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Manual No LI-4159-MIL Rev A

OPERATING INSTRUCTIONS

OPERATING INSTRUCTIONS

MILITARY BATTERY CHARGER / ANALYZER

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

NSN: 4920-01-498-2543



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PRECAUTIONS

Prior to using this equipment, there are several factors you must consider for your safety and the safety of others. When working with batteries, you will be exposed to gasses, acids and electrical power. Alone or in combination, physical danger to you exists from explosion, fire, acid burns to eyes and skin, and electrical shock and burns. In addition, handling batteries may expose you to lead and lead byproducts which if absorbed or ingested can be hazardous to your health. To avoid these hazards the following must be observed:

Read and understand all CAUTIONS and WARNINGS contained in this manual or posted on the equipment and battery.

Wear approved eye and skin protection when working with or charging batteries.

Never lay tools or metal objects on a battery as arcing may result in injury or explosion.

Never wear loose jewelry or metal belt buckles when working with batteries, chargers or test equipment as arcing may result in injury or explosion.

Make sure to ventilate the area well wherever batteries are serviced, stored or used.

Whenever batteries or their cables are handled, wash exposed areas or skin thoroughly as soon as possible to limit potential exposure to lead.

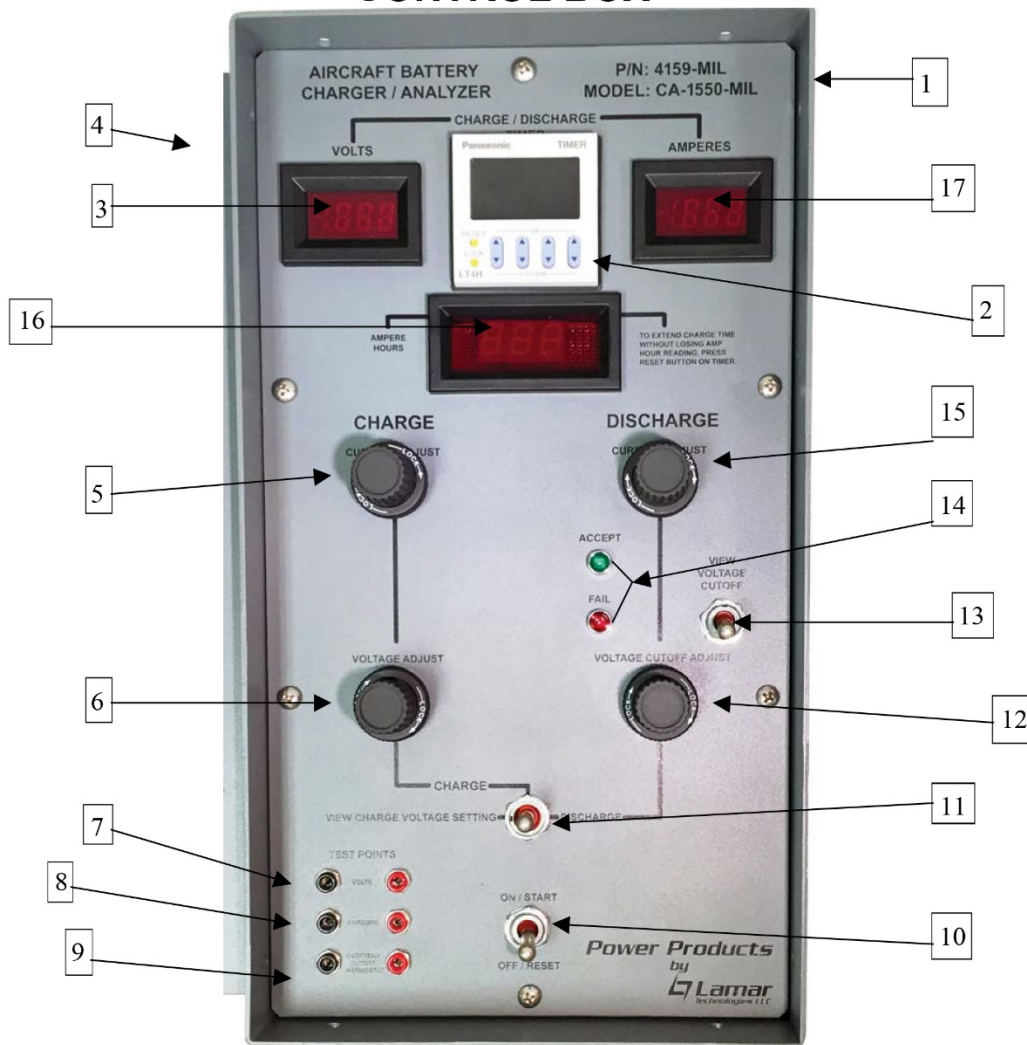
When using the CA-1550-MIL the cover must be in the fully open position.

