ENVIROMUX® Series

ENVIROMUX-ACLM-V

ENVIROMUX-ACLM-P12/8/18

AC LINE MONITORS
Installation and Operation Manual

ENVIROMUX-ACLM-V
(Front and Rear View)

ENVIROMUX-ACLM-P12
(Front and Rear View)

TRADEMARK

ENVIROMUX is a registered trademark of Network Technologies Inc in the U.S. and other countries.

CHANGES

The material in this guide is for information only and is subject to change without notice. Network Technologies Inc reserves the right to make changes in the product design without reservation and without notification to its users.

FEATURE UPDATE

In order to take full advantage of the available features in the ENVIROMUX-ACLM-V/P,   the ENVIROMUX-xD that it is connected to must first have firmware version 2.29 or later installed.

In order for the ENVIROMUX-xD to add the Frequency sensor of the ENVIROMUX-ACLM-V/P to the list of sensors, any previously installed ENVIROMUX-ACLM-V or ACLM-P must first be deleted from the ENVIROMUX-xD Summary page.   Within 30 seconds the ENVIROMUX-xD will re-sense the ENVIROMUX-ACLM-V/P and will include the Frequency sensor in the list of sensors. All applicable sensors included with the ENVIROMUX-ACLM-V/P (including Frequency Sensor(s)) will then be available for configuration.

The use of ENVIROMUX-ACLM-P18 requires ENVIROMUX-xD firmware version 2.35 or later to view the full scale (page 8).

⚠ **CAUTION**

➢ **To reduce the risk of electric shock- Disconnect power to the receptacle before installing or removing the unit.**

➢ **To Reduce the Risk of Electric Shock- Use only Indoors**

➢ **Do not plug into another relocatable power tap.**

➢ **Risk of electric shock, do not remove cover. No user serviceable parts inside. Refer servicing to qualified service personnel. For use in a controlled environment (see page 11).**

TABLE OF CONTENTS

TABLE OF FIGURES

MATERIALS

Materials supplied with ENVIROMUX-ACLM-V or P12/8:

- NTI ENVIROMUX-ACLM-V or -P12/8
- 1-Line cord, country specific IEC 320 C13
- 2- Mounting tabs for Zero-RU mounting (pre-assembled to back of ENVIROMUX-ACLM-V or P12/8, see page 4)
- 2-#10-32 x 3/4" pan head screws and #10-32 cage nuts (server cabinet mounting hardware)
- This manual

Also supplied for ENVIROMUX-ACLM-P12/8:

- IEC 320 C14 to IEC 320 C13 Cord Set for connection to AC load

Materials supplied for ENVIROMUX-ACLM-P18:

- NTI ENVIROMUX-ACLM-P18
- 1-Line cord L6-20p to IEC 320 C19
- 1-Device cord L6-20r to IEC 320 C20
- 2- Mounting tabs for Zero-RU mounting (pre-assembled to back of ENVIROMUX-ACLM-P18, see page 4)
- 2-#10-32 x 3/4" pan head screws and #10-32 cage nuts (server cabinet mounting hardware)
- This manual

Materials *Not* supplied but *REQUIRED:*

- Cat5/5e/6 cable for connection to ENVIROMUX-16D/5D/2D

INTRODUCTION

ENVIROMUX-ACLM-V

The ENVIROMUX-ACLM-V (ACLM-V) is a sensor for the ENVIROMUX-16D/5D/2D systems (ENVIROMUX) capable of monitoring AC line input voltages and frequencies between 50~250V AC and 47~63Hz from two separate AC lines. It will report the current RMS AC Voltage and AC Frequency (Hertz) to the ENVIROMUX-xD. The ACLM-V will also monitor the number of short term Swells[1] and Sags[2] as well as the number of Spikes[3].

The ACLM-V utilizes two UL certified IEC 320 C14 inlets to connect to the AC lines being monitored. The ACLM-V connects to the ENVIROMUX through up to 1,000 ft of CAT5/5e/6 cable. Data is transmitted to and from the ENVIROMUX using the RS485 protocol.

Features & Functions:

- 12 bit ADC resolution, 1% full scale ADC accuracy
- Measure AC Voltage (1% accuracy) and AC Frequency (1% accuracy)
- Monitors swells, sags, and spike events
- Auto-Configured upon connection with ENVIROMUX-xD
- RJ45 Status LED's for operating status
- User selectable data interpolation options

Measuring the AC Voltage, AC Frequency; Determining Swells, and Sags:

The ACLM-V provides constant monitoring of the AC line with an active sampling rate of 12,000 samples per second. The measurement data is transmitted to the ENVIROMUX once every second. Each time data is sent, the ACLM-V will report the current AC line voltage and frequency, as well as the number of sags, swells, and spikes that have occurred since the last data transmission.

After the ACLM-V has transmitted data to the ENVIROMUX (once every second), any stored values in the ACLM-V will be erased as new data is acquired.

If a swell, sag, or spike event lasts longer than 1 second (5 seconds, for example) it will be counted as multiple events by the ENVIROMUX because the ENVIROMUX will reset the data record to 0 each time the ACLM-V reports the data to the ENVIROMUX. The count displayed on the screen will be updated based on the configured Refresh Rate.

Measuring Spikes:

The ACLM-V is also capable of recording the number of Spike events with a peak greater than 50V, 250V, 500V, or 1KV as configured by the user. For example, if the spike threshold is set at 500V and the sensor records a voltage exceeding 500V for at least 5 microseconds, the ENVIROMUX will report a spike above 500V.

The User Interface:

From the Web Interface of the ENVIROMUX, the ACLM-V sensor can be customized and monitored. The user can modify all of the typical sensor attributes (description, group, sampling, etc.), as well as define the maximum and minimum critical threshold values for AC voltage, AC frequency and the threshold for spike measurement. The user may also configure the ENVIROMUX to send alerts based on the voltage or frequency level.

