

INSTRUCTION MANUAL

ACTIVATOR 282 BATTERY CHARGER

FOR 24 VOLT AIRCRAFT AND MILITARY BATTERIES

P/N ACTIVATOR 282 (also called 282-300)

Serial numbers 21228 and higher, manufactured January 2009 and later.



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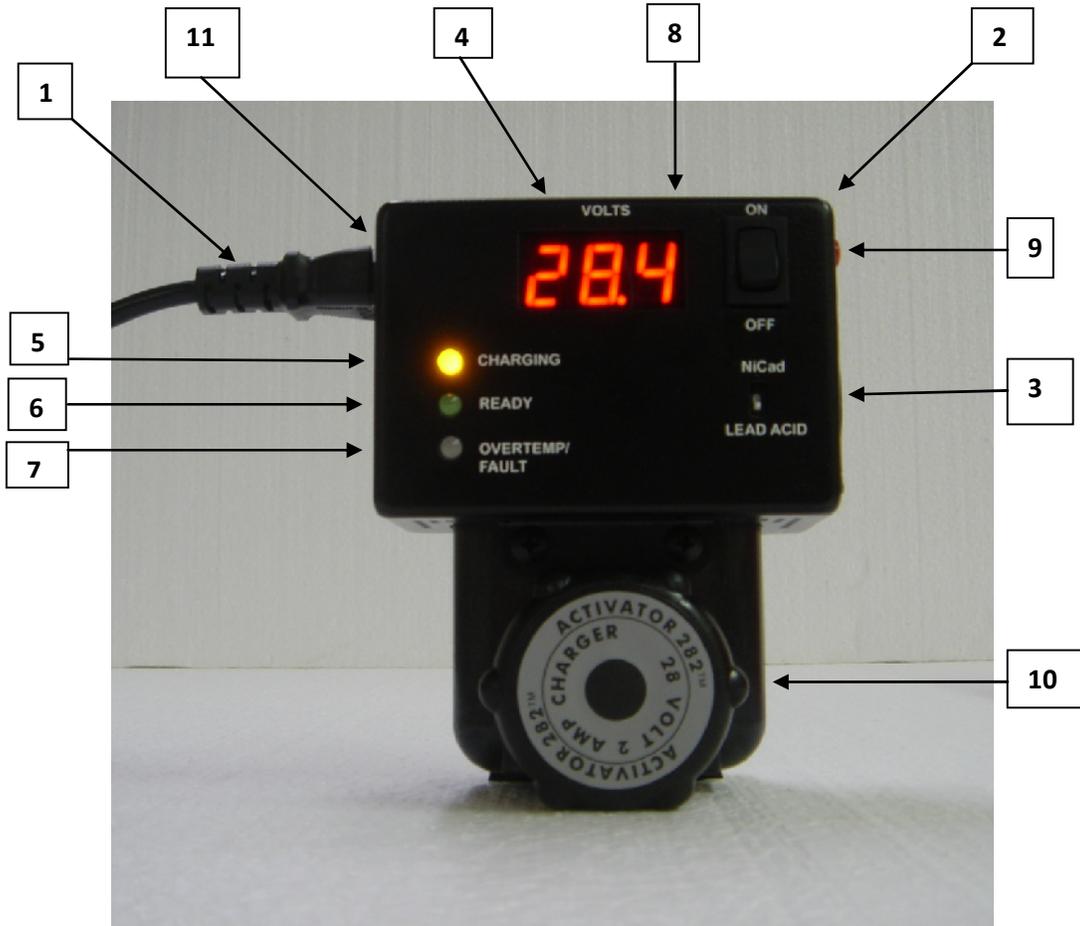


