Excellence in Compliance Testing

Certification Exhibit

FCC ID: T2K-ACTAE1000
IC: 11123A-AE1000

FCC Rule Part: 15.247
IC Radio Standards Specification: RSS-210

ACS Project Number: 12-0550

Manufacturer: Aeronix, Inc.
Model: AE1000

Manual

ACT

Title: ACT Module Integration Guide

Aeronix #: AE301128-001

Rev -

5/21/2013

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Document Revision History

Version/Revision	Description of Change	Chg'd By	Chg/Rel #	Date
-	Initial Baseline	S. Priddy		1 May 2013
-	Incorporate Design Review Feedback	S. Priddy		20 May 2013
	Add released part #	S. Priddy		21 May 2013
	All references to model number are now "AE1000"	P. Baron		July 2, 2013
	Added General Statement for FCC compliance. Removed "DRAFT" watermark	P. Baron		August 8, 2013
	Renamed Section 9.5 to "Module Labeling"	P. Baron		August 21, 2013

Table of Contents

1 Purpose

The purpose of this document is to describe the ACT Module AE1000 integration and operation.

2 Acronyms

SIM	Subscriber Identity Module
GPIO	General Purpose Input / Output
GPO	General Purpose Output
GND	Electrical Ground Reference
VDC	Voltage Direct Current
VAC	Voltage Alternating Current
mA	Millamperes
A/D	Analog-to-Digital
mAh	Milliampere Hours
PCB	Printed Circuit Board
RF	Radio Frequency

3 Reference Documents

The following documents of the latest issue, unless distinctly noted, will form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, this specification will take precedence.

NONE

4 Specifications

4.1 Environmental

4.1.1 Operating Temperature

- -10 to 60 Celsius

4.1.2 Storage Temperature

- -40 to 85 Celsius

4.1.3 Operating Humidity

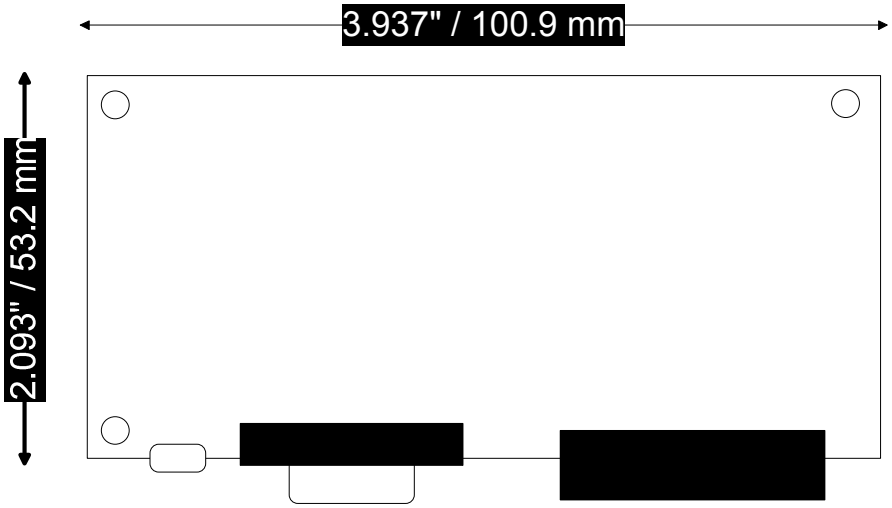
- 10-90%, non-condensing

4.2 Physical

4.2.1 Weight

- 1.2 oz / 32 grams

4.2.2 Approximate PCB Dimensions



NOTE: Dimensions are approximate. A STEP (.stp) file is available upon request.*

5 System Components

5.1 Supported USB Cable

- **Phihong USA IPUSB1MS-R**

5.2 PCB Module Assembly

- AE-101445-001 (GSM)