The CA-1550-MIL is housed in a ruggedized copolymer case for convenience and protection. The ruggedized case is not a shipping container. When shipping this instrument packaging suitable for heavy electronic equipment is required.

FRONT PANNEL CONTROLS

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

PRODUCT DESCRIPTION

The CA-1550 CML Charger/Analyzer is a portable or bench mounted self-contained unit for charging and discharge capacity testing of 12 and 24 volt aircraft or ground support batteries. The unit's intuitive design facilitates its ease of use and does not require programming or use of a computer. Digital read-outs of volts, amperes and time are clearly displayed. The CA-1550-MIL has been designed to accurately charge, test and ensure the emergency capacity of sealed lead-acid (SLAB) or nickel-cadmium (NiCad) batteries. However, the CA-1550-MIL is capable of charging and discharging batteries other than 12 and 24 volt SLAB and NiCad batteries by altering the time, current and voltage settings as required.

The unit comes in a convenient protective carrying case. The case is NOT intended as a shipping case. The flexibility of the charge and discharge functions of the CA-1550-MIL make it usable for a wide variety of batteries. The unit accurately charges and tests batteries from a single cell to 22 cells.

The charge section of the CA-1550-MIL allows charging at either constant potential or constant current to give maximum flexibility in selection of the charge method. The charger has an adjustable charge current from 0 to 25 amperes, and an automatic time to read and/or terminate charge and discharge time.

The discharge section of the CA-1550-MIL enables battery capacity testing with a constant current of 0-50 amperes. The unit automatically measures the battery voltage and passes or fails the battery depending on the battery's ability to maintain the specified minimum voltage for the pre-settable time, (usually one hour). All meters "freeze" their readings at the end of test and the operator thereby knows the precise ampere hour capacity of the battery.

The CA-1550-MIL includes an integrated battery temperature monitoring plate. This accessory allows the user to set up a test with limited monitoring. The plate is designed to shut down the charge or discharge portion of the test if the battery exceeds 50°C.

For detailed instructions and battery specifications follow NAVAIR 17-15BAD-1

The CA1550-MIL ships with the following accessories:

<u>Item</u>	<u>Part Number</u>
Operating Instructions	
Temperature Plate	9003-2550
Battery Harness, Ring Terminals	20678-01
Battery Harness, Quick Disconnect	9003-2016
Battery Harness, F-18 Model A & B	9003-2517
Spare 20A Fuse (MDA-20-R)	4510-0008
40A Fuse (MDL-40)	4510-0009

OPERATING INSTRUCTIONS

Charging Batteries

Refer to FRONT PANNEL CONTROLS diagram on page 4.

Caution: When using the CA-1550-MIL the cover must be in the fully open position.

The voltage and current adjustments will provide the voltage and current for Ni-Cad or Vented and Sealed Lead Acid Batteries (SLAB). The CA1550-MIL may also be used with other battery chemistries and voltages. The CA-1550-MIL 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).

Caution: Charging old batteries that have been in a very low state of charge 4 to 8 volts and or batteries that have been dead in excess of 24 hours to 30 days or more should be observed for possible temperature rise during charge. Refer to paragraph 7 CONDITIONING.

Caution: The AMPERE HOURS (16) meter provides 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, a shorted cell or end of battery life. With tapered battery (fully charged), ampere hours should be approximately 110% to 140% of the ampere hour rating of the battery, if the battery was initially completely discharged. Refer to NAVAIR 17-15-BAD-1 for further details.

