



CALIBRATOR PRACTICE EXERCISES - BEGINNER

SINE CALIBRATOR WEB APP 1.0.5 BETA

Use this booklet with the web app instruction manual. Complete familiarization first, then the assigned surveys. Web app 1.0.5 Beta includes these six exercises in the Beginner practice dropdown, with full applicable help and no instructor sign-in. The separate instructor kit contains the answer key and three locked beginner tests.

Training simulator: Measurements and tolerance limits are synthetic. These exercises develop the simulated setup and evaluation workflow; they do not authorize work on real equipment.

Reference: Use the Instruction Manual for source and DUT operation, lead selection, range selection, help behavior, reading collection, mean calculation, and Type A repeatability calculations.

1 FAMILIARIZATION EXERCISE

Purpose: Learn the complete operating sequence without an assigned fault. Use Free Use. Complete the checkboxes and note unfamiliar behavior. Open <https://sim.metrologylearning.com> and use Tutorial for a guided tour of the controls.

1.1 INITIAL SETUP

1. Press RESET ALL — Return to Free Use.
2. Confirm that no scenario is loaded and the app is in Free Use. RESET ALL — Return to Free Use is beside the top scenario controls. Confirm the reset when prompted.
3. Choose General-purpose quality and Bench range style. Use RES – / RES + to select 119,999 counts (5½-style resolution) and select 5 readings. For the initial familiarization pass, record only one reading per row; a full calculation is optional.
4. For each row, select the source function beside its readout, enter the digits and any prefix, then ENTER. Set the DUT function and range, connect the correct terminals, press OPERATE, wait for a completed conversion, record one reading, then press STANDBY. The V/A/Ω key clears a prefix; do not press it after m when you intend milli-units.
5. For each Bench Ω row, repeat in both 2-wire and 4-wire mode. For 4-wire select COMP 4W and connect both source and DUT sense pairs. The Basic handheld pass uses 2-wire only.
6. Use a fresh reading set for each row. A full mean calculation is not required for familiarization unless the instructor assigns it.

1.2 BENCH RANGE PASS

Function	DUT range	Setpoint to enter	Expected connection
DC V	100 mV	50 mV	OUTPUT HI-LO; INPUT HI and INPUT LO
DC V	1 V	0.5 V	OUTPUT HI-LO; INPUT HI and INPUT LO
DC V	10 V	5 V	OUTPUT HI-LO; INPUT HI and INPUT LO
DC V	100 V	50 V	OUTPUT HI-LO; INPUT HI and INPUT LO
DC V	1000 V	150 V	OUTPUT HI-LO; INPUT HI and INPUT LO
AC V	100 mV	50 mV at 60 Hz	OUTPUT HI-LO; INPUT HI and INPUT LO
AC V	1 V	0.5 V at 60 Hz	OUTPUT HI-LO; INPUT HI and INPUT LO
AC V	10 V	5 V at 400 Hz	OUTPUT HI-LO; INPUT HI and INPUT LO
AC V	100 V	50 V at 60 Hz	OUTPUT HI-LO; INPUT HI and INPUT LO
AC V	1000 V	150 V at 60 Hz	OUTPUT HI-LO; INPUT HI and INPUT LO
DC A	1 mA	0.5 mA	VI AUX/OUTPUT LO; I and INPUT LO
DC A	10 mA	5 mA	VI AUX/OUTPUT LO; I and INPUT LO
DC A	100 mA	50 mA	VI AUX/OUTPUT LO; I and INPUT LO

Function	DUT range	Setpoint to enter	Expected connection
DC A	1 A	0.5 A	VI AUX/OUTPUT LO; I and INPUT LO
DC A	10 A	1.5 A	VI AUX/OUTPUT LO; I and INPUT LO
AC A	1 mA	0.5 mA at 60 Hz	VI AUX/OUTPUT LO; I and INPUT LO
AC A	10 mA	5 mA at 400 Hz	VI AUX/OUTPUT LO; I and INPUT LO
AC A	100 mA	50 mA at 60 Hz	VI AUX/OUTPUT LO; I and INPUT LO
AC A	1 A	0.5 A at 60 Hz	VI AUX/OUTPUT LO; I and INPUT LO
AC A	10 A	1.5 A at 60 Hz	VI AUX/OUTPUT LO; I and INPUT LO
Ω	100 Ω	50 Ω	2W: OUTPUT/INPUT HI-LO
Ω	1 kΩ	500 Ω	2W: OUTPUT/INPUT HI-LO
Ω	10 kΩ	5 kΩ	2W: OUTPUT/INPUT HI-LO
Ω	100 kΩ	50 kΩ	2W: OUTPUT/INPUT HI-LO
Ω	1 MΩ	500 kΩ	2W: OUTPUT/INPUT HI-LO
Ω	10 MΩ	5 MΩ	2W or 4W per procedure
Ω	100 MΩ	50 MΩ	2W or 4W per procedure
Ω	1 GΩ	500 MΩ	2W or 4W per procedure

1.3 HANDHELD RANGE PASS

Select Basic quality to use the compact handheld. It has a function dial, RANGE and current SHIFT, with V / Ω, COM, μA/mA and A jacks. Current starts at 6 A; press SHIFT for the 6, 60 and 600 mA ranges. Move the red lead to the correct jack. Use 2-wire resistance only.

