RICOH SC-20

EtherNet/IP Function Operating Instructions

How to Read This Manual

About Symbols

The symbols used in this manual have the following meanings.

Important

Indicates an explanation containing points to pay attention to when operating the device, restrictions, or other information. Be sure to read the explanation.

Note

Indicates an explanation containing information that is useful to know, a supplementary operating procedure, or other information.

Reference /(→P. ##)

Indicates reference information.

[ ]

Indicates a screen item or button name.

Contents

1. Overview

The SC-20 can be connected to an external device by using the EtherNet/IP function.
This manual describes the connection procedure for the EtherNet/IP Mode and the data format to be set during the EtherNet/IP Mode.

Trademarks

- Ethernet/IP is a trademark or registered trademark of ODVA, Inc.
- Ethernet is a trademark or registered trademark of Fuji Xerox Co., Ltd.
- IEEE is a trademark of The Institute of Electrical and Electronic Engineers, Inc.
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2. EtherNet/IP Mode

Standards

Standards	Conforms to Ethernet II, I IEEE 802.3
Protocols	CIP Network Library Volume 1: Common Industrial Protocol
	CIP Network Library Volume 2: CIP-compliant EtherNet/IP
Communication Type	10Base-T
	100Base-TX
Device Profile	General-purpose device
Manufacturer ID	1591
Device Type ID	0x2B
Communication Speed	Automatic 10⁄100 Mbit (Half duplex and full duplex detection)
Polarity	Automatic polarity (for automatic correction of crossed TxD and RxD pairs)
Cyclic, Number of Explicit Connections	Max. 128 x Connections (Total)
Device Setting Options	Input from camera UI
	Electronic Data Sheet (EDS) incorporated into the device
EtherNet Interface Settings	Speed: Auto
	Duplex: Auto
Device Address Settings	Input from camera UI
	DHCP
Device Leveling (DLR)	Not supported
QoS	Supported
ACD	Not supported
Port No.	CIP: 44818, 2222

Important

- Set the EtherNet interface of the external device to automatic (auto-negotiation).

Fixed Input

RPI	50 milliseconds to 3200 seconds (factory default setting: 50 milliseconds)		
Connection Type	Sending/receiving		
	Sending only		
	Receiving only		
	Receiving only (Listen Only)		
Communication Settings (Common)		Instance	Size [byte]
	Instance setting:	0x66	4
	O → T setting:	0x64	96
	T → O setting:	0x65	40
Input Assembly	Status		
	Matching result		
	Output pin		

Input that can be set

RPI	5 milliseconds to 10 seconds (factory default setting: 20 milliseconds)
Input Assembly	Matching result
	Camera state

Fixed Output

Output Assembly	Start matching
	Stop matching
	External input
	Shutdown
	Change job ID
	Adjust sensor brightness
	Sound settings