1. Charging Sealed Lead Acid Batteries (SLAB) 12 and 24 volt

NOTE: Do not plug in or connect the battery until instructed to do so.

NOTE: Always leave the lid of the tester in the full open position when operating.

- 1.1. Remove the temperature plate from the cable well, plug the cable from the temperature plate into the OVERTEMP CUTOFF THERMOSTAT (9) jacks and place the battery on the plate, but do not connect battery.
- 1.2. Set the ON/START – OFF/RESET (10) switch to the OFF/RESET position.
- 1.3. Plug the CA-1550-MIL into 115V outlet – max current draw is 15 Amps.

NOTE: For 230V operation refer to paragraph 9 for internal jumper connections.

- 1.4. Set CHARGE/DISCHARGE (11) switch to CHARGE (center position).
- 1.5. Set CHARGE CURRENT ADJUST (5) completely counter-clockwise (CCW) to the minimum setting.

NOTE: Potentiometers have knob locks and are multi-turn (10 turns).

- 1.6. Set ON/OFF (10) switch to ON (the meter and timer displays will illuminate)
- 1.7. Set TIMER (2) to 180 minutes (3 hours). Time may be increased or decreased during operation.
- 1.8. Hold the CHARGE/DISCHARGE (11) toggle switch in the VIEW CHARGE VOLTAGE SETTING. Adjust the VOLTAGE ADJUST (6) potentiometer to 28.5 volts for 24 volt batteries. Adjust the VOLTAGE ADJUST (6) potentiometer to 14.7 volts for 12 volt batteries. Release the CHARGE/DISCHARGE (11) toggle switch after the voltage is set.
- 1.9. Set ON/OFF (10) to the OFF position.
- 1.10. Connect battery using the appropriate adapter cable for your application.
- 1.11. Set ON/OFF (10) to the ON position. The VOLTS (3) display will read the open circuit battery voltage.
- 1.12. Set the CURRENT ADJUST (5) potentiometer clockwise (CW) to maximum or to the current required, per NAVAIR 17-15 BAD-1. When set to maximum, the AMPERES (17) display reads charge current to a maximum of approximately 25 amps. For batteries that accept less than 25 amps due to capacity/size, the state of charge and condition, AMPERE HOURS (16) meter records amp-hours of charge into the battery.
- 1.13. As time progresses charge voltage will climb to 28.5 volts for 24 volt batteries or 14.7 volts for 12 volt batteries on the VOLT (3) meter. When the voltage holds constant at 28.5 for 24 volt batteries, 14.7 volts for 12 volt batteries, the current reading AMPERES (17) meter will begin to decrease (taper). You are now performing a constant potential charge. When the charge current on AMPERES (17) meter tapers to a low level the charge is complete, typically between 1-3 amps for larger batteries between 20 and 60 amp-hours (AH), and under 1 amp for smaller batteries, charge is complete. This will usually take 2-3 hours. Charge will stop at end of timing as displayed on TIMER (2).

Note: Charging old 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 possible temperature rise during charge. See conditioning section 7.

- 1.14. The AMPERE HOUR (16) meter 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 end of battery life. With a tapered battery (fully charged), ampere hours should be about 110% - 140% of ampere hour rating of the battery when the battery was initially completely discharged. See NAVAIR 17-15-BAD-1 manual for details
- 1.15. At the completion of charge 28.5 volts (14.7 volts), when battery has tapered to low amperes, the battery is charged even though the time is less than as set.

1.16. Note the ampere hours. These should be more than the ampere hour rating of the battery if the battery was completely discharged when placed on charge. If the amp hour reading is not higher than the battery amp hour 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 hour reading, press the reset button on the TIMER (2).

2. Cell Balancing 12 and 24 volt SLAB

Battery voltage is the average of the sum of the individual cells. There are 12 cells in a 24 volt SLAB battery, 6 cells in a 12 volt SLAB. 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 procedure for 12 or 24 volt lead acid batteries should be performed in a constant current mode. A battery requires cell balancing if after the completion of a full charge and the battery has tapered to low amperes, the battery appears charged even though the time is less than as set.

