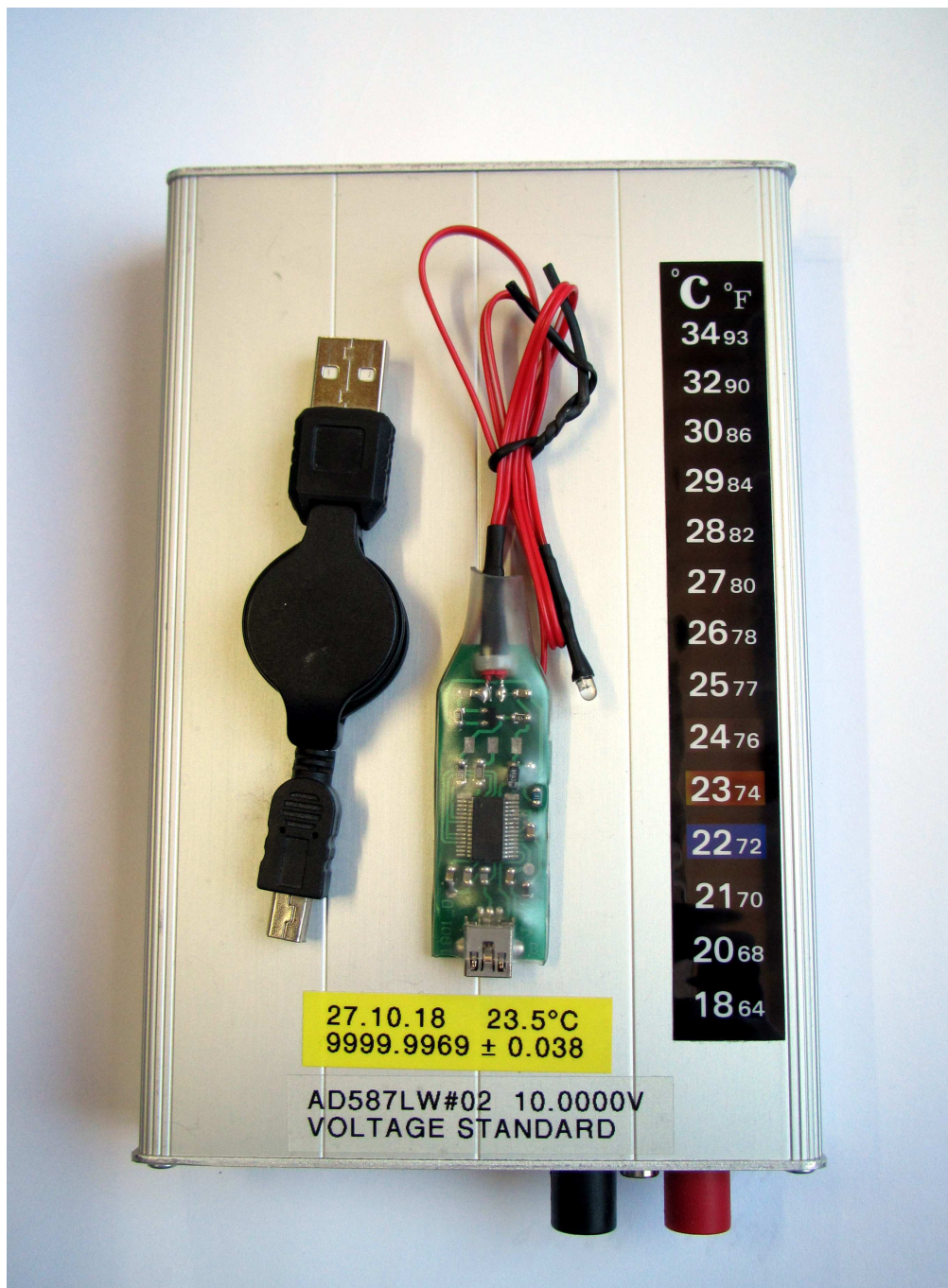


AD587LW

10V precision travel standard

Users Guide



Description:

The AD587LW/AD587LWB precision travel standard is a battery supplied 10.0000V voltage reference to transport a calibrated voltage from a calibration lab to your home laboratory. It is designed to maintain a stable voltage source for at least 6.5 digit multimeters.

Package contents:

- AD587LW/AD587LWB precision travel standard in aluminium case
- USB cable USB-A to USB-mini
- USB_1801 photo transistor read out circuit to USB-mini
- attached room temperature thermometer

Front panel:

- USB mini connector for charging (4.5-5.5V and 500 mA max.)
- Status LED and data readout for PC
- 2 mm guard connector
- 2 * 4 mm 10V voltage output connectors



Operating instructions:

Charging:

After transport the internal batteries should be charged by connecting the USB cable (USB mini connector) to the charging port of the AD587LW device. The other side (USB-A connector) should be connected to any active USB port. (PC, USB charger adapter or mobile power bank). Charging may need up to 16 hours. Charging should be at room temperature. Do not charge outside the temperature range of 10-40 deg C.

