ENGINE CONFIGURATIONS AVAILABLE:

ELECTRIC STARTER
HAND STARTER
HYBRID

CORS-AIR®
MOTORS

INDEX

IDENTIFICATION OF THE OWNER

Owner

Address

Serial number

Reseller

Address

Owner’s signature

Reseller’s signature and stamp

Date of sale

Introduction:

Thank you for choosing our engine BLACK BULL CORS-AIR ENGINE.

We tried to do everything possible to give accurate and update technical information in this manual.

The Company riserve the right to make technical and aesthetic changes without notice in order to improve quality of product.

This manual has been prepared to provide technical information necessary for the installation and repair of motors.

We invite you to spend some time reading this to avoid risks to the health and safety of people and economic damage.

Furthermore, we invite you to deliver this manual together with the engine if you sell it, so it can be useful for the next owner as well.

The manufacturer and the resellers are ready to answer your questions and, if necessary, to solve every problem, because YOUR AND THE OTHER PEOPLE’S SAFETY IS THE MOST IMPORTANT THING FOR US.

CYCLE	TWO STROKE
TOTAL DISPLACEMENT	235 C.C.
BORE	70mm
STROKE	61mm
COMPRESSION RATIO	10.5:1
COOLING	BY AIR
PEAK RPM max.	8000 /8300 RPM
PISTON	WITH TWO PISTON RINGS
HEAD	IN ALLOY WITH HIGH PERCENTAGE OF SILICONAN HEMISPHERIC COMBUSTION CHAMBER, WITH SQUISH
CRANKCASE	MOLTEN IN G-AL SI 9 UNI 3051 ALLOY SUBSEQUENTLY TREATED AND ANODIZED AGAINST SEA SALT
CONNECTING ROD	IN COPPER PLATED STELL 18 NI CR MO5 JOINED TO THE DRIVE SHAFT THROUGH VERY PRECISE HIGH SPEED SILVER-PLATED ROLLER BEARINGS
CARBURATOR	DIAPHRAGM
FEEDING	SIX BLADE REED-VALVE SYSTEM CONNECTED TO THE CRANKCASE
SPARK PLUG	NGK BR8ES OR SIMILAR
SYSTEM	SIX PORT DISTRIBUATION AND EXHAUST WITH BOOSTER
CYLINDER	IN ALLOY WITH NIKASIL COATING
REDUCTION	WITH POLY V BELT AVAIBLE IN 1:3.0
CYLINDER HEAD TEMPERATURE	MAX TEMPERATURE 230°C MEASURED UNDER SPARK PLUG EXHAUST GAS TEMPERATURE NOT EXCEEDING 590 C°
ENGINE MOUNTING	BY 4 SHOCK ABSORBING RUBBER MOUNTS
ROTATION	COUNTERCLOCKWISE
DRIVE SHAFT	IN 18 NI CR MO5 WITH 5 THERMIC TREATMENTS ON EVERY COMPONENT
SEAL RING	IN VITON WITH VERY HIGH RESI STANCE AND LONG DURATION
FUEL	MIXTURE 2,2% / 2.5% WITH SYNTHETIC OIL, SUGGESTED BRANDS: MALOSSI 7.1—WLADOIL

	K2T—ELF 2T MOTO
OIL	2.2% - 2,5%
ENGINE WEIGHT	HAND START KG 16,7 COMPLETE WITH 2018 VERS. EXHAUST AND INCLUDING RUBBER MOUNTS AND AIRBOX IN CARBON
	ELECTRIC START KG. 17,4 COMPLETE WITH 2018 VERSION EXHAUST, INCLUDING RUBBER MOUNTS AND AIRBOX IN CARBON

MAIN TORQUES

MAIN TORQUES	Kg. m	(Nm)
NUTS TO FIX THE HEAD	2,5	25
NUTS TO FIX HALF-CRANKCASE	1,2	12
NUTS TO FIX THE PINION (SMALL PULLEY)	3,5	35
NUTS TO FIX IGNITION HANDWHEEL (manual version)	4,5	45
NUTS TO FIX IGNITION HANDWHEEL (electric version)	2,5	25
GAP BETWEEN COIL AND HANDWHEEL	MIN. 0,3 mm MAX. 0,4 mm	
TIGHTENING OF REED VALVES PLATE	1,2	12
PISTON RINGS GAP TOLLERANCE	0,25 mm	

IMPORTANT:

Remember that the battery of the electric start should be recharged before starting the engine.

