AUTOBACS AUTOMOTIVE BATTERY GUIDE

AUTOBACS

SEALED MAINTENANCE FREE BATTERY

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Battery Characteristics

AUTOBACS Sealed Maintenance Free (SMF) batteries are manufactured under strict Japanese quality control regulations for reliability and performance. It is important to understand, however, that wet filled car lead acid batteries have a finite service life and will slowly self-discharge over time. The rate of self-discharge will be greater in hot climates or in areas of high humidity. The battery will be permanently damaged and unable to be used if the battery is allowed to self-discharge to the point where it becomes sulphated. For batteries stored in inventory, it is important to regularly check the charging codes and recharge dates while always ensuring good turnaround of stock on a first in, first out basis. Regular voltage checks should be performed with any battery showing 12.45 volt or less requiring immediate recharging. Recharging must be conducted in accordance with the recommended charge rate according to the battery specifications. Recharging should not be performed by a fast charger as this can permanently damage a partially sulphated battery and dramatically shorten its service life.

Battery Problems

Non-Manufacturing Defects

Physical Damage

Occurs if the battery is mishandled, abused or incorrectly installed. Overtightening of the battery hold-down, hammering down connector terminals or storing the battery incorrectly where it is subject to excess heat and water damage will result in damage to the casing and/or terminals. This is not a manufacturing defect.

Sulphation

Occurs if the battery is allowed to remain in a discharged state for a period of time. Sulphation is the result of a chemical reaction when the battery is not used and the longer the battery if left discharged the more severe the sulphation build up. The damage can occur in storage or while installed if the vehicle is not used for a period of time. Sulphation permanently impairs the electrochemical reaction within the battery and attempts to recharge the battery will cause further damage to the plates. This is not a manufacturing defect.

Wear and Tear

Occurs when the battery is subject to repeated high charge / discharge cycles. Every time the battery is charged and discharged, a small amount of the active material is used from the plates. Eventually, through normal ageing and repeated charge/discharge cycles, the active material will become depleted and the battery will lose capacity. This is not a manufacturing defect.

Deep Cycling

Occurs if the battery is deep discharged and results in accelerated loss of active material from the plates. Rapid recharging of a deep discharged battery will further reduce the performance and life expectancy of the battery. This is not a manufacturing defect.

Overcharging

Occurs when the voltage regulator in the vehicle's alternator has failed, is improperly configured or has otherwise malfunctioned. The excessive charge can cause the battery to overheat and evaporate the electrolyte. Overcharging accelerates the loss of active material and can damage the plates resulting in loss of performance. This is not a manufacturing defect.

Undercharging

Occurs when the battery does not receive sufficient charge to bring the battery to a fully charged state resulting in slow sulphation. Undercharging is caused by a defective alternator, loose or slipping alternator belt or defective battery cables. Undercharging can also occur if the vehicle is used only occasionally for short distances. This is not a manufacturing defect.

Incorrect Application

Occurs when a smaller or less powerful battery is installed. Fitting a smaller or less powerful battery will result in premature wear and tear with a shorter service life. Moreover, if the vehicle is originally fitted with an AGM battery by the manufacturer, then it should only be replaced by an AGM battery. Installing a smaller or less powerful battery or an EFB in place of an AGM battery will result in early failure. This is not a manufacturing defect.

False Claim

Occurs due to fraudulent claims from certain individuals seeking to obtain a warranty replacement under false pretenses.
Each AUTOBACS battery has a factory etched Assembly Code and Charging Code to allow checking of the manufacture and charge date to minimize false claims.
See page 21 for details on Assembly Code and Charging Code.

Other Defects

Manufacturing Defects

AUTOBACS Sealed Maintenance Free (SMF) batteries are manufactured on precision automated assembly lines under strict Japanese quality control standards. The rate of genuine manufacturing defects is extremely low and negligible.

Short Circuit/Dead Cell

Occurs when one cell goes short circuit most likely due to high under bonnet temperatures or from dendrite formation caused by over discharge.

Internal Break

Occurs when plates and/or internal components become separated most likely if battery is subject to strong impact causing the internal breakage.

Summary

Car batteries are a “live” product that are constantly undergoing a chemical reaction from the time of manufacture through to the end of its service life. All batteries have a finite service life that is heavily dependent on how the battery is used. Under normal operations and in the optimum conditions, the car battery will perform reliably for the expected service life. If the battery is allowed to become discharged and is left in such a condition, then the battery can become permanently damaged.

Causes for the battery to become discharged include:

- Faulty alternator and/or charging system
- Incorrectly adjusted alternator belt
- The vehicle's lights have been left on (interior lighting, hazards, headlights etc.)
- Battery has been left standing without recharging
- Electrical fault in vehicle causing the battery to drain abnormally
- Excessive electrical load through installation of aftermarket accessories connected to the battery
- Vehicle is used for infrequent short journeys

Deep discharging, referred to as deep cycling, will cause the battery to lose performance very quickly and is the most common cause of premature battery failure. Sulphation, deep cycling and wear and tear are not a manufacturing faults and are not covered by the AUTOBACS battery warranty.

Battery Testing

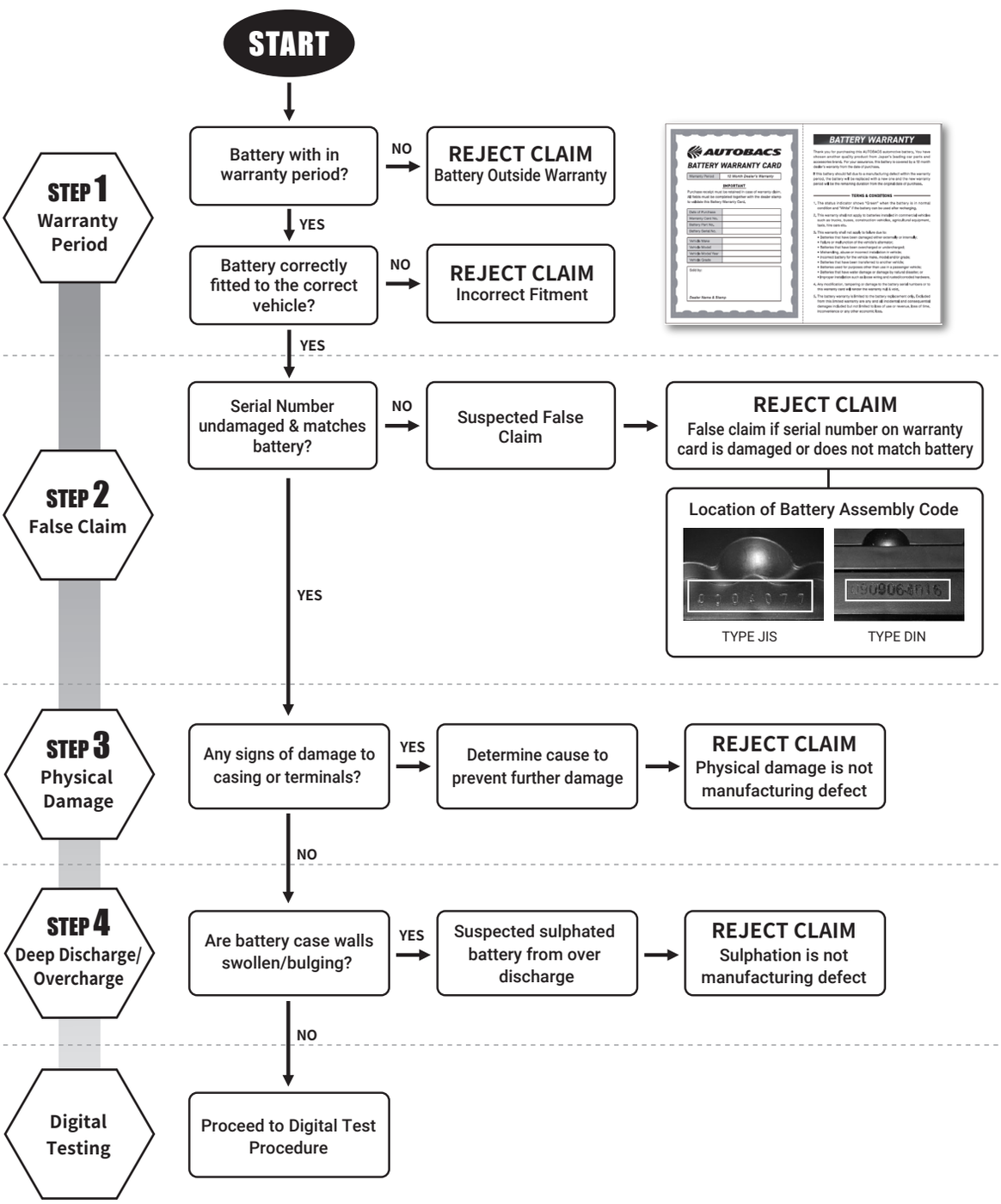
Visual Check

STEP 1 Confirm warranty period applies to the battery for the vehicle it was installed in.
Is the battery within the warranty period as stated on the Warranty Card?
YES–go to Step 2 NO–Reject Claim. Battery is outside warranty.

STEP 2 Confirm Battery Serial Number on the warranty card matches the Assembly Code engraved on the battery (Reject claim if Assembly code has been damaged/tampered).
YES–go to Step 3 NO–Reject Claim. Battery does not match Warranty Card.

STEP 3 Does the battery show signs of external damage?
NO–go to Step 4 YES–Reject Claim. Determine cause of physical damage.

STEP 4 Is the casing of the battery swollen/bulging?
NO–go to next section; Digital Test Procedure
YES–Reject Claim. Battery damage likely case by sulphation due to over discharge/overcharging.



Digital Test Procedure

Autobacs recommends using a recognised digital conductance tester such as Midtronics or the ARGUS AA series for checking the condition of Sealed Maintenance Free batteries. There are many different types of hand-held conductance testers on the market and it should be noted that different testers can give different results due to the various testing algorithms used. Importantly, hand held conductance testers are not a reliable method to check cold cranking performance (CCA) of a brand-new battery that has not been installed and/or used in a vehicle.

When to use a Digital Tester

Battery Condition	Voltage Test	CCA Test
Brand New & Never Installed	**YES**	**NO**
Warranty Claim After Installation	**YES**	**YES**
Health Check After Installation	**YES**	**YES**

Midtronics Battery Tester

If testing on the vehicle, observe the following requirements:

- Remove surface charge: with engine off, switch on the headlights for 1 minute then switch of all electrical loads and leave for 2 minutes prior to testing.
- Always connect the battery tester clamps directly to the lead of the battery terminals. Both jaws of each clamp must make direct contact with the lead of the battery terminal.
- Turn off all connected loads, close vehicle doors and disconnect chargers before starting a battery test.

Step 1. Ensure the battery terminals are clean before connecting test clamps to the battery. Connect the red clamp to the (+) terminal and the black clamp to the (-) terminal.

Step 2. Select the Battery Application to AUTOMOTIVE using the UP and DOWN buttons and press ENTER to confirm the selection.

