



UM-7700D
UTILITY MASTER
CURRENT/POWER METER

Instruction Manual

Manual UN-01-215
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NOTICE

See Page 3-1 for

SAFETY

Instructions !

Table of Contents

SECTION-1 INTRODUCTION	
DESCRIPTION.....	1-1
APPLICATIONS.....	1-1
SECTION-2 SPECIFICATIONS	
SPECIFICATIONS.....	2-1
SECTION-3 OPERATING INSTRUCTIONS	
OPERATOR SAFETY.....	3-1
OPERATING FEATURES.....	3-2
MEASUREMENT PROCEDURES.....	3-4
Meter Preparation.....	3-4
Measurement Hints.....	3-9
GENERAL MAINTENANCE.....	3-10
REGULATORY INFORMATION.....	4-1
WARRANTY.....	back cover

List of Tables

Table 2-1	UM-7700D Specifications.....	2-1
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List of Illustrations

Figure 3-1	Product features.....	3-2
Figure 3-2	LCD display at power on.....	3-4
Figure 3-3	LCD display after self-test.....	3-5
Figure 3-4	LCD display during zeroing process	3-5
Figure 3-5A	Single-phase, power connections.....	3-7
Figure 3-5B	Single-phase, 3-wire, power connections.....	3-7
Figure 3-5C	Three-phase, 3-wire, Delta or Wye power connections.....	3-7
Figure 3-5D	Three-phase, 4-wire, power connections.....	3-7
Figure 3-6	LCD display with low battery indicator.....	3-8
Figure 3-7	LCD display with idle indicator.....	3-10

Section 1

Introduction

DESCRIPTION

The *UM-7700D* is a hand-held, battery-powered, clamp-on instrument that measures dc and ac TRUE RMS current up to 1,000 amps and ac power up to 660 kW from 40 to 500 hertz. It features a push button zero and a custom formatted LCD display with the following indicators: current direction in the DC MODE, lead/lag in the POWER MODE and overrange. The meter is designed for use with conductors up to 2.375" in diameter.

The meter incorporates the same user-friendly pistol shape utilized in F.W. Bell's broad line of current and power meters and probes, providing rugged, well-balanced, one-handed operation. Its large aperture and high current capability make it ideal for utility and plant personnel.

The probe and accessories are protected by a sturdy carrying case (optional) when not in use.

APPLICATIONS

- Adjustment of motor loads.
- Adjustment of plant loads.
- Checking industrial and commercial power systems.
- Appliance testing.
- Plant maintenance and inspection.
- Electrical utility inspection.
- Determination of current balance between to wires.
- Measuring current transformers.

Section 2

Specifications

<u>Parameter</u>	<u>Range</u>	<u>Accuracy</u>
AC/DC Current:	1 to 1,000 A (1 to 25 A) (25 to 1,000 A)	$\pm 1.0\%$ of Rdg., ± 1.5 A $\pm 1.5\%$ of Rdg., ± 3.0 A
Frequency:	40 to 500 Hertz	
Power:	1 to 660 kW (< 10 kW) (≥ 10 kW)	$\pm 2.0\%$ of Rdg., ± 1.0 kW $\pm 2.0\%$ of Rdg., $\pm 1.0\%$ FS
Frequency:	45 to 65 Hertz and 380 to 420 Hertz	
Working Voltage:	600 Vrms max.	
<u>Additional Influences on Accuracy</u>		
Conductor Off Center:		$< \pm 2.0\%$ of Rdg., Cable dia. ≥ 0.63 " (16 mm)
Adjacent Conductor Current:		$< \pm 0.015$ A/A
Core Closure Repeatability:		$< \pm 0.5\%$ of Rdg.
DC Current Reversibility:		$< \pm 0.5\%$ of Rdg.
<u>General</u>		
<u>Parameter</u>	<u>Range</u>	
Operating Temperature Range:	0 to $+50$ °C	
Storage Temperature Range:	-40 to $+60$ °C	
Battery:	One 9V Alkaline (NEDA 1640)	
Battery Life:	8 hours	
Aperture Size:	Oval, 2.875" x 2.375" (73 mm x 60 mm)	
Weight:	29 ounces (822 grams)	

Table 2-1 UM-7700D Specifications

Section 3

Operating Instructions

OPERATOR SAFETY



This symbol appears on the meter's function label. It refers the operator to additional information contained in this instruction manual, also identified by the same symbol.

The following safety rules must be followed during the operation and servicing of the UM-7700D. Strict adherence to these rules is essential for safe operation. F.W. Bell Inc. assumes no liability for the failure to comply with these rules.



Do not clamp around conductors with voltages equal to or exceeding 600 V dc or rms ac.



Do not clamp the meter's jaws around bare conductors.



