

Unit Description

The EJ1N-HFU-ETN is a unit that can be connected to EJ1 modular temperature controllers. Indirectly the EJ1N-HFU-ETN can communicate to other Omron temperature controllers and other Modbus RTU nodes via port B of the EJ1C-EDU End Unit. The EJ1N-HFU-ETN supports up to 31 connected Modbus RTU nodes. The EJ1N-HFU-ETN allows controlling, monitoring and parameterization of Modbus RTU nodes via a PROFINET network. The application in the system that acts as a PROFINET IO Controller is responsible for correct behaviour of the system. The EJ1N-HFU-ETN is a gateway that passes the communicated register values from the PROFINET network to Modbus RTU nodes and vice versa.

Please note that the EJ1N-HFU-ETN can be directly connected to the left side of an End Unit as well. The EJ1N-HFU-ETN acts as a gateway without the need of having EJ1 temperature controllers directly connected.

Modbus RTU Node Configuration

The EJ1N-HFU-ETN communicates to temperature controllers and other equipment via the Modbus RTU protocol over RS485.

Select one baud rate and parity setting common for all Modbus RTU nodes that will be connected to the EJ1N-HFU-ETN. The amount of stop bits depends on the parity setting. The amount of stop bits is 2 if the parity is set to none. Otherwise the amount of stop bits is 1.

EJ1 temperature controllers must be configured to support Modbus RTU on port B instead of the default protocol: Compoway/F.

Follow the next steps to configure an EJ1 temperature controller to support Modbus RTU on port B:

- Switch on SW2 the switches 2 and 8 to OFF
- Use SW1 and SW2 switch 1 to select the correct Modbus node address between 1 and 31.
- Set, using CX-Termo, in the TC Communication settings
 - Port B Protocol to Modbus
 - Port B Baud Rate as selected
 - Port B Data Length to 8
 - Port B Stop Bits and Parity combination as selected (see above)

For a detailed explanation about the switches, please refer to the EJ1 manual H142.

Repeat the steps above for all temperature controllers and make sure that each temperature controller has a different Modbus node address.

Installation Procedure

Follow the next steps to connect an EJ1N-HFU-ETN to EJ1 Temperature Controller units and an End Unit:

- Power down the EJ1 system
- Align and connect the EJ1N-HFU-ETN at the left side of the Temperature Controllers
- Align and connect the End Unit at the right side of the Temperature Controllers
- Slide the yellow sliders on the top and bottom of the unit until the sliders click into place
- Mount the EJ1 system to a grounded DIN rail between end stops
- Push the EJ1 system to the left until the grounding plate at the back side of the EJ1N-HFU-ETN properly connects to the DIN rail end stop.
- Power up the EJ1 system
- Assign a PROFINET device name via a PROFINET network scan tool as included in e.g. CX-ConfiguratorFDT. Please refer to the PROFINET IO Controller manual.

PROFINET Wiring

The EJ1N-HFU-ETN unit is supplied with three RJ45 Ethernet connectors. Connect any of the Ethernet ports to the PROFINET IO Controller, if necessary via an Ethernet switch. The EJ1N-HFU-ETN unit cannot be part of a redundant Ethernet ring.

Follow the guidelines in the "PROFINET Installation Guideline for Cable and Assembly" (PNO Order No. 8.072) regarding:

- Ethernet cable selection and assembly
- Wiring and handling of the Ethernet cables
- Grounding and equipotential bonding

Modbus RTU Wiring

Connect other Modbus RTU nodes than EJ1 Temperature Controllers via a shielded cable to terminals 6 and 7 of the End Unit. Please note:

- Connect the cable shield to functional ground
- Separate the cable from power lines.

GSDML File and Omron CX-ConfiguratorFDT

Omron provides a GSDML file for the EJ1N-HFU-ETN unit via the myomron.com website. The GSDML file is named:

GSDML-V2.2-OMRON-EJ1N-HFU-ETN-yyyyymmdd.xml

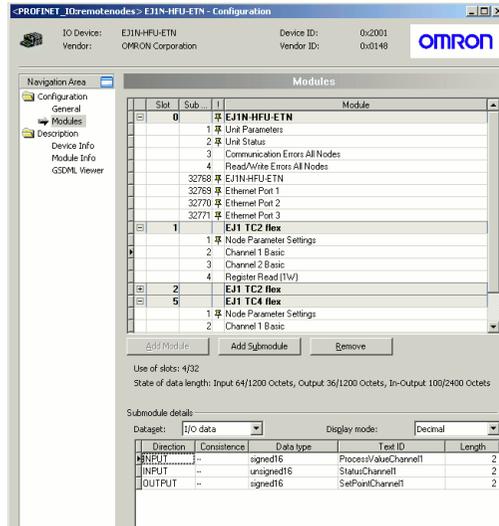
The yyyy, mm and dd part of the file name is replaced by the GSDML file release date elements year, month and day respectively.

