Battery Electrical System Analyser

User's Manual

Version: 3.0

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1.0 - Introduction

1.1-The Product:

Basic Set

Basic Set c/w Printer

As we all know battery plays a very important role in a vehicle by providing power to all the electrical components and also the initial power to get the engine started. Once the engine runs, the alternator will take over and at the same time it charges the battery. In order these power systems to perform efficiently at all times, they need to be checked regularly during service and maintenance of the vehicle.

For quick and convenient way of checking the condition of these power systems, this Battery Electrical System Analyser is designed to perform the following tasks:

1. Battery Test:

- Analyses the battery condition using microprocessor controlled testing methods without the need of fully charging it before test.
- The unit consumes very little current during testing hence the test can be repeated numerous times without worry of draining the battery and its results are highly accurate.
- Extremely safe as it does not create any sparks during clamp on and it takes less than 5 seconds to obtain the full analysed results of tested battery.

2. Grounding Test:

- Analyses the condition of the engine body grounding contact to the battery terminal with results and recommendations display after test.

3. Starter Test:

- Checks the cranking effectiveness of the battery to predict when the battery will fail to crank a vehicle basing on voltage profiles with results and recommendations display.

4. Alternator Test:

- This test checks the alternator charging condition during load at 2,000 RPM and without load at 3,000 RPM with results and recommendations display after each test.

This Analyser is maintenance free and does not require internal batteries. It powers up when connected to the battery posts during testing or through an external 12 Volts DC source for later review of the test results.

The operation is fast and simple. When hooked up to the battery posts, the displayed instructions on the screen will lead you through and a warning tone to caution you to perform the correct steps. In event that you need assistance, there is a HELP  key. It will display information about each function when selected.

Its result is consistent and repeatable and can be performed numerous times without heating up the unit. It is very safe as it does not create any sparks when connected to the battery terminals during testing on the vehicle.

After the test, the results will be stored in its memory and can be reviewed again later and printed if connected to a printer (Note: Printer is supplied separately – depending on the models).

1.2 Specifications:

Operating Voltage:	9V ~ 15V DC (max)			
Analysing Capacity (Amps):	CCA:	100 ~ 1700	EN:	100 ~ 1000
	IEC:	100 ~ 1700	DIN:	100 ~ 1000
	JIS#:	100 ~ 1700		
Battery analysing time:	Less than 5 seconds.			

Printer: **(Optional: Available in PRO Set only)**

Operating Voltage:	12V DC
Print Head Type:	Thermo
Power Adaptor:	Input: 110~240V AC 50/60Hz, Output: 12V DC, 2A
Dimensions:	181 x 110 x 90 mm

2.0 Safety Measures:

For safety reasons, read this manual thoroughly before operating the Tool.

Always refer to and follow the safety instructions and testing procedures provided by the car or equipment manufacturer. The safety messages presented below and throughout this user's manual are reminders to the operator to exercise extreme care when using this test instrument.

2.1 Safety Precautions:

⚠DANGER

When the engine is running, it produces carbon monoxide, a toxic and poisonous gas. Always operate the vehicle in a well ventilated area. Do not breathe exhaust gases – they are hazardous that can lead to death.

⚠CAUTION

To protect your eyes from propellant object such as caustic liquids, always wear safety eye protection.

⚠DANGER

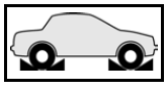
Fuel and battery vapors are highly flammable.
DO NOT SMOKE NEAR THE VEHICLE DURING TESTING.

⚠CAUTION

When engine is running, many parts (such as pulleys, coolant fan, belts, etc) turn at high speed. To avoid serious injury, always be alert and keep a safe distance from these parts.

⚠WARNING

Before starting the engine for testing or trouble shooting, always make sure the parking brakes is firmly engaged. Put the transmission in Park (automatic transmission) and Neutral (manual transmission).



⚠WARNING

Always block the drive wheels.
Never leave vehicle unattended while testing.

⚠CAUTION

Never lay tools on vehicle battery. You may short the terminals together causing harm to yourself, the tools or the battery.

⚠CAUTION

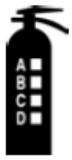
Engine parts become very hot when engine is running. To prevent severe burns, avoid contact with hot engine parts.

⚠WARNING

Do not wear loose clothing or jewelry while working on engine. Loose clothing can get caught in fan, pulleys, belts, etc. Jewelry can conduct current and can cause severe burns if comes in contact between power source and ground.

⚠CAUTION

When the engine is running, be cautious when working around the ignition coil, distributor cap, ignition wires and spark plugs. They are HIGH VOLTAGE components that can cause electrical Shock.



IMPORTANT

Always keep a fire extinguisher readily available and easily accessible in the workshop.

2.2 Other Precautions: 

- This battery analyser is meant for testing of 12 Volts batteries only.

- Its operating voltage is from 9V ~ 15V DC and should not be tested on 24V directly. It will cause damage the unit. For 12V x 2 batteries (in series or parallel), disconnect the connections and test them individually.

- Battery that has just been charged by the charger contains surface charge and it should be discharged by turning ON the Head lights for 3~5 minutes before testing.

- Always attached the analyser clips on the lead side of the battery terminal posts during testing so that it has a good contact. This will provide better and accurate results.

- Do not attach the analyser clips directly onto the steel bolt that tightened to the battery terminal posts; this may give inaccurate readings or inconsistent results. (Note: This also applies to all other battery testing methods.)

- If the battery terminal posts were oxidised or badly corroded and the connections were bad, the analyser will prompt you to check the connections. In this case, clean the terminal posts and performs testing directly on the terminal posts it-self.

- During testing on the battery whist it is still in the car, make sure the engine is OFF.

- Do not store the analyser near high humidity or temperature area. Exposing to extreme temperatures will cause damage to the unit.

3.0 Working with Batteries CAUTION

Lead-acid batteries contain a sulfuric acid electrolyte, which is a highly corrosive poison and will produce gasses when recharged and explode if ignited. It can hurt you badly.

When working with batteries, make sure you have plenty of ventilation, remove your hand jewelry, watch and wear protective eyewear (safety glasses), clothing, and exercise caution.

Do not allow battery electrolyte to mix with salt water. Even small quantities of this combination will produce chlorine gas that can KILL you!

Whenever possible, please follow the manufacturer's instructions for testing, jumping, installing, charging and equalising batteries.

- Never disconnect a battery cable from a vehicle with the engine running because the battery acts like a filter for the electrical system.

  Unfiltered [pulsating DC] electricity can damage expensive electronic components, e.g., emissions computer, radio, charging system, etc.

  Turn off all electrical switches and components; turn off the ignition before disconnecting the battery.

- For non-sealed batteries, check the electrolyte level. Make sure it is covering the plates, and it is not frozen before starting to recharge (especially during winters).

- Do not add distilled water if the electrolyte is covering the top of the plates because during the recharging process, it will warm and expand. After recharging has been completed, recheck the level.

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- Reinstall the vent caps BEFORE recharging, recharge ONLY in well-ventilated areas, and wear protective eye ware (safety goggle) .

  Do NOT smoke or cause sparks or flames while the battery is being recharged because batteries give off explosive gasses.

- If your battery is an AGM or a sealed flooded type, do NOT recharge with current ABOVE 12% of the battery's RC rating (or 20% of the ampere-hour rating).

  Gel cells should be charged over a 20-hour period and never over the manufacturer's recommended level or over 14.1 VDC.

- Follow the battery and charger manufacturer's procedures for connecting and disconnecting cables and other steps to minimize the possibility of an explosion or incorrectly charging the battery.

  You should turn the charger OFF before connecting or disconnecting cables to a battery.

  Do not wiggle the cable clamps while the battery is recharging, because a spark might occur, and this could cause an explosion. Good ventilation or a fan is recommended to disperse the gasses created by the recharging process.

- If a battery becomes hot, over 110° F (43.3° C), or violent gassing or spewing of electrolyte occurs, turn the charger off temporarily or reduce the charging rate.

- When charging the battery in the car with an external MANUAL charger, make sure that it will not damage the vehicle's electrical system or components with high voltages.

  Even if this is a remote possibility, it is best to disconnect the vehicle's battery cables from the battery BEFORE connecting the charger.

4.0 - The Battery Electrical System Analyser

4.1 – The Analyser Unit

Figure 1

4.2 - Keypad Functions:

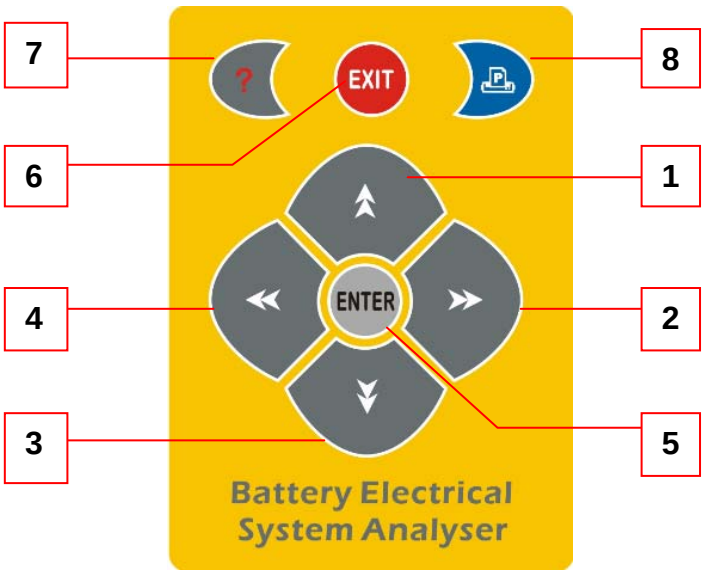

Figure 2

4.3 - Functions of Individual key:

1. 

   Use this key to scroll up to the next item OR when it is in the keying-in Battery Ratings values mode, press this key once will increase the value by step of 5 units.

2. 

   Use this key to shift the selection tab to the right item OR when it is in the keying-in Battery Ratings values mode, press this key once will increase the value by step of 100 units.

3. 

   Use this key to scroll down to the next item OR when it is in the keying-in Battery Ratings values mode, press this key once will decrease the value by step of 5 units.

4. 

   Use this key to shift the selection tab to the left item OR when it is in the keying-in Battery Ratings values mode, press this key once will decrease the value by step of 100 units.

5. 

   Press this key will get into the selected function or proceed to the next step.

6. 

   To EXIT the function, press this key once will return back to the previous screen.

7. 

   This is the HELP key. Press this key will enter into the help menu and it will explain the functions of the item you have selected in detail.

8. 

   This key will access the print command and will start printing when the 

   key is pressed.

   Note:
   Printing mode can only be activated while in "Last Test Results" menu.

