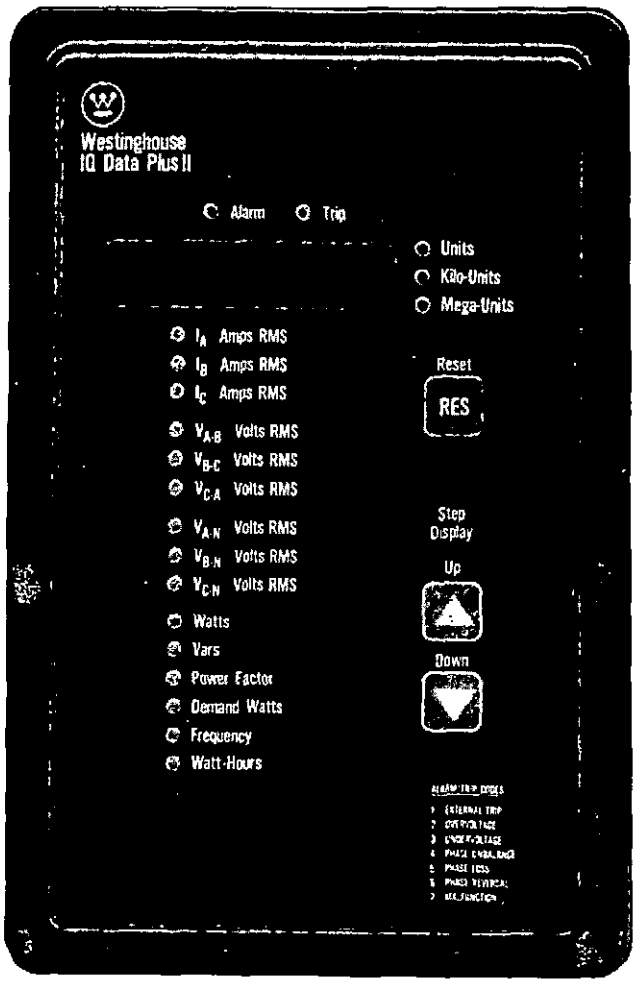
IQ DATA PLUS II™

LINE METERING AND PROTECTION SYSTEM USER'S MANUAL



Westinghouse

Effective September, 1989

ELECTRICAL COMPONENTS DIVISION

NOTE

All possible contingencies which may arise during installation, operation, or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is desired by purchaser regarding his particular installation, operation or maintenance of his equipment, the local Westinghouse Electric Corporation representative should be contacted.

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Westinghouse Electric Corporation
Distribution and Control Business Unit
Electrical Components Division
Pittsburgh, PA 15220

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QUICK LIST FOR IQ DATA PLUS II INSTALLATION

It is suggested that you thoroughly familiarize yourself with the IQ DATA PLUS II User's Manual before attempting installation. This list should be used to assist you.

1. The first thing to check on the IQ DATA PLUS II is that the voltage selector jumper is shorting at the correct level. **Each product is shipped from the factory at 120 volts.**

2. Using the technical manual, Sections 4.3 and 6, set the DIP switches on the back of the IQ DATA PLUS II at the desired values (CT ratio, PT ratio, nominal line voltage, protection settings).

3. Connect the power leads to the voltage inputs of the IQ DATA PLUS II – directly from the line if 600 volts or below, from PT's for up to 14.4 kV. Be sure to take special care of the phasing of the voltage. (The IQ DATA PLUS II looks for an A-B-C sequence.) The IQ DATA PLUS II is extremely phase sensitive – errant readings could occur in the power calculations if the phasing is wrong.

4. Connect CT inputs to the CT terminals of the IQ DATA PLUS II. Again be extremely careful to connect the inputs correctly and to line up the phases with the voltage. (The product could read voltage and current correctly, but read watts, vars, PF, and watthours incorrectly if the CT inputs are reversed or if the current phase does not match with the voltage phase.)

5. If installing an IQ DATA PLUS II equipped with a 3-phase power module, be sure that the voltage jumper is in the correct position. Power up the unit. If the unit does not power up or if one or more phases are reading the incorrect voltage, check the fuses located just above the voltage inputs inside the cover of the power module. The fuses should sit comfortably in their clips. Possible problems are blown fuses or fuses that have shaken loose in transit.

5. If installing an IQ DATA PLUS II with a 120/240 VAC Separate Source Power Supply Module, adjust the user-supplied jumpers to operate with at the voltage level that you are using. (See Paragraph 2.1.2, item 3, page 9.) After the DIP switch settings have been verified, apply 120/240 VAC control power to the unit at terminals 1 and 4. Power up the unit. If the unit does not power up, check the wiring diagram to ensure proper connections. If one or more phases are reading the incorrect voltage, check the fuses located just above the voltage inputs inside the cover. The fuses should sit comfortably in their clips. Possible problems are blown fuses or fuses that have shaken loose in transit.

6. If you think a problem exists, check the voltage and current readings with hand-held meters. If they are correct, the unit should be operating correctly. If an LED is not functioning, return the device to the factory for repairs. If a fuse is burned out, replace it with Buss Type KTK-R-3/4 or equivalent.

IMPORTANT

Areas in this manual shaded in gray (▒) pertain only to those units which operate with the optional 120/240 VAC Separate Source Power Supply Module (style number 2D78522G02). If your unit does not have this option, please skip these shaded areas.

▒ **Shaded area designates information that replaces or supplements applications using the 120/240 VAC Separate Source Power Supply Module.**

Section 1

INTRODUCTION

1.0 General — The IQ Data Plus II™ is a microprocessor-based, self-contained, door-mounted device designed to both monitor and display electrical parameters as well as to protect industrial equipment connected to the line. (See Figure 1.1)
The electrical parameters it meters are:

- AC line current (each phase)
- AC line to line voltage (all three)
- AC line to neutral voltage (four-wire systems — all three)
- Watts
- Vars
- Power Factor
- Peak Demand
- Frequency
- Watt-hours

It monitors the AC line feeding a specific load or loads to detect conditions which exceed user-chosen electrical parameters. It may protect the loads against such conditions as:

- Phase Loss
- Phase Unbalance
- Phase Reversal
- Undervoltage
- Overvoltage

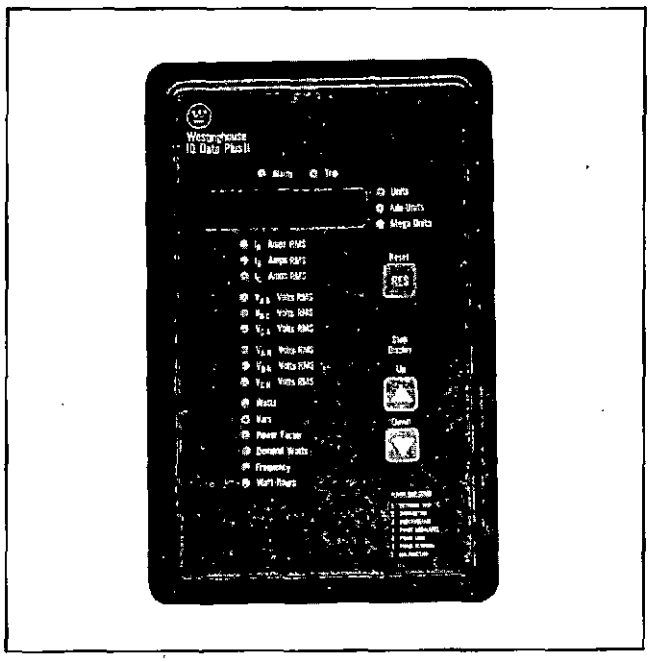

Figure 1.1 — IQ Data Plus II

Voltage may be directly monitored on 3-phase AC lines within a range of 120 to 600 VAC nominal without external potential transformers and within a range above 600 VAC to 14.4KV with external potential transformers.

Current monitoring is through external current transformers with ratios between 100/5 to 5000/5.

Typical applications for the IQ Data Plus II are:

- Incoming 3-phase AC lines
- *Transformer feeder circuits*
- Branch circuits
- *Motor starters*
- 3-phase electrical loads

A listing of the 15 monitored items appears on the unit's faceplate, as shown in Figure 3.1 on page 12.

The unit will auto-range all monitored values displayed on the screen by means of a floating decimal point and UNITS, KILO, and MEGA LED's on the device's faceplate. See Figure 3.1.

The program directing the monitoring function is permanently stored in the IQ Data Plus II, and so there is no need to reload programs after an AC power loss. Threshold setpoints, chosen by the user, are also retained throughout a power loss by means of DIP switch settings.

The non-volatile memory of the IQ Data Plus II will not only maintain programmed setpoints, it will save a "snapshot" of all metered values just before a trip condition. These values *can be stepped through and recorded before resetting the* unit to aid in troubleshooting the system.

The unit's monitoring and protective functions are preprogrammed in the form of software supplied as standard and resident in the IQ Data Plus II microprocessor. A complete listing of the monitored values is given in Table 3.A on page 13.

The Operator Panel, which makes up the unit's front face, supports a Display Window which visually indicates the actual *value of the metered item selected for display. The Display* Window is also used to visually indicate the cause of a detected trip signal. A self-diagnostic check program also initi*ates a malfunction display should the IQ Data Plus II detect* an internal malfunction.

The unit's primary function is to monitor and display electrical parameters that are required or desired by an operator.

The unit's secondary function is to monitor a 3-phase AC line and, if the tolerances are exceeded, a protective function will enable an internal Alarm and/or Trip Relay. Contacts from these relays may be used to alert personnel, to turn off the

load device, or to do both.

In instances where a particular protective item is not necessary for the application, it can be disabled, although it remains passively resident should it be required later.

The IQ Data Plus II is available in two models. One style (2D78522G01) comes equipped with a three-phase Voltage Power Module. Power for this unit is derived from the line being monitored. The second style (2D78522G02) is packaged with a 120/240 VAC Separate Source Power Supply Module. This model of the IQ Data Plus II requires 120 or 240 VAC control power.

Since the IQ Data Plus II has only two models and very few external options, individualizing for an application is performed in the field by the user/OEM. Users choose and enter the specifications for the individual setpoints by setting a series of DIP switches. No specialized programming language is necessary.

1.1 Features and Options — A list of features and benefits is given in Table 1.A (page 6). Since the IQ Data Plus II is a standardized package, there are very few external options. The options are:

- A 36-inch Extension Cable (style number 7871A40G02) which allows removal of the Three Phase Power Module or Separate Source Power Supply Module from the chassis for separate mounting
- A Communications Module (PONI Card) See IL 17158A
- A 120/240 VAC Separate Source Power Supply Module (style number 2D78508G01)

The IQ Data Plus II is capable of carrying on external data exchanges with a computer by means of a Communication Module. Electrical operating data supplied over a two-wire communication link will support plant energy management systems. This module can be added at any time. A list of communications configurations is given in Table 1.B (page 6).

1.2 Required External Hardware — In all instances, it is recommended that the IQ Data Plus II use 3 user-supplied external current transformers, with 5 amp secondaries in order to carry out metering functions involving current. In retrofit cases where only 2 current transformers are provided, see the sample wiring diagrams in Figures 4.4C, 4.4D, 4.4I and 4.4J.

NOTE: A 2 CT arrangement will work, but will not detect a current phase loss on L2.

The CT's may be chosen from a wide range of ratios, as is indicated in Table 6.B.

For applications in which the monitored AC line is 600 VAC, or less, **no external potential transformers are required.** In those cases where the monitored AC supply line exceeds 600 VAC, user-supplied potential transformers are required to step down the voltage to match the maximum allowable voltage permitted by the unit. See Tables 6.I and 6.L for the voltage ranges the IQ Data Plus II can monitor.

1.3 Use of Manual — This manual is designed for use during installation and troubleshooting and, if necessary, unit replacement. It also has information of specific importance for the user's application engineer who is planning the overall system and who is determining the setpoint values for a specific IQ Data Plus II application.

The manual is broad enough in scope to form the basis of new employee familiarization, refresher training sessions, and on-going maintenance.

It is strongly advised that the application engineer carefully read Sections 2 thru 6 before producing the application's wiring plan drawings and filling out the Setpoint Record Sheet. Installation teams should carefully read all of Section 4 **before** starting final installation. Maintenance personnel should be familiar with Section 7 before attempting to service the IQ Data Plus II.

1.4 Level of Repair — This manual is written with the assumption that only unit-level troubleshooting will be performed. If the cause of malfunction is traced to an IQ Data Plus II, the unit should be replaced with a spare. The malfunctioning unit should then be returned to Westinghouse for factory repairs.

Table 1.A

IQ DATA PLUS II FEATURES AND BENEFITS

Feature	Benefit
• Microprocessor-based control	• Reliable service without the need for numerous external measuring instruments
• All 15 values metered available in each IQ Data Plus II	• Allows for widespread standardization of units regardless of specific metering and control application requirements
• Undesired values/functions may be disabled	• No extra cost for unused features • In-field removal/activation of protection functions
• Only two models – both monitor over a wide range of 3-phase AC line voltages	• Low inventory of spares possible • Quick, inexpensive interchangeability during maintenance • In many cases eliminates external potential transformers
• Nonvolatile memory	• No lost programs or special backup batteries • Setpoints and current values retained on trip/alarm or power loss
• Simplified setpoint entry • Simplified Operator Panel	• No special language to be learned • No elaborate, complex keyboard or confusing, multi-function readings
• Large 6-digit Display Window	• Easy-to-read values and clear indication of cause of trip/alarm conditions
• Ease of startup	• Quick assembly and installation • Simple setpoint entry
• Separate auxiliary trip and alarm relay contacts	• Allow control of external devices or loads when setpoint thresholds are exceeded

Table 1.B

COMMUNICATION ARRANGEMENTS

Feature	Benefit
• Communication to an IBM PC (or clone) personal computer. This computer acts as the master and can also be used as the interface to other microprocessor-based devices.	• A Local Area Network, Westinghouse INCOM, is formed by 2 or more IQ Data Plus IIs connecting to a personal computer via a shared twisted pair of wires. The personal computer acts as a master. In this arrangement the PONI Communication Module is mounted on each IQ Data Plus II. A CONI Communication Card is used in an expansion slot of the personal computer. A standardized software package is available for data collection and storage.
• Communications via RS232C to other microprocessor-based products or phone modems.	• Using INCOM, 2 or more IQ Data Plus IIs (or other IQ products), each with a PONI Communication Module, can be connected to the two wire network to transmit data to a single Translator Module. This module converts INCOM formatted messages to RS232C for use with other RS232C compatible devices. No software is provided in this case.

Section 2

HARDWARE DESCRIPTION

2.0 General — The purpose of this Section is to familiarize the reader with the IQ Data Plus II hardware, its nomenclature, and to list the specifications of the unit.

2.1 Hardware Description — The IQ Data Plus II is designed to be mounted through a cutout in a panel. (This will generally be a cabinet's face or door.)

The description here is divided into the following:

- Operator Panel (Par. 2.1.1)
- Rear access area (Par. 2.1.2)
- External hardware (Par. 2.1.3)

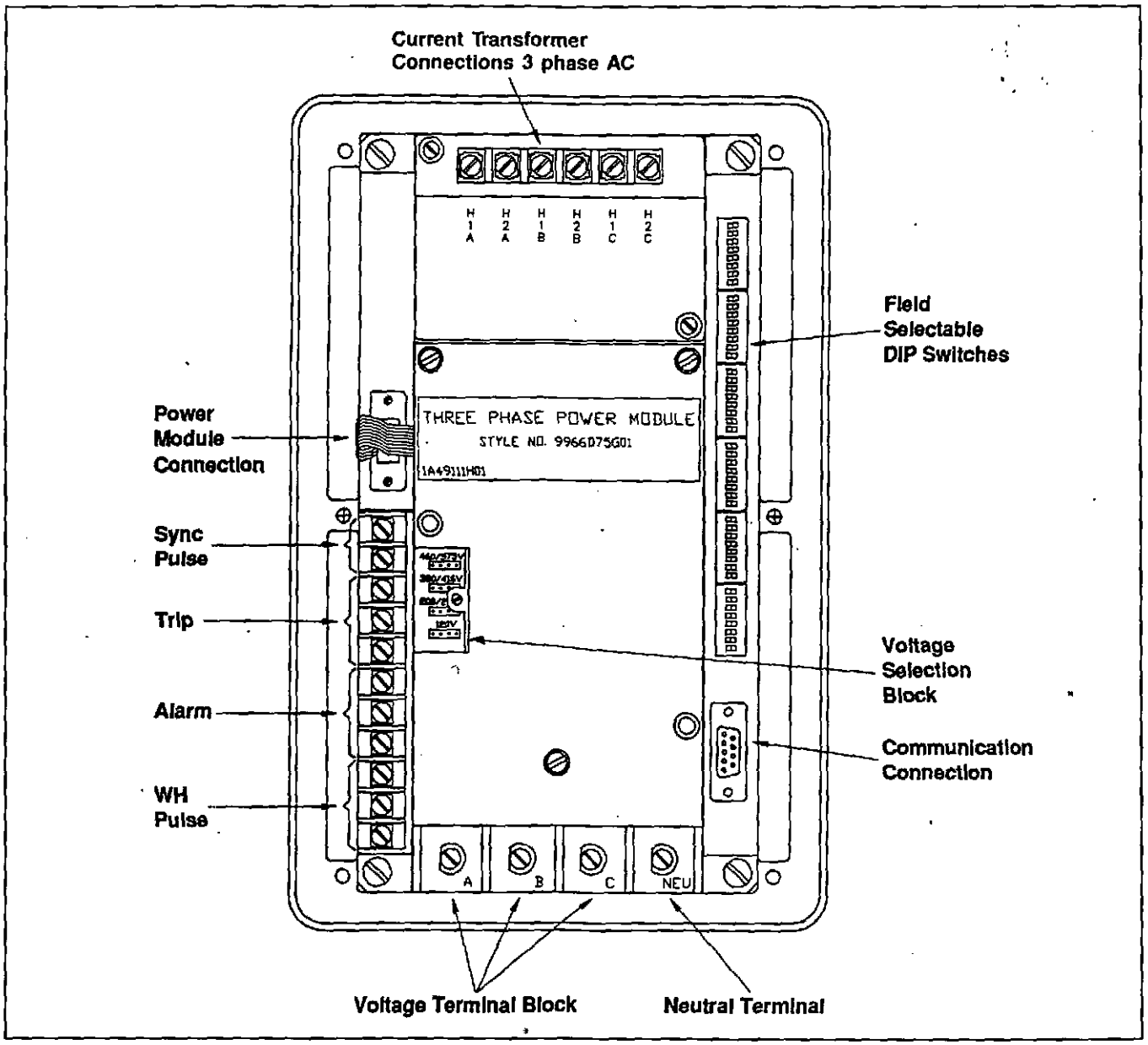

Figure 2.1A — Rear Access Area

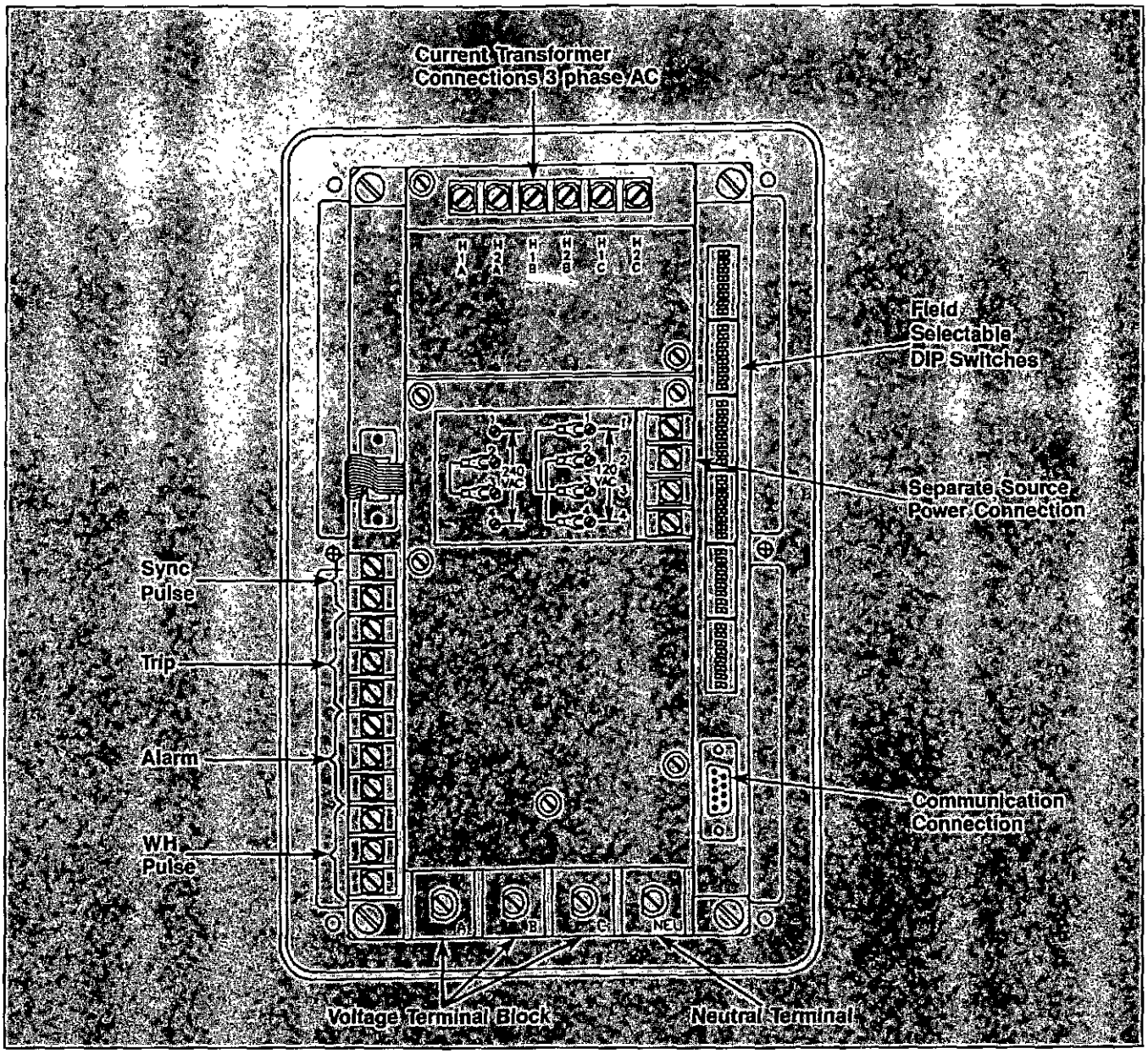

Figure 2.1B — Rear Access Area — Separate Source Power Module

2.1.1 Operator Panel — The Operator Panel, which is normally accessible from the outside of the panel or door, provides a means to:

- Monitor the actual metered values on the Display Window. (See Figure 3.1)
- Determine which metered value is being displayed by means of an illuminated LED located at the left of the monitor menu
- Step through the menu of metered items and actual values
- Determine that a trip or alarm condition exists by means of 2 distinct LEDs
- Determine the cause of a trip or alarm condition by means of a single-digit code shown in the Display Window. (The description of each code number is printed on the bottom of the Operator Panel.)
- Attempt to reset the unit after a trip or alarm condition has occurred by means of a Reset pushbutton

The use of the Operator Panel is detailed in Section 3.