FIG. 1

ITEM NO. DESCRIPTION

1. AC LINE CORD
2. ON/OFF SWITCH
3. LEAD ACID- NICAD SETTING
4. DIGITAL VOLTMETER, LED
5. LED: CHARGE (YELLOW)
6. LED: READY (GREEN)
7. LED: OVERTEMP/FAULT (RED)
8. COOLING FAN
9. TEST POINTS (FOR EXTERNAL VOLTMETER)
10. BATTERY QUICK DISCONNECT KNOB
11. INSTRUCTIONS & RATING PLATE

DIMENSIONS



FIG. 2

Activator Outline
ACTIVATOR 282
BATTERY CHARGER FOR 24 VOLT AIRCRAFT AND MILITARY BATTERIES

0.1 QUICK INSTRUCTIONS

CAUTION: Read the complete instructions before use. These quick instructions are for reference only.

- A. Set switch of 'Off': Select Lead Acid or NiCad.
- B. Plug in AC line, 90-240V 50/60/400 Hz. Connect Activator to battery via Quick-Connect knob.
- C. Switch to on. Digital Voltmeter reads charge voltage.
 - CHARGING LED on. Voltage begins to rise.
 - If battery voltage is below ~ 10V, OVERTEMP/FAULT LED will pulse. As battery voltages raises, OVERTEMP/FAULT LED will remain steady.
- D. When the battery is charged, yellow CHARGING LED is off, READY LED on.
- E. After 10 hours of charging, if the battery voltage remains under 28 Volts and voltage does not continue to rise (even very slowly), or if the voltage lowers instead of rising, the OVERTEMP/FAULT LED will blink and charge will cut off. This may be a battery fault or the battery requires more time to charge. Reset rocker switch to 'Off' then back to 'On' for further charge. If this requires many reset cycles, battery may not be accepting charge.
- F. If battery overheats, charge cuts off and OVERTEMP/FAULT LED is on.

1.0 INTRODUCTION

The Activator 282 is a self contained charger for 24 Volt batteries, using the standard MS 3509 Style “Quick Disconnect” pin terminations. This connector is found on most 24 Volt aircraft and military batteries, Sealed Lead Acid Batteries (SLAB), vented Lead Acid (VLRA), and Nickel Cadmium batteries.

Refer to NAVAIR17-15 BAD-1 Manual “Naval Aircraft and Naval Aircraft Support Equipment Storage Batteries” for military aircraft batteries, and to the battery manufacturers’ instruction manuals for commercial aircraft batteries. The Activator 282 charging methods conform to the BAD-1 Manual wherever possible within the ratings of the Activator 282, as well as to the commercial requirements.

Although very compact and lightweight, the Activator 282 is a complete charger and not a trickle charger. It also maintains a battery over an extended time period of days, weeks, or months by fully charging, shutting off, and then continuously recycling as the battery self-discharges and requires recharge. This method of maintenance extends the life of the battery as opposed to a constant trickle, which causes some gassing, heat, and loss of the electrolyte.

1.1 CONNECTION TO BATTERY

The charger electronics are built into a mating Quick Disconnect housing and plugs directly into the battery. Therefore, no charge cables are required and correct polarity is assured.

WARNING: Do not connect any charge cables to the Activator and a battery without the Quick Disconnect pins unless it is certain that polarity is correct. Reversed polarity will blow an internal fuse and may damage the Activator.

1.2 AC LINE CONNECTION

A standard IEC-320 "computer type" of AC line cord plugs into a receptacle on the Activator 282 and into a wall receptacle. AC line input is 1-- ~ 240 Volts 50 / 60 /400 Hz and can be used worldwide.

2.0 CHARGING

- a.) The maximum steady-state charge current of the Activator 282 is 5 amperes with average charge of 3 amperes.

- b.) The Activator 282 will charge either Lead Acid or Nickel Cadmium batteries, and although very compact will bring a fully discharged high Ampere-Hour rated battery up to full charge including a topping/equalizing charge. Lower A-H rated batteries are brought up to full charge more quickly than larger batteries.

