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# Installation and Operating Manual
# SWITCHBOARD INTEGRA 0340

## INTEGRA 0340

Digital Metering
of Volts and Amps


Crompton INSTRUMENTS

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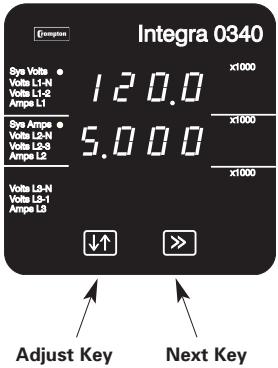
## Contents



Crompton INSTRUMENTS

# 1 Introduction

The Crompton Switchboard INTEGRA 0340 is a panel mounted self contained measuring display device. This system will measure and display up to 11 electrical parameters, integrating high accuracy measurement technology with the high visibility of 7 segment LED displays.




All voltage and current measurements are True RMS for accurate measurement of non sinusoidal waveforms.

Available in the following configurations:-

3 Phase 3 Wire Unbalanced

3 Phase 4 Wire Unbalanced

The INTEGRA 0340 front panel has two push buttons, referred to as “keys”. The two keys allow the user to select the required display and to configure the INTEGRA 0340.

| Measured Quantity | Units of measurement |
|---|---|
| System Voltage | Volts |
| System Current (Average) | Amps |
| Voltage L-N (4 wire only) | Volts |
| Voltage L-L (calculated in 4 wire) | Volts |
| Current in 3 Phases | Amps |

Important safety information is contained in the installation section. Installers must familarise themselves with this section before installation.

## 2 Display Screens

Use the >> (Next) key to scroll from one screen to the next in sequence. The sequence depends on the supply type (3 phase 3 wire or 3 phase 4 wire) as screen 2 is not shown on 3 wire systems.


### 2.1 Screen 1 – System Screen

The system screen is the default display. It appears when the unit is energised.

System Average Voltage (Volts)
{Line to Line for 3 wire systems,
Line to Neutral for 4 wire systems}

System Average Line Current (Amps)


### 2.2 Screen 2 – Line to Neutral Voltages

Three phase, four wire systems only.

Voltage Line 1 to Neutral (Volts)

Voltage Line 2 to Neutral (Volts)

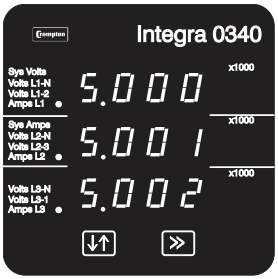
Voltage Line 3 to Neutral (Volts)


### 2.3 Screen 3 – Line to Line Voltages

Voltage Line 1 to Line 2 (Volts)

Voltage Line 2 to Line 3 (Volts)

Voltage Line 3 to Line 1 (Volts)




**2.4 Screen 4 – Line Currents**

Line 1 Current (Amps)

Line 2 Current (Amps)

Line 3 Current (Amps)

**2.5 Error Messages**

The display screen repeatedly requests new values from the measurement processor. If there is a problem obtaining these values the display will continue to retry but will alert the user by displaying the message Err1. This message may be seen briefly during conditions of extreme electromagnetic interference with the normal display returning once the interference has ceased. If the Err1 message persists a 10 second interruption to the auxiliary supply may restore normal operation.

## 3 Programming

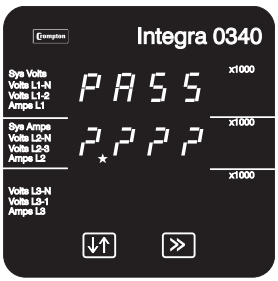
The following sections comprise step by step procedures for configuring the Switchboard INTEGRA 0340 for individual user requirements.

To access the set-up screens press and hold the "↓↑ Adjust" and ">> Next" keys simultaneously for 5 seconds. This will take the user into the password protection entry stage. (See Section 3.1 Password Protection). To return to the display screens at any time during these procedures, press the "↓↑ Adjust" and ">> Next" keys simultaneously for 5 seconds.

**3.1 Password Protection**

Password protection can be enabled to prevent unauthorised access to set-up screens. By default password protection is not enabled.

Password protection is enabled by selecting a four digit number other than 0000. Setting a password of 0000 disables the password protection.




Enter Password, prompt for first digit.

(* Denotes that decimal point will be flashing).

Press the "↓↑ Adjust" key to scroll the value of the first digit from 0 through to 9, the value will wrap from 9 round to 0.