The sensor page for the ACLM-V will display the AC line voltage and frequency from the most recent data transmission, as well as running totals for the number of swells, sags, and spike events that have occurred. It will also display the date and time from which the ENVIROMUX began the running totals. A "Clear" button, when clicked, will erase the running totals and update the date and time. The data displayed by the ENVIROMUX can be refreshed, at most, once per second. (The display may be refreshed less frequently dependent upon the user settings ("Refresh Rate")).

Note: As a result of the data transmission of the ACLM-V (once per second) and the browser refresh rate of the ENVIROMUX (up to once per second), the ACLM-V will report Sags or Swells on the AC line that may not be reflected in the numeric voltage display.

[1] Swells are defined as an AC voltage exceeding the user specified maximum critical threshold for a period of 5 cycles (i.e. 5/60th second for 60Hz) to 1 second's time.

[2] Sags are defined as an AC voltage exceeding the user specified minimum critical threshold for a period of 5 cycles (i.e. 5/60th second for 60Hz) to 1 second's time.

[3] Spikes are defined as a sudden high peak event lasting at least 5 microseconds that raises the voltage in either a positive or negative direction.

ENVIROMUX-ACLM-Pxx

The ENVIROMUX-ACLM-P12,-P18 and –P8 (ACLM-P) are triple sensors for the ENVIROMUX-16D/5D/2D (ENVIROMUX) capable of monitoring AC line input voltages between 50~250V AC, the Frequency (Hertz) between 47~63Hz, and the Power (Current) up to 12 amperes (for –P12), 8 amperes (for –P8) or 18 amperes (for –P18) from a single AC line. It will report the current RMS AC Voltage, AC Frequency and RMS AC Power to the ENVIROMUX. The ACLM-P will also monitor the number of short term Swells[1] and Sags[2] as well as the number of Spikes[3].   The ACLM-P12 is rated for 12A of continuous load, 15A max. The ACLM-P8 is rated for 8A of continuous load, 10A max.   The ACLM-P18 is rated for 18A of continuous load, 20A max.   The ACLM-P8/P12 uses a UL certified IEC 320 C14 inlet to connect to the AC line and a UL certified IEC 320 C13 socket to connect the AC load.   The ACLM-P18 uses a UL certified IEC 320 C20 inlet to connect to the AC line and a UL certified IEC 320 C19 socket to connect the AC load.

The ENVIROMUX-ACLM-P8/P12/P18 is connected to the ENVIROMUX through up to 1,000 ft of CAT5/5e/6 cable (**Exception**: When connected to the ENVIROMUX-5D/2D the cable length is limited to 750 ft (24AWG min.) for ENVIROMUX-ACLM-P18). Data is transmitted to and from the ENVIROMUX utilizing the RS485 protocol. ACLM-P is installed between the power source and the load device, able to sense a maximum surge current of 20A and will calculate and report the RMS AC Power. The device utilizes standard connection sockets for easy user installation. The ACLM-P is also equipped with a power interrupt feature, which allows power to be disconnected from the load device based on manual disconnect or configuration settings via the web interface.

The ACLM-P includes a resettable circuit breaker to protect the sensor from damage in the event the load device exceeds the rating of the ACLM-Pxx circuits.   In the event the circuit breaker should trip, remove the overload condition and reset the circuit breaker.

Note: The circuit breaker will not allow a reset until it has reached reset condition, which may take between 1 and 3 minutes from the time the breaker tripped.

Features & Functions:

- 12 bit ADC resolution, 1% full scale ADC accuracy
- Measure AC Voltage (1% accuracy) and AC Frequency (1% accuracy)
- Monitors swells, sags, and spike events
- Measures AC Current and Power (2% accuracy)
- Optional Power Disconnect and Reconnect
- Auto-Configured upon connection with ENVIROMUX-XD
- RJ45 Status LED's for operating status
- User selectable data interpolation options

Measuring the AC Voltage, AC Frequency, Power and Current Flow; Determining Swells, and Sags:

The ACLM-P provides constant monitoring of the AC line with an active sampling rate of 12,000 samples per second. The measurement data is transmitted to the ENVIROMUX once every second. Each time data is sent, the ACLM-P will report the present AC line voltage, frequency, current and calculated power, as well as the number of sags, swells, and spikes that have occurred since the last data transmission.

After the ACLM-P has transmitted data to the ENVIROMUX, any stored values in the ACLM-P will be erased as new data is acquired.

If a swell, sag, or spike event lasts longer than 1 second (5 seconds, for example) it will be counted as multiple events by the ENVIROMUX because the ENVIROMUX will reset the data record to 0 each time the ACLM-P reports the data to the ENVIROMUX.   The count displayed on the screen will be updated based on the configured Refresh Rate.

Measuring Spikes:

The ACLM-P is also capable of recording the number of Spike events with a peak greater than 50V, 250V, 500V, or 1KV as configured by the user.   For example, if the spike threshold is set at 500V and the sensor records a spike exceeding 500V for at least 5 microseconds, the ENVIROMUX will report a spike above 500V.

The User Interface:

From the Web Interface of the ENVIROMUX, the ACLM-P sensor can be customized and monitored. The user can define the maximum and minimum threshold values for AC power and frequency, and configure the ENVIROMUX to send alerts based on the power thresholds or disconnect power based on the voltage, current, frequency or power thresholds. The user may also define the threshold for spike measurement.

The ACLM-P has three sensor pages, each having a numeric display and status bar.   One is for power, another is for voltage, and a third for frequency. Each page also displays a table with readings from the most recent data transmission. The power and voltage pages also have running totals for the number of swells, sags, and spike events that have occurred. It will also display the date and time from which the ENVIROMUX began the running totals. A "Clear" button, when clicked, will erase the running totals and update the date and time. The data displayed by the ENVIROMUX can be refreshed, at most, once per second. (The display may be refreshed less frequently dependent upon the user settings ("Refresh Rate")). Additionally, the sensor page will display the status of the power interrupt relay.

Note: As a result of the data transmission rate of the ACLM-P (once per second) and the browser refresh rate of the ENVIROMUX (up to once per second), the ACLM-P will report Sags or Swells on the AC line that may not be reflected in the numeric voltage display.

