

OPERATING INSTRUCTIONS

NAVY BATTERY CHARGER / ANALYZER

P/N 4159-MIL MODEL CA-1550-MIL

NSN: 4920-01-498-2543

OPERATING INSTRUCTIONS



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COVER MUST BE FULLY OPEN WHEN IN USE!

OPERATING INSTRUCTIONS

P/N 4159-MIL Battery Charger / Analyzer

MODEL CA-1550-MIL

Charger Input, AC 115 V 50/60 HZ 15A Max. (For 230 V Input- See VI AC Line Change)

Battery Charging Current 0-25 amperes, Discharge Current 0-50 amperes

Follow NAVAIR 17-15BAD-1 for Detailed Instructions and Battery Specs

Refer to Illustrations. Call outs are referred to in these instructions. e.g. (2 is the timer)

I. GENERAL / QUICK INSTRUCTIONS

Note: Other voltage or chemistry batteries than 24 or 12 Volt SLAB or NiCads may be charged and discharged with the CA-1550-MIL. Time, Current & Voltage Settings may be changed as required.

1. CHARGING: 24 Volt SLAB or NiCads
 - a) Set Timer (2) to 180 minutes.
 - b) Set Charge Voltage (6) to 28.5 Volts.
 - c) Set Charge Current (5) to maximum. Battery is charged when current is tapered to low value and remains low as timer times-out. If not tapered, timer may be set to more time.
2. TOPPING: SLAB (Balancing / Equalizing Cells)
 - a) Set Charge Voltage to Maximum
 - b) Set Charge Current to C/10

Battery is equalized when charge voltage remains the same until timer is timed-out.
3. TOPPING NiCads (to 1.55 Volts / Cell)

Same as SLAB, except charge may be set to C/3.

Battery is topped when each cell reaches 1.55 Volts.
4. 12 VOLT BATTERY CHARGING:

Same as above, except set charge voltage to 14.7 Volts.

5. DISCHARGE / CAPACITY TEST

24 VOLT SLAB

- a) Set Timer (2) to 60 minutes.
- b) Set low cutoff Voltage (12) to 18.0 Volts.
- c) Set Constant Current Discharge (15) to the C Rate (e.g. 30 amp-hr battery set to 30.0 amps).
- d) **Accept** – If the Timer times-out before the battery voltage lowers to cutoff occurs before the timer times-out.
- e) **Fail** – If cutoff occurs before the timer times-out.

24 VOLT NiCads

Same as SLAB, except Set Voltage Cutoff to 1.0 Volt / Cell.

12 VOLT BATTERIES

Same, except Set Cutoff to 9.6 Volts.

II. CHARGING, GENERAL:

The voltage and current adjustments will provide the voltage and currents for Ni-Cad or Vented or Sealed Lead Acid batteries and other battery chemistries and voltages. The CA-1550-MIL unit will charge all 12 and 24 volt batteries including starting batteries, single cells, emergency batteries such as Inertial Navigation, Inertial Reference (24 cell NiCad). The CA-1550-MIL will charge in either the Constant Potential (voltage) or Constant Current (amperes) mode depending on the setting of the Charge Voltage Adjust (6) or Charge Current Adjust (5).

A. OPERATION: 24 VOLT SEALED LEAD-ACID BATTERIES (SLAB)

Set-Up and Procedure (with battery disconnected)

Note 1: Potentiometer knobs have knob locks. The settings will remain for any subsequent operations.

Note 2: The 4 potentiometer adjustments on the panel are multi-turn (10 turns).

1. Remove the temperature plate from the cable well, plug the cable from the temperature plate into the panel jacks "Overtmp Cutoff Thermostat" (9), place the battery on the plate.

2. Set On / Start – Off / Reset Switch (10) to Off Position.

3. Plug CA-1550-MIL into a 115 V outlet - max AC current draw is 15 Amps. For 230 Volt operation, internal jumper connections are changed (See VI for diagram).

