



**ACEX4405-LF**

## **USER'S MANUAL**

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**IMPORTANT SAFETY CONSIDERATIONS**

**It is very important for the user to consider the possible adverse effects of power, wiring, component, sensor, or software failures in designing any type of control or monitoring system. This is especially important where economic property loss or human life is involved. It is important that the user employ satisfactory overall system design. It is agreed between the Buyer and Acromag, that this is the Buyer's responsibility.**

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***WARNING***

This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

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***Warning for European Users – Electromagnetic Compatibility***

European Union Directive 89/336/EEC requires that this apparatus comply with relevant ITE EMC standards. EMC compliance demands that this apparatus is installed within a VME enclosure designed to contain electromagnetic radiation and which will provide protection for the apparatus with regard to electromagnetic immunity. This enclosure must be fully shielded.

The connection of non-shielded equipment interface cables to this equipment will invalidate European Free Trade Area (EFTA) EMC compliance and may result in electromagnetic interference and/or susceptibility levels that are in violation of regulations which apply to the legal operation of this device. It is the responsibility of the system integrator and/or user to apply the following directions, as well as those in the user manual, which relate to installation and configuration:

All interface cables should be shielded, both inside and outside of the enclosure. Braid/foil type shields are recommended for serial, parallel and SCSI interface cables. Where as external mouse cables are not generally shielded, an internal mouse interface cable must either be shielded or looped (1 turn) through a ferrite bead at the enclosure point of exit (bulkhead connector). External cable connectors must be metal with metal backshells and provide 360-degree protection about the interface wires. The cable shield must be terminated directly to the metal connector shell; shield ground drain wires alone are not adequate. Panel mount connectors that provide interface to external cables (e.g., RS232, USB, keyboard, mouse, etc.) must have metal housings and provide direct connection to the metal chassis. Connector ground drain wires are not adequate.

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***Environmental Protection Statement***

This product has been manufactured to satisfy environmental protection requirements where possible. Many of the components used (structural parts, printed circuit boards, connectors, batteries, etc.) are capable of being recycled.

Final disposition of this product after its service life must be accomplished in accordance with applicable country, state, or local laws or regulations.

## Technical Support

In the unlikely event that you experience problems with your product, contact Technical Support. Please be prepared to provide contact information and details of your problem. You may be asked for further details when calling:

TELEPHONE      248-624-1541  
FAX                248-624-9234

Support may also be obtained via email.

E-mail to [solutions@acromag.com](mailto:solutions@acromag.com)

## Chapter 1 – Introduction

---

ACEX4405-LF is a COM Express carrier board that supports both Type II and Type III COM Express modules. This board has a small footprint of 95mm x 125mm. The design includes Gigabit Ethernet ports, RS232/422 ports, and USB ports.

### Module Features

Mini PCIe site which can accommodate either a full or half length module  
Compact flash site with ejector  
Dual Gigabit Ethernet (if supported by COM Express module)  
Optional fan power interface  
Standard ATX Power connector  
LVDS for LCD panel display  
LCD backlight control  
Power, status, and user-defined LEDs  
All interfaces use locking and latching connectors

