GEH-7287

GE Energy

I-210™ Electronic Single Phase Meter

- *Product Description*
- *Operating Instructions*
- *Maintenance Instructions*
- *Installation Instructions*
- *Site Analysis Guides*
- *Diagrams.*

Price $30.00

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This product generates and uses radio frequency energy. It has been tested and verified that it complies with the limits for the Code of Federal Regulations (CFR) 47, Part 15 — Radio Frequency Devices, Subparts A — General and B — Unintentional Radiators issued by the Federal Communications Commission for Class "B" digital devices. If, however, the product causes radio or television interference, notify:

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130 Main Street
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Contents

1. Product Description

GE's I-210 meter is an electronic singlephase electricity meter. It measures active energy (kWh). The I-210 has two major components - a base and an electronic module. The electronic module assembles to the base. The base assembly contains a precision current transformer that senses the current. The electronic module has the metering circuitry that enables energy accumulation and contains calibration information.

Figure 1-1: I-210 Electronic Singlephase Meter

1.1 General Information

The I-210 meter measures kWh energy and is rated as an ANSI C12.20 class 0.5 meter. However, it is expected that accuracy under many operating conditions and loads will typically be within 0.2%. The meter is configured at the factory. Resetting energy is accomplished with GE's MeterMate software (Version 5.1 or greater) and a reset adaptor that mounts over the cover.

1.1.1 Physical Description

The I-210 meter uses a polycarbonate cover. The cover is molded in one piece.

The meter base assembly contains the current transformer.

The Liquid Crystal Display (LCD) indicates energy consumption and optionally, instantaneous power and a display segment check. The display is covered in detail in Chapter 2, Operating Instructions. The 5 large characters of the LCD display alphanumeric information.

A configuration port is located at the 3 o'clock position of the meter face. The factory uses the configuration port to configure the meter for a specific application. It is also used in conjunction with a reset adaptor and MeterMate software to reset accumulated energy to zero.

1.1.2 Meter Forms

The I-210 meter is available in several variants, which can be selected depending upon the application. The ANSI Standard S Base (socketed) Meter Forms are shown in Table 1-1 and the Non-ANSI Meter Forms without test links are shown in Table 1-2.

1.1.2.1 ANSI Standards

The performance of the I-210 meter meets or exceeds the following industry standards: ANSI C12.1, C12.10, C12.20, and all standards incorporated by reference.

Table 1-1. ANSI Standard Meter Forms

Form	Wires	Circuit	Elements	SC/TR	Class (Amps)	Voltage Rating (Volts)
1S	2	1Ø	1	SC	100	120
1S	2	1Ø	1	SC	100	240
2S	2	1Ø	1	SC	100	120
2S	3	1Ø	1	SC	100	240
2S	3	1Ø	1	SC	200	240
2S	3	1Ø	1	SC	320	240
3S	2	1Ø	1	TR	20	120
3S	2	1Ø	1	TR	20	240
4S	3	1Ø	1	TR	20	120
4S	3	1Ø	1	TR	20	240

Table 1-2. Non-ANSI Standard Meter Forms (Without Test Links)

Form	Wires	Circuit	Elements	SC/TR	Class (Amps)	Voltage Rating (Volts)
2S w/o Test Link	3	1Ø	1	SC	320	240
2S w/o Test Link	3	1Ø	1	SC	200	240

1.1.3 Physical variants:

The basic physical description of the meter and available S base forms have been described above. The table below provides information regarding the test constants and starting watts for each configuration. Additional information on some of these values follows.

Table 1-3. Meter Configuration Data

Form	Class	Volt	Kt (watthour)	Kh (watthour)	Starting Watts
2S	320	240	2.0	20.0	8
2S	200	240	1.0	10.0	5
2S	100	240	0.5	5.0	2.5
2S	100	120	0.25	2.5	1.25
1S	100	240	0.5	5.0	2.5
1S	100	120	0.25	2.5	1.25
3S	20	240	0.1	1.0	0.5
3S	20	120	0.05	0.5	0.25
4S	20	240	0.1	1.0	0.5
4S	20	120	0.05	0.5	0.25

1.1.3.1 Voltage ratings

Meters are available that operate at a single nominal supply voltage of 240 or 120 VAC +10% -20%, meeting ANSI accuracy class 0.5 requirements. The operating voltage must be specified when the meter is ordered.

1.1.3.2 Test Amp Rating

The test amp (design full load value) value for each Class are shown below:

- 50 Amps for Class 320
- 30 Amps for Class 200
- 15 Amps for Class 100
- 2.5 Amps for Class 20

These values are traditionally the current value used in conjunction with the rated nameplate voltage to conduct the “Full Load” and “Lag” calibration tests. It is printed on the nameplate and referred to as “TA”.

1.1.3.3 Frequency

The meter operates and correctly measures energy associated with 50 or 60 Hz electrical systems. Meter operation frequency must be specified when the meter is ordered.

1.1.3.4 Temperature

The meter will withstand and operate properly through temperature variations from –40°C to +85°C. The LCD display may cease to function at temperatures below -30°C and above +80°C. The meter will also withstand storage temperatures ranging from -40°C to +85°C.

1.1.3.5 Typical Watts Loss

The typical Watts loss will be 0.5W.

1.1.3.6 Weight

The weight of the meter with a polycarbonate cover is 1.7 lbs. The weight with a glass cover is 2.7 lbs.

1.2 Normal Operating Mode

The I-210 meter accumulates and displays kWh. The I-210 meter provides various features, some of which are configurable at the factory.

- kWh energy measurement can be accumulated in 4 ways:
  1. Received Only: Only the received energy is accumulated as a positive quantity
  2. Delivered Only: Only the delivered energy is accumulated
  3. Delivered + Received: The received and delivered energy are added together.
  4. Delivered - Received: The net energy is accumulated.
- Display of Energy configurable for 4 or 5 digits
- Disk Analog functionality on LCD - The disk analog is simulated on the display as explained in Chapter 2.
- Delivered and Received indicators on LCD
- Factory settable option of Instantaneous Power may be displayed on the LCD
- Optional segment check configured at factory (in addition to the segment check that is performed on power up and every 24 hours)
- Reset energy to zero in field - The customer can reset the energy accumulation to zero on site with MeterMate Software and a reset adaptor.
- Simple energy rollover - The energy will rollover from 99999 to 00000 or from 9999 to 0000 if four-digit display is selected.

1.2.1 On site user features

1.2.1.1 Operation

The I-210 meter has many features for ease of use on site.

- Nameplate and label information
- Numeric display with key annunciators
- Several display parameters including Energy accumulation, Instantaneous power, Delivered/Received indication and Disk analog.

These features are described in detail in Section 2, “Operating Instructions” of this manual.

1.2.1.2 Maintenance

Maintenance instructions are covered in Section 3 of this manual.

1.3 Software Tool (For Energy Reset)

The I-210 is supported by the MeterMate™ Software (Version 5.1 or greater), which facilitates the resetting of the energy accumulation to zero. Refer to Reading and Programming Instruction manual for MeterMate (GEH-5082E & GEH-5084E MeterMate MMCOMM Instructions book).

There is a reset adaptor that is available, part number 103X163001. The adaptor fits over a polycarbonate or glass cover and has a D-ring connector aligned with the configuration port to accommodate a SmartCoupler connection.

1.4 Technical Information

This section contains the theory of operation and general circuit configuration of the GE I-210 Meter.

