Altenergy Power System

Energy Communication Unit (ECU)

Installation and User Manual

（For ECU-3 V3.7）

Version：3.0

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1.0 Introduction

The APS-ECU is the information gateway for APS inverters. This internet ready data logger can communicate with every kind of APS interactive inverter available and provides the latest in system monitoring for your PV plant. The APS-ECU contains an integrated HTTP web server to allow the simplest and most flexible network integration of any data logger currently on the market. The user-friendly browser based interface provides the user with access to the solar array in seconds. Several configuration options ensure that any APS inverter system – regardless of the number of inverters, remoteness of the plant, or internet connection type – can be used with the APS ECU.
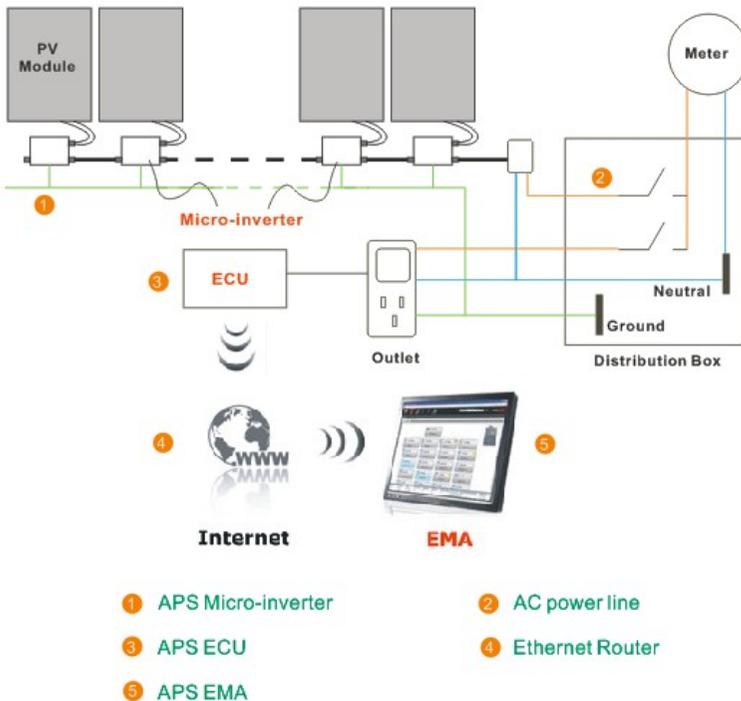
Other Elements in the APS Micro-inverter System
- The APS Micro-inverter is a fully integrated device that converts the DC output of a single solar module into grid-compliant AC electricity.
- The APS web-based Energy Monitoring and Analysis system (EMA) constantly monitors every module on every installation. The EMA analyzes the data collected by the ECU from each micro-inverter.

2.0 Installation

Preparation

Before installing the ECU, ensure the site meets the following requirements:
- Standard AC electrical outlet
- Broadband Internet connection
- Broadband router with Ethernet port
- Web browser to view EMA. Support web browsers are Internet Explore and Firefox

Find a Location for ECU

The ECU can be place on a table or be mounted on the distribution ark and wall. It is recommended that location for the ECU should be dry and cool. In addition, do not cover the ECU and keep it away from dust.

1) Distribution ark Mounting
   - Loosen ECU at the back of the two M3 screws and rotate the holders.

holder

M3 Screw
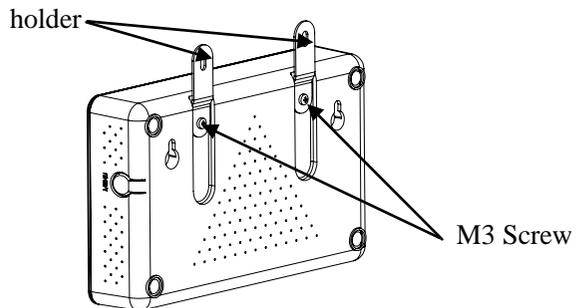
   - Fix the ECU on the frame with screws and keep it away from other heat-generating devices.

