

4314KVM

Rugged Digital Igniter Tester

Operation Manual

Rev 1.1



VALHALLA
S C I E N T I F I C

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VALHALLA SCIENTIFIC INC. CERTIFICATION

Valhalla Scientific, Inc. certifies that this instrument was thoroughly tested and inspected and found to meet published specifications when shipped from the factory. Valhalla Scientific, Inc. further certifies that its calibration measurements are traceable to the Nation Institute of Standards and Technology to the extent allowed by NIST's calibration facility.

Due to continuing product refinement and due to possible parts manufacturer changes, Valhalla Scientific, Inc. reserves the right to change any or all specifications without notice.

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The warranty period for this instrument is stated on your invoice and packing list. Please refer to these to determine appropriate warranty dates.

We will repair the instrument during the warranty period provided it is returned to Valhalla Scientific, Inc. freight prepaid. No other warranty is expressed or implied.

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Permission and a Return Material Authorization number (RMA) must be obtained directly from the factory for warranty repairs. No liability will be accepted if returned without such permission.

Due to continuing product refinement and due to possible parts manufacturer change, Valhalla Scientific reserves the right to change any or all specifications without notice.

4314KVM Digital Igniter Tester User Manual
Revision # 1 Edition 1 (2023)
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WARNINGS

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Valhalla Scientific assumes no liability for the customer's failure to comply with these requirements.

For continued protection, replace the line fuse(s) only with fuse(s) of the same voltage and current rating and type. DO NOT use repaired fuses or short-circuited fuse holders.

Keep away from live circuits: Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers or shields are for use of service trained personnel only. Under certain conditions, dangerous voltage may exist even with the equipment switched off. To avoid dangerous electrical shock, DO NOT perform procedures involving cover or shield removal unless you are qualified to do so.

DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any reason, REMOVE POWER and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to Valhalla Scientific for service and repair to ensure that safety features are maintained.

DO NOT substitute parts or modify equipment: Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to Valhalla Scientific for service and repair to ensure that safety features are maintained.

Permanent wiring of hazardous voltage or sources capable of delivering greater than 150VA should be labeled, fused, or in some other way protected against accidental bridging or equipment failure.

DO NOT leave measurement terminals energized when not in use.

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Chapter 1 – General Information

Instrument Description

The Valhalla Scientific Model 4314KVM Digital Igniter Tester is designed to provide extremely safe and reliable resistance testing of explosive or volatile devices. Some of the proven uses include fuses, squibs, igniters, explosive bolts, automobile airbag initiators and many others.

Essentially, a Model 4314KVM is a 4-wire ohmmeter which has been designed to use very low-test currents for its measurement. Additional circuitry proprietary to Valhalla Scientific is used to ensure that test current levels do not exceed the specified "failsafe current" even in a worst-case component failure situation. The failsafe feature is tested in every instrument before shipment and the results provided to the customer on a Certificate of Calibration that accompanies the unit. In addition, to prove that this level of safety is intact, the **4314KVM** is equipped with a constant test current monitoring display and a unique Fail-Safe test button that simulates a worst-case component failure and displays the measured fail-safe current, all while the output is isolated from the current source.

The Valhalla Scientific 4314KVM Igniter Tester contains the enhanced inner circuitry as its ultra-safe 4314 Series predecessors, with the addition of Constant Current monitoring, Fail Safe test, and 7 ranges (2Ω to $2M\Omega$), all designed in a compact, rugged water-resistant Pelican case for protection in the harshest environments. The KVM also features an additional safety feature compared to the models in the KV Series. The 4314KVM front panel has a 6-pin Mil-Spec circular connector, "MS3112E10-6S" that replaces the four-terminal banana jacks and battery charge jack located on the 4314KV/KVS front panel. This gives the 4314KVM, an added safety feature that prevents the possibility of having the charging adapter connected while using the instrument for measurements. This is accomplished by the removal of the rear panel charge jack and including its connections to the instruments charging circuits through the 6-pin front panel connector. Four of the front panel connector pins are used to mate with the measurement adapter cable and the other two pins are for the battery charging cable adapter. By using separate adapter cables for measurements and charging of the batteries, it ensures that the charge circuit cannot be activated at the same time as measurements are being made.

