Programming the "HVA" Series Precision High Voltage Amplifier

Introduction

This Tech Note explains how to implement the various control, programming, and monitoring functions of the "HVA" Series Precision High Voltage Amplifier.

Remote Programming

To program the Unipolar Version of the HVA High Voltage Amplifiers a 0 to +10 VDC is required. A 10VDC reference voltage is provided at pin 1 of the DB15 female connector mounted on the front of the HVA. It can be used to source the programming circuitry. In the case of a fixed (non-time varying) output, the programming circuitry could simply be a potentiometer connected to pin 1 and pin 6, with the wiper terminal connected to pin 3 (non-inverting) or pin 2 (inverting) Voltage Programming Pin.

In the following sections, we outline programming of the unipolar versions of the HVA followed by programming of the bipolar versions of the HVA.

As depicted in Figure 1 and in the subsequent illustrations, programming is performed by the appropriate connections to pins 2, 3, and 6 of the input connector. As depicted, the programming input is applied to an internal differential amplifier within the HVA. The inputs are tied to the signal ground within the HVA by 10MΩ resistors. Pin 6 is the signal ground and is connected to the power ground, internally.

Programming Unipolar HVAs — Positive Voltage Excursions

For positive voltage excursions (as depicted in Figure 1), the 0 to +10 VDC source is connected as shown in Figure 1 with pin 2 tied to the internal ground in the HVA at pin 6.
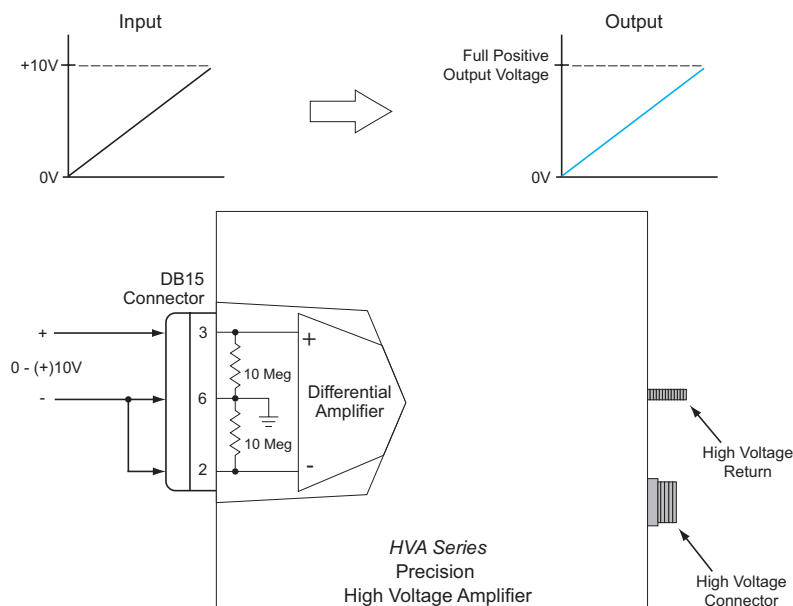

Figure 1. Programming the Unipolar Version - Positive Voltage Excursions

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Programming Unipolar HVAs — Negative Voltage Excursions

For negative voltage excursions (as depicted in Figure 2), the 0 to +10 VDC source is connected as shown, with pin 3 tied to the internal ground in the HVA at pin 6.

Negative voltage excursions can also be programmed with a -10V signal into the Vprog(+) — pin 3 — with pin 2 tied to the signal ground at pin 6.
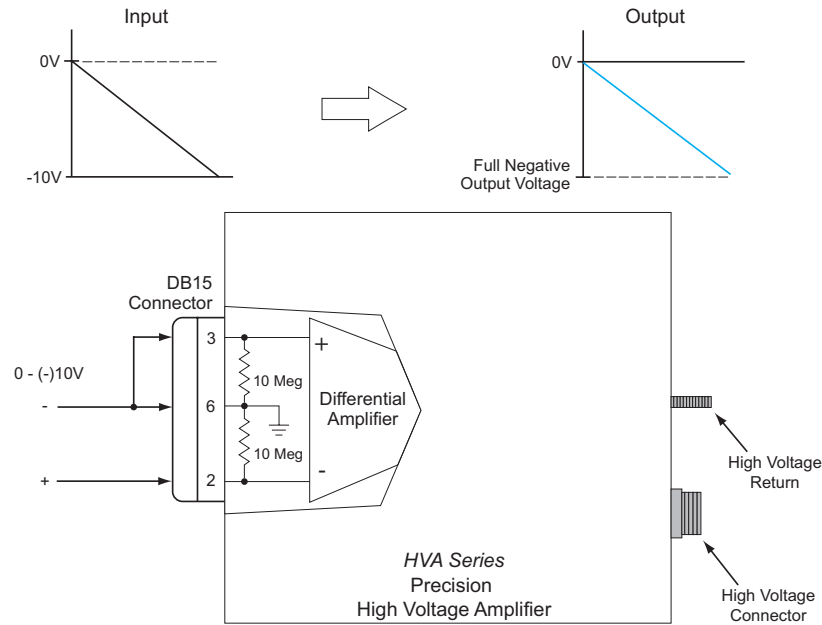

Figure 2. Programming the Unipolar Version - Negative Voltage Excursions

Programming Bipolar HVAs

For a bipolar HVA, a 0 to ±10 VDC source is connected (as depicted in Figure 3). The (-) terminal may be grounded at pin 6 (see note 1). If a waveform is required, a bipolar programming signal will yield a bipolar output voltage.
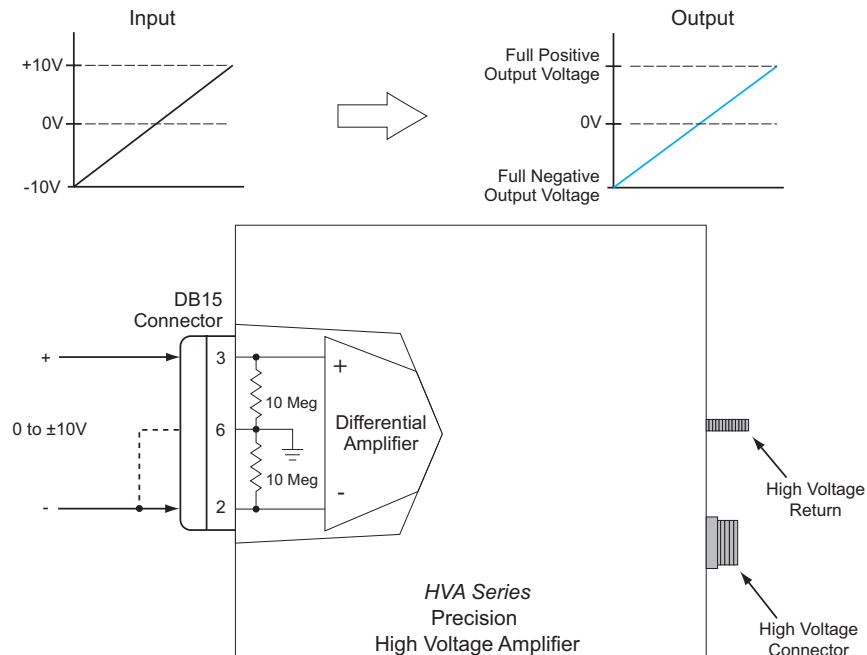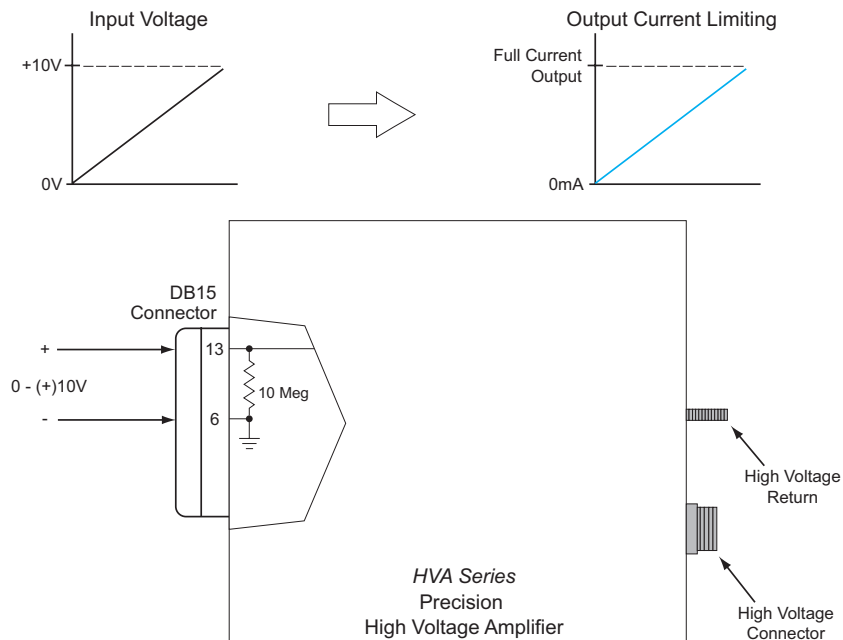

Figure 3. Programming Bipolar HVAs

Figure 4. Current Limiting

Current Limit Adjust

To establish current limiting, a 0 to +10 VDC source is connected to pin 13 and pin 6 (signal ground) as shown in Figure 4. Be sure to observe the polarity of the applied signal. The voltage is always positive because the current limiting circuitry seeks the absolute value of the current and limits the value — without regard to polarity. The input characteristic is high impedance with a 10MΩ pulldown to ground.

Enable/Disable

A TTL output can be connected to pins 11 and 6 (as shown in Figure 5) to enable or disable the HVA. Please note, when no TTL output is connected, the HVA defaults to Disable via the 10MΩ resistor shown in Figure 5, which pulls the TTL input to ground. As a matter of convenience, the Enable can be brought to the Vref at pin 1.
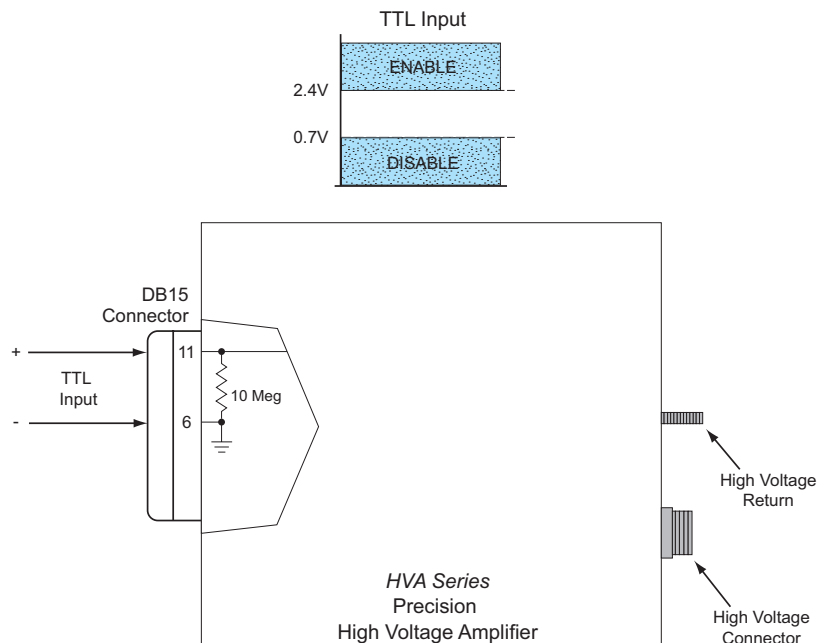

Figure 5. Enable/Disable

Voltage and Current Monitoring

As depicted in Figure 6, monitoring voltages corresponding to the voltage and current delivered between the High Voltage Connector and the 6-32 High Voltage Return stud are supplied at pins 4 and 12, respectively, versus the signal ground at pin 6. Both of these pins are buffered and can provide currents of 1mA, maximum. When the HVA is sourcing current, the current monitoring voltage will be positive; when sinking current, this voltage will be negative.

An accurate representation of the voltage waveform can be viewed with an oscilloscope at pin 4. Please note, the current monitoring circuitry is narrow band, so waveforms at pin 12 are accurate at frequencies of 15Hz or less. The voltage monitor employs a compensated voltage divider and, therefore, has an extended bandwidth.
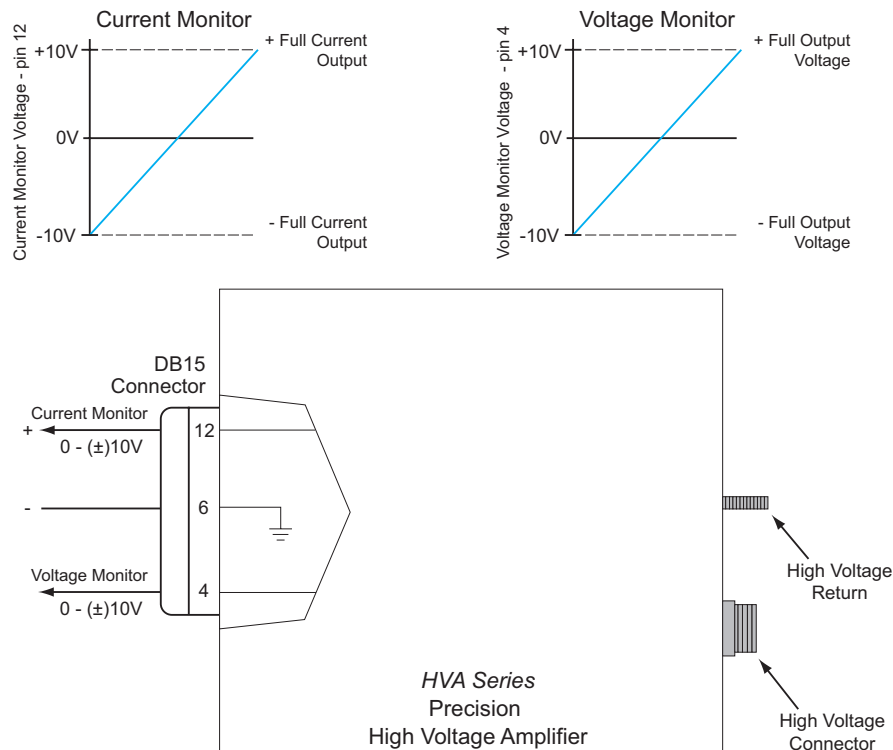

Figure 6. Current and Voltage Monitors

Reference Voltage

The HVA supplies 0 to +10 VDC ±0.05% at pin 1 versus the signal ground at pin 6. The maximum delivered current must be limited to 5mA or less.

LEDs

There are two LEDs located just to the left of the DB15 Connector on the front panel. The green POWER ON LED illuminates when power is applied to the HVA. The yellow HIGH VOLTAGE ON LED illuminates when the HVA is enabled.

High Voltage Connections

Connect the high voltage load to the High Voltage Connector and the High Voltage Return. Do NOT connect the High Voltage Return stud to the signal ground at pin 6. The High Voltage Return stud and the signal ground are connected internally to avoid ground loops.