POWERSMITHS

SMART PORTs

SMART-R1
SMART-R2A/R2B
SMART-R3A/R3B

MANUAL

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SMART-R1/2/3 Manual - ii - 202-003578-600 Rev: A02

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Safety Notice

A potential **Shock and Injury Hazard** exists when working on electrical systems which could lead to serious injury or even death if safety precautions are not observed. Only qualified competent personnel who have been trained in and are familiar with the **Risk of Electric Shock** and burns from **Plasma Arcs** should perform installation and maintenance on electrical systems. It is the sole **responsibility of the personnel** doing the work to be fully cognizant of all necessary safety regulations and procedures and **be familiar with the installation instructions detailed in this manual**.

*FOR YOUR SAFETY, IT IS IMPERATIVE THAT THE **POWER BE PROVEN DISCONNECTED** BEFORE ANY WORK ON OR PHYSICAL CONTACT TO ELECTRICAL CIRCUITS IS ATTEMPTED: **DO NOT ASSUME BUT CHECK** ACROSS THE LINES AND TO GROUND WITH AN APPROVED VOLTAGE INDICATING DEVICE AND ENSURE THAT THE POWER SOURCE(S) **DISCONNECTION DEVICES ARE LOCKED OUT.***

WHEN WORKING IN CLOSE PROXIMITY TO LIVE INSTALLATIONS FOLLOW ALL SAFETY REQUIREMENTS DEFINED IN NFPA 70E OR CSA Z462 WHICH WILL INCLUDE, BUT NOT LIMITED TO, THE USE OF PROTECTIVE EQUIPMENT (PPE) (CLOTHING, INSULATED GLOVES, SAFETY GOGGLES, ETC.). IT FURTHER RECOMMENDED THAT ALL METALLIC OBJECTS (SUCH AS JEWELRY, WATCHES, CHAINS ETC.) BE REMOVED FROM THEIR PERSON.

Symbols Used in this Manual

Risk of Electric Shock and/or ARC Flash Hazard: Life threatening voltages may be present with the risk of ARC Flash in the event of an inadvertent short circuit.

Cautionary Safety Alert: Draws attention to particular cautionary notes which, though not life threating, could result in injury or equipment damage if attention is not paid to the described precaution.

Limits to use of this equipment

This equipment is designed for permanent installation to monitor electrical circuits to 250VAC or 600VAC, model specific. Refer to the specific model as defined in the specifications for the model specific voltage limits and for the installation and environmental category.

The devices defined herein are intended to be used with defined current sensors; refer to the specific sections of the manual for the approved accessories. Use of other unapproved current sensors may compromise the safe operation of this instrument.

Devices and connections to the ancillary inputs and outputs (other than to external power) are required to be insulated and isolated from mains voltages and must not exceed 32VAC (60VDC); refer to relevant sections of this manual for additional notes and limits.

Protection is effected by double/reinforced insulation between the power and control/user circuits to 600V CATIII (UL61010-1) and by integral fusing for internal faults. Application of this equipment in a manner not specified in this manual may compromise its inherent protection.

The equipment is insulated by double/reinforced insulation up to 600VAC CAT III (UL61010-1) between the power inputs (L1, L2, L3, N) and the control and user circuits. The power input circuits may be field 'High Potential' tested up to 2.5kVAC without damage.

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1 *The SMART-RXX* Ports

The *SMART-RXX* family of Ports are provided as an accessory to the Powersmiths' family of transformers in a variety of configurations for application to commissioning and validation and on-going monitoring of electrical system performance for energy consumption and power quality.

Figure 1-1: SMART-R2B shown with External Measurement Port (EMP) option (cover removed)

The *SMART-R1* is a provides a measurement port, with no internal measurement capability, for measuring input and output parameters plus transformer temperature by the use of an external instrument like the Powersmiths portable Cyberhawk-EP300 Efficiency and Power Meter connected externally to its integrated "twist-lock" I/O connectors.

Note: This Model only provides for a measurement interface through its externally available measurement connection ports and has no integrated measurement capability.

SMART-R2X and *-R3X* Series have integrated output metering providing revenue grade ANSI C12.20 Class 0.5 accurate measurements of Voltage, Current, Power, Energy plus Power Quality analysis. Connectivity options are model specific and may include RS485 supporting Modbus/RTU and an Ethernet WEB Server supporting dynamic WEB pages, Modbus/TCP and BACnet/IP plus trend logs and Powersmiths WOW support depending on the model.

An external measurement port is also available on some models for measuring input and output parameters plus transformer temperature by the use of an external instrument like the Powersmiths portable Cyberhawk-EP300 Efficiency and Power Meter connected externally to its integrated "twist-lock" I/O connectors.

Alarming is optional to the integrated meter and includes alarming for up to 16 parameters with less than (<), equal to (=) or greater than (>) user set points. Alarms may be programmed to set a Modbus flag and operate the associated Relay Outputs. Two Alarm Conditions can also be "ANDED" for conditional operation of the Relay outputs.

These capacities provide users with the unique ability to easily commission the installed transformer and measure Voltages, Currents, Powers, Energy, and Power, Quality on an on-going basis and provides the data to assist in Energy Management providing an easy means of auditing energy usage to provide informed guidance on Energy management solutions and financial decisions and in evaluating and maintaining the effectiveness of energy saving devices or strategies.

1.1 SMART-RXX Model Variants

The model variants to the *SMART-R*XX family are summarized following:

SMART-1R has no integrated measurement capability but provides a means of measuring input and output parameters plus transformer temperature by the use of an external instrument like the Powersmiths Cyberhawk-EP300 connected to its integrated I/O receptacles.

Note: The primary application of the SMART-R1 is for Field Measurement and Validation

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SMART-R2X Models have an integrated measurement meter for direct measurement of transformer output electrical parameters ie. the load, with communication capabilities as described following:

-R2A: RS485 with Modbus/RTU for Building Management support

-R2B: RS485 with Modbus/RTU for Building Management support plus an External Measurement Port as per *SMART–R1*

-R3A: RS485 with Modbus/RTU and Ethernet with Modbus/TCP or BACnet/IP for Building Management support plus a WEB Server supporting dynamic WEB pages for simple anywhere anytime access to the data using only a WEB Browser. This model also includes local logging of selected parameters for trend graphs.

-R3B: RS485 with Modbus/RTU and Ethernet with Modbus/TCP or BACnet/IP for Building Management support plus a WEB Server supporting dynamic WEB pages for simple anywhere anytime access to the data using only a WEB Browser plus an External Measurement Port as per *SMART–R1*. This model also includes local logging of selected parameters for trend graphs.

Additional available options include:

- Modbus with BACnet/IP
- Alarm Option with Relay Outputs
- Bimetallic Temperature sensors for high temperature alarming

1.2 Application

The *SMART-RXX* series of Metering Ports integrated into Powersmiths' transformers is expected to find applications in Sub-metering, energy management and electrical system maintenance plus commissioning and validation. The SMART-R2X/R3X models support Building Management Systems through its Modbus/RTU protocol over RS485 or Modbus/TCP or BACnet/IP protocols over Ethernet. They also provide the technology infrastructure for the Powersmiths WOW Systems.

1.3 The Integrated SMART-R Meter

The Powersmiths *SMART-R2X and SMART-R3X Models* incorporate a revenue-accurate Power Meter with LCD display providing five (5) line numeric displays for simultaneous display of four (4) measurements plus energy. It housed and packaged at the top of the transformer and pre-wired to the transformer with CT installed in the transformer. The EMP option provides the physical means of externally connecting an external meter via the integrated twists-lock connectors for more extensive measurements including actual transformer real-life efficiency.

1.3.1 Measurement Parameters (SMART-R2/3)

Measurement parameters include:

Metered Values:

- Voltage V_{AN}, V_{BN}, V_{CN}, V_{LN}avg*, V_{AB}, V_{BC}, V_{CA}, V_{LL}avg* & Freq: H_Z (*average of three phases)
- Current I_A, I_B, I_C, I_N, $I_L$avg (average of three phases)
- Powers:
  - Active: P_A, P_B, P_C, P_{TOTAL}
  - Reactive Power Q_A, Q_B, Q_C, Q_{TOTAL}
  - Apparent Power S_A, S_B, S_C, S_{TOTAL}
- Demands: Pd, Qd, Sd; I_Ad, I_Bd, I_Cd,
- Power Factor PF (Phase/Total)
- Energies:
  - Active/Real*: E_P
  - Reactive Energy*: E_Q
  - Apparent Energy: E_S

Note: 4-Quadrants: Imported (imp); Exported (exp); Total (total); Net (net)

Accuracy:

Voltages/Currents: 0.2%

Energy (standard): Class 0.5 per ANSI C12.20; Class 0.5S per IEC 62053-22

Computed/Recorded:

- Power Quality
  - Standard: Voltage/Current THD & Harmonics 2ND to 31TH
  - High Accuracy: Voltage/Current THD & Harmonics 2ND to 63rd
  - Voltage Crest Factor
  - THFF (TIF)
  - Current K-Factor

- Voltage Unbalance Factor V_{UNBL}

- Current Unbalance Factor I_{UNBL}

- Max/Min Statistics with Time Stamps

1.3.2 User Interface (HMI)

The user interacts locally with the unit via the pushbutton keys at the Display and remotely over Ethernet (if so equipped) using a standard IE Browser or one of Powersmiths proprietary software suites. The local display is a backlit LCD and provides for simultaneous display of up to four (4) measured parameters plus an Energy / Quantity display line. The backlight is user programmable for selectable timeout periods.

1.4 Communication

All the S*MART-R2A and SMART-R2B models are* equipped with a native RS485 communication port supporting Modbus RTU Protocol. The *SMART-R3A* and *SMART-R3B* models are additionally equipped with a WEB server that serves up dynamic web pages for convenient anytime anywhere access to all measurement parameters and recorded logs remotely using only a web browser and also supports Modbus/TCP or BACnet/IP protocols.

The *SMART-R3A* and *SMART-R3B* models also support sustainability management systems such as Powersmiths 'Windows on the World" (WOW) system.

1.5 Model Information

The unit is available with a number of options with ordering information as follows:

SMART - R 2 A - EB

Accuracy:	Connectivity:	Measurement Port:	Options:
R: Revenue accurate Class 0.5	**1:** Measurement Port (no integrated meter) **2:** RS485 Modbus/RTU **3:** RS485 with Modbus/RTU, Ethernet Web-server with Dynamic web pages, Modbus /TCP, Trend Logs, WOW Push	**A:** None **B:** EMP installed	**AL:** Alarm with Relay O/P **TS:** 170C & 200C Sensor **EB:** RS485 with Modbus/RTU, Ethernet Web-server with Dynamic web pages, Modbus /TCP, Trend Logs, WOW Push, BACnet/IP

Figure 1-2: Model Number Structure

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1.6 SMART-R Meter Specifications

The integrated power meter transducer is manufactured by Accuenergy and Technical specifications are summarized in the table below.

Table 1-1: Specifications

System:

Measurement:	Output

Voltage Inputs:

Protection:	Fused Input Disconnect

Current:

CT Input:	5A nom. 10A max.
Crest Factor:	< 3
Protection:	Shorting shunts

Accuracy:

Voltage: L-L; L-N:	± 0.2% + 1 digit
Current: Full Scale:	± 0.2% + 1 dig

Powers:

Active/Reactive/Apparent:	0.5%
Energy:*	Class 0.5
Reactive Energy:	2
	per ANSI C12:20/IEC 62053-22

General

Frequency:	0.1Hz resolution
Sampling rate:	64/cycle

Power Quality

K-Factor	1%
Total Power Factor:	± 0.5%
Distortion (THD):*	± 1%
Harmonics:	*To the 31th*

Metering: Total & Per Phase

Voltage:	Vrms: L-L, L-N & Avg Crest, TIF
Current:	Arms: Phase & Avg K-Factor
Distortion/Harmonics:	V, I
Power Factor:	PF
Powers:*	P, Q, S (total & Phase)

*P: Active; Q: Reactive; S: Apparent

Energy & Demand:

Energy:	Ep,*, Eq.*, Es

*Four quadrants: Imported, Exported, Total, Net

Demands:	P, Q, S, I_A, I_B, I_C
Demand Type:	Sliding / Block (1 – 60 min.)
Max./Min. Registers:	V, I, PF, P, Q, S, THD

Relay Outputs (2 per): (Alarm Option)

Rating:	250VAC/30VDC 3A Res; 2A Ind. PF0.8)

Human Interface (HMI):

LCD Screen:	1 Line x 9 Alpha/numeric 4 Lines x 4 Alpha/numeric % Loading, Units, Scaling, Sectors, Descriptors, etc.
Operator Control:	Pushbuttons
Illumination	LED Backlight (timed)
User Graphic Aids	Loading Bar graph, Units, Scaling, Sector etc.
Viewing Data:	At LCD or Remote
Setup:	At LCD or Remote using PC Software

Communication:

RS485 (local/remote)

Protocol:	Modbus RTU
Bit rate:	1.2 kB – 38.4kB
Connection:	2-wire half duplex
Security:	4-Digit Password

WEB Server Ethernet option

Bit rate:	10/100 BaseT
Protocol:	TCP/IP, HTTP, Modbus TCP BACnet/IP (option)
IP Addressing:	Static & DHCP Client

Data Logs (trends)*:* (Models –R3A, R3B)

Parameters:	36 max.
Log interval:	1 min. minimum
Log Time:	3 month typ. @ 15 min.
(10 parameters)	(circular buffer)
Viewing:	Browser or Download

Physical:

Size	12"x16"x6" (1-2P Model)
Mounting:	Top Right on Tx Case

Environmental:

Protection:	NEMA 1 (3R option)
Temperature:	-25°C - + 50°C

2 SMART-R2A/B and SMART-R3A/B Operating Instructions

The units are factory setup and ready for immediate use. The only setup required by the user is communication settings to match the network parameters and Alarm Option settings. Note that some models may also require externally wired connections. For reference, Setup instructions are provided in the relevant sections in this manual.

