LEVITON®

Series 3300 Multi-Function Meter with RS485 Communications

Series 3500 Multi-Function Meter with Ethernet Communications

Cat. No 3KUMT, 3NUMT, 3OUMT, 3RUMT

Installation and User's Manual

TABLE OF CONTENTS

Definitions

Accuracy: The extent to which a given measurement agrees with the defined value.

Demand: The average power or related quantity over a specified period of time.

Demand-Maximum: The highest demand measured over a selected period of time.

Percentage Error: The difference between percentage registration and 100%.

Percentage Registration: The ratio of the actual registration to the true value, expressed as a percent.

Power-Active: The instantaneous power measured in Watts (W).

Power-Apparent: The product of rms current and voltage, measured in Volt-Amperes (VA).

Registration: The amount of electric energy, or other quantity, recorded by the meter.

WARNING:

- **HIGH VOLTAGE PRESENT. TO AVOID RISK OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH, THIS PRODUCT MUST BE INSTALLED BY QUALIFIED PERSONNEL WITH REQUISITE KNOWLEDGE, TRAINING AND EXPERIENCE RELATED TO INSTALLATION AND OPERATION OF THIS EQUIPMENT.**

- **TO AVOID FIRE, SHOCK OR DEATH**, turn off all power supplying equipment before working on or inside the equipment. Use a properly rated voltage sensing device to confirm power is off.

- Follow safe electrical work practices. See NFPA 70E in the USA, or applicable local codes.

- Product may use multiple voltage/power sources. Be sure all sources of power have been disconnected before servicing.

- Do not depend on this product for voltage indication.

- Only install this product on insulated conductors.

- If the meter appears damaged or defective, first disconnect all power to the meter. Then call or email technical support for assistance.

- **Bonding is not automatic for metal conduit connections; separate bonding is to be provided (see note 1).**

- **Installations should be done in accordance with local codes and current National Electric Code requirements.**

- **Equipment used in a manner not specified by this document impairs the protection provided by the equipment.**

 Failure to follow these warnings could result in serious injury or death.

[1] Bonding kit must be UL recognized. Leviton recommends Rockwell Automation 855BM-ABK

DO NOT EXCEED 346V Line to Neutral or 600 volts Line to Line. This meter is equipped to monitor loads up to 346V L-N. Exceeding this voltage will cause damage to the meter and danger to the user. Always use a Potential Transformer (PT) for voltages in excess of 346V L-N or 600 volts line to line. The meter is a 600 Volt Over Voltage Category III device.

For use in a Pollution Degree 2 or better environment only. A Pollution Degree 2 environment must control conductive pollution and the possibility of condensation or high humidity. Consider the enclosure, the correct use of ventilation, thermal properties of the equipment, and the relationship with the environment. Installation category: CAT II or CAT III

Provide a disconnect device to disconnect the meter from the supply source. Place this device in close proximity to the equipment, and within easy reach of the operator, and mark it as the disconnecting device. The disconnecting device shall meet the relevant requirements of IEC 60947-1 and IEC 60947-3 and shall be suitable for the application. In the US and Canada, disconnecting fuse holders can be used. Provide overcurrent protection and disconnecting device for supply conductors with approved current limiting devices suitable for protecting the wiring. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the device may be impaired.

CAUTION:

1. Verify the model number and electrical specifications of the device being installed to confirm they are appropriate for the intended electrical service (see Section 2).
2. Consult local codes for any possible permits or inspections required before beginning electrical work.
3. Outdoor applications: Ensure the conduit for the installation is flexible and non-metallic. Conduit and conduit fittings must be rated UL Type 4X. Failure to use the appropriate conduit impairs the degree of equipment protection.
4. Make sure all tools to be used during installation have proper insulation ratings.
5. Look inside the meter enclosure and electrical panel for possible exposed wire, broken wire, damaged components or loose connections.

• This product is not intended for life or safety applications.

• Do not install this product in hazardous or classified locations.

• The installer is responsible for conformance to all applicable codes.

• Mount this product inside a suitable fire and electrical enclosure.

• If the collector is connected directly to a source of voltage, the pulse isolator will immediately burn out and become non-responsive.

• Do no use any cleaning agents, including water, on the VerifEye device.

• No accessories are approved for use with the VerifEye meter other than those specified in the Leviton Manufacturing product literature and price sheets.

• A circuit breaker used as a disconnect must meet the requirements of IEC 60947-1 and IEC 60947-3 (Clause 6.11.4.2)

• Current transformers may not be installed in equipment where they exceed 75 percent of the wiring space of any cross-sectional area within the equipment.

- Current transformers may not be installed in an area where they block ventilation openings.

- Current transformers may not be installed in an area of breaker arc venting.

- Not suitable for Class 2 wiring method nor intended for connection to Class 2 equipment.

- Secure current transformer and route conductors so that they do not directly contact live terminals or bus.

- External secondary inputs and outputs should be connected to devices meeting the requirements of IEC 60950

- The following additional requirements apply for Recognized board versions of the VerifEye meter

  - For use only with Listed Energy-monitoring Current Transformers
  - Associated leads of the current transformers shall be maintained within the same overall enclosure.
  - Unless the current transformers and its leads have been evaluated for REINFORCED INSULATION, the leads must be segregated or insulated from different circuits.
  - The current transformers are intended for installation within the same enclosure as the equipment. These may not be installed within switchgears and panel boards" or similar.

- Use this device with **copper or copper clad wire only**.

- For indoor use only.

1.1 General Description

Series 3300/3500 Meters are revenue grade kWh electrical meters featuring Time of Use (TOU) meter readings, per-phase meter data, compatibility with either 3-phase 3-wire Delta or 3-phase 4-wire Wye configurations, and a user friendly LCD display.

1.2 Meter Features

- Revenue-grade accuracy energy data with solid-core CTs or easy to install split-core CTs
- Wide operating temperature range
- Built in LCD display
- Battery backed-up real time clock (RTC) for TOU meter readings
- Low voltage detection
- CT reverse (energy direction) indicator arrow
- Voltage, current, and power consumption per phase
- Power Factor
- Communication Options:
  - RS485 Options (Series 3300)
    - Modbus RTU
    - BACnet MS/TP
  - Ethernet Options (Series 3500)
    - Modbus TCP/IP
    - BACnet IP
  - Isolated Pulse Outputs (10Wh/pulse and 1kWh/pulse), all models
- 5-year warranty

WEB VERSION

2.1 Part Number Keys

Series 3300/3500 Kits (CTs Included)

3 **K** **U** **M R** - **0 1** M

Series
3=3300/3500

Kit Type
K = Indoor Steel
O = Outdoor Plastic NEMA 4X

Voltage Rating
U = Universal (208-480VAC)

Communication Protocol
MR = Modbus RTU (3300)
BM = BACnet MS/TP (3300)
MT = Modbus TCP or BACnet IP (3500)

Meter Type
M = Multifunction

Amperage Rating & CT Type
01 = 100A Split Core
02 = 200A Split Core
04 = 400A Split Core
08 = 800A Split Core
16 = 1600A Split Core
30 = 3000A Split Core
50 = 5000A Split Core
1S = 100A Solid Core
2S = 200A Solid Core
4S = 400A Solid Core

Series 3300/3500 Meters (CTs ordered seperately)

3 **K** **U** **M R** - **0 1** M

Series
3=3300/3500

Kit Type
K = Indoor Steel
O = Outdoor Plastic NEMA 4X

Voltage Rating
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01 = 100A Split Core
02 = 200A Split Core
04 = 400A Split Core
08 = 800A Split Core
16 = 1600A Split Core
30 = 3000A Split Core
50 = 5000A Split Core

WEB VERSION
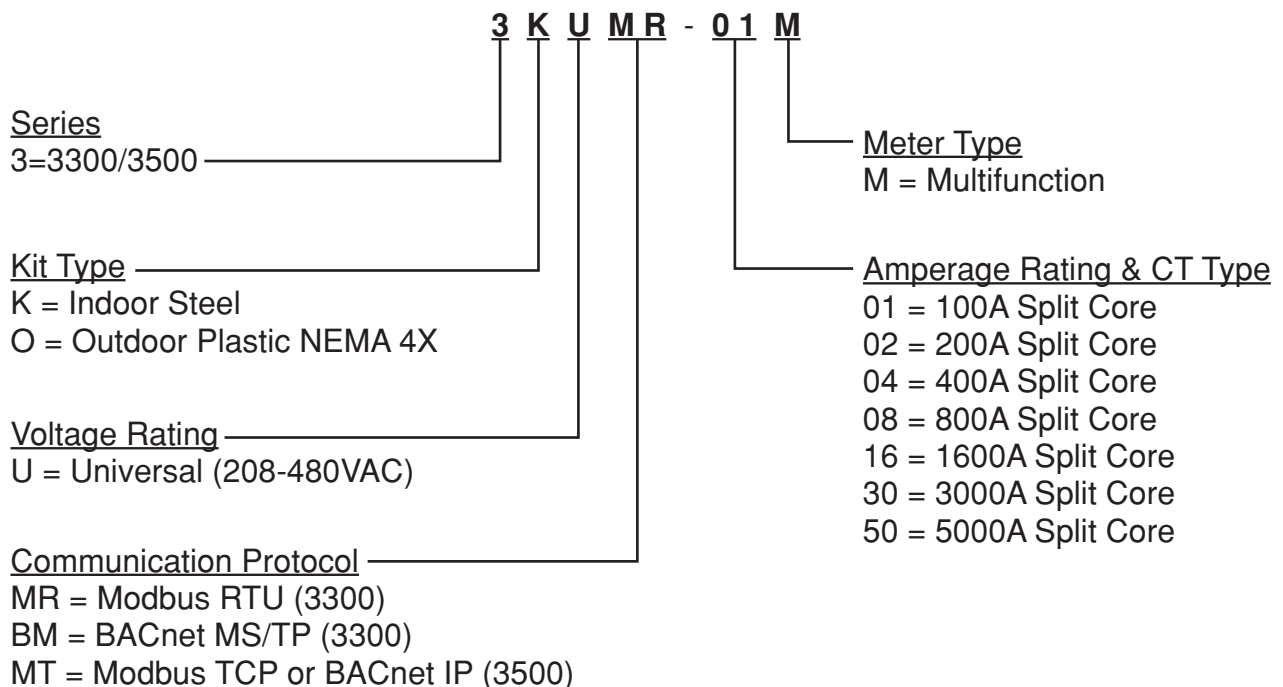
2.2 Serial Number Description

<u>YYDDDA0000</u>

1 ———————

2 ———————

3

4
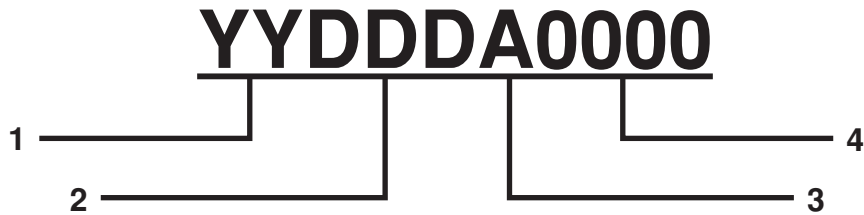
Figure 1: Series 3300/3500 Serial Number Format

1. YY: Last two digits of the manufacturing year
2. DDD: Day of manufacture, 1-366
3. A: First digit of meter serial number, alphabetic A-Z
4. 0000: Last four digits of meter serial number, numeric 0-9

For storage purposes, the last five digits of the serial number are converted to a hexadecimal number. For instance, meter C3591 is stored as 0x005C27.

2.3 Electrical Specifications

Input Configurations	Delta (No-Neutral) Configurations 3PH 3W 208VAC 3PH 3W 480VAC WYE (With Neutral) Configurations 3PH 4W 120/208VAC 3PH 4W 277/480VAC
Supply Voltage Range (Line 1 to Line 2)	177-552 VAC
Maximum Input Power	10.2 VA Max.
Maximum Rated Current	Primary: Max Rated Current + 10% Secondary: 0.11 A
Line Frequency	60 Hz
Power Factor Range	0.5 to 1.0 leading or lagging

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Accuracy[1]	kWh: Compliant with ANSI C12.1
Meter Operating Temperature	-30 to +60 degrees C
Display Operating Temperature	-20 to +50 degrees C
Terminal Blocks	
Voltage Inputs	14 AWG, 12 in-lb of torque maximum
Current Transformers Inputs, Pulse and RS485 outputs	14-18 AWG, 4.4 in-lb of torque maximum
Environment	Pollution Degree 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.

