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RTU-ECAT EtherCAT Remote IO Communication Module Operation Manual

*We reserve the right to change the information in this catalogue without prior notice.

DVP-2212920-01 10/04/2020





RTU-ECAT Operation Manual

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Chapter 1 Preface

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<u>∧</u> Caution

- This manual provides an introduction to product functions, specifications, installation, basic operations and settings.
- This product is an OPEN TYPE device and therefore should be installed in an enclosure free of airborne dust, humidity, electric shock and vibration. The enclosure should prevent non-maintenance staff from operating the device (e.g. key or specific tools are required for operating the enclosure) in case that danger and damage on the device may occur.
- Be sure to read the manual carefully and follow the instructions so as to avoid injuries to personnel and damage to products.

1.1 Explanation of Symbols in This Manual

• Precautions before operation

Before operation, please read relevant safety instructions carefully so as to prevent an injury to personnel and damage to products.

\land Danger	indicates the highly potential hazards. Severe personal injury or even death will result if you do not follow the instructions.
Marning	indicates the potential hazards. Minor personal injury or even death may result if you do not follow the instructions.
A Caution	indicates much attention should be paid. A bad accident can occur if you do not follow the instructions.

1.2 Revision History

Version	Revision	Release Date
1 st	The first version was published.	April 10, 2020



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Chapter 2 Overview

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- 1. Thank you for choosing Delta RTU-ECAT. To ensure correct installation and operation of RTU-ECAT, please read this manual carefully before use.
- 2. This manual only provides introductory information on RTU-ECAT. For more detailed information on EtherCAT protocol, please refer to relevant references or literatures.
- 3. RTU-ECAT is defined as an EtherCAT slave and DVP-S series DI/DO modules and special modules can be connected on its right side.
- 4. Refer to **DVP-PLC Application Manual: Special Modules** for more details on how to use DVP-S series special modules.

2.1 Characteristics

- Compliant with the EtherCAT protocol, RTU-ECAT supports PDO, SDO and other services in the COE protocol.
- Supports Distributed Clock SYNC and SyncManagers SYNC.
- On its right side, RTU-ECAT connects DVP-S series right-side modules with maximum 128 digital input points and 128 digital output points as well as maximum 8 special modules such as analog modules, temperature modules, pulse modules and etc.
- Maximum 14 DVP-S series digital modules and special modules in total can be connected to the right side of RTU-ECAT.
- Users can select that the output values of right-side special modules and digital output point values of digital modules keep the same as they are before disconnection or change to zero when RTU-EtherCAT is disconnected from the master.

2.2 Specifications

Electrical specification

Item	Specification	
Power voltage	24 VDC (-15% ~ 20%)	
Consumption power	1.8 W	
Isolation voltage	500 V	

EtherCAT specification

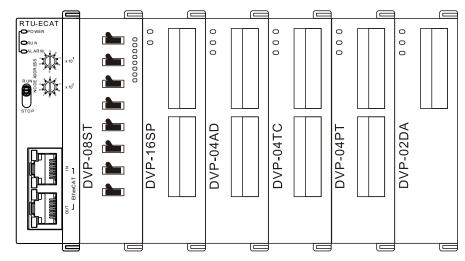
Item	Specification	
Communication protocol	EtherCAT Protocol	
Supported service	CoE (PDO, SDO)	
Physical layer	100BASE-TX	
Baud rate	100Mbps	
Transmission medium	Cat 5 or above shielded cable	
Transmission distance	100m	
Topology Structure	Linear topology	



Environment

Item	Specification		
	ESD(IEC 61131-2, IEC 61000-4-2):8KV Air Discharge, 6KV Contact		
	Discharge		
	EFT(IEC 61131-2, IEC 61000-4-4): Power Line: 2KV, Digital I/O: 1KV		
Noise Immunity	Communication I/O: 2KV		
	Damped-Oscillatory Wave: Power Line: 1KV, Digital I/O: 1KV		
	RS(IEC 61131-2, IEC 61000-4-3): 80MHz ~ 1000MHz, 10V/m; 1400MHz		
	~ 6000MHz, 3V/m		
Operation	0°C ~ 55°C (temperature), 50 ~ 95% (humidity), pollution degree 2		
Storage	-25°C ~ 70°C (temperature), 5 ~ 95% (humidity)		
Vibration/shock	Standard: IEC 61131-2, IEC 68-2-6 (TEST Fc)/IEC 61131-2 & IEC		
resistance	68-2-27 (TEST Ea)		
Safety	Conforms to IEC 61131-2, UL 61010-1, UL 61010-2-201		
Barometric	Operating: 1080~795hPa (-1000~2000m)		
pressure-altitude	Storage: 1080~660hPa (-1000~3500m)		
Weight	84g		

2.3 Extension Modules Connectable to RTU-ECAT



Digital modules connectable to RTU-ECAT

Di/Do module		Default I/O mapping data (RTU-ECAT → EtherCAT master)	
DVP08SM11N	N/A	8 bits	
DVP08SM10N	N/A	8 bits	
DVP16SM11N	N/A	16 bits	



DI/DO module (Model name)	Default I/O mapping data (EtherCAT master \rightarrow RTU-ECAT)		
DVP06SN11R	8 bits	N/A	
DVP08SN11R/T	8 bits	N/A	
DVP08SN11TS	8 bits	N/A	
DVP16SN11T	16 bits	N/A	
DVP16SN11TS	16 bits	N/A	
DVP08SP11R/T	8 bits	8 bits	
DVP08SP11TS	8 bits	8 bits	
DVP16SP11R/T	8 bits	8 bits	
DVP16SP11TS	8 bits	8 bits	
DVP32SM11N	N/A	32 bits	
DVP32SN11TN	32 bits	N/A	
DVP08ST11N	N/A	8 bits	

Special modules connectable to RTU-ECAT

	Default IO mapping data		Default IO mapping data	
Special module	(EtherCAT master \rightarrow RTU-ECAT)		(RTU-ECAT \rightarrow EtherCAT master)	
(Model name)	Start CR	Length (words)	Start CR	Length (words)
DVP02DA-S	CR10	2	N/A	N/A
DVP04DA-S	CR6	4	N/A	N/A
DVP04DA-S2	CR6	4	N/A	N/A
DVP04AD-S	N/A	N/A	CR12	4
DVP04AD-S2	N/A	N/A	CR12	4
DVP06AD-S	N/A	N/A	CR12	6
DVP04TC-S	N/A	N/A	CR14	4
DVP04PT-S	N/A	N/A	CR18	4
DVP06PT-S	N/A	N/A	CR18	6
DVP06XA-S	CR10	2	CR12	4
DVP06XA-S2	CR10	2	CR12	4
DVP01PU-S	CR42	4	CR33	4
DVP02TUL-S	CR4	2	CR2	2
DVP02TUR-S	CR4	2	CR2	2
DVP02TUN-S	CR4	2	CR2	2



Note:

When special modules are connected to RTU-ECAT, the start one of CRs for data upload and download and the length of data to be uploaded and downloaded can be set up via the EtherCAT network configuration tool.



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Chapter 3 Profile and Parts

3.1 Profile and Dimension	
3.2 Parts	
3.3 EtherCAT Port	
3.4 RUN/STOP Switch	
3.5 Address Switches	
3.6 Extended IO Interface	

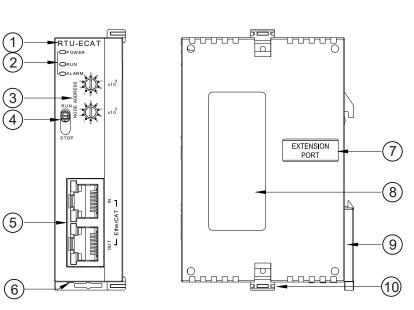


3.1 Profile and Dimension

63.4 60 25.2 RTU-ECAT ------0 0 D. 8 EXTENSION PORT 06 96 ⁼therCAT σ <u>----</u>-Ш

Unit: mm

3.2 Parts



1.	Model Name	6.	24V DC power port
2.	State indicators	7.	Right-side extension module port
3.	Address switch	8.	Nameplate
4.	RUN/STOP switch	9.	DIN rail clip
5.	EtherCAT port	10.	Extension module fixing clip



3.3 EtherCAT Port

EtherCAT port is used for the EtherCAT communication.

See the following table for the definitions of pins.

PIN	Signal	Description	
1	Tx+	Positive pole for transmitting data	
2	Tx-	Negative pole for transmitting data	
3	Rx+	Positive pole for receiving data	
4	Reserved	Reserved	87654321
5	Reserved	Reserved	
6	Rx-	Negative pole for receiving data	EtherCAT
7	Reserved	Reserved	
8	Reserved	Reserved	

3.4 RUN/STOP Switch

RUN/STOP switch	Description	
STOP \rightarrow RUN	 To re-detect the number of extension modules and digital points. To read/write the data in the extension module. 	RUN
$RUN \to STOP$	To stop reading/writing the data in the extension module.	STOP

3.5 Address Switches

The switches are used for setting up the node address of RTU-ECAT on EtherCAT network.

Switch setting	Description	8 ************************************
0 ~ 99	EtherCAT node address	

Example:

If you need to set the node address of RTU-ECAT to 26, simply switch the corresponding switch of $x10^{1}$ to 2 and the corresponding switch of $x10^{0}$ to 6.

Notes:

- ✓ Please set up the node address when the power is switched off. After the setup is completed, re-power RTU-ECAT.
- ✓ When RTU-ECAT is operating, changing the setting of the node address will be invalid.
- ✓ Use the slotted screwdriver to rotate the switch carefully in case the switch is scratched.



3.6 Extended IO Interface

The interface is used for connecting Delta DVP-S series DI/DO extension modules and special modules.



4

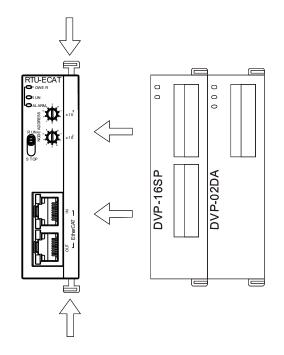
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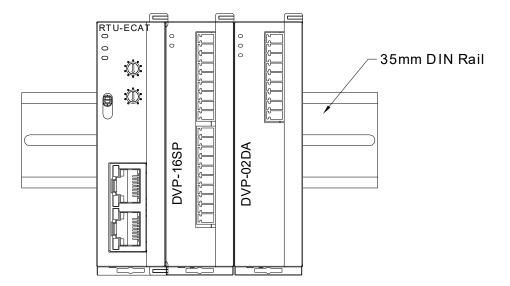
4.1 Installing RTU-ECAT and DVP-S Extension Modules

- Open the fixing clips on the top and bottom of RTU-ECAT, aim the extension module at the guiding holes and keep them met.
- Press the fixing clips on the top and bottom of RTU-ECAT to fix extension modules and ensure that the connection is fine.



4.2 Installing RTU-ECAT and DVP-S Modules on DIN Rail

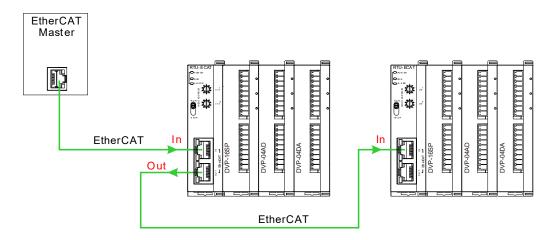
- Use the 35mm standard DIN rail.
- Open the DIN rail clips of RTU-ECAT and extension modules. Insert RTU-ECAT and extension modules into the DIN rail.
- Press the DIN rail clips of RTU-ECAT and extension modules to fix them on the DIN rail, as shown below.





4.3 Connecting to EtherCAT Port

- There is a strict network topology requirement for the EtherCAT network. The network must follow the rule that the input port of the next servo should be connected to the output port of the previous servo.
- Please use Delta cables as EtherCAT cables. For specifications of Delta cables, refer to Appendix 1.



4.4 Wiring

4.5 Power Input

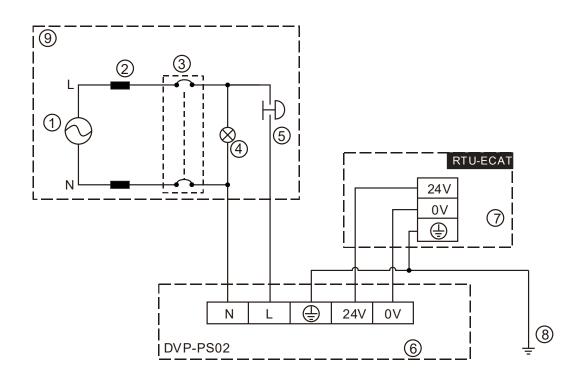
The power input of RTU-ECAT is 24V DC. Please notice the following points during use.

🕂 Warning

- Connect the supply power to the two terminals, 24V and 0V and the grounding terminal to the earth. Be cautious that the RTU-ECAT device may be damaged if the positive and negative polarities of the supply power are connected reversely.
- Please be sure to use certified power supply with SELV output or certified power supply providing double insulation evaluated by UL60950, or UL61010-1 and UL61010-2-201 standards
- The diameter of the power wire must be between 12 and 28AWG and the rated temperature should be greater than 70°C. The power terminal block plug wiring torque is 4.5 in-lbs.
- The cables of the AC power 110V, 220V and DC power 24V must be twisted and connected to the module as short as possible in length.
- Do not combine the AC 110V, 220V, and DC 24V cables with the main circuit and I/O signal cables together and please keep them away from each other. If the space permits, it's recommended to separate these lines by more than 100mm.



