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Rev. A

## **BVA-200s** **Operator's Manual**

### ***Hand Held-Accuracy with a Pulsed 120 Amp Load***

The BVA-200s is the ultimate hand-held tester. It is the auto industry's answer to portability in a professionally accurate load tester and system analyzer.

## LIMITED WARRANTY

### 12 MONTHS FROM DATE OF PURCHASE

The manufacturer warrants to the consumer that this product will be free from defects in material or workmanship for a period of twelve (12) months from the date of original purchase.

Products that fail within this 12 month warranty period will be repaired or replaced at the manufacturer's option to the consumer, when determined by the manufacturer that the product failed due to defects in material or workmanship. This warranty is limited to the repair or replacement of parts and the necessary labor by the manufacturer to effect the repair or replacement of the product. In no event shall the manufacturer be responsible for special, incidental or consequential damages or costs incurred due to the failure of this product.

Improper use, accident, water damage, abuse, unauthorized repairs or alterations voids this warranty. The manufacturer disclaims any liability or consequential damages due to breach of any written or implied warranty on its test equipment.

### WARRANTY AND SERVICE INFORMATION

Warranty claims to the manufacturer's service department must be transportation prepaid and accompanied with dated proof of purchase. This warranty applies only to the original purchaser and is non-transferable. Shipper damage incurred during return shipments is not covered under this warranty. It is the responsibility of the shipper (the customer returning the Test Equipment) to package the tester properly to prevent any damage during return shipment. Repair costs for such damages will be charged back to shipper (customer returning the Test Equipment). Protect the product By shipping in original carton or add plenty of over-pack cushioning such as crumpled up newspaper.

You have purchased one of Auto Meter's hand-held Charging System Analyzers. It is designed to test each component of a vehicle's electrical charging and starting system with speed and accuracy. If you should have any questions about your tester, testing procedures, or service see page 28 for contact information.

#### **BVA 200s**

Load Test Capacity.....	120 Amp
Battery sizes .....	100-1600 CCA
Digital Back-Lit Display .....	1" x 2.5" - 4 line x 16 character
Volt Ranges.....	Digital 0-30
Cooling.....	Vented
Leads .....	Load Amp-2 1/2 ft., 6 Gauge
Size .....	5 7/8" x 9 1/2" x 1 7/8"
Memory .....	stores the last 200 tests
Internal Battery.....	9 Volt Alkaline
<i>Optional</i> PR-12 .....	Infrared printer
<i>Optional</i> AC-24J.....	BVA-200s Carrying case only
<i>Optional</i> AC-12 .....	PC Interface adapter cord
Weight.....	4 lbs.

### **What to Expect from the BVA-200s:**

***Immediately recognize a bad battery and perform a complete charging system analysis.*** The BVA-200s is a portable full-featured menu-driven battery tester and charging system analyzer that provides quick, professional load results using Auto Meter's Pulsed Differential Load. Quick battery checks will increase charging productivity. The BVA-200s is user friendly. It tells you what to do. The stator-diode test automatically indicates open or shorted stator-diodes. It is professionally accurate. Detailed test results are displayed after each test or can be reviewed and/or printed from memory.

**Caution:** The BVA-200s grill may get hot after repeated use. Be sure to hold the unit from the side grips only. Keep hands away from the grill.

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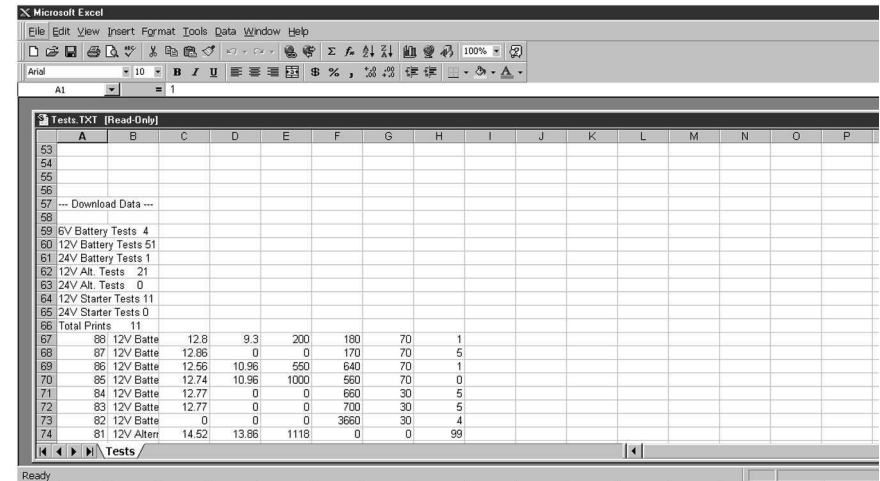
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**Note:** The BVA-200s checks and load tests 6 volt and 12 volt Batteries and tests the starter and alternator on 12 volt and 24 volt systems. The following examples illustrated are for a 12 volt system. The BVA-200s automatically identifies the appropriate voltage and displays the menu selection and instructions needed for that system.