5.3 USB Cable

- 1.5 meter length
- USB Type A and Micro-B connectors

5.4 Power Supply

5.4.1 Supported Power Supply

- Phihong USA PSA05F-050Q-H

5.4.2 Ratings

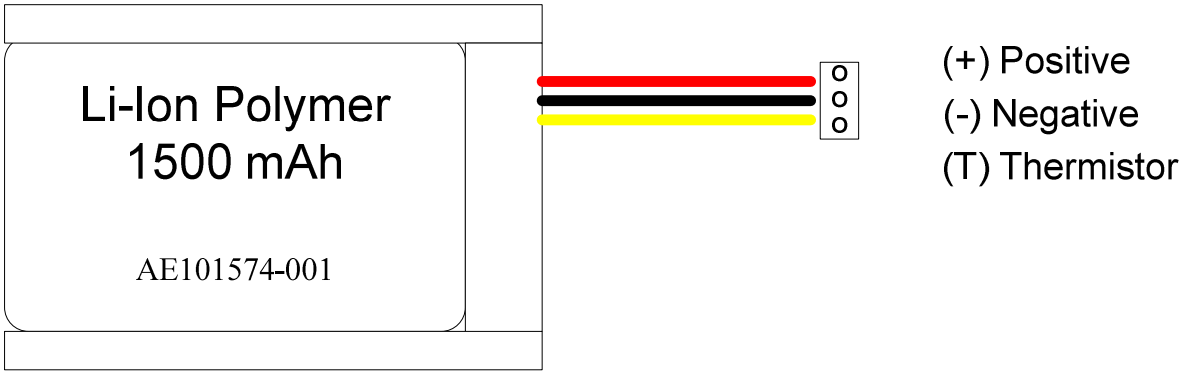
- Input Voltage Range: 90 VAC to 264 VAC
- Output Power Rating: 5W
- Output Voltage/Current: 5VDC / 1A

5.4.3 Connector

- USB Type A

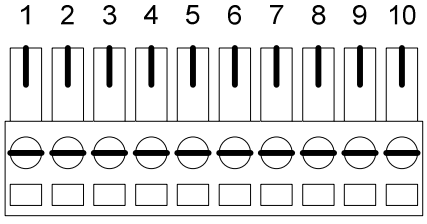
5.5 Battery

The rechargeable battery is a single cell, Li-Ion Polymer type with a rated capacity of 1500 mAh.



5.6 Euro Block Pluggable Terminal Block

This Euro Block pluggable terminal block supports wire sizes AWG: 16, 18, 20, 22, 24, and 30. Please refer to section 6.3 for detailed pin out information.



5.7 Antennas

5.7.1 Cellular

5.7.1.1 Frequency Bands

- GSM-850/GSM-1900

5.7.1.2 Maximum Antenna Gain

- GSM850: 850MHz < 4.25dBi
- GSM1900: 1900MHz < 2.74dBi

5.7.1.3 Supported Antennas

Manufacturer/PN	Internal/External	Max Gain (dBi)	Notes
Pulse W3538B0200	Internal	2.8	200mm cabled PCB antenna w/U.FL plug
WP Wireless WPANT30076-RA	External	2.0	Whip-type with male SMA.
Pulse SPDA24850/1900	External	1.5	Whip-type with male SMA.

NOTE: Allowable gain = total transmission line + connector + cable loss + antenna gain

5.7.2 GPS

5.7.2.1 Frequency Bands

- L1: 1575.42 MHz

5.7.2.2 Supported Antennas

Manufacturer/PN	Internal/External	LNA Gain (dBi)	Notes
Pulse W4000	External Patch	26	Active (3V). 5m cable terminating in male SMA
WP Wireless PANTMG1041105010A	Internal Patch	27	Active (3V). 5cm cable terminating in U.FL plug

NOTE: Allowable gain = total transmission line + connector + cable loss + antenna gain

5.7.3 Proprietary 915MHz RF

5.7.3.1 Frequency Bands

- 902.40 – 925.92MHz

5.7.3.2 Maximum Output Power to Antenna

- 20 dBm

5.7.3.3 Supported Antennas

Manufacturer/PN	Internal/External	Max Gain (dBi)	Notes
Pulse W3538B0200	Internal	2.8	200mm cabled PCB antenna w/U.FL plug
WP Wireless WPANT30076-RA	External	2.0	Whip-type with male SMA.
Pulse SPDA24850/1900	External	1.5	Whip-type with male SMA.

NOTE: Allowable gain (total transmission line + connector + cable loss + antenna gain)
NOTE: The Cellular radio and RF radio are precluded from concurrent operation via software.
NOTE: The RF radio antenna connectors MUST be reverse polarity.