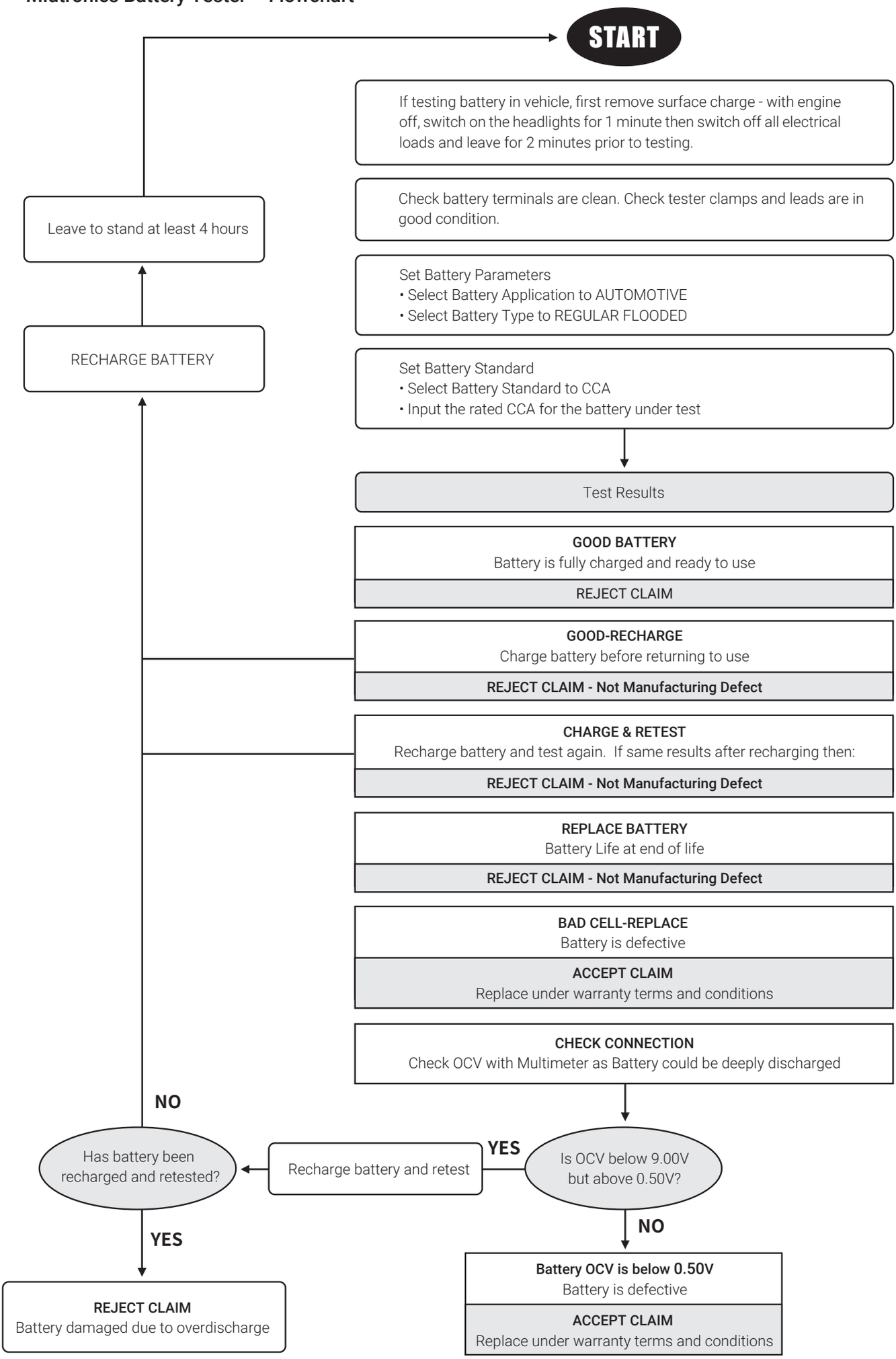
Step 3. Select the Battery Type to REGULAR FLOODED using the UP and DOWN buttons and press ENTER to confirm the selection.

Step 4. Select the Battery Standard to CCA then input the CCA rating as shown on the battery label. Press the ENTER button to start the test and observe the results as follows:

DISPLAY MESSAGE	RECOMMENDED ACTION
GOOD BATTERY	REJECT CLAIM: • Battery is fully charged and ready to use.
GOOD-RECHARGE	REJECT CLAIM: • Recharge battery then ready to use.
CHARGE & RETEST	Charge battery then test again. If same result appears after charging then REJECT CLAIM: • Battery has been subject to excessive charge/ discharge cycles. • Check electrical system for defects, non-OEM electrical devices. • Check for extreme service usage such as taxi, ride sharing, delivery vehicle etc.
REPLACE BATTERY	REJECT CLAIM: • Battery has lost significantly its original performance. • Battery has lost performance due to external factors such as overcharging, undercharging, deep discharge and/or wear & tear.
BAD CELL-REPLACE	ACCEPT CLAIM: • Battery is defective – Replace under warranty terms & conditions.
CHECK CONNECTION	Ensure terminals are clean. If testing on-car, ensure all electrical loads are switched off. Check battery voltage with multimeter – if below 9.00 Volts but above 0.50 Volts then recharge and retest. If same results after charging then REJECT CLAIM: • Battery is permanently damaged due to over discharge and sulphation. If OCV less than 0.50 Volts then ACCEPT CLAIM: • Battery is defective – Replace under warranty terms & conditions.

Midtronics display messages and recommended action.

Midtronics Battery Tester – Flowchart



Argus Battery Tester

If testing on the vehicle, observe the following requirements:

- Always connect the battery tester clamps directly to the lead of the battery terminals. Both jaws of eachclamp must make direct contact with the lead of the battery terminal.
- Turn off all connected loads, close vehicle doors and disconnect chargers before starting a battery test. Loads and/or chargers will affect the accuracy of the State of Charge Test and the results of the Cranking Performance Test.

Step 1. Ensure the battery terminals are clean before connecting the test clamps to the battery. Connect the red clamp to the (+) terminal and the black clamp to the (-) terminal. Maximise the surface contact between the clamp and terminal by rocking the clamp on the terminal to allow the clamp teeth to dig in.

Step 2. Set the test voltage to 12V using the [>] and [<] buttons and press [enter/print] to confirm the selection.

Step 3. Set Rating Standard to CCA for JIS battery or DIN for DIN battery using the [>] and [<] buttons and press [enter/print] to confirm the selection.

Step 4. Set Rated Value for the CCA using the [>] and [<] buttons and press [enter/print] to confirm the selection. If Rated Value is unknown or not required, press [enter/print] to proceed.

Step 5. State of Charge (SoC) Test process begins automatically after Step 4. Does the  undercharge icon illuminate and tester beep?

NO - go to step 7.

YES - State of Charge below 25%.
Charge battery then test again.
If same result after charging
then go to Step 6.

Step 6. Is the Open Circuit Voltage (OCV) below 10.50 Volts but above 9.0 Volts?

YES - ACCEPT CLAIM. Battery is defective.
Replace under warranty terms & conditions.

N O - REJECT CLAIM. Battery has been subject to excessive charge/discharge cycles.
- Check electrical system for defects, non-OEM electrical devices.
- check for extreme service usage such as taxi, ride sharing, delivery vehicle etc.

Step 7. Battery Life (BL) Test - Press [enter/print] to proceed to Battery Life screen.

Battery Life Test Results

Note : If Rated Value is not entered in Step 4 then battery life will not be measured.

PASS CONTINUE TO USE (Reject Claim)
Battery life is above 50% and retains more than half of its useful life. Battery should continue to be used.

CHARGE & CONTINUE TO USE (Reject Claim)
Battery life is above 50% but State of Charge is below 75%. The Battery is good but should be charged before returning to use.

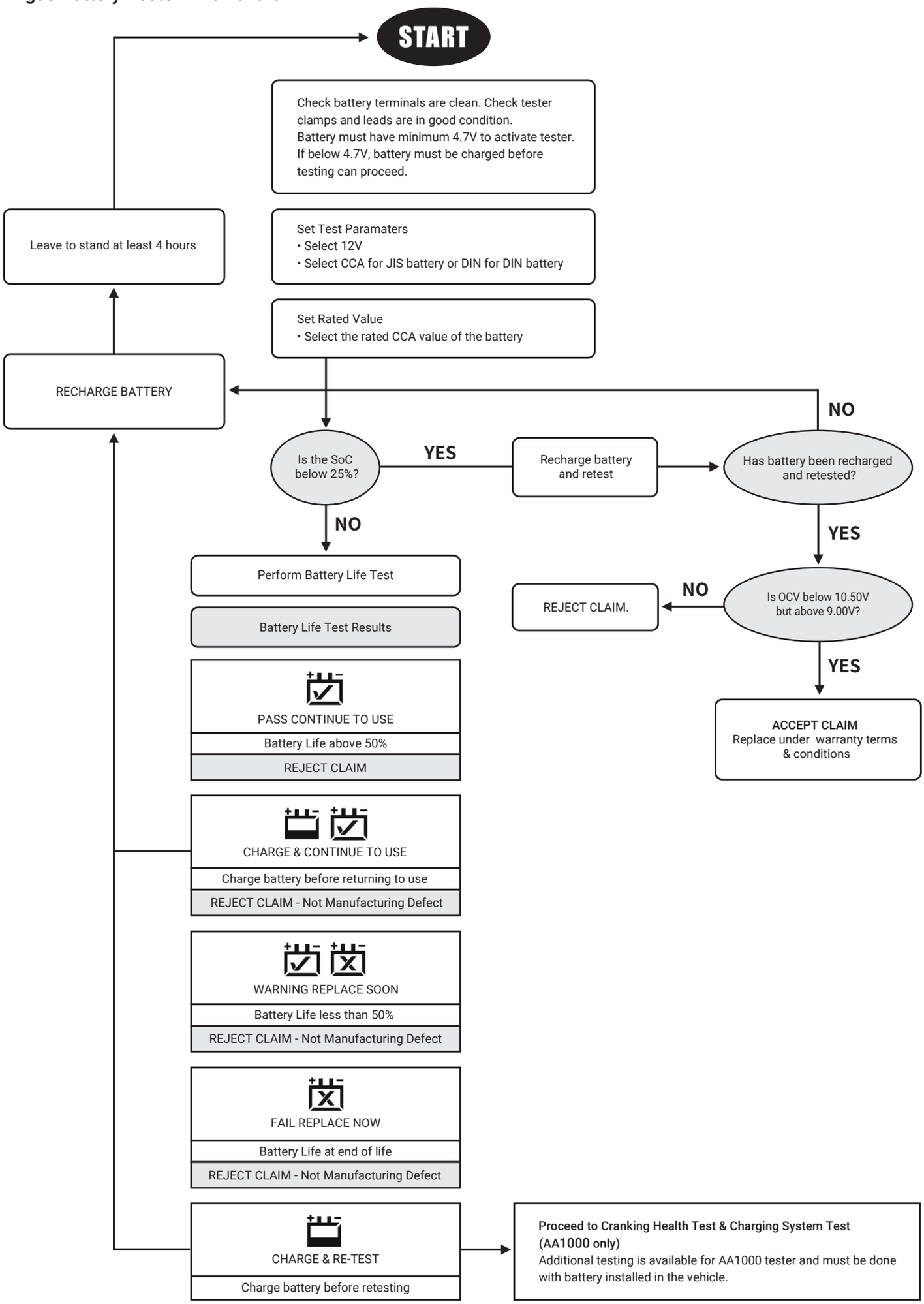
WARNING REPLACE SOON (Reject Claim)
Battery life is below 50% and has less than half its useful life remaining. Replacement should be considered soon.

FAIL REPLACE NOW (Reject Claim)
Battery has reached the end of life. Immediate replacement of battery is required.

CHARGE & RE-TEST
If State of Charge was 0% at the start of test then tester may not be able to make accurate battery life calculation. Charge battery and test again.

Argus display icons and recommended action.

Argus Battery Tester - Flowchart



OPTIONAL – Cranking Health Test & Charging System Test

The following tests are available only for Argus Battery Tester AA1000 and with the battery connected to its starting load i.e. starter motor. Ensure all accessory loads such as lights, car audio, air-conditioning etc. are turned off prior to starting the test.

Step 8. Starting the engine while the start icon is flashing will automatically initiate the Cranking Health Test. Cranking Health Test Results.

Note : If State of Charge is below 75% then battery must be charged before testing.