Table 1: Series 3300/3500 electrical specifications

[1]Accuracy based on Leviton solid-core current transformers with 100 mA max output. Meter input burden resistance at 1.62 Ohms.

2.4 I/O Connections and User Display

Pulse Outputs

Voltage Inputs
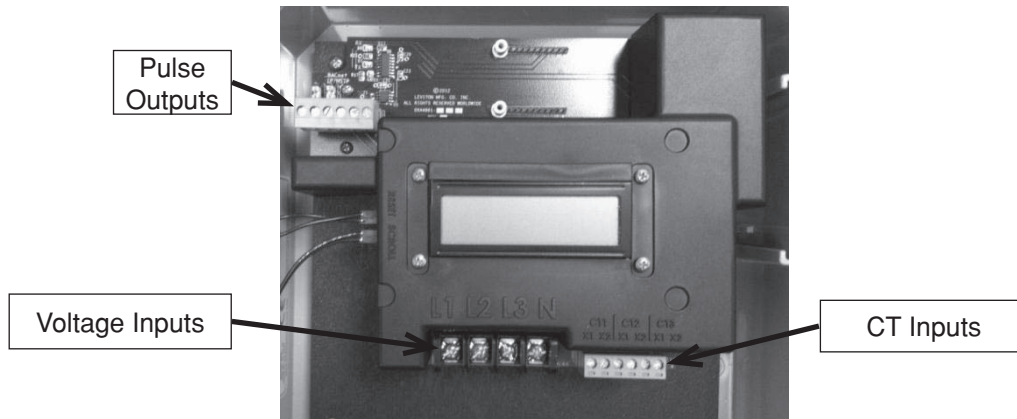
CT Inputs

Figure 2: Series 3300 Connections and Display

Voltage Inputs	Description
L1	Voltage Input, Line 1
L2	Voltage Input, Line 2
L3	Voltage Input, Line 3
N	Neutral input for WYE configurations only

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CT Inputs	Current Transformer input, CT1. Colored wire of CT1
CT1 : X1	Current Transformer input, CT1. White wire of CT1
CT1 : X2	Current Transformer input, CT2. Colored wire of CT2
CT2 : X1	Current Transformer input, CT2. Colored wire of CT2
CT2 : X2	Current Transformer input, CT2. White wire of CT2
CT3 : X1	Current Transformer input, CT3. Colored wire of CT3
CT3 : X2	Current Transformer input, CT3. White wire of CT3
Isolated Pulse Outputs	
10 (+) Terminal 1	Real Energy (kWh) consumption (energy delivered) pulse output, collector connection of an NPN opto-isolated transistor. 10 Watthour (Wh) pulse rate (5 watthours on, 5 watthours off). VCE = 70VDC; ICE 50mA max
COM (-) Terminal 2	Common connection (emitters) for 10 Wh and 1 kWh Isolated Pulse Outputs.
1k (+) Terminal 3	Real Energy (kWh) consumption (energy delivered) pulse output, plus (+) connection (collector of an NPN opto-isolated transistor). 10 Watthour (Wh) pulse rate (500 watthours on, 500 watthours off). VBce = ?; Ice Max = ?
RS485 Connections	For Modbus RTU and BACnet MS/TP. See section 6 of this manual.
RJ-45	For Modbus TCP and BACnet IP. See Section 7 of this manual.

Table 2: Series 3300 I/O connections

3 Installation Instructions

The following section contains installation and wiring instructions for Series 3300 and Series 3500 meters in an outdoor or outdoor enclosure. If technical assistance is required at any point during the installation, contact information can be found at the end of this manual. Leviton is not responsible for damage to the meter caused by incorrect wiring.

3.1   List of Materials

- Series 3300/3500 Meter and associated mounting materials.
- Line 1, Line 2, Line 3 and Neutral hook-up wires as needed for the electrical service. 14 AWG wires recommended and 600VAC minimum rating required. Check local electrical code for compliance with regulations.
- Current Transformers (CTs): This product is designed for use with Leviton CTs; see Section 3.7 for details.
- Conduit and fittings (see note 5 in Section 3.3).

3.2   Mounting the Enclosure

3.2.1 Mounting Location

- Series 3300/3500 meters require a switch or circuit breaker as part of the building installation.
- The switch or circuit breaker must be marked as the disconnecting device for the meter.
- It is recommended that the enclosure be mounted near the disconnecting device in an area with adequate ventilation.
- The enclosure should not be positioned in a manner that makes it difficult to operate the disconnecting device.
- Ensure that the lengths of the CT and voltage leads and conduit are capable of reaching the enclosure from the breaker panel. See Section 10.2 for more information.
- If a suitable mounting location near the panel cannot be found, additional in-line fuses or circuit breaker may be required in accordance with NEC regulations.

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3.2.2 Making Conduit Holes

<u>Steel (Indoor) Enclosure</u>

The Series 3300/3500 steel enclosure comes with several 1 1/16" knockouts (3/4"conduit). Remove as needed to connect conduit fittings. Reference voltage and CT connections should enter in lower half of enclosure.

<u>Outdoor Plastic Enclosure</u>

The bottom, top, and non-hinge side of the plastic enclosure can be used as the conduit location in outdoor single meter enclosures. Reference voltage and CT wires should enter in lower half of enclosure. If used, communication wires should enter in top-left of enclosure. Conduit openings should be as far away from inner components as possible for the installation. Opening sizes must be appropriate to fittings, and large enough to fit all voltage and CT wiring. Keep drill bit away from components inside the enclosure. Remove shavings from enclosure after drilling conduit holes.

3.2.3 Mounting Procedure and Conduit Installation

1. Fasten the enclosure to the selected surface using the mounting holes and appropriate screws. There are mounting holes on both top and bottom of each enclosure. See Figures 3 and 4 for mounting dimensions.
2. Upon mounting verify that the enclosure is not loose and that all connections are secure.
3. Attach the conduit between enclosure and distribution panel, routing wires as necessary for later use. For outdoor enclosures **UL Type 4X conduit and fittings must be used in order to maintain the outdoor rating of the enclosure.**
4. Ensure conduit fittings are aligned properly and tightened securely to prevent moisture from entering the enclosure (outdoor applications).

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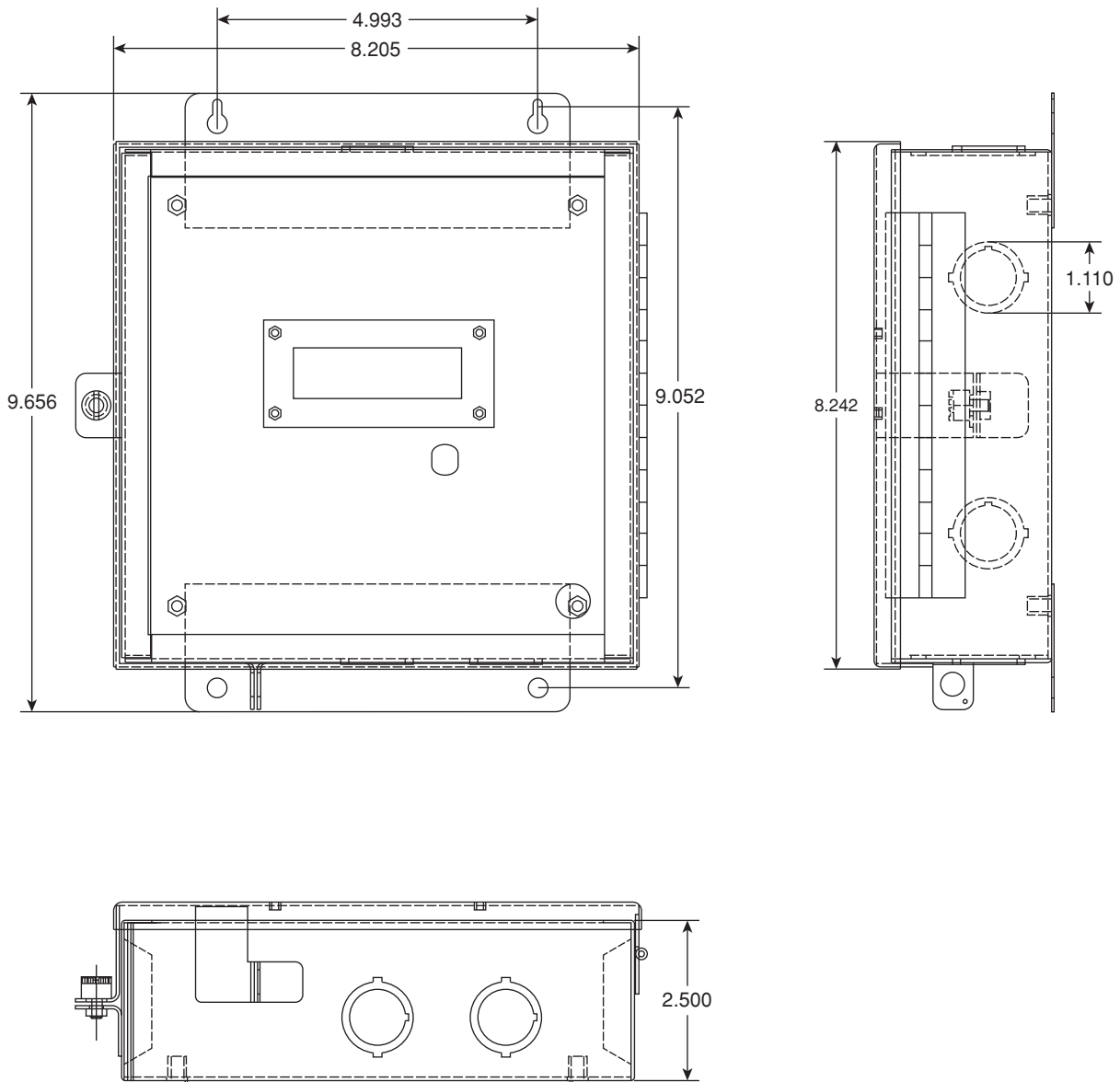
Figure 3: Series 3300/3500 Indoor Steel Enclosure Dimensions, in Inches

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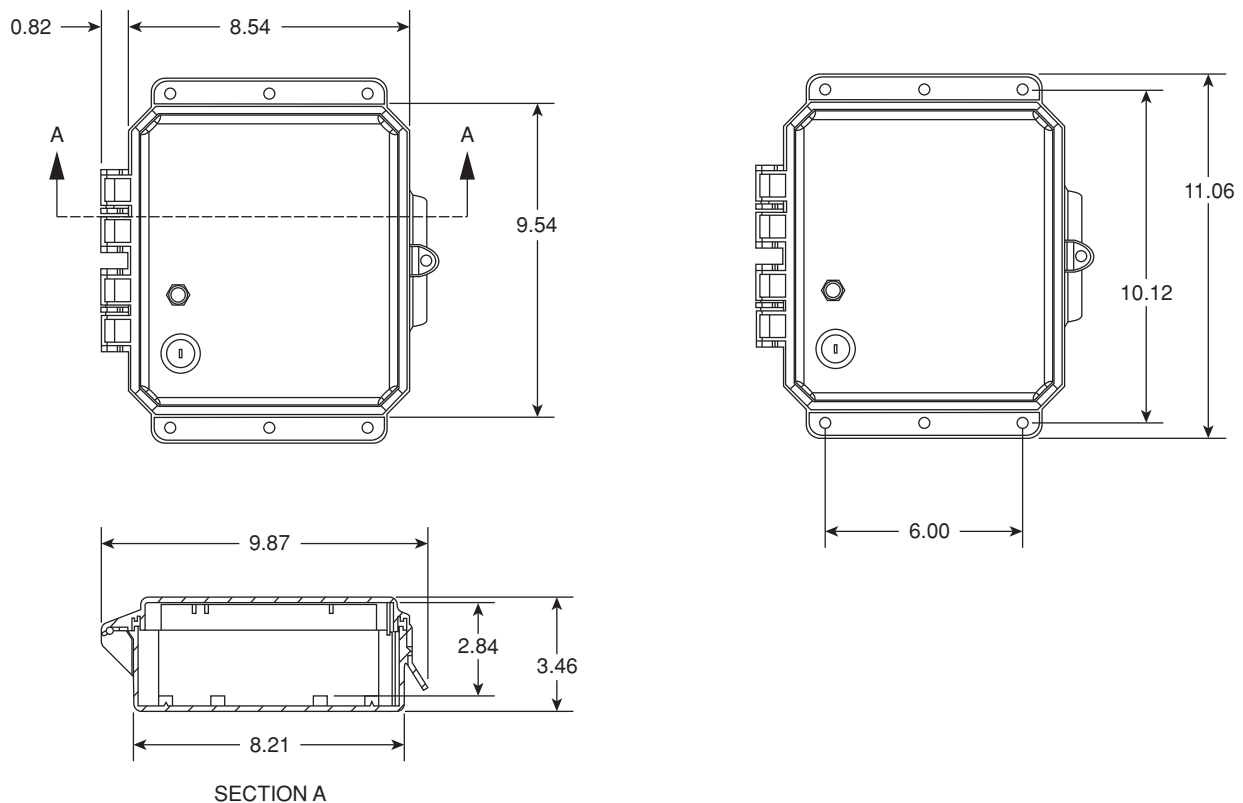
SECTION A

Figure 4: Series 3300/3500 Outdoor (plastic) Enclosure Dimensions, in Inches

3.3 Installation of Voltage Lines

WARNING: Check to ensure service is disconnected before any connections are made. Verify if additional in line fuses are required based on National and Local electrical codes.