2) Wall Mounting
   - Mount the ECU in a cool, dry, indoor location.
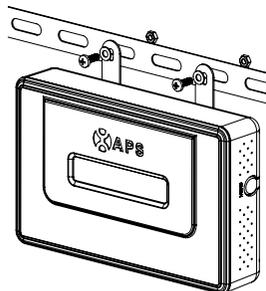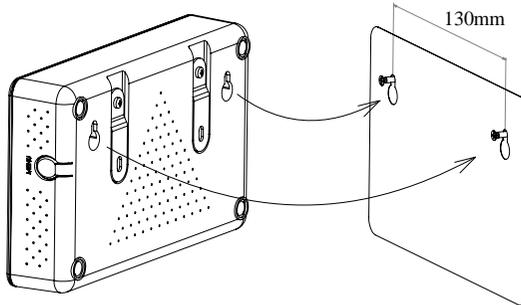   - Use two drywall screws or wall anchors to affix the ECU to the wall mounted at the dimensions shown. The maximum screw head diameter is 0.35''. Use #8 screws (not included in kit).
   - Slide the ECU onto the mounting screws, aligning the ECU screw holes with the screws installed in step 2. Lower the ECU onto the screw posts to secure the unit to the wall.

130mm

Install the ECU Cable Connections

The following diagram is a guide to the connections on the back of the APS ECU.

Power interface   Serial port   Network port   USB interface   Reset
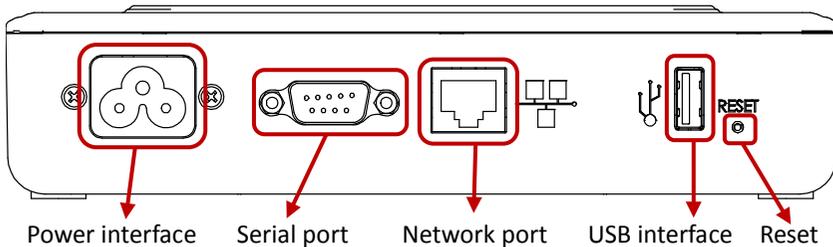
- Connect to Internet
  Option 1: LAN connection - use the LAN Cable to connect ECU to a Broadband Router.
  Plug the Ethernet cable into the network port on the ECU, and plug the other end into a spare port on the broadband router or LAN.

  Option 2: WiFi connection – use WiFi bridge to connect ECU to a Broadband Router.
  Configure the WiFi Bridge to connect to Wireless Router, please refer to WiFi Bridge User Manual

Connect the RJ45 LAN Cable and USB Cable on WiFi Bridge to the RJ45 Port and USB Port on ECU

The ECU needs to be able to obtain a Dynamic Host Configuration Protocol (DHCP) IP address and have a connection to the Internet. The ECU will only search for a DHCP IP address during its power up sequence. ECU will automatically obtain the IP address, such as: 139.168.200.65, and connect to Internet. If the IP address shows "60.190.131.228", it means ECU failed to get IP address. Make sure the connection between ECU and Router is working well, reboot ECU, it will obtain IP address.

- Plug the AC power cord into the AC input on the ECU, and then plug the other end into a standard AC electricity outlet.

Warning: Do not plug any electrical devices and power strip into the same that the ECU is connected to.
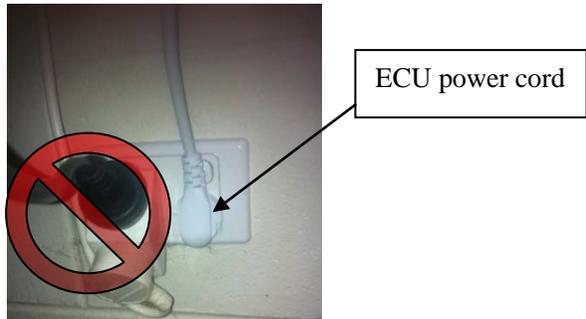
Warning: Do not plug the ECU into a power strip, surge protector, or uninterruptable power supply (UPS). The surge suppression or filtering from these devices can substantially diminish PLC communication performance.

