

Electronic control battery testing, charging, and replacement instructions



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Safety for life



Eaton's Cooper Power series products meet or exceed all applicable industry standards relating to product safety. We actively promote safe practices in the use and maintenance of our products through our service literature, instructional training programs, and the continuous efforts of all Eaton employees involved in product design, manufacture, marketing, and service.

We strongly urge that you always follow all locally approved safety procedures and safety instructions when working around high voltage lines and equipment and support our "Safety For Life" mission.

Safety information

The instructions in this manual are not intended as a substitute for proper training or adequate experience in the safe operation of the equipment described. Only competent technicians, who are familiar with this equipment should install, operate and service it.

A competent technician has these qualifications:

- Is thoroughly familiar with these instructions.
- Is trained in industry-accepted high- and low-voltage safe operating practices and procedures.
- Is trained and authorized to energize, de-energize, clear, and ground power distribution equipment.
- Is trained in the care and use of protective equipment such as flash clothing, safety glasses, face shield, hard hat, rubber gloves, hotstick, etc.

Following is important safety information. For safe installation and operation of this equipment, be sure to read and understand all cautions and warnings.

Hazard Statement Definitions

This manual may contain four types of hazard statements:

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in equipment damage only.

Safety instructions

Following are general caution and warning statements that apply to this equipment. Additional statements, related to specific tasks and procedures, are located throughout the manual.

DANGER

Hazardous voltage. Contact with hazardous voltage will cause death or severe personal injury. Follow all locally approved safety procedures when working around high- and low-voltage lines and equipment.

G103.3

WARNING

Before installing, operating, maintaining, or testing this equipment, carefully read and understand the contents of this manual. Improper operation, handling, or maintenance can result in death, severe personal injury, and equipment damage.

G101.0

WARNING

This equipment is not intended to protect human life. Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply may result in death, severe personal injury, and equipment damage.

G102.1

WARNING

Power distribution and transmission equipment must be properly selected for the intended application. It must be installed and serviced by competent personnel who have been trained and understand proper safety procedures. These instructions are written for such personnel and are not a substitute for adequate training and experience in safety procedures. Failure to properly select, install, or maintain power distribution and transmission equipment can result in death, severe personal injury, and equipment damage.

G122.3

Electronic control battery testing, charging, and replacement instructions

Introduction

Service information MN280074EN provides battery testing and charging information for the following electronic recloser controls: FXA, FXB, Form 3, Form 3A, Form 4C, Form 5, Form 5 LS/UDP, Form 5/Triple-Single, and Form 6 Pole Mount (standard, triple-single, loop scheme).

Read this manual first

Read and understand the contents of this manual, the specific control's service information manual, and follow all locally approved procedures and safety practices before installing or operating this equipment.

For battery testing and charging refer to the appropriate instruction manual:

- *Service Information S280-75-1, Installation, Setting, Testing Form 3A Type ME Control*
- *Service Information S280-78-1, Installation and Operation of Types FXA and FXB Control*
- *Service Information S280-78-3, Type FXB Control Front Panel Programming Guide*
- *Service Information S280-77-1, Installation and Operating Instructions Form 4C Control*
- *Service Information S280-79-1, Installation of the Form 5 Control*
- *Service Information S280-79-10, Installation and Operation of Form 5, Form 5 UDP, Form 5 DC NOVA Recloser Controls*
- *Service Information S280-79-12, Form 5 LS/UDP Recloser Controls Installation and Operation Instructions*
- *Service Information S280-42-3, Installation of Form 5/ Triple-Single Recloser Control*
- *Service Information MN280077EN, Form 6 Pole Mount Recloser Control Instructions*
- *Service Information MN280080EN, Form 6 Triple-Single Pole Mount Recloser Control Instructions*
- *Service Information MN280082EN, Form 6-LS Pole Mount Recloser Control Instructions*

Additional information

These instructions cannot cover all details or variations in the equipment, procedures, or process described, nor to provide directions for meeting every possible contingency during installation, operation, or maintenance. For additional information, contact your Eaton representative.