Inspect voltage input leads frequently for cracks, burns, etc. Do not use if leads become damaged.



Prolonged operation above 250 A•kHz can cause permanent damage due to heating effects. Do not use meter under conditions where the current/frequency product exceeds 250 A•kHz.

OPERATING FEATURES

OPERATING INSTRUCTIONS

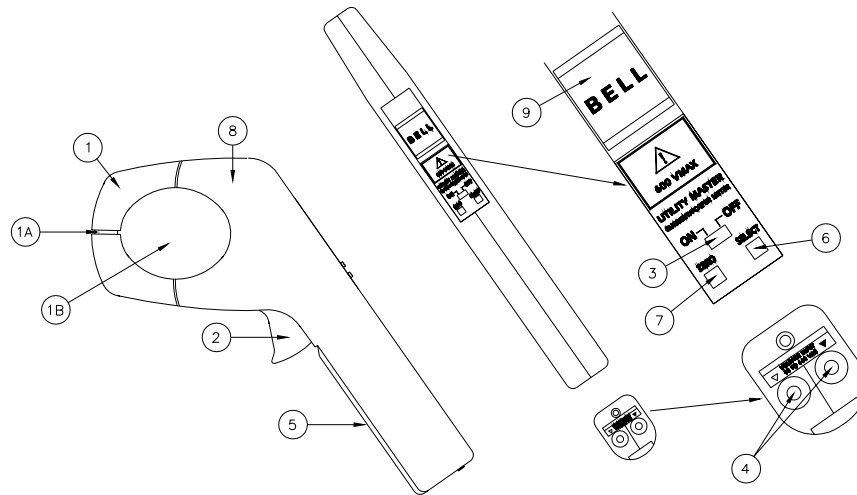


Fig. 3-1
Product Features

- ① **Jaws:** Jaws open to accept up to a 2.375" diameter conductor. Insulated except at core closure (1A).

Caution: DO NOT USE ON BARE CONDUCTORS OR AT VOLTAGES ABOVE 600 VOLTS.

NOTE: Inspect core closure (1A) frequently for foreign material. Avoid snapping the jaws shut as this can damage the core. Centering of conductors smaller than 2.375" diameter within the aperture (1B) is desirable, but not critical within specified accuracy limits.

- ② **Jaw trigger:** Designed for easy, one-handed opening of jaws. Positioned for maximum protection from circuit voltages.
- ③ **Power switch:** Applies power to the meter. (Left = "ON")
- ④ **Voltage input jacks:** Two connectors designed to accept safety-shrouded banana-type jacks, used for voltage input during power measurement. The red and black arrows above the con-

OPERATING INSTRUCTIONS

nectors facilitate proper phasing between the voltage and current signal.

- ⑤ **Battery compartment:** Accessed by sliding battery compartment door back. Battery snap will accept a commercial 9-volt alkaline battery.

NOTE: Support the battery snap when removing the battery to prevent unnecessary stress on the battery leads.

- ⑥ **Mode select switch:** Momentary push-button switch used to select the mode of operation of the meter: AC CURRENT, DC CURRENT and POWER.
- ⑦ **Zero switch:** The zero switch is used to zero the LCD display before making a dc current measurement.
- ⑧ **Case:** High-impact, high-dielectric ABS precision-molded plastic.
- ⑨ **LCD display:** Custom-formatted liquid crystal display for direct readout of measurements.

MEASUREMENT PROCEDURES

Meter Preparation

OPERATING INSTRUCTIONS

1) Battery installation: Ensure the power switch is in the “OFF” position. Turn the meter upside down with the battery arrow pointing towards you. Place thumb in notch and apply moderate pressure in the direction of the arrow until the door slides open. Locate battery snap and install a 9-volt battery (Eveready alkaline No. 522, NEDA 1640A, or equivalent). Slide battery door to the closed position.

NOTE: Support the battery snap when removing battery to avoid unnecessary stress on the battery leads. Observe battery polarity.

2) Voltage input leads: Install the voltage input leads into the jacks in the handle of the meter, observing the polarity indicated by the colored arrows (RED = signal, BLACK = neutral). If making current measurements only, the voltage leads are not needed.



NOTE: Exercise great care when attaching voltage lead clips to voltage source to avoid personal injury.

3) Power switch: Slide the power switch to the “ON” position. Initially, the display will appear as in figure 3-2.

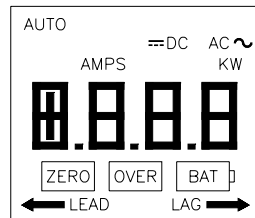


Fig. 3-2

During this time the meter is performing a test of all internal circuitry. Once these tests are complete (about 5 seconds), the meter is ready to be “zeroed”, and the display will appear as in figure 3-3.

