

Write acyclic data to IO-Link devices via RCCA

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Applies to the project "1200_RCCA-D_IOL_Parameterisation_via_Index". The manual provided by the manufacturer serves as a reference for indices and instructions for the "Werma ClearSIGN compact" demonstration hardware (download: https://www.werma.com/de/s_c1510i2688/ClearSIGN_BM_24VDC_MC/65610002.ht ml)



Creating the hardware configuration

An RCCA-D variant is used in the example project. Apart from the first IO-Link port, no other features are required here and are therefore not parameterised.

First, a suitable CPU is integrated into the project. An S7-1212FC is used in the example. However, an F-CPU is not absolutely necessary for the demonstration, as safe programme processing is not demonstrated. However, it is important to define the setting under "Start-up".



Figure 1: Hardware configuration S7-1212F

The setting "Start-up of CPU even with differences" also allows a demonstration without all components being connected to the RCCA/PLC.



After the RCCA module has been integrated into the hardware configuration - here TST-RCCA-D with the GSDML 20210906 - all unnecessary IO-Link modules are removed for demonstration purposes and the CRC is set for the default configuration. In order to be able to use the full output power of the IO-Link port, the "IQ behaviour" of the corresponding port in the IO-Link master module is set to "Digital output". The RCCA and PLC are then assigned to a common network.

Hardware catalog	∎ ∎ ►	
Options		
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Filter Profile: <all></all>		alo
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PC systems		8
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▶ 🛅 esd gmbh		
🕨 🫅 Euchner GmbH + Co. KG		
✓ Im FEIG ELECTRONIC GmbH		
🕶 🧾 Door Control		
🕶 🛅 Head module		
TST-RCCA-A		
TST-RCCA-B		
TST-RCCA-C		
TST-RCCA-D		
🕨 🧾 Hottinger Baldwin Messtechnik GmbH		
Information	•	
Device:	^	
-		
•		
TST-RCCA-D		
Article no.: TST-RCCA-D		
Version: (GSDML-V2.35-FEIG-ISTRCCA-20220216	.XIVIL)	
Description:		
TST-RCCA-D Extended		
Figure 2: Hardware catalogue		

-



Device overview							
Y Module	 Rack	Slot	I address	Q address	Туре	Article number	✓ Catalog
▼ tst-rcca	0	0			TST-RCCA-D	TST-RCCA-D	166 466
▶ X1	0	0 X1			tst-rcca		Filter Profile:
TST Door_1	0	1	6891	6474	TST Door		Need module
Digital I/O_1	0	2	1		Digital I/O		
 6xFDI Safety I/O and Control 	0	з	28	28	6xFDI Safety I/O an		The loci in the Digital IO
PROFIsafe V2.6 6xFDI	0	3.1	28	28	PROFIsafe V2.6 6xFDI		Digital Input
 4 Port IO-Link Master_1 	0	4			4 Port IO-Link Master	Order number	Digital Output
IO-Link Master	0	4 1	9	1	IO-Link Master		
IO-Link Port1	0	4 Port 1	9294	7576	IO-Link In/Out 2/ 2		I O-Link generic Devices
	0	4 Port 2					I O Link In/Out 2/2 Byte + ROI
	0	4 Port 3					I O Link In/Out 8/8 Byte + R
	0	4 Port 4					I O-Link In/Out 16/16 Byte + ROL
							I O-Link In/Out 32/32 Byte + POI
							IO Eink modules
							PROFisate V2.4 6xEDI
							PROFISATE V2.6 6xEDI
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Figure 3: IO-Link port configuration

tst-rcca [TST-RCCA-D]	💽 🖽 🚾 🍊 🎞 🛄 🔭 🖬	Device overview			
ھی	<u>^</u>	Wodule .	Rack	Slot	T
15th		▼ tst-rcca	0	0	
		▶ X1	0	0 X1	
		TST Door_1	0	1	1
	•	Digital I/O_1	0	2	
		 6xFDI Safety I/O and Control 	0	3	1
•	DP-NORM	PROFIsafe V2.6 6xFDI	0	3.1	
		 4 Port IO-Link Master_1 	0	4	
		IO-Link Master	0	4 1	1
		IO-Link Port1	0	4 Port 1	1
	~		0	4 Port 2	
< Ⅲ > 100%		<			
PROFIsate V2.6 6xEDI [PROF	Isafe V2.6.6xEDI				1
					-
General IO tags S	System constants Texts				
✓ General	DBOElasta				
Catalog information					-
PROFIsafe					
Hardware interrupts	F_SIL:	SIL3			_
Module parameters	F_CRC_Length:	4-Byte-CRC			-
I/O addresses	F Block ID:	1			
	F Par Version:	1			
	F Source Add:	1			
	F Dest Add:	2			
	E Par CRC WithoutAddresses				
	F Passivation:	Device/Module			-
	F CRC Seed:	CRC-Seed24/32			F
		Manual assignment of F-monitoring tim	e		
	F_WD_Time:	150 ms			
	F_iPar_CRC:	43EB5			
	F_Par_CRC:	45211			
	•	F-I/O DB manual number assignment			
	F-I/O DB-number:	30002			
	F-I/O DB-name:	F00002_PROFIsafeV2_66xFDI			

