

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	—	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
	2	—	
	3	—	
	4	—	
5	—		
	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.B**  
**CT RATIO SETTINGS**

CT Ratios	SW1 Switch Settings <sup>(1)</sup>				
	1	2	3	4	5
100:5 150:5 200:5	ON OFF ON	ON ON OFF	ON ON ON	ON ON ON	ON ON ON
250:5 300:5 400:5	OFF ON OFF	OFF ON ON	ON OFF OFF	ON ON ON	ON ON ON
500:5 600:5 800:5	ON OFF ON	OFF OFF ON	OFF OFF ON	ON ON OFF	ON ON ON
1000:5 1200:5 1500:5	OFF ON OFF	ON OFF OFF	ON ON ON	OFF OFF OFF	ON ON ON
1600:5 2000:5 2500:5	ON OFF ON	ON ON OFF	OFF OFF OFF	OFF OFF OFF	ON ON ON
3000:5 3200:5 4000:5 5000:5	OFF ON OFF ON	OFF ON ON OFF	OFF ON ON ON	OFF ON ON ON	ON OFF OFF 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 <sup>(1)</sup>	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 <sup>(1)</sup>	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 <sup>(1)</sup>	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 <sup>(1)</sup>	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	—	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)
	2	—	
	3	—	
	4	—	
	5	—	Peak demand window (sampling) time = _____ minutes. (5/10/15/30 min.) Refer to Table 6.J
	6	—	
	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.

(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 <sup>(1)</sup>	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			
<sup>(1)</sup> Required setting when no PT used.				

**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:

- 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.
- 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.

**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	—	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
	2	—	
	3	—	
	4	—	Test Mode. For normal operation, this switch should always be "OFF".
	5	—	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	—	
	7	—	
	8	—	

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

**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	—	Percent of line voltage variation between phases to cause phase unbalance = _____% (5/10/15/20/25/30/35/40%) Refer to Table 6.R
	2	—	
	3	—	
	4	—	WH count reset ON = Enabled OFF = Disabled
SW6	5	—	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
	6	—	
	7	—	
SW6	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  $\pm 5$  to  $\pm 40\%$ . 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
$\pm 5$	ON	ON	ON
$\pm 10$	OFF	ON	ON
$\pm 15$	ON	OFF	ON
$\pm 20$	OFF	OFF	ON
$\pm 25$	ON	ON	OFF
$\pm 30$	OFF	ON	OFF
$\pm 35$	ON	OFF	OFF
$\pm 40$	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, Hard-

ware 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 electro-mechanical 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<sub>A</sub> 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 $\frac{3}{4}$ ampere, 600 volt, Buss Type KTK-R- $\frac{3}{4}$ . (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 $\frac{3}{4}$ ampere, 600 volt, Buss Type KTK-R- $\frac{3}{4}$ . (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.)
<p>(1) See Table 3.B.</p> <p>(2) This assumes the unit is equipped with the Communications Option.</p> <p>(3) Whether the unit also reacts with a trip and/or alarm condition depends on switch settings, as described in Section 6.</p> <p>(4) Correct CT selection must be observed for current phase loss protection to operate correctly. See Section 6.1.2.</p> <p>(5) Applicable to IQ Data Plus II with 3-Phase Power Module only.</p>		

**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.



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