Measures Under all Conditions: The KV series of Igniter Testers are not only safe resistance testers for explosive devices, they also, thanks to the case, are impact resistant and water tight. The devices float in water, are waterproof when closed, to a depth of 3 feet, and can be operated outside in direct rain. They come self-contained with a slim-line AC/DC Battery Charger and measurement test leads ready to use.

The standard feature of the 4314KVM is a battery monitoring circuit that alerts the user if the batteries have become or will soon become unusable.

Safety Considerations

The 4314KVM Digital Igniter Testers are battery-operated equipment. For an optimal function of the Failsafe circuitry DO NOT connect the battery charger while the instrument is in an ON position. Always disconnect the battery charger before operating the instrument.

Instrument Identification

Valhalla Scientific instruments are identified by a two-part serial number. The Serial Tag is located on the rear or bottom of the instrument. The number is in the form of 68-0000 (KVS). The first two digits, called the serial number prefix, indicate the model. It changes only when a change is made to the instrument. The last 4 digits, called the serial number suffix, are unique for each individual unit.

Be sure to include the entire serial number, both prefix and suffix, in any correspondence about your instrument.

The serial number can also be found on the Main Board, Calibration Tag and Certificate of Calibration.

Chapter 2 – Unpacking and Installing

Inspection

If the shipping carton is damaged, request that the carrier's agent be present when the unit is unpacked. If the instrument appears damaged, the carrier's agent should authorize repairs before the unit is returned to the factory. Even if the instrument appears undamaged, it may have suffered internal damage in transit that may not be evident until the unit is operated or tested to verify conformance with its specifications. If the unit fails to operate or fails to meet the performance specifications of Chapter 3, notify the carrier's agent and the nearest Valhalla Sales Office. Retain the shipping carton for the carrier's inspection. DO NOT return equipment to Valhalla Scientific or any of its sales offices prior to obtaining authorization to do so.

Power Requirements

The Model 4314KV/KVS is powered by an internal rechargeable heavy-duty Nickel–metal hydride (NiMH) battery pack. The battery charge is maintained by an external AC/DC converter that plugs into a standard receptacle. The AC adapter can accept an input voltage from 100 to 240 Vac (50-60Hz) and an output of 7.5VDC @ 366mA.

The 4314KVM must be turned off and have the adapter connected to charge the batteries.

The battery pack may power the 4314KVM for up to 10 hours before requiring a recharge.

Although the batteries are fully charged prior to shipment, it may be desirable to refresh the charge for 24 hours before use. As a rule of thumb, the 4314KVM requires twice as much time to fully recharge as the amount of discharge time. For example, if the instrument was used continuously for 2 hours, the AC adapter must be connected for 4 hours to fully restore the charge.

Installation

The Model 4314KVM consumes little power and generates virtually no heat. Consequently, it may be used in any area where the environment does not exceed the temperature specifications of Chapter 3.

Chapter 3 – Specifications

Range/Resolution/Test Current/Failsafe Current

Table 1

Range Value	2Ω	20Ω	200Ω	2kΩ	20kΩ	200kΩ	2MΩ	Standby
Resolution	100μΩ	1mΩ	10mΩ	100mΩ	1Ω	10Ω	100Ω	-
Test Current	5mA	5mA	500μA	50μA	5μA	500nA	50nA	0A
Fail-Safe Current ^[1]	8mA	8mA	1.8mA	180μA	18μA	1.8μA	180nA	-

[1] Maximum value. Actual Failsafe Currents vary from instrument to instrument. The actual measured level is provided on the certificate of calibration.

Accuracy

Table 2

Range	Accuracy
2Ω - 20kΩ	±0.03% of reading ± 0.02% of range
200kΩ	±0.05% of reading ± 0.05% of range
2MΩ	±1% of reading ± 0.2% of range

Current Monitor Accuracy (KVS model)

Resistance Range	Current Measurement Limit	Current Range	Resolution	Tolerance
2Ω - 20kΩ	0-15.0mA	10mA – 15mA	0.1mA	±5%
		1mA – 9.99mA	0.01mA	±5%
		100μA – 999μA	1μA	±5%
		0 – 99.9μA	0.1μA	±5% ±0.3μA

- For 200kΩ and 2MΩ Range settings, ammeter displays range nominal Test Current and Fail-Safe Current values.
- Above 15.0mA the display will show O.L.