Do Not Connect Battery

4. Set Charge / Discharge switch (11) to Charge (center position).
5. Set Charge Current Adjust potentiometer (5) completely CCW to minimum.
6. Set On/Off Switch (10) to On, (Meter LED's, Digital Time and Ampere hour Meter Displays Illuminate).
7. Set Timer (2) to 180 Min (3 hrs). Time may be increased, even during operation (Also decreased, if it is not at or below the led time displayed).
8. Set Charge / Discharge Switch (11) to the left "View Charge Voltage Setting" position and hold it there (this is a momentary position and will snap back to "Charge" when released). While holding it set Charge Voltage Adjust potentiometer (6) to 28.5 Volts.
9. Release the Charge / Discharge Switch (11), the toggle will return to center charge.
10. Switch On / Off Switch (10) to Off.

Connect Battery.

11. Switch On / Off Switch (10) to On. Voltmeter (3) will now read the open circuit battery voltage.
12. Adjust the Charge Current Adjust Knob (5) CW to maximum, or to the current required, per NAVAIR 17-15 BAD-1. When set to maximum, the Ammeter (17) reads charge current to a maximum of approximately 25 amps or to lesser amperes that the battery accepts due to its capacity/size, state of charge and condition. The Ampere hour meter (16) records Amp-Hours of charge into the battery.
13. As time progresses charge voltage climbs to 28.5 volts. The Voltage holds Constant at 28.5 volts, Current begins to lower (taper). **This is a Constant Potential Charge.** When charge current tapers to a low level (typically 1-3 amps for larger batteries (20-60 AH) or under 1 amp for smaller, charge is complete. Usually 2-3 hours. Charge stops at end of timing.

Note: Charging old batteries or batteries that have been in a very low state of charge 4, 6, or 8 volts and/or batteries that have been dead in excess of 24 hours to 30 days or more, should be observed for a possible temperature rise during charge. See conditioning section IV.

14. Ampere Hour Meter (16): This provides the precise ampere hours of charge into the battery, and is an indicator of acceptance of charge. When used with the tapered current level and time, it is also an indicator of battery condition. If time, tapered current and ampere hours of charge do not all approximately coincide, there is a problem with the battery, such as sulfation, shorted cell or the end of battery life. With tapered battery (fully charged), ampere hours should be about 110-140% of the ampere hour rating of the battery, if the battery was initially completely discharged. See NAVAIR 17-15-BAD-1 manual for details.

B. 12 VOLT LEAD ACID BATTERIES

Procedure is exactly the same as for 24 Volt Batteries, except set voltage to 14.7 Volts.

C. CELL BALANCING

Battery voltage is the average of the sum of the individual cells.

There are 12 cells in a 24 volt L-A battery, 6 cells in a 12 volt L-A. The internal cells of the lead acid battery may be imbalanced after charge but it is not possible to verify this as there is no access to individual cells.

Therefore, a balancing mode procedure for 12 or 24 volt lead acid batteries should be performed in a Constant Current mode as follows:

- a. At completion of charge at 28.5 volts (or 14.7 V), when the battery has tapered to low amperes, the battery is charged even though the time is less than as set.
- b. Note the ampere hours. They should be more than the ampere hour rating of the battery if the battery was completely discharged when placed on charge. If the amp hr reading is not higher than the battery amp hr rating, leave on charge until the end of the time setting. **Note: To reset (extend) the time setting for the same time period as set on the timer without losing the amp hr reading, press the reset button on the timer (2).**

- c. Switch unit off (10).
- d. Set Charge Current Adjust (5) to Minimum, CCW
- e. Switch Unit On (10)
- f. Set Charge / Discharge Switch (11) to “View Voltage Setting”. Hold this position while setting the Charge Voltage Adjust knob (5) to approx. 34-35 Volts (or 17-18 V).
- g. Set Timer (2) to 120 minutes.
- h. Switch to On (10) and set Charge Current Adjust knob (5) to C/10 amperes (e.g.: 30 amp hr battery, set to 3.0 amperes, 10 amp hr battery set to 1.0 ampere).
- i. Voltage will soon rise above 28.5 V (or 14.7 V for 12 volt batteries). The voltage may continue to rise to the maximum of the previously set 34-35 Volts (or 17-18 V) or may remain at a lower voltage such as 30 or 31 volts, but the current will remain constant as set.
- j. At end of the set time or if the Voltage holds constant for three ½ hours periods, set unit to off (10) and remove battery, which is completely charged, cell- balanced, and Ready For Issue.

