

WE MAKE BATTERY TESTING EASY

User Manual for models

Manuel de l'utilisateur pour les modèles

Benutzerhandbuch für die Modelle

Gebruikershandleiding voor de volgende modellen

Manual del usuario para modelos

Manuale utente per i modelli

AA300, AA350, AA400, AA500P

.....
Digital Battery Analyzer for 12V storage batteries, cranking batteries, charging systems and starting systems.

Analyseur numérique de batterie pour batteries d'accumulateurs 12V, batteries de démarrage, systèmes de charge et systèmes de démarrage.

Digitales Batterieanalysegerät für 12V-Speicherbatterien, Starterbatterien, Ladesysteme und Startsysteme.

Digitale accutester voor 12 Volt verbruiksaccu's, startaccu's, oplaadsystemen en startsystemen.

Analizador digital de baterías de almacenamiento 12V, baterías de arranque y sistemas de carga y arranque.

Tester digitale per accumulatori a 12V, batterie di avviamento, sistemi di carica ed avviamento.

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EN

FR

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BATTERY SAFETY INFORMATION

Batteries can be very dangerous. Batteries contain toxic and caustic chemicals, and hopefully a large amount of energy. Batteries may produce explosive gasses. Please observe these basic safety guidelines when testing batteries.

1. Remove metal jewelry from your fingers and wrists before working with batteries.
2. Before touching a battery, inspect it visually for any leaking or corrosion.
3. If testing a battery in a vehicle, beware of adjacent hazards, such as moving fans and belts. Organize analyzer, cables, and clamps so they cannot interfere with any moving or hot parts.
4. Inspect the analyzer cables for damaged insulation before attaching the analyzer to the battery.
5. Do not bring a spark or flame near a battery when it is charging.
6. Clean terminals thoroughly before attaching clamps.
7. To avoid causing a spark during testing, maximize surface contact between clamp and terminal by rocking the clamp on the terminal to allow the clamp teeth to dig in.

AA SERIES TECHNICAL LIMITATIONS


The AA series models are designed to test lead acid batteries of all constructions and nearly any size with a nominal voltage of 12V. While the tester will not be harmed if connected to batteries of other chemistries (NiMh, Lilon, NiCad, etc.), the test results will not be accurate.

READING THIS MANUAL

We hope you will read every word. We also realize that time may not allow. If you are pressed for time, please read at a minimum: Battery Safety Information, Argus Analyzer Tour, and the Quick Testing Guide.

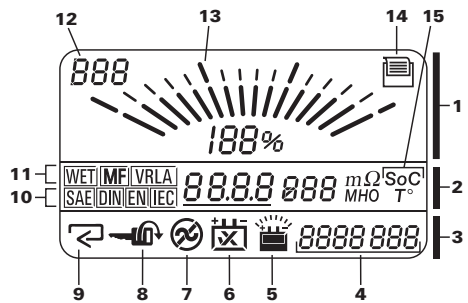
To help make this manual more useful, we use two icons to highlight particular points.

 important **information** about a test technique or interpreting results

 important **actions** you must take in the testing process

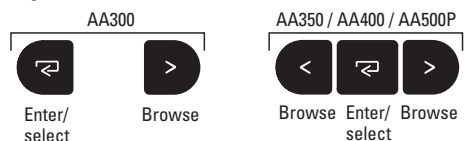
ARGUS ANALYZER TOUR

Display



- | | |
|---------------------|---|
| 1 Graphical Display | 4 Battery specification reference value |
| 2 Main Data Display | 5 Overcharge/undercharge icon |
| 3 Alarms/prompts | 6 Battery pass/fail icon |
| | 7 Alternator icon |
| | 8 'Start engine' prompt |
| | 9 'Enter' prompt |
| | 10 Rating standard |
| | 11 Battery type |
| | 12 Screen key |
| | 13 Fan display |
| | 14 Printer connected |
| | 15 Compensation mode (350, 400, 500P) |

Input keys



Navigation

Test setup: Use the > or < buttons to select values, and the ↵ button to confirm the selected value.

Testing: When prompted, use the ↵ button to initiate a test.

