Blinky Box® TG2122 & TG2124
Optically Isolated Impulse Distributor
User's Manual

RoHS Compliant & Pb Free*

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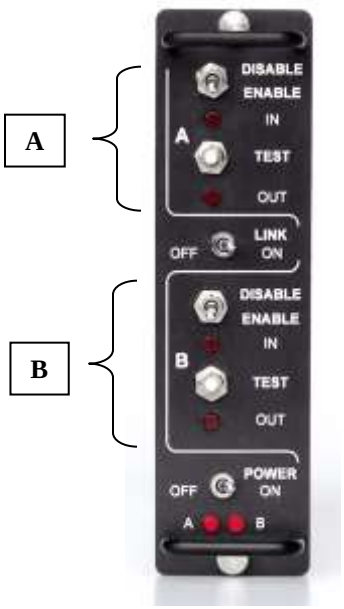
* Per Directive 2002/95/EC.



EACH CHANNEL A/B

DISABLE/ENABLE – allows blocking of incoming impulses but still allows monitoring of incoming impulses by the "IN" L.E.D.

IN – Visual indication of incoming impulses and short-circuit detection.

TEST – Allows an output impulse on demand (note: is after the Disable/Enable switch)

OUT – Visual indication of output impulses.

LINK – Used to engage the optically isolated "OR" circuit to create 4 outputs (8 for TG2124) at the first input impulse regardless of which channel is received. Also may be used to create a 1 input, 4 output channel for TG2122 (1 input, 8 output for TG2124).

POWER – Power switch for both A/B channels for onboard 9-volt batteries or external power via the isolated power supply module (on equipped World Cup and Nations Cup editions).

BATTERY CONDITION INDICATORS – Status of battery for each channel.
Flashes slowly (once every second) when battery ≤ 6 volts.
Flashes rapidly (twice a second) when battery ≤ 5 volts.

ALL CONNECTIONS THROUGH 4MM BANANA SOCKETS
NORMALLY OPEN (NO) WORKING CONTACTS

A Channel – 1 input, 2 optically isolated outputs for Channel A (TG2122)
1 input, 4 optically isolated outputs for Channel A (TG2124)

B Channel – 1 input, 2 optically isolated outputs for Channel B (TG2122)
1 input, 4 optically isolated outputs for Channel B (TG2124)

When LINK is engaged – First impulse on either A or B channel will create 4 optically isolated, simultaneous output impulses through both A/B output jacks. In this mode you can also create a single input with 4 isolated outputs to 4 completely isolated timing systems for extra redundancy. The TG2124 card can output 8 completely isolated output impulses per channel when jumpers are enabled on card.

Blinky Box ® Theory of Operation

0. Overview

Each Blinky Box® module is configured as two separate but identical impulse isolator circuits with a unique bi-directional link by which an impulse from the A-side or the B-side of the circuit -- whichever occurs first -- can simultaneously fire all four outputs of the board.

The board is designed to operate on low voltage and current to conserve battery life. In the multiple channel configuration, it can optionally be powered by off-board isolated power supplies. On-board 9-volt batteries are accessed by pulling the board about 75mm (3") out of its housing. Power indicator LEDs, one for each channel, light steadily if power is good, flash about once per second when battery power starts to get low (< 6-volts), and twice per second when the battery drops below 5-volts.

1. Pulse Inputs

Input pulses can be enabled or disabled from the front panel. A red LED lights when an impulse is received and remains lit in the event of a short on the input line.

A momentary push-button test switch is provided to trigger the outputs manually. This can be done with the input disabled.

Proprietary input circuitry allows operation with very long lines (2000 Ω).

2. Pulse Processing

Pulse inputs are conditioned to block out radio frequency interference, protected against over-voltage spikes, and processed using a quartz timebase. There are two internal settings on each channel of the board to accommodate different operating conditions. Switch bounce lockout time is presettable, as well as the ability to adjust the minimum time between input pulses. See *Advanced Settings* section for more detail.

