SBM 100

3-PHASE ENERGY SUBMETER
WITH DEMAND

Instruction Manual

Doc # E104720 V1.03
January 21, 2005

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"The Leader in Web Accessed Power Monitoring and Control"

Customer Service and Support

Customer service and support is available 9:00 am to 4:30 pm EST, Monday through Friday. Please have the model, serial number and a detailed problem description available. If the problem concerns a particular reading, please have all meter readings available. When returning any merchandise to EIG, a return authorization number is required. For customer or technical assistance, repair or calibration, call: 516-334-0870 or fax 516-338-4741.

Product Warranty

Electro Industries/GaugeTech warrants all products to be free from defects in material and workmanship for a period of four years from the date of shipping. During the warranty period, we will, at our option, either repair or replace any product that proves to be defective.

To exercise this warranty, fax or call our customer service department. You will receive prompt assistance and return instructions. Send the instrument, transportation prepaid, to EIG at 1800 Shames Drive, Westbury, NY 11590. Repairs will be made and the instrument will be returned.

Limitation of Warranty

This warranty does not apply to defects resulting from unauthorized modification, misuse or use for any reason other than electrical power monitoring.

OUR PRODUCTS ARE NOT TO BE USED FOR PRIMARY OVER-CURRENT PROTECTION. ANY PROTECTION FEATURE IN OUR PRODUCTS IS TO BE USED FOR ALARM OR SECONDARY PROTECTION ONLY.

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Statement of Calibration

Our instruments are inspected and tested in accordance with specifications published by Electro Industries/GaugeTech. The accuracy and a calibration of our instruments are traceable to the National Institute of Standards and Technology through equipment that is calibrated at planned intervals by comparison to certified standards.

Disclaimer

The information presented in this publication has been carefully checked for reliability; however, no responsibility is assumed for inaccuracies. The information contained in this document is subject to change without notice.

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CHAPTER 1
AC POWER MEASUREMENT

The economics of electric power distribution networking dictated several configurations of AC power transmission. These configurations are characterized by the number of phases and voltage levels.

1.1 SINGLE PHASE SYSTEM

SINGLE PHASE SYSTEM: A basic two wire system used in low power distribution applications, such as residential communities or offices. Typically, the voltage is 120V AC.

For higher power requirements, such as residential houses or small commercial facilities, the typical power configuration is two lines of 120V AC opposite in phase (See figure **1.1 B**).

This system produces 120 volts from line to neutral for lighting and small appliances use. The line to line voltage is 240V AC, used for higher loads such as water heaters, electric dryers, ranges, and machinery.

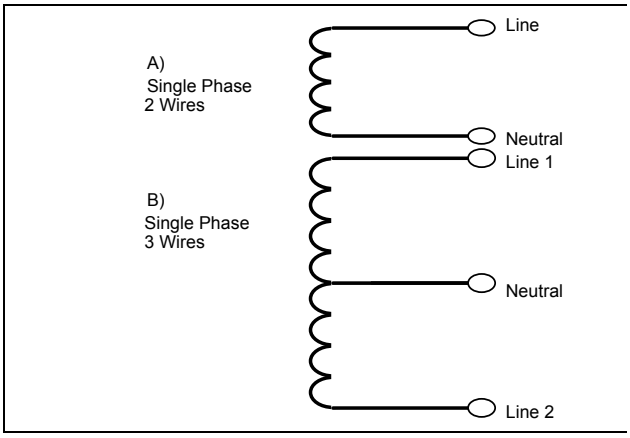


Figure 1.1
Single Phase System: (A) Two Wire
(B) Three Wire

The power (**W**) in a single phase system is: $W = E \cdot I \cdot \cos\Theta$
E = potential, **I** = current, and **cos**Θ = phase difference between the potential and the current.

Power in a 120/240V AC system is: $W = (E_{Line1} \cdot I_{Line1} \cdot \cos\Theta) + (E_{Line2} \cdot I_{Line2} \cdot \cos\Theta)$

Phase differential between the potential and the current results from a non-resistive load, either reactive or capacitive.

Reactive power **VAR**: The additional power consumed, that does not produce any work, but must be delivered to the load: $VAR = E \cdot I \cdot \sin\Theta$. This is a measure of the inefficiency of the electrical system.

Apparent power **VA**: The total power delivered to the load, and the vector sum of real power and reactive power. Figure 1.2 shows a triangle which is a graphic representation of the relationships between apparent, real, and reactive power.

Power Factor **PF**: The ratio between real power and apparent power: $PF = \frac{W}{VA} = \frac{W}{\sqrt{W^2 + VAR^2}}$

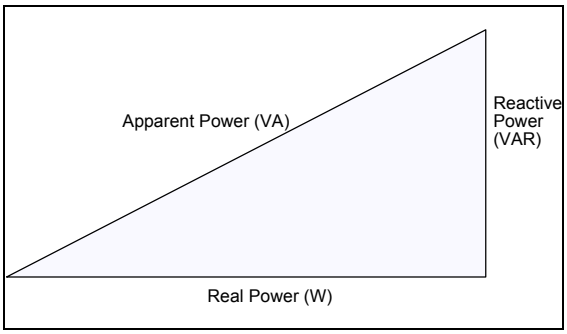


Figure 1.2

Ideal power distribution should have a PF of 1. This condition could be met only if there are no reactive power loads throughout the system. In real life applications, many loads are inductive loads. Often, corrective capacitors are installed to correct poor Power Factor.

1.2 THREE PHASE SYSTEM

THREE PHASE SYSTEM: Delivers higher levels of power for industrial and commercial applications; the three phases correspond to three potential lines. A 120° phase shift between the three potential lines.

A typical configuration has either a Delta connection or a Wye connection. (See in Figure 1.3).

$$E_{an} = E_{bn} = E_{cn} = \frac{E_{ab}}{\sqrt{3}} = \frac{E_{bc}}{\sqrt{3}} = \frac{E_{ac}}{\sqrt{3}}$$

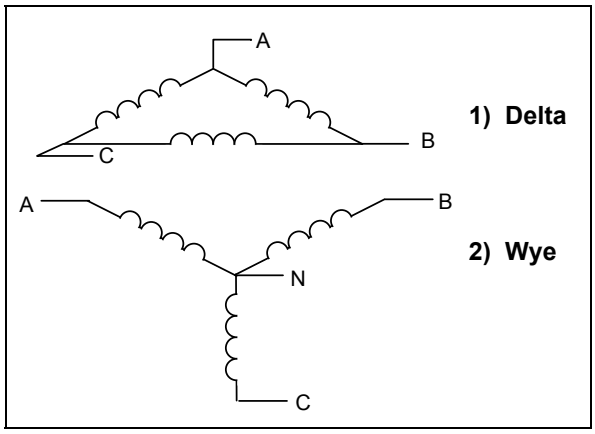


Figure 1.3
Three Phase System: 1) Delta
2) Wye

Voltages between the phases vary depending on loading factors and the quality of the distribution transformers. The three phase system is distributed in different voltage levels: 208V AC, 480V AC, 2400V AC, 4160V AC, 6900V AC, 13800V AC, and so on.

Power measurement in a poly phase system is governed by Blondel's Theorem. **BLONDEL'S THEOREM** states that in a power distribution network which has N conductors, the number of measurement elements required to determine power is N-1.

A typical configuration of poly phase system has either a Delta connection or a Wye connection. (See **Figure 1.4**).

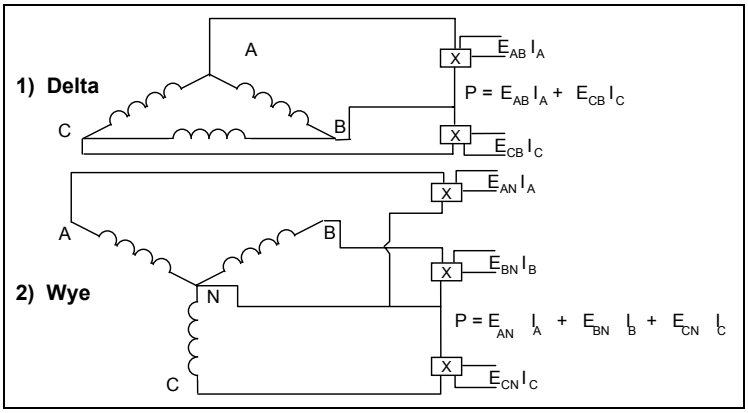


Figure 1.4
Poly Phase System: 1) Delta
2) Wye

1.3 CONSUMPTION, DEMAND AND POWER FACTOR LOSSES

The total electric energy usage over a period of time is the consumption **WH**.

CONSUMPTION: $H = W \cdot T$ **W =** instantaneous power **T =** time in hours

Typically, the unit in which consumption is specified is the kilowatt-hour (KWH). **KILOWATT-HOUR** : one thousand watts consumed over one hour. Utilities use the **WH** equation to determine the overall consumption in a billing period.

DEMAND: Average energy consumed over a specified time interval. The interval is determined by the utility; typically, 15 or 30 minutes. The utility measures the maximum demand over a billing period. This measurement exhibits a deviation from average consumption that may force the utility to provide generating capacity to satisfy a high maximum consumption demand. The highest average demand is retained in the metering until the demand level is reset.

POOR POWER FACTOR: Results in reactive power consumption. Transferring reactive power over a distribution network causes energy loss. To force consumers to correct their Power Factor, utilities monitor reactive power consumption and penalize the user for poor Power Factor. This is becoming an increasing problem.

1.4 WAVEFORM AND HARMONICS

Ideal power distribution has sinusoidal wave forms on voltages and currents. In real life application, where inverters, computers, and motor controls are used, distorted wave forms are generated. Those distortions consist of harmonics of the fundamental frequency.

SINUSOIDAL WAVEFORM: $A \cdot \sin(\omega \cdot t)$

DISTORTED WAVEFORM: $A \cdot \sin(\omega \cdot t) + A_1 \cdot \sin(\omega_1 \cdot t) + A_2 \cdot \sin(\omega_2 \cdot t) + A_3 \cdot \sin(\omega_3 \cdot t) + ...$

TOTAL HARMONIC DISTORTION (THD):

$$\%ofTHD = \frac{RMSofTotalHarmonicDistortionSignal}{RMSoftheFundamentalSignal} \cdot 100$$

HARMONIC DISTORTION: A destructive force in power distribution systems. It creates safety problems, shortens the life span of distribution transformers, and interferes with the operation of electronic devices.

CHAPTER 2
MECHANICAL INSTALLATION

These diagrams display the SBM 100 mechanical installation.

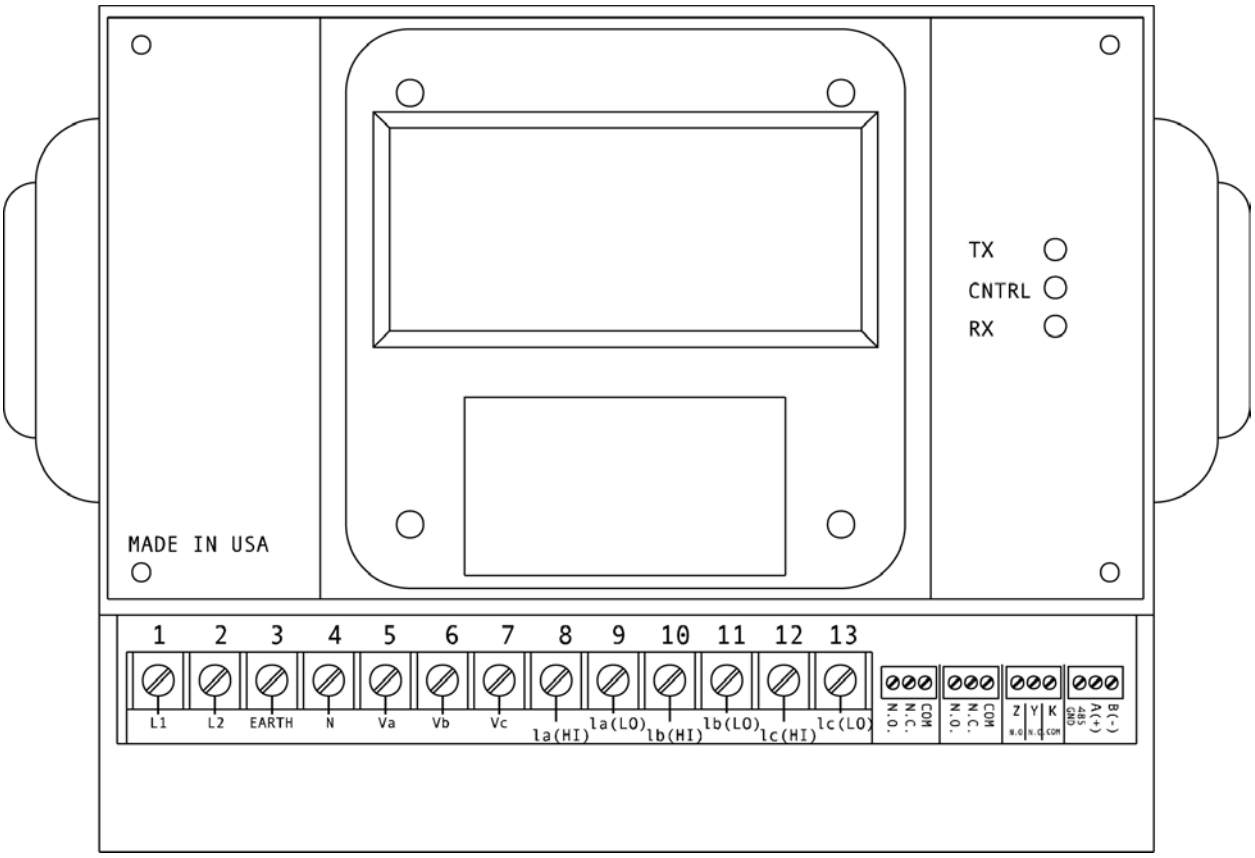


Figure 2.1 Face of the SBM 100 with lower cover removed.

NOTE: Mounting of the SBM 100 is very easy, because it requires no cutting. The meter is mounted with five screws and all wiring can be done through the front panel just below the face of the meter. Wiring can also be done through the back of the meter, if desired. The wiring will be described in the next chapter, Chapter 3.

NOTE: Dimensions of the meter are: 8.375"W x 7.125"H x 4.25"D.

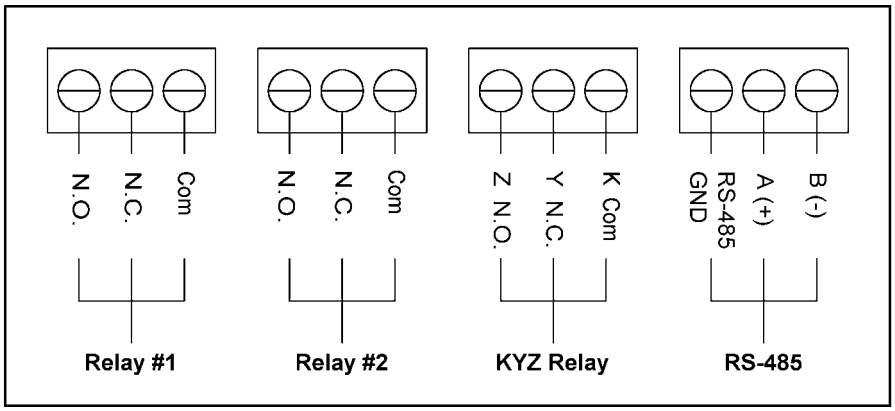


Figure 2.2 Relay Detail

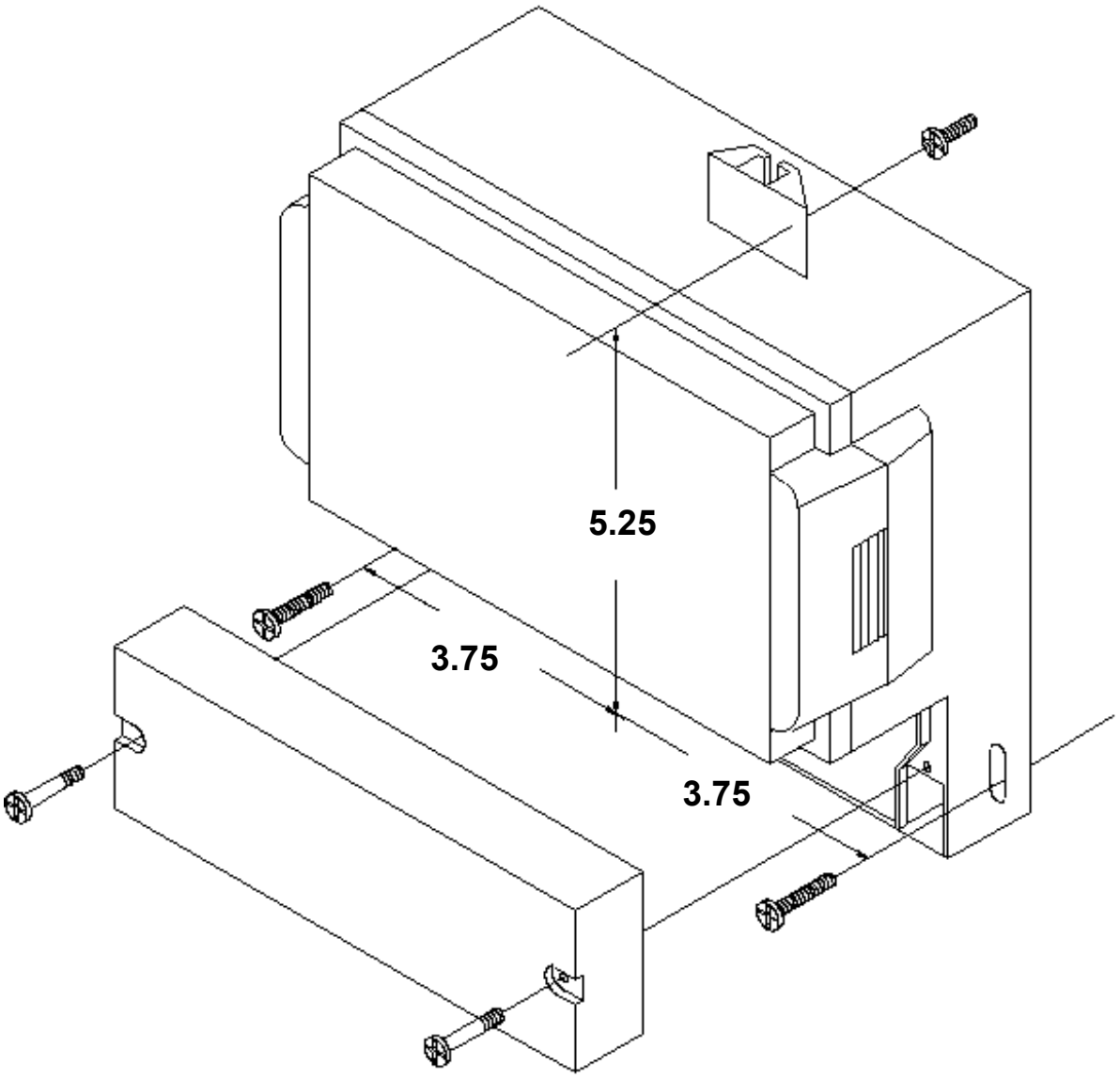


Figure 2.3 Mounting Detail for SBM 100.