RTU-ECAT Safety Circuit Wiring

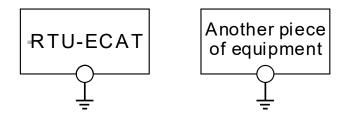


1	AC power supply: 100 ~ 240VAC; 50/60Hz.
2	Power supply circuit protection fuse
3	System circuit isolation device: The electromagnetic contactor, relay and other switch can be used as the isolation device to prevent the system from becoming unstable when the power supply is discontinuous.
4	Power indicator
5	Emergency stop button: The button cuts off the system power supply when an accidental situation takes place.
6	Delta power module DVP-PS02/24VDC
Ø	RTU-ECAT device
8	Ground
9	Safety circuit



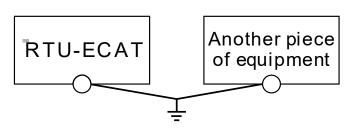
4.5.1 Ground

- The diameter of the ground should not be less than the diameters of the cables connected to the terminals L and N.
- If using multiple pieces of equipment, use a single-point ground.



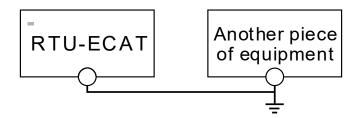
The single-point ground is better.

• If you cannot use a single-point ground, use a common-point ground.



The common-point ground is permitted.

• Do not connect equipment ground wires together as shown below.



The equipment can not be grounded in this way.



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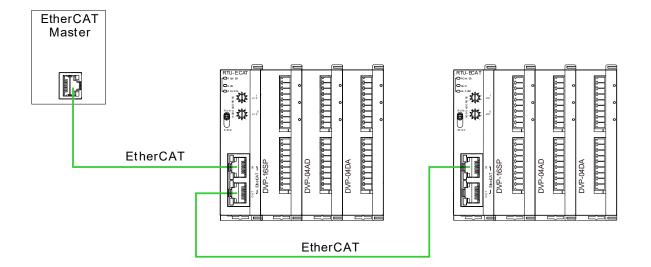
Chapter 5 Configuring RTU-ECAT

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5.2.4	Data Exchange Configuration Interface of Special Modules	5-5



This section describes how RTU-ECAT as an EtherCAT slave realizes the data exchange between EtherCAT master and DVP-S series extension modules.

- EtherCAT master transmits the data to extension modules.
- The input data from extension modules are transmitted back to EtherCAT master.



5.1 Terms

No.	Name	Unit	Explanation
1	Control word	Word	Sets the mode of RTU-ECAT. When the content of the control word is 8000Hex, RTU-ECAT is in STOP state. When the content of the control word is 8001Hex, RTU-ECAT is in RUN state. See section 6.3 for more details on the control word.
2	Status	Word	Status includes Error register (for error information), LV state (for voltage status), Error module number (for right-side module number) and Error list (for extension module errors) See section 6.3 for more details.
3	Digital input points	Bit	The number of digital input points is a multiple of 8. The number is regarded as 8 when it is less than 8 and as 16 when it is greater than 8 but less than 16.
4	Digital output points	Bit	The number of digital output points is a multiple of 8. The number is regarded as 8 when it is less than 8 and as 16 when it is greater than 8 but less than 16.
5	Special module number	Unit	Number of special modules connected to RTU-ECAT Range: 0~8
6	Input data length	Word	The total length of input data of special modules on the right of RTU-ECAT
7	Output data length	Word	The total length of output data of special modules on the right of RTU-ECAT



No.	Name	Unit	Explanation
8	IO mapping	N/A	The IO mapping between RTU-ECAT and the special modules connected to it.

5.2 Introduction to the Software Interfaces

This section introduces the configuration of RTU-ECAT by taking the TwinCAT3 software as an example.

5.2.1 Main Interface for RTU Configuration

Click on the RTU-ECAT symbol on the left list of the TwinCAT3 window as below. The main RTU configuration interface appears then.

ෙ ි යි ්⊙ - ද බ ් ≠ Search Solution Explorer (Ctrl+;) ♪ -	General EtherC	AT DC Process	Data Slots St	artup C	oE - Online	Online		
Solution 'RTU-ECAT' (1 project) SVSTEM SYSTEM MOTION PLC SAFETY SAFETY C++ Device 1 (EtherCAT) Provide 1 (EtherCAT) System Device 1 (EtherCAT) Provel 1 (EtherCAT) Provel 1 (RTU-ECAT) Mappings	Name: Object Id: Type: Comment:	Box 1 (RTU-ECAT) 0x03020001 RTU-ECAT				Id: 1	nbols 🗌	
	Name	Online	Туре	Size	>Add	In/Out	User	Linked to
	🕫 State		UINT	2.0	1548.0	Input	0	
	🔊 AdsAddr		AMSADDR	8.0	1550.0	Input	0	

5.2.2 DC Interface

On the RTU configuration interface, open the DC interface with a click on **DC** tab.

RT	U-ECAT	+ X								
(General	EtherCAT	DC	Process Data	S	lots	Startup	CoE - Online	Online	
	Operati	ion Mode:				SM-9	Synchron			~
	Advanced Settings									

Operation Mode:

RTU-ECAT supports two operation modes, SM (Synchro Manager) and DC (Distributed Clock). Either of the two operation modes can be chosen from the pull-down box.



Advanced Settings:

When choosing DC as the operation mode, do related settings on the following "Advanced Settings" interface.

Advanced Settings		×
Distributed Clock	Distributed Clock	
	Cyclic Mode	
	Operation Mode:	DC-Synchron \lor
	🗹 Enable	Sync Unit Cycle (µs): 4000
	SYNC 0 Cycle Time (μs):	Shift Time (μs):
	 Sync Unit Cycle 	x 1 \checkmark User Defined 0
	⊖ User Defined	+ SYNC0 Cycle 4000 × 0 ~ 0
		Based on Input Reference
	☑ Enable SYNC 0	= 0
	SYNC 1	
	⊖ Sync Unit Cycle	 Cycle Time (μs): 4000
	SYNC 0 Cycle	x 1 \checkmark Shift Time (µs): 0
	Enable SYNC 1	
	Use as potential Referen	ence Clock 确定 取消

5.2.3 Right-side Configuration of RTU-ECAT

Click on **Slots** tab on the configuration interface of RTU-ECAT to go to the interface for configuring right-side modules.



lot	Module	ModuleIdent	Module	ModuleIdent	Description
🛕 Terminals			 Digital Input Terminals 		
🛕 Terminals		<	DVP08SM11N	0x01DD0001	DVP08SM11N
🛕 Terminals			DVP08ST11N	0x01DD0002	DVP08ST11N
🛕 Terminals		×	DVP16SM11N	0x01DD0003	DVP16SM11N
🛕 Terminals			DVP32SM11N	0x01DD0004	DVP32SM11N
🛕 Terminals			 Digital Output Terminals 		
🛕 Terminals			DVP06SN11R	0x01DD0005	DVP06SN11R
🛕 Terminals			DVP08SN11R/T	0x01DD0006	DVP08SN11R
🛕 Terminals			DVP08SN11TS	0x01DD0007	DVP08SN11T
🛕 Terminals			DVP16SN11T	0x01DD0008	DVP16SN11T
🛕 Terminals			DVP16SN11TS	0x01DD0009	DVP16SN11TS
🛕 Terminals			DVP32SN11TN	0x01DD000A	DVP32SN11T
🛕 Terminals			Digital Input and Output Termin	nals	
🛕 Terminals			DVP08SP11R/T	0x01DD000B	DVP08SP11R/
			DVP08SP11TS	0x01DD000C	DVP08SP11TS
			DVP16SP11R/T	0x01DD000D	DVP16SP11R/
			DVP16SP11TS	0x01DD000E	DVP16SP11TS
			Analog Input Terminals		
		→	4		

Select the upper "Terminals" row from the left list based on the actually configured modules on the right of

RTU-ECAT. Then select the corresponding module from the right list and click on the symbol to have the modules configured to RTU-ECAT.

Adding extension modules must start from the first "Terminals" row and no empty slot is allowed to exist between modules.

5.2.4 Data Exchange Configuration Interface of Special Modules

On the main RTU configuration interface, click on "**Process Data**" tab. The data exchange configuration interface of special modules appears then. Take the special module DVP06XA-S2 for example here.

enera	l Ether	rCAT DC	; P	rocess Data	Slots	Startup	CoE - Online	e Online				
Sync N	Manage	r:		PC	O List:							
SM	Size	Туре	Flags	1	ndex	Size	Name		Flags	SM	SU	
0	128	Mbx		C	x1B00	0.0	Status			3	0	
1	128	MbxIn		C	x1B01	0.0	Control			2	0	
2	4	Outp		C	x1A00	8.0	DVP06XA-S2	Input mapping		3	0	
3	8	Inputs		0	x1600	4.0	DVP06XA-S2	Output mappi		2	0	
			21.01		0.0							
		ent (0x10	212):		O Conte	ent:						
⊡0x1 ⊡0x1					ndex	Size	Offs Nam	e		Туре	Default	(h



Explanation of PDO List on the configuration interface of special modules

Item	Description
Status	The parameters related to RTU-ECAT state and the CRs with the property of Read in the special modules which have been configured can be added or deleted
Control	The control word in RTU-ECAT and the CRs with the property of Write in the special modules which have been configured can be added or deleted.
DVP06XA-S2 Input mapping	The CRs with the property of Read in DVP06XA-S2 can be added or deleted.
DVP06XA-S2 Output mapping	The CRs with the property of Write in DVP06XA-S2 can be added or deleted.

How to configure the input/output mappings of special modules

Here is an example of the input mapping configuration.

Select the row where "DVP06XA-S2 Input mapping" is in the "PDO List" field and then configure input mapping parameters in the "PDO Content" field.

	Luiei	CAT	DC	Process D	ata Sl	ots	Startup	CoE - C	Online (Online						
Sync N	/lanage	r:			PDO L	.ist:										
SM	Size	Туре	Fla	gs	Inde	x	Size	Name				Flags	SM	SU		
0	128	Mbx.			0x1B	000	0.0	Status					3	0		
1	128	Mbx	n		0x1B	801	0.0	Control					2	0		
2	4	Outp			0x1A	00	8.0	DVP06X	A-S2 Inp	ut mappir	ng		3	0		
3	8	Input	s		0x16	00	4.0	DVP06X	A-S2 Out	tput mapp	pi		2	0		
PDO A	ssignm	ent (0x	(1C12):		PDO C	Conte	nt (0x1A0	00):								
√ 0x1	B01	ent (0x	:1C12):		PDO (-	-	Name					Туре	,	Default (h.
√ 0x1	B01	ent (0x	:1C12):		Inde		Size	Offs		resent val	lue o	f CH1 input	signal	Туре	•	Default (h.
√ 0x1	B01	ent (0x	:1C12):		Inde 0x20	x	Size 2.0	Offs 0.0	CR12: pr			f CH1 input f CH2 input	-		•	Default (h.
⊘ 0x1	B01	ent (0x	:1C12):		Inde 0x20 0x20	x 00	Size 2.0 2.0	Offs 0.0 2.0	CR12: pr CR13: pr	resent val	lue o		signal	INT	•	Defailt (h.
⊘ 0x1	B01	ent (0x	:1C12):		Inde 0x20 0x20 0x20	x 00 00	Size 2.0 2.0 2.0	Offs 0.0 2.0 4.0	CR12: pr CR13: pr CR14: pr	resent val resent val	lue o lue o	f CH2 input	signal signal	INT INT	;	Default (h.
PDO A ☑0x1 ☑0x1	B01	ent (0x	:1C12):		Inde 0x20 0x20 0x20	x 00 00	Size 2.0 2.0 2.0	Offs 0.0 2.0 4.0	CR12: pr CR13: pr CR14: pr	resent val resent val	lue o lue o	f CH2 input f CH3 input	signal signal	INT INT INT	2	Defau

Select one of the rows in the red box above and right click on the selected row. Then a pull-down menu appears as below.



Index	Size	Offs	Name			Туре	Default (h
0x2000	2.0	0.0	CR12: present v	alue of CH1 inp	INT		
0x2000	2.0	2.0	CR13: present v	value of CH2 inp	ut signal	INT	
0x2000	2.0	4.0	CR14: pres	Insert	t signal	INT	
0x2000	2.0	6.0	CR15: pres ᆽ	Delete	t signal	INT	
		8.0		Edit			
				Move Up			
Predefine	d PDO A	Assignme	ent: (none)	Move Down			

PDO Content (0x1A00):

Explanation of the pull-down menu

Item	Description
	Add or insert a CR with the property of Read in the module.
Insert	Selecting "Insert" in the place of an existing CR means to insert a CR row here.
	Selecting "Insert" in the empty place means to add a CR row in the end.
Delete	Delete one CR which has already been added
	Edit current parameter information such as Name, Index, Sub Index, Data Type and
Edit	etc.
Move Up	Move to the previous row
Move Down	Move to the next row





MEMO







Chapter 6 Introduction of Parameters

6.1 Parameters for Right-side Special Modules							
6.2 Parameters for Connection Status of Right-Side Modules							
6.3 Control Word and Status Indication Parameters							
6.3.1 Control Word Parameter	6-6						
6.3.2 Status Indication	6-7						



6.1 Parameters for Right-side Special Modules

The index of the special module on the right of RTU-ECAT ranges from 16#2000 to 16#21A0 and the index value is determined by the position of the special module on the right of RTU-ECAT. For example, when the special module is the first one on the right of RTU-ECAT, its index is 16#2000. When the special module is the second one on the right of RTU-ECAT, its index is 16#2020. Similarly, when the special module is the 14th one on the right of RTU-ECAT, its index is 16#21A0.

