Chapter 7 Electrical system

For information relating to the RD350 F II and N II models, refer to Chapter 8

Contents

Specifications

Battery	
Make	Nippon Denso
Type	Lead acid
Charge rate	0.55A for 10 hours
Specific gravity:	
RD350 LC II	1.260
Other models	1.280
Alternator	
Make	Nippon Denso
Model:	
RD350 LC II	AVCC58
Other models	51L
Charging output	14V 14A @ 5000 rpm
Charging coil resistance:	
RD350 LC II	0.4 ohms ± 20% @ 20°C (68°F)
Other models	0.5 ohms ± 20% @ 20°C (68°F)
Voltage regulator	
Type	Short circuit, combined with rectifier
Make	Shindengen Kougyou
Model	SH235-12C
Regulated voltage	14.5 ± 0.5V

Rectifier

Type	3-phase, full wave, combined with regulator
Make	Shindengen Kougyou
Model	SH235-12C
Capacity	15A
Withstand voltage	200V

Horn

Make	Nikko
Model	CF12
Max amperage	2.5A or less

Turn signal relay

Make	Nippon Denso
Model	FJ245ED
Type	Transistor
Frequency	85 cpm
Capacity	12 volt 21W x2 plus 3.4W x1

Fuses

Main	20A
Headlamp:	
RD350 LC II	10A
Other models	15A
Turn signal	15A
Ignition (RD350 LC II only)	5A
YPVS (not RD350 LC II)	5A
Spare:	
RD350 LC II	10A x2
Other models	20A x1, 15A x1, 5A x1

Temperature gauge sender

Make	Nissei
Model	YA55901NO

Bulb wattages (all 12 volt)

Headlamp	60/55W Quartz halogen
Tail/brake	5/21W (x2 except RD350 LC II model)
Turn signal	21W x4
Meter lamp	3.4W (x3, RD350 LC II – x5, other models)
Parking/city lamp	3.4W
Indicator lamps:	
Neutral	3.4W
High beam	3.4W
Oil warning	3.4W
Turn	3.4W x2

1 General description

The electrical system is powered by a crankshaft-mounted three-phase alternator located behind the left-hand engine casing. Output from the alternator is fed to a combined rectifier/regulator unit where it is converted from alternating current (ac) to direct current (dc) by the full-wave rectifier section, and the system voltage is regulated to 14.5 ± 0.5 volts by the electronic voltage regulator.

2 Testing the electrical system

1 Simple continuity checks, for instance when testing switch units, wiring and connections, can be carried out using a battery and bulb arrangement to provide a test circuit. For most tests described in this Chapter, however, a pocket multimeter should be considered essential. A basic multimeter capable of measuring volts and ohms can be bought for a very reasonable sum and will provide an invaluable tool. Note that separate volt and ohm meters may be used in place of the multimeter, provided those with the correct operating ranges are available.

2 Care must be taken when performing any electrical test, because some of the electrical components can be damaged if they are incorrectly connected or inadvertently shorted to earth. This is particularly so in the case of electronic components. Instructions

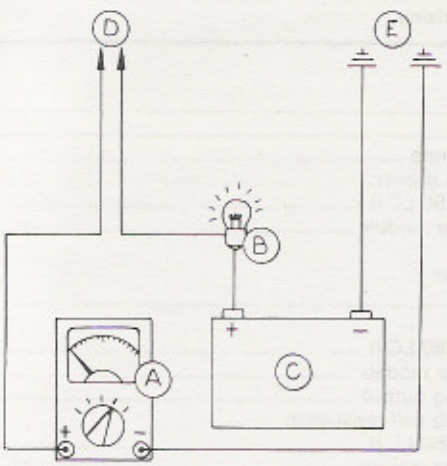


Fig. 7.1 Simple testing apparatus for electrical tests

A Multimeter
B Bulb
C Battery
D Positive probe
E Negative probe

regarding meter probe connections are given for each test, and these should be read carefully to preclude accidental damage occurring.
3 Where test equipment is not available, or the owner feels unsure of the procedure described, it is strongly recommended that professional assistance is sought. Errors made through carelessness or lack of experience can so easily lead to damage and the need for expensive replacement parts.
4 A certain amount of preliminary dismantling will be necessary to gain access to the components to be tested. Normally, removal of the seat and side panels will be required, with the possible addition of the fuel tank and headlamp unit to expose the remaining components.

3 Charging system: checking the output

1 In the event that the charging system fails or appears to be over- or under-charging the battery, the system voltage should be checked using a dc voltmeter or a multimeter set on the 0 – 20 volts dc scale. Remove the side panel to gain access to the battery terminals, noting that the battery leads must **not** be disconnected during the test. **Note:** If the machine is run with the battery disconnected the increased voltage across the alternator terminals will rise, causing damage to the regulator/rectifier unit or to the alternator windings.
2 Connect the positive (red) probe lead to the positive (+) battery terminal and the negative (black) probe lead to the negative (−) battery terminal. Start the engine and note the voltage reading at 2000 rpm. This should be 14.5 ± 0.5 volts if the system is operating correctly. If the voltage is outside this range it will be necessary to check the following, in the order shown below:

(a) Battery condition; see Sections 4 and 5
(b) Alternator windings; see Section 6
(c) Regulator/rectifier; see Section 7

4 Battery: examination and maintenance

1 The battery is housed in a tray on the right-hand side of the machine, behind the side panel. It is retained in the tray by a rubber strap. Note that the strap also holds a plastic shroud which is designed to cover the battery positive terminal. Care should be taken not to lose this; without it the battery may short out against the fuel tank.
2 The transparent plastic case of the battery permits the upper and lower levels of the electrolyte to be observed, without disturbing the battery, by removing the side cover. Maintenance is normally limited to keeping the electrolyte level between the prescribed upper and lower limits and making sure that the vent tube is not blocked.The lead plates and their separators are also visible through the transparent case, a further guide to the general condition of the battery. If electrolyte level drops rapidly, suspect over-charging and check the system.
3 Unless acid is spilt, as may occur if the machine falls over, the electrolyte should always be topped up with distilled water to restore the correct level. If acid is spilt onto any part of the machine, it should be neutralised with an alkali such as washing soda or baking powder and washed away with plenty of water, otherwise serious corrosion will occur. Top up with sulphuric acid of the correct specific gravity (1.260 to 1.280) only when spillage has occurred. Check that the vent pipe is well clear of the frame or any of the other cycle parts.
4 It is seldom practicable to repair a cracked battery case because the acid present in the joint will prevent the formation of an effective seal. It is always best to renew a cracked battery, especially in view of the corrosion which will be caused if the acid continues to leak.
5 If the machine is not used for a period of time, it is advisable to remove the battery and give it a 'refresher' charge every six weeks or so from a battery charger. The battery will require recharging when the specific gravity falls below 1.260 (at 29°C – 68°F). The hydrometer reading should be taken at the top of the meniscus with the hydrometer vertical. If the battery is left discharged for too long, the plates will sulphate. This is a grey deposit which will appear on the surface of the plates, and will inhibit recharging. If there is sediment on the bottom of the battery case, which touches the plates, the battery needs to be renewed. Prior to charging the battery refer to the following Section for correct charging rate and procedure. If charging from an external source with the battery on the machine, disconnect the leads, or the rectifier will be damaged.
6 Note that when moving or charging the battery, it is essential that the following basic safety precautions are taken:

(a) Before charging check that the battery vent is clear or, where no vent is fitted, remove the combined vent/filler caps. If this precaution is not taken the gas pressure generated during charging may be sufficient to burst the battery case, with disastrous consequences.
(b) Never expose a battery on charge to naked flames or sparks. The gas given off by the battery is highly explosive.
(c) If charging the battery in an enclosed area, ensure that the area is well ventilated.
(d) Always take great care to protect yourself against accidental spillage of the sulphuric acid contained within the battery. Eyeshields should be worn at all times. If the eyes become contaminated with acid they must be flushed with fresh water immediately and examined by a doctor at once. Similar attention should be given to a spillage of acid on the skin.