D. CHARGING NICKEL CADMIUM BATTERIES

Note 1: A Digital Multimeter (DMM) is required, set to DC Volts scale to read each cell voltage.

1. Perform All Steps as for Charging Lead Acid except as below.
 - a. Set Timer to at least 120 Minutes.
 - b. Set Voltage to 29.5 Volts (19 Cell) or 31.0 Volts (20 Cell).
 - c. Charge the same as the SLAB.
 - d. Near the end of timing, if battery is not fully charged as verified with the AH meter and all cells are not above 1.5 Volts, the CA-1550-MIL charger can be used as a constant current charger to top the battery as follows:
 - 1) If the timer (2) was timed-out, to check the cell voltages, press the reset button on the timer (2) to return the timer (2) to zero timing.
 - 2) Adjust the voltage adjust potentiometer (6) to 34-35 volts (approx. max CW on voltage adjust knob).
 - 3) Adjust the Charge Current potentiometer (5) as desired, 1, 3, 5, amps etc. (C/3, C/10, etc). The C/3 rate will bring the battery to full topping faster

than C/10. For a 40 amp-hr battery C/3 would be 13.3 amperes, C/10 would be 4.0 amperes.

- 4) During this topping charge, check the voltage of each cell with the DMM . When every cell has reached at least 1.5 volts (1.55 optimal), the battery is charged regardless of the time. The battery is now Ready For Issue.

Note 2: For a 30 ampere hour battery, if current is reduced to 10 amps, that's C/3. The charger should now be in a constant current mode "if the voltage was adjusted up to 34-35 volts." In this mode the battery would charge as long as you have the timer set for. Please study NAVAIR 17-15BAD-1 to become acquainted with the charge/discharge parameters, cell voltages, etc. for the particular battery you are planning to charge on the CA-1550-MIL.

- e. If battery did not fully charge per paragraph 1 a-c you may consider a Constant Current charge discussed in ID, par D.
- f. Check each cell with the DMM. 1.55 volts per cell is optimum, the range is 1.5 to 1.85 Volts per cell. When all cell voltages are within this range, the battery is considered charged. See NAVAIR 17-15BAD-1 manual for cells out of range.

III. DISCHARGE

Note 1: Discharging with the CA1550-MIL unit determines the ampere hour capacity of the battery and also reconditions the battery by breaking-up sulfation in SLABS and crystalline adhesion in NiCads. Battery must be fully charged before discharge testing. The discharge is constant current, as the current will remain constant as set by the Discharge Current potentiometer (15) from the start of the discharge procedure to the termination by time (Accept), or low voltage cutoff (Fail).

Note 2: Ammeter reads with a minus sign display in discharge.

A. OPERATION

- a. Set On /Off Switch (10) to Off.
- b. Connect Battery (battery must be fully charged).
- c. Discharge Current Adjust knob (15) to min. (CCW)
- d. Switch Charge / Discharge switch (11) to Discharge..
- e. Switch (10) to “On”. Voltmeter reads the battery open circuit voltage. Ammeter reads zero or low decimal.
- f. Set Timer (2) to 60 minutes (or other time if required by special instructions).
- g. Press Cutoff View Switch (13).
- h. Read Cutoff Voltage on Voltmeter (3).
- i. Set Cutoff Voltage Adjust knob (12) to 18.0 volts for a 24 volt battery (or other voltage if required by special instructions).
- j. Adjust Discharge Current knob (15), Adjust to Required Amperes (Usually C Rate, Same as 1 Hour Capacity of the Battery) e.g.: For a 40 amp-hr battery set discharge current (15) to 40.0 amperes.
- k. Press reset button on timer (2) to begin test period.

Ampere Hour Meter reads discharge ampere hours.

B. ACCEPT

If the Battery Maintains Voltage above the Set Cutoff Voltage for the amount of time set on the Timer, the “Accept” Led (14 green) illuminates, meters freeze their readings, high frequency buzzer sounds. (Buzzer indicates that meters and timer are frozen.)

