

12-24V BATTERY STARTER, GROUND AND CHARGING SYSTEM ANALYZER WITH PRINTER



Introduction

MBT2415 is the latest version of the Battery Analyzer which tests 12V systems (4 functions) and 24V systems on Starters and Alternators (Normal and Smart). This tester revolutionized its display format and is the first in the world with a fully graphical display. The graphical display is simple; with step by step instructions that enable the user to clearly understand the operation. The symbols used are universal which solve language barriers.

The unit comes with an integrated printer so the graphical results can be printed immediately after each test. Its memory stores up to 70 previous test results for later viewing. Its PC Link feature allows the results to be transferred and stored in the computer via a USB cable. The PC Link software is installed into the computer beforehand.

The Battery Analyzer operates on all 12V or 24V batteries and is able to perform four tests:

1. Battery Test:

This test is intended only on 12V batteries. The Analyzer clips (red & black) have to be clamped onto the battery terminals. When the Analyzer detects the voltage present, the Analyzer will automatically remind the user that it can test only on a 12V battery when connected to the 24V system.

- ✦ Analyzes 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 any worry of draining the battery, and its results are highly accurate.
- ✦ Extremely safe, as it does not create any sparks during clamping, and it takes less than 8 seconds to obtain the full analyzed results of tested battery.
- ✦ Temperature compensated end results.
- ✦ It is powered up from testing the 12V or 24V battery. No maintenance is required during its lifetime service.

2. Grounding Test:

Same as the battery test, this test is also meant for 12V batteries only.

- ✦ Analyzes the condition of the electrical return circuit contacts resistance which were connected to the engine or chassis body from the battery terminal with results and recommendations displayed after test.

3. Starter Test:

This test can be performed on 12V and 24V starters.

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

4. Alternator Tests (with diode ripple test):

This test can be done on 12V and 24V Alternators (Normal or Smart).

- ✦ These tests check the alternator charging conditions during load at 1,500 – 2,000 RPM, without load at 2,500 – 3,000 RPM and the diodes ripple volts with results and recommendations displayed after each test.

This test will determine whether the alternator is performing its job properly.

Specifications:

Operating Voltage: 9V – 36V DC (max)

Test Functions

12 Volts:	Battery test, Starter test, Alternator + Diode ripple & Grounding tests
24 Volts:	Starter test, Alternator test (Smart and Normal alternator)

Analyzing Capacity (Amps):

Automotive 12V Batteries:	CCA/SAE:	100A – 2000A	EN1:	100A – 2000A
	CA/MCA:	100A – 2000A	EN2:	100A – 2000A
	IEC:	100A – 2000A	DIN:	100A – 2000A
	JIS#:	100A – 2000A		

Motorcycle 12V Batteries:	CCA/SAE:	40A – 600A	EN1:	40A – 600A
	CA/MCA:	40A – 600A	EN2:	40A – 600A
	IEC:	40A – 600A	DIN:	40A – 600A
	JIS#:	40A – 600A		

DC Volts Accuracy: $\pm 1\%$ Reading

Battery analyzing time: Less than 8 seconds. Maximum key-in: 17 characters

Safety: Reverse polarity protected. Analyzer will not power ON.

Internal Memory storage: Store up to 70 test results.

PC communication: Through USB port.

Printer: Built-in

Printer head: Thermo unit.

Paper width: 57.5 mm \square 0.5mm

Paper roll diameter: Max. 45mm O.D.

Printing Speed: 50 mm / sec

Working Temperature: 0°C (32°F) – 50°C (122°F)

Working Humidity: 10% – 80 %

Approvals: CE, ROHS

Packing List:

(1) MBT2415 Tester	(1) Barcode Scanner
(1) USB Cable	(1) Cable for Barcode Scanner
(1) Software CD	(1) Roll of Thermal Printer Paper
(1) Battery Rating Chart	

Safety Precautions:

- 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 and can lead to death.
- To protect your eyes from propellant objects such as caustic liquids, always wear safety eye protection.
- Fuel and battery vapors are highly flammable. **DO NOT SMOKE NEAR THE VEHICLE DURING TESTING.**
- 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.
- Before starting the engine for testing or trouble shooting, always make sure the parking brake is firmly engaged. Put the transmission in Park (automatic transmission) or Neutral (manual transmission).
- Always block the drive wheels. Never leave vehicle unattended while testing.
- Never lay tools on vehicle battery. You may short the terminals together causing harm to yourself, the tools or the battery.
- 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 it comes in contact between power source and ground.
- Always keep a fire extinguisher readily available and easily accessible in the workshop.

Working with Batteries:

- 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 people badly.
- When working with batteries, make sure you have plenty of ventilation, remove your hand jewelry, wear protective eyewear (safety glasses) and 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 people!
- Whenever possible, please follow the manufacturer's instructions for testing, jumping, installing, charging and equalizing 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 winter).

- Do not add distilled water if the electrolyte is covering the top of the plates because during the recharging process, it will get warm and expand. After recharging has been completed, recheck the level.
- Do NOT smoke or cause sparks or flames while the battery is being recharged because batteries give off explosive gasses.

Preparing for Test:

1. The Battery Analyzer operating voltage is from 9V to 36V DC. For Battery and Grounding Tests on 24V system (12V x 2 batteries connected in series), disconnect the connection between each battery, clamp the Analyzer clips to one battery at a time and test them individually. For Starter Test (Cranking) and Alternator Test (Charging), these tests can be done on 12V or 24V system.
2. A 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.
3. Always attach the tester 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.
4. Do not attach the tester clips directly onto the steel bolt that is tightened to the battery terminal posts; this may give inaccurate readings or inconsistent results. (Note: This also applies to all other battery testing methods.)
5. During testing on the battery while it is still in the car, make sure the engine, all accessories and load are OFF. Close the trunk lid and all doors.
6. Inspect the battery for cracks or broken casing. Do not use the tester if the battery is damaged.
7. If the battery is a WET type: non sealed maintenance free, top up the level as specified by the markings on the battery with distilled water. This will help to purge the gas from the cells. DO NOT OVERFILL.
8. If necessary to remove the battery from the vehicle to test, ALWAYS remove the negative terminal from the battery first. Make sure all accessories are OFF so that you do not cause any arcing.

Initial Setup

Printer Paper Installation:

Open the printer cover by pushing it upwards from the middle. Place the roll of thermal paper into the slot with the paper edge facing up (Fig.1). Make sure the paper is about 1.0 inch (25.4mm) out when the printer cover is closed (Fig.2).

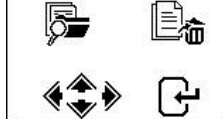


Setting of Date and Time:

The date and time on the Analyzer were set in the factory during production. Due to the differences of the time zone in your country, you may need to set it according to your local date and time, and this can be done by doing the following steps:

1. Power up the Analyzer by hooking up to a 12V battery. The screen will light up and the display will show as follows:

Fig.3 Fig.4





2. While still in this display (Fig.4), press the  and hold for about 3 seconds, there is a long beep sound which indicates Date and Time setting adjustment. The display will change and show as in (Fig.5) below:

Fig.5



3. Use ◀ key to move backward or ▶ key to move forward, ▲ key to increase the number and ▼ key to decrease it. When completed, press  key to return to the main menu (Fig.4).

Key in Company Name and Contacts:


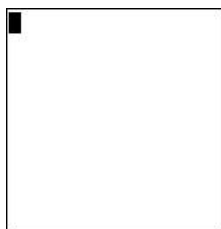




This feature is for the user to key-in the company or garage name and the contact information to be printed into the test report header. It allows 20 characters in one line and accommodates up to seven lines maximum. To enter into this mode, power ON the Analyzer by clamping on the battery terminals then after the beep press ▶ key twice (2 times) then press  key. It will enter into the display as shown below (Fig.6):

Fig.6




1. Use the keys ▲ or ▼ to scroll the numbers (0 to 9) or characters (A to Z) to input.
2. To move one space backward or forward, use ▶ or ◀ keys. Also, if there is a need to correct any character or number that was previously keyed in, use these keys to move backwards and correct the entry using ▲ or ▼ keys.
3. Once confirmed, press  key to move to the next line below.
4. To clear all the characters being keyed in, press  key.
5. When the key-in has finished, press  key to save the entry and then press  key to exit.

Note:

The information that has been keyed in will be shown in the result printout after test (see Fig.87).

Switch ON / OFF Key Sound Beep

Whenever a key is pressed, there is a corresponding beep sound which can be heard to indicate that a key has been pressed. This sound can be switched ON or OFF by doing the following:

1. Go to the Main Menu as shown in (Fig.4).
2. Press and hold  key for about 3 seconds and a long beep sound will be heard which indicates that the change has taken place.
3. Then, press any key and the sound is OFF.
4. To reverse back, do the same procedure as mentioned in step 2 and the sound will be switched ON.

Car / Truck Battery Test

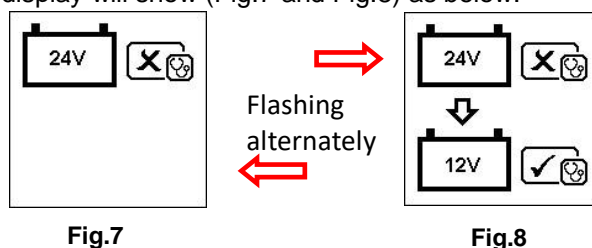
This test is intended for **12V batteries** but not for 24V. The reason is, most trucks that use 24V systems have two 12V batteries connected in series to produce 24V. To test on 24V system (12V battery x 2), disconnect the connection between each battery and test one battery at a time. The test results of an individual battery are more accurate than testing two batteries at once due to the unwanted resistance created by the cable joining the first battery to the second battery that makes 24V. So, the battery test is catered for 12V batteries only.

Performing Battery Test While it is Still in the Car or Truck:

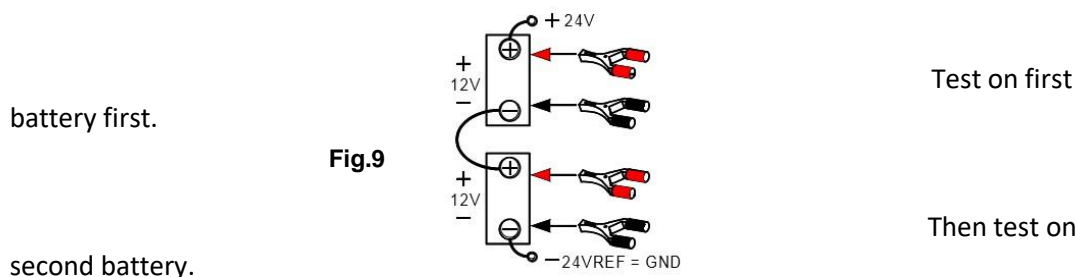
A vehicle that was running must have its engine OFF first and then switch ON the headlights for 30 seconds to remove the surface charge. After the headlights are switched OFF, let the battery rest for at least 1 minute to recover before testing commences.

