

Model T860

Compact Logic Buffer and Driver



Technical Manual

August 15, 2023

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1 Introduction

This is the technical manual for the Highland model T860 Buffer/Driver module.

The T860 is a general-purpose, GHz-speed discriminator and output driver.

Features of the T860 include:

- General-purpose fast logic buffer/driver
- Excellent as level translator, fet driver, laser driver, or clock buffer
- Accepts single-ended or differential inputs with user-adjustable logic threshold
- Single-ended output is adjustable for Vlow and Vhigh levels, up to 2.6 volts swing into 50 ohms
- Usable from DC to 1 GHz
- Rise/fall times below 200 picoseconds, 1 volt into 50 ohms
- Drives TTL, CMOS, ECL, PECL, RSECL, and CML loads
- 100 mA maximum output is suitable for driving lasers, LEDs, GaAs fets, transistors, e/o modulators, SRDs, cables, and oscilloscope triggers
- Converts nearly any signal or RF generator into a versatile logic or clock driver
- External universal power supply or 12-volt DC power
- Compact, rugged extruded anodized aluminum enclosure

2 Specifications

| | |
|-----------------------|--|
| FUNCTION | General-purpose, DC coupled discriminator and logic driver |
| INPUTS | Polarity: Single-ended (positive or inverting) or differential levels Range: ± 50 mV to ± 2.5 volts (at either input) Internal Terminations: $50\ \Omega$ |
| THRESHOLD | User adjustable: -2.5 to +2.5 volts |
| PROPAGATION DELAY | 1.2 ns, typical (input to main output or TRIG out) |
| OUTPUT | V low: adjustable -4 to +4 volts (-2 to +2 volts into $50\ \Omega$) V high: adjustable -3.5 to +5.2 volts (-1.75 to +2.6 volts into $50\ \Omega$) Max swing: 5.2 volts peak-to-peak (2.6 volts into $50\ \Omega$) Max Source Current: ± 100 mA Source impedance: $50\ \Omega$ |
| TRIGGER OUTPUT | +0.6 volts into $50\ \Omega$, typical (coincident with main output) |
| BANDWIDTH | DC to 1 GHz (1 volt peak-to-peak into $50\ \Omega$) DC to 500 MHz (2.6 volt peak-to-peak into $50\ \Omega$) |
| RISETIME | < 200 ps at 1 volt peak-to-peak into $50\ \Omega$ < 280 ps at 2.5 volt peak-to-peak into $50\ \Omega$ |
| FALLTIME | < 200 ps at 1 volt peak-to-peak into $50\ \Omega$ < 280 ps at 2.5 volt peak-to-peak into $50\ \Omega$ |
| JITTER | < 3 ps RMS |
| OPERATING TEMPERATURE | 0 to 60°C; extended MIL/COTS ranges available |
| CALIBRATION INTERVAL | One year |

| | |
|------------|---|
| POWER | +12 volts at 0.7 amps, maximum Highland J12 wall-plug adapter furnished |
| CONNECTORS | Gold plated SMB or SMA In+, In-, TRIG and OUT connectors Front panel test jacks for THR and MON measurement 2.1 mm X 5.5 mm barrel power connector, center positive |
| INDICATORS | LEDs: green power on, blue logic input high |
| PACKAGING | 4.75" (L) x 4.0" (W) x 1.25" (H) extruded anodized aluminum enclosure Optional T566 mounting flange available |

3 Overview

The T860 consists of an input discriminator, an output driver, and associated power supplies.

