

常问问题 • 05 月/2016

S7-1500 通过 PROFIBUS 通信 控制 CU320-2DP

S7-1500, CU320-2DP, PROFIBUS Communication

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Unrestricted

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概述

1

S7-1500PLC 与 SI NAMI CS CU320-2DP 之间可通过 PROFI BUS DP 总线进行周期性及非周期性数据通讯。对于 CPU 集成 DP 接口的 PLC (1516-3PN/DP、1517-3PN/DP 和 1518-4PN/DP)可以直接连接,对于没有 DP 接口的 CPU 需要使用 CM 1542-5 或者 CP 1542-5 模块进行 DP 接口的扩展。使用标准功能块 DPRD_DAT 及 DPWR_DAT, S7-1500PLC 通过 PROFI BUS 周期性通讯方式可将控制字和设定值发送 至驱动器,并从驱动器读取状态字和实际值;使用标准功能块 RDREC/WRREC,可以实现非周期性数据交换,读取或写入驱动器的参数。本文介绍了具体的组态 及编程方法。

2 项目配置

2.1 CU320-2DP 站地址的设置

控制单元 CU320-2 DP 上的 PROFIBUS 接口,地址开关分布位置如图 2-1 所示:



图 2-1. PROFIBUS 接口,地址开关分布位置

Copyright © Siemens AG Copyright year All rights reserved 有两种方法可以设置 CU320-2DP 的 PROFI BUS 地址:

- (1) 通过参数 P0918 来设置 PROFIBUS 地址
 - PROFIBUS 地址开关(两个旋码开关)出厂设置为 00hex。
 - 只有将地址开关设置为 00hex 或 7Fhex 时,才可以通过参数 P0918 来设置地址。地址范围为 1~ 126。
 - 执行" copy RAM to ROM" 将参数数据存储至 CF 卡。
 - 只有执行设备的掉电再上电后新设置的地址才生效。
 - (2) 通过控制单元上的 PROFIBUS 地址开关来设置 PROFIBUS 地址,即通过手动设置两个 DP 地址的旋码开关来设置站地址。

地址范围为1~ 126。

此时参数 P0918 显示所设置的 DP 地址。

只有执行设备的掉电再上电后新设置的地址才生效。

如图 2-2 所示, 高位 DP 地址的旋码开关 (H) 用于设置 16¹的十六进制

- 值,低位旋码开关(L)用于设置16°的十六进制值。如果要设置地址为
- 21, 十进制的 21dec 可转换为十六进制的 15hex, 将高位旋码开关(H) 设置为 1, 低位旋码开关(L) 设置为 5 即可。

Rotary coding switches	Significance	Examples			
52		21 _{dec} 15 _{hex}	35 _{dec} 23 _{hex}	126 _{dec}	
				7Ehex	
	16 ¹ = 16	1	2	7	
	16 ⁰ = 1	5	3	E	

图 2-2. 地址开关设置示例

2.2 软硬件环境

本文使用的软硬件:

- TIA Portal V13 SP1 Update8
- SIMOTION SCOUT V4.4 HF11
- S7-1516 PLC V1.8
- CU320-2DP FW4.7

2.3 项目配置步骤

本例系统连接如图 2-3 所示:



图 2-3. 硬件连接示意图

项目配置步骤如表 2-1 所示。

序号	描述	
1	创建一个 S7-1500 的新项目:	
	Create a new project X	
	571500CU220 200	
	Project name: 571500C0320-20H	
	Path: C:\Users\SIMOTION\Desktop	
	Author: SIMOTION	
	Comment:	
	Create Cancel	
2	点击"添加新设备"后, 选择 S7-1500 PLC,本文使用的是 S7-1516:	



4	通过接口间拖拽的方式创建 PROFI BUS 的网络连接:				
	S71500CU320-2DP →	Devices & networks	🔓 Topology view 🛛 🎄 Network view		
		PLC_1 CPU 1516-3 PN/	Slave_1 SINAMICS S120(E Not assigned		
5	在 CPU DP 接 [S71500CU320-2DP) Dd 『 Network II Connection	口的属性中设置 S7-1500PLC 的 evices & networks	匀 DP 站地址: ┏ Topology view ▲ Network view 『 Device view		
		PLC_1 CPU 1516-3 PN	Master system: PLC_1.DP-Mastersystem (1)		
	C m DP interface_1 [X3]		> 100%		
	General IO tags General PROFIEUS address Operating mode Time synchronization SYNC/FREEZE Hardware identifier	System constants Texts PROFIBUS address Interface networked with Subnet: PROFIBUS_1 Add new subnet			
		Parameters Address: 2 Highest address: 126			

