Quick Reference

Original Instructions

59RF High Frequency RFID Transceivers

Catalog Numbers 59RF-TR-M18, 59RF-TR-M30, 59RF-TR-4040

Description

This publication describes the IO-Link parameters and functionality to program the 59RF High Frequency Transceiver. Access these parameters from any IO-Link 1.1 compliant primary.

IO-Link Features

- Highly visible diagnostic status indicators
- Auto-read and auto-write functionality simplifies continuous read or write or data to the tag.
- Read tag UID with UID Timing
- Read/write speeds up to 26.6 kb/s
- Signal Strength helps verify that the tag is within a detection distance to the tag.
- ICODE ISO15693 compliant
- Operates in either IO-Link Mode or SIO (Standard I/O mode).
- Location indication lets you locate the transceiver in applications where multiple modules are used.

Communication Parameters

Specifications	Values
IO-Link revision	V1.1.2
Process Data In length	256 bits (32 bytes)
Process Data Out length	256 bits (32 bytes)
Communication mode	COM3 (230.4 kBaud)
Minimum cycle time	10 ms
Vendor ID	2 (0x02)
Device ID	236 (0xEC)
SIO mode	Supported
Data storage	Supported

Process Data In (Continuous Data)

Process Data In transmits cyclically to the IO-Link primary from the IO-Link device.

The 59RF Process Data is 32 bits and includes the data, signal strength, and state of the transceiver. This information sends to the IO-Link primary every 10 ms.

Table 1 - Process Data In

Byte	Properties					User Access	Description
0	255	7	MSB D7	Busy		Read	Indicates the status of an RFID transceiver. • 0 = RFID channel is not executing a command • 1 = Command in process If the transceiver is set to auto-read, auto-write or UID mode, the bit automatically toggles when the tag is within detection range.
	254	6	D6	Fault		Read	Indicates the fault status of the RFID channel. • 0 = Channel is operating normally • 1 = Channel faulted
	253	5	D5	TagPresent		Read	Indicates the status of a tag at the RFID channel. • 0 = No tag is present at the transceiver • 1 = One or more tags are detected at the transceiver
	252	4	D4	AntennaEnabled		Read	Indicates the status of the RFID Antenna. • 0 = RF Field is inactive • 1 = RF Field is active
	251	3	D3	Command	4 bits	Read	Displays the last command that the channel received; at power-up, this value is 0.
	250	2	D2				
	249	1	D1				
	248	0	LSB D0				
1	247	7	MSB D7	ErrorCode		Read	Indicates the last error code for the transceiver. See Table 2 on page 3.
	246	6	D6				
	245	5	D5				
	244	4	D4				
	243	3	D3				
	242	2	D2				
	241	1	D1	Alarm2		—	Indicates the status of Alarm 2. • 0 = Alarm is not active • 1 = Alarm is active
	240	0	LSB D0	Alarm1		—	Indicates the status of Alarm 1. • 0 = Alarm is not active • 1 = Alarm is active
2	239	7	MSB D7	SignalStrength	8 bits	Read	Displays the strength of the signal between the transponder and the tag.
	238	6	D6				
	237	5	D5				
	236	4	D4				
	235	3	D3				
	234	2	D2				
	233	1	D1				
	232	0	LSB D0				
3	231	7	MSB D7	Address	8 bits	Read	Displays the transponder memory block address where the Read/Write command executed.
	230	6	D6				
	229	5	D5				
	228	4	D4				
	227	3	D3				
	226	2	D2				
	225	1	D1				
	224	0	LSB D0				
4...27	223	7	MSB D7	Data	224 bits	Read	Depending on the Data Format, the Data word parameter is an array of either 2-byte values or an array of 1-byte values that total 28 bytes in length. This array stores information that returns from the RFID interface.
	...	6	D6				
		5	D5				
		4	D4				
		3	D3				
		2	D2				
		1	D1				
	0	0	LSB D0				

Table 2 - Error Codes

Code	Name	Description
1	CommandNotSupported	The transponder replies error code values to the RWM interrogation. Dependence of ISO15693 command set supported by the different transponder IC of the market. IOS15693 standard defines these error code values.
2	FormatError	
3	OptionNotSupported	
5	CommandProblem	
6	CommTagError	
15	TagError	
16	NoMemoryBlock	
18	BlockProtected	
27	AppLOGError	The RWM password (index 0x58) does not match the transponder password.
30	TAGCommError	Indicates a transponder communication error (more than 1 transponder is detected or the transponder reply is not understood).
255	AppGeneralError	General error

Process Data Out (Continuous Data)

Process Data Out transmits cyclically to the IO-Link primary from the IO-Link device.

The 59RF Process Data is 32 bits and includes the data, signal strength, and state of the transceiver. This information sends to the IO-Link primary every 10 ms.