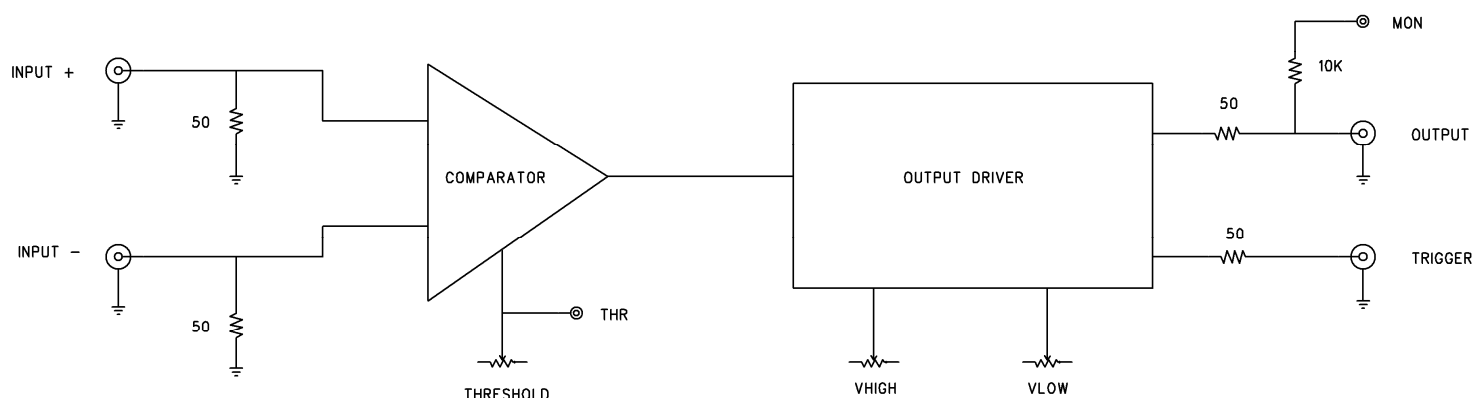


Diagram 1: Signal flow diagram

Single-ended inputs may be applied to the INPUT+ connector for non-inverting operation, or to the IN- connector to invert. Differential inputs may be applied to both connectors.

A trimpot is provided to set the input threshold. The voltage at the THR test point is equal to the threshold voltage at which $(IN+) - (IN-)$ trips the comparator. For single-ended positive inputs, this is simply the standard trigger level. For differential inputs, the threshold voltage is commonly adjusted to zero. The blue LVL LED illuminates when the comparator output is high.

Any common RF signal generator can be used to drive the IN+ input, with the threshold set to zero, allowing the T860 to become a wide-range digital clock generator. Adjustment of the threshold pot can alter output duty cycle.

The VH and VL pots set the respective high and low output voltages. VLOW is adjustable over the range of ± 4 volts as measured into a high-impedance load, and VHIGH is adjustable from -3.5 to +5.2 volts. Output swing is limited to about 5.2 volts peak-to-peak. All voltages are reduced 2:1 if the unit drives an external 50 Ω load.

Note that, because the T860 source-terminates its outputs, the output can drive a 50 Ω coaxial cable ending in a high-impedance load, such as a logic gate, and achieve full open-circuit signal swing without termination or reflection issues. Similarly, it can drive a laser or other unmatched device without explicit 50 Ω terminations at the load.

The TRIG output is a positive 1.2 volt level (+0.6 volts into 50 Ω) that tracks the high/low states of the main output. It is usable as an oscilloscope trigger or other timing reference.

A MON test jack is provided. This is connected to the main output through a 10 k resistor, so that a DVM can be used to check the static output levels.

4 Typical Performance

Illustration 1:

300 MHz square wave output, 2 volts peak-to-peak into a 50 Ω load.

Risetime is 155 picoseconds

Falltime is 203 picoseconds.

