Flexi Soft Ethernet IP: Implicit Messaging with a Omron PLC CJ2M

Flexi Soft Gateways

GB

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1   About this Online Help

This Online Help describes the integration from FX0-GENT into a OMRON PLC by Implicit Messaging

1.1   Hardware used:

- OMRON SPS: SYSMAC CJ2M-CPU33 (with integrated EtherNet/IP Port CJ2M-PEIP21)
- Flexi Soft system with an EtherNet/IP^{TM}-Gateway FX0-GENT (Version ≥ V2.00) (SICK number 1044072)

1.2   Software used:

- OMRON CX-one, CX-Programmer
- OMRON Network Configurator
- Flexi Soft Designer

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2 Preparation

2.1 Download driver

You will find the EDS files and the device icon for PLC interfacing:

- in the Internet on the Flexi Soft Gateway product page on www.sick.com.

3   Basic configuration

3.1   Assigning a device name and IP address

Configuration of the FX0-GENT is performed via the Flexi Soft Designer tool

- Open the Flexi Soft Designer and load the hardware configuration including the EtherNet/IP gateway
- Click on the **Gateways** button above the main window and select the FX0-GENT or double click the FX0-GENT in the hardware configuration to open the gateway configuration dialog
- Click on Gateway configuration on the left hand menu. The following dialog appears:

EtherNet/IP gateway configuration dialog
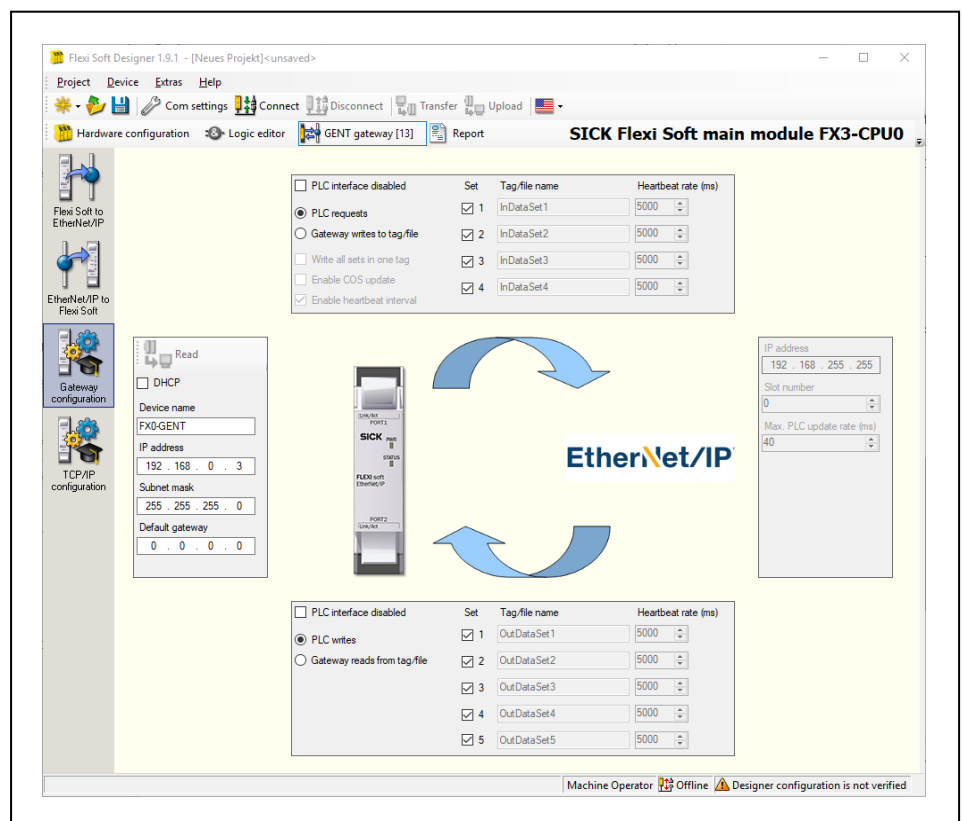
- If desired, change the **Device name** for the Flexi Soft gateway
- Enter a valid **IP address** for the Flexi Soft gateway, and if required a valid **Subnet mask** and a valid IP address for **a Default gateway**
- Click **Connect** to go online and download the configuration to the Flexi Soft system

3.2   Basic configuration of the PLC using CX-Programmer

- Set up a project in CX-Programmer for your PLC (e.g. CJ2M-CPU33) and assign the correct IP address to the EtherNet/IP interface. For more information, please refer to the software manual or to the online help of CX-Programmer

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3.3 Projecting the network variables

- Open the CX-Programmer **Symbol Table** and right click to open the context menu
- Choose the command **Insert symbol** to create a new symbol
- Create two variables in the CX-Programmer **Symbol Table**. For example, if 50 byte input data and 10 byte output data shall be transferred, create the following variables:
    - **GENT_IN_50** for data from the EtherNet/IP gateway to the PLC
      (size: 50 byte or 25 words)
    - **GENT_OUT_10** for data from the PLC to the EtherNet/IP gateway
      (size: 10 bytes or 5 words)
- Go online and download the program to your PLC

