



SHM Communications Ltd.

ML32 Logger Technical Information



Introduction

The ML32 logger together with the DL4, UL8 UL24 and RL32 form SHM's family of advanced data loggers for energy monitoring.

The ML32 allows up to 24 digital or analog channels to be collected via Modbus.

The ML32 is robust, reliable and easy to install. All input and power connections use 2-part plug-in terminal blocks.

The ML32 has eight Universal inputs (1 to 8) that can each be configured to monitor Digital (pulse), Status (on / off), Analog (0 to 10 V or 0 to 20 mA) or Temperature (thermistor) sensors, and 24 inputs (9 to 32) that collect data via Modbus from up to 24 Modbus slaves.

Digital and Status inputs accept volt-free relay contacts, providing direct connection to all the common utility meters (Electricity, Oil, Gas, Water, Compressed Air, Steam). Analog inputs can be connected to any sensor whose output is one of the industry standard levels, 0 to 10 V or 0 to 20 mA. Temperature inputs are connected to a NTC precision thermistor sensor.

Each universal channel in the logger is independent, and can be configured to log data at intervals of between 1 and 60 minutes, or be triggered by an external Universal input. When logging every 30 minutes, each channel logs data for approximately 50 days before wrap-around occurs.

The logger is mains powered, but can be fitted with a UPS that allows it to power the receiver and continue logging for up to 1 day without mains power.

The logger has its own clock / calendar which is used to timestamp all readings.

The logger is interrogated and controlled via its serial port. The main serial port on the enclosure is normally used for local interrogation by a portable PC. A second internal serial port can be used to connect to a modem or similar device, and is used for remote access.

The ML32 can be a stand-alone logger or be connected to other SHM loggers (of any type) via a simple local area network. Connection to the host PC can be via direct connection, telephone modem, RF modem (Paknet) or Ethernet TCP/IP. A variety of solutions are available to minimize installation and communications costs.

SHM supplies a simple PC utility to configure the many firmware options available on the logger. To collect the logged data another utility

is available to store it in standard CSV format for importing into spreadsheet programs like Microsoft Excel. If full-featured energy monitoring is required, then the leading energy information software package **Stark RT** is the preferred choice, and comes with the ML32 protocol built in. SHM is an Approved Application Partner for Stark Software International and will provide full details of RT on request.

For simpler applications SHM's Excel-based Energy Monitoring Software (XLeMs) can be used.

Modbus

Modbus is a standard protocol widely used in intelligent meters and sensors. It provides easy access to measured data values, but such devices rarely have any logging capability.

The ML32 brings logging capability to the world of Modbus by continuously polling up to 24 Modbus data registers and storing the results at regular intervals.

The ML32's Modbus configuration is programmed using a special software utility and adapter to connect to the Modbus RS485 interface. Each channel can be independently programmed to collect data from a specific device address and register address.

Digital channels collect data that is stored as 32-bit Unsigned Long Integers. Analog channels collect data that is stored as 16-bit Signed Integers.

SHM can supply compatible Modbus-enabled Carlo Gavazzi and Northern Design electricity meters.

Protocol

The ML32 uses a proprietary packet-based full-duplex protocol, designed to allow multiple loggers to be connected together in a variety of network configurations. It provides fast efficient data transfers and minimizes cost when using a communications medium with a per-packet tariff (eg. Packetnet).

Time Control

To avoid sudden changes in the time (and consequent discontinuities in the log), a 'phase lock' technique is used to keep the time on track.

During regular reading, the 'correct' time, derived from an accurate clock in the host computer, is sent to the logger. The logger compares this to its own time and finely adjusts the rate of its clock so that any error is corrected. This is a privileged function and requires knowledge of the 'time controller' password.

Logging Interval

A channel's logging interval can be changed at any time without losing the previous stored data.

A channel can also have its logging triggered by an external time reference connected to one of the logger Universal inputs (1 to 8). This can be used to log 30-minute electricity readings in synchronism with the supply tariff meter.