Fail-Safe Test Accuracy

Values displayed during the external Fail-Safe test are ±10% from the actual values measured during certification.

Temperature

Temperature Coefficient:	$\pm 0.002\%$ per °C (from 0°C-15°C and 35°C-50°C) <i>not applicable for 200kΩ range and above.</i>
Operating Temperature Range:	0°C to 50°C
Storage Temperature Range:	-10°C to 70°C

General Specifications

Display Type:	4 ½ digits Light Emitting Diodes (LED) (19999)
Current Display:	3 digits Light Emitting Diodes (LED) (999)
Overload Indication:	Screen displays "O.L."
Conversion Rate:	3 readings per second
Terminal Configuration:	4-Wire Kelvin
Current Source Compliance Voltage:	Clamped at 1.6V
Power:	("D" Cell Batt. Pk) 4.8V rechargeable NiMH Batteries 10000mAh
Battery Charger:	Provides 7.5VDC at 366mA nominal.

Physical Specifications

Width:	10.62" / 27cm
Depth:	9.68" / 24.6cm
Height:	4.87" / 12.4cm
Weight:	6 lbs / 2.7kg net; 7lbs / 3.2kg shipping [2]

[2] Shipping weight may vary.

Chapter 4 – Optional Features and Accessories

Each 4314KVM Igniter Tester is shipped with a detachable battery charger (AF-A) and a set of AF-K 4 wire leads. This section lists several items that may be desirable for special applications.

Accessories

AF-A: Battery Charger

"AF-A" is an AC/DC converter 115-240VAC line voltage to 7.5VDC at 366mA terminated in a 6-pin connector for matting to the 4314KVM front panel circular receptacle.

Replacement Battery Pack

The rechargeable NiMH battery pack installed in the 4314KVM should provide years of trouble-free operation. Replacement, however, will eventually be necessary. The 4314KVM uses a 4.8V four D-cell battery pack. When ordering replacement battery pack, please specify "HDP" Heavy Duty Battery Pack.

Test Leads

This section details the different test lead sets and connectors available for use with the 4314KVM Igniter Tester. All cables and test leads are manufactured by Valhalla Scientific Inc. and tested before shipping.

Alligator Clip Type Leads

AF-K: Kelvin Lead Set

"AF-K" is a shielded, 4-wire Kelvin cable set, 48 inches in length terminated in gold plated alligator clips (*KCS*). Option "K" is the recommended general purpose lead set for most applications. *Figure 3.*

KCS: Gold-Plated Clips

"KCS" are gold-plated alligator clips used on the "K" lead set for 4-wire measurements of smaller components and leads. Clips open to 1/2 inch and accommodate test currents of up to 10A.



AF-K: Kelvin 4-Wire Lead Set

Needle Type Probes

AF-MP-1: Kelvin Micro-Probes

"AF-MP-1" is a 48-inch shielded 4-wire Kelvin cable set with a 1A test current capacity employing a set of Kelvin Micro-Probes. The probes are equipped with spring-loaded stainless-steel tips with 0.05" spacing.

AF-MP-2: Kelvin Mini-Probes

"AF-MP-2" is a 48-inch shielded 4-wire Kelvin cable set with a 1A test current capacity employing a set of Kelvin Mini-Probes. The probes are equipped with spring-loaded stainless-steel tips with 0.18" spacing.

AF-MP-S: Single Pointed Probe Set

"AF-MP-S" is a 48-inch shielded cable set with a 1A test current capacity employing a set of single pointed handheld pencil type probes. (2 wires to each point).

Surface Probes

AF-MP-4: Surface Probes

These probes permit rapid, repeatable bonding testing on a variety of screened or flat surfaces. Test current is evenly distributed through the probe base while sensing is accomplished via a spring-loaded center contact. The target area is 1-inch in diameter. *Figure 5*

AF-MP-5: Surface Probes

These probes permit rapid, repeatable bonding testing on a variety of screened or flat surfaces. Test current is evenly distributed through the probe base while sensing is accomplished via a spring-loaded center contact. The target area is ½ inch in diameter.