2.1 Quick Guide for Reading the Meter

Voltages and Currents: Depress the V/A button repeatedly to toggle through the readings

Powers: Depress the P button repeatedly to toggle through the readings

Energies: Press the E button repeatedly to toggle through the readings

Voltage/Current Imbalances/Angles: Depress the H button repeatedly to toggle through the readings

See following instructions for detailed operation

2.2 User Controls

Each meter comprises a local 5-line plus LCD display with backlight. The user interacts locally with the unit via the touch keys ('H', 'P' 'E' V/A) and remotely using the provided communication means covered elsewhere in this manual.
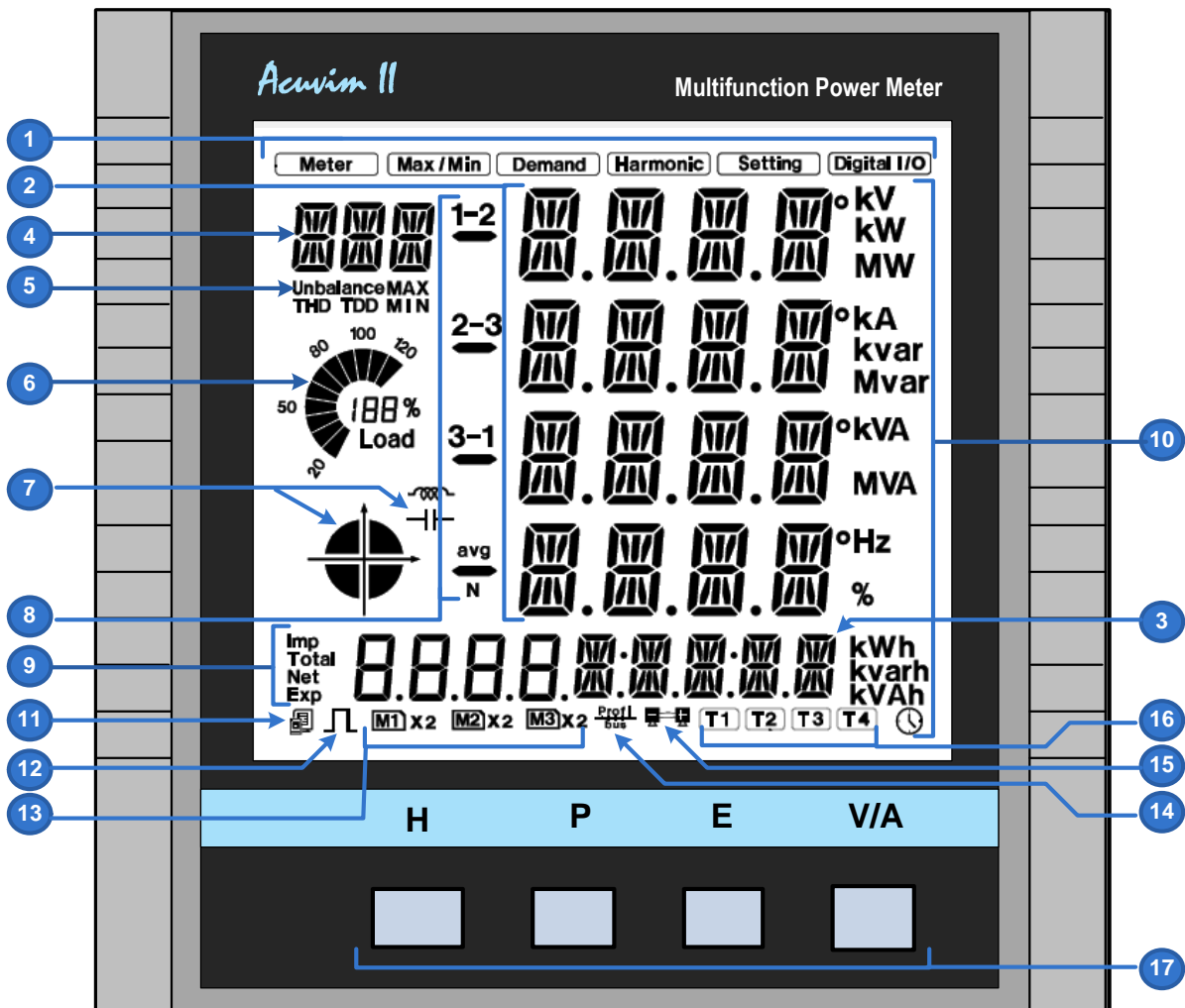
Figure 2-1: Meter Display Illustration

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2.2.1 Screen and Controls Description

1. Indication of the operational mode of the meter with 'Meter' the default mode for measurements; the other indicated modes are self-explanatory
2. 4-line x 4-digit Data display for V, I, P, PF Hz, V Unbalance, Min. /Max. etc. plus Setup, I/O, etc.
3. 9-digit for Energy data plus Setup and I/O data; the default is imported (consumed) Energy
4. 3-digit indicator for measurement parameter; eg. U: Voltage; I: Current; P: Power; Q: Reactive Power; S: Apparent power; F: Frequency; ∠: Angle; DMD: Demand; U02/3..: Voltage individual Harmonics; I02/3..: Individual Current Harmonics; Mxx: I/O & Setup page
5. Indicator for specific operational modes shown
6. Bar graph display of percentage loading based on current relative to nominal
7. Indicates power operational quadrant plus inductive or capacitive type loading per IEEE/IEC
8. Indication of measurement line and phase
9. Indicator for Energy flow direction; IMP: Import; Exp: Export; Total: Absolute Sum of Imp and Exp; Net: Algebraic sum of Imp and Exp
10. Units for measured data including time icon for time display on 5th line
11. Communication port activity; No Icon: No active communication; 1-Icon; Query received; 2-Icons: Query received and replied
12. Energy Pulse output indicator
13. Indicates installed modules; typically 1 x AXM-101 for Alarming
14. Indicates Profibus Module when installed (*Note: Not offered*)
15. Indicates Ethernet Module installed (*Note: Not used but supplied as an additional module*)
16. Current Tariff in use
17. User control Pushbutton Keys described in meter operation

2.3 Detailed Meter Operation

Meters are operated at the screen using the four control keys [H] [P] [E] [V/A]. In the following instructions, the arrow ↪[H] indicates that the identified key is to be depressed.

Note: The backlight may time out based on settings and reactivated by pushing any of the keys.

2.3.1 Mode Selection

The default meter operational mode is "Meter" for measurements of electrical parameters. The other modes are selected as follows:

Activate the display by pressing any key (display backlit) and simultaneously press the [H] and the [V/A] keys for > 1 second and release; the current mode indicator (eg. "Meter") will flash. Use the [P] or the [E] keys to highlight a different mode and the [V/A] key to select the desired mode. The [H] key will exit the selection process and return to the prior mode.
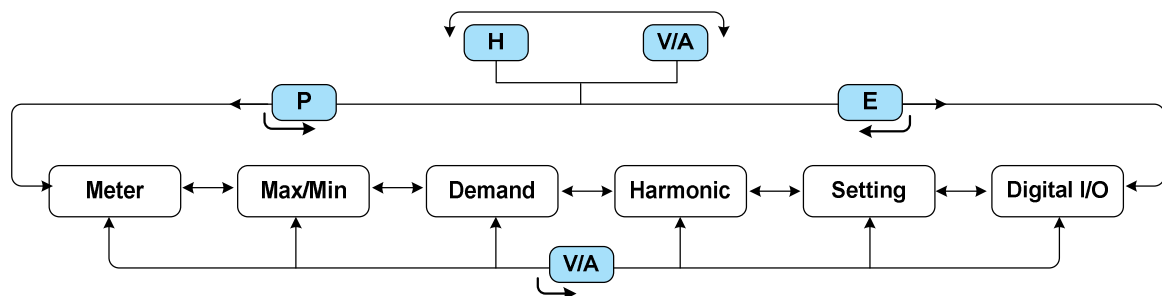
Figure 2-2: Mode Selection chart

2.3.2 'Meter' Mode

Select "Meter' mode as per the Mode selection above. Note that the measurement parameter will be indicated in the top left of the display (Screen note #4).

2.3.2.1 Voltages and Currents

Within the "Meter" mode, the key [V/A] pages through the Voltage and Current 1-Φ or 3-Φ measurements.

For data on the 5th line (Screen note #3) data see "Energies, Date and Times" following.
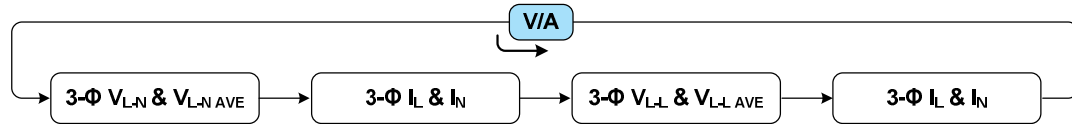
Figure 2-3: Voltage & Current measurements in "Meter" mode

Note: Based on the set system configuration, not all the 4-Digit lines will be active (eg. 2LL or 3LL).

2.3.2.2 Powers

Within the "Meter" mode, the [P] key toggles through the three powers (P: Active or real; Q: Reactive; S: Apparent), Power Factor (PF) and Frequency (Freq) 1-Φ or 3-Φ measurements.

For data on the 5th line (Screen note #3) data see "Energies, Date and Times" following.
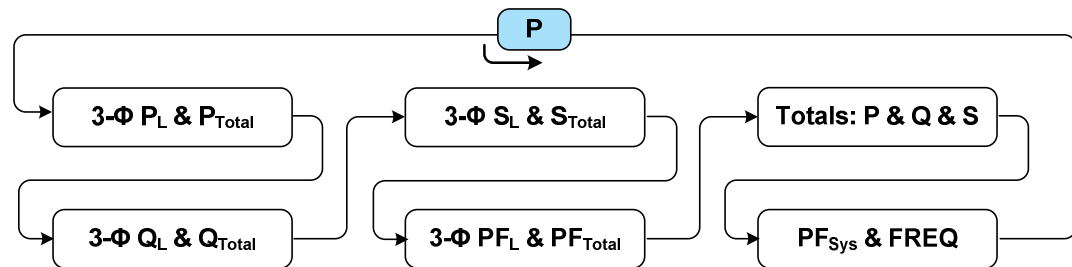
Figure 2-4: Power, Power Factor and Frequency Measurements

Note: Based on the set system configuration, not all the 4-Digit lines will be active (eg. 2LL or 3LL).

2.3.2.3 Imbalances and Phase Angles

Within the "Meter" mode, the [H] key toggles through the Voltage and Current Imbalances displayed as a percentage and the relative phase angles for each phase of the 3-phases.

For data on the 5th line (Screen note #3) data see "Energies, Date and Times" following.
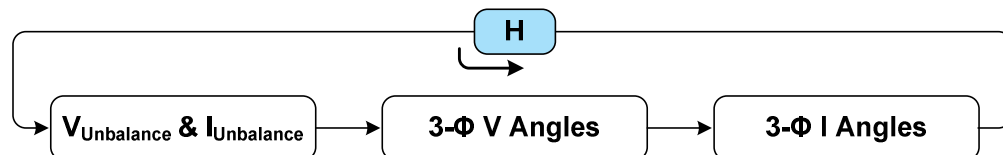
Figure 2-5: Percentage Voltage and Current Imbalance and relative Phase Angles

Note: Based on the set system configuration, not all the 4-Digit lines will be active (eg. 2LL or 3LL).

2.3.2.4 Energies, Date and Times

Within the "Meter" mode, the [E] key toggles through the Energies for Exported, Imported, Total and Net conditions, Date & Time and Run times which are displayed on the 5th line (Screen note # 3) from any screen (H, P, or V/A). Units are; Active Energy: kWh, Reactive Energy: kvarh for the four conditions of Imported (consumed) (IMP), Exported (generated) (Exp), Total, the absolute sum of Imported and Exported (Total), Net, the algebraic sum of Imported and Exported (Net).

Also displayed in sequence under this menu are: Total Apparent Energy: kVAh, Date (year, Month, Day), Time (Hours, Minutes, Seconds) and meter Run time (Hours, Mins).

```
                                    ┌──── P ────┐
                                    │           ▼
┌──────────────────┐      ┌──────────────────┐      ┌──────────────────┐
│  E kWh Imported  │      │  E kvarh Imported│      │     E kVAh       │
│      (Imp)       │      │      (Imp)       │      │                  │
└──────────────────┘      └──────────────────┘      └──────────────────┘

┌──────────────────┐      ┌──────────────────┐      ┌──────────────────┐
│  E kWh Exported  │      │  E kvarh Exported│      │ Date (Year, Month,│
│      (Exp)       │      │      (Exp)       │      │       Day)       │
└──────────────────┘      └──────────────────┘      └──────────────────┘

┌──────────────────┐      ┌──────────────────┐      ┌──────────────────┐
│   E kWh Total    │      │  E kvarh Total   │      │  Time (Hours,    │
│     (Total)      │      │     (Total)      │      │ Minutes, Seconds)│
└──────────────────┘      └──────────────────┘      └──────────────────┘

┌──────────────────┐      ┌──────────────────┐      ┌──────────────────┐
│  E kWh Net (Net) │      │ E kvarh Net (Net)│      │ Run Time (Hours, │
│                  │      │                  │      │    Minutes)      │
└──────────────────┘      └──────────────────┘      └──────────────────┘
```
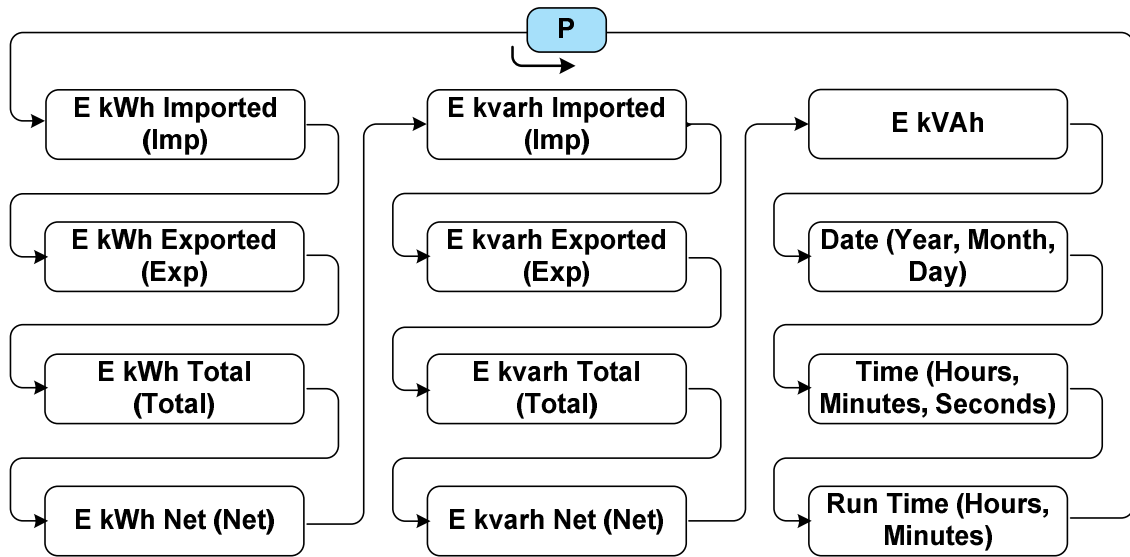
Figure 2-6: Energies plus Date, Time and Meter Run Time

2.3.2.5 Time of Use (TOU)

Time of use energy measurements are built into the meter module but not described for this application due to the difficulty of managing it on individual meters but supported through Powersmiths WOW. However, the user can reference the Accuenergy (the manufacturer of the meter module) Acuvim II manual for more details.

2.3.3 Max/Min Mode (Statistics)

To observe Maximums and Minimums, select the 'Max/Min' mode as previously described under "Meter Mode" selection.

