Integrated Metering Systems, Inc.

Models beginning with MS120S01, ES120S01, MD240S01, & ED240S01

Single Meter Outdoor Units

Product Description

Technical Specifications

Installation Instructions



PN: 114-0002
Revision 3.0

IMS INTEGRATED METERING SYSTEMS, INC.
Metering Excellence Since 1989

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1. Product Description

1.1 General Description

The IMS Mini Meter is a self-powered, current transformer (CT) rated electronic kilowatthour (kWh) meter designed for permanent connection to an electrical service. Mini Meters come in single element (2-wire) and dual element (3-wire) configurations. This guide is for use with the single unit outdoor enclosure.

1.2 Meter Features

- Revenue-grade accuracy with solid-core or easy to install split core CTs
- Built in LCD or external mechanical counter
- Multiple load monitoring with a single meter
- Encapsulated model for harsh environments (model number prefixes EE)
- AMR compatible isolated pulse outputs
- Reverse-phase LED indicator
- 10-year warranty

1.3 Meter Certifications

- UL Listed (100A & 200A models only) for use in the US or Canada
- Conforms to accuracy requirements set forth in ANSI C12.1
- Certified to California Division of Measurement Standards
- Approved by the California Energy Commission for use in the California Solar Initiative's Performance Based Incentive Program
- Approved by State of Maryland Public Service Commission in accordance with applicable ANSI C12.1 requirements

1.4 Physical Description

1.4.1 Single Meter

Figure 1 on the following page shows the dimensions of a single Mini Meter or EE Module case and cover.