Viewing Results: Use the ↵ button to change test result screens. Use the > or < buttons to view different test results within a test screen.

ONE TIME SETUP

(AA500P only)

If the AA500P will be used with the optional printer, please follow the one time setup section below to set the printer language, year, date and time. If a printer will not be used, you may skip this section.

- ❗ The AA500P must be connected to a battery during setup.
- ❗ Enter the Setup mode at any time from the 'SoC' page.
- ❗ If you make a mistake, simply enter the setup mode again and enter the correct values.
- ❗ The printer does not need to be attached to the AA500P to complete this set-up process.

Setup steps

1. Change the display to show the 'SoC' page.
2. Once on the 'SoC' page, press and hold the < button for 5 seconds. The unit will beep, the display will clear and the first set up screen will be displayed. 'Prn' will show in the upper left corner of the screen.
3. At each setup page, change the corresponding value using the > or < buttons, and set the value by pressing the ↵ button.
4. When you press the (enter) button you will move to the next setup screen. After the last setup screen (Time) all setup values

will be stored and the AA500P will exit the setup mode.

The setup screens are organized in the following order. Each screen is identified at the top left of the display

1. Print language (Prn)
2. Year (Yr)
3. Date (Dat)
4. Time (ti)

Printer language selection







The AATPR10 is capable of printing a test report in 17 different languages. Unless the language is changed using this setup process, the printer output language will be ENGLISH.

1. When 'Prn' appears on the top left of the display, use the > or < buttons to change the value in the center of the display. Each number represents a language selection as shown in the table below.
2. Press the ↵ key to set the selected the value.

Lang. Code	Language	Lang. Code	Language
1	English	10	Hungarian
2	French	11	Polish
3	German	12	Turkish
4	Dutch	13	Danish
5	Spanish	14	Finnish
6	Portuguese	15	Russian
7	Italian	16	Japanese
8	Swedish	17	Chinese
9	Czech		

Set Year, Date, and Time

The AA500P contains a clock, and each printed test report will include a date and time of the test. Properly setting the year, date and time will ensure that each test report is printed with the correct date and time.

1. After selecting the printer language, the display will show 'Yr' at the top left.
2. Use the > or < buttons to change the year in the center of the display to the current year, and press the  button to set the year and move to the Date (Dat) screen.
3. Use the > or < buttons to change the day. Press the  button to set the day. Use the > or < buttons to change the month. Press the  button to set the month and move to the Time (Ti) screen.
4. Use the > or < buttons to change the hour. Press the  button to set the hour. Use the > or < buttons to change the minutes. Press the  button to set the minutes. After pressing  button you will exit from setup mode and all values will be saved.

PERFORMING A BATTERY TEST

Connection

After following the safety guidelines, connect the analyzer clamps to the battery terminals. Be sure to connect the red wire to the positive terminal and the black wire to the negative terminal. Maximize surface contact between clamp and terminal by rocking the clamp on the terminal to allow the clamp teeth to dig in.

- ✦ Always connect the analyzer terminals directly to the lead of the battery terminals. Connection to a remote post or to vehicle ground will affect the test results. Both jaws of each clamp must make contact with the lead of the battery terminal.
- ✦ Turn off all connected loads or chargers before starting a battery test.
- ⓘ Loads or chargers connected to the battery will not effect capacity testing, but will influence the measurement of state of charge and the results of the Cranking Performance Test.

When the connection to the battery is made, the analyzer will beep, the screen will become


active, and if the battery voltage is above 10V, the display backlight will turn on.

To reset the analyzer for another test, disconnect one clamp from the terminal and reconnect.

Test Setup

The Battery Life Test requires that some information be entered into the analyzer before a test is performed. Analyzer units that perform these tests will prompt for this information after the analyzer is connected to the battery.

Set Battery Type

Use the > or < buttons to change the battery type that matches the battery you are testing. A flashing box surrounding the standard shows the value chosen. Press the  button to confirm the selection.

If you do not know the type of battery that you are testing, refer to this table for more information.