3.4 Direct settings on the PLC

- Set the Unit No. on the selector switch (here: 0)
- Set the double digit **Node No.** in hex format on the selector switches. The Node No. Is the same as the last number of the PLC's IP address. E.g. if the IP address of the PLC is 192.168.0.20, then the Node No. is 20 or 0x14

3.5 Installing the Flexi Soft FX0-GENT EDS file using Network Configurator

- In the OMRON Network Configurator open the **EDS file** menu and choose the **Install** command
- Follow the instructions in the online help or in the user manual of the Network Configurator for installing EDS files

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4 Network connection

4.1 Adding the PLC's EtherNet/IP interface to the network

- Double click on the CJ2M-EIP21 in the device selection window to add the device to the configuration
- Right click on the device and select the **Change Node Address** command from the context menu
- Enter the PLC's IP address (e.g. 192.168.0.20) and click **OK**

Setting the IP address for the PLC
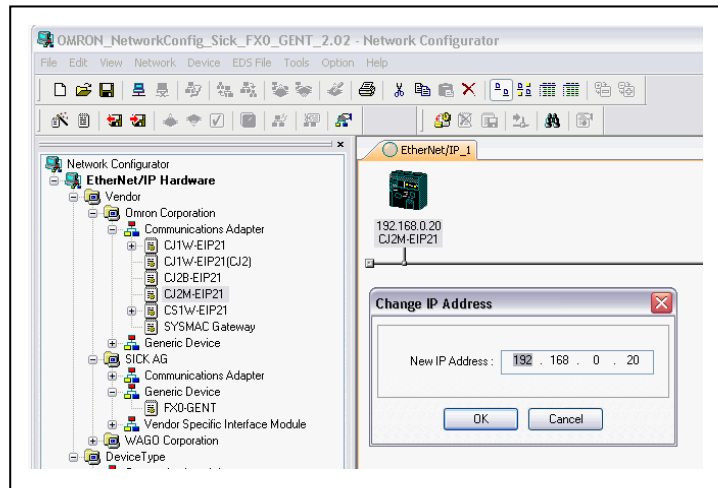
4.2 Adding the gateway to the network

- Double click on the FX0-GENT in the device selection window to add the gateway to the configuration
- Right click on the gateway and select the Change Node Address command from the context menu
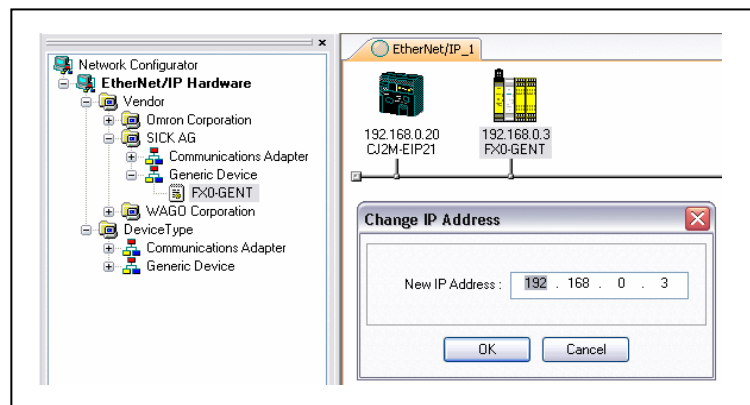- Enter the gateway's IP address (e.g. 192.168.0.3) and click OK. See section 3.1 "Basic configuration — assigning a device name and IP address" how to set the IP address for the gateway

Setting the IP address for the gateway

4.3 Defining the data to be read from and written to the gateway

- Double click on the gateway to open the Edit Device Parameters window

Edit the gateway device parameters
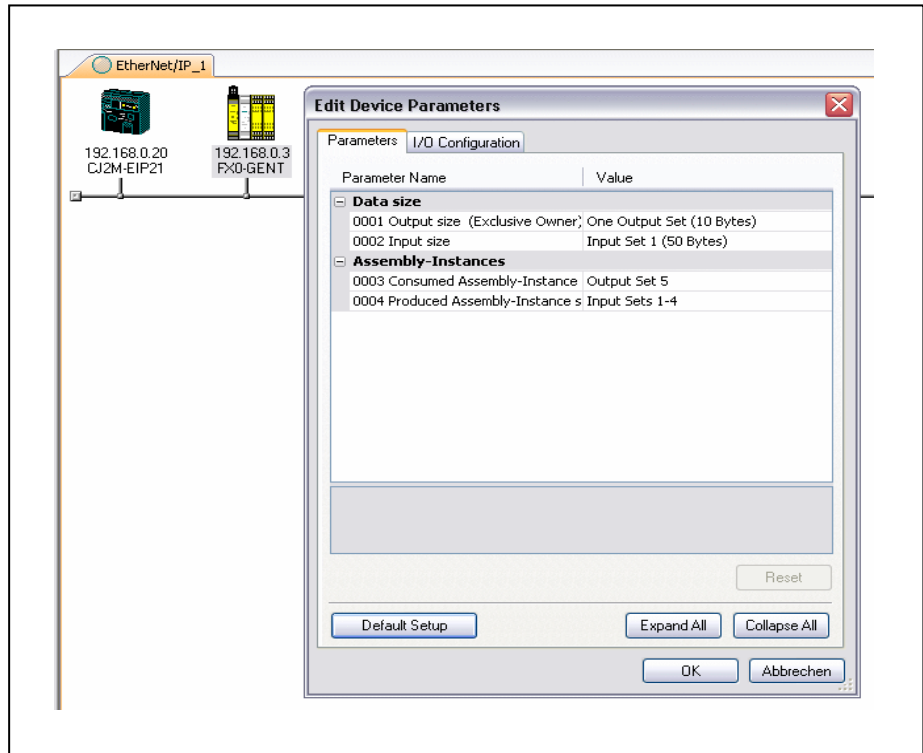
The following parameters can be set:

Gateway device parameters for input data and output data

Parameter name	Description	Possible values
Output size	Number of bytes to be transferred from the PLC to the gateway	
Input size	Number of bytes to be transferred from the gateway to the PLC Possible values are described in the operating instructions Flexi Soft gateways 8012662.	
Consumed Assembly Instance	Assembly instance number for data from the PLC to the gateway (output data sets)	
Produced Assembly Instance	Assembly instance number for data from the gateway to the PLC (input data sets)	

In the example shown on Page 9, input data set 1 (50 bytes) is read from the gateway and output data set 1 (10 bytes) is written to the gateway. See following Table:

Assembly object instance definitions

Assembly instance no.	Description	Data type	Data values	Access rule	Corresponding Full Data Transfer object attributes
Flexi Soft to Network					
1	Request input data sets 1 to 4 data	BYTE[202] Valid read lengths: 1-202	0-255	Get	1, 2, 3, 4
2	Request input data sets 2 to 4 data	BYTE[152] Valid read lengths: 1-152	0-255	Get	2, 3, 4
3	Request input data set 3 and 4 data	BYTE[120] Valid read lengths: 1-120	0-255	Get	3, 4
4	Request input data set 4 data	BYTE[60] Valid read lengths: 1-60	0-255	Get	4
Network to Flexi Soft					
5	Write output data set 1 to 5 data	BYTE[50] Valid write lengths: 10 = Set 1 20 = Sets 1-2 30 = Sets 1-3 40 = Sets 1-4 50 = Sets 1-5	0-255	Get/Set	5, 6, 7, 8, 9
6	Write output data sets 2 to 5 data	BYTE[40] Valid write lengths: 10 = Set 2 20 = Sets 2-3 30 = Sets 2-4 40 = Sets 2-5	0-255	Get/Set	6, 7, 8, 9
7	Write output data sets 3 to 5 data	BYTE[30] Valid write lengths: 10 = Set 3 20 = Sets 3-4 30 = Sets 3-5	0-255	Get/Set	7, 8, 9
8	Write output data sets 4 and 5 data	BYTE[20] Valid write lengths: 10 = Set 4 20 = Sets 4-5	0-255	Get/Set	8, 9
9	Write output data set 5 data	BYTE[10] Valid write lengths: 10 = Set 5	0-255	Get/Set	9

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4.4 Importing the network variables from the PLC project into the Network Configurator

Importing the network variables

- Make sure that only the related CX-Programmer project is open
- Double click the **CJ2M-EIP21** in the Network Configurator to open its **Edit Device Parameters** window
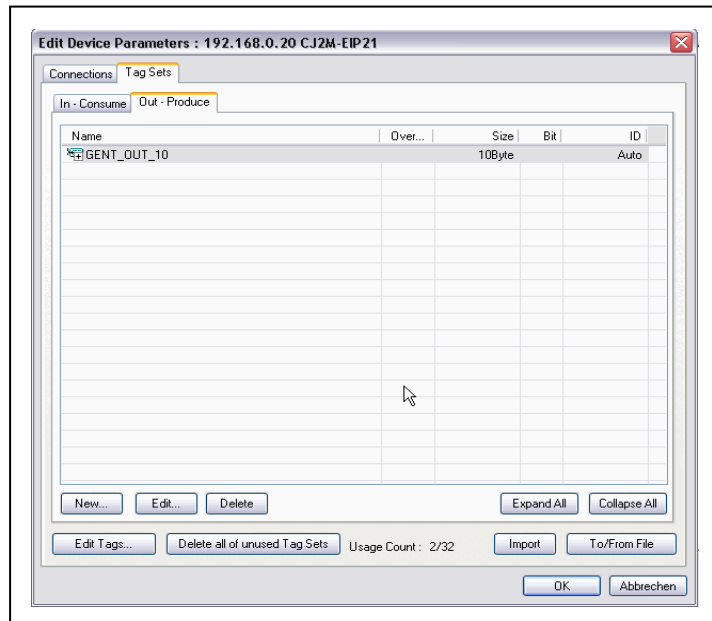
- Click on the **Import** button and import the PLC network variables created in the CXProgrammer project (e.g. **GENT_IN_50 and GENT_OUT_10**)

