

Instruction Manual
24-400A
Rev 1C - 19 May 1988

AERO QUALITY SALES

24-400A

NICKEL-CADMIUM BATTERY CHARGER/ANALYZER

Instruction Manual

Rev 1C - 19 May 1988

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INTRODUCTION

The 24-400A is an instrument designed to charge, trickle
charge, and analyze (discharge) various types of Nickel-Cadmium
and lead-acid batteries.

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INTRODUCTION

The 24-400A is an instrument designed to charge, trickle charge and analyze (discharge) various types of Nickel-Cadmium and sealed Lead-Acid batteries.

Its multiple modes of operation, Constant Current Charge, Constant Current & Float Charge, Constant Current & Stop Charge, Automatic Discharge (analysis) and Full Discharge (deep cycle), allows the 24-400A to satisfy the requirements of most small (0 to 5A-hr) rechargeable battery systems.

The charger is basically a voltage controlled constant current source/sink featuring safety interlocks to protect the operator, the charger and the battery, in the event of reversed polarity connection, short circuit, open circuit (no load), and overvoltage.

Two large meters permit the simultaneous monitoring of voltage and current, while four indicator lights inform of the status of the operation.

An external optional electronic timer (Timer 24) complements the 24-400A for applications requiring a time limit.

SEC 1 - SPECIFICATIONS

- 1.1 CURRENT:
 - Charge: constant current, adjustable: 0 to 500mA.
 - Discharge: constant current, adjustable: 0 to 5A.
- 1.2 VOLTAGE:
 - Charge: 0 to 37.5V.
 - Discharge: 3.0 to 25.0V.
- 1.3 MODES:
 - Charge.
 - Charge and float.
 - Charge and stop.
 - Automatic discharge.
 - Full discharge.
- 1.4 VOLTAGE CONTROL:
 - Adjustable: Usable from 00.0 to 37.5V on charge, and from 3.00 to 25.0V on discharge, with an accuracy of 2% \pm .1V.
- 1.5 METERS:
 - Voltage; 0 to 40V.
 - Current: 0 to 500mA for charge and 0 to 5A for discharge.
 - Accuracy: \pm 5%.
- 1.6 STATUS INDICATORS:
 - WHITE - Power on.
 - GREEN - Output on: continuous while the unit is running, pulsating (with beeper), to indicate cycle end.
 - RED - Fault: continuous (with beeper), to indicate over voltage, reverse polarity or open circuit.
 - YELLOW - Capacity failure: continuous (with beeper), to indicate low battery voltage on analysis.
- 1.7 CONTROLS:
 - Mode selector switch, Power ON-OFF switch and RUN-STOP/RESET switch, and potentiometers to select the charge and discharge currents,
- 1.8 FUSES:
 - Input: .5A slo-blow (.25A for 230V operation).
 - Output, 6A.
- 1.9 LINE VOLTAGE:
 - 115/230VAC \pm 10%, 50-60Hz.
- 1.10 AMBIENT:
 - +5 deg C to +35 deg C.
- 1.11 TIMER:
 - External, optional (Timer 24).

SEC 2 - DESCRIPTION

The 24-400A is basically a voltage controlled current source/sink.

In the charge mode, the current is constant and it is set by the charge current potentiometer. The value of the current remains the same regardless of the battery voltage, from 0 volts (short circuit) up to a battery voltage of 37.5V. The charge current is also independent of the line voltage, within the specified line voltage limits.

In the charge & float mode, the current starts constant (as per in the previous mode) and remains constant until the battery voltage is within a fraction of the selected value (.25V to .75V approximately). At this point the current is automatically reduced and regulated to maintain the programmed battery voltage.

In the charge & stop mode, the current starts constant (as in the first mode) but it is terminated automatically when the battery reaches the programmed voltage.

In the automatic discharge mode, the current is constant and it is set by the discharge current potentiometer. It is terminated automatically when the battery drops below the programmed voltage.

In the full discharge mode, the current is constant and it is set by the discharge current potentiometer. The current will gradually drop to zero as the battery reaches the 2V to 3V level.

A monitor circuit provides the following safety features:

Reverse polarity: if the charger is connected in reverse to a battery (or single cell) having at least .5V of charge, the 24-400A will signal a fault and inhibit further operation.

Open circuit: if the charger is started without connecting it to a battery, or if the battery is open, or if the battery voltage rises abnormally (over-voltage), the 24-400A will signal a fault and inhibit further operation.

Short circuit: the 24-400 is current limited, therefore, a short circuit will not result in any more current than the programmed level.

An optional external timer can be connected to the 24-400A to provide time limits for the charge and discharge modes.

SEC 3 - OPERATING INSTRUCTIONS

NOTE: before turning power ON or OFF, or before connecting or disconnecting a battery, make sure that the RUN-STOP/RESET switch is in the STOP/RESET position.