CX-ConfiguratorFDT is the configuration program for Omron PROFINET IO Controllers.

Please update CX-ConfiguratorFDT to August 2011 or newer.

Start CX-ConfiguratorFDT, open the Device Catalogue and use the button "Install Device Description Files...". Select the GSDML file with the name mentioned above to start using the EJ1N-HFU-ETN together with Omron PROFINET IO Controllers. The unit will appear in the Device Catalogue as "EJ1N-HFU-ETN".

The picture below shows CX-ConfiguratorFDT with an EJ1N-HFU-ETN configuration example.



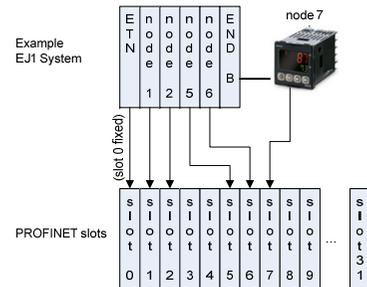
Unit Configuration

The EJ1N-HFU-ETN is configured using the configuration program for the PROFINET IO Controller. Use the Unit Parameters submodule of the EJ1N-HFU-ETN module (slot 0, sub-slot 1) to configure baud rate and parity setting as selected in the section Modbus RTU Node Configuration.

The EJ1N-HFU-ETN configuration is completed by assigning and configuring Modbus RTU nodes. This configuration step is described in the next section.

Temperature Controller / Modbus Node Allocation

The EJ1N-HFU-ETN provides 31 PROFINET slots for Modbus node addresses 1..31. Use the PROFINET configuration tool to assign EJ1 Temperature Controllers and other Modbus RTU nodes as modules to slots. A slot number corresponds with the Modbus node address. Slots may be skipped if a node address is not used. Please refer to the figure below.



Several modules are available that reflect a Modbus RTU node. The table below shows the available modules and the module parameters.

Module	Parameter	Description
Modbus Node	Timeout	Response timeout in 0.1 second units A timeout of 0 (zero) means 5 seconds
	Backup Total	Amount of registers to backup
	Backup Start	Start register of the backup register range
	Support RW	Yes: node supports Modbus function 23 No: node does not support function 23
EJ1 TC2 flex	Retries	Amount of retries before error indication
	Timeout	Response timeout in 0.1 second units A timeout of 0 (zero) means 5 seconds
EJ1 TC4 flex	Retries	Amount of retries before error indication
	Timeout	Response timeout in 0.1 second units A timeout of 0 (zero) means 5 seconds
	Retries	Amount of retries before error indication

The EJ1 TC2 flex module and the EJ1 TC4 flex module represent an Omron EJ1N-TC2 and an Omron EJ1N-TC4 respectively.

All modules provide free sub-slots for I/O data assignment.

I/O Data Assignment

The sub-slots in the EJ1N-HFU-ETN unit's modules provide space for the sub-modules. The available sub-modules represent I/O data that is continuously being transferred to or from registers in a Modbus RTU node.

Sub-Module	Module Support	Description and Configuration
Register Write (1W)	Modbus Node	Writes PROFINET output data into one Modbus register. Configure the register address.
	EJ1 TC2 flex	
	EJ1 TC4 flex	
Register Read (1R)	Modbus Node	Reads one Modbus register into PROFINET input data. Configure the register address.
	EJ1 TC2 flex	
	EJ1 TC4 flex	
Register Write (2W)	Modbus Node	Writes PROFINET output data into two Modbus registers. Configure both register addresses.
	EJ1 TC2 flex	
	EJ1 TC4 flex	
Register Read (2R)	Modbus Node	Reads two Modbus registers into PROFINET input data. Configure both register addresses.
	EJ1 TC2 flex	
	EJ1 TC4 flex	
Channel 1 Basic	EJ1 TC2 flex EJ1 TC4 flex	Set Point , Process value and Channel Status of TC channel 1
Channel 2 Basic	EJ1 TC2 flex EJ1 TC4 flex	Set Point , Process value and Channel Status of TC channel 2
Channel 3 Basic	EJ1 TC4 flex	Set Point , Process value and Channel Status of TC channel 3
Channel 4 Basic	EJ1 TC4 flex	Set Point , Process value and Channel Status of TC channel 4

The Register Write and Register Read sub-modules are also available in 4 and 8 word size. Configuration is required for each individual register address. A default of 0 (zero) indicates that the register is not used.

