



PIAGGIO
L I M I T E D

Technical Notes and Workshop Reference.

This reference file has been built up over the last twelve years at Piaggio Ltd, To help with fault finding, assembly understanding and to clarify and expand on technical information contained in Service Station Manuals and parts catalogues supplied from Italy.

Most of these pages have been created to help answer often asked questions I hope you find it useful.

We must ask you to consider this information as classified and therefore do not pass it on to anyone for any reason. I will be very disappointed if anything here turns up in the press or is quoted by customers. This information is continually being updated so please check the Piaggio Web site occasionally to see if there are new or updated pages available.

If you find an amended page please destroy the original to avoid any confusion.

If you find any mistakes or you feel that the information could be better presented or improved please contact me at Piaggio Ltd, after sales.

DISCLAIMER.

The information supplied here is accurate to the best of my knowledge but no guarantee is given as to the accuracy or suitability of this information. This information should always be used in conjunction with the relevant Piaggio manuals.

Piaggio Ltd, reserves the right to amend or withdraw any information contained here without prior notification.

Piaggio Ltd, its employees and agents can not be held responsible for any inaccuracies or omissions in this information. Nor can they be held liable for any consequence of using this information.

David Champion
Piaggio Ltd.
Technical Services
© Piaggio Ltd 1995 - 2006

Technical / After sales contacts:

For any After Sales problems or questions, your first contact should be your Regional After Sales Manager.

- Benjy Straw - Technical Services Manager
020 7401 4323. straw@piaggio.co.uk
- Gene Dalzell - Regional after sales manager, Midlands and North
07050 263036. dalzell@piaggio.co.uk
- Paul Balsillie - Regional after sales manager, Southern
07050 263039. basillie@piaggio.co.uk
- Mike Edwards - Warranty Management
020 7401 4322. edwards@piaggio.co.uk
Fax for warranty authorisation: 020 7401 4321
- David Champion - Technical information and advice
020 7401 4325. champion@piaggio.co.uk
- Adam Roylance - Technical & After Sales Training
07881 786478. roylance@piaggio.co.uk
- Sebnem Umman - Spare Parts and Accessories Manager
020 7401 4329. umman@piaggio.co.uk
- Technical department Fax: 020 7401 4321

**PLEASE MAKE SURE THAT YOU CONTACT THE
RIGHT PERSON**

Chapter 1

2 Stroke Auto engines

1. 50 / 80cc Charging early type
2. 50 / 80cc Charging later type
- 2a. NRG Charging & Gauges
- 2b. NRG Power Instrument connection
3. 50cc 2t Ignition
4. 125 & 180cc Charging / Ignition
5. 125 & 180cc Indicator circuit
6. 125 / 180cc Ignition
7. Runner 125 / 180cc 2t Fuses
8. Diesis 100 Ignition / Charging
9. Purejet 50 Charging / Ignition
10. Purejet 50 Indicators / Oil Check
11. Fly 50 Charging / Carb heater

Chapter 2

Leader / Quasar engines.

1. B125 / 200 Ignition / Charging
2. B125 Notes
3. B125 Fuse explanation
4. DNA 125 / 180 Ign. / Charging
5. DNA 125 / 180 Switch Wiring
6. ET4 125 Ignition / Charging
7. Hexagon GTX Ignition / Charging
8. Runner VX / VXR Ign./Charging
9. X9 125 / 180 Ignition / Charging
- 9a. X9 125 Indicator Wiring
10. Zip 125 Ignition / Charging
11. General notes
12. Immobiliser System explanation
13. Vespa GT 125 / 200 Ignition / Charging
14. Vespa GT Fuses
15. Skipper ST Ignition / Charging
16. Skipper ST Fuses
17. Skipper ST replacement instrument panel
18. X9 250 Evo Ignition / Charging
19. Fly 125 Ignition / Charging
- 19a Fly 125 Instrument panel connections
20. X8 125 / 200 Ignition / Charging
21. X8 Seat & Trunk Release
22. X8 125 / 200 Fuse Explanation

Chapter 3

4 Stroke (Non Leader) engines

1. Coguar 125 Ignition / Charging
2. ET4 (ZAPM04) Early Charging
3. ET4 (ZAPM04) Late Charging
4. ET4 (ZAPM04) Immobiliser Notes
5. Hexagon GTX 250 Ign./ Charging
6. Liberty 125(non Leader) Charging
7. X9 250 Ignition / Charging
8. X9 250 Notes
9. X9 250 Fuse Explanation
10. 50cc 4 stroke Ignition / Charging
11. 50cc 4 stroke Restriction Notes

Chapter 4

2 Stroke Manual engines.

1. H@k / GSM Ignition / Charging
2. H@K / GSM Notes
3. H@K / GSM Wiring Diagram
4. Vespa PX Ignition / Charging
5. Vespa PX Start Permissive Circuit
6. Vespa PX Indicator Circuit
7. Vespa T5 Horn circuit
8. Gilera RCR 50 Ignition / Charging
9. Gilera RCR Notes

Chapter 5

Electrical General

1. X9 Range General Notes
2. X9 Range. Under the front Panel
3. Stator Coil Values - Quick Ref.
4. Auto Choke Operation
5. Fuel Gauge Circuit
6. Digital Instrument Display Notes
7. Remote Seat Release
8. Setting the 2 button Digital Clock

Chapter 6

Fuel Systems

1. Typhoon 80 / 125 Fuel System
2. DNA Fuel Systems
3. Hexagon (EXS1T) Fuel System
4. Pumped Fuel Systems
5. Vespa PX Fuel Tap

Chapter 7

Mechanical

1. Fitting Main Bearings. All 2t autos.
2. Vespa PX Clutch assy.
3. Piston & Small End Sizes
4. Up Side Down Forks
5. Spark Plug List
6. Oil List
7. Tyres / Wheels Piaggio
- 7a. Tyres / Wheels Vespa
8. Tyres / Wheels Gilera
9. Keys Gilera
10. Keys General
11. De-Restriction Notes
12. Chassis Number Location
13. Quick Reference Guide
14. Service Limit List

Chapter 8

Injected Vehicles

1. X9 500 ignition
2. X9 500 lighting
3. X9 500 Centre Stand wiring
4. Nexus 500 Instrument panel connections

Chapter 9

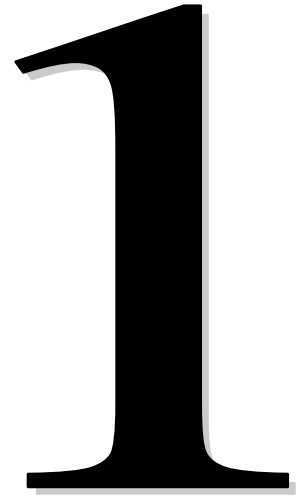
Tech Tips Collection

1. Tech Tips 01
2. Tech Tips 02
3. Tech Tips 03
4. Tech Tips 04
5. Tech Tips 05

Chapter 1

Electrical systems

Two Stroke Auto engines



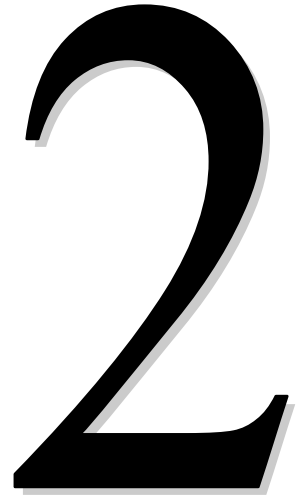
1. 50 & 80cc Charging, early type
2. 50 & 80cc Charging, later type
- 2a. NRG / Zip Cat Charging & Gauges
- 2b. NRG Power instruments
3. 50 & 80cc Ignition
4. 125 & 180cc Charging / Ignition
5. 125 & 180cc Indicator circuits
6. 125 & 180cc Ignition
7. Runner 125 / 180 2t Fuses
8. Diesis 100 Ignition / Charging
9. Purejet 50 Charging / Ignition
10. Purejet 50 Indicators / Oil check
11. Fly 50 Charging / Carb heater

Chapter 2

Electrical Systems

LEADER / QUASAR Engines

1. B125 / 200 Ignition / Charging
2. B125 Notes
3. B125 Fuse Explanation
4. DNA 125 / 180 Ign. / Charging
5. DNA 125 / 180 Switch Wiring
6. ET4 125 Ignition / Charging
7. Hexagon GTX Ign. / Charging
8. Runner VX / VXR Ign. / Charging
9. X9 125 / 180 Ignition / Charging
- 9a. X9 125 Indicator Wiring
10. Zip 125 Ignition / Charging
11. Leader General Notes
12. Immobiliser Notes
13. Vespa GT 125 / 200 Ignition / Charging
14. Vespa GT 125 / 200 Fuses
15. Skipper ST Ignition / Charging
16. Skipper ST Fuses
17. Skipper ST replacement instrument panel
18. X9 250 Evo Ignition / Charging
19. Fly 125 Ignition / Charging
- 19a. Fly 125 Instrument connections.
20. X8 125 / 200 Ignition / Charging
21. X8 Seat & Trunk release
22. X8 125 Fuse explanation