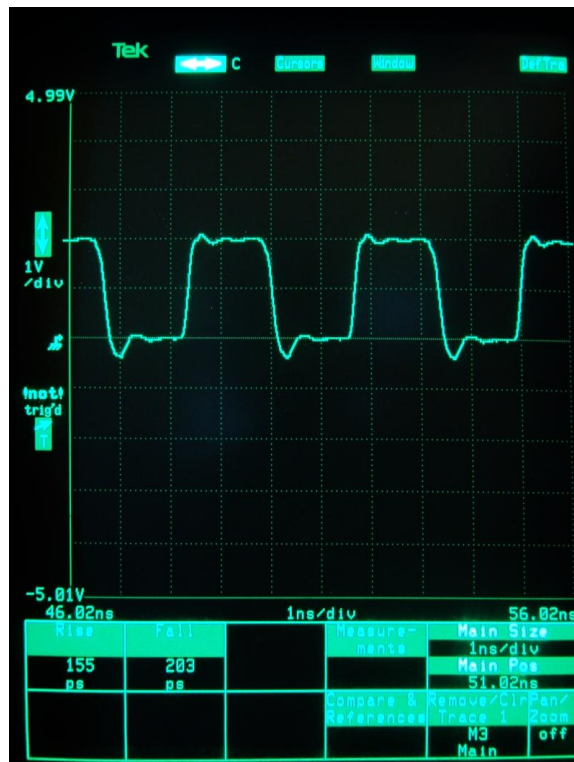


Illustration 2:

1 GHz square wave output driving 2 volts peak-to-peak into a 50 Ω load



Illustration 3:

Upper trace, main output.

Lower trace, TRIG out.

Both 200 mV/cm, both
driving 50 Ω loads.

Trigger output edges are
typically 260 picoseconds.

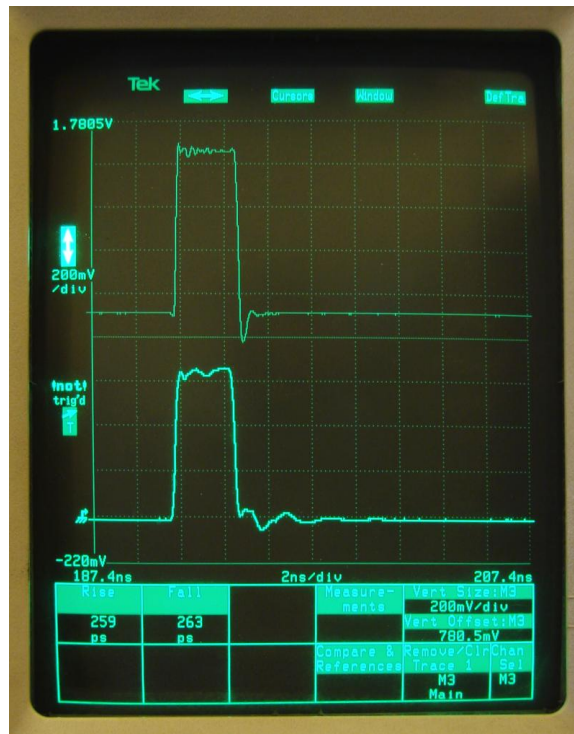
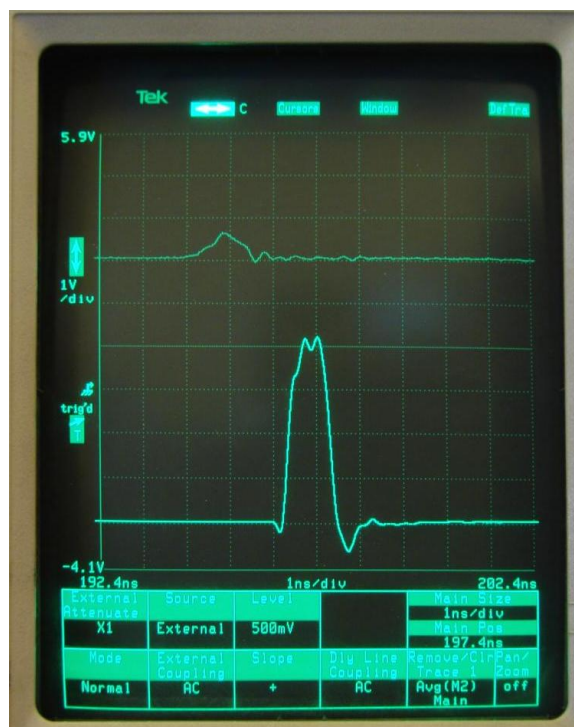


Illustration 4:

Input: 50 mV peak, 1 ns wide
Pulse from Highland P400 pulse/
delay generator

Output: 4 volt pulse into high
impedance load.