PASS CONTINUE TO USE Cranking Health is above 50%. Continue to use the battery.
WARNING REPLACE SOON Cranking Health is between 1% and 50%. The battery can still start the engine but performance is weak. Replacement should be considered soon.
FAIL REPLACE NOW Battery has reached the end of life. Immediate replacement of battery is required.

Argus cranking test display icons and recommended action.

Charging System Test Results

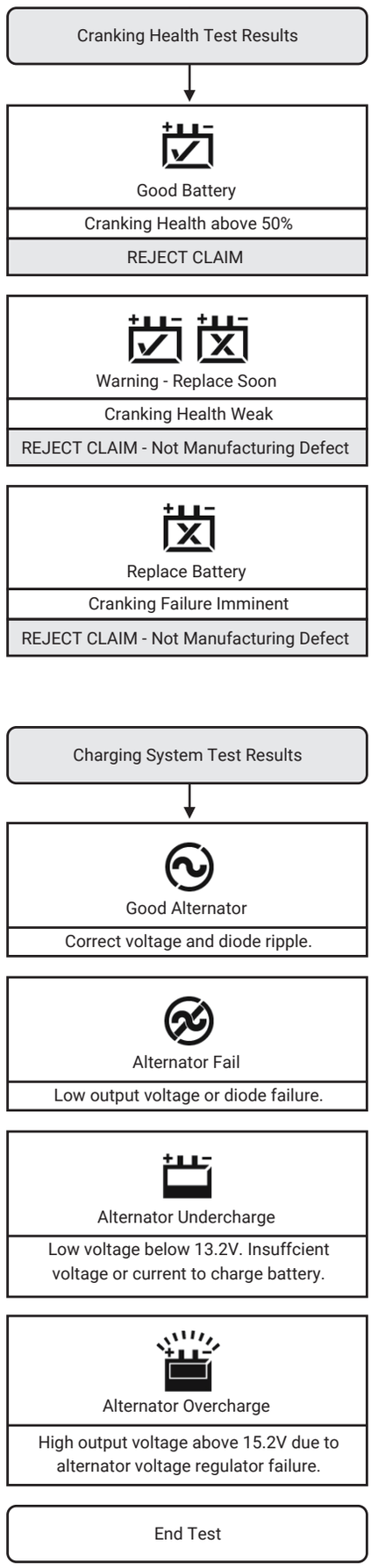
Tester automatically monitors the charging system after engine has started.

ALTERNATOR PASS Alternator is operating at the correct voltage and the diode ripple is within limits.
ALTERNATOR FAIL Alternator is not producing adequate voltage and/or diode has failed.
ALTERNATOR UNDERCHARGE Alternator voltage is below 13.2 volts. Alternator is not producing enough current or voltage to charge the battery.
ALTERNATOR OVERCHARGE Alternator output is above 15.2 volts. Voltage regulator may be defective. Overcharging of the battery can cause premature battery failure.

Argus charging test display icons and explanation.

Additional on-car testing for Argus AA1000

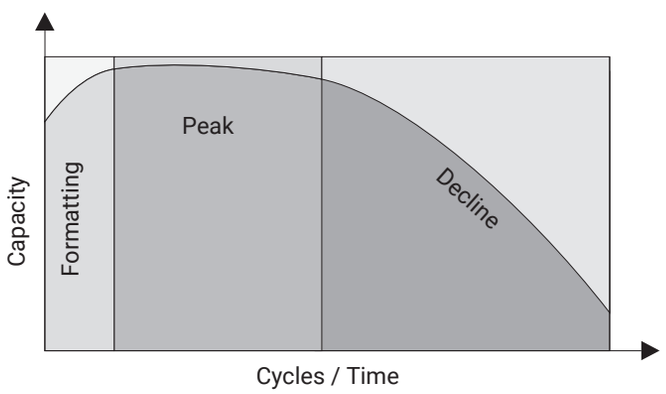
The following tests are only available for AA1000 and must be done with battery installed in the vehicle.



What is a Battery

A battery is a device that uses a chemical reaction to store an electrical charge. Within each battery, a positive electrode and a negative electrode are immersed in a chemical solution called the electrolyte. Automotive batteries are typically called lead-acid batteries meaning they have positive and negative electrodes that are made of lead compounds that are immersed in an electrolyte of diluted sulphuric acid.

As with all batteries, lead-acid batteries have a finite life expectancy and their performance will gradually decline over time. A lead-acid battery goes through three life phases: formatting, peak and decline. In the formatting phase, the electrodes activate and the capacity gradually increases into its peak phase. As the battery ages, and through wear and tear, its performance will decline and the battery should be replaced when it falls below 50% of its capacity.



Stages of a lead-acid battery capacity vs cycles & time.

How Lead Acid Car Batteries Work

Inside the car battery, the positive electrode is made of plates coated in lead dioxide and the negative electrode is made of plates coated in spongy, porous lead. The electrodes are immersed in a solution called electrolyte that contains 64% water and 36% sulfuric acid.

In a good battery, the electrolyte has a specific gravity of between 1.26g/cc ~1.29g/cc meaning the solution weighs between 1.26 ~ 1.29 times as much as water. A chemical reaction occurs between the electrodes that creates approximately 2.1 volts of electrical energy within each cell. There are 6 cells in a car battery for a total of approximately 12.6 volts.

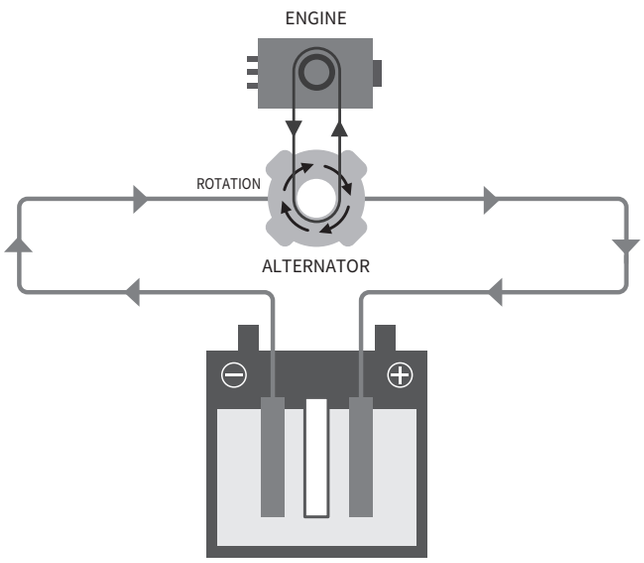
When an electrical load is connected to the battery, current flows from one plate, through the electrolyte and separator to the other plate and through the external load to complete the circuit. This causes the battery to discharge by changing the composition of the electrodes to lead sulphate, thereby converting its chemical energy into electrical energy.

The battery can be charged by putting current through the battery from an external source such as an alternator or charging unit. The current converts the lead sulphate back to its original composition of lead dioxide and spongy, porous lead. Charging the battery causes hydrolyses of the water in the electrolyte, releasing hydrogen and oxygen. This is often referred to as battery gassing and produces a characteristic acid smell.

Battery Charge and Discharge

CHARGE = Electrical power is stored from the Alternator

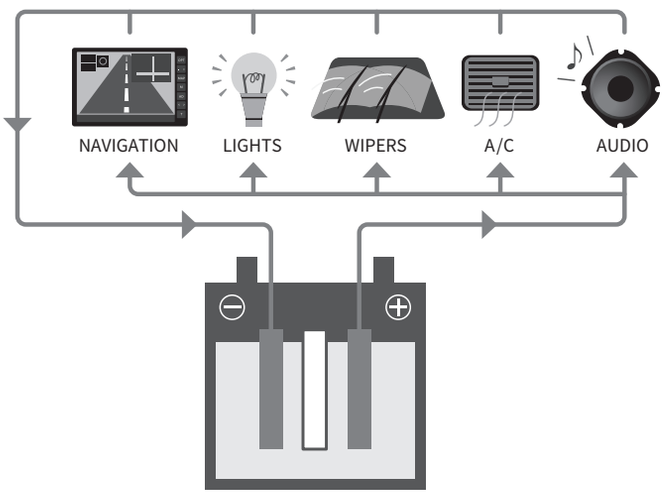
A charging device called the alternator is connected to the vehicle engine. When the engine is running, the alternator generates electrical power and a part of this electrical power is sent to the battery for charging. Under these conditions the battery is charging.



Current flows from the Alternator to charge the battery.

DISCHARGE = Electrical power is supplied to the electrical system

If the electrical load of the vehicle's electrical system exceeds the output of the alternator, or if the engine is not running to turn the alternator, then the electrical power for the electrical system is supplied by the battery.Under these condition the battery is discharging.



Current flows from the battery causing it to discharge.

Vehicle Type	Charging Current
Small-Medium Size	40 ~ 60A
Large Size	60 ~ 80A
Minivan & MPVs	

Typical Alternator charging current.

Vehicle Status	Current Draw
Engine Start	100 ~ 300A
Normal Driving	20 ~ 60A
Parked	0.04 ~ 0.06A

Typical vehicle electrical load.

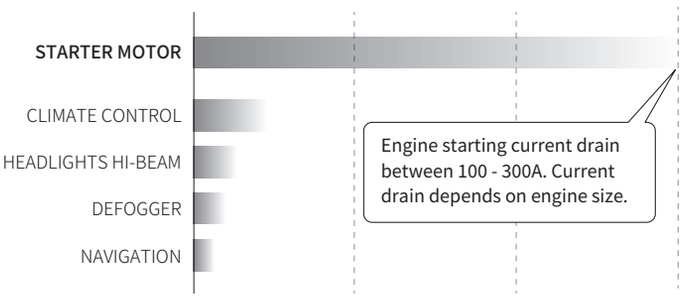
Battery Power Delivery

Starting the Engine

When starting the car, the starter motor must rotate the engine until the engine can run under its own power. This operation of the starter motor places the greatest demand on the car battery.

The car battery must be in good condition to deliver the large and instantaneous current required otherwise the car will not start.

Modern cars with automatic start-stop systems place even greater demand on the car battery due to having to start the engine multiple times during any drive.



Starting the engine places the greatest demand on the car battery. If the battery is worn out then it won't be able to start the engine.

Powering the Electrical System

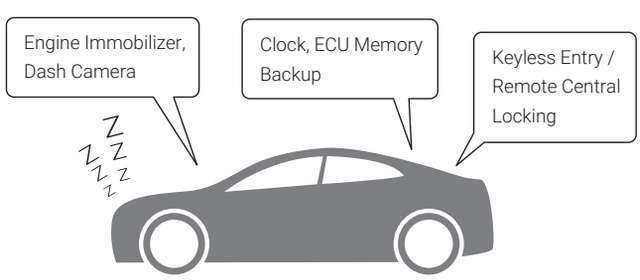
While the engine is running, the Alternator generates the electrical power for the vehicle's electrical system including the climate control, lighting and other electronic equipment. Over recent years, more electronic devices such as large display navigation, driver assist systems and multiple USB charging outlets are being being installed by car manufacturers that place even greater demands on the vehicle's electrical system.

Equipment	Current Draw
Climate Control	18A
Headlights	14A
Door Locks	11 ~ 12A
Defogger	10 ~ 11A
Power Windows	7 ~ 8A
Windscreen Wipers	6 ~ 8A
Fog Lights	4 ~ 6A
Hazard Lights	4 ~ 6A
Car Audio	4 ~ 6A
Parking Lights	3 ~ 4A
Navigation	2 ~ 4A
Interior Lighting	0.9 ~ 2A
Dash Camera	0.2A

Typical current of vehicle electrical equipment.
Total current draw with engine running: 20 ~ 60 Amps

Battery Backup and Parasitic Draw

Even after the engine is turned off and the car is not being used, the battery is required to maintain the various vehicle settings. Memory seats, radio presets, GPS systems and clocks require battery backup. This is known as parasitic draw and if the car is not started for a long period of time, the battery may be become drained and no longer be able to start the engine. If the car has additional equipment installed such as an alarm system, engine immobilizer, dash camera etc. then the parastic drain becomes even greater.