C. **FAIL**

The battery fails the discharge test because of insufficient capacity if the voltage decreases to below the preset voltage cutoff (usually 0.1-0.3 volts below preset cutoff depending on the rate at which battery voltage is falling), before the timer times-out, the “Fail”(14 Red) Led illuminates, Meters and Timer Hold (Freeze), buzzer sounds. The actual ampere hour capacity of the battery is indicated by Amps x Time divided by 60. Ampere hours are also directly read on the amp-hour Meter (16). **This is the actual ampere hour capacity of the battery.**

TEMPERATURE CUTOFF

A temperature sensing plate is provided which will Cut off the charge or discharge current when the battery reaches 113 degrees F. This is a cautionary indication to observe this battery. Plug the temperature plate into test points marked “Overtemp Cutoff Thermostat.” If not plugged-in, charge or discharge proceeds without temperature cut-off.

Note: If temperature cutoff occurs, the Ampere Hour Meter keeps its reading. The timer continues to run, while the battery is cooling (it may time-out). When the battery cools, the charge or discharge resumes (if its not timed-out). A new time setting may be needed to achieve the required ampere hours.

D. **SPECIAL ADJUSTMENTS**

For a battery of higher capacity than 50 ampere hours, set the time of discharge proportionately higher, e.g. for 60 Ampere hours- Set charge to 50 amps, and timer to 72 minutes, which is $50 \text{ A} \times 72 \text{ minutes} = 3600 \text{ amps min. divided by } 60 = 60 \text{ amp-hours}$. For 70-ampere hours, set unit to 50 amps, timer to 84 minutes. (Or for a 60 Ampere hour battery you could set the amps at 30 and the timer for 120 minutes. This is discharging at the 2-hour rate. Then the voltage cut-off should be 19 volts instead of 18. See NAVAIR 17-15BAD-1 for special case-by-case situations.

IV. **CONDITIONING CHARGE**

Lead acid batteries become sulfated either because they have not been charged for a long period of time (many months) or left discharged for even one or two days.

They have virtually no capacity and will not accept a charge, usually going up to full “chemical” voltage very quickly with little charge current. They can usually be recovered with a “conditioning charge” procedure as follows:

- a. Place the battery on the temperature plate, plug plate into thermostat jacks on the CA-1550-MIL panel.
- b. Set the CA-1550-MIL charge voltage to approximately 34-35 volts. (Max V. setting)
- c. Set timer to 999 minutes
- d. Set charge current to 1.0 ampere if the battery will accept 1 ampere.

Indications:

The battery voltage may rise up to the 34 volts immediately or more slowly. However, voltage may eventually begin to reduce, indicating acceptance of charge. When it is approximately 25-26 volts, set the charge-discharge switch (11) to “View Charge Voltage” and set Charge Voltage potentiometer (6) to 28.5 Volts. Increase the charge current adjust to maximum until the battery tapers. (If conditioning is unattended, the battery may remain at the 25-26 volts until current is manually increased).

- e. After acceptance of charge, allow battery to rest for 2-3 hours, then discharge at the C rate for 1 hour (normal discharge capacity test.) If the battery passes (“Accept”) then recharge.

If it fails, recharge normally, then retest. If it fails again, the battery cannot be recovered for its intended use.

Note: See BAD – 1 Manual for Complete Conditioning Techniques.

V. -SPECIFICATIONS –

P/N 4159-MIL MODEL: CA-1550-MIL NSN: 4920-01-498-2543

AC INPUT: 50/60 HZ 105 – 135 V 15A MAX
210-270 V 8A MAX

DC OUTPUT: CHARGE: @Nominal 115/230 VAC INPUT

- * 0-25 Amperes
- * 0-35 Volts

DISCHARGE 0-50 Amperes for 24 V Batteries
Less Than 50 Amperes for Lower Voltage Batteries.