2.1.2 Rear Access Area — The rear of the IQ Data Plus II is normally accessible from the rear of the panel's door. All wiring connections to the unit are made at the chassis' rear.

Study Figure 2.1 and note the following items:

Shaded area designates information that replaces or supplements applications using the 120/240 VAC Separate Source Power Supply Module.

1. The 3-phase AC line connections connect to the Voltage Terminal Block at the bottom of the IQ Data Plus II.
2. If using a three-phase power module, the Voltage Selector Jumper, essentially a shorting bar, must be positioned by the user during installation to match 1 of 4 operating voltage ranges. (Installation procedures, along with a listing of ranges, are given in Paragraph 4.1.4.) See Figure 2.1A.
3. The appropriate wiring configuration for 120 or 240 VAC operation is shown on the wiring label attached to the rear of the chassis. This is also shown in Figure 2.1B. For 120 VAC operation, jumpers must be installed from terminals 1 to 3 and 2 to 4. For 240 VAC operation, a jumper must be installed from terminals 2 to 3. The appropriate voltage should be applied across terminals 1 and 4. This will supply control power to the IQ Data Plus II independent of the AC line voltage being monitored. See Figure 2.1B.
4. Connections from the 3 required external current transformers are made at the Current Transformer Terminal Block located at the top of the chassis.
5. Connections with controlled, external devices, if used, are made at the Trip/Alarm Terminal Block.

   Trip and alarm relays energize on device power-up and de-energize on device power loss or trip condition. Terminal block label is in Trip/De-energized position. (These connections may be made at the NO or NC pairs (Form C) associated with the internal Trip and Alarm Relays.)
6. DIP switches, located on the rear right side of the chassis, tailor each IQ Data Plus II to a specific application. These DIP switches are set according to characteristics such as:
   - The external PT and CT ratios
   - The input voltage of the incoming AC line
   - Whether to trip on overvoltage or undervoltage conditions

   (A complete description of each DIP switch setting is listed in Section 6.)
7. The Power Module is factory-shipped mounted on the rear of the IQ Data Plus II chassis. However, this component may be detached from the chassis and moved up to 36 inches (91.44 cm) away if local codes prevent AC power devices being located on the cabinet door.
8. A fuse is located in series with each of the 3 incoming AC lines. The fuses are 3/4 Amp, 600 Volt, 200kA interrupting rating. These fuses are internal to the Power Module and can be accessed by removing the three screws holding the cover in place. (See Figures 2.1 and 2.3.) If it is necessary to replace fuses, make sure all voltage has been removed from the IQ Data Plus II before replacing the fuses.
9. A neutral Terminal is provided for 4-wire systems. (Where the monitored AC lines are a 3-wire configuration, this terminal is not to be wired.)
10. A Communication Port, located on the lower right of the

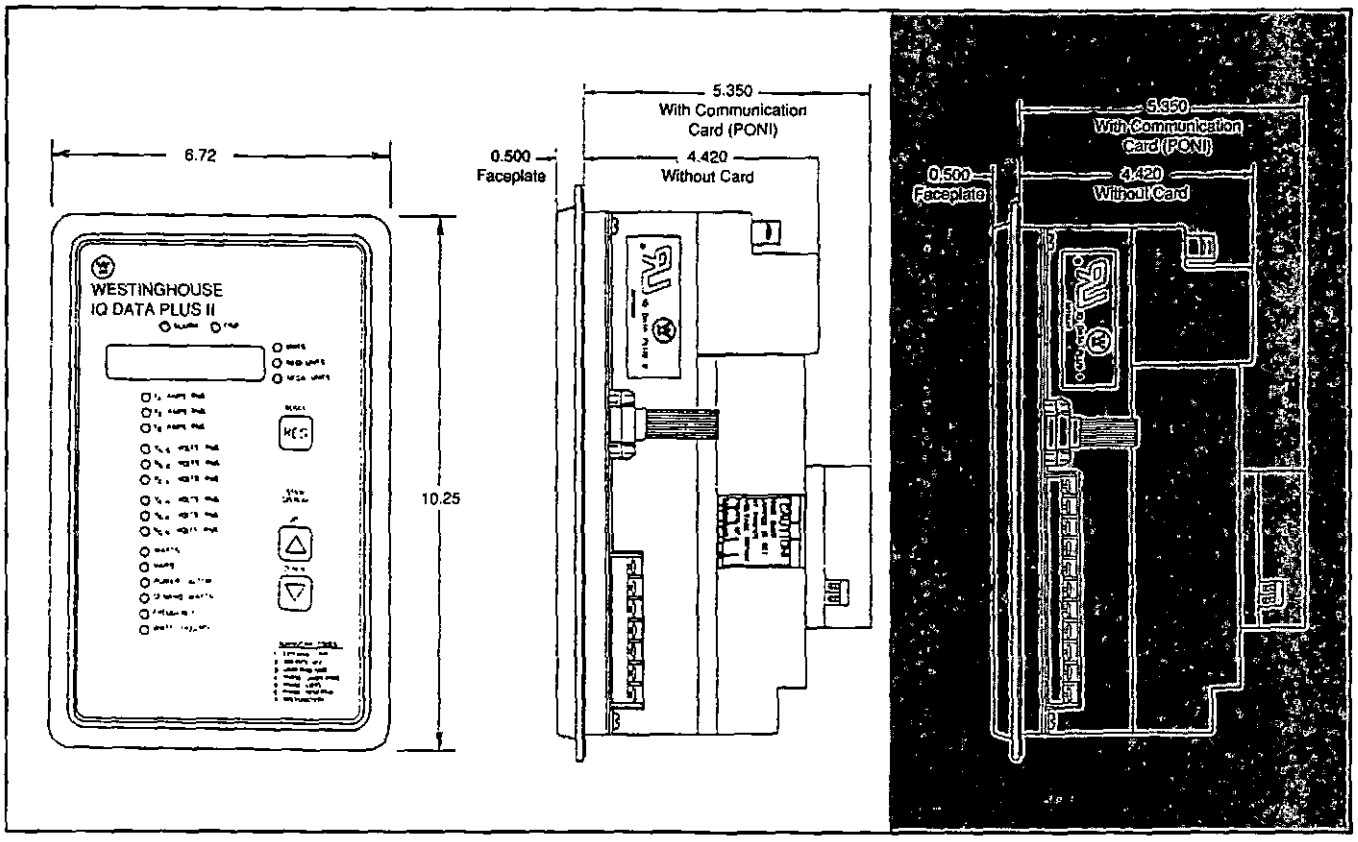

Figure 2.2 — Dimensions

Shaded area designates information that replaces or supplements applications using the 120/240 VAC Separate Source Power

chassis, is designed to connect with an optional Communication Module (PONI Card).

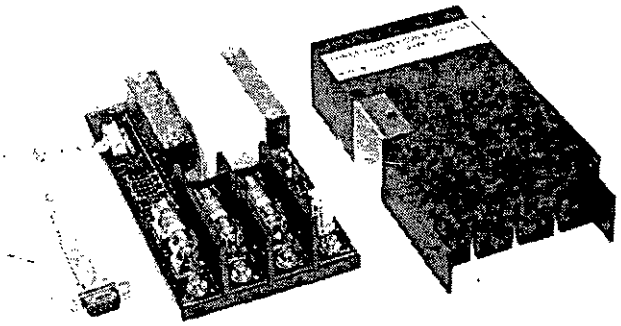

Figure 2.3A — Fusing
For Three-Phase Power Module

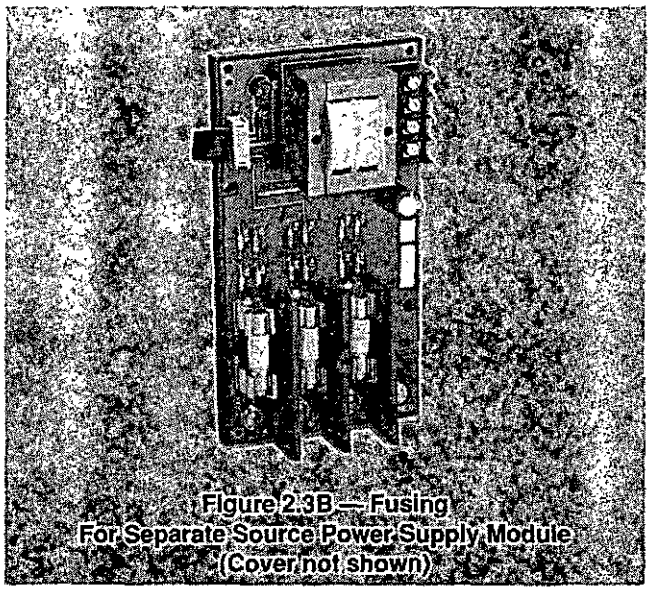

Figure 2.3B — Fusing
For Separate Source Power Supply Module
(Cover not shown)

2.1.2.1 SYNC PULSE — *The SYNC PULSE input is essentially a sensor that receives a signal from a utility company, synchronizing the IQ Data Plus II with the demand window the utility billing is based on.* The SYNC PULSE is activated by means of a DIP switch on the back of the IQ Data Plus II. See Table 6.H, page 33. **When the DIP switch for the SYNC PULSE is set, the demand time (5, 10, 15 or 30 minutes) is overridden** and the unit looks for a 24 volt DC signal to be passed from Contact 1 and received by Contact 2. When an exterior contact is closed by the utility and the contact 1-2 circuit is completed, it ends the last demand period, updates the displayed value, and begins the new period in line with the utility. The IQ Data Plus II will keep its demand window precisely in line with the utility when this function is activated.

2.1.2.2 Watthour Pulse — The Watthour Pulse Initiator is a Form C contact that when activated will complete a circuit and send a pulse signal to an external pulse recorder. The length between pulses is programmed using DIP switches. (See Table 6.M.) The pulse duration is approximately 150 ms.

2.1.3 External Hardware — Each IQ Data Plus II requires at least 2 current transformers be wired into the CT Terminal Block from an external location. (See Figures 4.4A-4.4L.) These are user-supplied and must have a 5 ampere secondary.

Potential Transformers are required when line voltage is above 600 volts. These are wired directly to the AC Line Connection Terminals. (See Figures 4.4B, 4.4D, 4.4F, 4.4H, 4.4J, 4.4L.)

2.2 Specifications — The following specifications of the IQ Data Plus II are contained here:

- General specifications (Table 2.A)
- Metering specifications (Table 2.B)
- Protection function specifications (Table 2.C)

Each of the protection functions can be individually DIP switch selected to initiate either a trip, alarm, trip and alarm, or neither trip nor alarm condition. A short description of each of the protection functions follows:

- **Phase loss protection.** A voltage phase loss is detected when the amplitude of any single phase is less than 50% of the nominal amplitude. A current phase loss is detected when the current amplitude of the smallest phase is $1/16$ the current amplitude of the largest phase.
- **Phase unbalance.** A phase voltage unbalance is detected when the difference of the largest and smallest line to line voltages exceeds the percentage of nominal line voltage by a factor of 5, 10, 15, 20, 25, 30, 35, or 40%. (The % factor is determined by DIP switches.)
- **Phase reversal.** A phase reversal is detected if a negative voltage phase sequence is detected.
- **Overvoltage.** An overvoltage is detected when the amplitude of the AC line voltage exceeds 105, 110, 115, 120, 125, 130, 135, or 140% of the nominal line voltage. (The % factor is determined by DIP switches.)
- **Undervoltage.** An undervoltage is detected when the amplitude of the AC line voltage falls below 95, 90, 85, 80, 75, 70, 65, or 60% of the nominal line voltage. (The % factor is determined by DIP switches.)

All protection functions are updated every 1.4 seconds with a 60 Hz line, or every 1.5 seconds with a 50 Hz line.

Shaded area designates information that replaces or supplements applications using the 120/240 VAC Separate Source Power Supply Module.

Table 2.A

GENERAL SPECIFICATIONS

Device's Power Requirement[1]

PT Burden (3-Phase Power Module) 10 VA
PT Burden (Separate Source Power Module) 0.02 VA
C.T. Burden 0.003 VA

Frequency

50/60 Hz[2]

Line Characteristics

- Nominal Line ± 20%
- Will continue to operate in event of a phase loss

Operating Temperature

0° to 70°C (32° to 158°F)

Storage Temperature

−20° to 85°C (−4° to 185°F)

Humidity

0 to 95% R.H. noncondensing

Fuses

(Supplied with the unit) 3/4 ampere, 600 volts
Buss Type KTK-R-3/4 (3 required)

Trip/Alarm/WH Contact Ratings

10 amperes @ 120/240 VAC (Resistive)
10 amperes @ 30 VDC (Resistive)

(1) For the IQ Data Plus II with a Three Phase Power Module, control power is drawn from the monitored incoming AC Line Terminal connections. The minimum input control voltage is 90 VAC.

(2) DIP switch must be set for the correct incoming frequency.

Table 2.B

METERING SPECIFICATIONS[1]

Item	Description	Accuracy in % of Reading
AC amperes[2] [3]	Phase A, B, C	±1%
Voltage	Line A-to-B, B-to-C, and C-to-A	±1%
Voltage	Line A-to-neutral, B-to-neutral, and C-to-neutral	±1%
Watts	Instantaneous watts collected and displayed each second	±2%
Vars	Reactive power	±2%
Power factor	$W/\sqrt{W^2+Q^2}$ for sinusoidal loads	±4%
Alt. power factor	$W/(V I\sqrt{3})$ for non-sinusoidal loads, and very light loads	±4%
Demand watts	Average watts occurring over a specified period. The period defined by DIP switch settings can be 5, 10, 15 or 30 minutes. The DIP switches can be disabled by using the Sync Pulse.	±2%
Frequency	Line frequency is displayed as a number and 2 decimal places (XX.XX). This is updated every 10 seconds.	±0.5%
Watthours		±2%
Pulse initiator	Settable WH, KWH or MWH intervals	

(1) Updated every 1.4 seconds with a 60 Hz line, or 1.5 seconds with a 50 Hz line, unless otherwise noted.
(2) At 2% of the CT ratio the unit will zero the current.
(3) Above 20% of the CT ratio the unit will meet accuracy.

Table 2.C

PROTECTION FUNCTION SPECIFICATIONS(1)

Voltage Phase Loss
Any phase less than 50% of nominal
Current Phase Loss
Smallest phase less than 1/16 of largest phase
Phase Unbalance(2)
Line voltage ± nominal in ranges from 5 to 40%
***Phase Reversal*(3)**
Absolute monitoring
Overvoltage
Range = 105 to 140%(2)
Undervoltage
Range = 95 to 60%(2)
Overvoltage/Undervoltage/Phase Unbalance/Delay
Range = 0 to 8 seconds(4)

(1) All protection functions updated approximately once per second except current phase loss which is updated twice per second.

(2) DIP switch selectable in 5% increments.

(3) See the description of Paragraph 2.2.

(4) DIP switch selectable in 1-second increments. Note: the trip delay setting is the same for all three protective functions: overvoltage, undervoltage, and phase unbalance.

Section 3

OPERATOR PANEL

3.0 Introduction — This Section describes the operation of the IQ Data Plus II. It is divided into the following Sections:

- Pushbutton (Par. 3.1)
- LEDs (Par. 3.2)
- Display Window (Par. 3.3)

3.1 Membrane Pushbuttons — The Operator Panel supports 3 membrane pushbuttons. (See Figure 3.1.) The membrane pushbuttons perform the following functions:

- **Reset.** The Reset pushbutton allows resetting from an alarm or trip condition, assuming the cause of the condition is corrected. (If the condition which caused the alarm or trip is still present, the alarm or trip occurs again after the pushbutton is pressed.)
- **Step Display: Up/Down.** The Step Display: Up/Down pushbuttons are used to step through the 15 monitored items listed on the monitor menu shown on the Operator Panel's face. Each time one of these pushbuttons is pressed, the LED at the left of the newly selected monitored item is illuminated. At the same time the current operating value corresponding to that item is shown in the Display Window.

  For example, while the Watts LED is illuminated, the Step Display, Down pushbutton is pressed once. Immediately the LED next to VARS lights, and a new value is shown in the Display Window.

  If the Step Display, Down pushbutton is pressed and held, the 15 monitored items are continuously stepped through.

  Table 3.A (page 14) contains a description of each of the 15 items that can be displayed.

3.2 LEDs — The Operator Panel LEDs are divided into 3 types:

3.2.1 Menu LEDs. At any given time, one of the LEDs associated with a menu item is illuminated. (See Table 3.A for a listing of these 15 items.) Each acts to identify which menu item value is currently being shown in the Display Window.