AF-MP-2 Micro-Probe

Chapter 5 – Features and Operations

General

This section of the manual contains complete operating instructions for the Model 4314KVM Digital Igniter Testers. A description of the front panel controls, connection instructions, and the theory behind 4-wire resistance measurement is discussed in this section.

Front Panel

ON/OFF Button

When the front panel power switch is placed in the OFF/CHARGE position, all power is removed from the output terminals, and the battery pack is connected to the charging circuit. When the switch is placed in the ON position, the battery pack is disconnected from the charging circuit. The possibility of a common mode voltage between the device under test and AC Power ground is therefore eliminated.

Range Selection Knob

The 4314KV/KVS measurement ranges are selected by turning the range knob to the desired position. Move knob clockwise to increase the range and counterclockwise to reduce the range. Range knob is also used to place the tester in Stand By mode.

Fuse Holder

The fuse holder is mounted on the front panel and contains a 2 amp in-line fuse. This fuse is designed to protect the battery pack from excessive charging currents. For continued protection, replace the line fuse only with fuse of the same voltage and current rating and type. DO NOT use repaired fuses or short-circuited fuse holders.

6 Pin Mil-Spec Connector for Measurement and Charging

Measurement connections and charging are made via the front panel 6 pin connector.

Source and Sense Connections

The 4314KVM will include a set of 4 wire alligator clips (AF-K) that will mate with the front panel connector via Mil-Spec MS3116F10-6P. Four of the terminal pins on the front panel receptacle are used as Sense and Source pins providing full 4-Wire Kelvin measurement capability.

PIN-A	Positive Voltage Sense	PIN-D	Negative Current Source
PIN-B	Negative Voltage Sense	PIN-E	Positive Current Source

Positive and negative current source terminals provide the test current, while the positive and negative voltage sense terminals are used to monitor the voltage drop across the load.

The 4-Wire Kelvin configuration eliminates errors normally caused by test lead and contact resistances. In many applications, the contact resistance can exceed the value of the load by several orders of magnitude. The 4314KVM bypasses this potential error source by providing two pins of constant current and an additional two pins for high impedance voltage sensing. The result is a fast, accurate resistance

measurement of the load, independent of the resistance of the current carrying leads. Later in this chapter we will illustrate how the 4-wire principle is used to eliminate lead, wire, and contact resistances as potential error sources.

4-Wire Resistance Measurement

The four-terminal configuration of the 4314KVM eliminates errors normally caused by test lead and contact resistances. In many applications the contact resistance can exceed the value of the load by several orders of magnitude. The 4314KVM bypasses this potential error source by providing two terminals of constant current and an additional two terminals for high impedance voltage measurement. The result is a fast, accurate resistance measurement of the load, independent of the resistance of the current carrying leads.

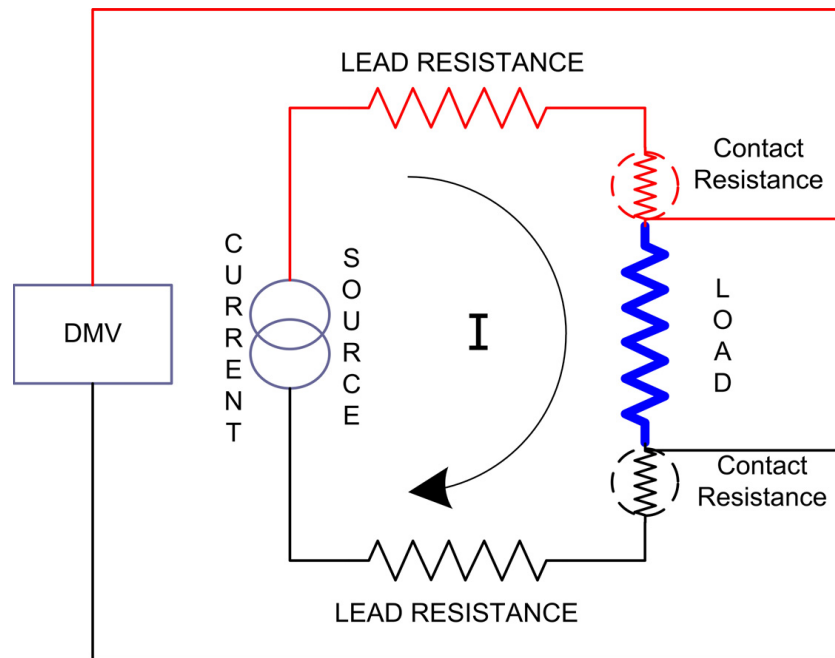


Figure 1 - Error Sources in Resistance Measurements

Figure 5 illustrates how the 4-wire principle is used to eliminate lead, wire, and contact resistances as potential error sources. The internal current source inherently overcomes all series resistance (within compliance voltage limits) and delivers a precise constant current.