1. The Series 3300/3500 meter is compatible with both 3-phase 3-wire (no-neutral) and 3-phase 4-wire systems. The meter derives power from the Line 1 and Line 2 voltage connections, which must be between 177 and 552V for the meter to work properly. Field wired voltage connections are made to the Series 3300/3500 voltage terminal block. The rated torque for these terminal blocks is 12 in-lb., and can be used with 14 AWG solid or stranded copper wires.
2. Connect 600 V min. insulated wiring for Line voltages and Neutral to the appropriate locations in the breaker panel, in accordance with all national and local electrical codes; see Hookup Diagrams in Figures 8 and 9 below for correct wiring information.
3. Route wires through the conduit if not already done.
4. Trim the wire to the appropriate length to avoid coils of excess wiring.
5. Connect additional in line fuses if required.
6. For connections to the Series 3300/3500 pulse outputs: Route wiring through the top of the enclosure. Strip wiring to approximately .300 inches and connect to the appropriate terminals. Wires should be tightened so that they are held snuggly in place, but do not to over-tighten, as this may compress and weaken the conductor.

3.4   Variations and Installation of Current Transformers

WARNING: Always open or disconnect the circuit from the power distribution system of a building before installing or servicing current transformers to reduce risk of electric shock.

WARNING: In accordance with NEC, CTs may not be installed in any panel board where they exceed 75% of the wiring space of any cross-sectional area.

General Requirements:

- Splices on the CT leads must be within the meter enclosure, not inside the conduit. Leviton provided CT leads are 48 inches minimum. Wire insulation should be stripped so that the bare conductor length that connects to the meter terminal block does not exceed 0.300 inches.
- CTs should be securely fastened such that they will not slide down to live terminals.
- Wires should be tightened so that they are held snuggly in place, but do not to over-tighten, as this may compress and weaken the conductor. Maximum rated torque for CT terminal blocks is 4.4 in-lb.
- Current and voltage inputs must be installed in phase' (e.g. CT1 on Line 1, CT2 on Line 2, CT3 on Line 3) and oriented correctly as shown in Hookup Diagrams in Figures 8 and 9.

CT Terminal Block in Place   CT Terminal Block Removed
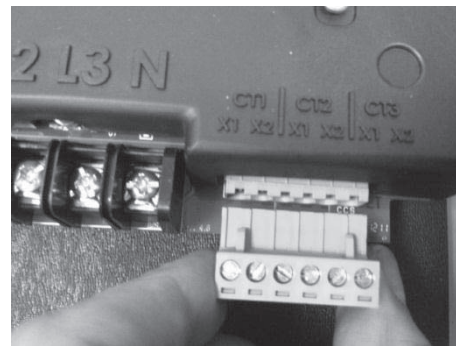
Figure 5: CT Terminal Block

CT Variations

- Leviton solid core CTs (Figure 6, left photo): In accordance with CT label, the LINE side of CT must face incoming Line. White lead connects to the appropriate X2 terminal. Black or colored lead connects to the appropriate X1 terminal.
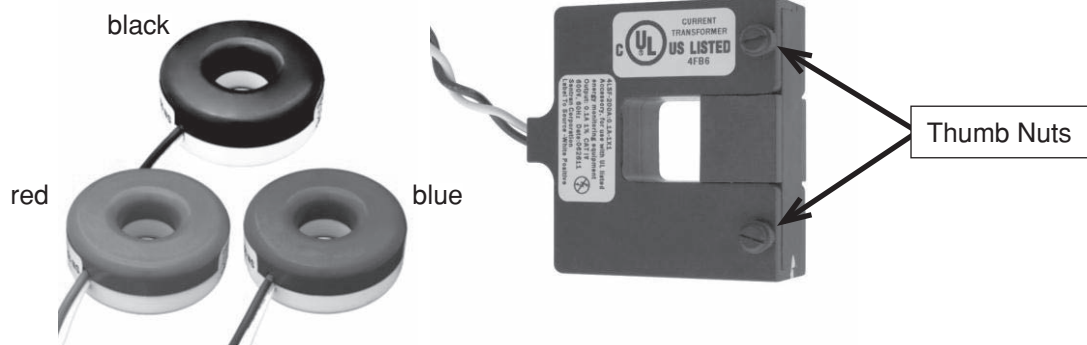
Figure 6: Leviton solid core and Split Core CTs

- Leviton split core CTs (Figure 6, right photo): The side with the white dot, white label, or H1, must face the incoming LINE. White wire connects to X2 terminal, black wire connects to X1 terminal.
- The hash marks on the two pieces of a split core CT must align as shown in figure 7.
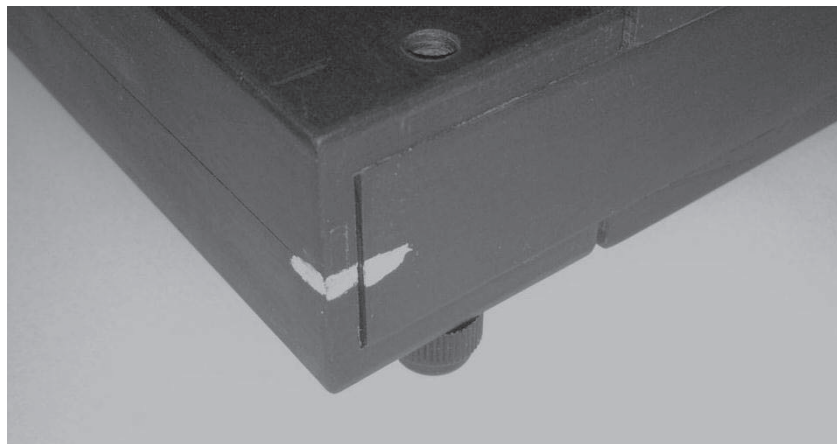
Figure 7: Hash Marks on Split Core CT

WEB VERSION

CT Installation Procedures

1. Route CT secondary wires through conduit if not already done.
2. Trim the wire to the appropriate length to avoid coils of excess wiring.
3. Strip wiring to approximately .300 inches.
4. Connect the CT leads to the appropriate terminals; see Hookup Diagrams in figures 8 and 9 below for correct CT orientations and connections. The CT terminal block is removable to make wire connections easier; see Figure 5. After securing CT wires to the appropriate terminals slide terminal block up into header until fully seated.
5. For Split Core CTs: Remove two thumb nuts (Figure 6) and remove section from CT. With power to the conductors turned off, place the 3-sided section of the CT around the appropriate conductor while ensuring that white label, white dot or H1 faces Line (source). Reassemble the CT while ensuring that the white hash marks align (figure 5) and reinstall thumb nuts. Repeat for remaining conductors for two or three phase applications, as shown in Figures 8 and 9.
6. For Solid Core CTs: With power turned off, disconnect each monitored conductor one at a time and slide on appropriate CT, ensuring the CT is correctly oriented as shown in Figures 8 and 9. Reconnect the conductors.

Hookup Diagrams, Figures 8 and 9

Series 3300/3500 METER
3PH 4W Hookup

L1 L2 L3 N   CT1 CT2 CT3
                 X1 X2 X1 X2 X1 X2

IMPORTANT!
H1, white side, white dot,
or labeled side of CTs
must face source (LINE)

A

black

B

LOAD   red   LINE

C

blue

N
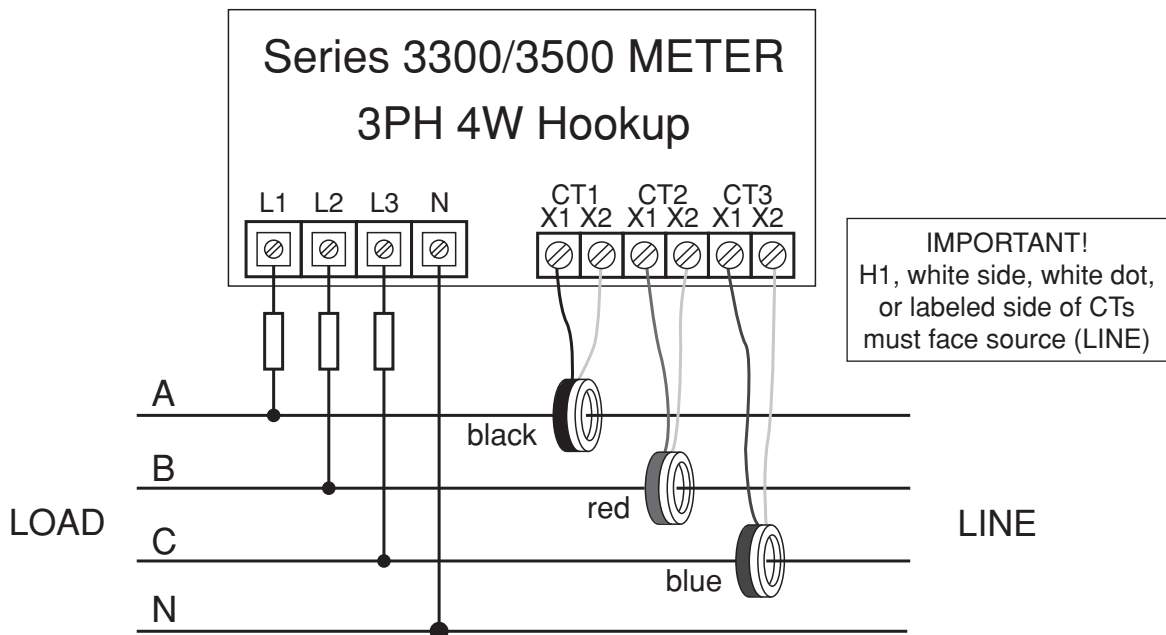
Figure 8: 3-phase 4-wire Wye hookup diagram

WEB VERSION

Series 3300/3500 Meter

3PH 3W Hookup

L1 L2 L3 N   CT1   CT2   CT3
                       X1 X2 X1 X2 X1 X2

IMPORTANT!
H1, white side, white dot,
or labeled side of CTs
must face source (LINE)

LOAD   LINE

A

black

B

red

C

blue
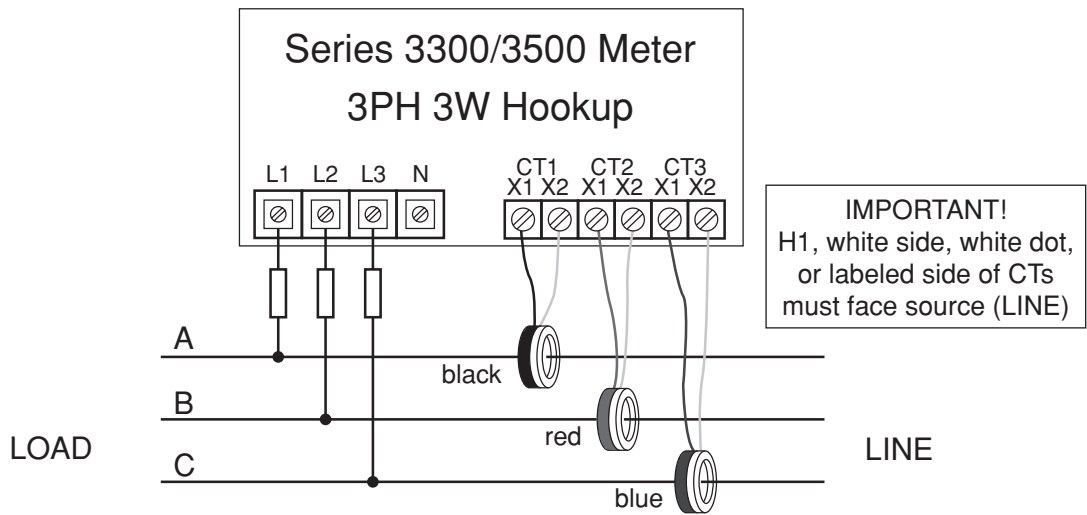
Figure 9: 3-phase, 3-wire Delta (no-Neutral) hookup diagram

Note: For Corner grounded systems leave neutral disconnected. Line
to Neutral voltage will be for virtual neutral (e.g. LL = 480V, LN = 277V)

3.5   Securing the Enclosure

The outdoor enclosure ships with a padlock and key for securing the door after installation is
complete. The indoor enclosure has a captive screw for securing the enclosure door.