ASSEMBLY:

You can install the engine on the frame by using 4 rubber mounts of 40 x 30 mm between the back flange and the engine mount.

To attach the propeller use only bolts of class 10.8 (100 Kg) and make sure that their length is enough to exit from the reductor-pulley. Tighten the 6 bolts M8 in a cross, at 1.5 Kg.m.(15Nm). Re-check the torque of the bolts after the first hour of engine's working.

We suggest not touse a variable pitch carbon prop, because the big hub pushes the prop too forward, with possible damages to pulley and bearings.

For the connection between the carburetor and the fuel tank use a proper hose of the right diameter.

The length of the fuel line should not be longer than 80 cm.

It is advisable to install a manual primer bulb to get the fuel to the carburetor before for starting. This device will allow the fuel to arrive to the carburettor, protecting in this way the battery.

IMPORTANT NOTES

DO NOT try to start the engine without the propeller.

DO NOT start the engine with loose bolts or parts, since this can cause the detaching of the propeller, the ovalization of the propeller holes, the damage of the electric start and the breakage of the rubber mounts.

BATTERY must be loaded and use a 6 Ah battery.

IMPORTANT! BEFORE FLYING CHECK ALWAYS EVERY PART OF YOUR CRAFT, FROM ENGINE TO FRAME.

Verify that there are no damaged electric wires, that there are no leaks from hoses, tank, carburettor or engine's crankcase, that the propeller is not damaged or loose, that the exhaust-pipe has no cracks, that the frame is not bent or broken because of falls, that rubber mounts are not cracked, that the reduction belt is not loose and every bolt is tight.

Finally you can start the engine, leaving it to warm up at a speed of 3000 to 4000 rpm with head temperature at least 90/100 °C, before start taking off so to avoid piston seizing.

FUEL

Use for the mixture only premium gas for cars 98 octane, together with good-quality, synthetic oil for mixtures at a quantity of 2.2% - 2,5%.

DO NOT USE MIXTURE ALREADY DONE AT PETROL PUMPS.

When you prepare the mixture, make sure that the tank has not dirt or water in it, filter the fuel with cotton white textile into a clean tank and then add the oil.

Never run the engine without the air-filter, because dirt and dust raised by the propeller can damage it.

Running- in procedure

The running-in is a key stage of the life of an engine.

Even if the high standard quality level of the machining and the exceptional material quality currently applied in the production process suggest that there is no need of an adjustment phase of the engine, the running-in is still a fundamental step in its life for getting the best performance and reliability.

The parts that require a longer running time for the operation of the propulsion and that need to get to an optimum settling are cylinder and piston.

During the running in phase and limited to this period only the fully synthetic oil percentage is 2,5%

All engines are tested in CORS-AIR before delivery, where we set carburetor and idle.

We strongly advise not to modify the carburetor settings during the engine running-in.

1. Turn on the engine and let it run at the ground for 10 minutes varying the rpm range from 3000 to 5500 rpm, after that switch off the engine and let it cool down for 10 minutes.
2. Turn on the engine and let it run at the ground for 15 minutes varying the rpm range from 3000 to 6000 rpm, after that switch off the engine at let it cool down for 15 minutes.
3. Turn on the engine and let it run at the ground for 15 minutes varying the rpm range from 3000 to 6500 rpm, after that switch off the engine at let it cool down.

The throttle must be continually opened and closed, so to vary the amount of fuel/oil mixture that lubricates all parts.

At this point, you can fly the engine normally, having care to warm it up to 90/100 C° before take-off.

For the first 5/6 hours of flight, fly the engine with cautions.