Chapter 3
Electrical Systems
Four Stroke (Non Leader)



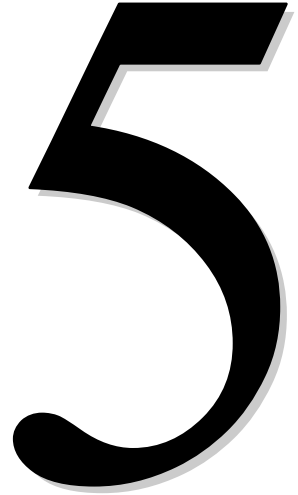
1. Coguar 125 Ignition / Charging
2. ET4 (ZAPM04) Early Charging
3. ET4 (ZAPM04) Late Charging
4. ET4 (ZAPM04) Immobiliser Notes
5. Hexagon GTX 250 Ign./ Charging
6. Liberty 125 (non Leader) Charging
7. X9 250 Ignition / Charging
8. X9 250 Notes
9. X9 250 Fuse Explanation
10. 50cc 4 stroke Ignition / Charging
11. 50cc 4 stroke Restriction Notes

Chapter 4
Electrical Systems
Two Stroke
Manual Engines

4

1. H@k / GSM Ignition / Charging
2. H@K / GSM Notes
3. H@K / GSM Wiring Diagram
4. Vespa PX Ignition / Charging
5. Vespa PX Start Permissive Circuit
6. Vespa PX Indicator Circuit
7. Vespa T5 Horn circuit
8. Gilera RCR 50 Ignition / Charging
9. Gilera RCR 50 Notes

Chapter 5
Electrical Systems
General



1. X9 Range General Notes
2. X9 Range. Under the front Panel
3. Stator Coil Values - Quick Ref.
4. Auto Choke Operation
5. Fuel Gauge Circuit
6. Digital Instrument Display Notes
7. Remote Seat Release

Chapter 6

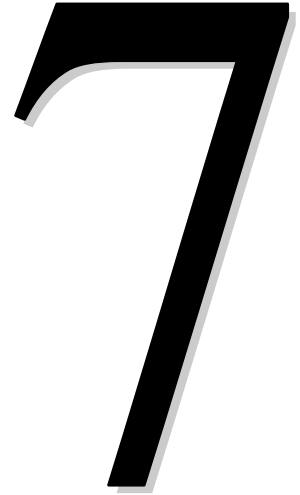
Fuel Systems

6

1. Typhoon 80 / 125 Fuel System
2. DNA Fuel Systems
3. Hexagon (EXS1T) Fuel System
4. Pumped Fuel Systems
5. Vespa PX Fuel Tap

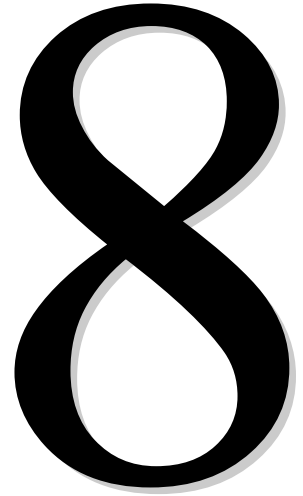
Chapter 7

Mechanical Systems



1. Fitting Main Bearings. All 2t autos.
2. Vespa PX Clutch assy.
3. Piston & Small End Sizes
4. Up Side Down Forks
5. Spark Plug List
6. Oil List
7. Tyres / Wheels Piaggio
- 7a. Tyres / Wheels Vespa
8. Tyres / Wheels Gilera
9. Keys Gilera
10. Keys General
11. De-Restriction Notes
12. Chassis Number Location
13. Quick Reference Guide
14. Service Limit List

Chapter 8
Injected Vehicles



1. X9 500 Charging wiring
2. X9 500 Ignition Wiring
3. X9 500 Centre Stand Wiring
4. Nexus 500 Instruments Wiring

Chapter 9

Tech Tips

A collection of the
Tech Tips
previously published
on the Piaggio Portal



01

02

03

04

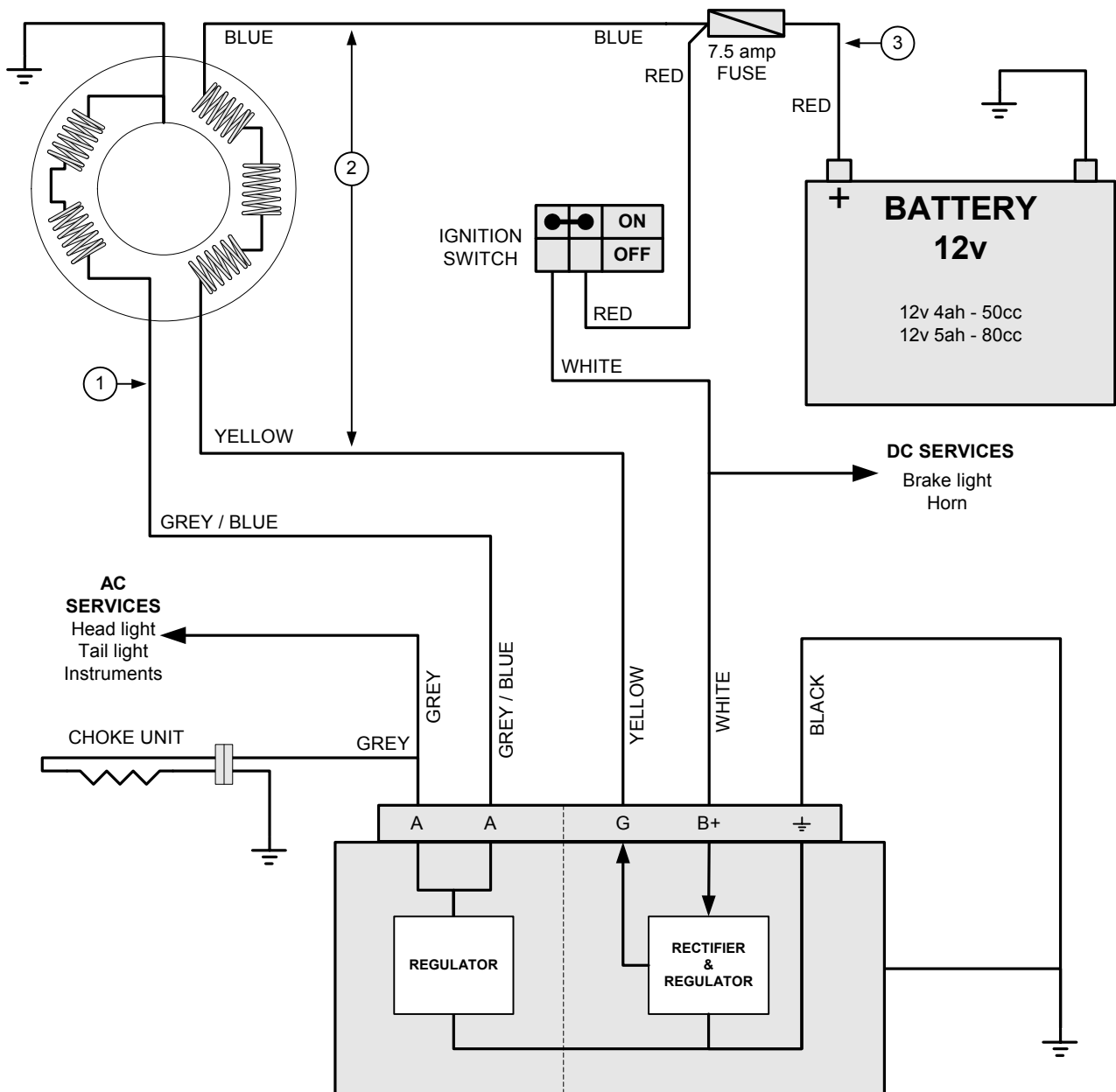
05

50 / 80cc 2T Charging (early vehicles)

Piaggio Ltd.

30/09/2005

5 pin regulator



* This diagram shows the early 50cc and 80cc two stroke wiring using a five pin connector on the rectifier / regulator. Refer to the separate diagram for later circuit using an eight pin rectifier / regulator.

* **RECOGNISE THIS CIRCUIT:** If the oil warning light comes on when the starter button is pressed.

* Two completely separate circuits for AC & DC.

AC is full wave and regulated

DC is half wave rectified and regulated

* 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 supplied with 12v AC when the engine is running .

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

NOTES.