The internal high-impedance DVM senses the voltage drop across the load. There is negligible contact and lead resistance error created by the voltage measurement because the high input impedance of the DVM limits current flow in the voltage leads.

The most common termination is alligator type clips. If this is your choice of leads, simply connect one clip to one end of your load and the other clip to the opposite side of the load.



For flat surfaces, you can choose between two different spring-loaded surface probes. If this is your choice of leads, simply press one probe against one side of the surface of your load, making sure that the surface of the probe is in full contact with the surface of the load. Press the second probe against the surface at the opposite side of your load making sure that the surface of the probe is in full contact with the surface of the load.

For hard-to-reach surfaces, Valhalla Scientific offers two sets of spring-loaded dual needle probes differentiated by overall size and distance between the needles. If this is your choice of leads, simply press both the needles of one probe against one end of the surface of your load, press both needles of the second probe against the surface at the opposite end of your load.

See chapter 4 for a full list of lead sets and accessories for your 4314KVM.

Charger Connections

The 4314KVM will include a battery charger that will mate with the front panel connector via Mil-Spec MS3116F10-6P. Two of the terminal pins on the front panel receptacle are used as charger inputs.

PIN-C	Battery Charger Negative	PIN-F	Battery Charger Positive
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The charging requirements of the internal battery pack are 7.5VDC @ 366mA. The correct charging voltage is supplied by the adapter included with the instrument. Additional adapters are available as Option "AF-A".

Fail Safe Button

When pressed, the Fail-Safe test button simulates a worst-case component failure and displays the measured fail-safe current. During the test, the current source is isolated from the binding-post. The ohms measurement window will display FSt, to indicate that the unit is in fail-safe test mode.



Figure 2 - Fail-Safe test button detail (KVM)

Displays

Ohms Display and Multiplier LEDs

Under normal operations, the Ohms display will indicate the value of the resistance being measured. The 3 LEDs next to the display window will indicate whether the value displayed is in Ohms, kOhms or MOhms. (Ohms, kilo-ohms or mega-ohms).

The ohms display will read FSt during Fail-Safe test mode.

Interpreting the Display

All Valhalla ohmmeters and igniter testers use a high impedance voltmeter as part of the resistance measurement process. This voltmeter is a highly accurate and stable 24 bit analog-to-digital converter (ADC). Unless it is receiving a definite input signal, the output reading of this ADC is ambiguous. The display may indicate a randomly wandering number, or it may indicate an over-range condition. This unpredictable display may make it seem to appear that the instrument is experiencing some sort of malfunction. It is, in fact, just a characteristic of the voltmeter circuit and should not be mistaken for a fault in the instrument.

The display indications should be ignored unless there is a definite measurement being taken. If this wandering display is not acceptable, the ohmmeter can be made to indicate zero whenever the sense terminals are shorted.

The display should indicate a stable reading when the test leads are securely attached to the device under test. If the display appears to be erroneous when connected to a load, recheck the test leads for integrity and cleanliness. If all external items appear to be functioning properly, the problem may be the ohmmeter. In this case, please contact your local Valhalla Scientific Sales Office.

Current Display and Multiplier LEDs

Under normal operations, the Current display will indicate the value of the source current being used by the tester. The 3 LEDs next to the display window, will indicate whether the value displayed is in mAmps, μ Amps or nAmps. (milli-Amps, micro-Amps or nano-Amps). The display will indicate the measured value of the current on ranges 2Ω to $20k\Omega$ and the nominal value of the current. The display indications should be ignored unless there is a definite measurement being taken.

When a Fail-Safe test is initiated by the user by pressing the Fail-Safe Test button, the Current display will indicate the true (measured) Fail-Safe value for the range selected.

During Fail-Safe test mode, the Current display will indicate the value of the fail-safe current being measured.

