TIA 环境下 Profinet 通讯控制 CPX-E-CEC 从站



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关键词:

TIA Portal, Siemens, Profinet, CPX-E-CEC, 从站, CODESYS

摘要:

本文介绍西门子 PLC 对 CPX-E-CEC 的控制实例(通讯协议为 Profinet,编程环境为 TIA Portal 与 Codesys).文档主要 内容包括软硬件安装,西门子 PLC 基于 TIA Portal 的调试,CPX-E-CEC 基于 CODESYS 的调试。

目标群体:

本文仅针对有一定自动化设备调试基础的工程师,需要对 CODESYS 软件以及西门子 TIA Poral 有一定了解。

声明:

本文档为技术工程师根据官方资料和测试结果编写,旨在指导用户快速上手使用 Festo 产品,如果发现描述与官方 正式出版物冲突,请以正式出版物为准。

我们尽量罗列了实验室测试的软、硬件环境,但现场设备型号可能不同,软件/固件版本可能有差异,请务必在理 解文档内容和确保安全的前提下执行测试。

我们会持续更正和更新文档内容, 恕不另行通知。

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1 软件环境

软件/设备描述文件/硬件	版本
软件	
TIA Portal	V15
CODESYS	V3.5 SP12
设备描述文件	
GSDML	GSDML-V2.32-Festo-CPX-E-CEC-20180304
XML	Festo CPX-FB38-USINT-20141216
硬件	
S7-1200	211-1AE31-0XB0
CPX-FB38	R09
CPX-E-CEC-C1-PN	FESTO CPX-E-CEC-C1-PN 1.1.18

2 硬件安装

2.1 CPX-E-CEC 硬件接口说明

- 1 PROFINET IO Port 1 网络接口 [XF1]
- 2 PROFINET IO Port 2 网络接口 [XF2]
- 3 操作单元的插槽盖板
 - (不包含在供货范围内)
- 4 LED 显示元件
- 5 Ethernet 网络接口 [ETH 1]
- 6 MicroSD 插槽 [Card]
- 7 USB 接口 [USB]
- 8 EtherCAT-Master 网络接口 [EC]
- 9 Ethernet 网络接口 [ETH 2] 10 工作电源 U_{EL/SEN} 端子条 [XD]
- □□ ⊥1F电線 UEL/SEN 场丁余 [1] 端子条锁定装置



电源接口[XD]:

接口 [XD] ¹⁾		Si gna l
	0	+24 V DC 工作电源 U _{EL/SEN}
	1	
	2	0 V DC 工作电源 U _{EL/SEN}
	3	

1) 接口 XD.0 和 XD.1 以及 XD.2 和 XD.3 分别相互连接在端子条中。

网络接口:

网络接口	功能CPX-E-CECPN
[XF1]	PROFINET 10 Port 1
[XF2]	PROFINET 10 Port 2
[ETH 1]	Ethernet 接口,用于连接编程设备、
[ETH 2]	PC 或 CDPX 操作单元
[EC]	EtherCAT-Master

2.2 系统拓扑结构



实物连接:



本例中使用西门[A1]子 1200PLC 作为 PN 主站, CPX-E-CEC-C1-PN 作为 PN 从站, CPX-E 从站扩展集成 CPX-E-4IOL 主站模块 (IO-LINK 主站上接 SPAU IO-LINK 传感器<u>连接到 CPX-E-4IOL 主站模块上</u>), CPX-E-CEC-C1-PN 的 EC 口外连 CPX-FB38 阀岛 (阀岛上扩展 8DI 模块,用来读取气抓上传感器输入信号)。

3 CODESYS 下软件调试

3.1 软件安装

3.1.1 CODESYS 软件安装

从 FESTO 官网下载相应的 CODESYS 软件,链接如下: <u>https://www.festo.com/net/en-</u> gb_gb/SupportPortal/Downloads/320883/291469/CoDeSysV3_pbf_Full(89e893c8675d).zip

