

Chapter 5 Wheels, brakes and tyres

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Specifications

Tyres	Front	Rear
XS250	3.00 x 18 in	3.50 x 18 in
XS360	3.00 x 18 in	3.50 x 18 in
XS400	3.50 x 18 in	3.50 x 18 in
Brakes		
XS250, XS360 and XS400	Single disc	Single disc
XS360 C	Single disc	Single leading shoe, drum
XS360 2D	Twin leading shoe, drum	Single leading shoe, drum
Tyre pressures	Solo	Pillion or continuous high speed
Front	26 psi (1.8 kg/cm ²)	28 psi (2.0 kg/cm ²)
Rear	28 psi (2.0 kg/cm ²)	33 psi (2.3 kg/cm ²)

1 General description

All models are fitted with 18 inch diameter wheels carrying a 3-50 in section tyre at the rear, and with the exception of the XS400 model which is fitted with a 3-50 in front tyre, a 3-00 in section tyre at the front.

Wheels are either of the traditional type having steel rims laced to aluminium alloy hubs or are one-piece seven spoke cast units. The wheels fitted depend on the model, date of manufacture and country of original delivery.

All XS250 and 400 models and also the XS360D, are fitted with an hydraulic single disc brake on both wheels. The earlier XS360C model has a single leading shoe drum brake at the rear in place of the disc, and the XS360D, introduced as an economy model, has the drum rear brake and a twin leading shoe front brake.

2 Front wheel: examination and renovation (spoked wheel models)

1 Place the machine on the centre stand so that the front wheel is raised clear of the ground. Spin the wheel and check the rim alignment. Small irregularities can be corrected by tightening the spokes in the affected area, although a certain amount of practice is necessary to prevent over-correction. Any flats in the wheel rim should be evident at the same time. These are more difficult to remove and in most cases it will be necessary to have the wheel rebuilt on a new rim. Apart from the effect on stability, a flat will expose the tyre bead and walls to greater risk of damage.

2 Check for loose or broken spokes. Tapping the spokes is the best guide to tension. A loose spoke will produce a quite different sound and should be tightened by turning the nipple in

an anti-clockwise direction. Always re-check for run-out by spinning the wheel again. If the spokes have to be tightened an excessive amount, it is advisable to remove the tyre and tube by the procedure detailed in Section 21 of this Chapter; this is so that the protruding ends of the spokes can be ground off, to prevent them from chafing the inner tube and causing punctures.

3 Front wheel: examination and renovation (cast alloy wheel models)

- 1 Carefully check the complete wheel for cracks and chipping, particularly at the spoke roots and the edge of the rim. As a general rule a damaged wheel must be renewed as cracks will cause stress points which may lead to sudden failure under heavy load. Small nicks may be radiused carefully with a fine file and emery paper (No. 600 - No. 1000) to relieve the stress. If there is any doubt as to the condition of a wheel, advice should be sought from a Yamaha repair specialist.
- 2 Each wheel is covered with a coating of lacquer, to prevent corrosion. If damage occurs to the wheel and the lacquer finish is penetrated, the bare aluminium alloy will soon start to corrode. A whitish grey oxide will form over the damaged area, which in itself is a protective coating. This deposit however, should be removed carefully as soon as possible and a new protective coating of lacquer applied.
- 3 Check the lateral run out at the rim by spinning the wheel and placing a fixed pointer close to the rim edge. If the maximum run out is greater than 2.0 mm (0.08 in), Yamaha recommend that the wheel be renewed. This is, however, a counsel of perfection: a run out somewhat greater than this can probably be accommodated without noticeable effect on steering. No means is available for straightening a warped wheel without resorting to the expense of having the wheel skimmed on all faces. If warpage was caused by impact during an accident, the safest measure is to renew the wheel complete. Worn wheel bearings may cause rim run out. These should be renewed as described in Section 11 of this Chapter.

