

Introduction to the ezeio

Thank you for purchasing or considering the ezeio® !

What is the ezeio®?

The ezeio is a complete solution for monitoring, alarming, control and automation of commercial and industrial equipment.

The ezeio hardware connects to sensors, meters, thermostats, VFD's and other control devices locally via a number of industry standard interfaces.

It connects securely and seamlessly via the Internet (Ethernet or Cellular) to the eze.io cloud application, where the user can access all data in real time as well as historical.

All configuration settings and programming is done via the cloud interface, allowing multiple concurrent users, automatic synchronization and secure access from anywhere without any special software or setup.

Common applications include:

- Monitoring energy meters (electrical, water, gas)
- M&V applications (energy saving, improvements)
- Monitoring refrigeration systems (temperature, pressure)
- Controlling & monitoring HVAC systems (thermostats, room sensors)
- Construction site monitoring (cement curing, heating/cooling, alarms)
- Automating thermal energy storage systems (*TES)
- Technical alarm systems (fan monitors, temperature, tank levels)
- Lighting control, monitoring and scheduling/automation
- Irrigation control, monitoring and scheduling/automation
- Battery / EV charging, monitoring and control
- Vehicle tracking, monitoring (GPS)

The ezeio system is designed for easy deployment in geographically spread out, multi-dicipline applications where traditionally several single-purpose systems were needed.

The ability to support different kinds of sensors, meters, actuators and applications within a single, low cost yet complete and secure system makes the ezeio system unique.

Model information

Part number	Model	Cloud connectivity
EM2010	ezeio Cat-M1	Ethernet + IoT (4G/5G) cellular

Please contact eze System for other cloud-connectivity options.

Local connectivity includes;

	Quantity	Comment
Discrete inputs	8	Individually configurable for 0-10V, 0-30mA, Resistor, Thermistor, Pulse
Discrete outputs	4	2 digital (voltage output), 1 Pulse Width, 1 Analog 0-10V
SDI-12 serial	1	Serial I/O for SDI-12 sensors or GPS receiver
Modbus/RTU	1	Serial (RS485) port supporting the Modbus/RTU protocol
Modbus/TCP	1	Ethernet (TP10/100) ¹⁾ supporting the Modbus/TCP protocol
CAN	1	CANbus compatible port

Additional inputs and outputs can be added using [ezeio expansion devices](#) and/or third party devices.

Standard & Optional Features; ²⁾

- Data logging with over 50 days of local buffer storage ³⁾
- Flexible alarming functions
- Reporting to email, SMS, Voicecalls, Pushover, API and more
- Direct control from web
- Complete remote access to configuration and programming
- Easy to configure local logic
- Scheduling with 10 year calendar
- Powerful Scripting running on hardware
- REST API
- Built-in Real Time Clock
- Low power consumption (<1Watt)
- Smart drivers for common Modbus, SDI12 and CAN devices
- Multiple dashboards
- Easy management and hierarchical groups
- Unlimited user access with multiple permission levels from view only to full admin

Functional overview

Communication

The ezeio connects to the Internet via Cellular or Ethernet. A cellular modem is built in to the unit, but an external antenna is required. By default, if there is an Ethernet connection that allows Internet access, *Ethernet is prioritized*. If for any reason the Ethernet connection is not available, the ezeio will automatically switch to use the cellular connection. If the Ethernet becomes available after the cellular connection has been established, the ezeio will switch to the Ethernet after a few seconds.

All communication via Ethernet and Cellular is secure, encrypted and controlled. The ezeio is always a 'client', which means that it will actively seek a connection to the servers. Typically this means there is no special network configuration required, and the ezeio should be expected to work on any network setup - even behind routers and firewalls. However if the network blocks certain traffic or uses proxy

technologies, there is a risk that the ezeio will not work on that network, and fall back to the cellular connection if coverage is available.

Ethernet specifications

Hardware	Ethernet TP10/100BASE-T, Auto MDI-X
Max cable length	100m (320ft)
Addressing	DHCP (default) or static IP
Protocol	Proprietary, encrypted, Port TCP/443
Security	PKI handshake, 128 bit encryption

Cellular specifications

Antenna	SMA, standard rugged knob-style antenna with mounting bracket. 1m cable.
Technology	LTE CAT-M1
Carrier support	Global, multi-carrier with localization
SIM card	Built-in ⁴⁾

Inputs and Outputs

The ezeio connects to local sensors and devices through the green screw terminal. There are several connection options.