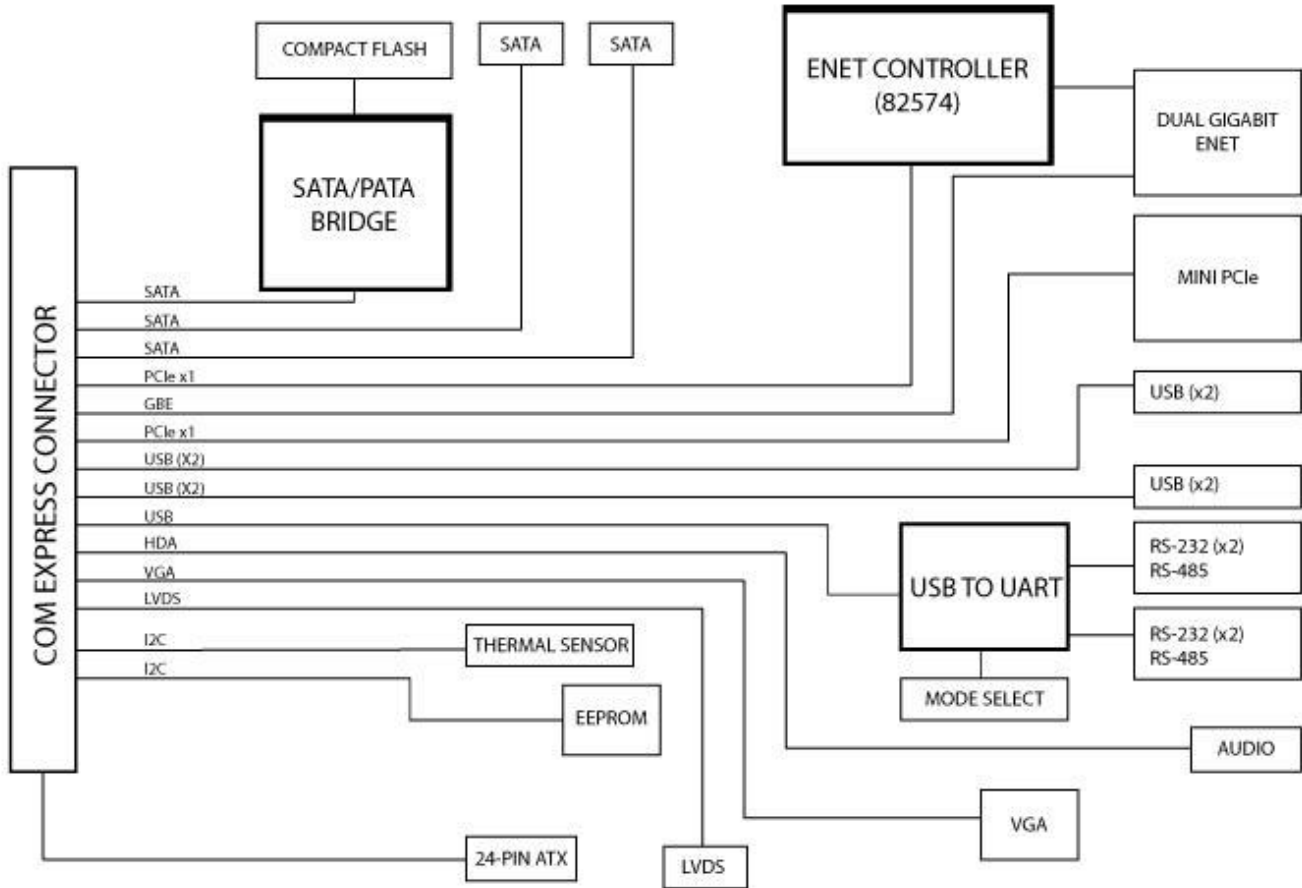
### Handling

Modules should be handled in ESD-safe work areas in order to prevent damage to sensitive components from electrostatic discharges. These areas must be designed and maintained to prevent ESD damage.