+ https://www.festo.com.cn/cr	n/zh/search/?text=CODES	/S&tab=DOWNL	OADS		
┣ 捜索 CODESYS Festo CN × []					
	主页自动化教	学与培训 案	國 关于费斯托	职业发展	
		O CODE	SYS		
		产品 0	支持/下载 320	主题 13	
	CODESYS provided b Codesys V 3.5.0.19 ir Programming Supported systems: • Controller CECC- • Controller CECC-	y Festo ncl. CECC Packag D (574415) LK (574418)	ge and Support Packag	e	
	∃.5.0 (valid since 01/0)	7/2012)			
	→ CODESYS provid 391 MB de, en	ed by Festo			

3.1.2 CPX-E-CEC 支持包安装

从 FESTO 官网下载相应的目标支持包文件,链接如下: https://www.festo.com.cn/cn/zh/search/?text=CPX-E-CEC-C1-PN&tab=DOWNLOADS



```
如下图所示,在 Codesys 中安装目标支持包文件。[A2]
```



⑦ 包管理器				×
当前安装的软件包刷新		排	列: 名称 ~	安装
名称 ② CECC Package ③ CMMT-AS (point to point) Package ③ CMMT-AS (SoftMotion) Package ③ CODESYS SoftMotion ④ CPX-CEC Package ④ CPX-E-CEC Package	版本 安装日 3.5.7.159 2019/1 3.5.10.38 2019/1 4.0.16.0 2019/1 4.6.0.0 2019/1 3.5.12.174 2019/1 3.5.12.75 2019/1	3期 更新信息 0/23 1/5 0/23 0/23 免费更新! 0/23 1/5	许可证信息 无要求的许可证 无要求的许可证 援索 无要求的许可证 无要求的许可证 无要求的许可证	卸戰… 详细说明 更新 下载… CODESYS Store 等级… <u>CODESYS Store</u>
□ 显示版本				关闭

3.1.3 传感器 SPAU IODD 文件安装

由于本测试中使用了 IO-LINK 主站来控制 SPAU 传感器,为此需要在 CODESYS 中安装 SPAU 传感器的 IODD 文件。

从 FESTO 官网下载相应的 IODD 文件, 链接如下: <u>https://www.festo.com/net/en-gb_gb/SupportPortal/Downloads/368086/354510/SPAU-MPa-IODD1.1.zip</u>



Import and Export Options...

Behaviour after SCO (Output

Configuration Port 1

PS power

Cycle Time

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8	0 🔞 IODD 1.1						
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	CMMO-ST-C5-1-LKP	(FHPP Standard only)	Festo AG & Co. KG	V1.11.0	IO-Link device based on an IODD file		
	EHPS-16-A-LK		Festo AG & Co. KG	V1.1.2	IO-Link device based on an IODD file		
	💮 🔟 Generic device		-	V1.0	IO-Link device based on an IODD file		
	SDAT-MHS-M100		Festo AG & Co. KG	V3.00.00	IO-Link device based on an IODD file		
	SDAT-MHS-M125		Festo AG & Co. KG	V3.00.00	IO-Link device based on an IODD file		
	SDAT-MHS-M160		Festo AG & Co. KG	V3.00.00	IO-Link device based on an IODD file		Details
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	SPAN-P10R		Festo AG & Co. KG	V1.8	IO-Link device based on an IODD file		
	SPAU-B2_MPa		Festo AG & Co. KG	V1.07	IO-Link device based on an IODD file		
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3.1.4 CPX 阀岛 XML 文件安装

由于本测试中使用了 CPX-E-CEC 的 ETHERCAT 主站来控制 CPX-FB38 从站,为此需要在 CODESYS 中安装 FB38 的 XML 描述文件。

从 FESTO 官网下载相应的 XML 文件,链接如下:

https://www.festo.com.cn/cn/zh/search/?text=cpx-fb38&tab=DOWNLOADS

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3.2 CPX-E 系统组态

3.2.1 远程 IO 模块配置

CODESYS 中 CPX-E 远程 IO 模块可以通过扫描的方式自动上传,首先新建项目。



确保电脑 IP 与 CPX-E-CEC 的 IP 在同一个网段后,点击 Device 后双击 Gateway-1 扫描 CPX-E-CEC,扫描后双击激活[A3]。