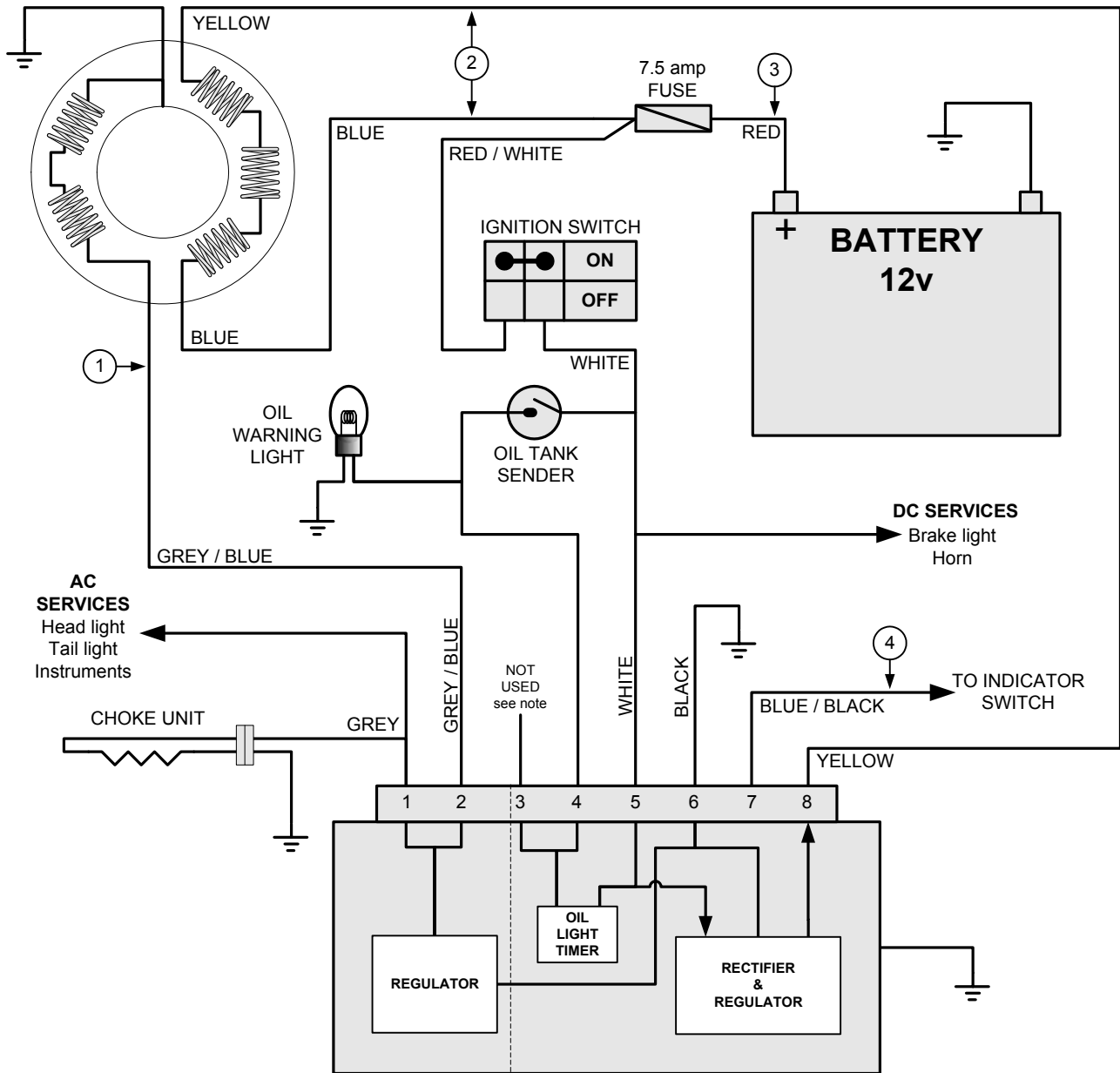
Engine must be earthed to the chassis / battery. Lack of this connection will affect the AC circuit and starter motor but not the DC circuit or ignition circuit.

50 / 80cc 2T charging

Piaggio Ltd.

30/12/2005

8 pin regulator



* This diagram shows the later 50cc and 80cc two stroke wiring using an eight pin connector on the rectifier / regulator. Refer to the separate diagram for earlier circuit using a five pin rectifier / regulator.

* **RECOGNISE THIS CIRCUIT:** If the oil warning light comes on for 15 seconds when ignition is turned on.

* Two completely separate circuits for AC & DC.

* Eight pin rectifier / regulator incorporates the indicator relay and oil light check function.

* The choke is supplied with 12v AC when the engine is running .

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.

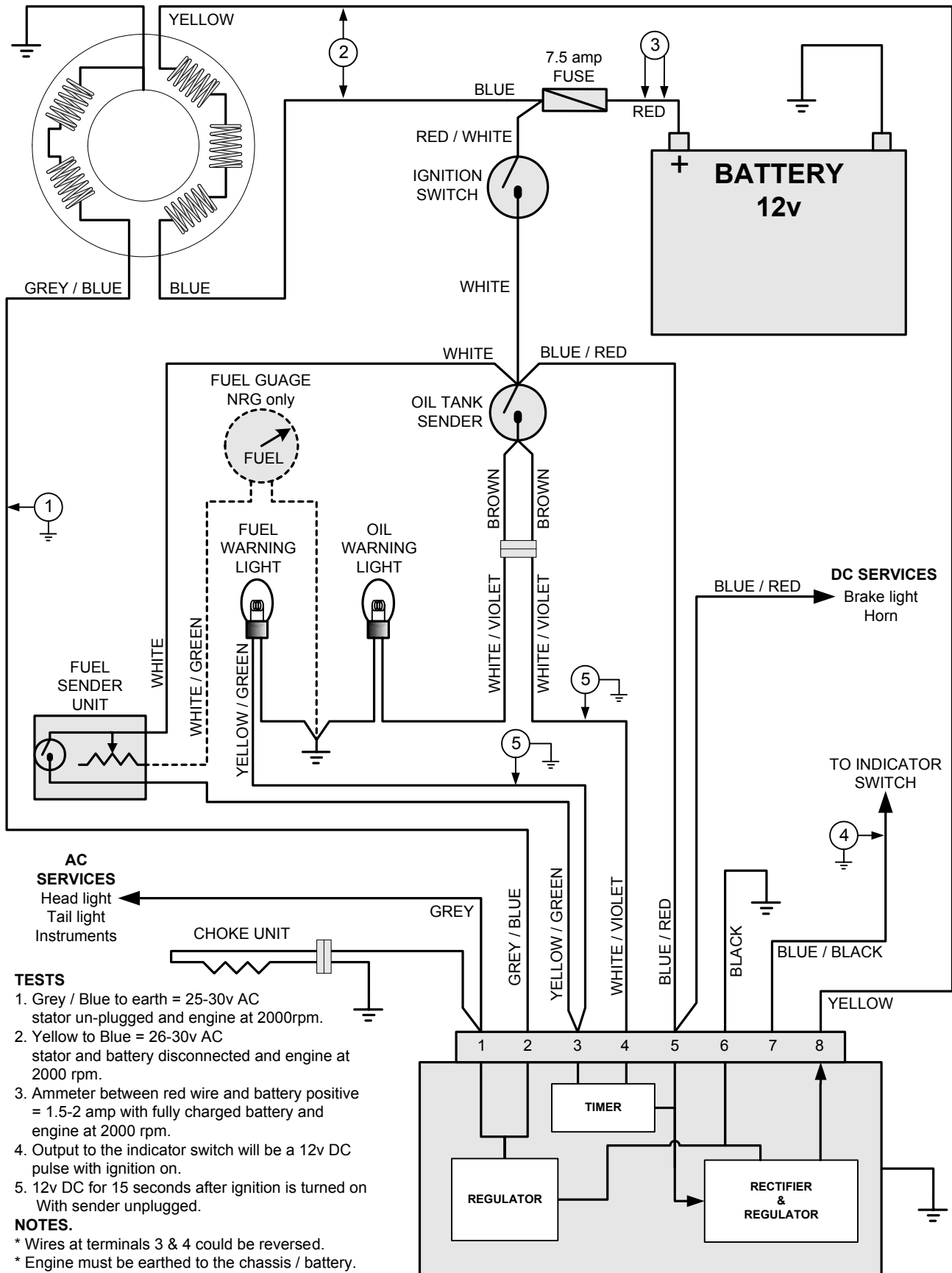
* Rectifier regulator pin 3 & 4 are both out puts from the timer so the wire could be connected to either pin.

NRG (up to Mc3) & ZIP Cat. Charging & Guages

Piaggio Ltd.

30/09/2005

8 pin regulator



TESTS

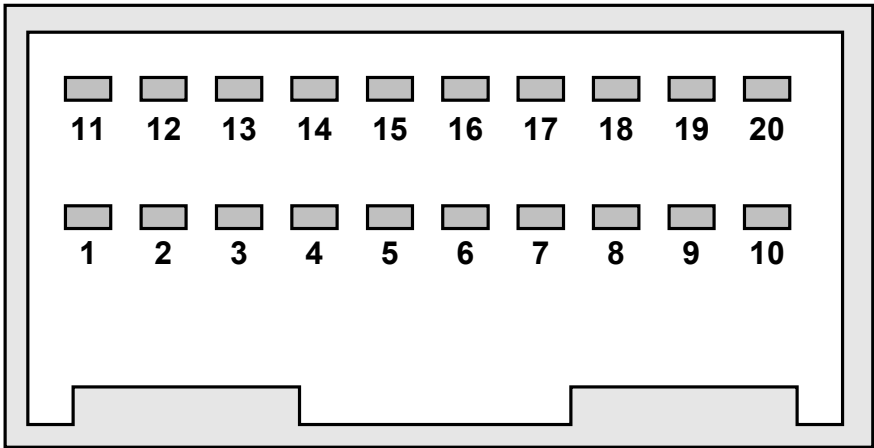
1. Grey / Blue to earth = 25-30v AC stator un-plugged and engine at 2000rpm.
2. Yellow to Blue = 26-30v AC stator and battery disconnected and engine at 2000 rpm.
3. Ammeter between red wire and battery positive = 1.5-2 amp with fully charged battery and engine at 2000 rpm.
4. Output to the indicator switch will be a 12v DC pulse with ignition on.
5. 12v DC for 15 seconds after ignition is turned on With sender unplugged.