1.4.1 Theory of Operation

The theory of operation of Single Phase I-210 meter is explained in conjunction with the block diagram shown in Figure 1-2.

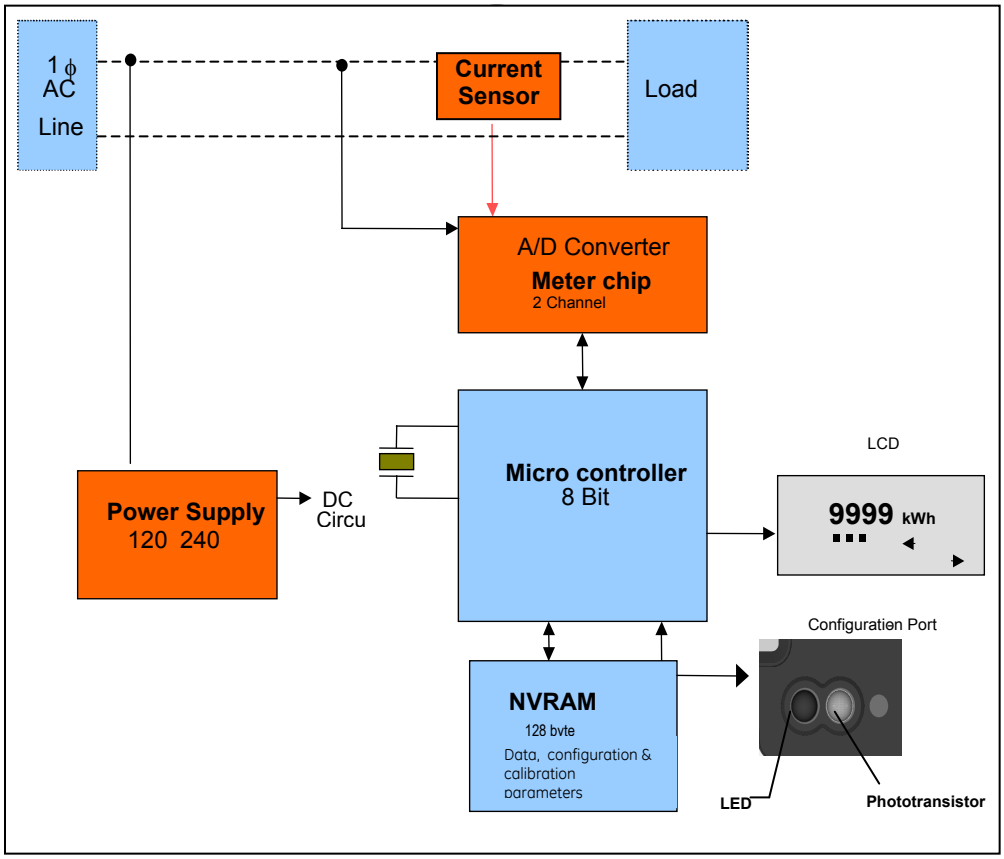


Figure 1-2 I-210 Meter Block Diagram

1.4.1.1 Sensing Devices

A current transformer that feeds the scaled current signals to the meter chip senses current. The voltage signal is scaled for measurement using a precision resistor divider circuit.

1.4.1.2 Meter Chip

The Meter chip contains two independent, fully integrated analog-to-digital converters, one for the current signal and one for the voltage signal. The meter chip integrates the product of voltage and current over small intervals and also accumulates the energy in a register.

1.4.1.3 Microcontroller

The microcontroller is an 8 bit single chip. It reads the accumulated energy over momentary intervals from the meter chip and maintains the energy consumption for display. It uses the non-volatile memory on the board to store the metered data and metering parameters.

1.4.1.4 Non-volatile Memory

The I-210 meter is equipped with a non-volatile memory that is used to store the metered data, calibration parameters, configuration constants and the program parameters. The non-volatile memory does not require a battery to retain information when line power is not present.

1.4.1.5 Power Supply

The I-210 Meter is powered from the line voltage. It has an operating range of –20% to +10% of rating. Versions are available for either 50 Hz or 60 Hz operation as specified at time of order.

2. Operating Instructions

2.1 Nameplate Information and Labels

See Figure 2-1 for a graphic representation of the meter nameplate. The meter nameplate is found on the front of the meter.

