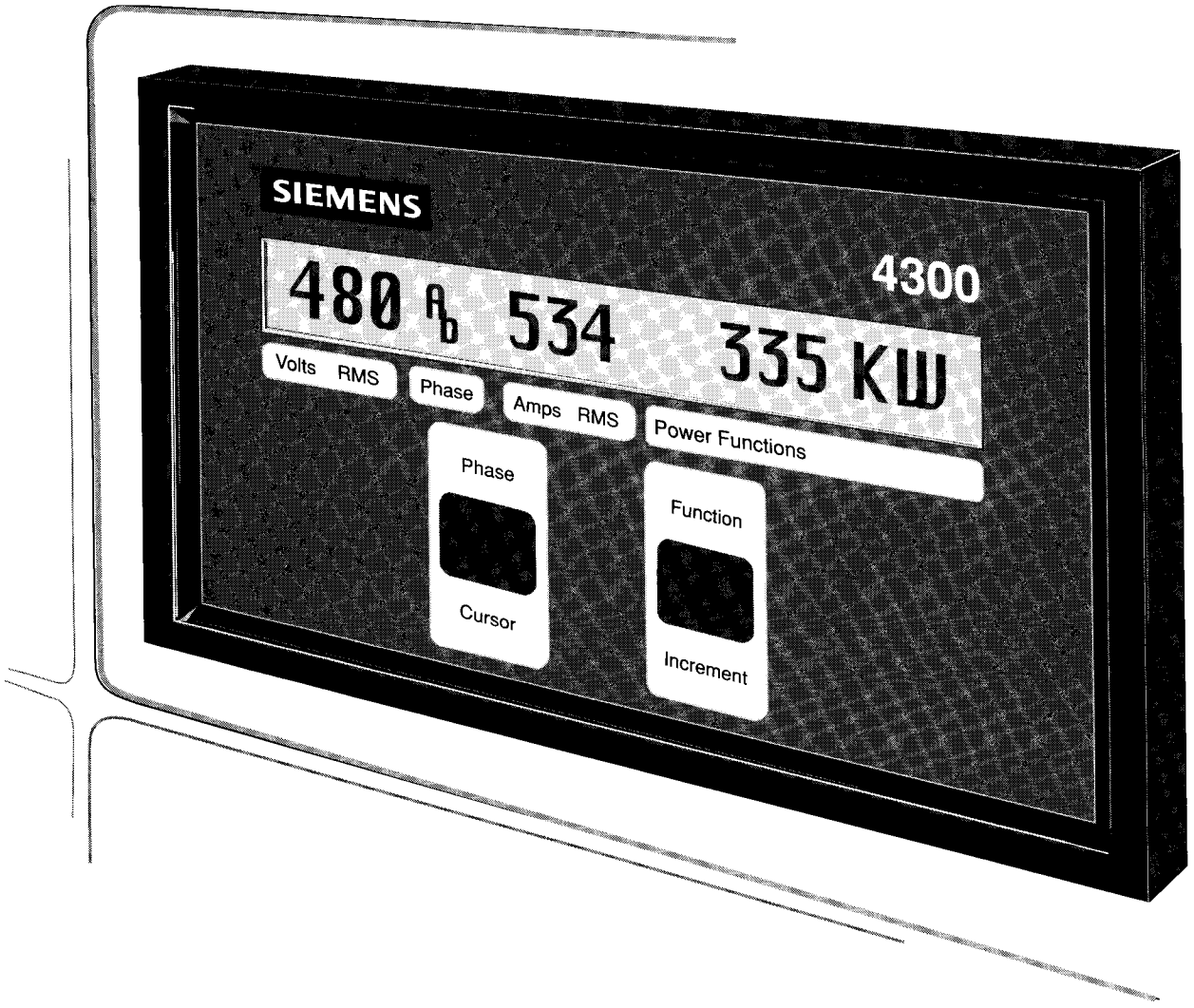
SIEMENS

4300 Power Meter

Operator's Manual



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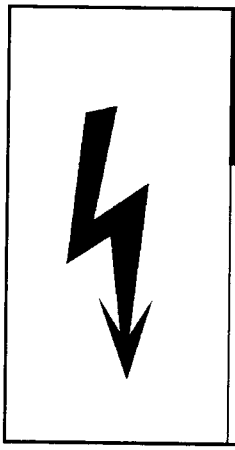

DANGER

Hazardous voltages are present in the equipment that will cause severe personal injury and equipment damage. Always de-energize and ground the equipment before maintenance. Maintenance should be performed only by qualified personnel. The use of unauthorized parts in the repair of the equipment or tampering by unqualified personnel will result in dangerous conditions which can cause severe personal injury or equipment damage. Follow all safety instructions contained herein.

Circuit breaker indicators shown in this booklet are for illustration purposes only. Circuit breakers are to be installed in "Discharged" and "Open" positions only.

IMPORTANT

The information contained herein is general in nature and not intended for specific application purposes. It does not relieve the user of responsibility to use sound practices in application, installation, operation, and maintenance of the equipment purchased. Siemens reserves the right to make changes in the specifications shown herein or to make improvements at any time without notice or obligations. Should a conflict arise between the general information contained in this publication and the contents of drawings or supplementary material or both, the latter shall take precedence.

NOTE

***Authorized and qualified personnel—**
For the purpose of this manual a qualified person is one who is familiar with the installation, construction or operation of the equipment and the hazards involved. In addition, he has the following qualifications:

(a) **is trained and authorized** to de-energize, clear, ground, and tag circuits and equipment in accordance with established safety practices.

(b) **is trained** in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established safety practices.

(c) **is trained** in rendering first aid.

SUMMARY

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local sales office, listed on back of this instruction guide.

The contents of this instruction manual should not become part of or modify any prior or existing agreement, commitment or relationship. The sales contract contains the entire obligation of Siemens Energy & Automation, Inc. The warranty contained in the contract between the parties is the sole warranty of Siemens Energy & Automation, Inc. Any statements contained herein do not create new warranties or modify the existing warranty.

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Problem Report for ACCESS Systems and Devices

1 Introduction

The 4300 power meter is a microprocessor-based, three-phase power meter that provides advanced features at an affordable price.

The 4300 power meter is designed as an alternative to full-featured digital instrumentation packages. It provides high accuracy, high reliability, high transient surge and hipot-withstand capabilities. Volts and amps measurements are true RMS, including harmonics.

The 4300 power meter replaces standard analog meters and selector switches, and its unique two-module design simplifies wiring and reduces installation time. This design makes the meter ideally suited for economical metering on three-phase industrial and commercial switchboards and switchgear.

A communications port lets you use the 4300 power meter as a stand-alone power monitoring station or as one element in a large energy-management network.

1.1 Measurement Functions and Displays

The 4300 power meter can be configured to operate in Wye (Star), Delta, or Single-phase voltage modes. The meter is equipped to monitor the following measurements:

- Line-to-neutral voltages (Van, Vbn, Vcn)
- Line-to-neutral average voltage (LNav)
- Line-to-line voltages (Vab, Vbc, Vca)
- Line-to-line average voltage (LLav)
- Current on each phase (Ia, Ib, Ic)
- Average current
- KW total for all phases
- KWH total for all phases
- KW Demand
- MAX KW Demand
- PF (Power Factor)

As illustrated in Figure 1-1 below, the display module has a high-visibility, 20-character, liquid crystal display (LCD). Operators use its functions buttons to display measured data, including volts, amps, power function, all three volts phases, and all three amps phases.

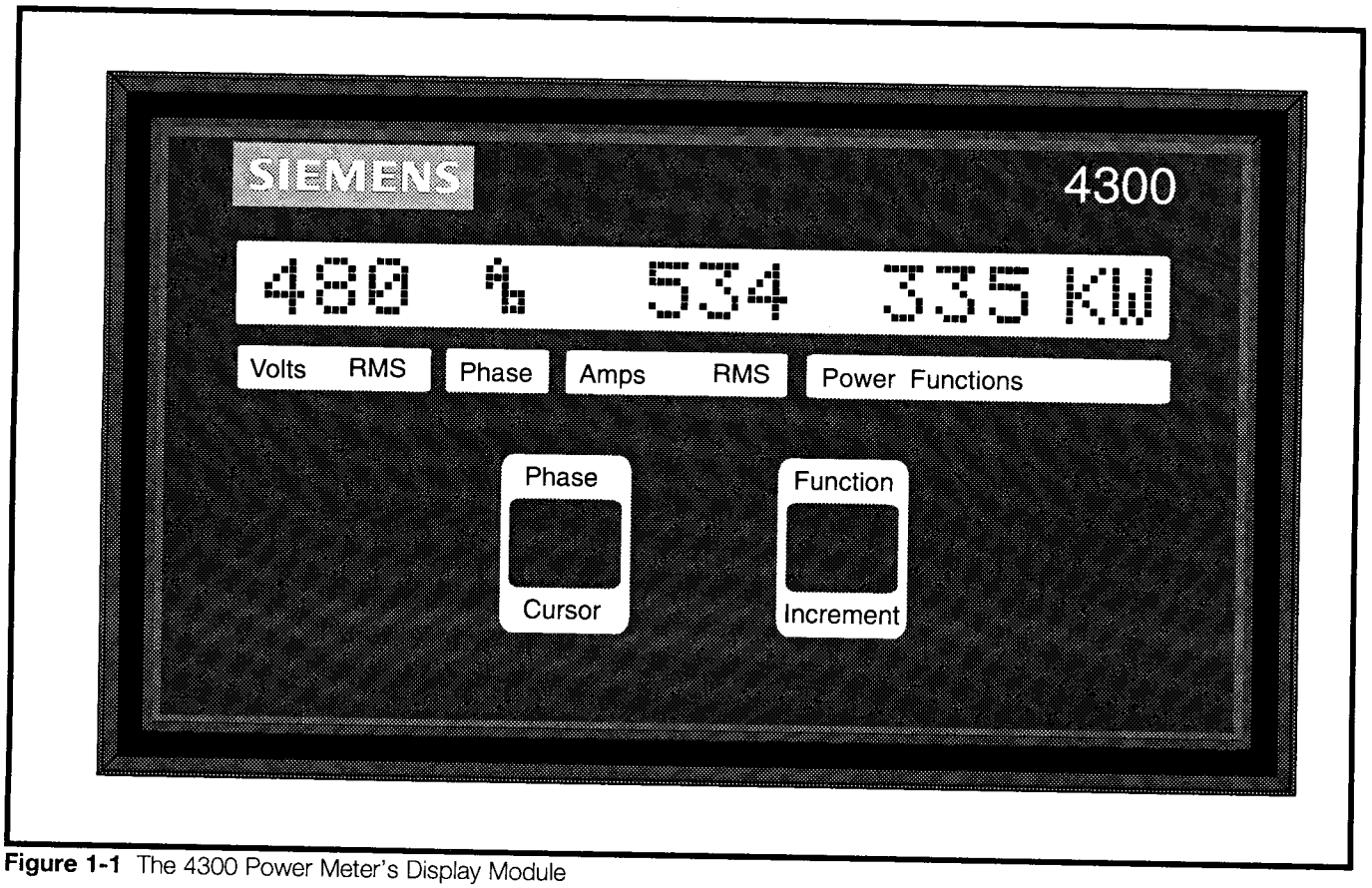


Figure 1-1 The 4300 Power Meter's Display Module

1.2 Quick and Easy Installation

The 4300 power meter's two-module design simplifies wiring connections and reduces installation time. As illustrated in Figure 1-2 below, the base module is equipped with a large, utility approved, barrier-style terminal strip for reliable connections, and the meter requires no transducers. You can connect current transformers (CTs) to the meter directly (via shorting blocks), and no potential transformers (PTs) are needed for four-wire Wye systems 347/600 volts and below.

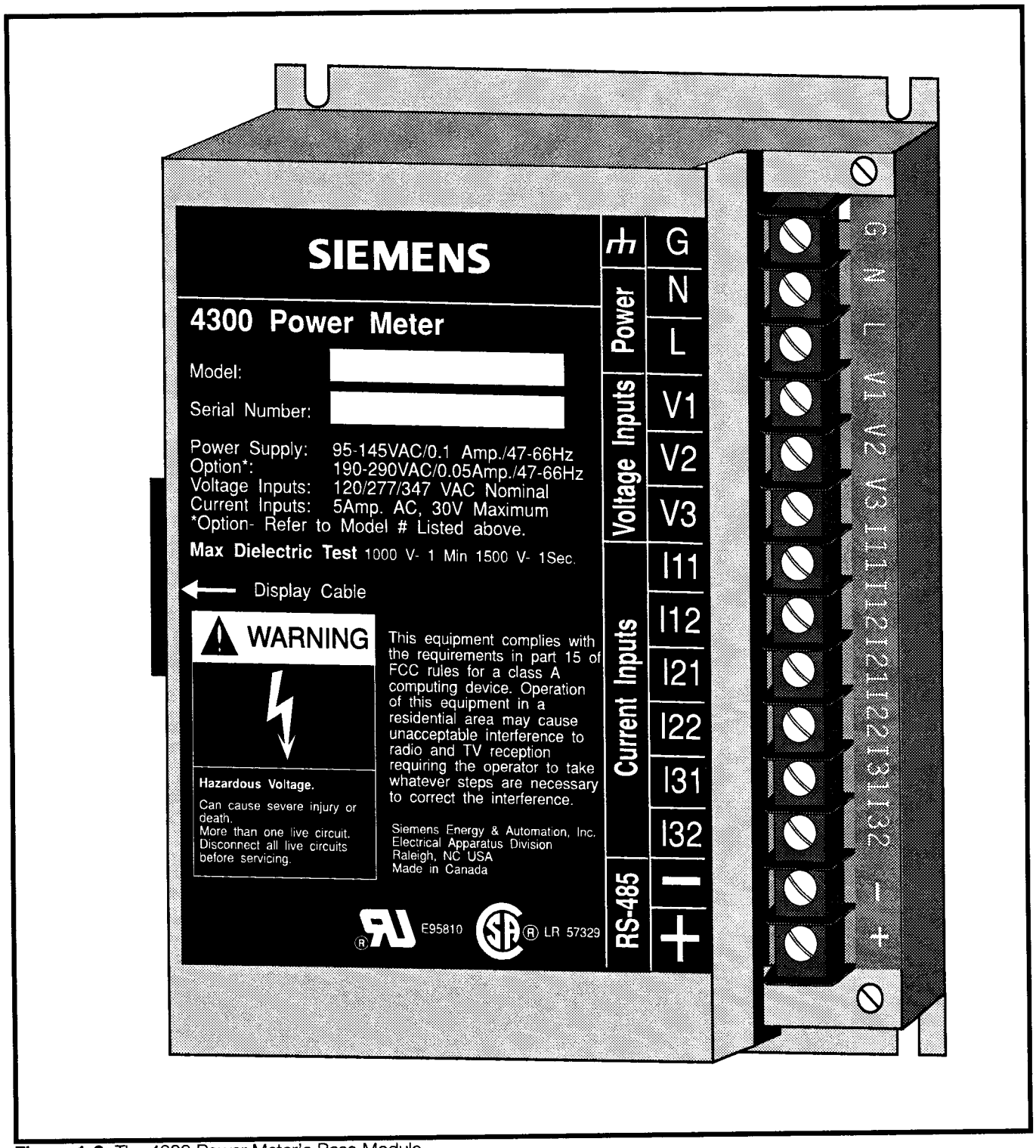


Figure 1-2 The 4300 Power Meter's Base Module

1 Introduction

The meter's base module mounts directly to a switchgear panel, and the display module mounts in ANSI C39.1 cutouts. This arrangement simplifies the replacement of existing analog meters. A single plug-in cable connects the two modules, permitting you to mount the base module inside a switchgear cabinet. (No switches or additional wiring is required on the panel door.) If you ever need to remove or replace the display module, you can do so without shutting down the meter.

1.3 Field Programmability

You can easily program the metering parameters from the display module. A listing of these parameters appears in Table 3-3. You can also use a portable or remotely located PC, with the proper software, to program setup data via the meter's communications port. The 4300 power meter saves all set-up data at power down, and all programming is protected by password.

1.4 Communications and ACCESS™ Compatibility

The 4300 power meter is equipped with an optically isolated, RS-485 communications port for displaying data on a remote supervisory device. Examples of this device include the Power Monitor™ display and monitoring unit (a standard personal computer running the Power Monitor PC™ communications and supervisory software) and Siemens Microsoft® Windows™ based SIEServe or WinPM software. These supervisory devices and programs can communicate with the 4300 power meter, allowing it to operate in the ACCESS™ electrical distribution communications system.

The 4300 power meter can also communicate with a host PC as part of the ACCESS system. The *4300 Power Meter SEAbus™ Protocol* document provides a comprehensive description of the meter's communications protocol. This open protocol enables other systems to gain access to the 4300 power meter. Siemens' continuing development program provides further compatibility with third-party communications protocols.

1.5 New Feature Upgrades Made Easy

The 4300 power meter is designed to maintain its position at the forefront of developing technology through upward compatibility. An advanced system architecture supports simple upgrades of the meter's on-board operating software.

If you connect the 4300 power meter to a supervisory device that has software downloading capability, you can easily install new features or performance enhancements via the meter's communications port without interrupting electrical service. Be sure to connect each 4300 power meter to a local RS-485 communications bus during installation so that you can upgrade the meter's software without disconnecting wires or removing the unit from its installation.

1.6 System Applications

The 4300 power meter is a state-of-the-art alternative to traditional analog, electromechanical metering devices. Because of its unique measurement, display, and communications capabilities, the 4300 power meter can be used in any of the following applications:

- utility installations and substation metering
- industrial, office, and commercial buildings
- hospitals
- telephone exchanges
- factories and chemical process plants
- pulp mills and saw mills
- large stores, shopping centers, and hotels
- co-generation systems
- multi-user sites for allocation of electrical costs
- any other installation that uses significant amounts of electrical energy

2.1 Location

Mount the 4300 power meter in a dry, dirt-free environment, away from heat sources and high electrical fields. The temperature of the meter's environment should not exceed 50°C (112°F) or fall below 0°C (32°F).

2.2 Mounting

Mount the display module of the 4300 power meter in a switchgear panel for easy access and viewing. As illustrated in Figure B-1 (in Appendix B), the display module requires four holes and one cutout that allows you to connect the display cable. The mounting studs and display connector for the display module fit existing ANSI C39.1 panel cutouts.

As illustrated in Figure B-2, mount the base module of the meter flush against any flat surface, using the four slots on its mounting flange. Normally, you mount the base module inside a switchgear cabinet. The position of the labeling on the base module lets you mount the module against a wall, with the terminal strip aligned vertically, but you can mount the module in the position you find most convenient.

The distance between the mounting locations of the display and base modules can be up to 10 feet (3.03 meters). The interconnecting display cable supplied with the power meter is six feet. Display cables are available in lengths up to 10 feet. Contact your Siemens representative for ordering information.

Note: The display cable is not a standard RS-232 cable. Use only the cable supplied by Siemens with the 4300 power meter. Using any other cable may damage the meter.

2.3 Power Supply

The 4300 power meter is powered by a nominal 120 VAC (47 to 66 Hz) at 0.1 amps. It can be powered from a dedicated fused feed or from the voltage source it monitors, as long as that source is a 120-volt system. An optional 240 VAC (47 to 66 Hz) at 0.05 amps power supply is available.

2.4 Wiring

Make electrical and communications connections for the 4300 power meter to the terminal strip located on the base module. Figure B-2 illustrates the location of the terminal strip on the base module.

2.4.1 Electrical Connections

Use 12-gauge to 14-gauge wire for all electrical connections. Use ring or spade terminals to simplify connection. Phasing and polarity of the AC current and voltage inputs, and their relationship, are critical for proper operation of the meter. The following list contains the figure numbers and titles that illustrate the six electrical configurations for the 4300 power meter.

Figure 2-1 Four-Wire Wye, Three-Element Direct Connection for Systems of 120/208 to 347/600 Volts

Figure 2-2 Four-Wire Wye, Three-Element Connection Using Three PTs

Figure 2-3 Four-Wire Wye, 2 1/2-Element Connection Using Two PTs, for Balanced Systems Above 347/600 Volts

Figure 2-4 Three-Wire Wye, Three-Element Direct Connection for 120/208 to 347/600 Volt Systems

Figure 2-5 Three-Wire Delta, 2 1/2-Element Connection Using Two PTs and Three CTs

Figure 2-6 Three-Wire Delta, 2 1/2-Element Connection Using 2 PTs and Two CTs

Figure 2-7 Three-Wire Single-Phase, Two-Element Direct Connection

These figures, which appear on pages 7-13, illustrate the proper electrical wiring for each configuration.

2.4.2 Communications Connection

Make RS-485 communications connections with a 22-gauge, shielded, twisted-pair cable. Siemens recommends Alpha Wire Corp. part numbers 5121C or 55121. Refer to section 5, "Communications," for detailed information on communications wiring.

2.5 PT and CT Transformer Selection

To properly monitor data with the 4300 power meter, you must select the correct current transformers (CTs) and potential transformers (PTs) if required. Metering accuracy depends on the combined accuracies of the 4300 power meter, the CTs, and the PTs (if used). Subsections 2.5.1 and 2.5.2 provide the information you need to properly select PTs and CTs.

2.5.1 PT Selection

Whether you need PTs to install the 4300 power meter in your system depends on the voltage levels it monitors. You can use the 4300 power meter for direct connection (without PTs) in the following configurations:

- four-wire Wye, direct connection for 120/208 to 347/600 volt systems
- three-wire Wye, direct connection for 120/208 to 347/600 volt systems
- three-wire Single Phase (350 VAC or less)

You must use PTs in the following configurations:

- four-wire Wye systems over 347/600 volts
- three-wire Delta

You can also use the meter's inputs with PTs that have a 120-volt secondary. If line-to-neutral (L-N) or line-to-line (L-L) voltages exceed 347/600, you must use PTs. PTs scale down the system L-N (Wye) or L-L (Delta) voltage to 120 volts full-scale. Select PTs as follows:

- Wye (Star): PT primary rating = system L-N voltage or nearest higher standard size; PT secondary rating = 120 volts.
- Delta: PT primary rating = system L-L voltage; PT secondary rating = 120 volts.

PT quality directly affects system accuracy. The PTs you use must provide good linearity and must maintain the proper phase relationship between voltage and current in order for the volts, KW, and PF readings to be valid. Use instrument Accuracy Class 1 or better.

2.5.2 CT Selection

The 4300 power meter uses CTs to sense the current in each phase of the power feed. CT selection also affects metering accuracy.

The 4300 power meter's current-input rating is five amps. Normally you select a CT primary rating that equals the current rating of the power-feed protection device; however, if peak anticipated load is much less than the system's rated capacity, you can improve accuracy and resolution by selecting a lower rated CT. In this case, CT size should equal the maximum expected peak current plus 25 per cent, and rounded to the nearest standard CT size.

Other factors can affect CT accuracy, too. For instance, long cables can contribute to inaccuracy. To avoid this problem, keep cables as short as possible, and make sure that the CT burden rating exceeds the combined burden of the 4300 power meter (.05 VA), plus cables, and other connected devices. (Burden is the amount of load being fed by the CT, measured in volt-amps.)

2.6 Connecting the Ground Terminal

The G (ground) terminal of the 4300 power meter is both the meter's measurement reference point and the chassis ground connection for the meter. This lead must be connected to earth ground. A good, low-impedance chassis ground is essential for accurate measurement. Do not rely on metal door hinges as a ground path.

CAUTION: To prevent electrical noise and electrical surges from interfering with the meter, connect the 4300 power meter's ground terminal to the switchgear earth ground with a 14-gauge (or larger) wire. Failure to ground the meter adequately voids its warranty.

2.7 Connecting Three-Phase, Wye (Star) Systems

In three-phase Wye systems, the 4300 power meter senses the line-to-earth ground voltage of each phase. If the power system being monitored is a 120 VAC to 347 VAC system, the meter's inputs can be connected directly. Figure 2-1 (on page 7) illustrates a three-phase, four-wire Wye, 120/208 to 347/600 volt system with a three-element direct connection.

Figure 2-2 (on page 8) illustrates a three-phase, four-wire Wye, three-element connection using three PTs. Figure 2-3 (on page 9) illustrates a three-phase, four-wire Wye, 2 1/2-element connection using two PTs. (Use this connection for balanced systems only.) When using PTs, wire both the PT primary and secondary in a Wye (Star) configuration, and protect voltage sensing leads at their sources with breakers or fuses. If the power rating of the PTs exceeds 25 Watts, fuse the secondaries. Wiring must be exactly as shown for correct operation.

Figure 2-4 (on page 10) illustrates a three-phase, three-wire Wye, 120/208 to 347/600 volt system with a three-element direct connection. When the Star point of a three-wire Wye system is grounded, the 4300 power meter can be directly connected without PTs, provided that the voltages are within the input range of the unit. For line-to-neutral (L-N) voltages over 347 volts, use PTs.