NOTES.

- * Wires at terminals 3 & 4 could be reversed.
- * 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.

The NRG (up to Mc3) / Zip Cat wiring is very similar to other 50 / 80 scooters. Refer to page 1-2 (50 / 80 Charging) and page 1-3 (50cc 2t Ignition) for other information.

- NRG POWER Digital Instrument Panel Connector -



Multi pin connector on rear of instrument panel

PIN	WIRE COLOUR		CONNECTION
1	Blue / Red	BIR	Battery Positive. Permanent Live +
2	White	B	Ignition Switch. Switched Live +
3	Black	N	Earth -
4	Grey / Black	GrN	Wheel Speed Sender. Earth -
5	Red	Rs	Wheel Speed Sender. Power +
6	Light Blue	Az	Wheel Speed Sender. Signal
7	Yellow / Black	GN	Instrument lights
8	Black / Orange	NAr	?
9	-	-	Not used
10	Green	V	Rev counter signal. 100> volts AC
11	Yellow / Red	GR	Coolant temperature. Signal out to gauge, gauge earth's
12	White / Green	BV	Fuel gauge. 12v out to sender, sender earth's
13	Purple	Vi	High beam
14	White / Blue	BBI	Turn signal right. 12v in to bulb when right turn selected
15	Pink	R	Turn signal left. 12v in to bulb when left turn selected
16	White / Purple	BVi	Low two stroke oil warning light. Power in from sender
17	Yellow / Green	GV	Low fuel light. Power out to gauge, gauge earth's
18	-	-	Not used
19	-	-	Not used
20	-	-	Not used

* Pin 11 is only used on the liquid cooled engine *

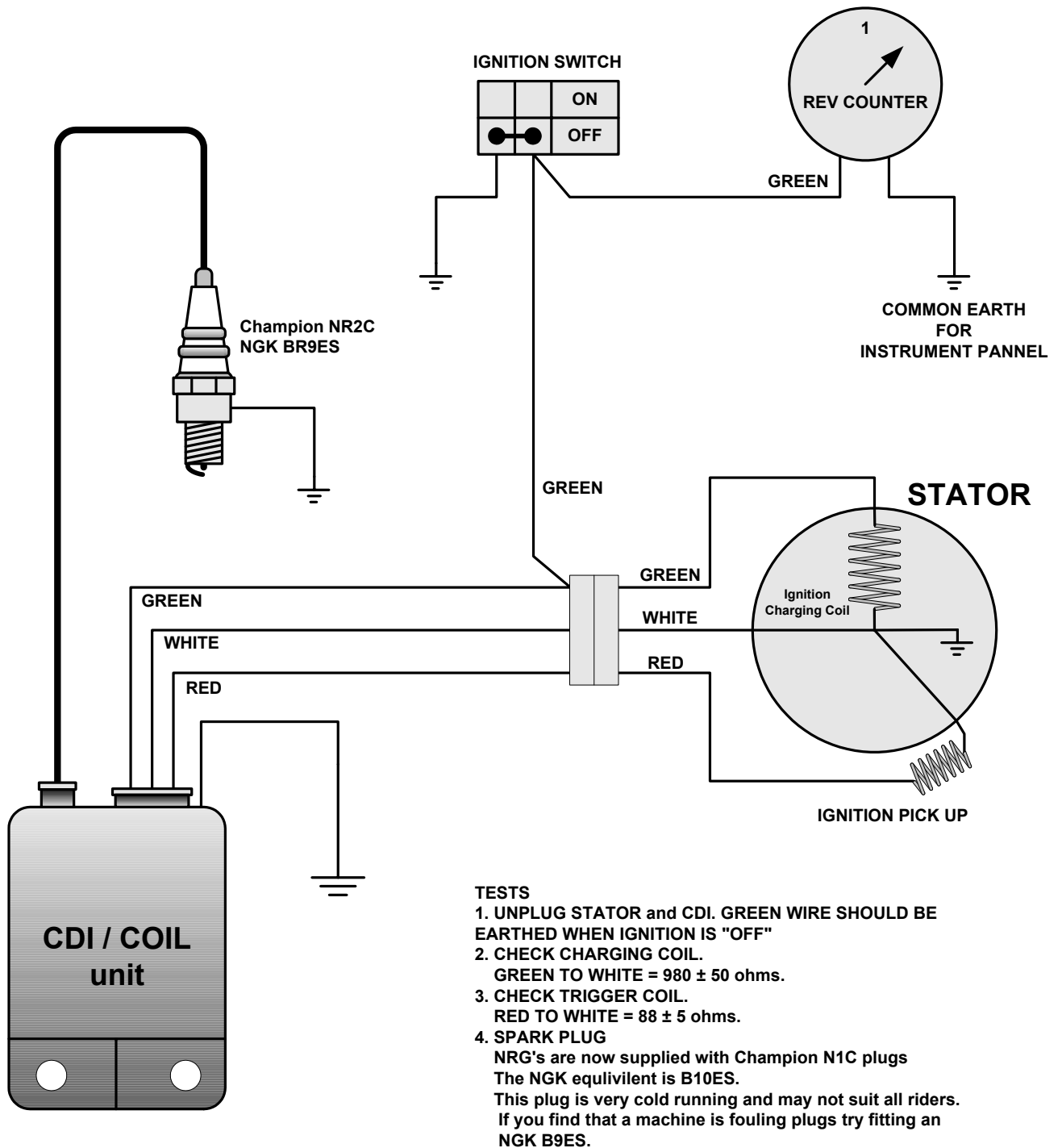
50cc 2t Ignition

Piaggio Ltd

25/08/05

Piaggio Ltd

This circuit could apply to any twist & go 50cc two stroke with or without a rev counter



NOTES

White wire is a common, dedicated earth for the ignition system.

If the engine earth strap was missing the engine would run but you may have problems with the CDI unit failing because the electrical system may try to use the white wire as its earth connection.

Green wire will have 150-200v AC when engine is running.

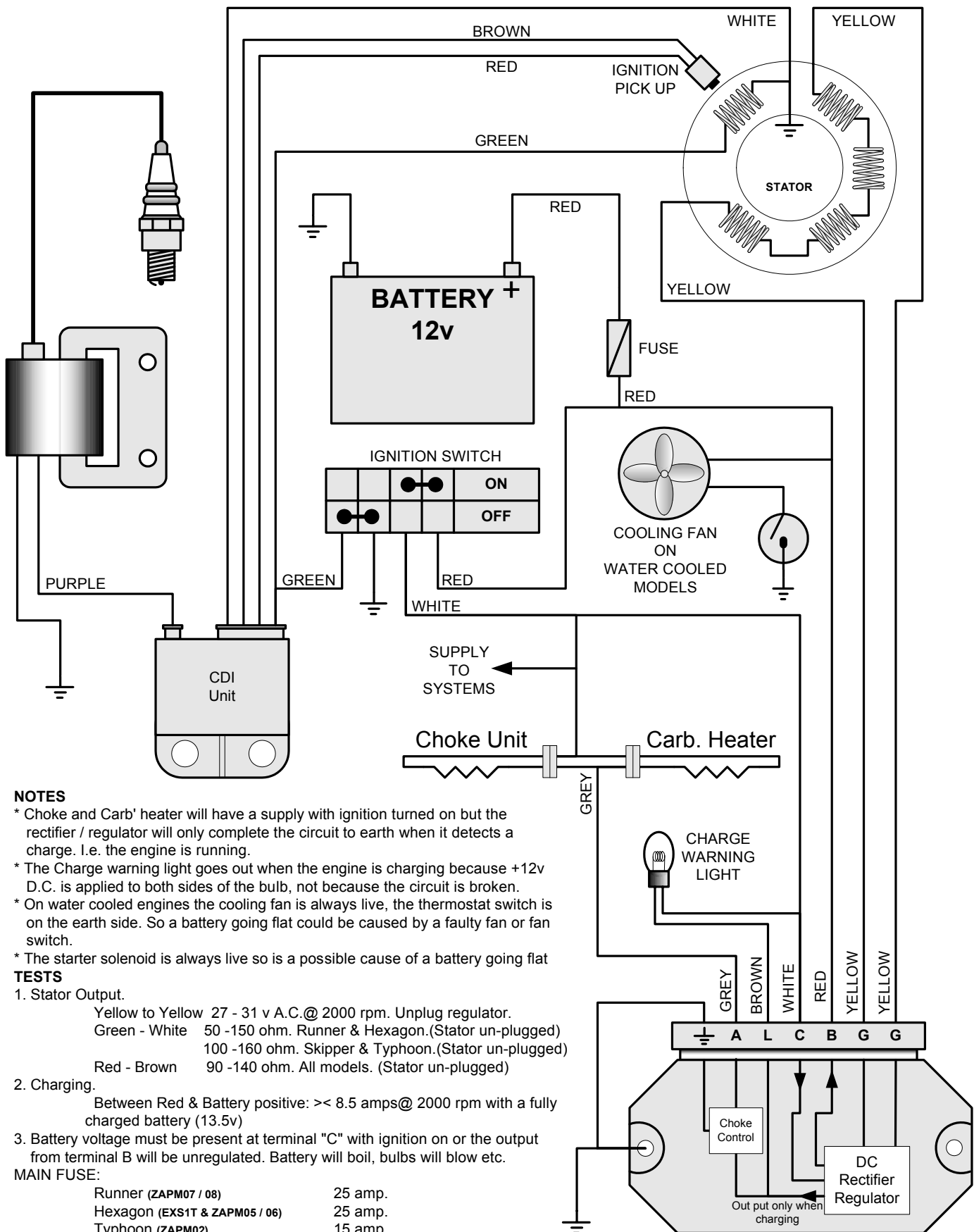
Ignition timing is fixed, i.e. there is no automatic advance / retard.