NOTE: Mounting of the SBM 100 is very easy, because it requires no cutting. The meter is mounted with five screws as shown and all wiring can be done through a front panel just below the face of the meter.
All dimensions in the figure above are in inches.

CHAPTER 3
ELECTRICAL INSTALLATION

3.1 CONNECTING THE CURRENT CIRCUIT

Install the cable current at 600V AC minimum. The cable connector should be rated at 6 Amps or greater and have a cross-sectional area of 16 AWG.

Mount the current transformers as close as possible to the meter. The following table illustrates the maximum recommended distances for various CT sizes, assuming the connection is via 16 AWG cable.

CT SIZE (VA)	MAXIMUM DISTANCE (CT TO SBM 100)
2.5 VA	10 FEET
5.0 VA	15 FEET
7.5 VA	30 FEET
10.0 VA	40 FEET
15.0 VA	60 FEET
30.0 VA	120 FEET

WARNING: DO NOT LEAVE SECONDARY OF CT WHEN PRIMARY CURRENT IS FLOWING. THIS MAY CAUSE HIGH VOLTAGE WHICH OVERHEATS THE SECONDARY OF THE CT. IF THE CT IS NOT CONNECTED, PROVIDE A SHORTING BLOCK ON THE SECONDARY OF THE CT.

3.2 CT CONNECTION

If the SBM 100 is connected directly, maintain the exact connection to avoid incorrect polarity.

When the SBM 100 is connected using the CTs, it is imperative to maintain the correct CT polarities. CT polarities are dependent upon correct connections of CT leads and the direction that the CTs are facing when they are clamped around the conductors. The dot on the CT must face the line side and the corresponding secondary connection must connect to the appropriate pin. Failure to connect CTs properly results in incorrect Watt readings.

3.3 CONNECTING THE VOLTAGE CIRCUIT

For proper meter operation, the voltage connection *must* be maintained. The voltage must correspond to the correct terminal.

The cable required to terminate the voltage sense circuit should have an insulation rating greater than 600V AC and a current rating greater than 0.1 A.

3.4 SELECTING THE VOLTAGE FUSES

We recommend using fuses, although connection diagrams do not show them. Slow blow, 200 mA rated fuses should be used.

3.5 CONNECTION TO THE MAIN POWER SUPPLY

The SBM 100 requires a separate power supply. Listed are the 5 different power supply options and corresponding suffixes.

CONTROL POWER	OPTION
120V AC	NO SUFFIX
240V AC	A
24V DC	D
48V DC	D[1]
125V DC	D[2]

NOTE: FOR DC-POWERED UNITS, POLARITY MUST BE OBSERVED. CONNECT THE NEGATIVE TERMINAL TO L1 AND POSITIVE TERMINAL TO L2. AN EARTH GROUND CONNECTION TO CHASSIS IS MANDATORY FOR NORMAL OPERATION (TERMINAL 3). DO NOT GROUND THE UNIT THROUGH THE NEGATIVE OF THE DC SUPPLY. SEPARATE GROUNDING IS REQUIRED.

3.6 ELECTRICAL CONNECTION INSTALLATION

Choose the diagram that best suits your application and maintain the polarity. Follow the outlined procedure to verify correct connection.

NOTE: THIS PROCEDURE IS ONLY SUITABLE WHEN POWER FLOW IS SINGLE DIRECTION.

HELPFUL DEBUGGING TOOLS

ISOLATING A CT CONNECTION REVERSAL

(1.) ⇨ Remove potential connections to terminals 6 and 7. Observe the KW reading. It should be positive (unless you are generating power).

⇨ If negative, reverse the CT wires on terminals 8 and 9.

(2.) Connect terminal number 6 potential. If KW decreases to about zero, reverse CT wires on terminals 10 and 11.

(3.) Connect terminal number 7 potential. If KW is low, reverse CT wires to terminals 12 and 13.

LISTING OF CONNECTION DIAGRAMS

I Three-Phase, Three-Wire System Delta with Direct Voltage and CTs.

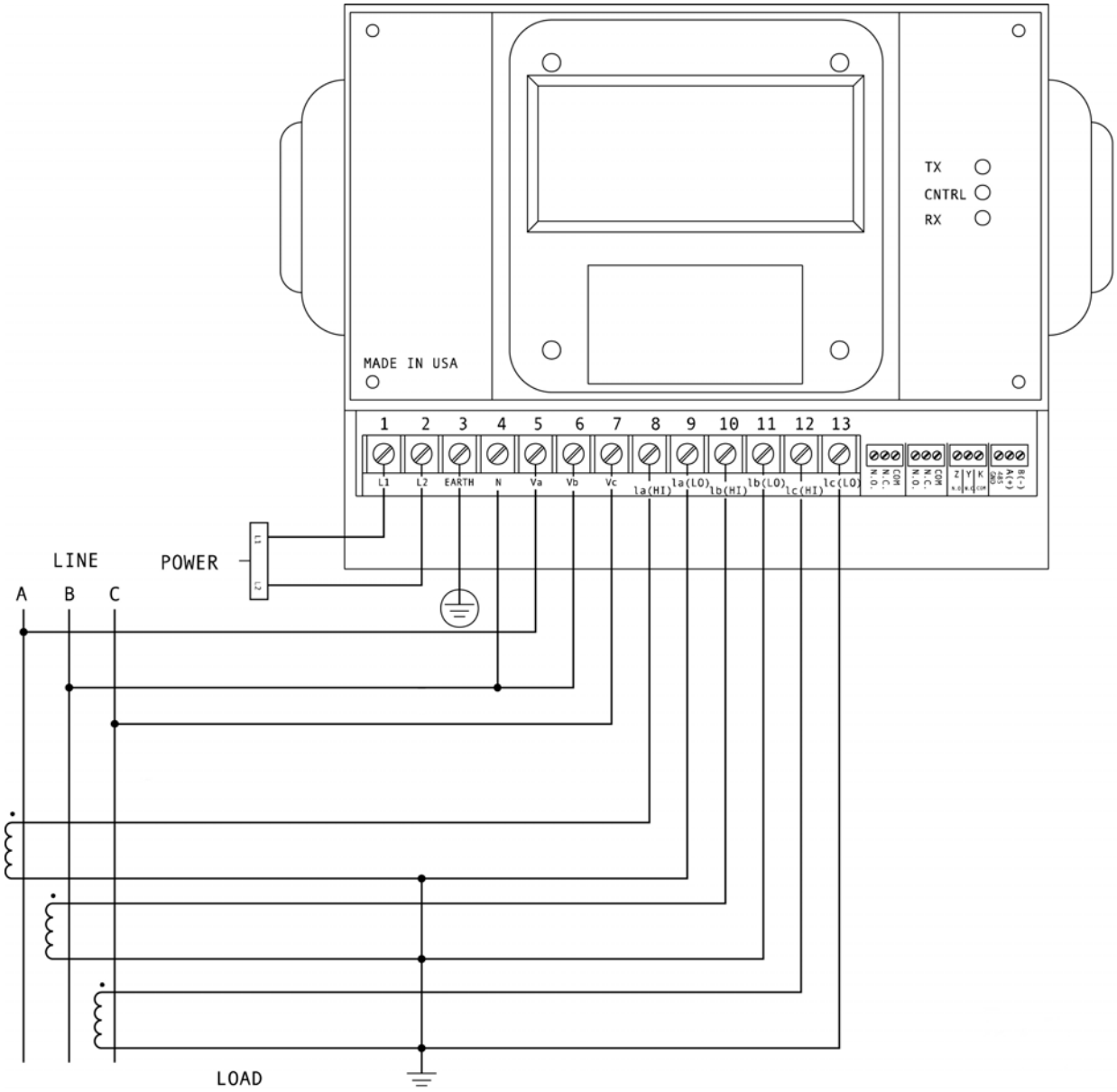
II Three-Phase, Three-Wire Open Delta with two CTs and two PTs.
(*Open Delta System should only be used if the electrical system is a 3-wire OPEN DELTA. Open Delta can be enabled or disabled in Programming Group 0, Function 3).*

III Three-Phase, Three-Wire Open Delta with three CTs and two PTs.

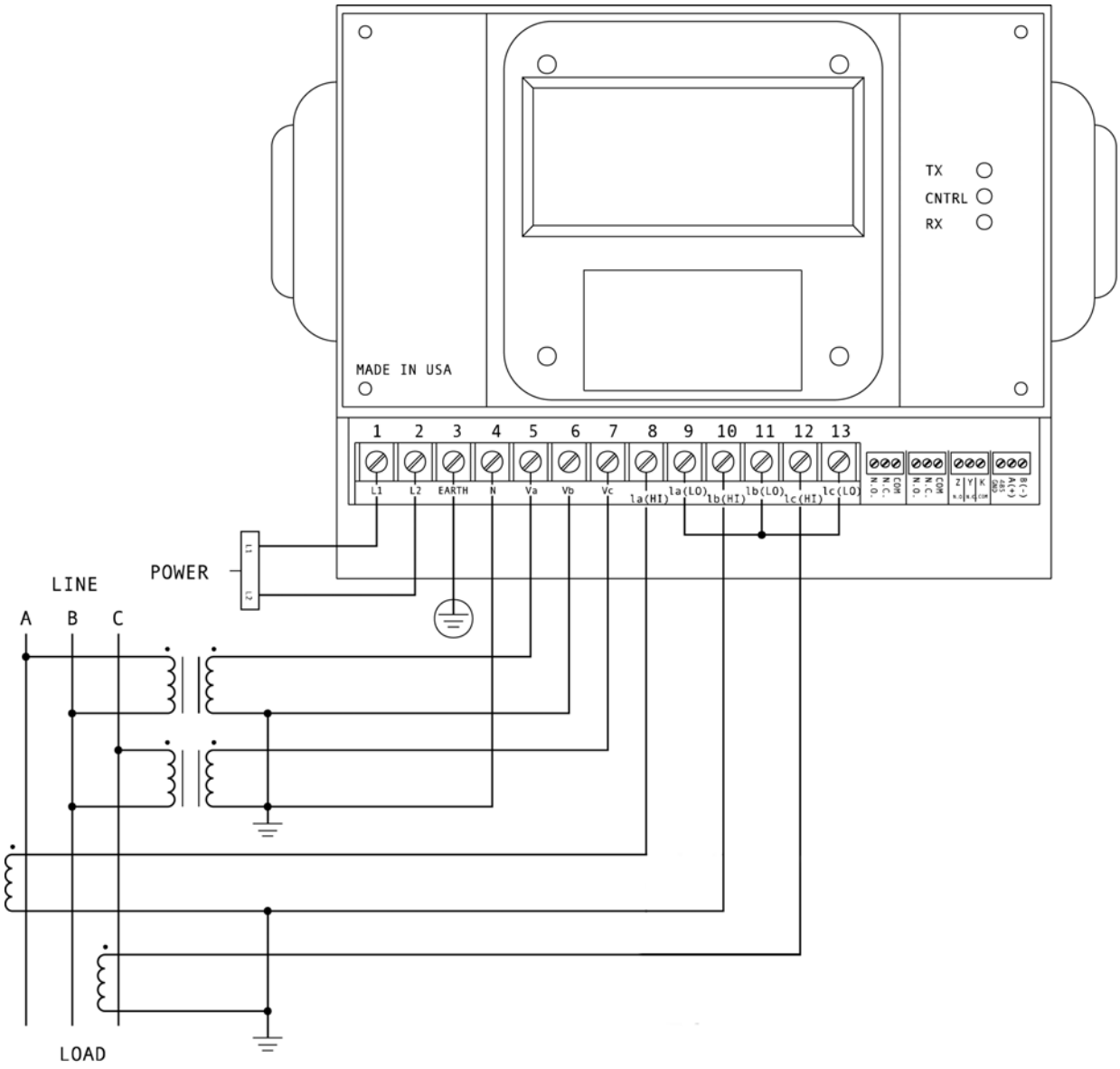
IV Three-Phase, Four-Wire System Wye with Direct Voltage and CTs.

V Three-Phase, Four-Wire System Wye with CTs and PTs.

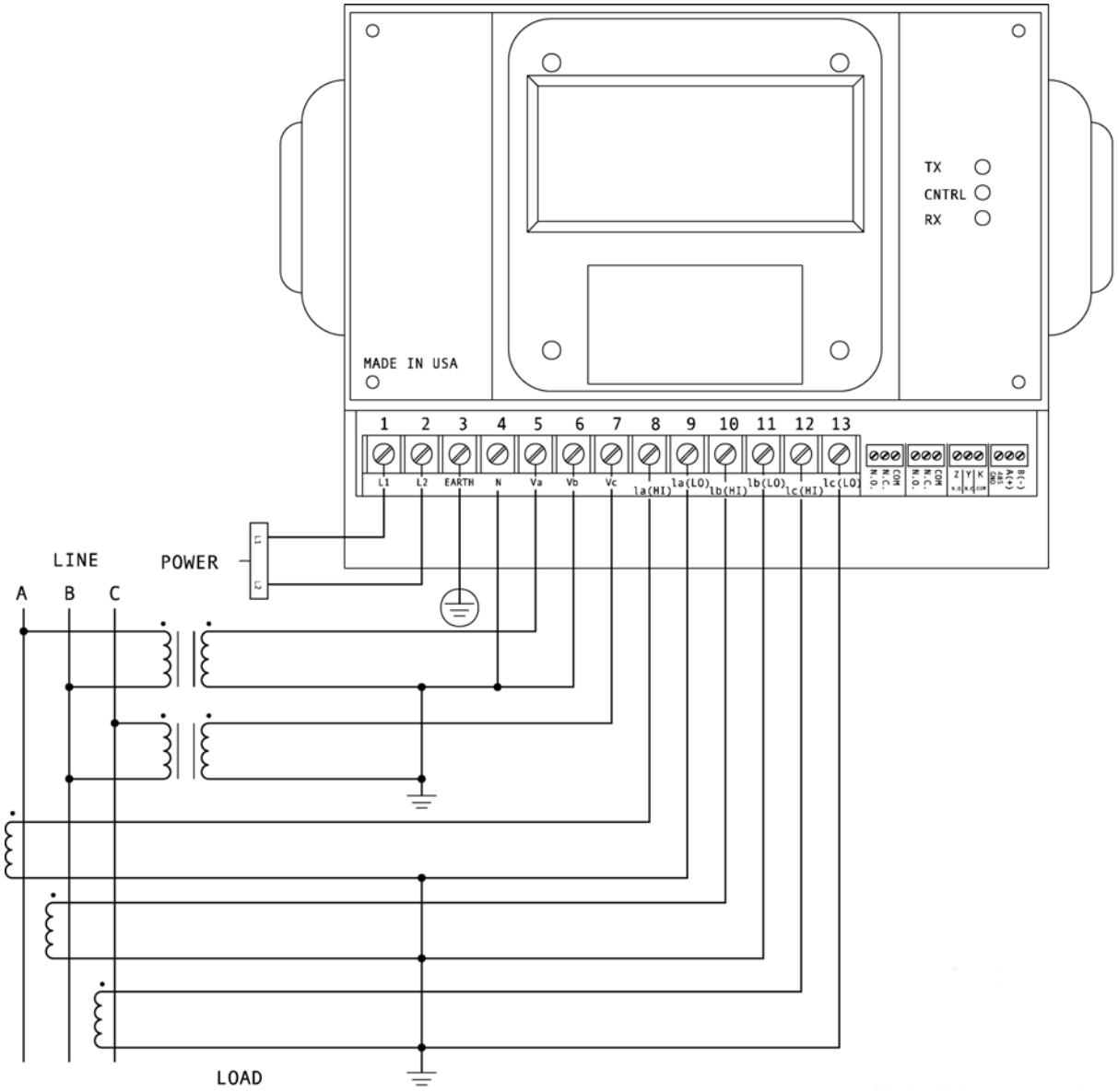
VI Three-Phase, Four-Wire System Wye 2.5 Element with CTs and PTs.