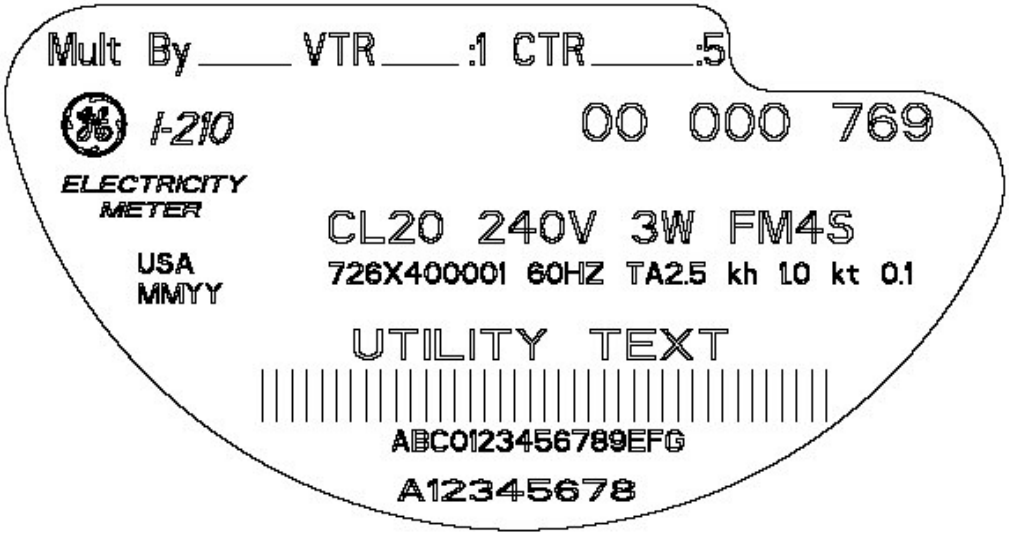


Figure 2-1. Meter Nameplate

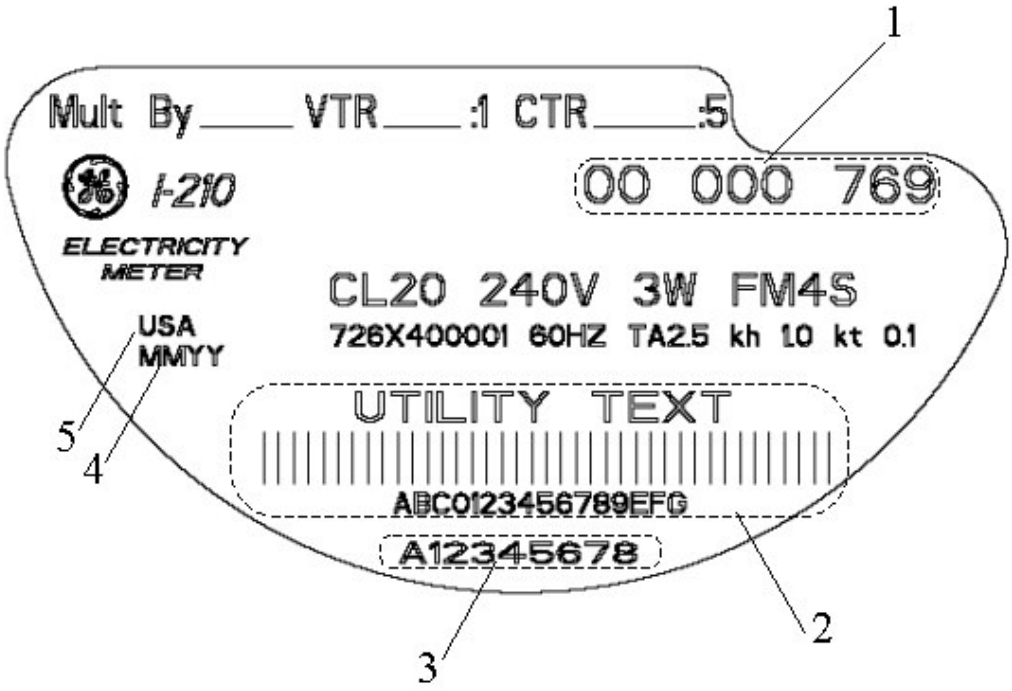


Figure 2-2. Nameplate Information

2.1.1 Nameplate Information

The nameplate information is shown in Figure 2-2. The following numbered list coincides with the numbers in the figure.

1. Meter serial number
2. Utility information and bar code area
3. AMR ID
4. Month and two digit year of manufacture
5. Assembly location

2.1.2 Nameplate Information

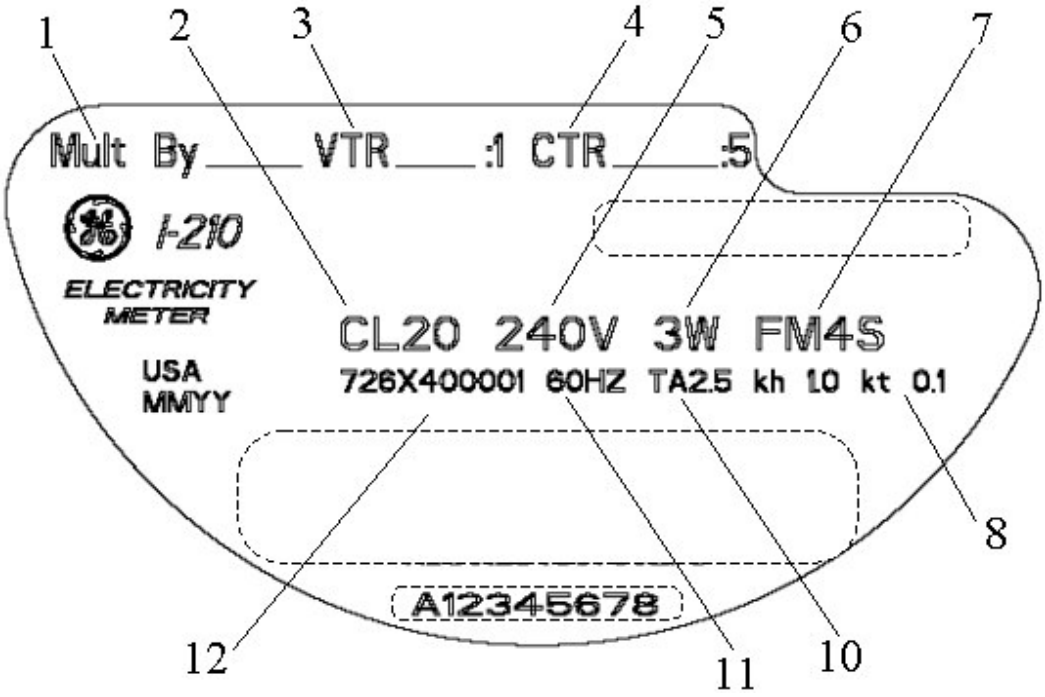


Figure 2-3: Nameplate

The numbered list below coincides with the numbers in Figure 2-3.

1. Multiply by constant
2. Current Class
3. Voltage Transformer Ratio
4. Current Transformer Ratio
5. Nominal Voltage
6. Number of wires for the metered service
7. ANSI C12.10 Form Number
8. Watthour test constant
9. Primary Watthour constant
10. Test amperes
11. Nominal Frequency
12. Catalog number

2.2 Display Information

The Liquid Crystal Display (LCD) indicates energy consumption and instantaneous power.

Display Item

Quantities
- **Energy in kWh**
- **Instantaneous Power**

Segment Check

Real Time Indicators
- **Watthour Disk Emulator**
- **Energy Direction (Delivered/Received) with Indicator Arrows**

Static Indicators
- **kWh**

2.2.1 Normal LCD Display Characteristics

In Normal Display mode, the meter display is always visible. Normal Display items are selected by the customer at the time of ordering the meter and are loaded into the meter at the factory.

The display segments are illuminated when the meter powers up and every 24 hours when the meter stores information to NVRAM. All of the annunciatiors are illuminated and 8 is displayed in each of the kWh display positions.

2.2.1.1 Energy (kWh)

The I-210 displays the energy accumulated in the top row of the LCD. The customer has an option, at the time of ordering, to select 4 or 5 digit display of the accumulated energy. This is settable only at the factory. The LCD also has an annunciator, **kWh,** (under the kWh display and to the right) which is displayed whenever energy is indicated. The energy display is refreshed every 5 seconds.

2.2.1.1.1 Accumulation Mode

The energy accumulation depends on the energy direction and the mode that is selected.

If the energy is continuously delivered, the energy accumulated will progress from zero to 99999(or 9999 for four digit display) and the energy will rollover to 00000 after 99999 (or 9999 for four digit display).

If the energy is continuously received, the energy accumulated, will decrement from 99999 (or 9999 for four digit display) to 0 and the energy will roll down to 99999(or 9999 for four digit display) after 0.

2.2.1.1.2 Available Accumulation Modes

Delivered plus Received Energy: The magnitudes of the delivered energy and received energy are added together. This mode of operation is often referred to as "unidirectional" because the meter registration will always be positive, regardless of the direction of energy flow. This accumulation mode may deter tampering by meter inversion. This mode is enabled by default if the accumulation mode is not specified when the meter is ordered.

Delivered Only Energy**:** Only delivered energy is accumulated. Received energy is not accumulated.

Received Only Energy: Only received energy is accumulated as a positive quantity. Delivered energy is not accumulated.

Delivered – Received Energy: The received energy is subtracted from the delivered energy. This mode of operation is often referred to as "net energy".

Note that for the first three modes of operation the accumulation is always positive. The displayed kWh never decrements and can not underflow zero.

2.2.1.2 Instantaneous Power

The I-210 can be configured to display instantaneous power in the lower row of the LCD. This value is refreshed every second. The customer has an option of whether the meter should display instantaneous power or not. The Instantaneous Power has a real time indicator, **kW,** which is displayed whenever the instantaneous power value is displayed. The instantaneous power display is auto-ranging to display the most appropriate precision for the current load conditions.

2.2.1.3 Segment Check

The I-210 can also be configured to display a segment check. When configured to do so, the kWh value and the segment check alternate on the top row of the LCD. Each of these items is displayed for a fixed number of seconds (4 seconds for utilities in the United States; 6 seconds for utilities in Canada). The display is blank for 0.5 seconds in between these two items. The following display items are illuminated for the segment check: eights in the kWh display, the minus sign (-) in front of the kWh display and the kWh annunciator.