MOUNTING

The ENVIROMUX-ACLM (-V or -P) can be placed on a solid surface, mounted to a wall, or mounted to an accessible surface within a rack (Zero-RU).   To mount to a wall or other surface, first remove the screws holding the mounting tabs to the rear of the box. Rotate the tabs such that they extend from the back of the box, and attach the tabs with the screws removed. Now the ENVIROMUX-ACLM can be secured to any convenient surface. Two #10-32 x 3/4" machine screws and cage nuts have been provided to assist mounting within a server cabinet. Use appropriate hardware (not supplied) when mounting to a wall.

CAUTION: To reduce the risk of electric shock- Disconnect power to the receptacle before installing or removing the unit.
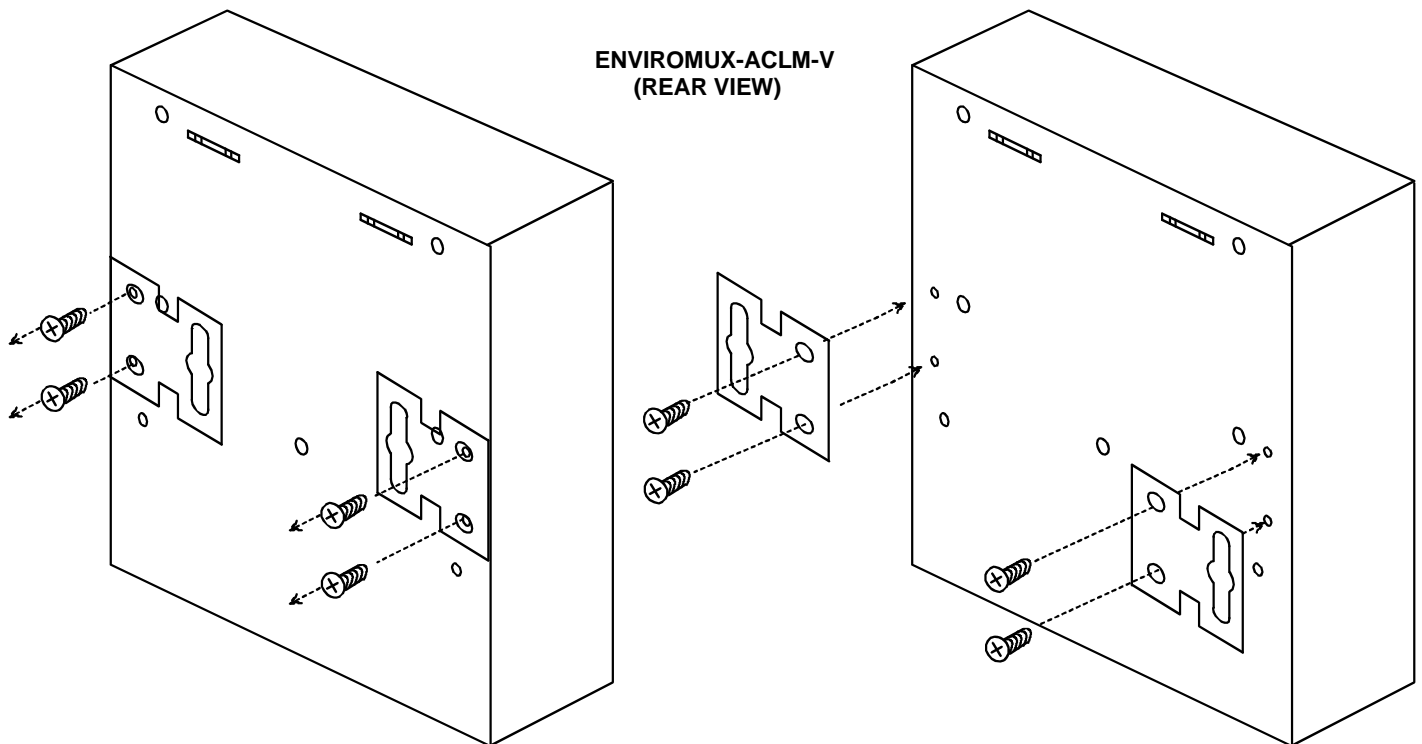

**ENVIROMUX-ACLM-V
(REAR VIEW)**

Figure 1- Rotate the tabs for Zero-RU mounting

CONNECTIONS

ENVIROMUX-ACLM-V

Connect Voltage Source(s)

1. Connect a voltage source (50-250VAC, 47-63Hz) to the ACLM-V at "AC IN 1".

2. Connect a second voltage source (50-250VAC, 47-63Hz) to the ACLM-V at "AC IN 2".

Note: The voltage source connected to "AC IN 1" does not need to be the same voltage or frequency as the voltage source connected to "AC IN 2".
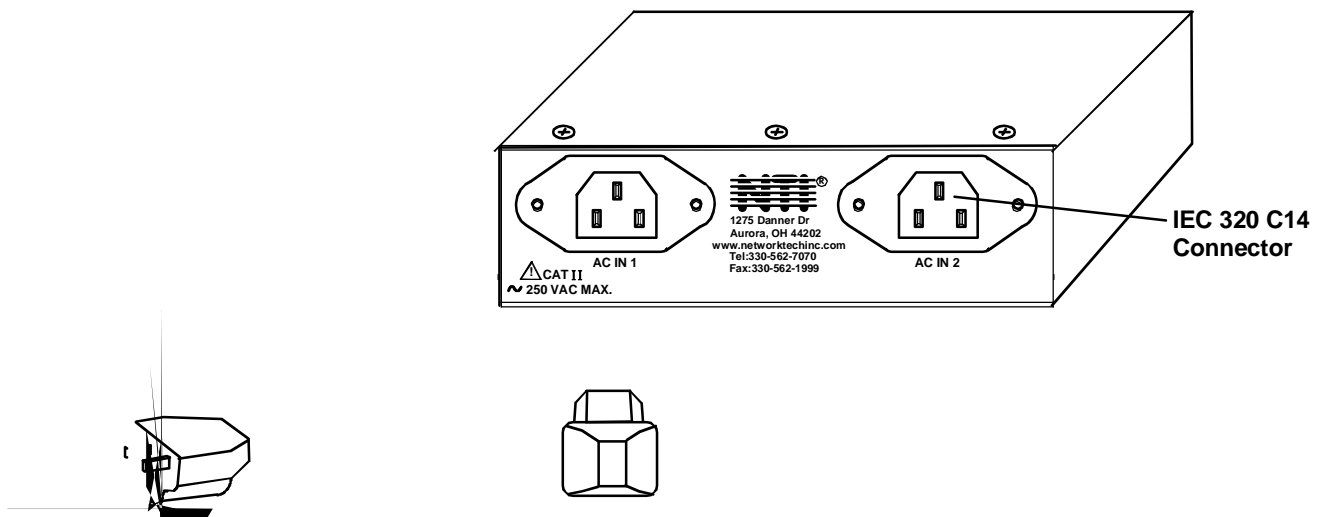

