FCC PART 15 INFORMATION

NOTE: This equipment has been tested by the manufacturer and found to comply with the limits for a class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Modifications to this product without the express authorization of Veris Industries nullify this statement.

APPLICATIONS

- Tenant submetering
- Performance contracting
- Cost allocation
- Real time power monitoring via local display or control/data acquisition system

FAST TROUBLE-FREE INSTALLATION

- Split-core CTs eliminate the need to remove electrical conductors
- Meter automatically detects phase reversal - eliminates concerns about CT orientation
- CTs and voltage leads are color coded making it easy to determine matching
- Safe low voltage output CTs eliminate the need for shorting bars

EXCEPTIONAL SYSTEMS ACCURACY

- ± 1% total system accuracy of 1% from 2% to 100% of the rating of the CTs
- True RMS measurement

OPERATION

The 8100 series Energy Meter combines highly accurate industrial grade split-core CTs and precision microprocessor based metering electronics in a single package to provide exceptional metering accuracy and to greatly reduce the total metering system installed cost. To provide excellent total system accuracies of 1% from 2% to 100% of the ratings of the CTs (e.g., 2-100 amps with 100 amp CTs), each meter is factory matched with quick to install split-core CTs. The meter/CTs are system calibrated.

The unique design and installer friendly features of the Energy Meter greatly reduce the time and overall cost of installing an energy metering system. The split-core CT’s install very quickly and clamp directly to the electrical conductor, eliminating the need for mounting brackets. All models feature low voltage outputs so shorting blocks are unnecessary. CT load orientation concerns are eliminated because the meter automatically detects phase reversal.

The meter display provides valuable installation diagnostics. If the meter is installed and the CT’s and voltage leads are not properly matched the display will provide the installer with human readable feedback as to what is wrong and how to correct the installation.

The H8150 Series Energy Meter provides an input voltage range of 120-240VAC, and an option of a communications board (Modbus RTU presently available)*. The H8160 Series Energy Meter provides an extended input voltage range (120-480 VAC, auto-ranging), a pulse output for easy integration with control systems, a phase loss output to help protect equipment, and the option of a communications board (Modbus RTU presently available)*.

When equipped with a communications board and connected to a Modbus control/data acquisition system, the Energy Meter can report 26 energy and power diagnostics variables, including, kWh, kW, PF, KVAR, Volts, and Amps.

*Other protocols available. Contact factory.
A Large Digit Backlit Display for data and diagnostics
B Security Hasp
C CT Input Terminals ensure that voltage lead and CT are properly matched (e.g. red on red, see page 5)
D Voltage Input Terminals ensure that voltage lead and CT are properly matched (e.g. red on red, see page 5)
E Pulse Output Terminal provides easy integration to existing control/data acquisition systems. (see page 6) [H8160 Series only]
F Phase Loss Output Alarm Alarm trips if phase voltage drops 25% to protect valuable equipment. (see page 6) [H8160 Series only]
G Pulse Rate Selection Switch Set the pulse output at 0.1, 0.25, 0.50, or 1 pulse/kWh to match resolution requirements. (see page 7) [H8160 Series only]
H kWh Reset To reset the kWh counter, both buttons must be pushed at the same time (see page 8)
I Backlight Enable Jumper Remove this jumper to disable lighting (see page 6)
J Plain/Full Display Data Jumper (see page 7)

*H8160 Series only.

Color match CTs and voltage leads!
Example: Install the red label CT around the conductors that the red voltage lead is attached to.
Installation should only be performed by qualified personnel who are familiar with applicable codes and regulations. The meter enclosure is designed FOR INDOOR USE ONLY. Install the Energy Meter within a maximum of 20’ (5m) of the desired CT location. To prevent tampering, the meter should be secured with a padlock or other locking device.

The meter and CTs are calibrated as a system. Prior to installation insure that the serial numbers match.

Meter Installation

1. Disconnect power and lockout all power sources during installation and configuration. DO NOT CONNECT VOLTAGE INPUTS LIVE!

