

FLUKE®

80i-500s AC CURRENT PROBE FOR OSCILLOSCOPES

Instruction Sheet

INTRODUCTION

The Fluke 80i-500s is a clamp-on current probe that is designed to reproduce current waveforms found in modern commercial and industrial power distribution systems. The probe's performance is optimized for accurate reproduction of currents at line frequency and up to the 50th harmonic. The 80i-500s is also compatible with any instrument capable of millivolt measurements.

- Ideal for measuring distorted current waveforms and associated harmonics.
- Allows measurement of currents from 1 to 500A ac rms, 5 Hz to 10 kHz without breaking into the circuit.
- Provides an output of 1 mV ac per 1 amp ac.
- A passive filter eliminates noise and ring on rapidly rising waveforms, ensuring accurate reproduction on oscilloscope displays.
- Rated for 600V circuits of Overvoltage Category III per IEC 1010-1. (See "Safety Specifications" for an explanation of Overvoltage Categories.)

⚠ WARNING

Read "Safety Information" Before using the probe.

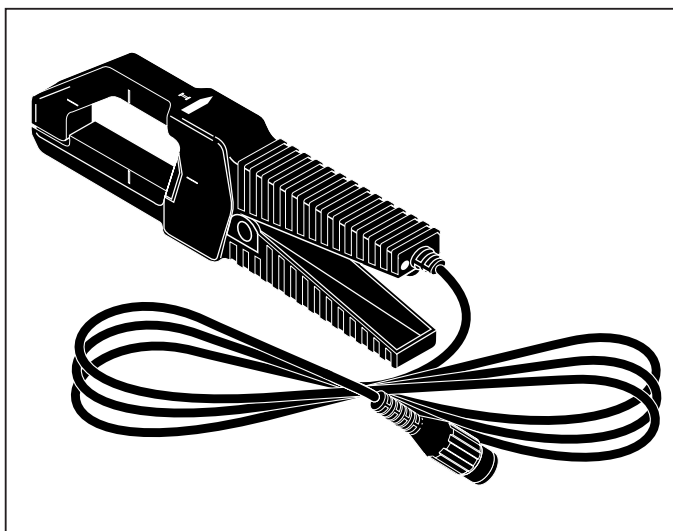


Figure 1. 80i-500s AC Current Probe

PN 936922

January 1994

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BOX CONTENTS

The shipping container includes the 80i-500s Current Probe, this Instruction Sheet, a Quick Reference Card, and a product registration card.

SAFETY INFORMATION

Read the following safety information carefully before attempting to operate or service the current probe.

- **⚠** Never use the probe on circuits rated higher than 600V in Overvoltage Category III (CAT III) or 300V in Overvoltage Category IV (CAT IV) of IEC-1010-1. (See “Safety Specifications”.) Use extreme caution when clamping around uninsulated conductors or bus bars.
- Keep your fingers behind the finger guard.
- Check magnetic mating surface of the probe jaws; these should be free of dust, dirt, rust, and other foreign matter.
- Do not use a probe that is cracked, damaged, or has a defective cable. Such probes should be made inoperative by taping the clamp shut to prevent operation.

In this instruction sheet, a **WARNING** identifies conditions and actions that pose hazards to the user. A **Caution** identifies conditions and actions that may damage the current probe. International electrical symbols used are explained in Figure 2.

~	AC-ALTERNATING CURRENT	⚠	CAUTION see explanation in manual
≈	Either DC or AC	ⓧ	Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION
⏚	EARTH		

Figure 2. International Electrical Symbols

The 80i-500s complies with IEC Publication 1010-1 and other safety standards (see “Safety Specifications”). Follow all warnings to ensure safe operation.

Use of this equipment in a manner not specified herein may impair the protection provided by the equipment.

SAFETY SPECIFICATIONS

⚠ Rated for 600V ac circuits of Overvoltage Category III per IEC 1010-1 and 300V ac circuits of Overvoltage Category IV per IEC 1010-1.

Overvoltage (Installation) Category III refers to distribution level and fixed installation circuits inside a building electrical service entrance. Overvoltage (Installation) Category IV refers to primary supply, overhead lines, and cable systems outside a building.