2.2.1.4 Real Time Watthour Disk Emulator

The I-210 meter display contains a three-segment real-time disk-analog display (caterpillar) that is intended to emulate the motion of an electromechanical meter disk. The states of the disk-analog display are sequenced to give the appearance of left-to-right motion of the disk timing mark when the energy flow is in the "delivered" direction. The apparent direction of motion will reverse when energy flow is in the "received" direction regardless of the energy accumulation option that was selected. The Delivered and Received annunciators will also indicate the direction of energy flow.

The disk-analog completes one apparent revolution when the meter accumulates Kh watthours. This is consistent with the meaning of Kh used in electromechanical watthour metering.

The disk-analog simulates motion by sequencing through a series of related display states to animate the display. The disk-analog display will advance by one display state whenever the meter generates a test pulse (i.e. Kt watt-hours are accumulated). So the Kh of the disk analog and the Kt of the test pulse are always related in the I-210 meter by the expression Kh = 10 * Kt.

The values of Kh and Kt were chosen for the available forms of I-210 to provide a consistent rate of rotation for all meter types operating at the same percent of class rating. For example,

the apparent rotation rate will be the same for a class 200 meter and a class 20 meter, each running at Test Amps.

Because the disk-analog is a real-time display it can be used in conjunction with a stopwatch to estimate the current meter load. In addition, if you have enabled the instantaneous power display, this information is accurately reported in numeric form by the instantaneous kW display of the I-210 meter.

The diagram below illustrates the display states of the watthour disk emulator. The disk analog has 10 states, 5 of which are invisible. The following diagram shows what you will see on the display and what it represents in watthours when Kt equals 1 and energy is being delivered. Each state represents 10% of the Kh value. The flow of the disk indicators is from right to left when energy is being received. Refer to Section 1.1.3 for Kt values.

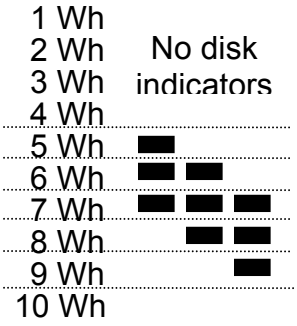


Figure 2-4. Disk analog operation when Kt equals one and energy is delivered.

2.2.1.5 Real Time Energy Direction Indicators

The meter LCD has a method of indicating the positive or negative nature of energy accumulation relative to normally correct meter installation. The two arrows combined with the textual indicators “Received” and “Delivered” indicate whether the energy accumulated is delivered to the load or received from the load. The right pointing arrow will illuminate when energy accumulation is positive (delivered) along with “Delivered” text. The left pointing arrow will illuminate when the energy is negative (received) along with “Received” text. If the energy is not above the anti-creep threshold, both indicators will be displayed without any text.

2.2.2 Liquid Crystal Display Information

The liquid crystal display (LCD) is shown. The numbered list coincides with the numbers in Figure 2-5.

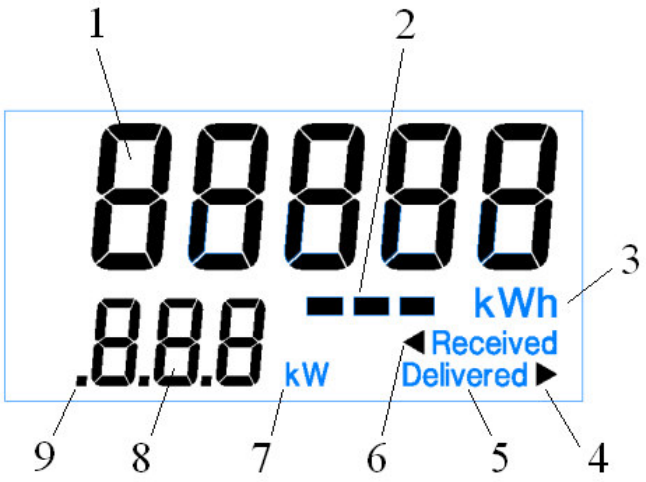


Figure 2-5 Liquid Crystal Display Information

1. These characters display alphanumeric quantities
   a. The kWh energy value is displayed during normal operation
   b. "ERROR" is displayed if the meter detects an error that could affect the metering data.
   c. If the optional segment check is enabled, the following will be illuminated: eights in the kWh display, the kWh annunicatior and the minus sign (-) that is to the left of the kWh display.
2. These are the disk analog blocks to indicate the percentage of energy accumulated in comparison to the Kh value.
3. The kWh annunciator
4. When displayed, this arrow indicates energy is being delivered to the load
5. Text annunciators to indicate whether energy is being delivered to load or received from load
6. When displayed, this arrow indicates energy is being received from the load.
7. The kW annunciator is on when the instantaneous power reading is displayed by the meter
8. If enabled, the instantaneous power reading is displayed on the LCD during normal operation. "ERR" is displayed in this area if an error is detected during the self-test operation
9. Decimal Point indicator is active when floating values of instantaneous power are displayed. The auto-ranging kW value can be displayed as:
   XX.X
   X.XX
   .XXX

3. Maintenance Instructions

WARNING: The information contained within this document is intended to be an aid to qualified metering personnel. It is not intended to replace the extensive training necessary to install or remove meters from service. Any work on or near energized meters, meter sockets, or other metering equipment presents the danger of electrical shock. All work on these products must be performed by qualified industrial electricians and metering specialists only. All work must be done in accordance with local utility safety practices and the procedures outlined in the current edition of the Handbook for Electricity Metering. The handbook is available from the Edison Electric Institute, 701 Pennsylvania Avenue N.W., Washington D.C. 20004-2696.

3.1 Test Procedures

The procedures described below are suggested test procedures for use with the I-210 meter. They are not intended to supercede or replace local utility operating practices.

3.1.1 Meter Testing Tools

The meter is equipped with a light-emitting diode (LED) for verifying calibration and a liquid crystal display with disk analog. The calibration LED is part of the configuration port as shown in Figure 3-1.

3.1.1.1 Calibration LED

The Infra-Red LED emits optical pulses proportional to kWh accumulation. The output of the calibration LED is compatible with commercially available test equipment designed to verify the calibration of watthour meters in the shop and field. Each calibration pulse represents Kt watthours of energy accumulated by the meter. The duration of each output pulse is approximately 25 milliseconds.

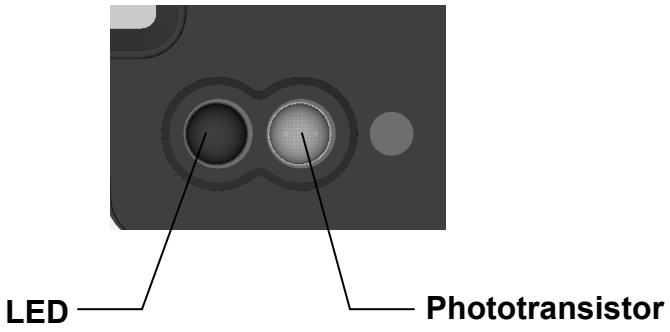


Figure 3-1: Configuration Port

3.2 Field Accuracy Test

The most accurate way to verify meter calibration is the use of test equipment designed to compare the meter accumulation to a precision watthour standard. This equipment uses the calibration pulse output from the meter to gate (start and stop) the standard at precise times

to minimize the measurement uncertainty. The equipment will also typically provide known regulated loads to the meter and standard during the test. In the event such equipment is not available, the I-210 meter provides two methods for making a reasonable verification of the meter's accuracy.