**4. Using Microsoft Excel**

**Note:** For other software applications consult your software manual.

- Make sure menu is displayed as shown in illustration page 20 #3.
- Select "Capture Text" in the Transfer Menu.
- Type in **c:\my documents\download.txt** and then select Start.
- Press "1" to download. When finished select "Capture Text" again from the Transfer Menu then select "Stop".
- Launch Microsoft Excel and select "Open File".
- Under "Files of Type" at the bottom of the open file window select All Files (\*.\*) .
- Highlight your **download.txt** file then select "Open".
- Select "Delimited" and start at row 1 then "Next"
- Select "Comma" then "Next"
- Under Column Date Format select "General" then "Finish"
- After the file is loaded you can delete unwanted rows and format columns as desired. The following are labels for identifying the 8 columns of information.

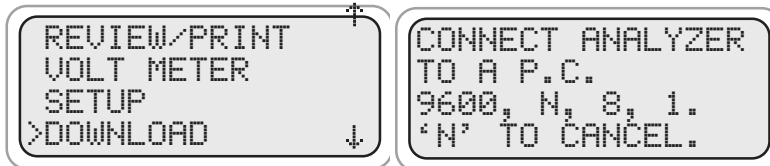


Loaded Voltage	Rated CCA	Est. CCA	TEMP	Condition: 0 = BAD 1 = GOOD	3 = GOOD NEEDS CHARGE 4 = CHARGE AND RETEST 5 = CONTINUE TESTING 6 = MARGINAL
Ending Voltage	Est. Current (12 V only)	N/A	N/A	N/A	
Loaded Voltage (12 V only)	mV Ripple * 100	Est. Output (12 V only)	N/A	N/A	

## DOWNLOAD TEST INFORMATION

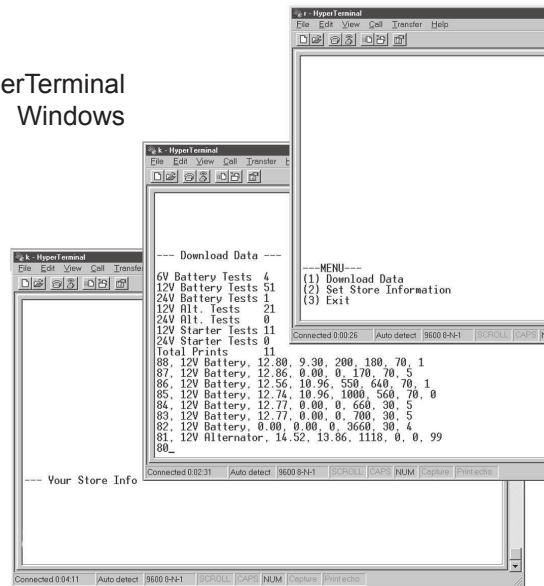
### 3. PC Screen Menu

From the BVA-200s main menu select DOWNLOAD.



- If the BVA-200s is properly connected to your PC and the LCD shows "CONNECT ANALYZER TO A PC" the menu should automatically be displayed in Hyper Terminal.
- Press 1 to download the last 200 tests.  
To save the information displayed see "Capture text into Microsoft Excel." See BVA-200s test labels below for identification.
- Press Enter to return to Menu.
- Press 2 to Exit.

HyperTerminal  
Windows



BVA-200s  
Test Labels

Battery	Test #	Test Type	Beginning Voltage
Starter	Test #	Test Type	Beginning Voltage
Alternator	Test #	Test Type	Regulation Voltage

## SAFETY

- Carefully read all operating instructions before using the BVA-200s
- Wear eye protection when working around batteries.
- Be sure each test is completed before removing load clamps to prevent arcing and potential explosion from battery gases. Never remove load clamps while testing. Keep sparks, flames, or cigarettes away from batteries.
- Keep hair, hands, and clothing as well as tester leads and cords away from moving blades and belts.
- Provide adequate ventilation to remove car exhaust.
- In extremely cold temperatures, check for frozen electrolytic fluid before applying load. Do not attempt to Load Test or charge a battery under 20 degrees. Allow the battery to warm to room temperature before testing or charging.
- **Warning!** Never attach the BVA-200s to a battery that is connected to any other tester or charging unit. Damage may result.

