

Industrial Automation Headquarters

Taiwan: Delta Electronics, Inc.
Taoyuan Technology Center
No.18, Xinglong Rd., Taoyuan District,
Taoyuan City 33068, Taiwan
TEL: +886-3-362-6301 / FAX: +886-3-371-6301

Asia

China: Delta Electronics (Shanghai) Co., Ltd.
No.182 Minyu Rd., Pudong Shanghai, P.R.C.
Post code : 201209
TEL: +86-21-6872-3988 / FAX: +86-21-6872-3996
Customer Service: 400-820-9595

Japan: Delta Electronics (Japan), Inc.
Industrial Automation Sales Department
2-1-14 Shibadaimon, Minato-ku
Tokyo, Japan 105-0012
TEL: +81-3-5733-1155 / FAX: +81-3-5733-1255

Korea: Delta Electronics (Korea), Inc.
1511, 219, Gasan Digital 1-Ro., Geumcheon-gu,
Seoul, 08501 South Korea
TEL: +82-2-515-5305 / FAX: +82-2-515-5302

Singapore: Delta Energy Systems (Singapore) Pte Ltd.
4 Kaki Bukit Avenue 1, #05-04, Singapore 417939
TEL: +65-6747-5155 / FAX: +65-6744-9228

India: Delta Electronics (India) Pvt. Ltd.
Plot No.43, Sector 35, HSIIDC Gurgaon,
PIN 122001, Haryana, India
TEL: +91-124-4874900 / FAX: +91-124-4874945

Thailand: Delta Electronics (Thailand) PCL.
909 Soi 9, Moo 4, Bangpoo Industrial Estate (E.P.Z),
Pattana 1 Rd., T.Phraksa, A.Muang,
Samutprakarn 10280, Thailand
TEL: +66-2709-2800 / FAX: +66-2709-2827

Australia: Delta Electronics (Australia) Pty Ltd.
Unit 20-21/45 Normanby Rd., Notting Hill Vic 3168, Australia
TEL: +61-3-9543-3720

Americas

USA: Delta Electronics (Americas) Ltd.
5101 Davis Drive, Research Triangle Park, NC 27709, U.S.A.
TEL: +1-919-767-3813 / FAX: +1-919-767-3969

Brazil: Delta Electronics Brazil
Rua Itapeva, 26 - 3º, andar Edifício Itapeva,
One - Bela Vista 01332-000 - São Paulo - SP - Brazil
TEL: +55-12-3932-2300 / FAX: +55-12-3932-237

Mexico: Delta Electronics International Mexico S.A. de C.V.
Gustavo Baz No. 309 Edificio E PB 103
Colonia La Loma, CP 54060
Tlalnepantla, Estado de México
TEL: +52-55-3603-9200

EMEA

EMEA Headquarters: Delta Electronics (Netherlands) B.V.
Sales: Sales.IA.EMEA@deltaww.com
Marketing: Marketing.IA.EMEA@deltaww.com
Technical Support: iatechnicalsupport@deltaww.com
Customer Support: Customer-Support@deltaww.com
Service: Service.IA.emea@deltaww.com
TEL: +31(0)40 800 3900

BENELUX: Delta Electronics (Netherlands) B.V.
Automotive Campus 260, 5708 JZ Helmond, The Netherlands
Mail: Sales.IA.Benelux@deltaww.com
TEL: +31(0)40 800 3900

DACH: Delta Electronics (Netherlands) B.V.
Coesterweg 45, D-59494 Soest, Germany
Mail: Sales.IA.DACH@deltaww.com
TEL: +49(0)2921 987 0

France: Delta Electronics (France) S.A.
ZI du bois Challand 2, 15 rue des Pyrénées,
Lisses, 91090 Evry Cedex, France
Mail: Sales.IA.FR@deltaww.com
TEL: +33(0)1 69 77 82 60

Iberia: Delta Electronics Solutions (Spain) S.L.U
Ctra. De Villaverde a Vallecas, 265 1º Dcha Ed.
Hormigueras – P.I. de Vallecas 28031 Madrid
TEL: +34(0)91 223 74 20
Carrer Llacuna 166, 08018 Barcelona, Spain
Mail: Sales.IA.Iberia@deltaww.com

Italy: Delta Electronics (Italy) S.r.l.
Via Meda 2–22060 Novedrate(CO)
Piazza Grazioli 18 00186 Roma Italy
Mail: Sales.IA.Italy@deltaww.com
TEL: +39 039 8900365

Russia: Delta Energy System LLC
Vereyskaya Plaza II, office 112 Vereyskaya str.
17 121357 Moscow Russia
Mail: Sales.IA.RU@deltaww.com
TEL: +7 495 644 3240

Turkey: Delta Greentech Elektronik San. Ltd. Sti. (Turkey)
Şerifali Mah. Hendem Cad. Kule Sok. No:16-A
34775 Ümraniye – İstanbul
Mail: Sales.IA.Turkey@deltaww.com
TEL: + 90 216 499 9910

MEA: Eltek Dubai (Eltek MEA DMCC)
OFFICE 2504, 25th Floor, Saba Tower 1,
Jumeirah Lakes Towers, Dubai, UAE
Mail: Sales.IA.MEA@deltaww.com
TEL: +971(0)4 2690148



AH500 Redundancy System Operation Manual

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AH500 Redundancy System Operation Manual

Revision History

Version	Revision	Date
1 st	The first version was published.	2018/04/12
2 nd	<ol style="list-style-type: none"> Added product information on AHBP06MR1-5A, AHBP08MR1-5A, AH15EN-5A, synchronization fiber and FE SFP transceiver in section 1.2. Added DCISoft compatible firmware version in section 1.3. Added specifications of real-time clock and accuracy of real-time clock in section 3.1. Added new backplanes AHBP06MR1-5A and AHBP08MR1-5A and updated the table of fiber transceivers in section 3.2. Updated the "To enable redundancy system" image in section 3.3. Updated the table of Standard procedure to determine the roles of CPU in section 3.3.1. Added a new image "Only Master CPU can communicate" in section 4.1.1. Added new description on Set up the Data Mapping Parameters in section 4.2.2.2. Updated new description of API2901 RCS in section 5.1.4. Added EtherNet/IP connection timeout setting and in section 5.1.5 and AM/SR table of synchronization in section 5.1.6. Added new description on Creating Connection in section 6.3. Updated SR table in section 6.4.3. Updated Event ID List in section 7.1.3. Added new error codes and descriptions 16#00025, 16#0068, 16#6013, 16#212A, and 16#E2A0-16#E2AB. Updated error codes and descriptions 16#6010, 16#6011, 16#600F-16#6013, 16#1409, 16#6218-16#621A, 16#6400, 16#E206-16#E29B and 16#8240. Updated the table of Switchover When Error Occurs in section A.2. Updated and added AH15EN-5A in the table of Interoperability between Modules and Backplanes in Redundant Mode in section B.1. Added a new section B.5 Restrictions on COM Port Communications in Appendix B. Added a new Appendix C: Application of Setting the Synchronization Option to Conditions. 	2020/06/30
3 rd	<ol style="list-style-type: none"> Added a copyright notice. Added more extension cables from 5 meter to 100 metres for selection. 	2022/02/10

Version	Revision	Date
	3. Changed the images in sections 2.3.1 and 2.3.2. 4. Changed the images in section 4.1.2. 5. Updated the descriptions of error codes 16#9A01-16#9A60 and 16#9B21-16#9B60.	
4 th	1. Corrections on the descriptions of error codes 16#9A01-16#9A60 and 16#9B21-16#9B60.	2022/02/25

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Chapter 1 Introduction

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1.1 Overview

This manual introduces the redundancy architecture of AH500 Series CPU and shows you how to use AH500 Series CPU to build up a redundancy system to minimize the impact on a process resulting from a single failure of a critical component of the control system and have a more secured and safe system.

1.2 Supported Model Descriptions

Type	Model	Description
Power module	AHPS05-5A	100~240 V AC 50/60 Hz
	AHPS15-5A	24 V DC
CPU module	AHCPU560-EN2	It is a redundant CPU module with one built-in Ethernet port, one built-in RS-485/232 port, one built-in USB port, and one built-in SD interface. It supports 65536 inputs/outputs. The program capacity is 1M steps.
Main backplane	AHBP04M1-5A	Four-slot main backplane for a CPU/RTU backplane
	AHBP06M1-5A	Six-slot main backplane for a CPU/RTU backplane
	AHBP08M1-5A	Eight-slot main backplane for a CPU/RTU backplane
	AHBP12M1-5A	Twelve-slot main backplane for a CPU/RTU backplane
Redundant main backplane	AHBP04MR1-5A	Four-slot redundant main backplane for a CPU/RTU backplane
	AHBP06MR1-5A	Six-slot redundant main backplane for a CPU/RTU backplane
	AHBP08MR1-5A	Eight-slot redundant main backplane for a CPU/RTU backplane
Extension backplane	AHBP06E1-5A	Six-slot extension backplane for a CPU/RTU extension backplane
	AHBP08E1-5A	Eight-slot extension backplane for a CPU/RTU extension backplane
Redundant extension backplane	AHBP06ER1-5A	Six-slot redundant extension backplane for a CPU/RTU extension backplane with redundant power supply function
	AHBP08ER1-5A	Eight-slot redundant extension backplane for a CPU/RTU extension backplane with redundant power supply function
Digital input/output module	AH16AM10N-5A	24 V DC 5 mA 16 inputs Terminal block
	AH16AM30N-5A	100~240 V AC 4.5 mA~9 mA (100 V, 50 Hz) 16 inputs Terminal block

Type	Model	Description
	AH16AR10N-5A	24 V DC 5 mA 16 inputs Terminal block (I/O interrupts are supported.)
	AH32AM10N-5A	24 V DC 5 mA 32 inputs Terminal block
	AH32AM10N-5B	24 V DC 5 mA 32 inputs DB37 connector
	AH32AM10N-5C	24 V DC 5 mA 32 inputs Latch connector
	AH64AM10N-5C	24 V DC 3.2 mA 64 inputs Latch connector
	AH16AN01R-5A	240 V AC/24 V DC 2 A 16 outputs Relay Terminal block
	AH16AN01T-5A	12~24 V DC 0.5 A 16 outputs Sinking output Terminal block
	AH16AN01P-5A	12~24 V DC 0.5 A 16 outputs Sourcing output Terminal block

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Type	Model	Description
	AH16AN01S-5A	100~240 V AC 0.5 A 16 outputs TRIAC Terminal block
	AH32AN02T-5A	12~24 V DC 0.1 A 32 outputs Sinking output Terminal block
	AH32AN02T-5B	12~24 V DC 0.1 A 32 outputs Sinking output DB37 connector
	AH32AN02T-5C	12~24 V DC 0.1 A 32 outputs Sinking output Latch connector
	AH32AN02P-5A	12~24 V DC 0.1 A 32 outputs Sourcing output Terminal block
	AH32AN02P-5B	12~24 V DC 0.1 A 32 outputs Sourcing output DB37 connector
	AH32AN02P-5C	12~24 V DC 0.1 A 32 outputs Sourcing output Latch connector
	AH64AN02T-5C	12~24 V DC

Type	Model	Description
		0.1 A 64 outputs Sinking output Latch connector
	AH64AN02P-5C	12~24 V DC 0.1 A 64 outputs Sourcing output Latch connector
	AH16AP11R-5A	24 V DC 5 mA 8 inputs 240 V AC/24 V DC 2 A 8 outputs Relay Terminal block
	AH16AP11T-5A	24 V DC 5 mA 8 inputs 12~24 V DC 0.5 A 8 outputs Sinking output Terminal block
	AH16AP11P-5A	24 V DC 5 mA 8 inputs 12~24 V DC 0.5 A 8 outputs Sourcing output Terminal block
Analog input/output module	AH04AD-5A	Four-channel analog input module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, -10 V~10 V, 0/4 mA~20 mA, and

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Type	Model	Description
		-20 mA~20 mA Conversion time: 150 us/channel
	AH08AD-5A	Eight-channel analog input module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, -10 V~10 V, 0/4 mA~20 mA, and -20 mA~20 mA Conversion time: 150 us/channel
	AH08AD-5B	Eight-channel analog input module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, and -10 V~10 V Conversion time: 150 us/channel
	AH08AD-5C	Eight-channel analog input module Hardware resolution: 16 bits 0/4 mA~20 mA, and -20 mA~20 mA Conversion time: 150 us/channel
	AH04DA-5A	Four-channel analog output module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, -10 V~10 V, and 0/4 mA~20 mA Conversion time: 150 us/channel
	AH08DA-5A	Eight-channel analog input module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, -10 V~10 V, 0/4 mA~20 mA Conversion time: 150 us/channel
	AH08DA-5B	Eight-channel analog output module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, and -10 V~10 V Conversion time: 150 us/channel
	AH08DA-5C	Eight-channel analog output module Hardware resolution: 16 bits 0/4 mA~20 mA Conversion time: 150 us/channel
	AH06XA-5A	Four-channel analog input module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, -10 V~10 V, 0/4 mA~20 mA, and -20 mA~20 mA Conversion time: 150 us/channel

Type	Model	Description
		Two-channel analog output module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, -10 V~10 V, and 0/4 mA~20 mA Conversion time: 150 us/channel
Temperature measurement module	AH04PT-5A	Four-channel four-wire/three-wire RTD Sensor type: Pt100/Pt1000/Ni100/Ni1000 sensor, and 0~300 Ω input impedance Resolution: 0.1°C/0.1°F (16 bits) Four-wire conversion time: 150 ms/channel Three-wire conversion time: 300 ms/channel
	AH08PTG-5A	Eight-channel four-wire/three-wire/two-wire RTD Sensor type: Pt100/Pt1000/Ni100/Ni1000, and 0~300 Ω input impedance Resolution: 0.1°C/0.1°F (16 bits) Conversion time: 20 ms/4 channels and 200 ms/8 channels
	AH04TC-5A	Four-channel thermocouple Sensor type: J, K, R, S, T, E, N, and -150~+150 mV Resolution: 0.1°C/0.1°F Conversion time: 200 ms/channel
	AH08TC-5A	Eight-channel thermocouple Sensor type: J, K, R, S, T, E, N, and -150~+150 mV Resolution: 0.1°C/0.1°F Conversion time: 200 ms/channel
Network module	AH10EN-5A	It is an Ethernet communication module. It can function as a master or a slave. It is equipped with two Ethernet ports, and supports Modbus TCP master. (compliance with EtherNet/IP V2.0)
	AH15EN-5A	It is an Ethernet communication module. It can function as a master or a slave. It is equipped with two Ethernet ports, and supports Modbus TCP master. (compliance with IEC60870-5-104)
	AH10SCM-5A	It is a serial communication module with two RS-485/RS-422 ports, and supports Modbus and UD Link protocols. One part of communication is isolated from the other part of the communication, and one part of power is isolated from the other part of the power.
	AH15SCM-5A	It is a serial communication module with two RS-232 ports, and supports Modbus and UD Link protocols.

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Type	Model	Description
		One part of communication is isolated from the other part of the communication, and one part of power is isolated from the other part of the power.
Extension cable	AHACAB06-5A	0.6 meter extension cable for connecting an extension backplane
	AHACAB10-5A	1.0 meter extension cable for connecting an extension backplane
	AHACAB15-5A	1.5 meter extension cable for connecting an extension backplane
	AHACAB30-5A	3.0 meter extension cable for connecting an extension backplane
	AHACAB50-5A	5.0 meter extension cable for connecting an extension backplane
	AHACABA0-5A	10.0 meter extension cable for connecting an extension backplane
	AHACABA5-5A	15.0 meter extension cable for connecting an extension backplane
	AHACABB0-5A	20.0 meter extension cable for connecting an extension backplane
	AHACABC0-5A	30.0 meter extension cable for connecting an extension backplane
	AHACABD0-5A	40.0 meter extension cable for connecting an extension backplane
	AHACABE0-5A	50.0 meter extension cable for connecting an extension backplane
	AHACABF0-5A	60.0 meter extension cable for connecting an extension backplane
	AHACABG0-5A	70.0 meter extension cable for connecting an extension backplane
	AHACABH0-5A	80.0 meter extension cable for connecting an extension backplane
	AHACABJ0-5A	90.0 meter extension cable for connecting an extension backplane
	AHACABK0-5A	100.0 meter extension cable for connecting an extension backplane
	AHAADP01EF-5A/ AHAADP02EF-5A	Fiber optics modules for extension backplanes
I/O extension cable	UC-ET010-24A	1.0 meter I/O extension cable (latch connector) for AH32AM10N-5C and AH64AM10N-5C
	UC-ET010-24C	1.0 meter I/O extension cable (latch connector) for AH32AN02T-5C, AH32AN02P-5C, AH64AN02T-5C and AH64AN02P-5C
	UC-ET010-33B	1.0 meter I/O extension cable (DB37 connector) for AH32AM10N-5B, AH32AN02T-5B, and AH32AN02P-5B
	UC-ET010-13B	1.0 meter I/O extension cable for AH04HC-5A and AH20MC-5A
	UC-ET010-15B	1.0 meter I/O extension cable for AH10PM-5A and AH15PM-5A
External terminal module	UB-10-ID32A	I/O external terminal module for AH32AM10N-5C and AH64AM10N-5C 32 inputs
	UB-10-ID32B	I/O external terminal module for AH32AM10N-5B 32 inputs

Type	Model	Description
	UB-10-OR16A	I/O external terminal module for AH32AN02T-5C and AH64AN02T-5C 16 relay outputs
	UB-10-OR16B	I/O external terminal module for AH32AN02P-5C and AH64AN02P-5C 16 relay outputs
	UB-10-OR32A	I/O external terminal module for AH32AN02T-5B 32 relay outputs
	UB-10-OR32B	I/O external terminal module for AH32AN02P-5B 32 relay outputs
	UB-10-OT32A	I/O external terminal module for AH32AN02T-5C, AH32AN02P-5C, AH64AN02T-5C, and AH64AN02P-5C 32 transistor outputs
	UB-10-OT32B	I/O external terminal module for AH32AN02T-5B and AH32AN02P-5B 32 transistor outputs
	UB-10-IO16C	I/O external terminal module for AH04HC-5A and AH20MC-5A
	UB-10-IO24C	I/O external terminal module for AH10PM-5A
	UB-10-IO34C	I/O external terminal module for AH15PM-5A
Space module	AHASP01-5A	Space module used for an empty I/O slot
Optical fiber cable	UC-FB010-01A	Single-mode optical fiber: 1 m (LC-LC)
	UC-FB030-01A	Single-mode optical fiber: 3 m (LC-LC)
	UC-FB010-02A	Multimode optical fiber: 1 m (LC-LC)
	UC-FB030-02A	Multimode optical fiber: 3 m (LC-LC)
FE SFP Transceiver	LCP-100MMF	100Mbps SFP multimode optical fiber module with one port, LC conector, 2 km, -5°C~70°C
	LCP-100MMFT	100Mbps SFP multimode optical fiber module with one port, LC conector, 2 km, -40°C~85°C
	LCP-100SMF30	100Mbps SFP single mode optical fiber module with one port, LC conector, 30 km, -5°C~70°C
	LCP-100SMF30T	100Mbps SFP single mode optical fiber module with one port, LC conector, 30 km, -40°C~85°C
	LCP-100SMF60	100Mbps SFP single mode optical fiber module with one port, LC conector, 60 km, -5°C~70°C
	LCP-100SMF60T	100Mbps SFP single mode optical fiber module with one port, LC conector, 60 km, -40°C~85°C



1.3 Compatible Modules and Firmware

● AH Modules

Item	Model	Firmware Version
1	AH10EN-5A	V2.04 or later
2	AH10SCM-5A	V1.06 or later
3	AH15SCM-5A	V1.02 or later

● Software

Item	Software	Software Version
1	ISPSoft	V3.04 or later
2	DCISoft	V1.19 or later
3	EIP Builder	V1.05 or later

Chapter 2 Redundant Architecture

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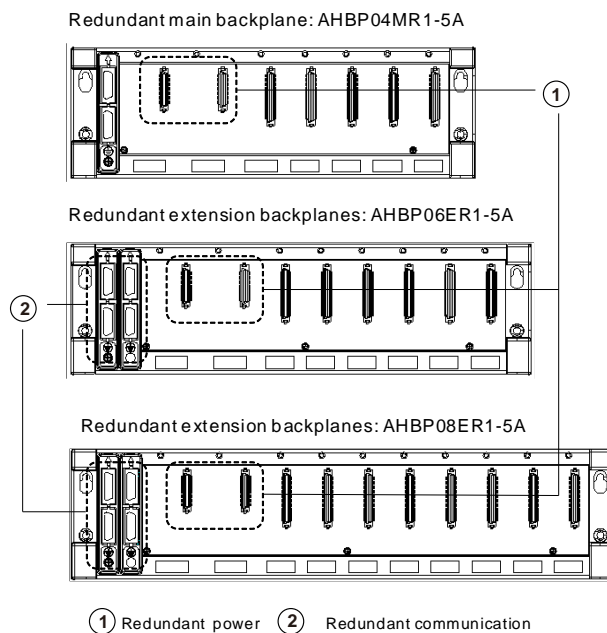
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2.1 AH500 Redundancy Products

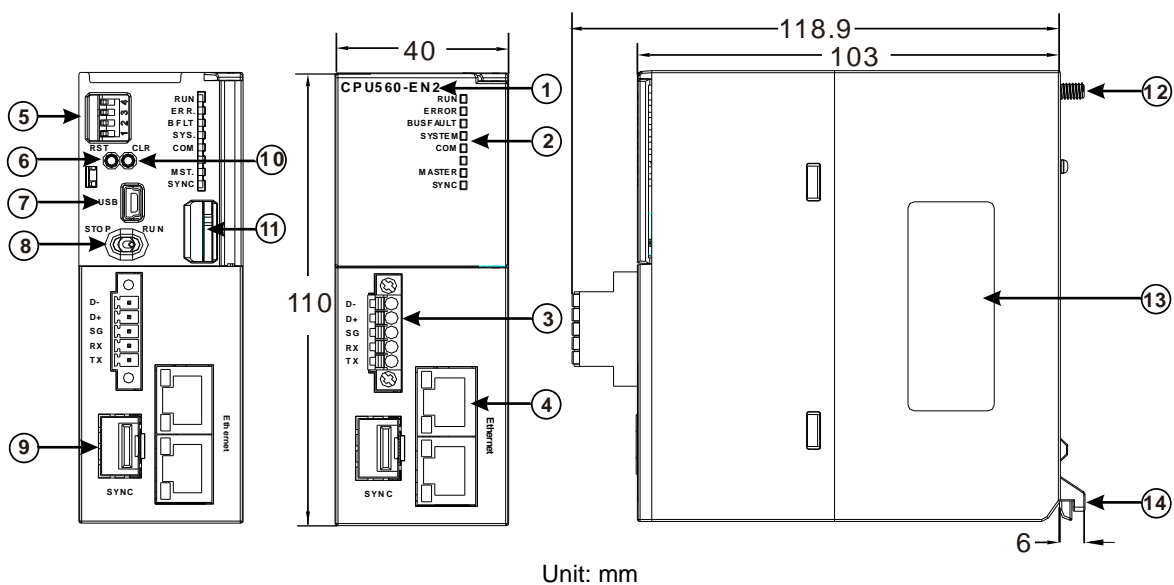
AH500 redundancy product series can be divided to redundant backplanes and redundant CPU modules. Select what you need from the AH500 redundancy product series to create your own redundancy architecture.

2.1.1 Redundant Backplane

There are two kinds of redundant backplanes, redundant main backplanes (AHBP04MR1-5A) and redundant extension backplanes (AHBP06ER1-5A, AHBP08ER1-5A). You can simply change the original AH500 backplane to redundant backplane to achieve the redundant power and redundant communication.



2.1.2 Redundant CPU Module AHCPU560-EN2



1. Model name	2. System LED indicator	3. COM port
4. Ethernet port	5. DIP switch	6. RST button
7. USB port	8. RUN/STOP switch	9. Fiber port
10. CLR button	11. SD card slot	12. Set screw
13. Label	14. Module connecting set	

Number	Name	Description
1	Model name	Shows the model name of the CPU module.
2	Run/Stop LED	Operating status of the CPU ON: the module is running OFF: the module stops Blinking: the program is checking if there is any error
	Error LED	Indicates CPU error ON: a serious error occurs in the module. OFF: the module is normal. Blinking: a minor error occurs in the module.
	Bus Fault LED	Indicates I/O Bus error ON: a serious error occurs in the I/O Bus. OFF: the I/O Bus is normal. Blinking: a minor error occurs in the I/O Bus.
	SYSTEM LED	Indicates the system status of the CPU ON: external I/O is locked OFF: system in default Blinking: reset/clear
	COM LED	Indicates the communication status of the COM port. OFF: no communication over the COM port Blinking: communication over the COM port
	MASTER LED	Indicates the system is in redundant mode ON: Master CPU in redundant mode OFF: Standby CPU in redundant mode / single mode
	SYNC LED	Indicates the synchronization status of the redundancy system ON (Green): in synchronization mode Blinking (Orange): identification check ON (Red): fiber disconnected Blinking (Red): identification check failed OFF: single mode
3	COM port	Provides an interface for RS-232/RS-485 communication
4	Ethernet port	Provides an interface for a n Ethernet communication, supports EtherNet/IP and MODBUS TCP protocols
5	DIP switch	Sets the executing items
		SW1 OFF: no action (default) ON: written protection
		SW2 OFF: no action (default) ON: when power-on, it copies programs, CPU parameters, I/O configurations, device setting values from SD card to CPU module
		SW3 OFF: no action (default) ON: works with clear button and it backups programs, CPU parameters, I/O configurations, device setting values from CPU module to SD card.
		SW4 Works with SW3 OFF: system backups (device contents are included) ON: system backups (device contents are excluded)
6	RST button	Resets CPU module to factory defaults Note: after the CPU module is rest, the ERROR LED will be ON and error code is 16#1402. You need to set the I/O configurations

Number	Name	Description
		again via HWCONFIG of ISPSoft to have the PLC function normally.
7	USB port	Mini USB communication port
8	RUN/STOP	RUN: execute the programs STOP: stop the programs
9	Fiber communication port	For data synchronization
10	CLR button	Clears data from the latched area
11	SD card slot	Provides an interface for an SD card
12	Set screw	Fixes the base
13	Label	Nameplate
14	Module connecting set	Fixing a module

2.2 Introduction on AH500 Redundancy System

AH500 redundancy system includes redundant power supply, redundant communication for extension backplane and network redundancy. You can simply change the original AH500 backplane (main backplane or extension backplane) to redundant backplane to achieve the redundant power supply without making any change on the current system architecture.

A redundant power supply use redundant backplanes to create at least two power supply modules in one power supply for continual operation. You can use independent power supplies for each of all modules on the backplane. If one of the power supply fails (power down or bad power module), the other power supply takes over to keep the system powered up.

AH500 CPU redundant architecture contains Master CPU and Standby CPU. Only redundant extension backplanes can be used in this architecture. When errors occur in Master CPU, the system switches to Standby CPU to ensure a non-stop operation. The communication between redundant extension backplane and other redundant extension backplane is through two sets of communication cables. If one communication is not working correctly, the other communication will take over to ensure robust reliable communications.

Network redundancy works when the network cable of the controller or communication module is damaged and causing Master CPU unable to communicate with workstations or I/O modules remotely. Once Master CPU is unavailable, Standby CPU will be instantly deployed to ensure minimal downtime and network availability.

With a redundancy system, you can minimize the impact on a process resulting from a failure or a critical component of the system. It is an effective method to reduce risks. If the system goes down, usually the recovery costs are very high, especially for valuable production lines or the highly important equipments. Though the cost to build a redundancy system is at least twice high, but comparing to the loss, it is next to nothing.

Note: Redundant backplanes include redundant main backplanes (AHBP04MR1-5A) and redundant extension backplanes (AHBP06ER1-5A, AHBP08ER1-5A).

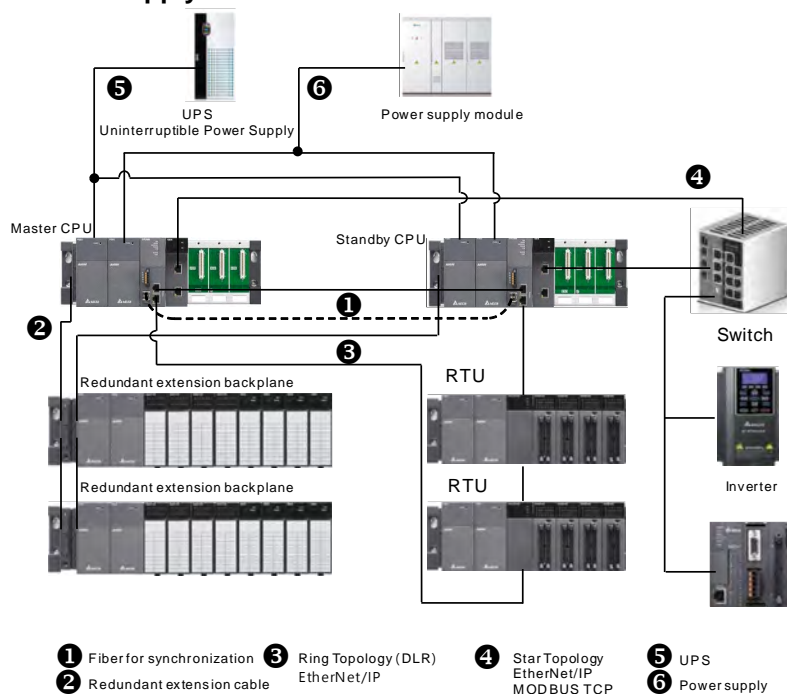
The diagram illustrates a redundant industrial control system architecture. At the top, three user devices are shown: a **Workstation**, a **Client**, and an **HMI** (Human Machine Interface). These devices are connected to a central **Switch**. The switch is connected to a **Master CPU** and a **Standby CPU** via a connection labeled **4**. The Master CPU and Standby CPU are connected to each other via a connection labeled **1**. The Master CPU is connected to a **Redundant extension backplane** via a connection labeled **2**. The Standby CPU is connected to another **Redundant extension backplane** via a connection labeled **3**. Both backplanes are connected to two **RTU** (Remote Terminal Unit) modules. The RTU modules are connected to the backplanes via connections labeled **2** and **3**.

- 2-5

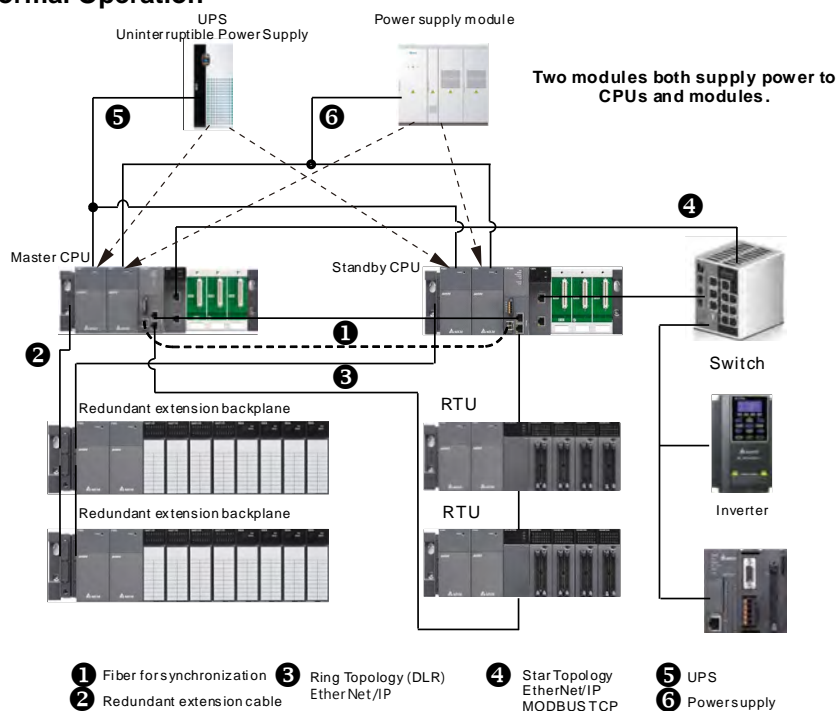
2.2.1 Redundant Power Supply

Under normal operation, redundant power supply consists of two power supply modules, providing power for master CPU and modules on the same backplane. When error occurs in one of the power modules, the other independent power can supply power to keep the system running. You can use the online mode in HWCONFIG of ISPSOFT software to check and confirm the failure status of the power supply module or use instruction RCS (API2901) to check if the current working power module is running logically.

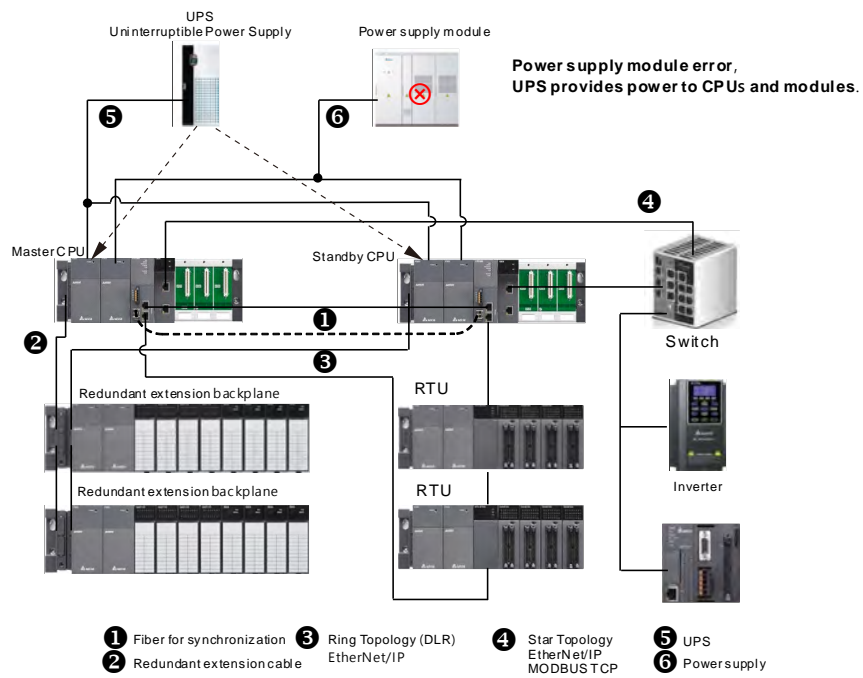
- **Redundant Power Supply Architecture**



- **Under Normal Operation**



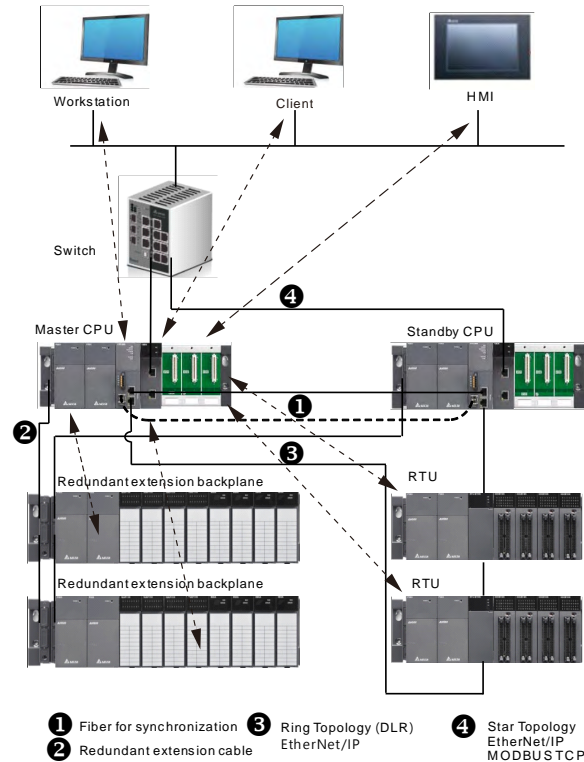
● Power Supply Module Error



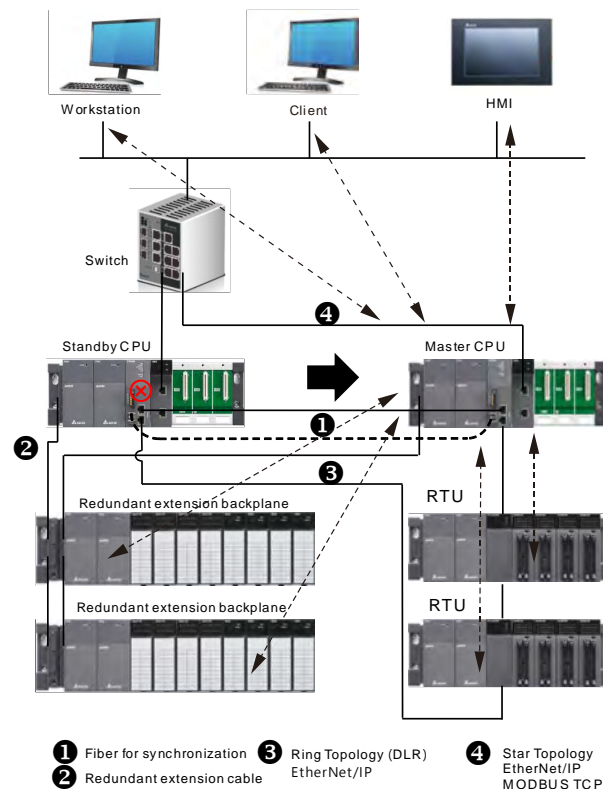
2.2.2 Redundant CPUs

AH500 redundancy system consists of Master CPU and Standby CPU. When error occurs in Master CPU or modules, Standby CPU takes over to ensure a non-stop operation and minimize the impact on a process resulting from a failure or a critical component of the system.

● Under Normal Operation



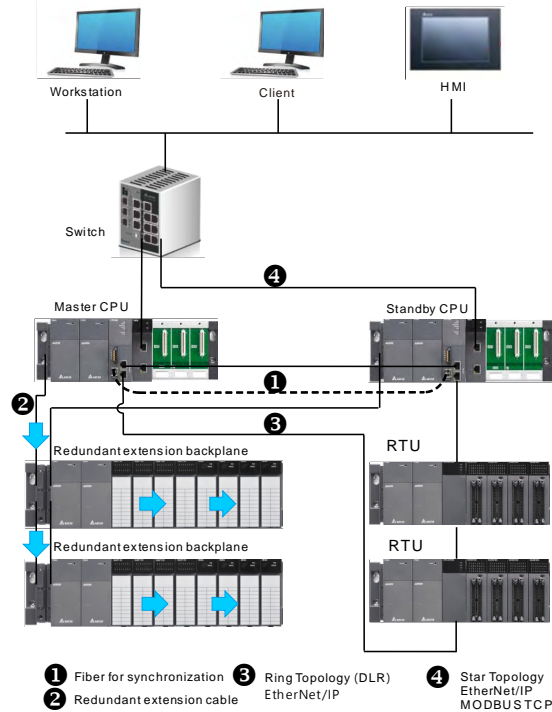
● CPU or Module Error



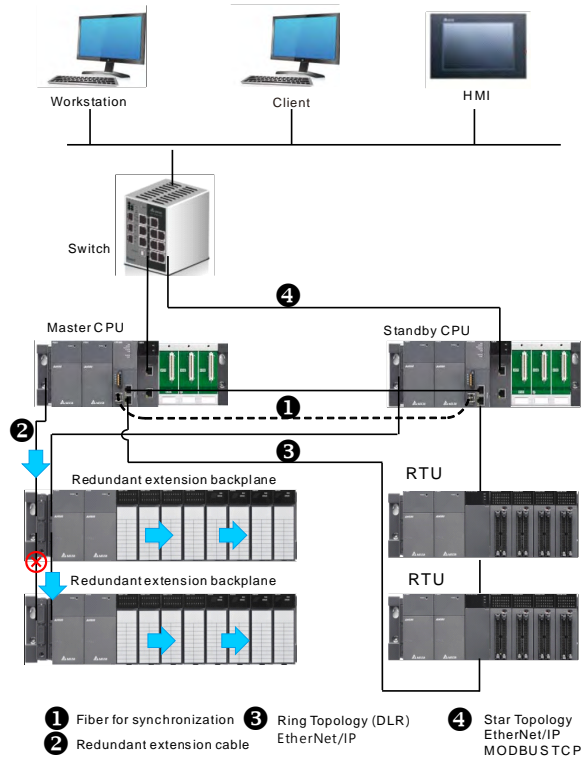
2.2.3 Redundant Extension Backplane

Redundant extension backplane provides the possibility to install two power modules to create a redundant power supply and it also provides a continual communication by two sets of extension cables. If one communication is not working correctly, the other communication will take over to ensure robust reliable communications.

