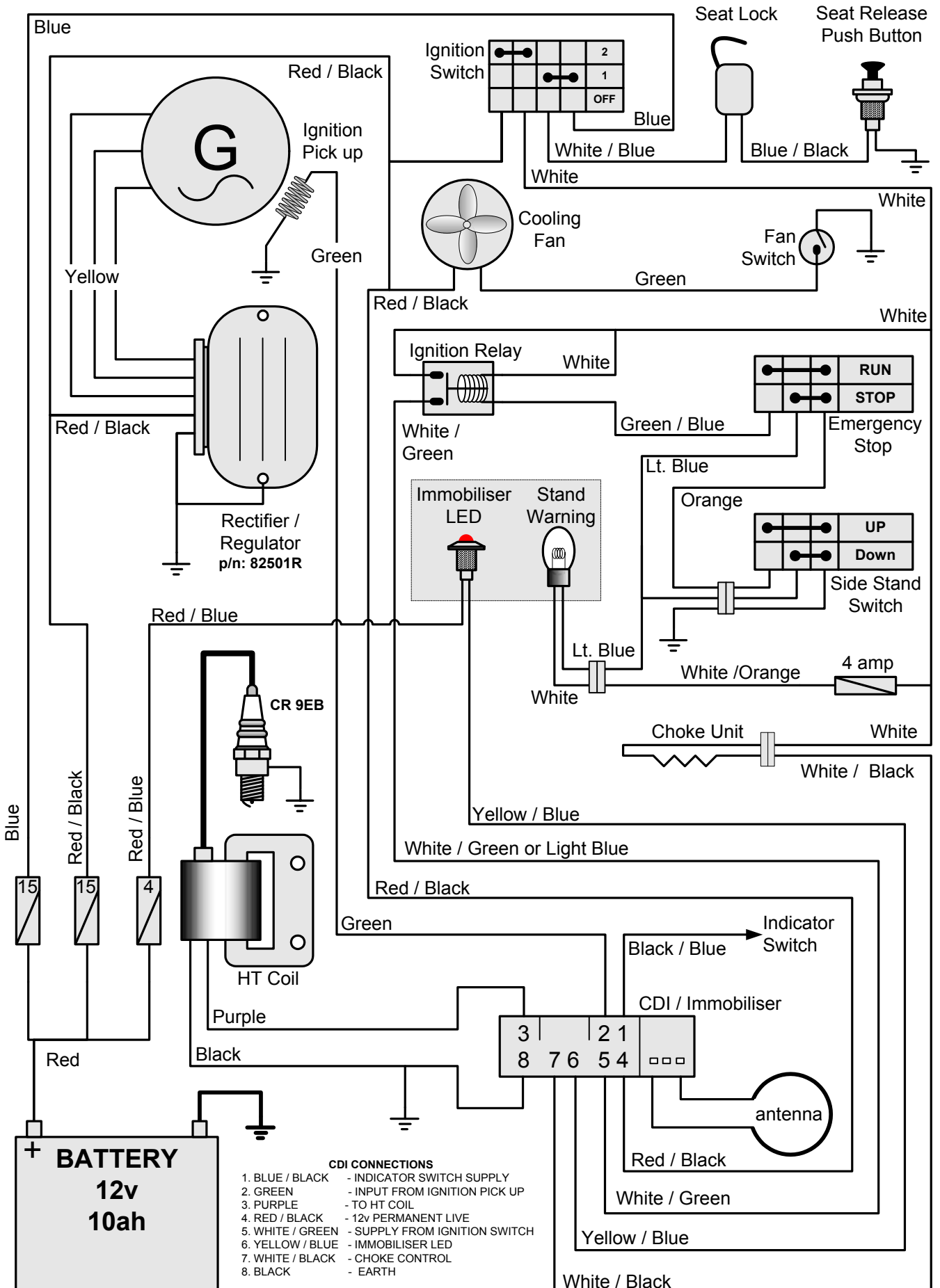


B 125 / 200 ignition / charging

Piaggio Ltd.

25/08/05

With IMMOBILISER



B 125 / 200 NOTES

The notes should be used in conjunction with Service Station Manual 594845 and the notes "B 125 ignition / charging" and "B 125 Fuse Explanation"

1. **Seat has electric release.** Only works when ignition switch is in the "off" position.

If seat lock fails to operate:

- ❑ Check fuse "7" in rear fuse box. 4 amp red wire in & blue wire out.
- ❑ Check for power on Blue wire at ignition switch
- ❑ Check for power on White / Blue wire at ignition switch with ignition "off".
- ❑ Check the push button, Blue / Black should earth when button is pressed. Seat lock, power socket and under seat light are all controlled by the same fuse.

2. **Wires from The engine.**

- ❑ Three Yellow wires: Three phases of generator, all feed directly to the rectifier / regulator.
- ❑ Green wire: Ignition pick up. Goes to ECU unit.
- ❑ Brown wire: From oil pressure switch, goes to indicator light on instrument panel.

3. **Immobiliser** is like other Leader engines. There are separate notes to explain the immobiliser system.

4. **Fuel system.** (similar to the DNA 125 / 180 four strokes)

- ❑ Fuel is pumped from the tank and supplied to the carburettor under pressure.
- ❑ Fuel pump is on the bottom of the tank and is driven by manifold vacuum.
- ❑ The feed pipe from pump to carburettor has a non-return valve and an inline filter.
- ❑ 200cc engine may (early vehicles) have a vacuum pipe that branches off to operate an over run valve in the carburettor.
- ❑ Carburettor icing is controlled by a warm water feed from the cooling system.
- ❑ Choke is the automatic (wax pellet) type used on all our automatics. Remember that these units default to being "ON" and are turned off electrically. They are more likely to cause running rich when hot than cold starting problems.

5. **Spark Plugs.**

Please note that the correct spark plugs are:

125cc :- NGK CR8 EB p.n. 828866

200cc :- Champion RG6 YC p.n. 828708 (or NGK CR7EB)

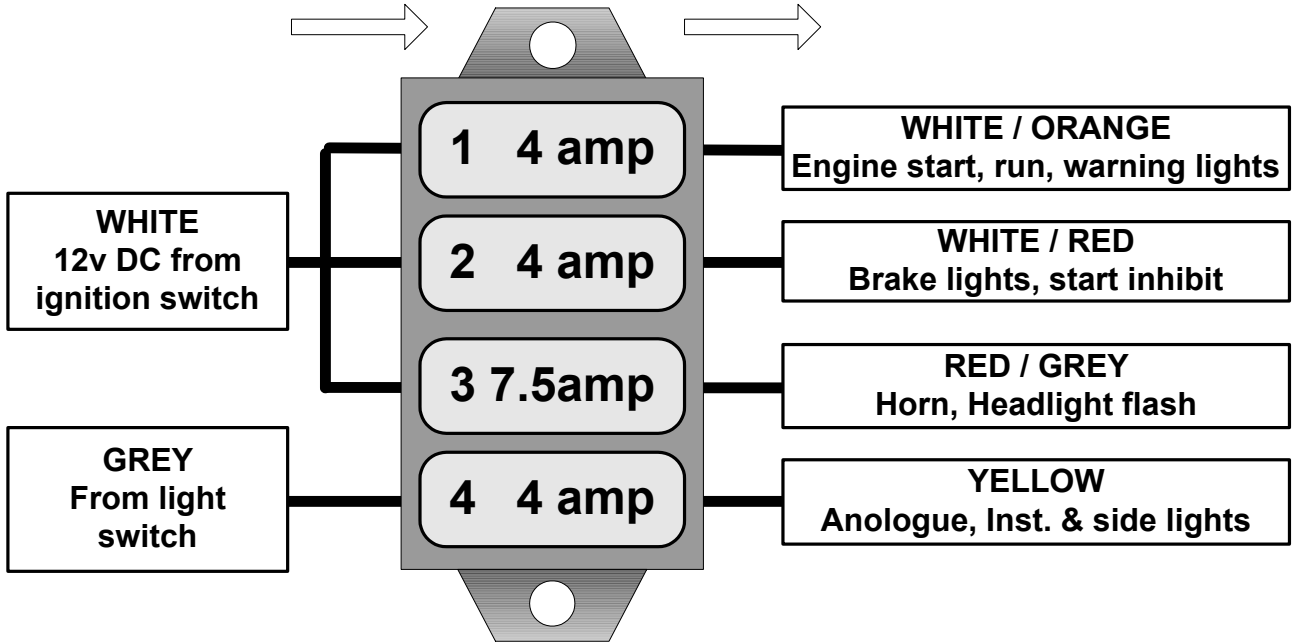
B 125 FUSE EXPLANATION

Piaggio Ltd.

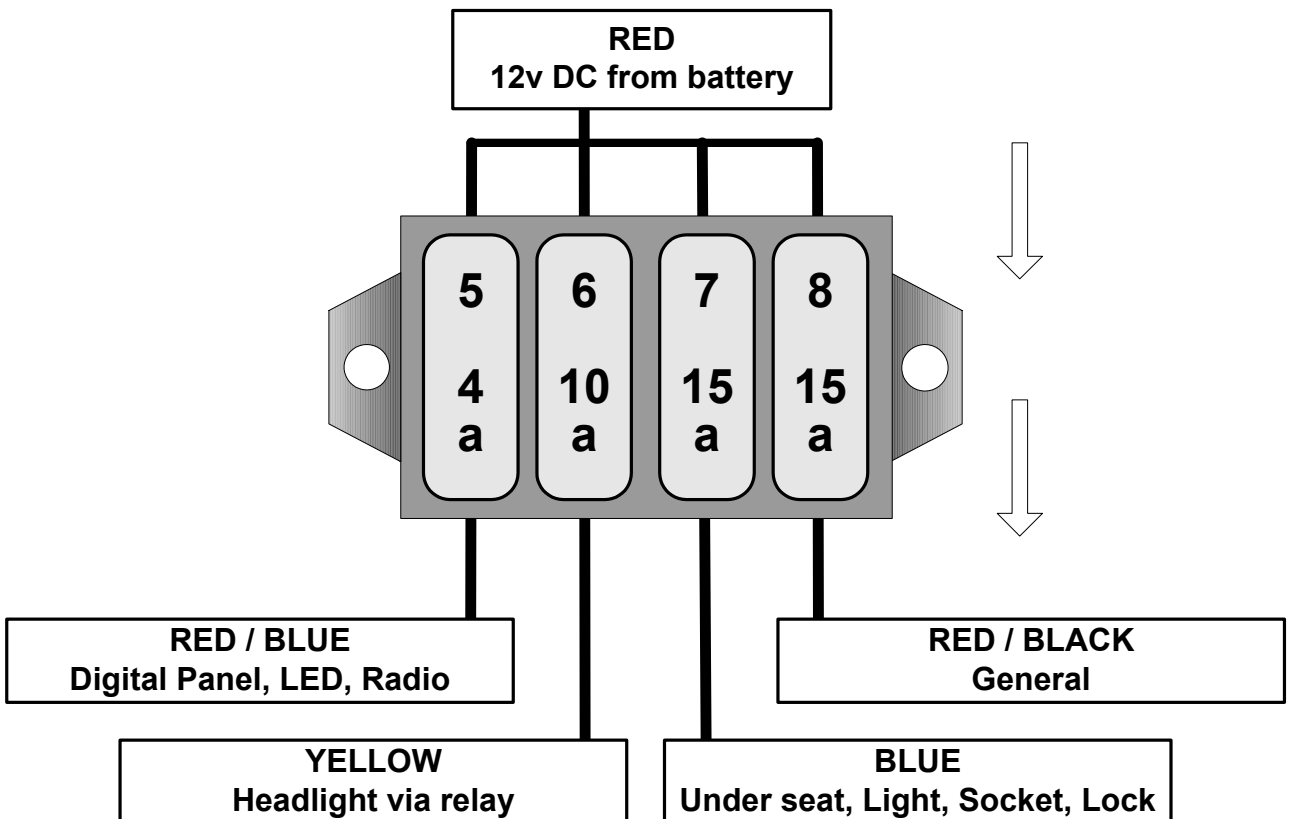
08/05/2003

Piaggio Ltd.

FRONT FUSE BOX



REAR FUSE BOX

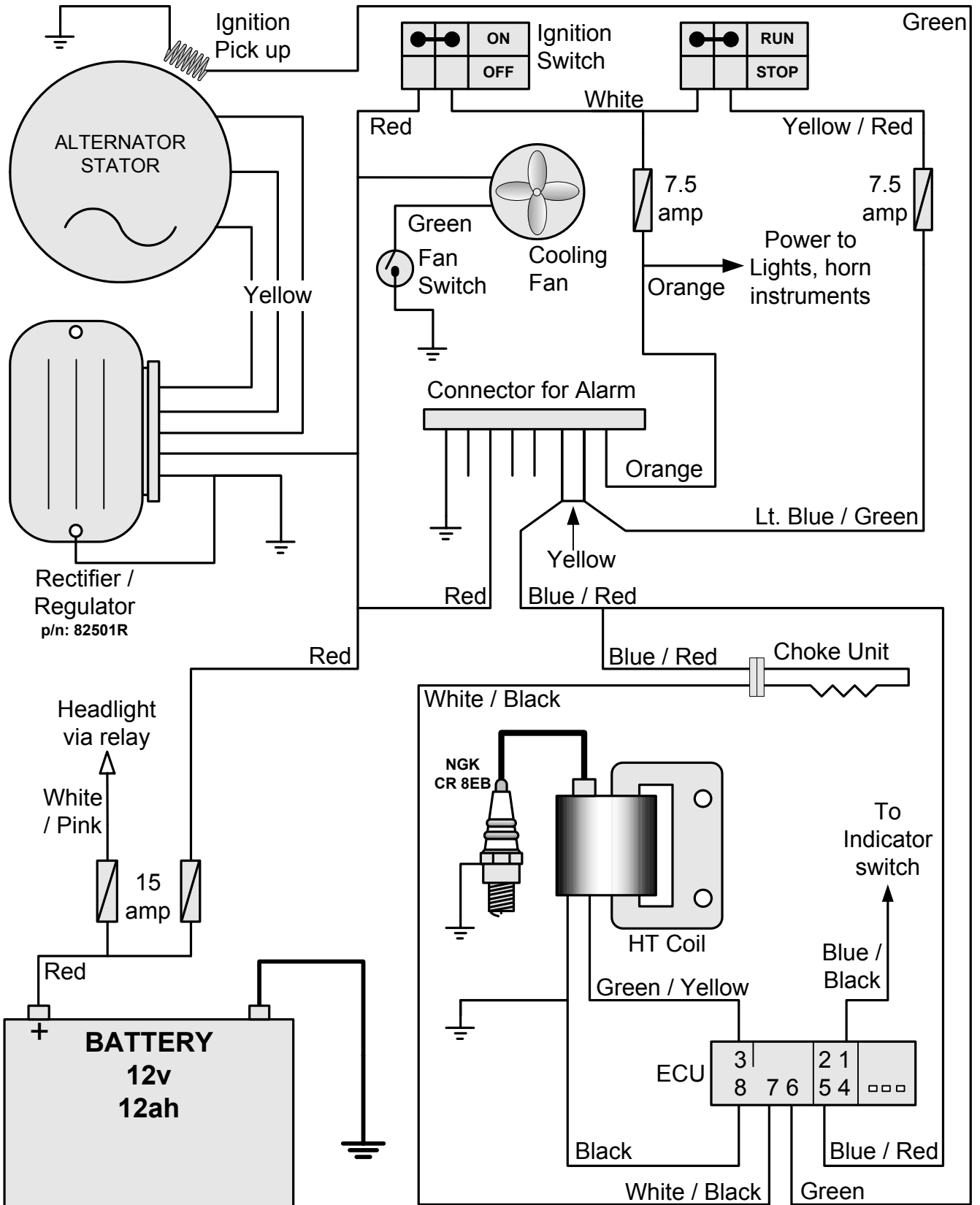


DNA Leader engine ignition / charging

Piaggio Ltd.

13/08/2003

DNA 125 / 180



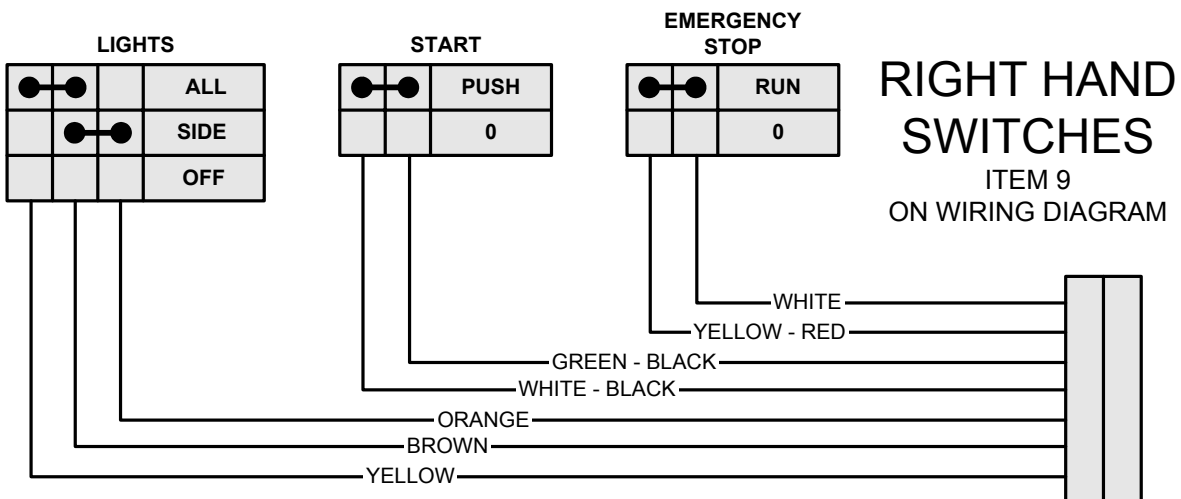
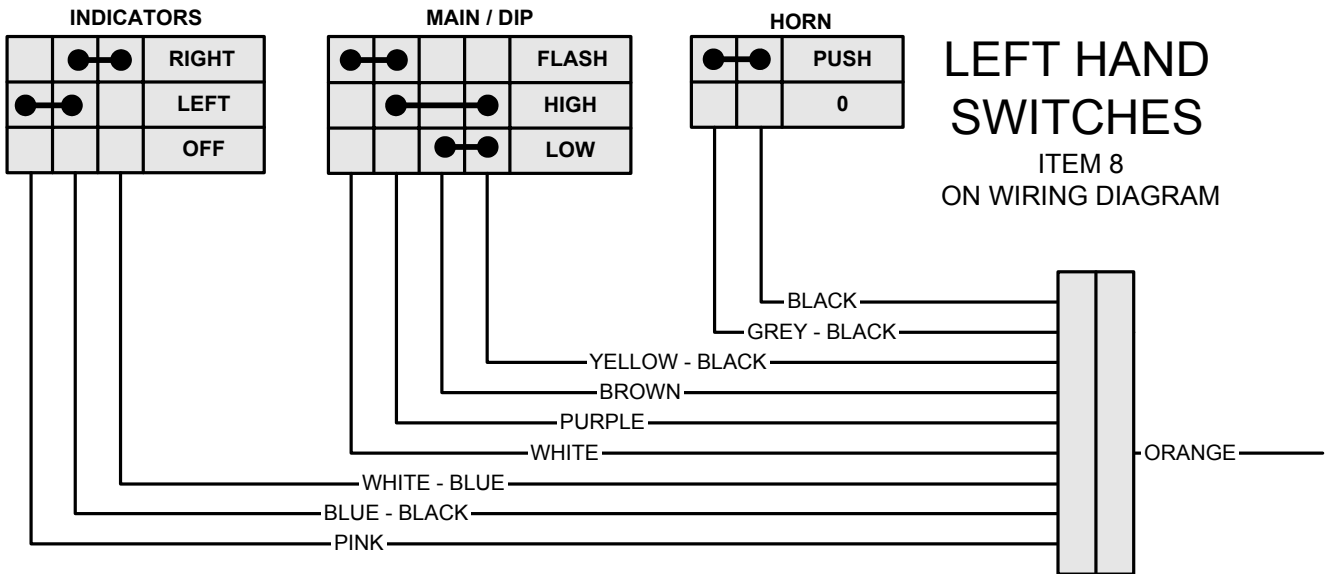
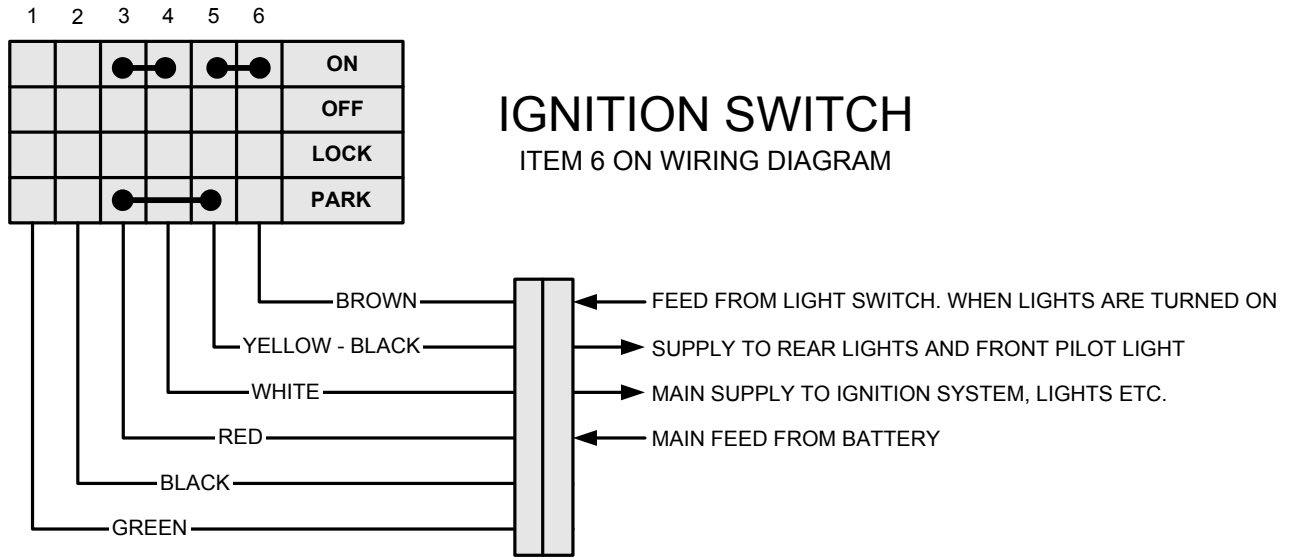
- STATOR:** ANY YELLOW TO ANY YELLOW = 0.7 - 0.9 ohm. YELLOW TO EARTH = NO CONTINUITY
 GREEN TO BLACK (EARTH) = 105 - 124 ohm
- REGULATOR:** VOLTAGE ACROSS A FULLY CHARGED BATTERY, LIGHTS OFF, HIGH REVS = 14 - 15.2 V.
- CHARGING:** AMMETER IN RED WIRE => 8 AMPS WITH LIGHTS ON AND HIGH REVS.
- HT COIL:** PRIMARY = 0.4 - 0.5 OHM. SECONDARY = 3K ± 300 OHM.

DNA 125 / 180 Switch Wiring

Piaggio Ltd.

08/05/2003

Refer to Service Station Manual
594329 (02/01) page 4-23>

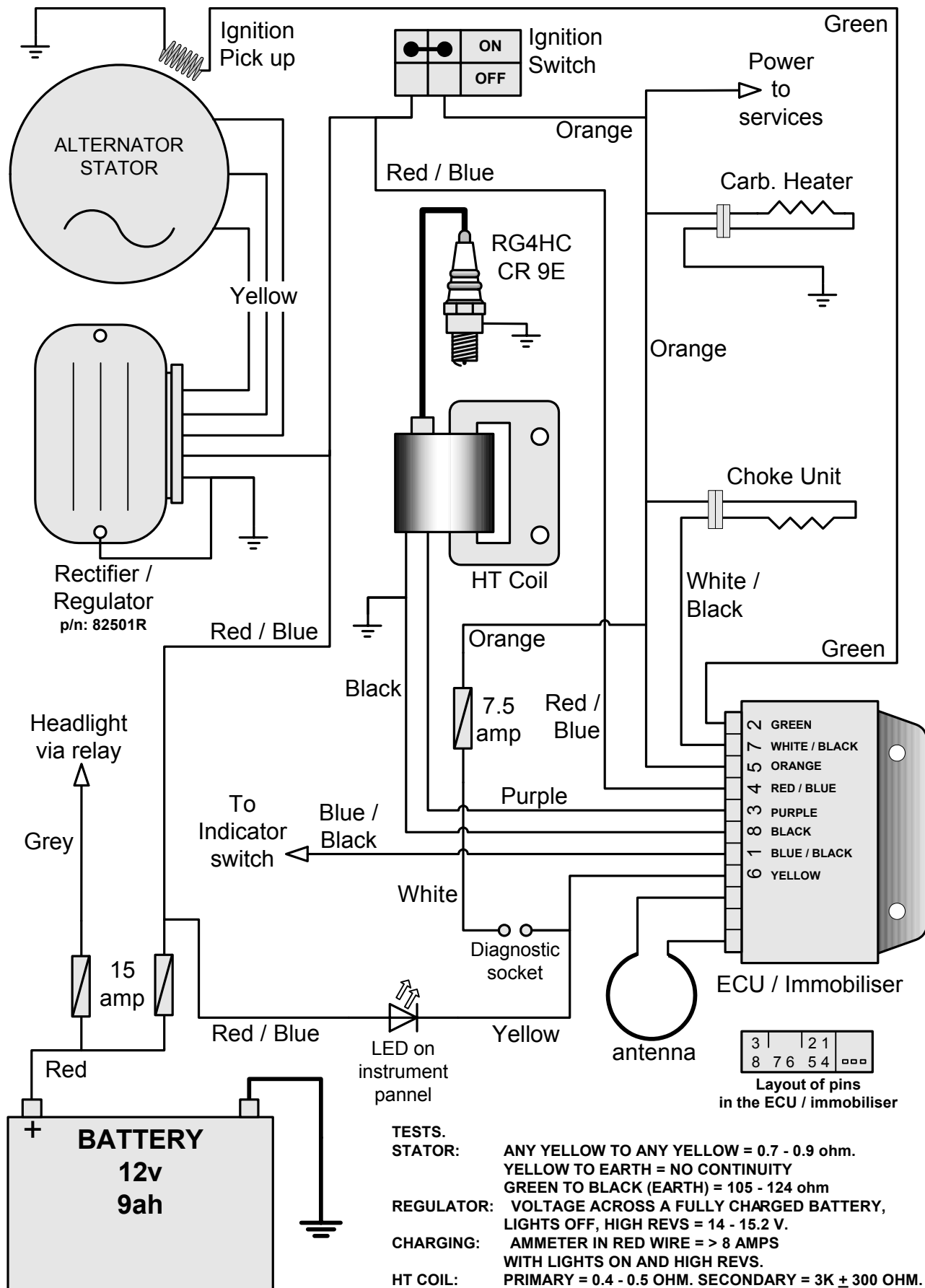


ET4 Leader / LX 125 ignition / charging

Piaggio Ltd.

