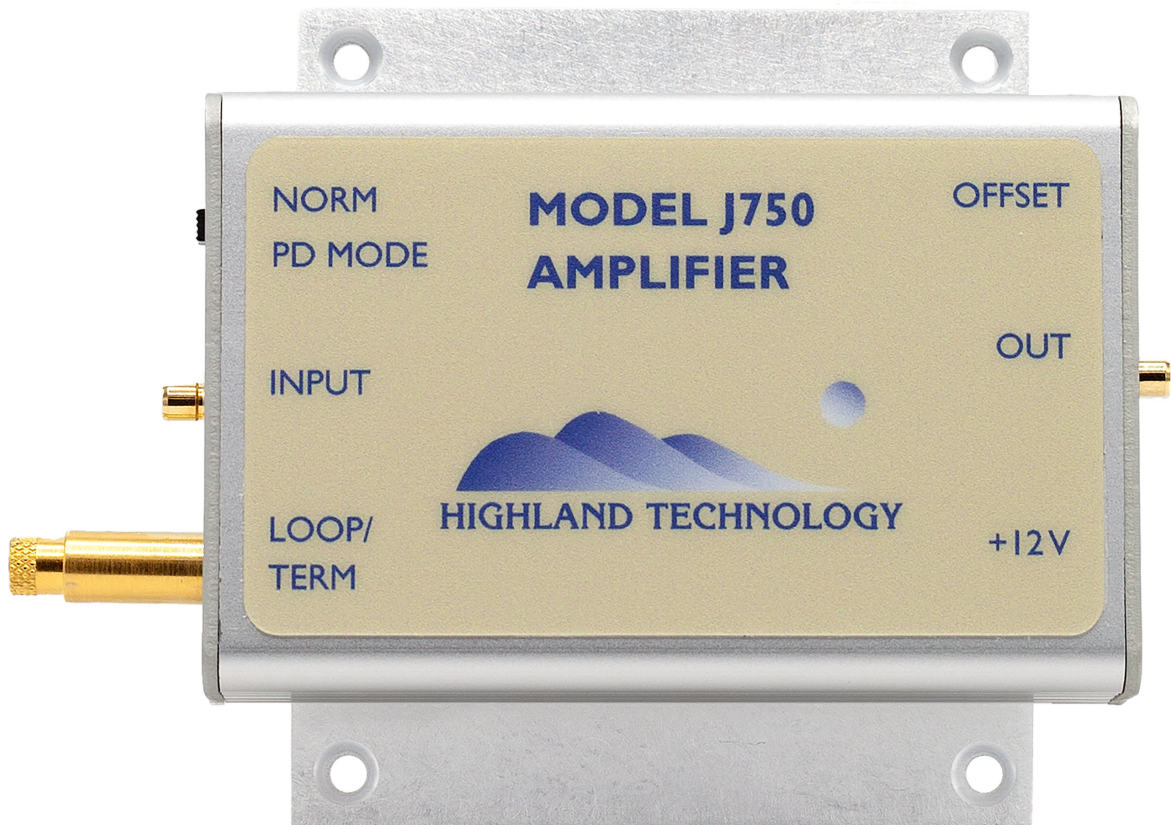




HIGHLAND TECHNOLOGY

# **MODEL J750**

## **WIDEBAND AMPLIFIER**



## **Technical Manual**

March 22, 2023

Copyright © Highland Technology  
650 Potrero Avenue, San Francisco, CA 94110  
Phone 415-551-1700 • Fax 415-551-5129  
www.hIGHLANDTECHNOLOGY.com

## NOTICE

HIGHLAND TECHNOLOGY, INC. PROVIDES THIS PUBLICATION “AS IS” WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

(Disclaimer of expressed or implied warranties in certain transactions is not allowed in some states. Therefore, the above statement may not apply to you.)

This manual may contain technical inaccuracies and/or typographical errors. Changes are periodically made to this manual, which are incorporated in later editions. Highland Technology, Inc. may make changes and improvements to the product(s) and/or programs described in this publication at any time without notice.

This product has finite failure rates associated with its hardware, firmware, design, and documentation. Do not use the product in applications where a failure or defect in the instrument may result in injury, loss of life, or property damage.

IN NO EVENT WILL HIGHLAND TECHNOLOGY, INC. BE LIABLE FOR DAMAGES, INCLUDING LOST PROFITS, LOST SAVINGS OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF OR INABILITY TO USE SUCH PRODUCT, EVEN IF HIGHLAND TECHNOLOGY, INC. OR AN APPROVED RESELLER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR FOR ANY CLAIM BY ANY OTHER PARTY.

