# Analog Breakout Data Sheet
# 2012 *FIRST* Robotics Competition

## Analog Breakout



Labels on figure:
- 4-40 x .75" (2PL)
- DB25 to NI 9201
- Selection Jumper
- Battery Voltage
- Ain8
- Input Header Ain8
- Ain1
- + Power Input
- - 6V-20V
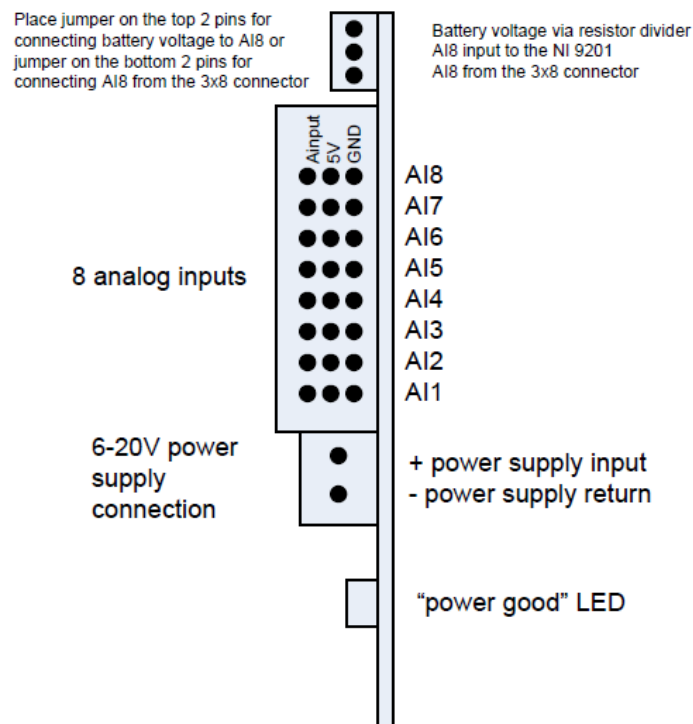- Power Good LED
- 5V Supply
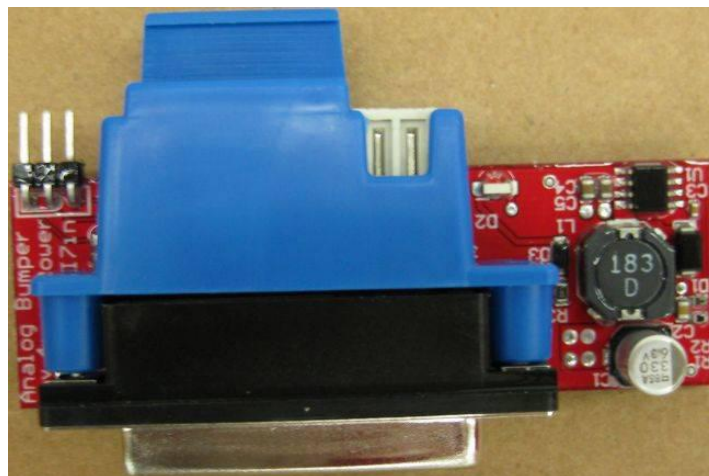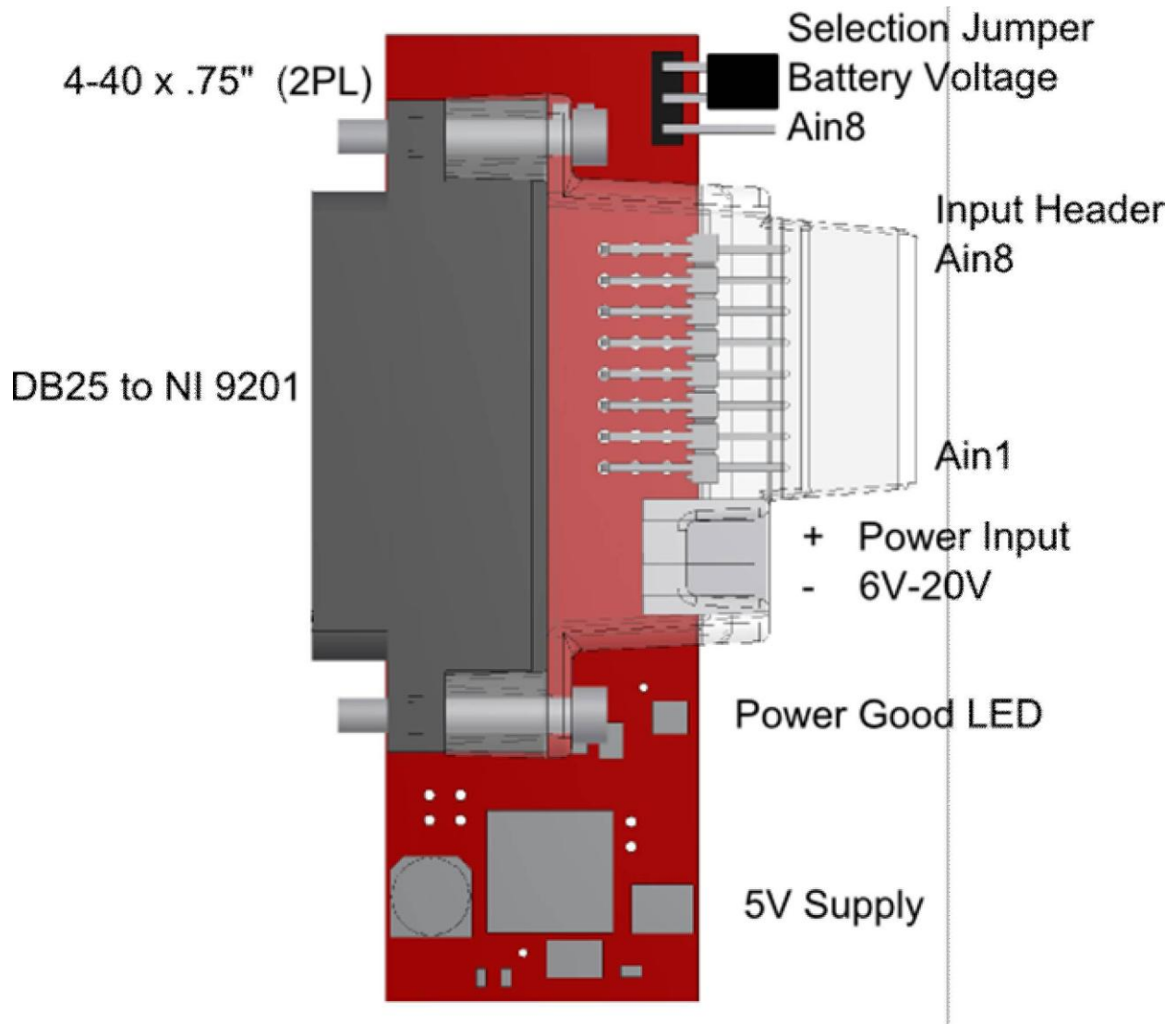
## Functional Description