5.0 – Help Key

This selection helps you to familiarise with the usage of the analyser as well as explaining the various test functions and its results. To get into this function, just

press  key at any one of the functions displayed on the menu screens as shown below (Fig.3 and Fig 4):

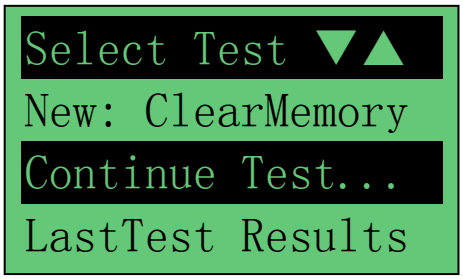

Figure 3

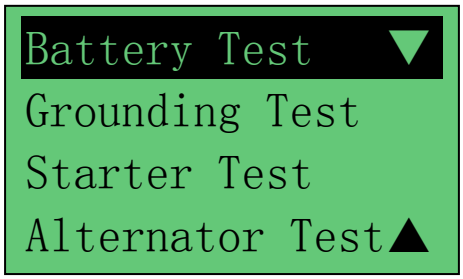

Figure 4

For Example:

If help is needed on "Battery Test", then press  key and the display will change to

as shown (Fig 5) and pressing the  key will scroll down to the next item

" Results" (Fig 6) and so forth until it reaches "LIFE".

To see the help text, press  key again on the selected item and it will display on the screen.

If you need to quit, just press 

key will go back to the main menu (Fig. 4).

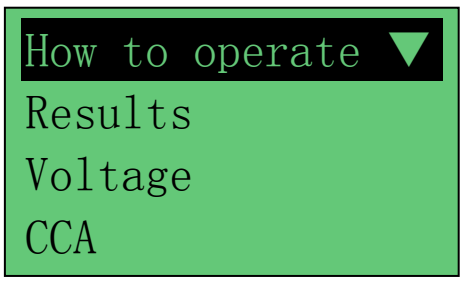

Figure 5

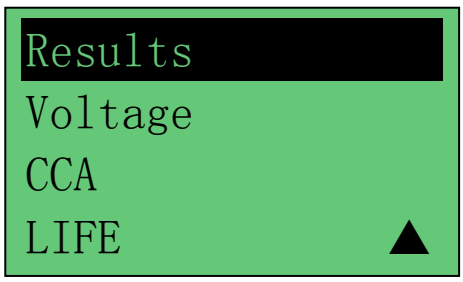

Figure 6

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Let say if you need help on "How to operate"", press  key in this selection will get into the display as shown below:

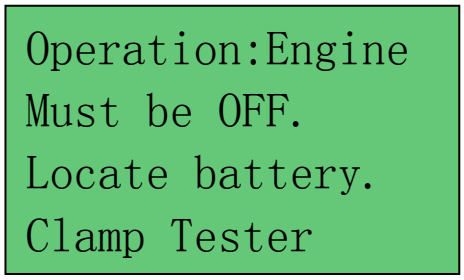

Figure 7

Press  key will scroll down to the next page to continue reading the text (Fig. 8 and Fig 9) below.

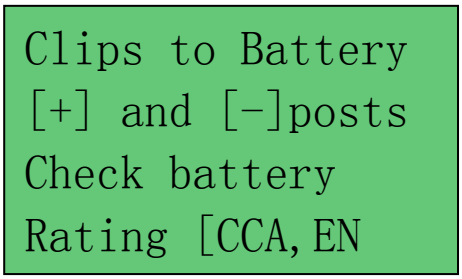

Figure 8

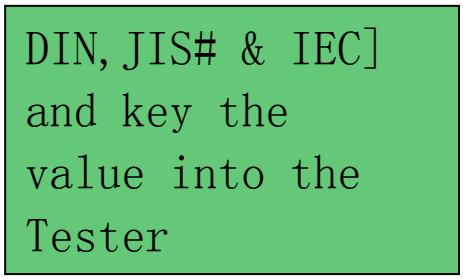

Figure 9

If you wish to continue help on rest of the item like "Results, Voltage, CCA, LIFE", press  key anytime will go back to the main menus (Fig. 5). Here just select the item you want with  key and then press  key will enter into the display screen with the explanation text.

To exit press  key twice will go back to the main menu for you to begin testing. (Fig.4)

6.0 - Battery Test

6.1 – Start Testing

This Battery Electrical System Analyser can perform tests while the battery is still fixed on the vehicle. Please make sure the engine is turned OFF while performing battery test.

1. Attach the Analyser clips onto the battery terminal posts [Red to (+) and Black to (-)] the unit will power up and lights up the LCD display screen as shown (Fig.10).

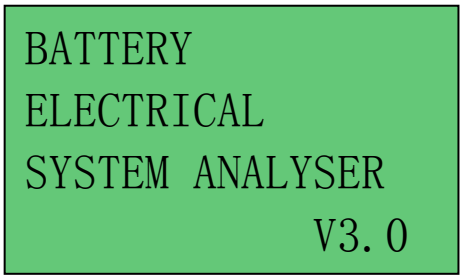

Figure 10

2. It will run through a self-test and when completed it displays the Main Menu as shown: (Fig. 11)

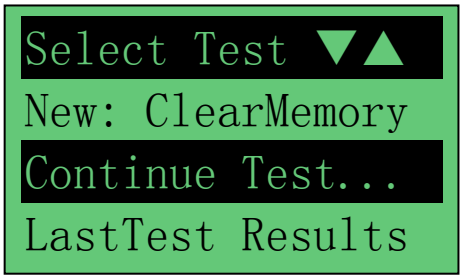

Figure 11

Here, it will let you select your choice from the Menu:

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New: Clear Memory
Selecting this item will allow the tester to clear the last tested results stored in its memory and begin a new test.

Continue… Test
Selecting this item will allow you to continue the last test on the same car from where you had stopped.

For example:
If you had done Battery Test and later you wish to do Alternator Test or Grounding Test on the same car, just select this item and it will update the results after each test in its memory so that it can be review later or to be printed out from the printer.

Last Test Results
Here it will let you review the test results of the last tested car. The results stored will always depends on the tests that you had done.

Use  or  keys to scroll for the pages during viewing.

While in this mode, you can print the results by pressing  key and the display will prompt you: (Fig. 12) if the printer is connected.

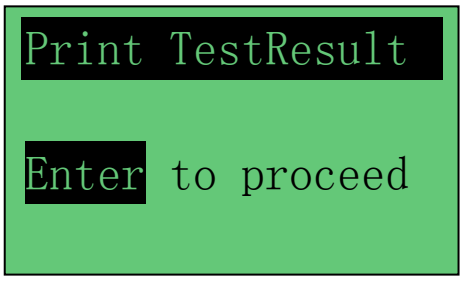


Figure 12

Press  key will activate the printer to start printing.

3. After you have made your choice, selecting "New: Clear Memory" or "Continue…Test" will proceed to the display below: (Fig. 13)

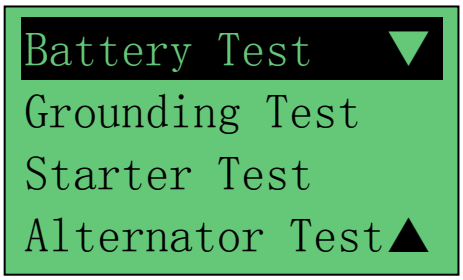


Figure 13

4. Pressing  key once will scroll down to the next item if there is a need to select it.

5. As an example (Fig.13) the selected item was on "Battery Test" and it is being highlighted.

6. Press ENTER key will proceed to do the battery testing and if it has detected any surface charge on the battery, it will start to remove and a message is shown (Fig. 14) below.

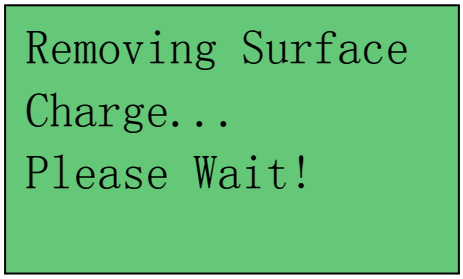


Figure 14

7. If the surface charge is too great for the analyser to handle, it will prompt you with the instructions as shown: (Fig. 15) below.

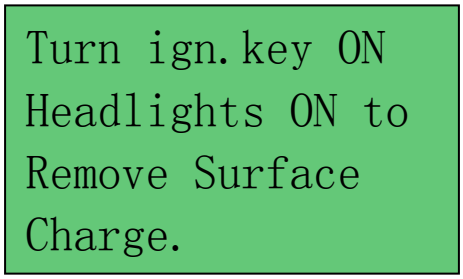


Figure 15

8. Wait until the surface charge removal had completed, the analyser will advise as follows: (Fig.16) and then press ENTER key.

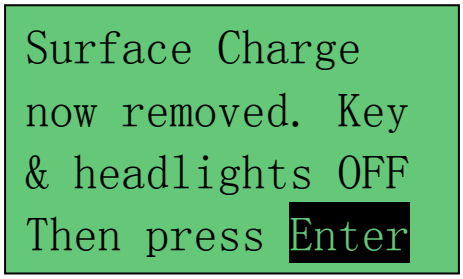


Figure 16

9. If there is no surface charge present, then it will straight away enter into "Select Rating" menu screen as shown in Fig. 17

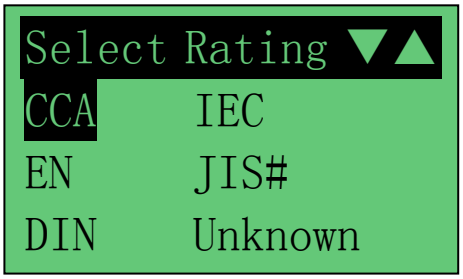
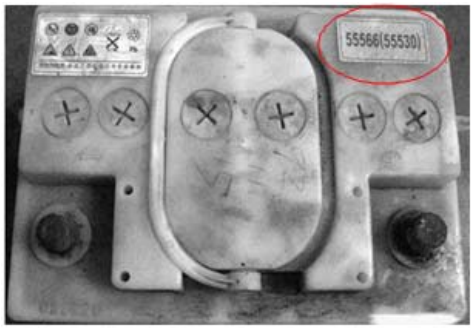
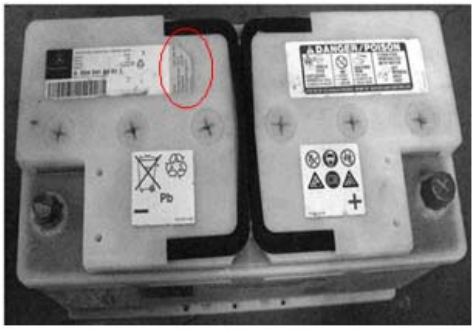


Figure 17

10. Before selecting the ratings 'CCA, EN, IEC, DIN and JIS #' from the menu, check the battery specification value. This value can be checked on the battery labels as some of the examples shown below:





If it is selected under JIS # (Japanese Industrial Standard) then the display will prompt you as shown (Fig.18) below.

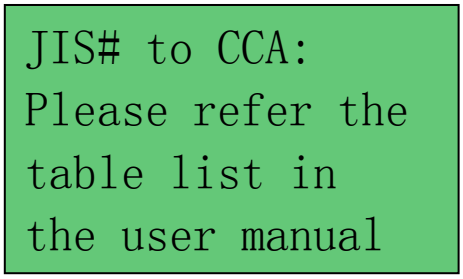


Figure 18

Refer to the battery model (example: 80D26L or NX110-5L) on the Cold Cranking Amps (CCA) Table list supplied separately or from this manual on page 24 & 25 (See example Fig.19 below.)