125 & 180cc 2t charging / Ignition

Typhoon, Skipper, Hexagon, Runner

Piaggio Ltd

11/09/2003



NOTES

- * Choke and Carb' heater will have a supply with ignition turned on but the rectifier / regulator will only complete the circuit to earth when it detects a charge. I.e. the engine is running.
- * The Charge warning light goes out when the engine is charging because +12v D.C. is applied to both sides of the bulb, not because the circuit is broken.
- * On water cooled engines the cooling fan is always live, the thermostat switch is on the earth side. So a battery going flat could be caused by a faulty fan or fan switch.
- * The starter solenoid is always live so is a possible cause of a battery going flat

TESTS

1. Stator Output.

- Yellow to Yellow 27 - 31 v A.C. @ 2000 rpm. Unplug regulator.
- Green - White 50 - 150 ohm. Runner & Hexagon. (Stator un-plugged)
- 100 - 160 ohm. Skipper & Typhoon. (Stator un-plugged)
- Red - Brown 90 - 140 ohm. All models. (Stator un-plugged)

2. Charging.

Between Red & Battery positive: >> 8.5 amps @ 2000 rpm with a fully charged battery (13.5v)

3. Battery voltage must be present at terminal "C" with ignition on or the output from terminal B will be unregulated. Battery will boil, bulbs will blow etc.

MAIN FUSE:

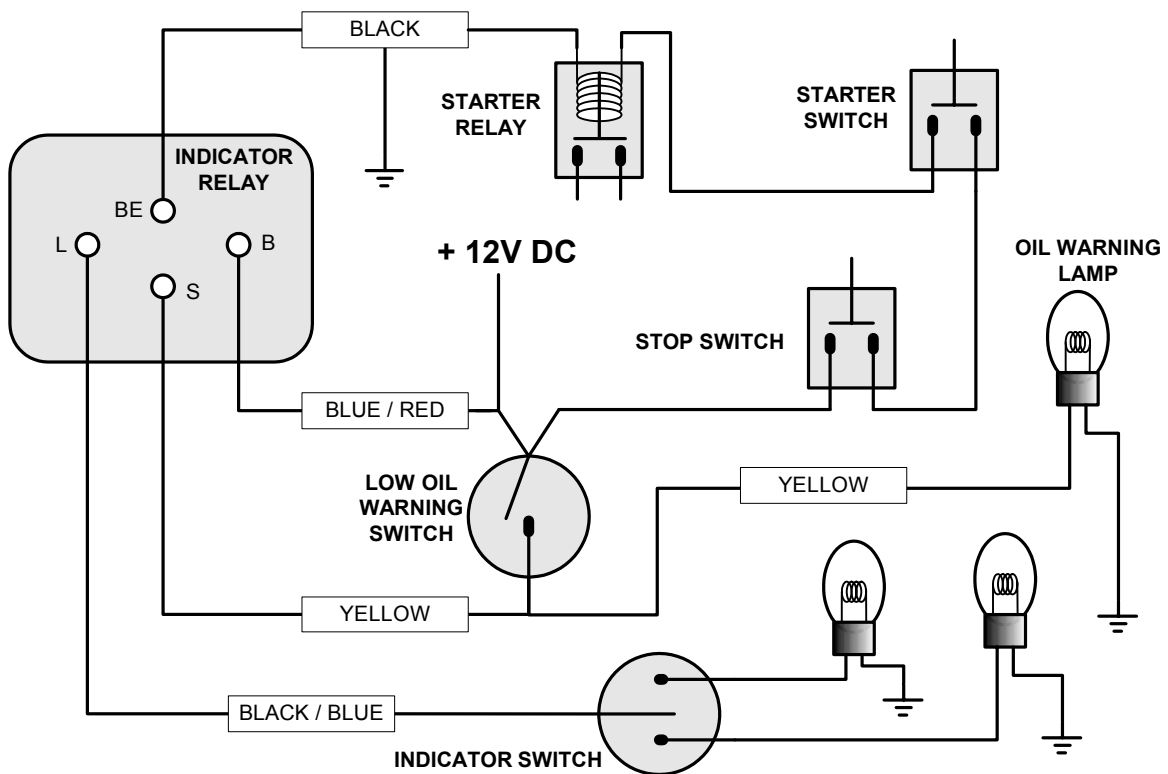
Runner (ZAPM07 / 08)	25 amp.
Hexagon (EXS1T & ZAPM05 / 06)	25 amp.
Typhoon (ZAPM02)	15 amp.
Skipper (CSM1T)	7.5 amp.

125 / 180 Two Stroke INDICATOR CIRCUIT

Piaggio Ltd

11/09/2003

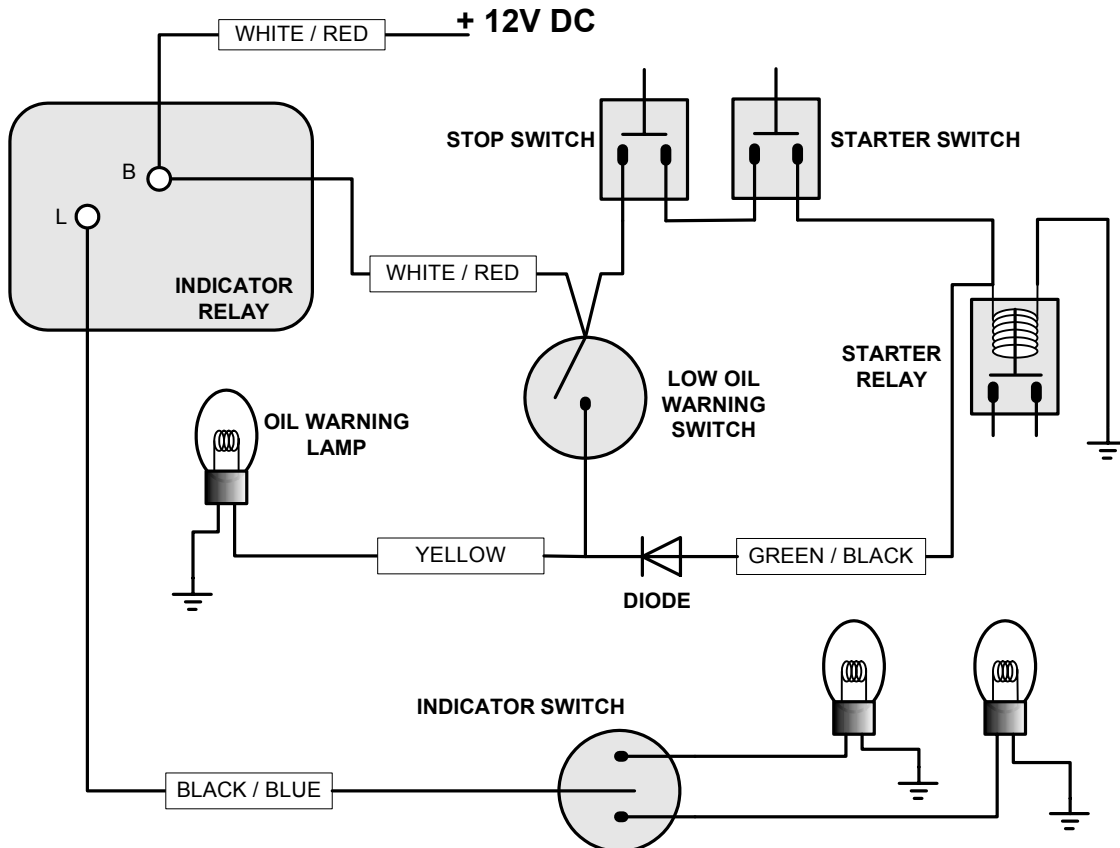
Piaggio Ltd



ABOVE. Vehicles 1999> Circuit with oil check light that comes on when ignition is switched on.

Refer to the Service Station Manual. Also Technical Notes 2/99 and 3/99.