Typical current draw while engine is OFF: 0.04 ~ 0.06A.

If the engine is not started for 1 month:

0.06A x 24hrs x 30 days = 43.2A Current Drain

Sealed Maintenance Free

In the past, battery grids used a chemical element called Antimony (Sb) as an alloying metal to increase the hardness and mechanical strength of the soft lead. Although highly effective in giving the necessary rigidity to the lead, invariably some of the Antimony dissolves in the acid causing the battery to lose water. If the water is not checked and topped up through regular maintenance, the grids become exposed and the battery will fail.

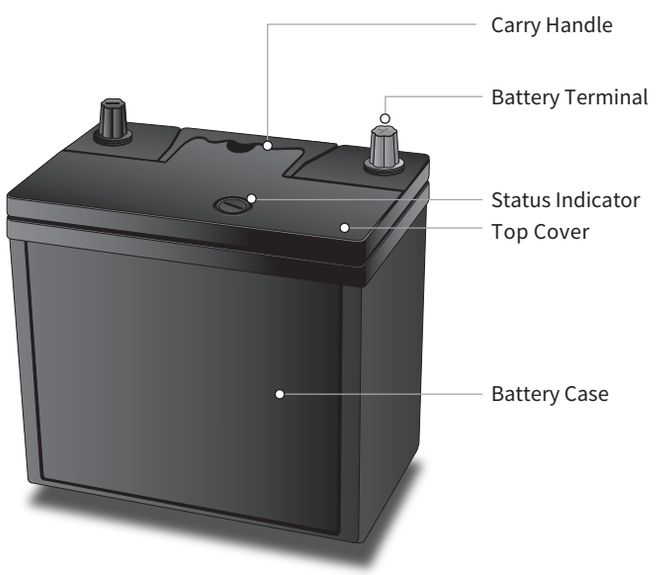
Using the latest improvements in battery design and technology, Autobacs Sealed Maintenance Free (SMF) batteries use Calcium (Ca) to harden and strengthen the grids instead of Antimony. The use of Calcium reduces the contamination of the acid thereby dramatically reducing water loss so that no water needs to be added for the operational life of the battery. With no regular maintenance needed, the traditional vent plugs found on older style batteries are not required and the entire top cover can be sealed off making the battery Sealed Maintenance Free (SMF).

Battery External Components

External Appearance

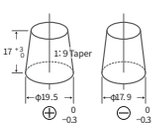
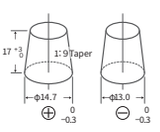
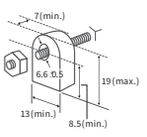
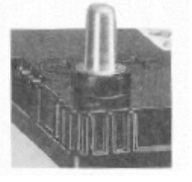
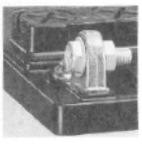
Your car battery converts chemical energy into the electrical energy that is required to power your car. The chemicals are contained inside the battery case that is permanently sealed by the top cover.

Autobacs Sealed Maintenance Free batteries (SMF) do not require the adding of water for the life of the battery and therefore the top cover does not have cell inspection holes.



Battery Terminals

Car battery terminals, also referred to as battery posts, are made of lead. Lead is relatively malleable and care should be taken not to apply excessive force to the terminals as deformation and breakage can occur. The size and shape of the terminal varies depending on the current draw requirements of the car. Larger engines with higher curent draw require a larger terminal.

	Tapered Terminal (Standard)	Tapered Terminal (Small)	L Terminal (Nut & Bolt)
Shape			
Dimensions - JIS Standard (mm)			
Battery Size	- Size D20 & larger - P Size & larger (ISS Battery) - European car	- Size B24 & smaller - N Size & smaller (ISS Battery)	- Size A19
Application	- medium/large cars - MPV & SUV	- compact cars - small/medium cars	- motorcycles - agricultural machinery
Exceptions	B24 & smaller with standard terminal identified by suffix "S". e.g. 55B24RS	A19 with small terminal identifed by suffix "T". e.g. 28A19T	Size A19 not suitable for use in passenger cars.
Appearance			

Types of battery terminals.

Top Cover

The top cover of AUTOBACS Sealed Maintenance Free batteries are permanently bonded to the battery case using high a temperature and high-pressure heat-sealing process. The top cover is specially designed to prevent acid leakage even under high vibration use and because of the SMF design, there is no provision to add water to the battery cells.

The top cover has several significant features:

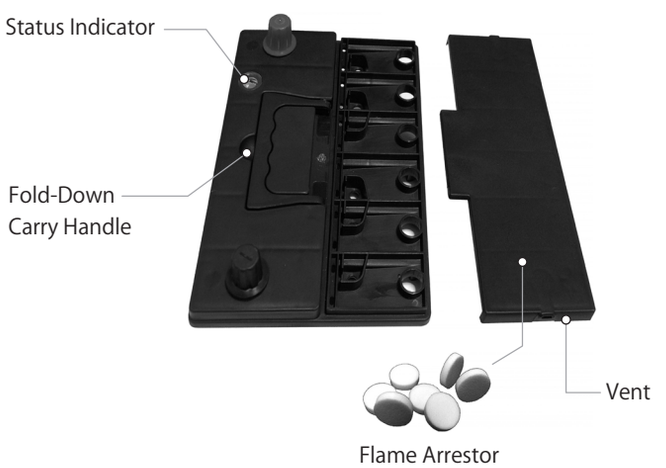
• Permanently heat-sealed to the case

• Built-in high-grade flame arrestor

• Built in fold-down carry handle

• Built-in Status Indicator (hydrometer)

• End-Venting



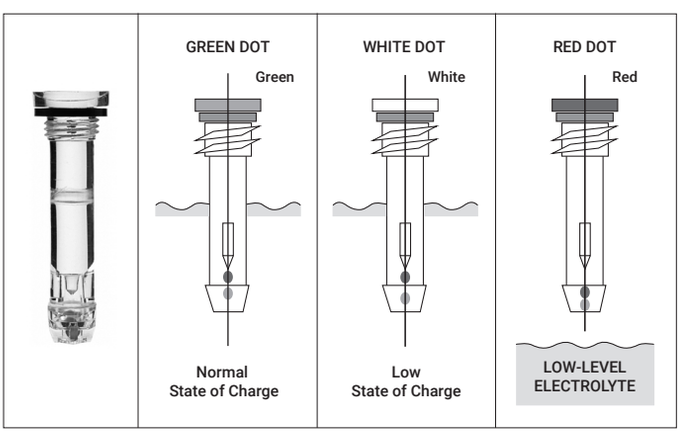
SMF heat sealed top cover.

Fold-down carry handle in the up position.

Status Indicator

As the battery becomes discharged, the specific gravity of the electrolyte decreases (i.e. gets lighter) and this is directly related to the battery`s state of charge.

Autobacs Sealed Maintenance Free batteries feature a built-in hydrometer to indicate the battery`s state of charge. The built-in hydrometer is called the Status Indicator and it contains a green ball and a red ball. A green reading indicates a normal battery with over 70% state of charge. A white reading indicates the battery has dropped below 50% state of charge and a red reading indicates the battery has reached the end of its service life and requires replacement.

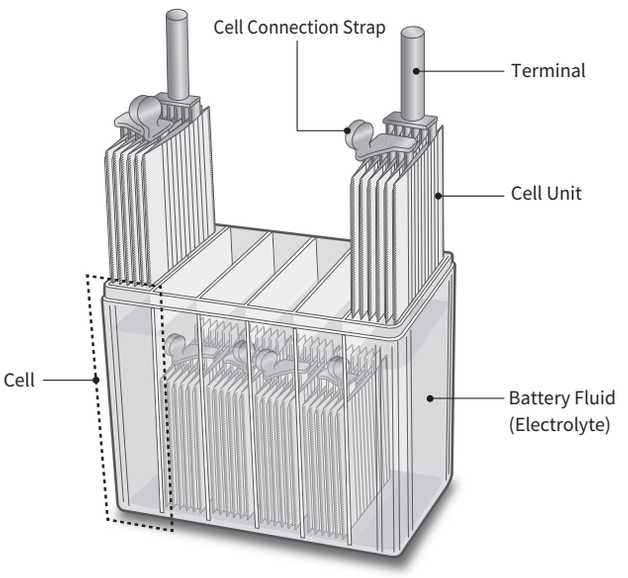


The different colors of the Status Indicator.

Status Indicator - Built-in Hydrometer.

Battery Cell Structure

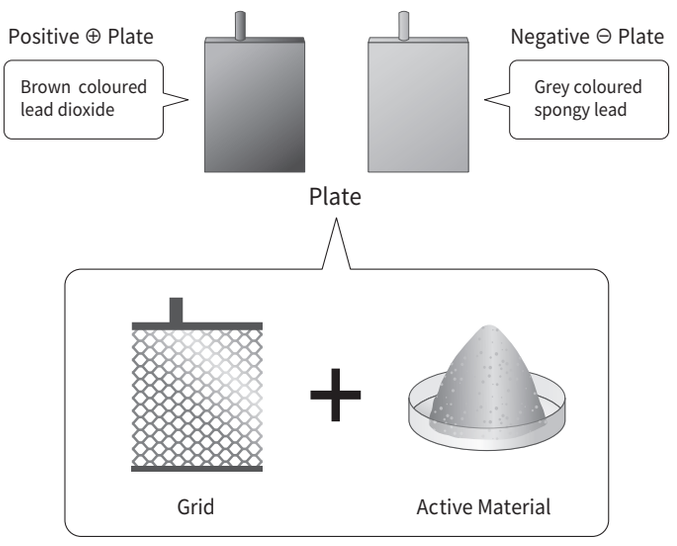
12 volt car batteries contain six (6) cells that each contain a cell unit immersed in battery fluid called electrolyte. The cell unit is an assembly of positive and negative plates with each cell unit producing approximately 2.1 volts. The six (6) cell units are connected in series by the cell connection strap to produce a 12 volt car battery.



Battery internal components.

Battery Plates

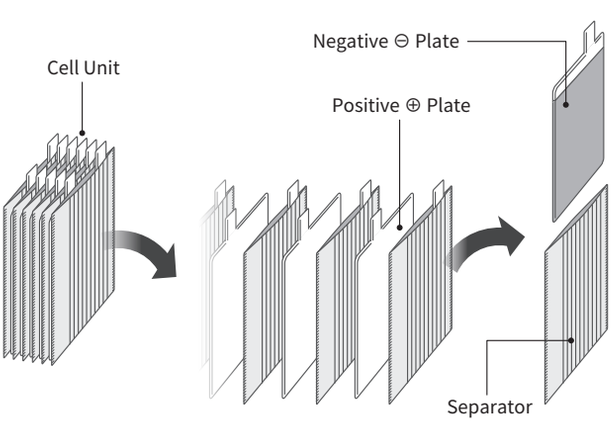
The plates of the battery are made of a lattice structured lead alloy grid coated in a paste called the active material. It is this combination of grid and active material that collects and distributes electrical energy. The design of the grid and the amount of active material applied to the grids are the most critical factors that determine the performance of the battery.



Battery plates are grids pasted in active material.