- 2.1. Set the ON/START – OFF/RESET (10) switch to the OFF/RESET position.
- 2.2. Set the CHARGE CURRENT ADJUST (5) potentiometer CCW to the minimum.
- 2.3. Set the ON/START – OFF/RESET (10) switch to the ON/START position.
- 2.4. Hold the CHARGE/DISCHARGE (11) toggle switch in the VIEW CHARGE VOLTAGE SETTING. Adjust the VOLTAGE ADJUST (6) potentiometer to approximately 34 to 35 volts for 24 volt batteries, 17 to 18 volts for 12 volt batteries.
- 2.5. Set timer (2) to 120 minutes.
- 2.6. Set CHARGE CURRENT ADJUST (5) to the battery amp hour capacity divided by 10. Example: for a 30 amp hour battery, set to 3.0 amperes.
- 2.7. Voltage will rise above 28.V for a 24 volt battery (14.7 V for a 12 volt battery). The voltage may continue rise to the maximum set voltage of 34-35 volts for a 24 volt battery or 17 to 18 volts for a 12 volt battery or may remain at a lower voltage such as 30 or 31 volts, but the current will remain constant as set.
- 2.8. Verify the voltage every 30 minutes.
- 2.9. At the end of the set time (120 minutes) or if the voltage holds constant during three consecutive 30 minute voltage checks the battery is balanced and charged and ready for use.
- 2.10. Set the ON/START – OFF/RESET (10) switch to the OFF/RESET position and disconnect the battery.

3. Charging Nickel Cadmium Batteries (NiCad)

Additional Equipment: A Digital Multimeter (DMM) is required. Set DMM to DC Volts scale to read individual cell voltage.

- 3.1. Perform all steps as for charging SLAB except as listed below.
 - 3.1.1. Set TIMER (2) to 120 minutes.
 - 3.1.2. Set voltage to 29.5 volts (19 cell) or 31.0 volts (20 cell).
 - 3.1.3. Charge the same as the SLAB.
 - 3.1.4. Near the end of timing, if battery is not fully charged as verified with the AMPPERE HOUR (16) meter and all cells are not above 1.5volts, the CA-1550-MIL charger can be used as a constant current charger to top the battery as follows:
 - 3.1.4.1. 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.
 - 3.1.4.2. Adjust the VOLTAGE ADJUST (6) potentiometer (6) to 34-35 volts (approximately max CW on adjustment knob).
 - 3.1.4.3. Adjust the CHARGE CURRENT (5) potentiometer 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-hour battery C/3 would be 13.3 amperes, C/10 would be 4.0 amperes.
 - 3.1.4.4. 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: for 30 ampere hour battery, if current is reduced to 10 amps, that is C/3. The charger should now be in a constant current mode "if voltage was adjusted up to 34-35 volts." In this mode the battery would charge as long as you have TIMER (2) set for. Please study NAVAIR 17-15BAD-1 to become acquainted with the charge/discharge parameters, cell voltage, etc. for the particular battery you are planning to charge on the CA-1550MIL.

- 3.1.5. If the battery did not fully charge per paragraph 3.1.1 you may consider a constant current charge discussed in 3.1.4
- 3.1.6. 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.

4. Discharge

Refer to FRONT PANNEL CONTROLS diagram on page 4.

When using the CA-1550-MIL the cover must be in the fully open position.

Discharging with the CA-1550-MIL determines the ampere hour capacity (C) of the battery and also reconditions the battery by breaking-up sulfation in SLABs and crystalline adhesion in NiCads. The 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 ADJUST (15) potentiometer from the start of the discharge procedure to the termination by time (Accept), or low voltage cutoff (Fail).

Caution: When operating in the discharge mode it is normal for ammeter readings AMPERES (17) to be displayed with a minus sign.