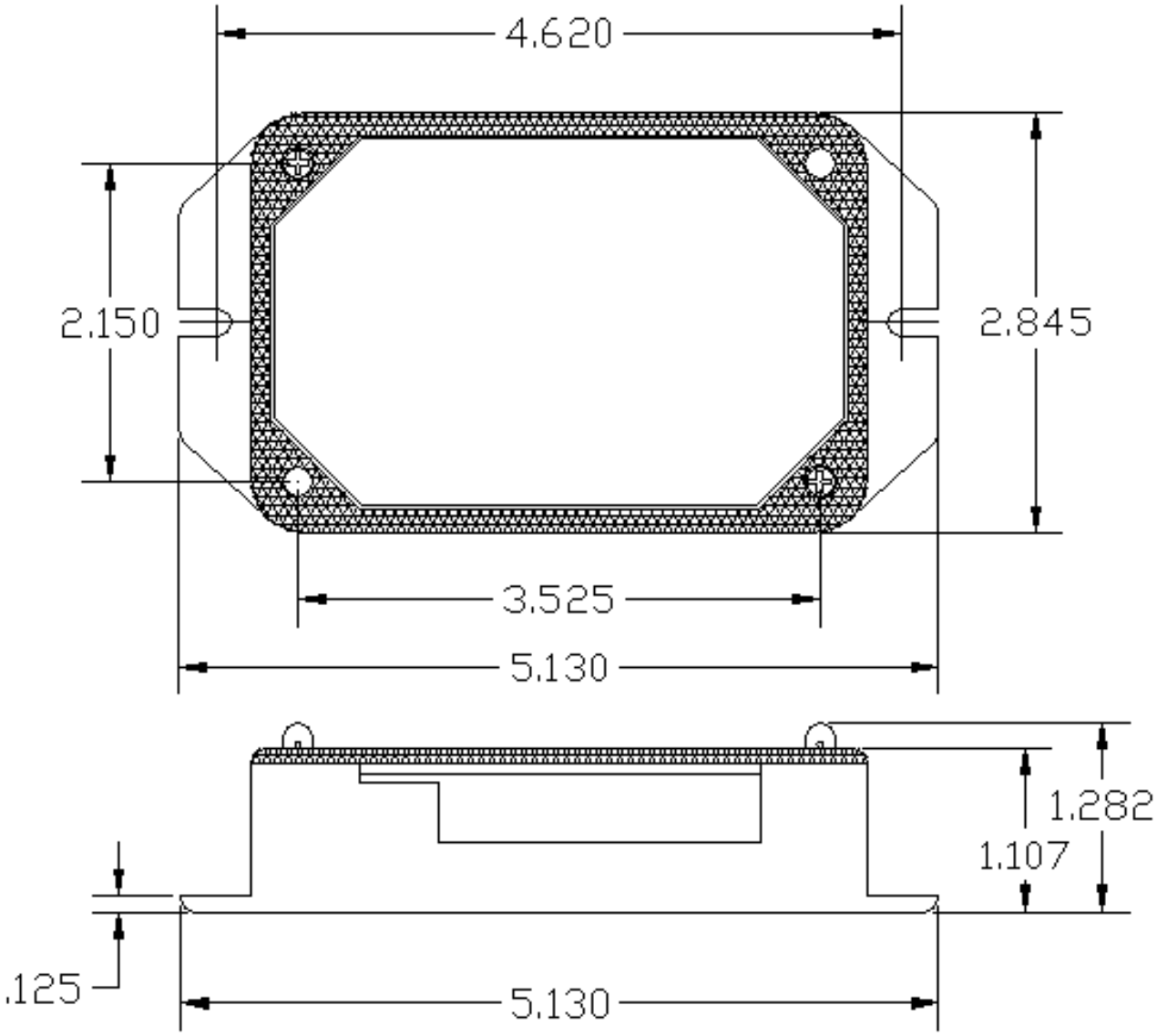


Figure 1: Single Mini Meter/EE Module case dimensions

1.4.2 Enclosures

Mini Meter and EE Module small enclosures are manufactured by Bud Industries, Inc. (www.budind.com). The outline and mounting drawing for the small enclosure is shown below in Figure 2. More detailed specification sheets are available from the Bud website, part number NBB-15240.

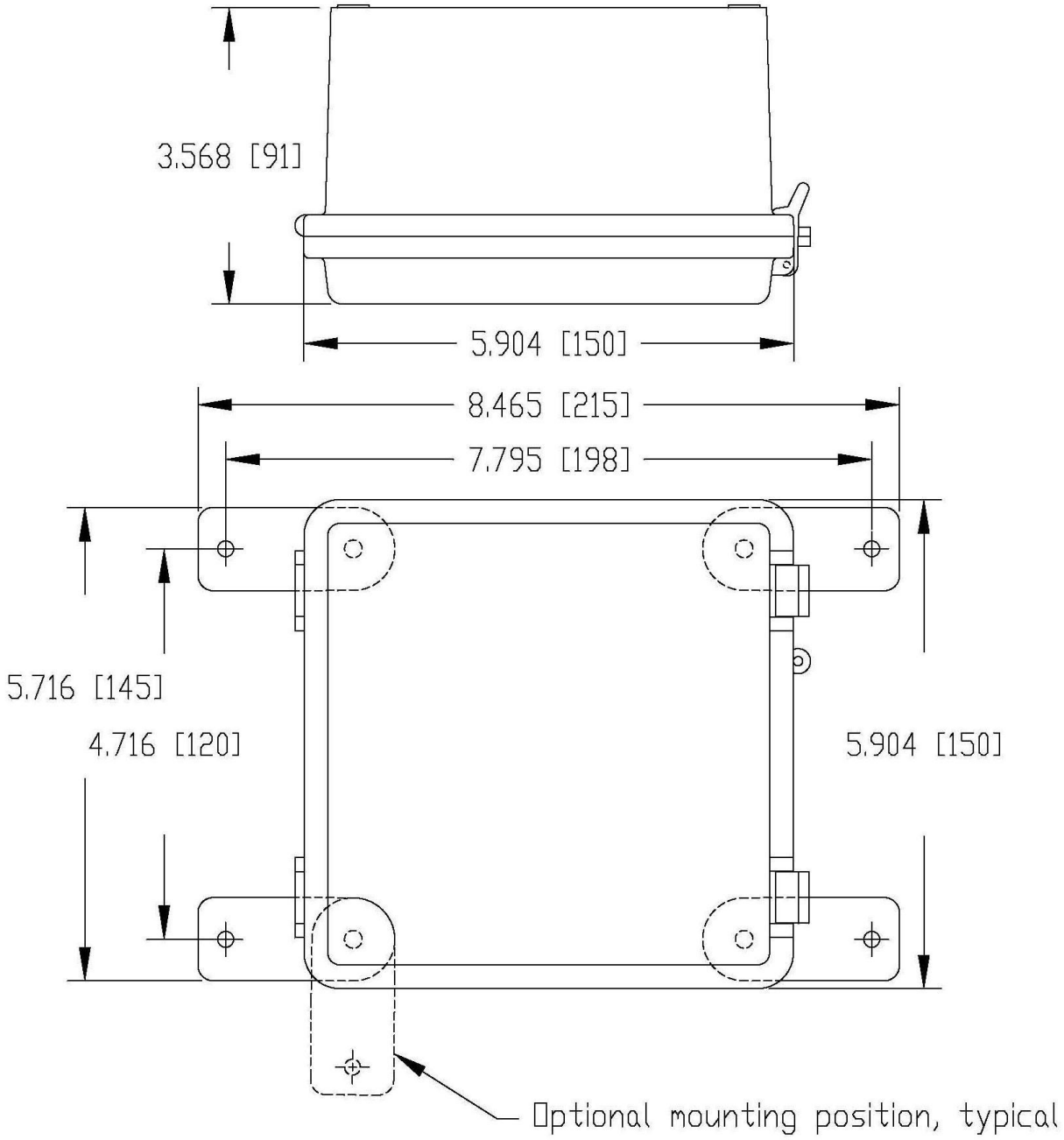


Figure 2: Small enclosure outline and mounting dimensions

1.5 Applications

- Apartments
- Marinas
- Mobile Home Parks
- Campgrounds
- Anywhere accurate electric submetering is needed