- **Under Normal Operation**



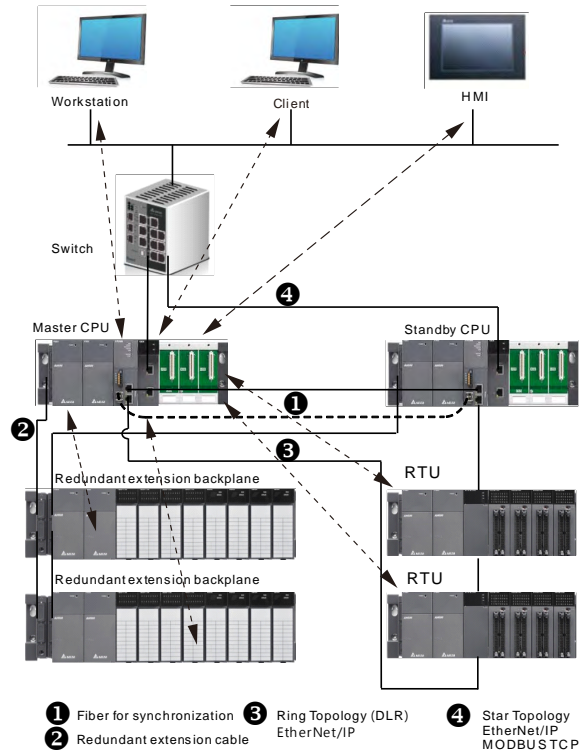
- **Extension backplane communication error**



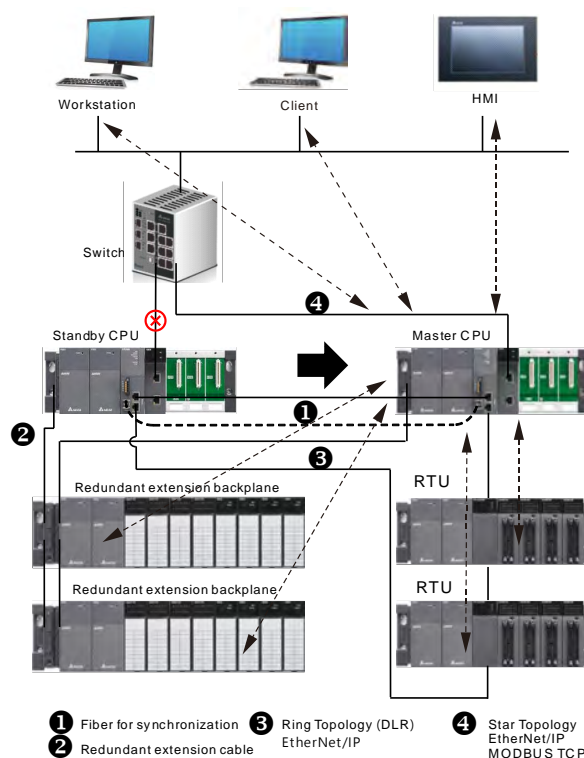
2.2.4 Network Redundancy

When the network cable of the controller or communication module is damaged and causing Master CPU unable to communicate with workstations or I/O modules remotely, Standby CPU will be instantly deployed to ensure minimal downtime and network availability.

● Under Normal Operation



● Network communication error

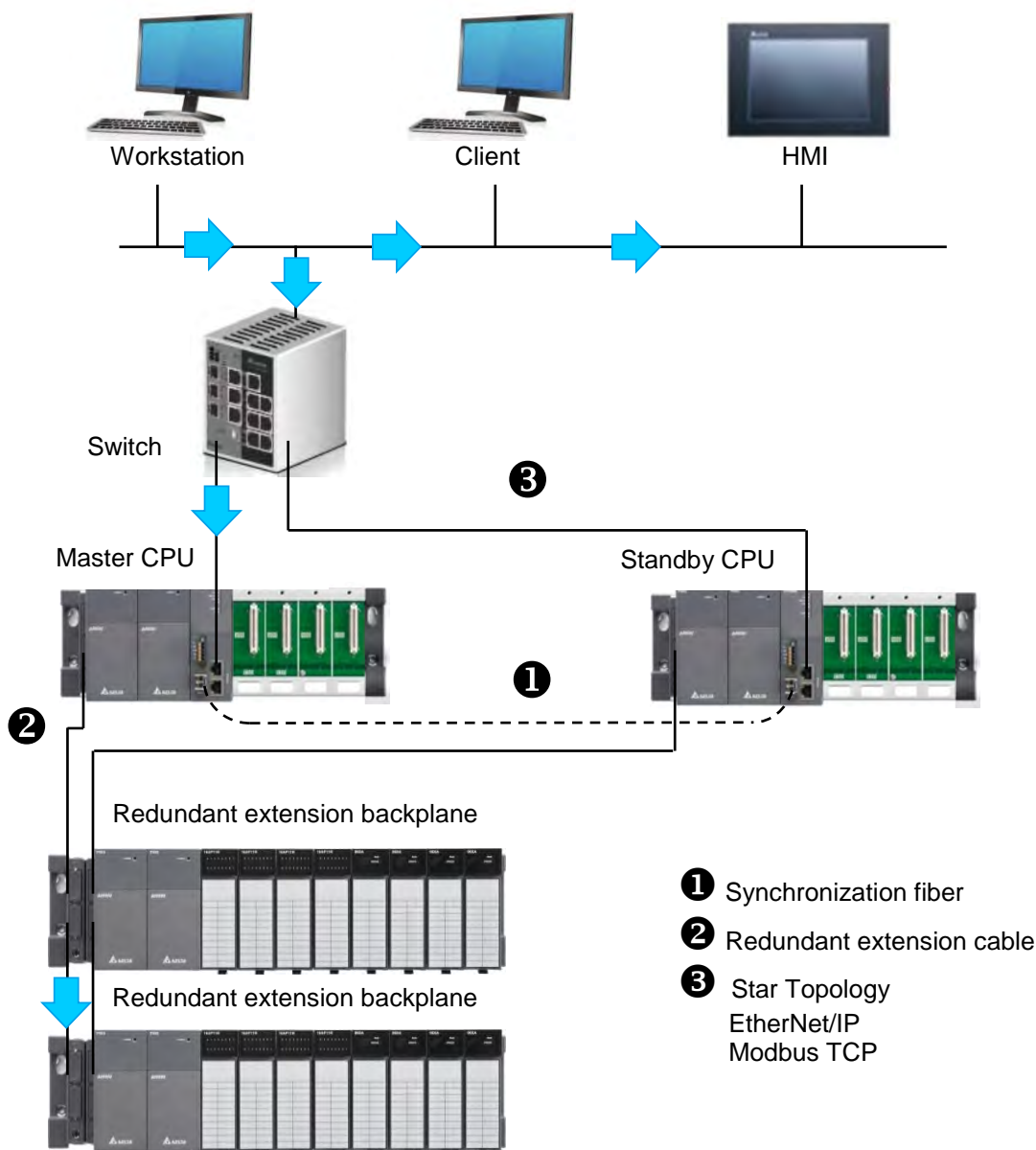


2.3 Network Architecture of AH500 Redundancy System

AH500 redundancy system supports Modbus TCP protocol and EtherNet/IP protocol. Master CPU (AHCPU560-EN2) is equipped with dual ports, supporting star topology and ring topology. EtherNet/IP DLR function is required for devices to be used in a ring topology.

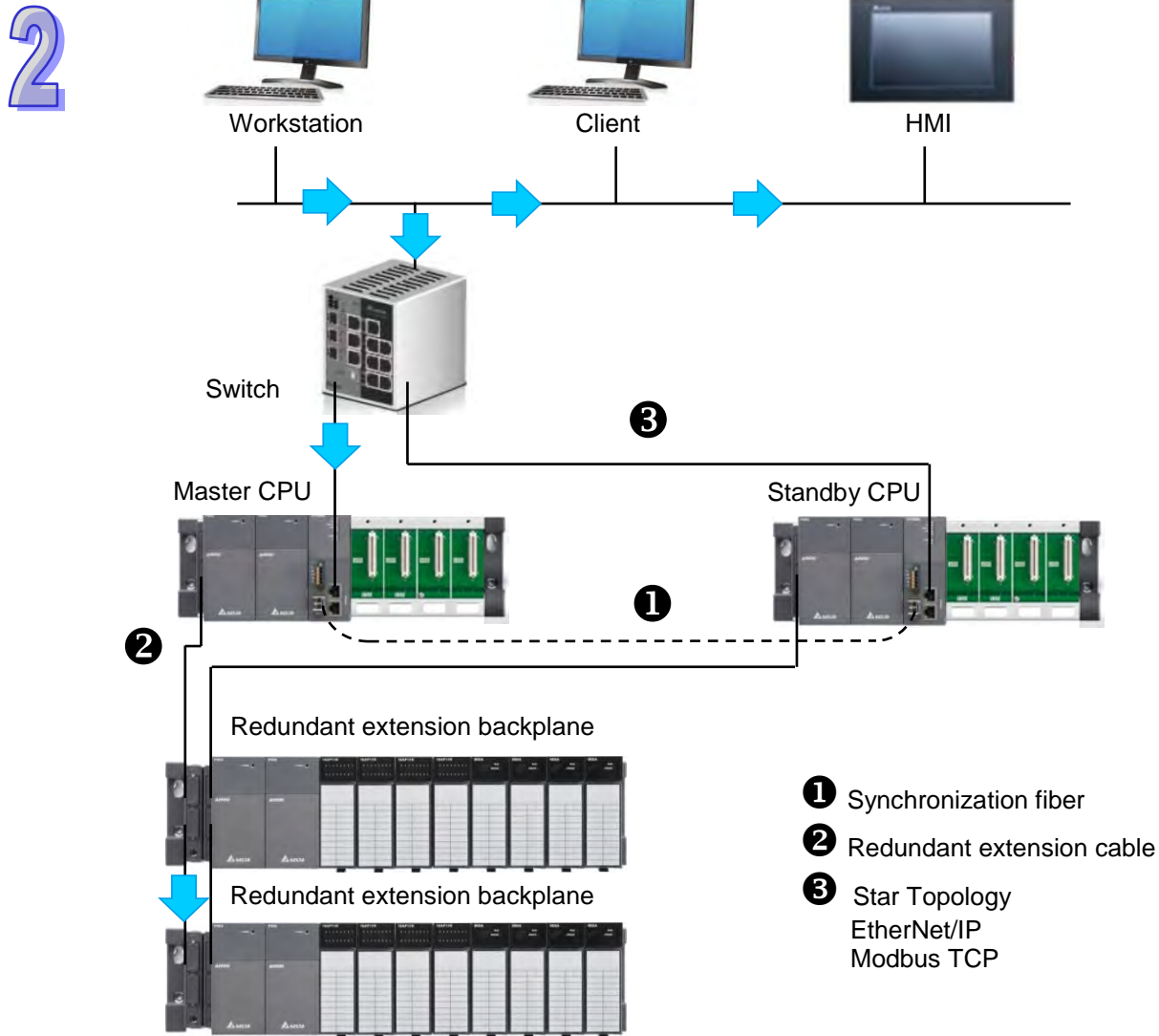
2.3.1 Star Topology

Star topology is created by connecting all devices through a switch. AH500 redundancy system connects Master CPU and Standby CPU through a switch and then connects to all devices. Only Master CPU can send communication commands to send and receive data. As for Standby CPU, it does not take initiative in sending or receiving communication commands.



2.3.2 Ring Topology

EtherNet/IP DLR function is required for devices to be used in a ring topology. Thus you need to make sure all the devices to be connected support the EtherNet/IP DLR (Device-level Ring). If not, you need to install an EtherNet/IP TAP or error may occur during communication.



Chapter 3 Creating Redundancy System



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This chapter introduces the specifications and minimum requirements for creating AH500 Redundancy System and shows you how to build up a basic AH500 Redundancy System by simply changing the original AH500 series to a redundancy system.

3.1 AH500 Redundancy CPU Module Specification

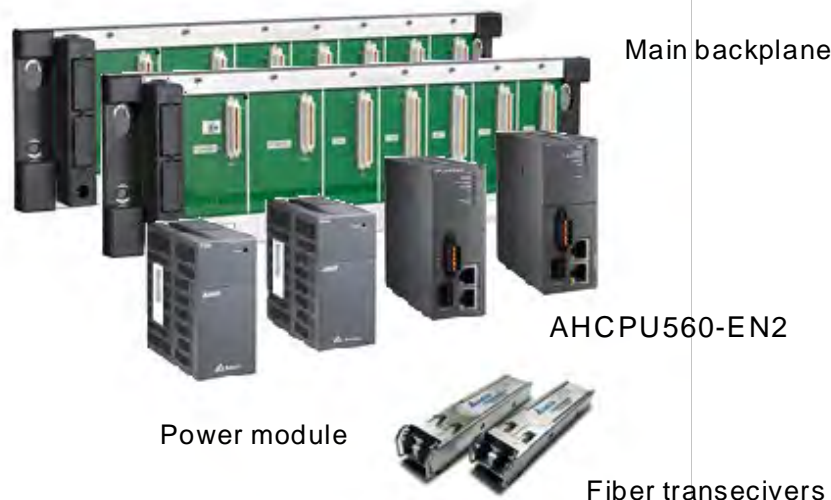
Item	AHCPU560-EN2	Remark
Execution	The program is executed cyclically.	
Input/Output control	Regenerated inputs/outputs Direct inputs/outputs	The inputs and outputs can be controlled through the direct inputs and direct outputs.
Programming language	IEC 61131-3	
	Ladder diagrams, function block diagrams, instruction lists, structured texts, and sequential function charts	
Instruction execution speed	12K steps/ms	
Number of instructions	Approximately 666 instructions	
Constant scan cycle (ms)	1-32000 (The scan cycle can be increased by one millisecond.)	By setting the parameter
Program capacity (step)	1M Steps	
Installation	DIN rails or screws	
Installation of a module	A module is installed directly on a backplane.	
Connection between two backplanes	An extension cable connects two backplanes.	
Maximum number of modules which can be installed	64	
Maximum number of backplanes which can be connected	8	
Number of tasks	Single mode: 283 tasks (32 cyclic tasks; 32 I/O interrupts; 4 timed interrupts; 2 communication interrupts; 1 external 24 V low-voltage interrupt; 212 external interrupts)	

Item	AHCPU560-EN2	Remark
	Redundant mode: 36 tasks (32 cyclic tasks; 4 timed interrupts)	
Number of inputs/outputs	Single mode: 4352 Redundant mode: 3584	For I/O module
Input relays [X]	65536 (X0.0-X4095.15)	
Output relays [Y]	65536 (Y0.0-Y4095.15)	
Internal relays [M]	8192 (M0-M8191)	
Link registers [L]	262144 (L0-L262143)	
Timers [T]	2048 (T0-T2047)	
Counters [C]	2048 (C0-C2047)	
32-bit counter [HC]	64 (HC0-HC63)	
Data register [D]	262144 (D0-D262143)	
Stepping relay [S]	4096 (S0-S4095)	
Index register [E]	32 (E0-E31)	
Special auxiliary relay [SM]	4096 (SM0-SM4095)	
Special data register [SR]	4096 (SR0-SR4095)	
Serial communication port	1 port: RS-232/485	
Ethernet port	10/100M	
MODBUS TCP connection number (Slave)	160	
MODBUS TCP connection number (Master)	128	
USB port	Mini USB	
Storage interface	Micro SD	
Remote RUN/STOP	The setting range is X0.0~X511.15.	
Real-time clock	Years, months, days, hours, minutes, seconds, and weeks; Ambient environment of 25 °C / 77 °F: the real-time clock is retainable for 30 days after power-off	
Accuracy of real-time clock	Accumulated error time per month Ambient environment of -20°C / -4°F: -117 seconds Ambient environment of 25 °C / 77 °F: 52 seconds Ambient environment of 60 °C / 140 °F: 7 seconds	
Switchover Time	For modules on extension backplane: under 20 ms For remote I/O modules (Master CPU controls): under 2 s	
Synchronization speed	0.5 ms / kbyte	

3.2 AH500 Redundancy System Requirements

AH500 Redundancy System consists of two CPU controllers with exact installments and they are connected by a fiber for synchronizations. You can extend the redundancy system according to your demands, such as adding more extension backplanes or redundant network. The minimum hardware requirement for AH500 Redundancy System is 2 power modules, 2 main backplanes, 2 AHCPU560-EN2, 2 fiber transceivers, and 1 fiber.

Note: refer to section 1.2 Supported Models Description for more information on what models that AH500 Redundancy System supports.



- **Main backplane:** when you need to use redundant power, it is required to use a redundant main backplane

Type	Model	Description
CPU module	AHBP04M1-5A	Four-slot main backplane for a CPU/RTU backplane
	AHBP06M1-5A	Six-slot main backplane for a CPU/RTU backplane
	AHBP08M1-5A	Eight-slot main backplane for a CPU/RTU backplane
	AHBP12M1-5A	Twelve-slot main backplane for a CPU/RTU backplane
Redundant main backplane	AHBP04MR1-5A	Four-slot redundant main backplane for a CPU/RTU backplane
	AHBP06MR1-5A	Six-slot redundant main backplane for a CPU/RTU backplane
	AHBP08MR1-5A	Eight-slot redundant main backplane for a CPU/RTU backplane

- **Power module:** when you need to use redundant power, it is required to have more than 2 power modules

Type	Model	Description
Power module	AHPS05-5A	100~240 V AC 50/60 Hz
	AHPS15-5A	24 V DC

- **CPU:** AH500 Redundancy System currently supports AHCPU560-EN2 only

Type	Model	Description
CPU module	AHCPU560-EN2	It is a redundant CPU module with one built-in Ethernet port, one built-in RS-485/232 port, one built-in USB port, and one built-in SD interface. It supports 65536 inputs/outputs. The program capacity is 1M steps.

- **Fiber transceivers and fiber for synchronization**

Synchronization is required to ensure an intact data and a smooth switchover between Master CPU and Standby CPU. You can use fiber transceivers and fiber to synchronize the CPUs.

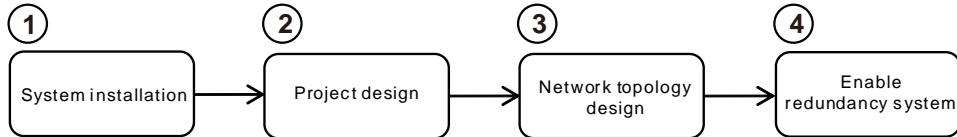
Note: for selections on fiber transceivers and fiber cables, you can see the table below for more details. There are different modes for you to select, choose the most suitable one according to your requirements on the maximum transmission distance.

- **Fiber Transceivers**

Product	Fiber Optics		
Operating Temperature -5 °C ~ 70 °C (T) -40 °C ~ 85 °C	Connector Interface	Mode	Maximum Transmission Distance
LCP-100MMF (T)	Duplex LC	MultiMode	2km
LCP-100SMF30 (T)	Duplex LC	SingleMode	30km
LCP-100SMF60 (T)	Duplex LC	SingleMode	60km

3.3 Building up AH500 Redundancy System

There are limitations on building up redundancy system, such as hardware installation and project design. You need to make sure the redundant architecture works and be sure that no error occurs after switching over between CPUs. See the basic steps to build up AH500 Redundancy System.



Step 1. System installation

- Main backplane: AH10/15EN-5A or AH10/15SCM-5A
- Redundant main backplane: if you need to use redundant power, this should be included.
- Fiber cable: connecting two CPUs

Note: AH500 Redundancy System should use redundant extension backplane.

Step 2. Project design

- When redundancy is enabled, you can only assign POU to cyclic and timed interruption tasks.
- Synchronization setups (refer to Chapter 5 AH500 Redundancy System Program Design)

Step 3. Network topology design

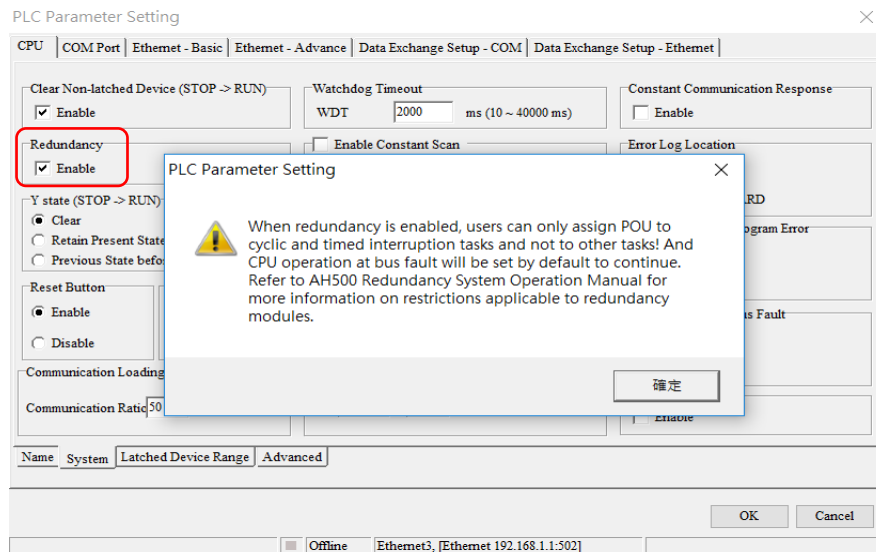
- Star topology (MODBUS TCP, EtherNet/IP)
- Ring topology (EtherNet/IP DLR)

Refer to Chapter 4 AH500 Redundant Network Architecture

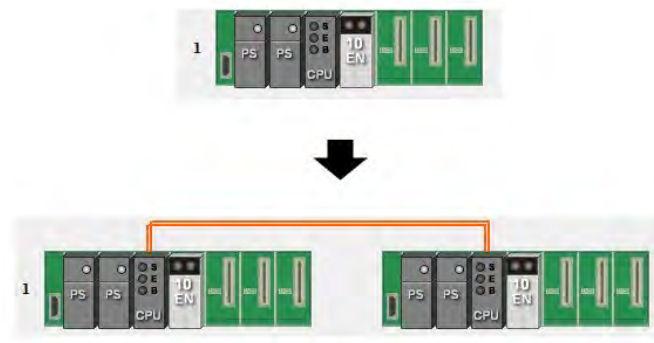
Step 4. Enable Redundancy System

- Enable redundancy function and download the project to the controller
- Go to: ISPSOft -> HWCONFIG -> CPU -> System -> Redundancy

- To enable redundancy system



- When the Redundancy is enabled, redundancy system architecture shows up in HWCONFIG.



3.3.1 Rules on Determining the CPUs to be Master or Standby

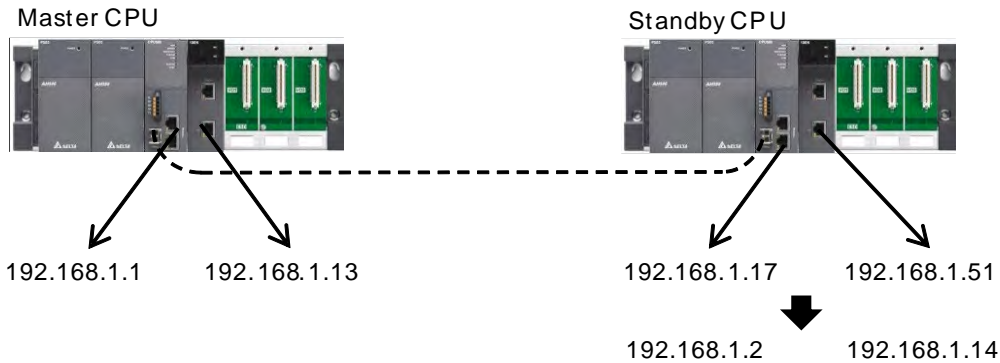
After AH500 Redundancy System is powered on, one CPU becomes Master CPU and the other becomes Standby CPU. After the roles of CPUs are determined, the IP addresses of Standby CPU and its network module change automatically to the next IP address number of Master CPU to avoid IP conflicts and system errors. Remember to save the next IP address number of Master CPU for Standby CPU.

- Standard procedure to determine the roles of CPU

	Rules	Description
1	By free of system error	The CPU that is without any system error is the Master CPU.
2	By enabling redundancy function	The CPU that you use to enable the redundancy function is the Master CPU.
3	By power-up order	The CPU that is powered on first is the Master CPU.
4	By project	The CPU that is with a project is the Master CPU.
5	By module configuration	The CPU that is with correct module configuration is the Master CPU.
6	By MAC address	The CPU that is with a bigger MAC address is the Master CPU.

Note: when the roles of CPU cannot be determined by rule number one, go to check rule number two and so forth.

- **Assign next IP address number automatically**



3.3.2 Identification Check

When the roles of CPUs are determined, Master CPU starts to perform identification check before synchronization. For a more secured and safe system, Master CPU makes sure Standby CPU is capable of handling tasks if Master CPU is down. If the identification check failed, Standby CPU changes its mode to STOP.

- **Identification Check Items**

	Check Items
1	The firmware of Master CPU and Standby CPU should be compatible with one another.
2	The module configurations on main backplanes of Master and Standby CPU should be exactly the same.
3	All the corresponding modules on Master and Standby CPU of the redundancy system should be connected to the same network.

3.3.3 From AH500 System to AH500 Redundancy System

You can simply change the original AH500 system to create your own redundancy architecture. The check items to create a redundancy system are listed below.

- Use AH redundant CPU (AHCPU560-EN2) instead of AH500 CPU.
- Use synchronization fiber cable to connect two CPUs.
- Module configurations of the main backplane (currently AH500 redundancy system only supports AH10/15EN-5A and AH10/15SCM-5A).
- Make sure the extension backplane is a redundant extension backplane.
- Use only cyclic and timed interruption types for project programming and task (currently AH500 redundancy system only supports cyclic and time interruption types).
- Network topology (refer to chapter 4 AH500 Redundant Network Architecture for more details.)

3.4 AH500 Redundancy System Operating Modes

You can use LED indicator to see the operation status and the current mode of AHCPU560-EN2.

- **LED indicators for modes in redundancy system**

Mode \ CPU	Master CPU		Standby CPU	
	Master LED	Sync LED	Master LED	Sync LED
Redundant mode Under identification check	ON	Blinking (Orange)	OFF	Blinking (Orange)
Redundant mode Identity matched for synchronization (during synchronization)	ON	ON (Green)	OFF	ON (Green)
Redundant mode Identification check failed	ON	Blinking (Red)	OFF	Blinking (Red)
Redundant mode Identification check failed (Synchronization fiber is not connected.)	ON	ON (Red)	OFF	ON (Red)
Single mode (Synchronization fiber is not connected.)	OFF	OFF	OFF	OFF
Single mode (Synchronization fiber is connected.)	ON	OFF	OFF	OFF

● **Modes in redundancy system**

Item	Mode	Description
1	Redundant mode Under identification check	Master CPU is checking the identity of Standby CPU before synchronization.
2	Redundant mode Identity matched for synchronization (during synchronization)	Identity of Standby CPU is matched for synchronization and the system is now under synchronization.
3	Redundant mode Identification check failed	Identity of Standby CPU is not matched for synchronization; check the identification checklist and perform identification check again.
4	Redundant mode Identification check failed (Synchronization fiber is not connected.)	Since Standby CPU failed the identification check, error occurs in synchronization fiber. Check fiber transceivers and synchronization fiber to see if they are working properly.
5	Single mode (Synchronization fiber is not connected.)	Single mode and synchronization fiber is not connected.
6	Single mode (Synchronization fiber is connected.)	Single mode

3

3.5 Switchover Time

When an error occurs in Master CPU, a switchover from Master CPU to Standby CPU completes within 20 milliseconds. It takes a bit longer for remote I/O communication modules, since it is required to renew the network settings such as IP address and so on.

Output refresh delay time:

Type	Output Refresh Delay Time
Extension backplane	Number of the extension backplane x 2 ms
Remote I/O communication module	Connection time + 100 ms

Note: if output refresh delay time of remote IO communication module is less than 100 ms, it will be seen as 100 ms.

3.6 Measuring Scan Time of a Program

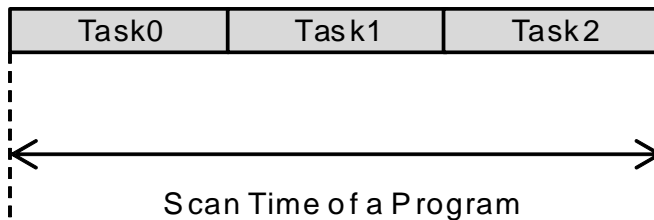
Scan time measurement is different for single mode and redundant mode. For redundant mode, scan time includes two parts, program execution time and synchronization time between two CPUs.

When the redundancy system is ready, every cyclic scan performs synchronization with Master CPU. The amount of data to be synchronized is according to how different the data is from the last synchronization. The bigger the difference is, the bigger data amount to be synchronized is. You need to put this into consideration while designing programs.

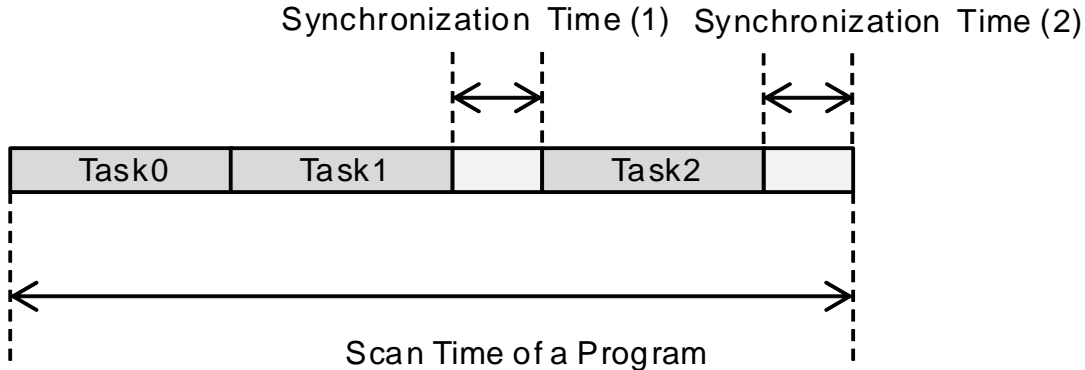
Synchronization time (ms) = data amount to be synchronized (kbyte) x 0.5

Note: refer to section 5.13 Amount of Data Device to be Synchronized for more details.

- **Single Mode**



- **Redundant mode**



(1) Synchronization set by user

(2) Synchronizes when program ends

Note: refer to section 5.1.1 Synchronization

Chapter 4 Redundant Network Architecture

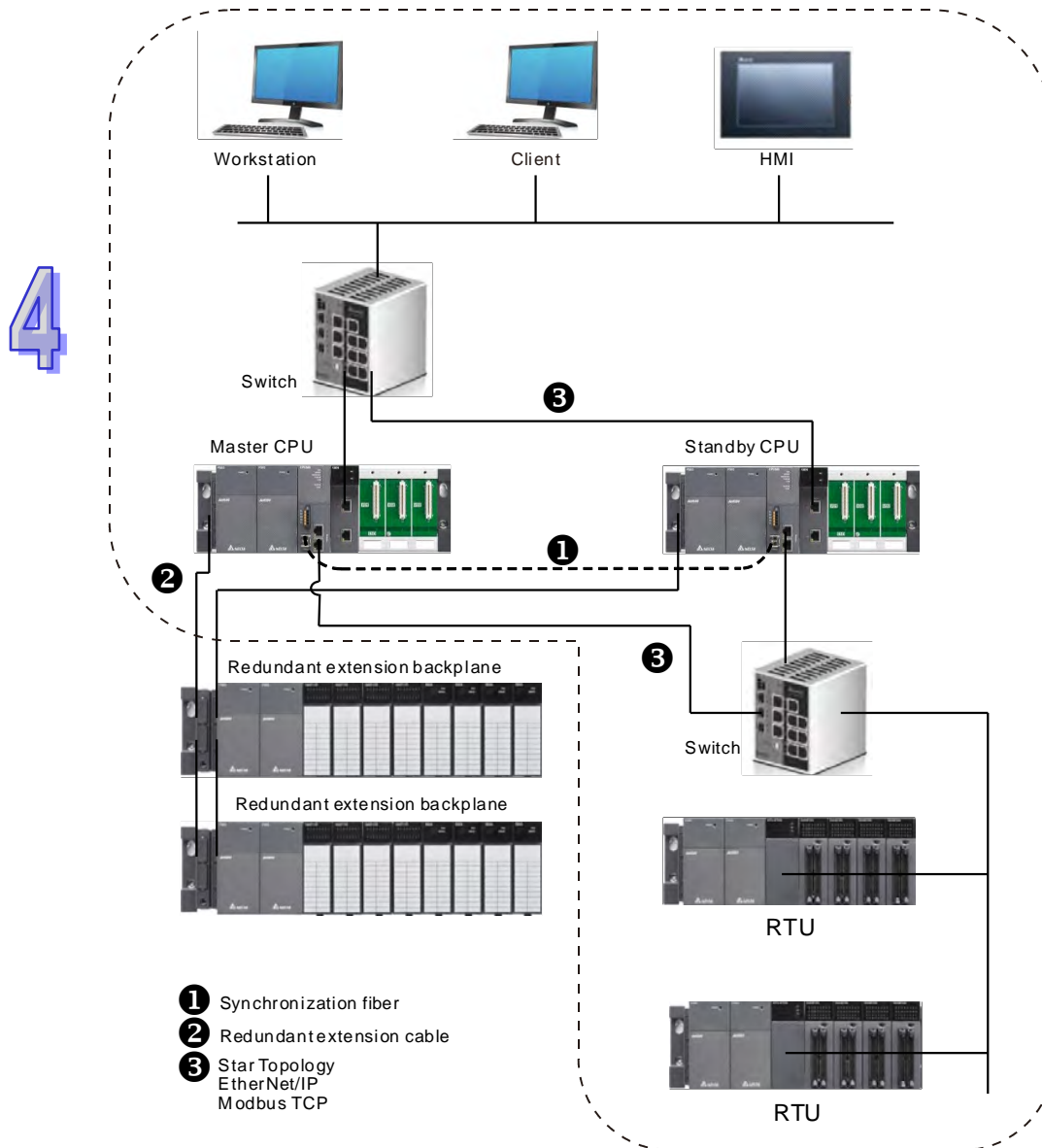
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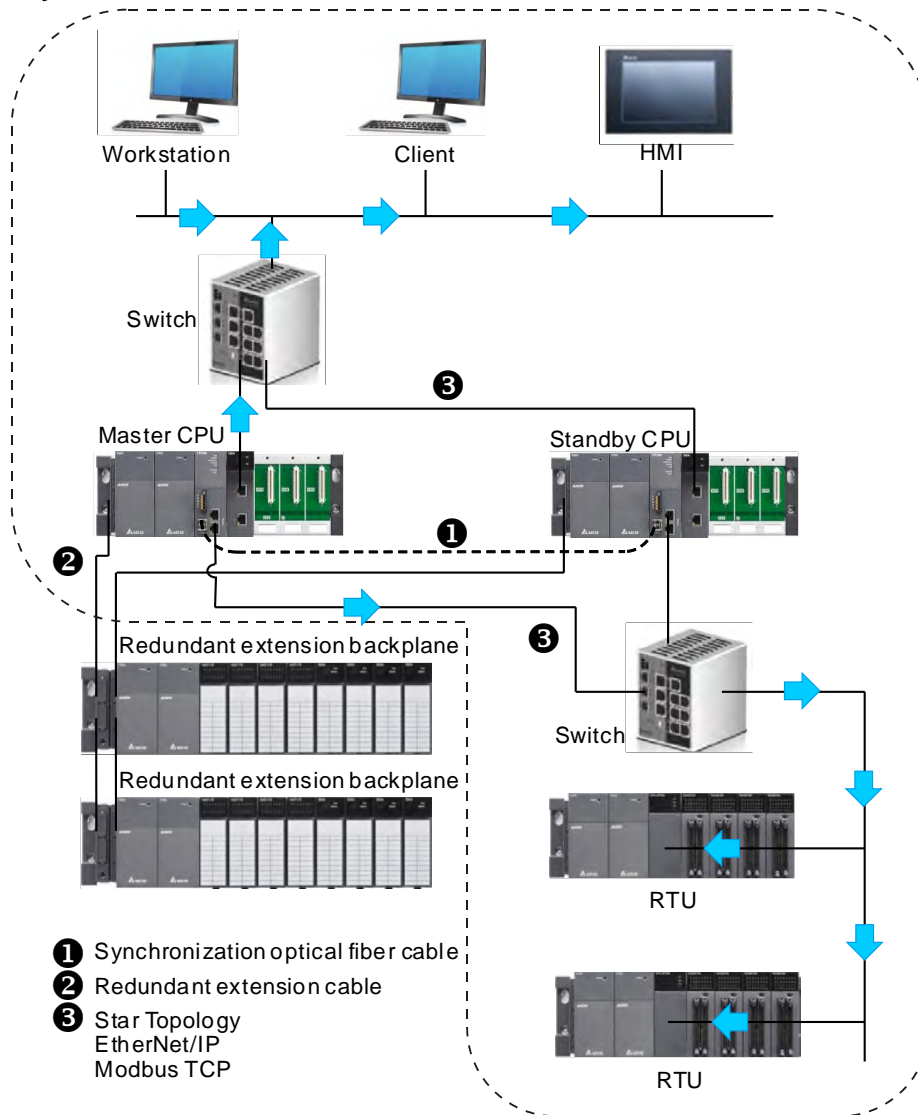
4.1 AH500 Redundant Network Architecture

4.1.1 Star Topology

Star topology is created by connecting all devices through a switch. AH500 redundancy system connects Master CPU and Standby CPU through a switch and then connects to all devices. During the same time, only Master CPU can send communication commands to send and receive data. As for Standby CPU, it stays in standby mode and does not take initiative in sending or receiving communication commands.