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Network connection

4.5 Assigning the gateway input and output data to the PLC network variables

- Switch to the **Connections** file card of the **Edit Device Parameters** window of the

  CJ2M-EIP21

Edit the device parameters
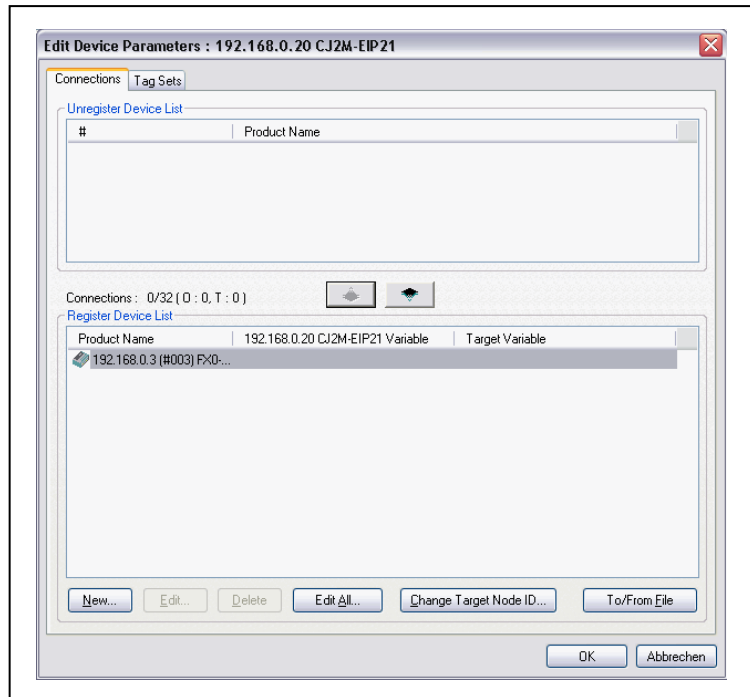
- Double click on the EtherNet/IP gateway in the **Register Device List** (in this case

  192.168.0.3). The **Edit Connection** window opens

Edit the connection parameters
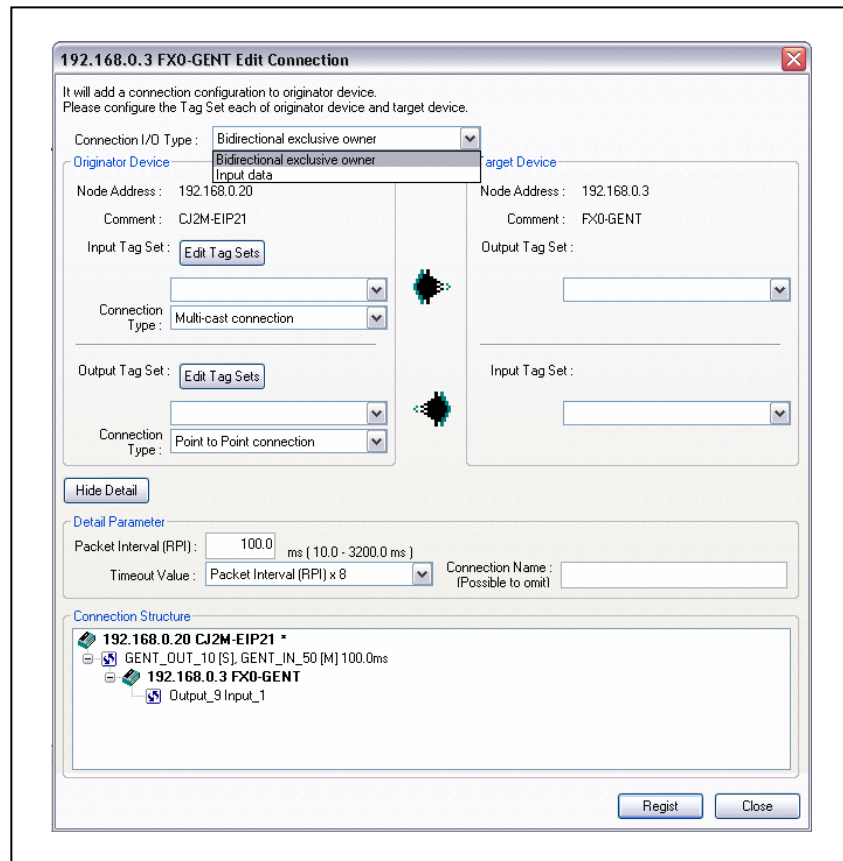
- Set the **Connection I/O Type** to **Bidirectional exclusive owner**
- Under **Originator Device**, select the PLC network variables from your CX-Programmer project for the **Input Tag Set** (e.g. **GENT_IN_50**) and for the **Output Tag Set** (e.g. **GENT_OUT_10**)
- Under **Target Device**, select the **Output Tag Set** and the **Input Tag Set** that have been defined for the FX0-GENT as shown in the picture on page 9
- For the **Packet Interval (RPI)**, enter a value that conforms to the requirements of your system. Please refer to the sections **"Packet update interval"** and **"Bandwidth limitations"** in chapter 4.5.1 and 4.5.2
- Click on **Regist** to register the configuration
- Click on **Close** to return to the **Edit Device Parameters** window

