System integration
Modbus TCP – documentation

Integration with Modbus TCP

Modbus TCP is available on the Ethernet port only with prior activation.

(For activation via the operating panel follow the steps showed below)

Activation via RS-232 serial communication: using command ETH MODBUS ON [‹Port›]. Modbus can be deactivated by entering ETH MODBUS OFF. Please refer to chapter 2 for detailed information on serial communication.

CAUTION: this mode opens an unsecure port into the network and thus requires a secure local network with firewall, to avoid risk of attacks on the EFOY.

Requirements:

- The default TCP port is 502, but configurable via RS-232 communication at ETH command.
- The byte ordering for a 16-bit word is Big-endian. The word order is Little-endian for all 32bit/64bit values.
- The EFOY accepts up to eight concurrent TCP connections from the local subnet (defined by IPv4 Mask via DHCP or via ETH command).
- The MODBUS TCP client must support TCP Keep-Alive (every 15 minutes).
- The input registers and discrete inputs are updated with 1Hz at maximum. (Therefore, higher polling rates are useless).
- Coil values are OFF by default. To apply the function, set the coil to ON. The EFOY will clear the coil on execution starting.
- Holding register values are -1 for integer and NAN for floats by default. To apply a new value, set the input register to the new value. The EFOY will clear the value on successfully altering the underlying preference.

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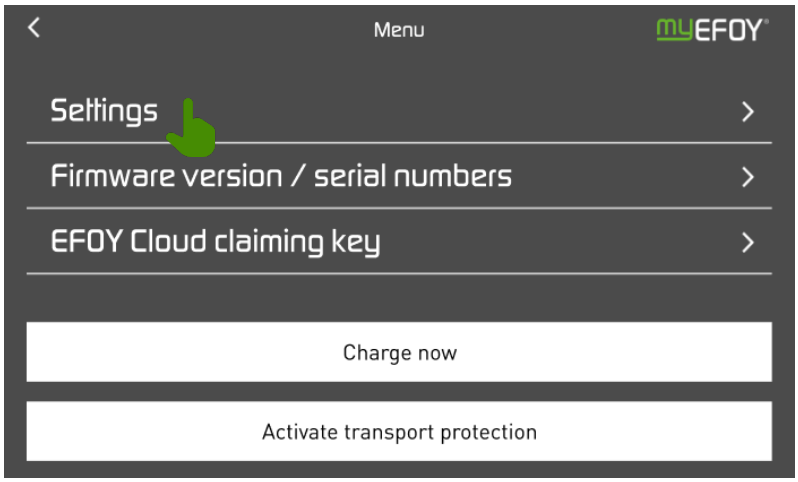
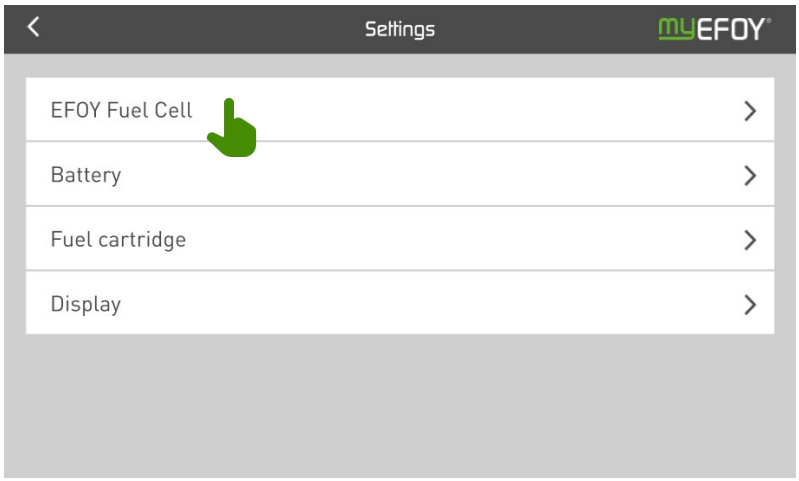
Activation of the Modbus TCP via operating panel:

- Go to Menu and select ‹‹Settings››



- Then go to ‹‹EFOY Fuel Cell››



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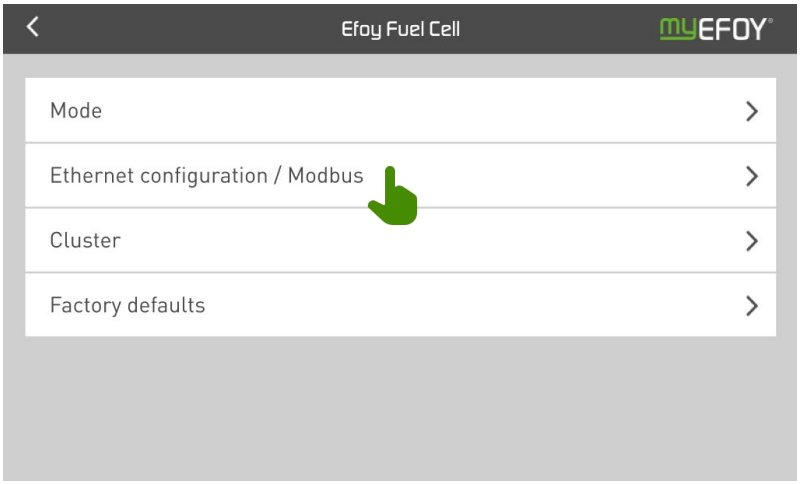
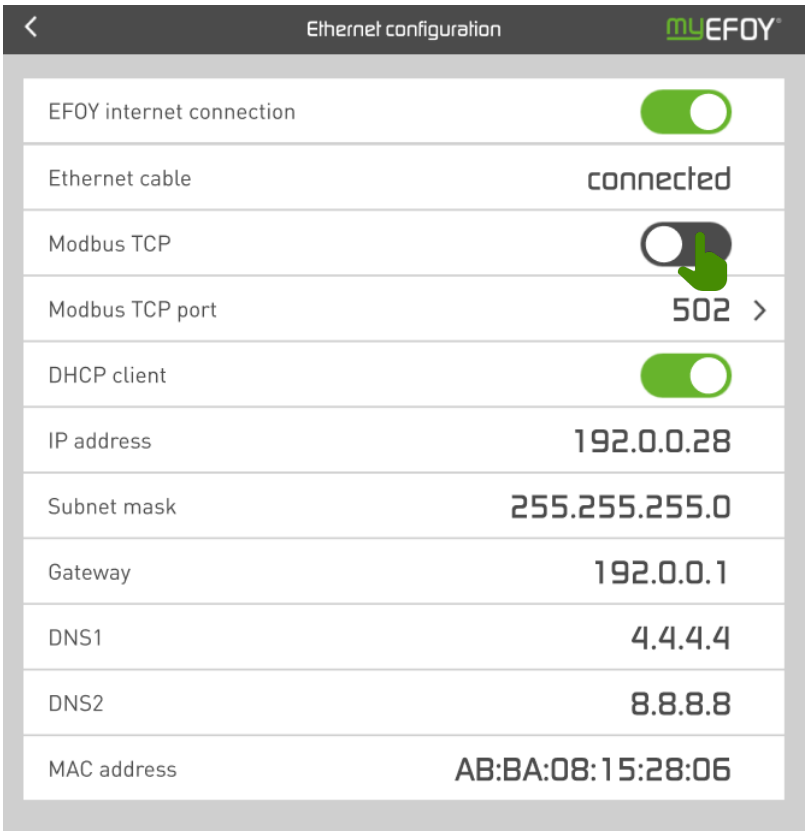
- Select ‹‹Ethernet configuration / Modbus››



- To activate the Modbus TCP functions you have to press the ‹‹Modbus TCP switch››
- Modbus TCP port is by default set to 502



- Your Modbus TCP is now activated

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Current Firmware Version 24.14.294