NEVER FLY THE ENGINE AT FULL THROTTLE FOR A LONG TIME.

The engine running-in is finished, respect your engine and it will become your trustworthy partner in flight.

CARBURETOR

Your Black Bull is equipped with a Tryton carburettor, specially adapted for the Cors-Air engines;

It is a top quality membrane carburettor, 100% made in Italy, that grants an optimal performance, with decreased consumption and a better atomization of the mixture fuel/air.

It is more sensitive to setting adjustments, and it is suggested for a competition use, or for pilots skilled in mechanics who want the best results.

CARBURETOR SETTINGS	BLACK BULL engine (all configurations)
L screw	30/35 minutes
H screw	2 hours + 10 minutes

MAINTENANCE

- ✓ AFTER THE FIRST HOUR OF RUNNING, CHECK THE BELT TENSIONING, AND IN CASE **RE-TENSIONING IT AT 380/400 Hz**
- ✓ AFTER THE FIRST 2 HOURS, TIGHTEN HEAD NUTS (IN CROSS ORDER) WITH A TORQUE WRENCH AT 2.5 Kg.m (25Nm).
- ✓ AFTER THE FIRST 3 HOURS OF ENGINE RUNNING MAKE A NEW BELT CHECK UP AND IN CASE RETENSIONING IT.

Please note that if you find black dust inside pinion and/or rubber inside pinion's groove, it means that belt is not well tensioned and need to be tightened.

Every 20 hours check:

- The condition and gap (0,7 mm) of the spark plug electrode
- Clean the air-filter, in case you have a fuel filter before carburetor, clean it also.
- The torque of every bolt
- The tension and condition of the reduction belt
- Fuel lines and wiring
- That the cord of the starter has no abrasions

Every 50 hours check:

- Same controls of the 20 hours and furthermore
- The torque of the engine's crankcase nuts
- Change spark plug
- Change the petals of the reed valve
- The reduction belt and the play of the pulley and change them in case of need
- The condition of the starter gears (version with electric start)
- Once a year (independently from flight hours) change the diaphragm of the carburettor

N.B.: It is advisable to keep records of all maintenance in a log book for the engine.

It is also advisable to install an instrument (CHT) to control the head temperature at sight, it is important because you can understand when your engine is running at the proper temperature before taking off.

If you install also an EGT probe you will be able to check the temperature of exhaust gas and avoid the engine seizure. The max. temperature of exhaust gas is 590 C°

DO NOT EXCEED THIS TEMPERATURE

Tutorials on our web page at:

http://www.corsairmotors.com/en/download/

TENSION OF THE REDUCTION BELT DRIVE

USE CAUTION

Attention: a belt which is “over tensioned” can do permanent damage to the bearings inside of the pulley hubs and drive shaft.

Therefore we strongly suggest for you to follow carefully these instructions.

Before adjusting the belt take a felt pen or marker and make a small sign on the cam shaft and on the front of the reduction plate.

This is your Zero or start point and from here you will be able to clearly see how much you move the eccentric tensioning cam in relation to the reduction plate.

Remember “these are Fine adjustments” and we suggest not to rotate the cam any more than 1 mm per adjustment.

After each adjustment you can try to start the engine and check the result.

If the engine does not start well then it usually means the belt is still too loose and is slipping - in this case repeat the operation by tensioning the belt another 1 mm.

Consider that if the belt slips a little, but the engine still starts fine, then the tension is correct.

Belt tension always increases automatically when the engine is running because of thermal expansion in the pulleys.

Once you have found the correct tension, do not adjust it any more.

In case of doubts please contact your paramotor dealer – or CORS-AIR.

To adjust the belt do the following:

- Loosen the safety bolt located high up behind the reduction mounting plate and the side bolt.
- Once these are loosened then you can turn the cam with a n.27 mm size wrench - careful to observe the 1 mm increments.
- Once you have finished turning the cam remember to re-tighten the safety bolts, first the exagonal bolt, by keeping firm the cam with the wrench, and then the side bolt.
- Should you notice any black rubber dust inside small pulley (pinion), your belt needs to be re-tensioned because it is loosing.