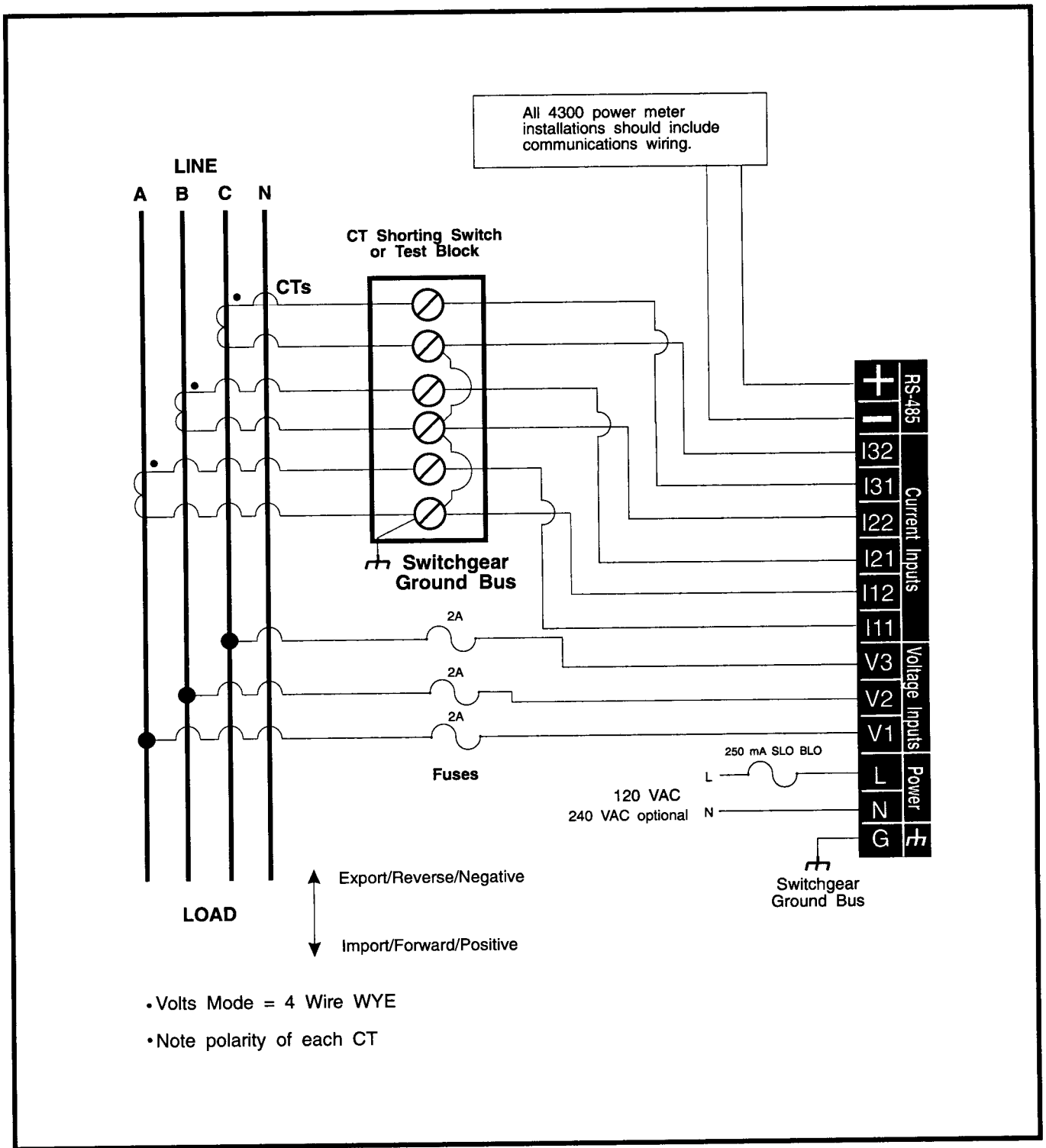


Figure 2-1 Four-Wire Wye, Three-Element Direct Connection, for Systems of 120/208 to 347/600 Volts

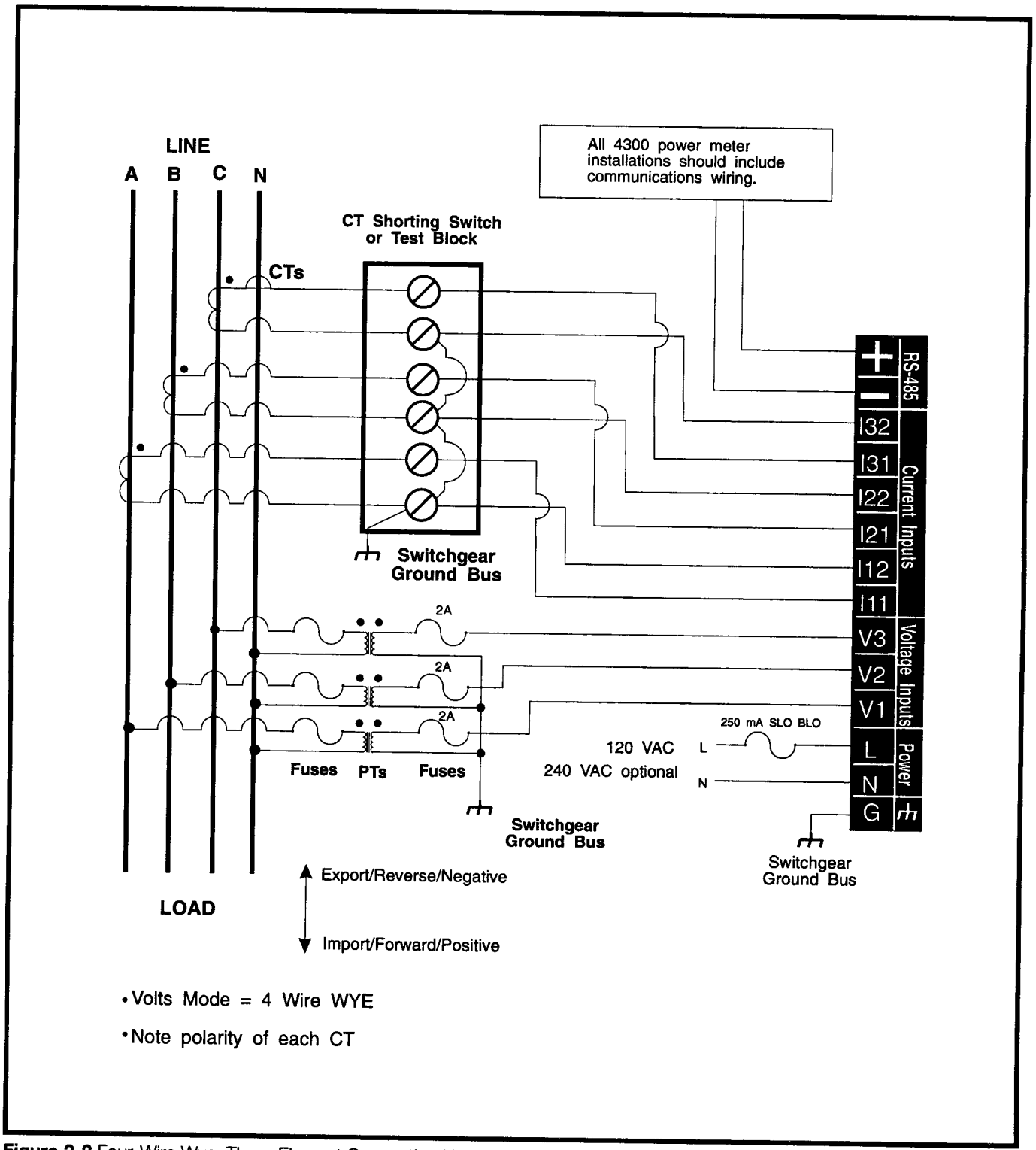


Figure 2-2 Four-Wire Wye, Three-Element Connection Using Three PTs

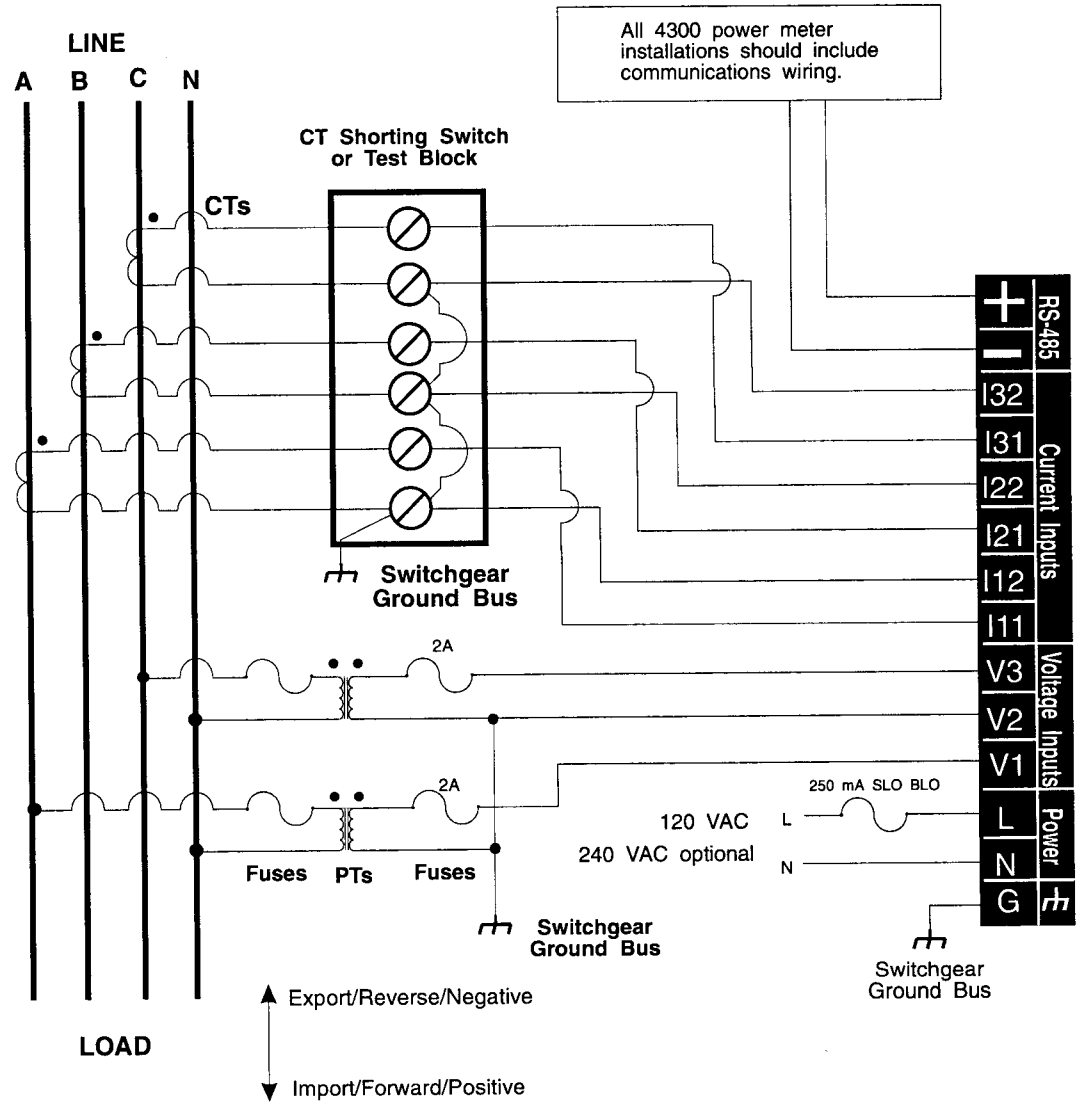
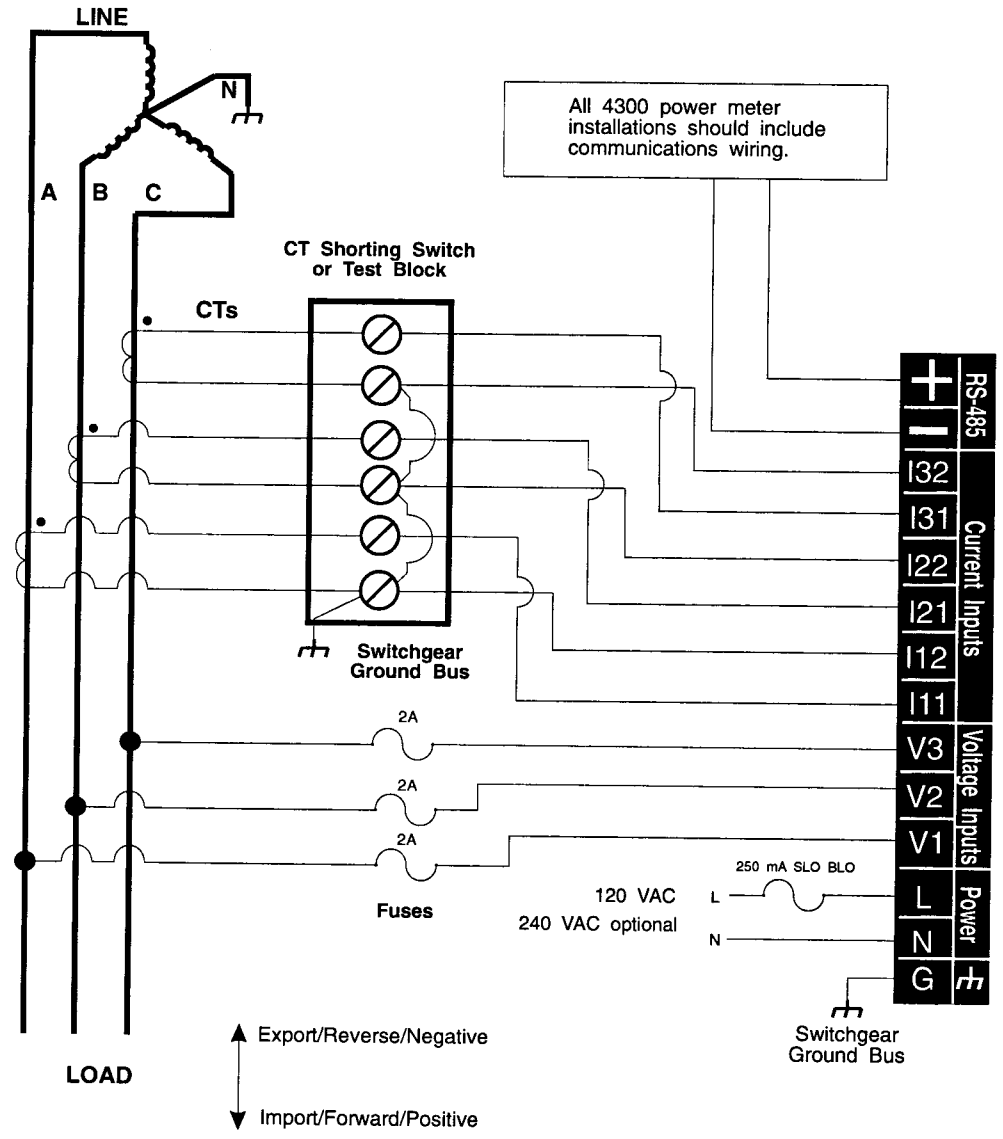


Figure 2-3 Four-Wire Wye, 2 1/2-Element Connection Using Two PTs, for Balanced Systems Above 347/600 Volts



- Volts Mode = 4 Wire WYE
- The line transformer neutral must be equipotential with the Switchgear Ground Bus for this meter configuration to operate properly.
- Note polarity of each CT

Figure 2-4 Three-Wire Wye, Three-Element Direct Connection, for Systems of 120/208 to 347/600 Volts

2.8 Connecting Three-Phase, Delta Systems

When configured for ungrounded (floating) Delta operation, the 4300 power meter requires PTs and senses the line-to-line voltages between each of the phases. In these open configurations, connect the 4300 power meter using PTs and either three or two CTs. Figures 2-5 and 2-6 (on pages 11 and 12) illustrate Delta connections using three and two CTs respectively.

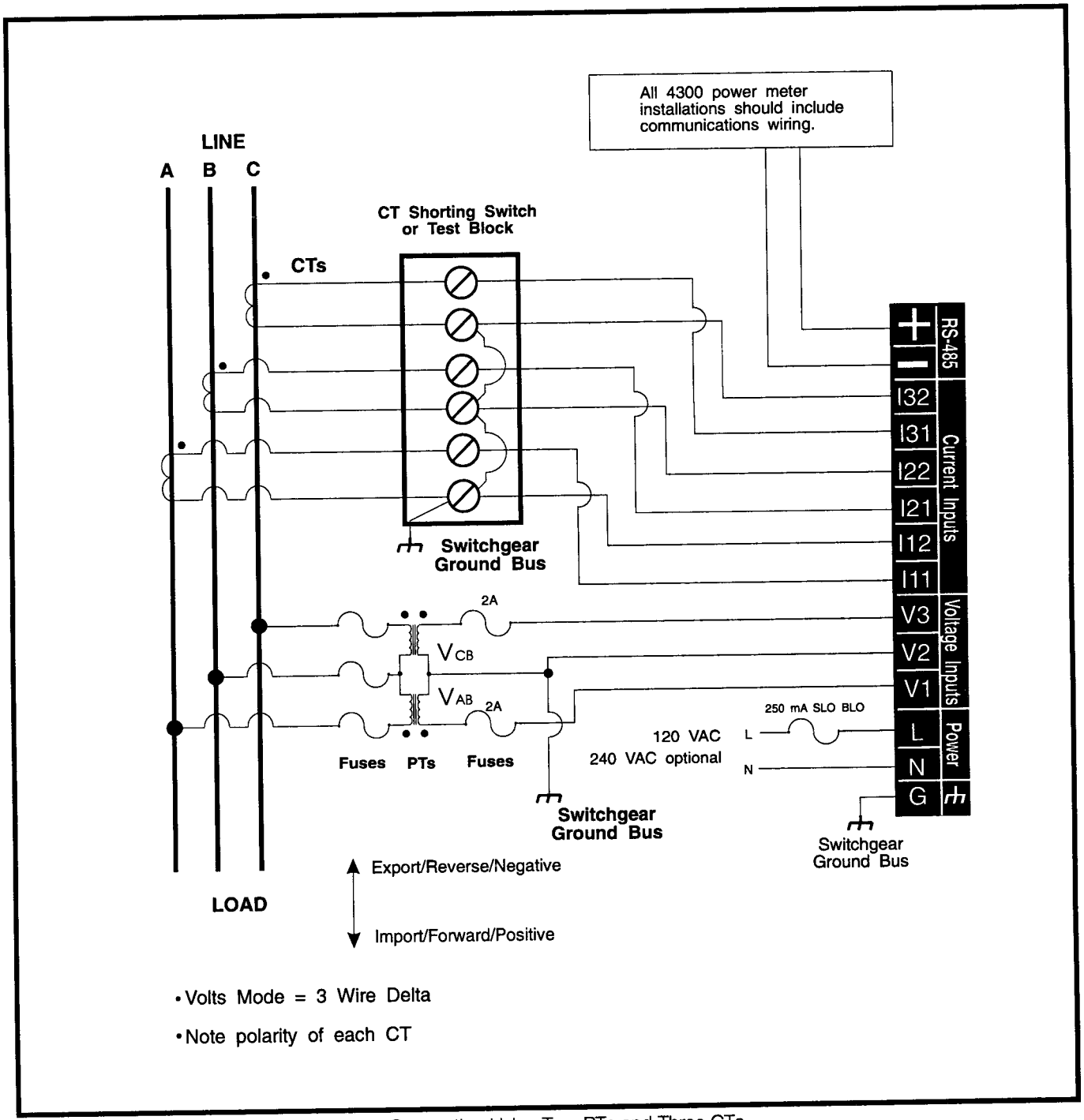


Figure 2-5 Three-Wire Delta, 2 1/2-Element Connection Using Two PTs and Three CTs

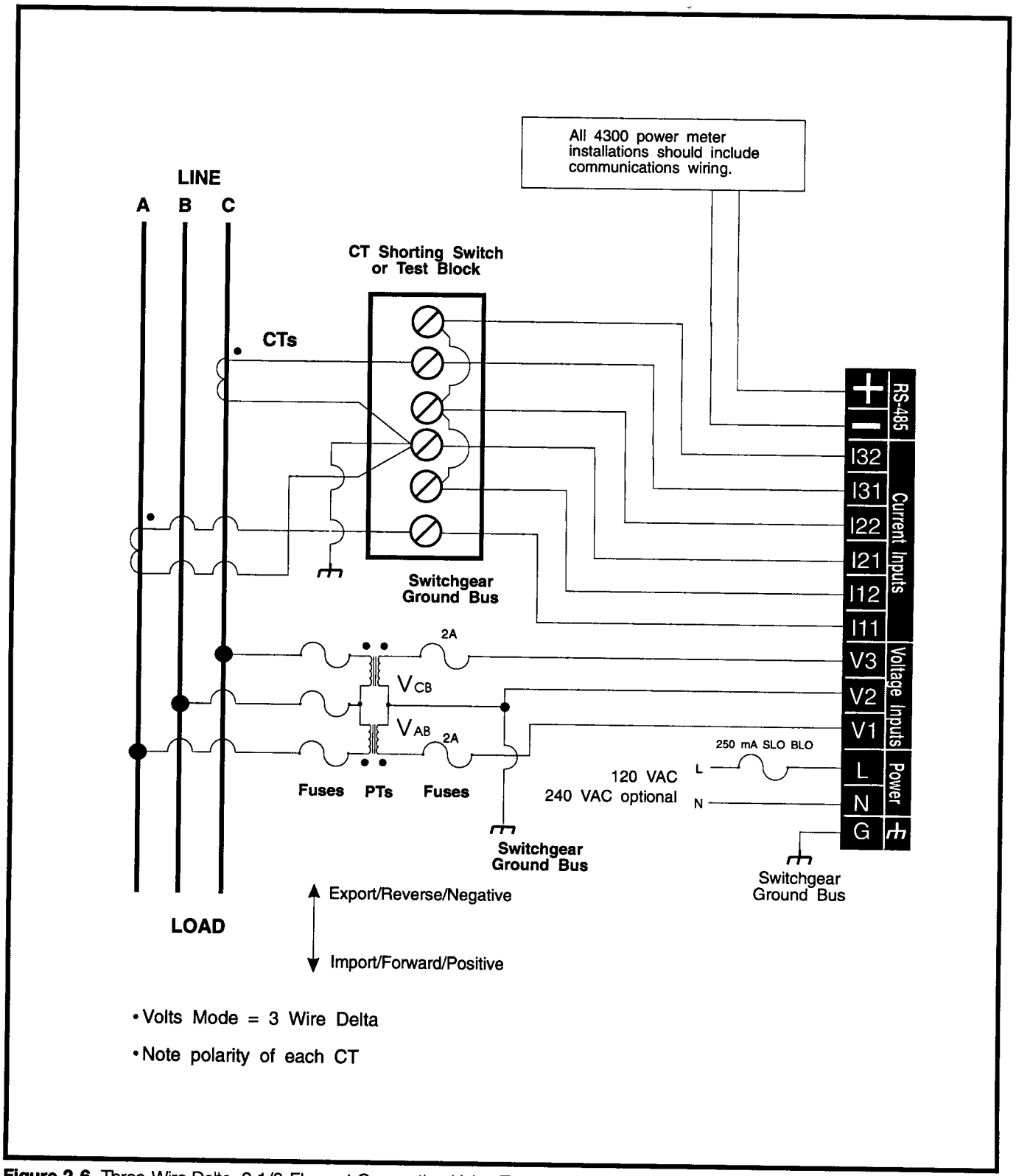


Figure 2-6 Three-Wire Delta, 2 1/2-Element Connection Using Two PTs and Two CTs

2.9 Connecting Single-Phase, Three-Wire Systems

When wiring for single-phase systems, you must connect the system's two voltage phases (each 180° with respect to each other) to the V1 and V2 inputs of the 4300 power meter. You must also connect the wiring from the outputs of the two CTs to the meter's corresponding I11/I12 and I21/I22 input pairs. This connection is illustrated in Figure 2-7 below.

Note: The V3 input and the I31/I32 input pair are not used for this wiring system and should be grounded.

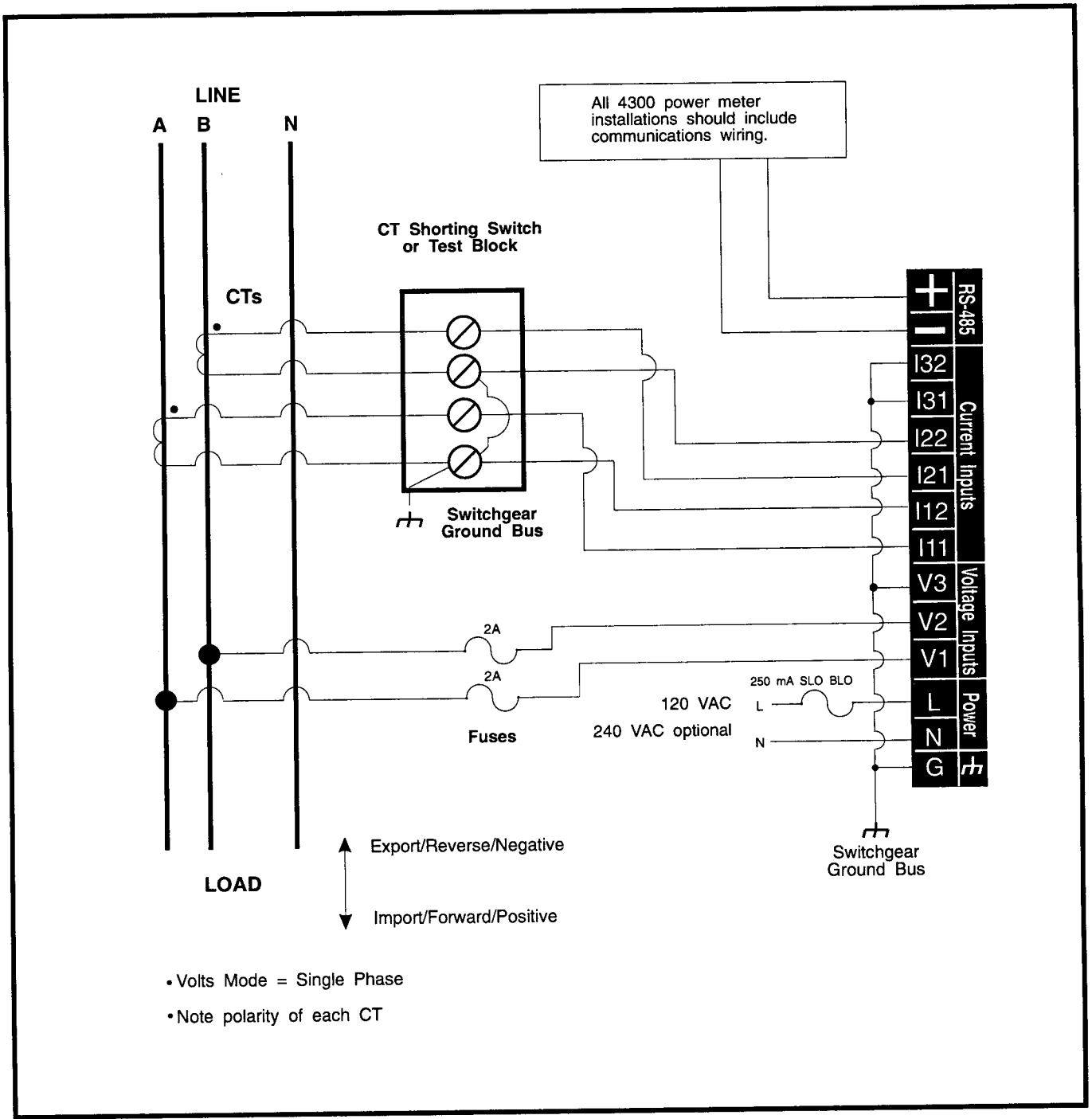


Figure 2-7 Three-Wire Single-Phase, Two-Element Direct Connection

2.10 Communications Connections

The 4300 power meter communicates with supervisory devices using the RS-485 communications standard. RS-485 connections are made to the meter's main terminal strip, located on the base module. The wiring diagram for RS-485 communications is illustrated in Figure 2-8 below.

Note: Wire the RS-485 port of every 4300 power meter you install, and extend the wiring to a safely accessible location. Field service of the meter, including running diagnostics, testing, software upgrades, and feature upgrades is performed via the communications link.