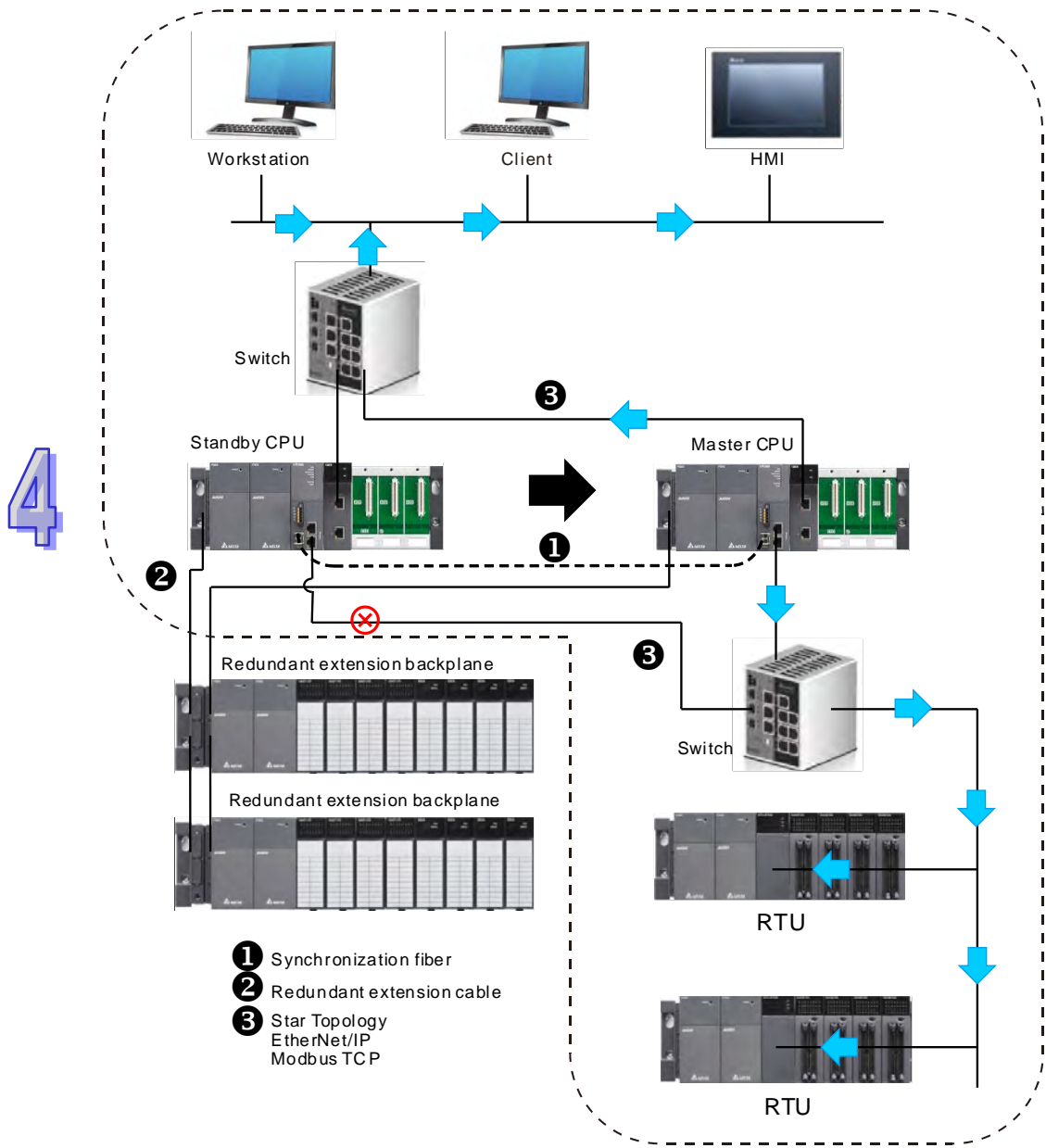
Only Master CPU can communicate



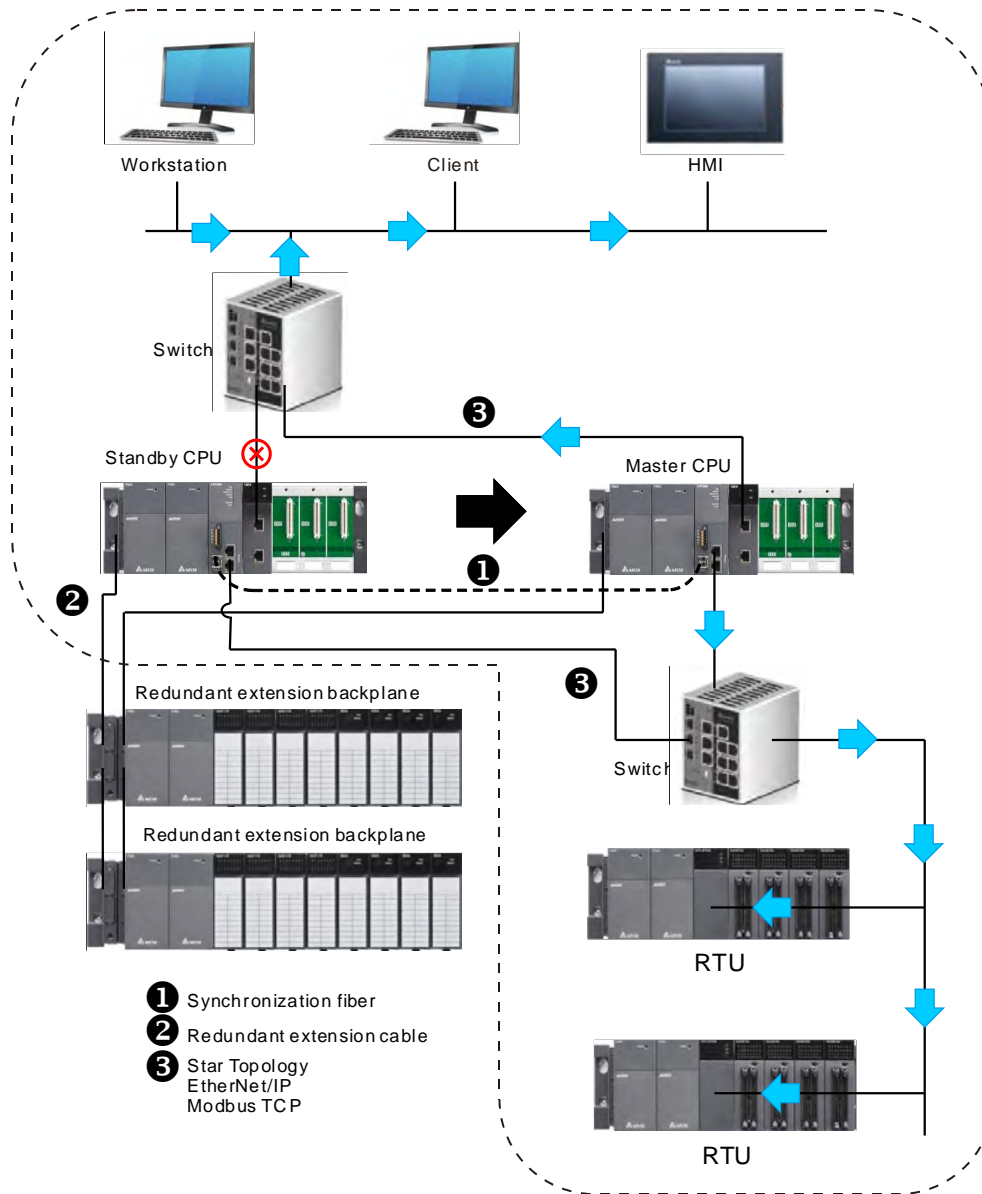
4

When network is down, a switchover from Master CPU to Standby CPU begins.

- CPU network is down.

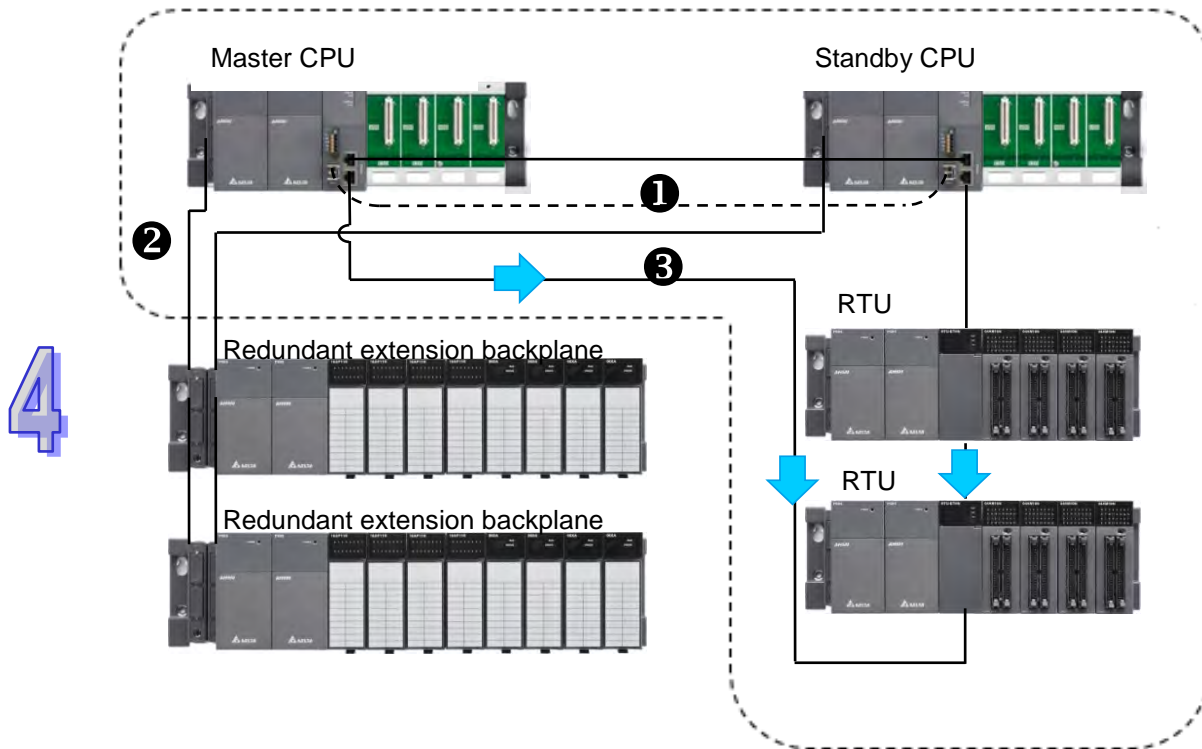


- Module network is down.



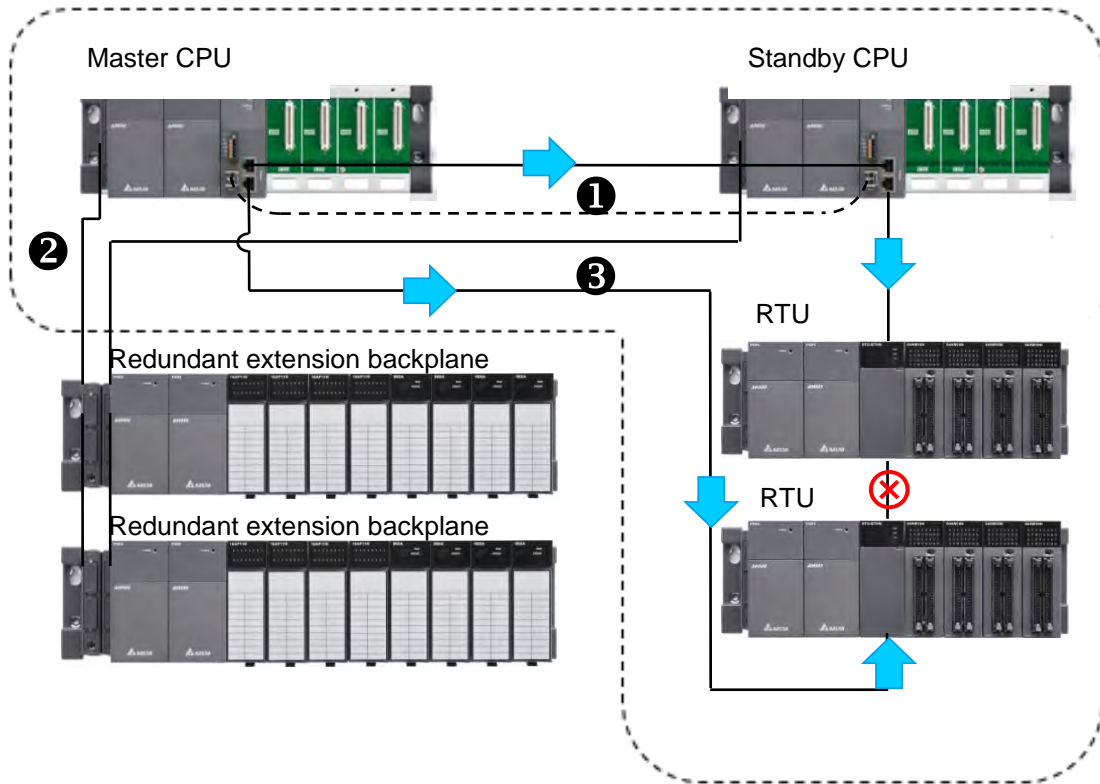
4.1.2 Ring Topology

EtherNet/IP DLR function is required for devices to be used in a ring topology. Thus you need to make sure all the devices to be connected support the EtherNet/IP DLR (Device-level Ring). If not, you need to install an EtherNet/IP TAP or error may occur during communication.



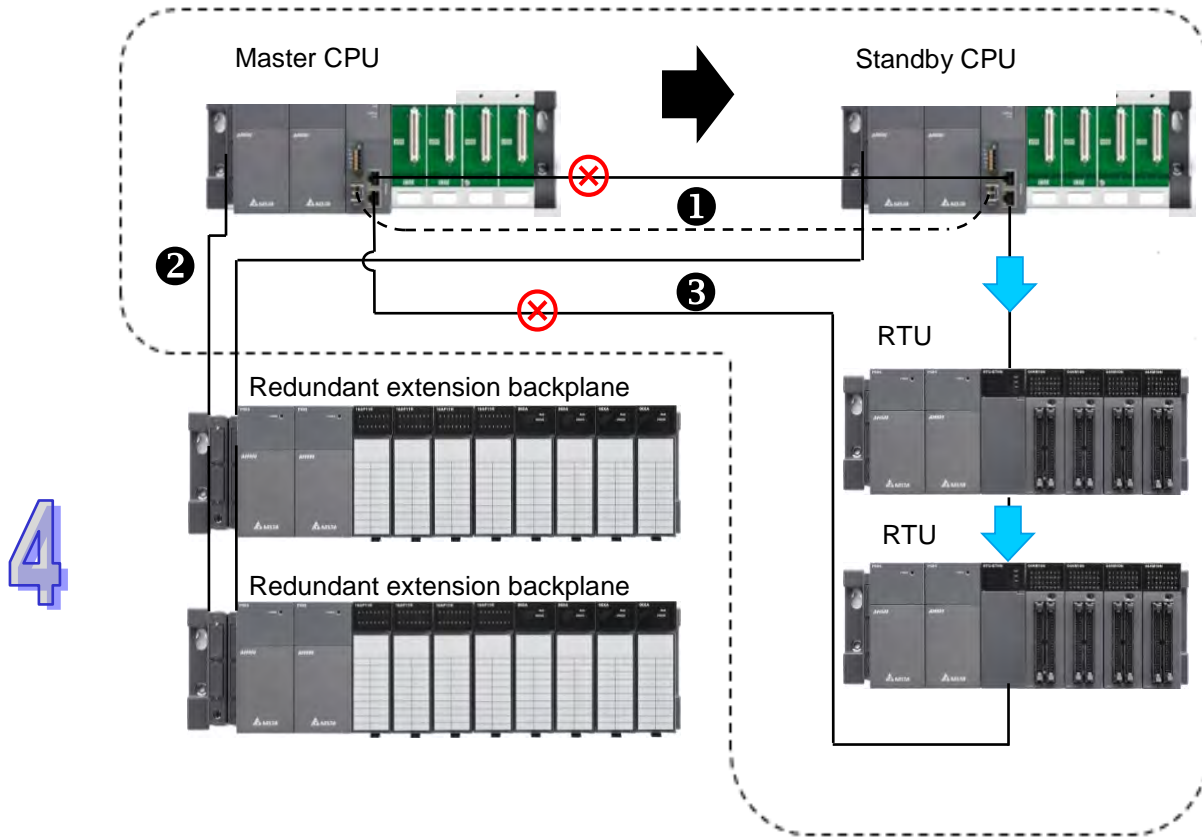
- ❶ Synchronization fiber
- ❷ Redundant extension cable
- ❸ Ring Topology (DLR) EtherNet/IP

If the connection with the remote I/O module cannot be established, CPU establishes another connection with other I/O module remotely.



- ❶ Synchronization fiber
- ❷ Redundant extension cable
- ❸ Ring Topology (DLR) EtherNet/IP

When network is down, a switchover from Master CPU to Standby CPU begins.



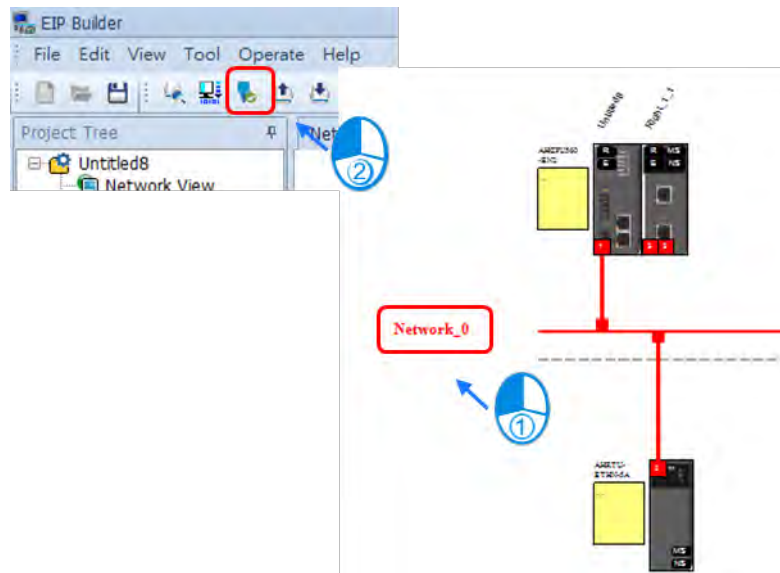
- ❶ Synchronization fiber
- ❷ Redundant extension cable
- ❸ Ring Topology (DLR) EtherNet/IP

4.1.2.1 Enabling DLR Function

This section introduces you how to enable the DLR function. For network creation through EIP Builder, refer section 4.2.2 or EtherNet/IP Operation Manual for more details.

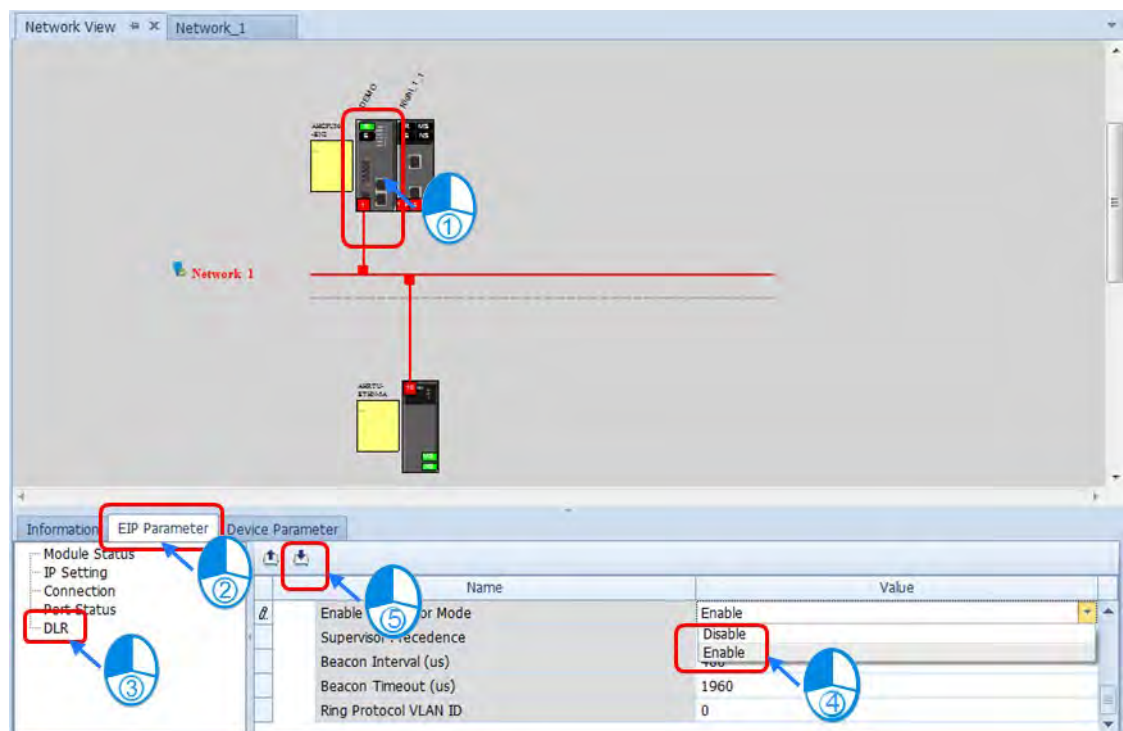
Online Mode

Once EIP Builder is open, click the Online Mode icon on the tool bar.



DLR Function

To enable the DLR function, you need to click **CPU** and see the setting tabs. Go to **EIP Parameter** and select **DLR** to see the setting window. Enable **Supervisor Precedence** and then click download.

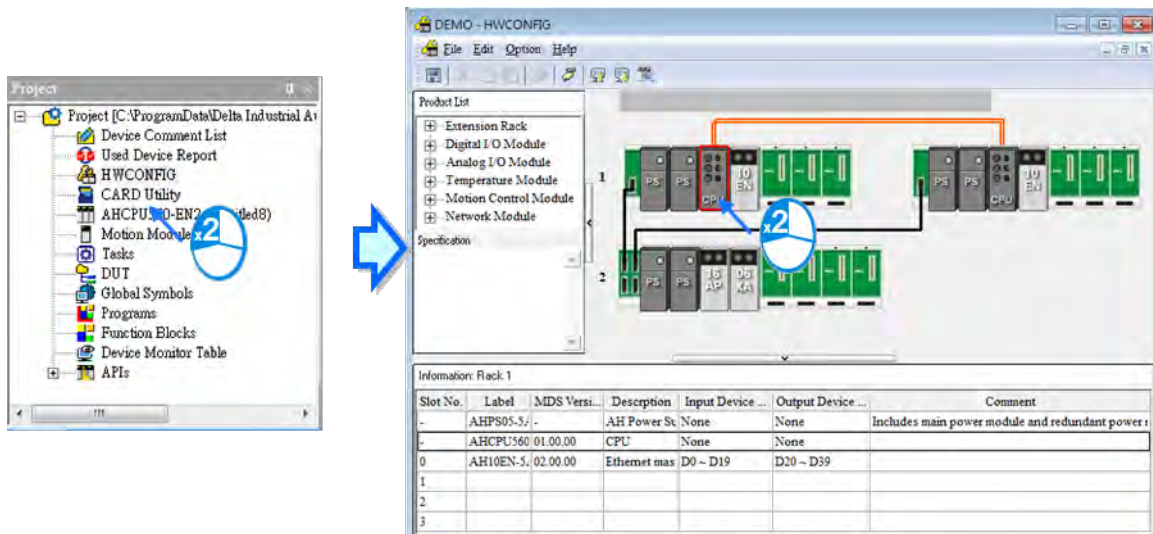


4.2 AH500 Redundancy System Network Data Mapping

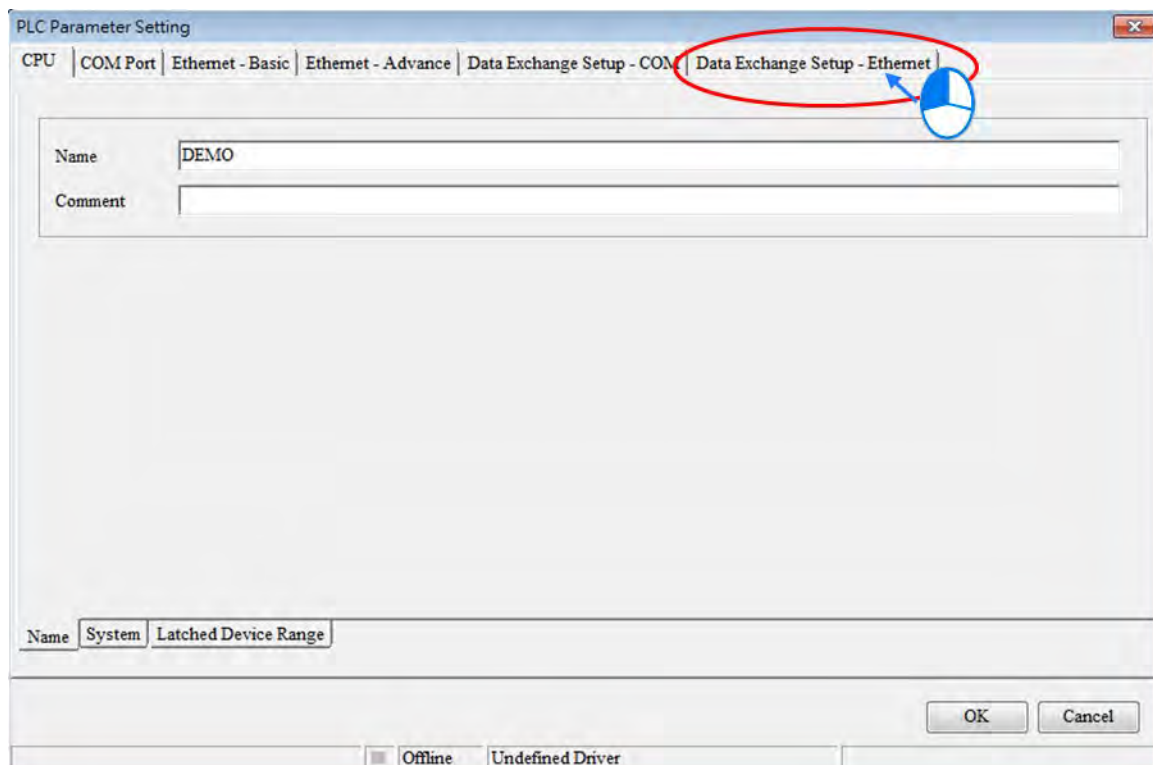
There are two kinds of network topologies for AHCPU560-EN2, including start topology and ring topology. Star topology supports Modbus TCP and EtherNet/IP protocols; as for ring topology, it supports EtherNet/IP protocols and a DLR function is required.

4.2.1 Data Mapping Via Modbus TCP

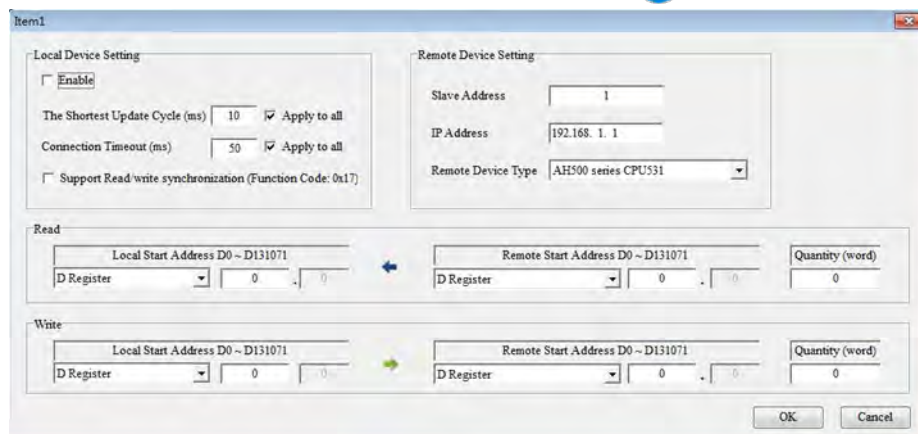
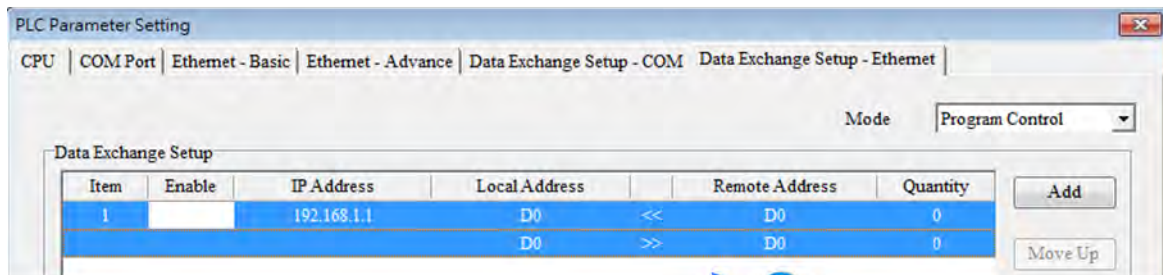
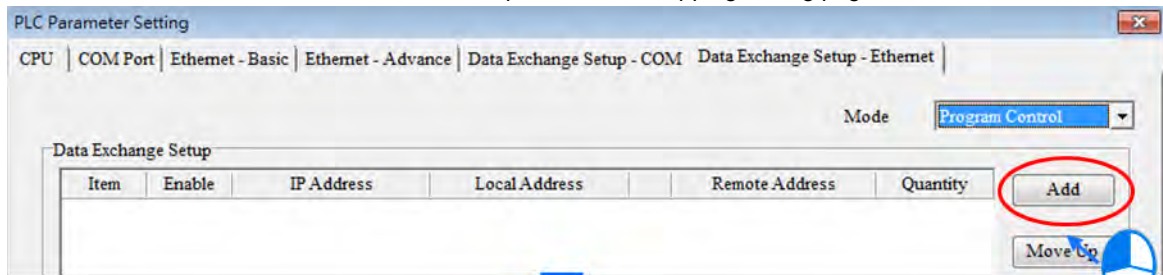
Open HWCONFIG and double-click CPU icon to open the PLC Parameter Setting page.



Click the tab **Data Exchange Setup – Ethernet** to set up.



Click **Add** to add new data in. Double-click to open the data mapping setting page.



Descriptions for the setting items are explained below:

- **Enable**

It is required to select **Enable** to activate the data mapping function. Uncheck **Enable** to disable the data mapping function.

- **IP Address**

Here you need to input IP address of the device to be connected for data mapping.

- **The Shortest Update Cycle (ms)**

The system refreshes according to the setting here during data mapping; the setting unit is millisecond. But if network traffic is busy or other reasons that may have impact on the handling time, the system refreshes according to the actual situations.

- **Connection Timeout (ms)**

Once the connection is down, the system keeps trying for connection for a period of time. If the connection cannot be established during the set time, it will be seen as a connection timeout and will be recorded in the error log. The setting unit is millisecond. PLC still tries to reconnect in every scan cycle during the downtime. Once the connection is established, the operation can go on.

- **Support Read/Write Synchronization (Function code 0x17)**

When the connected device supports Read/Write Synchronization (Modbus function code 0x17) and this function is enabled, PLC will read/write synchronous during data mapping to ensure high efficiency.

- **Remote Device Type**

Select the remote device type from the drop-down list. You can select devices from Delta Electronics or Modbus TCP devices. If you choose a Delta device, you can set registers according to Delta PLC naming rules. The byte and word addresses given are the absolute HEX locations in the device. If the device you are using is not a Delta device, you can select Standard Modbus TCP Device and use the 4 digits Modbus absolute hexadecimal address for the starting register address.

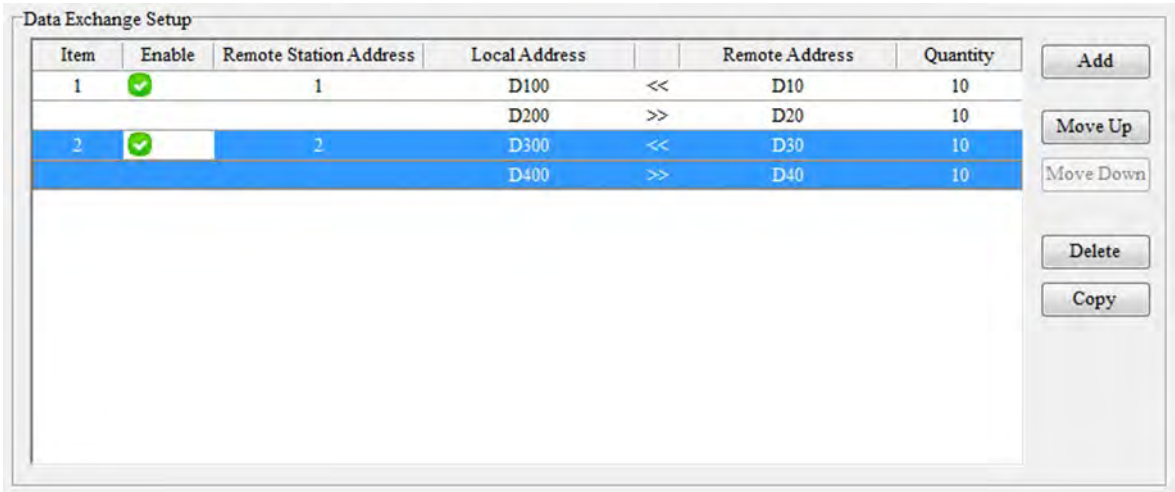
- **Read**

Local Start Address is the starting data register from where PLC stores received data. **Remote Start Address** is the starting data register of the remote device where PLC begins to read. You can set the register type and address according to the device type. **Quantity** is the data length to read; up to 400 Words (6400 Bits) can be set.

- **Write**

Local Start Address is the starting data register from where PLC stores data to be sent. **Remote Start Address** is the starting data register of the remote device where PLC sends data to. You can set the register type and address according to the device type. **Quantity** is the data length to write; up to 400 Words (6400 Bits) can be set.

After the setting is done, click **OK** to confirm the setting. By following this method, you can add more blocks for data mapping.



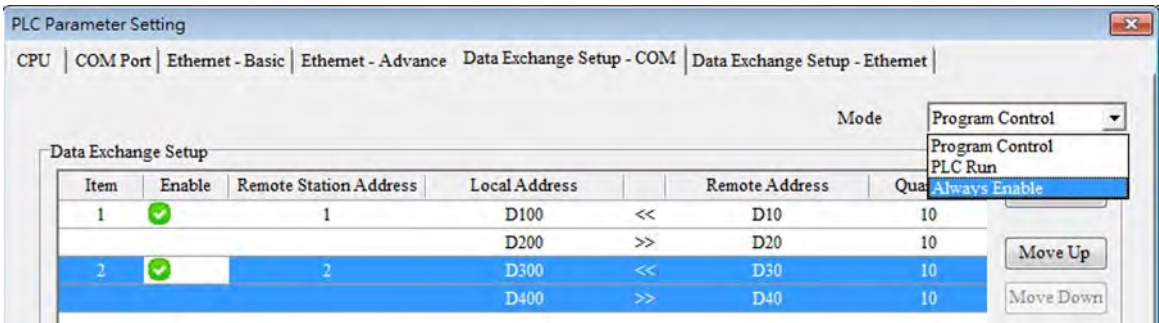
Use the buttons on the right to rearrange the created data in Data Exchange Setup page.

Button	Description
Move Up	Moving the item selected in the table upwards
Move Down	Moving the item selected in the table downwards
Delete	Deleting the item selected in the table
Copy	Copying the item selected in the table, and automatically adding the item which is copied to the bottom of the table

4

*1. The order to perform data mapping is according to the order in the table of Data Exchange Setup page.

After the setting on the order is done, you can use the drop-down list on the upper right corner to select the start mode.



Start Mode	Description
Program Control	It performs data mapping according to the corresponding flags*2 to start or stop data mapping. ON means to starts data mapping.
PLC RUN	It performs data mapping when PLC is in RUN state. .
Always Enable	It performs data mapping constantly when PLC is powered on.

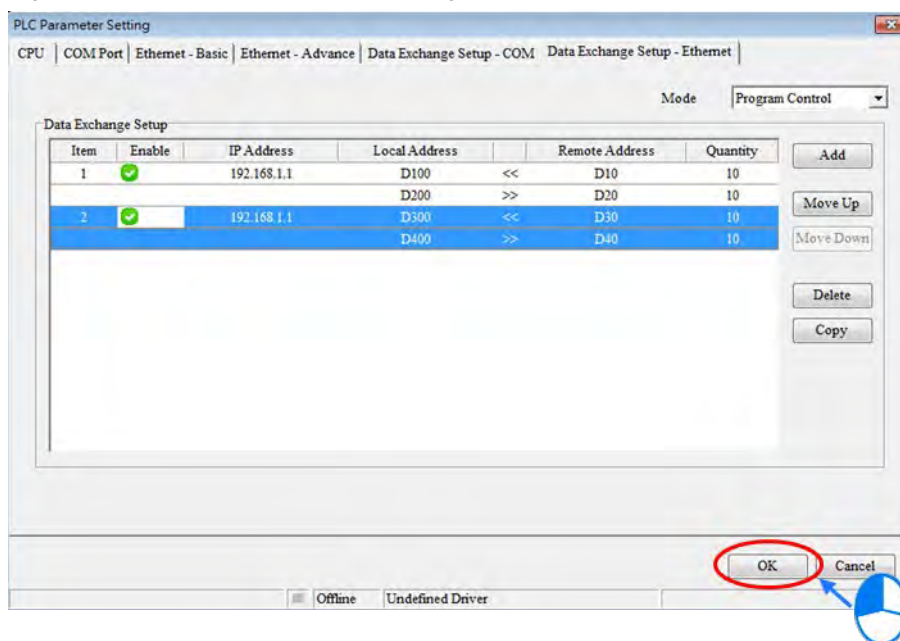
*1. You need to enable Data Mapping function to make the mentioned Start Mode work.



*2. Refer to section 11.3.2.4 in AH500 Operation Manual for the corresponding flags.

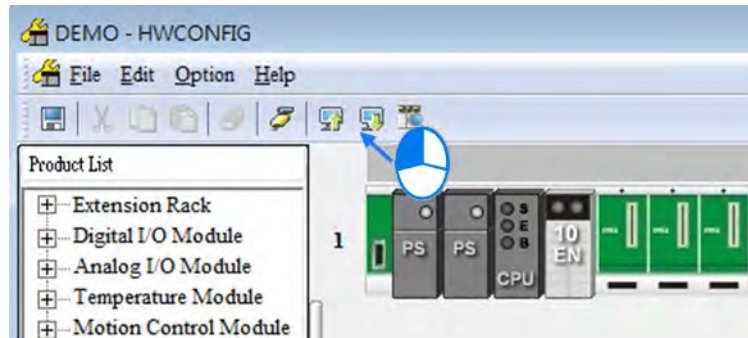
4.2.1.1 Downloading / Uploading Parameters

After the data mapping blocks are set, you need to download the parameters that are set to the PLC. This section briefly introduces the downloading/uploading of the parameters set. Refer to chapter 3 in ISPSOft User Manual for more information. Before downloading the set parameters, you need to make sure that ISPSOft connects to the PLC used normally. Refer to section 2.4 in ISPSOft User Manual for more information on Communication Setting.

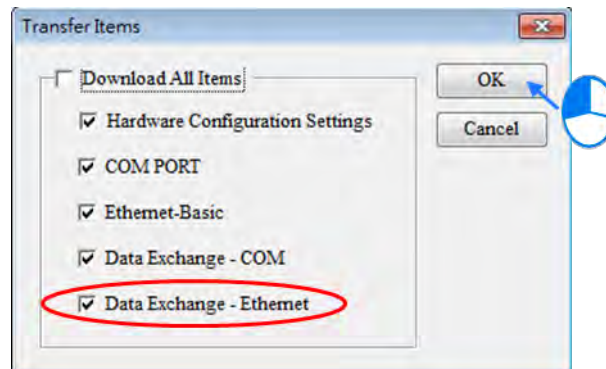
After the setting is done, click **OK** to confirm the setting.



Click the icon  on the tool bar to download parameters and click the icon  on the tool bar to upload parameters.



Select **Data Exchange – Ethernet** and click **OK** to transfer the parameters.



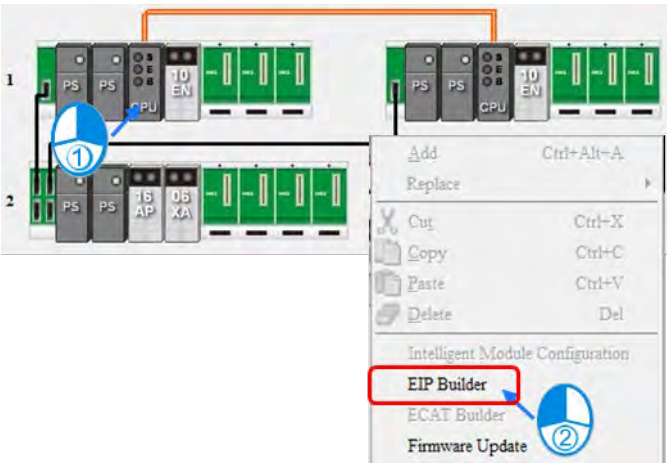
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4.2.1.2 Special Auxiliary Relays

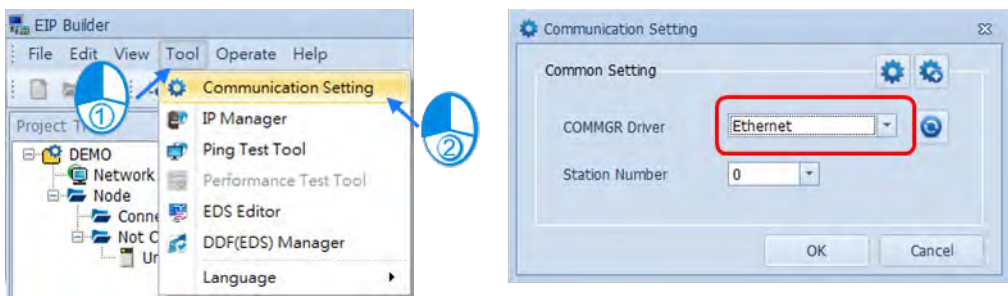
Device	Name	R/W	Description
SM700 SM827	Start the execution of data mapping via Modbus TCP connection 1 Start the execution of data mapping via Modbus TCP connection 128	R/W	ON: start the execution of data mapping via Modbus TCP connection 1 OFF: Stop the execution of data mapping via Modbus TCP connection 128
SM828 SM955	Error flag of data mapping via Modbus TCP connection 1 Error flag of data mapping via Modbus TCP connection 128	R/W	ON: Error occurs during data mapping via Modbus TCP connection 1 OFF: No error occurs during data mapping via Modbus TCP connection 128

4.2.2 Data Mapping Via EtherNet/IP


Open HWCONFIG and right-click CPU icon to open EIP Builder.

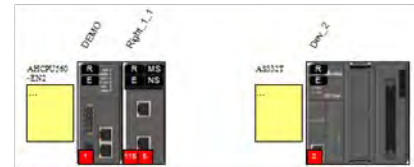
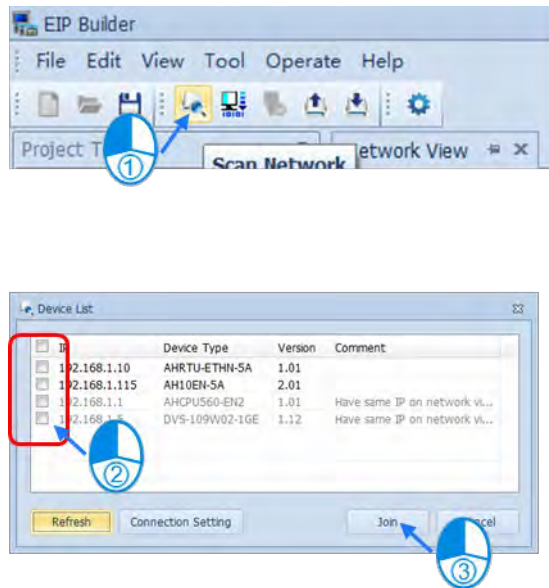


Set communication method for PC to connect to EIP Scanner.