Within the "Max/Min" mode, toggle through the Maximums and Minimums for Voltages, Currents, Powers (kW, kvar, kVA), Power Factor and Frequency, Voltage and Current Percentage Imbalance, Power Demands (kWd, kvard, kVAd), Voltage THD, Current THD and Current Demand maximum. The [P] key selects the next page and the [E] selects the previous page; the [V/A] key switches between Maximums and Minimums.

```
                        ┌──── P ────┐   ┌──── E ────┐
┌──────────────────┐    ┌──────────────────┐    ┌──────────────────┐
│  3-Φ V_{L-N} Max./Min │    │   kW, kvar, kVA  │    │ kWd, kvard, kVAd │
│                  │    │     Max./Min     │    │     Max./Min     │
└──────────────────┘    └──────────────────┘    └──────────────────┘

┌──────────────────┐    ┌──────────────────┐    ┌──────────────────┐
│ 3-Φ V_{L-L} Max./Min.│    │    PF Max/Min    │    │  3-Φ V_{L-N} THD │
│                  │    │  Freq. Max./Min  │    │     Max./Min     │
└──────────────────┘    └──────────────────┘    └──────────────────┘

┌──────────────────┐    ┌──────────────────┐    ┌──────────────────┐
│ 3-Φ I_L Max./Min.│    │ V Unbal. Max./Min│    │   3-Φ I_L THD    │
│                  │    │ I Unbal. Max/Min.│    │     Max./Min     │
└──────────────────┘    └──────────────────┘    └──────────────────┘

                                                 ┌──────────────────┐
  [V/A]   Min/Max Switch                         │   3-Φ I_L DMD    │
                                                 │     Max./Min     │
                                                 └──────────────────┘
```
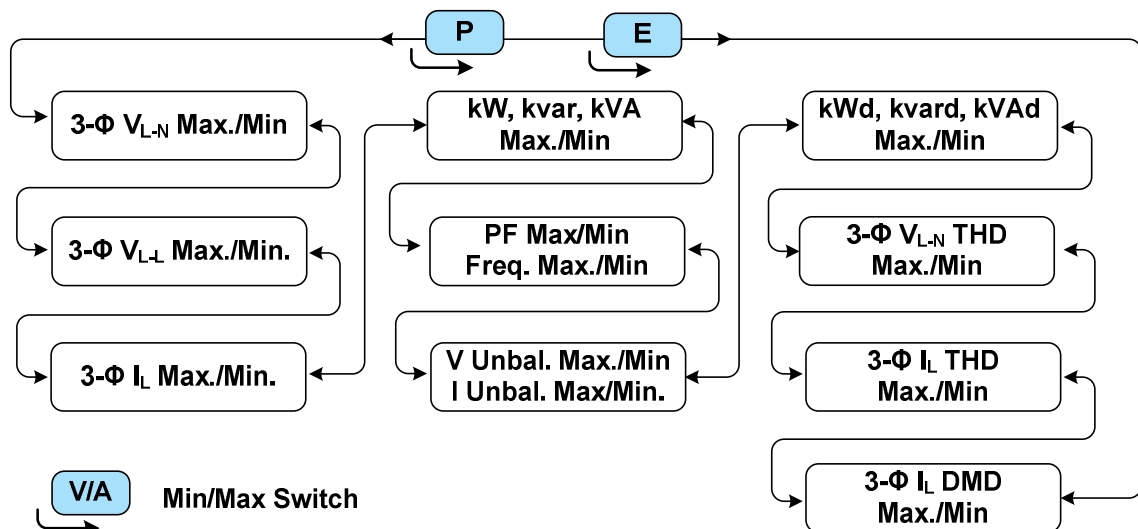
Figure 2-7: Maximum and Minimum Pages in the Max/Min mode

2.3.4 Demands

To read Power and Current demands, select the 'Demand' mode as previously described under "Meter Mode" selection.

Within the 'Demand' mode, toggle through the Demand Powers (kW, kvar, kVA) and Current Demand using the [P] or the [E] keys.
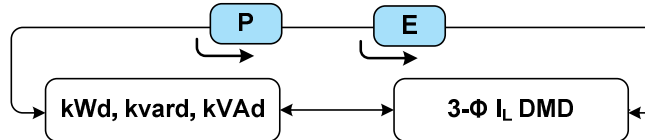
Figure 2-8: Power and Current Demand Pages

2.3.5 Power Quality

Power quality data is accessed via the 'Harmonic' Mode following the mode selection procedure previously described.

Within the 'Harmonic' mode, page through the Power Quality data using the [H] keys for %V THD and % I THD for all, even and odd harmonics plus Crest factor (CF), K-Factor (kF). The [V/A] key enters the individual harmonic V & I measurement mode from any page and indicated by U02, U03, etc. for voltage or I02, I03 etc. for current with the [H] key to exit this mode back to the first power quality page.
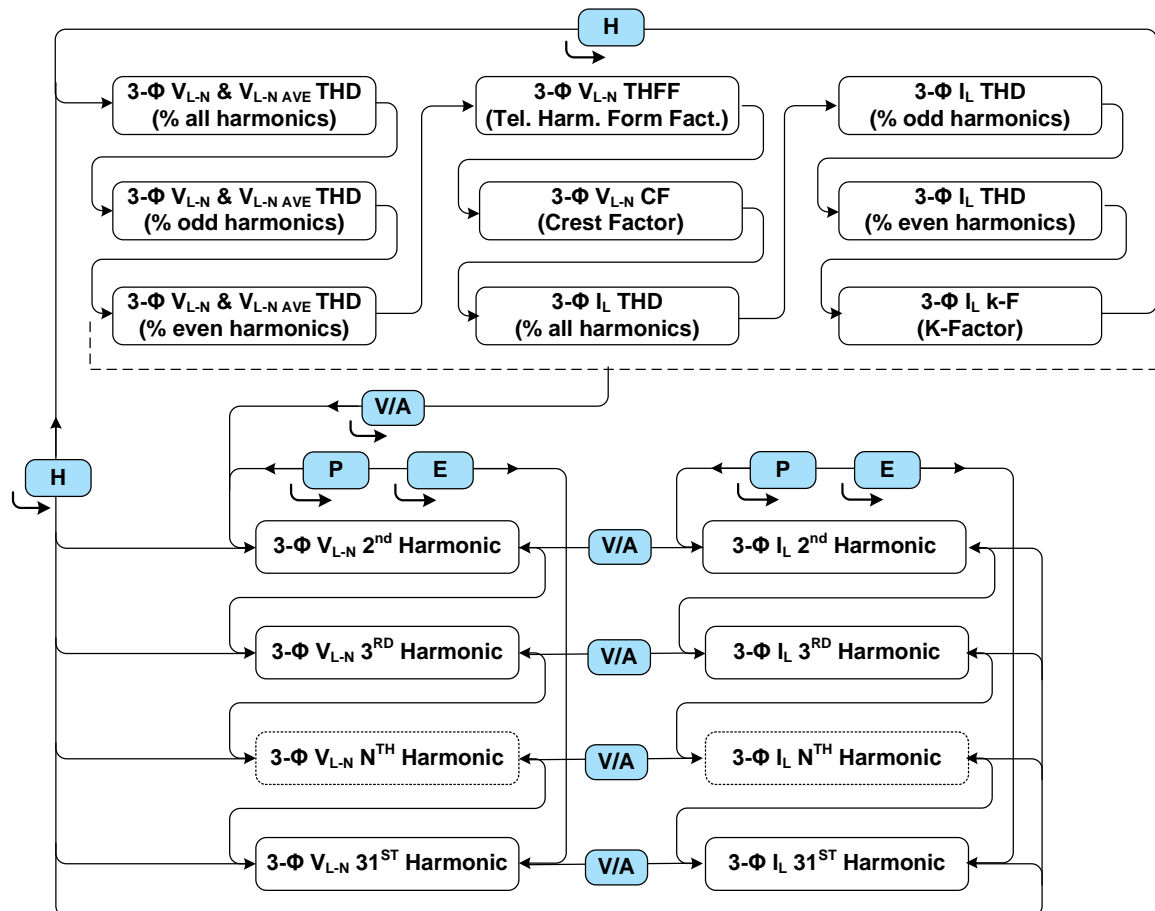
Figure 2-9: Power Quality Data Pages

2.3.6 Relay O/P & Digital I/O

The Relay Outputs and Digital Inputs (not used in this application) are accessed via the 'Digital I/O' Mode following the mode selection procedure previously described.

Within the 'Digital I/O' mode indicated by '*M11*', enter the Digital I/O screens by the [V/A] key and select the Digital Inputs (DI), Digital Outputs (DO) or Counter (CTR) screens using the [P] or [E] keys. When selected, the [V/A] key enters the selection and the [P] or [E] keys scrolls through the pages. The [H] key exits from any page to its upper parent.
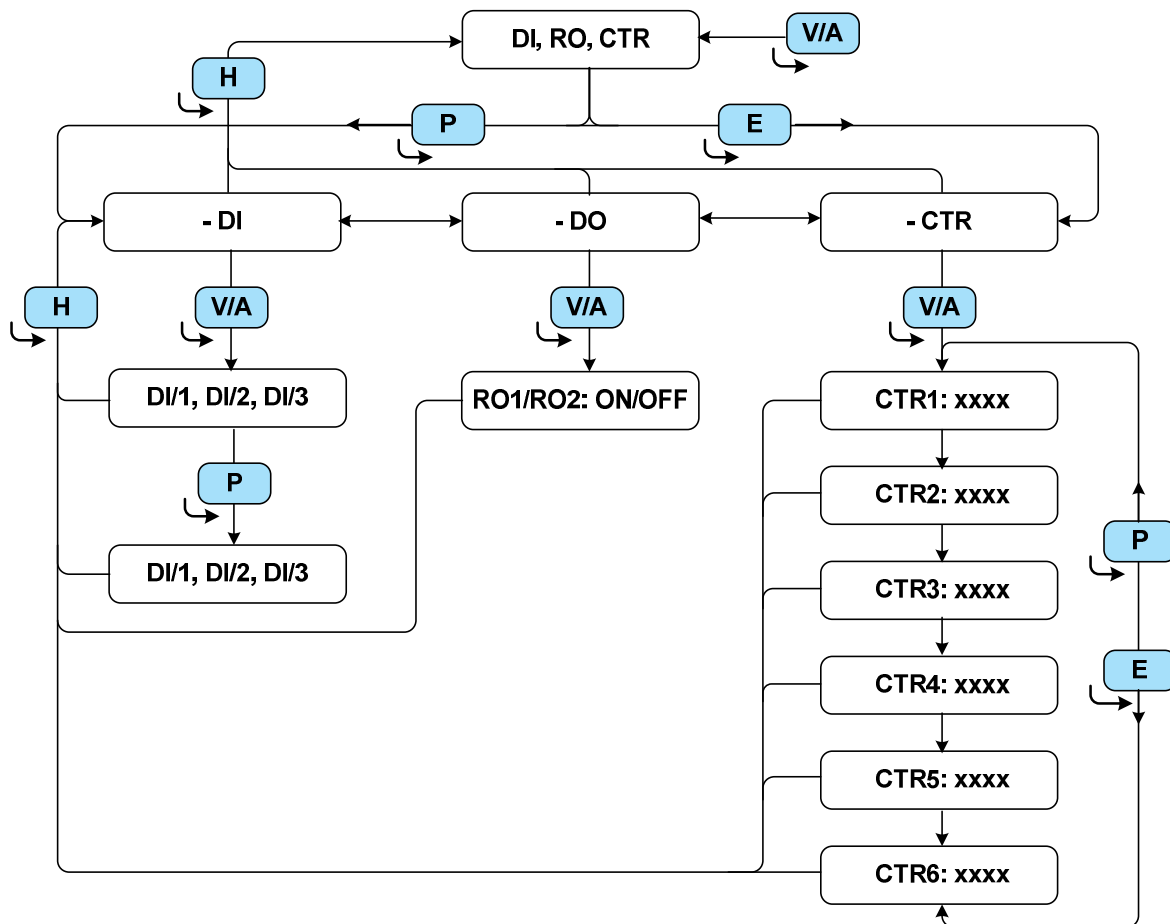
Figure 2-10: Digital Input and Output Pages

2.3.7 Setup

The unit is factory setup for immediate use except for alarming functions; please refer to the section on "Programming and Setup".

2.4 Network Access

The *SMART–R3A* and *SMART–R3B* models are equipped with a WEB Server that allows the user to view live data, events and logged data over an Ethernet network.

- On PC, open a WEB Browser and in the address bar type: **[http://***.***.***.***]**

  (User assigned Cyberhawk Ethernet address)*

- ⇒ User name: *****; Password: ***** in dialog box displayed

Note: Factory defaults are:

User Name: *guest*; Password: *guest*

- Select menus for required parameters

Figure 2-11: Typical Login Screen

*Note: If the IP is not known, use the Powersmiths "Network Configuration Utility" to locate all Cyberhawk devices on the network available from www.powersmiths.com/download (under COMSERVER selection)

Figure 2-12: Typical Browser Screen

2.5 Powersmiths WOW Systems

SMART-R3A/-R3B also provides the technology infrastructure for the Powersmiths WOW systems that dynamically and graphically illustrate the environmental effects/benefits of an organization's energy saving strategies using live data and also helps to educate and engage people in energy conservation. Please contact Powersmiths for more information.

3   *SMART-R1* and *-R2B* & *-R3B* External Measurement Port Operation

The instruction given here covers both *SMART-R1* and the External Measurement Port (EMP) option to *SMART-R2B* and *SMART-R3B* Ports.

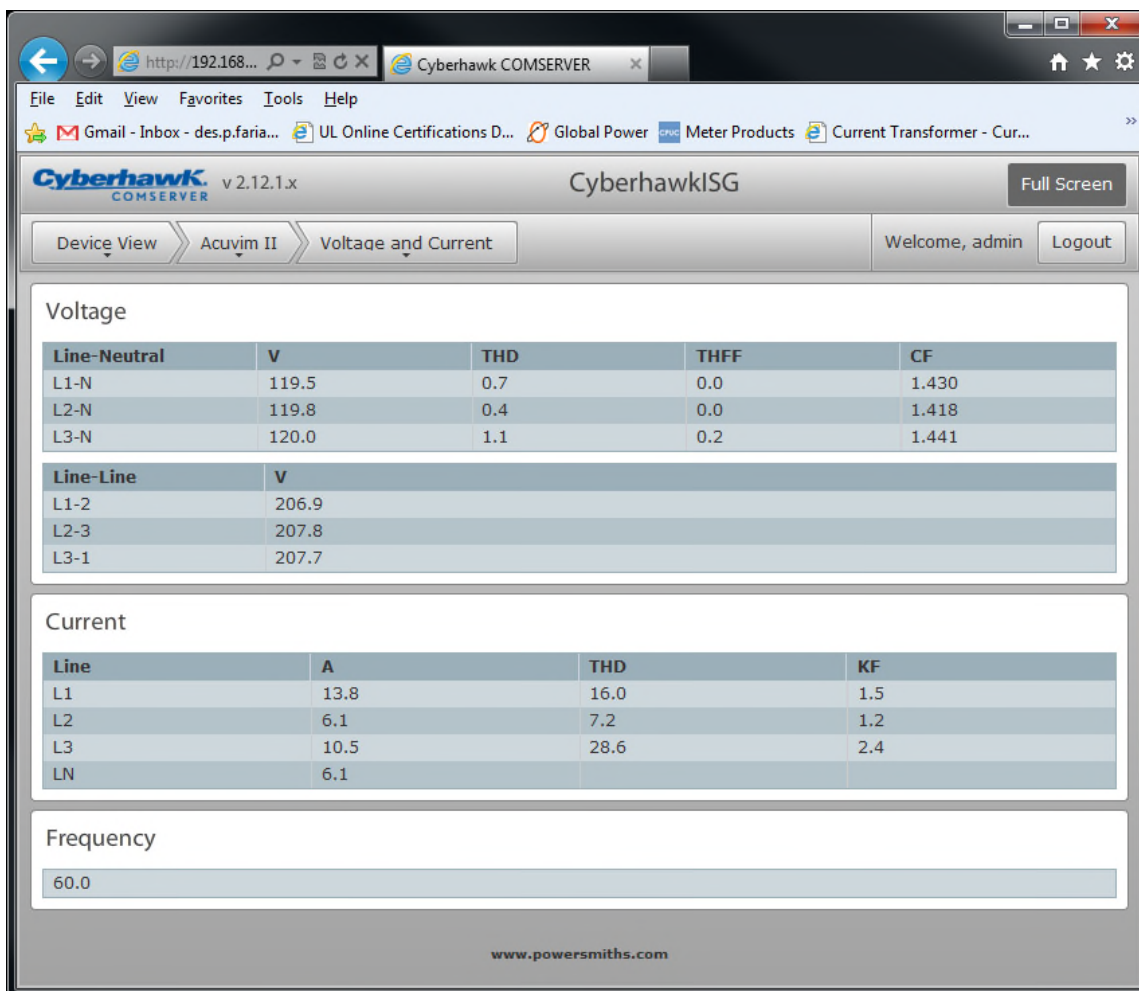*Note: For more in-depth operational instructions, please refer to the instructions provided with the Cyberhawp-EP300 meter*

3.1   *Description*

The External Measurement Port (EMP) facilitates external measurement of both Input and Output voltages and currents via twist-lock connectors. Voltage connections are internally protected by a fast-blow 2 Amp current limiting fuses in each voltage connection and currents are sensed by Current Transformers (CTs) with 5 amp outputs protected by voltage limiting diodes to prevent an inadvertent open-circuited CT.

