MIDTRONICS

Battery Management Innovation

Celltron *Advanced*™

Stationary Battery String Analyzer
CTA-2000 and CTA-4000

INSTRUCTION MANUAL

INNOVATION TECHNOLOGY QUALITY WORLDWIDE

Table of Contents

Introduction 1

⚠ Safety instructions 1

Important 1

Guidelines 1

About the analyzer 1

Terminology 1

Accessories 1

Chapter 1: Description 3

Specifications 3

Measurements 3

Test capability 3

Test range 3

Data storage 3

Parts of the analyzer 4

Panels 4

Parts on the panels 5

Menu options 5

Menus 5

Main MENU 5

String names 5

1. SET PARAMETERS menu 6

2. TEST BATTERY option 7

3. VIEW PARAMETERS menu 7

4. PRINT RESULTS option 7

5. VIEW RESULTS menu 7

6. EXPORT DATA option 7

ERASE DATA option 8

CHANGE REF. option 8

UTILITIES menu 8

Chapter 2: Pre-testing 10

Determining a reference value 10

Reference values 10

Options 10

Testing a sample of jars 11

Using the average in STRING SUMMARY 11

Setting options in the UTILITIES menu 12

Introduction 12

Options 12

Accessing the UTILITIES menu 12

Selecting a language (A. LANGUAGE) 13

Setting the date and time (B. DATE & TIME) 13

Setting the date and time format (C. SET DATE FORMAT) 14

Editing the string name (D. EDIT STRING NAME) 14
Setting percentages for warnings and failings (E. SET WARN/FAIL %) 15
Setting the low voltage value (F. LOW VOLTS) 16
Adjusting the screen contrast (G. CONTRAST) 16
Setting values in the SET PARAMETERS menu 17
Introduction 17
Options 17
Accessing the SET PARAMETERS menu 18
Selecting CONDUCTANCE & V or VOLTS ONLY 19
Setting the start mode (AUTO START or MANUAL START) 19
Selecting JARS ONLY, JARS & 1 STRAP, or JARS & 2 STRAPS 20
Setting the string temperature (TEMP:) 20
Setting the reference value (REF:) 21
Setting the number of volts per jar (VOLTS/JAR) 21
Setting the number of posts per jar (POSTS/JAR) 22
Editing the string name (EDIT STRING NAME) 22
Selecting the jar (SELECT BATTERY) 23
Selecting the TEST BATTERY option 24
Adding or editing a vendor name (EDIT VENDOR NAME) 24
Adding or editing a model name (EDIT MODEL NAME) 24
Chapter 3: Testing 26
Labeling jars and straps 26
Introduction 26
Labels 26
Jars 26
Straps 27
Recommendations 28
Recording jar information 28
Labels for jars and straps 28
Preparing to test 28
Introduction 28
Requirements 28
Selecting a cable 28
Attaching the cable to the analyzer 29
Determining a test pattern 30
Introduction 30
Posts and straps 30
String 30
Setting the TEST BATTERY option 31
Attaching the cables 32
Introduction 32
General rules 32
Attaching the cable to jar posts 32
Attaching the cable to a strap 34
Retesting jar posts or straps 35
Introduction 35

Retesting after testing the jar post or strap 35
Retesting after testing the string 35
Chapter 4: Test Results 37
Viewing test results 37
Introduction 37
Viewing test results 37
Interpreting test results 38
STRING SUMMARY 38
REVIEW DATA SET 38
Using the percentages of the reference value 39
Archiving test results 39
Reasons 39
Options 40
Printing test results 40
Downloading test results 41
Chapter 5: Troubleshooting 42
Screen does not light during testing 42
Possible reasons 42
Recharging the NiMH battery pack 42
Replacing a fuse 43
Probe tip is bent or stops retracting 43
Replacing a probe tip 43
Chapter 6: Specifications 44

Introduction

This manual provides descriptions and operating instructions for the Midtronics Celltron *Advanced* CTA-2000 and CTA-4000 stationary battery string analyzers. It helps you understand the parts of the analyzer and how to use it to test batteries.

⚠ Safety instructions

Important

Read the instructions below before you operate the analyzer.

Guidelines

To avoid electric shock when testing batteries, follow your company safety practices and these guidelines:

- Wear safety glasses or a face shield.
- Wear protective rubber gloves.
- Wear a protective apron or shop coat.
- Perform service work only for which you have been trained.
- Do not disconnect the battery cables from power systems during the test without authorization
- Do not place yourself in an electrical circuit
- Avoid contact with frame racks and adjacent hardware that may be grounded while in contact with the battery.

About the analyzer

Terminology

The analyzer and manual use the term “jar,” when referring to a monobloc, which can contain 1 to 8 cells. A string is a series of jars connected together by straps to provide power as a whole.

Accessories

Table 1 lists the accessories that come with the CTA-2000.

Table 1. CTA-2000 accessories

Accessory	Part Number	Description
Softcase	C015	Soft vinyl case to hold the analyzer and cables.
DuraClamps	C088	Cables with five-inch clamps and two-inch openings to attach to large battery terminals.

Table 2 lists the accessories that come with the CTA-4000.

Table 2. CTA-4000 accessories

Accessory	Part Number	Description
Hardcase	C057	Hard plastic case to hold the analyzer and the accessories in this table.
Midtronics Printer	A087: North America A088: Europe A089: U.K.	Handheld printer with an infrared light to accept test results for printing.
Temperature sensor	C058	Sensor with infrared light to measure battery temperature.
DuraClamps	C088	Cables with five-inch clamps and two-inch openings to attach to large battery terminals.
DuraProbes	C087	Cables with six-inch probes with rotating heads and ½-inch tips for instant contact with large battery terminals.
Replacement tips (DuraProbes)	C069	Four tips and two safety caps to replace the tips and caps on the DuraProbes.
Infrared (IR) receiver with cable and CD with inFORM™ software	C085	Receiver that attaches to the com. port of a PC by the cable and software that allows you to view and save test results on a PC.
Rechargeable Battery Pack and Rubber Boot	C016	Two NiMH rechargeable battery packs, battery charger and protective rubber boot.

Table 3 lists additional accessories for the analyzer.

Table 3. Additional accessories

Accessory	Part Number	Description
Amp test connector cable	C056	Cable with connector to an amp cable that connects to the battery terminals.
Mueller clamps	C052	Cables with two-inch clamps and one-inch openings to attach to small battery terminals.
MiniProbes	C046	Cables with four-inch probes and ⅛-inch tips for instant contact with small battery terminals.
Replacement tips (MiniProbes)	C059	Eight tips and two safety caps to replace the tips and caps on the Miniprobes.
Extenders (DuraProbes)	C075	Thirty-six-inch plastic extenders.
Battery	C090	Spare NiMH battery, 9.6 V, 1600 mAh
Battery Charger	C091	Charger for NiMH battery12 V, 100mA

For information about ordering these parts as replacements or additions to your analyzer, contact Midtronics Customer Service.

Chapter 1: Description

The Celltron *Advanced* is a stationary battery string analyzer that measures the conductance and voltage of individual or strings of single-cell (2 V) through 8-cell (16 V) stationary, lead-acid jars to help identify those that:

- are good
- are serviceable
- need to be replaced

Specifications

Measurements

The analyzer measures the status of a jar in voltages and conductance values. It displays conductance values in siemens (S). Ampere hours (Ah) are a typical measurement of jar capacity, however, they are difficult to measure without knowing the load to which the jars supply power.

Midtronics recommends that you use a reference value to compare the conductance value to the test results. A reference value is a typical conductance value for the type of jars you are testing. For more information about determining a reference value, refer to "Chapter 2: Pre-testing."

Test capability

The analyzer tests jars that are providing power to a load or (in-service) or those that are not providing power (not in-service).

Test range

The analyzer has an operating range of 0 to 20000 S. This range includes jars that have about 5 to 6000 Ah of reserve capacity.

Data storage

The analyzer can store 480 test results for a string at one time. Tables 4 and 5 show the number of jars you can test depending on the number of jar posts and straps that you test.

Table 4. Test results when testing jars only

# of jar posts	# of jars you can test
2	480
4	240
6	160
8	120

Table 5. Test results when testing jars and straps

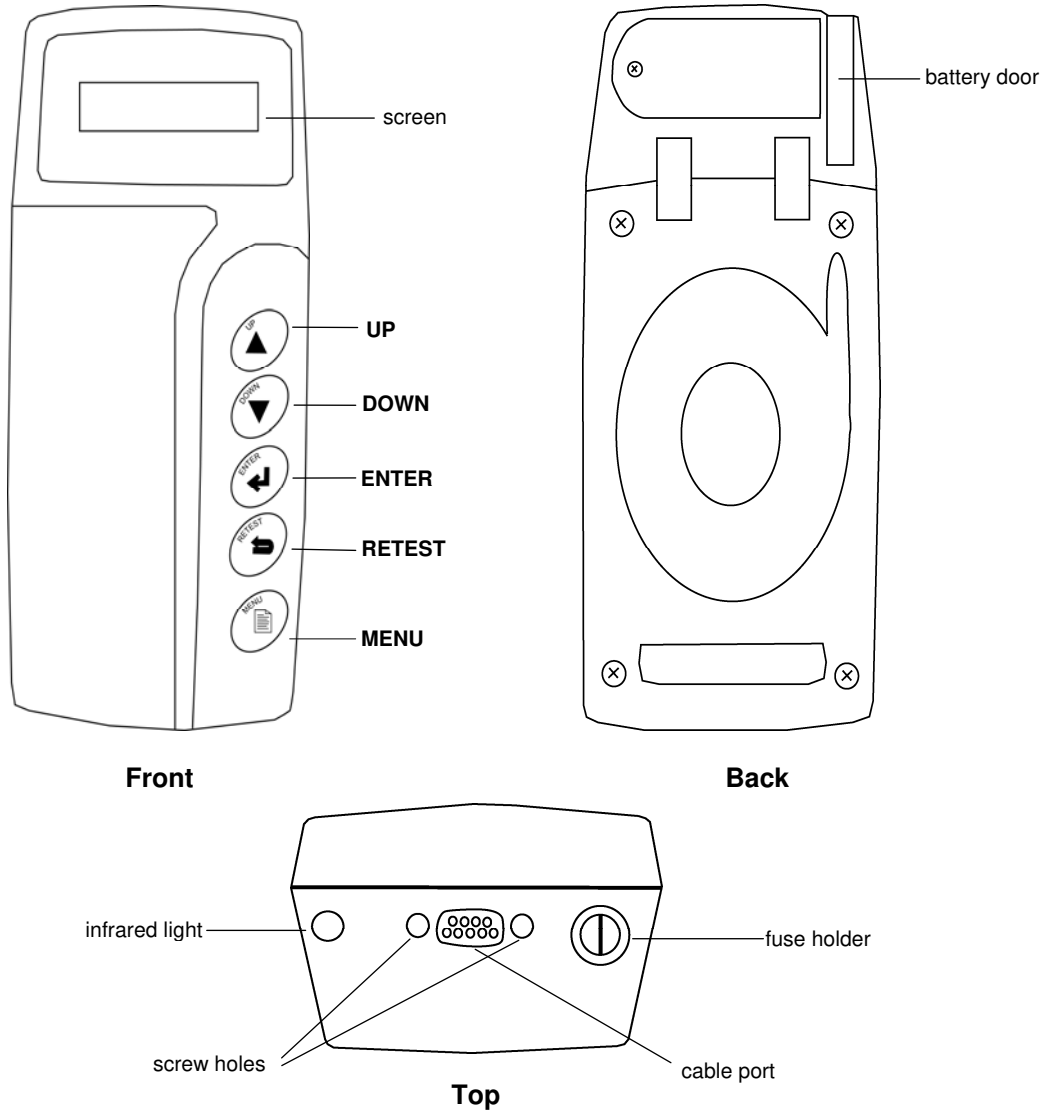
# of jar posts	# of straps	# of jars you can test
2	1	240
4	2	120
6	3	80
8	4	60

Parts of the analyzer

Panels

The panels allow you to use, care for, and hook up the analyzer. Figure 1 displays the front, back, and top panels of the analyzer and their parts.

Figure 1. Front, back, and top panels



Parts on the panels

Table 6 describes the parts of the panels.

Table 6. Parts of the panels

Part	Description
Screen	Displays menus, options, and test results.
UP	Allows you to scroll up in a menu or number selections.
DOWN	Allows you to scroll down in a menu or number selections.
ENTER	Moves to the option you select or enters number selections.
RETEST	Opens a menu with options to retest the jar or strap you just tested.
MENU	Turns the analyzer on and off.
Battery door	Houses the battery for the analyzer.
Infrared light	Transfers data from the analyzer to the printer and PC.
Screw holes	Allow screws to anchor the cable to the analyzer.
Cable port	Connects clamps or probes to the analyzer for testing.
Fuse holder	Houses the fuse for the analyzer.

Menu options

Menus

The analyzer displays menus on the screen that you can select options from before, during, and after testing. You can access options from the main MENU.

Main MENU

To access the main MENU, press and hold **MENU** on the analyzer. The main MENU displays these options:

1. SET PARAMETERS
2. TEST BATTERY
3. VIEW PARAMETERS
4. PRINT RESULTS
5. VIEW RESULTS
6. EXPORT DATA
7. ERASE DATA
8. CHANGE REF.
9. UTILITIES

Note: The MAIN MENU option is available on some menu screens to allow you to return to the main MENU.

String names

The string names are 16 memory locations that are listed after you select an option on the main MENU. These locations store the information you enter about strings so you do not have to reenter data each time you test a string. You select the string name you want to create, add, or change information about. The default names are "01. STRING 01" through "16. STRING 16," but you can change these names to the names of the strings you are testing. For information about changing the string names, refer to "Setting options in the UTILITIES menu" in Chapter 2.

1. SET PARAMETERS menu

The SET PARAMETERS menu allows you to set values for a string so it is ready to test. When you select a string name, the screen displays these options:

1. CONDUCTANCE & V
2. AUTO START
3. JARS ONLY
4. TEMP
5. REF
6. VOLTS/JAR
7. POSTS/JAR
8. EDIT STRING NAME
9. SELECT BATTERY
10. MAIN MENU

Table 7 describes these options.

Table 7. SET PARAMETERS menu options

Option	Description
CONDUCTANCE & V VOLTS ONLY	Test option that enables you to: • Test the conductance and voltage of a jar (CONDUCTANCE & V) • Test voltage only (VOLTS ONLY) The default is CONDUCTANCE & V.
AUTO START MANUAL START	Connection mode option that enables you to: • Begin a test automatically when you connect to the jar (AUTO START) • Press ENTER to begin a test after you connect to the jar (MANUAL START) The default is AUTO START.
JARS ONLY JARS & 1 STRAP JARS & 2 STRAPS	Jars/straps options that enable you to select: • Jars (JARS ONLY) (default setting). • Cells and inter-cell connections of the string (JARS & 1 STRAP, JARS & 2 STRAPS).
TEMP	The default is 77 °F (25 °C). Conductance measurements vary by jar temperature. To compensate, the analyzer uses the TEMP value to adjust the percentage of the reference value you set as the WARN/FAIL threshold. The percent is compensated to 25 °C (77 °F). Compensation is adjusted at 0.7% per degree Celsius between 0 °C and 35 °C.
REF	Reference value in siemens. The default is 2000 S. For more information about reference values, refer to "Determining a reference value."
VOLTS/JAR	Number of volts for a jar (2, 4, 6, 8, 10, 12, or 16 V). The default is 2 V.
POSTS/JAR	Number of posts for a jar (2, 4, 6, or 8 posts). The default is 2 posts.
EDIT STRING NAME	Allows you to change the name of a string using alphanumeric characters.
SELECT BATTERY	Test option that enables you to: • Select the battery manufacturer. (The default is NONE SELECTED.) • Select the battery model. • And accept or change the reference value for the battery model in the analyzer database. After you select the reference value, the analyzer will display the DEFINE BATTERY submenu, which has 4 options: • 1. TEST BATTERY • 2. EDIT VENDOR NAME (add or edit the name of the battery manufacturer) • 3. EDIT MODEL NAME (add or edit the name of the battery model) • 4. REF (change the reference value)

You must set the values for these options for each string you test. If you do not set these options for a string, the analyzer tests the string against the default values.

2. TEST BATTERY option

The TEST BATTERY option allows you to test a string after you connect the cables to the jar posts. If you do not have the cables connected to the jar posts before you select TEST BATTERY, the screen prompts you to connect to a jar.

3. VIEW PARAMETERS menu

The VIEW PARAMETERS menu displays the values you set up for a string under the SET PARAMETERS menu. This menu allows you to view the parameters only. For descriptions of these options, refer to "SET PARAMETERS menu."

4. PRINT RESULTS option

The PRINT RESULTS option allows you to print test results for one string or for all strings.

5. VIEW RESULTS menu

The VIEW RESULTS option allows you to view test results for a string you tested. When you select a string name, the screen displays these options:

1. STRING SUMMARY
2. REVIEW DATA SET
3. MAIN MENU

Table 8 describes these options.

Table 8. VIEW RESULTS menu options

Option	Description
STRING SUMMARY	Lists these values as a summary of the string you tested: • AVG. % — Average percentage of the reference value. • AVG. SIEMENS: — Average conductance value. • TOTAL JARS: — Total number of jars you tested in the string. • LOW: — Jar number with the lowest percentage of the reference value. • HIGH: — Jar number with the highest percentage of the reference value. • STRING —Average percentage of the string as compared to the jar in the string with the highest conductance value
REVIEW DATA SET	Lists these values for a jar or strap: • voltage • conductance value • number of the jar or strap • percent of the reference value

The analyzer keeps the test results for a string until you erase the data.

6. EXPORT DATA option

The EXPORT DATA option allows you to download test results through the infrared (IR) receiver to a PC. You can export data for individual strings or for ALL STRINGS.

7. ERASE DATA option
The ERASE DATA option allows you to erase data for individual strings or for ALL STRINGS.

8. CHANGE REF. option
The CHANGE REF. option allows you to change the reference value for a string or for all the strings without changing other values in the SET PARAMETERS menu. For more information about reference values, refer to "Determining a reference value" in Chapter 2.

9. UTILITIES menu
The UTILITIES menu allows you to set up preferences in the analyzer. When you select a string name, the screen displays these options:

A. LANGUAGE
B. DATE & TIME
C. SET DATE FORMAT
D. EDIT STRING NAME
E. SET WARN/FAIL %
F. LOW VOLTS
G. CONTRAST
H. MAIN MENU

Table 9 describes these options.

Table 9. UTILITIES menu options

Option	Description
LANGUAGE	Language the screen displays text and results in: • ENGLISH (USA) • ESPAÑOL • FRANÇAIS • DEUTSCH • PORTUGUÊS • ITALIANO The default is ENGLISH (USA).
DATE & TIME	Current date and time set in the formats from the SET DATE FORMAT option.
SET DATE FORMAT	Formats for the date and time: • MM/DD/YY (month/day/year) and a 12-hour clock or DD/MM/YY (day/month/year) with a 24-hour clock • 12- or 24-hour for the time
EDIT STRING NAME	Name of the string you can edit with numbers or characters.
SET WARN/FAIL %	Percentages of the reference value for a jar and string that are thresholds to indicate test results that fall below them. In the test results a ? is displayed as a warning and a ! is displayed if the jar or string is failing. The defaults for a jar and string in-service: • JAR FAIL: <60% • JAR WARN: <70% • STRING FAIL: <60% • STRING WARN: <70%

LOW VOLTS	Threshold amount of low voltage for a string. The defaults are: • 2.1 V for a 2 V jar • 4.2 V for a 4 V jar • 6.3 V for a 6 V jar • 8.4 V for an 8 V jar • 10.5 V for a 10 V jar • 12.6 V for a 12 V jar • 16.8 V for a 16 V jar The analyzer will use a **!** in the test results to indicate a value below this threshold.
CONTRAST	Contrast between the screen and text.

Chapter 2: Pre-testing

Before you test a string with the analyzer, you need to:

- Determine a reference value
- Set options in the UTILITIES menu
- Set values in the SET PARAMETERS menu

Note: Make sure the jars you are testing are 2, 4, 6, 8, 10, 12, or 16 V.

Determining a reference value

Reference values

Reference values are average conductance values from a sample of strong jars similar in condition and age. You can compare reference values to test results from a string. The differences between test results and reference values help you determine the capacity of the string to see if it is providing enough conductance for the load. Differences can reflect how a string was treated, installed, or maintained.

Options

Midtronics recommends that you create your own reference values for a string to get values specific to the string you are testing. For this reason, the following options are listed in the order you should take to obtain a reference value.

To obtain a reference value for a string:

1. Consult your company documentation for previous reference values that were created for the string you are testing. If you do not have previous reference values for the string, do step 2.

2. Test a sample of jars. Refer to “Testing a sample of jars.” If you cannot test a sample of jars, do step 3.

3. Test the jars in the string that you need to test with the analyzer and use highest conductance value as a reference value. If you cannot test the jars for a reference value, do step 4.

4. Use the average from STRING SUMMARY after you test the string. Refer to “Using the average in STRING SUMMARY."

5. Contact the jar manufacturer or Midtronics for a list of reference values for common jar types: www.midtronics.com.

Note: The reference values from STRING SUMMARY and the website are guidelines only. Midtronics updates the website with new reference values when they are created. If you create a reference value for a jar model, e-mail the value and information to net@midtronics.com or fax it to 630.323.7752 (Attn: Reference value list).

Testing a sample of jars

To test a sample of jars for a reference value:

1. Choose at least 30 jars from one manufacturer with the same make, model, power rating, age (within 6 months), and service history.

2. Record this information about the jars:
   - Jar manufacturer
   - Model number
   - Date of manufacture
   - Date of installation
   - Condition the jar operates in, such as charge voltage (volts per cell), temperature, and DC current through the jar
   - Visible warnings, such as leaking acid, corrosion, or distorted jar cases

3. Test the jars. Refer to "Chapter 3: Testing."

4. Test one jar five times in a row on float charge. Conductance results should be within ±2% of each other.

   Note: If the test results do not conform to this pattern, an electrical signal might be present in the system.

5. Figure the average conductance of the jars.

   Note: Do not include jars that are higher or lower than 30% from the average because they might be outside an acceptable range.

Using the average in STRING SUMMARY

If you cannot obtain a reference value for a string, test the string and use the average conductance value (AVG. SIEMENS) in the STRING SUMMARY menu as your reference value. If jars in the string have been replaced recently, test the new jars, especially if they correlate to the HIGH jar value in STRING SUMMARY. Once you have determined a reference value, go to CHANGE REF. in the main MENU and enter your new reference value. This will update the test results.

Setting options in the UTILITIES menu

Introduction

Before testing, you can set the options in the UTILITIES menu. If you do not set up values for the string in this menu, the analyzer uses the defaults when you test the string. For information about the defaults and descriptions of the values in the UTLITIES menu, refer to "Menu options" in Chapter 1.

Options

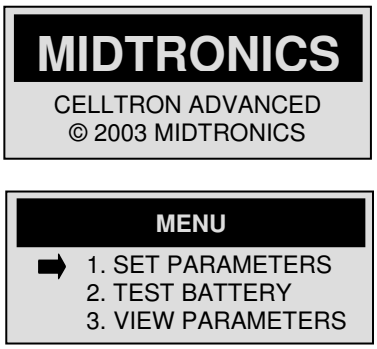
After you access the UTILITIES menu, you can:

- Select a language (A. LANGUAGE)
- Set the date and time (B. DATE & TIME)
- Set the date and time format (C. SET DATE FORMAT)
- Edit the string name (D. EDIT STRING NAME)
- Set percentages for warnings and failings (E. SET WARN/FAIL %)
- Set the low voltage value (F. LOW VOLTS)
- Adjust the screen contrast (G. CONTRAST)

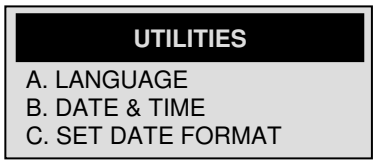
Accessing the UTILITIES menu

To access the UTILITIES menu:

1. Press and hold **MENU** until the analyzer powers on.



2. Press ▼or ▲ to scroll to 9. UTILITIES menu and press **ENTER**.



Note: If you select an option you do not want to change, press **ENTER** to return to the main MENU.

Selecting a language (A. LANGUAGE)

To select the language you want to see displayed on the screen:

1. Press ▼or ▲ to scroll to A. LANGUAGE in the UTILITIES menu and press **ENTER**.

2. Press ▼or ▲ to select the language you want to see text in on the screen.

Setting the date and time (B. DATE & TIME)

To set the date and time on the analyzer:

1. Press ▼or ▲ to scroll to B. DATE & TIME in the UTILITIES menu and press **ENTER**.

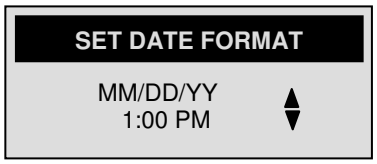
2. Press ▼or ▲ to select the number of the month, day, year, hour, minutes, and AM or PM and press **ENTER** after each selection.

.

Setting the date and time format (C. SET DATE FORMAT)

To set the date and time format on the analyzer:

1. Press ▼or ▲ to scroll to C. SET DATE FORMAT in the UTILITIES menu and press **ENTER**.



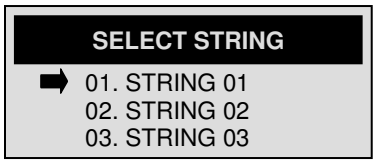
2. Press ▼or ▲ to select MM/DD/YY (month/day/year) and a 12-hour clock or DD/MM/YY (day/month/year) with a 24-hour clock

3. Press **ENTER**.

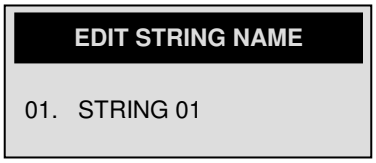
Editing the string name (D. EDIT STRING NAME)

To edit the name of a string:

1. Press ▼or ▲ to scroll to D. EDIT STRING NAME in the UTILITIES menu and press **ENTER**.



2. Press ▼or ▲ to select the string name you want to edit and press **ENTER**.



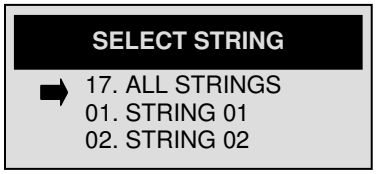
3. Press ▼or ▲ to scroll through the letters, numbers, and symbols for each character in the name and press **ENTER** after each selection.

> **Note:** The string name can be 12 characters long. When you are done entering characters, press **ENTER** to fill the rest of the name with spaces until the UTILITIES menu is displayed.

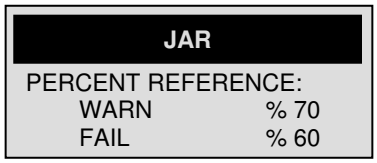
Setting percentages for warnings and failings (E. SET WARN/FAIL %)

To set percentages for warnings and failings for a string:

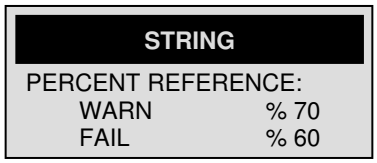
1. Press ▼or ▲ to scroll to E. WARN/FAIL % in the UTILITIES menu and press **ENTER**.



2. Press ▼or ▲ to select the string name, and press **ENTER**. To set the warn/fail percentage for all strings, select 17. ALL STRINGS, and press **ENTER**.



3. Press ▼or ▲ to select the WARN and FAIL percentages for the jars in the string and press **ENTER** after each selection.

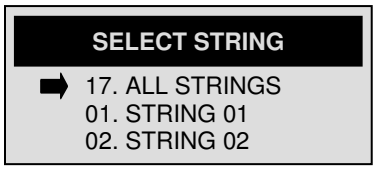


4. Press ▼or ▲ to select the WARN and FAIL percentages for the string and press **ENTER** after each selection.

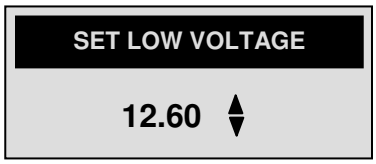
Setting the low voltage value (F. LOW VOLTS)

To set the low voltage value for a string:

1. Press ▼or ▲ to scroll to F. LOW VOLTS in the UTILITIES menu and press **ENTER**.



2. Press ▼or ▲ to select the string name, and press **ENTER**. To set the low voltage value for all strings, select 17. ALL STRINGS, and press **ENTER**.

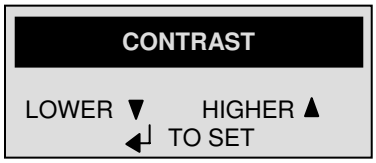


3. Press ▼or ▲ to select a low voltage value and press **ENTER**.

Adjusting the screen contrast (G. CONTRAST)

To change the screen contrast:

1. Press ▼or ▲ to scroll to G. CONTRAST in the UTILITIES menu and press **ENTER**.



2. Do one of the following:
   - Press ▼to increase text shade.
   - Press ▲to decrease the screen shade.

Setting values in the SET PARAMETERS menu

Introduction

You need to enter parameter values for a string you have not tested with the analyzer. The analyzer uses these values when testing the string. If you do not set up values for the string in this menu, the analyzer uses the defaults when you test the string. For information about the defaults and descriptions of the parameter values in the SET PARAMETERS menu, refer to "Menu options" in Chapter 1.

Note: When you set the values in this menu for a string and then test it, you cannot change these values under that string name. To change the values, you must delete the test results for the string or enter new values under a different string name.

If you have set up parameters for a string and are ready to test it, make sure you select the string you want to test in the analyzer and refer to "Chapter 3: Testing."

Options

After you access the SET PARAMETERS menu, you can:

- Select measurements (1. VOLTS ONLY or CONDUCTANCE & V)
- Select a test start mode (2. AUTO START or MANUAL START)
- Select the test points (3. JARS ONLY, JARS & 1 STRAP or JARS & 2 STRAPS)
- Set the string temperature (4. TEMP:)
- Set the reference value (5. REF:)
- Set the number of volts per jar (6. VOLTS/JAR:)
- Set the number of posts per jar (7. POSTS/JAR:)
- Edit the name of the string (8. EDIT STRING NAME)
- Select the battery manufacturer, model number, and accept or change the reference value associated with the model (9. SELECT BATTERY)

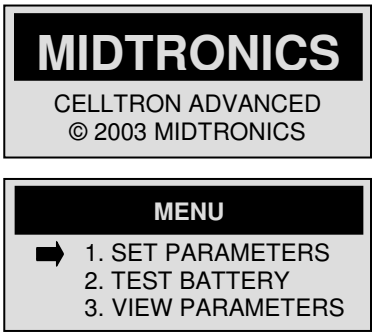
  In the DEFINE BATTERY submenu,
  - Add or edit a vendor (EDIT VENDOR NAME)
  - Add or edit a model (EDIT MODEL NAME)
  - Begin testing (TEST BATTERY)

Note: If you exit the SET PARAMETERS menu before completing your test setup, the analyzer will save your settings up to where you stopped in the menu.

Accessing the SET PARAMETERS menu

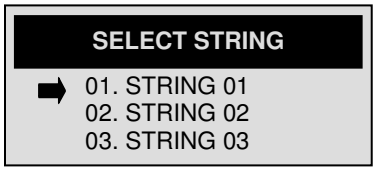
To access the SET PARAMETERS menu:

1. Press and hold the **MENU** button.

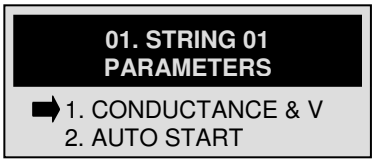


Note: If menus other than the main MENU is displayed, press ▼or ▲ to scroll to the MAIN MENU option and press **ENTER**.

2. Press ▼or ▲ to scroll to 1. SET PARAMETERS and press **ENTER**.

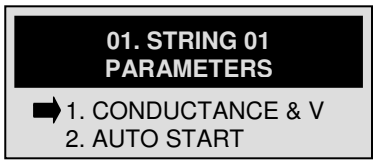


3. Press ▼or ▲ to scroll to a memory location (string name) for the string you are testing. Press **ENTER**.

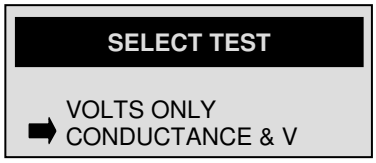


Selecting CONDUCTANCE & V or VOLTS ONLY

To change the setting:



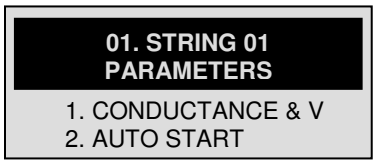
1. Press ▼or ▲ to select parameter 1, which will appear as either CONDUCTANCE & V or VOLTS ONLY. Press **ENTER**.



2. Press ▼or ▲ to test: VOLTS & CONDUCTANCE or VOLTS ONLY. Press **ENTER**.

Setting the start mode (AUTO START or MANUAL START)

To change the setting:



1. Press ▼or ▲ to scroll to parameter 2, which will appear as either AUTO START or MANUAL START. Press **ENTER.**

2. Press ▼or ▲ to select the connection mode: MANUAL START or AUTO START. Press **ENTER**.

Selecting JARS ONLY, JARS & 1 STRAP, or JARS & 2 STRAPS

To change the setting:

1. Press the ▼or ▲ arrow to scroll to option 3. (JARS ONLY, JARS & 1 STRAP, or JARS & 2 STRAPS). Press **ENTER**.

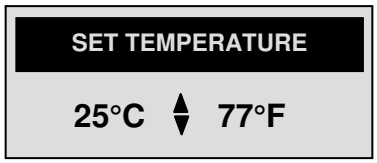
2. Press ▼or ▲ to scroll to 1. JARS ONLY, 2. JARS & 1 STRAP, or 3. JARS & 2 STRAPS. Press **ENTER**.

Setting the string temperature (TEMP:)

To set the temperature of the string:

1. Use the temperature sensor to measure the temperature of one of the jars in the string.

2. Press ▼or ▲ to scroll to 4. TEMP: in the SET PARAMETERS menu in the analyzer and press **ENTER**.



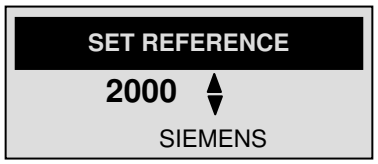
3. Press ▼or ▲ to select the temperature in either Celsius or Fahrenheit and press **ENTER.**

Note: The temperature converts automatically to Celsius or Fahrenheit.

Setting the reference value (REF:)

To set a reference value:

1. Press ▼or ▲ to scroll to 5. REF: in the SET PARAMETERS menu and press **ENTER**.



2. Press ▼or ▲ to select the reference value for the string you are testing and press **ENTER**.

Note: You can also set a reference value in the

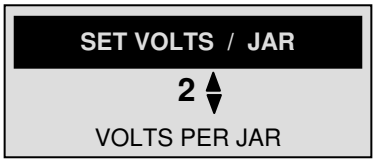
- SELECT BATTERY option from the SET PARAMETERS menu after you select a vendor and model number
- CHANGE REF option from the main MENU

For information about determining a reference value, refer to "Determining a reference value."

Setting the number of volts per jar (VOLTS/JAR)

To set the number of volts per jar:

1. Press ▼or ▲ to scroll to 6. VOLTS/JAR and press **ENTER**.

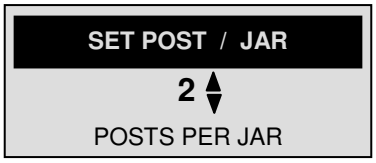


2. Press ▼or ▲ to scroll to the number of volts per jar and press **ENTER**.

Setting the number of posts per jar (POSTS/JAR)

To set the number of posts per jar:

1. Press ▼or ▲ to scroll to 7. POSTS/JAR and press **ENTER**.

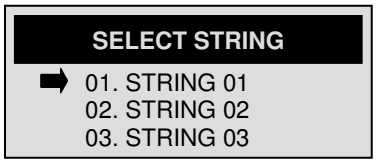


2. Press ▼or ▲ to scroll to the number of posts per jar and press **ENTER**.

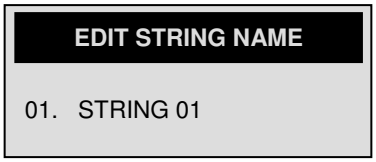
Editing the string name (EDIT STRING NAME)

To edit the name of a string:

1. Press ▼or ▲ to scroll to 8. EDIT STRING NAME and press **ENTER**.



2. Press ▼or ▲ to select the string name you want to edit and press **ENTER**.



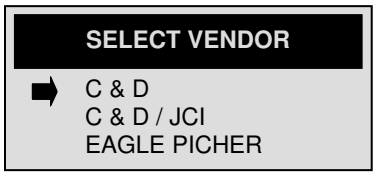
3. Press ▼or ▲ to scroll through the letters, numbers, and symbols for each character in the name and press **ENTER** after each selection.

Note: The string name can be 12 characters long. When you are done entering characters, press **ENTER** to fill the rest of the name with spaces until the SET PARAMETERS menu is displayed.

Selecting the jar (SELECT BATTERY)

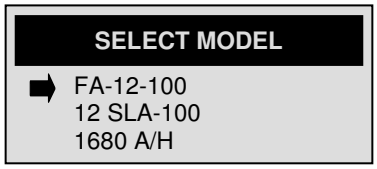
To select a jar type:

1. Press ▼or ▲ to scroll to SELECT BATTERY in the SET PARAMETERS menu and press **ENTER**.



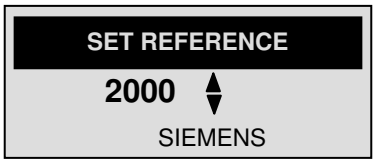
Note: If the vendor for the jars you are testing is not in the list of names, you can enter new vendors in the locations that contain only dots (or periods). For more information about entering new vendors, refer to "Adding or editing a vendor name."

2. Press ▼or ▲ to select the vendor for the jars in the string you are testing and press **ENTER**.



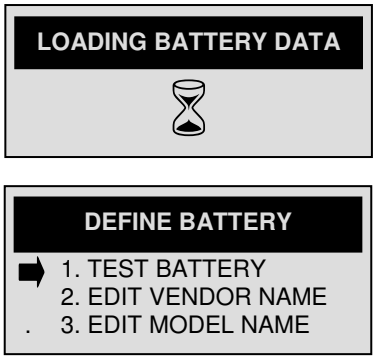
Note: If the model of the jars you are testing is not in the list of names, you can enter a new model name in a slot that contains only dots (or periods). For more information about entering new model names, refer to "Adding or editing a model name."

3. Press ▼or ▲ to select the model of the jars and press **ENTER**.



4. Press ▼or ▲ to select the reference value for the string and press **ENTER**.

Note: If you set the reference value in "Setting a reference value (REF:)," verify the value is correct and press **ENTER**.



Selecting the TEST BATTERY option

After you complete the test setup by selecting parameters in the DEFINE BATTERY submenu you have the option of exiting and testing the string later or testing immediately.

To begin testing immediately, press ▼or ▲ to select 1.TEST. The analyzer will prompt you to connect to the first jar to start the test with the saved settings. (Refer to "Chapter 3: Testing."

Adding or editing a vendor name (EDIT VENDOR NAME)

To add or edit a vendor name:

1. Do the steps in "Selecting a jar (SELECT BATTERY)."
2. Select **EDIT VENDOR NAME** from the DEFINE BATTERY menu and press **ENTER**.

3. Press ▼or ▲ to scroll through the letters, numbers, and symbols for each character in the name and press **ENTER** after each selection.

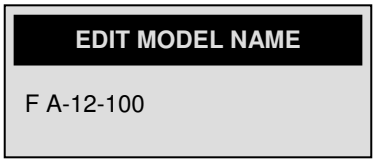
> **Note:** The vendor name can be 18 characters long. When you are done entering characters, press **ENTER** to fill the rest of the name with spaces until you return to the DEFINE BATTERY menu.

Adding or editing a model name (EDIT MODEL NAME)

To add or edit a model name:

1. Do the steps in "Adding or editing a vendor name (EDIT VENDOR NAME)."

2. Press ▼to select EDIT MODEL NAME from the DEFINE BATTERY menu.



3. Press ▼or ▲ to scroll through the letters, numbers, and symbols for each character in the name and press **ENTER** after each selection.

Note: The model name can be 18 characters long. When you are done entering characters, press **ENTER** to fill the rest of the name with spaces until you return to the DEFINE BATTERY menu.

Chapter 3: Testing

Testing a string requires consistent practices in the procedures in this section and keeping records of the test results. Midtronics recommends that you establish a testing routine to monitor conductance loss and prevent failures.

Note: Power outages can affect test results. Do not test the string if a power outage occurred recently and the string is boost-charged.

Labeling jars and straps

Introduction

The analyzer assigns labels to jars and straps based on the values you enter in the SET PARAMETERS menu. It displays these labels in the test results to help you keep track of the jar posts and straps you have tested and lets you know the jar posts and straps you still need to test.

Labels

The labels consist of numbers and letters that correspond to the

- Locations and connections of the jar posts and straps
- Direction you test the jars in

The label identifies

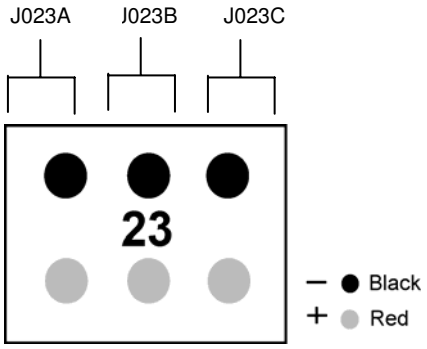
- Jar or strap
- Number of the jar
- Position of the posts

Jars

The analyzer uses “J” for jar. It assigns a number to the number of the jar you tested in sequence. It assigns a letter to the set of positive and negative posts you tested on a jar.

For example, in the label “J023C,” “J” means you tested a jar, “023” is the 23rd jar you tested, and “C” is the third set of posts you tested on that jar. Figure 2 shows an example of the labels for a jar when testing the posts from left to right.

Figure 2. Labels for a jar



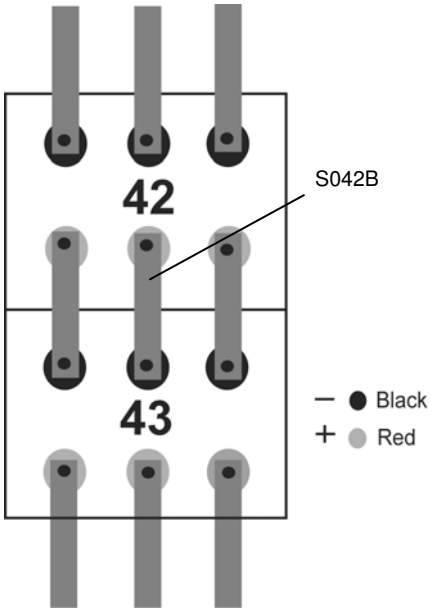
If the jars you are testing have one set of posts, the analyzer does not assign a letter. For example, “J023” means the jar has one set of posts.

Straps

The analyzer uses “S” for strap. It assigns a number to the jar that is connected to the strap. It assigns a letter that corresponds to the letter for the set of posts the strap is connecting.

For example, in the label “S042B,” “S” means you tested a strap, “142” is the number of the jar connected to the strap, and “B” is the second strap you tested for that jar. Figure 3 shows an example of this label.

Figure 3. Labels for a strap



Recommendations

Recording jar information

Because conductance values vary with such factors as age, temperature, and site conditions, record the following about the jars you are testing each time you test:

- power load
- physical condition of the jars
- site condition
- jar rating

You can use the inFORM software (Refer to "Accessories" in the Introduction.) to enter this information after you test the string and download the test results. If you do not have the inFORM software, keep this information in an area that is convenient to refer to the next time you test. If you are not sure about the condition of a jar, ask for help before testing.

Labels for jars and straps

To make sure the test results correlate to the same jar or strap each time you test, you should identify the jars and straps on the string with a label to make sure the labels the analyzer uses are the same. For information about how the analyzer labels jars and straps, refer to "Labeling jars and straps."

Preparing to test

Introduction

To prepare for testing, you need to

- Select a cable
- Attach the cable to the analyzer

Requirements

To do these procedures, you need

- Flat-tip screwdriver
- Clamp or probe cables

Selecting a cable

You can use clamp or probe cables to test the string.

To choose a cable:

1. Determine the type of testing you are doing:
   - One or a few jars
   - Jars and straps in a string

2. From Table 10, select a cable type based on the type of testing you are doing.

Table 10. Advantages of cables

Probes	Clamps
Quick testing of jars and straps in a string	Retest without reconnecting
Make contact with small posts or straps	Allow you to interact with the analyzer

3. If you choose a probe cable, do one of the following:

    - Select AUTO START from the SET PARAMETERS menu to keep both hands free to hold the probes.

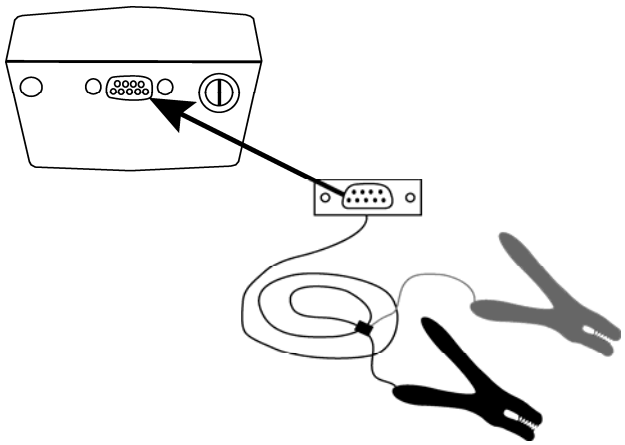
    - Have someone hold the analyzer while you connect the probes to the jars during testing.

Attaching the cable to the analyzer

To attach the cable to the analyzer:

1. Insert the DB-9 connector at the end of the cable into the cable port at the top of the analyzer. Refer to Figure 4.

Figure 4. Attaching the cable to the analyzer



2. Tighten the two screws on the sides of the DB-9 connector in the screw holes on the analyzer with a flat-tip screwdriver.

Determining a test pattern

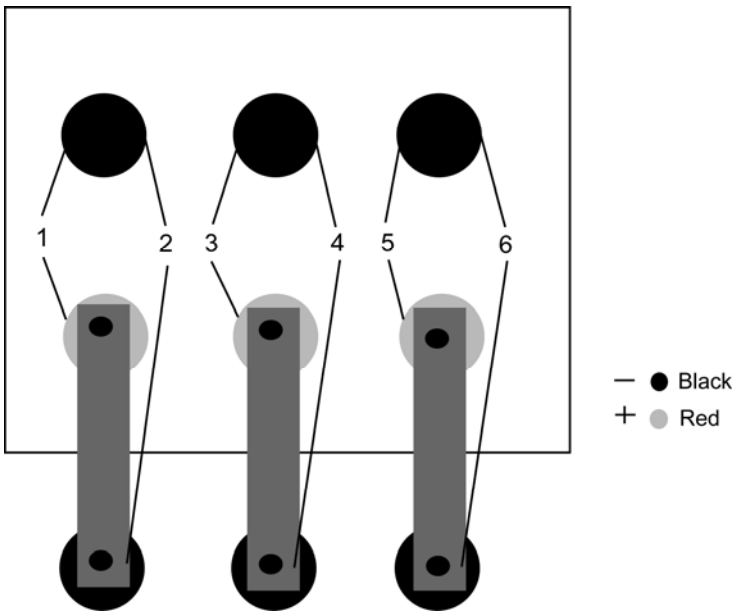
Introduction

Before you attach the cable to the jar, you should determine a pattern for testing to make testing a consistent and fluid process.

Posts and straps

You must test all posts and straps on a jar before testing the next jar in the string. You can test jar posts in any direction as long as you are consistent for each jar. However, you must test a jar post and then the strap that connects it before you test the next post on the jar. Figure 5 displays the pattern you should test posts and straps in.

Figure 5. Pattern for testing posts and straps

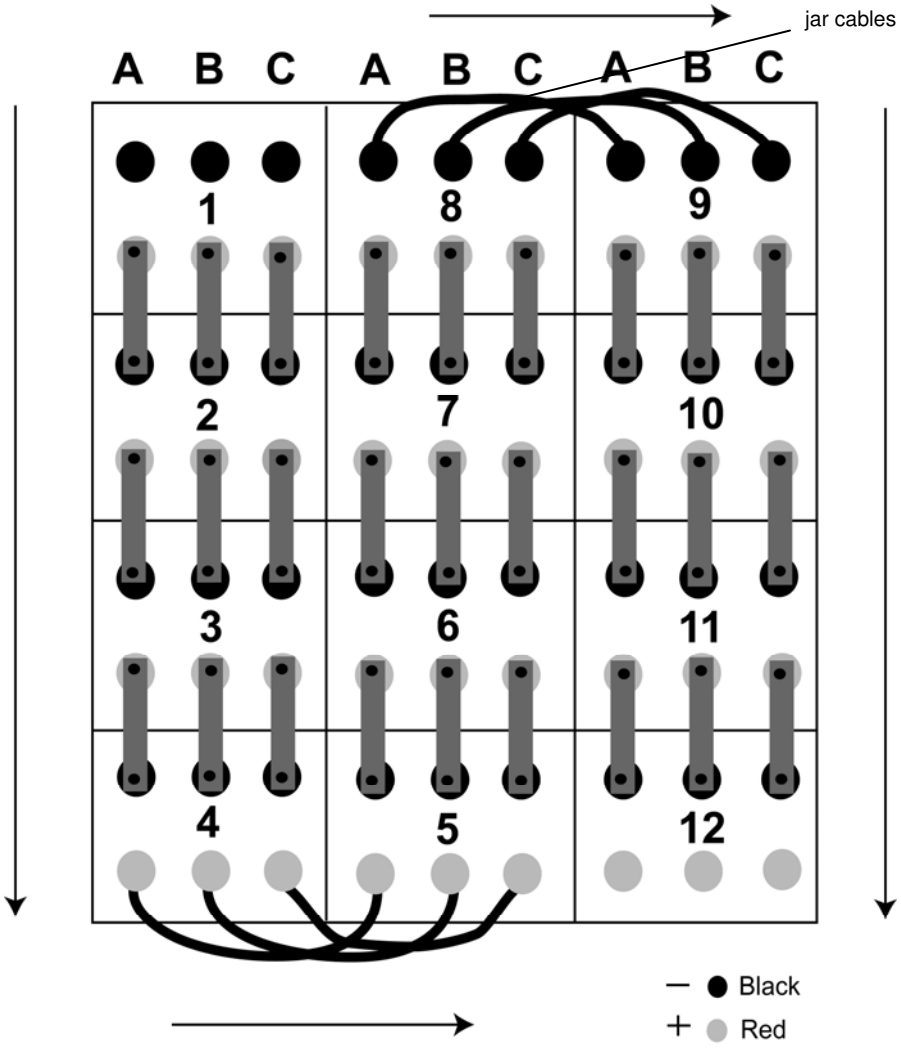


In Figure 5, step 1 in the test pattern shows the clamps/probes connection between the first set of positive and negative posts. Step 2 shows the clamps/probes connection between the negative post and the end of the strap that attaches to the next jar. Step 2 ensures that you test the entire strap and its connections. Steps 3 through 6 repeat the process.

String

First test at the jar post, then at the strap. After you test a jar's posts and straps, test the next jar in the direction in which it is connected by its straps and cables. Figure 6 is an example of a test pattern for a string. The numbers on the jars indicate the direction to test based on the connections. The straps connect the jars from top to bottom. The cables connect the jars from side to side.

Figure 6. Pattern for testing jars in a string

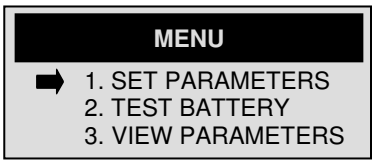


Setting the TEST BATTERY option

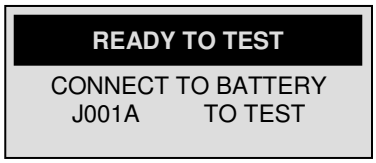
After you determine a test pattern, you need to set the analyzer to test the string.

To set the TEST BATTERY option:

1. If the analyzer has timed out, press **MENU** for the main MENU.



2. Press ▼or ▲ to scroll to TEST BATTERY and press **ENTER**.



Attaching the cables

Introduction

After you turn on the analyzer and set the test battery option, you are ready to test. To test a string, you need to attach the clamp or probe cables to the first jar in the string.

Note: The figures in this section show clamps connecting to the jar posts or straps. However, you can connect the probes in the same positions.

General rules

You should follow these guidelines when testing a jar:

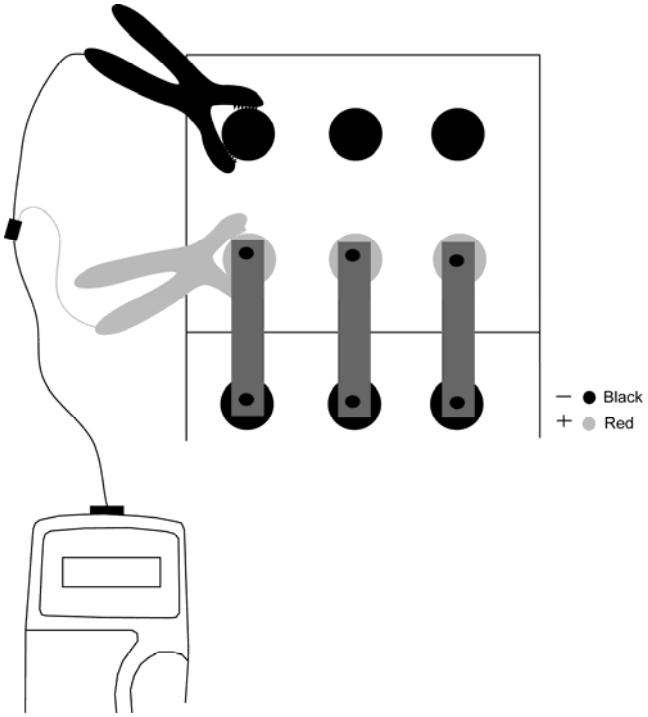
- Do not place clamps or probes on stainless steel hardware, such as bolt heads, washers, or threaded posts. Stainless steel hardware can yield low conductance values. If you have to test on stainless steel, record it in your testing records.
- The jars might have grease on the terminals and connections to prevent corrosion. You do not have to wipe off the grease before attaching the clamps or connecting the probes.
- Test each jar in the same location or position. Changing the location of the test point might vary test results.

Attaching the cable to jar posts

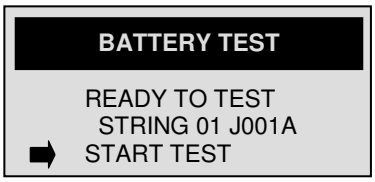
To attach the cable to the jar:

1. Attach the black clamp or probe tip to the black (–) terminal. Refer to Figure 7.
2. Attach the red clamp or probe tip to the red (+) terminal.

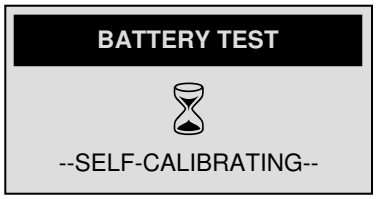
Figure 7. Attaching the cable to jar posts

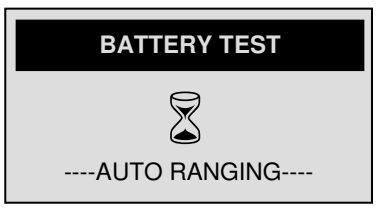


Screen display if the analyzer is in MANUAL START:



3. If you selected MANUAL START when you set values in the SET PARAMETERS menu, press **ENTER** to start testing.





The analyzer beeps twice when the test is done. If test results are under the values you set in the SET PARAMETERS and UTILITIES menus, the analyzer also beeps longer for each of the following:

- Conductance value is below the reference value and the percentage of the reference is below the values for WARN or FAIL
- The voltage level is below the LOW VOLTS value

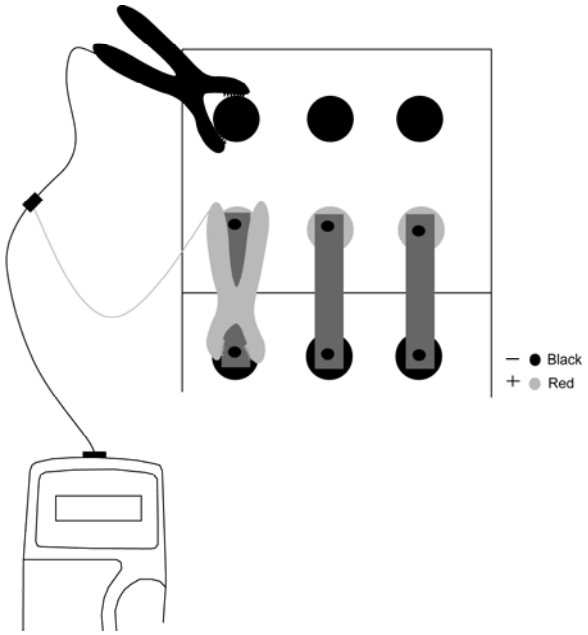
4. Choose one of the following based on the type of testing you are doing:
   - If you are testing jars only, test the next set of jar posts if you have more than one set of posts or test the next jar in the string. Refer to the test patterns in "Determining a test pattern."
   - If you are testing jars and straps, follow the steps in "Attaching the cable to a strap."

Attaching the cable to a strap

To attach the cable to a strap:

1. Remove the red clamp or probe from the red (+) terminal.
2. Attach the red clamp or probe at the end of the strap above the black (–) terminal on the next jar. Refer to Figure 8.

Figure 8. Attaching the cable to a strap



3. Choose one of the following based on the number of posts the jars have:

    - If the jar has more than one set of posts, attach the black and red clamps or probes to the next set of posts on the jar.

    - If the jar has one set of posts, test the jar connected to the jar you just tested. Follow the steps in "Attaching the cable to jar posts."

4. Repeat the steps in "Attaching the cable to jar posts" and "Attaching the cable to a strap" until you are finished testing the string.

5. Refer to "Chapter 4: Test Results" to view test results or "Retesting jar posts or straps" to retest the set of jar posts or straps.

Retesting jar posts or straps

Introduction

You can retest jar posts or straps if you get test results you think are not accurate. Factors such as operating conditions, site conditions, manufacturer changes, can vary test results. If you accept results under these conditions, your maintenance routine might not have an accurate history.

You can retest a set of jar posts or straps right after you test them or you can test the rest of the string before you retest certain jar posts or straps.

Retesting after testing the jar post or strap

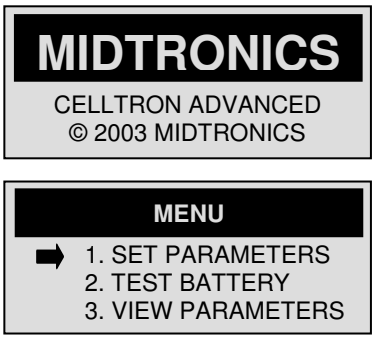
To retest a set of jar posts or a strap just after you test it, press **RETEST**. If you selected AUTO START and you are still connected to the battery, the test will begin immediately. The test results are displayed again for that jar post or strap.

Retesting after testing the string

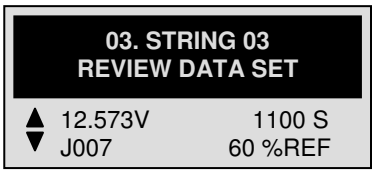
To retest a set of jar posts or a strap after you test the entire string:

1. Remove the clamps or probes from the set of jar posts or strap.

2. Press **MENU** to turn on the analyzer.



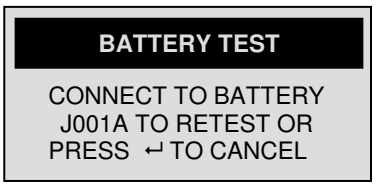
3. Press **RETEST**.



Note: For information about this screen, refer to "Interpreting test results" in Chapter 4.

4. Press ▼or ▲ to scroll through the test results to find the set of jar posts or strap you want to retest.

5. Press **RETEST**.



6. Follow the steps under "Attaching the cables" to retest the set of jar posts or strap.

Chapter 4: Test Results

After you test a string, you can:

- View test results
- Interpret test results
- Archive test results

Viewing test results

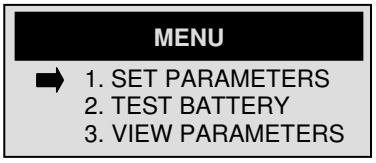
Introduction

After you test a string, the analyzer saves the test results that are displayed on the screen. You can view the test results for a string as many times as you want until you erase the values you set for the string by attempting to test the string again.

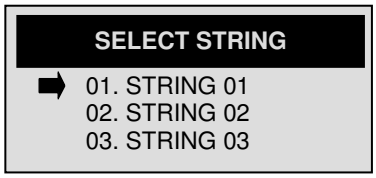
Viewing test results

To view test results:

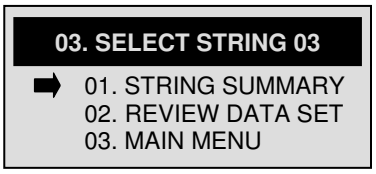
1. Press **MENU** to access the main MENU.



2. Press ▼or ▲ to scroll to VIEW RESULTS and press **ENTER**.

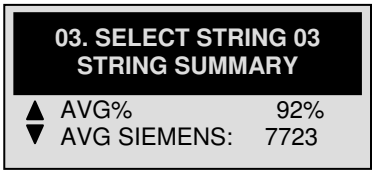


3. Press ▼or ▲ to scroll to the name of the string for which you want to view test results, and press **ENTER**.

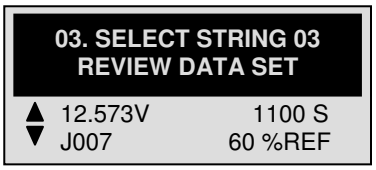


4. Choose one of the following options:

   - To view a summary of averages and high and low values, scroll to STRING SUMMARY and press **ENTER**.



   To view the test results as the analyzer displayed them when you tested the string, scroll to REVIEW DATA SET and press **ENTER.**



Interpreting test results

STRING SUMMARY

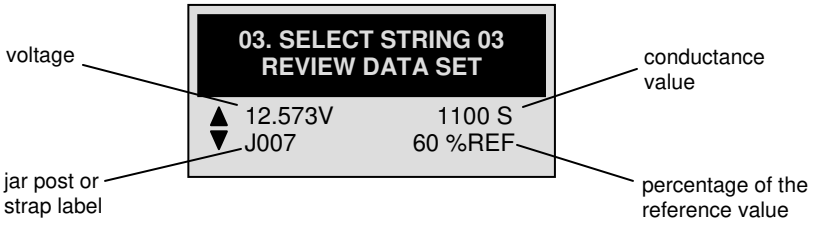
The values in the STRING SUMMARY option are a summary of values, such as averages, from all jar posts and straps you tested in the string.

For descriptions of these values, refer to "Menu options" in Chapter 1. To view all summary values in STRING SUMMARY, press ▼or ▲.

REVIEW DATA SET

The values in the REVIEW DATA SET option are the test results for all jar posts and straps you tested in the string. Figure 9 labels the values.

Figure 9. REVIEW DATA SET values



These values are displayed for each set of jar posts and straps in the order you tested them in the string. The conductance value is not displayed if you selected VOLTS ONLY from the SET PARAMETERS menu. If the voltage, conductance value, or percentage of the reference value is below the value you set in the UTILITIES MENU, a warning (?) or fail (!) symbol is displayed next to the value. To view the data for other sets of jar posts or straps, press ▼or ▲.

Using the percentages of the reference value

You can use the percentages of the reference value from STRING SUMMARY for all of the jar posts and straps to help you determine the strength of the string. Table 11 lists ranges of reference value percentages, the condition the string is in, and the action you should take.

Table 11. Strength of the string

% of the reference value	Jar strength	Action
> 80 %	Good condition	Check the jars to look for physical damage.
60–80%	Serviceable with maintenance	Check for problems and refer to • Test results or other information about the string to determine the cause of low readings • Your company maintenance procedures for jar maintenance • IEEE standard 1188-1996: Recommended Practice for Maintenance, Testing and Replacement of Valve-Regulated, Lead-Acid (VRLA) Jars for Stationary Application
< 60 %	Unserviceable	Replace the jars. Refer to your company jar replacement procedures or IEEE standard 1188-1996.

Archiving test results

Reasons

You should archive test results and keep them onsite to help you establish a routine maintenance program. Archiving this data can help you

- Compare results for changes or trends in string performance.
- Recognize when your string needs maintenance or repair.
- Provide warranty data for your supplier.

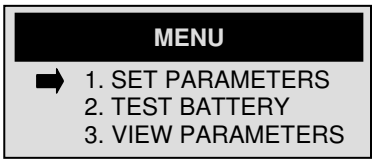
Options

You can print test results from the analyzer to the handheld printer or download test results from the analyzer to the IR receiver attached to a PC.

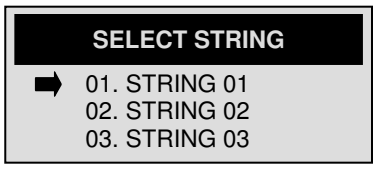
Printing test results

To print test results:

1. Turn the printer on.
2. Place the infrared light on the analyzer in front of the infrared light on the printer.
3. Press **MENU** to access the main MENU.



4. Press ▼or ▲ to scroll to PRINT RESULTS and press **ENTER**.



5. Press ▼or ▲ to scroll to the name of the string for which you want to print test results and press **ENTER**.

The printer prints the test results. The printout displays the following values for each jar post or strap:

- Voltage
- Percentage of the reference value
- Conductance value
- Temperature
- Volts per jar

For more information about the printer, refer to the printer manual.

Downloading test results

To download test results to your PC, refer to the *Infrared Receiver and Celltron inFORM™ Battery Management Software* instruction manual.

Chapter 5: Troubleshooting

The Celltron *Advanced* requires troubleshooting basic areas of the unit. The sections below describe what you need to maintain and troubleshoot your Celltron *Advanced*.

If you have problems with the printer, IR receiver, or temperature sensor, refer to their manuals or call Midtronics Customer Service.

Screen does not light during testing

Possible reasons

If the screen does not light when you test a jar, check the connection to the jar.

- Jar voltage might be too low (<1 V) to test.
- Analyzer battery might need to be recharged or replaced.
- A fuse might be blown.

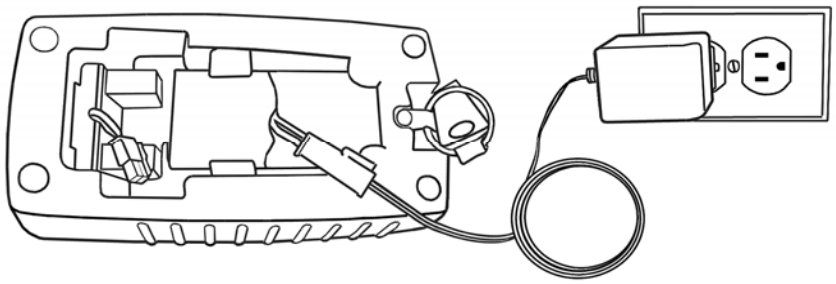
Recharging the NiMH battery pack

Recharge the analyzer battery pack if:

- The display does not power when you press the **POWER** button
- The screen displays a low-battery warning.

1. Insert the AC adapter plug into the battery pack connector as shown in Figure 9.

Figure 9. Connecting the NiMH battery charger



2. Connect the power of the AC adapter to an AC outlet.

3. When the battery pack is fully charged disconnect the adapter from the analyzer and the AC outlet.

Note: The maximum charge time is 14 to 16 hours. Do not overcharge.

Replacing a fuse

To replace a fuse:

1. Unscrew the fuse holder on the top of the analyzer. Refer to Figure 1 in Chapter 1.
2. Remove the fuse.
3. Insert a spare fuse included with the analyzer or a 5 x 20mm, 1.25 A fuse.

Probe tip is bent or stops retracting

Replacing a probe tip

To replace a probe tip:

1. Grasp the probe tip with pliers at the top of the sleeve.

   Caution: Do not grasp the sleeve that encases the tips. You can damage the probe.

2. Pull the tip straight out.
3. Grasp the replacement tip with the pliers and insert it into the sleeve.
4. Push probe tip into a soft surface, such as cardboard, until it hits the bottom of the sleeve.

Note: To obtain replacement tips, contact Midtronics Customer Service and ask for the part number C069 for the DuraProbes or C059 for the MiniProbes.

Chapter 6: Specifications

Model Number: CTA-4000 (kit), CTA-2000 (analyzer only)	***Power Requirements:*** NiMH rechargeable battery, 9.6 V, 1600 mAh
Applications: Tests individual lead acid cells or monoblocs (up to 16 volts) in any common configuration	***Environmental Operating Range:*** 0 to +40 °C, 95% relative humidity, non-condensing
Voltage Measurement Accuracy: ± 30 mVdc Range: 1.000–19.999 Vdc	***Storage Temperature:*** –20 to 82°C
Conductance: 100–19 990 siemens	***Over Voltage Protection:*** • Fused protection to 60 Vdc • Reverse polarity protected
Test Data Storage: Up to 480 consecutive test results	***Housing Material:*** Acid-resistant ABS plastic
Conductance Measurement Accuracy: ± 2% across test range	***Analyzer Dimensions:*** 9 in x 4 in x 2.5 in 230 mm x 102 mm x 65 mm
Voltmeter Resolution: 100 mVdc	***Case Dimensions:*** 19 in x 15.5 in x 5 in 750 mm x 610 mm x 200 mm
User Programmable Functions: • Preset values for over 200 battery types • Low voltage alarm setting • Low conductance warning • Low conductance failure • Day/date/time formats (USA/international) • Test mode (push button/auto start)	***Analyzer Weight:*** 1 lb / 500 gm ***Shipping Weight: CTA-4000 Test Kit*** 9.5 lb / 4 kg
Calibration: Auto-calibration prior to every test; no future calibration required	***Special Features:*** • Impact-resistance tested • Connection interfaces tested for durability and endurance • No-Ox grease petroleum product resistance
Connectorized Test Cable Options: • Dual contact clamps • Dual contact probes • Custom cables by quotation	

Patents

Made in the U.S.A. by: Midtronics, Inc., protected by one or more of the following U.S. Patents: 6,456,045. 6,441,585. 6,392,414. 6,359,441. 6,323,650 B1. 6,316,914. 6,310,481. 6,304,087. 6,172,505 B1. 6,163,156. 6,091,245. 6,051,976. 5,914,605. 5,598,098. 5,592,093. 5,572,136. 5,343,380. 5,140,269. 4,881,038. 4,816,768. Canadian Patents: 2,091,262. 1,280,164. European Patent: 0,548,266. EP: C382.13-0026. WO: C382.13-0040. China Patent: C382.13-0027. Hong Kong Patent: C382.13-0038. Japan Patents: C382.13-0041. 30006800. Other U.S. and Foreign Patents issued and pending. This product may utilize technology exclusively licensed to Midtronics, Inc. by Johnson Controls, Inc. and Motorola, Inc.

Warranty

The analyzer is warranted to be free of defects in materials and workmanship for a period of one year from date of purchase. Midtronics will, at our option, repair the unit or replace the unit with a remanufactured analyzer. This limited warranty applies only to Midtronics battery analyzers and does not cover any other equipment, static damage, water damage, over-voltage, dropping the unit or damage resulting from extraneous causes including owner misuse. Midtronics is not liable for any incidental or consequential damages for breach of this warranty. The warranty is void if owner attempts to disassemble the unit, or to modify the cable assembly.

Service

To obtain service, purchaser should contact Midtronics for a Return Authorization number, and return the unit to Midtronics freight prepaid, Attention: RA# _____. Midtronics will service the analyzer and reship, the next scheduled business day following receipt, using the same type carrier and service as received. If Midtronics determines that the failure was caused by misuse, alteration, accident, or abnormal condition of operation or handling, purchaser will be billed for the repaired product and unit will be returned freight prepaid with freight charges added to the invoice. Battery analyzers beyond the warranty period are subject to the repair charges in effect at that time. Optional remanufacturing service is available to return the analyzer to like new condition. Out of warranty repairs will carry a 3-month warranty. Remanufactured units purchased will carry a 6-month warranty.

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