

Y8100 DC/AC Current Probe

INSTRUCTION MANUAL

DESCRIPTION

The F.W. Bell Y8100 DC/AC Current Probe is a clamp-on probe that is used with a voltmeter, multimeter, or oscilloscope to read dc, ac, or composite (ac on dc) current measurements. The jaws on the Y8100 are designed to clamp around conductors up to $\frac{3}{4}$ inch in diameter. The pistol shape allows safe, easy, one-hand operation when making current measurements.

APPLICATIONS

The Y8100 can be used to measure any of the following:

- Ground currents ac and dc.
- Power supply ripple.
- Current distribution in multiple systems.
- Current balance in two wires ac and dc.
- Current in audio distribution systems (using 440 to 1000 Hz signals).
- Starting currents without introducing impedance (imparts negligible inductance in the mH range).
- Transformer currents.
- Battery currents.
- Current distribution and perform ripple current tests in plating operations.
- Current transients (dc to 1 kHz) when used with an oscilloscope.

FEATURES

As shown in Figure 1-1, major features of the Y8100 include the following. Table 1-1 provides the specifications of the Y8100.

1. Jaws - The jaws can enclose conductors up to $\frac{3}{4}$ inch (19 mm) in diameter. Except at the core closure, the jaws are insulated. The closure is chamfered for positive alignment and minimum air gap. The jaws are rated for voltages up to 600V dc or 480V ac. Inspect core closure area frequently for foreign material. Centering of conductors smaller than $\frac{3}{4}$ inch in diameter is desirable, but not critical for specified accuracy.

WARNING

Do not use at voltages above 600V dc or 480V ac. Avoid snapping the jaws as this could damage the core.

2. Jaw Trigger - The jaw trigger is designed for easy, one-hand operation and positioned for maximum protection from circuit voltages.

3. Slide Lock - The slide lock mechanically locks the push-to-read switch in the on or off position.
4. Push-To-Read-Switch - The push-to-read switch turns the Y8100 on for zeroing and measurement. Switch operation also demagnetizes the core.
5. Output Banana Jacks - The output banana jacks are color coded red for positive and black for negative with reference to the current direction arrow. They will accept standard dual banana connector plugs or individual banana plug leads.
6. Connection Cable - A 5-foot cable with standard dual banana connectors is supplied. A molded tab indicates the negative lead on the connectors.
7. Battery Compartment - The battery compartment can be reached by removing the butt plate, which is held in place by a single phillips screw. Contained in the battery compartment is the battery holder, which slides out to accept four "AA" alkaline batteries (6 volts) required for operation of the Y8100.

NOTE

Support the battery holder when removing it to prevent unnecessary stress on the flexible leads connected to the unit. Cell polarity is molded into the battery holder and should be carefully observed when installing batteries.

8. Zero Adjustment Thumbwheel - Used to zero the voltage output from the Y8100 on the meter before taking current readings.
9. Battery-Low Indicator Light - Lights whenever battery voltage falls below that required for proper operation. Alkaline battery life under continuous operation is approximately 20 hours.
10. Range Switch - The range switch is a two position slide switch for either 20A or 200A operation.
11. Current Direction Arrow - A positive (+) reading on dc indicates current in the direction of the arrow.
12. Case - The case is made of high-impact, high-dielectric, precision-molded plastic.

UNPACKING

The Y8100 was packed and shipped in a container especially designed to protect your current probe. Check your shipment thoroughly. If anything is wrong, contact the place of purchase immediately or F.W. Bell. If return is necessary, please use the original shipping container. If the original container is not available, a new one can be obtained from F.W. Bell. Please give the instrument model number when requesting a new container.

BATTERY INSTALLATION

To install new batteries, remove the battery cover (butt plate) by unscrewing the single phillips screw. Carefully remove the plastic battery holder being sure not to pull too hard and loosen or disconnect the two flexible leads to the unit. The battery holder has cell polarity indicator marks (+) (-) to ensure proper installation of the four new batteries. Install the batteries as indicated on the battery holder and carefully insert the encased batteries back in the handle. Install the battery cover (butt plate).

There are four "AA" alkaline batteries that supply +6V operating power for the Y8100. (See Figure 4-1). A "batteries low" indicator light, located just above the "zero adjustment thumbwheel," will come on whenever the batteries require replacement.

CAUTION

If the Y8100 is not to be used for an extended period, it is recommended that the batteries be removed to protect the unit.

OPERATING INSTRUCTIONS

INTRODUCTION

The following measurement techniques are provided as guidelines to be followed when using the Y8100. Included are procedures for measuring ac, dc, composite (ac on dc) currents, safety hints, and measurement notes. These procedures should be read carefully before using the Y8100.