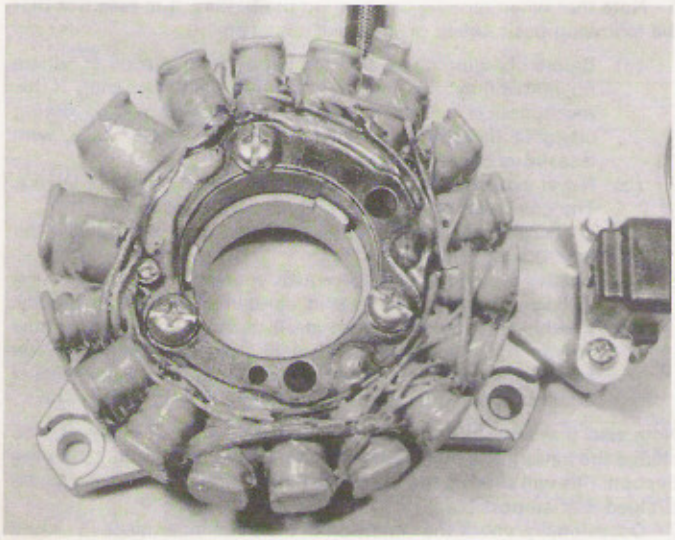
Note also that although, should an emergency arise, it is possible to charge the battery at a more rapid rate than that stated in the following Section, this will shorten the life of the battery and should therefore be avoided if at all possible.
7 Occasionally, check the condition of the battery terminals to ensure that corrosion is not taking place, and that the electrical connections are tight. If corrosion has occurred, it should be cleaned away by scraping with a knife and then using emery cloth to remove the final traces. Remake the electrical connections whilst the joint is still clean, then smear the assembly with petroleum jelly (NOT grease) to prevent recurrence of the corrosion. Badly corroded connections can have a high electrical resistance and may give the impression of complete battery failure.
8 It should be noted that it is almost impossible to test the electrical system with any degree of accuracy unless the battery is in sound condition and fully charged. Many apparent charging system faults can be attributed to an old and worn out battery which can no longer hold a charge. If the battery runs flat when the machine is left unused for a few days it is fairly safe to assume that its useful life has ended. To be certain, have the battery checked under load by an auto-electrical specialist, or check the electrical system using a battery known to be in good condition.

5 Battery: charging procedure

1 The normal charging rate for the 5.5 amp hour battery is 0.5 amps. A more rapid charge, not exceeding 1 amp can be given in an emergency. The higher charge rate should, if possible, be avoided since it will shorten the working life of the battery.
2 Make sure that the battery charger connections are correct, red to positive and black to negative. It is preferable to remove the battery from the machine whilst it is being charged and to remove the vent plug from each cell. When the battery is reconnected to the machine, the black lead must be connected to the negative terminal and the red lead to positive. This is most important, as the machine has a negative earth system. If the terminals are inadvertently reversed, the electrical system will be damaged permanently.

6 Alternator: winding resistance tests

1 The condition of the alternator windings can be checked by measuring their resistance. It should be noted that the resistance figure is very low and cannot be measured accurately using a very cheap multimeter with only a K ohms scale. In the absence of a good meter, take the machine to a Yamaha dealer to have the test performed, or check the fault by substituting a new stator assembly and noting the effect.
2 Trace the alternator wiring back to the four-pin connector and separate it. Measure the resistance between each pair of White leads; a total of three tests. A reading of 0.4 ohms ± 20% at 20°C (68°F) for the RD350 LC II or 0.5 ohms ± 20% at 20°C (68°F) for the remaining models should be indicated. A break in one or more windings will show infinite resistance. A short-circuit is less easy to distinguish, given the very low standard resistance of the windings.



6.2 Alternator stator windings are encapsulated in resin – broken or shorted windings indicate renewal

7 Regulator/rectifier unit: testing

1 The regulator/rectifier unit is a sealed, finned alloy unit, mounted between the frame top tubes below the rear of the fuel tank. To remove the unit it is first necessary to release the electrical panel. The unit is attached to the underside of the panel. Note that it can be tested in position.

2 The regulator's operation is tested by performing the charging system output test, as described in Section 3. If the output voltage is incorrect, and the battery, alternator and rectifier are known to be operating correctly, it can be assumed that the unit is faulty and in need of renewal. It is worth having this checked by a Yamaha dealer though.

3 The rectifier is an arrangement of six diodes, connected in a bridge pattern to provide full-wave rectification. This means that the full output of the alternator is converted to dc, rather than half of it, as is the case with simple half-wave rectifiers as used on lightweight machines and mopeds.

4 The condition of the rectifier can be checked using a multimeter, set on its resistance scale, as a continuity tester. Each of the diodes acts as a one-way valve, allowing current to flow in one direction, but blocking it if the polarity is reversed. Perform the resistance check by following the table accompanying this Section. If any one test produces the wrong reading the rectifier will have to be renewed.

8 YPVS system: general description and fault diagnosis

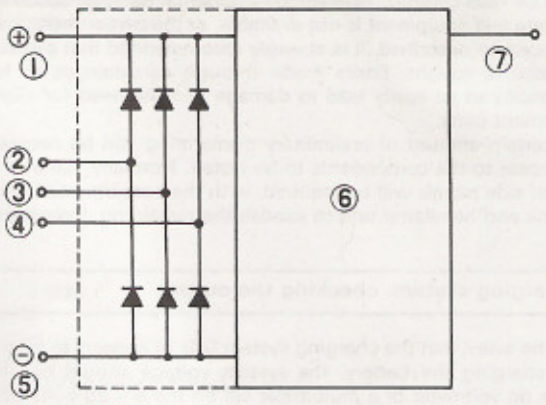
1 The Yamaha Power Valve System (YPVS) comprises a mechanical valve and control cables, described in Chapter 1, and the associated electrical and electronic control equipment, these being covered in this Section.

2 The valve is opened and closed by the servomotor unit. This is mounted below the frame top tubes, near the steering head. Beneath the seat is the control unit which senses engine speed by picking up pulses from the CDI unit and uses this information to set the power valve to the correct position.

3 In the event of a suspected fault, always check first that the power valve cables are correctly adjusted as described in Section 35 of Chapter 1. Note also that it is essential that the recommended resistor-type spark plugs are used. If non-resistor plugs are fitted, spurious signals are fed to the control unit, causing the valve to flutter at some engine speeds. If the fault persists, proceed as described below.

4 Switch the ignition on and check that the valve opens and closes normally. The valve cycles automatically each time the ignition is switched on as a self-cleaning measure. If the valve fails to move, and assuming that it is not physically jammed, check that all wiring connectors between the servomotor, control unit and CDI unit are sound. If this fails to effect a cure, test the servomotor (see Section 9). If this fails to resolve the problem, check the control unit (see Section 10).

5 If the valve cycles normally, but the valve is not in its closed position when the engine is started, check the wiring connections between the CDI unit and the control unit. If this fails to find the problem, check the control unit (Section 10). If everything else seems to operate normally, the fault lies with the CDI unit which should be checked by substitution.

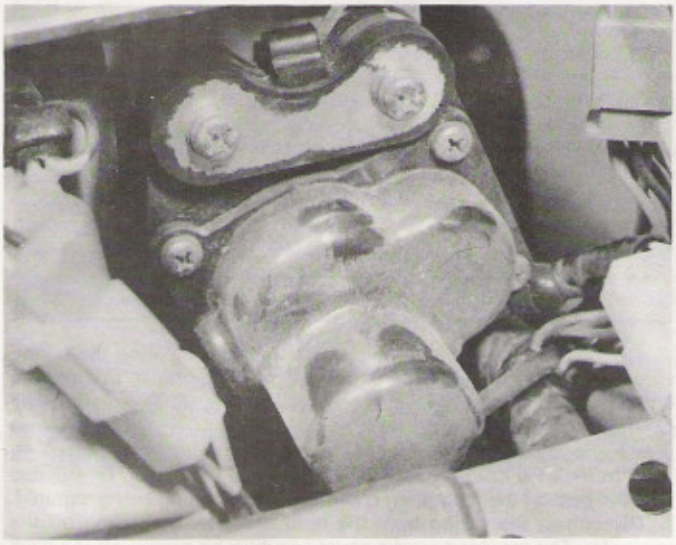


Checking element	Pocket test connecting point (+) (red)	Pocket test connecting point (−) (black)	Good	Replace (element shorted)	Replace (element opened)
D_1	B	U	O	O	×
	U	B	×	O	×
D_2	B	V	O	O	×
	V	B	×	O	×
D_3	B	W	O	O	×
	W	B	×	O	×
D_4	U	E	O	O	×
	E	U	×	O	×
D_5	V	E	O	O	×
	E	V	×	O	×
D_6	W	E	O	O	×
	E	W	×	O	×