Battery Model (JIS#)		CCA			Battery Model (JIS#)		CCA		
NEW	OLD	WET	MF	CMF SMF	NEW	OLD	WET	MF	CMF SMF
50D20R		310	380	480					
50D20L		310	380	480	85B60K				500
50D23R	85BR60K	500			85BR60K				500
50D23L	85B60K	500			95D31R	NX120-7	620	660	850
50D24R	NT80-S6	390			95D31L	NX120-7L	620	660	850
50B24L	NT80-S6L	390			95E41R	N100	515	640	770
50D26R	50D20R		370		95E41L	N100L	515	640	770

Figure 19

Press ENTER key and the display will show: (Fig.20) below:

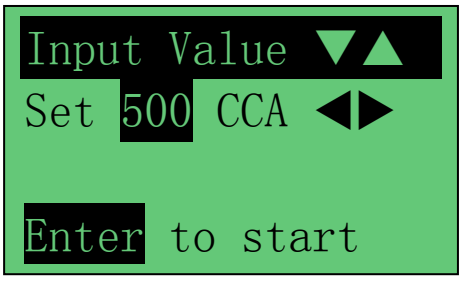


Figure 20

9. Referring to the Table list (Fig.19) under 80D26L, check the battery type: WET, MF, Sealed MF or Closed MF (CMF) as each category has different CCA ratings. For instance, if the battery is a Sealed MF (CMF) then it is rated at 630 CCA.

Note: *WET - Wet Cell Type*
MF - Maintenance Free Type
SMF - Closed or Sealed Maintenance Free

10. To enter the value 630, press  key will increase the original value of 500 (Fig.20) by step of 100 units to 600. Likewise use  key to increase the last two digits (00) to 30 by step of 5 units for each pressing. (Fig. 21)

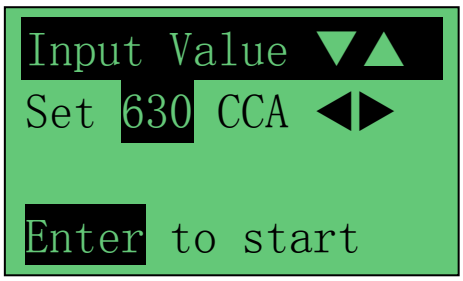


Figure 21

11. Once the CCA rating of the battery is confirmed, press  key will start the testing process. Refer to the display below (Fig. 22).

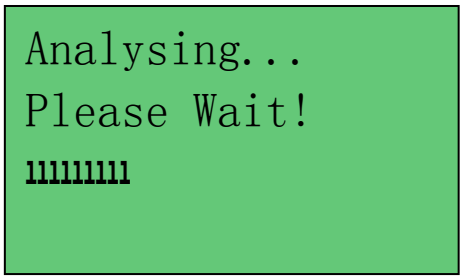


Figure 22

12. For less than 5 seconds, the results of the testing will be displayed on the LCD screen. (Fig. 23)

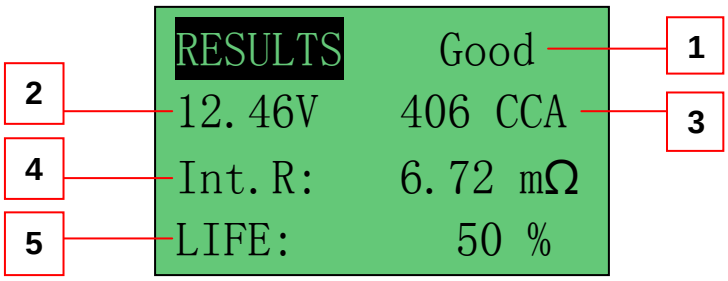


Figure 23

Interpretations of the above results:

1. **RESULTS:** **Good**
A very straight forward display of the final results basing on the evaluation of the tested condition. 'Good' indicates the battery in good condition. 'Replace' indicates that the battery needs to be replaced. If not, the battery will fail anytime without any warning.

2. **Voltage :** **12.46V**
This indicates the tested battery voltage (12.46V). It depends on the state of charge on the battery:

100% fully charged	-	13.20V
90% charged	-	12.90V
75% charged	-	12.45V

3. **CCA (Cold Cranking Amps):** **406 CCA**
CCA ratings has been used here, therefore the tested result is in 406 CCA. If other rating (DIN or JIS, or IEC, or EN) were selected, it will base on the respective rating to calculate and show the results in that selected rating.

Please take Note:

This output value (406 CCA) is related to the actual power available in the battery in relation to that battery's rating (630 CCA). On average, a new battery's CCA as measured by this tester will read 10-15 % higher than its stated rating.

As the battery ages, the CCA number measured by this tester will decrease so it reads near its rating. While this value is not the same as a CCA test, it is the best available measurement for showing a battery's current condition in relation to its rating.

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From the above example, a 630 CCA rated battery measuring 406 CCA available power does not mean that the battery would pass a CCA test at 406 CCA. The available power reading shows that the battery is not able to perform up to its rated ability (630 CCA).

In comparison to another battery when fully charged, the 630 CCA battery measuring 406 CCA is no stronger than a 400 CCA battery showing 400 CCA available power when fully charged.

The available power number is meant for comparison to its own rating. In fact, in this example the 630 CCA battery is failing to perform to its rating, while the 400 CCA battery is still working.

Basing on SAE, CCA test is a manufacturing process control test applicable only on new, fully charged batteries. It does not produce an actual value, but is a PASS / FAIL test.

It measures the discharge load, in amps, that a battery can supply for 30 seconds at 0°F/-18°C while maintaining a voltage of 1.2 volts per cell (7.2 volts per battery) or higher.

Thus, the CCA test shows the minimum power requirement for the battery as rated, which means a battery rated at 400 CCA must measure 7.2 volts or above for 30 seconds when a load of 400 amps is applied at 0°F/ -18°C.

The above methods also hold for DIN, IEC, JIS, EN basing on its individual ratings.

4. **Int. R (Internal Resistance):** **6.72mΩ**
In normal condition, the internal resistance should fall between 2.0 mΩ ~ 15.0 mΩ. As a matter of fact, the higher the battery CCA readings obtained the lower the internal resistance should be.

5. **LIFE:** **50 %**
This is an indication of the battery life expectancy in percentage. If the life falls below 45 %, the RESULT will display "Replace" and it is time to change to a new battery.

Explanation of the following terms used as shown on the LCD display:

- **CCA (Cold Cranking Amps) – most commonly used Standard.**
  CCA is a rating used in the battery industry to rate a battery's ability to start an engine in cold temperatures. This rating is the number of amperes that a new fully charged battery can delivery at 0℉ (-18℃) for 30 seconds, while maintaining a voltage of at least 7.2 Volts for a 12V battery.

  The bigger the CCA will have the greater starting power of the battery.

- **IEC (International Electrotechnical Commission) Standard.**
  IEC amperes rating require that at 0℉ (-18℃), the number of amperes that the 12V battery can deliver while maintaining a voltage of at least of 8.4 Volts for 60 seconds during cranking.

- **EN (European Norms) Standard**
  EN amperes rating require that at 0℉ (-18℃), the number of ampere that the 12V battery can deliver while maintaining a voltage of at least 6.0 Volts for 180 seconds during cranking.

- **JIS# (Japanese Industrial Standard)**
  JIS # amperes' rating is based on Ampere Hours and is calculated using 20 hours rating. In this manual, it is using CCA ratings reference table list provided basing on the JIS model number (See page 24 & 25).

- **DIN (Deutsches Institut für Normung)** - German Institute for Standardization.
  Basing on DIN , the rating requires that at 0℉ (-18℃), the 12V battery is able to deliver the number of amperes while maintaining a voltage of at least of 9.0 Volts for 30 seconds and 8.0 Volts for 150 seconds during cranking.

- **Unknown**
  If you are not sure which ratings (CCA, EN, IEC, JIS or DIN) that the battery is based on then choose this setting. It will show the battery's Voltage, CCA and the Internal Resistance (mΩ) only. This selection can also be used to test 12V - Deep Cycle Batteries.
  An example of the results display is shown below: (Fig.24)

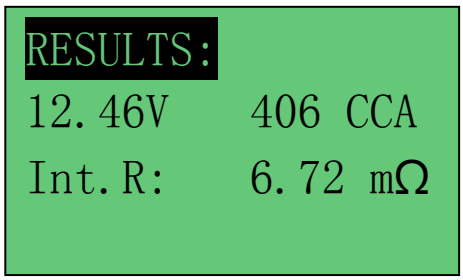

Figure 24

To determine the condition of the tested Deep Cycle Batteries, refer the **Voltage** reading (*should not fall below 12.6V when fully charged*) and the Internal Resistance [**Int.R**] (*should not more 15mΩ*) readings.

Batteries that had been left idle for long periods can still be tested with this analyser. To perform the test, just clamp the analyser clips onto the battery terminals and it will display the screen (Fig.25) as shown if its voltage falls below the normal 12 volts and a buzzing sound is heard.

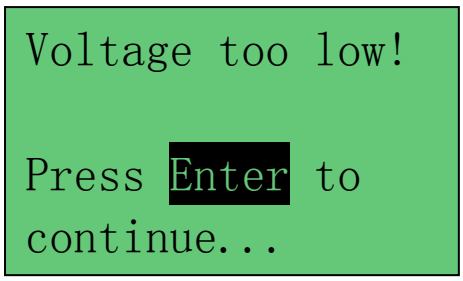

Figure 25

Press ENTER key to continue and the display will show: (Fig.26)

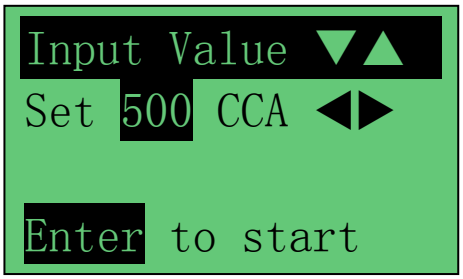

Figure 26

Check the battery ratings and enter it as described in step 10 and 11 (page 19) and the results will show as an example below: (Fig. 27)

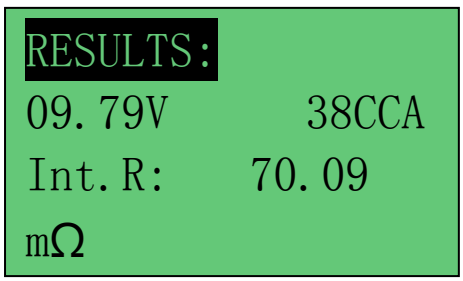

Figure 27

You will notice that there is no indication of message (Good or Replace) on the RESULTS instead on LIFE; it indicates "Charge > Test". It means that the battery has to be fully charged and repeat the test again.