2. Technical Specifications

2.1 Model Number Description

2.1.1 Individual Meter Model Numbers

The Mini Meter model number format is shown below and in Figure 3. The breakdown of the model number is as follows:

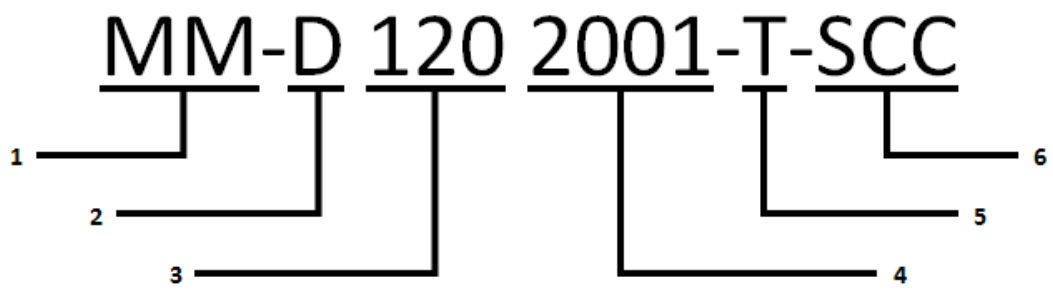


Figure 3: Mini Meter model number format

1. MM indicates a Mini Meter Product; EE denotes epoxy encapsulated versions
2. Meter configuration
   S – Single Element Meter
   D – Dual Element Meter
3. Rated Voltage (L1 or L2 to Neutral)
4. CT Ratio
   1001 – 100:0.1
   2001 – 200:0.1
   2002 – 200:0.2
   4001 – 400:0.1
5. Outputs
   T – Provided with 0.1 kWh and 0.01 kWh isolated outputs and 0.1 kWh counter output
   Blank – Provided with 1.0 kWh, 0.1 kWh, and 0.01 kWh isolated outputs and 1.0 kWh counter output
6. Counter
   SCC – Self Contained Counter (built-in LCD)
   Blank – Not provided

2.1.2 Meter in Enclosure Model Numbers

Enclosure model numbers were recently changed to supply more precise information. The old model number (MMD or MMS – PKG – O) has been replaced with the format shown in Figure 4.

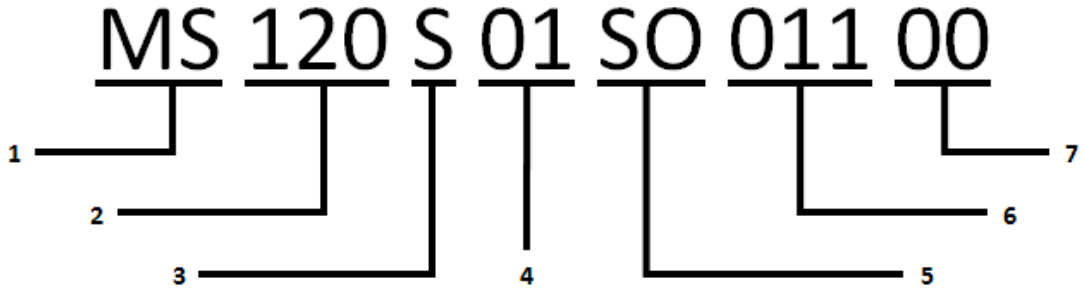


Figure 4: New enclosure model number format

1. Meter Type
   MS – Single Element Mini Meter (1-phase, 2-wire)
   MD – Dual Element Mini Meter (1 or 2-phase, 3-wire)
   ES – Single Element EE module (1-phase, 2-wire)
   ED – Dual Element EE module (1 or 2-phase, 3-wire)
2. Voltage
   120 – 120V (1-phase, 2-wire) (Single Element only)
   240 – 240V (1 or 2-phase, 3-wire) (Works with 208V applications as well)
   For Single Element Models (MS and ES), 1PH 2W: Voltage rating is Phase-to-Neutral
   For Dual Element Models (MD and ED), 1PH 3W, 2PH 3W: Voltage rating is Phase-to-Phase
3. Enclosure Size
   S – Small outdoor enclosure
4. Number of Meters Enclosed
5. Counter Type
   MO – Mechanical 1 kWh
   TO – Mechanical 1/10 kWh
   SO – Self-contained LCD
   XO – No Counter
6. CT Ratio
   011 – 100:0.1
   021 – 200:0.1
   022 – 200:0.2
   044 – 400:0.1
7. Additional Options
   00 – No Options

2.2 Electrical Specifications

Mini Meters and EE Modules fall under UL Circuit Category III: a device for measurements performed in the building installation. The electrical specifications for Mini Meters are given in the table below.