## Table of Contents

1	Introduction .....	4
2	Specifications.....	6
3	Theory of Operation .....	7
3.1	General-Purpose Wideband Amplifier Mode .....	7
3.2	Loop-Through/Pickoff Mode .....	8
3.3	Photodiode Mode .....	8
3.4	Mounting and Grounding .....	8
4	Typical Performance.....	9
5	Dimensions .....	11
6	Versions .....	13
7	Accessories .....	13

# 1 Introduction

This is the technical manual for the Highland Model J750 wideband amplifier.

The J750 is a self-contained DC to 1 GHz electrical signal amplifier. It is suitable for general-purpose instrumentation and has provision for loop-through (signal pickoff) and photodiode applications.

Features of the J750 include:

- Operates as a general-purpose wideband amplifier
- Pickoff mode samples and amplifies loop-through signals
- Photodiode mode provides diode bias and allows fast photodiode to be located at the end of a coaxial cable
- Fixed gain of 40dB (100x), DC to 1 GHz
- Typical risetime below 350 picoseconds
- Adjustable DC offset
- Operates from standard 12 volt power supply
- Compact extruded enclosure is supplied with mounting flange



**Figure 1.1. Input endplate: Normal/PD Mode Switch, Input, Loop**



**Figure 1.2. Output endplate: +12V Power, Power LED, Output, Zero Offset**



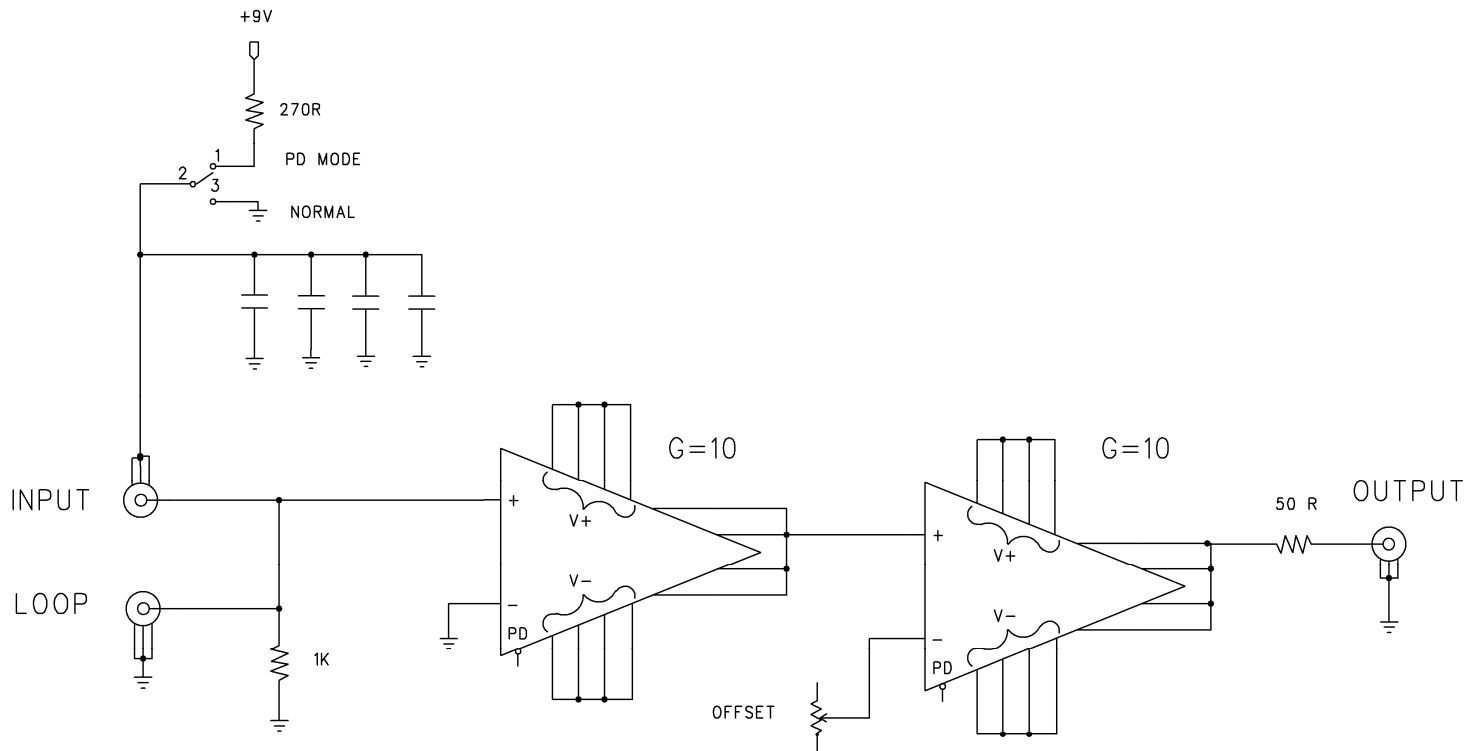
**Figure 1.3. Model J50 SMB Terminator**

## 2 Specifications

FUNCTION	Fixed-gain, general-purpose DC to 1 GHz amplifier with loop-through and photodiode modes
INPUT	Input signal level: $\leq \pm 20$ millivolts, peak Input impedance: 1 k $\Omega$ (50 $\Omega$ when loop-through connector is terminated) Highland J50 SMB terminator is furnished
GAIN	40 dB (100x) into Hi-Z load, non-inverting 34 dB (50x) into 50 $\Omega$ load, non-inverting
OUTPUT	Output signal level: $\leq \pm 2$ volt, peak (Hi-Z load) $\leq \pm 1$ volt, peak (50 $\Omega$ load) Output impedance: 50 $\Omega$ , source terminated
BANDWIDTH	DC to 1 GHz
NOISE	5 mV RMS into 50 $\Omega$ load, typical Equivalent to 100 $\mu$ V RMS input noise, 3.2 nV/ $\sqrt{\text{Hz}}$
DC OFFSET	Adjustable $\pm 1$ volt (Hi-Z load, relative to output) $\pm 500$ millivolts (50 $\Omega$ load, relative to output)
BIAS CURRENT	8 $\mu$ A, typical
PHOTODIODE EXCITATION	+9 volts on coaxial cable shield, user selectable On/Off
OPERATING TEMPERATURE	0 to 60°C; extended MIL/COTS ranges available
CALIBRATION INTERVAL	One year
POWER	+12 volts at 100 mA, max J12 12 volt power supply adapter furnished
CONNECTORS	Gold plated SMB Input, Loop/Term, Output jacks 2.1 mm X 5.5 mm barrel power connector
INDICATOR	LED: green power
PACKAGING	3.3" (L) x 2.1" (W) x 0.9" (H) extruded anodized aluminum enclosure J732 mounting flange included

### 3 Theory of Operation

The equivalent circuit diagram of the J750 is shown below.



**Figure 3.1. J750 Circuit Diagram**

#### **3.1 General-Purpose Wideband Amplifier Mode**

As a conventional 50  $\Omega$  amplifier, signals are applied to the INPUT connector and the LOOP connector is terminated with the furnished 50  $\Omega$  SMB terminator (J50); The slide switch should be set to the NORM position.

Note that the J750 output can drive a 50  $\Omega$  load, which results in an overall voltage gain of 50. Signal reflections are minimized when the load is a true 50  $\Omega$ .

The J750 can also drive a high-impedance load, such as a conventional oscilloscope input. Since the J750 source-terminates the cable, the full 100:1 gain is available without severe reflections. Lumped load capacitance may limit signal bandwidth.

### **3.2 Loop-Through/Pickoff Mode**

The J750 may also be inserted into a 50  $\Omega$  signal path and serve as a high-gain signal pickoff. Break an existing 50  $\Omega$  coaxial signal path and route the break through the INPUT and LOOP connectors.

### **3.3 Photodiode Mode**

In photodiode mode, a PIN photodiode may be connected to the far end of a 50  $\Omega$  coaxial cable plugged into the INPUT connector, with a 50  $\Omega$  terminator at the LOOP connector. The effective transimpedance gain is 5 k $\Omega$  if the output is terminated with a Hi-Z device, or 2.5 k $\Omega$  if the output drives 50  $\Omega$ . For example, if the diode has a sensitivity of 0.5 A/W, the output voltage will be 1.25 V/mW into a 50  $\Omega$  load.

In photodiode mode, the INPUT connector shell is connected to a current-limited +9 volt supply, so that the coaxial cable shield becomes the photodiode excitation. Take care to not short or incorrectly connect the photodiode, as this may damage the input amplifier stage.

To activate photodiode mode, move the slide switch to the right, towards the INPUT connector.

The full 1 GHz bandwidth is available if a low-capacitance (roughly 2 pF or less) PIN photodiode is connected at the end of a low-loss 50  $\Omega$  coaxial cable.

The LOOP connector can be left open, in which case the input impedance is 1 k $\Omega$  and effective transimpedance is 100 k $\Omega$ . Bandwidth will then be dominated by cable capacitance. For example, a 10 pF photodiode connected to the J750 through a meter of RG174 coax will have a time constant of about 100 nanoseconds, or a bandwidth of about 1.6 MHz.

### **3.4 Mounting and Grounding**

It is recommended that the J750 be securely mounted to a grounded metal surface. It may be mounted from below with 4-40 machine screws, or from above using the J732 mounting flange furnished.

If the mounting flange is not used, the box can be bolted to a mounting surface using the four tapped 4-40 holes on the bottom, denoted "B" in figure 5.1. Screws MUST NOT penetrate more than 0.100 inches into the enclosure.

See section 5 for dimensions.



## 4 Typical Performance



Figure 4.1. Typical Step Response, Risetime = 315 picoseconds



Figure 4.2. Typical Frequency Response, -3 dB at 1 GHz

5 Dimensions

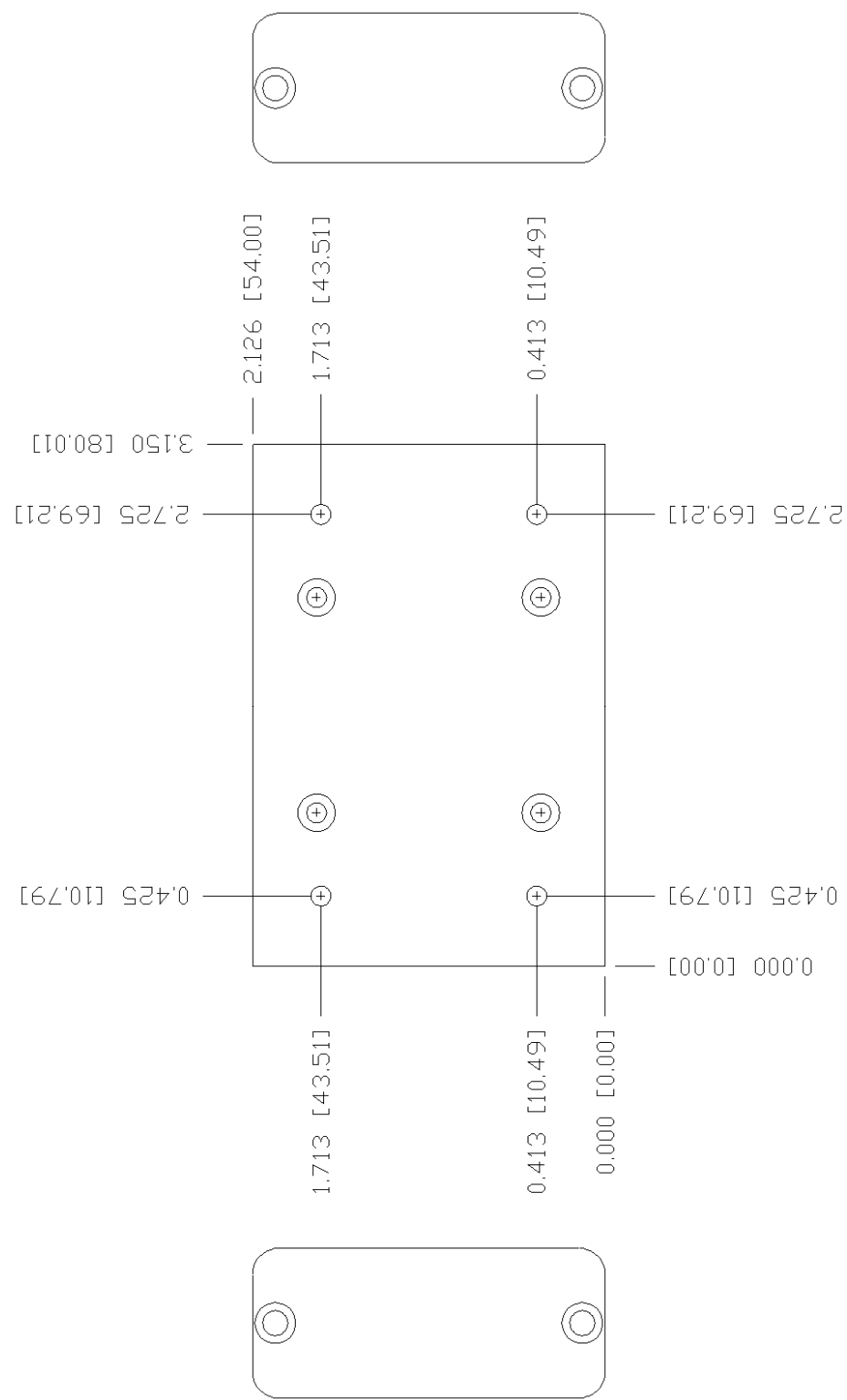
