



AC Power Monitor
Voltage Inputs and Current Inputs
HE800ACM200 / HE-ACM200*
 * HE- denotes plastic case.



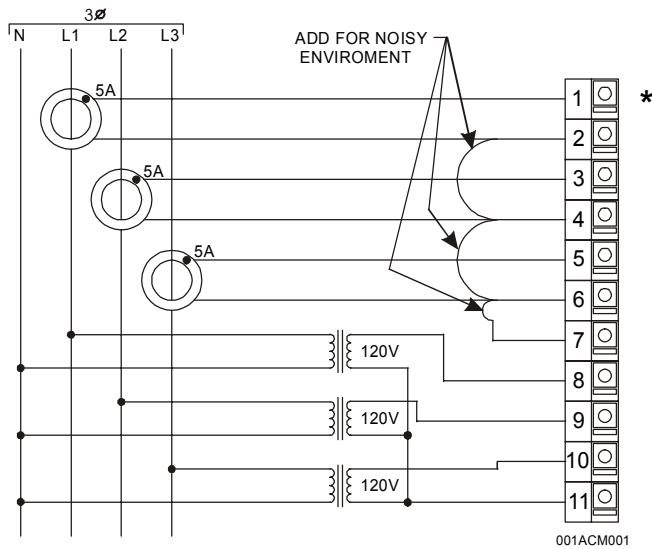
This datasheet also covers products starting with IC300.

1 SPECIFICATIONS

VOLTAGE INPUTS			
Input Range	120 three-phase Wye, 208 V line to line	Input Impedance	1 Mega ohm to ground; External Potential Transformers (PTs) required
Overrange	50%	Input Frequency	50—70 Hz
Conversion Time	Voltage values updated once per PLC scan	Voltage Measurement	Average scaled to RMS sine wave equivalent
Accuracy	0.2%	Voltage Resolution	0.1 V
Filter Delay	Less than 2 line cycles	Frequency	Referenced to L1
Phase Accuracy	0.2°	Frequency Resolution	0.01 Hz
Phase	Referenced to L1	Frequency Accuracy	0.1%
Phase Resolution	0.1°	Frequency Measurement	Values updated once per line cycle
Phase Measurement	Values updated once per line cycle		
CURRENT INPUTS			
AC Current	Three-phase 5 A, External Current Transformers (CTs) required	Common Mode	1 Vrms maximum to common. Each CT low input must be returned to common directly or through a suitable monitoring switch unit.
Overrange (See Note 1)	6 A continuous 10 A / 10 s	Input Frequency	50—70 Hz
Input Impedance	0.1 Ω, 1 VA burden at 100% overload	Current Measurement	Average scaled to RMS sine wave equivalent
Accuracy	0.2% (See Note 1.)	Resolution	0.005 A
Conversion Time	Current values updated once per PLC scan	Filter Delay	Less than 2 line cycles
Phase	Referenced to L1 voltage channel	Phase Accuracy	0.2° (See Note 1.)
Phase Resolution	0.1°	Phase Measurement	Values updated once per line cycle
Differential Phase	See Note 2.	Differential Phase Resolution	0.1°
Differential Phase Accuracy	0.2° (See Note 1.)		

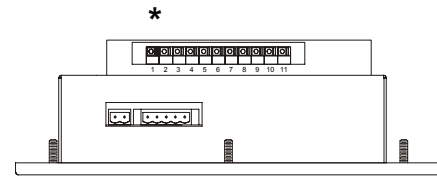
GENERAL SPECIFICATIONS				
Required Power (Steady State)	1.5 W (60 mA @ 24 VDC)		Relative Humidity	5–95% Non-condensing
Required Power (Inrush)	80 mA @ 24 VDC		Operating Temperature	0°–60° Celsius
Connectors	Fixed, front access, spring		Weight	9 oz. (256 g)
Terminal Type	Spring Clamp, Removable			
CE UL	See Compliance Table at http://www.heapg.com/Support/compliance.htm			
<p>Note 1: As an option, a measured, 60 A, 1 s overload is available on current inputs. For this option, current amplitude accuracy is 1.0% up to 60 A. Current phase and Differential phase accuracy also changes to 1 degree. Voltage phase accuracy is <u>not</u> affected.</p> <p>Note 2: Unit reports phase difference between itself and the next lower adjacent unit on the stack. Phase difference is the relative phase between L1 channels. If all four modules on stack are AC Monitor modules, the bottom unit reports the phase difference between itself and the top unit.</p>				