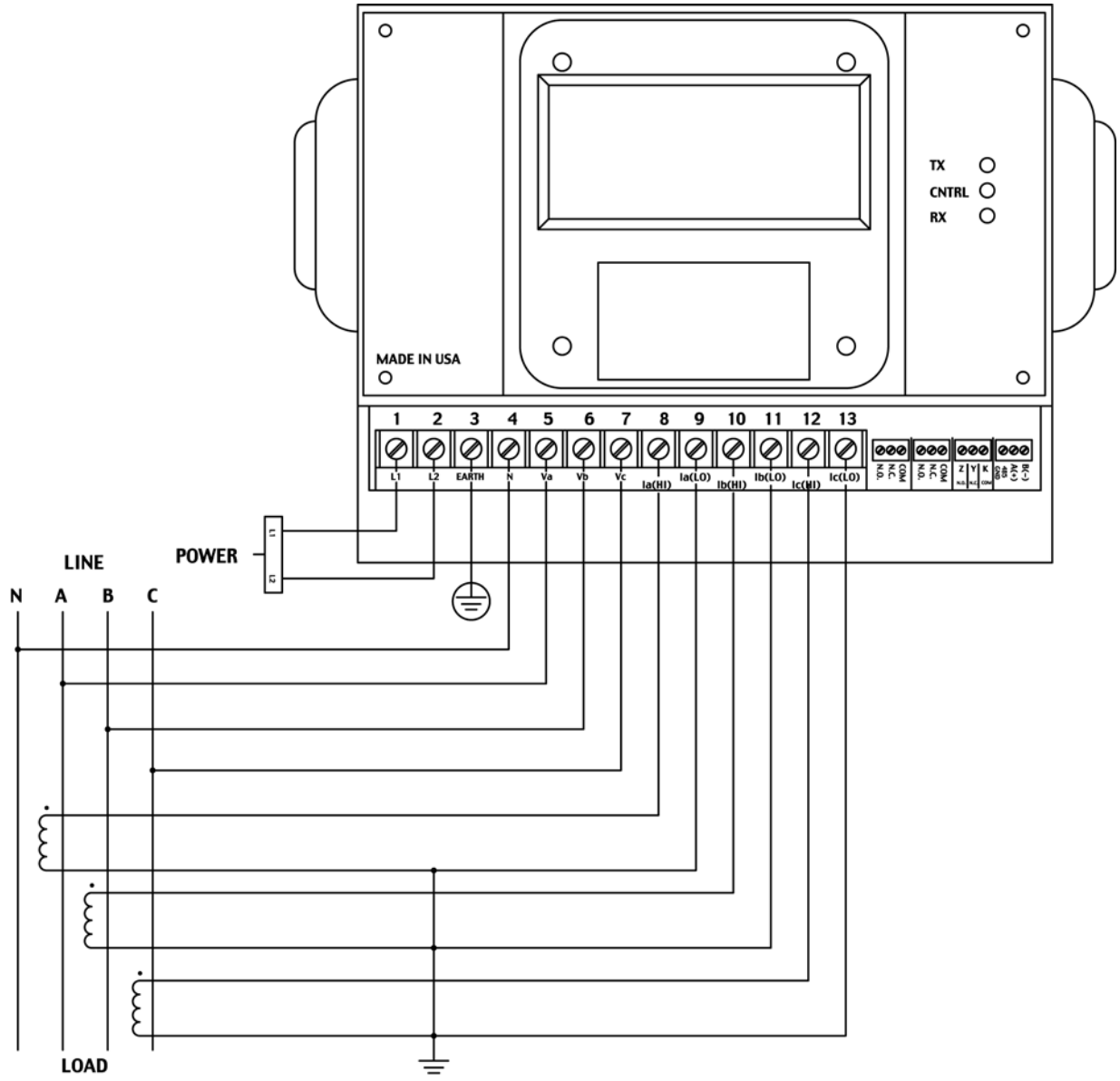
I. Three Phase, Three-Wire System Delta with Direct Voltage and three CTs.



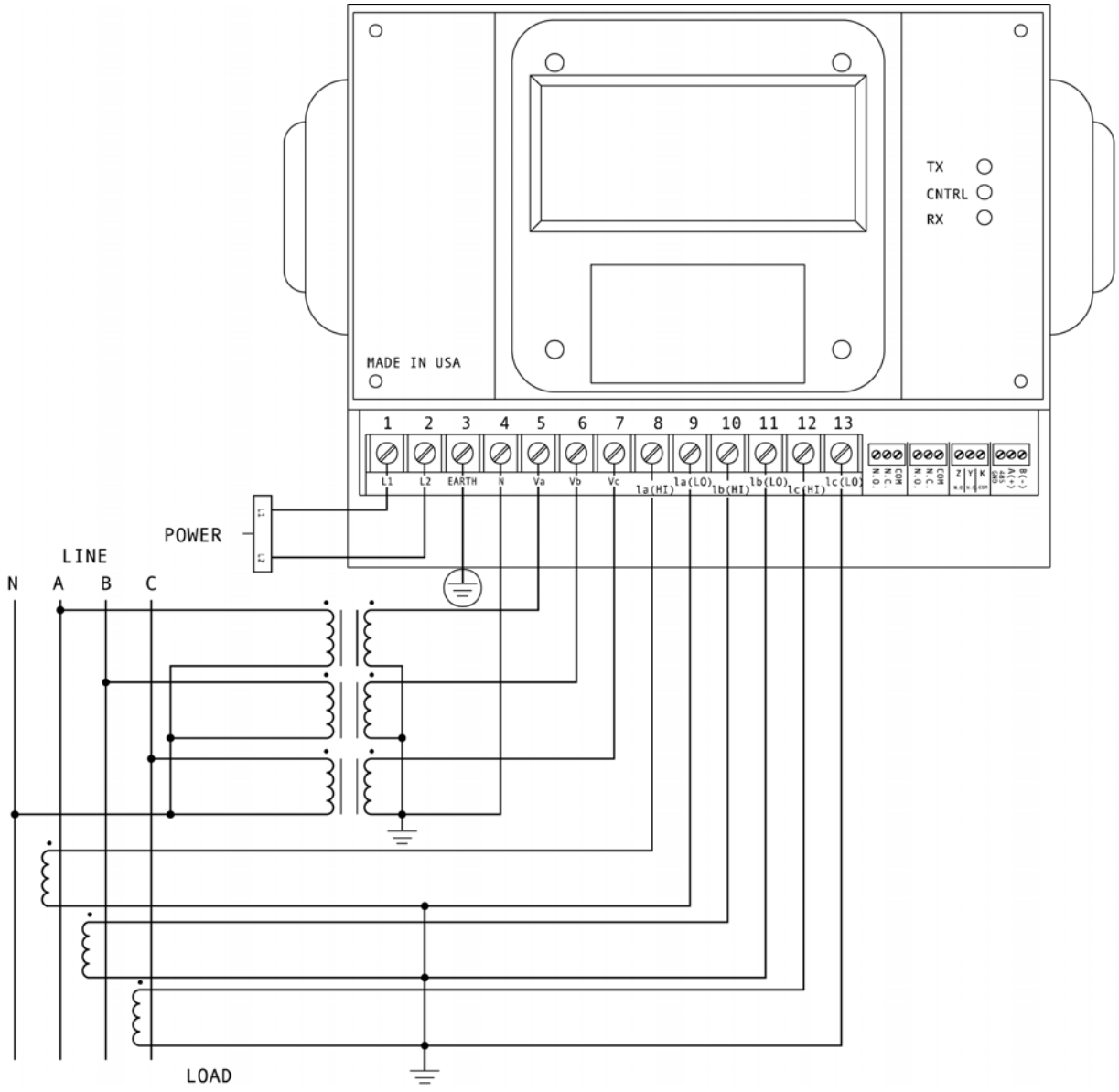
II. Three-Phase, Three-Wire Open Delta with two CTs and two PTs.



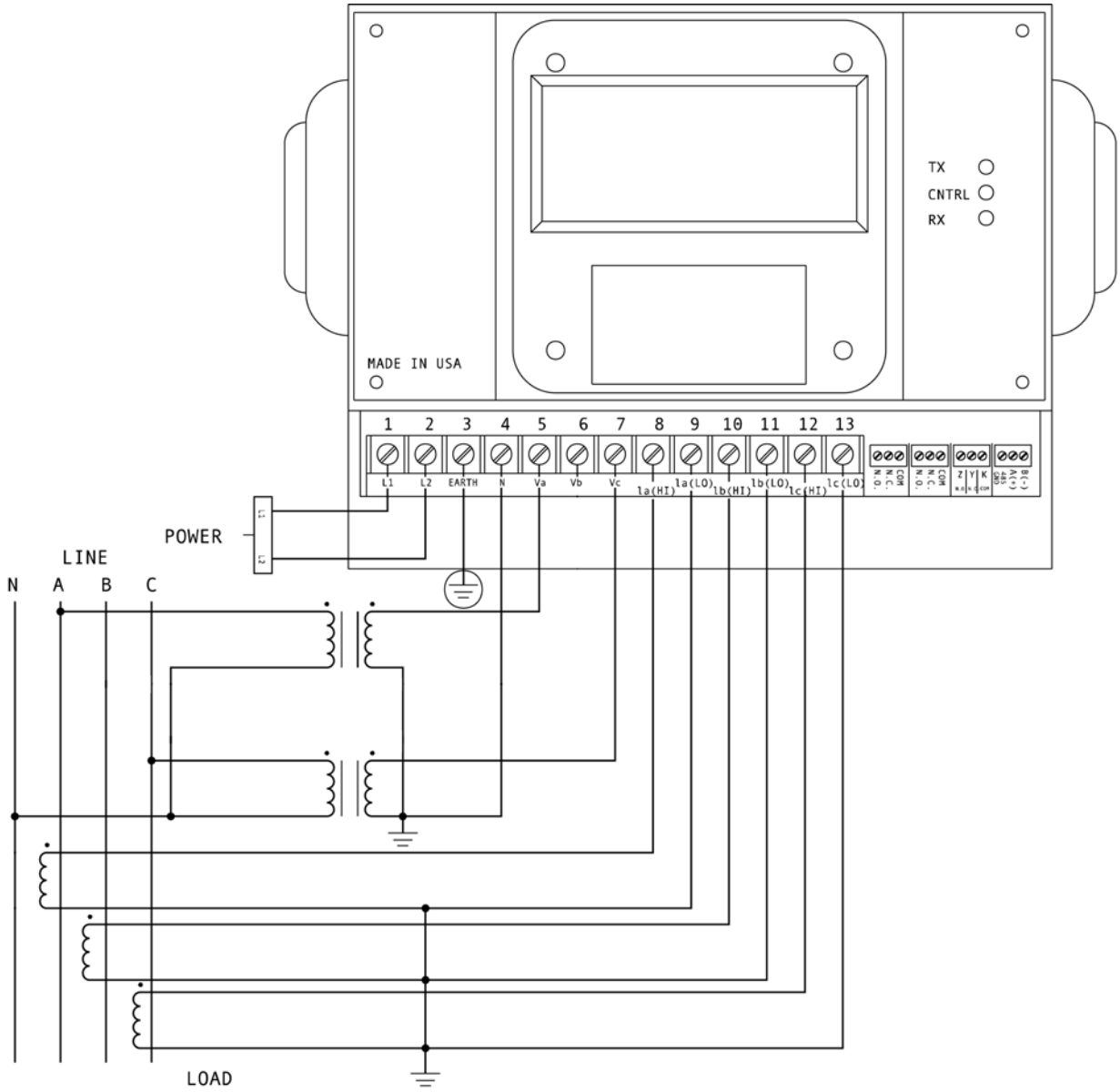
III. Three-Phase, Three-Wire Open Delta with three CTs and two PTs.



IV. Three-Phase, Four-Wire System Wye with Direct Voltage and three CTs.



V. Three-Phase, Four-Wire System Wye with three CTs and three PTs.



VI. Three-Phase, Four-Wire System Wye 2.5 Element with three CTs and two PTs.
For this installation, SBM100-2.5E (Only) must be specified when ordering.

3.7 RELAYS, PROTECTION AND PULSE OUTPUT

This section is applicable only if the -NL Relay Option was ordered.

The SBM 100 accesses a variety of relay options through the Programming Mode. The relay option package consists of two relays with two contacts. One is normally open and one is normally closed (either to alarm or communication, or both), and one is KYZ pulse output.

TIME DELAY: Sets the alarm off, alerting the user an out-of-limit condition occurred over the user-defined time limit. The time delay can be programmed for any desirable duration.

If the relays are dedicated to communication, there are two different modes:

- Lock ON Relay will not be affected by any alarm condition.
- Lock OFF Relay will not be affected by any alarm condition.

If the relays are used for communication and alarm, there are four different modes:

- Lock ON Relay stays on regardless of any alarm condition.
- Lock OFF Relay stays off regardless of any alarm condition.
- Free ON Relay turns on unless other conditions force it off.
- Free OFF Relay turns off unless other conditions force it on.

Relay connection (See **Figure 3.1**).

Form C relays, rated 250V, 5A, 2 each.

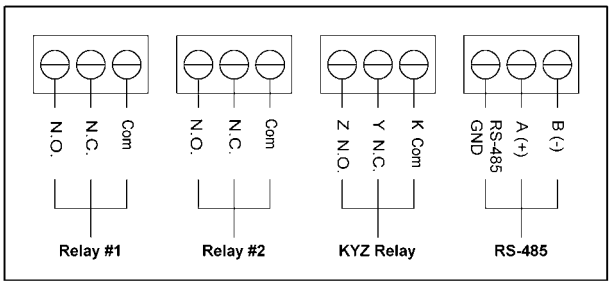


Figure 3.1
Close-up of the relays and KYZ pulse output on the rear panel. The relays shown are in the NOT energized state.

The SBM 100 can be programmed to detect two alarm levels for Over and Reverse Power.

KYZ RELAYS: Provides pulses for energy management systems or any other type of recording device. These pulses represent accumulated positive watt-hour, or negative watt-hour. Accomplish this assignment through Programming Mode. The pulse value is determined by the decimal increment of the power function assigned to the pulse.

kW Meter The scale factor for wattage (selectable in Programming Mode Group 0, Function 3, Pack 1) is set on kW. Follow the Decimal Point Placement corresponding to the Change in Level.

DECIMAL POINT PLACEMENT (KW)	CHANGE IN LEVEL
9999.	1 kW Per Pulse
999.9	0.1 kW Per Pulse
99.99	0.01 kW Per Pulse
9.999	0.001 kW Per Pulse

MW Meter The scale factor for wattage (selectable in Programming Mode Group 0, Function 3, Pack 1) is set on MW. Follow the Decimal Point Placement corresponding to the Change in Level.

DECIMAL POINT PLACEMENT (MW)	CHANGE IN LEVEL
9999.	1 MW Per Pulse
999.9	0.1 MW Per Pulse
99.99	0.01 MW Per Pulse
9.999	0.001 MW Per Pulse