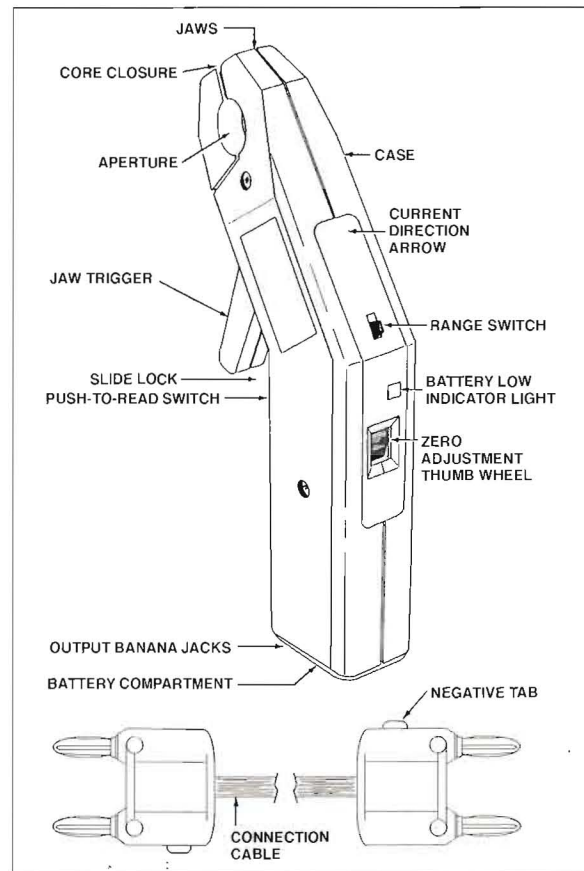
SAFETY HINTS

1. Remove batteries when not using the current probe for an extended period of time.
2. Do not clamp the probe onto anything other than the conductor being measured. The probe may hang from aperture if necessary to read the remote meter.
3. Observe all maximum circuit voltage warnings.
4. The aperture is insulated except at core closure. Withstand voltage from core to output terminals and case is safe for the working voltage specified. Avoid touching uninsulated core closure area to conductor.

MEASUREMENT NOTES

1. There can be a few millivolts of thermal drift during the first 60 to 120 seconds of warmup of the current probe. For maximum dc accuracy, a warmup of 60 seconds before zeroing will eliminate 90-95% of the drift.

Figure 1-1



2. The Earth's magnetic field is an influence to be zeroed out before taking dc readings. Depending on geographical location and immediate environment, the magnitude of error current indication can be ± 200 mA. Being careful to zero and read with the probe at the same angle and orientation will minimize any error from this influence.
3. It is not possible to totally zero the output of the current probe in ac measurements, due to pick-up of stray ac fields and a small amount of normal amplifier noise. This output is typically 1.0 to 5.0 mV reflecting 20 mA to 200 mA on the 20A range.
4. When using a meter which does not provide dc blocking on ac ranges, the dc zeroing procedure should be followed to obtain a minimum reading on the meter (it may not be possible to completely zero the output, as explained in note 3, above.) Alternately, at 60Hz and higher frequencies, the dc may be blocked by use of a non-polarized capacitor with a 50 mfd, 5V rating in series with the positive (red) lead from the current probe.
5. Where possible, when reading low ac or dc current, looping a number of turns of the conductor through the aperture will multiply the sensitivity of the reading. Note that this will not cause multiplication of the influences that tend to produce errors. To obtain the actual current, the reading on the meter must be divided by the total number of turns through the aperture (use a higher scale on the meter when necessary to prevent going off scale.)
6. Make certain that the core closes completely on larger conductors, $\frac{3}{4}$ inch diameter maximum.
7. Keep core closure area clean of foreign material.

Table 1-1. Specifications

RANGES: 20A ac or dc
200A ac or dc

RATE OUTPUT: 2V at full range

ACCURACY:
DC to 65 Hz: $\leq 100A$, $\pm 2\%$ of range $\pm 0.7A$
 $> 100A$, $\pm 3\%$ of range $\pm 0.7A$
65 Hz to 1 kHz: $\leq 100A$, add $\pm 3\%$ of reading
 $> 100A$, add $\pm 6\%$ of reading

EMC: If an RF field of 3V/M with 80% 1 kHz Modulation on all Ranges:
Total Accuracy
DC TO 65 Hz: Specified Accuracy $\pm 2.9A$
65 Hz to 1 kHz: Specified Accuracy

CALIBRATION CYCLE: 1 year

FREQUENCY RESPONSE: dc to 1.0 kHz

RECOMMENDED LOAD: $\geq 1M \Omega$, 100pF

TEMPERATURE RANGE: $+15^{\circ}C$ to $+35^{\circ}C$; for specified accuracy $-10^{\circ}C$ to $+50^{\circ}C$; storage and operation at reduced accuracy.

HEATING LIMITATION: Prolonged operation above 200A ac or 1 kHz can cause damage to the Y8100.