Settings

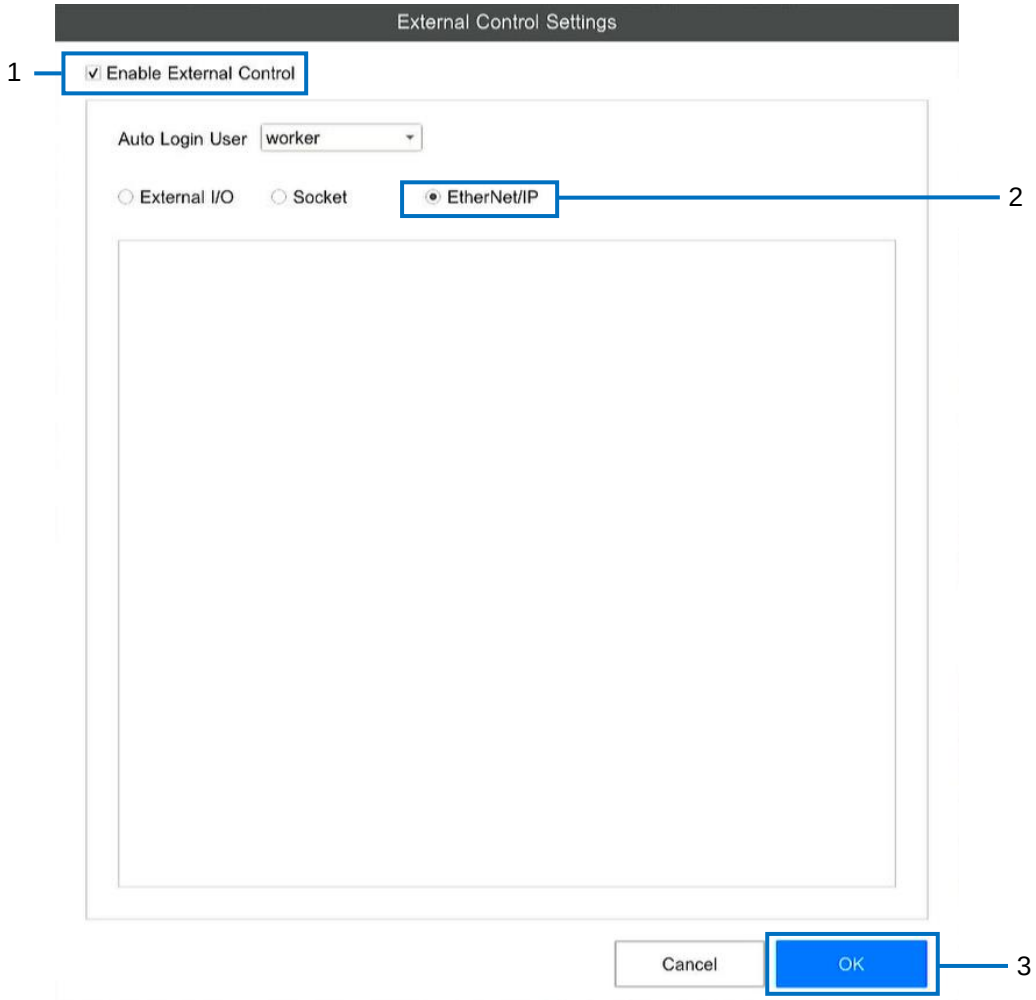
Already-defined Standard Objects	Identity Object (0x01)
	Message Route Object (0x02)
	Assembly Object (0x04)
	Camera Object (0x7F)

Enabling the EtherNet/IP Mode Control Function

Log in to the SC-20 in the “Administrator Mode”, and select [External Control Settings ...] from the [System Settings] menu to view the screen shown in the figure below.

Reference

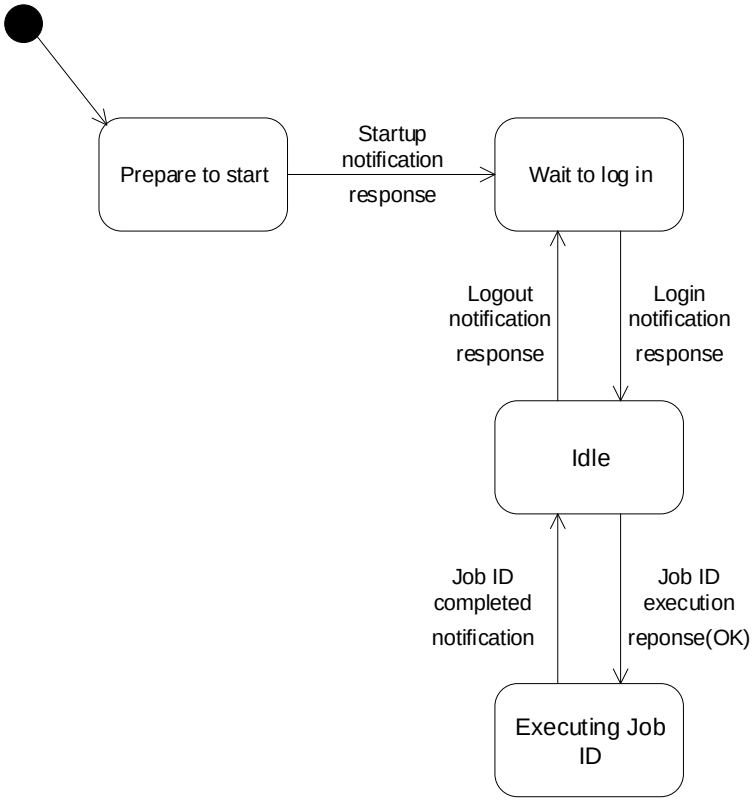
- For details on operating the SC-20, refer to the SC-20 Operating Instructions.



1. **Select the [Enable External Control] checkbox.**
2. **Select [EtherNet/IP].**
3. **Click [OK].**
   The settings are saved, and the function is reflected after the device restarts.