Additionally transformer temperature data is provided by transformer coil embedded Thermistors and installed SPDs (TVSS) are monitored by the wired out auxiliary status contact

Shown below is the electrical *SMART-R1* Interface diagram for reference.
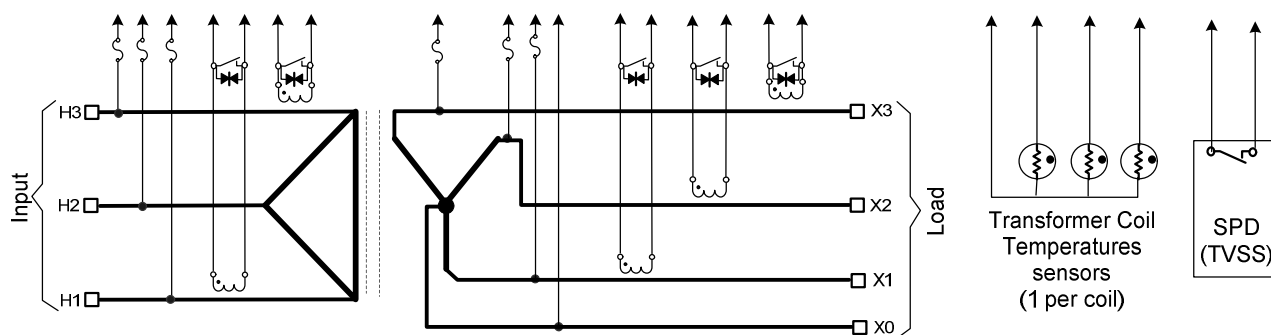
Figure 3-1: SMART-R -1and EMP simplified Electrical Interface Diagram

Note: The diodes in the current circuit provide a measure of protection against operation with open circuit CT outputs.

3.2   *Operating Instructions*

The following instructions assume connection using the UL Listed Powersmiths Efficiency and Power Meter (Cyberhawk-EP300) with ancillary the UL Listed leads with Twist-Lock connectors.

Note: Safety Banana type adapters (UL Listed) are available from Powersmiths for connection to generic Power Meters
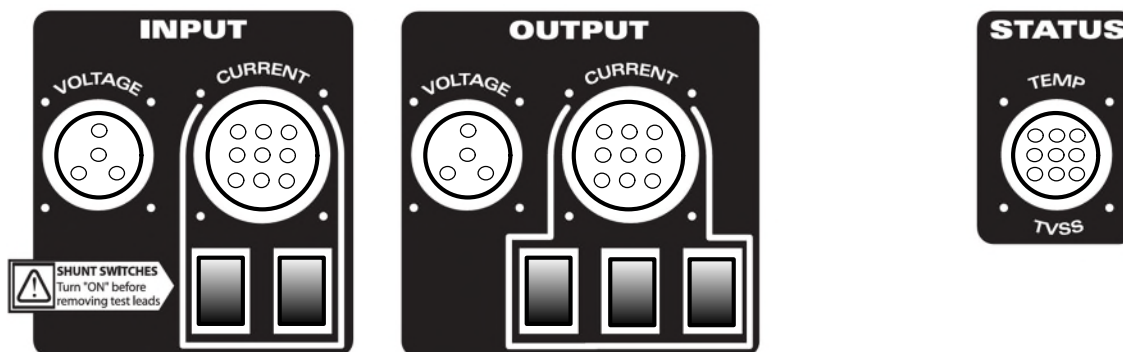
Figure 3-2: SMART-R -1 and EMP Measurement Interface

To access to the External Measurement Ports remove the three screws from the front cover and swing out and up.

Note that the cover is retained at the rear by locating tabs (see diagram in section on Maintenance)

When work is complete replace cover and screws.

With reference to the above figure:

1. Before connection to the meter open each of the shunt switches in turn and reclose; ÒN` position *Note: This procedure resets the residual flux in the CTs for more accurate efficiency measurements*

2. Connect Meter to EMP terminals with twist-lock leads as follows:
   a. Connect Input Voltage to Meter Input Port-1 Voltage input
   b. Connect Input Current to Meter Port-1 Current input
   c. Connect Output Voltage to Meter Input Port-2 Voltage input
   d. Connect Output Current to Meter Port-2 Current input
   e. Repeat c. & d. with dual output models

3. Connect Status (temperature and TVSS) test leads between *SMART-R* Port and meter
   Note: An embedded Thermistor in the status leads provides ambient temperature data

4. Configure Meter for measurement method following meter setup instructions including:
   a. System Parameters (Voltages and kVA)
   b. Input and Output Voltages
   c. 2-Watt-Meter measurement for Input and 3-Watt-Meter measurement for Output
   d. CT Ratios and Correction Factors (these shown on label attached to SMART-R Package
   e. Set Demand integration period
      Note: Industry standard is 60 secs. with 15 periods but use 10 secs. with 6 periods for shorter measurements periods allowing for quicker measurement stabilization
   f. Reset energy and demand registers

5. Switch Shunt Switches to "OFF" position to begin measurement

6. Perform required measurements and when finished turn shunt switches to ÒN

⚠ **CAUTION** ***Turn shunt switches to "ON" before removing meter leads***

Resistance to Temperature Conversion Chart
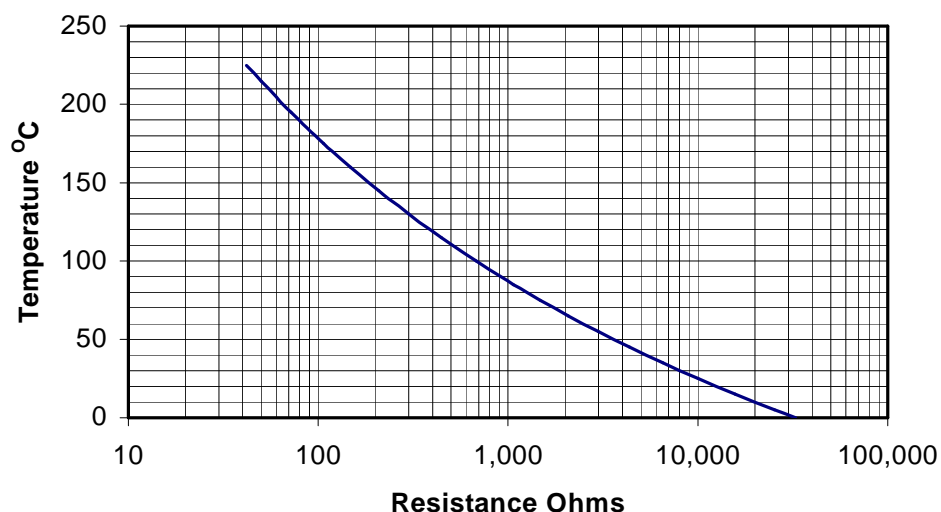
Figure 3-3: Conversion chart for Thermistor resistance to temperature

Note: *In the absence of a Cyberhawk EP30, the transformer temperature may be determined from resistance/temperature chart and TVSS status can be read by ohmmeter.*

4 Connections and Setup

There is no actual installation required with this product as it is supplied integrated and installed with the transformer other that connection to the user terminals and communication ports and associated setting of the required communication port characteristics.

Note: The unit is already factory setup for normal operation with default settings as recorded in the default settings table at the end of this section.

4.1 Physical

The *SMART-RXX* Port is normally mounted on the top right corner of the transformer with the RS485 and/or the Ethernet Port on the right rear of the unit beneath the top cover extension
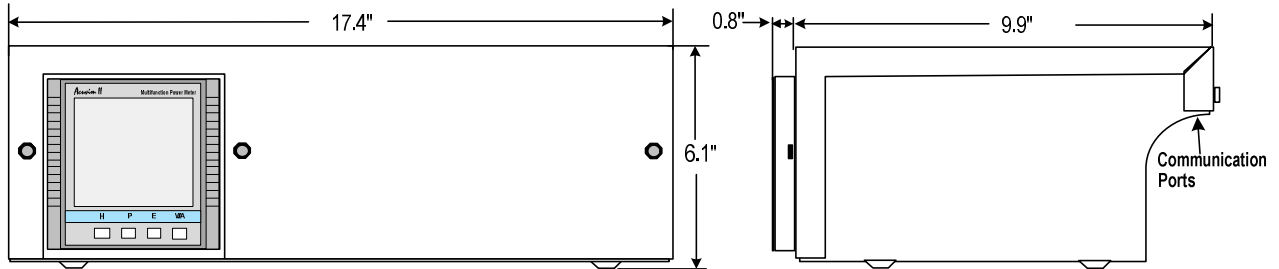
Figure 4-1: Outline of SMART-R2X Port

To access the communication ports remove the three screws from the front cover and swing out and up. *Note that the cover is retained at the rear by locating tabs. When work is complete replace cover and screws.*

4.2 RS485 Connection

This connection is made at the rear of the device as illustrated above. This port has a total communication cable length capability of up to 4,000 feet with up to 32 devices. Is recommended that a low capacitance twisted shielded 22 AWG gauge (or larger) wire be used for busing.

Wire the RS485 terminals to the external RS485 Network by connecting the R/T-(A), R/T+(B) and common terminals. Terminate and ground as required per the Network configuration using the diagram provided as a guide.
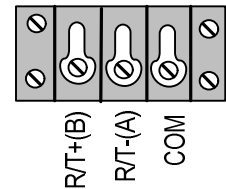
Figure 4-2: RS485 Terminal
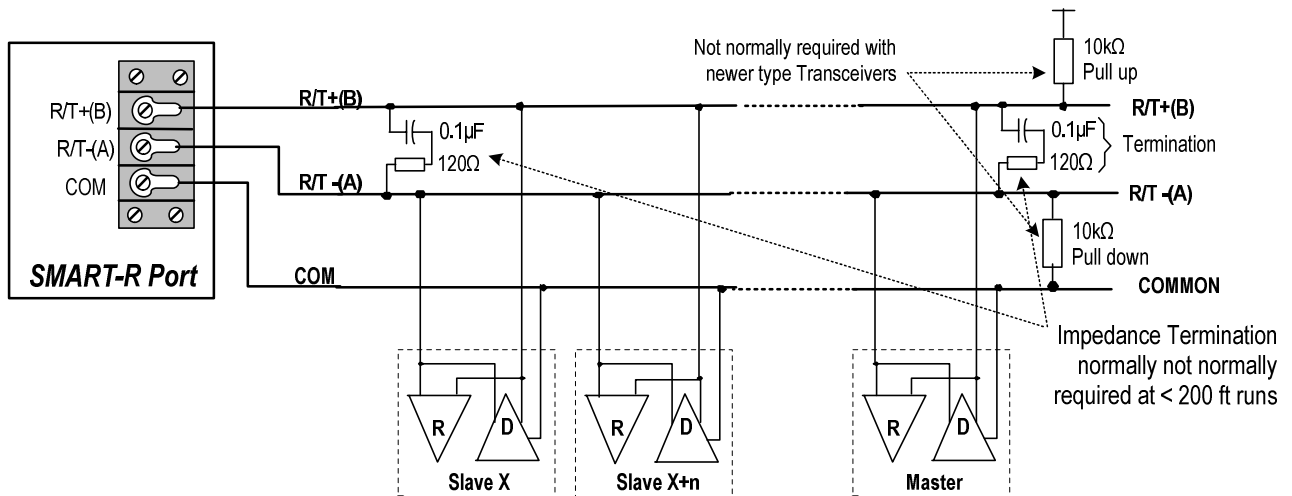
Figure 4-3: RS485 Typical Network Connection

Note that a register map is available from Powersmiths by request.

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4.2.1 Meter Supported RS485

The RS485 port in *SMART-R2A* and *SMART-R2B* is directly supported by the meter and setup is done at the meter for the required characteristics with port characteristics given in the table below.

Table 4-1: Meter Supported RS485 Port Characteristics

Port	Duplex	Baud	Format	Protocols	Isolation
RS485	Half	4,800 9,600 19,600 38,400	1 start Bit 8 Bit 1 Stop Bit No Parity	Modbus RTU	1,500 VAC

Set the required Port characteristics at the meter; see section on setup.

4.2.2 WEB Server Supported RS485

The RS485 port in *SMART-R3A* and *SMART-3B* is directly supported by the integrated WEB Server, which provides a pass-through function through its internal RS485 port to the meter with port characteristics given in the table below.

Table 4-2: WEB Server Supported RS485 Port Characteristics

| Port	Duplex	Baud	Format	Protocols	Isolation
RS485	Half	4,800 9,600 19,600 38,400	1 start Bit 8 Bit 1 Stop Bit No Parity	Modbus RTU	None

Set the required Port characteristics at the meter; see section on setup.

If this port is required to be used as well as the Ethernet port, please refer to the WEB Server (COMSERVER) manual for setup and operation.

4.3 WEB Server (Ethernet Port)

The Ethernet port when installed is located at the rear right of the SMART-R enclosure under the cover. Connect the Ethernet Port to the Network using a CAT 5 Ethernet cable to the Network.

Table 4-3: Table of Ethernet Port Characteristic

Port	Bit Rate	IP Adressing	WEB Server	Protocols	Isolation
Ethernet	*10/100 BaseT*	*DHCP Client (Dynamic & Static)*	*TCP/IP, HTTP*	Modbus/TCP or BACnet/IP (option)	1,500 VAC (magnetic)

Connect the Cat 5 Ethernet Cable to the RJ45 jack provided.

Note: This Network Device is shipped with dynamic IP addressing to facilitate immediate connection to a Ethernet Network. However it may be advisable to check with your IT administrator prior to actually connecting the unit to the network for pre-assignment of Network IP addresses; to this end a crossover cable may be used with a local PC for local setup but this is covered in the referenced Comserver manual in the section on "Setup".