FUSES: AC LINE 20A 250V TYPE MDA 1.25 x 0.25
DC charge 40A 32V TYPE MDL 1.25 x 0.25
DISCHARGE 70A 32V. MFR: Littlefuse “MAXI”

DIMENSIONS: 20 ½ L x 16 ¾ W x 8 ½ D

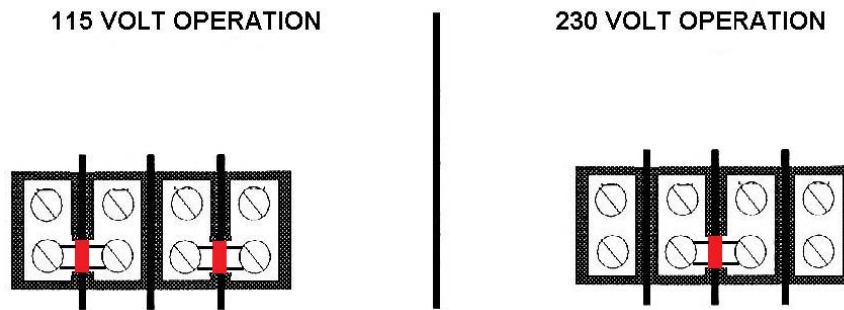
WT 67 LBS

*Actual Current and Voltage, charge and discharge, start at zero, but Digital Meters may not read to zero.

VI. CHANGING THE AC LINE INPUT FROM 115 TO 230 VOLTS.

WARNING: Before change-over, the AC line plug must be physically unplugged from any wall outlet or switch box or serious injury or death may result from AC line electrical shock.

- a. Unless otherwise specified CA-1550-MIL is shipped connected in the 115 Volt AC position and a standard USA 125 Volt 15 ampere 3 wire grounded plug is connected to the AC line cord.
- b. To change the AC line input from 115 Volt to 230 Volt perform the following:
 1. Remove the large louvered panel on the power section of the unit. Wired to the large main transformer is the terminal strip with two jumpers. The diagram below denotes the jumper arrangement for AC line input of 115 or 230 Volts. The user will have to adapt or change the AC plug to conform to the AC line mains receptacle. For 230 Volt operation the two jumpers may be placed together on the 2 and 3 terminals so that the second jumper is not lost if change over back to 115 Volts is required in the future.



VII. VERIFYING METER READING (NOT CALIBRATION)

1. **GENERAL:** The CA-1550-MIL has been factory calibrated prior to shipment and the unit can be checked for verification of readings of the voltmeter and ammeter with a DMM. The ampere-hour meter and ammeter must be checked with a load.
2. **CHECKING THE VOLTMETER WITHOUT THE BATTERY CONNECTED:**
 - a) On / Off switch OFF (10).
 - b) Charge / Discharge switch to Charge (11).
 - c) Charge Current Adjust Max. (5).
 - d) Insert external DC Voltmeter leads into the panel volts test points (7).
 - e) On / Off switch to On (10).
 - f) Verify that the panel meter and test meter such as DMM on the DC Volts scale read within ± 0.3 Volts.
 - g) Adjust Voltage to confirm that the readings coincide over a voltage range e.g.:22-30 Volts.
 - h) Reset Voltage adjust as required when the check is completed e.g.: 28.5 Volts.
3. **CHECKING VOLTMETER WITH THE BATTERY CONNECTED:**
 - a) Perform as above, except start with the Charge Current Adjust (5) set to minimum. Increase current to increase and check the voltage. (Do not exceed any maximum current requirements).

4. CHECKING THE AMMETER:

- a) In order to check the ammeter, a load is necessary in order to draw current. A battery may be used but if the battery is fully charged or is rapidly tapering, it may be difficult to check the current. A discharged battery with the CA-1550-MIL unit, when set to charge, or a charged battery with the unit set to discharge is the most convenient. Also, a high wattage load resistor may be used for both voltmeter and ammeter checks. The voltage adjust when the unit is in charge may be used to verify both volts and amperes. A suggested resistor is about 2 Ohms, whereby 24 Volts will draw 12 amperes. Wattage should be 300 Watts or higher, or as rated if fan-cooled.
- b) Connect the test meter such as DMM to the amps (MV) test points. The test meter must be on the DC Millivolt scale.