2. If the connections to the meter will be made through more than one metallic conduit, the conduits will require bonding to prevent the hazard of electric shock. A bonding plate is available (P/N: AH11), or an equivalent means may be used.

3. Mount the meter box at an appropriate height allowing for direct vision as illustrated below.

Shock Hazard!

- Accessory bonding plate or equivalent required when more than one metallic conduit will be used.

Bond multiple metallic conduit runs with available bonding plate, or equivalent

If using a hub on rigid conduit, assemble to conduit before attaching to meter.
External fuses must be provided by installer, and may be purchased as an accessory, to comply with local and national codes. Fuse rating must be adequate to the applied voltage, with a current rating of 1/2 A (T) SLO-BLO. To comply with the requirements of the IEC and others, the fuse installation must be visible from the meter, or be provided with a lockout/tagout disconnect.

4. **Attach CT's to conductors.** The meter automatically detects phase reversal so it is not necessary to orient a particular side of each CT toward the load. A mounting
bracket may be desirable to meet local inspection requirements, and/or to maximize accuracy. Specified accuracy is achieved by passing the conductor through the geometric center of the CT window.

5. Attach CT leads to appropriately colored CT input terminals (e.g., red lead to red terminal) as shown. Polarity is indicated, with the minus (-) terminals connected to neutral within the meter, but polarity is insignificant to the operation of the meter.

6. Connect voltage leads to phase conductors as shown. Connect leads from the colored voltage terminals to the power conductor with the matching CT (e.g., red CT lead to red terminal). Since the meter is powered from the monitored source it is important that the voltage leads be connected to a circuit which is not normally switched off.

Connecting the Energy Consumption (Pulse) Output to Control/Data Acquisition Systems (DAQ) [H8160 Series only]

For service across the full ambient temperature load range, 1600A and larger model(s) in contact with a power conductor must be used with 90°C wire insulation, or be derated appropriately.
INSTALLATION INSTRUCTIONS

Wire the pulse output (pictured below) to the controller. Output is an electronic N.O. “contact closure” rated for 24V AC/DC @ 100mA maximum. Ensure that installation method and insulation ratings comply with local and national electrical codes.

**Connecting the Phase Loss Output to Control/Data Acquisition Systems. [H8160 Series only]**

Wire the phase loss output (pictured below) to the controller/DAQ system. Output is an electronic N.C. “contact closure” rated for 24V AC/DC @ 100mA. maximum. Ensure that installation method and insulation ratings comply with local and national electrical codes.

7. **Set the Backlight Enable Jumper** to the desired operating condition. Remove the jumper to disable the LCD backlight.
6. Set the Display Data Jumper to select between the “Plain” and “Full” settings. The “Plain” mode cycles the display through five data elements (kW, max kW since last reset, average power factor, line-to-line voltage, and amps) for four seconds each. The “Full” mode cycles through all of the data available in the meter (all the above, plus kVAR, data on individual phases, etc.) as described on following page.

![Display Data Jumper](image)

<table>
<thead>
<tr>
<th>20 seconds per cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>KW</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>90 seconds per cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>KW</td>
</tr>
</tbody>
</table>

9. Set PULSE RATE Slide Switch [H8160 Series only]: Set to desired output rate. Note that 0.1 is not valid for 1600A systems, and 0.1 and 0.25 are not available for 2400A systems.

10. Apply power to the meter.

11. Check the meter display. The meter checks each phase to ensure that the phasing is correct. If the phasing is correct the meter responds with OKAY, if the phasing of the CT and voltage leads are incorrect, the meter displays, ERROR CHECK WIRES RED* CT RED* VOLT LEAD SAME PHASE. *appropriate color

12. Approximate check of power reading:

Check actual current with amp clamp. Expected power is:

- $kW = \text{Volts} \times \text{Amps} \times 1.732 \times \text{PF} \times 1000$
- $kW = \text{Horsepower} \times 0.746$
Operation and Information Reporting

Power-Up

On power-up, the meter displays the firmware revision. It then checks each connection to ensure that the CT and voltage leads have been properly matched. A warning message will indicate each phase which has been found to be mismatched (note: the meter uses low Power Factor to determine improper phase matching).