As shown below, DVP04DA-S, DVP04AD-S, DVP16SP11T and DVP06XA-S are connected on the right of RTU-ECAT in order and then the index for DVP04DA-S is 16#2000, for DVP04AD-S is 16#2020 and for DVP06XA-S is 16#2060.

Slot	Module	ModuleIdent
🛕 Terminals	DVP04DA-S	0x01DD0013
🛕 Terminals	DVP04AD-S	0x01DD000F
🛕 Terminals	DVP16SP11R/T	0x01DD000D
🛕 Terminals	DVP06XA-S	0x01DD0015
🛕 Terminals		
A = 1 1		

Each subindex of a special module corresponds to one CR parameter of the special module. When the special module is located as the first one on the right of RTU-ECAT, the index 16#2000 and subindex 16#1 correspond to CR0 of the special module. When the special module is the second one on the right of RTU-ECAT, the index 16#2020 and subindex 16#7 correspond to CR6 of the special module.

For example, DVP04DA-S, DVP04AD-S, DVP16SP11T and DVP06XA-S are connected on the right of RTU-ECAT in order and the indexes and subindexes for DVP06XA-S parameters are showned below.

<u> </u>	DVP06XA-S CR		
2060:01	CR0: module type	RO P	
2060:02	CR1: input mode setting	RW P	
2060:03	CR2: CH1 average times	RW P	
2060:04	CR3: CH2 average times	RW P	
2060:05	CR4: CH3 average times	RW P	
2060:06	CR5: CH4 average times	RW P	
2060:07	CR6: average value of CH1 inp	RO P	
2060:08	CR7: average value of CH2 inp	RO P	
2060:09	CR8: average value of CH3 inp	RO P	
2060:0A	CR9: average value of CH4 inp	RO P	
2060:0B	CR10: CH5 output signal value	RW P	
2060:0C	CR11: CH6 output signal value	RW P	
2060:0D	CR12: present value of CH1 in	RO P	



Index	Subindex	Description
	16#1	The index and subindex that CR0 parameter corresponds to when the special module is located as the 1 st one on the right of RTU-ECAT.
16#2000	16#2	The index and subindex that CR1 parameter corresponds to when the special module is located as the 1 st one on the right of RTU-ECAT.
40//0000	16#1	The index and subindex that CR0 parameter corresponds to when the special module is located as the 2 nd one on the right of RTU-ECAT.
16#2020	16#2	The index and subindex that CR1 parameter corresponds to when the special module is located as the 2 nd one on the right of RTU-ECAT.
	16#1	The index and subindex that CR0 parameter corresponds to when the special module is located as the 3 rd one on the right of RTU-ECAT.
16#2040	16#2	The index and subindex that CR1 parameter corresponds to when the special module is located as the 3 rd one on the right of RTU-ECAT.
	16#1	The index and subindex that CR0 parameter corresponds to when the special module is located as the 4 th one on the right of RTU-ECAT.
16#2060	16#2	The index and subindex that CR1 parameter corresponds to when the special module is located as the 4 th one on the right of RTU-ECAT.
	16#1	The index and subindex that CR0 parameter corresponds to when the special module is located as the 5 th one on the right of RTU-ECAT.
16#2080	16#2	The index and subindex that CR1 parameter corresponds to when the special module is located as the 5 th one on the right of RTU-ECAT.
	16#1	The index and subindex that CR0 parameter corresponds to when the special module is located as the 6 th one on the right of RTU-ECAT.
16#20A0	16#2	The index and subindex that CR1 parameter corresponds to when the special module is located as the 6 th one on the right of RTU-ECAT.
	<u> </u>	
	16#1	The index and subindex that CR0 parameter corresponds to when the special module is located as the 7 th one on the right of RTU-ECAT.
16#20C0	16#2	The index and subindex that CR1 parameter corresponds to when the special module is located as the 7 th one on the right of RTU-ECAT.
16#20E0	16#1	The index and subindex that CR0 parameter corresponds to when the special module is located as the 8 th one on the right of RTU-ECAT.
	16#2	The index and subindex that CR1 parameter corresponds to when the special module is located as the 8 th one on the right of

Explanation of paramters for special modules on the right of RTU-ECAT



6_

Index	Subindex	Description
		RTU-ECAT.
	16#1	The index and subindex that CR0 parameter corresponds to when the special module is located as the 9 th one on the right of RTU-ECAT.
16#2100	16#2	The index and subindex that CR1 parameter corresponds to when the special module is located as the 9 th one on the right of RTU-ECAT.
	16#1	The index and subindex that CR0 parameter corresponds to when the special module is located as the 10 th one on the right of RTU-ECAT.
16#2120	16#2	The index and subindex that CR1 parameter corresponds to when the special module is located as the 10 th one on the right of RTU-ECAT.
	16#1	The index and subindex that CR0 parameter corresponds to when the special module is located as the 11 th one on the right of RTU-ECAT.
16#2140	16#2	The index and subindex that CR1 parameter corresponds to when the special module is located as the 11 th one on the right of RTU-ECAT.
	16#1	The index and subindex that CR0 parameter corresponds to when the special module is located as the 12 th one on the right of RTU-ECAT.
16#2160	16#2	The index and subindex that CR1 parameter corresponds to when the special module is located as the 12 th one on the right of RTU-ECAT.
	16#1	The index and subindex that CR0 parameter corresponds to when the special module is located as the 13 th one on the right of RTU-ECAT.
16#2180	16#2	The index and subindex that CR1 parameter corresponds to when the special module is located as the 13 th one on the right of RTU-ECAT.
	16#1	The index and subindex that CR0 parameter corresponds to when the special module is located as the 14 th one on the right of RTU-ECAT.
16#21A0	16#2	The index and subindex that CR1 parameter corresponds to when the special module is located as the 14 th one on the right of RTU-ECAT.



6.2 Parameters for Connection Status of Right-Side Modules

⊟ 8200:0	Detected information	RO	
8200:01	Digital in	RO	
8200:02	Digital out	RO	
8200:03	Anolog module number	RO	
8200:04	Anolog module ID1	RO	
8200:05	Anolog module ID2	RO	
8200:06	Anolog module ID3	RO	
8200:07	Anolog module ID4	RO	
8200:08	Anolog module ID5	RO	
8200:09	Anolog module ID6	RO	
8200:0A	Anolog module ID7	RO	
8200:0B	Anolog module ID8	RO	

The index 16#8200 shows the actual connection state of the modules on the right of RTU-ECAT

Explanation of parameters

Index	Subindex	Description	Data type	Access type
	16#1	The number of digital input points	Word	RO
	16#2	The number of digital output points	Word	RO
	16#3	The number of special modules	Word	RO
	16#4	The model code of the 1 st special module	Word	RO
	16#5	The model code of the 2 nd special module	Word	RO
16#8200	16#6	The model code of the 3 rd special module	Word	RO
	16#7	The model code of the 4 th special module	Word	RO
	16#8	The model code of the 5 th special module	Word	RO
	16#9	The model code of the 6 th special module	Word	RO
	16#A	The model code of the 7 th special module	Word	RO
	16#B	The model code of the 8 th special module	Word	RO



6.3 Control Word and Status Indication Parameters

6.3.1 Control Word Parameter

Explanation of control word parameter

Index	Subindex	Description	Data type	Access type
16#A100	16#1	Control Word	WORD	RW

Explanation of control word parameter bits

Bit	Value	Description
Dit 0	0	RTU-ECAT is set to STOP as bit 15 of the control word parameter is 1 and bit 0 is 0.
Bit 0	1	RTU-ECAT is set to RUN as bit 15 of the control word parameter is 1 and bit 0 is 1.
	0	The output values of right-side special modules and digital output point values of digital modules keep the same as they are before disconnection when RTU-EtherCAT is disconnected from the master.
Bit 1	1	The output values of right-side special modules change to zero and digital output points of digital modules change to OFF when RTU-EtherCAT is disconnected from the master.
Bit 2	0/1	Reserved
Bit 3	0/1	Reserved
Bit 4	0/1	Reserved
Bit 5	0/1	Reserved
Bit 6	0/1	Reserved
Bit 7	0/1	Reserved
Bit 8	0/1	Reserved
Bit 9	0/1	Reserved
Bit 10	0/1	Reserved
Bit 11	0/1	Reserved
Bit 12	0/1	Reserved
Bit 13	0/1	Reserved
Bit 14	0/1	Reserved
Bit 15	0	Control word is disabled. When the bit value is 0, RTU-ECAT can not be controlled to enter RUN or STOP state via bit0 in the control word.



Bit	Value	Description
	1	Control word is enabled. When the bit value is 1, RTU-ECAT can be controlled to enter RUN or STOP state via bit0 in the control word.

6.3.2 Status Indication

Index	Subindex	Description	Data type	Access type
16#1001	16#0	Error register which contains RTU-ECAT error information	WORD	RO
	16#1	LV state which is voltage status	BYTE	RO
16#A000	16#2	Error module number which is the number of the module in error on the right side	BYTE	RO
	16#3	Error list which shows errors of extension modules	ARRAY [18] OF BYTE	RO

Explanation of RTU-ECAT status indication parameters

Status value	Description	How to correct
0x1000 (4096)	The special modules on the right of RTU-ECAT are inconsistent with the configuration in the software.	 Ensure that the special modules configured in the software match the modules actually connected. Ensure that the connection between the right-side special modules and RTU-ECAT is normal.
0x1001 (4097)	The special modules and digital modules on the right of RTU-ECAT are inconsistent with the configuration data.	 Ensure that the special module number and input and output point numbers of digital modules configured in the software match the modules actually connected. Ensure that the connection between the right-side modules and RTU-ECAT is normal.

Error register (RTU-ECAT error)

Status value	Description	How to correct
0x1002 (4098)	An error occurs in the special modules on the right of RTU-ECAT	 Ensure that the power supply to the right-side special modules is normal. Check the error information of the special modules on the right of RTU-ECAT. Configure the error status CR registers for the right-side special modules to the input data of IO data and then get to know the cause based on the values in the error status CRs. Refer to error status CRs in DVP-PLC Application Manual: Special Modules for more details on error codes of special modules.
0x1004 (4100)	The modules configured in the software are inconsistent with those actually connected and meanwhile an error in extension modules on the right of RTU-ECAT occurs.	 Ensure the modules configured in the software match those actually connected. Ensure the power supply to the right-side modules works normally. Check the error information of the right-side modules and then get rid of it according to the instructions in the module manual.
0x1005 (4101)	The special modules configured on the right of RTU-ECAT exceeds 8 units.	Ensure that the number of special modules configured in the software is no more than 8 units.

■ LV state (voltage status)

Bit	Value	Description	How to correct
	0	The voltage for RTU-ECAT is normal.	
Bit 0	1	Ũ	Check if the voltage of the power supply to RTU-ECAT is normal.
Bit 1~bit 7	0/1	Reserved	Reserved

Error module number (The number of the right-side module in error)

Bit	Value	Description	How to correct
Bit 0	0	The 1 st special module on the right of RTU-ECAT is normal.	



Bit	Value	Description	How to correct
	1	The 1 st special module on the right of RTU-ECAT is alarming.	Refer to "Error list (Extension module error information)" below.
Bit 1	0	The 2 nd special module on the right of RTU-ECAT is normal.	
	1	The 2 nd special module on the right of RTU-ECAT is alarming.	Refer to "Error list (Extension module error information)" below.
Bit 2	0	The 3 rd special module on the right of RTU-ECAT is normal.	
	1		Refer to "Error list (Extension module error information)" below.
Bit 3	0	The 4 th special module on the right of RTU-ECAT is normal.	
Dit 3	1		Refer to "Error list (Extension module error information)" below.
Bit 4	0	The 5 th special module on the right of RTU-ECAT is normal.	
Dit 4	1		Refer to "Error list (Extension module error information)" below.
Bit 5	0	The 6 th special module on the right of RTU-ECAT is normal.	
DIL 5	1	The 6 th special module on the right of RTU-ECAT is alarming.	Refer to "Error list (Extension module error information)" below.
Pit 6	0	The 7 th special module on the right of RTU-ECAT is normal.	
Bit 6	1	The 7 th special module on the right of RTU-ECAT is alarming.	Refer to "Error list (Extension module error information)" below.
	0	The 8 th special module on the right of RTU-ECAT is normal.	
Bit 7	1	The 8 th special module on the right of RTU-ECAT is alarming.	Refer to "Error list (Extension module error information)" below.



Error list (Extension module error information)

Bit	Description
	The error code in the 1 st special module on the right of RTU-ECAT; the error code value
Error list[0]	is the value in the error status CR of the special module. For details, refer to error
	status CRs in DVP-PLC Application Manual: Special Modules.
	The error code in the 2 nd special module on the right of RTU-ECAT; the error code
Error list[1]	value is the value in the error status CR of the special module. For details, refer to error
	status CRs in DVP-PLC Application Manual: Special Modules.
	The error code in the 3 rd special module on the right of RTU-ECAT; the error code value
Error list[2]	is the value in the error status CR of the special module. For details, refer to error
	status CRs in DVP-PLC Application Manual: Special Modules.
	The error code in the 4 th special module on the right of RTU-ECAT; the error code value
Error list[3]	is the value in the error status CR of the special module. For details, refer to error
	status CRs in DVP-PLC Application Manual: Special Modules.
	The error code in the 5 th special module on the right of RTU-ECAT; the error code value
Error list[4]	is the value in the error status CR of the special module. For details, refer to error
	status CRs in DVP-PLC Application Manual: Special Modules.
	The error code in the 6 th special module on the right of RTU-ECAT; the error code value
Error list[5]	is the value in the error status CR of the special module. For details, refer to error
	status CRs in DVP-PLC Application Manual: Special Modules.
	The error code in the 7 th special module on the right of RTU-ECAT; the error code value
Error list[6]	is the value in the error status CR of the special module. For details, refer to error
	status CRs in DVP-PLC Application Manual: Special Modules.
	The error code in the 8 th special module on the right of RTU-ECAT; the error code value
Error list[7]	is the value in the error status CR of the special module. For details, refer to error
	status CRs in DVP-PLC Application Manual: Special Modules.