4.1. Equipment set up

- 4.1.1. Set the ON/START – OFF/RESET (10) switch to the OFF/RESET position.
- 4.1.2. Connect Battery (battery must be fully charged).
- 4.1.3. Set the DISCHARGE CURRENT ADJUST (15) potentiometer to minimum (CCW).
- 4.1.4. Set CHARGE/DISCHARGE (11) switch to Discharge setting.
- 4.1.5. Set the ON/START – OFF/RESET (10) switch to the ON/START position. The VOLTS (3) meter reads the battery open circuit voltage. The AMPERES (17) meter reads zero or a low decimal.
- 4.1.6. Set TIMER (2) to 60 minutes (or alternate time as specified in the battery CMM).
- 4.1.7. Engage momentary VIEW VOLTAGE CUTOFF (13).switch and read cutoff voltage on VOLTS (3) meter. While engaged adjust VOLTAGE CUTOFF ADJUST (12) potentiometer to 18.0 volts for a 24 volt battery (9 volts for a 12 volt battery or alternate voltage as specified in the battery CMM).)
- 4.1.8. Adjust DISCHARGE CURRENT ADJUST (15) potentiometer to required amperes.
- 4.1.9. Typically the discharge current is set to the charge capacity rate of the battery. (Example: 40 amp hour battery, discharge current is 40)

4.2. Test Sequence

- 4.2.1. Press the RESET button on the TIMER (2) to initiate the test. The AMPERE HOUR (16) meter reads discharge ampere hours.
- 4.2.2. .Accept - If the Battery Maintains Voltage above the set cutoff voltage for the amount of time set on the TIMER (2) in section 4.1.6, the ACCEPT (14, green) LED illuminates, meters freeze their readings, high frequency buzzer sounds. (Buzzer indicates that meters and timer are frozen.).

4.2.3. 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 amperes x time divided by 60. Ampere hours are also directly read on the AMPERE HOURS (16) meter. This is the actual ampere hour capacity of the battery.

5. Temperature Cutoff Plate

A temperature sensing plate is provided with the CA-1550-MIL. The plate will disable the charging and discharging functions of the unit if the battery temperature exceeds 113°F (45°C). To use, plug the cable from the temperature plate into the OVERTEMP CUTOFF THERMOSTAT (9) jacks and place the battery on the plate. If a temperature cutoff occurs the AMPERE HOURS (16) meter continues to read and the TIMER (2) continues to run while the battery cools. When the battery cools below 113°F (45°C) the charge or discharge process will resume if the TIMER (2) has not timed out. If a cutoff occurs during the discharge process a new time setting may be needed to achieve the required ampere hours.

6. Special Discharge Instructions

For a battery of higher capacity than 50 ampere hours, set the time of discharge proportionately higher. For 60 ampere hour battery, set charge to 50 amps, and TIMER (2) to 72 minutes, which is 50 amps x 72 minutes equals 3,600 amp minutes divided by 60 equals 60 amp hours. For 70 ampere hour battery, set unit to 50 amps and TIMER (2) to 84 minutes. Or, for a 60 ampere hour battery you could set the amps at 30 and the TIMER (2) for 120 minutes. This is discharging at the 2-hour rate and the voltage cut-off should be set at 19 volts instead of 18. See NAVAIR 17-15BAD-1 for special case-by-case situations.

7. Conditioning Charge 24 Volt SLAB

Lead acid batteries become sulfated because they have not been charged for a long period of time (many months) or they are left discharged for even one or two days. When a battery is sulfated it has virtually no capacity and will not accept a charge, but will usually appear to go to a full chemical voltage very quickly with little charge current. A sulfated battery can usually be recovered with a conditioning charge.

Note: Refer to NAVAIR 17-15-BAD-1 manual for complete conditioning techniques

7.1. Equipment set up

NOTE: Do not plug in or connect the battery until instructed to do so.

NOTE: Always leave the lid of the tester in the full open position when operating.

7.1.1. Remove the temperature plate from the cable well, plug the cable from the temperature plate into the OVERTEMP CUTOFF THERMOSTAT (9) jacks and place the battery on the plate, but do not connect battery.