30/09/2005

With IMMOBILISER

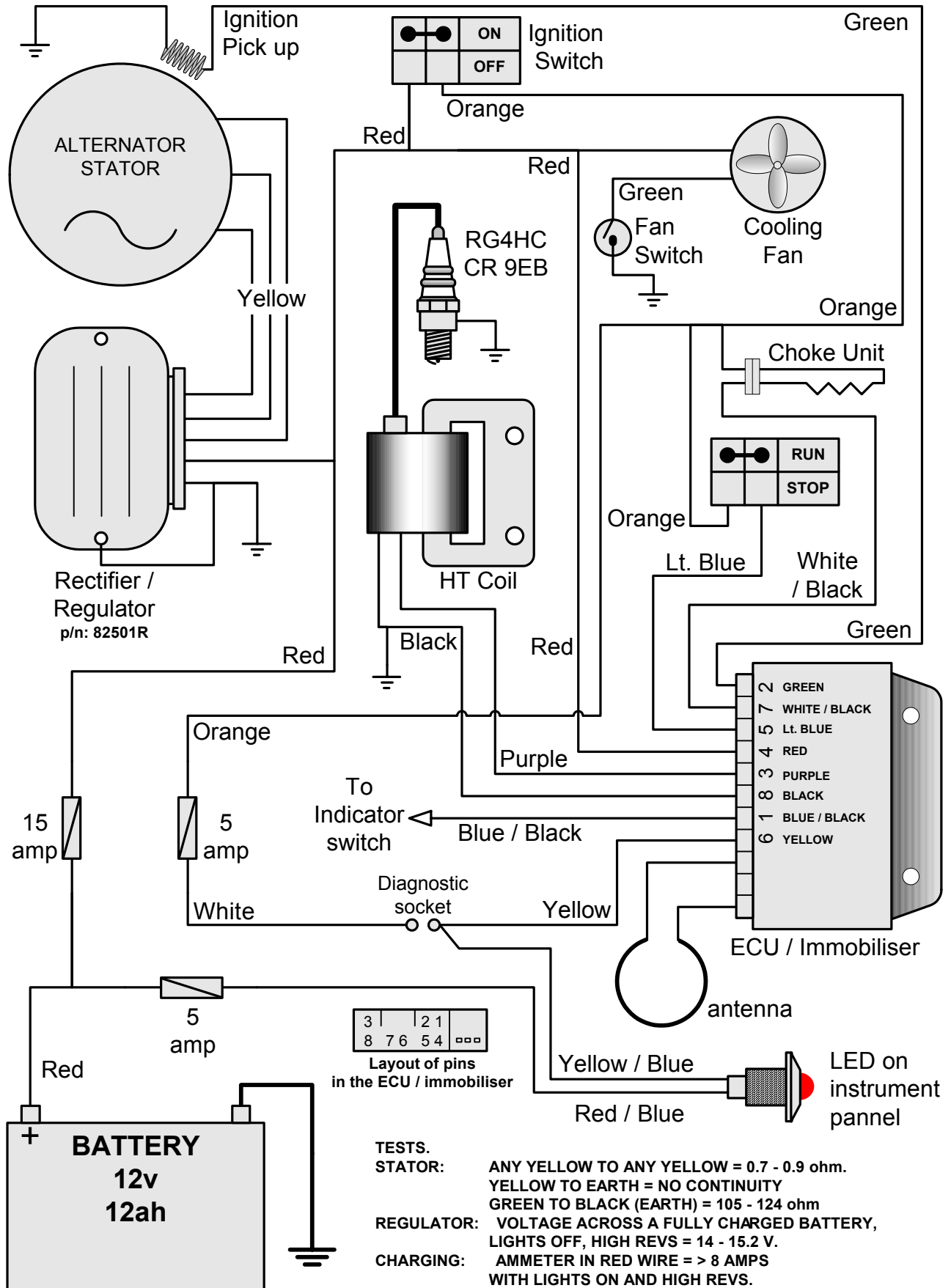


Hexagon GTX 125 ignition / charging

Piaggio Ltd.

13/03/02

With IMMOBILISER

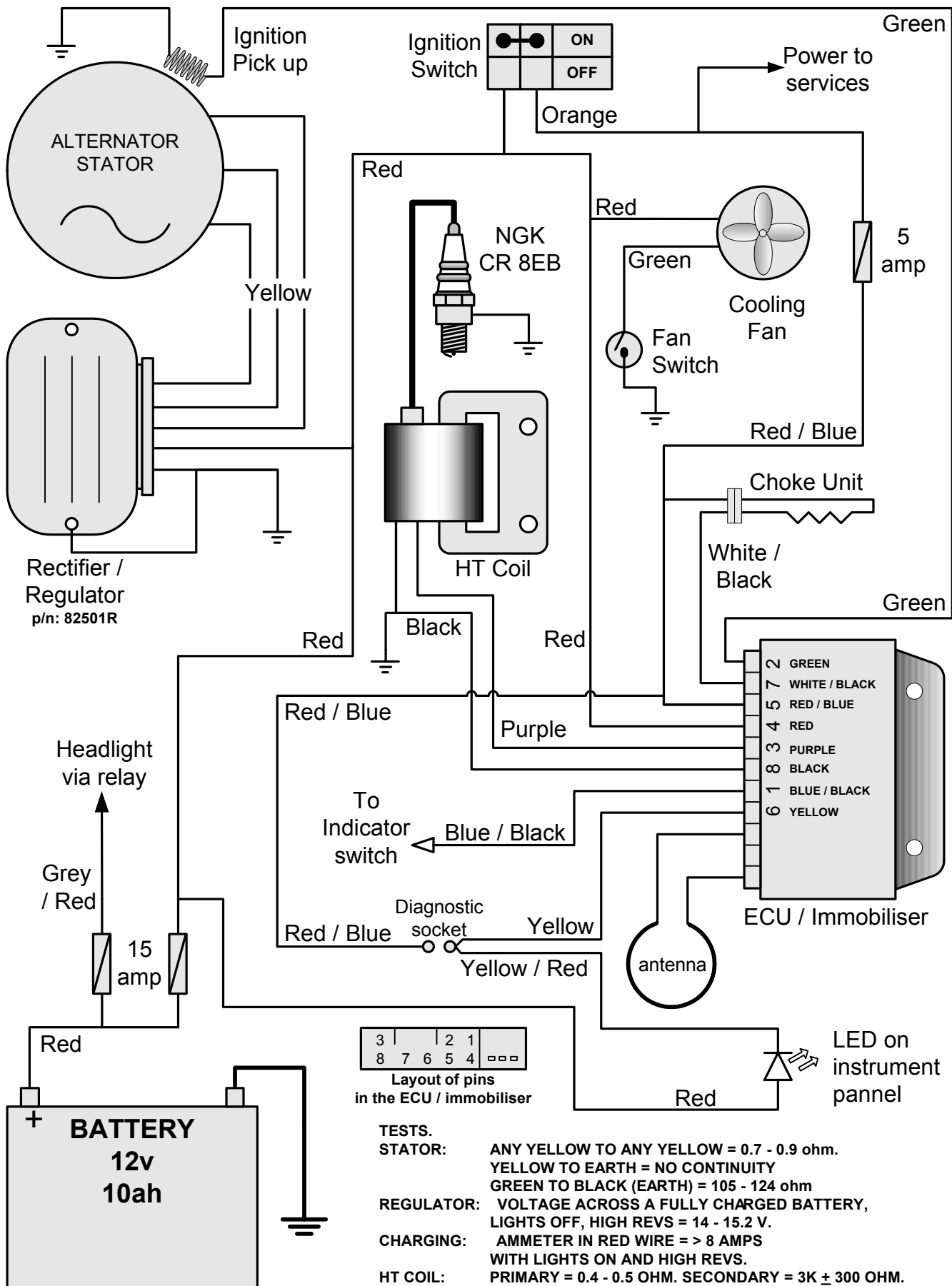


Runner VX / VXR ignition / charging

Piaggio Ltd.

19/07/02

With IMMOBILISER



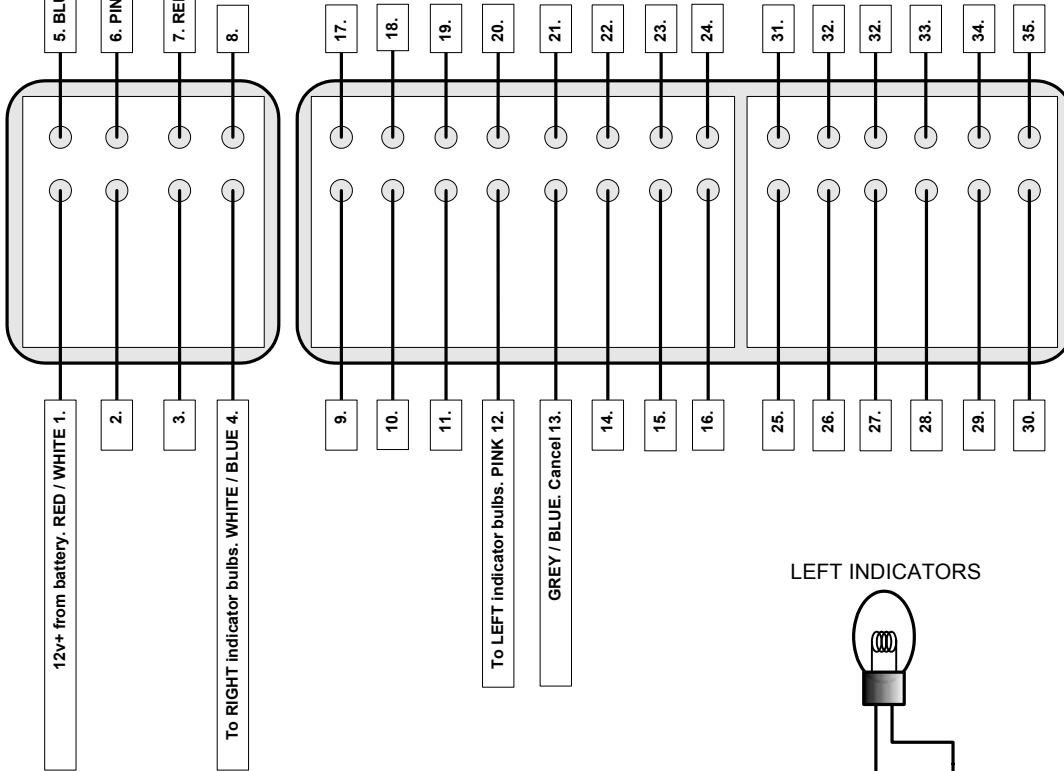
X9 125 indicator wiring

Piaggio Ltd

27/02/2004

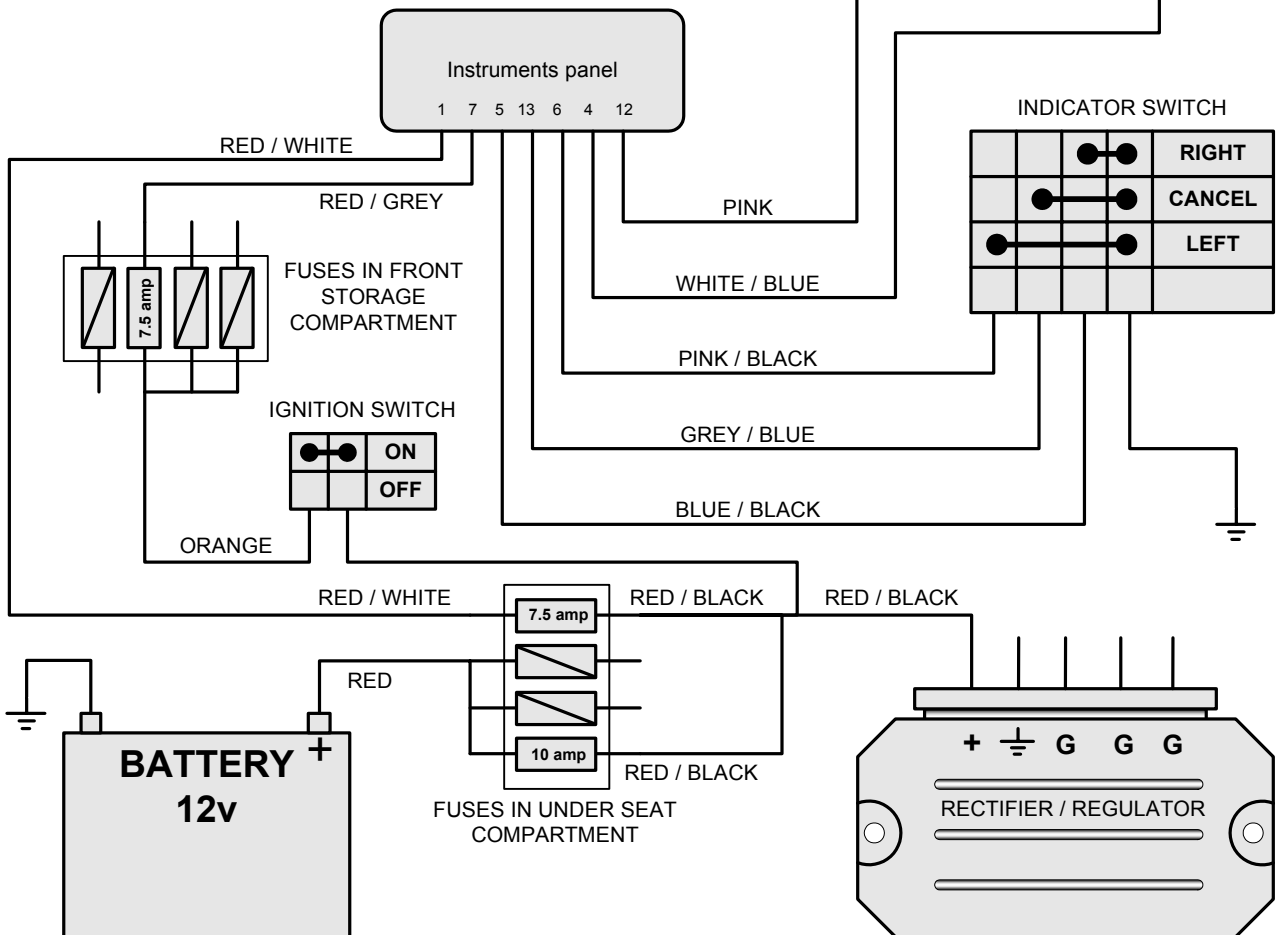
SSM page 4-8

LAYOUT OF INSTRUMENT PANEL MULTI PIN CONNECTOR



LEFT INDICATORS

RIGHT INDICATORS

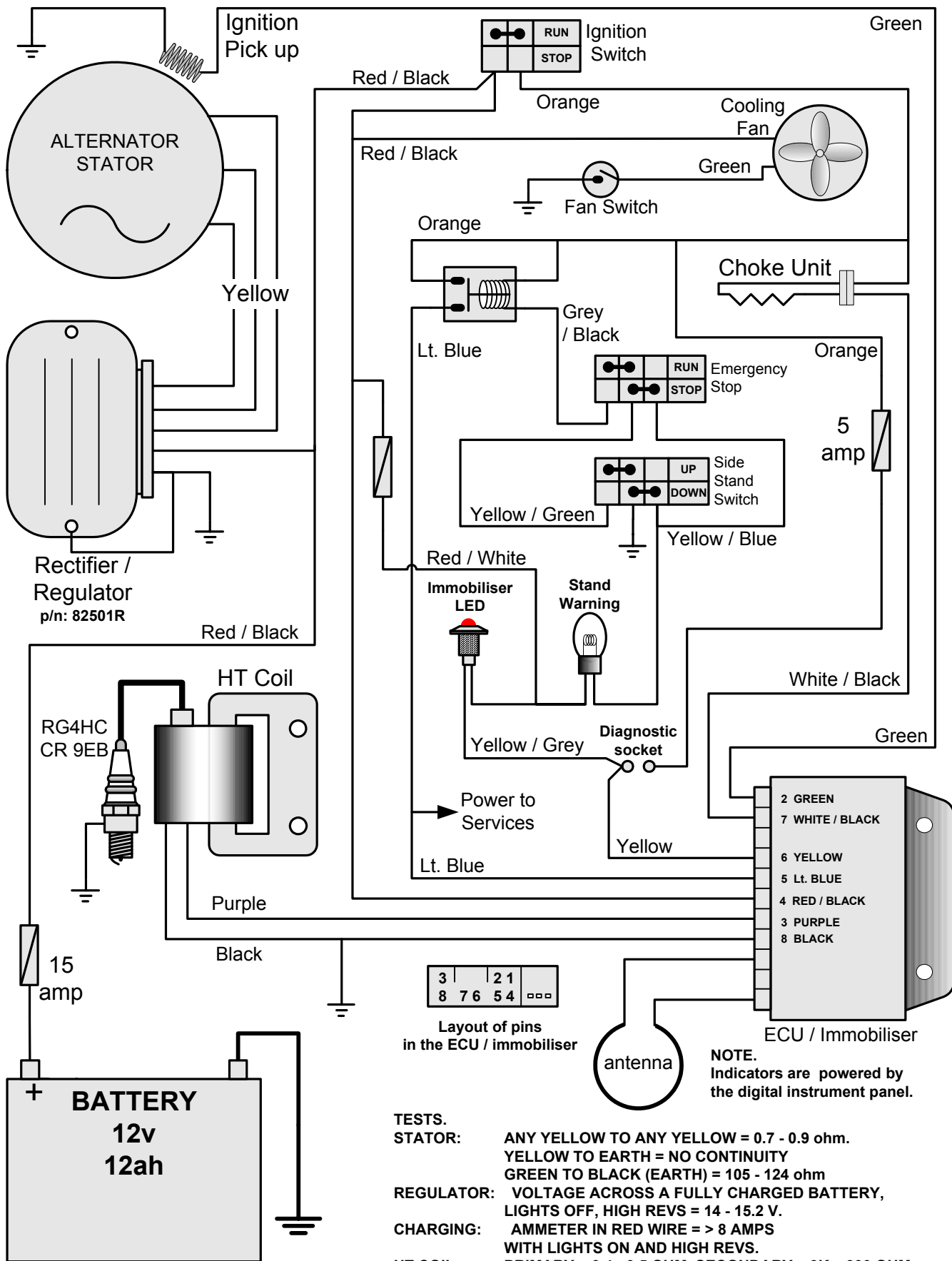


X9 125 / 180 & 250 Evo ignition / charging

Piaggio Ltd.

15/10/2004

With IMMOBILISER

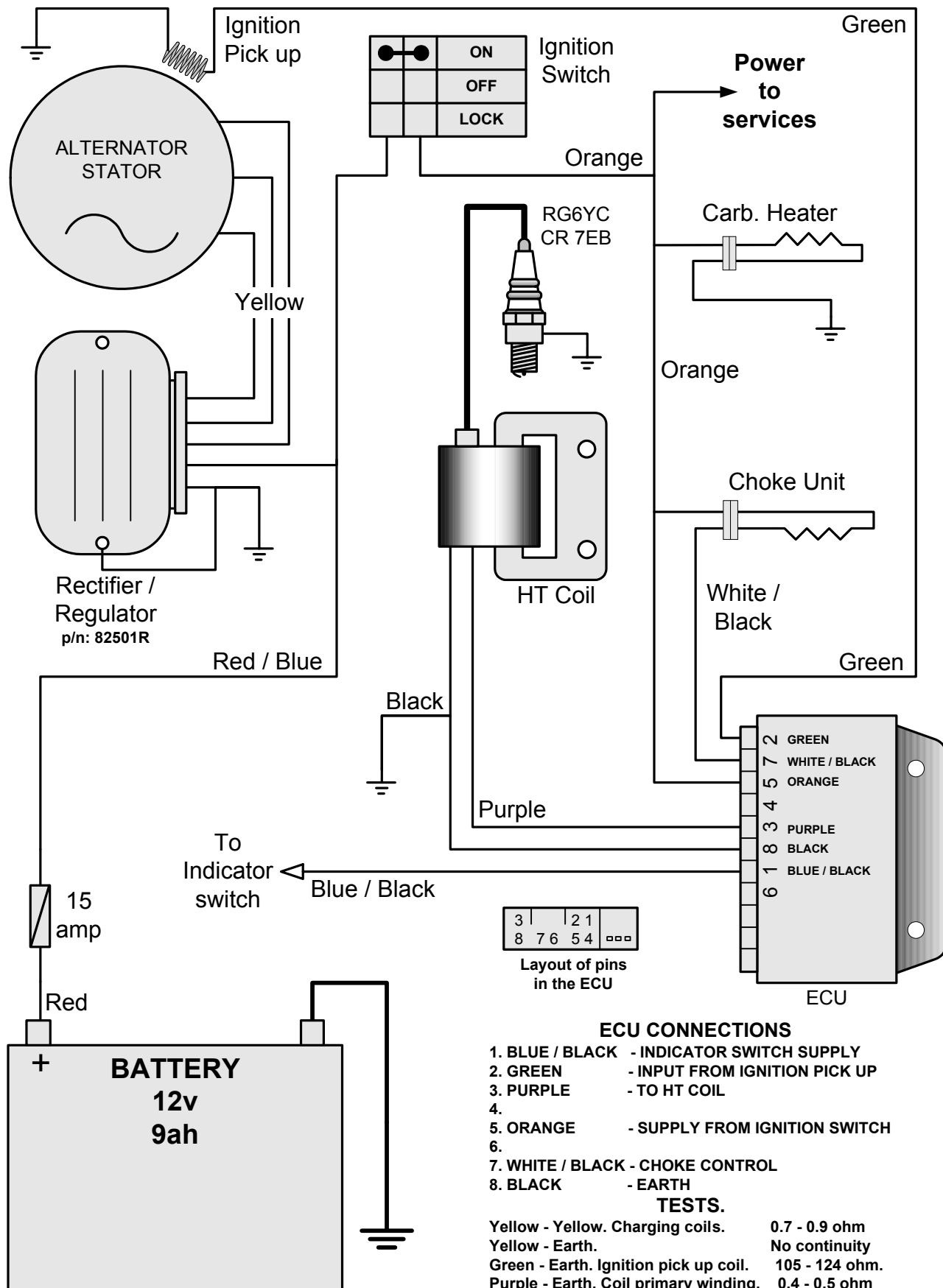


ZIP 125 Leader engine ignition / charging

Piaggio Ltd.

13/08/2003

NO Immobiliser



LEADER ENGINE

Ignition, charging & immobiliser

Use these notes in conjunction with the SERVICE STATION MANUAL

The electrical system on the new Leader engine is very different to previous two stroke and four stroke Piaggio engines. The ignition, charging & immobiliser circuits do not function in the same way and do not share common components with previous versions.

- ❑ Ignition is now using the battery circuit. Everything shares one common supply.
- ❑ Alternator has three phase (all yellow wires) and ignition pick up coil (green wire) outputs only.
- ❑ Rectifier / Regulator is very simple. Three phase (yellow) inputs and one output.
- ❑ ECU unit has become more complicated. The one unit is responsible for: ignition, immobiliser, indicators & choke unit.
- ❑ Much of the circuit is the same on ET4 Leader, Fly 125, Super Hexagon GTX 125, Liberty 125 Leader, B 125, Skipper ST, Runner VX / VXR and DNA 125 / 180, Vespa GT 125 / 200 X8 125, X9 125 and Zip 125 but be careful because there are differences. Early Skipper ST did not have an immobiliser, the later version does have it.

IGNITION.

When the ignition is turned on power is supplied to the CDI (terminal 5).

Ignition pick up is via green wire (terminal 2).

Output to the HT coil is via purple wire (terminal 3).

The unit is earthed via black wire (terminal 8).

CDI / IMMOBILISER

Note the ECU units have different part numbers for different models and engines size.

Refer to the diagram for each specific model. The wiring and wire colours may vary.

It is important that the correct part number is used as the ignition characteristics vary and although the units look the same they are different!

On vehicles with an immobiliser;

The wires connected to the unmarked terminals are from the antenna that is mounted around the ignition lock barrel.

Check antenna for continuity, unplugged resistance = 7 - 9 Ω .

The red or red / blue wire (terminal 4) supplies battery voltage even with ignition off.

Yellow wire (terminal 6) is from the LED on the instrument panel. If the system is programmed and working correctly the LED should be flashing steadily with the ignition turned off to confirm that the immobiliser system is functioning. The immobiliser earths the LED (or not) to make it turn on or off.

See pages 3-4 below for more details on using the LED for immobiliser fault finding.

HT COIL. 82597R = Common to most Leader engines. 82582R = Skipper ST & X9 125

- ❑ Purple to Black - primary winding = 0.4 - 0.5 Ω
- ❑ HT to Black - secondary winding = 3000 \pm 300 Ω
- ❑ Plugged in with engine cranking the peak voltage Purple to Earth = 100 vdc

IGNITION PICK UP COIL.

- Un plug, check resistance, Green to Black = 105 - 124 Ω
- Un-plugged with engine cranking the peak voltage Green to Black = 2 vdc

STATOR.

Any yellow to yellow should give continuity. Un-plugged, yellow to yellow = 0.7 - 0.9 Ω
Yellow to earth should not give continuity.

RECTIFIER / REGULATOR. p/n 82501R common to leader engines.

- Regulated voltage. With a fully charged battery check charging rate by putting volt meter across the battery terminals. Peak voltage = 14 - 15.2 vdc. Engine at high speed and lights off.
- Charge current. Connect ammeter to the red wire. Then Start engine. Charge \geq 10 amp. With the head light turned on.

INDICATORS (Not X9 125).

There is no separate indicator relay. The relay function is contained within the ECU unit, Power to the indicator switch is via the blue / black wire (terminal 1).
If the indicators fail first check that you are getting voltage at terminal 1 (blue/black)
To check the switch and wiring. Unplug the CDI and link red/blue wire to blue/black wire, when the turn switch is operated the appropriate lights should come on. (you will not need the ignition to be turned on).

INDICATORS X9 125.

X9 has indicators driven by the digital instrument panel.

Three wires go to the switch from the panel. The switch earth's the appropriate wire to operate the indicators. Output to the indicators comes from the panel. See the explanation diagram 2-9a.

CHOKE UNIT.

The choke is now controlled by the CDI. (not the regulator).

Power is supplied to the choke via the main switched wire from the ignition switch to the ECU. The unit will not function until the engine is running when the CDI will complete the circuit to earth (terminal 7).

- Un Plugged, resistance across the connections = \gg 30 Ω @ 20°C
- Plunger extension. Measure how far the plunger protrudes from the body when it is cold, this should be 12.5 - 13.0 mm. Now connect the choke unit to a 12v battery. The plunger should have extended to 18.5 - 19.0 mm within 5 minutes.
- Supply. Orange or Red / Blue to earth = Battery volts with ignition on.
- Orange or Red / Blue to White/Black = 13-14.5v dc (system volts) with engine running.

CARB. HEATER. Fitted to air-cooled engines.

The carburettor heater will start working as soon as the ignition is turned on. Power is supplied via the switched wire that goes to the CDI.

Water cooled engines use a warm water connection from the cooling system.

COOLING FAN. On water-cooled engines.

The live feed from battery to fan is permanently connected. The switch is in the earth from the fan. So if the fan is faulty it could be the cause of a flat battery.

Piaggio, Gilera & Vespa

Immobiliser systems

The following pages are an explanation of the original fitment immobiliser systems fitted to vehicles beginning in the 1990's with the original (pre Leader) Vespa ET4.

Most space is devoted to the system fitted to Leader engined vehicles because this is by far the most common. Much of the operation of other systems is the same as the Leader system.

Systems covered:

Leader
Pre Leader
Quasar
Master

Published January 2006
1st edition

Piaggio and other after market alarms and immobilisers are not covered here.

Copies of this and other Piaggio technical information can be obtained from the Piaggio UK dealer portal web site or from Piaggio Ltd.

