

SIEMENS

9300DP

Power Meter
Instruction Manual





⚠ DANGER

Hazardous voltages are present inside the enclosures or panels in which the power meters are installed. Death, serious injury, and/or equipment damage will result if equipment is incorrectly installed and maintained, or if precaution is not used.

De-energize all incoming power prior to installation of power meters or associated accessories.

Only qualified personnel should work on or around this equipment.

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. The successful and safe operation of this equipment is dependent upon proper handling, installation, operation, and maintenance.

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.

Danger

For the purpose of this manual and product labels, **DANGER** indicates an imminently hazardous situation which, if not avoided will result in death or serious injury.

Warning

For the purpose of this manual and product labels, **WARNING** indicates a potentially hazardous situation which, if not avoided could result in death or serious injury.

Caution

For the purpose of this manual and product labels, **CAUTION** indicates a potentially hazardous situation which, if not avoided may result in minor or moderate injury.

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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 Siemens sales office.

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

1 Introduction

The **9300DP** is a digital power meter ideally suited for industrial, commercial and utility applications. It provides over 100 high accuracy 3-phase measurements for a variety of system configurations, including 4-wire Wye, 3-wire Delta and Single Phase. Its compact size, DIN-compatible installation and high reliability make the **9300DP** ideal for stand-alone metering in panelboards, switchboards, switchgear, gensets and UPS systems. Profibus communications capability allows the **9300DP** to be fully integrated with SCADA and energy management systems.



Figure 1.1 9300DP Power Meter

1.1 Features

The **9300DP** offers the following advantages:

- Economical alternative to traditional analog meters, offering a large selection of digitally-accurate power, energy and demand measurements in a single package
- Fast and simple DIN-compatible installation with single panel cutout and minimal wiring requirements
- Small, space-saving case size makes it an ideal choice for OEM switchboards and switchgear
- Bright, backlit LCD front panel display shows up to four measurements at once
- PT scales, CT scales, demand period and other setup parameters are all easily programmed from the front panel with full password protection
- Communication support for front panel infrared port to download information to portable computers

- Equipped with harmonics analyzers, capable of calculating up to the 15th harmonic.

1.1.1 Simple Installation

The **9300DP** requires only a single panel cutout to mount it on a panel door. It is DIN-compatible, so you can reuse existing DIN cutouts in switchgear cabinet doors. It is easily secured by sliding brackets, tightened by thumbscrews.

You can connect the **9300DP**'s voltage inputs for Wye (Star) systems up to 347/600 VAC without using PTs. For higher voltage systems, PTs with 120 VAC secondaries may be used. Voltage and current inputs are available in either barrier strip or pluggable captured-wire type connectors for systems up to 277/480 VAC.

1.1.2 Flexible Front Panel Display

The front panel of the **9300DP** provides local data display, as well as basic setup and configuration capabilities. It features an easy-to-read liquid crystal display (LCD) with adjustable contrast, programmable backlighting and automatic screen scrolling.

The front panel has eight configurable display screens. Each screen can display up to four values at once. Its default setup displays common values, such as voltage, current and kW. Screens can be customized to show the parameters of your choice, in the format of your choice.

1.1.3 Default Measurements

By default, the **9300DP** offers the following measurements:

Basic Power

- Voltage (I-I-I-n) per phase & average
- Power Factor (signed), per phase & total
- Current per phase & average
- Voltage Unbalance
- Real Power per phase & total
- Current Unbalance
- Reactive Power per phase & total
- Frequency
- Apparent Power per phase & total

Energy

- Imported, exported, absolute and net kWh & kVARh.
- Accumulated kVAh.

1 Introduction

Demand

Sliding Window, Predicted, and Thermal Demand on:

- kW
- kVAR
- kVA
- Average Current

Minimums and Maximums

Minimums and maximums are stored for:

- Voltage (l-n) and (l-l) per phase
- Current per phase
- kW total
- kVAR total
- kVA total,
- Power Factor total
- Frequency
- Sliding Window Demand for kW total and kVA total.

1.1.4 Communications

The 9300DP power meter communicates with other intelligent devices in a Profibus-DP network. Profibus (Professional Fieldbus) is a multi-master/slave communications protocol designed for use in power distribution, manufacturing or process automation. Profibus-DP (Decentralized Periphery) is a performance-optimized protocol that is dedicated to time-critical communications between automation systems and peripherals. Baud rates for the Profibus-DP can range from 9600 bps to 12Mbps.

1.1.5 Digital Outputs

The 9300DP also offers programmable LEDs that can each be used for energy (kWh) pulsing: a regular LED at the rear panel (L1) and an infrared LED at the front optical port.

1.1.6 Simple Upgrades

The 9300DP firmware is flash-memory based so it can be upgraded remotely, via communications.

1.2 About This Manual

This manual is intended to provide you with all the information you need to install and set up the 9300DP power meter. It also provides information on the device's Profibus DP protocol registers and block format.

For installation, you should be familiar with electrical switchgear, electrical codes, and safety procedures. Refer to the inside front cover for important safety instructions. For integration into a network of Profibus devices, you should be familiar with Profibus device programming and protocols.

For help in finding the information you need in this manual refer to the table below.

If you need more information about:	Refer to:
product features	Section 1.1 Features, Appendix A Specifications
physical mounting procedures	Section 2.1 Location & Mounting
wiring the device	Section 2.2 Field Wiring Connections
configuring the device for basic operation	Section 3.2 Setup for Basic Operation, Section 3.3 Displaying Basic Parameters
customizing the display screens	Section 3.8 Customizing the Data Display Screens
Profibus communications packet structure	Appendix B.1 Profibus DP Standard, Appendix B.3 Request Packet Structure
Profibus communications packet examples	Appendix B.10 Profibus Communications Examples, Appendix B.10.2 Write Register Example

2 Installation

2.1 Location & Mounting

The 9300DP should be mounted in a dry, dirt free location. Once installed, no cleaning of the device is necessary. To operate properly and effectively, environmental conditions should fall within the guidelines listed below.

Table 2.1 Environmental Conditions

Environmental Condition	Acceptable Range
Operating Temperature	0°C (32°F) to 50°C (122°F)
Storage Temperature	-30°C (-22°F) to +70°C (158°F)
Relative Humidity	5 to 95% non-condensing

The safety regulation standards specify that the unit be operated no higher than 2000 m (6100 ft.) above sea level

The enclosure the 9300DP 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 9300DP wiring and related components to allow for convenient servicing. When choosing the enclosure size, allow for extra space for all wiring, intermediate terminal strips, shorting blocks, or any other required components. The mounting enclosure should not impede ventilation.

A switch or circuit breaker should be included in the installation and clearly marked as the disconnecting device for the unit. It should be located in close proximity to the unit and within easy reach to the operator.

The 9300DP fits in a DIN standard 92 X 92 mm (3.63" X 3.63") panel cutout. It can be panel mounted on the door of the switchgear cabinet; however, some electrical codes may prohibit extending greater than 120 VAC line-to-neutral or 208 VAC line-to-line to the door. If this is the case, for higher system voltages a 9300DP equipped with 120 VAC inputs (120 option) can be used with PTs that provide 120 VAC secondaries (see the sections, "Connecting the Phase Voltage Inputs" and "Connecting the Phase Current Inputs" on pages 5 and 7).

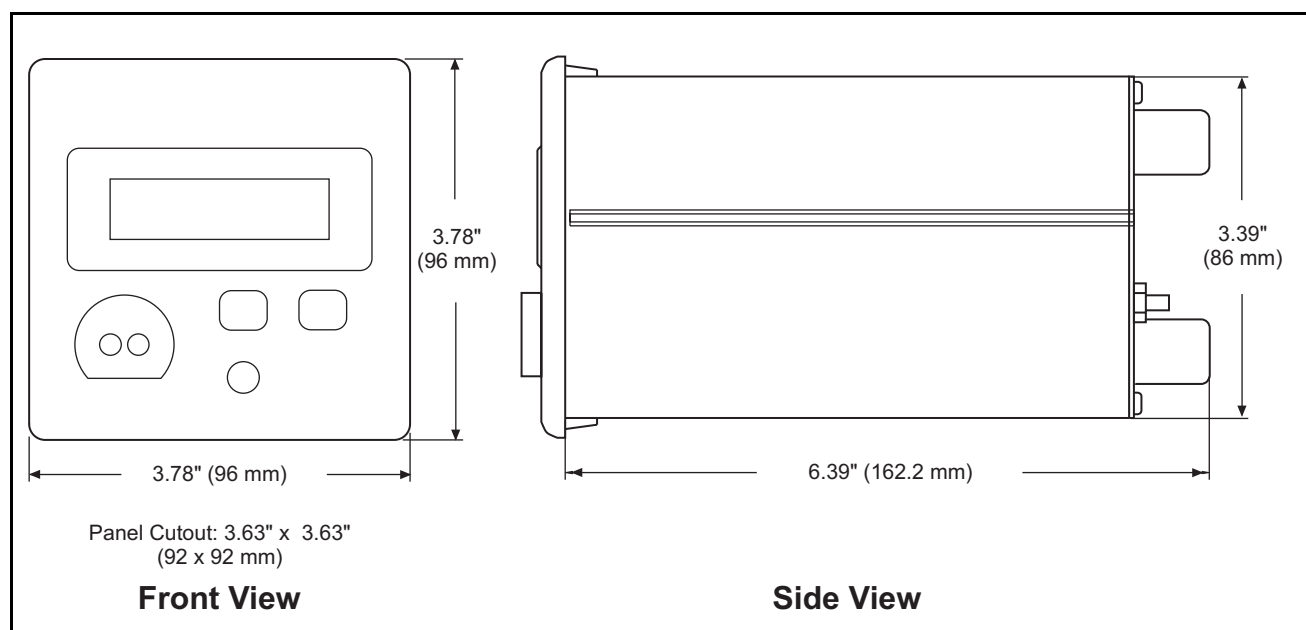


Figure 2.1 Mounting Dimensions

A Greenlee 60174 or equivalent cutout punch is suitable if you are installing a large number of devices.

To mount the 9300DP, fit it into the cutout then slide the supplied slide bars into the grooves on either side of the unit. Insert the thumbscrews and tighten them until the slide bars securely anchor it to the cabinet door.

2 Installation

2.2 Field Wiring Connections

Be familiar with the warnings presented at the beginning of this document before proceeding with the installation of the 9300DP.

2.2.1 The 9300DP Nameplate Label

The 9300DP is available with several different options, and some of these options require special installation procedures.

Refer to the label on the 9300DP to see which options are included on the device you are installing.

The options box on the above label can contain any of the codes shown below. The power supply option is reflected in the **POWER SUPPLY** box.

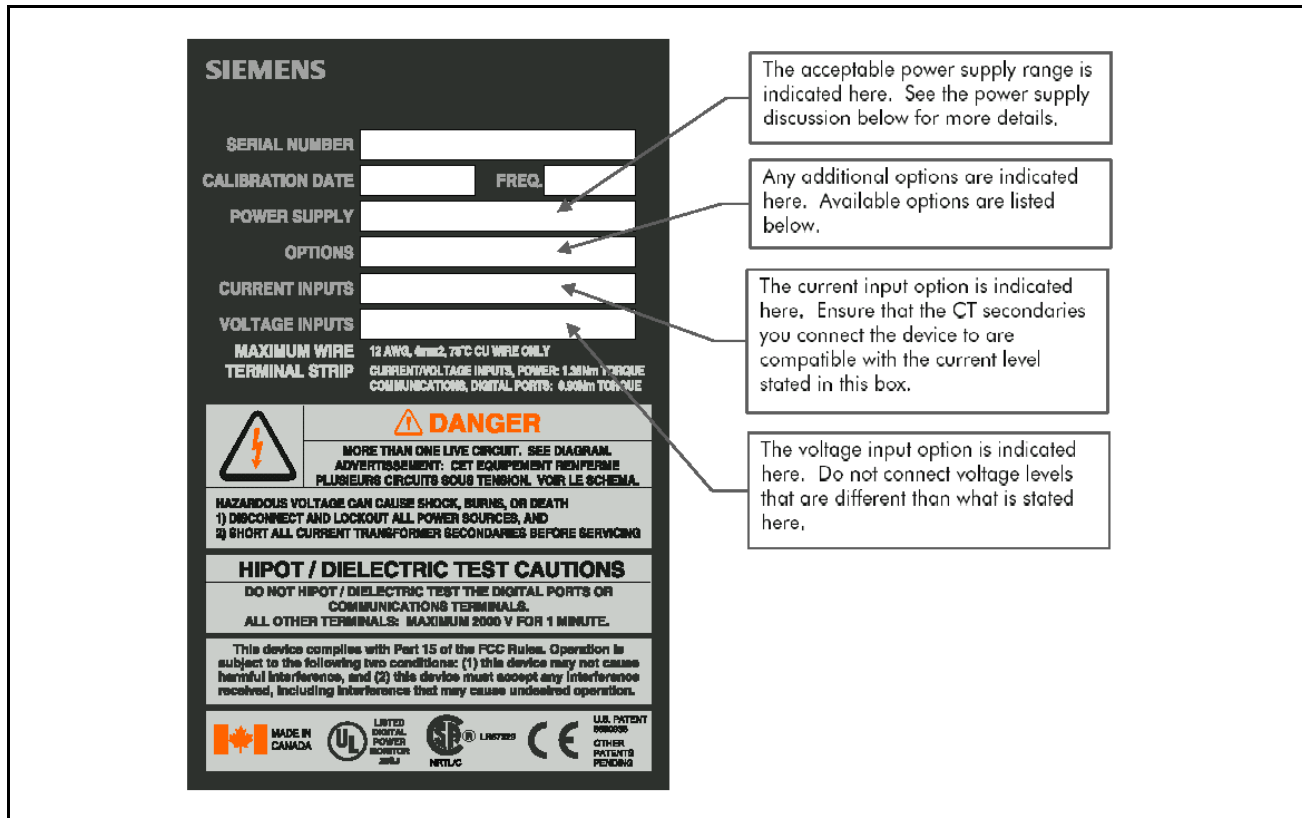


Figure 2.2 Nameplate Label

2.2.2 Field Service Considerations

If the 9300DP requires servicing or field upgrading, you may need to disconnect and remove the unit from its mounting. The initial installation should be done in a way which makes this as convenient as possible:

- All phase voltage sense leads should be protected by breakers or fuses at their source such that the 9300DP can be safely disconnected.
- A CT shorting block should be provided so that the 9300DP current inputs can be safely disconnected without open circuiting the CT's. The shorting block should be wired so that protective relaying is not affected.