Designed to Protection Class II, double or reinforced insulation requirements of UL 1244, ANSI / ISA S82, CSA-C22.2 No. 1010.1-92, and IEC 1010-1.

ELECTRICAL SPECIFICATIONS

Current Range: 1A to 500A ac rms.

AC Current Over Range Limit: Up to 700A ac rms for maximum of 10 minutes, followed by removal from current carrying conductor for at least 30 minutes.

Output Signal: 1 mV ac/A ac

Influence of Temperature on Accuracy: <0.15% per 10°C (18°F) for temperatures from -10 to 18°C (14 to 64°F) and from 28 to 50°C (82 to 122°F).

Basic Accuracy (45 to 65 Hz):

Input Current:	Error:	Phase Shift:
1 to 20A	5% of rdg + 0.3A	Not Specified
20 to 100A	5% of rdg	±3°
100 to 500A	2% of rdg	±1°

Extended Accuracy:

For other frequencies, refer to the appropriate input current range and **add the error listed below to the “Basic Accuracy” error.**

	Input Current:	Error:
(5 to 10 Hz):	1 to 500A	not specified*
(10 to 20 Hz):	1 to 300A	5%
	300 to 400A	15%
	400 to 500A	25%
(20 to 45 Hz):	1 to 500A	5%
(65 Hz to 3 kHz):	1 to 50A	5%+0.4A
	50 to 500A	5%
(3 kHz to 10 kHz):	1 to 500A	not specified*

**-3 db @ 5 Hz and 10 kHz typical*

Input Load Impedance (of host instrument): >1MΩ in parallel with up to 47 pF

dV/dt max: 0.24 mV/μsec

Rise or Fall Time: <40 μsec

⚠ Working Voltage: 600V ac rms, in compliance with IEC-1010-1.

⚠ Common Mode Voltage: 600V ac rms from earth ground, in compliance with IEC 1010-1.

Influence of Adjacent Conductor: <5 mA/A

Influence of Conductor Position in Jaw Opening: +/- (1.5% of reading +0.1A).

GENERAL SPECIFICATIONS

Dimensions: 66 x 195 x 34 mm (2.6 x 7.7 x 1.3 in.)

Weight: 420g (14.8 oz.)

Temperature: Operating: -10 to 50°C (14 to 122°F)
Storage: -40 to 71°C (-40 to 160°F)

Relative Humidity: 0 to 95% (10 to 30°C; 50 to 86°F)
0 to 75% (30 to 40°C; 86 to 104°F)
0 to 45% (40 to 50°C; 104 to 122°F)

Altitude: non-operating: 0 to 12000 meters (0 to 39370 ft.) operating: 0 to 2000 meters (0 to 6560 ft.)

Maximum Conductor Size:

One 30 mm (1.18 in.), 750 kcmils (MCM) THHN, two 25 mm (0.98 in.), 500 kcmils (MCM) THHN, or one 63 x 5 mm (2.5 x 0.2 in.) Bus Bar.

Output Cable: 1.6 meters (63 in.), BNC termination. Cable and BNC are rated to 600V ac rms for enhanced safety.

Mechanical Shock: 100G per IEC 68-2-27

INSTRUMENT COMPATIBILITY

The 80i-500s is compatible with any oscilloscope, voltmeter, or other voltage measuring device that has the following features:

- Accepts a standard BNC connector. A BNC-to-banana adapter (order PM 9053 from Fluke) can also be used with standard inputs on a digital multimeter (DMM).
- Range and resolution capable of displaying 1mV of output per amp of measured current.
- AC Volts accuracy of 1% or better to take full advantage of the accuracy of the probe.
- Input impedance of greater than or equal to 1M Ω in parallel with a maximum of 47 pF.

OPERATING INSTRUCTIONS (Scope Mode)

1. Connect the 80i-500s Current Probe to the desired input channel on the oscilloscope.
2. Use a 1 : 1 probe setting.
3. Clamp the current probe around the conductor.
4. Press **SCOPE** to select Scope Mode.
5. Press **AUTO SET**.
6. Adjust **V** or **mV** (volts/division) for the best vertical display. (For line power currents less than 100A, 50 mV/div is a good first choice.)
7. Adjust **s TIME ns** (time/division) for the best horizontal display. (For power line frequency, 5 msec/div is a good choice.)