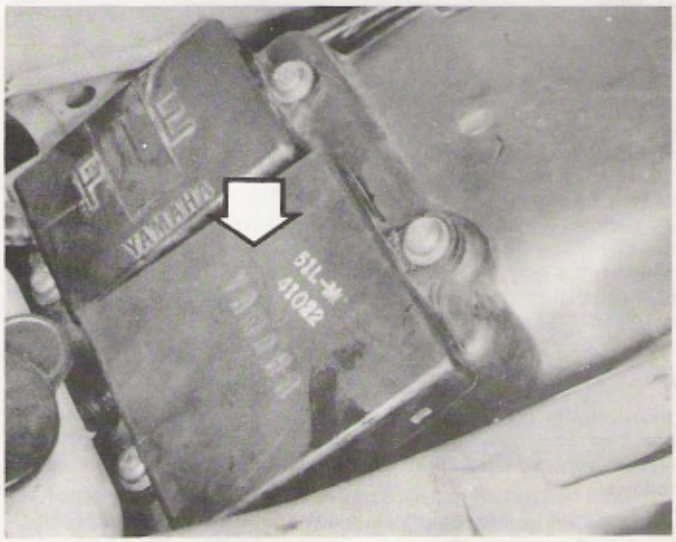
O – Continuity
X – No continuity

Fig. 7.2 Rectifier test table

1 Red wire (B)
2 White wire (U)
3 White wire (V)
4 White wire (W)
5 Black wire (E)
6 Regulator unit
7 Brown wire (L)



8.2a The YPVS servomotor is located to the rear of the steering head



8.2b The YPVS control unit (arrowed) is mounted next to the fuse box

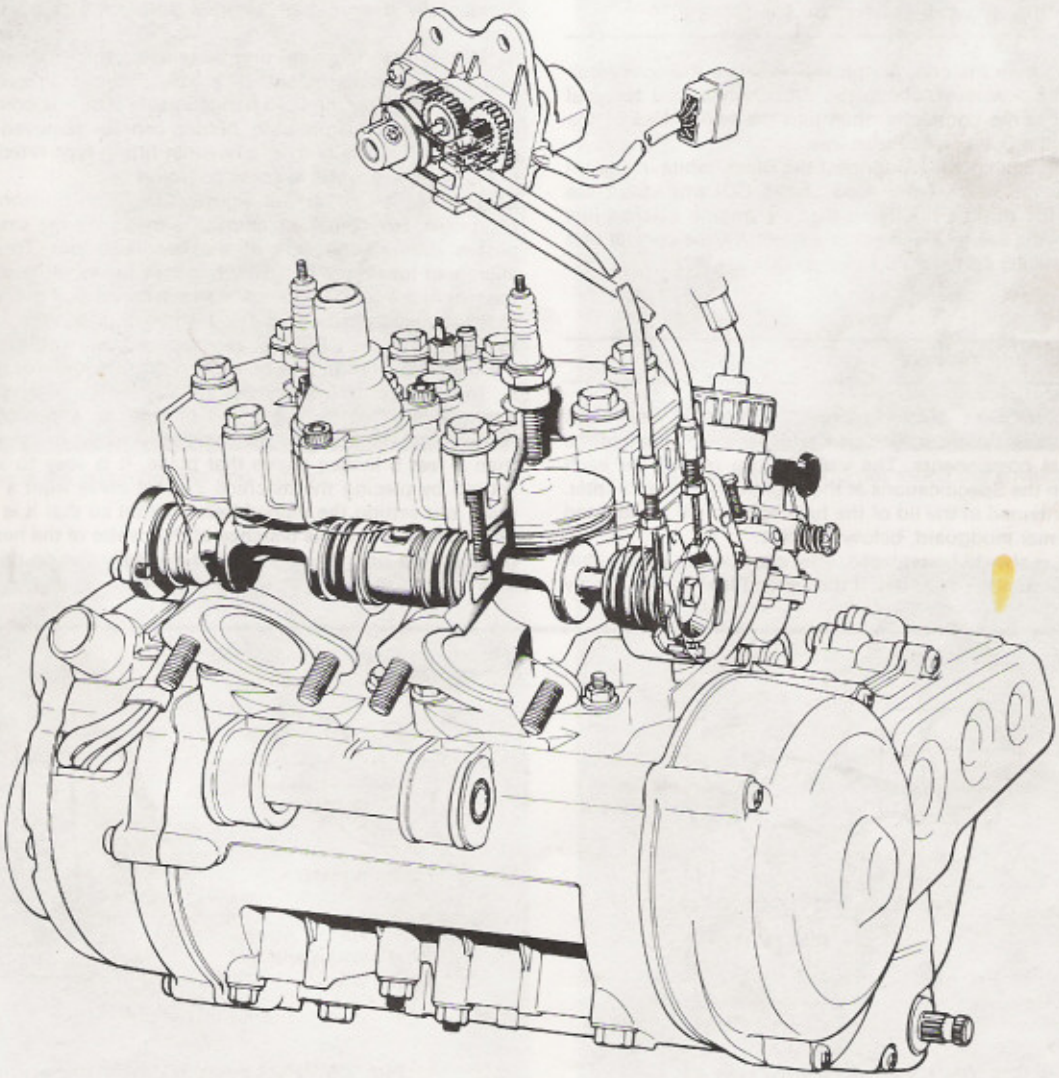


Fig. 7.3 Cutaway view of engine showing power valve operation

9 YPVS system: testing the servomotor

1 The tests described below require a good quality multimeter capable of reading on an ohms x 1 range, and also two insulated jumper leads with small crocodile clips on each end. Trace the servomotor wiring back to the 5-pin connector and separate it.

Motor operation

2 Connect a jumper lead between the negative battery terminal and the Black/Red pin in the connector block, and a second jumper lead between the positive battery terminal and the Black/Yellow pin in the connector. If the motor operates it can be considered serviceable. If not, renew the servomotor complete.

Potentiometer resistances

3 Using a multimeter, measure the potentiometer resistances as shown below. If the resistance of any one of the tests falls outside the specified figure of 7.5 K ohms ± 30% at 20°C (68°F), renew the servomotor assembly. The potentiometer test connections are as follows:

(a) Connect the Blue/Yellow lead to the White/Black lead
(b) Connect the Blue/Yellow lead to the White/Red lead
(c) Connect the White/Red lead to the White/Black lead

10 YPVS system: testing the control unit

1 Trace the wiring from the control unit and separate the connector. Using an electrical screwdriver, unclip the Black/white lead terminal and withdraw it from the connector, then join the two halves of the connector, leaving the Black/white lead free.
2 Using an insulated jumper lead, connect the Black/white lead from the control unit to the Black/white lead of the CDI unit. Start the engine, and open the throttle briefly so that the engine reaches just below 7000 rpm. If the valve fails to operate normally, the control unit can be considered faulty and should be renewed.

11 Fuses: location and renewal

1 The electrical system is protected by fuses, intentional weak links designed to break down before an electrical fault causes damage to the system or electrical components. The various fuse ratings for each model are shown in the Specifications at the beginning of the Chapter. Spare fuses are contained in the lid of the fuse box, which is mounted at the front of the rear mudguard, below the seat.
2 If a fuse blows, it should be replaced, after checking to ensure that no obvious short circuit has occurred. If the second fuse blows shortly afterwards, the electrical circuit must be checked thoroughly, to trace the fault.
3 When a fuse blows whilst the machine is running and no spare is available, a 'get you home' remedy is to remove the blown fuse and wrap it in metal foil before replacing it in the fuseholder. The foil will restore electrical continuity by bridging the broken fuse wire. This expedient should never be used if there is evidence of a short circuit or other major electrical fault, otherwise more serious damage will be caused. Replace the blown fuse at the earliest possible opportunity, to restore full circuit protection.

12 Headlamp: bulb renewal and beam alignment

1 On RD350 LC II models, remove the two bolts holding the fairing and tip it forward to gain access to the headlamp unit. On this and the RD350 N model, the headlamp unit should be detached from its shell by releasing the retaining screws and lifting the unit away. As it comes clear of the shell, disconnect the wiring from the headlamp and parking lamp. In the case of the RD350 F, the bulb and wiring can be reached from the back of the fairing, no preliminary dismantling being required.
2 Disconnect the wiring from the bulb terminals by pulling off the connector. The moulded plastic cover can now be peeled off the back of the unit to expose the bulb holder ring. Before the bulb is removed it should be noted that it is of the quartz halogen type. The bulb envelope will become permanently etched if touched, and so it is essential that it is handled by the metal part only. If the quartz envelope is touched accidentally it should be cleaned with methylated spirit and a soft cloth.
3 Remove the retaining ring by twisting it anticlockwise and lift the bulb away. Replacement is a straightforward reversal, the three locating tangs on the bulb flange ensure that it is correctly aligned.
4 The parking lamp bulb holder can be removed by twisting it anticlockwise. The bulb is a bayonet fitting type rated at 3.4 watts in the UK and 4.0 watts in other countries.
5 The headlamp can be adjusted for both horizontal and vertical alignment. Horizontal adjustment is made via the small screw which passes through the side of the headlamp rim. To set the vertical alignment locate the bolt which passes through the slotted bracket at the rear of the unit. This should be slackened and the headlamp moved to the required position. The bolt is then tightened to retain the setting. In the case of the RD350 F, headlamp adjustment is made from inside the fairing using the two control knobs provided for this purpose.
6 In the UK, regulations stipulate that the headlamp must be arranged so that the light will not dazzle a person standing at a distance greater than 25 feet from the lamp, whose eye level is not less than 3 feet 6 inches above that plane. It is easy to approximate this setting by placing the machine 25 feet away from a wall, on a level road, and setting the dipped beam height so that it is concentrated at the same height as the distance of the centre of the headlamp from the ground. The rider must be seated normally during this operation and also the pillion passenger, if one is carried regularly.