The car or truck engine and all other accessory loads must be **OFF** during test in order to have accurate results. When attaching the analyzer clips, make sure that the battery posts were not oxidized or badly corroded. Clean them first before clamping to it. Do not clamp onto the steel bolts directly which may give inaccurate and inconsistent results.

If the red and black clips were accidentally clamped directly on to the 24V output terminals of the battery while testing truck batteries, the Analyzer display will show (Fig.7 and Fig.8) as below:



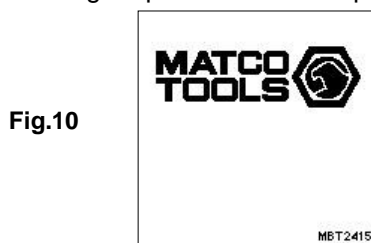
This is to indicate that it cannot test a 24V battery. In this case, if the truck consists of two 12V batteries, then test them individually (one at a time) see (Fig.9):



Testing on stand-alone Batteries:

Clean the battery posts with a wire brush prior to testing. For side post batteries, install stud adapters. For better results, do not use steel bolts.

1. Clamp the Analyzer red clip to the battery positive terminal (+) clamp the black clip to the battery negative terminal (-). The Analyzer LCD will light up with the wake-up screen (Fig.10) on following page:

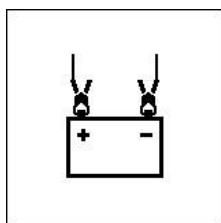


2. When one of the Analyzer clamps is not properly secured to the battery posts, it will prompt you as shown below (Fig.11 and Fig.12 flashing alternately). In this case, unclamp and clamp the Analyzer clips again on the battery posts. The Analyzer will ensure that its contacts are good before conducting a test.

alternately

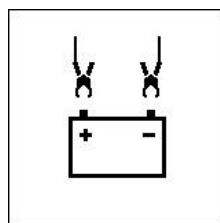


Fig.11



Flashing

Fig.12



3. If the contacts between the battery and the Analyzer are at proper position, then the Menu screen will display as shown in (Fig.13):

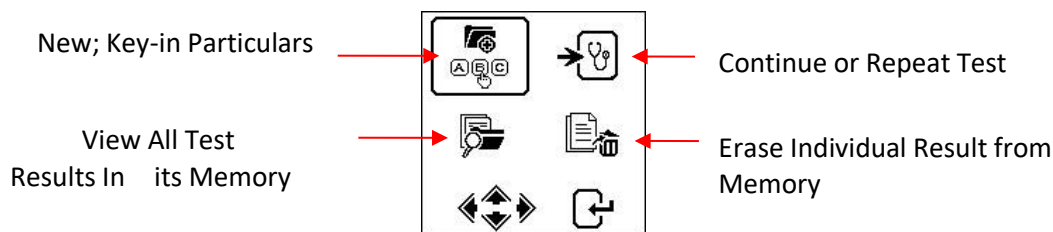


Fig.13

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

New: Key-in Particulars

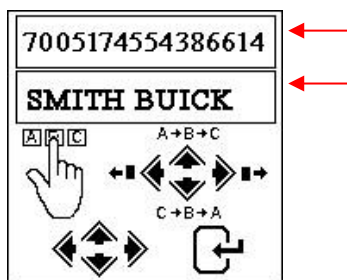


The Analyzer will always begin in this mode. Once entered, the display will show (Fig.14) as below:

Barcode Data Window

Key-in Data Window

Fig.14



To key-in the particulars (e.g. VIN, vehicle registration numbers/ battery model/ testing date/ customer's name/reference numbers/ etc. which can only be entered with a single choice having no more than 17 characters), press ▲ key to scroll up the alphabet A, B, C - Z and numbers 1, 2, 3 - 0 while ▼ key to scroll down from Z, Y, X - A or 0, 9, 8-1 to select. Press ► key will move one space to the right while ◀ key will move one space backwards for editing purposes.

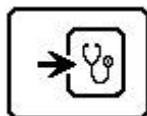
Using the Barcode Scanner

You may use the barcode scanner to scan the VIN attached to the vehicle (or any other barcode), the scanned number will be entered in the Barcode Data Window (see Fig.14). Then press ◀ key to confirm.

Note: If you do not input any particulars and then press ◀ key to continue, the test results will not save in its memory.

To Continue or Repeat Test

Select:



Selecting this function allows user to continue or repeat the last test and not need to key-in (type) the particulars again on the same car from where the last test was conducted and it will update the results. For example: If you had done Battery Test and later wished to perform Alternator Test or Grounding Test on the same car, just select this function and it will update the results after each test in its memory and it can be retrieved for review later or to be printed out.

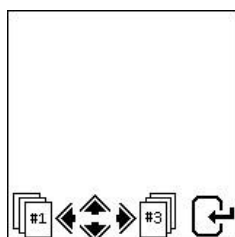
View Test Results from the Memory



Select:

This lets the user view all the test results stored in its memory. Once entered, the display will show (Fig.15) as below showing all the particulars that were keyed-in (typed) during the test. Press ▲ key to scroll upwards and ▼ key to scroll downwards to select. During scrolling the highlight bar will move up or down on the required particulars.

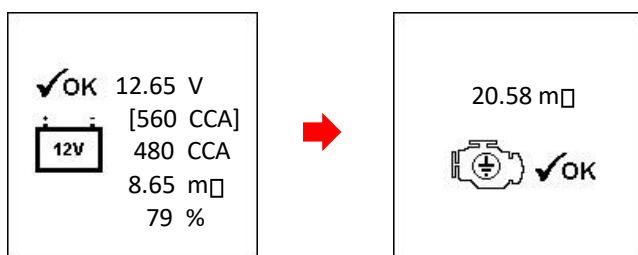
Fig.15



Press ◀ or ▶ key to move forward or backward to the next page. Once confirmed, press ↻ to view the results:

Examples:

Fig.16 Fig.17



Delete Individual Result from the Memory

Select:



When this function is selected, it lets the user select and delete the result individually from the memory. Once entered, the display will show (Fig.18) as below which shows all the particulars that were keyed-in (typed) during the test.



Fig.18

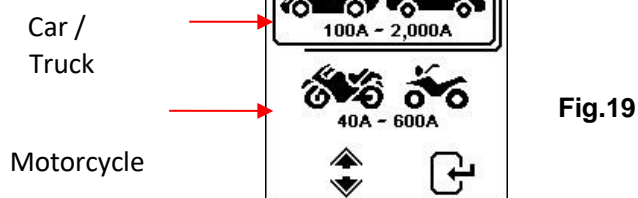




Press ▲ key to scroll upwards and ▼ key to scroll downwards to select. When scrolling, the highlight bar will move up or down on the required particulars.


Press ► key to move forward or ◀ key to move backward to the next page. Once confirmed, press ↵ key. Then press again ↵ key one more time to delete the result. This action allows user to double confirm before deleting the result.

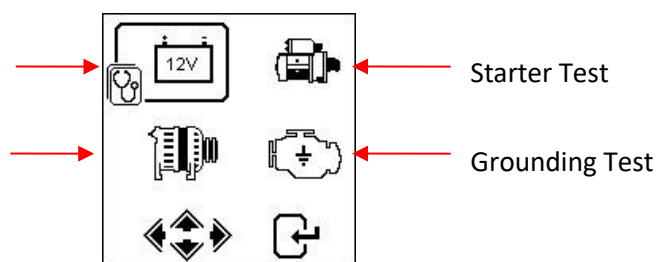
Continue from Step 3:

4. After you have made your choice, you can begin testing by selecting  or  will proceed to the display below (Fig.19):



Selecting  will allow you to test car batteries (up to 2000A) whereas  will only test motorcycle batteries (up to 600A).

Here if you have selected  test, then there is an option to select Battery or other system

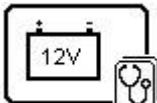


test. See display below (Fig.20):


Actual Test Displayed

Alternator Test

Fig.20

Select for Battery Test  and then press ↵ key.

5. If the tester detects that the battery has surface charge, it will prompt you to turn the ignition key to ON and switch on the headlights (Fig.21) to discharge the battery. Turn ignition OFF and headlights OFF (Fig.22) as

shown below and then press  to continue.

Turn

Turn Ignition Key to ON Position

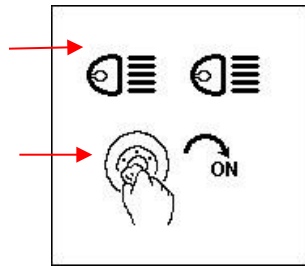
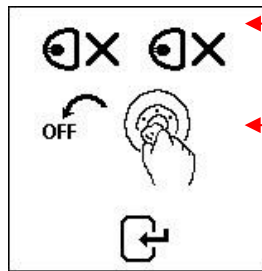


Fig.21



High Beams
ON

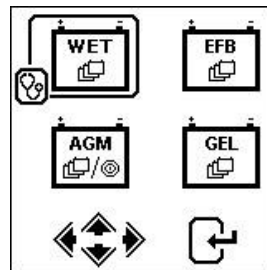
High Beams OFF

Turn Ignition Key OFF
Position

Fig.22

6. Next it will prompt you to select the type of battery (Fig.23):

Fig.23



WET (SLI) battery is meant for all normal flooded types like Wet Low Maintenance (Lead [Pb] / Calcium [Ca]) or Wet Standard (Lead [Pb] / Lead [Pb]) Batteries.

AGM FLAT / SPIRAL tests on Wet (MF) Maintenance Free (Calcium [Ca] / Calcium [Ca]), AGM Flat or Spiral Plates Batteries.

EFB tests Start/Stop or Enhanced Flooded Batteries.

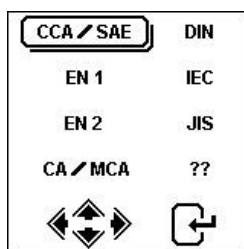
GEL tests Gel Cell VRLA Batteries with units of measurement in Cold Cranking Amps.

7. Before selecting the ratings 'CCA, SAE, EN, IEC, DIN, CA 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:



8. Once the selection has been done, it will proceed to the display as shown below (Fig.24):

Fig.24



9. If the rating is selected under JIS # (Japanese Industrial Standard), then you need to refer to the conversion chart provided separately with the Tester when purchased to convert to CCA ratings.

Refer to the battery model (example: 80D26L or NX110-5L) on the Cold Cranking Amps (CCA), WET is 580 CCA and AGM is 630 CCA.