3.6   Turning Power On and Checking for Correct Functionality

3.6.1 Mounting Location

1. After installation is completed and enclosure has been secured the meter may be energized at
   the disconnect switch, upon which the meter will go through a power up sequence as described
   in Section 4.3. **It is strongly advised that users of this product read Section 4 below for a
   complete description of meter functionality and displayed values.**

2. Several diagnostic tools built into the Series 3300/3500 meter that should be utilized to ensure
   the meter and CTs are installed correctly and functioning properly:

   a. Energy Flow arrow – Indicates direction of energy flow' on amperage and kW screens.
   b. For mono-directional metering applications the Energy Flow arrow should always point
      to the right. If an Amperage or kW screen shows the arrow pointing to the left a current
      transformer may be installed backwards or on the wrong phase, or CT connections at
      the meter may be reversed or connected to the wrong CT input terminals, or voltage
      wires at the meter could be cross-phased. Section 4 further describes how the Amperage
      screens operate to indicate a reverse energy condition. Refer to Hookup Diagrams in
      Figures 8 and 9 for correct wiring and CT orientations.

WEB VERSION

       c. Power Factor Screens – Except in rare circumstances where predominantly inductive loads are metered, Power Factor values should have an absolute value greater than 0.6. A lower value indicates CTs installed on the wrong phase, backwards, or incorrectly connected at the meter, or voltage connections at the meter could be cross-phased. If PF is lower than 0.6 recheck CT placements and orientations and CT and voltage connections at the meter against the appropriate Hookup Diagram shown in Figures 8 and 9.

3. The Series 3300/3500 meter indicates reverse energy direction with the Energy Flow arrow and blinking Amperage and phase indicator icons when CTs are oriented backwards.

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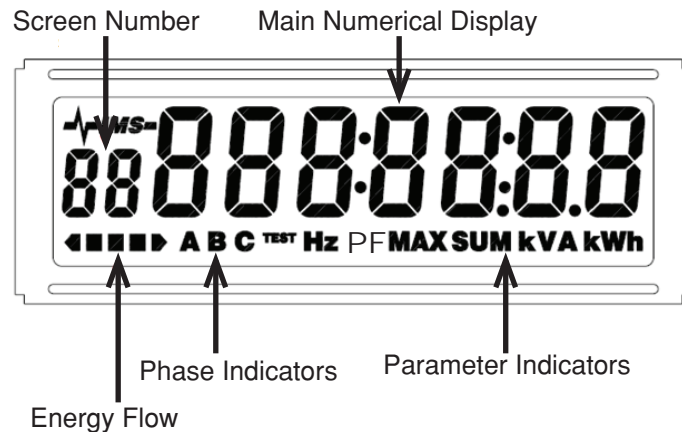
4.1   Display

Figure 10: Custom LCD sections

Main Numerical Display and Scroll Button

The main numerical display section indicates the numerical value of the current item. After startup sequence (see section 4.3) the display will revert to Real Energy (kWh) delivered (consumed). The Scroll button on the enclosure door permits the user to scroll through nineteen screens of information (00-18) as shown in Table 4. Depress and hold scroll button for a few seconds to enter auto-scroll mode in which each screen appears for 4 seconds in the order shown in Table 4. To return to manual mode press and release the scroll button briefly (less than one second).

Phase Indicators and Parameter Indicators

The Phase and Parameter Indicator sections have two purposes. The Phase Indicators show the phase currently being displayed on per-phase values. Parameter Indicators are associated with values on the main numerical display.

- Low Voltage

    Low voltage (below minimum rated voltage with respect to neutral) on a phase is shown by a blinking of the 'V' Parameter Indicator in conjunction with corresponding Phase Indicator. For example, if low voltage is detected on phase A the 'V' Parameter Indicator and the A' phase indicator will blink simultaneously.

- Energy Flow Indicator

    On all Amps and kW screens the Energy Flow arrow will illuminate indicating energy direction. Arrow pointing to the right indicates energy delivered from grid. Arrow pointing to the left indicates energy reversed. In addition to the arrow, the Amps parameter indicator ("A") and the corresponding phase indicator (A, B, or C) flash when Energy Flow arrow points left. The Amps and kW arrows should always point to the right when load current are present. The Energy Flow arrow points to the left when CT orientation is reversed or energy is being delivered to the grid, however the energy and power will not register on the meter.

4.2   Display Sequence and Screen Numbers

See Appendix A for examples of each display.

Table 4: Screen Numbers and Sequence Order

Screen Numbers & Sequence	Description of Displayed Value
00	Real Time Clock
01	Real Energy Delivered (kWh)
02	Maximum Demand (MAX KW)
03	Max Demand Time (MAX)
04	Max Demand Date (MAX)
05	Voltage(V) Phase A
06	Voltage (V) Phase B
07	Voltage (V) Phase C
08	Voltage (V) Line A to B
09	Voltage (V) Line B to C
10	Voltage (V) Line A to C
11	Phase A Amps (A)
12	Phase B Amps (A)
13	Phase C Amps (A)
14	Real Power (kW) Phase A
15	Real Power (kW) Phase B
16	Real Power (kW) Phase C
17	Real Power (SUM kW) A+B+C
18	Power Factor (PF) Phase A
19	Power Factor (PF) Phase B
20	Power Factor (PF) Phase C
21	Frequency (HZ)

4.3   Power-on Sequence

When the Series 3300/3500 meter is initially powered on it displays the following sequence of information:

1. Hello screen.
2. Meter Serial Number

WEB VERSION

The Meter Serial Number screen displays first. The lower left number is the alphabetical digit from the meter serial number (from 01=A to 26=Z), and the main display shows the numerical portion of the Serial Number. For example, a display showing "03" on the left and "6149" on the right below represents meter serial number XXXXXC6149, with the X's indicating the manufacturing day and year. See section 2.2 for more information on meter serial numbers.

3. Hardware Version -- The Hardware Version screen displays the word "Hard' and the meter's hardware version.
4. Software Version -- The Software Version screen displays the word "Soft' and the meter's software version.
5. CT Ratio -- The CT Ratio screen displays the meter's programmed CT ratio. For instance, "400:0.1" indicates the meter has been calibrated for CTs with a 400:0.1A ratio.
6. Compute Engine Test Runs -- The compute engine performs 10 test runs before the meter starts normal operation. The test runs are indicated by the TEST icon and the words "Pass X', where X is the test run number.

Once the startup sequence has completed the display defaults to Screen 01, Real Energy (kWh) delivered (consumed).

4.4   Descriptions of Displayed Information

Push and release the scroll button to cycle through the display screens. Each button press moves to the next screen in the sequence shown in table 4. After 5 minutes of inactivity on the scroll button the display will return to Screen 01, Real Energy Delivered (kWh) and remain there until the scroll button is depressed again.

Refer to section 4.1 for a description of how to set the meter into auto-scroll mode. In this mode the display is updated every four seconds to cycle through the screens automatically.

All displayed values update approximately once a second.

• **Screen 00 – Real Time Clock.** Real Time Clock (RTC) is factory set to Pacific Time (GMT-8). A factory-installed battery backup maintains the RTC before the meter is installed and in power loss situations.

For information on replacing the battery, please see section 5. The RTC can be set using the communications port as described in sections 6 and 7 or by using the procedure outlined in Section 4.5.

WEB VERSION

- **Screen 01 – kWh – Real Energy Delivered (consumed), non-resettable.** After initial startup the display reverts to and stays on this screen unless scroll or auto-scroll functions are initiated. The displayed value correlates to "kWh from grid" stored in Modbus or BACnet Address 0004 (see Sections 6 and 7). In the event of a power loss Real Energy Delivered data will be saved in EEPROM and retained even if backup battery is depleted. The direction arrow always points to the right to indicate energy consumed (delivered).

- **Screen 02 – kW Max – Maximum Demand** – can be calculated in 15 or 30 minute blocks. The default value from factory is 15 minutes. The interval can be changed using the RS485 communication port (see sections 6 and 7).
  - Sub-intervals – Each Max Demand data block has 3 sub-intervals in which demand is calculated. Sub-intervals are 5 minutes for a 15 minute Max Demand block and 10 minutes for a 30 minute block. For each sub-interval the total kWh consumption is divided by the number of accumulations to give average demand for the sub-interval. Accumulations occur approximately every second.
  - Max Demand calculation – After each sub-interval is finished, a new block demand is calculated. The block demand is comprised of the average of the 3 most recent sub-intervals. The largest block demand since a demand reset is stored as the maximum demand. When an update of the maximum demand occurs, the new value and current date and time are saved to EEPROM, Modbus Address 0060. Max Demand is displayed in kW.
  - Max Demand Reset. All series 3300/3500 meters have the capability to reset maximum demand. When maximum demand is reset, the maximum block demand and all current sub-interval demands are set to zero. An internal register is also incremented upon demand reset to keep a total of the times this action was taken. The register is a single byte, and rolls over at 255. The register content is accessible and Max Demand can be reset via the communications port; see sections 6 and 7. Max Demand also can be reset with the keyed switch on the meter enclosure door. Turn the key lock into the 'on' position for at least 5 seconds. When Max Demand is reset manual or via the coms port the LCD will give a visual confirmation that the demand was reset.
- **Screens 03 and 04** – Max Demand time and date – displayed immediately following the Max Demand screen.
- **Screens 05-13 – Voltage (V) and Amperage (A)**
  Volts and Amps are saved and displayed as root mean square (RMS) values. Appropriate Phase Indicators and Display Indicators will illuminate as shown in Figure 10. On all Amps and kW screens the Energy Flow arrow will illuminate indicating energy direction. Arrow pointing to the right indicates energy delivered (from grid); arrow pointing to the left indicates energy received (to the grid, for grid-tied meters in renewable energy applications). In addition to the arrow, the Amps indicator ("A") and the corresponding phase indicator (A, B, or C) flash when Energy Flow arrow points left. If meter is installed in a mono-directional application, the Amps and kW arrows should always point to the right when load current is present.

WEB VERSION

- **Screens 14-17 – Real Power Delivered (consumed) kW A, kW B, kW C, kW SUM** - Also known as Instantaneous Demand. Displayed values correspond to "Phase A Real Power," "Phase B Real Power," "Phase C Real Power," and "Total Power (A+B+C)" in Modbus Register Map (see Appendix A).
- **Screens 18-20 – Power Factor (PF)** – Per-phase Power Factor is displayed. A lagging power factor is indicated by the Energy Flow arrow pointing to the left; for leading power factor arrow points to the right.
- **Screen 21 – Frequency (HZ)** - Displayed in Hertz.

