



WORLD  
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*Instrumenting scientific ideas*

# INSTRUCTION MANUAL

## DAM50

*Differential Amplifier*

Serial No. \_\_\_\_\_

[www.wpiinc.com](http://www.wpiinc.com)

092618



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## ABOUT THIS MANUAL

The following symbols are used in this guide:



This symbol indicates a CAUTION. Cautions warn against actions that can cause damage to equipment. Please read these carefully.



This symbol indicates a WARNING. Warnings alert you to actions that can cause personal injury or pose a physical threat. Please read these carefully.

NOTES and TIPS contain helpful information.

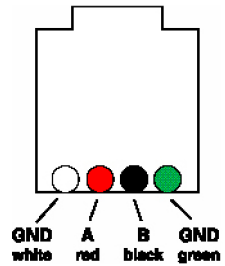


Fig. 1—The DAM50 is a differential amplifier.

# INTRODUCTION

Differential amplification is of great importance in bioelectric recording to reduce the ever present effect of noise interference from power line induction. A well designed differential amplifier will significantly diminish power line (mains) noise. It is most essential that the preparation be connected with an electrode to a good electrical ground as well as to the grounding wire of the DAM50 itself. This should have the effect of greatly reducing electrostatically induced potential. In addition to the preparation ground, two differential input connections must be made via appropriate electrodes applied to the recording site so as to optimally record a bioelectric potential difference.

#3517 Cable



## Parts list

Contents

DAM50 amplifier

3518 shielded cable (bare termination) (available in a package of two as P/N 3517).

300647 shielded cable for metal electrodes

## Unpacking

Upon receipt of this instrument, make a thorough inspection of the contents and check for possible damage. Missing cartons or obvious damage to cartons should be noted on the delivery receipt before signing. Concealed damage should be reported at once to the carrier and an inspection requested. Please read the section entitled "Claims and Returns" on page 11 of this manual. Please contact WPI Customer Service if any parts are missing at 941.371.1003 or [customerservice@wpiinc.com](mailto:customerservice@wpiinc.com).

**Returns:** Do not return any goods to WPI without obtaining prior approval (RMA # required) and instructions from WPI's Returns Department. Goods returned (unauthorized) by collect freight may be refused. If a return shipment is necessary, use the original container, if possible. If the original container is not available, use a suitable substitute that is rigid and of adequate size. Wrap the instrument in paper or plastic surrounded with at least 100mm (four inches) of shock absorbing material. For further details, please read the section entitled "Claims and Returns" on page 11 of this manual.

## INSTRUMENT DESCRIPTION

### The Amplifier

INPUT to the DAM50 amplifier is made via a flexible, 4-wire shielded cable terminated in a miniature telephone-style plug. The DAM50 now has a prewired cable (300647) made for metal electrodes (0.031" pin) and a reference electrode on a 2 mm pin. Refer to the appendix for wiring configurations.

The designation of the four wires is indicated on the mating panel receptacle. The INPUT SELECT switch allows the user to choose A, B (inverting) or differential A-B. It is recommended that, while the electrodes are being connected, amplifier inputs should be grounded with the INPUT SELECT switch to avoid input overload which may result in excessive recovery time as described below. Further, inputs A and -B must be connected to a ground return path. In A-B mode, if either input is not placed on the preparation, it must be connected to ground. Note that in A or -B INPUT SELECT modes, the input not selected is grounded internally. The recorder or oscilloscope is connected via the cable provided to the OUTPUT connector on the right side of the amplifier case.

Amplification is controlled by the GAIN selector switch. Note that amplification is ten times larger in the AC mode than in the DC mode.

### Electrode Impedance

If electrodes of very high impedance are used, electrostatic induction will induce objectionably large noise signals. It may then be necessary to enclose the electrode and cable with an electrostatic shield (keep the cable length short) or alternatively to shield the entire recording area (The DAM80, a companion instrument in the DAM amplifier series, is especially designed for high impedance electrode recording).