ECU initial setting

Step 1: Power on ECU
The following information will be displayed in LCD after ten seconds.

Initialization Interface:

> Loading…

Starting up Interface:

> Searching   V3.7
> 192.168.2.101

Operation interface:

> 192.168.2.101   +Web
> 750W   11Kwh   12

When the communication between the ECU and inverters builds up successfully, the LCD will show the value of your system. The data in operation interface includes:

- Local IP address, for example: 192.168.2.101 (your actual local IP address will be different)
- Web connection information: "+Web". This means the ECU is connected to the internet. If it is "–Web", Internet itself has problem. Need to setup the security authority to offer Auto IP configuration.
- Data of the present power-production in watts, for example: 750W
- Data of the life time output of the system in kWh, for example: 11kWh
- The number of online micro-inverters producing power and reporting in to the ECU, for example: 12

Step 2: ECU time zone setting
- Enter the IP address shown on the ECU LCD into the internet browser, and then open the web page.

- Click "Administration", then "Date, Time, Time zone". In the corresponding box, enter local date/time/time zone, click Update after finished.   For details, refer to 5.4.2 time management.

Step 3: EMA Monitoring

After ECU display "+web"，contact APS technical staffs in your local area and they will setup an EMA account with User Name and Password.

3.0 Interface Explanation

3.1 Interface position

All of the ECU interface as below, from left to right in turn for power interface, serial port, network port and USB interface:

| Power interface | RS232 serial port | network port | USB interface |
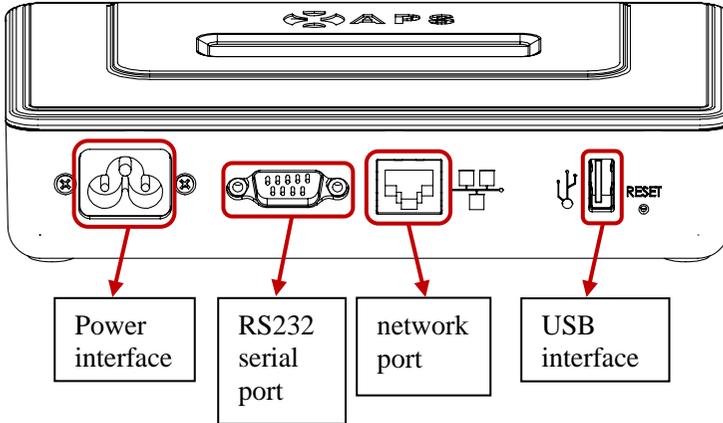
3.2 Power Interface

Power interface through the power line connect power, connection mode as below:

3.3 RS232 Serial Port

The serial port works in two modes: GPRS mode and host communication mode. GPRS mode: In the case of the absence of the wired network, we can select

GPRS module to connected to the network, and communicate with the EMA, to check the system data.

Host communication mode: in this mode, you can directly read data from the ECU. ECU use RS232 serial DB9 male interface, users through the corresponding female interface or extension cord to connect, also can use RS232 to RS485 interface converter.

3.4 Network Port

RJ45 Ethernet network port: ECU allows user to communicate with EMA, and log in ECU's local page, set up the system and view the system data via Ethernet network port. In the case of the absence of the wired network, user can select optional WiFi-Bridge wireless Internet. WiFi-Bridge connection shown as below:

3.5 USB Interface

In the case of the absence of the wired network, user can select optional WiFi-Bridge wireless Internet. USB interface provide 5V DC power supply for the WiFi-Bridge.

4.0 Basic Operation

The APS ECU has one two-line, 40-character LCD display with alphanumeric and graphic displays. Set the mode using a single button.

4.1 Power Up

As soon as the ECU is plugged into an AC outlet, it will power up and display several information screens. The ECU will be ready to work less than five minutes after powering up. The ECU has completed booting up and has started normal operation when it displays the following information:

Initialization Interface:

> Loading…

Work Started Interface:

> Searching   V3.7
> 192.168.2.101

The V3.0 indicates the firmware version from which the ECU's operation and features are dictated. After the ECU receives an IP address and establishes an Internet connection, the ECU will contact a Network Time Protocol (NTP) server so that it can set an accurate local time.