WORKING VOLTAGE RATING: Core to output, 600V dc or 480V ac max Output to ground, 42V dc or 30V ac max

APERTURE SIZE: $3/4"$ (19 mm) diameter

SIZE-OVERALL: $9" \times 4 1/2" \times 1 7/16"$ (230 mm x 115 mm x 37 mm)

WEIGHT: 14 ounces (0.4 kg), with batteries

POWER: 4 "AA" cells

BATTERY LIFE: Alkaline 20-hours continuous

CAUTION

The Y8100 is not to be used at circuit voltages above 600V dc or 480V ac.

CAUTION

The current probe, although designed for rugged use, is a precision measurement tool. Do not snap jaws, doing so may damage the core and/or alter the zero set on dc.

8. Conductors smaller than $3/4$ inch should be centered in the aperture for maximum accuracy. However, conductor position within the aperture is not critical in attaining the accuracy specified in Table 1-1. Overall accuracy is determined by adding the error of the indicating instrument to that of the probe. Measurement of high dc currents, exposure to large transient currents, or turning the Y8100 or the source current off while the probe is clamped around a conductor carrying current may result in a small residual magnetic field in the core. Before attempting to read lower dc currents, this potential cause for error in readings should be eliminated by removing the unit from the conductor, and turning it on and off a few times (this will demagnetize the core) and then repeating the zeroing steps. When practical, this procedure is recommended for all dc measurements and is good practice for any current measurement.
9. Rated voltage between the uninsulated core closure and the output terminals will protect any connected equipment when used in circuits up to 600V dc or 480V ac.

WARNING

Do not measure circuits over 480V ac.

MEASURING AC CURRENT

1. Select a voltmeter (input impedance $\geq 1M \text{ ohm}$).
2. Connect current probe to voltmeter with banana plug cable supplied, or other appropriate cable.
3. Select 20A or 200A range on current probe using the range switch.
4. Turn on the voltmeter. Select proper ac voltage range (full-scale readings will go to 2.0V). Determine scale factors: On the 20A range, the scale is 0.1V per amp, e.g., a 15A reading, will be displayed as 1.5V. On the 200 A range, the scale is 0.01V per amp, e.g., a 65A reading will be displayed as 0.65V.
5. Turn current probe on using push-to-read switch. If desired, lock on using the slide lock.
6. Select a spot along the conductor to be measured where the influence of stray fields from adjacent conductors and large ferrous objects is at a minimum.
7. Use Jaw Trigger to open jaws and clamp around conductor.

NOTE

When measuring current in an ac line cord, the jaws should be clamped around only one conductor (black or hot wire in a three-wire cord). If the jaws are clamped around both current carrying conductors, the currents will cancel and produce a zero reading.

8. Read current indication on meter. Observe proper scale factor.

MEASURING DC CURRENT

1. Select a voltmeter (input impedance $\geq 1M \text{ ohm}$).
2. Connect current probe to voltmeter with banana plug cable supplied, or an equivalent appropriate cable.
3. Select 20A or 200A range on current probe using the Range Switch.
4. Turn voltmeter on.
5. Select suitable dc voltage range on the voltmeter (full-scale will go to 2.0V).
6. Turn current probe on with push-to-read switch. Lock on with the slide lock.
7. Select a spot along the conductor to be measured where the influence of stray fields from adjacent conductors and large ferrous objects is at a minimum.
8. Hold the current probe at right angles to the conductor 2 to 4 inches away from the selected spot at the same angle and orientation as will be used for final reading.
9. Zero the output of the current probe on the voltmeter using the zero adjustment thumbwheel. Output may be either + or -.
10. Leave the current probe turned on.
11. Use jaw trigger to open jaws and clamp around conductor.

CAUTION

Release jaw trigger gently. Allowing the jaws to snap closed may alter the zero set.

12. Read current on meter. Observe proper scale factor.

WARNING

Do not measure on circuits over 600V dc.

13. To accurately measure low dc currents after measurement of a higher dc current, exposure to large transient currents, or if the current probe, or the source current has been turned off while still clamped around a conductor carrying current, remove the current probe from the conductor, turn it on and off a few times to demagnetize the core and repeat zeroing steps numbers 4 through 10 above.

MEASURING COMPOSITE (AC-ON-DC) CURRENT

1. To measure the dc component of the composite current, proceed as if measuring dc currents.
2. Switch the voltmeter to a proper ac voltage range to measure the ac (ripple) component of the composite current. The meter must provide dc blocking (see "measurement note" number 4).

WARNING

Do not use the Y8100 on voltages exceeding 600V dc or 480V ac.

WARRANTY

F.W. Bell warrants each instrument of its manufacture to be free from defects in material and workmanship. Our obligation under this warranty is limited to servicing or adjusting any instrument returned to our factory for that purpose, and to replace any defective parts thereof. This warranty covers instruments which, within one year after delivery to the original purchaser, shall be returned with transportation charges prepaid by the original purchaser, and which upon examination shall disclose to our satisfaction to be defective. If it is determined that the defect has been caused by misuse or abnormal conditions of operation, repairs will be billed at cost after submitting an estimate to the purchaser.

F.W. Bell reserves the right to make changes in design at any time without incurring any obligation to install same on units previously purchased.

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