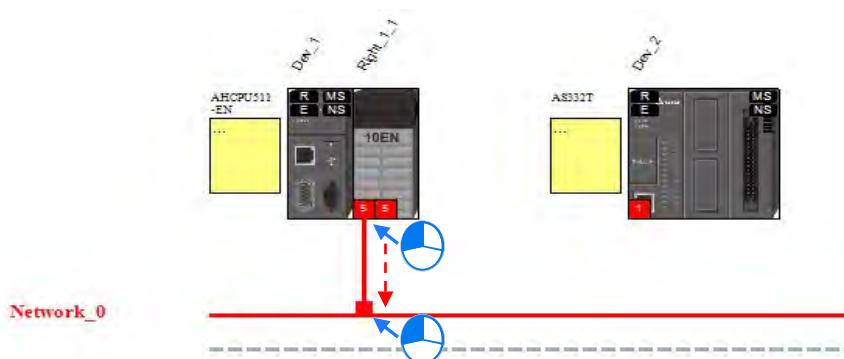


Add devices by scanning the network:

Click Scan Network icon  on the tool bar to see the available devices that can be added to Device List. Select the ones you'd like to add and click **Join**.

**Add devices manually:**

Drag and drop the selected device from the Product List to the Device List.



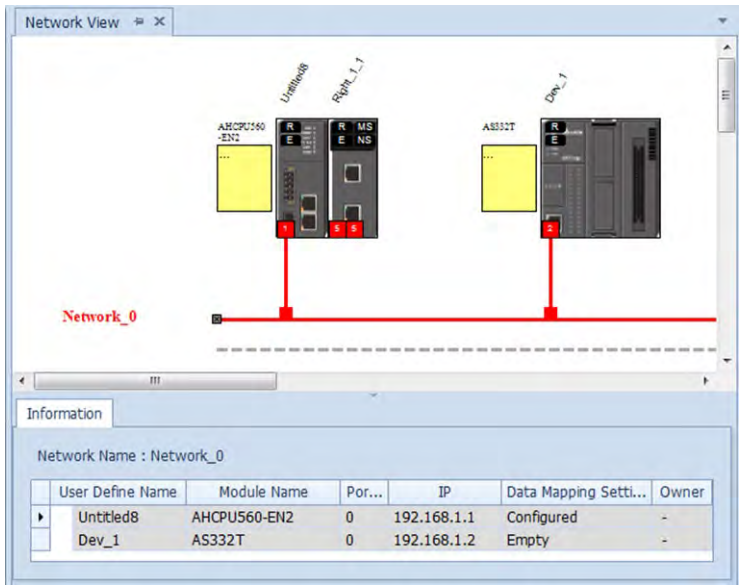
Create Network:

Drag the Ethernet communication port of the device to the network to create connection.



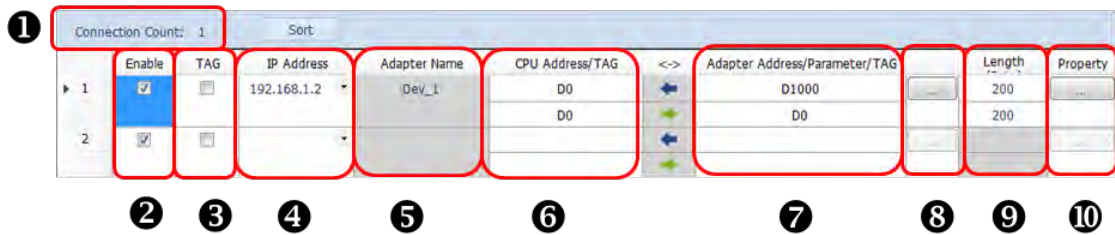
Once the connection is established, click the network line “Network_0”, you will see all the connected devices in this network.

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When the connection between devices is established, users can use the data mapping function to exchange data between devices. This section will provide an overview of how to create a data mapping table.



Descriptions for the Data Mapping:

	Name	Definition
❶	Connection Count	Data mapping connection count; each row represents one independent EtherNet/IP connection. The number of connections cannot exceed the maximum connection number that the Scanner supports. For the AH10EN-5A series, the maximum connection number is 64.
❷	Enable	Enable / Disable the data mapping function
❸	TAG	Use TAGs created to execute data mapping; after selected, this function is enabled and <ul style="list-style-type: none"> ● read only (←) ● registers are not available for the row selected ● the length cannot be modified ● consumed TAG should be created in ISPSoft global symbols beforehand
❹	IP Address	The IP address of the Adapter that you'd like to connect to. After the data mapping connection is established, the system will load the connected device's IP address. Users can also use the drop down list to select the device's IP address to add and edit the connection.
❺	Adapter Name	Once the IP address is selected, its name will be displayed but cannot be modified here. Refer to section 4.3 ❷ for more information on how to change the device name.
❻	CPU Address	Start address of the data mapping's register
	Scanner's register address + address offset (EtherNet/IP modules)	Actual represented register = starting register address + address offset; starting register address can be set on the HWCONFIG setup page.
	If TAG ❸ is selected	Consumed TAG can be selected from the drop-down list
❼	Adapter Address/Parameter	Target adapter's register address / parameters

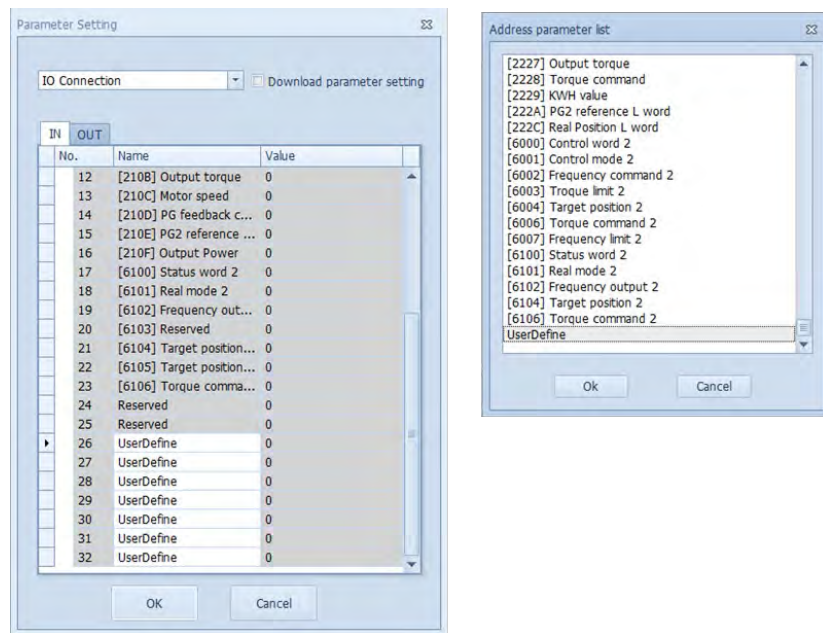
	Name	Definition
	If TAG ⑧ is selected	Input the Produced TAG of the EIP to be connected; the default name is the same as TAG in ⑥.
⑧	I/O Mapping Table	Set up the IN/OUT parameters; when there is no I/O representative table presented for the Adapter, they cannot be opened, for example some PLCs.
⑨	Length	Set up the data mapping length; unit: byte, the maximum is 500 byte.
⑩	Property	Set up the advanced data mapping parameters.

⑧ I/O Mapping Table

Delta EIP devices provide I/O mapping table. If needed, users can use the table to edit the parameters.

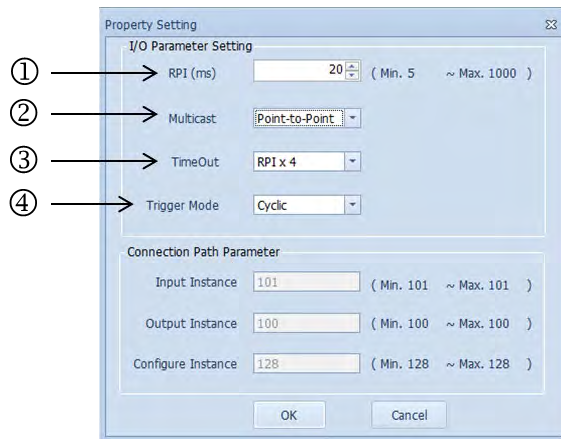
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	Name	Definition
①	Connection	Select the connection from the drop down list. Different connection might have different mapping parameters.
②	In	Input the mapping parameters. The column No. states the maximum number of mapping parameters to input. Double-click the column Name to open the mapping table to edit.
③	Out	Output the mapping parameters. The column No. states the maximum number of mapping parameters to output. Double-click the column Name to open the mapping table to edit.
④	Name	The parameter name; double-click the column Name to open the mapping table to edit.
⑤	Value	Values; after editing and downloading the values will be stored in the Scanner. When the connection is established, the values will be written to the Adapter.



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⑩ Property



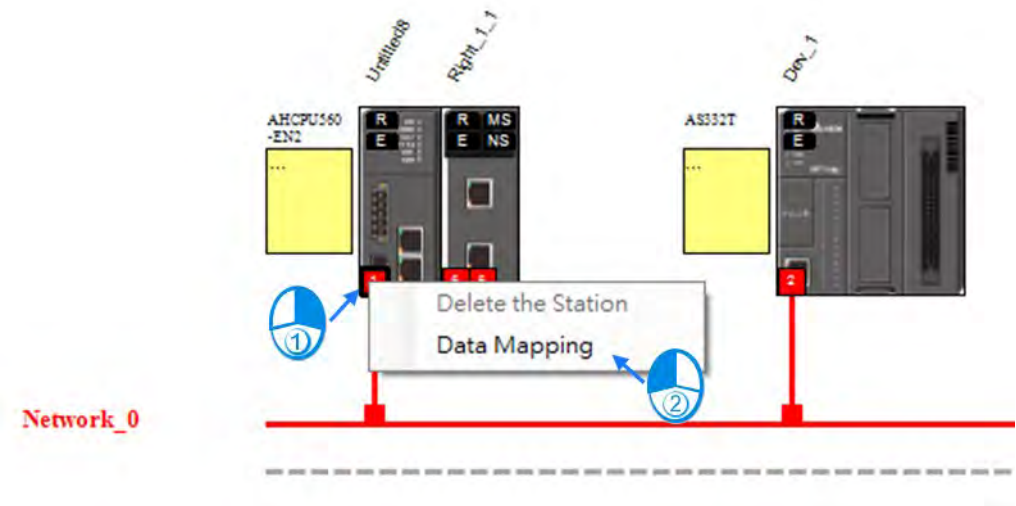
	Name	Definition
①	Requested Packet Interval (RPI)	RPI setup: via the I/O connection to connect to EtherNet/IP to exchange data at regular time intervals, unit: ms
②	Multicast	Communication mode setup: Multicast or Point-to-Point
③	Timeout	Timeout setup; set up the timeout time according to the RPI or the multiple of RPI (RPI*X).
④	Trigger Mode	Trigger Mode: Cyclic, Change of State, and Application Cyclic: renew data cyclically Change of State: renew data once there is any change Application: renew data according to the product setup

4.2.2.1 Create a Data Mapping Table

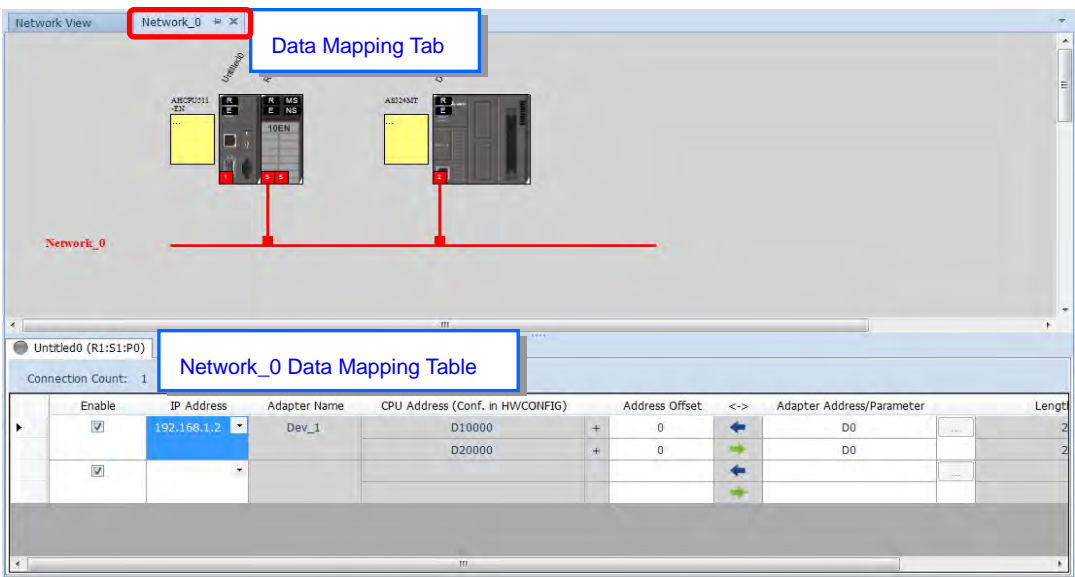
1. Create a data mapping table (※):

Click to select the Scanner Ethernet COM port that you'd like to perform the data mapping and then right-click to see the options. Click Data Mapping to open the Data Mapping Table.

4



2. After the selection is made, the system will create a Data Mapping Tab, shown as Network_0.



4.2.2.2 Set up the Data Mapping Parameters

Type the parameters in the data mapping table

- a) See the example of reading the D1000~D1199 of the Adapter with the IP address 192.168.1.2 to the D100~D299 of the Scanner below.
- b) See the example of writing the D500~D699 of the Scanner to the D2000~D2199 of the Adapter with the IP address 192.168.1.2.

DEMO (P0)

Connection Count: 1 Sort

	Enable	TAG	IP Address	Adapter Name	CPU Address/TAG	<->	Adapter Address/Parameter/TAG	length	p
1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	192.168.1.2	Dev_1	D100	←	D1000	200	
					D500	→	D2000	200	
2	<input checked="" type="checkbox"/>	<input type="checkbox"/>				←			
						→			

MEMO



Chapter 5 AH500 Redundancy System Program Design

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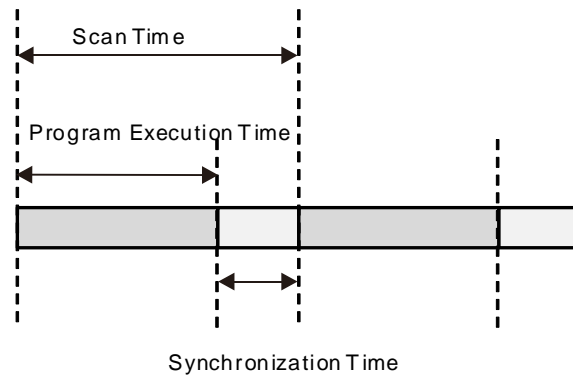
5.1	AH500 Redundancy System Program Design	5-2
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5.1 AH500 Redundancy System Program Design

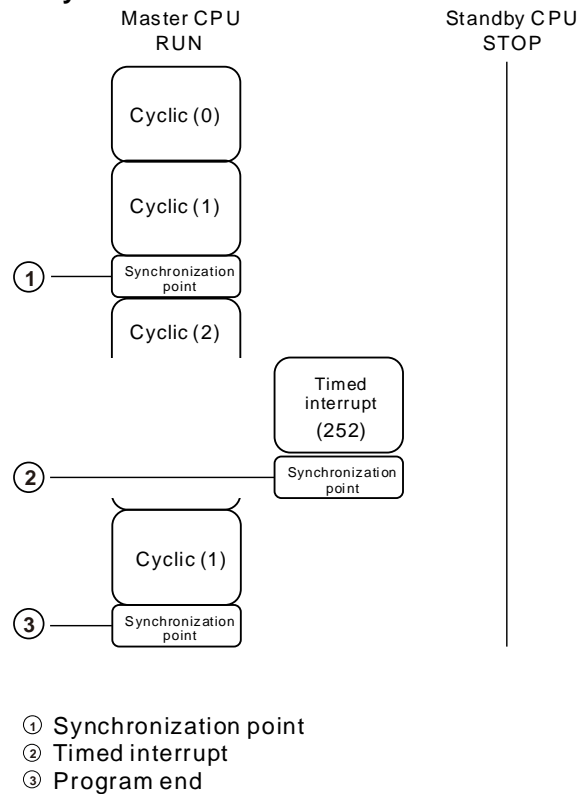
5.1.1 Synchronization

Master CPU synchronizes its parameters, projects with Standby CPU in AH500 redundancy architecture. It also synchronizes all the changed values in devices with Standby CPU during operation to prevent system errors after a switchover. Any of the following three conditions is met can lead to a synchronization, including a program ends, synchronization points that you set in tasks, and timed interrupts. When you set synchronization points in a task, the system performs synchronization on the changed values in devices to ensure the consistency between Master and Standby CPUs. But the more synchronization points you set, the longer the scan time will take.

- **Synchronization and Scan Time**



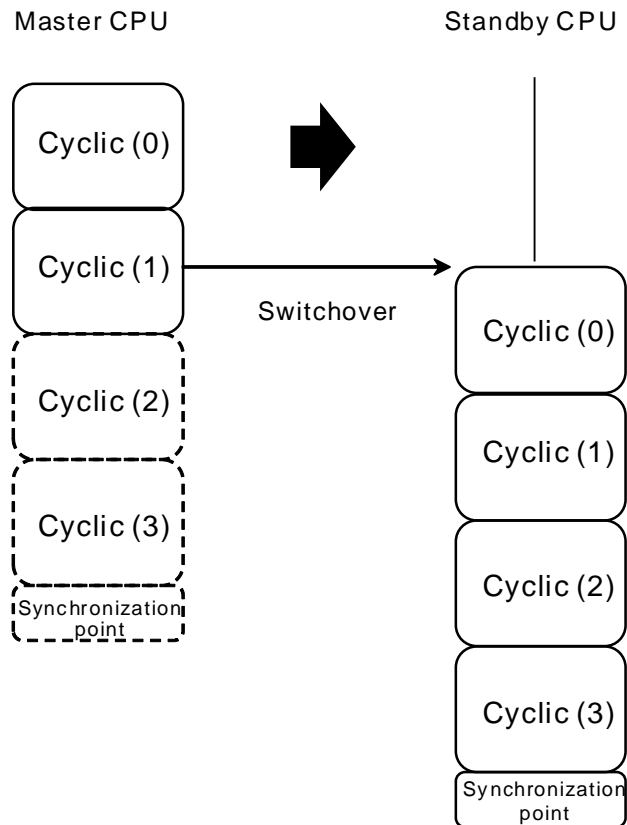
- **Three Conditions for Synchronization**



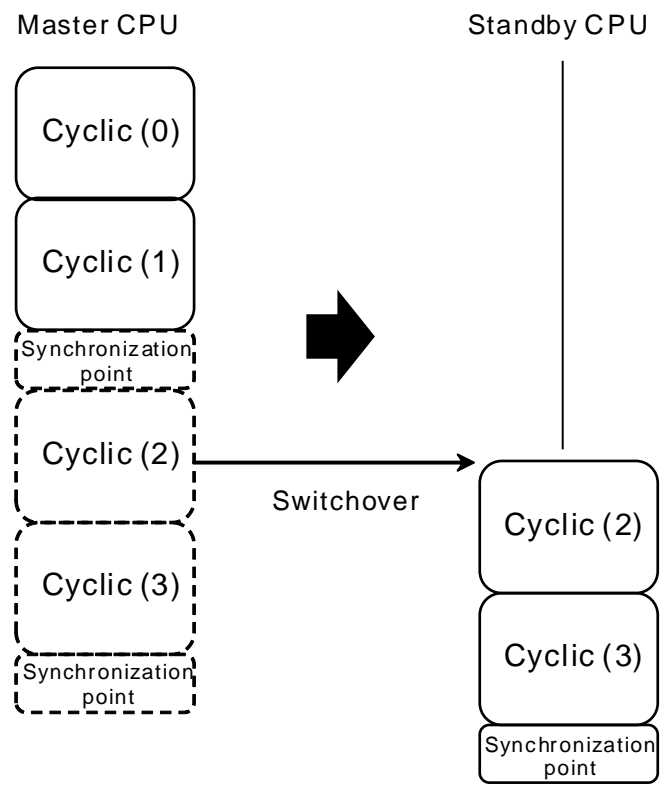
5.1.2 Operation After Switchover

During operation, if a switchover occurs, new Master CPU continues executing at the last synchronization point in AH500 redundancy architecture. How the Standby CPU will operate is according to the conditions set in a program. See the following various conditions in a program and corresponding operations.

- **Switchover occurs during execution of a program without synchronization points or timed interrupts**

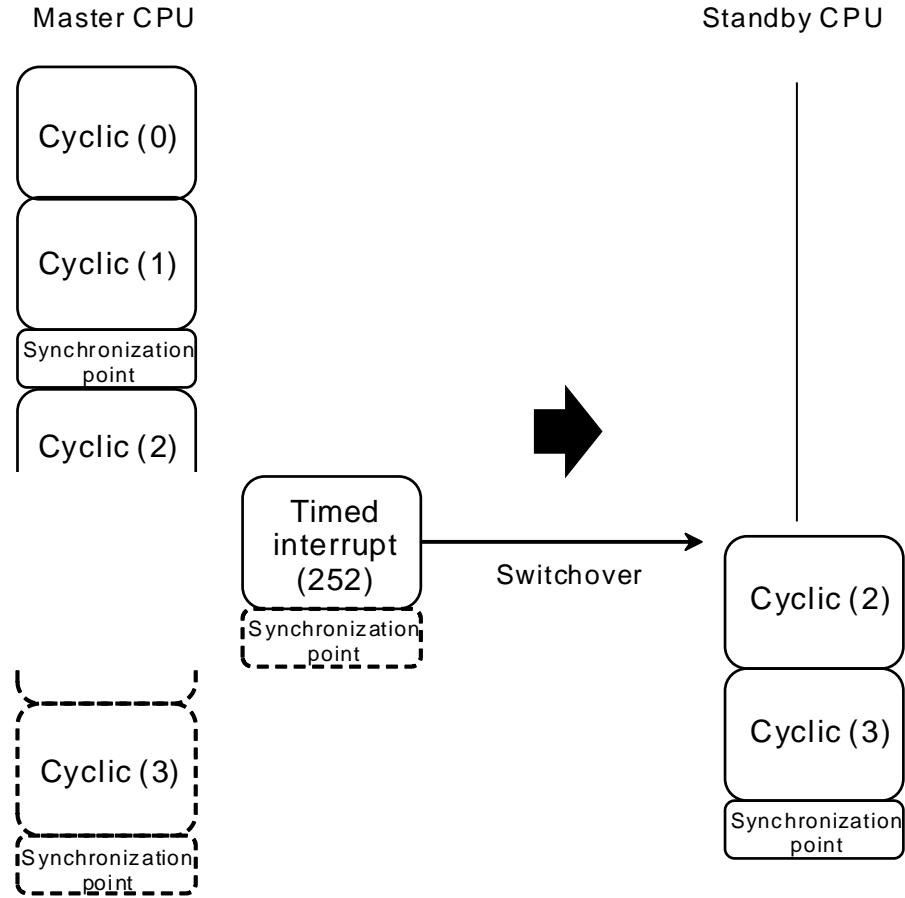


- **Switchover occurs during execution of a program with synchronization points**

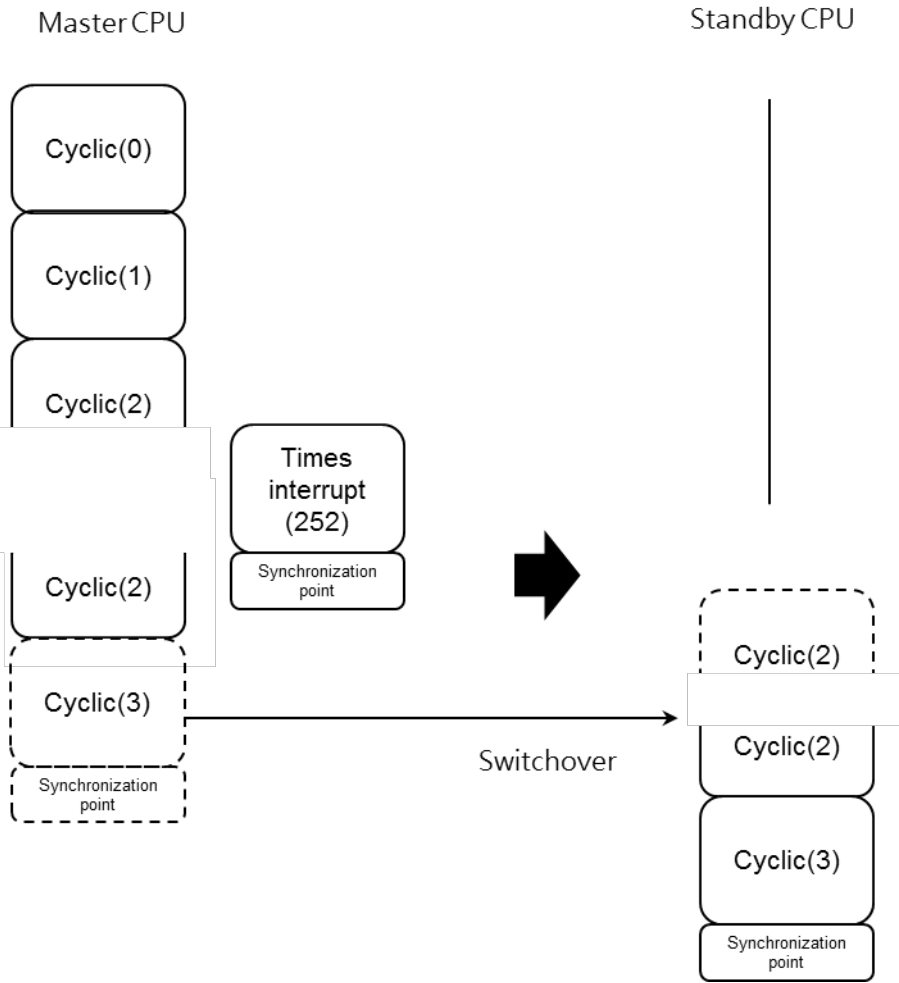


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- **Switchover occurs during execution of timed interrupts**



- **Switchover occurs after execution of timed interrupts**



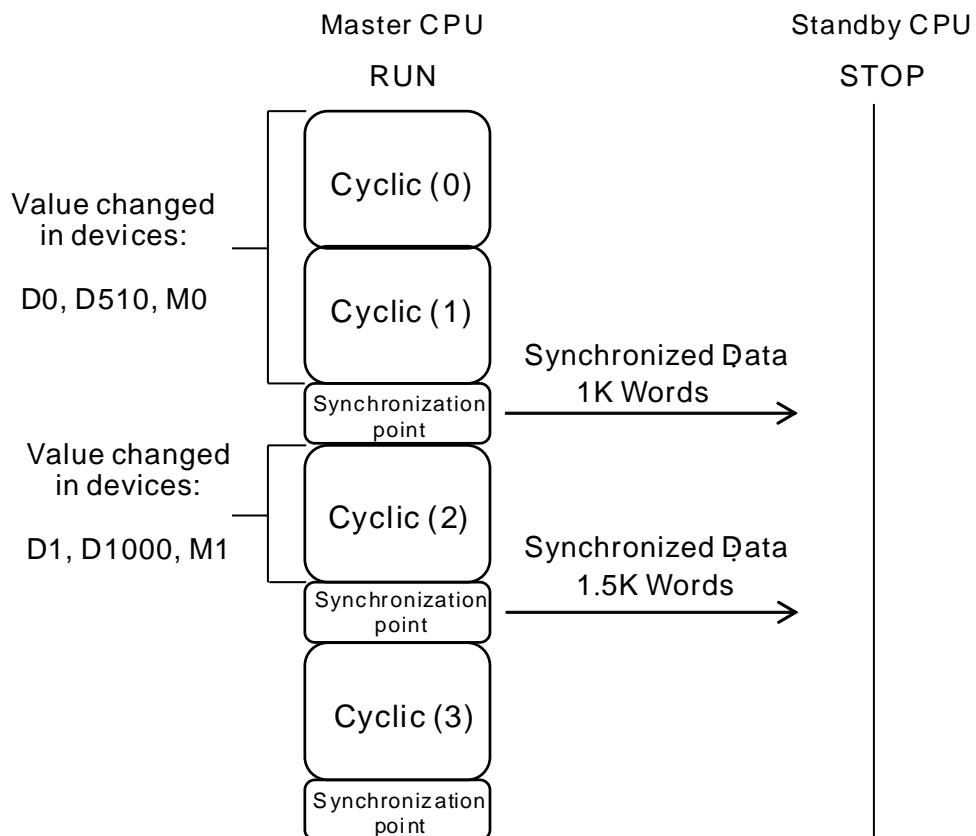
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5.1.3 Amount of Data Device to be Synchronized

The amount of data to be synchronized is according to how different the data is from the last synchronization. The bigger the difference is, the bigger data amount to be synchronized is.

Every data synchronization runs one unit of 512 words. If values in devices D0, D510 and M0 have changed, the system synchronizes devices D0-D511, and M0-M8191. If values in devices D1, D1000 and M1 have changed, the system synchronizes devices D0-D1023 and M0-M8191. You can write data in consecutive devices when programming a redundant system to minimize the synchronization time. You can use the following special register SR24-SR27 to check the synchronized data size.

- SR24, SR25: current synchronized data amount
- SR26, SR27: maximum synchronized data amount



5.1.4 Instructions for Redundancy System

There are two instructions for AH500 redundancy system, including SSOP (API2900) and RCS (API2901) for you to check and program AH500 redundancy system.

- **SSOP (switch to Standby CPU)**

SSOP instruction is used to switch between systems. You can only use this instruction in a working redundancy system. That means there should be a Standby CPU and it should pass the identification check. If there is no other CPU to switch to or the Standby CPU fails to pass the identification check, this instruction cannot be executed and an error code will be generated.

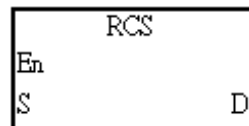


Explanations:

Codes	Descriptions
0	A successful switchover
1	Failed to switch over; the Standby CPU not passing the identification check
2	Failed to switch over; the Standby CPU does not exist

- **RCS (read the Standby CPU information)**

RCS instruction is used to read the Standby CPU information in redundant mode. You can also use this instruction to set the system ID.



Explanations:

S	Description	S+1	Description	D	Description
0	System ID	0	Read the CPU ID	1	The system ID is A.
				2	The system ID is B.
		1	Set the CPU ID to A	Ignorable	
		2	Set the CPU ID to B	Ignorable	
1	Redundant System Status	Ignorable		1	Under identification check
				2	A successful switchover
				3	Redundant function is not enabled.
				4	Standby CPU not passing the identification check
				5	Standby CPU does not exist

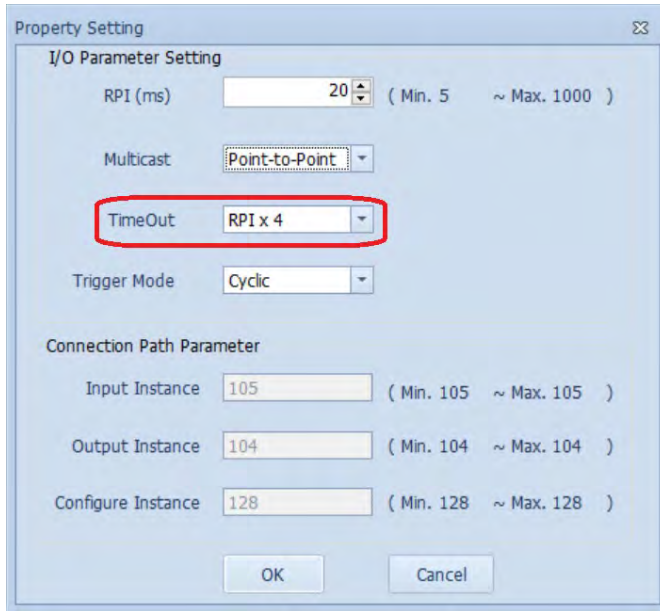
S	Description	S+1	Description	D	Description
2	Power module of Master CPU	Ignorable		1	Power module normal
				2	1 st power module abnormal
				3	2 nd power module abnormal
3	CPU LED	Ignorable		D: Master CPU ; D+2: Standby CPU	
				Bit0	D: Standby CPU does not exist D+2: Master CPU does not exist
				Bit1	RUN LED ON
				Bit2	RUN LED OFF
				Bit3	RUN LED Blinking
				Bit4	ERROR LED ON
				Bit5	ERROR LED OFF
				Bit6	ERROR LED Blinking
				Bit7	BUS FAULT LED ON
				Bit8	BUS FAULT LED OFF
				Bit9	BUS FAULT LED Blinking
				Bit10	SYSTEM LED ON
				Bit11	SYSTEM LED OFF
				Bit12	SYSTEM LED Blinking
				Bit13~ Bit15	Ignorable
				D+1: Master CPU ; D+3: Standby CPU	
				Bit0	MASTER LED ON
				Bit1	MASTER LED OFF
				Bit2	MASTER LED Blinking
				Bit3	SYNC LED (Orange) ON
				Bit4	SYNC LED (Orange) Blinking
				Bit5	SYNC LED (Green) ON
				Bit6	SYNC LED (Green) Blinking
				Bit7	SYNC LED (Red) ON
				Bit8	SYNC LED (Red) Blinking
				Bit9	SYNC LED OFF
				Bit10~ Bit15	Reserved
4	Power module of	Ignorable		0	Standby CPU does not exist
				1	Power module normal

S	Description	S+1	Description	D	Description
5	Standby CPU			2	1 st power module abnormal
				3	2 nd power module abnormal
	Power module of Redundant extension backplane	1	1 st Redundatnt extension backplane	0	Standby CPU does not exist
		2	2 nd Redundatnt extension backplane	1	Power module normal
		3	3 rd Redundatnt extension backplane	2	1 st power module abnormal
		4	4 th Redundatnt extension backplane	3	2 nd power module abnormal
		5	5 th Redundatnt extension backplane		
		6	6 th Redundatnt extension backplane		
		7	7 th Redundatnt extension backplane		

5

5.1.5 EtherNet/IP Connection Timeout Setting

AH PLC CPU will only start EtherNet/IP communication after the program is executed. Thus even if the requested packet interval (RPI) you have set is smaller than the AH PLC CPU scan time, the actual operation cannot run as you have set. To avoid timeout errors, the time of timeout you set for the EtherNet/IP communication should be at least two times bigger than the scan time of the AH PLC CPU.



5.1.6 SM/SR Table (Synchronization)

Every special auxiliary relay (SM) and special data register (SR) have their definitions and specific functions. You need to refer to the SM/SR table while writing the program to see if the SM/SR to be used will be synchronized to the Standby CPU or not and what the consequences are after the CPU switch, for instance, what action should be taken in order to maintain the system operation.

SM	Description
SM106	COM1 8/16-bit mode selection; ON: 8-bit; OFF: 16-bit
SM206	No output is allowed
SM402	Enable forward pulse (ON: the moment start to RUN)
SM403	Enable backward pulse (OFF: the moment start to RUN)
SM600	Zero flag
SM601	Borrow flag
SM602	Carry flag
SM604	Workmode setting for the instruction SORT (ON- by descending order; OFF- by ascending order)
SM605	Workmode setting for the instruction SMOV
SM606	8/16-bit wordmode selection
SM607	Matrix comparison flag. ON: Comparing the equivalent values OFF: Comparing the different values
SM608	Matrix comparison complete flag When the last bits are compared, the matrix comparison is complete. This flag is ON.
SM609	Matrix comparison start flag When this flag is ON, the comparison starts from bit 0.
SM610	Matrix bit search flag When the bit is found, the searching stops immediately, and this flag is ON.
SM611	Matrix pointer error flag When the value of the pointer exceeds the comparison range, this flag is ON.
SM612	Matrix pointer increment flag The current value of the pointer incremented by one.
SM613	Matrix pointer clearing flag Clear the current value of the pointer to zero
SM614	Carry flag for the matrix rotation/shift/output.
SM615	Borrow flag for the matrix shift/output.
SM616	Direction flag for the matrix rotation/shift The bits are shifted leftward when this flag is OFF, whereas the bits are shifted rightward when

SM	Description
	this flag is ON.
SM617	The bits with the value 0 or 1 are counted.
SM618	This flag is ON when the matrix counting result is 0.
SM619	This flag is ON when the instruction EI is executed.
SM620	When the results, obtained from the CMPT# comparison instruction, are that all devices are outputted, this flag is ON.
SM621	HC0 counting mode setting (Counts down when this flag is ON.)
~	~
SM684	HC63 counting mode setting (Counts down when this flag is ON.)
SM685	The instruction DSCLP uses the floating-point operation.
SM686	Mode setting of the instruction RAMP
SM687	The execution of the instruction RAMP is complete.
SM688	The execution of the instruction INCD is complete.
SM690	String control mode
SM691	The input mode of the instruction HKY is the 16-bit mode. The input is the hexadecimal input if this flag is ON, whereas A~F are function keys if it is OFF.
SM692	After the execution of the instruction HKY is complete, this flag is ON for a scan cycle.
SM693	After the execution of the instruction SEGL is complete, this flag is ON for a scan cycle.
SM694	After the execution of the instruction DSW is complete, this flag is ON for a scan cycle.
SM695	It is the radian/degree flag. ON: The degree

SR	Description
SR408	When the PLC runs, the value in SR408 increases by one every scan cycle. SR408 counts from 0 to 32767, and then from -32768 to 0.
SR409	The pulse is ON for n seconds and is OFF for n seconds during the 2n second clock pulse. The interval n is stored in SR409, and the setting range is 1~32767.
SR410	The pulse is ON for n milliseconds and is OFF for n milliseconds during the 2n millisecond clock pulse. The interval n is stored in SR410.
SR623 ~ SR638	Bit 0~bit 15: The conditions of the interrupt programs I0~I255 are set by the instruction IMASK.