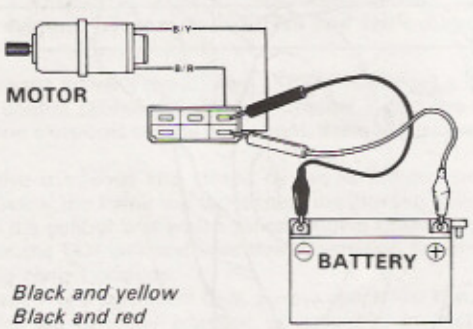


Fig. 7.4 YPVS system motor test

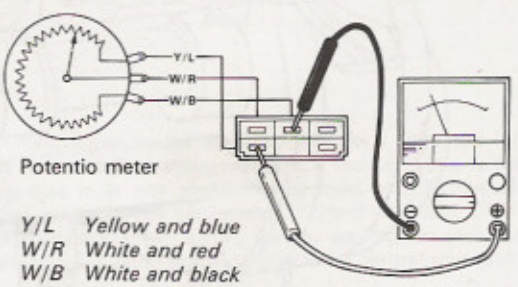
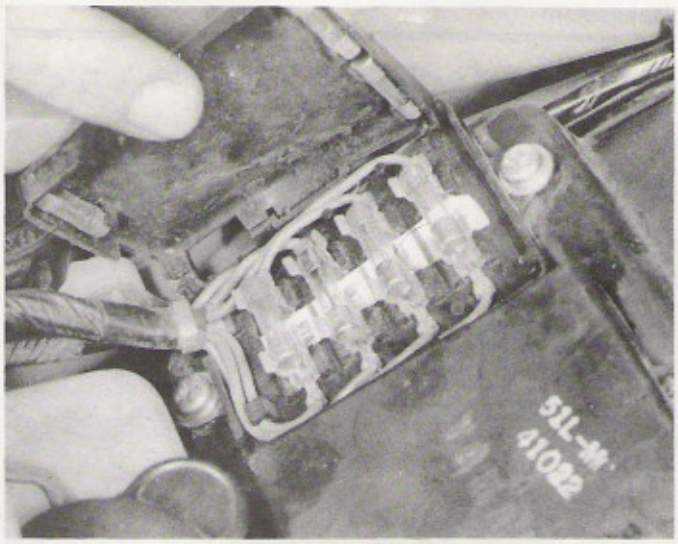
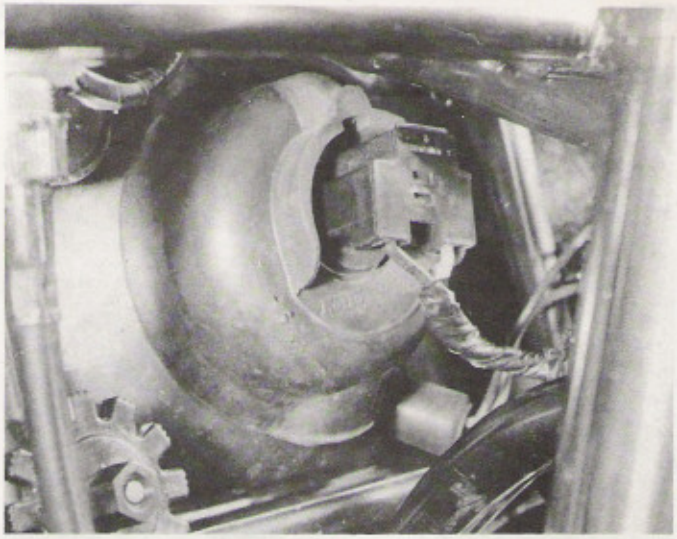


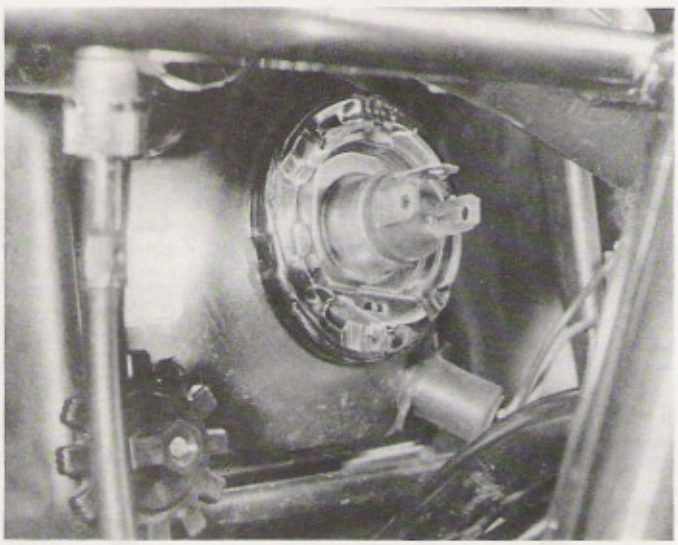
Fig. 7.5 YPVS system potentiometer test



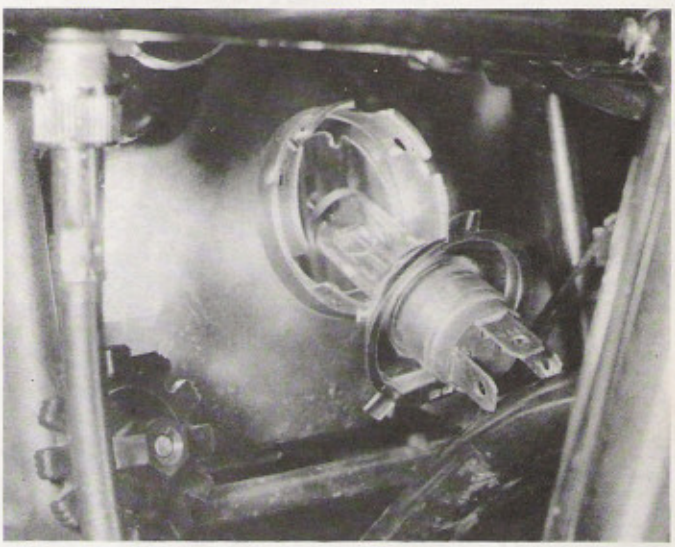
11.1 Fuse box lid houses spare fuses – remember to replace them if used



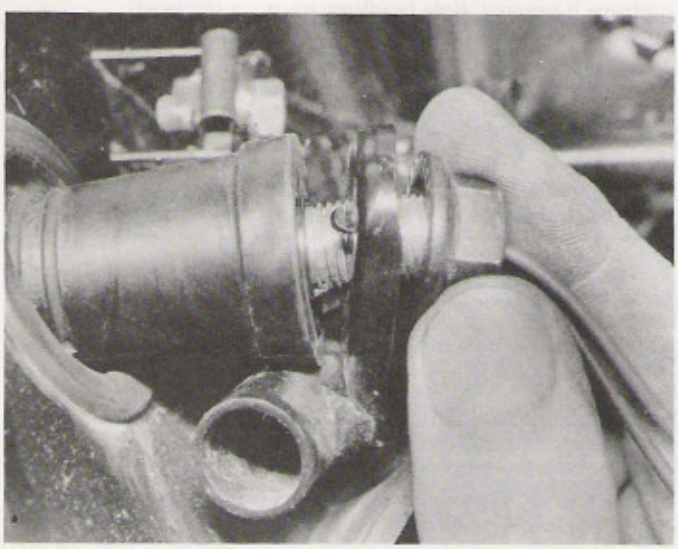
12.1a On the 'F' model the headlamp bulb can be reached from inside the fairing. Pull off the wiring connector and rubber shroud ...



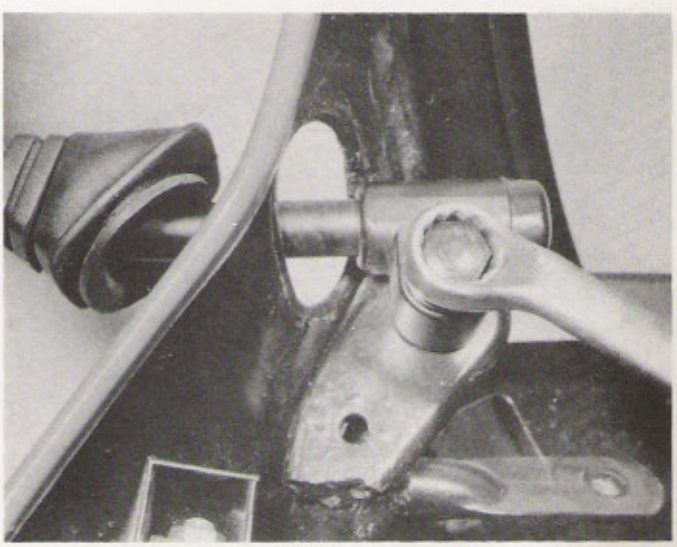
12.1b ... then twist the retaining ring and remove it ...