Table 3 - Process Data Out

Byte	Properties					User Access	Description
0	255	7	MSB D7	Run		Read	Set the RFID transceiver to Run or Program mode. • 0 = Program mode • 1 = Run mode When in Program mode, the interface maintains the connection to the transceiver but does not execute commands. If the Auto-Read, Auto-Write or UID command is selected, the bit is not used. The RFID commands send automatically if a transponder is within the detection range.
	254	6	D6				
	253	5	D5				
	252	4	D4	DisabledAntenna		Read	Disable or enable the transceiver RFID antenna. • 0 = Enabled • 1 = Disabled
	251	3	D3	Command	4 bits	Read	Enter the desired command for RFID Operation. See Table 4 on page 4 valid commands.
	250	2	D2				
	249	1	D1				
	248	0	LSB D0				
1	247	7	MSB D7				
	246	6	D6				
	245	5	D5				
	244	4	D4				
	243	3	D3				
	242	2	D2	DataLength	3 bits	Read	Stores the expected block size for the tag. A maximum value of 7 can be entered for EEPROM and 3 for FRAM tags.
	241	1	D1				
	240	0	LSB D0				
2	239	7	MSB D7				
	238	6	D6				
	237	5	D5				
	236	4	D4				
	235	3	D3				
	234	2	D2				
	233	1	D1				
	232	0	LSB D0				

Table 3 - Process Data Out (Continued)

Byte	Properties					User Access	Description
3	231	7	MSB D7	Address	8 bits	Read	Displays the transponder memory block address where the Read/Write command executed.
	230	6	D6				
	229	5	D5				
	228	4	D4				
	227	3	D3				
	226	2	D2				
	225	1	D1				
	224	0	LSB D0				
4...27	223	7	MSB D7	Data	224 bits	Read	Depending on the data format, the Data word parameter is an array of either 2-byte values or an array of 1-byte values that total 28 bytes in length. This array is used to store information that returns from the RFID interface.
	...	6	D6				
		5	D5				
		4	D4				
		3	D3				
		2	D2				
		1	D1				
	0	0	LSB D0				

Table 4 - RFID Commands

Name	Value	Description
CMD	0	No command
	1	Auto-Read
	2	Auto-Write
	3	Read
	4	Write
	5	UID and tag timings

Software Tabs

Table 5 - Identification Tab

Index (Dec)	Index (Hex)	Sub	Parameter Name	Description	User Access	Data Type	Size (Bytes/Bits)	Value
Device Information								
16	0x10		Vendor Name	Vendor name of the product	Read	Str	13/104	Allan-Bradley
17	0x11		Vendor Text	Vendor-specific text of the product	Read	Str	18/144	https://www.rockwellautomation.com/en-us/products/hardware/allen-bradley/sensors-and-switches.html
18	0x12		Product Name	Product Cat. No.	Read	Str	64/512	59-TR-4040, 59-TR-M18, 59-TR-M30
19	0x13		Product ID	Sensor Cat. No.	Read	Str	64/512	SAP PN
20	0x14		Product Text	Brief description of the sensor	Read	Str	64/512	Compact HF RFID IO-Link Device
21	0x15		Serial Number	Serial number of the unit	Read	Str	16/128	–
User-specific Information								
24	0x18		Application-specific Tag	Describe the sensor in the application. For example, the roll level sensor.	Read/write	Str	4/32	–
72	0x48	0x01	User Tag 1	Add information about the application where the sensor is installed.	Read/write	Str	32/256	–
		0x02	User Tag 2	Add information about the application where the sensor is installed.	Read/write	Str	32/256	–
Revision Information								
22	0x16		Hardware Version	–	Read	Str	–	1.0 (default)
23	0x17		Software Version	–	Read	Str	–	1.0 (default)