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3 编程

3.1 电机的起停及速度控制

西门子针对 TIA 博途软件提供预定的 PLC 数据类型,类型涵盖当前各种类型的 报文,可以基于这些 UDT 来建立 PLC 和 SINAMICS S 的通讯。程序编写步骤如表 3-1 所示。



Δ	通过拖拽的方式	把使用的报文类刑添加到项目中。	木砌使田的县标准报
4	立1 田仲选择	山顶门的这天主称加封次百千,	中国民间的建筑建设
	▼ 1, □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □		
	Device configuration		
	Add new block		
	Main [OB1] S120_ctrl_telegram1 [DB1]		✓ Global libraries ∅ 𝔅 𝔅 𝔅 𝔅
	General source files General source files		Monitoring-and-control-objects Documentation templates
	✓ C PLC data types Add new data type		III WinAC_MP UI Sinamics_telegram_library_V13_SP1
	I! Telegramm_1 I Watch and force tables		Add new type
	Qonline backups Traces		 → G120 → G121 → G120
	Program mio Device proxy data PLC alarms		Fall S120 Fill Telegramm_1
	Text lists	💽 Properties 🚺 Info 🔃 Diagnostics 🗈 🖃 🥆	El Telegramm_2
	Image: The second	General Cross-references Compile Syntax	Telegramm_4
Δ	创建诵信使田的	数据中 并且创建报文相关变量,	Til Telegramm 7
-	Add new block	或出头,并且否 <u>是</u> 派 <u>又</u> 相八文重;	X
	Name:		
	S120_ctrl_telegram1		
		Tana Cabal DB	
	Organization	Number	
	block	Manual	
		Automatic	
		Description:	
		Data blocks (DBs) save program data.	
	FC		
	Function		
	DB		
	Data block		
		More	
	Additional information	tion	
	Add new and open		OK Cancel
	添加相关的变量	vector_02\03,注意类型选择:	

	Program blocks \$120_ct	rl_telegram1 [DB1]	_∎≡×	
	S120_ctrl_telegram1		10	
	Name	Data type	Start value	
	2 I vector 02	Telegramm 1*	alse	
	3 Add new>	*Telegramm_1*		
-				
5	调用通信指令 DPRD_DAT、D	PWR_DAT 进行通信	三 Continue	
	<mark>(청 (</mark> 장 알 반) 등 돈 홈 ■ 및 원 ± 월 발 일 받 () 등 전 영 왕 Block interfa	I the second sec	Eavorites) est est
	H → H →	N	Basic instruction Name Basic instruction General Gift logic opera Gi	Description Version tions ns tions tions teretions
		EN ENC ADDR RET_VA	<pre></pre>	Uctions Description Version ofday
	Network 2: Comment	►) 100% •		Read data record Vinite data record VI.1 Read process image Transfer process image Read process image are Transfer process image. Receive interrupt Expoluditional DP charac
	General Coros-references Compile Syntax Ip Image: Image in the state of t	Go to ? Date Time	stics	iystem Reconfigure IO system Read data record from L. Write data record to IO AT Read consistent data of.
	'CPU general' will be created! I device of type 'CPU_1511-1_PN' was successfully updated! I device of type 'S71500/ET200/NP_station' was successfully updated!	5/16/2016 10:10:54 / 5/16/2016 10:10:54 / 5/16/2016 10:10:54 /	M iDevice / iS M iDevice / iS M iB RCVREC	Al Write consistent data o
6	The manual fails for a set of the second set of	second bioser 月: 需要到从站的 1: 	₩ 硬件组态中获 20 ISI63 PNDP[) > Distributed /0	Nekle data mecord avail. ②取,选择报文 OPAdesteasystem (): PROFIBUS_1 ② Topology view ③ Indedule ③ Standard telegram 1, P202.0 Aris separator_1 ③ Standard telegram 1, P202.0 ④ Standard telegram 1, P202.0 ● Sta
	Comment			0
	K III > 100% .	✓ < III > 100%	×	0
	Standard telegram 1, PZD-2/2, 1 [Module] General IO tags System constants Texts Name Type H H Name Type H Constants Type H	landware identi 61		Roperties 2
7	编写程序如下图所示:			