SR	Description
SR1118 ~ SR1221	TCP Socket 1~8-- The local communication port
	TCP Socket 1~8-- The high word in the remote IP address
	TCP Socket 1~8-- The low word in the remote IP address
	TCP Socket 1~8-- The remote communication port
	TCP Socket 1~8-- The length of the data transmitted
	TCP Socket 1~8-- The high word in the address of the data transmitted
	TCP Socket 1~8-- The low word in the address of the data transmitted
	TCP Socket 1~8-- The length of the data received
	TCP Socket 1~8-- The high word in the address of the data received
	TCP Socket 1~8-- The low word in the address of the data received
	TCP Socket 1~8-- The time for which the connection has been persistent
	TCP Socket 1~8-- The received data counter
	TCP Socket 1~8-- The transmitted data counter
SR1222 ~ SR1317	UDP Socket 1~8-- The local communication port
	UDP Socket 1~8-- The high word in the remote IP address
	UDP Socket 1~8-- The low word in the remote IP address
	UDP Socket 1~8-- The remote communication port
	UDP Socket 1~8-- The length of the data transmitted
	UDP Socket 1~8-- The high word in the address of the data transmitted
	UDP Socket 1~8-- The low word in the address of the data transmitted
	UDP Socket 1~8-- The length of the data received
	UDP Socket 1~8-- The high word in the address of the data received
	UDP Socket 1~8-- The low word in the address of the data received
	UDP Socket 1~8-- The time for which the connection has been persistent
	UDP Socket 1~8-- The received data counter
	UDP Socket 1~8-- The transmitted data counter
SR1318	Socket input counter
SR1319	Socket output counter
SR1320	Socket error counter

6

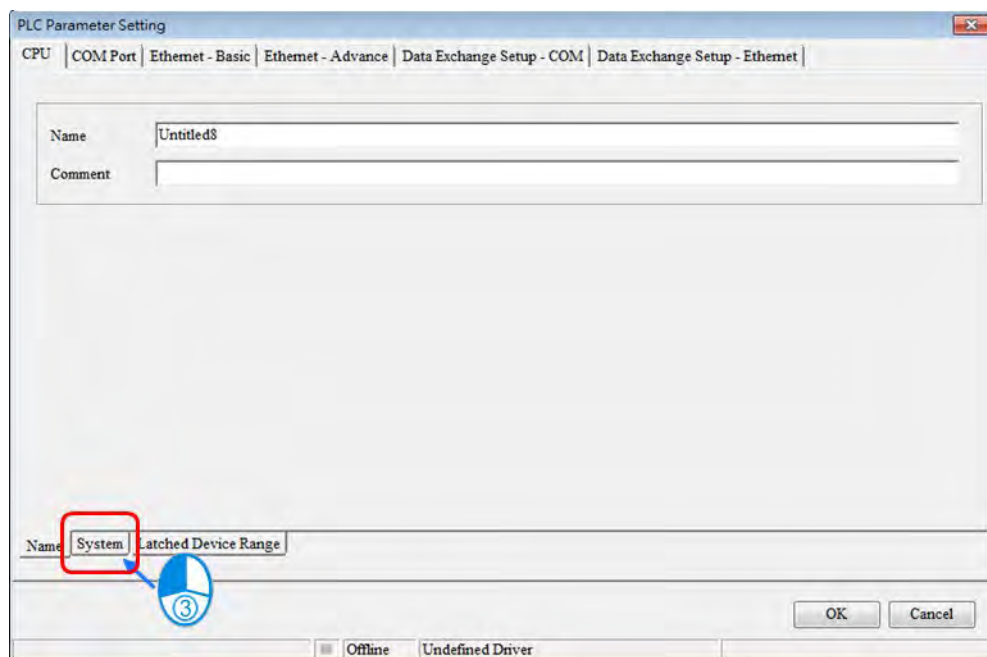
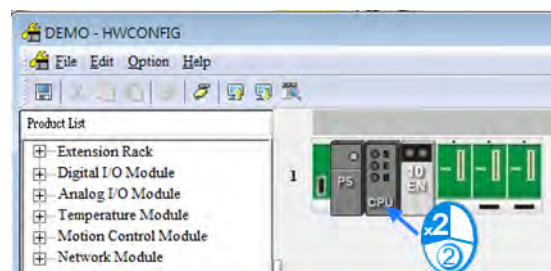
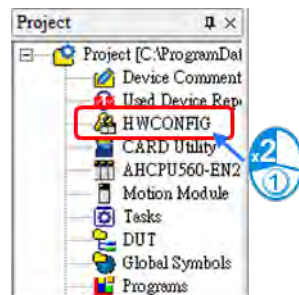
Chapter 6 Configuring Redundancy System in ISPSOft

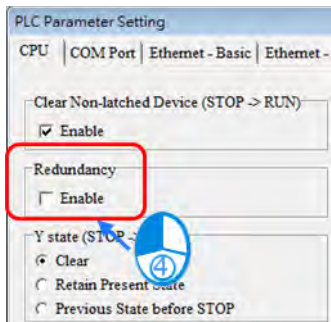
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6.1 Starting Redundancy

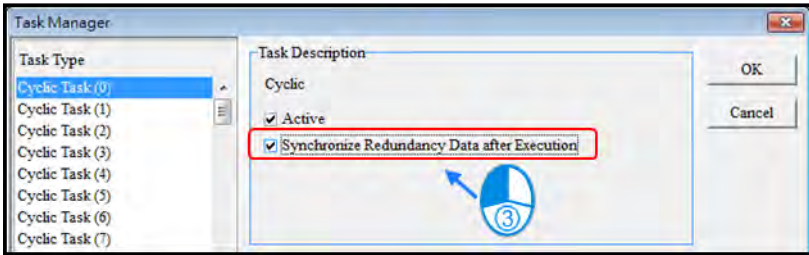
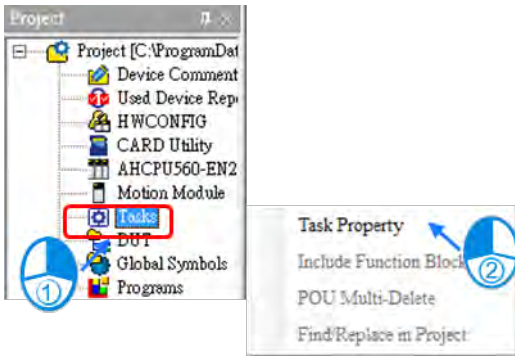
Once AH500 redundant architecture is ready, you can go to **ISPSoft -> HWCONFIG -> CPU Module -> PLC Parameter Setting -> System** and tick the Redundancy option to enable this function. And then download the project to AH redundant Master CPU to start the redundant mode.





6.2 Setting Synchronization Points

You can set up when to start synchronization and ensure when Standby CPU takes over, the devices in Master and Standby CPU are identical. Be aware that too many synchronization points may increase program scan time.



6

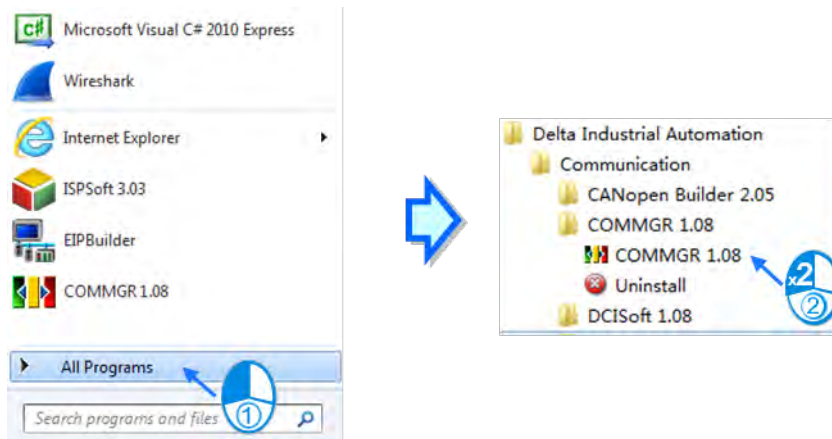
6.3 Creating Connection

You need to create a connection to ISPSoft before downloading the program and parameters to the PLC. The following example uses AHCPU560-EN2 to demonstrate the connection to ISPSoft created with a USB terminal. For other types of connection, you can refer to section 2.4 from ISPSoft User Manual for more information. For the wiring, you can refer to the operation manuals of each series.

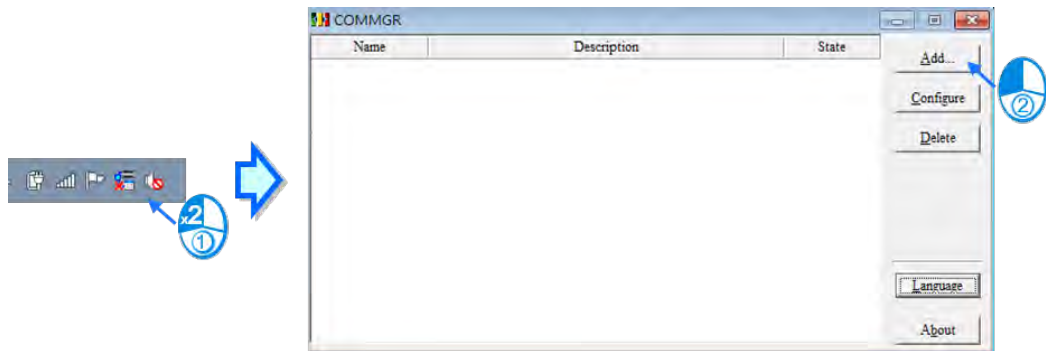
1. Make sure the module is correctly installed on the backplane of the PLC and the number of the slot you installed the module on is the same as what you have configured in HWCONFIG. After that you can have the PLC power on.
2. Connect the PLC to your PC (with ISPSoft installed) with a USB terminal. If you have installed AH560 USB driver, you can find the option of Silicon Lab CP210x USB to UART Bridge with a assigned COM Port number in the Windows device management. Refer to Appendix A from ISPSoft User Manual for more information on USB connection.



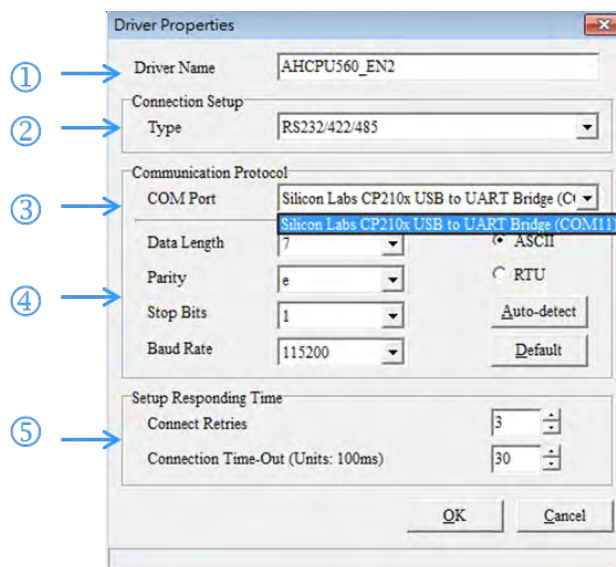
3. Make sure your COMMGR is installed and activated. If not, go to **All Program** and find **Delta Industrial Automation -> Communication -> COMMGR** and double click **COMMGR** to install.



4. Double-click the COMMGR icon on the system bar to open the COMMGR setting window. Click **Add** to add a new driver in.

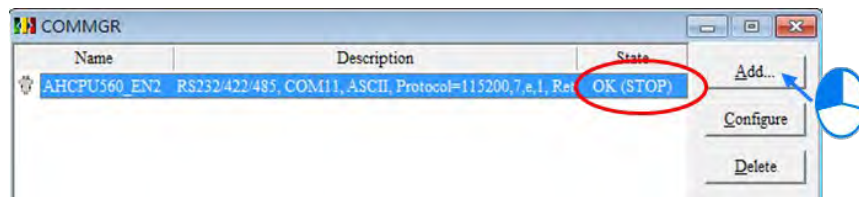


5. Set up a driver by entering relevant parameters on the Driver Properties page and click **OK** to confirm the settings.

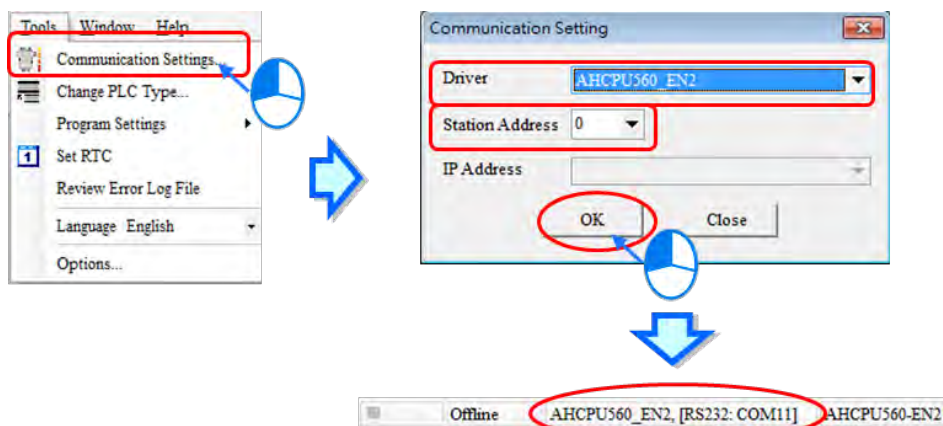


- ① **Driver Name:** Type the **Driver Name** in the box.
- ② **Connection Setup:** Select **RS232/422/485** from the drop-down list.
- ③ **COM Port:** Select the desired port for communication from the drop-down list. If above-mentioned steps are confirmed, you can find the connected PLC device name and COM Port number.
- ④ **Data Length:** Select 7.
Parity: Select e.
Stop Bits: Select 1.
Baud Rate: Select 115200.
- ⑤ To setup parameters concerning responding time. For **Connect Retries**, users need to setup the number of retry once connection error occurs, while for **Connection Time-Out** setting, the parameter concerns the time interval between retries.

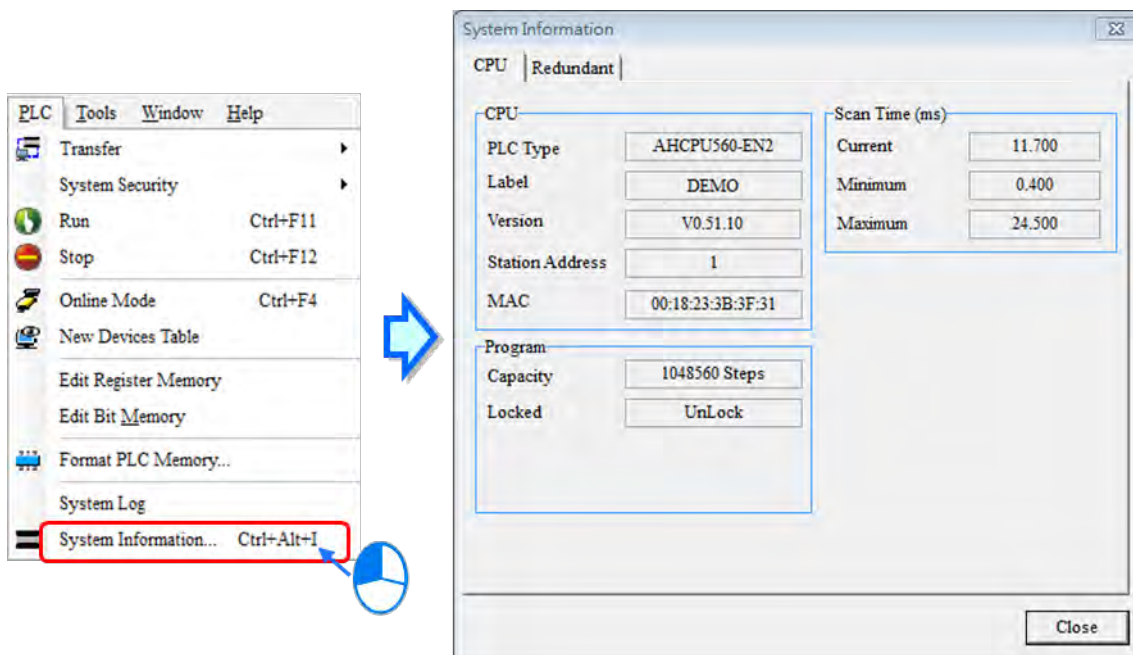
- Before adding this driver in, make sure the status of the driver is **OK**. After that you can close the window and COMMGR is still activated in your Windows system.



- Go to **Tool -> Communication Setting** and double-click **Communication Setting** to open the setting page. Select the driver you have created from the drop-down list of Driver and keep the Station Address to 0 and then click **OK**. After that you can find the current setting in the status bar.

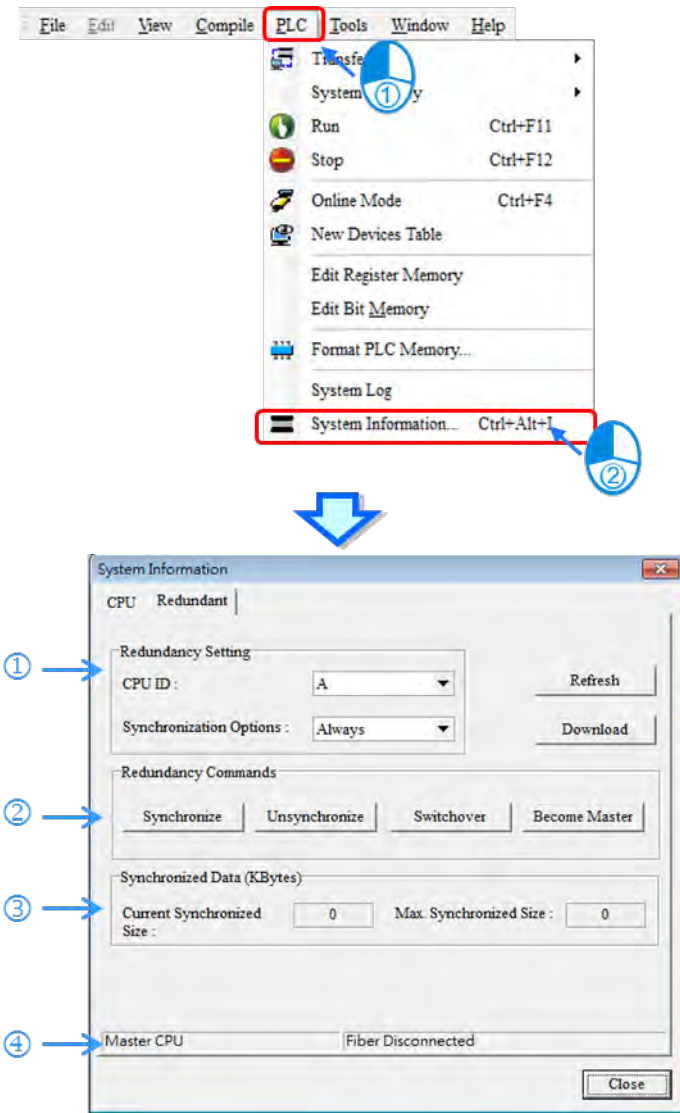


- Go to **PLC -> System Information** and double-click **System Information** to open the information page. If you have successfully created the connection, the detailed information displays here.



6.4 Redundant System Information

From the system information, you can check the redundant system status and relevant settings. This page is only available when the system is in redundant mode.



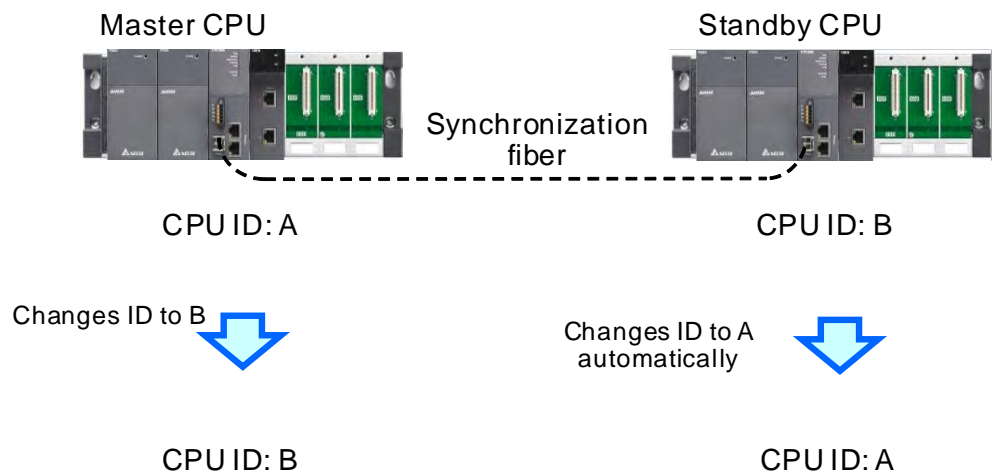
	Type	Description
①	Redundancy Setting	Redundancy system settings
②	Redundancy Commands	Redundant function keys
③	Synchronized Data	Current amount of data being synchronized
④	System Status	Status of Master / Standby CPU

6.4.1 Configuring Redundancy System

- **CPU ID**

You can use CPU ID to identify if the CPU has been switched from Master to Standby. This ID can be set and read in this setting page as well as by RCS instruction (API2901).

Note: when you use a synchronization fiber to connect two CPUs, their IDs should be different. When one CPU changes its ID, the other CPU changes to the other ID automatically.



- **Synchronization settings:**
Checking Types

	Type	Description
1	Identification check	Master CPU performs identification check before synchronization to make sure Standby CPU is capable of handling tasks once Master CPU is down.
2	Cyclic check	During operation, Master CPU performs identification checks regularly to make sure Standby CPU is capable of handling tasks once Master CPU is down.
3	Communication	External devices can communicate with the CPU
4	Synchronization	Synchronization between Master and Standby CPU

Synchronization Types:

Synchronization	Identification Check	Cyclic Check	Communication	Data to be synchronized
Always	1. Firmware version 2. Module configurations of the main backplane 3. If connected to the same network (the system checks the identification automatically)	1. Any serious error occurs in the system 2. Any Bus fault 3. If connected to the same network 4. If the Standby CPU existed	Master CPU	1. Project 2. Module configurations 3. Device values
Conditional	Firmware version (you need to check the identification manually by enabling synchronization)	1. Any serious error occurs in the system 2. If the Standby CPU existed	Master / Standby CPU	Device values

6.4.2 Redundancy Commands

Actions	Description
Synchronize	Master CPU performs identification check; if the identity of Standby CPU is matched, the synchronization begins.
Unsynchronize	When synchronization is disabled, the identity of Standby CPU is temporarily cancelled.
Switchover	If the identity of Standby CPU is matched, a switchover from Master CPU to Standby CPU takes place and continues to execute program.
Become Master	If Master CPU is not existed, Standby CPU takes over and becomes Master CPU.

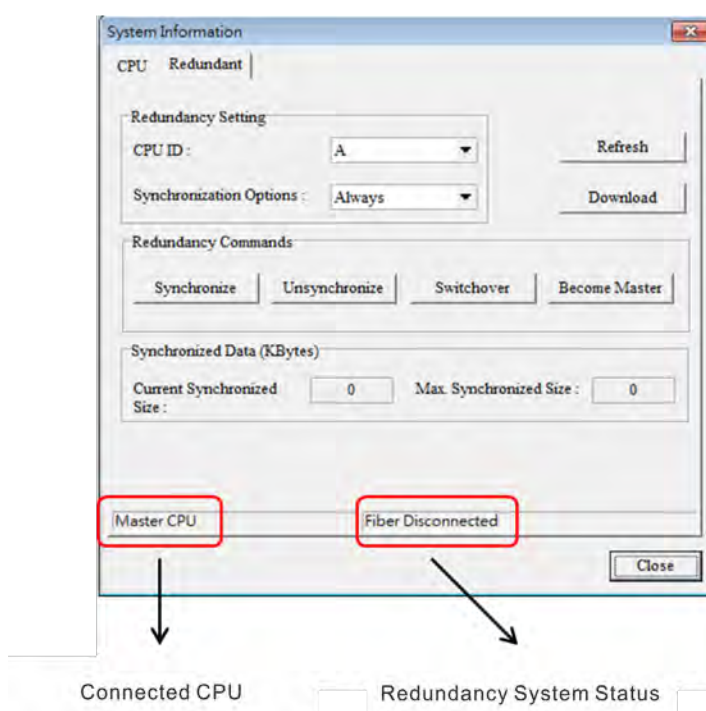
6.4.3 Synchronized Data

Here displays current synchronized data amount (kbytes) and maximum synchronized data amount (kbytes).

You can also use special register SR24-SR27 to check the synchronized data size.

6.4.4 System Information

Here shows the connected CPU is a Master or a Standby CPU. And the redundancy system status is also presented here.

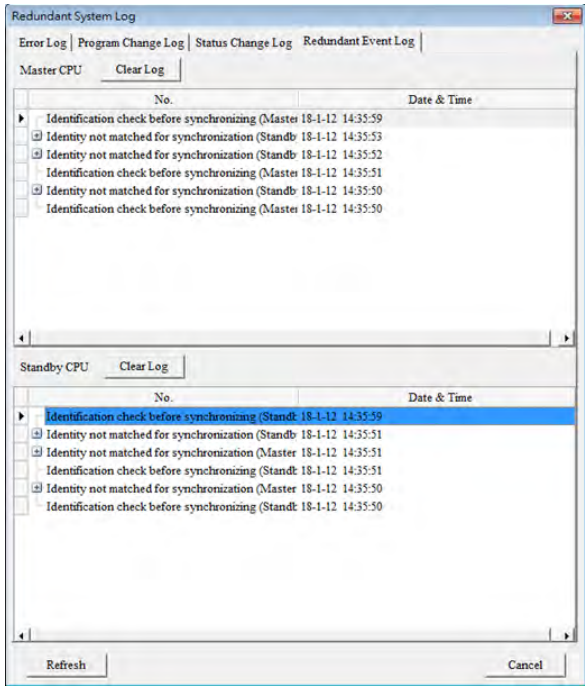


	Connected CPU	Redundancy System Status
1	Master CPU	Redundancy system checking
2	Standby CPU	Redundancy system is ready
3	-	Single mode
4	-	Redundancy system is failed
5	-	Fiber Disconnected

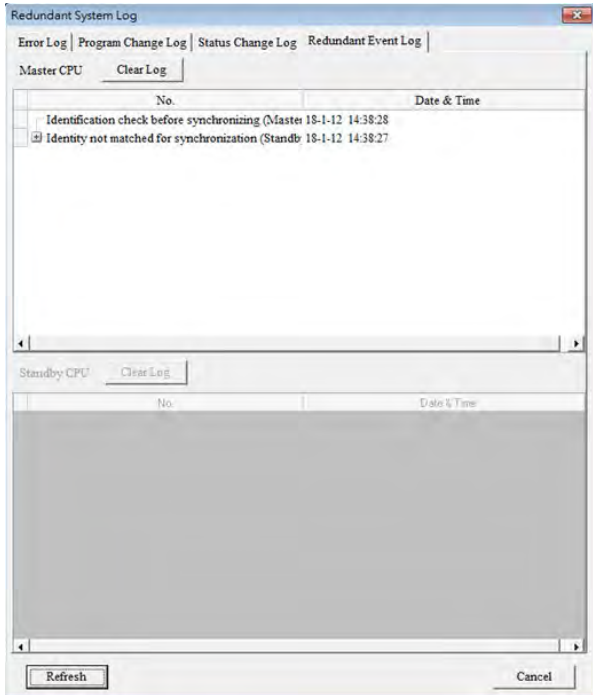
6.5 Redundant System Log

The system log includes Error Log, Program Change Log, Status Change Log and Redundant Event Log. Each page is divided into two parts, upper part: logs for Master CPU and lower part: logs for Standby CPU. If there is only one connected CPU, the page only contains one part, logs for Master CPU.

- Two CPUs are connected by a synchronization fiber



- Only one connected CPU



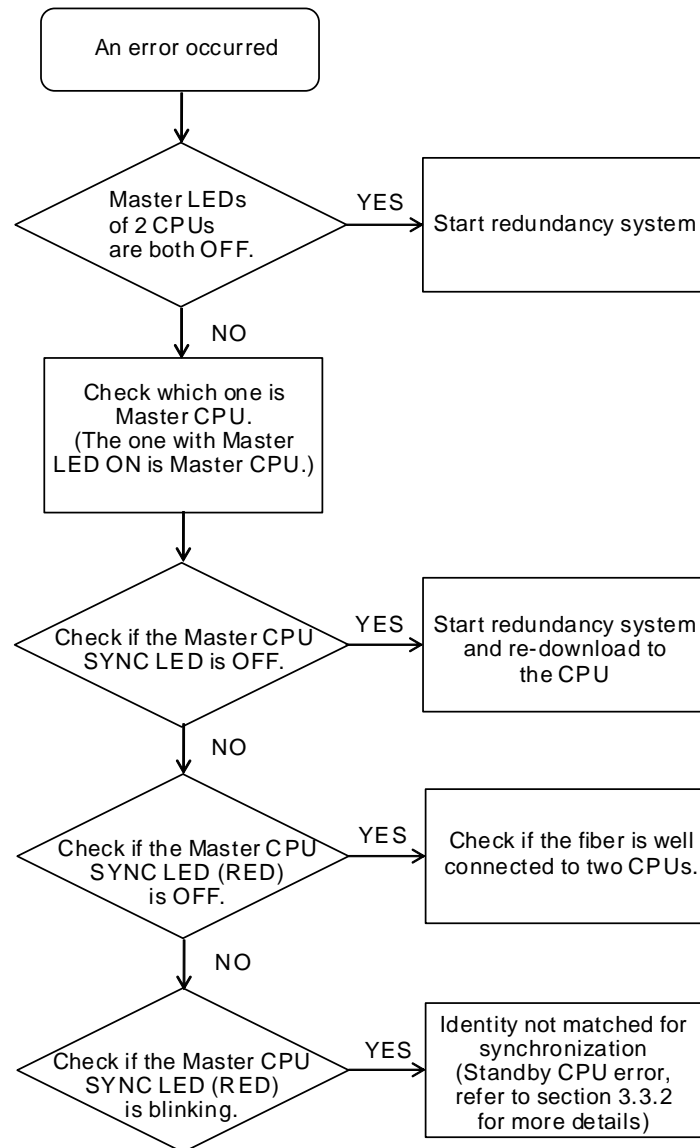
Chapter 7 Troubleshooting

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7.1 AH500 Redundancy Troubleshooting SOP

When an error occurs in AH500 Redundancy System, you can check the LEDs on the CPUs / modules and the event log in HWCONFIG to determine what may cause the error. This section introduces the troubleshooting on redundancy systems; for troubleshootings on CPUs, refer to section 7.2 for more details.



7.1.1 LED Indicator

- **Power Module**

Indicator	Description	Solution
POWER	Operating status of the module	-
	ON: the module is running.	-
	OFF: the module has low voltage or no power.	Check if the external power supply is normal; if it is working properly, change the power module.

- **AH500 Redundancy System**

Indicator	Description	Solution
ERROR	CPU error	-
	ON: a serious error occurs in the module.	(Note 1)
	OFF: the module is normal.	-
	Blinking: a minor error occurs in the module.	(Note 1)
BUS FAULT	I/O Bus error	-
	ON: a serious error occurs in the I/O Bus.	(Note 1)
	OFF: the I/O Bus is normal.	-
	Blinking: a minor error occurs in the I/O Bus.	(Note 1)
SYSTEM	Indicates the system status of the CPU	-
	ON: external I/O is locked	-
	OFF: system in default	-
	Blinking: reset/clear	-
COM	Indicates the communication status of the COM port.	-
	OFF: no communication over the COM port	-
	Blinking: communication over the COM port	-
MASTER	Indicates the system is in redundant mode	-
	ON: Master CPU in redundant mode	-
	OFF: Standby CPU in redundant mode / single mode	-
SYNC	Indicates the synchronization status of the redundancy system	-
	ON (Green): in synchronization mode	-
	Blinking (Orange): identification check	-
	ON (Red): fiber disconnected	Check if fiber is well-connected.
	Blinking (Red): identification check failed	Check the identification rules. (Note 2)
	OFF: single mode	

Note 1: refer to section 7.2.6 Troubleshooting for AH500 Redundancy System

Note 2: Refer to section 3.3 Establishing AH500 Redundancy System

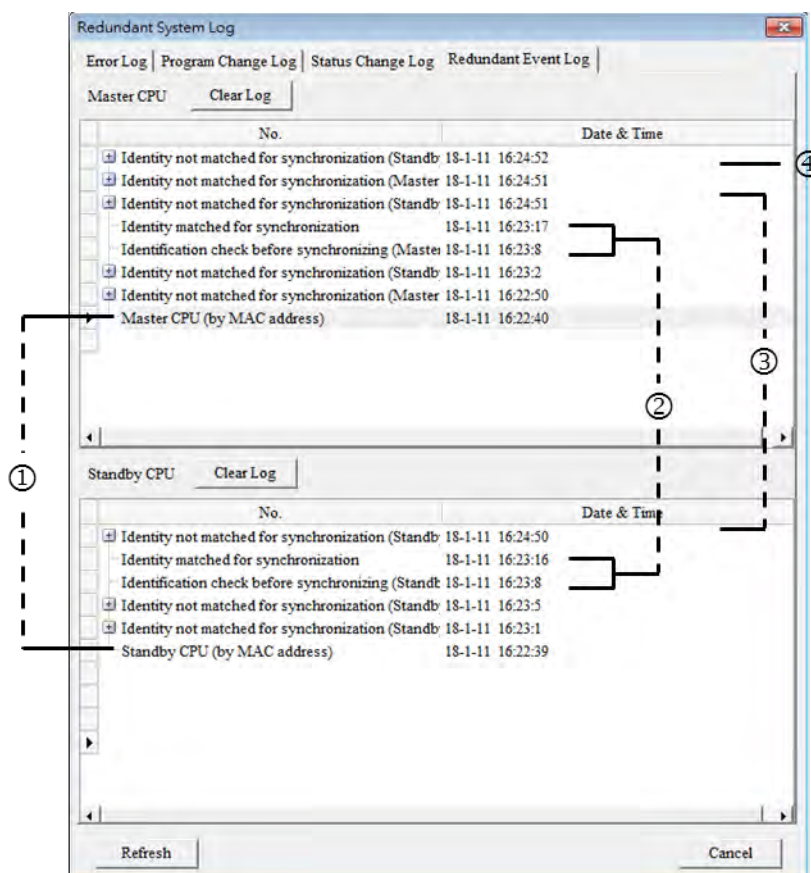
- **AH module: refert to AH500 module manual**

7.1.2 Online Diagnosis

You not only can configure modules in HWCONFIG offline, but also can operate and inspect the system through the Online Mode function if ISPSOft is connected to the CPU module. Since HWCONFIG adopts the communication setting in ISPSOft, you have to make sure that ISPSOft is connected to the CPU module normally before the Online Mode function is enabled. (refer to section 3.7.6 in ISPSOft Manual for more details)

7.1.3 Redundant System Log

If you cannot establish the redundancy system or errors occur during switchover, you can check the redundant system log for explanaitons on reasons why errors occur.



Item	Description
①	Whether it is Master or Standby CPU is determined by the MAC address
②	Master CPU checks the identification of Standby CPU during synchronization.
③	Since the parameters of I/O module (Standby CPU) are not identical to the parameters of Master CPU, the identification check failed.
④	Master CPU checks the identification of Standby CPU during synchronization. But the parameters of I/O module (Standby CPU) are not identical to the parameters of Master CPU, the identification check failed.

- **Event ID List**

Item	Description	Master CPU	Standby CPU
1	Master CPU (by function enable rule)	V	
2	Master CPU (by power-up order)	V	
3	Master CPU (by project)	V	
4	Master CPU (by module configuration)	V	
5	Master CPU (by MAC address)	V	
6	Master CPU (no Standby CPU)	V	
7	Becomes Master CPU (by redundancy commands)		V
8	Master CPU (by ruling out system error)	V	
9	Standby CPU (by function enable rule)		V
10	Standby CPU (by power-up order)		V
11	Standby CPU (by project)		V
12	Standby CPU (by module configuration)		V
13	Standby CPU (by MAC address)		V
14	Standby CPU (by ruling out system error)		V
15	Identity matched for synchronization (Master CPU)	V	
16	Identity matched for synchronization (Standby CPU)		V
17	Synchronization complete	V	V
18	Identity not matched for synchronization (Master CPU error)	V	V
19	Identity not matched for synchronization (Standby CPU error)	V	V
20	Cancel a synchronization (by redundancy commands)	V	V
21	Switchover (by redundancy commands)	V	V
22	Switchover (API SSOP)	V	
23	Switchover (Master CPU error)	V	
24	Standby CPU becomes Master (by Master CPU commands)		V
25	Standby CPU becomes Master (no Master CPU is present)		V
26	Switchover (Power error)	V	
27	Standby CPU becomes Master (by Standby CPU commands)	V	
28	Master CPU and identity matched Standby CPU	V	
29	Master CPU and without identification checked	V	

Item	Description	Master CPU	Standby CPU
	Standby CPU		
30	Master CPU and identity not matched Standby CPU	V	
31	No Standby CPU is present	V	
32	Identities matched Standby CPU and Master CPU		V
33	Without identification checked Standby CPU and Master CPU		V
34	Identity not matched Standby CPU and Master CPU		V
35	No Master CPU is present		V

7.1.4 Special Registers (SR)

- **Status of Power Module**

When an error occurs in the power module, the corresponding bit of the special register should be ON. For example, when an error occurs on the Standby power module of the 3rd redundant extension backplane, the corresponding bit of the special register SR33 is ON.

Bit	Master Power Module (SR32)	Standby Power Module (SR33)
0	Main backplane of the redundancy system	Main backplane of the redundancy system
1	1 st extension backplane of the redundancy system	1 st extension backplane of the redundancy system
2	2 nd extension backplane of the redundancy system	2 nd extension backplane of the redundancy system
3	3 rd extension backplane of the redundancy system	3 rd extension backplane of the redundancy system
4	4 th extension backplane of the redundancy system	4 th extension backplane of the redundancy system
5	5 th extension backplane of the redundancy system	5 th extension backplane of the redundancy system
6	6 th extension backplane of the redundancy system	6 th extension backplane of the redundancy system
7	7 th extension backplane of the redundancy system	7 th extension backplane of the redundancy system
8~15	N/A	

7.2 Troubleshooting for CPU Modules

Users can get the remedies from the tables below according to the statuses of the LED indicators and the error codes.

7.2.1 ERROR LED Indicator's Being ON

Error code	Description	Solution
16#000B	The program in the PLC is damaged.	Download the program again.
16#000D	The CPU parameter is damaged.	Reset the CPU parameter, and download it.
16#0010	The access to the memory in the CPU is denied.	Download the program or parameters again. If the problem still occurs, please contact the factory.
16#0011	The PLC ID is incorrect. (SM9)	Please check the PLC ID.
16#0012	The PLC password is incorrect. (SM9)	Please check the PLC password.
16#0014	The procedure of restoring the system cannot be executed. (SM9)	The contents of the system backup file are incorrect, or the file does not exist in the path specified. If the file exists and the procedure of restoring the system can not be executed, please backing up the system again. If the error still occurs, please contact the factory. (Please refer to section 7.5 in AH500 Operation Manual, and Chapter 20 in ISPSOft User Manual for more information about the memory card.)
16#0015	The module table is incorrect. (SM10)	The module table stored in the CPU module is incorrect. Compare the module table in HWCONFIG with the actual module configuration, and download the module table again.
16#0016	The module setting is incorrect. (SM10)	The module setting stored in the CPU module is incorrect. Check whether the version of the module inserted in the slot is the same as the version of the module in HWCONFIG. After the version of the module is updated, users can download the module setting again.
16#0017	The data register exceeds the device range. (SM10)	The data register stored in the CPU module exceeds the device range. Check whether the module parameter in HWCONFIG is correct, and download the module parameter again.
16#001B	Timed interrupt 0 is set incorrectly.	Set the CPU parameter in HWCONFIG again, and download the CPU parameter again.

7

Error code	Description	Solution
16#001C	Timed interrupt 1 is set incorrectly.	Set the CPU parameter in HWCONFIG again, and download the CPU parameter again.
16#001D	Timed interrupt 2 is set incorrectly.	Set the CPU parameter in HWCONFIG again, and download the CPU parameter again.
16#001E	Timed interrupt 3 is set incorrectly.	Set the CPU parameter in HWCONFIG again, and download the CPU parameter again.
16#001F	The watchdog timer is set incorrectly.	Set the CPU parameter in HWCONFIG again, and download the CPU parameter again.
16#0020	The setting of the fixed scan time is incorrect.	Set the CPU parameter in HWCONFIG again, and download the CPU parameter again.
16#0021	The setting of the fixed scan time is incorrect.	Set the CPU parameter in HWCONFIG again, and download the CPU parameter again.
16#0022	The CPU parameter downloaded to the PLC is incorrect.	Set the CPU parameter in HWCONFIG again, and download the CPU parameter again.
16#0023	The Y state (STOP→ RUN) section in the PLC Parameter Setting window is set incorrectly.	Set the CPU parameter in HWCONFIG again, and download the CPU parameter again.
16#0025	The initial value of the symbol is not consistent with what is set in the program.	Download the symbol table again.
16#0026	The Communication Ratio box in the Communication Loading of Scan Time (%) section in the PLC Parameter Setting window is set incorrectly.	Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again.
16#0027	The latching auxiliary relay range which is set is incorrect.	Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again.
16#0028	The latching data register range which is set is incorrect.	Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again.
16#0029	The latching timer range which is set is incorrect.	Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again.

Error code	Description	Solution
16#002A	The latching counter range which is set is incorrect.	Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again.
16#002B	The range settings of the latched 32-bit counters are incorrect.	Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again.
16#0050	The memories in the latched special auxiliary relays are abnormal.	Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again.
16#0051	The latched special data registers are abnormal.	Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again.
16#0052	The memories in the latched auxiliary relays are abnormal.	Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again.
16#0053	The latched timers are abnormal.	Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again.
16#0054	The latched counters are abnormal.	Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again.
16#0055	The latched 32-bit counters are abnormal.	Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again.
16#0056	The memories in the latched timers are abnormal.	Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again.
16#0057	The memories in the latched counters are abnormal.	Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again.
16#0058	The memories in the latched 32-bit counters are abnormal.	Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again.
16#0059	The latched data registers are abnormal.	Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again.

Error code	Description	Solution
16#005A	The latched working registers are abnormal.	Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again.
16#6010	BOOTP IP is set incorrectly. (SM1107)	Check BOOTP or DHCP Server settings.
16#6011	BOOTP Gateway is set incorrectly. (SM1107)	Check BOOTP or DHCP Server settings.
16#6013	DNS IP is set incorrectly. (SM1107)	Check DNS settings and download the parameters again.

7.2.2 ERROR LED Indicator's Blinking

Error code	Description	Solution
16#000A	Scan timeout (SM8: The watchdog timer error)	1. Check the setting of the watchdog timer in HWCONFIG. 2. Check whether the program causes the long scan time
16#000C	The program downloaded to the PLC is incorrect.	Compile the program and download the program again.
16#000E	The program or the parameter is being downloaded, and therefore the PLC can not run.	1. After the program or the parameter is downloaded to the PLC, users can try to run the PLC. 2. Supply power to the PLC again.
16#0018	The serial port is abnormal. (SM9)	Retry the connection. If the error still occurs, please contact the factory.
16#0019	The USB is abnormal. (SM9)	Retry the connection. If the error still occurs, please contact the factory.
16#001A	The contents of the system backup file (DUP) are incorrect.	Generate the system backup file again.
16#0033	The communication setting of COM1 is incorrect. (SM9)	1. Check the program and the related special data registers. 2. Set the communication port parameter for the CPU module in HWCONFIG again.
16#0034	The setting of the station address of COM1 is incorrect. (SM9)	1. Check the program and the related special data registers. 2. Set the communication port parameter for the CPU module in HWCONFIG again.