### Filters

The LOW FILTER selector switch determines the lower cut off frequency when the user is in the AC MODE. Note that at 0.1 Hz setting the amplifier may take a long time to recover if the user inadvertently disconnects an input wire or if the input is exposed to an excessively large artifact. This is a typical property of AC amplifiers set at very low frequency filter settings. For fast recovery from signal overload the user is advised to operate at the highest frequency setting of the low frequency filter consistent with the application. Generally, slow signals such as ECG and EEG require the 0.1 Hz setting, while nerve action potential recording allows the use of the 10 Hz LOW FILTER setting without sacrificing signal quality.

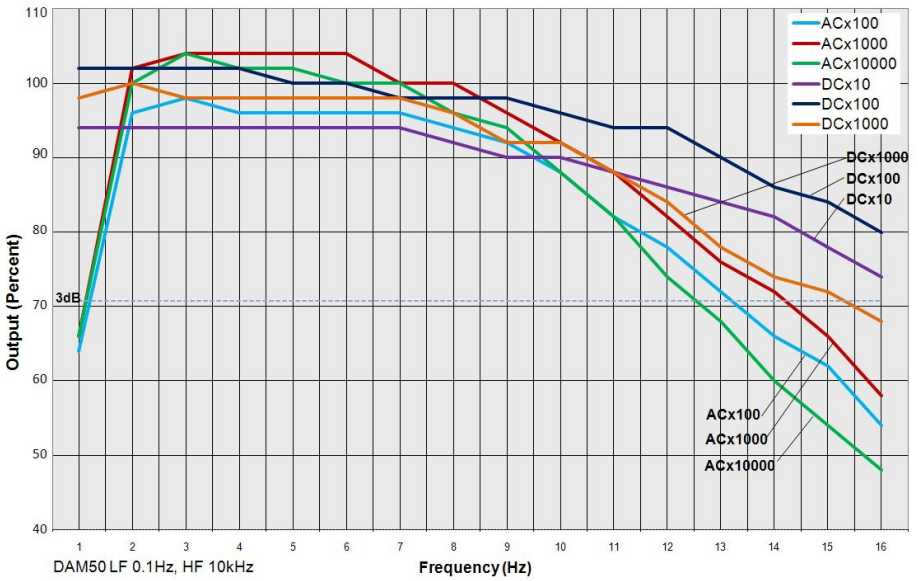
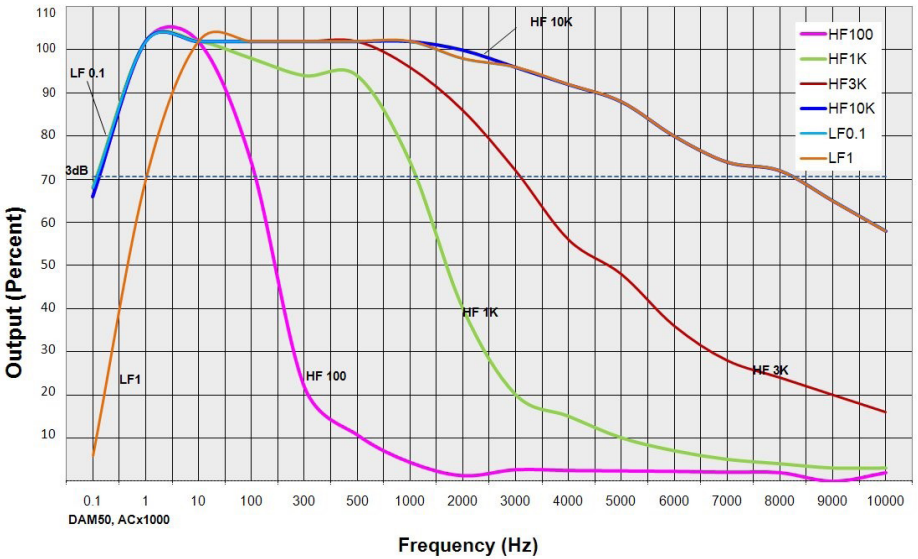


Fig. 1—GAINS: This chart shows the standard 3dB frequency cutoff at maximum filter band pass.