Press the ">> Next" key to advance to the next digit.

In the special case where the Password is "0000" pressing the ">> Next" key when prompted for the first digit will advance to the "Password Confirmed" screen.


Enter Password, first digit entered, prompt for second digit. (* Denotes that decimal point will be flashing).

Press the "↓↑ Adjust" key to scroll the value of the second digit from 0 through to 9, the value will wrap from 9 round to 0.

Press the ">> Next" key to advance to the next digit.


Enter Password, second digit entered, prompt for third digit. (* Denotes that decimal point will be flashing).

Use the "↓↑ Adjust" key to scroll the value of the third digit from 0 through to 9, the value will wrap from 9 round to 0.

Press the ">> Next" key to advance to the next digit.


Enter Password, third digit entered, prompt for fourth digit. (*decimal point indicates that this will be flashing.)

Use the "↓↑ Adjust" key to scroll the value of the fourth digit from 0 through to 9, the value will wrap from 9 round to 0.

Press the ">> Next" key to advance to verification of the password.


Enter Password, fourth digit entered, awaiting verification of the password.


Password Confirmed

Pressing "↓↑ Adjust" key will advance to the "New/Change Password" entry stage.

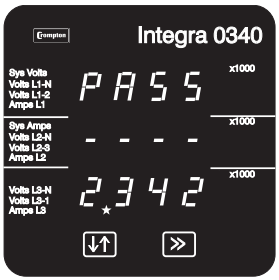
Pressing the ">> Next" key will advance to the Full Scale Current Set-Up Screen.


Password Incorrect

The unit has not accepted the password entered.

Pressing the "↓↑ Adjust" key will return to the "Enter Password" stage.

Pressing the ">> Next" key exits the set-up menus and returns operation to the normal display mode.

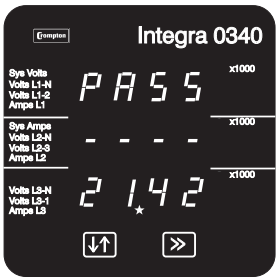



New/Change Password.

(* decimal point indicates that this will be flashing.)

Pressing the "↓↑ Adjust" key will scroll the value of the first digit from 0 through to 9, the value will wrap from 9 round to 0.

Pressing the ">> Next" key advances the operation to the next digit and sets the first digit, in this case to "2".




New/Change Password, first digit entered, prompting for second digit. (*decimal point indicates that this will be flashing)

Pressing the "↓↑ Adjust" key will scroll the value of the second digit from 0 through to 9, the value will wrap from 9 round to 0.

The procedure for second, third and fourth digits follows the same principals.

Pressing the ">> Next" key advances to the new password confirmed screen.


New Password Confirmed.

Pressing "↓↑ Adjust" key will return to the "New/Change Password".

Pressing the ">> Next" key will advance to the Full Scale current Set-Up Screen.

## 3.2 Set-Up Screens

### 3.2.1 Full Scale Current

This parameter is the value of nominal Full Scale Current that will be displayed as the Line Currents. This screen enables the user to display the Line currents inclusive of any transformer ratios. The values displayed represent the Current in Amps. For example setting 800 on this screen will cause the display to indicate 800 when the nominal maximum (typically 5A or factory build option of 1A) current flows through the current inputs.


Pressing the ">> Next" key accepts the present value and advances to the potential transformer ratio menu.

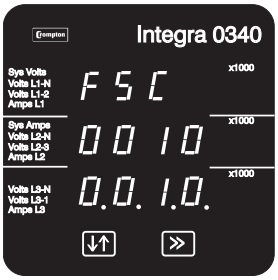
Pressing the "↓↑ Adjust" key will enter the "Full Scale Current Edit" mode. This will scroll the value of the most significant digit from 0 through to 9, unless the presently displayed current transformer ratio together with the full scale voltage value results in a maximum power of greater than 360 Megawatts in which case the digit range will be restricted.

Pressing the ">> Next" key will advance to the next less significant digit. (* Denotes that decimal point will be flashing).

The "Maximum Power" restriction of 360 Megawatts refers to 120% of nominal current and 120% of nominal voltage, i.e. 250 Megawatts nominal system power.

When the least significant digit has been set, pressing the ">> Next" key will advance to the "Full Scale Current Confirmation" stage.

The minimum value allowed is 1. The value will be forced to 1 if the display contains zero when the ">> Next" key is pressed.




Full Scale Current Confirmation

This screen will only appear following an edit of the full-scale current.