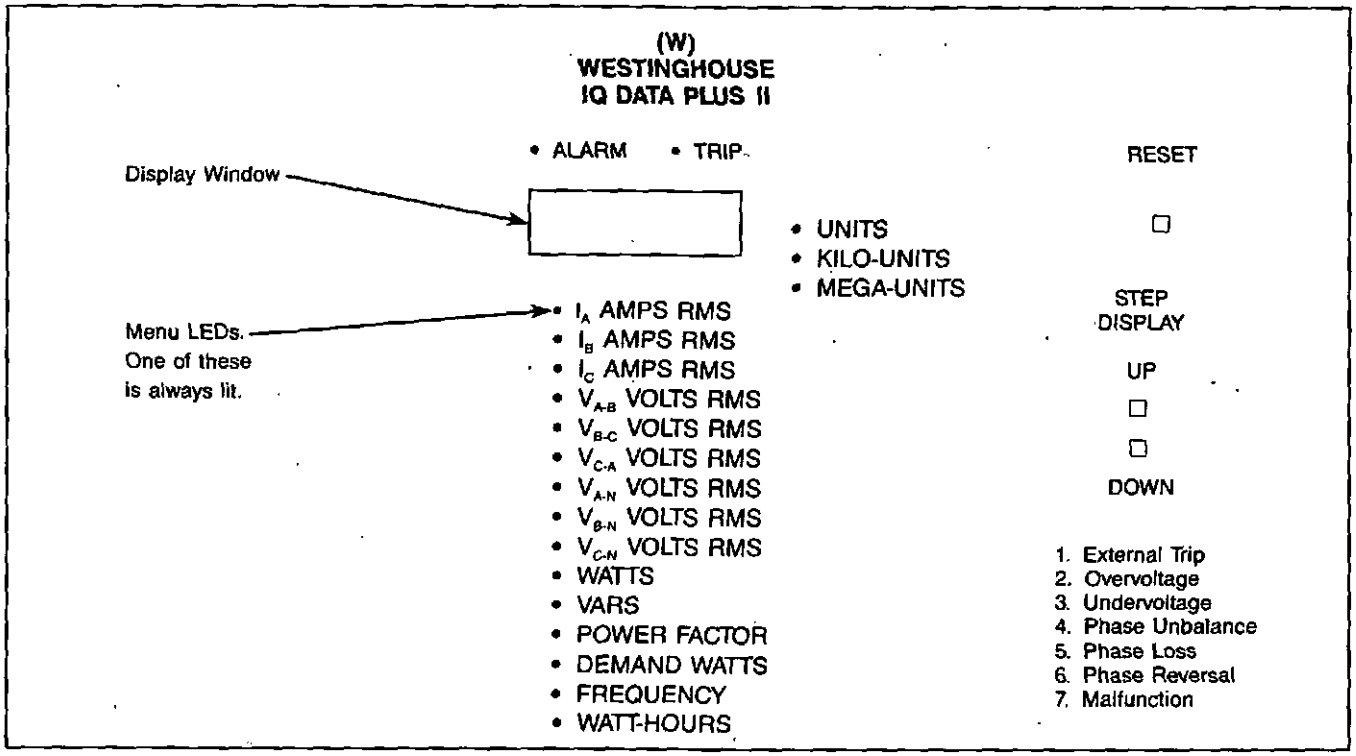

Figure 3.1 Operator Panel

Table 3.A

METERED VALUES

Selection		Display Format	Description
I_A Amps RMS I_B Amps RMS I_C Amps RMS	Amps K Amps	XXXXXX or XXX.XXX	
V_{A-B} Volts RMS	V KV	XXXXXX or XXX.XXX	Phases A-to-B
V_{B-C} Volts RMS	V KV	XXXXXX or XXX.XXX	Phases B-to-C
V_{C-A} Volts RMS	V KV	XXXXXX or XXX.XXX	Phases C-to-A
V_{A-N} Volts RMS(1)	V KV	XXXXXX or XXX.XXX	Phase A-to-neutral
V_{B-N} Volts RMS(1)	V KV	XXXXXX or XXX.XXX	Phase B-to-neutral
V_{C-N} Volts RMS(1)	V KV	XXXXXX or XXX.XXX	Phase C-to-neutral
Watts Vars Watthour Counter	KW MW KV MV KWH MWH MWH	XXXXXX XXX.XXX XXXXXX XXX.XXX XXXXXX XXX.XXX XXXX.XX	Instantaneous Watts. Sampling time = 1 second. Menu LED blinks if this is a negative value. Refer to Par. 3.2.2. Vars Menu LED blinks if the Vars are negative. Refer to Par. 3.2.1.1. Units in Watthours. Refer to Par. 3.4.
Power Factor		XX.XX	Power Factor. Menu LED blinks if the power factor is lagging. Refer to Par. 3.2.1.1.
Demand Watts	KW MW	XXXXXX XXX.XXX	Demand Watts over a 5, 10, 15, or 30 minute interval as determined by SW3 DIP switches 5 and 6 or by a Sync Pulse Input (Contacts 1 & 2).
Frequency		XX.XX	Incoming AC line frequency.

(1) These values are blanked automatically with systems which do not wire the neutral line to the Neutral Terminal of the IQ Data Plus II. The blanking occurs when position 8 of SW1 is set for the 3 wire position.

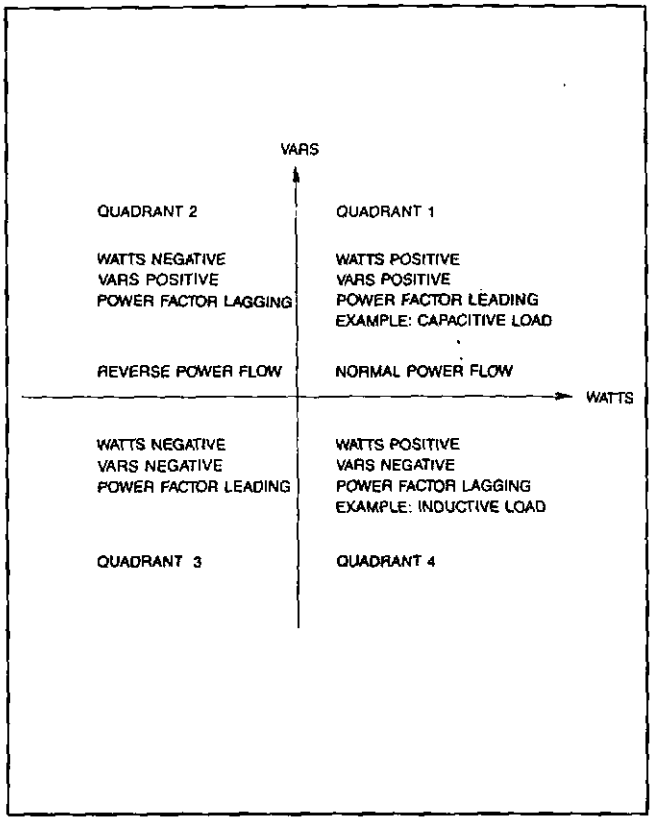

Figure 3.2 Power Quadrants

3.2.1.1 Blinking LEDs: Watts, Vars and/or Power Factor — To display reverse power flow, lagging (negative) power factor, and negative var, the menu select LED being viewed will blink. If it is not blinking the values are positive (leading). Refer to Figures 3.2, 3.3, 3.4 for a further explanation.

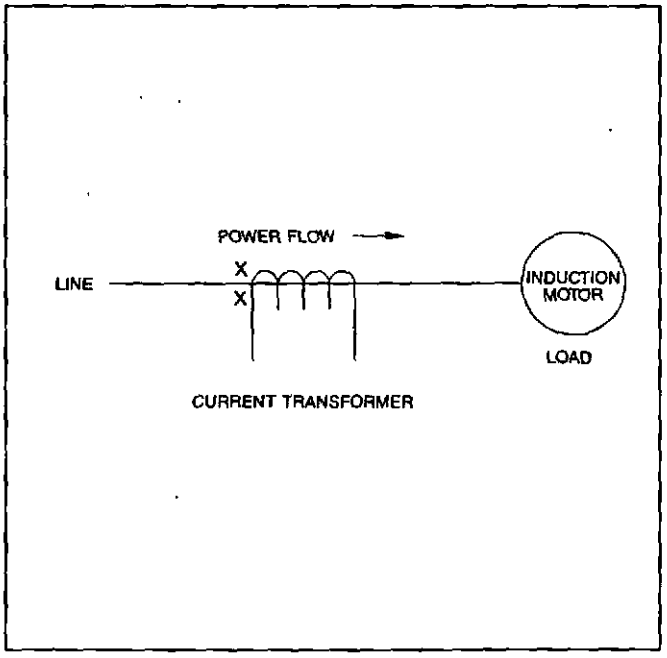

Figure 3.3 Induction Motor Load

3.2.1.2 Monitoring Inductive Loads — Typically when monitoring induction motor loads the power flow is in Quadrant 4. The watts are positive and the power factor is lagging.

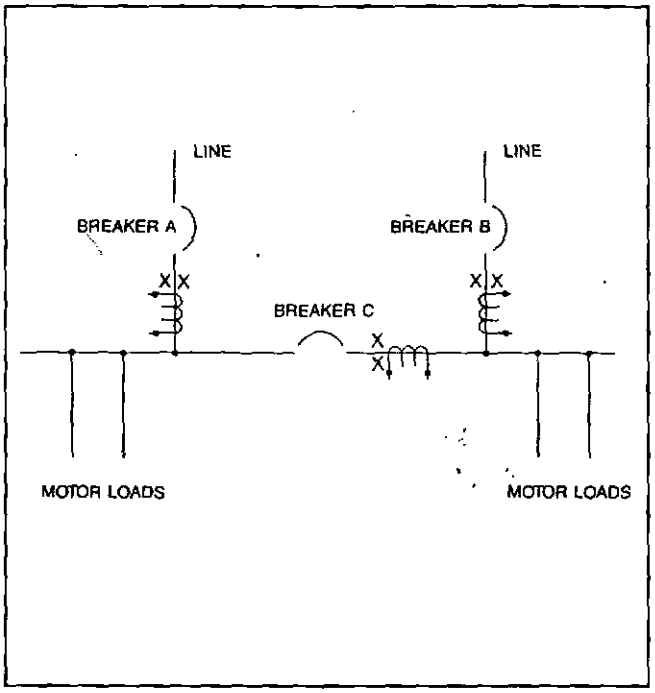

Figure 3.4 Power Distribution

Thus by definition the power factor and var will be negative and the LEDs will blink for these two values. Refer to Figure 3.3.

3.2.1.3 Power Factor Correction Capacitors — When monitoring a load that also has power factor correction capacitors and/or leading power factor synchronous motors such that the net load is capacitive, then the power flow is in Quadrant 1. In this case, none of the LEDs will blink.

3.2.1.4 Power Distribution — Referring to Figure 3.4, three conditions typically can be encountered.

Condition 1: Breaker A & B closed, Breaker C open. Power flow is in Quadrant 4. The power factor and var will be negative and their respective LEDs will blink.

Condition 2: Breaker A & C closed, Breaker B open. Power flow for Breaker A & C is in Quadrant 4. The power factor and var will be negative, and thus the LEDs will be blinking for power factor and var readings.

Condition 3: Breaker B & C closed, Breaker A open. The power flow for Breaker B is in Quadrant 4 and the metering condition is the same as condition 1 & 2. But the power flow for Breaker C is reversed and will be in Quadrant 2. Only the watts LED and power factor LED will blink.

3.2.2 Units LEDs: Auto range units for monitoring — Units, kilo, mega. Refer to Figure 3.1.

3.2.3 Alarm/Trip LEDs. The Alarm and Trip LEDs, when lit, indicate that an alarm or trip condition exists, respectively. At the same time a blinking digit, from 1 to 7, appears in the Display Window. This digit represents the specific type of alarm or trip condition that occurred. (See Table 3.B.)

Table 3.B

DISPLAY TRIP CONDITIONS

Display Window Number	Operator Panel Designation	Description
1	External trip	A trip initiated from a remote device by means of the Communication Module.
2 3 4 5 6	Overvoltage Undervoltage Phase unbalance Phase loss Phase reversal	A trip or alarm condition occurred as listed here. See Table 2.C for a description of the trip specifications. Also Section 6 describes how to set the DIP switches for the desired values.
7	Malfunction	Indicates an internal malfunction was monitored by the IQ Data Plus II microprocessor. See Section 7, Maintenance, for details.

These digits may be compared with a listing of the conditions on the bottom of the Operator Panel in order to identify the cause of the alarm or trip condition.

When an alarm condition occurs, the internal Alarm Relay is de-energized. Likewise, when a trip condition occurs, the internal Trip Relay is de-energized. (External NO/NC contact pairs, brought out from these Relays, are available to the user.)

The possible causes of the alarm and trip conditions are:

- External trip
- Undervoltage
- Overvoltage
- Phase loss
- Phase reversal
- Phase unbalance
- Malfunction

Table 3.B further describes these conditions.

The resulting overvoltage, undervoltage, phase unbalance, phase loss, and phase reversal conditions can be individually tailored to cause one of the following:

- An alarm only
- A trip only
- Both a trip and alarm
- No trip or alarm

These reactions are selected by means of DIP switches located on the rear of the unit. (Section 6, Application Considerations, lists each DIP switch setting.)

3.3 Display Window — The 6-digit LED Display Window displays one of the 15 metered values listed in Table 3.A at any given time. (See Paragraph 3.1 for details on selecting an individual value.) In addition there are 2 special situations, as listed next:

- When a trip condition occurs, the Display Window contains a blinking digit from 1 to 7. Table 3.B lists each of the conditions and supplies additional information where needed.
- An overrange occurs when a monitored value exceeds the absolute range of the 6-digit Display, at which time the value 999.999 appears on the Display. For example, the instantaneous Watts value can display up to 9999.99 megawatts. If an instantaneous value of 10500.00 megawatts is monitored, an overrange condition would exist, and the value freezes at its highest value, 9999.99.

3.4 Watthour Counter — To reset, set DIP switch **SW6 No. 4** (Table 6.Q), and hold down the reset pushbutton for 5 seconds while the Menu LED is illuminated for Watthours. The Watthour counter will not reset on a power loss.

3.5 Demand Watts — This parameter will collect and calculate the average Demand Watts over a preset time period (or by the SYNC PULSE). The IQ Data Plus II will store the highest value until the unit is reset. The reading can be reset by holding down the reset pushbutton for 5 seconds while the Menu LED is illuminated for Demand Watts. The Demand Watts will not reset on a power loss.

Section 4

INSTALLATION AND STARTUP

4.0 Introduction — This Section describes the following items associated with the installation and startup of the IQ Data Plus II:

- Mounting (Par. 4.1)
- Wiring (Par. 4.2)
- DIP switch settings (Par. 4.3)
- Initial startup (Par. 4.4)

Earlier Sections, especially Section 2, Hardware Description, should be read by anyone using this Section to install an IQ Data Plus II.

WARNING

Do not high-pot or megger this device.

4.1 Panel Preparation — This Paragraph describes the panel preparation and mounting of the IQ Data Plus II.

4.1.1 Cutout, Clearances — Since the IQ Data Plus II is typically mounted on a cabinet's door, it is necessary to prepare a cutout in which it will be placed. The dimensions for this cutout, along with the location of 6 mounting holes, are shown in Figure 4.1. Before actually cutting the panel, be sure that the required 3-dimensional clearances for the IQ Data Plus II chassis allow mounting in the desired location. (Clearances are shown in Figure 2.2.)

It is necessary to hold fairly close to tolerances when making the cutout and placing the holes for the mounting screws. In particular the horizontal dimension between the center of the mounting holes and the cutout's vertical edge must be within 0 and +0.050 in. (0.13 cm).

4.1.2 Mounting — Do not use a tap on the face since this will remove excessive plastic from the holes, resulting in less threaded material to secure the IQ Data Plus II to its mounting panel.

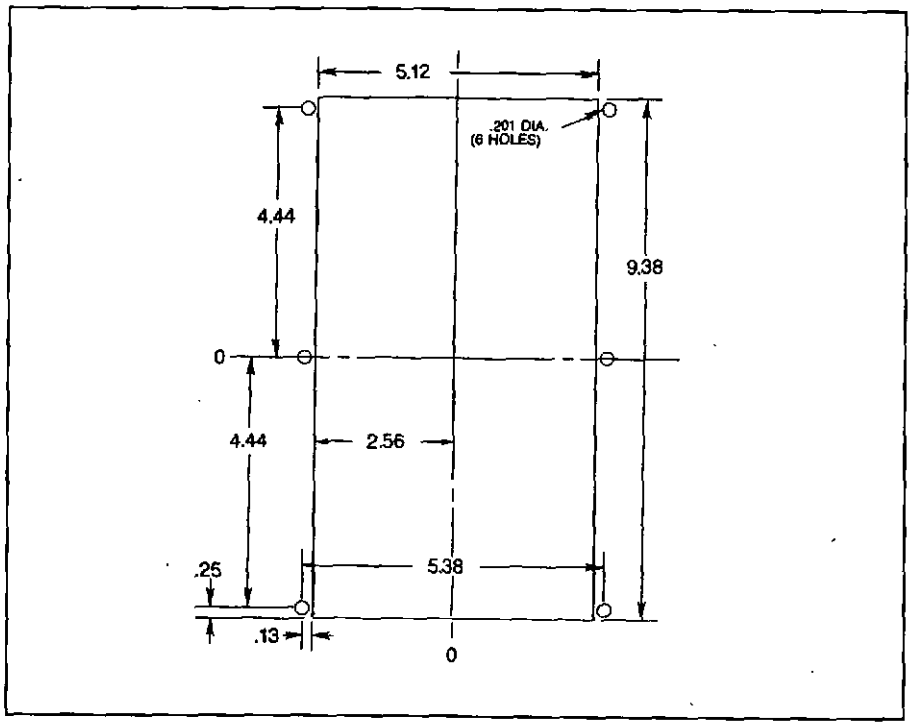

Figure 4.1 Chassis Cutout Dimensions

These dimensions must be −0 and +0.050 in.

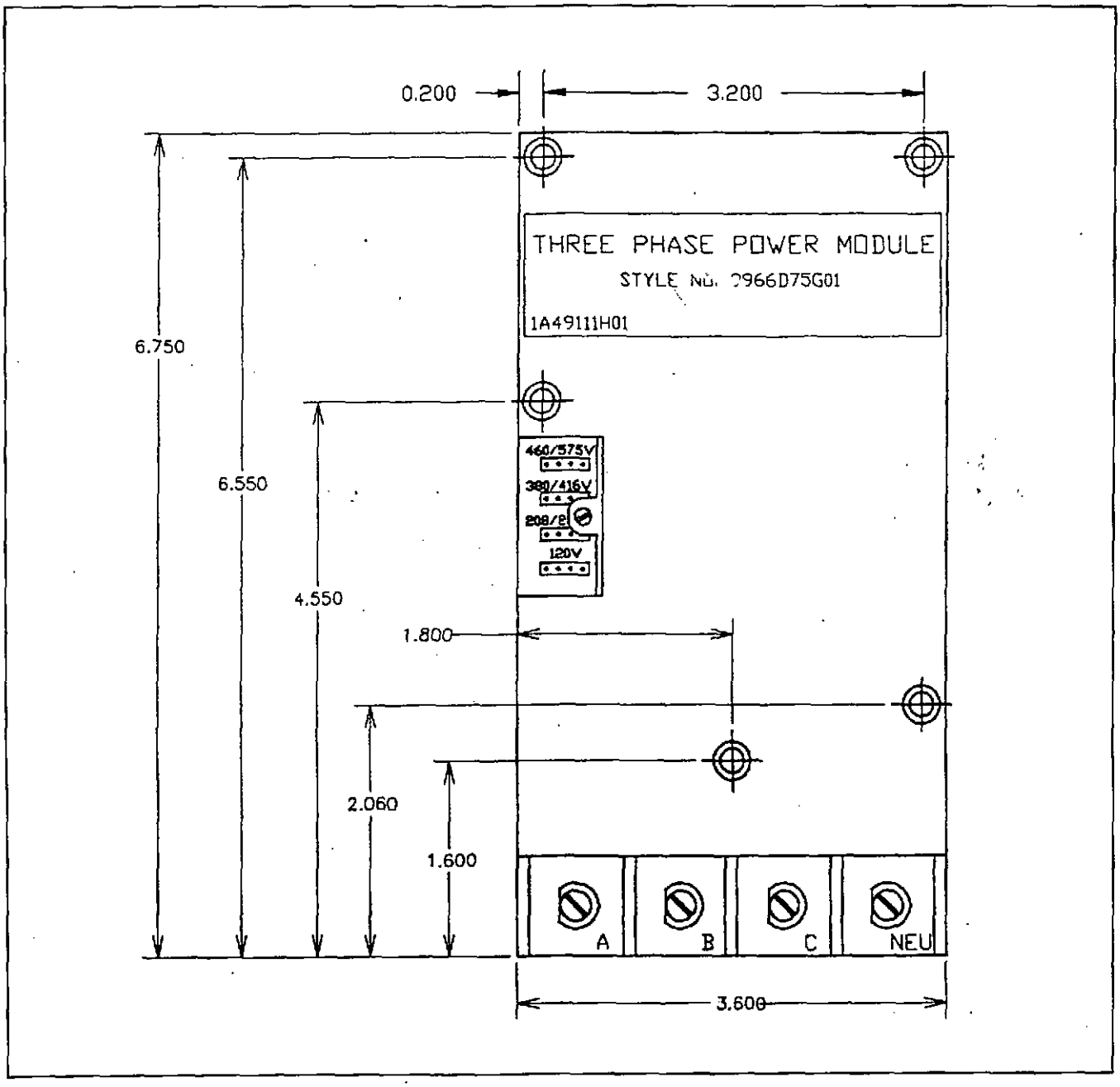

Figure 4.2A — Removable Power Module

Place the IQ Data Plus II through the cutout in the panel. Be sure the Operator Panel faces outward. Use 0.5 in. (1.2 cm) long screws (included with the Data Plus II) to mount the unit on a single-thickness panel. Be sure to start the screws from ***inside*** the panel so that they go through the metal first.

4.1.3 3-Phase Power Module and 120/240 VAC Separate Source Power Supply Module — In those cases where it is necessary to remove the Power Module and mount it separately from the chassis, be sure that:

- The location allows for a cable connection between the IQ Data Plus II chassis and Power Module by means of the 36 in. (91.4 cm) Extension Cable Option.
- The separated Power Module can physically fit in the location desired. (See clearance dimensions in Figure 4.2A or 4.2B.)