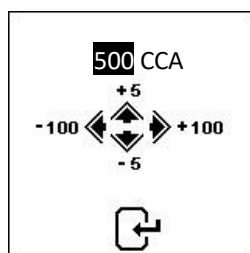
Battery Model (JIS#)			CCA			Battery Model (JIS#)			CCA		
NEW	OLD		WET	MF	CMF SMF	NEW	OLD		WET	MF	CMF SMF
50D20R			310	380	480	80D26L	NX110-5L		580	580	630
50D20L			310	380	480	85B60K					500
50D23R	85BR60K		500			85BR60K					500
50D23L	85B60K		500			95D31R	NX120-7		620	660	850
50D24R	NT80-S6		390			95D31L	NX120-7L		620	660	850
50B24L	NT80-S6L		390			95E41R	N100		515	640	770
50D26R	50D20R			370		95E41L	N100L		515	640	770

10. You can also use the rough CCA guide below, based on the engine capacity of vehicle, but the percentage (%) life is not that precise as compared to the actual battery rating due to this rough estimation.

1000 – 1299 cc	300 CCA
1300 – 1599 cc	400 CCA
1600 – 1999 cc	500 CCA
2000 – 2999 cc	700 CCA
3000 – 3500 cc	800 CCA

11. To enter the value, press ◀ or ▶ key to increase or decrease the original value shown on the display by 100 units. Likewise use ▲ or ▼ key to increase or decrease the last two digits by 5 units for each press. See (Fig.25) below:

Fig.25



12. Once the Amps rating of the battery is confirmed, press [Enter] key to start the testing process. Refer to the display below (Fig.26):

Fig.26



13. In less than 8 seconds, the results of the testing will be displayed on the LCD screen (Fig.27) if the battery condition is very good (e.g. having more than 75% life).

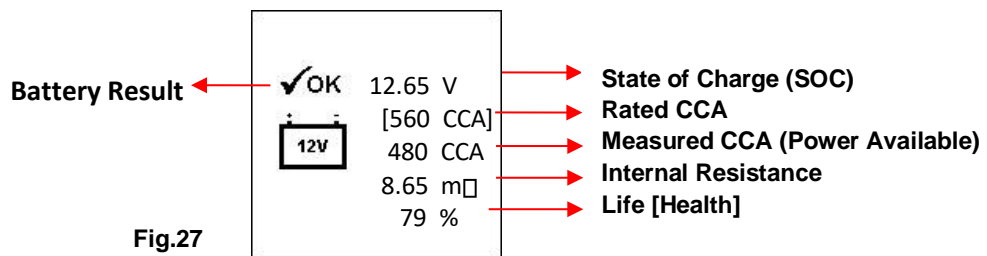
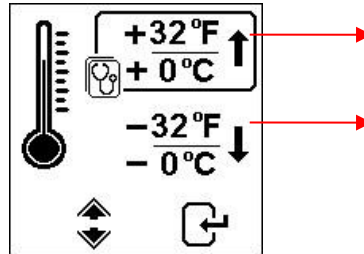


Fig.27

14. This Analyzer will also take the temperature of the battery into consideration when it has detected that the battery condition is marginal (SOC below 75%), and it will prompt you with the display as shown (Fig.28):

(+) 0°C and above

Fig.28 (-) 0°C and below



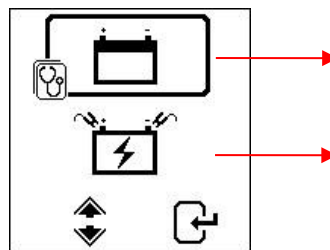
Here it lets you select the surrounding temperature that you are working with the battery. If the surrounding temperature is for example 15°C, then select **+32°F / +0°C** and press **↩** key. Then the results will show on the LCD display (Fig.27).

15. Sometimes during the test, the Analyzer will ask whether the battery condition is “Before charge” or “After charge” (Fig.29). Selecting “Before charge” or “After charge” will determine final test results.

Before charge

After charge

Fig.29



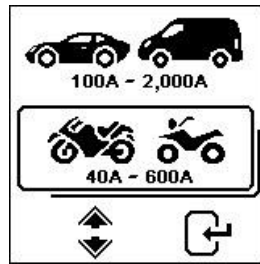
16. To print out the results, just  press **↩** key on the Analyzer, the printer will start printing.

Motorcycle Battery Test:

To test motorcycle batteries, it is better to test with the battery taken out from the motorcycle. This is mainly due to the obstruction of the wires that were attached to the battery terminals, and the tester clamps may not clip properly due to lack of space at its terminals, thereby causing false test results.

17. While on the main menu as shown (Fig.30) below, select  for Motorcycle Battery test.

Fig.30




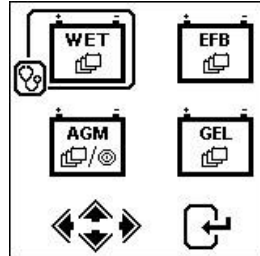
18. Press  key, the screen will show as (Fig.31) below:

Fig.31



19. For motorcycle batteries, before selecting whether [WET (SLI)] or [AGM] and the ratings 'CCA, SAE, EN, IEC, DIN, CA and JIS #' from the menu, check the battery model. This can be checked on the battery label as some of the examples show below:



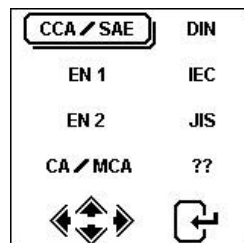
With the battery model in hand, refer to the battery rating chart (as seen in this example Fig.32 below) provided in separate copies with the tester when purchased, to get values to be keyed in.


Battery Model	AH	CCA		Battery Model	AH	CCA	
		WET	AGM			WET	AGM
YT4L-4	3		50	YTZ12S-BS	11		210
YT7B-4	6.5		110	YTZ14S	11.2		230
YT7B-BS	6.5		110	YTZ14S-BS	11.2		230
YT9B-4	8		120				

Fig.32

Once the battery type [SLI (WET)] or [AGM] has been selected, it will proceed to the display as shown below (Fig.33):

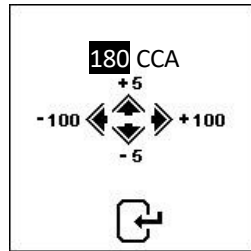
Fig.33



20. Press  key and the display will show as in (Fig.34). To enter the value, press ◀ or ▶ key to increase or decrease the original value shown on the display by 100 units.

Likewise use ▲ or ▼ key to increase or decrease the last two digits step of 5 units for each pressing.

Fig.34



21. Once the Amps rating of the testing process. Refer to the



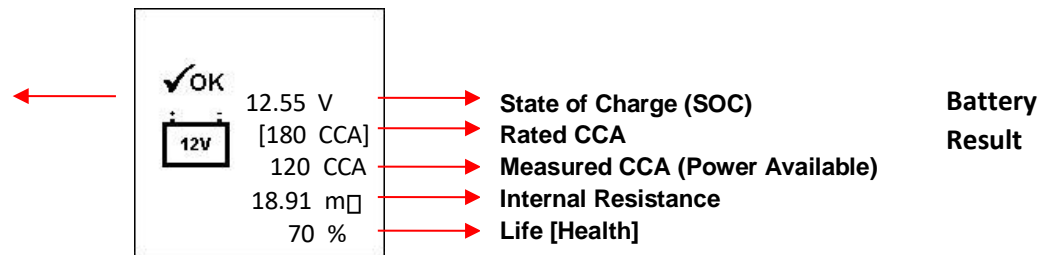
battery is confirmed, press display below (Fig.35):

key to start the

Fig.35



22. In less than 8 seconds, the results of the testing will be displayed on the LCD screen (Fig.36):




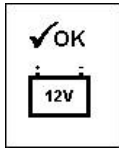
23. To print out the results, just press  key on the Analyzer, the printer will start printing.

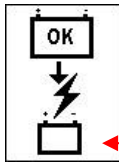
Fig.36

Interpretation of Results:

The battery is in good condition.

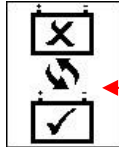


The battery is OK but needs to be recharged first in order to have the maximum performance.



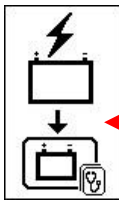
Flashing

The battery is weak, needs to be replaced with a good one.



Flashing

The battery needs to be recharged first and then tested again to confirm the final results.



Flashing

2. Volts: 12.55V (State of Charge [SOC])

The volts here indicated the State of Charge (SOC) of the tested battery which is 12.55V during open circuit condition. [By referring to the table below, this battery is above 50% SOC].

State Of Charge(SOC)	WET/SLI	AGM	GEL
100%	12.60 V	12.80 V	12.85 V
90%	12.58 V	12.72 V	12.77 V
80%	12.44 V	12.64 V	12.69 V
75%	12.40 V	12.60 V	12.65 V
50%	12.20 V	12.30 V	12.35 V
25%	12.00 V	12.00 V	12.00 V
0%	11.80 V	11.80 V	11.80 V

3. Battery Rating: 180 CCA

The battery capacity rated output is normally stated on the label for car batteries (either in CCA, EN, DIN, JIS, etc.). For batteries with model numbers, please refer the charts provided with the Analyzer.

4. Power Available: 120 CCA

It means that the battery tested has a capacity of 120 CCA power available. CCA ratings have been used here, therefore the tested result is in CCA and if other rating (DIN, SAE, JIS, IEC, CA, or EN) were selected, it will be based on the respective rating to calculate and show the results in that selected rating.

Please take Note:

This output value (120 CCA) is related to the actual power available in the battery in relation to that battery's rating (180 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.

From the above example, a 180 CCA rated battery measuring 120 CCA available power does not mean that the battery would pass a CCA test at 120 CCA.

The available power reading shows that the battery is not able to perform up to its rated ability (180 CCA).

In comparison to another battery when fully charged, the 180 CCA battery measuring 120 CCA is no stronger than a 100 CCA battery showing 100 CCA available power when fully charged.

The available power number is meant for comparison to its own rating. In fact, in this example the 180 CCA battery was failing to perform to its rating, while the 100 CCA battery is still working.

Based on the Society of Automotive Engineers (SAE) in America, 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.

5. Internal Resistance: 18.91mΩ

In normal condition, the internal resistance of the motorcycle battery should fall in the range of between **5.0 mΩ – 45.0 mΩ** to be considered to be good. Anything above 45.0 mΩ resistance shows that its internal plates have been aged or sulfated.

For car batteries, its internal resistance of **2.0 mΩ – 15.0 mΩ** is considered to be good due to high CCA value.

As a matter of fact, the higher the battery CCA readings obtained, the lower the internal resistance should be.

6. LIFE: 75% (Health)

This is an indication of the battery life expectancy [Health] in percentage.

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 deliver at 0°F (-18°C) for 30 seconds, while maintaining a voltage of at least 7.2 Volts for a 12V battery during cranking.