7

Chapter 7 Application Examples

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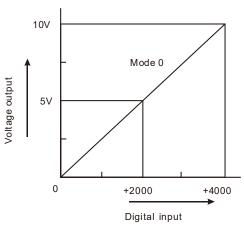
tput

This part describes how to configure RTU-ECAT module parameters through examples. Section 7.1, 7.2 and 7.3 respectively introduce the configuration methods when RTU-ECAT works together with different EtherCAT masters.

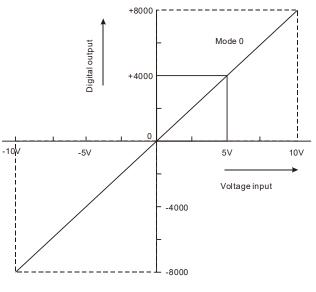
Control requirement

- DVP16SP11T is controlled to change its outputs Y0~Y7 to ON and its inputs X0~X7 are monitored via RTU-ECAT.
- 2. Channel 1 ~ channel 4 of DVP04DA-S are controlled to output the voltage of 5V via RTU-ECAT.
- The analog data conversion values of Channel 1 ~ channel 4 of DVP04AD-S are read via RTU-ECAT.

• Digital-Analog Relations for DVP04DA-S and DVP04AD-S



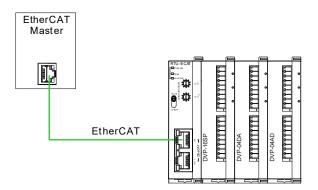
Digital input- Voltage output relation for $\ensuremath{\mathsf{DVP04DA-S}}$ in mode 0



Digital output- Voltage input relation for DVP04AD-S in mode 0



• Constructing an EtherCAT network with RTU-ECAT



• Devices used in the example:

Device Name	Description
AX-832E CPU	Delta AX-8 series motion controller CPU
TwinCAT software	Beckhoff EtherCAT configuration software
NJ301	OMRON NJ series CPU
RTU-ECAT module	Delta EtherCAT remote IO module
DVP04DA-S	Delta analog output module
DVP04AD-S	Delta analog input module
DVP16SP11T	Delta digital IO module with 8 input points and 8 output points

Note:

- 1. Please ensure that DVP16SP11T, DVP04DA-S, DVP04AD-S and RTU-ECAT modules work normally and the whole network wiring is proper.
- 2. Refer to **DVP-PLC Application Manual: Special Modules** for more about DVP04DA-S and DVP04AD-S.

7.1 Using Delta AX8 Series CPU with RTU-ECAT

1. Download CODESYS software from Delta official website and install it. And then start the software.

CODESYS		- 0	×
File Edit View Project	Build Online Debug Tools Window Help	,	T
🎦 🛩 🔚 🎒 🗠 બ 🐰 🖿 f	跑× 两端酷猛 貝乳乳液 隐 ‰+ ㎡	' 🎬 🎯 🧐 🔸 🔳 🤻 🗊 📲 📲 🎗	Ŧ
r			
Devices 👻 🕂 🗙	Start Page 🗙	▼ ToolBox ▼ ₽	×
	CODESYS V3.5 SP15		
	Basic operations	Latest news	
	New Project		
	൙ Open Project		
	Open Project from PLC	CODESYS	
	Recent projects		
	Recent projects		
	Close page after project load	CODESV	
Sevices POUs	Show page on startup	NT:NS:	
Messages - Total 0 error(s), 0 warn	ing(s), 0 message(s)		
	Last build: 😳 0 🕐 0 🛛 Precompile 🗸	Project user: (nobody) 🦸)

2. A new project is created by selecting the icon in the red box and then typing a project name and storage location as below.

🖹 New Pr					
Categories	5	Templates			
	oraries ojects	Empty project	HMI project	Standard project	Standard project w
A project c	ontaining one device, one a	application, and an e	empty implemen	tation for PLC_	PRG
Name	RTU-ECAT使用范例				
	RTU-ECAT使用范例 D:\范例				×
Name				ОК	∼ … Cancel

Click "OK" button to complete the setting. Afterward, select "AX-8xxEP0 Series (Delta Electronics, Inc.)" in the "Device" field and then click "OK" in the pop-out window.



Standard	l Project		Х
	You are about to create a new standard project. This wizard will create the following objects within this project: - One programmable device as specified below - A program PLC_PRG in the language specified below - A cyclic task which calls PLC_PRG - A reference to the newest version of the Standard library currently installed.		
	Device	AX-8xxEP0 Series (Delta Electronics, Inc.)	~
	Device PLC_PRG in	AX-8xxEP0 Series (Delta Electronics, Inc.) Structured Text (ST)	~ ~
			~ ~

3. The created new project is shown as below.

◆ RTU-ECAT使用范例,project - CODESYS	- 0 ×
File Edit View Project Build Online Debug Tools Window Help	۲.
🛅 📽 🖬 番目の つ & 時 வ 米 桷 築 🍓 🥸 貝 雅 雅 准 釉 獅 - 音 囲 Application (Device: PLC Logic) - 🧐 🧐 → 🔳 💐 (耳 雪 雪 雪 多 々 第 雪 ひ	
Devices 🗸 🕂 X	ToolBox 👻 📮 🗙
■ ····································	
🚊 🔟 Device (AX-8xx870 Series)	
□ 副U PLC Logc	
S 🕼 Application	
ULCHRY Manager	
— ④ PLC_PRG	
- 📆 EtherCAT_Master (AX-8xx	
a builth	
- 🖞 sultin_DIO (sultin_DI	
SoftWatan General Axis P	
Devices (1) POUs	
Compared and the state of	
Last build: 📀 0 🕐 0 Precompile 🗸 👫 Project user: (n	obody) 🜍

Double-click on "Device" in the red box above and then click on "Scan Network" in the red box in the following window.



7

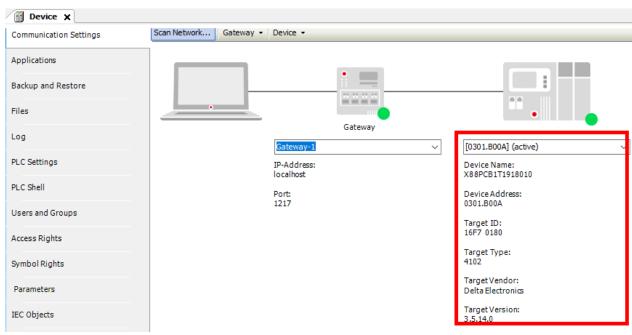
Device X	
Communication Settings	Scan Network Gateway 👻 Device 👻
Applications	
Backup and Restore	
Files	
Log	Gateway Gateway-1 CNWJ6ENNB009
PLC Settings	IP-Address: localhost
PLC Shell	Port:
Users and Groups	1217

Then the following window appears, where AX-8 series controller will be searched automatically. After the AX-8 controller shows up, select the controller and click "OK" button.

Select Device	×
Select the network path to the controller:	Device Name: Scan Network X88PCB 1T 19 180 10 Wink Device Address: Wink 0301.B00A Block driver: UDP Encrypted Communication: TLS supported Number of channels: 8 Target ID:
	OK Cancel

After the operations above are done, the connected CPU will automatically show up in the "Device" interface as below.





4. Double-click on "EtherCAT Master" in the red box below to open the "EtherCAT Master" interface.

Devices 👻 🕂 🗙	Device I EtherCAT_Ma	ister X	
■	General	Autoconfig Master/Slaves	Ether CAT.
PLC Logic	Sync Unit Assignment	EtherCAT NIC Setting	
Library Manager	EtherCAT I/O Mapping	Destination address (MAC) FF-FF-FF-FF-FF	Enable redundancy
□ PLC_PRG (PRG) □ Task Configuration	EtherCAT IEC Objects	Source address (MAC) 00-00-00-00-00 Browse Network Name ECAT	
EtherCAT_Tas	Status	Select network by MAC Select network by name	
PLC_PRG	Information	✓ Distributed Clock	
BuiltIn		Cycle time 4000 🗼 µs	
···· 📆 BuiltIn_DIO (BuiltIn_DI		Sync offset 20 🔶 %	
BuiltIn_Pulse_Encoder		Sync window monitoring	
🛛 🍐 SoftMotion General Axis Po		Sync window 1 🗢 µs	

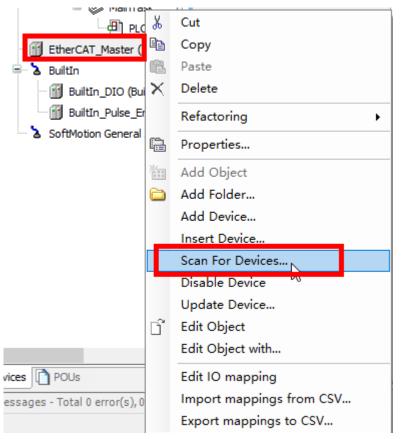
Click "Browse" button in the "EtherCAT Master" configuration area, then select the ECAT port from the pop-out "Select Network Adapter" window as below and afterwards click "OK" button.

Select Network Adapter		
MAC address N	ame	Description
- 00182373D26A EC.	AT	CoDeSys EtherExpress GBit PCI Ethernet Adapter
- 00182373D269 GL	AN2	CoDeSys EtherExpress GBit PCI Ethernet Adapter #2
001823727777 GL	AN1	CoDeSys EtherExpress GBit FCI Ethernet Adapter #3
		OK Abort



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5. Right-click on the "EtherCAT Master" after the above action is done and then choose "Scan For Devices..." from the context menu.

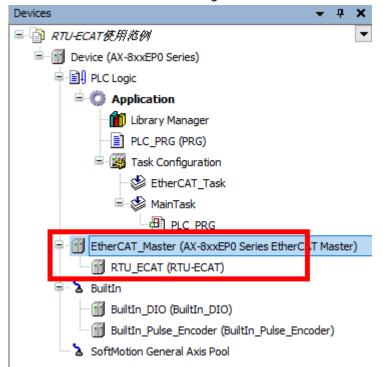


Then the following "Scan Devices" window appears with the scanned slave as follows.

	Device type	Alias Address			
RTU_ECAT	RTU-ECAT	0			
			_		

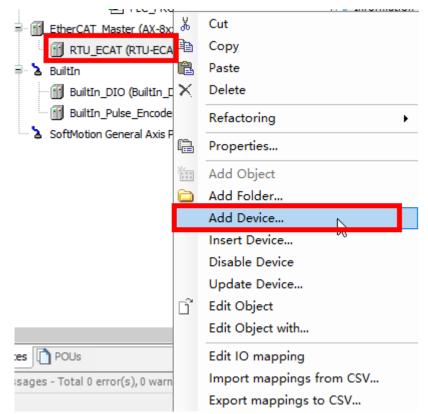
After the software scan is complete, select the scanned RTU-ECAT and then click on "Copy to project" to add





the RTU-ECAT to the EtherCAT configuration as shown below.

6. Right-click on the RTU-ECAT after it is added and select "Add Device" from the context menu to add extension modules.



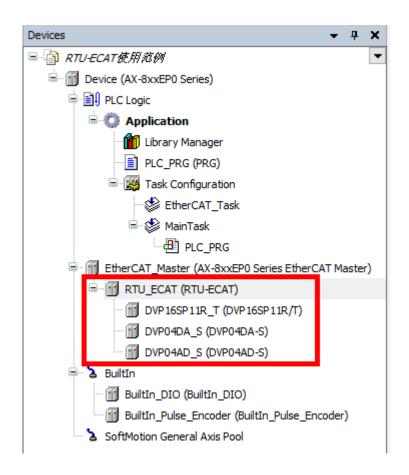
The following "Add Device" window appears for users to select extension modules.



7						
🕤 Add Device						×
Name DVP16SP11R_T						1
Action						1
Append device	🔿 Plug d	evice 🔿 U	pdate device			
		1	-			_
String for a fulltext search		Vendor	<all td="" vendors<=""><td>></td><td></td><td>~</td></all>	>		~
Name	Vendor		Versio	n Description		<u>^ </u>
🖃 · 🚹 Fieldbuses						
் _{Be} ar EtherCAT						
Brat Module						
DVP01PU-S	Delta Ele	ctronics, Inc.	0	EtherCAT Module	imported from Sl	
DVP02DA-S	Delta Ele	ctronics, Inc.	0	EtherCAT Module	imported from Sl	
🔟 DVP02TUL-S	Delta Ele	ctronics, Inc.	0	EtherCAT Module	imported from Sl	
- M DVP02TUN-S	Delta Ele	ctronics, Inc.	0	EtherCAT Module	imported from Sl	
···· 🗊 DVP02TUR-S	Delta Elec	ctronics, Inc.	0	EtherCAT Module	imported from Sl	
DVP04AD-S	Delta Elec	ctronics, Inc.	0	EtherCAT Module	imported from Sl	
···· 🔟 DVP04AD-S2	Delta Ele	ctronics, Inc.	0	EtherCAT Module	imported from SI EtherCAT Mod	
DVP04DA-S	Delta Ele	ctronics, Inc.	0	EtherCAT Module	EtherCAT Wood	
1 4 10 10 10 10 10 10 10 10 10 10 10 10 10	- 111				· · · · · ·	rll
Group by category Display all v	versions (f	or experts o	nlv) 🗌 Disr	play outdated version		
						\square
Name: DVP16SP11R/T				^		
Vendor: Delta Electronics, Inc. Categories: Module						
Version: 0						
Order Number: DVP 16SP 11R/T	г			~	~	
						-
Append selected device as last chil RTU_ECAT	d of					
			late all a sub-second			
(You can select another target no	de in the i	navigator wi	nite this wind	ow is open.)		
				Add Device	Close	
					0.030	

Find out and select DVP16SP11R/T in the red box above and then click "Add Device" button to add DVP16SP11T/R to RTU-ECAT. In the same way, add DVP04DA-S and DVP04AD-S respectively to the RTU-ECAT configuration.