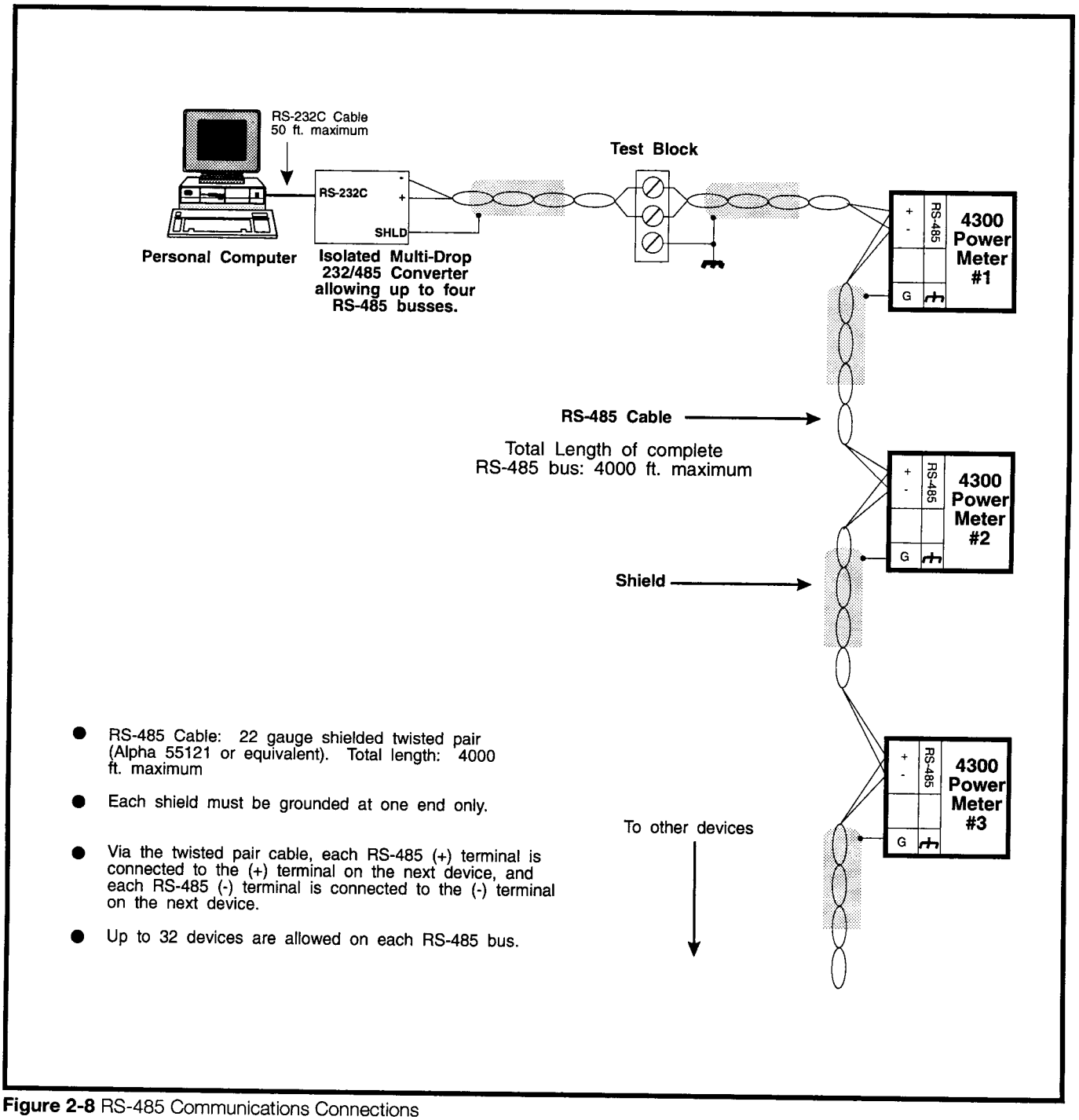


Figure 2-8 RS-485 Communications Connections

2.10.1 Test Block Termination

Extend RS-485 communications wiring to an easily and safely accessible location, and terminate the communications wiring at a test block. Because it simplifies field-testing and diagnostics, terminating communications wiring at a test block is always recommended, regardless of whether a computer is used on the network.

2.10.2 Connecting To A Computer

To connect a computer to a network of 4300 power meters, use a Siemens Isolated Multi-Drop™ 232/485 converter. As illustrated in Figure 2-7 on the previous page, the Isolated Multi-Drop converter (Siemens part number 18-658-582-537) lets a computer's RS-232 port communicate with the 4300 power meter via the meter's RS-485 port.

CAUTION: Failure to use an appropriate converter can cause equipment damage.

To install the converter, connect one end of an RS-232 cable to the computer's RS-232 serial port and the other end to the RS-232 port on the converter. Next, connect the converter to the meter, using 22-gauge, shielded, twisted-pair wire. Use the same kind of wire to daisy-chain additional 4300 power meters or other RS-485 devices in a network. As explained in subsection 2.10.1, terminating the RS-485 cable at an intermediate test block simplifies local testing.

2.11 Maintenance

The 4300 power meter has a battery-backed, nonvolatile memory. Other than battery replacement, the meter needs no regular maintenance. The life expectancy of the battery is seventy years at 50°C, 28 years at 60°C, and 11 years at 70°C.

If the meter operates at less than 50°C for 60% of the time, less than 60°C for 90% of the time, and less than 70°C for 100% of the time, the life expectancy of the battery is 35 years. If the meter operates in an environment where temperatures regularly exceed 60°C, replace the battery every ten years.

For a replacement battery, contact your Siemens representative.

2.12 Calibration

Siemens calibrates all 4300 power meters at the factory. Because it contains no mechanical parts, the 4300 power meter should not need calibrating while operating in the field. If your 4300 power meter needs recalibration, contact your Siemens representative.

2.13 Field Service

The 4300 power meter is not designed for servicing in the field. If a meter fails, replace it with a new one. To remove the meter, use a CT shorting block to disconnect the meter's current inputs, without open-circuiting the CTs. Wire the shorting block so that protective relaying is not affected.

3.1 Powering Up the Meter

After you have installed the meter and checked the wiring, power up the unit by connecting its power wires to the L and N leads on the 120 VAC control power source and the G lead to the equipment ground bus. Connect the 240 VAC version to a 240 VAC control power source only. The 240 VAC version does not function if connected to a 120 VAC source.

CAUTION: Do not connect the 120 VAC unit to a 240 VAC control power source. This can damage your equipment.

Figure 3-1 illustrates the 4300 power meter's display module in Display mode. On power up, the meter enters its Display mode (the default mode), displaying fields for volts, phase, amps, and power function (KW). If the power function value is too large to fit on the display, the value does not appear initially. Refer to section 3.2 for a detailed discussion of Display mode.

The values that appear initially on the display are probably incorrect, since the meter hasn't yet been configured for a live system. Configuring the meter, or field-programming, is covered in section 3.3.

Note: The measurements and set-up data displayed by the 4300 power meter's are also available to a supervisory device via the meter's RS-485 communications port. Refer to section 5, "Communications," for details concerning remote communications with the meter.

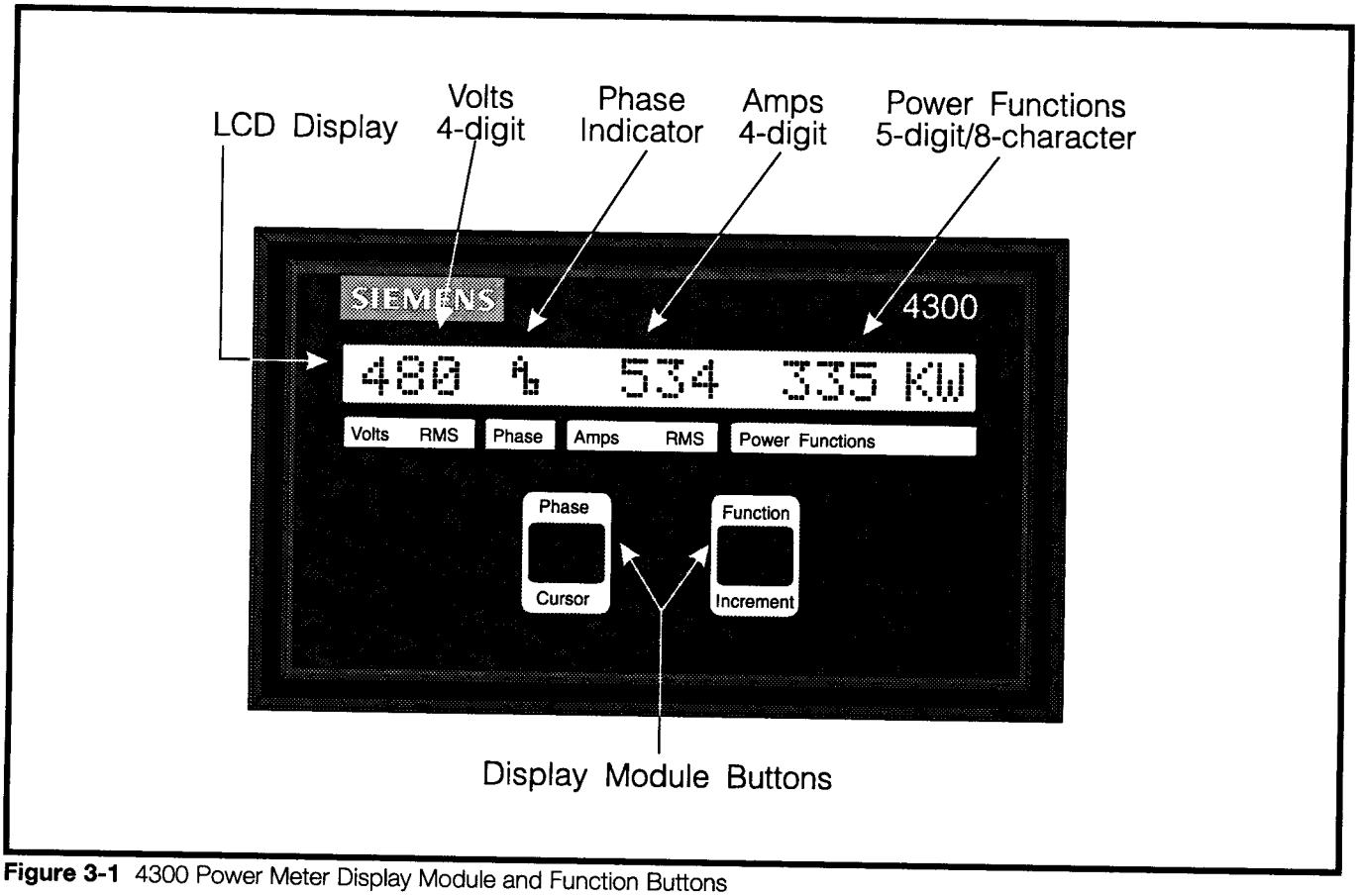


Figure 3-1 4300 Power Meter Display Module and Function Buttons

3.2 Display Mode

The 4300 power meter operates in two modes: Display mode and Programming mode. Display mode displays measured data, and Programming mode displays the meter's set-up parameters.

After powering up the meter, it enters Display mode, and the digital LCD displays fields for volts, phase, amps, and power function. The two buttons on the display module, the Phase/ Cursor and Function/Increment buttons, let you select different options for displaying real-time data. While in Display mode, these buttons allow you to display Phase and Function (power functions) information. In Programming mode, the buttons on the display module have functions that are different from the ones they have in Display mode. The label below each button indicates the button's alternate function in Programming mode.

Note: No more than five characters of the power function value can appear simultaneously with the volts and amps values; instead, the power function field of the display appears blank. To display a power function value of more than five characters, press the Function button. Pressing the Function button at this point displays the power function on the entire display, replacing the Volts-Phase-Amps display. To display volts, phase, and amps again, press the Phase button.

3.2.1 How to Use the Phase Button

Press the Phase button to view volts and amps readings for each line-to-neutral or line-to-line phase, as well as for average readings for all phases. You can also display readings for all three volts phases or all three amps phases simultaneously. The number of different displays available depends on the setting of the "V(olts) Mode" parameter. The procedure for setting the "V(olts) Mode" parameter is explained in subsection 3.3.5.

3.2.2 Phase Displays

The following procedures explain the sequence of readings displayed by pressing the Phase button. The readings differ according to which volts mode you select during programming. Refer to Table 3-1 for definitions of the abbreviations used to display these readings.

If you select "4-Wire Wye" or "4W Wye 2PT" for the V(olts) Mode parameter, the power meter display readings appear in the following sequence:

1. While in Display mode, press the Phase button three times. The meter displays each pair of line-to-neutral volts and amps phase readings (A, B, C).
2. Press the Phase button once. The meter displays the average for all line-to-neutral readings (L-N).
3. Press the Phase button three times. The meter displays each pair of line-to-line volts (^{a}b, ^{b}c, ^{c}a) and amps phase readings.
4. Press the Phase button once. The meter displays the average for all line-to-line volts and amps.
5. Press the Phase button once. The meter simultaneously displays the readings for all three-phase, line-to-neutral volts (A, B, C). (Power function values do not appear because the entire display is used to display data for all three phases.)
6. Press the Phase button once. The meter simultaneously displays readings for all three-phase, line-to-line volts. (^{a}b, ^{b}c, ^{c}a). (Power function values do not appear because the entire display is used to display data for all three phases.)
7. Press the Phase button once. The meter simultaneously displays readings for all three amps phases (A, B, C). (Power function values do not appear because the entire display displays all three phases of data.)

If you select "3-Wire Delta" for the V(olts) Mode parameter, the power meter display readings appear in the following sequence:

1. While in Display mode, press the Phase button three times. The meter displays each pair of line-to-line volts (^{a}b, ^{b}c, ^{c}a) and amps phase readings.
2. Press the Phase button once. The meter displays the average for all line-to-line volts and amps.
3. Press the Phase button once. The meter simultaneously displays readings for all three-phase, line-to-line volts. (^{a}b, ^{b}c, ^{c}a). (Power function values do not appear because the entire display is used to display data for all three phases.)
4. Press the Phase button once. The meter simultaneously displays readings for all three amps phases (A, B, C). (Power function values do not appear because the entire display displays all three phases of data.)

If you select "Single Phase" for the V(olts) Mode parameter, the power meter display readings appear in the following sequence:

1. From Display mode, press the Phase button twice. The meter displays each phase of line-to-neutral volts and amps phase readings (A, B).
2. Press the Phase button once. The meter displays the average for both line-to-neutral readings (L-N).

3.2.3 How to Use the Function Button

As illustrated in Figure 3-1 on the preceding page, power functions are displayed in the power function field of the digital display next to the volts-phase-amps fields. Pressing the Function button advances the display through each power function: Power Factor, KWH total, KW Demand, and KW Demand Max. After it advances through all the functions, the display loops back to the first function.

Under certain conditions, the meter cannot display power function values simultaneously with the volts, phase, and amps values. The power meter does not display power functions in the following cases:

- when viewing values for all three-phase volts (line-to-line or line-to-neutral)
- when viewing values for all three-phase amps
- when viewing a power function value that consists of more than five characters

In any case, use the Phase and Function buttons to re-display the volts and amps fields, and power function field respectively. Pressing the Function buttons displays in sequence the power functions measured by the 4300 power meter. Pressing the Phase button displays in sequence the volts, phase, and amps readings measured by the 4300 power meter.

3.2.4 Power Function Displays

The 4300 power meter has five power functions: KW, KW Demand, KW TOT (net), KW Demand Max, and Power Factor. These functions are listed in Table 3-1 below with their descriptions.

The list of 4300 power meter power functions indicates which functions provide individual phase readings, average-of-all-phases readings, and totaled values for all phases. Functions that provide individual phase readings and average-of-all-phases readings indicate which reading is displayed by imbedding the name in the function label as follows:

- phase name (a, b, c, ^{a}b, ^{b}c, ^{c}a), for example, Vab
- average (av, LNav, LLav), for example, V(LN)

Some readings given in K units automatically change to M units when values exceed 9999 K.

3.3 Programming Mode

After installing the 4300 power meter, you must program it specifically for your system. You use the meter's Programming mode to gain access to its set-up parameters.

3.3.1 Switching to Programming Mode

To enter Programming mode from Display mode, press and hold down the Phase/Cursor and Function/Increment buttons simultaneously for two to three seconds until the message "Programming Mode" appears in the digital display. While in the Programming mode, the labels below each button describe its function. The Cursor button moves the cursor to the left one digit. The Increment button increases by one the digit or character over the cursor. To return to Display mode from Programming mode at any time, simultaneously press and hold

Table 3-1 Abbreviations Used by the 4300 Power Meter in Display Mode

Abbreviations Used for Phase Readings				
A,B,C	Individual phases (line-to-neutral for volts)	total	=	Total of all phases
L-N	Average of all phases (line-to-neutral for volts)			
ab, bc, ca	Individual phases (line-to-line for volts)			
L-L	Average of all phases (line-to-line for volts)	* (asterisk)	=	sliding-window demand (i.e. not thermal)

Abbreviations Used for Power Functions Readings	
KW	Total instantaneous real-power flow for all phases. A positive number (no sign) indicates real power in the forward direction (imported). A negative number (negatively signed) indicates real power in the reverse direction (exported).
KWHTOT	Total accumulated real energy (total KW Hours) for all phases. This accumulated value increases when real power is being imported, and decreases when real power is exported. Therefore, this value can be signed either positively (net import) or negatively (net export). Note also that its value rolls over to 0 (zero) at 1,999,999,999 KWH*.
KW DMD	Total instantaneous, real-power demand of all phases.
KW DMD MAX	Maximum instantaneous, real-power demand of all phases since the last reset.
PF	Power factor--total of all phases. A leading PF (current leads voltage) is indicated by the designation PF LEAD. A lagging PF (current lags voltage) is indicated by the designation PF LAG.

down the Phase/Cursor and Function/Increment buttons again for two to three seconds.

Each time you press the Cursor button in Programming mode, you move the cursor to the left one digit. If you move the cursor past the left-most digit, the cursor wraps to the right of the number.

Pressing the Increment button increases by one the digit or character over the cursor. For parameters that have Yes or No values, such as "Clear All Hours?", pressing the Increment button toggles a value to either Yes or No. Other parameters, such as the "Baud Rate" parameter, have a number of possible values, and you can scroll through them by pressing the Increment button repeatedly.

Note: To scroll through each setup parameter, press the Cursor and Increment buttons simultaneously, then release them quickly. If you hold down the buttons for longer than two seconds, the meter switches to Display mode.

Entering the Password

To advance the display to the first parameter in Programming mode (which is the "Password" parameter) press and release the Cursor and Increment buttons simultaneously. You must enter the password before changing any parameter values. If you do not enter a password, you can still view programming values but you cannot change them. When the meter is shipped, the password is set to 0 (zero), but you can redefine it. See section 3.3.10 to redefine the password. If you should lose your password, contact your Siemens representative.

Note: If you pass a parameter by mistake, continue to press and then quickly release both the Cursor and Increment buttons at the same time until the desired parameter appears again.

3.3.2 Descriptions of Operating Parameters

Table 3-2 on the following page briefly describes each parameter that may be programmed from the meter's display module and gives the acceptable range of values for each parameter. In the subsections that follow the table, these parameters are discussed in more detail.

3.3.3 Selecting Direct or PT Input and Setting PT Volts Scales

You can connect the 4300 power meter's voltage inputs either directly to the phase A, B, and C power lines or to potential transformers (PTs). You can connect the meter directly to four-wire Wye systems up to 347 VAC. Above this voltage level, you must use PTs.

If you connect the 4300 power meter directly to the power lines, set the "Using PTs?" parameter to No. This setting allows you to connect the meter directly to line-to-neutral (Wye) or line-to-line (Delta), 120 to 347 VAC systems. The meter automatically selects the appropriate scale.

If you use PTs to connect to line-to-neutral (Wye) or line-to-line (Delta) voltages higher than 347 VAC, set "Using PTs?" to Yes. The meter then displays the PT Primary and PT Secondary parameters, which give the meter the PT voltage ratings and allow it to set its internal, full-scale input references.

Set "PT Primary" to the primary rating of the PTs you are using. This setting should be equivalent to the line-to-neutral or line-to-line voltages being measured by the meter.

Set PT Secondary to the secondary rating of the PTs you are using. The maximum secondary voltage you can use is 347 VAC.

3.3.4 Setting the CT Primary

Set the "CT Primary" parameter to the primary rating of the CTs being used only if the CTs are rated for a five-amp, full-scale output. If the CTs are not rated for these output levels, contact a Siemens factory representative for assistance.

3.3.5 Setting the Volts Mode

Options for setting the Volts Mode parameter comprise three-wire Wye, four-wire Wye, three-wire Delta, and single-phase systems. Set the Volts Mode parameter to match your system according to the following guidelines:

- If your system is four-wire Wye and is either direct connect or using three PTs, set the Volts Mode parameter to "4-Wire Wye."
- If your system is balanced four-wire Wye using only two PTs, set the Volts Mode parameter to "4W Wye 2PT."
- If your system is three-wire Wye, set the Volts Mode parameter to "4-Wire Wye."
- If your system is three-wire Delta, set the Volts Mode parameter to "3-Wire Delta."
- If your system is three-wire single-phase, set the Volts Mode parameter to "Single Phase."

Note: If you set the Volts Mode parameter to "4W Wye 2PT," the meter will measure power accurately *only* if the voltages are balanced.

The 4300 power meter also offers a "Demo" Volts Mode parameter that you can use to demonstrate the meter's ability to display and communicate data, without connecting to a real power system. Specifically, you can display and communicate volts, amps, and power function values based on the input scales you have programmed through the display module or communications port.

3.3.6 Setting the Communications Parameters

The "Unit ID" and "Baud Rate" parameters are communications parameters. Each 4300 power meter on an RS-485 communications network must have a unique Unit ID in the range 1-254. If you use a remotely located communications device to communicate with a meter, set the baud rate of the meter to match the baud rate of its master device and all other devices on the network.

Table 3-2 Programmable Operating Parameters

Parameter	Description	Range
Password	Must be entered correctly to allow you to change the value of any setup parameter(s) or to allow you to clear/reset any function.	Up to a four-digit number
Using PTs?	Selecting No indicates that meter voltage inputs are being connected directly to the power lines, without PTs. Selecting Yes indicates PTs are being used.	No (direct connection) Yes (input from PTs)
PT Primary=	Set to PT primary voltage rating. This parameter only appears when Using PTs? parameter has been set to Yes.	0 to 999,999 (volts)
PT Secondary=	Set to PT secondary voltage rating. This parameter only appears when Using PTs? parameter has been set to Yes.	0 to 347 (volts)
CT Primary=	Sets full-scale AC input current for A, B, and C phases (CT primary current rating).	0 to 32,000 (amps)
V(olts) Mode=	Sets Volts Mode for correct power system configuration. Demo mode provides preset values for all measurements based on input scales - use for demonstration purposes only.	4-Wire Wye, 4W Wye 2PT, 3-Wire Delta, Single Phase, DEMO
UNIT ID=	Sets communications SEAbus address for each 4300 power meter.	1 to 254
BAUD RATE=	Baud rate at which the 4300 power meter transmits and receives information via communications.	300, 1200, 2400, 4800, 9600, 19,200
CLEAR ALL HOURS?	Selecting Yes sets the KW Hours (import & export) readings to 0.	No, Yes
RESET MIN/MAX?	Selecting Yes resets KW Demand Max.	No, Yes
DEMAND PERIOD=	Sets length of the demand subperiod to be used in calculating optional demand values. See section 4, Demand.	1 to 99(minutes)
# OF DMD PERIODS=	Sets number of sub-periods to be averaged in calculating the sliding window demand values. See section 4, Demand.	1 to 15 (periods)
CONTRAST/ANGLE	Press Increment to adjust contrast of the LCD display.	(Contrast changes)
DIAGNOSTIC MODE?	Setting this parameter to Yes allows access to the DIAGNOSTIC MODE parameter group listed below.	No (bypass diagnostics) Yes (gain access)
Diagnostic Mode Parameters		
SERIAL NUMBER:	Allows you to view the 4300 power meter's factory-set serial number.	(five-digit #)
FIRMWARE SMN	This parameter indicates the present version of firmware operating in the meter.	(four-digit #)
REV DATE	Revision date of the operating software in the 4300 power meter.	(day/mo/yr format)
CHECKSUM	Checksum value in program memory. Indicates pass or fail.	PASS OR FAIL six-character hexadecimal #
STATUS FLAGS:	Indicates status of various internal systems. Normally reads zero (0). If other than zero contact your Siemens representative.	six-character hexadecimal #
CLEAR STATUS?	Clears STATUS FLAGS field to zero.	YES or NO

3.3.7 Clear and Reset Functions

The Reset Min/Max function clears and resets the KWH DMD* MAX value to zero. Choose either Yes or No using the Increment button while in Programming mode. The "Clear All Hours?" function resets the KW Hours readings to 0. Choose either Yes or No using the Increment button while in Programming mode.

3.3.8 Adjusting the Display Contrast

The Contrast/Angle function allows you to adjust the contrast of the display module's LCD for optimum readability at any vertical viewing angle. To adjust the LCD, press the Increment button to change the contrast level of the display in preset steps, and adjust the level until you achieve the best readability for a given installation.

3.3.9 Using The Diagnostic Parameters

The group of parameters listed in the Diagnostics mode are not normally used, but these parameters do have a number of special functions that can be helpful in certain circumstances. The diagnostic group is not displayed if the "Diagnostic Mode?" parameter is set to No. To view the diagnostic group, set the "Diagnostic Mode?" parameter to Yes. Pressing the Cursor and Increment buttons together advances through the parameters.

The Serial Number, Checksum, and Status Flags parameters are included primarily for Siemens internal use. If you encounter a problem with the meter and suspect the problem is due to a device failure, contact Siemens immediately. A Siemens representative may ask you to check these values to help determine the source of the problem.

The 4300 power meter has been designed to easily upgrade meters already in service. New features can be added to the meter using a simple software upgrade that loads a new operating program into the power meter. The "Software Ver" and "Rev Date" parameters indicate which version of software is currently installed. This feature lets you know if your 4300 power meter is operating with the most advanced software available.

3.3.10 Redefining the Password

To change the meter's password, enter Programming mode and advance to the "Password" parameter. You must first enter the present value of the password before you can redefine it. To enter the password, use the Increment button to increase by one the digit or character over the cursor and use the Cursor button to move the cursor to the left by one place.

To change the password, simultaneously press the Cursor and Increment buttons repeatedly until the "Password" parameter reappears, then enter the new password (four-digits maximum). Return to Display mode to complete the process.

If you lose your password, contact your Siemens representative.