4.5 Manually Setting the Real Time Clock

Figure 11: SCROLL and Max Demand/Clock Reset Switch on Outdoor Series 3300/3500 Meter

SCROLL Pushbutton

Max Demand Reset/RTC KEYSWITCH shown in OFF/Normal

Outdoor Models

Indoor Models
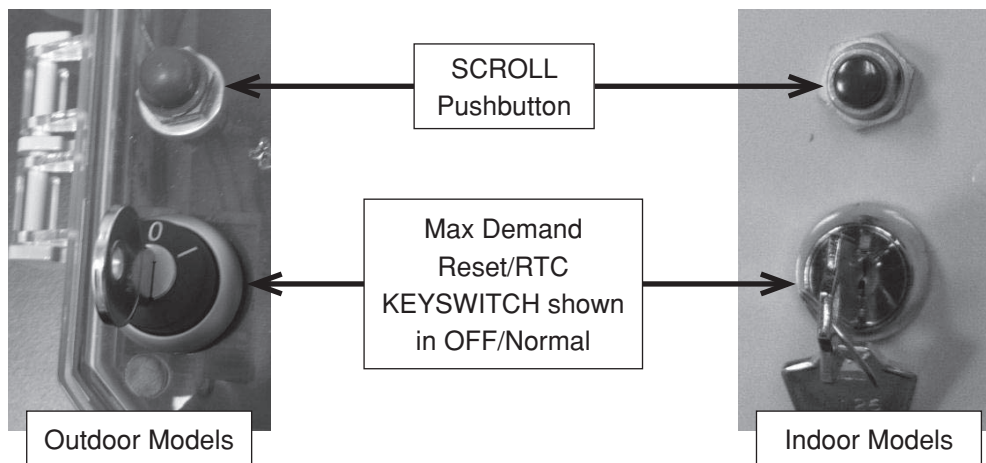
1. Press and hold the SCROLL pushbutton; see Figure 11.
2. While holding SCROLL, rotate the Max Demand Reset/RTC KEYSWITCH to the right into the RESET/ON position within 3 seconds and then release it. Date will be displayed and Year will flash.
3. Press SCROLL to advance the Year (you may also hold it down to advance automatically). The Year will cycle from 12 through 99 then back to 12 (for 2012 through 2099).
4. When the Year is set, rotate the KEYSWITCH to ON again and release. The Month will now flash.
5. Set the Month (1 to 12).
6. Repeat for Day of the Month (range varies by month and leap-year).
7. The next KEYSWITCH ON/release cycle will show the Time and flash the Hour.
8. Repeat the setting sequence for Hour (0-23), Minutes (0-59) and Seconds (0-59).
9. You may again perform KEYSWITCH ON/Release to cycle back to the Date settings, if desired.
10. The Date/Time setting mode will end automatically after no user activity for 10 seconds. The Date/Time settings will be stored and the meter will return to its normal display operation.

Note:

- The Day of the Week (Sunday through Saturday) is calculated and stored automatically by the meter.
- Metering functions and communications are not affected during this Date/Time setting process.

WEB VERSION

5 Real Time Clock (RTC) Battery Replacement

If the battery depletes and no power is connected to the meter the RTC resets to 01/01/00 00:00:00 when power returns. The battery backup is a standard CR2025 lithium coin cell, rated at 3V and 165 mAh. The lifetime of the battery depends on the operating temperature of the meter, as shown in Table 5.

Operating Temperature (°C)	Estimated Battery Life (No external power) (Years)	Estimated Battery Life (90% power uptime) (Years)
Temp < 25	3	19
25 < Temp < 60	2	12
Temp > 60	1	9

Table 5: Battery Life Estimates

Since minimal current is drawn from the battery when the meter in powered on, most batteries do not need replaced over the lifetime of the meter. If a situation occurs in which the meter will be powered off for a prolonged period, battery life will be significantly reduced. In the event that the battery needs to be replaced while the meter is still in operation, please contact Meter Support.

WARNING: TO AVOID FIRE, SHOCK OR DEATH, turn off all power supplying equipment before working on or inside the equipment. Use a properly rated voltage sensing device to confirm power is off.

WEB VERSION

6.1   Modbus RTU Quick Start Guide

Figure 12: RS485 Cable Entry Location
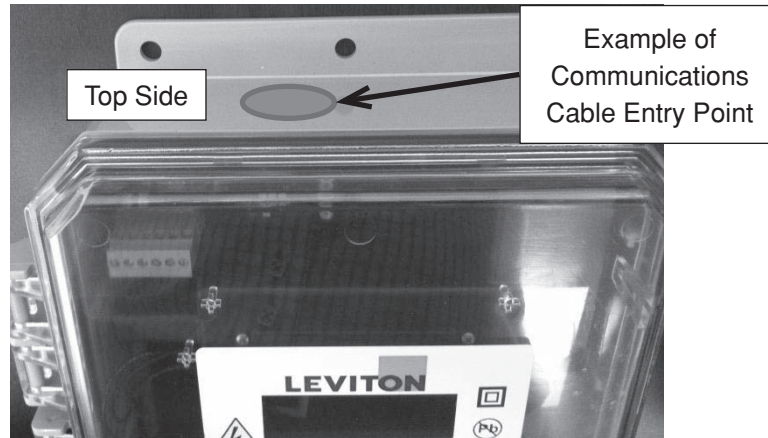
Top Side

Example of Communications Cable Entry Point

WARNING: TO AVOID FIRE, SHOCK OR DEATH, turn off all power supplying equipment before working on or inside the equipment. Use a properly rated voltage sensing device to confirm power is off.

1. Install meter as outlined in Section 3.
2. Modbus cable shall enter at the TOP side of the enclosure as shown in Figure 12. Use shielded twisted-pair cable to prevent interference. Replace plastic cap 33 with webbed bushing (provided).
3. Connect Inverting (-), Non-Inverting (+), and Signal Common (C) wires using the 4-pin removable terminal block shown in Figure 13. Do not over-tighten the terminal screws. Modbus output is electrically isolated from input power.

Figure 13. Modbus RTU Connection

Inverting (-)

Non-Inverting (+)

Signal Common (C)

5V DC (Typically not connected)

WEB VERSION
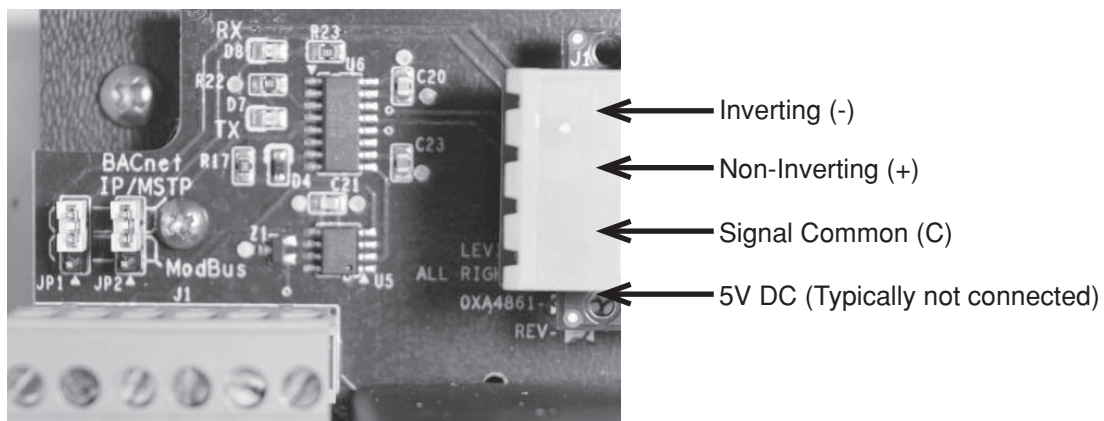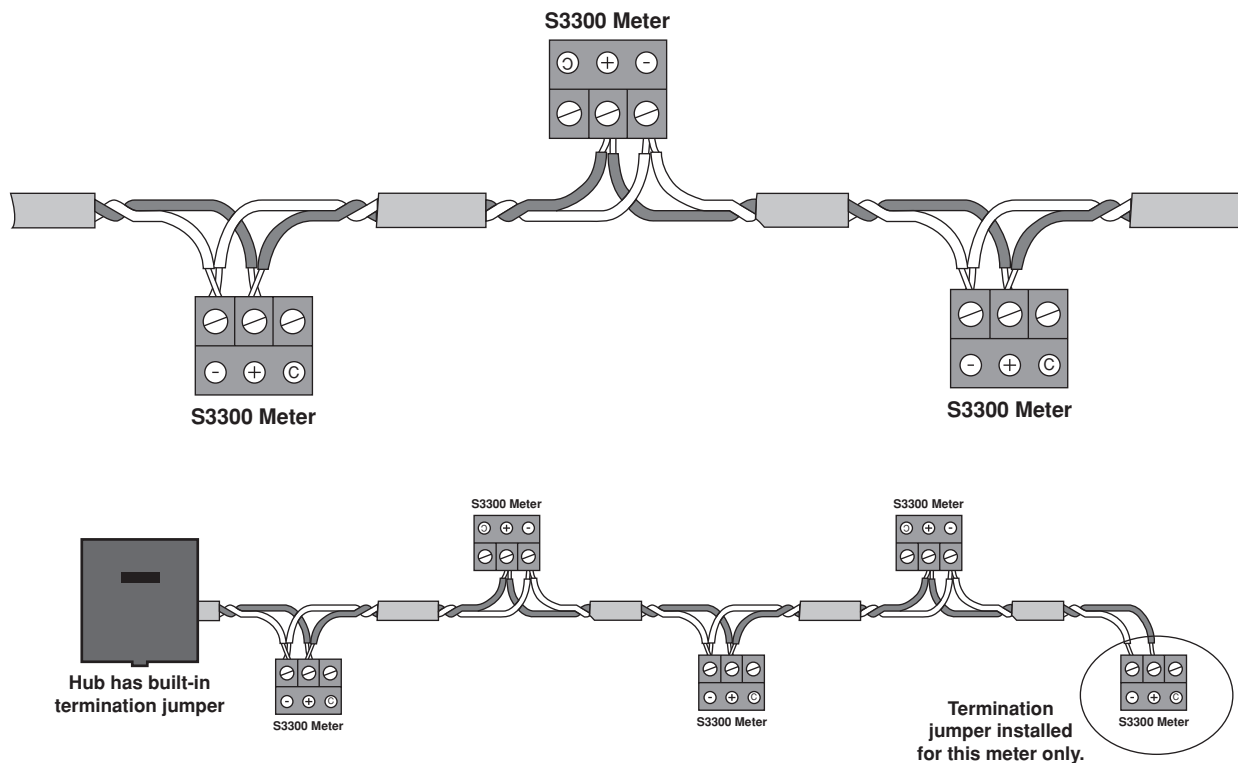
4. Select Modbus address using the upper bank of DIP switches labeled "ADDRESS" as shown in Figure 14. Switch 1 corresponds to the low-order bit of the address and setting a switch ON selects a bit value of 1. For example, set switches 1 and 3 on to select address 5. See Appendix A for a complete list of Modbus address switch settings. The Modbus address is set using the bank of dip switches circled in red in the Figure 14. Every meter in the Modbus network must have a unique Modbus address. The address is not set at the factory—it must be set appropriately at installation. Zero (all switches off) is not a valid Modbus address. The address 255 (all switches on) is generally reserved and not recommended. The table below shows how to set the switches for each address.

5. Select Modbus baud rate using the switches 1 and 2 in the lower bank of DIP switches, labeled "BAUD" as shown in Figure 14. Switches 3 – 8 are reserved for future use and must be set to the OFF position. Baud rate options are shown in Table 6.

6. To use the Modbus RTU communication module the jumpers shown in Figure 14 be set in the top position, which is the default setting from factory. The jumpers must be set as shown in Figure 14 regardless of the communication protocol in use.

7. RS485 Line (Twisted Pair) Termination Jumper; when installed as shown in Figure 14, this jumper enables the internal RC line termination circuit. The jumper must be installed only if the meter is the last device in the daisy chain and otherwise must be removed. In the example shown above, only the meter at the far right of the diagram needs a termination jumper because it is the last device in the daisy chain.