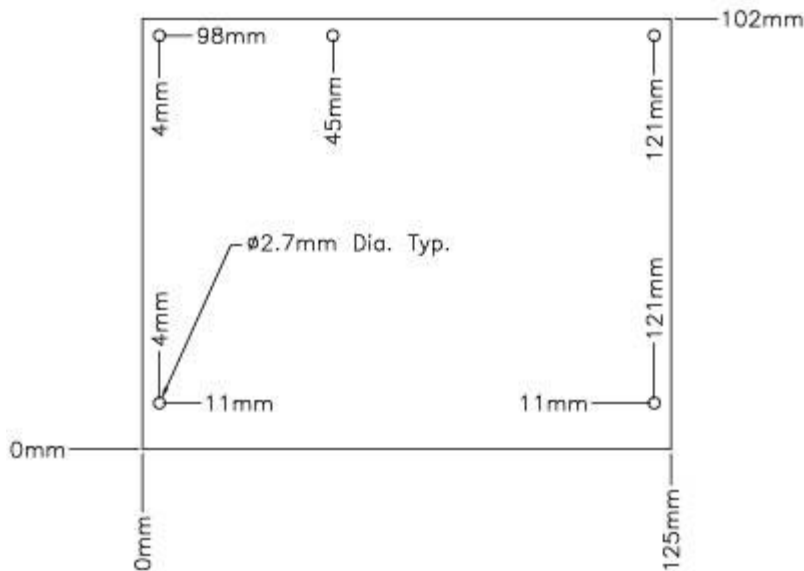
#### ESD Safe Work Area Guidelines

1. Module should be handled at properly designated work areas only.
  2. Designated ESD safe work areas must be checked periodically to ensure their continued safety from ESD. The areas should be monitored for the following:
    - a. Proper grounding methods.
    - b. Static dissipation of work surfaces.
    - c. Static dissipation of floor surfaces.
    - d. Operation of ion blowers and ion air guns.
  3. Designated work areas must be kept free of static generating materials such as styrofoam, vinyl, plastic, fabrics or any other static generating materials.
  4. Work areas must be kept clean and neat in order to prevent contamination of the work area.
  5. Modules should be handled by the edges. Avoid touching the component leads.
- NOTE:** *When not installed in a system, modules must be enclosed in shielded bags or boxes. There are three types of ESD protective enclosure materials this module was shipped in an approved ESD bag.*
6. Whenever handling the module the operator must be properly grounded by one of the following:
    - a. Wearing a wrist strap connected to earth ground.
    - b. Wearing heel grounders and have both feet on a static dissipative floor surface.
  7. Stacking of modules should be avoided to prevent physical damage.

### Operational Block Diagram



### Mechanical Dimensions



## Environmental Specifications

### Flammability

The circuit board is made by an UL recognized manufacturer and has a flammability rating of UL94V-0.

## Electrical Specifications

### Power Supply Requirements

The ACEX4405 requires +3.3V and +5V for full operation, sinking 1705mW and 4117mW respectively. Per the COM Express specification, the COM module requires +12V for operation while +5V\_Standby is optional.

### LVDS Backlight Overview

From COM Express Carrier Design Guide Revision 1.0:

*“Backlight inverters are either: voltage, PWM, or resistor controlled. The COM Express specification provides two methods for controlling the brightness. One method is to use the backlight control and enable signals from the CPU chipset. These signals are brought on COM Express LVDS\_BKLT\_EN and VDS\_BKLT\_CTRL. LVDS\_BKLT\_CTRL is a Pulse Width Modulated (PWM) output that can be connected to display inverters that accept a PWM input. The second method is to use the LVDS I2C bus to control an I2C DAC. The output of the DAC can be used to support voltage controlled inverters. The DAC can be used driving the backlight voltage control input pin of the inverter.”*

### Battery and Fan Selection

There are three conditions that need to be met when selecting a compatible fan:

1. Operates with +5V or +12V power
2. Connector is 3-pin, 2 mm pitch socket
3. Fan outputs tachometer signal

*Panasonic, NMB, and Comair Rotron currently offer a tachometer output option on their fans.*

The battery holder accommodates a CR1225 coin-cell battery.

## Architecture

### COM Module Considerations

The ACEX4405-LF is COM Express Type II compliant. In order for the ACEX4405-LF to fully operate, the attached COM Express module must be configured such that the lowest two PCIe lanes are PCIe x1 pipes.

### Pushbuttons

When viewing the non-COM connector side of the board, you will notice two momentary switches.



*SW2400*

The SW2400 pushbutton will power down the system, and then power up a system utilizing a standard ATX power supply.

**Note**

Depending on your default BIOS settings, the power button may need to be pressed in order to power up your system.

*SW2401*

The SW2401 pushbutton will reset the system.