4 Front wheel: removal and replacement

- 1 Place the machine on the centre stand and place wooden blocks below the crankcase so that the front wheel is well clear of the ground.
- 2 Remove the speedometer drive cable from the drive within the front hub by releasing the spring clip (drum brake models) or unscrewing the knurled ring (disc brake models).
- 3 On drum brake models detach the front brake cable by removing the split pin through the clevis pin passing through the brake operating arm. When the clevis pin is withdrawn, the cable can be detached complete with rubber gaiter and cable adjuster, after the latter has been unscrewed from the brake plate. Removal of the disc brake caliper on disc brake models is not required when detaching the front wheel.
- 4 The front wheel can now be released by withdrawing the spindle, which passes through the left-hand fork leg and is retained by a castellated nut, and split pin. Note that it will be necessary to slacken the two bolts which hold the clamp around the head of the spindle at the extreme end of the left-hand fork leg. The head of the spindle is drilled, so that a tommy bar can be inserted to aid removal. On drum brake models the wheel will pull clear after the anchorage slot on the brake plate has disengaged from the abutment on the left-hand fork leg.
- 5 Refit the wheels by reversing the dismantling procedure. Ensure that the speedometer gearbox (disc brake models) and the brake back plate (drum brake models) engage with the fork leg as the wheel is being refitted.

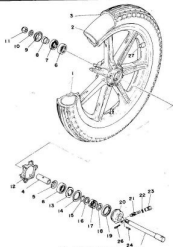
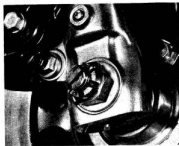


Fig. 5.1 Front wheel

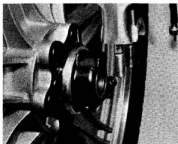
- | | |
|----------------------------------|--|
| 1 Front wheel | 15 Circlip |
| 2 Front inner tube | 16 Washer |
| 3 Front outer cover | 17 Drive gear pinion (17T) |
| 4 Bearing spacer | 18 Washer |
| 5 Bearing spacer flange | 19 Oil seal |
| 6 Sealed bearing - 2 off | 20 Speedometer drive gearbox |
| 7 Oil seal | 21 Driven shaft (10T) |
| 8 Spacer | 22 Circlip |
| 9 Dust cover | 23 Gland union |
| 10 Washer | 24 Roll pin |
| 11 Castellated nut | 25 Front wheel spindle |
| 12 Housing cover | 26 Split pin |
| 13 Speedometer gearbox drive dog | 27 Wheel balance weight - 10g or 20g A/R |
| 14 Retainer | |



4.3a Remove the nut and spindle to allow ...



4.3b ... the front wheel to be lowered between the forks



4.4a Speedometer gearbox recess must locate with fork projection



4.4b Wheel spindle clamp must be fitted with arrowmark forwards

5 Front disc brake: pad removal and replacement XS 250, 360D and 400 models

1 The condition of the brake pads can be determined with the pads in place in the caliper by viewing them through the inspection aperture in the caliper cover. The aperture is closed by a small plastic cap which may be hinged back to give access. Each pad has a red marked groove around the periphery. If it can be seen that one or both pads have worn down to or past the groove, the pads must be renewed as a set.

2 Pad removal can be accomplished without removing the front wheel, as follows. Remove the single bolt which passes through the piston/cylinder casting into the caliper support bracket. It is upon this bolt that the casting slides. From the rear of the unit remove the single crosshead screw by passing the shank of a screwdriver through the wheel spokes. Grasp the piston/cylinder casting and lift it away, leaving the two pads in place on the support bracket, either side of the disc. To prevent the piston being expelled from the cylinder, in the event of the brake lever being applied inadvertently, place a wooden wedge between the piston and outer wall of the casing.

3 Lift each pad away from the disc and out of the support bracket. Note that the outer pad of the XS360C model is fitted

with an anti-chatter shim. This should be detached from the pad.

4 As stated above, the pads must be renewed as a pair if either pad has worn down to the groove. The minimum pad thickness is 1.5 mm (0.06 in).

5 Replace the new pads by reversing the dismantling procedure. On XS360C models, the anti-chatter spring must be fitted to the outer pad so that the stamped arrow mark is facing the direction of normal wheel travel. The outer faces of both pads should be smeared with a thin coating of silicon grease of the type supplied especially for disc brakes. Do not allow any grease to find its way onto the friction surfaces of the pad. It goes without saying that a pad contaminated with grease will not function efficiently. Make sure that the brake pads are correctly located in the caliper and that the front wheel revolves freely when reassembly is complete. Always check the brake action before taking the machine on the road.