Figure 2- Connect ACLM-V to voltage source(s)

ENVIROMUX-ACLM-P

Connect Voltage Source and Load

1. Connect a voltage source (50-250VAC, 47-63Hz) to the ACLM-Pxx at "AC IN".

2. Connect an AC load device to the "AC OUT" that is compatible with the voltage source connected to "AC IN". The device connected to "AC OUT" must be rated at 12A or less for model –P12, 8A or less for –P8, or 18A or less for –P18.
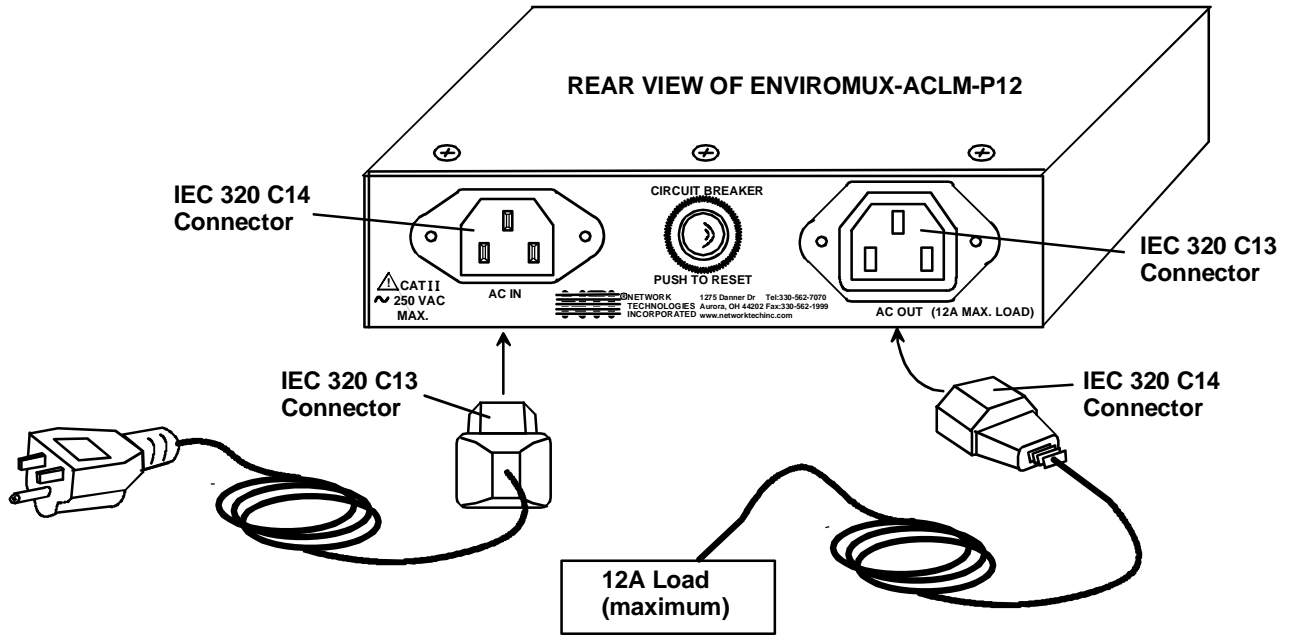
REAR VIEW OF ENVIROMUX-ACLM-P12

IEC 320 C14 Connector

IEC 320 C13 Connector

CIRCUIT BREAKER

PUSH TO RESET

⚠ CAT II
~ 250 VAC MAX.

AC IN

©NETWORK TECHNOLOGIES INCORPORATED   1275 Danner Dr   Tel:330-562-7070   Aurora, OH 44202 Fax:330-562-1999   www.networktechinc.com

AC OUT (12A MAX. LOAD)

IEC 320 C13 Connector

IEC 320 C14 Connector

12A Load (maximum)

Figure 3- Connect ENVIROMUX-ACLM-P12 to voltage source and load

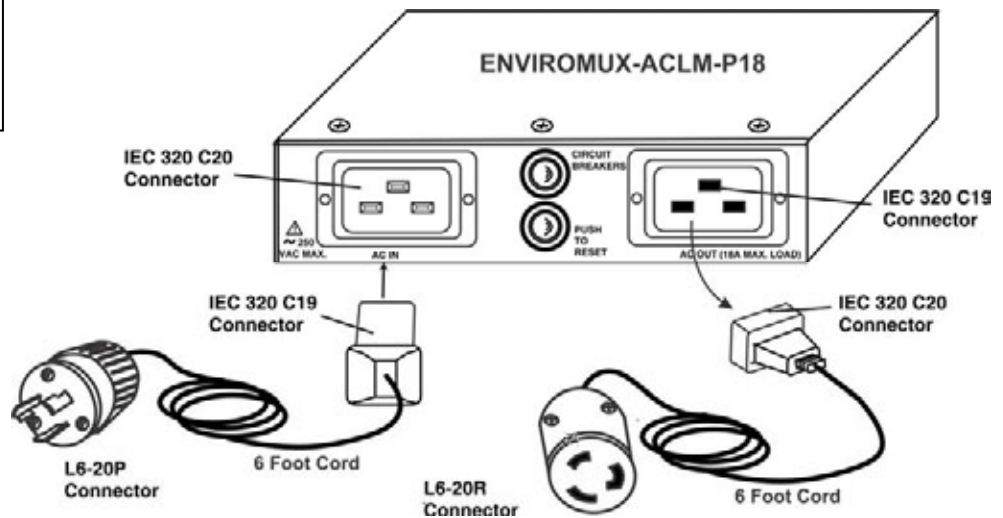**The use of ENVIROMUX-ACLM-P18 requires ENVIROMUX-xD firmware version 2.35 or newer**