Normal Work Interface:

> 192.168.2.101   +Web
> 750W   11kWh   12

The number 12 indicates the number of panels to which the ECU is connected.

Use the Menu button on the ECU to set the number of micro-inverters you are going to install. Press and hold the Menu button. When it reaches the first digit of the number of micro-inverters you are going to connect to the ECU, release the button and move the cursor forward one space. Repeat this process until the complete number of micro-inverters connected to the ECU is displayed.

After inputting the number, move the cursor until it is under 'OK.' Hold the button for three seconds to finish setting the number of micro-inverters. Then enter the work started interface and begin to search for the micro-inverters.

The symbol "!" following the number 12 indicates that the number of micro-inverters connected to the ECU doesn't match the number programmed into the ECU.

```
192.168.2.101      +Web
750W        11kWh     12!
```

This scan continues to search for new micro-inverters until all of the micro-inverters are connected to the ECU, which can take anywhere from a few minutes to several hours, depending on the strength of the network. Once the ECU is connected to all the micro-inverters, it begins collecting data from each.

4.2 Menu Structure

The following figure shows the ECU side of the button:
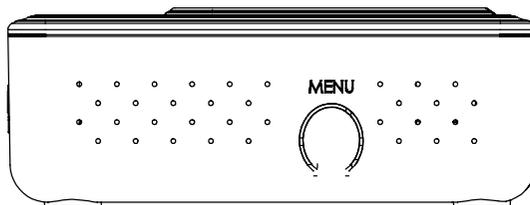
You can access the ECU LCD panel menu by pressing and holding the Menu button; after two seconds you will enter the ECU menu. Continue holding the button, and menu items will appear in the following order:

Exit Menu
Device Search
Status
Shutdown

Continue holding the Menu button. When the LCD displays "Device Search," release the Menu button. The following display will appear:

> Searching   V3.7
> 192.168.2.101

The ECU will automatically report inverter's ID again.
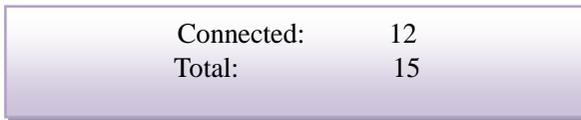
Enter the ECU menu. Hold the Menu button until the LCD displays "Status." Release the Menu button, and the following items will appear:

> Connected: 12
> Total: 15

The numbers above mean that there are 15 micro-inverters that need to be connected to the ECU, but that the ECU is only connected to 12 micro-inverters.

Enter the ECU menu. Hold the Menu button until the LCD displays: "Shutdown." Release the Menu button, and the following items will appear:

> Ok
> Cancel
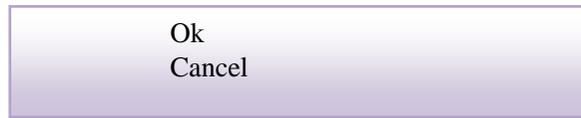
Choose "Ok", and the system of inverter will shut down. If within one minute without pressing the button again, then automatically exit the menu button.

4.3 Restore the factory set operation

The following diagram guides to the connectors back of APS-ECU.
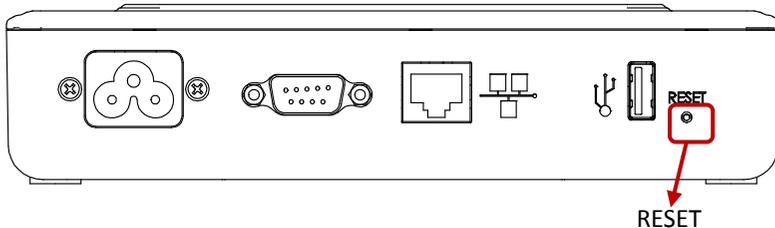
RESET

For the ECU restore the factory set, simply press the "Reset" button for three seconds or more long, ECU will automatic return to the factory default settings.