3.3.11 A Programming Example

The programming example in Table 3-3 on the next page is a step-by-step guide to programming the meter from the display module. The example shows you how to set the PT Primary and PT Secondary parameters for the meter and return to Display mode. The example is for a PT primary of 14.4 KV. The secondary is the required rating of 120 V.

Table 3-3 Programming Example: Setting the Volts Scale

STEP	ACTION	DISPLAY READS
1.	Simultaneously press and hold down for two to three seconds the Phase and Function buttons to enter Programming mode.	PROGRAMMING MODE
2.	Simultaneously press and then quickly release the Cursor and Increment buttons once.	PASSWORD= ****
3.	Enter password (default = 0) by using the Cursor and Increment buttons.	PASSWORD= 0
4.	Simultaneously press and then quickly release the Cursor and Increment buttons once.	USING PTS?= No
5.	Press the Increment button once to toggle to Yes.	USING PTS?= Yes
6.	Simultaneously press and then quickly release the Cursor and Increment buttons once.	PT PRIMARY= 1
7.	Enter a new value for the PT Primary. To set the value to 14400 (14.4 KV), first set the far right digit to 0 by pressing the Increment button until the display reads 0.	PT PRIMARY= 0
8.	Move the cursor one digit to the left by pressing the Cursor button.	PT PRIMARY= 0
9.	Set the second digit to zero by pressing the Increment button. To set a digit's value (other than the least significant digit) to zero, press and release the Cursor button to move to the next digit to the left. The display automatically enters a zero in the previous place.	PT PRIMARY= 00
10.	Repeat steps 8 and 9 above until all the digits are set.	PT PRIMARY 14400
11.	Simultaneously press and then quickly release the Cursor and Increment buttons once.	PT SECONDARY= 1
12.	Enter a new value for the PT Secondary. Follow steps 8 through 10 above, using the Increment and Cursor buttons until the display reads 120.	PT SECONDARY= 120
13.	Simultaneously press and hold down the Cursor and Increment buttons to return to Display mode.	VOLTS, PHASE, AMPS, POWER FUNCTIONS

3.4 Polarity of Power Readings

Figure 3-2 below illustrates how the 4300 power meter interprets and displays signed (positive or negative) values for power imported or exported and for leading or lagging indicators of power factor.

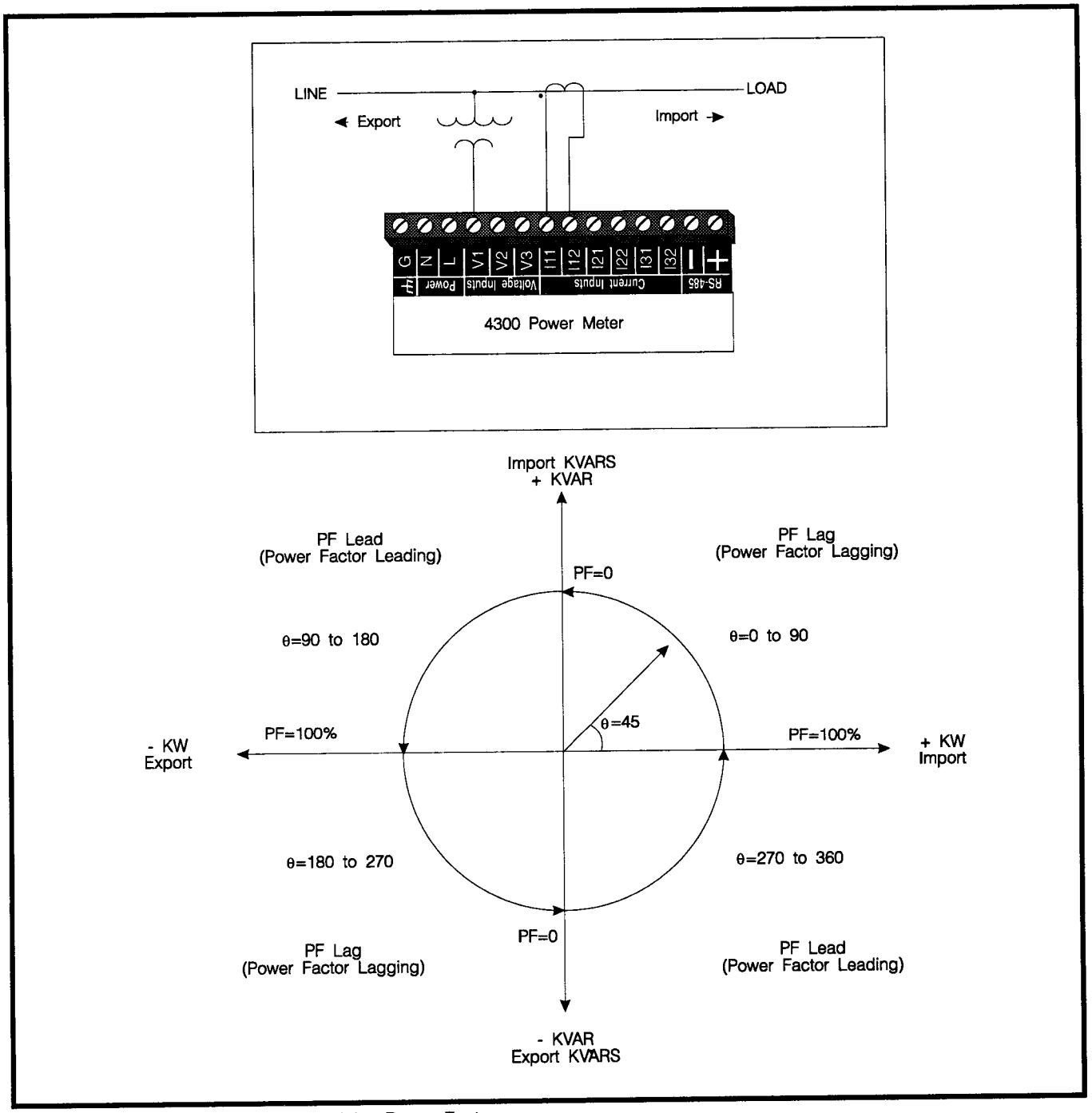


Figure 3-2 Polarity Indications Determining Power Factor

4 Demand

Power utilities generally bill commercial customers based on their energy consumption (in KWH) and on their peak-usage levels, called peak demand in KW. Demand is a measure of average power consumption over a fixed time period, typically 30 minutes. Peak demand is the highest demand level recorded during the billing period.

Methods and intervals for measuring demand vary among power utilities. Some common methods include thermal-averaging, sliding-window, and fixed-interval techniques. The 4300 power meter performs sliding-window demand calculations.

4.1 Sliding-Window Demand

The sliding-window (or rolling-interval) method divides the demand interval into subperiods, and measures it electronically based on the average load level over the most recent set of subperiods. Compared to the fixed-interval method, this method has a faster response time.

The 4300 power meter has a "Demand Period" parameter (one to 99 minutes) and a "# of DMD Periods" parameter (one to 15), both of which you can program from the display module. The "Demand Period" parameter represents the length of the utility's demand subperiod; the "# of DMD Periods" parameter represents the number of subperiods that make up the total demand interval. For example, with a 6x5 minute (30 minutes total) sliding-window method, demand equals the average power consumption over the last six five-minute periods.

The sliding-window method used by the 4300 power meter allows you to match virtually any type of sliding-window measurement method used by your utility (for example, 15x2, 6x5, 1x30). Using this method ensures that the meter's readings are always as high or slightly higher than those of the utility.

4.2 Synchronizing Sliding-Window Demand

You can synchronize the internally timed Demand Period of the meter to the utility's timing by performing a manual procedure at the display module.

To synchronize the "Demand Period" parameter, first reset either the "Demand Period" parameter or the "number of DMD Periods" parameter to its present value. (Do not actually modify it; just reset the parameter to its present value—for instance from 5 back to 5). At the start of the utility's Demand Period, press both Cursor and Increment buttons simultaneously to advance to the next parameter. This procedure resets the meter's Demand Period clearing all sliding-window demand measurements and synchronizes the meter to the power utility's timing.

4.3 Resetting the Real-Time Demand Parameters

To reset the KW Demand Max value, enter the Programming mode and step through each parameter until "Reset Min/Max" appears. Using the Increment key, choose Yes to reset this value to 0. This action clears both the maximum KW demand and the real-time accumulated demand.

The 4300 power meter is equipped with an RS-485 communications port, which enables it to exchange data over long distances with a master display/control station running compatible software. This feature allows you to monitor or control (or both depending on your software) a single meter or a number of meters connected on a common network. You can also use the RS-485 communications port to update the meter's software, as described in subsection 5.3.

Before connecting a meter to a supervisory device, set the meter's baud rate to that of the supervisory device. In addition, set the Unit I.D. for each meter to a unique value.

5.1 RS-485 Communications

Provided that each meter has a unique Unit ID, you can use RS-485 communication to connect many remote meters to a device running supervisory software. This software displays all data normally displayed on the display module of each meter.

Using RS-485 communications allows you to monitor all meters from a single master device. The distance for RS-485 communications is limited to 4000 feet, using 22-gauge, twisted-pair, shielded cable. Figure 2-8 (on page 14) illustrates how to connect the 4300 power meter within the RS-485 network. For more information regarding the ACCESS™ RS-485 network refer to *Installing the ACCESS™ System* (manual no. SG-6028).

5.2 Communication With Other Systems

The 4300 power meter's communications protocol is described in detail in the *4300 Power Meter SEAbus™ Protocol* document. This open protocol allows other systems to communicate with the 4300 power meter via the meter's RS-485 port. To obtain this document, contact your Siemens representative.

5.3 Updating Software Via The Communications Port

As Siemens releases new versions of 4300 power meter software, you will be able to update your software via the meter's RS-485 port. You can update the software from a directly connected monitoring and supervisory device. Refer to your device's user manual for instructions on downloading device software.

Note: To update the meter's on-board software remotely, Siemens recommends that you connect the meter to a communications bus during installation, even if you do not require remote communications initially.

6 Troubleshooting

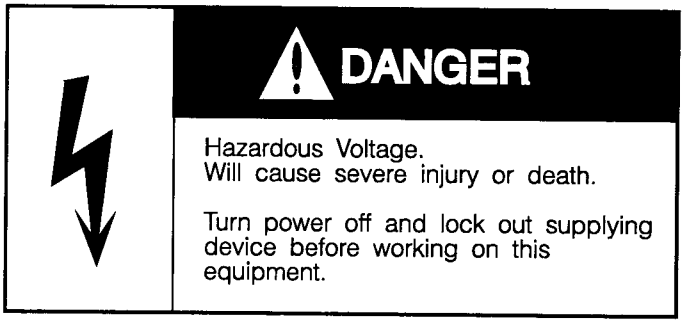
This section presents a few problems you might encounter during normal operation of the 4300 power meter. Some special situations can cause the 4300 power meter to malfunction. This section lists a number of their symptoms and explains how to correct them.

If the display does not operate:

1. Check that the correct voltage is available to the power supply (L and N connections on the terminal strip). The required voltage depends on the meter's power supply option (120 VAC for the standard unit or 240 VAC for the optional unit).
2. Check that the G terminal is properly grounded.
3. Check the cable connection between the display module and the base module.
4. Turn the power off for 10 seconds, and turn it back on.
5. Check that the cable is the same one supplied with the power meter. A standard RS-232 cable may cause equipment damage.

If the voltage or current readings are incorrect:

1. Check that the voltage mode is properly set for the given wiring.
2. Check that the voltage and current scales are properly set.
3. Make sure the G terminal is properly grounded.
4. Check the quality of the CTs and PTs being used.
5. Make the following voltage tests:
   a) V1, V2, V3 to G should be reasonably balanced, and no greater than 347 VAC.
   b) The G-to-switchgear earth ground should be 0 V.
6. Measure the current flowing into I11, I21, and I31. These measurements should be proportional to the amps readings on phases A, B, and C, where CT Primary ÷ CT Secondary x I11 = amps. Secondary phase A (similar for phases B and C) Currents should be no greater than 5 amps AC.



If the KW or power factor readings are incorrect, but voltage and current readings are correct:

1. Make sure that the phase relationship between the voltage and current inputs is correct by comparing the wiring with the appropriate wiring diagram.

If the RS-485 communication does not work:

1. Check that the baud rate of the supervisory device is the same as that of the 4300 power meter.
2. Power down the 4300 power meter and the supervisory device. Then power them up and try to establish communication.
3. Check that the Unit ID (address) of the 4300 power meter is the same as the address assigned to it in the supervisory device.

The following tables contain technical specifications and input ratings of the 4300 power meter.

Table A-1 4300 Power Meter Technical Specifications

Parameter	Accuracy	Resolution	Range
Volts	0.5 %	0.1 %	0 - 999,999[2]
Amps	0.5 %	0.1 %	0 - 9999
KW & KW Demand[1]	1.0 %	0.1 %	0 - 999,999[2]
Power Factor[1]	2.0 %	1.0 %	-1.0 - 0.6, 1.0 - 0.6

Notes:

1. Reads in K (i.e. x 1,000) for readings over 9,999
2. Reads in M (i.e. x 1,000,000) for readings over 9,999

Table A-2 Input Ratings

Voltage Inputs:	Standard:	120 to 347 VAC nominal full-scale input (programmable).
	Overload withstand:	600 VAC continuous, 1500 VAC for 1 Sec
	Input impedance:	1 mega-ohm
Current Inputs:	Standard:	5.000 amps AC nominal full-scale input
	Overload withstand:	15 amps continuous, 300 amps for 1 second
	Input impedance:	0.002 ohm
	Burden:	0.05 VA
Power Supply:	Standard:	95 - 145 VAC / 0.1 amps / 47 to 66 Hz
	Optional:	190 - 290 VAC / 0.05 amps / 47 to 66 Hz
Operating Temperature:	Standard: 0°C to 50°C (32°F to 122°F) ambient air	
Storage Temperature:	-30°C to +70°C (-22°F to +158°F)	
Humidity:	5 to 95 percent, non-condensing	

Appendix B Mounting Dimensions

The following figures illustrate the mounting and mechanical dimensions for the 4300 power meter's display and base modules.

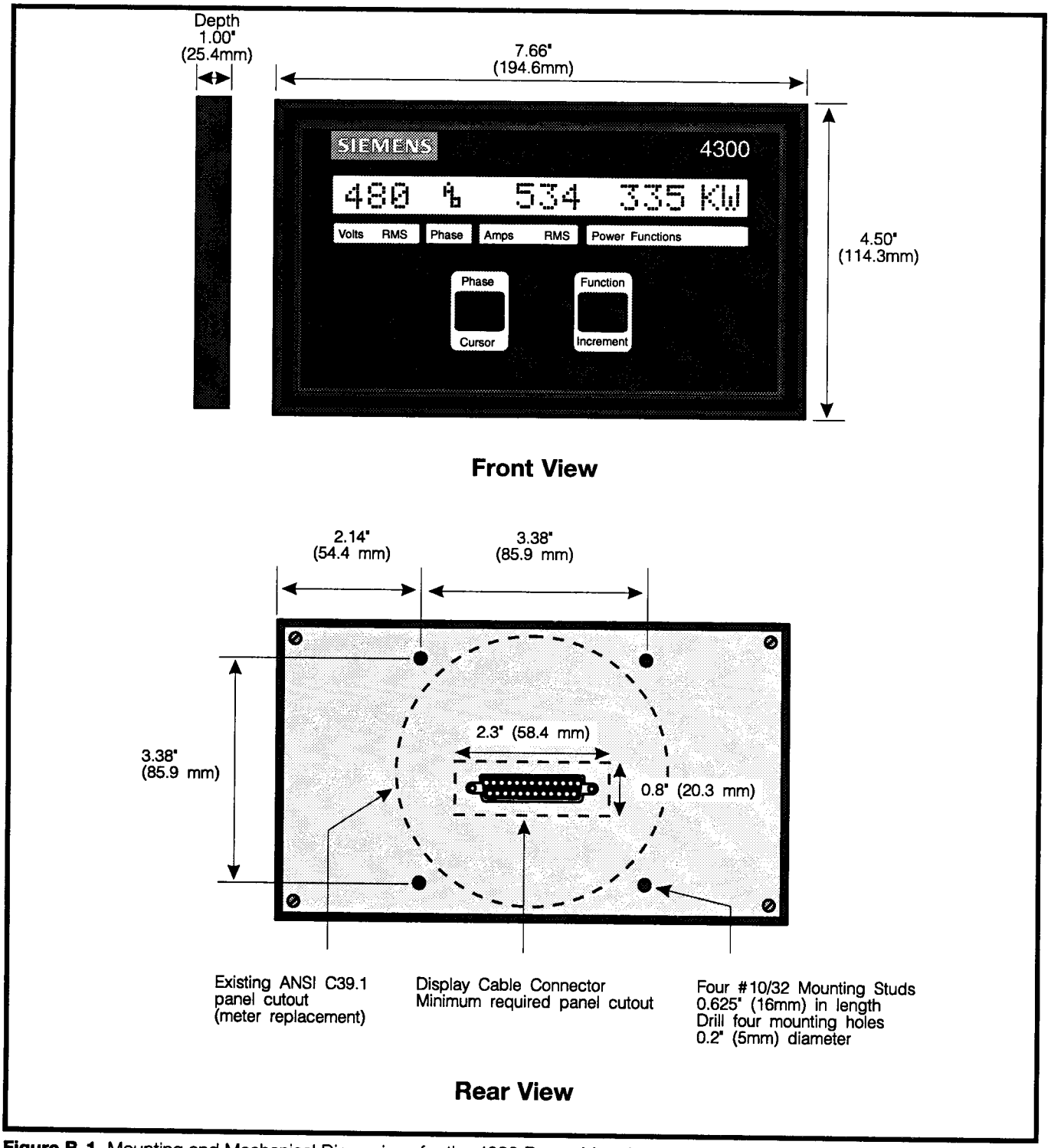


Figure B-1 Mounting and Mechanical Dimensions for the 4300 Power Meter's Display Module

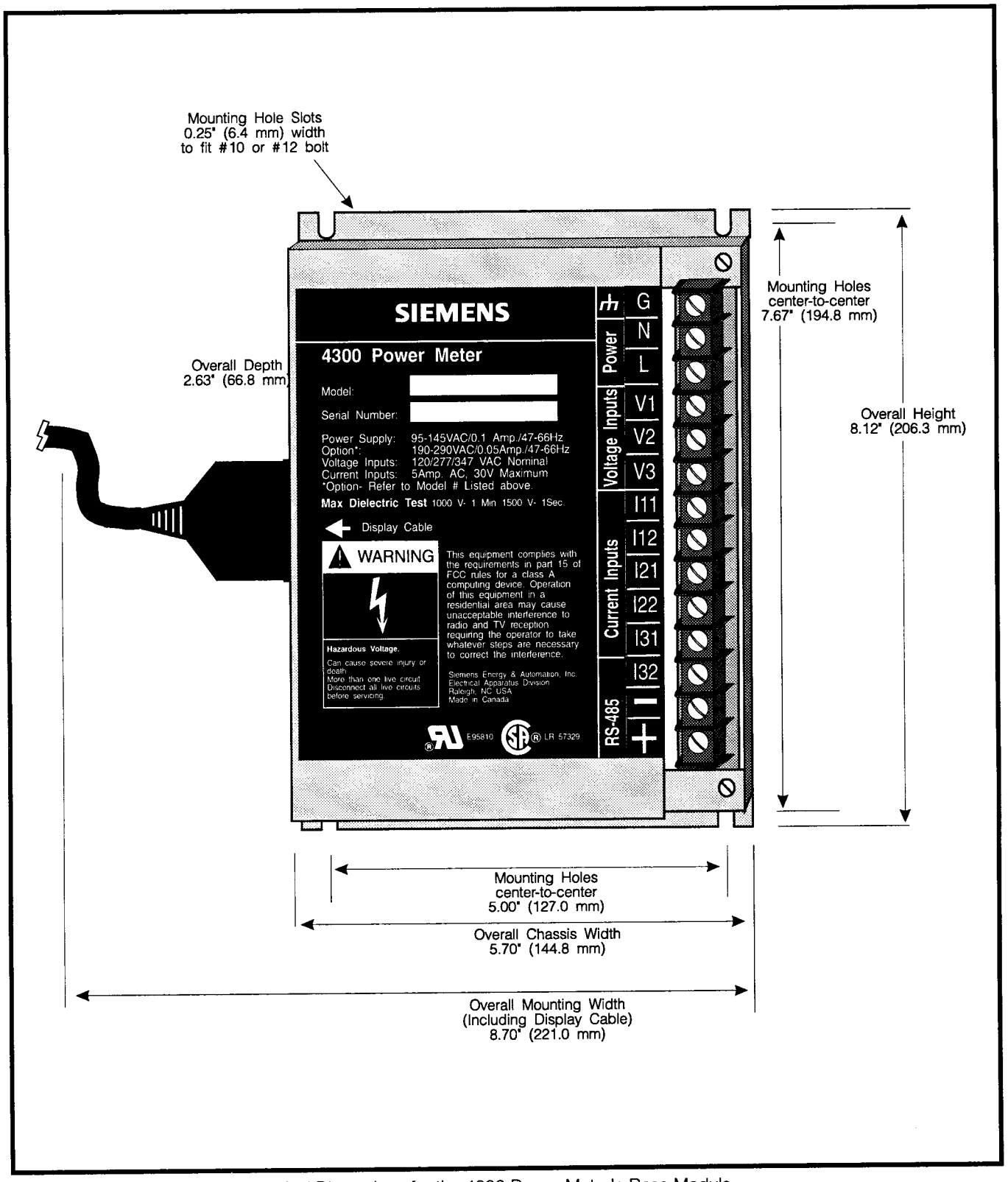


Figure B-2 Mounting and Mechanical Dimensions for the 4300 Power Meter's Base Module

Appendix C Ordering Information

The following table contains ordering information for the 4300 power meter. A product name and catalog number is provided for ordering convenience.

Product Name	Catalog Number
4300 power meter version 120 VAC	4300DC-120VAC
4300 power meter version 240 VAC	4300DC-240VAC

The 4300 power meter comes with a 6-foot display cable. Cables measuring up to 10 feet can be special ordered by contacting you Siemens representative.

Warranty

Company warrants that on the date of shipment to Purchaser the goods will be of the kind and quality described herein, merchantable, and free of defects in workmanship and material.

If within one year from date of initial operation, but not more than eighteen months from date of shipment by Company, of any item of the goods, Purchaser discovers that such item was not as warranted above and promptly notifies Company in writing thereof, Company shall remedy such defect by, at Company's option, adjustment, repair or replacement of the item and any affected part of the goods. Purchaser shall assume all responsibility and expense for removal, reinstallation and freight in connection with the foregoing remedy. The same obligations and conditions shall extend to replacement items furnished by Company hereunder. Company shall have the right of disposal of items replaced by it. Purchaser shall grant Company access to the goods at all reasonable times in order for Company to determine any defect in the goods. In the event that adjustment, repair or replacement does not remedy the defect, the Company and Purchaser shall negotiate in good faith an equitable adjustment in the contract price.

The Company's responsibility does not extend to any item of the goods which has not been manufactured and sold by Company. Such item shall be covered only by the express warranty, if any, of the manufacturer thereof. The Company and its suppliers shall also have no responsibility if the goods have been improperly stored, handled or installed. If the goods have not been operated or maintained according to their ratings or according to instructions in Company or supplier furnished manuals, or if unauthorized repairs or modifications have been made to the goods.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES (EXCEPT TITLE). INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS, AND CONSTITUTES THE ONLY WARRANTY OF COMPANY WITH RESPECT TO THE GOODS.

The foregoing states Purchaser's exclusive remedy against Company and its suppliers for any defect in the goods or for failure of the goods to be as warranted, whether Purchaser's remedy is based on contract, warranty, failure of such remedy to achieve its essential purpose, tort (including negligence), strict liability, indemnity or any other legal theory, and whether arising out of warranties, representations, instructions, installation or defects from any cause.

Registration

Siemens customer service personnel records your warranty date as the date of energization. This allows Siemens to add you to our mailing list, to keep you up to date on the latest product software releases, and new feature offerings.

Your comments and suggestions for product improvement and feature additions are welcome.

Problem Report for ACCESS Systems and Devices

If you have a problem with Siemens ACCESS systems or devices, please make a copy of this two-page form and fill it out. Then contact your Siemens representative to report the problem. (If you have an emergency, call 1-800-241-4453.)