3.2.2 IO-LINK 从站配置

右键点击 CPX-E-4IOL 模块第一个插槽, Plug Device, 插入 SPAU 传感器



3.2.3 EhterCAT 从站配置

右键点击 EhterCA EtherCAT_Mast ■ ## PROFINET Dev □32_Byt 1	T主 y>(≪ ™ ¥ ™ ¥ ™ ¥ ™ ×	文片, SCAN FOR DEVICE Empty>) Cut Copy Paste Delete Browse Refactoring Properties idd Object Avid Folder Ad bevice	
		Scan For Devices	
<	ß	Disable Device Update Device Edit Object Edit Object With Edit IO mapping Import mappings from CSV Export mappings to CSV Simulation	s - Iotal U error(s), U warning(s), 52 message(s)

复制到工程中

IO-LINK-SPAU-TEST			
Device [connected] (CPX-E-CEC-C1-PN)	St	atus	Common.IoLink
■ III PLC Logic	In	formation	x
🖻 😳 Application			
Library Manager			
DOU (PRG)			
POU_EC (PRG)			
🖃 🌃 Task Configuration			
🖹 🍪 EtherCAT_Task	Ιſ	Scan Devices	— П X
POU_EC		Scan Devices	
🖻 😻 MainTask		Scanned Devices	
POU Commence and the second second		Devicename D	Devicetype Alias Address
PLC_Diagnosis (PLC-Diagnosis)		····· CPX_EB38_64Byte	PX-FB38 Ether(AT Eieldhus module (3599) 0
☐ ☐ CPX_E_System (CPX_E_System)			
E_CEC_C1_PN (E-CEC-C1-PN)			
SPAU_P10_L_bar (SPAU-P10-L_bar)			
<pre>< <empty> (<empty>)</empty></empty></pre>			
<pre><empty> (<empty>)</empty></empty></pre>			
<pre>C C C C C C C C C C C C C C C C C C C</pre>			
EtherCAT_Master (EtherCAT Master)			
CPX_FB38_64Byte (CPX-FB38 EtherCAT Fieldbus m			
PROFINET_Device (PROFINET Device)			
			Show Differences to Brainst
		Assign Address	
		Scan Devices	夏制剤工程由

3.2.4 Profinet 从站配置

Profinet 组态,右键点击 profinet_device,选择 add device [A4]



4 TIA Portal 下软件调试

4.1 安装 GSDML 文件

从 FESTO 官网下载 CPX-E-CEC 的 GSDML 文件, 链接如下: https://www.festo.com.cn/cn/zh/search/?text=CPX-E-CEC&tab=DOWNLOADS

■ 搜索 CPX-E-CEC Festo CN × []		200-001110000	
	主页自动化教学	与培训 案例 关于费斯托 职业发展	▲ <u>登</u> 录 ~
		CPX-E-CEC	
	:	产品1 支持/下载70 主题59	
	PROFINET GSDML CPX-E-CEC-C1/M1-PN Co Device Description Files PROFINET Device descrip for Festo CPX-E-CEC-C1/I	ntroller vtion file (GSDML-file) M1-PN Controller V2.32	
	Supported systems: • Automation system • Controller CPX-E-CE • Controller CPX-E-CE	CPX-E (5237644) C-C1-PN (4252741) C-M1-PN (4252743)	
	(valid since o4/03/2	018)	
	→ GSDML-V2.32-Festo	-CPX-E-CEC-20180304.zip	

如下图所示,在 TIA Portal 中安装 GSDML 文件。

K Siemens - C:\Users\Festo\Docum	ents\Automatisierung\CPX_AP_I_PN_TEST\CPX_AP_I_PN_TEST
Project Edit View Insert Online	Options Tools Window Help
📑 🎦 🔚 Save project ا 👗 🗓	🕆 Y Settings e 🖉 Go offline 🏭
Project tree	Support packages
Devices	Manage general station description files (GSD)
	Start Automation License Manager
	Show reference text
TI CPX AP L PN TEST	🛄 Global libraries 🔸
H Add new device	
ස් Devices & networks	
▼ 📺 PLC_1 [CPU 1516-3 PN/DP]	
Device configuration	