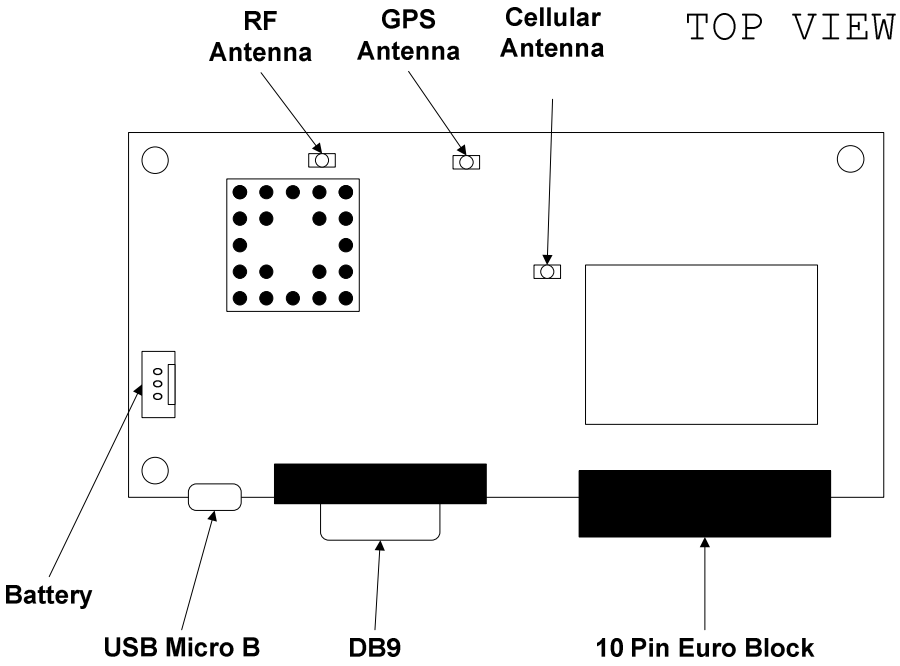
5.7.4 Industry Canada Detachable Antennas

This radio transmitter model AE1000 has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

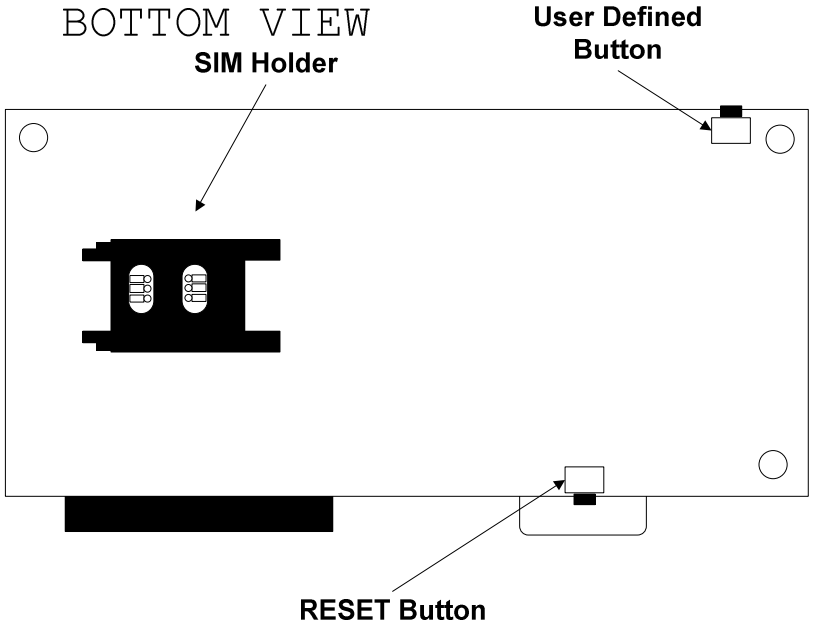
Le présent émetteur radio modèle AE1000 a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