Immobiliser Systems

INDEX

LEADER

Page 2 - Explanation of operation & Fault codes

Page 3 - I need new keys

Page 4 - I need new locks

Page 5 - I need to fit a new CDI / Immobiliser unit

Page 6 - No Spark - Fault Finding Flow Chart

Page 7 - LED Not Flashing - Power supply problem

Page 8 - Immobiliser functioning correctly

Page 9 - Programming a CDI / Immobiliser

Page 10 - Transponder not detected

Page 11 - Transponder not recognised

PRE LEADER

Page 12 - Explanation of operation & Fault codes

Page 13 - Pre Leader ET4 wiring explanation

QUASAR

Page 14 - Explanation of operation & Fault codes

Page 15 - Notes on fault codes and diagnostic tester

Page 16 - Programming

MASTER

Page 17 - Explanation of operation & Fault codes

Page 18 - Notes on fault codes

Page 19 - Programming

Leader Immobiliser

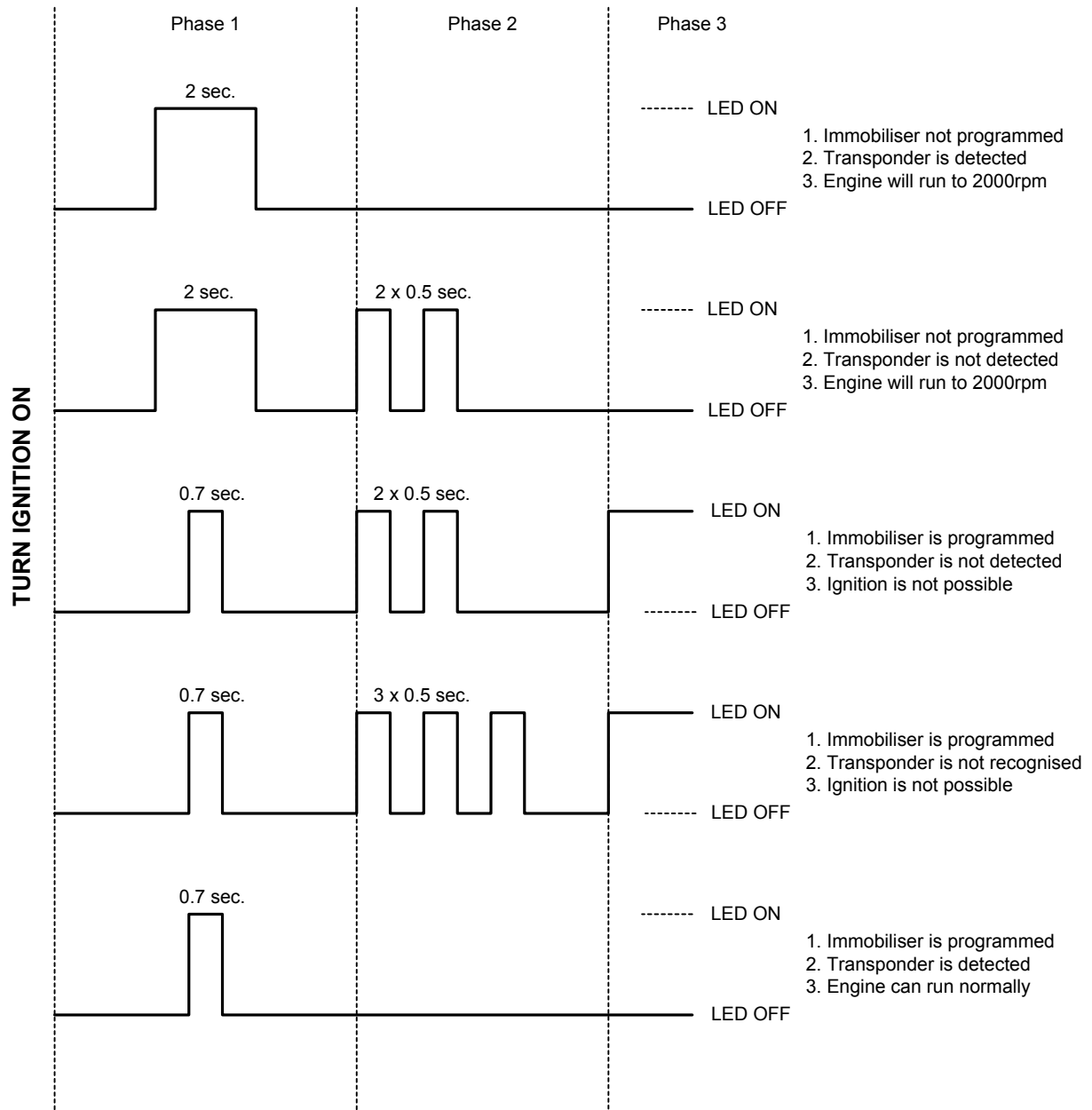
PAGE 2

19/01/2006

EXPLANATION

1. The immobiliser system fitted to all Piaggio, Gilera & Vespa "Leader" engined vehicles operates in exactly the same way.
2. Although the principle is the same the wiring differs on different models.
Refer to the wiring diagram and Service Station Manual for your specific model.
3. CDI and immobiliser are combined in one unit.
4. The CDI / immobiliser units may look the same but:
They have different characteristics on different models.
Ensure you fit the correct unit. Always order by part number .
5. The flashing LED on the instrument panel is the key to understanding how the immobiliser is behaving. The list below shows what the LED can tell you.
Note that the LED should flash steadily all the time the ignition is off and the battery is connected.
If not, go to PAGE 7 for fault finding information.
6. If you have no spark you must first prove that it is not due to the immobiliser.
7. Keys should not be on a metal key ring or with other keys. Sometimes this can upset the system.

Possible LED Flashing Fault Codes

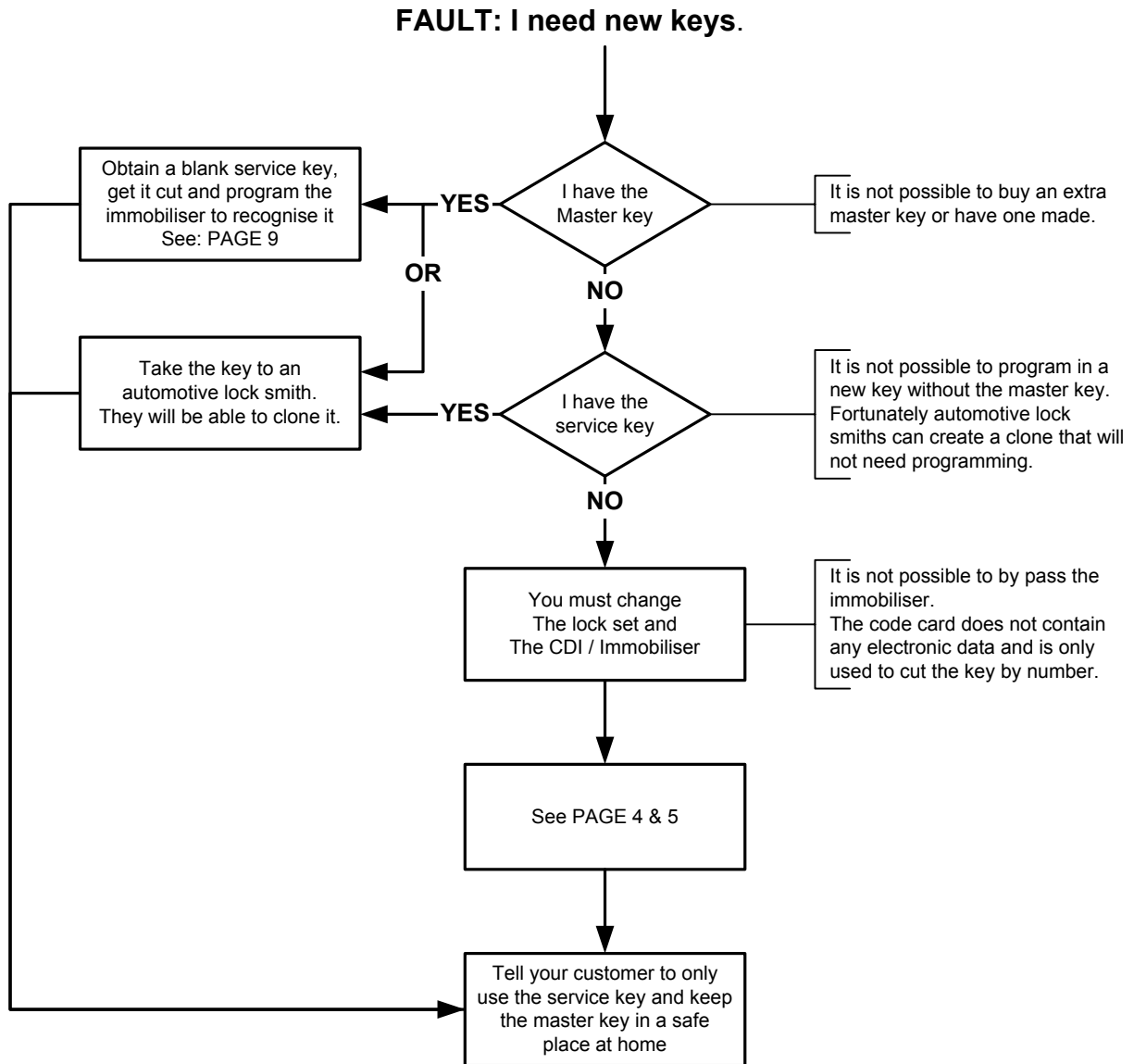


Leader Immobiliser

PAGE 3

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NEW KEYS

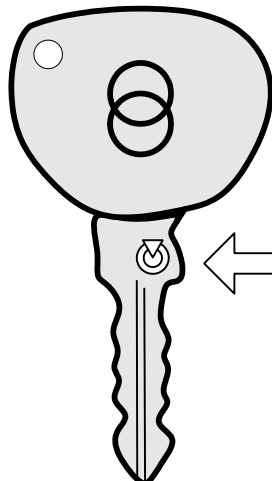


Gilera Runner service keys

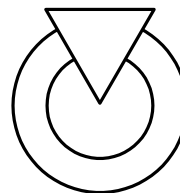
The red service key for Runner two strokes and Runner four strokes now look the same.

The four stroke key has a transponder chip in it and the two stroke key does not.

You can recognise the keys which contain a transponder by a symbol that is engraved on the key



This key contains a transponder



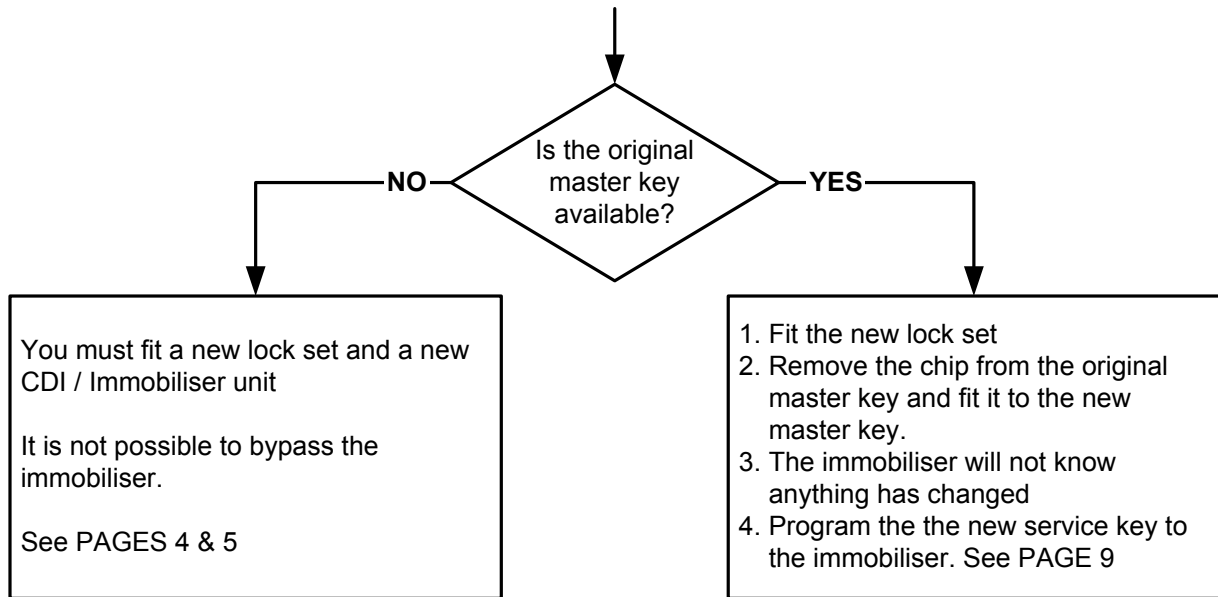
Leader Immobiliser

PAGE 4

19/01/2006

NEW LOCKS

FAULT: I need to fit new locks.



The lock set is supplied with one (brown) master key and one service key.

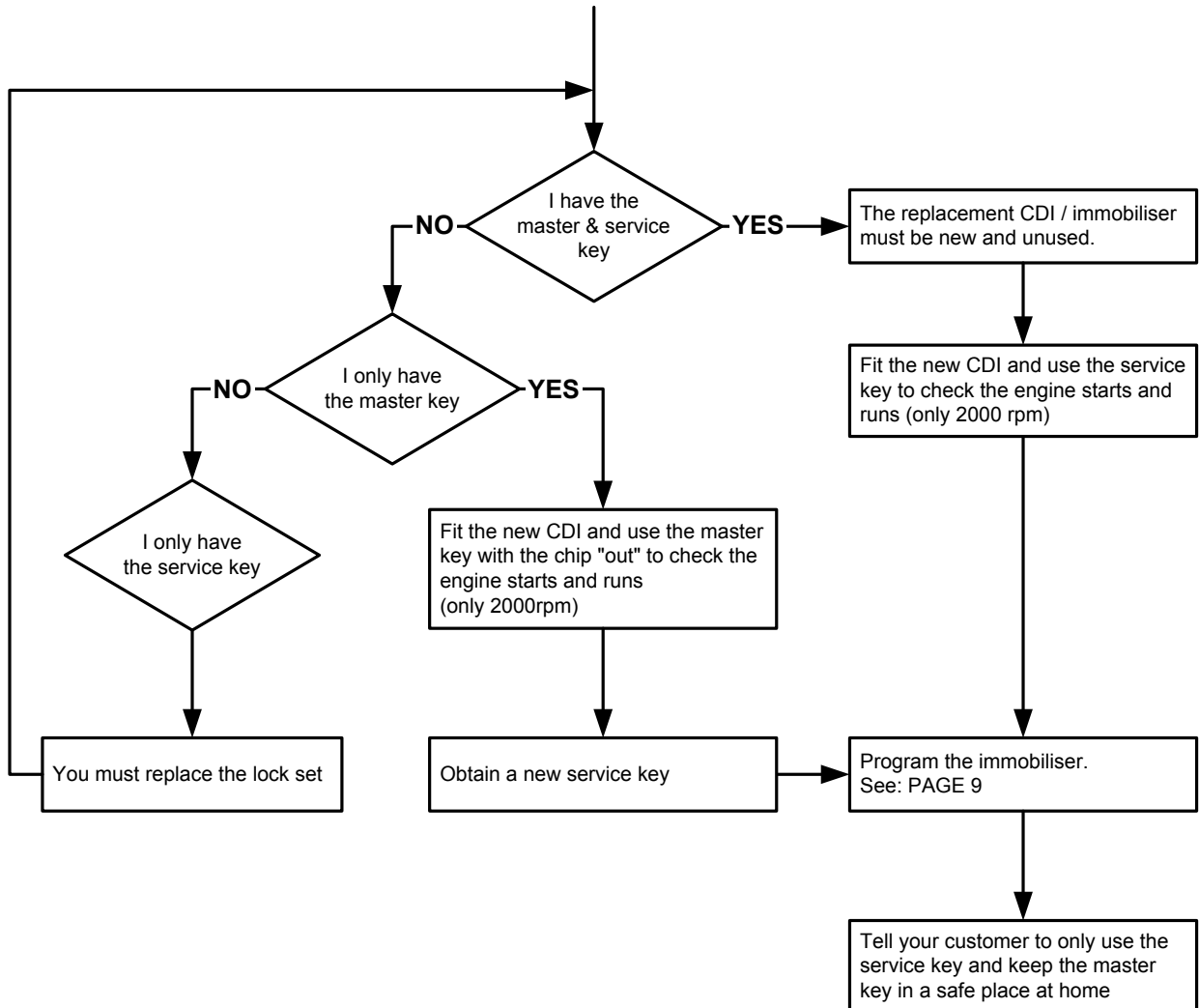
Leader Immobiliser

PAGE 5

19/01/2006

NEW CDI

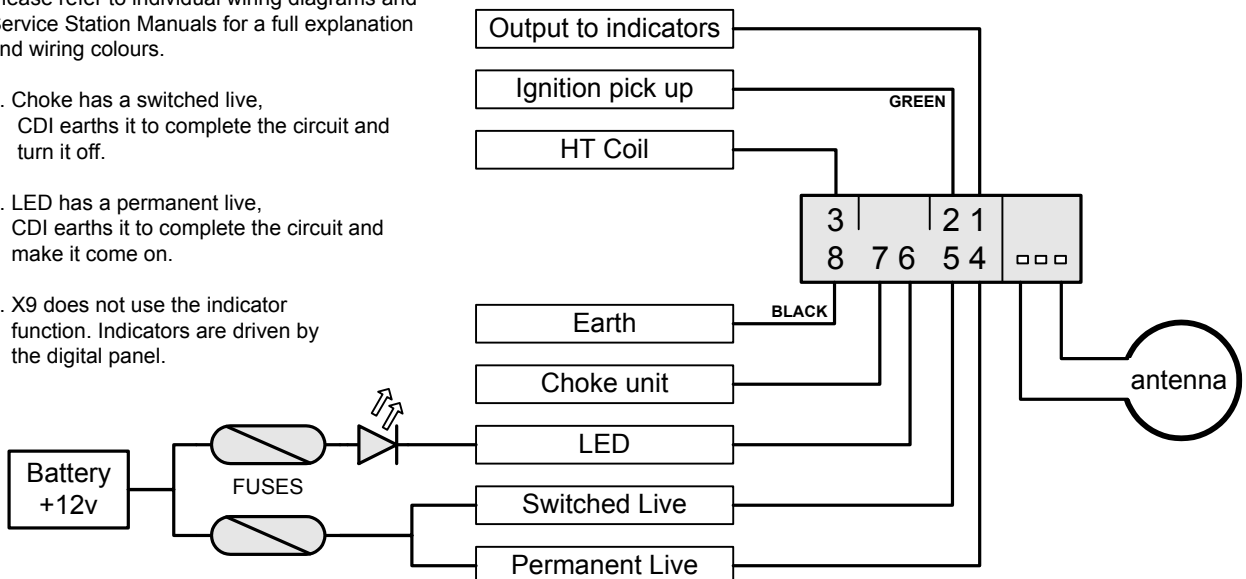
FAULT: I need to fit a new CDI / Immobiliser.



CDI / Immobiliser Connections

Please refer to individual wiring diagrams and Service Station Manuals for a full explanation and wiring colours.

1. Choke has a switched live, CDI earths it to complete the circuit and turn it off.
2. LED has a permanent live, CDI earths it to complete the circuit and make it come on.
3. X9 does not use the indicator function. Indicators are driven by the digital panel.



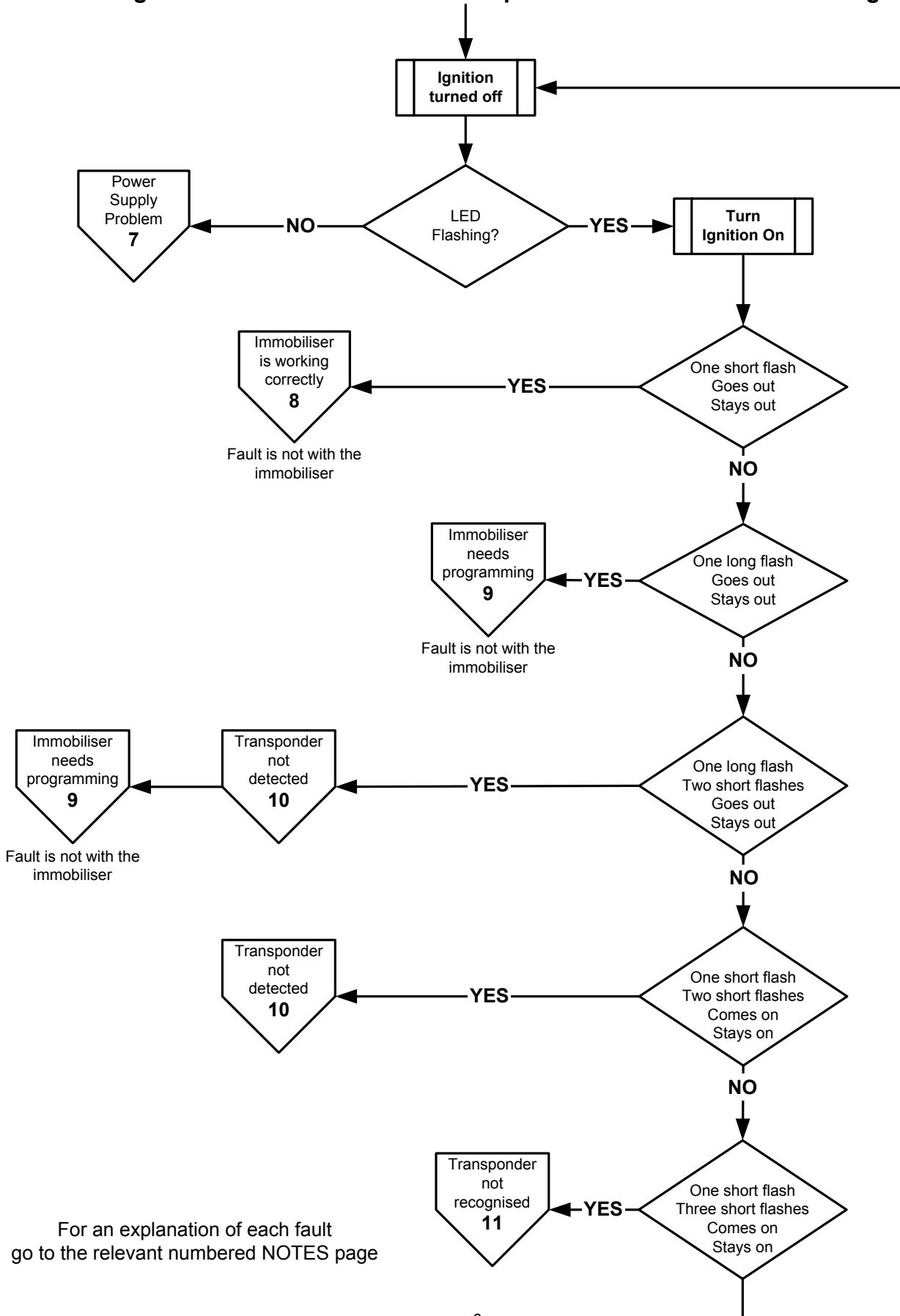
Leader Immobiliser

PAGE 6

19/01/2006

Fault Finding

FAULT: Engines turns over but there is no spark when tested with a strobe light



For an explanation of each fault go to the relevant numbered NOTES page

Leader Immobiliser

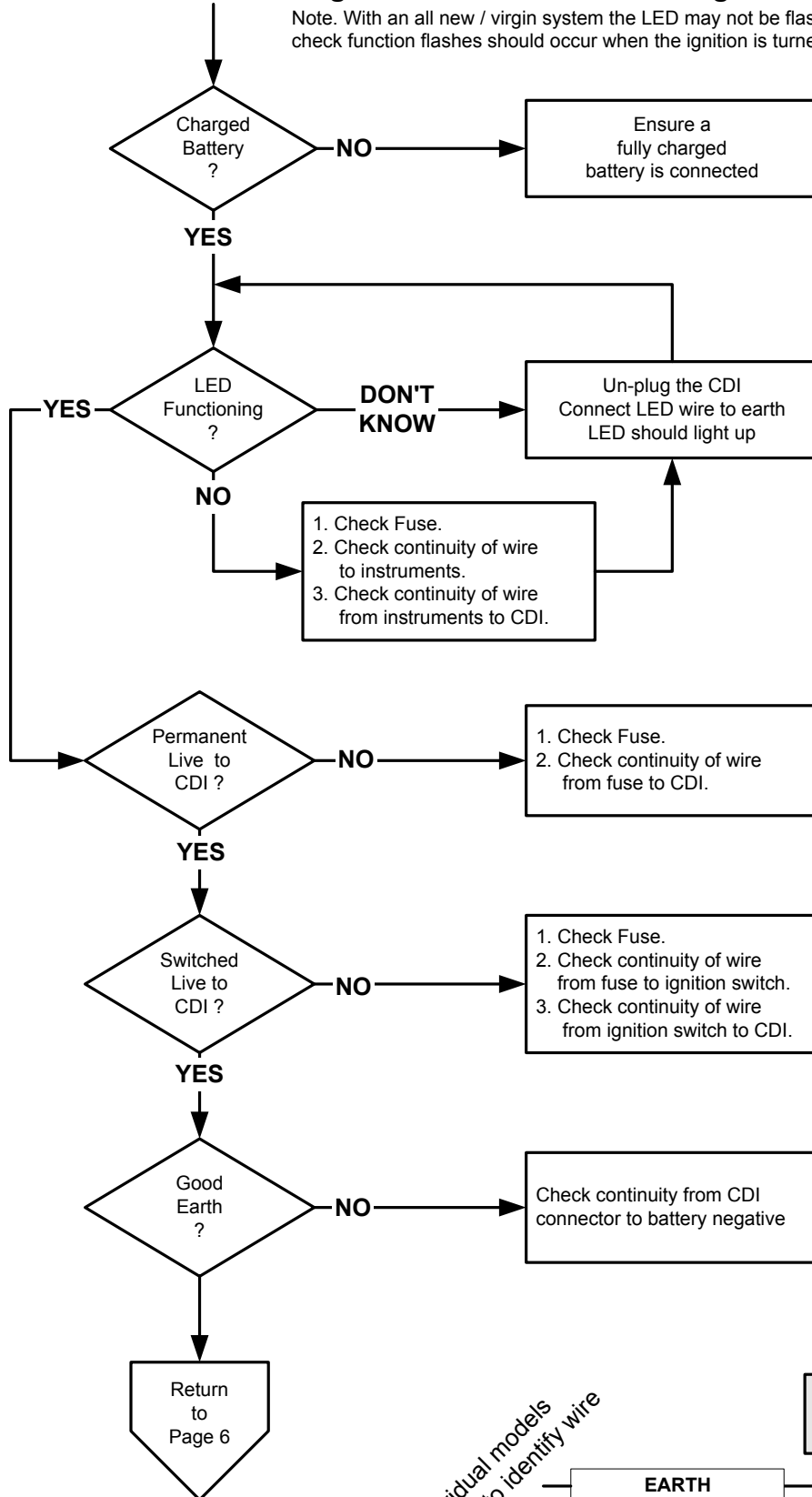
PAGE 7

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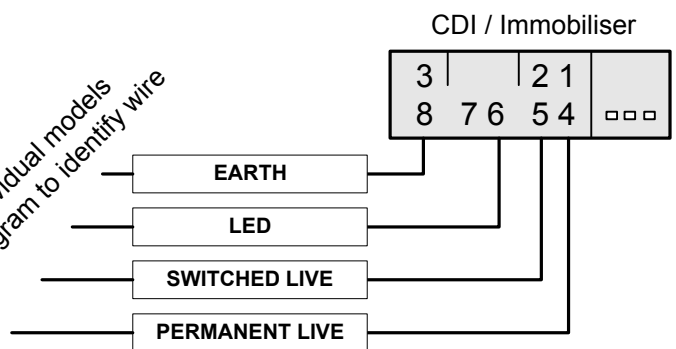
NO LED

FAULT: With Ignition turned off the LED light is not flashing

Note. With an all new / virgin system the LED may not be flashing but the check function flashes should occur when the ignition is turned on.



