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

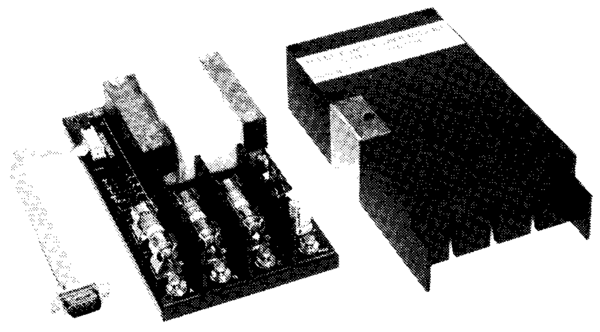

Figure 2.3A — Fusing For Three-Phase Power Module

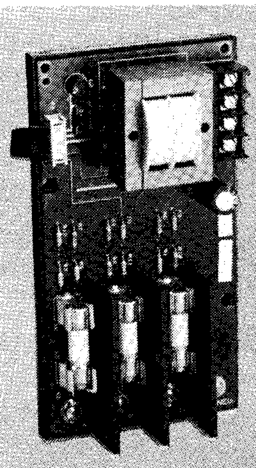

Figure 2.3B — Fusing For Separate Source Power Supply Module (Cover not shown)

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.

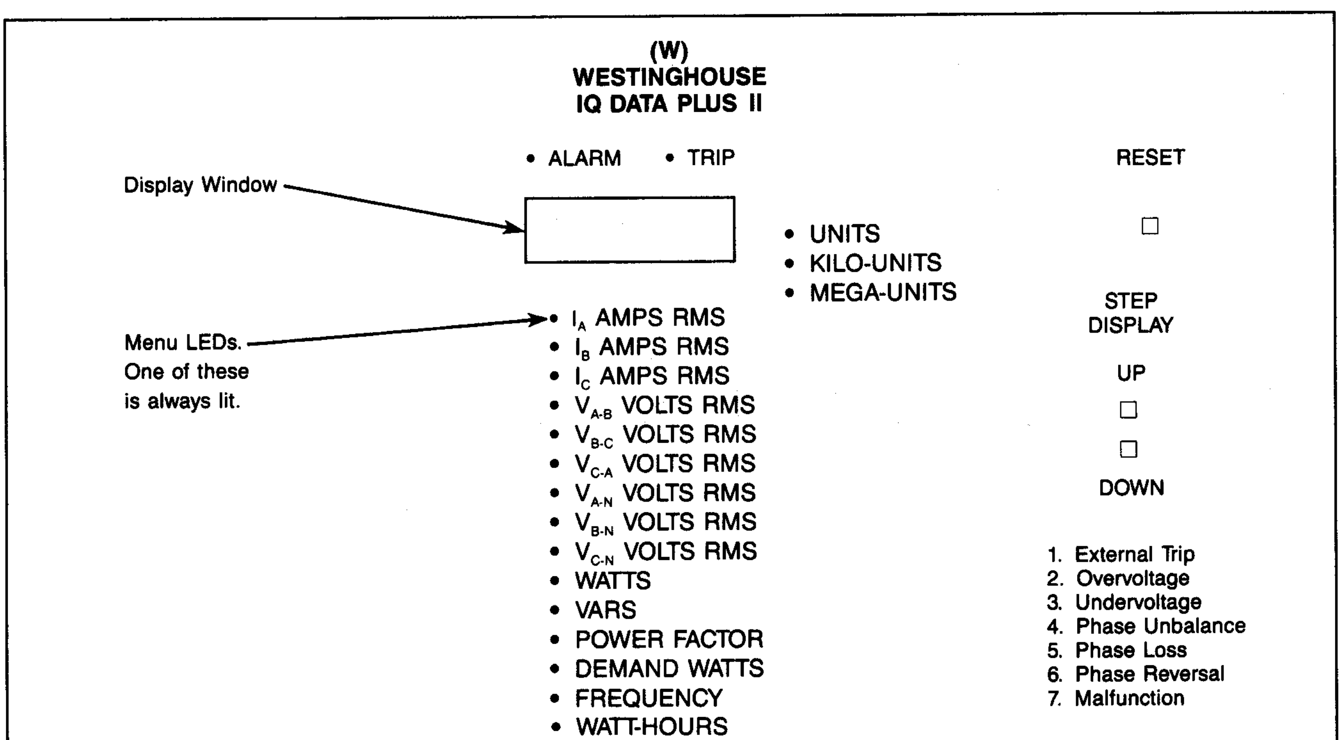

Figure 3.1 Operator Panel

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_{B-C} Volts RMS V_{C-A} Volts RMS	V KV V KV V KV	XXXXXX or XXX.XXX XXXXXX or XXX.XXX XXXXXX or XXX.XXX	Phases A-to-B Phases B-to-C Phases C-to-A