OPERATING INSTRUCTIONS (Meter Mode)

1. See Figure 3. Connect the 80i-500s Current probe to Channel A.
2. Use a 1 : 1 probe setting.
3. Clamp the current probe around the conductor.
4. Press **METER** to select the Meter Mode.
5. Press **▲** or **▼** to select an appropriate meter range. (The current probe output is 1 mV per ampere measured.)

MEASUREMENT CONSIDERATIONS

Observe the following guidelines for positioning the current probe jaws:

- Center the conductor inside the probe jaws.
- Make sure the probe is perpendicular to the conductor.
- If possible, avoid measurements close to other current carrying conductors.

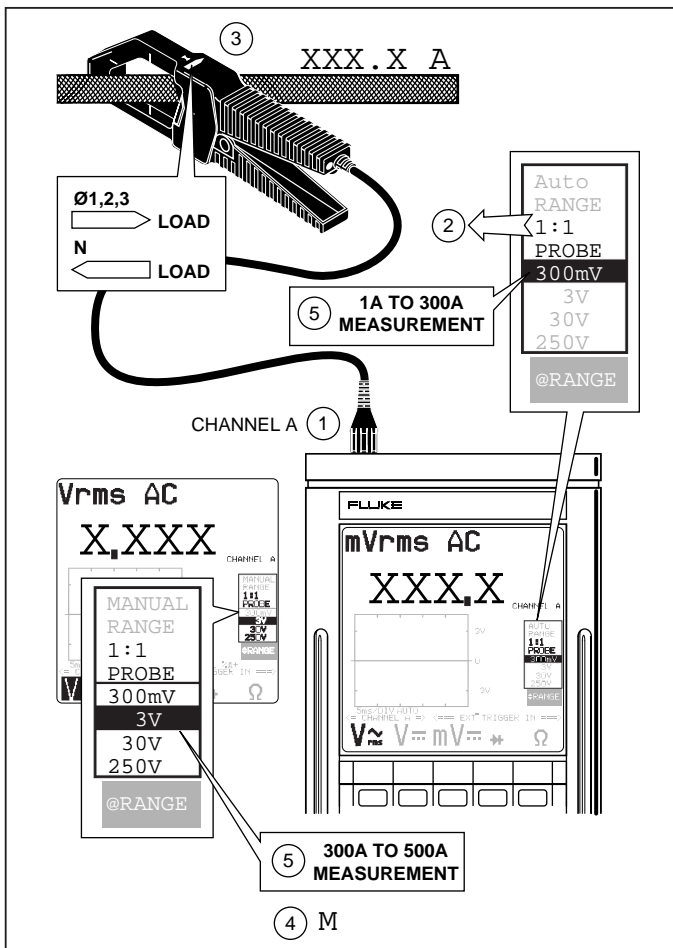


Figure 3. Setup Guide (Meter Mode)

MAINTENANCE

Before each use, assure continued safety by inspecting the probe. Look for cracks or missing portions of the probe housing and output cable insulating cover and for loose or weakened components. Pay particular attention to the insulation surrounding the probe jaws. If a probe fails this inspection, tape is shut to prevent unintended operation. To check probe performance, complete the "Performance Verification" procedure.

WARNING

THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING PROCEDURES UNLESS YOU ARE QUALIFIED TO DO SO. READ THE INFORMATION TITLED "SAFETY" AT THE BEGINNING OF THIS INSTRUCTION SHEET BEFORE PROCEEDING.

Repairs or servicing not covered in this instruction sheet should be performed only at a Fluke Service Center. A probe under warranty will be promptly repaired or replaced (at Fluke's discretion) and returned at no charge. See the registration card for warranty terms. If the warranty has lapsed, the probe will be repaired or replaced and returned for a fixed fee.