2.1 CHARGING TIME

The average time to fully charge and top a completely discharged large (40-50 Amp-Hour) Sealed Lead Acid Battery is approximately 20 hours. Larger or smaller batteries are charged in proportionate time. Nickel Cadmium batteries take approximately 20% longer than SLABS to charge, and it is usual to fully discharge a NiCad before recharge. However, most batteries placed on charge have some residual charge and average charge times have proven to be about 9 hours for large SLAB batteries, and 5 hours for small batteries. Because of this relatively slow charge, maximum ampere-hours of discharge are attained by the battery when in use or test. The Activator 282 will not overcharge any battery, even if the battery has a high residual charge.

2.2 PULSE CHARGE

If the battery voltage is below approximately 10 Volts, the Activator 282 will pulse-charge with a series of high current pulses of approximately 10 amperes, 1 millisecond in duration, at a repetition of about 2 pulses per second. This

protects the charger and brings the battery up to charge efficiently with minimum heating, and also helps in conditioning (breaking chemical barriers) of the battery. The yellow 'CHARGING LED pulsating indicates these pulses. The pulses are too rapid to be read on the Activator 282 digital voltmeter.

3.0. GENERAL OPERATION

Refer to Figure 1.

When switched to 'ON', an automatic cycle of charge is initiated regardless of the state of charge or discharge of the battery. The battery voltage is sensed by the Activator 282 which determines the level of the charge algorithm, whether Pulse, Constant Current, Constant Voltage or timing to topping (cell equalization) and completion of charge Cutoff with READY LED indication.

Note that if the battery voltage is less than 4 Volts, the display may read only some digital segments or not at all.

Switch (2) to 'ON'. The fan will operate.

The yellow CHARGING LED (5) will illuminate.

Observe the digital voltmeter on the Activator 282. If the voltage is below 10 Volts, the CHARGING LED will indicate pulsing charge. The fan (8) rotation may also be intermittent until the battery voltage is above about 9 Volts.

READY Led (6): Charging will continue for the time period necessary to completely charge the battery. This may be a fraction of an hour or many hours. When the battery reaches 28 Volts, the charging algorithm allows the battery to continue charge as the battery voltage rises (maximum 28.6 Volts for Lead Acid or 31 Volts for NiCad), for an additional 30 minutes. At the end of 30 minutes the READY LED (6) illuminates. Topping charge

will reduce from 30 minutes to 15 minutes for a second cycle, and then to two minutes for subsequent cycles.

If, when switched from 'Off' to 'On', the battery voltage rises rapidly from its Open Circuit Voltage (OCV) to a voltage above 28 volts, this high voltage surge may be due to the battery not accepting charge. With Lead Acid batteries, this indicates that the battery is sulfated. NiCad batteries may also exhibit this under certain conditions of corrosion at the cell linkages. When rising to maximum immediately, the voltage seen is only a "Chemical" voltage.

When this occurs, a sulfated Lead Acid battery requires a Conditioning Charge and a Nickel Cadmium battery requires service.

(See the BAD-1 Manual referred to in paragraph 1.)

4.0 BATTERY CHARGING PROTECTION

The Activator 282 protects the battery with an over temperature cutout, and a charge cutout if the voltage does not continue to rise.

4.1 OVER TEMPERATURE CUTOUT

Charging a battery generates heat within the battery. The generation of excess heat, especially with a low rate charge such as with the Activator 282, is often an indication of a problem battery. This can include a shorted cell, but can also occur during a long conditioning charge or if the battery is charged in a high ambient temperature environment. The heat generated internally is conducted to the cell interconnections and then to the terminals of the battery.

The Activator 282 has a temperature detector with a heat detecting tab thermally connected to the Activator 282 quick disconnect receptacle and hence to the terminal pins of the battery.

If the battery heats up on charge to 45°C (113°F) the charge will cut off and the OVERTEMP/FAULT LED will illuminate. When the battery cools down to approximately 90°F, the charge restores.