## AC or DC Recording?

It should be noted that DC recording with metal electrodes will invariably result in excessively large galvanic potentials being applied to the amplifier's input terminals. This can result in overdriving the amplifier so that the POSITION control will not be able to restore the operating baseline's position. In this case, use Calomel or Ag-AgCl electrodes, or use an external variable bucking potential; alternatively, resort to AC recording.

## MAINTENANCE

### Testing the Amplifier

Instrument POWER is provided by two alkaline 9 volt batteries. Battery operation results in lower internal noise level. Batteries can be tested by activating the BAT/CAL switch. If a short tone is heard, the batteries are functional. Conversely if the tone is absent, the batteries must be replaced. An additional function that the BAT/CAL switch performs is to provide a low frequency square wave test signal which is applied to the amplifier input. The amplitude of this signal is 100 microvolts when operating in either of the two highest GAIN positions and 1 millivolt in the lowest GAIN position.

Mode	Gain	Cal signal	Output
DC	10×	1 mV	10 mV
DC	100×	1 mV	100 mV
DC	1000×	100 $\mu$ V	100 mV
AC	100×	1 mV	100 mV
AC	1000×	1 mV	1000 mV
AC	10,000×	100 $\mu$ V	1000 mV

## SPECIFICATIONS

This unit conforms to the following specifications:

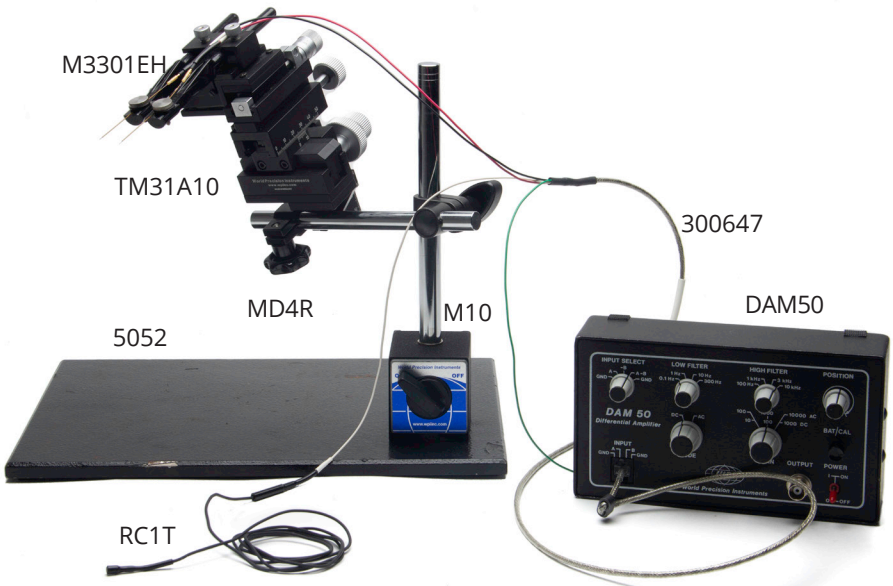
Input Resistance .....	>10 <sup>12</sup> Ohms, common mode and differential
Input Leakage Current .....	50 pA, max.
Amplification .....	100×, 1000×, 10,000× (AC) 10×, 100×, 1000× (DC)
Common Mode Rejection Ratio (CMRR) .....	100 dB typ. @ 50/60 Hz, 80 dB typ. @ 1 KHz
Equivalent Noise Signal Input (ENSI) AC amplifier (typ.).....	0.4 μV rms (2.0 μV p/p), 0.1-100 Hz 2.0 μV rms (10 μVp/p), 1 Hz-10 kHz
DC Amplifier .....	6.0 μV rms (30 μV p/p), 3-10 kHz
Bandwidth Filter Settings AC .....	low frequency 0.1, 1, 10, 300 Hz
AC and DC .....	high frequency 100 Hz, 1, 3, 10 KHz
Position .....	250mV
Output Voltage Swing.....	± 8 V
Output Resistance.....	470 Ohms
Battery Test.....	1 second audible tone
Calibrator Signal.....	10 Hz square wave, amplitude 100 μV (at 1000× and 10,000×), 1 mV (at 100×) and 10× DC).
Power.....	2 9V alkaline batteries, supplied
Input Cables.....	1 shielded cable with metal electrode connectors are provided and 1 shielded cable with bare wires.