Cleaning and Storage

Periodically wipe the case with a damp cloth and detergent; do not use abrasives or solvents. Open the jaws and wipe the magnetic pole pieces with a lightly oiled cloth. Do not allow rust or corrosion to form on the magnetic core ends.

PERFORMANCE VERIFICATION

Verify probe accuracy with the test setups shown in Figure 4. Required test equipment is defined in Table 1. Toriod coil construction is illustrated in Figure 5. First setup Connection A, and makes the checks called for in Table 2. (Connect the output of the probe directly to the signal-in on the phase meter for the phase check.)

Then disconnect A at the 5100B, and set up Connection B. Make the first four checks called for in Table 3. (Connect the probe directly to the phase meter for the phase check.)

CAUTION

Remove the shunt before making the last check at 500A. Otherwise, the maximum current rating of the shunt will be exceeded.

Table 1. Required Test Equipment

REQUIRED	RECOMMENDED MODEL
AC Calibrator	Fluke Model 5100B
Transconductance Amplifier	Fluke Model 5220A
Digital Multimeter (DMM)	Fluke Model 8050A
Phase Meter	Clarke-Hess Model 6000
0.05Ω, 2A, non-inductive shunt	Empro Model HA-2-100
Small insulated screwdriver	Spectral
Banana-to-BNC Adapter	Fluke Model PM9053
50-Turn Toriod Coil	(See Figure 5.)

