OPTO 22

SNAP ENERGY MONITORING UNIT

Features

> Monitors power usage for a 3-phase electrical device such as an HVAC system, compressor, or electric motor

> Plots realtime and historical energy usage data in an easy-to-use HMI

> Sends email notification when energy usage is above preset levels

> Can be expanded and modified to suit your application

SNAP-IT-EMU1

DESCRIPTION

The Opto 22 Energy Monitoring Unit (OptoEMU1) is a complete package of Opto 22 hardware and software that lets you monitor energy usage for a 3-phase electrical device—such as an air conditioning and heating unit, compressor, or electric motor—so you can anticipate energy bills and respond quickly when energy use rises unexpectedly. The OptoEMU1:

• Monitors power usage

• Provides real-time and historical energy usage data, including peak usage for each 24-hour period

• Calculates live kilowatt hours and stores accumulated KWH data usage for every hour

• Checks changes in energy, and sends email if KWH usage or the rate of increase is greater than a preset limit you determine

• Alerts you when power exceeds or fails to reach limits you set

The OptoEMU1 hardware comes mounted and pre-wired in a sturdy polycarbonate industrial enclosure. The following hardware is included:

• A SNAP-PAC-R2 programmable automation controller (PAC), already programmed

• One SNAP-AIPM-3 three-phase power monitoring module

• Power supply

Software and documentation in Adobe® Acrobat® PDF format are available on the Opto 22 website. Software includes PAC Project Basic, a software suite with flowchart-based control programming and human-machine interface (HMI) development and runtime, plus a sample control program and a sample HMI to monitor energy use. The HMI can be easily installed on a computer networked with the unit over a standard 10/100 Mbps Ethernet network.

The HMI provides realtime and historic data in graphic plots, including:

• True power, volts, amps, and power factor

• Live kilowatt usage based on true power samples every second

• Kilowatt hour usage per hour for a maximum of 24 hours

• Kilowatt hours for each 24-hour period

• Peak wattage and the time and date of occurrence (peak value resets at midnight)

Use As Is or Modify for Your Needs

The OptoEMU1 comes ready to monitor one three-phase electrical device, but you will want to expand or change it to suit your needs. Since the mounting rack can hold three more SNAP I/O modules (for a total of four), you can:

• Add additional SNAP-AIPM-3 modules to include other 3-phase electrical devices in your energy usage monitoring

• Add other SNAP I/O modules of any type (analog, digital, and serial) to control or monitor a wide range of other devices

• Change or add programming logic to the sample PAC Control strategy to incorporate additional devices

• Change or add to the sample PAC Display HMI

NOTE: The OptoEMU1 can monitor devices using 85–250 volts and 0–10 amps, and it can also monitor AC line currents greater than 10 amps using a standard current transformer (CT) of suitable ratio. For line voltage higher than 250 VAC, use a step-down potential transformer. If hazardous voltage or current is to be monitored, an interposing potential transformer and a CT must be used for safety.