Enable/Disable Current Display

The Current display can be enabled or disabled by the user. To turn the display on/off, set the range to Stand By. Press the Fail-Safe Test button for approximately 2 seconds. The display will toggle from on to off or off to on.

Fail-Safe Operation

The 4314KVM incorporates a proprietary current source design that renders them incapable of delivering excessive voltage or current to the device under test. Maximum Fail-Safe Current values are list in Table 3.

Range	Fail-Safe Current[3]
2 Ω	8mA
20 Ω	8mA
200 Ω	1.8mA
2k Ω	180 μ A
20k Ω	18 μ A
200k Ω	1.8 μ A
2M Ω	180nA

Table 3 - Fail-Safe Current Values per Range

Every 4314KVM Igniter Testers are thoroughly tested before the leaves the factory. These tests include a failsafe test that simulates a "worst case" failure condition. The resulting output current is recorded and provided on the Certificate of Calibration included with every unit.

Fail-Safe Test

The 4314KVM is equipped with a Fail-Safe test feature that allows for real time verification of the fail-safe current. When the Fail-Safe test button is pressed, the unit disconnects the source terminals from the internal circuitry, simulates a worst-case scenario failure, and measures the source current. The value measured is displayed in the Current window. If the Fail-Safe current measured ever exceeds the max values listed in Table 3, do not use the device, and contact your local Valhalla Scientific Sales or Tech Support Office.

Values displayed during the external Fail-Safe test are accurate to $\pm 10\%$ from the actual values measured during certification.

Low Battery Indicator

A standard feature of 4314KVM is a circuit that monitors the output voltage of the internal battery supply. The Battery Status LED for this feature is located to the far left of the display window.

- Non lit LED indicates that the batteries are charged, and the device can be used.
- A flashing Low Battery LED indicates that the batteries will require recharging within the next ½ hours of continuous use. Readings are still within specified accuracies at this point.
- A Red Low Battery LED indicates that battery is low and that readings should not be trusted. An overnight recharge should be performed before using the device for critical testing.

NOTE: It is possible for the user to receive a low battery indication on a single range only (particularly the 2Ω and 20Ω range), while the 4314 remains well within operating limits on other ranges. **Unless the user observes a continuous low battery indication during measurement, readings are still valid.**

Standby Mode

Standby Mode is a safety range that allows the user to make connections to a load while there is no source current applied. The Standby range is purposely positioned as the 8th range of the 4314KVM, so that the adjacent range has the lowest test current.

When in Standby mode, Ohms and Current display will read StAnd bY.

Chapter 6 - Troubleshooting

Malfunctions are often the result of misinterpretation of specifications or due to an incomplete understanding of the instrument. **A thorough review of the operating instructions for this instrument is recommended prior to any component replacement.** Check to be sure that cables and other test equipment are in good working order before attempting to troubleshoot the 4314KVM.

If the 4314KVM exhibits problems that cannot be eliminated by reviewing Chapter 3 and 5, the following guidelines have been established to help solve the problem.

Localizing the Problem

The key to successful troubleshooting is to localize the problem as much as possible before trying to pin the problem down to a specific component. Certain questions should be asked such as "Does the problem occur on all ranges or on a specific range only?" The power supplies are also one of the first things that should be checked.

Schematics and Parts List

The schematics and parts list are not part of this User Manual. Please contact Valhalla Scientific Engineering Department for additional information.

Component Replacement

If the problem has been identified as a faulty component, the accuracy of the 4314KVM can be maintained only if the following precautions are taken:

- a) Use only the specified component or its exact equivalent. Spare parts can be ordered from your nearest Valhalla Scientific Service Center.
- b) Use only 63/37 grade rosin core electronic grade solder with a 50W or lower maximum power soldering iron.
- c) When soldering, heat the terminal of the component, not the solder. Apply solder smoothly and evenly. Do not move the component until the solder has cooled. Bad solder joints can cause additional problems!
- d) Static sensitive parts require special handling procedures. Always treat an unknown part as if it were static sensitive.

Chapter 7 - Routine Maintenance

General

This section of the manual contains routine maintenance information regarding the Valhalla Scientific Model 4314KVM Digital Igniter Testers. Calibration should be performed on a regular basis to ensure continued instrument accuracy. The recommended calibration interval is 1 year.

