inform™
Modbus
SETUP GUIDE

[i] inform™
by **LEVITON®**

Modbus
SETUP GUIDE

USER SUPPORT

Tech Line: 1-800-824-3005
Monday - Friday   8 AM - 10 PM ET
Saturday   9 AM - 7 PM ET
Sunday   9 AM - 5 PM ET

Email: inform@leviton.com

Website: leviton.com/inform
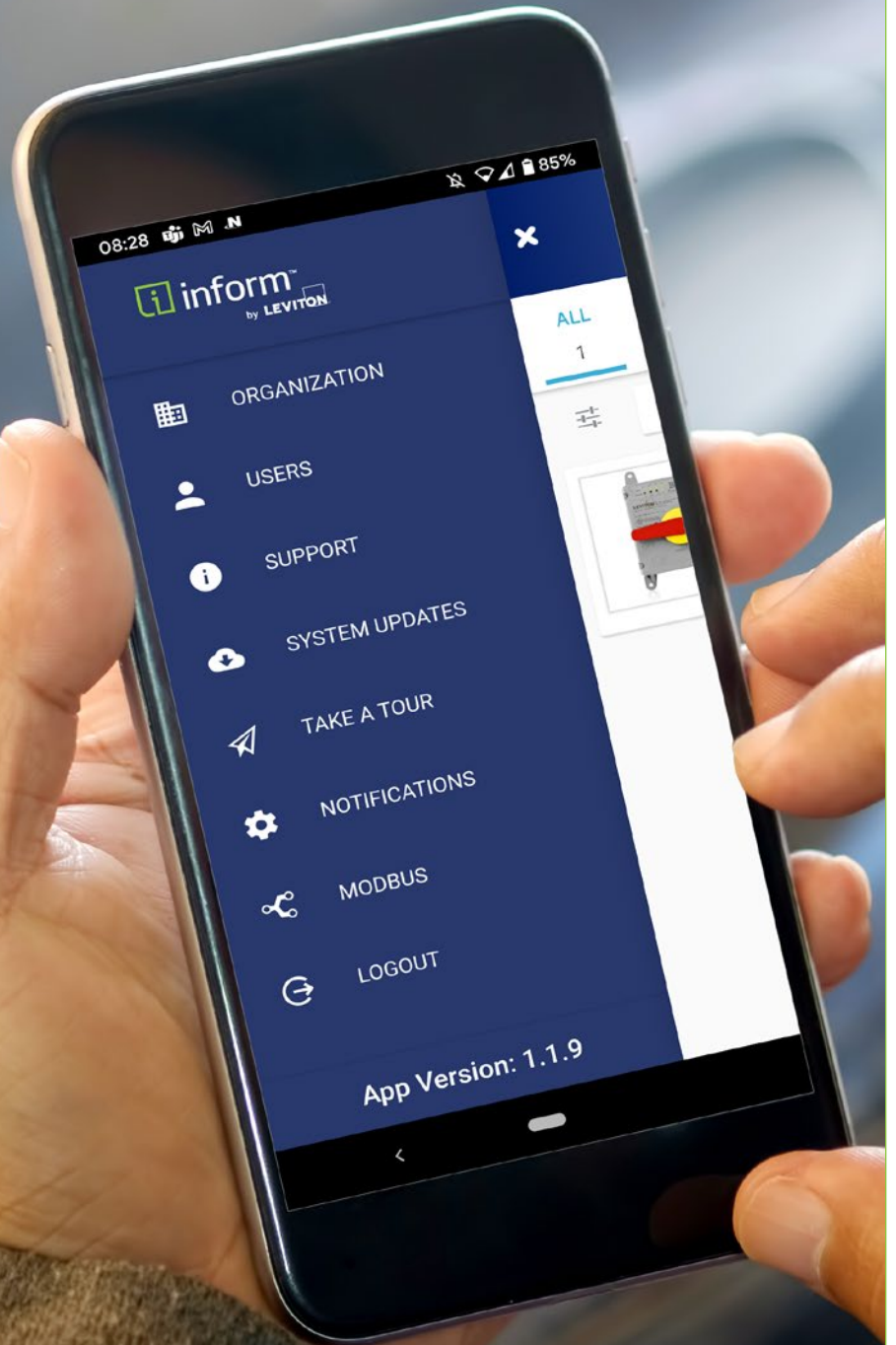
# TABLE OF CONTENTS