WEB VERSION

8. Before energizing the meter close and secure the enclosure door.

Table 6. Modbus RTU Baud Rate Switch Settings

Switch		Baud Rate
1	2	
Off	Off	(Default) 9600
On	Off	19200
Off	On	38400
On	On	76800

Figure 14. Modbus RTU Switches

Jumpers in the UP position

RS485 Terminals

RS485 Termination Jumper

RS485 Activity LEDs

Address Dipswitch

10 Wh/Pulse
Common
1kWh/Pulse

Internal Comms LEDs

Baud Rate Dipswitch
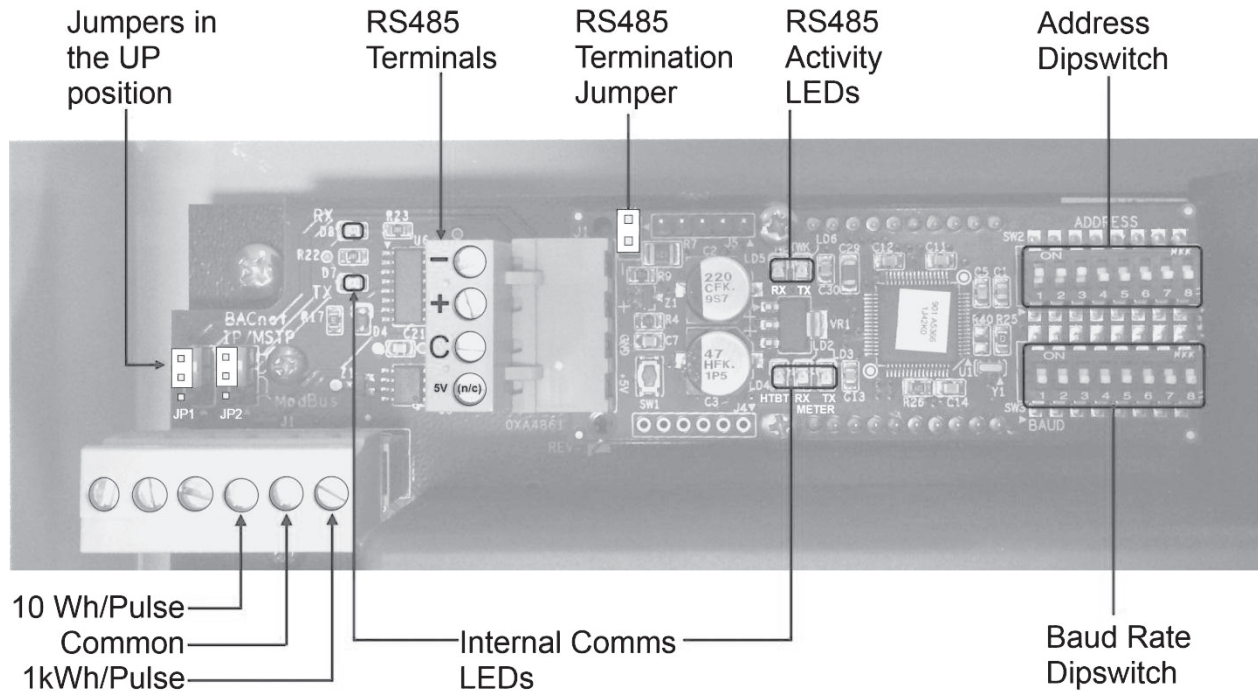
6.2   BACnet MS/TP Quick Start Guide

WARNING: TO AVOID FIRE, SHOCK OR DEATH, turn off all power supplying equipment before working on or inside the equipment. Use a properly rated voltage sensing device to confirm power is off.

1. Install meter as outlined in Section 3.
2. BACnet cable shall enter at the TOP side of the enclosure as shown in Figure 12. Use shielded twisted-pair cable to prevent interference. Replace plastic cap with webbed bushing (provided).
3. Connect Inverting (-), Non-Inverting (+), and Signal Common (C) wires using the 3-pin removable terminal block shown in Figure 15. Do not over-tighten the terminal screws. BACnet output is electrically isolated from input power.
4. Select the 8-bit MS/TP MAC address using DIP switches A1 – A8 (Figure 16). Switch A1 corresponds to the low-order bit of the address and setting a switch ON selects a bit value of 1. For example, set switches 1 and 2 on to select MAC address 3 (binary value 00000011).
5. Select the baud rate using DIP switches B1 – B4 as shown in Figure 16. Baud rate options are shown in Table 7.
6. Before energizing the meter close and secure the enclosure door.

Note: For detail information refer to FieldServer Website: www.fieldserver.com

Table 7. BACnet MS/TP Baud Rate Switch Settings

Switch				Baud Rate
B1	**B2**	**B3**	**B4**	
Off	Off	Off	Off	Auto
On	Off	Off	Off	9600
Off	On	Off	Off	19200
Off	Off	On	Off	38400
Off	Off	Off	On	76800

Figure 15. BACnet MS/TP Connections

Non-Inverting (+)

Inverting (-)

Signal Common (C)

Figure 16. BACnet MS/TP Switches

MAC Address

Baud Rate

WEB VERSION

BACnet IP and Modbus TCP Quick Start Guide

WARNING: TO AVOID FIRE, SHOCK OR DEATH, turn off all power supplying equipment before working on or inside the equipment. Use a properly rated voltage sensing device to confirm power is off.

1. Install meter as outlined in Section 3.
2. Ethernet cable (CAT-5e) shall enter at the TOP side of the enclosure as shown in Figure 12. Replace plastic cap with webbed bushing (provided).
3. Plug Ethernet connector into the RJ-45 jack as shown in Figure 17.
4. Before energizing the meter close and secure the enclosure door.

Note: For detail information refer to FieldServer Website: www.fieldserver.com

Figure 17. Ethernet Connection

Ethernet Cable
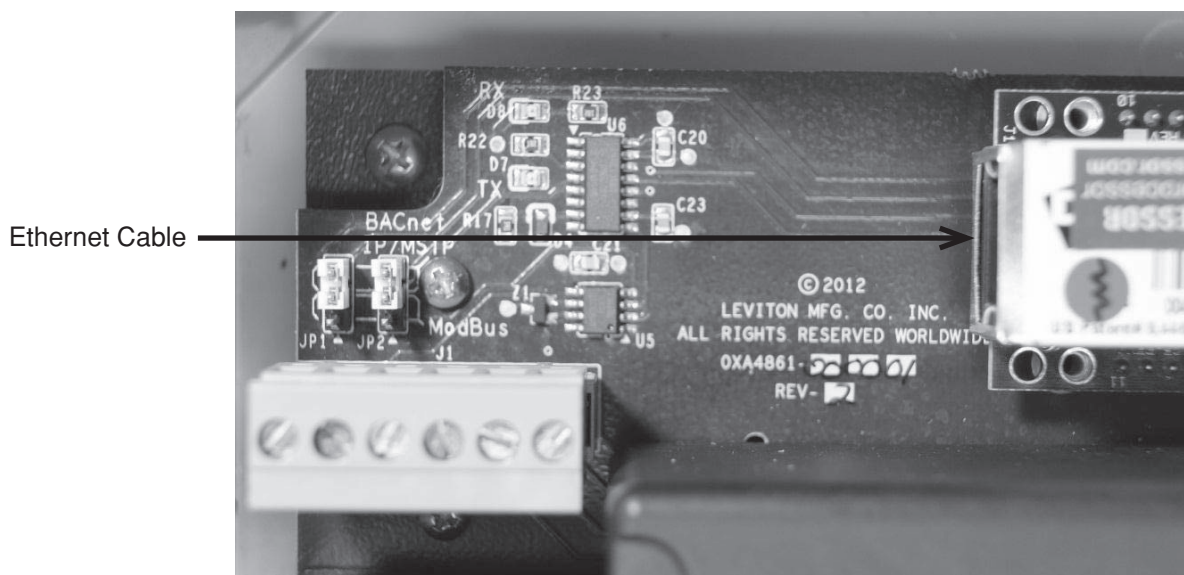
WEB VERSION

When communicating with the meter base unit for historical data extraction, always send messages to Modbus address 83 regardless of the meter's normal Modbus address configuration.

For diagnostic purposes, history data can be extracted from the meter using a Modbus RTU connection to the meter base unit. This feature is intended for trained field service personnel only. Contact Leviton Customer Support for assistance.

8.1 Connecting for History Data Extraction

WARNING: TO AVOID FIRE, SHOCK OR DEATH, turn off all power supplying equipment before working on or inside the equipment. Use a properly rated voltage sensing device to confirm power is off.

1. Install meter as outlined in Section 3.
2. Change the JP1 and JP2 jumper settings as shown in Figure 18.
3. Use shielded twisted-pair cable to prevent interference. Connect Inverting (-), Non-Inverting (+), and Signal Common (C) wires using the 6-pin removable terminal block shown in Figure 18. Do not over-tighten the terminal screws. Modbus output is electrically isolated from input power.
4. Before energizing the meter close and secure the enclosure door.

To restore the meter to normal operation, jumpers at JP1 and JP2 must be returned to their default settings.

Figure 18. Base Unit Modbus RTU Connections for History Data Extraction

Move jumpers at JP1 and JP2 to "ModBus" position as shown.

Signal Common (C)

Non-Inverting (+)

Inverting (-)
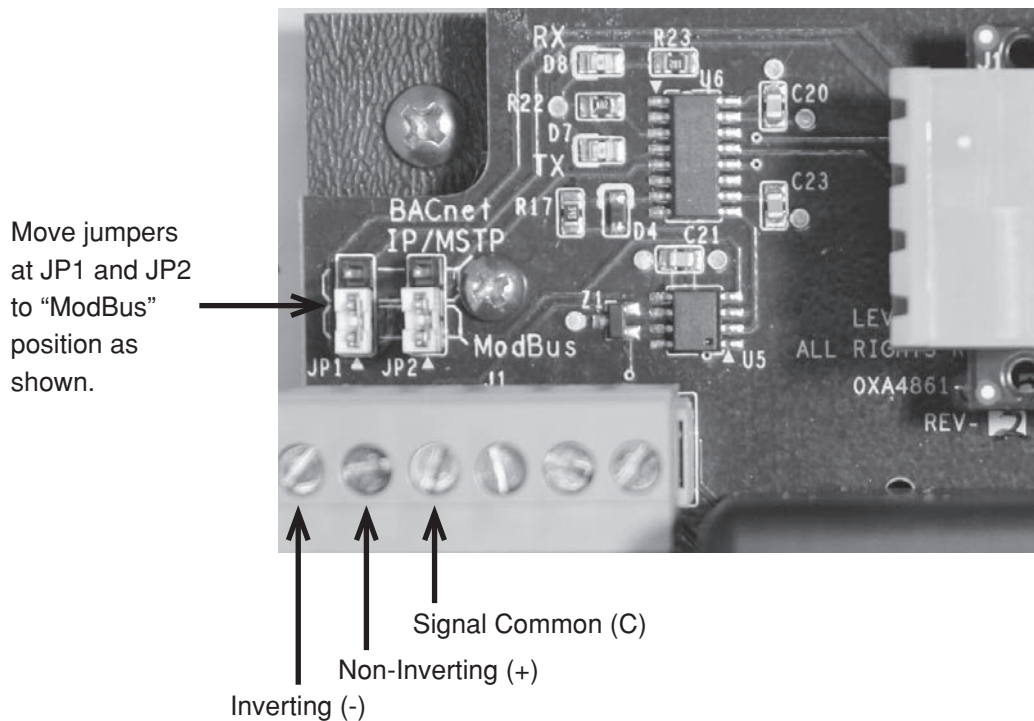
8.2   Data Extraction Procedure

Historical readings or "data profiles" are not stored in standard Modbus registers. Instead, the historical readings are provided as a stream of data, controlled by a date filter and number of readings to be extracted. The control options for the date and the number of profiles are made available in registers 0504-0506. **Sending large streams of historical data halts the meter computation to avoid conflicting processor demands. As such, large historical reads should not be used on a frequent basis.** Once the transfer completes, the meter will resume normal operations.