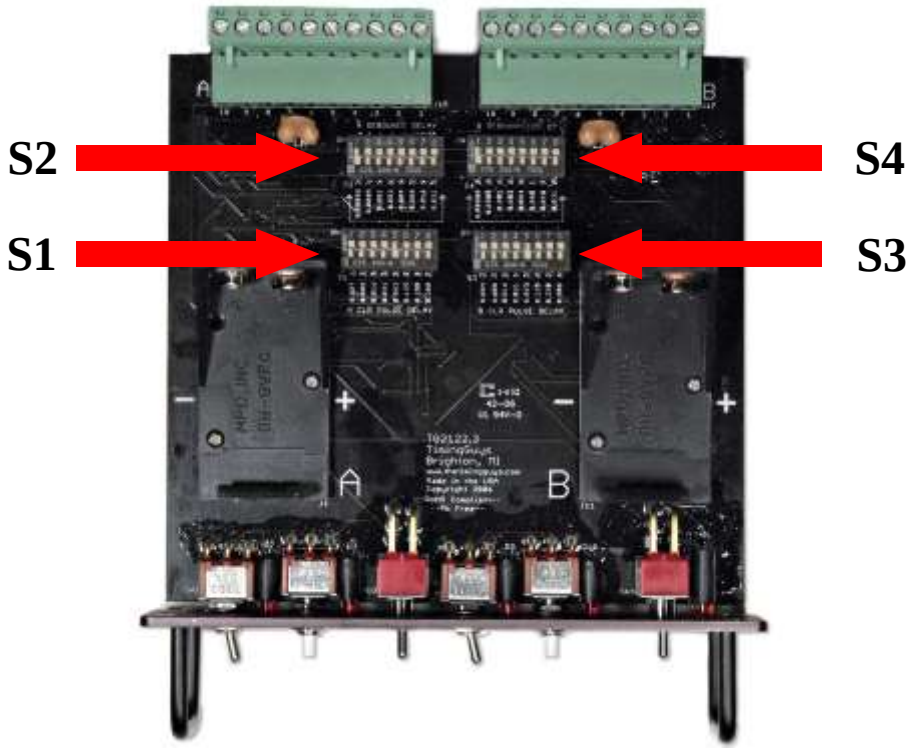
3. Pulse Outputs

After internal processing, input pulses fire a pair of opto-isolators in each channel. These provide a transistor "contact closure" to external devices. Red output LEDs light to indicate when the outputs have triggered. Outputs are fully isolated from each other. There is also complete isolation between board channels, and the Link connections are bi-directionally opto-isolated.

4. Power

Critical timing circuits are electronically voltage stabilized. When off-board power is supplied, switchover from internal battery to external power is fully automatic.

Advanced Settings



NOTE: Only ONE switch may be ON in each Dip Switch Bank for proper function and Switch Debounce Settings must be smaller than Clear Pulse Delay settings (the time when 2 sequential impulses are treated as one). All channels used should be set with the same values.

(S2 & S4) **Switch Debounce Delay:** **(Typical Measured Values)**	**(S1 & S3)** **Clear Pulse Delay Settings:**
Dip 1 = 0.0002	Dip 1 = 0.004
Dip 2 = 0.0006	Dip 2 = 0.008
Dip 3 = 0.0011	Dip 3 = 0.016
Dip 4 = 0.0021	Dip 4 = 0.031
Dip 5 = 0.0041	Dip 5 = 0.063
Dip 6 = 0.0080	Dip 6 = 0.125
Dip 7 = 0.0158	Dip 7 = 0.250
Dip 8 = 0.0314	Dip 8 = 0.500

Blinky Box® World Cup Edition with 12 Modules

Alternate Configurations:

World Cup Edition

12 module maximum in custom designed case with TG2122 cards or up to 6 modules with TG2124 cards.

Nations Cup Edition

6 module maximum in custom designed case with TG2122 cards or up to 3 modules with TG2124 cards.