7. After the above configuration setting is complete, right-click on the RTU-ECAT and select "Edit IO Mapping" from the context menu to review the IO mapping information of RTU-ECAT.

🚹 Device 📑 Eth	erCAT_Master	Edit IO map	ping 🗙			
Find	Filter Show all					
Variable	Channel	Address	Туре	Description		
■- 🔐 RTU_ECAT						
😟 - 👘	Digital output CH1	%QB0	USINT	Digital output CH1		
	Digital input CH1	%IB0	USINT	Digital input CH1		
🖹 🔐 DVP04DA_S						
	CR6: value of CH1 output signal	%QW1	INT	CR6: value of CH1 output signal		
😟 🍢	CR7: value of CH2 output signal	%QW2	INT	CR7: value of CH2 output signal		
	CR8: value of CH3 output signal	%QW3	INT	CR8: value of CH3 output signal		
😟 Kø	CR9: value of CH4 output signal	%QW4	INT	CR9: value of CH4 output signal		
🖃 🔐 🔂 DVP04AD_S						
	CR12: present value of CH1 input signal	%IW1	INT	CR12: present value of CH1 input signal		
iii ¥≱	CR13: present value of CH2 input signal	%IW2	INT	CR13: present value of CH2 input signal		
🚊 - 🎽	CR14: present value of CH3 input signal	%IW3	INT	CR14: present value of CH3 input signal		
	CR15: present value of CH4 input signal	%IW4	INT	CR15: present value of CH4 input signal		

Variables can be combined in the red boxes above. When module channels are not combined to variables, the I and Q devices in the "Addresss" column are valid. The values of module channels can be read through



the I and Q devices in the program.

When module channels are combined to variables, the I and Q devices in the "Addresss" column are invalid. The values of module channels can be read through variables in the program.

E.g. when module channels are not combined with variables, write 255 in %QB0 device in the program to change the Y0~Y7 output of DVP16SP11T into ON. If channel 1~ channel 4 of DVP04DA-S output 5V voltage, write 2000 to %QW1~QW4 in the program and then read the value converted from the analog data of channel 1~ channel 4 of DVP04AD-S in %IW1~%IW4.

If you need to modify the mode of channel 1~ channel 4 of DVP04DA-S, click "Startup Parameters" in the configuration interface of RTU-ECAT to open the "Startup" configuration interface and then click **Add** button as follows.

General	╊ Add 👔 🖉 Edit 🗙 Delete 🐨 Move Up 🗣 Move Down					
Process Data	Line	Index:Subindex	Name	Value	Bit Ler	
	1	16#8000:16#01	module code	113	8	
Startup Parameters	2	16#8020:16#01	module code	3	8	
EtherCAT IEC Objects	3	16#8040:16#01	module code	0	8	
Status						
Information						

Click **Add** button and then click icon beside DVP04DA-S in the pop-out window to unfold all configurable CRs of DVP04DA-S. Then select the option "CR1: output mode setting" and enter 585 (16#249) in the "Value" field.



nd	lex:Subindex	Name	Flags	Туре	Default		
0	16#10F1:16#0	0 Error Settings					
.	16#1C32:16#0	0 SM output parameter					
÷.	16#1C33:16#0	0 SM input parameter					
<u>.</u>	6#2020:16#0	0 DVP04DA-S CR					
	:16#02	CR1: output mode set	RW	INT	16#0000		
	:16#03	CR2: reserved	RW	INT	16#0000		
	:16#04	CR3: reserved	RW	INT	16#0000		
	:16#05	CR4: reserved	RW	INT	16#0000		
	:16#06	CR5: reserved	RW	INT	16#0000		
	:16#07	CR6: value of CH1 ou	RW	INT	16#0000		
	:16#08	CR7: value of CH2 ou	RW	INT	16#0000		
	:16#09	CR8: value of CH3 ou	RW	INT	16#0000		
	:16#0A	CR9: value of CH4 ou	RW	INT	16#0000		
	:16#0B	CR 10: reserved	RW	INT	16#0000		
Na	ame	CR1: output mode setting	-				
In	dex: 16#	2020 🚖	Bit length	16		÷	ОК
~	ıbIndex: 16#	2	/alue	585		÷	Cancel

Click "OK" button to finish the setting. The "Startup Parameters" interface is disaplayed as follows after the setting is over.

General	- Add	Add 📝 Edit 🗙 Delete 🕆 Move Up 🖶 Move Down							
Expert Process Data	Line	Index:Subindex	Name	Value	Bit Length	Abort on Error	Jump to Line on Err	Next Line	Comment
		16#8000:16#01	module code	113	8			0	module code
Process Data	2	16#8020:16#01	module code	3	8			0	module code
	- 3	16#8040:16#01	module code	0	8			0	module code
Startup Parameters	4	16#2020:16#02	CR1: output mode setting	585	16			0	
EtherCAT IEC Objects									
Status									

Click login button and download the EtherCAT configuration data to the AX8 series CPU. Then the mode of channel 1~ channel 4 of DVP04DA-S is automatically switched to mode 1.

Refer to DVP-PLC Application Manual: Special Modules for details on CR1 in DVP04DA-S.

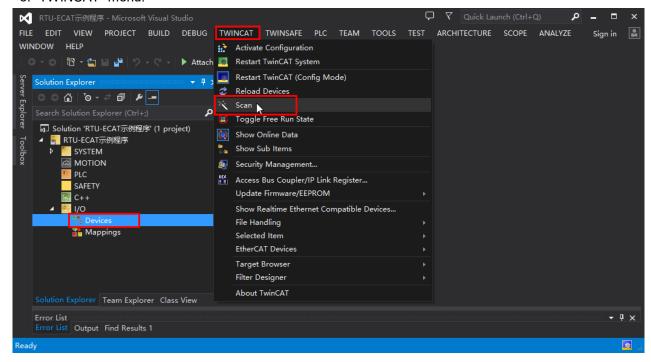
7.2 Using TwinCAT3 with RTU-ECAT

7.2.1 Configuring the Network via TwinCAT3

- Configuring RTU-ECAT
- 1. Start the TwinCAT3 software and create a TwinCAT project as below.

NTU-ECAT示例程序 - Microsoft Visual Studio			↓ ↓ Quick Lat	unch (Ctrl+Q)	- • ×
FILE EDIT VIEW PROJECT BUILD DEBUG	TWINCAT TWINSAFE PLC	TEAM TOOLS	TEST ARCHITECTURE	SCOPE ANALYZE	Sign in 🔒
Attach	- 🔿 - Release - 🎜 🚽				
Solution Explorer					
Solution Explorer Team Explorer Class View					
Error List Error List Output Find Results 1					- ₽×
Creating project 'RTU-ECAT示例程序' project creation suc	cessful.				1

2. Click on the "I/O" item on the left list of the software interface, select "Devices" and then click on "Scan" of "TWINCAT" menu.



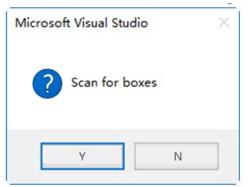
With a click on "Scan" the following dialog appears, where you click on the "OK" button.

Microsoft Visual Studio		×
HINT: Not all types of o	levices can be found a	utomatically
	ОК	Cancel

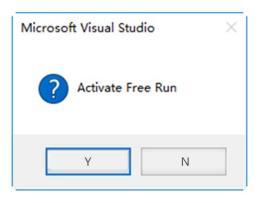
3. During the scan, the adapters information is listed as below. Select the right adapter and click on the "OK" button.

3 new I/O devices found	×
□ Device 1 (EtherCAT Automation Protocol) [以太网 5 (DIACom Ethernet Adapter)] □ Device 2 (EtherCAT Automation Protocol) [以太网 3 (Realtek USB FE Family Contro ☑ Device 4 (EtherCAT) [以太网 (TwinCAT-Intel PCI Ethernet Adapter (Gigabit]	OK Cancel Select All
	Unselect All

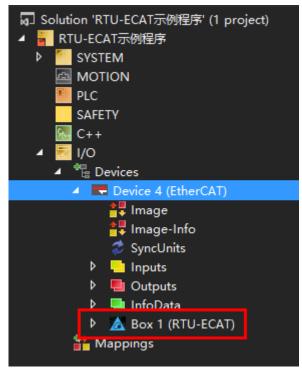
4. Click on the "Y" button in the following dialog to scan the slave modules on the network.



5. After the scan is over, the following dialog appears. Click on the "Y" button then.



6. Then the names of all node devices which have been scanned appear on the software interface as follows.



7. With a double-click on the RTU-ECAT symbol, the interface for configuring RTU-ECAT appears.



General EtherC	AT DC Process Data Slots Startup CoE -	Online Online
Name:	Box 1 (RTU-ECAT)	Id: 1
Object Id:	0x03020001	
Туре:	RTU-ECAT	
Comment:		^
		\sim
	Disabled	Create symbols

8. Click on "Slots" tab and then set the right-side module configuration of RTU-ECAT as below.

General	EtherCAT	DC	Process Data	Slots	Startup	CoE	- Online	Online		
Slot	Terminals Terminals Terminals Terminals Terminals Terminals Terminals Terminals	DC		Slots	Startup	СоЕ	- Online	Online	ModuleIdent	: Description
▲	vnload Slot(îfg	□ (I->P)	_		Þ		Create project s	specific XML File	•

9. Click on the top "Terminals" row of the left list. Then the DVP-S series right-side extension modules which can be added appear on the right list.



Slot	Module			Module	ModuleIdent	Des
Taminala N				Digital Input Terminals		
A Terminals			<	DVP08SM11N	0x01DD0001	DVF
A Terminals				DVP08ST11N	0x01DD0002	DVF
A Terminals			×	DVP16SM11N	0x01DD0003	DVF
A Terminals				DVP32SM11N	0x01DD0004	DVF
A Terminals				 Digital Output Terminals 	0,01000001	
A Terminals				DVP06SN11R	0x01DD0005	DVF
A Terminals				DVP08SN11R/T	0x01DD0006	DVF
A Terminals				DVP08SN11TS	0x01DD0007	DVF
A Terminals				DVP16SN11T	0x01DD0008	DVF
A Terminals				DVP16SN11TS	0x01DD0009	DVF
A Terminals				DVP32SN11TN	0x01DD000A	DVF
A Terminals				Digital Input and Output Tern		
A Terminals				DVP08SP11R/T	0x01DD000B	DVF
				DVP08SP11TS	0x01DD000C	DVF
				DVP16SP11R/T	0x01DD000D	DVF
				DVP16SP11TS	0x01DD000E	DVF
				Analog Input Terminals		
Download SlotCfg](I->P) T from the righ	t list a	nd click or	Create project specific XML Fi		
_ • -	T from the righ	t list a	nd click or	<		
Select DVP16SP11R/	T from the righ		nd click on CoE - Online	to add DVP16SP		
Select DVP16SP11R/	T from the righ U-ECAT.			to add DVP16SP		t De
Select DVP16SP11R/ configuration list of RT eneral EtherCAT DC P Slot & Terminals	T from the righ U-ECAT. rocess Data Slots	Startup	CoE - Online	to add DVP16SP	11R/T to the	t De
Select DVP16SP11R/ configuration list of RT eneral EtherCAT DC P	T from the righ U-ECAT. rocess Data Slots Module	Startup		 to add DVP16SP Online Module 	11R/T to the	
Select DVP16SP11R/ configuration list of RT eneral EtherCAT DC P Slot & Terminals & Terminals & Terminals	T from the righ U-ECAT. rocess Data Slots Module	Startup	CoE - Online	 to add DVP16SP Online Module Digital Input Terminals 	11R/T to the ModuleIdent	D
Select DVP16SP11R/ configuration list of RT eneral EtherCAT DC P Slot & Terminals & Terminals	T from the righ U-ECAT. rocess Data Slots Module	Startup	CoE - Online	 to add DVP16SP Online Module Digital Input Terminals DVP08SM11N 	11R/T to the ModuleIdent 0x01DD0001	ים ים
Select DVP16SP11R/ configuration list of RT eneral EtherCAT DC P Slot & Terminals & Terminals & Terminals	T from the righ U-ECAT. rocess Data Slots Module	Startup	CoE - Online	 to add DVP16SP Online Module Digital Input Terminals DVP08SM11N DVP08ST11N 	ModuleIdent 0x01DD0001 0x01DD0002	רם ים ים
Select DVP16SP11R/ configuration list of RT eneral EtherCAT DC P Slot & Terminals & Terminals & Terminals & Terminals	T from the righ U-ECAT. rocess Data Slots Module	Startup	CoE - Online	 to add DVP16SP Online Module Digital Input Terminals DVP08SM11N DVP08ST11N DVP16SM11N 	ModuleIdent 0x01DD0001 0x01DD0002 0x01DD0003	רם ים ים
Select DVP16SP11R/ configuration list of RT eneral EtherCAT DC P Slot & Terminals & Terminals & Terminals & Terminals & Terminals & Terminals	T from the righ U-ECAT. rocess Data Slots Module	Startup	CoE - Online	 to add DVP16SP Online Module Digital Input Terminals DVP08SM11N DVP08ST11N DVP08ST11N DVP16SM11N DVP32SM11N 	ModuleIdent 0x01DD0001 0x01DD0002 0x01DD0003	ים ים ים
Select DVP16SP11R/ configuration list of RT eneral EtherCAT DC P Slot & Terminals & Terminals & Terminals & Terminals & Terminals & Terminals & Terminals & Terminals	T from the righ U-ECAT. rocess Data Slots Module	Startup	CoE - Online	 to add DVP16SP Online Module Digital Input Terminals DVP08SM11N DVP08ST11N DVP16SM11N DVP16SM11N DVP32SM11N Digital Output Terminals 	11R/T to the ModuleIdent 0x01DD0001 0x01DD0002 0x01DD0003 0x01DD0004	ים יים יים יים
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Select DVP16SP11R/ configuration list of RT eneral EtherCAT DC P Slot Terminals Terminals Terminals Terminals Terminals Terminals Terminals Terminals Terminals Terminals Terminals Terminals	T from the righ U-ECAT. rocess Data Slots Module	Startup	CoE - Online	 to add DVP16SP Online Module Digital Input Terminals DVP08SM11N DVP08ST11N DVP16SM11N DVP16SM11N DVP16SM11N DVP06SN11R DVP06SN11R/T DVP08SN11TS DVP16SN11T 	11R/T to the ModuleIdent 0x01DD0001 0x01DD0002 0x01DD0003 0x01DD0004 0x01DD0005 0x01DD0005 0x01DD0006 0x01DD0007 0x01DD0008	יים יים יים יים יים יים
Select DVP16SP11R/ configuration list of RT eneral EtherCAT DC P Slot Terminals Terminals Terminals Terminals Terminals Terminals Terminals Terminals Terminals Terminals Terminals Terminals Terminals Terminals	T from the righ U-ECAT. rocess Data Slots Module	Startup	CoE - Online	 to add DVP16SP Online Digital Input Terminals DVP08SM11N DVP08ST11N DVP16SM11N DVP16SM11N DVP16SM11N DVP06SN11R DVP06SN11R DVP06SN11R/T DVP08SN11TS DVP16SN11T DVP16SN11TS 	11R/T to the Module1dent 0x01DD0001 0x01DD0002 0x01DD0003 0x01DD0004 0x01DD0005 0x01DD0006 0x01DD0006 0x01DD0006 0x01DD0008 0x01DD0008 0x01DD0008	יים יים יים יים יים יים
Select DVP16SP11R/ configuration list of RT eneral EtherCAT DC P Slot & Terminals & Terminals	T from the righ U-ECAT. rocess Data Slots Module	Startup	CoE - Online	 to add DVP16SP Online Digital Input Terminals DVP08SM11N DVP08ST11N DVP16SM11N DVP16SM11N DVP06SN11R DVP06SN11R/T DVP08SN11R/T DVP08SN11TS DVP16SN11T DVP16SN11TS DVP16SN11TS DVP16SN11TS DVP16SN11TS DVP16SN11TS 	11R/T to the Module1dent 0x01DD0001 0x01DD0002 0x01DD0003 0x01DD0004 0x01DD0005 0x01DD0006 0x01DD0006 0x01DD0006 0x01DD0008 0x01DD0008 0x01DD0008	יים יים יים יים יים יים
Select DVP16SP11R/ configuration list of RT eneral EtherCAT DC P Slot & Terminals & Terminals	T from the righ U-ECAT. rocess Data Slots Module	Startup	CoE - Online	to add DVP16SP Online Module Digital Input Terminals DVP08SM11N DVP08SM11N DVP16SM11N DVP16SM11N DVP16SM11N DVP06SN11R DVP08SN11R/T DVP08SN11TS DVP16SN11TS DVP16SN11TS DVP16SN11TS DVP16SN11TN DVP16SN11TN DVP16SN11TN DVP16SN11TN DVP16SN11TN DVP16SN11TN DVP16SN11TN	11R/T to the ModuleIdent 0x01DD0001 0x01DD0002 0x01DD0003 0x01DD0004 0x01DD0005 0x01DD0006 0x01DD0006 0x01DD0007 0x01DD0008 0x01DD0008 0x01DD0008	יים יים יים יים יים יים
Select DVP16SP11R/ configuration list of RT eneral EtherCAT DC P Slot & Terminals & Terminals	T from the righ U-ECAT. rocess Data Slots Module	Startup	CoE - Online	 to add DVP16SP Online Digital Input Terminals DVP08SM11N DVP08ST11N DVP16SM11N DVP16SM11N DVP16SM11N DVP06SN11R DVP06SN11R/T DVP08SN11R/T DVP16SN11TS DVP16SN11TS DVP16SN11TS DVP16SN11TS DVP16SN11TS DVP16SN11TS DVP16SN11TS DVP16SN11TS DVP16SN11TN DVP16SN11TS DVP16SN11TS DVP16SN11TN DVP16SN11TN DVP16SN11TN DVP16SN11TN DVP16SN11TN DVP08SP11R/T 	11R/T to the ModuleIdent 0x01DD0001 0x01DD0002 0x01DD0003 0x01DD0004 0x01DD0005 0x01DD0006 0x01DD0006 0x01DD0008 0x01DD0008 0x01DD0008	יים יים יים יים יים יים יים

11. Following the steps above, add DVP04DA and DVP04AD under DVP16SP as below.



General	EtherCAT	DC	Process Data	Slots	Startup	CoE - Online	Online		
Slot			1	Module			Module	ModuleIdent	Descr
	Terminals			OVP16SP	P11R/T		DVP16SP11R/T	0x01DD000D	DVP1
	Terminals		(OVP04D	A-S	<	DVP16SP11TS	0x01DD000E	DVP1
	Terminals		1	OVP04A	D-S		Analog Input Terminals		
	Terminals					×	DVP04AD-S	0x01DD000F	DVP0-
	Terminals						DVP04AD-S2	0x01DD0010	DVP0-
	Terminals						DVP06AD-S	0x01DD0011	DVP0
	Terminals						Analog Output Terminals		
	Terminals						DVP02DA-S	0x01DD0012	DVP0:
	Terminals						DVP04DA-S	0x01DD0013	DVP0-
	Terminals						DVP04DA-S2	0x01DD0014	DVP0-
	Terminals						 Analog Input and Output Te 	rminals	
	Terminals						DVP06XA-S	0x01DD0015	DVP0
	Terminals						DVP06XA-S2	0x01DD0016	DVP0
	Terminals						 Temperatrue Terminals 		
							DVP04PT-S	0x01DD0018	DVP0-
							DVP06PT-S	0x01DD0019	DVP0
							DVP04TC-S	0x01DD001A	DVP0-
							DVP02TUN-S	0x01DD001B	DVP0
◀						•	•		•

12. After the configuration is completed, click the "Process Data" tab to enter the data exchange configuration interface.

vnc I	Manage	r:		PDO List:							
SM	Size	Туре	Flags	Index	Size	Name		Flags	SM	SU	
	128	Mbx	riags					riags			
0 1	128	MbxIn		0x1B00 0x1B01	0.0 0.0	Status Control	1		3	0	
	9			0x1A00	1.0				2	0	
2 3	9	Outp Inputs		0x1600	1.0		SP11R/T Input mapp SP11R/T Output ma		2	0	
э	9	inputs		0x1600	8.0				2	0	
				0x1A20	8.0		DA-S Output mapping AD-S Input mapping		2	0	
DO	Assianm	ent (0x10	12):	PDO Contr	-nt (0x16	10):					
		ent (0x1C	:12):	PDO Conte	•	-	Name		Type	Default	+ (h.
Z0x Z0x	1B01 1600	ient (0x1C	:12):	Index	Size	Offs	Name	utout si	Туре	Default	t (h
Z0x Z0x	1B01	ient (0x1C	:12):	Index 0x2020	Size 2.0	Offs 0.0	CR6: value of CH1 o		INT	Default	t (h
Z0x Z0x	1B01 1600	ent (0x1C	:12):	Index 0x2020 0x2020	Size 2.0 2.0	Offs 0.0 2.0	CR6: value of CH1 o CR7: value of CH2 o	utput si	INT INT	Default	t (h
Z0x Z0x	1B01 1600	nent (0x1C	:12):	Index 0x2020	Size 2.0 2.0 2.0	Offs 0.0	CR6: value of CH1 o	utput si utput si	INT INT INT	Default	t (h

Add or delete a special module CR which need be read or written to in the "PDO Content" box as below.



Index	Size	Offs	Name	Туре	Default (h
0x2020	2.0	0.0	CR6: value of CH1 outp	out si INT	
0x2020	2.0	2.0	CR7: value of CH2	Insert	
0x2020	2.0	4.0	CR8: value of CH3		
0x2020	2.0	6.0	CR9: value of CH4 🔀	Delete	
		8.0		Edit	
				Move Up	
				Move Down	

PDO Content (0x1610):

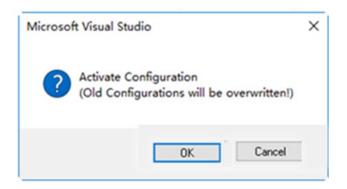
Explanation of the pull-down menu:

Item	Description
Insert	Add or insert a special module CR.
Delete	Delete a special module CR which has been added.
Edit	Edit the selected parameter
Move Up	Move to the previous row
Move Down	Move to the next row

13. After the above setting is over, click on the "Activate Configuration" option on "TwinCAT" menu to make the current configuration effective.

FILE	EDIT	VIEW	PROJECT	BUILD	DEBUG	TWIN	CAT TWIN	SAFE	PLC	TEAM	TOOLS	TEST	ARCHI	TECTURE	SCOPE	ANALYZE	WIND	woo	HELP
		18 - 省	8 8 7		Attach		ctivate Confi estart TwinC		- A										
Server Explorer		⊡`o`	・ ご	4 +;)	د ب - م	■ R 2 R	estart Twinc estart TwinC eload Device can	AT (Co		ode)			rtup C	CoE - Online	e Online				
er Toolbox	▲ <mark> </mark>	ution 'RTL RTU-ECAT	M	郢序' (1 pro	ject)	🔯 s	oggle Free F how Online I how Sub Iter	ata	te					ame atus		Flags	;	SM 3	SU 0
6		PLC SAFETN				S €	ecurity Mana ccess Bus Co pdate Firmw	gemer upler/	1P Link	Register.			D\ D\	ntrol /P16SP11R/ /P16SP11R/ /P04DA-S C	T Output r	ma		2 3 2 2	0 0 0
	-	*	Device 4 (Etl 📮 Image			S Fi	how Realtim le Handling elected Item			mpatible I	Devices			PO4DA-S Ir		1 9		3	0
		▶ ₹	🖡 Image-In 🏂 SyncUnits 🚺 Inputs				therCAT Dev arget Brows						×1610): Of		e		Тур	e	Default (h
		♪ 	Outputs InfoData			Fi	lter Designe bout TwinCA						0.0			H1 output si H2 output si			
		A	Box 1 (R ⁻ Lostatus)20 2.0)20 2.0	4.0 6.0			H3 output si H4 output si			

With a click on "Activate Configuration", the following reminder dialog appears, where you click "OK" button.



14. If the mode of channel 1~ channel 4 of DVP04DA-S need be modified, e.g. the mode of channel 1~ channel 4 is to be changed to mode 1, click "Startup" tab in the configuration interface of RTU-ECAT and then press "New..." button as shown in the red box below.

ransiti	Protocol	Index	Data	Comment	
<ps></ps>	CoE	0x1C12:00	0x00 (0)	clear sm pdos (0x1C1	
<ps></ps>	CoE	0x1C13:00	0x00 (0)	clear sm pdos (0x1C1	
<ps></ps>	CoE	0x1B00:00	0x00 (0)	clear pdo 0x1B00 ent	
<ps></ps>	CoE	0x1B01:00	0x00 (0)	clear pdo 0x1B01 ent	
<ps></ps>	CoE	0x1A00:00	0x00 (0)	clear pdo 0x1A00 ent	
<ps></ps>	CoE	0x1A00:01	0x60000108 (1610613	download pdo 0x1A0	
<ps></ps>	CoE	0x1A00:00	0x01 (1)	download pdo 0x1A0	
<ps></ps>	CoE	0x1600:00	0x00 (0)	clear pdo 0x1600 ent	
<ps></ps>	CoE	0x1600:01	0x70000108 (1879048	download pdo 0x160	
<ps></ps>	CoE	0x1600:00	0x01 (1)	download pdo 0x160	
<ps></ps>	CoE	0x1610:00	0x00 (0)	clear pdo 0x1610 ent	
<ps></ps>	CoE	0x1610:01	0x20200710 (5389698	download pdo 0x161	
<ps></ps>	CoE	0x1610:02	0x20200810 (5389701	download pdo 0x161	
<ps></ps>	CoE	0x1610:03	0x20200910 (5389703	download pdo 0x161	
<ps></ps>	CoE	0x1610:04	0x20200A10 (5389706	download pdo 0x161	
<ps></ps>	CoE	0x1610:00	0x04 (4)	download pdo 0x161	
<ps></ps>	CoE	0x1A20:00	0x00 (0)	clear pdo 0x1A20 ent	
<ps></ps>	CoE	0x1A20:01	0x20400D10 (541068	download pdo 0x1A2	
00	0.5	0 1400 00	0.00400510 (5410500		

After pressing above "New.." button, click to unfold configurable CRs of DVP04DA-S in the following window.