OPERATING INSTRUCTIONS



Fig. 3-3

4) Zeroing: The process of zeroing the meter provides the most accurate readings when making dc current measurements (no other measurements are affected by this process). Magnetic fields from adjacent conductors, large ferrous objects and from the earth itself, as well as internal circuit offsets and temperature effects, can contribute to inaccurate readings.

To cancel these effects, select a point along the conductor where the stray fields should be at a minimum. Hold the meter perpendicular to the conductor, and about two to four inches (5 - 10 cm) from it.

Whether you have just turned the meter on and a flashing ZERO is displayed or you wish to rezero the meter, press and release the lower left button to initiate the zeroing process. The zeroing process is complete when the ac amps indicator appears.

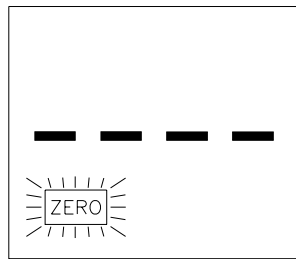


Fig. 3-4

5) Mode selection: Pressing and releasing the SELECT switch allows you to step through the following readings.

OPERATING INSTRUCTIONS

Current (AC): The ac current reading represents the true rms value of the current waveform. This value does not include the dc component in the waveform, if any. If no ac waveform is detected through the aperture, or if the current is below 1.0 amp, the reading will be displayed as 0.0. Readings will be displayed as 1.0 to 1000.0 amps.

Current (DC): The dc current reading represents the average dc value of the current waveform, whether the current is pure dc or an ac waveform with a dc component. In the later case, the reading will only show average dc current above 20 amps. The meter should be zeroed before the measurement is performed for best accuracy. The readings will be displayed as 0.0 to 1000. amps. The direction of the current flow through the aperture is indicated by one of two display arrows, as shown in figure 3-2.

NOTE: Readings that are accompanied by a flashing “OVER” indicator or that are below 1.0 amp or above 1000 amps may not be accurate.

Power (KW): Real power is displayed in 1000's of watts, and is a measure of the rate of energy consumption. If no ac waveform is detected on the voltage input or through the aperture, or the voltage and/or current is below the minimum range of the meter, the reading will be 0.0. Readings will be displayed as 0.1 to 999.9 kW. The power reading is accompanied by a LEAD or LAG indicator.

Single- and multi-phase power may be measured by connecting the UM-7700D as shown in figures 3-5A, B, C and D.

Note: “R” = Red, “B”= Black

OPERATING INSTRUCTIONS

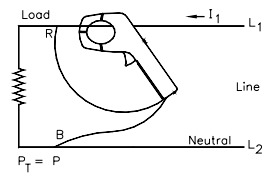


Fig. 3-5A: Single-Phase

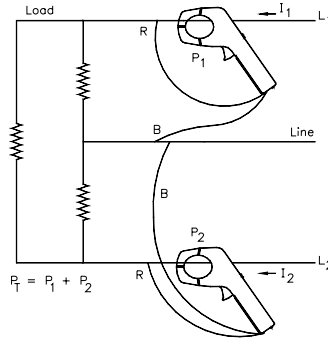


Fig. 3-5B: Single-Phase, 3-Wire

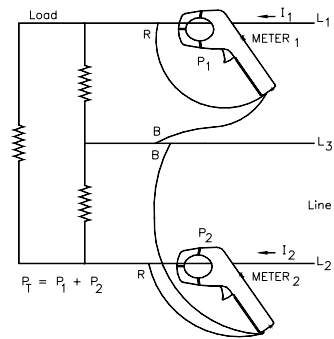


Fig. 3-5C: Three-Phase, 3-Wire, Delta or Wye

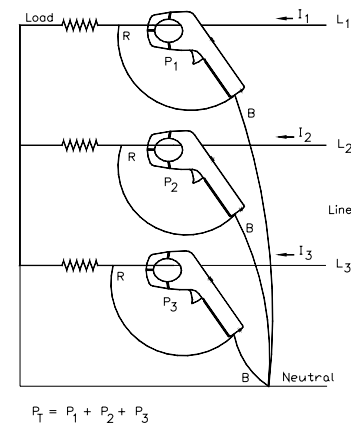


Fig. 3-5D: Three-Phase, 4-Wire

6) Lead/Lag indicator: The lead or lag indicator will appear during power measurement to indicate whether the current leads or lags the voltage (see figure 3-2). Neither indicator will appear if the

OPERATING INSTRUCTIONS

phase angle is exactly 0 or 180 degrees, or if there is no current or voltage present.

Typically current will LEAD voltage in capacitive systems and LAG voltage in inductive systems. The lead or lag indicator will flash for any phase angle between 90 and 180 degrees. This is intended to warn the user that there is a negative power situation and to re-check the probe's voltage connections for proper polarity or investigate the system under test for miswiring.