Commands and System Status

The commands exchanged in the EtherNet/IP Mode and the status transition of the system is described below.



3. Communication Method

This section describes the communication format used for the EtherNet/IP Mode.

3.1 EDS (Electronic Data Sheets) File

The EDS (Electronic Data Sheets) file is an ASCII text file describing the functions of the EtherNet/IP™ device, and is used with the software tool for device and network configuration.
The EDS file required for the EtherNet/IP™ protocol of the industrial network can be downloaded from the website.
(https://industry.ricoh.com/en/support/fa_camera_lens/download/soft/)

3.2 Cyclic Communication

3.2.1 Message specifications (Cyclic: Master → Slave)

Output Data
Data size: 96 bytes

Message format

Address	bit																															
	31(MSB)															16	15															(LSB)0
0x0000							EXTIN9	EXTIN8	EXTIN7	EXTIN6	EXTIN5	EXTIN4	EXTIN3	EXTIN2	EXTIN1	EXTIN0					ERROR OFF	FAIL OFF	OK OFF	ALL RESET					RESTART	STOP	START	CHG JOB ID
0x0004	Job ID																															
0x0024	Reference ID																															
0x0044	reserve																															

Address	Size	Attribute	Field name	Description
0x0000 [0]	1bit	BOOL	CHG JOB ID	0: CHG JOB ID OFF 1: CHG JOB ID ON *1
0x0000 [1]	1bit	BOOL	START	0: START OFF 1: START ON *1
0x0000 [2]	1bit	BOOL	STOP	0: STOP OFF 1: STOP ON
0x0000 [3]	1bit	BOOL	RESTART	0: RESTART OFF 1: RESTART ON *1 Set the allocation of the restart position for the job ID that is in the stopped state. 0: Start from the beginning of the job ID 1: Start from the items of the failed or stopped job ID
0x0000 [7-4]	4bit	-	reserve	Unused area
0x0000 [8]	1bit	BOOL	ALL RESET	Turn OFF all of OK/FAIL/CHG JOB ID flags.

0x0000 [9]	1bit	BOOL	OK OFF	Turn OFF the OK flag.
0x0000 [10]	1bit	BOOL	FAIL OFF	Turn OFF the NG flag.
0x0000 [11]	1bit	BOOL	ERROR OFF	Turn OFF the ERROR flag.
0x0000 [15-12]	9bit	-	reserve	Unused area
0x0000 [16]	1bit	BOOL	EXTIN0	0: EXTIN0 OFF 1: EXTIN0 ON
0x0000 [17]	1bit	BOOL	EXTIN1	0: EXTIN1 OFF 1: EXTIN1 ON
0x0000 [18]	1bit	BOOL	EXTIN2	0: EXTIN2 OFF 1: EXTIN2 ON
0x0000 [19]	1bit	BOOL	EXTIN3	0: EXTIN3 OFF 1: EXTIN3 ON
0x0000 [20]	1bit	BOOL	EXTIN4	0: EXTIN4 OFF 1: EXTIN4 ON
0x0000 [21]	1bit	BOOL	EXTIN5	0: EXTIN5 OFF 1: EXTIN5 ON
0x0000 [22]	1bit	BOOL	EXTIN6	0: EXTIN6 OFF 1: EXTIN6 ON
0x0000 [23]	1bit	BOOL	EXTIN7	0: EXTIN7 OFF 1: EXTIN7 ON
0x0000 [24]	1bit	BOOL	EXTIN8	0: EXTIN8 OFF 1: EXTIN8 ON
0x0000 [25]	1bit	BOOL	EXTIN9	0: EXTIN9 OFF 1: EXTIN9 ON
0x0000 [31-26]	6bit	-	reserve	Unused area
0x0004	32 bytes	char	Job ID	Only single-byte alphanumeric characters are valid. Up to 30 characters.
0x0024	32 bytes	char	Reference ID	Only single-byte alphanumeric characters are valid. Up to 30 characters.
0x0044	4 bytes	char	reserve	Unused area

*1: Data must be present in the job ID field.