Table 6 - Parameter Tab

Index (Dec)	Index (Hex)	Sub	Parameter Name	Description	User Access	Data Type	Size (Bytes/Bits)	Value
User Interface Configuration								
	Device Access Locks							
12	0xC	3	Device Access Locks.Data Storage Lock	Locks the data storage functionality.	Read/write	Boolean	1/1	0, 1
Operation Configuration								
	Signal Strength							
66	0x42	1	Threshold	Indicates the minimum signal strength threshold for the transceiver to read/write the tag.	Read/write	Uinteger	1/8	0...7 (default 1)
		Output 1						
65	0x41	0x01	.Operating Mode	Select the desired operation mode of the transceiver.	Read/write	Uinteger	1/8	• 0 - Transponder presence (default) • 1 - Compare data • 2 - Alarm 1 • 3 - Alarm 2
		0x02	.Start Address	Enter the desired start address where the transceiver makes the compare data operation from the tag.	Read/write	Uinteger	1/8	Transponder memory block address where to make the Compare Data operation 0x00 (default)
		0x03	.Data to Compare	Enter the desired data that is compared in the tag.	Read/write	Uinteger	4/32	Reference data value stopped in the transceiver to be compared with the transponder data 0x00 (default)
		0x04	.Polarity	Defines the operation of the output when the sensor is operating in SIO (Standard IO) mode.	Read/write	Uinteger	1/8	• 0 - Output open if the transceiver condition is true (default) • 1 - Output closed if the transceiver condition is false
		Output 2						
		0x06	.Operating Mode	Select the desired operation mode of the transceiver.	Read/write	Uinteger	1/8	• 0 - Transponder presence (default) • 1 - Compare data • 2 - Alarm 1 • 3 - Alarm 2
		0x07	.Start Address	Enter the desired start address where the transceiver makes the compare data operation from the tag.	Read/write	Uinteger	1/8	Transponder memory block address where to make the Compare Data operation 0x00 (default)
		0x08	.Data to Compare	Enter the desired data that is compared in the tag.	Read/write	Uinteger	4/32	Reference data value stopped in the transceiver to be compared with the transponder data 0x00 (default)
		0x09	.Polarity	Defines the operation of the output when the sensor is operating in SIO (Standard IO) mode.	Read/write	Uinteger	1/8	• 0 - Output open if the transceiver condition is true (default) • 1 - Output closed if the transceiver condition is false
		Data Hold Time		Define the desired time to hold the data that is read.	Read/write	Uinteger	1/8	• 0 - No hold time (default) • 1 - Hold time 100 ms • 2- Hold time 200 ms • 3 - Hold time 500 ms • 4 - Hold time 1000 ms • 5 - Hold time 2000 ms
	Alarms							
		Alarm 1						
	0x47	0x01	Configuration	Enables or disables the alarm function of the transceiver.	Read/write	Uinteger	1/8	• 0 - Off (default) • 1 - Active
		0x02	Threshold	Defines the alarm threshold trigger for the Signal Strength and Time Under Detection source.	Read/write	Uinteger	4/32	Threshold value 0 (default)
		0x03	Source	Defines the desired source of the Alarm parameter. The alarm is ON when the value is below or equal to the Threshold parameter.	Read/write	Uinteger	1/8	• 2 - Signal Strength • 3 - Time Under Detection (ms)
		Alarm 2						
		0x04	Configuration	Enables or disables the alarm function of the transceiver.	Read/write	Uinteger	1/8	• 0 - Off (default) • 1 - Active
		0x05	Threshold	Defines the alarm threshold trigger for the Signal Strength and Time Under Detection source.	Read/write	Uinteger	4/32	Threshold value 0 (default)
		0x06	Source	Defines the desired source of the Alarm parameter. The alarm is ON when the value is below or equal to the Threshold parameter.	Read/write	Uinteger	1/8	• 2 - Signal Strength • 3 - Time Under Detection (ms)

Table 7 - Observation Tab

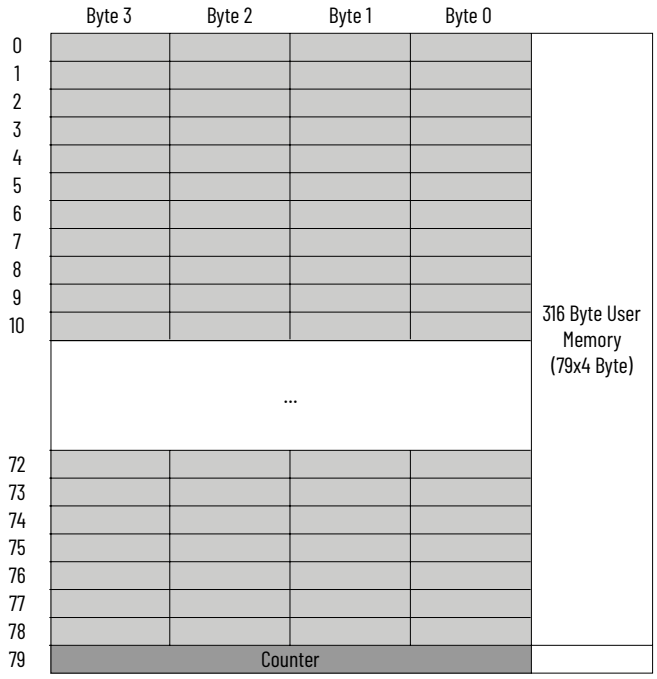
Index (Dec)	Index (Hex)	Sub	Parameter Name	Description	User Access	Data Type	Size (Bytes/Bits)
Device Monitoring							
	Tag Info						
67	0x43	1	UID		Read	Uinteger	8/64
		2	Transponder DSFID	Displays the Tag DSFID information if available.	Read	Uinteger	1/8
		3	Transponder AFI	Displays the Tag AFI information if available.	Read	Uinteger	1/8
		4	Number of Memory Blocks	Displays the number of memory blocks available in the tag under detection.	Read	Uinteger	1/8
		5	Memory Block Size	Displays the size of each memory block present in the tag under detection.	Read	Uinteger	1/8
		6	Signal Strength	Displays the signal strength at the time of the tag was read from the transceiver.	Read	Uinteger	1/8
		7	IC Manufacturer Code	Displays the IC manufacturer's code.	Read	Uinteger	1/8
		8	IC Reference	Displays the IC reference code.	Read	Uinteger	1/8
	UID List						
68	0x44	1	Tag UID 1	Displays the UID (Unique Serial Number) of the most recent tag under detection.	Read	Uinteger	8/64
		2	UID Timestamp 1	Displays the time stamp (ms) of the tag under detection for the most recent tag under detection.	Read	Uinteger	8/64
		3	Tag UID 2	Displays the UID of the second most recent tag under detection.	Read	Uinteger	8/64
		4	UID Timestamp 2	Displays the time stamp (ms) of the tag under detection for the second most recent tag under detection.	Read	Uinteger	8/64
		5	Tag UID 3	Displays the UID of the third most recent tag under detection.	Read	Uinteger	8/64
		6	UID Timestamp 3	Displays the time stamp (ms) of the tag under detection for the third most recent tag under detection.	Read	Uinteger	8/64
		7	Tag UID 4	Displays the UID of the fourth most recent tag under detection.	Read	Uinteger	8/64
		8	UID Timestamp 4	Displays the time stamp (ms) of the tag under detection for the fourth most recent tag under detection.	Read	Uinteger	8/64
		9	Tag UID 5	Displays the UID of the last five tags under detection.	Read	Uinteger	8/64
		10	UID Timestamp 5	Displays the time stamp (ms) of the tag under detection for the last fifth tag under detection.	Read	Uinteger	8/64
Tag Detection Time							
			Last Time Since Tag In	Displays the last time (ms) the tag was inside the transceiver detection field.	Read		8/64
			Last Time Since Tag Out	Displays the last time (ms) the tag was outside the transceiver detection field.	Read		8/64
			Time Under Detection	Displays the time (ms) that the tag was outside the detection field minus the time the transceiver was inside the detection field.	Read		8/64