Channel Size

The available memory can be distributed among the channels to tailor the channel size to the application.

Channel Type

Each Universal channel (1 to 8) can be configured to log pulse counts, status (on / off), analog values or temperature. A built-in linearizer converts the resistance of a 10k thermistor to degrees Celsius.

Data Authentication

All messages containing logged data have a 16-bit validator appended. This validator provides a checksum for all the data in the message and guards against data corruption or tampering. The validator calculation uses a configurable 32-bit authentication key.

Immediate Data

All channels can be read as immediate (rather than stored) values, updated every second.

Channel Alarms

The logger can be programmed with simple high and low alarm thresholds for each Universal channel (1 to 8). The alarm status of each channel is logged alongside its data. The logger can be programmed to make selected channel alarms notify the user, either by activating a relay, or by dialling in to a central point.

For Modbus channels, an alarm is generated if there is a communication problem for that channel.

Communications Sharing

There are a number of features for sharing communications with other users, thus minimizing cost.

Contact the sales office or web-site "technical support" for details.

Hardware Options

The following hardware options are available to order :-

1. Integral telephone modem.
2. RS485 Interface. Used to connect loggers together in a LAN.
3. GSM modem.
4. Integral Ethernet Interface



For further information on this product or advice on loggers, meters, sensors or Energy Monitoring Systems, contact SHM.



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◆ ML32 Specifications ◆

INPUTS

Configuration	1 to 8 universal, 9 to 32 via Modbus
Pulse Counting	Volt-free contact closure input, 10k pull-up to +5V Pulse width 20 ms (minimum) Pulse rate 20 Hz (maximum)
Status	Binary status input, 10k pull-up to +5V Glitches of 20 ms (minimum) recorded
Current	Range 0 to 20 mA Input impedance 250 ohms 10-bit ADC, $\pm 2\%$
Voltage	Range 0 to 10 V Input impedance 200 kohms 10-bit ADC, $\pm 2\%$
Temperature	Thermistor sensor, 10k nominal at 25 °C Range -80 to +150 °C Input impedance 10k pull-up to +5V Resolution 0.1 °C ± 0.5 °C at +25 °C

CHANNELS

Pulse Counting	Configurable pre-scaler 1 to 255 32-bit (9 digit) register, pre-settable
Status	Time and date of every state change logged Resolution 1 second
Capacity	512 kbytes of RAM memory provides storage for up to 96,000 readings (50 days logging at 30 minutes)

MODBUS

Bus Type	RS485 2-wire + Gnd
Protocol	Modbus RTU with 16-bit CRC (JBUS compatible) Logger is Bus Master.
Baud Rate	9600
Tx Drive	32 Unit Loads
Bus Length	Up to 1000 m with suitable cable and terminations

REAL-TIME CLOCK

Accuracy	± 1 second per day
External Sync	Volt-free relay contact provides 1-sec time synchronization pulse every $\frac{1}{2}$ hour

COMMUNICATIONS

Character Set	7-bit printable ASCII plus CR
Character Format	Asynchronous 7 data bits, 1 stop bit
Parity	Configurable to Even, Odd, Mark (1) or Space (0)
Flow Control	XON / XOFF in both directions
Local Access	RS232 9-way D-type
Remote Access	Separate internal RS232 port for connection of external BT modem or Paknet radio modem

POWER SUPPLY

Voltage	240V or 110V AC $\pm 15\%$ selectable
Consumption	3VA (maximum)
UPS Battery	15 hours sustained logging in the absence of external power
Memory Battery	60 days retention of logged data and calendar clock

ENCLOSURE

Construction	Three parts. Base-plate, sub-chassis and cover. Mild steel, powder coated. Separate RF receiver.
Cable Entry	Eight 20mm conduit knock-outs for bottom and rear entry of cables.
W x H x D	265 x 262 x 95 mm
Environmental	IP 41