4.2 FAULT INDICATION AND CUTOUT

While charging with the Activator 282, a 24 Volt battery voltage will continuously rise to over 28 Volts. However, if a battery will not accept charge due to corroded terminals or deficiencies such as a shorted cell, or has been cycled or is aged or defective to an extent of not being able to attain 28 Volts, the Activator 282 will detect this condition. If the battery is less than 28 Volts and remains at a fixed voltage for 4 consecutive hours or drops in voltage instead of increasing, the charge will cut off and the OVERTEMP/FAULT lamp will illuminate.

5.0 NICKEL CADMIUM TOPPING

5.1 General: Refer to the NAVAIR BAD-1 Manual and/or battery manufacturer's manual for servicing of Nickel Cadmium batteries. This is a process requiring discharging, charging, and discharge capacity checks and recharging.

WARNING: Servicing, testing, and maintaining Nickel Cadmium Batteries in accordance with accepted BAD-1 Manual, other military manuals, or the manufacturer's procedures are the only means of assuring a Nickel Cadmium batteries safety and effectiveness.

6.0 CALIBRATION VERIFICATION

The Activator 282 is factory calibrated. A Certificate of Calibration is supplied with each unit by serial number. The unit requires no further calibration, only output verification. If the display segments are damaged or illegible, the unit must be returned to factor for repair.

6.1 OPERATIONAL

Verification of output is the only check that is required on an annual basis. Voltage test points are provided on the unit and verification can be accomplished with a calibrated voltmeter such as the Fluke 77 / AN.

If the Activator 282 supplies the correct voltage, the required charge current will automatically follow, and charge amperes are a consequence of the charger and battery voltage. Charge current from the Activator 282 is not adjustable, and is automatically limited to the capacity of the Activator 282: 10 Amp pulses for a low battery voltage, and 2 ~ 5 amp steady state).

6.2 OUTPUT VOLTAGE VERIFICATION AND CALIBRATION PROCEDURE

Tools and materials:

- 1) Activator 282 to be verified.
- 2) Calibrated voltmeter with 0.080" (2mm) tip probes.
- 3) Fine-tipped (1/16") flat blade screwdriver

Procedure:

- a) It does not matter if the Activator 282 is connected to a battery. It does not matter if the Activator 282 is set for a Lead Acid or NiCad battery.
- b) Connect a calibrated voltmeter to the red (+) and black (-) tip jacks on the Activator 282.
- c) Turn on the Activator 282 and observe both its displayed voltage and the voltmeter voltage. This should be between 28 and 35 Volts.
- d) The Activator 282 must agree with the voltmeter within ± 0.3 Volts. If not, locate the adjustment hole on top of the Activator 282, at the fan outlet and near the most significant digit of the voltmeter display. Adjust the control with a fine-tipped blade screwdriver to bring the indicated voltage into agreement with the external calibrated voltmeter.

6.3 CHECKING THE CURRENT

Tools and materials:

- 1) Activator 282 to be verified
- 2) This requires a battery or resistance load such as a 10 100 Watt power resistor. A DC ammeter (0 – 10 Amps) can be connected in series with the battery and load to verify amperes if desired.

BATTERY LOAD

- a) Check that the battery on charge reaches 28 Volts (it will continue to increase). Approximately 30 minutes after reaching 28 Volts, the yellow CHARGING LED will go out and the green READY Lamp will illuminate. The battery voltage will drop. This demonstrates charge cutoff.

- b) Load the battery with a resistive load (suggested load is approximately 10 Ohms 150 Watt resistor) until the battery drops to approximately 25.2 Volts. The READY LED will go out and CHARGING LED lamp will illuminate. Remove the load and allow the battery to charge until the READY lamp comes back on.

6.4 VERIFYING CHARGING VOLTAGE THRESHOLDS (MANUAL METHOD)

This procedure is not required but may be performed as desired. The manual method requires the least equipment but is very labor intensive. A more convenient automated method is given below.