13. Pressing the EXIT key at any moment will exit and return back to the previous screen.

7.0 – Battery Ratings Charts

7.1 Japanese Industrial Standard (JIS#) CCA Ratings

Battery Model (JIS#)		CCA Rating			Battery Model (JIS#)		CCA Rating		
NEW	OLD	WET	MF	CMF SMF	NEW	OLD	WET	MF	CMF SMF
26A17R		200			34B17L		280		
26A17L		200			34B19R	NS40ZA	270	325	400
26A19R	12N24-4	200	220	264	34B19L	NS40ZAL	270	325	400
26A19L	12N24-3	200	220	264	34B19RS	NS40ZAS	270	325	400
28A19R	NT50-N24	250			34B19LS	NS40ZALS	270	325	400
28A19L	NT50-N24L	250			36B20R	NS40Z	275	300	360
32A19R	NX60-N24	270	295		36B20L	NS40ZL	275	300	360
32A19L	NX60-N24L	270	295		36B20RS	NS40ZS	275	300	360
26A17R		200			36B20LS	NS40ZLS	275	300	360
26B17L		200			38B20R	NX60-N24	330	340	410
28B17R		245			38B20RS	NT60-N24S	330	340	410
28B17L		245			38B20L	NX60-24L	330	340	410
28B19R	NS40S	245			38B20LS	NX60-24LS	330	340	410
28B19L	NS40LS	245			40B20L		330		
32B20R	NS40	270			40B20R		330		
32B20L	NS40L	270			42B20L		330		
32C24R	N40	240	325	400	42B20RS		330		
32C24L	N40L	240	325	400	42B20LS		330		
34B17R		280			46B24L	NS60L	325	360	420

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Battery Model (JIS#)		CCA Ratings			Battery Model (JIS#)		CCA Ratings		
NEW	OLD	WET	MF	CMF SMF	NEW	OLD	WET	MF	CMF SMF
46B24R	NS60	325	369	420	75D31L	N70ZL	450	540	725
46B24RS	NS60S	325	360	420	80D23R		580		
46B24LS	NS60LS	325	360	420	80D23L		580		
46B26R	NS60	360			80D26R	NX110-5	580	580	630
46B26L		360			80D26L	NX110-5L	580	580	630
46B26RS		360			85B60K				500
46B26LS		360			85BR60K				500
48D26R	N50	280	360	420	95D31R	NX120-7	620	660	850
48D26L	N50L	280	360	420	95D31L	NX120-7L	620	660	850
50B24L	NT80-S6L	390			95E41R	N100	515	640	770
50B24R	NT80-S6	390			95E41L	N100L	515	640	770
50D20R		310	380	480	105E41R	N100Z	580	720	880
50D20L		310	380	480	105E41L	N100ZL	580	720	880
50D23R	85BR60K	500			105F51R	N100Z	580		
50D23L	85B60K	500			105F51	N100ZL	580		
50D26R	50D20R		370		115E41R	NS120	650	800	960
50D26L	50D20L		370		115E41L	NS120L	650	800	960
55B24R	NX100-S6	435	420	500	115F51R	N120	650	800	960
55B24L	NX100-S6L	435	420	500	115F51L	N120L	650	800	960
55B24RS	NT80-S6S	430	420	500	130E41R	NX200-10	800		
55B24LS	NT80-S6LS	430	420	500	130E41L	NX200-10L	800		
55D23R		355	480	500	130F51R		800		
55D23L		355	480	500	130F51L		800		
55D26L	N50ZL	350	440	525	145F51R	NS150	780	920	
55D26R	N50Z	350	440	525	145F51L	NS150L	780	920	
60D23R		520			145G51R	N150	780	900	1100
60D23L		520			150F51R	NT200-12	640		
65D23R		420	540	580	150F51L	NT200-12L	640		
65D23L		420	540	580	165G51R	NS200	935	980	
65D26R	NS70	415	520	625	165G51L	NS200L	935	980	
65D26R	NS70L	415	520	625	170F51R	NX250-12	1045		
65D31R	N70	390	520	630	170F51L	NX250-12L	1045		
65D31L	N70L	390	520	630	180G51R	NT250-15	1090		
70D23R	35-60	490	540	580	180G51L	NT250-15L	1090		
70D23L	25-60	490	540	580	195G51R	NX300-51	1145		
75D23R		500	520	580	195G51L	NX300-51L	1145		
75D23L		500	520	580	190H52R	N200	925	1100	1300
75D26R	F100-5	490			190H52L	N200L	925	1100	1300
75D26L	F100-5L	490			245H52R	NX400-20	1530	1250	
75D31R	N70Z	450	540	735	245H52L	NX400-20L	1530	1250	

7.2 DIN & EN Standards Rating Chart

Battery Model No.	Amps		Battery Model No.	Amps	
	DIN	EN		DIN	EN
52805	180	240	55057	320	540
52815	180	240	55068	220	390
53517	175	300	55069	220	390
53520	150	240	55218	255	420
53521	150	240	55414	265	450
53522	150	240	55415	265	450
53621	175	300	55421	265	450
53624	175	300	55422	265	450
53625	175	300	55423	300	510
53638	175	300	55427	300	510
53646	175	300	55428	300	510
53653	175	300	55457	265	450
53836	175	300	55529	220	360
53890	175	300	55530	255	420
54038	175	300	55531	255	420
54039	175	300	55545	255	420
54232	175	300	55548	255	420
54312	210	360	55552	255	420
54313	220	330	55559	255	420
54317	210	360	55559L	255	420
54324	220	330	55563	255	420
54434	210	360	55564	255	420
54437	210	360	55565	255	420
54449	210	360	55565L	255	420
54459	210	360	55566	265	450
54459L	210	360	55567	255	420
54464	220	330	55811	360	540
54465	210	360	56012	230	420
54466	210	360	56048	250	390
54469	210	360	56049	250	390
54519	210	360	56068	250	390
54523	220	300	56069	250	390
54524	220	300	56073	250	390
54533	210	360	56077	300	510
54537	190	300	56091	360	540
54545	190	300	56092	300	510
54551	220	300	56111	300	540
54577	220	300	56216	300	510
54578	220	300	56218	300	510
54579	220	300	56219	300	510
54580	220	300	56220	280	510
54584	220	300	56225	300	510
54590	210	330	56311	300	510
54612	210	360	56312	300	510
54801	190	300	56318	300	510
54827	240	360	56322	300	510
55040	265	450	56323	300	510
55041	220	360	56420	300	510
55042	220	360	56530	300	510
55044	265	450	56618	300	510
55046	300	510	56619	300	510
55048	300	540	56620	300	510
55056	320	540	56633	300	510

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Battery Model No.	Amps		Battery Model No.	Amps	
	DIN	EN		DIN	EN
56638	300	510	**60026**	440	720
56641	300	510	**60038**	500	760
55647	300	510	**60044**	500	760
56821	315	540	**60527**	410	680
56820	315	540	**60528**	410	680
56828	315	540	**61017**	400	680
57024	315	540	**61018**	400	680
57029	315	540	**61023**	450	760
57113	400	680	**61047**	450	760
57114	400	680	**61048**	450	760
57217	420	720	**62034**	420	680
57218	420	720	**62038**	420	680
57219	420	720	**62045**	420	680
57220	420	720	**62529**	450	760
57230	380	640	**63013**	470	680
57412	400	680	**63545**	420	680
57412L	400	680	**63549**	420	680
57413	400	680	**64020**	325	550
57512	350	570	**64028**	520	760
57513	350	570	**64035**	520	760
57531	350	570	**64036**	460	760
58424	450	760	**64317**	540	900
58513	320	540	**64318**	540	900
58514	320	540	**64323**	540	900
58515	450	760	**65513**	540	900
58521	320	540	**65514**	570	900
58522	320	540	**65515**	570	900
58527	395	640	**67043**	600	1000
58811	440	720	**67045**	600	1000
58815	395	640	**68021**	570	950
58820	395	640	**68032**	600	1000
58821	395	640	**68034**	600	1000
58827	400	640	**68040**	570	950
58833	400	680	**70027**	630	1050
58838	400	680	**70029**	630	1050
59017	360	600	**70036**	570	950
59018	360	600	**70038**	630	1050
59040	360	600	**71014**	700	1150
59215	450	760	**71015**	700	1150
59218	290	480	**72512**	680	1150
59219	290	480	**73011**	740	1200
59226	450	760	**88038**	175	300
59514	320	540	**88046**	210	360
59518	395	640	**88056**	265	450
59519	395	640	**88066**	300	510
59615	360	600	**88156**	320	540
59616	360	600	**88074**	400	680
60018	250	410	**88092**	400	680
60019	250	410			

7.3 YUASA Battery Rating Chart

Battery Model No.	CCA	Battery Model No.	CCA
24-500	500	75A-72	630
34-6MF	500	75-660	660
34-60	525	78A-72	670
34-610MF	610	78-710	710
34-710	710	GR40R-MF	700
35-580	580	GR40R-CMF	820
41-580	580	GTH40	277
55D23R	522	GTH40L	276
58-6MF	530	GTH40S	275
58-60	525	GT50L	356
58-530	530	GTH55DL	356
65-70	700	GTH60L	325
65-730	730	GTH60DL	325
65-900	850	GTH75DL	520
74-60	525	GTH75DR	521
75-6MF	615	GR96R-MF	500
75-72	500	GR96R-CMF	580

7.4 Rough CCA Guide

Given below is a rough CCA ratings guide for any unknown battery model basing on the capacity of the vehicle:

Vehicle Capacity	*Approximate Battery CCA Rating*
1200 ~ 1600 cc	350 CCA
1600 ~ 2000 cc	500 CCA
2000 ~ 3000 cc	650 CCA
3000 cc and above	750 CCA
M. Benz over 3000 cc	760 CCA

8.0 – Grounding Test

The engine body and the vehicle chassis are always connected to the battery negative terminal to provide the electrical return path (grounding) for all the electrical components. Due to the surrounding environmental effect, the surface contacts of these joints or connections of these circuits will subject to oxidation and corrosion in a matter of time rendering them to have high resistance in it. One typical example is the connection at the battery terminals where oxidation and corrosion takes place very often. If these contacts were no good then it will pose a lot of electrical problems to the vehicle.

To check the grounding condition, this Analyser will measure the resistance from the engine body contact to the battery terminal then it will display the results and the recommendations.

8.1 – Start Testing

1. Make sure that the engine is switched OFF. Attach the clips onto the battery terminal posts and the analyser will power up and lights up the LCD display screen as shown (Fig.28).