Error code	Description	Solution
16#0035	The setting of the communication type of COM1 is incorrect. (SM9)	<ol style="list-style-type: none"> 1. Check the program and the related special data registers. 2. Set the communication port parameter for the CPU module in HWCONFIG again.
16#0038	The communication setting of COM2 is incorrect. (SM9)	<ol style="list-style-type: none"> 1. Check the program and the related special data registers. 2. Set the communication port parameter for the CPU module in HWCONFIG again.
16#0039	The setting of the station address of COM2 is incorrect. (SM9)	<ol style="list-style-type: none"> 1. Check the program and the related special data registers. 2. Set the communication port parameter for the CPU module in HWCONFIG again.
16#003A	The setting of the communication type of COM2 is incorrect. (SM9)	<ol style="list-style-type: none"> 1. Check the program and the related special data registers. 2. Set the communication port parameter for the CPU module in HWCONFIG again.
16#0066	An error occurs when the system is backed up.	<ol style="list-style-type: none"> 1. Check whether the memory card is normal, and whether the capacity of the memory card is large enough. 2. Retry the backup procedure. If the error still occurs, please contact the factory.
16#0067	The size of the PLC parameters restored exceeds the size of the PLC parameters of the CPU module.	The error code is a warning code.
16#0068	Corrupted symbol initialization table	Download the symbol initialization again.
16#2000	There is no END in the program in the PLC. (SM5)	<ol style="list-style-type: none"> 1. Compile the program again, and download the program again. 2. Reinstall ISPSOFT, compile the program again, and download the program again.
16#2001	The program is incorrect. There is a syntax error. (SM5)	Check the program, compile the program again, and download the program again.
16#2002	GOEND is used incorrectly. (SM5)	Check the program, compile the program again, and download the program again.

Error code	Description	Solution
16#2003	The devices used in the program exceed the range. (SM0/SM5)	Check the program, compile the program again, and download the program again.
16#2004	The part of the program specified by the label used in CJ/JMP is incorrect, or the label is used repeatedly. (SM0/SM5)	Check the program, compile the program again, and download the program again.
16#2005	The N value used in MC is not the same as the corresponding N value used in MCR, or the number of N values used in MC is not the same as the number of N values used in MCR. (SM5)	Check the program, compile the program again, and download the program again.
16#2006	The N values used in MC do not start from 0, or the N values used in MC are not continuous. (SM5)	Check the program, compile the program again, and download the program again.
16#2007	The operands used in ZRST are not used properly. (SM5)	Check the program, compile the program again, and download the program again.
16#200A	Invalid instruction (SM5)	Check the program, compile the program again, and download the program again.
16#200B	The operand n or the other constant operands exceed the range. (SM0/SM5)	Check the program, compile the program again, and download the program again.
16#200C	The operands overlap. (SM0/SM5)	Check the program, compile the program again, and download the program again.
16#200D	An error occurs when the binary number is converted into the binary-coded decimal number. (SM0/SM5)	Check the program, compile the program again, and download the program again.
16#200E	The string does not end with 0x00. (SM0/SM5)	Check the program, compile the program again, and download the program again.
16#200F	The instruction does not support the modification by an index register. (SM5)	Check the program, compile the program again, and download the program again.

Error code	Description	Solution
16#2010	1. The instruction does not support the device. 2. Encoding error 3. The instruction is a 16-bit instruction, but the constant operand is a 32-bit code. (SM5)	Check the program, compile the program again, and download the program again.
16#2011	The number of operands is incorrect. (SM5)	Check the program, compile the program again, and download the program again.
16#2012	Incorrect division operation (SM0/SM5).	Check the program, compile the program again, and download the program again.
16#2013	The value exceeds the range of values which can be represented by the floating-point numbers. (SM0/SM5)	Check the program, compile the program again, and download the program again.
16#2014	The task designated by TKON/YKOFF is incorrect, or exceeds the range. (SM5)	Check the program, compile the program again, and download the program again.
16#2015	There are more than 32 levels of nested program structures supported by CALL. (SM0)	Check the program, compile the program again, and download the program again.
16#2016	There are more than 32 levels of nested program structures supported by FOR/NEXT. (SM0/SM5)	Check the program, compile the program again, and download the program again.
16#2017	The number of times FOR is used is different from the number of times NEXT is used. (SM5)	Check the program, compile the program again, and download the program again.
16#2018	There is a label after FEND, but there is no SRET. There is SRET, but there is no label. (SM5)	1. Compile the program again, and download the program again. 2. Reinstall ISPSOft, compile the program again, and download the program again.
16#2019	The interrupt task is not after FEND. (SM5)	1. Compile the program again, and download the program again. 2. Reinstall ISPSOft, compile the program again, and download the program again.

Error code	Description	Solution
16#201A	IRET/SRET is not after FEND. (SM5)	1. Compile the program again, and download the program again. 2. Reinstall ISPSOft, compile the program again, and download the program again.
16#201B	There is an interrupt task, but there is no IRET. There is IRET, but there is not interrupt task. (SM5)	1. Compile the program again, and download the program again. 2. Reinstall ISPSOft, compile the program again, and download the program again.
16#201C	End is not at the end of the program. (SM5)	1. Compile the program again, and download the program again. 2. Reinstall ISPSOft, compile the program again, and download the program again.
16#201D	There is CALL, but there is no MAR instruction. (SM5)	1. Compile the program again, and download the program again. 2. Reinstall ISPSOft, compile the program again, and download the program again.
16#201E	The function code used in MODRW is incorrect. (SM102/SM103)	Check the usage of the instruction and the setting of the operands. Please refer to the explanation of the instruction MODRW in AH500 Programming Manual for more information.
16#201F	The length of the data set in MODRW is incorrect. (SM102/SM103)	Check the usage of the instruction and the setting of the operands. Please refer to the explanation of the instruction MODRW in AH500 Programming Manual for more information.
16#2020	The communication command received by using MODRW is incorrect. (SM102/SM103)	Check whether the slave supports the function code and the specified operation.
16#2021	The checksum of the command received by using MODRW is incorrect. (SM102/SM103)	1. Check whether there is noise, and retry the sending of the command. 2. Check whether the slave operates normally.
16#2022	The format of the command used in MODRW does not conform to the ASCII format. (SM102/SM103)	Make sure that the format of the command conforms to the ASCII format.
16#2023	There is a communication timeout when MODRW is executed. (SM120/SM103)	Check whether the slave operates normally, and whether the connection is normal.

Error code	Description	Solution
16#2024	The setting value of the communication timeout is invalid. (SM120/SM103)	1. Check the program and the related special data registers. 2. Set the communication port parameter for the CPU module in HWCONFIG again.
16#2025	There is a communication timeout when RS is executed. (SM120/SM103)	Check whether the slave operates normally, and whether the connection is normal.
16#2026	The RS communication interrupt is abnormal. (SM120/SM103)	Please check whether the interrupt service routine used with RS is downloaded.
16#2027	The execution of FWD is abnormal. (SM102/103)	Please refer to AH500 Programming Manual, and check the instruction FWD.
16#2028	The execution of REV is abnormal. (SM102/103)	Please refer to AH500 Programming Manual, and check the instruction REV.
16#2029	The execution of STOP is abnormal. (SM102/103)	Please refer to AH500 Programming Manual, and check the instruction STOP.
16#202A	The execution of RSDT is abnormal. (SM102/103)	Please refer to AH500 Programming Manual, and check the instruction RSDT.
16#202B	The execution of RSTEF is abnormal. (SM102/103)	Please refer to AH500 Programming Manual, and check the instruction RSTEF.
16#202C 16#204B	I/O interrupt service routine 0 I/O interrupt service routine 31 does not exist.	Please download I/O interrupt service routine 0~31.
16#2054 16#2127	I/O interrupt service routine 40 I/O interrupt service routine 251 does not exist.	Please download I/O interrupt service routine 40~251.
16#2128	An action in a sequential function chart is incorrectly assigned qualifiers related to time. (SM0/SM1)	Check whether the action in the sequential function chart is assigned qualifiers related to time.
16#2129	The modifier R is assigned to an action in a sequential function chart incorrectly. (SM0/SM1)	Check whether the reset modifier assigned to the action in the sequential function chart conflicts with another modifier assigned to the action in the sequential function chart.

Error code	Description	Solution
16#212A	The instructions MC and MCR cannot be used in interrupts or subroutines. (SM5)	Check the program and compile the program again. After that redownload the project to the PLC.
16#6000	Ethernet connection error (SM1106)	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6001	Illegal IP address (SM1107)	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6002	Illegal netmask address (SM1107)	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6003	Illegal gateway mask (SM1107)	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6004	The IP address filter is set incorrectly. (SM1108)	Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6006	The static ARP table is set incorrectly. (SM1108)	Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6007	The NTP client service is set incorrectly.	Please check the setting of the NTP client service, and download it again.
16#6008	Illegal network number (SM1107)	Check the network configuration in NWCONFIG, and download it again.
16#6009	Illegal node number (SM1107)	Check the network configuration in NWCONFIG, and download it again.
16#600F	Maximum number of the connections via Modbus TCP server is reached. (SM1089)	Check the Modbus TCP connection number between AH CPU and the station.
16#6012	The IP address is duplicated. (SM1107)	Modify the IP settings and download again.
16#6101	The trigger in the email is set incorrectly. (SM1112)	Set the Ethernet parameter for the CPU module in HWCONFIG again.

Error code	Description	Solution
16#6102	The interval of sending the email is set incorrectly. (SM1112)	Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6103	The device containing the data specified as the attachment exceeds the device range. (SM1112)	Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6106	The SMTP server address is incorrect. (SM1112)	Make sure that the address is correct, and set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6108	SMTP authentication error (SM1112)	Check the user name, and the password. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6110	The SMTP server needs to be authenticated. (SM1112)	Check the user name, and the password. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6111	The specified email address does not exist. (SM1112)	1. Check whether the email address is correct. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6200	The remote IP address set in the TCP socket function is illegal. (SM1196)	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6209	The remote IP address set in the UDP socket function is illegal. (SM1196)	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6300	Only auxiliary relays, data registers, and link registers can be used in the Ether Link.	Check the setting of the Ether Link in NWCONFIG, and download it again.
16#6301	The device used in the Ether Link exceeds the device range.	Check whether the device used in the Ether Link is within the device range supported by the CPU module.
16#6302	The length of the data exchanged in the Ether Link exceeds the limit.	Check whether the length of the data exchanged in the Ether Link is within the range supported by the CPU module.

Error code	Description	Solution
16#6305	The node used in the communication command is different from the local node.	Check the setting of the Ether Link in NWCONFIG, and download it again.
16#630A	The module ID or the setting of the module is different from the setting in the Ether Link.	1. Check the setting of the parameter in HWCONFIG. 2. Check the setting of the Ether Link in NWCONFIG.
16#630B	The setting of the netmask address for the CPU or the module is different from the setting in the Ether Link.	1. Check the setting of the parameter in HWCONFIG. 2. Check the setting of the Ether Link in NWCONFIG.
16#6500	An error occurs when a data exchange function is initialized. (SM699)	Check whether the sum of the number of Modbus TCP data exchange blocks and the number of the Ether link data exchange blocks exceeds the system specifications, and download the setting again.
16#6602	The node number exceeds the limit. (SM1598)	Check the network configuration in NWCONFIG, and download it again.
16#6603	The device is undefined. (SM1599)	Check the network configuration in NWCONFIG, and download it again.
16#860F	System restore error	The system restore file is incorrect or the file is not existed. Generate the system restore file again and perform system restore again. If the error still occurs, contact the factory.

7.2.3 BUS FAULT LED Indicator's Being ON

When a CPU module detects an error, the BUS FAULT LED indicator on the CPU module is ON. The BUS FAULT LED indicator on the CPU module corresponds to the ERROR LED indicator on an I/O module. If an error occurs in an I/O module, the status of the BUS FAULT LED indicator on the CPU module is the same as that of the ERROR LED indicator on the I/O module. If there are errors occurring in the I/O modules, the BUS FAULT LED indicator on the CPU module will be ON. For example, the BUS FAULT LED indicator on the CPU module will be ON if the ERROR LED indicator on I/O module A is ON and the ERROR LED indicator on I/O module B blinks. If the ERROR LED indicator on I/O module B still blinks after the error occurring in I/O module A is eliminated, the BUS FAULT LED indicator on the CPU module will blink.

Solutions for the errors detected by a CPU module are listed in the table below. If the error code you are having is not listed in the table below, you can check if the I/O module operates normally.

Error code	Description	Solution
16#0013	The I/O module cannot run/stop. (SM10)	Check whether the setting of the parameter for the module is correct. If the setting is correct, please check whether the module breaks down. If the error still occurs, please contact the factory.
16#0014	The procedure of restoring the system cannot be executed. (SM9)	The contents of the system backup file are incorrect, or the file does not exist in the path specified. If the file exists and the procedure of restoring the system can not be executed, please backing up the system again. If the error still occurs, please contact the factory. (Please refer to section 7.5 in AH500 Operation Manual, and section 18.2 in ISPSOFT User Manual for more information about the memory card.)
16#1400	An error occurs when the data is accessed through the auxiliary processor. (SM9)	Please contact the factory.
16#1401	An error occurs when the data in the I/O module is accessed. (SM9)	Please contact the factory.
16#1402	The actual arrangement of the I/O modules is not consistent with the module table. (SM9)	Check whether the module table in HWCONFIG is consistent with the actual arrangement of the I/O modules.

Error code	Description	Solution
16#1403	An error occurs when the data is read from the module. (SM9)	Check whether the module operates normally. If the error still occurs, please contact the factory.
16#1405	The setting parameter of the module is not found. (SM9)	Set the parameter in HWCONFIG again, and download it.
16#1407	A communication error occurs when the data is accessed through the auxiliary processor. (SM9)	Check whether there is noise, and eliminate the noise. If the error still occurs, please contact the factory.
16#1409	The extension backplane is disconnected. (SM9)	<ol style="list-style-type: none"> 1. Check whether the extension backplane is connected properly. And make sure the configurations of the extension backplane in HWCONFIG are the same as the actual placement. 2. Check whether the extension backplane operates normally, and make sure that the extension backplane is not affected by noise.
16#140A	The communication with the extension backplane is incorrect. (SM9)	<ol style="list-style-type: none"> 1. Check whether the extension backplane is connected properly. 2. Check whether the extension backplane operates normally, and make sure that the extension backplane is not affected by noise.
16#140B	The number of network modules exceeds the limit. (SM9)	Please decrease the number of network modules to the number supported by the system.
16#140C	The checksum of the high-speed data exchange is incorrect.	Check the module firmware version and contact the factory.
16#140D	The ID of the actual power supply module is not the same as the ID of the power supply module set in HWCONFIG.	Check whether the ID of the power supply module set in HWCONFIG is the same as the ID of the actual power supply module.
16#140E	The amount of data exchanged at a high speed exceeds the maximum amount supported.	Check the module firmware version and contact the factory.
16#140F	High-speed data exchange error	Check the module firmware version and contact the factory.
16#1410	RTU IO module sending out error	Check the installation and power of the RTU IO modules.
16#1411	RTU IO module sending out warnings	Check if the RTU IO modules function normally.

Error code	Description	Solution
16#1421	Error occurs when a CPU module reads settings from the Intelligent module configuration	Check the module firmware version and contact the factory.
16#1422	Error occurs when a CPU module writes settings in the Intelligent module configuration	Check the module firmware version and contact the factory.

7.2.4 BUS FAULT LED Indicator's Blinking

If the BUS FAULT LED blinks, please check the operating state of the module.

7.2.5 Troubleshooting for EtherNet/IP

Error Code	Description	Solution
16#B100	I/O connections duplicated	1. Check if the system has created the I/O connections. 2. Change the connection type to Listen Only.
16#B106	Ownership conflict (I/O connection)	Check the scanner owner. Reconfigure the invalid scanner. Change the connection to multicast.
16#B110	Adapter configuration setting error	1. Check the I/O connection status. 2. Activate the I/O connections again.
16#B111	Adapter RPI configuration setting error	Check the RPI for the adapter.
16#B113	I/O connection exceeding the limit	1. Check if the connection exceeds the limit. 2. Reduce the number of the product connection.
16#B119	Failed to establish a Non-Listen Only connection	1. Check if the system has created the I/O connections. 2. Check the scanner I/O connection status.
16#B127	Adapter input size setting error	Check the module number and the product setup file to see if they are matched.
16#B128	Adapter output size setting error	Check the output size in the connection parameters.

Error Code	Description	Solution
16#B129	The configuration path settings in the EDS file is incorrect.	<ol style="list-style-type: none"> 1. Check if the product information and the EDS file are matched. 2. Reload the EDS file. 3. Ask the vendor of the device for the EDS file.
16#B12D	Consumed tag error	Check if the parameters in the consumed tag are correctly set.
16#B12E	Produced tag error	Check if the parameters in the produced tag are correctly set.
16#B203	I/O connection timeout	<ol style="list-style-type: none"> 1. Check the network connection status. 2. Check if the module is working fine. 3. Increase the RPI value.
16#B204	Creating a I/O connection timeout	No response from the adapter; check if the power and the network connection of the adapter are working properly.
16#B302	Network configuration is set over the product specifications (PPS)	<ol style="list-style-type: none"> 1. Check the I/O connection limit between the scanner and the adapter. 2. Increase the RPI value or reduce the number of the connections.
16#B315	Adapter input/output instance parameters are set incorrectly.	Check the module number and the product setup file to see if they are matched.

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7.2.6 Troubleshooting for AH500 Redundancy System

Error Code	Description	Solution
16#E206	The model number for the control mode CPU and the standby mode CPU are not the same.	Use two same models and assign one as the control mode CPU and the other as the standby mode CPU.
16#E207	The firmware version for the control mode CPU and the standby mode CPU are not the same.	Use two same models and assign one as the control mode CPU and the other as the standby mode CPU.
16#E208	Ethernet for the control mode CPU and the standby mode CPU are not in the same physical network.	The IP address and mask for the control mode CPU and the standby mode CPU must be on the same physical network.

Error Code	Description	Solution
16#E209	The I/O configurations of the control mode CPU is not the same as the actual I/O configurations of the standby mode CPU. (while checking the validation)	Make sure the IO configurations on the backplane for the control mode CPU and the standby mode CPU are the same. Both the control mode CPU and the standby mode CPU must be connected to the backplane. And make sure the firmware versions for the control mode CPU and the standby mode CPU are the same.
16#E20A	The I/O configurations of the control mode CPU is not the same as the actual I/O configurations of the standby mode CPU. (after the validation is checked)	Make sure the IO configurations on the backplane for the control mode CPU and the standby mode CPU are the same. Both the control mode CPU and the standby mode CPU must be connected to the backplane. And make sure the firmware versions for the control mode CPU and the standby mode CPU are the same.
16#E20B	System error	Check the error log for more information
16#E20C	Synchronization error	While downloading, the system can not synchronize. Try again later.
16#E20D	Validation failed	Check the standby mode CPU error log
16#E20E	I/O bus fault	Clear the I/O bus error
16#E20F	Heart beat error	Check the standby mode CPU error log
16#E210	Heart beat communication timeout	Make sure the fiber module is well-connected.
16#E211	Synchronization failed	Power off and then power on the standby mode CPU and start synchronization again. If the error still occurs, please contact the factory.
16#E212	The standby mode CPU is being switched.	Try again later.
16#E213	There is no program on the PLC.	Check the error log for more information
16#E214	PLC program is damage.	Check the error log for more information
16#E215	Scan time out	Check the error log for more information
16#E216	CPU access denied	Check the error log for more information
16#E217	System busy (RST)	Try again later.
16#E218	System busy (CLR)	Try again later.
16#E219	Turning on the system	Wait
16#E21A	Initialization error	Resupply power and turn it on again.
16#E21B	CPU parameters are damage.	Check the error log for more information

Error Code	Description	Solution
16#E21C	Non-latched area error	Check the error log for more information
16#E21D	CPU EIP parameters are damage.	Check the error log for more information
16#E21E	The I/O configuration file does not exist.	Download a correct I/O parameter file via HWCONFIG again.
16#E21F	The I/O configuration file is damage.	Download a correct I/O parameter file via HWCONFIG again.
16#E221	PLC program error	Check the error log for more information
16#E230	Ethernet connection error in a redundancy system	Check the Ethernet connection on the control mode CPU and standby mode CPU
16#E260	Module on the main backplane slot 0 does not support a redundancy system.	Update module firmware.
16#E261	Module on the main backplane slot 1 does not support a redundancy system.	Update module firmware.
16#E262	Module on the main backplane slot 2 does not support a redundancy system.	Update module firmware.
16#E263	Module on the main backplane slot 3 does not support a redundancy system.	Update module firmware.
16#E264	Module on the main backplane slot 4 does not support a redundancy system.	Update module firmware.
16#E265	Module on the main backplane slot 5 does not support a redundancy system.	Update module firmware.
16#E266	Module on the main backplane slot 6 does not support a redundancy system.	Update module firmware.
16#E267	Module on the main backplane slot 7 does not support a redundancy system.	Update module firmware.
16#E268	Module on the main backplane slot 8 does not support a redundancy system.	Update module firmware.
16#E269	Module on the main backplane slot 9 does not support a redundancy system.	Update module firmware.
16#E26A	Module on the main backplane slot 10 does not support a redundancy system.	Update module firmware.
16#E26B	Module on the main backplane slot 11 does not support a redundancy system.	Update module firmware.

Error Code	Description	Solution
16#E270	Network module on the main backplane slot 0 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplane slot 0.
16#E271	Network module on the main backplane slot 1 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplane slot 1.
16#E272	Network module on the main backplane slot 2 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplane slot 2.
16#E273	Network module on the main backplane slot 3 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplane slot 3.
16#E274	Network module on the main backplane slot 4 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplane slot 4.
16#E275	Network module on the main backplane slot 5 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplane slot 5.
16#E276	Network module on the main backplane slot 6 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplane slot 6.
16#E277	Network module on the main backplane slot 7 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplane slot 7.
16#E278	Network module on the main backplane slot 8 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplane slot 8.
16#E279	Network module on the main backplane slot 9 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplane slot 9.
16#E27A	Network module on the main backplane slot 10 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplane slot 10.
16#E27B	Network module on the main backplane slot 11 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplane slot 11.

Error Code	Description	Solution
16#E280	The network module IP of the control mode CPU on the main backplane slot 0 cannot be detected.	<ol style="list-style-type: none">1. Make sure the network cables of the network modules on the main backplane slot 0 are well-connected both on the control mode CPU and standby mode CPU.2. If the network module's network cable of the control mode CPU on the main backplane slot 0 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 0 must be connected to the network port 1 as well.3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 0 are on the same physical network.
16#E281	The network module IP of the control mode CPU on the main backplane slot 1 cannot be detected.	<ol style="list-style-type: none">1. Make sure the network cables of the network modules on the main backplane slot 1 are well-connected both on the control mode CPU and standby mode CPU.2. If the network module's network cable of the control mode CPU on the main backplane slot 0 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 1 must be connected to the network port 1 as well.3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 1 are on the same physical network.

Error Code	Description	Solution
16#E282	The network module IP of the control mode CPU on the main backplane slot 2 cannot be detected.	<ol style="list-style-type: none"> 1. Make sure the network cables of the network modules on the main backplane slot 2 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 2 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 2 must be connected to the network port 1 as well. 3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 2 are on the same physical network.
16#E283	The network module IP of the control mode CPU on the main backplane slot 3 cannot be detected.	<ol style="list-style-type: none"> 1. Make sure the network cables of the network modules on the main backplane slot 3 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 3 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 3 must be connected to the network port 1 as well. 3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 3 are on the same physical network.

Error Code	Description	Solution
16#E284	The network module IP of the control mode CPU on the main backplane slot 4 cannot be detected.	<ol style="list-style-type: none">1. Make sure the network cables of the network modules on the main backplane slot 4 are well-connected both on the control mode CPU and standby mode CPU.2. If the network module's network cable of the control mode CPU on the main backplane slot 4 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 4 must be connected to the network port 1 as well.3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 4 are on the same physical network.
16#E285	The network module IP of the control mode CPU on the main backplane slot 5 cannot be detected.	<ol style="list-style-type: none">1. Make sure the network cables of the network modules on the main backplane slot 5 are well-connected both on the control mode CPU and standby mode CPU.2. If the network module's network cable of the control mode CPU on the main backplane slot 5 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 5 must be connected to the network port 1 as well.3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 5 are on the same physical network.

Error Code	Description	Solution
16#E286	The network module IP of the control mode CPU on the main backplane slot 6 cannot be detected.	<ol style="list-style-type: none"> 1. Make sure the network cables of the network modules on the main backplane slot 6 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 6 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 6 must be connected to the network port 1 as well. 3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 6 are on the same physical network.
16#E287	The network module IP of the control mode CPU on the main backplane slot 7 cannot be detected.	<ol style="list-style-type: none"> 1. Make sure the network cables of the network modules on the main backplane slot 7 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 7 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 7 must be connected to the network port 1 as well. 3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 7 are on the same physical network.

Error Code	Description	Solution
16#E288	The network module IP of the control mode CPU on the main backplane slot 8 cannot be detected.	<ol style="list-style-type: none">1. Make sure the network cables of the network modules on the main backplane slot 8 are well-connected both on the control mode CPU and standby mode CPU.2. If the network module's network cable of the control mode CPU on the main backplane slot 8 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 8 must be connected to the network port 1 as well.3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 8 are on the same physical network.
16#E289	The network module IP of the control mode CPU on the main backplane slot 9 cannot be detected.	<ol style="list-style-type: none">1. Make sure the network cables of the network modules on the main backplane slot 9 are well-connected both on the control mode CPU and standby mode CPU.2. If the network module's network cable of the control mode CPU on the main backplane slot 9 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 9 must be connected to the network port 1 as well.3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 9 are on the same physical network.

Error Code	Description	Solution
16#E28A	The network module IP of the control mode CPU on the main backplane slot 10 cannot be detected.	<ol style="list-style-type: none"> 1. Make sure the network cables of the network modules on the main backplane slot 10 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 10 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 10 must be connected to the network port 1 as well. 3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 10 are on the same physical network.
16#E28B	The network module IP of the control mode CPU on the main backplane slot 11 cannot be detected.	<ol style="list-style-type: none"> 1. Make sure the network cables of the network modules on the main backplane slot 11 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 11 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 11 must be connected to the network port 1 as well. 3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 11 are on the same physical network.

Error Code	Description	Solution
16#E290	The network module heart beat of the control mode CPU on the main backplane slot 0 cannot be detected.	<ol style="list-style-type: none">1. Make sure the network cables of the network modules on the main backplane slot 0 are well-connected both on the control mode CPU and standby mode CPU.2. If the network module's network cable of the control mode CPU on the main backplane slot 0 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 0 must be connected to the network port 1 as well.3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 0 are on the same physical network.
16#E291	The network module heart beat of the control mode CPU on the main backplane slot 1 cannot be detected.	<ol style="list-style-type: none">1. Make sure the network cables of the network modules on the main backplane slot 1 are well-connected both on the control mode CPU and standby mode CPU.2. If the network module's network cable of the control mode CPU on the main backplane slot 0 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 1 must be connected to the network port 1 as well.3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 1 are on the same physical network.

Error Code	Description	Solution
16#E292	The network module heart beat of the control mode CPU on the main backplane slot 2 cannot be detected.	<ol style="list-style-type: none"> 1. Make sure the network cables of the network modules on the main backplane slot 2 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 2 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 2 must be connected to the network port 1 as well. 3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 2 are on the same physical network.
16#E293	The network module heart beat of the control mode CPU on the main backplane slot 3 cannot be detected.	<ol style="list-style-type: none"> 1. Make sure the network cables of the network modules on the main backplane slot 3 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 3 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 3 must be connected to the network port 1 as well. 3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 3 are on the same physical network.

Error Code	Description	Solution
16#E294	The network module heart beat of the control mode CPU on the main backplane slot 4 cannot be detected.	<ol style="list-style-type: none">1. Make sure the network cables of the network modules on the main backplane slot 4 are well-connected both on the control mode CPU and standby mode CPU.2. If the network module's network cable of the control mode CPU on the main backplane slot 4 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 4 must be connected to the network port 1 as well.3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 4 are on the same physical network.
16#E295	The network module heart beat of the control mode CPU on the main backplane slot 5 cannot be detected.	<ol style="list-style-type: none">1. Make sure the network cables of the network modules on the main backplane slot 5 are well-connected both on the control mode CPU and standby mode CPU.2. If the network module's network cable of the control mode CPU on the main backplane slot 5 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 5 must be connected to the network port 1 as well.3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 5 are on the same physical network.

Error Code	Description	Solution
16#E296	The network module heart beat of the control mode CPU on the main backplane slot 6 cannot be detected.	<ol style="list-style-type: none"> 1. Make sure the network cables of the network modules on the main backplane slot 6 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 6 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 6 must be connected to the network port 1 as well. 3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 6 are on the same physical network.
16#E297	The network module heart beat of the control mode CPU on the main backplane slot 7 cannot be detected.	<ol style="list-style-type: none"> 1. Make sure the network cables of the network modules on the main backplane slot 7 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 7 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 7 must be connected to the network port 1 as well. 3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 7 are on the same physical network.

Error Code	Description	Solution
16#E298	The network module heart beat of the control mode CPU on the main backplane slot 8 cannot be detected.	<ol style="list-style-type: none">1. Make sure the network cables of the network modules on the main backplane slot 8 are well-connected both on the control mode CPU and standby mode CPU.2. If the network module's network cable of the control mode CPU on the main backplane slot 8 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 8 must be connected to the network port 1 as well.3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 8 are on the same physical network.
16#E299	The network module heart beat of the control mode CPU on the main backplane slot 9 cannot be detected.	<ol style="list-style-type: none">1. Make sure the network cables of the network modules on the main backplane slot 9 are well-connected both on the control mode CPU and standby mode CPU.2. If the network module's network cable of the control mode CPU on the main backplane slot 9 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 9 must be connected to the network port 1 as well.3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 9 are on the same physical network.

Error Code	Description	Solution
16#E29A	The network module heart beat of the control mode CPU on the main backplane slot 10 cannot be detected.	<ol style="list-style-type: none"> 1. Make sure the network cables of the network modules on the main backplane slot 10 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 10 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 10 must be connected to the network port 1 as well. 3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 10 are on the same physical network.
16#E29B	The network module heart beat of the control mode CPU on the main backplane slot 11 cannot be detected.	<ol style="list-style-type: none"> 1. Make sure the network cables of the network modules on the main backplane slot 11 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 11 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 11 must be connected to the network port 1 as well. 3. Make sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 11 are on the same physical network.
16#E2A0	The network module IP detection of the control mode CPU on the main backplane slot 0 has not been executed.	Wait for the network module IP detection of the control mode on the main backplane slot 0 to execute.
16#E2A1	The network module IP detection of the control mode CPU on the main backplane slot 1 has not been executed.	Wait for the network module IP detection of the control mode on the main backplane slot 1 to execute.

Error Code	Description	Solution
16#E2A2	The network module IP detection of the control mode CPU on the main backplane slot 2 has not been executed.	Wait for the network module IP detection of the control mode on the main backplane slot 2 to execute.
16#E2A3	The network module IP detection of the control mode CPU on the main backplane slot 3 has not been executed.	Wait for the network module IP detection of the control mode on the main backplane slot 3 to execute.
16#E2A4	The network module IP detection of the control mode CPU on the main backplane slot 4 has not been executed.	Wait for the network module IP detection of the control mode on the main backplane slot 4 to execute.
16#E2A5	The network module IP detection of the control mode CPU on the main backplane slot 5 has not been executed.	Wait for the network module IP detection of the control mode on the main backplane slot 5 to execute.
16#E2A6	The network module IP detection of the control mode CPU on the main backplane slot 6 has not been executed.	Wait for the network module IP detection of the control mode on the main backplane slot 6 to execute.
16#E2A7	The network module IP detection of the control mode CPU on the main backplane slot 7 has not been executed.	Wait for the network module IP detection of the control mode on the main backplane slot 7 to execute.
16#E2A8	The network module IP detection of the control mode CPU on the main backplane slot 8 has not been executed.	Wait for the network module IP detection of the control mode on the main backplane slot 8 to execute.
16#E2A9	The network module IP detection of the control mode CPU on the main backplane slot 9 has not been executed.	Wait for the network module IP detection of the control mode on the main backplane slot 9 to execute.
16#E2AA	The network module IP detection of the control mode CPU on the main backplane slot 10 has not been executed.	Wait for the network module IP detection of the control mode on the main backplane slot 10 to execute.
16#E2AB	The network module IP detection of the control mode CPU on the main backplane slot 11 has not been executed.	Wait for the network module IP detection of the control mode on the main backplane slot 11 to execute.

7.2.7 Others

Error Code	Description	Solution
16#000F	The original program in the PLC is damaged.	After users compile the program again, they can download the program again.
16#0024	There is no I/O module on a backplane.	Please check whether a module exists.
16#005D	The CPU module does not detect a memory card. (SM453)	Check whether a memory card is inserted into the CPU module correctly.
16#005E	The memory card is initialized incorrectly. (SM453)	Check whether the memory card breaks down.
16#005F	A nonexistent file is read from the memory card, or a nonexistent file is written to the memory card. (SM453)	Check whether the file path is correct.
16#0060	The CPU module can not create a default folder in the memory card. (SM453)	Check whether the capacity of the memory card is large enough, or whether the memory card breaks down.
16#0061	The capacity of the memory card is not sufficient. (SM453)	Check whether the capacity of the memory card is large enough.
16#0062	The memory card is write-protected. (SM453)	Check whether the memory card is write protected.
16#0063	An error occurs when data is written to the memory card. (SM453)	Check whether the file path is correct, or whether the memory card breaks down.
16#0064	A file in the memory card can not be read. (SM453)	Check whether the file path is correct, or whether the file is damaged.
16#0065	A file in the memory card is a read-only file. (SM453)	Users need to set the file so that the file is not a read-only file.
16#1420	The module Ethernet port is off.	Check if the module network cable is connected correctly.
16#1801	There is no interrupt service routine in the CPU module.	Check whether there is a corresponding interrupt task (24V low voltage interrupt service routine) in the program.

Error Code	Description	Solution
16#600A	TCP connection failure (SM1090)	<ol style="list-style-type: none"> 1. Check the actual network configuration, and check whether the number of TCP connections exceeds the upper limit supported by the CPU module. 2. Retry the TCP connection later. (This error does not cause the PLC to stop running. Users can perform the corresponding remedy through the related flag in the program.)
16#600B	UDP connection failure (SM1091)	<ol style="list-style-type: none"> 1. Check the actual network configuration, and check whether the number of UDP connections exceeds the upper limit supported by the CPU module. 2. Retry the TCP connection later. (This error does not cause the PLC to stop running. Users can perform the corresponding remedy through the related flag in the program.)
16#600C	The communication socket has been used. (SM1109)	<ol style="list-style-type: none"> 1. Check whether the actual data access results in the use of the same socket. 2. Change the socket number, or retry the socket later. (This error does not cause the PLC to stop running. Users can perform the corresponding remedy through the related flag in the program.)
16#600D	The RJ45 port is not connected.	Check the communication cable.
16#600E	An RJ45 port on AH10EN-5A is not connected to a network cable.	Please check whether AH10EN-5A is connected to a network cable.
16#6100	The email connection is busy. (SM1113)	Retry the email connection later. (This error does not cause the PLC to stop running. Users can perform the corresponding remedy through the related flag in the program.)
16#6104	The attachment in the email does not exist. (SM1113)	Check whether the attachment exists in the memory card.
16#6105	The attachment in the email is oversized. (SM1113)	Check the size of the file which is specified as the attachment. If the size is over 2 MB, the file can not be specified as the attachment.

Error Code	Description	Solution
16#6107	There is an SMTP server response timeout. (SM1113)	<ol style="list-style-type: none"> 1. Check whether the status of the SMTP server is normal. 2. Retry the sending of the email later. (This error does not cause the PLC to stop running. Users can perform the corresponding remedy through the related flag in the program.)
16#6201	The local communication port set in the TCP socket function is illegal.	<ol style="list-style-type: none"> 1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6202	The remote communication port set in the TCP socket function is illegal.	<ol style="list-style-type: none"> 1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6203	The device from which the data is sent in the TCP socket function is illegal.	<ol style="list-style-type: none"> 1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6204	The transmitted data length set in the TCP socket function is illegal.	<ol style="list-style-type: none"> 1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6205	The data which is sent through the TCP socket exceeds the device range.	<ol style="list-style-type: none"> 1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6206	The device which receives the data in the TCP socket function is illegal.	<ol style="list-style-type: none"> 1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6207	The received data length set in the TCP socket function is illegal.	<ol style="list-style-type: none"> 1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.

Error Code	Description	Solution
16#6208	The data which is received through the TCP socket exceeds the device range.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#620A	The local communication port set in the UDP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#620B	The remote communication port set in the UDP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#620C	The device from which the data is sent in the UDP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#620D	The transmitted data length set in the UDP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#620E	The data which is sent through the UDP socket exceeds the device range.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#620F	The device which receives the data in the UDP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6210	The received data length set in the UDP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.

Error Code	Description	Solution
16#6211	The data which is received through the UDP socket exceeds the device range.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6212	There is no response from the remote device after the timeout period. (socket)	Make sure that the remote device is connected.
16#6213	The data received exceeds the limit. (socket)	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6214	The remote device refuses the connection. (socket)	Make sure that the remote device operates normally.
16#6215	The socket is not opened.	Check whether operational sequence in the program is correct.
16#6217	The socket is opened.	Check whether operational sequence in the program is correct.
16#6218	The data is being sent through the socket.	Check whether operational sequence in the program is correct.
16#6219	The data is being received through the socket.	Check whether operational sequence in the program is correct.
16#621A	The socket is being closed.	Check whether operational sequence in the program is correct.
16#6303	The remote device in the Ether Link aborts the connection.	1. Check the connection and the status of the remote device. 2. Check whether the remote device supports the Ether Link.
16#6304	The connection in the Ether Link is busy.	1. Check whether the number of connections in the Ether Link exceeds the system load. 2. Retry the connection in the Ether Link later.
16#6309	The remote device in the Ether Link does not respond after the timeout period.	1. Check whether the CPU module in the Ether Link operates normally. 2. Check whether the CPU modules are connected normally.

Error Code	Description	Solution
16#6400	The number of TCP connections specified by EMDRW exceeds the limit, or the sending of the flag is not set. (EMDRW)	1. Check whether the flag which is related to the sending of the data in the program is modified. 2. Set the sending of the flag and the sending of the packet again.
16#6401	The remote device aborts the connection. (EMDRW)	Check whether the remote device support the Modbus port (502).
16#6402	There is no response from the remote device after the timeout period. (EMDRW)	Check whether the remote device operate normally.
16#6403	The remote IP address is illegal. (EMDRW)	Check whether the program is correct.
16#6404	The Modbus function code is not supported. (EMDRW)	Check the command transmitted from the remote device.
16#6405	The number of data which will be received is not consistent with the actual length of the data. (EMDRW)	Check the command transmitted from the remote device.
16#6501	The remote device involved in the data exchange does not respond after the timeout period. (SM828~SM955)	Check the device whose connection number corresponds to the error flag, and check whether it is connected normally.
16#6502	The remote device involved in the data exchange does not respond correctly. (SM828~SM955)	Check the device whose connection number corresponds to the error flag, and check whether it is connected normally.
16#6600	The network number which receives the command exceeds the range.	Check the command transmitted from the remote device.
16#6601	The network is undefined in the network configuration parameter.	Check the network configuration in NWCONFIG, and download it again.
16#6604	The number of routing connections reaches the upper limit.	Resend the packet later. ((This error does not cause the PLC to stop running. Users can perform the corresponding remedy through the related flag in the program.)
16#6605	The unexpected packet is received.	Check the command transmitted from the remote device.
16#6606	There is a routing response timeout.	1. Check the network configuration in NWCONFIG. 2. Check whether the setting of the communication timeout conform to the practical application.