Setting the Date

The historical data access date provides filtering criteria for data retrieval. By default, all historical data access dates are "don't care" (0xFF). When a date value is don't care , it has no effect on the filtering of historical data. Any other value acts as a filter for the data retrieved from memory. The date value specifies the oldest data to be retrieved. For instance, setting the historical data year to 0x08 will filter out any meter readings prior to 2008. Each part of the historical date is treated as an independent filter. Some examples are provided below in Table 8 to further illustrate.

Table 8. Setting the Historical Data Access Date

Year	Mouth	Date	Hour	Meter Readings Sent
0xFF	0xFF	0xFF	0xFF	Any
0x08	0xFF	0xFF	0xFF	Any reading in 2008 or later
0xFF	0x06	0xFF	0xFF	Any reading from June-Dec in any year
0x09	0x06	0xFF	0xFF	Any reading in June, 2009 or later
0xFF	0xFF	0xFF	0x11	Any reading after 5:00 PM on any day of any year
0x09	0x03	0x01	0xFF	Any reading on March 01, 2009 or later
0xFF	0xFF	0x1C	0x17	Any reading after 11:00 PM on the 28th to the end of the month

The historical data access date information is stored in registers 0504 and 0505 (0x01F8 and 0x01F9). The year and month are stored in register 0504, and the date and hour are stored in register 0505.

8 Communications – History Data Extraction

Initiating Data Retrieval and Controlling the Number of Profiles Sent

To initiate historical data retrieval, a read holding register command is issued to address 0506. The "number of registers" variable in the read command controls the number of historical profiles to be extracted. Once the desired number of readings has been found and transferred the transmission ends.

Historical Data Profile Structure

The historical data is transmitted in frames consisting of 48 bytes each. The frame structure is shown in the table below.

Data profile information, except RTC, kWh and VAh, is saved in 16-bit floating point format using truncation of the least significant decimal information. To increase resolution from truncating data for storage, each part of the profile has an associated multiplier. When data is extracted, first make the 16-bit value into a 32-bit float by appending 0x7FFF and then multiply by the multiplier. VAh and kWh are stored as 32-bit floating point numbers and do not need a multiplier.

As an example of using the multiplier, assume the phase A voltage reading is 276.7 V. This value is divided by the multiplier (100) to become 2.767 (0x40311687) and is stored in the data profile as 0x4031. When translated back from hex to a float, 0x40317FFFbecomes 2.7734, and using the 100 multiplier gives a value of 277.34 V. This data condensing is used to increase storage capacity, and does not affect long term meter accuracy. The running kWh and VAh totals are a combination of two floating point numbers, which maintains accuracy beyond thousandths of a kWh, even when high values are reached.

Frame Item	Size (bytes)	Multiplier
Meter Address	1	n/a
Function Code (0x03)	1	n/a
Profile Memory Address (decreases with each frame)	2	n/a
Time of use Year	1	1
Time of use Month	1	1
Time of use Day	1	1
Time of use Hour	1	1
Time of use Minute	1	1

WEB VERSION

Time of use Second	1	1
Phase A Voltage	2	100
Phase B Voltage	2	100
Phase C Voltage	2	100
Phase A Current	2	100
Phase B Current	2	100
Phase C Current	2	100
Phase A Watts	2	100
Phase B Watts	2	100
Phase C Watts	2	100
Total kWh +	4	1
Total kWh -	4	1
Total kVA +	4	1
Total kVA -	4	1
Maximum Demand	2	100
CRC	2	n/a

Once one frame is finished transmitting, the next frame will begin automatically until the number of profiles left to send reaches zero. History data is transmitted in reverse chronological order—the most recent frame is transmitted first and the oldest frame is transmitted last.

WEB VERSION

9.1   Connecting to the Pulse Output Terminals

WARNING: TO AVOID FIRE, SHOCK OR DEATH, turn off all power supplying equipment before working on or inside the equipment. Use a properly rated voltage sensing device to confirm power is off.

1. Install meter as outlined in Section 3.
2. Communications cable shall enter at the TOP side of the enclosure as shown in Figure 12. Replace plastic cap with webbed bushing (provided).
3. Use shielded twisted-pair cable to prevent interference and connect to the 6-pin removable terminal block as shown in Figure 19. Two pins provide 10 watt-hour and 1 kWh pulse rates. Pulses at these terminals are positive (+) with respect to the shared common ("COM") terminal (-), and represent energy delivered (from grid). Do not over-tighten the terminal screws. Both pulse outputs are electrically isolated from input power and can be used independent of one another or simultaneously.
4. Before energizing the meter close and secure the enclosure door.

Figure 19. Pulse Output Connections

10 Wh/P   COM   1 kWh/P
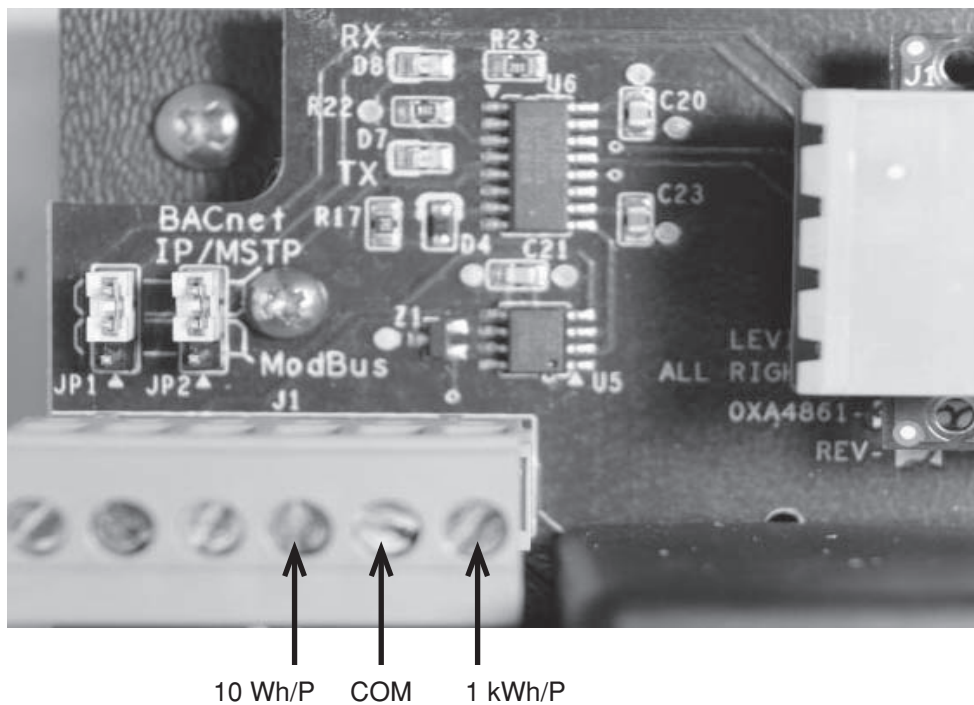
9.2   Connecting Pulse Outputs to Data Acquisition Equipment.

A variety of data acquisition equipment may be connected to the Series 3300/3500 pulse output terminals, including wireless pulse transceivers and data logging equipment. For information on Leviton's complete line of data acquisition products go to www.Leviton.com.

10 Diagnostic Tools and Frequently Asked Questions

10.1 Diagnostic Tools

Several diagnostic tools built into the Series 3300/3500 meter should be utilized to ensure the meter and CTs are installed correctly and functioning properly.

1. Energy Flow arrow (see Section 4.1, Figure 10) – Indicates direction of 'energy flow' on amperage and kW screens.
   a. **For mono-directional metering applications the Energy Flow arrow should always point to the right.** If an Amperage or kW screen shows the arrow pointing to the left a current transformer may be installed backwards or on the wrong phase, or CT connections at the meter may be reversed or on the wrong phase. See Hookup Diagrams in Figures 8 and 9 for correct wiring and CT orientations.
   b. Blinking "A" on the Amperage screens – Indicates reverse energy flow.
   c. The Series 3300/3500 meter indicates reverse energy direction with the Energy Flow arrow and blinking Amperage and phase indicator icons when CTs are oriented backwards.
2. Power Factor Screens – Except in rare circumstances where predominantly inductive loads are metered, Power Factor values should be between -0.5 and +0.5. An absolute value less than 0.5 indicates CTs installed on the wrong phase or backwards. Recheck wiring and CT orientations against the appropriate Hookup Diagram shown in Figures 8 and 9.

10.2 Frequently Asked Questions

Q: Can I use the Series 3300/3500 meter on a single phase 3-wire system?
A: The meter should not be used in this configuration. The per-phase energy, power, voltage and amperage values in this configuration will be correct; however the Line-to-Line voltage will be calculated for a 3phase system, and will not represent the actual L-L voltage.

Q: Can I use the S3300/S3500 meter in a 3 phase corner grounded delta configuration?
A: Yes. The meter must be installed with the neutral terminal disconnected. Note: Line-to-Neutral voltages will be reported for a virtual neutral. (e.g. L-L=480V, L-N=277)

Q: Can I use the S3300/S3500 meter in a 3 phase center tapped (high side) delta configuration?
A: The meter should not be used in this configuration. The per-phase energy, power, voltage and amperage values in this configuration will be correct, however the Line-to-Line voltage will be calculated for a balanced 3phase system, and will not represent the actual L-L voltage. If the neutral is not connected, the Line-to-Line voltages will be reported for a virtual neutral. (e.g. L-L=240V, L-N=139)

Q: Can I route voltage input wires and current sensing leads through the same conduit?
A: Yes. CTs must have 18 AWG or heavier wires with proper VAC insulation rating (check local electrical code).

WEB VERSION

Q: Can I extend the CT leads?

A: Yes. You should try to avoid extending the native CT leads by locating the meter next to the circuit breaker. If you must extend the leads, take into consideration the following inaccuracy contributors. Here are some of the factors that will affect accuracy when using long CT leads:

1. Wire Length
   - Native CT length is best
   - Longer run decreases accuracy
2. CT wire gauge (18 AWG preferred)
   - Thinner wire > more resistance > affects accuracy
   - Thicker wire > more capacitance > affects accuracy
3. Conduit material
   - Metal conduit will effect accuracy
   - Non-metal conduit has minimal effect
4. High voltage wires run in parallel with CT wires inside the same conduit
   - Approximately 0.7%/100ft. deviation at 277V
   - Approximately 0.5%/100ft. deviation at 120V
   - Accuracy deviation increases as current increases on the voltage wires.
5. Wire type
   - When extending CT leads, twisted pair wire type gives better accuracy.

Q: How do I retrieve Data from the meter?

A: Data Acquisition equipment, also known as Automatic Meter Reading (AMR) and Middleware, consists of radio transmitters, repeaters, and a collector that monitors, records, and transmits data to energy management or billing software solutions. Various software solutions manage and display data in user-friendly formats. See Sections 6 and 7 or go to Leviton.com for more information.

Q: Why are solid core current transformers color coded (Black & white, red & white, and blue & white)?

A: Industry convention for color coding in 3 Phase 208V electrical systems assigns the color black to phase A, red to phase B, Blue to phase C, and white to Neutral. Leviton's 100A and 200A solid core CTs are coded with the same colors (on the body of the CTs and on the wires) to help installers get each CT placed on the correct hot leg. Further, the white half of the CT always faces incoming Line or source. Phase A CT (black) connects to CT1 at the meter, phase B CT (Red) connects to CT2, and phase C CT (blue) connects to CT3. See hookup diagrams in figures 8 and 9.

Q: Can digital output wires be routed through the same conduit as voltage input and current sensing wires?

A: No. In accordance with NEC and UL requirements, Class 2 wiring (digital inputs/outputs) must be separated from Class 1 wiring. Digital output wires must enter the meter housing through the top of the enclosure, and voltage and CT wires must enter at bottom of enclosure. See Installation Instructions in Section 3.

Q: I still can't get my meter to work, what now?

A: Contact technical support at via phone or email; see Contact Information on following page.