4.4 Troubleshooting

Potential Problems and Solutions

IP Address Problem: If the IP address displayed on the ECU's LCD does not match the subnet on your internal network and shows something beginning with "60.190.x.x," it means that it was unsuccessful in obtaining a DHCP IP address from your router.

- Check network connectivity to the router or other DHCP server. You may need to contact your Internet Service Provider or refer to your router documentation for troubleshooting assistance.

LCD Displays "-Web": The ECU could not connect to the Internet to find an NTP server and could not connect to the APS website.

- Check network connectivity to the router. You may need to contact your Internet Service Provider or refer to your router documentation for troubleshooting assistance.

LCD Display "!": The number of installed units doesn't match the micro-inverter-count. This may indicate that the ECU is having difficulty communicating over the power lines. It could also be caused by low light levels, resulting in module voltage that is too low for the micro-inverter to power up.

```
192.168.2.118     +Web
2776W      1kWh    12!
```

- Plug the ECU into an electrical socket in a different location. Keep it away from your router.

5.0 ECU Local Interface

Connection to APS's web-based monitoring and analysis website (EMA) requires an Internet connection. However, if there is no Internet access at the installation site, it is still possible to communicate directly with the ECU local interface using the Ethernet port and a personal computer with a web browser.

5.1 Home Screen

Once the browser has successfully connected with the ECU, the following screen is displayed in the browser. This home screen provides a system overview and shows the current status of the micro-inverters that have been identified by the ECU. From this screen, you can access other screens in the interface.

Home   Real Time Data   Status   Administration

ECU ID	100000000002
Lifetime generation	732.0 kWh
Current Power	1905 W
Generation Of Current Day	14.4 kWh
Last connection to website	2013-05-02 01:07:29
Number of Inverters	8
Number of Inverters Online	8
Current Software Version	V3.7
Database Size	9695 kB
Current Timezone	Asia/Shanghai
ECU Mac Address	80:97:1B:10:00:02

5.2 Real-time Data Screen

To view the real-time system operation data statistics for your solar array, click "Real Time Data" from the ECU home screen to navigate to the real-time data screen.

Home   Real Time Data   Status   Administration

Inverter ID	Current Power	Grid Frequency	Grid Voltage	Temperature	Date
100000000391-A	125 W	50.0 Hz	226 V	49 °C	2013-05-02 14:25:25
100000000391-B	125 W	50.0 Hz	226 V	49 °C	2013-05-02 14:25:25
100000001008-A	125 W	50.0 Hz	224 V	51 °C	2013-05-02 14:25:25
100000001008-B	138 W	50.0 Hz	224 V	51 °C	2013-05-02 14:25:25
401000000332-A	125 W	50.1 Hz	234 V	39 °C	2013-05-02 14:25:25
401000000332-B	124 W	50.1 Hz	234 V	39 °C	2013-05-02 14:25:25
401000000400-A	100 W	50.0 Hz	234 V	35 °C	2013-05-02 14:25:25
401000000400-B	101 W	50.0 Hz	234 V	35 °C	2013-05-02 14:25:25

5.3 Status

To view system status, click "Status" from the ECU home screen.

Home   Real Time Data   Status   Administration

Event Id	Event	Inverter ID	Date
1	AC Voltage exceeding Range	100000000391	2013-05-01 13:15:16
2	AC Voltage exceeding Range	100000000391	2013-05-01 13:10:16
3	AC Voltage exceeding Range	100000000391	2013-05-01 12:45:16
4	AC Voltage exceeding Range	100000000391	2013-05-01 12:40:16
5	AC Voltage exceeding Range	403900001148	2013-05-01 12:35:16
6	AC Voltage exceeding Range	100000000391	2013-05-01 12:30:16
7	AC Voltage exceeding Range	403900001148	2013-05-01 12:25:16
8	AC Voltage exceeding Range	403900001148	2013-05-01 12:10:16
9	AC Voltage exceeding Range	100000000391	2013-05-01 12:05:16
10	AC Voltage exceeding Range	100000000391	2013-05-01 12:00:16
11	AC Voltage exceeding Range	100000000391	2013-05-01 11:55:16
12	AC Voltage exceeding Range	403900001148	2013-05-01 11:50:16
13	AC Voltage exceeding Range	100000000391	2013-05-01 11:50:16
14	AC Voltage exceeding Range	100000000391	2013-05-01 10:40:16
15	AC Voltage exceeding Range	100000000391	2013-05-01 10:35:16
16	AC Voltage exceeding Range	403900001148	2013-05-01 07:30:16
17	AC Voltage exceeding Range	100000000391	2013-05-01 07:30:16
18	AC Frequency exceeding Range	403900001148	2013-05-01 07:15:16
19	AC Frequency exceeding Range	403900001148	2013-05-01 07:10:16
20	AC Voltage exceeding Range	100000000391	2013-04-30 10:55:21