ENVIROMUX-ACLM-P18

IEC 320 C20 Connector

CIRCUIT BREAKERS

PUSH TO RESET

⚠ ~ 250 VAC MAX.

AC IN

AC OUT (18A MAX. LOAD)

IEC 320 C19 Connector

IEC 320 C19 Connector

IEC 320 C20 Connector

L6-20P Connector

6 Foot Cord

L6-20R Connector

6 Foot Cord

Figure 4- Connect ENVIROMUX-ACLM-P18 to voltage source and load

Connect Sensor to ENVIROMUX-xD

With the voltage source(s) and load connected to the sensor (as applicable), connect a CAT5/5e/6 cable between the "Cat5" connector on the sensor and one of the "RJ45" sensor ports on the ENVIROMUX-xD.   This cable can be up to 1,000 feet in length (**Exception:** This cable is limited to 750 feet (24AWG minimum) for ENVIROMUX-ACLM-P18 when connected to ENVIROMUX-5D/2D),   The pinout for this cable can be found below.
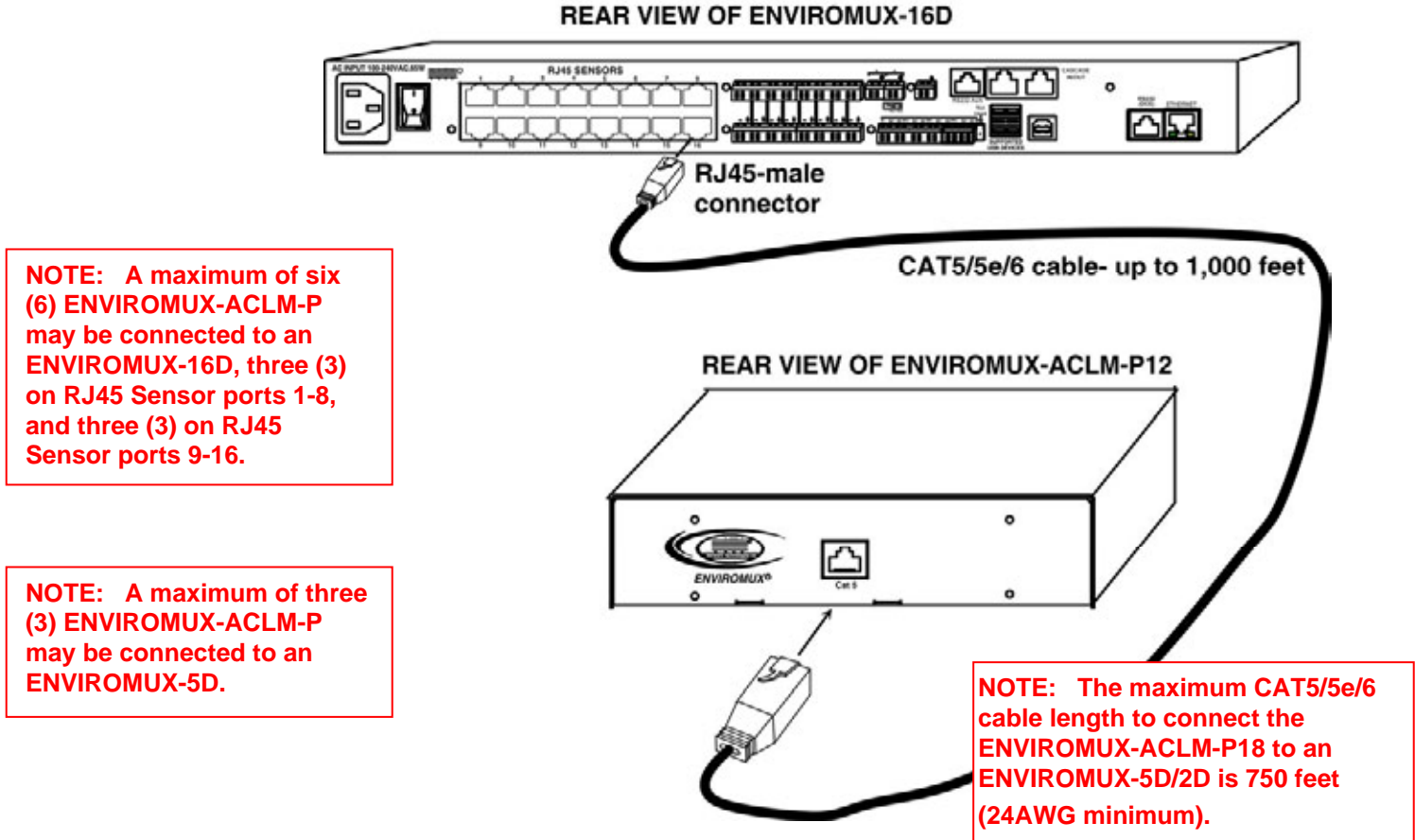

NOTE: A maximum of six (6) ENVIROMUX-ACLM-P may be connected to an ENVIROMUX-16D, three (3) on RJ45 Sensor ports 1-8, and three (3) on RJ45 Sensor ports 9-16.

NOTE: A maximum of three (3) ENVIROMUX-ACLM-P may be connected to an ENVIROMUX-5D.