V_{A-N} Volts RMS(1) V_{B-N} Volts RMS(1) V_{C-N} Volts RMS(1)	V KV V KV V KV	XXXXXX or XXX.XXX XXXXXX or XXX.XXX XXXXXX or XXX.XXX	Phase A-to-neutral Phase B-to-neutral 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.

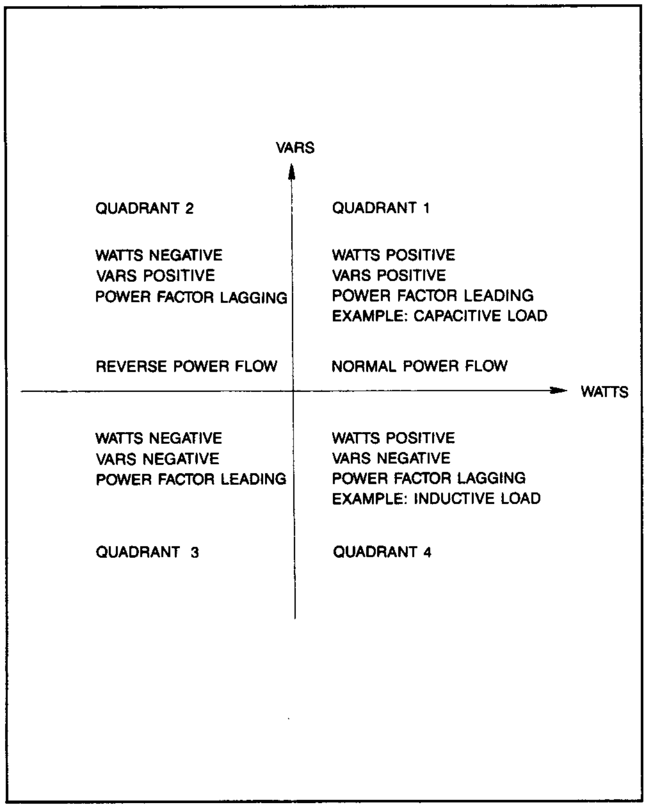

Figure 3.2 Power Quadrants

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.

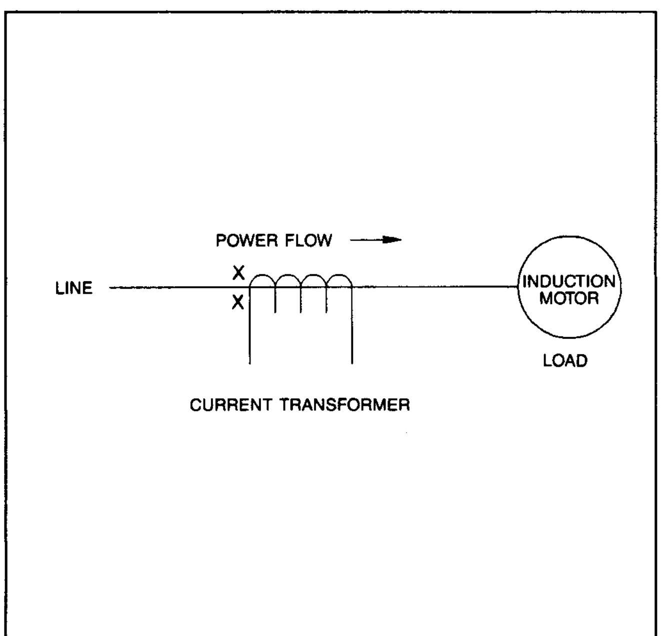

Figure 3.3 Induction Motor Load

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.