Table 8 - Diagnosis Tab

Index (Dec)	Index (Hex)	Sub	Parameter Name	Description	User Access	Data Type	Size (Bytes/Bits)
Service Function							
			Standard Command <Device Reset >	Resets the device, acting like a power on cycle reset.	Write		
			Standard Command <Restore Factory Settings>	Restores the transceiver to its default factory settings.	Write		
			Standard Command <Location Indicator>	Enables the location indication mode on the transceiver. All status indicators flash for 30 s.	Write		
Operation Information							
	Operating Hours						
			Operating Hours - Since Power Up	(ms)	Read	Uinteger	8/64
	Counters						
		Error					
			General Error Counter	Displays how many transceiver errors have occurred since the last power up/ device reset.	Read	Uinteger	4/32
			Power On Cycle Counter	Displays the number of times the sensor was powered on since manufacture. You cannot reset this counter. Power down the transceiver for more than 550 ms to increment the counter.	Read	Uinteger	4/32

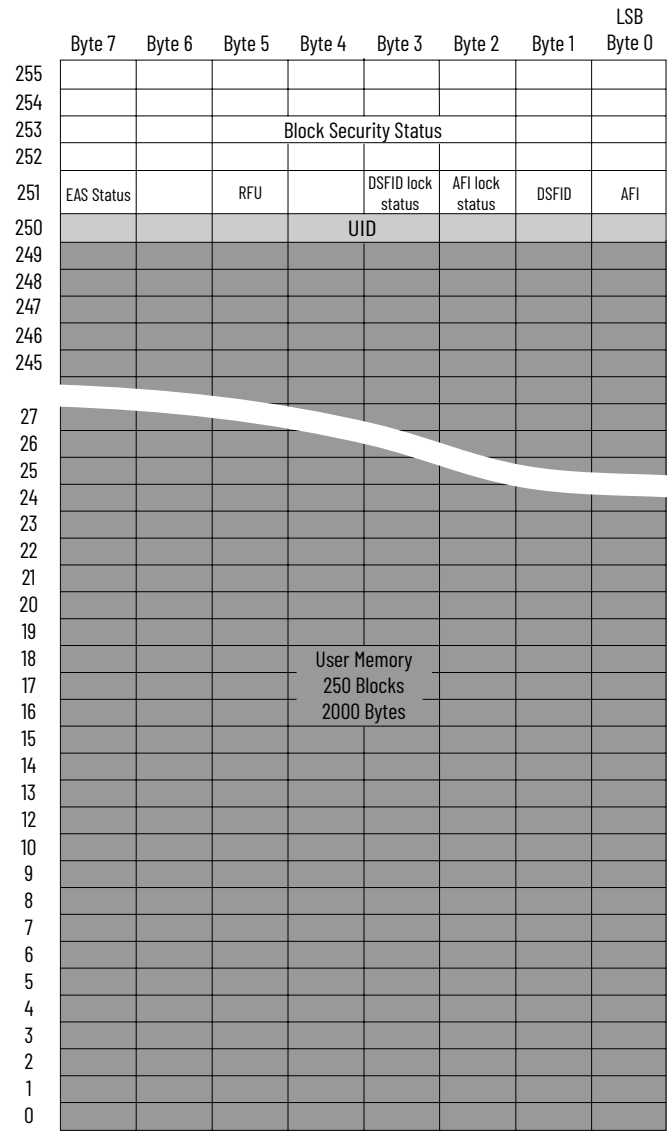
Memory Mapping

Figure 1 - 4-byte Tags



- EPROM memory: 160 bytes user area
- 4 bytes per block, 64 blocks
- 40 blocks of user memory
- Read endurance: Unlimited
- Write endurance: 10^5 cycles
- Data retention: > 10 years