Redundant Power Supply Module Specs (future development)

The redundant power supply module contains an isolated power distribution system to 11 modules (22 channels) via an external battery (not included) by a 4 pin XLR connector and an isolated beeper for acoustic feedback of a received impulse on any channel. The acoustic beeper will have a mute switch and a separate LED for visual indication of activity. For maximum power flexibility, a set of internal DIP switches will allow you to turn off any of the unused, redundant power distribution channels to maximize battery life.

Technical Specifications and Drawings
Timing Guys, Inc. TG2122/TG2124 Module

The World Cup and Nations Cup versions can contain an isolated, redundant power supply distribution system and adds an acoustical/visual system for all input impulses (future development).

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Input Triggering – 120 impulses/second maximum.
De-bounce S2- Dip 1 On
Delay S1- Dip 2 On
Input pulse duty cycle 20-80%

Output Signal – Adjustable: 0.004 - 0.500 sec., depending on setting of Clear Pulse Delay switch. (normally open working contact)

Triggering Delay – Adjustable	Min. Adjustment:	0.0002
	Max. Adjustment:	0.0314
Clear Pulse Delay – Adjustable	Min. Adjustment:	0.004
	Max. Adjustment:	0.500

Working Temperature - -40ºC to +50ºC

Internal Power Supply – 2 x 9 V Alkaline (6LR61) batteries, isolated, one per channel

External Power Supply – 6-18 V DC via optional power supply module (Redundant)

Triggering Indicator – L.E.D. with short-circuit detection (x 2)

Output Indicator – L.E.D (x 2)

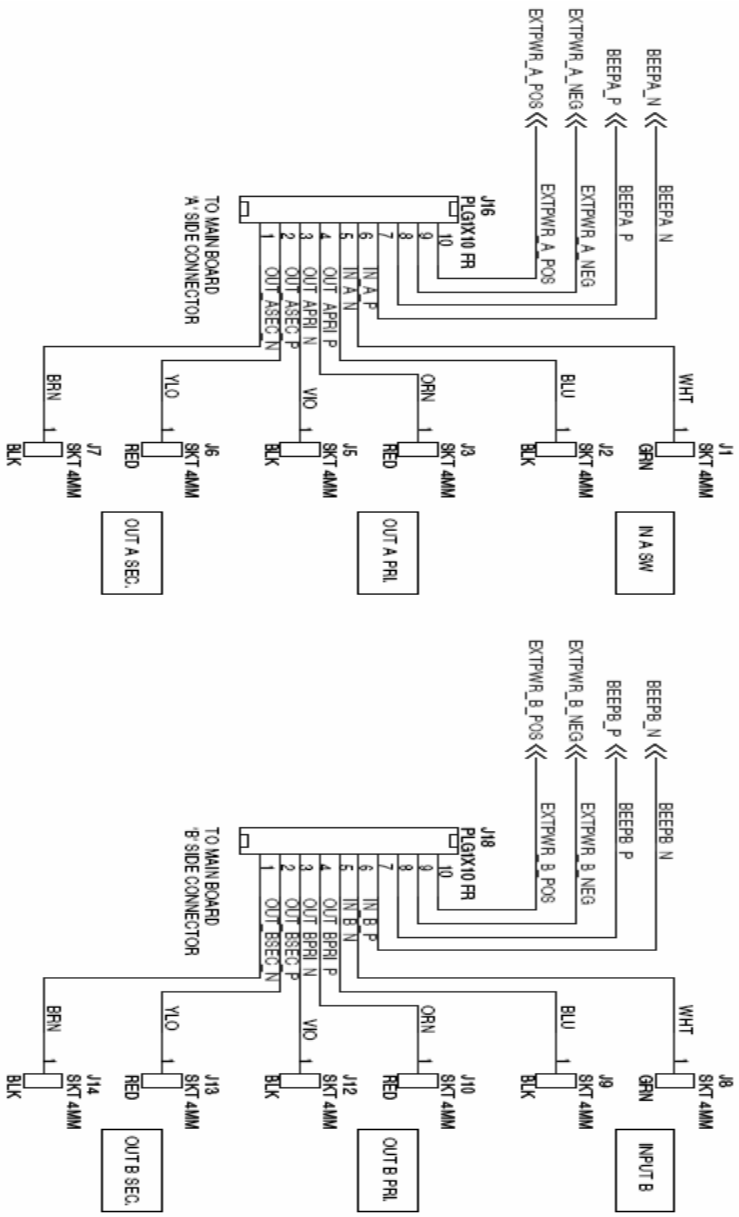
Battery Condition Indicator – L.E.D. with flashing low voltage indication (x 2)