- 7.1.2. Set the ON/START – OFF/RESET (10) switch to the OFF/RESET position.
- 7.1.3. Plug the CA-1550-MIL into 115V outlet – max current draw is 15 Amps.
NOTE: For 230V operation refer to paragraph 9 for internal jumper connections.
- 7.1.4. Set CHARGE/DISCHARGE (11) switch to CHARGE (center position).
- 7.1.5. Set CHARGE CURRENT ADJUST (5) potentiometer CCW to the minimum.
Note: potentiometers have knob locks and are multi-turn (10 turns).
- 7.1.6. Set ON/OFF (10) switch to ON (the meter LED's, digital time and ampere hour meter displays will illuminate).
- 7.1.7. Set TIMER (2) to 999 minutes.
- 7.1.8. Hold the CHARGE/DISCHARGE (11) toggle switch in the VIEW CHARGE VOLTAGE SETTING.
 - 7.1.8.1. Adjust the VOLTAGE ADJUST (6) potentiometer to 34 - 35 volts for 24 volt batteries.
- 7.1.9. Release the CHARGE/DISCHARGE (11) toggle switch.
- 7.1.10. Set ON/OFF (10) to the OFF position.
- 7.1.11. Connect battery using the appropriate adapter cable for your application.

7.2. Charge

- 7.2.1. Set ON/OFF (10) to the ON position.
- 7.2.2. Set CHARGE CURRENT ADJUST (5) to 1.0 ampere if the battery will accept 1.0 ampere.
- 7.2.3. The battery voltage may rise to 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 (11) switch to VIEW CHARGE VOLTAGE SETTING and set VOLTAGE ADJUST (6) POTENTIOMETER TO 28.5 VOLTS. Increase the charge current adjust to maximum until the battery tapers. (If the conditioning is unattended, the battery may remain in the 25-26 volts until current is manually increased).
- 7.2.4. After acceptance of charge, allow battery to rest for 2-3 hours, then discharge at C rate for one hour (normal discharge capacity test). If the battery passes ACCEPT (14) then recharge. If the battery FAIL (14) the retest. If the battery fails a second time the battery cannot be recovered for its intended use.

8. Specifications

8.1. P/N 4159-MIL, Model: CA-1550-MIL, NSN: 4920-01-498-2543

8.2. AC input

8.2.1. 50/60 HZ, 105-135 Volts, 15A max

8.2.2. 50/60 HZ, 210-270 Volts, 8A max

8.3. DC output

8.3.1. Charge at normal 115/230 volts input

8.3.1.1. 0-25 amperes

8.3.1.2. 0-35 volts

8.3.2. Discharge

8.3.2.1. 0-50 amperes for 24 volt batteries

8.3.2.2. Less than 50 amperes for lower voltage batteries

8.4. Fuses

8.4.1. AC line: 20A, 250V type MDA, 1.25 x 0.25

8.4.2. DC charge: 40A, 32V type MDL, 1.25 x 0.25

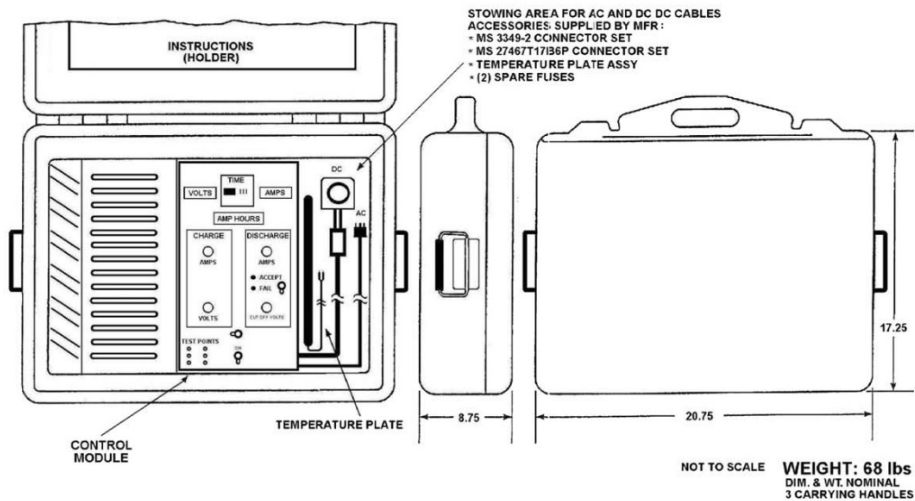
8.4.3. Discharge: 70A, 32V, Littlefuse MAXI