Figure 2 - 8-byte Tags



- FRAM memory: 2 KB, 2000 bytes user area
- 8 bytes per block, 256 blocks
- 250 blocks user memory
- Read endurance: Unlimited
- Write endurance: 10^{12} cycles
- Data retention: > 10 years

Process for Reading and Writing Tag Data

The transceiver offers the following modes to access tag data:

- Auto Read
- Auto Write
- Read Only
- Write Only
- UID Mode

Auto Read Command

With an automatic read, the device automatically executes a read command as soon as the status of the start bit changes (rising or falling edge). The start bit automatically switches if a tag enters the detection range. 28 bytes of user data can transfer in each IO-Link cycle. The maximum number of transferable memory blocks depends on the chip type used (EEPROM or FRAM).

You must know the chip type of the tag to execute a write or read command. Because you cannot select the chip type via the IO-Link parameters, seven memory blocks are normally written or read. If you select a value > 3 for FRAM tags, only three blocks are written or read. No error message is sent to the transceiver.

Select the values for Length and Address according to Table 9:

Table 9 - Tag Values

Type	Catalog No.	Block Size (Bytes)	Memory Block No.	Memory Size (Bytes)	Memory Address
SLI	56RF-TG-16	4	32	128	0...32
SLI	56RF-TG-20	4	32	128	0...32
SLI	56RF-TG-30	4	32	128	0...32
SLI	56RF-TG-50	4	32	128	0...32
SLI-S	56RF-TG-16-64B	4	32	128	0...32
SLI-L	56RF-TG-10-256B	4	32	128	0...32
SLI	56RF-TG-35HIR	4	32	128	0...32
SLI	56RF-TG-20MOM	4	32	128	0...32
SLI	56RF-TG-50MOM	4	32	128	0...32
SLI	56RF-TG-5486	4	32	128	0...32
SLI	56RF-TG-5050	4	32	128	0...32
SLI	56RF-TG-5486SC	4	32	128	0...32
SLI	56RF-TG-50HT	4	32	128	0...32

The transceiver can also read ICODE compatible third-party tags. Review the tag information parameters to obtain specific information about the tags block size and available addresses.

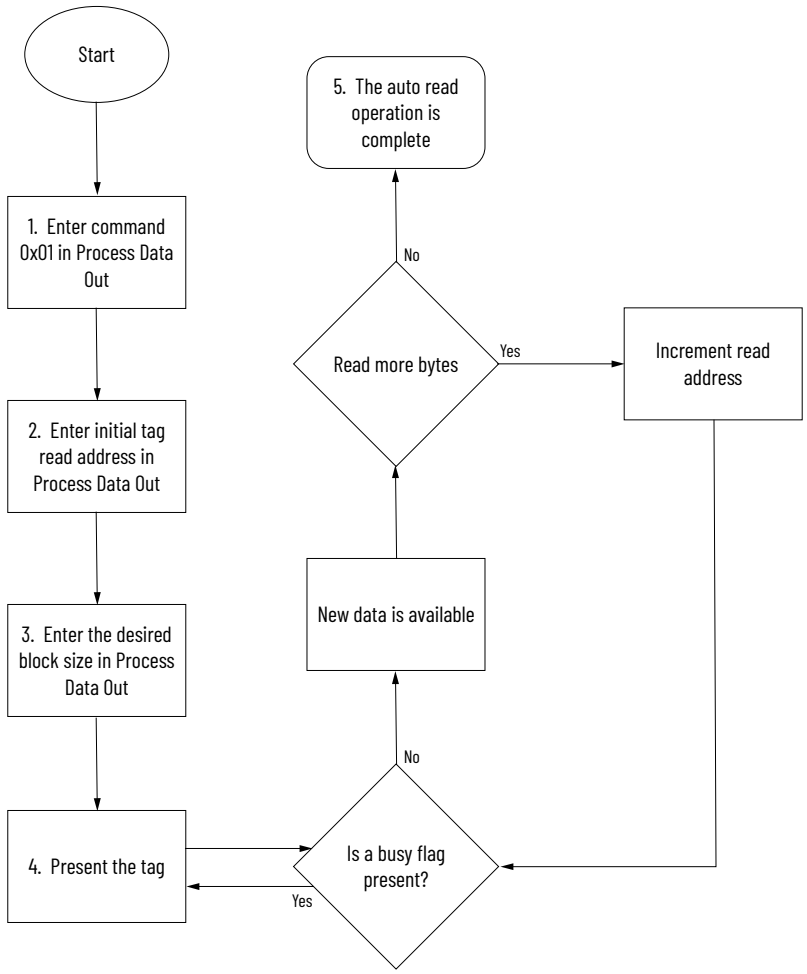
Auto Read a Tag

1. Enter the 0x01 value in the Command parameter of the Process Data Out structure.
2. Enter the memory address where you want the read operation to start.
3. Enter the desired block size length in the Process Data Out parameter.
4. Place the tag within the transceiver sensing range.