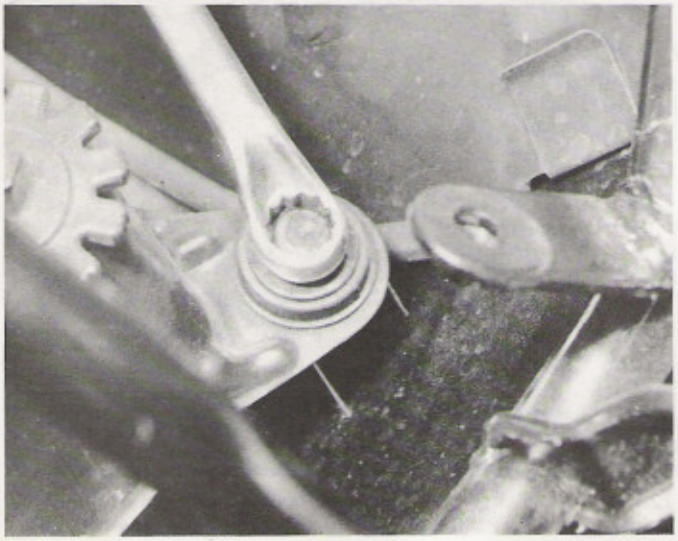
12.1c ... to free the bulb. Do not touch the envelope with fingers



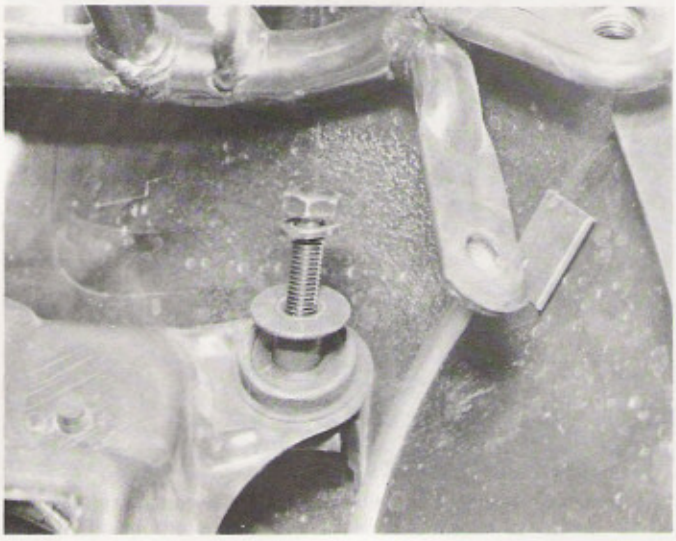
12.6a To remove the 'F' model headlamp unit, first remove the turn signal lamps ...



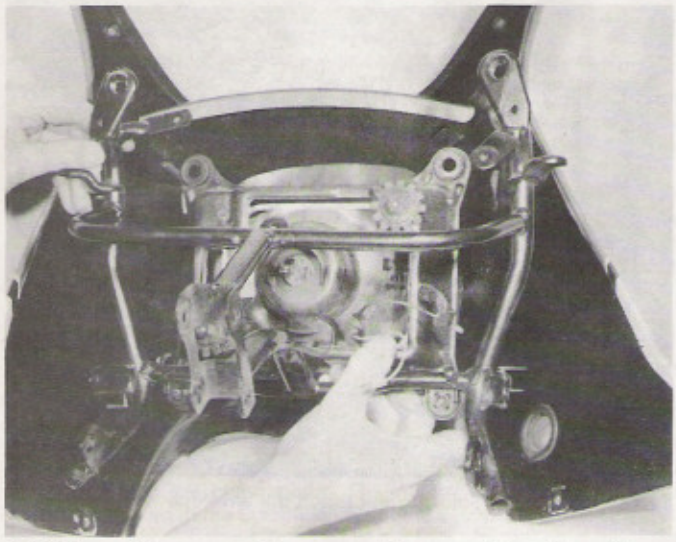
12.6b ... and the rear view mirrors



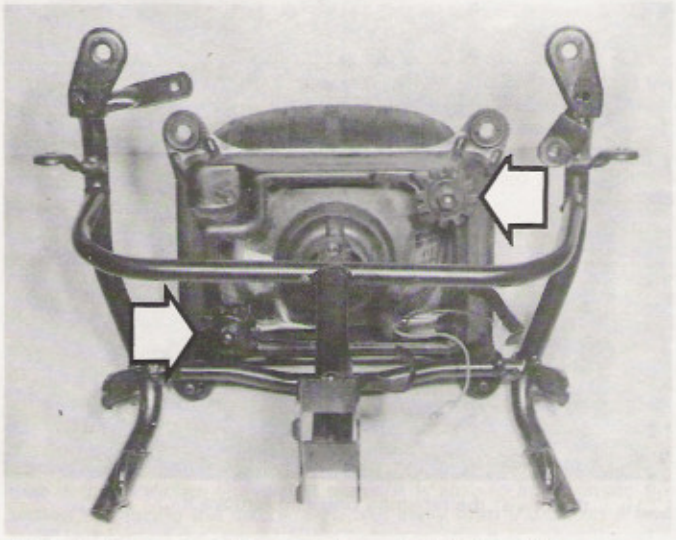
12.6c Slacken and remove the bolts holding the fairing to the subframe ...



12.6d ... taking care not to lose the rubber bushes and headed spacers



12.6e The subframe assembly can now be removed together with the headlamp



12.6f Headlamp support frame can be unbolted from fairing subframe if required. Note headlamp adjusters (arrowed)

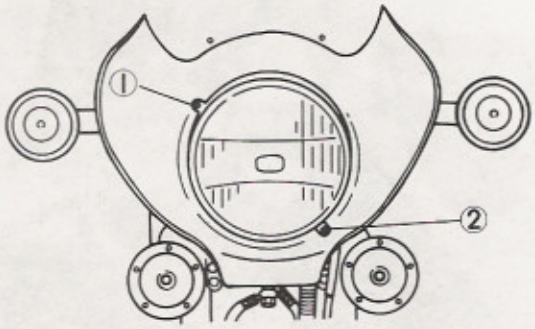


Fig. 7.6 Location of headlamp beam adjusting screws – RD350 LC II

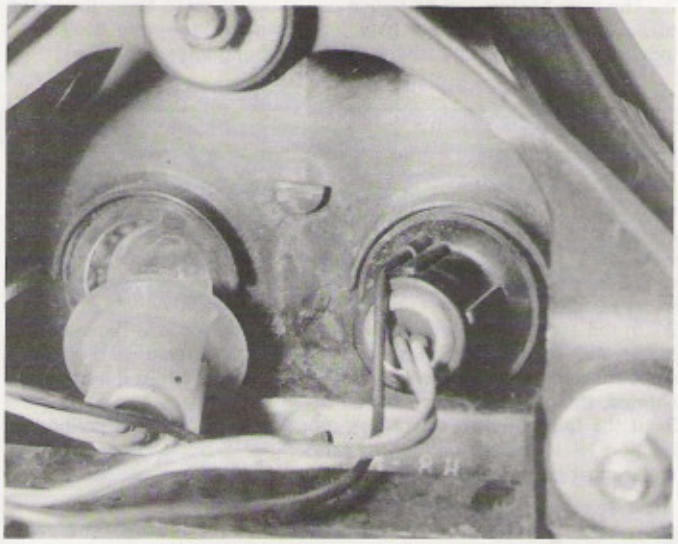
1 Horizontal adjustment screw
2 Vertical adjustment screw

13 Stop/tail lamp: bulb renewal

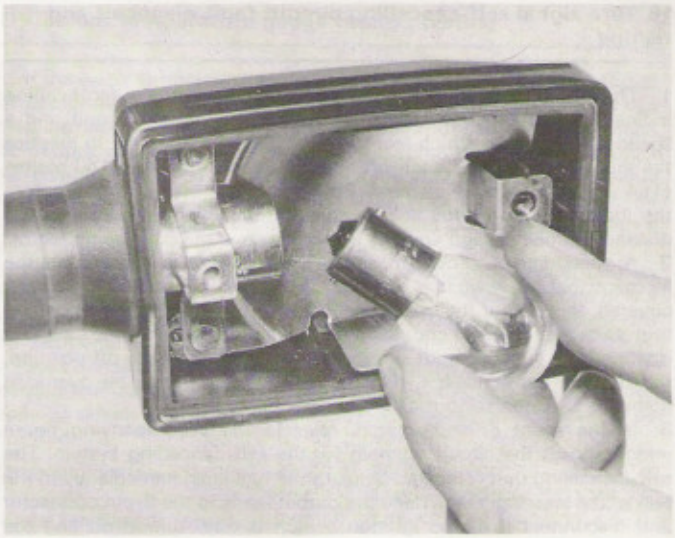
1 The stop/tail lamp houses two twin filament bulbs. The bulb holders are a bayonet fit in the back of the lamp unit, and are accessible via the seat tail hump. The bulbs are a bayonet fit in the bulbholders and have offset pins to ensure that they are refitted correctly. Each bulb is rated at 12V 5/21W.

14 Turn signals: bulb renewal

1 The turn signal lamps are mounted on short stalks at the front and rear of the machine. To gain access to the bulbs, remove the plastic lens by removing the retaining screws or prising it away from the lamp body, depending on the model. Bulbs are a bayonet fit and are rated at 12V 21W.