- 3.1 Plug the 24-400A line cord into a receptacle providing 115VAC (230VAC) \pm 10%, 50-60Hz and turn power on.
Note: see section 7 for line voltage change.
- 3.2 Turn the current selector(s) to the desired current (approximate).
- 3.3 Set the voltage selector in accordance to the type of battery (and number of cells) to be serviced, and mode of operation (charge vs discharge). see CHARGING NOTES on page 6.
- 3.4 Connect the battery to the charger. Battery voltage will be displayed on the voltmeter.
- 3.5 Turn the RUN-STOP/RESET switch to RUN. The ON green indicator will light up.
- 3.6 Adjust the current to the desired level.
- 3.7 To stop the operation or to reset a FAULT or CAPACITY FAILURE condition, place the RUN-STOP/RESET switch in the STOP/RESET position.

SEC 4 - CHARGING NOTES

The charge & float and the charge & stop modes are particularly useful with lead acid batteries, where the battery voltage is a better indicator of the state of charge, as compared with Nickel-Cadmium batteries, where terminal voltage gives little information on the state of charge.

Lead-Acid batteries are float charged (constant voltage) typically at 2.3V/cell. A 6 cell pack (12V), will then be float charged with the voltage selector at 13.8V. In this mode, the charge current is set to the highest that the cell will safely take (typically 1C), and this will be the charge current until the float voltage is reached, at which time the current will diminish to the level needed to maintain the float voltage.

Lead-Acid batteries can also be charged in a manner in which it is possible to know the end of charge. When a Lead-Acid cell is charged with constant current at C/15 to C/10, the end voltage will rise rapidly at about 95% of charge. This point occurs at about 2.4 to 2.45V/cell. A 5A-hr, 6 cell pack, can be charged at 335mA to 500mA, with the voltage selector at 14.7V. The 24-400A will stop the charge operation when the rapid rise of end-of-charge voltage is detected.

For Nickel-Cadmium batteries the most effective charge method is constant current vs time.

In the absence of any particular instructions from the manufacturer, charging at c/10 for 12 to 16 hours will insure a complete charge.

SEC 5 - VERIFICATION OF PERFORMANCE AND CALIBRATION

R30, ZERO:

Adjust R30 for 0.00V \pm 0.01V at pin 7 of U9 (right lead of C10); use the top connection of C19 as common for the meter).

R31, CURRENT:

Adjust R31 for a maximum of 500mA on charge (or 5A on discharge).

R44, VOLTAGE:

Adjust R44 for the float voltage on charge or capacity failure voltage on discharge.

NOTE: there is a difference of about 2% between the voltage selector setting and the actual voltage (higher on charge and lower on discharge).

SEC 6 - TROUBLESHOOTING

- 6.1 DOES NOT TURN ON:
Unit not plugged in. Open line fuse. Burned out power on indicator.
- 6.2 DOES NOT CHARGE OR DISCHARGE:
Open output fuse.
- 6.3 DOES NOT CHARGE IN THE FLOAT MODE:
Battery voltage above or very close to voltage selected.
- 6.4 GOES INTO CYCLE END IMMEDIATELY IN THE CHARGE & STOP MODE:
Battery voltage above or very close to voltage selected.
- 6.5 FAULT ALARM:
Open output fuse. Battery not connected or open. Reverse polarity connection. Worn out or dry battery (voltage rising rapidly), resistors and/or diodes in the charge path.
- 6.6 CAPACITY FAILURE ALARM:
Battery below setting on voltage selector. Battery not connected or open.

SEC 7 - INSTALLATION

7.1 SPACE:

Place the 24-400A so that heat can be adequately dissipated by the heat sink (rear panel), particularly during discharge.

Operation of the unit in a confined space without proper ventilation can lead to semiconductor damage due to the heat build-up.

7.2 LINE VOLTAGE:

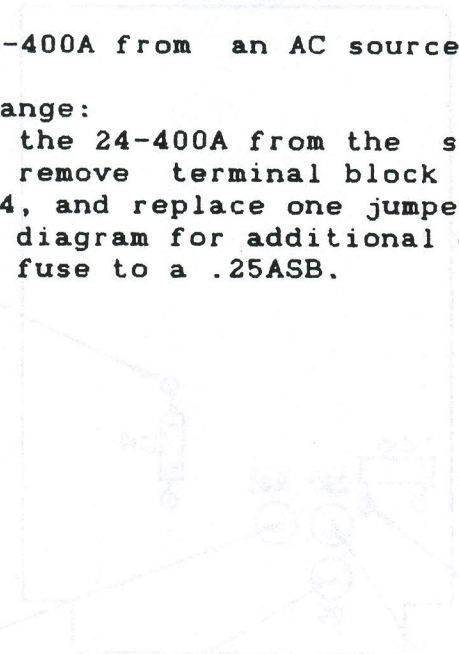
Operate the 24-400A from an AC source of 115VAC or 230VAC, $\pm 10\%$, 50-60Hz.

Line voltage change:

To convert the 24-400A from the standard 115V to 230V operation, remove terminal block jumpers at positions 1-2 and 3-4, and replace one jumper at positions 2-3.

See wiring diagram for additional details.

Change the fuse to a .25ASB.



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REVISION INDEX

1A - 25 Jan 88 - Released

1B - 5 Apr 88 - Text enhancements

1C - 19 May 88 - New Dallas office address