**LEDs**

| Device           | Function                                   |
|------------------|--|
| ENET LED – Green | Link                                       |
| ENET LED – Amber | Activity                                   |
| LED600           | SATA Activity                              |
| LED700           | Compact Flash Drive Active / Slave Present |
| LED1700          | Fan Power                                  |
| LED2400          | +3.3V                                      |
| LED2401          | +12V                                       |
| LED2402          | +5V Standby                                |
| LED2403          | +5V  |

**Fuses**

The polyfuse F1700 is electrically located at the junction between the fan power selection jumper and the fan power rail.

The polyfuse F1400 is electrically located at the junction between the +5V rail and the VGA power rail.

## Chapter 2 – Installation and Setup

Below is the outline of the ACEX4405-LF showing the multiple connector locations. The following information will help you understand how to configure this module.

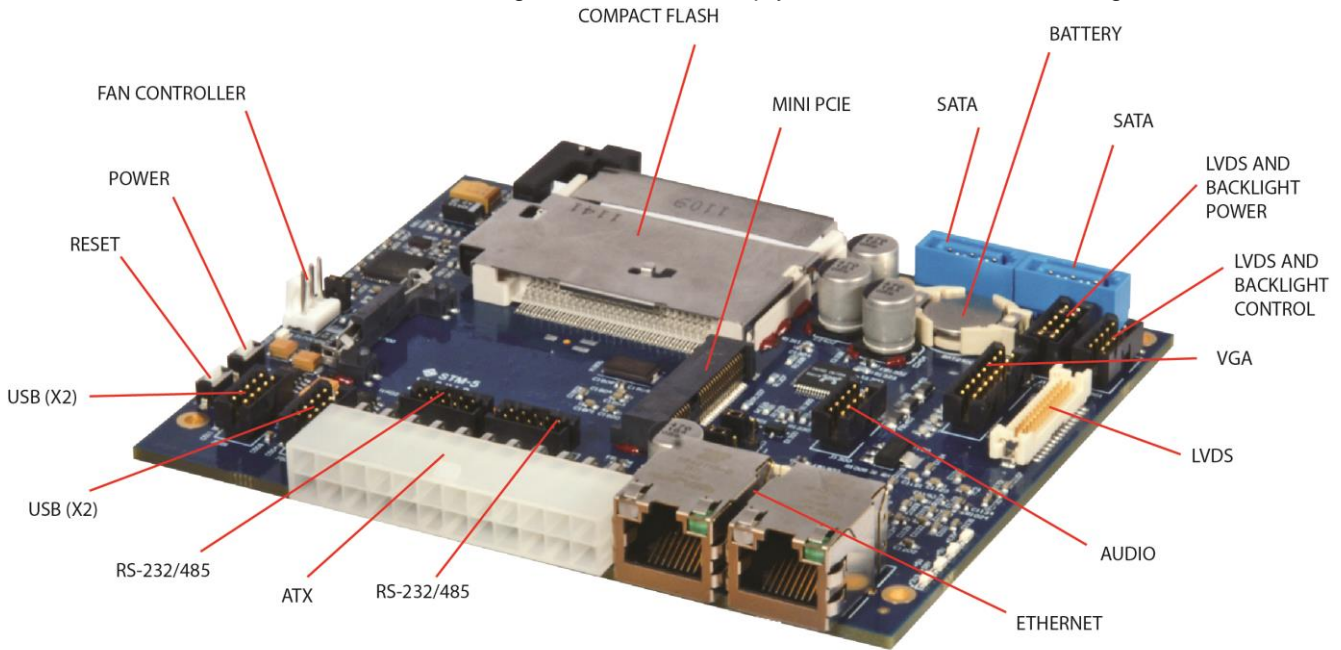


Fig. 2-1 shows the connector locations on the ACEX4405-LF

### Jumper Settings

#### RS-232/485

Configuration of the RS-232/485 connectors is set by shorting the following jumper pins:

| Serial Port Configuration  | Mode 0 (JP2000) | Mode 1 (JP2001) |
|----------------------------|-----------------|-----------------|
| Dual RS-232                | 0               | 0               |
| COM0:RS-232<br>COM1:RS-485 | 0               | 1               |
| Dual RS-485                | 1               | 0               |
| High Z                     | 1               | 1               |