5. CHECKING THE AMPERE-HOUR METER:

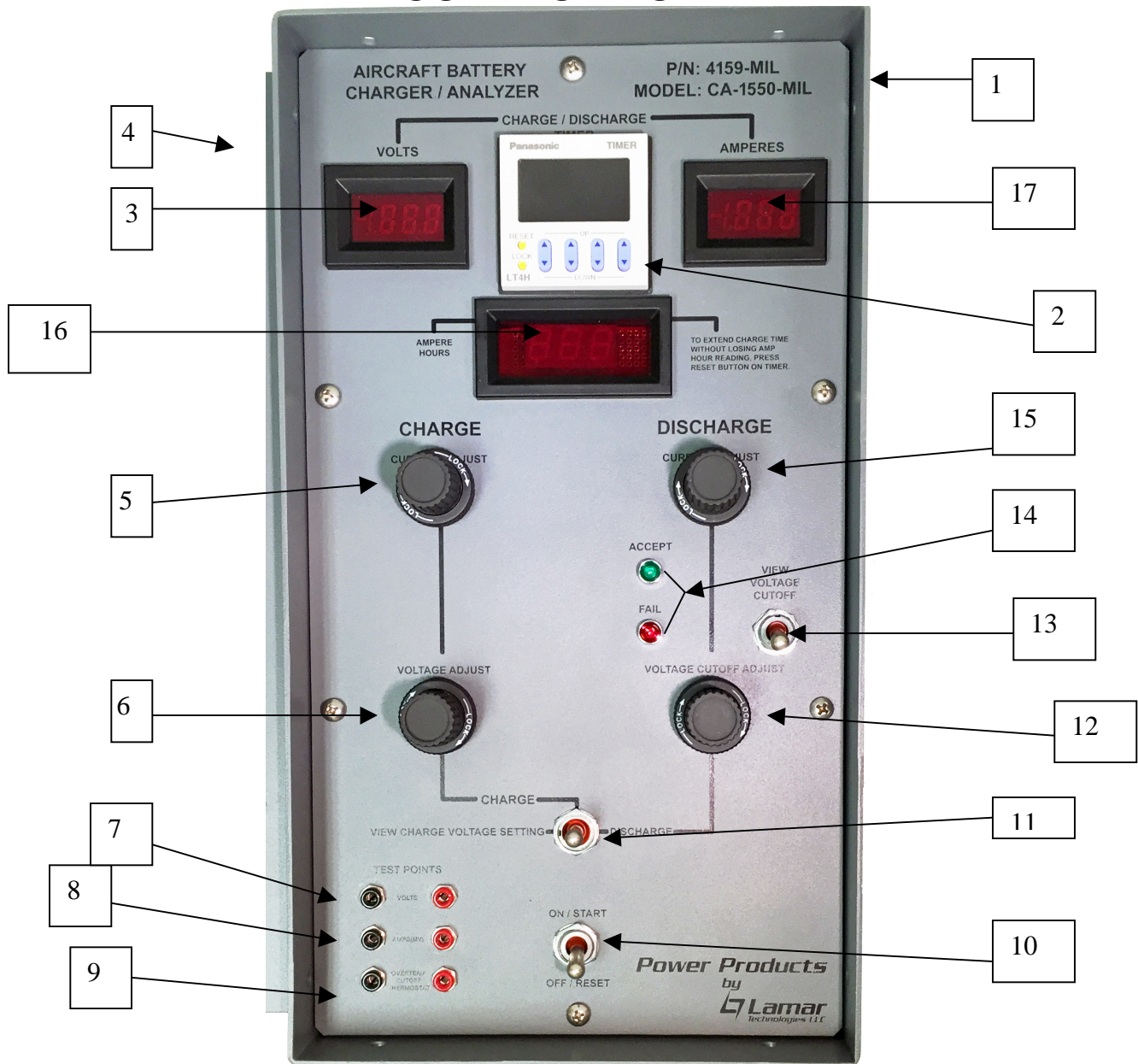
- a) As with the Ammeter, a load is necessary to check the amp-hr meter.
- b) If a battery is used, the amp-hr meter reads on Charge or Discharge without a minus sign for discharge.