4.4 Alarm Relay Outputs

The *SMART-RXX* with Alarm option is equipped with a two (2) NO Relay Outputs. The primary functions provided by the Relay Outputs

- Signaling for set alarm conditions
- On/Off control under Modbus or Manual control

Table 4-4: Alarm Relay Characteristics

Parameter	Description
Relay Connections	RO/1, RO/2, RO/C
Normal State	NO (Normally Open)
Rating	250VAC/30VDC, 3A Resistive; 2A Inductive
Termination	Compression; #12 to 18 ga. Wire
Location	DIN Rail Terminal Strip

Typical applications are illustrated below:
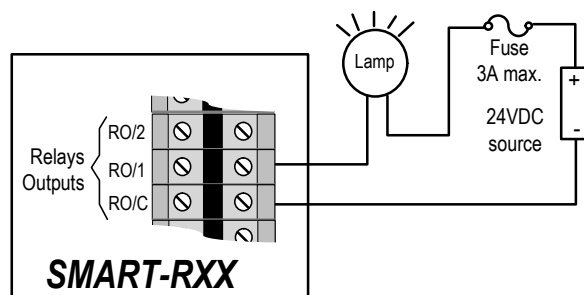
Figure 4-4: Application of Alarm Relay for driving external visual indicator
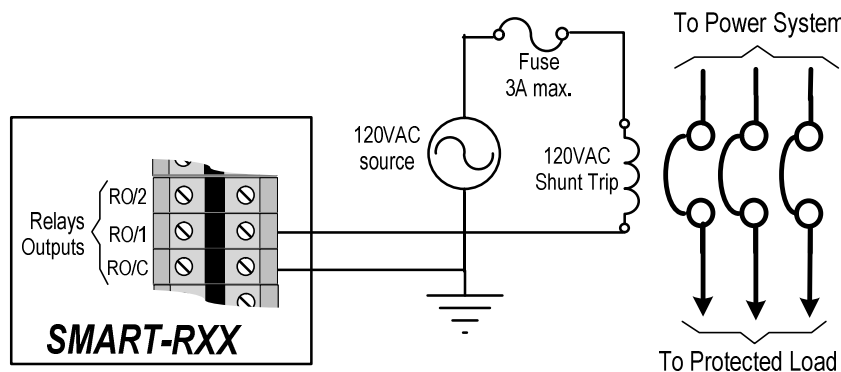
Figure 4-5: Application of Alarm Relay for Shunt Trip of Breaker
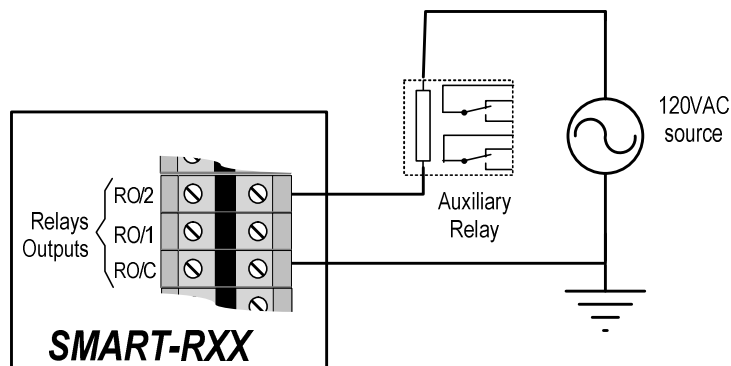
Figure 4-6: Boosting the current capability of the Alarm Relays with an External Auxiliary Relay

4.5 Temperature Sensors (option)

The Transformer Temperature sensors are Bi-metallic switches set for 170°C and 200°C operation and when ordered in with a SMART-RXX are wired up to the SMART-RXX enclosure for user connection convenience. The primary functions provided by the sensors are:

- Signaling of over-temperature conditions
- Over-temperature protection of the Transformer

Table 4-5: Transformer Temperature Sensor Characteristics

Parameter	Description
Connection	170°C, 200°C, Tcom
Normal State	NC (Normally Closed)
Rating	120VAC/30VDC, 6A Resistive; 5A Inductive
Termination	Compression; #12 to 18 ga. Wire
Location	DIN Rail Terminal Strip

Typical applications are illustrated below:

*Figure 4-7: Application of Temperature Sensors to Remote Monitoring*

Figure 4-8: Application of Temperature Sensors for Indicators and Protection

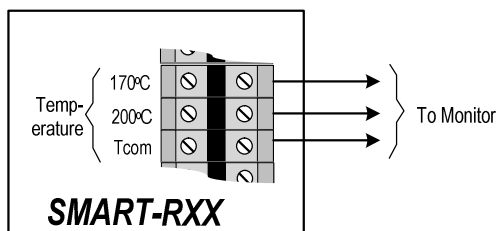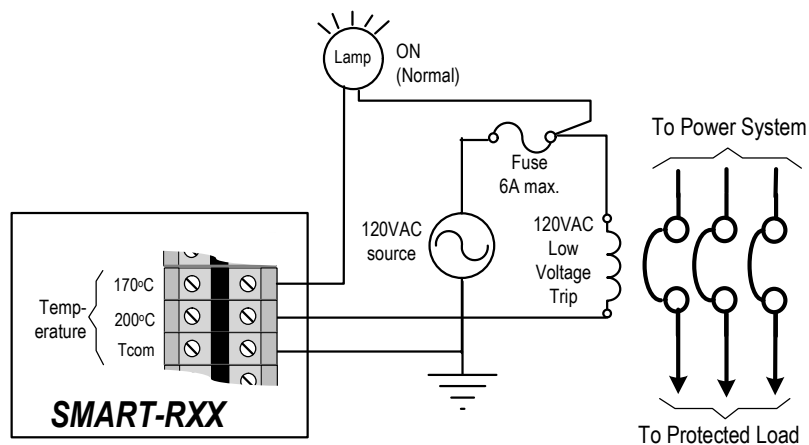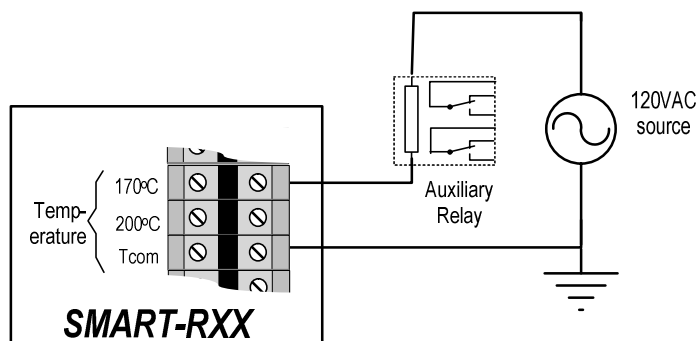*Figure 4-9: Boosting the current capability of the Alarm Relays with an External Auxiliary Relay*

4.6 Verifying Operation

Normal operation of SMART-RXX is indicated when the Display is 'ON', and displaying valid data. A blank display will indicate that the unit is not powered or there is an internal blown fuse or unit failure.

4.7 General Setup Procedures

These procedures provide comprehensive information on the manual setup of the meter at the screen but only certain parameters such as Passwords, Communication, Resets or Alarms need be set by the user. The description outlines the general approach and following the specific programming procedure. For reference, a test certificate shipped with the unit lists the factory default settings.

Note: Setup at the screen is tedious at best but can be more conveniently done using the available setup software connected via an RS485 connection or Ethernet if provided; see Appendix for details.

4.8 Local Programming and Setup

Programming the meter at the screen is a step by step procedure and the step name is indicated as shown below with a description of each indicator. The following is a step by step guide to the local programming the meter. Please refer to the programming sequence guide as a help in the programming sequence.

4.8.1 Mode Selection

The default meter operational mode is "Meter" for current measurements of electrical parameters. The other modes are selected as follows:

Activate the display by pressing any key (display backlit) and simultaneously press the [H] and the [V/A] keys for > 1 second and release; the current mode indicator (eg. "Meter") will flash. Use the [P] or the [E] keys to highlight a different mode and the [V/A] key to select the desired mode. The [H] key will exit the selection process and return to the prior mode.
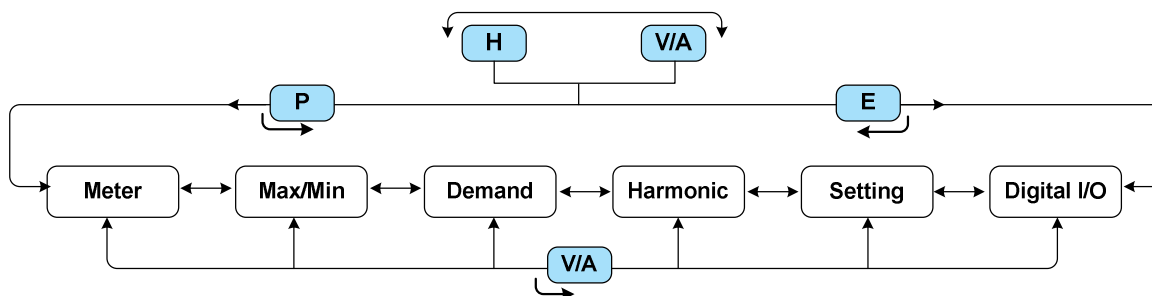
Figure 4-10: Mode Selection chart

4.8.2 Enter Setup with Password Entry

To enter the Setup mode, select the 'Setting' Mode as described above. The Modbus address that the meter is set to will be displayed for about 3 seconds before the password page is displayed.

Enter a valid 4-digit password as follows:

The [H] key selects the digit which will blink

The [P] key increments the selected (flashing) digit and the [E] key decrements it.

The [V/A] key enters the value and a successful entry will present a menu selection.

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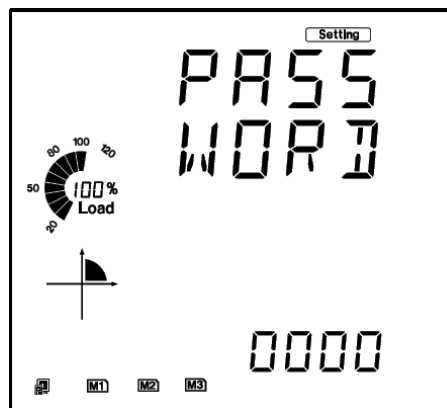
4.8.3 Parameter Selection

After entering the Password, use the [P] or the [E] keys to select the parameter (move the dash) to be programmed as shown:

- System setting (SYS)
- Input and Outputs (I/O)
- Network (NET)
- Alarm (ALM)

The [V/A] key enters the selected parameter and the [H] key exits back to this selection screen.

4.8.4 System Programming

The system programming menu flow diagram is shown in the following diagrams:

SYS (System)	
S01 ADDR (Address)	Modbus Address: 1 - 247
S02 BPS (Baud Rate)	Baud Rate bps: 1200, 2400, 4800, 9600, 19200, 38000
S03 BPS2 (2nd Baud Rate)	External RS485 Baud Rate bps: 4800, 9600, 19200, 38000
S04 WIRE MODE U (Voltage)	Voltage Wiring Mode: 3LN; 2LN, 2LL, 3LL *Note: See System wiring for further details*
S05 WIRE MODE I (CTs)	CT Wiring Mode: 3CT; 2CT, 1CT *Note: See System wiring for further details*
S06 PT1 (Primary Voltage)	Nominal Primary PT Voltage: 50.0 – 500,000.0 *Note: With no PT, set nominal system voltage*
S07 PT2 (Secondary Voltage)	Nominal Secondary PT Voltage: 50.0 – 400.0 *Note: With no PT, set nominal system voltage*
S08 CT1 (CT Primary Current)	Nominal Primary CT Current: 1 – 50000
S09 CT2 (CT Secondary Current)	Nominal Secondary CT Current: 1 or 5
S10 PUL CONT P (kWh Pulse Weight)	Active Power Pulses weighing factor (eg. 0.1kWh/pulse)

Figure 4-11a: Programming Flow Chart 1 (S01 – S10)

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Box	Description
S11 PUL CONT Q (kvarh Pulse Weight)	Reactive Power Pulses weighing factor (eg. 0.1kWh/pulse)
S12 BLT TIME (Backlight time)	Backlight ON Time: 0 – 120 minutes *Note: Enter 0 for constant ON*
S13 DMD MODE (Demand Mode)	Demand Mode; Sliding Block: 1; Thermal:2
S14 WIND TIME (Demand Window)	Demand Window: 1 – 30 minutes *Note: Typical is 15 minutes*
S15 DMD CLR (Demand Clear)	Clear Demand: Yes or No
S16 MAX MIN CLR (Clear Max and Mins.)	Clear prior maximums and minimums in registers: Yes or No *Note: Clearing restarts from the time of clearing*
S17 RUN HOUR CLR (Run Time Clear)	Clear Run Time: Yes or No
S18 I1 DIR (CT Current Direction)	
S19 I2 DIR (CT Current Direction)	Corrects for CT polarity error: Positive: P; Negative N *Note: Normal is P for correctly installed CT*
S20 I3 DIR (CT Current Direction)	
S21 VAR DEF (VAR/PF Convention)	IEC: 0; IEEE: 1
S22 E CLR (Energy Clear)	Clear Energy: Yes or No
S23 E Mode (Energy Clear)	Fundamental: Fund; Full Wave: Full
S24 Q MODE (var Calculation method)	True: 0; Generalized: 1 where Q = SQR of $S^2 – P^2$
S25 E SEL (Energy Type)	Primary Energy: PRE; Secondary Energy: SEC
S26 IO CNTR CLR (Clear Pulse Counter)	Clear No: 0; Yes: 1

Figure 4-2b: Programming Flow Chart 2 (S11 – S26)

S27 IE SOE ENBL (Module Enable)

Disable: 0; Enable AXM-I011: 1
Note: The AXM-I-011 Module is normally installed in Port 1 & 2

S28 PROF IBUS ADDR (Profibus Add.)