8.5. Dimensions

8.5.1. 20.75(L) x 17.25(W) x 8.75(D)

8.5.2. 68 pounds

CA - 1550 P/N 4159 NSN: 4920-01-498-2543 AIRCRAFT BATTERY CHARGER / DISCHARGE ANALYZER

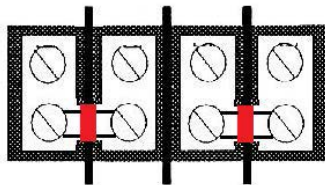


9. Changing the AC line input from 115 to 230 volts

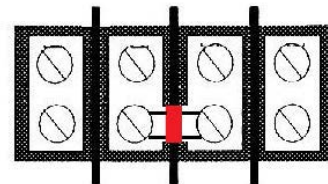
WARNING: Before change-over, the AC line plug must be physically unplugged from the wall outlet or switch box or serious injury or death may result from AC line electrical shock.

- 9.1. Unless otherwise specified the 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.
- 9.2. To change the AC line input from 115 volt to 230 perform the following:
- 9.3. 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.

115 VOLT OPERATION



230 VOLT OPERATION



10. Verifying Meter Reading (not calibration)

- 10.1. 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.
- 10.2. Checking the voltmeter without the battery connected.
 - 10.2.1. ON/START OFF/RESET(10) switch OFF/RESET
 - 10.2.2. CHARGE/DISCHARGE (11) switch to CHARGE
 - 10.2.3. CHARGE CURRENT ADJUST (5) potentiometer to max
 - 10.2.4. Insert external DMM leads into the panel TEST POINTS VOLTS (7)
 - 10.2.5. ON/START OFF/RESET(10) switch ON/START
 - 10.2.6. Verify that the VOLTS (3) meter and DMM on the DC Volts scale read within (+/-) 0.3 volts
 - 10.2.7. Rotate VOLTAGE ADJUST (6) to confirm that the readings coincide over a voltage range e.g.:22-30 volts.
 - 10.2.8. Reset VOLTAGE ADJUST (6) as required when the check is completed e.g.: 28.5 volts.
- 10.3. Checking the voltmeter with the battery connected.
 - 10.3.1. Perform test as outlined in section 10.2, except start with the CHARGE CURRENT ADJUST (5) set to minimum. Increase current to increase and check voltage.

CAUTION: Do not exceed any maximum current requirements.
- 10.4. Checking the AMPERES (17) meter.
 - 10.4.1. In order to check the AMPERES (17) meter, 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.
 - 10.4.1.1. Connect the test meter such as DMM to the AMPS (MV) (8) test points. The test meter must be on the DC Millivolt scale.
- 10.5. Checking the AMPERE HOURS (16) meter.
 - 10.5.1. As with the AMPERES (17) meter, a load is necessary to check the AMPERE HOURS (16) meter.

10.5.2. If a battery is used, the AMPERE HOURS (16) meter reads on Charge or Discharge without a minus sign for discharge.

Note: If the CA-1550-MIL CHARGE/DISCHARGE (11) switch is toggled from Charge to Discharge, the Discharge amp-hours will subtract from the Charge amp-hours. If the AMPERE HOURS (16) meter was reading Discharge, switching to Charge will subtract from the Discharge reading.

To check the AMPERE HOURS (16) meter accuracy, set the TIMER (2) 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 AMPERE HOURS (16) 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%.

CERTIFICATION OF FACTORY VERIFICATION

AIRCRAFT BATTERY CHARGER / DISCHARGE TESTER

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

MFD. BY: Lamar Technologies LLC

13115 41st Ave NE

Marysville, WA 98271

Cage Code #: 3RCD2

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.

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Power Products
by
 ***Lamar***
Technologies LLC

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

*Lamar Technologies, LLC
13115 41st Ave NE, Marysville, WA 98271*