Registered connection
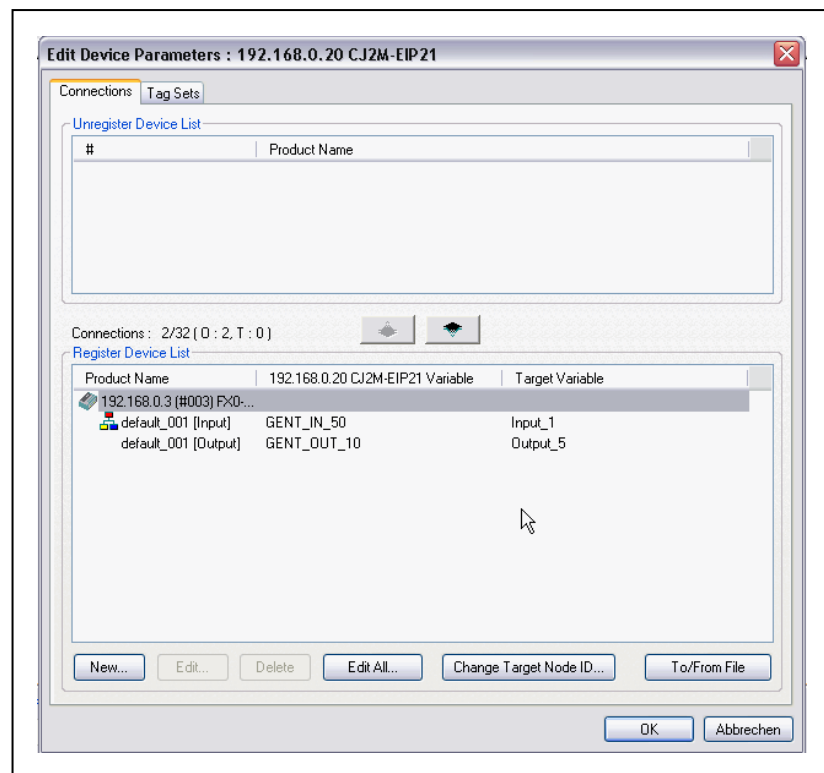
- Click on **OK**

4.5.1 Packet update interval

The packet update interval for Class 1 connections that will be returned to the EtherNet/IP PLC in the Forward Open response depends on the following factors:

- the value for the **Requested Packet Interval** received from the EtherNet/IP PLC in the Forward Open message
- the **Maximum PLC Update Rate** as configured in the **Gateway configuration** dialog of the Flexi Soft Designer
- the system clock that the EtherNet/IP gateway operates on

  system clock FX0-GENT, FW < 3.04.0 = 10 ms
  system clock FX0-GENT, FW > 3.04.0 = 4 ms

Network connection

If the Requested Packet Interval is less than the Maximum PLC Update Rate, the packet update interval will be set to the Maximum PLC Update Rate. Otherwise, it will be set to the Requested Packet Interval.

FW < 3.04.0: If the packet update interval is not a multiple of 10 ms (10, 20, 30, 40, etc.), then the packet update interval will be adjusted up to the next multiple of 10 ms.

FW > 3.04.0:Tthe packet update interval can be increased in steps of 1 ms.

Examples for the packet update interval from FX0-GENT (FW < 3.04.0)

Requested Packet Interval	Maximum PLC Update Rate	Actual packet update interval	Description
5 ms	10 ms	10 ms	Set to Maximum PLC Update Rate
10 ms	10 ms	10 ms	Requested Packet Interval accepted
15 ms	20 ms	20 ms	Set to Maximum PLC Update Rate
15 ms	10 ms	20 ms	Requested Packet Interval adjusted upward to 20 ms
20 ms	25 ms	30 ms	Maximum PLC Update Rate adjusted upward to 30 ms
40 ms	30 ms	40 ms	Requested Packet Interval accepted
32 ms	30 ms	40 ms	Requested Packet Interval adjusted upward to 40 ms
48 ms	40 ms	50 ms	Requested Packet Interval adjusted upward to 50 ms
50 ms	40 ms	50 ms	Requested Packet Interval accepted

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5 Transferring the configuration

• In the **Network** menu select the **Connect** command. The **Select Connect Network Port** window opens