2 WIRING



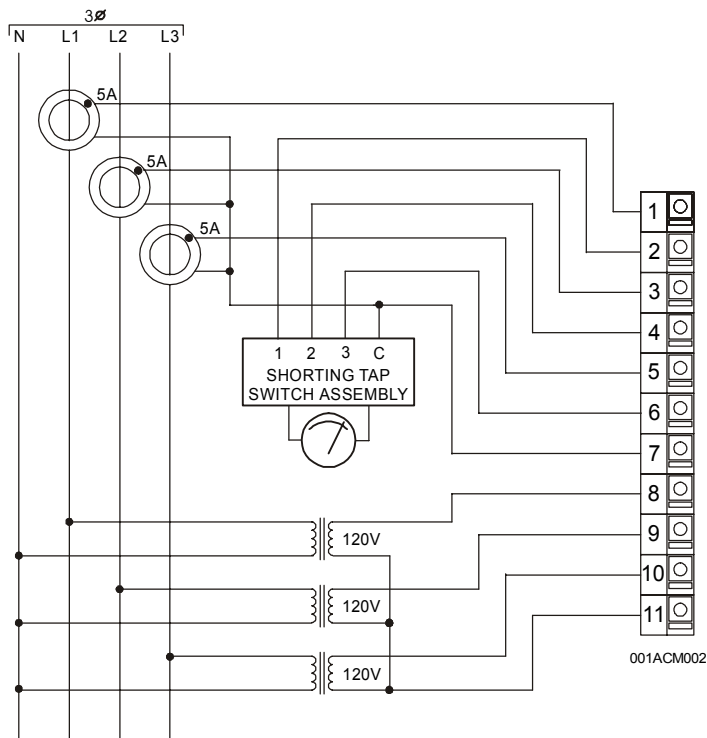
CT Mode: Return through Monitoring Switch

Warning: Connecting high voltage to any I/O pin may cause high voltage to appear at other I/O pins.



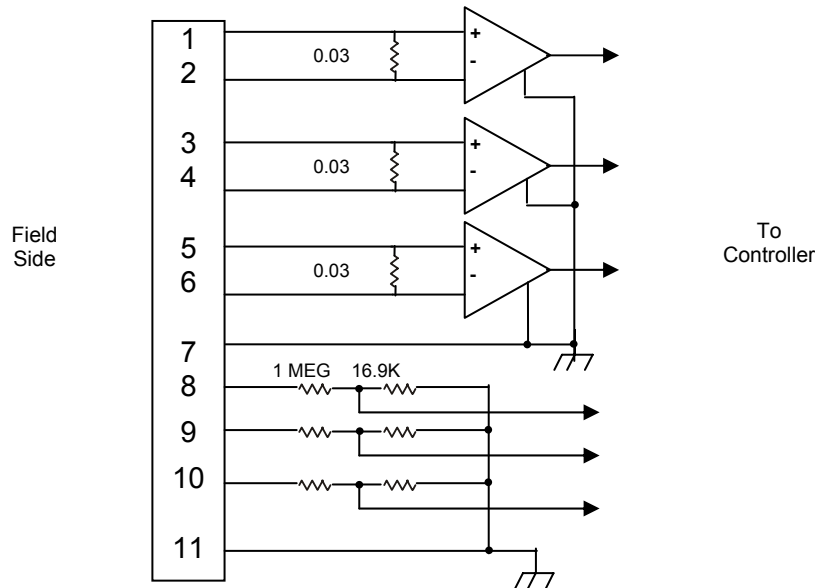
OCS Bottom View – Shows corresponding I/O pin location for Pin 1. Also applies to RCS and Graphical OCS units.

Pin #	ACM200
1	Current Phase 1 In
2	Current Phase 1 Out
3	Current Phase 1 In
4	Current Phase 1 Out
5	Current Phase 1 In
6	Current Phase 1 Out
7	Current Sense Common (Connected to bus common)
8	Voltage Phase 1
9	Voltage Phase 2
10	Voltage Phase 3
11	Voltage Common (Connected to bus common)



CT Mode: Return to Common Directly

3 INTERNAL CIRCUIT SCHEMATIC



4 CONFIGURATION

Note: The status of the I/O can be monitored in Cscape Software.

4.1 Software Configuration

Preliminary configuration procedures that apply to SmartStack™ Modules are contained in the hardware manual of the controller you are using. Refer to the [Additional References](#) section in this data sheet for a listing of hardware manuals.

I/O Map Tab

The I/O Map describes which I/O registers are assigned to a specific SmartStack™ Module and where the module is located in the point map. The I/O Map is determined by the model number and location within the SmartStack™. The I/O Map is not edited by the user.

Phase and frequency values are referenced to the L1 voltage input.

%AI1	L1 Voltage Value
%AI2	L2 Voltage Value
%AI3	L3 Voltage Value
%AI4	L1 Current Value
%AI5	L2 Current Value
%AI6	L3 Current Value
%AI7	Differential Phase
%AI8	L2 Voltage Phase
%AI9	L3 Voltage Phase
%AI10	L1 Current Phase
%AI11	L2 Current Phase
%AI12	L3 Current Phase
%AI13	Frequency

5 INPUT CONVERSION FACTOR

a. Scaling Inputs

The following table describes how real-world inputs are scaled into the controller. Given a known input voltage, the data value is configured by using the conversion factor from the table. The following formula is used:

$$\text{Data} = \text{Voltage In (Vin)} / \text{Conversion Factor}$$

Example: The user selects a voltage of 120 V.

- 1) The known input voltage is 120 V.
- 2) Using the table, the conversion factor for 120 Volts is **0.1**.
- 3) To determine the data value, the formula is used: $\text{Data} = \text{Vin} / \text{Conversion Factor}$
 $1200 = 120 \text{ V} / 0.1$.

