HALO®
AMMETER

Instruction & Operation Manual

MODEL NUMBERS:
8280, 8281, 9390 & 9391

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Note - *Prior to use, this manual should be fully read and understood.*

General

HALO is a high-current, digital ammeter designed to be used on system voltages up to 69,000 volts AC. The HALO ammeter will sense and display current to 1,999 amps, and will hold the maximum reading and/or track the reading for the user.

HALO was designed for the purpose of measuring current flow on overhead lines and/or underground systems. When using the HALO, a hotstick must be used at all times and rigorous hotstick work precautions must be followed. When used correctly, HALO can enable fast, accurate and safe load surveys and load balance investigations.

The instrument is constructed of durable plastic and fiberglass tubing and will require a minimum of maintenance. However, regular examinations are needed to ensure that no deep scratches or physical damage has occurred. If damage does occur, remove from service and arrange for repair.

The HALO has 4 models, HALO I HOOKHEAD and FORKHEAD has one mode (Hold). HALO II HOOKHEAD and FORKHEAD has two modes of operation (Track and Hold).

The opening in the head is large enough to accept all sizes of wire conductors.

Safety

As HALO is often used on and in the vicinity of high voltage equipment, please practice the following safety precautions.

1. Before use, make certain that:
   A. Operating instructions are read, understood, and questions answered.
   B. Rigorous hotstick work precautions are followed.
   C. Industry and/or company standard safety practices are followed.
   D. All parts of the equipment are dry, clean, properly secured together and in working order.
   E. The equipment set-up is correct for the voltage system to be monitored.
2. During the use of the unit, make certain that:
   A. Correct hotsticks are installed for the system voltage being tested.
   B. Hands are kept only on the insulated handle section of the hotstick and not on the HALO!
   C. Electrically safe, insulated rubber gloves are used at all times on the hotstick.
   D. The HALO is not an insulator. Do not bridge the HALO from energized line to ground or from line to line.

Description of Equipment

See Page 7 for a brief overview of the HALO's features and operating procedures.

The HALO instrument has a molded sensing coil in the head and a 3½ digit LCD display in the fiberglass tube. The HALO measures current between 0 and 1,999 amperes. The HALO is autoranging providing a reading between 0 to 199.9 on the low range and 200 to 1999 on the high range. When in the HOLD mode, the display will lock in at the highest current monitored on the conductor. If an over-range condition exists (above 1,999 amps), the display will show a 1. Reset display prior to using again.

The HALO I (models 8280/8281) has two pressure switches, one marked "ON/RESET" to switch on the display and to reset the display after testing. The second switch marked "OFF" turns the HALO off

after use. The HALO II (models 9390/9391) has two pressure switches, one marked “OFF/ON” to switch the display off and on. The second switch of the HALO II is marked “TRACK/HOLD”. In the TRACK mode the readings will follow the current and in the HOLD mode the reading will display and hold the highest current. When in TRACK mode, a sine wave appears in the lower left corner of the display.

The HALO units have an automatic shut off feature that will turn the unit off after approximately 10 minutes.

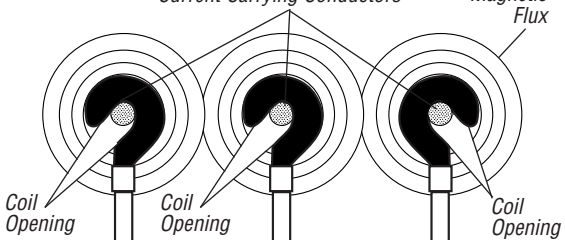
The HALO is powered by a replaceable, 9 volt alkaline battery. Under normal conditions, a battery will provide approximately 50 hours of continuous use. A low battery indicator is displayed on the left hand side of the display when the battery is low, as shown in Figure 1. Incorrect readings may be displayed if the HALO is operating with a low battery.

Figure 1
Low battery indicator signal shown in upper lefthand corner of display.

Using the Equipment

1. Inspect HALO and hotstick for any damage, cleanliness and proper working order. If damage is suspected, remove from service and arrange for repair.
2. Attach the hotstick, which can be supplied by HD as an accessory or by the user, to the universal spline located at the base of HALO.
   Note - *The load on the HALO should not exceed 22 lbs. (10kgs) longitudinal or 11 lbs. (5kgs) in any other direction.*
3. Turn the HALO on by pressing the “ON/RESET” switch (HALO I) or “ON/OFF” switch (HALO II) for approximately 5 seconds. While the button is depressed a reading of 1888 will be displayed to indicate that all digits are functional. Note, the 1888 only appears momentarily with the HALO II. The display will come ON and should display 0 to 2 on the HALO I and 00.0 to 00.6 on the HALO II.
   Note - *It is very important that the “ON” switch is held down for the 5 seconds for the HALO I.*
4. Place the HALO, using the hotstick, over the conductor to be monitored. Leave in place for 5 to 10 seconds.
   WARNING - *Do not bridge the HALO from energized line to ground or from line to line.*