13.1 Access to tail lamp bulbs is through the seat tail hump



14.1 Turn signal bulbs are a bayonet fitting

15 Turn signals: fault diagnosis and testing

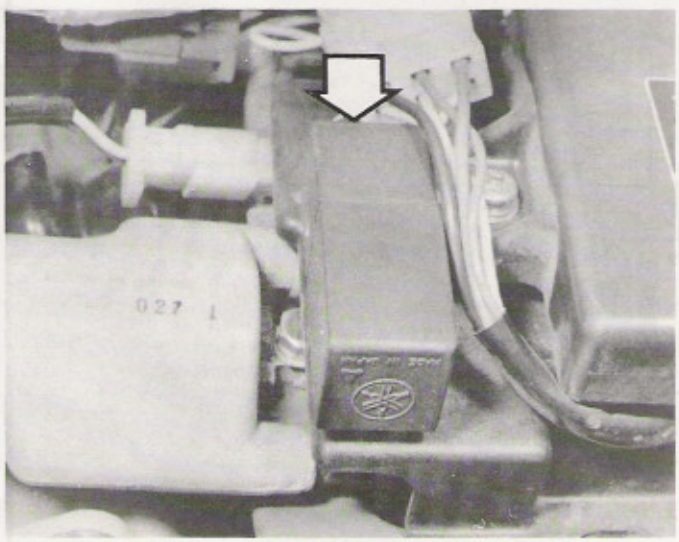
1 If the indicators fail to operate, the nature of the fault gives a good indication of its cause. If the fault is restricted to one set of lamps only and yet the remaining set operate correctly the fault is almost certainly due to a blown bulb, or broken or shorted wiring on that side of the circuit. If the system fails totally, check that this is not caused by the self-cancelling system by unplugging the flasher cancelling unit (see Section 16). If it is found that the latter is at fault it can be left disconnected and the indicators used manually until a replacement unit is obtained.

2 If the fault cannot be attributed to any other cause it will be necessary to renew the flasher relay. It is located on the electrical panel below the fuel tank and is held in a rubber mounting. The relay is a sealed unit and cannot be repaired if it is faulty. Ensure that the new unit is of the same rating as the standard item. Any variation in its output will affect the flash rate.

3 In the event of a fault occurring in the indicator circuit, the following check list will prove helpful.

Indicators do not work

(a) Check bulb
(b) Right circuit:
  1 Check for 12V on dark Green wire to light.
  2 Check for ground on Black wire to light assembly.
(c) Left circuit:
  1 Check for 12V on dark Brown wire to light.
  2 Check for ground on Black wire to light assembly.
(d) Right and left circuits do not work:
  1 Check for 12V on Brown/white wire to flasher switch on left handlebar.
  2 Check for 12V on Brown wire to flasher relay.
  3 Replace flasher relay
  4 Replace flasher switch.
(e) Check flasher self cancelling system. (Refer to flasher self cancelling system).



15.1 Turn signal self-cancelling unit (arrowed) is mounted beneath the tank

15.2 Rubber-mounted turn signal relay is fitted forward of the air filter casing

16 Turn signal self-cancelling circuit: fault diagnosis and testing

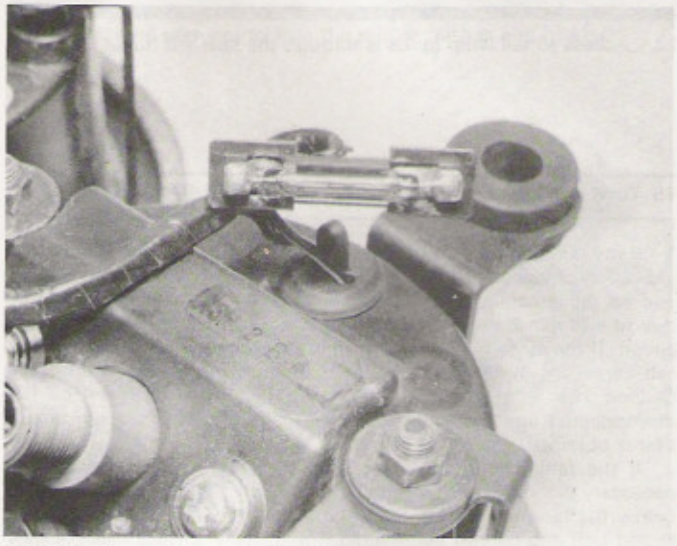
1 The RD350 YPVS models are equipped with self-cancelling indicators, this function being controlled by a timing circuit and a speedometer sensor which measures the distance travelled. In practice the indicators should switch off after 10 seconds or after 150 metres (164 yards) have been covered. Both systems must switch off before the indicators stop, thus at low speeds the system is controlled by distance, whilst at high speeds, elapsed time is the controlling factor.
2 A speedometer sensor measures the distance covered from the moment that the switch is operated. After the 150 metres have been covered, this part of the system will reset to off. The flasher cancelling unit starts a ten second countdown from the moment that the switch is operated. As soon as both sides of the system are at the off position, the flashers are cancelled. If required, the system may be overriden manually by depressing the switch inwards.
3 In the event of malfunction, refer to the accompanying figure which shows the circuit diagram for the self-cancelling system. The self-cancelling unit is located beneath the fuel tank, immediately to the rear of the steering head. Trace the output leads to the 6-pin connector and disconnect it. If the ignition switch is now turned on and the indicators will operate normally, albeit with manual cancelling, the flasher relay, bulbs, wiring and switch can be considered sound.
4 To check the speedometer sensor, connect a multimeter to the White/green and the black leads of the wiring harness at the 6-pin connector. Set the meter to the ohms x 100 scale. Release the speedometer cable at the wheel end and use the projecting cable end to turn the speedometer. If all is well, the needle will alternate between zero resistance and infinite resistance. If not, the sender or the wiring connections will be at fault.
5 Connect the meter probes between the Yellow/red lead and earth, again on the harness side of the 6-pin connector. Check the switch and associated wiring by turning the indicator switch on and off. In the off position, infinite resistance should be shown, with zero resistance in both on positions.

17 Instrument panel warning lamps: bulb renewal

1 The various warning and illumination bulbs are housed in rubber bulb holders which are a push fit into the underside of the instrument panel. The method of gaining access to the bulbs varies according to the model. In the case of the RD350 LC II, it is first necessary to remove the plastic cover from the underside of the panel, this being retained by four self-tapping screws.
2 The bulb holders can be pulled out of the panel to allow the bulbs to be checked or renewed. It is suggested that they are dealt with individually to avoid any risk of them becoming interchanged.

18 Coolant temperature gauge: description and testing

1 The coolant temperature is monitored by a gauge arrangement consisting of the meter unit mounted in the instrument panel, controlled by a sender unit which is screwed into the cylinder head water jacket. As the engine temperature rises, the resistance of the sender unit reduces, and this is used to control the position of the meter needle.
2 In the event of a fault, check the wiring connections between the meter and sender unit. Note that if the sender lead is broken or disconnected, the gauge will read cold all the time, whilst if it becomes shorted, the gauge will read hot all the time.
3 If the fault persists, check the sender resistances as described in Section 19. If this proves that the sender unit is working normally, the meter must be renewed.



16.2 This shows the reed switch fitted to the speedometer to sense distance travelled. It controls the self-cancelling system

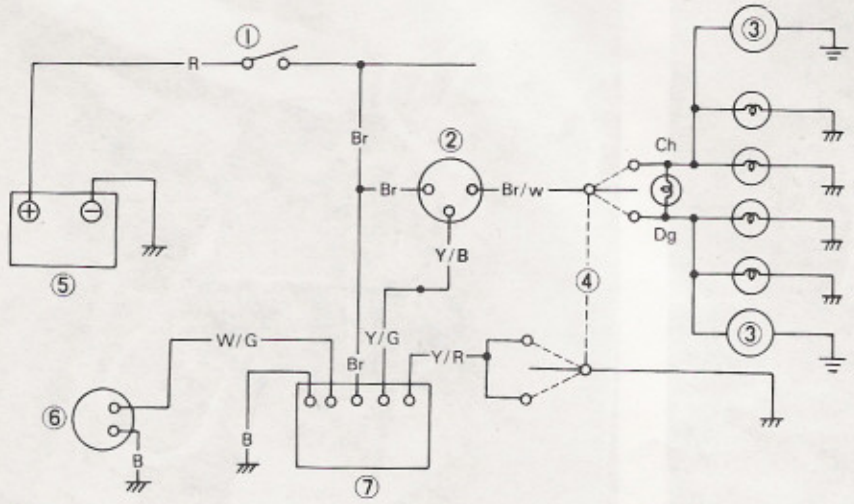
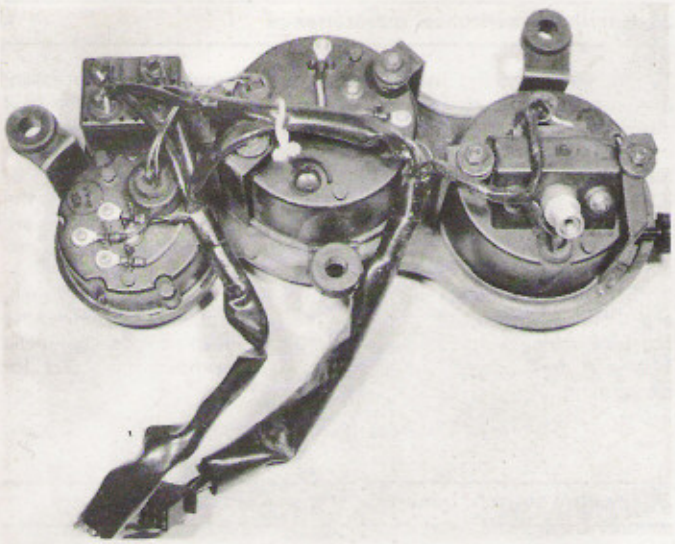


