Ajile
Light Industries

Ajile Isolated Trigger Board Hardware User's Guide

AJL-TRG-01-01

Draft Version 1.0 – March 8th, 2018

Revision History

March 3rd, 2018	DSO	Initial Release

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1.0 - Introduction

1.1 - Board Overview

Congratulations on your choice of the Ajile AJL-TRG-01-01 optically-isolated high-speed bi-directional trigger interface board. Designed to complement the Ajile series of camera and DMD controller boards, this interface board features 850v of isolation between the external trigger ports and the rest of the system, ensuring clean, accurate triggering in even the most challenging environments.

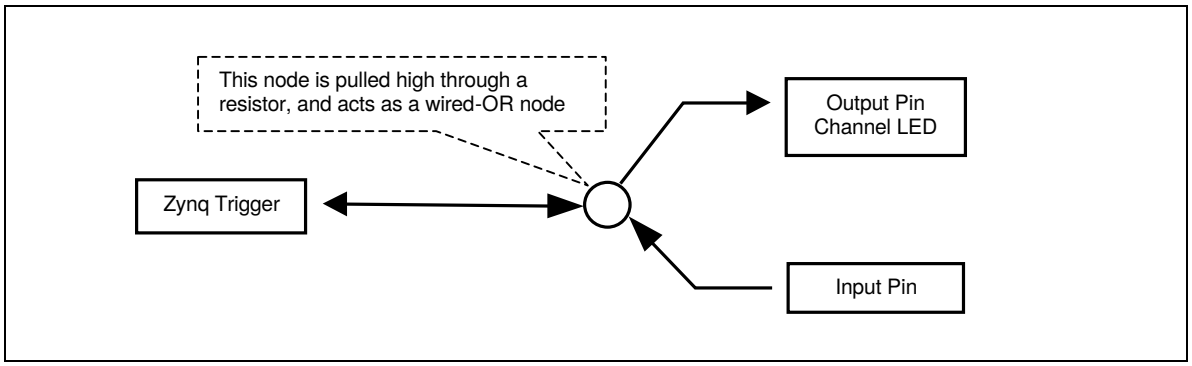
Overview of Ajile Optically-Isolated Trigger Board Features:

- *4-trigger breakout module featuring bi-directional triggers for maximum flexibility*
- *Full optical isolation, providing trigger isolation up to 850V*
- *High-speed, low latency operation*
- *Flexible trigger input structure allows for compatibility with most single-ended I/O standards*
- *Output pins can be safely zener clamped to a lower voltage if +5v is excessive*
- *Operates from a single +5v supply provided through 6-pin trigger/power cable*
- *Status indicators for board power and trigger channel state*
- *Pass-through feature allows for external fan power*

The form factor of this board features a mounting pattern compatible with other Ajile system boards allowing for convenient board-stacking when used as part of a multi-board module.

The Ajile AJL-TRG-01-01 is designed for reliable, high-performance service as part of Ajile applications that require high-speed but electrically-isolated triggers, providing maximum flexibility to even the most demanding end-use applications.

Trigger I/O structure



1.2 - Bi-directional Trigger Structure

In order to support fully bi-directional triggers and full optical isolation, a unique external trigger structure is supported. Since it is difficult to make 'bi-directional' optical isolators, instead each trigger pin is connected to a unique input and output pin on the external trigger interface. This results in a configuration where an input pin is matched to a corresponding output pin, and also connected to a violet LED indicator to indicate channel state. These raw pins are connected across the optically-isolated interface, and connected into this unique I/O structure on the 'low-voltage' side of the trigger interface.

The combination of a Zynq trigger, an input pin, an output pin, and a channel state LED are thus all connected to a single node, which in turn is pulled up to a high logic level through a pullup resistor. This is the normal state of 'off' for this I/O structure.

The output pin and the channel indicator can be driven high if the voltage at the trigger node falls to a logic low level, and this output state (and channel state LED) directly indicates this node state.

Two conditions can be met to drive the trigger node to a low state, and those are:

- A high trigger input is connected to the external trigger input matched to the associated trigger node.
- The Zynq drives the trigger node low directly.

Note that the Zynq must be configured for open-drain drive for correct trigger board operation. It must not directly drive the trigger pin high or anomalous operation may be observed.