Figure 2
Current Carrying Conductors



Note - *For best accuracy, the opening of the sensing coil (hook) of the HALO should face away from any other energized conductors so as not to influence the reading. See Figure 2.*

Note - *When conductors are spaced closely, raise the HALO with the core parallel to the conductors, then slip the coil over the desired conductor by rotating 90°. The sensing coil of the HALO may pick up external signals from conductors if it passes within 12 inches (0.3 meters) of a conductor while being lifted into position or lowered to the ground. Care should be taken to minimize this situation by avoiding contact or close proximity with conductors other than the conductor being tested.*

Note - *To maintain maximum accuracy, the head must be perpendicular as seen in Figures 3 thru 6. Failure to do so may result in incorrect readings on the display.*

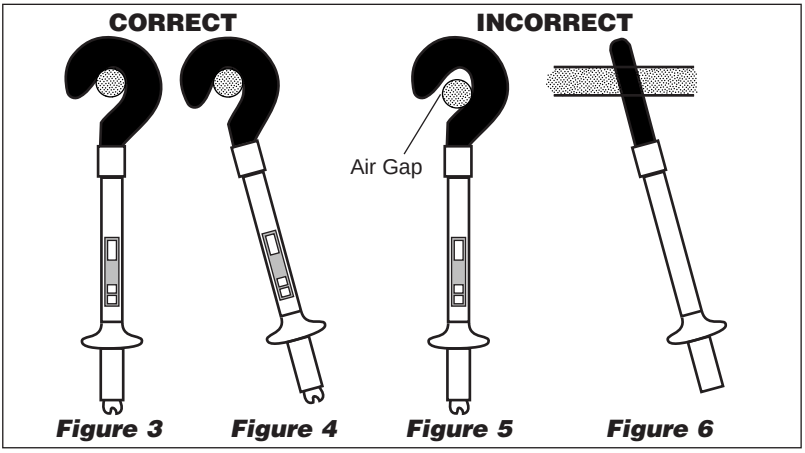


Figure 3 ***Figure 4*** ***Figure 5*** ***Figure 6***

5. HALO I will continue to lock on the maximum current reading during the time it is hanging on the conductor. HALO II can be switched between modes by pressing the "TRACK/HOLD" switch. When the sine wave symbol appears in the display, the ammeter is in the track mode. When the sine wave does not appear, the ammeter is in Hold mode.
   WARNING - *Before switching mode, always remove HALO from the voltage source.*
   Note - *If HALO II is reset in either mode it will automatically revert to the other mode.*
6. On completion of a monitoring period, the instrument should be removed from the voltage source, carefully lowered, and the reading on the display noted.
7. If another test is required, press the "ON/RESET" switch for HALO I to zero the display and test again and "TRACK/HOLD" switch for HALO II. Prior to retesting, make certain HALO II is in correct mode. Press the "OFF" switch if testing is complete until the display is blank.

HALO - Battery Replacement

Note - *Figures 7.1 & 7.2 show a cross sectional view of the battery holder and calibration ports.*

1. Place the HALO horizontally.
2. The Battery Holder is attached to the fiberglass body by two brass screws (4 screws on some versions). Remove the screws.
3. When both brass screws have been removed, carefully slide the Battery Holder out beyond the end of the fiberglass body.

CAUTION: *The battery clip is attached to the circuit board and to the battery that is located inside the Battery Holder. IF THE BATTERY CLIP IS PULLED TOO FAR, THEN IT CAN BE DISCONNECTED FROM THE CIRCUIT BOARD AND THE HALO WILL NOT OPERATE.*

4. Remove the old battery and disconnect from the battery clip.
5. Insert a new 9 volt alkaline battery in the battery clip and install back in the Battery Holder.
6. Slide the Battery Holder back into the HALO body and replace the brass screws that were removed in Step 2.

Note - *Make sure the splines are facing up on the end of the Battery Holder - Please reference Figure 7.2.*