6 Module Connections

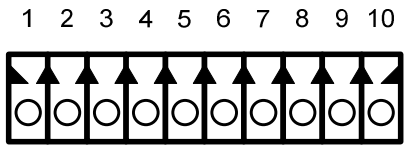
6.1 Top View



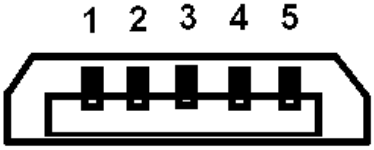
6.2 Bottom View



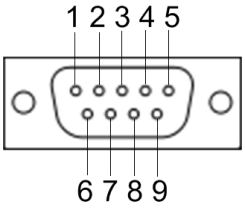
6.3 Euro Block Receptacle

	**Description**	**Rating**	**Configurations**
1	Output Power	100mA @ +5VDC	
2	Alt. Input Power	+5VDC / 1A (5W)	
3,4	Analog I/O	0-5 VDC 5 VDC 4-20mA 3.0 VDC	(2) Single-ended A/D (1) Differential A/D (1) Current Loop (2) GPIO
5	Signal Ground		
6,7	Analog I/O	0-5 VDC 5 VDC 4-20 mA 3.0 VDC	(2) Single-ended A/D (1) Differential A/D (1) Current Loop (2) GPIO
8	Analog Out	0-3.0 VDC	DAC or GPO
9	Signal Ground		
10	1-wire (Maxim)	+5 VDC	

6.4 USB Micro-B

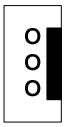
	**Name**	**Description**
1	VBUS	+5VDC
2	D-	Data (-)
3	D+	Data (+)
4	ID	Host/Slave Detect
5	GND	Signal Ground

6.5 DB9

	**RS-232**	**RS-485 (4W)**	**RS-485 (2W)**	**RS-422**
1		TxD-(A)		TxD-(A)
2	RXD	TxD+(B)		TxD+(B)
3	TXD	RxD-(B)	Data+(B)	
4		RxD+(A)	Data-(A)	RxD+(A)
5	GND			
6				
7	RTS			
8	CTS			
9				

6.6 Battery Connector

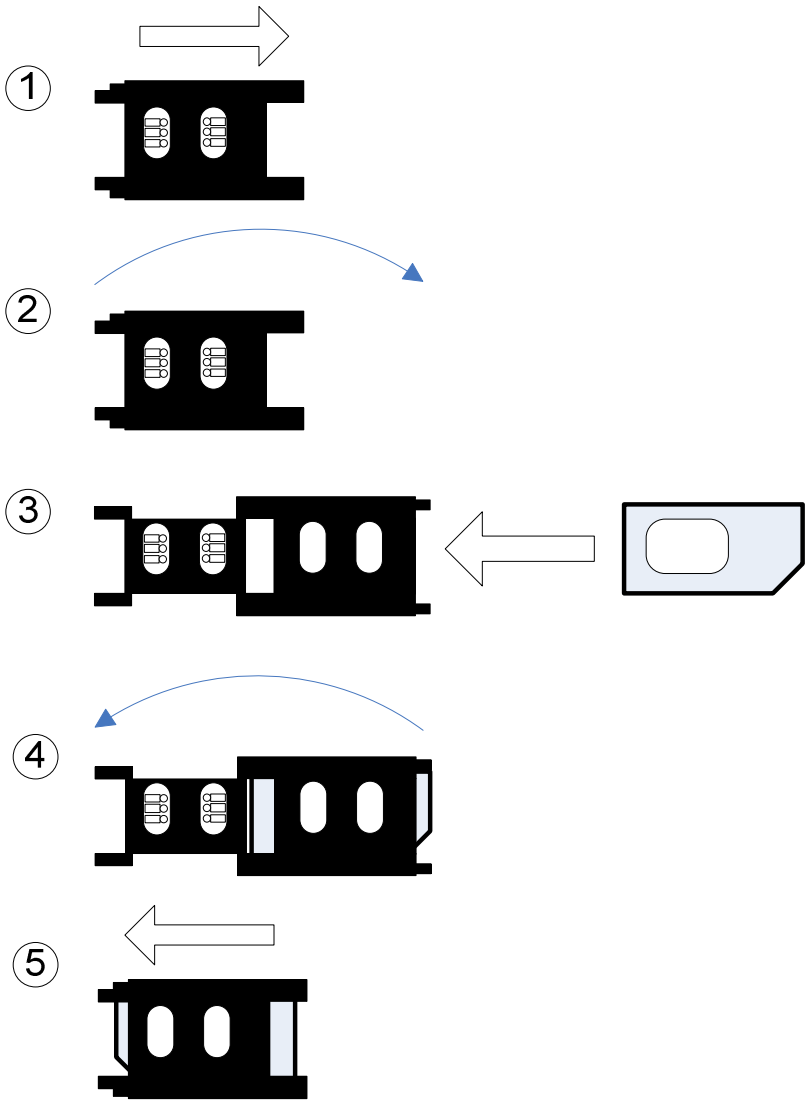
The battery connector is a 3-pin, proprietary, keyed connector which only fits the standard battery cable connector.