Note: If the CA-1550-MIL Charge / Discharge Switch (11) is toggled from Charge to Discharge, the Discharge amp-hrs will subtract from the Charge amp-hrs. If the amp-hr meter was reading Discharge, switching to Charge will subtract from the Discharge reading.

- c) To check the amp-hr meter accuracy, set the timer to 6 minutes. Connect a resistive load in charge, or battery in Discharge for a Constant Current of 10.0 amperes. This will supply 60 ampere minutes or 1 ampere hour. The amp-hr meter should read 1.0 ampere hours at the end of 6 minutes. The accuracy will be affected by any variation in setting-up this procedure, plus the inherent instrument accuracy of + - 2%.

CA1550-MIL CHARGER / ANALYZER

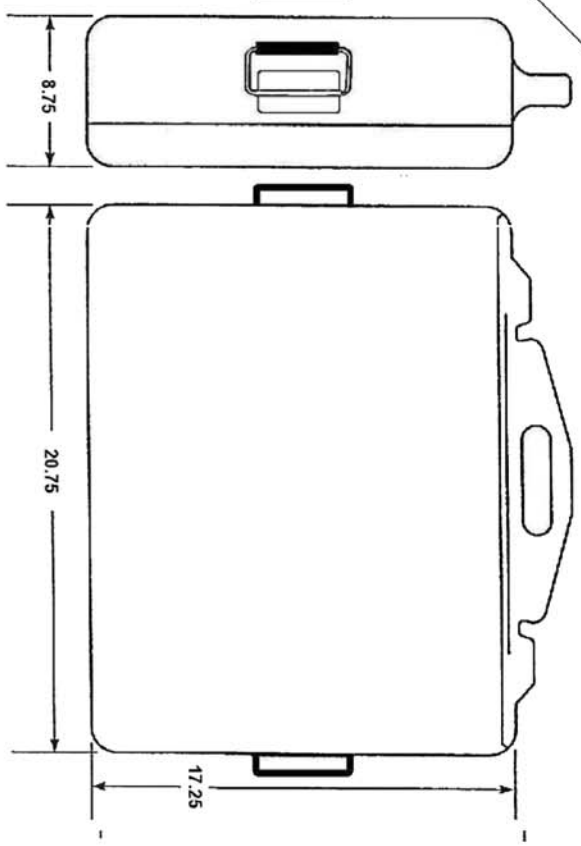
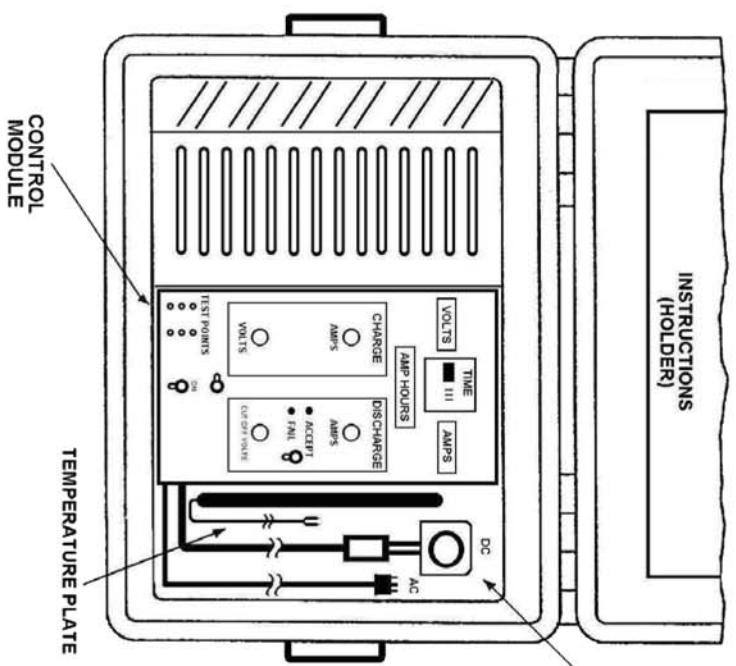
CONTROL BOX