**Wear  
Safety  
Glasses**



### WARNING!

#### TESTING OF HYBRID VEHICLES

**DO NOT** test the starter, alternator and/or 12 volt starting battery while it is in the vehicle.

**DO NOT** remove, service or test the hybrid battery pack under any circumstances.

**Remove** the 12 volt starting battery, starter or alternator from the vehicle prior to testing.

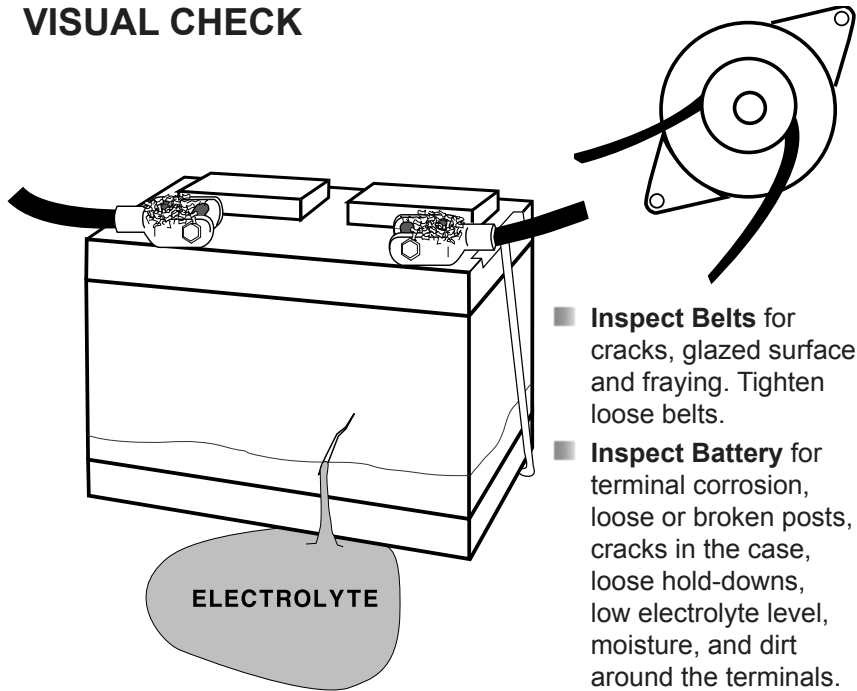
## CAUSE OF BATTERY FAILURE

- **Incorrect Application:** Wrong size battery may have inadequate cold cranking rating for original vehicle specifications.
- **Incorrect Installation:** Loose battery hold-downs cause excessive vibration, which can result in damage to the plates.
- **Improper Maintenance:** Low electrolytic fluid and corrosion on battery connections can greatly reduce battery life and affect battery performance.
- **Age of Battery:** If the date code on the battery indicates it is fairly old, the failure may be caused by natural causes.
- **Overcharging:** Overcharging caused by a high voltage regulator setting or incorrect battery charging can cause excessive gassing, heat and water loss.
- **Undercharging:** Undercharging caused by a faulty charging system or low voltage regulation can cause lead sulfate to gradually build up and crystallize on the plates greatly reducing the battery's capacity and ability to be recharged.

## INSPECTION

- Valid automotive electrical system testing depends on all the components being in good operating condition. In addition, the battery MUST have sufficient charge for testing. Carefully perform the following steps before attempting any electrical diagnosis.

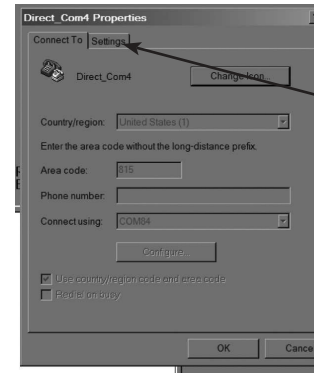
## VISUAL CHECK



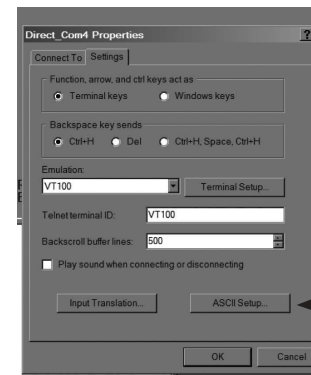
- Inspect Belts** for cracks, glazed surface and fraying. Tighten loose belts.
- Inspect Battery** for terminal corrosion, loose or broken posts, cracks in the case, loose hold-downs, low electrolyte level, moisture, and dirt around the terminals.

- Inspect Starting System.** Check starter, solenoid, and regulator for loose connections, loose mounts and frayed or cracked wires.
- Important Note:** A known defective battery must be replaced before proceeding.

## Opening Windows HyperTerminal cont.

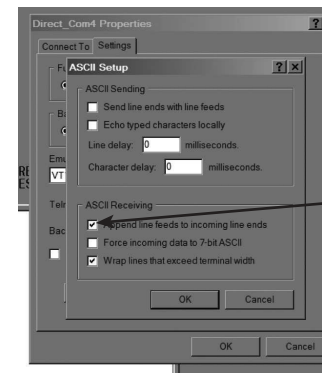


- Select file in the Hyper Terminal menu.
- Select Properties.
- The screen on left will appear.
- Click on the Settings tab.



Now this screen will appear.

- Click on the ASCII Setup button.



- Make sure the "Append Lines Feed to Incoming Line Ends" is checked.
- Click ok on both screens.



This allows you to enter & save the following company information which is included in printouts: Company name, address, city, state, zip code and phone number.