6 Front disc brake: removing, renovating and replacing the caliper unit

1 Before the caliper assembly can be removed from the right-hand fork leg, it is first necessary to drain off the hydraulic fluid. Disconnect the brake pipe at the union connection it makes with the caliper unit and allow the fluid to drain into a clean container. It is preferable to keep the front brake lever applied throughout this operation, to prevent the fluid from leaking out of the reservoir. A thick rubber band cut from a section of inner tube will suffice, if it is wrapped tightly around the lever and the handlebars.

2 Note that brake fluid is an extremely efficient paint stripper. Take care to keep it away from any paintwork on the machine or from any clear plastic, such as that sometimes used for instrument glasses.

3 When the fluid has drained off, remove the caliper mounting bolts, then rotate the caliper unit upwards and lift it away from the disc and the machine. Separate the cylinder/piston casting from the support bracket as described for brake pad removal in the preceding Section, and remove the pads.

4 The rubber boot which protects the caliper piston is secured by a circlip. Displace the circlip and pull off the boot. The piston is best expelled from the cylinder by applying a blast of compressed air through the fluid inlet orifice. Take care to catch the piston as it emerges from its bore - if dropped or prised out of position with a screwdriver, it may be damaged irreparably and will have to be replaced. Remove the piston seal from the piston.

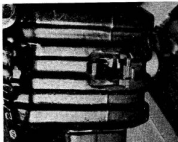
5 The parts removed should be cleaned thoroughly, using

only brake fluid as the liquid. Petrol, oil or paraffin will cause the various seals to swell and degrade, and should not be used under any circumstances. When the various parts have been cleaned, they should be stored in polythene bags until reassembly, so that they are kept dust free.

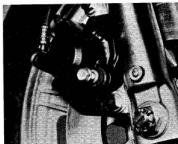
6 Examine the piston for score marks or other imperfections. If there are any imperfections it must be renewed, otherwise air or hydraulic fluid leakage will occur, which will impair braking efficiency. With regard to the various seals, it is advisable to renew them all, irrespective of their appearance. It is a small price to pay against the risk of a sudden and complete front brake failure. It is standard Yamaha practice to renew the seals every two years, even if no braking problems have occurred.

7 Check the condition of the bolt and bush upon which the cylinder casting slides. Renew any component that has worn or corroded.

8 Reassemble under clinically-clean conditions, by reversing the dismantling procedure. The new piston seal should be soaked in clean brake fluid for a few hours to ensure it is supple, before replacement. Lubricate the slide bolt and bush with a graphited or silicon grease and check that the boot has not perished. Reconnect the hydraulic fluid pipe and make sure the union has been tightened fully. Before the brake can be used, the whole system must be bled of air, by following the procedure described in Section 17 of this Chapter.



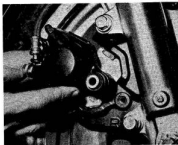
5.1 Disc pad inspection window in caliper



5.2a Remove the caliper slide bolt and ...



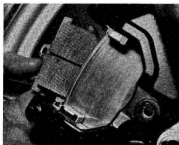
5.2b ... the single screw from the rear and ...



5.2c ... pull the caliper casing off the pads



5.3a The outer pad will lift out as will ...



5.3b ... the inner pad



6.6 Seal and boots must be perfect for efficient brake operation

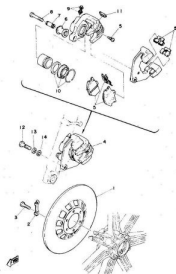


Fig. 5.2 Front disc brake caliper

- | | |
|-----------------------------|--------------------------|
| 1 Disc brake | 8 Retaining bolt |
| 2 Tab washer - 2 off | 9 Bleed nipple |
| 3 Bolt - 6 off | 10 Caliper seal kit |
| 4 Caliper assembly complete | 11 Inspection cap |
| 5 Caliper pad set | 12 Bolt - 2 off |
| 6 Boot | 13 Spring washer - 2 off |
| 7 Sleeve | 14 Washer - 2 off |

7 Master cylinder: examination and renewing seals

1 The master cylinder and hydraulic fluid reservoir take the form of a combined unit mounted on the right-hand side of the handlebars, to which the front brake lever is attached.