Input Configurations	1 Phase, 2 wire 1 or 2 Phase, 3 wire
Supply Voltage Range (L1 or L2 to Neutral)	Min. 102 VAC Max. 138 VAC
Maximum Input Power, L1 and L2	8 VA
Maximum Rated Current[1]	440 A primary for 400 A models 220 A primary for 200 A models 110 A primary for 100 A models 0.11 A secondary for 0.1 A secondary models 0.22 A secondary for 0.2 A secondary models
Line Frequency	50-60 Hz
Power Factor Range	0.5 to 1.0, leading or lagging
Accuracy	+/- 0.5% of registration @ 1.0pf. 2 to 200 A +/- 0.75% of registration @ 0.5pf, 2 to 200 A
Operating Temperature Range	-30 to +60 degrees C
Rated Pollution Degree[2]	2
Rated Relative Humidity	80%
Terminal Blocks: Dinkle/International Connector EK508-11P or equiv.	4.4 in-lb of torque maximum

Table 1: Electrical and environmental specifications

[1]Product approved for use with included IMS Current Transformers, as follows:
400A: Part number CT400148SO or CT400148SO-1.5 or CT400148SP-142
200A: Part number CT200124XX or CT200148XX or CT200148XXSO-0.72 or CT200148SP-095
100A: Part number CT100124XX or CT100148XX or CT100148XXSO-0.72 or CT100148SP-095
[2]Pollution Degree 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.

2.3 Input/Output Connections and User Display

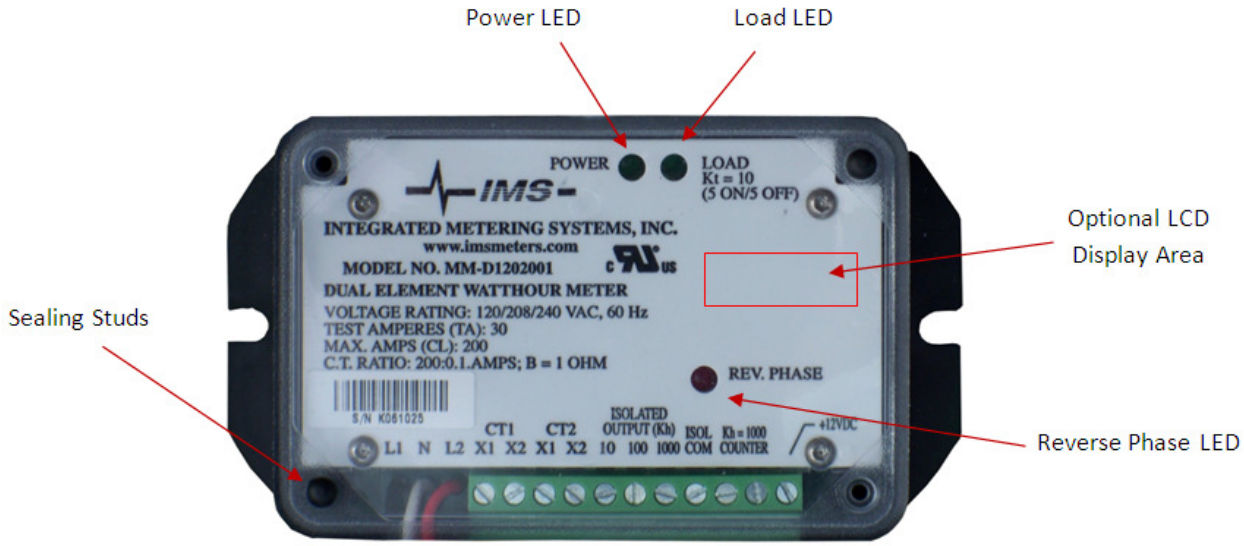


Figure 5: Mini Meter connections and display

Voltage Inputs (wire connections)	Description
L1	Black wire, voltage input, Line 1, 120V with respect to neutral
N	White wire, Neutral input
L2	Red wire, voltage input, Line 2, 120V with respect to neutral (MMD and EED models only)
CT Inputs	
CT1 : X1	Current Transformer input, CT1. Colored wire of CT1
CT1 : X2	Current Transformer input, CT1. White wire of CT1
CT2 : X1	Current Transformer input, CT2. Colored wire of CT2 (MMD and EED models only)
CT2 : X2	Current Transformer input, CT2. White wire of CT2 (MMD and EED models only)