NOTE: The maximum CAT5/5e/6 cable length to connect the ENVIROMUX-ACLM-P18 to an ENVIROMUX-5D/2D is 750 feet (24AWG minimum).

Figure 5- Connect sensor to ENVIROMUX-16D Sensor Cable

Sensor Cable

The CAT5 connection cable between the ENVIROMUX and the "Cat5" port on the ACLM-V/-P sensor is terminated with RJ45 connectors and must be wired according to the EIA/TIA 568 B industry standard.   Wiring is as per the table and drawing below.

Pin	Wire Color	Pair
1	White/Orange	2
2	Orange	2
3	White/Green	3
4	Blue	1
5	White/Blue	1
6	Green	3
7	White/Brown	4
8	Brown	4

(View Looking into RJ45 Socket)
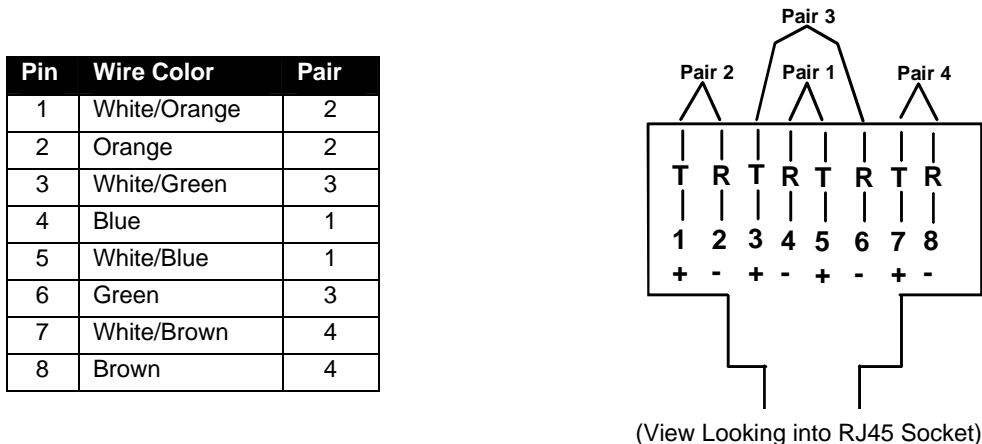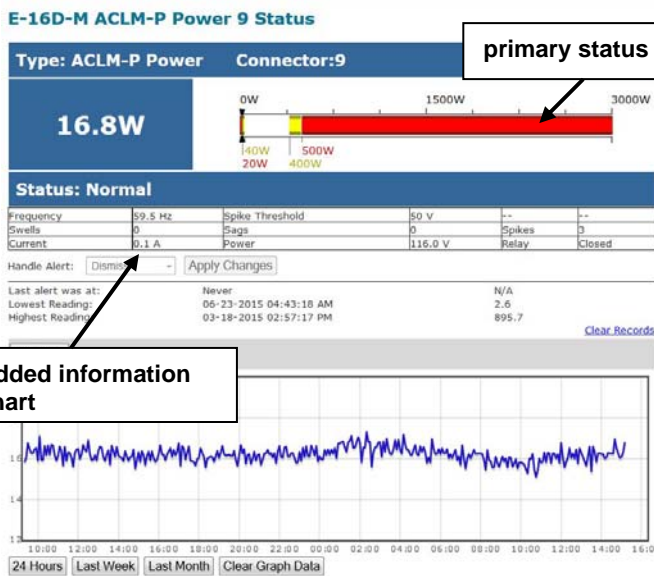
Figure 6- CAT5 Cable pinout

USE AND OPERATION

For instruction on how to monitor and use the data provided by the ENVIROMUX-ACLM-V / -P Line Monitors, see the ENVIROMUX manual.   Most of the features configurable on the ENVIROMUX-ACLM-V and -P Line Monitors are common to all sensors and are described in the manual for the ENVIROMUX.   This manual will introduce features that are new and not described in that manual.
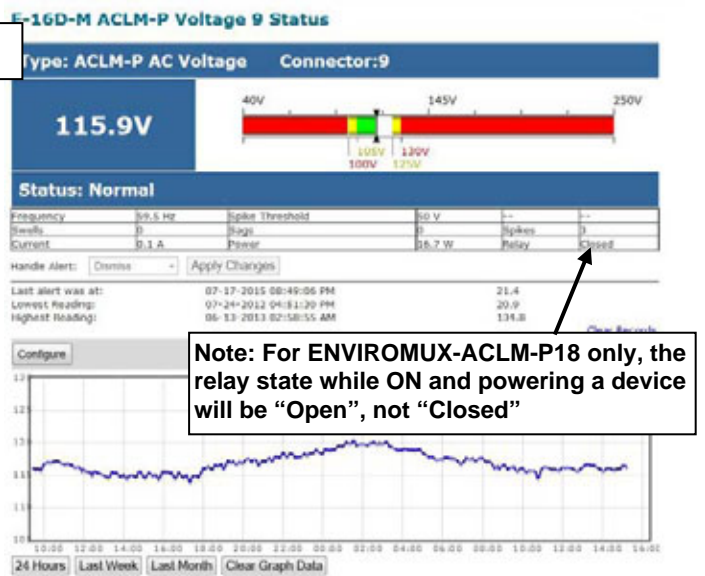
The sensor status page for the ENVIROMUX-ACLM-V and –P includes a chart detailing information not found in the primary status bar.   The chart includes:

- the last reading taken for the line frequency
- number of swells,sags, and spikes that have occurred
- the current setting of the spike threshold.
- the current status of the outlet relay (ACLM-P only)

The ENVIROMUX-ACLM-P additionally displays the present current draw and either the input voltage or the power consumption depending on whether the sensor status being viewed is the "Power Status" or the "Voltage Status" respectively, as seen in the images below.

primary status bar

Added information chart

Note: For ENVIROMUX-ACLM-P18 only, the relay state while ON and powering a device will be "Open", not "Closed"