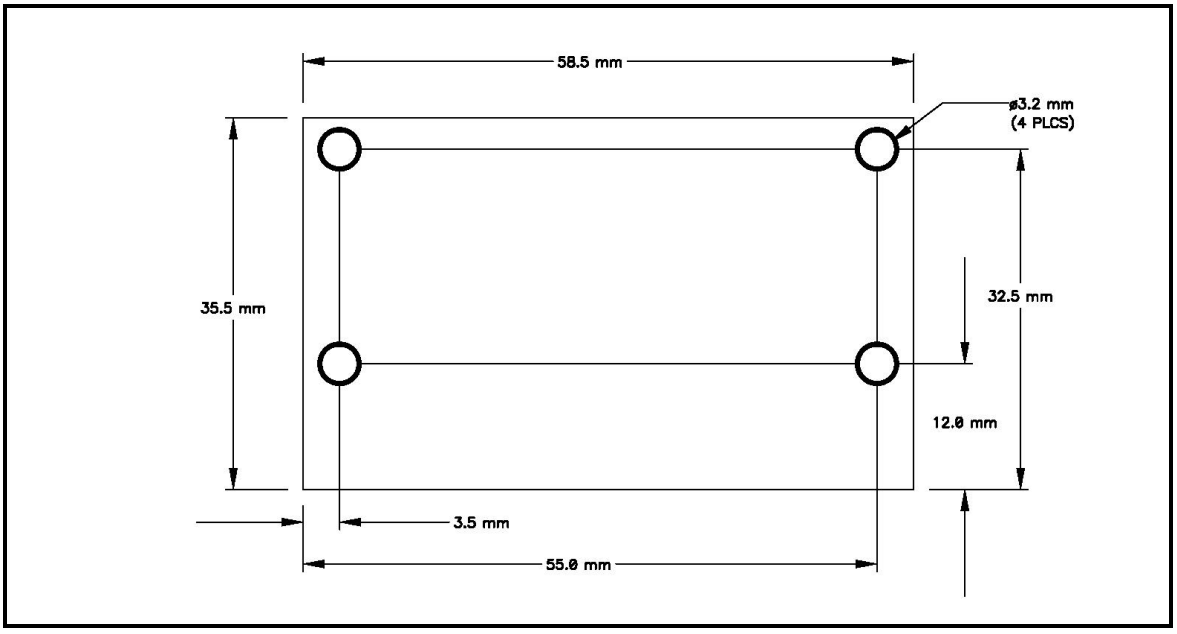
These two inputs are configured in a wired-OR configuration, so either input can override the state of the other. This is the normal configuration used when a Zynq trigger pin is configured as an output trigger. In this case the corresponding input is then ignored/unconnected, and the Zynq is solely responsible for setting the state of the internal trigger node.

If the Zynq trigger pin is configured as an input rather than an output, then the state of the trigger node can be monitored directly. Since only the input pin can drive this node low when configured in this manner, the state of the input pin can thus be monitored, with this state reproduced at the corresponding output pin and on the channel state LED.

1.3 - Basic Installation and Mounting

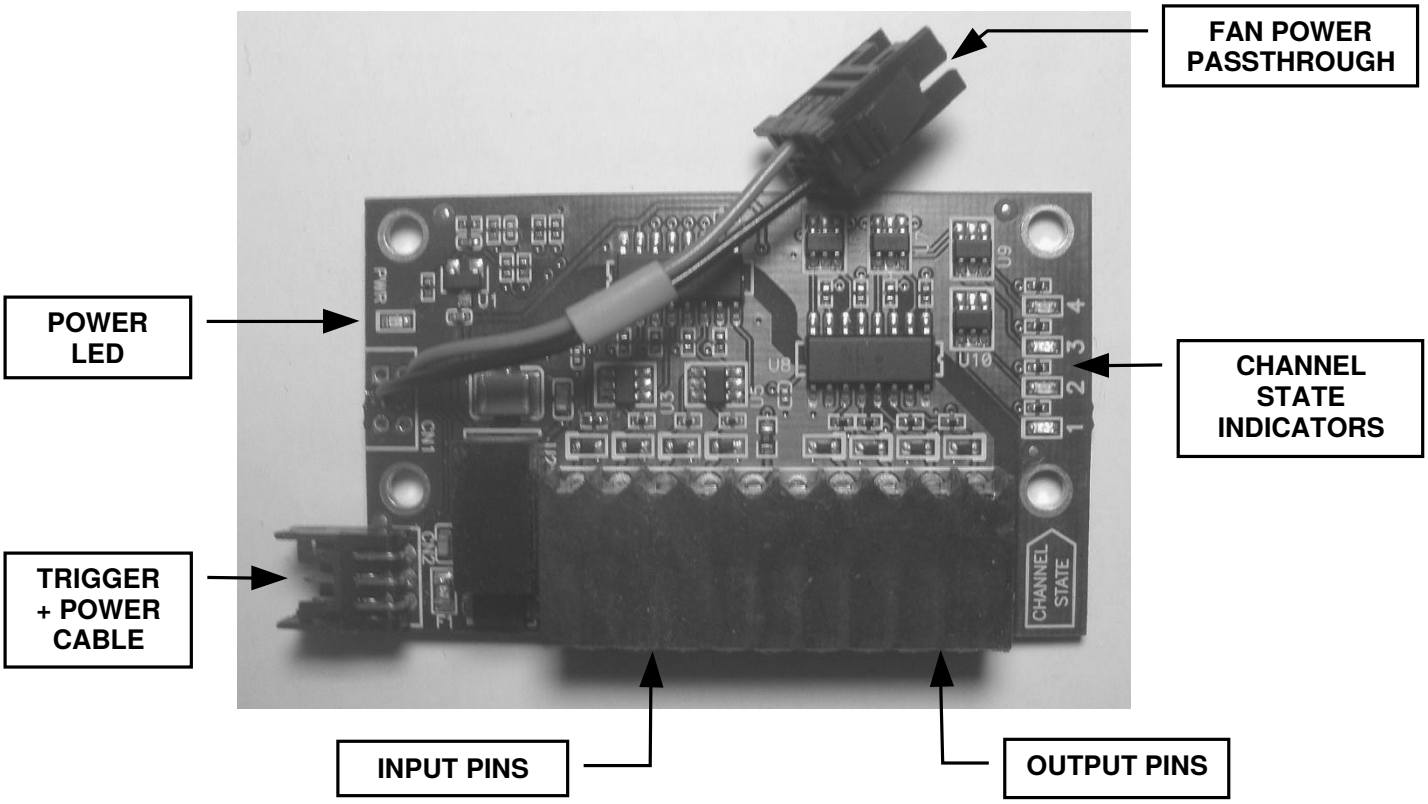
Four (4) mounting holes are provided to suitably affix the board to a support plate or chassis in the end-use device. Note that these holes are in a standard configuration to allow for stacking of Ajile boards for prototyping or production. Overall board dimensions and hole locations are as noted below:

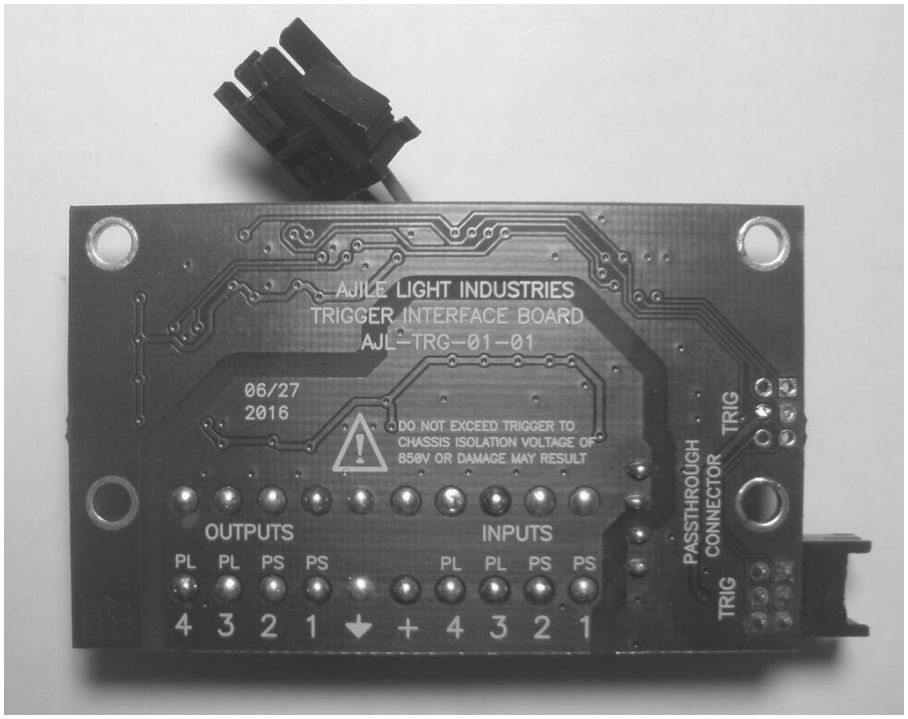
Ajile Trigger Interface Board, Mechanical Dimensions for Mounting, Top View



Note that these dimensions are circuit-board dimensions, and do not take into account peripheral space required for connectors. Mounting should also take into consideration overall cooling considerations and issues.

1.4 – External Connections and Indicators





1.4.1 - Fan Power connector

This provides a power passthrough to allow the use of a +5.0v fan if required, or if this board is added to a system with a fan currently plugged into the raw trigger connector on an Ajile controller.

1.4.2 - Trigger/Power connector

This is the main connection to the Ajile controller board. This carries the 4 raw triggers from the connected Ajile controller board, plus includes a +5.0v power feed and a system ground input for integrated board power.

1.4.3 - External Trigger connector

This connector has the optically-isolated external trigger inputs and outputs. There are 10 pins, with 4 allocated as channel inputs, 4 allocated as channel outputs, a ground pin, and a +5.0v reference pin. This +5.0v pin is not suitable for driving external devices, however if it is connected to a trigger input, it will drive the pin high. This is to allow for easy connection of dry-contact triggers into the system in addition to triggers that are active drive.

1.4.4 - Power LED

When the board is powered and functioning, this LED lights to indicate normal internal power state.

1.4.5 - Channel State indicators

These 4 violet LED's indicate the internal state of the trigger node for each of the 4 trigger channels, and thus also indicate the state of the output pins of the trigger interface. A lit channel-state LED indicates that the node is 'active', and that the state of the corresponding output trigger pin is high. Once the trigger node is set 'inactive', both the trigger output and the channel state LED are both set low.

The channel state indicators make useful channel state information available at a glance regardless of whether the associated trigger is being used as an input or an output.

Channel LED Trigger Mapping:

Channel LED	Internal Trigger Node State
1	Trigger 1: Lit = Trigger Active
2	Trigger 2: Lit = Trigger Active
3	Trigger 3: Lit = Trigger Active
4	Trigger 4: Lit = Trigger Active