	·····································	► 124	Block in	terface
▼ Blo	ck title: "Main Program Sweep (Cycle)"			
Com	ment			
- 1	Network 1:			
0	lomment			
			DPMR DAT	
	EN ENO	EN	EN	o ——•
	261 LADDR %MWD	261 — LADDR	DET M	%MW2
	KE LVAL TELVAL *S12	0_ctrl_ ram 1".	KE I_V	
	"S120_ctrlvector_02 telegram1".	2.Send — RECORD		
	vector_02. Record Receive			
通j	twatch table 即可进行变频器的启动(亭止以及	调速控制	:
\$7150	0CU 320-2DP → PLC 1 [CPU 1516-3 PN/DP] → Watch and force tables	Watch table 1	1.61211	
	14 1 4 4 4 100 000			
	Name	Display format	Monitorvalue	Modify valu
1	"S120 ctrl telegram1".vector 02.Send.Element 1.Reserved Bit 8	Bool	FALSE	NOUTY Value
2	"S120_ctrl_telegram1".vector_02.Send.Element_1.Reserved_Bit_9	Bool	FALSE	
з	"S120_ctrl_telegram1".vector_02.Send.Element_1.Control_via_PLC	Bool		TRUE
4	"S120_ctrl_telegram1".vector_02.Send.Element_1.Direction_reversal "S120_ctrl_telegram1".vector_02.Send.Element_1 "Unconditionally.open.brak	Bool	FALSE	
6	"S120_ctrl_telegram1".vector_02.Send.Element_1. Unconditionally open brak	Bool	FALSE	
7	"S120_ctrl_telegram1".vector_02.Send.Element_1.MOP_down	Bool	FALSE	
8	"S120_ctrl_telegram1".vector_02.Send.Element_1.Reserved_Bit_15	Bool	FALSE	
9	"S120_ctrl_telegram1".vector_02.Send.Element_1.ON_OFF1	Bool	FALSE	TRUE
11	"S120_ctrl_telegram1".vector_02.Send.Element_1.0FF3	Bool		TRUE
12	*S120_ctrl_telegram1*.vector_02.Send.Element_1.Enable_Operation	Bool	TRUE	TRUE
13	"S120_ctrl_telegram1".vector_02.Send.Element_1.Do_not_disable_RFG	Bool	TRUE	TRUE
14	"S120_ctrl_telegram1".vector_02.Send.Element_1.Enable_RFG	Bool		TRUE
16	*S120_ctrl_telegram1_vector_02.Send.Element_1.Enable_setpoint	Bool	FALSE	INUE
17	"S120_ctrl_telegram1".vector_02.Send.Speed_Setpoint	DEC+/-	100	100
18			12	
	"S120_ctrl_telegram1".vector_02.Receive.ZSW_1.Speed_deviation_in_tol	Bool	TRUE	
19		0001	INUE	
19 20 21	"S120_ctrl_telegram1".vector_02.Receive_ZSW_1.Mastel_control_requested	Bool	FALSE	
19 20 21 22	*S120_ctrl_telegram1*.vector_02.Receive_ZSW_1.Comp_speed_reached *S120_ctrl_telegram1*.vector_02.Receive_ZSW_1.L_M_P_Limit_reached	Bool Bool	FALSE	
19 20 21 22 23	S120_ctrl_telegram1*vector_02.Receive_ZSW_1*Master_ctmtol_requested *S120_ctrl_telegram1*vector_02.Receive_ZSW_11.comp_speed_reached *S120_ctrl_telegram1*vector_02.Receive_ZSW_11.Holding_brake_open	Bool Bool Bool	FALSE TRUE FALSE	
19 20 21 22 23 24	5120_ctrl_telegram1*vector_02.Receive_ZSW_1Abstel_ctmlob_requested *5120_ctrl_telegram1*vector_02.Receive_ZSW_1Comp_speed_reached *5120_ctrl_telegram1*vector_02.Receive_ZSW_1Abstel_telegram2*vector_02.Receive_ZSW_1Abstel_telegram2*vector_02.Re	Bool Bool Bool Bool	FALSE TRUE FALSE TRUE TRUE	
19 20 21 22 23 24 25 26	5120_ctrl_telegram1*vector_02.Receive_ZSW_1Abstel_ctmtol_requested *5120_ctrl_telegram1*vector_02.Receive_ZSW_1Comp_speed_reached *5120_ctrl_telegram1*vector_02.Receive_ZSW_1Alstrl_meached *5120_ctrl_telegram1*vector_02.Receive_ZSW_1Alstrl_motor_overtemp *5120_ctrl_telegram1*vector_02.Receive_ZSW_1Alstrl_motor_overtemp *5120_ctrl_telegram1*vector_02.Receive_ZSW_1Alstrl_inverter_thermal_overtemp *5120_ctrl_telegram1*vector_02.Receive_ZSW_1Alstrl_inverter_thermal_overtemp *5120_ctrl_telegram1*vector_02.Receive_ZSW_1Alstrl_inverter_thermal_overtemp	Bool Bool Bool Bool Bool Bool	FALSE TRUE FALSE TRUE TRUE TRUE TRUE TRUE	
