



Care and Maintenance

CLEANING

The exterior of the probe and cable should be cleaned only using a soft cloth moistened with water or isopropyl alcohol. The use of abrasive agents, strong detergents, or other solvents may damage the probe. Always ensure that the input receptacles are free of debris before connecting accessories.

CALIBRATION INTERVAL

To guarantee accurate performance, you should have the probe calibrated every 12 months. Avoid exposing the probe to extreme mechanical shock and excessive bending of the cable because these may alter the calibration.

SERVICE STRATEGY

The AP033 circuits utilize fine pitch surface mount devices; it is, therefore, impractical to attempt component-level repair in the field. Defective probes must be returned to a LeCroy service facility for diagnosis and exchange. A defective probe under warranty will be replaced with a factory refurbished probe. A probe that is not under warranty can be exchanged for a factory refurbished probe. A modest fee is charged for this service. The defective probe must be returned in order to receive credit for the probe core.

TROUBLESHOOTING

If the probe is not operating properly the problem may be the way in which it is used. Before assuming the probe is defective, perform the following troubleshooting procedures.

A. Trace Off Scale

This is typically caused by improper offset setting, or by an input signal that exceeds the probe differential or common mode range. Perform the following:

1. Remove the input signal from the probe, return the offset to zero, and Autobalance the probe. Does the trace return to



approximately the center of the graticule? If not, proceed to step 7.

2. Set the oscilloscope calibrator to output a 100-mV 1-kHz square wave. Using the flex lead set, connect the probe + input to the calibrator output signal, leave the – input open. Set the oscilloscope to 50 mV/div and 500 μ s/div. Is the displayed waveform a 100-mV 1-kHz square wave with the correct polarity?
3. Repeat step 2 with the – input connected to the calibrator and the + input left open. In this case, the displayed waveform should be inverted.
4. Connect both the + input and – input to the calibrator output. Is the trace approximately a flat line near zero volts?
5. If steps 1 to 4 give the correct results, the problem is likely a result of the input signal exceeding the differential or common mode range.
6. Connect both the + input and – input to one of the two input signals. If the trace is off scale, the input signal is probably exceeding the common mode range. Repeat with the other input signal.
7. Is a ProBus Power Supply Overload error message displayed? If so, remove all other ProBus accessories from the oscilloscope. Is the message still displayed? If so, remove the AP033. Is the message still displayed? If so, the oscilloscope should be returned for service.
8. If, after removing the AP033, the Power Supply Overload error message is not displayed, the problem may be either the probe or the oscilloscope. Repeat the test with a different ProBus accessory. If the message does not return with a different accessory, the AP033 may be defective and should be returned for service.

B. Incorrect Frequency Response

Possible causes are a defective probe or oscilloscope, poor connections, or poor grounding. Try the following:

1. Verify that the BW limiting of the oscilloscope is not enabled.

2. Connect the probe to another oscilloscope. If the probe now measures properly, the problem may be in the oscilloscope.
3. If the probe behaves as if it is ac-coupled at high frequency, check for an open input connection.
4. Poor frequency or transient response and AC gain errors may result when one of the two input connections is open.
5. Excessive “ring” and other transient problems can result from excessive input lead length. To test this, shorten the input leads to less than 1 cm. If the transient response changes significantly, the lead parasitics are the cause.

C. DC Errors

Incorrect DC gain requires recalibration or factory repair. This can be determined by completing the gain checks in the Performance Verification Procedure.

1. Extremely high source resistance will result in DC gain errors. Check the probe accuracy with the oscilloscope calibrator signal.
2. Verify that the probe is not being overdriven into clipping for its current gain setting.
3. Excessive offset can result from large changes in ambient temperature. Remove the input signal from the probe and repeat the Autobalance cycle. With the Offset set to zero, did the trace return to the center of the graticule?

D. Poor Common Mode Rejection

Use the 1-kHz calibrator signal from the oscilloscope to check common mode rejection. With both the + input and – input connected to the calibrator signal, a flat line at zero volts should be seen on the graticule.

1. Check the probe with the plug-on attenuator installed and removed. If excessive common mode signal appears only when the attenuator is present, the attenuator may need to be rematched to the probe. Use the procedure listed in this section to match the attenuator.
2. If the common mode signal appears when the probe is connected to the test circuit, but not when it is attached to



the calibrator, the problem may be caused by large mismatches in the source impedance. Try connecting both inputs to one of the input signals in the test circuit, then the other. If the common mode signal disappears, try probing lower impedance points within the circuit.