Type	Description	Characteristics or Clues
WET or MF	Wet, flooded, low maintenance, or maintenance free	Make this selection if your battery has caps for inspection of the water level, is labeled as 'maintenance free', or 'low maintenance', or if the battery has a 'colored eye' for inspecting the charge level. These are the most common types of batteries for starting cars.
SLA, Sprial, VRLA or AGM	Valve regulated lead acid, spiral wound, or Absorbed Glass Matt	These batteries will likely be specially labeled or shaped. These batteries are commonly used in specialty automotive and other applications.

Set Battery Rating Standard

Use the **>** or **<** buttons to change the standard that matches the standard used to specify the battery. A flashing box surrounding the standard shows the value chosen. Press the **↵** button to confirm the selection. The analyzer will format test results according to the standard selected.

The battery rating standard is often printed on the battery or is indicated by the units used to describe the size of the battery. Refer to the table below for more information to help you select the most appropriate standard.

Standard	Units	Description	Primary Use
SAE	CCA	Cold Cranking Amps	USA, Japan Automotive
DIN	A	German Industry Norm	Germany Automotive (older)
EN	A	European Norm	Europe Automotive (newer)
IEC	A	Intl. Electrochem. Commission	Europe (older)

Set Reference Rating Value

(AA350, AA400, AA500P)

The reference rating of the battery is the Cold Cranking Amps rating of the battery as determined by the manufacturer when the battery was made. This value is generally printed on the battery, for example '530 CCA' or 'EN300A' depending upon the rating standard used to rate the battery. The analyzer will compare the reference value to the measured value to understand how much capability the battery has lost. This comparison is used to determine 'Battery Life', discussed later in this manual.

After selecting the rating standard, use the **>** or **<** buttons to set the reference rating of

the battery. Hold the **>** or **<** button to quickly change the value. Press the **↵** button to confirm the value. The reference value will be shown in the lower right of the display.

If you do not know the battery rating, or if you do not wish to enter a reference rating value, press the **↵** button to start the test procedure. In this case, a reference value will not be shown in the lower right of the display.

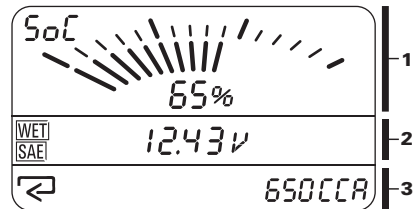
❗ If you have entered an incorrect reference value, or selected an incorrect rating standard, 'Battery Life' results will be incorrect.

TESTING

After selecting the last value in the test setup process, the testing process begins.

Basic Diagnostic Test

The first test performed is the basic battery diagnostic test. This test is performed and the results are displayed automatically upon completing test set up. The basic battery diagnostic test screen can be identified by the 'SoC' in the upper left corner of the display.



- 1 State of Charge
- 2 Battery Voltage
- 3 Alarms/Prompts


The **↵** prompt will flash in the Alerts and Prompts display. Pressing the **↵** button will initiate the Battery Life Test and change the display to the Battery Life screen.

Basic Diagnostic Test Results

State of Charge

- SoC indicates how full the battery is presently. If SoC is less than 75%, charging is recommended to improve subsequent test results.

Low Battery

- If the SoC is below 25%, the  icon will turn on. Battery life analysis, and pass/fail results will not be displayed. The battery must be charged and tested again.

Battery Voltage

- Battery voltage is the open circuit voltage across the battery terminals.

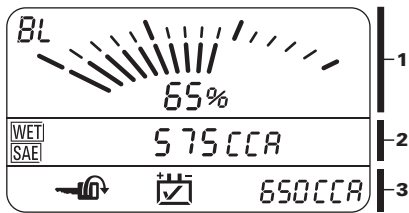
Battery Defect

- If a short circuit is detected in one or more cells, the failed battery symbol will be turned on, and the unit will beep three times. Re-test the battery to confirm the condition. If the result is confirmed, the battery should be replaced. Charging the battery is NOT recommended.