Required Test Equipment

Following is a list of the standard resistors and other equipment required to calibrate the 4314KVM.

Precision Resistors:

.1 Ω \pm 0.01% Accuracy
1 Ω \pm 0.005% Accuracy
10 Ω \pm 0.005% Accuracy
100 Ω \pm 0.005% Accuracy
1K Ω \pm 0.005% Accuracy
10K Ω \pm 0.005% Accuracy
100K Ω \pm 0.005% Accuracy
1M Ω \pm 0.005% Accuracy

Voltage Standard:

Voltage Calibrator capable of outputting from 0V to negative 75mV, 0.03% Accuracy or better.

DMM:

Model 3458A or equivalent.

Power Supply:

Power supply capable of outputting from 4.6 to 6VDC.

Calibration Procedure

To perform calibration, you will need access to the main board of the device. Remove the 10 panel screws to remove the panel assembly from the case.

VOLTAGE SENSE ADJUSTMENTS

Connection:

Apply voltage at Sense Inputs and short Source and Sense negative Pins.

PIN-A	Positive Voltage Sense	PIN-D	Negative Current Source
PIN-B	Negative Voltage Sense	PIN-E	Positive Current Source

Using the Range Knob, select Stand By. On the main board press SW7 tact switch to initiate calibration routine.

4314KVM Procedure:

1. Display will prompt "CAL-0".
Apply 0.000mV to the Voltage Sense and press the FAILSAFE TEST button on the front panel.
2. When the display prompts "CAL-1".
Apply -0.5mV and press the FAILSAFE TEST button.
3. When the display prompts "CAL-2"
Apply -5.0mV and press the FAILSAFE TEST button.
4. When the display prompts "CAL-3"
Apply -9.0mV and press the FAILSAFE TEST button.
5. When the display prompts "CAL-4"
Apply -75.0mV and press the FAILSAFE TEST button.
6. When the display prompts "CAL-C | 5.00mA"
Remove voltage connections and connect the Sense terminals to a 3458A precision Multimeter in DC-Amp mode.
7. Adjust RV15 for a reading of 5.00mA and press the FAILSAFE TEST button.
8. When the display prompts "CALC2 | 5.00mA"
9. Adjust RV15 for a reading of 5.00mA and press the FAILSAFE TEST button.
10. When the display prompts "CAL-C | 500μA"
Adjust RV15 for 0.500mA and press the FAILSAFE TEST button.
11. When the display prompts "CAL-C | 50.0μA"
Adjust RV1 for 50.0μA and press the FAILSAFE TEST button.
12. When the display prompts "CAL-C | 5.00μA"
Adjust RV2 for 5.00μA and press the FAILSAFE TEST button.
13. When the display prompts "CAL-C | 500nA"
Adjust RV3 for 0.500μA and press the FAILSAFE TEST button.
14. When the display prompts "CAL-C | 50nA"
press the FAILSAFE TEST button, no adjustment.
15. Display will prompt "dOnE | CAL". Calibration is complete.

RESISTANCE ADJUSTMENTS

1. Select 200 Ω range.
2. Connect to a 100 Ω standard resistor.
Adjust R15 for a display reading equal to the value of the resistor.
3. Select 2k Ω range and connect to a 1k Ω standard resistor.
Adjust RV1 for a display reading equal to the resistor value.
4. Select 20k Ω range and connect to a 10k Ω standard resistor.
Adjust RV2 for a display reading equal to the resistor value.
5. Select 200k Ω range and connect to a 100k Ω standard resistor.
Adjust RV3 for a display reading equal to the resistor value.
6. Select 2M Ω range and connect to a 1M Ω standard resistor.
No adjust. Verify that display reading is within tolerance of the resistor value.
7. Select 2 Ω range and connect to a 1 Ω standard resistor.
No adjust. Verify that display reading is within tolerance of the resistor value.
8. If the 2 Ω range is too low, select R27 using the RC Box.
9. Select 20 Ω range and connect to a 10 Ω standard resistor.
No adjust. Verify that display reading is within tolerance of the resistor value.
10. If the 20 Ω range is too low, select R37 using the RC Box.

IMPORTANT: If it is necessary to perform step 4.8 or 4.10, go back and forth between the 2 Ω , 20 Ω and 200 Ω ranges until all are in spec.