BELOW. Vehicles <1999 Circuit with oil check light that comes on when brake is held on and starter button is pressed.

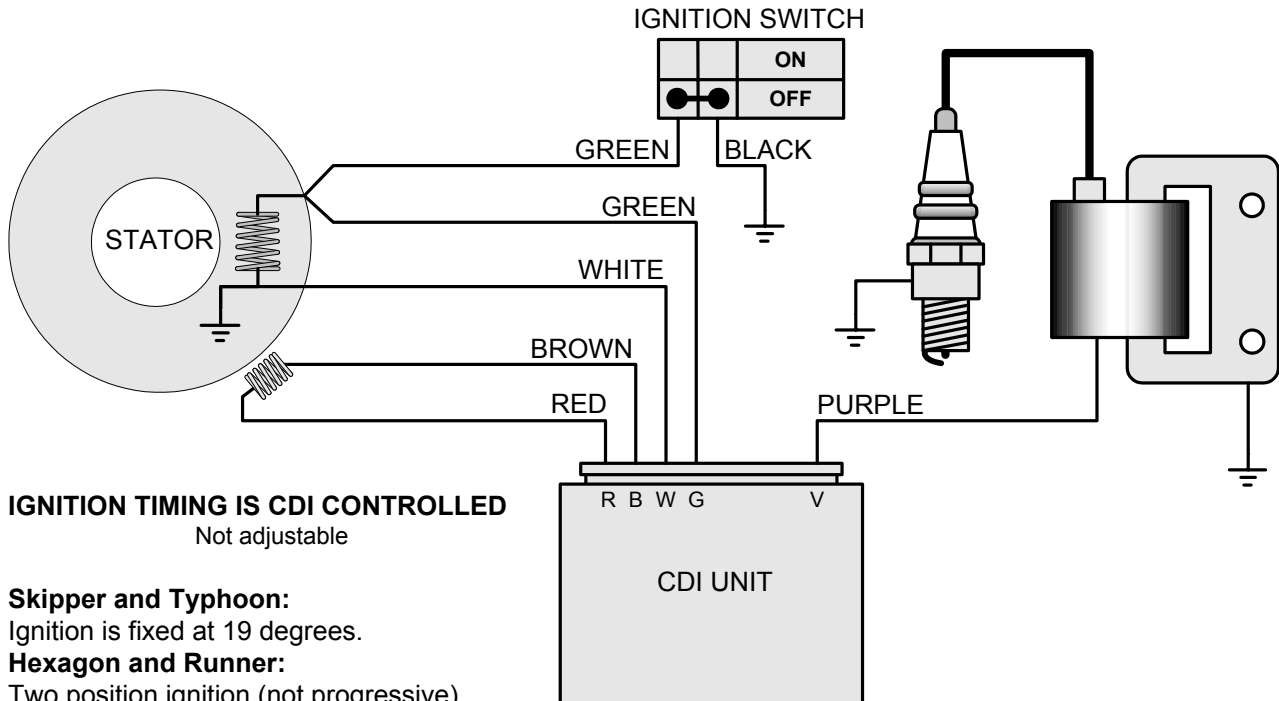


125 / 180 2T Ignition

Piaggio Ltd.

11/09/2003

Hexagon LX / LXT
Runner FX / FXR
Skipper & Typhoon 125



IGNITION TIMING IS CDI CONTROLLED
Not adjustable

Skipper and Typhoon:

Ignition is fixed at 19 degrees.

Hexagon and Runner:

Two position ignition (not progressive).

9 deg @ 1500+ rpm. Then 22 deg @ 7500+

STATOR TEST VALUES. Stator un-plugged

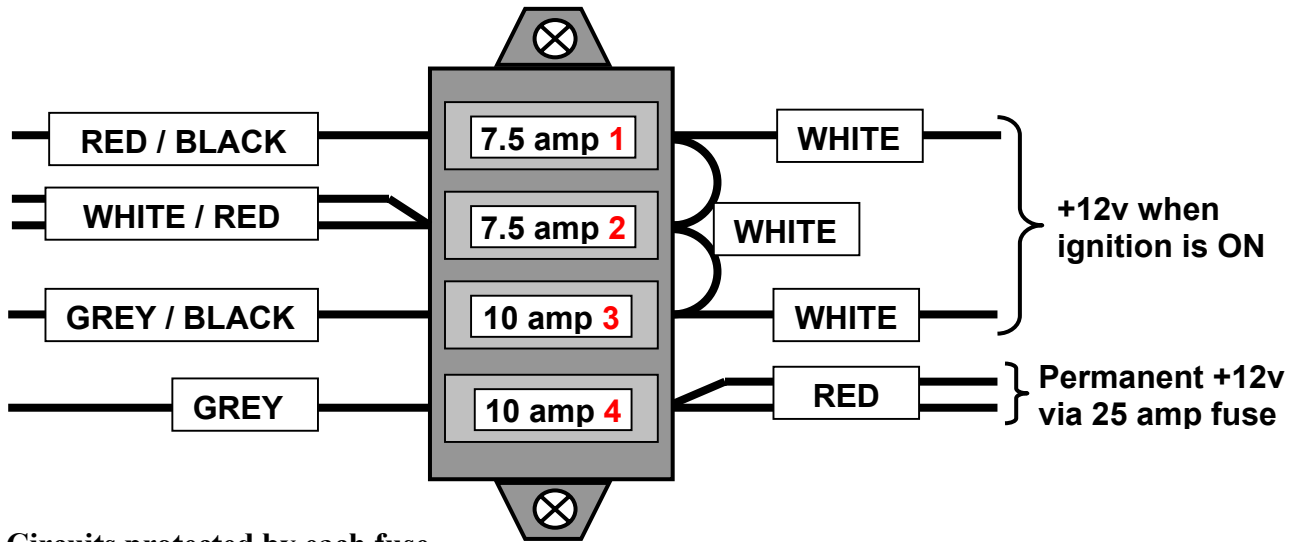
Meter between >	Red - Brown	White - Green	Purple - Earth	HT lead - Earth
To test >	Pick - up Coil	Charge Coil	HT Primary	HT Secondary
Hexagon LX / LXT	90 - 140 ohm	50 - 100 ohm	0.5 ± 0.025 ohm	4.8 ± 0.25 k ohm
Runner FX / FXR	90 - 140 ohm	50 - 100 ohm	0.5 ± 0.025 ohm	4.8 ± 0.25 k ohm
Skipper / Typhoon 125	90 - 140 ohm	100 - 160 ohm	0.5 ± 0.025 ohm	4.8 ± 0.25 k ohm

NOTES.

- * The ignition circuit is a separate self-contained circuit with no fuses and no connection to the other electrical circuits on the vehicle. It has a separate charging coil in the stator (Green & White wires).
- * The ignition switch contacts are OPEN when the engine is RUNNING. Contacts are CLOSED when switch is turned OFF, this allows the system to discharge to earth. When fault finding, if there is no spark then check the "green" and "purple" wires to see if there is a "leak" to earth. Unplug stator & CDI, check green to earth: Ignition on = no continuity. Ignition off = continuity.
- * A "Resistor" type spark plug and a resistor plug cap should always be fitted.
- * This circuit does not require the engine to chassis earth. But if that earth lead is missing it is possible that trying to use the starter motor could force excess current through the CDI and damage it. Always prove you have a good engine to chassis earth connection.

FUSE EXPLANATION

Runner FX 125 & FXR 180



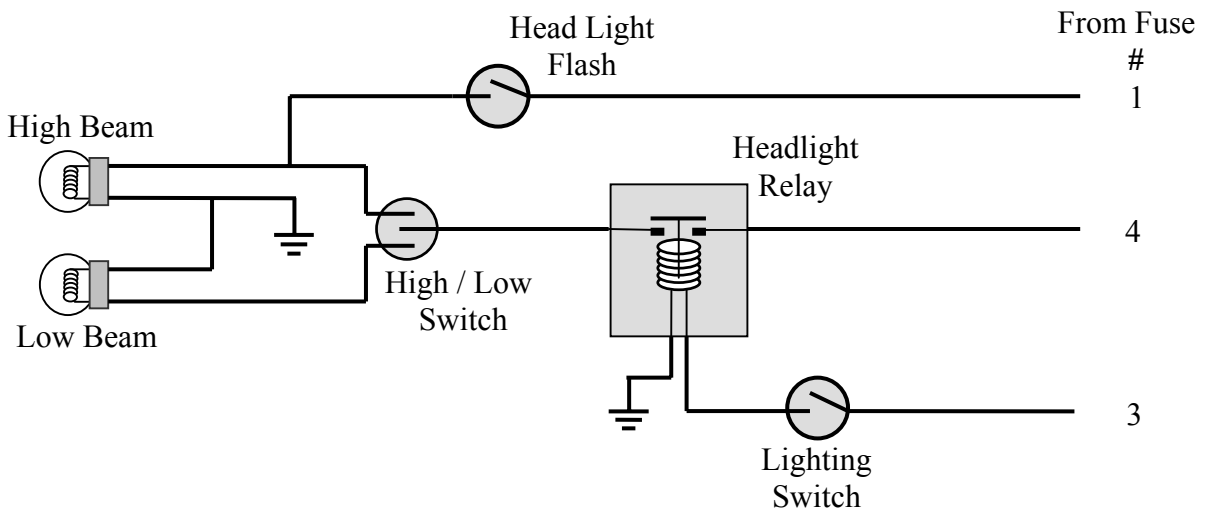
Circuits protected by each fuse.