CHAPTER 4
COMMUNICATION INSTALLATION

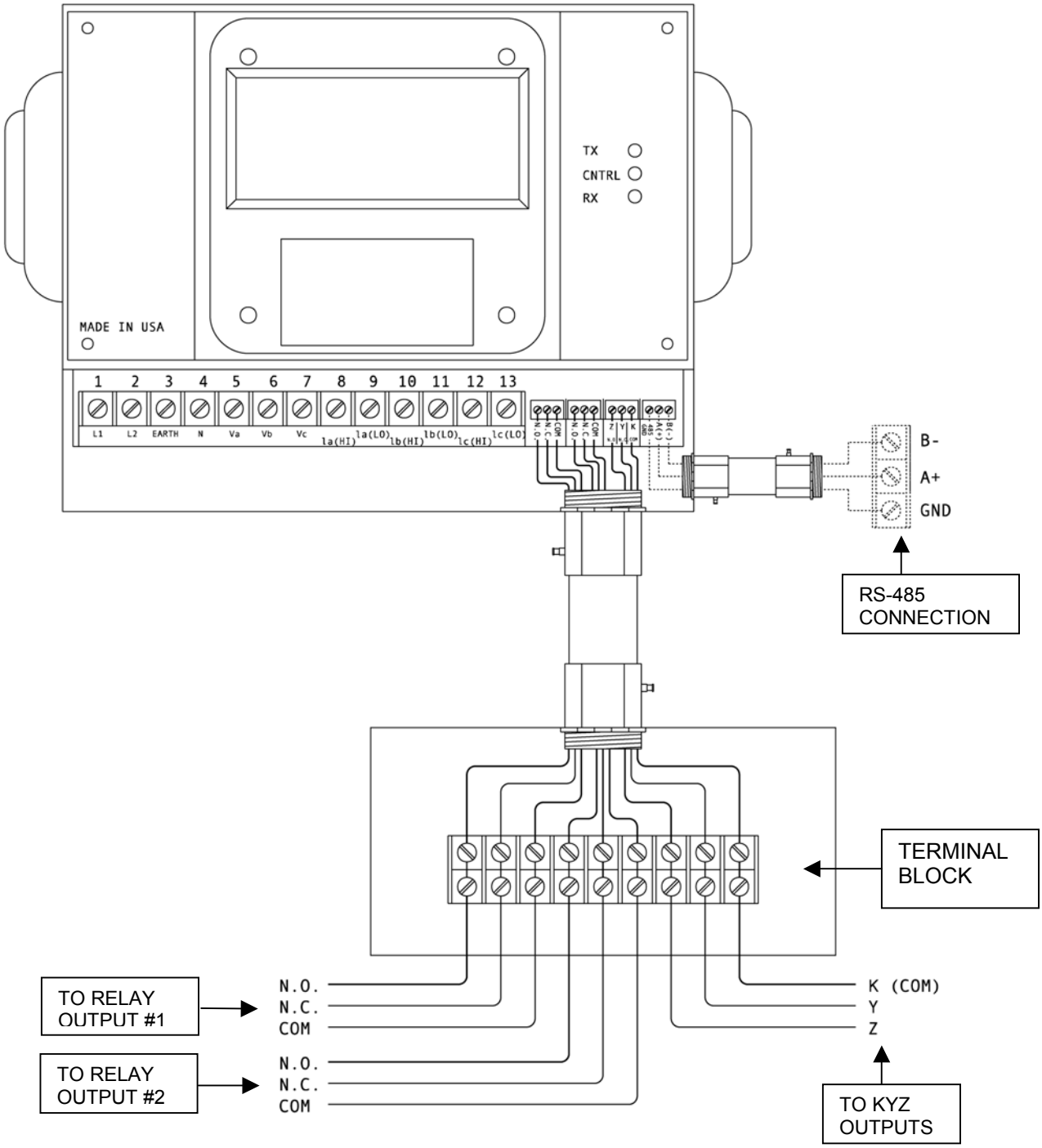
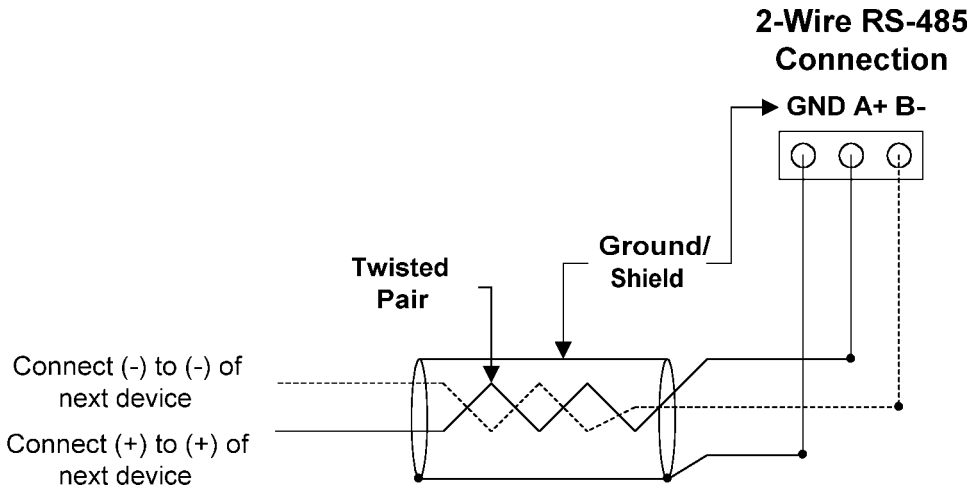


Figure 4.1: Wiring Diagram of SBM 100
RS-485 Communication and Relay Output Installation.

Figure 4.2 RS-485 Communication Connection



4.1 RS-485

Each SBM 100 instrument has an unique address up to four digits. Available standard baud rates are available up to 4800 baud. To select the proper baud rate, apply the following rules:

For a smaller number of instruments over a long distance, use a lower baud rate. Optimal recommended baud rate is 1200 baud.

RS-485 parallels multiple instruments on the same link. Its operating capability is up to 4000 feet.
When using only 2 wires (on the RS-485), the link can include up to 30 instruments (see Figure 4.2 above).

4.2 NETWORK OF INSTRUMENTS AND LONG DISTANCE COMMUNICATION

Use modems (dedicated or dial-up) when the instruments are located at great distances. However, set the modem to auto answer at the recommended value of 1200 baud rate, if noise conditions exist. Also, flow control must be disabled.

I. MODEM CONNECTED TO COMPUTER (ORIGINATE MODEM)

PROGRAMMING THE MODEM

Comply with the modem's instruction manual and follow these instructions:

RESTORE MODEM TO FACTORY SETTINGS:
- Erases all previously programmed settings.

SET MODEM TO DISPLAY RESULT CODES:
- The device uses the result codes.

SET MODEM TO VERBAL RESULT CODE:
- The device uses the verbal codes.

SET MODEM TO IGNORE DTR SIGNAL:
- Necessary for the device to ensure connection with originate modem.

SET MODEM TO DISABLE FLOW CONTROL:
- Necessary to communicate with remote modem connected to device.

TELL MODEM TO WRITE THE NEW SETTINGS TO ACTIVATE PROFILE:
- Places these settings into nonvolatile memory; the settings take effect after the modem powers up.

II. MODEM CONNECTED TO THE DEVICE (REMOTE MODEM)

PROGRAMMING THE MODEM

Comply with the modem's instruction manual and follow these instructions:

RESTORE MODEM TO FACTORY SETTINGS:
- Erases all previously programmed settings.

SET MODEM TO AUTO ANSWER ON **N** RINGS:
- Sets the remote modem to answer the call after **N** rings.

SET THE MODEM TO AUTO NEGOTIATE MODE:
- Sets the remote to auto-negotiate to communicate successfully with the Futura+ Series and other devices in the modem.

SET MODEM TO RETURN NUMERIC RESULT CODES:
- Increases speed connection with the Futura+ Series.

SET MODEM TO IGNORE DTR SIGNAL:
- Necessary for device to ensure connection with originate modem.

SET MODEM TO DISABLE FLOW CONTROL:
- Necessary to communicate with remote modem connected to the Futura+ Series

TELL THE MODEM TO WRITE THE NEW SETTINGS TO ACTIVATE PROFILE:
Places new settings into nonvolatile memory; settings take effect after the modem powers up.

CHAPTER 5
SBM 100 OVERVIEW

The SBM 100 monitors Kilowatt, Kilowatt Demand and Kilowatt-Hour readings.

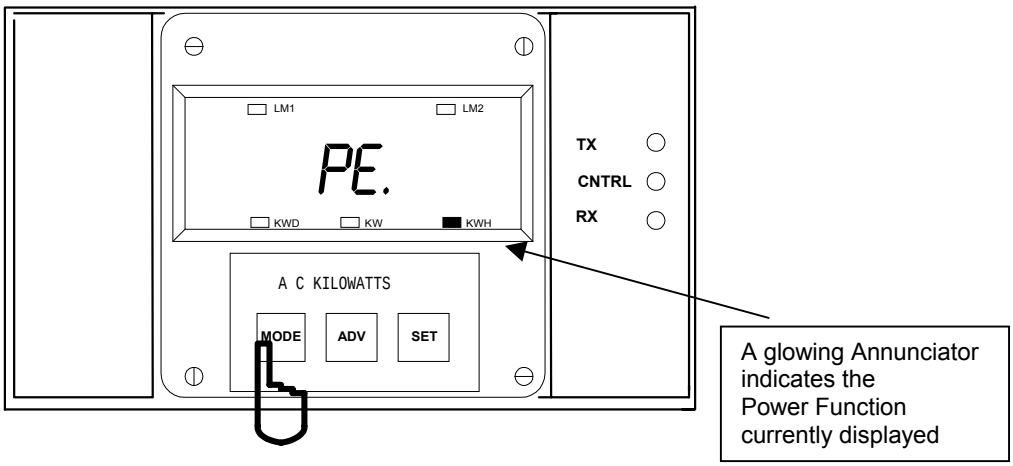


Figure 5.1 *The SBM 100 front panel with display and keypad.*

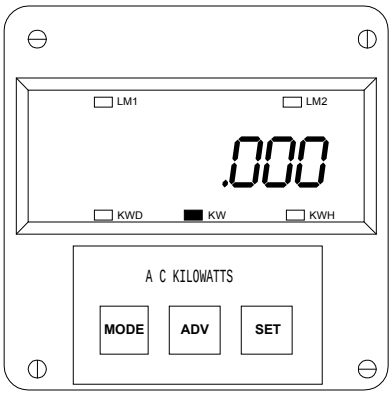
5.1 THE SBM 100 METER SYSTEM

The SBM 100 measures electrical power demand and energy for usage monitoring, cost allocation, load monitoring or demand tracking and control. The digital display is intuitive and requires virtually no user training. Open Modbus digital communication protocol ensures simple interface to any digital control or monitoring system. The SBM 100 is a basic energy/demand meter.

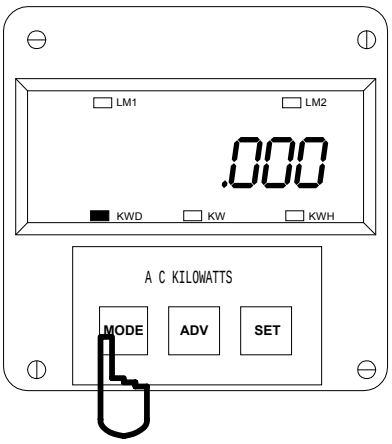
5.2 PRODUCT FEATURES

- True RMS measurements of bi-directional energy, power and demand.
- Tracks positive and negative kWh in separate registers.
- ANSI C-12 revenue metering accuracy.
- Reads primary values; no multiplication factors are required.
- User programmable for any PT and CT ratio.
- KYZ pulse output.
- Relay output for over/under power alarms.
- Six digit, long-life LED display.
- Super Bright display for outdoor application.
- Supports Modbus RTU digital protocol.
- Supports RS-485 communication connection.
- Surface mount design for easy installation.
- Meets and exceeds IEEE C37.90.1 surge withstand requirements to ensure long life, even in harsh electrical environments.
- Designed for harsh temperature conditions (- 20 to + 70) ° C.
- Dimensions – 8.375”W x 7.125”H x 4.25”D.

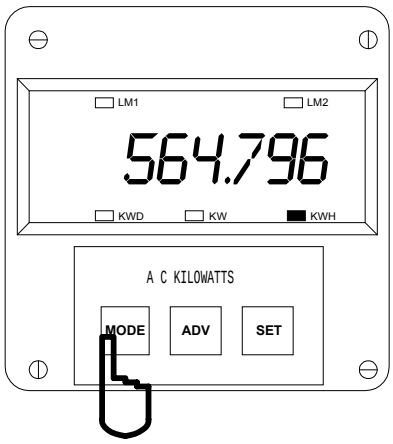
5.3 ACCESSING KW, KWD, KWH



⇨Upon power up, the SBM 100 monitors instantaneous kilowatts and KW glows.



Step 1:
a. To access the kilowatt demand reading, press ***MODE*** once and KWD glows.



Step 2:
a. Press ***MODE*** once more to access kilowatt hour reading and KWH glows.

5.4 RESETTING KWD/KWH READINGS

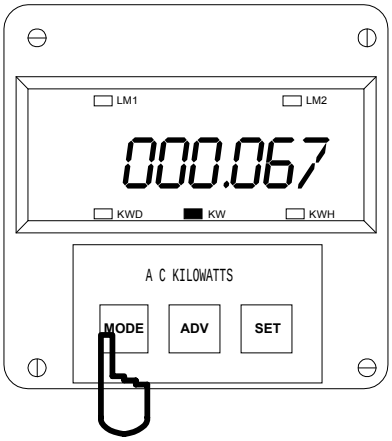
Use the reset function if a new value is desired. It is available in two different modes.

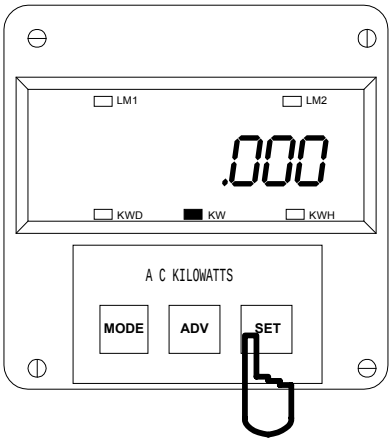
1. **UNPROTECTED MODE** - Allows quick and easy resetting of kilowatt-demand and Kilowatt-Hour readings
2. **PROTECTED MODE** - Prevents unauthorized personnel from resetting the kilowatt-demand and Kilowatt-Hour readings.

Select Unprotected Reset or Protected Reset in Programming Mode in Group 0, Function 3, Pack 1, Switch B. Set to Disable for Unprotected Reset. Set to Enable for Protected Reset. (See Programming Section for Reset Protection procedure)

- **UNPROTECTED RESET**
  Select KWD or KWH by pressing ***MODE***. To reset in the unprotected mode, press ***SET***. The reading resets.

To **reset the KWH reading in Unprotected Mode**, follow these steps:





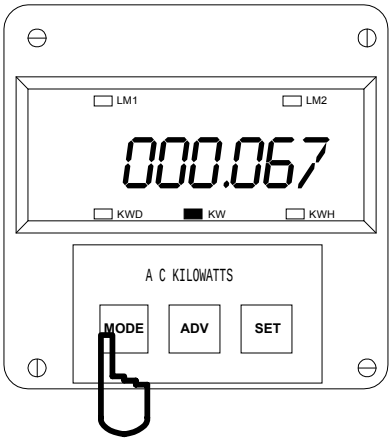
Step 1:
a. Press ***MODE*** to access Kilowatt-Hour readings.

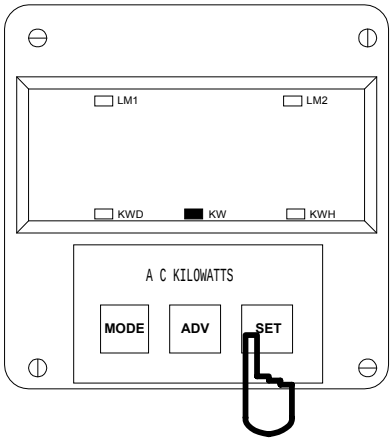
Step 2:
a. Press ***SET*** to reset.

⇨The display blanks and the KWH reading resets to *.000*.

❑ **PROTECTED RESET**
If the has a protected reset, the user must enter a password before resetting the readings. The password ***005***.

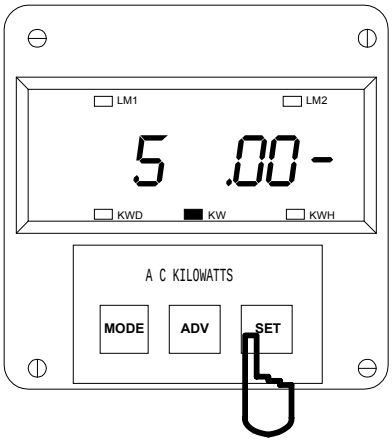
To **reset KWH reading in the Protected Mode**, follow these steps:

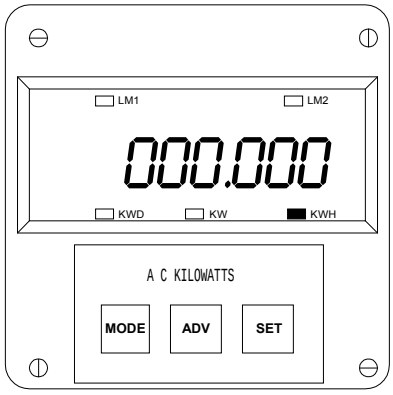




Step 1:
a. Press ***MODE*** to access Kilowatt-Hour readings.

Step 2:
a. Press ***SET*** to start the reset procedure.





Step 3:
⇨Three dashes appear on the right side.

⇨A single digit begins scrolling on the left side.

a. Press ***SET*** to select the appropriate digits.

⇨The selection is ***005***.

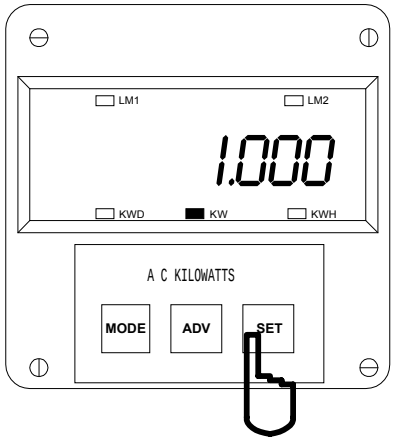
⇨After entering the correct password, the display blanks and the KWH reading resets to *000.000*.

5.5 ACCESSING THE LM1/LM2 SET LIMITS FOR KW

The SBM 100 has two manual set limits that monitor the instantaneous readings, warning the user of any abnormal conditions. Each limit detects readings either above or below the set level. **SET LIMITS**: The point when the relay changes position if the SBM 100 is equipped with the Relay Option Package (Suffix -NL).

If a limit is exceeded, the LM1 or LM2 annunciator indicator glows and the display flashes, alternating between the instantaneous reading, and the limit (LM1 or LM2).

To **view the LM1/LM2 set limits**, follow these steps:



Step 1:
a. Press MODE until KW is glowing

⇨ The set limits appear momentarily.

Step 2:
a. Press SET:

- once to access positive LM1 limit
- twice for the positive LM2 limit
- three times for the negative LM1 limit
- four times for the negative LM2 limit

⇨ LM1 and LM2 are available only for KW. See Chapter 12 to Set Limits.

ACCESS MODE - Sections 5.4, 5.5, and 5.6 allow the user to access specific operation tasks (see Table 4-1).

TABLE 4-1

ACCESS	OPERATION
1	Print Programming Data
2	Print Operating Data
3	Enter Programming Mode (See Programming Manual)
4	Firmware Version/LED. Test

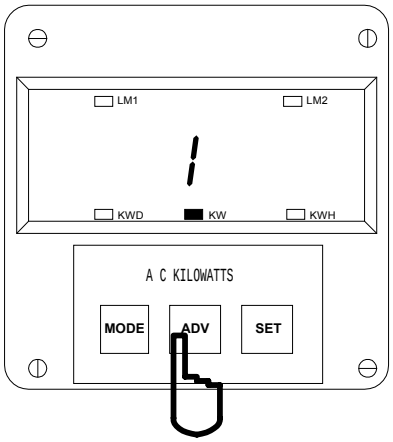
NOTE: PRINT COMMANDS 1 AND 2 ARE ONLY AVAILABLE IF ENABLED IN THE PROGRAMMING MODE AND ARE NOT RECOMMENDED WHEN USING THE RS-485 MULTIMETER CONNECTION.