Control battery storage

Sealed lead acid batteries should only be stored in a fully charged state. Permanent irreversible damage will result if a battery is stored in a deeply discharged state. After three months of storage, check the open circuit voltage. The battery will require recharging if it is at or below 24 volts at 25°C (77°F). Never store batteries at temperatures exceeding 47°C (117°F), as permanent damage can result in one month. Storage at or below room temperature is recommended to prolong storage time and maintain maximum capacity over time.

IMPORTANT

To maintain sufficient charge to operate the control and prevent battery cell damage, the sealed lead-acid batteries should be charged after no more than three months of storage.

IMPORTANT

The battery must be disconnected prior to shipping or storing the control.

The control battery is fully charged prior to shipment and is ready for use. Refer to the **battery charging information** section.

IMPORTANT

Connect the control battery when ac power is connected to the control's ac supply input terminal block.

When shipped from the factory, the battery source is disconnected and its output plug is taped to the cabinet. Connect the battery plug into the mating connector to complete the battery circuit.

Battery testing procedure

A control battery can be tested in the control or on the bench. When performing a manual battery test, while the battery is in the control, follow the battery testing procedure as specified in the control's service information manual.

In general, battery testing is accomplished on the front panel of the FXA / FXB, Form 4C, Form 5, Form 5 LS/UDP, Form 5/Triple-Single, and Form 6 Pole Mount controls.

Battery test in the control

CAUTION

Recloser misoperation. The control must be removed from service before disconnecting the control battery. Disconnecting the control battery from an in-service control may cause recloser misoperation (unintentional operation). Failure to comply can result in equipment damage and personal injury.

T213.4

Follow the appropriate procedure below to perform a battery test in the control. The values in the test procedures are based on testing at 25°C (77°F).

CAUTION

Equipment damage. Shorting battery positive to battery negative at the battery test terminals on the control panel will cause damage to the control. The control will be inoperative and possible misoperation (unintentional operation of the recloser) can result.

T214.1

Form 3/3A battery test procedure

Follow the procedure to perform a battery test on the nickel-cadmium battery in the Form 3 / 3A control. This procedure requires a separate battery tester (kmet tester).

1. Remove the control from service. Refer to the To Remove Control From Service Section in Service Information S280-75-1.
2. Disable the control battery charger by opening the fused switch or removing ac power from the control. Wait 3 to 5 minutes to allow the battery voltage to stabilize prior to testing open circuit battery voltage.
3. Three battery test terminals in the lower right corner of the front panel are used to check the battery voltage, quiescent drain, and charging rate. The left hand pair of terminals (v) are connected directly across the battery to check battery voltage. The red terminal (far left) is battery positive (+).
4. The battery in the Form 3/3A control will see a steady drain of approximately 1.5–2.5 Milliampères (may be as high as 4.5 Milliampères with certain accessories).
5. From the battery test terminals on the control front panel measure the battery voltage. If battery voltage is below 24 volts, the battery is either low on charge or failing. The battery should be removed for recharging and re-tested before returning to service.
6. If battery voltage is above 24 volts, perform the following load test. While measuring battery voltage connect a 10Ω, 10 watt resistor across the battery test terminals, for approximately 2–3 seconds. For ambient temperatures above -6°C (20°F), battery voltage should drop by no more than 3 volts from the open circuit voltage.

Note: Either a ka638me voltmeter accessory or a kmet tester can be used for the load test. Both devices have a built in 10Ω load resistor.

7. If the temperature is below -6°C (20°F), the battery voltage / temperature should follow the lower curve in Service Information S280-75-2 Figure 53. If the voltage falls below the lower curve, the battery should be removed for bench testing.

FXA/FXB battery test procedure

Follow the procedure to perform a battery test in the FXA/FXB control.

Control connected to ac power

Initial condition: ac power is connected to the control and battery circuit is connected.

1. For the FXA, connect a voltmeter to the battery test terminals located on the lower half of the front panel. Battery voltage should read 26–28 vdc.
For the FXB, monitor the lcd display.
2. For the FXA, press and hold the battery load test switch for 5 seconds, this places a 15Ω load on the battery. Voltage drop should not exceed 2 vdc.

For the FXB, press the battery test button. The FXB will provide the unloaded and loaded battery voltage and a BATTERY OK! Or BATTERY NOT OK! Indication.