**Entry Hints**

**Note:** Address and city have a max of 23 characters.

To change the text or number press the (+) or (-) keys. If you press N at the beginning of the screen, no changes will be made. To make changes, use the (+) and (-) keys then press Y to save the change. The cursor will then go to the next character or number. If

you are done making changes but there is more text keep pressing Y until the cursor is on a blank space at the end of the lines of text. Pressing N saves the text up to the cursor position. Any text after is deleted.

**PC INTERFACE**

Using Auto Meter's optional adapter cord AC-12 insert the stereo plug into the jack on the BVA-200s, then plug the serial adapter into a free serial port on the rear of your computer.

**Note:** Most computers are configured with at least one serial port (identified as COM 1), and some have a second serial port, usually identified as (COM 2). Check your computer manual to locate and identify a serial port connector. Even if you have a physical COM port you need to make sure it is working properly before you proceed. Consult your computer manual. If your computer serial port is configured for 25 pin you will need to obtain an adapter from

your computer store. If your computer does not have an available serial port and you're planning on using *Windows HYPER Terminal* as illustrated below, you will need to buy and install an adapter card with a serial port. The BVA-200s will interface with any basic (ANSI) terminal emulation software. Most operating systems contain a program that will do this. For other operating systems consult the Manual for that system.

**2. Opening Windows HyperTerminal:**

- Select Windows "Start"
- Then "Programs"
- Then "Accessories"
- Then "Communications"
- Then "Hyper Terminal"
- Double Click Hypetrm.exe Application
- Type in a name for your connection
- Select an icon for future identification
- Select OK
- Select the COM port number you have previously identified in step 1.
- Select OK and select the following from the pull down menus:
- Bits per second 9600
- Data bits 8
- Parity None
- Stop Bits 1
- Flow Control None
- Select OK



**LCD:**

Displays menus and test results.

**KEYS:**

When each key is pressed, a beep sounds to assure contact has been made.

**On/Off Key:**

This is the manual on/off key. The display will show "Ready to Connect!" when the unit is turned on.

**Y Enter Key:**

This key selects the next menu, the cursor line item and answers 'yes' to a test progression.

**+Up Key:**

This key moves the cursor up in order to select a menu line item and increments certain displayed values.

**-Down Arrow Key:**

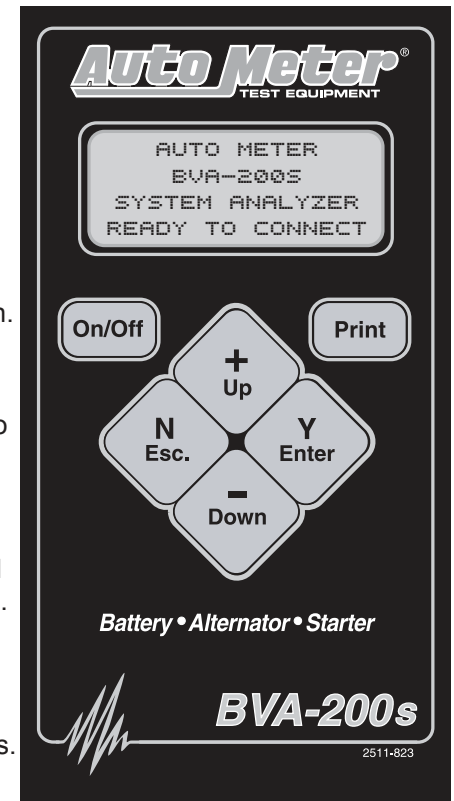
This key moves the cursor down in order to select a menu line and decrements certain displayed values.

**N Esc Key:**

This key cancels a test or progression. It also returns to the previous menu.

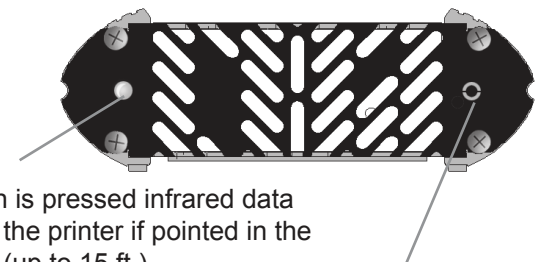
**Print Key:**

Point the BVA-200s infrared print light towards the *Optional* infrared printer receiver and press the print key. Test results will be printed.



**Infrared Print Light:**

When the print button is pressed infrared data will be transmitted to the printer if pointed in the appropriate direction (up to 15 ft.)



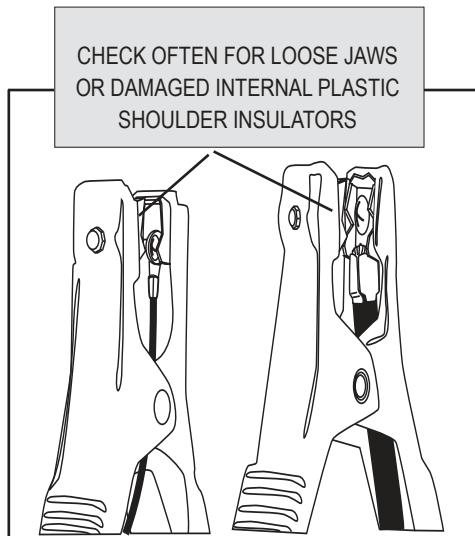
**PC Download Jack:**

Adapter cord inserted here.