- **SAE (The Society of Automotive Engineers) Standard.**

SAE has established Cold Cranking Amperes (CCA) rating for batteries as their standard. Therefore this rating is the same as CCA rating as mentioned above.

- **IEC (International Electro technical Commission) Standard.**

IEC amperes rating require that at 0°F (-18°C), 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 1 (European Norms) Standard.**

EN 1 amperes rating require that at 0°F (-18°C), the number of amperes that the 12V battery can deliver while maintaining a voltage of at least 7.5 Volts for 10 seconds discharged at the rated current, followed by 10 seconds rest, then it is discharged at 60% of the original current for further 73 seconds to give an equivalent total discharge time at the lower current of 90 seconds still maintaining 7.5 Volts.

- **EN 2 (European Norms) Standard.**

EN 2 amperes rating require that at 0°F (-18°C), the number of amperes that the 12V battery can deliver while maintaining a voltage of at least 7.5 Volts for 10 seconds discharged at the rated current, followed by 10 seconds rest, then it is discharged at 60% of the original current for further 133 seconds to give an equivalent total discharge time at the lower current of 150 seconds still maintaining 6.0 Volts.

- **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.

- **DIN (Deutsches Industrie Normen) Standard.**

Basing on DIN , the rating requires that at 0°F (-18°C), 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.

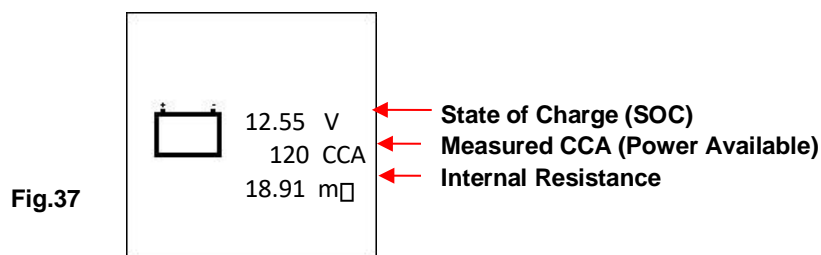
- **CA (Cranking Amperes) / MCA (Marine Cranking Amperes) Rating.**

This rating is the number of amperes that a new fully charged battery can delivery at 32°F (0°C) for 30 seconds, while maintaining a voltage of at least 7.2 Volts for a 12V battery 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 (State of Charge), CCA and the Internal Resistance (mΩ) only.

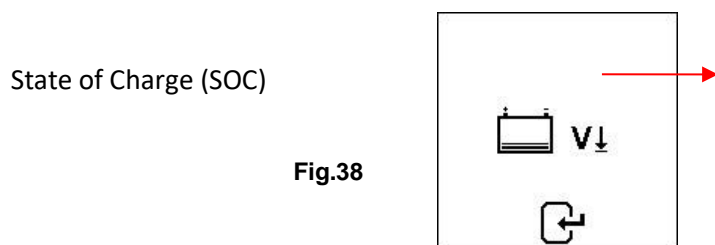
This selection can also be used to test 12V - Deep Cycle Batteries. An example of the results display is shown below (Fig.37):



To determine the condition of the tested Deep Cycle Batteries, refer to the **Volts** reading – State of Charge (should not fall below 12.60V when fully charged for Lead Acid Batteries, 12.85V for Gel Batteries and 12.80V for AGM Batteries) and the Internal Resistance [**Int. R**] of the tested battery should *not be more* 15 mΩ to be considered a good battery.

7. Batteries that have been left idle for long periods can still be tested with this Analyzer. To perform the test, just clamp the Analyzer clips on the battery terminals and it will display the screen (Fig.38 on following page) as shown if its voltage falls below the normal 12.0 volts.

Note: Any battery whose voltage falls below 10.6V will be considered a shorted battery.




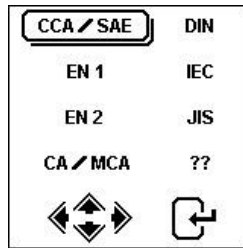
Press  key to continue and the display will show: (Fig.39):

Fig.39



Check the battery ratings and enter it as described earlier and the results will show as an example below (Fig. 40 and Fig.41):

Fig.40

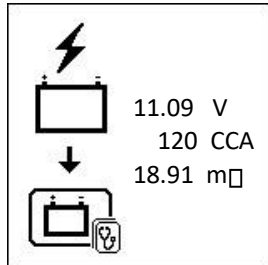


Fig.41

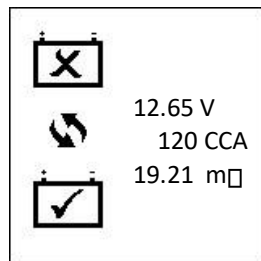



Fig.40 - Results shown [Recharge and test again], indicates that the battery has to be fully charged first before repeating the test. Reason: State of Charge: 11.09V is too low.

Fig.41 - Results shown [To replace], this means that the battery needs to be replaced as its internal plate resistance [Int. R] 19.21mΩ is higher than 15 mΩ limit.

Pressing the  key at any moment will exit and return back to the main menu display.

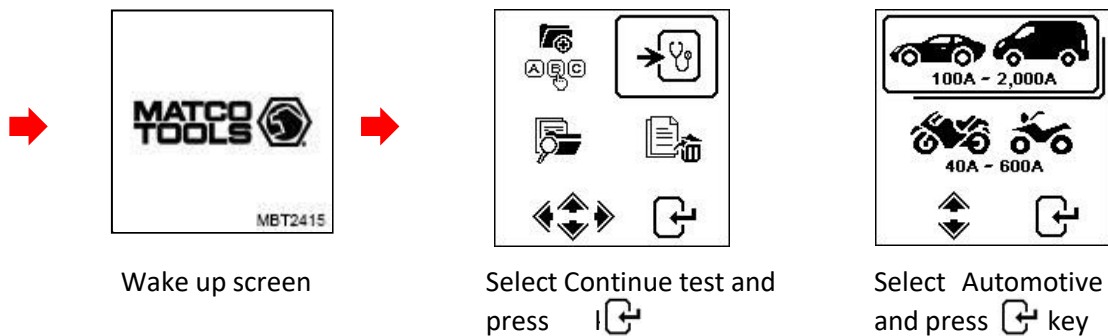
Starter Test:

This test is only available in battery system during

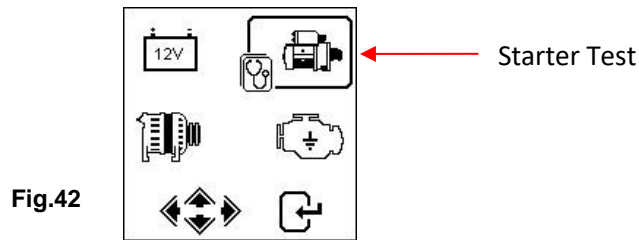



test and it actually checks the cranking effectiveness of the 12V or 24V starting and also the starter condition.

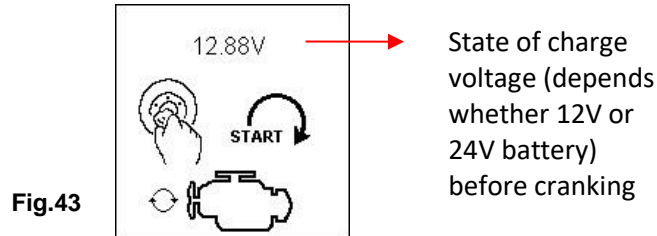
1. With engine OFF, place the vehicle transmission in NEUTRAL for Manual and PARK for Automatic then apply the hand brake.
2. Connect the tester to the battery terminals and the displays will light up as shown below:



From the main MENU (Fig.42), select  by scrolling left using ► key.

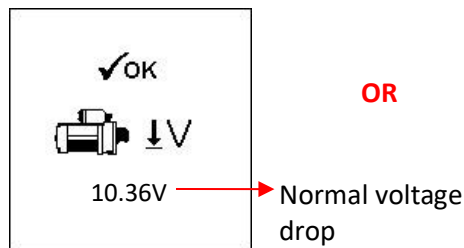


Press  key to continue and the display will show (Fig.43):

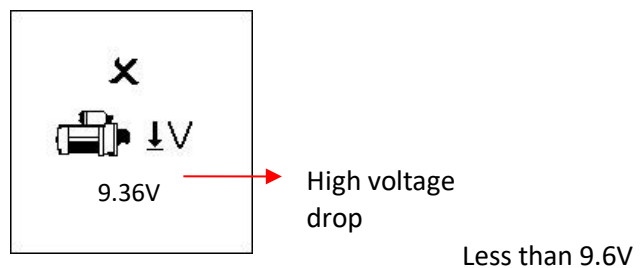


Note: In event that you did not crank the engine while on this screen; the starter test will be terminated after 30 seconds and will return to the main menu.



- Now switch the ignition key to ON and start cranking the engine until it starts. As soon as the engine starts, the results will automatically display as shown in examples below (Fig.44 or Fig.45):




OR



Note: 9.6 Volt is the voltage drop limit for 12V system whereas 19.2 Volt is for 24V system. Voltage drop more than the limits mentioned are considered bad.

- To print out the results, just press  key on the Analyzer, the printer will start printing.
- Pressing the  key will exit and return to the main menu screen (Fig.42).

Alternator Test:

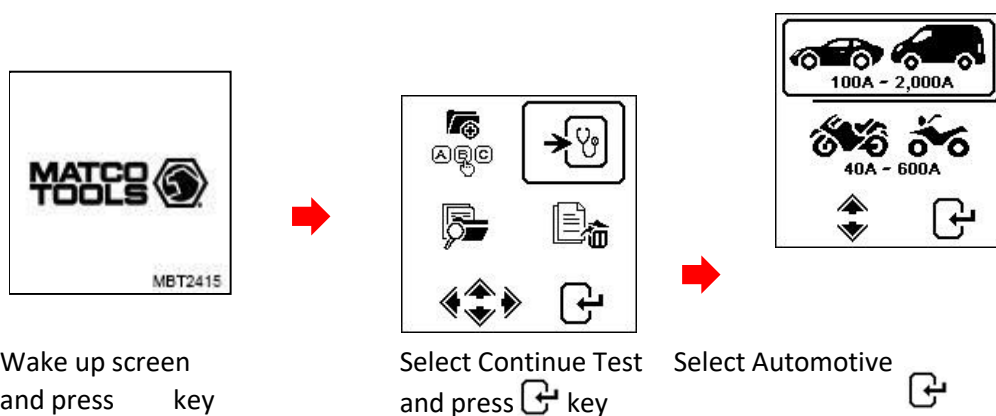
This test is only available in  test. It checks the MAX and MIN charging voltages output of Normal or Smart Alternator at 2,500 – 3000 RPM without load and 1,500 – 2,000 RPM with all loads ON. As Normal and Smart Alternators on a 12V and 24V systems have its own set of parameters, it can determine the alternator's charging conditions and with the test results, you can check its condition in reference to the vehicle's Service Manual.