Figure 7.1

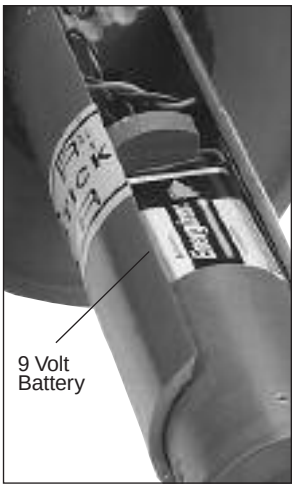
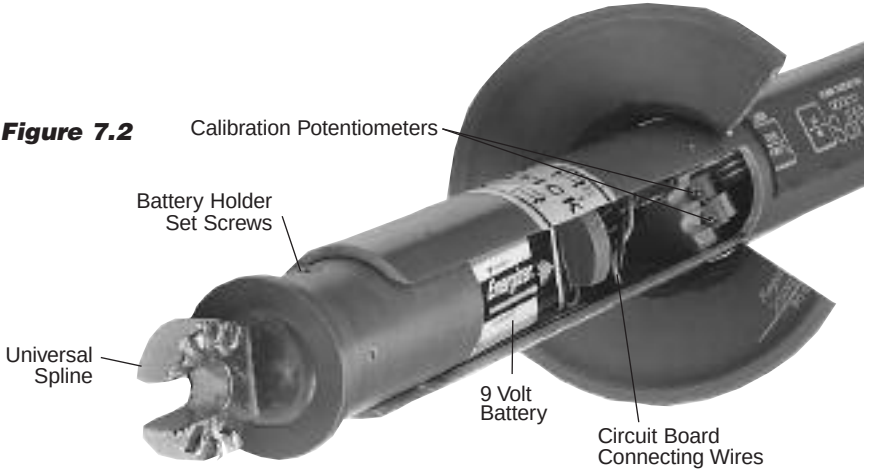


Figure 7.2



HALO Calibration

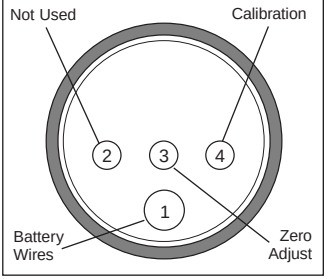
WARNING - *FOR SAFETY REASONS, ONLY USE A LOW VOLTAGE (LESS THAN 50 VOLTS), HIGH CURRENT POWER SOURCE FOR CALIBRATING HALO. NEVER USE HIGH VOLTAGE CURRENT SUPPLIES.*

1. Place the HALO horizontally.
2. The Battery Holder is attached to the fiberglass body by two brass screws. Remove screws.
3. When both brass screws have been removed, carefully slide the Battery Holder out beyond the end of the fiberglass body.

CAUTION:*The battery clip is attached to the circuit board and to the battery that is located inside the Battery Holder. IF THE BATTERY CLIP IS PULLED TOO FAR, THEN IT CAN BE DISCONNECTED FROM THE CIRCUIT BOARD AND THE HALO WILL NOT OPERATE.*

4. Remove the battery from the Battery Holder, but do not disconnect it from the battery terminal connector.
5. Carefully, turn the HALO vertically so the head is downward.
6. Looking down inside the fiberglass body you will see the following: A gray PVC end piece with four holes. Hole #1 has the leads for the battery clip going through it. Hole #2 is not used. Hole #3 has a potentiometer behind it that zeros the meter. Hole #4 has a potentiometer behind it that is used to calibrate the meter. See Figure 8.
7. Adjust the zero first by placing a small, insulated slotted screwdriver down inside the fiberglass body. Attach the screwdriver to potentiometer #3 adjusting display to zero.
8. Adjust the calibration second, by attaching the screwdriver to potentiometer #4. Turning the potentiometer clockwise will raise the reading when calibrating the meter. Turning the potentiometer counter-clockwise will lower the reading when calibrating the meter.

Figure 8
Bottom View
(after removing battery holder)



Note - *The slotted screwdriver should be at least eight (8) inches long and when turning the HALO over to attach the head to the load, be careful not to remove the screwdriver from the potentiometer.*

9. Carefully, turn the HALO over so that the head is up and the opening with the screwdriver is down.
10. Attach the head to the load. Make sure the head is properly positioned as per instructions.
11. Ensure the load is set to 500 amperes.
12. Turn the screwdriver to adjust the potentiometer so that the DISPLAY reads 502 to 503 amps. This will ensure a good calibration at the lower side and the upper side.

13. Every time the potentiometer is turned, the following sequence of tests must be followed based upon the HALO model you are calibrating. Follow steps A-F based on model number, referencing Figures 3, 4, 5, 6, 9, 10 for correct positioning.

    MODEL 8280/8281: ***Note -*** *Reference Figures 3, 4, 5 and 6.*
    A. Press the Reset Button.
    B. Read the display on the HALO and compare it with the control input.
    C. Continue to adjust the potentiometer and follow the steps until the Display is 502 to 503 amps when the control is 500 amps.

    MODEL 9390/9391: ***Note -*** *Reference Figures 9 and 10.*
    A. Press the Track Button.
    B. Read the Display on the HALO and compare it with the control input.
    C. Then press the Hold Button.
    D. Read the Display on the HALO and compare it with the control input.
    E. The reading between the track mode and the hold mode may have a difference of up to three (3) amperes.
    F. The track mode should be calibrated to 500 to 501 amps; this will ensure the hold mode to be calibrated to 503 to 504 amps.