Tools and materials:

- 1) Activator 282 to be verified
- 2) Good Lead-Acid battery for test
- 3) Calibrated voltmeter
- 4) (Optional) Power resistor, 5 to 20 , 150 Watt or greater
- 5) (Optional, for use with power resistor) Two tip plugs, 0.080" (2mm), Emerson-Johnson 105-0302-001, Mouser Electronics 530-105-0302-001
(www.mouser.com)

- 6) (Optional, for use with power resistor) Wire, #22AWG (0.65mm), 6 ft (2 meters)
- 7) (Optional, for use with power resistor) Wire, #18 AWG (1mm), 6 ft (2 meters)

Procedure:

- 1) (Optional) Into each tip plug connect 3 feet of #18AWG and #22AWG wire. The #22 will go to a voltmeter and the #18 will sometimes be connected to the power resistor.
- 2) Connect the Activator 282 to a Lead Acid battery and set the front panel switch to "Lead Acid".
- 3) Connect a voltmeter to the red and black tip jacks on the Activator 282, either directly or through the added #22 wires.
- 4) Turn on the Activator 282 to charge the battery. Leave the Activator 282 charging the battery for at least three charge cycles, so that the Activator 282 "topping charge" is only two minutes.
- 5) Observe the voltmeter as the battery approaches 28 Volts with the Activator 282 yellow CHARGING LED lit. When the green READY LED comes on, note the highest voltmeter voltage. That must be 28.2V within ± 0.3 Volts. If not, the Activator 282 must be returned to the factory for repair and calibration.

NOTE – the topping charge will slowly raise the battery voltage above the internal charge voltage threshold. Using a two minute topping charge minimizes this error. Using a good battery minimizes this error.

- 6) (Optional, for use with power resistor) With the voltmeter still connected and the Activator 282 showing the green READY light, apply the power resistor across the two tip jacks through the #18 wire harness constructed above. This will discharge the battery, since the Activator 282 has cut off charging when the READY light is illuminated.
- 7) Observe the voltmeter as the battery voltage approaches 25.2 Volts with the Activator 282 green READY light illuminated. When the yellow CHARGING light comes on, note the lowest voltmeter reading. That must be 25.2V within ± 0.3 Volts. If not, return the Activator 282 to the factory for repair and calibration.

6.5 VERIFYING CHARGING VOLTAGE THRESHOLDS (MIN-MAX METER)

This procedure is not required but may be performed as desired. It achieves the same results as the previous procedure, but uses a recording instrument to watch battery voltages instead of a technician.

Tools and materials:

- a) Activator 282 to be verified
- b) Battery for test
- c) Calibrated “min-max” holding voltmeter such as the Fluke 287. Alternately, you may use another voltage recording device such as a chart recorder or data acquisition system that can accurately capture the highest and lowest voltages seen in the range of 24 ~ 32 Volts DC.
- d) (Optional) Power resistor, as in previous procedure
- e) (Optional, for use with power resistor) Tip plugs and wiring as in previous procedure

Procedure:

- 1) (optional) Make up the wire harnesses as detailed in the previous procedure.
- 2) Connect the Activator 282 to a battery.
- 3) Connect a calibrated min-max voltmeter or other recording device to the red and black tip jacks of the Activator 282, either directly or through the wire harness.
- 4) Turn on the Activator to charge the battery. Leave the Activator 282 charging the battery for at least three charge cycles, so the Activator 282 “topping charge” lasts only two minutes.
- 5) Set the recording device to record maximum and minimum voltages.
- 6) (Optional) When the Activator 282 shows a green READY light, connect the power resistor across the tip jacks in parallel with the voltmeter/recording device. This will discharge the battery. Without the resistor it may take several days for the battery to self-discharge and start the next charge cycle.