19 20 21 22 23 24 25 26 27	5120_ctrl_telegram1*vector_02.Receive_ZSW_1Master_tomtol_requested 5120_ctrl_telegram1*vector_02.Receive_ZSW_11.comp_speed_reached 5120_ctrl_telegram1*vector_02.Receive_ZSW_11.Holding_brake_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_11.Motor_rootates_clockwise 5120_ctrl_telegram1*vector_02.Receive_ZSW_11.Motor_rootates_clockwise 5120_ctrl_telegram1*vector_02.Receive_ZSW_11.Marm_inverter_thermal_ove. 5120_ctrl_telegram1*vector_02.Receive_ZSW_11.Redy_to_start	Bool Bool Bool Bool Bool Bool Bool	FALSE TRUE FALSE TRUE TRUE TRUE FALSE FALSE	
19 20 21 22 23 24 25 26 27 28	5120_ctrl_telegram1*vector_02.Receive_ZSW_1.Mestel_ctmlob_requested 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.Comp_speed_reached 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.Mestel_ctmlob_reached 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.Matm_motor_overtemp 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.Matm_inverter_ctmermal_ove. 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.Matm_inverter_thermal_ove. 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.Matm_inverter_thermal_ove. 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.Ready_to_start 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.Ready	Bool Bool Bool Bool Bool Bool Bool	FALSE TRUE FALSE TRUE TRUE TRUE TRUE FALSE FALSE FALSE FALSE	
19 20 21 22 23 24 25 26 27 28 29	5120_ctrl_telegram1*vector_02.Receive_ZSW_11_Me_to_eached 5120_ctrl_telegram1*vector_02.Receive_ZSW_11_ME_Limit_reached 5120_ctrl_telegram1*vector_02.Receive_ZSW_11dlding_brake_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_11Mam_motor_overemp 5120_ctrl_telegram1*vector_02.Receive_ZSW_11Mator_inverter_thermal_ove. 5120_ctrl_telegram1*vector_02.Receive_ZSW_11Mator_inverter_thermal_ove. 5120_ctrl_telegram1*vector_02.Receive_ZSW_11Ready_to_start 5120_ctrl_telegram1*vector_02.Receive_ZSW_11Ready 5120_ctrl_telegram1*vector_02.Receive_ZSW_10Peration_enabled 5120_ctrl_telegram1*vector_02.Receive_ZSW_10Peration_enabled	Bool Bool Bool Bool Bool Bool Bool Bool	FALSE TRUE FALSE TRUE TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE	
19 20 21 22 23 24 25 26 27 28 29 30 31	5120_ctrl_telegram1*vector_02.Receive_ZSW_1.hubta_telegram1*vector_02.Receive_ZSW_1.comspeed_reached 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.hubta_teleached 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.hubtam_motor_overtemp 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.hubtam_totates_clockwise 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.hubtam_totates_clockwise 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.hubtam_totates_clockwise 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.hubtam_totates_clockwise 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.hubtam_totates_clockwise 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.Ready_to_start 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.Ready 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.feult_active 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.feult_active 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.feult_active	Bool Bool Bool Bool Bool Bool Bool Bool	FALSE TRUE FALSE TRUE TRUE FALSE FALSE FALSE FALSE TRUE FALSE FALSE FALSE FALSE FALSE	
19 20 21 22 23 24 25 26 27 28 29 30 31 32	5120_ctrl_telegram1'.vector_02.Receive_ZSW_1.hult_active 5120_ctrl_telegram1'.vector_02.Receive_ZSW_1.tolding_brake_open 5120_ctrl_telegram1'.vector_02.Receive_ZSW_1.tolding_brake_open 5120_ctrl_telegram1'.vector_02.Receive_ZSW_1.talarm_motor_overtemp 5120_ctrl_telegram1'.vector_02.Receive_ZSW_1.talarm_inverter_thermal_ove. 5120_ctrl_telegram1'.vector_02.Receive_ZSW_1.talarm_inverter_thermal_ove. 5120_ctrl_telegram1'.vector_02.Receive_ZSW_1.talarm_inverter_thermal_ove. 5120_ctrl_telegram1'.vector_02.Receive_ZSW_1.talarm_inverter_thermal_ove. 5120_ctrl_telegram1'.vector_02.Receive_ZSW_1.talatary_to_start 5120_ctrl_telegram1'.vector_02.Receive_ZSW_1.talatary_to_start 5120_ctrl_telegram1'.vector_02.Receive_ZSW_1.talatary_to_start 5120_ctrl_telegram1'.vector_02.Receive_ZSW_1.talat_active 5120_ctrl_telegram1'.vector_02.Receive_ZSW_1.talatary_to_start 5120_ctrl_telegram1'.vector_02.Receive_ZSW_1.talatary_to_start 5120_ctrl_telegram1'.vector_02.Receive_ZSW_1.talatary_to_start 5120_ctrl_telegram1'.vector_02.Receive_ZSW_1.talatary_to_start 5120_ctrl_telegram1'.vector_02.Receive_ZSW_1.talatary_to_start	Bool Bool Bool Bool Bool Bool Bool Bool	FALSE TRUE TRUE TRUE TRUE TRUE TRUE FALSE	
19 20 21 22 23 24 25 26 27 28 29 30 31 32 33	5120_ctrl_telegram1*vector_02.Receive_ZSW_1.holding_brack_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.comspeed_reached 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.holding_brake_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.holding_brake_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.holding_brake_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.holding_brake_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.holding_brake_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.holding_brake_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.holding_brake_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.holding_brake_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.holding_brake_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.feady 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.foreI_inactive 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.OFF3_inactive 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.OFF3_inactive 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.foreJ_inactive	Bool Bool	FALSE TRUE FALSE TRUE TRUE TRUE TRUE FALSE FALSE FALSE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	
19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34	5120_ctrl_telegram1*vector_02.Receive_ZSW_1.hdlsrg_eached 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.tolding_brake_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.tolding_brake_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.tolding_brake_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.tolding_brake_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.tolding_brake_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.tolding_brake_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.tolding_brake_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.tolding_brake_open 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.tolding_brake 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.tolding_enabled 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.toPeration_enabled 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.toFt2_inactive 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.toFt2_inactive 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.toFt2_inactive 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.toFt3_inactive 5120_ctrl_telegram1*vector_02.Receive_ZSW_1.toFt3_inactive	Bool Bool Bool Bool	FALSE TRUE FALSE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE FALSE FALSE FALSE TRUE TRUE TRUE TRUE TRUE	



3.2 非周期性通讯方式的功能库

非周期性数据传送编程十分复杂,需要用户自行建立 DB 块用于参数读写,对于 S7-1500 PLC 可以使用 FB286(SI NA_PARA)读写 S120 参数,这可以大大的简化编 程周期,具体的操作步骤可以参考如下文档:

https://support.industry.siemens.com/cs/cn/zh/view/109478311