Information Displayed When Meter is Running

The Energy Meter continually reports kilowatt hours (KWH) or megawatt hours (MWH), depending on the total energy accumulated. A secondary display cycles through other parameters. There are two modes of operation, depending on the setting of the DISPLAY DATA jumper (J8) on the main circuit board:

PLAIN:  KW, MAX-KW, PF, VOLTS, AMPS

Every 10th rotation of parameters, the following parameters are also displayed:
PULSE-RATE****, ADDRESS*, BAUD-RATE*, PARITY*, 2/4WIRE*

*Only if Comms board installed
**2 and 3-CT meters only
***3-CT meters only

Alarms

The following alarm messages remain on the lower display as long as the alarm condition persists:

Phase Loss  If the voltage of any phase is measured as less than 75% of the voltage on any other phase, the display will show PHASE LOSS and indicate the problem phase(s).
Over Current  If the measured current is greater than 110% of the rated CT range, the display will show AMPS OVER and indicate the problem phase(s).
Over Voltage  Volts A-C, B-C or A-C is greater than 660VAC. If an error is detected, the display will show VOLTS OVER and indicate the problem phase(s).

Meter/Display Configuration

KWh Reset: Press and hold the two pushbuttons on the back of the LCD display board for about 10 seconds to zero the KWH accumulator.

KW Max. Reset: Press and hold the two pushbuttons on the back of the LCD display board for about 5 seconds to zero the KW max. register.
<table>
<thead>
<tr>
<th>Problem</th>
<th>Check</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Display</td>
<td>Voltage at Voltage Terminals</td>
<td>Check External Fuses</td>
</tr>
<tr>
<td></td>
<td>Is the input power to the meter switched?</td>
<td>We recommend that the voltage connections be made to a point ahead of commonly operated switches, motor controllers, etc.</td>
</tr>
<tr>
<td></td>
<td>Check Display cable</td>
<td>Assure that the ribbon cable from the main circuit board to the display has not been disconnected during installation.</td>
</tr>
<tr>
<td></td>
<td>Check Wiring to product</td>
<td>Is A-N Voltage other than 100-300VAC correct voltage input.</td>
</tr>
<tr>
<td></td>
<td>Check CT POWER terminals (holes on PC board)</td>
<td>Don’t allow conductive materials (wire clippings, etc) to short between the holes in the main board near the CT Terminals, as these connect to the main power supply.</td>
</tr>
<tr>
<td>Too much, or too little display data</td>
<td>Display Data Jumper</td>
<td>Set jumper to correct position</td>
</tr>
<tr>
<td>No pulse output (H8163)</td>
<td>Supply voltage</td>
<td>The pulse output is a contact closure only — power must be supplied externally in the range of 5 – 24V AC/DC, with a maximum load of 100mA</td>
</tr>
<tr>
<td></td>
<td>Signal Timing</td>
<td>The pulse output provides a contact closure for 200ms at each pulse time. Assure that the controller will accept this signal as an input.</td>
</tr>
<tr>
<td>Pulse output wrong, Display O.K (H8163)</td>
<td>Pulse Rate Switch</td>
<td>Set the pulse rate switch and controller to match. Pulse rate switch selects 0.1, 0.25, 0.5, or 1 kWh/Pulse Note that 0.1 is not valid for 1600A systems, and 0.1 and 0.25 are not available for 2400A systems.</td>
</tr>
<tr>
<td>Phase Loss output (H8163)</td>
<td>Always on</td>
<td>This output is normally closed (N.C.). Therefore it is closed at all times when the meter is correctly powered.</td>
</tr>
<tr>
<td></td>
<td>No output</td>
<td>This output is a contact closure only and requires an external power supply in the range of 5-24V AC/DC, with a maximum load of 100mA</td>
</tr>
<tr>
<td>Reported power too low</td>
<td>CT match to voltage leads</td>
<td>The CT’s must be mounted around the corresponding voltage lead’s power conductor, e.g., the red CT must be mounted to the power conductor connected to the red voltage lead (the same is true for any other CT/voltage lead pairs). Check for phase loss Check fuses in voltage leads (field installed)</td>
</tr>
<tr>
<td>Reported power inaccurate</td>
<td>Check CT serial numbers</td>
<td>The CT’s are calibrated to individual meters and must be connected to the meter they were calibrated with to assure optimum accuracy.</td>
</tr>
<tr>
<td>“bAd” appears on the display (H8163)</td>
<td>Pulse Rate Selection Switch</td>
<td>When an illegal pulse setting is selected, the kWh/PULSE segment is illuminated and “bAd” is shown on the lower display.</td>
</tr>
<tr>
<td>Accuracy not as specified</td>
<td>Check that CT serial numbers and meter serial numbers match.</td>
<td>Meter and CTS sold as set with accuracy calibrated as a set.</td>
</tr>
</tbody>
</table>
GENERAL SPECIFICATIONS