- 7) After at least one additional charge and discharge cycle, read the minimum and maximum voltages observed. The highest voltage must be $28.2V \pm 0.3$ Volts. The lowest voltage must be $25.2V \pm 0.3$ Volts. If either voltage is outside the listed range, the Activator 282 must be returned to the factory for repair and calibration.

6.6 VERIFYING TOPPING TIME

This procedure is not required but may be performed as desired. The timing of the Activator is set by a crystal oscillator, verified at the factory. If it fails, the Activator 282 display will fail.

Tools and materials:

- a) Activator 282 to be verified
- b) Electrolytic capacitor, 4700 to 10,000 μ F, 3 Volts or greater
- c) Resistor, about 10K , $\frac{1}{4}$ Watt or greater
- d) Stopwatch or clock with seconds display

Procedure:

- a) Connect the resistor across the capacitor terminals.

NOTE: The resistor and capacitor together determine the delay time between charge cycles in this test. The time is not critical, but should be long enough to avoid missing a charge cycle. 10,000 μ F and 10K gives about 9 ~ 10 seconds between charge cycles.
- b) Connect the capacitor positive terminal to the positive output of the Activator 282. That is the battery connection on the same side as the red and black test jacks and the instruction label. Connect the capacitor negative terminal to the negative output of the Activator 282.
- c) Set the Activator 282 for Lead Acid battery. Turn on the Activator 282 and begin timing immediately. The Activator 282 will indicate $28.6V \pm 0.3V$. The yellow CHARGING LED will be lit.

- d) After 30 ± 3 minutes of topping time the green READY LED will light and the yellow CHARGING light will extinguish. Note the elapsed time. The indicated voltage will drop towards 25.2 Volts over a few seconds (time set by the capacitor and resistor choice).
- e) As the indicated voltage drops below 25.2 Volts, the yellow CHARGING LED will again light and the green READY LED will extinguish. Immediately begin timing the second topping duration.
- f) After 15 ± 1.5 minutes the second topping charge will complete, the green READY light will illuminate, and the yellow CHARGING LED will extinguish. Note the elapsed time. Again, the indicated voltage will drop towards 25.2 Volts.
- g) As the indicated voltage drops below 25.2 Volts, the yellow CHARGING LED will again light and the green READY LED will extinguish. Immediately begin timing the third topping duration.
- h) After 2 minutes ± 15 seconds the third topping charge will time out, the green READY light will light and the yellow CHARGING light will extinguish. Note the elapsed time.
- i) The Activator 282 will repeat this cycle with two minute topping charges indefinitely, until AC power is removed.

7.0 ROUTINE MAINTENANCE

There are only three items that require routine maintenance:

- a) Fan – Keep clean and free of dust or debris. Use low pressure air or vacuum cleaner. Check air vent holes. Vacuum clean if necessary.
- b) Connections – Check that the quick disconnect contacts are tight and free of corrosion. Use approved contact cleaner. Check movement of the quick – disconnect knob – clean and lubricate if necessary. Do not get lubricate on the contacts or inside the unit.

c) AC Line Cord – If the insulation or plug is damaged, replace the cord.

8.0 TROUBLESHOOTING

CAUTION: Do not attempt to repair the electronics – contact Power Products.

PROBLEM	POSSIBLE CAUSES
Voltage on charge goes to maximum immediately	The battery is sulfated or connections corroded
OVERTEMP/FAULT Lamp blinks – fan rotates intermittently.	<ol style="list-style-type: none"> 1. The battery voltage is low. 2. If the battery voltage does not begin to rise within one hour, the battery is defective. Remove the Activator 282, and check the digital voltmeter to see if the voltage reaches maximum without a load. If not, potential faulty Activator 282. (fuse, no power, etc.)
No Output Voltage, fan does not operate	<ol style="list-style-type: none"> 1. No AC Input 2. Blown fuse on power supply Note: contact factory before opening the unit. A blown AC fuse denotes problem with power supply, not AC line.
No Output Voltage, fan operates	<ol style="list-style-type: none"> 1. Thermal Detector within connector is shorted. 2. Fuse on PCB may be blown.
OVERTEMP/FAULT LED is on, no Output	1. This is normal if battery is over 113°F. Charge will resume when temp reaches below 90°F.
OVERTEMP/FAULT LED is blinking	Battery may be defective or aged
Charging Voltage does not rise to 28.0 volts	Battery may be defective or aged