RETURNING A PROBE

The procedure for returning a probe for calibration or repair, is as follows:

Contact your local LeCroy sales representative to find out where to return the product. All returned products should be identified by model and serial number. You should describe the service to be performed, and provide your name and contact number. In the case of products returned to the factory, a Return Authorization Number (RAN) should be used. The RAN can be obtained by contacting your nearest LeCroy office, or the New York Customer Care Center.

Return shipments should be made prepaid. LeCroy cannot accept COD or Collect Return shipments. We recommend air-freighting. It is important that the RAN be clearly shown on the outside of the shipping package for prompt redirection to the appropriate LeCroy department.

1. Contact your local LeCroy sales or service representative to obtain a Return Authorization Number.
2. Remove all accessories, including all removable cables, from the probe.
3. Pack the probe in its case, surrounded by the original packing material (or equivalent) and box.
4. Label the case with a tag containing:
 - The RAN
 - Name and address of owner
 - Instrument model and serial number
 - Service to be performed or description of the failure mode

5. Package the probe case in a cardboard shipping box with adequate padding to avoid damage in transit.
6. Mark the outside of the box with the shipping address given to you by the LeCroy representative; be sure to add the following:
 - ATTN: <RAN assigned by the LeCroy representative>
 - FRAGILE
7. Insure the item for the replacement cost of the probe.
8. Ship the package to the appropriate address.

REPLACEMENT PARTS

The probe connection accessories, and other common parts can be ordered through the regional customer care centers. Refer to Figure 7 for LeCroy Part numbers. Defective probes can be replaced on an exchange basis. The replacement exchange probe will have been factory repaired, inspected and calibrated to the same standards as a new product. In order to obtain an exchange probe, you must return the defective probe. The returned probe should be sent back to the regional customer care center without any accessories, manual, or case.