   The transceiver automatically reads the parameters starting from the selected address and reading the defined number of block sizes.

   The busy flag in the Process Data In parameters indicates when the auto read operation is complete. You can use this flag to perform multiple read processes during operation.
5. The auto read operation is complete.

Figure 3 - Auto Read Operation Flowchart



Auto Write Command

With the automatic write operation, the device automatically executes a write command once the status of the start bit changes (rising or falling edge). The start bit automatically switches if a tag enters the detection range. 28 bytes of user data can transfer in each IO-Link cycle. The maximum number of transferable memory blocks depends on the chip type used (EEPROM or FRAM).

You must know the chip type of the tag to execute a write or read command. Because you cannot select the chip type via the IO-Link parameters, seven memory blocks are normally written or read. If you select a value > 3 for FRAM tags, only three blocks are written or read. No error message is sent to the transceiver.

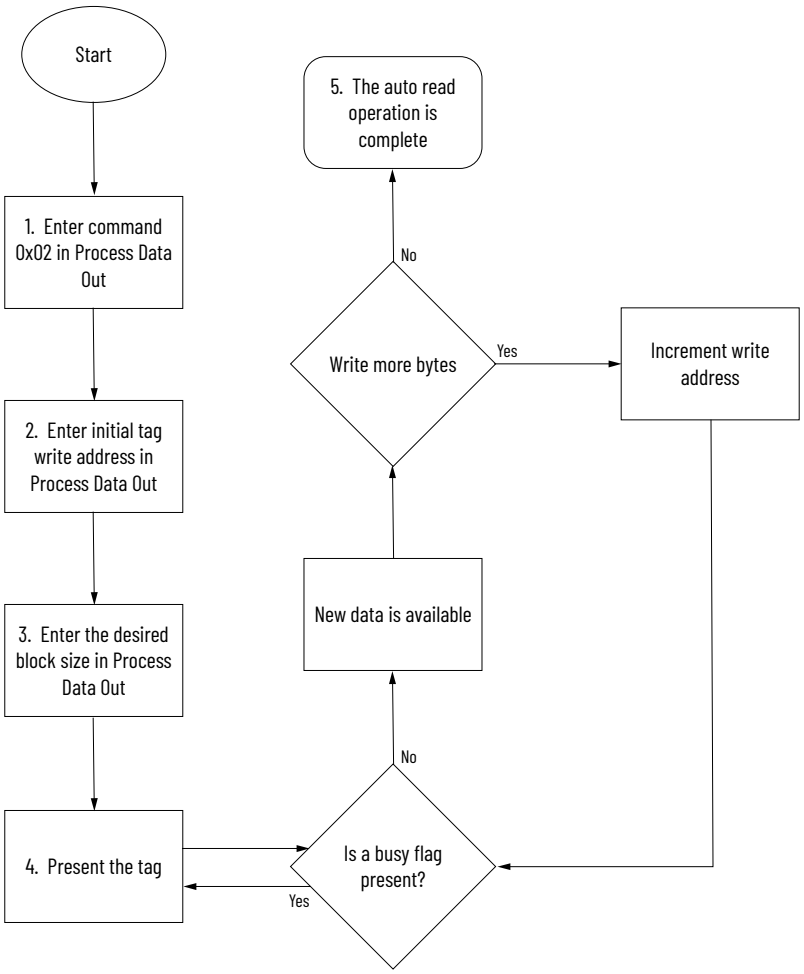
Auto Write a Tag

1. Enter the 0x02 value in the Command parameter of the Process Data Out structure.
2. Enter the memory address where you want the write operation to start.
3. Enter the desired block size length in the Process Data Out parameter.
4. Place the tag within the transceiver sensing range.

   The transceiver automatically reads the parameters starting from the selected address and reading the number of block sizes that you defined.

   The Busy Flag in the Process Data In parameters indicates when the auto write operation is complete. You can use this flag to perform multiple write processes during operation.
5. The auto write operation is complete.

Figure 4 - Auto Write Operation Flowchart



Read Command

With the read operation, the device automatically executes a read command once the status of the start bit changes (rising or falling edge). You must manually trigger the switching of the start bit. 28 bytes of user data can transfer in each IO-Link cycle. The maximum number of transferable memory blocks depends on the chip type used (EEPROM or FRAM).