#### LVDS and Backlight Power

Configuration of the LVDS and backlight power are set by shorting the following shrouded connector pins in J1500:

| Device          | +3.3 V        | +5V            |
|-----------------|---------------|----------------|
| LVDS Power      | Pins 1 and 2  | Pins 3 and 4   |
| Backlight Power | Pins 9 and 10 | Pins 11 and 12 |

#### Fan Power

The power supplied to the fan can be selected by jumping JP1700 as follows:

| Power Rail |                |
|------------|----------------|
| +5V        | Pin 2 to Pin 1 |
| +12V       | Pin 2 to Pin 3 |

## Connectors

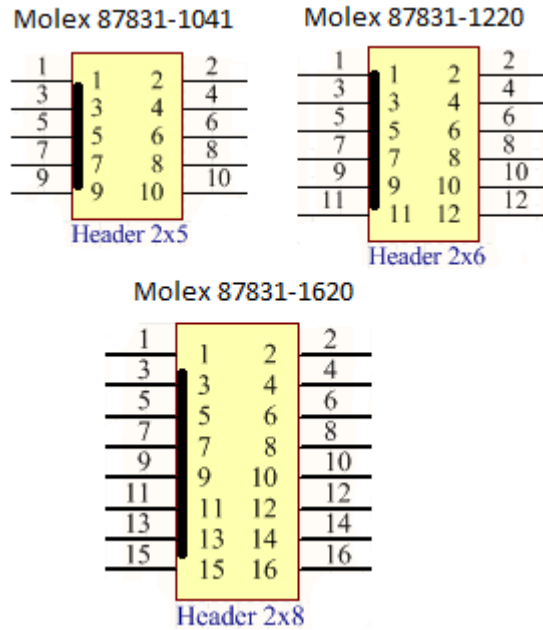
The following is a list of connectors that keep to standardized pinouts and connector types:

| Connector Number | Connector Type |
|------------------|----------------|
| 2 (J1600)        | SATA           |
| 4 (J1601)        | SATA           |
| 1 (J700)         | Compact Flash  |
| 10 (J1600)       | Mini PCIe      |
| 12 (J2400)       | ATX12 v2.2     |
| 11 (J900)        | Cat5e          |
| 11 (J1200)       | Cat5e          |

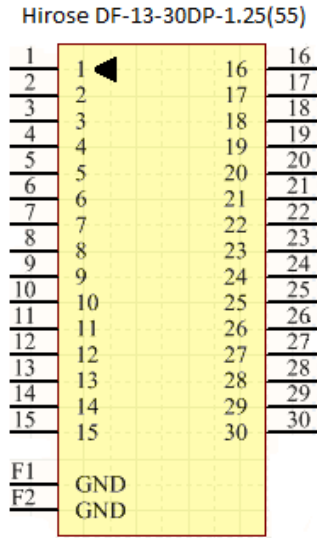
## Non-Standard Connectors

### Schematics

For the following connectors, the thick black line represents the connector's notched key slot:



For the following connector, the black arrow represents the pin-1 arrow indicator on the connector:



**Pinouts**

| Connector Designator | Interface Type | Connector Type   | Mating Connector |
|----------------------|----------------|------------------|------------------|
| 16 (J500)            | USB            | Molex 87831-1041 | Molex 51110-1060 |
|                      | Pin            | Pin              |                  |
| USB0 VCC             | 1              | 2                | USB1 VCC         |
| USB0 A N             | 3              | 4                | USB1 A N         |
| USB0 A P             | 5              | 6                | USB1 A P         |
| USB0 GND             | 7              | 8                | USB1 GND         |
| GND                  | 9              | 10               | GND              |

| Connector Designator | Interface Type | Connector Type   | Mating Connector |
|----------------------|----------------|------------------|------------------|
| 15 (J501)            | USB            | Molex 87831-1041 | Molex 51110-1060 |
|                      | Pin            | Pin              |                  |
| USB2 VCC             | 1              | 2                | USB3 VCC         |
| USB2 A N             | 3              | 4                | USB3 A N         |
| USB2 A P             | 5              | 6                | USB3 A P         |
| USB2 GND             | 7              | 8                | USB3 GND         |
| GND                  | 9              | 10               | GND              |