1. INSTALLATION INSTRUCTIONS

1.1. ELECTRICAL SERVICE

For instructions on installation and connection of the switch to the electrical service, refer to the installation instructions included in the box. Instruction sheets can also be found on **www.leviton.com**.

1.2. MODBUS NETWORK

1.2.1. Cabling

RS-485 is a three-wire bus. One twisted pair is required for the two data signal wires, plus an additional wire for a common reference, which does not need to be twisted. A cable with two twisted pairs may also be used, where one or both conductors of the second pair is/are used for the common.
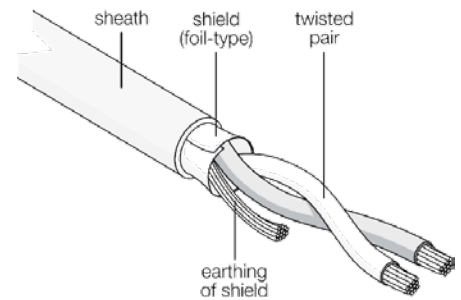
1.2.2. Shielding

A shield may not be needed for short networks, but is recommended and required for long networks or networks in an electrically noisy environment. The shield must be connected to a ground point at ONE side only. Although the shield can be used for the common reference, it is preferable to use a separate wire for the common.

1.2.3. Termination

RS-485 (EIA-485) networks typically require a termination resistor of 120Ω. Depending on the bus, a termination resistor may be needed. Additional bias resistors may also be needed.

1.2.4. Topology

Utilize a daisy-chain bus configuration for connecting up to 32 devices.

1.2.5. Connection

The terminal block on the Modbus communication PCBA can accommodate 24 – 16 AWG cable. Connect the communication cable to the terminal block on the Modbus PCBA.
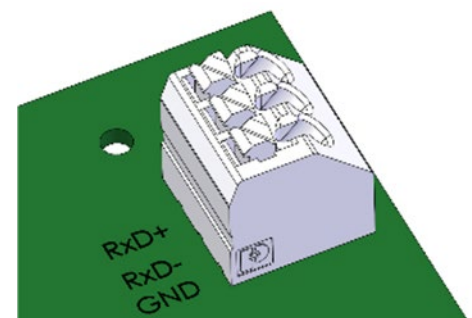
2. MODBUS CONFIGURATION

2.1. MODBUS COMMANDS

The following describes the Modbus commands and messages. The basic instructions should be adequate for Modbus host programming.

The Modbus Interface requires about 150 ms to read sensor elements and respond. The default configuration is:

- Modbus address: 02
- Baud Rate: 19200
- Data Length: 8-bit
- Parity: Even
- Stop Bits: 1

NOTE: To reset the communication parameters (including device address) to the factory default settings, press and hold the reset button (SW1) on the Display PCBA for 5 to 7 seconds)

2.2. SUPPORTED FUNCTIONS

Function Code [dec]	Function Code [hex]	Action	Relevant Table
03	03	Read	Holding Registers
04	04	Read	Input Registers
06	10	Write	Holding Registers

2.3. CONFIGURATION REGISTERS

The following registers represent the Modbus network communication parameters:

Name	Register Address	Data Address [Dec]	Data Address [Hex]	Data Type	Value Range		Default Value	Description
					Min	Max		
Address	40001	0	0	UINT16	1	247	2	Value between 1 and 247
Baud Rate	40002	1	1	UINT16	96	1152	192	Modbus Baud rate value/ 100; 96: 9600, 192: 19200, 384: 38400, 576: 57600
Parity	40003	2	2	UINT16	0	2	2	0: No parity, 2: Even Parity, 1: Odd Parity
Stop Bits	40004	3	3	UINT16	1	2	1	
Data Length	40005	4	4	UINT16	8	8	8	The Only acceptable value is 8 for RTU mode

2.4.   MEASUREMENT REGISTERS

The following registers represent the sensor and alarm outputs available:

Name	Register Address	Modbus Data Address [Dec]	Modbus Data Address [Hex]	Number of Modbus Registers	Data Type	Description
Line 1 Voltage	30001	0	0	1	INT16	Line 1 RMS Voltage (V)
Line 2 Voltage	30002	1	1	1	INT16	Line 2 RMS Voltage (V)
Line 3 Voltage	30003	2	2	1	INT16	Line 3 RMS Voltage (V)
Load 1 Voltage	30004	3	3	1	INT16	Load 1 RMS Voltage (V)
Load 2 Voltage	30005	4	4	1	INT16	Load 2 RMS Voltage (V)
Load 3 Voltage	30006	5	5	1	INT16	Load 3 RMS Voltage (V)
Ground Status	30007	6	6	1	UINT16	1: GND/Earth Present, 0: GND/Earth Fault
Switch Status	30008	7	7	1	UINT16	1: Switch Open, 0: Switch Closed
Temperature	30009	8	8	1	INT16	Temperature (°C); Multiply by 0.1
Humidity	30010	9	9	1	UINT16	Relative Humidity (%); 0-100
Liquid Accumulation	30011	10	A	1	UINT16	1: Liquid Accumulation Detected, 0: Absence of Liquid
Line 1 Avg Voltage	30012	11	B	1	INT16	Not yet implemented
Line 2 Avg Voltage	30013	12	C	1	INT16	Not yet implemented
Line 3 Avg Voltage	30014	13	D	1	INT16	Not yet implemented
Line 1 LED	30015	14	E	1	UINT16	Line 1 Voltage State 0: Off (Normal), 2: Energized (Normal), 4: Improper Voltage
Line 2 LED	30016	15	F	1	UINT16	Line 2 Voltage State 0: Off (Normal), 2: Energized (Normal), 4: Improper Voltage
Line 3 LED	30017	16	10	1	UINT16	Line 3 Voltage State 0: Off (Normal), 2: Energized (Normal), 4: Improper Voltage
Load 1 LED	30018	17	11	1	UINT16	Load 1 Voltage State 0: Off (Normal), 2: Energized (Normal), 4: Improper Voltage
Load 2 LED	30019	18	12	1	UINT16	Load 2 Voltage State 0: Off (Normal), 2: Energized (Normal), 4: Improper Voltage
Load 3 LED	30020	19	13	1	UINT16	Load 3 Voltage State 0: Off (Normal), 2: Energized (Normal), 4: Improper Voltage
GND LED	30021	20	14	1	UINT16	Ground Continuity State 2: Normal, 4: Fault
Fault LED	30022	21	15	1	UINT16	General warning error states 2: Normal, 6: Fault. Includes liquid accumulation sensor and internal communication state
Load 1 Current	30023	22	16	2	INT32	Load 1 current in mA
Load 2 Current	30025	24	18	2	INT32	Load 2 current in mA
Load 3 Current	30027	26	1A	2	INT32	Load 3 current in mA
Load 1 Avg Current	30029	28	1C	2	INT32	Not yet implemented
Load 2 Avg Current	30031	30	1E	2	INT32	Not yet implemented
Load 3 Avg Current	30033	32	20	2	INT32	Not yet implemented

2.5.   DEVICE INFORMATION REGISTERS

The following registers represent the device information available:

Name	Register Address	Modbus Data Address [Dec]	Modbus Data Address [Hex]	Number of Modbus Registers	Data Type	Description
Wiring Config	31001	1000	3E8	6	String*	3-7 characters, plus null terminator: 1P+N+E = Single Phase, Neutral, Ground 2P+E = Single (split) Phase, Ground 2P+N+E = Single (split) Phase, Neutral, Ground 3P+E = Three-phase, Ground 3P+N+E = Three-phase, Neutral, Ground 3PB+E = 4-wire Delta B leg high 3PB+N+E = 5-wire Delta B leg high 3PB+E = 4-wire Delta B leg high 3PB+N+E = 5-wire Delta B leg high 3PC+E = 4-wire Delta C leg high 3PC+N+E = 5-wire Delta leg high C 3PC+E = 4-wire Delta C leg high 3PC+N+E = 5-wire Delta C leg high
Voltage Config	31007	1006	3EE	2	uint16	DIP switch-based user-configured nominal voltage
Reserved	31013-31100			87		
Model Number	31101	1100	44C	32	String*	Device model number; 1-63 characters, plus null terminator
Serial Number	31133	1132	46C	16	String*	Device serial number; 1-31 characters, plus null terminator
Display PCBA FW Version	31149	1148	47C	6	String*	Display PCBA firmware version; 5-11 characters plus null terminator
Power Sense PCBA FW Version	31155	1154	482	6	String*	Power Sense PCBA firmware version number; 5-11 characters
Modbus PCBA FW Version	31161	1160	488	6	String*	Modbus board firmware version number; 5-11 characters

*String data stored in hex bytes

2.6.   SENSOR DATA FORMAT

Sensor data as delivered as signed and unsigned integers and strings. Consequently, numeric conversion may be required to display in preferred conventional units.

2.6.1.   Voltage Format

The voltage value displayed for Line 1, Line 2, Line 3, Load 1, Load 2, and Load 3 is the measured RMS phase voltage measured at their respective switch terminals. Line 1 Avg, Line 2 Avg, and Line 3 Avg are calculated values. Volts (V) = ModbusData.

2.6.2.   Current Format

The current value displayed for Line 1 Current, Line 2 Current, and Line 3 Current is the measured RMS current in milliamps. Line 1 Avg Current, Line 2 Avg Current, and Line 2 Avg Current are calculated values. Amps (A) = (ModbusData) /1000

2.6.3.   Temperature Format

The measured temperature range is -40.0°C to 125.0°C.
The Modbus data range is -400 to 1250. Temperature (°C) = (ModbusData) /10.

2.6.4.   Humidity Format

The measured relative humidity range is 0% to 100%. The Modbus data range is 0 to 100. Relative Humidity (%) = ModbusData.

2.6.5.   Ground Continuity

The ground continuity sensor has a two-state output: present or fault.
The Modbus data is 0 (fault) or 1 (present).

2.6.6.   Liquid Accumulation

The liquid accumulation sensor has a two-state output: liquid absent or present.
The Modbus data is 0 (absent) or 1 (present).

2.6.7.   Switch Position

The switch position sensor has a two-state output: switch open or closed.
The Modbus data is 0 (closed) or 1 (open).

2.7.   ERROR DETECTION

The Inform technology firmware processes the sensor outputs to determine if they are normal for the specified operating conditions. There are a series of status registers that can be used for alerting abnormal operating conditions. These registers control the LED display on the device and are also available to external devices.

2.7.1.   Voltage alarms

The voltage sensor outputs, switch position indicator output, and device configuration settings are analyzed to determine if the voltage level present on each switch terminal is normal. These registers are Line 1 LED, Line 2 LED, Line 3 LED, Load 1 LED, Load 2 LED, and Load 3 LED.

- Unused terminals yield a "normal – OFF" output.
- Load side terminals that are de-energized with the switch turned to the off position also yield an "OFF - normal" output.
    - An RMS voltage of ≤ 50 V is classified as "de-energized".
- Applicable line side terminals and corresponding load side terminals that are energized when the switch handle is turned to the ON position yield an "Energized - normal" output.
- Terminals with voltage present when there should not be, or improper voltage level, yield an output of "improper voltage level."
- The Modbus data is 0 (Off - Normal), 2 (Energized - Normal), or 4 (Improper voltage level).