Housing- Aluminum, aluminum extrusion and laser etched aluminum face plates

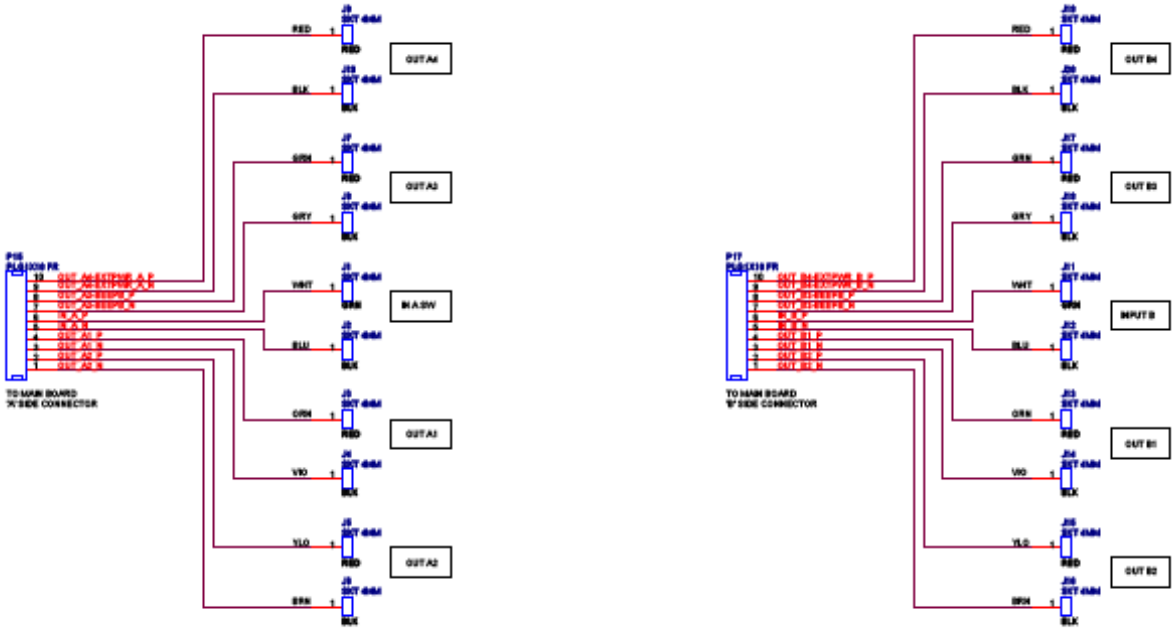
Dimensions – 215mm x 141mm x 40mm

Weight (incl. batteries) – 750 grams ; World Cup Version with 12 modules – 10 kg

Rear Panel Connector Harness TG2122



Rear Panel Connector Harness TG2124

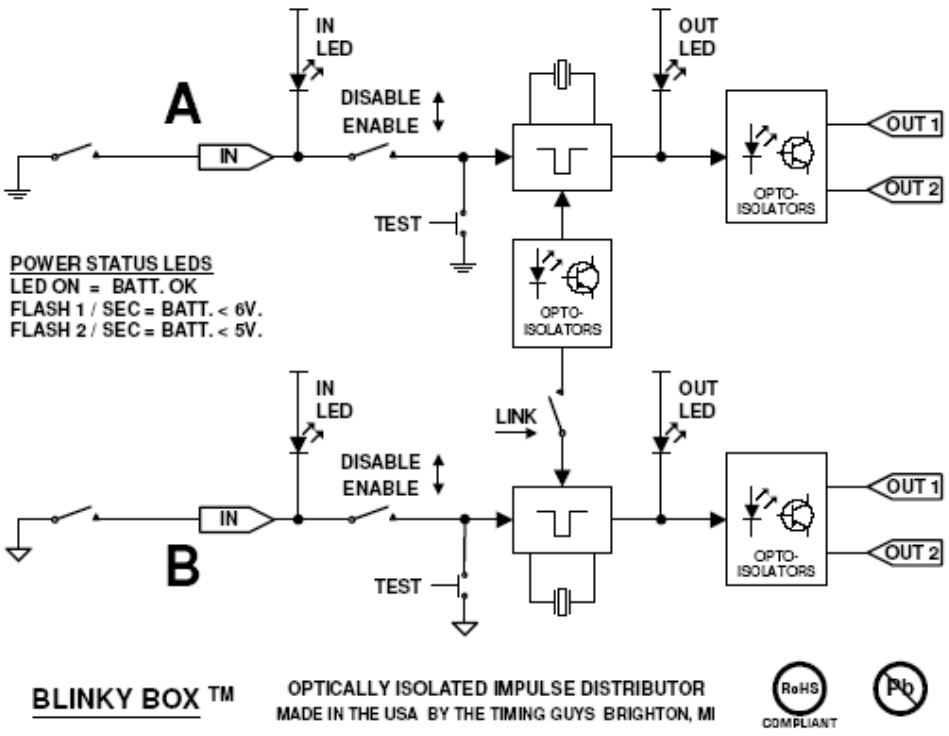


Note:

Alternate wiring, when jumpers enable the extra outputs, is to repeat wire colors from pins 1-4 for pins 7-10.

Jumpers located near the wire harness connector selects how pins 7-10 are utilized. When jumpers are in the Xout position, pins 7-10 are 2 extra isolated outputs on each channel.

Simple Block Diagram of Impulse Flow



Current manual can always be found on the web at:
www.thetimingguys.com or www.blinkybox.com

Your comments are always welcome at info@thetimingguys.com

ALWAYS REMOVE BATTERIES FOR LONG TERM STORAGE.

Technical Notes:

Line Interface Details for CASCADE OPERATION:

The + Input connector on the TG2122/TG2124 board supplies between 1 and 2 milliamps to the gate switch in normal operation.

With a good built-in safety factor, the board will correctly read the gate switch with up to about 2,000 ohms of line resistance.

With #24 solid wire, this is a 12km long circuit. The TG2122/TG2124 board have been designed for the specifications of *guaranteed* operation with a 6km circuit (~1,000 ohms).

But when operating with "cascaded" Blinky Box® TG2122/TG2124 boards, that is, the output of one board feeding the input of another, the line length must be "de-rated."

The Blinky Box® board's output is thought of as a 10 mSec "contact closure." It is actually the collector and emitter contacts of an optocoupler's photo-transistor. Unlike a relay whose contact resistance is measured in milliohms, the optocoupler has a "contact" resistance of about 400 ohms. When operated "cascaded" this output resistance must be added to any line resistance to get the total circuit resistance. 400 ohms equates to a little over 2km of line, so in "cascade" mode the line should be limited to about 4km. or 600 ohms.

FALSE POSITIVES

The Blinky Box® "Enable/Disable" switch can be used to test a line without triggering the output, and a "false positive" indication is a reliability feature.

When "Enabled," the Blinky Box® feeds more current into the line than when "Disabled." This safety factor guarantees that if the line looks OK when "Disabled" it will work correctly when enabled."

It's possible to get an output trigger when "Enabled" even if the Input LED won't light when "Disabled." What this means is that the Blinky is reading the gate switch, but the line resistance is too high for reliable operation. And if correct operation can't be guaranteed the line shouldn't be used.

Technical Notes: