

Precision 4KV High Voltage Interface Specifications

Author: Joe Evans

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Discussion:

The Precision High Voltage Interface (HVI-4KV) is an attachment for any Precision tester. It allows the Vision operating system to control High Voltage Amplifiers (HVAs) and execute tests at voltages up to 4,000V. The 4KV Precision HVI controls a single HVA.



The HVI has two primary functions. First, it acts as a signal router, sending stimulation voltages from the tester to the HVA while connecting the output of the HVA to the sample. The return signal from the sample is also routed through the HVI on its way back to the tester for analysis.

The second primary function of the HVI is to provide protection to the user from the high voltages present during tests. The maximum voltage rating for the Precision HVI is 4KV. All high voltage wires internal to the system have insulation with a DC breakdown specification greater than 25KV. During normal operation, when a test is not being performed, the high voltage DRIVE and RETURN outputs of the Precision HVI are disconnected from the HVA and connected directly to earth ground. The sample is connected to the HVA and the tester only during the execution of hardware task in the Vision operating system. The four high voltage isolation relays that execute the switch matrix function are rated for 5KV.

Safety:

High Voltage ceramic samples routinely breakdown during high voltage testing creating a strong chance of damage to the test system measurement circuits. To prevent this damage, the HVI has four layers of protection. The first is a voltage limiting circuit on the HVI RETURN input that prevents the HV RETURN from exceeding 2.1 Volts. For voltages greater than 2.1V, all current is routed to the earth ground and away from the tester inputs. This prevents the excess voltage and current during a sample breakdown from exceeding the current canceling capability of the virtual ground circuitry on the tester input.

The second form of protection is a slower circuit in the HVI RETURN input that will open the isolation relays and ground the sample if the shorted condition persists for longer than 17ms.

The third safety layer for the HVI lies in its digital communications channel with the Precision tester. Through this communications interface, the tester can control the state of the HVI and detect a fault condition. As well, the High Voltage Amplifier must have an Identification Module (ID Module) attached that holds the specifications of the HVA. The Vision operating system will not allow a test to proceed if the specifications of the HVA do not match those specified for a test. This feature prevents inadvertent application of excess high voltage to the sample.

Finally, the 4KV HVI has a safety interlock system that allows the researcher to connect the HVI to a door, lid, or other physical barrier. The high voltage function in the HVI is disabled unless the safety interlock is activated.

HVI Specifications:

Channels:	One HVA
Maximum International Voltage Rating	4KV (AC)
Power:	110V or 220V switch selectable
High Speed Protection Current Rating	10 Amps
High Speed Protection Trigger Voltage	2.1V
Low Speed Protection Delay Time:	17ms
Isolation Relay Switchable Voltage	5KV
Internal Insulation Rating:	>25KV DC

Origin of Voltage Limits

The DC voltage rating for high voltage insulation does not take into account RF coupling of high voltage AC Signals through the insulation to grounded objects. We have found that high voltage wire insulation must be de-rated by approximately a factor of four for the high voltage frequency levels used in Radiant's testers. For instance, to run a 4KV triangle wave at 1KHz requires insulation on the test cables with a DC rating of at least 16KV. Radiant normally supplies its customers with high voltage cables having ratings greater than 25KV for use with the 4KV HVI.

Multiplexing HVIs:

The Precision Premier and Precision Workstation both have two COMM channel connectors capable of controlling either a 4KV or 10KV HVI. The COMM channel of choice is selectable from the menu page for each hardware task in Vision. Thus, a Premier or Workstation, using two 10KV HVIs, can control up to four HVAs during the execution of a Vision program. The Precision LC has only one COMM channel but it will function with either the 4KV or 10KV HVIs.