- All wiring should be routed to allow easy removal of the connections to the 9300DP terminal strips and the 9300DP itself.

2.2.3 Terminal Strips

All connections to the 9300DP are made to terminal strips at the back of the unit. The terminal strips for phase voltage and current are barrier-type, for which ring or spade terminals may be used to simplify connection.

The terminal strip for the supply power input is a captured-wire type; the terminals accept stripped wire ends. This connector can be unplugged first, making it easier and safer to wire the connections.

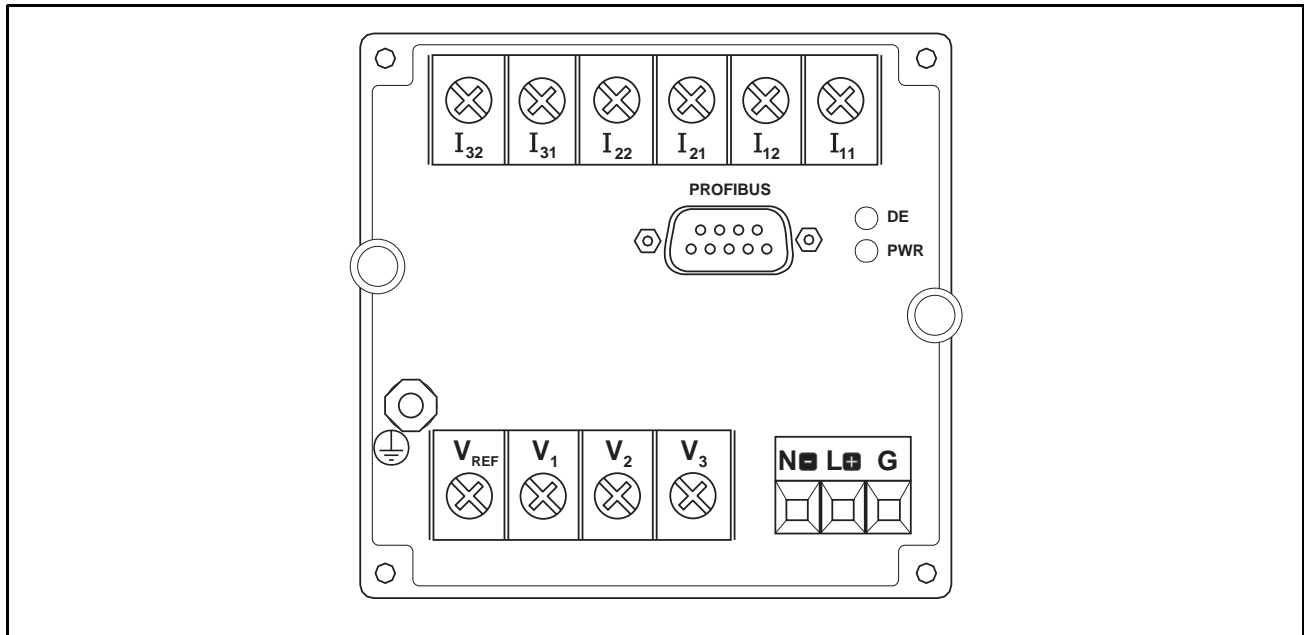


Figure 2.3 Rear Panel Terminals

2.2.4 Connecting the Base Unit's Chassis Ground

The ground terminal of the 9300DP provides the chassis ground connection. This terminal must be connected to earth ground. A good, low impedance chassis ground connection is essential for the 9300DP surge and transient protection circuitry to function effectively. It should be made to the switchgear earth ground using a dedicated AWG 14 (2.5 mm²) 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 ground terminal nut is tightened down securely onto the ground wire.

The 9300DP chassis ground must be properly connected to the switchgear earth ground for the noise and surge protection circuitry to function correctly. Failure to do so will void the warranty.

2.2.5 Connecting the Base Unit's Power Supply

Standard Power Supply Range

The standard 9300DP can be powered from 85 to 240 VAC $\pm 10\%$ (20 to 440 Hz) or 85 to 240 VDC $\pm 10\%$. Supply current can be as high as 0.5 Amp (20W).

Optional -P24 Power Supply Range

The -P24 option of the 9300DP is equipped with a 24-volt DC power supply. It can be powered from 20 to 60 VDC $\pm 10\%$. Supply current can be as high as 1 Amp (10W).

Power Sources and Connections

The 9300DP can be powered from a dedicated fused feed, or from the voltage source which it is monitoring, as long as it is within the supply range.

If an AC power supply is being used, connect the line supply wire to the L+ terminal and the neutral supply wire to the N-terminal. If a DC power supply is being used, connect the positive supply wire to the L+ terminal and the negative (ground) supply wire to the N-terminal.

The power for the 9300DP should be protected by a 2A slo-blow fuse or circuit breaker.

The 9300DP requires a constant power supply to maintain monitoring, analysis, data logging, control and communications operations. Powering the device from the voltage source it is monitoring is not suitable for applications where these operations must be maintained in the event of a power outage.

If the 9300DP is used to perform control functions or monitor power quality and power disruption events, an Uninterruptable Power Supply (UPS) should be used to ensure constant supply power.

LED Functions

The 9300DP has two LED indicators on the back, DE and PWR. The PWR LED indicates that the unit has been powered and is functioning. The DE LED flashes when the device is communicating.

2 Installation

2.2.6 Connecting the Phase Voltage Inputs

AWG 12 to 14 wire (2.5 to 4.0 mm²) is recommended for all phase voltage connections. Phasing and polarity of the AC voltage inputs and their relationship is critical to the correct operation of the unit. All phase voltage sense leads should be protected by breakers or fuses at their source.

Note: Refer to the 9300DP serial number label for the voltage option purchased.

V1 Input Connection

The 9300DP uses the V1 input as the reference for frequency for all power and energy related measurements. For any system configuration, the V1 input must be connected to ensure accurate readings and correct operation of the 9300DP.

Voltage Reference (Vref) Input Connection

The voltage reference terminal, Vref, of the 9300DP serves as the zero voltage reference for voltage readings. A good, low impedance Vref connection is essential for accurate measurement. It should be made using a dedicated

14 gauge wire to a point where there will be no voltage error due to distribution voltage drops.

Direct Connection

Whether or not potential transformers (PTs) are required depends on the nature of the system being monitored, the voltage levels to be monitored, and the phase voltage input option of the 9300DP.

Table 2.2 Direct Connection Options

Voltage Option	Direct Connection to Wye Systems up to:	Direct Connection to Single Phase Systems up to:
-120	120 VAC line-to-neutral or 208 VAC line-to-line	120 VAC line-to-neutral or 240 VAC line-to-line
-277	277 VAC line-to-neutral or 480 VAC line-to-line	277 VAC line-to-neutral or 554 VAC line-to-line
-347	347 VAC line-to-neutral or 600 VAC line-to-line	

2.2.7 Using Potential Transformers

Potential Transformers (PTs) are required for Wye systems over 347 VAC line-to-neutral/600 VAC line-to-line, Single Phase systems over 277 VAC line-to-neutral/554 VAC line-to-line, and all Delta systems. The inputs of devices equipped with the 120 option can be used with PTs that have secondaries rated at 120 VAC or less. This can include 100/√3, 110/√3, 100, 110, or 120 VAC secondaries. Devices equipped with the 277 option can be used with PTs that have secondaries rated up to 277 VAC, such as 220 VAC.

For proper monitoring, correct selection of PTs is critical. For Wye systems, the PT primary rating should equal the sys-

tem line-to-neutral voltage or nearest higher standard size. For Delta systems, the PT primary rating should equal the system line-to-line voltage. For all system configurations, the PT secondary rating must be within the rated full scale range of the 9300DP voltage inputs.

PT quality directly affects system accuracy. The PTs must provide good linearity and maintain the proper phase relationship between voltage and current in order for the voltage, kW, and power factor readings to be valid. Instrument Accuracy Class 1 or better is recommended.

In cases where PTs are required, if the power rating of the PTs is over 25 Watts, the secondaries should be fused.

2.2.8 Connecting the Phase Current Inputs

The 9300DP uses CTs to sense the current in each phase of the power feed. AWG 12 to 14 (2.5 to 4.0 mm²) is recommended for all phase current connections. CTs should be connected to the device via a shorting block or test block to facilitate the safe connection and disconnection of the CTs.

Using Current Transformers

The 9300DP is compatible with CTs with 10 Amp full scale secondaries. The current input ratings of all three phase inputs are equivalent.

The CT secondary should have a burden capacity greater than 3 VA. Instrument accuracy Class 1 or better is recommended (for measurement accuracy).

The CT primary rating is normally selected to be equal to the current rating of the power feed protection device. However, if the peak anticipated load is much less than the rated system capacity, you can improve accuracy and resolution by selecting a lower rated CT. In this case, the CT size should be the maximum expected peak current, rounded up to the nearest standard CT size.

The length of the CT cabling should be minimized because long cabling contributes to inaccuracy. Also, the CT burden rating must exceed the combined burden of the 9300DP plus cabling plus any other connected devices (burden is the amount of load being fed by the CT, measured in Volt-Amps). The 9300DP burden rating is 0.0625 VA.

Overall accuracy depends on the combined accuracies of the 9300DP, the CTs, and the PTs (if used).

PT & CT Connection

AWG 12 to 14 wire is recommended for all phase voltage and current connections.

⚠

WARNING

Hazardous voltages and currents.

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

PT and CT secondary circuits are capable of generating lethal voltages and currents with their primary circuit energized. Follow standard safety precautions while performing any installation or service on the device (e.g., removing PT fuses, shorting CT secondaries, etc.). Installation and servicing should be performed only by qualified, properly trained personnel.

⚡

Phasing and polarity of the AC current and voltage inputs and their relationship is critical to the correct operation of the unit. All phase voltage sense leads should be protected by breakers or fuses at their source. In cases where PTs are required, if the power rating of the PTs is over 25 Watts, the secondaries should be fused.

CTs should be connected to the device via a shorting block or test block

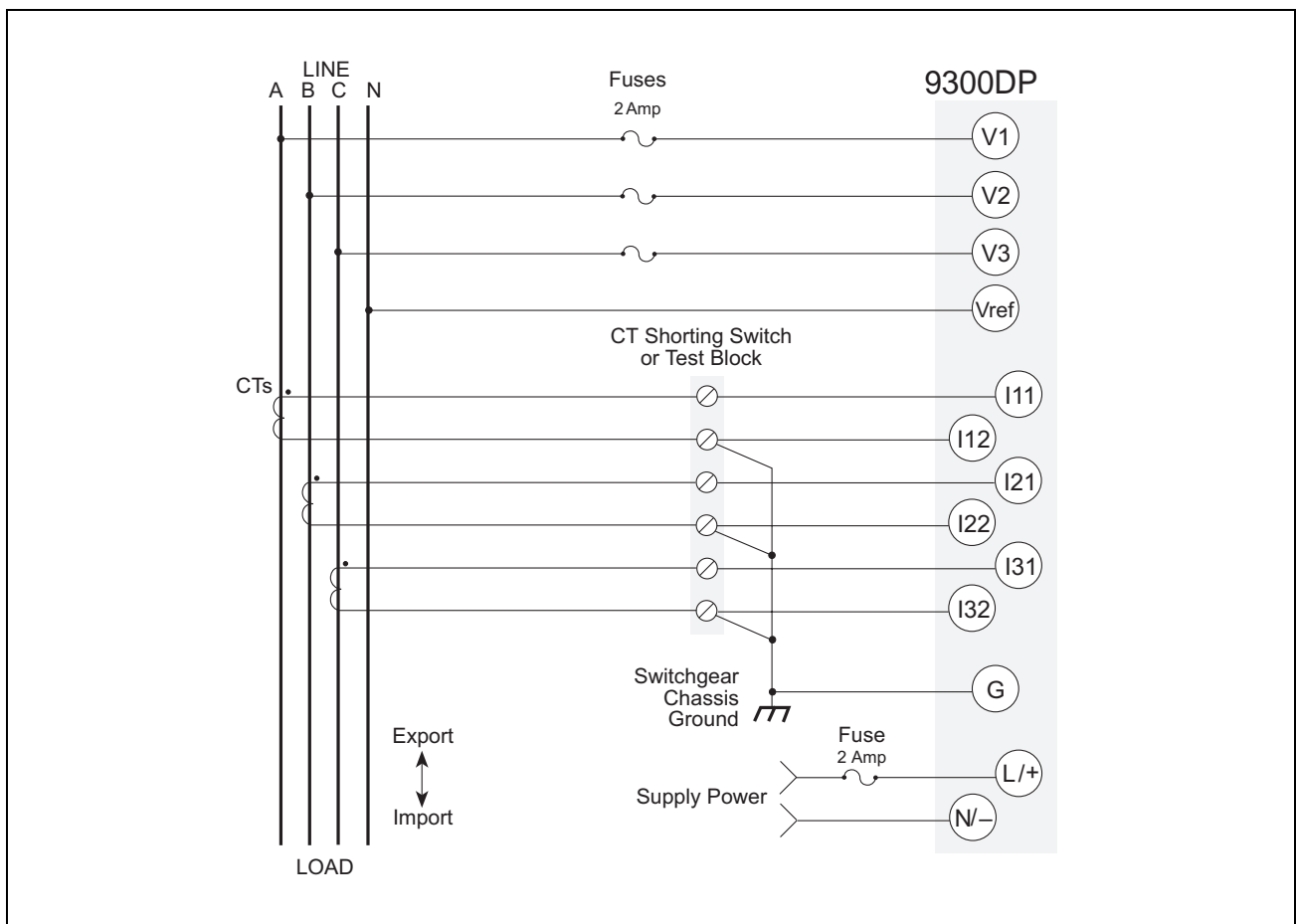


Figure 2.4 4-Wire Wye, 3-Element Direct Connection Diagram

The 9300DP senses the line-to-neutral (or ground) voltage and current for each phase, creating an equivalent 3 element metering configuration.

VOLTS MODE should be set to 4W-WYE.