Part Numbers

Part	Description
SNAP-IT-EMU1	Monitoring system for electrical energy usage

MADE IN THE
USA

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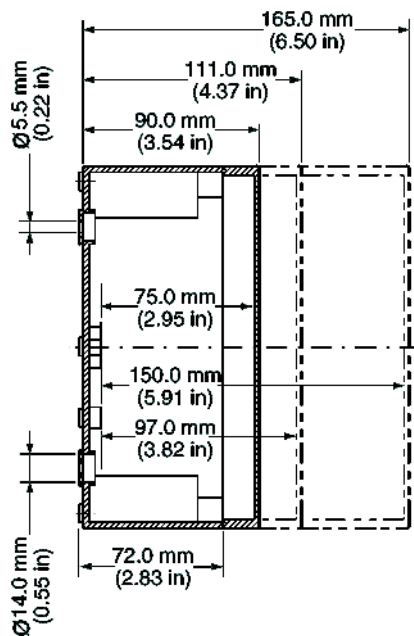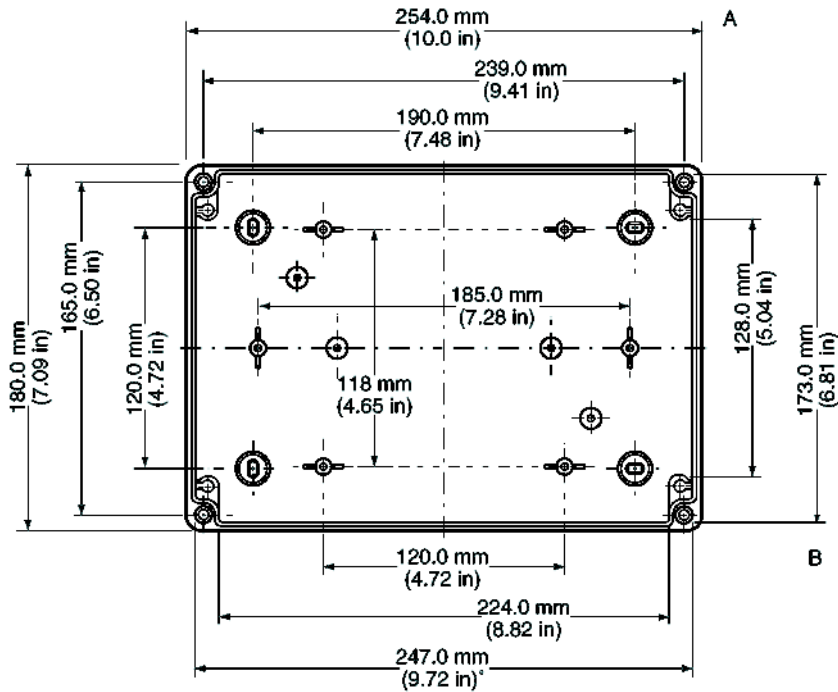
SPECIFICATIONS

Overall Unit	
Power Requirements	100–240 VAC, 0.6 A
Communication	10/100 Mbps Ethernet network interface (RJ-45 connector)
Backup battery	Rechargeable (recharges whenever the unit has power), 3-year power-off data retention
Operating Temperature	0 to 60 °C
Storage Temperature	-40 to 85 °C
Humidity	0–95% humidity, non-condensing
Enclosure	NEMA Type 4X polycarbonate
SNAP-AIPM-3 Voltage inputs (each input)	
Recommended Input Range	85 to 250 VAC RMS
Input Over Range	To 275 volts
Maximum Input	300 V
Input Resistance – Single Ended	1 Megohm (NOTE: Because both channels share the same reference terminal, **polarity must be observed** when connecting the current channel.)
SNAP-AIPM-3 Current Inputs (each input)	
Input Range	0 to 10 AC amps RMS
Input Over Range	To 11 amps (Reading is not reliable over 11 A.)
Maximum Input	15 A continuous
AC Common Mode Rejection	> – 120 dB at 60 Hz
Maximum Operating Common Mode Voltage	250 VAC
Input Resistance – Single Ended	0.005 Ohm (NOTE: Because both channels share the same reference terminal, **polarity must be observed** when connecting the voltage channel.)

Software Installation Requirements

- Computer with at least the minimum processor required for your version of Microsoft® Windows® (single or dual core, 1 GHz Pentium®-class or better recommended) and Ethernet capability.
- Windows Vista® Business (32-bit), Windows XP Professional (with SP2 or higher) or Windows 2000® (with SP4) workstation operating system. (Microsoft Windows server, 64-bit versions of Windows workstation, and embedded operating systems are not supported.)
- At least 1 GB RAM for Windows Vista, or at least 512 MB for Windows XP or Windows 2000.
- VGA or higher resolution monitor (Super VGA recommended), minimum size 800x600 with small fonts.
- Mouse or other pointing device. Printer optional.
- Available hard disk space required: 124 MB

Please note that the sample control strategy and HMI project files included with the OptoEMU1 are sample files that may be used at your own risk. They are provided free of charge and in "as is" condition. These are not official Opto 22 products, and Opto 22 does not guarantee the performance and/or suitability of this freeware for any specific customer or application.

MADE IN THE
USA

DIMENSIONAL DRAWING—OPTOEMU1

WARNING!

Disconnect power upstream from unit when wiring or servicing to avoid potential shock hazard.