2 Before the master cylinder unit can be removed and dismantled, the system must be drained. Place a clean container below the brake caliper unit and attach a plastic tube from the bleed screw of the caliper unit to the container. Lift off the master cylinder cover (cap), gasket and diaphragm, after removing the four countersunk retaining screws. Open the bleed screw one complete turn and drain the system by operating the brake lever until the master cylinder reservoir is empty. Close the bleed screw and remove the tube.

3 Before dismantling the master cylinder, it is essential that a clean working area is available on which the various component parts can be laid out. Use a sheet of white paper, so that none of the smaller parts can be overlooked.

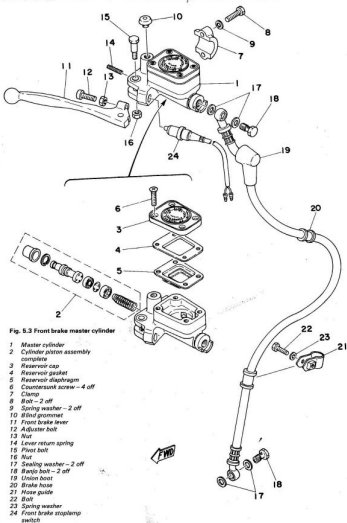
4 Disconnect the stop lamp switch and front brake lever, taking care not to misplace the brake lever return spring. The stop lamp switch is a push fit in the lever stock. The lever pivots on a bolt retained by a single nut. Remove the brake hose by unscrewing the banjo union bolt. Take the master cylinder away from the handlebars by removing the two bolts that clamp it to the handlebars. Take care not to spill any hydraulic fluid on the paintwork or on plastic or rubber components.

5 Withdraw the rubber boot that protects the end of the master cylinder and remove the snap ring that holds the piston assembly in position, using a pair of circlip pliers. The piston assembly can now be drawn out, followed by the return valve, spring cup and return spring.

6 The spring cap can now be separated from the end of the return valve spring and the main cup prised off the piston.

7 Examine the piston and the cylinder cup very carefully. If either is scratched or has the working surface impaired in any other way, it must be renewed without question. Reject the various seals, irrespective of their condition, and fit new ones in their place. It often helps to soften them a little before they are fitted by immersing them in a container of clean brake fluid.

8 When reassembling, follow the dismantling procedure in reverse, but take great care that none of the component parts is scratched or damaged in any way. Use brake fluid as the lubricant whilst reassembling. When assembly is complete, reconnect the brake fluid pipe and tighten the banjo union bolt. Use two new sealing washers at the union so that the banjo bolt does not require overtightening to effect a good seal. Refill the master cylinder with DOT 3 or SAE J1703 brake fluid and bleed the system of air by following the procedure described in Section 17 of this Chapter.



8 Removing and replacing the brake disc

1 It is unlikely that the disc will require attention until a considerable mileage has been covered, unless premature scoring of the disc has taken place thereby reducing braking efficiency. To remove the disc, first detach the front wheel as described in Section 4 of this Chapter. The disc is bolted to the front wheel on the right-hand side by six bolts, which are secured in pairs by a common tab washer. Bend back the tab washers and remove the bolts, to free the disc.

2 The brake disc can be checked for wear and for warpage whilst the front wheel is still in the machine. Using a micrometer, measure the thickness of the disc at the point of greatest wear. If the measurement is much less than the recommended service limit of 4.5 mm (0.177 in), the disc should be renewed. Check the warpage of the disc by setting up a suitable pointer close to the outer periphery of the disc and spinning the front wheel slowly. If the total warpage is more than 0.15 mm (0.006 in), the disc should be renewed. A warped disc, apart from reducing the braking efficiency, is likely to cause juddering during braking and will also cause the brake to bind when it is not in use.

9 Front drum brake: examination and renovation

1 With the front wheel removed, as described Section 4 of this Chapter, the twin leading shoe brake mechanism and backplate can be pulled free from the drum.

2 Examine the drum surface for signs of scoring or oil contamination. Both of these conditions will impair braking efficiency. Remove all traces of dust, preferably using a brass wire brush, taking care not to inhale any of it, as it is of an asbestos nature, and consequently toxic. Remove oil or grease deposits, using a petrol soaked rag.