(+) Positive
(-) Negative

6.7 SIM Holder

The SIM connector is a hinged assembly. To insert a SIM card, lift the hinged assembly upwards. Then slide the SIM card into the SIM connector. Place shut the hinged portion. Then slide the hinged flap towards the notch edge of the SIM connector. The user should feel a perceptible click, once it is inserted properly.



6.8 Antenna Connectors

All of the antenna connectors are u.Fl type.

6.9 Cellular Antenna

The Cellular Antenna connector is located near a corner of the cellular module shield.

6.10 RF Antenna

The RF antenna connector is located along the long edge of the PCB assembly nearest to the RF shield which has many circular holes.

6.11 GPS Antenna

The GPS antenna connector is located along the long edge of the PCB assembly furthest from the RF shield which has many circular holes.

7 Assembly

Note: The ACT module MUST have the battery connected for proper operation. The USB power supply cannot provide sufficient power alone for the system to run reliably.

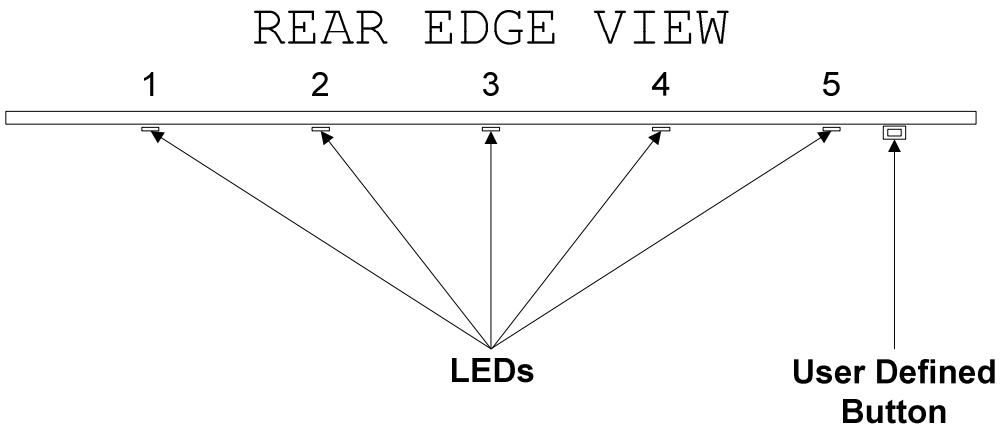
7.1.1 Connections

Use the following connection procedure.

- Connect the cellular antenna
- Connect the GPS antenna
- Connect the RF antenna
- Insert an SIM into the SIM holder
- Connect the battery
- Connect the power supply

8 Operation

Once power is applied to the module, the default LED behavior is as follows:



8.1 Cellular Connection (LED 1)

The module has established a connection with the cellular network.

8.2 Server Connection (LED 2)

The module has established a connection with the device management server.

8.3 GPS (LED 3)

The module has acquired a GPS location fix.

8.4 RF Connection (LED 4)

The module has established an RF connection.

8.5 DC Power

The module has DC power connected.

9 Certification Statements

Warning: Changes or modifications to this device not expressly approved by Aeronix could void the user's authority to operate the equipment.

9.1 FCC Part B

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no harmful interference to radio or television reception, which can be determined by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

9.2 RF Exposure

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

9.3 Industry Canada Specific Statements

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le

type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

9.4 License Exempt

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

9.5 Module Labeling

MODEL AE1000
FCC ID: T2K-ACTAE1000
IC: 11123A-AE1000
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.