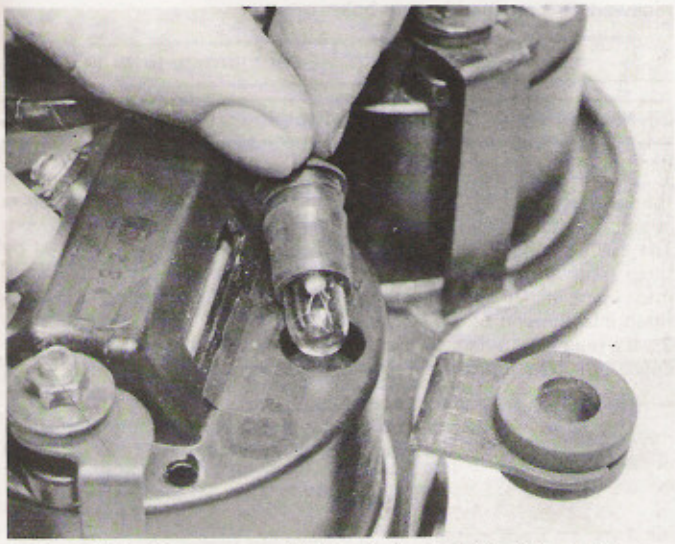
Fig. 7.7 Turn signal circuit diagram

1 Ignition switch
2 Flasher unit
3 Turn signal lamps
4 Handlebar switch
5 Battery
6 Speedometer sensor
7 Cancelling unit

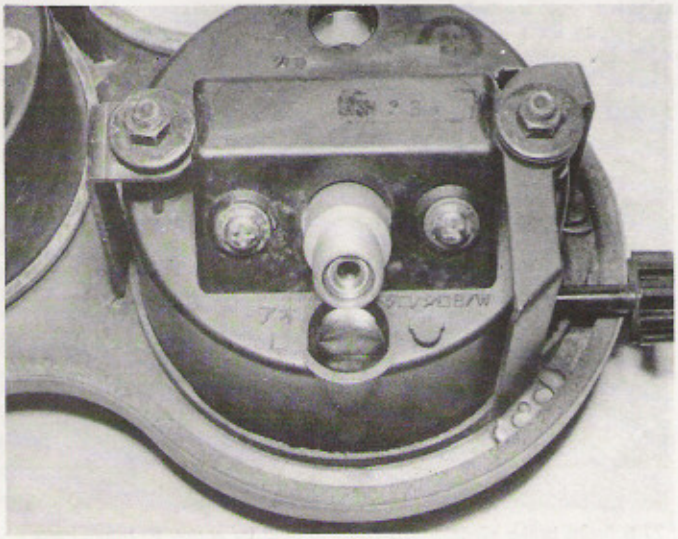
B	*Black*
Br	*Brown*
Ch	*Dark brown*
Dg	*Dark green*
G	*Green*
R	*Red*
W	*White*
Y	*Yellow*



17.1a Instrument panel assembly removed to show wiring and bulb holders (F model shown)



17.1b Bulb holders are a push-fit in the back of the instrument heads



17.1c Instrument heads are held in place by rubber-bushed studs and nuts

19 Coolant temperature gauge sender: testing

1 If the water temperature sender appears to be faulty it can be tested by measuring its resistance at various temperatures. To accomplish this it will be necessary to gather together a heatproof container into which the sender can be placed, a burner of some description (a small gas-powered camping burner would be ideal), a thermometer capable of measuring between 40°C and 120°C (122°F – 248°F) and an ohmmeter or multimeter capable of measuring 0 – 250 ohms with a reasonable degree of accuracy.

2 Fill the container with cold water and arrange the sender unit on some wire so that the probe end is immersed in it. Connect one of the meter leads to the sender body and the other to the terminal. Suspend the thermometer so that the bulb is close to the sender probe.

3 Start to heat the water, and make a note of the resistance reading at the temperature shown in the table below. If the unit does not give readings which approximate quite closely to those shown it must be renewed.

Water temperature	40°C 104°F	60°C 140°F	80°C 176°F	100°C 212°F
Sender resistances (ohms)	240	104 ± 4	52.1 ± 2	27.4

20 Horn: location and testing

Either a single or twin horns are fitted, depending on the model concerned. The horn or horns are bolted to a flexible mounting strip below the headlamp. In the event of the horn failing to operate it is usually necessary to renew it. It is of sealed construction and thus cannot be dismantled for repair. Before blaming the horn, check for battery voltage on the Brown lead when the horn button is pressed (ignition on). Check also that the Pink earth lead is securely connected.

21 Brake light circuit: testing

1 In the event of a fault in the brake light circuit follow the test sequence shown below. The switches must be renewed if they are faulty, but occasionally they can be persuaded to work after a good soaking in WD40 or similar.

(a) Check bulb and connections.
(b) Check for 12 volts on Yellow lead to brake lamp.
(c) Check for 12 volts on Brown lead to front and rear brake switches.
(d) Check Black earth lead from lamp unit to frame (continuity test).

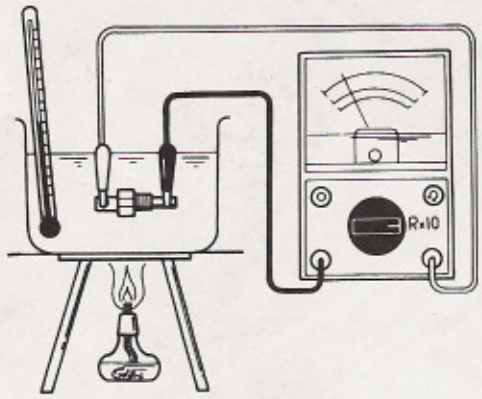
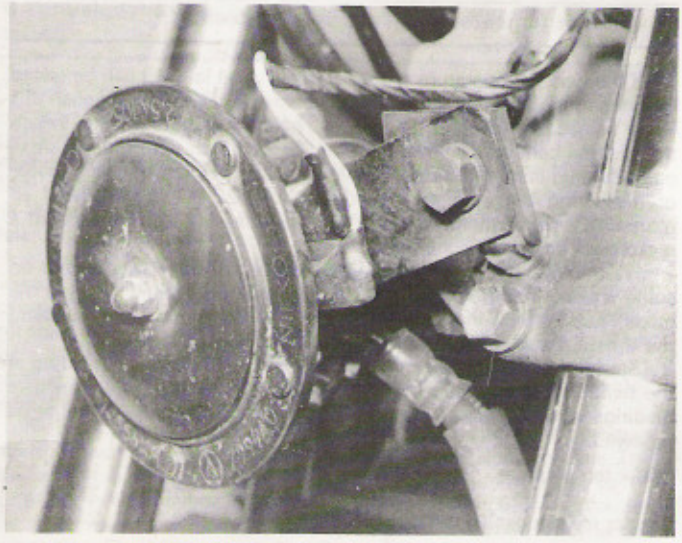


Fig. 7.8 Coolant temperature sender test



20.1 Typical horn mounting arrangement (F model shown)

22 Brake light switches: location and adjustment

1 All models have a stop lamp switch fitted to operate in conjunction with the rear brake pedal. The switch is located immediately to the rear of the crankcase, on the right-hand side of the machine. It has a threaded body giving a range of adjustment.
2 If the stop lamp is late in operating, slacken the locknuts and turn the body of the lamp in an anticlockwise direction so that the switch rises from the bracket to which it is attached. When the adjustment seems near correct, tighten the locknuts and test.
3 If the lamp operates too early, the locknuts should be slackened and the switch body turned clockwise so that it is lowered in relation to the mounting bracket.
4 As a guide, the light should operate after the brake pedal has been depressed by about 2 cm (¾ inch).
5 The front brake lever is also fitted with a switch. This is a non-adjustable unit and is of sealed construction. In the event of a fault, renew the switch.

23 Handlebar switches: maintenance

1 Generally speaking, the switches give little trouble, but if necessary they can be dismantled by separating the halves which form a split clamp around the handlebars. Note that the machine cannot be started until the ignition cut-out on the right-hand end of the handlebars is turned to the central 'Run' position.
2 Always disconnect the battery before removing any of the switches, to prevent the possibility of a short circuit. Most troubles are caused by dirty contacts, but in the event of the breakage of some internal part, it will be necessary to renew the complete switch.
3 Because the internal components of each switch are very small, and therefore difficult to dismantle and reassemble, it is suggested a special electrical contact cleaner be used to clean corroded contacts. This can be sprayed into each switch, without the need for dismantling.