Selecting a network port
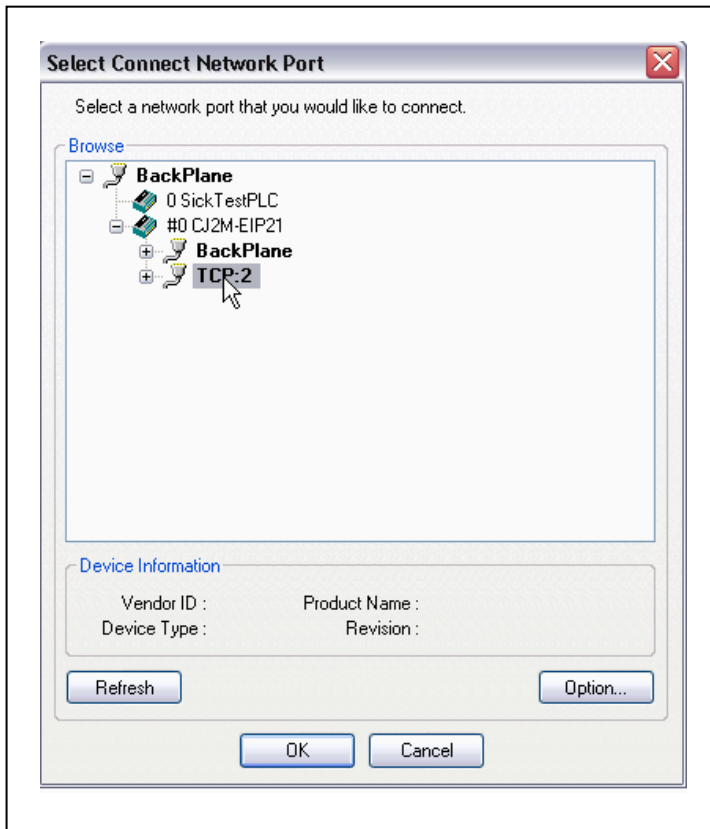
• In the device tree select **TCP:2**, then click **OK**

Downloading the configuration to the PLC
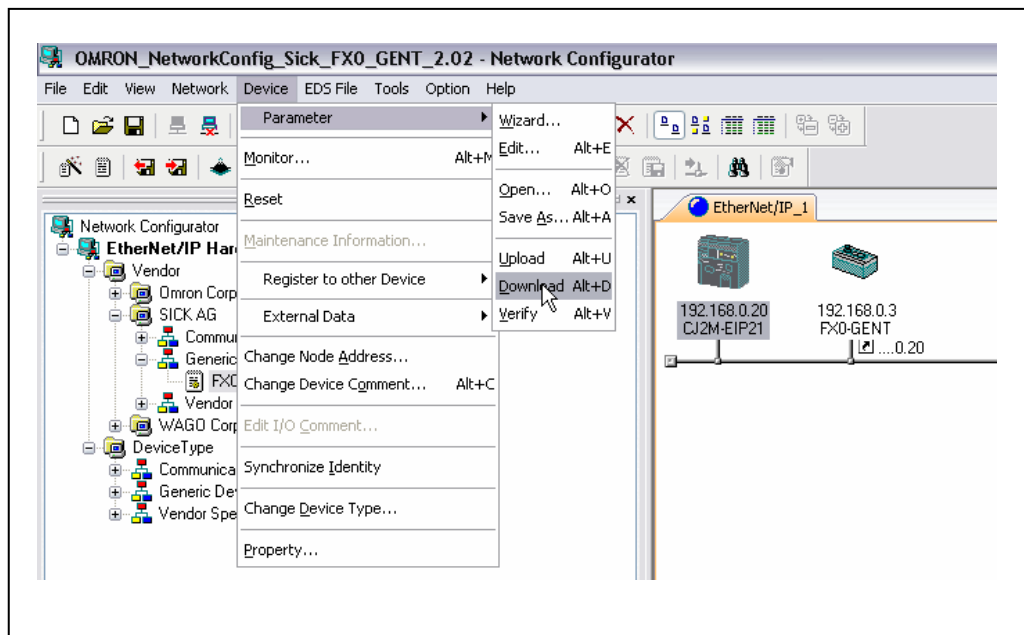
• In the Network Configurator, select the CJ2M-EIP21. Then, in the **Device** menu open the **Parameter** submenu and select the **Download** command

6 Class 1 connection parameter examples

This section shows examples for the **Input Tag Sets** or **Output Tag Sets** that are required in order to get different input data sets and set different output data sets. See page 9.