To separate the Power Module, remove the 2 mounting screws securing it, then use the Module as a drilling template at the new location. The two 8-32 screws can be used to remount the Module in holes properly drilled and tapped.

4.1.4 Voltage Selector Jumper — It is necessary to match the placement of the Voltage Selector Jumper with the incoming AC line voltage, measured line-to-line. (See Figure 4.3.)

The IQ Data Plus II with Separate Source Power Supply Module does not include a Voltage Selector Jumper. (Compare Figures 4.2B and 4.3.)

Shaded area designates information that replaces or supplements applications using the 120/240 VAC Separate Source Power

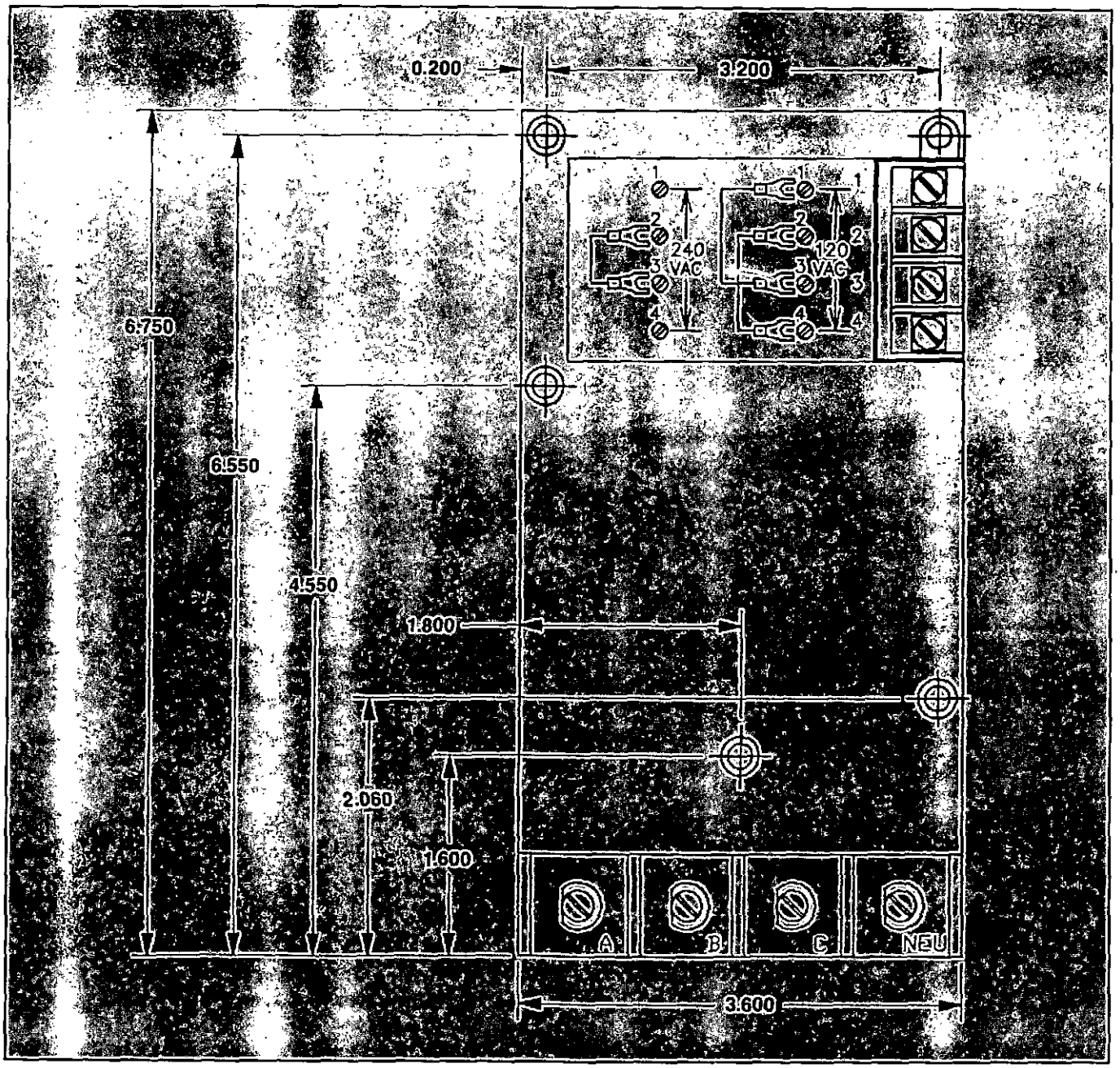

Figure 4.2B — Removable Separate Source Power Supply Module

Shaded area designates information that replaces or supplements applications using the 120/240 VAC Separate Source Power Supply Module.

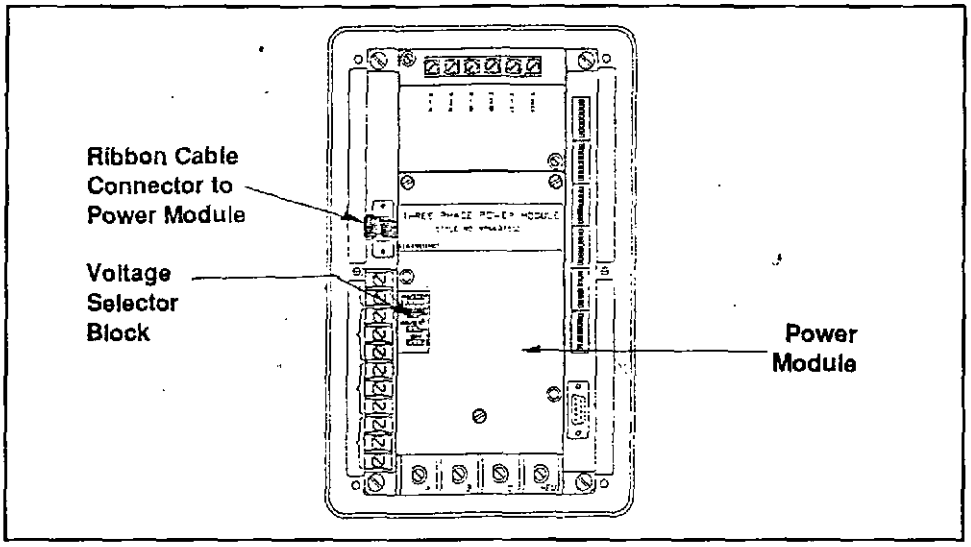

Figure 4.3 — Voltage Selector Jumper

WARNING

Never attempt to change the position of the Voltage Selector Jumper when AC line power is applied to the IQ Data Plus II. Personal injury, including death, could result.

CAUTION

The Voltage Selection Block on the Module accepts the Voltage Selector Jumper **ONLY**. *Do not connect any other* type of wires to this Terminal Block since improper operation and/or equipment damage will result.

A plastic cover with a screw is used to cover the Voltage Selector Jumper. The Jumper is positioned as determined by the monitored, nominal AC line voltage. There are 4 possible positions, which represent ranges, measured line-to-line. These are:

- 425 to 680 VAC = 460/575V
- 270 to 432 VAC = 380/416V
- 170 to 272 VAC = 208/220/240V
- 96 to 154 VAC = 120V

These ranges are indicated on the Power Module, as shown in Figure 4.3. Consult the wiring plan drawings made up by the user or OEM to determine the intended line voltage. Change the Selector Jumper to the Line Voltage when not using potential transformers. When using potential transformers with a 120 volt (or 110 volt) secondary, the Selector Jumper should be positioned for 96-154 volt range.

After repositioning the Jumper, replace the plastic cover and secure with screw.

4.2 Wiring — The wiring of the IQ Data Plus II must follow a suitable "wiring plan drawing." The term wiring plan, as used here, refers to the drawings made for the specific application. It describes all electrical connections between the IQ Data Plus II and the machine or process equipment. This is made up by the user or OEM.

A typical wiring plan is shown in Figures 4.4A thru 4.4L. Observe the Figures and note the following:

1. Phasing and polarity of the AC current inputs and the AC voltage inputs and their relationship is critical to the correct operation of the wattmeter.
2. The incoming AC line phases A, B and C wire directly to the AC Line Connection Terminals on the chassis, when line voltage is 600 volts or less.
3. NO and NC contacts from the Alarm and Trip Relays can be used to control external devices. These contacts are rated at 10 amperes for 120/240 VAC or 30 VDC.
4. The wires connecting to the IQ Data Plus II must not be larger than AWG No. 14. Larger wires will not connect properly with the various terminal blocks.
5. Wiring between the current transformers and the IQ Data Plus II should be kept as short as possible (200 feet max.). Also, whenever possible, route these lines away from other AC lines and inductive devices. If the lines must cross other AC lines, plan to cross them at right angles.
6. The protective functions of the IQ Data Plus II directly control the Trip or Alarm Relays, as described in Paragraph 2.2 and Table 2.C. DIP switch settings, listed in Paragraph 6.1, determine if and when the Trip and Alarm Relays will be energized.
7. Sync Pulse 24VDC on Terminal 1.
8. WH Pulse Initiator 10A 30VDC, 10A 120/240 VAC NO & NC.

All wiring must conform to applicable Federal, state, and local codes.

WARNING

Insure that the incoming AC power and all "foreign" power sources are turned OFF and locked out before performing any work on the IQ Data Plus II or its associated equipment. Failure to observe this practice can result in serious or even fatal injury and/or equipment damage.