No load testing at 2,500 – 3,000 RPM

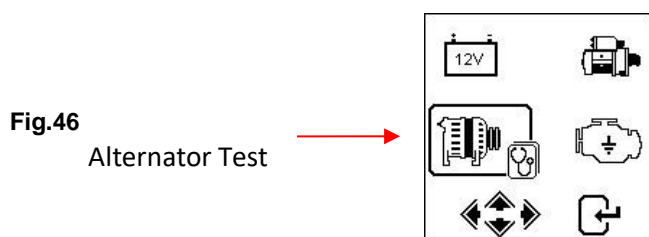
- With engine OFF, place the vehicle transmission in NEUTRAL for Manual or PARK for Automatic and apply the parking brake.

2. Attach the Analyzer clips on the battery terminal posts and it will power up and lights up the LCD display screens as shown below:

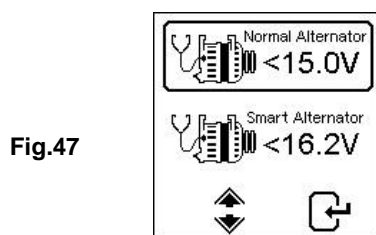
Note: The Analyzer will auto detect the battery voltage once it has clamped onto the battery terminals, if it has detected a 24V battery then it will set its test perimeters to cater to a 24V system and vice versa if it is a 12V system.



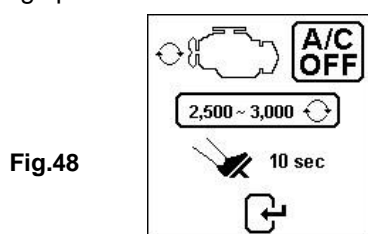
3. From the main MENU (Fig.46), select by scrolling left using .




Press key and the display will prompt you to select which type of Alternator (Smart or Normal) for testing (Fig.47) below:

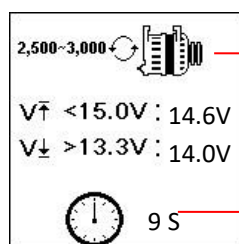


Once selected, press key to continue and the display will show (Fig.48). Start the engine if it is not running and keep it running at idling speed. Make sure the air conditioning is OFF.



4. Then, rev the engine to around 2,500 – 3,000 RPM and hold this speed. Press  key to continue and display will show (See Fig.49):

speed.



Rev engine around 2,500 to 3,000 RPM and hold this

Fig.49

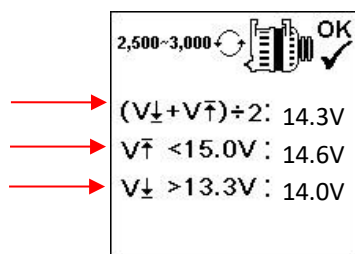
Timer starts

countdown from

10s to 0s.

5. While still holding around 2,500 – 3,000 RPM, the timer will start to countdown from 10s to 0s. As soon as it reaches 0s, the results will automatically display as example shown below (Fig.50):

Average Charging Voltage
Max. Volts must be less than
Min. Volts must be more



Captured readings:
Maximum Volts.
Minimum Volts.

than

Fig.50

With the captured readings, analysis can be done by referring to the limits as indicated:

Normal Alternator Charging:

12V System: No load - MAX voltage should **not exceed 15.0V** and MIN voltage should be **13.3V**.
Loaded - Should be **more than 12.6V**.

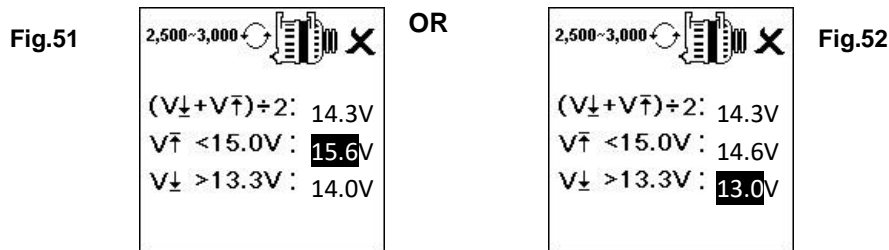
24V System: No load - MAX voltage should **not exceed 30.0V** and MIN voltage should be **26.6V**.
Loaded - Should be **more than 25.2V**.

Smart Alternator Charging:

12V System: No load - MAX voltage should **not exceed 16.2V** and MIN voltage should be **12.4V**.
Loaded - Should be **more than 12.0V**

24V System: No load - MAX voltage should **not exceed 33.0V** and MIN voltage should be **24.8V**.
Loaded - Should be **more than 24V**

6. If either minimum or maximum charging volts are not within the voltage range limits, then it will display one of the screens as below (Fig.51 or Fig.52) and it will highlight which prompt to check the charging system for the fault.



Testing with Electrical Load at 1,500 – 2,000 RPM

As more electrical accessories, such as lights, rear defroster, heater, car stereos, etc. are used; voltage 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.

Continue from the previous test (either Fig.50, 51 or 52); the Analyzer will automatically proceed to Load Test at 1,500 to 2,000 RPM. The display will show as below (Fig.53):

Switch ON all electrical loads
(Head lights – High & Low,
Radio, Heater, etc.)

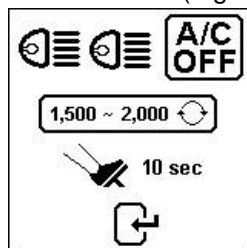


Fig.53

Switch ON all electrical loads (Head Lights, Radio, Rear Defroster, Heater, etc.).

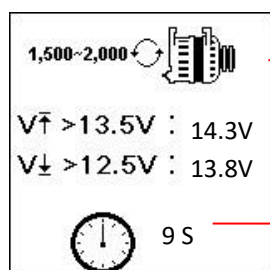
Note: Air-Conditioning (highest mechanical load), should be OFF as it sometimes slows down the idling speed of certain cars while it is ON thereby affecting the idling speed charging results.

- Press key and the display will change as shown in (Fig.54) below. Rev the engine up around 1,500 to 2,000 RPM by referring to the dashboard meter maintaining the engine speed as shown in the example (Fig.54):

Rev engine to 2,000 RPM

Fig.54

Timer
from 10s to 0s.



and hold at this speed.

starts countdown

Wait for the countdown from 10s to 0s. As soon as it reaches 0s, the results will automatically display as example shown below (Fig.55):

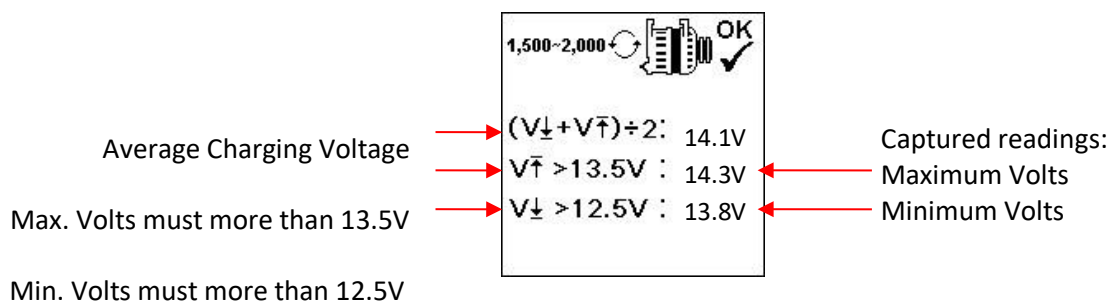
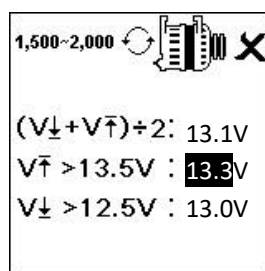
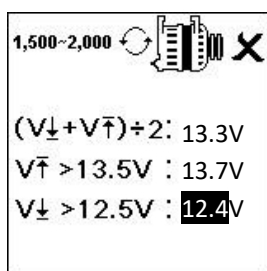


Fig.55

8. If either minimum or maximum charging volts are not within the voltage range limits, then it will display one of the screens as below (Fig.56 or Fig.57) and it will highlight which prompt to check the charging system for the fault.

OR

Fig.56 Fig.57

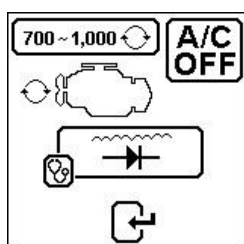


Testing diode ripple at idling speed with electrical load ON

This test is to check the AC ripple of the alternator diodes whether it is within the 0.5V limit. Normally, if one of the diodes is faulty, the AC ripple will produce higher than the acceptable 0.5V.

9. Continue from the previous test (either Fig. 55, 56 or 57); the Analyzer will automatically proceed to diode ripple test. The display will show as below (Fig.58):

Fig.58




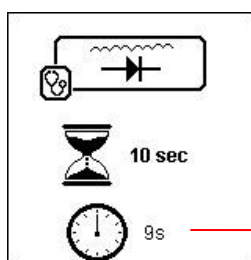
10. While the engine is still running, make sure the air conditioning is OFF and the headlights (low and high beams) are switched ON. Press  key to continue and the display will change to (Fig.59) as shown below:

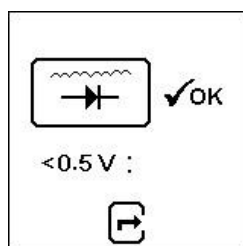
Fig.59



Timer starts countdown from 10s to 0s.

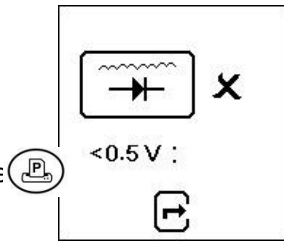
11. Wait for the countdown from 10 to 0. As soon as it reaches 0, the results will automatically display as example shown below (Fig.60):

Fig.60



12. If the ripple voltage is above 0.5V then it will display (Fig.61) as below:

Fig.61



13. To printout the results, just pre

key on the Analyzer, the printer will start printing.

14. Pressing the

key will exit and return to the main menu screen (Fig.46).

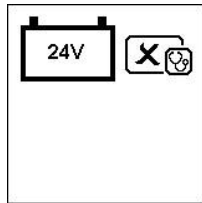
Grounding Test:



This test is available in only. The purpose of this test is to check the grounding cable condition to the engine body. If the grounding circuit is not good, it may pose a lot of problems to the vehicle ECU. The Analyzer will measure the contact resistance from the engine body to the battery terminal, then it will display the results and the recommendations after each test.