LCD Display
1.2” x 3.8” viewing area, 160 segments, back lit with green LEDs

Insulation Class
600VAC†

Sample Rate
1280Hz.

Internal Isolation
2500VAC

Operating Temp. Range
0 to 50°C (<95%RH, non-condensing)

Storage Temp. Range
-40°C to 70°C

Systems Accuracy
±1% of reading from 2% to 100% of the rated current of the CTs...accomplished by matching the CTs with a meter and calibrating them as a system

Power Consumption
50VA

Voltage Tolerance
H8150 (90 - 132VAC line-to-neutral)
H8163 (90-300VAC line-to-neutral)

Electrical Services
H8150 120/240 VAC with neutral, 208Y/120 VAC line to neutral
H8163 Any service where the phase A-N voltage is ≤300VAC, and the phase-to-phase voltage is 480VAC nominal with neutral

Frequency
50/60Hz.

Pulse Output (H8163 only)
N.O., Opto-FET, 100mA @ 24VAC/DC

Pulse Rate (H8163 only)
0.10, 0.25, 0.50, or 1.00 kWh per pulse

Pulse Width (H8163 only)
200msec closed

Phase Loss Alarm Output (H8163 only)
N.C., Opto-FET, 100mA @ 24VAC/DC.

Safety
UL 3111-1 Cat. III pollution degree 2, alt. 0-2000 meters

Protection Class
NEMA 1

†Do not apply 600V Class current transformers to circuits having a phase-to-phase voltage greater than 600V, unless adequate additional insulation is applied between the primary conductor and the current transformers. Veris assumes no responsibility for damage of equipment or personal injury caused by products operated on circuits above their published ratings.

DATA OUTPUT (requires H8163-CB Communication Board)

kWh, Consumption

kW, Real power

kVAR, Reactive power

kVA, Apparent power

Power factor

Voltage, line to line

Voltage, line to neutral

Amps, Average current

kW, Real Power ØA

kW, Real Power ØB

kW, Real Power ØC

Power factor ØA

Power factor ØB

Power factor ØC

Voltage, ØA to ØB

Voltage, ØB to ØC

Voltage, ØA to ØC

Voltage, ØA to Neutral

Voltage, ØB to Neutral

Voltage, ØC to Neutral

Amps, Current ØA

Amps, Current ØB

Amps, Current ØC

COMMS BOARD OPTION

Modbus Communications

Output type..............................................Modbus RTU

Connection.............................................2-wire or 4-wire selectable

Baud rate.............................................2400, 4800, 9600, 19200 baud

Parity....................................................None/Odd/Even Selectable

Address..................................................1-63

Data Output..........................................refer to COMMS Board spec.

Inputs

Demand Reset...........................................Starts a new demand interval. Pulled-up to +5V via 4.7k. Contact closure or pull-to-ground. Edge-triggered