## MAINTENANCE

### IMPORTANT:

- Both jaws of each clamp must firmly engage the battery terminal. The copper jaw contains the smaller gauge wire that reads the voltage and the silver jaw contains the larger conducting wire that draws the load in each test. Jaw insulation is necessary for accurate readings. Damaged clamps or loose wires will affect the readings. Keep clamps clean and in good repair.



Over time the battery clamps will need to be replaced if any of the following are indicated:

### BATTERY CLAMP REPLACEMENT

- CCA values seem to be way off.
- If there is continuity between the silver and copper jaw.
- If there is excessive damage or corrosion to the cables or clamps.

### PROCEDURE

- Disconnect the back cover.
- Disconnect the two small wires from the PCB.
- Remove the large cables from the copper busses.
- Carefully pull each wire through the grommets.
- Reverse the procedure when installing new clamps.

**Caution:** With cables pointing down, make sure the red clamp wires are attached to the left buss and the black clamp is attached to the right buss. Putting a little mineral spirits on the new cable ends will help with ease of insertion through the grommets.

### BATTERY REPLACEMENT

When the LCD indicates a low internal battery remove the back cover and replace the battery with a 9 volt Alkaline battery.

## VOLT METER

Scroll Down to Volt Meter then select **Volt Meter** by pressing Y

```
REVIEW/PRINT  ↑
>VOLT METER
SETUP
DOWNLOAD      ↓
```

Press (Y Enter)  
The following will be displayed.

```
--VOLT METER--
VOLTS:  12.24V
RIPPLE  00.0mV
```

**Note:** If the car is running and the clamps are attached to the battery a high ripple (over 50.0 mv) indicates bad diodes in the alternator.

### SETUP

Scroll Down to Setup, Select setup by pressing Y

```
REVIEW/PRINT  ↑
VOLT METER
>SETUP
DOWNLOAD      ↓
```

```
>SET LANGUAGE:
ENGLISH
USE+/-
Y TO SELECT
```

Choose between English or Spanish using the + and - keys to change the language. Press Y to select.

```
>SET TEMPERATURE
SCALE: F.
USE +/-
'Y' TO SELECT
```

Select the temperature in Fahrenheit or Centigrade.

```
>DEFAULT BATTERY
RATING: CCA
USE +/-
'Y' TO SELECT
```

Select the rating from CA, MCA, CCA, AH

```
>SET DEFAULT CCA
AS: LAST CCA.
USE +/-
Y TO SELECT
```

You can also select the default rating to be the last entered CCA value or a particular amount such as 600 CCA.

```
>USE TEST RESULT
MARGINAL BATTERY
USE +/-
Y TO SELECT
```

Battery test results default to "Marginal". To change to "Good" or "Bad" test results only, use + or - to change setting then use "y" to select this third test result option.



## PRINTING TEST RESULTS

Point the BVA-200s in the direction of the printer (in or out of the case) with the printer's IR receiver pointed in the direction of the BVA-200s. Press (Print). You should be within 15 ft. of the printer. Wait for the screen to clear before moving the BVA-200s. It takes a moment to send all the test data. The BVA-200s also operates the AC-14 printer installed in Auto Meter's XTC-150 and XTC-160 tester/charger or BVA-2100 heavy duty tester/analyzer.

- Make sure the Infrared Printer is properly set up.
- After a test is made with the BVA-200s make sure the results are displayed on the LCD.
- Point the BVA-200s in the direction of the Infrared Printer (within 15 ft.)
- Press the <Print> key and the test results will be printed.
- Depending upon the test made the printer will sometimes yield more information than the LCD.
- Wait until the printer stops printing before you press the BVA-200s print key again.

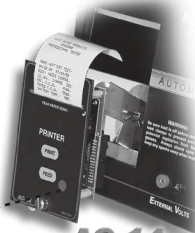
PR-12



BVA-200s



AC-14



# 1

## HOOK UP

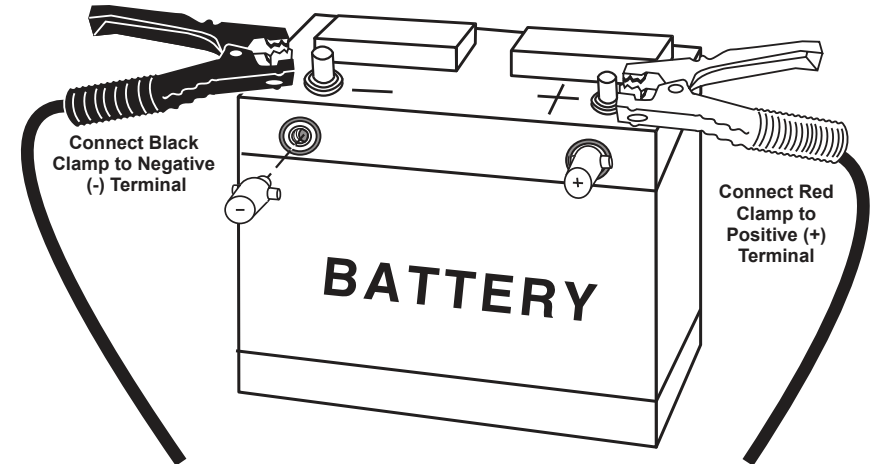
Press the On/Off button: Connect the clamps as instructed on the LCD.

```
AUTO METER  
BVA 200s  
SYSTEM ANALYZER  
READY TO CONNECT
```

```
>ENTER BATTERY  
TEMP 70F  
12.50V USE +/-  
'Y' TO CONTINUE
```