Outputs	
10, Isolated Output (10 Wh/P, Kh = 10)	Isolated pulse output: 5 watthours on, 5 watthours off, referenced to ISOL COM **NOT TO BE USED FOR FIELD WIRING**
100, Isolated Output (100 Wh/P, Kh=100)	Isolated pulse output: 50 watthours on, 50 watthours off, referenced to ISOL COM
1000, Isolated Output (1 kWh/P, Kh=1000)	Isolated pulse output: 500 watthours on, 500 watthours off, referenced to ISOL COM (not available on models with T suffix)
ISOL COM	Isolated common for 10/100/1000 isolated outputs
Counter (kh = 100 or kh = 1000)*	For 12 VDC electro-mechanical counter
Counter (kh = 100 or kh = 1000)*	For 12 VDC electro-mechanical counter
+12 VDC (MMS and MMD models only)	12 VDC output; current rating is 3 mA max.

Table 2: I/O connections

*Recommend IMS counter #521-001 (1 kWh models), #512-002 (0.1 kWh models), or equivalents

LED Indicators	Description
Power LED (green)	Illuminates when the meter is supplied with proper voltage
Load LED (green)	50% duty cycle (at constant load) LED to verify proper meter function when connected to a load. At 200 watts, LED will illuminate for 1.5 minutes, then turn off for 1.5 minutes; with no load, LED will remain on or off
Reverse Phase LED (red)	Illuminates when a problem with meter phasing exists. With no load, LED may be on or off. See section 3.7 for CT installation instructions
LCD Display	Optional LCD display that shows total kWh

Table 3: Display indicators

3. Installation Instructions

The following section contains installation and wiring instructions for the IMS Mini Meter or EE Module in a single meter outdoor enclosure. If technical assistance is required at any point during the installation, contact information can be found at the end of this manual. IMS is not responsible for damage to the meter caused by incorrect wiring.

3.1. Explanation of Warning Symbols



Indicates the need to consult the operation manual due to the presence of a potential risk.



Indicates the presence of electric shock hazards. Prior to proceeding, de-energize the circuit and consult the operation manual.



Indicates that the equipment is protected throughout by double insulation.

3.2 Safety Precautions

WARNING

- **Installation of electric meters requires working with possibly hazardous voltages. These instructions are meant to be a supplement to aid trained, qualified professionals.**
- **Turn off all power supplying the equipment before performing any wiring operations. Use a properly rated voltage sensing device to confirm power is off.**
- **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.

3.3 Preparation

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. Ensure the conduit for the installation is flexible and non-metallic. For outdoor applications conduit and conduit fittings must be rated for UL Type 4X outdoor enclosures. 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 at the meter and inside the electrical panel for possible exposed wire, broken wire, damaged components or loose connections.

3.4 List of Materials

- Mini Meter or EE Module small enclosure and associated mounting materials.
- Line 1, Line 2, and Neutral hook-up wires as needed for the electrical service. Wires must be 18 AWG or larger and insulated for 300 VAC min.
- Current Transformers (CTs): This product is designed for use with IMS CTs; see Section 2.2 for details.
- Flexible, non-metallic conduit and fittings; UL Type 4X for outdoor applications.

3.5 Mounting the Enclosure

3.5.1 Mounting Location

- Meter installations 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 CT and voltage lead lengths (and conduit lengths) are capable of reaching the enclosure from the load center.

- If a suitable mounting location near the load center cannot be found, additional in-line fuses or circuit breaker may be required in accordance with NEC regulations.

3.5.2 Drilling Conduit Holes

The bottom panel and lower half of the side panels work best for conduit opening locations in outdoor single meter enclosures. Select the location the makes wire installation easiest for the given environment. If the side panels are used, holes should be centered approximately half an inch from the bottom of the enclosure. Hole sizes must be appropriate to fittings, and large enough to fit all voltage and CT wiring (4-7 18 AWG min. wires insulated for 300 V min.). Care should be exercised to keep drill bit away from components inside the enclosure. **Type 4X conduit and fittings must be used in order to maintain the outdoor rating of the enclosure.**

3.5.3 Mounting Procedure and Conduit Installation

1. Attach the mounting brackets to the back of the enclosure with the four provided screws as shown in Figure 6.

2. Fasten the enclosure to the selected surface via mounting holes.

3. Verify that the enclosure is not loose and that all connections are secure.

4. Attach the conduit between enclosure and load center, routing wires as necessary for later use.

5. Make sure the conduit fittings are aligned properly and tightened securely to prevent moisture from entering the enclosure (outdoor applications).