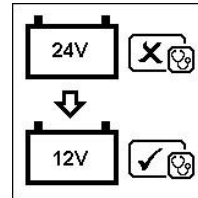
Again, this test can only be performed with a 12V battery. If you need to check grounding on a 24V vehicle system (12V x 2 batteries), all you have to do is to clamp onto one of the two batteries that provides the 12V for the operation. If you had accidentally clamped onto a 24V battery output, it will remind you with the display as shown below (Fig.62 and Fig.63):

Fig.62



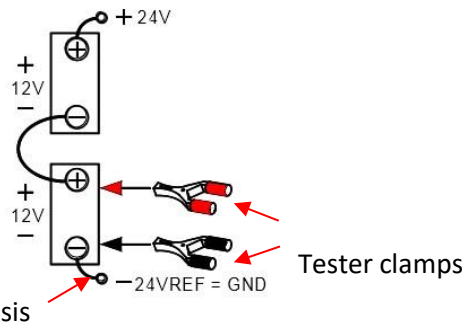
Flashing
alternately

Fig.63



In this case, clamp the tester onto one of the 12V batteries that has a negative terminal connected the chassis (see Fig.64 below).

Fig.64

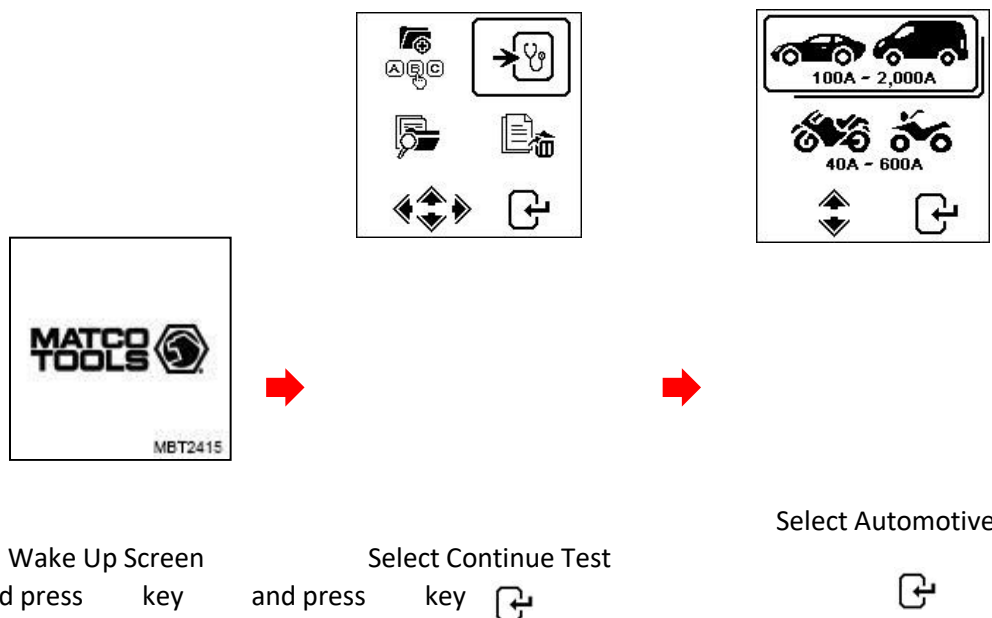


Note:

To conduct Ground Resistance test on a 24V (12V x 2 batteries) system, always look for the 12V battery with its negative terminal connected to the vehicle chassis (see Fig.64 above). Clamp the tester clips onto the battery terminals to be able to proceed with the test.

Start Testing

1. Make sure that the engine is switched OFF. Attach the clips onto the battery terminal posts and the Analyzer will power up and light up the LCD display screen as shown below:




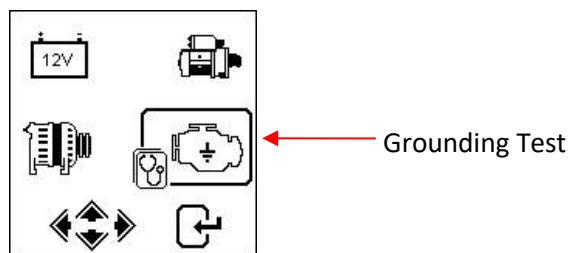
2. From the main MENU, select  by scrolling left using ► key. The screen will show (Fig.65):

Fig.65




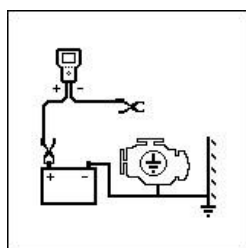
Press  key to continue and the display will show (Fig.66 & Fig.67):

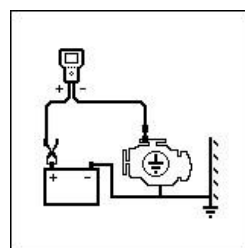
Fig.66




Flashing
alternately



Fig.67

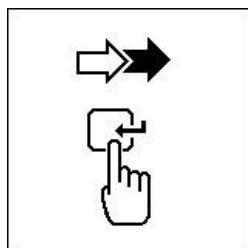


Now transfer the BLACK tester clip from the battery [-] terminal to a suitable position on the engine or chassis body leaving the RED clip still attached to the battery [+] terminal as shown above.

3. As soon as the display will show  to continue.

BLACK tester clip is attached to the engine body, the (Fig.68) which means that you need to press key

Fig.68




4. When  key is pressed, it will start analyzing and the display will change to the screen below (Fig.69):

Fig.69



5. Once it has finished analyzing, it will prompt you with instructions (Fig.70 & Fig.71) stating that you should unclamp the Black tester clip from the engine or chassis body and transfer to the battery negative [-] terminal within a 15 second time limit. If not, the testing procedure has to be repeated again as the gathered data will be lost.

Flashing
alternately

Fig.70 

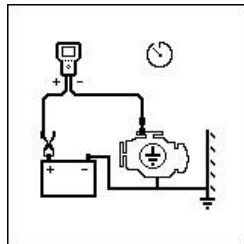
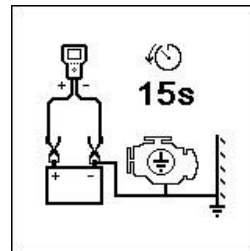
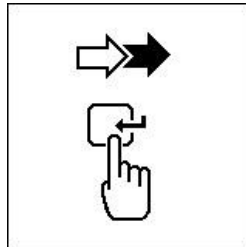


Fig.71



6. Once the Black clip is clamped onto the battery [-] terminal, the Analyzer display will light up as shown. (Fig.72):

Fig.72



the battery [-] terminal, the Analyzer display will


7. Now you need to press  key to proceed and the display will show as follows (Fig.73):

Fig.73

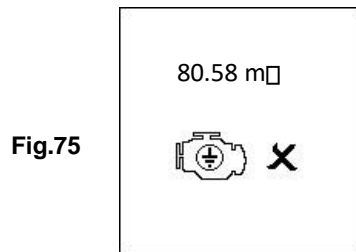


8. If the measured resistance reading is within limits, then it will display as follows (Fig.74).

Fig.74



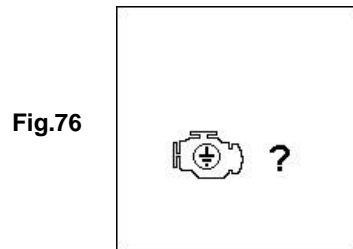
9. If the measured resistance reading has gone beyond the limits, then it will display the screen as follows (Fig.75).





Note:

The above (Fig.75) 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. Repeat the test again after fixing.

10. If you did not follow the right procedures during the testing, it will display the results as follows (Fig.76) below:



11. To printout the results, just press  key on the Analyzer, the printer will start printing.

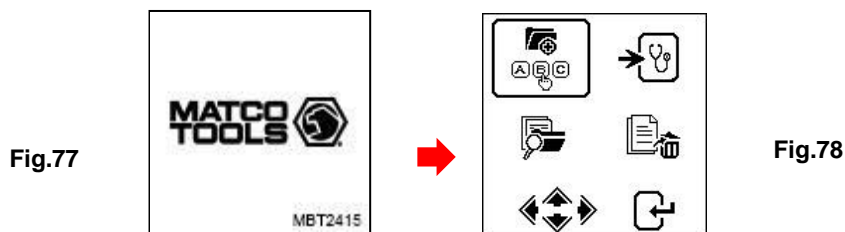
12. To exit the program, pressing the  key at any moment will exit and return back to the main menu screen (Fig.65).


View Test Results from Memory

To view all the test results, the Analyzer has to be connected to an external power source by either clamping its clips directly to a 12 Volt car battery or connected to a PC via the USB port using a USB cable.



1. Once powered up, the wakeup screen will display as follows: (Fig.77 & Fig.78)



2. Select **View Test Report from Memory** by scrolling with ▼ key to  See display below (Fig.79).

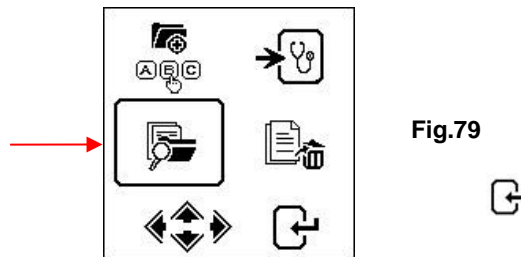


Fig.79

3. Once key is pressed, the display will show as follows (Fig.80).

Fig.80



Select the particulars that you have keyed in earlier from the list by scrolling the highlighted bar up or down when pressing \blacktriangle or \blacktriangledown key. If the particular is not in the list that you are looking at, you may go to the next page by pressing \blacktriangleleft or \blacktriangleright key. Once you have found it, press \square key to confirm. The display will show the results stored from its memory as example shown below:

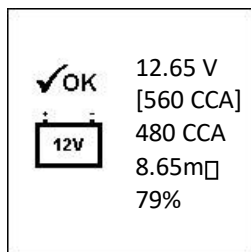


Fig.81

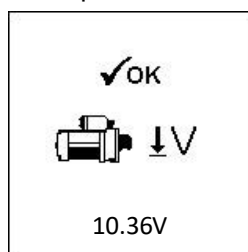


Fig.82

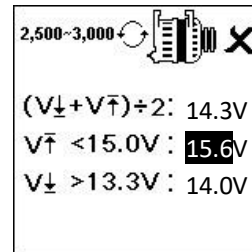


Fig.83

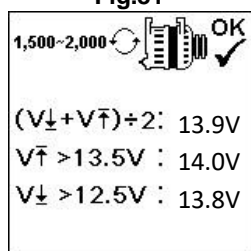


Fig.84

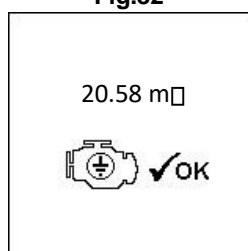


Fig.85

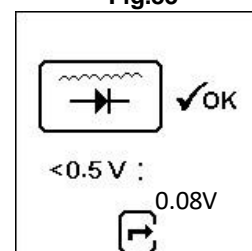


Fig.86

Printout of Stored Test Results Important:

The Analyzer has to be connected to a 12V battery in order to work with its printer. This is because the printer needs higher Amps to operate which the PC USB output is unable to provide.