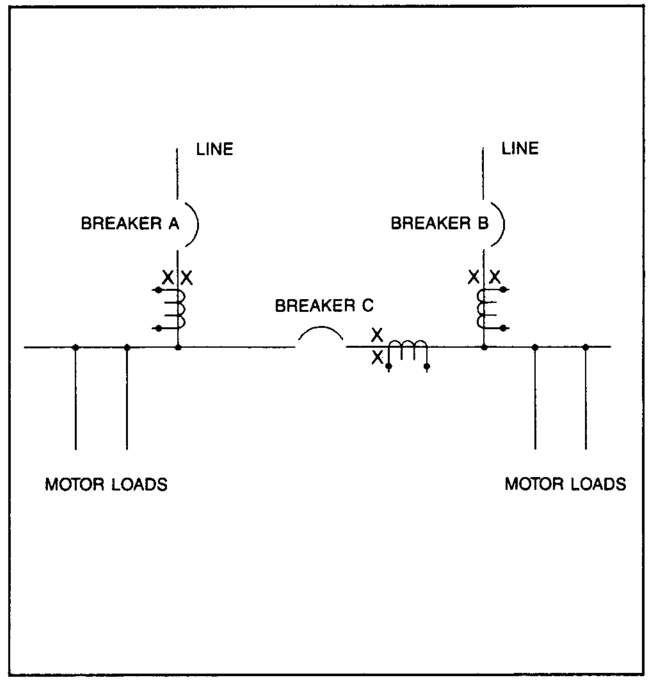

Figure 3.4 Power Distribution

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.

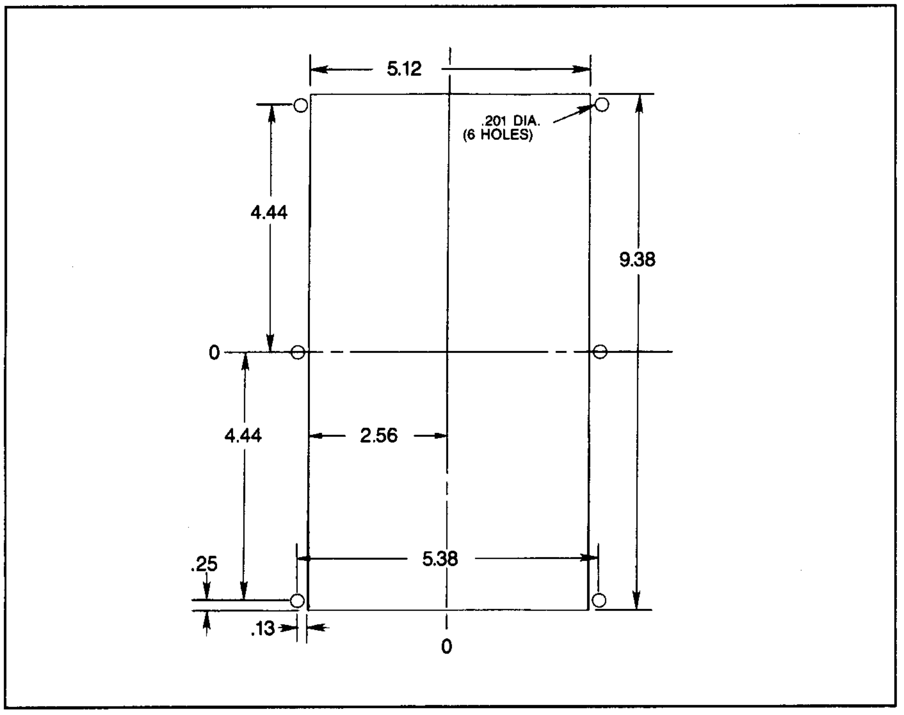

Figure 4.1 Chassis Cutout Dimensions

These dimensions must be −0 and +0.050 in.