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11 Warranty and Contact Information

LIMITED 5 YEAR WARRANTY AND EXCLUSIONS

Leviton warrants to the original consumer purchaser and not for the benefit of anyone else that this product at the time of its sale by Leviton is free of defects in materials and workmanship under normal and proper use for five years from the purchase date. Leviton's only obligation is to correct such defects by repair or replacement, at its option. For details visit www.leviton.com or call 1-800-824-3005. This warranty excludes and there is disclaimed liability for labor for removal of this product or reinstallation. This warranty is void if this product is installed impro perly or in an improper environment, overloaded, misused, opened, abused, or altered in any manner, or is not used under normal operating conditions or not in accordance with any labels or instructions. There are no other or implied warranties of any kind, including merchantability and fitness for a particular purpose, but if any implied warranty is required by the applicable jurisdiction, the duration of any such implied warranty, including merchantability and fitness for a particular purpose, is limited to five years. Leviton is not liable for incidental, indirect, special, or consequential damages, including without limitation, damage to, or loss of use of, any equipment, lost sales or profits or delay or failure to perform this warranty obligation. The remedies provided herein are the exclusive remedies under this warranty, whether based on contract, tort or otherwise.

FOR CANADA ONLY

For warranty information and/or product returns, residents of Canada should contact Leviton in writing at Leviton Manufacturing of Canada Ltd to the attention of the Quality Assurance Department, 165 Hymus Blvd, Pointe-Claire (Quebec), Canada H9R 1E9 or by telephone at
1 800 405-5320.

FCC STATEMENT:

This device complies with Part 15 of the FCC Rules and ISED License-exempt RSS standard(s). Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation. Changes or modifications not expressly approved by Leviton could void the user's authority to operate the equipment.
These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
  - Reorient or relocate the receiving antenna.
  - Increase the separation between the equipment and receiver.
  - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
  - Consult the dealer or an experienced radio/TV technician for help.
This Class A digital apparatus complies with Canadian CAN ICES-3(A)/NMB-3(A)

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FOR TECHNICAL ASSISTANCE CALL:

1-800-824-3005 (U.S.A. Only)

1 800 405-5320 (Canada Only)

Leviton Manufacturing Co., Inc.

201 North Service Road, Melville, NY 11747

Telephone : 1-800-824-3005

Visit Leviton's Web site at http://www.leviton.com

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Specifications and price subject to change at any time without notice.

Appendix A

Modbus and BACnet Address Map

Meter Readings

Address	Hex Value	Holding Register	Width (16-bit registers)	Description	Unit of Measure	Data Type	R/W	BACnet Object Type	BACnet Object Instance
0000	0000	40001	2	kWh from grid	kWh	FLOAT32	R	AI	1
0002	0002	40003	2	(Reserve for Future Use)	kWh	FLOAT32	R	AI	2
0004	0004	40005	2	kVAh from grid	KVAh	FLOAT32	R	AI	3
0006	0006	40007	2	(Reserve for Future Use)	KVAh	FLOAT32	R	AI	4
0008	0008	40009	2	Total Power (A+B+C) [6]	kW	FLOAT32	R	AI	5
0010	000A	40011	2	Total Apparent Power (A+B+C) [6]	KVA	FLOAT32	R	AI	6
0012	000C	40013	2	Total Reactive Power (A+B+C) [6]	kVAR	FLOAT32	R	AI	7
0014	000E	40015	2	Total Power Factor	N/A	FLOAT32	R	AI	8
0016	0010	40017	2	Phase A Voltage (L-N)	V	FLOAT32	R	AI	9
0018	0012	40019	2	Phase B Voltage (L-N)	V	FLOAT32	R	AI	10
0020	0014	40021	2	Phase C Voltage (L-N)	V	FLOAT32	R	AI	11
0022	0016	40023	2	Phase A Current	A	FLOAT32	R	AI	12
0024	0018	40025	2	Phase B Current	A	FLOAT32	R	AI	13
0026	001A	40027	2	Phase C Current	A	FLOAT32	R	AI	14
0028	001C	40029	2	Phase A Real Power	kW	FLOAT32	R	AI	15
0030	001E	40031	2	Phase B Real Power	kW	FLOAT32	R	AI	16
0032	0020	40033	2	Phase C Real Power	kW	FLOAT32	R	AI	17
0034	0022	40035	2	Phase A Apparent Power	KVA	FLOAT32	R	AI	18
0036	0024	40037	2	Phase B Apparent Power	KVA	FLOAT32	R	AI	19
0038	0026	40039	2	Phase C Apparent Power	KVA	FLOAT32	R	AI	20
0040	0028	40041	2	Phase A Reactive Power	kVAR	FLOAT32	R	AI	21
0042	002A	40043	2	Phase B Reactive Power	kVAR	FLOAT32	R	AI	22

WEB VERSION

Address	Hex Value	Holding Register	Width (16-bit registers)	Description	Unit of Measure	Data Type	R/W	BACnet Object Type	BACnet Object Instance
0044	002C	40045	2	Phase C Reactive Power	kVAR	FLOAT32	R	AI	23
0046	002E	40047	2	Phase A Power Factor	N/A	FLOAT32	R	AI	24
0048	0030	40049	2	Phase B Power Factor	N/A	FLOAT32	R	AI	25
0050	0032	40051	2	Phase C Power Factor	N/A	FLOAT32	R	AI	26
0052	0034	40053	2	Voltage A to B (L-L)	V	FLOAT32	R	AI	27
0054	0036	40055	2	Voltage B to C (L-L)	V	FLOAT32	R	AI	28
0056	0038	40057	2	Voltage C to A (L-L)	V	FLOAT32	R	AI	29
0058	003A	40059	2	Line Frequency	Hz	FLOAT32	R	AI	30
0060	003C	40061	2	Maximum Demand	kW	FLOAT32	R	AI	31
0062	003E	40063	1	Maximum Demand Timestamp: Year/Month	Year/Month	Two UINT8	R	AI	32 & 33
0063	003F	40064	1	Maximum Demand Timestamp: Day/Hour	Day/Hour	Two UINT8	R	AI	34 & 35
0064	0040	40065	1	Maximum Demand Timestamp: Minute/Second	Min/Sec	Two UINT8	R	AI	36 & 37
0065	0041	40066	1	Power Loss Timestamp: Year/Month	Year/Month	Two UINT8	R	AI	38 & 39
0066	0042	40067	1	Power Loss Timestamp: Day/Hour	Day/Hour	Two UINT8	R	AI	40 & 41
0067	0043	40068	1	Power Loss Timestamp: Minute/Second	Min/Sec	Two UINT8	R	AI	42 & 43
0068	0044	40069	1	RTC Year/Month	Year/Month	Two UINT8	R/W	AV	44 & 45
0069	0045	40070	1	RTC Day/Hour	Day/Hour	Two UINT8	R/W	AV	46 & 47
0070	0046	40071	1	RTC Minute/Second	Min/Sec	Two UINT8	R/W	AV	48 & 49
0071	0047	40072	1	RTC Day of the Week	N/A	8-bit enumerated in LSB[1]	R	AI	50
0072	0048	40073	2	Net kWh ("from grid" minus "to grid") (Reserve for Future Use)	kWh	FLOAT32	R	AI	51
0074	004A	40075	2	Net kVAh ("from grid" minus "to grid") (Reserve for Future Use)	kVAh	FLOAT32	R	AI	52

Appendix A

Control Registers

Address	Hex Value	Holding Register	Width (16-bit registers)	Description	Unit of Measure	Data Type	R/W	BACnet Object Type	BACnet Object Instance
0500	01F4	40501	1	Maximum Demand Reset	N/A	Write 0x00AA to initiate reset	W	AV	53

Meter Information

Address	Hex Value	Holding Register	Width (16-bit registers)	Description	Unit of Measure	Data Type	R/W	BACnet Object Type	BACnet Object Instance
5000	1388	45001	2	Meter Serial Number	N/A	UINT32	R	AI	54
5002	138A	45003	1	Hardware Version/Software Version	N/A	Two 8-bit hex values[3]	R	AI	55 & 56
5003	138B	45004	1	Program Number	N/A	INT16	R	AI	57
5004	138C	45005	1	Meter Type/Demand Reset Counter	N/A	8-bit enumerated[4] and 8-bit integer	R	AI	58 & 59
5005	138D	45006	1	Max Demand Sub-interval Calc EEPROM Save Interval	N/A	8-bit enumerated in LSB[5]	R/W	AV	60

[1] To maintain cohesiveness of date, time and day of week, it is recommended that the four RTC registers be updated as a group

[2] Day of the week: 0x01 to 0x07 (0x01 = Sunday)

[3] Each 8-bit version number is encoded as two 4-bit hex digits, for example the value 0x19 represents version 1.9

[4] Meter type has a fixed value of 4

[5] See "Encoding of Demand Calculation and History Data Save Interval" below

[6] Values report instantaneous measurements

Encoding of Demand Calculation and History Data Save Interval

Register address 5005 is encoded as two 8-bit enumerated values, with demand calculation interval in the MSB and history data save interval in the LSB.

Max Demand sub-interval (MSB) defines the interval for calculation of maximum demand:

- Each Max Demand data block has 3 sub-intervals in which demand is calculated.
- Sub-intervals are 5 minutes for a 15 minute Max Demand block and 10 minutes for a 30 minute block.

For each sub-interval the total kWh consumption is divided by the number of accumulations to give average demand for the sub-interval. Accumulations occur approximately every second.

0 = 5 minute sub- interval (15 minute Max Demand interval)

1 = 10 min sub-interval (30 minutes Max Demand interval)

Other values return an error

History interval (LSB) defines the interval for saving history data in EEPROM:

1 = 5 minute interval

3 = 15 minute interval

6 = 30 minute interval

12 = 60 minute interval

Other values return an error

When this register is read, the demand calculation interval appears in the MSB and history data save interval is in the LSB.

The method of writing to the register depends on the communication protocol. For Modbus RTU, the demand calculation interval value is written to the LSB and the history data save interval is fixed at 5 minutes and cannot be changed. For all other protocols, the demand calculation interval value is written to the MSB and the history data save interval value is written to the LSB.

Modbus Address	Dip Switch Number							
	1	2	3	4	5	6	7	8
1	On	Off	Off	Off	Off	Off	Off	Off
2	Off	On	Off	Off	Off	Off	Off	Off
3	On	On	Off	Off	Off	Off	Off	Off
4	Off	Off	On	Off	Off	Off	Off	Off
5	On	Off	On	Off	Off	Off	Off	Off
6	Off	On	On	Off	Off	Off	Off	Off
7	On	On	On	Off	Off	Off	Off	Off
8	Off	Off	Off	On	Off	Off	Off	Off
9	On	Off	Off	On	Off	Off	Off	Off
10	Off	On	Off	On	Off	Off	Off	Off
11	On	On	Off	On	Off	Off	Off	Off
12	Off	Off	On	On	Off	Off	Off	Off
13	On	Off	On	On	Off	Off	Off	Off
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16	Off	Off	Off	Off	On	Off	Off	Off
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18	Off	On	Off	Off	On	Off	Off	Off
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38	Off	On	On	Off	Off	On	Off	Off
39	On	On	On	Off	Off	On	Off	Off
40	Off	Off	Off	On	Off	On	Off	Off
41	On	Off	Off	On	Off	On	Off	Off
42	Off	On	Off	On	Off	On	Off	Off
43	On	On	Off	On	Off	On	Off	Off

Modbus Address	Dip Switch Number							
	1	2	3	4	5	6	7	8
44	Off	Off	On	On	Off	On	Off	Off
45	On	Off	On	On	Off	On	Off	Off
46	Off	On	On	On	Off	On	Off	Off
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85	On	Off	On	Off	On	Off	On	Off
86	Off	On	On	Off	On	Off	On	Off

Modbus Address	Dip Switch Number							
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89	On	Off	Off	On	On	Off	On	Off
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128	Off	Off	Off	Off	Off	Off	Off	On
129	On	Off	Off	Off	Off	Off	Off	On

Modbus Address	Dip Switch Number							
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169	On	Off	Off	On	Off	On	Off	On
170	Off	On	Off	On	Off	On	Off	On
171	On	On	Off	On	Off	On	Off	On
172	Off	Off	On	On	Off	On	Off	On

WEB VERSION

Modbus Address	Dip Switch Number							
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211	On	On	Off	Off	On	Off	On	On
212	Off	Off	On	Off	On	Off	On	On
213	On	Off	On	Off	On	Off	On	On

Modbus Address	Dip Switch Number							
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251	On	On	Off	On	On	On	On	On
252	Off	Off	On	On	On	On	On	On
253	On	Off	On	On	On	On	On	On
254	Off	On	On	On	On	On	On	On

WEB VERSION