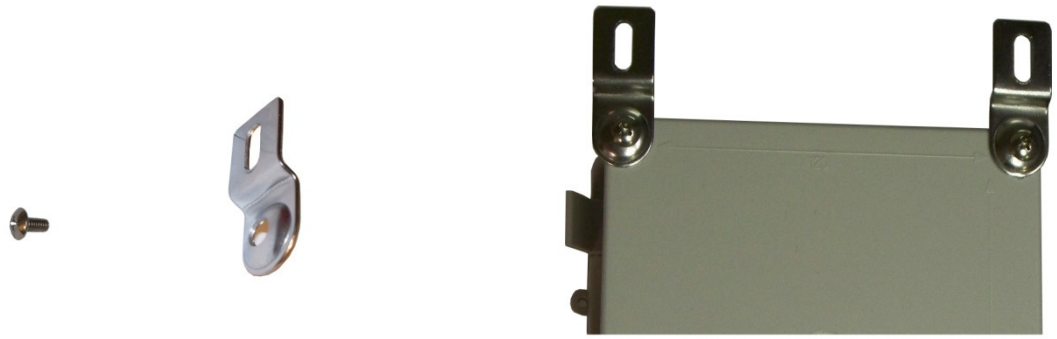


Figure 6: Mounting the enclosure

3.6 Installation of Voltage Lines



Check to make sure service is disconnected before any connections are made.

1. Field wired voltage connections are made to the Mini Meter terminal block. The rated torque for these terminal blocks is 4.4 in-lb, and can be used with solid and stranded copper wires, at 12-18 AWG.
2. Verify that branch circuit fuse specifications meet local electric codes. (See section 2.2).
3. Connect 18 AWG min., 300 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 Figure 9 for wiring diagram.
4. Route wires through the conduit if not already done.
5. Trim the wire to the appropriate length to avoid coils of excess wiring.
6. Strip wiring to approximately .300 inches if needed 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

3.7 Variations and Installation of Current Transformers



To reduce risk of electric shock, always open or disconnect the circuit from the power distribution system of a building before installing or servicing current transformers.



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. IMS provided CT leads are 24 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.
- Current and voltage inputs must be installed ‘in phase’ for accurate readings (e.g. CT1 on Line 1, CT2 on Line 2); see Figure 9.

CT Variations

- IMS solid core CTs (Figure 7): In accordance with CT label, the LINE side of CT must face incoming Line. White lead connects to X2 of CT connection (CT1:X2 or CT2:X2). Colored lead connects to X1 of the corresponding CT connection (CT1:X1 or CT2:X1).



Figure 7: IMS solid core CTs

Installing solid core CTs

1. Route CT wires through the conduit if not already done.
2. Trim the wire to the appropriate length to avoid coils of excess wiring.
3. At MMU, strip insulation from wires to approximately .300 inches.
4. Connect CT leads to the appropriate meter as described above.
5. With power turned off, disconnect each monitored conductor and slide on a CT, ensuring the CT is correctly oriented as noted above.
6. Reconnect the conductors.

- IMS split core CTs (Figure 8): The side with the white dot, H1, must face the incoming LINE. White wire connects to X2 terminal, black wire connects to X1 terminal.



Figure 8: IMS split core CTs

Installing split core CTs

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 meter as described above.
5. With power to the conductors turned off, place one CT around each conductor, ensuring that the white dot is facing the line side.

Failure to install CTs in the correct orientation and on the correct phase will lead to inaccurate meter readings. Figure 9 shows a wiring diagram for Mini Meters and EE Modules.