If the scaling is not correct, pressing the "↓↑ Adjust" key will return to the "Full Scale Current Edit" stage with the most significant digit highlighted (associated decimal point flashing) and the bottom line of the display will be blanked.

Pressing the ">> Next" key sets the displayed value and will advance to the "Potential Transformer Primary Value" menu.

### 3.2.2 Potential Transformer Ratio

This defines the nominal full scale voltage which will be displayed as the L1-N, L2-N and L3-N for a four wire system or as L1-2, L2-3 and L3-1 in a three wire system. This screen enables the user to display the line to neutral and line to line voltages inclusive of any transformer ratios. The values displayed represent the voltage in kilovolts (note the x1000 annunciator). For example on a 2.2kV system with 110v PT secondary, set 2.200 at this screen.

If there is no PT in the system, leave this value unchanged and skip this set up step. If the PT primary and secondary values are changed and it is desired to revert to a set up with no PT, then set both PT primary and secondary values to the nominal maximum voltage for the Integra 0340. For example 139V L-N for a 4 wire LOV range instrument.


### 3.2.3 Potential Transformer Primary Value

Pressing the ">> Next" key accepts the present value and advances to the "Potential Transformer Secondary Value" menu. (See Section Potential Transformer Secondary Value).

Pressing the "↓↑ Adjust" key will enter the "PT Primary Multiplier Edit" Mode.

Initially all the digits of the present value will be flashing and the decimal point position will be illuminated. This is to indicate that initially the "multiplier" must be selected. Pressing the "↓↑ Adjust" key will move the decimal point position to the right until it reaches ###.# after which it will return to #.###

Pressing the ">> Next" key will accept the present multiplier (decimal point position), stop the digits flashing and advances to the "PT Primary Digit Edit" mode


PT Primary Digit Edit

Pressing the "↓↑ Adjust" key will scroll the value of the most significant digit from 0 through to 9 unless the presently displayed potential transformer ratio together with the full scale current value, previously set, would result in a maximum power of greater than 360 Megawatts in which case the digit range will be restricted.

Pressing the ">> Next" key accepts the present value at the cursor position and advances the cursor to the next less significant digit.

(* Denotes that decimal point will be flashing).

Note: the flashing decimal point indicates the cursor position. A steady decimal point will be present to identify the scaling of the number until the cursor position coincides with the steady decimal point position. At this stage the decimal point will flash.

When the least significant digit has been set pressing the ">> Next" key will advance to the "PT Primary Value Confirmation" stage.


PT Primary Value Confirmation

This screen will only appear following an edit of the PT Primary Value.

If the scaling is not correct, pressing "↓↑ Adjust" will return to the "Potential Transformer Ratio Edit" stage with the digits flashing indicating that the multiplier (decimal point position) should be selected.

Pressing the ">> Next" key sets the displayed value and will advance to the "Potential Transformer Secondary Value" menu.

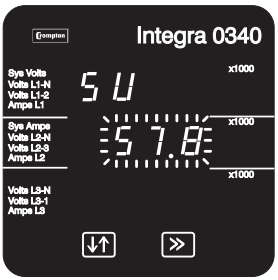
### 3.2.4 Potential Transformer Secondary Value

The nominal full scale secondary voltage will be displayed as the L1-N, L2-N and L3-N for a four wire system or as L1-2, L2-3 and L3-1 in a three wire system. This screen enables the user to define the PT secondary value which corresponds to the primary value set previously. The secondary voltage shown is in volts. Following the previous example, on a 2.2kV system with 110V PT secondary, set 110 at this screen. If there is no PT in the system, leave this value unchanged and skip this step.

### 3.2.5 Potential Transformer Secondary Decimal Point Edit

Pressing the ">> Next" key accepts the present value and returns to the display mode.

Pressing "↓↑ Adjust" will enter the "PT Secondary Value" Mode depending on the system build voltage. See note below.




Initially all the digits of the current value will be flashing and the decimal point position illuminated. This is to indicate that initially the "multiplier" must be selected, pressing "↓↑ Adjust" will move the decimal point position to the right.

Note that the decimal point edit will only appear when the Integra 0340 is factory configured for connection to voltages in the range 57.7 to 139V.

Pressing "↓↑ Adjust" will move the decimal point to allow voltages less than 100V to be entered, e.g. 57.7V L-N.