| Connector Designator | Interface Type | Connector Type   | Mating Connector |
|----------------------|----------------|------------------|------------------|
| 9 (J1300)            | Stereo Jack    | Molex 87831-1041 | Molex 51110-1060 |
|                      | Pin            | Pin              |                  |
| MIC2_L               | 1              | 2                | GND              |
| MIC2_R               | 3              | 4                | PRESENCE         |
| LINE2_R              | 5              | 6                | MIC2_JD          |
| GND                  | 7              | 8                | SPKR             |
| LINE2_L              | 9              | 10               | LINE2_JD         |

| Connector Designator | Interface Type | Connector Type          | Mating Connector        |
|----------------------|----------------|-------------------------|-------------------------|
| <b>8 (J1400)</b>     | <b>VGA</b>     | <b>Molex 87831-1041</b> | <b>Molex 51110-1060</b> |
|                      | <b>Pin</b>     | <b>Pin</b>              |                         |
| <b>X VGA RED</b>     | <b>1</b>       | <b>2</b>                | <b>X VGA GREEN</b>      |
| <b>X VGA BLUE</b>    | <b>3</b>       | <b>4</b>                | <b>N/C</b>              |
| <b>GND</b>           | <b>5</b>       | <b>6</b>                | <b>GND</b>              |
| <b>GND</b>           | <b>7</b>       | <b>8</b>                | <b>N/C</b>              |
| <b>VGA POWER</b>     | <b>9</b>       | <b>10</b>               | <b>GND</b>              |
| <b>N/C</b>           | <b>11</b>      | <b>12</b>               | <b>X VGA I2CDAT</b>     |
| <b>X VGA HSYNC</b>   | <b>13</b>      | <b>14</b>               | <b>X VGA VSYNC</b>      |
| <b>X VGA I2CCK</b>   | <b>15</b>      | <b>16</b>               | <b>N/C</b>              |

| Connector Designator           | Interface Type             | Connector Type          | Mating Connector        |
|--------------------------------|----------------------------|-------------------------|-------------------------|
| <b>5 (J1501)</b>               | <b>LVDS Backlight Ctrl</b> | <b>Molex 87831-1020</b> | <b>Molex 51110-1060</b> |
|                                | <b>Pin</b>                 | <b>Pin</b>              |                         |
| <b>GND</b>                     | <b>1</b>                   | <b>2</b>                | <b>+12V</b>             |
| <b>+5V</b>                     | <b>3</b>                   | <b>4</b>                | <b>+3V</b>              |
| <b>BACKLIGHT ANALOG</b>        | <b>5</b>                   | <b>6</b>                | <b>LVDS BKLT EN</b>     |
| <b>LVDS BKLT EN INVERTED</b>   | <b>7</b>                   | <b>8</b>                | <b>LVDS BKLT CRTL</b>   |
| <b>LVDS BKLT CRTL INVERTED</b> | <b>9</b>                   | <b>10</b>               | <b>GND</b>              |