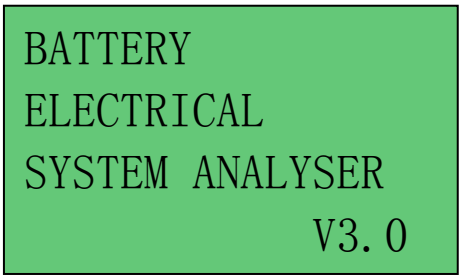


Figure 28

2. It will run through a self-test and when completed it displays the Main Menu as shown: (Fig. 29)

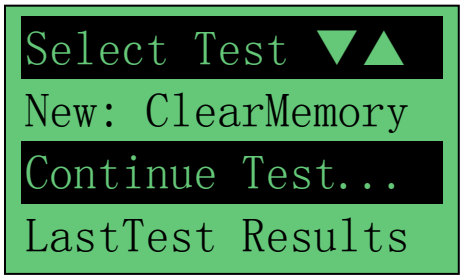


Figure 29

3. After you have made your choice, selecting "New: Clear Memory" or "Continue…Test" will proceed to the display below: (Fig. 30)

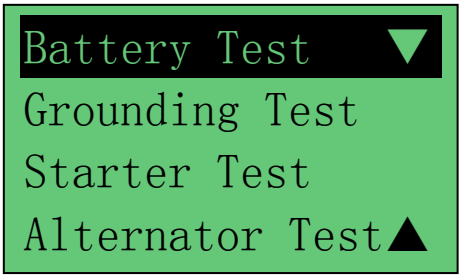


Figure 30

4. Pressing  key once will scroll down to the 'Grounding Test' (Fig.31)

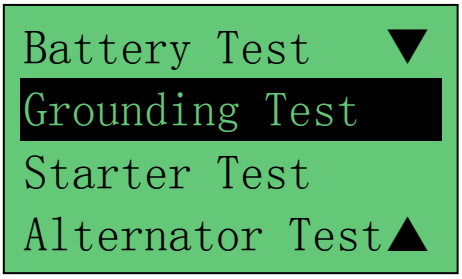


Figure 31

5. Press 

key will proceed to the display as follows: (Fig. 32)

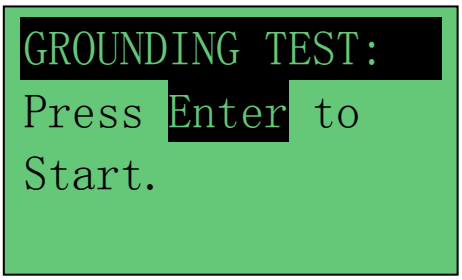


Figure 32

6. Press ENTER key again and it will starts analyzing (Fig. 33)

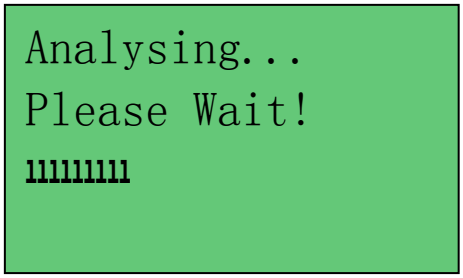


Figure 33

7. Once it has finished analysing, it will prompt you with an instruction (Fig. 34) stating that you have should unclamp the black battery clip from the battery negative terminal and clamp it to the engine body within 20 seconds time limit.

Note:

Before removing the black clamp from the battery terminal, try look for a position that the clamp can hold securely at the engine body in order to get a good reading.

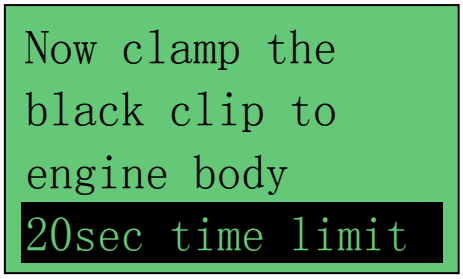


Figure 34

7. The moment you remove the Black clip from the battery terminal, the analyser screen display will switched OFF until you have clamp it to the engine body.

   During the procedure, your time limit is within 20 seconds to establish the contact to the engine body failing which the data obtained earlier will be lost. Then you need to repeat the whole testing procedures again from steps 2. page 29.

8. Once the Black clip is clamped onto the engine body, the Analyser display will light up as shown. (Fig. 35)

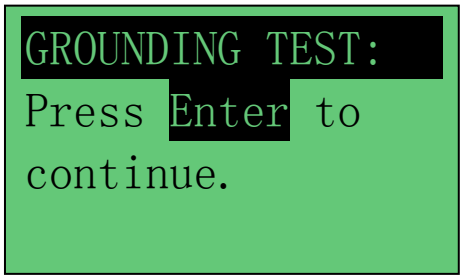


Figure 35

9. Now you need to press ENTER key to proceed and the display will show as follows (Figure 36).

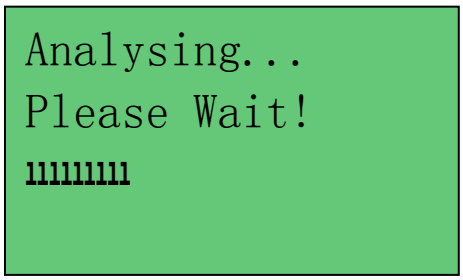


Figure 36

10. If the measured resistance reading is within limits, then it will display as follows (Fig. 37)

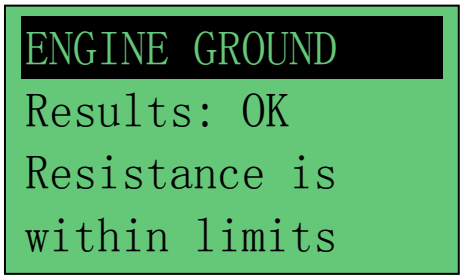


Figure 37

11. If the measured resistance reading has gone beyond the limits, then it will display the screen as follows (Fig. 38).

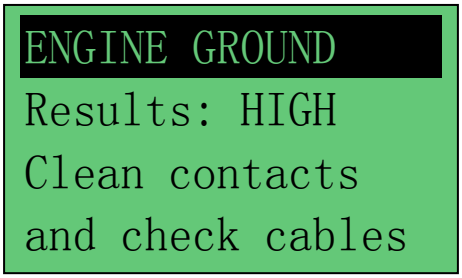


Figure 38

Note:

The above indicates that the ground contact from the engine body to the battery is bad. Check for rusted or corroded point of contacts. If found, dismantle it for cleaning or replace before fixing back. Repeat the test again after fixing.

Another thing is that if you suspect that the result is in question, you may conduct the test with the Black clip clamp at different locations in the engine.

12. If you did not follow the right procedures during the testing, it will display the results as follows (Fig. 39) below:

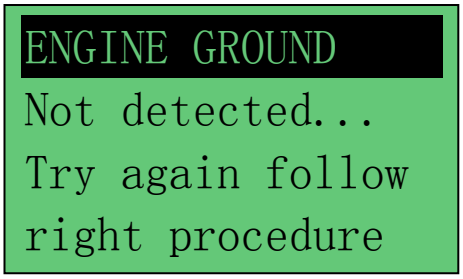


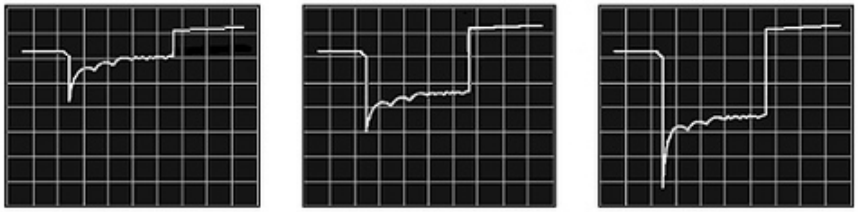
Figure 39

13. To exit the program, pressing the EXIT key at any moment will exit and return back to the main menu screen (Fig.30).

9.0 – Starter Test

This test actually checks the cranking effectiveness of the battery and also can predicts when the battery will fail to crank a vehicle.

This Analyser is designed to address the weakness of conventional testers with its cranking power measurements. Simply connect the analyzer to the battery in the vehicle and start the engine!



To understand the working principle of the tests, let's look at the wave form displays taken during the cranking tests with an oscilloscope.

Figure (A) above shows the voltage profile of a healthy battery during the cranking of an engine. The graph starts off at the battery's nominal voltage, and a voltage drop is detected when the vehicle is cranked. The voltage recovers to the battery's nominal voltage and eventually rises to approximately 14.4 V when the alternator starts charging the battery.

For Figure (B) where a typical 2 year-old battery, you noticed the difference in the voltage drop which indicates that it is weaker but still usable.

Whereas Figure (C) represents a very weak battery that can barely crank a car and is due to fail in the very near future.

As voltage profiles can indicate the relative ability of the tested battery in starting an engine, so there is no need for knowledge on the starter motor requirement or the battery's rating and size.

This Battery System Analyser utilises the mentioned voltage profile to determine the cranking power of the tested batteries and it will display the results after every test.

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9.1– Begin Testing

1. With engine OFF, place the vehicle transmission in NEUTRAL for Manual and PARK for Automatic then apply the parking brake.

2. Connect the analyser to the battery terminals and the display will light up as shown (Fig 40).

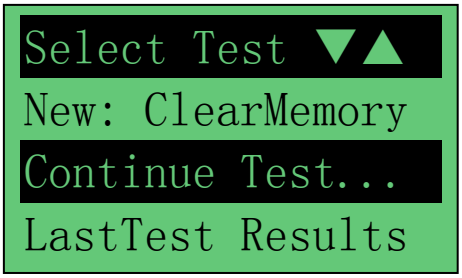

Figure 40

3. After you have made your choice, selecting "New: Clear Memory" or "Continue…Test" will proceed to the display below: (Fig. 41)

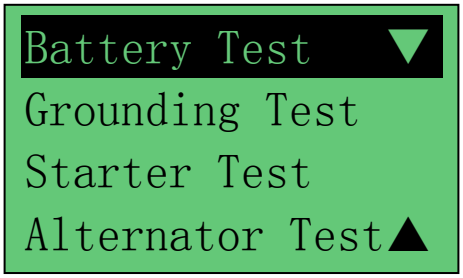

Figure 41

4. From the main MENU, select 'Starter Test' by scrolling down using  key. (Fig.42)

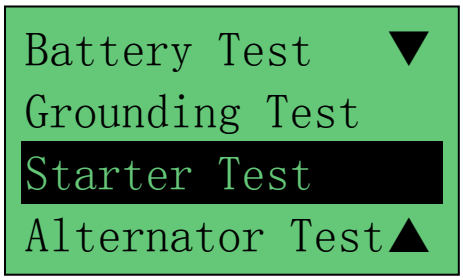

Figure 42

2. Press ENTER key to continue and the display will show: (Fig.43)

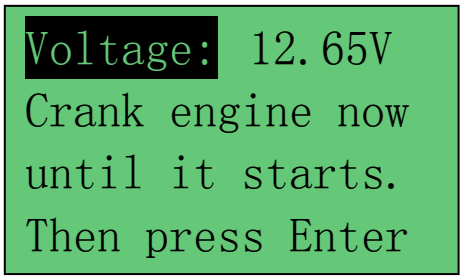

Figure 43

3. Switch the ignition key to ON and start cranking the engine until it starts. Immediately after that press ENTER key and the results will show as follows (Figure 44):

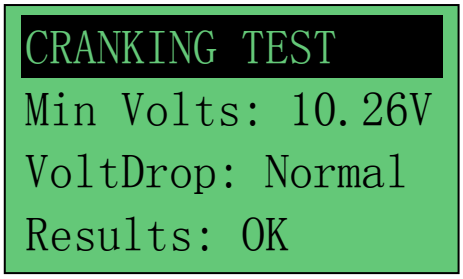

Figure 44

4. If the voltage drop is too great during the cranking, the tested results will display as follows (Figure 45) and will prompt you to check the starter system.