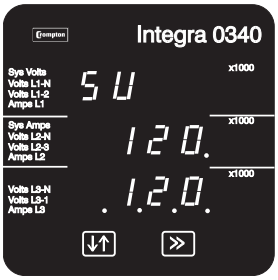

### 3.2.6 PT Secondary Digit Edit

Pressing "↓↑ Adjust" will scroll the value of the most significant digit within the range indicated on the rating label.

Pressing the ">> Next" key accepts the present value at the cursor position and advances the cursor to the next less significant digit.

Note: the flashing decimal point indicates the cursor position. A steady decimal point will be present to identify the scaling of the number until the cursor position coincides with the steady decimal point position. At this stage the decimal point will flash.

When the least significant digit has been set pressing the ">> Next" key will advance to the "Potential Transformer Secondary Value Confirmation" stage.




### 3.2.7 Potential Transformer Secondary Value Confirmation

This screen will only appear following an edit of the Potential Transformer Secondary Value.

If the value is not correct, pressing "↓↑ Adjust" will return to the "Potential Transformer Secondary Value Edit" stage.

Pressing the ">> Next" will return to the display mode.

The secondary value may only be set to values within the range defined by the factory voltage build option. These nominal RMS input voltages are shown below in the Specification section.

## 4 Specification

### Inputs

Three phase three wire

| | |
|---|---|
| Voltage range ELV | 100 - 120V L-L |
| Voltage range LOV | 121 - 240V L-L |
| Voltage range MIV | 241 - 480V L-L |
| Voltage range HIV | 481 - 600V L-L |

Three phase four wire

| | |
|---|---|
| Voltage range ELV | 100 - 120V L-L (57.7 - 70V L-N) |
| Voltage range LOV | 121 - 240V L-L (70.1 - 139V L-N) |
| Voltage range MIV | 241 - 480V L-L (140 - 277V L-N) |
| Voltage range HIV | 481 - 600V L-L (277 - 346V L-N) |

Voltage range is defined by factory build option.

| | |
|---|---|
| Nominal input voltage (a.c. rms) | 57.7 to 346V L-N<br>100 to 600V L-L |
| System PT/VT primary values | 1 Volt to 400 kVolt |
| Max continuous input voltage | 120% of nominal (up to 720 V max.) |
| Max short duration input voltage | 2* nominal (1s application repeated 10 times at 10s intervals) |
| Nominal input voltage burden | 0.2 VA approx. per phase |
| Nominal input current | 1 or 5 A a.c. rms |
| System CT primary values | Standard values up to 9999 Amps (5 A secondaries)<br>(1 A on application) |
| Max continuous input current | 120% of nominal |
| Max short duration current input | 20* nominal (1s application repeated 5 times at<br>5 min intervals) |
| Nominal input current burden | 0.6VA approx. per phase |

### Auxiliary

| | |
|---|---|
| Standard supply voltage | 100 to 250V AC nominal ±15% (85V AC<br>absolute minimum to 287V AC absolute maximum) or<br>100V to 250V DC nominal +25%, -15% (85V DC absolute minimum to 312V DC absolute maximum) |
| a.c. supply frequency range | 45 to 66 Hz |
| a.c. supply burden | 3W |
| Optional auxiliary d.c.supply | 12 to 48V DC. nominal +25%, -15% (10.2V DC absolute minimum to 60V DC absolute maximum) |
| d.c. supply burden | 3W |

**Measuring Ranges**

Values of measured quantities for which errors are defined.

| | |
|---|---|
| Voltage | 70 .. 120% of nominal |
| Current | 5 .. 120% of nominal |
| Frequency | 45 .. 66 Hz |

**Accuracy**

| | |
|---|---|
| Voltage | 0.4% of reading ±0.1% of range |
| Current | 0.4% of reading ±0.1% of range |
| Temperature coefficient | 0.013%/°C typical |
| Response time to step input | 1.5 seconds approx. |

**EMC Standards**

| | |
|---|---|
| EMC Immunity | EN61326 for Industrial Locations to performance criterion A |
| EMC Emissions | EN61326 to Class B - Domestic |

**Safety**

| | |
|---|---|
| IEC1010-1 (BSEN 61010-1) | Permanently connected use, Normal Condition Installation category III, pollution degree 2, Basic Insulation 720V RMS maximum. All terminals are for use only with equipment that has no live parts WHICH ARE ACCESSIBLE and the insulation for external circuits is to be suitable for SINGLE FAULT CONDITIONS. |