Function	DUT range	Setpoint	Expected connection
DC V	600 mV	300 mV	OUTPUT HI / LO; V / Ω and COM
DC V	6 V	3 V	OUTPUT HI / LO; V / Ω and COM
DC V	60 V	30 V	OUTPUT HI / LO; V / Ω and COM
DC V	600 V	150 V	OUTPUT HI / LO; V / Ω and COM
AC V	600 mV	300 mV at 60 Hz	OUTPUT HI / LO; V / Ω and COM
AC V	6 V	3 V at 400 Hz	OUTPUT HI / LO; V / Ω and COM

Function	DUT range	Setpoint	Expected connection
AC V	60 V	30 V at 60 Hz	OUTPUT HI / LO; V / Ω and COM
AC V	600 V	150 V at 60 Hz	OUTPUT HI / LO; V / Ω and COM
DC A	6 mA	3 mA	VI AUX / OUTPUT LO; μ A/mA / COM
DC A	60 mA	30 mA	VI AUX / OUTPUT LO; μ A/mA / COM
DC A	600 mA	300 mA	VI AUX / OUTPUT LO; μ A/mA / COM
DC A	6 A	1.5 A	VI AUX / OUTPUT LO; A / COM
AC A	6 mA	3 mA at 60 Hz	VI AUX / OUTPUT LO; μ A/mA / COM
AC A	60 mA	30 mA at 400 Hz	VI AUX / OUTPUT LO; μ A/mA / COM
AC A	600 mA	300 mA at 60 Hz	VI AUX / OUTPUT LO; μ A/mA / COM
AC A	6 A	1.5 A at 60 Hz	VI AUX / OUTPUT LO; A / COM
Ω	600 Ω	300 Ω	2W: OUTPUT HI / LO; V / Ω and COM
Ω	6 k Ω	3 k Ω	2W: OUTPUT HI / LO; V / Ω and COM
Ω	60 k Ω	30 k Ω	2W: OUTPUT HI / LO; V / Ω and COM
Ω	600 k Ω	150 k Ω	2W: OUTPUT HI / LO; V / Ω and COM
Ω	6 M Ω	3 M Ω	2W: OUTPUT HI / LO; V / Ω and COM
Ω	60 M Ω	30 M Ω	2W: OUTPUT HI / LO; V / Ω and COM
Ω	600 M Ω	150 M Ω	2W: OUTPUT HI / LO; V / Ω and COM

Familiarization completion check: I can select the correct source posts, select the correct DUT jack and COM state, match source and DUT functions, cycle RANGE to a suitable range, enter a setpoint with the correct unit, operate, record, and return to STANDBY.

Done	Task	Observed result / notes
☐	Completed the Bench range pass	
☐	Completed the Handheld range pass	
☐	Practiced at least one intentional wrong lead setup and used Help	
☐	Practiced one overrange condition and corrected it with RANGE	
☐	Returned the simulator to Generic DUT and STANDBY	

2 FUNCTION AND RANGE SURVEY EXERCISE

Purpose: Survey the functions and ranges assigned by your trainer. Each section has its own S- code. The code loads the General-purpose bench DUT, locked 5½-style resolution and a Basic one-reading activity. Basic here describes the activity level, not the handheld device. Configure the measurement yourself from the blank-start state.

2.1 HOW TO USE THE FUNCTION CODES

1. Press RESET ALL — Return to Free Use.
2. Choose the assigned beginner survey from the dropdown, or enter its S- code, then press Load scenario.
3. Read the exercise introduction. Confirm one reading is required, the bench DUT is loaded, and the source shows DC V, 10 V, STANDBY with no source plugs selected. All DUT leads also start disconnected. The assigned fault is hidden; do not expect a fault description on the learner screen.
4. From the blank state, set the source function, value and frequency. Select the source terminals, DUT function and range, DUT terminals, and required leads. These guided surveys allow setup help after an unsuccessful OPERATE attempt and Scenario Answer for review.
5. For each row, configure the listed source setpoint and DUT range, press OPERATE, wait for a completed reading, and record it. Answer the tolerance question using the displayed limit, then Submit Results for Range. Press STANDBY before moving to the next row. No mean, s or u(mean) answer is required for this one-reading activity.
6. Changing the setpoint or DUT range clears the current reading set while keeping the scenario and previously submitted ranges. Do not use RESET ALL during a section. Higher-voltage entries may require a new OPERATE press.
7. After the section, identify the suspected abnormal range and explain your comparison. Save as text or Print before loading the next code. Use Save to server only if your instructor requests it, and confirm the saved message.