3 If deep scoring is evident, due to the linings having worn through to the shoe at some time, the drum must be skimmed on a lathe, or renewed. Whilst there are firms who will undertake to skim a drum whilst fitted to the wheel, it should be borne in mind that excessive skimming will change the radius of the drum in relation to the brake shoes, therefore reducing the friction area until extensive bedding in has taken place. Also full adjustment of the shoes may not be possible. If in doubt about this point, the advice of one of the specialist engineering firms who undertake this work should be sought.

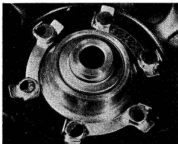
4 If fork oil or grease from the wheel bearings has badly contaminated the linings, they should be renewed. There is no satisfactory way of degreasing the lining material, which in any case is relatively cheap to replace. It is a false economy to try to out corners with brake components; the whole safety of both machine and rider being dependent on their condition.

5 The linings are bonded to the shoes, and the shoe must be renewed complete with the new linings. This is accomplished by folding the shoes together until the spring tension is relaxed, and then lifting the shoes and springs off the brake plate. Fitting new shoes is a direct reversal of the above procedure.

6 Before refitting existing shoes, roughen the lining surface sufficiently to break the glaze which will have formed in use.

7 Examine the linkage which runs from the brake actuating lever to operate the second fulcrum. This may be removed after slackening the pinch bolts which retain it to the spindles. The linkage may be further dismantled, if desired, by removing the clevises and clevises which retain the connecting rod to the actuating levers.

8 Push out the fulcrums from the brake plate. If there is corrosion of the fulcrum face or in its bore, this should be removed using wet or dry paper. Grease both fulcrums before installation. With the shoes, fulcrums and linkage in position on the brake plate, adjust the linkage by means of the turnbuckle and locknut on the connecting rod, so that the fulcrum faces are parallel to each other. This is an important point as both shoes should commence to act on the drum surface at the same point. A



8.1 The brake disc is retained by six bolts

maladjusted linkage can result in impaired braking efficiency, whilst a correctly set up twin leading shoe drum brake is both powerful and sensitive in use, giving most of the benefits of a disc brake without the risk of impaired wet weather performance. After reinstallation of the wheel, the front brake should be adjusted finally, as described in the following Section.

10 Adjusting the twin leading shoe front brake

1 If the adjustment of the front brake cable is correct, there should be a clearance of 5 – 8 mm (0.2 – 0.3 in) measured between the brake lever and the lever stock when the brake has just commenced operation. Adjustment may be made either at the handlebar lever cable adjuster or at the adjuster on the brake back plate.

2 The only time the operating rod connecting the two operating levers requires adjustment is when the original setting has been disturbed, or if uneven wear of the brake shoes had led to reduced braking efficiency. It is imperative that the leading edge of each brake shoe contacts the brake drum at the same time, for maximum braking efficiency.

3 Check by detaching the clevis pin from the eye of one end of the operating rod so that the brake operating arms can be applied independently. Operate each arm separately and note when the brake shoe first makes contact with the brake drum surface. Make a mark to show the exact position of each operating arm when the initial contact is made. Replace the clevis pin and check that the marks coincide when the brake is applied in similar fashion. If they do not, withdraw the clevis pin and use the rod adjuster to extend or reduce the length of the operating rod until the marks correspond exactly. Replace the clevis pin and do not omit the 'E' clip over the end which retains the clevis pin in position. Redcheck the brake lever adjustment before taking the machine on the road. As a rough guide the two brake operating arms should be parallel with one another, when adjustment is correct.

4 Check that the brake pulls off correctly when the handlebar lever is released. Slight action can be due to a poorly lubricated cable or one with a frayed inner.

11 Front wheel bearings: examination and replacement

All models

1 Place the machine on the centre stand and remove the front wheel as described in Section 4. On disc brake machines

remove the speedometer gearbox, drive gear and oil seal on the right-hand side of the hub and remove the spacer, oil seal and bearing retainer circlip from the left-hand side. To give access to the bearings or drum brake machines, first remove the brake plate on the left-hand side of the hub and the dust excluder and oil seal from the right-hand side of the hub.

2 The wheel bearings can now be tapped out from each side with the use of a suitable long drift. Careful and even tapping will prevent the bearing 'tying' and damage to the races.

3 Remove all the old grease from the hub and bearings, giving the latter a final wash in petrol. When the bearings are dirty, lubricate them sparingly with a very light oil. Check the bearings for play and roughness when they are spun by hand. All used bearings will emit a small amount of noise when spun but they should not chatter or sound rough. If there is any doubt about the conditions of the bearings they should be renewed.