1. Disk analog testing
2. Instantaneous demand feature of the I-210

3.2.1 Disk Analog Testing

The disk analog provides a means of checking the calibration of the meter. There are some practical limits to this method of testing. For example, if the load on the meter is very low, the test may take a long time. Conversely, if the load is high, it may be difficult to accurately time the apparent revolutions of the disk analog display.

For a complete description on the operation of the disk analog feature of I-210, refer to section *2.2.1.1.4 Real Time Watthour Disk Emulator*.

If a load is applied to the meter in service that is constant and reasonably well known, the accuracy of the meter can be estimated using the time-Watts method of testing. Since the apparent revolution of the disk analog is equal to the meter Kh, the amount of time required to accumulate a fixed quantity of energy can be timed with a stopwatch. By observing the disk analog display, the user can time the apparent revolutions by starting and stopping the watch when the disk analog has cycled through the required number of revolutions back to its beginning state.

The accumulation in Wh divided by the accumulation time (in hours) will give a value in Watts that can be compared to the known value of the load to estimate the meter accuracy.

(Meter Kh * number of revolutions) / (t seconds / 3600) = Metered load in Watts

This method of testing is only applicable to providing a rough estimate of the meter performance since the actual load in operation is not normally known with a high degree of precision.

A more accurate field test of meter calibration can be performed using a reference watthour standard and a controlled load as described above. If the reference standard does not support an interface (optical pickup) for the calibration LED it is often possible to gate the reference standard manually using a switch.

1. Connect the portable standard and test load to the meter according to the wiring instructions provided by the test equipment manufacturer.
2. Reset the standard and apply an appropriate test load. A nominal Test Ampere rating (TA) is indicated on the meter nameplate
3. Observe the disk analog. One complete apparent revolution of the disk analog display represents Kh Watthours as accumulated by the meter (The Kh value is printed on the meter nameplate.)
4. When the disk analog appears to transition off of the visible display start the standard manually.
5. Let the disk analog scroll through a predetermined number of evolutions (10, for example).

6. Stop the standard manually when the disk analog transitions off of the visible display after the required number of apparent revolutions are complete.
7. Calculate the accumulated Watt-hours as shown in the following equation.

$$Accumulated\ Energy = (Kh) \times (the\ number\ of\ complete\ disk\ analog\ cycles)$$

8. Compare the results of the calculation to the reading on the reference standard.

The human reaction time in starting and stopping the reference standard is a significant source of measurement uncertainty when using this test technique. Increasing the number of apparent disk revolutions per test can reduce this uncertainty.

3.2.2 Instantaneous Power Testing

When enabled, the I-210 displays instantaneous power with kW indicator in the lower row of the LCD. The instantaneous power indication is useful for making a rough estimate of meter performance by comparing the displayed power to the expected load on the meter. The result is similar to the time-Watts test method and depends upon reasonably knowing the applied load and upon the displayed precision of the result. Because the display is auto-ranging, at low loads the displayed precision can differentiate a load variation of a few watts of power. The instantaneous power value may be useful for resolving customer questions about meter performance since no computation is necessary to obtain meaningful data. The value is also useful to service personnel for providing immediate data on the applied load.

3.3 Shop Test

Shop testing consists of verifying the meter's accuracy.

3.3.1 Meter Shop Equipment

The I-210 meter has a capacitive type power supply designed to operate at a single nominal supply voltage. The low burden design of the I-210 should be compatible with most commercially available test equipment. Meters may be tested in any shop that meets the requirements outlined in the current editions of the *Handbook for* Electricity Metering published by the Edison Electric Institute and the American National Standard Code for Electricity Metering.

3.3.1.1 Equipment Setup

The meter mounting equipment and its electrical connections must be used as required for the meter form number on the meter nameplate. For some test equipment, the meter test link(s) must be opened in order to isolate the meter voltage and current circuits. Refer to the instructions provided by the test equipment manufacturer to determine if this is necessary. The I-210 meter is also available in non-standard forms without test-links where improved reliability and/or tamper resistance is desired.

3.3.1.2 Testing

The Watthour constant (Kh) of a meter is defined as *Watthours per disk revolution*. Because electronic meters do not rely on disk revolutions to measure energy, the revolutions of the disk analog, described in Section *2.2.1.1.4 Real Time Watthour Disk Emulator*, are associated with Kh. Kh is printed on the meter label as a reference to an equivalent electromechanical meter as required by applicable meter standards.

3.3.2 Test Constant

The meter test constant (Kt) is the number of Watthours per calibration pulse. Typically the I-210 Meter is tested like an electromechanical meter. An optical pickup is typically used to gate a reference standard based upon a fixed accumulation in the meter as indicated by some quantity of output calibration pulses. Because the pulse-gating method has a very low measurement uncertainty, good results can be obtained in relatively short test times. In the I-210 meter the Kt value is always fixed at one-tenth the value of Kh. Values of test constants are shown in the table 3-1 below for various meter forms.

Table 3-1 Meter Configuration Data

Form	Class	Volt	Kt (Watthour)	Kh (Watthour)	Starting Watts
2S	320	240	2.0	20.0	8
2S	200	240	1.0	10.0	5
2S	100	240	0.5	5.0	2.5
2S	100	120	0.25	2.5	1.25
1S	100	240	0.5	5.0	2.5
1S	100	120	0.25	2.5	1.25
3S	20	240	0.1	1.0	0.5
3S	20	120	0.05	0.5	0.25
4S	20	240	0.1	1.0	0.5
4S	20	120	0.05	0.5	0.25

3.3.3 General Watthour Meter Test Procedure

To test the meter, proceed as follows:

1. Note the meter Kt value listed on the nameplate.
2. Select the desired voltage and current level(s) on the test equipment. Observe the appropriate voltage and current ratings for the Device Under Test. Exceeding the device ratings can result in permanent damage to the meter.
3. Install the meter in the test socket, making certain that the socket is wired and/or configured for the appropriate meter form.
4. Align the optical pickup of the test equipment with the calibration LED.
5. Begin testing according to standard test procedures. Allow 15 seconds of settling time after applying voltage before making accuracy measurements.
6. Under typical test conditions a minimum test time of 30 seconds is needed to reduce test uncertainty to a level compatible with the accuracy of the I-210 meter. (Check the instruction book for your test board or standard to determine the actual minimum test time.)

3.4 Service

The GE I-210 Meter is factory calibrated and requires no routine or scheduled service by the user.

3.5 Repair

Factory repair or replacement service is offered when you cannot fix a problem. If a problem can't be corrected, return the whole meter to General Electric as described in the following paragraph.

3.6 Returning a Meter

If you wish to return a meter, call your General Electric sales representative for a Return Authorization. The entire meter should be returned with the GE supplied Return Authorization information form completed. Key information includes quantity, catalog number, serial number(s) and a complete description of the problem. Your General Electric sales representative will provide return instructions.

3.7 Cleaning

CAUTION	*Care must be taken during cleaning not to damage or contaminate any gold-plated contacts of the connectors.*
CAUTION	***Do not immerse the meter in any liquid.*** ***Do not use abrasive cleaners on the Polycarbonate covers.*** ***Do not use chlorinated hydrocarbon or ketone solvents on the covers.***

3.8 Storage

The I-210 Meter is a durable device; however, it should be handled and stored with care. The temperature and humidity levels in storage are not critical; but extremes of either factor should be avoided.