| Connector Designator | Interface Type             | Connector Type                    | Mating Connector              |
|----------------------|----------------------------|-----------------------------------|-------------------------------|
| <b>7 (J1502)</b>     | <b>LVDS Backlight Ctrl</b> | <b>Hirose DF-13-30DP-1.25(55)</b> | <b>Hirose DF13-30DS-1.25C</b> |
|                      | <b>Pin</b>                 | <b>Pin</b>                        |                               |
| <b>LVDS A0-</b>      | <b>1</b>                   | <b>16</b>                         | <b>LVDS B1+</b>               |
| <b>LVDS A0+</b>      | <b>2</b>                   | <b>17</b>                         | <b>GND</b>                    |
| <b>LVDS A1-</b>      | <b>3</b>                   | <b>18</b>                         | <b>LVDS B2-</b>               |
| <b>LVDS A1+</b>      | <b>4</b>                   | <b>19</b>                         | <b>LVDS B2+</b>               |
| <b>LVDS A2-</b>      | <b>5</b>                   | <b>20</b>                         | <b>LVDS B CLK-</b>            |
| <b>LVDS A2+</b>      | <b>6</b>                   | <b>21</b>                         | <b>LVDS B CLK+</b>            |
| <b>GND</b>           | <b>7</b>                   | <b>22</b>                         | <b>LVDS B3-</b>               |
| <b>LVDS A CLK-</b>   | <b>8</b>                   | <b>23</b>                         | <b>LVDS B3+</b>               |
| <b>LVDS A CLK+</b>   | <b>9</b>                   | <b>24</b>                         | <b>GND</b>                    |
| <b>LVDS A3-</b>      | <b>10</b>                  | <b>25</b>                         | <b>GND</b>                    |
| <b>LVDS A3+</b>      | <b>11</b>                  | <b>26</b>                         | <b>N/C</b>                    |
| <b>LVDS B0-</b>      | <b>12</b>                  | <b>27</b>                         | <b>GND</b>                    |
| <b>LVDS B0+</b>      | <b>13</b>                  | <b>28</b>                         | <b>LVDS POWER</b>             |
| <b>GND</b>           | <b>14</b>                  | <b>29</b>                         | <b>LVDS POWER</b>             |
| <b>LVDS B1-</b>      | <b>15</b>                  | <b>30</b>                         | <b>LVDS POWER</b>             |

| Connector Designator | Interface Type | Connector Type   | Mating Connector |
|----------------------|----------------|------------------|------------------|
| 19 (J1700)           | Fan Power      | Molex 22-23-2031 | Molex 10-11-2034 |
|                      | Pin            | Pin              |                  |
| FB MOT-              | 1              | 2                | MOT+             |
| TACHO SIG            | 3              |                  | SER0 CTS         |

| Connector Designator | Interface Type | Connector Type   | Mating Connector |
|----------------------|----------------|------------------|------------------|
| 14 (J1900)           | RS-232/485     | Molex 87831-1020 | Molex 51110-1060 |
|                      | Pin            | Pin              |                  |
| SER0 RX              | 1              | 2                | SER0 TX          |
| SER0 RTS             | 3              | 4                | SER0 CTS         |
| N/C                  | 5              | 6                | N/C              |
| GND                  | 7              | 8                | N/C              |
| N/C                  | 9              | 10               | N/C              |

| Connector Designator | Interface Type | Connector Type   | Mating Connector |
|----------------------|----------------|------------------|------------------|
| 13 (J1901)           | RS-232/485     | Molex 87831-1020 | Molex 51110-1060 |
|                      | Pin            | Pin              |                  |
| SER1 RX              | 1              | 2                | SER1 TX          |
| SER1 RTS             | 3              | 4                | SER1 CTS         |
| N/C                  | 5              | 6                | N/C              |
| GND                  | 7              | 8                | N/C              |
| N/C                  | 9              | 10               | N/C              |

| Connector Designator | Interface Type | Connector Type   | Mating Connector |
|----------------------|----------------|------------------|------------------|
| 20 (P2400)           | PWR/RST        | Molex 53398-0571 | Molex 51021-0500 |
|                      | Pin            |                  |                  |
| PWRBTN#              | 1              |                  |                  |
| GND                  | 2              |                  |                  |
| NC                   | 3              |                  |                  |
| SYS RESET#           | 4              |                  |                  |
| GND                  | 5              |                  |                  |

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## Revision History

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The following table shows the revision history for this document:

| Release Date | Version | EGR/DOC | Description of Revision  |
|--------------|---------|---------|--|
| 08/2011      | A       |         | Initial Release.   |
| 02/2012      | B       |         | Redesign.  |
| 03/2012      | C       |         | Electrical modifications.  |
| 8/2014       | D       | DAG/ARP | Converted to new model number. Reworked to Acromag style. Updated phone numbers and email address. Removed conformal coating note. |