Get all input data sets and set all output data sets

| Parameter name	Description	Value
Output size (Exclusive Owner)	Number of bytes to be transferred from the PLC to the gateway	Five Output Sets (50 Bytes)
Input size	Number of bytes to be transferred from the gateway to the PLC	Input Sets 1-4 (202 Bytes)
Consumed Assembly Instance	Assembly instance number for data from the PLC to the gateway (output data sets)	Output Sets 1-5
Produced Assembly Instance	Assembly instance number for data from the gateway to the PLC (input data sets)	Input Sets 1-4

Get input data set 1 and set output data set 1

Parameter name	Description	Value
Output size (Exclusive Owner)	Number of bytes to be transferred from the PLC to the gateway	One Output Set (10 Bytes)
Input size	Number of bytes to be transferred from the gateway to the PLC	Input Set 1 (50 Bytes)
Consumed Assembly Instance	Assembly instance number for data from the PLC to the gateway (output data sets)	Output Sets 1-5
Produced Assembly Instance	Assembly instance number for data from the gateway to the PLC (input data sets)	Input Sets 1-4

Get input data set 2 and set output data set 3

Parameter name	Description	Value
Output size (Exclusive Owner)	Number of bytes to be transferred from the PLC to the gateway	One Output Set (10 Bytes)
Input size	Number of bytes to be transferred from the gateway to the PLC	Input Set 2 (32 Bytes)
Consumed Assembly Instance	Assembly instance number for data from the PLC to the gateway (output data sets)	Output Sets 3-5
Produced Assembly Instance	Assembly instance number for data from the gateway to the PLC (input data sets)	Input Sets 2-4

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Class 1 connection parameter examples

Get input data sets 1 and 2 and set output data sets 1 and 2

Parameter name	Description	Value
Output size (Exclusive Owner)	Number of bytes to be transferred from the PLC to the gateway	Two Output Sets (20 Bytes)
Input size	Number of bytes to be transferred from the gateway to the PLC	Input Sets 1-2 (82 Bytes)
Consumed Assembly Instance	Assembly instance number for data from the PLC to the gateway (output data sets)	Output Sets 1-5
Produced Assembly Instance	Assembly instance number for data from the gateway to the PLC (input data sets)	Input Sets 1-4

Get input only data set 1

Parameter name	Description	Value
Output size (Exclusive Owner)	Number of bytes to be transferred from the PLC to the gateway	NoOutputData
Input size	Number of bytes to be transferred from the gateway to the PLC	Input Set 1 (50 Bytes)
Consumed Assembly Instance	Assembly instance number for data from the PLC to the gateway (output data sets)	Any value
Produced Assembly Instance	Assembly instance number for data from the gateway to the PLC (input data sets)	Input Sets 1-4

Get input only data set 2

Parameter name	Description	Value
Output size (Exclusive Owner)	Number of bytes to be transferred from the PLC to the gateway	NoOutputData
Input size	Number of bytes to be transferred from the gateway to the PLC	Input Set 2 (32 Bytes)
Consumed Assembly Instance	Assembly instance number for data from the PLC to the gateway (output data sets)	Any value
Produced Assembly Instance	Assembly instance number for data from the gateway to the PLC (input data sets)	Input Sets 2-4

Get input only data set 3

Parameter name	Description	Value
Output size (Exclusive Owner)	Number of bytes to be transferred from the PLC to the gateway	NoOutputData
Input size	Number of bytes to be transferred from the gateway to the PLC	Input Set 3 or 4 (60 Bytes)
Consumed Assembly Instance	Assembly instance number for data from the PLC to the gateway (output data sets)	Any value
Produced Assembly Instance	Assembly instance number for data from the gateway to the PLC (input data sets)	Input Set 3-4

Get input only data set 4

Parameter name	Description	Value
Output size (Exclusive Owner)	Number of bytes to be transferred from the PLC to the gateway	NoOutputData
Input size	Number of bytes to be transferred from the gateway to the PLC	Input Set 3 or 4 (60 Bytes)
Consumed Assembly Instance	Assembly instance number for data from the PLC to the gateway (output data sets)	Any value
Produced Assembly Instance	Assembly instance number for data from the gateway to the PLC (input data sets)	Input Set 4

Get input only data sets 1 and 2

Parameter name	Description	Value
Output size (Exclusive Owner)	Number of bytes to be transferred from the PLC to the gateway	NoOutputData
Input size	Number of bytes to be transferred from the gateway to the PLC	Input Sets 1-2 (82 Bytes)
Consumed Assembly Instance	Assembly instance number for data from the PLC to the gateway (output data sets)	Any value
Produced Assembly Instance	Assembly instance number for data from the gateway to the PLC (input data sets)	Input Sets 1-4

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Class 1 connection parameter examples

Get input only data sets 2 and 3

Parameter name	Description	Value
Output size (Exclusive Owner)	Number of bytes to be transferred from the PLC to the gateway	NoOutputData
Input size	Number of bytes to be transferred from the gateway to the PLC	Input Sets 2-3 (92 Bytes)
Consumed Assembly Instance	Assembly instance number for data from the PLC to the gateway (output data sets)	Any value
Produced Assembly Instance	Assembly instance number for data from the gateway to the PLC (input data sets)	Input Sets 2-4