5.6 PRINTING OPERATING DATA

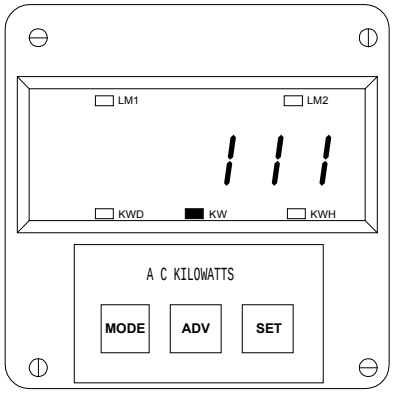
This function applies only if a serial printer is connected to the SBM 100 via an RS-232C Communication Converter.

This function sends the data to a serial printer. This allows a hard copy of the instantaneous data for KW, KWD and KWH to compile without manually copying the data.

To **print the operating data**, follow these steps:



Step 1:
a. Press ***ADV*** until ***1*** appears.



Step 2:
a. Press ***SET*** to print Operating Data.

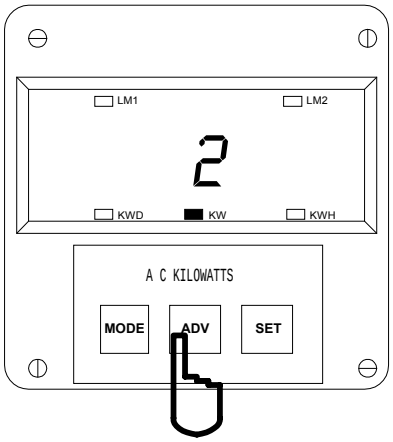
⇨***111*** appears momentarily, confirming printing.

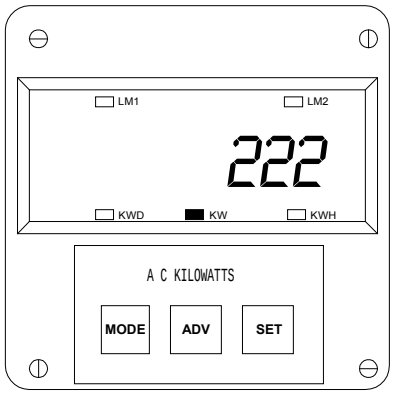
5.7 PRINTING PROGRAMMING DATA

This function applies only if a serial printer is connected to the SBM 100 via an RS-232C Communication Converter.

This function sends the programming data (or meter setup) to a serial printer for quick reference and verification.

To **print the programming data**, follow these steps:





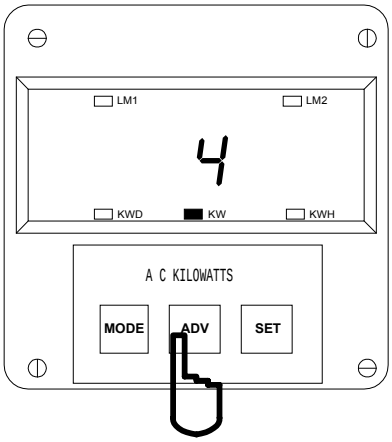
Step 1:
a. Press ***ADV*** until ***2*** appears.

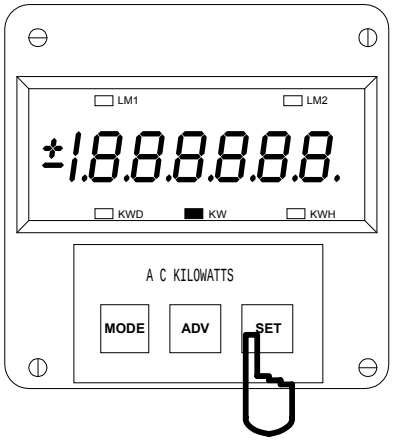
Step 2:
a. Press ***SET*** to print the Programming data.

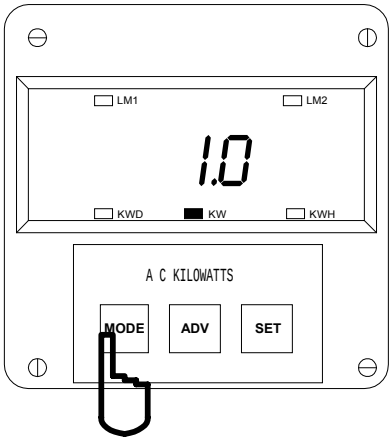
⇨***222*** appears momentarily to confirm printing.

5.8 FIRMWARE VERSION/LED TEST

The SBM 100 accesses the firmware version number of the analog and digital microprocessors. Also, the LED test checks if the LED's and annunciators are functioning properly.







Step 1:
a. Press ***ADV*** until ***4*** appears.

Step 2:
a. Press ***SET*** to activate LED test.

⇨444 appears momentarily.

⇨Then, all LEDs glow twice.

Step 3:
a. Press ***MODE*** to view the Firmware Version.

CHAPTER 6
PROGRAMMING OVERVIEW

6.1 How to Use this Portion of the Manual

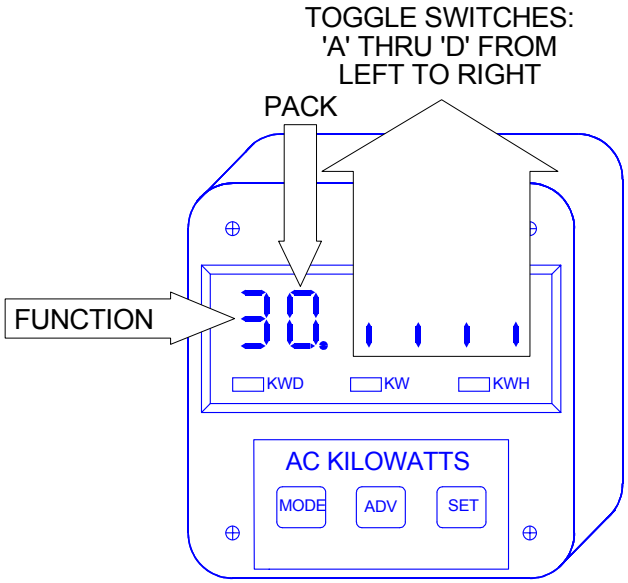
This manual contains programming for the basic operation, available options and parameters. Using the table of contents, find the programming feature location and read that chapter.

Programming tasks are arranged into seven GROUPS. Within each GROUP are the specific meter FUNCTIONS. Outlined is the general approach to alter programming mode values.

1. Enter the Programming Mode.
2. Select the desired GROUP.
3. Once the desired GROUP is selected, select a FUNCTION within the GROUP.
4. After the FUNCTION selection, proceed with DATA ENTRY of the new value of the desired parameter.
5. Proceed to program another location and/or exit the programming mode.

IMPORTANT: The full exiting procedure must be followed to store any new programming.

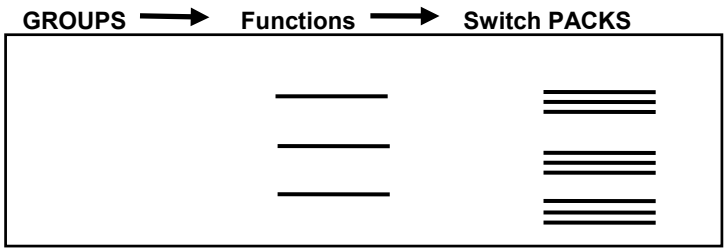
6.2 Switch Packs



GROUPS, Functions, and Switch PACKS

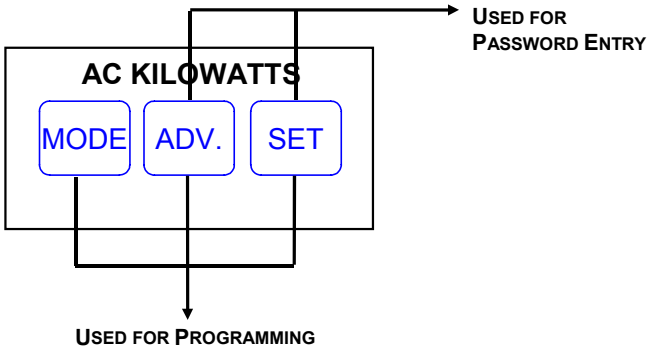
- GROUPS are the main category.
- Functions are sub categories of GROUPS.
- Switch PACKS are sub categories of FUNCTIONS.

The diagram below illustrates the arrangement of the three categories:



6.3 Programming Mode Data Entry

The SBM 100 programming mode utilizes all three keypad buttons.



BUTTON	FUNCTION	DESCRIPTION
MODE	ADVANCES	Scrolls groups, functions, and advances to exit point from function and group level.
ADV	CHANGE VALUE	Scrolls packs, digit counters, and changes switch pack position UP or DOWN.
SET	STORE	Activates new data entry and enters or exits from group or function level.

6.4 Standard Numeric Data Entry

Programmable FUNCTION values are always four digit numeric fields designed to accept any value between 0000 and 9999. When entering the value of a function, enter all four digits, leading zero's included. For instance, to enter the number 25, enter 0025.

CHAPTER 7
ENTERING THE PROGRAMMING MODE

7.1 PASSWORD ENTRY

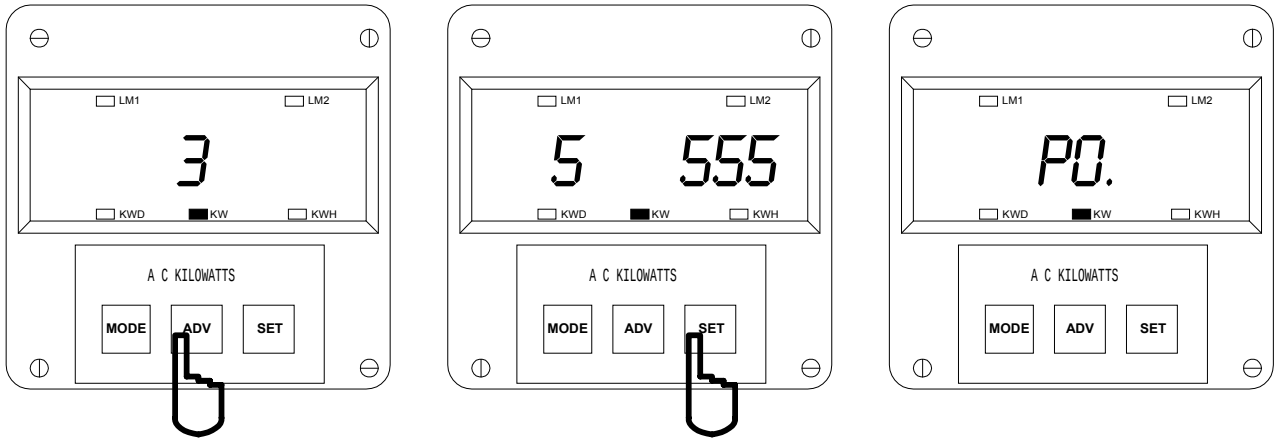
NOTE: TO ENTER THE PROGRAMMING MODE THE SBM 100 MUST BE IN THE KW MODE.

The SBM 100 is password protected. To enter the Programming Mode, key in the following password. The password is 555.

The password entry may seem awkward at first. It is designed initially be difficult to use. This secures unauthorized tampering. After the user becomes familiar with password entry, it will be quick and easy to enter.

NOTE: THE METER WILL NOT STORE ANY PROGRAMMING UNLESS PROPERLY EXITED. (SEE CHAPTER 13 TO EXIT).

⇨ENTERING THE PROGRAMMING MODE:



Step 1:
a. Press ***ADV.*** until ***3*** appears.

b. Press ***SET*** to select and ***333*** flashes momentarily.

Step 2:
⇨Three dashes appear to the right and digits begin scrolling to the left.

⇨The password is **555**.

a. Press ***SET*** each time ***5*** appears.

⇨ Selected digits appear.

⇨Display blanks and ***PPP*** flashes, confirming a correctly entered password.

⇨***PPP*** is replaced by ***P0.*** and the meter is now in the Programming Mode, GROUP 0.

CHAPTER 8
PROGRAMMING GROUP 0: GLOBAL METER SETUP

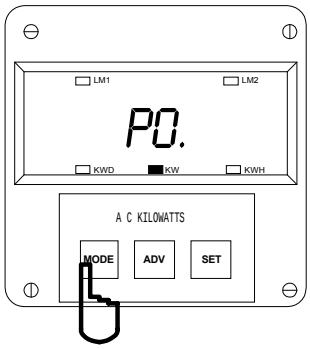
The Global Meter Setup includes functions *0* through *5* that control configuration and basic operation.

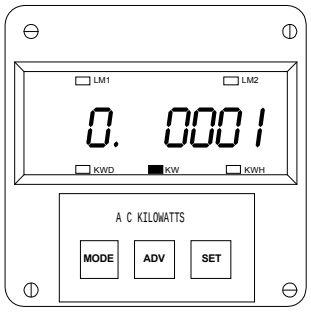
TABLE 8-1: GROUP *0* PROGRAMMING FORMAT

FUNCTION NUMBER	FUNCTION
0.	Interval
1.	Meter Address for Communication
2.	Baud Rate for Communication
3.	System Configuration
4.	Delay Time in Seconds for Relay 1
5.	Delay Time in Seconds for Relay 2
E.	Exit Programming Group 0

8.1 GROUP *0*, FUNCTION *0* - THE INTEGRATION INTERVAL

INTEGRATION INTERVAL: Time which all instantaneous readings are averaged to obtain a max and min demand. The Integration Interval is entered in seconds. When entering 15 minutes, enter 0900 seconds.

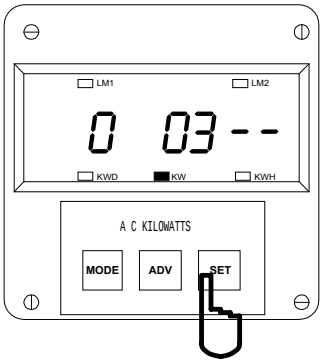




To **change the Integration Interval**, follow these steps:

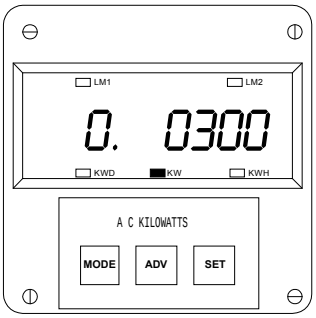
Step 1:
a. Enter Group Level of Programming Mode, (See Chp. 2)

b. Press ***MODE*** until ***P0.*** appears.



c. Press ***SET*** to activate the Group

⇨Function ***0.*** appears to the left and the current setting appears to the right.



Step 2:
a. Press ***SET*** once to begin the data entry sequence.
⇨The previous value is replaced with four dashes.

b. Press ***ADV.*** for desired number

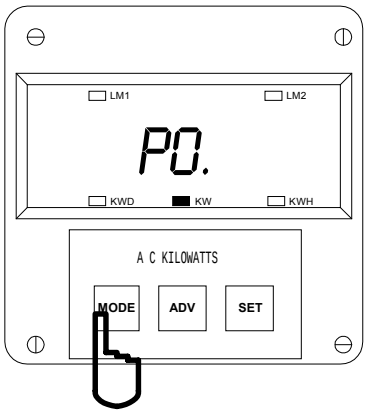
c. Press ***SET*** to store.

⇨Repeat this procedure until the desired value is entered.
⇨When complete, a decimal appears next to the function number and the new Integration Interval appears to the right. *See Chapter 13 to Exit.*

8.2 GROUP *0*, FUNCTION *1* - THE METER ADDRESS

METER ADDRESS: Identifies the meter when communicating with digital communications. When numerous meters at one site, it is essential that each meter have its own address.

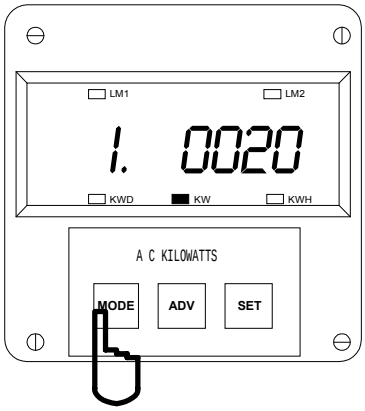
To **change the Meter Address**, follow these steps:



Step 1:
a. Enter Group Level of Programming Mode, (See Chp. 2).

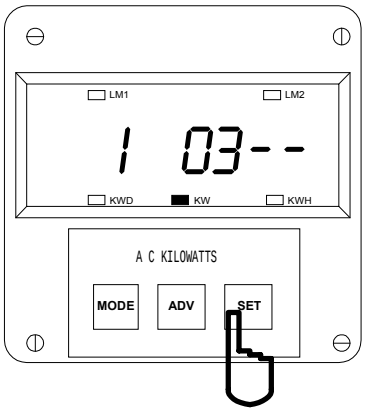
b. Press ***MODE*** until ***P0.*** appears.

c. Press ***SET*** to activate the Group.



Step 2:
a. Press ***MODE*** until Function ***1.*** appears.

⇨The current meter address appears to the right of the function number.

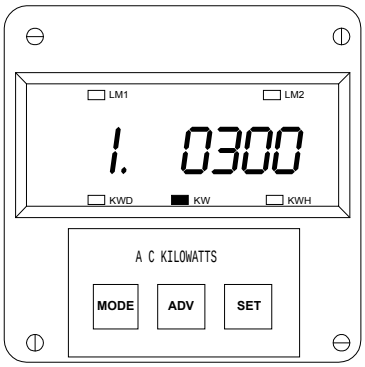


Step 3:
a. Press ***SET*** once to begin Data Entry Sequence.