An example of the printout as shown in Fig.87 below:

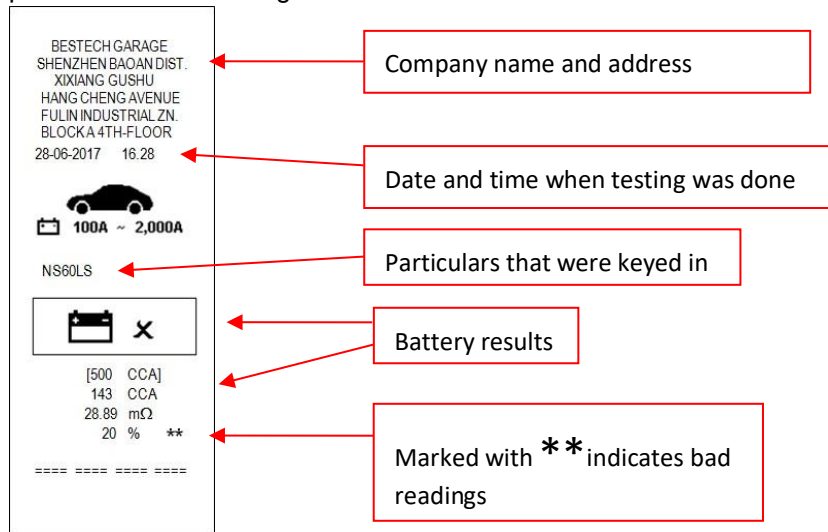


Fig.87

Printing of the stored Test Results can be done while in View Test Results from Stored Memory (Fig.81–86). To print just press key on the Analyzer, the printer will start printing.

Note: To print out on a normal computer printer, it must be connected to the PC with the Analyzer software installed. (See Printing Results from PC Printer – Page 32).

To exit the program, pressing the key at any moment will exit and return to the main menu screen (Fig.79).

Personal Computer (PC) Link

The Analyzer is also designed to link with a PC for data storage and printout through normal printer. To do so, the PC has to install the driver first and the software provided in order to operate.

Installing Driver

Important to Note:

Before you start to install the driver, please do not plug the Analyzer into the computer's USB port or the installation will fail and the computer will not detect the proper driver for the Analyzer when connected.

If you have made the above error and wish to install the driver the second time, you need to uninstall the previously installed driver first before reinstallation. This time make sure that the Analyzer is not plugged in.

Step 1. You can install the driver from the CD provided or download from this link:

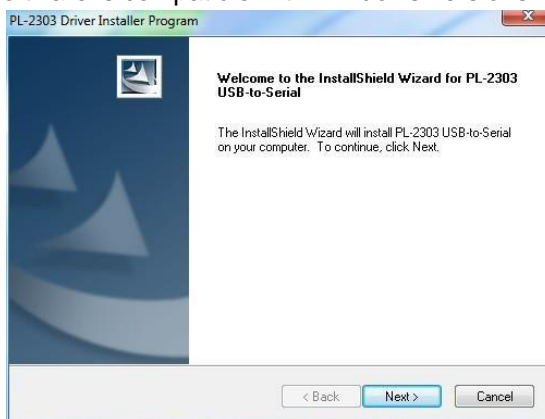
<https://associatedequip.com/product/12-2415/>

First click to open the folder: MBT2415 Software and Driver

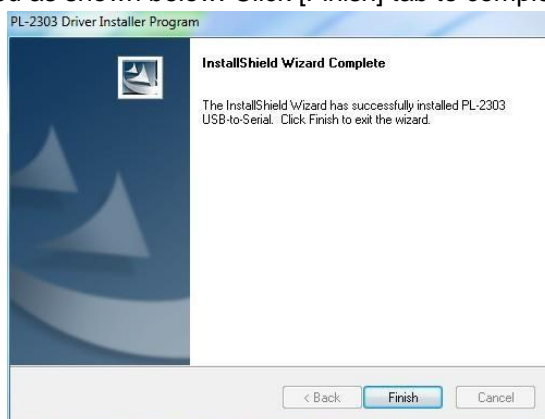
You will find the following files: MBT2415 Setup Setup Application 9.5.0.0 XP_Vista_7_8_10 Driver Installer V.1.20.0 Setup.exe



Step 2. Double click on the icon . The installation will start automatically. Typical example below is for Windows 7 operating system. The software is compatible with Windows versions XP, Vista, 7, 8 and 10.

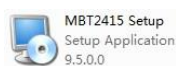


As instructed, click [Next>] tab. The program will continue to install the driver on the computer. Once it has finished, it will prompt you as shown below. Click [Finish] tab to complete the installation.



 MBT2415 Software and Driver

Step 3. Next open this folder again:



Look for the program icon:


Then double click to open the program. See examples below:



Click “OK” tab to continue the installation and the software will start to install.

A few seconds later, the display will show, as below, that the installation has been completed. Click “OK” tab to exit.



Once the software has been installed, the icon  will appear on the desktop.

Step 4. Now plug the Analyzer into any one of the PC USB ports and link up the Analyzer with the PC by the following procedures:

1. Go to the Main Menu (Fig.88), select View Test Results (Fig.89) as shown below:

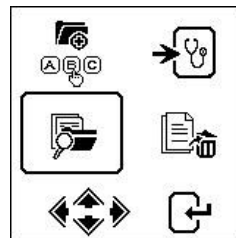
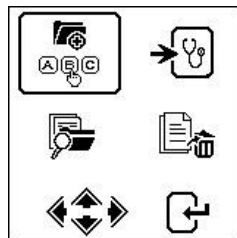



Fig.88 Fig.89

While in display (Fig.90), select which results you need to view by scrolling ▼ or ▲ key and then press  key to get the test result display as example shown (Fig.91):

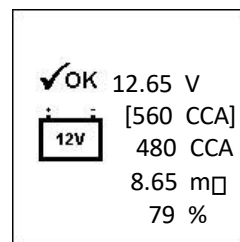


Fig.90 Fig.91

2. Press USB key on the keypad (Fig.92) will display as shown below:

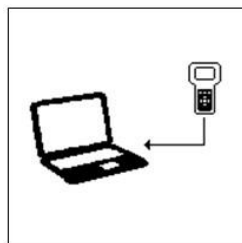


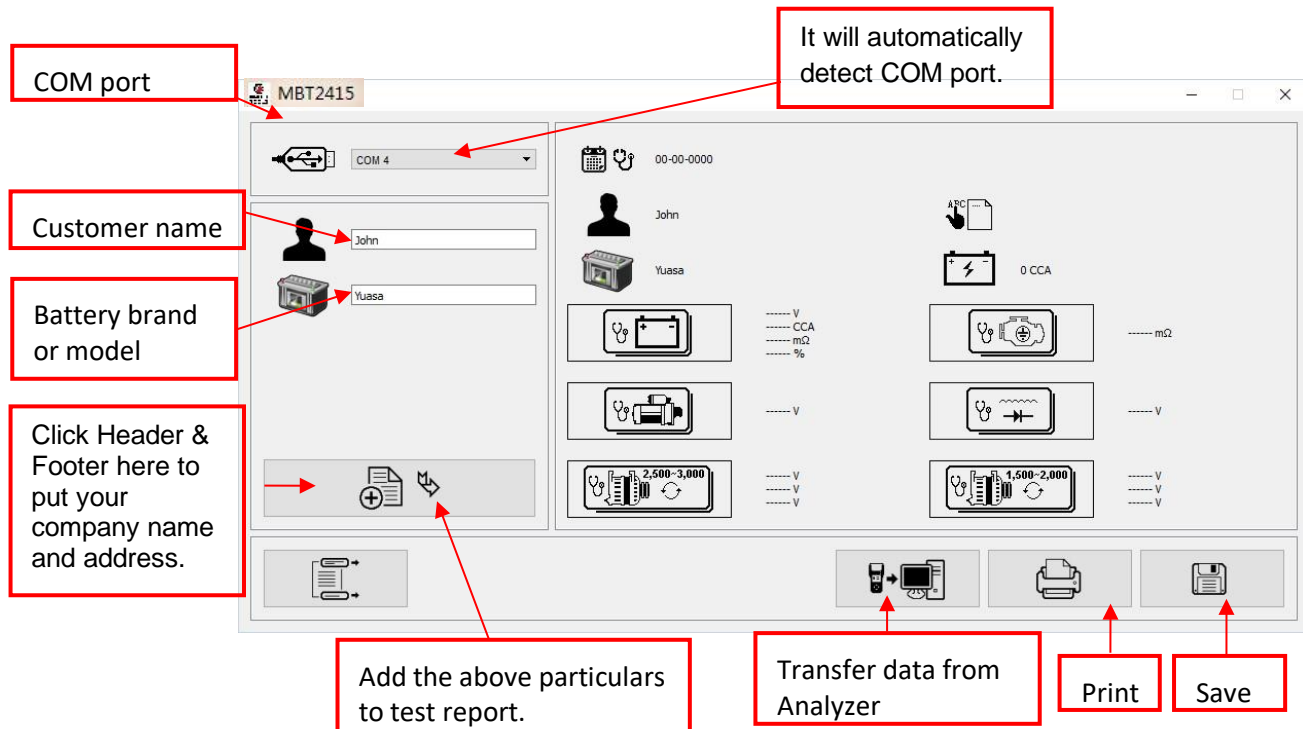
Fig.92


It will remain in this display while logged into the PC. Do not press any other keys because the Analyzer is already communicating with the PC.