Customer Information

Job-site contact _____
Company's name _____
Job site or location where equipment is installed _____
Siemens sales order number _____
Siemens manufacturing order number (from manufacturing drawing) _____
Date problem occurred _____
Contact's phone number _____
Contact's fax number _____

Device Information

If you are experiencing a problem with a specific device, please provide the following information from the device's label(s):

Device type _____
Model (or catalog number) number _____
Part number _____
Serial number _____
Hardware version _____
Software version _____
Device options _____

Problem-Specific Information

1. Please provide a brief, general description of any performance problems with the system or any devices. _____

2. Does the system have any of the following supervisory and monitoring devices? How many?

   - ❑ ACCESS Host PC _____
   - ❑ Power Monitor unit _____
   - ❑ Power Monitor PC units _____
   - ❑ Other (please specify) _____

3. How many of the following ACCESS devices are on the system?

   - ❑ 3600 power meter _____
   - ❑ 4300 power meter _____
   - ❑ 4700 power meter _____
   - ❑ Static Trip IIIC trip unit _____
   - ❑ Static Trip IIICP trip unit _____
   - ❑ SCOR relay _____
   - ❑ SB breaker trip unit _____
   - ❑ Sensitrip III trip unit _____
   - ❑ SAMMS device _____
   - ❑ Isolated Multi-Drop converter _____
   - ❑ Multiplexer Translator _____
   - ❑ Other (please specify) _____

4. What type of electrical equipment is the system or device installed on (switchgear, motor control center, switchboard, etc.)? _____

5. If the problem is with a specific device, describe its configuration; that is, describe its particular operational settings and parameters. (Attach additional sheet if necessary.) _____

6. List any error codes, error messages, or targets that have been generated by the system or by individual devices. _____

7. If the device is installed on an ACCESS system, please provide a summary (or a copy) of any Event Logs and System Diagnostic Logs. ___

8. Please provide any other information that you think might help Siemens correct the problem (such as information about the wiring, system application, system load, operating environment, or about the physical condition of the system or devices). _____

To be completed by Siemens personnel

Initial Problem Report completed by _____

Division or department name _____
Phone number _____
Problem report reviewed by _____
Review date _____
Sales engineer _____
Problem referred to _____
Date problem referred _____
Problem Report tracking number _____
Problem classification code _____

Corrective action taken _____

Upon completing this form, please forward a copy to:

Siemens Energy & Automation, Inc.
Electrical Apparatus Division
Customer Service Department
P. O. Box 29503
Raleigh, North Carolina 27626-0503

Fax Number 919-365-2598

SIEMENS

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& Automation, Inc.
Electrical Apparatus
Division
P.O. Box 29503
Raleigh, NC 27626-0503

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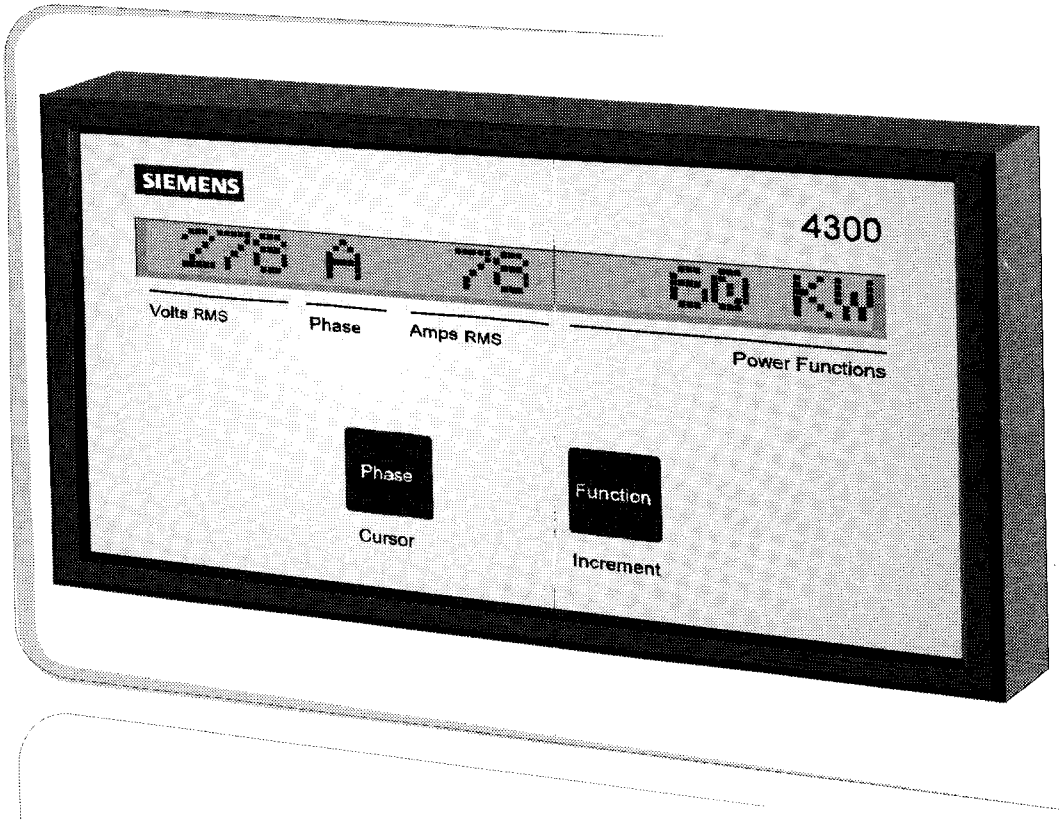
SIEMENS

4300 Power Meter

Operator's Manual



Manual No. SG6038-03

⚠ DANGER

Hazardous voltages and high-speed moving parts.

Will cause death, serious personal injury, or equipment damage.

Always de-energize and ground equipment before maintenance. Read and understand this instruction manual before using equipment. Maintenance should be performed only by qualified personnel. The use of unauthorized parts in the repair of the equipment or tampering by unqualified personnel will result in dangerous conditions that will cause severe personal injury or equipment damage. Follow all safety instructions contained herein.

IMPORTANT

The information contained herein is general in nature and not intended for specific application purposes. It does not relieve the user of responsibility to use sound practices in application, installation, operation, and maintenance of the equipment purchased. Siemens reserves the right to make changes at any time without notice or obligations. Should a conflict arise between the general information contained in this publication and the contents of drawings or supplementary material, or both, the latter shall take precedence.

QUALIFIED PERSON

For the purposes of this manual, a qualified person is one who is familiar with the installation, construction, or operation of the equipment and the hazards involved. In addition, this person has the following qualifications:

(a) **is trained and authorized** to de-energize, clear, ground, and tag circuits and equipment in accordance with established safety practices.

(b) **is trained** in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, flash clothing,etc., in accordance with established safety procedures.

(c) **is trained** in rendering first aid.

NOTE

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local sales office.

The contents of the instruction manual shall not become part of or modify any prior or existing aggreement, commitment or relationship. The sales contract contains the entire obligation of Siemens Energy & Automation, Inc. The warranty contained in the contract between parties is the sole warranty of Siemens Energy & Automation, Inc. Any statements contained herein do not create new warranties or modify the existing warranty.

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1 Introduction

The 4300 power meter is a microprocessor-based, three-phase power meter that provides advanced features at an affordable price.

The 4300 power meter is designed as an alternative to full-featured digital instrumentation packages. It provides high accuracy, high reliability, high transient surge, and hipot-withstand capabilities. Voltage and current measurements are true rms, including harmonics.

The 4300 power meter replaces standard analog meters and selector switches, and its unique two-module design simplifies wiring and reduces installation time. This design makes the meter ideally suited for economical metering on three-phase industrial and commercial switchboards and switchgear.

A communications port lets you use the 4300 power meter as a stand-alone power monitoring station or as one element in a large energy-management network.

1.1 Quick and Easy Installation

The 4300 power meter's two-module design simplifies wiring connections and reduces installation time. As illustrated in **Figure 1.1**, the base module is equipped with a large, utility approved, barrier-style terminal strip for reliable connections, and the meter requires no transducers. You can connect current transformers (CTs) to the meter directly (via shorting blocks), and no voltage transformers (VTs) are needed for four-wire wye systems 347/600 V and below.

The meter's base module mounts directly to a switchgear panel, and the display module mounts in ANSI C39.1 cut-outs. This arrangement simplifies the replacement of existing analog meters. A single plug-in cable connects the two modules, permitting you to mount the base module inside a switchgear cabinet. (No switches or additional wiring is required on the panel door.) If you ever need to remove or replace the display module, you can do so without shutting down the meter.

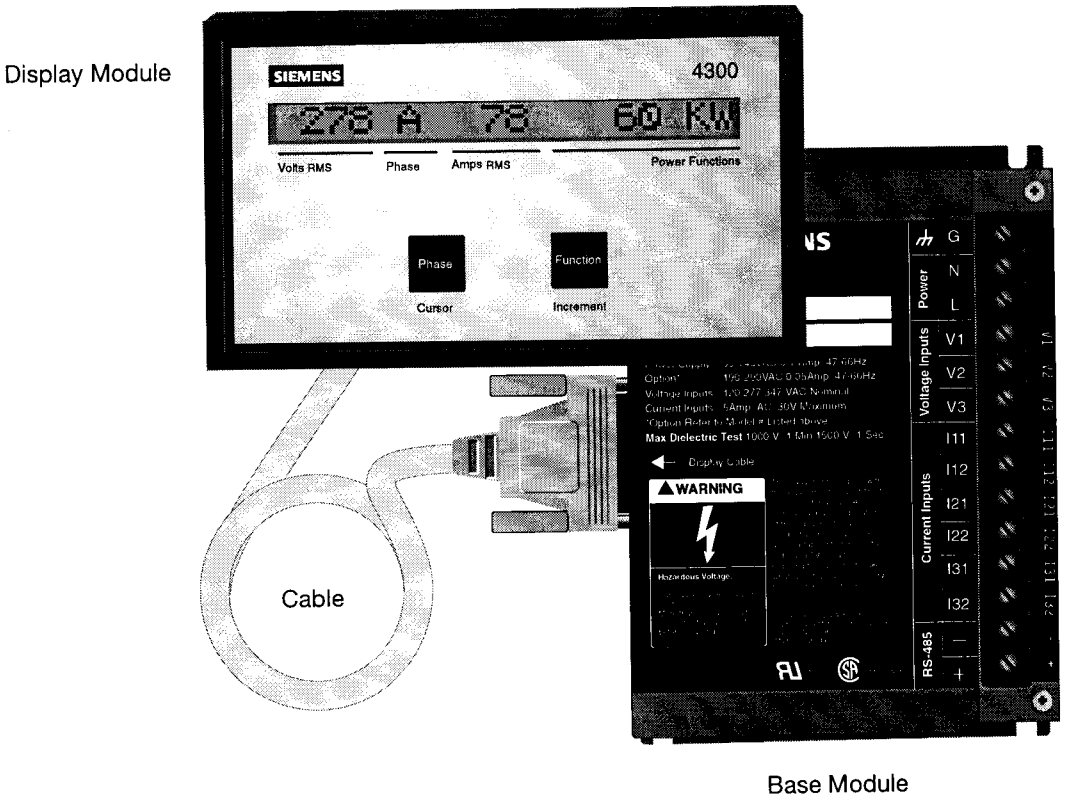


Figure 1.1 4300 Power Meter Modules

1.2 Measurement Functions and Displays

As illustrated in **Figure 1.1**, the display module has a high-visibility, 20-character, liquid crystal display (LCD). Operators use its function buttons to display measured data, including voltage, current, power function, all three voltage phases, and all three current phases.

The 4300 power meter can be configured to operate in wye (star), delta, or single-phase voltage modes. The meter is equipped to monitor the following measurements:

- Line-to-neutral voltages (Van, Vbn, Vcn)
- Line-to-neutral average voltage (LNav)
- Line-to-line voltages (Vab, Vbc, Vca)
- Line-to-line average voltage (LLav)
- Current on each phase (Ia, Ib, Ic)
- Average current
- KW total for all phases
- KWH total for all phases
- KVA total
- KVAR total
- KW Demand
- MAX KW Demand
- PF (Power Factor)
- Frequency

1.3 Local Programmability

You can easily program the metering parameters from the display module. A listing of these parameters appears in **Table 4.1**. You can also use a portable or remotely located PC, with the proper software, to program setup data via the meter's communications port. The 4300 power meter saves all set-up data at power down, and all programming is protected by password.

1.4 Communications Compatibility

The 4300 power meter is equipped with an optically isolated, RS-485 communications port for displaying data on a remote supervisory device. Examples of this device include the Power Monitor display and monitoring unit (a standard personal computer running the Power Monitor PC communications and supervisory software) and Microsoft® Windows® based Siemens SIEServe™ or WinPM™ software. These supervisory devices and programs can communicate with the 4300 power meter, allowing it to operate in the ACCESS™ electrical distribution communications system.

The 4300 power meter can also communicate with a host PC as part of the ACCESS system. The *4300 Power Meter SEAbus Plus Protocol Reference Manual* (Manual No. SG6353-01) provides a comprehensive description of the meter's communications protocol. This open protocol enables other systems to gain access to the 4300 power meter.

1.5 New Feature Upgrades Made Easy

The 4300 power meter is designed to maintain its position at the forefront of developing technology through upward compatibility. An advanced system architecture supports simple upgrades of the meter's on-board operating software.

If you connect the 4300 power meter to a supervisory device that has software downloading capability, you can easily install new features or performance enhancements via the meter's communications port without interrupting electrical service. Be sure to connect each 4300 power meter to a local RS-485 communications bus during installation so that you can upgrade the meter's software without disconnecting wires or removing the unit from its installation.

1.6 System Applications

The 4300 power meter is a state-of-the-art alternative to traditional analog, electromechanical metering devices. Because of its unique measurement, display, and communications capabilities, the 4300 power meter can be used in any of the following applications:

- utility installations and substation metering
- industrial, office, and commercial buildings
- hospitals
- telephone exchanges
- factories and chemical process plants
- pulp mills and saw mills
- large stores, shopping centers, and hotels
- co-generation systems
- multi-user sites for allocation of electrical costs
- any other installation that uses significant amounts of electrical energy

2 Installation

2.1 Location

Mount the 4300 power meter in a dry, dirt-free environment, away from heat sources and high electrical fields. The temperature of the meter's operating environment should not exceed 50°C (112°F) or fall below 0°C (32°F). Refer to specifications in **Appendix A**.

The enclosure that the 4300 power meter is mounted in (typically a switchgear cabinet), should protect the device from atmospheric contaminants such as oil, moisture, dust, and corrosive vapors, or other harmful airborne substances.

The mounting enclosure should be positioned such that the doors may be opened fully for easy access to the wiring to the 4300 power meter display module, base module, and all related components to allow for convenient troubleshooting. When choosing the enclosure size, allow for extra space for all wiring, intermediate terminal strips, shorting blocks, or any other required components.

2.2 Mounting

Mount the display module of the 4300 power meter in a switchgear panel for easy access and viewing. As illustrated in **Figure B.1** (**Appendix B**), the display module requires four holes and one cutout that allows you to connect the display cable. The mounting studs and display connector for the display module fit existing ANSI C39.1 panel cutouts.

As illustrated in **Figure B.2**, mount the base module of the meter flush against any flat surface, using the four slots on its mounting flange. Normally, you mount the base module inside a switchgear cabinet. The position of the labeling on the base module lets you mount the module against a wall, with the terminal strip aligned vertically, but you can mount the module in the position you find most convenient.

The distance between the mounting locations of the display and base modules can be up to 10 feet (3.03 meters). The interconnecting display cable supplied with the power meter is six feet. Display cables are available in lengths up to 10 feet. Contact your Siemens representative for ordering information.

> **Note:** The display cable is not a standard RS-232 cable. Use only the cable supplied by Siemens with the 4300 power meter. Using any other cable may damage the meter.

2.3 Power Supply

The 4300 power meter is powered by a nominal 120 VAC (47 to 66 Hz) at 0.1 A. It can be powered from a dedicated fused feed or from the voltage source it monitors, as long as that source is a 120 VAC system. An optional 240 VAC (47 to 66 Hz) at 0.05 A power supply is available.

2.4 Wiring

Make electrical and communications connections for the 4300 power meter to the terminal strip located on the base module. **Figure B.2** illustrates the location of the terminal strip on the base module.

2.4.1 Electrical Connections

Use 12 AWG to 14 AWG wire for all electrical connections. Use ring or spade terminals to simplify connection. Phasing and polarity of the AC current and voltage inputs, and their relationship, are critical for proper operation of the meter.

Proper electrical wiring for the following configurations are illustrated in **section 2.7** to **section 2.9**:

- Four-Wire Wye, Three-Element Direct Connection for Systems of 120/208 VAC to 347/600 VAC (**Figure 2.1**)
- Four-Wire Wye, Three-Element Connection Using Three VTs (**Figure 2.2**)
- Four-Wire Wye, 2 1/2-Element Connection Using Two VTs, for Balanced Systems Above 347/600 VAC (**Figure 2.3**)
- Three-Wire Wye, Three-Element Direct Connection for Systems 120/208 VAC to 347/600 VAC (**Figure 2.4**)
- Three-Wire Delta, 2 1/2-Element Connection Using Two VTs and Three CTs (**Figure 2.5**)
- Three-Wire Delta, 2 1/2-Element Connection Using 2 VTs and Two CTs (**Figure 2.6**)
- Three-Wire Single-Phase, Two-Element Direct Connection (**Figure 2.7**)

2.4.2 Communications Connection

Make RS-485 communications connections with a 22 AWG, shielded, twisted-pair cable. Siemens recommends Alpha Wire Corporation part numbers 5121C or 55121. Refer to **Chapter 6** for detailed information on communications wiring.

2.5 Voltage and Current Transformer Selection

To properly monitor data with the 4300 power meter, you must select the correct current transformers (CTs) and voltage transformers (VTs) if required. Metering accuracy depends on the combined accuracies of the 4300 power meter, the CTs, and the VTs (if used). The information you need to properly select VTs and CTs, is discussed next.

2.5.1 VT Selection

Whether you need VTs to install the 4300 power meter in your system depends on the voltage levels it monitors. You can use the 4300 power meter for direct connection (without VTs) in the following configurations:

- four-wire wye, direct connection for 120/208 VAC to 347/600 VAC systems
- three-wire wye, direct connection for 120/208 VAC to 347/600 VAC systems
- three-wire single-phase (350 VAC or less)

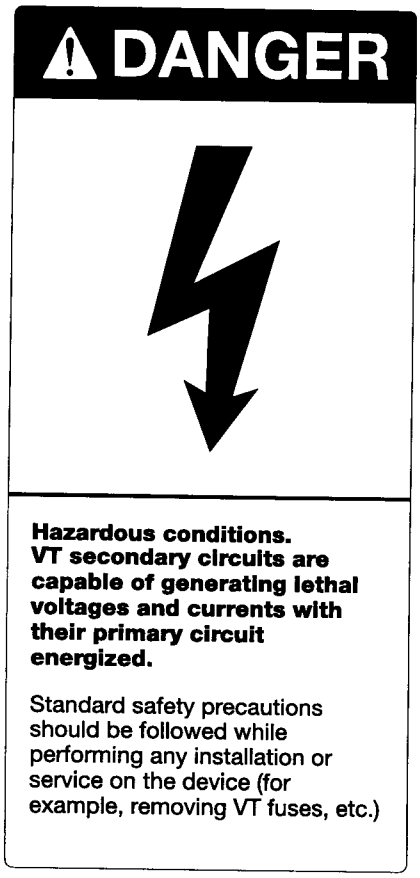
You must use VTs in the following configurations:

- four-wire wye systems over 347/600 VAC
- three-wire delta

You can also use the meter's inputs with VTs that have a 120 V secondary. If line-to-neutral (L-N) or line-to-line (L-L) voltages exceed 347/600, you must use VTs. VTs scale down the system L-N (wye) or L-L (delta) voltage to 120 V full-scale. Select VTs as follows:

- wye (star): VT primary rating is the system L-N voltage or nearest higher standard size; VT secondary rating is 120 V.
- delta: VT primary rating is the system L-L voltage; VT secondary rating is 120 V.

VT quality directly affects system accuracy. The VTs you use must provide good linearity and must maintain the proper phase relationship between voltage and current in order for voltage, kW, and PF readings to be valid. Use instrument Accuracy Class 1 or better.

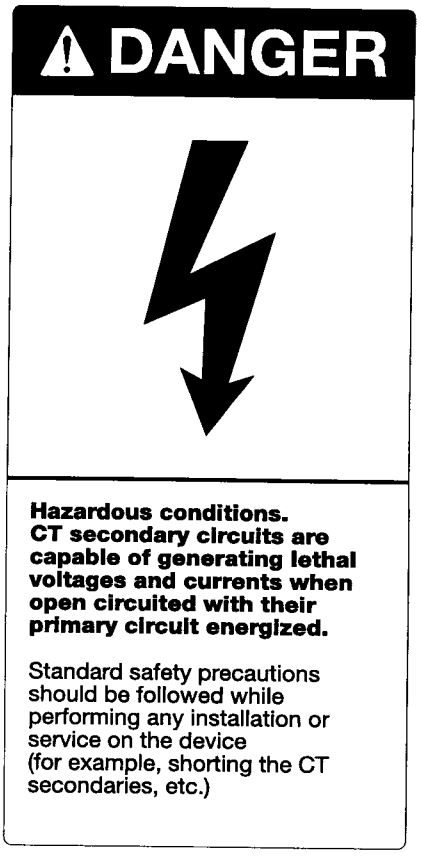


2.5.2 CT Selection

The 4300 power meter uses CTs to sense the current in each phase of the power feed. CT selection also affects metering accuracy.

The 4300 power meter's current-input rating is 5 A. Normally you select a CT primary rating that equals the current rating of the power-feed protection device; however, if peak anticipated load is much less than the system's rated capacity, you can improve accuracy and resolution by selecting a lower rated CT. In this case, CT size should equal the maximum expected peak current plus 25%, and rounded to the nearest standard CT size.

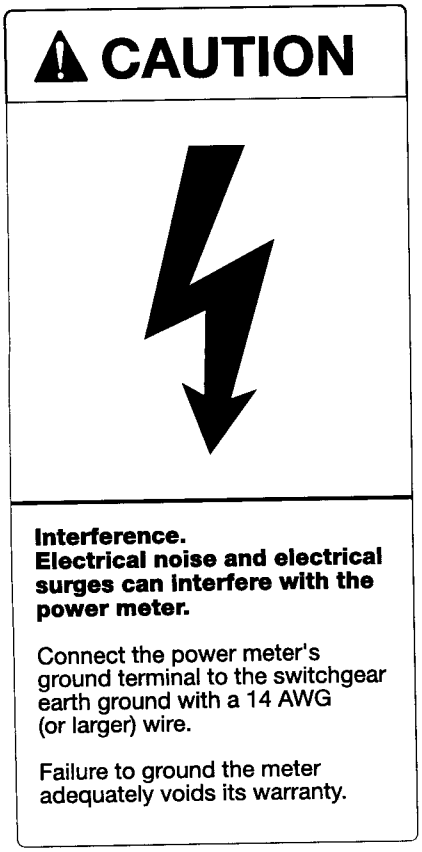
Other factors can affect CT accuracy, too. For instance, long cables can contribute to inaccuracy. To avoid this problem, keep cables as short as possible, and make sure that the CT burden rating exceeds the combined burden of the 4300 power meter (0.05 VA), plus cables, and other connected devices. (Burden is the amount of load being fed by the CT, measured in VA.)



2.6 Connecting Ground Terminal

The G (ground) terminal of the 4300 power meter is both the meter's measurement reference point and the chassis ground connection for the meter. This lead must be connected to earth ground. A good, low-impedance chassis ground is essential for accurate measurement. Do not rely on metal door hinges as a ground path.

A good, low impedance chassis ground connection is essential for accurate measurements and proper protection. It should be made to the switchgear earth ground using a dedicated 14 AWG (2.7mm^2) or larger wire to a point where there will be no voltage error due to distribution voltage drops. Do not rely on metal door hinges as a ground path. Ensure that the screw has been tightened down securely onto the ground wire.



2.7 Connecting Three-Phase Wye (Star) Systems

In three-phase wye systems, the 4300 power meter senses the line-to-earth ground voltage of each phase. If the power system being monitored is a 120 VAC to 347 VAC system, the meter's inputs can be connected directly. **Figure 2.1** illustrates a three-phase, four-wire wye, 120/208 VAC to 347/600 VAC system with a three-element direct connection.

Figure 2.2 illustrates a three-phase, four-wire wye, three-element connection using three VTs. **Figure 2.3** illustrates a three-phase, four-wire wye, 2 1/2-element connection using two VTs. (Use this connection for balanced systems only.)

When using VTs, wire both the VT primary and secondary in a wye (star) configuration, and protect voltage sensing leads at their sources with breakers or fuses. If the power rating of the VTs exceeds 25 W, fuse the secondaries. Wiring must be exactly as shown for correct operation.

Figure 2.4 illustrates a three-phase, three-wire wye, 120/208 VAC to 347/600 VAC system with a three-element direct connection. When the star point of a three-wire wye system is grounded, the 4300 power meter can be directly connected without VTs, provided that the voltages are within the input range of the unit. For line-to-neutral (L-N) voltages over 347 VAC, use VTs.

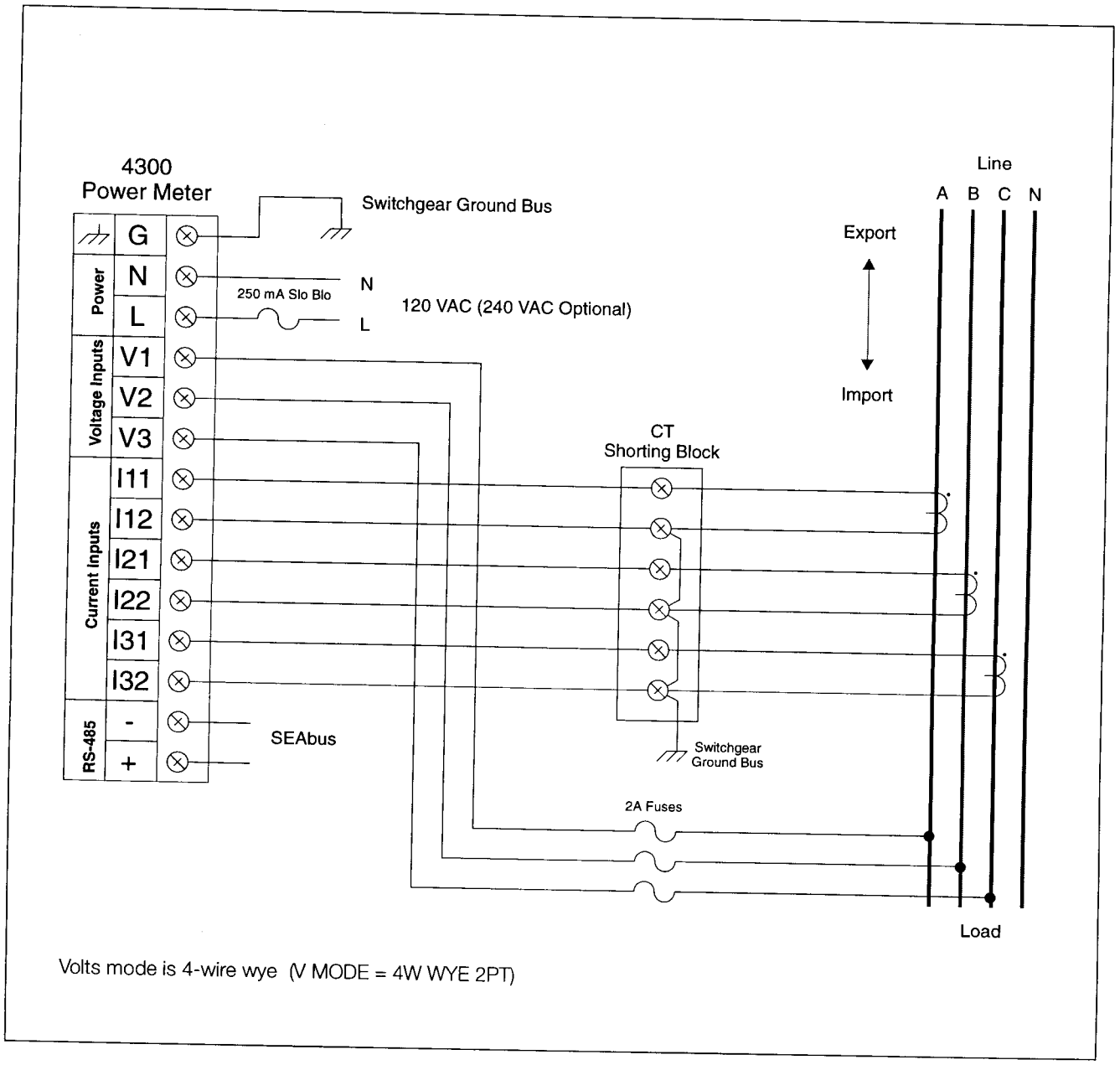


Figure 2.1 Four-Wire Wye, Three-Element Direct Connection for Systems of 120/208 VAC to 347/600 VAC

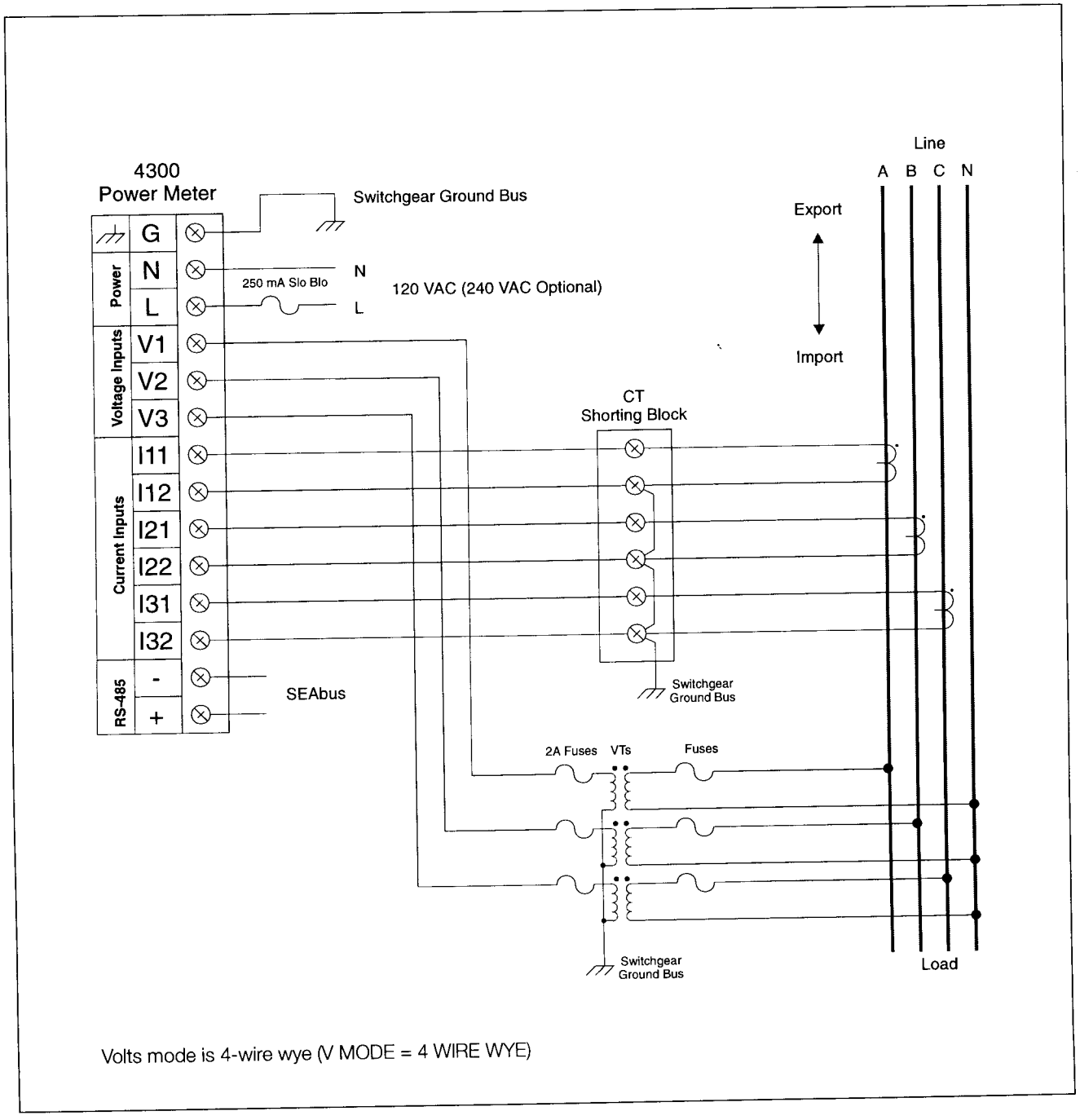


Figure 2.2 Four-Wire Wye, Three-Element Connection Using Three VTs

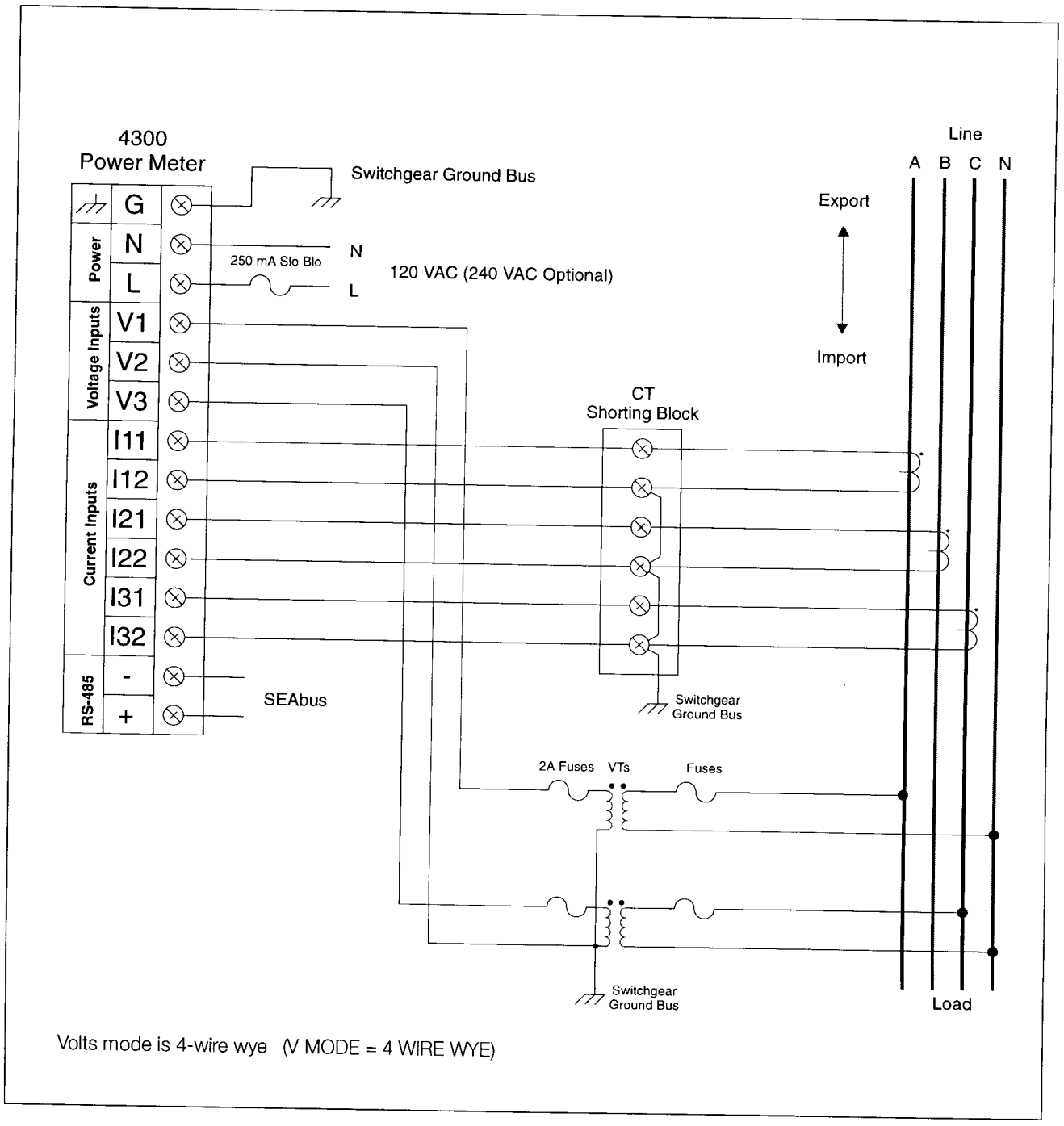


Figure 2.3 Four-Wire Wye, 2 1/2-Element Connection Using Two VTs, for Balanced Systems Above 347/600 VAC

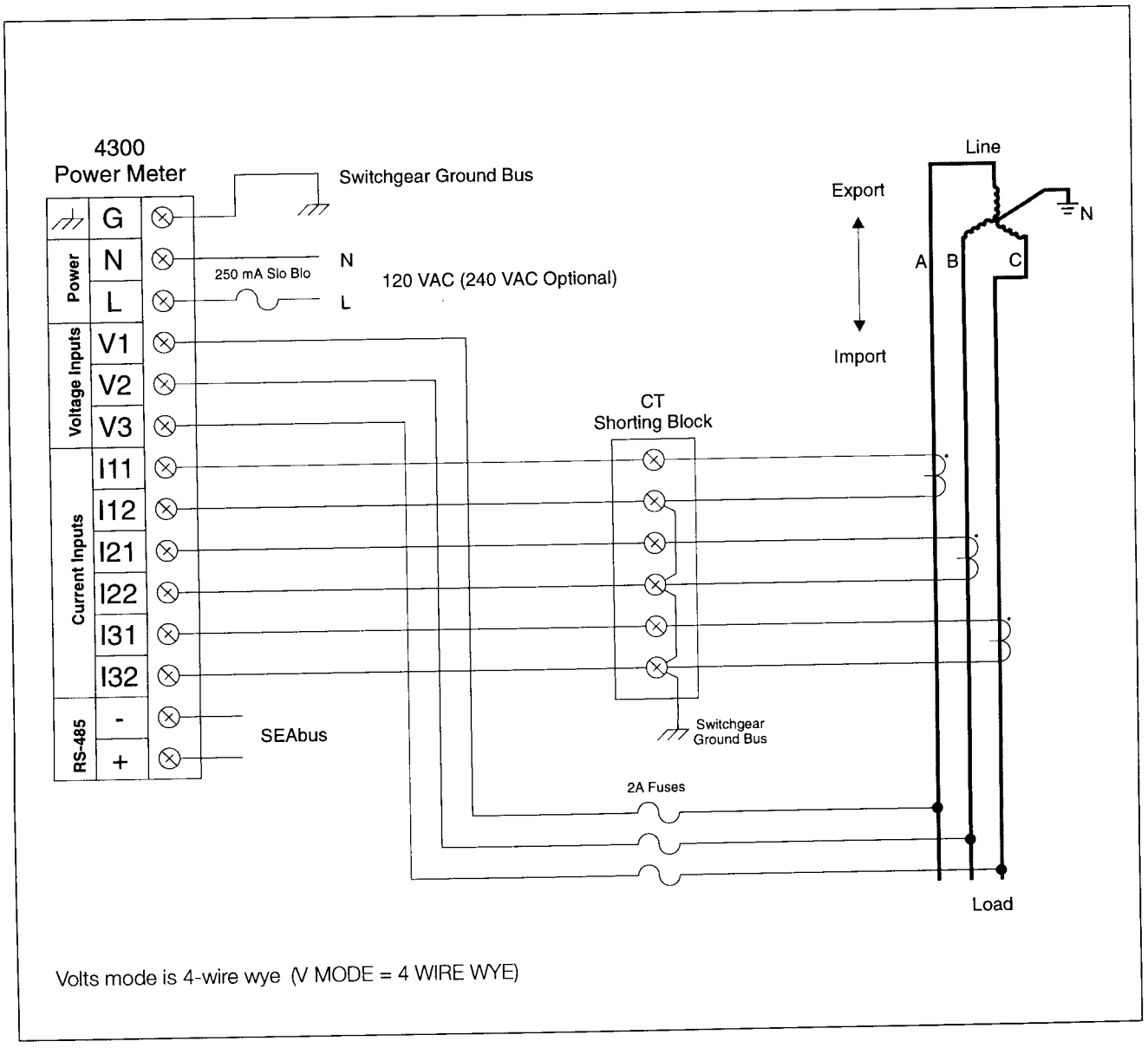


Figure 2.4 Three-Wire Wye, Three-Element Direct Connection for 120/208 VAC to 347/600 VAC Systems

2.8 Connecting Three-Phase Delta Systems

When configured for ungrounded (floating) delta operation, the 4300 power meter requires VTs and senses the line-to-line voltages between each of the phases.

In these open configurations, connect the 4300 power meter using VTs and either three or two CTs. **Figure 2.5** and **Figure 2.6** illustrate delta connections using three and two CTs respectively.

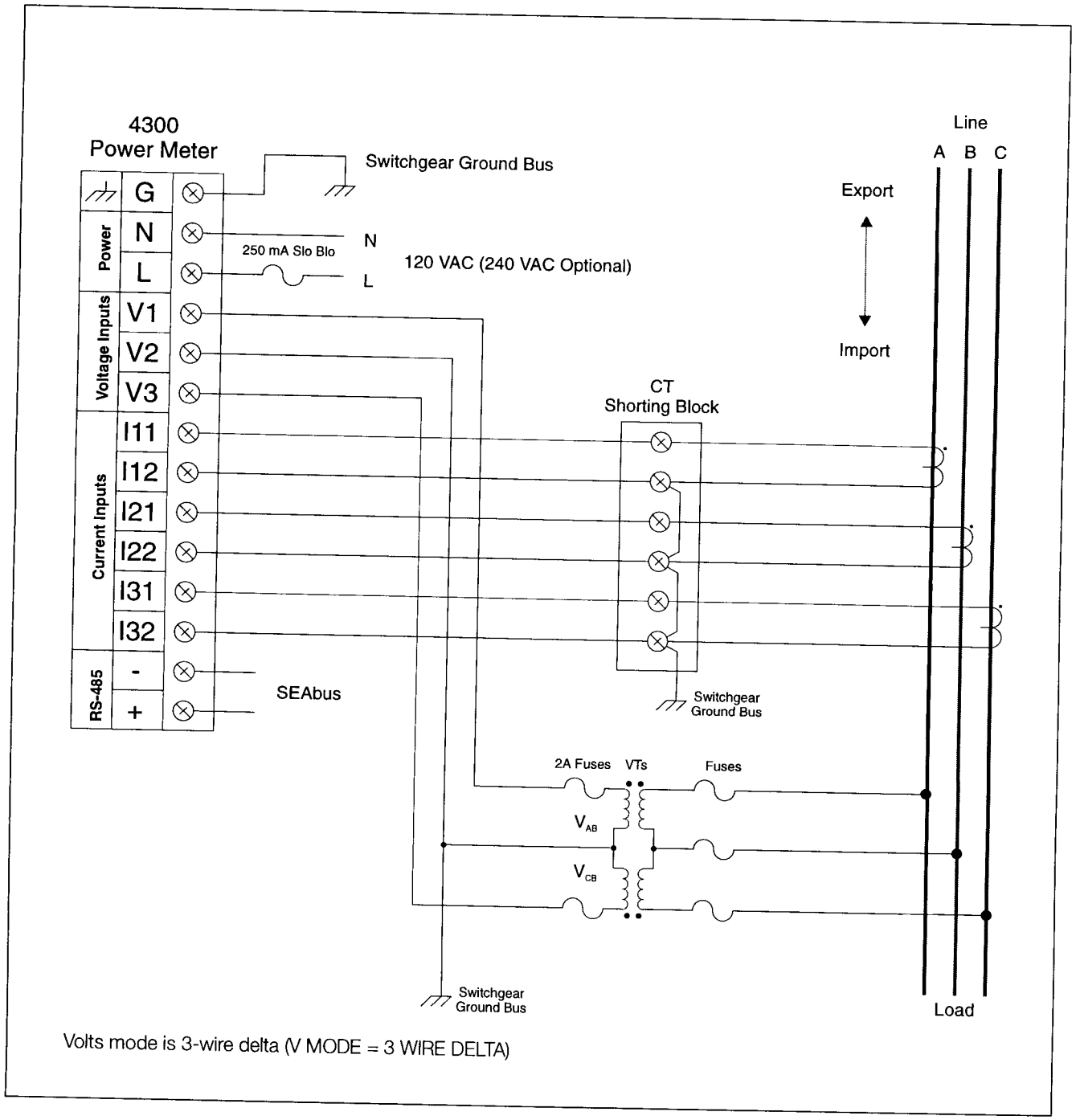


Figure 2.5 Three-Wire Delta, 2 1/2-Element Connection Using Two VTs and Three CTs

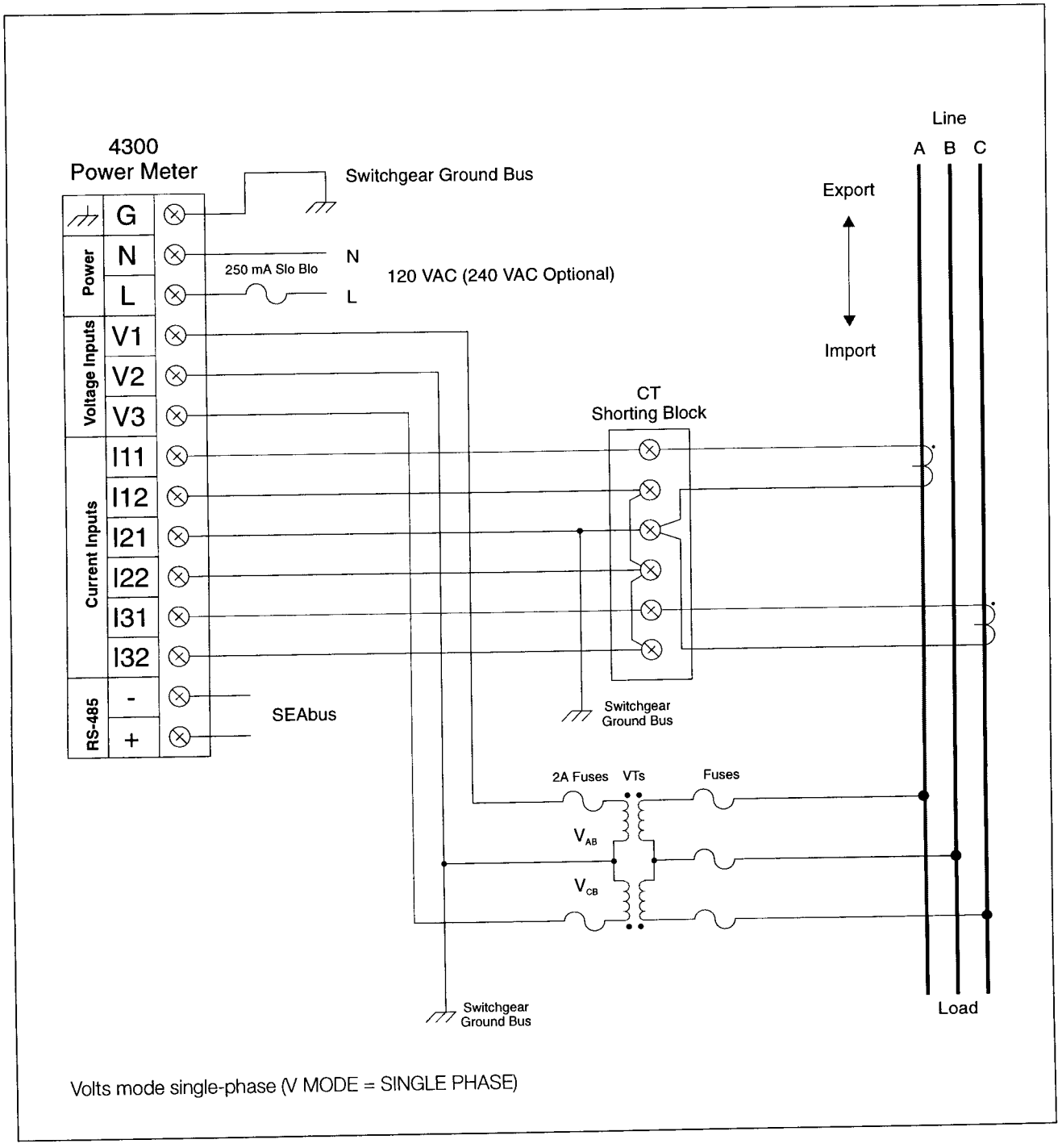


Figure 2.6 Three-Wire Delta, 2 1/2-Element Connection Using 2 VTs and Two CTs

2.9 Connecting Single-Phase, Three-Wire Systems

When wiring for single-phase systems, you must connect the system's two voltage phases (each 180° with respect to each other) to the V1 and V2 inputs of the 4300 power meter.

You must also connect the wiring from the outputs of the two CTs to the meter's corresponding I11/I12 and I21/I22 input pairs. This connection is illustrated in **Figure 2.7**.

Note: The V3 input and the I31/I32 input pair are not used for this wiring system and should be grounded.

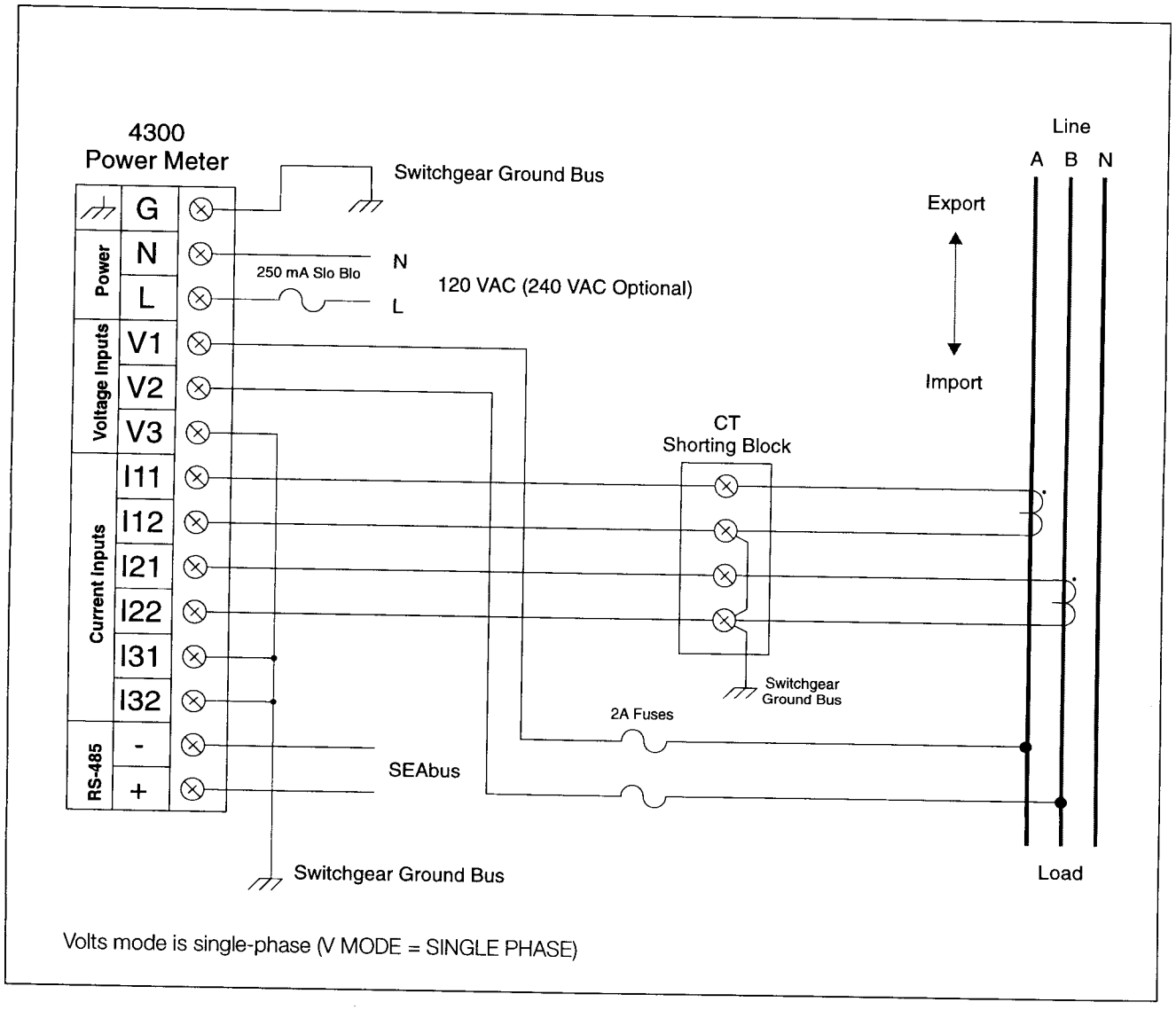


Figure 2.7 Three-Wire Single-Phase, Two-Element Direct Connection

2.10 Communications Connections

The 4300 power meter communicates with supervisory devices using the RS-485 communications standard. RS-485 connections are made to the meter's main terminal strip, located on the base module. The wiring diagram for RS-485 communications is illustrated in **Figure 2.8**.

Note: Wire the RS-485 port of every 4300 power meter you install, and extend the wiring to a safely accessible location. Field service of the meter, including running diagnostics, testing, software upgrades, and feature upgrades is performed via the communications link.