2 Installation

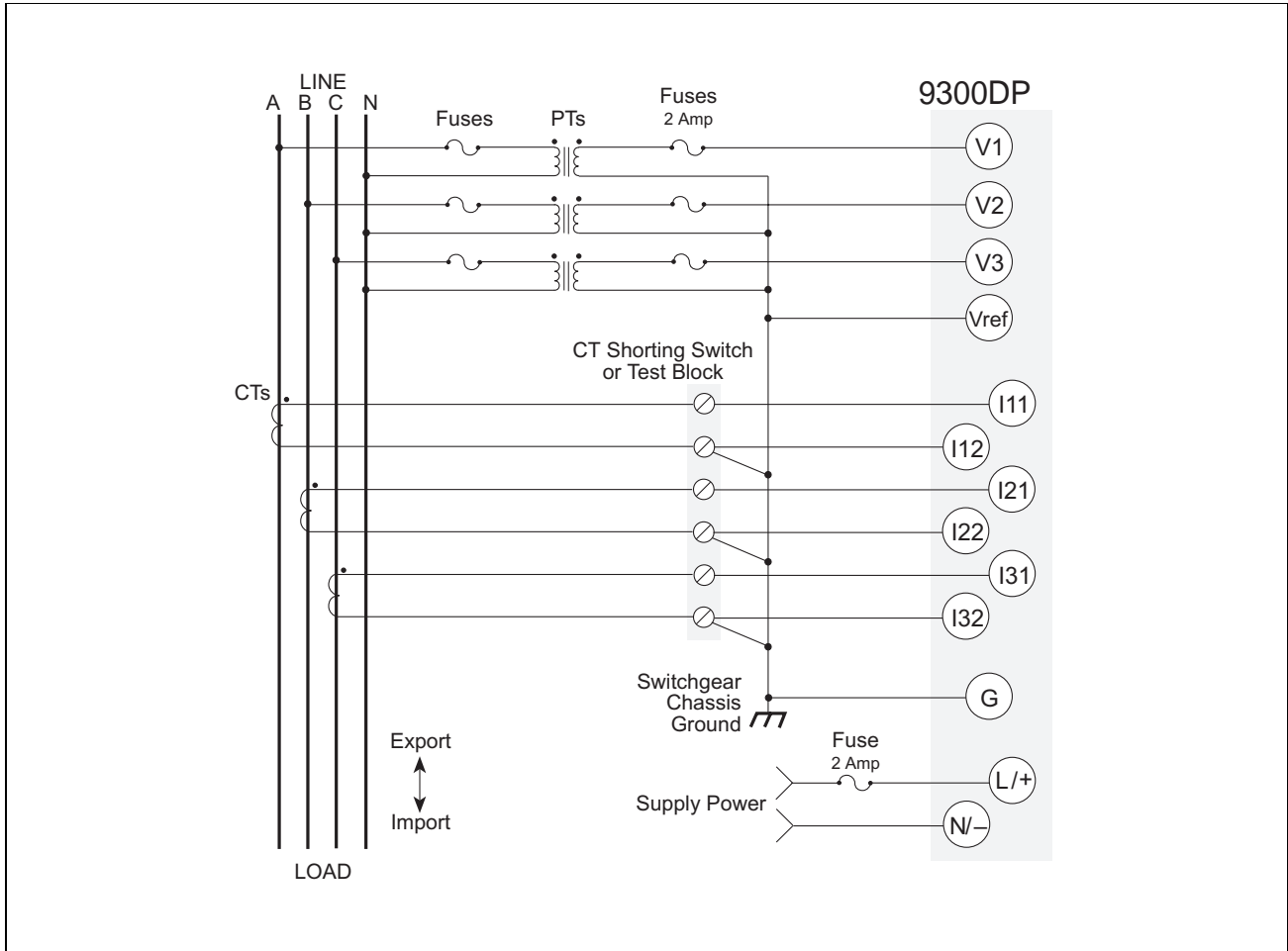


Figure 2.5 4-Wire Wye, 3-Element, 3 PT Connection Diagram

PTs must be used for 4-wire Wye systems with voltages over 347 VAC line-to-neutral / 600 VAC Line-to-line. Both the PT primary and secondary must be wired in a Wye (star) configuration. Voltage sense leads should be protected by breakers or fuses at their source. Wiring must be exactly as shown for correct operation.

VOLTS MODE should be set to 4W-WYE.

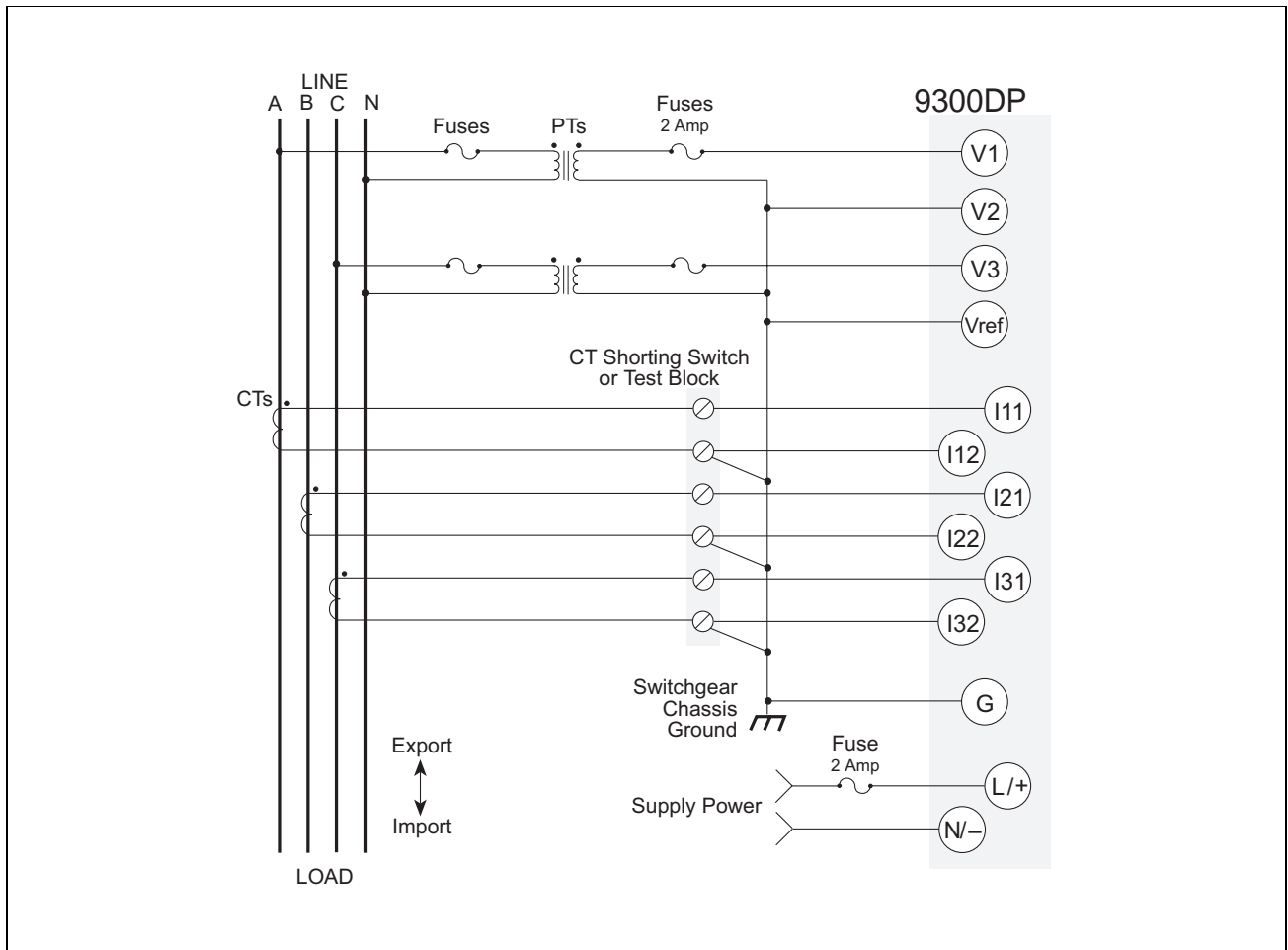


Figure 2.6 4-Wire Wye, 2½-Element, 2 PT Connection Diagram

This 2½-element scheme requires only 2 PTs. In this configuration, the phase B voltage displayed by the meter is derived from the phase A and C voltages.

VOLTS MODE should be set to 3W-Wye.

2 Installation

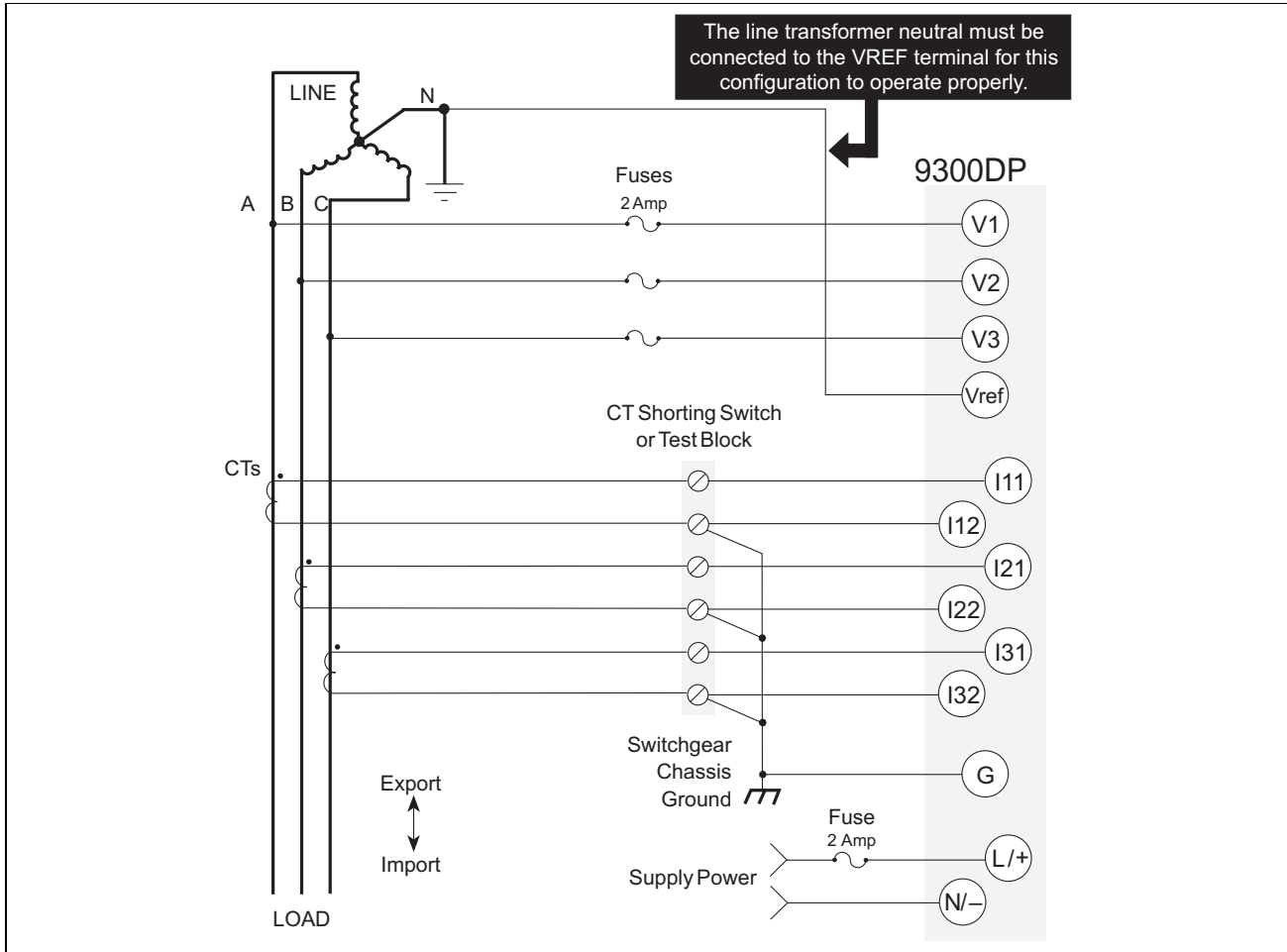


Figure 2.7 3-Wire Grounded Wye, 3-Element Direct Connection Diagram

When the common or star point of a 3 wire Wye system is grounded, the **9300DP** may be connected directly without the use of PTs, provided the phase voltages are within the device's range.

VOLTS MODE should be set to 4W-Wye.

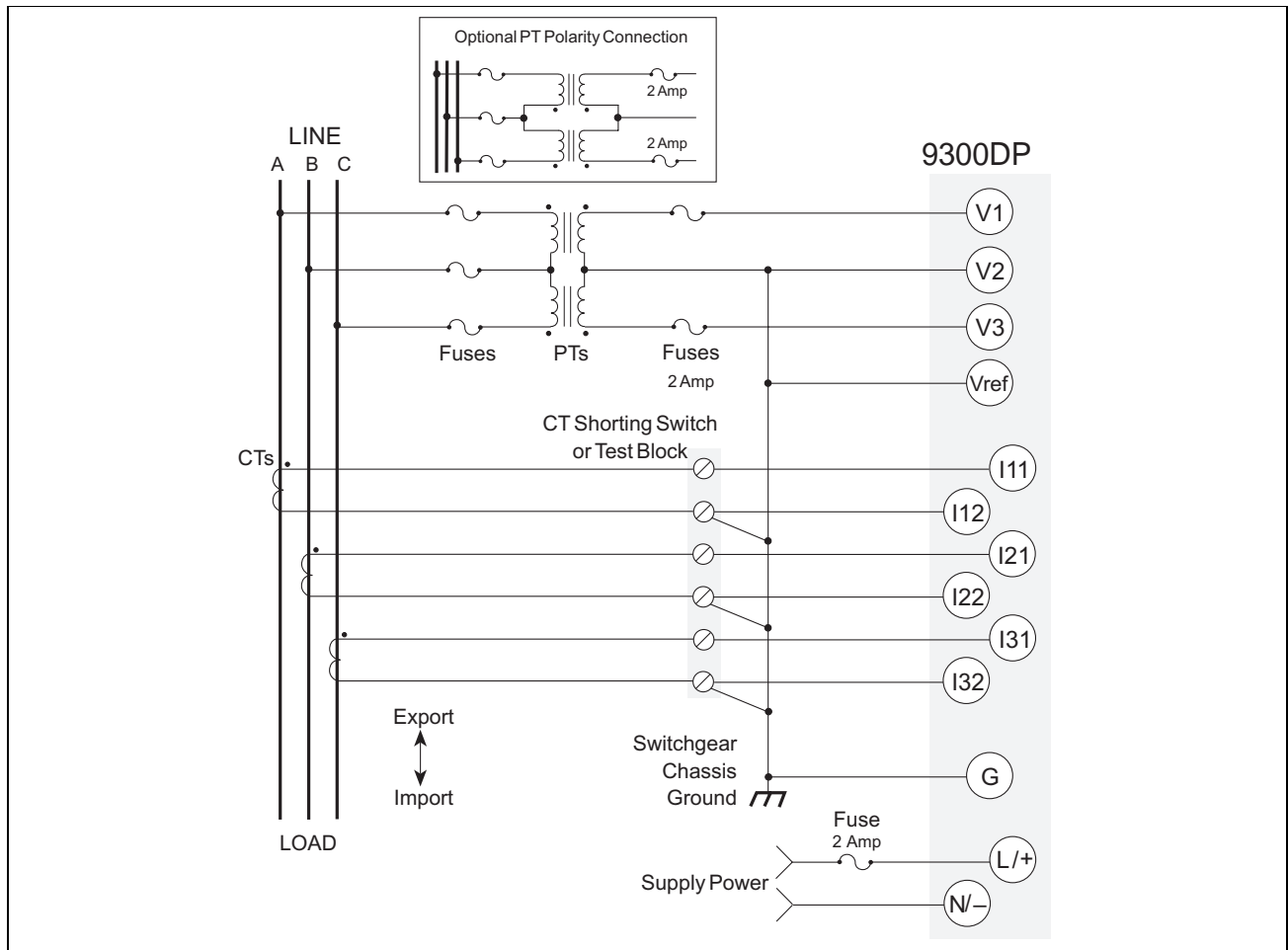


Figure 2.8 3-Wire Delta, 2½-Element, 2PT & 3 CT Connection Diagram

For ungrounded (floating) 3-wire open Delta systems, the 9300DP always requires PTs, and senses the line-to-line voltages between each of the phases. The 9300DP can be connected using 3 CTs or 2 CTs (see next page).