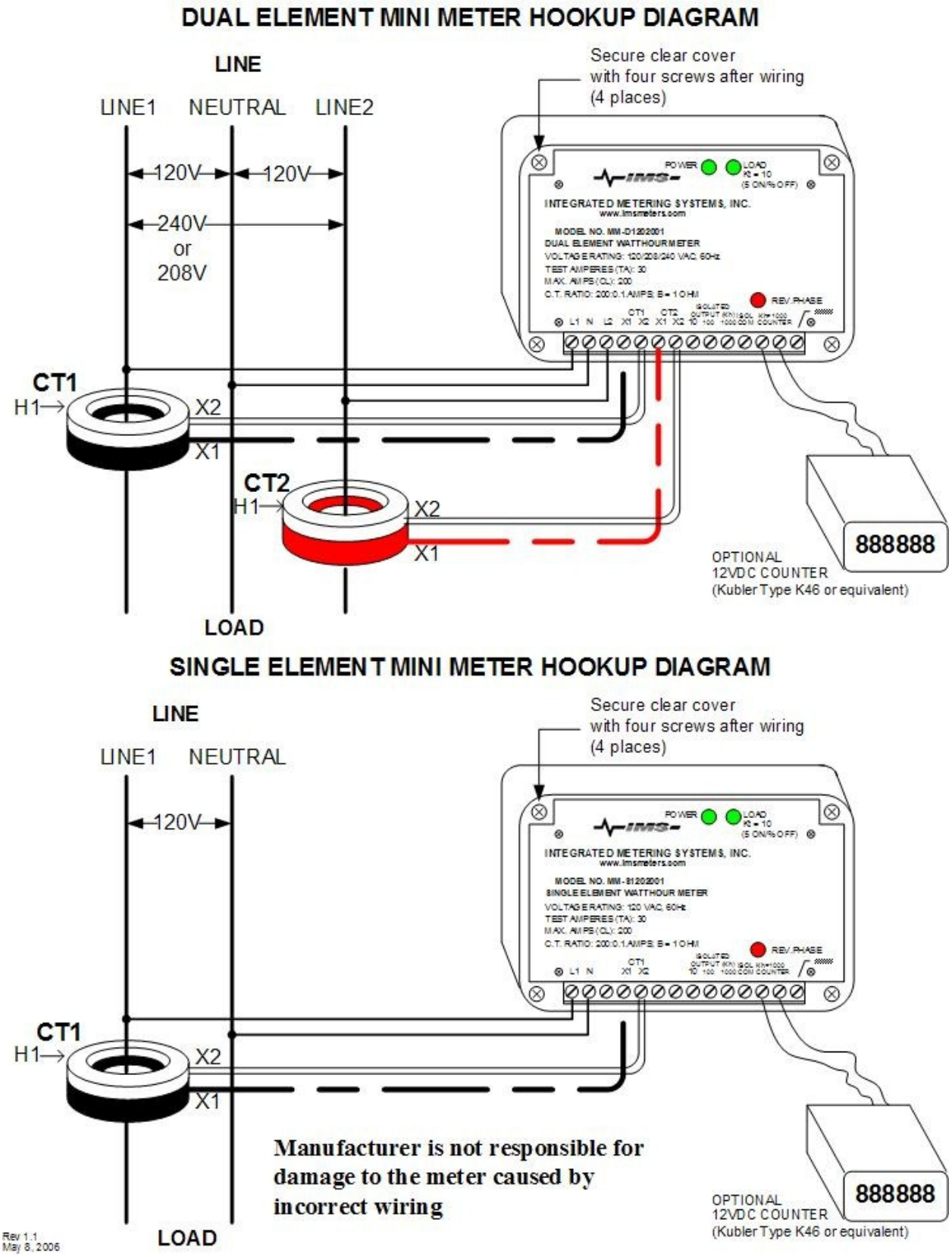


Figure 9: Mini Meter or EE Module hookup diagram

3.8 Testing the Installation

Testing Voltage

The power LED illuminates when the Mini Meter or EE Module has a proper power supply. Voltage should also be tested using an AC Voltmeter to verify that the voltage across voltage line terminals (L1 to Neutral and L2 to Neutral) is not in excess of the maximum rated voltage in section 2.2.

CT Reverse Phase Indicator

Mini Meters and EE Modules have a red reverse phase indicator LED as described in section 2.3. **There must be a load drawing a minimum of 1 A connected to the meter in order for the reverse phase LED to function correctly**. If a proper load is connected, and the LED is illuminated, power down the voltage supply and verify that CTs are installed correctly.

Load LED

The load LED is described in section 2.3. This LED should be cycling at 50% duty cycle when the meter is connected properly and a constant load is applied.

3.9 Securing the Enclosure

In accordance with safety requirements, enclosures must be secured using the provided key lock once installation is complete. The purpose of the lock is to prevent access to live parts that pose potential safety risks. To install the lock, slide through the provided holes on the clamp side of the enclosure and fasten securely.

4. Maintenance

Properly installed meters with sound connections and secure conduit fittings should not require user maintenance. If the meter is functioning abnormally, consult the FAQ/Troubleshooting guide. If the answer cannot be found there, contact IMS technical support (see Section 6).

