FLUKE®

Calibration

A40B Precision Current Shunts

Answers to frequently asked questions

Question	Answer
What leads and adapters are included in the A40B-SET and what are they used for?	Three leads and two adapters are included with the A40B-SET to satisfactorily cover most A40B applications. They can also be ordered individually.

Qty 2 of A40B-LEAD/4MM
N-type male to 4 mm double banana connector

This lead permits connecting the A40B shunt's N-type connectors to instrumentation that uses dual banana plug connection terminals. Having two leads permits connecting the shunt's voltage output to a voltage measuring instrument and also connecting the shunt's current input to a UUT current source.

Qty 1 of A40B-LEAD/N
N-type male to N-type male lead

This lead permits connecting the A40B shunt's voltage output to a voltage measurement device with a female N-type input connector.

Qty 1 of A40B-ADAPT/LCN
LC female to N-type male inter-series adapter

This adapter permits connecting current sources with male LC current connectors to A40B N-type input connectors for shunts rated at 20 A or less.

Qty 1 of A40B-ADAPT/LC
LC male to LC male adapter

This adapter permits connecting current sources with LC female current connectors to A40B LC female shunt input connectors (the 50 A and 100 A shunts or other shunts using the A40B-ADAPT/LCN adapter).

Question	Answer
Which leads and adapters does Fluke Calibration recommend for the shunt input (current) connection?	Depending upon the model of the A40B shunt, and the current source connectors, we have these recommendations:   1. The current input connector used on A40B shunts rated for 20 A or less is the N-type connector. Depending upon the connectors used on the current source, Fluke Calibration recommends using either one of the two following leads: a. To connect with sources that have dual banana plug outputs (like Fluke Calibration calibrators) use the **A40B-LEAD/4MM** to connect directly to the current output terminals. b. Some high current sources, such as the Clarke Hess 8100, use LC output connectors. The **A40B-ADAPT/LCN** adapts the A40B N-type input connector to an LC style connector. With this adapter, the shunt will then accept a male LC connector on a user supplied cable for connection to the current source. 2. The current input connectors on A40B's 50 A and 100 A shunts are female LC connectors. Simply connect to sources with a user supplied cable having a male LC connector. No other adapter is necessary.  3. If the user supplied cable for the current source has a female LC connector, use the **A40B-ADAPT/LC** to change to a male connection at the shunt input.
Which leads does Fluke Calibration recommend for the shunt output (voltage measurement) connection?	All shunts have voltage outputs using N-type female connectors. So either of these two leads can work.  1. The **A40B-LEAD/4MM** connects the shunt output voltage connector to measurement instruments with dual banana plug inputs. (8508A, 5790A Input 2, Agilent 3458, etc.)  2. The **A40B-LEAD/N** connects the shunt output voltage connector to measurement instruments with an N-type input connector. (792A, 5790A Input 1 terminal, etc.)

Question	Answer
What are the A40B/CAL adapters used for? Do I need them?	The A40B/CAL adapters are used only during the calibration of A40B shunts. Their usage permits connecting the current source and two shunts (a certified or reference shunt, and a UUT shunt that is being calibrated) in a series configuration. See Figure 5 in the calibration section of the A40B manual. Only labs calibrating A40B shunts will need such adapters.  The **A40B-CAL/LC** high current adapter is used when calibrating shunts at currents higher than 2 A. It connects two shunts and the current source in series for the calibration. It uses LC connectors. For calibrating shunts with N-type connectors, two A40B-ADAPT/LCN adapters are also needed.  **A40B-CAL/N** low current adapter is used to calibrate shunts at currents of 2 A or less. It connects two shunts and the current source in series for the calibration. It mates with N-type connections to the shunts and a dual banana connection to the source.
Why is the radial shunt an open design?	An open design permits free air flow. This improves the shunt's power and temperature coefficients. It provides better accuracy and a faster settling time. A closed design requires external fans—making repeatable measurements less easily done, and incurring longer settling times. The shunts in the range from 1 mA to 50 mA do not dissipate as much power and do not require an open design.
Is the open radial design safe?	Yes, this design and its applications do not expose the user to dangerous conditions. Voltages are less than 1 V. On high current shunts, then normal consideration needs to be taken regarding component heating due to power dissipation. The temperature rise is not extreme or dangerous. Such components are not located where inadvertent contact is likely to occur. Cautionary labels provide reminders on shunts where this condition applies. This product meets all the applicable health and safety standards.
Is the open radial design rugged?	Before being a commercially available product, shunts of this design have been used in laboratory applications for many years. They are proven to be rugged and durable for metrology laboratory use. Users are very satisfied with the performance.
What calibration frequency points come with the A40B shunts?	The new A40B series shunts are supplied with a calibration certificate, with performance certified at dc and five frequencies (1 kHz, 10 kHz, 30 kHz, 70 kHz and 100 kHz). If other frequencies or amplitudes are required, the specification table in the manual provides formulas to perform the appropriate specification calculation.

Question	Answer
Why are the frequencies different from calibration reports for the original A40s and A40As?	The original A40 and A40A shunts were calibrated at a variety of frequencies—depending upon the measurement device used, and the measurement application. For example, Fluke Calibration's standard alternatives were for use with the obsolete 540B (three frequencies), or with the 5790A used for 5720A verification to 10 kHz (seven frequencies), or with 792A or TVCs for a general workload to 100 kHz (ten frequencies). Users had to choose which set of frequencies best fit their requirements and select the appropriate calibration. With the calibration certificates and interpolation guidelines, the A40Bs can be used over a broader range of frequencies.
Why does the 1 mA shunt have a battery?	The A40B 1 mA shunt contains both a shunt resistor and an active amplifier circuit. This circuit is operated by an internal rechargeable battery for proper isolation from the power line and the associated line related measurement errors.
What is the purpose of the amplifier in the 1 mA shunt?	To accurately measure low currents, such as 1 mA, the shunt resistor is relatively large. In the case of the 1 mA shunt, Fluke Calibration uses an 800 Ω resistor. (For comparison, the 100 A shunt uses a 0.008 Ω resistor.) Such a relatively high value of resistance can interact with the voltage measurement device and cause loading related errors. The loading errors are eliminated by using the amplifier to drive the output voltage of the shunt. The benefit is these high precision current measurements are simpler to make with smaller errors.

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