5 Connectors and Installation

5.1 Mechanical Installation

The T860 mechanical dimensions are shown in section 6. It is preferred that the enclosure is securely bolted to a grounded metal surface. If rear fastener access is not convenient, the T566 mounting flange is optionally available.

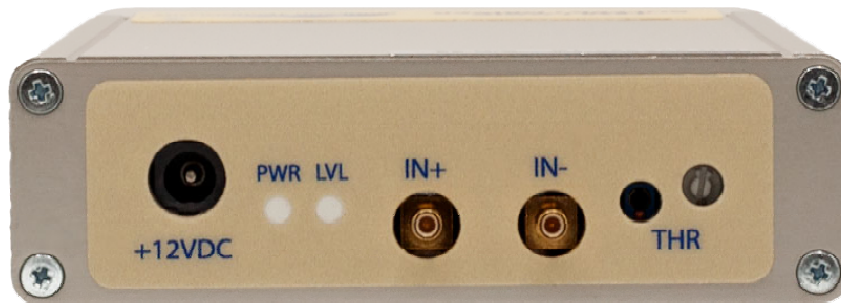
5.2 Connectors

The T860 includes the following connectors:

| FUNCTION | CONNECTOR TYPE | FUNCTION |
|----------|-----------------|----------------------------------|
| IN+ | SMB or SMA jack | Positive (non-inverting) input |
| IN- | SMB or SMA jack | Negative (inverting) input |
| OUT | SMB or SMA jack | Signal output (adjustable level) |
| TRIG | SMB or SMA jack | Trigger output (fixed level) |
| THR | Tip jack | Trigger level monitor |
| MON | Tip jack | Vout level monitor |
| PWR | 2.1 mm x 5.5 mm | +12 volt power input |



T860-1 Signal Endplate w/ SMB connectors



T860-1 Power Endplate w/ SMB connectors



T860-2 Signal Endplate w/ SMA connectors



T860-2 Power Endplate w/ SMA connectors

Dimensions and Mounting

T860 mechanical dimensions are shown below. The optional T566 mounting flange may be bolted to the bottom of the extruded enclosure to make it easier to install on mounting surfaces which do not have rear access. Captive female 4-40 machine inserts on the underside of the enclosure enable bottom mounted configurations.



CAUTION: Mounting screws may not penetrate more than 0.160 inches (4 mm) into the T860 enclosure.