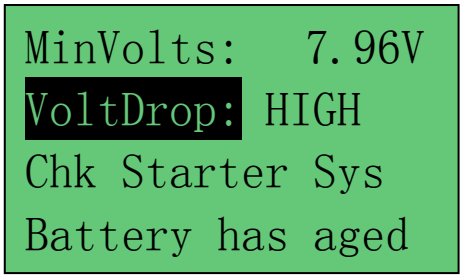

Figure 45

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5. During cranking when it detects that there is no drop in voltage, it will display the following screen (Figure 46).

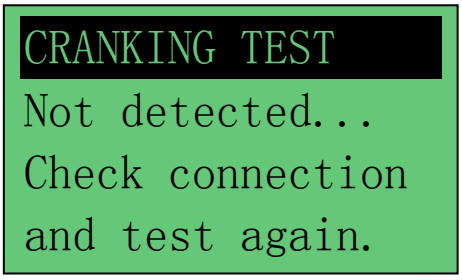
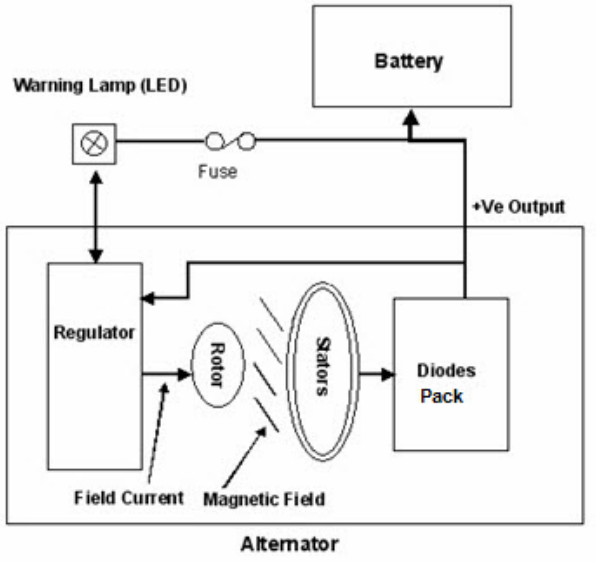


Figure 46

6. Pressing the EXIT key at any moment will exit and return back to the previous screen.

10.0 – Alternator Test

An alternator is the device used to produce the electricity the car needs to run and to keep the battery charged. The alternator uses the principle of electromagnetic induction to produce voltage and current. The four main parts of the alternator are the Rotor, Stator, Diode Pack, Voltage Regulator and an Ammeter or Indicator Light to inform the driver of any problems. All of these parts must be in good working order for the alternator to do its job.



The Rotor is a coil of wire wound around an iron core. The Rotor rotates as the alternator shaft rotates and current passes through brushes. The Rotor winding passes the Field current. This causes the Rotor to produce a magnetic field. So basically the Rotor is a rotating electro magnet.

The Stator is a set of three windings fixed to the case of the alternator and these windings are static i.e. they don't rotate. As the Rotor rotates its magnetic field "cuts" each Stator winding in turn, this induces a current in each winding. The outputs from the Stator windings are 120 degrees apart and are alternating current (AC).

But vehicles run on DC current, so we need something that will convert the AC current to DC current. This is the job of the diode pack. A diode is an electrical one-way check valve that will let current flow in only one direction. The typical diode pack uses four diodes to accomplish this. AC current is feed in on one side of the diode pack and DC current comes out the other side. The diode pack here will rectify the alternating 3 phases from the Stators and combine them into a single Direct Current which also works the dash ammeter or indicator light.

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Now that we have a DC current that the vehicle can use, we need a way to control that current. That is the job of the voltage regulator. As the name implies, it regulates the voltage going to the battery. It does this by turning current to the field (stator) terminal of the alternator on and off.

If the battery voltage goes below 13.5 volts, the voltage regulator sends current to the field terminal and allows the alternator to start charging. Current will then flow into the battery and bring it up to full charge.

If the voltage goes above 14.5 volts, the voltage regulator shuts off the current to the field terminal and keeps the battery from overcharging and cooking itself. This is how the voltage regulator controls the alternator output.

When you first start your vehicle, the alternator needs some current to start working. The voltage regulator supplies this current from the battery to the field (stator) terminal of the alternator to get it started.

The state of charge of the battery controls amperage output of the alternator. When the battery has a full charge, the electro-motive force of the voltage lowers the amperage to almost zero. As the battery charge wears down, the electro-motive force is not enough to stop the amperage, so it flows into the battery and charges it again.

10.1 – Start Testing

This test is to check the MAX and MIN charging voltages output of the alternator at 3000 RPM without load and 2000 RPM with all loads ON. With this test you can determine the alternator's condition when in reference with the vehicle's Service Manual.

No load testing at 3,000 RPM

1. With engine OFF, place the vehicle transmission in NEUTRAL for Manual and PARK for Automatic and apply the parking brake.

2. Attach the Analyser clips onto the battery terminal posts and it will power up and lights up the LCD display screen as shown (Fig.47)

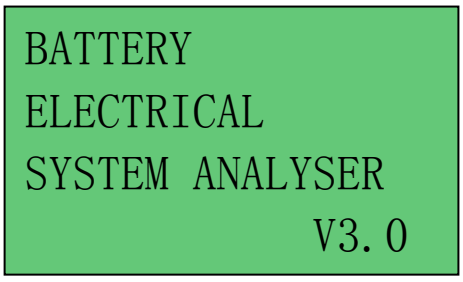

Figure 47

3. It will run through a self-test and when completed it displays the Main Menu as shown: (Fig. 48)

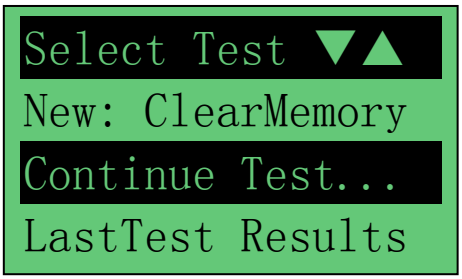

Figure 48

4. After you have made your choice, selecting "New: Clear Memory" or "Continue…Test" will proceed to the display below: (Fig. 49)

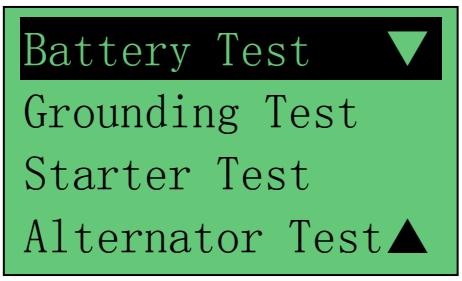

Figure 49

Pressing  key to scroll down to the 'Alternator Test' (Fig.50)

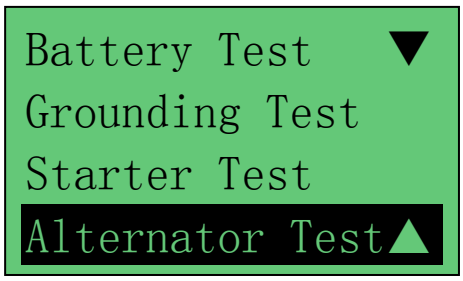

Figure 50

5. Press 

key to continue and the display will show: (Fig.51)

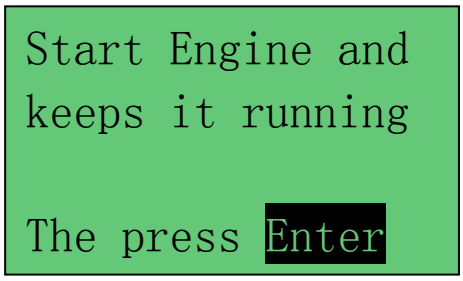

Figure 51

Start the engine and then press ENTER key again and the screen will prompt you as shown below (Fig. 52).

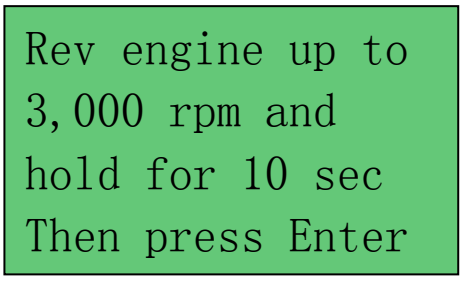

Figure 52

Make sure that all loads (lights, air-condition, etc) are OFF. Rev the engine up to **3000 RPM** by referring to the dashboard meter and maintain it for about 10 seconds and then release the pedal. The maximum and minimum voltages values will be captured.

Note: While revving the engine, you need not have to hold the analyser in your hand as it can capture the maximum voltage generated at 3,000 RPM in the display. Just place the analyser in a safe and secure place during testing.

After that press ENTER key and it show as below (Fig 53.)

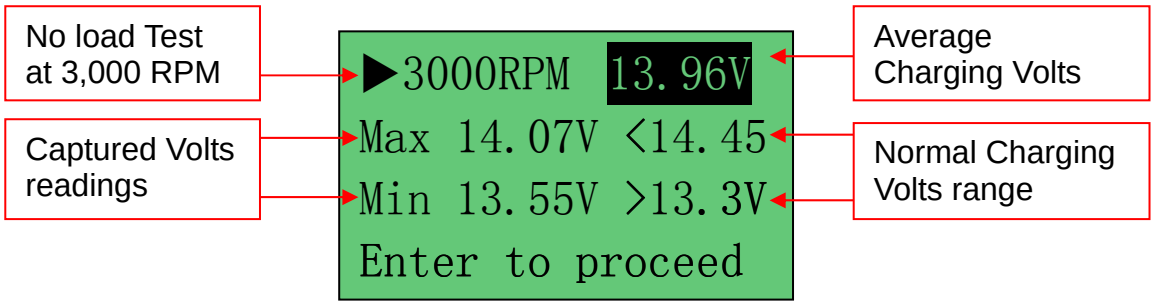

Figure 53

With the captured readings, analysis can done by referring to the limits as indicated that **MAX voltage should not exceed 14.5V** (max. voltage at 3,000 RPM) and **MIN voltage should be more than 13.3V** (min voltage during idling speed).

6. Press ENTER key will show the results of the test (Figure 54):

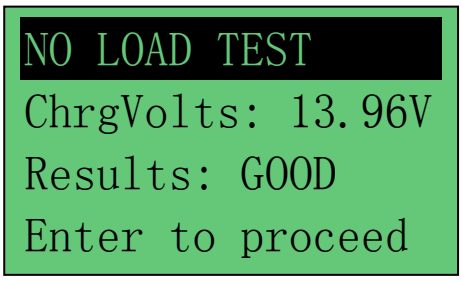

Figure 54

7. If either minimum or maximum charging volts are not within the voltage range limits then it will display one of the screen as below (Figures 55 & 56) and it will prompt you to check the alternator system for the fault.

