Adjustment Procedure

INTRODUCTION

This procedure should only be performed if the instrument fails to meet the Performance Check tests for Output Zero or Offset Accuracy (steps A and B). Gain, which affects DC Accuracy, cannot be adjusted during routine calibration. Probes that fail DC Accuracy during performance verification (step C) must be returned to the factory for rework. If the probe cannot be adjusted to meet the Performance Verification Limits, repair may be necessary.

To ensure instrument accuracy, check the calibration of the AP022 every 2000 hours or every year if used infrequently. Before calibration, thoroughly clean and inspect the unit as outlined in the Maintenance section.

To ensure that the probe will meet published specifications over the entire temperature range, adjustment must be performed in a controlled ambient environment with temperature of 23 ±5 °C.

TEST EQUIPMENT REQUIRED

The following test equipment and accessories, or their equivalents, are required for complete calibration. Specifications given for the test equipment are the minimum necessary for accurate calibration. All test equipment is assumed to be correctly calibrated and operating within the listed specifications. Detailed operating instructions for the test equipment are not given in this procedure. Refer to the test equipment manual if more information is needed.

If alternate test equipment is substituted, control settings or calibration equipment setups may need to be altered.
### Test Equipment and Accessories

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<td>Digital Multimeter (DMM) with test probe leads</td>
<td>4.5 digit 0.1% Basic DC Accuracy 0.1% basic AC Accuracy</td>
<td>HP 34401A</td>
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<td>Terminator, precision, BNC</td>
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### PRELIMINARY PROCEDURE

**Caution**

*Repair and adjustment should only be performed by a qualified service technician. Probe disassembly should only be attempted in a ESD protected work area. Exercise normal ESD control procedures when handling the probe circuit board.*

- Remove the two screws that secure the plastic cover on the cable end of the ProBus interface housing. Gently pull on the probe cable to slide the circuit board assembly from the metal housing.

- Connect the AP022 Active Probe to the female end of the ProBus Extension Cable, being careful to line
up all six pins of the ProBus connector. Connect the male end of the ProBus extension cable to Channel 1 of the oscilloscope. (See Figure 8 in Performance Verification).

- Apply power to the oscilloscope and to the test equipment.
- Allow at least 30 minutes warm-up time for the AP022 and test equipment before starting the calibration procedure.

**Note**

Completion of each step in the Adjustment Procedure ensures that this instrument meets the electrical specifications. For best overall instrument performance when performing the adjustment procedure, make each adjustment to the exact setting, even when the adjustment is within the allowable calibration limits.
ADJUSTMENT PROCEDURE

A. Adjust Offset Zero

1. Connect one end of a BNC cable to the probe end of the ProBus Extension Cable. Connect the Precision 50 Ω Terminator to the other end of the BNC cable, as shown in Figure 8.

2. Connect the banana plugs of the precision terminator to the input of the digital multimeter (DMM). Make sure that the plug corresponding to the BNC shield (marked “Ground”) is connected to the LO or COMMON input of the DMM.

3. Select the channel to which the probe and ProBus Extender is connected. Set OFFSET on the oscilloscope to zero, as indicated by on-screen display.

4. Set the DMM to read DC Volts on the most sensitive range.

5. Make sure that the probe tip input of the AP022 is open.

6. Adjust the OFFSET trimmer on the AP022 board until the DMM reads 0 V ±100 μV. (See Figure 10 for location)

7. Leave the setup connections in place for the next section.

B. Adjust Offset Gain

1. Connect the Probe Tip adapter to a BNC tee and a BNC-to-dual banana plug adapter, as shown in Figure 9 in the Performance Verification Procedure.

   Caution

Make sure that a non-terminated adapter is used. The power level used in this test would destroy the 50 Ω resistor in a terminated adapter.

2. Carefully insert the AP022 probe tip into the Probe Tip Adapter. Make sure that the probe is fully seated in the adapter.

3. Set the power supply to approximately 0 volts.
4. Plug the dual banana plug adapter, with the probe attached, into the output terminals of the power supply. Make sure the side of the banana plug corresponding to the probe and BNC ground is connected to the negative, or common terminal of the power supply.

5. Attach a BNC cable to the unused port of the BNC tee. Attach a dual banana plug adapter to the other end of the cable and plug it in to the DMM input, as shown in Figure 9. Make sure that the side of the banana plug corresponding to the BNC shield (marked “GROUND”) is connected to the LOW or COMMON input of the DMM.

6. Adjust the power supply to an output of 10.00 V ±10 mV. Record the DMM reading.

7. Remove the banana plug adapter from the DMM and plug the precision 50 Ω terminator into the DMM input. Make sure that the side of the banana plug corresponding to the BNC shield (marked “Ground”) is connected to the LOW or COMMON input of the DMM.

8. Make sure that the display for channel 1 on the oscilloscope is turned on. Set the oscilloscope OFFSET knob to –10.00V, as read on the oscilloscope display.

9. Set the DMM to read DC Volts on the most sensitive range.

10. Subtract 10.0 V from the power supply output recorded in step B-6. Be sure to keep track of the sign of the result.

11. Adjust the GAIN trimmer on the AP022 board until the DMM reads the same voltage (±2 mV) as calculated in step B-10 above. Be sure the sign agrees.

12. Repeat steps A-3 through A-7 of the ADJUST OFFSET procedure (above).

13. Disconnect the probe from the ProBus extension cable and reinstall the circuit board in the probe case, being careful to align the ProBus interface connector with the opening on the other end of the case.
C. Verify Calibration

Use the Performance Verification procedure to ensure that the probe meets accuracy specifications. Apply a calibration seal, if required, in accordance with your quality process.

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