Selectable Impedance Adapter

(Item #5615)

(Manual 410)

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Contents

High Impedance Buffer – P/N 5615

The selectable **High Impedance Buffer** (HIB) is a multipurpose device that may be used to vary the input impedance of data loggers and voltmeters. With the use of the HIB, you will have the ability to select suitable impedance to overcome any external contact resistance as may be done with MCM's LC-4.5. In addition, the HIB may be used as a filter to remove AC noise.

The HIB has excellent AC noise rejection capabilities that improve as the frequency of the noise increases. Noise at the frequency of 50 Hz and 6.36 VRMS (9V-peak) produces only one count of error (1.5mV) at the output, while at 60Hz, it takes 19.1 VRMS (27 V-peak) of noise to cause one count of error.

Features:

- Improve Accuracy of P/S Readings
- Compensates for high resistance contacts between the soil and the electrode
- Detects High Contact Resistance at the Test Lead/Structure Connection
- Operates with Any Voltmeter
- Selectable Bypass Polarity Switch
- Switch Selectable Input Impedances of 20MΩ, 50MΩ, 100MΩ, 200MΩ, and 1GΩ / Open
- Superior Filters of AC Noise
- Watertight Enclosure
- Small and Convenient Size

When Structure-to-Soil readings are taken across highly resistive materials such as dry soil, sand, rock, and concrete, readings may appear lower than their actual values. Relying on such low readings may lead to over protection of the structure and wasted resources.

It is no longer necessary to rely on the fixed 20MΩ input impedance of the standard voltmeters and data loggers for dependable readings. The solution to this common difficulty is the selectable HIB from M. C. Miller Co., Inc. The HIB enables any standard impedance voltmeter or data logger to vary its input impedance thereby eliminating contact resistance errors from readings.

Components:

The HIB has two (2) sets of banana jack terminals and a selector knob with a selectable Bypass Switch. The unit is sealed in a Lexan® case and is powered by a 9V transistor battery. The battery should power the unit continuously for at least 3 months without fault. The "**OFF"** position of the HIB functions as a means of testing its internal battery from a digital multi-meter. To test the battery, turn the switch to the "**OFF/BAT.TEST"** position and he selectable Bypass switch in the "**ON"** position, then connect the HIB's output to a DMM set to the 200mV range. A reading below 80mV requires that the battery be charged. The battery voltage should not be allowed to drop below 8Vdc before the battery is replaced.

Selectable Impedance Buffer Unit Operating Instructions

How to Check the Battery Status:

This process is recommended prior to each use of the unit.

Connect your voltmeter to the Buffer unit via the two banana plug-to-banana plug cables provided with the unit. Connect the cables to the Buffer unit (black cable to the black banana jack, and, red cable to the red banana jack) on the "**DC OUT**" side of the unit. Next, connect the cables to your voltmeter (black cable to the black banana jack, and, red cable to the red banana jack) and select a mV DC Range setting on the voltmeter (for example, 200mV Range).

Next, (making sure that your voltmeter is switched "**ON"**), move the toggle switch located on the "**DC OUT**" side of the to the "**ON HIB**" position. Read the voltage reading on the voltmeter's LCD. The reading will be higher than the 90mV in the case of a new battery. The battery should be replaced if the reading is less than 80mV. A 9Volt Lithium Ion battery is recommended.

Note: The battery is accessed by removing the 4 screws at the corners of the top cover of the unit and lifting the cover off.

Finally, move the toggle switch back to the "**OFF**" position (center position) after the battery check reading.

How to Insert the Buffer unit between your Voltmeter and your Test Station:

Connect your voltmeter to the Buffer unit via the two banana plug-to-banana plug cables provided with the unit. Connect the cables to the Buffer unit (black cable to black banana jack, and, red cable to red banana jack) on the "**DC OUT**" side of the unit. Next, connect the cables to your voltmeter (black cable to black banana jack, and, red cable to red banana jack) and select the Volts DC Range setting on your voltmeter that will be suitable for your expected "structure-to-soil" reading values (typically less than 2 Volts).

Next, connect the Buffer unit to your test station via two test leads (for example, using two "banana plug to C-clip" test leads, one black and one red colored). Connect your red test lead to the red banana plug jack on the "**DC IN**" side of the Buffer unit, and, connect your black test lead to the black banana plug jack on the "**DC IN**" side of the Buffer unit.

Next, connect your test leads to your test station. *Note:* if you require **negative** "structure-to-soil" readings, connect your red colored test lead to the structure terminal and your black test lead to your reference electrode. If you require **positive** "structure-to-soil" readings, connect your black colored test lead to the structure terminal and your red colored test lead to your reference electrode.

How to Take Readings with the Buffer Unit Connected:

With the Buffer unit, voltmeter and test leads connected as described above, (making sure that your voltmeter is switched "**ON"**), move the toggle witch located on the "**DC OUT**" side of the unit to the "**ON HIB**" position.

Next move the selector switch from the "**OFF**" position to the 20MΩ position. You should now have a "structure-to-soil" voltage reading displayed on your voltmeter. Next, take note of this reading and then move the selector switch to the progressively-higher impedance settings, taking note of the reading in each case, until the reading value does not change, i.e. does not increase significantly from its previous value. The highest voltage reading

observed, as you step through the different impedance settings, will be the most "accurate" voltage reading possible.

Finally, move the selector switch back to its "**OFF**" position, and, also move the toggle switch on the ""**DC OUT**" side of the Buffer unit to its "**OFF**" position.

Note: The maximum input voltage (maximum voltage that you can apply at the "**DC IN**" terminals) is 4 volts with the Buffer unit "**ON**". Should you require to measure higher voltages with your voltmeter, with the Buffer unit still connected, you can bypass the Buffer unit by moving the toggle switch on the "**DC OUT**" side of the Buffer unit to the "**BYPASS**" position.

Caution: When you are applying higher voltage values (higher than 4V) across the "**DC IN**" terminals of the Buffer unit, make sure that you **do not** switch back to the "**ON HIB**" position when you are still connected, as this will cause the PC board in the Buffer unit to burn out.

Buffer Unit Specifications:

Frequency Response
Frequency Attenuation Counts of Error
50Hz: 74.3 dB, 1 count in 5,120
60Hz: 85.6 dB, 1 count in 19,149

AC Rejection @ 50Hz
Rejection Counts of Ripple
Setting Time
6.36 VRMS1 (01.5mV) <200ms
11.3 VRMS2 (12.5mV) <200ms
17.7 VRMS3 (03.5mV) <200ms

Maximum AC Noise Before Distortion Occurrence
Frequency AC Noise
50Hz 25.5 VRMS
60Hz 34.0 VRMS

DC Response and Accuracy
The HIB uses less than 200ms to reach output voltage of 2VDC @ 1 mV with a 2VDC input

Maximum Operational DC Input
4V

Input Impedance
Switch Selectable (20MΩ, 50MΩ, 100MΩ, 200MΩ, 1GΩ /Open)

Definitions
Rejection: The 60Hz (50Hz) RMS voltage required to cause the corresponding counts of ripple.
Counts of Ripple: The amount of amplitude variation due to noise.
Setting Time: The time for the output to be within the corresponding counts of ripple for each rejection.

Battery
9V lithium battery is recommended

Battery Life
Alkaline: > 60 hours of continuous operation (worst case)
Lithium: > 210 hours of continuous operation (worst case)

Minimum Battery Voltage
8.0 Volts

Size
3-1/4" x 3-3/16" overall (8.3 x 9.0 x 7.5 cm)

Weight
9.3 oz. (0.242kg)