Battery Cell Unit

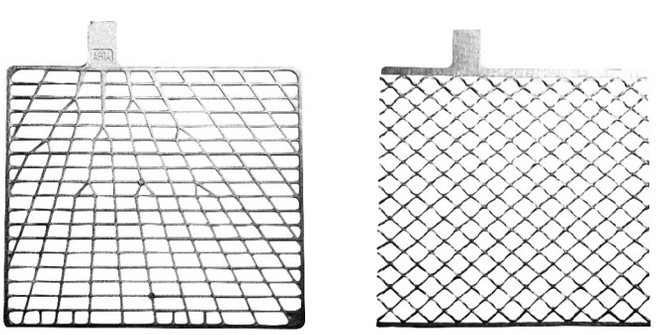
Each 2.1 volt cell unit is an assembly of positive ⊕ plates and negative ⊖ plates insulated by a separator to prevent a short circuit. The plates are made from lead alloy with each pair of plates forming a single battery that produces an electric current. Increasing the number of plates in each cell unit increases the capacity of the battery however this also increases the size and weight of the battery. Optimizing the number of plates for each battery size delivers the best battery capacity performance for the space available.



Cell unit showing plates & separator

Grid Design

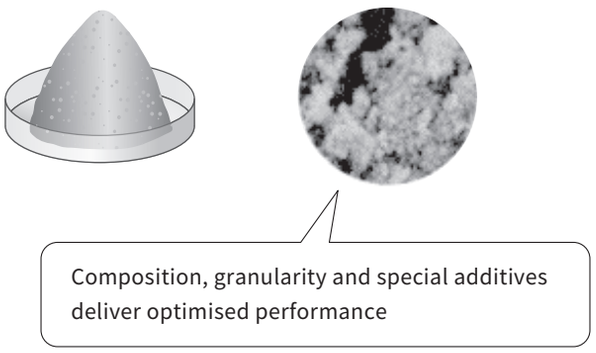
The primary function of the grid is to provide the path for electrical current to reach the battery terminals. Additionally, the grid must be resitant to corrosion from the battery acid, resistant to expansion / shrinkage, resistant against heat and be a good electrical conductor. The design of the grid considers the above requirements to deliver the optimum performance for the type of usage.



Frame grid and expanded grid designs.

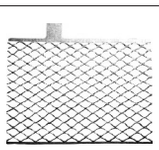
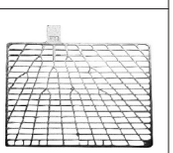
Active Material (Paste)

Key battery performance features such as capacity, life expectancy, charging rate and self discharge rate are determined by the active material. The composition, granularity and density of the active material is adjusted for balanced performance. Special additives are combined to further improve the performance of the active material.



Grid Alloys

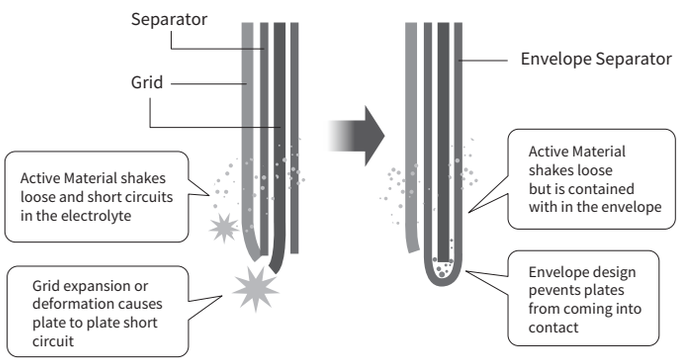
The grids are made by combining lead and other metals to form an alloy. The type of alloy selected determines the performance and durablity of the battery depending on the type of usage intended. In the past, high levels of antimony was required to create a lead alloy with sufficient hardness and strength. The disadvantage of antimony lead alloy is high electrolyte consumption, with regular topping up of the battery water required. As battery technology improved, the amount of antimony used in the lead alloy has been reduced to minimise the water consumption. Low antimony content batteries are often referred to a low maintenance or maintenance-free as they do not consume as much water as regular lead-acid batteries.
Using the latest technology, calcium and tin are used instead of antimony to create lead alloys that are now able to deliver high durability while significantly reducing electrolyte consumption so that adding water is no required for the life of the battery.

	Antimony	Low Antimony	**Calcium**
Positive Grid	Antimony Alloy	Low Antimony	Calcium-Tin Alloy
Negative Grid	Antimony Alloy	Low Antimony	Calcium Alloy
Durability	High	Medium	**High**
Maintenance	High Maintenance	Low Maintenance	**Maintenance Free**
Design	–	Expanded Grid	Frame Grid
Appearance	–		

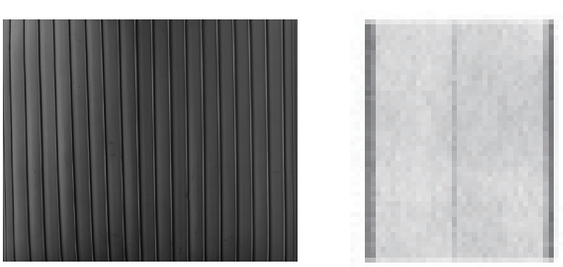
Properties of battery grid alloys.

Separator

The separator is a microporous, non-conductive sheet made from polyethylene (PE) that is designed to prevent the positive and negative plates from touching each other. Separators are often shaped like an envelope and wrapped around either the positive plate or the negative plate. The separator must allow good electrolyte diffusion between the plates while preventing active material from one plate transferring to the next plate. If the separator becomes damaged, active material may form a bridge to the adjacent plate causing a short circuit in a condition known as treeing.



The envelope separator (shown on right) provides increased protection against short circuits.

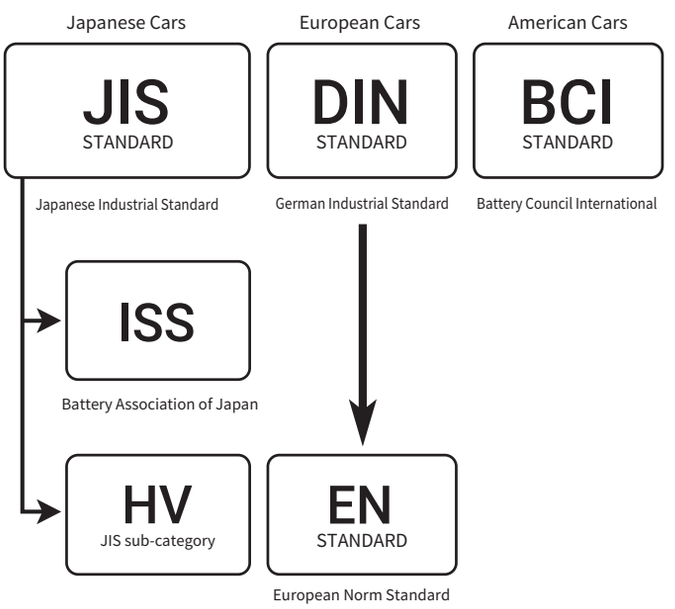


Envelope Separator | Glass Mat Separator

Glass mat separators are used when extreme high resistance to shock and vibration is required.

Battery Specifications

Battery part numbers, their dimensions and other specifications vary according the standard adopted by the manufacturer. The standards are different depending on country and region, with no cross-reference available between each standard. The most widely adopted standards are the Japanese JIS, German DIN and North American BCI. With the widespread adoption of engine stop-start vehicles and hybrid engine vehicles, the JIS standard has expanded to include specifications for batteries specific to these applications.
Autobacs Sealed Maintenance Free batteries are manufactured according to the Japanese standard JIS and the German standard DIN which are the most understood for Japanese and European motor vehicles.

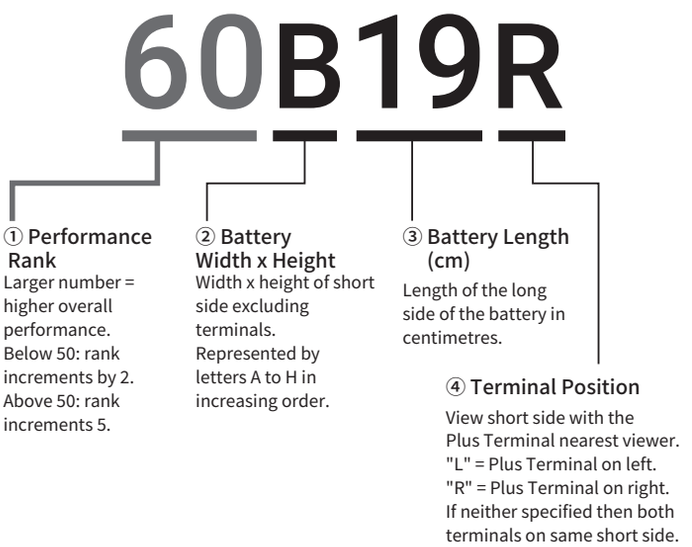


Battery standards used by each country.

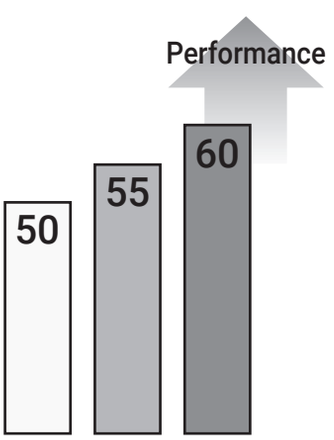
JIS Battery Standard

JIS Part Number System

Japanese Industrial Standard (JIS) defines the battery dimensions, size and position of the terminals, performance rank as well as defining the test requirements to meet the JIS standards. Autobacs Sealed Maintenance Free JIS batteries are manufactured according to Japan Industrial Standard JIS D 5301:2006 for lead-acid starter batteries.



JIS battery number code system.



JIS Performance Rank.

(unit:mm)

	Width	Height
A	127	162
B	129(127)	203
C	135	207
D	173	204
E	176	213
F	182	213
G	222	213
H	278	220

Letters A - H define the width & height.

JIS Performance Rank

The JIS Performance Rank is a function of the battery's Cold Cranking Amps (CCA) and its Reserve Capacity (RC). A higher Performance Rank number indicates a higher overall performance of the battery and is calculated using the formula below:

$$\text{PERFORMANCE RANK} = \frac{\sqrt{(\text{CCA} \times \text{RC})}}{2.8}$$

COLD CRANKING AMPS (CCA) × **RESERVE CAPACITY (RC)**

CCA rating indicates the ability to deliver current even when cold. The higher the CCA, the easier it will be to start the engine.

RC rating indicates the duration the battery can be discharged. The higher the RC rating, the longer the battery can last before recharging.

CCA (Amps) : Rated Cold Cranking Amps
The amount of electrical current that a battery can deliver at -18°C, discharged to 7.2V after 30 seconds.

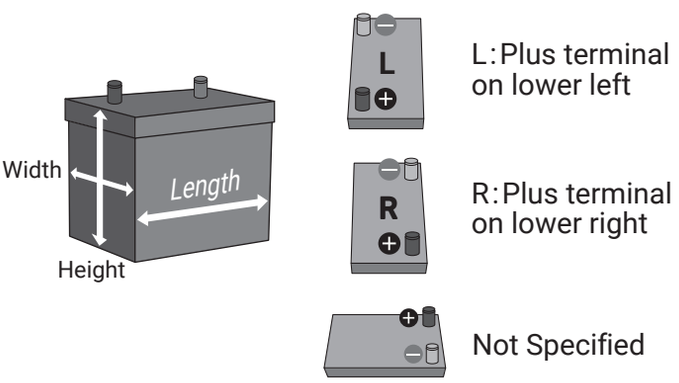
RC (minutes) : Rated Reserve Capacity
The amount of time in minutes that a battery at 25°C can deliver a current of 25 Amps until the voltage drops to 10.5V.