Refer to individual models wiring diagram to identify wire colours



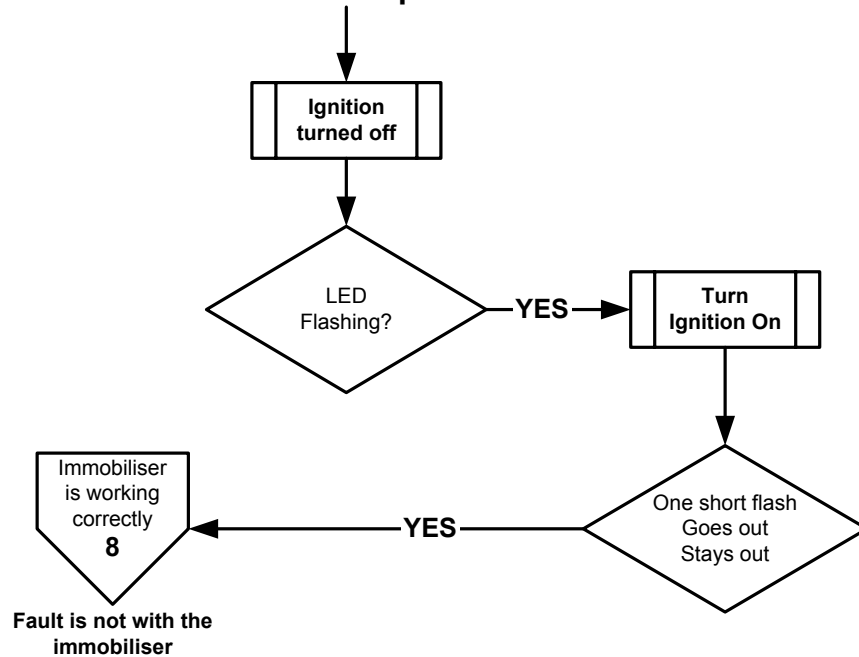
Leader Immobiliser

PAGE 8

19/01/2006

Immobiliser OK

FAULT: Engines turns over but there is no spark when tested with a strobe light



We know that the immobiliser is working correctly so the immobiliser system can now be ignored and normal fault finding can be continued.

1. Test the ignition pick up.
Un-plug the CDI. Green wire to earth = 105 - 124 ohms.
2. Test the HT coil (unplugged).
Primary: Purple to Earth = 0.4 - 0.5 ohm.
Secondary: HT to Earth = 3000 ohms (3k ohm).
A 5000 ohms (5K ohm) resistor plug cap should be fitted.
3. Test earth continuity.
Un-plug the CDI. Check continuity between black wire and battery negative.

If no fault has been found you should suspect the CDI unit.

- * Fit a new CDI (not from another bike)
- * Use the service key (not the brown master key)
- * Check that the spark is restored. engine should start but it will not rev beyond 2000 rpm.

If the fault is cured you must program the CDI unit.

GO TO PAGE 9 for programming information.

Leader Immobiliser

PAGE 9

19/01/2006

PROGRAMMING

FAULT: I need to program the immobiliser unit

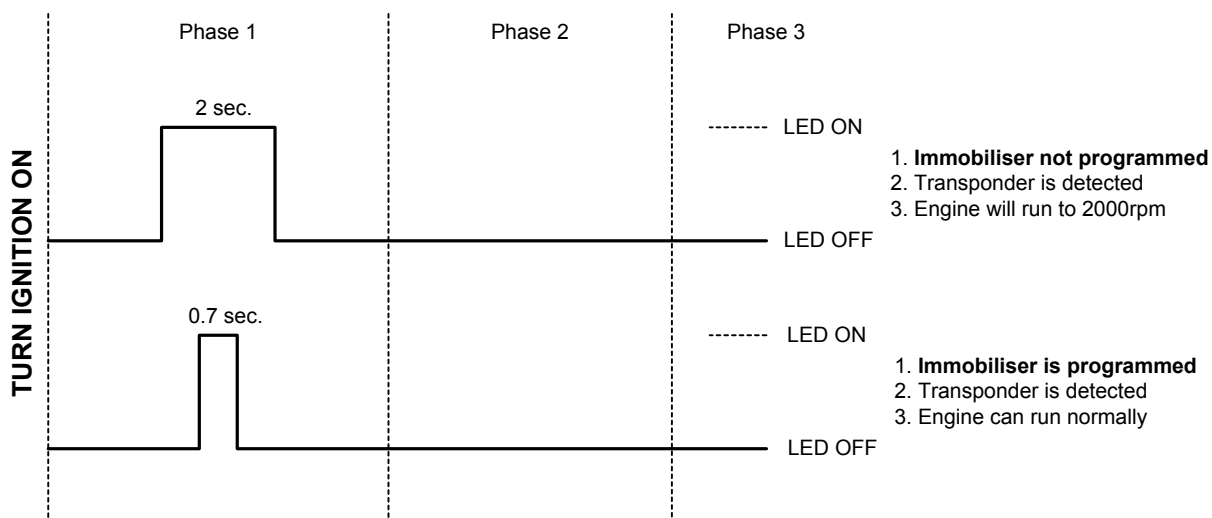
Notes.

1. It is not possible to re-program an immobiliser unit to a new master key.
Once it has been programmed it is irrevocably linked to that master key.
2. It is not normally possible for an immobiliser to lose its program and then need re-programming.
If it was programmed and working but now it is saying that it is not programmed, First, check the HT lead and plug cap, It is possible that extreme electrical interference from a faulty HT circuit could upset the immobiliser.
Plug cap must be at least 5000 ohms. Change the cap and lead if suspect.
A resistor plug must be used on all Leader engines.
Then try re-programming the immobiliser.
If it will not re-program then it is faulty.

Programming a new immobiliser.

1. Do not attempt to program a new immobiliser until you know that the fault is cured.
Attach the new immobiliser, use the service key (not the brown master key)
LED will give one long flash then go out and stay out. System is working correctly, Immobiliser is not programmed
The engine should start but will not rev above 2000 rpm until the immobiliser is programmed.
2. To program a new immobiliser
 - * Insert the brown master key and turn on for two seconds
 - * Insert the service key and turn on for two seconds
 - * (extra service keys are included here)
 - Insert the extra service key and turn on for two seconds
 - * Insert the brown master key and turn on for two seconds
 - * The timing of the two seconds can be critical so use a watch to time it, you may need to do the sequence several times before it is accepted.
 - * Changing from one key to the next should be done within ten seconds.
 - * An extra service key is not just added, you must go through re-programming all the keys as above.
You are not re-programming the master key, the master key is giving permission for the service keys to be added.
 - * You do not need to start the engine just to check if the programming has been successful, Just turn on the ignition and watch the LED.
One short flash (half second) means the programming was successful.
One long flash (two seconds) means the system is still not programmed.

Possible LED Flashing Codes



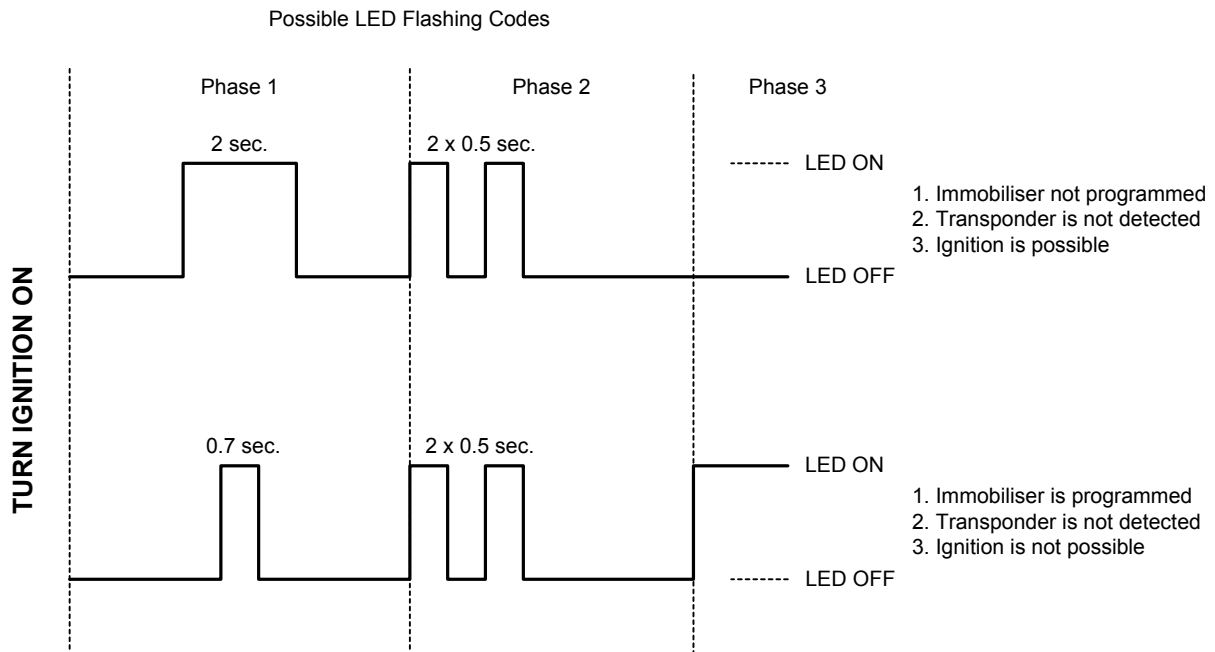
Leader Immobiliser

PAGE 10

19/01/2006

NOT DETECTED

FAULT: Transponder not detected.



The immobiliser knows the ignition has been turned on but it has not been able to detect the transponder chip in the key.

Possible reason for transponder chip not being detected.

1. The transponder chip is damaged or missing from the key.
 - * Try another key.
2. The aerial is damaged, un-plugged or not correctly positioned
 - * Un-plug the aerial from the CDI and check the aerial for continuity.
Aerial resistance = 7 to 9 ohms. If resistance is wrong replace the aerial.
 - * Check that the black plastic aerial housing is securely clipped into position around the ignition switch.
 - * Inspect the pins in the plug and socket for signs of damage or corrosion.

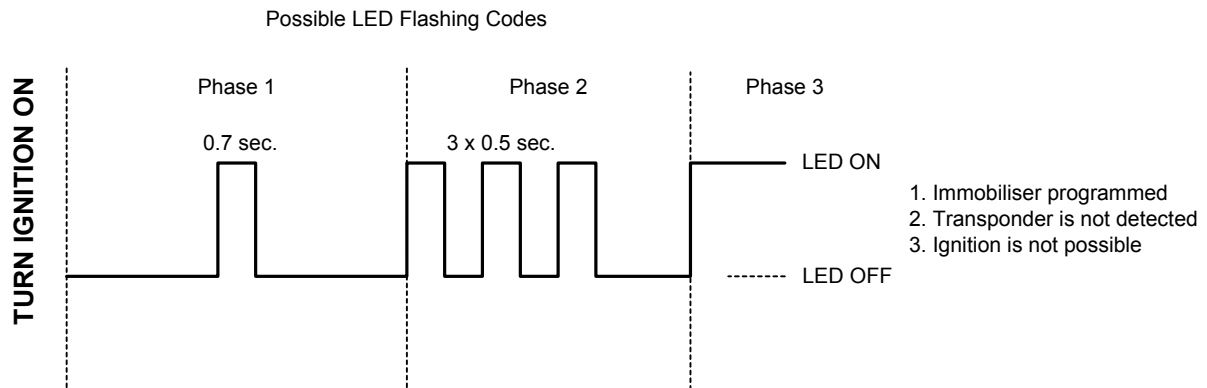
Leader Immobiliser

PAGE 11

19/01/2006

NOT RECOGNISED

FAULT: Transponder is not recognised.



The immobiliser has seen the transponder chip so you know that the chip in the key is intact and the aerial is working correctly.

Possible reasons for the transponder not being recognised.

1. The wrong key is being used.
It is possible for two keys to have the same cut profile on different vehicles (there are limited number of profiles).
If the keys were mixed up you could turn on the ignition but the immobiliser would not recognise the chip.
2. The key you are using has not been programmed into the immobiliser.
See PAGE 9 for details of programming .

Non Leader Immobiliser

PAGE 12

19/01/2006

EXPLANATION

The original Vespa ET4 (ZAPM04) was powered by an air-cooled four stroke engine that looked similar but was very different to the Leader engine.

On the next page there is an explanation of the wiring for this engine.

Immobiliser operation once the system is programmed and working correctly:

CDI is irrevocably linked to the immobiliser

Immobiliser is irrevocably linked to the red master key.

It is possible to fit a new CDI alone.

It is not possible to fit a new immobiliser alone, you must also change the CDI.

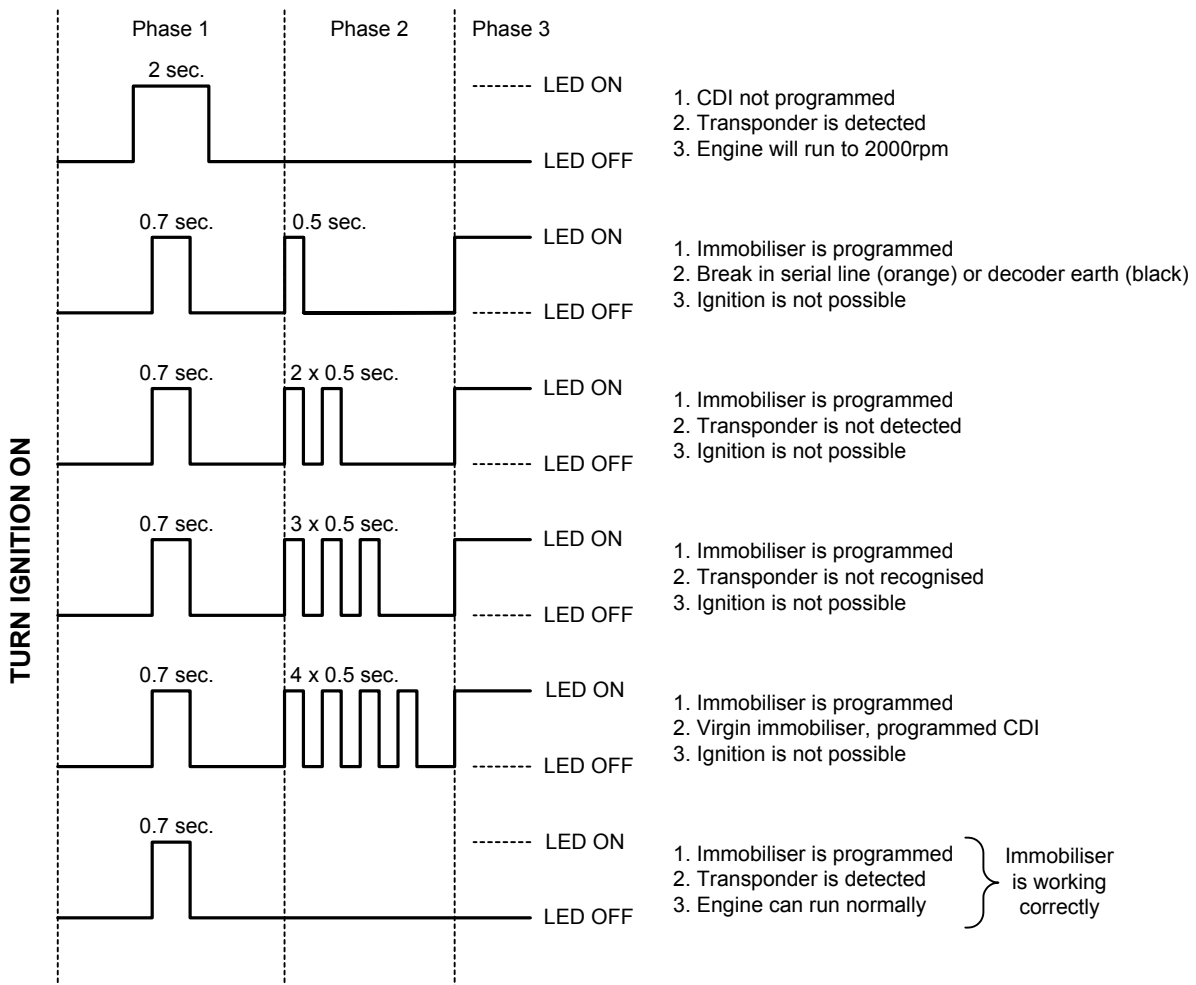
It is not possible to change the red key alone.

Fault finding:

- * Fault finding is done either with the diagnostic tester or a 12 volt LED.
- * The tester is explained in the service station manual. Using an LED is explained here.
- * The vehicle is not fitted with an LED in the instrument panel.
- * You must connect a 12 volt LED to the test socket.
- * The test socket is a grey two pin plug with nothing plugged into it located in a large rubber sheath on the right side of the engine bay.
- * Remove the helmet storage to access the socket.

Note. Keys should not be on a metal key ring or with other keys.
Sometimes this can upset the system.

Possible LED Flashing Fault Codes

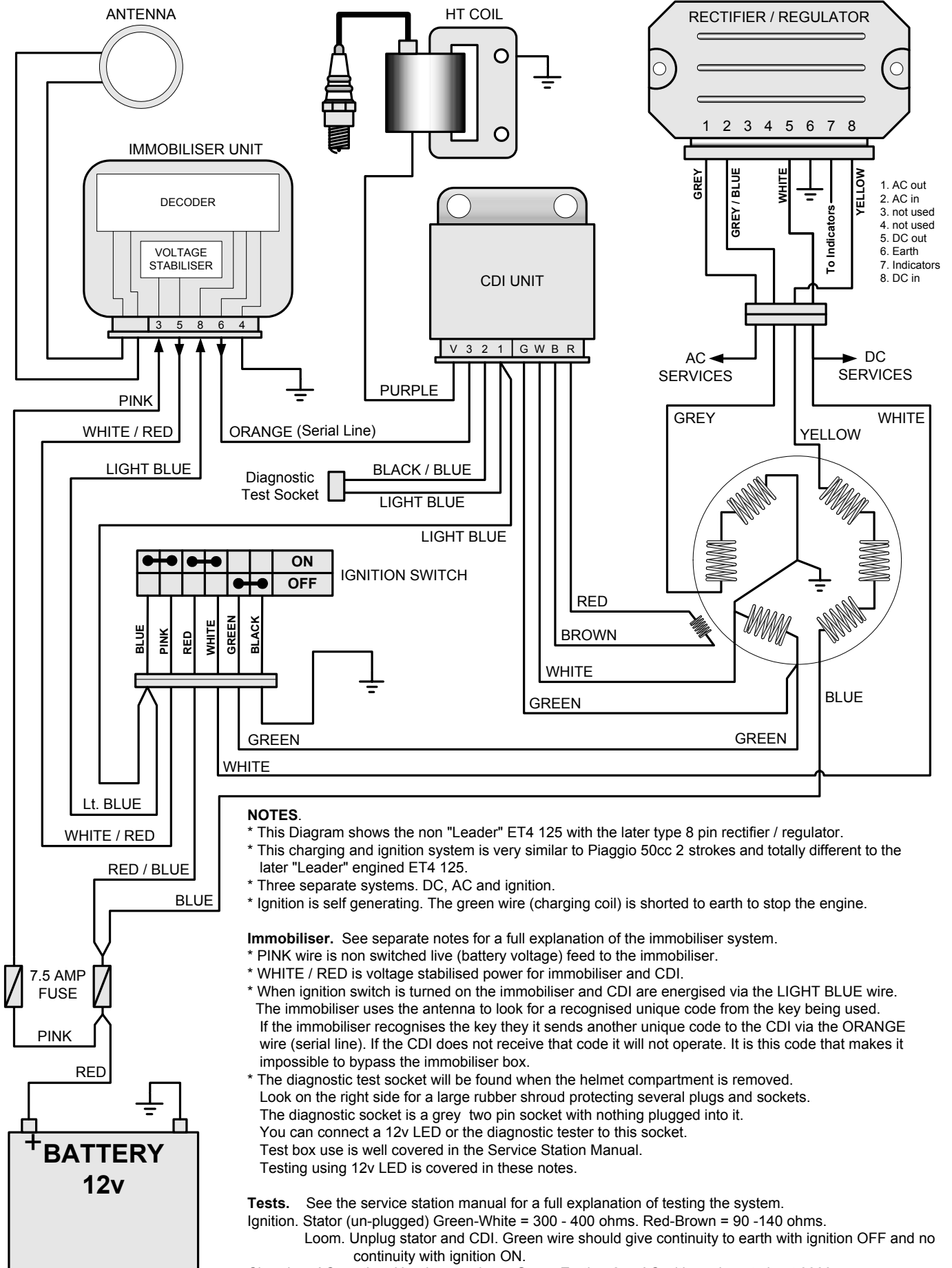


Vespa ET4 125 charge / ignition (non Leader)

PAGE 13

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ZAPM 04 Later version



NOTES.

- * This Diagram shows the non "Leader" ET4 125 with the later type 8 pin rectifier / regulator.
- * This charging and ignition system is very similar to Piaggio 50cc 2 strokes and totally different to the later "Leader" engined ET4 125.
- * Three separate systems. DC, AC and ignition.
- * Ignition is self generating. The green wire (charging coil) is shorted to earth to stop the engine.

Immobiliser. See separate notes for a full explanation of the immobiliser system.

- * PINK wire is non switched live (battery voltage) feed to the immobiliser.
- * WHITE / RED is voltage stabilised power for immobiliser and CDI.
- * When ignition switch is turned on the immobiliser and CDI are energised via the LIGHT BLUE wire. The immobiliser uses the antenna to look for a recognised unique code from the key being used. If the immobiliser recognises the key they it sends another unique code to the CDI via the ORANGE wire (serial line). If the CDI does not receive that code it will not operate. It is this code that makes it impossible to bypass the immobiliser box.
- * The diagnostic test socket will be found when the helmet compartment is removed. Look on the right side for a large rubber shroud protecting several plugs and sockets. The diagnostic socket is a grey two pin socket with nothing plugged into it. You can connect a 12v LED or the diagnostic tester to this socket. Test box use is well covered in the Service Station Manual. Testing using 12v LED is covered in these notes.

Tests. See the service station manual for a full explanation of testing the system.

- Ignition. Stator (un-plugged) Green-White = 300 - 400 ohms. Red-Brown = 90 -140 ohms. Loom. Unplug stator and CDI. Green wire should give continuity to earth with ignition OFF and no continuity with ignition ON.
- Charging. AC section. Un-plug regulator. Grey - Earth = 25v AC with engine at about 3000 rpm. DC section. Ammeter between Battery + and red wire = at least 1.8 amps, fully charged battery Disconnect battery. yellow - red = at least 15v AC @ 3000 rpm.

Quasar Immobiliser

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19/01/2006

NOTES

LED flashing code notes.

A. ECU is not programmed.

The LED gives a single two second flash. The Engine management light will be on.
 You should get this code when you have fitted a new ECU.
 The immobiliser system is working correctly and only needs programming.

B. ECU is not programmed. Transponder is not detected.

The LED gives a single two second flash, then two short flashes, then comes back on..
 The ECU is not programmed (as above) but also the chip in the key has not been detected.
 You must resolve the transponder problem before trying to program the ECU.
 The master key will give this fault if the chip is hinged out.
 If you have another key try that, if it is still not detected it is probably the aerial.
 Verify that the aerial is correctly located and secure in it's mounting around the ignition lock.

C. Break in the Serial line.

A single short flash, pause, then a second short flash, LED then comes back on.
 There is a break in the wire between the ECU and the aerial (active antenna).
 The Orange / White wire on pin 7. is the link.

D. Transponder is not detected.

A single short flash, then two short flashes, then comes back on.
 The chip in the key has not been seen.
 Either there is a fault with the key or the aerial.
 If you have another key try that, if it is still not detected it is probably the aerial.
 Verify that the aerial is correctly located and secure in it's mounting around the ignition lock.

E. Transponder is not recognised.

A single short flash, then three short flashes, then comes back on.
 The chip in the key is seen be is not recognised.
 The key is not programmed into the immobiliser memory.
 You are using the wrong key or it needs to be programmed into the immobiliser memory.

Diagnostic Tester

If you use the hand held diagnostic tester you can check the immobiliser.
 Select the "Errors" menu to see detailed fault information.

DISPLAY	NOTES
Uncoded ECU Yes / No	Yes = Virgin ECU LED - one 2 sec flash in phase one (page 14 A)
Imm start inhib Yes / No	Yes = Ignition is not possible (no spark). LED remaining on in phase three (page 14 B,C,D,E)
Universal code Yes / No	For production assembly line use only. Yes = Virgin ECU
Key failure Yes / No	Yes = Key transponder is not seen. LED - two flashes in phase two (page 14 D)
Wrong Key code Yes / No	Yes = Key transponder is seen but not recognised LED - three flashes in phase two (page 14 E)
Commun timeout Yes / No	Yes = No signal from active antenna to ECU LED - one flash in phase two (page 14 C)
Stored key num <value>	Number of keys coded to the ECU (0 up to 7)

Programming.

Notes.

1. It is not possible to re-program an immobiliser unit to a new master key.
Once it has been programmed it is irrevocably linked to that master key.
2. It is not normally possible for an immobiliser to lose its program and then need re-programming.
If it was programmed and working but now it is saying that it is not programmed, First, check the HT lead and plug cap. It is possible that extreme electrical interference from a faulty HT circuit could upset the immobiliser.
Plug cap must be at least 5000 ohms. Change the cap and lead if suspect.
A resistor spark plug must be used.
Then try re-programming the immobiliser.
If it will not re-program then it is faulty.

Programming a new immobiliser.

1. Do not attempt to program a new immobiliser until you know that the fault is cured.
Connect the new immobiliser, use the service key (not the brown master key)
LED will give one long flash then go out and stay out. System is working correctly,
Immobiliser is not programmed
The engine should start but will not rev above 2000 rpm until the immobiliser is programmed.
 2. To program a new immobiliser
 - * Insert the brown master key and turn on for two seconds
 - * Insert the service key and turn on for two seconds
 - * (any extra service keys are included here)
 - Insert the extra service key and turn on for two seconds
 - * Insert the brown master key and turn on for two seconds
- * The timing of the two seconds can be critical so use a watch to time it, you may need to do the sequence several times before it is accepted.
- * Changing from one key to the next should be done within ten seconds.
- * An extra service key is not just added, you must go through re-programming all the keys as above.
You are not re-programming the master key, the master key is giving permission for the service keys to be added.
- * It is not the keys that are programmed.
The immobiliser is being programmed to recognise the keys.
- * You do not need to start the engine just to check if the programming has been successful, Just turn on the ignition and watch the LED.
One short flash (half second) means the programming was successful.
One long flash (two seconds) means the system is still not programmed.