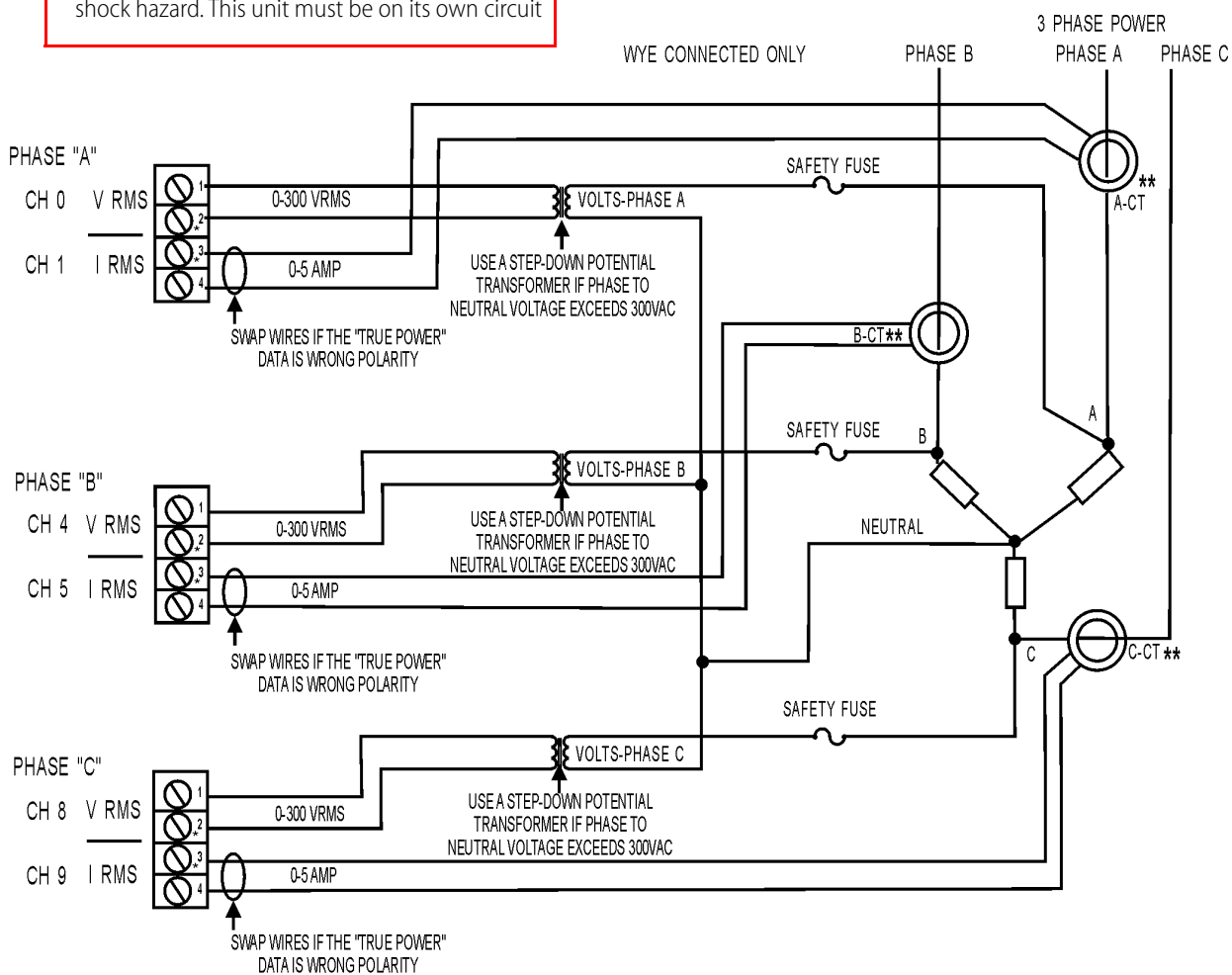This unit must be on **its own circuit breaker**.

WIRING DIAGRAMS—SNAP-AIPM-3

Three-Phase Wiring to SNAP-AIPM-3

CAUTION: Be very careful when connecting input channels. **Do not connect line voltage to the current input channel**; such a connection will cause **severe damage** to the module. This damage is **not covered by warranty**. Use a current transformer instead.

CAUTION: Use caution when selecting wire gauges for your application. Use conservative wire gauges with proper voltage ratings.

CAUTION: Terminals 2 and 3share a common connection inside the module. **Make sure you observe polarity** when connecting the second channel. To avoid a potentially hazardous short circuit, double-check wiring before turning on the current to be monitored.