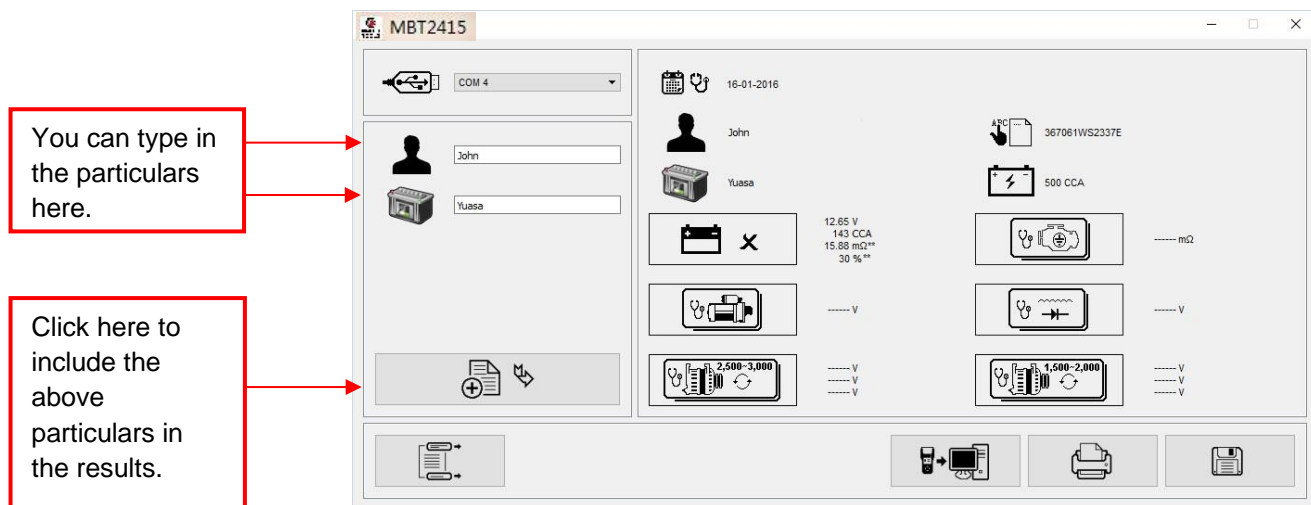
Step 5. On the PC, go to desktop display and look for



icon. Left click on the icon to open the program and the display page will show as below:




1. To confirm whether there is communication; click on  [Transfer Data from Analyzer] tab and the Test Result will appear. See example below:



2. If there is no communication, a message text box will appear (see below) Fig.93:




Fig.93

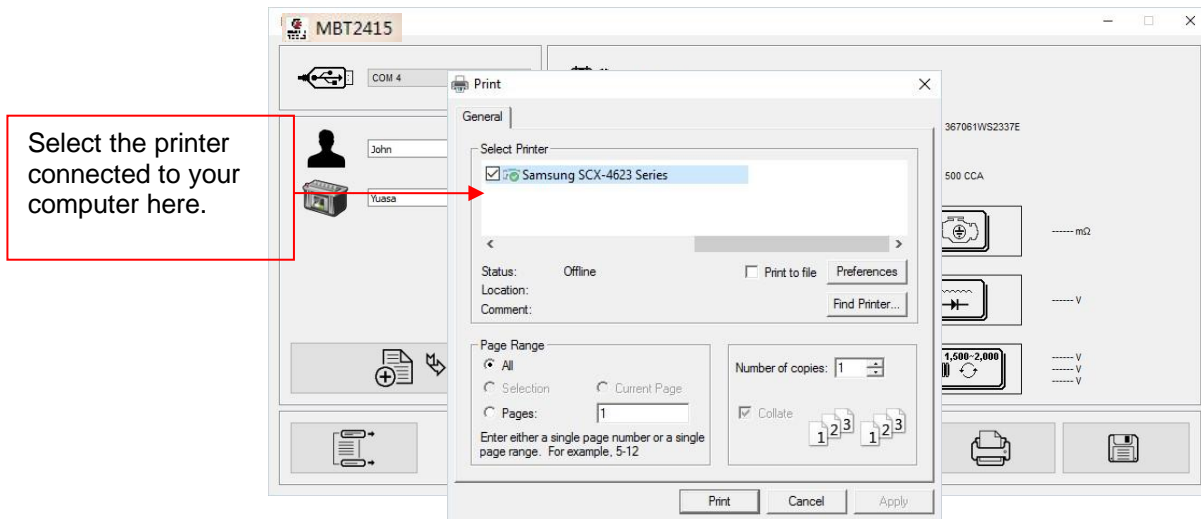
In this case, unplug the Analyzer from the PC and repeat Step 4 and Step 5. If problem persists, then select an alternate COM PORT individually from the dropdown list and click  tab to see whether the Last Test Result will appear (as displayed in Step 5).

If the above fails again, try plugging the Analyzer to the PC's other USB port and repeating Step 4 and 5 again.

Printing Results from PC Printer

While on this page, if you wish to print out the results, make sure that your printer is connected to the computer.

Click on  tab and a text box will appear. Select the right printer and click [Print] tab to print.



Saving Results:

Note:

The results will be saved in MS Office Word document format. Set the paper size to A4. Use "Scale To Fit" to print on standard A (8.5x11) paper.

While in MS Office Word page, go to [Page Layout] tab and right click, display shows as in Fig. A:

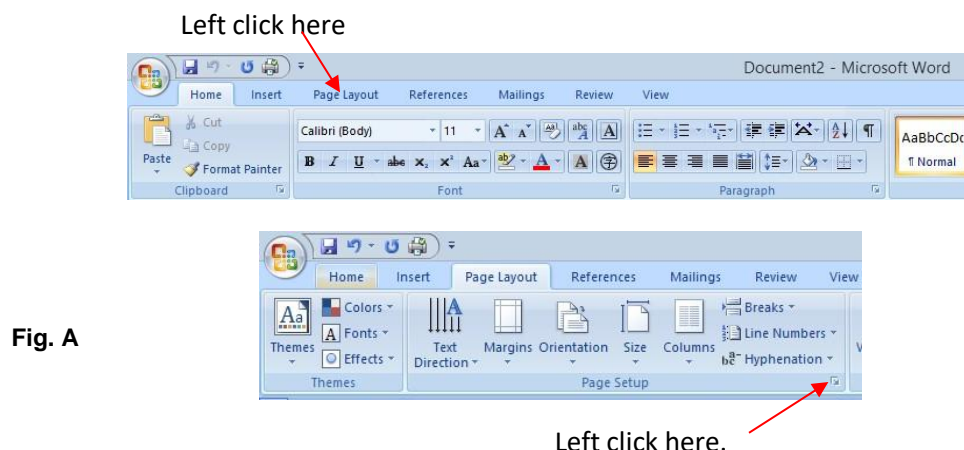


Fig. A

On [Page Layout], left click on  sign (see Fig. A) to show Page Setup dialogue box as shown (Fig. B) below. Then select [Paper] tab and browse [paper size] drop down menu for A4 click on it (Fig. C). Click [OK] to apply and confirm.

Left click here

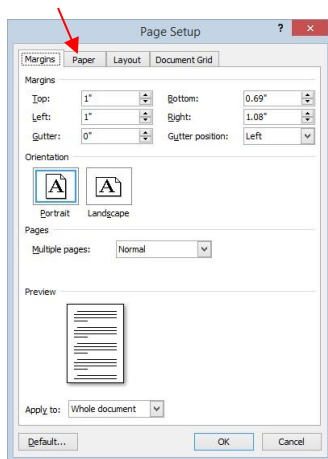


Fig. B

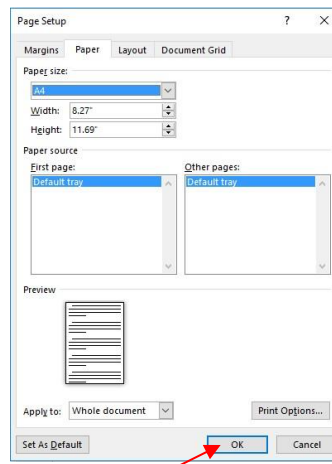

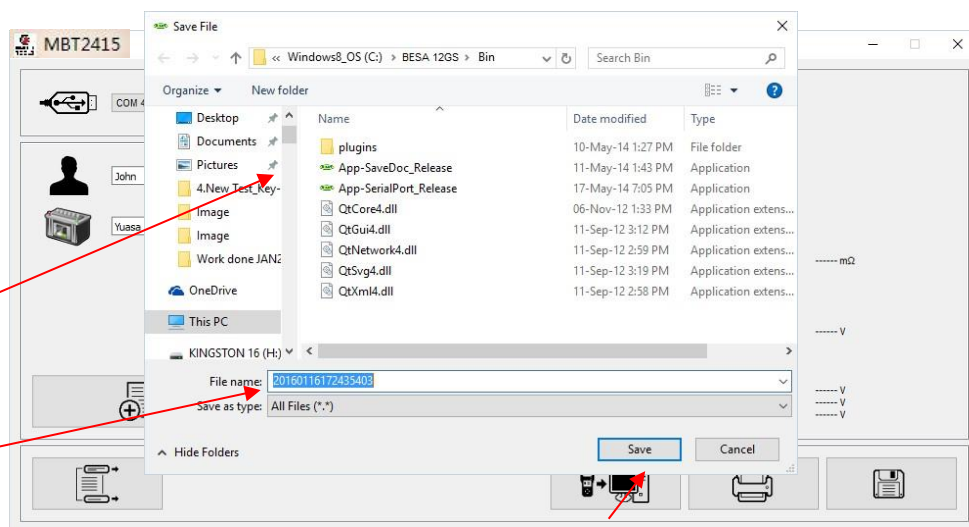


Fig. C

Left click here

To save results, click on  tab. A message box (see below) will appear. Create a file name and then click [Save] as shown below.



The document will be saved in this folder in drive C.

Type in here to create your own file name

Left Click to Save

Erase All the Stored Results in the Memory


This function allows you to erase off all the results stored in its memory and start a fresh new list after you have backed up all the stored results to the PC. To access this function, press  and press

Fig.94

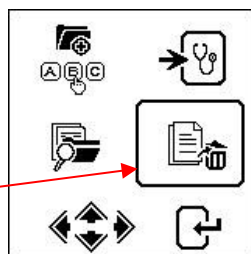


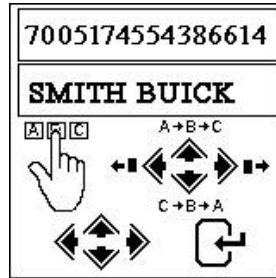
Fig.95

Erase Results from Memory.



1. Press and hold ◀ and ▶ keys together. A few seconds later the display will change to (Fig.96) as shown below and that completes the process.

Fig.96



Warning: Performing the above procedures will erase all records from the tester.

Using The Barcode Scanner

Insert the cable to the Barcode Scanner, then plug the cable into the tester. Aim the scanner at the barcode, press the trigger to scan a barcode. See page 7 topic **New: Key-in Particulars** for additional information.

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 during testing. Safe and effective use of this tester is very much dependent on the user following the normal practices and procedures outline in this manual.

Warranty Information

Limited Warranty

This limited warranty covers defects in materials and workmanship for a period of two (2) years beginning the date the product is purchased by the end user and is subject to the following terms and conditions:

1. Within the warranty period, the manufacturer will repair or replace, at their option, 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.
3. This warranty only extends to the first owner and is 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 arise as a result of normal use and does not cover those that arise 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.

Limitations of Warranty

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

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

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