5.4 Administration Screen

For the user to set up the ECU parameters

1) ID Management

ECU will automatically report inverter's ID in the first boot up. The input box will display the connected inverter's ID. As shown below:

Home   Real Time Data   Status   Administration

ID Management   Date,Time,Timezone   Language   Network Connectivity
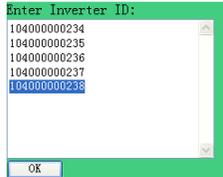
Enter Inverter ID:
104000000234
104000000235
104000000236
104000000237

OK

Clear ID

Automatically Report ID

If the number of inverter ID displayed on the page is less than the actual number of inverters installed, you can enter the lost inverters ID to "Input Inverter ID" section, then click "OK".

Home	Real Time Data	Status	Administration
ID Management	Date,Time,Timezone	Language	Network Connectivity

Enter Inverter ID:
```
104000000234
104000000235
104000000236
104000000237
104000000238
```
OK

Clear ID

Automatically Report ID

If the number of inverter ID displayed on the page is more than the actual number of inverters installed, you can remove the redundant inverters ID from "Input Inverter ID" section, then click "OK".
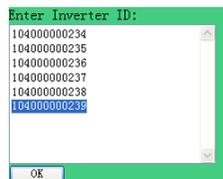
Home	Real Time Data	Status	Administration
ID Management	Date,Time,Timezone	Language	Network Connectivity

Enter Inverter ID:
```
104000000234
104000000235
104000000236
104000000237
104000000238
104000000239
```
OK

Clear ID

Automatically Report ID

Home	Real Time Data	Status	Administration

ID Management	Date,Time,Timezone	Language	Network Connectivity

Enter Inverter ID:
```
104000000234
104000000235
104000000236
104000000237
104000000238
```
OK

Clear ID

Automatically Report ID
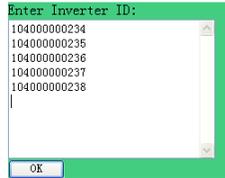
If the inverter ID displayed on the page is discrepancy with the actual inverters ID installed, please modified the wrong inverters ID from "Input Inverter ID" section, then click "OK".

Home	Real Time Data	Status	Administration

ID Management	Date,Time,Timezone	Language	Network Connectivity

Enter Inverter ID:
```
104000000234
104000000235
104000000236
104000000237
104000000999
```
OK

Clear ID

Automatically Report ID

Home	Real Time Data	Status	Administration

ID Management	Date,Time,Timezone	Language	Network Connectivity

Enter Inverter ID:

```
104000000234
104000000235
104000000236
104000000237
104000000238
|
```

OK
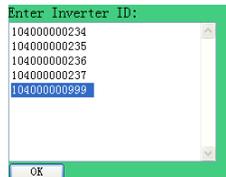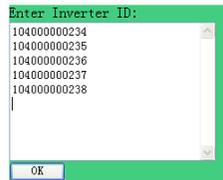
Clear ID

Automatically Report ID

Also the user can input ID manually. For the user to input 12 digits inverter ID, each input the ID number and press "Enter" a line break, then enter the next inverter ID, all inverter ID into finish, press the "ok" button, the input completed. If you need to remove all the inputted inverter ID, you can click the "Clear ID" button. If you need ECU to automatically report inverter's ID again, you can click "Automatically Report ID" button.