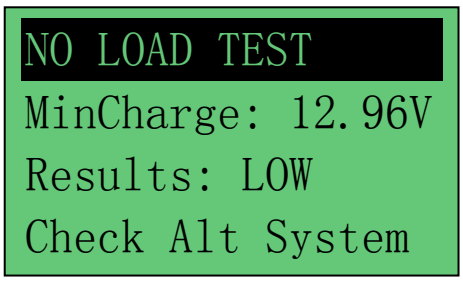

Figure 55

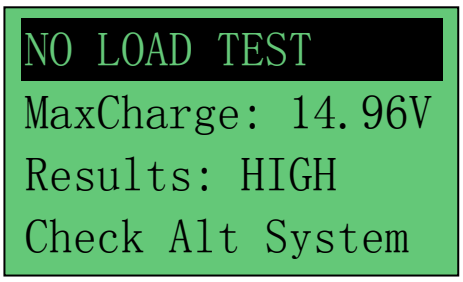

Figure 56

Testing with load at 2,000 RPM

As more electrical accessories, such as lights, heater, air condition, car stereos, etc. were used; the electro-motive force decreases and this will allow more amperage from the alternator to flow into the battery to compensate for the added load. This test is to check the alternator's behavior during loading.

8. Continue from the previous test (either Fig. 54, 55 or 56); proceed to the next step by pressing ENTER key will enter to the display as follows. (Fig.57)

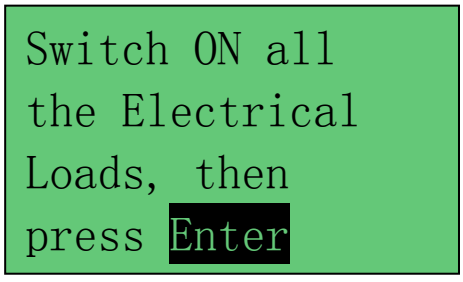

Figure 57

Now, switch ON all loads (Head Lights, Radio, Air-condition, Heater, etc) and press ENTER enter key will display: (Fig.58)

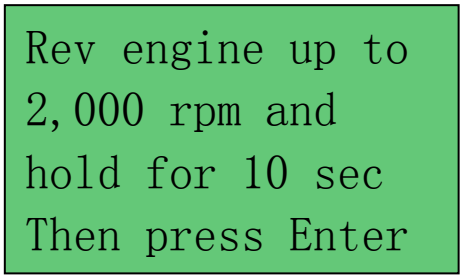

Figure 58

With all loads ON, rev the engine to 2000 RPM and maintain it for about 10 seconds and then release the pedal. The MAX and MIN readings will be captured.

After that press ENTER key and it show as below (Fig 59.)

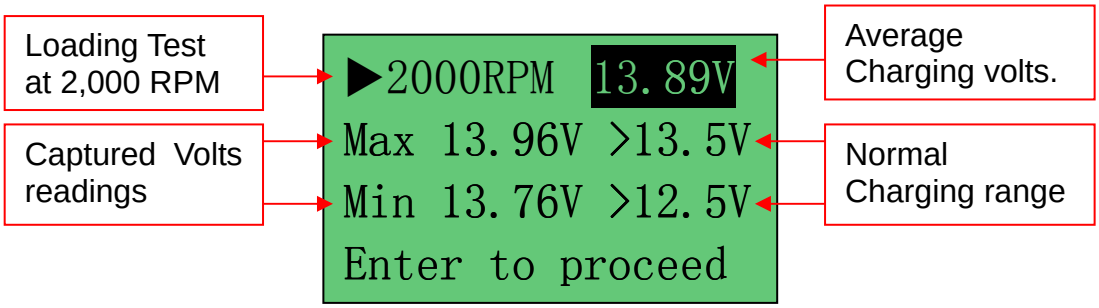

Figure 59

With the captured readings, analysis can done by referring to the limits as indicated that **MAX voltage should exceed 13.5V** (max. voltage at 2,000 RPM) and **MIN voltage should be more than 12.5V** (min voltage during idling speed).

8. Press ENTER key will proceed to show the results of the test:

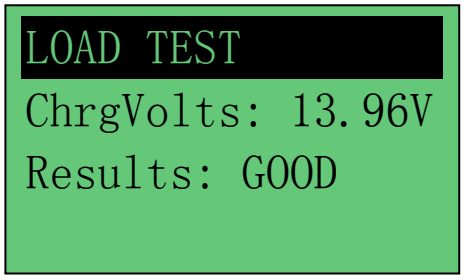

Figure 60

9. If either minimum or maximum charging volts are not within the voltage range limits then it will display one of the screen as below (Figures 61& 62) and it will prompt you to check the alternator system for the fault.

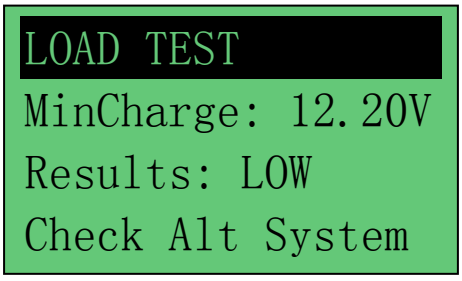

Figure 61

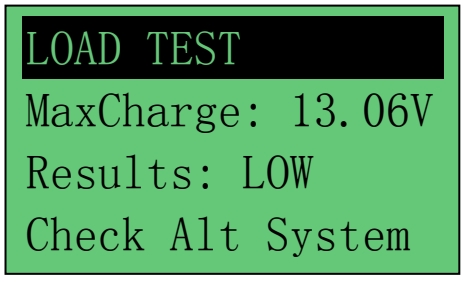

Figure 62

10. To exit the program, pressing the EXIT key at any moment will exit and return back to the previous screen.

11.0 Last Test Results

To view the results of the last test, the Battery System Analyser has to be connected to an external power source by either clamping its clips directly to a 12Volt car battery or using a 12Volt AC/DC adaptor. (Fig. 63)

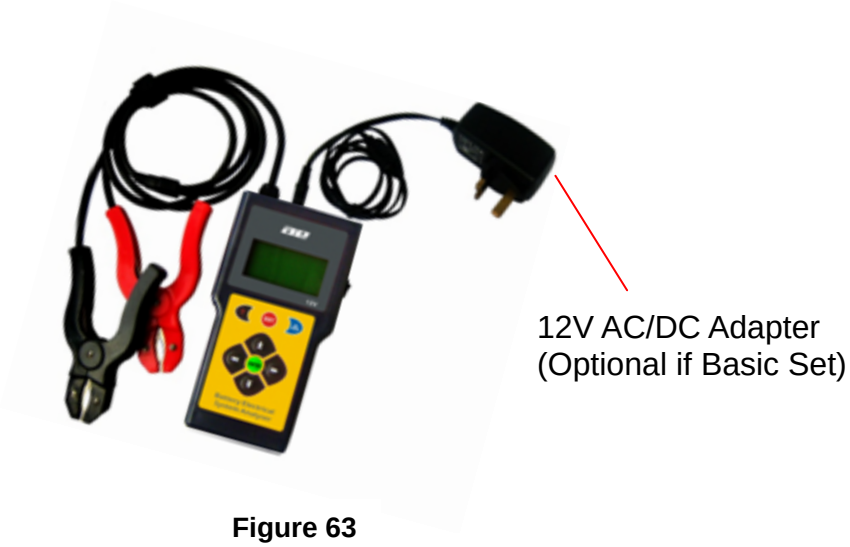

Figure 63

1. Once power up, the wakeup screen will display as follows:

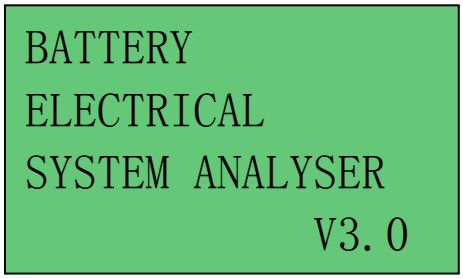

Figure 64

2. It will run through a self-test and when completed it displays the Main Menu as shown: (Fig. 65)

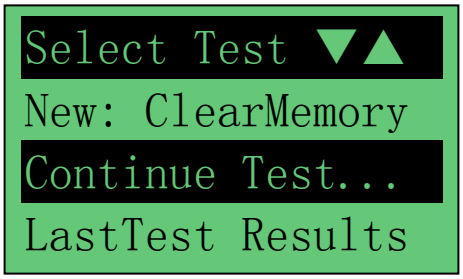

Figure 65

3. Pressing  key once will scroll down to the 'Last Test Results' Fig. 66 below.

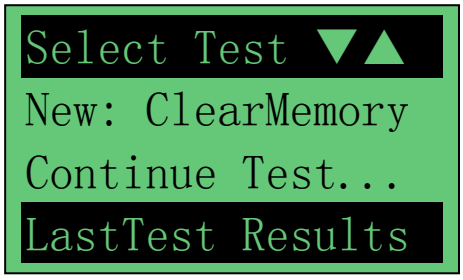

Figure 66

4. Press  key will proceed to display the last test results depending the type of test you had performed earlier. (Fig. 67)

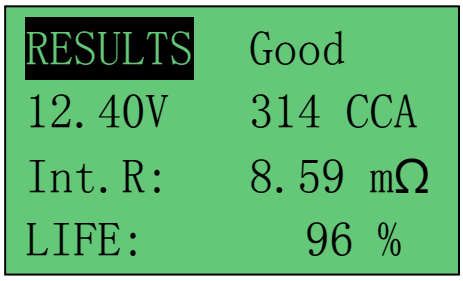

Figure 67

5. To view the next page, press  or  key to get to the page you want.

   Some examples below are: (Figs. 68, 69, 70 & 71)

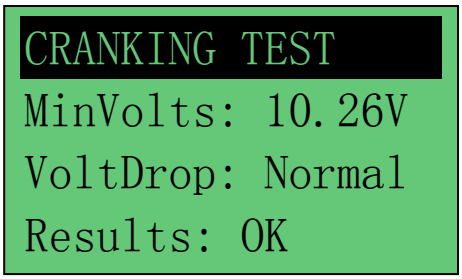

Figure 68

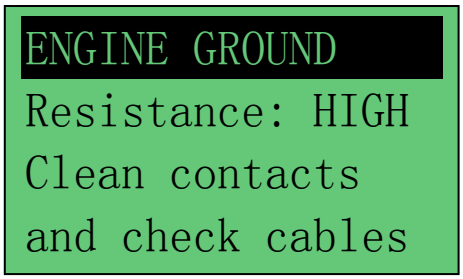

Figure 69

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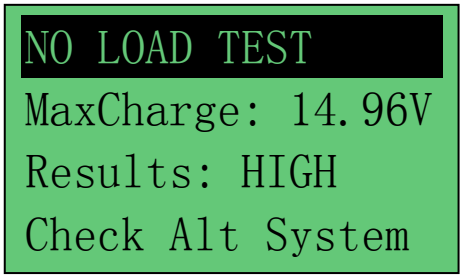


Figure 70

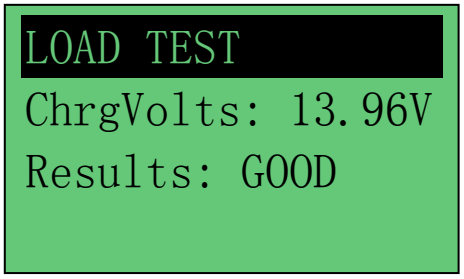


Figure 71

12.0 – The Printer (Optional)