Master Immobiliser

PAGE 17

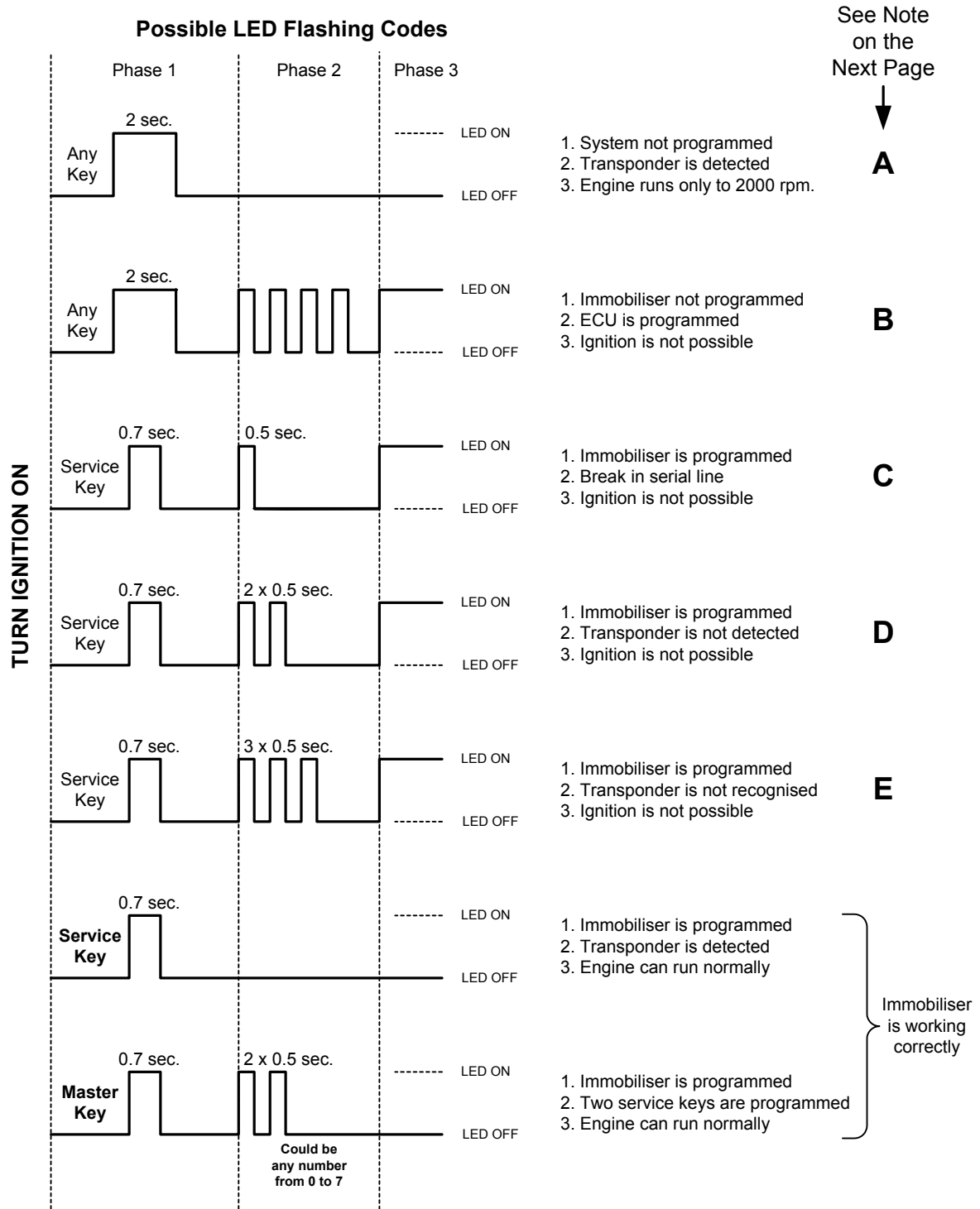
19/01/2006

EXPLANATION

The 500 cc Master engine has separate immobiliser and ECU.
Once the system is programmed the ECU and immobiliser are irrevocably linked to the brown master key.

Keys should not be on a metal key ring or with other keys. Sometimes this can upset the system.

For a full explanation of fault finding please see the Service Station manual.



Master Immobiliser

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19/01/2006

NOTES

LED flashing code notes.

A. System is not programmed.

The LED gives a single two second flash. The Engine management light will be on.
You should get this code when you have fitted a new immobiliser and ECU.
The immobiliser system is working correctly and only needs programming.

B. Immobiliser is not programmed, ECU is programmed.

The LED gives one long flash, then four short flashes, LED then comes back on.
Programming the immobiliser is only possible if the original master key is used.
If the original master key (chip) is not available then you must change the ECU as well.

C. Break in the Serial line.

A single short flash, pause, then a second short flash, LED then comes back on.
Either there is a break in the orange / white wire between the immobiliser and ECU (serial line) or if the vehicle has a "fall over cut out" fitted it could be that.
If the cut out is active it shorts the serial line to earth.
The fall over sensor is located behind the fuel tank (Nexus) in a rubber mounting.

The fall over sensor
must be mounted
THIS WAY UP



D. Transponder is not detected.

A single short flash, then two short flashes, then comes back on.
The chip in the key has not been seen.
Either there is a fault with the key or the aerial.
If you have another key try that, if it is still not detected it is probably the aerial or it's wires.
Un-plug the aerial from the immobiliser and check for continuity.
Check that the aerial is correctly located and secure in it's mounting.

E. Transponder is not recognised.

A single short flash, then three short flashes, then comes back on.
The chip is seen be is not recognised. The key is not programmed into the immobiliser.
You are using the wrong key or it needs to be programmed into the immobiliser memory.

Master Immobiliser

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19/01/2006

PROGRAMMING

Programming.

Notes.

1. It is not possible to re-program an immobiliser unit to a new master key.
Once it has been programmed it is irrevocably linked to that master key.
2. It is not normally possible for an immobiliser to lose its program and then need re-programming.
If it was programmed and working but now it is saying that it is not programmed, First, check the HT lead and plug cap, It is possible that extreme electrical interference from a faulty HT circuit could upset the immobiliser.
Plug cap must be at least 5000 ohms. Change the cap and lead if suspect.
Also a resistor spark plug must be used.
Then try re-programming the immobiliser.
If it will not re-program then it is faulty.

Programming a new immobiliser.

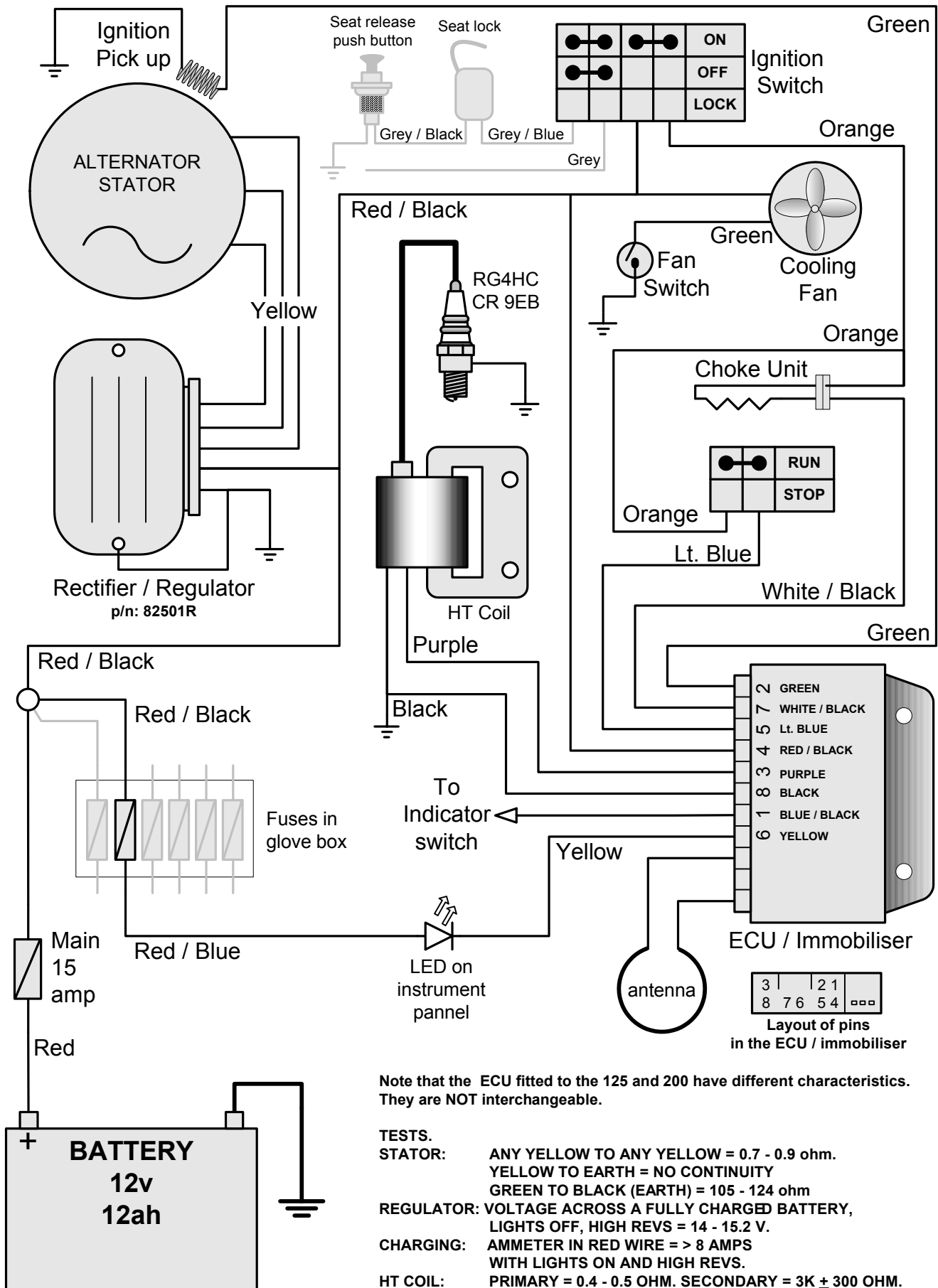
1. Do not attempt to program a new immobiliser until you know that the fault is cured.
Connect the new immobiliser, use the service key (not the brown master key)
LED will give one long flash then go out and stay out. System is working correctly, Immobiliser is not programmed
The engine should start but will not rev above 2000 rpm until the immobiliser is programmed.
 2. To program a new immobiliser
 - * Insert the brown master key and turn on for two seconds
 - * Insert the service key and turn on for two seconds
 - * (any extra service keys are included here)
 - Insert the extra service key and turn on for two seconds
 - * Insert the brown master key and turn on for two seconds
- * The timing of the two seconds can be critical so use a watch to time it, you may need to do the sequence several times before it is accepted.
- * Changing from one key to the next should be done within ten seconds.
- * An extra service key is not just added, you must go through re-programming all the keys as above.
You are not re-programming the master key, the master key is giving permission for the service keys to be added.
- * It is not the keys that are programmed.
The immobiliser is being programmed to recognise the keys.
- * You do not need to start the engine just to check if the programming has been successful, Just turn on the ignition and watch the LED.
One short flash (half second) means the programming was successful.
One long flash (two seconds) means the system is still not programmed.

Vespa GT 125 / 200 ignition / charging

Piaggio Ltd.

30/09/2005

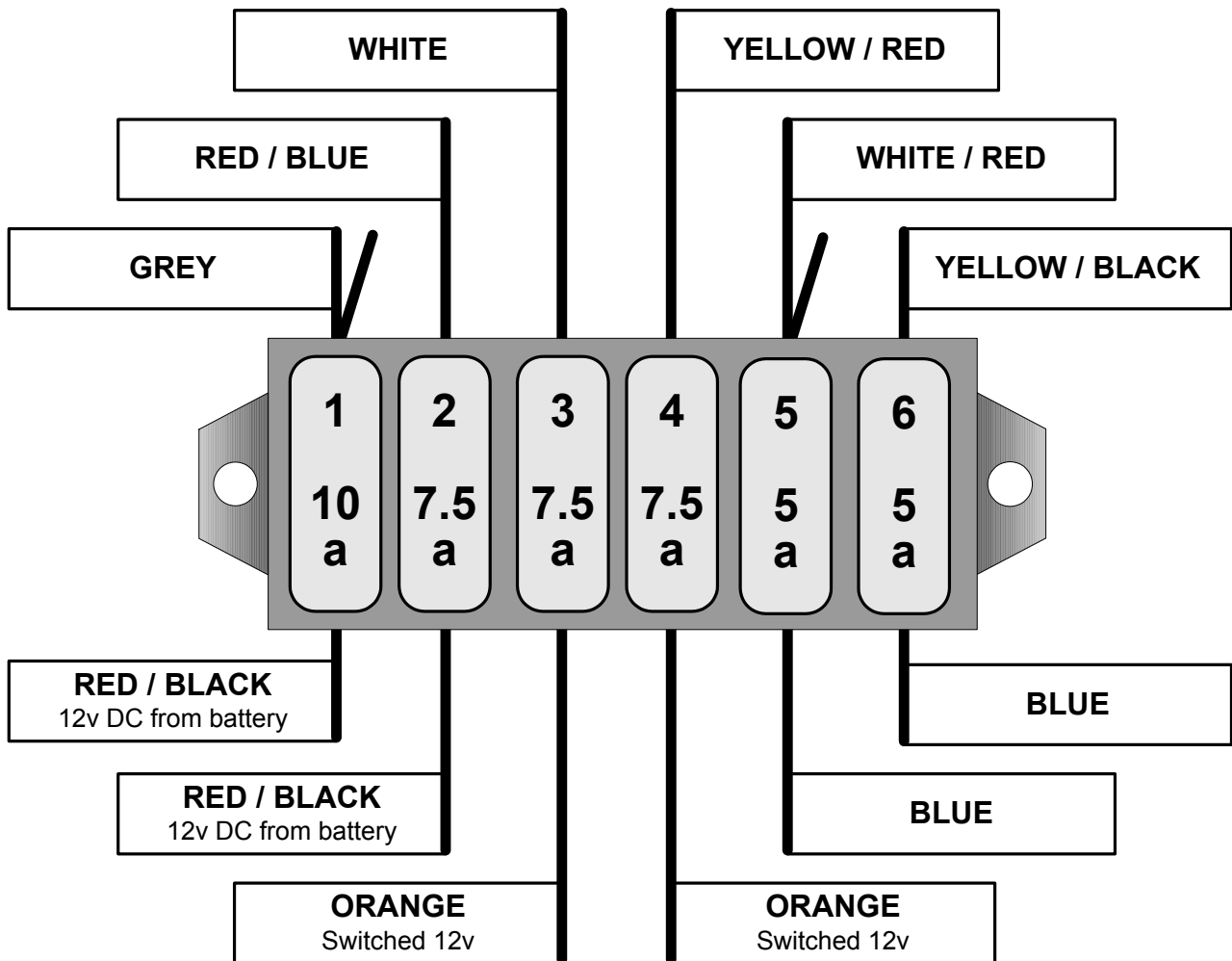
With IMMOBILISER



Vespa GT Fuses

Piaggio Ltd.

19/08/2003



The wire colours shown here are different to those "on line" and in the owners hand book.

The colours and fuse functions here are correct, they were checked on GT200 ZAPM312 * 2550.

FUSE:

1. 10 amp. Electric seat release. Headlights. Main beam warning light.
2. 7.5 amp. Intercom. Alarm. Immobiliser LED.
3. 7.5 amp. Intercom. Alarm. Water temp. Fuel warning & guage. Oil pressure warning.
4. 7.5 amp. Horn.
5. 5 amp. Stop light. start switch.
6. 5 amp. Side lights. Number plate light. Instrument panel lights.

MAIN FUSE.

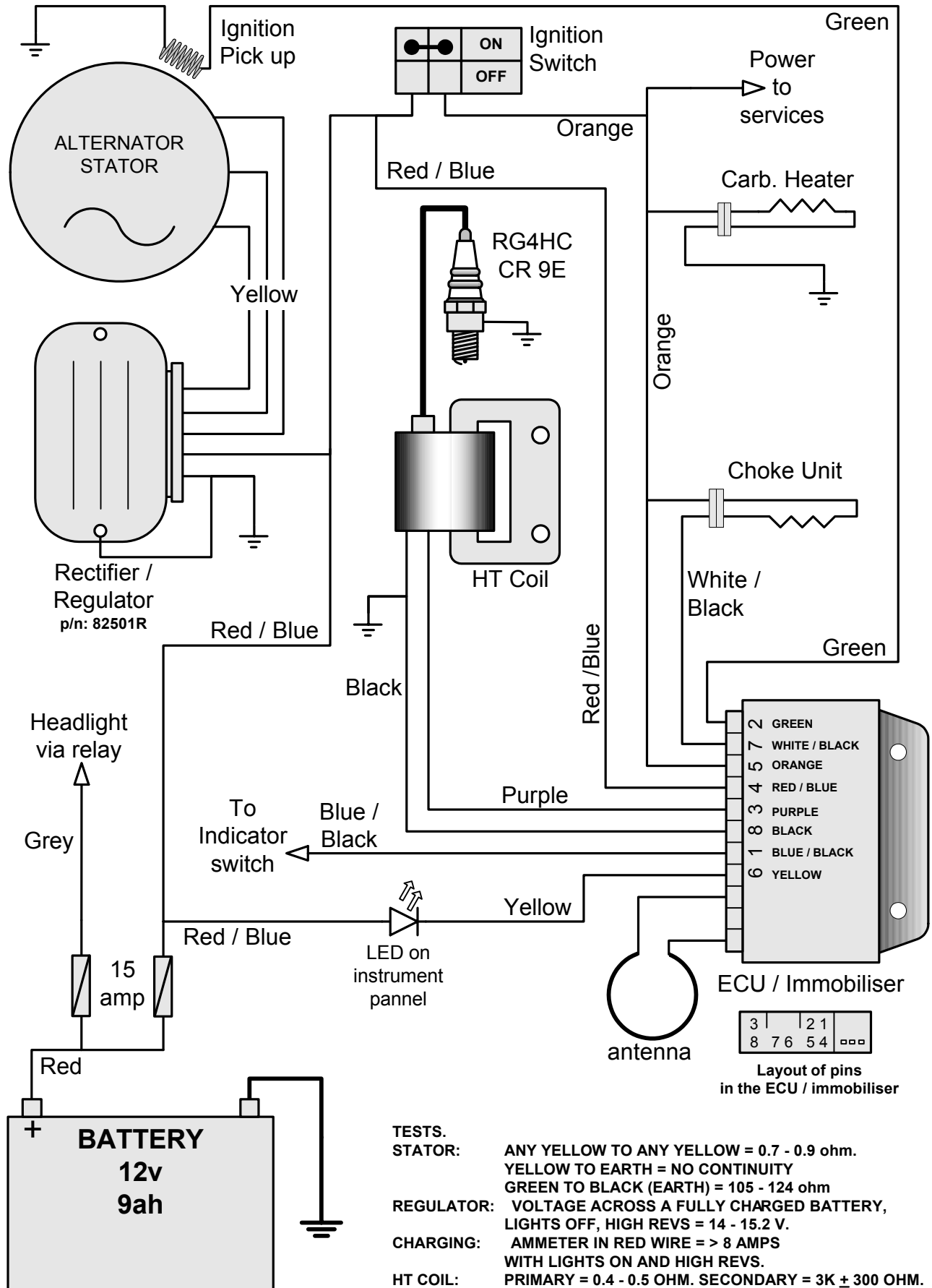
A 15 amp fuse is located at the front of the under seat compartment.

Skipper ST ignition / charging

Piaggio Ltd.

30/09/05

With IMMOBILISER

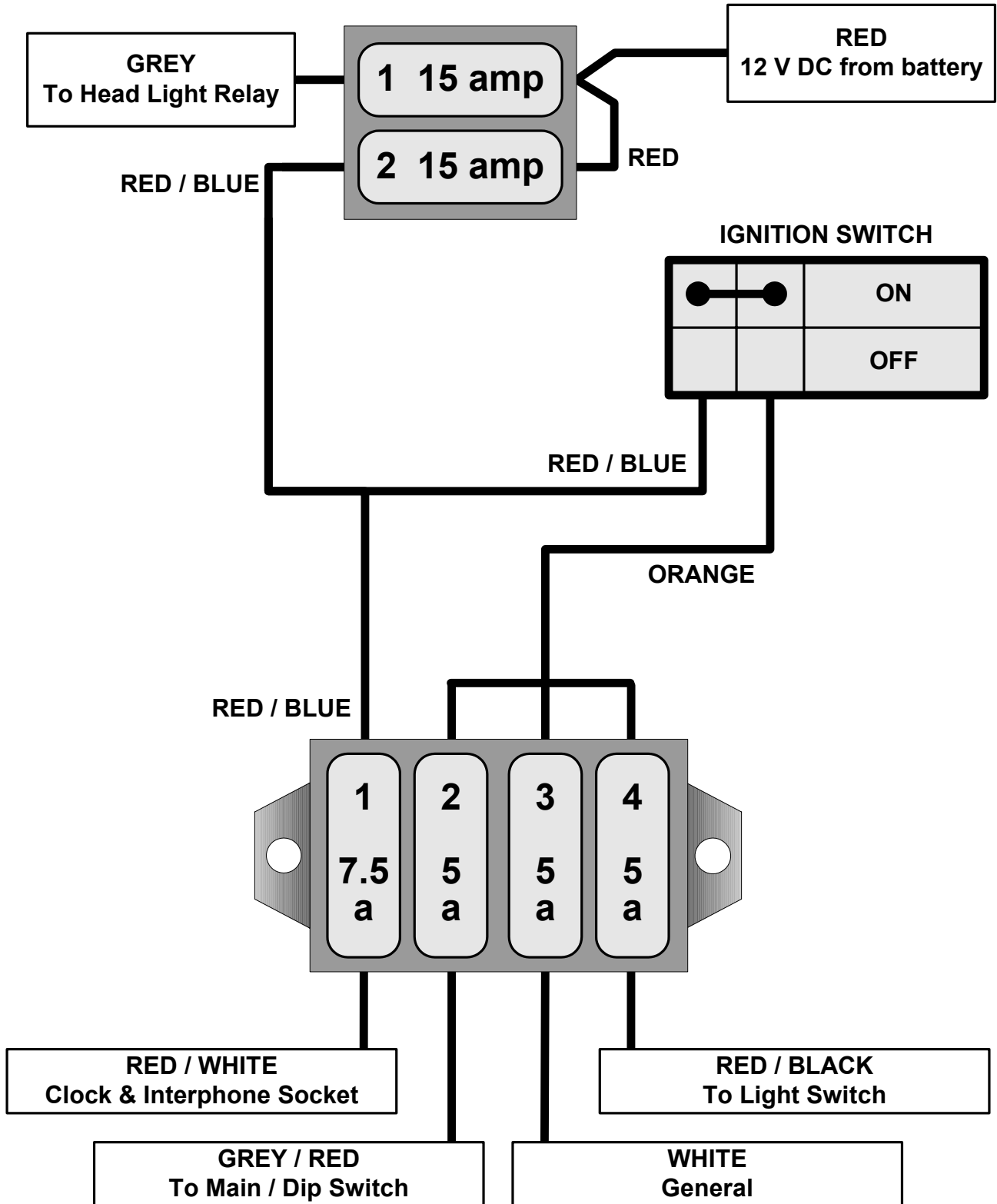


SKIPPER ST 125 FUSE EXPLANATION

Piaggio Ltd.

06/01/2004

Leader Engine



Replacing Skipper ST speedometer

Piaggio Ltd.

13/12/2005

With IMMOBILISER

The early Skipper ST did not have an immobiliser. The speedo unit for this vehicle 581308 (or 581307) is no longer available.

It must be replaced with 583271, this is the speedo fitted to later Skipper ST with immobiliser.

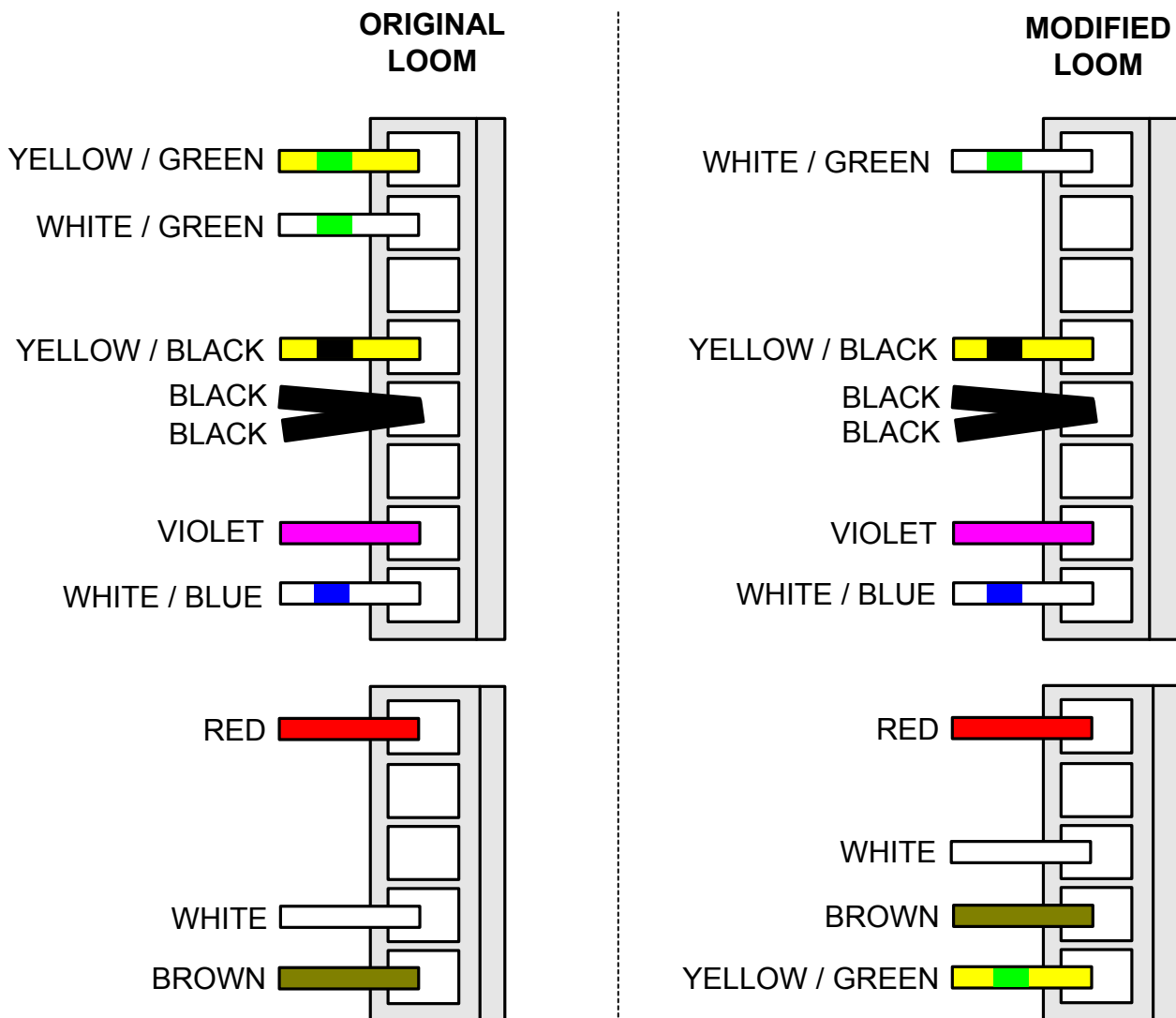
To fit this new speedo you must make some modifications to the wiring at the plugs which connect to the speedo unit.

Below are diagrams that show the plugs on the wiring loom as they appear on the vehicle and also how they must appear to enable the new speedo to be used.

1. Confirm that the wiring on your vehicle is as shown on the "Original Loom" diagram
2. Remove the white / green and yellow / green wires from the large plug complete with their connectors.
3. Remove the white and the brown wires from the small plug complete with their connectors.
4. Re-fit these wires in the positions shown on the "Modified Loom" diagram.

It is possible to remove the connectors by carefully inserting a small screwdriver or similar and pressing the retaining tag in.