3.9 Troubleshooting Guide

Table 3-1 Troubleshooting

Symptom	Probable Cause	Remedy
High/low demand registration	a. Socket wiring error. b. Meter internal wiring defective. c. Defective sensor.	a. Rewire according to applicable diagram. b. Check that voltage and current connectors are seated properly. Check the leads for damage. c. Replace meter.
Meter overheats	a. Meter socket has insufficient capacity or is not adequately wired. b. Meter is overloaded. c. Poor connection at socket terminal.	a. Replace meter socket with a heavy-duty model. b. Use transformer rated installation. c. Replace socket terminal.
Meter runs slow	a. Socket wiring error. b. Meter internal wiring defective. c. Defective sensor.	a. Rewire according to applicable diagram. b. Check that voltage and current connectors are seated properly. Check the leads for damage. c. Replace meter.
No display	a. Circuit de-energized. b. Test link(s) open. c. Meter internal wiring defective.	a. Check circuit voltages. b. Close test links. c. Check that the voltage leads are properly connected. Also check the wires for damage.
ERROR message on display	a. Meter detected an internal condition that may affect the meter data.	a. Replace the meter and return to factory for service.

3.9.1 Self-Tests and Error Codes

The meter performs self-tests periodically. These self-tests are performed when the meter powers up and once every 24 hours thereafter. The current metering data is stored to non-volatile memory (NVRAM) prior to performing the periodic self-test. If the meter detects an error it will repeat the self-test every minute in order to attempt to recover from the condition causing the error. If the conditions causing the error clear, the meter will resume metering.

If an error occurs, the meter will display “ERROR” in the primary display along with the kWh value at the time the error occurred. The kWh value and “ERROR” will alternate on the display with a 3 second display time and a 0.5 second blank time between display items. The alternate display will also indicate “ERR” continuously. The disk analog display and the energy direction display will not be operational and the meter will not accumulate energy when an error is present.

An error display indicates a fault in an electronic subsystem of the meter and indicates a condition that is not user serviceable.

4. Installation Instructions

4.1 General

WARNING: The GE *I-210* meter contains lethal voltages. The meter should never be disassembled. Failure to observe this practice can result in serious injury or death.

CAUTION: Do not interchange base and electronics module assemblies between meters. Calibration data stored in meter is particular to a matched base assembly and electronics module. Interchanging these components causes the meter to lose calibration.

4.2 Meter installation

The meter is plugged into a meter socket using standard meter installation practices. The meter base has current and potential terminals extending outside from the back of the meter. These terminals engage with the socket jaws, which are connected to the service lines. The socket jaws provide heavy contact force with the help of spring. In some heavy-duty sockets, contact force is provided by a handle or wrench.

On powering-up the meter, verify meter operations by observing the display:

- For the first 3 seconds, the register displays an All Segment Test (all display items shown). If this all segment display is continued after 3 seconds then there is possibly an error in the installation wiring.
- LCD displays the correct number of digits (4 or 5) for Energy along with “kWh” annunciator.
- Verify the expected direction of energy flow on the display annunciators.

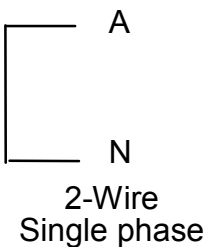
5. Site Analysis Guides

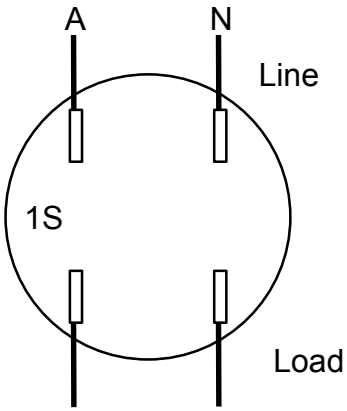
NOTICE:

These site analyses include rudimentary connection diagrams for identification of metering installation. *These diagrams are not metering installation guides.*

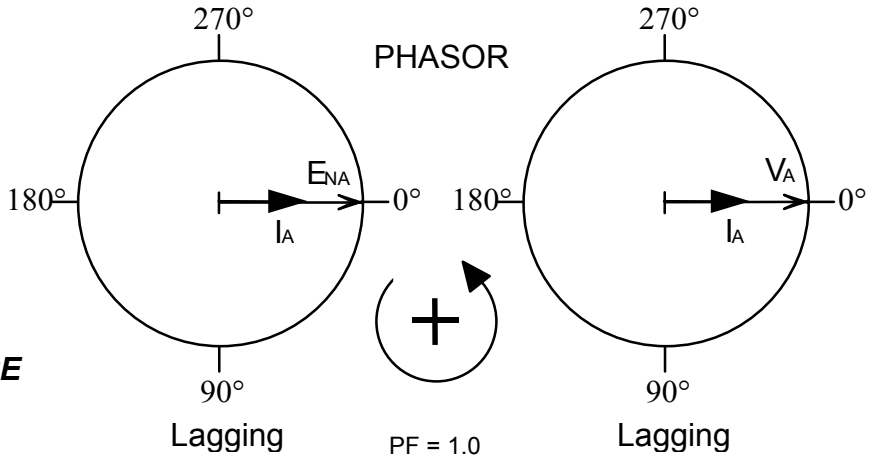
I210 Site Analysis

Form 1S *(Self-Contained)*





B LONDE solution L



SERVICE

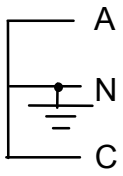
Actual installation procedures, equipment, and connections must conform to applicable codes and standards

2-wire, 1-phase, 1-element

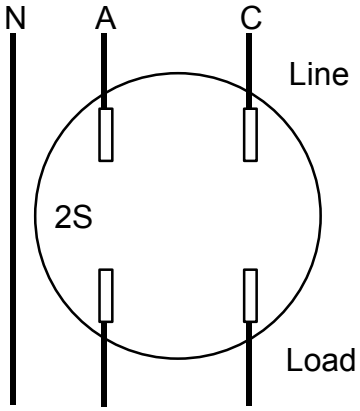
MO 3–5

I210 Site Analysis

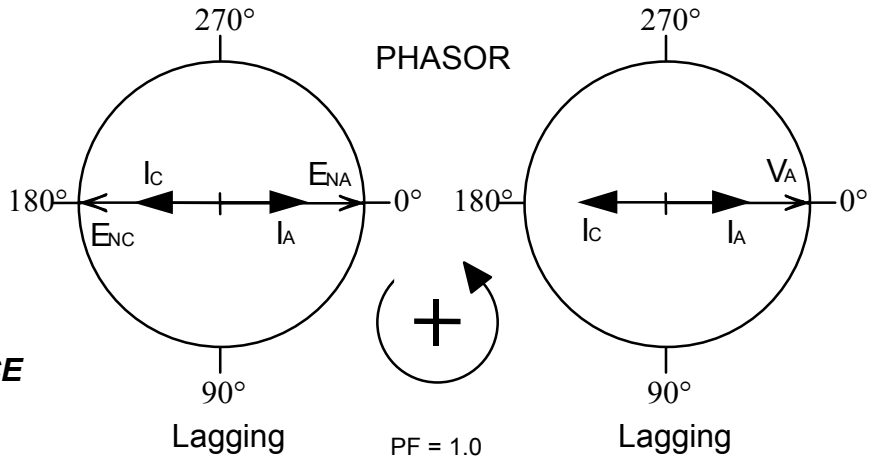
Form 2S *(Self-Contained)*



3-
Singlephase



Accuracy is based on assumptions which, if not fulfilled, may result in systematic errors unrelated to meter calibration.