12.1 Functions

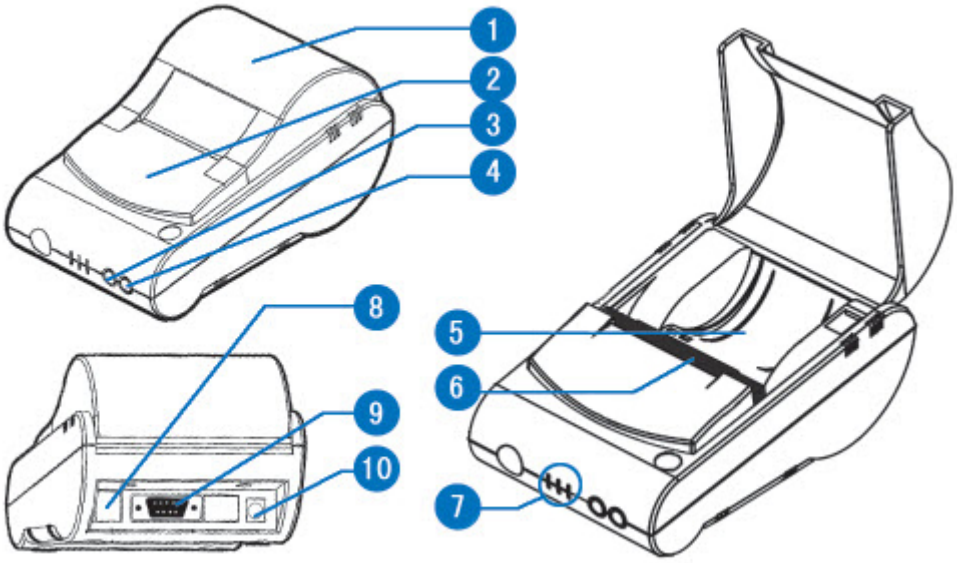


Figure 72

1. Paper cover
2. Print head cover
3. SEL Button
4. TF Button
5. Paper Compartment
6. Roller guide
7. LED indicating lights
8. Universal Interface jack
9. Connection to Battery Analyser System
10. 12 Volts DC power Input Jack.

12.2 Printer Set-up

1. Open the paper cover (**1**) and put the roll of thermal printing paper into the paper compartment (**5**). The paper should face up with some extra length shown when closing the paper cover. The roller guide (**6**) should be tightly press against the paper when the cover was closed.

2. The input power to the printer can be powered either by a 12 Volts car Battery or through a 12 Volts output AC/DC power adopter supplied with the set.

Connection using 12Volts Battery:

Figure 73

Connection using 12VDC Output AC/DC Power Adapter:

Figure 74

3. Once the power has been supplied to the units, the analyser display will light up. Check the power led on the printer whether it is lighting, if not switch the power switch to ON (See Fig. 73).

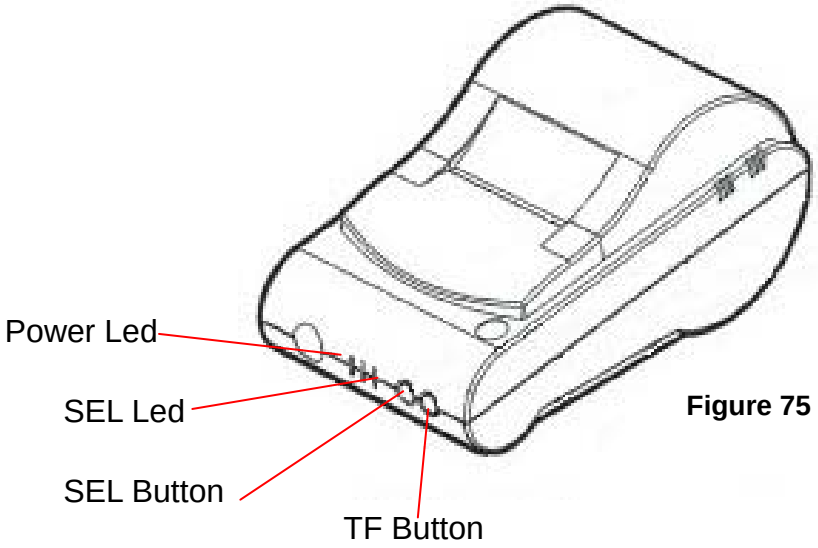


Figure 75

4. To advance the paper forward, the SEL Led should be OFF. Switch it OFF by pressing the SEL button once. Then, press TF button once the paper will scroll forward. (Fig. 75)

5. To start to print, SEL Led should light up. Activate it by pressing the SEL Button again. (Fig. 75)

12.3 Printing the Last Test Results

To print the results of the test, the Battery System Analyser has to be connected to the printer and powered up as described above on page 48 (Fig. 73 & 74).

1. The wakeup screen will display as follows:

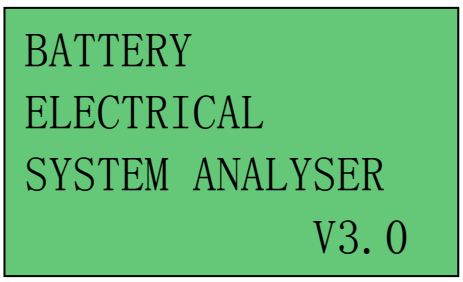


Figure 76

2. It will run through a self-test and when completed it displays the Main Menu as shown: (Fig. 77)

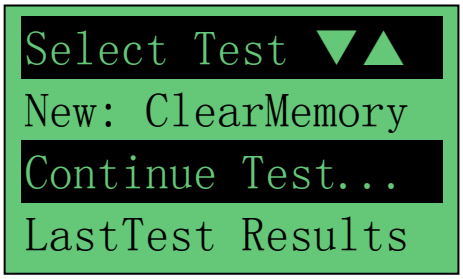


Figure 77

3. Pressing  key once will scroll down to the 'Last Test Results' as shown below (Fig. 78)

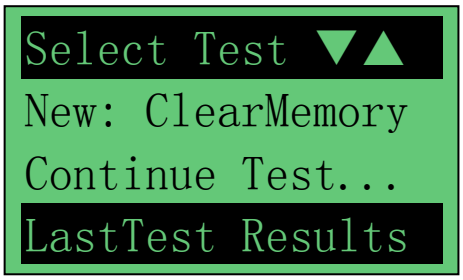


Figure 78

4. Press 

key will proceed to display the last test results depending the type of test you had performed earlier. (Fig. 79)

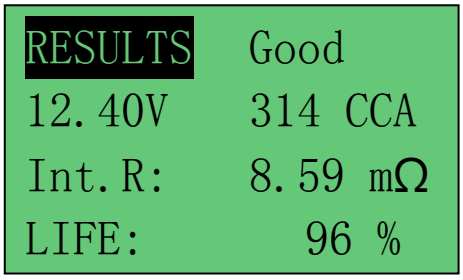


Figure 79

5. While in this mode, you can print the results by pressing  key and the display will prompt you: (Fig. 80) if the printer is connected.

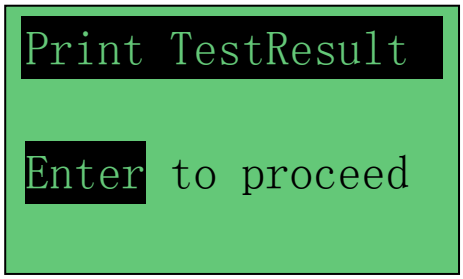
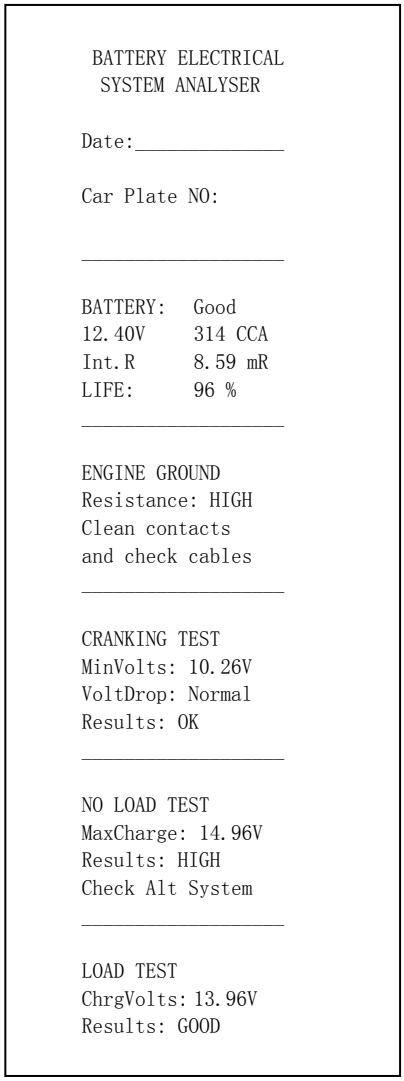


Figure 80

6. Press  key will activate the printer to start printing.

7. Below is the sample of the printout of the test results.



Disclaimer

All information, illustrations, and specifications contained in this user manual are based on the latest information available at the time of printing. The right is reserved to make any changes at any time without obligation to notify any person or organization of such revisions or changes.

Furthermore, the manufacturer or its sales agents are not liable for errors contained herein or for incidental or consequential damages (including lost profits) in connection with the furnishing, performance or use of this material.

This user manual tells how to use and perform the required procedures on vehicles. Safe and effective use of this Analyser is very much dependant on the user following the normal practices and procedures outline in this manual.

13.0 – Warranty Information

13.1 – Limited Warranty

This limited warranty cover defects in materials and workmanship for a period of twelve (12) months which begins from the date the product is purchased by the end user and is subjected to the following terms and conditions:

1. Within the warranty period, the manufacturer will repair or replace, at their options, any defective parts and return to the owner in good working condition.

2. Any repaired or replaced parts will be warranted for the balance of the original warranty or three months (3) months from the date of repair, whichever is longer.

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3. This warranty only extends to the first owner and not assignable or transferable to any subsequent owner.

4. Cost of delivery charges incurred for the repair of the product to and from the manufacturer will be borne by the owner.

5. This limited warranty covers only those defects that arises as a result of normal use and does not cover those that arises as a result of:

- Unauthorized modifications and repair.
- Improper operation or misuse.
- Accident or neglect such as dropping the unit onto hard surfaces.
- Contact with water, rain or extreme humidity.
- Contact with extreme heat.
- Cables that have broken, bent contact pins or subject to extreme stress or wear.
- Physical damage to the product surface including scratches, cracks or other damage to the display screen or other externally exposed parts.

13.2 - Limitations of Warranty

Other than the foregoing limited warranty, the manufacturer does not make any other warranty or condition of any kind, whether express or implied.

Any implied warranty of merchantability, or fitness for use shall be limited to the duration of the foregoing limited warranty.

Otherwise, the foregoing limited warranty is the owner's sole and exclusive remedy and is in lieu of all other warranties whether express or implied.

The manufacturer or any of its exclusive sales agents shall not be liable for any consequential or incidental damages or losses arising of the loss of uses of this product.

All warranty information, product features and specifications are subjected to change without prior notice.