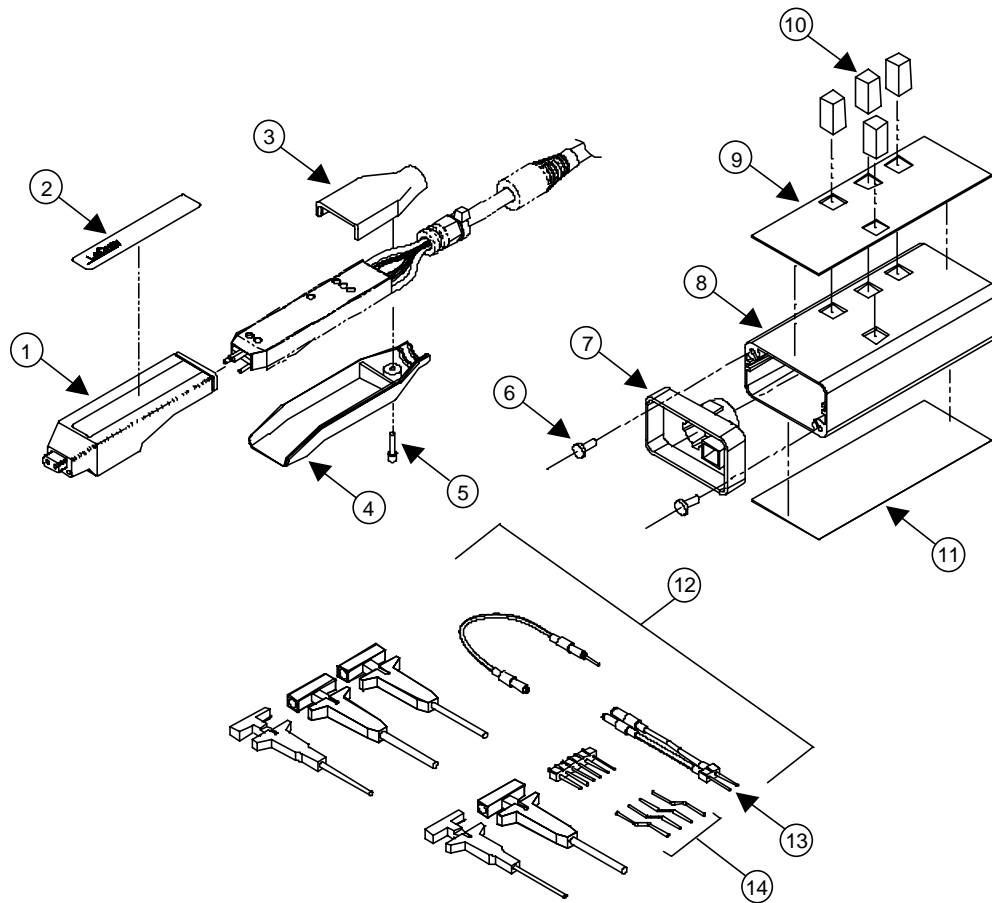


Figure 7. Replaceable Parts

Care and Maintenance

Reference	LeCroy Part Number	Description	Rev	Qty.
1	529-304-001	Plastic probe tip housing Top	A	1
2	70A-P03-304	LeCroy AP033 Probe Tip Label	A	1
3	529-304-003	Plastic probe tip housing End	A	1
4	529-304-002	Plastic probe tip housing Bottom	A	1
5	555-001-000	#2 Allen Screw, Black	A	1
6	554-425-003	Screw, M 2.5x6, self tapping	A	4
7	709-3XX-P53	ProBus End Cap	A	1
8	70A-P03-303	Termination Box	A	1
9	70A-P03-301	LeCroy Termination Box Label with cutouts	A	1
10	416-090-004	Grey Switch Cap	A	4
11	70A-P03-305	LeCroy Termination Box Rear Label	A	1
12	PK033	Accessory Kit, AP033 without AC Coupler and Attenuator	A	1
13	AP03X-FLEX-LEAD	Flex Lead	A	1
14	405400003	Offset Pin	B	--
--	AP033-PROBE-FRU	AP033 Probe only Exchange	A	--
--	AP033-ATTEN	Plug-On Attenuator, /10, AP033	A	1
--	AP03X-AC-COUPLER	Plug-On AC Coupler, AP033/AP034	B	1
--	AP033-OM-E	Instruction Manual, AP033, English	F	1



MATCHING PROCEDURE FOR ± 10 PLUG-ON EXTERNAL ATTENUATOR

The ± 10 Plug-on attenuator provided as a standard accessory with the AP033 is calibrated to match the specific probe it was shipped with. Individual probes will have small variations in parasitic capacitance within the input circuits. To obtain maximum common mode rejection performance, the attenuators are calibrated to match a specific probe during the manufacturing process. In order to preserve the maximum Common Mode Rejection, do not interchange external attenuators between probes.

The Plug-on AC coupling adapter is not matched to a specific probe and, therefore, does not need to be matched.

If the ± 10 Plug-on attenuators become accidentally mixed between probes, you can use the procedure listed below to restore the compensation match. This adjustment does not affect any of the parameters in the warranted specifications. Therefore, the required test equipment does not need to be calibrated.

Note

The AP033 and AP034 Active Differential Probe have different input capacitance. The ± 10 Plug-on attenuator supplied with the model AP034 cannot be properly adjusted for use with the model AP033. Make sure the attenuator is not marked "AP034" before attempting this procedure.

EQUIPMENT REQUIRED

Test Oscilloscope

The oscilloscope must support ProBus. Otherwise use a non-ProBus oscilloscope and ADPPS power supply.

Signal Source

Low frequency square wave: Frequency 50 Hz to 5 kHz, Amplitude 1 V to 10 V. The output waveform must have a square corner and flat top with minimum overshoot suitable for adjusting compensation. The generator should have trigger output, or use

a BNC Tee connector and separate BNC cable from the output to provide the trigger signal for the test oscilloscope.

Interconnect Cable

This is for connecting the output of the signal source to the probe. A BNC cable and a pair of small alligator clips or “lead grabber” adapter (Pomona #3788) may be used.

0.025 in. (0.635 mm) Square Pins (3 required). The pins from the header supplied in the probe accessory kit are suitable.

Tools

Flat bladed screwdriver, 0.040 in. (1 mm) wide

Adjustment Tool: 0.025 in. (0.635 mm) square head

Note

You can fabricate the Adjustment Tool by flattening the end of a 0.025 in. (0.635 mm) square pin with a file. Insert the pin into a short length of rigid plastic tubing to serve as a handle.