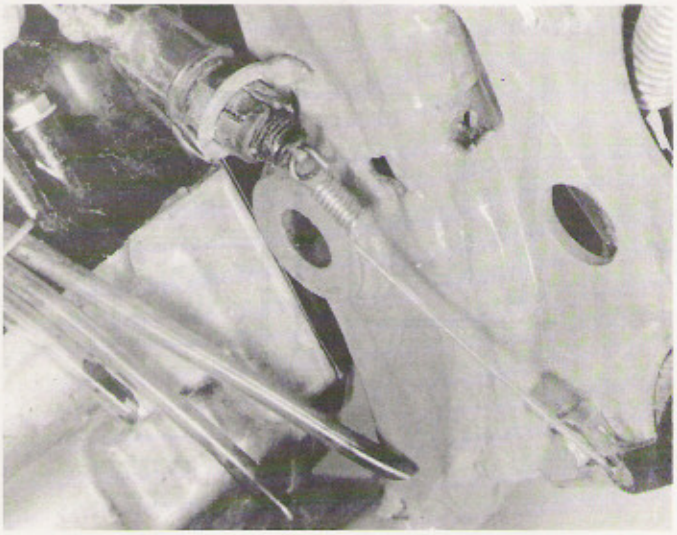
24 Ignition switch: general

1 The combined ignition switch and steering lock is mounted on the underside of the top yoke. In the event of a fault, try soaking the switch in WD40 or similar. If this fails to get it working, it will have to be renewed. It is retained by two bolts.

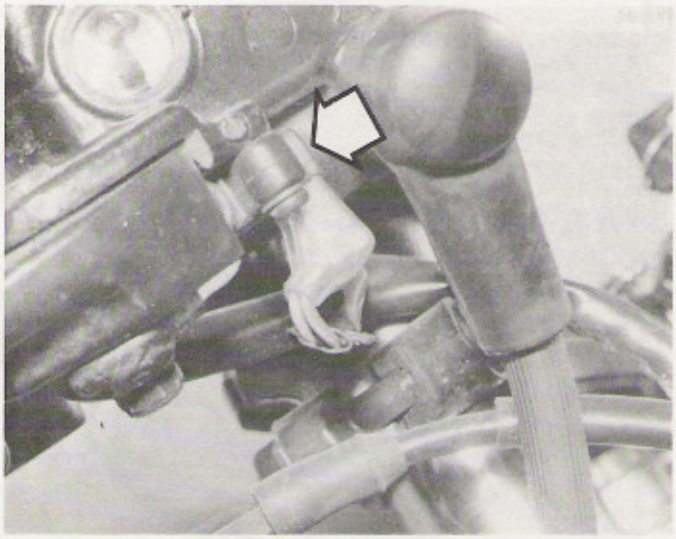
25 Neutral switch: location and testing

1 The neutral indicator lamp is operated by a switch arrangement on the left-hand end of the gear selector drum. Access to the switch is straightforward once the left-hand engine casing has been removed. The switch consists of a triangular plastic cover which is retained by three screws. The inner face of the cover incorporates a circular track into which the fixed contact is set flush. A spring-loaded contact is fitted into the end of the selector drum.
2 If a fault is experienced it is not very likely that the switch will be the cause of it. The following check sequence should be followed:

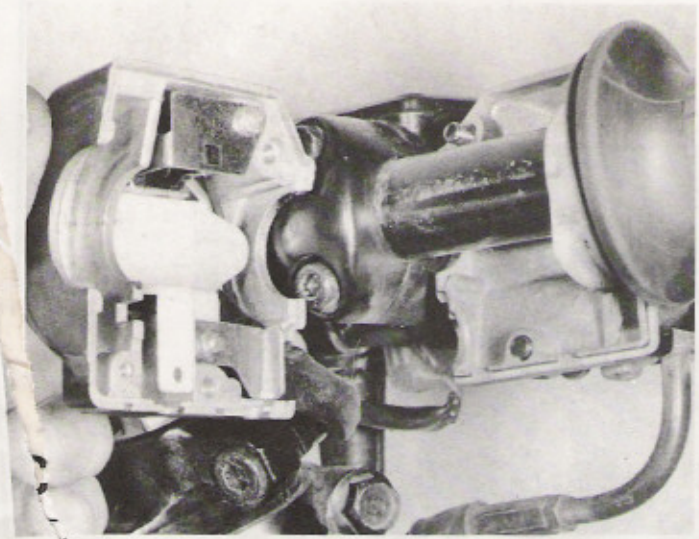
(a) Check bulb and connections.
(b) Check for 12 volts on Sky blue lead at switch terminal.
(c) Check switch continuity. If faulty, clean or renew damaged parts.



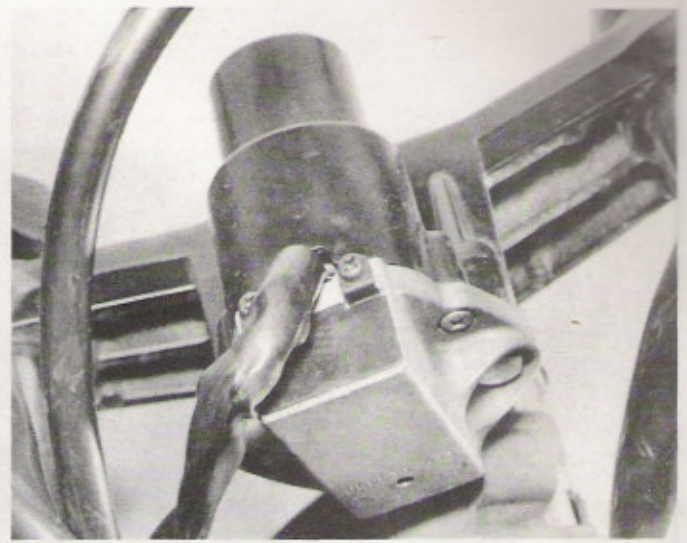
22.1 Rear brake lamp switch is mounted inboard of the frame



22.5 Front brake switch (arrowed) is held by screw to brake lever assembly



23.3 Handlebar switches can be separated for examination and maintenance



24.1 Ignition switch bolts to the underside of top yoke

26 Oil level warning lamp circuit: testing

1 The oil level warning lamp is operated by a float-type switch mounted in the oil tank. The circuit is wired through the neutral switch so that when the ignition is switched on and the machine is in neutral, the lamp comes on as a means of checking its operation. As soon as a gear is selected the lamp should go out unless the oil level is low.

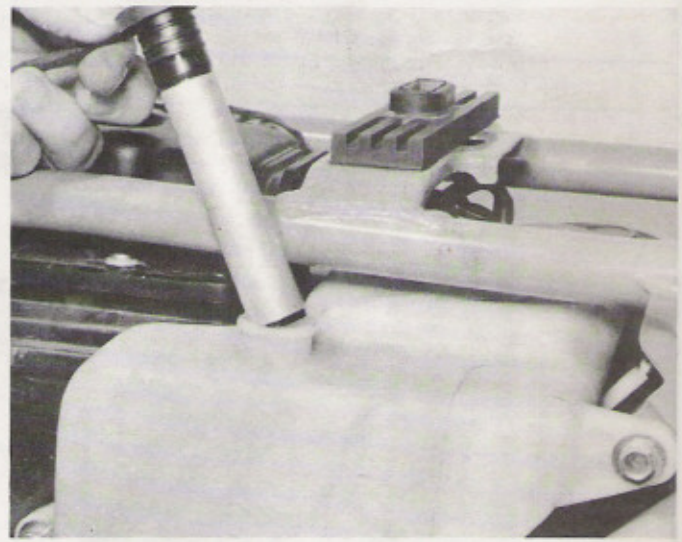
2 In the event of a fault the bulb can be checked by switching the ignition on and selecting neutral. If this proves sound, check for 12 volts on the Black/Red lead to the switch. If the switch proves to be defective it can be unclipped from the tank and withdrawn.

27 Wiring: layout and examination

1 The wiring harness is colour-coded and will correspond with the accompanying wiring diagram. When socket connections are used, they are designed so that reconnection can be made in the correct position only.

2 Visual inspection will usually show whether there are any breaks or frayed outer covering which will give rise to short circuits. Occasionally a wire may become trapped between two components, breaking the inner core but leaving the more resilient outer cover intact. This can give rise to mysterious intermittent or total circuit failure. Another source of trouble may be the snap connectors and sockets, where the connector has not been pushed fully home in the outer housing, or where corrosion has occurred.

3 Intermittent short circuits can often be traced to a chafed wire that passes through or is close to a metal component such as a frame member. Avoid tight bends in the lead or situations where a lead can become trapped between casings.



26.2 Oil level switch can be pulled out of tank for renewal