of Reg Set ModBus request/response cycle
6	Read Set Register 01 Value	16-bit Uinteger	0..65535	40001	Latitude Signed Upper
7	Read Set Register 02 Value	16-bit Uinteger	0..65535	40002	Latitude Signed Lower
8	Read Set Register 03 Value	16-bit Uinteger	0..65535	40003	Longitude Signed Upper
9	Read Set Register 04 Value	16-bit Uinteger	0..65535	40004	Longitude Signed Lower
10	Read Set Register 05 Value	16-bit Uinteger	0..65535	40005	Altitude Signed Upper
11	Read Set Register 06 Value	16-bit Uinteger	0..65535	40006	Altitude Signed Lower
12	Read Set Register 07 Value	16-bit Uinteger	0..65535	40007	UTC Time Signed Upper
13	Read Set Register 08 Value	16-bit Uinteger	0..65535	40008	UTC Time Signed Lower
14	Read Set Register 09 Value	16-bit Uinteger	0..65535	40009	Date Signed Upper
15	Read Set Register 10 Value	16-bit Uinteger	0..65535	40010	Date Signed Lower
16	Read Set Register 11 Value	16-bit Uinteger	0..65535	42006	Signal Quality
17	Read Set Register 12 Value	16-bit Uinteger	0..65535	42008	Number of Satellites Being Tracked
18	Read Set Register 13 Value	16-bit Uinteger	0..65535	42010	Time (seconds) since the last DGPS update
19	Read Set Register 14 Value	16-bit Uinteger	0..65535	42104	2D/3D Fix
20	N/A				



## RegSet = 1

Subindex	Name	Number of Bits	Data Values	Modbus Register Address	Description
1	Register Set To Read	4-bit Uinteger	0..2		Register Set To Read - Value set via Process Data Out
2	Register Read Successful	Boolean	0=false, 1=true		Register Read Successful
5	Counter Value	8-bit Uinteger	0..255		Counter increments upon the completion of Reg Set ModBus request/response cycle
6	Read Set Register 01 Value	16-bit Uinteger	0..65535	42129	PDOP - Position Dilution of Precision Register Upper
7	Read Set Register 02 Value	16-bit Uinteger	0..65535	42130	PDOP - Position Dilution of Precision Register Lower
8	Read Set Register 03 Value	16-bit Uinteger	0..65535	42131	HDOP - Horizontal Dilution of Precision Registers Upper
9	Read Set Register 04 Value	16-bit Uinteger	0..65535	42132	HDOP - Horizontal Dilution of Precision Registers Lower
10	Read Set Register 05 Value	16-bit Uinteger	0..65535	42133	VDOP - Vertical Dilution of Precision Registers Upper
11	Read Set Register 06 Value	16-bit Uinteger	0..65535	42134	VDOP - Vertical Dilution of Precision Registers Lower
12	Read Set Register 07 Value	16-bit Uinteger	0..65535	42207	Speed Upper
13	Read Set Register 08 Value	16-bit Uinteger	0..65535	42208	Speed Lower
14	Read Set Register 09 Value	16-bit Uinteger	0..65535	42209	Direction Upper
15	Read Set Register 10 Value	16-bit Uinteger	0..65535	42210	Direction Lower
16	N/A				
17	N/A				
18	N/A				
19	N/A				
20	N/A				

## RegSet = 2

Subindex	Name	Number of Bits	Data Values	Modbus Register Address	Description
1	Register Set To Read	4-bit Uinteger	0..2		Register Set To Read - Value set via Process Data Out
2	Register Read Successful	Boolean	0=false, 1=true		Register Read Successful
5	Counter Value	8-bit Uinteger	0..255		Counter increments upon the completion of Reg Set ModBus request/response cycle
6	Read Set Register 01 Value	16-bit Uinteger	0..65535	44101	Serial Number - Higher
7	Read Set Register 02 Value	16-bit Uinteger	0..65535	44102	Serial Number - Lower
8	Read Set Register 03 Value	16-bit Uinteger	0..65535	44103	Model Number - Higher
9	Read Set Register 04 Value	16-bit Uinteger	0..65535	44104	Model Number - Lower
10	Read Set Register 05 Value	16-bit Uinteger	0..65535	11405	Production Date - Higher
11	Read Set Register 06 Value	16-bit Uinteger	0..65535	11406	Production Date - Lower
12	Read Set Register 07 Value	16-bit Uinteger	0..65535	44301	RF Firmware Part Number - Higher
13	Read Set Register 08 Value	16-bit Uinteger	0..65535	44302	RF Firmware Part Number - Lower
14	Read Set Register 09 Value	16-bit Uinteger	0..65535	44303	RF Firmware Version Upper
15	Read Set Register 10 Value	16-bit Uinteger	0..65535	44304	RF Firmware Version Lower
16	Read Set Register 11 Value	16-bit Uinteger	0..65535	44305	RF Firmware Version Engineering
17	Read Set Register 12 Value	16-bit Uinteger	0..65535	44306	RF EEPROM Part Number - Higher
18	Read Set Register 13 Value	16-bit Uinteger	0..65535	44307	RF EEPROM Part Number - Lower
19	Read Set Register 14 Value	16-bit Uinteger	0..65535	44308	RF EEPROM Version Upper
20	Read Set Register 15 Value	16-bit Uinteger	0..65535	44309	RF EEPROM Version Lower