PROCEDURE

1. Attach the AP033 to the test oscilloscope. If the test oscilloscope is not equipped with ProBus, use the ADPPS to provide power for the AP033.
2. Attach the ÷10 Attenuator Adapter to the AP033 probe tip.
3. Insert 0.025 in. (0.635 mm) square pins into the +, –, and $\frac{1}{\infty}$ input connectors of the ÷10 Attenuator Adapter.
4. Attach the interconnect cable to the output of the signal source.
5. Attach the Trigger Out signal from the signal source to the External Trigger Input of the test oscilloscope. If the signal source does not have a separate Trigger Out signal, use a BNC Tee connector in the output. Run one cable to the External Trigger Input of the test oscilloscope. Connect the other to the probe inputs.
6. Using the alligator clips on the end of the interconnect cable, connect the signal source ground to the square pin on the



- $\div 10$ Attenuator Adapter's "–" input. Attach the signal output to the square pin on the $\div 10$ Attenuator Adapter's "+" input.
7. Turn on the test oscilloscope. Set the AP033 GAIN to **X10**. The EFFECTIVE GAIN indicator for $\div 10$ should be lit. (NOTE: If the X1 EFFECTIVE GAIN indicator is lit rather than the $\div 10$, make sure that the adapter installed on the probe tip is the $\div 10$ Attenuator, and not the AC Coupler.)
 8. Set the test oscilloscope Volts/Div to 200 mV (for LeCroy oscilloscopes with ProBus) or 20 mV/Div when using the ADPPS with an oscilloscope without scale factor correction; 5 μ s/Div; AUTO trigger mode; Trigger source: External. Set the Bandwidth Limiting to 20-30 MHz and Average the waveform 1:31 to reduce noise.
 9. Turn on the signal source. Set the output frequency to approximately 5 kHz. Set the output amplitude to approximately 1 Volt.
 10. Adjust the test oscilloscope trigger level for a stable trace. If necessary, use the probe offset to position the waveform to show the square corner of the test signal. NOTE: Do not use the oscilloscope offset or position controls to reposition the trace. Many of the signal generators used for compensation calibration only have square corners on one of the two edges of the output waveform. (Rising or falling edge, but not both.) Be sure to display the correct edge for this step.
 11. Using the square adjustment tool, adjust the **+LF Comp** (See Figure 8) to achieve the best square corner and flat top of the displayed waveform. Note that the added capacitance of the adjustment tool may change the compensation of the waveform when it is inserted into the adjustment. The correct adjustment is achieved when the best corner is displayed with the adjustment tool removed.

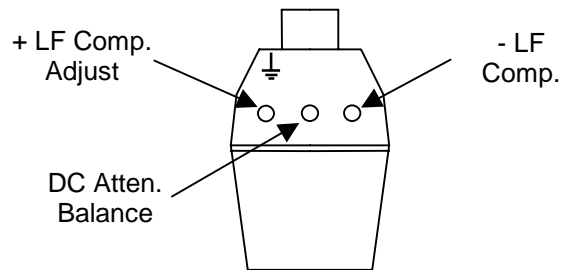


Figure 8. +10 Attenuator Adjustment Locations

12. Move the connections on the interconnect cable so the signal generator ground is connected to the square pin inserted in the ground connector of the +10 Attenuator Adapter. Connect the signal generator output to BOTH the + input and – input square pins in the +10 Attenuator Adapter.
13. Set the signal generator frequency to about 50 Hz, and the output amplitude to about 10 V.
14. Set the test oscilloscope Volts/Div to 20 mV (for LeCroy oscilloscopes with ProBus) or 2 mV/Div when using the ADPPS with an oscilloscope without scale factor correction, and the time scale to 2 ms/Div. It may be necessary to increase the averaging to 1:127 to remove noise.
15. The displayed waveform is the common mode feedthrough. Using the adjustment screwdriver with the flat blade, adjust the DC Atten. Balance (See Figure 8) to minimize the amplitude of the flat portions of the displayed waveform. This adjustment only affects the flat portions of the square wave. Do not be concerned with any overshoot at the transitions.
16. Reduce the Test Oscilloscope Averaging weighting to 1:31. Return the Volts/Div to 200 mV (for LeCroy oscilloscopes with ProBus) or 20 mV/Div when using the ADPPS with an oscilloscope without scale factor correction, and the Time/Div to 5 μ s.
17. Return the signal source output frequency to approximately 5 kHz. Set the output amplitude to approximately 1 Volt.
18. Using the 0.025 in. square adjustment tool, adjust the **–LF Comp** (See Figure 8) to minimize the amplitude of overshoot



AP033 Active Probe

during the transition of the displayed waveform. It may not be possible to completely eliminate the overshoot. As with the +LF Comp adjustment, the added capacitance of the adjustment tool may change the amplitude of the waveform when it is inserted into the adjustment. The correct adjustment is achieved when the overshoot is minimized.

#