Profibus Address: 0 – 126

S29 PARA MODE (Parameter Mode)

Basic Primary Parameters: PRE;
Basic Secondary Parameters: SEC

E

S30 PASS WORD (Set New Passwordw)

Set a New Password: 0 – 9999
Note: Default is '0'; Take care to note the new password

P

S31 PAR SET 1 (Set Parity Int. RS485)

Parity: None, 1 Stop Bit: NON1; None, 2 Stop Bits; NON2;
Odd, 1 Stop Bit: ODD; Even 1 Stop Bit: EVEN
Note: Class 0.2 Models only (Model IIR); Default is 'NON1'

S32 PAR SET 2 (Set Parity 2nd R485)

Parity: None, 1 Stop Bit: NON1; None, 2 Stop Bits; NON2;
Odd, 1 Stop Bit: ODD; Even 1 Stop Bit: EVEN
Note: Class 0.2 Models only (Model IIR); Default is 'NON1'
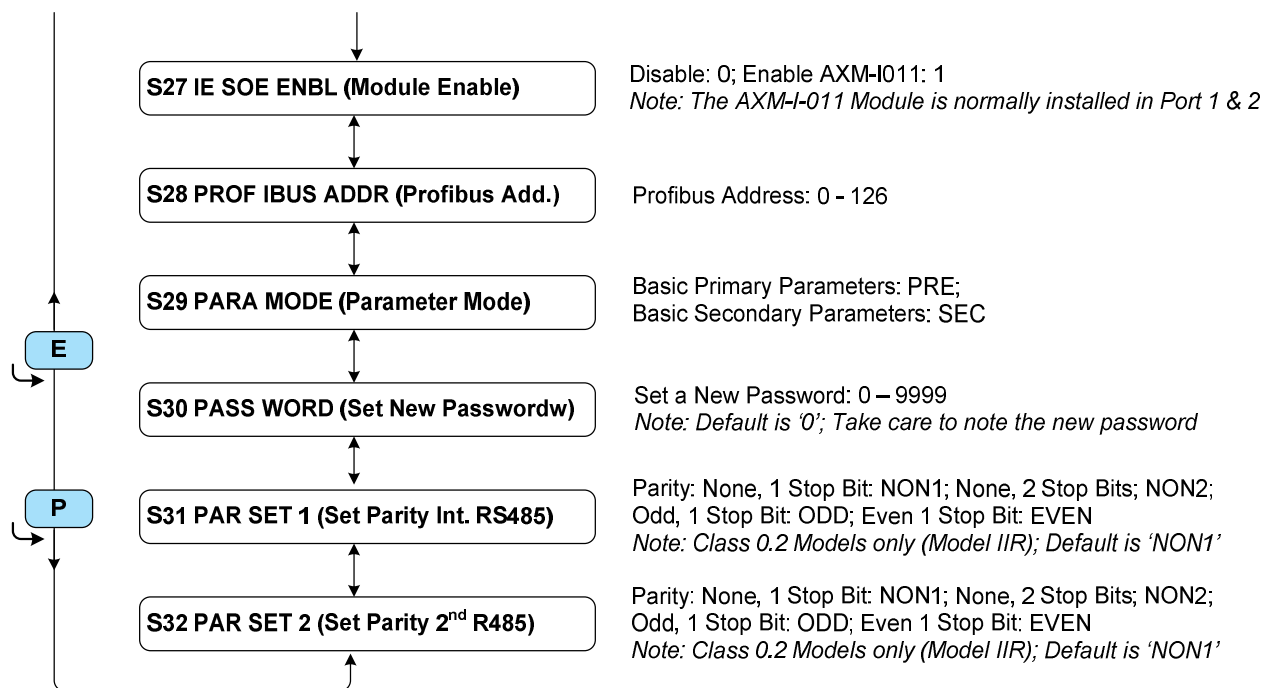
Figure 4-2c: Programming Flow Chart 3(S27 – S32)

4.8.5 System Wiring Modes

Note: Factory set for the system and should not be changed

Match the System type to the diagrams shown in the table below for further guidance on the setting

Table 4-6: Supported System Configurations and Program Identifier

System Type	Diagrams	Reference Diagrams	Mode
Single Phase	A N	Single Phase 2-Wire; 1-CT	3LN 3CT
Split Phase 3-Wire	N A B	Split Phase 3-Wire; 2-CT	3LN 3CT
Three Phase	A B C	Three Phase 3-Wire; 2-CT	3LL 2CT
		Three Phase 3-Wire; 3-CT	3LL 3CT
	A N C B	Three Phase 4-Wire; 3-CT	3LN 3CT
	A A N B N C B	Three Phase High-Leg; 3-CT	3LN 3CT
		Three Phase Open-Delta, 2CT	3LL 2CT

4.8.6 I/O Module Programming

Note: Only with Alarm option

The I/O Module is enabled on Step 27 (S27) of the System menu and is programmed for the function by selecting 'I/O' in the Setting menu.

Within 'Setup', use the P or the E keys to select the I/O function (move the dash) as shown:

The V/A key enters the selected parameter and the H key exits back to this selection screen.

There are a number of menus for setting the functions of the I/O Module:

- Digital Input Counter Enable (IO CTR ENBL). Eg. 0 = Status; 1 = Count

- Digital Count Weighing (constant) Factor (IO CNTR CONT). eg. A factor of I0 means 10 pulses for 1 count

- Relay Output Mode (RO MODE). Control: CTRL; Alarm: ALRM

- Relay Operation (RO OUT). Latch: LATCH; Pulse: PUL

- Pulse Width (RO PUL WIDH). Pulse settable 50 – 3000 ms.

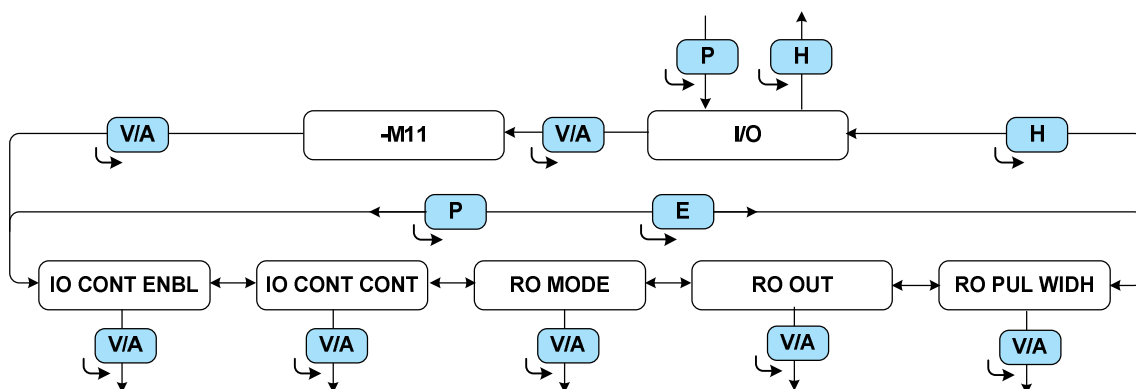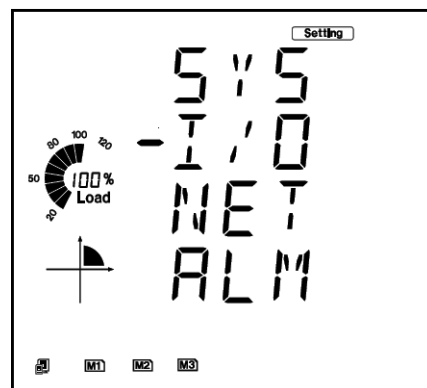Within the I/O function programming, use the P or the E keys to select the function to be programmed.

Figure 4-12: I/O Function Programming Chart

4.8.6.1 Digital Input Function

Note: Not used but described for information only.

At the IO CONT ENBL selection, use the V/A key to select and enable setting the Digital inputs (1 to 6) using the 6 Bits respectively for the counting function on all digital inputs, 0 for Status, 1 for Counting.

The H key selects the digit and the P or the E keys changes the digits to '1' or '0'.

Note: Setting the "Status" mode enables the status of the digital inputs to be read over Modbus and recording the Digital Input Sequence of Events (SOE); Setting "Count" enables the digital inputs to be used as counters which is its default setting.
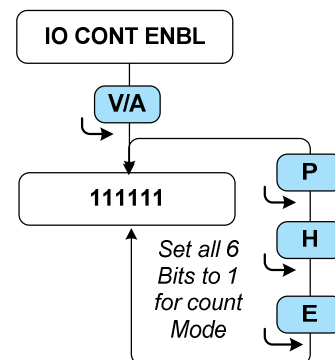
Figure 4-13: Setting the Digital Input Count Function

4.8.6.2 Digital Count Weighing Factor

Note: Not used but described for information only.

At the `IO CNTR CONT` selection, use the `V/A` key to select and enable setting the weighing factor for the digital count. The weighing factor divides the input pulses by the entered number.

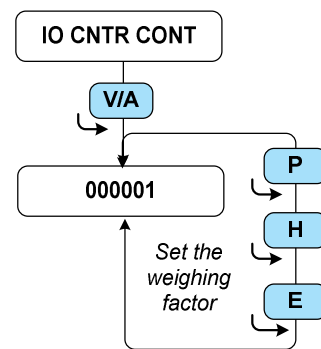The `H` key selects the digit and the `P` key increments the digit and the `E` key decrements.

IO CNTR CONT
V/A
000001
P
H
E
Set the weighing factor

Figure 4-14: Setting the Weighing Factor

4.8.6.3 Relay Mode

Note: Only with Alarm option.

At the `RO Mode` selection, use the `V/A` key to select and enable setting the Digital Relay Output function to Control or Alarm. The `P` or the `E` key changes the function as shown.

Note: The Control Function operates based on a Modbus command or direct user control input at the screen or using the Setup Software and the Alarm function operates based on set Alarm conditions.
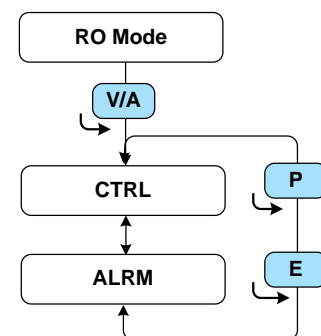
RO Mode
V/A
CTRL
ALRM
P
E

Figure 4-15: Relay Output Mode

4.8.6.4 Relay Output Operation

At the `RO OUT` selection, use the `V/A` key to select and enable setting the Digital Relay Operational function to Latch or Pulse. The `P` or the `E` key changes the function as shown.
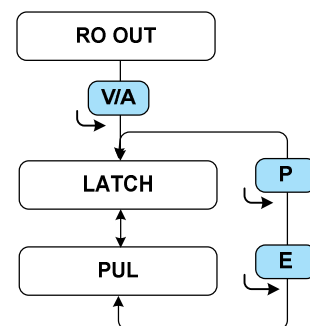
Note: Only applicable in the "Control" mode.

RO OUT
V/A
LATCH
PUL
P
E

Figure 4-16: Relay Output Function

4.8.6.5 Relay Output Pulse Width

At the `RO PUL WIDH` selection, use the `V/A` key to select and enable setting the Pulse Width for the pulse function.

The `H` key selects the digit and the `P` key increments the digit and the `E` key decrements.

Note: Only applicable in the "Control" mode when set for "Pulse" Mode

RO PUL WIDH
V/A
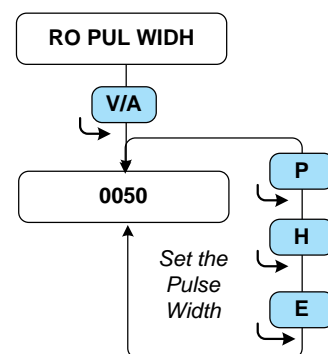0050
P
H
E
Set the Pulse Width

Figure 4-17: Relay Pulse Width

4.8.7 Alarm Functions (Option)

The *SMART-RXX* Alarm option has over/under and equal to alarming functions for measured parameters and when set provides a time stamped record of the event subject to the set delays. Each meter Port can record up to 16 Alarms of selected parameters. All models include a wired I/O module with Relay Outputs For Ports 1 and 2 which may be programmed to provide operation for indication of the alarm condition including 'AND' conditions between any two adjacently set alarms.

Note: Full setup of the Alarm functions can only be done using the setup software "Acuview" with partial setup of "Control/Alarm" functions possible from the meter screen as shown in the following diagram.
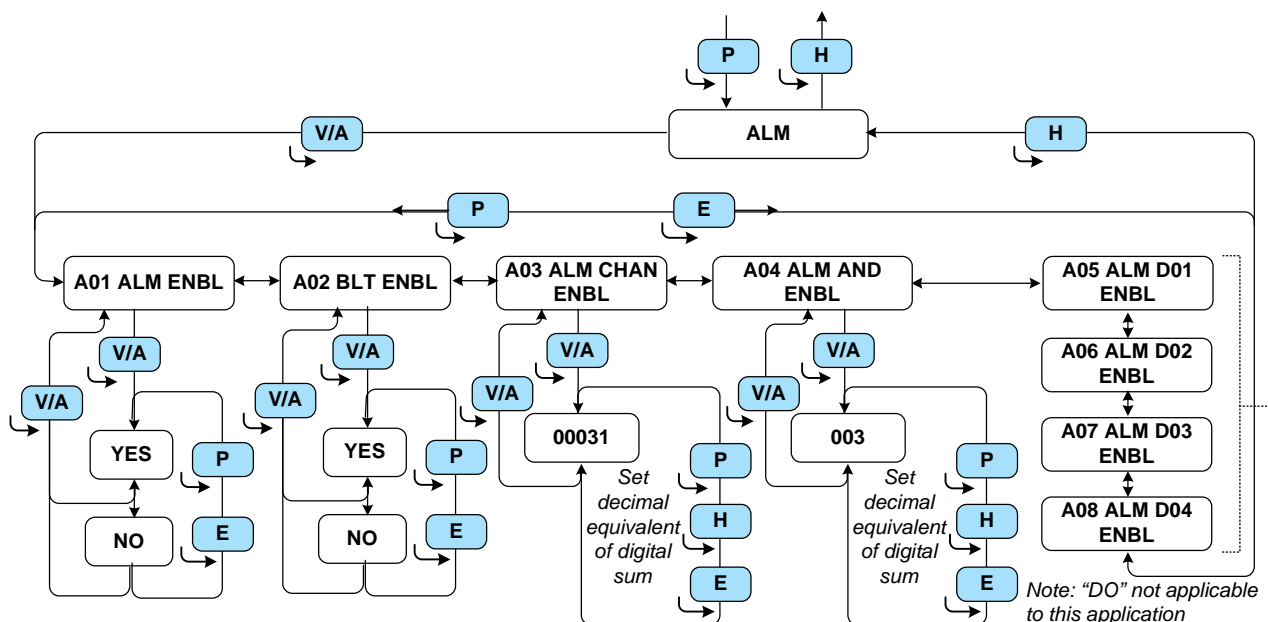

Figure 4-18: Flow diagram for Enabling Control/Alarm functions

Table 4-7: Table of Alarm & "AND" Functions Decimal Equivalents

Alarm No:	Decimal Equivalent	Alarm "AND"	Decimal Equivalent	Notes:
1	1	1 "AND" 2	1	To Manually set Alarms, enter the sum of the decimal equivalent. eg: Alarm 1, 2 & 3 = 7 (decimal)
2	2			
3	4	3 "AND" 4	2	
4	8			
5	16	5 "AND" 6	4	
6	32			
7	64	7 "AND" 8	8	To manually set the Alarm "AND" conditions, enter the sum of the decimal equivalent. eg. Alarm 1 "AND" 2 = 1
8	128			
9	264	9 "AND" 10	16	
10	512			
11	1,024	11 "AND" 12	32	
12	2,048			
13	4,096	13 "AND" 14	64	***Full Alarm functions can only be completely set using the setup software***
14	8,192			
15	16,384	15 "AND" 16	128	
16	32,768			

4.8.8 Ethernet Function

The Ethernet function is not directly supported from the meter module and should be skipped.

4.9 WEB Server Communication Setup

The SMART-R3A and SMART-R3B are equipped with a WEB Server and a RS485 port supported by the WEB Server. The meter supported RS485 is covered in the prior meter setup section.

Table 4-8: Communication Ports when equipped with a WEB Server

COM Ports	Connector	Protocols	Notes
Ethernet	RJ-45	HTTP, Modbus/TCP BACnet/IP (option)	Magnetically Isolated
RS485 (WEB Server supported)	Screw Terminal	Modbus RTU	Not Isolated

4.9.1 WEB Server Supported RS485 Connection

This connection is made at the rear of the device as illustrated above. This port is not isolated and has a drive capability of up to 4,000 feet with up to 32 devices. Is recommended that a low capacitance twisted shielded 22 AWG gauge (or larger) wire be used for busing.

Wire the RS485 terminals to the external RS485 Network by connecting the R/T-(A), R/T+(B) and common terminals. Terminate and ground as required per the Network configuration using the diagram provided as a guide.
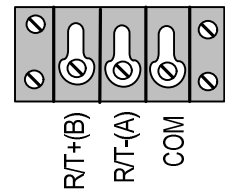
Table 4-9: RS485 Port Characteristics

Port	Load	Duplex	K Baud	Format	Protocols	Isolation
RS485	32 units	Half	9.6 19.2 38.4	1 start Bit 8 Bit Word 1 Stop Bit No Parity	Modbus RTU	None

4.9.2 Ethernet Port Characteristics

The Ethernet port is supported through the integrated WEB Server with an Ethernet RJ45 jack located at the rear of the unit beside the RS485 terminal. Connect the Ethernet Port to the Network using a CAT 5 Ethernet cable to LAN1 of the Network Interface.