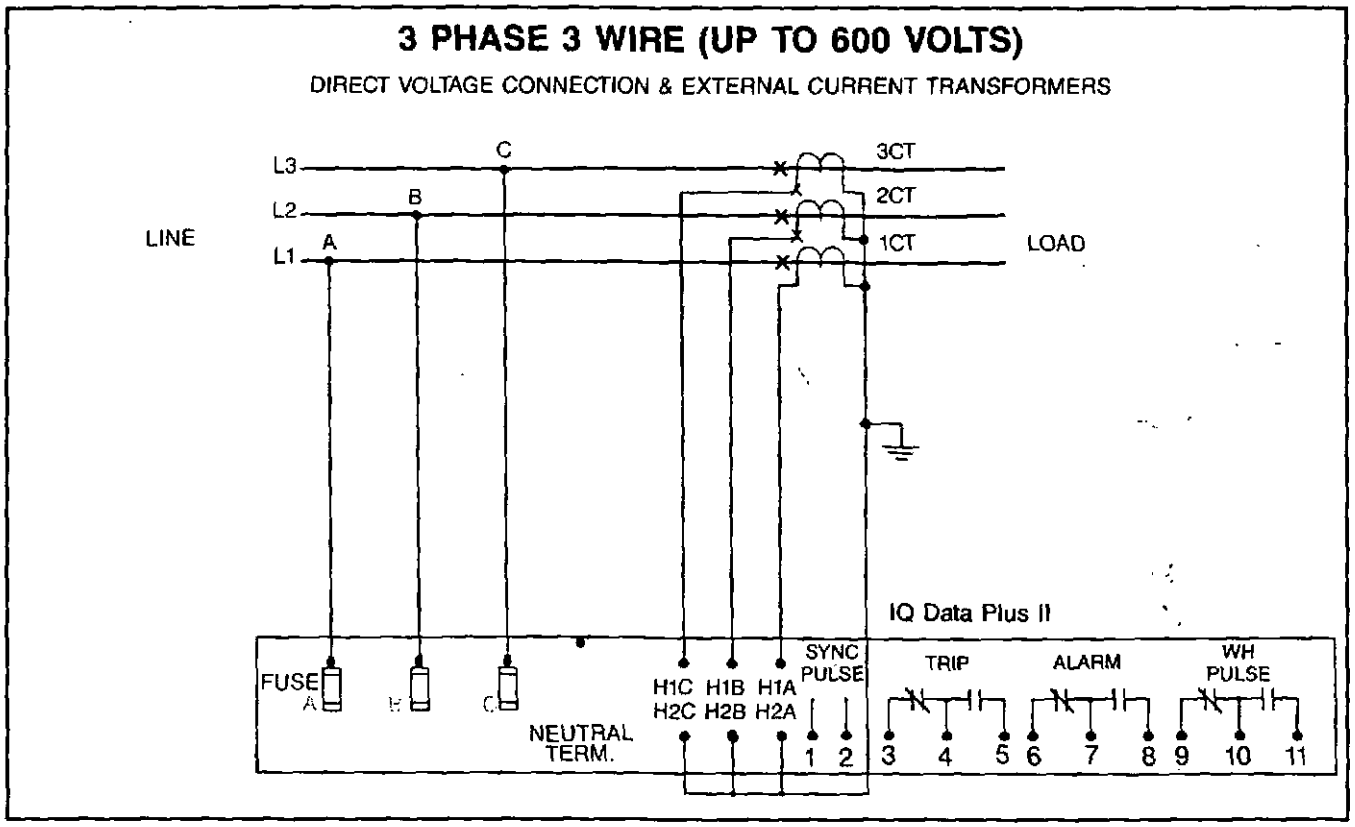

Figure 4.4A — Wiring Diagram

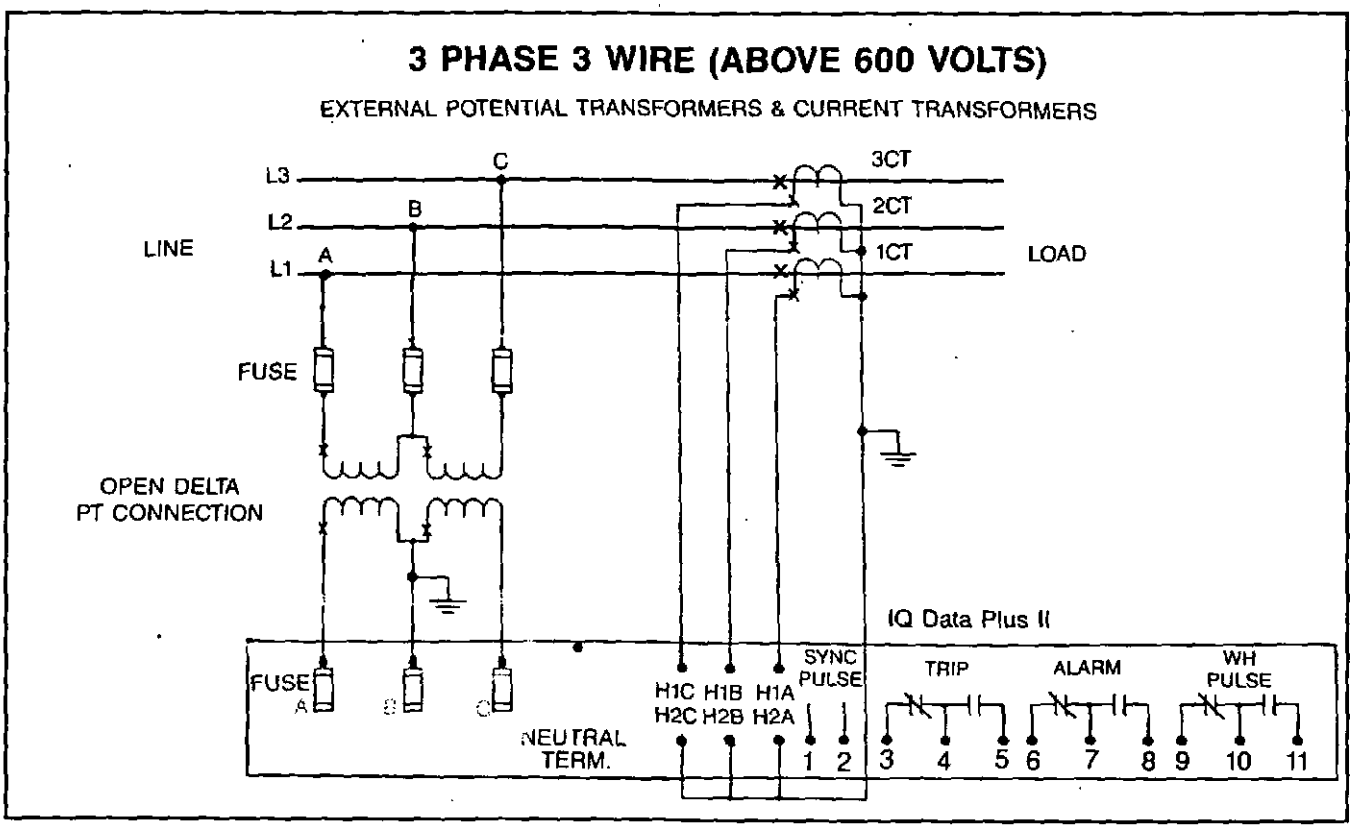

Figure 4.4B — Wiring Diagram

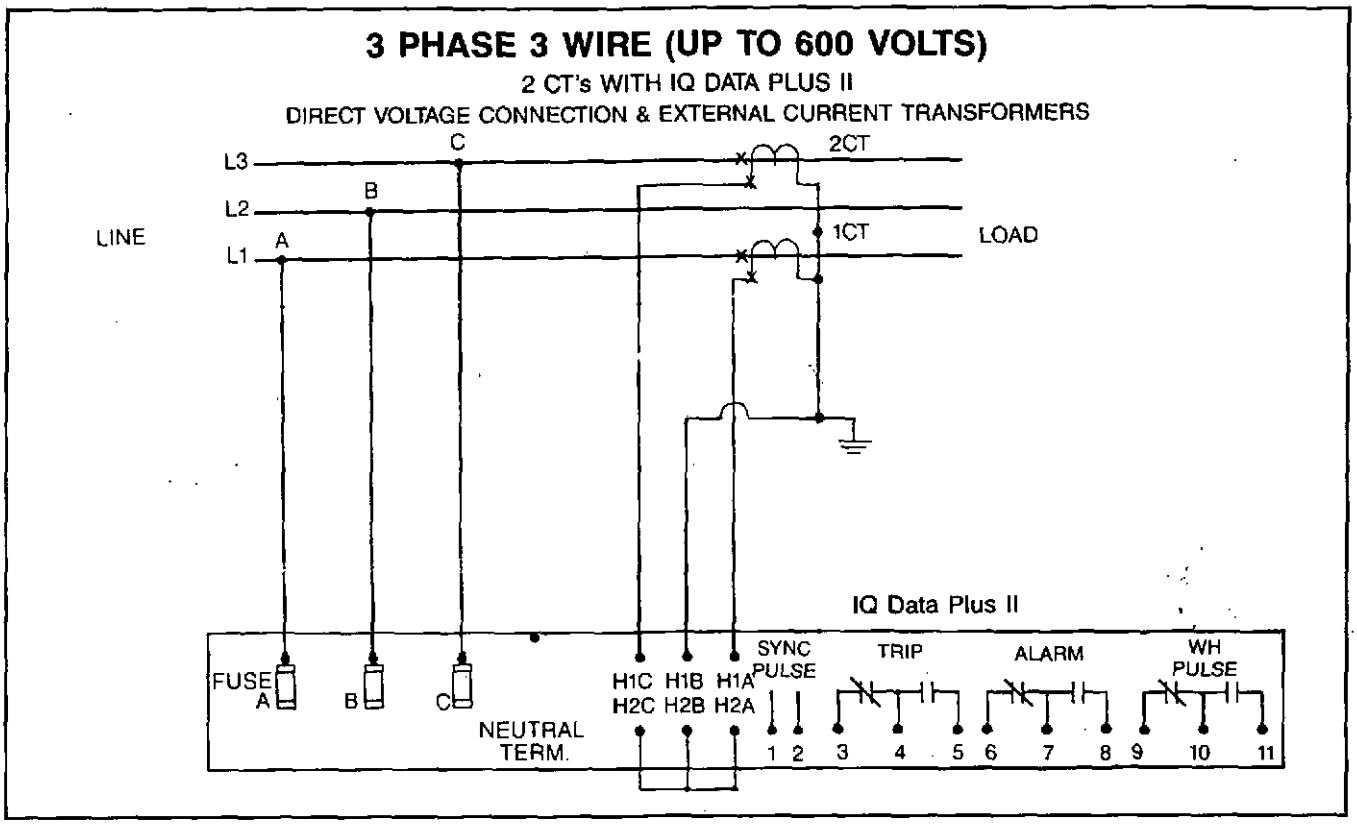

Figure 4.4C — Wiring Diagram

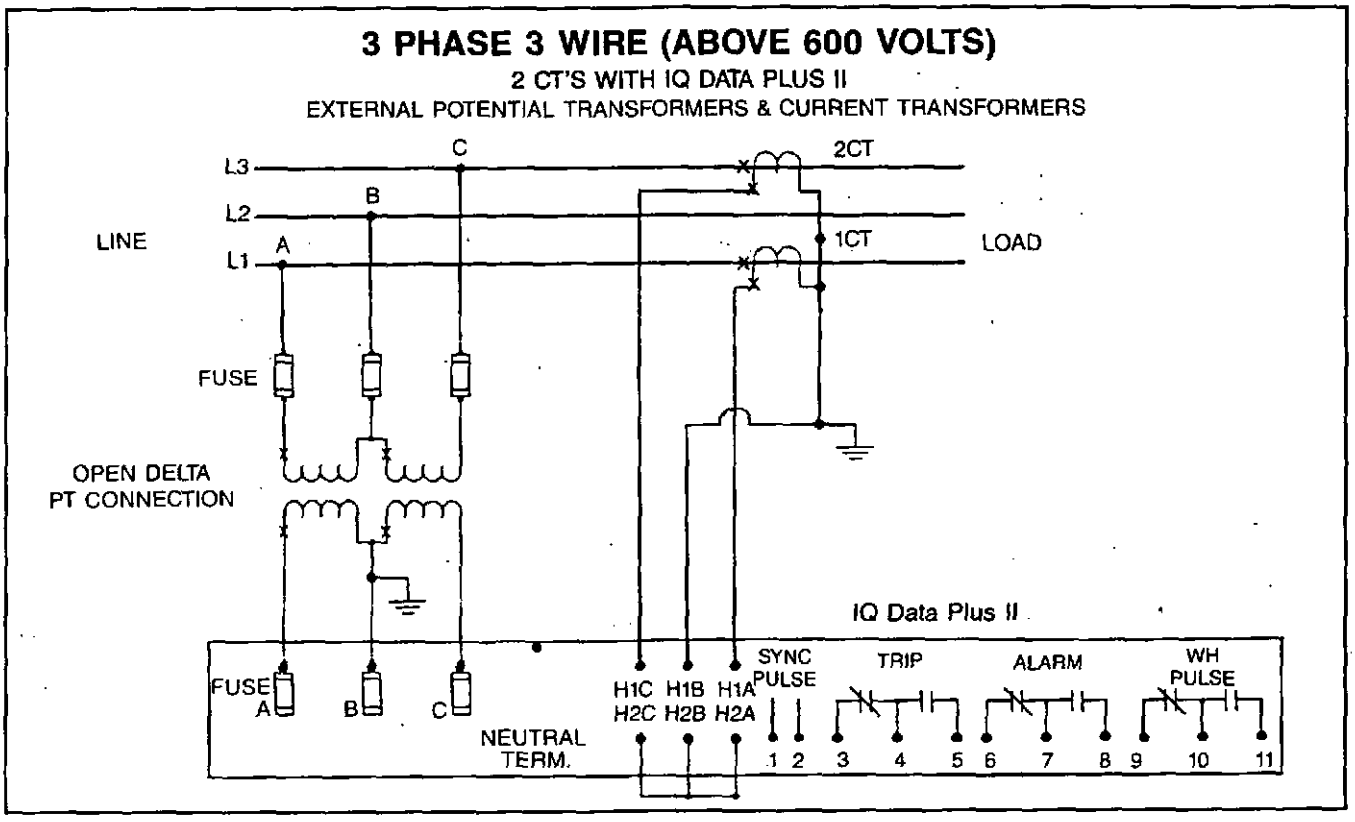

Figure 4.4D — Wiring Diagram

NOTE: This circuit will work, but will not detect a current phase loss if L2 is grounded.