9.0 SPECIFICATIONS

Dimensions: The unit has a T-shaped configuration.
Max. Unit width: 4.5"
Max. Unit height: 5.75"
Max. Unit depth: 3.5"
Note: See page 2 for dimensional images

Weight: 2 LBS.

AC Input: 90 – 240 VAC 50/60/400 Hz, 500 mA

AC Inlet: Standard IEC-320 (60320) receptacle. 3 wire grounded.
Mates with USA and international IEC line cords. Internal AC fuse protection.

AC Line Cord: Provided: 6 ft. 3 Wire with IEC-320 plug one end and standard NEMA 15-5, 125V plug on the other end. Change line cord or use adapter plug for 230V input.

Ambient Operating temp: 0 to 40°C (32 – 104°F)

Storage Temp: -40 to 80°C (-40 – 125°F)

Fan Cooled

DC OUTPUT

- 10 Amp max pulse for low batteries (below 18V), then approx. 3 ~ 5 Amps electronic current and voltage limiting.
- Charge regulation within AC line limits and low to full charge load $\pm 1\%$
- RMS Ripple 0.25 %, except during pulsing. Pulsing 10A 1ms, 2 pulses / sec.
- Internal AC and DC fuse protection.

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CERTIFICATION OF FACTORY CALIBRATION

BATTERY CHARGER – DIRECT CONNECT
MODEL ACTIVATOR 282 P/N: 282

APPLICATION: Automatic charging of 24 volt aircraft batteries – vented Lead Acid, sealed Lead Acid or Nickel Cadmium.

SPECIFICATIONS: AC input Nominal 115 or 230VAC 50/60/400Hz – auto ranging
On/Off Toggle Switch
Lead Acid / NiCad Slide Switch

NOTES: A. Unit manufactured and calibrated under MIL-I-45208
B. Calibrating instruments used:
Meter: FLUKE Model 8010A & 73 DC Volts / DC MV
(Amperes)
Shunt: EMPRO Standard 0.25% 50Amp 50MV.
Digital Timer, Calibrated standard

UNIT: 24 VOLT BATTERY CHARGER
MODEL: ACTIVATOR 282
DATE MANUFACTURED: _____
SERIAL #: _____
PROCEDURE: PPSP 282V
ENVIRONMENTAL CONDITIONS: NOMINAL 74°F 38% R.H.
DATE CALIBRATED: _____
CALIBRATED BY: _____
SHIPPED CONDITION: _____ CALIBRATED / IN TOLERANCE – PASSED

Power Products Inc. certifies that the above listed instrument meets or exceeds all published specifications. It has been calibrated using standards MIL-I-45208 whose accuracies are traceable to the National Institute of Standards and Technology.

1 YEAR WARRANTY

POWER PRODUCTS INC. warrants its products to be free from defects in workmanship and material for a one-year period from the date of shipment to the distributor, original equipment manufacturer (OEM), or original end user. If any product shall prove to be defective during the warranty period, POWER PRODUCTS INC. will repair or replace such part.

There are no warranties, which extend beyond the description on the face hereof. This warranty is in lieu of all other warranties, express or implied. **Lamar Technologies LLC** excludes liability for incidental and consequential damages.

An action for breach of this warranty must be commenced within one year after the breach is or should have been discovered.

Lamar Technologies LLC specifically disclaims all other representations to the first user/purchaser, and all other obligations or liabilities. No person is authorized to give any other warranties or to assume any liabilities on Lamar Technologies LLC behalf.



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