## APPENDIX A DAM50 WIRING CONFIGURATIONS

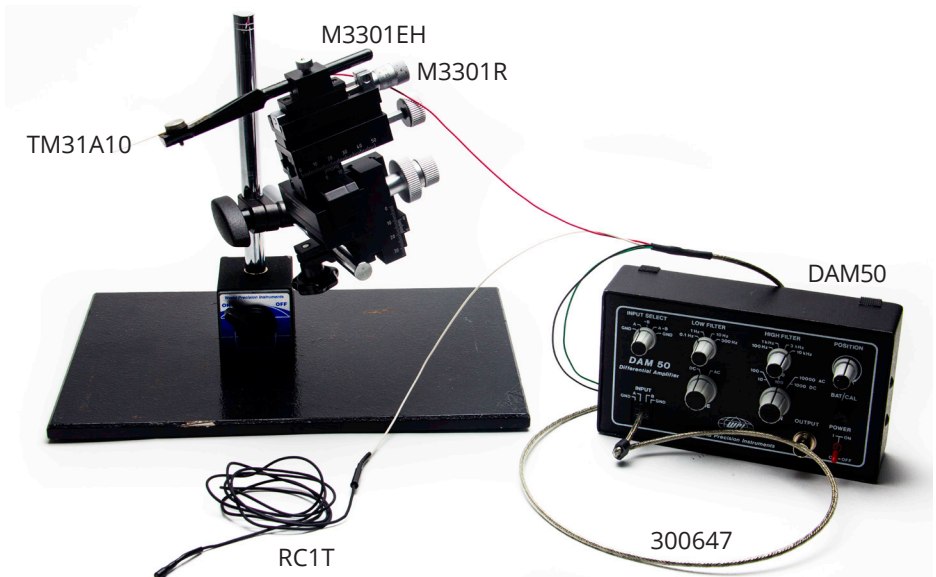
PART NUMBER	DESCRIPTION
M3301EH	Replacement Electrode Holder
M3301R	Manual Micromanipulator
MD4R	Dual Tool-Holder Micromanipulator
TM31A10	Tungsten Metal Electrodes Profile A, 76 mm, 1 micron
RC1T	Reference Cells
M10	M10 Magnetic Stand
5052	Steel Base Plate, 10 lbs
3294	Ground Wire for DAM80 Probe
EP2	Ag/AgCl Electrode
2505	Electrode Handle 6.3 mm
5444	Electrode Handle 4.8 mm
13620	Low-noise cable for Microelectrode Holder
5489	Optional Probe for DAM50
MEH7W-10	Microelectrode Holder