7) Low battery indicator: The low battery indicator will flash when the battery voltage drops to 6 volts. The battery should be replaced as soon as possible. See figure 3-6.

NOTE: The accuracy of the readings can not be guaranteed when the low battery indicator is flashing.

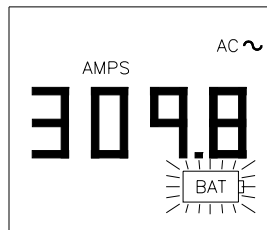


Fig. 3-6

Measurement Hints

- **Warm-up:** In the AMPS DC mode, there will be some drifting in the reading during the first 60 to 120 seconds of warm-up.

OPERATING INSTRUCTIONS

For the most accurate readings, wait this long before making measurements.

- **Zeroing:** For maximum accuracy in the dc current (amps) mode rezero the meter before each measurement. When the meter is exposed to relatively high current, a residual magnetism can be left in the core that may result in an offset reading of several amps. This can be removed by rezeroing the meter.
- **Relative zeroing:** In some instances, when measuring dc current, it may be desirable to zero the meter around a conductor carrying a non-zero current in order to use that current level as a reference. This is called relative zeroing.

For example, the user may want to measure variations on a conductor that normally carries 200 amps dc, flowing left (←). The user can rezero the meter with 200 amps (←) flowing through the aperture. From then on, readings will reflect the change around the 200 amp mark. Thus, a current of 210.3 amps (←) will read 10.3 amps (←), and a current of 175.9 amps (←) will read 24.1 amps (→).

- **Multi-turn measurements:** The sensitivity of the measurement can be increased by wrapping several turns of the same conductor through the aperture. The turns must be circulating in the same direction. The actual current can be calculated by dividing the reading by the number of turns. For instance, suppose there are 10 turns and the reading is 100 amps. The actual current flow is:

$$100 \text{ Amps} / 10 \text{ turns} = 10 \text{ Amps}$$

$$10 \text{ kW} / 10 \text{ turns} = 1 \text{ kW}$$

- **Core closure:** Foreign material in the core closure area can prevent the jaws from fully closing, causing inaccurate current and power readings.

OPERATING INSTRUCTIONS

- **Idle mode:** To conserve power in the event that the meter is accidentally left on for more than five minutes and no voltage or current is detected, the meter will go into a low power consumption IDLE state and the word "IDLE" will appear on the display. To return to normal operation, turn the unit off and then back on. See figure 3-7.

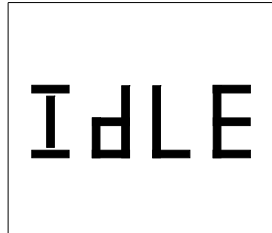


Fig. 3-7

GENERAL MAINTENANCE

- Use only isopropyl alcohol and a cotton swab to clean the aperture area. ***Never use a sharp instrument or a stiff brush to clean the aperture or damage will occur !***

WARNING !

The probe is a precision instrument with no serviceable parts and no adjustment points. Under no circumstances attempt to disassemble the probe !

- Gently clean the display and case with a soft, dry cloth (**do not use chemicals !**).
- If the meter is to be idle for an extended period of time, remove the battery. Battery corrosion can damage the meter.

Regulatory Information

WARRANTY

F.W. BELL INC. warrants each instrument it manufactures to be free of defects in material and workmanship. Our obligation under this warranty is limited to servicing and adjusting any instrument returned to our factory for that purpose, and to replacing any defective parts thereof (excluding batteries). 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, abnormal conditions of operation or alteration, repairs will be billed at cost after submitting an estimate to the purchaser.

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

This warranty is expressly in lieu of all other obligations or liabilities on the part of F.W. BELL INC., and F.W. BELL INC. neither assumes nor authorizes any other person to assume for them any other liability in connection with the sales of F.W. BELL INC. instruments.

DAMAGE IN SHIPMENT

The instrument should be examined and tested as soon as it is received. If it does not operate properly, or is damaged in any way, immediately file a claim with the carrier. The claim agent will provide report forms. A copy of the completed form should be forwarded to F.W. BELL INC. We will then make the necessary arrangements for repair or replacement. All correspondence concerning this instrument should include model and serial numbers.

SHIPPING INSTRUCTIONS

Use the original shipping carton and inserts, or surround the instrument with several thick layers of shock-absorbing material and pack it in a sturdy container. F.W. BELL INC. cannot be responsible for damage to the instrument due to improper packaging. Include a contact name, phone number and describe the problem with as much detail as possible. Ship to:

F.W. BELL Inc.
Repair Department
6120 Hanging Moss Road
Orlando, Fl. 32807
(407)678-6900