Table 4-10: Table of Ethernet Port Characteristic

Parameter	Description
Bit Rate	10/100 BaseT
Connection	RJ-45
Isolation	1,500V (Galvanic)
Location	Internal, Class 2 compartment
Protocols	HTTP, Modbus/TCP, BACnet/IP (option)
IP Addressing	DHCP Client (Dynamic & Static)

Note: This Network Device is shipped with dynamic IP addressing to facilitate immediate connection to a Ethernet Network. However it may be advisable to check with your IT administrator prior to actually connecting the unit to the network for pre-assignment of Network IP addresses; to this end a crossover cable may be used with a local PC for local setup but this is covered in the section on communication setup.

4.10 Ethernet Network Port Setup

These setup instructions are specific to configuring a static IP address on the *SMART-R3A/B* equipped with the WEB Server (Powersmiths (COMSERER). For detailed setup related to the WEB Server functions please refer to the COMSERVER manual and the "Network Configuration Utility" downloadable at www.powersmiths.com/cyberhawk under the COMSERVER (from the menu tree on the middle left of the screen).

The configuration utility used to set the TCP/IP network settings is a PC-based software configuration utility entitled "Cyberhawk Network Utility" available from the Powersmiths website as listed above. This utility has the ability to search the local Ethernet network for connected COMSERVER equipped Cyberhawk devices and allows the user to modify the network properties (IP address, subnet mask, DNS addresses and/or hostname) and passwords for each device found.

Note: Some Firewalls prevent the utility from communicating and finding the connected Cyberhawk COMSERVER devices which may require that the firewall be temporarily disabled prior to running the utility.
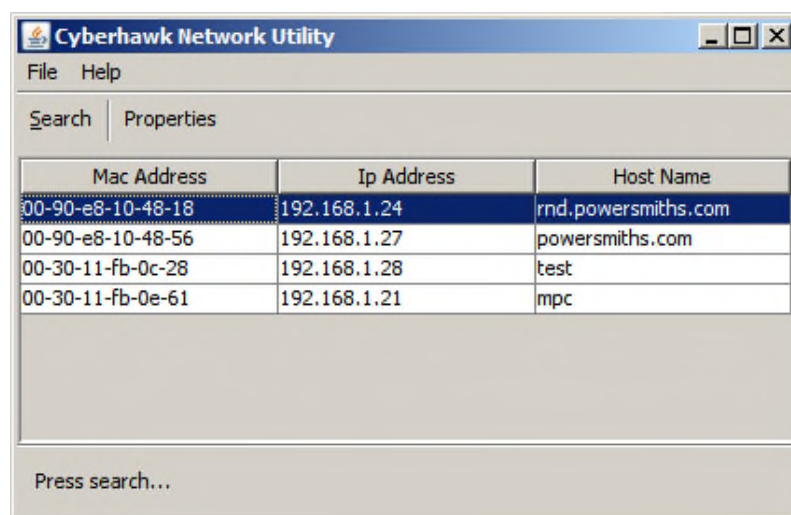
4.10.1 Static IP Setup

There are two methods of using the configuration utility as follows:

1. By connecting the Cyberhawk Ethernet port directly to the Intranet network (with an Ethernet patch cable) on which it will function (note that IP administrator may require prior configuration)

Note: Both the Cyberhawk Ethernet port and the setup PC must be connected on the same Ethernet network for this utility to work.

2. By directly connecting to a PC by means of a crossover cable which will be used to configure the Cyberhawk Ethernet port (normally preferred method)

With the unit connected for Method 1 or 2, start the 'Cyberhawk Network Utility' (usually loaded on the PC under Programs/Powersmiths/Utilities) and press 'Search' button on the toolbar or 'Ctrl + s' on your keyboard to begin to search the local Ethernet network for Cyberhawk devices equipped with a COMSERVER. Detected devices will be listed in table as shown below.

Nomenclature:

- MAC Address: The Ethernet MAC address
- IP Address: The IP address of the Gateway
- Host Name: The host name

Figure 4-19: Screen for the "Cyberhawk Network Utility"

### 4.10.2 Configure Network settings

To configure the network properties for a detected Cyberhawk COMSERVER device, select the Cyberhawk COMSERVER device you want to configure from the selection provided (screen above) and select the 'Properties' button on the toolbar or 'Ctrl + P' on your keyboard. This will open the 'Device Properties' dialog. For an example of configuration enter as follows:

![POWERSMITHS]

- DHCP: Uncheck DHCP* (for a static IP address otherwise it will be set to a dynamic IP address)
- IP Address: Enter an IP address* (e.g. 192.168.1.21)
- Subnet Mask: Enter a Subnet Mask* (e.g. 255.255.255.0)
- Gateway Address: Enter the default network gateway address(e.g. 192.168.1.8)
- Host Name: Assign any name that the unit is to be called (optional)
- DNS 1 & 2 (Domain Name server): Obtain from IP System administrator

Upon completion of your network settings, press the 'Apply' (not to exit) or 'Ok' buttons. For security, you will be prompted for the root user password (the default is '***root***') before applying any changes.

*Caution: Please contact the competent network administrator to obtain a static IP address including Subnet mask etc. prior to setting or network conflicts could occur
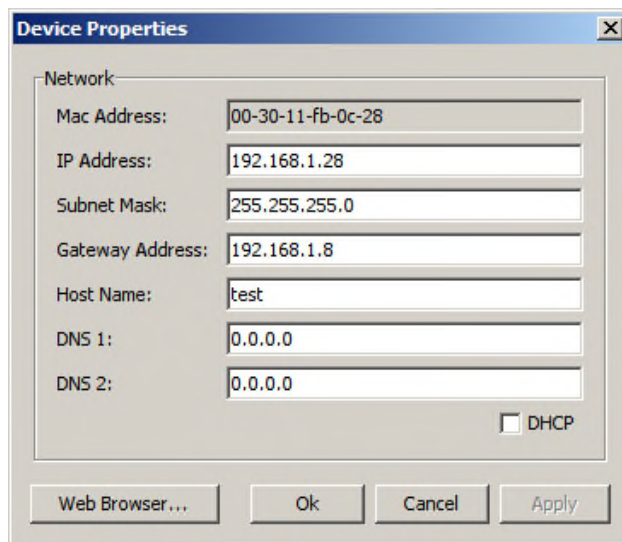
Nomenclature:

- IP Address: The IP address.
- Subnet Mask: The subnet mask
- Host Name: Here you can enter a hostname of your device (optional)
- DNS 1: The primary Domain Name Server (optional)
- DNS 2: The primary Secondary Name Server (optional)

Figure 4-20: IP dialog box

4.10.3 Test

To test if the network property changes have been applied, repeat the steps from 1.2 'Finding Devices' or open a WEB Browser directly from the IP dialog box and viewing the delivered WEB page.

4.10.4 Other Setups

Other setups may be required and these will include:

- Location (used by the user to identify the unit when accessed over Ethernet)
- Date/Time
- Passwords
- Add/Change Users
- Data Logs
- Firmware updates
- WEB Page updates

Please refer to the COMSERVER manual available from www.powersmiths.com/cyberhawk for more details and full instructions.

4.11 Factory Default Settings

The following setup tables document the default ship values (factory set).

System Settings						
Meter Modbus+ Address		Default:	1	Other		
Meter RS485**	Baud Rate:	Defaults:	19,200	Other:		
	Parity:		None			
Assigned IP*:		●	●	●	DHCP:	ON
MAC Address:						
WEB Server RS485*	Baud Rate:	Defaults:	19,200	Other:		
	Parity:		None			
Notes:	**Models SMART-R3A & SMART-R3B* ***Meter parameter set manually at the screen*					

General Meter Setup		
Password	Default (0)	0
Backlight	*Default (1)*:	1
Voltage Wiring	Default (3LN):	3LN (3-Phase), 2LN (Split-Phase)
CT Wiring	Default (3CT):	3CT (3-Phase), 2CT (Split-Phase)
PT Ratio PT1/PT2	Default (400/400):	400/400
CT Ratio CT1/CT2	Default (100/5):	kVA Size Specific (see label on SMART-R Lid)
CT Direction I$_A$, I$_B$, I$_C$:		P (positive)
Demand	Thermal/Slide/Time:	Sliding / 15 mins
Energy	Type:	Fund.
	Reading:	Secondary
Convention/ Calculation	VAR/PF:	IEEE
	VAR Method:	1 (true)
Clock Set	Local:	Local (Eastern Standard Time)

Alarm Option		
SOE *AXM-IO1* Enable:		AXM-IO11
Digital Inputs	DI 1 – DI 6:	Not wired and not used
Alarm Option:	Relay O/P Type (Control/Alarm	Alarm

5 Maintenance

WARNING	HAZARD OF ELECTRIC SHOCK OR ARC FLASH
Risk of Electric Shock	▪ Open Disconnect to the Transformer and "Lock-out" before servicing this equipment ▪ Open all local Fused disconnects to de-energize the internal circuits within this equipment ▪ Never open CT secondaries in powered circuit as dangerous voltages or damage can result

Do not assume but check that all power sources at the system connection points are off using a properly rated voltage indicating device (Multi-meter, etc.) and that the source switch is "Locked out"

5.1 Maintenance Requirements

The *SMART-R* series of Ports do not require any routine maintenance by the user.

5.2 Fuses

The unit incorporates internal fusing for safety and equipment protection in event of a catastrophic component failure. The fuses are located on the DIN rail within the SMART enclosure and are safety touch safe types.

5.2.1 Replacement Fuse Ratings:

The replacement fuses are shown in the table below relative to the transformer voltage rating on the Input and Output.

Note: For continued protection for safety, risk or fire or equipment damage, it is important to replace the fuses with the same type and rating.

Table 5-1: Table of Replacement Fuse ratings

Fuse ID	Tx. Circuit	Voltage	Current Rating	Voltage Rating	Class/Type/ Speed	Powersmiths Part No:	Manufacturers
F1,F2, F3	Output (Secondary)	208/240V	1 A	600 VAC	Midget 38 x 10 mm Fast	928-000679-102	Bussmann: KTK 1 Mersen: ATM 1 Littlefuse KLK 1 Edison: MCL 1
		480/600V	400mA	600 VAC	CC 38 x 10 mm Delay	928-000845-111	Mersen: ATQR 4/10 Edison: EDCC 0.4
F4, F5, F6	Input (Primary)	208/240V or 480/600V	1 A	600 VAC	Midget 38 x 10 mm Fast	928-000679-102	Bussmann: KTK 1 Mersen: ATM 1 Littlefuse KLK 1 Edison: MCL 1

The fuses are located on the DIN terminal rail within the unit.

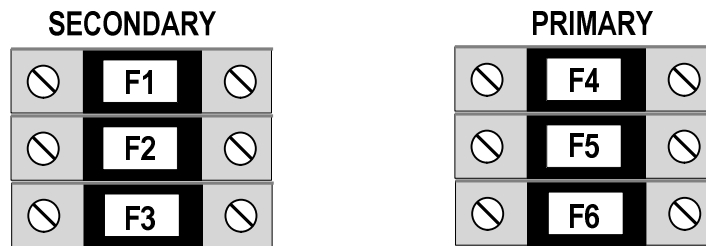SECONDARY   PRIMARY

Figure 5-1: Identification of fuses

5.3   Calibration

Calibration is not normally required through the life of the product.

6 Appendix 1: Setup with the "Acuview" Software Tool

6.1 Overview

The meters may be setup locally using the display and the menu sensitive keys (as previously described) but this can be a slow and tedious process. Alternatively the meters may be setup using PC based setup software with communication over a wired external network (RS485 or Ethernet) as equipped. The software utility "Acuview" is provided by Accuenergy, the manufacturer of the meter module and may be found at: http://accuenergy.com under the Support/download section and select "Acuview".

The following is intended as an aid to establishing initial communication with the meter with detailed instructions provided by the included software manual.

6.1.1 RS485

The *SMART-RXX* family is equipped with a standard half-duplex RS485 serial port that can be used to communicate with the meter if required. A suitable probe is available from directly from FTDI Future Technology Model USB-RS485-WE-1800-BT (illustrated opposite) or through Digikey. The probe will need a Virtual Communication Port (VCP) software driver available from the manufacturer before communication can be established.

Connections: Common: Black; B (Data +): Orange; A (Data -): Yellow
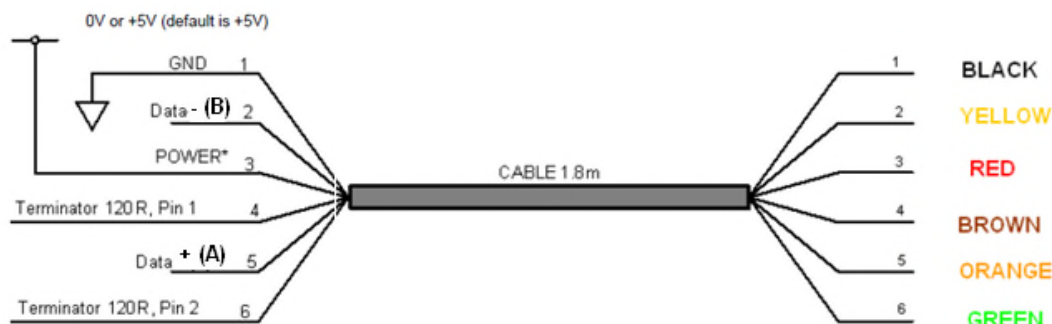
Note: Insulate unused leads

Figure 6-1: Connections to the USB-RS485-WE-1800-BT (USB to RS485) VCP

Notes:

- *The Baud Rate and Parity must be matched both at the meter and at the computer with the appropriate Modbus address (typically 1, 2, 3, 4, 5 & 6) and a valid password.*

- *The serial port parameters may be supported directly by the meter or by the Ethernet Port module if the unit is so equipped.*

- *Only one RS485 "Master" may be simultaneously attached to this network; this means that any other 'Master' (eg. BMS) will have to be temporarily disconnected.*

6.1.2 Ethernet Connections

If so equipped, communication can be established with the meters over the local Intranet or by direct PC to Meter Ethernet link. Note that the Protocol will be Modbus TCP which will require each meter on the IP will need to be addressed with each meter's unique Modbus address and password.

Note for more details please refer to the section on "Ethernet Communication Setup".

Notes:

- *The unit is accessible over a connected Intranet and its IP can be "Discovered" using the Powersmiths "Cyberhawk Network Utility".*

- *A local direct port to port Ethernet connection is possible (a cross wired connection may be required for older PCs but the PC will need to be set to a fixed IP and the Ethernet port also set to a fixed IP within the same range.*

6.2 Establishing Communication with Setup Tool

Note: Program is written and provided by Accuenergy and the following is provided by Powersmiths as an aid to its operation.