3.2.2 Message specifications (Cyclic: Slave → Master)

Input Data
Data size: 40 bytes

Message format

Address	bit																															
	31(MSB)											16	15																			(LSB)0
0x0000			EXTOUT5	EXTOUT4	EXTOUT3	EXTOUT2	EXTOUT1	EXTOUT0				Job ID Complete	FAIL (OS)	OK (OS)	FAIL	OK							ERROR	Power supply status					Job ID being	IDLE	Before login	Before startup
0x0004							EXTIN9	EXTIN8	EXTIN7	EXTIN6	EXTIN5	EXTIN4	EXTIN3	EXTIN2	EXTIN1	EXTIN0					ERROR OFF	FAIL OFF	OK OFF	ALL RESET					RESTART	STOP	START	CHG JOB ID
0x0004	Job ID																															
0x0028	reserve																Error code															

Address	Size	Attribute	Field name	Description
0x0000 [3-0]	4bit	-	Camera state	[0]: Before startup [1]: Before login [2]: IDLE [3]: Job ID execution
0x0000 [7-4]	4bit	-	Reserve	Unused area
0x0000 [8]	1bit	-	Power supply status	0: OFF 1: ON
0x0000 [9]	1bit		ERROR	0: Normal 1: Abnormal
0x0000 [15-10]	6bit	-	Reserve	Unused area
0x0000 [19-16]	4bit	-	Judgment result	[16]: OK [17]: FAIL [18]: OK(OneShot) [19]: FAIL (OneShot)
0x0000 [23-20]	4bit	-	Reserve	Unused area
0x0000 [29-24]	6bit	-	External I/O area (Output)	[24]: EXTOUT0 [25]: EXTOUT1 [26]: EXTOUT2 [27]: EXTOUT3 [28]: EXTOUT4 [29]: EXTOUT5
0x0000 [31-30]	2bit	-	Reserve	Unused area
0x0004	4 bytes		Input status	Return the bit status entered in Input.
0x0008	32 bytes	char	Job ID	Only single-byte alphanumeric characters are valid. Up to 30 characters.
0x0028	2 bytes	char	Error code	Error No.
0x002A	2 bytes	char	reserve	Unused area

3.3 Class Objects

The following standard/optional/unique class objects are defined in the SC-20 Ethernet/IP.
For details on the other standard class objects, refer to the Ethernet/IP specifications.

Object Name	Class Code	Description
Identity	0x01	Provides the product identification information.
Message Router	0x02	Omitted
Assembly	0x04	Omitted
Connection Manager	0x06	Omitted
TCP/IP Interface	0xF5	Provides an interface concerning the TCP/IP network.
Ethernet Link	0xF6	Provides information concerning the IEEE802.3 communication interface.
Quality of Service	0x48	Provides information concerning the priority order of the Ethernet frame.
Camera Object	**0x7F**	**Product-specific object**

3.3.1 Camera Object (0x7F)

Service Codes

Service Codes	Name	Description
0x0E	Get_Attribute_Single	Reads the attribute.
0x10	Set_Attribute_Single	Writes the attribute.
0x32	START	Starts the job. The job ID (string) is required as additional data. The initial value of the SC-20 job ID is “Default”.
0x33	STOP	Stops the job.
0x34	EXTIN	External input. 1 BYTE is required as additional data. Additional data = 0x00 to 0x07
0x35	SHUTDOWN	Shuts down the system.

Attributes

Instance ID	Attributes	Name	Access Control	Data Type	Description
0	1	Revision	Get	UINT	0001h (Object revision)
0	2	MaxInstance	Get	UINT	Maximum instance No.
0	3	Number of instances	Get	UINT	Maximum number of instances
1-13	1	Parameter Value	Get/Set	*1	Acquires and sets the value of each instance.
1-13	2	Descriptor	Get	USINT	0x00: Get Only 0x01: Set/Get
1-13	3	Data Type	Get	USINT	Data type code: BOOL (0xC1) USINT (0xC6) UINT (0xC7) STRING (0xD0)
1-13	4	No. of Elements	Get	USINT	No. of elements of each data type
1-13	5	Parameter Name String	Get	SHORT-STRING	Parameter name
1-13	6	Help String	Get	SHORT-STRING	Instance description text
1-13	7	Minimum Value	Get	*1	Minimum value
1-13	8	Maximum Value	Get	*1	Maximum value
1-13	9	Default Value	Get	*1	Stipulated value

*1 Size of instance attribute 3 (Data Type) × 4 (No. of Elements)
* In the SHORT-STRING data type, the size (num. of char.) is indicated in the first byte and the characters are arranged thereafter (no NULL).