Get input only data set 1, 2 and 3

Parameter name	Description	Value
Output size (Exclusive Owner)	Number of bytes to be transferred from the PLC to the gateway	NoOutputData
Input size	Number of bytes to be transferred from the gateway to the PLC	Input Sets 1-3 (142 Bytes)
Consumed Assembly Instance	Assembly instance number for data from the PLC to the gateway (output data sets)	Any value
Produced Assembly Instance	Assembly instance number for data from the gateway to the PLC (input data sets)	Input Sets 1-4

Get input only data sets 1 to 4

Parameter name	Description	Value
Output size (Exclusive Owner)	Number of bytes to be transferred from the PLC to the gateway	NoOutputData
Input size	Number of bytes to be transferred from the gateway to the PLC	Input Sets 1-4 (202 Bytes)
Consumed Assembly Instance	Assembly instance number for data from the PLC to the gateway (output data sets)	Any value
Produced Assembly Instance	Assembly instance number for data from the gateway to the PLC (input data sets)	Input Sets 1-4

7 Diagnostics and troubleshooting

For information how to perform diagnostics on the Flexi Soft system please refer to theoperating instructions for the Flexi Soft Designer software (SICK part no. 8012998).

Fault	Possible cause	Possible measures
The computer is unable to establish a connection to the Flexi Soft gateway.	The supply voltage of the FX0-GENT is too low or missing. The FX0-GENT is not located on the same physical network as the computer. A different subnet mask has been configured in the TCP/IP settings of the computer. The FX0-GENT has been configured already at some point and either has a fixed IP address or an IP address that has been assigned by an unrecognized DHCP server.	Switch on the voltage supply. Check the Ethernet cabling and network settings of the computer and make any necessary corrections. Set the subnet mask of the computer to 255.255.0.0 (as-delivered state of the FX0-GENT). Check the communication settings of the FX0-GENT.
The FX0-GENT is not supplying any data. PWR ● Green LINK/ACT ●/☀ Green STATUS [1] ☀ Red/green	The FX0-GENT has been configured for transmitting data to the PLC but no Ethernet communication has been established yet or this communication is faulty. Duplicate IP address detected. Another device on the network has the same IP address.	At least one Ethernet connection must be established. Set up an Ethernet connection on the computer and check the Ethernet cabling. Check the Ethernet settings for the Flexi Soft system on the PLC and in the configuration software. If no Ethernet communication is required, deactivate the Ethernet connections/PLC interfaces on the FX0-GENT. Correct the IP address. Then switch the device off and back on again.
The FX0-GENT is not supplying any data. PWR ● Green LINK/ACT ●/☀ Green STATUS [1] ☀ Red (1 Hz)	Configuration required. The configuration has not yet been transferred in full.	Configure the FX0-GENT and transfer the configuration to the device. Wait until the configuration has been fully transferred.
The FX0-GENT is not supplying any data. PWR ● Green LINK/ACT ●/☀ Green STATUS [1] ● Green	No data set has been activated. No Ethernet communication interface has been activated.	Activate at least one data set.
The FX0-GENT is not supplying any data. PWR ● Green LINK/ACT ●/☀ Green STATUS [1] ☀ Green (1 Hz)	The FX0-GENT is in the "Stopped" state.	Start the main module (switch to the "Run" state).

Flexi Soft Gateway

Troubleshooting for the FX0-GENT

Fault	Possible cause	Possible measures
The FX0-GENT was functioning correctly following configuration but has suddenly stopped supplying data. PWR ● Green LINK/ACT ●/☀ Green STATUS [1] ☀ Red/green	The FX0-GENT is being operated in slave mode, with the IP address assigned by a DHCP server. Following a restart of the FX0-GENT or the DHCP server, a different IP address was assigned to the FX0-GENT that is not recognized by the PLC.	Either assign a fixed IP address to the FX0-GENT or allocate a fixed IP address for the FX0-GENT on the DHCP server (assigned manually via the MAC address of the FX0-GENT).
The FX0-GENT is in the "Serious error" state. PWR ● Green LINK/ACT ●/☀ Green STATUS [1] ☀ Red (2 Hz)	Internal device error on the FX0-GENT. The FX0-GENT is in an incorrect position. No Flexi Soft gateways are supported by the firmware version of the main module.	Switch the voltage supply for the Flexi Soft system off and then back on again. Check whether the FX0-GPNT is positioned correctly in the Flexi Soft system. Use the configuration software to check the diagnostic messages. Use a main module with the required firmware version. If the fault persists, replace the gateway.
The FX0-GENT/ Flexi Soft system is in the "Serious error" state. PWR ● Green LINK/ACT ☀ Green STATUS [1] ● Red	The FX0-GENT has not been connected correctly to the other Flexi Soft modules. The module connector is contaminated or damaged. The FX0-GENT is in an incorrect position. There is an internal serious error on another Flexi Soft module.	Plug in the FX0-GENT correctly. Check whether the FX0-GPNT is positioned correctly in the Flexi Soft system. Clean the male and female connectors. Switch the voltage supply back on. Check the other Flexi Soft modules.

[1]   On older versions of the FX0-GENT, the STATUS LED is called the MS LED.

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