Example: Battery with CCA 370 & RC 64 minutes.

$$\sqrt{(370 \times 64)} / 2.8 = 55.0$$

Performance Rank 55

Dimensions and Terminals



L: Plus terminal on lower left

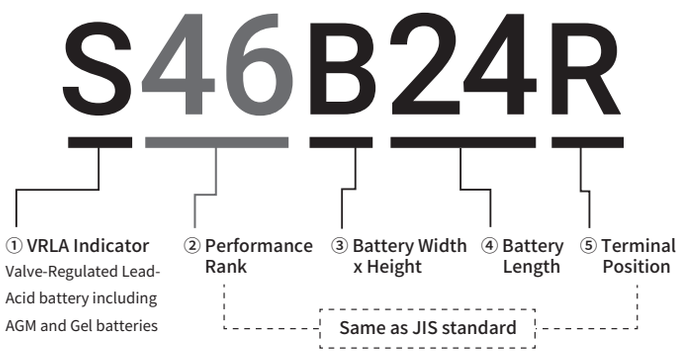
R: Plus terminal on lower right

Not Specified

Terminal Size : Battery sizes B24 and smaller by default use the smaller terminal. In the case that the larger size terminal is used on a B24 or smaller battery, then the letter "S" is added after the terminal position to indicate the variation e.g. 50B24RS.

Hybrid (HV) Vehicles

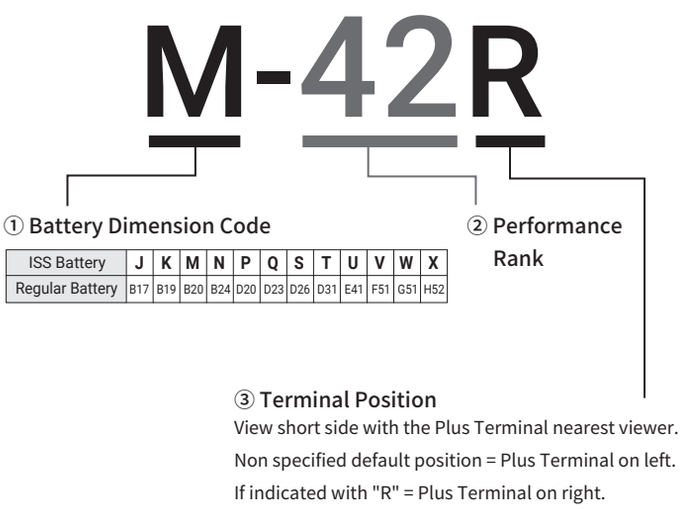
Hybrid Vehicles require a specialized battery indicated by the letter "S" at the beginning of the model number.
The model number structure is based on the JIS format however the batteries are not interchangeable.



Hybrid Vehicle (HV) battery number code system.

Idle Stop-Start (ISS) Vehicles

Engine Stop-Start batteries, also referred to as Idle Stop-Start (ISS) batteries, are standardized by the Battery Association of Japan standard SBS S 0101. In vehicles fitted with Idle Stop-Start systems, the battery must be able to handle the rigours of constant engine stop-start demands, rapid recharging and the power requirements needed to run electrical accessories while the engine is switched off. ISS batteries use a completely different model number system to avoid mistakenly installing a regular lead acid battery where an ISS battery is specified.

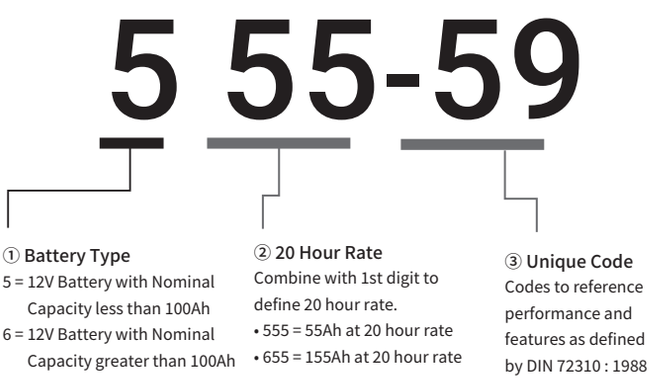


ISS Battery	J	K	M	N	P	Q	S	T	U	V	W	X
Regular Battery	B17	B19	B20	B24	D20	D23	D26	D31	E41	F51	G51	H52

Idle Stop-Start (ISS) battery number code system.

DIN Standard for European Cars

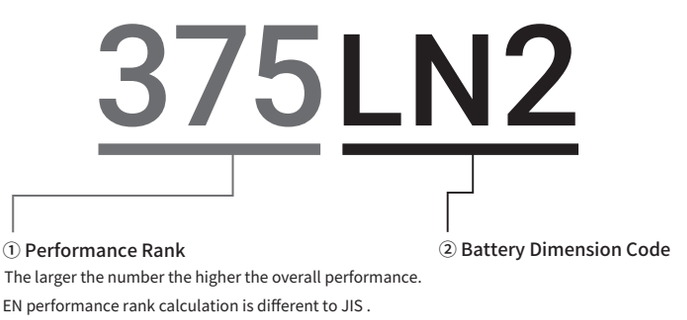
DIN stands for Deutsches Institut fur Normung (German Industry Standard) commonly found in European vehicles and selected Korean vehicles. The DIN part number system is being replaced by the EN part number system however is still used within Europe to identify battery types.



DIN battery number code system.

EN European Standard

The EN standard is defined by the European standards bodies made up of the CEN, CENELEC and ETSI to form the system for technical standardization. Standards harmonized by these agencies are regularly adopted in countries outside Europe with Japanese batteries adopting the EN standard defined by the Battery Association of Japan (SBA S 0102).



TYPE	TYPE	LENGTH (mm)	WIDTH (mm)	HEIGHT (mm)
LN	LN 0	175	175	190
	LN 1	207	175	190
	LN 2	242	175	190
	LN 3	278	175	190
	LN 4	315	175	190
	LN 5	353	175	190
	LN 6	394	175	190

TYPE	TYPE	LENGTH (mm)	WIDTH (mm)	HEIGHT (mm)
LBN	LBN 0	175	175	175
	LBN 1	207	175	175
	LBN 2	242	175	175
	LBN 3	278	175	175
	LBN 4	315	175	175
	LBN 5	353	175	175
	LBN 6	394	175	175

EN battery number code system.

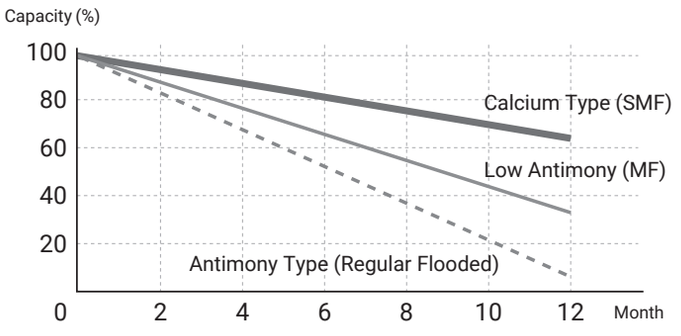
Storage & Recharging

Storage Basics

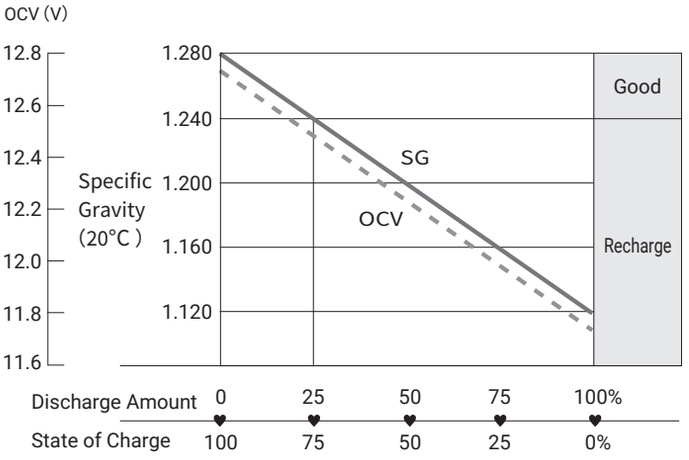
1. Always implement good stock rotation on FIFO (First In, First Out) basis. Batteries slowly lose their charge in storage. Correct stock-rotation will prevent batteries from going flat while in storage. Printed on the top flap of each battery carton box is a 7-digit charging code. The charging code indicates the date at which the battery was charged from the factory and should be used to ensure the oldest batteries are used from inventory first.
2. Store batteries in a cool, dry and well-ventilated area.
3. Do not allow the batteries to become wet.
4. Do not store near sources of heat and/or in direct sunlight. Excess heat can accelerate internal discharge and can damage the batteries.
5. Do not store in cold areas that can cause the electrolyte to freeze.
6. Do not store batteries for extended periods of time. Ideally, batteries should be installed within 15 months from date of manufacture.
7. Store batteries on racks or pallets. Do not store on the floor as debris, stones and other particles can damage the base carton box and battery.
8. Store batteries upright inside their original carton box. Stack to a maximum of 4 high. Stacking higher may damage batteries on bottom row and increase risk of batteries falling over.
9. Store batteries with protective terminal caps fitted to prevent accidental short circuit.

Storage and Internal Discharge

As mentioned previously, batteries slowly lose their charge in storage. The rate of this internal discharge is dependent on the ambient temperature and the type of construction of the battery. Regular flooded batteries will internally discharge at a rate of approx. 0.3% per day at room temperature, Maintenance Free (low antimony) discharge at approx. 0.2% and Sealed Maintenance Free (calcium) discharge at the lowest rate of approx. 0.1% per day. The rate of internal discharge increases with temperature. Batteries in storage should be checked at least once every 3 months and recharged if the OCV drops to 12.45V.



Storage Time vs Internal Discharge.



OCV vs State of Charge.

OCV (V)	Recharging Time (hours)
12.6～12.8	3～5
12.3～12.5	6～7
12.1～12.2	8～9
11.8～12.0	10～12
Less than 11.7	15 +

CAUTION: Do not allow electrolyte temperature to exceed (45°C). Reduce charge current by 50% or pause recharge until temperature lowers before resuming.

Recharging time guide.

Maintenance of Batteries in Storage

For batteries stored in inventory, the OCV should be checked after 3 months of storage and checked monthly thereafter to identify any batteries that require recharging. Batteries require recharging when the Open Circuit Voltage (OCV) has dropped to 12.45V. The OCV should be checked using a good quality digital multimeter with at resolution to at least 2 decimal places. Any battery that shows a voltage below 11.0V should be scrapped as they have developed sulphation and will not deliver the rated performance and/or life expectancy even after fully recharging. The graph below shows the correlation between the OCV, Specific Gravity (SG) and the State of Charge (SoC) as a percentage of its capacity. The SG of Sealed Maintenance Free Batteries cannot be checked and therefore OCV should be used to monitor the battery condition.

Recharging Batteries

There are many types of automotive battery chargers available with varying levels of performance. Regardless of the type charger, always follow the safety instructions provided and charge in well ventilated area. It is not recommended to recharge a battery while it is fitted in a vehicle and instead it should be removed prior to recharging. Do not attempt to recharge a battery if the air temperature is below 3°C as the electrolyte may have frozen.

Constant Potential Chargers

These maintain a constant, fixed voltage throughout the charging process. The charging current will automatically reduce as the battery's state of charge increases. Generally designed to charge one battery at a time, constant potential charges closely match the way a car's alternator charges the battery and is the recommended type of charger for Autobacs SMF batteries. Stop charging when the battery voltage shows no increase over a period of 2 hours.

Modified Constant Potential Chargers

These are the most common type of home-use chargers available. Simple to operate, they do not provide any user adjustment for the current or voltage. Modified contact potential chargers are suitable for charging Autobacs SMF batteries. Stop charging when the battery voltage shows no increase over a period of 2 hours.

"SMART" Chargers

The latest generation of automotive battery charges that automatically adjust voltage and current based on the condition of the battery. These chargers can charge in the least amount of time without damaging or overcharging the battery and are generally compatible with SMF, AGM, EFB and regular flooded batteries. Follow the manufacturer's instructions for charging procedure.