⇨The previous value is replaced by four dashes.

b. Press ***ADV.*** until the desired number appears.

c. Press ***SET*** to store.



⇨Repeat this procedure until new Address is entered.

⇨Once complete, a decimal appears next to the function number and the new Address appears to the right.

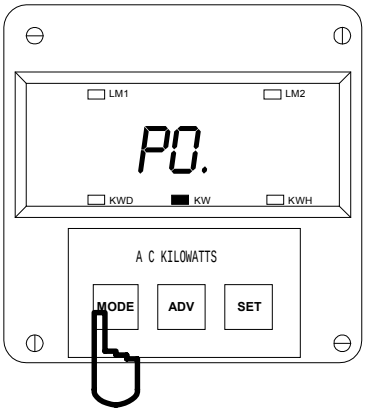
See Chapter 13 to Exit.

8.3 GROUP *0*, FUNCTION *2* - THE COMMUNICATION BAUD RATE

BAUD RATE: Speed at which data is transmitted between meter and remote computer or serial printer. The rate programmed into the meter must match the rate used by the remote device. Valid Baud Rates are 110, 150, 300, 600, 1200, 2400, 4800 and 9600.

To **change the Communication Baud Rate**, follow these steps:

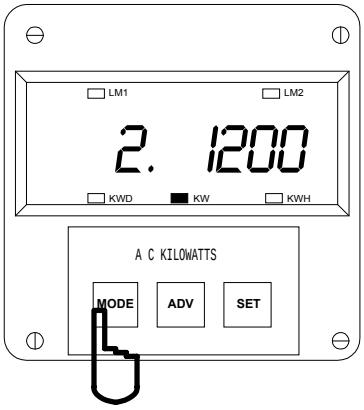
NOTE: WHEN ENTERING THE COMMUNICATION BAUD RATE REMEMBER TO INCLUDE LEADING ZERO'S FOR A FOUR DIGIT ENTRY.



Step 1:
a. Enter Group Level of Programming Mode, (See Chp. 2).

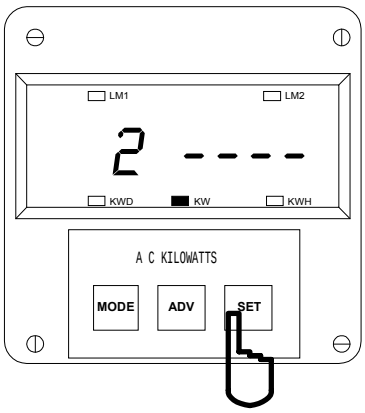
b. Press ***MODE*** until ***P0.*** appears.

c. Press ***SET*** to activate the Group.



Step 2:
a. Press ***MODE*** until Function ***2.*** appears.

⇨The current Baud Rate appears to the right of the function number.

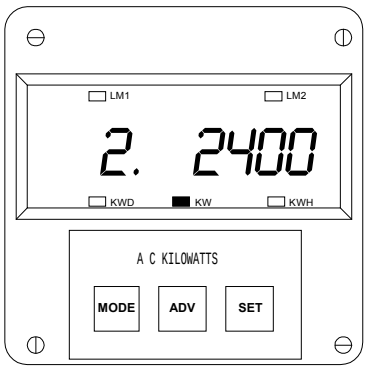


Step 3:
a. Press ***SET*** once to begin Data Entry Sequence.

⇨The previous value is replaced with four dashes.

b. Press ***ADV.*** for desired number.

c. Press ***SET*** to store.



⇨Repeat this procedure until new Baud Rate is entered.

⇨When complete, a decimal appears next to the function number and new Baud Rate appears to the right.

See Chapter 13 to Exit.

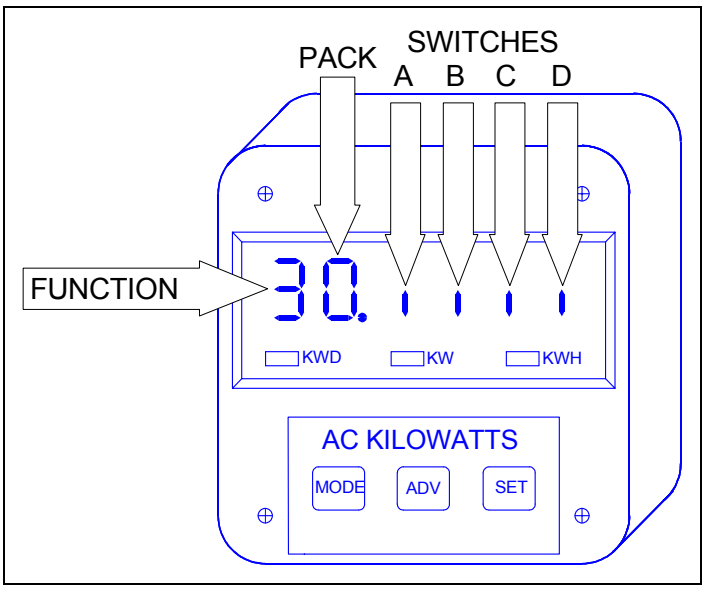
8.4 GROUP *0*, FUNCTION *3* - SYSTEM CONFIGURATION

The System Configuration sets the SBM 100's basic operational parameters. This Function utilizes Switch PACKS (See SWITCH PACKS).

Function *3* contains four separate Switch PACKS: 0 - 3. Each PACK contains four individual UP/DOWN segments.

- Toggling the segment between UP and DOWN, toggles the switch ON or OFF, or choose between two options.

The meter displays one Switch PACK at a time. Press ***ADV.*** to scroll from PACK to PACK.



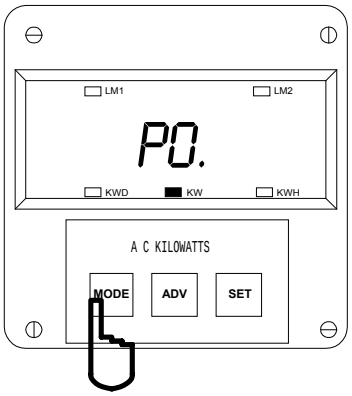
PRINTING OPTION
To print, Access Mode 1 and Mode 2 (See Installation and Operation section). Disable printing serial options when using a multimeter communications connection RS-485.

Disabling prevents:
1. Printing through the keypad.
2. Corrupting data at a computer terminal while multiple meters poll.
3. Corrupting printing commands through communications.

TABLE 8-2: SYSTEM CONFIGURATION - SWITCH FEATURES

PACK	SWITCH	FEATURE	SEGMENT POSITION
0	A	Reserved	-
	B	Reserved	-
	C	Reserved	-
	D	Reserved	-
1	A	Non-significant Blank Leading Zero	Up Enable DOWN Disable
	B	Reset Protection (Refer to Installation and Operation Section)	UP Enable DOWN Disable
	C	Reserved	-
	D	Open Delta Installation (Refer to Installation and Operation Section)	UP Enable DOWN Disable
2	A	KYZ Output for Positive WH	UP Enable DOWN Disable
	B	KYZ Output for Negative WH	UP Enable DOWN Disable
	C	Reserved	-
	D	For EI protocol, Switch D is DOWN. For MODBUS protocol, Switch D is UP.	-
3	A	Trip Relay Computer Control (Relay Control 1 and 2 apply only if Relay Option -NL was ordered)	UP Enable DOWN Disable
	B	Trip Relay Computer Control 2	UP Enable DOWN Disable
	C	Communications	UP Enable DOWN Disable

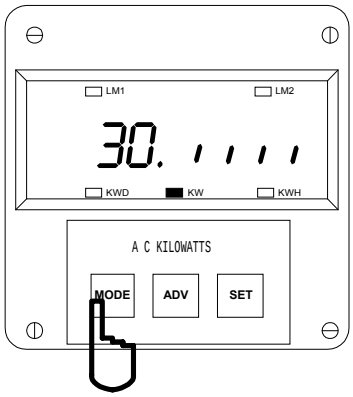
To **change the System Configuration Switch Setting**, follow these steps:



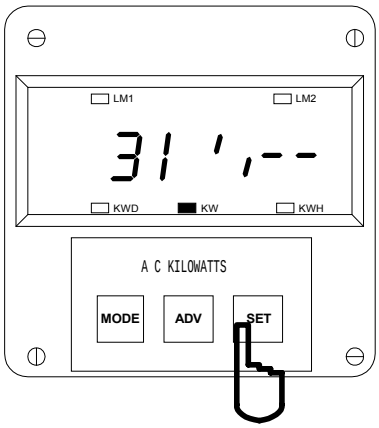
Step 1:
a. Enter Group Level of the Programming Mode, (See Chp. 2).

b. Press ***MODE*** until ***P0.*** appears.

c. Press ***SET*** to activate the Group.



Step 2:
a. Press ***MODE*** until ***30.*** appears to the left, followed by the current setting for PACK 0.

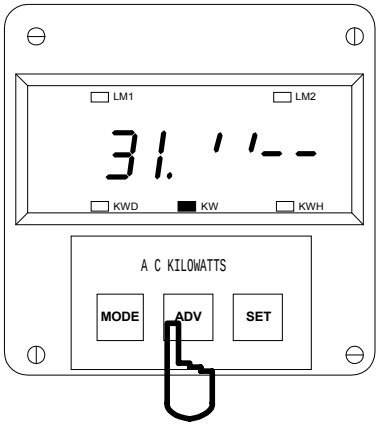


Step 3:
a. Press ***ADV.*** for the desired PACK.

⇨The current setting appears to the right of the Function and PACK numbers.

b. Press ***SET*** to activate Data Entry Sequence.

⇨The previous setting is replaced by four dashes.



Step 4:
a. Press ***ADV.*** to toggle segments for the desired settings.

b. Press ***SET*** to store.

⇨A decimal appears next to the PACK number and the new setting appears to the right.

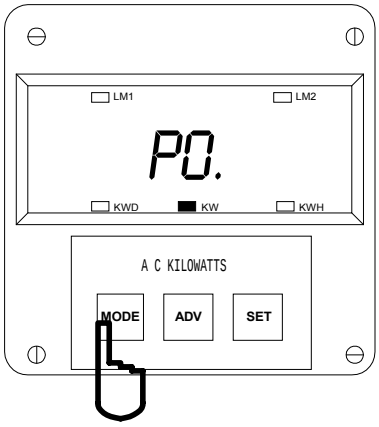
See Chapter 13 to Exit.

8.5 GROUP *0*, FUNCTIONS *4-5* - TIME DELAY FOR RELAYS 1 & 2 (OPTION -NL)

GROUP *0*, FUNCTIONS *4-5* sets the time delay for Relays 1 and 2 between 0 - 255 seconds. This allows conditions (example below) to exist for a user specified time period before the relay or alarm activates. If a time greater than 255 seconds is entered, the meter defaults to the maximum value of 255 seconds.

EXAMPLE: If Relay 1 is set for 500 Watts and the Watts increase to 501, the relay trips only after the time delay period. If the meter then measures 499 Watts, the relay returns to its original position.

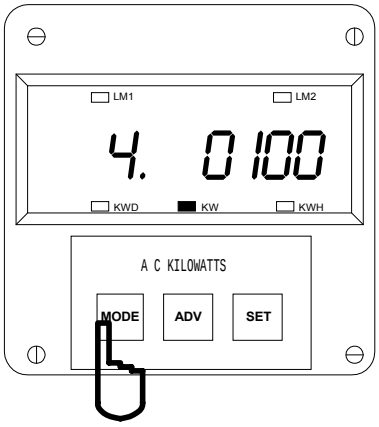
To **program Time Delay for Relay 1 and 2**, follow these steps:



Step 1:
a. Enter Group Level of Programming Mode, (See Chp. 2).

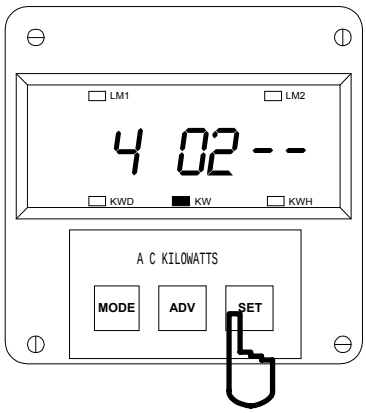
b. Press ***MODE*** until ***P0.*** appears.

c. Press ***SET*** to activate the Group.



Step 2:
a. Press ***MODE*** until Function ***4.*** appears.

⇨The current Delay Time appears to the right of the function number.

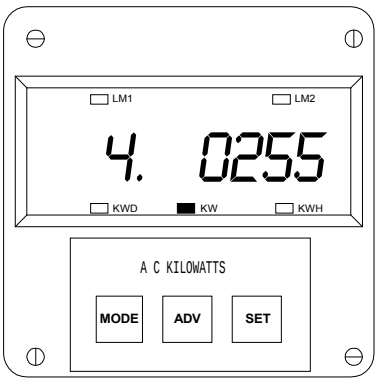


Step 3:
a. Press ***SET*** once to begin Data Entry Sequence.

⇨The previous value shifts and is replaced with four dashes.

b. Press ***ADV.*** for the desired number.

c. Press ***SET*** to store.



⇨Repeat until the desired value is entered.

⇨When complete, a decimal appears next to the function number and the new Delay Time appears to the right.

NOTE: Default of 0255 is the highest setting.

CHAPTER 9
PROGRAMMING GROUP 1: FULL SCALE SETTINGS FOR WATTS

Programming Group 1 provides Full Scale Settings for Watts. The site technician has a choice of Scale Selection between Kilowatts and Megawatts.

TABLE 9-1: GROUP 1 PROGRAMMING FORMAT

FUNCTION NUMBER	FUNCTION
0.	Full Scale Selection for Watts
E.	Exit Programming Group 1

9.1 GROUP 1, FUNCTION 0 - FULL SCALE SETTINGS AND DECIMAL POINT PLACEMENT FOR WATTS

Programming Group 1, Function 0 provides decimal point positioning for maximum resolution.

EXAMPLE 1:
Full Scale Voltage (FSV) = 120 V
Full Scale Amperage (FSA) = 5.00 A

Full Scale Wattage (FSW) is the product of FSV and FSA. For the FSW for two and a half or three element multiply the FSW by 3. For two element multiply the FSW by 2.

FSW (one element) = 120 V • 5.00 A
FSW (one element) = 600 W
FSW (three element) = 600 W •3 = 1,800 W

Here the FSW is too small a value for a Megawatt meter. FSW in the Kilowatt meter equals 1.800 KW. In Function *2*, place the decimal point after the first digit from the left.

EXAMPLE 2: 480/120, 1000/5 CT
FSV = 480 V
FSA = 1000 A
FSW (one element) = 480 V • 1000 A
FSW (one element) = 480,000 W
FSW (three element) = 480,000 W • 3 = 1,440,000 W

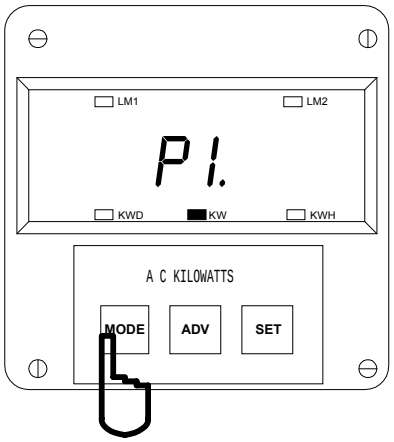
FSW for Kilowatt a meter equals 1440. KW. FSW for a Megawatt meter equals 1.440 MW. In Function 2 place the decimal point after the last digit for a Kilowatt meter and after the first digit for a Megawatt meter.

EXAMPLE 3:
FSV = 1.440 KV
FSA = 1000 A
FSW (one element) = 1440 V • 1000 A
FSW (one element) = 1,440,000 W
FSW (three element) = 1,440, 000 W • 3 = 4,320,000 W

FSW for a Kilowatt meter equals 4320 KW. Here the FSW is too large a value for a Kilowatt meter (the range is 0 - 1000). FSW for a Megawatt meter equals 04.32 MW. In Function *2*, place the decimal point after the second digit.

EXAMPLE 4: 277/480 DELTA, NO PT
FSV = 300 V
FSA = 1000 A
FSW (one element) = 300 V • 1000 A
FSW (one element) = 300,000 W
FSW (three element) = 300, 000 W • 3 = 900,000 W (or 900 KW)
FSW enter 0900 KW.

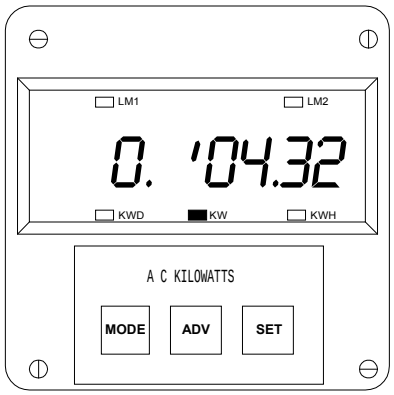
To **change the Full Scale Setting and Decimal Point Placement for Watts**, follow these steps:



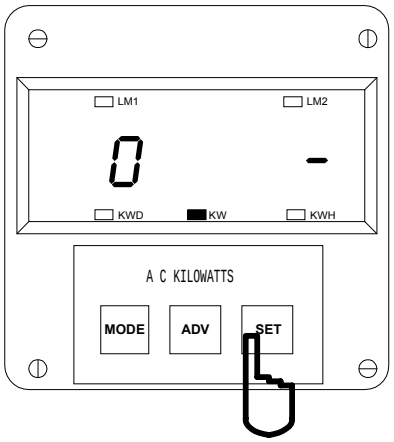
Step 1:
a. Enter Group Level of the Programming Mode, (See Chp. 2).

b. Press ***MODE*** until ***P1.*** appears.

c. Press ***SET*** to activate the Group.