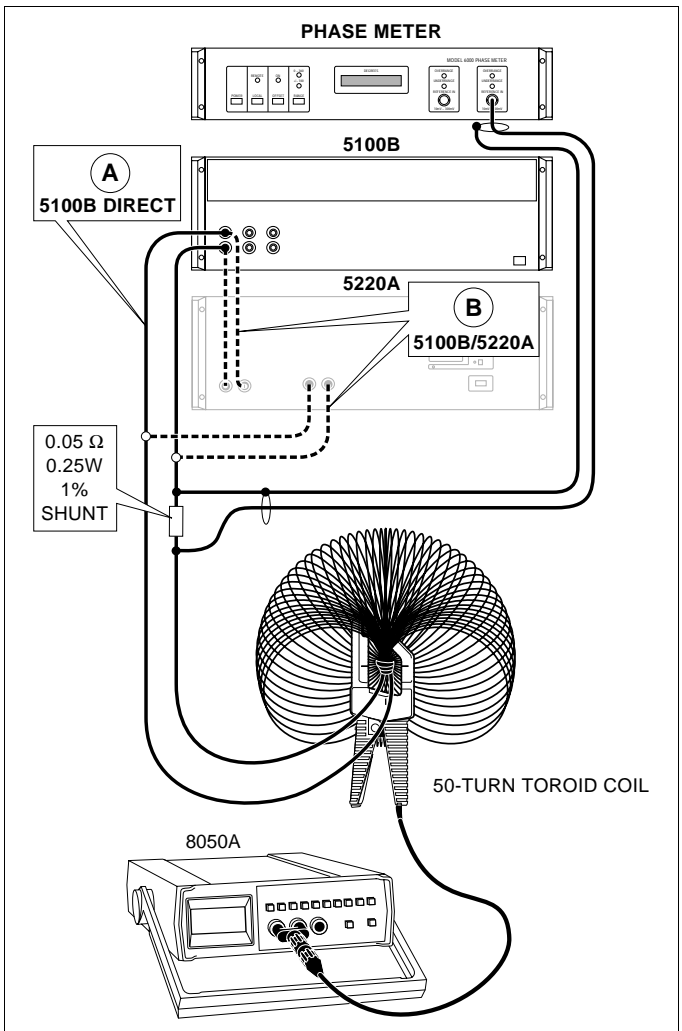


Figure 4. Performance Test and Calibration Setup

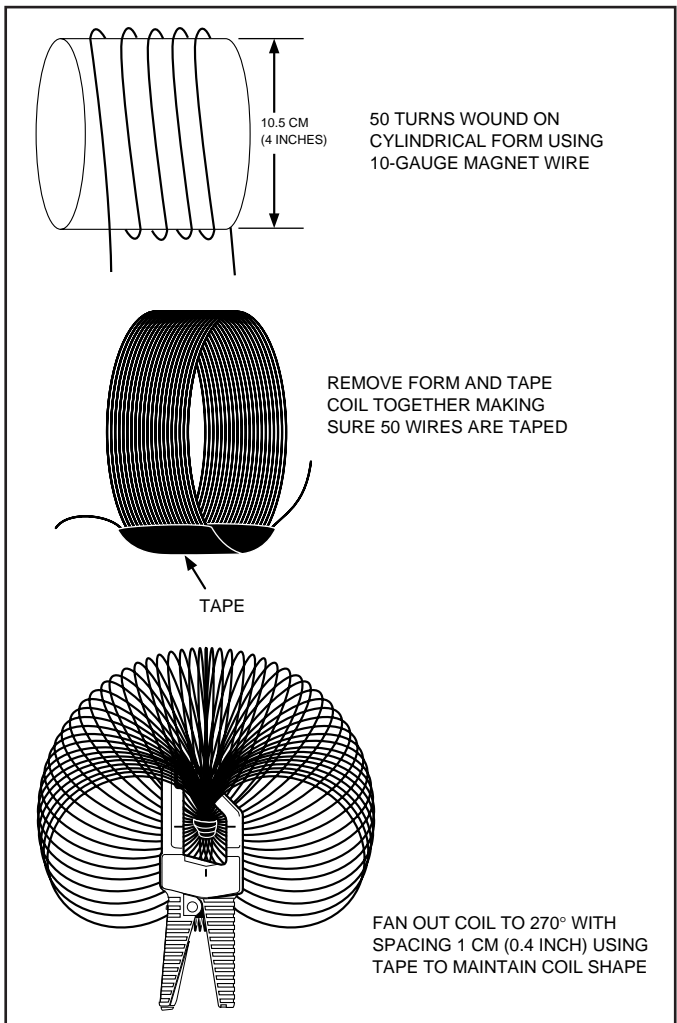


Figure 5. Toriod Coil Construction

Table 2. Performance Test Points (5100B Direct)

5100B SETTINGS	RMS AMPS MEASURED	LOW LIMIT OUTPUT mV	HIGH LIMIT OUTPUT mV	PHASE SHIFT
0.1A, 50 or 60 Hz	5A	4.45	5.55	-
0.4A, 50 or 60 Hz	20A	19.0	21.0	$\pm 3^\circ$

Table 3 Performance Test Points (5100B and 5220A)

5100B SETTINGS	RMS AMPS MEASURED	LOW LIMIT OUTPUT mV	HIGH LIMIT OUTPUT mV	PHASE SHIFT
1V 50 or 60 Hz	50A	47.5	52.5	-
1V 400 Hz	50A	45.0	55.0	-
1V 1 kHz	50A	45.0	55.0	-
2V 50 or 60 Hz	100A	98.0	102.0	$\pm 1^\circ$
10V 50 or 60 Hz	500A	490.0	510.0	-

CALIBRATION

If the performance test fails, a qualified technician should complete the following calibration procedure:

1. Connect test equipment as shown in Figure 4 (Connection B) and allow 30 minutes for stabilization. (Do not have the shunt connected during the calibration procedure.)
2. Set the 5100B output to 8V at 50 Hz, and enable the 5220A to operate. This produces 400 ampere-turns in the center conductor bundle of the toriod coil (8 x 50 turns).
3. Set the DMM function and range to display 400 mV ac.
4. Using the Banana-to-BNC Adapter, connect the probe to the DMM.
5. Clamp the Current Probe around the coil as shown. (The probe jaws must be centered around the coil.)
6. Adjust the calibration potentiometer (accessible next to cable input to probe handle) to read 403 mV ac on the DMM. (The adjustment to 403 mV ensures that the probe meets accuracy specifications where response roll-off occurs.)
7. Verify calibration by rechecking the test points in Tables 2 and 3.

CAUTION

Remove the shunt before making the last check at 500A. Otherwise, the maximum current rating of the shunt will be exceeded.