Control disconnected from ac power

Initial condition: ac power is disconnected and battery circuit is connected.

1. For the FXA, connect a voltmeter to the battery test terminals located on the lower half of the front panel. Battery voltage should read 23–27 vdc. If the battery voltage is less than 23 vdc, recharge the battery prior to performing step 2.
2. For FXA, press the battery load test switch for 5 seconds; this places a 15Ω load on the battery. Voltage drop should not exceed 2 vdc.

For FXB, press battery test button. The FXB will provide the unloaded and loaded battery voltage and a BATTERY OK! Or BATTERY NOT OK! Indication.

Note: Disconnect the battery when the control is removed from service.

Electronic control battery testing, charging, and replacement instructions

Form 4C battery test procedure

CAUTION

Equipment damage. Shorting battery positive to battery negative at the battery test terminals on the control panel will cause damage to the control. The control will be inoperative and possible misoperation (unintentional operation of the recloser) can result.

T214.1

CAUTION

Equipment damage. Do not short battery positive to mechanical ground. Failure to comply will cause damage to the control.

T256.1

Follow the procedure to perform a battery test in the Form 4C control.

Control connected to ac power

Initial condition: ac power is connected to the control and battery circuit is connected.

1. Set meter range switch to lo.
2. Place the battery meter toggle switch in volts position. Battery voltage should read 27–29 vdc.
3. With the battery meter toggle switch in volts position, press the battery load test button for 5 seconds (places 5 load on battery). Voltage drop should not exceed 3 vdc.
4. Set meter range switch to hi.
5. Place the battery meter toggle switch in current position. Press the battery load test button for 5 seconds. Battery charger should show charge rate of 250 to 500 ma.

Control disconnected from ac power

Initial condition: ac power is disconnected, battery circuit connected, and meter range switch set to lo.

1. Place battery meter toggle switch in the volts position. Battery voltage should read 25–27 vdc. If the battery voltage is less than 23 vdc, recharge the battery prior to performing step 2.
2. With the battery meter toggle switch in the volts position, press the battery load test button for 5 seconds, this places a 5Ω load on the battery. Voltage drop should not exceed 3 vdc.

Form 5 battery test procedure

The battery test key on the operator panel is used to test the condition of the Form 5 control battery. No external current/voltage meter is necessary for testing.

The control performs a self test every 12 hours or when initiated by an external command. When a battery test is initiated, the spurious charge is first drained to allow the

battery voltage to equalize. A 5Ω, 55 watt resistor is then placed across the battery terminals and a voltage drop is calculated. If the drop from the equalized voltage to the test voltage exceeds 2 volts, then the check battery led is illuminated.

Follow the procedure to perform a battery test in the form 5 control.

1. Using the next and back keys, scroll through the lcd display to the battery monitor screen, either screen 29 or 31 depending on firmware version.
2. Note the normal volts and normal current readings from the screen.

Note: Charging: normal voltage should be between 25–31 volts with the higher voltage at colder temperatures. Under normal conditions, with ac connected and the battery trickle charging the current should read between 12–20 ma. With ac connected and in bulk charging mode, current will range from 12–600 ma.

Discharging: with ac disconnected and the battery supplying the load, the current will read -180 to -350 ma depending on the accessories connected.

3. Momentarily, press the change/lamp test key, then the battery test key.

Note: Ac power can be either connected or disconnected for step 3.

4. Note the test volts reading from the lcd and the status of the check battery led. Service the battery if the check battery led is illuminated.

Form 6 battery test procedure

This procedure applies to Form 6 pole mount control only.

The condition of the Form 6 control battery can be determined by using the battery test function in the battery menu. No external current/voltage meter is necessary for testing.

Alarm conditions

- During a manual battery test a 5Ω, 55 watt resistor is placed across the battery terminals for approximately 5 seconds. The Form 6 control measures the battery voltage, if the voltage drops below 22.8 Vdc for one full second, the alarm led (battery alarm) is illuminated.
- When the Form 6 control is disconnected from ac power and the control battery drops below 23.5 Vdc for 60 seconds, the alarm led will illuminate. If the battery voltage continues to decay and drops below 22 vdc, the Form 6 control will shut down.