16#6700	An error occurs when a Modbus TCP data exchange is initialized.	Please check setting values, and download them again.
16#6701	Modbus TCP data exchange timeout	Please check whether the remote device supports the Modbus communication protocol.
16#6702	The data received through a Modbus TCP data exchange is incorrect.	Please check whether the remote device supports the Modbus communication protocol.
16#7002	The CPU module does not support the function.	Please check the version of the firmware installed on the CPU module.
16#7203	Invalid access code	Please check the contents of the packet sent by the remote device.
16#7401	Function code error	Please check the contents of the packet sent by the remote device.
16#7402	The size of a packet exceeds the maximum data length.	Please check the contents of the packet sent by the remote device.
16#7404	Packet format error	Please check the contents of the packet sent by the remote device.
16#7405	The number of bytes is incorrect.	Please check the contents of the packet sent by the remote device.
16#7406	Checksum error	Please check the contents of the packet sent by the remote device.
16#7407	There are non-ASCII characters in a command.	Please check the contents of the packet sent by the remote device.
16#7408	The PLC is running.	When the PLC is running, data such as a program and CPU parameters can not be downloaded to the PLC.
16#740A	Data is being written to the memory in the PLC or data fails to be written to the memory in the PLC.	Data is being written to the flash memory/SD card. Please try again later.
16#740B	The CPU module is being reset, or the values in the latching devices are being cleared.	The CPU module is being reset, or the values in the latching devices are being cleared. Please try again later.
16#740C	The backplane number in a communication command is incorrect.	Please check the version of the firmware installed on the CPU module and the version of ISPSOft, and contact the factory.
16#740D	The slot number in a communication command is incorrect.	Please check the version of the firmware installed on the CPU module and the version of ISPSOft, and contact the factory.

16#740E	An error occurs when the the data in the memory in the PLC is cleared.	Please try agin. If the error still occurs, please contact the factory.
16#740F	Communication timeout	Please check whether the remote device operates normally.
16#7410	The function code in a reply command is incorrect.	Please check the contents of the packet sent by the remote device.
16#7412	Owing to the fact that SW1 is ON, data can not be downloaded to the CPU module.	Please make sure that SW1 is OFF.
16#757D	The remaining number of PLC password guesses is 0.	Please power the CPU module again.
16#757E	The PLC password entered is incorrect.	Please check whether the PLC password entered is correct.
16#8105	The contents of the program downloaded are incorrect. The program syntax is incorrect.	1. Check whether the program syntax which is not supported by the CPU module is used, and check whether the version of the firmware has its special limitation. 2. Check whether the version of ISPSOft used to create the program is the same as the version of ISPSOft used now.
16#8106	The contents of the program downloaded are incorrect. The length of the execution code exceeds the limit.	1. Shorten the length of the program, and download the program again. 2. Check whether the version of ISPSOft used to create the program is the same as the version of ISPSOft used now.
16#8107	The contents of the program downloaded are incorrect. The length of the source code exceeds the limit.	1. Shorten the length of the program, and download the program again. 2. Check whether the version of ISPSOft used to create the program is the same as the version of ISPSOft used now.
16#8230	A CPU parameter downloaded is incorrect. The IP address is illegal.	Please check the Ethernet parameters downloaded.
16#8231	A CPU parameter downloaded is incorrect. The netmask address is illegal.	Please check the Ethernet parameters downloaded.

16#8232	A CPU parameter downloaded is incorrect. The gateway address is illegal.	Please check the Ethernet parameters downloaded.
16#8233	A CPU parameter downloaded is incorrect. The IP address filter is set incorrectly.	Please check the Ethernet parameters downloaded.
16#8235	A CPU parameter downloaded is incorrect. The static ARP table is set incorrectly.	1. Check the Ethernet parameters for the CPU module in HWCONFIG. 2. Check whether the version of HWCONFIG is compatible with the version of the CPU module.
16#8236	A CPU parameter downloaded is incorrect. The NTP client service is set incorrectly.	1. Check the Ethernet parameters for the CPU module in HWCONFIG. 2. Check whether the version of HWCONFIG is compatible with the version of the CPU module.
16#8239	A CPU parameter downloaded is incorrect. The email sending function is set incorrectly.	1. Check the Ethernet parameters for the CPU module in HWCONFIG. 2. Check whether the version of HWCONFIG is compatible with the version of the CPU module.
16#823A	A CPU parameter downloaded is incorrect. The condition for the sending of an email is set incorrectly.	1. Check the Ethernet parameters for the CPU module in HWCONFIG. 2. Check whether the version of HWCONFIG is compatible with the version of the CPU module.
16#823B	A CPU parameter downloaded is incorrect. A TCP socket is set incorrectly.	1. Check the Ethernet parameters for the CPU module in HWCONFIG. 2. Check whether the version of HWCONFIG is compatible with the version of the CPU module.
16#823C	A CPU parameter downloaded is incorrect. A UDP socket is set incorrectly.	1. Check the Ethernet parameters for the CPU module in HWCONFIG. 2. Check whether the version of HWCONFIG is compatible with the version of the CPU module.
16#823E	A CPU parameter downloaded is incorrect. The web function is set incorrectly.	1. Check the Ethernet parameters for the CPU module in HWCONFIG. 2. Check whether the version of HWCONFIG is compatible with the version of the CPU module.
16#8240	A CPU parameter downloaded is incorrect. EtherLink	Modify the setting, and download it again.

16#8241	The setting of a DNS server is incorrect.	Modify the setting, and download it again.
16#8522	A module configuration is being scanned.	The module configuration is being scanned.
16#853B	An I/O module is not configured.	Check whether the module configuration in HWCONFIG is correct.
16#853C	An I/O module does not exist.	Check whether the module configuration in HWCONFIG is correct.
16#854B	An I/O module is not configured.	Check whether the module configuration in HWCONFIG is correct.
16#854C	An I/O module does not exist.	Check whether the module configuration in HWCONFIG is correct.
16#8572	The checksum of the module configuration table is incorrect.	Please check the version of the firmware installed on the CPU module and the version of ISPSOft, and contact the factory.
16#8576	The checksum of the module parameter setting is incorrect.	Please check the version of the firmware installed on the CPU module and the version of ISPSOft, and contact the factory.
16#857A	The checksum of the module parameter mapping table is incorrect.	Please check the version of the firmware installed on the CPU module and the version of ISPSOft, and contact the factory.
16#85E1	An I/O interrupt number is incorrect.	Please check the version of the firmware installed on the CPU module and the version of ISPSOft, and contact the factory.
16#85E2	An I/O interrupt service routine does not exist.	Check whether the corresponding interrupt service routine is downloaded to the CPU module.
16#860F	System restoration error	<ol style="list-style-type: none"> 1. The contents of the system backup file are incorrect, or the file does not exist in the path specified. 2. If the file exists and the procedure of restoring the system can not be executed, please backing up the system again. 3. If the error still occurs, please contact the factory.
16#8611	No memory card exists, or the memory card format is incorrect.	No memory card is detected. Please format the memory card, and try again.

16#8612	An error occurs when data is accessed from the memory card, or the memory card is in read-only mode.	Please make sure that the memory card is not in read-only mode, and try again.
16#8F03	A node number is undefined.	Modify the instruction and the network parameters, and download them again.
16#9A01	The data exchange setting for data exchange connection 1 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A02	The data exchange setting for data exchange connection 2 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A03	The data exchange setting for data exchange connection 3 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A04	The data exchange setting for data exchange connection 4 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A05	The data exchange setting for data exchange connection 5 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A06	The data exchange setting for data exchange connection 6 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A07	The data exchange setting for data exchange connection 7 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A08	The data exchange setting for data exchange connection 8 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.

Error Code	Description	Solution
16#9A09	The data exchange setting for data exchange connection 9 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A0A	The data exchange setting for data exchange connection 10 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A0B	The data exchange setting for data exchange connection 11 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A0C	The data exchange setting for data exchange connection 12 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A0D	The data exchange setting for data exchange connection 13 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A0E	The data exchange setting for data exchange connection 14 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A0F	The data exchange setting for data exchange connection 15 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A10	The data exchange setting for data exchange connection 16 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.

Error Code	Description	Solution
16#9A11	The data exchange setting for data exchange connection 17 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A12	The data exchange setting for data exchange connection 18 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A13	The data exchange setting for data exchange connection 19 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A14	The data exchange setting for data exchange connection 20 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A15	The data exchange setting for data exchange connection 21 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A16	The data exchange setting for data exchange connection 22 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A17	The data exchange setting for data exchange connection 23 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A18	The data exchange setting for data exchange connection 24 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.

Error Code	Description	Solution
16#9A19	The data exchange setting for data exchange connection 25 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A1A	The data exchange setting for data exchange connection 26 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A1B	The data exchange setting for data exchange connection 27 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A1C	The data exchange setting for data exchange connection 28 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A1D	The data exchange setting for data exchange connection 29 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A1E	The data exchange setting for data exchange connection 30 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A1F	The data exchange setting for data exchange connection 31 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A20	The data exchange setting for data exchange connection 32 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A21	A communicational error occurs in data exchange connection 1 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.

Error Code	Description	Solution
	A communicational error occurs in Modbus data exchange connection 1 via COM1.	
16#9A22	A communicational error occurs in data exchange connection 2 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 2 via COM1.	
16#9A23	A communicational error occurs in data exchange connection 3 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 3 via COM1.	
16#9A24	A communicational error occurs in data exchange connection 4 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 4 via COM1.	
16#9A25	A communicational error occurs in data exchange connection 5 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 5 via COM1.	
16#9A26	A communicational error occurs in data exchange connection 6 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 6 via COM1.	
16#9A27	A communicational error occurs in data exchange connection 7 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 7 via COM1.	
16#9A28	A communicational error occurs in data exchange connection 8 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.

Error Code	Description	Solution
	A communicational error occurs in Modbus data exchange connection 8 via COM1.	
16#9A29	A communicational error occurs in data exchange connection 9 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 9 via COM1.	
16#9A2A	A communicational error occurs in data exchange connection 10 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 10 via COM1.	
16#9A2B	A communicational error occurs in data exchange connection 11 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 11 via COM1.	
16#9A2C	A communicational error occurs in data exchange connection 12 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 12 via COM1.	
16#9A2D	A communicational error occurs in data exchange connection 13 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 13 via COM1.	
16#9A2E	A communicational error occurs in data exchange connection 14 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 14 via COM1.	
16#9A2F	A communicational error occurs in data exchange connection 15 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.

Error Code	Description	Solution
	A communicational error occurs in Modbus data exchange connection 15 via COM1.	
16#9A30	A communicational error occurs in data exchange connection 16 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 16 via COM1.	
16#9A31	A communicational error occurs in data exchange connection 17 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 17 via COM1.	
16#9A32	A communicational error occurs in data exchange connection 18 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 18 via COM1.	
16#9A33	A communicational error occurs in data exchange connection 19 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 19 via COM1.	
16#9A34	A communicational error occurs in data exchange connection 20 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 20 via COM1.	
16#9A35	A communicational error occurs in data exchange connection 21 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 21 via COM1.	
16#9A36	A communicational error occurs in data exchange connection 22 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.

Error Code	Description	Solution
	A communicational error occurs in Modbus data exchange connection 22 via COM1.	
16#9A37	A communicational error occurs in data exchange connection 23 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 23 via COM1.	
16#9A38	A communicational error occurs in data exchange connection 24 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 24 via COM1.	
16#9A39	A communicational error occurs in data exchange connection 25 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 25 via COM1.	
16#9A3A	A communicational error occurs in data exchange connection 26 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 26 via COM1.	
16#9A3B	A communicational error occurs in data exchange connection 27 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 27 via COM1.	
16#9A3C	A communicational error occurs in data exchange connection 28 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 28 via COM1.	
16#9A3D	A communicational error occurs in data exchange connection 29 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.

Error Code	Description	Solution
	A communicational error occurs in Modbus data exchange connection 29 via COM1.	
16#9A3E	A communicational error occurs in data exchange connection 30 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 30 via COM1.	
16#9A3F	A communicational error occurs in data exchange connection 31 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 31 via COM1.	
16#9A40	A communicational error occurs in data exchange connection 32 via PLC Link.	1. Check the communication settings. 2. Check the communication cable.
	A communicational error occurs in Modbus data exchange connection 32 via COM1.	
16#9A41	There is no response from data exchange connection 1 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A42	There is no response from data exchange connection 2 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A43	There is no response from data exchange connection 3 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A44	There is no response from data exchange connection 4 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A45	There is no response from data exchange connection 5 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.

Error Code	Description	Solution
16#9A46	There is no response from data exchange connection 6 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A47	There is no response from data exchange connection 7 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A48	There is no response from data exchange connection 8 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A49	There is no response from data exchange connection 9 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A4A	There is no response from data exchange connection 10 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A4B	There is no response from data exchange connection 11 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A4C	There is no response from data exchange connection 12 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A4D	There is no response from data exchange connection 13 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A4E	There is no response from data exchange connection 14 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A4F	There is no response from data exchange connection 15 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A50	There is no response from data exchange connection 16 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.

Error Code	Description	Solution
16#9A51	There is no response from data exchange connection 17 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A52	There is no response from data exchange connection 18 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A53	There is no response from data exchange connection 19 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A54	There is no response from data exchange connection 20 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A55	There is no response from data exchange connection 21 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A56	There is no response from data exchange connection 22 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A57	There is no response from data exchange connection 23 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A58	There is no response from data exchange connection 24 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A59	There is no response from data exchange connection 25 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A5A	There is no response from data exchange connection 26 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A5B	There is no response from data exchange connection 27 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.

Error Code	Description	Solution
16#9A5C	There is no response from data exchange connection 28 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A5D	There is no response from data exchange connection 29 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A5E	There is no response from data exchange connection 30 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A5F	There is no response from data exchange connection 31 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A60	There is no response from data exchange connection 32 in the PLC Link / COM1 Modbus. (SM1591)	1. Check the communication settings. 2. Check the communication cable.
16#9A61	The setting of the PLC Link mode is incorrect. (SM1589)	Make sure that SM1586 and SM1587 are not both ON.
16#9A62	The number of polling cycles in the PLC Link is incorrect. (SM1592)	If the PLC Link is in the manual mode, please make sure that the number of polling cycles is within the range between 1 and 65535.
16#9A63	There is a handshaking timeout when the CPU module establishes a connection with the network module. (SM1596)	Check whether the network module operates normally.
16#9A64	There is no network module parameter in the CPU module. (SM1596)	Download the parameter in HWCONFIG again.
16#9B21	A communicational error occurs in Modbus data exchange connection 1 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B22	A communicational error occurs in Modbus data exchange connection 2 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B23	A communicational error occurs in Modbus data exchange connection 3 via COM2.	1. Check the communication settings. 2. Check the communication cable.

16#9B24	A communicational error occurs in Modbus data exchange connection 4 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B25	A communicational error occurs in Modbus data exchange connection 5 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B26	A communicational error occurs in Modbus data exchange connection 6 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B27	A communicational error occurs in Modbus data exchange connection 7 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B28	A communicational error occurs in Modbus data exchange connection 8 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B29	A communicational error occurs in Modbus data exchange connection 9 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B2A	A communicational error occurs in Modbus data exchange connection 10 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B2B	A communicational error occurs in Modbus data exchange connection 11 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B2C	A communicational error occurs in Modbus data exchange connection 12 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B2D	A communicational error occurs in Modbus data exchange connection 13 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B2E	A communicational error occurs in Modbus data exchange connection 14 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B2F	A communicational error occurs in Modbus data exchange connection 15 via COM2.	1. Check the communication settings. 2. Check the communication cable.

16#9B30	A communicational error occurs in Modbus data exchange connection 16 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B31	A communicational error occurs in Modbus data exchange connection 17 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B32	A communicational error occurs in Modbus data exchange connection 18 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B33	A communicational error occurs in Modbus data exchange connection 19 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B34	A communicational error occurs in Modbus data exchange connection 20 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B35	A communicational error occurs in Modbus data exchange connection 21 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B36	A communicational error occurs in Modbus data exchange connection 22 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B37	A communicational error occurs in Modbus data exchange connection 23 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B38	A communicational error occurs in Modbus data exchange connection 24 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B39	A communicational error occurs in Modbus data exchange connection 25 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B3A	A communicational error occurs in Modbus data exchange connection 26 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B3B	A communicational error occurs in Modbus data exchange connection 27 via COM2.	1. Check the communication settings. 2. Check the communication cable.

16#9B3C	A communicational error occurs in Modbus data exchange connection 28 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B3D	A communicational error occurs in Modbus data exchange connection 29 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B3E	A communicational error occurs in Modbus data exchange connection 30 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B3F	A communicational error occurs in Modbus data exchange connection 31 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B40	A communicational error occurs in Modbus data exchange connection 32 via COM2.	1. Check the communication settings. 2. Check the communication cable.
16#9B41	There is no response from data exchange connection 1 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B42	There is no response from data exchange connection 2 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B43	There is no response from data exchange connection 3 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B44	There is no response from data exchange connection 4 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B45	There is no response from data exchange connection 5 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B46	There is no response from data exchange connection 6 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B47	There is no response from data exchange connection 7 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.

16#9B48	There is no response from data exchange connection 8 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B49	There is no response from data exchange connection 9 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B4A	There is no response from data exchange connection 10 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B4B	There is no response from data exchange connection 11 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B4C	There is no response from data exchange connection 12 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B4D	There is no response from data exchange connection 13 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B4E	There is no response from data exchange connection 14 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B4F	There is no response from data exchange connection 15 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B50	There is no response from data exchange connection 16 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B51	There is no response from data exchange connection 17 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B52	There is no response from data exchange connection 18 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B53	There is no response from data exchange connection 19 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.

16#9B54	There is no response from data exchange connection 20 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B55	There is no response from data exchange connection 21 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B56	There is no response from data exchange connection 22 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B57	There is no response from data exchange connection 23 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B58	There is no response from data exchange connection 24 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B59	There is no response from data exchange connection 25 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B5A	There is no response from data exchange connection 26 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B5B	There is no response from data exchange connection 27 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B5C	There is no response from data exchange connection 28 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B5D	There is no response from data exchange connection 29 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B5E	There is no response from data exchange connection 30 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.
16#9B5F	There is no response from data exchange connection 31 in the COM2 Modbus.	1. Check the communication settings. 2. Check the communication cable.

16#9B60	There is no response from data exchange connection 32 in the COM2 Modbus.	<ol style="list-style-type: none">1. Check the communication settings.2. Check the communication cable.
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7.3 Error Codes and LED Indicators for CPU Modules

● Columns

- a. Error code: If the error occurs in the system, the error code is generated.
- b. Description: The description of the error
- c. CPU status: If the error occurs, the CPU stops running, keeps running, or in the status defined by users.
 - Stop: The CPU stops running when the error occurs.
 - Keep: The CPU keeps running when the error occurs.
 - Self-defined: The status of the CPU can be defined by users. Please refer to section 8.2.1 in Operation Manual for more information.
- d. LED indicator status: If the error occurs, the LED indicator is ON, OFF, or blinks.
 - ERROR: The system error
 - BUS FAULT: The I/O bus error
 - Module ERROR: The module error

● LED indicators for CPU Modules

	LED indicator	Description
CPU	ERROR	The status of the CPU ON: A serious error occurs in the system. OFF: The system is normal. Blinking: A slight error occurs in the system.
	BUS FAULT	The status of the I/O bus ON: A serious error occurs in the I/O bus. OFF: The I/O bus is normal. Blinking: A slight error occurs in the I/O bus.
Module	ERROR	The status of the module ON: A serious error occurs in the module. OFF: The module is normal. Blinking: A slight error occurs in the module.

7.3.1 Error Codes for CPU Modules

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#000A	Scan timeout (SM8: The watchdog timer error)	Stop	Blinking	Keep
16#000B	The program in the PLC is damaged.	Stop	ON	Keep
16#000C	The program downloaded to the PLC is incorrect.	Stop	Blinking	Keep
16#000D	The CPU parameter is damaged.	Stop	ON	Keep
16#000E	The program or the parameter is being downloaded, and therefore the PLC can not run.	Stop	Blinking	Keep
16#000F	The original program in the PLC is damaged.	Continue	Keep	Keep
16#0010	The access to the memory in the CPU is denied.	Stop	ON	Keep
16#0011	The PLC ID is incorrect. (SM9)	Continue	ON	Keep
16#0012	The PLC password is incorrect.	Continue	ON	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#0013	The I/O module can not run/stop. (SM10)	Stop	Keep	ON
16#0014	The procedure of restoring the system can not be executed. (SM9)	Stop	ON	ON
16#0015	The module table is incorrect. (SM10)	Stop	ON	Keep
16#0016	The module setting is incorrect. (SM10)	Stop	ON	Keep
16#0017	The device which is associated with the data register is incorrect. (SM10)	Stop	ON	Keep
16#0018	The serial port is abnormal. (SM9)	Continue	Blinking	Keep
16#0019	The USB is abnormal. (SM9)	Continue	Blinking	Keep
16#001A	The contents of the system backup file (DUP) are incorrect.	Stop	ON	Keep
16#001B	Timed interrupt 0 is set incorrectly.	Stop	ON	Keep
16#001C	Timed interrupt 1 is set incorrectly.	Stop	ON	Keep
16#001D	Timed interrupt 2 is set incorrectly.	Stop	ON	Keep
16#001E	Timed interrupt 3 is set incorrectly.	Stop	ON	Keep
16#001F	The watchdog timer is set incorrectly.	Stop	ON	Keep
16#0020	The setting of the fixed scan time is incorrect.	Stop	ON	Keep
16#0021	The setting of the fixed scan time is incorrect.	Stop	ON	Keep
16#0022	The CPU parameter downloaded to the PLC is incorrect.	Stop	ON	Keep
16#0023	The Y state (STOP->RUN) section in the PLC Parameter Setting window is set incorrectly.	Stop	ON	Keep
16#0024	There is no I/O module on a backplane.	Continue	Keep	Keep
16#0025	The initial value of the symbol is not consistent with what is set in the program.	Stop	ON	Keep
16#0026	The latching auxiliary relay range which is set is incorrect.	Stop	ON	Keep
16#0027	The latching data register range which is set is incorrect.	Stop	ON	Keep
16#0028	The latching timer range which is set is incorrect.	Stop	ON	Keep
16#0029	The latching counter range which is set is incorrect.	Stop	ON	Keep
16#002A	The latching 32-bit counter range which is set is incorrect.	Stop	ON	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#002B	The latching auxiliary relay range which is set is incorrect.	Stop	ON	Keep
16#0033	The communication setting of COM1 is incorrect. (SM9)	Continue	Blinking	Keep
16#0034	The setting of the station address of COM1 is incorrect. (SM9)	Continue	Blinking	Keep
16#0035	The setting of the communication type of COM1 is incorrect. (SM9)	Continue	Blinking	Keep
16#0038	The communication setting of COM2 is incorrect. (SM9)	Continue	Blinking	Keep
16#0039	The setting of the station address of COM2 is incorrect. (SM9)	Continue	Blinking	Keep
16#003A	The setting of the communication type of COM2 is incorrect. (SM9)	Continue	Blinking	Keep
16#0050	The memories in the latched special auxiliary relays are abnormal.	Continue	ON	Keep
16#0051	The latched special data registers are abnormal.	Continue	ON	Keep
16#0052	The memories in the latched auxiliary relays are abnormal.	Continue	ON	Keep
16#0053	The latched timers are abnormal.	Continue	ON	Keep
16#0054	The latched counters are abnormal.	Continue	ON	Keep
16#0055	The latched 32-bit counters are abnormal.	Continue	ON	Keep
16#0056	The memories in the latched timers are abnormal.	Continue	ON	Keep
16#0057	The memories in the latched counters are abnormal.	Continue	ON	Keep
16#0058	The memories in the latched 32-bit counters are abnormal.	Continue	ON	Keep
16#0059	The latched data registers are abnormal.	Continue	ON	Keep
16#005A	The latched working registers are abnormal.	Continue	ON	Keep
16#005D	The CPU module does not detect a memory card. (SM453)	Continue	Blinking	Keep
16#005E	The memory card is initialized incorrectly. (SM453)	Continue	Blinking	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#005F	The data is read from the inexistent file in the memory card, or the data is written into the inexistent file in the memory card. (SM453)	Continue	Blinking	Keep
16#0060	The default folder can not be created in the CPU module. (SM453)	Continue	Blinking	Keep
16#0061	The capacity of the memory card is not large enough. (SM453)	Continue	Blinking	Keep
16#0062	The memory card is write protected. (SM453)	Continue	Blinking	Keep
16#0063	An error occurs when the data is written into the memory card. (SM453)	Continue	Blinking	Keep
16#0064	The file in the memory card can not be read. (SM453)	Continue	Blinking	Keep
16#0065	The file in the memory card is a read-only file. (SM453)	Continue	Blinking	Keep
16#0066	An error occurs when the system is backed up.	Continue	Blinking	Keep
16#0067	The size of the PLC parameters restored exceeds the size of the PLC parameters of the CPU module.	Continue	Blinking	Keep
16#0068	Corrupted symbol initialization table	Stop	Blinking	Keep
16#1400	An error occurs when the data is accessed through the auxiliary processor. (SM9)	Stop	Keep	ON
16#1401	An error occurs when the data in the I/O module is accessed. (SM9)	Stop	Keep	ON
16#1402	The actual arrangement of the I/O modules is not consistent with the module table. (SM9)	Stop	Keep	ON
16#1403	An error occurs when the data is read from the module. (SM9)	Stop	Keep	ON
16#1405	The setting parameter of the module is not found. (SM9)	Stop	Keep	ON
16#1407	A communication error occurs when the data is accessed through the auxiliary processor. (SM9)	Continue	ON	Keep
16#1409	The extension backplane is disconnected. (SM9)	Stop	Keep	ON
16#140A	The communication with the extension backplane is incorrect. (SM9)	Stop	Keep	ON

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#140B	The number of network modules exceeds the limit. (SM9)	Stop	Keep	ON
16#140C	The checksum of the high-speed data exchange is incorrect. (SM9)	Stop	Keep	ON
16#140D	The ID of the actual power supply module is not the same as the ID of the power supply module set in HWCONFIG. (SM9)	Stop	Keep	ON
16#140E	The amount of data exchanged at a high speed exceeds the maximum amount supported. (SM10)	Stop	Keep	ON
16#140F	High-speed data exchange error (SM11)	Stop	Keep	ON
16#1801	There is no interrupt service routine in the CPU module.	Continue	Keep	Keep
16#2000	There is no END in the program in the PLC. (SM5)	Stop	Blinking	Keep
16#2001	The program is incorrect. There is a syntax error. (SM5)	Stop	Blinking	Keep
16#2002	GOEND is used incorrectly. (SM5)	Stop	Blinking	Keep
16#2003	The devices used in the program exceed the range. (SM0/SM5)	Self-defined	Blinking	Keep
16#2004	The part of the program specified by the label used in CJ/JMP is incorrect, or the label is used repeatedly. (SM0/SM5)	Stop	Blinking	Keep
16#2005	The N value used in MC is not the same as the corresponding N value used in MCR, or the number of N values used in MC is not the same as the number of N values used in MCR. (SM5)	Stop	Blinking	Keep
16#2006	The N values used in MC do not start from 0, or the N values used in MC are not continuous. (SM5)	Stop	Blinking	Keep
16#2007	The operands used in ZRST are not used properly. (SM5)	Stop	Blinking	Keep
16#200A	Invalid instruction (SM5)	Stop	Blinking	Keep
16#200B	The operand n or the other constant operands exceed the range. (SM0/SM5)	Self-defined	Blinking	Keep
16#200C	The operands overlap. (SM0/SM5)	Self-defined	Blinking	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#200D	An error occurs when the binary number is converted into the binary-coded decimal number. (SM0/SM5)	Self-defined	Blinking	Keep
16#200E	The string does not end with 0x00. (SM0/SM5)	Self-defined	Blinking	Keep
16#200F	The instruction does not support the modification by an index register. (SM5)	Stop	Blinking	Keep
16#2010	1. The instruction does not support the device. 2. Encoding error 3. The instruction is a 16-bit instruction, but the constant operand is a 32-bit code. (SM5)	Stop	Blinking	Keep
16#2011	The number of operands is incorrect. (SM5)	Stop	Blinking	Keep
16#2012	Incorrect division operation (SM0/SM5).	Self-defined	Blinking	Keep
16#2013	The value exceeds the range of values which can be represented by the floating-point numbers. (SM0/SM5)	Self-defined	Blinking	Keep
16#2014	The task designated by TKON/YKOFF is incorrect, or exceeds the range. (SM5)	Stop	Blinking	Keep
16#2015	There are more than 32 levels of nested program structures supported by CALL. (SM0)	Self-defined	Blinking	Keep
16#2016	There are more than 32 levels of nested program structures supported by FOR/NEXT. (SM0/SM5)	Self-defined	Blinking	Keep
16#2017	The number of times FOR is used is different from the number of times NEXT is used. (SM5)	Stop	Blinking	Keep
16#2018	There is a label after FEND, but there is no SRET. There is SRET, but there is no label. (SM5)	Stop	Blinking	Keep
16#2019	The interrupt task is not after FEND. (SM5)	Stop	Blinking	Keep
16#201A	IRET/SRET is not after FEND. (SM5)	Stop	Blinking	Keep
16#201B	There is an interrupt task, but there is no IRET. There is IRET, but there is not interrupt task. (SM5)	Stop	Blinking	Keep
16#201C	End is not at the end of the program. (SM5)	Stop	Blinking	Keep
16#201D	There is CALL, but there is no MAR. (SM5)	Stop	Blinking	Keep
16#201E	The function code used in MODRW is incorrect. (SM102/SM103)	Self-defined	Blinking	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#201F	The length of the data set in MODRW is incorrect. (SM102/SM103)	Self-defined	Blinking	Keep
16#2020	The communication command received by using MODRW is incorrect. (SM102/SM103)	Self-defined	Blinking	Keep
16#2021	The checksum of the command received is incorrect. (SM102/SM103)	Self-defined	Blinking	Keep
16#2022	The format of the command used in MODRW does not conform to the ASCII format. (SM102/SM103)	Self-defined	Blinking	Keep
16#2023	There is a communication timeout when MODRW is executed. (SM120/SM103)	Self-defined	Blinking	Keep
16#2024	The setting value of the communication timeout is invalid. (SM120/SM103)	Self-defined	Blinking	Keep
16#2025	There is a communication timeout when RS is executed. (SM120/SM103)	Self-defined	Blinking	Keep
16#2026	The interrupt number used in RS is incorrect. (SM102/104)	Self-defined	OFF	Keep
16#2027	The execution of FWD is abnormal. (SM102/103)	Self-defined	Blinking	Keep
16#2028	The execution of REV is abnormal. (SM102/103)	Self-defined	Blinking	Keep
16#2029	The execution of STOP is abnormal. (SM102/103)	Self-defined	Blinking	Keep
16#202A	The execution of RSDT is abnormal. (SM102/103)	Self-defined	Blinking	Keep
16#202B	The execution of RSTEF is abnormal. (SM102/103)	Self-defined	Blinking	Keep
16#202C	I/O interrupt service routine 0 does not exist.	Stop	Blinking	Keep
16#202D	I/O interrupt service routine 1 does not exist.	Stop	Blinking	Keep
16#202E	I/O interrupt service routine 2 does not exist.	Stop	Blinking	Keep
16#202F	I/O interrupt service routine 3 does not exist.	Stop	Blinking	Keep
16#2030	I/O interrupt service routine 4 does not exist.	Stop	Blinking	Keep
16#2031	I/O interrupt service routine 5 does not exist.	Stop	Blinking	Keep
16#2032	I/O interrupt service routine 6 does not exist.	Stop	Blinking	Keep
16#2033	I/O interrupt service routine 7 does not exist.	Stop	Blinking	Keep
16#2034	I/O interrupt service routine 8 does not exist.	Stop	Blinking	Keep
16#2035	I/O interrupt service routine 9 does not exist.	Stop	Blinking	Keep
16#2036	I/O interrupt service routine 10 does not exist.	Stop	Blinking	Keep
16#2037	I/O interrupt service routine 11 does not exist.	Stop	Blinking	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#2038	I/O interrupt service routine 12 does not exist.	Stop	Blinking	Keep
16#2039	I/O interrupt service routine 13 does not exist.	Stop	Blinking	Keep
16#203A	I/O interrupt service routine 14 does not exist.	Stop	Blinking	Keep
16#203B	I/O interrupt service routine 15 does not exist.	Stop	Blinking	Keep
16#203C	I/O interrupt service routine 16 does not exist.	Stop	Blinking	Keep
16#203D	I/O interrupt service routine 17 does not exist.	Stop	Blinking	Keep
16#203E	I/O interrupt service routine 18 does not exist.	Stop	Blinking	Keep
16#203F	I/O interrupt service routine 19 does not exist.	Stop	Blinking	Keep
16#2040	I/O interrupt service routine 20 does not exist.	Stop	Blinking	Keep
16#2041	I/O interrupt service routine 21 does not exist.	Stop	Blinking	Keep
16#2042	I/O interrupt service routine 22 does not exist.	Stop	Blinking	Keep
16#2043	I/O interrupt service routine 23 does not exist.	Stop	Blinking	Keep
16#2044	I/O interrupt service routine 24 does not exist.	Stop	Blinking	Keep
16#2045	I/O interrupt service routine 25 does not exist.	Stop	Blinking	Keep
16#2046	I/O interrupt service routine 26 does not exist.	Stop	Blinking	Keep
16#2047	I/O interrupt service routine 27 does not exist.	Stop	Blinking	Keep
16#2048	I/O interrupt service routine 28 does not exist.	Stop	Blinking	Keep
16#2049	I/O interrupt service routine 29 does not exist.	Stop	Blinking	Keep
16#204A	I/O interrupt service routine 30 does not exist.	Stop	Blinking	Keep
16#204B	I/O interrupt service routine 31 does not exist.	Stop	Blinking	Keep
16#2054 16#2127	External interrupt service routine 40~251 does not exist.	Stop	Blinking	Keep
16#2128	An action in a sequential function chart is incorrectly assigned qualifiers related to time. (SM0/SM1)	Self-defined	Blinking	Keep
16#2129	The modifier R is assigned to an action in a sequential function chart incorrectly. (SM0/SM1)	Self-defined	Blinking	Keep
16#212A	The instructions MC and MCR cannot be used in interrupts or subroutines. (SM5)	Self-defined	Blinking	Keep
16#6000	Ethernet connection error (SM1106)	Continue	Blinking	Keep
16#6001	Illegal IP address (SM1107)	Continue	Blinking	Keep
16#6002	Illegal netmask address (SM1107)	Continue	Blinking	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#6003	Illegal gateway mask (SM1107)	Continue	Blinking	Keep
16#6004	The IP address filter is set incorrectly. (SM1108)	Continue	Blinking	Keep
16#6006	The static ARP table is set incorrectly. (SM1108)	Continue	Blinking	Keep
16#6007	The NTP client service is set incorrectly. (SM1380)	Continue	Blinking	Keep
16#6008	Illegal network number (SM1107)	Continue	Blinking	Keep
16#6009	Illegal node number (SM1107)	Continue	Blinking	Keep
16#600A	TCP connection failure (SM1090)	Continue	Keep	Keep
16#600B	UDP connection failure (SM1091)	Continue	Keep	Keep
16#600C	The TCP socket has been used. (SM1109)	Continue	Keep	Keep
16#600D	The RJ45 port is not connected.	Continue	Keep	Keep
16#600E	An RJ45 port on AH10EN-5A is not connected to a network cable.	Continue	Keep	Keep
16#600F	Maximum number of the connections via Modbus TCP server is reached. (SM1089)	Continue	Blinking	Keep
16#6010	BOOTP IP is set incorrectly. (SM1107)	Continue	Keep	Keep
16#6011	BOOTP Gateway is set incorrectly. (SM1107)	Continue	Keep	Keep
16#6012	The IP address is duplicated. (SM1107)	Continue	Blinking	Keep
16#6013	DNS address is set incorrectly. (SM1107)	Continue	Keep	Keep
16#6100	The email connection is busy. (SM1113)	Continue	Keep	Keep
16#6101	The trigger in the email is set incorrectly. (SM1112)	Continue	Blinking	Keep
16#6102	The interval of sending the email is set incorrectly. (SM1112)	Continue	Blinking	Keep
16#6103	The device containing the data specified as the attachment exceeds the device range. (SM1112)	Continue	Blinking	Keep
16#6104	The attachment in the email does not exist. (SM1113)	Continue	Keep	Keep
16#6105	The attachment in the email is oversized. (SM1113)	Continue	Keep	Keep
16#6106	The SMTP server address is incorrect. (SM1112)	Continue	Blinking	Keep
16#6107	There is an SMTP server response timeout. (SM1113)	Continue	Keep	Keep
16#6108	SMTP authentication error (SM1112)	Continue	Blinking	Keep
16#6110	The SMTP server needs to be authenticated. (SM1112)	Continue	Blinking	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#6111	The specified email address does not exist. (SM1112)	Continue	Blinking	Keep
16#6200	The remote IP address set in the TCP socket function is illegal. (SM1196)	Continue	Blinking	Keep
16#6201	The local communication port set in the TCP socket function is illegal.	Continue	Keep	Keep
16#6202	The remote communication port set in the TCP socket function is illegal.	Continue	Keep	Keep
16#6203	The device from which the data is sent in the TCP socket function is illegal.	Continue	Keep	Keep
16#6204	The transmitted data length set in the TCP socket function is illegal.	Continue	Keep	Keep
16#6205	The data which is sent through the TCP socket exceeds the device range.	Continue	Keep	Keep
16#6206	The device which receives the data in the TCP socket function is illegal.	Continue	Keep	Keep
16#6207	The received data length set in the TCP socket function is illegal.	Continue	Keep	Keep
16#6208	The data which is received through the TCP socket exceeds the device range.	Continue	Keep	Keep
16#6209	The remote IP address set in the UDP socket function is illegal. (SM1196)	Continue	Blinking	Keep
16#620A	The local communication port set in the UDP socket function is illegal.	Continue	Keep	Keep
16#620B	The remote communication port set in the UDP socket function is illegal.	Continue	Keep	Keep
16#620C	The device from which the data is sent in the UDP socket function is illegal.	Continue	Keep	Keep
16#620D	The transmitted data length set in the UDP socket function is illegal.	Continue	Keep	Keep
16#620E	The data which is sent through the UDP socket exceeds the device range.	Continue	Keep	Keep
16#620F	The device which receives the data in the UDP socket function is illegal.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#6210	The received data length set in the UDP socket function is illegal.	Continue	Keep	Keep
16#6211	The data which is received through the UDP socket exceeds the device range.	Continue	Keep	Keep
16#6212	There is no response from the remote device after the timeout period. (Socket)	Continue	Keep	Keep
16#6213	The data received exceeds the limit. (Socket)	Continue	Keep	Keep
16#6214	The remote device refuses the connection. (Socket)	Continue	Keep	Keep
16#6215	The socket is not opened.	Continue	Keep	Keep
16#6217	The socket is opened.	Continue	Keep	Keep
16#6218	The data is being sent through the socket.	Continue	Keep	Keep
16#6219	The data is being received through the socket.	Continue	Keep	Keep
16#621A	The socket is being closed.	Continue	Keep	Keep
16#6300	Only auxiliary relays, data registers, and link registers can be used in the Ether Link.	Continue	Blinking	Keep
16#6301	The device used in the Ether Link exceeds the device range.	Continue	Blinking	Keep
16#6302	The length of the data exchanged in the Ether Link exceeds the limit.	Continue	Blinking	Keep
16#6303	The remote device in the Ether Link aborts the connection.	Continue	Keep	Keep
16#6304	The connection in the Ether Link is busy.	Continue	Keep	Keep
16#6305	The node used in the communication command is different from the local node.	Continue	Blinking	Keep
16#6309	The remote device in the Ether Link does not respond after the timeout period.	Continue	Keep	Keep
16#630A	The module ID or the setting of the module is different from the setting in the Ether Link.	Continue	Blinking	Keep
16#630B	The setting of the netmask address for the CPU or the module is different from the setting in the Ether Link.	Continue	Blinking	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#6400	The number of TCP connections specified by EMDRW exceeds the limit, or the sending of the flag is not set. (EMDRW)	Continue	Keep	Keep
16#6401	The remote device aborts the connection. (EMDRW)	Continue	Keep	Keep
16#6402	There is no response from the remote device after the timeout period. (EMDRW)	Continue	Keep	Keep
16#6403	The remote IP address used in the applied instruction is illegal. (EMDRW)	Continue	Keep	Keep
16#6404	The Modbus function code not supported is received. (EMDRW)	Continue	Keep	Keep
16#6405	The number of data which will be received is not consistent with the actual length of the data. (EMDRW)	Continue	Keep	Keep
16#6500	An error occurs when a data exchange function is initialized. (SM699)	Continue	Blinking	OFF
16#6501	A remote device does not respond after a timeout. (SM828-SM955)	Continue	OFF	OFF
16#6502	The packet with which a remote device replies is incorrect. (SM828-SM955)	Continue	OFF	OFF
16#6700	An error occurs when a Modbus TCP data exchange is initialized.	Continue	Keep	Keep
16#6701	Modbus TCP data exchange timeout	Continue	Keep	Keep
16#6702	The data received through Modbus TCP data exchange is incorrect.	Continue	Keep	Keep
16#7002	The CPU module does not support the function.	Continue	Keep	Keep
16#7203	Invalid access code	Continue	Keep	Keep
16#7401	Function code error	Continue	Keep	Keep
16#7402	The size of a packet exceeds the maximum data length.	Continue	Keep	Keep
16#7404	Packet format error	Continue	Keep	Keep
16#7405	The number of bytes is incorrect.	Continue	Keep	Keep
16#7406	Checksum error	Continue	Keep	Keep
16#7407	There are non-ASCII characters in a command.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#7408	The PLC is running.	Continue	Keep	Keep
16#740A	Data is being written to the memory in the PLC or data fails to be written to the memory in the PLC.	Continue	Keep	Keep
16#740B	The CPU module is being reset, or the values in the latching devices are being cleared.	Continue	Keep	Keep
16#740C	The backplane number in a communication command is incorrect.	Continue	Keep	Keep
16#740D	The slot number in a communication command is incorrect.	Continue	Keep	Keep
16#740E	An error occurs when the the data in the memory in the PLC is cleared.	Continue	Keep	Keep
16#740F	Communication timeout	Continue	Keep	Keep
16#7410	The function code in a reply command is incorrect.	Continue	Keep	Keep
16#7412	Owing to the fact that SW1 is ON, data can not be downloaded to the CPU module.	Continue	Keep	Keep
16#757D	The remaining number of PLC password guesses is 0.	Continue	Keep	Keep
16#757E	The PLC password entered is incorrect.	Continue	Keep	Keep
16#8105	The program downloaded to the CPU module is incorrect. The syntax downloaded is incorrect.	Continue	Keep	Keep
16#8106	The program downloaded is incorrect. The length of the machine code exceeds the limit.	Continue	Keep	Keep
16#8107	The program downloaded is incorrect. The length of the source code exceeds the limit.	Continue	Keep	Keep
16#8230	A CPU parameter downloaded is incorrect. The IP address is illegal.	Continue	Keep	Keep
16#8231	A CPU parameter downloaded is incorrect. The netmask address is illegal.	Continue	Keep	Keep
16#8232	A CPU parameter downloaded is incorrect. The gateway address is illegal.	Continue	Keep	Keep
16#8233	A CPU parameter downloaded is incorrect. The IP address filter is set incorrectly.	Continue	Keep	Keep
16#8235	A CPU parameter downloaded is incorrect. The static ARP table is set incorrectly.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#8236	A CPU parameter downloaded is incorrect. The NTP client service is set incorrectly.	Continue	Keep	Keep
16#8239	A CPU parameter downloaded is incorrect. The email sending function is set incorrectly.	Continue	Keep	Keep
16#823A	A CPU parameter downloaded is incorrect. The condition for the sending of an email is set incorrectly.	Continue	Keep	Keep
16#823B	A CPU parameter downloaded is incorrect. A TCP socket is set incorrectly.	Continue	Keep	Keep
16#823C	A CPU parameter downloaded is incorrect. A UDP socket is set incorrectly.	Continue	Keep	Keep
16#823E	A CPU parameter downloaded is incorrect. The eeb function is set incorrectly.	Continue	Keep	Keep
16#8240	A CPU parameter downloaded is incorrect. The data exchange through Ethernet is set incorrectly	Continue	Keep	Keep
16#8241	The setting of a DNS server is incorrect.	Continue	Keep	Keep
16#8522	A module configuration is being scanned.	Continue	Keep	Keep
16#853B	An I/O module is not configured.	Continue	Keep	Keep
16#853C	An I/O module does not exist.	Continue	Keep	Keep
16#854B	An I/O module is not configured.	Continue	Keep	Keep
16#854C	An I/O module does not exist.	Continue	Keep	Keep
16#8572	The checksum of the module configuration table is incorrect.	Continue	Keep	Keep
16#8576	The checksum of the module parameter setting is incorrect.	Continue	Keep	Keep
16#857A	The checksum of the module parameter mapping table is incorrect.	Continue	Keep	Keep
16#85E1	An I/O interrupt number is incorrect.	Continue	Keep	Keep
16#85E2	An I/O interrupt service routine does not exist.	Continue	Keep	Keep
16#860F	System restoration error	Continue	Blinking	Blinking
16#8611	No memory card exists, or the memory card format is incorrect.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#8612	An error occurs when data is accessed from the memory card, or the memory card is in read-only mode.	Continue	Keep	Keep
16#9A01	The data exchange setting for data exchange connection 1 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A02	The data exchange setting for data exchange connection 2 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A03	The data exchange setting for data exchange connection 3 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A04	The data exchange setting for data exchange connection 4 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A05	The data exchange setting for data exchange connection 5 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A06	The data exchange setting for data exchange connection 6 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A07	The data exchange setting for data exchange connection 7 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A08	The data exchange setting for data exchange connection 8 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A09	The data exchange setting for data exchange connection 9 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A0A	The data exchange setting for data exchange connection 10 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#9A0B	The data exchange setting for data exchange connection 11 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A0C	The data exchange setting for data exchange connection 12 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A0D	The data exchange setting for data exchange connection 13 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A0E	The data exchange setting for data exchange connection 14 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A0F	The data exchange setting for data exchange connection 15 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A10	The data exchange setting for data exchange connection 16 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A11	The data exchange setting for data exchange connection 17 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A12	The data exchange setting for data exchange connection 18 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A13	The data exchange setting for data exchange connection 19 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A14	The data exchange setting for data exchange connection 20 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A15	The data exchange setting for data exchange connection 21 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#9A16	The data exchange setting for data exchange connection 22 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A17	The data exchange setting for data exchange connection 23 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A18	The data exchange setting for data exchange connection 24 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A19	The data exchange setting for data exchange connection 25 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A1A	The data exchange setting for data exchange connection 26 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A1B	The data exchange setting for data exchange connection 27 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A1C	The data exchange setting for data exchange connection 28 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A1D	The data exchange setting for data exchange connection 29 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A1E	The data exchange setting for data exchange connection 30 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A1F	The data exchange setting for data exchange connection 31 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep
16#9A20	The data exchange setting for data exchange connection 32 in the PLC Link / COM1 Modbus is incorrect. (SM1590)	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#9A21	A communicational error occurs in data exchange connection 1 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 1 via COM1.			
16#9A22	A communicational error occurs in data exchange connection 2 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 2 via COM1.			
16#9A23	A communicational error occurs in data exchange connection 3 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 3 via COM1.			
16#9A24	A communicational error occurs in data exchange connection 4 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 4 via COM1.			
16#9A25	A communicational error occurs in data exchange connection 5 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 5 via COM1.			
16#9A26	A communicational error occurs in data exchange connection 6 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 6 via COM1.			
16#9A27	A communicational error occurs in data exchange connection 7 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 7 via COM1.			
16#9A28	A communicational error occurs in data exchange connection 8 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 8 via COM1.			
16#9A29	A communicational error occurs in data exchange connection 9 via PLC Link.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
	A communicational error occurs in Modbus data exchange connection 9 via COM1.			
16#9A2A	A communicational error occurs in data exchange connection 10 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 10 via COM1.			
16#9A2B	A communicational error occurs in data exchange connection 11 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 11 via COM1.			
16#9A2C	A communicational error occurs in data exchange connection 12 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 12 via COM1.			
16#9A2D	A communicational error occurs in data exchange connection 13 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 13 via COM1.			
16#9A2E	A communicational error occurs in data exchange connection 14 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 14 via COM1.			
16#9A2F	A communicational error occurs in data exchange connection 15 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 15 via COM1.			
16#9A30	A communicational error occurs in data exchange connection 16 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 16 via COM1.			
16#9A31	A communicational error occurs in data exchange connection 17 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 17 via COM1.			