VOLTS MODE should be set to DELTA.

2 Installation

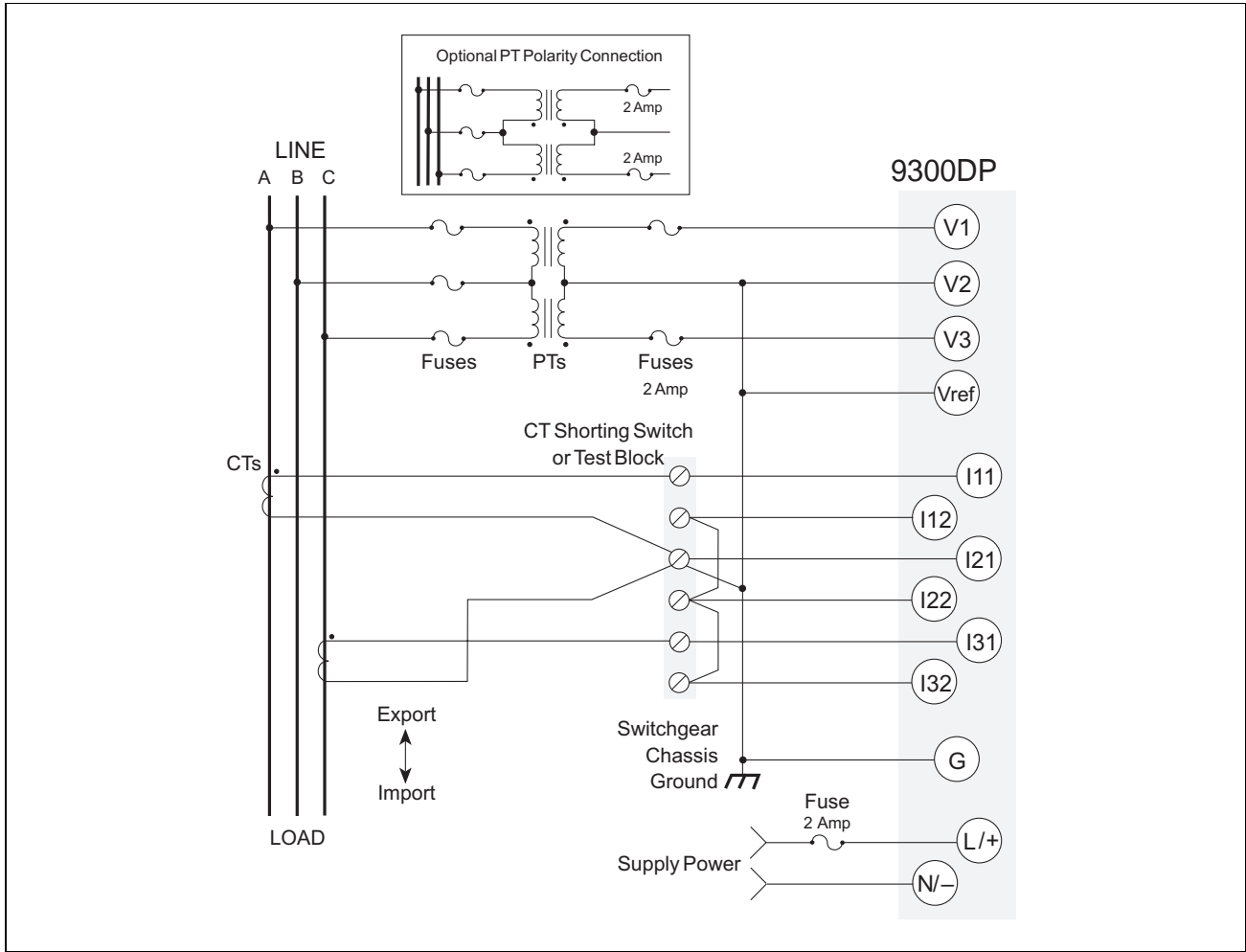


Figure 2.9 3-Wire Delta, 2-Element, 2PT & 2 CT Connection Diagram

For ungrounded (floating) 3-wire open Delta systems, the 9300DP always requires PTs, and senses the line-to-line voltages between each of the phases.

VOLTS MODE should be set to DELTA.

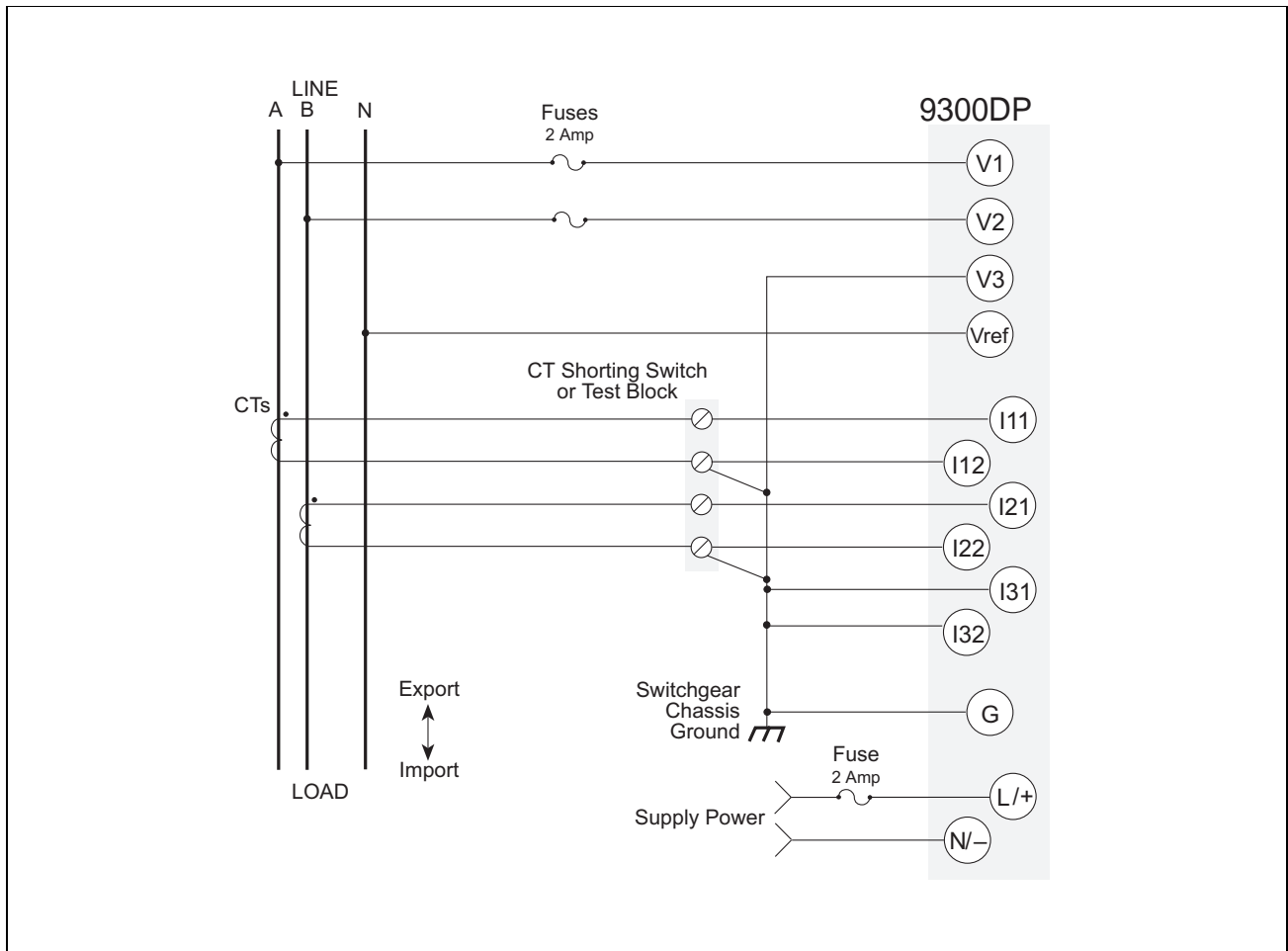


Figure 2.10 Single Phase Connection Diagram

Connect the two voltage phases (each at 180 degrees with respect to each other) to the V1 and V2 inputs of the 9300 DP, and the outputs of the two corresponding CTs to the I1 and I2 input pairs. V3, I31 and I32 are unused and should be grounded.

VOLTS MODE should be set to SINGLE.

Note: For this configuration ONLY, the 208 VAC line-to-line voltage inputs can be used with 240 VAC line-to-line systems.

Contact Siemens customer service if you intend to connect to a single phase system that differs from that shown here.

2 Installation

2.3 Communications Connections

The 9300DP provides a Profibus port at its rear panel. Profibus communications is achieved via an internal Profibus expansion communications card. This card allows communication using the Profibus standard at baud rates up to 12 Mbps. Connection to the Profibus network is achieved via a Profibus adapter (not included) and Profibus cables (not included).

2.3.1 Profibus Connections

Profibus communications allows multiple master and slave devices to be connected on the same communications line. Up to 32 devices can be connected on a single Profibus comm line, or up to 126 devices, if repeaters are used. Connection to the Profibus network is achieved via a Profibus adapter (not included) and Profibus cables (not included).

2.3.2 General Bus Wiring Considerations

Devices connected on the bus, including the 9300DP, converter(s) and other instrumentation, must be wired as follows:

- Ensure that the polarity is correct when connecting Profibus cables and adapters. Refer to the manufacturer's installation document for proper connection of these devices.
- Isolate cables as much as possible from sources of electrical noise.

2.3.3 Communications Module Configuration

The Communications module controls how the 9300DP communicates with other devices. In some cases, you may need to configure the following setup registers for the 9300DP to operate.

CM4 PB Address

The default for this register is 126. You must ensure that the device's Profibus address is unique among the other Profibus devices on the same communications line.

The remaining setup registers of the Communications module and their default settings are given in the table at the beginning of Chapter 5 of the 9300DP Operation Manual.

3 Front Panel Setup

The 9300DP front panel provides a flexible interface that allows you to display data or configure setup parameters. A variety of data can be displayed with default or customized formatting. This section describes how to setup the front panel display and configure the 9300DP setup parameters.

3.1 Front Panel Buttons

The 9300DP front panel has three buttons:



- **Up Arrow** This button allows you to scroll up through display screens and setup options. For numeric entries, holding down this button for more than one second allows you to move the cursor to the LEFT.



- **Down Arrow** This button allows you to scroll down through display screens and setup options. For numeric entries, holding down this button for more than one second allows you to move the cursor to the RIGHT.



- **Select** This button allows you to access the **Select Setup** menu or make a selection.

3.2 Setup for Basic Operation

- Press the Select button on the front panel to access the **Select Setup** menu.
- Use the Arrow buttons to scroll down the menu list to the **Quick Setup** option so it is highlighted.
- Select **Quick Setup** by pressing the Select button.
- Use the Arrow buttons to scroll through the list of registers, so that the one you wish to configure is highlighted, then press the Select button to select it.
- You can edit other setup registers in Advanced Setup. For more details, refer to **Section 3.7**.

3.3 Displaying Basic Parameters

The default display mode is a programmable mode, which provides a maximum of eight screens that can be configured to your requirements. Programmable mode gives you freedom to control the number and size of parameters dis-

played on each screen. In addition, you can also choose which parameters you want displayed on each screen. For more information on this, refer to **Section 3.8**.

You can also display basic parameters by choosing the "fixed display mode" for the 9300DP. The fixed mode display gives you readings of average volts, amps, kW total, and PF total in large, easy-to-read type instead of the eight-user configurable screens. For more details see **Section 3.5.5**

1. Press the Select button on the front panel to access the **Select Setup** menu.
2. Use the Arrow buttons to scroll down the menu list to the **Display Setup** option so it is highlighted.
3. Select **Display Setup** by pressing the Select button.
4. Use the Arrow buttons to scroll to the **Display Mode** option so that it is highlighted, and press the Select button.
5. Use the Down Arrow to highlight the **Fixed** option and press the Select button.
6. Enter your password at the prompt. If you have not modified the password from the factory default, press the Select button to accept "00000" as your password.
7. Confirm your change to the display mode. Use the Arrow buttons to highlight **YES** and press the Select button to accept fixed display mode.

3.3.1 Selecting Menu Options

You can scroll through menu choices using the Arrow buttons. All the menus are organized into circular lists that begin again as you reach the end of the choices. The menu items are highlighted as you scroll down the list. Once the choice you want is highlighted, select the option by pressing the Select button. The **RETURN** option allows you to exit that menu without selecting any of the choices.



The front panel screen displays the menu header and only the first two options on the list. In the example above, the Select Setup menu is shown. The **RETURN** option is the first choice on the list, followed by **Clear Functions**. As you scroll down the list, the other choices will become visible.

3.3.2 Specifying Numeric Values

For screens that require you to enter a number, press the Up Arrow button to increment the digit, and press the Down Arrow button to decrement it. For example, the **Update**

3 Front Panel Setup

Rate screen requires you to enter a number. The cursor in the screen below is under the 4; each press of the Up Arrow increments this digit and each press of the Down Arrow decrements it.



The cursor is the triangle depicted under the number "4", in this example. To move the cursor to the next position to the left (so it points to the "0" in the above diagram), press and hold the Up Arrow for approximately one second. If you want to move the cursor to the right, press and hold the Down Arrow for approximately one second. The cursor will shift one position every second while you continue to hold down either Arrow button.

Note: To shift the cursor to the left, hold down the Up Arrow button. To shift the cursor to the right, hold down the Down Arrow button.

3.3.3 Entering a Password

You must enter a password to make changes to the **9300 DP** through the front panel. Once you begin to change the parameters currently set in the **9300DP**, it will prompt you for your password only after the first change. If you do not return to the Real-Time screen (which is the screen you see when the **9300DP** operates normally), and instead continue to make changes, you will not be prompted to re-enter your numeric password. For more information on changing your password, refer to **Section 3.6**

3.4 9300DP Basic Configuration

For most applications, you must first set up the Power Meter module and the Communications module(s) before you can implement other features in the **9300DP**. These modules control how the **9300DP** measures data from the power system it is connected to and how it communicates.

The **9300DP** is pre-programmed to provide many common measurements so you do not have to do a lot of configuration if these measurements are appropriate for your purposes.

If your installation requires settings that differ from the defaults, you must change them through the front panel.

3.4.1 Configuring the 9300DP from the Front Panel

The **9300DP** front panel allows you to change the values of setup registers only. You can configure the **9300DP** from the front panel via two methods:

- Basic setup via the "Quick Setup" option

- Parameter configuration via "Advanced Meter Setup," which allows you to access all setup parameters in the **9300DP**. Refer to **Section 3.7** for more information.

3.4.2 Using the Quick Setup

The Quick Setup menu includes the following choices:

QUICK SETUP
CM4 PB Address
CM1 Unit ID
CM1 Baud Rate
CM1 Protocol
IR1 Unit ID
IR1 Baud Rate
IR1 Protocol
PM1 Volts Mode
PM1 PT Prim
PM1 PT Sec
PM1 CT Prim
PM1 CT Sec
PM1 V1 Polarity
PM1 V2 Polarity
PM1 V3 Polarity
PM1 I1 Polarity
PM1 I2 Polarity
PM1 I3 Polarity

The Quick Setup allows the user to configure a minimum set of parameters necessary to make the **9300DP** operate at your site.

To set the Quick Setup options:

1. Select **Quick Setup** from the main **Select Setup** menu. You will see a list of registers that may need to be set up in order for the **9300DP** to operate at your site.
2. Press the Down arrow to scroll through the registers, and press the Select button to select desired register.
3. For each register, either select the appropriate option from the menu or enter the appropriate value as described in **Section 3.3.2**.
4. If the default settings already match your requirements, select **RETURN** to accept the default and exit.

The following parameters may need to be configured:

CM4 PB Address

This register specifies the Profibus slave address for the device, which you can set between 0 to 126. The default is 126. You must ensure that each device on the Profibus communications line has a unique address.

CM1 Unit ID

This register specifies the communications identification (ID) for the device, which you can set between 1 to 9999. Since you can connect multiple devices to a single RS-485 communications link, you must ensure that each device in the loop has a unique unit ID. By default each **9300DP** is assigned a Unit ID based on its serial number.

Note: The unit ID for the **9300DP** is based on its serial number. In the following example, the unit ID is 9263:

PA-9709B263-01

As shown above, the four-digit unit ID's are derived from the same digit positions in the **9300DP**'s serial number.

CM1 Baud Rate

This register specifies the baud rate at which the device is communicating. It should be set to match the baud rate of the computer. The options are 1200, 2400, 4800, 9600 or 19200. The default is 9600.

CM1 Protocol

This register specifies the protocol in which the main communications port will be communicating. The options are ION or MODBUS. The default is ION.

IR1 Unit ID

This register specifies the communications identification (ID) for the device's infrared port, which you can set between 1 to 9999. By default each **9300DP** is assigned a Unit ID based on its serial number. See the note above.

IR1 Baud Rate

This register specifies the baud rate at which the device is communicating. It should be set to match the baud rate of the computer. The options are 1200, 2400, 4800, 9600 or 19200. The default is 9600.

IR1 Protocol

This register specifies whether the infrared port will be used as an I/O port, or as a communications port; if used for communications, this register specifies the protocol in which the infrared port will be communicating. The options are **Infrared I/O**, **ION** or **MODBUS**. The default is **ION**.

PM1 Volts Mode

This register reflects the power system configuration and determines the mode of calculation. The choices are: **4W-WYE**, **3W-WYE**, **DELTA**, **SINGLE**, and **DEMO**. The demo mode generates dynamic artificial readings for all power meter output parameters. The default is **4W-WYE**.

PM1 PT Primary

If potential transformers (PTs) are used on V1 - V3 inputs, this register should be set to the full scale ratings of the V1 -

V3 inputs. The register can be set from 1 to 999999. The default is 120.

PM1 PT Secondary

If potential transformers (PTs) are used on V1-V3 inputs, this register determines the secondary winding rating for the PTs. If direct connection is used, this register sets the full scale ratings of the V1-V3 inputs. The register can be set from 1 to 999999. The default is 120.

PM1 CT Primary

This register should be set to the Current Transformer (CT) primary winding rating for inputs I1-I3. The register can be set from 1 to 999999. The default is 10.

PM1 CT Secondary

This register should be set to the Current Transformer (CT) secondary winding rating for inputs I1- I3. The register can be set from 1 to 999999. The default is 10.

PM1 V1 Polarity

This register should be set to the polarity of the V1 Potential Transformer (PT). The choices are **NORMAL** and **INVERTED**. The default is **NORMAL**.

PM1 V2 Polarity

This register should be set to the polarity of the V2 Potential Transformer (PT). The choices are **NORMAL** and **INVERTED**. The default is **NORMAL**.

PM1 V3 Polarity

This register should be set to the polarity of the V3 Potential Transformer (PT). The choices are **NORMAL** and **INVERTED**. The default is **NORMAL**.

PM1 I1 Polarity

This register should be set to the polarity of the I1 Current Transformer (CT). The choices are **NORMAL** and **INVERTED**. The default is **NORMAL**.

PM1 I2 Polarity

This register should be set to the polarity of the I2 Current Transformer (CT). The choices are **NORMAL** and **INVERTED**. The default is **NORMAL**.

PM1 I3 Polarity

This register should be set to the polarity of the I3 Current Transformer (CT). The choices are **NORMAL** and **INVERTED**. The default is **NORMAL**.

3.4.3 Communications Module Configuration

The Communications modules CM4 (Profibus), CM1 (RS-485) and IR1 (infrared port) control how the **9300DP** communicates with other devices. In some cases, you may need to configure the following setup registers for the **9300DP** to operate.

3 Front Panel Setup

CM4 PB Address The default for this register is 126. You must ensure that the device's Profibus address is unique among the other Profibus devices on the same communications line.

3.4.4 Power Meter Module Configuration

For the 9300DP to measure and calculate data properly, the following setup registers in the Power Meter module must be configured:

Volts Mode The default for this register is 4W-Wye. If your power system is not 4-Wire Wye, select the option that matches your system.

PT Prim The default for this register is 120. Set this to a value that corresponds to the PT primary rating of the power system.

PT Sec The default for this register is 120. Enter PT secondary rating of the power system.

CT Prim The default for this register is 10. Set this to a value that corresponds to the CT primary rating of the power system.

CT Sec The default for this register is 10. Set this to a value that corresponds to the CT secondary rating of the power system.

3.5 Adjusting Front Panel Options

This section describes how to set up the front panel itself. The front panel display has a number of basic operating parameters that may need adjustment to suit the environment under which it operates. For example, you may need to adjust the display contrast to improve visibility for the lighting conditions at your site.

SELECT SETUP	
Clear Functions	Clears the Minimum/Maximum, Sliding Window Demand, Thermal Demand, or Integrator registers.
Quick Setup	Configures some parameters in the Communications modules and Power Meter modules.
Adv Meter Setup	Configures all allowable parameters in all the modules contained in the 9300DP.
Display Setup	Customizes the appearance of the display screen.
Screen Setup	Customizes the style and values appearing on the display screen.
Nameplate Info	Contains information for the revenue version of the 9300 DP.
Security	Allows you to modify your password.

The options described below are accessible by selecting Display Setup from the main Select Setup menu. The main

Select Setup menu is the first menu that appears when you press the Select button on the front panel. Use the Up or Down Arrow to highlight Display Setup in the list of choices and press the Select button to select it.

The following options are available under the Display Setup menu:

DISPLAY SETUP
Auto Scroll
Contrast
Backlight Time
Update Rate
Display Mode

3.5.1 Setting the Auto Scroll Option

The Auto Scroll feature causes the front panel screens to advance automatically so you do not have to press a button to see the next screen. Set the Auto Scroll option to define the amount of time that each screen is displayed. The parameter can be set to a maximum of 99 seconds. A value of zero disables this option so that the screen will not advance until you press an arrow button.

Note: A screen that has been disabled will not appear in the auto scroll sequence. Refer to **Section 3.8** to disable a screen.

To set up auto scroll feature:

1. Select **Auto Scroll** from the **Display Setup** menu.
2. The default time is set at 00. To move the cursor to the digit you wish to change, hold the Up or Down Arrow button for approximately one second to move the cursor left or right, respectively.



3. Enter your desired time lapse by pressing the Up Arrow button to increment and the Down Arrow button to decrement the time lapse between each screen display. Press the Select button to accept the change. Enter your password at the prompt if required and press the Select button.
4. Select **Yes** to accept your new auto scroll time. You will be returned to the **Display Setup** menu.

3.5.2 Changing the Display Contrast

The 9300DP front panel display features a back lit, liquid crystal display. The visibility depends on surrounding light conditions and the front panel's mounting angle.

Note: Contrast can be adjusted from any screen when the Select button is held for more than five seconds. Re-lease the button when the contrast is at the desired setting.

To change the contrast:

1. Select **Contrast** from the **Display Setup** menu.
2. Press either the Up or Down Arrow button to begin varying the contrast. The screen will begin to fade to completely black and then will grow lighter until it appears blank. When the screen appears to have the clearest contrast between these two extremes, press the Up or Down Arrow to stop.
3. Press the Select button to accept the contrast adjustment and return to the **Display Setup** menu.

3.5.3 Setting the Backlight Timeout

To prolong the life of the backlight, you should use the backlight only when actively using the 9300DP. The backlight will automatically shut off after the specified time lapse. Pressing any button on the face plate will turn the backlight on if the 9300DP has been left idle for more than the specified amount of time.

The default backlight timeout is 30 minutes, but can be changed to a maximum of 1000 minutes or a minimum of one minute.

To set the backlight timeout:

1. Select **Backlight Time** from the **Display Setup** menu.
2. You will see that the default time is set at 0030 minutes. To move the cursor to the digit you wish to change, hold the Up or Down Arrow button for approximately one second to move the cursor left or right, respectively.



3. Enter your desired time delay by pressing the Up Arrow button to increment and the Down Arrow button to decrement the time lapse. Press the Select button to accept the change. Enter your password at the prompt if required and press the Select button.
4. Select **Yes** to accept your new backlight timeout value. You will be returned to the **Display Setup** menu.

3.5.4 Setting the Update Rate

The update rate option allows you to specify how frequently data on a screen is updated. Measurements are updated every second on the 9300DP, but displaying results every second may be too fast and the screen may change too

quickly to be read. If the update rate is set too slow, the data shown on the screen may lag too far behind the actual values. The default update rate is four seconds, but can be changed to a maximum of 99 seconds or a minimum of one second. Experiment with the update rate to find a comfortable setting that displays values at a rate that suits your needs.

To set the update rate:

1. Select **Update Rate** from the **Display Setup** menu.
2. The default time is set at 04 seconds. To move the cursor to the digit you wish to change, hold the Up or Down Arrow button for approximately one second to move the cursor left or right, respectively.



3. Enter your rate by pressing the Up Arrow button to increment and the Down Arrow button to decrement the time lapse. Press the Select button to accept the change. Enter your password at the prompt if required and press the Select button.
4. Select **Yes** to accept your new update rate value. You will be returned to the **Display Setup** menu.

3.5.5 Choosing the Display Mode

The 9300DP gives you the choice between two display modes; fixed or programmable. Fixed mode gives you readings of the average volts, amps, kWtotal, and PFTotal in large, easy-to-read type. Programmable mode enables you to choose the parameters you want to show on any of the eight screens.

Note: Auto scrolling is also available in Fixed mode, so you can set the time interval between each screen display. To set the auto scrolling feature, see **Section 3.8**.

Programmable Mode

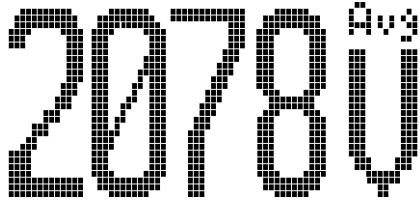
The default display mode is a programmable mode, which provides a maximum of eight screens that can be configured to your requirements. Programmable mode gives you freedom to control the number and size of parameters displayed on each screen. You can also choose which parameters you want displayed on each screen. To customize your display screens, set the Display Mode to programmable mode, and then refer to **Section 3.8**.

3 Front Panel Setup

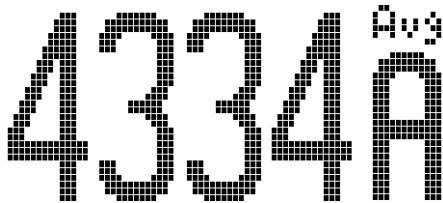
Fixed Mode

The fixed mode has four screens, each with one large number followed by a label. The format is "fixed;" you cannot change the style or parameters in this mode. The following measurements are displayed in highly visible type, which can be seen easily from a distance.

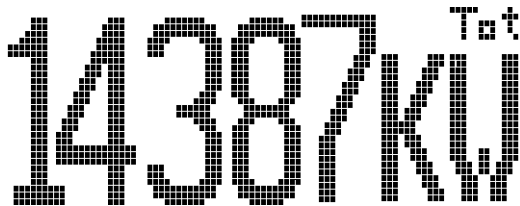
- Average volts



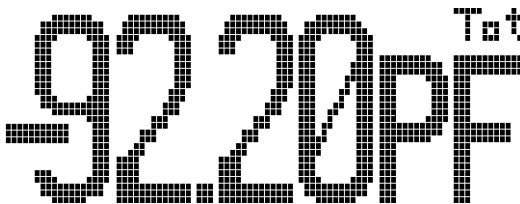
- Average Amps



- kWtotal



- PFtotal



To choose the display mode you want to use:

1. Select **Display Mode** from the **Display Setup** menu.
2. Press an Arrow button to choose between **Programmable** and **Fixed**. The asterisks indicate the current display mode.

3. When your desired choice is highlighted, press the Select button to select it. Enter your password at the prompt if required and press the Select button.
4. Select **Yes** and press the Select button to accept your new display mode. You will be returned to the **Display Setup** menu.

3.6 Modifying the Password

When any changes are made to the 9300DP via the front panel, the 9300DP prompts for a user password. The password prevents unauthorized tampering with your 9300 DP's configuration. Depending on site security, you may want to modify the user password from the default to protect your configuration. The default password is 0 and can be set to a maximum numeric value of 60000.

The front panel of the 9300DP also has another password called the backdoor password. This password provides access to all of the configurable options of the 9300DP as well as access to user and backdoor password revision. This password is contained in the 9300DP when it is shipped from the factory, and does not need to be changed for regular operation. However, if the default backdoor password is maintained, the 9300DP could be accessed by Siemens. If you wish to change the backdoor password, contact Siemens with the 9300DP's serial number, and obtain the backdoor password key. Note that once the backdoor password is changed, Siemens will no longer be able to access the 9300DP.

To modify the user password:

1. Select **Security** from the Select Setup menu.
2. You will see that the screen displays 00000. Enter the current password. If you have not previously changed your password, the default is 00000. Press the Select button to accept your password.
3. Choose **Modify Password** from the two choices to alter your password. The **Factory Use Only** option is for factory purposes and is not accessible without proper authorization.
4. You can now enter your new numeric password in the place of the 00000. To move the cursor to the digit you wish to change, hold an Arrow button for approximately one second to move the cursor left or right.



5. Enter your password by pressing the Up Arrow button to increment and the Down Arrow button to decrement the numeric value of each digit. Press the Select button to accept the changes.
6. Select **Yes** to accept your new password. You will be returned to the **Select Setup** menu.

Note: Once the correct password is entered, you will not have to re-enter the password for any other changes unless you exit setup.

Keep your new user password in a safe place so it will not be lost. If you forget your new password contact Siemens for assistance.

3.7 Advanced Meter Setup

All setup parameters in the **9300DP** can be configured from the front panel. The **9300DP**'s data is organized in a hierarchical tree structure. The diagram below depicts how to change the PM Volts Mode option of the **9300DP** to **DEMO**, using the hierarchical structure of the advanced meter setup. For example, you would choose **Power Meter Manager** from the **9300DP Manager** menu. At the list of modules, you would choose which one you wanted to change. In the example below, the **Power Meter** module was chosen, as opposed to the **MU Power Meter**. At the list of setup registers, you would choose **PM1 Volts Mode**. Since PM1 Volts Mode is an enumerated parameter, you can scroll through the list to highlight the desired selection, which for this example is **DEMO**.

To configure setup registers from the front panel:

1. Select **Adv Meter Setup** from the **Select Setup** menu.
2. At the **9300DP Manager** menu, highlight the manager that contains the module you want to configure and press the Select button.
3. The modules that have been created are displayed on the screen. Scroll through the list of modules and highlight the one that contains the setup register you wish to configure by pressing the Select button.
4. For each module, a list of setup registers will be displayed. Select the setup register you wish to change.
5. Select from the menu or change the value of the setup register, depending on whether the register is enumerated or numeric bounded. The present selection will be indicated by asterisks if it is enumerated, or will be displayed if numeric bounded. Press the Select button to accept the change to the setup register.
6. Enter your password at the prompt if required. Select **Yes** to accept your changes. You will be returned to the module screen you originally chose.

3 Front Panel Setup

3.8 Customizing the Data Display Screens

The eight user-configurable screens of the 9300DP are factory set to display the values shown below; however, you

may want to change this default setup to suit your requirements. The Screen Setup option allows you to configure the eight screens with new Values or Styles. The following illustrates the default configuration of the eight programmable screens:

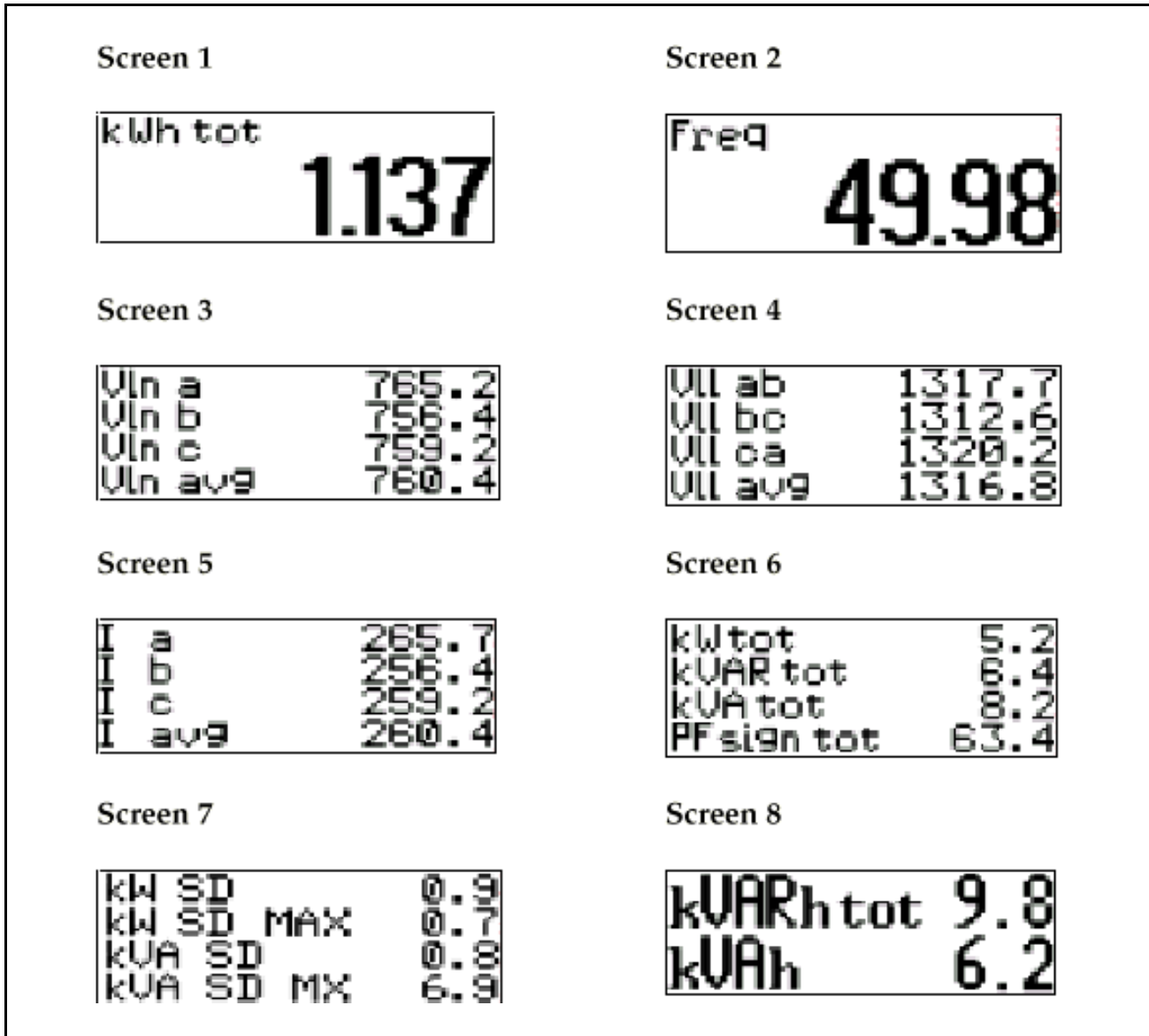


Figure 3.1 Default Screen Configuration

You can press an arrow button to advance to the next screen, or the screens can be set on auto-scroll so that they change automatically. Refer to **Section 3.5.1** for more details.

To change a screen:

1. Scroll through the screens by pressing an Arrow button, or wait for the auto-scroll to show the screen you wish to change. Once the screen you wish to change appears on the screen, press the Select button.
2. Select **Screen Setup** from the main Select Setup menu.
3. Move through the eight screen choices with the Arrow button until the screen you were at, which will be indicated by asterisks, is highlighted. Press the Select but-

ton. To change the Style or Values, refer to **Section 3.8**.

3.8.1 Selecting the Screen Style

The style option gives you the ability to control the number of parameters you want to display on each screen. You also have the choice to disable screens from being displayed when you scroll through the initial screens.

There are four options available for the style display which range from a four-parameter small character display to a single-parameter large character display. The asterisks indicate the current style of the display.

- The **1 Value** screen style shows one large number with the label in the top left corner.

```
kWh net
1475.35
```

- The **2 Value** screen style shows two rows of numbers with the labels on the left of the screen. The label length is limited to nine characters.

```
kW sud 459
kW sud mx 700
```

- The **4 Value** screen style shows four rows of numbers with the labels on the left of the screen. The label length is limited to 14 characters.

```
I a 177
I b 184
I c 210
I avg 190
```

- The **Disable** option hides the selected screen so that it will not appear in the auto scrolling sequence, or when you manually scroll through the screens. The previously programmed values in the screen are retained so that you can re-enable the screen later by selecting its previous style.

To adjust the style:

- After you have selected the screen you want to change, select **Style** and then press the Arrow button to choose among the four style types. The current style of the display for the selected screen will be highlighted by asterisks.
- Press the Select button to accept the changes. Enter your password at the prompt if required.
- Select Yes to enter your new style. You will be returned to the original screen menu with the Style or Values choices.

3.8.2 Specifying the Values to Display

The Values option allows you to choose which output parameters you want to display in the selected screen. To change the values to be displayed, you must access the ION tree. The **9300DP** will prompt you to select the manager, the specific module, and finally the parameter you want to display.

Note: If you choose an incompatible choice, when you press the Select button the **9300DP** will display a message that states you have made an invalid selection.

To specify the values to display:

- Scroll through the screens by pressing an Arrow button (or wait for the auto-scroll to show the screen you wish to change). Once the screen you wish to change appears on the screen, press the Select button.
- Select **Screen Setup** from the main Select Setup menu.
- Move through the eight screen choices with the Arrow button until the screen you were at, which will be indicated by asterisks, is highlighted. Press the Select button.
- Scroll down to **Values**, then press the Select button. This will display whatever value is being currently displayed.
- Scroll down to the value you wish to change, then press the Select button. This will return you to the **Feature Manager** menu.
- Select the output register you want the screen to display by highlighting and selecting in turn, the manager, module, and finally, the parameter. For example, if you wanted to change the default display for Screen 2 so that it shows kWh net instead of Freq, you would:
 - Scroll through the Feature Manager list, highlight **Integrator Modules**, then press the Select button.
 - Scroll down and highlight **Integrator 4**, then press the Select button.

3 Front Panel Setup

- Scroll down and highlight **kWh net**, then press the Select button.
 - Enter your password at the prompt.
 - The new value will appear; select **Yes** to accept (or **No** to reject the change).
7. Press the Select button repeatedly to exit the screen setup mode.

3.9 Clearing Accumulated and Min/Max Values

You can reset minimum, maximum, demand and energy accumulators to zero using the Clear Functions option on the Front Panel. The four factory default options that can be reset from the front panel are listed under the Clear Functions menu.

Table 3.1 Clear Functions

MIN/MAX Reset	Reset all default minimum and maximum modules.
SWD Reset	Reset all default sliding window demand modules.
TD Reset	Reset all default thermal demand modules.
INT Reset	Reset all default energy accumulator (integrator) modules.

The four choices that are shown in the table above are the factory default values that can be reset from the front panel. Choosing **MIN/MAX Reset**, for example, will clear all the minimum and maximum values in the **9300DP**.

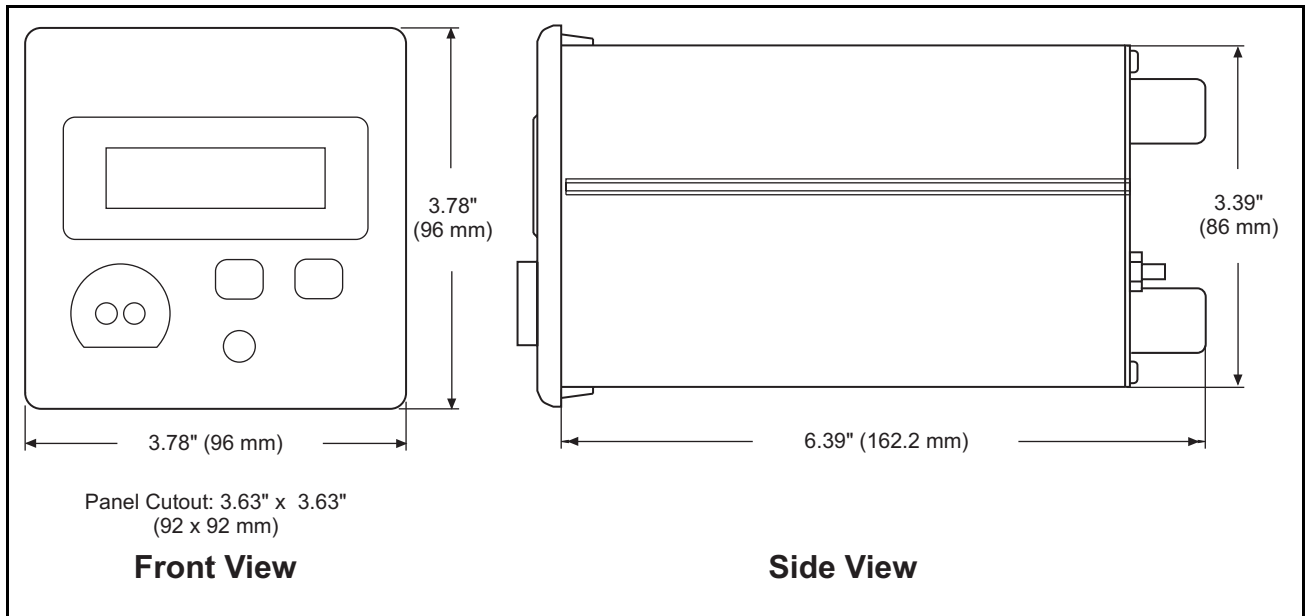
To reset values from the front panel:

1. Select **Clear Functions** from the main Select Setup menu. A list of the available menu options, which you can reset, are listed in the table above.
2. Use the Arrow buttons to scroll through the choices and when the one you want is highlighted, press the Select button. You are given a choice between **Yes** or **No**.
3. Select **Yes** to reset the selected value. Enter your password at the prompt if required and press the Select button. You will be returned to the **Clear Functions** menu.

A Specifications

A.1 Physical

Mounting Dimensions



Additional Specifications

Operating Temp:	0°C to +50°C (+32°F to +122°F) ambient air.
Storage Temp:	-30°C to +70°C (-22°F to +158°F)
Humidity:	5% to 95% non-condensing

Appendix A: Specifications

A.2 Measurement Accuracy

(@ 50.0 Hz or @ 60.0 Hz @ 25°C/77°F)

Note: Accuracy specifications subject to change. Contact Siemens for more information. Please note

that if the voltage on Phase A drops to 20% or less of its rated nominal, frequency detection will not work and the accuracy of the 9300DP measurements will be impaired.

Table 3.2 Basic Measurement Accuracy

Parameter	Accuracy ±(%rdg + %range*)	Display Resolution (%range) †	Range
Voltage (I-n) in Wye, Vab, Vbc in Delta	0.25% + 0.05%	0.1%	0 to 1x10 ⁶
Voltage (I-l) in Wye, Vca in Delta	0.75% + 0.1%	0.1%	0 to 2x10 ⁶
Frequency	0.01%	0.01 Hz	40 Hz to 70 Hz
Current	0.25% + 0.05%	0.1%	0 to 1x10 ⁶
KVA	0.5% + 0.1%	0.1%	0 to 3.3x10 ⁷
KVAR (>5% F.S.)	1.5% reading	0.1%	0 to ± 3.3x10 ⁷
KVAh	1.0% reading	0.1% of reading	0 to 1038
KVARh	1.5% reading	0.1% of reading	0 to ± 1038
Power Factor	1.5% reading	0.01	-0.01 to -100.00, 100.00 to 0.01
Total Harmonic Distortion (THD)	1.0% Full Scale	0.1%	0.01 to 100.00
K Factor	5.0% Full Scale	0.1%	0 to 1x10 ⁶

* %range is defined as a percentage of nominal full scale voltage & current

† Resolutions given are from the front panel display. Higher resolution can be obtained via communications.

Table 3.3 kW and kWh Measurement Accuracy

% Rated Current (Ir) &	Accuracy *	Display Resolution †	Range		
Power Factor (PF)		kW (% range)	kWh (% reading)	kW	kWh
@ PF between ±0.8 and 1.0 @ 2% * Ir * 100%	1.0% reading	0.1%	0.1%	0 to ± 3.3x10 ⁷	0 to ± 1038
@ PF between ±0.8 and 1.0 @ 1% * Ir < 2%	1.5% reading	0.1%	0.1%	0 to ± 3.3x10 ⁷	0 to ± 1038
@ PF between 0.8 and 0.5 Lead or Lag @ 20% * Ir * 100%	1.0% reading	0.1%	0.1%	0 to ± 3.3x10 ⁷	0 to ± 1038
@ PF between 0.8 and 0.5 Lead or Lag @ 2% * Ir < 20%	1.5% reading	0.1%	0.1%	0 to ± 3.3x10 ⁷	0 to ± 1038

* All accuracy specifications in this table comply with IEC 1036 Class 1 specification and ANSI C12.16 Class 10 at 25°C (77°F)

† Resolutions given are from the front panel display. Higher resolution can be obtained via communications.

The following graphs show the accuracy specifications for kW and kWh (at 25°C/77°F):

Appendix A: Specifications

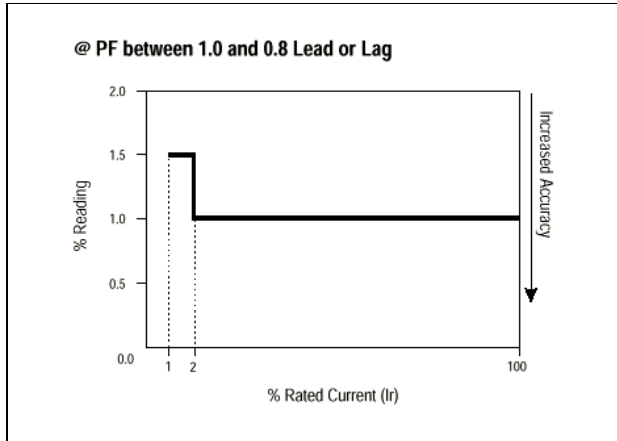


Figure 3.2 PF Between 1.0 and 0.8 Lead or Lag

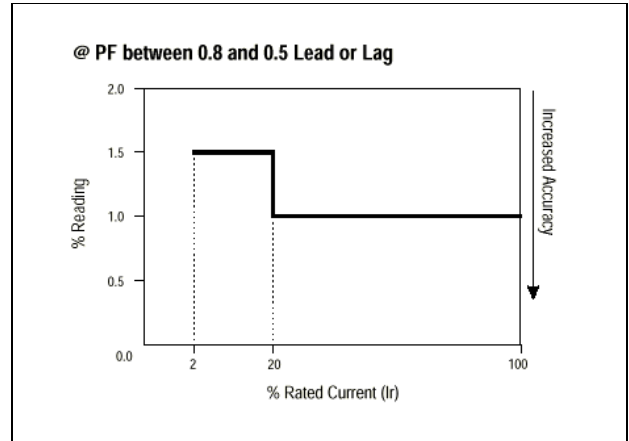


Figure 3.3 PF Between 0.8 and 0.5 Lead or Lag

Table 3.4 Input Ratings

Input	Options	Specifications
Voltage Inputs	-120 option:	120 VAC nominal F.S. input, 25% overrange. Barrier strip connector rated to 600 Volts line-to-line.
	-277 option:	277 VAC nominal F.S. input, 25% overrange. Barrier strip connector rated to 600 Volts line-to-line.
	-347 option:	347 VAC nominal F.S. input, 25% overrange. Barrier strip connector rated to 600 Volts line-to-line.
	CWC option:	(available with -120 & -277 options only). Captured-wire connectors rated to 500 Volts line-to-line.
		Overload withstand for all options: 1500 VAC continuous, 2500 VAC for 1 second non-recurring
		Input Impedance for all options: 2 MW
Current Inputs		5 Amp nominal/10 Amps full scale, 25% overrange
		Overload withstand for all options: 15 Amps continuous, 300 Amps for 1 second non-recurring
		Input Impedance: 2 mW
		Worst Case Burden (@ 10 Amps): 0.0625 VA
Power Supply*	Standard	85-240VAC (20-440 Hz) or 85-240VDC (*10%), 0.5 Amp worst case loading (20 W) @ 100 VAC @ 25°C
	-P24 option	20-60VDC (*10%), 1 Amp worst case loading (10 W)
		Power supply fuse current rating, type and rupturing speed: 2 A slow blow

*Power supply ratings apply to both 9300DP and the external I/O boards.

Appendix A: Specifications

A.3 Standards Compliance

UL:	Certified to UL 3111
CSA:	No.142-M1987 Certified to CAN/CSA C22.2 No.1010-1
International:	IEC 1010-1
Measuring inputs comply with Installation Category III	
Power supply inputs comply with Installation Category II	
Device operable under Pollution Degree II	
Surge Withstand:	All inputs pass ANSI/IEEE C37.90-1989 surge withstand and fast transient tests
FCC:	Part 15 of FCC Rules for a Class A Digital Device
CE:	approved

Quality Assurance Certification: ISO 9002 certified by QMI

Note: CSA is a Nationally-Recognized Test Laboratory (NRTL), accredited at the US Federal Government level by the Occupational Safety and Health Association (OSHA).

B 9300DP Profibus DP Protocol

The 9300DP performs Profibus DP communications using the Siemens SPC3 ASIC (Application Specific Integrated Chip) and Profibus DP Standard protocol (EN50170 Part 3). Profibus DP Enhanced V1 protocol is not supported in the initial release.

This document describes the communications messaging protocol employed by the 9300DP meter to pass information within a Profibus DP network. This protocol is called the Meter Messaging Protocol in the remainder of this document. The Profibus Register and Block maps are also included in this appendix.

It is assumed that the reader has a general understanding of Profibus DP protocol.

B.1 Profibus DP Standard

Profibus DP Standard is designed to support remote I/O on a Programmable Logic Controller. In this Master/Slave environment message sizes are small and of fixed length. The request packet is often no more than eight bytes and the response typically no more than 32 bytes although 244 bytes are available for each request and response. These small packets allow for very fast and deterministic update rates for the remote I/O.

The 9300DP has much more information to transfer than is directly supportable in Profibus DP. To make this information available a messaging protocol called Meter Messaging Protocol has been layered on top of the fixed sized packets of the Profibus DP protocol.

B.2 Sub-Protocols

The meter messaging protocol is handled by the master and slave applications and is independent of the Profibus DP protocol. The output (request) data is fixed at eight bytes and the input (response) data is fixed at 32 bytes.

The meter messaging protocol can be divided into two simpler protocols. The first allows the Master to access real-time meter parameters in blocks of six parameters each. This protocol is called Block Access Protocol in the remainder of this document. The second protocol allows the Master to access setup and control registers in the 9300DP meter. This protocol is called Register Access Protocol in the remainder of this document.

B.2.1 Block Access Protocol

The 9300DP meter has 12 predefined blocks of data each with six real-time parameters. To read these parameters the Master must use the Block Access Protocol.

The Master must set the Block Field to the desired block. The 9300DP meter will respond with the same Block Field, the requested data in the Block Data Field and Acknowledge With Data in the Block Acknowledge Field.

See **Section B.8** for the default Block Map.

If the Master requests an invalid block the 9300DP will respond with the same Block Field, the Block Data Field cleared and Negative Acknowledgment in the Block Acknowledge Field.

B.2.2 Register Access Protocol

To access the setup and control registers of the 9300DP meter the master must use the Register Access Protocol. To read a setup register the Master sets the Register Field to the desired register and the Command Field to Read Register. The 9300DP meter will respond with the same Register Field, the request value in the Register Data Field and Acknowledge With Data in the Register Acknowledge Field.

See **Section B.9** for the Default Register Map.

If the request is invalid the 9300DP will respond with the same Register Field, the exception in the Register Data Field and Negative Acknowledgment in the Register Acknowledge Field. See **Section B.6** for a detailed description of the exceptions.

B.3 Request Packet Structure

Every meter messaging request packet consists of four fields. See **Section B.10** for examples.

1. Data Field
2. Register Field
3. Control Field
4. Block Field

B.3.1 Data Field

This four byte field from bytes 0 to 3 is used to write a parameter or control a function within the slave. During a Read Register command this field is ignored by the 9300DP meter. During a Write Register Command this field contains the integer value to be written.

Byte 0, the left most byte represents the most significant byte and byte 3, the least significant byte.

B.3.2 Register Field

This two byte field indicates which Profibus register the Master wishes to read or write. These registers represent the setup and control parameters of the 9300DP device. See **Section B.9** for the Default Register Map.

B.3.3 Control Field

This one byte field indicates the type of request. The acknowledgment bits are not used.

See **Section B.5** for more details on this field.

B.3.4 Block Field

This one byte field indicates which fixed Block of real-time data the Master wishes to read. This field controls the last 24 bytes of the response packet which represents six values. See **Section B.8** for the default Block Map.

Appendix B: 9300DP Profibus DP Protocol

B.4 Response Packet Structure

Every meter messaging response packet consists of five fields. See **Section B.10** for examples.

1. **Data Field**
2. **Register Field**
3. **Control Field**
4. **Block Field**
5. **Block Data Field**

B.4.1 Data Field

This four byte field from bytes 0 to 3 is used to pass back requested data or as part of a write acknowledgment. It is also used to return exception values. Byte 0, the left most byte represents the most significant byte and byte 3, the least significant byte.

B.4.2 Register Field

The Slave responds with the same register address that was sent by the Master so the Master will know that this packet is the response to the last request.

B.4.3 Control Field

This one byte field informs the Master which request was made and the acknowledgment value.

B.4.4 Block Field

The Slave responds with the same Block number that was sent by the Master so the Master will know that this packet is the response to the last Block request.

Bytes 8 to 31 of the response packet are the Block Data Field and represent the six real-time parameters.

If an invalid Block is requested, the response packets Block Field will contain the invalid Block value and the Block Acknowledgment Field will contain Negative Acknowledgment. The Block Data will contain all zeros.

B.4.5 Block Data Field

Bytes 8 to 31 of the response packet represent the Block Data Field. This field is divided into six sections which represents a value within the requested Block.

B.5 Control Field

The Control Field is made up of three sub-fields:

1. **Register Acknowledgment Field**
2. **Block Acknowledgment Field**
3. **Command Field**

B.5.1 Register Acknowledgment Field

The Register Acknowledgment Field is made up of bits 0 and 1 of the Control Field. The below sections illustrate the

Meter Messaging Acknowledgments supported by the 9300 DP.

Acknowledgment	Value (Bits)
Null Acknowledgment	00
Acknowledge with Data	01
Negative Acknowledgment (exception response)	10
Not Used	11

Null Acknowledgment

After a successful register read or write the Master can request to read or write another parameter or enter into an Idle State. During an Idle State the request and response Data Field is set to zero and the Command Field is set to Null Command. The response Register Acknowledge Field is set to Null Acknowledgment.

Acknowledge with Data

The Slave sets the Register Acknowledgment Field to Acknowledge with Data on a successful register read or write.

Negative Acknowledgment

The Slave sets the Register Acknowledgment Field to Negative Acknowledgment on a unsuccessful register read or write. For an unsuccessful request the Data Field contains the value of the exception. See **Section B.6**.

B.5.2 Block Acknowledgment Field

The Block Acknowledgment Field is made up of bits 2 and 3 of the Control Field. The below sections illustrate the Meter Messaging Acknowledgments supported by the 9300DP.

Acknowledgment Value	Bits)
Not Used	00
Acknowledge with Data	01
Negative Acknowledgment	10
Block Value Not Available	11

Acknowledge with Data

The Slave sets the Block Acknowledgment Field to Acknowledge with Data on a successful Block request.

Negative Acknowledgment

The Slave sets the Block Acknowledgment Field to Negative Acknowledgment on an unsuccessful Block request. This can occur if the Master requests an out of bounds Block.

Block Value Not Available

The 9300DP meter will set the Block Acknowledgment Field to Block Value Not Available if one or more block values are not available within the meter. All valid block values will be sent correctly and the not available values will be set to zero.

This condition can occur if the meter's Volts Mode is set to DELTA and the Master requests Block #1 (Volts line-neutral) which is not valid in this mode.