IGNITION (ONLY FOR ENGINE WITH HAND START)

In case the coil and/or the handwheel must be changed, it is compulsory to turn to your dealer or to trained personnel, even if this operation can appear simple at the first sight, since the timing of the engine, if wrong, can change the performance and cause damage to the engine.

To check the timing: the distance between the coil and the flywheel magnet is 0,40 mm.

CORS-AIR AND ITS RESELLERS REMAIN AT YOUR DISPOSAL FOR EVERY INFORMATION AND ADVICE ABOUT THE USE OF THE ENGINE.

WARRANTY

CORS-AIR engines are manufactured with top-quality material, therefore warranty is valid also for their accessories.

DURATION OF WARRANTY

- 1 YEAR beginning from the date of sell or exit from CORS-AIR
- Warranty includes spare parts and labour, transport excluded.

WARRANTY IS VOID IN THE FOLLOWING SITUATIONS:

- Alterations to the engine not approved by CORS-AIR.
- Wear&tear of components of the engine due to the instructions within the product manual not being adhered to.
- Accidental falls, crash or dropping of the engine or its components.
- Overheating and seizure of the engine due to prolonged high speed running of the engine, running with excessive loads, running with inadequate loads, running with insufficient oil in the petrol (for a wrong tuning of the carburettor) or running with petrol only (oil mixture omitted).
- The presence of dirt, sand or foreign bodies in the carburettor of the engine.
- Corrosion through bad storage of the engine or inadequate preparation for storage of the engine.
- Running the engine without an air-filter fitted to the carburettor.
- Miss-assembly of engine parts or components not assembled by CORS-AIR but by the manufacturer of the paramotor or by the end user, supplied disassembled for packing and transport purposes, included all electrical or electronic components including electric starter.
- Corrosion of the engine or components emanating from stone chips or any other impact or abnormal stress damage.
- Work other than the maintenance set out in the product manual having been carried out on the engine by anyone other than CORS-AIR or official dealers.
- Incidental or consequential loss or damage.
- Service bulletins from CORS-AIR not having been adhered to.
- Engine used for racing use.

TROUBLE SHOOTING

CHECK	PROBLEMS					SOLUTION
	DON'T START	FLOODED	DON'T HOLD IDLE SPEED OR HAS IRREGULAR SPEED	CANNOT REACH MAXIMUM SPEED	HEAD IS DECARBONED	
SWITCH ON/OFF						
CONNECTION OF CABLE OF THE SPARK PLUG						
CORRECT SPARK PLUG GAP						
CONNECTIONS OF THE ELECTRIC PLANT						
THE FUEL ARRIVES CORRECTLY FROM THE TANK TO THE CARBURETTOR						
						DISMANTLE THE SPARK PLUG AND DRY IT
						BEFORE REASSEMBLING SPARK PLUG, TAKE OFF THE FUEL LINE FROM CARBURETOR AND START THE ENGINE 2/3 TIMES
THE REED VALVE PETALS ARE OPENED OR BROKEN						
						CLEAN AND ADJUST THE CARBURETTOR
CABLE PULLING THROTTLE IS NOT FULLY OPEN						
CLEAN THE CARBURETOR NETS inside						
THERE IS NO TANK-FILTER RESTRICTION IN THE FUEL PIPE						
SPARK PLUG						
						CHANGE HEAD GASKET AND THE CYLINDER GASKET

SOME FINAL IMPORTANT ADVICE

NEVER switch on the engine with people near propeller, or to sides.

The BREAKAGE of a propeller can cause very severe hurts even several metres away.

DO NOT keep engine at peak rpm after the take off, except for the absolutely necessary time and for emergencies (obstacles or sudden wind).

REMEMBER that the longer the propeller is and more thrust you get but less cooling system is granted to the engine which it will operate under stress.