٦	danage general	station description	ı files			×
	Installed GSD	GSDs in the p	project			
	Source path:	C:\Users\Administrato	or\Desktop			
	Content of imp	orted path				
	Fle		Version	Language	Status	Info
	GSDML-V2.32	-Festo-CPX-E-CEC-20	V2.32	English, Ger	Already installed	PROFINET I
	-					
	-					
	<					>
					Delete	Cancel

4.2 硬件组态

4.2.1 配置 PN 从站

当 CPX-E-CEC 作为智能从站时,选择 PLCs&CPs 文件夹下 CPX-E-CEC V1:



分配交换字节长度,由于 CPX-E-CEC 最多支持 64byte,所以此处最大可以分配 64byte,注意此处分配的大小要和 CODESYS 中所设置的长度一致,否则会报模块错误。



4	Device	overview					
^		Module	Rack	Slot	I address	Q address	✓ Catalog
_		 CPX-E-CEC-PN_1 	0	0			<search></search>
=	~	PN-IO Interface	0	0 X1			Filter Profile:
	Image: A start of the start	IO 32 byte_1	0	1	6899	6899	Head module
	_		0	2			
			0	3			- Madula
			0	4			IO 1 hito
			0	5			IO 16 hite
			0	6			IO 7 byte
			0	7			IO 2 byte
			0	8			IO 32 byte
	•		0	9			IO 4 byte
			0	10			10 8 byte
	•		0	11			
			0	12			
			0	13			
			0	14			
			0	15			
			0	16			

4.2.2 分配设备名称

右击 CPX-E-CEC,选择 Assign device name: 🔐 CPX-E-CEC-PN_1 [CPX-E-CEC V 🔽 🕎 🕎 🙀 🔛 🛄 🍳 🛨 Device overview ^ * Rack Slot ... Module Laddress O address \checkmark CPX-E-CEC-PN_1 0 0 \checkmark PN-IO Interface 0 0 X1 \checkmark IO 32 byte_1 0 1 68 99 68 99 0 2 0 з 1 0 4 0 5 0 6 0 7 CEC 0 8 Change device 0 9 Write IO-Device name to Micro Memory Card 0 10 Start device tool. 0 11 X Cut Ctrl+X 12 0 Copy Ctrl+C 13 0 Ctrl+V 🛅 Paste 0 14 X Delete Del 0 15 🚪 Go to topology view 0 16 🚠 Go to network view Compile ۲ Download to device) 🚿 Go online Ctrl+K 🛃 Go offline Ctrl+M V. Online & diagnostic Ctrl+D × • < Assign device name -< Jogate and display CPX-E-CEC-PN_1 [CPX 🗓 Info 🔒 🗓 Diagnostics 🔍 Properties R Cross-references F11 General IO tags Cross-reference information Shift+F11

_ = = > Assign PROFINET device name. × vork view Device view CPX-E-CEC Configured PROFINET device ack Slot I address Q address PROFINET device name: cpx-e-cec-pn_1 -0 Device type: CPX-E-CEC V1 0 X1 68...99 68...99 1 Online access 23 2 Type of the PG/PC interface: PN/IE з Intel(R) PRO/1000 MT Desktop Adapter - 🖲 🖸 4 5 Device filter 6 Only show devices of the same type 8 Only show devices with bad parameter settings 9 10 Only show devices without names 11 12 Accessible devices in the network: 13 IP address MAC address Device PROFINET device name Status 14 192.168.0.3 00-0E-F0-57-28-7D Festo CPX... cpx-e-cec-pn 1 🕜 ок 15 16 🔄 Flash LED < Ш > Update list Assign name < > Diagnostics Online status information: General A Search completed. 1 of 2 devices were found. General

分配成功。

	IP address	MAC address	Device	PROFINET device nar	le	Status	-	
	192.168.0.3	00-0E-F0-57-28-7D	Festo CPX	cpx-e-cec-pn_1	 Image: Contract of the second s	ок		
					-			
· · · · · ·								
Hash LED								
	<							>
					Upda	ate list	Assign name	