6.2.1 Connection using USB to RS485 VCP

Prior to opening the program, it will be necessary to establish the "Windows" assigned Virtual Com Port (VCP). Plug in the USB to RS485 Adapter and In "Windows 7" select "Devices and Printers" from the main start menu and select USB-RS485 and right mouse click it.
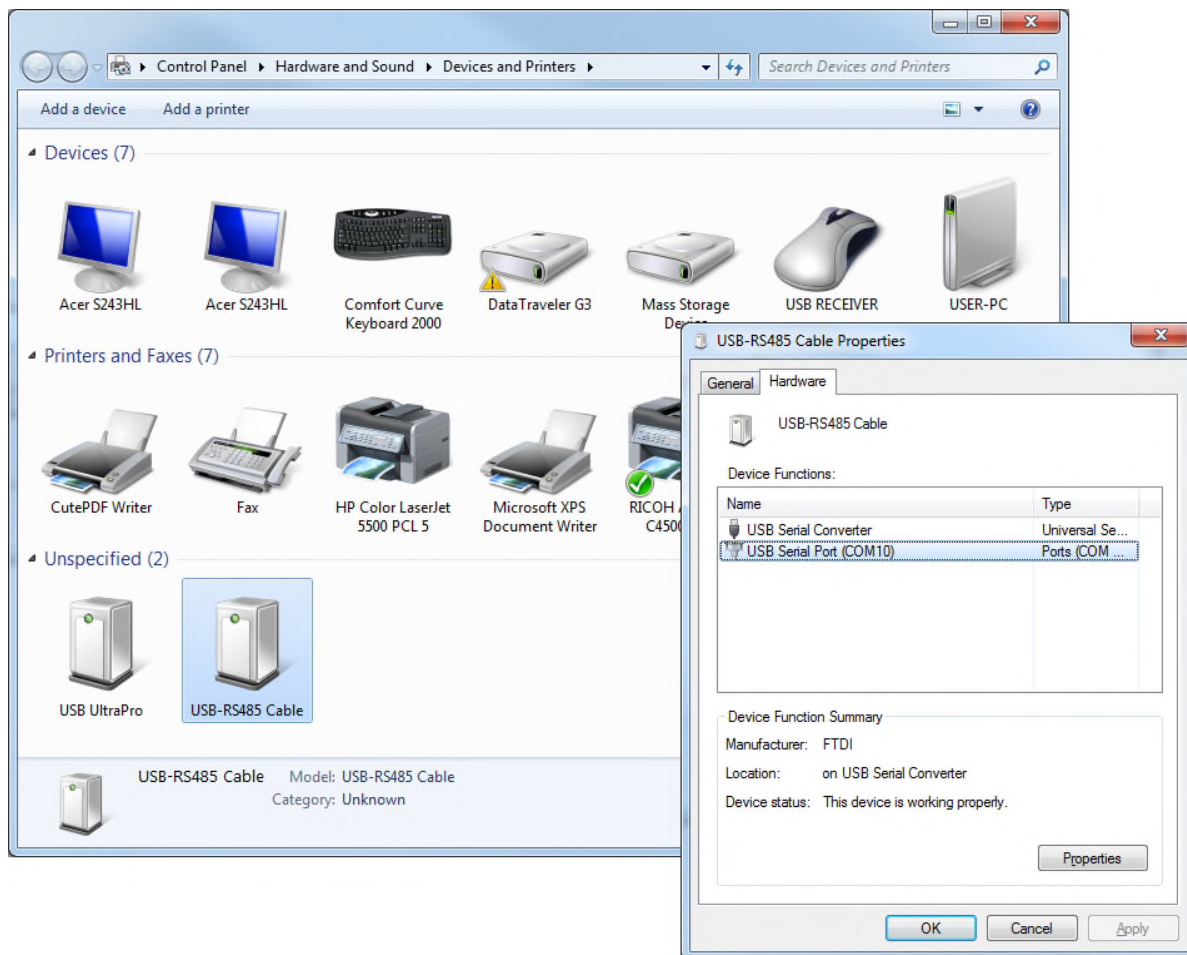

Figure 6-2: Checking the assigned Virtual Com Port (VCP)

Select "Properties" and under the "Hardware Tab observe the COM Port Assignment (eg. COM10) as shown.

Note: Alternatively the assigned VCP may be checked using the "Windows Device Manager" and under "Ports (COM & LPT)

6.2.2 Opening the "Acuview" Software over RS485

Run the software and in the presented dialog box. Click "Serial Port" and enter the VCP (COM Port #), the Baud Rate (19,200 default), the Device Modbus Address and the Scan interval (500 ms. Default).
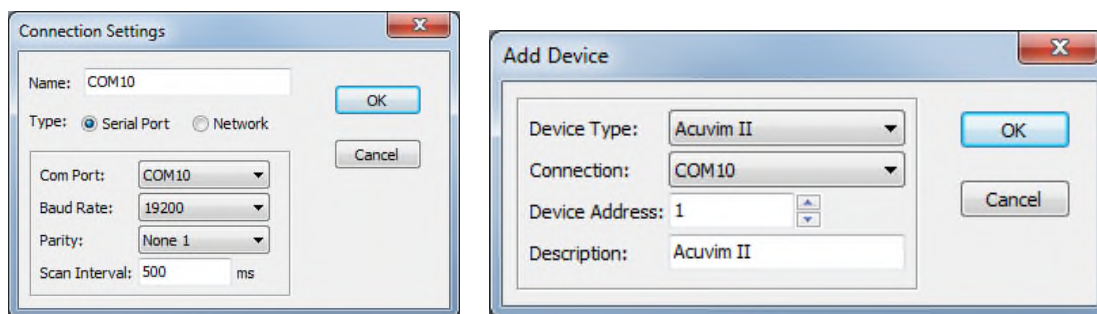
Figure 6-3: Acuview software RS485 Communication Parameters

6.2.3 Opening the "Acuview" Software over Ethernet

Run the software and in the presented dialog box. Select "Network" and enter the IP Address*, the Modbus Port (502) and in the next dialog box enter the Device Modbus Address and the Device type should be Acuvim II.
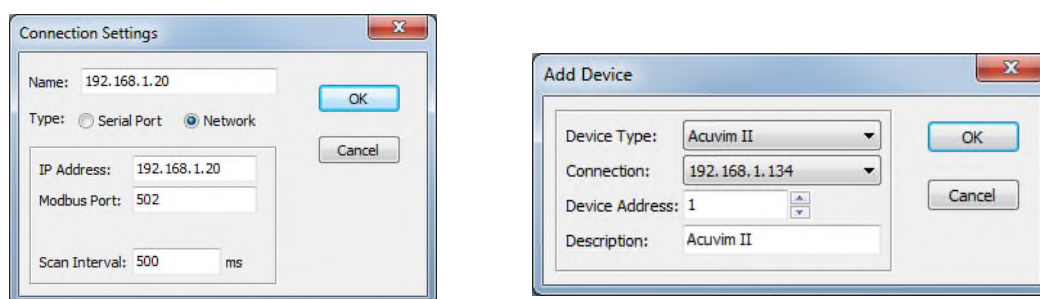

Figure 6-4: Acuvim II software Network Communication Parameters

*Note: The IP address may be discovered using the "Powersmiths Network Utility" described in the Section on "Setup".

To switch the view to a different meter while still connected, terminate communication and under the "Settings" menu select "Device Properties" and select another Device Address or Connection type.

6.3 Using Acuview

The following is a brief guide to the use of the "Acuview" Setup software; note that a soft copy of the software manual is provided with the software and available under the Help (?).

6.3.1 Readings: Voltage/Current/Power

Under the "Readings" Tab, select "Real Time Metering"; a typical screen is shown below:
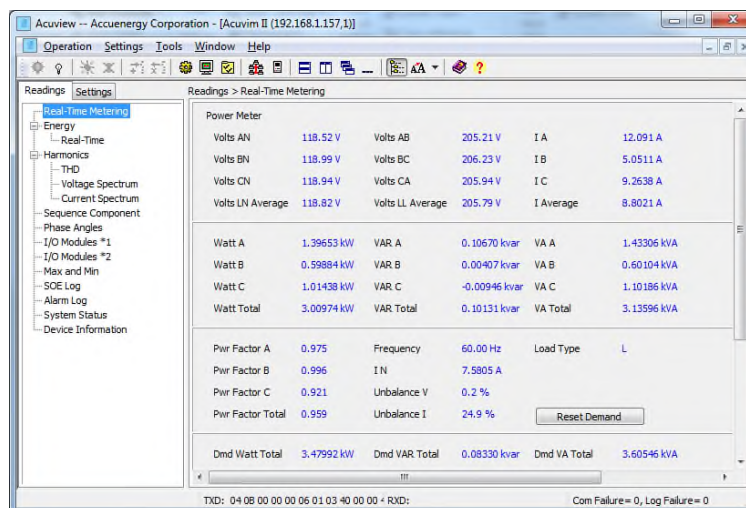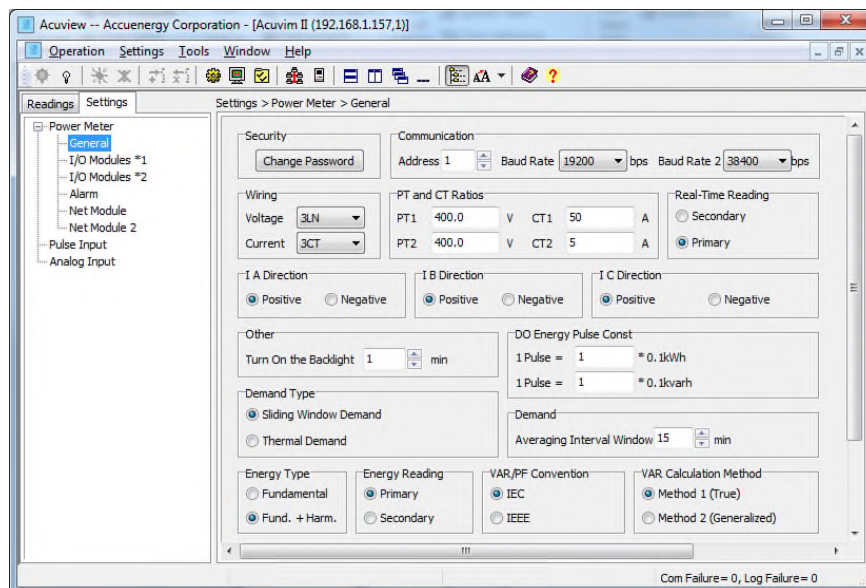

For other readings, select the required parameters in turn (see left column on prior screen)
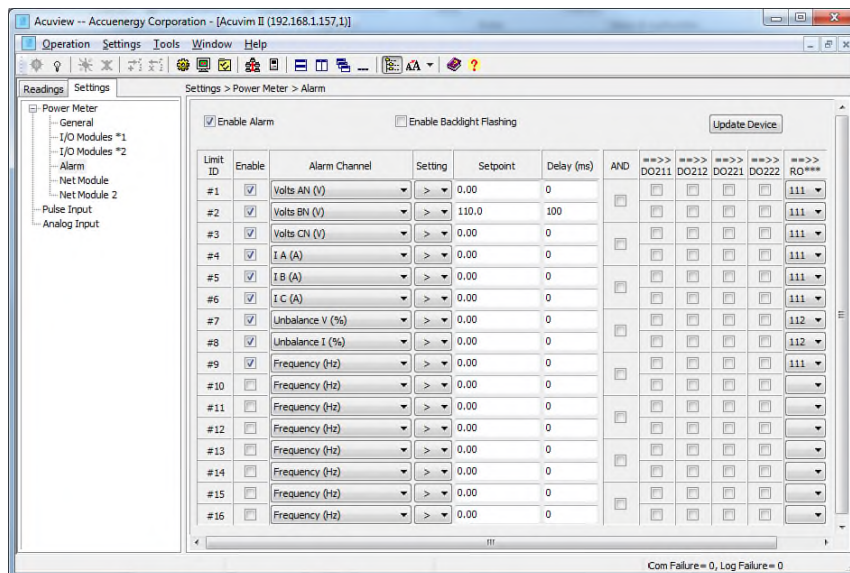
6.3.2 Setup

Under the "Settings" Tab, select "General"; a typical screen is shown below:

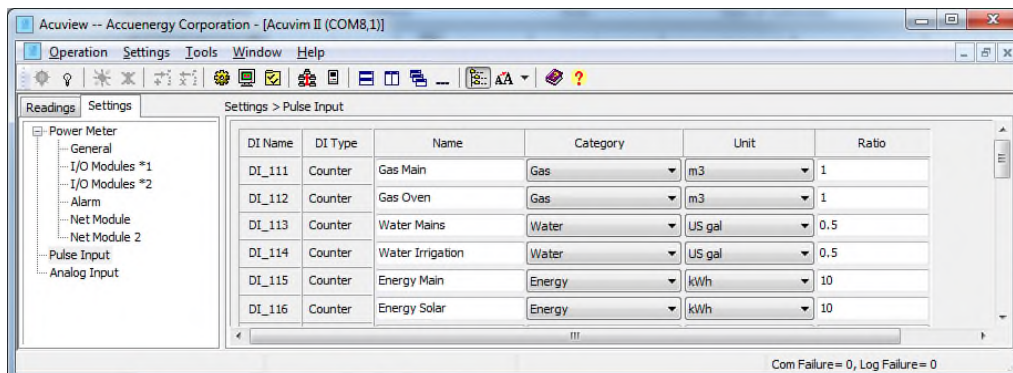*Note that only Module *1 is installed in this application*

For other Setups, select the required parameters in turn (see left column on prior screen).

A typical Alarm Setup screen is shown below:

A typical Pulse Counting Screen is shown below (includes assigned name and category):

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7 Appendix 2: Programming Chart Record

Instructions: To program this unit, follow instructions as given in Section 4 of this manual. Note make copies of this chart or download a copy of this manual from www.powersmiths.com/cyberhawk and reprint these pages.

System Settings							√
Meter Modbus+ Address		Default:	1	Other			
Meter RS485**	Baud Rate:	Defaults:	19,200	Other:			
	Parity:		None				
Assigned IP*:		•	•	•	DHCP:	ON	
MAC Address:							
Location (user assigned)**:**							
WEB Server RS485*	Baud Rate:	Defaults:	19,200	Other:			
	Parity:		None				
Notes:	**Models SMART-R3A & SMART-R3B* ***Meter parameter set manually at the screen*						

General Meter Setup (1)			√
Password	Default (0)	0	
	*Other (0-9999)***:**		
Backlight	*Default (1)***:**	1	
	Other (0-120):		
Voltage Wiring	Default (3LN):	3LN (3-Phase), 2LN (Split-Phase)	
CT Wiring	Default (3CT):	3CT (3-Phase), 2CT (Split-Phase)	
PT Ratio	Default (400/400):	400/400	
CT Ratio CT1/CT2	CT kVA Size Specific (as SMART-R Label)		

General Meter Setup (2)			√
CT Direction	I_A, I_B, I_C:	P (positive)	
Demand	Thermal/Slide:	Sliding	
	Time (mins.):	15	
Energy	Type:	Fund.	
	Reading:	Secondary	
Convention /Calculation	VAR/PF:	IEEE	
	VAR Method:	1 (true)	
Relay Outputs (RO 1; RO2)*	Type (Control/Alarm):	Alarm	
	Mode (Latch/Moment.):	N/A	
	On Time (Pulse):	N/A	
Clock Set	Local:	Local (Eastern Standard Time)	
	Other:		
SOE*	*AXM-IO1**:	Enable	
Notes :	*Set defaults unless otherwise specified* **If fitted*		

Alarm Settings and Test (if fitted)					√
No:	**Alarm Name**	**Set Point**	**Delay (ms)**	**"AND"**	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					