SERVICE

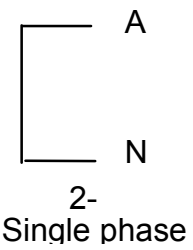
Actual installation procedures, equipment, and connections must conform to applicable codes and standards

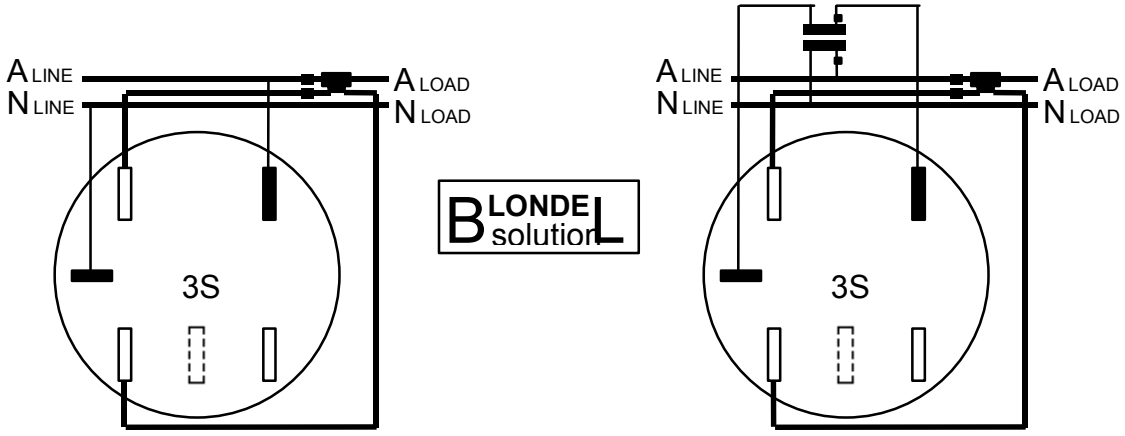
3-wire, 1-phase, 1-element

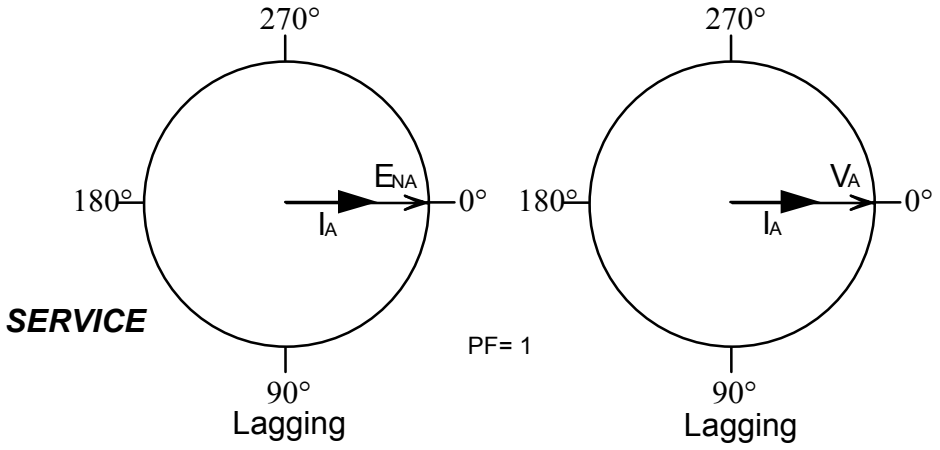
MO 2–1

I210 Site Analysis

Form 3S *(Transformer Rated)*







Actual installation procedures, equipment, and connections must conform to applicable codes and standards

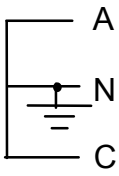
2-wire, 1-phase, 1-element

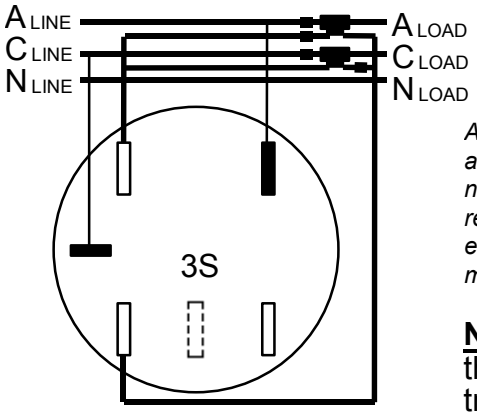
MO 3-5

I210 Site Analysis

Form 3S *(Transformer Rated)*

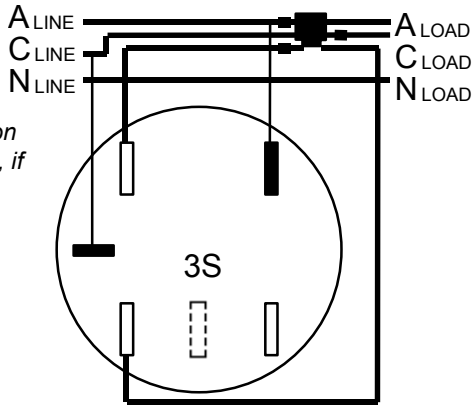
3-Singlephase

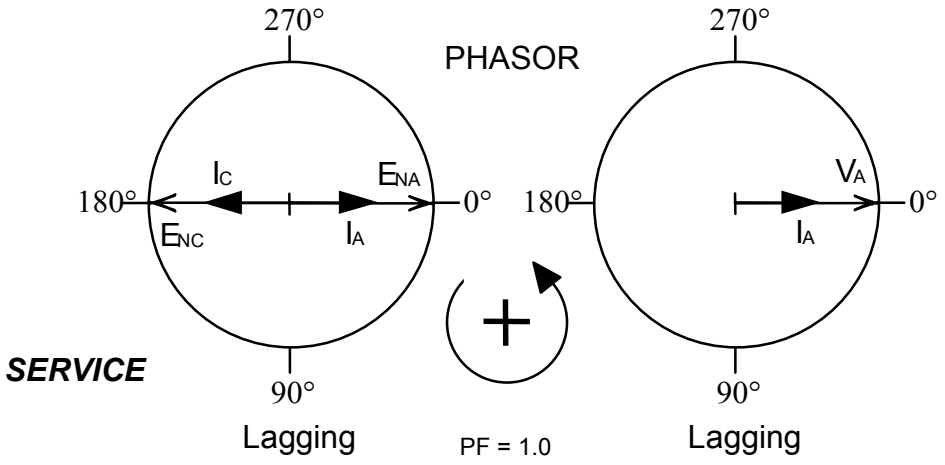




Accuracy is based on assumptions which, if not fulfilled, may result in systematic errors unrelated to meter calibration.

NOT: Use the CTs' ratio transformer in meter except for–wire CTs.