ITEM NO.	DESCRIPTION
1.	ENCLOSED ALUMINUM ENCLOSURE DIM: 13L x 7W x 7D 11 LBS
2.	TIMER
3.	VOLTMETER
4.	MS CONNECTOR (CABLE TO POWER COMPONENTS)
5.	CHARGE CURRENT ADJUST
6.	CHARGE VOLTAGE ADJUST
7.	VOLTMETER TEST POINTS
8.	AMMETER TEST POINTS
9.	TEMPERATURE PLATE POINTS
10.	ON/OFF SWITCH
11.	VIEW CHARGE / CHARGE / DISCHARGE SWITCH
12.	CUTOFF VOLTAGE ADJUST
13.	VIEW CUT OFF VOLTAGE (VIEW ON VOLTMETER)
14.	ACCEPT / FAIL LAMPS
15.	DISCHARGE CURRENT ADJUST
16.	AMPERE HOUR METER
17.	AMMETER

CA - 1550

P/N 4159 NSN: 4920-01-498-2543
 AIRCRAFT BATTERY CHARGER / DISCHARGE ANALYZER



- STOWING AREA FOR AC AND DC DC CABLES
 ACCESSORIES: SUPPLIED BY MFR:
 * MS 3349-2 CONNECTOR SET
 * MS 27467T17136P CONNECTOR SET
 * TEMPERATURE PLATE ASSY
 * (2) SPARE FUSES

NOT TO SCALE
WEIGHT: 68 lbs
 DIM. & WGT. NOMINAL
 3 CARRYING HANDLES

**CERTIFICATION OF FACTORY VERIFICATION
AIRCRAFT BATTERY CHARGER / DISCHARGE TESTER**

MODEL: CA-1550-MIL P/N: 4159-MIL

MFD. BY: Lamar Technologies LLC

14900 40th Ave NE

Marysville, WA 98271

Cage Code #: 3RCD2

Tel: 360-651-8869 Fax: 360-651-6677

E-Mail: admin@lamartech.com

AC INPUT: 50/60 HZ 115 V 14A MAX., 230 V 7A MAX.

DC OUTPUT: CHARGE 0-25A

DISCHARGE: 0-50A MAX

Refer to Operating Instructions for more complete specifications.

Standards Used Traceable to National Institute of Standards and Technology (NIST)

Calibrated Instruments:

- a) **Digital Multimeter** _____
- b) **Digital Multimeter** _____
- c) **Shunt** _____

Auxiliary Non-Calibratable Equipment Used:

Batteries: _____

Lamar Technologies LLC Test Procedure LTS-1188

VERIFICATION:

AMMETER WITHIN TOLERANCE _____

VOLTMETER WITHIN TOLERANCE _____

AMPERE HOUR METER WITHIN TOLERANCE _____

TIMER WITHIN TOLERANCE _____

SERIAL NO: _____ **DATE OF MANUFACTURE:** _____

VERIFIED BY: _____ **DATE OF VERIFICATION:** _____

Lamar Technologies LLC certifies that the above listed CA-1550-MIL Battery Charger / Discharger meets or exceeds all published specifications. Accuracies of calibration of instruments used are traceable to the National Institute of Standards and Technology.

ACCESSORIES INCLUDED WITH CA-1550 UNIT:

- **OPERATING INSTRUCTIONS**
- **TEMPERATURE SENSING PLATE**
- **SPARE 20A AND 40A FUSES**
- **ADAPTOR FOR RING TERMINALS**
- **ADAPTOR FOR F18 MODEL A & B BATTERY**
- **ADAPTOR FOR BATTERY QUICK DISCONNECT**

Power Products
by
The logo for Lamar Technologies LLC features a stylized blue lightning bolt symbol to the left of the word "Lamar" in a bold, black, sans-serif font. Below "Lamar" is the text "Technologies LLC" in a smaller, black, sans-serif font.

Lamar
Technologies LLC

*Designer and Manufacturer of Aircraft Lead-Acid and
Nickel-Cadmium Battery Support Equipment Since 1980.*

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