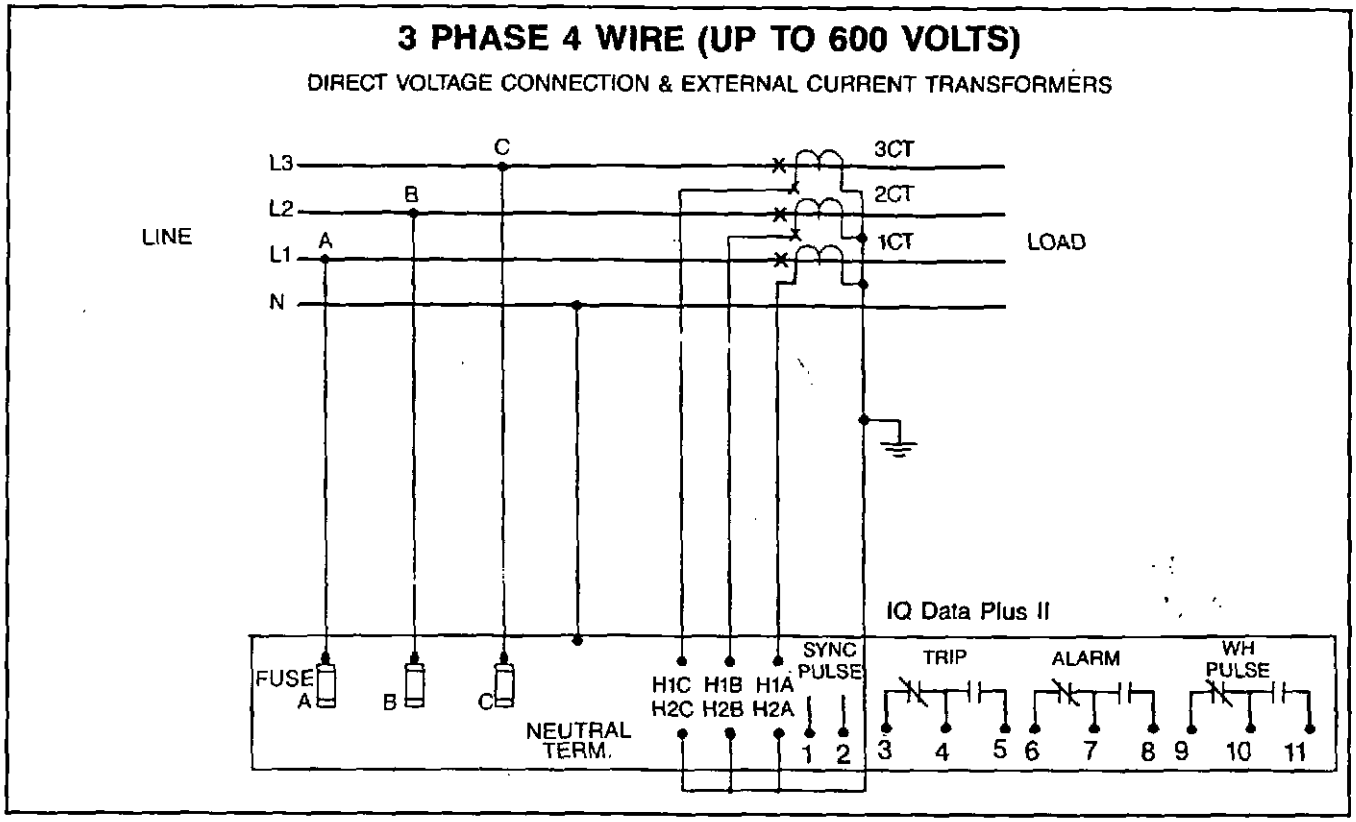

Figure 4.4E — Wiring Diagram

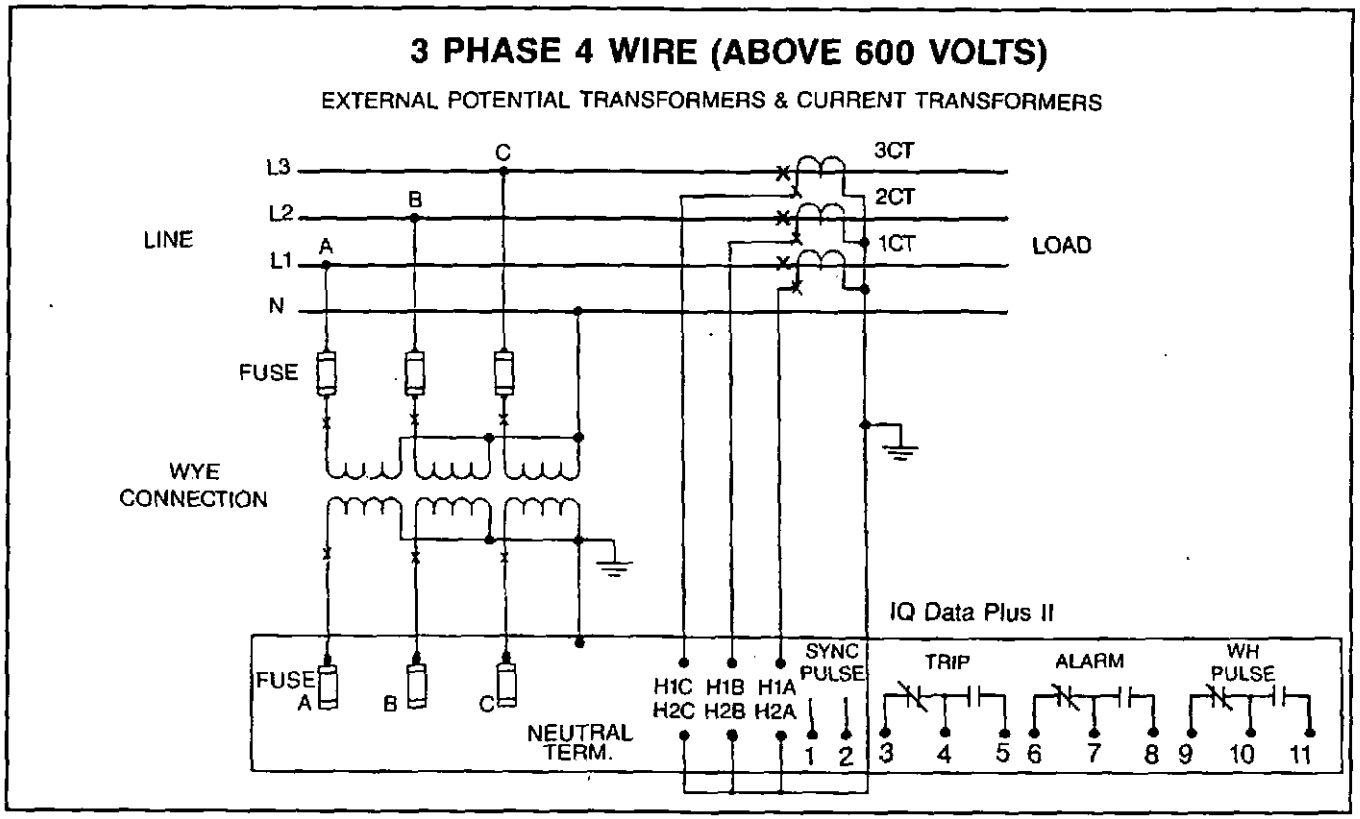

Figure 4.4F — Wiring Diagram

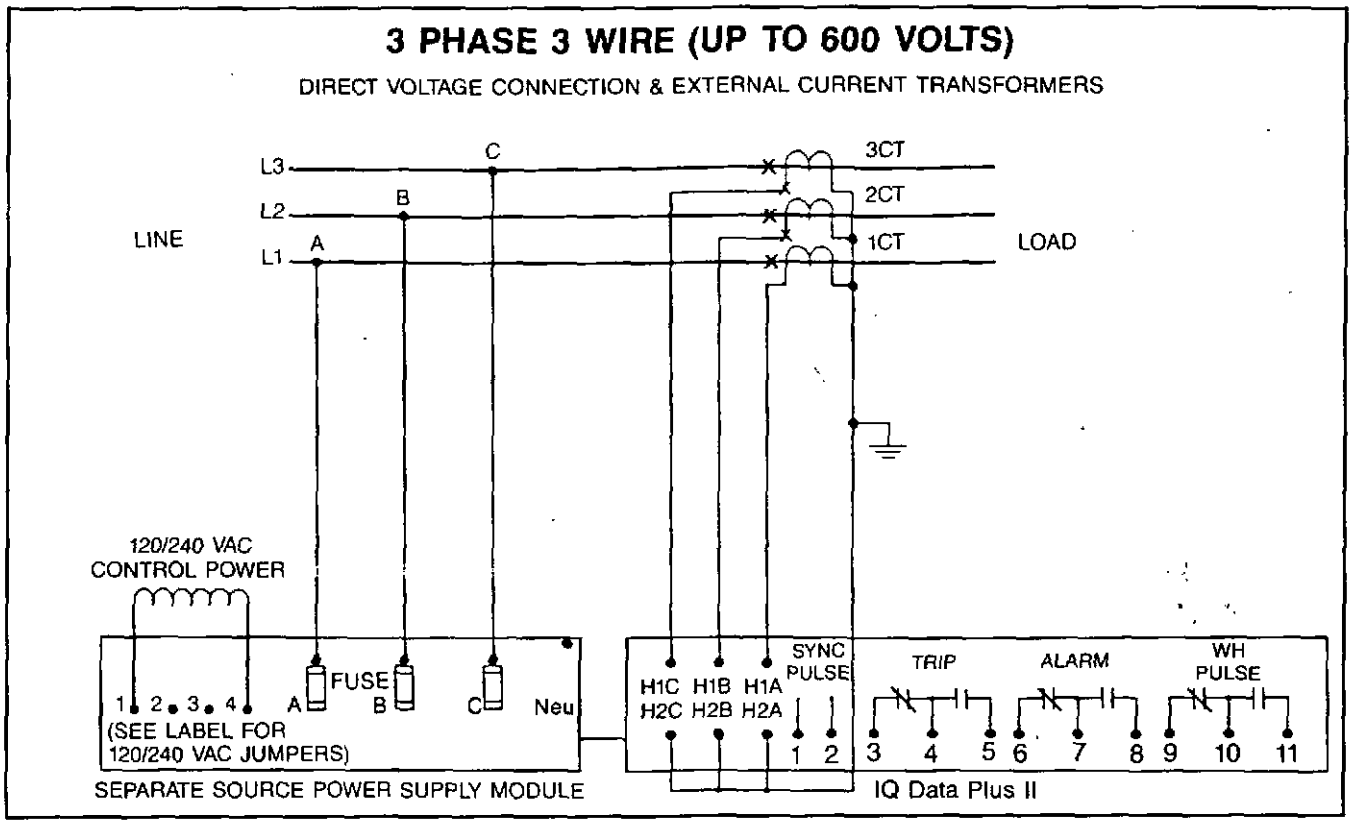

Figure 4.4G — Wiring Diagram

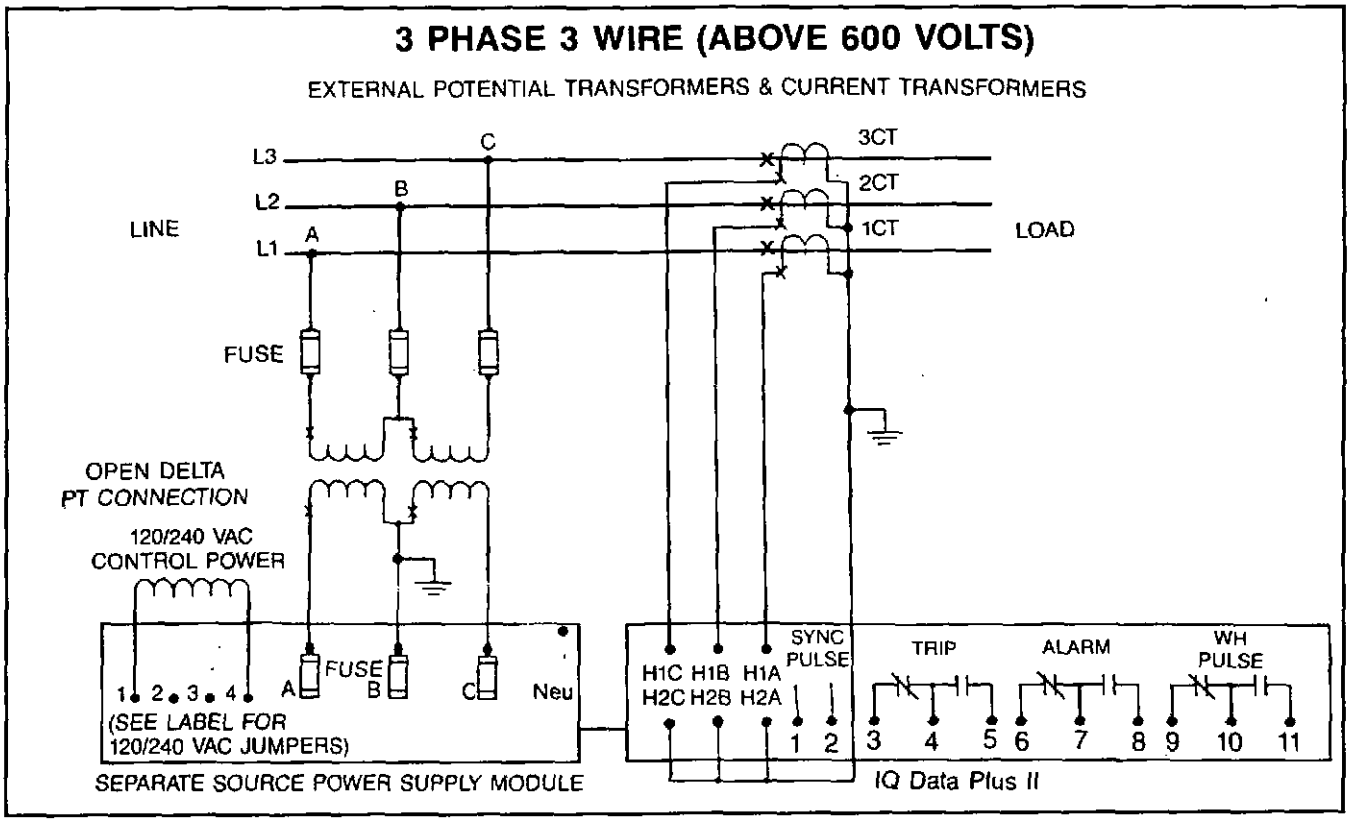

Figure 4.4H — Wiring Diagram

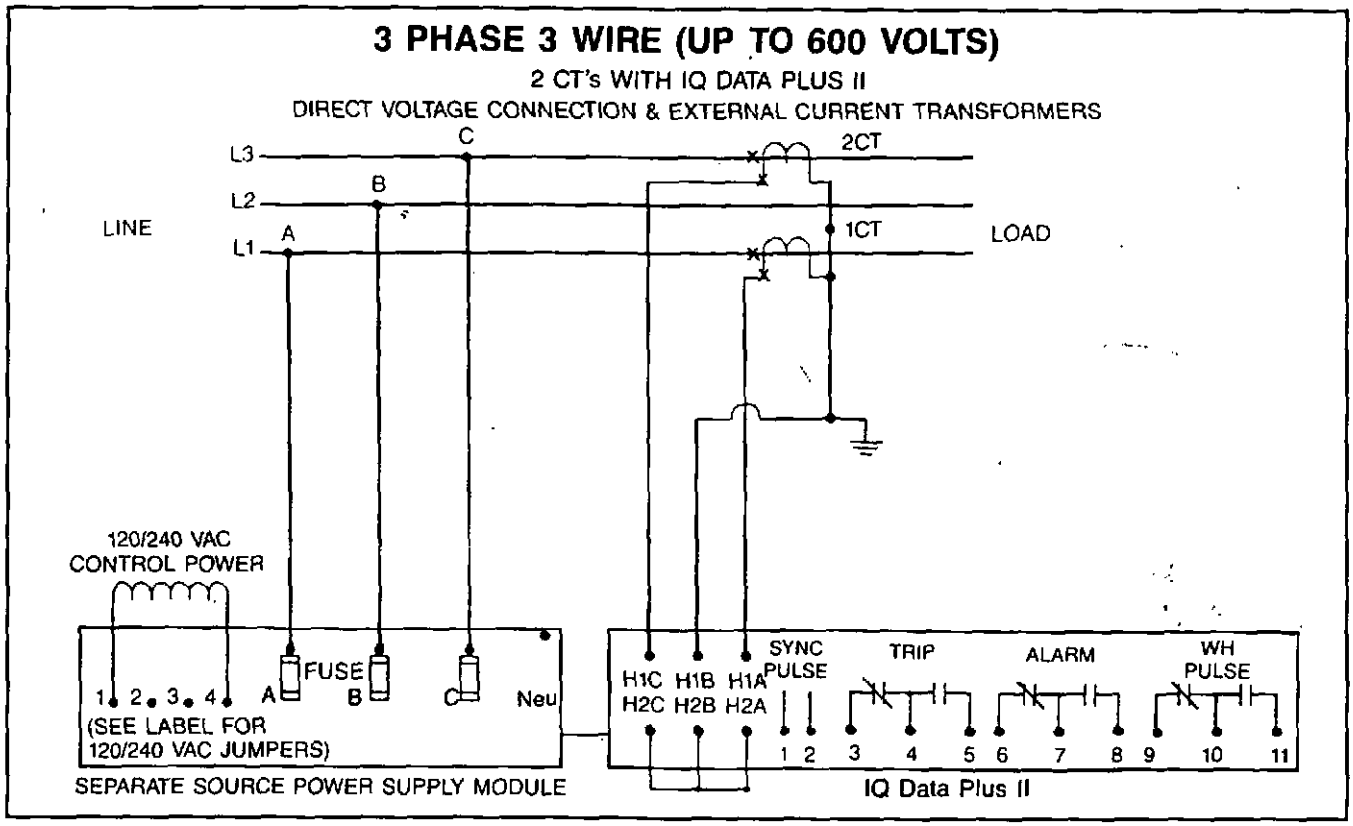

Figure 4.4I — Wiring Diagram

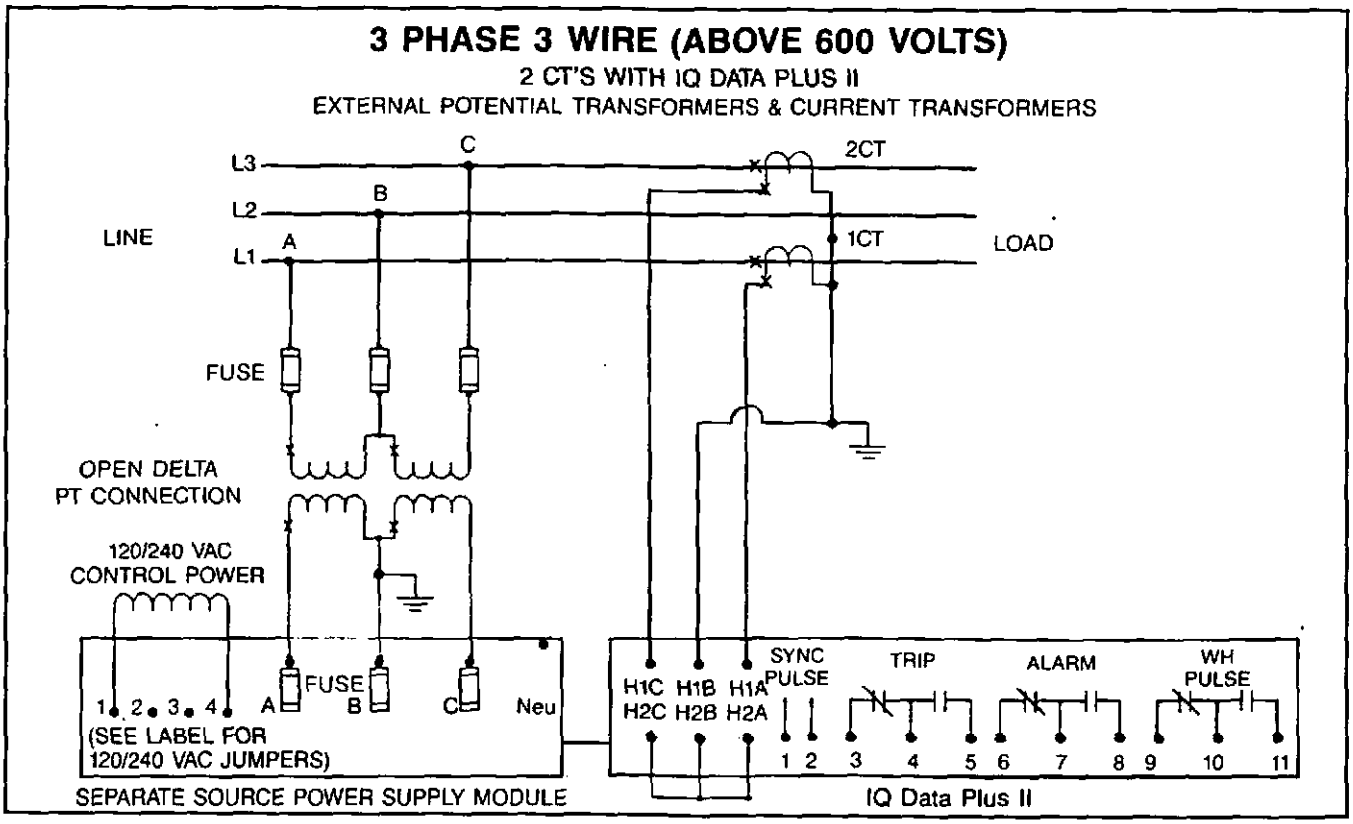

Figure 4.4J — Wiring Diagram

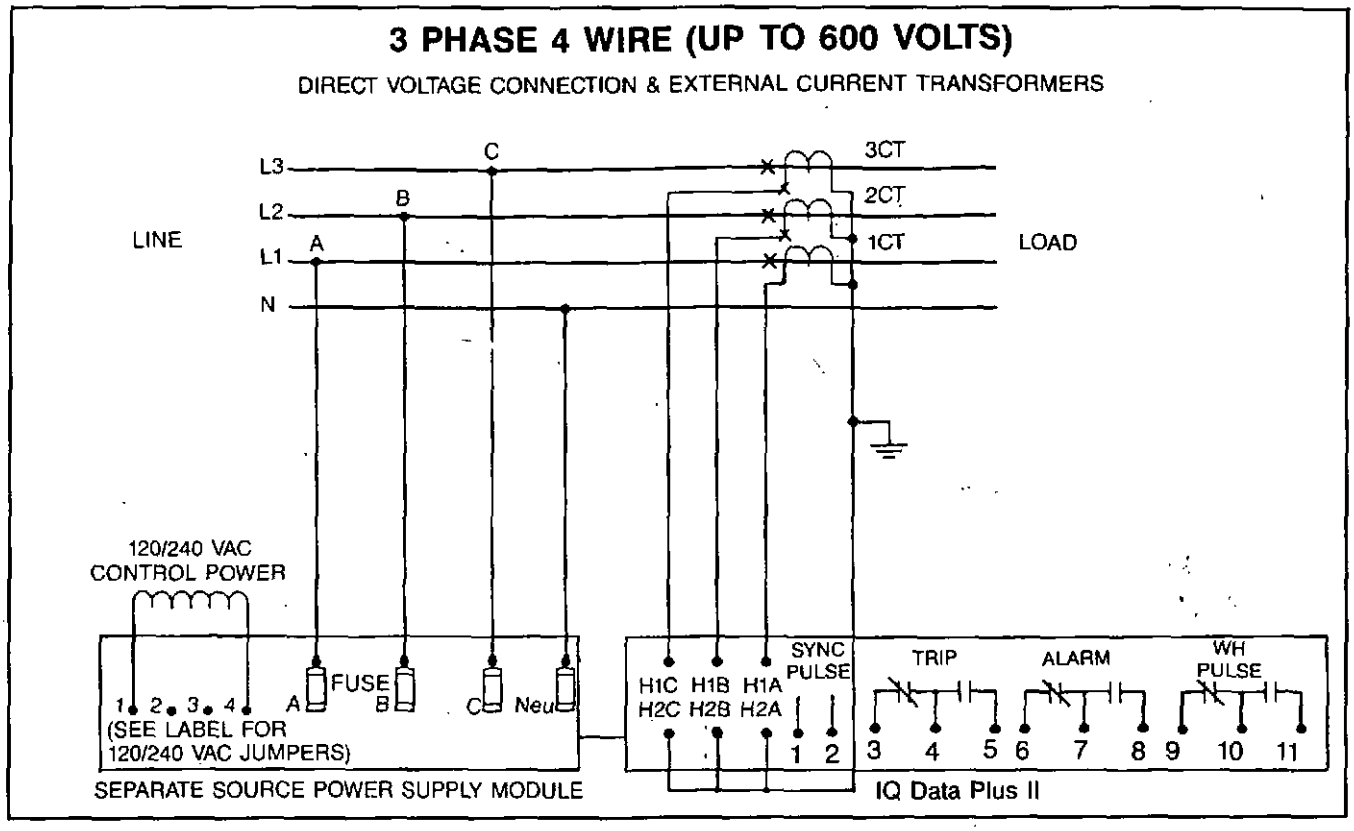

Figure 4.4K — Wiring Diagram

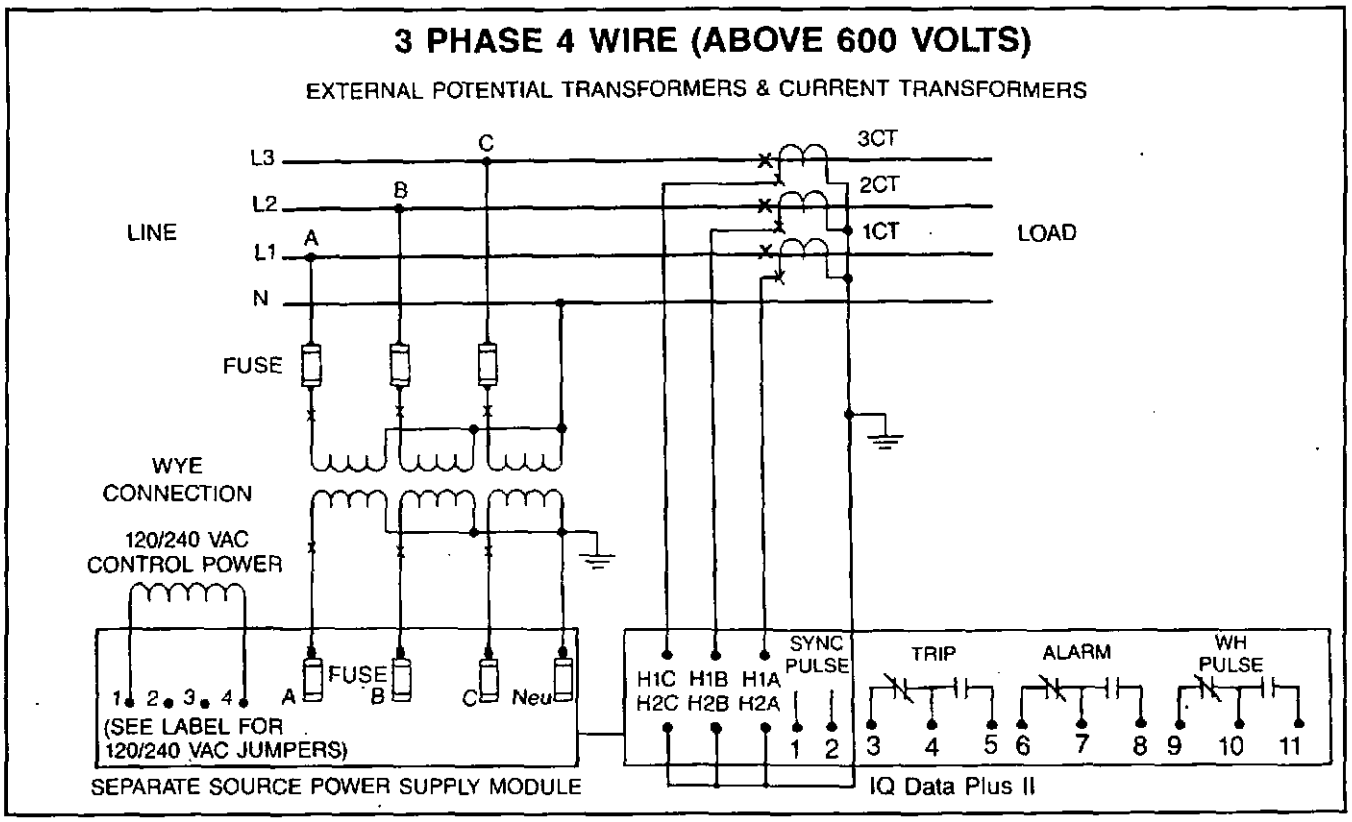

Figure 4.4L — Wiring Diagram

4.3 DIP Switch Settings — The DIP switches located and accessed from the rear-right portion of the chassis must be properly set according to application requirements. Obtain the Installation Record Sheet produced specifically for the application. A blank Record Sheet is shown in the Tables 6.A, 6.C, 6.H, 6.K, 6.N, 6.Q. Note: Section 6 describes how to determine the DIP switch positions. Each of the DIP switches — SW1 thru SW6 — contains eight 2-position switches which are set in combination. (See Figure 4.5.) The switches are turned ON or OFF by sliding the switch. As you face the DIP switches, slide:

- To the LEFT to turn the switch OFF
- To the RIGHT to turn the switch ON

Figure 4.6 shows a side view of a single slide switch and how it is turned on and off.

Observe the ON and OFF designations on the DIP switches shown in Figure 4.5. Always look for the OFF and ON designations on the hardware or printed circuit board to be sure you are setting the switches correctly.

After all the DIP switches are set according to the settings listed on the Installation Record Sheet, the system is ready to have AC power applied. Follow the procedure listed in Paragraph 4.4 when first applying power to the IQ Data Plus II.

4.4 Initial Startup — The information here is intended to be used when first applying AC power to the IQ Data Plus II. Each item is shown with a box to the left. In this way it can be used as a checklist to reduce the chance of omitting or skipping an item.

WARNING

The following startup procedures must be performed only by qualified personnel who are familiar with the IQ Data Plus II and its associated electrical and/or mechanical equipment. Failure to observe this caution can result in serious or even fatal personal injury and/or equipment damage.

4.4.1 Before Power Application — Before applying AC power to the IQ Data Plus II, perform the following:

☐ Verify that the incoming AC power to the system is disconnected. Also, if foreign power sources – such as may be wired to the Alarm and Trip Relay contacts – are wired into the panel, verify that these sources are turned OFF and, if possible, locked out.

☐ Verify all DIP switches are set according to the Installation Record Sheet.

☐ If installing an IQ Data Plus II with a 3-Phase Power Module, verify that the position of the Voltage Selector Jumper on the Voltage Terminal Block is correct for the nominal voltage.

☐ Verify that all wiring is correct, as shown on the wiring plan drawings.

☐ When possible, disable the IQ Data Plus II until the rest of the machine or process has been started up and checked out.

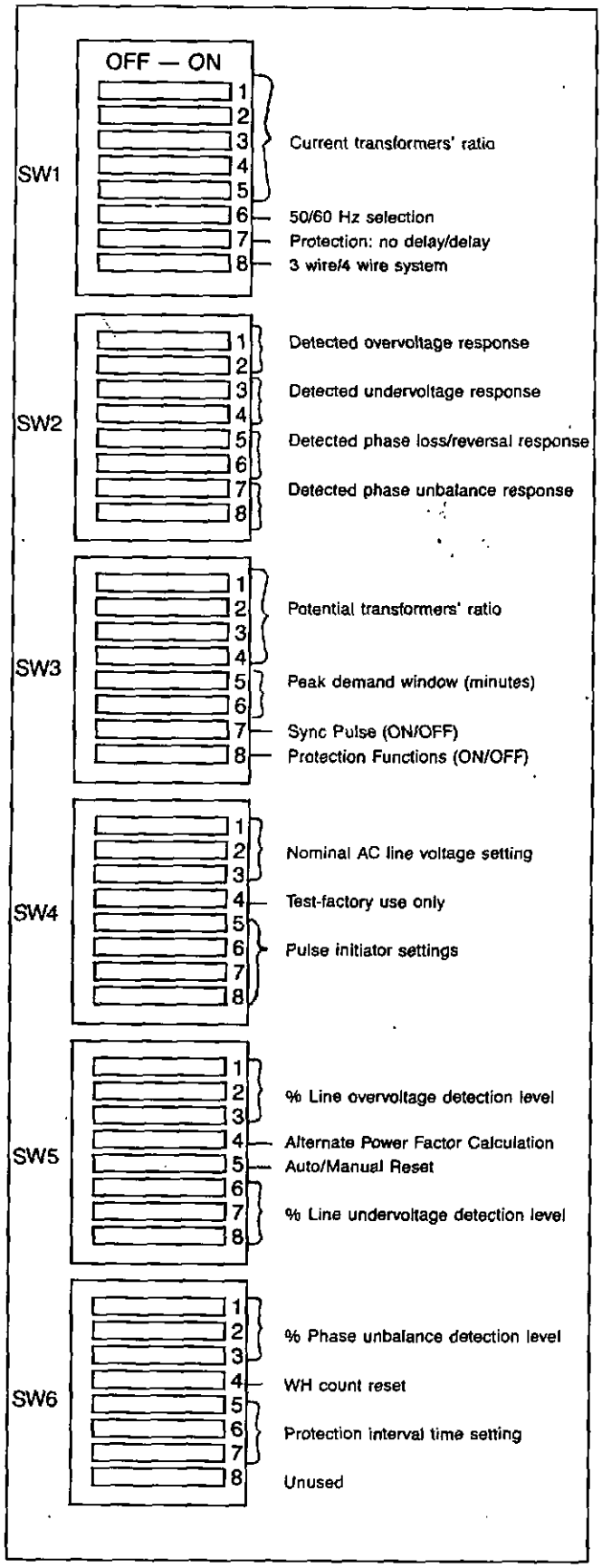

Figure 4.5 — DIP Switches — See Section 6 for programming information

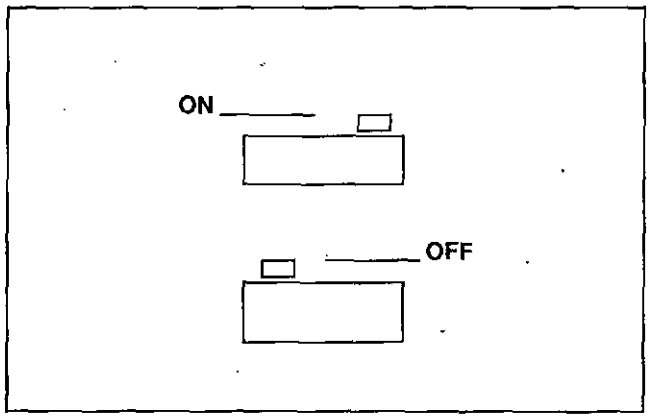

Figure 4.6 — DIP Switch (side view)

☐ Restore AC power and verify that the Operator Panel functions, after an initial 2-second delay, are as follows:

- The I_A AMPS RMS LED illuminates
- The Display Window shows the actual line phase A amperes

4.4.2 *Initial Power Application* — *Perform the following* steps when first applying AC power to the IQ Data Plus II:

☐ Apply 120/240 VAC control power between terminals 1 and 4 of Separate Source Power Supply Module. The display should be illuminated. If the unit is not powered, remove control power and check connections to Separate Source Power Supply Module.

☐ Turn on AC power to line being monitored and verify that the line-to-line voltages (A-to-B, A-to-C, and B-to-C) fall within the correct range, as noted on the wiring plan diagram. This is the last step in the initial power application of an IQ Data Plus II with a Separate Source Power Supply Module.

☐ Remove the 3 line fuses contained in the Power Module of the IQ Data Plus II.

☐ Turn on AC power and verify that the line-to-line voltages (A-to-B, A-to-C, and B-to-C) fall within the correct range, as noted on the wiring plan drawing. Note: The voltage range must match the Voltage Selector Jumper's position. See Paragraph 4.1.4 which lists the ranges.

If the voltages do not match — as determined by comparing the actual reading with the Voltage Selector Jumper's position, refer to the system wiring drawings to locate the error.

☐ Remove AC power and re-install the 3 line fuses.

NOTE

If a trip or alarm occurs, refer to Section 7, Maintenance, for details.

Shaded area designates information that *replaces or supplements applications using* the 120/240 VAC Separate Source Power Supply Module.

Section 5

THEORY OF OPERATION

5.0 General — This Section provides a general description of how the IQ Data Plus II functions internally. Its purpose is to give the user only an overview theory of operation.

5.1 Basic Block — The IQ Data Plus II is controlled by a self-contained microprocessor which is directed by an "executive program" resident in ROM (read-only memory). (See Figure 5.1.) The microprocessor directs the following 4 operations:

- Monitoring the AC line voltage and currents and storing their levels in a "data table" which is a solid state memory device. (The actual signals from the AC line are "conditioned" by various circuits grouped together here and referred to simply as the line interface).
- Checking the information obtained from the AC line being monitored for the various trip and alarm conditions, as listed in Paragraph 2.2.
- Updating the Operator Panel on a regular basis. When a component of the Panel — such as the Step Display Up pushbutton — is pressed, the executive program reacts by displaying the new information requested in the Display Window.
- Conditioning the signals from the control area to make them compatible with the Operator Panel devices and the internal Trip and Alarm Relays. This is carried out in the interface area.

The executive program assigns the highest priority to energizing the Trip and Alarm Relays. Lower priorities are given to other operations, such as updating the Display Window of the Operator Panel.