Figure 4: F-CRC default configuration



tst-rcca [TST-f	RCCA-D]	💌 🖽 🔣 🖽 🛄 M		Device overview					
SCO .			^	Wodule .	Rack	Slot	I address	Q address	ŀ
S.				▼ tst-rcca	0	0			ſ
				► X1	0	0 X1			•
				TST Door_1	0	1	6891	6474	•
			4	Digital I/O_1	0	2	1		
				 6xFDI Safety I/O and Control 	0	З	28	28	
		DP-NORM	-	PROFIsafe V2.6 6xFDI	0	31	28	28	
				 4 Port IO-Link Master_1 	0	4			1
				IO-Link Master	0	4 1	9	1	
				IO-Link Port1	0	4 Port 1	9294	7576	
			~		0	4 Port 2			
<	> 100%		. 🔍	<		1111			
IO-Link Master [IO-Link Maste	er]					🔍 Prope	ties 🚺	4
General	O tags Sy	stem constants Texts							
▼ General		10 haberian							
Catalog inform	nation	IQ benaviour							-
Hardware interru	ipts	IQ behaviour							
▼ Module paramet	ers								
IQ behaviour IQ behaviour F			r Port 0:	rt 0: Digital output					
Module failure IO behaviour		r Port 1:	Not supported						
I/O addresses		IO habauiau	r Port 2:	Not supported					_
		iq benaviou	mont 2:	Not supported					
	IQ behaviour			Not supported					

Figure 5: IQ behaviour in master module

Network Connections HMI connections	tion 🔽 🐮 🖽 🔟 🍳 🛨	
PLC_1 CPU 1212FC	tst-rcca TST-RCCA-D DP-NORM Not assigned • Select IO controller PLC_1.PROFINET-S chnitts telle_1	

Figure 6: Establishing a network connection

Finally, the hardware configuration is translated and transferred to the target device.



Creating the test program

IO-Link library

To be able to use IO-Link technology with Siemens components, at least TIA Portal V15.0 is required. All the modules required for this can be found in the library "IO LINK Library V5.2" or V6.0 for TIA V15 or V16.

(https://support.industry.siemens.com/cs/document/82981502/bibliothek-f%C3%BCrio-link-(liolink)?dti=0&lc=en-WW)

The "IO_LINK_DEVICE V3.3" module is transferred from this library to the project.

The remaining program

To simplify the use of the FB, a further FB "IOL_Com" is created which is structured as follows:

K 🗟 🖏 👘 📰 🚍 🕅	💬 📲 ± 📲 ± 👑 ±	😑 😰 🍋 🕻	o 🕼 🐨 🗎	₽ 🖛 🖽 🖽	‡‡ Ⅰ	= ² =	କାରାବ		
OL_Com									
Name	Data type	Default value	Retain	Accessible f W	rita	Visible in	Setpoint	Supervis	Comment
💷 🔻 Input									
HW_address	HW_ANY	0	Non-retain		\checkmark				Module's hardware address. Get from
💷 = rec_Index	Int	0	Non-retain		$\mathbf{\sim}$				Index to read/write. Refer to device's us
💷 = CAP	Dint	16#0000b400	Non-retain		\checkmark				Manufacturer specific. FEIG = B400
💷 = Port	Int	0	Non-retain		\checkmark				IOL-Port to access. Count starts at 1
💷 💻 rec_SubIndex	Int	0	Non-retain		\checkmark				Subindex to read/write. Refer to user m
💷 💻 wr_Len	Int	0	Non-retain		\checkmark				Length to read/write in Byte.
💷 🔻 Output									
💷 💶 status	DWord	16#0	Non-retain						
💷 🔻 InOut									
💷 💶 🕨 record	Array[0231] of Byte								
💷 💶 put	Bool	false	Non-retain						
💷 💶 get	Bool	false	Non-retain						
💷 🔻 Static									
💷 💶 valid	Bool	false	Non-retain						
a busy	Bool	false	Non-retain				Ā		
a error	Bool	false	Non-retain				Ä		
💷 = 🕨 string	Array[0231] of Char		Non-retain				Ā		
IO LINK DEVICE Insta.	"IO LINK DEVICE"								
	Bool	FALSE	Non-retain				Ā		False = Read; True = Write
Image: Temp					Ā				
• Ien	Int				\square				
Constant	[12]	1							

Figure 7: IOL_Com IO range





Figure 8: IOL_Com program sequence



To store the user data, the target for #record is now required, which is created as a DB without optimised memory access and contains a byte array with 232 entries.