Follow the procedure to perform a battery test in the Form 6 pole mount control.

Note: The battery test is blocked for 30 seconds upon power up of the control.

Electronic control battery testing, charging, and replacement instructions

Note: Ac power can be either connected or disconnected for battery test.

1. Press the menu button on the front panel.
2. Using the down arrow key, navigate to the battery menu and press enter.
3. Using the down arrow key, navigate to the test battery menu and press enter.
4. Press the F4 button to test the battery. The message testing will appear on the LCD while the load is being applied to the battery. The battery test results will display in the battery metering menu.

Note: Voltage should be between 25–31 vdc with the higher voltage at colder temperatures.

Under normal conditions, with ac connected and a fully charged battery, the charging current should be less than 20 ma.

With ac connected and a discharged battery the current range should be between 20 and less than 450 ma. Current of 450 ma or greater indicates a problem with the charging circuit on the pole mount power supply.

With ac disconnected and the battery supplying the load, current will read -400 to -600 ma depending on connected accessories. (On the LCD it will display as -0.40 To -0.60.)

This battery test procedure should be conducted in a clean environment, such as a repair shop.

Follow the procedure to perform a bench test on a control battery in a service shop:

1. Remove the control from service. Refer to the control's service information for the **Remove the control from service** procedure.
2. Remove the battery from the control and carefully transport it to a suitable service facility.
3. Measure battery voltage.
4. Apply test load and measure battery voltage after 5 seconds of load to determine voltage drop. Refer to Table 1 for bench test load condition.
5. Remove test load.

Refer to Table 1 for battery test information. If the battery fails the test or is four years or older refer to Table 1 in the **Battery replacement** section for battery replacement information.

For additional detail regarding battery testing, including charge and discharge rates, refer to the control's service information manual.

Battery test on the bench

CAUTION

Recloser misoperation. The control must be removed from service before disconnecting the control battery. Disconnecting the control battery from an in-service control may cause recloser misoperation (unintentional operation). Failure to comply can result in equipment damage and personal injury.

T213.4

Battery test information

Table 1. Control battery bench testing and replacement information

Control type	Battery	Battery catalog part #	Voltage	Type	Amp/Hour	Bench test load condition for 5 sec.	Acceptable voltage drop at end of test load	Battery tester	**Battery replacement kit
Form 3/ Form 3A	Gould or Gates or General Electric	KA450ME2S	24V	Nickel- Cadmium	1.5	10Ω, 55 watt	3V or less	KA638ME voltmeter or *MET Tester	not required
FXA/FXB	Hawker Cyclon	KFX-105-1	24V	Lead Acid	2.5	15Ω, 55 watt	2V or less	voltmeter or BATTERY TEST button on control panel	not required
Form 4C	Hawker Cyclon	KME4-215	24V	Lead Acid	8	5Ω, 55 watt	3V or less	Battery test panel	not required
Form 5 Swing Panel standard capacity	Hawker Cyclon	KME4-215	24V	Lead Acid	8	5Ω, 55 watt	3V or less	BATTERY TEST hot key on control panel	not required
Form 5 Swing Panel high capacity	Hawker Genesis or Yuasa	KME5-134-1 KME5-134-3	24V (two 12V batteries)	Lead Acid	13	5Ω, 55 watt	2V or less	BATTERY TEST hot key on control panel	KME5-709-11 or KME5-709-14
Form 5 Fixed Panel standard capacity	Hawker Cyclon	KME4-215	24V	Lead Acid	8	5Ω, 55 watt	3V or less	BATTERY TEST hot key on control panel	not required
Form 5 Fixed Panel high capacity	Hawker Genesis or Sonnenschein or Yuasa	KME5-134-1 KME5-134-2 KME5-134-3	24V (two 12V batteries)	Lead Acid	13 18 12	5Ω, 55 watt	2V or less	BATTERY TEST hot key on control panel	KME5-709-17 or KME5-709-12 or KME5-709-13
Form 5/ Triple- Single high capacity	Hawker Genesis or Sonnenschein or Yuasa	KME5-134-1 KME5-134-2 KME5-134-3	24V (two 12V batteries)	Lead Acid	13 18 12	5Ω, 55 watt	2V or less	BATTERY TEST hot key on control panel	KME5-709-17 or KME5-709-12 or KME5-709-13
Form 6 Pole Mount standard capacity	Hawker Cyclon	KME4-215	24V	Lead Acid	8	5Ω, 55 watt	3V or less	MENU button on operator panel	not required
Form 6 Pole Mount high capacity	Hawker Genesis	KME5-134-1	24V (two 12V batteries)	Lead Acid	13	5Ω, 55 watt	2V or less	MENU button on operator panel	not required