14. Continue to adjust the potentiometer and follow steps 11 and 12 in the *HALO Calibration* Section.
15. Be sure the load is de-energized and carefully remove the HALO from the control load.
16. Place the HALO horizontally with the switch facing up.
17. Place the Battery back into the Battery Holder.
18. Slide the Battery Holder back into the HALO body.
19. Replace the brass screws that were removed in Step 2.

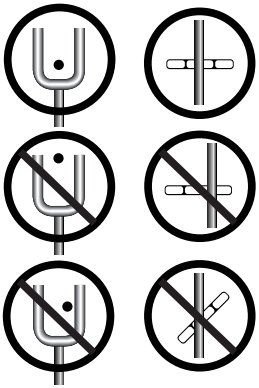
Note - *Make sure the splines are facing up on the end of the Battery Holder.*

HALO FORKHEAD INSTRUCTIONS *(Models 8281 and 9391)*

The operational performance of the forkhead is the same as the hookhead, but offers a slightly different approach in obtaining current measurements. All safety concerns that apply to the hookhead apply to the forkhead. The positioning of the instrument with respect to the conductor and the positioning of the conductor within the forkhead is critical in obtaining an accurate reading. To obtain the most accurate reading, the following guidelines should be observed.

1. Be sure the HALO body is perpendicular (90°) to the conductor (reference Figures 3, 4, 5 and 6).
2. If there are other conductors in close proximity, face the opening of the fork away from the other conductor(s) as much as possible.
3. Position the forkhead so the conductor is close to, or pressed against, the base of the fork and is centered between the legs of the fork (See Figure 9).
4. Keep the opening of the forkhead perpendicular to the conductor (See Figure 10).

Figure 9 ***Figure 10***



WARNING - *Do not bridge the HALO from energized line to ground or from line to line.*

Note - *When using the forkhead on underground systems near the elbow, the concentric neutral cannot be inside the forkhead for the unit to perform properly. Position the forkhead around the conductor where the concentric neutral is peeled back. This is usually high on the cable, just below the elbow or on the elbow below the pulling ground.*

Specifications and Dimensions*

Display:	3½ digit LCD ½" (13mm) high characters
Measurement Range:	0.1 to 199.9 amps low range - 199.9 to 1,999 amps high range
Accuracy:	± 3% of reading ±1 digit
Operating Temperature:	0°F to 122°F (-18°C to 50°C)
Storage Temperature:	0°F to 122°F (-18°C to 50°C)
System Voltage:	Up to 69,000 volts AC
Maximum Hook Opening:	2.3" (5.8cm)
Maximum Hook Depth:	3.7" (9.4cm)
Outside Fork Dimension:	5.5"W x 8.5"L x 1.1875"Thick (14cm x 22cm x 3cm)
Inside Fork Dimension:	2.75"W x 5.5"Deep (7cm x 14cm)
Overall Length:	28" (71cm)
Tube Dimensions:	18" x 1¾" (45.7cm x 4.5cm) diameter
Weight:	2lbs. 13oz. (1.26 kg)

*Specifications subject to change without notice

Limitation of Warranty and Liability

NOTICE: READ THIS LIMITATION OF WARRANTY AND LIABILITY BEFORE BUYING OR USING THIS PRODUCT. IF THE TERMS ARE NOT ACCEPTABLE, RETURN THE PRODUCT AT ONCE, AND THE PURCHASE PRICE WILL BE REFUNDED.

It is impossible to eliminate all risks associated with the use of this product. Risks of serious injury or death, including risks associated with electrocution, arcing and thermal burns, are inherent in work in and around energized electrical systems. Such risks arise from the wide variety of electrical systems and equipment to which this product may be applied, the manner of use or application, weather and environmental conditions or unknown factors, all of which are beyond the control of HD Electric Company.

HD Electric Company does not agree to be an insurer of these risks.
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HD Electric Company warrants that this product is free of defects in material and workmanship, under normal use and service, for a period of one (1) year from the date of shipment. This warranty is void in the event of misuse, alteration, faulty installation, or misapplication of the product.

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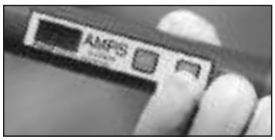
1. Inspect HALO. Turn on by pressing “On/Reset” button and check for “Low Battery” indication on Display. Replace battery if needed before using.

2. Attach to hotstick using universal spline.

3. Hang on conductor for a minimum of 5-10 seconds.



4. Remove from conductor and read maximum amperes.

5. Reset display by depressing the “On/Reset” button down for a minimum of 2 seconds. HALO is ready to use again. When finished, turn HALO off by depressing “Off” button and return HALO to case.