TROUBLESHOOTING

If the 80i-500s does not perform properly, use the following steps to help isolate the problem:

1. Inspect the jaw mating surface for cleanliness. If any foreign material is present, the jaws will not close properly and errors will result.
2. Verify that the BNC is connected to an ac volts input on the measurement instrument. (The Current Probe outputs 1 mV ac per amp measured.)
3. Verify that the function selection on the measurement instrument is correct, i.e., the display vertical resolution is not too low or high.

REPLACEMENT PARTS

To order replacement parts in the USA, call 1-800-526-4731. To order outside the USA, contact the nearest service center. Use the following part numbers:

- Cable, 600V rms, Safety Insulated 935036
- Quick Reference Card 936927
- Instruction Sheet 936922

Order Fluke Part PM 9053 BNC-to-Banana Adapter to use the Current Probe with a DMM.

SERIAL NUMBER LOCATION

The serial number date code is located on the handle. The serial number should be used when ordering parts or requesting service/calibration information.

WARRANTY & LIMITATION OF LIABILITY

Fluke Corporation (Fluke) warrants this instrument to be free from defects in material and workmanship under normal use and service for a period of 1 year from date of shipment. Software is warranted to operate in accordance with its programmed instructions on appropriate Fluke instruments. It is not warranted to be error free. This warranty extends only to the original purchaser and shall not apply to fuses, computer media, batteries or any instrument which, in Fluke's sole opinion, has been subject to misuse, alteration, abuse or abnormal conditions of operating or handling.

Fluke's obligation under this warranty is limited to repair or replacement of an instrument which is returned to an authorized service center within the warranty period and is determined, upon examination by Fluke, to be defective, if Fluke determines that the defect or malfunction has been caused by misuse, alteration, abuse or abnormal conditions of operation or handling, Fluke will repair the instrument and bill the purchaser for the reasonable cost of repair. If the instrument is not covered by this warranty, Fluke will, if requested by purchaser, submit an estimate of the repair costs before work is started.

To obtain repair service under this warranty purchaser must forward the instrument, (transportation prepaid) and a description of the malfunction to the nearest Fluke Service Center. The instrument shall be repaired at the Service Center or at the factory, at Fluke's option, and returned to purchaser, transportation prepaid. The instrument should be shipped in the original packaging carton or a rigid container padded with at least four inches of shock absorbing material. **FLUKE ASSUMES NO RISK FOR IN-TRANSIT DAMAGE.**

THE FOREGOING WARRANTY IS PURCHASER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY, OR FITNESS FOR ANY PARTICULAR PURPOSE OR USE. FLUKE SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OR LOSS WHETHER IN CONTRACT, TORT, OR OTHERWISE.

CLAIMS

Immediately upon arrival, purchaser shall check the packing container against the enclosed packing list and shall, within (30) days of arrival, give Fluke notice of shortages or any nonconformity with the terms of the order, if purchaser fails to give notice, the delivery shall be deemed to conform with the terms of the order.

The purchaser assumes all risk of loss or damage to instruments upon delivery by Fluke to the carrier. If an instrument is damaged in transit, **PURCHASER MUST FILE ALL CLAIMS FOR DAMAGE WITH THE CARRIER** to obtain compensation. Upon request by purchaser, Fluke will submit an estimate of the cost to repair shipment damage.

Fluke will be happy to answer all questions to enhance the use of this instrument. Please address your requests or correspondence to: **FLUKE CORPORATION, P.O. BOX 9090, EVERETT, WA 98206-9090, ATTENTION: Sales Department.** For European Customers: **Fluke Europe B.V., P.O. Box 1186, 5602 B.D., Eindhoven, The Netherlands.**

SERVICE

For service information, call 1-800-825-9810 (USA and Canada).
From other countries, contact the nearest Fluke Service Center.

**For application or operation assistance, or information on
Fluke products, call:**

USA: 1-888-99-FLUKE (1-888-993-5853)

Canada: 1-800-36-FLUKE (1-800-363-5853)

Europe: +31 402-678-200

Japan: +81-3-3434-0181

Singapore: +65-738-5655

Anywhere in the world: +1-425-446-5500

Or, visit Fluke's Web site at www.fluke.com.

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