Instance ID	Parameter name	Data Type	Number of Elements	Value Access Type
0		-	-	-
1	Camera State	USINT	1	Get
2	Power State	BOOL	1	Get
3	Matching Result	USINT	1	Get
4	JobID	STRING	1	Set/Get
5	White Balance R	UINT	1	Set/Get
6	White Balance B	UINT	1	Set/Get
7	Auto White Barance	BOOL	1	Set/Get
8	Target Point	USINT	1	Set/Get
9	Sensor Shutter	UINT	1	Set/Get
10	Sensor Gain	UINT	1	Set/Get
11	Sensor Flip	BOOL	1	Set/Get
12	Auto Exposure	BOOL	1	Set/Get
13	WDR	BOOL	1	Set/Get
14	Gamma Curve	UINT	1	Set/Get
15	Edge Controll	BOOL	1	Set/Get
16	Denoise	USINT	1	Set/Get
17	Sharpness	USINT	1	Set/Get
18	Beep Sound	USINT	1	Set/Get
19	Audio Mode	BOOL	1	Set/Get
20	Audio Volume	USINT	1	Set/Get
21	LED Mode	USINT	1	Set/Get

- **About each instance ID**

Instance ID	Parameter name	Description		
1	Camera State	Acquires the camera state.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
USINT	1	0/4/0	Get	[0]: Sleeping [1]: Log off [2]: IDLE [3]: Job Matching

Instance ID	Parameter name	Description		
2	Power State	Acquires the startup state.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
BOOL	1	0/1/0	Get	0: Power OFF 1: Power ON

Instance ID	Parameter name	Description		
3	Matching Result	Acquires the judgment results.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
USINT	1	0/1/1	Get	0: Matching OK 1: Matching FAIL

Instance ID	Parameter name	Description		
4	Job ID	Sets or acquires the current job ID.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
STRING	1	1/50/Default	Set/Get	

Instance ID	Parameter name	Description		
5	White Balance R	Sets or acquires the white balance R value.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
UINT	1	200/3900/1456	Set/Get	

Instance ID	Parameter name	Description		
6	White Balance B	Sets or acquires the white balance B value.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
UINT	1	200/1456/3900	Set/Get	

Instance ID	Parameter name	Description		
7	Auto White Barance	Sets or acquires the auto white balance adjustment.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
BOOL	1	0/1/1	Set/Get	0: Auto White Barance OFF 1: Auto White Barance ON

Instance ID	Parameter name	Description		
8	Target Point	Sets or acquires the target point.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
USINT	1	0/80/255	Set/Get	

Instance ID	Parameter name	Description		
9	Sensor Shutter	Sets or acquires the shutter speed.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
UINT	1	115/49871/40871	Set/Get	

Instance ID	Parameter name	Description		
10	Sensor Gain	Sets or acquires the gain value.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
UINT	1	1/62/31	Set/Get	

Instance ID	Parameter name	Description		
11	Sensor Flip	Sets or acquires the image inversion.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
BOOL	1	0/1/0	Set/Get	0: Flip OFF 1: Flip ON

Instance ID	Parameter name	Description		
12	Auto Exposure	Sets or acquires the auto exposure adjustment.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
BOOL	1	0/1/1	Set/Get	0: Auto Exposure OFF 1: Auto Exposure ON

Instance ID	Parameter name	Description		
13	WDR	Sets or acquires the WDR.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
BOOL	1	0/1/0	Set/Get	0: WDR OFF 1: WDR ON

Instance ID	Parameter name	Description		
14	Gamma Curve	Sets or acquires the gamma curve.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
UINT	1	100/4000/200	Set/Get	

Instance ID	Parameter name	Description		
15	Edge Controll	Sets or acquires the filter (edge) adjustment.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
USINT	1	0/1/0	Set/Get	0: Disable 1: Enable

Instance ID	Parameter name	Description		
16	Denoise	Sets or acquires denoise.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
USINT	1	0/10/1	Set/Get	

Instance ID	Parameter name	Description		
17	Sharpness	Sets or acquires the sharpness.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
USINT	1	0/10/3	Set/Get	

Instance ID	Parameter name	Description		
18	Beep Sound	Sets or acquires the beep volume.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
USINT	1	0/2/0	Set/Get	0: None 1: Low 2: High

Instance ID	Parameter name	Description		
19	Audio Mode	Sets or acquires the USB audio mode.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
BOOL	1	0/1/0	Set/Get	0: Disable 1: Enable