Enter the approximate battery temperature in degrees Fahrenheit then press (Y Enter).

**Note:** Go to the setup to change temp scale to centigrade. The temperature request only appears once for each battery tested. If the clamps are disconnected you will be prompted again to begin a new battery test.



**Note!** Take special care when connecting to battery side terminals. If necessary use a side post adapter to prevent thread damage. When testing dual post batteries always check the post to which the system is attached. If a load test is made from a post connection and the alternator is mounted to side terminals a battery load test can be completed, but a continuity problem may still be in the side terminals when testing the alternator.

### CONNECTION ERRORS

- If the clamps are reversed the Reversed Connection warning will be displayed on the LCD with an audible beeping.
- If one or both of the clamps are not in complete contact (both the copper and silver jaw) CHECK CONNECTIONS! will flash on the LCD.

# 2

## BATTERY TEST

```

>BATTERY TEST
  STARTER TEST
  ALTERNATOR TEST
  REVIEW/PRINT ↓
  
```

You can also select Battery Test from the main menu and then press (Y Enter).

If any of the tests (battery test, starter test, or alternator test) are selected and the clamps are not connected to the battery the following screen will appear.

```

>CONNECT CLAMPS
  TO BATTERY.
  RED+, BLACK-
  'N' TO CANCEL
  
```

Press N to cancel once the clamps are connect the test will proceed.

```

>ENTER BATTERY
  TEMP      70F
  USE +/- .
  'Y' TO CONTINUE
  
```

Note: Enter the approximate battery temperature in degrees Fahrenheit.

```

>ENTER RATED CCA
  600      USE +/- .
  12.50V
  'Y' TO BEGIN
  
```

Press the (+Up) or (-Down) key to increment or decrement to the rated CCA of the battery.

For ease of adjustment the last CCA rating will appear unless you have set a default CCA rating in the SETUP menu. Press (Y Enter) to continue test.

# 5

## OTHER MENU ITEMS

### REVIEW TESTS

Scroll Down to Review/Print

```

>REVIEW/PRINT ↑
  VOLT METER
  SETUP
  DOWNLOAD ↓
  
```

Press (Y Enter) to select Review/Print.

The last test will be displayed.

```

#44 12V CHARGE ↑
  PASS REGULATOR
  PASS DIODES
  PASS OUTPUT ↓
  
```

Press (N Esc.) to select previous test. Press (+Up) or (-Down) key to select the desired test.

### ABOUT SCREEN

```

  VOLT METER ↑
  SETUP
  DOWNLOAD
  >ABOUT ↓
  
```

Scroll down to about. Press Y to select.

```

  BVA-200s
  VERSION 8.1
  SER #: 17533
  COPYRIGHT 2010
  
```

The about screen shows the model number. Firmware revision and date.

Press any key to go back to the menu.

### OPTIONAL INFRARED PRINTER

An invisible infrared beam links the BVA-200s to the optional printer from up to 15 ft away. No connection cords are needed. For more instructions on how to operate the printer consult the printer manual.

Printer Type ----- Thermal Printing  
 Paper ----- 2.25 in x 80 ft. (58 mm x 25m) roll (included)  
 Power ----- AC adapter (included)

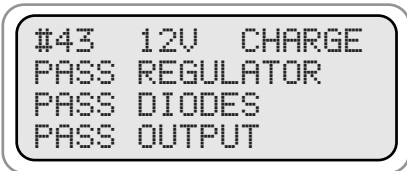
## ALTERNATOR TEST (cont.)

Allow the charging test to finish.

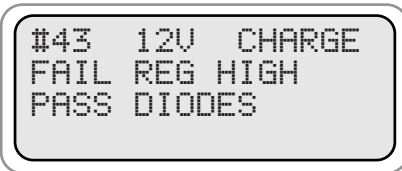


Bar at the bottom of the screen will show the tests progress.

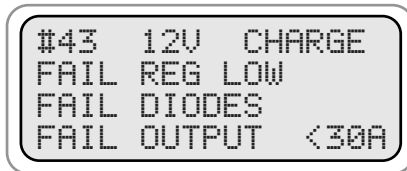
Test result will appear. The following are examples.



Alternator has GOOD regulation and GOOD output.