1. Head light flash (passing light).
2. Indicators. Brake light. Oil indicator. Electric start relay. Temp gauge. Fuel gauge. Horn. Choke.
3. Headlight relay. Town light. Rear light (lighting switch)
4. Both headlights (power)

Notes.

- Ignition circuit is completely separate and self powered. It does not have any fuses.
- The cooling fan is permanently live and is protected by the main 25 amp fuse.
- The starter motor supply is not fused.

Relation between lighting and the fuses.

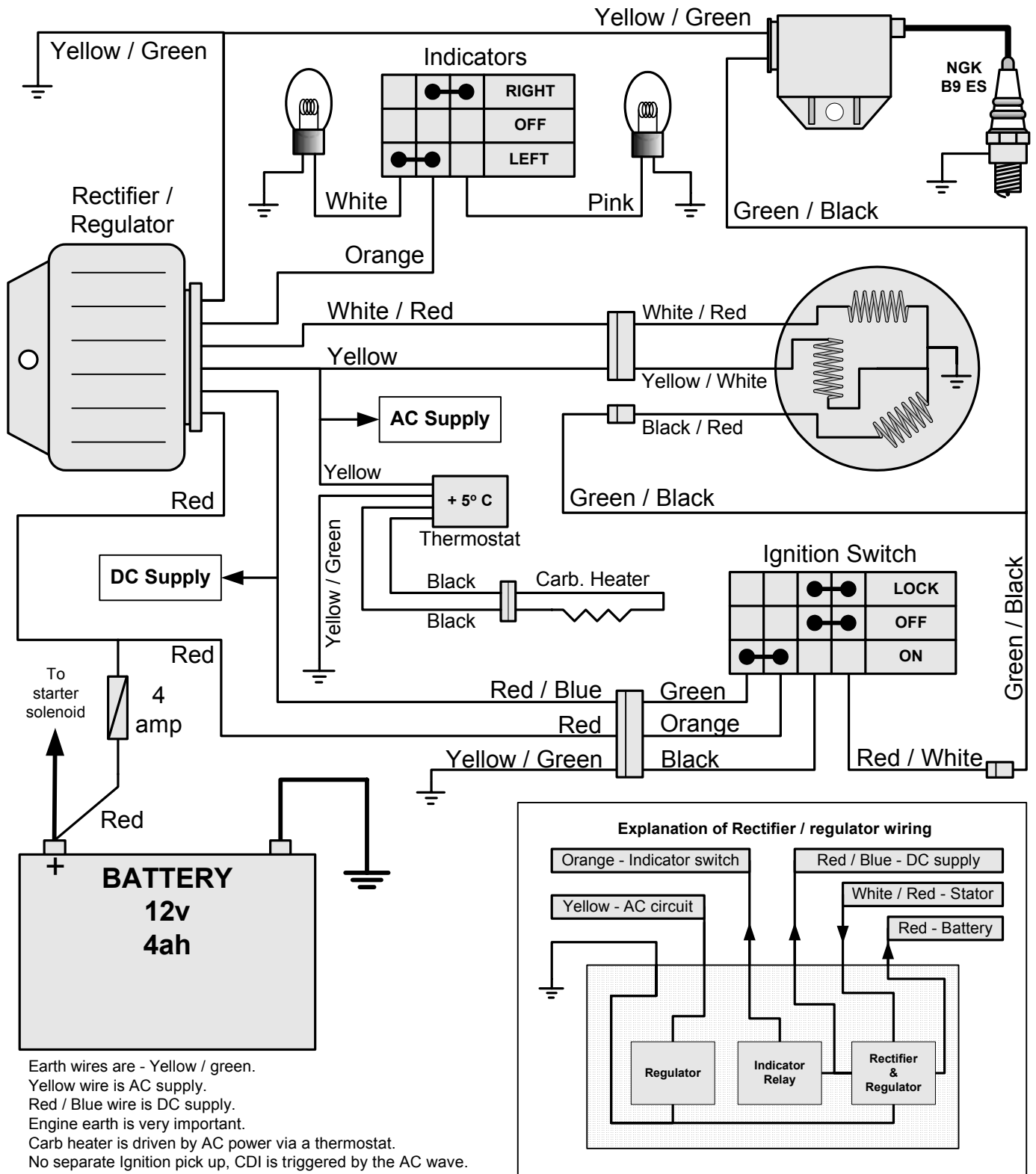


DIESIS 100 Charging / Ignition

Piaggio Ltd.

11/06/02

Derbi engine

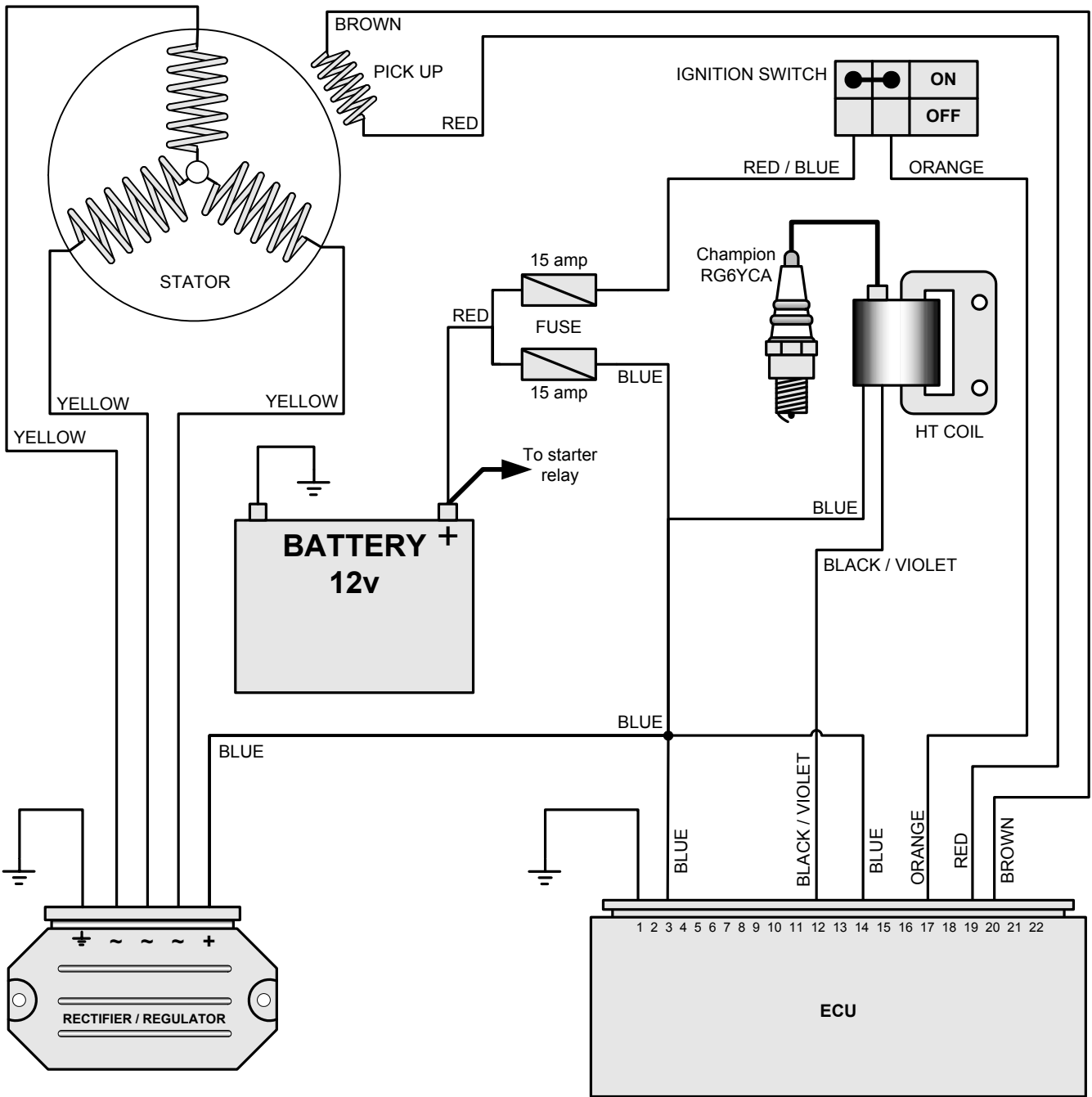


PUREJET 50 IGNITION / CHARGE

Piaggio Ltd.

02/09/2003

GILERA RUNNER



SYSTEM NOTES.

* 3 Phase AC.

* Permanent live battery feed to Rectifier, ECU, HT Coil (blue wire). Any of these could drain the battery if they were faulty.

* HT Coil is triggered by the BLACK / VIOLET wire being earthed via the ECU.

TESTS:

Stator: Disconnected. Any yellow to any yellow = 0.7 - 0.9 ohm. Any yellow to earth = No continuity
Pick Up coil value is not quoted.