Conversion of Real-World Inputs into Controller			
Range	Input	%AI Value	Conversion Factor
120 V	0	0	0.1
	120	1200	
5 A	0	0	0.005
	5	1000	
Frequency	60	6000	0.01
Phase	0	0	0.1
	-180	-1800	
	+180	+1800	

b. Calculation of Additional Power System Values

Using the %AI registers listed in Section 4.1:

- Volt-Amperes for phase 1, VA1, is %AI1 times %AI4 divided by 2000.
- Volt-Amperes for phase 2, VA2, is %AI2 times %AI5 divided by 2000.
- Volt-Amperes for phase 3, VA3, is %AI3 times %AI6 divided by 2000.
- Total Volt-Amperes, VA, is the sum of VA1 plus VA2 plus VA3.

- Watts for phase 1, W1, is the product of VA1 and the cosine of the product of 0.0017453 and %AI10.
- Watts for phase 2, W2, is the product of VA2 and the cosine of the product of 0.0017453 and the difference between %AI8 and %AI11.
- Watts for phase 3, W3, is the product of VA3 and the cosine of the product of 0.0017453 and the difference between %AI9 and %AI12.
- Total power, W, is the sum of W1 plus W2 plus W3.

- Power Factor, PF, is W divided by VA.
- VAR is VA minus W.
- K Wh can be accumulated by setting a timer to trigger a calculation every 100 ms, for instance. The calculation consists of dividing Watt by 10, the reciprocal of the calculation interval in seconds and adding the result to a running Watt-second total, WS. Divide WS by 3,600,000 to display K Wh.

6 INSTALLATION / SAFETY

Warning: Remove power from the OCS controller, CAN port, and any peripheral equipment connected to this local system before adding or replacing this or any module.

Use the following wire type or equivalent:

- Belden 8917
- 16 AWG or larger

For detailed installation and a [handy checklist](#) that covers panel box layout requirements and minimum clearances, refer to the hardware manual of the controller you are using. (See the [Additional References](#) section in this document.).

When found on the product, the following symbols specify:



Warning: Consult user documentation.



Warning: Electrical Shock Hazard.

WARNING: To avoid the risk of electric shock or burns, always connect the safety (or earth) ground before making any other connections.

WARNING: To reduce the risk of fire, electrical shock, or physical injury it is strongly recommended to fuse the voltage measurement inputs. Be sure to locate fuses as close to the source as possible.

WARNING: Replace fuse with the same type and rating to provide protection against risk of fire and shock hazards.

WARNING: In the event of repeated failure, do not replace the fuse again as a repeated failure indicates a defective condition that will not clear by replacing the fuse.

WARNING: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

For detailed installation and a handy checklist that covers panel box layout requirements and minimum clearances, refer to the hardware manual of the controller you are using. (See the [Additional References](#) section in this document.):

- All applicable codes and standards need to be followed in the installation of this product.
- For I/O wiring (discrete), use the following wire type or equivalent: Belden 9918, 18 AWG or larger.

Adhere to the following safety precautions whenever any type of connection is made to the module.

- Connect the green safety (earth) ground first before making any other connections.
- When connecting to electric circuits or pulse-initiating equipment, open their related breakers. Do not make connections to live power lines.
- Make connections to the module first; then connect to the circuit to be monitored.
- Route power wires in a safe manner in accordance with good practice and local codes.
- Wear proper personal protective equipment including safety glasses and insulated gloves when making connections to power circuits.
- Ensure hands, shoes, and floor are dry before making any connection to a power line.
- Make sure the unit is turned OFF before making connection to terminals. Make sure all circuits are de-energized before making connections.
- Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.

7 ADDITIONAL REFERENCES

The following information serves as a *general* listing of Horner controller products and other references of interest and their corresponding manual numbers. Visit our website listed in the [Technical Support](#) section to obtain user documentation and updates.

Note: This list is <u>not</u> intended for users to determine which products are appropriate for their application; controller products differ in the features that they support. If assistance is required, see the Technical Support section in this document.	
Controller	Manual Number
XLE Series (e.g., HE-XExxx)	MAN0805
QX Series (e.g., HE-QXxxx)	MAN0798
NX Series (e.g., HE-NXxxx)	MAN0781
LX Series (e.g., LX-xxx; also covers RCS116)	MAN0755
Color Touch OCS (e.g., OCSxxx)	MAN0465
OCS (Operator Control Station) (e.g., OCS1xx / 2xx; Graphic OCS250)	MAN0227
Remote Control Station (e.g., RCS2x0)	
MiniOCS (e.g., HE500OCSxxx, HE500RCSxxx)	MAN0305
Other Useful References	
CAN Networks	MAN0799
Cscape Programming and Reference	MAN0313
Wiring Accessories and Spare Parts Manual	MAN0347
DeviceNet™ Implementation	SUP0326
Wiring Accessories and Spare Parts Manual	MAN0347

8 TECHNICAL SUPPORT

For assistance and manual up-dates, contact Technical Support at the following locations:

North America:+

(317) 916-4274

www.heapg.com

Europe:

(+) 353-21-4321-266

www.horner-apg.com

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