One selected range contains a persistent fault intended to be obvious in this beginner survey. Other assigned points have normal simulated variation. Record the observed value and compare its error with the displayed tolerance. Exact readings vary; the trainer has a separate fault-location key.

At 30 V or higher the simulator displays HIGH VOLTAGE while operating. These are on-screen exercises only; the listed test points are not instructions for energizing real equipment.

2.2 DC V SURVEY

Scenario code: S-7E8A3B791A

Connect OUTPUT HI / OUTPUT LO to INPUT HI / INPUT LO. Use DC V on both instruments.

Done	Source setpoint	DUT range	Displayed value / notes
☐	100 mV	100 mV	
☐	1 V	1 V	
☐	10 V	10 V	
☐	100 V	100 V	
☐	1000 V	1000 V	

Trainer or learner observation: Which row appears abnormal, and what comparison supports that conclusion?

2.3 AC V SURVEY

Scenario code: S-0F9F250782

Connect OUTPUT HI / OUTPUT LO to INPUT HI / INPUT LO. Use AC V on both instruments and set 60 Hz.

Done	Source setpoint	DUT range	Displayed value / notes
☐	100 mV at 60 Hz	100 mV	
☐	1 V at 60 Hz	1 V	
☐	10 V at 60 Hz	10 V	
☐	100 V at 60 Hz	100 V	
☐	1000 V at 60 Hz	1000 V	

Trainer or learner observation: Which row appears abnormal, and what comparison supports that conclusion?

2.4 DC A SURVEY

Scenario code: S-B93090E0BA

Use DC A on both instruments. At 1 mA through 1 A connect VI AUX / OUTPUT LO to I / INPUT LO. At 10 A move the source high lead to 30 A; OUTPUT LO remains the return.

Done	Source setpoint	DUT range	Displayed value / notes
☐	1 mA	1 mA	
☐	10 mA	10 mA	
☐	100 mA	100 mA	
☐	1 A	1 A	
☐	10 A	10 A	

Trainer or learner observation: Which row appears abnormal, and what comparison supports that conclusion?

2.5 AC A SURVEY

Scenario code: S-92F33A0B28

Use AC A on both instruments at 60 Hz. At 1 mA through 1 A use VI AUX / OUTPUT LO to I / INPUT LO. At 10 A move the source high lead to 30 A.

Done	Source setpoint	DUT range	Displayed value / notes
☐	1 mA at 60 Hz	1 mA	
☐	10 mA at 60 Hz	10 mA	
☐	100 mA at 60 Hz	100 mA	
☐	1 A at 60 Hz	1 A	
☐	10 A at 60 Hz	10 A	

Trainer or learner observation: Which row appears abnormal, and what comparison supports that conclusion?

2.6 Ω , 2-WIRE SURVEY

Scenario code: S-D60582727B

Use Ω on both instruments, COMP OFF and 2-wire DUT mode. Connect OUTPUT HI / OUTPUT LO to INPUT HI / INPUT LO. Leave all sense terminals disconnected.

Done	Source setpoint	DUT range	Displayed value / notes
☐	100 Ω	100 Ω	
☐	1 k Ω	1 k Ω	
☐	10 k Ω	10 k Ω	
☐	100 k Ω	100 k Ω	
☐	1 M Ω	1 M Ω	

Trainer or learner observation: Which row appears abnormal, and what comparison supports that conclusion?

2.7 Ω , 4-WIRE SURVEY

Scenario code: S-50DCAD4C41

Use Ω on both instruments, COMP 4W and 4-wire DUT mode. Connect OUTPUT HI / LO to INPUT HI / LO and both source SENSE posts to the matching DUT SENSE posts.

Done	Source setpoint	DUT range	Displayed value / notes
☐	100 Ω	100 Ω	
☐	1 k Ω	1 k Ω	
☐	10 k Ω	10 k Ω	
☐	100 k Ω	100 k Ω	
☐	1 M Ω	1 M Ω	

Trainer or learner observation: Which row appears abnormal, and what comparison supports that conclusion?

3 INSTRUCTOR OR LEARNER RECORD

Use this page to capture the minimum evidence that the learner completed the familiarization and assigned function survey sections. The simulator itself is not a calibration record.

Activity	Date	Learner initials	Instructor initials	Notes
Familiarization Bench range pass				
Familiarization Handheld range pass				
DC V survey				
AC V survey				
DC A survey				
AC A survey				
Resistance survey				

IMPORTANT LIMITATIONS

- The source output, DUT behavior, uncertainty values, TUR estimate, range styles, and error models are synthetic teaching choices.
- AC readings are RMS values for a simulated sine wave. Frequency and setpoint affect the simulated source uncertainty and supported output envelope.
- Resistance is synthesized by the simulator; 4-wire operation uses separate source and DUT sense connections.
- The simulator does not replace a validated calibration procedure, traceability chain, uncertainty budget, guard or grounding instructions, safety assessment, or decision rule.
- A successful exercise demonstrates simulator operation only. It does not establish competence on real equipment.