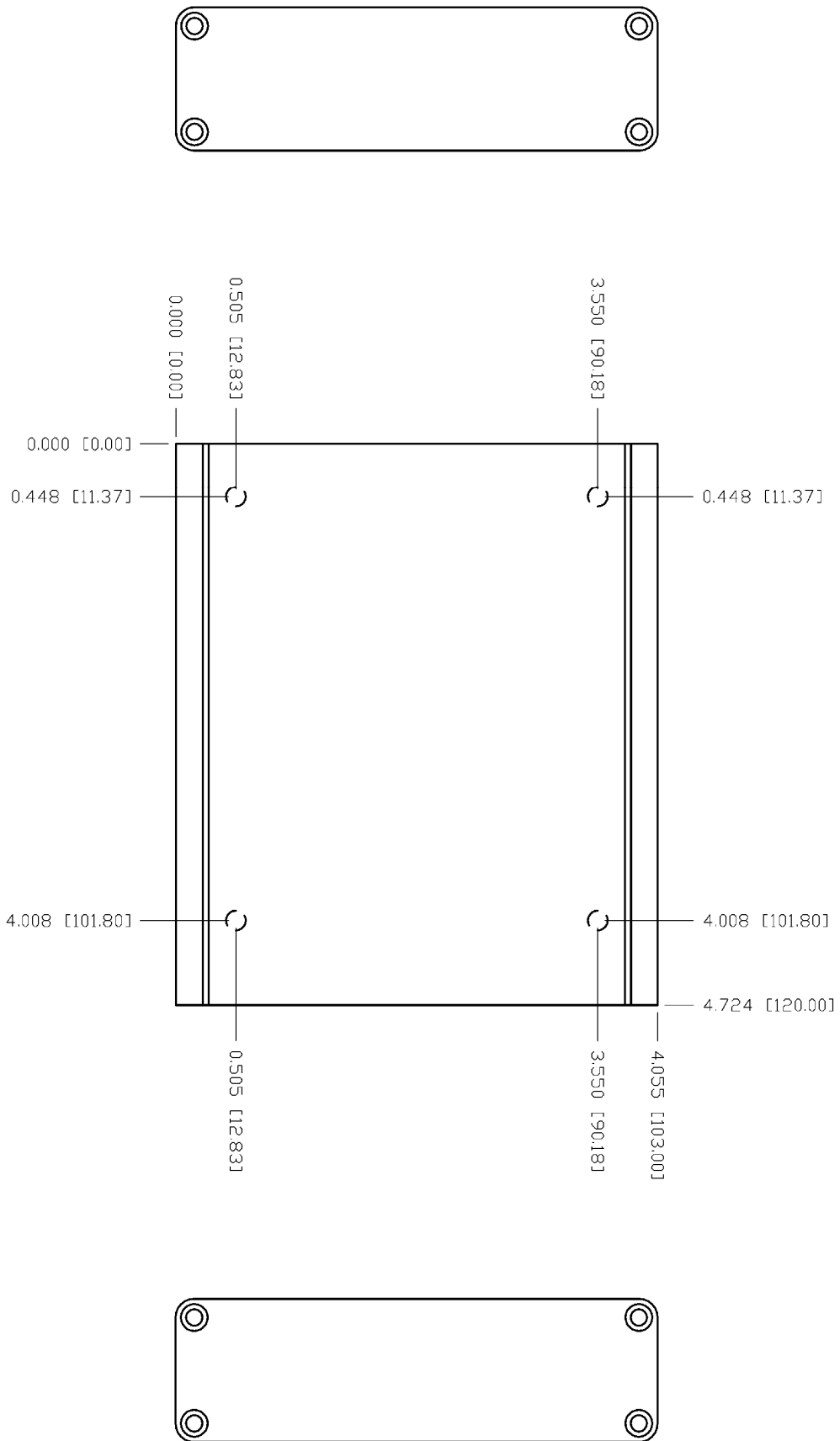


Diagram 2: T860 Outline and Mounting

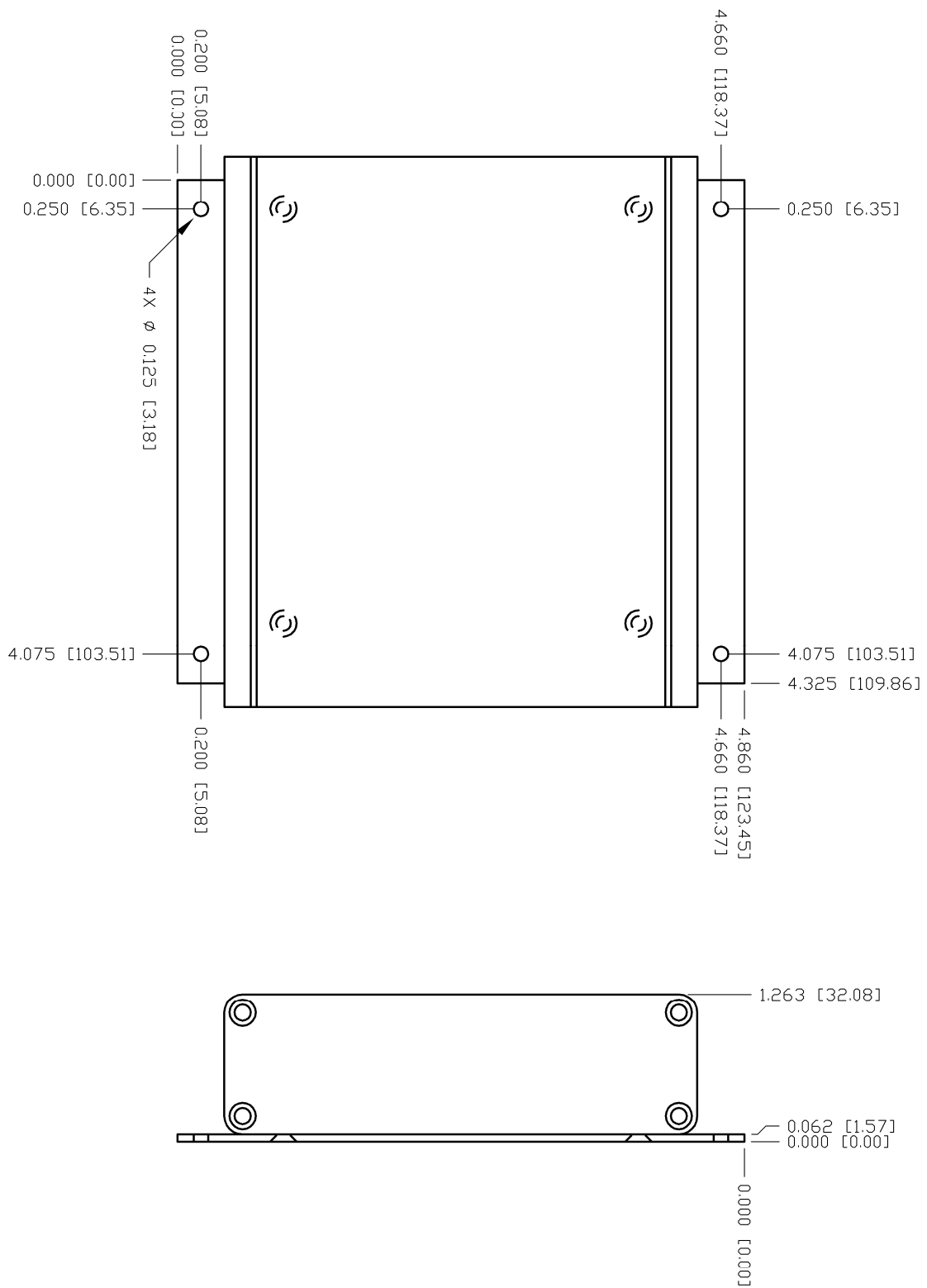


Diagram 3: Flange Mounting Dimensions

6 Versions

T860-1: single-channel compact logic buffer and driver with SMB connectors

T860-2: single-channel compact logic buffer and driver with SMA connectors

7 Customization

Consult factory for information on additional custom versions.

8 Hardware Revision History

Revision B Apr 2012
Manufacturability improvements. Functionally equivalent to Revision A.

Revision A Apr 2009
Initial PCB release

9 Accessories

J12-1: 12 volt power supply (furnished with purchase)

J41-1: 3' SMB to SMB cable

J41-2: 6" SMB to SMB cable

J42-1: 3' SMB to SMA cable

J44-1: 3' SMA to SMA cable

J53-1: 3' SMB to BNC cable

J53-2: 6" SMB to BNC cable

P10-1: 19" rack mount shelf (four t-boxes per rack)

T566-1: mounting flange