B.5.3 Command Field

The Command Field is bits 5 to 8 of the Control Field. The below sections illustrate the Meter Messaging commands supported by the 9300DP.

Command	Value (Bits)
Null Command	0000
Read Register	0001
Write Register	0010

Null Command

This command allows the Master to clear a read or write request. This is also the command the Master and Slave are set to when the device enters Profibus DP Data Exchange mode. The Slave will respond with the Null Command in the Command Field and Acknowledge with Data in the Register Acknowledgment Field.

Read Register

This command allows the Master to read the value of a single register in the 9300DP. With a successful read the Slave responds with a packet containing the single value of the register in the Data Field and an Acknowledge with Data in the Register Acknowledgment Field. See **Section B.10.1** for an example.

If the request fails, the exception value is returned in the Data Field and a Negative Acknowledgment is set in the Register Acknowledgment Field.

Write Register

This command allows the Master to write a value to a single register. The Data Field of the request represents the value to be written. With a successful write the Slave responds with a packet containing the sent value in the Data Field and an Acknowledge with Data in the Register Acknowledgment Field. See **Section B.10.2** for an example.

If the request fails, the exception value is returned in the Data Field and a Negative Acknowledgment is set in the Register Acknowledgment Field.

B.6 Exceptions

The below table lists the conditions that can cause exception responses. All exception responses are placed in the Data Field of the response packet and the Acknowledgment Field is set to Negative Acknowledgment.

Exception	Value (Hex)
Invalid Register Request	00 00 00 01
Invalid Command Request	00 00 00 02
Invalid Value Write Request	00 00 00 04
Register Not Available	00 00 00 08

Invalid Register Request

If the Master requests a register that is not in the register map the Slave will respond with this exception.

Invalid Command Request

If the Master sends a command that does not equal Read Register, Write Register, or Null Command the Slave will respond with this exception.

Invalid Value Write Request

If the Master sends a value that is out of bounds for the register to be written the Slave will respond with this exception.

Register Not Available

If the Master requests a register that is not available the Slave will respond with this exception.

e.g. External Boolean Register #4 is in the Profibus Register Map but is not created in the 9300DP meter.

Appendix B: 9300DP Profibus DP Protocol

B.7 Diagnostics

The below table lists the extended diagnostic packet for the 9300DP meter.

As the 9300DP meter does not maintain time during power down, the time must be sent by the Master after power up. Byte #1, Bit #1 indicates time is required by the meter. Once time has been sent this bit will be cleared.

Byte #2 represents the number of power cycles that have occurred in the meter.

Extended Diagnostics	Description
Byte #1 – Bit #1 (LSB)	TRUE: Time required
Byte #1 – Bit #2	Future
Byte #1 – Bit #3	Future
Byte #1 – Bit #4	Future
Byte #1 – Bit #5	Future
Byte #1 – Bit #6	Future
Byte #1 – Bit #7	Future
Byte #1 – Bit #8 (MSB)	Future
Byte #2	Number of meter power cycles
Byte #3 to #7	Future

B.8 Default Block Map

Note: This section applies only to a 9300DP device which has been factory-initialized. Any setup changes to the Profibus Export Modules negates the validity of this map.

Block: #1

Scaling: Yes (x10)
 ProfiZero, ProfiFull: 0, 2147483640

Description	Display Label	Links
Volts line to neutral A	Vln a	Power Meter
Volts line to neutral B	Vln b	Power Meter
Volts line to neutral C	Vln c	Power Meter
Volts line to neutral average	Vln avg	Power Meter
Vln avg Maximum	N/A	MAX #4
Vln avg Minimum	N/A	MIN #4

Block: #2

Scaling: Yes (x10)
 ProfiZero, ProfiFull: 0, 2147483640

Description	Display Label	Links
Volts line to line AB	Vll ab	Power Meter
Volts line to line BC	Vll bc	Power Meter
Volts line to line CA	Vll ca	Power Meter
Volts line to line average	Vll avg	Power Meter
Vll avg MAX	N/A	MAX #8
Vll avg MIN	N/A	MIN #8

Block: #3

Scaling: Yes (x10)
 ProfiZero, ProfiFull: 0, 2147483640

Description	Display Label	Links
Current A	I a	Power Meter
Current B	I b	Power Meter
Current C	I c	Power Meter
Current average	I avg	Power Meter
Current average MAX	N/A	MAX #12
Current average MIN	N/A	MIN #12

Block: #4

Scaling: Yes (x10)
 ProfiZero, ProfiFull: -247483640, 2147483640

Description	Display Label	Links
KW A	N/A	Power Meter
KW B (kWb)	N/A	Power Meter
KW C (kWc)	N/A	Power Meter
KW Total (kW Tot)	kW tot	Power Meter
KW Total Thermal Demand	N/A	TD #1
KW Tot Thermal Demand MAX	N/A	MAX #30

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Block: #5

Scaling: Yes (x10)
 ProfiZero, ProfiFull: -247483640, 2147483640

Description	Display Label	Links
KVAR A	N/A	Power Meter
KVAR B	N/A	Power Meter
KVAR C	N/A	Power Meter
KVAR Total	kVAR tot	Power Meter
KVAR Total Thermal Demand	N/A	TD #2
KVAR Tot Thermal Dmd MAX	N/A	MAX #31

Block: #6

Scaling: Yes (x10)
 ProfiZero, ProfiFull: -247483640, 2147483640

Description	Display Label	Links
KVA A	N/A	Power Meter
KVA B	N/A	Power Meter
KVA C	N/A	Power Meter
KVA Total	kVA tot	Power Meter
KVA Total Thermal Demand	N/A	TD #3
KVA Total Thermal Dmd MAX	N/A	MAX #32

Block: #7

Scaling: Yes (x10)
 ProfiZero, ProfiFull: -247483640, 2147483640

Description	Display Label	Links
Power Factor A	N/A	Power Meter
Power Factor B	N/A	Power Meter
Power Factor C	N/A	Power Meter
Power Factor Total	PF sign tot	Power Meter
Power Factor Total MAX	N/A	MAX #16
Power Factor Total MIN	N/A	MIN #16

Block: #8

Scaling: Yes (x100)
 ProfiZero, ProfiFull: 0, 2147483600

Description	Display Label	Links
Volts unbalanced	N/A	Power Meter
Current unbalanced	N/A	Power Meter
Line Frequency	Freq	Power Meter
Line Frequency MAX	N/A	MAX #17
Line Frequency MIN	N/A	MIN #17
Not used		

Block: #9

Scaling: NO (x1)
 ProfiZero, ProfiFull: N/A, N/A

Description	Display Label	Links
KW hour Total	KWH TOTAL	INT #3
KVAR hour Total	KVARH TOT	INT #7
KVA hour	KVAH	INT #9
Not used	N/A	
Not used	N/A	
Not used	N/A	

Block: #10

Scaling: NO (x1)
 ProfiZero, ProfiFull: N/A, N/A

Description	Display Label	Links
KW hour Import	N/A	INT #1
KW hour Export	N/A	INT #2
KW hour Net	N/A	INT #4
KVAR hour Import	N/A	INT #5
KVAR hour Export	N/A	INT #6
KVAR hour Net	N/A	INT #8

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Block: #11

Scaling: Yes (x10)

ProfiZero, ProfiFull: -247483640, 2147483640

Description	Display Label	Links
KW Sliding Demand	KW SWD	SWD #1
KW Predicted Demand	N/A	SWD #1
KW Sliding Demand MAX	KW SWD MX	MAX #27
KW Sliding Demand MIN	N/A	MIN #27
Not used		
Not used		

Block: #12

Scaling: Yes (x100)

ProfiZero, ProfiFull: 0, 2147483600

Description	Display Label	Links
Va Total Harmonic Distortion	N/A	V1 Harmonics
Vb Total Harmonic Distortion	N/A	V2 Harmonics
Vc Total Harmonic Distortion	N/A	V3 Harmonics
Ia Total Harmonic Distortion	N/A	I1 Harmonics
Ib Total Harmonic Distortion	N/A	I2 Harmonics
Ic Total Harmonic Distortion	N/A	I3 Harmonics

Appendix B: 9300DP Profibus DP Protocol

B.9 Profibus Register Map

Enumerated

Profibus Register (Hex)	Read/Write	Description	Enumeration
7800	R/W	Volts Mode	0='4W-WYE' 1='DELTA' 2='SINGLE' 3='DEMO' 4='3W-WYE'
7801	R/W	I1 Polarity	0='Normal' 1='Inverted'
7802	R/W	I2 Polarity	
7803	R/W	I3 Polarity	
7A4A	R/W	V1 Polarity	0='Normal' 1='Inverted'
7A4B	R/W	V2 Polarity	
7A4C	R/W	V3 Polarity	

Numeric

Profibus Register (Hex)	Read /Write	Description	Low Bound	High Bound
7000	R/W	PT Primary	1	999999
7001	R/W	PT Secondary	1	999999
7002	R/W	CT Primary	1	999999
7003	R/W	CT Secondary	1	999999
FF40	RO	Profibus Software Version	1	2147483647
FF41	RO	Profibus Hardware Version	1	2147483647
FF42	RO	Meter Messaging Protocol Version	1	2147483647
FF43	RO	Meter Hardware Version	00	99
FF44	RO	Meter Serial Number Upper	0001	9912
FF45	RO	Meter Serial Number Lower	000	999
FF46	RO	ION Framework Version	1	2147483647
FF47	RO	Profibus Address	0	126
FF48	RO	Meter Type	0	2147483647
FFC0	R/W	Time of Day	0	2147483647
FFC1	R/W	Sliding Demand Sub-Intervals	60	5940
FFC2	R/W	Sliding Demand # of Sub-Intervals	1	15

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Control - External Numeric Modules

Module	Profibus Register (Hex)	Read/Write	Default Link	Low Bound	High Bound
#1	5ADC	R/W	None	-2,147,483,647	2,147,483,647
#2	5ADD	R/W	None	-2,147,483,647	2,147,483,647
#3	5ADE	R/W	None	-2,147,483,647	2,147,483,647
#4	5ADF	R/W	None	-2,147,483,647	2,147,483,647

Control - External Boolean Modules

Turn OFF with register value equal to zero

Turn ON with register a non-zero value

Module	Profibus Register (Hex)	Read/Write	Default Link
#1	608F	R/W	Min/Max Enable
#2	6090	R/W	Integrator Enable
#3	6091	R/W	None
#4	6092	R/W	None
#5	6093	R/W	None
#6	6094	R/W	None
#7	6095	R/W	None
#8	6096	R/W	None

Control - External Pulse Modules

To Pulse, write to the register.

Module	Profibus Register (Hex)	Read/Write	Default Link
#1	68AE	R/W	Min/Max Reset
#2	68AF	R/W	SWD Reset
#3	68B0	R/W	TD Reset
#4	68B1	R/W	Integrator Reset
#5	68B2	R/W	None
#6	68B3	R/W	None
#7	68B4	R/W	None
#8	68B5	R/W	None
#9	68B6	R/W	None
#10	68B7	R/W	None
#11	68B8	R/W	None
#12	68B9	R/W	None
#13	68BA	R/W	None
#14	68BB	R/W	None
#15	68BC	R/W	None
#16	68BD	R/W	None
#17	68BE	R/W	None
#18	68BF	R/W	None
#19	68C0	R/W	None
#20	68C1	R/W	None

Appendix B: 9300DP Profibus DP Protocol

Control - External Pulse Modules, Continued

Module	Profibus Register (Hex)	Read/Write	Default Link
#21	68C2	R/W	None
#22	68C3	R/W	None
#23	68C4	R/W	None
#24	68C5	R/W	None
#25	68C6	R/W	None
#26	68C7	R/W	None
#27	68C8	R/W	None
#28	68C9	R/W	None
#29	68CA	R/W	None
#30	68CB	R/W	None
#31	68CC	R/W	None
#32	68CD	R/W	None

Appendix B: 9300DP Profibus DP Protocol

B.10 Profibus Communications Examples

B.10.1 Read Register Example

Request Packet (Master station to 9300DP)

Data (Not Used)	(4 bytes)
Register Address	(2 bytes)
Register Acknowledge (N/U)	(2 bits)
Block Acknowledge (N/U)	(2 bits)
Command	(4 bits)
Block	(1 byte)

Response Packet (9300DP to Master station)

Data	(4 bytes)
Register Address	(2 bytes)
Register Acknowledge	(2 bits)
Block Acknowledge	(2 bits)
Command	(4 bits)
Block	(1 byte)
Block Data	(24 bytes)

Example:

A 9300DP is configured as a Profibus slave device. The Master station requests to read PT Primary. The parameter is mapped to Register 7000 Hex. The Block value is set to 2, voltage line to line parameters.

Request Packet:

MSB		LSB		Register		Control	Block
00	00	00	00	70	00	01	02

Response Packet:

MSB		LSB		Register		Control	Block
00	00	04	B0	70	00	51	02
byte 8				byte 15			
Block Data #1 (VII AB)				Block Data #2 (VII BC)			
byte 16				byte 23			
Block Data #3 (VII CA)				Block Data #4 (VII avg)			
byte 24				byte 31			
Block Data #5 (N/U)				Block Data #6 (N/U)			

Note: The values shown in illustrated packets are all represented in hexadecimal format.

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B.10.2 Write Register Example

Request Packet (Master station to 9300DP)

Data	(4 bytes)
Register Address	(2 bytes)
Register Acknowledge (N/U)	(2 bits)
Block Acknowledge (N/U)	(2 bits)
Command	(4 bits)
Block	(1 byte)

Response Packet (9300DP to Master station)

Data	(4 bytes)
Register Address	(2 bytes)
Register Acknowledge	(2 bits)
Block Acknowledge	(2 bits)
Command	(4 bits)
Block	(1 byte)
Block Data	(24 bytes)

Example:

A 9300DP is configured as a Profibus slave device. The Master station requests to change PT Primary (2000 hex) from 1200 to 2400. The Block Value is set to 01, Voltage line to neutral parameters.

Request Packet:

MSB			LSB	Register	Control	Block
00	00	9	60	70	00	01

Response Packet:

MSB			LSB	Register	Control	Block
00	00	9	60	70	52	01
byte 8			byte 15			
Block Data #1 (VIn A)			Block Data #2 (VIn B)			
byte 16			byte 23			
Block Data #3 (VIn C)			Block Data #4 (VIn avg)			
byte 24			byte 31			
Block Data #5 (N/U)			Block Data #6 (N/U)			

Note: The values shown in illustrated packets are all represented in hexadecimal format.

Appendix B: 9300DP Profibus DP Protocol

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