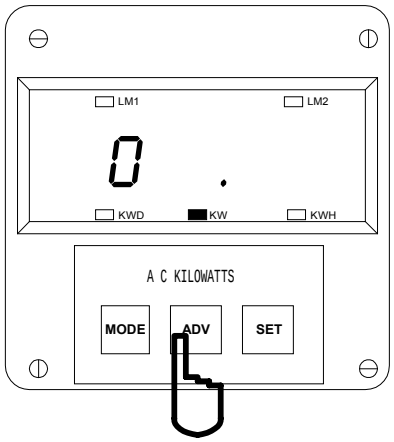
Step 2:
⇨***0.*** appears to the left, followed by the current Scale Factor, Full Scale, and Decimal Point Placement Settings.



ENTERING THE SCALE FACTOR
Step 3:
a. Press ***SET*** to begin Data Entry.
⇨The current setting is replaced by a single dash to the far right.
⇨The Function Number remains on the far left.

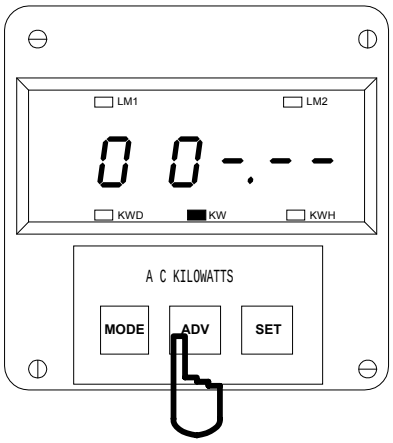
b. Press ***ADV.*** to toggle.
UP - Megawatts
DOWN - Kilowatts

c. Press ***SET*** to store.



DECIMAL POINT SELECTION
Step 4:
a. Press ***ADV.*** to move the decimal point to desired position.

b. Press ***SET*** to store.

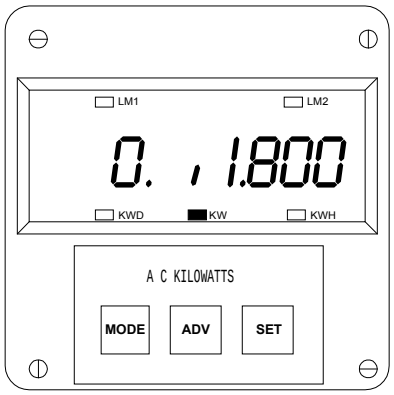


Step 5:

a. Press ***ADV.*** for desired digits.

b. Press ***SET*** to select.

⇨Repeat this procedure until entire Full Scale is entered.



⇨When complete, a decimal appears next to the Function number.

⇨To the right the new Scale Factor, Full Scale and Decimal Point Placement Settings appear.

See Chapter 13 to Exit.

CHAPTER 10
PROGRAMMING GROUP 2: METER CALIBRATION

WARNING - READ THIS SECTION CAREFULLY BEFORE PROCEEDING:

- ☒ The calibration procedure requires highly accurate and stable input signals. Incorrect readings result from improper calibration procedures. If unsure, return unit to the factory for calibration.
- ☒ BEFORE calibrating any channel, make a note of its Full Scale Setting (See Chapter 9). Set the Full Scale in accordance with **Table 10-2** for calibration. Restore original Full Scale Setting when calibration is completed.
- ☒ The first function in Group *2* (STD.CORR) is ***NOT*** to be changed by the user. Please make a note of the value here (☐☐☐☐) before using any *other* function in this group. If the STD.CORR value is inadvertently lost or changed, contact the factory for assistance.

All sensitive electronic measuring devices may *drift* slightly over time and require periodic calibration. We recommend returning the meter to the factory on a yearly basis for proper calibration. However, if the drift in calibration is not significant, the meter does not need yearly calibration.

TABLE 10--1: GROUP 2 PROGRAMMING FORMAT

FUNCTION NUMBER	FUNCTION
P.	Standard Correction - Factory Procedure only.
0.	High End Calibration for Watts
1.	Low End Calibration for Watts
E.	Exit Programming Group 2

10.1 CALIBRATION REQUIREMENTS

Calibration on the SBM 100 requires precise inputs of 120 Volts, and 5 Amps. The SBM 100 Suffix -G model requires precise inputs of 300 Volts and 5 amps. If this equipment is unavailable contact, the factory for assistance.

The power supply phase shift must be adjusted to achieve unity (Power Factor must equal 1). The Watts input must equal the calibration value. If PT and CT ratios are supplied, the calibration value is equal to the full scale value.

NOTE: THE METER MAY BE RESCALED BY CHANGING THE FULL SCALE ONLY WITHOUT CALIBRATING.

TABLE 10-2: CALIBRATION VALUES FOR SBM 100, 2.5 OR 3 ELEMENTS

MODEL	VOLTS / AMPS	CALIBRATION VALUE
Suffix L	75 V • 5 A • 3 or 2-1/2 Elements	1.125 KW
Standard	120 V • 5 A • 3 or 2-1/2 Elements	01.80 KW
Suffix G	300 V • 5 A • 3 or 2-1/2 Elements	04.50 KW

TABLE 10-3: CALIBRATION VALUES FOR SBM 100, 2 ELEMENTS

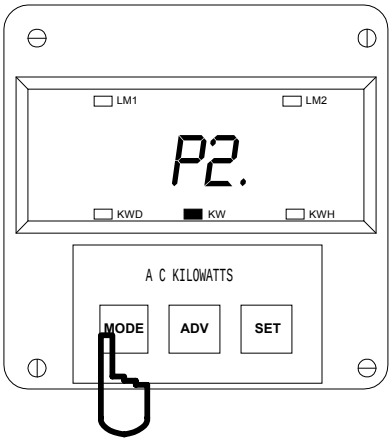
MODEL	VOLTS / AMPS	CALIBRATION VALUE
Suffix L	75 V • 5 A • 2 Elements	0750 KW
Standard	120 V • 5 A • 2 Elements	1200 KW
Suffix G	300 V • 5 A • 2 Elements	0.300 MW

Full Scale Watts is the product of Full Scale Volts and Full Scale Amps:

V • I • 3 = FSW *or* **PT • CT • 3 = FSW**

10.2 GROUP 2, FUNCTIONS 0-1 - HIGH AND LOW END CALIBRATION FOR WATTS

To **change the calibration**, follow these steps:



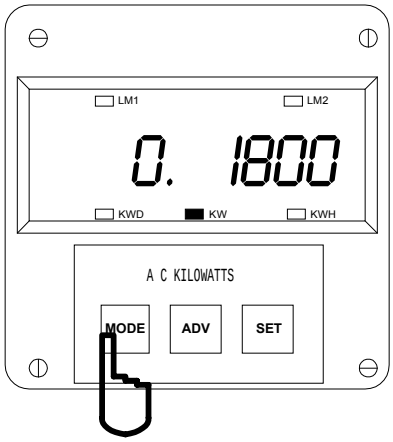
Step 1:
a. Enter Group Level of Programming Mode, (See Chp. 2).

b. Press ***MODE*** until ***P2.*** appears.

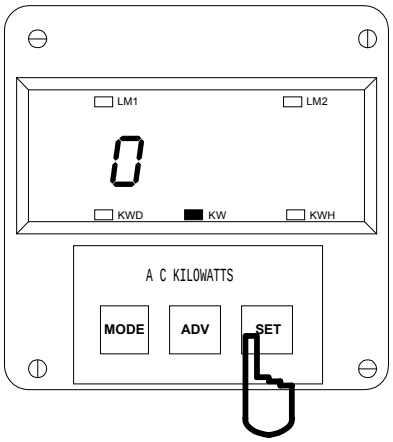
c. Press ***SET*** to activate the Group.
⇨A one digit password is required to continue.

d. Press ***ADV.*** until ***5*** appears.

e. Press ***SET*** to select.



Step 2:
a. Press ***MODE*** until Function ***0*** appears to perform High End Calibration for Watts.



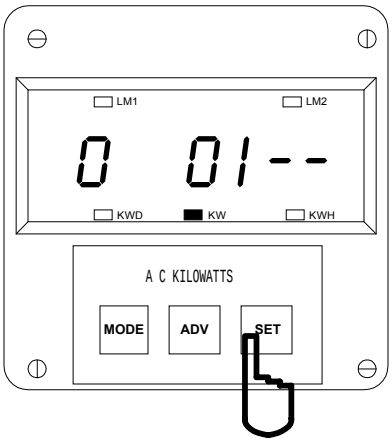
Step 3:
⇨*At this time the calibration source should be applied to the appropriate channel.*

a. Press ***SET*** to enter the Full Scale Value.

⇨The current value is replaced with four dashes.

b. Press ***ADV.*** for the desired digit.

c. Press ***SET*** to select.



Step 4:
⇨Repeat this procedure until the new value is entered.

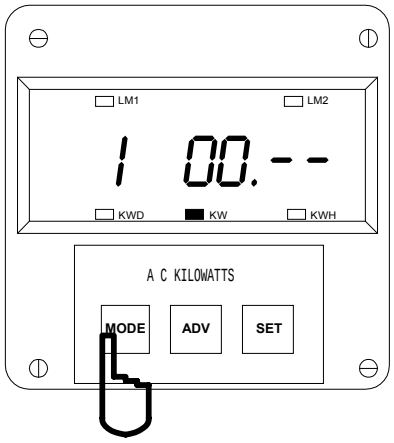
⇨When complete, the new value blanks and after 10-15 seconds the instantaneous reading appears.

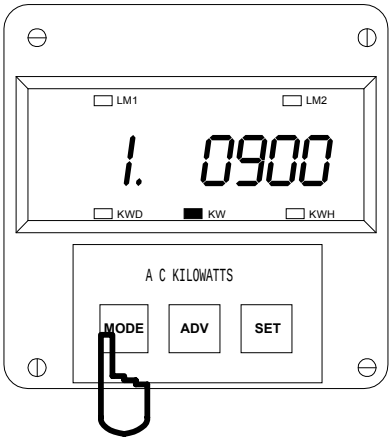
⇨Make any necessary adjustments to watts input.

a. Press ***SET*** to store.

If the calibrated reading is unacceptable, repeat the entire procedure after checking all connections and calibration inputs.

To **perform Low End Calibration for Watts**, follow these steps:





Step 1:
⇨*Reduce the watts input to one-half the Full Scale.*

a. Press ***MODE*** until Function ***1*** appears.

b. Press ***SET*** to enter 1/2 Full Scale Value.

c. Press ***MODE*** to begin Data entry Sequence.

d. Press ***ADV.*** for desired digits.

e. Press ***SET*** to store.

Step 2:
⇨Repeat this procedure until entire value is entered.

⇨When complete, the display blanks.

⇨After 10-15 seconds a number appears.

⇨Make any necessary adjustments to input.

a. Press ***MODE*** to store.

You cannot cancel at this time.

See Chapter 13 to Exit.

CHAPTER 11
PROGRAMMING GROUP 3

The SBM 100 is constructed with two separate modules, joined by a connector and secured with two screws. The front module *(meter module)* contains the microprocessors, displays and related circuitry. The rear *(input module)* supports all incoming signal connections. The sections can be easily separated, allowing the meter module to move or serviced off-site without interrupting service loops or removing meter connections.

The input module does contain some step down circuitry. Due to normal CT tolerance and resistance limitations, small channel offsets, unique to each input module can be seen. *They are measured at the factory and printed on the face of the input (rear) module, referred to as* **CORRECTION RATIOS**.

The Programming Mode enables the user to enter the CORRECTION RATIO of any input module. This allows a site technician to move a meter to a different input module, re-program the correction ratio and resume accurate power metering.

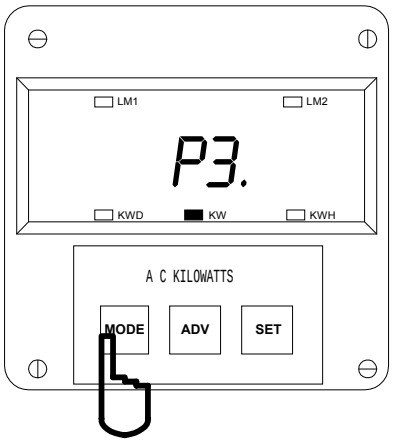
WARNING: AN INCORRECT CORRECTION RATIO ENTRY RESULTS IN FALSE READINGS.

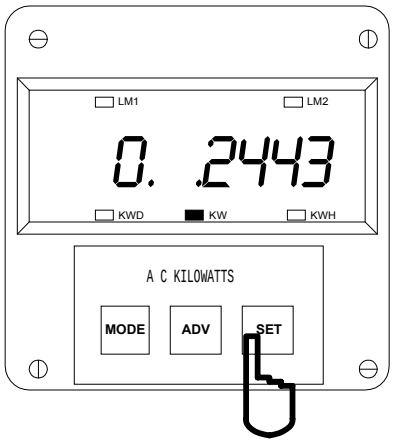
TABLE 11-1: GROUP 3 PROGRAMMING FORMAT

FUNCTION NUMBER	FUNCTION
0.	High End Correction Ratio for Kilowatts
1.	Low End Correction Ratio for Kilowatts
E.	Exit Programming Group 3

11.1 GROUP *3*, FUNCTION *0-1*, HIGH AND LOW CORRECTION RATIOS

To **change a correction ratio for Functions *0* and *1***, follow these steps:





Step 1:
a. Enter Group Level of Programming Mode, (See Chp. 2).

b. Press ***MODE*** until ***P3.*** appears.

c. Press ***SET*** to activate the Group.
⇨A one digit password is required to continue.

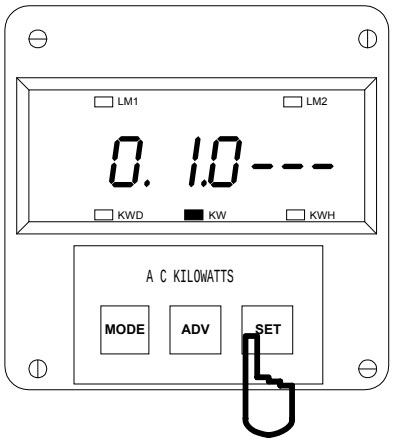
d. Press ***ADV.*** until ***5*** appears.

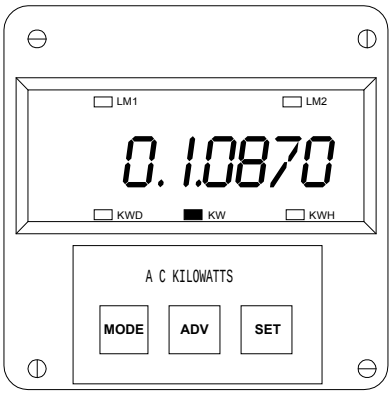
e. Press ***SET*** to select.

Step 2:
⇨Function number ***0.*** appears, followed by the current Correction Ratio.

a. To begin entry of new Correction Ratio, press ***SET*** once.

⇨The current Correction Ratio is replaced by five dashes.





Step 3:

a. Press ***ADV.*** for the desired digits.

b. Press ***SET*** to select.

⇨Repeat this procedure until the new Correction Ratio is entered.

⇨When complete, a decimal appears next to the Group number and the new Correction Ratio appears to the right.

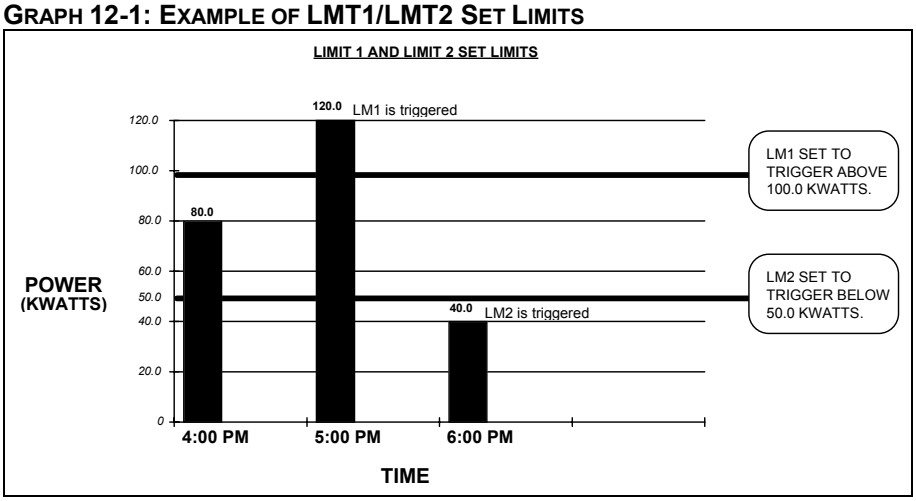
See Chapter 13 to Exit.

CHAPTER 12
PROGRAMMING GROUP 5

Set Limits alert the user when a particular power level changes. The Set Limits on the SBM 100 are LMT1 and LMT2. Each limit can be set at any desired level.

Group *5* contains LMT1 and LMT2 Set Limit Values for Watts. The user can program the limits for positive and negative Watts.

GRAPH 12-1: EXAMPLE OF LMT1/LMT2 SET LIMITS



12.1 TRIP RELAY

NOTE: ALL INFORMATION PERTAINING TO TRIP RELAYS 1 AND 2 APPLIES TO THE SBM 100-3-NL ONLY.