WARNING! Disconnect power upstream from unit when wiring or servicing to avoid potential shock hazard. This unit must be on its own circuit

* Pins 2+3 are internally connected

** Typically a 5A current transformer is used.

CAUTION: The SNAP-AIPM-3 module does not contain a fuse. Protect the system by adding fuses.

Suggested vendors
Protection fuses: http://www.littelfuse.com
Voltage and current transformers: http://www.crmagnetics.com

More about Opto 22

PRODUCTS

Opto 22 develops and manufactures reliable, easy-to-use, open standards-based hardware and software products. Industrial automation, process control, building automation, industrial refrigeration, remote monitoring, data acquisition, and industrial internet of things (IIoT) applications worldwide all rely on Opto 22.

groov EPIC® System

Opto 22's *groov* Edge Programmable Industrial Controller (EPIC) system gives you an industrially hardened system with guaranteed-for-life I/O, a flexible Linux®-based processor with gateway functions, and software for your automation and IIoT applications.

groov EPIC I/O

groov I/O connects locally to sensors and equipment with up to 24 channels on each I/O module. Modules have a spring-clamp terminal strip, integrated wireway, swing-away cover, and LEDs indicating module health and discrete channel status.

groov I/O is hot swappable, UL Hazardous Locations approved, and ATEX compliant.

groov EPIC Processor

The heart of the system is the *groov* EPIC processor. It handles a wide range of digital, analog, and serial functions for data collection, remote monitoring, process control, and discrete and hybrid manufacturing.

In addition, the EPIC provides secure data communications among physical assets, control systems, software applications, and online services, both on premises and in the cloud.

Configuring and troubleshooting I/O and networking is easier with the EPIC's integrated high-resolution color touchscreen. Authorized users can manage the system locally on the touchscreen or on a monitor connected via the HDMI or USB ports.

groov EPIC Software

Software included in the *groov* EPIC processor:

- PAC Control engine to run PAC Control and PAC Display
- CODESYS Runtime engine to run IEC61131-3 compliant programs built with CODESYS Development System
- Optional access to the Linux operating system through a secure shell (SSH) to download and run custom applications
- *groov* View for building your own device-independent HMI, viewable on the touchscreen, PCs, and mobile devices
- Node-RED for creating simple logic flows from pre-built nodes
- Ignition Edge® from Inductive Automation®, with OPC-UA drivers to Allen-Bradley®, Siemens®, and other control systems, and MQTT communications with Sparkplug for efficient IIoT data transfer

groov RIO®

groov RIO revolutionizes remote I/O by offering a single, compact, PoE-powered industrial package with web-based configuration, commissioning, and flow logic software built in, plus support for multiple OT and IT protocols.

Standing alone, it meets the needs of small, variable I/O count applications, especially those that require data logging or data communications, commonly found in IIoT applications. *groov* RIO can also be used with a Modbus/TCP master or as remote I/O for a *groov* EPIC system.

Older products

From solid state relays (our first products) to world-famous G4 and SNAP I/O, to SNAP PAC controllers, older Opto 22 products are still supported and still doing the job at thousands of installations worldwide. You can count on us to give you the reliability and service you expect, now and in the future.

QUALITY

Founded in 1974, Opto 22 has established a worldwide reputation for high-quality products. All are made in the U.S.A. at our manufacturing facility in Temecula, California.

Because we test each product twice before it leaves our factory rather than testing a sample of each batch, we can afford to guarantee most solid-state relays and optically isolated I/O modules for life.

FREE PRODUCT SUPPORT

Opto 22's California-based Product Support Group offers free, comprehensive technical support for Opto 22 products from engineers with decades of training and experience. Support is available in English and Spanish by phone or email, Monday–Friday, 7 a.m. to 5 p.m. PST.

Support is always available on our website, including free online training at OptoU, how-to videos, user's guides, the Opto 22 KnowledgeBase, troubleshooting tips, and OptoForums. In addition, instructor-led, hands-on Premium Factory Training is available at our Temecula, California headquarters, and you can register online.

PURCHASING OPTO 22 PRODUCTS

Opto 22 products are sold directly and through a worldwide network of distributors, partners, and system integrators. For more information, contact Opto 22 headquarters at **800-321-6786** (toll-free in the U.S. and Canada) or **+1-951-695-3000**, or visit our website at www.opto22.com.