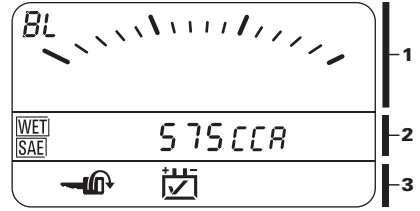
Battery Life Test

Immediately upon pressing the enter key on the Basic Diagnostics screen, the Battery Life Test is initiated, and the results are displayed.

The Battery Life screen can be identified by 'BL', the abbreviation for Battery Life, in the upper left corner of the display.




AA400, AA500P



AA300

- 1 Battery Life
- 2 Battery Performance
- 3 Alarms/Prompts

The  prompt will flash in the Alerts and Prompts screen. Starting the engine will initiate the 'Cranking Performance' test.

Battery Life Test Results

AA300:

The main data display shows the measured performance of the battery in CCA or A, based on the rating standard selected. The AA300 does not offer State of Charge or Temperature correction, so a battery life value can not be calculated automatically. If the battery being tested is fully charged and near 20C degrees, a battery life value can be manually calculated using the formula found in the section 'Interpreting Battery Life Test Results.'

AA350, AA400, AA500P:

The top of the display indicates remaining battery life as a percentage. This is a comparison of the measured performance of the battery (adjusted for low state of charge and temperature) to the manufacturer's reference value entered during the set-up.

The main data display shows the measured performance of the battery (in CCA or A, based on the rating standard selected. The value displayed is corrected for state of charge and temperature ('SoC' and 'T' are shown on right side of display.)


By pressing the right browse button, you will change the main data display to sequentially show the following:

- measured performance (CCA or A) with SoC and T correction applied
- measured performance (CCA or A) without SoC and T correction
- battery internal resistance in milliohms (AA500P only)
- battery conductance in siemens (AA500P only)

The recommendation prompts (warning, pass, fail) are determined using the SoC and T corrected performance value only.



Interpreting Battery Life Test Results

End of Life (AA350, AA400, AA500P)

- The battery has reached 'end of life' when its measured performance has dropped to 75% of the manufacturers specified reference value. When this occurs, the Battery Life = 0%, and the replace battery  indicator will turn on and the unit will beep three times. Immediate battery replacement is advised.
- ① Depending upon the application, a battery that has 0% battery life (based on the manufacturers specification) may still have enough capability to remain in service for a period of time. For cranking batteries, the subsequent 'Cranking Performance Test' will provide a more direct indication of a battery's ability to remain in service.
- ① Battery Life can be calculated using an end of life value other than 75%. $BL = (Cm - (Cr * Cu\%)) / Cr * (1 - Cu\%)$. Where Cm = measured value, Cr = reference value, Cu% = target end of life value.


~ Low Battery Life

(AA350, AA400, AA500P)





- If Battery Life is between 0% and 50%, the Low Battery Life indication,  ~  (alternating pass / fail symbol) will turn on.
- If the battery is used in an application sensitive to downtime – the battery should now be replaced proactively.

- If the battery is not in a downtime sensitive application, the battery can remain in service, but should be tested frequently. Replacing the battery soon is recommended.

Good battery (AA350, AA400, AA500P)

- If Battery Life is above 50%, the  icon will turn on. The battery can continue to be used.

+ Good battery, charge before using (AA350, AA400, AA500P)

- If the Battery Life is above 50%, but the State of Charge is below 75%, the  icon and the  icon will turn on. The battery is good and should be charged before using.
- A more accurate Battery Life result will be determined if the battery is charged and tested again.
- If the battery has been recently charged and the  and  icons are displayed, the battery may not be able to accept a full charge. Use the battery life value calculated without SoC and T correction. Alternatively, test the battery again while connected to a charger.


Charge and Test Again

- If the State of Charge was below 25% at the start of the test a Battery Life calculation is not performed, and a pass / fail result will not be shown. The battery must be charged and tested again.
- ① If a reference value was not entered during set up, Battery Life values will not appear on the display, and Battery pass / fail results will not be indicated.
- ① If SoC is 25% or less, Battery Life values will not appear on the display, and Pass / Fail results will not be indicated. The battery must be charged and tested again.