The Analog Breakout is designed to make interfacing with the NI 9201 analog input module easier for FIRST teams. It adapts the DB25 interface to the familiar three row 0.1" pin field and provides a 5V rail to power sensors. The included plastic shroud provides an easy way to lock the connectors.

## Features

- 5V/0.25A power supply for providing power to analog sensors
- Wide-range power input for tolerating battery voltage variations
- Reverse Battery Protection
- Jumper to optionally connect battery voltage to AI8 for sensing battery/power input status
- Standard 3-pin PWM cable interface (5V, ground and analog input) for sensors with locking feature built into the plastic shroud
- DB25 connector with screw holes for securely mounting to an NI 9201 analog input module
- Per-Channel 1600Hz single pole filters.

## Pinout

### Analog Breakout – side view of connectors

Place jumper on the top 2 pins for connecting battery voltage to AI8 or jumper on the bottom 2 pins for connecting AI8 from the 3x8 connector

Battery voltage via resistor divider
AI8 input to the NI 9201
AI8 from the 3x8 connector

Ainput 5V GND

AI8
AI7
AI6
AI5
AI4
AI3
AI2
AI1

8 analog inputs

6-20V power supply connection

+ power supply input
- power supply return

"power good" LED

| PCB Reference Designator | Name | Description |
|---|---|---|
| J1 | DB25 | Mates to NI 9201 (with optional cable) |
| J2 | Analog Input | Mates to 8 3-conductor cables |
| J3 | Power Input | 734-162 mates to 734-102 Supplies power to the module |
| J4 | AI8 Select | Accepts 2 conductor Shunt Selects what AI8 is connected to |
| D2 | Power LED | Lit when power is applied |

## Typical Application

** Always refer to *FIRST* rules for using this module within competition robots. The following sequence describes an example application that may not fully comply with *FIRST* rules.

1) Plug the Analog Breakout module into an NI 9201 analog input module and secure with screws
2) Apply power to J3 from the PD via 5A breaker and smaller WAGOs
3) Select whether AI8 is to be connected to the 3x8 header or input power for battery sensing and apply jumper accordingly
4) Attach sensors via 3-pin PWM to the 3x8 header with careful consideration of polarity

## Specifications

| Parameter | Min | Nom | Max | Units | Description |
|---|---|---|---|---|---|
| Vin Survive | -20 | | 20 | V | Survivable voltage on J3 |
| Vin Operational | 5.6 | 12 | 15 | V | Acceptable voltage on J3 for normal operation |
| Vout | 4.9 | 5 | 5.1 | V | Output Voltage of linear supply |
| Iout Total | | | 0.25 | A | Output Current of linear supply |
| Iout / Channel | | | 0.25 | A | Output Current per pin |
| AI Voltage | -10 | | 10 | V | Input on any AI pin on J2 (from 9201) |
| AI8 Divider | 0.590 | 0.595 | 0.6 | | |

## Troubleshooting and FAQ

### How do I build a cable for passing 12V power to the Analog Breakout?

- Take a color coded pair of 22AWG or better wire and cut to length
- Optionally twist the pair now for better cable management.
- Strip 7mm off the ends.
- To insert wire into a WAGO 734-102 connector, push down on the actuation port in back with a screw driver, or use an actuation lever.
- Insert the positive wire in the right port of the WAGO 734-102 connector. Note: the correct orientation can be verified by looking at the silk screen on the Analog Breakout
- Insert the negative wire in the left port of the WAGO 734-102 connector.
- Give a smart tug to verify the connection is secure.

- Verify proper polarity. Plug the new cable into a Solenoid Breakout. If the green LED lights, the cable is correct.
- Insert the WAGO 734-102 into the mating connector on the Breakout.

### How do I measure the battery voltage using the Analog Breakout
- Use a shunt (jumper) to connect the outer two pins of the "AI8 Select" connector
- Battery voltage is reduced to ~40% of its actual value by a 680/1k voltage divider and filtered by a 0.1uF capacitor.

### Why isn't AI8 working?
- Use a shunt (jumper) to connect the inner two pins of the "AI8 Select" connector.

### My sensors don't work, and D2 isn't lit. Why?
- Check with a multi-meter to see if you are getting power onto J3. Is a breaker missing?
- The Analog Breakout is not protected from reversed polarity on J3. Did you wire it backwards? You may need to replace the module.

### How do I connect a potentiometer?
- Connect the wiper to the input pin – Top row.
- Connect the other two pins to +5 and ground – Middle and bottom rows.

### My sensor draws more than 0.25A. Can I use it?
- The circuit can source burst currents up to 1.0A, but steady state dissipation is limited by power dissipation.
- If you need higher steady state current, please use a 2009 Analog Breakout.

Note: the supply will thermal shut down if overused. No damage will occur but it could shut down in the middle of a match. If you want to try pushing the envelope install a jumper on one of the analog channels so that you are monitoring the power supply.

## Mechanicals



ALL DIMENSIONS ARE IN "INCH [MM]"

1.934 [49.12]
.831 [21.10]

.635 [16.14]
.556 [14.12]
2X .309 [7.85]
.326 [8.28]
2.178 [55.32]
3.095 [78.61]
2X ⌀.120 THRU