The unit has two relays linked through the program to LMT1 and LMT2 Set Limits. The relay outputs can be programmed individually to close when LMT1 and/or LMT2 is triggered. Each relay has provisions for a separate delay time (see Chapter 4).

①**ABOVE/BELOW** Whether to trip on a signal ABOVE, or BELOW, to the selected level.
②**TRIP RELAY 1** Whether to trip relay 1.
③**TRIP RELAY 2** Whether to trip relay 2.
④**LEVEL** The level at which the warning mechanism trips.

TABLE 12-1: GROUP 5 PROGRAMMING FORMAT

FUNCTION NUMBER	FUNCTION
0.	LMT1/LMT2 Set Limits for Positive Watts
1.	LMT1/LMT2 Set Limits for Negative Watts
E.	Exit Programming Group 5

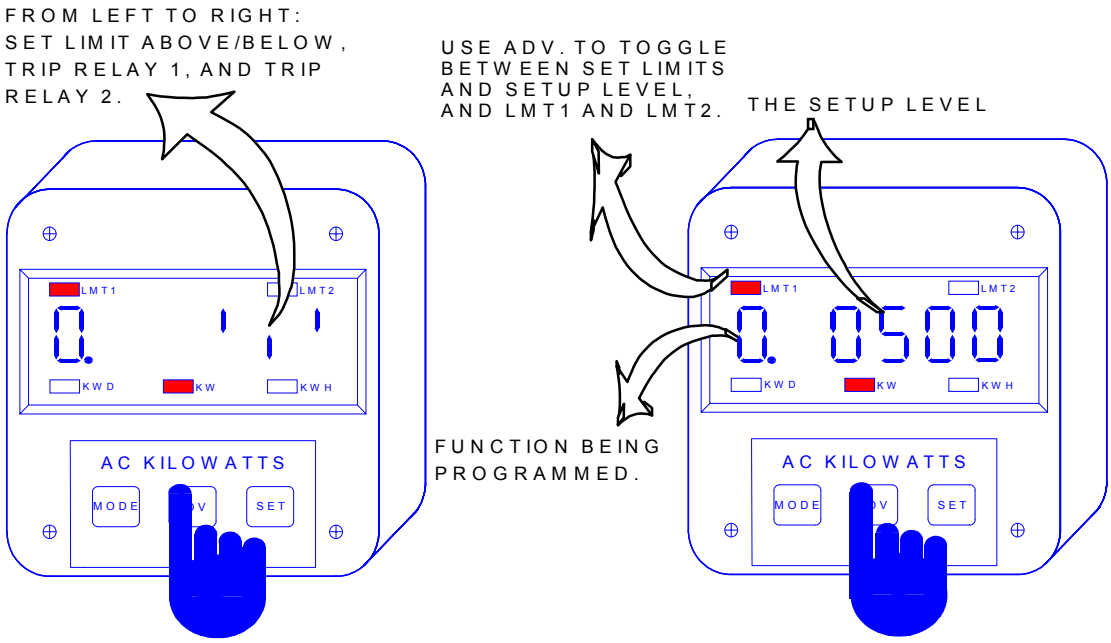


Diagram 12-1
Programming Group 5, LMT1/LMT2 Set Limits

TABLE 12-2: FUNCTIONS *0-1*

LM1 LED	LM2 LED	ABOVE/ BELOW	RELAY 1	RELAY 2	LEVEL
ON	OFF	Digit Up-trigger above level Digit Down-trigger below level	Digit Up-enabled Digit Down-disabled	Digit Up-enabled Digit Down-disabled	0-9999 0-9999
OFF	ON	Digit Up-trigger above level Digit Down-trigger below level	Digit Up-enabled Digit Down-disabled	Digit Up-enabled Digit Down-disabled	0-9999 0-9999

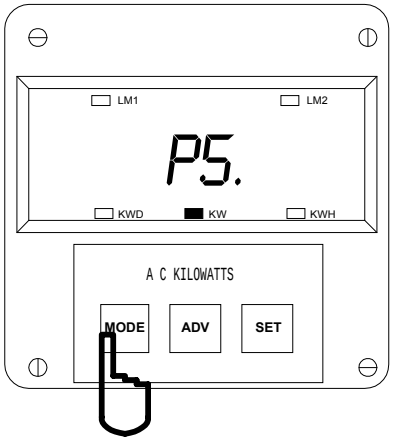
TABLE 12-3: EXAMPLE FOR FUNCTION *0*

ON	OFF	Digit Up	Digit Up	Digit Down	0120
OFF	ON	Digit Down	Digit Down	Digit Up	0090

EXAMPLE:
If Kilowatts exceed 120W, LMT1 is triggered and Relay 1 is enabled. If the Kilowatts do not exceed 90W, LMT2 is triggered and Relay 2 is enabled.

Programming procedure for Group 5 contains four separate parts: Limit 1 Set Limits and Setup Level, and Limit 2 Set Limits and Setup Level.

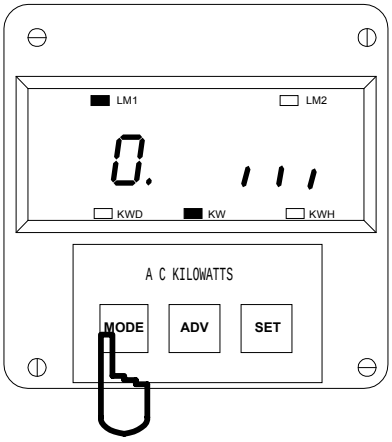
To **begin programming**, follow these steps:



Step 1:
a. Enter Group Level of Programming Mode, (see Chp. 2).

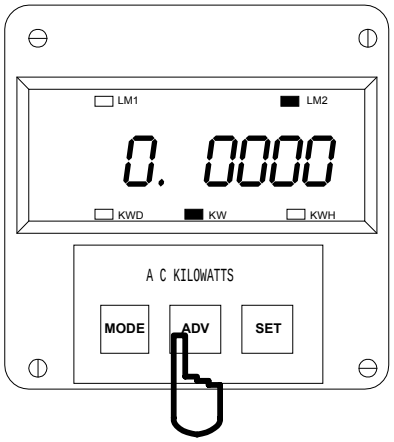
b. Press ***MODE*** until ***P5.*** appears.

c. Press ***SET*** to activate the Group.



Step 2:
⇨Function number ***0.*** appears followed by (from Left to Right) the Set Above/Below, Trip Relay 1 and Trip Relay 2 current Set Limits.

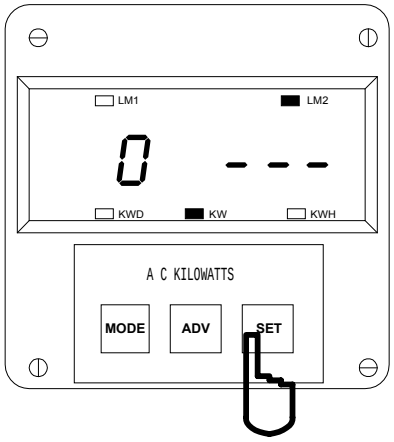
a. Press ***MODE*** to select Function 0 or 1.



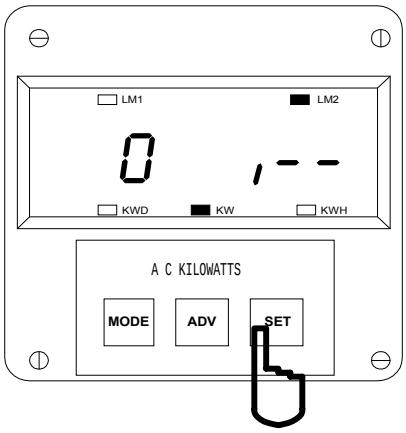
Step 3:
a. Press ***ADV.*** to view the current Setup Level.

b. Press ***ADV.*** twice to skip programming of Limit 1 and proceed to Limit 2.

c. Press ***ADV.*** three times to view the Setup Level for Limit 2.



Step 4:
a. Press ***SET*** to begin the data entry sequence for the Set Limits or to Disable the Limits.

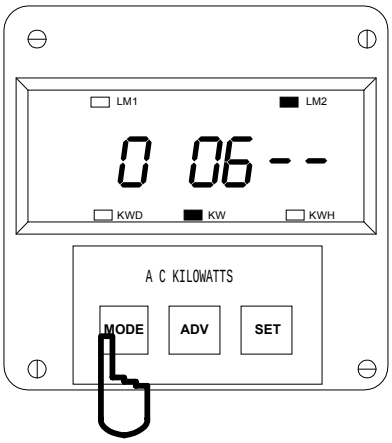


Step 5:
b. Press ***ADV.*** to toggle the segments.

c. Press ***SET*** to store.

⇨Repeat until all information is entered.

⇨To leave segments unchanged and to change the Limit Value, select MODE. Then proceed to Step 6.



Step 6:
a. Press ***MODE*** once to Disable the Limits.

⇨Four dashes appear next to the Function number.

b. Press ***ADV.*** for desired digits.

c. Press ***SET*** to store.

⇨Repeat until all information is entered.

d. After entering all four digits, the display will revert back to showing segments. Press ADV to see the Limit Value.

e. After the fourth digit is stored, the display reverts back to the segment setting and the decimal point will reappear after the Function 0 digit.

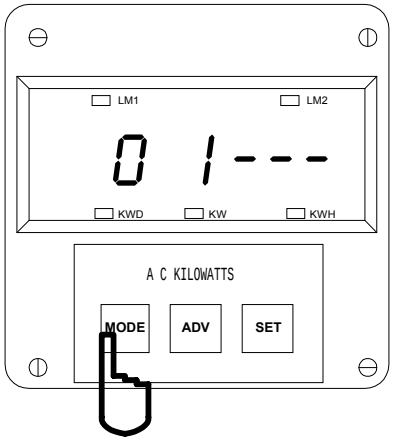
See Chapter 13 to Exit.

CHAPTER 13
EXITING THE PROGRAMMING MODE

STEPS TO EXIT THE PROGRAMMING MODE VARIES AS THE PROGRAMMING STAGE VARY.

Exiting the Programming is always necessary to store any new changes.

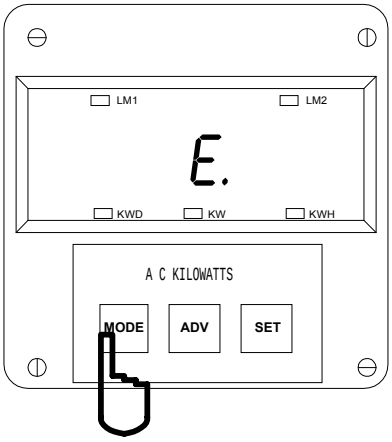
If you are located at:	FUNCTION Level - begin at Step 1.
If you are located at:	GROUP Level - begin at Step 2.



Step 1:
EXITING FROM DATA ENTRY SEQUENCE

a. Press ***MODE*** to cancel the Data Entry Sequence.

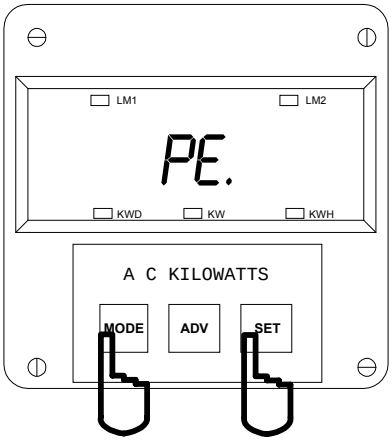
⇨The EPM 4300S returns to the Function Level.



Step 1a:
EXITING FROM FUNCTION LEVEL

a. Press ***MODE*** until ***E.*** appears.

b. Press ***SET*** to exit from the Function Level to Group Level.



Step 2:
EXITING FROM GROUP LEVEL

a. Press ***MODE*** until ***PE.*** appears.

b. Press ***SET*** to exit entirely from the Programming Mode.
⇨You have exited the Programming Mode. After a moment the meter returns to the Operating Mode.

APPENDICES

A. RESERVED GROUPS, FUNCTIONS AND PACKS

Programming Group 4, Group 6, and Group 7 are reserved, because these Groups are not used.

In Group 0, Function 3, certain Switch PACKS are reserved. When encountering a pack which is reserved move to the next Switch PACK. (See Chapter 8).

B. QUICK REFERENCE

PROGRAM GROUP	PURPOSE	DESCRIPTION
0	Global Meter Setup	Sets meter parameters: Integration Interval, Meter Address, Communication Baud Rate, System Configuration, and Relay Operation
1	Full Scale Settings	Changes Full Scale settings for Watts
2	Calibration	High and Low End Calibration for Watts
3	Correction Ratio	Changes the Correction Ratio
4	RESERVED	RESERVED
5	LMT1/LMT2 Set Limits for Power Functions	Changes High and Low Set Limits for Watts
6	RESERVED	RESERVED
7	RESERVED	RESERVED
8	RESERVED	RESERVED

C. OPEN DELTA SYSTEM INSTALLATION PROGRAMMING

A special switch alerts the meter that the electrical system being monitored is a Three-wire Open Delta System using the connection installation in Chapter 3 of this manual. The switch is located in GROUP 0, FUNCTION 3, PACK 1, SWITCH D. (See Chapter 8 of this manual).

WARNING: SET THIS SWITCH TO '1' ONLY IF THE ELECTRICAL SYSTEM IS A THREE-WIRE OPEN DELTA. OTHERWISE, SET THE SWITCH TO '0' ALL THE TIME. FAILURE TO SELECT THIS SWITCH RESULTS IN PHASE-TO-NEUTRAL READINGS.

Follow the special Open Delta Connection Installation. (See Chapter 3).

D. MODBUS MAPPING FOR SBM 100

The Modbus Mapping for the SBM 100 Meter is on the following pages.

Register Address	Description	Range	Unit	R/W
Meter Profile Block				
0x0000		0x0020	B15-VAN B14-VBN B13-VCN B12-VAB B11-VBC B10-VCA B9-IA B8-IB B7-IC B6-IN **B5-Watts** B4-VAR B3-VA B2-PF B1-FQ B0-n/a	R
0X0002		0X0008	B15-KFVA B14-KFVB B13-KFVC B12-KFIA B11-KFIB B10-KFIC B9-n/a B8-n/a B7-n/a B6-n/a B5-n/a B4-n/a **B3-Watt Hour** B2-Var Hour B1-VA Hour B0-n/a	R
0X0004		0XCC80	**B15-Limits1** **B14-Limits2** **B11-Relay1** **B10-Relay2** B9-Relay3 **B7-KYZ 1ch** B6-KYZ 3 ch	R
Meter Information Block				
0x0008-0x0011	Meter Name	DMWH300	ASCII	R
0x0025	Modbus version number	0…9999	n/a	R
0x0027	Digital version number	0…9999	n/a	R
Programming Data Block				
0x0028	Interval		Seconds	R/W
0x0029	Address	1…254	HEX	R/W
0x002A	Baud Rate	1200, 2400, 4800,	Bits/Sec	R/W

Register Address	Description	Range	Unit	R/W
0x002B	Config	0xFFFF	B13-MW B11-LZ B10-RST B8-DLT B7-KYZ for WH B6-KYZ for -WH B4-Modbus/EI protocol B3-RLY1 B2-RLY2 B1-COM B0-DC	R/W
0x002C	Watt Full Scale	0…2000	HEX	R/W
0x002F	Power DP	only High byte	Watt DP	R/W
0x0030	Set Above/Below Lim1 bit 1 : Below bit 0 : Above		B5-Positive Limit 1 B4-Negative Limit 1	R/W
0x0031	Set Above/Below Lim2 bit 1 : Below bit 0 : Above		B5-Positive Limit 2 B4-Negative Limit 2	R/W
0x0046	Limit 1 Watt Value	0…2000	HEX	R/W
0x0047	Limit 2 Watt Value	0…2000	HEX	R/W
0x0050	Limit 1 Negative Watt Value	0…2000	HEX	R/W
0x0051	Limit 2 Negative Watt Value	0…2000	HEX	R/W
0x0070	RLY1 Lim1 bit 1 : Turn on Relay bit 0 : Turn off Relay		B5-Positive Limit 1 B4-Negative Limit 1	R/W
0x0071	RLY1 Lim2 bit 1 : Turn on Relay bit 0 : Turn off Relay		B5-Positive Limit 2 B4-Negative Limit 2	R/W
0x0072	RLY2 Lim1 bit 1 : Turn on Relay bit 0 : Turn off Relay		B5-Positive Limit 1 B4-Negative Limit 1	R/W
0x0073	RLY2 Lim2 bit 1 : Turn on Relay bit 0 : Turn off Relay		B5-Positive Limit 2 B4-Negative Limit 2	R/W
0x0074	Delay on Relays, Each byte has delay for relays	0…250, 0…250	Seconds	R/W
DAXI Data Block				
0x0120	Inst. Watt	-9999…9999	HEX	R
0x0147	Watt Average	-9999…9999	HEX	R
0x016E	Max. Watt	0…9999	HEX	R
Hour Block				
0x01B2-0x01B9	Watt Hour	0~19999999.99	ASCII	R

Register Address	Description	Range	Unit	R/W
Reset Block				
0x0504	Setting bits will reset the values		B5-(+,-)MAX Watt B3-(+,-)Watt Hour	W
Negative MAX/MIN Block				
0x050A	Negative MAX. Watt	-9999…0	HEX	R
Negative Hour Block				
0x09BA-0x09C1	Negative Watt Hour	0~19999999.99	ASCII	R
Null-Terminated Hour Readings				
0x09CE-0x09D5	Watt Hour	0~19999999.99,00	ASCII	R
0x09E6-0x09ED	Negative Watt Hour	0~19999999.99,00	ASCII	R