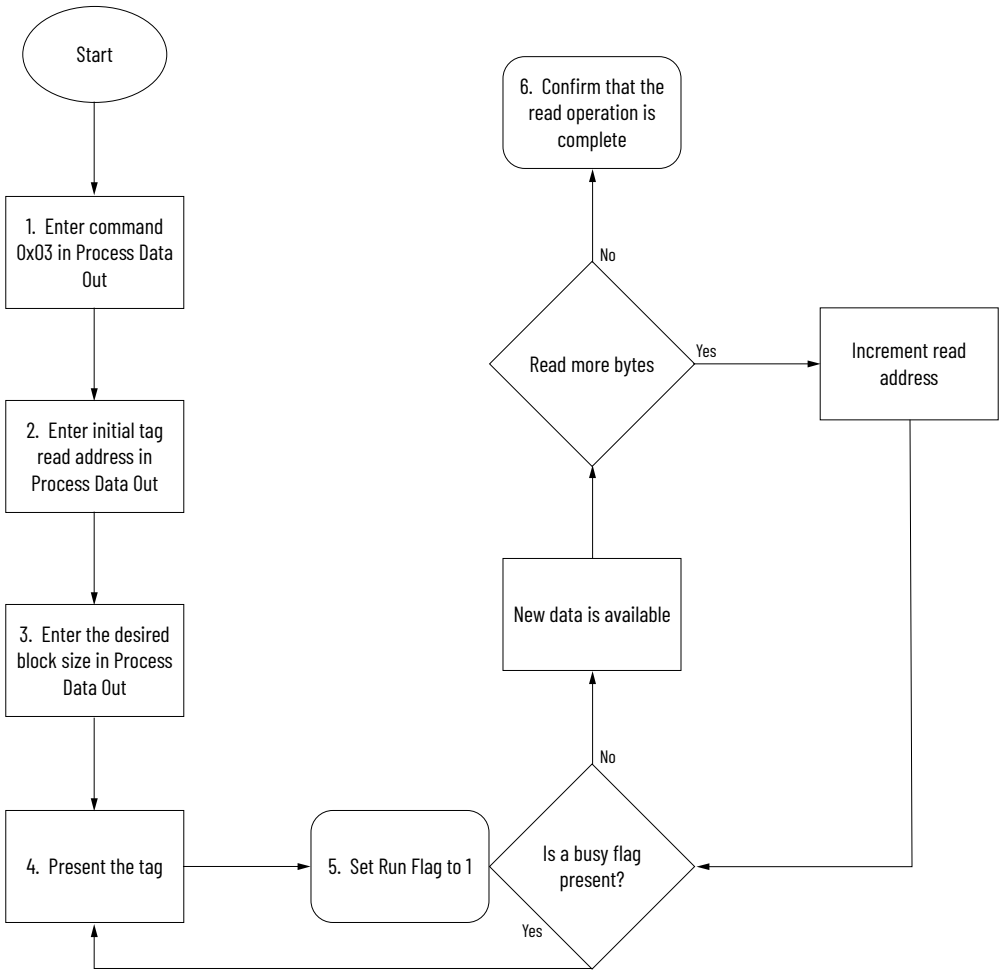
You must know the chip type of the tag to execute a write or read command. Because you cannot select the chip type via the IO-Link parameters, seven memory blocks are normally written or read. If you select a value > 3 for FRAM tags, only three blocks are written or read. No error message is sent to the transceiver.

Read a Tag

1. Enter the 0x03 value in the Command parameter of the Process Data Out structure.
2. Enter the memory address where the operator wants the read operation to start.
3. Enter the desired Block Size Length in the Process Data Out parameter.
4. Place the tag within the transceiver sensing range.
5. Set the run bit to 1.
6. Check on the Busy Bit in the process data to confirm if the read procedure is complete.

   A valid read sets the Busy flag bit to 1. If no tag is present, the Busy bit remains as 0.