After charging it needs up to 30-60 minutes until the internal temperature normalizes and the voltage reference has its full accuracy.

Status LED:

Flashing once very second indicates that the batteries are not empty and the reference circuit is switched on. On empty batteries the voltage reference is switched off to protect the battery from deep discharge. In this state the status LED flashes once every two seconds. Switching off is done at typical 14.1V. Switching on again needs minimum a charging up to 15 V due to hysteresis.

Data read out via PC:

Plug the photo transistor of the USB_1801 interface into the opening of the status LED. Connect the interface with the USB cable to a PC. On a Windows 7 to Windows 10 system the FTDI USB serial port drivers are automatically installed if necessary.

For reading the data you can either use your preferred terminal program (like HTERM) or the PC logging software from the EEVBLOG discussion page:

<http://www.eevblog.com/forum/metrology/ad587lw-10v-precision-travel-standard/msg1449493/#msg1449493>

In operating state every second the internal temperature near the voltage reference and the battery voltage is sent to the PC as ASCII characters separated by a semi-colon and terminated by a carriage return character.

Example for data in operating mode: (10 bytes every second)

26.2;16.2<CR>

Meaning: 26.2 deg C internal temperature and 16.2 V battery voltage

Example for data in off mode: (10 bytes every 2 seconds)

23.2;14,2<CR>

Meaning: 23.2 deg C internal temperature and 14.2 V battery voltage

the comma ',' instead of the decimal point '.' in the voltage string indicates that the reference is switched off.

Against a terminal program the logging software adds a timestamp and a frame counter for every received transmission and logs it to a text file. A 2nd file is generated for the 1 minute averages.

Battery status according to battery voltage @ 23 deg C room temperature:

>= 15.5 ... 17.4V full

>= 14.5 ... 15.5V fair

>= 14.3 ... 14.5V empty

<= 14.2V switched off

Connection to a digital multimeter (DMM):

Connect 2 measurement cords to the multimeter at the voltage input. Then connect both lines to the 10V output (4 mm sockets) of the reference. The reference should be disconnected from charging for more than 30-60 minutes before taking readings. Also 1-2 hours should be the waiting time to equalize temperature after temperature changes.

The 2 mm socket with connection to housing of the reference should be connected to the guard terminal of your multimeter. Alternatively you can check whether a connection to the metal case of your instrument or a connection to the negative input terminal gives more stable readings.

The housing of the AD587LW reference is intended to be kept isolated from environment (4 rubber bumpers on the bottom side) except for the guard connection described above.

General rules for stable readings:

- keep the connections clean
 - use high quality cables with gold finish
 - keep air drafts away from connections
 - after touching connectors let the temperature settle
 - do not place the reference on top of instruments which will warm up
 - best readings will be made at a environment temperature around 23 deg C
- In this case the internal temperature near the reference is about 2 deg C higher.

Maintenance:

Keep the unit dry and clean. Cleaning of the surfaces may be done by a wettish cloth. The 10 V output contacts may be cleaned by a cotton bud with some ethylene or propylene alcohol.

Charging of the batteries should be done for 16 hours after and before transport and at least once every week.

Calibration (verification) cycle is 1 year for the voltage output.

Verification of temperature stability between 18-33 deg C internal temperature should also be done before calibration.

There are no user servicable parts inside. So no internal maintenance necessary. After opening calibration may lose its validity. So a re-calibration against a 10V standard with better than 5 ppm expanded uncertainty should be done.

Technical data:

values are for A-grade

specified temperature range (operating):	18-33 deg C (internal sensor)
temperature transport:	10-40 deg C
humidity (operating):	< 70% rH
humidity during transport:	< 90% rH (non condensing)
Transport duration (operating, no load)	up to 7 days
Output voltage (RL > 10 Meg Ohm):	10.0000 V +/- 10 ppm
Output resistance:	< 1 Ohm (typ 0.18/0.46 Ohm)
Maximum output current (load/sink):	10 mA
Output connector material:	gold plated brass / NYLON 6
Noise (1/f noise + popcorn noise):	<= 1 ppm (<= 10 Hz)
Temperature drift (18-33 deg C int):	<= 2 ppm
Ageing drift (1 year operating)	<= 2 ppm
Power supply:	12 * AAA NiMH cells 950 mAh
Max charging supply:	<= 500 mA @ 4.5V-5.5V USB port
Charging duration:	14-16 hours (80-100 mA charge current)
Status LED during operation:	once every second
Status LED during reference switched off:	once every 2 seconds
RS232 parameters on status read out:	4800,n,8,1