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#9A32	A communicational error occurs in data exchange connection 18 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 18 via COM1.			
16#9A33	A communicational error occurs in data exchange connection 19 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 19 via COM1.			
16#9A34	A communicational error occurs in data exchange connection 20 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 20 via COM1.			
16#9A35	A communicational error occurs in data exchange connection 21 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 21 via COM1.			
16#9A36	A communicational error occurs in data exchange connection 22 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 22 via COM1.			
16#9A37	A communicational error occurs in data exchange connection 23 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 23 via COM1.			
16#9A38	A communicational error occurs in data exchange connection 24 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 24 via COM1.			
16#9A39	A communicational error occurs in data exchange connection 25 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 25 via COM1.			
16#9A3A	A communicational error occurs in data exchange connection 26 via PLC Link.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
	A communicational error occurs in Modbus data exchange connection 26 via COM1.			
16#9A3B	A communicational error occurs in data exchange connection 27 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 27 via COM1.			
16#9A3C	A communicational error occurs in data exchange connection 28 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 28 via COM1.			
16#9A3D	A communicational error occurs in data exchange connection 29 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 29 via COM1.			
16#9A3E	A communicational error occurs in data exchange connection 30 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 30 via COM1.			
16#9A3F	A communicational error occurs in data exchange connection 31 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 31 via COM1.			
16#9A40	A communicational error occurs in data exchange connection 32 via PLC Link.	Continue	Keep	Keep
	A communicational error occurs in Modbus data exchange connection 32 via COM1.			
16#9A41	There is no response from data exchange connection 1 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A42	There is no response from data exchange connection 2 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#9A43	There is no response from data exchange connection 3 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A44	There is no response from data exchange connection 4 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A45	There is no response from data exchange connection 5 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A46	There is no response from data exchange connection 6 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A47	There is no response from data exchange connection 7 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A48	There is no response from data exchange connection 8 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A49	There is no response from data exchange connection 9 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A4A	There is no response from data exchange connection 10 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A4B	There is no response from data exchange connection 11 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A4C	There is no response from data exchange connection 12 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A4D	There is no response from data exchange connection 13 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#9A4E	There is no response from data exchange connection 14 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A4F	There is no response from data exchange connection 15 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A50	There is no response from data exchange connection 16 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A51	There is no response from data exchange connection 17 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A52	There is no response from data exchange connection 18 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A53	There is no response from data exchange connection 19 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A54	There is no response from data exchange connection 20 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A55	There is no response from data exchange connection 21 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A56	There is no response from data exchange connection 22 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A57	There is no response from data exchange connection 23 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A58	There is no response from data exchange connection 24 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#9A59	There is no response from data exchange connection 25 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A5A	There is no response from data exchange connection 26 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A5B	There is no response from data exchange connection 27 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A5C	There is no response from data exchange connection 28 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A5D	There is no response from data exchange connection 29 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A5E	There is no response from data exchange connection 30 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A5F	There is no response from data exchange connection 31 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A60	There is no response from data exchange connection 32 in the PLC Link / COM1 Modbus. (SM1591)	Continue	Keep	Keep
16#9A61	The setting of the PLC Link / COM1 Modbus mode is incorrect. (SM1589)	Continue	Keep	Keep
16#9A62	The number of polling cycles in the PLC Link / COM1 Modbus is incorrect. (SM1592)	Continue	Keep	Keep
16#9A63	There is a handshaking timeout when the CPU module establishes a connection with the network module. (SM1596)	Continue	Keep	Keep
16#9A64	There is no network module parameter in the CPU module. (SM1596)	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#9B21	A communicational error occurs in Modbus data exchange connection 1 via COM2.	Continue	Keep	Keep
16#9B22	A communicational error occurs in Modbus data exchange connection 2 via COM2.	Continue	Keep	Keep
16#9B23	A communicational error occurs in Modbus data exchange connection 3 via COM2.	Continue	Keep	Keep
16#9B24	A communicational error occurs in Modbus data exchange connection 4 via COM2.	Continue	Keep	Keep
16#9B25	A communicational error occurs in Modbus data exchange connection 5 via COM2.	Continue	Keep	Keep
16#9B26	A communicational error occurs in Modbus data exchange connection 6 via COM2.	Continue	Keep	Keep
16#9B27	A communicational error occurs in Modbus data exchange connection 7 via COM2.	Continue	Keep	Keep
16#9B28	A communicational error occurs in Modbus data exchange connection 8 via COM2.	Continue	Keep	Keep
16#9B29	A communicational error occurs in Modbus data exchange connection 9 via COM2.	Continue	Keep	Keep
16#9B2A	A communicational error occurs in Modbus data exchange connection 10 via COM2.	Continue	Keep	Keep
16#9B2B	A communicational error occurs in Modbus data exchange connection 11 via COM2.	Continue	Keep	Keep
16#9B2C	A communicational error occurs in Modbus data exchange connection 12 via COM2.	Continue	Keep	Keep
16#9B2D	A communicational error occurs in Modbus data exchange connection 13 via COM2.	Continue	Keep	Keep
16#9B2E	A communicational error occurs in Modbus data exchange connection 14 via COM2.	Continue	Keep	Keep
16#9B2F	A communicational error occurs in Modbus data exchange connection 15 via COM2.	Continue	Keep	Keep
16#9B30	A communicational error occurs in Modbus data exchange connection 16 via COM2.	Continue	Keep	Keep
16#9B31	A communicational error occurs in Modbus data exchange connection 17 via COM2.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#9B32	A communicational error occurs in Modbus data exchange connection 18 via COM2.	Continue	Keep	Keep
16#9B33	A communicational error occurs in Modbus data exchange connection 19 via COM2.	Continue	Keep	Keep
16#9B34	A communicational error occurs in Modbus data exchange connection 20 via COM2.	Continue	Keep	Keep
16#9B35	A communicational error occurs in Modbus data exchange connection 21 via COM2.	Continue	Keep	Keep
16#9B36	A communicational error occurs in Modbus data exchange connection 22 via COM2.	Continue	Keep	Keep
16#9B37	A communicational error occurs in Modbus data exchange connection 23 via COM2.	Continue	Keep	Keep
16#9B38	A communicational error occurs in Modbus data exchange connection 24 via COM2.	Continue	Keep	Keep
16#9B39	A communicational error occurs in Modbus data exchange connection 25 via COM2.	Continue	Keep	Keep
16#9B3A	A communicational error occurs in Modbus data exchange connection 26 via COM2.	Continue	Keep	Keep
16#9B3B	A communicational error occurs in Modbus data exchange connection 27 via COM2.	Continue	Keep	Keep
16#9B3C	A communicational error occurs in Modbus data exchange connection 28 via COM2.	Continue	Keep	Keep
16#9B3D	A communicational error occurs in Modbus data exchange connection 29 via COM2.	Continue	Keep	Keep
16#9B3E	A communicational error occurs in Modbus data exchange connection 30 via COM2.	Continue	Keep	Keep
16#9B3F	A communicational error occurs in Modbus data exchange connection 31 via COM2.	Continue	Keep	Keep
16#9B40	A communicational error occurs in Modbus data exchange connection 32 via COM2.	Continue	Keep	Keep
16#9B41	There is no response from data exchange connection 1 in the COM2 Modbus.	Continue	Keep	Keep
16#9B42	There is no response from data exchange connection 2 in the COM2 Modbus.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#9B43	There is no response from data exchange connection 3 in the COM2 Modbus.	Continue	Keep	Keep
16#9B44	There is no response from data exchange connection 4 in the COM2 Modbus.	Continue	Keep	Keep
16#9B45	There is no response from data exchange connection 5 in the COM2 Modbus.	Continue	Keep	Keep
16#9B46	There is no response from data exchange connection 6 in the COM2 Modbus.	Continue	Keep	Keep
16#9B47	There is no response from data exchange connection 7 in the COM2 Modbus.	Continue	Keep	Keep
16#9B48	There is no response from data exchange connection 8 in the COM2 Modbus.	Continue	Keep	Keep
16#9B49	There is no response from data exchange connection 9 in the COM2 Modbus.	Continue	Keep	Keep
16#9B4A	There is no response from data exchange connection 10 in the COM2 Modbus.	Continue	Keep	Keep
16#9B4B	There is no response from data exchange connection 11 in the COM2 Modbus.	Continue	Keep	Keep
16#9B4C	There is no response from data exchange connection 12 in the COM2 Modbus.	Continue	Keep	Keep
16#9B4D	There is no response from data exchange connection 13 in the COM2 Modbus.	Continue	Keep	Keep
16#9B4E	There is no response from data exchange connection 14 in the COM2 Modbus.	Continue	Keep	Keep
16#9B4F	There is no response from data exchange connection 15 in the COM2 Modbus.	Continue	Keep	Keep
16#9B50	There is no response from data exchange connection 16 in the COM2 Modbus.	Continue	Keep	Keep
16#9B51	There is no response from data exchange connection 17 in the COM2 Modbus.	Continue	Keep	Keep
16#9B52	There is no response from data exchange connection 18 in the COM2 Modbus.	Continue	Keep	Keep
16#9B53	There is no response from data exchange connection 19 in the COM2 Modbus.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#9B54	There is no response from data exchange connection 20 in the COM2 Modbus.	Continue	Keep	Keep
16#9B55	There is no response from data exchange connection 21 in the COM2 Modbus.	Continue	Keep	Keep
16#9B56	There is no response from data exchange connection 22 in the COM2 Modbus.	Continue	Keep	Keep
16#9B57	There is no response from data exchange connection 23 in the COM2 Modbus.	Continue	Keep	Keep
16#9B58	There is no response from data exchange connection 24 in the COM2 Modbus.	Continue	Keep	Keep
16#9B59	There is no response from data exchange connection 25 in the COM2 Modbus.	Continue	Keep	Keep
16#9B5A	There is no response from data exchange connection 26 in the COM2 Modbus.	Continue	Keep	Keep
16#9B5B	There is no response from data exchange connection 27 in the COM2 Modbus.	Continue	Keep	Keep
16#9B5C	There is no response from data exchange connection 28 in the COM2 Modbus.	Continue	Keep	Keep
16#9B5D	There is no response from data exchange connection 29 in the COM2 Modbus.	Continue	Keep	Keep
16#9B5E	There is no response from data exchange connection 30 in the COM2 Modbus.	Continue	Keep	Keep
16#9B5F	There is no response from data exchange connection 31 in the COM2 Modbus.	Continue	Keep	Keep
16#9B60	There is no response from data exchange connection 32 in the COM2 Modbus.	Continue	Keep	Keep
16#B100	I/O connections duplicated	Continue	Keep	Keep
16#B106	Ownership conflict (I/O connection)	Continue	Keep	Keep
16#B110	Adapter configuration setting error	Continue	Keep	Keep
16#B111	Adapter RPI configuration setting error	Continue	Keep	Keep
16#B113	I/O connection exceeding the limit	Continue	Keep	Keep
16#B119	Failed to establish a Non-Listen Only connection	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#B127	Adapter input size setting error	Continue	Keep	Keep
16#B128	Adapter output size setting error	Continue	Keep	Keep
16#B129	The configuration path settings in the EDS file is incorrect.	Continue	Keep	Keep
16#B12D	Consumed tag error	Continue	Keep	Keep
16#B12E	Produced tag error	Continue	Keep	Keep
16#B203	I/O connection timeout	Continue	Keep	Keep
16#B204	Creating a I/O connection timeout	Continue	Keep	Keep
16#B302	Network configuration is set over the product specifications (PPS)	Continue	Keep	Keep
16#B315	Adapter input/output instance parameters are set incorrectly.	Continue	Keep	Keep
16#E206	The model number for the control mode CPU and the standby mode CPU are not the same.	Continue	Keep	Keep
16#E207	The firmware version for the control mode CPU and the standby mode CPU are not the same.	Continue	Keep	Keep
16#E208	Ethernet for the control mode CPU and the standby mode CPU are not in the same physical network.	Continue	Keep	Keep
16#E209	The I/O configurations of the control mode CPU is not the same as the actual I/O configurations of the standby mode CPU. (while checking the validation)	Continue	Keep	Keep
16#E20A	The I/O configurations of the control mode CPU is not the same as the actual I/O configurations of the standby mode CPU. (after the validation is checked)	Continue	Keep	Keep
16#E20B	System error	Continue	Keep	Keep
16#E20C	Synchronization error	Continue	Keep	Keep
16#E20D	Validation failed	Continue	Keep	Keep
16#E20E	I/O bus fault	Continue	Keep	Keep
16#E20F	Heart beat error	Continue	Keep	Keep

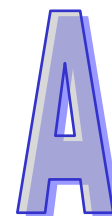
Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#E210	Heart beat communication timeout	Continue	Keep	Keep
16#E211	Synchronization failed	Continue	Keep	Keep
16#E212	The standby mode CPU is being switched.	Continue	Keep	Keep
16#E213	There is no program on the PLC.	Continue	Keep	Keep
16#E214	PLC program is damage.	Continue	Keep	Keep
16#E215	Scan time out	Continue	Keep	Keep
16#E216	CPU access denied	Continue	Keep	Keep
16#E217	System busy (RST)	Continue	Keep	Keep
16#E218	System busy (CLR)	Continue	Keep	Keep
16#E219	Turning on the system	Continue	Keep	Keep
16#E21A	Initialization error	Continue	Keep	Keep
16#E21B	CPU parameters are damage.	Continue	Keep	Keep
16#E21C	Non-latched area error	Continue	Keep	Keep
16#E21D	CPU EIP parameters are damage.	Continue	Keep	Keep
16#E21E	The I/O configuration file does not exist.	Continue	Keep	Keep
16#E21F	The I/O configuration file is damage.	Continue	Keep	Keep
16#E221	PLC program error	Continue	Keep	Keep
16#E230	Ethernet connection error in a redundancy system	Continue	Keep	Keep
16#E260	Module on the main backplane slot 0 does not support a redundancy system.	Continue	Keep	Keep
16#E261	Module on the main backplane slot 1 does not support a redundancy system.	Continue	Keep	Keep
16#E262	Module on the main backplane slot 2 does not support a redundancy system.	Continue	Keep	Keep
16#E263	Module on the main backplane slot 3 does not support a redundancy system.	Continue	Keep	Keep
16#E264	Module on the main backplane slot 4 does not support a redundancy system.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#E265	Module on the main backplane slot 5 does not support a redundancy system.	Continue	Keep	Keep
16#E266	Module on the main backplane slot 6 does not support a redundancy system.	Continue	Keep	Keep
16#E267	Module on the main backplane slot 7 does not support a redundancy system.	Continue	Keep	Keep
16#E268	Module on the main backplane slot 8 does not support a redundancy system.	Continue	Keep	Keep
16#E269	Module on the main backplane slot 9 does not support a redundancy system.	Continue	Keep	Keep
16#E26A	Module on the main backplane slot 10 does not support a redundancy system.	Continue	Keep	Keep
16#E26B	Module on the main backplane slot 11 does not support a redundancy system.	Continue	Keep	Keep
16#E270	Network module on the main backplane slot 0 does not connect to a network cable.	Continue	Keep	Keep
16#E271	Network module on the main backplane slot 1 does not connect to a network cable.	Continue	Keep	Keep
16#E272	Network module on the main backplane slot 2 does not connect to a network cable.	Continue	Keep	Keep
16#E273	Network module on the main backplane slot 3 does not connect to a network cable.	Continue	Keep	Keep
16#E274	Network module on the main backplane slot 4 does not connect to a network cable.	Continue	Keep	Keep
16#E275	Network module on the main backplane slot 5 does not connect to a network cable.	Continue	Keep	Keep
16#E276	Network module on the main backplane slot 6 does not connect to a network cable.	Continue	Keep	Keep
16#E277	Network module on the main backplane slot 7 does not connect to a network cable.	Continue	Keep	Keep
16#E278	Network module on the main backplane slot 8 does not connect to a network cable.	Continue	Keep	Keep
16#E279	Network module on the main backplane slot 9 does not connect to a network cable.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#E27A	Network module on the main backplane slot 10 does not connect to a network cable.	Continue	Keep	Keep
16#E27B	Network module on the main backplane slot 11 does not connect to a network cable.	Continue	Keep	Keep
16#E280	The network module IP of the control mode CPU on the main backplane slot 0 cannot be detected.	Continue	Keep	Keep
16#E281	The network module IP of the control mode CPU on the main backplane slot 1 cannot be detected.	Continue	Keep	Keep
16#E282	The network module IP of the control mode CPU on the main backplane slot 2 cannot be detected.	Continue	Keep	Keep
16#E283	The network module IP of the control mode CPU on the main backplane slot 3 cannot be detected.	Continue	Keep	Keep
16#E284	The network module IP of the control mode CPU on the main backplane slot 4 cannot be detected.	Continue	Keep	Keep
16#E285	The network module IP of the control mode CPU on the main backplane slot 5 cannot be detected.	Continue	Keep	Keep
16#E286	The network module IP of the control mode CPU on the main backplane slot 6 cannot be detected.	Continue	Keep	Keep
16#E287	The network module IP of the control mode CPU on the main backplane slot 7 cannot be detected.	Continue	Keep	Keep
16#E288	The network module IP of the control mode CPU on the main backplane slot 8 cannot be detected.	Continue	Keep	Keep
16#E289	The network module IP of the control mode CPU on the main backplane slot 9 cannot be detected.	Continue	Keep	Keep
16#E28A	The network module IP of the control mode CPU on the main backplane slot 10 cannot be detected.	Continue	Keep	Keep
16#E28B	The network module IP of the control mode CPU on the main backplane slot 11 cannot be detected.	Continue	Keep	Keep
16#E290	The network module heart beat of the control mode CPU on the main backplane slot 0 cannot be detected.	Continue	Keep	Keep
16#E291	The network module heart beat of the control mode CPU on the main backplane slot 1 cannot be detected.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#E292	The network module heart beat of the control mode CPU on the main backplane slot 2 cannot be detected.	Continue	Keep	Keep
16#E293	The network module heart beat of the control mode CPU on the main backplane slot 3 cannot be detected.	Continue	Keep	Keep
16#E294	The network module heart beat of the control mode CPU on the main backplane slot 4 cannot be detected.	Continue	Keep	Keep
16#E295	The network module heart beat of the control mode CPU on the main backplane slot 5 cannot be detected.	Continue	Keep	Keep
16#E296	The network module heart beat of the control mode CPU on the main backplane slot 6 cannot be detected.	Continue	Keep	Keep
16#E297	The network module heart beat of the control mode CPU on the main backplane slot 7 cannot be detected.	Continue	Keep	Keep
16#E298	The network module heart beat of the control mode CPU on the main backplane slot 8 cannot be detected.	Continue	Keep	Keep
16#E299	The network module heart beat of the control mode CPU on the main backplane slot 9 cannot be detected.	Continue	Keep	Keep
16#E29A	The network module heart beat of the control mode CPU on the main backplane slot 10 cannot be detected.	Continue	Keep	Keep
16#E29B	The network module heart beat of the control mode CPU on the main backplane slot 11 cannot be detected.	Continue	Keep	Keep
16#E2A0	The network module IP detection of the control mode CPU on the main backplane slot 0 has not been executed.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#E2A1	The network module IP detection of the control mode CPU on the main backplane slot 1 has not been executed.	Continue	Keep	Keep
16#E2A2	The network module IP detection of the control mode CPU on the main backplane slot 2 has not been executed.	Continue	Keep	Keep
16#E2A3	The network module IP detection of the control mode CPU on the main backplane slot 3 has not been executed.	Continue	Keep	Keep
16#E2A4	The network module IP detection of the control mode CPU on the main backplane slot 4 has not been executed.	Continue	Keep	Keep
16#E2A5	The network module IP detection of the control mode CPU on the main backplane slot 5 has not been executed.	Continue	Keep	Keep
16#E2A6	The network module IP detection of the control mode CPU on the main backplane slot 6 has not been executed.	Continue	Keep	Keep
16#E2A7	The network module IP detection of the control mode CPU on the main backplane slot 7 has not been executed.	Continue	Keep	Keep
16#E2A8	The network module IP detection of the control mode CPU on the main backplane slot 8 has not been executed.	Continue	Keep	Keep
16#E2A9	The network module IP detection of the control mode CPU on the main backplane slot 9 has not been executed.	Continue	Keep	Keep
16#E2AA	The network module IP detection of the control mode CPU on the main backplane slot 10 has not been executed.	Continue	Keep	Keep
16#E2AB	The network module IP detection of the control mode CPU on the main backplane slot 11 has not been executed.	Continue	Keep	Keep



Appendix A How AH500 Redundancy System Operates

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A.1 How CPUs Operate When Error Occurs

After AH500 Redundancy System is powered-on, one CPU becomes Master CPU and the other becomes Standby CPU. After the roles of CPUs are determined, Master CPU performs identification check on Standby CPU. The system works differently according to handlings on different situations.

- **Standby CPU NOT Passing Identification Check**

If the Standby CPU cannot pass the identification check, the Standby CPU operation status changes to STOP and cannot change to RUN.

- **Master CPU Error**

When errors occur in Master CPU, it cannot perform identification check on Standby CPU and the operation status for Master CPU and Standby CPU are both STOP and cannot change to RUN.

- **Master CPU Bus Fault**

If bus fault occurs in Master CPU and the configuration setting is set to “when bus fault occurs, CPU stops”, the Master CPU cannot perform identification check on Standby CPU and the operation status for Master CPU and Standby CPU are both STOP and cannot change to RUN.

- **Standby CPU Error**

If WDT (watchdog timeout) occurs after Standby CPU passed the identification check, Master CPU synchronizes all the settings with Standby CPU. Error codes on Standby CPU will all be cleared off and then Standby CPU cannot be connected for communication.

Note: in the Synchronization setting, when set to Always: after Standby CPU passed the identification check, it stops any external communications; when set to Conditions, it can still communicate.

- **Standby CPU Bus Fault**

If bus fault occurs in Standby CPU after it passed the identification check, Master CPU synchronizes all the settings with Standby CPU. Error codes on Standby CPU will all be cleared off and then Standby CPU cannot be connected for communication.

Note: in the Synchronization setting, when set to Always: after Standby CPU passed the identification check, it stops any external communications; when set to Conditions, it can still communicate.



A.2 Switchover When Error Occurs

When errors occur in Master CPU, the system switches to Standby CPU to ensure a non-stop operation. Refer to below for more information on how the CPU operates when encountering the following errors.

	AH500 Redundancy System Status	CPU Operation Status				Switchover
		Program operation error		Bus fault		
		Stop	Maintain	Stop	Maintain	
1	Synchronization fiber cable disconnected	✓		✓		X
		✓			✓	
			✓	✓		
			✓		✓	
2	CPU error	✓		✓		O
		✓			✓	
			✓	✓		X
			✓		✓	
3	Main backplane module error	✓		✓		O
		✓			✓	
			✓	✓		
			✓		✓	
4	Extension backplane module error	✓		✓		O
		✓			✓	V1.00: X V1.01: O
			✓	✓		O
			✓		✓	V1.00: X V1.01: O
5	Network connection error	✓		✓		O
		✓			✓	
			✓	✓		
			✓		✓	
6	Remote slave response timeout	✓		✓		X
		✓			✓	
			✓	✓		
			✓		✓	

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Appendix B Operational Restrictions for Redundant Mode

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B.1 Interoperability between Modules and Backplanes

● Backplanes Supported

Backplane Type	Model	AHCPU560-EN2 (Redundant Mode)
Main backplane	AHBP04M1-5A	O
	AHBP06M1-5A	O
	AHBP08M1-5A	O
	AHBP12M1-5A	O
Extension backplane (Note 1)	AHBP06E1-5A	X
	AHBP08E1-5A	X
Redundant main backplane (Note 1 & 2)	AHBP04MR1-5A	O
Redundant extension backplane (Note 1 & 2)	AHBP06ER1-5A	O
	AHBP08ER1-5A	O
Note 1: Do not mix extension backplane and redundant extension backplane together.		
Note 2: Redundant power supply supported		

● Interoperability between Modules and Backplanes in Redundant Mode

Module		Backplane Type		
Type	Model	Main backplane	Redundant main backplane	Redundant extension backplane
Power module	AHPS05-5A	O	O	O
	AHPS15-5A	O	O	O
CPU module	AHCPU560-EN2	O	O	X
Digital input/output module	AH16AM10N-5A	X	X	O
	AH16AM30N-5A	X	X	O
	AH16AR10N-5A	X	X	O
	AH32AM10N-5A	X	X	O
	AH32AM10N-5B	X	X	O
	AH32AM10N-5C	X	X	O
	AH64AM10N-5C	X	X	O
	AH16AN01R-5A	X	X	O

Module		Backplane Type		
Type	Model	Main backplane	Redundant main backplane	Redundant extension backplane
	AH16AN01T-5A	X	X	O
	AH16AN01P-5A	X	X	O
	AH16AN01S-5A	X	X	O
	AH32AN02T-5A	X	X	O
	AH32AN02T-5B	X	X	O
	AH32AN02T-5C	X	X	O
	AH32AN02P-5A	X	X	O
	AH32AN02P-5B	X	X	O
	AH32AN02P-5C	X	X	O
	AH64AN02T-5C	X	X	O
	AH64AN02P-5C	X	X	O
	AH16AP11R-5A	X	X	O
	AH16AP11T-5A	X	X	O
	AH16AP11P-5A	X	X	O
Analog input/output module	AH04AD-5A	X	X	O
	AH08AD-5A	X	X	O
	AH08AD-5B	X	X	O
	AH08AD-5C	X	X	O
	AH04DA-5A	X	X	O
	AH08DA-5A	X	X	O
	AH08DA-5B	X	X	O
	AH08DA-5C	X	X	O
	AH06XA-5A	X	X	O
Temperature measurement module	AH04PT-5A	X	X	O
	AH08PTG-5A	X	X	O
	AH04TC-5A	X	X	O
	AH08TC-5A	X	X	O
Motion Control Module	AH02HC-5A	X	X	O
	AH04HC-5A	X	X	O
	AH05PM-5A	X	X	O
	AH10PM-5A	X	X	O
	AH15PM-5A	X	X	O
	AH20MC-5A	X	X	O

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Module		Backplane Type		
Type	Model	Main backplane	Redundant main backplane	Redundant extension backplane
Network module	AH10EN-5A	O	O	X
	AH15EN-5A	(Note 1)	(Note 1)	
	AH10SCM-5A	O	O	O
	AH15SCM-5A	O	O	O
Space module	AHASP01-5A	O	O	O
Note 1: Up to 8 pieces of AH10EN-5A can be installed on the main backplane.				

B.2 Restrictions on Different Modes

Items		Single Mode	Redundant Mode
CPU Module	Error detection	O	X
	Backup function	O	X
	Restore function	O	X
Task Properties	Cyclic tasks	O	O
	I/O interrupts	O	X
	Communication interrupts	O	X
	External 24V low-voltage detected interrupts	O	X
	External interrupts	O	X
	Timed interrupts	O	O

B.3 Restrictions on Function Keys

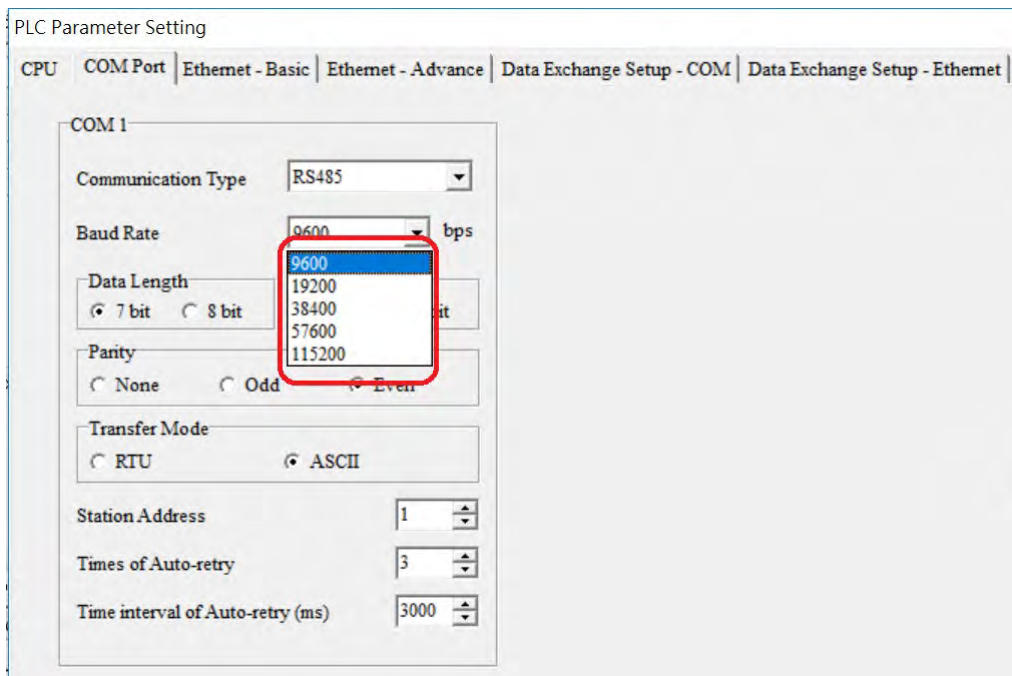
In order to prevent synchronization error, once identification check starts in redundant mode, the function keys CLR and RST on Master and Standby CPUs (AHCPU560-EN2) cannot be used. They can only be used after exiting redundant mode.

B.4 Restrictions on CPU Communications

In the Synchronization setting, when set to **Always**: after Standby CPU passed the identification check, it stops any external communications; when set to **Conditions**, it can still communicate.

B.5 Restrictions on COM Port Communications

When the redundant mode is enabled, if you select the communication type RS-485 for the COM port of AHCPU560-EN2, the highest baud rate can select is 115200 bps.



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Appendix C Application of Setting the Synchronization Option to Conditions

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C.1	Set Synchronization Option to Conditions	2
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C.1 Set Synchronization Option to Conditions

You can set the synchronization option to **Conditions** to achieve updating the project, updating the CPU firmware and managing the module configurations, without bring the redundancy system to a halt.

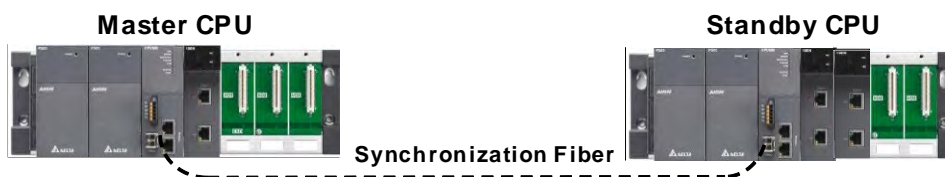
- **Add or remove the modules on the Standby CPU while the system is still running.**

Step 1: Set the synchronization options to **Conditions**.



- Redundancy System Status: Redundancy system is ready.
- Synchronization Options: Conditions

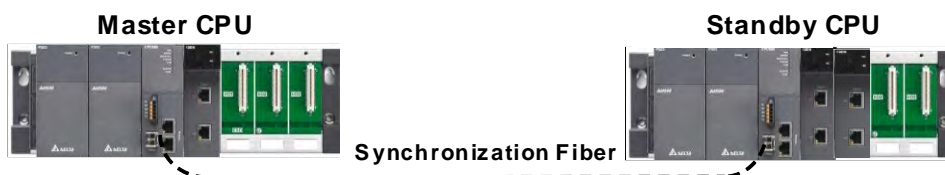
Step 2: Add a module on the Standby CPU. Here uses AH10EN-5A module as an example.



- Redundancy System Status: Redundancy system is ready.
- Synchronization Options: Conditions

When the synchronization option is set to **Conditions**, you can add or remove the modules on the Standby CPU; this act does NOT affect the qualification of the Standby CPU to be a secondary CPU.

Step 3: Download the PLC project and module configuration to the Standby CPU.



- Redundancy System Status: Redundancy system is ready.
- Synchronization Options: Conditions

When the synchronization option is set to **Conditions**, the Standby CPU can communicate. You can use this advantage to update the PLC project and configurations on the Standby CPU. And the Standby CPU project will not be overwritten by the Master CPU's.

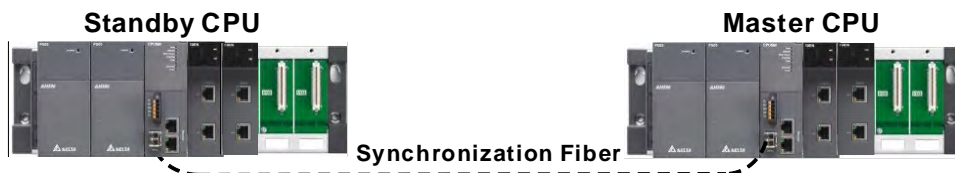
Step 4: CPU switchover



- Redundancy System Status: Redundancy system is ready.
- Synchronization Options: Conditions

You can use either the **SSOP** instruction or the setting **Switchover** in ISPSOft to switch between Master CPU and Standby CPU. After the switchover, the system operation (RUN/STOP) is determined by the new Master CPU. And then the Redundancy System Status shows Redundancy system is failed.

Step 5: After CPU switchover, you need to add the module on the Standby CPU (originally a Master CPU) so that the module configurations can stay consistent.



- Redundancy System Status: Redundancy system is failed.
- Synchronization Options: Conditions

Step 6: Set the synchronization options to **Always**.

When the synchronization option is set from **Conditions** to **Always**, the Master CPU will check the identity of the Standby CPU to see if it is qualified to be a secondary CPU.



- Redundancy System Status: Redundancy system is ready.
- Synchronization Options: Always

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