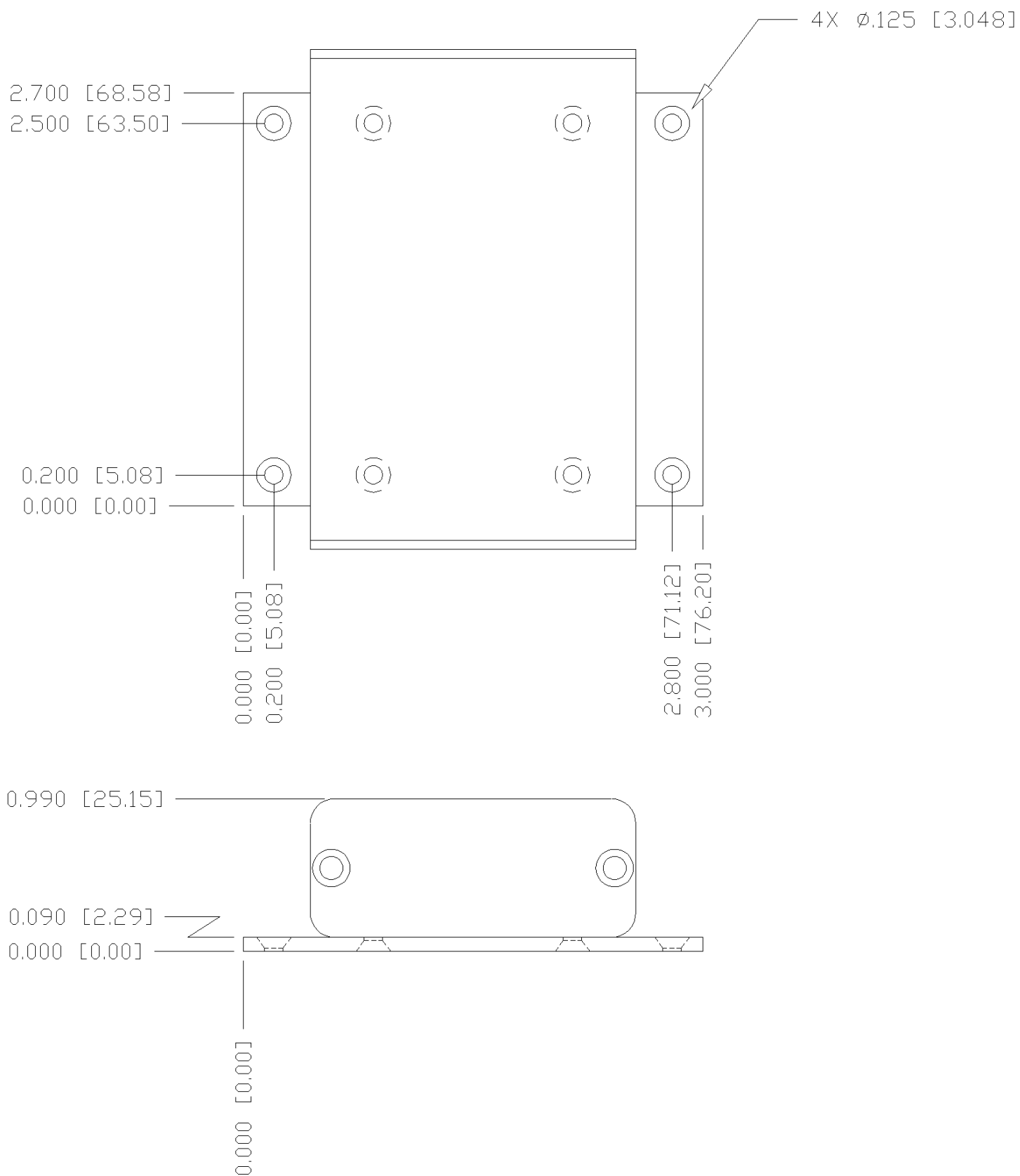


Fig 5.1 J750 Enclosure Dimensions



**Fig 5.2. Dimensions with Mounting Flange**

## 6 Versions

J750-1: single-channel compact wideband amplifier

## 7 Customization

Consult factory for information on additional custom versions. Variations can include gain, photodiode voltage, bandwidth, input and output swing range, connectors, and packaging.

## 8 Hardware Revision History

J750 Revision A    January 2009  
Initial J750 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

J50-1: 50 ohm SMB Terminator (furnished with purchase)

J53-1: 3' SMB to BNC cable

J53-2: 6" SMB to BNC cable

J732-1: mounting flange (furnished with purchase)