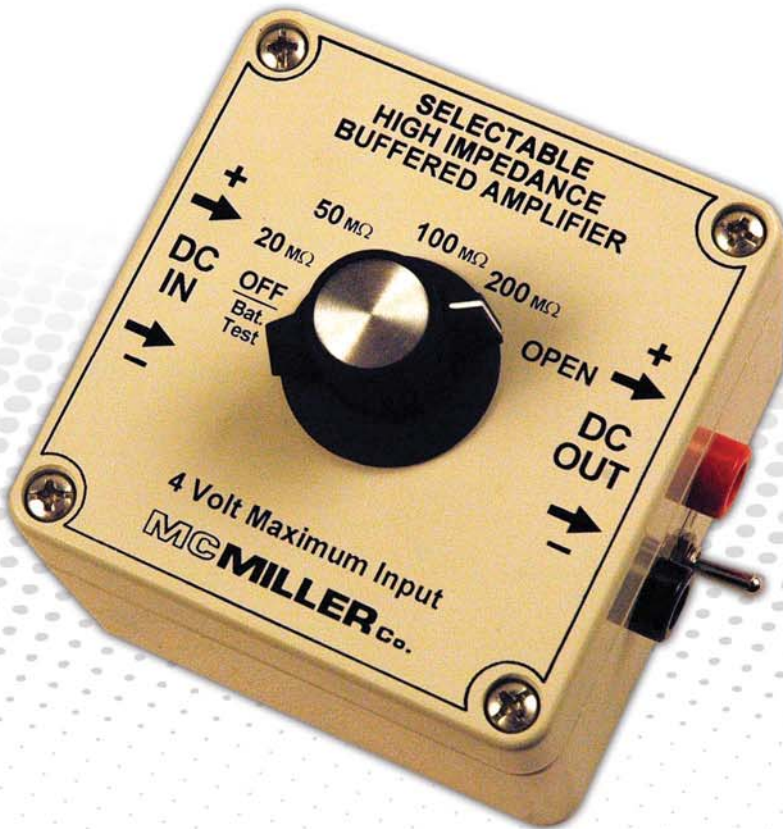


## SELECTABLE HIGH IMPEDANCE BUFFER



Model M-3-A2 Multimeter  
Cat. No. 5615



Included red and black test leads  
Cat. No. SIN008

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

No longer is it necessary to rely on the fixed 10 Megohm input impedance of standard voltmeters and data loggers for dependable readings. The solution to this common difficulty is the SELECTABLE HIGH IMPEDANCE BUFFER. The adapter enables any standard impedance voltmeter or data logger to vary its input impedance thereby eliminating contact resistance errors from readings.

### ADVANTAGES:

- Improves accuracy of pipe-to-soil readings
- Compensates for high resistance contacts between soil and electrode
- Detects high contact resistance at the test lead/structure connection
- Adapts with any voltmeter
- Switch selectable input impedance of 20MΩ, 50MΩ, 100MΩ, 200MΩ or 1GΩ/Open
- Superior filtering of AC noise
- Watertight enclosure
- Small and convenient



# GENERAL INFORMATION:

Due to the limitations of standard voltmeters, an error can be realized while performing readings with high impedance sources (e.g. structure-to-soil readings at the point where a copper sulfate reference electrode makes contact with the earth). This error is a result of a current loop created by the voltmeter which causes a drop across the source resistance. The SELECTABLE HIGH IMPEDANCE BUFFER varies this current loop allowing the user to determine when the error has been made insignificant. However, with higher impedances there is an increase in noise pickup. Therefore, when two adjacent ranges give the same readings, select the lower of the two ranges to limit pickup while maintaining the most precise reading.

The SELECTABLE HIGH IMPEDANCE BUFFER is a multipurpose device used to vary the input impedance of data loggers and voltmeters, as well as a filter to remove AC noise.

The high impedance adapter has excellent AC noise rejection capabilities that improve as the frequency of the noise increases. Noise at a frequency of 50 Hz and 6.36 VRMS (9V-peak) produces only 1 count of error ( $\pm 1.5$  mV at the output, while at 60 Hz, it takes 19.1 VRMS (27 V-peak) of noise to cause 1 count of error.

The selectable input impedance feature permits detection of high resistance in the external circuit and the elimination of resulting errors in virtually all cases. This feature is implemented by first taking the reading with the SELECTABLE HIGH IMPEDANCE BUFFER in the 20 M position and switching to the next higher impedance while watching the output until the reading is constant. Next, turn the switch back one position to decrease the impedance which will reduce any noise pickup and will result in the most precise reading.

In addition to giving precise readings, the SELECTABLE HIGH IMPEDANCE BUFFER can also withstand a constant DC input of 700 volts as well as 1.5 kV voltage spikes.

The OFF position of the adapter functions as a means of testing its internal battery from a digital multimeter. To test the battery, turn the switch to OFF/BAT. TEST position and connect the HIGH IMPEDANCE BUFFER'S output to a DMM set to the 200mV range. A reading below 80mV requires that the battery be changed.

# SPECIFICATIONS:

## Frequency Response

Frequency	Attenuation	Count of Error
50 Hz	-74.3 dB	1 in 5,210
60 Hz	-85.6 dB	1 in 19,149

## AC Rejection @ 50 Hz

Rejection	Counts of Ripple	Setting Time
6.36 VRMS	1 ( $\pm 1.5$ mV)	<200 ms
11.3 VRMS	2 ( $\pm 2.5$ mV)	<200 ms
17.7 VRMS	3 ( $\pm 3.5$ mV)	<200 ms

## AC Rejection @ 60 Hz

Rejection	Counts of Ripple	Setting Time
19.1 VRMS	1 ( $\pm 1.5$ mV)	<200 ms
33.2 VRMS	2 ( $\pm 2.5$ mV)	<200 ms

## Maximum AC noise before distortion occurs

Frequency	AC Noise
50 Hz	25.5 VRMS
60 Hz	34.0 VRMS

## DC Response and Accuracy

It takes the HIGH IMPEDANCE BUFFER less than 200 ms to reach an output voltage of 2 VDC  $\pm$  1mV with a 2 VDC input.

**Maximum Operational DC Input**  $\pm$  4 Volts.

**Input Impedance:** Switch selectable (20 M $\Omega$ , 50 M $\Omega$ , 100 M $\Omega$ , 1G $\Omega$ /Open)

## Definitions

Rejection is defined as the 60Hz (50 Hz) RMS voltage required to cause the corresponding counts of ripple. Setting time is defined as the time for the output to be within the corresponding counts of ripple for each rejection. Counts of ripple refers to the amount of amplitude variation due to AC noise.

**Battery:** (1) - 9V alkaline or  
(1) - 9V lithium (recommended)

## Battery Life:

*Alkaline*- greater than 60 hours of continuous operation (worst case)  
*Lithium*- greater than 120 hours of continuous operation (worst case)

**Min. Battery Voltage:** 8.0 Volts

**Operating Temp:** -40°F to 185°F (-40°C to +85°C)  
**Size:** 3-1/4" x 3-9/16" x 3 overall (8.3 x 9.0 x 7.6 cm)  
3-1/4" x 3-3/16" x 2-3/16" box (8.3 x 8.1 x 5.6 cm)  
**Weight:** 9.3 oz (264 gr.)



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