So keep under control the temperature of the engine with proper instruments (CHT under spark plug and we reccomend also EGT of the exhaust gas check page. 5 for the correct engine temperature)

In addition, dismantle the propeller at regular intervals and check that it is perfectly balanced, since an unbalanced propeller, even slightly, creates micro-vibrations which are not felt by the pilot, but can damage seriously parts of the engine with consequent breakages.

Please do NOT forget that the propeller has mass and a considerable inertial moment, so it's advisable not to vary suddenly the RPM of the engine, both in flight and on the ground.

These violent stresses could cause damages to the reduction, to the engine, to the belt and also possible deformations to the fixing holes of the propeller.

Once you have found the perfect carburation, DO NOT modify it unless you change flying place going to much higher or lower altitudes or unless climate and temperature are very different from the ones where you fly usually.

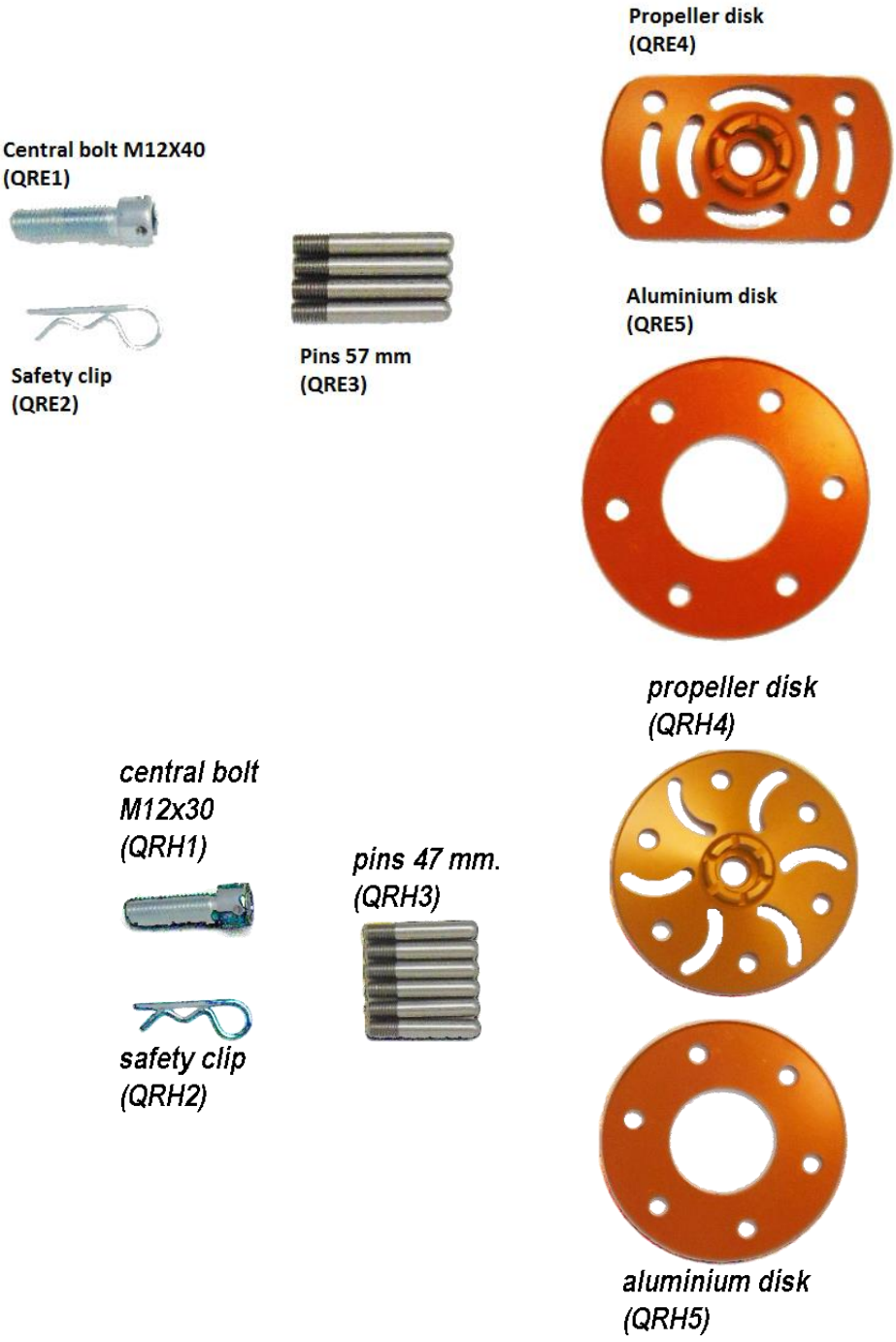
DO NOT FLY in bad weather conditions, you'll fly the day after.