Port type	Qty	Description
Inputs	8	0-10V, 0-30mA, Resistor, Thermistor, Switch, Pulse count/rate
Outputs	4	On/Off (2), 50Hz PWM (1), Analog 0-10V (1)
SDI-12	1	For environmental sensors or GPS
Modbus/RTU	1	Modbus/RTU master, RS485, 2400-115200bps (19200 bps standard)
Modbus/TCP	1	Server or Client, standard Ethernet
CAN	1	For I/O expansion, configurable for other protocols
Antenna	1	Cellular LTE CAT-M1 (optional GSM 2G/3G) SMA standard
Power supply		Barrel DC jack input or screw terminal
Power output		Terminals for fused or passthrough DC as well as regulated +5VDC
Ground		Inputs, outputs and supply use a common ground. Multiple ground terminals

Discrete inputs

There are eight (8) discrete inputs on the ezeio. Each input can be individually configured to monitor voltage, current, resistance or pulses. The configuration is done via the web interface at <https://eze.io>.

More information about connecting to the inputs is available [here](#).

Discrete outputs

There are four (4) discrete outputs on the ezeio. The function of each output is completely controlled by software.

Output 1 and 2 are purely on/off. They will output the supply voltage when on, and no voltage when off.

Output 3 is a Pulse Width output. It will output a 50Hz rectangular wave, with duty cycle from 0-100%. The high state is the supply voltage. This output can also be used as a regular on/off output by only setting it to 0 and 100% in software.

Output 4 outputs an analog voltage between 0 and 10V. The software controls this in 100mV steps (0-100%).

More information about connecting to the outputs is available [here](#).

SDI-12

SDI-12 is a bidirectional communications protocol for relatively simple sensors, and commonly used for monitoring environment data. See <http://www.sdi-12.org> for more details.

The ezeio supports the standard SDI-12 protocol and multiple drivers are available for different types of sensors. The SDI-12 port can also be used as a generic serial input to read GPS data and other nonstandard devices.

More information about SDI-12 is available [here](#).

Modbus/RTU

Modbus/RTU is also a bidirectional communication protocol, but faster and more powerful than SDI-12. Developed 1979, it is still by far the most common protocol in industrial automation systems, and supported by multiple manufacturers in many industries.

The ezeio supports standard Modbus/RTU as a 'master', meaning the ezeio controls the communication between multiple devices. eze System provides drivers for many types of devices from various manufacturers.

Several devices can be connected at the same time on the same Modbus/RTU cable. The protocol is very robust, uses low cost bulk wires and can be used in noisy environments and over long distances.

More information about Modbus/RTU is available [here](#).

Modbus/TCP

Modbus/TCP is similar to Modbus/RTU, but uses Ethernet network signalling to connect to the devices. This allows for faster data transfers than over Modbus/RTU and has the benefit of using standard plug-and-play Ethernet hardware (switches, cabling). Modbus/TCP can be routed using standard WiFi hardware, allowing one ezeio to communicate directly to another ezeio or other device within range. The downside is somewhat more complex configuration, shorter range without using additional hardware and higher device cost.

The ezeio supports standard Modbus/TCP as both a 'server' and a 'client'. There are multiple drivers available for various devices.

More information about Modbus/TCP is available [here](#).

CAN

The ezeio has a CAN port, which by default is used for expanding the system with additional I/O hardware and terminal made by eze System. When used for this purpose, the protocol is proprietary to eze System, and other devices cannot be connected to the CAN port.

The CAN port is controlled by software and may be configured for other protocols, such as NMEA2000, J1939, DeviceNet or CANopen. Please contact eze System for options.

Operation

Startup

The ezeio will automatically connect to the cloud services when power is applied. It is designed to be always-on, and always stay connected to the servers. If the communication is interrupted, the ezeio will automatically attempt to reconnect until the connection is restored.

Configuration

The user can configure each ezeio with multiple sensors and devices, to collect data (log), set alarm conditions, construct automation logic and directly remote control the units.