View of the two plugs that connect to the speedometer

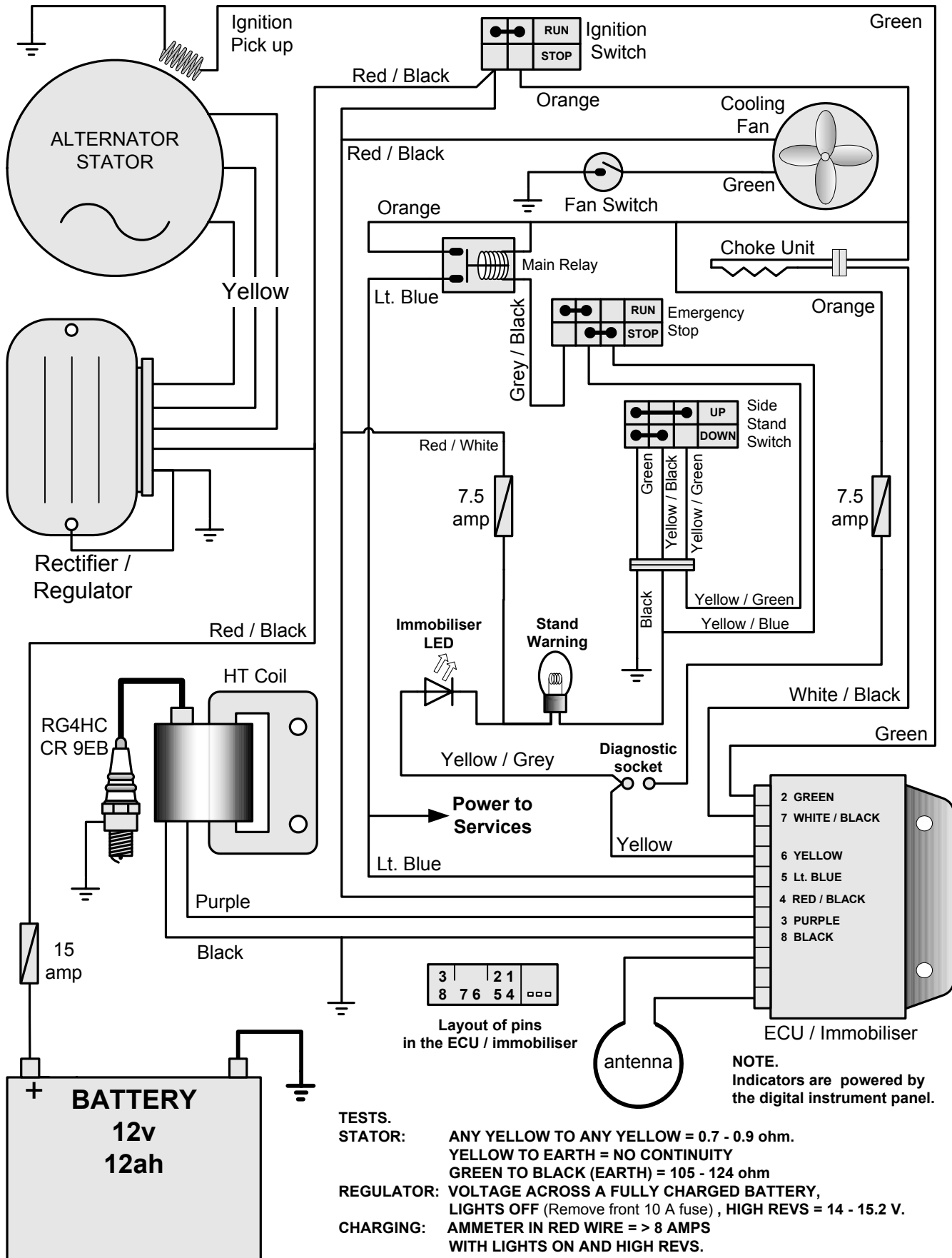


X9 250 Evo ignition / charging

Piaggio Ltd.

05/05/2004

QUASAR Engine

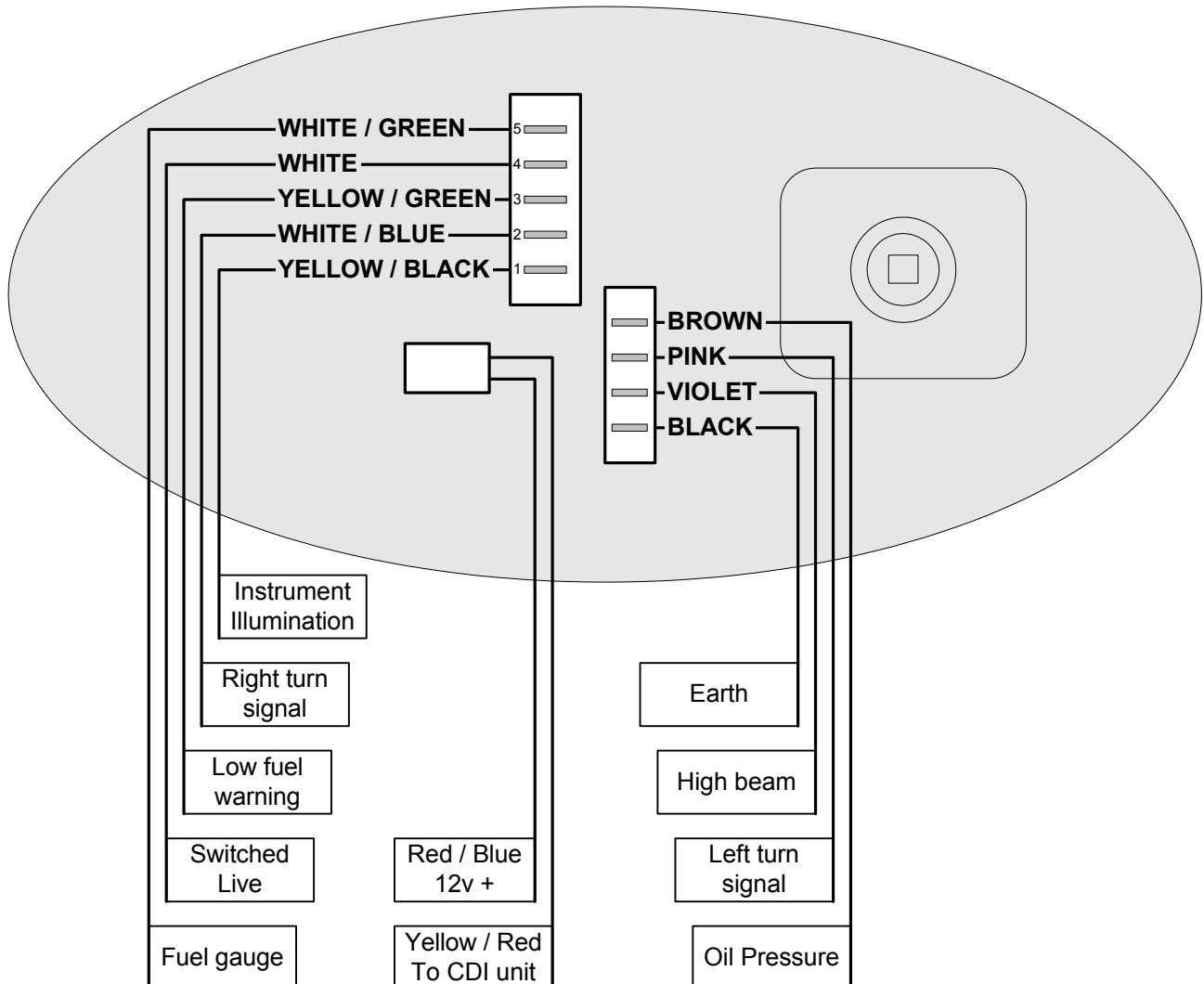


Fly 125 Instrument connection

Piaggio Ltd

25/01/2006

You may find an incorrect wiring diagram, with wiring that does not match the vehicle. This diagram should match the vehicle.



Immobiliser LED.

The LED has a permanent live feed, the CDI earths it when it wants it to light. If the battery is connected the LED should have a live feed on the Red / Blue wire. If you short the Yellow / Red wire to earth the LED should light.

Oil Pressure.

Live feed to switch. Switch shorts it to earth to light the bulb.

Fuel Gauge.

Live feed to unit in tank. The tank unit shorts it to earth via a variable resistor.

If the gauge is not working.

Un-plug the instruments put a meter between white / green and black.

Low resistance (3 ohms) = full tank. High resistance (100 ohms) = empty tank.

This has checked the wiring and tank unit.

Low Fuel Warning.

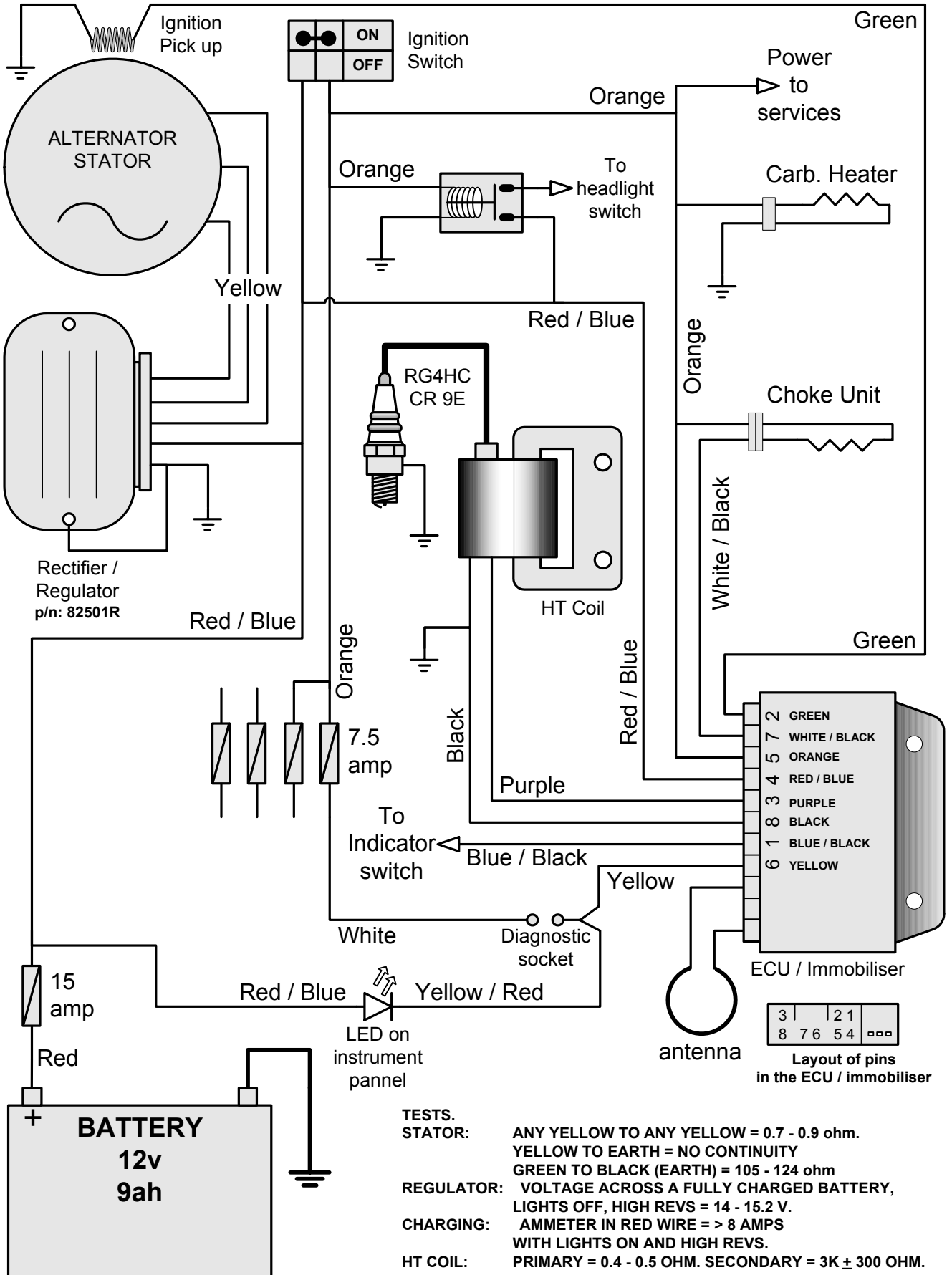
Live feed to unit in tank. The tank unit shorts to earth to light the bulb.

Fly 125 ignition / charging

Piaggio Ltd.

21/10/04

With IMMOBILISER

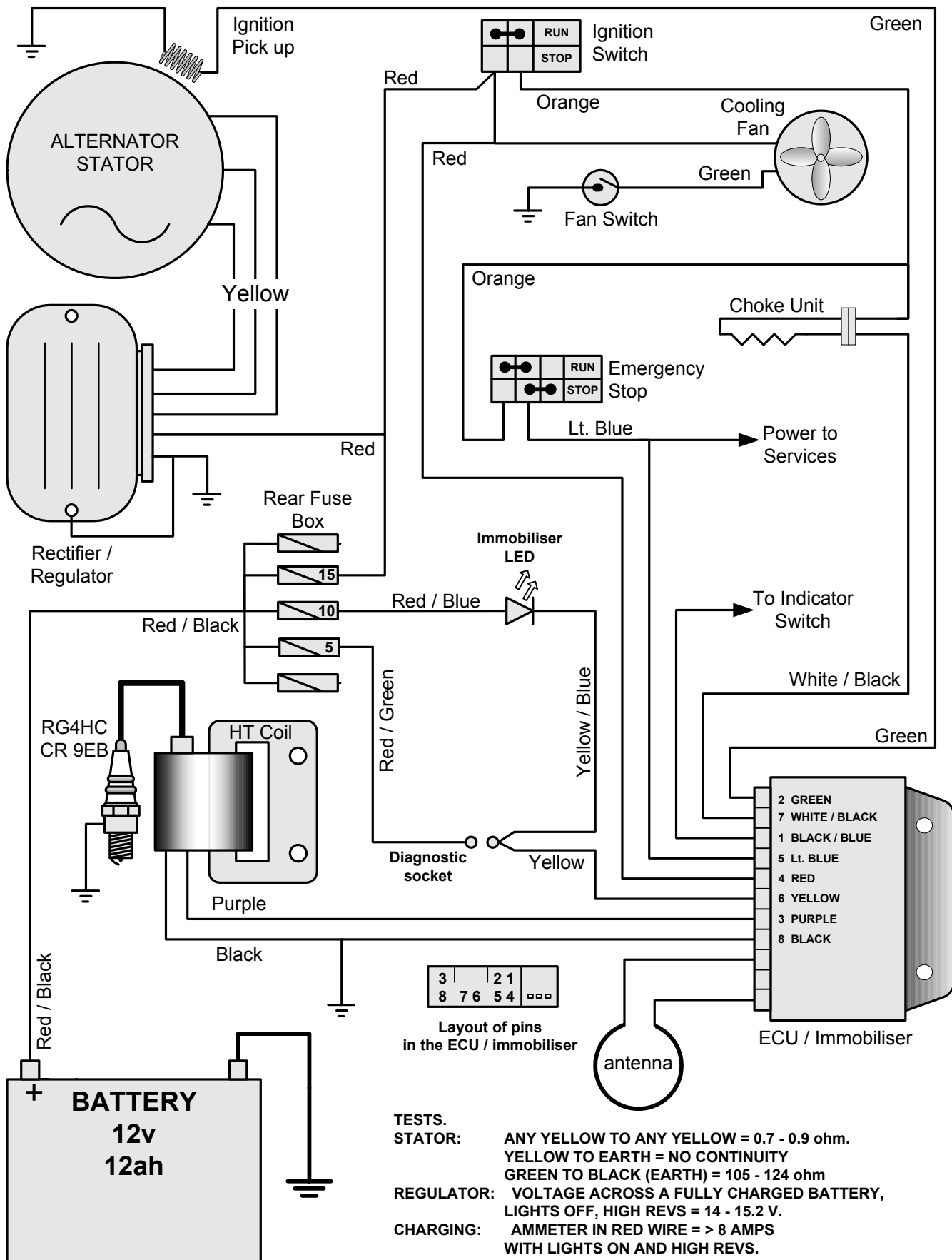


X8 125 / 200 ignition / charging

Piaggio Ltd.

04/01/2005

With IMMOBILISER

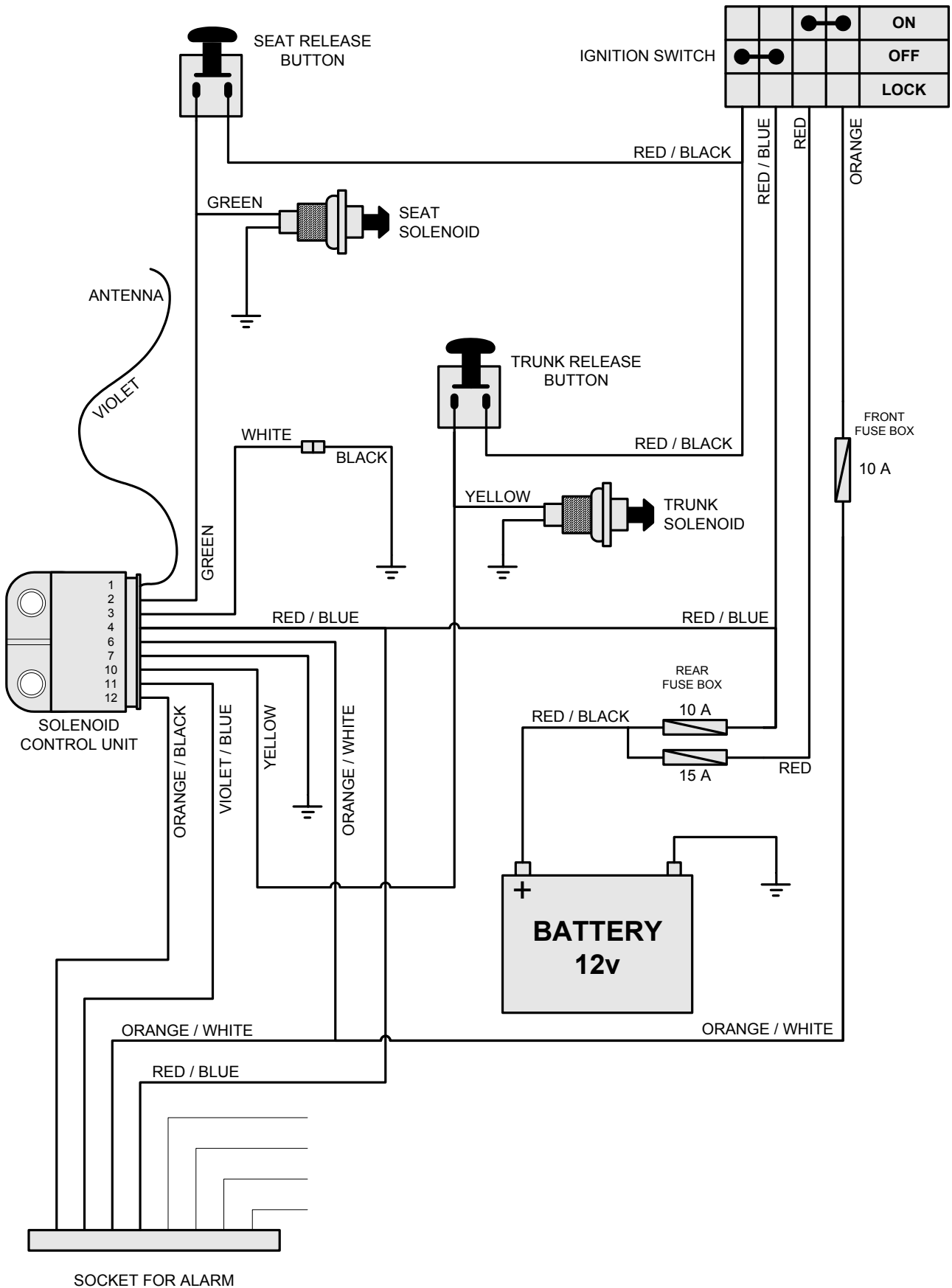


X8 125 Seat & Trunk Release

Piaggio Ltd.

30/09/2005

Piaggio Ltd.

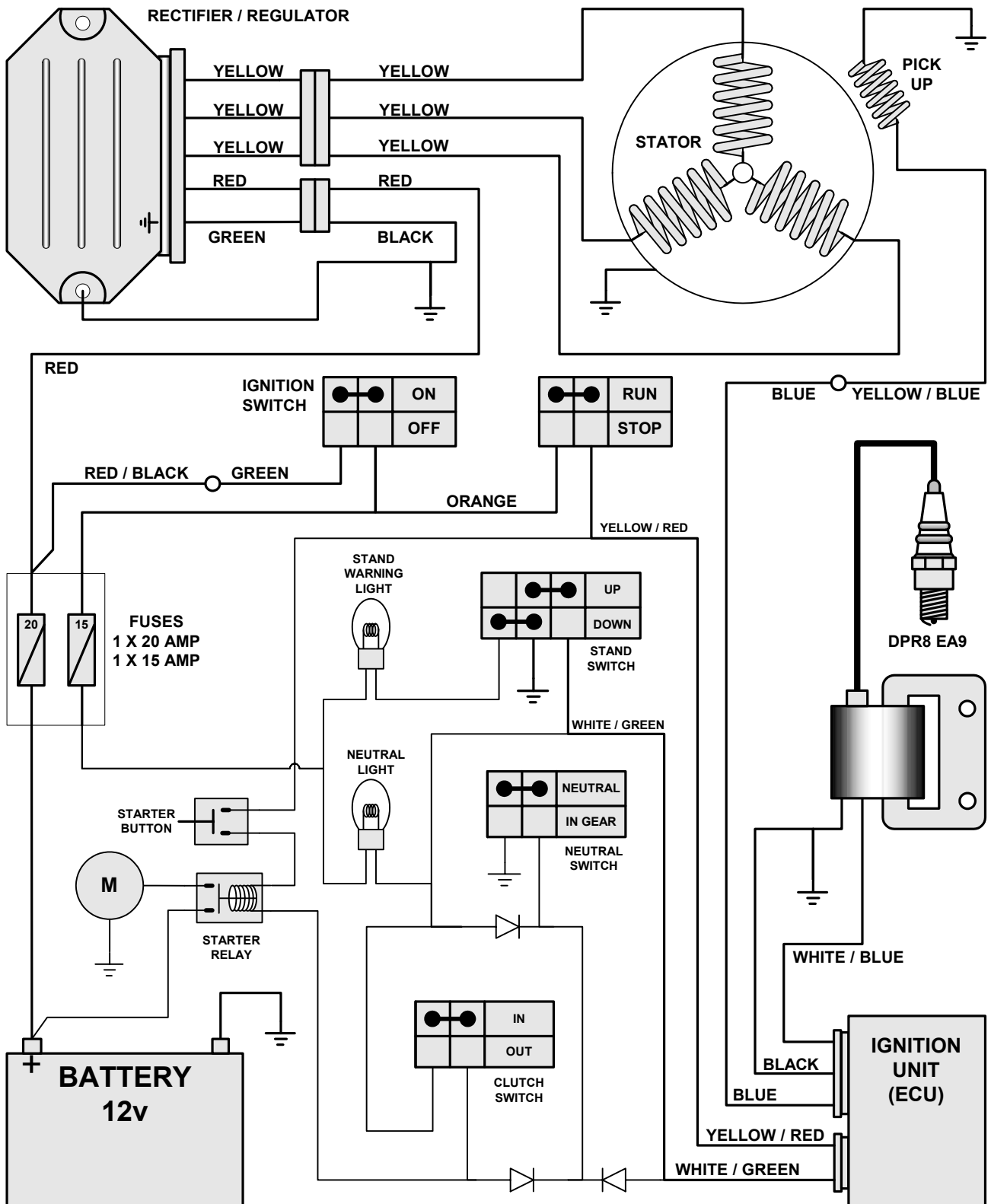


Coguar 125 Charging & Ignition

Piaggio Ltd.

04/02/2004

Honda XLR 125w Engine



NOTES

Three phase charging with inductive low voltage ignition.
 The start & run permissive circuit is shown here in lighter detail.
 For the engine to run the ECU must be earthed via the White / Green wire.

TESTS

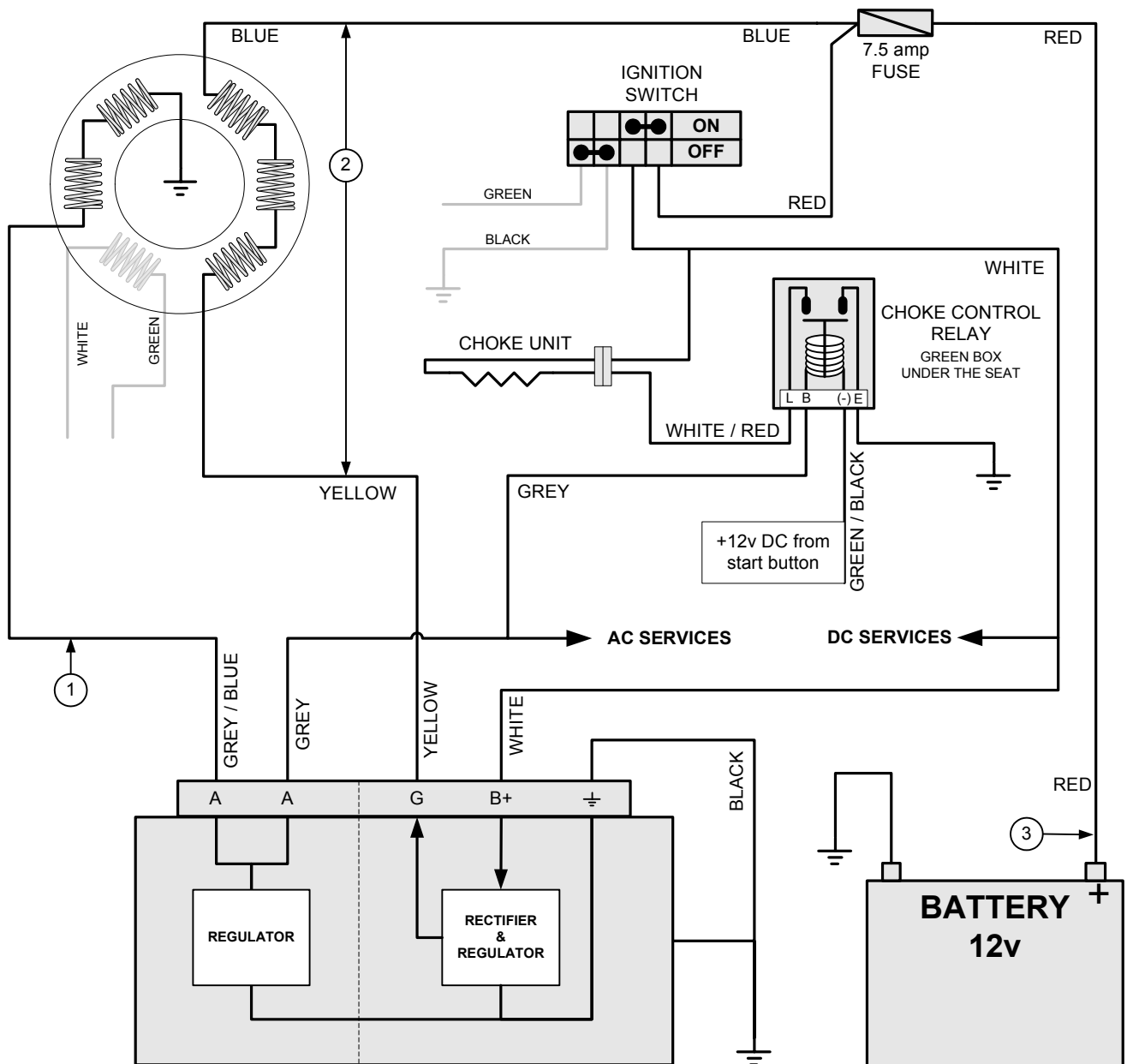
Stator: Any yellow to any yellow = 0.8 ohm. Any yellow to earth should give NO continuity.
 Regulated voltage: 14.0 - 14.8 volts with fully charged battery and lights on. Engine running at 5000 rpm.

Vespa ET4 (ZAPM04) charging

Up to ZAP04 * 51159

11/09/2003

5 pin regulator



- * This diagram shows the early ET4 (non Leader) wiring using a five pin connector on the rectifier / regulator. Refer to the separate diagram for later circuit using an eight pin rectifier / regulator.
- * Three completely separate circuits for AC, DC & ignition.
 - AC is full wave and regulated
 - DC is half wave rectified and regulated
 - Ignition is the self powered CDI type typical on our two stroke scooters. Shorted to earth to stop.
- * Engine must be earthed to the chassis / battery. Lack of this connection will affect the AC circuit and starter motor but not the DC circuit or ignition circuit.
- * If voltage at the **B+** terminal falls below 8v (approx) the DC rectifier / regulator will not function so there will be no output from the alternator on the DC circuit.
- * Separate indicator relay.
- * The choke is powered by the DC circuit but the relay to activate it is controlled by the AC circuit. Circuit will only be completed when both:
 - AC is present at relay terminal "B" and +12v DC is NOT present at the unmarked terminal.