REMEMBER: FLIGHT IS FOR FUN, NOT FOR RISKING YOUR LIFE! HAVE A GOOD FLIGHT AND ENJOY YOURSELF.

STORAGE OF THE ENGINE FOR A LONG TIME

In case the engine is not used for a long time, act like this:

- Empty the fuel tank, included the fuel lines and the carburetor.
- Disassemble the battery (version with electric start).
- Unscrew the spark plug and pour into the hole a teaspoon of oil for engines, then re-install the spark plug letting the propeller turn slowly by hand for 2 or 3 times completely.
- Disassemble the propeller.
- Loosen the reduction belt.
- Plug the hole of the exhaust pipe.
- Cover everything with a cloth and put it in a dry place.
- Once a month charge the battery and let the pinion of the drive shaft turn by hand 2 or 3 times completely.

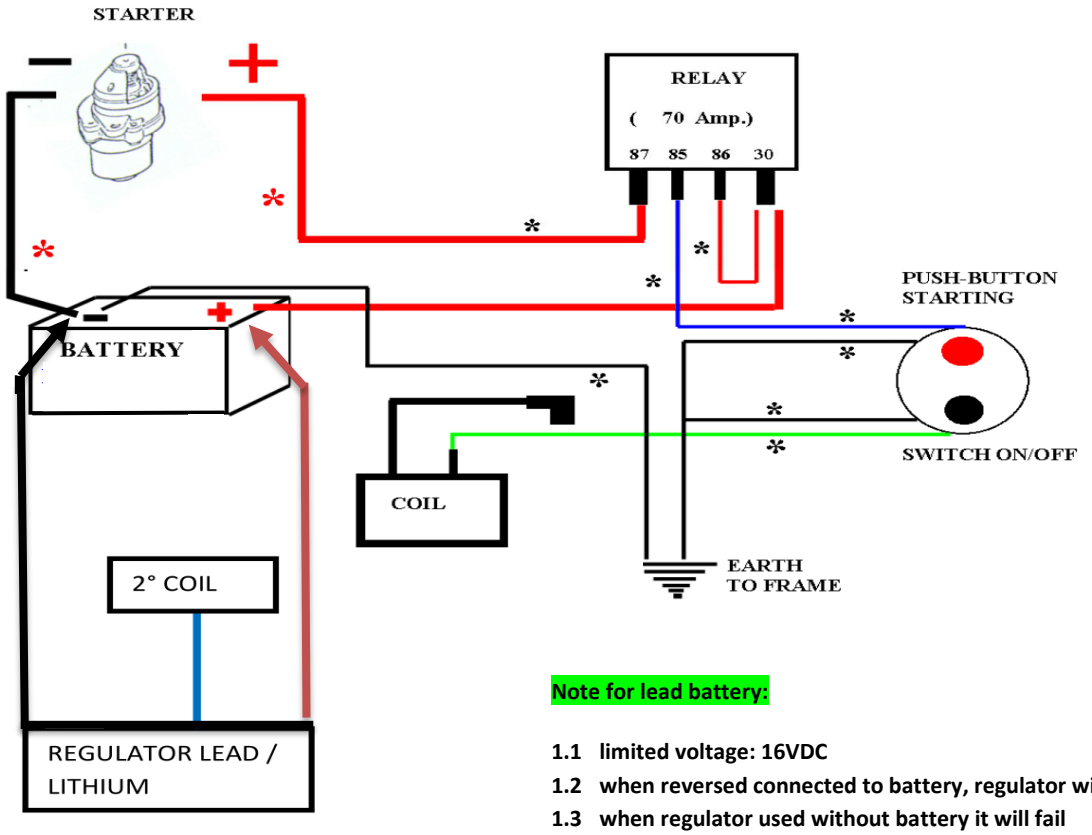


Instructions for assembly:

- Put some light or medium Loctite on the 4/6 pins and tighten them completely
- Always use the aluminium disk
- Insert the propeller
- Insert the propeller disk
- Insert the central bolt and tighten it at about 1,5 Kg (15Nm), checking that the clip can be inserted
- Insert the safety clip

ELECTRIC SYSTEM FOR BLACK BULL WITH RECHARGING KIT FOR LEAD OR LITHIUM BATTERY

N.B. * CABLE SECTION MIN. Ø 4 mm. * CABLE SECTION MIN. Ø 2 mm.

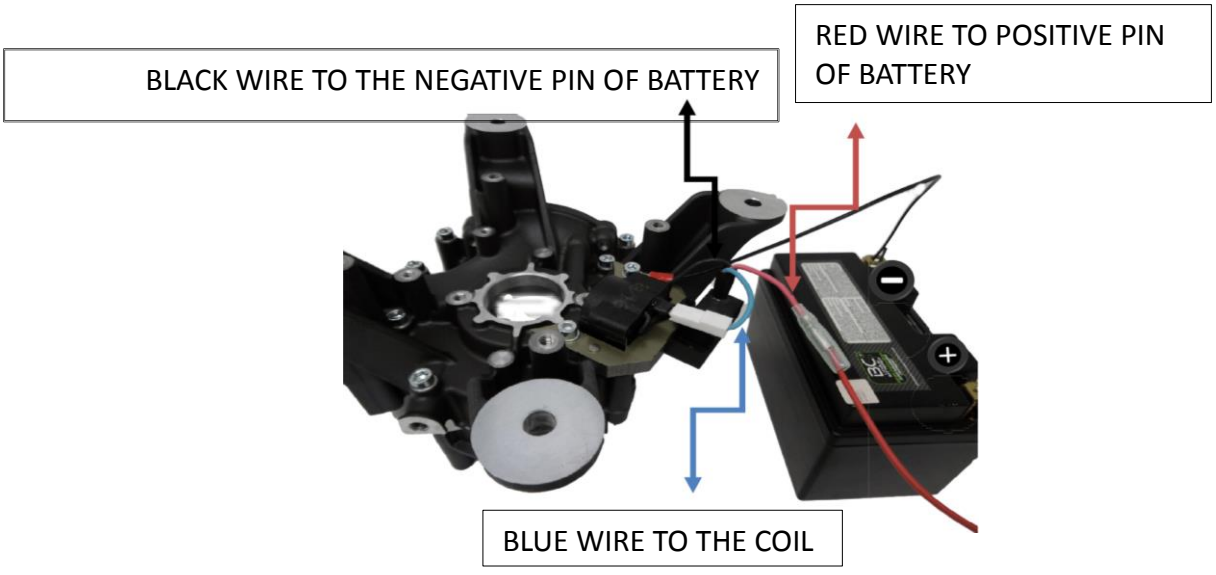


Note for lead battery:

1.1 limited voltage: 16VDC
1.2 when reversed connected to battery, regulator will fail
1.3 when regulator used without battery it will fail
1.4 unit temperature working range: -10°C to 50°C (on unit surfare)

NOTE FOR LITHIUM BATTERY:

1.1 LIMITED VOLTAGE: 13.5÷14.5VDC
1.2 REGULATOR MUST BE DISCONNECTED BY BATTERY WHEN ENGINE STOPPED
1.3 WHEN REVERSED CONNECTED TO BATTERY, REGULATOR WILL FAIL
1.4 WHEN REGULATOR USED WITHOUT BATTERY IT WILL FAIL
1.5 UNIT TEMPERATURE WORKING RANGE: -10° C TO 50° C (on unit surface)



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