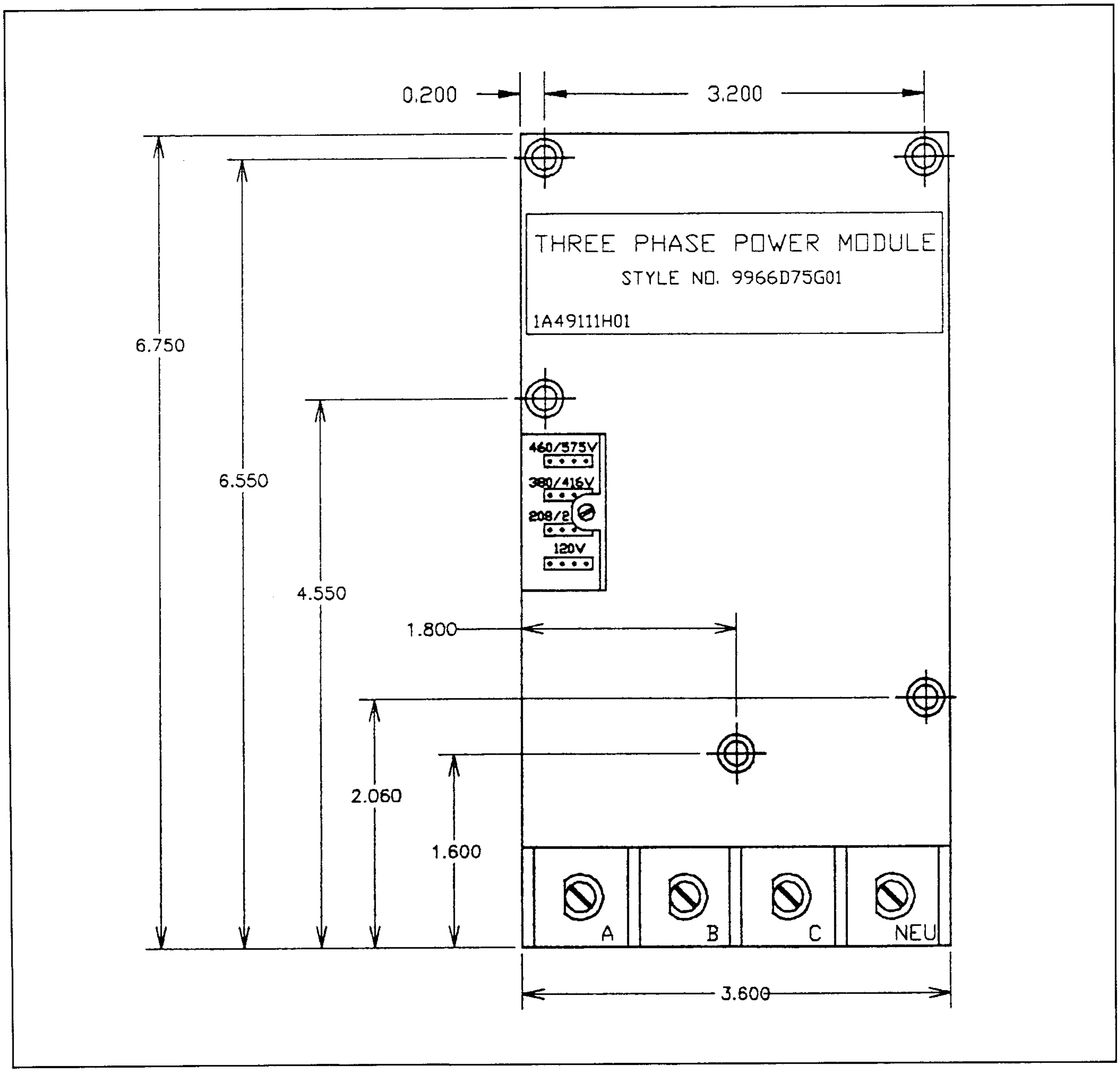

Figure 4.2A — Removable Power Module

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 Supply Module.