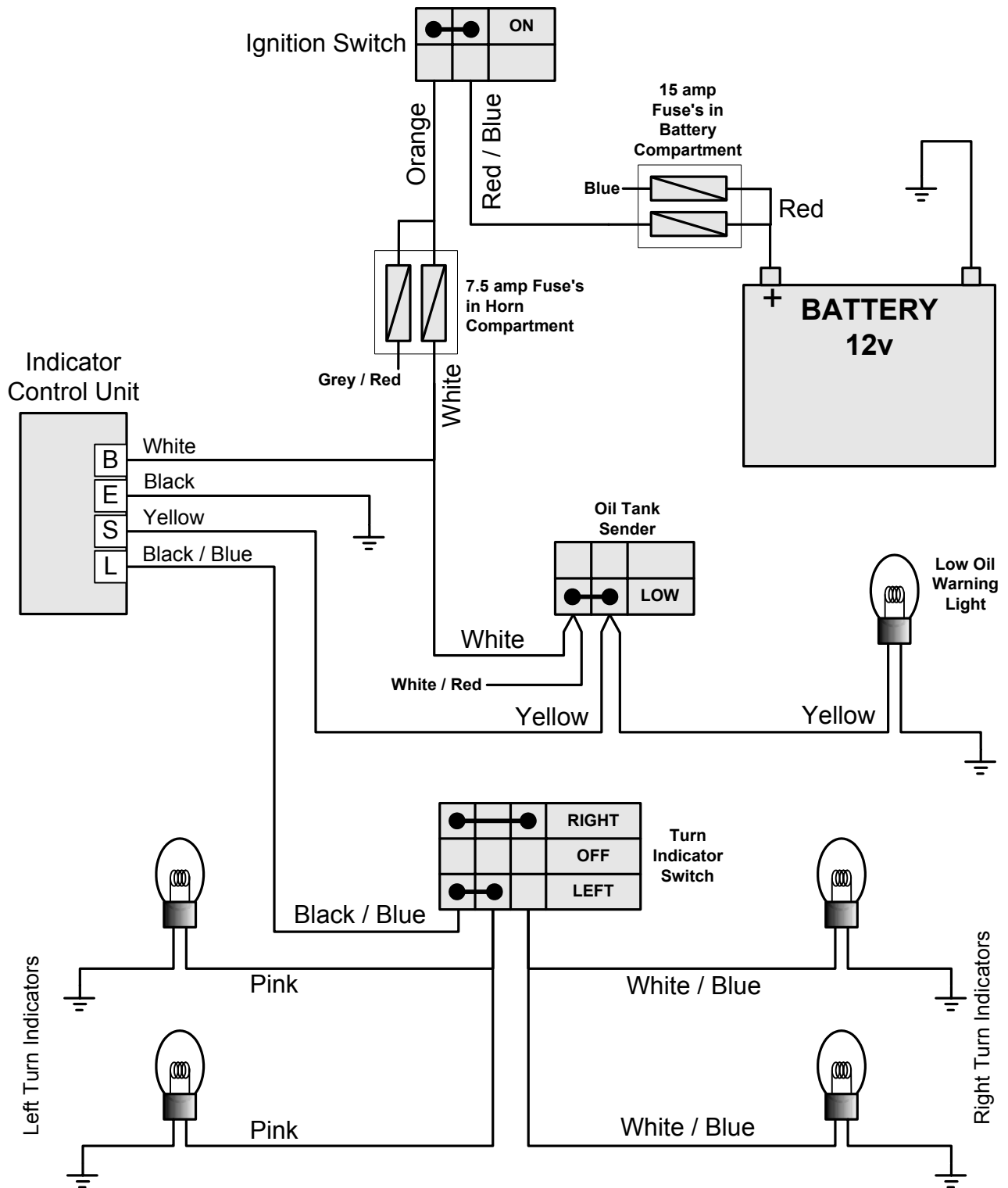
Rectifier / Regulator: With a charged battery the possible voltage must not exceed 15.2 volts.

Purejet 50 Turn Signals & Oil check

Piaggio Ltd.

12/01/2004

Runner



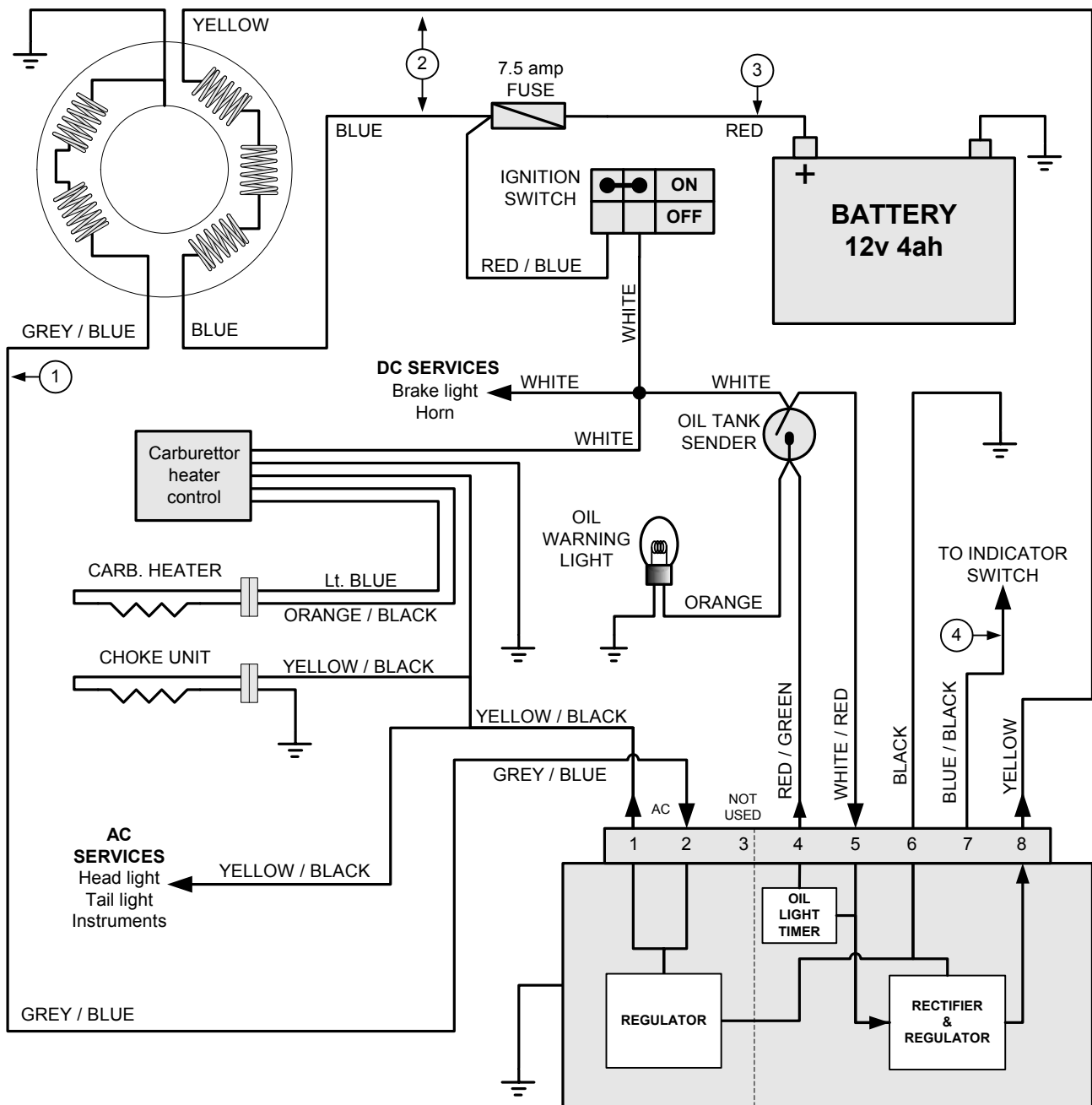
- * The low oil warning light check function is controlled by the indicator relay.
- * The oil check light should come on for 15 seconds when the ignition is first turned on.
- * If the system fails: first check the 7.5 amp fuse located under the front grill (horn) panel.

Fly 50 & Vespa LX 50 charging & carb heater

Piaggio Ltd.

13/12/2005

2 stroke engine



This diagram shows the Fly 50 & Vespa LX 50 two stroke wiring, it is basically the same as other 50 two strokes but there are a few slight variations including the electric carb heater.

TESTS.

- Stator out put. Grey / Blue to earth = 25-30v AC stator un-plugged and engine at 2000rpm.
- Stator out put. Yellow to Blue = 26-30v AC stator un-plugged and engine at 2000 rpm.
- Ammeter between red wire and battery positive = 1.5-2 amp with fully charged battery and engine at 2000 rpm
- Output to the indicator switch will be a 12v DC pulse with ignition on.

NOTES.

- The carburettor heater is DC powered but the controller is activated by AC so it will only turn the heater on when the engine is running (AC output is detected).
- The choke is AC powered as normal. It is not controlled by the Carb. heater controller.
- 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.