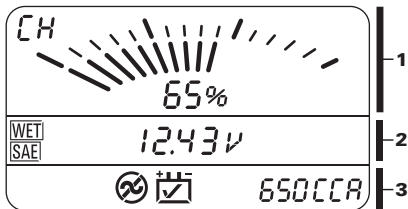
Cranking Performance Test

(AA300, AA400, AA500P)

The Cranking Performance Test is the most relevant and informative test for understanding the performance of a starting battery, and can be performed on batteries connected to their starting load. If you are bench testing a battery or testing a battery other than a starting battery, ignore the Cranking Performance Test and rely on the Battery Life Test results for battery performance information.

1. Turn off all accessory loads before starting the engine (lights, fans, radios, etc.)
2. Crank the engine when prompted by the  symbol flashing on the display.

The analyzer will automatically sense engine starting and will capture cranking performance data and display the cranking performance results. The Cranking Performance Test screen can be identified by 'CH', the abbreviation for Cranking Health, in the upper left corner of the display.



- 1 Cranking Health AA400, AA500P
- 2 Battery Voltage
- 3 Alarms/Prompts

- ① For accurate Cranking Health (CH) results, it is not necessary that the engine actually start. However, it is important that the engine be turned over completely during this test. If the engine does not fully start, a complete alternator test is not possible.

Interpreting Cranking Performance Test Results

- The Cranking Health is the actual cranking performance of the battery during that start shown as a percentage (in the graphical

section of the display.) A result of 100% Cranking Health is the starting performance expected from a properly sized, fully charged, new battery. A result of 0% Cranking Health is a level of performance that implies immanent starting failure.

- If Cranking Health (not adjusted for temperature) is below 40% during normal temperatures (10° - 30°C), expect cranking failure if the temperature becomes cold (< 0°C.) Consider replacing battery now in advance of failure.
- If battery temperature is very low, for example below -15°C, poor cranking performance and CH (not adjusted for temperature) are expected even for a healthy battery. Replacing a battery may not help in these conditions.


- ① Cranking performance and CH results are dramatically affected by temperature.
- ① Cranking performance and CH results can also be affected by a drained battery. If SoC is below 75%, recharge the battery and test again.
- ① Cranking performance and CH results will be lower the first time an engine is started after a period of rest. Cold engine and lubrication temperatures present the highest starting load. A warm engine will be easier to start and CH values will be higher. Use the lower value to inform your replace battery decision.

Crank Failure Immanent


- If CH = 0%, the failed battery symbol will be turned on and the analyzer will beep three times. Immediate battery replacement is advised.
- ① Charge and test again if there is a temporary reason for poor starting performance – such as accidental battery discharge.

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Weak Cranking Health

- If CH is between 50% and 0%, the 'Weak Cranking Health' indication,  (alternating pass / fail symbol) will turn on.
- If the battery is used in an application sensitive to downtime – the battery should proactively be replaced now.
- If the battery is not in a downtime sensitive application, the battery can remain in service, but should be tested frequently. Replacing the battery soon is recommended.


Good battery, Continue to use

- If Cranking Health is above 50%, the  icon will turn on. The battery can continue to be used.

Alternator working, voltage and ripple OK

- After starting the engine, if the alternator is operating at the correct voltage and the diode ripple is within limits, the  icon will turn on.
- Alternator output voltage is shown in the main data display.

Alternator not working

- If the alternator is not producing adequate voltage after cranking the engine, the alternator failure indicator is turned on.
 - If the alternator is producing excessive diode ripple after cranking the engine, the alternator failure indicator is turned on.
 - Alternator output voltage is shown in the main data display
-  On some vehicles, the alternator output is managed by a control system. The control system may not activate immediately after engine start. If alternator output is not apparent after engine start, turn on some accessory loads (air conditioning, cabin fan, headlights) to activate the alternator controller, and monitor the alternator icon.

Alternator Overcharge

- If the alternator output is above 15V, the overcharge indicator will turn on. The voltage regulator in the alternator should be tested. Chronic overcharge of the battery can cause premature battery failure.