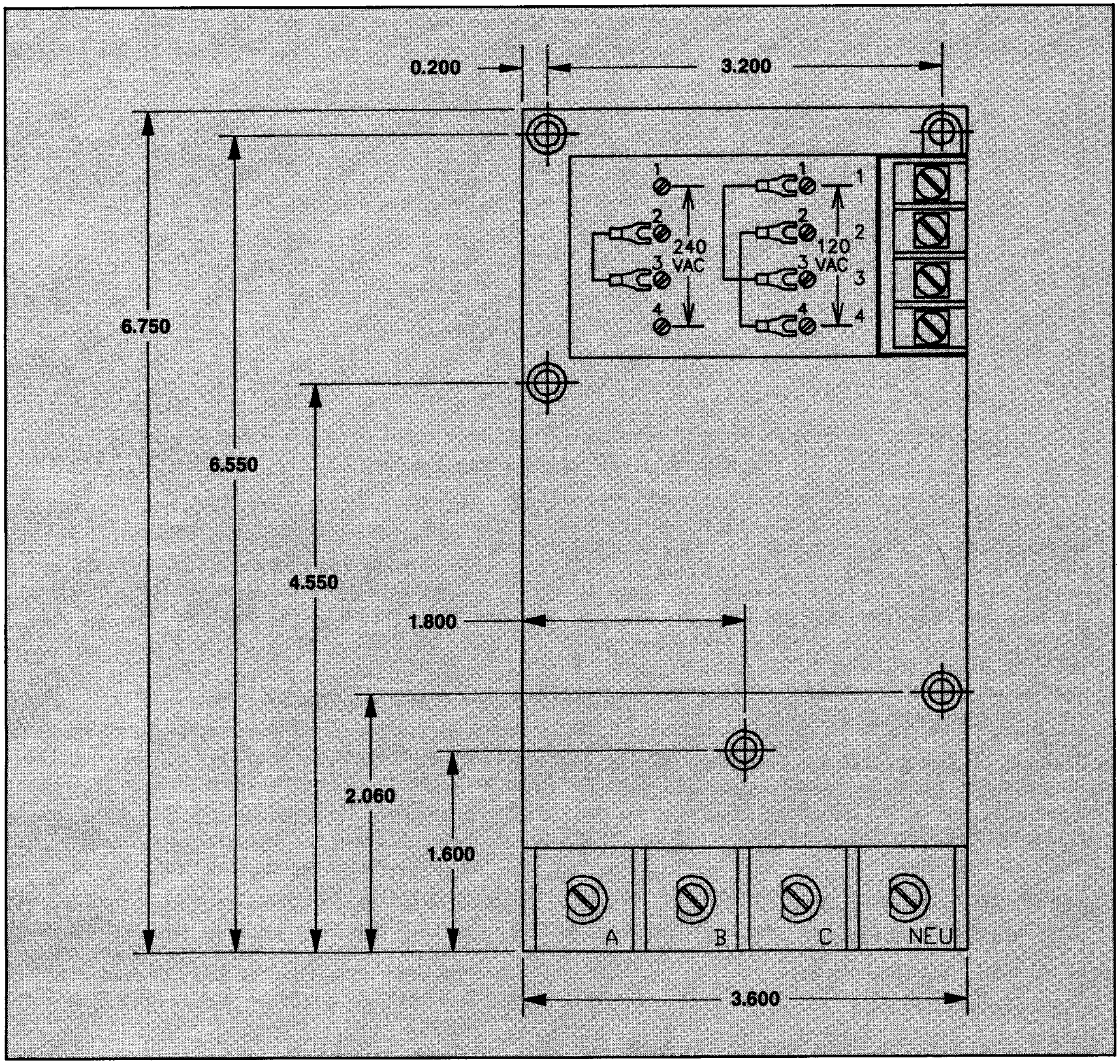

Figure 4.2B — Removable Separate Source Power Supply Module

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