ACLM-P Power Status Page

ACLM-P Voltage Status Page
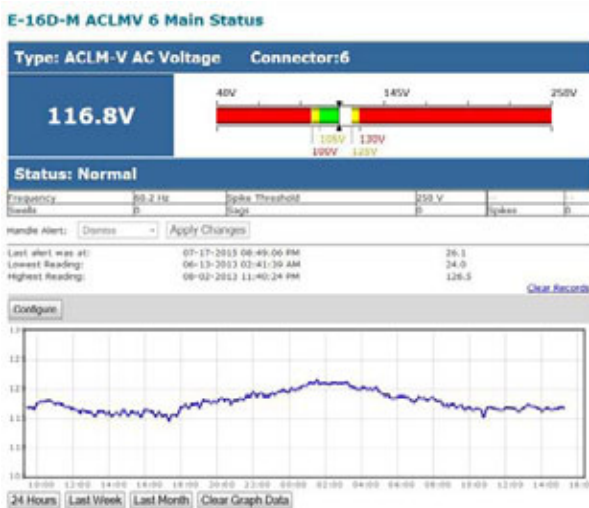
ACLM-V Voltage Sensor Status Page
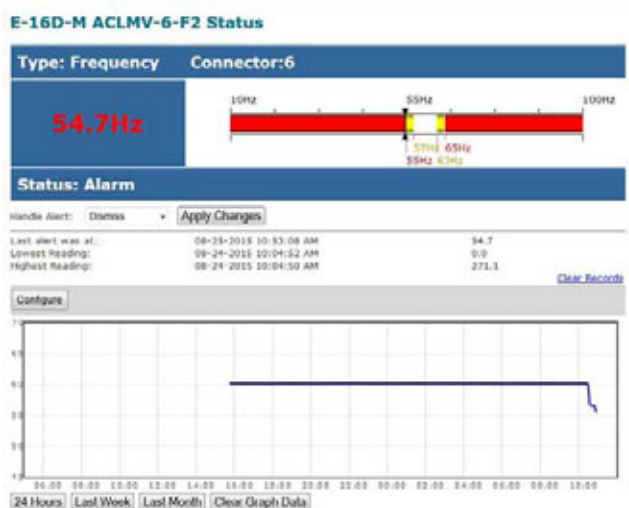
ACLM-V (or P) Frequency Sensor Status

Figure 7- Status windows for ENVIROMUX-ACLM sensors

A **Configure** button on the page allows the user to configure parameters of the sensor.

Note: Configuration options on this page are similar to those of other ENVIROMUX sensors and are covered at length in the ENVIROMUX manual.

Figure 8- Configurations page for sensors

To configure the spike threshold , click on "Voltage Spike Threshold".   Select the value to use from the dropdown.   Options include 50, 250, 500 and 1000 volts.
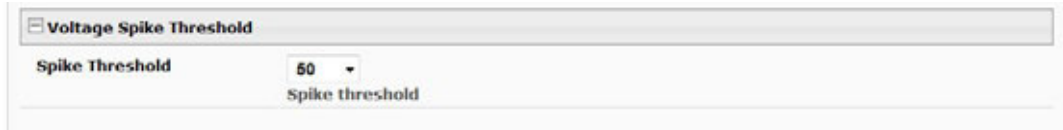
Figure 9- Configuration for Spike Thresholds

The ENVIROMUX-ACLM-P provides additional configuration to control an internal relay that toggles power ON/OFF to the AC outlet.   The relay can be configured to disconnect power using one of four types of readings:
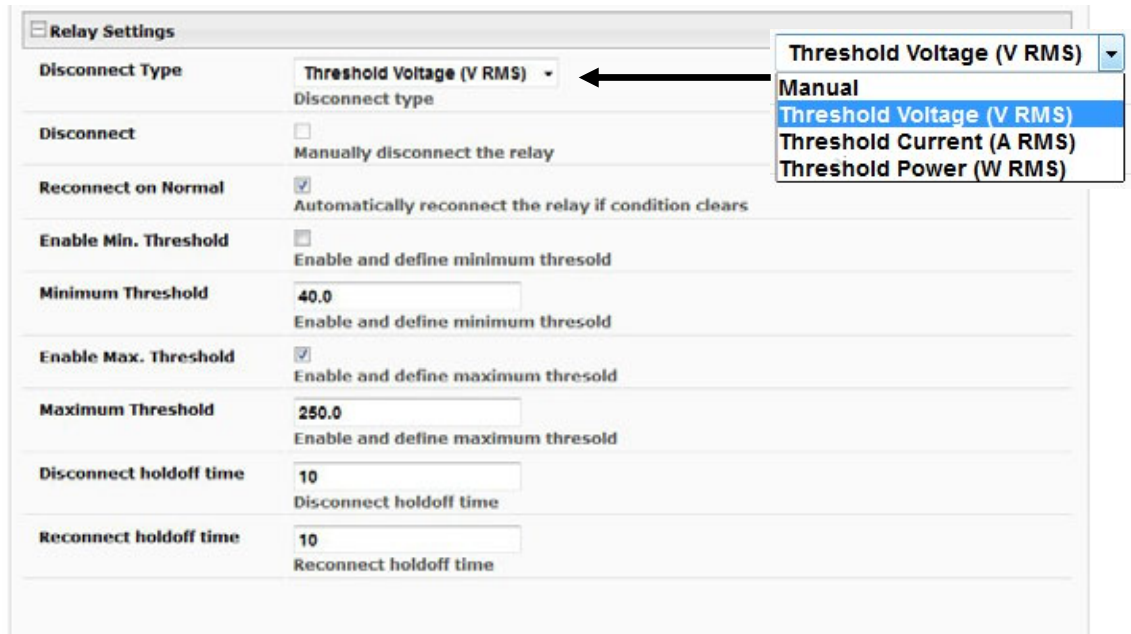
Figure 10- ACLM-P Spike Threshold and Relay Settings

Relay Settings include:

Feature	Description
Disconnect Type	Select the type of reading that will effect the operation of the relay (see below)
Disconnect	Place a checkmark to manually disconnect power through the relay (the Disconnect Type must be set to Manual)
Reconnect on normal	Select if the outlet should be powered ON when the reading has returned to the normal operating range (provided the Disconnect Type isn't set to Manual)
Enable Min. Threshold	Select if the outlet should power OFF when the minimum threshold setting is reached
Minimum Threshold	Define what the minimum threshold value is
Enable Max Threshold	Select if the outlet should power OFF when the maximum threshold setting is reached
Maximum threshold	Define what the maximum threshold value is
Disconnect Holdoff Time	Number of seconds to delay power OFF when the minimum or maximum threshold setting is reached
Reconnect Holdoff Time	Number of seconds to delay powering ON when the reading has returned to normal operating range (only applicable if Reconnect on Normal is selected)

Disconnect Types:
- ➢ Manually-   the user can select/deselect the "Disconnnect" box to power the outlet ON/OFF
- ➢ Threshold Voltage- control power to the outlet based on minimum and or maximum configurable threshold voltage readings
- ➢ Threshold Current- control power to the outlet based on maximum configurable threshold current readings
- ➢ Threshold Power- control power to the outlet based on maximum configurable threshold power readings

Once settings are changed, press the **Save** button to save them.

TECHNICAL SPECIFICATIONS

Sensor Performance Specifications

AC Inlet (ACLM-V).. ....IEC 320 C14

AC Inlet (ACLM-P12/-P8)...IEC 320 C14

AC Outlet (ACLM-P12/-P8)...IEC 320 C13

AC Intlet (ACLM-P18) ....IEC 320 C20

AC Outet (ACLM-P18) ....IEC 320 C19

Maximum Spike Threshold 1kVAC

Voltage Range ....50 to 250VAC

Voltage Frequency Range ....47 to 63Hz

Voltage Accuracy ....+/- 1%

Frequency Accuracy ....+/- 1%

Measurable Current range... ...300mA to 20A

Continuous Current (ACLM-P12)...12A

Continuous Current (ACLM-P8)..8A

Continuous Current (ACLM-P18)...18A

Maximum Current (ACLM-P12) 15A

Maximum Current (ACLM-P8) 10A

Maximum Current (ACLM-P18) 20A

Current Accuracy ....+/- 2%

Voltage Supply..12VDC from ENVIROMUX-XD

Max Current Consumption (ACLM-P) 130mA

Max Current Consumption (ACLM-V) 70mA

Max. Cable Length (from Sensor to ENVIROMUX-16D)...............1000 ft

Max. Cable Length (from Sensor to ENVIROMUX-2D/5D)……….ACLM-V   1000ft

ACLM-P8/12   1000ft

ACLM-P18   750ft (24AWG minimum)

Communication Type..RS485

Data rate ....96kbps max

General Specifications

Temperature Range...32° to 104° F (0° to 40° C)

Humidity Range ....20% to 80% RH

Enclosure Size..2.5" x 3.25 x 1.03"

Compliance Specifications

CE Mark..BS EN55022: 2006+A1:2007

ESD Protection ....BS EN61000-4-2: 2009

RoHS ....All parts comply with RoHS

TROUBLESHOOTING

Each and every piece of every product produced by Network Technologies Inc is 100% tested to exacting specifications.   We make every effort to insure trouble-free installation and operation of our products. If problems are experienced while installing this product, please look over the troubleshooting chart below to see if perhaps we can answer any questions that arise.   If the answer is not found in the chart, a solution may be found in the knowledgebase on our website at **http://information.networktechinc.com/jive/kbindex.jspa** or please call us directly at (**800) 742-8324 (800-RGB-TECH)** or **(330) 562-7070** and we will be happy to assist in any way we can.

Problem	Cause	Solution
Sensor data is not updating	Communication has been lost between the sensor and the ENVIROMUX-xD	Check CAT5 cable connections at both ends. Make sure they are fully snapped in.
ACLM-P is not reading power	Breaker on ACLM-P is tripped	Reset circuit breaker
ACLM-P repeatedly trips breaker	Excessive current draw from connected load device	Check connected load device- must be rated at 12A or less for ACLM-P12, 8A or less for ACLM-P8 and 18A or less for ACLM-P18.
No Frequency sensor shown in Summary page of ENVIROMUX-xD	• ENVIROMUX-xD firmware not updated • ENVIROMUX-xD system not refreshed	• Updated ENVIROMUX-xD with version 2.29 or later. • Delete the ENVIROMUX-ACLM-V/P from the Summary page and wait 30 seconds for sensor to be re-sensed by the ENVIROMUX-xD. See Note below.

Note: In order for the ENVIROMUX-xD to add the Frequency sensor of the ENVIROMUX-ACLM-V/P to the list of sensors, any previously installed ENVIROMUX-ACLM-V or ACLM-P must first be deleted from the ENVIROMUX-xD Summary page. Within 30 seconds the ENVIROMUX-xD will re-sense the ENVIROMUX-ACLM-V/P and will include the Frequency sensor in the list of sensors. All applicable sensors included with the ENVIROMUX-ACLM-V/P (including Frequency Sensor(s)) will then be available for configuration.

WARRANTY INFORMATION

The warranty period on this product (parts and labor) is two (2) years from the date of purchase. Please contact Network Technologies Inc at **(800) 742-8324** (800-RGB-TECH) or **(330) 562-7070** or visit our website at **http://www.networktechinc.com** for information regarding repairs and/or returns. A return authorization number is required for all repairs/returns.

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[1] Swells are defined as an AC voltage exceeding the user specified maximum critical threshold for a period of 5 cycles (i.e. 5/60th second for 60Hz) to 1 second's time.

[2] Sags are defined as an AC voltage exceeding the user specified minimum critical threshold for a period of 5 cycles (i.e. 5/60th second for 60Hz) to 1 second's time.

[3] Spikes are defined as a sudden high peak event lasting at least 5 microseconds that raises the voltage in either a positive or negative direction.