Instance ID	Parameter name	Description		
20	Audio Volume	Sets or acquires the USB audio volume.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
USINT	1	0/100/0	Set/Get	

Instance ID	Parameter name	Description		
21	LED Mode	Sets or acquires the LED ON mode.		
Data Type	**Number of Elements**	**Minimum/Maximum/Default**	**Access Type**	**EDS Notation**
USINT	1	0/1/0	Set/Get	0: OneShot 1: Keep

3.3.2 Identity Object(0x01)

Service Codes

Service Codes	Name
0x01	Get_Attribute_All
0x0E	Get_Attribute_Single

Attributes

Instance ID	Attributes	Name	Access Control	Data Type	Description
0	1	Revision	Get	UINT	Revision of the Identity object
0	2	Max Instance	Get	UINT	Maximum instance No.
1	1	Vendor ID	Get	UINT	Product vendor identification number
1	2	Device Type	Get	UINT	General device classification
1	3	Product Code	Get	UINT	Product identification number
1	4	Revision	Get	Structure	Product revision number
1	5	Status	Get	WORD	Device communication status
1	6	Serial Number	Get	UDINT	Vendor-specific product identification number
1	7	Product Name	Get	SHORT_STRING	Product name

3.3.3 TCP/IP Interface (0xF5)

Service Codes	Name
0x01	Get_Attribute_All
0x0E	Get_Attribute_Single
0x10	Set_Attribute_Single

Instance ID	Attributes	Name	Access Control	Data Type	Description
0	1	Revision	Get	UINT	Revision of the TCP/IP Interface object *2
0	2	Max Instance	Get	UINT	Maximum instance No.
1	1	Status	Get	DWORD	TCP/IP network status Bit0-3: Interface Configuration Status 1 = Established based on BOOTP, DHCP, or NV 2 = Established based on rotary switch Bit4-31: 0 Fixed
1	2	Configuration Capability	Get	DWORD	Setting function Bit0: BOOTP Client Bit1: Reserved Bit2: DHCP Client Bit3: Reserved Bit4: Configuration Settable Bit5: Hardware Configurable Bit6: Reserved Bit7: ACD Capable Bit8-31: Reserved
1	3	Configuration Control	Get	DWORD	IP address setting method Bit0-3: Configuration Method 0 = Fixed IP address 1 = BOOTP 2 = DHCP Bit4-31: 0 Fixed
1	4	Physical Link Object	Get	Structure	Path to the physical layer link object
1	5	Interface Configuration	Get	Structure	TCP/IP network settings
1	6	Host Name	Get	STRING	Host name
1	8	TTL Value	Get	USINT	Time to Live for multicast
1	9	Mcast Config	Get	Structure	Multicast address settings

*2 The actual value and the EDS description value may be different.

3.3.4 Ethernet Link (0xF6)

Service Codes	Name
0x01	Get_Attribute_All
0x0E	Get_Attribute_Single
0x10	Set_Attribute_Single

Instance ID	Attributes	Name	Access Control	Data Type	Description
0	1	Revision	Get	UINT	Revision of the Ethernet Link object *3
0	2	Max Instance	Get	UINT	Maximum instance No.
1-2	1	Interface Speed	Get	UDINT	Communication speed of the TIN port
1-2	2	Interface Flags	Get	DWORD	Status of the IN port
1-2	3	Physical Address	Get	DWORD	MAC Address
1-2	7	Interface Type	Get	USINT	Type of physical interface
1-2	8	Interface State	Get	USINT	Interface state
1-2	9	Admin State	Get/Set	USINT	Interface enabled/disabled
1-2	10	Interface Label	Get	SHORT_STRING	Interface identification name

*3 The actual value and the EDS description value may be different.

3.3.5 Quality of Service (0x48)

Service Codes	Name
0x0E	Get_Attribute_Single
0x10	Set_Attribute_Single

Instance ID	Attributes	Name	Access Control	Data Type	Description
0	1	Revision	Get	UINT	Revision of the Quality of Service object
0	2	Max Instance	Get	UINT	Maximum instance No.
1	5	DSCP Scheduled	Get/Set	USINT	Priority of CIP transport class 0/1 Messages Scheduled
1	8	DSCP Explicit	Get/Set	USINT	Priority of UCMM CIP transport class 2/3 Other Messages

Revision History

Rev.	Date	Changes	Note
1.0	30th June,2023	New issue	