* Form 3 controls below serial number 10649 require a special battery-testing cable and adapter (ka1114me1) with the met tester.

**The form 5 control batteries have different dimensions; therefore, if the replacement battery ordered is a different brand than the original battery, a kit with mounting hardware may be required to accommodate the replacement battery size.

Battery charging information

Battery charging

To maintain the battery charge, energize the control's built-in charger with ac power applied to the input terminal block. If it is not possible to charge the battery with the control's built-in charger, a portable bench type charger is available. Refer to Table 2 for the appropriate portable charger and charging procedures for each specific control.

Note: Do not attempt to charge a lead acid battery below 2 vdc with the ka43me7001 charger. The charger will not operate if it does not detect a battery above 2vdc.

If the lead acid battery is below 19 vdc for more than two days, replace the battery. The expired battery should be disposed of in an environmentally responsible manner. Consult local regulations for proper battery disposal.



Figure 1. KA43ME7001 battery charger

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Table 2. Portable battery charging information

Control type	Portable charger	Portable battery charging information*
Form 3 /3A	KA1142ME3 (120 VAC) or KA1142ME4 (240 VAC)	Charge discharged battery at 50 mA for 48 hrs (CHARGE switch position), then adjust to 15 mA (MAINTAIN switch position) to maintain a full charge.
Form 4C FXA/FXB	KME4-711 (240 VAC) charger kit or	Refer to instruction manual S280-77-7.
Form 5 swing panel std capacity	KA43ME7001 (120 VAC)	
Form 5 fixed panel std capacity		Connect the battery directly to KA43ME7001 charger. The charger continuously monitors the battery voltage. A red LED indicator on the body of the charger illuminates when charging. The red LED blinks to indicate when the battery has reached a full charge. This process can take up to 24 hours.
Form 6 pole mount std capacity		
Form 5 swing panel high capacity	KA43ME7001 (120 VAC)	Use adapter KME5-325-1 battery assembly to connect the two 12 volt batteries to the KA43ME7001 charger.
Form 5 fixed panel high capacity		The charger continuously monitors the battery voltage. A red LED indicator on the body of the charger illuminates when charging. The red LED blinks to indicate when the battery has reached a full charge. This process can take up to 24 hours.
Form 5 triple-single high capacity		
Form 6 pole mount high capacity		

IMPORTANT

Use adapter KME5-325-1 battery assembly to connect the two 12 Volt batteries to the KA43ME7001 charger. Never connect a single 12 Volt battery to the KA43ME7001 charger.

* For more detailed charging instructions refer to the following instruction manuals:
for chargers KA1142ME3 and KA1142ME4 refer to manual S280-75-61
for charger KME4-711 refer to manual S280-77-7
for charger KA43ME7001 refer to manual S280-79-14

Battery replacement

In a typical application, the life expectancy of a lead acid battery is three to five years. To determine the state of the battery, perform a bench battery test. If a nickel-cadmium battery fails the bench battery test, recharge and retest. If it fails a second test replace the battery. Battery replacement is recommended after four years for lead acid batteries and five years for nickel-cadmium batteries, or if the battery fails the bench battery test procedure. Refer to table 1 to identify the appropriate replacement battery and whether a battery replacement kit is necessary. The form 5 control batteries have different dimensions; therefore, if the replacement battery ordered is a different brand than the original battery, a kit with mounting hardware may be required.

Battery disposal

Expired batteries should be disposed of in an environmentally responsible manner. Consult local regulations for proper battery disposal.



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