5. Troubleshooting/FAQ

Problem	Solution
1. Power LED not illuminated	• Check to make sure all connections are wired according to section 3.6 • Test the voltage being supplied to the meter using an AC voltmeter • With power off, remove any additional line fuses and test with ohmmeter
2. Load LED not flashing	• Verify CT connections and orientations (see Section 3.7) • Make sure there is sufficient load to draw a significant current (~1 A) • Test the voltage being supplied to the meter using an AC voltmeter
3. Registered consumption low	• Check to make sure the reverse phase LED is not on. • Even if the reverse phase LED is off, double-check CT orientations. One CT installed in the incorrect direction doesn't always illuminate the reverse phase LED. • Make sure that current and voltage connections are in phase (see Sections 3.6 and 3.7) • Check power connections and fuses
4. Counter isn't incrementing	• Verify the Load LED is working • On Mini Meters, verify that counter wires are connected to COUNTER terminals

FAQ

Q: Can you use additional sets of current transformers (CT's) with a submeter to accommodate more circuits?
A: Yes, you can use up to three sets of CT's in parallel per meter. Just make sure you do not exceed the current rating per phase. Consult IMS technical support for more information (see Section 6).

Q: What is AMR equipment?
A: AMR is Automatic Meter Reading equipment. This typically consists of radio transmitters, repeaters and a collector that monitors, records, and is capable of transmitting data to a third party billing service (RBC).

Q: Why are the current transformers color coded (Black & white, red & white, and blue & white)?
A: CT1 needs to monitor the same phase used to power the meter on line 1, CT2 needs to monitor the same phase used to power line 2. Color coding helps the installer maintain correct phasing.

Q: I accidentally installed my CTs backwards; can I switch the X1 and X2 terminal connections instead of flipping the CT?
A: Meters are tested and approved for accuracy with CTs installed in the correct orientation. Installing CTs backwards and inverting the terminal connections has a slight affect on meter accuracy.

Q: Can the meters be tampered with after installation?
A: All of the IMS meter enclosures provide a loop for padlocks or other tamper evident equipment. The displays are all non-resettable.

Q: Can voltage input wires and current transformer secondary leads be routed through the same conduit?
A: Yes, provided you are using IMS supplied CTs. Alternate CTs must have a 0.1 A max secondary rating and 18 AWG min. wires with at least 300 VAC insulation rating.

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 outputs) must be separated from Class 1 wiring.

Q: I still can't get my meter to work, what now?
A: Contact technical support via phone or on our website given in the following section.

6. Contact Information

Integrated Metering Systems, Inc.
11701 S. Belcher Rd., Suite 123
Largo, FL 33773
Phone: 727-539-1813
Toll Free: 800-488-3594
On the web: http://www.imsmeters.com/

7. **Returned Material Policy**

After acceptance, all sales of meters are final. IMS, in its sole discretion, authorizes product returns in appropriate circumstances, subject to such conditions as IMS may specify. Any such return is subject to the express prior authorization and approval of IMS. Buyer must notify IMS at 800-488-3594 (telephone) or 727-539-1984 (fax) and request a Returned Material Authorization Number (RMA Number) and state the specific reason for return. Unauthorized returns will not be accepted.

When requesting an RMA Number please supply the following information:

1. Distributors name and address
2. Model number of meter
3. Original purchase order number
4. Reason for return

All paperwork and boxes must be marked with an RMA number issued by IMS. All authorized returned materials must be shipped freight prepaid to IMS to the address specified below. IMS is not responsible for uninsured packages or packages lost by your carrier.

Integrated Metering Systems (IMS)
11701 S Belcher Rd., Suite 123
Largo, FL 33773

All returns are subject to a handling/restocking charge, except for product shipped in error or products under warranty. All charges (modification, repair, restock etc) related to returned products will be determined by IMS upon evaluation. All shipping costs are the responsibility of the buyer.

METERS RETURNED FOR CREDIT*

Replacement meter ordered • *RMA Number requested by stocking distributor for credit must be accompanied by a purchase order for material of equal or greater value.*	0% Restock Charge
NO replacement meter ordered	25% Restock Charge

METERS RETURNED FOR REPAIR (STILL UNDER WARRANTY)*

No defects found	$75.00 evaluation charge
Defects not covered under warranty	Charges upon evaluation
Defects found covered under warranty	No Charge

METERS RETURNED FOR EVALUATION (NO LONGER UNDER WARRANTY)*

Evaluation charge of $75.00 applies
Other charges will apply depending on evaluation by IMS

*Prices are as of May 01, 2009 and subject to change

8. Revision History

Revision	Date	Changes
2.2	19 Feb 2009	Initial Release to UL
2.3	17 Mar 2009	Revised with changes from UL Added new enclosure model numbers Changes Figure/Table linking Removed transmitter installation Added section 3.9: Securing the Enclosure Changed “NEMA” to “UL Type” Removed IMS CT open circuit protection wording Removed reference to metallic conduit
2.5	18 May 2009	Stylistic Changes Added double insulation symbol and RMA page
3.0	22 May 2009	Final Review Changes and Production Release