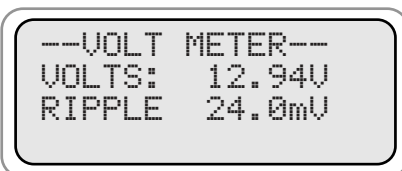
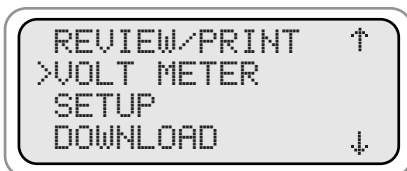
High Regulation will damage the system. Replace or repair the Alternator.



If Measured Output is displayed the output may be low for some systems.

**NOTE 1:** Use the VOLTMETER test as shown below to obtain the actual diode ripple. Typically a ripple above 50mV indicates a bad diode. If the system has a strong battery the ripple will be lower than if the system has a weak battery.

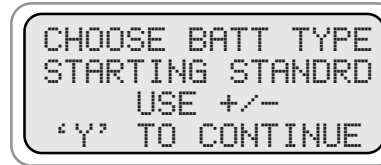
**NOTE 2:** If the LCD reads "FAIL OUTPUT" it is recommended you run the test again with the engine at fast idle. If the LCD still reads FAIL OUTPUT turn on the accessories and select the VOLTMETER test as show below.



Press (Y Enter).

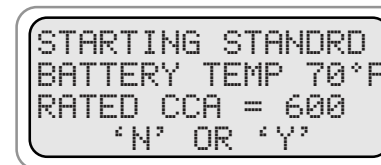
Run this test with the accessories on and the engine at fast idle. If the voltage drops below 13 volts the alternator does have LOW OUTPUT.

## BATTERY TEST (cont.)



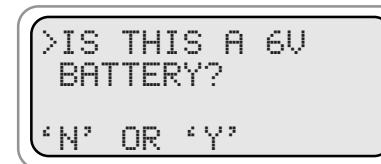
Choose the battery type you are testing using the +/- keys. The choices are:  
STARTING STANDARD  
STARTING AGM  
DEEP CYCLE AGM  
DEEP CYCLE STANDARD

## SUMMARY SCREEN

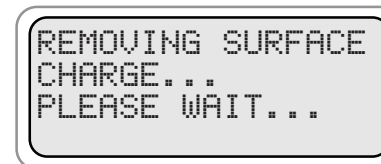


Confirm that the inputs are correct. Press "Y" is they are correct. The test will start. Press "N" to re-enter battery type, temp, and rating.

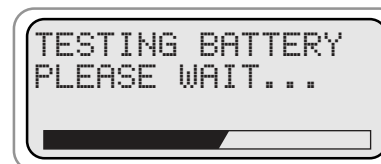
If the reading is below 7.2 Volts you will get the following:



If you answer 'No" you will later be asked if the battery has been charged.



Surface charge removed if detected.



Bar at the bottom of the screen will show the tests progress.

Wait for test results.

## BATTERY TEST (cont.)

After the Load Test is completed results similar to one of the following sample screens will appear.

```
#32 12V BATTERY  
GOOD BATTERY.  
12.84V CHG 100%  
RATED CCA 600
```

Battery passes testing. Return to service.

```
#33 12V BATTERY  
BAD BATTERY  
12.45V CHG 75%  
RATED CCA 600
```

Battery did not have sufficient remaining capacity to pass tests. Battery should be replaced immediately.

```
#34 12V BATTERY  
GOOD NEEDS CHARG  
12.24V CHG 50%  
RATED CCA 600
```

Charge battery and place into service.

```
#35 12V BATTERY  
CHARGE AND TEST  
12.06V CHG 25%  
RATED CCA 600
```

Battery did not have a sufficient charge for a complete Load Test. Charge and retest.

```
#36 12V BATTERY  
MARGINAL BATTERY  
12.80V CHG 100%  
RATED CCA 600
```

Battery passes testing but is marginal. Battery should be replaced soon. Extreme temperatures/weather may cause battery to fail.

## 4

## ALTERNATOR TEST

This test measures the output of the alternator under load conditions. This information provides the basis for further charging system tests. It also detects the presence of an open or shorted diode that causes an output loss of several amps and can cause the failure of other diodes.

### Symptomatic Check before Proceeding:

- Battery should be in good condition and charged before testing the Alternator.
- Check warning light indications.
- Check belt condition and tension.
- Check all cables and connections.
- Check the battery for corrosion and dirty terminals.
- Does the battery have a low state of charge? (See section 2 and 3)
- Make sure all electrical items are off.
- Check for Alternator noise.

## ALTERNATOR TEST

**Note:** Battery should be in good condition and charged before proceeding with this test. Press (N Esc.) to return to main menu. Select **Alternator Test** then press (Y Enter).

```
BATTERY TEST  
STARTER TEST  
>ALTERNATOR TEST  
REVIEW/PRINT ↓
```

Use the (+Up and -Down) keys to move cursor to the desired test.

```
START ENGINE.  
  
'N' TO CANCEL
```

Start engine.