·	💣 💣 🔩 🎲 🖿 🖏 Keep a	ctual values 🔒 Snapshot 🦄 🖏 Copysnapshots to star
	IOL_Com_Data	
N	Name	Data type Offset Start value
I	1 🕣 🔻 Static	
l	2 📲 🕨 Data	Array[0231] of Byte 🔳 💌 0.0
P	OL_Com_Data [DB2]	
	General Texts	
	General	Attributes
	Information	
	Time stamps	
	Compilation	Only store in load memory
	Protection	Data block write-protected in the device
	Attributes	
	Download without reinitializati	
		DB accessible from OPC UA

Figure 9: IOL data storage without optimisation

1200	_RCCA-D_IOL	_Parametrierung_	_über_Index 🕨	PLC_1 [C	PU 1212FC DC/I	DC/DC] ▶	Programmba	usteine	• IO-Link	► IOL_Co	m_Data [DB2]
*	* 🔍 🍢 🖿	Aktualwerte	e behalten 🛛 🔒 🛚 N	/lomentauf	nahme 📑 🖳	Momentauf	nahmen in Stai	rtwerte ko	opieren 🔣	🖳 Startw	erte als Aktualwerte
10	L_Com_Data										
	Name	Dat	tentyp	Offset	Startwert	Remanenz	Erreichbar a	Schrei	Sichtbar i	Einstellwert	Kommentar
1 🕣	🔻 Static										
2 🕣	🔹 🕨 Data	Arra	ray[0231 🔳 💌	0.0			~				
1 € 2 €	L_Com_Data Name Static	Dat	tentyp ray[0231 📺 💌	Offset 0.0	Startwert	Remanenz	Erreichbar a	Schrei	Sichtbar i	Einstellwert	Kommentar

Figure 10: IOL data storage data view

Once this configuration has been finished, the program is completed by calling up the FB created in the main program.

For demonstration purposes, a simple variable table is created and assigned in the main programme.





Figure 11: Interaction variables and call in OB1

The program is now translated and loaded into the target device. The program execution can be started.

Use the example program

Write the index

A monitoring and force table is now created to control the program sequence. All relevant variables are recorded there.



er_Index PLC_1 [CPU 1212FC DC/DC/DC] Watch and force tables Watch and f									
·	Name	Address	Display format	Monitor value					
1	"MasterPQI_Port1"	%Q1.0	Bool						
2	"IOL_Get"	%M300.0	Bool						
3	"IOL_Put"	%M300.1	Bool						
4	"IOL_Index"	%MW302	DEC+/-						
5	"IOL_RecLen"	%MW306	DEC+/-						
6	"IOL_OutData_By	%QB75	Bin						
7	"IOL_OutData_By	%QB76	Bin						
8									
9	"IOL_Com_Data"	%DB2.DBB0	Bin						
10	"IOL_Com_Data"	%DB2.DBB1	Bin						
11	"IOL_Com_Data"	%DB2.DBB2	Bin						
12	"IOL_Com_Data"	%DB2.DBB3	Bin						
13	"IOL_Com_Data"	%DB2.DBB4	Hex						
14	"IOL_Com_Data"	%DB2.DBB5	Hex						
15	"IOL_Com_Data"	%DB2.DBB6	Hex						
16	"IOL_Com_Data"	%DB2.DBB7	Hex						
17	"IOL_Com_Data"	%DB2.DBB8	Hex						
18	"IOL_Com_Data"	%DB2.DBB9	Hex						
19	"IOL_Com_Data"	%DB2.DBB10	Hex						
20	"IOL_Com_Data"	%DB2.DBB11	Hex						
21	"IOL_Com_Data"	%DB2.DBB12	Hex						
22	"IOL_Com_Data"	%DB2.DBB13	Hex						
23	"IOL_Com_Data"	%DB2.DBB14	Hex						
24	"IOL_Com_Data"	%DB2.DBB15	Hex						
25	"IOI Com Data"	%DB2 DBB16	Hex						