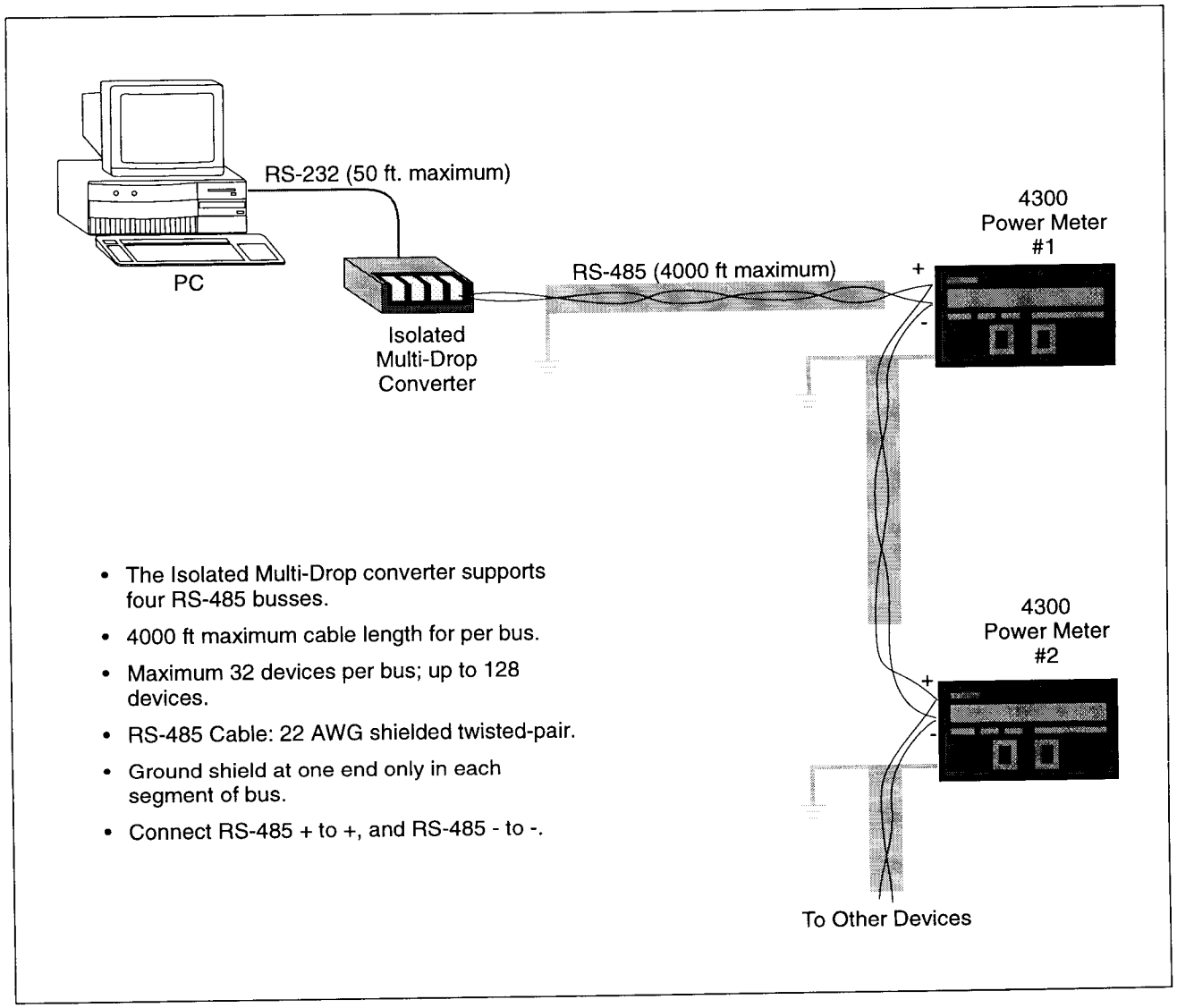


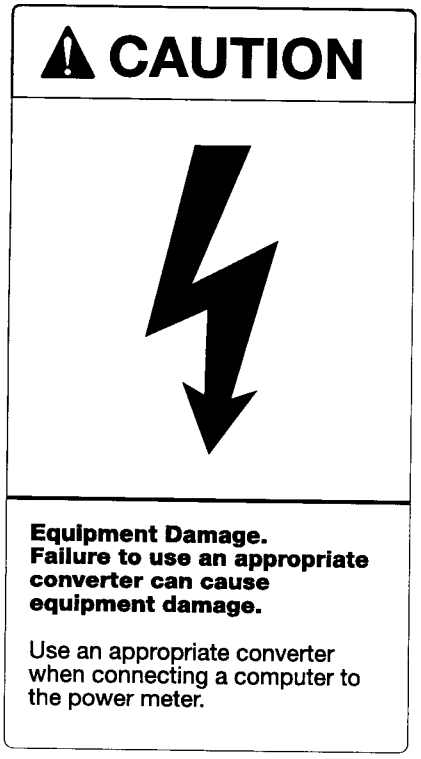
Figure 2.8 RS-485 Communications Connection

2.10.1 Test Block Termination

Extend RS-485 communications wiring to an easily and safely accessible location, and terminate the communications wiring at a test block. Because it simplifies field-testing and diagnostics, terminating communications wiring at a test block is always recommended, regardless of whether a computer is used on the network.

2.10.2 Connecting to a Computer

To connect a computer to a network of 4300 power meters, use a Siemens Isolated Multi-Drop converter. As illustrated in **Figure 2.8**, the Isolated Multi-Drop converter (Siemens part number 18-658-582-537) lets a computer's RS-232 port communicate with the 4300 power meter via the meter's RS-485 port.



To install the converter, connect one end of an RS-232 cable to the computer's RS-232 serial port and the other end to the RS-232 port on the converter. Next, connect the converter to the meter, using 22 AWG, shielded, twisted-pair wire. Use the same kind of wire to daisy-chain additional 4300 power meters or other RS-485 devices in a network. As explained in **section 2.10.1**, terminating the RS-485 cable at an intermediate test block simplifies local testing.

3 Operator Interface

The 4300 power meter operates in two modes: Display mode and Programming mode. Display mode allows the viewing of metered data. Programming mode allows access to the 4300 power meter set-up parameters for either display or configuration. The front panel operator interface of the 4300 power meter display module provides access to both modes and performs all required operating functions.

The front panel uses two labeled buttons and an LCD. The buttons and the LCD serve separate functions in each of the two operating modes. The buttons control the information shown on the display. The label below each button indicates the button's alternate function.

Refer to **Figure 3.1** for an illustration of the 4300 power meter display module front panel operator interface in Display mode.

3.1 Display Mode

In Display mode, the LCD uses four fields to display voltage, phase, current, and power functions information.

> **Note:** No more than five characters of the power function value can appear simultaneously with voltage and current values; instead, the power function field of the display appears blank. To display a power function value of more than five characters, press the Function button. Pressing the Function button at this point displays the power function on the entire display, replacing the voltage, phase, and current display. To display voltage, phase, and current again, press the Phase button.

3.1.1 Phase Button

The Phase button selects the phase for which the voltage and current values shall be displayed in the Volts, Phase, and Amps fields of the LCD.

While in Display mode, press the Phase button repeatedly to advance through the Phase button menu until you have reached the desired parameter.

3.1.2 Phase Button Menu

The Phase button menu can display voltage and current readings for

- line-to-neutral for each phase
- line-to-line for each phase
- average for all phases

You can also display the readings for all three voltage phases or all three current phases simultaneously.

Refer to **Table 3.1** for definitions of abbreviations used to display these readings.

The number of different readings available depends on the Volts mode setting (V MODE parameter).

The next three examples show you the menus when Volts mode is set to 4-WIRE WYE or 4W WYE 2 PT, 3-WIRE DELTA, or SINGLE PHASE.

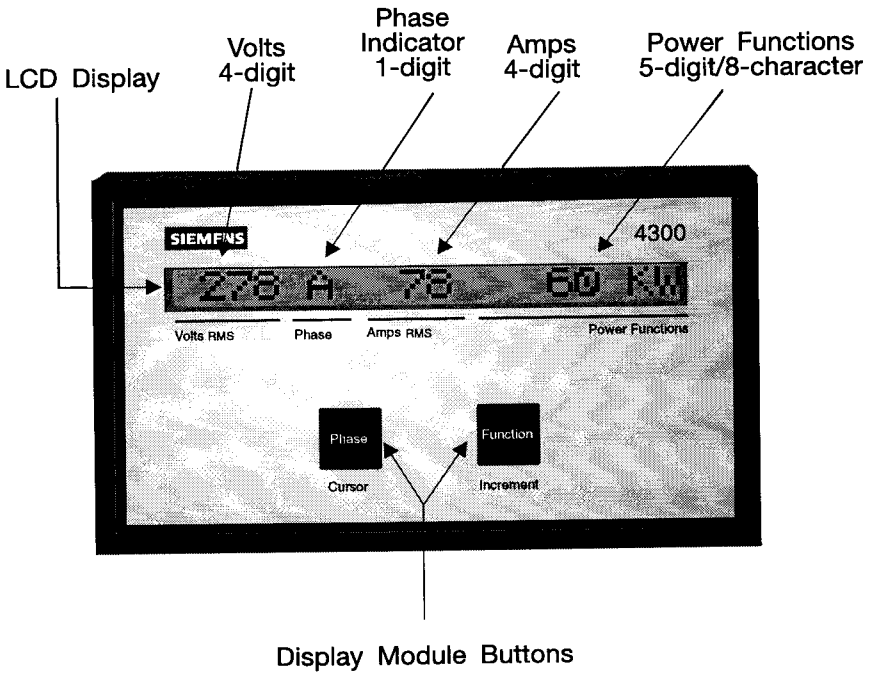


Figure 3.1 4300 Power Meter Display Module and Operating Buttons

Volts mode set to 4-WIRE WYE or 4W WYE 2 PT:

1. While in Display mode, press the Phase button three times. The meter displays each pair of line-to-neutral volts and amps phase readings (A, B, C).

2. Press the Phase button once. The meter displays the average for all line-to-neutral readings (L-N).

3. Press the Phase button three times. The meter displays each pair of line-to-line volts (ab, bc, ca) and amps phase readings.

4. Press the Phase button once. The meter displays the average for all line-to-line volts and amps.

5. Press the Phase button once. The meter simultaneously displays the readings for all three-phase, line-to-neutral volts (A, B, C). (Power function values do not appear because the entire display is used to display data for all three phases.)

6. Press the Phase button once. The meter simultaneously displays readings for all three-phase, line-to-line volts. (ab, bc, ca). (Power function values do not appear because the entire display is used to display data for all three phases.)

7. Press the Phase button once. The meter simultaneously displays readings for all three amps phases (A, B, C). (Power function values do not appear because the entire display displays all three phases of data.)

Volts mode set to 3-WIRE DELTA:

1. While in Display mode, press the Phase button three times. The meter displays each pair of line-to-line volts (ab, bc, ca) and amps phase readings.

2. Press the Phase button once. The meter displays the average for all line-to-line volts and amps.

3. Press the Phase button once. The meter simultaneously displays readings for all three-phase, line-to-line volts. (ab, bc, ca). (Power function values do not appear because the entire display is used to display data for all three phases.)

4. Press the Phase button once. The meter simultaneously displays readings for all three amps phases (A, B, C). (Power function values do not appear because the entire display displays all three phases of data.)

Volts mode set to SINGLE PHASE:

1. From Display mode, press the Phase button twice. The meter displays each phase of line-to-neutral voltage and current phase readings (A, B).

2. Press the Phase button once. The meter displays the average for both line-to-neutral readings (L-N).

3.1.3 Function Button

The Function button selects the power function to be displayed in the Power Functions field of the LCD next to the Volts, Phase, and Amps fields.

While in Display mode, press the Function button repeatedly to advance through the Function button menu until you have reached the desired parameter.

After the display advances through all the functions, it loops back to the first function.

3.1.4 Function Button Menu

The Function Button Menu displays the following power function:

- KW
- KW total
- KVAR total
- KVA total
- Power Factor
- Frequency
- KWH total
- KW Demand
- KW Demand Max.

Power function abbreviations and definitions are provided in **Table 3.1**. The definitions also show which functions provide individual phase readings, average-of-all-phases readings, and totaled values for all phases. Functions that provide individual phase readings and average-of-all-phases readings indicate which reading is displayed by embedding the name in the function label as follows:

- phase name (a, b, c, ab, bc, ca), for example, Vab
- average (av, LNav, LLav), for example, V(LN)

Some readings given in K units automatically change to M units when values exceed 9999 K.

Under certain conditions, the meter cannot display power function values simultaneously with the voltage, phase, and current values. The power meter does not display power functions in the following cases:

- when viewing values for all three-phase voltages (line-to-line or line-to-neutral)
- when viewing values for all three-phase currents
- when viewing a power function value that consists of more than five characters

Use the Phase and Function buttons to re-display the Volts, Amps, and Power Functions fields.

Table 3.1 Abbreviations used by the 4300 Power Meter in Display Mode

Abbreviations Used in Display for Phase Readings	
A, B, C	Individual (line-to-neutral for volts), total = total of all phases.
L-N	Average of all phases (line-to-neutral for volts).
ab, bc, ca	Individual (line-to-line for volts).
L-L	Average of all phases (line-to-line for volts)* (asterisk) = sliding window demand (that is, not thermal).
Abbreviations Used in Display for Power Functions	
KW	Total instantaneous real-power flow for all phases. A positive number (no sign) indicates real power in the forward direction (imported). A negative number (negative signed) indicates real power in the reverse direction (exported).
KVR	Total reactive power.
KVA	Total apparent power.
KW/TOT	Total accumulated real energy (total KW Hours) for all phases. This accumulated value increases when real power is being imported, and decreases when real power is exported. Therefore, this value can be signed either positively (net import) or negatively (net export). Note also that its value rolls over to (zero) at 1,999,999,999 KWH.
KW DMD	Total instantaneous real-power demand of all phases.
KW DMD MAX	Maximum instantaneous real-power demand of all phases since the last reset.
HZ	Frequency, all phases, in Hertz.
PF	Power factor total of all phases. A leading PF (current leads voltage) indicated by the designation PF LEAD. A lagging PF (current lags voltage) is indicated by the designation PF LAG.

3.2 Polarity of Power Readings

Figure 3.2 illustrates how the 4300 power meter interprets and displays signed (positive or negative) values for power imported or exported and for leading or lagging indicators of power factor.

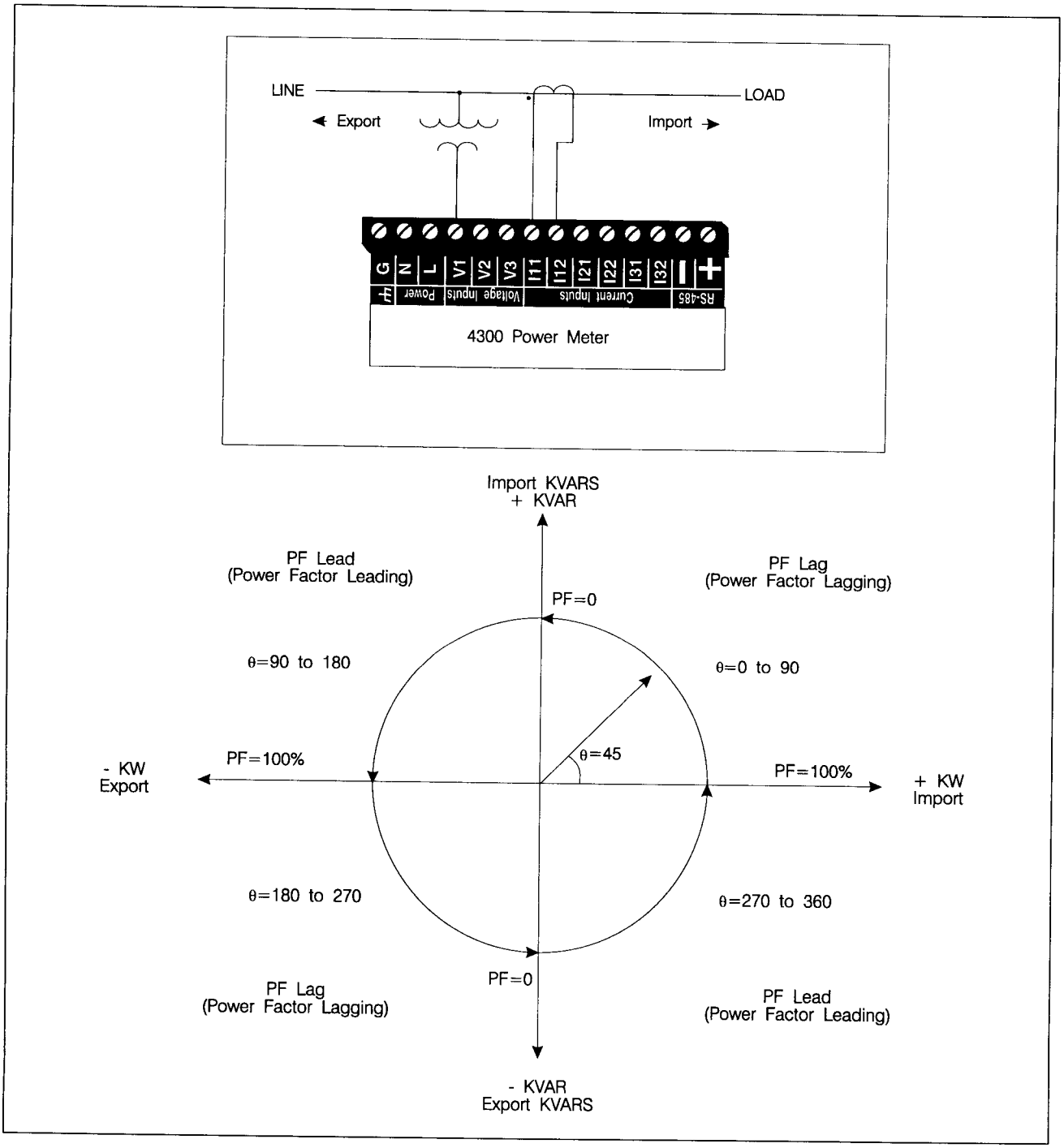


Figure 3.2 Polarity Indications Determining Power Factor

3.3 Programming Mode

After installing the 4300 power meter, you must program it specifically for your system. You use the power meter's Programming mode to gain access to its set-up parameters. In Programming mode, the LCD displays all setup parameter information.

Enter Programming mode by pressing and holding down the Phase and Function buttons simultaneously for two to three seconds until the LCD displays PROGRAMMING MODE.

Return to Display mode by pressing the Phase and Function buttons again.

In Programming mode, the front panel buttons assume new programming functions. The label below each button indicates its alternate function. For example, the Function button used in Display mode changes to the Increment button in Programming mode.

3.3.1 Cursor and Increment Buttons

The Cursor and Increment buttons change the value of the displayed parameter.

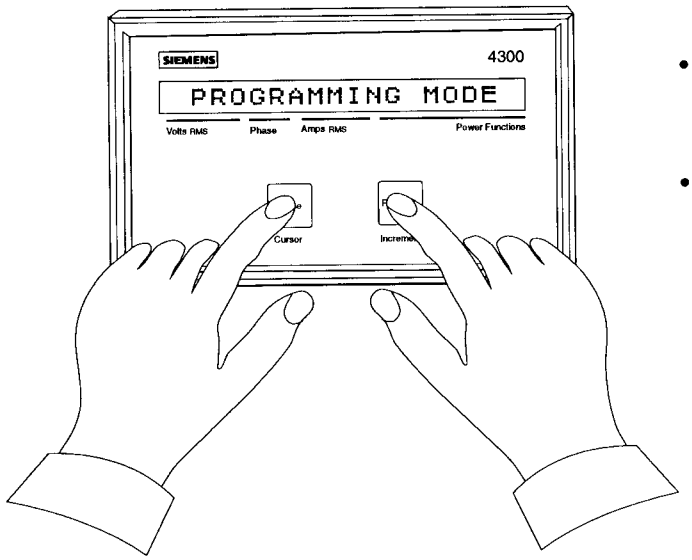
Press the Cursor button to move the cursor left one digit (cursor wraps around if necessary).

Press the Increment button to increase the value of the digit where the cursor resides. For parameters that have YES or NO values, pressing the Increment button toggles a value to either YES or NO.

Other parameters, such as BAUD RATE, have several values available. Press the Increment or Decrement button to scroll through the values.

> **Note:** To scroll through each setup parameter, press the Cursor and Increment buttons simultaneously, then release them quickly. If you hold down the buttons for longer than two seconds, the meter switches to Display mode. Refer to **Figure 3.3**.
>
> If you pass a parameter by mistake, continue to press and then quickly release both the Cursor and Increment buttons at the same time until the desired parameter appears again. Refer to **Figure 3.3**.

Local programming and all programmable operating parameters are described in the next chapter.



- To enter or leave Programming mode, press both buttons > 2 sec.
- To scroll through parameters, press both quickly.

Figure 3.3 Entering Programming Mode

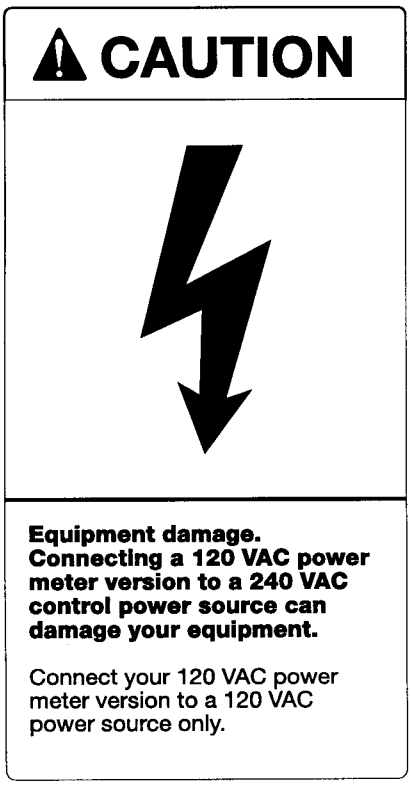
3 Operator Interface

4 Local Programming

The process of supplying necessary information to the 4300 power meter from the front panel is known as local programming. This chapter covers programming the power meter locally.

4.1 Start Up

After you have installed the 4300 power meter and checked the wiring, start up the unit by connecting its power wires to the L and N leads on the 120 VAC control power source and the G lead to the equipment ground bus. Connect the 240 VAC version to a 240 VAC control power source only. The 240 VAC version does not function if connected to a 120 VAC source.



On startup, the 4300 power meter enters Display mode showing values in the Volts, Phase, Amps, and Power Functions fields of the front panel LCD (refer to **Chapter 3**, **Figure 3.1**). The values that initially appear on the LCD are usually incorrect because the power meter has not yet been programmed for a live system.

4.2 Password Protection

A password should be used to prevent any accidental or unauthorized parameter changes. While power meter information can be accessed for display without a password, changes to parameter settings require a user password. At shipping, the 4300 power meter password is set to 0 (zero).

4.2.1 Entering the Password

In Programming mode, press and release the Cursor and Increment buttons simultaneously until the PASSWORD parameter appears. It is the first parameter in Programming mode. Enter the password using the Increment button to increase by one the digit or character over the cursor. Use the Cursor button to move the cursor to the left by one place.

4.2.2 Changing the Password

In Programming mode, press and release the Cursor and Increment buttons simultaneously until the PASSWORD parameter appears. Enter the old password using the Cursor and Increment buttons as described in the previous paragraph.

To change the password, again press and release the Cursor and Increment buttons simultaneously until the PASSWORD parameter appears. Now enter the new password using the Increment button to increase by one the digit or character over the cursor. Use the Cursor button to move the cursor to the left by one place (four-digits maximum). Return to Display mode to complete the process.

If you lose or forget your password, contact Siemens customer service.

4.3 CT Primary Rating

Set the CT PRIMARY parameter to the primary rating of the CTs being used only if the CTs are rated for a 5 A, full-scale output. If the CTs are not rated for these output levels, contact a Siemens factory representative for assistance.

4.4 Voltage Inputs

You can connect the 4300 power meter's voltage inputs either directly to the phase A, B, and C power lines or to voltage transformers (VTs).

You can connect the meter directly to four-wire wye systems up to 347 VAC. Above this voltage level, you must use VTs.

4.4.1 Direct Connection

If you connect the 4300 power meter directly to the power lines, set the USING PT'S? parameter to NO. This setting allows you to connect the meter directly to line-to-neutral (wye) or line-to-line (delta), 120 to 347 VAC systems. The meter automatically selects the appropriate scale.

4.4.2 VT Connection

If you use VTs to connect to line-to-neutral (wye) or line-to-line (delta) voltages higher than 347 VAC, set USING PT'S? to YES. The meter then displays the PT PRIMARY and PT SECONDARY parameters, which give the meter the VT voltage ratings and allow it to set its internal, full-scale input references.

Set PT PRIMARY to the primary rating of the VTs you are using. This setting should be equivalent to the line-to-neutral or line-to-line voltages being measured by the meter.

Set PT SECONDARY to the secondary rating of the VTs you are using. The maximum secondary voltage you can use is 347 VAC.

4.5 Volts Mode

Options for setting Volts mode comprise three-wire wye, four-wire wye, three-wire delta, and single-phase systems. Set Volts mode to match your system according to the following guidelines:

- If your system is balanced four-wire wye using only two VTs, set Volts mode to 4W WYE 2PT.
- If your system is four-wire wye and is either direct connect or using three VTs, set Volts mode to 4 WIRE WYE.
- If your system is three-wire wye, set Volts mode to 4 WIRE WYE.
- If your system is three-wire delta, set Volts mode to 3 WIRE DELTA.
- If your system is three-wire single-phase, set Volts mode to SINGLE PHASE.

Note: If you set Volts mode to 4W WYE 2PT, the meter will measure power accurately only if the voltages are balanced.

The 4300 power meter also offers a demo mode (VMODE = DEMO) parameter that you can use to demonstrate the meter's ability to display and communicate data, without connecting to a real power system. Specifically, you can display and communicate voltage, current, and power function values based on the input scales you have programmed through the display module or communications port.

4.6 Communications

The UNIT ID and BAUD RATE parameters are communications parameters. Each 4300 power meter on an RS-485 communications network must have a unique Unit ID in the range 1 to 254. If you use a remotely located communications device to communicate with a meter, set the baud rate of the meter to match the baud rate of its supervisory device and all other devices on the network.

4.7 Clear and Reset

The RESET MIN/MAX function clears and resets the KWH DMD* MAX value to zero. Choose either YES or NO using the Increment button while in Programming mode. The CLEAR ALL HOURS? function resets the KW HOURS readings to 0 (zero). Choose either YES or NO using the Increment button while in Programming mode.

4.8 Demand Periods

The DEMAND PERIOD parameter sets the length of demand subperiods to be used in calculating optional demand values. You can set the number of demand subperiods with the # OF DMD PERIODS parameter. Refer to **Chapter 5** for more details and demand measurements.

4.9 Display Contrast

The CONTRAST/ANGLE function allows you to adjust the contrast of the display module's LCD for optimum readability at any vertical viewing angle. To adjust the LCD, press the Increment button to change the contrast level of the display in preset steps, and adjust the level until you achieve the best readability for a given installation.

4.10 Diagnostic Mode

Diagnostic mode is a special mode that is only used to

- check the present software version when planning to upgrade the power meter
- when equipment failure is suspected

Diagnostic mode is only displayed if the DIAGNOSTIC MODE? parameter is set to YES. Pressing the Cursor and Increment buttons simultaneously advances through the parameters.

4.10.1 Version Check

The 4300 power meter has been designed to easily upgrade meters already in service. New features can be added to the meter using a simple software upgrade that loads a new operating program into the power meter.

The SOFTWARE VER and REV DATE parameters indicate which version of software is currently installed.

4.10.2 System Status

The CHECKSUM parameter provides a pass or fail value. The STATUS FLAGS parameters indicate the status of the internal system and reset the status flag.

If you encounter a problem with the meter and suspect the problem is due to a device failure, contact Siemens immediately. A Siemens representative may ask you to check the values of the diagnostic parameters to help determine the source of the problem.

A summary of all programmable operating parameters and the special diagnostic parameters are provided on the next page in **Table 4.1** and **Table 4.2**.