FAILSAFE CHECK

1. Connect the 3458A in the ammeter mode across the current terminals. Select the 2Ω range.
2. Short TP1 to TP2 (see image) and verify that the measured current is equal or less than the value specified in the Fail-Safe current table.
3. Repeat this process for each range.
4. For $M\Omega$ ranges it will be necessary to connect the appropriate calibration resistor and measure the voltage drop across it. Use Ohm's Law to calculate the failsafe current.

Range	Fail-Safe Current
2Ω	8mA
20Ω	8mA
200Ω	1.8mA
$2k\Omega$	$180\mu A$
$20k\Omega$	$18\mu A$
$200k\Omega$	$1.8\mu A$
$2M\Omega$	180nA

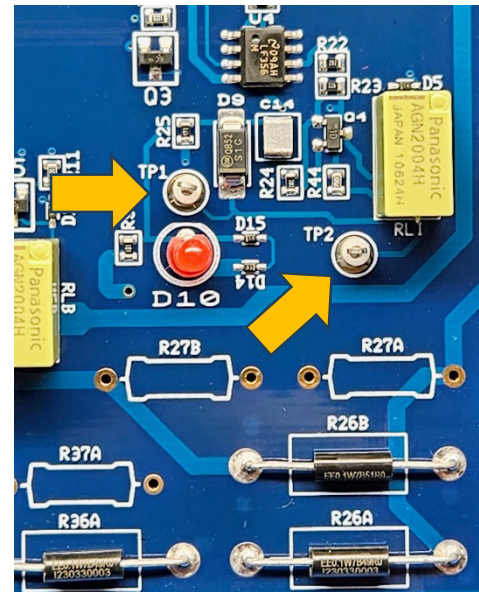


Figure 3 – Fail-Safe shorting points

LOW BATTERY & POWER-UP CHECK

1. Remove the batteries and connect a power supply at 5.4 volts to the battery holder terminals, observing polarity.
2. Connect a 10Ω resistor in the 20Ω range. Dial the power supply down to 4.8 volts. The “Low Battery” indicator should start flashing red. Below 4.8V, “Low Battery” indicator should be solid Red. If not, adjust R32 until the LED Turn RED below 4.8V. The display **must** remain stable and must not freeze up.
3. Increase the supply to 4.81 volts and note that the LED turns off. Return the supply to 5.4 volts.
4. Turn off the power switch and remove the load. Turn the power switch back on and reconnect the load. The reading must return to the same value as before and not freeze up.
5. Remove power supply and install batteries.

Checking the Calibration Results

½ Scale and Linearity Check

Apply to each range resistor values equal to 50% of range, 5% of range.

All values should be within the tolerance specified in Chapter 3.

Zero Check

1. Apply a short between VHI and VLO.
2. Apply a short between VLO and ILO.
3. Check the display for 0 ± 3 digits.

Battery Replacement Instructions

The rechargeable NiMH battery pack used in the 4314KVM are very durable and should provide years of trouble-free operation. As with all batteries, replacement will eventually be necessary. Battery pack may be ordered from Valhalla Scientific as stock #HDP, quantity: (1).

The process of battery replacement is described below:

Remove the 10 panel screws.

1. Undo hook and loop strap.
2. Remove the old battery pack and replace it.
3. Secure the new battery pack in place. Hook and loop strap.
4. Put the panel in place and tighten screws.

Chapter 8 –Structural Features



Figure 4 - Pelican 1200 Case

- Watertight, crushproof, and dustproof
- Automatic Pressure Equalization Valve - balances interior pressure, keeps water out.
- Easy open Double Throw latches

Certifications

- Certified Mil Std 810 – Method 511 Safe for Explosive & Volatile Atmospheres
- Complies to (EWR) 127-1, Section 3.13.8.1-2
- Certified Mil Std 810 – Fungus Test
- IP67
- DEF STAN 81-41 (Vibration Test K, Impact Test E)



Figure 5 - Pressure Equalization Valve

Chapter 9 - Addendums

Immediately following this page may be found any notices regarding manual changes, or operating considerations for special 4314KVM. Please refer to any applicable material before attempting to operate your Model 4314KVM

Note that not all the addendums may apply to your meter.

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