Edit CANopen	Startup Entry			×
Transition □ I -> P \bigvee P -> S □ S -> 0	Index (hex): □ S -> P Sub-Index (dec):	2020		OK Cancel
<u> </u>	0 -> S Validate	Complete /	Access	
Data (hexbin):	00 00			Hex Edit
Validate Mask:				
Comment:	CR1: output mode setting			Edit Entry
Index	Name	Flags	Value	^
😟 - 10F1:0	Error Settings		>2<	
	SM output parameter	RO	> 32 <	
😟 1C33:0	SM input parameter	RO	> 32 <	
EI 2020:0	DVP04DA-S CR			
	CR0: module type	RO P		
- 2020:02		RW P		
2020:03	CR2: reserved	RW		
2020:04	CR3: reserved	BW		
2020:05	CR4: reserved	RW		
2020:06	CR5: reserved	RW		
2020:07	CR6: value of CH1 output signal	RW P		
2020:08	CR7: value of CH2 output signal	RW P		
2020:09	CR8: value of CH3 output signal	BW P		¥
<				>

Double-click "CR1: output mode setting" in the red box above. Then set the value for CR1 in the following new window.

Set Value D	ialog	×
Dec:	585	OK
Hex:	0x0249	Cancel
Float:		
Bool:	0 1	Hex Edit
Binary:	49 02	2
Bit Size:	○1 ○8 ●16 ○32 ○6	4 () ?

Click "OK" to close current window. After the setting is over, the CR1 parameter of DVP04DA-S which has been added can be seen in the "Startup" tab page.



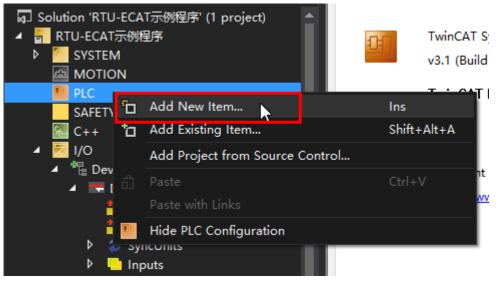
Transiti	Protocol	Index	Data	Comment	
C <ps></ps>	CoE	0x1A20:00	0x00 (0)	clear pdo 0x1A20 ent	
C <ps></ps>	CoE	0x1A20:01	0x20400D10 (541068	download pdo 0x1A2	
C <ps></ps>	CoE	0x1A20:02	0x20400E10 (5410688	download pdo 0x1A2	
C <ps></ps>	CoE	0x1A20:03	0x20400F10 (5410690	download pdo 0x1A2	
C <ps></ps>	CoE	0x1A20:04	0x20401010 (5410693	download pdo 0x1A2	
C <ps></ps>	CoE	0x1A20:00	0x04 (4)	download pdo 0x1A2	
C <ps></ps>	CoE	0x1C12:01	0x1B01 (6913)	download pdo 0x1C1	
C <ps></ps>	CoE	0x1C12:02	0x1600 (5632)	download pdo 0x1C1	
C <ps></ps>	CoE	0x1C12:03	0x1610 (5648)	download pdo 0x1C1	
C <ps></ps>	CoE	0x1C12:00	0x03 (3)	download pdo 0x1C1	
C <ps></ps>	CoE	0x1C13:01	0x1B00 (6912)	download pdo 0x1C1	
C <ps></ps>	CoE	0x1C13:02	0x1A00 (6656)	download pdo 0x1C1	
C <ps></ps>	CoE	0x1C13:03	0x1A20 (6688)	download pdo 0x1C1	
C <ps></ps>	CoE	0x1C13:00	0x03 (3)	download pdo 0x1C1	
C PS	CoE	0x8000:01	0x71 (113)	module code	
C PS	CoE	0x8020:01	0x03 (3)	module code	
C PS	CoE	0x8040:01	0x00 (0)	module code	
C PS	CoE	0x2020:02	585	CR1: output mode set	

Click "TwinCAT" menu > "Activate Configuration" option to make current configuration effective. Refer to **DVP-PLC Application Manual: Special Modules** for details on CR1 in DVP04DA-S.

7

7.2.2 Controlling RTU-ECAT's Right-side Modules via PLC

- After the configuration of the entire network is finished by following the steps above, create the PLC program to control the modules on the right of RTU-ECAT.
- 1. Select "PLC" on the left list of the TwinCAT software, right click on "PLC" and select "Add New Item" to add a PLC project.

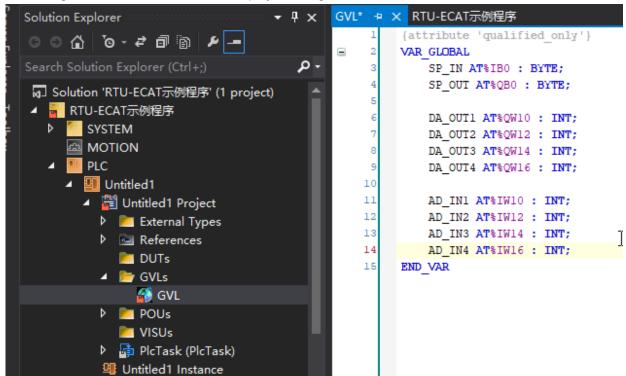


2. Select "Standard PLC Project" from the new PLC project list, enter a name for the project and then click on the "Add" button.

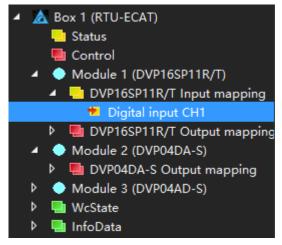
Add New Item - RTU	J-ECAT示例程序						?	Х
▲ Installed		Sort by:	Default -	₩ 🗉		Search Installed Template	s (Ctrl+E)	.م
Plc Templates		Standard PLC Project			Plc Templates			
			Empty PLC Project		Plc Templates	Creates a new TwinCAT F containing a task and a p		
			<u>Click here to go o</u>	nline and find template				
Name:	Untitled1							
Location:	F:\测试\RTU-ECA	T\测试稽	官令、TwinCAT程序、RTU-ECAT示	例程序\RTU-ECAT示例和	\$\$\ ▼	Browse		
						Add	Cano	el



3. Create a global variable table in the PLC project and global variables as follows.



- 4. Click on "Build Solution" of "BUILD" menu to compile current project after global variables are created.
- 5. After the compiling is over, unfold the mapping list of RTU-ECAT's right-side module with a click on it as below.



6. With a click on "Digital input CH1" above, the following window shows up, where you click on the "Linked to" button.



RTU-ECAT Operation Manual

v · · · ·	-1			
Variable	Flags	Online		
Name:		Digital input CH1		
Type:		USINT		
Group:		DVP16SP11R/T Input mappi	Size:	1.0
				-
Address		39 (0x27)	User ID:	0
Linked t	to			
Comme	nt:			A.
				•
ADS Info	o:	Port: 11, IGrp: 0x3040030, IO	ffs: 0x80000027, I	Len: 1

With a click on "Linked to", the following interface pops out, where you select desirable varaibles and then click on the "OK" button.

Attach Variable Digital input CH1 (Input)	×
Search: X PLC Unitited1 Instance SVL.SP_IN > IB 128000.0, BYTE [1.0]	Show Variables Unused Used and unused Exclude disabled Exclude other Devices Exclude same Image Show Tooltips Show Tooltips Show Variable Groups Show Variable Groups Show Variable Types Matching Type Matching Size All Types All Types Array Mode Offsets Continuous Show Dialog Variable Name / Comment / Hand over / Take over



Following the instructions of step 5 and step 6, make the connection between other global variables and the channels of DVP16SP11T, DVP04DA and DVP04AD.

The relations between global variables and RTU-ECAT 's right-side modules:

Input:				
SP_IN	÷		+	Read the state of input points of DVP16SP11T
AD_IN1	÷		÷	Read current value of channel1 of DVP04AD
AD_IN2	÷	RTU-ECAT	÷	Read current value of channel2 of DVP04AD
AD_IN3	÷		÷	Read current value of channel3 of DVP04AD
AD_IN4	÷		÷	Read current value of channel4 of DVP04AD
Output:				
SP_OUT	↑		→	Control the output of output points of DVP16SP11T
DA_OUT1	→		→	Control the output of channel1 of DVP04DA
DA_OUT2	→	RTU-ECAT	→	Control the output of channel2 of DVP04DA
DA_OUT3	→		→	Control the output of channel3 of DVP04DA
DA_OUT4	→		→	Control the output of channel4 of DVP04DA

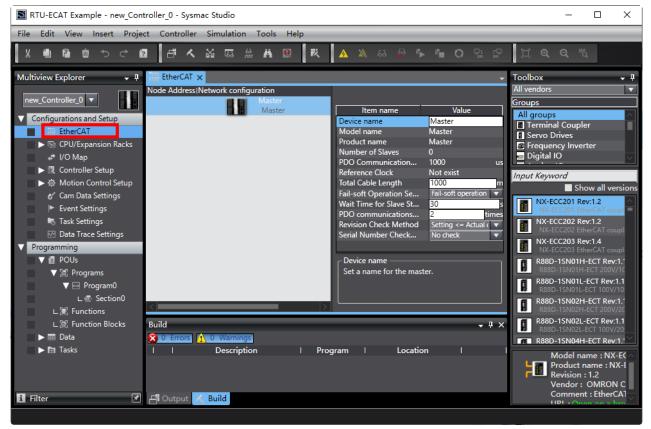
7. After the variables and channels are connected, the values of channels of RTU-ECAT's right-side modules can be read through the variables in the program. Setting the value of SP_OUT to 255, Y0~Y7 outputs of DVP16SP11T all change into ON. Setting the values of DA_OUT1~DA_OUT4 to 2000, channel 1~ channel 4 of DVP04DA-S can be controlled to output 5V voltage.

7.3 Using OMRON NJ301 with RTU-ECAT

1. Start the OMRON Sysmac Studio software and create a new project as below.

RTU-ECAT Example - new_Co	ontroller_0 - Sysmac Studio	- 🗆 X
File Edit View Insert Pro	oject Controller Simulation Tools Help	
	2	a, ™
Multiview Explorer	Toolbox Search>	
🖬 Filter D	Build The second	

2. Double-click "EtherCAT" under "Configurations and Setup" in the red box below to open the EtherCAT configuration interface.

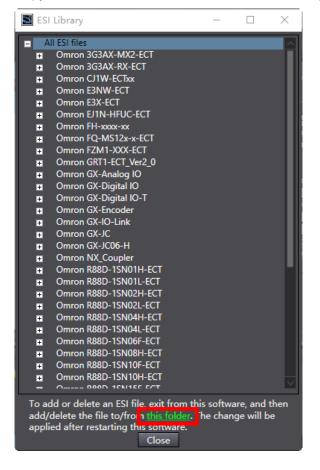


3. Right-click on "Master" and then select "Display ESI Library" from the context menu.



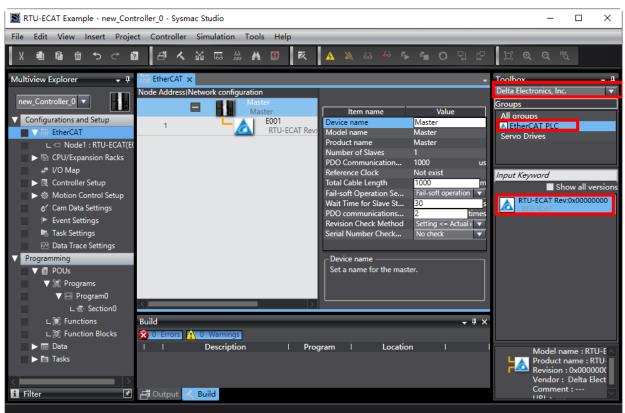
RTU-ECAT Example - new_Controller_0 - Sysmac Studio	- 0	×
File Edit View Insert Project Controller Simulatio	n Tools Help	
「「「「」」」 「「」」 「」」 「」」 「」」 「」」 「」」 「」」 「	## 😃 🗮 🛕 🔌 & 🍦 🐂 🔿 및 🖓 🍳 Q 🔍	
Multiview Explorer 🗸 🕂 🚟 EtherCAT 🗙	- Toolbox	• I
new_Controller_0 Image: Section 2000 Configurations and Setup EtherCAT Controller Setup Controller Setup Motion Control Setup Cam Data Settings Event Settings Task Settings Data Trace Settings Programming Image: Programs Image: Program 0 L Image: Function Blocks L Image: Tasks Image: Tasks	figuration All vendors Groups Groups Cut All groups Copy Paste Delete Undo Undo Frequency Inverter Digital IO Digital IO Undo Imput Keyword Expand All Imput Keyword Calculate Transmission Delay Time of the Master INX-ECC201 Rev:1.2 Import Slave Settings NX-ECC203 EtherCAT cou Write Slave Node Address NX-ECC203 EtherCAT cou Compare and Merge with Actual Network Configuration R88D-1SN011-ECT Rev:1 Mixed Statistics Information R88D-1SN011-ECT Rev:1 Display Diagnosis/Statistics Information R88D-1SN021-ECT Rev:1 Display Production Information R88D-1SN021-ECT Rev:1	sions
🚹 Filter 📝 🗗 Output 📈 Build	Output to ENS File Comment : EtherC Export All Couplers' I/O Allocations	A1 ~

Click "this folder" in the red box in the ESI Library window to open the folder where ESI file is to be stored. Copy the ESI file of RTU-ECAT to this folder to complete the installation of RTU-ECAT device file.

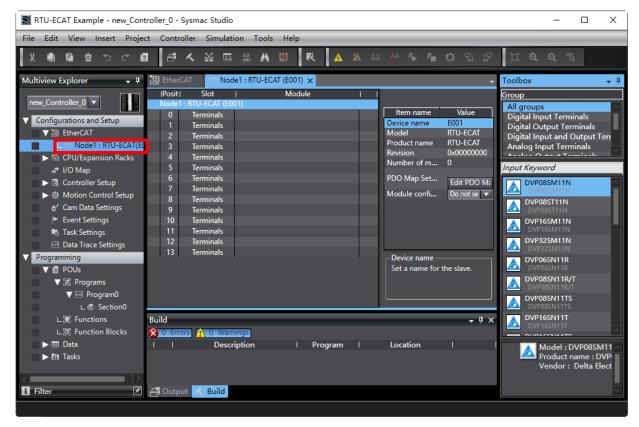




4. Select "Delta Electronics, Inc." from the Toolbox pulldown list and then choose "EtherCAT PLC" as well as double-click on RTU-ECAT to add RTU-ECAT to the EtherCAT network.

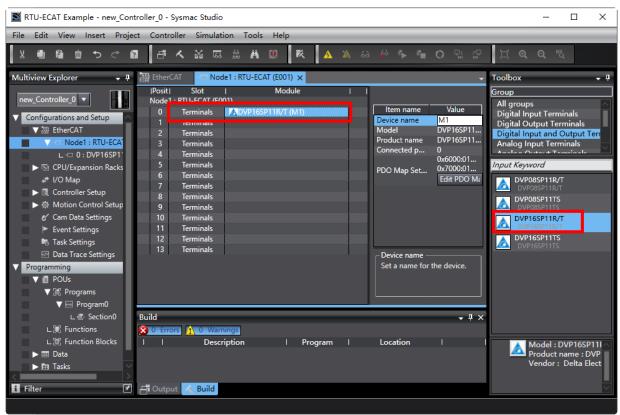


5. Double-click on "Node1: RTU-ECAT(E001)" to open the configuration interface after RTU-ECAT is added to the EtherCAT network.



7-30

6. Add DVP16SP11T to the node configuration as below by selecting the top slot and then finding out and double-clicking on DVP16SP11R/T from the Toolbox area on the right side of the software.



7. Add DVP04DA-S and DVP04AD-S to the second and third slots respectively in the method of step 6.

7

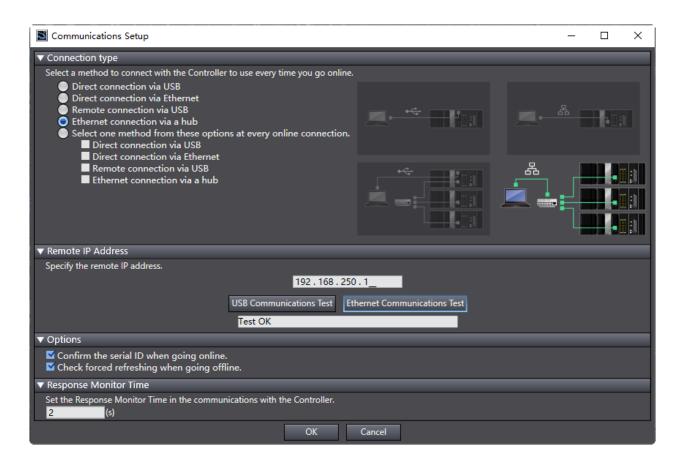
RTU-ECAT Example - new_Cont	troller_0 - Sysmac Studio	– 🗆 X
File Edit View Insert Project	ct Controller Simulation Tools Help	
	▋ Ê ヘ ぬ ╔ ӝ # 0 ҟ ▲ Ҳ & ҂ ݨ 0 な ?	[] @ Q [™] 2
Multiview Explorer 🚽 🕂	EtherCAT ONde1:RTU-ECAT (E001) ×	Toolbox 🝷 🖡
new_Controller_0 ▼ ▼ Configurations and Setup ▼ B EtherCAT ▼ Node1 : RTU-ECA L = 0 : DVP16SP1 ⁺ L = 0 : DVP04DA-1 L = 2 : DVP04AD-1 ► COULExpansion Racks * I/O Map ► Controller Setup € Motion Control Setup €' Cam Data Settings ► Task Settings ► Data Trace Settings ▼ Data Trace Settings ▼ Programming ▼ POUs	IPositi Slot I Module I Nodel : RTU-ECAT (E001) Item name Value Image: Terminals : ADVP04DA-S (M2) Item name Model DVP04AD-S 1 Terminals : ADVP04AD-S (M2) Model DVP04AD-S 2 Terminals : ADVP04AD-S (M3) Model DVP04AD-S 3 Ierminals : ADVP04AD-S (M3) Model DVP04AD-S 5 Terminals : ADVP04AD-S (M3) : ADVP04AD-S Ox2000:0E 6 Terminals : ADVP04AD-S : ADVP04AD-S Ox2000:0E : Ox2000:0E 6 Terminals : ADVP04AD-S : ADVP04AD-S : Ox2000:0E : Ox2000:0E 6 Terminals : ADVP04AD-S : Device name : Ox2000:0E : Ox2000:0E 7 Terminals : ID : IDO Map Set : Device name : Edit PDO M: 10 Terminals : ID : IDO Map Set : Edit PDO M: : Edit PDO M: 11 Terminals : ID : ID : ID : ID : ID : ID : ID	Group Digital Input and Output Tern Analog Input Terminals Analog Input and Output Ter Position Control Terminals Totel Strategy Input Keyword DVP04AD-S DVP04AD-S2 DVP04AD-S2 DVP06AD-S DVP06AD-S DVP06AD-S
▼ 🗐 Programs ▼ 🔤 Program0	Build - T X	
L 중· Section0 上宮 Functions 上宮 Function Blocks > <	I I Description I Program I Location I I	Model : DVP04AD-S Product name : DVPi Vendor : Delta Elect

8. Double-click on "I/O Map" in the red box below and then type variables for mapping of module channels in the "Variable" column of the "IO Map" interface.

RTU-ECAT Example - new_Controller_0 - Sysmac Studio		- 🗆 X
File Edit View Insert Project Controller Simulation Tools Help		
メ 巻 隆 竜 つ ご 超 「書 人 盗 辱 魚 甚 ③ 茂 🔺 🛽	🔉 🕹 🆗 🍾 🛍 🔿 🖫	₽ 0, 0, %
Multiview Explorer 🗸 📮 🛗 EtherCAT 🖃 Node1 : RTU-ECAT (E001) 🚅 I/O Mag	рх	→ Toolbox →
Multiview Explorer ↓ ↓ Port Description new_Controller_0 Port Description ✓ Configurations and Setup T Network Configuration ✓ EtherCAT //P16SP11R/T Port Description ✓ Node1 : RTU-ECAT //P16SP11R/T PifSP11R/T PifSP11R/T └ 0 : DVP16SP1 //P04DA-S Po4DA-S Output mapping_CR6: PifSP11R/T └ 1 : DVP04DA- 'P04DA-S Output mapping_CR7: Po4DA-S Output mapping_CR12: PifSP11R/T Image: Controller Setup 'P04DA-S Output mapping_CR12: 'P04DA-S Input mapping_CR12: 'P04DA-S Input mapping_CR12: ✓ Controller Setup 'P04DA-S Input mapping_CR12: 'P04AD-S Input mapping_CR12: 'P04AD-S Input mapping_CR12: ✓ Task Settings 'P04AD-S Input mapping_CR15: 'P04AD-S Input mapping_CR15: 'P04AD-S Input mapping_CR15: ✓ Porgramming 'Mid 'P04AD-S Input mapping_CR15: 'P04AD-S Input mapping_CR15: ✓ Porgramming 'Mid 'Mid 'Mid 'Mid	R/W Data Type Variable R USINT SP_IN W USINT SP_OUT W INT DA_OUT1 W INT DA_OUT2 W INT DA_OUT3 W INT DA_OUT4 R INT AD_IN1 R INT AD_IN2 R INT AD_IN3 R INT AD_IN4	<pre> Ioolbox</pre>
V M Program0 20 Errors 1 0 Warnings	· ·	
L 🗟 Section0 Description Program	I Location I	
L 訳 Functions L 認 Function Blocks マ		
🚹 Filter 🕜 🗗 Output 🔀 Build		

9. Click menu "Controller" > "Communications Setup..." to set up the connection type between the NJ CPU and computer as follows.





10. After the communication setup is complete, click "OK" button in the window above and then select "Online" from the "Controller" menu in the window below.

e Edit View Insert Project X 🗐 🖻 前 🕤 C 🔞	Controller Simulation Communications Setup. Change Device		A ×	63	<i>₽</i> ₽	େ ତ ୍ରା	r 		ર ™્
ultiview Explorer 🛛 🗸 🖡 👔	Online N	Ctrl+W	🧈 I/O Map	×			- 1	Foolbox	
	Offline	Ctrl+Shift+W	tion	R/W	Data Type	Variable		<search></search>	▼ 2
new_Controller_0 🔻	Synchronize	Ctrl+M							
Configurations and Setup	Transfer	,							
▼	Mode			R	USINT	SP_IN			
▼ -□ Node1 : RTU-ECA' —		•		w	USINT	SP_OUT			
∟-□ 0:DVP16SP1	Monitor					-	t II		
L -□ 1 : DVP04DA-:	Stop Monitoring			w	INT	DA_OUT1	TH		
∟-□ 2 : DVP04AD-:	Set/Reset	,		w	INT	DA_OUT2			
📄 🕨 🔄 CPU/Expansion Racks	Forced Refreshing	,		w	INT	DA_OUT3			
📕 🛷 I/O Map	MC Test Run	•		w	INT	DA_OUT4	ы.		
Controller Setup	MC Monitor Table	,		R	INT	AD IN1			
▶ ∯ Motion Control Setup				R	INT	AD_IN1 AD_IN2	┼┨		
Cam Data Settings	SD Memory Card			R	INT	AD_IN3			
Event Settings	Controller Clock			R	INT	AD_IN4			
Task Settings —	Release Access Right								
🖂 Data Trace Settings —	Update CPU Unit Name.								
Programming ▼	Security	,		_	_		>		
V III POUS VIII Programs B	Clear All Memory					. 4			
V i Programs B V i Program0 5	Reset Controller					- 4	<u> </u>		
L 🗟 Section0	Description		Program	1	Location		-		
	Description				Location		_		
L 🗟 Function Blocks 🗸									
E B Function blocks									



11. When going online is successful, click menu "Controller" > "Transfer..." > "To Controller..." to download the EtherCAT configuration and program to the controller. After the download is done, the channels of the right-side modules of RTU-ECAT can be read and written to via the variables set in the I/O Map interface.

Setting the value of SP_OUT to 255, Y0~Y7 outputs of DVP16SP11T all change into ON. Setting the values of DA_OUT1~DA_OUT4 to 2000, channel 1~ channel 4 of DVP04DA-S can be controlled to output 5V voltage.





Chapter 8 Error Diagnosis and Trouble-shooting

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8.1 LED Indicator Diagnosis	8-2
8.2 Status Indication Diagnosis	8-3



RTU-ECAT provides two diagnostic methods, LED indicator diagnosis and status indication diagnosis.

8.1 LED Indicator Diagnosis

POWER LED

LED status	Indication	How to correct
Off	Power is abnormal.	Make sure that RTU-ECAT is powered.
Green light on	Power is normal.	

ALARM LED

LED status	Indication	How to correct
Off	RTU-ECAT works normally or lacks the work power.	
Red light blinking	Possible causes: 1. The configuration data of RTU-ECAT are invalid; 2. The extension modules on the right of RTU-ECAT are in error or are offline.	 Check if the modules on the right of RTU-ECAT are consistent with those configured in the software. Check out the error information of the modules on the right of RTU-ECAT and then deal with the errors by following related module manual instructions. Check if the power supply and wiring of the modules on the right of RTU-ECAT are fine. Make sure that the wiring of EtherCAT cables is proper.
Red light on	RTU-ECAT is under voltage	Check if the power supply for RTU-ECAT is normal.

RUN LED

LED status	Indication	How to correct
Off	RTU-ECAT in STOP mode	 Ensure that the power supply for RTU-ECAT and the connection are fine. Check if the RUN/STOP switch of RTU-ECAT has been switched to RUN. Check if the control word of RTU-ECAT is effective and controlling RTU-ECAT in STOP state.
Green light on	RTU-ECAT in RUN mode	



LED	LED status	Indication	How to correct
Green light	ON	The EtherCAT port has been connected to the EtherCAT network.	
	OFF	The EtherCAT port has not yet been connected to the EtherCAT network.	Ensure that the hardware connection to the EtherCAT port is proper.
Yellow light	Blinking	Data are being transmitted or received via the EtherCAT port	
	ON	No data are being transmitted or received via EtherCAT port.	Add RTU-ECAT to the master.
	OFF	There is no hardware connection to the EtherCAT port.	Ensure that the hardware connection to the EtherCAT port is proper.

EtherCAT LED

8.2 Status Indication Diagnosis

The status indication parameters of RTU-ECAT are used to display the operating states of special modules and DI/DO modules. See section 6.3.2 for details on related status indication parameters.



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Appendix A List of Accessories

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A.1	Accessories	for	EtherCAT	Communication	 A- 2	2
A. 1	Accessories	101	LUICICAI	communication	 ~ '	-



A.1 Accessories for EtherCAT Communication

• Cables

Figure	Model	Length	Diameter(AWG)
	UC-EMC003-02A	0.3M	4#22 PVC
	UC-EMC005-02A	0.5M	4#22 PVC
	UC-EMC010-02A	1.0M	4#22 PVC
12	UC-EMC020-02A	2.0M	4#22 PVC
03	UC-EMC050-02A	5.0M	4#22 PVC
~	UC-EMC100-02A	10.0M	4#22 PVC
	UC-EMC200-02A	20.0M	4#22 PVC