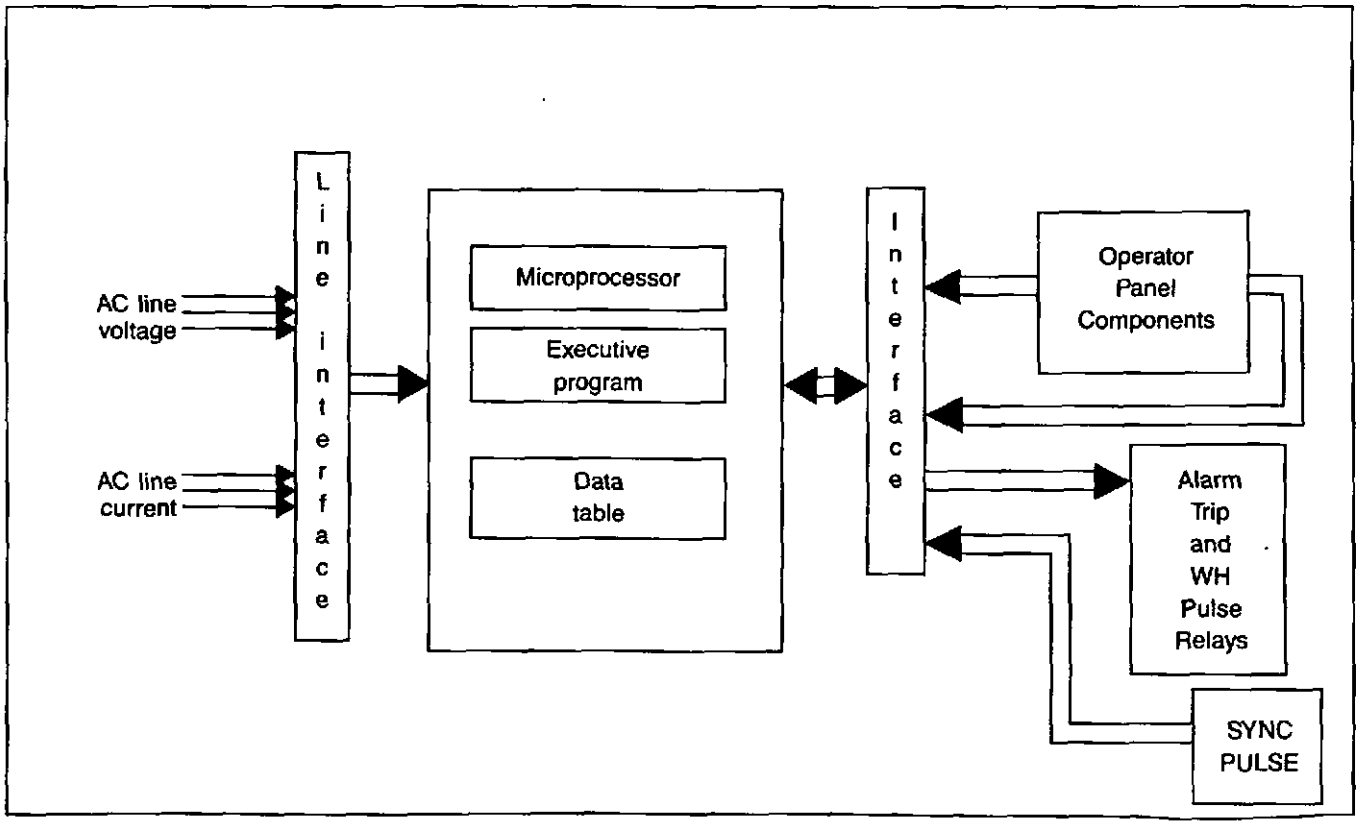

Figure 5.1 — IQ Data Plus II Basic Block

Section 6

APPLICATION CONSIDERATIONS

6.0 General — This Section contains various considerations to be kept in mind when applying the IQ Data Plus II to a specific application. It is designed primarily for the systems or application engineer responsible for making up the wiring plan drawings.

It is strongly suggested that all earlier Sections — especially 2 and 3 — be read thoroughly before proceeding.

6.1 DIP Switch Settings — A number of DIP switches, located on the right rear side of the chassis, tailor each IQ Data Plus II to a specific application The switches provide 18 selection groupings which must be set by the user during installation. Once these settings are determined, they should be recorded on a copy of the Installation Record Sheet, shown in Tables 6.A, 6.C, 6.H, 6.K, 6.N, 6.Q. The filled-in Record Sheet should then be made available to the installation team and to maintenance personnel. Paragraph 4.3 describes how to physically set the switches.

Table 6.A

IQ DATA PLUS II INSTALLATION RECORD SHEET: SW1

DIP Switch	Slide Switch	Setting ON/OFF Combinations	Description
SW1	1 2 3 4 5	— — — — —	The ratio of the external current transformers = _____:5 (100/150/200/250/300/400/500/600/800/1000/1200/1500/1600/ 2000/2500/3000/3200/4000/5000) Refer to Table 6.B
	6	—	Line frequency ON = 60 Hz; OFF = 50 Hz
	7	—	Action on over/undervoltage/phase unbalance detection. Action = immed. (Delay/immediate) *OFF = immediate; ON = delay*
	8	—	AC line wiring = 3 wire ON = 4 wire 3 wire or 4 wire OFF = 3 wire

6.1.1 Current Transformer Ratio — The ratio of the user-provided external current transformers can vary from 100:5 to 5000:5. Switch **SW1, Nos. 1 thru 5** must be set to correspond to the external current transformer's ratio, as listed in Table 6.B.

The CT's must be chosen so that at least 20% of the primary rated current is drawn. The 1% accuracy of the IQ Data Plus II is valid only above 20% of the current rating. Below 2% of the primary rated current, the IQ Data Plus II reads zero current.

6.1.2 Display Current — The AC line current level appearing in the Display Window is auto ranged to represent amperes to kiloamperes.

6.1.3 Line Frequency — The IQ Data Plus II can accept a line frequency of either 50 or 60 Hz. Selection is made at **SW1, No. 6.** Place the switch in the:

- OFF position for a 50 Hz line
- ON position for a 60 Hz line

6.1.4 Overvoltage, Undervoltage, Phase Unbalance — Instantaneous or Time Delay on Trip/Alarm — When an overvoltage, undervoltage or phase unbalance condition is first detected, the IQ Data Plus II can actuate its Alarm and Trip Relays immediately; or the trip condition can be selected to continuously persist for several seconds before it actuates the Alarm and Trip Relays.

Switch **SW1, No. 7** must be set to correspond to the desired action on over/under voltage/phase unbalance detection. Set this switch to the:

- OFF position for an immediate response
- ON position for a delayed response

When the ON position is selected, the time delay can be programmed using switches **SW6, Nos. 5, 6 and 7.** (See Paragraph 6.1.23.)

6.1.5 3 Wire/4 Wire Line — The IQ Data Plus II can be used to monitor either a 3-conductor or 4-conductor AC line. An example of a 4-wire system is a case in which a transformer's secondary is wired in a wye configuration with the XO neutral terminal ground brought out as the fourth wire. In this case the XO fourth wire connects with the Neutral Terminal on the IQ Data Plus II's chassis. (See Figure 2.1.)

Switch **SW1, No. 8** must be set to correspond to the chosen wiring configuration. Set this switch to the:

- OFF position for a 3-wire wiring configuration
- ON position for a 4-wire wiring configuration

When the OFF position is selected for the 3-wire configuration, the Display Window does not display the 3 line-to-neutral AC line measurements of the Operator Panel's menu. The measurements **not** displayed are:

- V_{A-N} Volts RMS
- V_{B-N} Volts RMS
- V_{C-N} Volts RMS

Table 6.8

CT RATIO SETTINGS

CT Ratios	**SW1** Switch Settings[1]				
	1	2	3	4	5
100:5	ON	ON	ON	ON	ON
150:5	OFF	ON	ON	ON	ON
200:5	ON	OFF	ON	ON	ON
250:5	OFF	OFF	ON	ON	ON
300:5	ON	ON	OFF	ON	ON
400:5	OFF	ON	OFF	ON	ON
500:5	ON	OFF	OFF	ON	ON
600:5	OFF	OFF	OFF	ON	ON
800:5	ON	ON	ON	OFF	ON
1000:5	OFF	ON	ON	OFF	ON
1200:5	ON	OFF	ON	OFF	ON
1500:5	OFF	OFF	ON	OFF	ON
1600:5	ON	ON	OFF	OFF	ON
2000:5	OFF	ON	OFF	OFF	ON
2500:5	ON	OFF	OFF	OFF	ON
3000:5	OFF	OFF	OFF	OFF	ON
3200:5	ON	ON	ON	ON	OFF
4000:5	OFF	ON	ON	ON	OFF
5000:5	ON	OFF	ON	ON	OFF

(1) All other combinations are invalid.

Table 6.C

IQ DATA PLUS II INSTALLATION RECORD SHEET: SW2

DIP Switch	Slide Switch	Setting ON/OFF Combinations	Description
SW2	1 2	— —	Action on overvoltage = _____ (Do nothing/trip/alarm/trip and alarm) Refer to Table 6.D
	3 4	— —	Action on undervoltage = _____ (Do nothing/trip/alarm/trip and alarm) Refer to Table 6.E
	5 6	— —	Action on phase loss/reversal = _____ (Do nothing/trip/alarm/trip and alarm) Refer to Table 6.F
	7 8	— —	Action on phase unbalance = _____ (Do nothing/trip/alarm/trip and alarm) Refer to Table 6.G

6.1.6 Overvoltage Detection Response — Should an overvoltage condition be detected, the IQ Data Plus II can control the internal Trip and Alarm Relays in 4 ways:

- Activate trip relay
- Activate alarm relay
- Activate both trip and alarm relays
- Activate neither trip and alarm relays

Switch **SW2, Nos. 1 and 2** determine the response of the unit, as listed in Table 6.D.

Table 6.D

OVERVOLTAGE DETECTION RESPONSE

Response of Relay(s)	SW2 Switch Settings	
	1	2
Alarm only	ON	OFF
Trip only	OFF	ON
Alarm and trip(1)	OFF	OFF
No alarm or trip	ON	ON
(1) Relays energize or de-energize simultaneously		

Note also that the Switch **SW1, No. 7** determines whether the response is instantaneous or a selectable time interval, as described in Paragraph 6.1.4. Switch **SW6, Nos. 5, 6, 7** determine the time interval, in seconds, as described in Paragraph 6.1.23. Switch **SW3, No. 8** disables or enables all of the overvoltage and undervoltage protective capabilities, as described in Paragraph 6.1.12.

6.1.7 Undervoltage Detection Response — Should an undervoltage condition be detected, the IQ Data Plus II can control the internal Trip and Alarm Relays in 4 ways:

- Activate trip relay
- Activate alarm relay
- Activate both trip and alarm relays
- Activate neither trip and alarm relays

Switch **SW2, Nos. 3 and 4** determine the response of the unit, as listed in Table 6.E.

Table 6.E

UNDERVOLTAGE DETECTION RESPONSE

Response of Relay(s)	SW2 Switch Settings	
	3	4
Alarm only	ON	OFF
Trip only	OFF	ON
Alarm and trip(1)	OFF	OFF
No alarm or trip	ON	ON
(1) Relays energize or de-energize simultaneously		

Note also that Switch **SW1, No. 7** determines whether or not there is a time interval, as described in Paragraph 6.1.4. Switch **SW6, Nos. 5, 6, 7** determine the time interval, in seconds, as described in Paragraph 6.1.23. Switch **SW3, No. 8** disables or enables all of the overvoltage and undervoltage protective capabilities, as described in Paragraph 6.1.12.

6.1.8 Phase Loss/Phase Reversal Detection Response — Should either a phase loss or phase reversal condition be detected, the IQ Data Plus II can control the internal Trip and Alarm Relays in 4 ways:

- Activate trip relay
- Activate alarm relay
- Activate both trip and alarm relay
- Activate neither trip and alarm relay

Switch **SW2, Nos. 5 and 6** determine the response of the unit, as listed in Table 6.F.

Table 6.F

PHASE LOSS/REVERSAL DETECTION RESPONSE

Response of Relay(s)	SW2 Switch Settings	
	5	6
Alarm only	ON	OFF
Trip only	OFF	ON
Alarm and trip(1)	OFF	OFF
No alarm or trip	ON	ON
(1) Relays energize or de-energize simultaneously		

There are no time interval enable/disable switch settings — as described in Paragraphs 6.1.4 and 6.1.23, respectively — for this feature.

Switch SW1, No. 7 determines whether the Alarm/Trip Relays actuate on an immediate basis or after a delay.

- OFF position for immediate actuation
- ON position for delayed actuation

Note also that **Switch SW6, Nos. 5, 6, 7**, determine the specific time in seconds that the condition must persist before the Alarm/Trip Relays are actuated as described in Paragraph 6.1.23.

6.1.9 Phase Unbalance Detection Response — Should a phase unbalance condition be detected, the IQ Data Plus II can control the internal Trip and Alarm Relays in 4 ways:

- Activate trip relay
- Activate alarm relay
- Activate both trip and alarm relay
- Activate neither trip and alarm relay

Switch **SW2, Nos. 7 and 8** determine the response of the unit, as listed in Table 6.G.

Table 6.G

PHASE UNBALANCE DETECTION RESPONSE

Response of Relay(s)	SW2 Switch Settings	
	7	8
Alarm only	ON	OFF
Trip only	OFF	ON
Alarm and trip(1)	OFF	OFF
No alarm or trip	ON	ON
(1) Relays energize or de-energize simultaneously		

Note also that Switch **SW1, No. 7** determines whether or not there is a time interval, as described in Paragraph 6.1.4. Switch **SW6, Nos. 5, 6, 7** determine the time interval, in seconds, as described in Paragraph 6.1.23. Switch **SW3, No. 8** disables or enables all of the protective capabilities, as described in Paragraph 6.1.12.

Table 6.H
IQ DATA PLUS II INSTALLATION RECORD SHEET: SW3

DIP Switch	Slide Switch	Setting ON/OFF Combinations	*Description*
SW3	1 2 3 4	— — — —	Potential transformers, if used ratio = _____:1 (1/2/4/5/20/30/35/40/55/60/70/100/120) Refer to Table 6.I or ratio = _____: 110V (3.3kV, 6.6kV, 11kV)
	5 6	— —	Peak demand window (sampling) time = _____ minutes. (5/10/15/30 min.) Refer to Table 6.J
	7	—	Sync Pulse = _____ ON = Enabled OFF = Disabled
	8	—	Protection Functions = _____ ON = Enabled (Enabled/Disabled) OFF = Disabled

6.1.10 Potential Transformers' Ratio — Some systems may include optional, user-provided potential transformers. Their ratios must be taken into account by means of settings on Switch **SW3, Nos. 1, 2, 3 and 4**, as listed in Table 6.I. In this case, **SW4, Nos. 1, 2 and 3** should be set to correspond with the PT's secondary voltage.

CAUTION

When external potential transformers are used, calculate the secondary output level of the transformers by dividing the nominal voltage input to the PT's primary side by the turns ratio. The secondary of the PT's must be 110 or 120 VAC, measured line-to-line. Place the Voltage Selector Jumper to 120 volts, as described in Paragraph 4.1.4.

The IQ Data Plus II is self-powered through the voltage circuit connections. Therefore, when selecting external *potential transformers, the nominal secondary voltage must* be at least 110 volts.

Examples:

1. 4160 Volt System: *Select a potential transformer with a* 4160/120 ratio = 35/1. Therefore, set Switch **SW3** for 35:1 *ratio and set selector jumper on 120 volts.*
2. 3300 Volt System: Select a potential transformer with a 3600/120 ratio = 30/1. Therefore, set Switch **SW3** for 30:1 ratio and set selector jumper on 120 volts.

International PT settings have been included for customers that use 110V secondary PT's. In these applications, the *international PT settings are selected using* **SW3, Nos. 1, 2, 3 and 4** as shown in Table 6.I. When international PT settings *are used, the nominal line voltage is automatically set to 110* V line-to-line, 64V line-to-neutral (SW4, Nos. 1, 2 and 3 are disabled). The 110V nominal line voltage can only be obtained when 3.3kV:110V, 6.6kV:110V or 11kV:110V ratios are selected.

If potential transformers are not used, select a ratio of 1:1.

(For more application details on the use of potential transformers, see Paragraph 1.2.)

Table 6.I
PT RATIO SETTINGS

PT Ratio	**SW3** Switch Settings 1	2	3	4
1:1 [1]	ON	ON	ON	ON
2:1	OFF	ON	ON	ON
4:1	ON	OFF	ON	ON
5:1	OFF	OFF	ON	ON
20:1	ON	ON	OFF	ON
30:1	OFF	ON	OFF	ON
35:1	ON	OFF	OFF	ON
40:1	OFF	OFF	OFF	ON
55:1	ON	ON	ON	OFF
60:1	OFF	ON	ON	OFF
70:1	ON	OFF	ON	OFF
100:1	OFF	OFF	ON	OFF
120:1	ON	ON	OFF	OFF
INTERNATIONAL PT SETTINGS				
3.3kV:110V	OFF	ON	OFF	OFF
6.6kV:110V	ON	OFF	OFF	OFF
11kV:110V	OFF	OFF	OFF	OFF
120:1	ON	ON	OFF	OFF
INVALID	Any other combinations			

[1]Required setting when no PT used.

6.1.11 Peak Demand Window and SYNC Pulse— The peak demand, in watts, may be shown in the Display Window. Switch **SW3, Nos. 5 and 6** determine the time, in minutes, upon which the consumption sampling will be based. The samplings are made from a range between 5 and 30 minutes, as indicated in Table 6.J. The highest value obtained is stored in the unit until the reset button is pressed. The peak demand value accumulated during the time interval may be reset by either pressing the reset (red) pushbutton on the front of the IQ Data Plus II while the demand LED is illuminated, or remotely over the INCOM network.

The demand window time can be disabled by turning on the SYNC PULSE, **SW3, No. 7**. When changing from SYNC mode to time based demand, you must reset the demand value. Refer to Paragraph 2.1.2.1 for a description of the SYNC PULSE.

Table 6.J

PEAK DEMAND SAMPLING INTERVAL

Time Interval (minutes)	**SW3** Switch Settings	
	5	6
5	ON	ON
10	OFF	ON
15	ON	OFF
30	OFF	OFF

6.1.12 Protection Functions — The IQ Data Plus II's protection features can be enabled or disabled.

Switch **SW3, No. 8** determines the response of the unit. Set this switch to the:

- OFF position to **disable** protection features
- ON position to **enable** protection features

If these features are disabled, the functions contained in the following list are also disabled. (Since they are disabled, the switches listed here may be left in any position.) In the ON or OFF position, the External Trip via the Communication Link and the internal diagnostic functions remain active.

- SW5, Nos. 1, 2, 3 — % point to initiate an overvoltage response
- SW2, Nos. 1, 2 — Overvoltage detection response
- SW5, Nos. 6, 7, 8 — % point to initiate an undervoltage response
- SW2, Nos. 3, 4 — Undervoltage detection response
- SW6, Nos. 1, 2, 3 — Phase unbalance detection level
- SW2, Nos. 7, 8 — Phase unbalance detection response
- SW1, No. 7 — Overvoltage, undervoltage, and phase unbalance instantaneous or time interval
- SW6, Nos. 5, 6, 7 — Protection time interval (seconds)
- SW2, Nos. 5, 6 — Phase loss/reversal detection response

Table 6.K

IQ DATA PLUS II INSTALLATION RECORD SHEET: SW4

DIP Switch	Slide Switch	Setting ON/OFF Combinations	Description
SW4	1 2 3	— — —	Nominal monitored line voltage selection: • If measured line-to-line = _____VAC in a 3 wire system (120/208/220/240/380/416/460/575) • If measured line-to-neutral = _____VAC in a 4 wire system (69/120/127/138/219/240/266/332) Refer to Table 6.L
	4	—	Test Mode. For normal operation, this switch should always be "OFF".
	5 6 7 8	— — — —	Pulse Initiator Settings. Refer to Table 6.M (100, 500 W) (1, 5, 10, 50, 100, 500 KW) (1, 5, 10, 50, 100, 500 MW)

6.1.13 AC Line Voltage — The IQ Data Plus II can be set to measure AC line voltage in one of two ways:

- Line-to-line — 3 Phase 3 Wire
- Line-to-neutral — 3 Phase 4 Wire

(SW4 setting continued on following page)

It is necessary to set switches to indicate the nominal AC line voltage applied to the AC Line Terminals, as determined by the wiring configuration for the system.

Switch **SW4, Nos. 1, 2 and 3** specify these factors. Set the switches according to Table 6.L.

Follow the Table's line-to-line column when the wiring configuration of the AC line is 3-wire. Follow the Table's line-to-neutral column when the configuration of the AC line is 4-wire.

NOTE: If the International PT settings are selected using SW3, Nos. 1, 2, 3 and 4, the nominal line voltage will automatically be set to 110V line-to-line, 64V line-to-neutral.