Table 4.1 Programmable Operating Parameters

Parameter	Description	Range
PASSWORD	Must be entered correctly to allow you to change the value of any setup parameter(s) or to allow you to clear/reset any function.	Up to four-digit number
USING PT'S	Selecting NO indicates that meter voltage inputs are being connected directly to the power lines, without PTs. Selecting YES indicates PTs are being used.	NO (direct connection) YES (input from PTs)
PT PRIMARY=	Set to PT primary voltage rating. This parameter only appears when USING PT'S? parameter has been set to YES.	0 to 999,999 V
PT SECONDARY=	Set to PT secondary voltage rating. This parameter only appears when USING PT'S? parameter has been set to YES.	0 to 347 V
CT PRIMARY	Sets full scale AC input current for A, B, C phases (CT primary current rating).	0 to 32,000 A
V MODE=	Sets Volts mode for correct power system programming. Demo mode provides preset values for all measurements based on input scales—use for demonstration purposes only.	4-WIRE WYE, 4W WYE 2 PT, 3-WIRE DELTA, SINGLE PHASE, DEMO
UNIT ID=	Sets communications SEAbus address for each 4300 power meter.	1 to 254
BAUD RATE=	Baud rate at which the power meter transmits and receives information via communications.	300, 1200, 2400, 4800, 9600, 19200
CLEAR ALL HOURS?	Selecting YES sets the KW HOURS (import and export) readings to 0 (zero).	NO, YES
RESET MIN/MAX?	Selecting YES resets KW DMD MAX.	NO, YES
DEMAND PERIOD=	Sets length of the demand subperiod to be used in calculating optional demand values. See **Chapter 5**, Demand Measurements.	1 to 99 (minutes)
# OF DMD PERIODS	Sets the number of demand subperiods to be averaged in calculating the sliding window demand values. See **Chapter 5**, Demand Measurements.	1 to 15 (periods)
CONTRAST/ANGLE	Press increment to adjust contrast of the LCD display.	(Contrast changes)
DIAGNOSTIC MODE?	Setting the parameter to YES allows access to the DIAGNOSTIC MODE parameter.	NO (bypass diagnostic) YES (gain access)

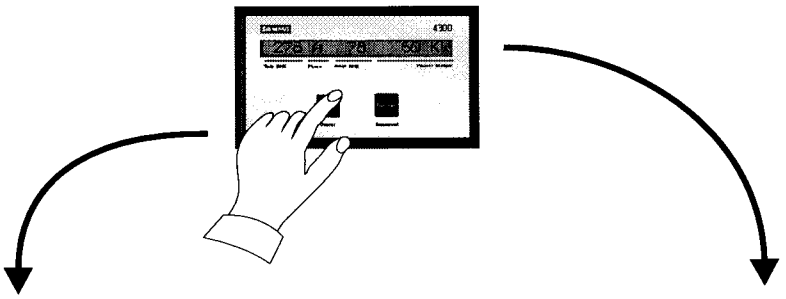
Table 4.2 Diagnostic Parameters (displayed only if set to DIAGNOSTIC MODE? YES)

Parameter	Description	Range
SERIAL NUMBER:	Allows you to view the 4300 power meter's factory-set serial number.	five-digit number
FIRMWARE SMN	This parameter indicates the present version of firmware operating in the meter.	four-digit number
REV DATE	Revision date of the operating software in the 4300 power meter.	day/mo/yr format
CHECKSUM	Checksum value in program memory. Indicates PASS or FAIL.	six-character hexadecimal number
STATUS FLAGS:	Indicates status of various internal systems. Normally reads 0 (zero). If other than zero, contact your Siemens representative.	six character hexadecimal number
CLEAR STATUS?	Clears STATUS FLAGS: field to zero.	YES or NO

4.11 Programming Example

The programming example in **Figure 4.1** is a step-by-step guide to programming the meter from the display module. The example shows you how to

- enter your password
- set the VT PRIMARY parameter to 480 V
- continue through the parameters
- return to Display mode.



Press these buttons: | Display reads:

1 — Phase (Cursor) / Function (Increment) — PROGRAMMING MODE

Press and hold down both buttons to enter programming mode.

2 — Phase (Cursor) / Function (Increment) — PASSWORD= ****

Press and quickly release both buttons.

3 — Function (Increment) — PASSWORD= 0

Press the Increment button once to display 0 (zero), the default password..

4 — Phase (Cursor) / Function (Increment) — USING PT'S?= NO

Press and quickly release both buttons to advance to the next menu.

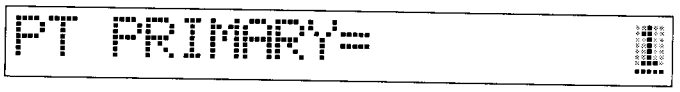
5 — Function (Increment) — USING PT'S?= YES

Press the Increment button once to toggle to Yes..

Figure 4.1 Programming Example

Press these buttons: Display reads:

6 Phase Function



Cursor Increment

Press and quickly release both buttons to advance to the next menu.

7 Function

Increment

Press the increment button nine times to set the rightmost digit to 0 (zero).

8 Phase

Cursor

Press Cursor to move to the next digit.

9 Function

Increment

Press the increment button eight times to set the second digit to 8.

10 Phase

Cursor

Press Cursor to move to the next digit.

11 Function

Increment

Press the increment button four times to set the leftmost digit to 4.

12 Continue to enter the other parameter in the same manner. Press both buttons to advance to the next parameter. Press Increment to increment a particular digit or selection. Press Cursor to move the cursor to the left.

13 Phase Function

Cursor Increment

Press and hold down both buttons to return to display mode.

Figure 4.1 (continued) Programming Example

4 Local Programming

5 Demand Measurements

Power utilities generally bill commercial customers based on their energy consumption (in KWH) and on their peak-usage levels, called peak demand in KW. Demand is a measure of average power consumption over a fixed time period, typically 30 minutes. Peak demand is the highest demand level recorded during the billing period.

Methods and intervals for measuring demand vary among power utilities. Some common methods include thermal-averaging, sliding-window, and fixed-interval techniques. The 4300 power meter performs sliding-window demand calculations.

5.1 Sliding-Window Demand

The sliding-window (or rolling-interval) method divides the demand interval into subperiods, and measures it electronically based on the average load level over the most recent set of subperiods. Compared to the fixed-interval method, this method has a faster response time.

The 4300 power meter has a DEMAND PERIOD parameter (one to 99 minutes) and a # OF DMD PERIODS parameter (one to 15), both of which you can program from the display module. The DEMAND PERIOD parameter represents the length of the utility's demand subperiod; the # OF DMD PERIODS parameter represents the number of subperiods that make up the total demand interval. For example, with a 6x5 minute (30 minutes total) sliding-window method, demand equals the average power consumption over the last six five-minute periods.

The sliding-window method used by the 4300 power meter allows you to match virtually any type of sliding-window measurement method used by your utility (for example, 15x2, 6x5, 1x30). Using this method ensures that the meter's readings are always as high or slightly higher than those of the utility.

5.2 Synchronizing Sliding-Window Demand

You can synchronize the internally timed Demand Period of the meter to the utility's timing by performing a manual procedure at the display module.

To synchronize the DEMAND PERIOD parameter, first reset either the DEMAND PERIOD parameter or the # OF DMD PERIODS parameter to its present value. (Do not actually modify it; just reset the parameter to its present value, for instance from 5 back to 5). At the start of the utility's Demand Period, press both Cursor and Increment buttons simultaneously to advance to the next parameter. This procedure resets the meter's Demand Period clearing all sliding-window demand measurements and synchronizes the meter to the power utility's timing.

5.3 Resetting the Real-Time Demand Parameters

To reset the KW DEMAND MAX value, enter the Programming mode and step through each parameter until RESET MIN/MAX appears. Using the Increment key, choose Yes to reset this value to 0 (zero). This action clears both the maximum kW demand and the real-time accumulated demand.

5 Demand Measurements

6 Communications

The 4300 power meter is equipped with an RS-485 communications port, which enables it to exchange data over long distances with a supervisory display/control station running compatible software. This feature allows you to monitor or control (or both depending on your software) a single meter or a number of meters connected on a common network. You can use the RS-485 communications port to program your device remotely (local programming is covered in **Chapter 4**) and update the meter's software, as described in **section 6.3**.

Before connecting a meter to a supervisory device, set the meter's baud rate to that of the supervisory device. In addition, set the Unit ID for each meter to a unique value.

6.1 Connecting to an RS-485 Network

Provided that each meter has a unique Unit ID, you can use RS-485 communication to connect many remote meters to a device running supervisory software. This software displays all data normally displayed on the display module of each meter.

Using RS-485 communications allows you to monitor all meters from a single supervisory device. The distance for RS-485 communications is limited to 4000 feet, using 22 AWG, twisted-pair, shielded cable.

Chapter 2, **Figure 2.8** illustrates how to connect the 4300 power meter within the RS-485 network. For more information regarding the ACCESS RS-485 network refer to the *ACCESS Systems Installation Guide* (Manual No. SG6028-01).

6.2 Using Other Systems

The 4300 power meter's communications protocol is described in detail in the *4300 Power Meter SEAbus Protocol Reference Manual* (Manual No. SG6353-00). This open protocol allows other systems to communicate with the 4300 power meter via the meter's RS-485 port. To obtain this manual, contact Siemens customer service.

6.3 Updating Software

As Siemens releases new versions of 4300 power meter software, you will be able to update your software via the meter's RS-485 port. You can update the software from a directly connected monitoring and supervisory device. Refer to your device's operator manual for instructions on downloading device software.

> **Note:** To update the meter's on-board software remotely, Siemens recommends that you connect the meter to a communications bus during installation, even if you do not require remote communications initially.

6 Communications

7 Validation

7.1 Maintenance

The 4300 power meter has a battery-backed, nonvolatile memory. Other than battery replacement, the meter needs no regular maintenance. The life expectancy of the battery is seventy years at 50°C, 28 years at 60°C, and 11 years at 70°C.

If the meter operates at less than 50°C for 60% of the time, less than 60°C for 90% of the time, and less than 70°C for 100% of the time, the life expectancy of the battery is 35 years. If the meter operates in an environment where temperatures regularly exceed 60°C, replace the battery every ten years.

For a replacement battery, contact Siemens customer service.

7.2 Calibration

Siemens calibrates all 4300 power meters at the factory. Because it contains no mechanical parts, the 4300 power meter should not need calibrating while operating in the field. If your 4300 power meter needs recalibration, contact Siemens customer service.

7.3 Field Service

The 4300 power meter is not designed for servicing in the field. If a meter fails, replace it with a new one. To remove the meter, use a CT shorting block to disconnect the meter's current inputs, without open-circuiting the CTs. Wire the shorting block so that protective relaying is not affected.

7 Validation

8 Troubleshooting

If you encounter problems during normal operation of the 4300 power meter, check the following list for symptoms and explanations on how to correct this particular problem.

If the display does not operate:

3. Check that the correct voltage is available to the power supply (L and N connections on the terminal strip). The required voltage depends on the meter's power supply option (120 VAC for the standard unit or 240 VAC for the optional unit).

4. Check that the G terminal is properly grounded.

5. Check the cable connection between the display module and the base module.

6. Turn the power off for 10 seconds, and turn it back on.

7. Check that the cable is the same one supplied with the power meter. A standard RS-232 cable may cause equipment damage.

If the voltage or current readings are incorrect:

1. Check that the voltage mode is properly set for the given wiring.

2. Check that the voltage and current scales are properly set.

3. Make sure the G terminal is properly grounded.

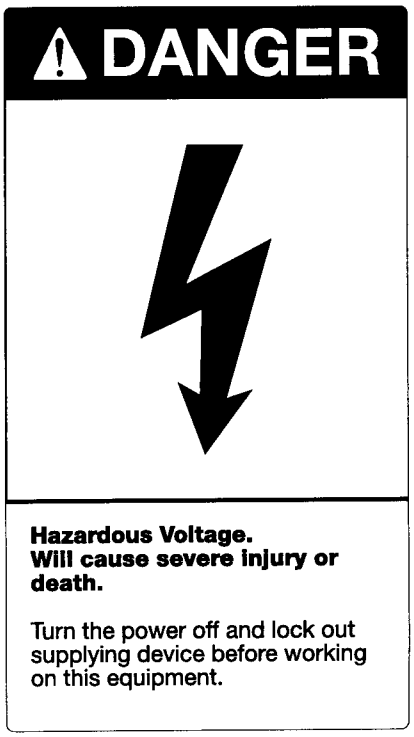
4. Check the quality of the CTs and VTs being used.

5. Make the following voltage tests:

   a. V1, V2, V3 to G should be reasonably balanced, and no greater than 347 VAC.

   b. The G-to-switchgear earth ground should be 0 V.

6. Measure the current flowing into I11, I21, and I31. These measurements should be proportional to the amps readings on phases A, B, and C, where CT Primary, CT Secondary x I11 = amps. Secondary phase A (similar for phases B and C) currents should be no greater than 5 A AC.



If the KW or power factor readings are incorrect, but voltage and current readings are correct:

Make sure that the phase relationship between the voltage and current inputs is correct by comparing the wiring with the appropriate wiring diagram.

If the RS-485 communication does not work:

1. Check that the baud rate of the supervisory device is the same as that of the 4300 power meter.

2. Power down the 4300 power meter and the supervisory device. Then power them up and try to establish communication.

3. Check that the Unit ID (address) of the 4300 power meter is the same as the address assigned to it in the supervisory device.

8 Troubleshooting

A Technical Specifications

The following tables contain technical specifications and input ratings of the 4300 power meter.

Table A.1 Technical Specifications

Parameter	Accuracy	Resolution	Range
Volts	0.5%	0.1%	0 to 999,999 [1]
Amps	0.5%	0.1%	0 to 9999
KVA and KVAR	1.0%	0.1%	0 to 999,999 [2]
KW and KW Demand	1.0%	0.1%	0 to 999,999 [2]
Power Factor	2.0%	1.0%	0.6 to 1.0 lead or lag

[1] Reads in K (that is, x 1,000) for readings over 9,999

[2] Reads in M (that is, x 1,000,000) for readings over 9,999

Table A.2 Input Ratings

Voltage Inputs	Standard:	120 to 347 VAC nominal full-scale inut (programmable)
	Overload withstand:	600 VAC continuous, 1500 VAC for 1 s
	Input impedance	1 MΩ
Current Inputs	Standard:	5.000 A AC nominal full-scale input
	Overload withstand:	15 A continuous, 300 A for 1 s
	Input impedance:	0.002 Ω
	Burden:	0.05 VA
Power Supply	Standard:	95 to 145 VAC/0.1 A/47 to 66 Hz
	Optional	190 to 290 VAC/0.05 A/47 to 66 Hz
Operating Temperature	Standard:	0°C to 50°C (32°F to +122°F) ambient air
Storage Temperature		-30°C to +70°C (-22°F to +158°F)
Humidity		5 to 95%, non-condensing

B Mounting Dimensions

Figure B.1 and **Figure B.2** illustrate the mounting and mechanical dimensions for the 4300 power meter's display and base modules.

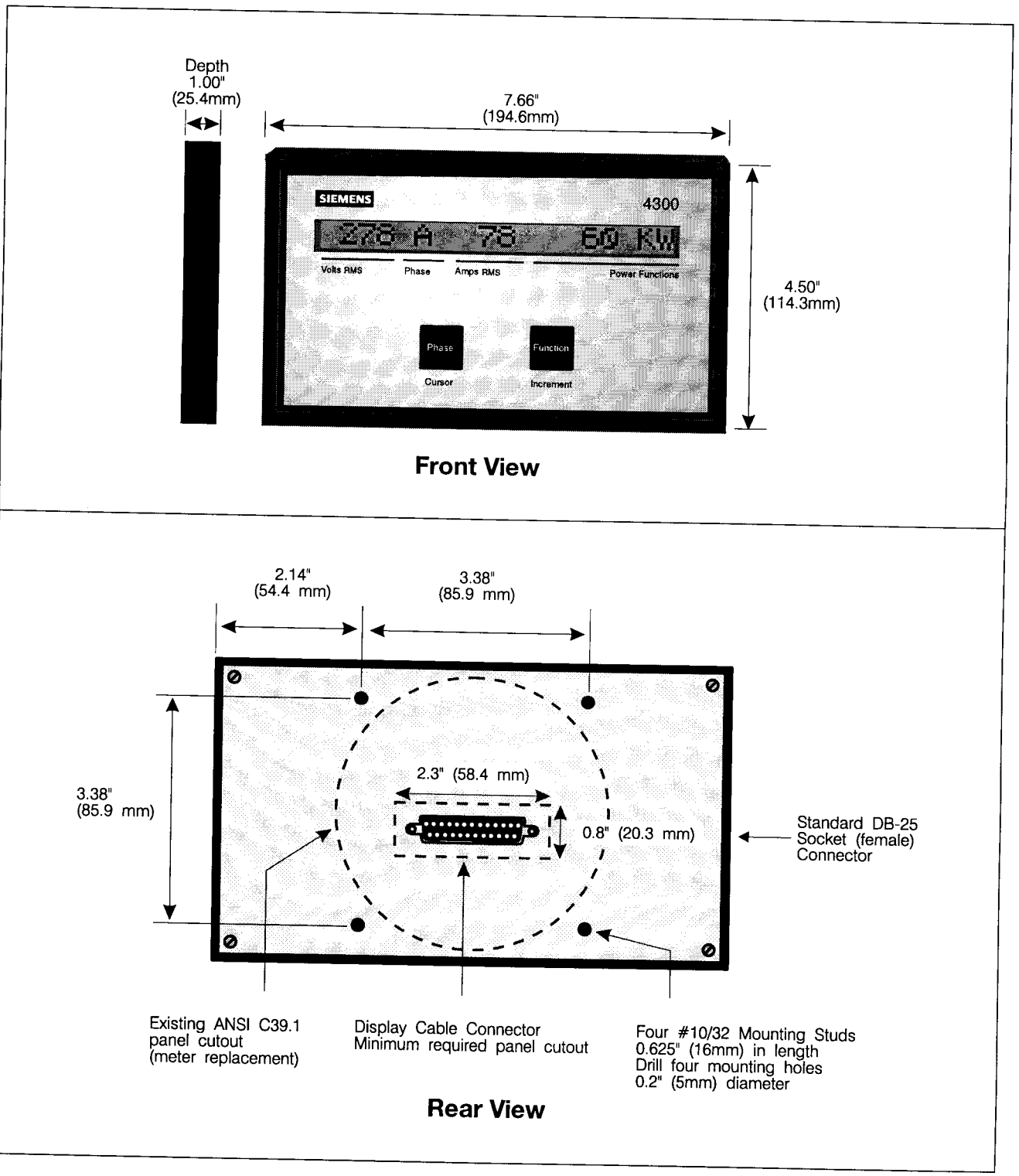


Figure B.1 4300 Display Module Dimensions

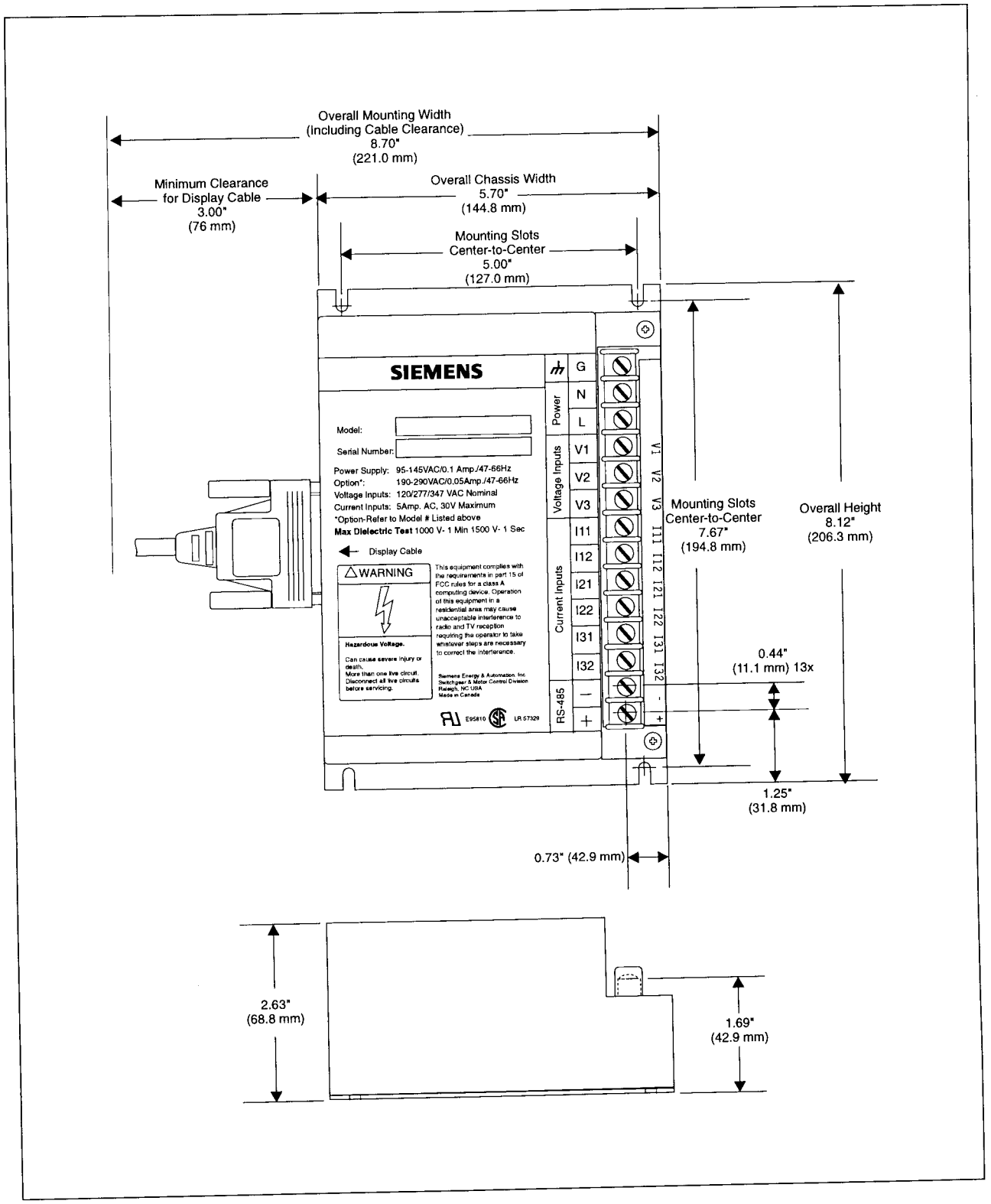


Figure B.2 4300 Base Module Dimensions

Appendix C: Ordering Information

C Ordering Information

The following table contains ordering information for the 4300 power meter. A product name and catalog number is provided for ordering convenience.

Table C.1 Ordering Information

Product Name	Catalog Number
4300 power meter 120 VAC	4300DC-120VAC
4300 power meter 240 VAC	4300DC-240VAC

The 4300 power meter comes with a 6-foot display cable. Cables measuring up to 10 feet can be special ordered by contacting you Siemens representative.

SIEMENS

Siemens Energy
& Automation, Inc.
Switchgear and Motor Control
Business
Customer Service
P.O. Box 29503
Raleigh, NC 27626

ACCESS Systems Service Request Form

To report problems with Siemens ACCESS systems and devices, make a copy of this form, complete it with as much information as you can, and contact your Siemens representative. You can also fax this form to Siemens Customer Service at 919-365-2830.
For emergency service call 1-800-347-6659.

Customer Information

Job site location and contact: _____

_____

_____

Phone and fax number: _____

Siemens sales order number: _____

Siemens manufacturing order number (from drawing): _____

System Information

Describe the number and type of devices on your ACCESS system.

Field Devices

Quantity	Device Type	Quantity	Device Type
	4300 power meter		SCOR relay
	4700 power meter		ISGS relay
	4720 power meter		7SA, 7SJ, or 7UT relay
	Static Trip IIIC trip unit		Multiplexer Translator
	Static Trip IIICP trip unit		Isolated Multi-Drop converter
	Sensitrip III trip unit		S7-I/O device
	SB breaker trip unit		Pulse reading meter
	SAMMS-LV device		Other:
	SAMMS-MV device		Other:

Supervisory Devices and Software

Quantity	Product	Quantity	Product
	WinPM software		Power Monitor Panel (PMP)
	Host PC software		PC32F power monitor
	Power Monitor PC software		Siemens PLC
	SIEServe software		Other hardware:
	Other software:		Other hardware:

Problem Description

Provide the following information on the affected device(s):

Device type: _____

Model or catalog number: _____

Part number: _____ Serial number: _____

Hardware version: _____ Software version: _____

Installed options: _____

Configuration information, including operational settings, parameters, wiring, type of system:

_____

_____

_____

_____

On what type of electrical equipment are the devices installed? (switchgear, motor control center, switchboard, and so on): _____

_____

_____

Provide a brief description of the problem: _____

_____

_____

_____

_____

Indicate what error messages, if any, are generated by the device or supervisory software. Include messages listed in the event log: _____

_____

_____

_____

_____

To be completed by Siemens

Received by: _____ Date received: _____

Reviewed by: _____ Date reviewed: _____

Sales engineer: _____

Problem report tracking number: _____

Problem classification code: _____

Corrective action: _____

_____

_____

_____

_____

_____

SIEMENS

Warranty

Company warrants that on the date of shipment to Purchaser the goods will be of the kind and quality described herein, merchantable, and free of defects in workmanship and material.

If within one year from date of initial operation, but not more than eighteen months from date of shipment by Company, of any item of the goods, Purchaser discovers that such item was not as warranted above and promptly notifies Company in writing thereof, Company shall remedy such defect by, at Company's option, adjustment, repair or replacement of the item and any affected part of the goods. Purchaser shall assume all responsibility and expense for removal, reinstallation and freight in connection with the foregoing remedy. The same obligations and conditions shall extend to replacement items furnished by Company hereunder. Company shall have the right of disposal of items replaced by it. Purchaser shall grant Company access to the goods at all reasonable times in order for Company to determine any defect in the goods. In the event that adjustment, repair or replacement does not remedy the defect, the Company and Purchaser shall negotiate in good faith an equitable adjustment in the contract price.

The Company's responsibility does not extend to any item of the goods which has not been manufactured and sold by Company. Such item shall be covered only by the express warranty, if any, of the manufacturer thereof. The Company and its suppliers shall also have no responsibility if the goods have been improperly stored, handled, or installed; if the goods have not been operated or maintained according to their ratings or according to instructions in Company or supplier furnished manuals; or if unauthorized repairs or modifications have been made to the goods.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES (EXCEPT TITLE). INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS, AND CONSTITUTES THE ONLY WARRANTY OF COMPANY WITH RESPECT TO THE GOODS.

The foregoing states Purchaser's exclusive remedy against Company and its suppliers for any defect in the goods or for failure of the goods to be as warranted, whether Purchaser's remedy is based on contract, warranty, failure of such remedy to achieve its essential purpose, tort (including negligence), strict liability, indemnity, or any other legal theory, and whether arising out of warranties, representations, instructions, installation or defects from any cause.

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