

# Headphone Dummy Load



## User's Guide

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## Revision History

### HP-LOAD Design Documentation

Revision	Date	Notes
1.0	08 JUL 2021	Document created.
1.1	21 DEC 2024	General consolidation & cleanup.

### HP-LOAD Circuit Board

Revision	Date	Notes
1.0	28 APR 2020	First production layout.

### HP-LOAD Firmware

Revision	Date	Notes
1.0	07 JAN 2021	First production release.

**WARNING!****POWER DISSIPATION**

The maximum power dissipation allowed for the HP-LOAD is as follows:

Load Resistance	Continuous Power (RMS)
12 $\Omega$	27 W
16 $\Omega$	20 W
20 $\Omega$	8 W
32 $\Omega$	10 W
50 $\Omega$	8 W
300 $\Omega$	13 W
600 $\Omega$	6.6 W

The maximum AC voltage that can safely be applied to the HP-LOAD is 63 V RMS, which limits the maximum power dissipation in the 300  $\Omega$  and 600  $\Omega$  ranges.

**POWER SUPPLY**

The absolute maximum DC power supply voltage that can safely be applied to the HP-LOAD is 6.0 V. Please use the included power adapter.

## Connectors & Switches

### *Front Panel*

The HP-LOAD is turned on/off by pressing and holding the POWER button for 500 ms.

The HP-LOAD has two operating modes: Local and Remote.

In Local Mode the green LEDs are illuminated and the load impedance is controlled by pressing the green UP and DOWN buttons for the resistive and capacitive loads, respectively. The selected load is indicated by a red LED.

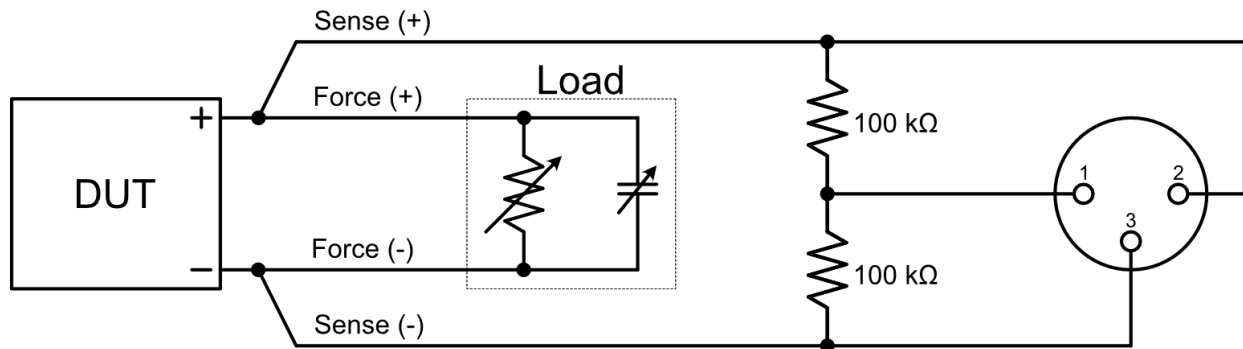
Remote Mode is entered by presenting a rising edge on the REMOTE pin of the APx Control connector. In Remote Mode the load impedance is selected by the logic signals provided to the APx Control connector and the manual selection is disabled.

The HP-LOAD can be returned to Local Mode either by pressing the LOCAL button on the front panel or by presenting a falling edge on the REMOTE pin of the APx Control connector. In Local mode the control inputs of the APx Control connector are ignored.

The device under test (DUT) is connected at the 9-pin D-Sub connector. The pinout of the DUT connector is tabulated below.

Pin	Function
1	Right - Force (+)
2	Right - Sense (+)
3	Right - Force (-)
4	Right - Sense (-)
5	Left - Force (+)
6	Left - Sense (+)
7	Left - Force (-)
8	Left - Sense (-)
9	Ground (shield)

The HP-LOAD uses a Kelvin connection to sense the output voltage of the DUT directly at the output connector of the DUT. This eliminates any voltage drop across the cable connecting to the DUT. The sensed voltage is provided on the two XLR connectors. The connections are shown below.



### Rear Panel

The rear panel of the HP-LOAD contains two connectors: A 9-pin male DB-9 connector for remote control of the load impedance and a 5.5 mm barrel connector for the power supply.

The DB-9 connector is intended for use with Audio Precision's APx-series of audio analyzers but can be controlled by any appliance that is capable of generating 5 V TTL-level logic signals. The pinout of the APx Control connector is tabulated below.

Pin	Function
1	Resistance, Bit 0
2	Resistance, Bit 1
3	Resistance, Bit 2
4	Capacitance, Bit 0
5	Capacitance, Bit 1
6	Capacitance, Bit 2
7	REMOTE
8	No Connection
9	Ground (shield)

By asserting the various Resistance and Capacitance bits any combination of the supported load impedances can be selected. The bit patterns are tabulated below.

Resistance <2:0>	Selected Load Resistor
000	12 $\Omega$
001	16 $\Omega$
010	20 $\Omega$
011	32 $\Omega$
100	50 $\Omega$
101	300 $\Omega$
110	600 $\Omega$
111	Open (no load resistor selected)

Capacitance <2:0>	Selected Load Capacitor
000	100 pF
001	200 pF
010	500 pF
011	1.0 nF
100	4.7 nF
101	10 nF
110	100 pF
111	100 pF

The selected impedance is indicated by a red LED on the front panel of the HP-LOAD. Note that no LED will be illuminated for selections that are out of range (marked in red in the tables above).

The timing diagram for the control of the HP-LOAD is shown below. Note that the control lines are de-bounced for noise immunity. Thus, the HP-LOAD takes approximately 60 ms to change from one load impedance to the next.