TESTS.

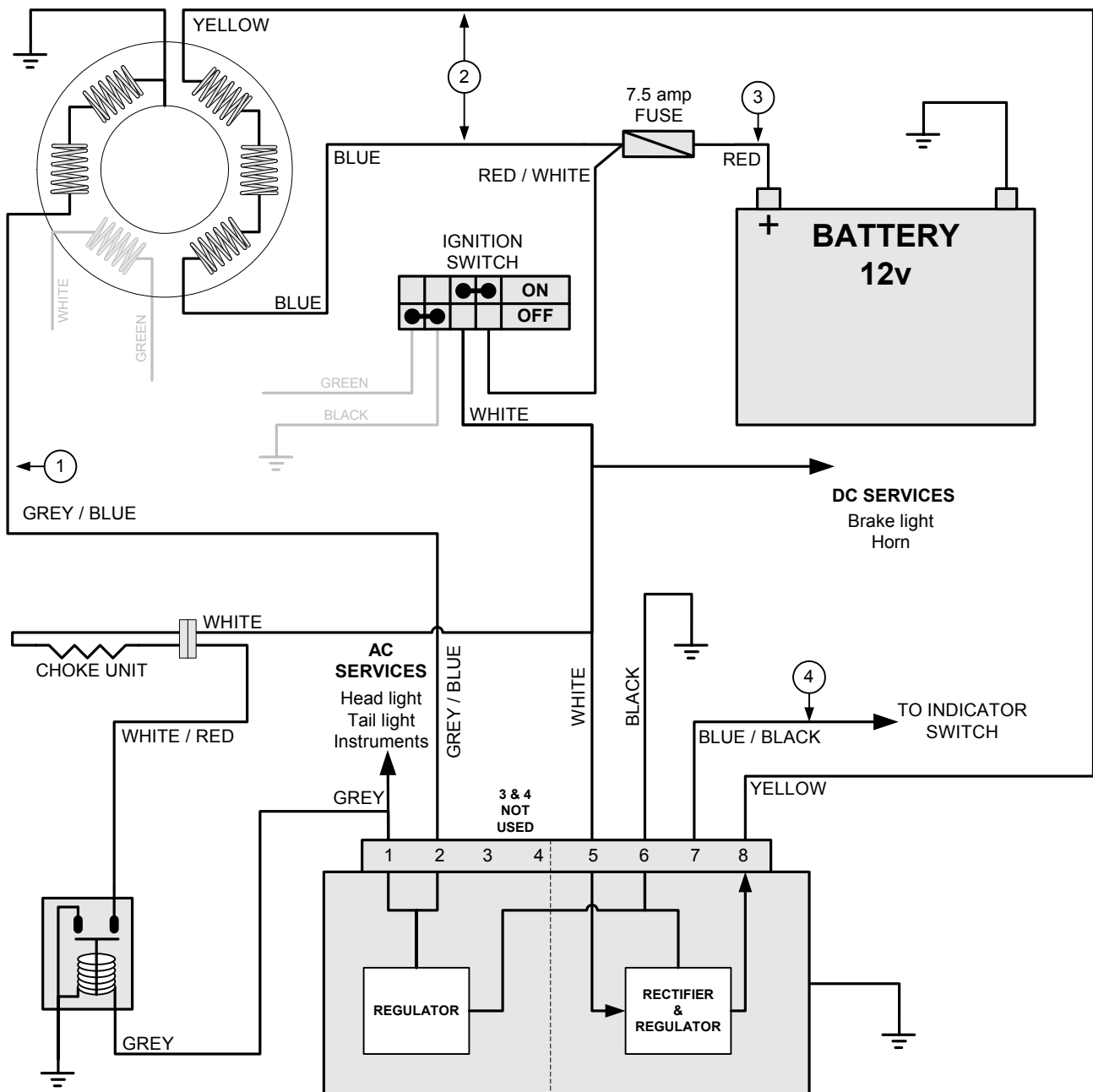
1. Grey / Blue to earth = 25-30v AC stator un-plugged and engine at 2000rpm.
2. Yellow to Blue = 26-30v AC stator and battery disconnected and engine at 2000 rpm.
3. Ammeter between red wire and battery positive = 1.5-2 amp with fully charged battery and engine at 2000 rpm

Vespa ET4 (ZAPM04) charging circuit

From ZAPM04 * 51160

11/09/2003

8 pin regulator



* This diagram shows the later (non Leader) ET4 wiring using an eight pin connector on the rectifier / regulator. Refer to the separate diagram for earlier circuit using a five pin rectifier / regulator.

* The charging system is basically the same as the 50cc & 80cc two stroke Sferoids.

* Two completely separate circuits for AC & DC.

* Eight pin rectifier / regulator incorporates the indicator relay.

* The choke is supplied with 12v DC when the ignition is turned on but the circuit to earth is only completed when the engine is running and 12v AC is supplied to the choke control relay.

TESTS.

1. Grey / Blue to earth = 25-30v AC stator un-plugged and engine at 2000rpm.

2. Yellow to Blue = 26-30v AC stator and battery disconnected and engine at 2000 rpm.

3. Ammeter between red wire and battery positive = 1.5-2 amp with fully charged battery and engine at 2000 rpm

4. Output to the indicator switch will be a 12v DC pulse with ignition on.

NOTES.

* Engine must be earthed to the chassis / battery. Lack of this connection will affect the AC circuit and starter motor but not the DC circuit or ignition circuit.

ET4 IGNITION IMMOBILISER.

Original, Non Leader

General description

The ignition key contains an electronic digital code; this code must be recognised by the system before the ignition system will function.

Thus the scooter has two forms of security – the key must physically operate the lock (in the normal way), and the electronic code must be recognised by the system. In this way the scooter is safe against having the ignition switch forced, or being hot-wired.

Main components

Special keys, with built in transponders.

The red key is the “master” key, which is used for programming, with the transponder mounted in a flip-out section.

The blue key(s) is for normal use.

Decoder, which uses the antenna to read the electronic code of the key transponder.

CDI unit, which latches to the ON position only if an appropriate signal is received from the decoder.

Other components

Antenna, located encircling the ignition switch.

7.5 amp fuse, which supplies +12V DC to the voltage stabiliser (located within the decoder box).

Voltage stabiliser (located within the decoder box), whose output (+12V DC) supplies power to the decoder and the CDI unit via contacts in the ignition switch.

“**Serial Line**”, connects the decoder to the CDI unit, and conveys the authorising signal enabling the CDI to latch to the “ON” position.

Diagnostic test socket under the helmet holding compartment.

Normal Operation

The key grip contains a passive electronic transponder – a device that contains a unique pre-set digital code, which can be read without direct electrical contact (similar to those used in the Datatag system). The keys do not need any power and they do not contain a battery.

When the ignition switch is turned on, the decoder interrogates the key’s transponder.

Only if the decoder recognises the transponder’s electronic digital code will it send a signal via the serial line to the CDI unit, enabling the otherwise conventional ignition system (alternator with pick-up and charger coil, CDI unit and HT coil) to function.

However, the CDI unit and the decoder are also programmed to operate together as a matched pair; if they detect a mismatch the CDI unit will not allow ignition.

To check the correct operation of the system

IT IS IMPORTANT THAT ON PDI AND AFTER ANY WORK ON THE IMMOBILISER SYSTEM, THE CORRECT OPERATION OF THE SYSTEM IS CHECKED.

- Insert the red key with the hinged transponder in the flipped out position (this takes it out of radio range of the antenna, thus enabling the system to be tested without the antenna automatically picking up a code).
- Turn the ignition on and try to start the engine. IT SHOULD NOT START.
- Insert the blue key and try to start the engine. IT SHOULD START AND RUN NORMALLY.

Fault finding points to note

Decoder and CDI units are initially manufactured as blank units. In this state ("Virgin") and up to the time they are programmed the immobiliser system will not offer any protection, and the ignition will function in a conventional way. However, a "virgin" unit can be used as a substitute to aid in fault finding.

Programming functions can only be done with a red key. Once either the decoder or the CDI unit has been programmed using a red key, they will only ever recognise that particular red key.

Therefore, it is vital that you USE ONLY THE BLUE KEY FOR ALL TESTING PURPOSES other than the programming procedure itself.

Diagnostic test procedure

If there is any fault with the system, the Immobiliser Test Box should be plugged in to the diagnostic test socket. The test box (Part no 020319Y, Current dealer price £53.99 + VAT) is an invaluable, time saving tool, and one which without doubt should be owned by all dealers.

Proceed as follows-

- With ignition off, turn on and wait for 'On' and 'Pronto' LEDs to illuminate.
- Turn ignition on. The 'Seriale' LED will flash, showing the signal on the Serial line.
- After a few seconds the appropriate LED will indicate the result of the diagnostic tests.

If the "No Serial line" LED lights up, it may be for the following reasons-

Serial Line circuit is broken.
Decoder is faulty
CDI unit is faulty

However if no LEDs light up, it may be for the following reasons-

+12V DC power supply failure.
Decoder is faulty
CDI unit is faulty

Before re-testing, press the reset button.

Diagnostic points to note-

To check for +12V DC power supply failure, check 7.5 amp fuse, and that +12V DC is present on decoder terminals 3,5 and 8, and CDI unit terminal 1.

The CDI unit does not have its own earth lead, but is earthed to the alternator stator back-plate via the white wire from terminal W. However, note also that back-plate and the engine itself is only earthed via the electric starter motor lead. The decoder has its own earth lead.

There are two different types of transponder/decoder system; each type is not compatible with the other. However this problem should only show up when trying to program new blue keys. In this case most automotive locksmiths will be able to “clone” a new blue key if they are provide with a functioning red key. These “cloned” keys will be recognised by the system without the need for programming.

Component replacement procedure

Component to be replaced	Action
Blue key	Follow programming procedure (pages 4-14,4-15 in SSM)- 1. Turn the ignition ON using the red key. After 1 to 3 seconds turn OFF. 2. Within 10 seconds turn the ignition ON using a blue key. After 1 to 3 seconds turn OFF. 3. If needed, repeat step 2 up to seven times to program further spare keys. 4. Turn the ignition ON using the red key. After 1 to 3 seconds turn OFF.
Red key	Red key alone cannot be replaced. Follow appropriate replace lock set instructions
Lock set (if old red key available)	1. Replace lock set. 2. Swap red transponder from old key into new key. 3. Check for correct operation of system. 4. Program new blue key using above procedure.
Lock set (if old red key not available)	1. Replace lock set, decoder and CDI unit. 2. Check for correct operation of system. 3. Program system as per blue key procedure above.
Decoder	1. Replace decoder (CDI must also be replaced). 2. Check for correct operation of system. Note that with a virgin decoder the engine will start, but won't rev above 2,000rpm. 3. Program system as per blue key procedure above
CDI unit	1. Replace CDI unit (CDI can be replaced on its own). 2. Check for correct operation of system. Note that with a virgin CDI unit the engine will start and run normally, but the immobiliser system is inactive. 3. Program the CDI unit simply by turning on the ignition switch using the red key

When programming keys do not have more than one transponder type key on the key ring, as the decoder may pick-up both transponders.

VESPA ET4 IMMOBILIZER DIAGNOSTICS

When fault finding the ignition system on VESPA ET4, there is a very simple and quick check, which can be done to give the Immobiliser the 'all clear'. If you don't have the effort-saving Immobiliser Tester (part no. 020319Y) then insert a 12 Volt LED in the 2 pin socket (the blue/black lead is negative) located under the helmet compartment and switch on the ignition whilst observing the LED. Note that the LED marked **Seriale** on the Tester display shows this same signal.

It is advisable to get into the habit of using the blue key for all use and testing purposes other than the programming procedure itself.

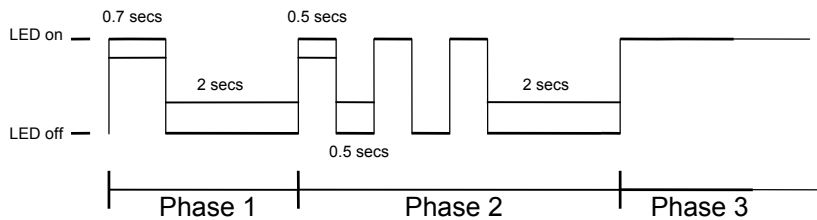
Normally-Functioning Immobiliser

The signal for a normally functioning Immobiliser system is a quick flash (0.7 seconds) and then the LED remains off.

Immobilizer Fault-Finding

If the system is not functioning normally, it is recommended to obtain the Piaggio Immobiliser Tester. This is by far the easiest way to diagnose faults. However, if for some reason this is not available, fault finding can be done by observing the following.

Example Serial Line Signal



The above diagram shows the trace of the diagnostic signal for Decoder and CDI Units both programmed, using a key with an unknown transponder (Table 2, case 5), resulting in 3 FLASHES during the second phase of the diagnostic signal (Phase 2).

Phase 1: 0.7 sec flash = NORMAL OPERATION (Cases 7-14 in Table 2)
 2 sec flash = CDI Unit unprogrammed (Cases 1-6 in Table 2)
 BOTH of the above flashes will be followed by a 2-second pause.

Phase 2: A series of 0-4 flashes (0.5 sec each with 0.5 sec pauses) which form diagnostic signal (refer to Table 1).

Phase 3: LED remains OFF if no fault is detected or ON if a fault is detected in the Immobilizer system (the Tester does not consider a non-programmed CDI Unit a fault).

If the led does not light up at all try the following:

Possible Fault	Test
No power supply to Immobiliser circuitry in CDI	12 V. should show on blue lead (pin 1 of the CDI unit).
Faulty Decoder unit	Replace and test with BLUE KEY
Faulty CDI unit	Replace and test with BLUE KEY

Table 1: Immobilizer Diagnosis Chart

Phase 2 LED Signal	DIAGNOSIS
0 FLASHES	NORMAL OPERATION
1 FLASH	BREAK IN SERIAL LINE (ORANGE) OR DECODER EARTH (BLACK)
2 FLASHES	NO TRANSPONDER DETECTED - FAULTY KEY OR IMMOB. ANTENNA
3 FLASHES	TRANSPONDER DETECTED BUT NOT RECOGNISED BY IMMOB.
4 FLASHES	VIRGIN DECODER AND PROGRAMMED CDI UNIT

Table 2: Immobilizer Component Combinations and Related Diagnostic Signal

	Phase 1 Flash	Phase 2 Signal	Decoder	CDI Unit	Key Transponder	Antenna	Spark	Notes
1	2 sec	0 flashes	V	V	PRESENT - ANY	Y	✓	Note 1
2	2 sec	2 flashes	V	V	ABSENT or ANY	N	✓	Note 1
3	2 sec	0 flashes	P	V	PRESENT - PROG.	Y	✓	
4	2 sec	2 flashes	P	V	ANY	N	X	
5	2 sec	3 flashes	P	V	PRESENT - UNKNOWN	Y	X	
6	2 sec	2 flashes	P	V	ABSENT	Y or N	X	
7	0.7 sec	4 flashes	V	P	ANY	Y	✓	Notes 1,2
8	0.7 sec	2 flashes	V	P	ANY	N	X	
9	0.7 sec	2 flashes	V	P	ABSENT	Y or N	X	
10	0.7 sec	2 flashes	P	P	ABSENT	Y or N	X	
11	0.7 sec	2 flashes	P	P	ABSENT or UNKNOWN	N	X	
12	0.7 sec	3 flashes	P	P	PRESENT - UNKNOWN	Y	X	
13	0.7 sec	2 flashes	P	P	PRESENT - PROG.	N	X	
14	0.7 sec	0 flashes	P	P	PRESENT - PROG.	Y	✓	Note 3
15	N/A	1 flash	N/A	N/A	N/A	N/A	X	Note 4

KEY:

P = UNIT PROGRAMMED

V = VIRGIN i.e. UNPROGRAMMED

Y = ANTENNA FUNCTIONING

N = ANTENNA ABSENT or NOT FUNCTIONING

✓ = IGNITION POSSIBLE

X = IGNITION NOT POSSIBLE

PROG. = TRANSPONDER RECOGNISED THROUGH PROGRAMMING PROCEDURE

ANY = KEY WITH TRANSPONDER PRESENT BUT CODE DOESN'T MATTER

NOTES:

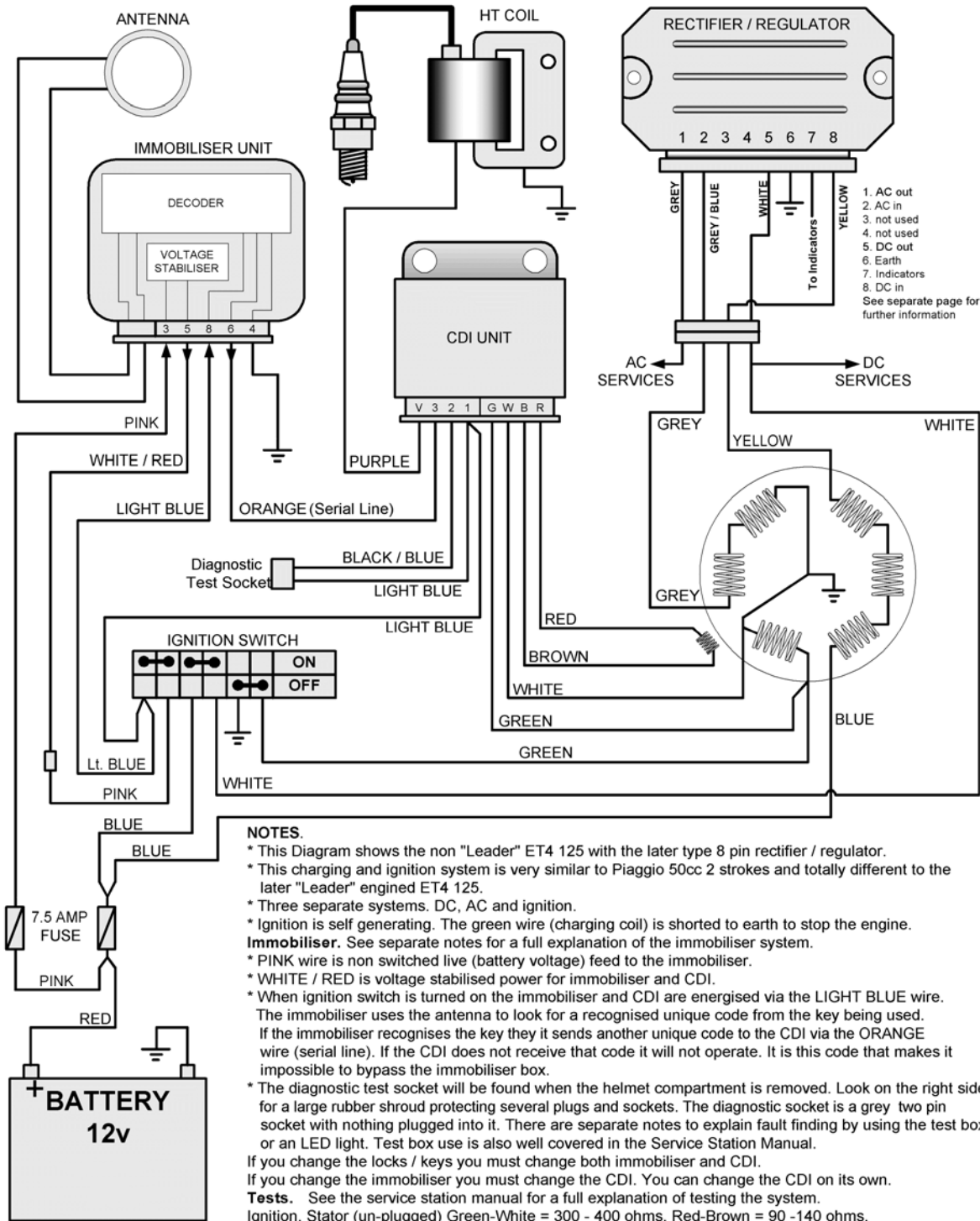
1. BLUE KEY - use for testing ignition after replacing Decoder and / or CDI Unit, otherwise you may sacrifice perfectly good units; programs both Decoder and CDI Unit.
RED KEY - only use for programming operations and ONLY when you are sure the ignition system is delivering a satisfactory spark.
The EXCEPTION to the above two points is when testing the Antenna with the RED KEY transponder flipped out, as per the ET4 Service Station Manual.
2. LIMITED TO 2000 rpm
3. Normal operation with the either key
4. Break in the Serial line (orange lead) or Decoder not earthed properly (black lead)

Vespa ET4 125 charge / ignition

Piaggio Ltd.

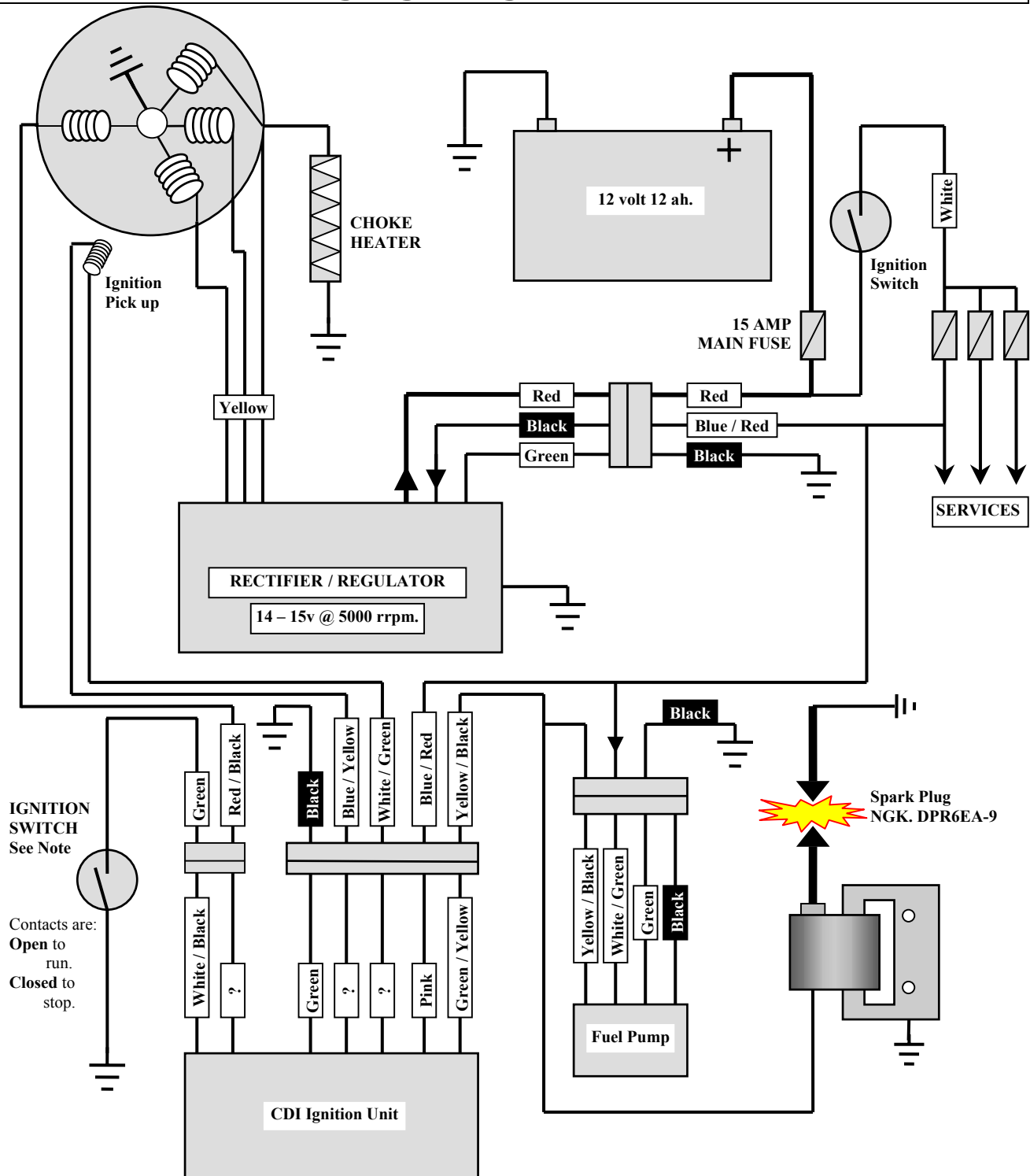
19/02/2003

ZAPM 04 Later version



HEXAGON 250

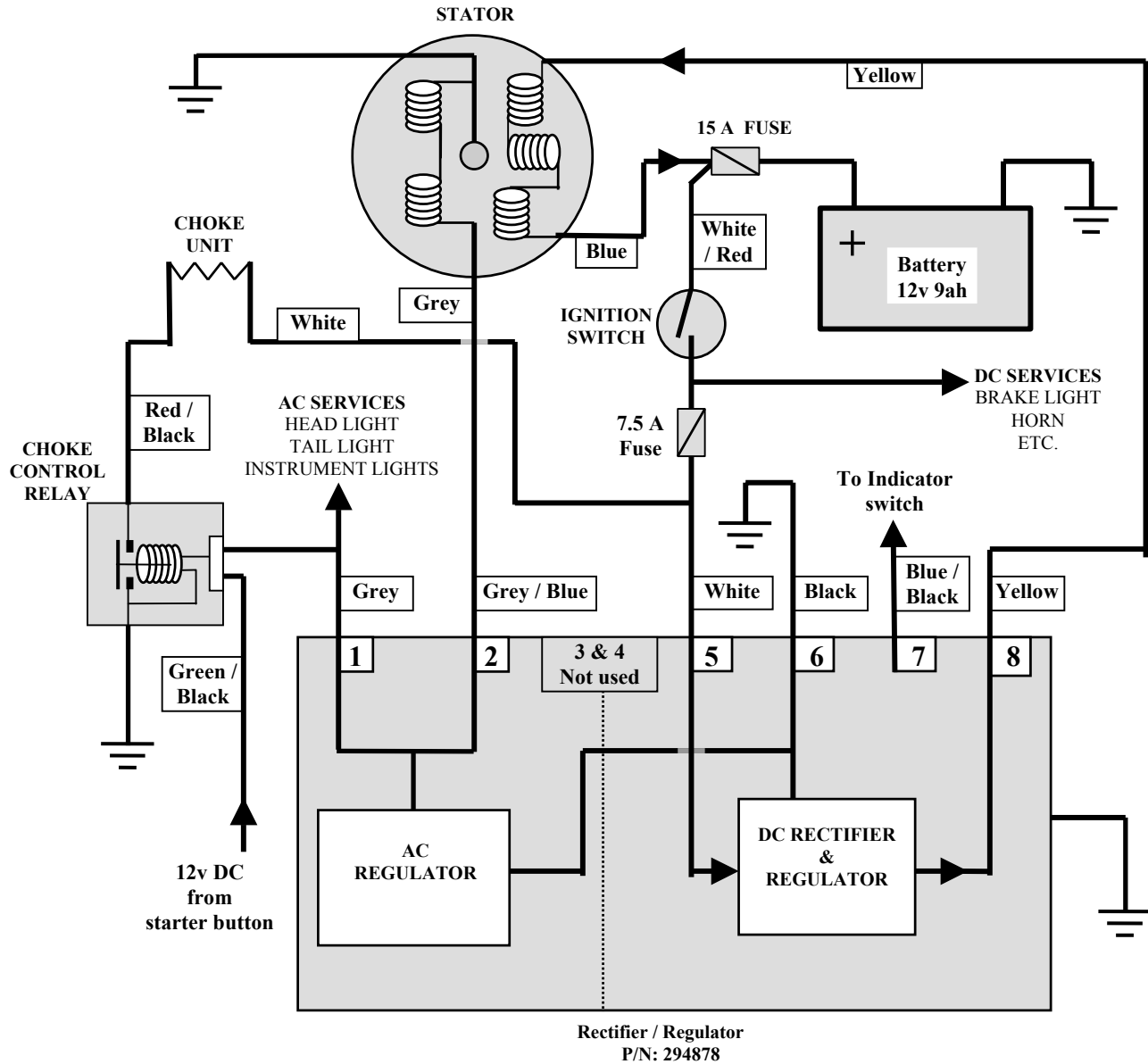
Charging & Ignition Circuit



- Note that the wire colour sometimes changes from one side of a connector to the other.
 - The choke supply is $\gg 12$ volts AC (only when the engine is running).
 - The fuel pump senses the engine speed and varies the supply rate accordingly.
- TESTING. **Green – Black:** No continuity with ignition switch and kill switch to Run.
Yellow - Yellow - Yellow: 0.1 – 1.0 Ω . Stator winding.
Black/Red – Black: 50 – 350 Ω . Ignition charging coil.
Green/White – Blue/Yellow: 50 – 170 Ω . Ignition pick up coil
Yellow/Black – Black: 0.1 – 0.2 Ω . HT coil primary winding.
HT – Black: 3.6 – 4.6 K Ω . HT coil secondary winding.