Name	Type	Unit	Address	Description
CurrentErrorActive	bit		10003	A critical problem will prevent the fuel cell from operating correctly. Immediate maintenance is required for continued operation
CurrentWarningActive	bit		10004	Whether any warning is active. A warning indicates that maintenance should be done on the system soon
fuelBelow25	bit		10013	Remaining fuel in cartridge or all active FM ports is less than 25%
FmdPort1EnabledStatus	bit		10021	Fuel Manager (FM) port 1 enabled
FmdPort2EnabledStatus	bit		10022	Fuel Manager (FM) port 2 enabled
FmdPort1ActiveStatus	bit		10029	FM port 1 active
FmdPort2ActiveStatus	bit		10030	FM port 2 active
SystemType	unit32		30001	First part of the serial number
AssemblyDate	unit32		30003	Middle part of the serial number
SequentualNumber	unit32		30005	Last part of the serial number
FirmwareVersionMajor	unit16		30007	Major firmware version
FirmwareVersionMinor	unit16		30008	Minor firmware version
FirmwareRevision	unit32		30009	Firmware revision
RatedOutputPower	unit16	W	30011	The rated output power
LogPOut	float32	W	30021	Actual power output
LogUBat	float32	V	30023	Battery voltage
LogTAmb	float32	C	30025	Ambient temperature
LogWOutCum	unit32	Wh	30027	Cumulative power generated by the EFOY
CurrentErrorCode	unit16, enum		30032	The actual error code (Major) when ErrorActive is set, 0 otherwise
CurrentErrorCodeMinor	unit16, enum		30033	Minor value of error code
LastErrorCode	unit16, enum		30034	The previously set error code
LastErrorCodeMinor	unit16, enum		30034	Minor value of error code
CurrentWarningCode	unit16, enum		30036	The actual warning code when WarningActive is set, 0 otherwise
CurrentWarningCodeMinor	unit16, enum		30037	Minor value of warning code
SystemState	unit16, enum		30040	Current EFOY state *See Notes
OperatingMode	unit16, enum		30041	Current EFOY operating mode **See Notes
CartCapStatus	float32	L	30203	Capacity of the current cartridge
FmdActivePortNum	uint16		30230	The number of the active port
FmdPort1RlVolStatus	float32	%	30231	FM port 1 remaining relative vol
FmdPort2RlVolStatus	float32	%	30233	FM port 2 remaining relative vol
FmdPort1CapStatus	float32	L	30247	FM port 1 capacity of the current cartridge
FmdPort2CapStatus	float32	L	30249	FM port 2 capacity of the current cartridge
LogStackOpTime	float	H	30271	Stack Operating Time in hours

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LogIOut	float	A	30273	Output Current in A
LogUOut	float	V	30275	Output Voltage in V
ClusterRole	uint16, enum		30279	Cluster Role
ClusterClientCnt	unit16		30281	Total number of cluster clients connected to the cluster controller
ClusterControllerIP	unit32		30282	Currently configured IP of the cluster controller
ClusterControllerPin	unit32		30284	The cluster controller pin, if 0 then there is no pin
ClusterClientPin	unit32		30286	Currently configured client pin, if 0 then there is no pin configured
LogTStack	float32	C	30288	Stack temperature
LogTHE	float32	C	30290	Heat exchanger temperature
LogFL	float32	%	30300	Fill level of the fluid in the internal system (intermediate tank + tubes)
LogSystemStarts	uint32		30308	Number of system starts
SystemOn	bit		1	Turn the EFOY on manually
SystemOff	bit		2	Turn the EFOY off manually
SystemAuto	bit		3	Let the EFOY decide when to turn itself on and off automatically
SystemReset	bit		4	Reset any warnings and errors, clear the warning and error registers
FmdPort1Enable	bit		21	Enable FM port 1
FmdPort2Enable	bit		22	Enable FM port 2
FmdPort1Disable	bit		31	Disable FM port 1
FmdPort2Disable	bit		32	Disable FM port 2

SystemState and OperatingMode

SystemState

0	off
1	standby
2	in operation
3	shut down
4	frost protection
5	deep discharge protection
6	transport lock procedure
7	transport lock
8	reset
9	factory defaults
10	error
11	frost protection
12	pending
13	pending
14	update EFOY accessories