## Example Process Data In

<b>Octet 0</b>								
Subindex	20	20	20	20	20	20	20	20
Bit offset	255	254	253	252	251	250	249	248
<b>Octet 1</b>								
Subindex	20	20	20	20	20	20	20	20
Bit offset	247	246	245	244	243	242	241	240
<b>Octet 2</b>								
Subindex	19	19	19	19	19	19	19	19
Bit offset	239	238	237	236	235	234	233	232
<b>Octet 3</b>								
Subindex	19	19	19	19	19	19	19	19
Bit offset	231	230	229	228	227	226	225	224
<b>Octet 4</b>								
Subindex	18	18	18	18	18	18	18	18
Bit offset	223	222	221	220	219	218	217	216
<b>Octet 5</b>								
Subindex	18	18	18	18	18	18	18	18
Bit offset	215	214	213	212	211	210	209	208
<b>Octet 6</b>								
Subindex	17	17	17	17	17	17	17	17
Bit offset	207	206	205	204	203	202	201	200
<b>Octet 7</b>								
Subindex	17	17	17	17	17	17	17	17
Bit offset	199	198	197	196	195	194	193	192
<b>Octet 8</b>								
Subindex	16	16	16	16	16	16	16	16
Bit offset	191	190	189	188	187	186	185	184
<b>Octet 9</b>								
Subindex	16	16	16	16	16	16	16	16
Bit offset	183	182	181	180	179	178	177	176
<b>Octet 10</b>								
Subindex	15	15	15	15	15	15	15	15
Bit offset	175	174	173	172	171	170	169	168
<b>Octet 11</b>								
Subindex	15	15	15	15	15	15	15	15
Bit offset	167	166	165	164	163	162	161	160
<b>Octet 12</b>								
Subindex	14	14	14	14	14	14	14	14
Bit offset	159	158	157	156	155	154	153	152
<b>Octet 13</b>								
Subindex	14	14	14	14	14	14	14	14

<b>Octet 13</b>								
Bit offset	151	150	149	148	147	146	145	144
<b>Octet 14</b>								
Subindex	13	13	13	13	13	13	13	13
Bit offset	143	142	141	140	139	138	137	136
<b>Octet 15</b>								
Subindex	13	13	13	13	13	13	13	13
Bit offset	135	134	133	132	131	130	126	128
<b>Octet 16</b>								
Subindex	12	12	12	12	12	12	12	12
Bit offset	127	126	125	124	123	122	121	120
<b>Octet 17</b>								
Subindex	12	12	12	12	12	12	12	12
Bit offset	119	118	117	116	115	114	113	112
<b>Octet 18</b>								
Subindex	11	11	11	11	11	11	11	11
Bit offset	111	110	109	108	107	106	105	104
<b>Octet 19</b>								
Subindex	11	11	11	11	11	11	11	11
Bit offset	103	102	101	100	99	98	97	96
<b>Octet 20</b>								
Subindex	10	10	10	10	10	10	10	10
Bit offset	95	94	93	92	91	90	89	88
<b>Octet 21</b>								
Subindex	10	10	10	10	10	10	10	10
Bit offset	87	86	85	84	83	82	81	80
<b>Octet 22</b>								
Subindex	9	9	9	9	9	9	9	9
Bit offset	79	78	77	76	75	74	73	72
<b>Octet 23</b>								
Subindex	9	9	9	9	9	9	9	9
Bit offset	71	70	69	68	67	66	65	64
<b>Octet 24</b>								
Subindex	8	8	8	8	8	8	8	8
Bit offset	63	62	61	60	59	58	57	56
<b>Octet 25</b>								
Subindex	8	8	8	8	8	8	8	8
Bit offset	55	54	53	52	51	50	49	48
<b>Octet 26</b>								
Subindex	7	7	7	7	7	7	7	7
Bit offset	47	46	45	44	43	42	41	40