The BVA-200s will allow the voltage to stabilize before starting the test.

```
>ALLOW VOLTAGE  
TO STABILIZE  
14.43V
```

Bar at the bottom of the screen will show the tests progress. Be patient it can take up to 30 seconds for the voltage to stabilize.

## STARTER TEST cont

If manufacturer's specifications are not available the chart below can be used as a general guideline. The amounts are in Amps.

4 Cyl Gas 120-250A	6 Cyl Gas Up to 250A	8 Cyl Gas Up to 250A
4 Cyl Dsl Up to 350A	6 Cyl Dsl Up to 450A	8 Cyl Dsl Up to 650A

If the results are out of specification do the following:

- Inspect the connectors for excessive voltage drop.
- Repair or replace any defective cables or connectors.
- Retest the system.

If still out of specifications: **High** Amp reading may indicate engine is out of time or a faulty starter. Some possible causes are shorted windings, bent armature, broken housing or bad bearings. Repair or replace starter as needed.

## STARTING CURRENT DRAW AND DIESEL ENGINES

There are a few points to consider in testing a starter on a diesel engine. The BVA-200s is designed to recognize any significant amount of draw; this includes glow plugs in small diesel engines. In heavy-duty applications consider computer and accessory draw.

- Make sure you start the engine quickly. The engine should be warm.
- Turn the ignition on and allow the glow plugs to heat up and click off before you run the Starting Test.
- Repeat the test in different ways and compare results.

## 3 STARTER TEST

The starter test measures the amount of current needed to crank the engine and provides the initial information to diagnose and/or further test the starting system if necessary

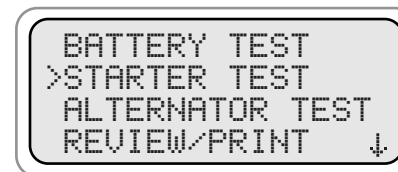
### Symptomatic Check before Proceeding:

- Check all cables and connections.
- Check the battery for corrosion and dirty terminals.
- Check starter/solenoid for visual defects.
- Check the ignition switch and any magnetic switches for loose or bad wiring, loose mounting, or connections and sticking contacts.
- Check for starter/solenoid noise. The type of noise or the lack thereof can help in diagnosing the problem.
- Does the solenoid click, but the starter does not turn? Does the starter turn, but not engage the flywheel? Is the starter sluggish?

**Note:** A remote starter switch can be used to bypass the ignition switch and crank the engine from under the hood. This way the sounds of the starter can be heard.

## STARTER TEST

Press (N Esc.) to return to main menu. Select **Starter Test** then press (Y Enter).



Use the (+Up) and (-Down) to move cursor to the desired test

Press (Y Enter) and the BVA-200s does a preliminary check.



Bar at the bottom of the screen will show the preliminary checks progress

## STARTER TEST cont

Wait for instructions before cranking engine.

```
>START ENGINE
'N' TO CANCEL
```

The BVA-200s will test the starting system. A bar at the bottom of the screen will show the tests progress.

```
TESTING STARTING,
SYSTEM
PLEASE WAIT ...
```

If the current draw is between 75A & 250A (for gas powered engines) the starting system is likely good and the following screen will appear

```
#40 12V START
CURRENT 200A
STARTING SYSTEM
- PASS -
```

If the current is under 75A a solenoid connection or corrosion problem is likely and the following screens appear.

```
#73 12V START
CURRENT 60A
STARTING SYSTEM
- FAILED - ↓
```

Press the (-Down) key to display the next screen. Press Y or N to go to the main menu.

```
CK SOLENOID ↑
CK CABLES
CK CONNECTIONS
CK FOR CORROSION ↓
```

Press the (-Down) key to display the next screen. Press the (+Up) key to move to the previous screen

```
IF ALL CK GOOD ↑
RECOMMEND BENCH
TESTING STARTER
```

## STARTER TEST cont

If the current is over 250A, the system will need more information to determine if the starter is good. The next screen will ask what type of engine you are testing.

```
WHAT TYPE ENGINE
ARE YOU TESTING
USE +/- DIESEL
'Y' .TO CONTINUE
```

Use the +/- key to choose between gas and diesel.

```
HOW MANY CYLINDERS
DOES ENGINE HAVE
USE +/- 4
'Y' TO CONTINUE
```

If the engine is diesel the system will need to know the number of cylinders the engine has. Use the +/- key to choose either 4, 6 or 8.

The chart on page 15 shows the current limits for the different engine types. If the starter is likely to have a problem the following screens will appear.

```
#74 12V STARTING
CURRENT 680A
STARTING SYSTEM
- FAILED - ↓
```

```
CK CABLES ↑
CK CONNECTIONS
CK SHORT/GROUND
CK SOLENOID ↓
```

```
IF ALL CK GOOD ↑
RECOMMEND BENCH
TESTING STARTER
```

Use the (+ Up) and (- Down) keys to scroll through the screens. Press Y or N to go to the main menu.