Figure 12: Watch and force table

The process data of the IO-Link device can be written directly here. In the example, these are QB75 and QB76. In the standard setting of the ClearSIGN (lamp), this means



Process D	Data	Single Segment	RGB	Level dimmed	Level blinking
Byte 0	Bit O	Segment 1 Red	Segment 1	A	A
	Bit 1	Segment 1 Green	Segment 2	n	n
	Bit 2	Segment 1 Blue	Segment 3	а	а
	Bit 3	Segment 2 Red	Segment 4	1	1
	Bit 4	Segment 2 Green		0	0
	Bit 5	Segment 2 Blue		g	g
	Bit 6	Segment 3 Red		Value (0100%)	Value (0100%)
	Bit 7	Segment 3 Green			
Byte 1	Bit O	Segment 3 Blue			
	Bit 1	Segment 4 Red			
	Bit 2	Segment 4 Green			
	Bit 3	Segment 4 Blue			
	Bit 4				
	Bit 5				
	Bit 6				
	Bit 7	Akustik (optional)	Akustik (optional)	Akustik (optional)	Akustik (optional)

Figure 13: Excerpt of Werna ClearSIGN

(Unfortunately there is a bug in the implementation of the lamp. The sequence of the process data is reversed. To control the lamp, byte 0 from the documentation corresponds to IOL_OutData_Byte1 and vice versa.)

To change the parameterisation of the device, the previously created variables and the documentation provided by the device manufacturer are important. In the example, the operating mode of the segments is to be changed from the standard single segment mode to RGB mode.



4.3 Konfiguration der ClearSIGN über Indexparametrierung Beschreibung der Parameter

Index	Parameter	Zugang	Byte Länge	Wert	
02	System Command	wo	1	130	Reset Factory Settings
16	Vendor Name	ro	48	WERM/	A Signaltechnik GmbH + Co. KG
17	Vendor Text	ro	48	www.v	verma.com
18	Product Name	ro	32	ClearS	IGN compact
19	Product ID	ro	16	656.100	D
20	Product Text	ro	64	ClearS	IGN compact / ClearSIGN act Contin. tone
21	Serial Number	ro	16	Not use	ed
22	Hardware Revision	ro	16	AB	
23	Firmware Version	ro	16	1.21	
24	Application Text	rw	32		
64	Operating	rw	1	0	Single Segment Mode
	Mode			1	RGB Mode
				2	Level Meter Mode dimmed
				3	Level Meter Mode blinking
65	Appearance	rw	12	0	Continuous
	Single			1	Blinking
				2	Flashing
				3	EVS
66	Intensity Single	rw	12	0100	
69	Segment Color	rw	5	0	Dark
	(wird bei			1	Red
	Betriebsart RGB			2	Green
	und Level Meter			3	Yellow
	verwendet)			4	Blue
				5	Purple
				6	Cyan
				7	White
70	Appearance	rw	5	0	Continuous
	RGB (wird nur			1	Blinking
	bei Betriebsart			2	Flashing
	RGB verwendet)			3	EVS
71	Intensity RGB	rw	5	0100	
74	OperatingHours	ro	4		

The table shows that the index with number 64 must be written with a length of one byte. The variables created are assigned as follows:

IOL_Put = TRUE IOL_Index = 64d



IOL_RecLen = 1 IOL_Com_Data.Data[0] = 1 (RGB mode)

After setting the variables once (button in the ribbon menu), the operating mode was changed.

To activate the segments, the process data in the range Q76.0 to Q75.3 is no longer relevant, but only Q76.0 to Q76.3. (note byte rotation)

Another example now changes the colour of the individual segments:

IOL_Put = TRUE IOL_Index = 69d IOL_RecLen = 5 IOL_Com_Data.Data[0] = 2d (Green) IOL_Com_Data.Data[1] = 3d (Yellow) IOL_Com_Data.Data[2] = 4d (Blue) IOL_Com_Data.Data[3] = 5d (Purple) IOL_Com_Data.Data[4] = 0 (Only relevant with acoustic element)

It is essential to ensure that the variable IOL_RecLen matches the specified length (here 5). Otherwise, the write operation will fail.

After setting the variables once, the colour change is immediately visible.

Read index

Reading the entries works in the same way as writing them. Index 20 "Product text" is selected here as an example. The variables are written as follows:

IOL_Get = TRUE

IOL_Index = 20d

After writing to the variables once (button in the ribbon menu), the first 64 bytes are written to the DB IOL_Com_Data. To simplify matters, the display can be set to "characters" here.

It is not necessary to write to the IOL_RecLen variable when reading entries.