Octet 27								
Subindex	7	7	7	7	7	7	7	7
Bit offset	39	38	37	36	35	34	33	32
Octet 28								
Subindex	6	6	6	6	6	6	6	6
Bit offset	31	30	29	28	27	26	25	24
Octet 29								
Subindex	6	6	6	6	6	6	6	6
Bit offset	23	22	21	20	19	18	17	16
Octet 30								
Subindex	5	5	5	5	5	5	5	5
Bit offset	15	14	13	12	11	10	9	8
Octet 31								
Subindex	///	///	///	2	1	1	1	1
Bit offset	7	6	5	4	3	2	1	0

## IO-Link Process Data Out (Master to Device)

Subindex	Name	Number of Bits	Data Values
1	Register Set To Read	8	0..2

## Example Process Data Out

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

## Example Based Upon the Value Above

Register Set To Read = 1

## Parameters Set Using IO-Link

These parameters can be read from and/or written to the S15C-MGP-KQ converter. 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	Sub-Index	Name	Length	Value Range	Default	Access Rights	Data Storage?
0	1-15	Direct Parameter Page 1 (incl. Vendor ID & Device ID)				ro	
0	16	Standard Command		130 = Restore Factory Settings 162 = Start discovery 163 = Stop discovery		wo	
1	1-16	Direct Parameters Page 2				rw	
2		Standard Command	8-bit uinteger	130 = Restore Factory Settings 162 = Start discovery 163 = Stop discovery		wo	

Index	Sub-index	Name	Length	Value Range	Default	Access Rights	Data Storage?
3		Data Storage Index (device-specific list of parameters to be stored)					
4-11		reserved by IO-Link Specification					
<b>12</b>		<b>Device Access Locks</b>					
12	1	Parameter Write Access Lock		0 = off, 1 = on	0	rw	y
12	2	Data Storage Lock		0 = off, 1 = on	0	rw	y
13-15		<i>unused</i>				ro	
16		Vendor Name string		Banner Engineering Corporation		ro	
17		Vendor Text string		More Sensors. More Solutions		ro	
18		Product Name string				ro	
19		Product ID string				ro	
20		Product Text string		S15C-MGP-KQ		ro	
21		Serial Number				ro	
22		Hardware Version				ro	
23		Firmware Version				ro	
24		App Specific Tag (user defined)				rw	y
25-35		<i>reserved</i>					
36		Device Status	8-bit integer	0 = Device is OK 1 = Maintenance required 2 = Out of specification 3 = Functional check 4 = Failure 5..255 Reserved		ro	
37		Detailed Device Status	Array[6] of 3-octet			ro	
<b>80</b>		<b>ModBus Setting</b>					
80	1	ModBus Address	16-bit uinteger	1..247	1	rw	y
80	2	ModBus Baud Rate	16-bit uinteger	24 = 2400 96 = 9600 192 = 19200 384 = 38400 576 = 57600 1152 = 115200	192	rw	y
80	3	ModBus Parity	16-bit uinteger	0 = None 1 = Odd 2 = Even	0	rw	y
80	4	ModBus Stop Bits	16-bit uinteger	1 = 1 2 = 2 3 = 1.5	1	rw	y

## 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.

### Events

Code	Type	Description
0 (0x0000)	Notification	No malfunction
20480 (0x5000)	Error	Device hardware fault

## ErrorTypes

Code	Additional Code	Description
128 (0x80)	0 (0x00)	Service has been refused by the device application and not detailed information of the incident is available
128 (0x80)	17 (0x11)	Access occurs to a not existing index
128 (0x80)	18 (0x12)	Access occurs to a not existing subindex
128 (0x80)	32 (0x20)	Parameter is not accessible due to the current state of the device application
128 (0x80)	35 (0x23)	Write access on a read-only parameter
128 (0x80)	48 (0x30)	Written parameter value is outside its permitted value range
128 (0x80)	49 (0x31)	Written parameter value is above its specified value range
128 (0x80)	51 (0x33)	Written parameter length is above it predefined length
128 (0x80)	52 (0x34)	Written parameter length is below its predefined length
128 (0x80)	53 (0x35)	Written command is not supported by the device application
128 (0x80)	54 (0x36)	Written command is not available due to the current state of the device application
128 (0x80)	65 (0x41)	Parameter inconsistencies were found at the end of block parameter transfer, device plausibility check failed