## A. 300647 Prewired cable for metal electrodes

### a. Differential configuration (Mode A-B)



### b. Single ended configuration (Mode A)

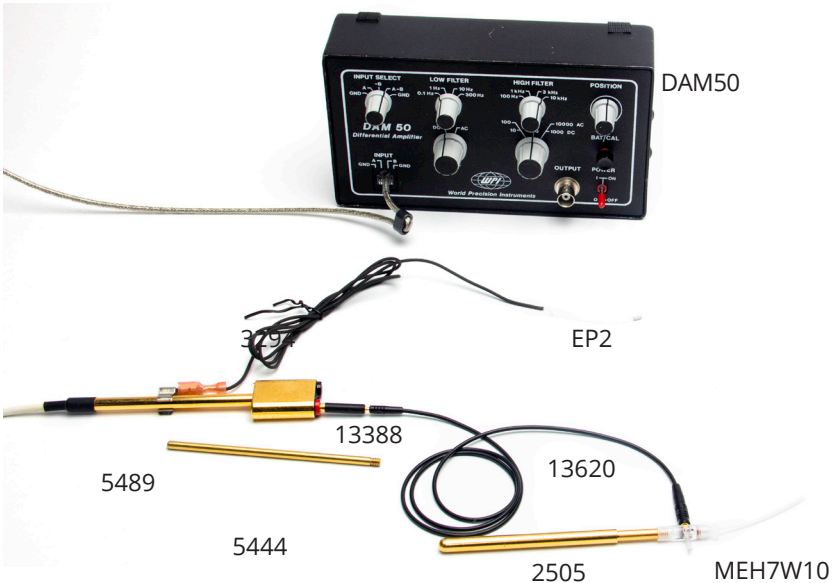


## B. 5489 mini-banana adaptor for glass

### a. Differential configuration (Mode A-B)



### b. Single ended configuration (Mode A)



## C. 5447 2 mm adaptor for glass

### a. Differential configuration (Mode A-B)



### b. Single ended configuration (Mode A)



# DECLARATION OF CONFORMITY



## WORLD PRECISION INSTRUMENTS, LLC.

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## DECLARATION OF CONFORMITY

We: World Precision Instruments, Inc.  
175 Sarasota Center Boulevard  
Sarasota, FL 34240-9258 USA

As the **manufacturer/distributor** of the apparatus listed, declare under sole responsibility that the product(s):  
**DAM50**

To which this declaration relates is/are in conformity with the following standards or other normative documents:

**Safety:** EN 61010-1:2010  
**EMC:** EN61326-2-3:2013, EN 61326-1:2013

And therefore conform(s) with the protection requirements of Council Directive 89/336/EEC relating to electromagnetic compatibility and Council Directive 73/23/EEC relating to safety requirements:

Issued on: **July 20, 2018**

  
Quality Department Manager

## WARRANTY

WPI (World Precision Instruments, Inc.) warrants to the original purchaser that this equipment, including its components and parts, shall be free from defects in material and workmanship for a period of one year\* from the date of receipt. WPI's obligation under this warranty shall be limited to repair or replacement, at WPI's option, of the equipment or defective components or parts upon receipt thereof f.o.b. WPI, Sarasota, Florida U.S.A. Return of a repaired instrument shall be f.o.b. Sarasota.

The above warranty is contingent upon normal usage and does not cover products which have been modified without WPI's approval or which have been subjected to unusual physical or electrical stress or on which the original identification marks have been removed or altered. The above warranty will not apply if adjustment, repair or parts replacement is required because of accident, neglect, misuse, failure of electric power, air conditioning, humidity control, or causes other than normal and ordinary usage.

To the extent that any of its equipment is furnished by a manufacturer other than WPI, the foregoing warranty shall be applicable only to the extent of the warranty furnished by such other manufacturer. This warranty will not apply to appearance terms, such as knobs, handles, dials or the like.

WPI makes no warranty of any kind, express or implied or statutory, including without limitation any warranties of merchantability and/or fitness for a particular purpose. WPI shall not be liable for any damages, whether direct, indirect, special or consequential arising from a failure of this product to operate in the manner desired by the user. WPI shall not be liable for any damage to data or property that may be caused directly or indirectly by use of this product.

## Claims and Returns

Inspect all shipments upon receipt. Missing cartons or obvious damage to cartons should be noted on the delivery receipt before signing. Concealed loss or damage should be reported at once to the carrier and an inspection requested. All claims for shortage or damage must be made within ten (10) days after receipt of shipment. Claims for lost shipments must be made within thirty (30) days of receipt of invoice or other notification of shipment. Please save damaged or pilfered cartons until claim is settled. In some instances, photographic documentation may be required. Some items are time-sensitive; WPI assumes no extended warranty or any liability for use beyond the date specified on the container

Do not return any goods to us without obtaining prior approval and instructions from our Returns Department. Goods returned (unauthorized) by collect freight may be refused. Goods accepted for restocking will be exchanged or credited to your WPI account. Goods returned which were ordered by customers in error are subject to a 25% restocking charge. Equipment which was built as a special order cannot be returned.

## Repairs

Contact our Customer Service Department for assistance in the repair of apparatus. Do not return goods until instructions have been received. Returned items must be securely packed to prevent further damage in transit. The Customer is responsible for paying shipping expenses, including adequate insurance on all items returned for repairs. Identification of the item(s) by model number, name, as well as complete description of the difficulties experienced should be written on the repair purchase order and on a tag attached to the item.

*\* Electrodes, batteries and other consumable parts are warranted for 30 days only from the date on which the customer receives these items.*

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