All configuration is managed through the cloud portal at <https://eze.io>. Any changes to the configuration of an ezeio unit is stored in the cloud databases, and automatically synchronized to the unit as soon as possible - typically within a few seconds assuming the unit is powered up and connected.

Data acquisition

Captured data is first buffered in the built-in memory, which holds over 50 days of 10 minute interval data, or 300000 samples at other intervals. Buffered data is uploaded automatically to the cloud

databases as soon as the connection allows, and can be easily viewed in real time or historically, and downloaded as CSV or via API. The data is kept in the servers databases for a minimum of three years.

Events

If the ezeio is programmed to trigger alarm events, messages can be sent via email, SMS, Pushover or voice calls to any number of recipients. The conditions that trigger such events is completely user programmable, and can be changed at any time from the portal.

Logic

The user may construct any logic using a powerful scripting language, and download this logic into the ezeio unit(s). Such logic will run independent of the servers.

Management system

On the server/portal side, the user may manage multiple units, provide access to multiple users with varying privileges, design dashboards, reports and have a quick overview of the real-time state of all units. The system scales easily from a single ezeio to thousands.

ezeio hardware and firmware

The ezeio hardware is highly optimized for its purpose. An embedded microcontroller (ARM Cortex-M4) manages all the communications, logic, I/O's, ports and memories. There are several different types of memory chips for programs, configuration, recorded data and status, as well as power management, I/O interfaces, real-time clock/calendar etc. The inputs and outputs are protected against excessive voltages/currents and the hardware is designed for wide temperature and rugged for interference expected in harsh environments.

CPU	ARM Cortex-M4 @ 120MHz
Memory	On-chip flash and RAM for system and configuration
	32MB flash buffer for log data
Interfaces	Ethernet, CAN, Modbus RS485, SDI-12, Discrete I/O
Cellular	LTE CAT-M1 global
RTC	Automatically synchronized with servers. Supercap backup (~24h)
Power	12-24VDC supply (switching ⁵), <1W self-draw average

There are no provisions for directly connecting to the hardware for configuration. All configuration is managed through the servers <https://eze.io>.

Embedded software

The ezeio runs a proprietary software stack, designed from scratch by eze System. The software is embedded in the microcontroller and runs immediately when power is applied. The configuration, drivers and user designed logic is synchronized automatically from the cloud servers, and runs locally on the ezeio.

Each ezeio unit has unique keys for validating with the ezeio cloud system and will refuse any other attempts to communicate than with the ezeio servers. The system is inherently secure, designed for direct use on the public Internet with no need for additional VPN, firewalls or other third-party security measures.

In case the communication is interrupted, all logic continues to run, and any messages/log data is buffered and automatically sent to the servers when the communication is restored.

Capacity and performance

Field width	64 bit, double precision
Max fields	90 (logged data points)
Log buffer, fixed	56 days, 10 minute interval, all fields and system status
Log buffer, configurable	262000 blocks of 11 fields each
Log interval	10 minute standard, configurable down to 5s, configurable to record mean/max/min/snapshot/trend
Event buffer	8000 events
Alarms	300, individual condition, holdoff and restore settings. Each alarm may trigger up to four separate actions.
Schedules	30 daily/weekday or by 10-year calendar
Register width	32 bit, as signed integer or floating point
Max registers	2000 total, max 150 per device
Devices	Up to 40 total
Hardware inputs	8 on main hardware. Expandable to 64 with ezeio expansion. 12 bit resolution, 1000Hz sampling speed (fixed)
Hardware outputs	4 on main hardware. Expandable to 74 with ezeio expansion. Types: On/Off max 200mA active output, PWM 50Hz/RC servo, Analog 0-10V 0.1V step
Expression processing	10Hz, fields and alarms
Script execution	Approx 200k instructions per second
Script language	See Script reference

1)

Same physical port may be used for cloud connectivity

2)

Some features require additional paid subscription

3)

Logging intervals 10 min, 5 min, 2 min, 1 min, 15 sec, 5 sec

4)

SIM is provided by eze System, and not user replaceable

5)

Power consumption mostly independent of input voltage

From:

<https://doc.eze.io/> - **ezeio documentation**

Permanent link:

<https://doc.eze.io/ezeio2/introduction/start>

Last update: **2022-07-07 16:59**