Boost Chargers

These deliver a very high charge current and are designed to charge a flat battery very quickly. Boost charging is not recommended as it reduces the battery life and should only be used in exceptional cases where the battery is required urgently.

Constant Current Chargers

These maintain a constant, fixed charging current for the entire duration of the charging period regardless of the battery on-charge voltage. It is extremely important to monitor both battery voltage and charging time to avoid overcharging and damaging the battery. It is for this reason that this type of charger is not recommended unless the operator is highly experienced. Constant current chargers must not be used on AGM batteries.

1. Measure the OCV of the battery. Confirm that the battery has been at rest for at least 3 hours before checking the voltage to obtain an accurate reading.
2. Refer to Table 1. (Max. charge current) below to set the maximum recommended charge rate.
3. Refer to Table 2. (Charging time) below for the number of hours required to charge the battery depending on the OCV.

Battery Size	Current (Amps)
B19（B20)	3.5
B24	4.5
B23	5.0
B26	6.5
B31	8.0
LNO	4.4
LN1	5.5
LN2	6.2
LN3	7.4
LBN3	7.5
LN4	9.0
LN5	10.0
LN6	11.0

Table 1. Max. charge current.

OCV (V)	Charging Time (Hours)
Above 12.40	4
12.31 - 12.40	6
12.21 - 12.30	8
12.11 - 12.20	10
12.01 - 12.10	12
11.91 - 12.00	14
11.81 - 11.90	16
11.71 - 11.80	18
11.00 - 11.70	20
Below 11.00	overdischarged

Table 2. Charge time.

Charging Code and Assembly Code

Autobacs car batteries have an Assembly Code and Charging Code etched into the top cover of the battery. The Assembly Code shows the date of production of the battery and the Charging Code shows the date the battery was charged from factory.

Assembly Code

The Assembly Code, or Production Code, is either a 7-digit code for JIS batteries or a 10-digit code for DIN batteries. The format of the Assembly Code is as follows:

A B CC DD E XXX

A : Identifier for Autobacs reference

B : Year of Assembly

CC : Month of Assembly

DD : Date of Assembly

E : Assembly Line Number

XXX : Serial Number for 10-digit DIN battery only.

JIS BATTERY

7-digit Assembly Code under the carry handle in format: A B CC DD E.
E.g. Assembly Code 0102 255

0 : Identifier
1 : Year 2021
02 : Month (Feb.)
25 : Date (25th)
5 : Assy. Line 5

This battery was manufactured on February 25th, 2021
on assembly line number 5.

DIN BATTERY

10-digit Assembly Code on the top cover in format: A B CC DD E XXX.
E.g. Assembly Code 0104224416

0 : Identifier
1 : Year 2021
04 : Month (Apr.)
22 : Date (22nd)
4 : Assy. Line 4
416 : Serial No. 416

This battery with serial number 416 was manufactured
on April 22nd, 2021 on assembly line number 4.

Charging Code

The Charging Code is a 7-digit code used for both JIS batteries and DIN batteries. To assist in good inventory control, the Charging Code is also printed on the top flap of the carton box packaging. The format of the Charging Code is as follows:

FFF G HHH

FFF : The Running Date of the Year
(i.e. 001 = Jan. 1st, 002 = Jan. 2nd ..., 365 = Dec. 31st)

G : The Last Number of the Year

HHH : Charger/Rectifier Number

Charging Code on Carton Box

Charging Code on Battery Top Cover

For this example, the Charging Code is 0661056.
066 : 066th day of the year (Mar. 7th)
1 : 2021
056 : Charger / Rectifier #056

This battery was charged on Mar. 7th, 2021 on charger / rectifier 56.

Battery Removal & Installation

Removal

Check your vehicle owner's manual prior to disconnecting the battery. Some electrical systems such as audio and power windows may reset and require security code and /or recalibration.

Before handling the battery, discharge any static electricity by touching a metallic section of the vehicle body. Wear eye protection and protective gloves whenever handling the battery.

1. Turn off all vehicle electrical systems such lights, car radio, climate control etc.
2. Turn off engine and remove the key from the ignition.
3. First disconnect the Negative Terminal (-) then disconnect the Positive Terminal (+).
4. Remove the battery retaining bracket to remove the battery from the vehicle. Battery is heavy, and care must be taken to keep upright when lifting.

Installation

1. Check and confirm the Negative Terminal (-) and the Positive Terminal (+) are correctly matched to your vehicle. If necessary, clean the cable terminals with a wire brush or sand paper to remove any oxidization.
2. Without removing the protective battery terminal caps, install the new battery into the battery tray.
3. Refit the battery retaining bracket(s). Battery should be firmly secured but do not overtighten brackets as this can damage the battery.
4. Remove Positive Terminal (+) cap and connect the positive cable battery clamp.
5. Tighten the battery clamp securely and refit the battery clamp cover if present.
4. Remove the Negative Terminal (-) cap and connect the negative cable battery clamp.

6.Tighten the battery clamp securely.

※Check and confirm tools and work equipment are not left inside the engine bay.

Jump Starting

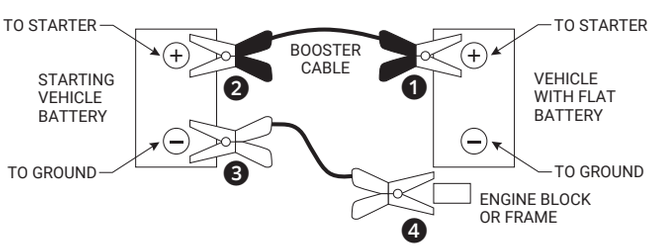
Portable Jump Starter

In case of a flat battery, a good quality portable jump starter that is correctly matched to your vehicle's engine size requirements is an effective method to start the vehicle. The jump starter should have safety features including spark-proof connectors, reverse polarity protection and short circuit protection. Always follow the manufacturer's instructions when using the portable jump starter.

Jump Starting with Booster Cables

Vehicle to vehicle jump starting using booster cables is not recommended due to the potential hazards involved. If, however, there is no other option, then the following procedure is to be followed.

- Some vehicles have dedicated jump start connections in the engine compartment. In this case, the booster cables must be connected to the jump start connections and not directly to the battery.
- Ensure jumper cables cannot come into contact with radiator fan or any other moving parts in the engine bay.
- Do not stretch or pull the jumper cables. Bring vehicles closer together if necessary.



1. Connect one end of the red jumper cable to the Positive (+) terminal of the flat battery. The Positive (+) will usually have a red plastic cover on it. Pull back the cover to access the terminal.
2. Connect the other end of the red jumper cable to the Positive (+) terminal of the battery providing the jump start.
3. Connect one end of the black jumper cable to the Negative (-) terminal of the battery providing the jump start.
4. Connect the other end of the black jumper cable to an unpainted, solid metal component of the engine. Do not connect the other end of the black jumper cable directly to the battery terminal as this can cause sparks and risk explosion.
5. Check and confirm the vehicles are not in gear. Start the engine in the vehicle providing the jump start then start the engine in the vehicle with the flat battery.
6. Disconnect the jumper cables in the reverse sequence to when connected.

Health & Safety

Lead Acid Batteries can be hazardous if the correct usage and handling precautions are not observed. It is important that staff are provided with the training and knowledge so that unnecessary accidents do not occur.

Label Information

The symbols below commonly used on lead acid batteries have the meanings as follows:

Refer to the Instruction Manual

Wear Eye Protection

Keep Out of Reach of Children

Explosive Material

No Open Flame

Corrosive Substances

Do Not Dispose as Household Waste. Contains Lead.

Recycle Battery at Approved Recycling Depot. Contains Lead.

Battery Acid

The Hazard:

The battery contains Sulphuric Acid which is a corrosive and poisonous liquid and will cause burns and irritation to skin and eyes. Sulphuric Acid may leak from the battery and may be released as vapour/mist during recharging.

Precautions:

- Handle battery with care
- Wear eye protection
- Wear gloves and protective clothing
- Store upright
- Recharge in a well-ventilated area
- Keep out of reach of children
- Do not allow vents to become blocked

Treatment in Case of Accident or Emergency:

Skin Contact - Immediately wash affected area with large amounts of clean water. Remove any contaminated clothing and seek medical attention of irritation persists.

Eye Contact - Immediately flush eyes continuously for at least 10 minutes with clean water. Seek medical attention immediately.

Ingestion - Immediately rinse mouth with clean water. DO NOT INDUCE VOMITING. Give water and milk as much as can be comfortably consumed and seek medical attention immediately.

Spillage - For small spillages wash away with large amounts of water. For larger volumes dispose in suitable acid resistant containers and refer to local authorities for correct disposal method.

Electrical Energy

The Hazard:

Short circuit of the battery terminals by metallic objects such as tools, jewelry, battery retaining brackets etc. may cause the metal object to heat up that can lead to severe burns, sparks, molten metal or battery explosion.

Precautions:

- Always remove metal objects such as rings, watches, bracelets, chains/necklaces etc. from hands, wrists, neck and other parts of the body.
- Turn off all electrical loads before disconnecting the battery when working on the vehicle's electrical systems.
- Never place any tools or metallic objects near the top of the battery.

Treatment in Case of Accident or Emergency:

Burns – Apply a sterile dressing and seek medical attention immediately.

Explosive Gases

The Hazard:

Hydrogen gas is emitted during charging is explosive at concentration levels above 4%. Hydrogen and oxygen gases are produced while the battery is being recharged. These gases may also be emitted at other times.

Precautions:

- Always recharge in a well-ventilated area.
- Connect the charging clamps to the battery terminal before switching on the charger.
- Switch off the charger at the mains before disconnecting the charging clamps from the battery.
- Always wear eye protection and protective clothing when handling and/or recharging.
- Take due care to ensure cables and connections do not cause accidental sparks.
- Never smoke near a battery.
- Never allow sparks, naked flames or other sources of ignition near a battery.

Treatment in Case of Accident or Emergency:

Seek assistance from emergency services as appropriate to the injury. In case of explosion, battery acid, shards of plastic and metals may have been ejected causing severe injury.

Weight

The Hazard:

Batteries contain large amounts of lead and are very heavy resulting in possible lifting injuries to the human body. Risk of dropping the battery may result in bodily injury, damage to property and acid spillage.

Precautions:

- Always use correct lifting techniques and procedures to minimize the strain on the human body.
- Always use the lifting handle when moving the battery.

Treatment in Case of Accident or Emergency:

Seek medical assistance as appropriate to the injury.

In case of droppage, battery acid may have been spilled

Battery Terminology

Assembly Code – 7-digit or 10-digit code that provides information on when the battery was manufactured.

Charging Code – 7-digit code that provides information on when the battery was initially charged from the factory. Charging Code is printed on the battery and the top lid of the carton box packaging.

Cold Cranking Performance (CCA) – Measures the starting performance of the battery. The higher the CCA the easier it will be to start the vehicle.

DIN Number – German Industrial Standard 5-digit part number system commonly used in Europe.

ETN Number – Introduced to replace the DIN number system. The 9-digit number system is based on the DIN number system with 4th, 5th & 6th digits used to reference battery performance and 7th, 8th & 9th digits specifying Cold Cranking Performance.

End-Venting – Gassing outlets fitted to the ends of the battery rather than normal venting through the individual cell plugs.

JIS – Japanese Industrial Standard for batteries commonly used in Japanese vehicles. The standards are defined based on tests carried out at -18°C with loads applied for 30 seconds such that battery voltage drops to 7.2V.

Open Circuit Voltage (OCV) – Measured in Volts (V) , the OCV is the difference in potential between the 2 terminals of the battery when disconnected from the vehicle's electrical system and with no external load connected.