Operating Mode

0	Automatic
1	off

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SystemOnReason / OffReason

SystemOn	Reason the system has turned on: 0: None 1: System has been turned on manually. 2: The system has turned on automatically because the battery required charging. 3: The system has turned on automatically to enter frost protection mode. 4: The system turned on automatically to enter deep discharge protection mode.
SystemOff	Reason the system has turned off: 0: None 1: System has been turned off manually. 2: The system turned off automatically because the battery has been fully charged. 3: The system has turned off automatically because the maximum charge time has been reached. 4: The system has turned off automatically because an overvoltage at the output was detected. 5: The system has turned off because frost protection mode has finished. 6: The system has turned off because the fuel cartridge has depleted. 7: The system has turned off because methanol in reservoir and tubes is depleted for UN3363 requirement. 8: The system has turned off because an error has occurred. 9: The system was reset.

Battery types

Battery types	0: No Battery 1: Lead Acid 12V 2: Lead Acid 24V 3: LiFePO4 12V 4: LiFePO4 24V 5: EFOY Battery

Cartridge types

Cartridge types	0: unspecified 1: fuel container with custom capacity 2: M5 3: M10 4: M28 5: MT60 6: FM (only register 30201)

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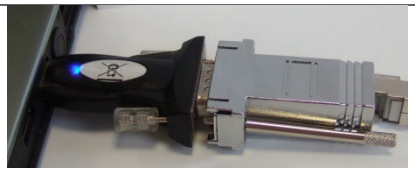
Serial communication and ethernet configuration

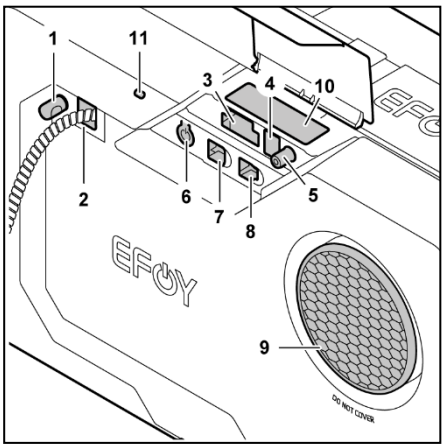
Serial communication with EFOY fuel cells

The SIO-commands can be used for serial communication with the EFOY fuel cell via a Terminal program.
For example: Terminal 2014, v.1.39b – provided by SFC
Required components:

Interface Adapter IA1	151 075 011
USB Adapter	151 906 018
Data Cable RJ-45 / RJ-12	158 906 008 (in urgent cases a cable RJ-12 / RJ-12 can also be used)
Windows PC	With installed terminal program, example: Terminal 2014

1. Connect the EFOY fuel cell to a windows PC by using the EFOY Interface Adapter IA1, USB Adapter and data cable
2. Connect the RJ-12 connector into the plug nr. 8 on the fuel cell.
3. Open the Terminal and follow the instructions in the PDF





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ETH command

SFC›ETH ‹ARGUMENT›

Displays or sets the Ethernet configuration.

Possible transmission parameters:

Argument	Description
	Display DHCP client state, IP, mask, gateway, hardware address, device name
DHCP [ON|OFF]	Turn DHCP client on or off. Renew DHCP with ON command.
SET ‹IP› ‹Mask› ‹Gateway›	Set the current IP configuration, DHCP must turned off before.
CLAIMING	Get claiming key if one is set and not expired.
MODBUS [ON [‹Port›]|OFF]	**Caution: The mode opens an unsecure port into the network and thus requires a secure local network with firewall, otherwise there are great risks for attacks on the EFOY.** Enables the unsecure Modbus mode at user defined port. (Default port is 502). EFOY must reset after turn off command to disable the Modbus mode or after changing the port.
CN	Common name (Device name)
RXER	Error counter, irrelevant to end user
LINK	Physical link and DCHP client state

Example 1

SFC›ETH

Ethernet cable connected
Connected to IoT Hub
DHCP client: On
IP: 10.1.6.56
Mask: 255.255.0.0
Gateway: 10.1.255.1
Hardware Address: E4:1E:0A:6F:AC:B1

Should you require assistance please contact the SFC Energy Canada service department at
1 800 565 7431 or service-support@sfc.com

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