LIBERTY 125 Charging Circuit

RECTIFIER / REGULATOR WITH AN EIGHT PIN CONNECTOR



THIS IS THE ORIGINAL ENGINE NOT THE LEADER

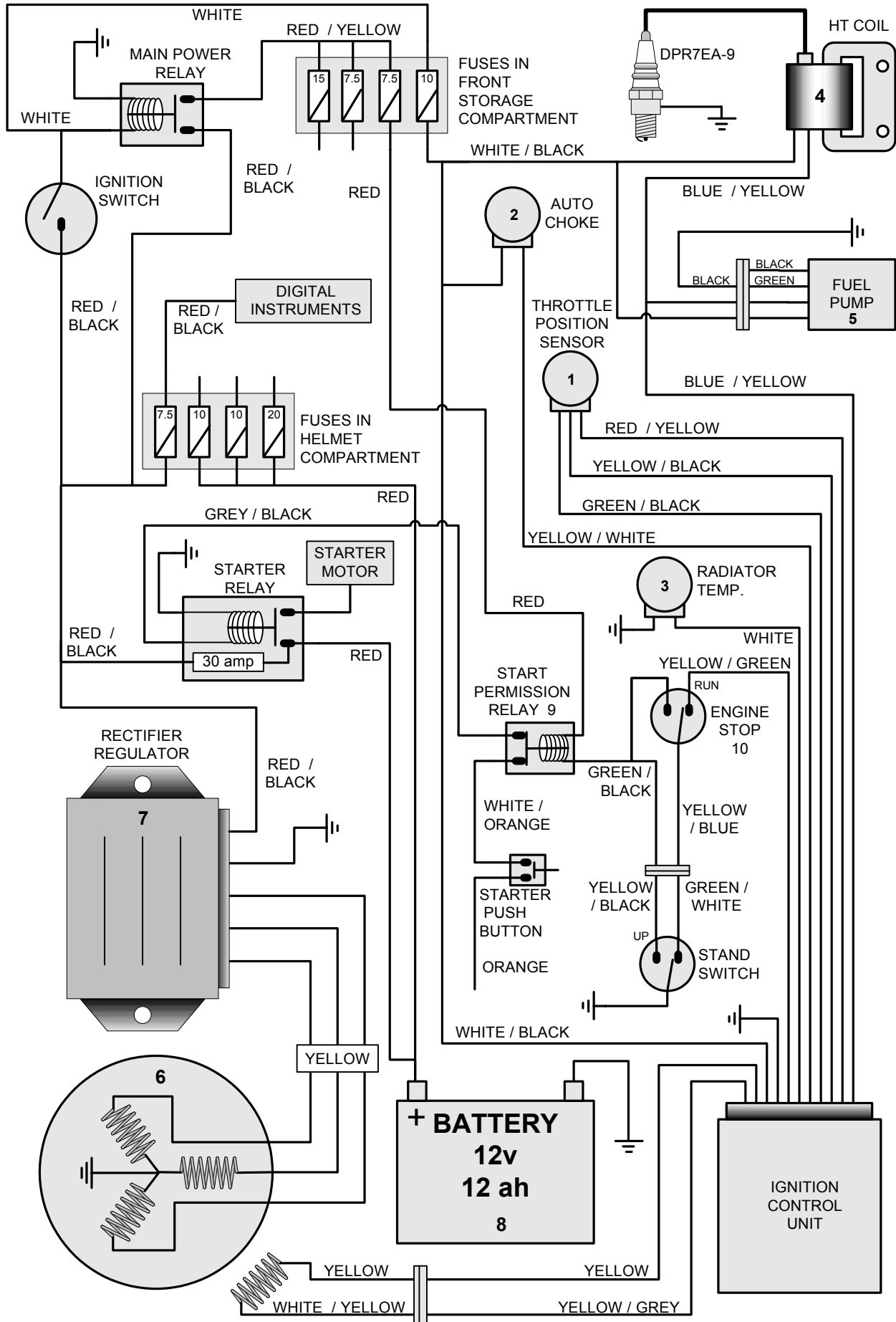
- The charging system is basically the same as the 50 / 80cc Sferoids.
 1. Two completely separate circuits, AC & DC.
 2. DC circuit is regulated on the negative side of the alternator.
- The eight pin rectifier / regulator combines the indicator relay.
- Choke unit is supplied with + 12v DC when ignition is switched on. But current can only flow (via choke control relay contacts) when the engine is running so AC is present to pull the relay "in". A logic circuit in the relay will not allow the choke to begin to turn off while the starter button is being pressed.

X9 250 Charging & Ignition

Piaggio Ltd.

11/09/2003

Honda Engine



X9 250 (Honda engine)

* At PDI

Set the clock TIME and DATE.
Set the TRIP to MILES.
Reset all three SERVICE LIGHTS.

* To change km to miles.

Insert ignition key.
Press and hold down "Trip" and "M" buttons
Turn on the ignition.
The display should now have changed.

* To reset the service light.

1. Remove the central panel between the headlights, this is retained by 5 screws.
2. You will find a button above the headlight unit marked "RES"
3. Turn on the ignition. One of the three service lights will be flashing.
4. Briefly press the button. The light before the one you want to reset should light.
5. Press and hold the button. The light you want to reset will start flashing fast. While it is flashing fast release the button. Now the light should have gone out.
6. Turn off the ignition and turn back on to prove the light has been cancelled.

* To test System.

With ignition off.
Press and hold down "clock" and "set" buttons
Turn on the ignition
All the systems will check them selves and all the lights should come on.
Any blown bulb or faulty system will be obvious.

* Stop lights.

There are a total of five stop light bulbs.
If two or more bulbs fail the warning light will come on.

* Hazard Lights.

Ignition on
Press hazard button, lights will start flashing.
Turn ignition off.
To stop the lights, first turn the ignition on then press the switch.

* Battery current drain.

Current drain with ignition off should be 1-1.5ma. This equates to a useful battery life of 40 days without any charging.

Test the drain by inserting your meter between battery and earth lead.

* If the battery is going flat check that the helmet compartment light is going out. Remove the battery cover to see into the helmet compartment with seat closed.

* Battery charging.

Charging at idle (1500 rpm) with the main beam on should be 2 amps.

*** Low fuel warning lamp.**

The light will only come on when it has received a continuous signal from the sender for 13 seconds.

*** Relays.**

The vehicle has five relays.

Starter relay p/n 496403 has a 30 amp fuse and is in the battery compartment.

Start Permission relay p/n 292332 is in the battery compartment.

Two head light relays and the main power relay are all the same p/n 58002R they are all under the front shield, headlights are central and the power relay is on the near side by the indicator.

*** Headlights.**

The headlights are controlled by relays and each has it's own relay so if the light fails and it is not the bulb, check the relay.

*** Choke unit.**

Temperature sensor in the radiator can control the choke.

If the temperature drops to 0 degrees C then choke will come on (no voltage to the unit)

*** Honda Foresight Engine.**

There are two versions of the engine. The engine number will contain the letter "X" or "UU" . Piaggio use the "UU" version. Specific parts for this engine are identified by the colour blue (blue rollers etc.)

*** Valve clearance.**

Set Cold.

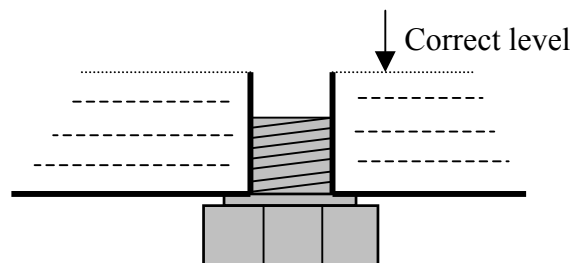
Engine at TDC.

Valve clearance is one division on the scale.

*** Gear Box Oil Level**

Remove the level screw.

If no oil comes out top up until oil drips then wait until oil stops before re-fitting the bolt.



*** Indicators**

The indicator relay function is part of the digital display cluster. P/n. 581413. There is no separate relay.

The wires involved are:

Blue / Black - right turn

Grey / Blue

Red / Black - left turn

Note that to operate the indicators the handlebar switch shorts the relevant wire to earth.

Hazard lights work by the switch earthing the brown wire from the digital cluster.

*** Braking system**

1. Three brake disks are all the same size. 200mm diameter.
2. Both master cylinders are the same size.
3. All brake pads are the same. p.n. 494966
4. L/H front and rear calliper are the same and have 22mm pistons
5. R/H front calliper has 24mm pistons.
6. L/H front and rear are linked together in the following way
When left hand lever is used
Up to 8 bar pressure the rear brake only is operated.
8 - 23 bar both brakes are applied.
Over 23 bar the amount of pressure to the front brakes begins to decrease relative to the rear.
7. The R/H front calliper is operated by the R/H brake lever and has no connection to the other brakes.

*** Rollers and Drive Belt**

Roller kit p.n. 496293. Roller min dia. = 22.5mm. Rollers are coloured blue.
Drive Belt p.n. 496304 Min width = 22.3mm

X9 250 CHARGING & IGNITION

Refer to the X9 Charging & Ignition diagram.

* Note that sometimes the wires coming from a component change colour at the connector that joins them to the wiring loom.

* See the separate sheet for an explanation of the fuses.

* Charging is three phase, fully rectified.

* Ignition is digitally mapped and can not be manually adjusted.

Spark advance will be affected by:

- Engine speed.
- Throttle position. See # 1
- Coolant temperature. See # 3

1. **Throttle position sensor** is on the carburettor.

Power supply is nominally 5v dc.

Resistance drops as throttle is opened.

2. **Auto Choke.** Normal wax pellet type. Defaults to “on” it is controlled by the ignition control box and can be turned on by low coolant temperature (temperature sender in radiator). If coolant temp is less than 0°C the choke will stay on.

Checks.

1. Remove the choke unit from the carb. Measure the length of the plunger extension.

Attach the choke to a 12 volt battery, after 4-5 minutes the plunger should have extended by about 4.5 mm.

2. White/Black wire should have 12v when ignition is on.

Yellow /White wire should have continuity to earth when the engine is running.

3. **Radiator temperature sender.**

This is on the right hand side of the radiator. The fan switch is on the left.

4. **HT Coil.**

Primary. White/black to blue/yellow = 3Ω

Secondary. HT to blue/yellow = 15,000Ω (15k)

Plug cap. 5,000Ω (5k)

5. **Fuel Pump** is situated under the left foot board.

6. **Stator.**

Charging coils. yellow to yellow = 0.6Ω

yellow to earth should give continuity.

Ignition Pick up. White/yellow to yellow = 200Ω

7. **Rectifier / Regulator.** With a fully charged battery. To check the charging rate, place a voltmeter across the battery terminals.

With lights off you should have 14-15 volts at 5,000 rpm.

8. **Battery** drain with ignition off should be 1-1.5 ma. This gives a useful battery life without charging (or use) of about 40 days.

#9. **Start Permission Relay.**

Situated in the battery compartment. Contacts are normally closed. When green/black is earthed by the stand switch the contacts will open to break the start circuit..

#10. **Engine Stop Switch.**

The yellow/green wire from the ECU must be earthed to allow the engine to run. When the stop switch is “stop” the connection to earth is broken.

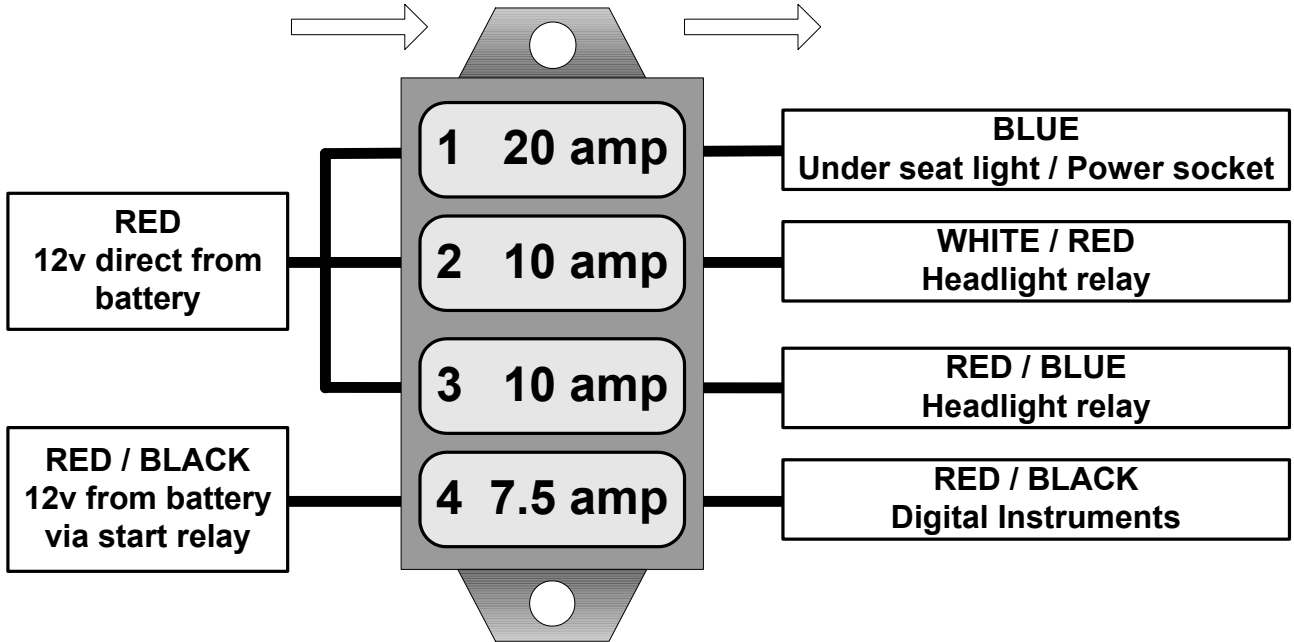
X9 250 FUSE EXPLANATION

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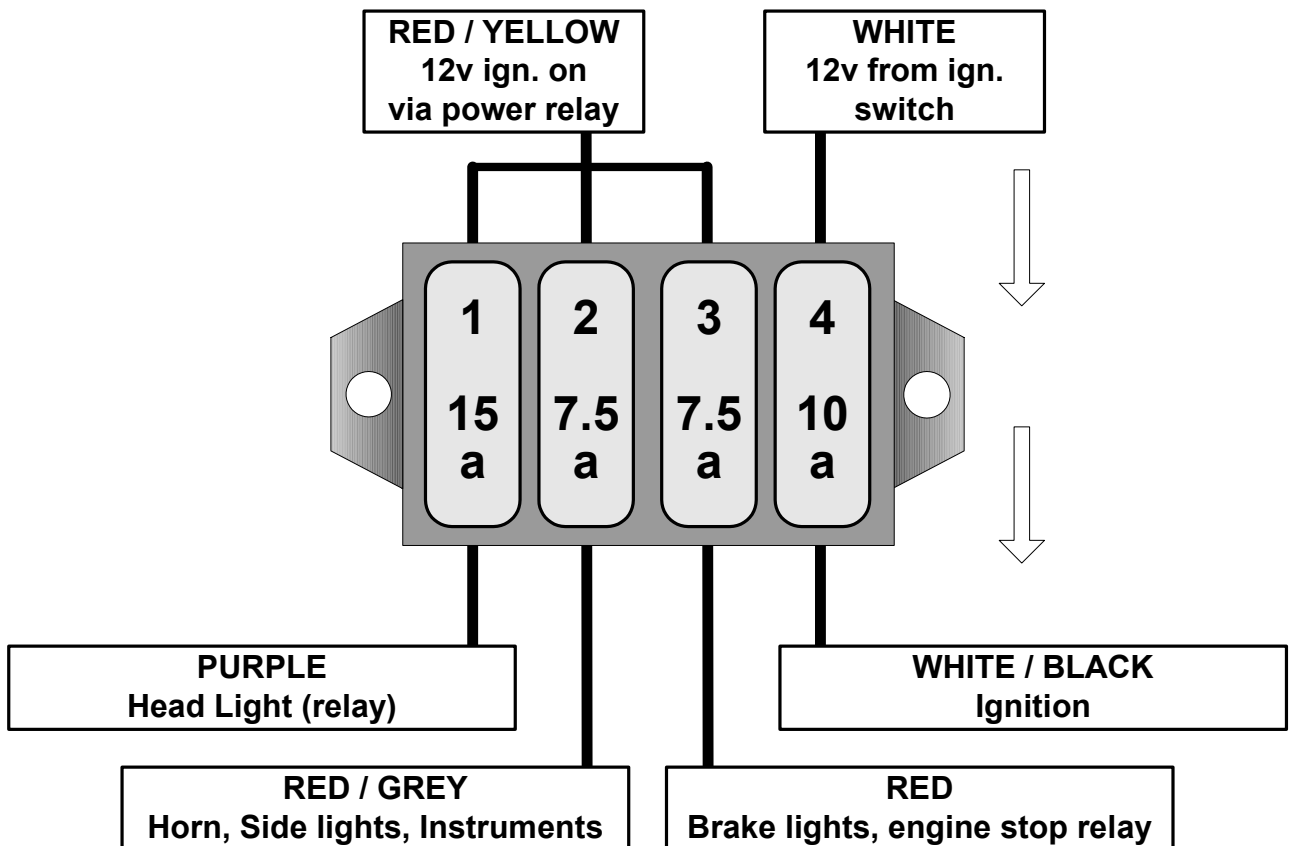
11/09/2003

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FUSES IN HELMET COMPARTMENT



FUSES IN FRONT STORAGE COMPARTMENT

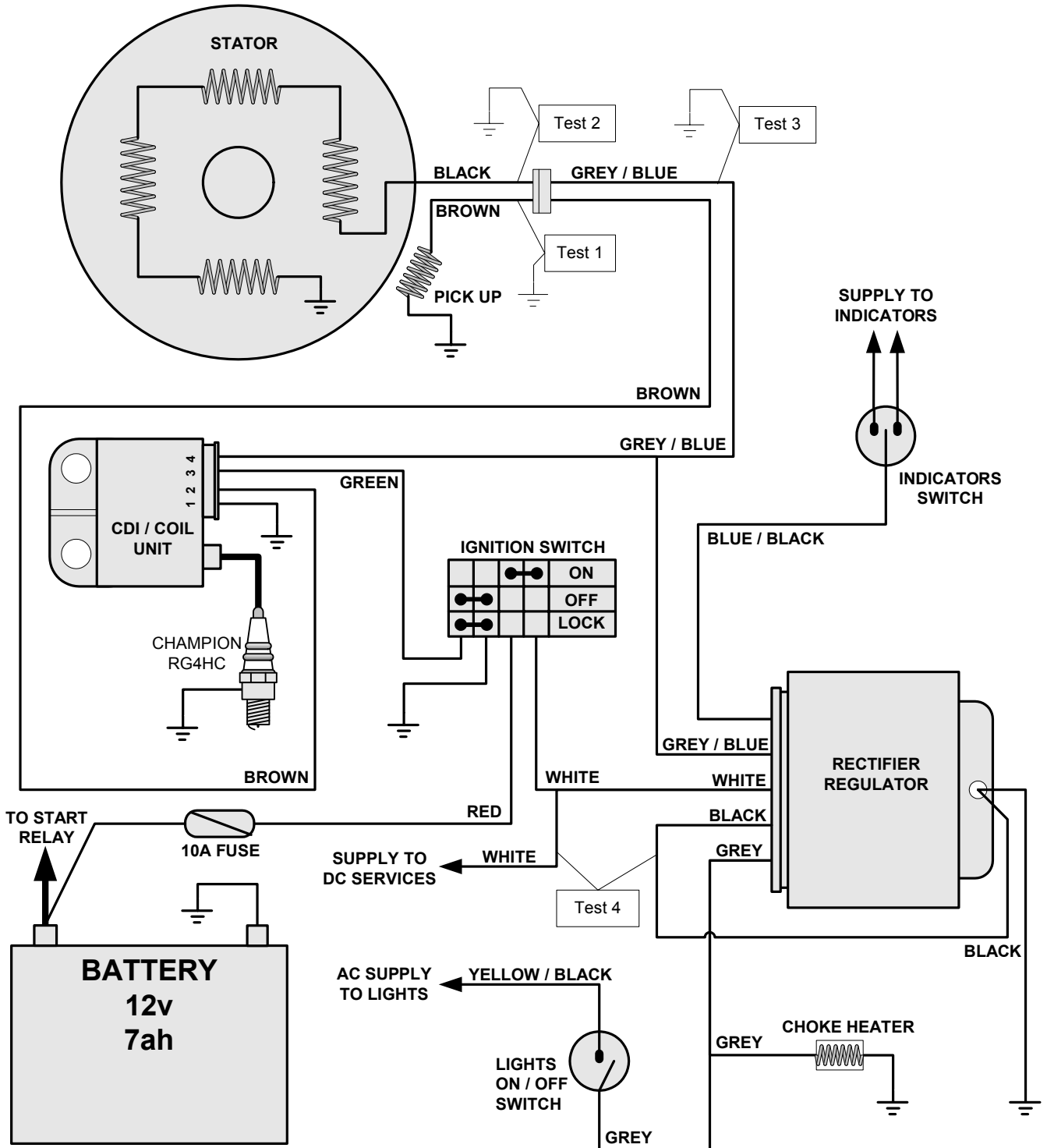


50cc 4 stroke Charging / Ignition

Piaggio Ltd.

22/11/01

Piaggio Ltd.



Only two wires come from the stator. The engine to earth connection is very important.
 Battery voltage at idle = 13 v (Battery charged) max will be 14.5 volts at high revs. Meter between battery neg. & pos.
 Battery charge at idle = 1.5 - 2 amps (lights off). max will be >5 amps at high revs with all lights on. Meter between red wire and battery pos.
 Test 1: Brown - earth = ~170 ohm To test pick up coil. Stator un-plugged
 Test 2: Black - earth = ~1 ohm To test charging coils. Stator un-plugged
 Test 3: Blue / Grey - earth = 25 - 35 v ac @ 2000 rpm with regulator disconnected. To test charging coils.
 Test 4: White - Black = ~8 M ohm. If the resistance is low it could cause the fuse to blow.

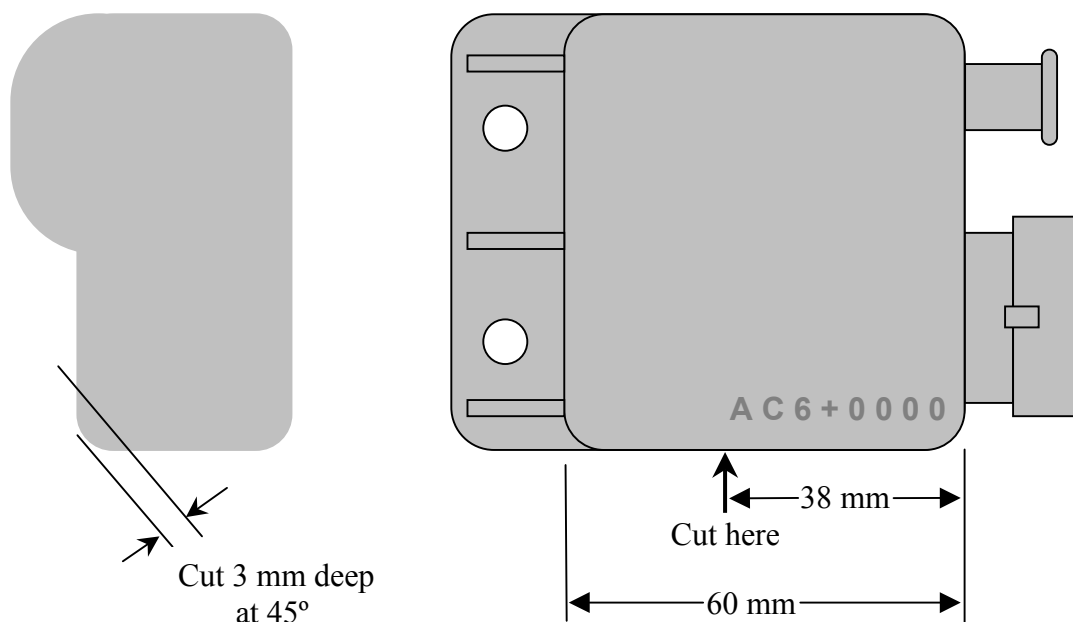
This information is intended **only** for authorised Piaggio dealers.

50cc Four Stroke Restriction

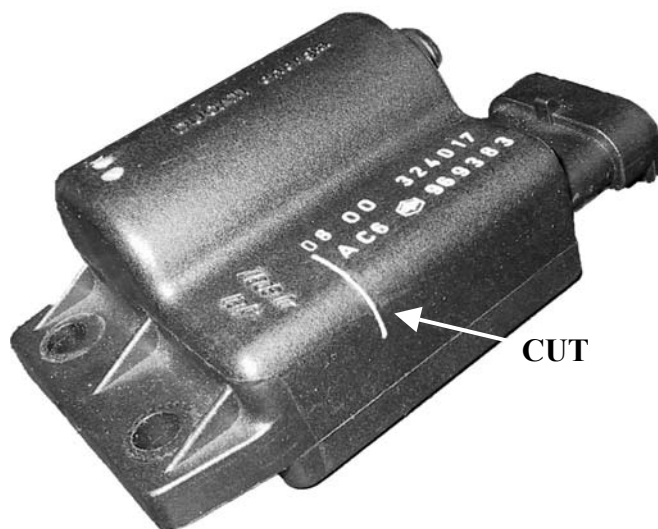
Piaggio do not advocate changing the restriction on any 50cc machine that may be used on public roads. Remember that if a Piaggio, Gilera or Vespa 50cc moped is de-restricted it will be technically illegal. It will not conform to Motorcycle legislation but it did conform to Moped legislation.

The restriction is the same on all 50cc four stroke models including the LX 50 4t, Fly 50 4t and Zip 50 4t (China).

The main restriction on the 50 cc four stroke engine is electronic. There is no restriction in the exhaust pipe.



1. Make a 3mm deep cut with a hacksaw in the position shown. Then fill the slot with silicon.
2. Remove the spacer washer between the front pulley halves.
3. Fit carburettor main jet size #78. Part number CM 142103



If you do not de-restrict. A moped should have a top speed of 45 km/h on the flat. This engine will achieve that with an average size rider once it has run in for about 50 km. Initial acceleration is brisk but changing the main jet for that mentioned above will help it obtain top speed more easily.