**Insulation**

| | |
|---|---|
| Dielectric voltage withstand test | 3.25kV RMS 50Hz for 1 minute between all electrical circuits |

**Environmental**

| | |
|---|---|
| Operating temperature | -20 to +70°C |
| Storage temperature | -20 to +80°C |
| Relative humidity | 0 .. 95% non condensing |
| Shock | 30g in 3 planes |
| Vibration | 10-150 Hz, 1g/0.15mm amplitude |
| Enclosure integrity | (front face only) IP54 |

**Enclosure**

| | |
|---|---|
| Style | ANSI C39.1 |
| Material | Polycarbonate front and base, steel case |
| Terminals | 6-32 UNC slotted barrier type |

# 5 Installation

## 5.1 Display

The Switchboard INTEGRA 0340 may be mounted in a panel of any thickness up to a maximum of 0.47". Mounting is by four 1/4 - 28 UNF corner studs and nuts. Consideration should be given to the space required behind the instrument to allow for bends in the connection cables.
As the front of panel enclosure conforms to IP54 it is protected from water spray. Additional protection to the panel may be obtained by the use of an optional panel gasket. The terminals at the rear of the product should be protected.
Switchboard INTEGRA 0340 should be mounted in a reasonably stable ambient temperature within the range -20 to +70°C. Vibration should be kept to a minimum and the product should not be mounted where it will be subjected to direct sunlight.

**Caution:**

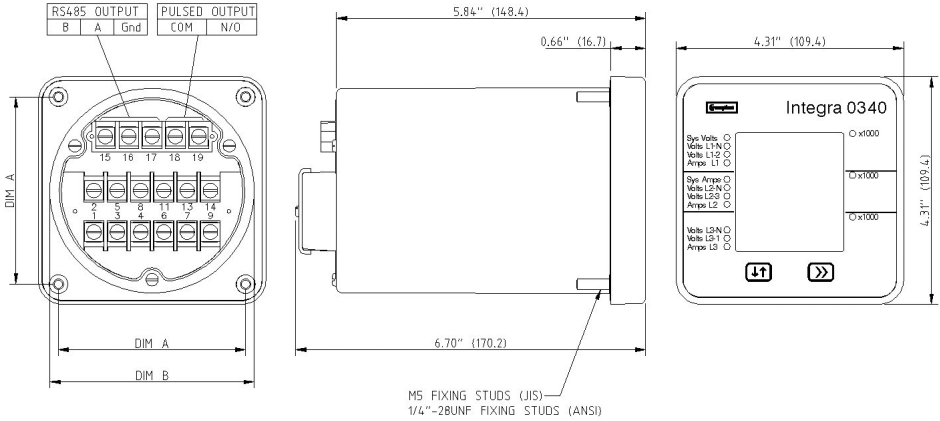
- In the interest of safety and functionality these products must be installed by a qualified engineer, abiding by any local regulations.
- Voltages dangerous to human life are present at some of the terminal connections of these units. Ensure that all supplies are de-energised before attempting any connection or disconnection. Terminals should not be user accessible after installation and external installation provisions must be sufficient to prevent hazards under fault conditions
- These products do not have internal fuses therefore external fuses must be used for protection for safety under fault conditions.
- This unit is not intended to function as part of a system providing the sole means of fault protection - good engineering practice dictates that any critical function be protected by at least two independent and diverse means.
- Never open circuit the secondary winding of an energised current transformer.

## 5.2 EMC Installation Requirements

This unit has been designed to provide protection against EM (electro-magnetic) interference in line with requirements of EU and other regulations. Precautions necessary to provide proper operation of this and adjacent equipment will be installation dependent and so the following can only be general guidance:-

- Avoid routing wiring to this unit alongside cables and products that are, or could be, a source of interference.
- The auxiliary supply to the unit should not be subject to excessive interference. In some cases, a supply line filter may be required.
- To protect the product against incorrect operation or permanent damage, surge transients must be controlled. It is good EMC practice to suppress differential surges to 2kV or less at the source. The unit has been designed to automatically recover from typical transients, however in extreme circumstances it may be necessary to temporarily disconnect the auxiliary supply for a period of greater than 10 seconds to restore correct operation.
- Screened communication leads are recommended and may be required. These and other connecting leads may require the fitting of RF suppression components, such as ferrite absorbers, line filters etc., if RF fields cause problems.
- It is good practice to install sensitive electronic instruments that are performing critical functions in EMC enclosures that protect against electrical interference causing a disturbance in function.