REVIEWING RESULTS

All test results may be reviewed (or printed, AA500P only) until the analyzer is disconnected from the battery. Use the 'enter' button to move from one test screen to another. Use the 'browse' buttons to view different results within a test screen.

To print a test report (AA500P with connected printer only) change to the 'SoC' screen and press the > button.

Each test is distinct and analyzes a different aspect of the battery. Results are not shared from one test to another. It is not uncommon for one test to indicate a battery failure and another test to pass the battery. Your decision to replace a battery should be based on how the battery is used.

When testing starting batteries, the combination of Cranking Health and Battery Life test results can be used to help identify other battery and system problems. See the table on the following page.

BATTERY LIFE TEST RESULTS (BL)

	0%	~ 1 – 50%	51 – 100%
	<p>Replace Battery Now</p>	<ol style="list-style-type: none"> 1. Check Correct Rating Entered in tester and retest 2. Check/repair Starting System and retest 3. Check Battery Size (too small?) 4. Replace Battery Now with appropriate size battery 	<ol style="list-style-type: none"> 1. Check Correct Rating Entered in tester and retest 2. Check/repair Starting System and retest 3. Check Battery Size (too small?) 4. Replace Battery Now with appropriate size battery
	<ol style="list-style-type: none"> 1. Check Correct Rating Entered in tester and retest 2. Check battery size (too large?) 3. Replace Battery Now with appropriate size battery 	<p>Replace Battery Soon</p>	<ol style="list-style-type: none"> 1. Check Correct Rating Entered in tester and retest 2. Check/repair Starting System and retest 3. Check Battery Size (too small?) 4. Replace Battery Now with appropriate size battery
	<ol style="list-style-type: none"> 1. Check Correct Rating Entered in tester and retest 2. Check battery size (too large?) 3. Replace Battery Now with appropriate size battery 	<ol style="list-style-type: none"> 1. Check Correct Rating Entered in tester and retest 2. Check battery size (too large?) 3. Replace Battery Now with appropriate size battery 	<p>Battery OK</p>

For more information on battery testing methods and technologies, see the Argus Analyzers “Guide to Battery Testing”: <http://www.argusanalyzers.com/images/BatteryTestingHandbook.pdf>

SERVICE

(AA500P only)

The AA500P contains a small battery to run the internal date and time clock. This internal battery is designed to have a service life of 4 to 5 years. When this battery becomes low, a icon will appear on the screen whenever the display is active. The battery should be replaced with a new battery. The battery is type: CR-2032 and is commonly available.

To replace the internal battery, follow this procedure.

1. Ensure the AA500P is disconnected from any external battery.
2. Remove the 4 screws on the back of the AA500P. The screws are located under the rubber feet.
3. Carefully separate the back cover from the AA500P.
4. Using a small pointed object, remove the coin battery from the holder and install the new battery in the same orientation, plus side facing up.

5. Replace the back cover and re-install the 4 screws (do not over tighten) and rubber feet.

The internal date and clock must be re-set after replacing the battery. Please see the 'One-Time Setup' section at the beginning of this manual.

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TROUBLESHOOTING

Problem:

The analyzer doesn't turn on when connected to a battery

Cause:

- The analyzer clamps are connected to the incorrect poles of the battery.
- Battery voltage is below 6V. If battery voltage is below 6V, the analyzer will not turn on. Charge battery and retest.

Problem:

The analyzer does not provide a similar result when a test is repeated.

Cause:

- The terminals are not clean or the clamps are not making secure contact with the battery terminals. Reconnect clamps.

Problem:

The analyzer indicates a failed battery after the capacity test, but a passed battery after the cranking test.

Cause:

- A wrong value was entered as the reference value for the capacity test.
- The battery capacity has dropped below the manufacturer's specification, but still has enough power to start the particular engine.
- The battery is larger than necessary for the starting load.

Problem:

The analyzer indicates a passed battery after the capacity test, but a failed battery after the cranking test.

Cause:

- A wrong value was entered as the reference value for the capacity test.
- The battery is too small for the starting application.

If you have other troubleshooting questions, please visit the support section of our web site.

<http://www.argusanalyzers.com/support/index.htm>