Figure 5 - Read Operation Flowchart



Write Command

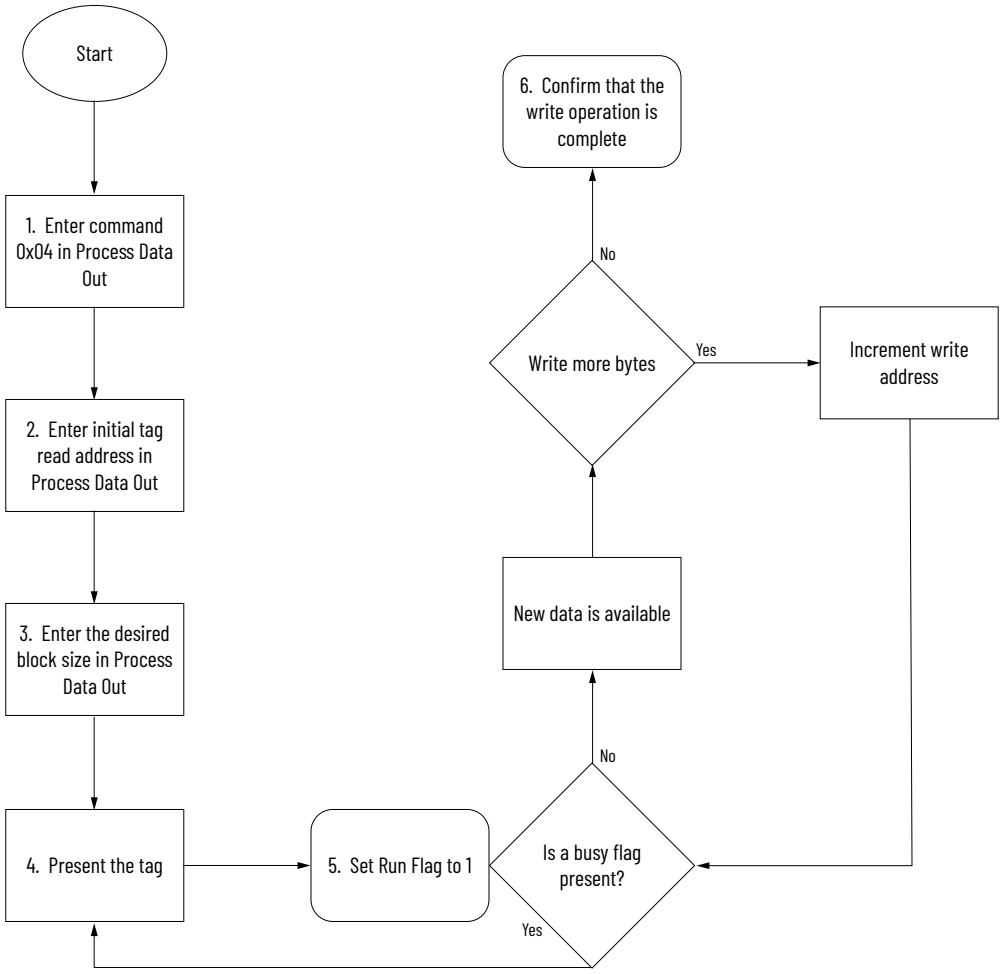
With the write operation, the device automatically executes a write command once the status of the start bit changes (rising or falling edge). You must manually trigger the switching of the start bit. 28 bytes of user data can transfer in each IO-Link cycle. The maximum number of transferable memory blocks depends on the chip type used (EEPROM or FRAM).

You must know the chip type of the tag to execute a write or read command. Because you cannot select the chip type via the IO-Link parameters, seven memory blocks are normally written or read. If you select a value > 3 for FRAM tags, only three blocks are written or read. No error message is sent to the transceiver.

Write a Tag

1. Enter the 0x04 value in the Command parameter of the Process Data Out structure.
2. Enter the memory address where the operator wants the write operation to start.
3. Enter the desired Block Size Length in the Process Data Out parameter.
4. Place the tag within the transceiver sensing range.
5. Set the run bit to 1.
6. Check on the Busy Bit in the process data to confirm if the read procedure is complete. A valid read sets the Busy flag bit to 1. If no tag is present, the Busy bit remains as 0.

Figure 6 - Write Operation Flowchart



Tag Serial Number ID and Time Stamps

The device queries the UID and the following time stamps:

- The time at which the tag is detected
- The time in which the tag is in the detection range

Read UID Data

The following steps are needed to read the values of the tag under detection:

1. Enter the 0x05 value in the Command parameter of the Process Data Out structure.
2. Place the tag within the transceiver sensing range.
3. If the tag is present and is correctly detected:
   a. UID data is in PDI Byte 4…12.
   b. Time stamp when tag is detected in Process Data In Bytes 13…21.
   c. Time Under Detection IN range time Process Data In Byte 22…30. Value is rising.

Rockwell Automation Support

Use these resources to access support information.

Technical Support Center	Find help with how-to videos, FAQs, chat, user forums, Knowledgebase, and product notification updates.	rok.auto/support
Local Technical Support Phone Numbers	Locate the telephone number for your country.	rok.auto/phonesupport
Technical Documentation Center	Quickly access and download technical specifications, installation instructions, and user manuals.	rok.auto/techdocs
Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
Product Compatibility and Download Center (PCDC)	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	rok.auto/pcdc

Documentation Feedback

Your comments help us serve your documentation needs better. If you have any suggestions on how to improve our content, complete the form at rok.auto/docfeedback.

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 compliance information on its website at rok.auto/pec.

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

Connect with us.

rockwellautomation.com — expanding **human possibility**®

AMERICAS: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000
EUROPE/MIDDLE EAST/AFRICA: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2663 0600
ASIA PACIFIC: Rockwell Automation SEA Pte Ltd, 2 Corporation Road, #04-05, Main Lobby, Corporation Place, Singapore 618494, Tel: (65) 6510 6608
UNITED KINGDOM: Rockwell Automation Ltd., Pitfield, Kiln Farm, Milton Keynes, MK11 3DR, United Kingdom, Tel: (44)(1908) 838-800

Publication 59RF-QR001A-EN-P - August 2024 | Supersedes Publication 59RF-QS001A-EN-P - March 2023