2)   Time management

In date column, input date, format for day/month/year, in time column, input time, format for hour/minute/second, after the completion of the input, click on the "ok" button. The ECU also can connect to the NTP server for obtaining accurate date and time automatically. In "NTP server" Spaces place, users can set NTP server address. As shown below:

Home	Real Time Data	Status	Administration

ID Management	Date, Time, Timezone	Language	Network Connectivity

Date:
02/05/2013
Time:
14:40:39
Update date and time

Time Zone: [Current Time Zone: Asia/Shanghai]
Select Time Zone
Update timezone

NTP Server:
0.asia.pool.ntp.org
Update NTP server setting

3) Language management. Users can switch between in both Chinese and English. As shown below:

Home	Real Time Data	Status	Administration

ID Management	Date, Time, Timezone	Language	Network Connectivity

Current language: [English]
Select a language
Select a language
English
Simplified Chinese

4) Network management. For the customer to choose GPRS function (need matching GPRS module), set up automatic assign IP address, manual input IP address and DNS server. As shown below:

Home	Real Time Data	Status	Administration

ID Management	Date, Time, Timezone	Language	Network Connectivity

☐ Use GPRS Module
Update

☑ Use DHCP
Update

IP address for interface 0:

Netmask:

Gateway IP:

Primary DNS Server:

Secondary DNS Server:

Update

20

Event Messages

The table below lists messages that the ECU provides to indicate certain conditions. These messages appear on your computer screen when your computer is connected to the ECU local interface. These messages provide APS Customer Support with useful information when you call for assistance.

Home Screen	Description
AC Frequency exceeding Range	The frequency of the AC grid has exceeded the upper limit.
AC Frequency under Range	The frequency of the AC grid has exceeded the lower limits.
AC Voltage exceeding Range	The voltage of the AC phase has exceeded the upper limit.
AC Voltage under Range	The voltage of the AC phase has exceeded the lower limit.
Over Critical Temperature	The inverter is producing less power in an attempt to not overheat.
GFDI Locked(only NA version contains)	An inverter has detected ground fault current greater than one amp. The error can only be cleared via the ECU after the ground fault condition has been remedied. The GFDI can be cleared using the GFDI page unless the failure is permanent.

Notes: If you don't have a LAN, you must use a crossover Ethernet cable to connect the ECU directly to your computer to access the local ECU interface. This assumes that your computer has a network interface card. If you fail to make a connection at this point, you can try to manually configure your subnet to 60.190.131.1, subnet mask 255.0.0.0.

6.0 Technical Data

Model: ECU-3	
Communication Interface	
Power Line	APS Proprietary
Ethernet	10/100M Auto-sensing, Auto-negotiation
USB interface	Standard
RS232 (GPRS)	Optional
Power Requirements	
AC Outlet	110~240 VAC, 50~60 Hz
Power Consumption	2.5 W
Mechanical Data	
Dimensions(WxHxD)	182 mm x 113 mm x 42 mm
Weight	380 g
Ambient Temperature Range	-40°C to +65°C
Cooling	Nature Convection; No Fans
Enclosure Environmental Rating	Indoor - NEMA 1(IP30)
Features	
Standard Warranty Term	3 Years
Compliance	IEC 60950-1, EN60950-1, IEC 60529, EN 60529, ANSI/UL 60950-1, CAN/CSA C22.2 No.60950-1, UL50E, FCC part 15, EN61000-6-1, EN61000-6-3, ICES-003, AS NZS 60950-1, GB/T17799

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This Class B digital apparatus complies with Canadian ICES-003.

:: WEEE (for Europe)

Disposal of your old appliance

1. When this crossed-out wheeled bin symbol is attached to a product it means the product is covered by the European Directive 2002/96/EC.
2. All electrical and electronic products should be disposed of separately form the municipal waste stream via designated collection facilities appointed by the government or the local authorities.
3. The correct disposal of your old appliance will help prevent potential negative consequences for the environment and human health.
4. For more detailed information about disposal of your old appliance, please contact your city office, waste disposal service or the shop where you purchased the product.

Contact Information

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