### 5.3 Case Dimension and Panel Cut-Out




| MODEL | JIS | ANSI |
|---|---|---|
| DIM A | 3.54" (90.0mm) | 3.37" (85.7mm) |
| DIM B | 3.90" (99.0mm) | 3.98" (101.2mm) |

### 5.4 Wiring

Input connections are made to screw clamp terminals. Choice of cable should meet local regulations.

Terminals for both current and voltage inputs will accept up to 3mm² x 2 diameter cables or ring lugs suitable for 6-32 screws. Terminal screws should be tightened to 1.35Nm or 1.0 ft/lbf only. Terminal covers are held in place by miniature self tapping screws into plastic. These screws should be tightened by hand only, sufficiently to secure the terminal cover and prevent it vibrating.

- The current inputs of these products are designed for connection into systems via current transformers only.

#### Additional considerations for three wire systems

If this product is used in a system with an a.c. auxiliary where the frequency of the auxiliary may be different to the frequency of the signals being measured it will be necessary to connect the neutral terminal (terminal number 11) either to the system neutral connection or to an earth (ground) connection in order to achieve the published specifications.

The neutral terminal (terminal number 11) is indirectly connected to the voltage input terminals (terminals 2, 5 and 8). When connected to a three wire system the neutral terminal will adopt a potential somewhere between the remaining lines.

- If external wiring is connected to the neutral terminal it must be connected to either the neutral line or earth (ground) to avoid the possibility of electric shock from the neutral terminal.

### 5.5 Auxiliary Supply

INTEGRA 0340 should ideally be powered from a dedicated supply, however it may be powered from the signal source, providing the source remains within tolerance for the auxilary supply.

### 5.6 Fusing

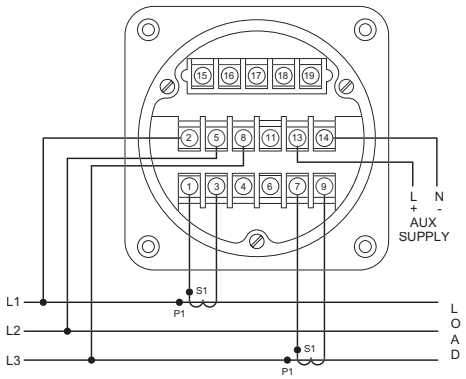
This unit must be fitted with external fuses in voltage and auxiliary supply lines. Voltage input lines must be fused with a quick blow fuse 1A maximum. Auxiliary supply lines must be fused with a slow blow fuse rated 1A maximum. Choose fuses of a type and with a breaking capacity appropriate to the supply and in accordance with local regulations.

### 5.7 Earth/Ground Connections

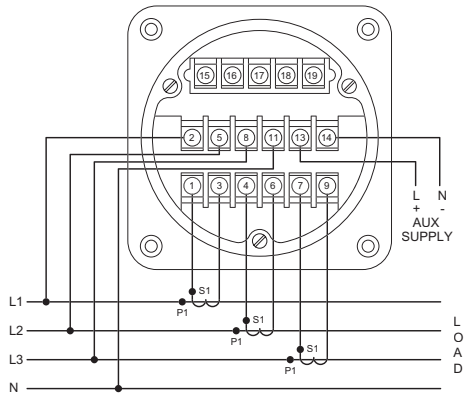
For safety reasons, CT secondary connections should be grounded in accordance with local regulations.

## 6 Connection Diagrams

3-PHASE 3-WIRE UNBALANCED LOAD




3-PHASE 4-WIRE UNBALANCED LOAD




Voltage lines and auxiliary supplied must be fused - see above.

## 7 Maintenance

In normal use, little maintenance is needed. As appropriate for service conditions, isolate electrical power, inspect the unit and remove any dust or other foreign material present. Periodically check all connections for freedom from corrosion and screw tightness, particularly if vibration is present.

The front of the case should be wiped with a dry cloth only. Use minimal pressure, especially over the viewing window area. If necessary wipe the rear case with a dry cloth. If a cleaning agent is necessary, isopropyl alcohol is the only recommended agent and should be used sparingly. Water should not be used. If the rear case exterior or terminals should accidentally be contaminated with water, the unit must be thoroughly dried before further service. Should it be suspected that water might have entered the unit, factory inspection and refurbishment is recommended. In the unlikely event of a repair being necessary, it is recommended that the unit be returned to the factory or nearest Crompton service centre.

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