Maintenance Free Battery (MF) – Battery with grids with low antimony content of around 1.5%. Low antimony grids consume less water and require less maintenance at around once or twice a year.

Recommended Charge Rate – Recommended charging rate in Amps to safely charge the battery using a constant current charger. Usage of constant current chargers is not recommended unless the operator is well experienced.

Reserve Capacity (RC) – The amount of time in minutes that a battery at 25°C can deliver a current of 25 Amps until the voltage drops to 10.50V. The Reserve Capacity provides an indication of how long a vehicle can run under a typical 25 Amp electrical load if the alternator or alternator drive belt fails.

Sealed Maintenance Free Battery (SMF) – Battery with grids made from Calcium alloy instead of antimony. Calcium grids consume the least amount of water and do not require any maintenance for the life of the battery.

Specific Gravity (SG) – The mass of the electrolyte as a multiple of the mass of water. In a fully charged battery, the Specific Gravity is 1.28 meaning the electrolyte weights 1.28 times as much as the same volume of water.

Status Indicator – Floating ball and prism diagnostic tool inserted into one of the cells of the battery. The status indicator provides a quick and easy way to check the electrolyte level and state of charge within the battery.

20 Hour Rate (20Ah) – The amount of electricity that a battery will deliver during 20 hours before the battery voltage falls to 10.50V. For example, a 60Ah battery will deliver a current of 3 Amps for 20 hours.

Material Safety Data - General

*Full MSDS available upon request from Autobacs Product Support

Product Name:

AUTOBACS SEALED MAINTENANCE FREE BATTERY

Lead Acid Battery, Wet, Filled with Acid

Chemical Family / Classification

Electric Storage Battery

I. COMPANY INFORMATION

Company Name / Address

AUTOBACS SEVEN CO., LTD.
NBF Toyosu Canal Front, 6-52, Toyosu 5-Chome,
Koto-ku, Tokyo 153-8717, Japan.

Telephone

Emergency Telephone Number:
+81-3-6219-8779

II. GENERAL COMPOSITION

Inorganic Lead Compound

Lead : ◆ Calcium
◆ Arsenic
◆ Tin
Case Material : ◆ Polypropylene (PP)
Others: ◆ Sulfuric Acid (H2SO4)
◆ AGM (Absorptive Glass Mat) Separators
◆ Polyethylene (PE) Separators

III. HAZARDOUS INFORMATION

Air Exposure Limits (μg / m3)

Inorganic Lead Compound LEAD	CAS Number	Approx. % by Weight or Vol.	OSHA	ACGIH	NIOSH
	7439-92-1	53	50	150	100
◆ Antimony	7440-36-0	0.20	500	500	—
◆ Calcium	7440-70-2	0.002	—	—	—
◆ Arsenic	7440-38-2	0.003	10	200	—
◆ Tin	7440-31-5	0.06	2000	2000	—
CASE MATERIAL					
◆ Polypropylene	9003-07-0	5-6	N/A	N/A	N/A
OTHERS					
◆ Sulfuric Acid	7664-92-1	16-20	1000	1000	1000
◆ AGM Separators					
◆ PE Separators					

Material Safety Data - General continued

*Full MSDS available upon request from Autobacs Product Support

IV. EMERGENCY AND FIRST AID PROCEDURES

INHALATION - Remove to fresh air, seek medical attention.

SKIN CONTACT - Immediately soak the affected are with clean water and remove any contaminated clothing. Seek medical attention if soreness or irritation persists.

EYE CONTACT - Immediately wash out eyes with clean water for at least 10 minutes. Seek medical attention immediately.

INGESTION - DO NOT INDUCE VOMITING. Give patient as much water as can be consumed and seek medical attention.

BURNS - Apply sterile dressing and seek medical attention.

V. FIRE FIGHTING MEASURE

Maintenance Free Battery with Electrolyte can cause explosion because they generated Hydrogen Gas

Flash Point: N/A Flammable Limits LEL = 4.1% (Hydrogen Gas) UEL = 74.2%

Source of ignition away from filled lead acid batteries.

Do not allow metallic materials to simultaneously contact negative and positive terminals of cells and batteries.

Follow manufacturer’s instructions for installation and service Extinguishing Media : CO2; Foam; Dry Chemical

Special Fire Fighting Procedures:

Wear full body protective clothing and self-contained breathing apparatus with positive pressure and full - face piece

VI. ACCIDENTAL RELEASE MEASURE

Steps to be taken in case material is released or spilled:

- Stop flow if possible
- Soak up small spills with clay, sand, or diatomaceous earth
- Dilute spill cautiously with five to six volumes of water and gradually neutralize with sodium bi- carbonate, soda ash, or lime

When exposure level is not known, wear NIOSH/MSHA approved respirator or SCBA

Waste disposal method:

Neutralized and dispose in accordance with local, state, and federal regulations

Avoid Direct Contact

Other Precautions:

Sodium bi - carbonate, soda ash, sand, or lime should be kept in same general area for emergency use

VII. HANDLING AND STORAGE

1) Store batteries in cool, dry, well - ventilated areas with impervious surfaces and adequate containment in the event of spills
2) Batteries should also be stored under roof for protection against adverse weather conditions
3) Separate from incompatible materials
4) Store and handle only in areas with adequate water supply and spill control
5) Avoid damage to containers
6) Keep away from fire, sparks and heat

VIII. HEALTH HAZARD DATA

Routes of Entry:

Lead Compounds:

Hazardous exposure can occur only when product is heated, oxidized or otherwise processed or damaged to create dust, vapor or fume.

Inhalation: Lead Compounds:

Inhalation of lead dust or fumes may cause irritation of upper respiratory tract and lungs.

Ingestions: Lead Compounds:

Acute ingestion may cause abdominal pain, nausea, vomiting, diarrhea, and severe cramping. This may lead rapidly to systemic toxicity and must be treated by physician.

Skin Contact:

Lead Compound: not absorbed through the skin.

Eye Contact:

Lead Compounds: may cause eye irritation.

Effects of Overexposure – Acute:

Lead Compounds: Symptoms of toxicity include headache, fatigue, abdominal pain, loss of appetite, muscular aches and weakness, sleep disturbances and irritability

Effects of Overexposure – Chronic:

Lead Compounds: Anemia; neuropathy; particularly of the motor nerves, with wrist drop; kidney damage; reproductive changes in males and females

Carcinogenicity:

Lead Compounds: Lead is listed as a 2B carcinogen, likely in animals at extreme doses. Proof of carcinogenicity in humans is lacking at present

Medical Conditions Generally Aggravated by Exposure:

Overexposure to sulfuric acid mist may cause lung damage and aggravate pulmonary conditions. Contact of sulfuric acid with skin may aggravate skin diseases such as eczema and contact dermatitis. Lead acid and its compounds can aggravate some forms of kidney, liver and neurologic diseases

IX. PHYSICAL AND CHEMICAL PROPERTIES

The lead and lead compounds are in the form of solids which can be exposed if the battery case is damaged. The sulphuric acid contained inside is a corrosive liquid which can escape through the vents if the battery is tipped over.

X. STABILITY AND REACTIVITY

Stability : Stable

Condition to avoid:

Contact with metal may release explosive hydrogen gas

Incompatibility (Materials to Avoid) :

Strong alkali materials, carbides, chlorates, nitrates, and pirates, organic acid, acetates, anhydrates, metals

Hazardous Decompositions of By - Products :

Thermal decomposition or combustion may produce a sulfur trioxide and/or sulfur dioxide.

Hazardous Polymerization : will not occur

XI. ECOLOGICAL CONSIDERATION

Lead from soil may be absorbed by plants and can be concentrated in the food chain.
Lead and sulphuric acid is relatively mobile in aquatic environments and can be concentrated by aquatic organisms.

XII. DISPOSAL CONSIDERATION

- Dispose in accordance with all applicable federal, state, and local regulations.
- The contents of this battery, as a waste, may be regulated by the Resource Conservation and Recovery Act (RCRA): As a D008 (Lead) and D002 (Corrosive) hazardous waste.
- Send to a secondary lead smelter for recycling. Refer to local regulation.
- **THIS SHEET MUST BE PASSED TO ANY SCRAP DEALER OR SMELTER WHEN THE BATTERY IS RESOLD**

XIII. TRANSPORTATION INFORMATION

IATA : The international transportation of wet and moist charged a (moist active) battery is regulated by the International Air Transport Association (IATA). These regulations also classify these types of batteries as a hazardous material. The batteries must be packed according to IATA Packing Instruction 800. The shipping information is as follows:

Proper Shipping Name	:	Lead-Acid Batteries, Wet, Filled with Acid
Hazardous Class	:	8
UN Identification	:	UN2794
Packing Group	:	III
Label / Placard Required	:	Corrosive

Some batteries have been tested and meet the non-spillable criteria listed in IATA packing instruction 806. Non-spillable batteries must be packed according to IATA packing instruction 806.

The shipping information for non-spillable is as follows:

Proper Shipping Name	:	Lead-Acid Batteries, Wet, Filled with Acid
Hazardous Class	:	8
UN Identification	:	UN2800
Packing Group	:	III
Label / Placard Required	:	Corrosive

In addition, some non-spillable batteries have been tested and meet the non-regulated criteria listed in IATA special provision A67. These batteries are excepted from all IATA regulations provided that the batteries' terminals are protected against short circuits

IMDG : The international transportation of wet and moist charged (moist active) batteries is regulated by the International Maritime Dangerous Goods code (IMDG). These regulations also classify these types of batteries as a hazardous material. The batteries must be packed according to IMDG code pages 8120 and 8121. The shipping information is as follows:

Proper Shipping Name	:	Lead-Acid Batteries, Wet, Filled with Acid
Hazardous Class	:	8
UN Identification	:	UN2794
Packing Group	:	III
Label / Placard Required	:	Corrosive

Some batteries have been tested and meet the non-spillable criteria listed on page 8121.
Non-spillable batteries must be packed according to IMDG page 8121.
The shipping information for non-spillable is as follows:

Proper Shipping Name	:	Lead-Acid Batteries, Wet, Filled with Acid
Hazardous Class	:	8
UN Identification	:	UN2800
Packing Group	:	III
Label / Placard Required	:	Corrosive

In addition, some non-spillable batteries have been tested and meet the non-regulated criteria listed in IMDG code page 8121. These batteries are excepted from all IMDG code provided that the batteries' terminals are protected against short circuits.

XIV. REGULATORY INFORMATION

Shipping Name : Lead-Acid Battery, Wet, Filled with Acid
Identification Number : N/ A, non-assigned
Hazard Class : Applicable to 49CFR 172.101 Hazardous Material and subject to Parts 170 - 189 of this Sub - chapter
RCRA : Regulated as hazardous waste by the EPA when recycled

XV. OTHER REGULATORY INFORMATION

RCRA:

Spent lead-acid batteries are not regulated as hazardous waste by the EPA when recycled, however state and international regulations may vary

CERCLA (Superfund) and EPCRA:

Refer to the latest revision of the OSHA general Industry Standards, 29 CFR 1910. Information about the hazardous ingredients contained in lead compounds are shown in Subpart Z – Toxic and Hazardous Substances: antimony is discussed in 1910.1000, air contaminants; inorganic arsenic is covered in the Inorganic Arsenic Standard, 1910.1018; and inorganic lead is covered in the Inorganic Lead Standard, 1910.1025

a) EPCRA Section 312 Tier 2 reporting is required for batteries if sulphuric acid is present in quantities of 500 lbs. or more and/or if lead is present in quantities of 10,000 lbs. or more.
b) Supplier Notification: This product contains toxic chemicals, which may be reportable under EPCRA Section 313 Toxic Chemical Release Inventory (Form R) requirements.

AUTOBACS JAPAN

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