CODESYS 中 CPX-E-CEC-C1-PN 下载并在线 IO-LINK 设备, EC 从站; 1200PLC 下载并在线,从站状态显示正常,与 CPX-E-CEC-C1-PN 通讯正常。



5. TIA Portal 与 Codesys 数据交换测试

作为 PN 从站 CPX-E-CEC-C1-PN 内部集成 PLC 功能,可以独立进行数据处理并与 1200PLC 进行数据交换, CPX-E-CEC-C1-PN 的输出数据作为 1200PLC 的输入数据,1200 的输出数据作为 CPX-E-CEC-C1-PN 的输入数据,下面进行演示。

5.1 TIA 输出到 Codesys

在 TIA 中新建监控表,在首个 BYTE QB68 中写入数据,在 CPX-E-CEC-C1-PN 的首个输入 BYTE 中可以读取到同样的数据,通讯正常。



5.2 Codesys 输出到 TIA

在监控表中监控输入数据第一个 BYTE IB68,可以看到和 CPX-E-CEC-C1-PN 的第一个输出 BYTE 中的数据相同,通讯正常。



EC 从站的过程数据转换作为 PLC 的输入信号——如下作者准备将 CPX-E-CEC EC 从站中的传感器信号映射到与 PLC 交互 的输出过程数据中,如下图所示:

首先找到传感器所在字节位,并新建关于该传感器所在字节的中间变量(例中为"out_1200")



Devices v 4 X	POU_EC x								
- Dutitled 1	I PROGRAM POU_EC								
E Device (CPX-E-CEC-C1-PN)	2 VAR								
B PLC Logic	3 Out_1200 AT	<pre>%IB3 : BYTE;</pre>							
= 🛱 Application	END_VAR								
Library Mapager									
- D POL (PRG)									
Tack Configuration	PROFINET Device	CPX FB38 64Bvt ¥ - 32 Bvte Pro	finet LO	Ain Tas	k n POL		Device		
SterCAT Tack				×					
Elicited Task	General	Find	Filter Show all			-			
- S Hairrask						-			
POU_EC	Process Data	Variable	Mapping	Channel	Address	lype	Default Value	Unit	Descripti
				TB2	%IB2	USINT			IB2
C PLC_Diagnosis (PLC-Diagnosis)				101					
	Startup Parameters	- * Application.POU_EC.out_1200	~≱	IB3	%IB3	USINT			IB3
CL_Diagnosis (PLC-Diagnosis) CPX_E_System_1 (CPX_E_System) EtherCAT_Master (EtherCAT Master)	Startup Parameters	Application.POU_EC.out_1200	~	IB3 Bit0	%IB3 %IX3.0	USINT BOOL			IB3 IB3
	Startup Parameters EtherCAT I/O Mapping	Application.POU_EC.out_1200	*	IB3 Bit0 Bit1	%IB3 %IX3.0 %IX3.1	USINT BOOL BOOL			IB3 IB3 IB3
CPLC_Diagnosis (PLC-Diagnosis) CPX_E_System_1 (CPX_E_System) CPX_E_System_1 (CPX_E_System) CPX_ES3_649yte (CPX-FB38 EtherCAT Fieldbus r PROFINET_Device (PROFINET Device)	Startup Parameters EtherCAT I/O Mapping		~>	IB3 Bit0 Bit1 Bit2	%1B3 %1X3.0 %1X3.1 %1X3.2	USINT BOOL BOOL BOOL			IB3 IB3 IB3 IB3
C. Diagnosis (PLC Diagnosis) C. Chagnosis (PLC Diagnosis) C. Chagnosis (PLC Diagnosis) EtherCAT_Master (EtherCAT Master) Core (PSI) Core (PSI)	Startup Parameters EtherCAT I/O Mapping Status	- *9 Application.POU_EC.out_1200	*	IB3 Bit0 Bit1 Bit2 Bit3	%IB3 %IX3.0 %IX3.1 %IX3.2 %IX3.2	USINT BOOL BOOL BOOL BOOL			IB3 IB3 IB3 IB3 IB3

将包含传感器信号的中间变量,映射到 Profinet 通讯所在字节:



可以从 TIA 监控表中看到同样的输入状态。