SERVICE

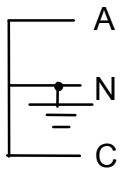
Actual installation procedures, equipment, and connections must conform to applicable codes and standards

3-wire, 1-phase, 1-element

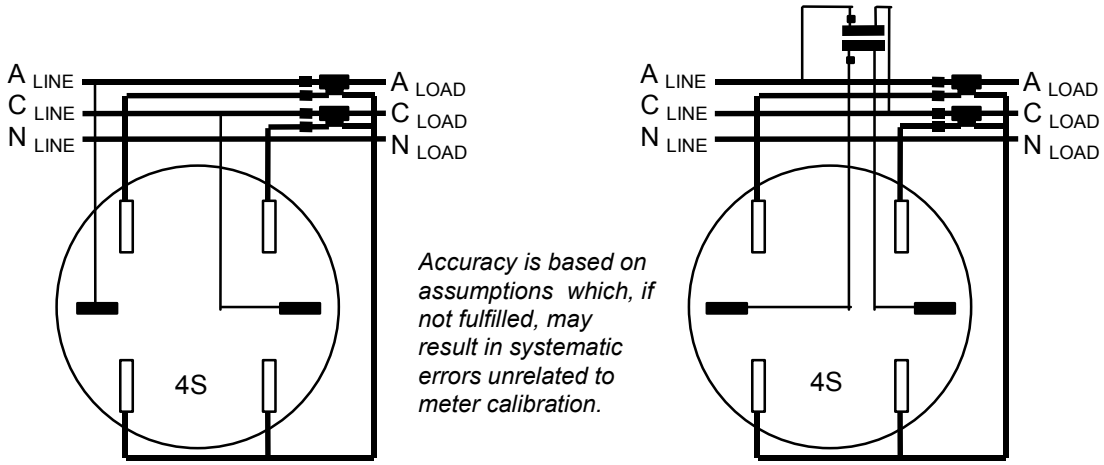
MO 3–5

I210 Site Analysis

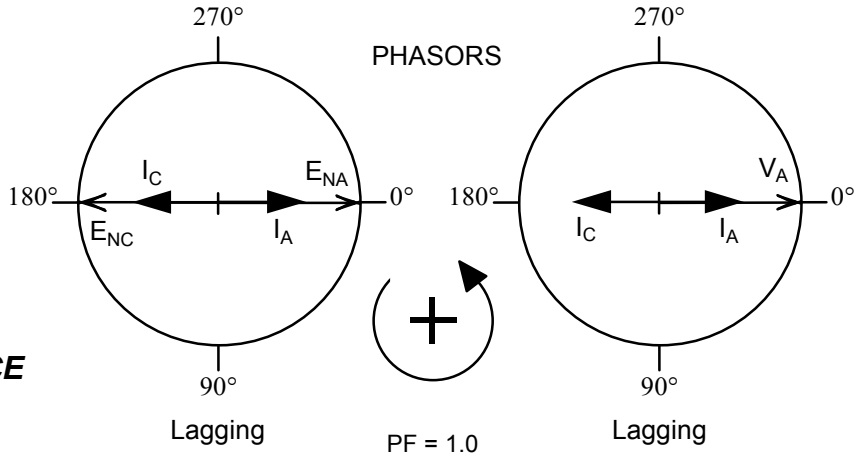
Form 4S *(Transformer Rated)*



3-Wire
Singlephase



Accuracy is based on assumptions which, if not fulfilled, may result in systematic errors unrelated to meter calibration.



SERVICE

Lagging

PF = 1.0

Lagging

Actual installation procedures, materials, equipment, and connections must conform to applicable codes and standards

3-wire, 1-phase, 1-element

MO 2–1

6. Diagrams

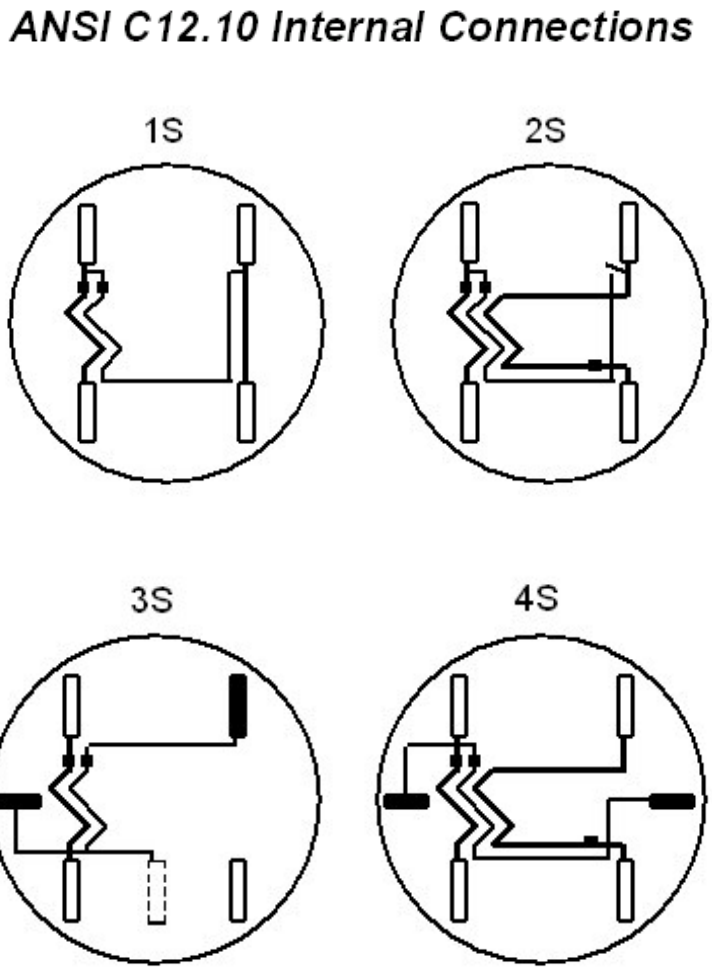
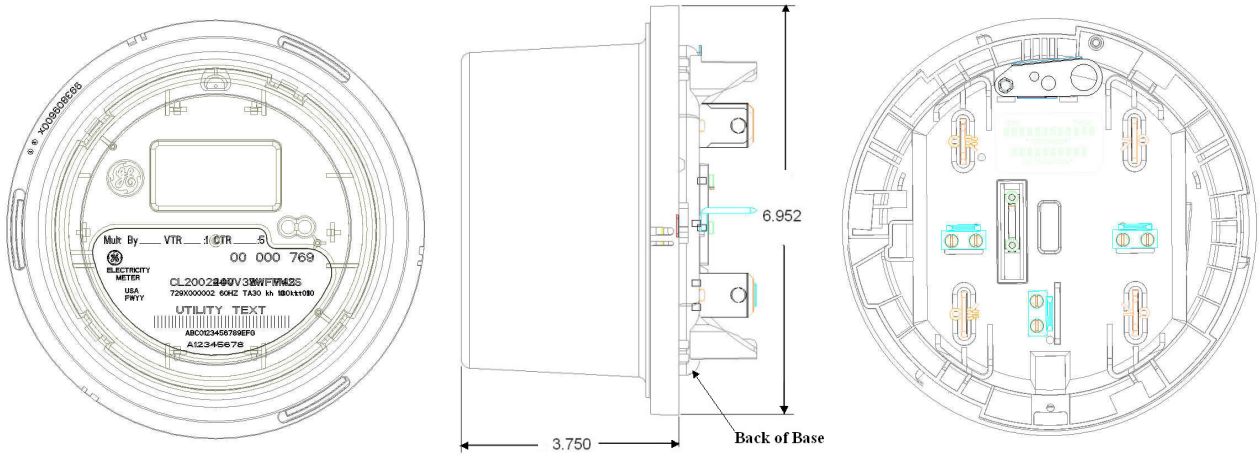


Figure 6-1 ANSI Meter Diagrams

Figure 6-2 Outline Drawings



7. Index