2.7.2.   Ground Continuity Alarm

This alarm is a redundant register for indicating the ground continuity sensor's status, either normal or fault. The Modbus data is 2 (Normal) or 4 (Fault).

2.7.3.   General Fault Alarm

This register is a "catch-all" for a variety of error conditions. If the device experiences any internal communication failures between the sensor and processing electronics or the liquid accumulation sensor detects liquid, an alarm will be generated. The Modbus data is 2 (normal) or 6 (error detected).

2.7.4.   Modbus Errors

Situation	Error Response	Modbus Error Code
Query is not an allowable action for the server (slave)	Invalid Function Error	0x01
Writing to an undefined holding register	Invalid Address Error	0x02
Writing invalid data to a holding register	Invalid Data Error	0x03
Reading undefined holding register	Invalid Address Error	0x02
Reading undefined input register	Invalid Address Error	0x02
Incorrect CRC	None	N/A
Incorrect Parity	None	N/A
Incomplete Modbus Message	None	N/A
Incorrect interbyte timing	None	N/A

3. SOFTWARE

3.1. INTRODUCTION

Leviton devices with Inform Technology incorporate firmware that provides critical functions, including sensor element interface, sensor value processing, error detection, and Modbus operation. The firmware includes a boot loader for in-field firmware updates via Leviton's Inform Mobile App. It is recommended that installer check for updated firmware after the initial installation and, if available, perform the update as described in section 3.1.2.

Additionally, the Inform Mobile App provides a utility for setting the Modbus device ID and network communication parameters

3.1.1. Required Equipment

- Mobile device with Bluetooth enabled
- Inform mobile app

3.1.2. Updating Firmware

NOTE: The firmware update process utilizes a Bluetooth-enabled mobile device and the Inform Mobile App to transfer the firmware file to the Inform device. Therefore, you must be in close proximity to the Inform device requiring the firmware update.

Step 1.   Using the Inform mobile app, navigate to Modbus from the main menu.

Step 2.   Select the Inform device you wish to update

- If multiple Inform devices are in range, you can identify the correct Inform device by tapping the magnifying glass icon to the left of the Inform device name. This will flash the LEDs 10 times on the corresponding Inform device.

- Tap on the arrow to the right of the Inform device name

Step 3.   Tap the Update Available / Start Update button

- The update process may take several minutes to complete

Step 4.   Tap the Finish button

3.1.3. Setting Device ID and Network Communication

NOTE: This process utilizes a Bluetooth-enabled mobile device and the Inform Mobile App to modify these settings of the Inform device. Therefore, you must be in close proximity to the Inform device requiring these changes.

Step 1. Using the Inform mobile app, navigate to the Modbus section from the main menu.

Step 2. Select the Inform device you wish to modify

- If multiple Inform devices are in range, you can identify the correct Inform device by tapping the magnifying glass icon to the left of the Inform device name. This will flash the LEDs 10 times on the corresponding Inform device.
- Tap on the arrow to the right of the Inform device name

Step 3. Adjust the parameters as required to integrate with the target network.

- To change device ID, enter a number between 1 and 247 that is unique to the target network loop.
- For network communication parameters, select the values from the drop down menu that correspond with the target network loop.

NOTES:

CONTACT INFORMATION

User Support

Tech Line: 1-800-824-3005

Monday - Friday   8 AM - 10 PM ET
Saturday   9 AM - 7 PM ET
Sunday   9 AM - 5 PM ET

Email: inform@leviton.com

Website: leviton.com/inform

Leviton Manufacturing Co., Inc.
201 N Service Rd, Melville, NY 11747
Telephone: 1-800-323-8920 • FAX: 1-800-832-9538