Modbus on TCP Support

The EJ1N-HFU-ETN services Modbus on TCP requests during the time it exchanges I/O data with a PROFINET IO Controller. Use the IP address as configured for PROFINET. The EJ1N-HFU-ETN will gateway the request to the Modbus RTU node as identified using the Unit Identifier in the Modbus on TCP message.

The list of supported Modbus registers is listed on the myomron.com website. Also refer to this website for using Modbus on TCP without having a PROFINET IO Controller.

Diagnosis and LED Indicators

The table below shows the meaning of the LED indicators.

Indicator	Status	Meaning
RUN	Green	Normal operating status
	Off	The unit is initializing
ERR	Red	The product detected an error and cannot continue
	Blinking	Backup or restore operation failed
	Off	The unit is operating normally
COMM	Green	A PROFINET IO Controller connected properly
	Off	No PROFINET IO Controller connected
BF	Red	No PROFINET IO Controller connected
	Blinking	The last PROFINET connection is not accepted
	Off	A PROFINET IO Controller connected properly
TS	Green	All assigned Modbus nodes are communicating
	Blinking	Backup or restore operation in progress
	Red	Communication failure with all Modbus RTU nodes
	Blinking	Communication failure with at least one Modbus RTU node
	Off	No Modbus RTU nodes assigned

For detailed diagnosis on error situations and Ethernet diagnosis consult the myomron.com website.

Unit Status

The EJ1N-HFU-ETN always provides unit status information in slot 0 of the PROFINET configuration.

Bit	Name	Description
0	Unit Ready	1: Unit is ready to accept requests 0: Unit is initialising
1	Status Port 1	1: Port 1 is operating at 100M, full duplex 0: Port 1 is operating at either 10M or half duplex
2	Status Port 2	1: Port 2 is operating at 100M, full duplex 0: Port 2 is operating at either 10M or half duplex
3	Status Port 3	1: Port 3 is operating at 100M, full duplex 0: Port 3 is operating at either 10M or half duplex
8	Backup	1: BACKUP switch is set to ON 0: BACKUP switch is set to OFF
9	Restore	1: RESTORE switch is set to ON 0: RESTORE switch is set to OFF

Note: Check the bits 1-3 for being ON during operation. Communication failures may occur otherwise.

Unit Communication Status

The EJ1N-HFU-ETN optionally can provide the communication status of the assigned Modbus RTU nodes. One sub-module is available in slot 0 showing to which assigned Modbus RTU nodes the EJ1N-HFU-ETN cannot communicate. Another sub-module is available showing register access errors while exchanging the configured I/O data. Assign a sub-module to a sub-slot to make this data available for the application.

The data available in the word for nodes 1-15 is a 16-bit value

Bit	Name	Description
0	Comm Error	1: At least one Modbus node is not communicating 0: All assigned Modbus nodes are communicating
1-15	Node Error	1: Modbus RTU Node is not communicating 0: Modbus RTU Node is communicating normally

The bit numbers correspond to Modbus node addresses

The data available in the word for nodes 16-31 is a 16-bit value as well

Bit	Name	Description
0-15	Node Error	1: Modbus RTU Node is not communicating 0: Modbus RTU Node is communicating normally

Bit 0 corresponds to Modbus node address 16
Bit 15 corresponds to Modbus node address 31

Modbus RTU Node Register Backup

The EJ1N-HFU-ETN provides the means to support a backup and restore of Modbus node registers. Registers can be stored centrally using an Omron PLC function block. The backup and restore operation can nevertheless be activated locally using the switches.



Note: Before being able to activate backup or restore the following steps are required:

- Download the function block from the myomron website
- Insert the downloaded function block in the PLC program
- Connect the function block enable input to the Ready bit of the Unit Status

Follow the next steps to execute a backup of the assigned Modbus nodes:

- Make sure that the TS LED is Green
- Switch the BACKUP switch to ON
- The PLC program starts the backup of the configured backup register ranges (see the module parameters above). The TS LED starts blinking green.
- Wait until the TS LED switches back to Green again.
- Switch off the BACKUP switch

Follow the next steps to execute a restore of the assigned Modbus nodes:

- Make sure that the TS LED is Green
- Switch the RESTORE switch to ON
- The PLC program starts the backup of the configured backup register ranges (see the module parameters above). The TS LED starts blinking green.
- Wait until the TS LED switches back to Green again.
- Switch off the RESTORE switch