Table 6.L

AC LINE VOLTAGE SELECTION

Voltages (Nominal)		SW4 Switch Settings		
Line-to-Line	Line-to-Neutral	1	2	3
120	69	ON	ON	ON
208	120	OFF	ON	ON
220	127	ON	OFF	ON
240	138	OFF	OFF	ON
380	219	ON	ON	OFF
416	240	OFF	ON	OFF
460	266	ON	OFF	OFF
575	332	OFF	OFF	OFF

The Voltage Selector Jumper's position and the optional, external potential transformers' output ratings must be matched to prevent damage to the IQ Data Plus II.

6.1.14 Display Volts — The 3 AC line-to-line voltages and the 3 AC line-to-neutral voltages which appear in the Display Window are auto ranged to represent units of kilovolts or volts.

6.1.15 Normal Operation — Switch **SW4, No. 4** should always be set in the OFF position. This switch is only used during factory testing.

6.1.16 Pulse Initiator Settings — *Table 6.M shows the DIP* switch combinations for the pulse initiator feature of the IQ Data Plus II. This lets the user determine when the IQ Data *Plus II will send pulses to an external recorder (supplied by* the user). For example, if **SW4, Nos. 5, 6, 7, 8** are set to ON-ON-ON-ON, the IQ Data Plus II will close its Form C contact and send a short pulse every 100 watthours.

Table 6.M shows all Watthour Pulse settings available to the *user. These DIP switches can vary the pulse output from 100* watthours to 500 mega-watt hours. The Form C pulse contacts, shown in Figure 4.4A, change state and complete a circuit to a pulse recorder based on the programmed value.

Table 6.M

WATTHOUR PULSE SETTINGS

Pulse Every	SW4			
	5	6	7	8
100 WH	ON	ON	ON	ON
500 WH	OFF	ON	ON	ON
1 KWH	ON	OFF	ON	ON
5 KWH	OFF	OFF	ON	ON
10 KWH	ON	ON	OFF	ON
50 KWH	OFF	ON	OFF	ON
100 KWH	ON	OFF	OFF	ON
500 KWH	OFF	OFF	OFF	ON
1 MWH	ON	ON	ON	OFF
5 MWH	OFF	ON	ON	OFF
10 MWH	ON	OFF	ON	OFF
50 MWH	OFF	OFF	ON	OFF
100 MWH	ON	ON	OFF	OFF
500 MWH	OFF	ON	OFF	OFF
500 MWH	Any other selection			

Table 6.N

IQ DATA PLUS II INSTALLATION RECORD SHEET: SW5

DIP Switch	Slide Switch	Setting ON/OFF Combinations	Description
SW5	1 2 3	— — —	Percent of nominal monitored line voltage to cause overvoltage = _____ (105/110/115/120/125/130/135/140%) Refer to Table 6.O
	4	—	Alt. Power Factor Calculation ON = Disabled OFF = Enabled
	5	—	Auto Reset attempt 3 times within 3 seconds. ON = Enabled OFF = Disabled
	6 7 8	— — —	Undervoltage % detection point = _____% (95/90/85/80/75/70/65/60%) Refer to Table 6.P

6.1.17 % Line Overvoltage Detection Level — The IQ Data Plus II can be set to detect an overvoltage condition as a selectable level. The available range is from 105 to 140% of the nominal AC line voltage. As the result of a detected level, the Trip and Alarm Relays may be actuated.

Switch **SW5, Nos. 1, 2, and 3** determine the detection level, as shown in Table 6.O.

Note also that Switch **SW2, Nos. 1 and 2** determine the unit's response to a detected overvoltage condition, as described in Paragraph 6.1.6.

Table 6.O

LINE OVERVOLTAGE DETECTION (% LEVEL)

% Detection Level	SW5 Switch Settings		
	1	2	3
105	ON	ON	ON
110	OFF	ON	ON
115	ON	OFF	ON
120	OFF	OFF	ON
125	ON	ON	OFF
130	OFF	ON	OFF
135	ON	OFF	OFF
140	OFF	OFF	OFF

Note: If the protection function switch is in the ON position and you wish to disable a particular protection function, set its specific detection response to No Alarm or Trip. Example: To disable Overvoltage refer to Table 6.D and set Switch **SW2 No. 1** ON and **No. 2** ON.

6.1.18 Alternate Power Factor Calculation — The standard power factor calculation for the IQ Data Plus II is $W/\sqrt{W^2+Q^2}$ for sinusoidal loads. If the user has a load waveform that is nonsinusoidal (e.g. chopped) or a load that is extremely light, the alternate calculation can be enabled with **SW5, No. 4.** Applications that may require the alternate calculation include lighting loads, computer room monitoring, and loads at less than 20% of the current transformer full load rating.

6.1.19 Auto Reset — Setting Switch **SW5, No. 5** to the ON position will enable the IQ Data Plus II to attempt an auto reset based on any protective function. The unit will attempt to reset itself 3 times in 3 seconds by monitoring the line and looking for a fault. If the condition still exists, the IQ Data Plus II will remain off-line until an operator resets it, either locally or over INCOM.

6.1.20 % Line Undervoltage Detection Level — The IQ Data Plus II can be set to detect an undervoltage condition at a selectable level. The available range is from 60 to 95% of the nominal AC line voltage. As the result of a detected level, the Trip and Alarm Relays may be actuated.

Switch **SW5, Nos. 6, 7 and 8** determine the detection level, as shown in Table 6.P.

Note also that Switch **SW2, Nos. 3 and 4** determine the unit's response to a detected undervoltage condition, as described in Paragraph 6.1.7.

Table 6.P

LINE UNDERVOLTAGE DETECTION (% LEVEL)

% Detection Level	SW5 Switch Settings		
	6	7	8
95	ON	ON	ON
90	OFF	ON	ON
85	ON	OFF	ON
80	OFF	OFF	ON
75	ON	ON	OFF
70	OFF	ON	OFF
65	ON	OFF	OFF
60	OFF	OFF	OFF

Table 6.Q

IQ DATA PLUS II INSTALLATION RECORD SHEET: SW6

DIP Switch	Slide Switch	Setting ON/OFF Combinations	Description
SW6	1 2 3	— — —	Percent of line voltage variation between phases to cause phase unbalance = _____% (5/10/15/20/25/30/35/40%) Refer to Table 6.R
	4	—	WH count reset ON = Enabled OFF = Disabled
	5 6 7	— — —	Only used if SW1 No. 7 is on for a continued trip condition. Delay = _____ sec. (1/2/3/4/5/6/7/8 sec.) Refer to Table 6.S
	8	—	Unused

6.1.21 % Phase Unbalance Detection Level — The IQ Data Plus II can detect a phase unbalance condition within a selectable range from ±5 to ±40%. As a result, the Trip and/or Alarm Relays may be actuated.

Switch **SW6, Nos. 1, 2 and 3** determine the detection level, as shown in Table 6.R.

Table 6.R

PHASE UNBALANCE DETECTION (% LEVEL)

% Detection Level	SW6 Switch Settings		
	1	2	3
± 5	ON	ON	ON
±10	OFF	ON	ON
±15	ON	OFF	ON
±20	OFF	OFF	ON
±25	ON	ON	OFF
±30	OFF	ON	OFF
±35	ON	OFF	OFF
±40	OFF	OFF	OFF

Note also that Switch **SW2, Nos. 7 and 8** determine the response to a detected phase unbalance condition, as described in Paragraph 6.1.9.

6.1.22 Watthour Count Reset — Switch **SW6 No. 4** is used to reset the watthour count internal to the IQ Data Plus II. If the user sets the switch and then presses and holds the reset button (while watthours are displayed on the screen), the displayed value of watthours will reset to zero.

6.1.23 Protection Time Delay — Assuming the unit is set to detect an undervoltage, overvoltage, or phase unbalance condition and Switch **SW1, No. 7** is set in the ON position, the IQ Data Plus II must also be set to determine how long the condition must exist before it actuates the Alarm and Trip Relays. The selectable range is 1 to 8 seconds.

Switch **SW6, Nos. 5, 6, and 7** determine the time interval the condition must persist as indicated in Table 6.S.

Table 6.S

OVERVOLTAGE/UNDERVOLTAGE/PHASE UNBALANCE TIME DELAY ON TRIP/ALARM

Time (in seconds)	SW6 Switch Settings		
	5	6	7
1	ON	ON	ON
2	OFF	ON	ON
3	ON	OFF	ON
4	OFF	OFF	ON
5	ON	ON	OFF
6	OFF	ON	OFF
7	ON	OFF	OFF
8	OFF	OFF	OFF

6.1.24 Switch SW6 No. 8 Is Unused — The circuitry internal to the device is using this space for other functions of the IQ Data Plus II. Setting **SW6 No. 8** will not affect the operation of the unit.

Section 7

MAINTENANCE

7.0 General — This Section describes maintenance procedures for the IQ Data Plus II. The information contained here is divided as follows:

- Isolating a malfunction (Par. 7.1)
- Replacing the IQ Data Plus II (Par. 7.2)

Earlier Sections of this Manual, especially Section 2, Hardware Description; Section 3, Operator Panel; and Section 4, Installation and Startup, should be read thoroughly to familiarize the maintenance person with the IQ Data Plus II.

Note: The **phasing** and **polarity** of the AC current inputs and the AC voltage inputs and their relationship is critical to the correct operation of the unit. (Same as wiring an electromechanical wattmeter.)

Table 7.A

INITIAL POWER-ON TROUBLESHOOTING

Symptom	Probable Cause(s)	Solution
All Operator Panel indicators are off.	• *AC line voltage level is deficient.	• Locate cause of deficiency in AC line monitored.
	• Separate Source AC control power is deficient.	• Locate the cause of the deficiency in the AC control power line. If power is sufficient, replace unit. (See Paragraph 7.2.)
	• AC line, Voltage Selector Jumper, or optional, external PT transformers are not properly selected, wired or installed.	• Verify that the AC line and/or PT transformers are wired as shown on the wiring plan drawings for the application.
	*If AC voltage level being applied to the AC line Connection Terminals is correct.	• Check the position of the Voltage Selector Jumper for proper placement. (See Paragraph 4.1.4.) • Replace unit. (See Paragraph 7.2.)
• Digit 1 flashes in the Display Window, indicating an "external trip." (1)	A trip condition has been externally initiated through the Communications Port. (2)	Determine why the trip was initiated from the external device through the Communications Option.
• Digit 2 flashes in the Display Window, indicating an overvoltage. (1)	AC line, Voltage Selector Jumper, or optional, external PT transformers are not properly installed or wired. (3)	Verify that the AC line, Voltage Selector Jumper and PT transformers are installed and wired as shown on the wiring plan drawing for the application.
• Digit 3 flashes in the Display Window, indicating undervoltage. (1)	An undervoltage condition actually exists. (3)	Isolate the AC line deficiency's cause.

(1) See Table 3.B.

(2) This assumes the unit is equipped with the Communications Option.

(3) Whether the unit also reacts with a trip and/or alarm condition depends on switch settings, as described in Section 6.

Shaded area designates information that replaces or supplements applications using the 120/240 VAC Separate Source Power Supply Module.

7.1 Troubleshooting — This Paragraph describes the following procedures:

- Troubleshooting when AC power is first applied to an IQ Data Plus II in an application (Par. 7.1.1).
- Troubleshooting assuming the IQ Data Plus II has been installed and was operational for a period of time (Par. 7.1.2).

7.1.1 Initial Start-up — This Paragraph lists procedures to follow when the IQ Data Plus II is not operating properly after AC power is first applied. The procedures assume that:

- All steps listed in Paragraph 4.4.1 and 4.4.2 have been completed, and
- The I_A AMPS RMS LED and Display Window do not display the line phase A amperes message.

DANGER

All maintenance procedures must be performed only by qualified personnel who are familiar with the IQ Data Plus II and the associated AC lines being monitored. Failure to observe this caution can result in serious or even fatal personal injury and/or equipment damage.

The following procedures at times involve working in equipment areas where the hazard of fatal electrical shock is present. Live parts are exposed. Personnel must exercise extreme caution to avoid injury, including possible fatal injury.

Always disconnect and, if necessary, lock out the AC power source before touching the components on the rear of the IQ Data Plus II. Failure to do so can result in serious or even fatal personal injury and/or equipment damage.

Table 7.A (Cont'd.) INITIAL POWER-ON TROUBLESHOOTING

Symptom	Probable Cause(s)	Solution
Digit 4 flashes in the Display Window, indicating a phase unbalance. (1)	A phase unbalance condition exists. (3)	Isolate the cause of the AC line deficiency.
Digit 5 flashes in the Display Window, indicating a phase loss. (1)	A phase loss condition exists. (3)	Isolate the AC line phase problem's cause
	Blown or loose fuse(s)	Check fuse(s) on affected phase(s) located just above voltage inputs behind cover of power module. Reseat fuse(s). Replace if necessary with 3/4 ampere, 600 volt, Buss Type KTK-R-3/4. (See Par. 2.1.2, No. 8)
One or more voltage phases read incorrect	Blown or loose fuse(s)	Check fuse(s) on affected phase(s) located just above voltage inputs behind cover of power module. Reseat fuse(s). Replace if necessary with 3/4 ampere, 600 volt, Buss Type KTK-R-3/4. (See Par. 2.1.2, No. 8)
Current readings not accurate or zero	Incorrect size CT's used	Replace with proper size CT's (See Paragraph 6.1.1)
Power readings are incorrect	Phasing for voltage and current is incorrect	Check phasing. Verify connections with wiring diagrams. (Figures 4.4A-4.4L)
Digit 6 flashes in the Display Window, indicating a phase reversal. (1)	AC line phases are incorrectly wired to the AC Line Connection Terminals. The IQ Data Plus II is phase sensitive. The IQ Data Plus II looks for an A-B-C phase sequence. (3)	Correct the improper wiring. Check utility to determine their phase sequence.
Digit 7 flashes in the Display Window indicating an internal malfunction. (1)	IQ Data Plus II has detected an internal malfunction.	Replace the unit. (See Paragraph 7.2)
The numbers 111111, 222222, . . . 999999, 0000 appear in the display. The select LED scans down the functions at a fast rate. The trip/alarm LEDs flash. The units LEDs flash. The trip/alarm/WH pulse contacts change state.	The Test switch is in the "ON" position. The unit is in self-test mode.	Set the Test Mode switch (SW4, switch 4) to the "OFF" position.

(1) See Table 3.B.

(3) Whether the unit also reacts with a trip and/or alarm condition depends on switch settings, as described in Section 6.

Table 7.B

OPERATIONAL TROUBLESHOOTING

Symptom	Probable Cause(s)	Solution
All Operator Panel indicators are off.	AC line being monitored is below 85 VAC. (5)	Locate the cause of the deficiency in the AC line monitored.
	Separate Source AC line voltage is deficient.	Locate the cause of the deficiency in the AC control power line.
	AC line fuses on the IQ Data Plus II are blown or missing, or are not contacting correctly. (5)	Verify that the incoming AC line is at the correct voltage level. Check that the fuses are sitting correctly in their clips.
	IQ Data Plus II is malfunctioning	Replace the unit. (See Paragraph 7.2.)
Digit 1 flashes in the Display Window, indicating an "external trip". (1)	A trip condition has been externally initiated through the Communications Port. (2)	Determine why the trip was initiated from the external device through the Communications Option.
Digit 2 flashes in the Display Window, indicating an overvoltage. (1)	An overvoltage condition was detected. (3)	The AC line being monitored is deficient with respect to the probable cause stated.
Digit 3 flashes. (1)	An undervoltage condition was detected. (3)	
Digit 4 flashes. (1)	A phase unbalance condition was detected. (3)	
Digit 5 flashes. (1) (4)	A phase loss condition was detected. (3)	
	Blown or loose fuse(s)	Check fuse(s) on affected phase(s) located just above voltage inputs behind cover of power module. Reseat fuse(s). Replace if necessary with 3/4 ampere, 600 volt, Buss Type KTK-R-3/4. (See Par. 2.1.2, No. 8)
One or more voltage phases read incorrect	Blown or loose fuse(s)	Check fuse(s) on affected phase(s) located just above voltage inputs behind cover of power module. Reseat fuse(s). Replace if necessary with 3/4 ampere, 600 volt, Buss Type KTK-R-3/4. (See Par. 2.1.2, No. 8)
Current readings not accurate or zero	Incorrect size CT's used	Replace with proper size CT's (See paragraph 6.1.1)
Power readings are incorrect	Phasing for voltage and current is incorrect	Check phasing. Verify connections with wiring diagrams. (Figures 4.4A-4.4L)
Digit 6 flashes (1)	A phase reversal condition was detected. (3)	The AC line being monitored is deficient with respect to the probable cause stated.
Digit 7 flashes. (1)	IQ Data Plus II has detected an internal malfunction.	Replace the unit. (See Paragraph 7.2.)

(1) See Table 3.B.

(2) This assumes the unit is equipped with the Communications Option.

(3) Whether the unit also reacts with a trip and/or alarm condition depends on switch settings, as described in Section 6.

(4) Correct CT selection must be observed for current phase loss protection to operate correctly. See Section 6.1.2.

(5) Applicable to IQ Data Plus II with 3-Phase Power Module only.

Table 7.B (Cont'd)

OPERATIONAL TROUBLESHOOTING

Symptom	Probable Cause(s)	Solution
Watthours counter not accumulating	CT polarity is reversed	If an inductive load is being monitored, the WATTS LED should be solid; if it is blinking, check wiring diagrams (Figures 4.4A-4.4F) and verify CT connections.

Before attempting to troubleshoot the IQ Data Plus II and the associated equipment, read and observe the Dangers listed in the box on page 39. When the normal operational conditions of the IQ Data Plus II listed above cannot be observed, refer to Table 7.A. This Table lists a probable cause and suggests an approach for each possible symptom.

7.1.2 Operational Troubleshooting — A troubleshooting chart, shown in Table 7.B, lists the probable causes and solutions for each of a number of symptoms. This Table assumes the IQ Data Plus II has been operating properly for a period of time. Before attempting to troubleshoot the unit and its associated equipment, read and observe the Dangers listed in this Section.

7.2 Unit Replacement — Follow this procedure to replace the IQ Data Plus II.

Step 1 — Remove AC power at the main disconnect or isolation switch of the line being monitored. If the switch is located at a distance from the IQ Data Plus II, lock it out to guard against personnel accidentally turning it on.

Step 2 — Verify that all "foreign" power sources wired to the IQ Data Plus II are de-energized. These may be present on the Trip/Alarm Terminal Block.

Remove separate source 120/240 VAC control power from IQ Data Plus II.

Step 3 — Before disconnecting any wires from the unit, make sure they are individually identified to assure that reconnection will be correctly performed. Make a sketch to help with the task of terminal and wire identification.

Step 4 — If an optional ribbon cable connects with the Communications Port, carefully unplug it. The connectors may be screwed together.

Step 5 — If the unit has its Power Module remotely located, carefully unplug the optional Extension Cable from the IQ Data Plus II's chassis, **not** the Power Module. (See Figure 2.1.)

Step 6 — Loosen each screw terminal or nut where there is a wire connection. Remove the associated wire.

Step 7 — Remove the 6 mounting screws holding the unit against the door or panel. These are accessed from the IQ Data Plus II's rear.

CAUTION: Be prepared to support the IQ Data Plus II from its front side once most of the screws are loosened or removed. Without such support, the unit could fall off, and the Panel could be damaged.

Step 8 — Carefully lay these screws aside for later use.

Step 9 — Read Paragraph 4.1.2 before attempting to mount the replacement unit.

Step 10 — Reverse the procedure noted in Steps 4 thru 7.

Step 11 — Using the sketch noted in Step 3, above, replace each wire at the correct terminal. Be sure each is firmly tightened.

Step 12 — Be sure the Voltage Selector Jumper on the standard Voltage Terminal Block, if used, is positioned according to the AC line's input level. It may be necessary to reposition it. (See Paragraph 4.1.4.)

Step 13 — Set the DIP switches on the right rear of the unit according to the individual application's Installation Record Sheet. (If necessary, see Paragraph 4.3 for details.)

Step 14 — Restore AC power and verify that the Operator Panel functions, after an initial 2-second delay, are as follows:

- The I_A AMPS RMS LED illuminates.
- The Display Window shows the actual line phase A amperes.

Shaded area designates information that replaces or supplements applications using the 120/240 VAC Separate Source Power Supply Module.

Tear along perforation. Fold the top half down and tape.

IQ-1000 & IQ DATA PLUS II USER MANUAL
Customer Comments

Did you find any corrections that need to be made to this manual? (Include page number.)

_____

_____

_____

_____

Were any parts of the manual unclear? Do any require further detail or description? (List parts.)

_____

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What are your special application needs?

_____

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As part of a constant effort to serve your needs, Westinghouse is interested in any information you can supply about your application or use of the IQ-1000/IQ DATA PLUS II. If you would like to share this information, please check the box below.

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