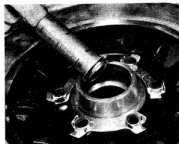
4 Before replacing the bearings pack them with high melting point grease. Do not overfill the hub centre with grease as it will expand when hot and may find its way past the oil seals. The hub space should be about 2/3 full of grease. Drift the bearings in, using a drift on the outside ring of the bearing. Do not drift the centre ring of the bearing or damage will be incurred. Replace the oil seals carefully, drifting them into place with a thick walled tube of approximately the same dimension as the oil seal. A large socket spanner is ideal.



11.1a Remove spacers before drifting out bearings



11.1b Oil seals may be prised out or drifted out with bearing



11.1a Do not omit bearing spacer on reassembly



11.4b Drive in bearings using suitable tubular drift

12 Rear wheel: examination and renovation

1 When inspecting the rear wheel follow the procedure given for front wheel inspection in either Section 2 or 3 of this Chapter, depending upon whether the wheel is of the spoked or cast alloy type.

2 The procedure for removal, examination and lubrication of the rear wheel bearings is materially the same as that used when attending to the front wheel bearings. Follow the procedure given in the preceding Section.

13 Rear wheel: removal and replacement

1 Place the machine on the centre stand so that the rear wheel is clear of the ground. Separate the rear chain at the master link, and then replace the link on one end of the chain to avoid loss.

2 Remove the two bolts which secure the chainguard and lift the guard away from the machine towards the rear.

XS 360 drum brake models

3 Detach the brake torque arm from the brake back plate by removing the special bolt, held by a nut and split pin. Unscrew the brake adjuster nut from the brake operating rod and depress the brake pedal, so that the rod leaves the operating arm. Push out the trunnion from the arm and replace it on the rod, together with the adjuster nut. This will prevent loss of these two components and the brake rod spring.

Disc brake models

4 When removing the rear wheel on disc brake models, the rear suspension should be compressed a number of inches, to allow sufficient clearance between the brake caliper and the ground for the disc to be able to leave the caliper. A short length of steel cable with a hook at either end is supplied in the tool kit. After compressing the rear dampers this may be secured on two

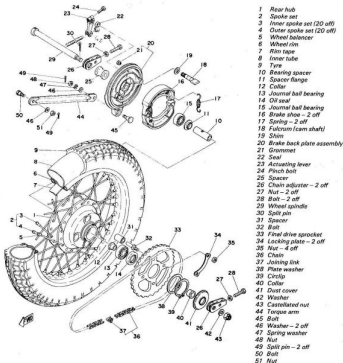
lugs provided and so hold the suspension in the compressed position.

All models

5 Remove the split pin from the end of the wheel spindle and unscrew the nut. To free the wheel, withdraw the wheel spindle, if necessary passing a tommy bar through the hole in the spindle head. As the spindle is withdrawn, the two chain adjuster units will fall free, together with the wheel spacer on the right-hand side of the spindle.

6 Lower the wheel and manoeuvre it from position between the swinging arm fork.

7 Refit the rear wheel by reversing the dismantling procedure. On drum brake models it is essential that the torque arm bolt is tightened fully and the split pin refitted. If the arm falls free in service, the rear brake will lock-up. The results of this are obvious.

Fig. 5.4 Rear wheel and final drive – components

- 1 Rear hub
- 2 Spoke set
- 3 Inner spoke set (20 off)
- 4 Outer spoke set (20 off)
- 5 Wheel balancer
- 6 Wheel rim
- 7 Rim tape
- 8 Inner tube
- 9 Tyre
- 10 Bearing spacer
- 11 Spacer flange
- 12 Collar
- 13 Journal ball bearing
- 14 Oil seal
- 15 Journal ball bearing
- 16 Brake shoe – 2 off
- 17 Spring – 2 off
- 18 Fulcrum (cam shaft)
- 19 Shim
- 20 Brake back plate assembly
- 21 Grommet
- 22 Seal
- 23 Actuating lever
- 24 Pinch bolt
- 25 Spacer
- 26 Chain adjuster – 2 off
- 27 Nut – 2 off
- 28 Bolt – 2 off
- 29 Wheel spindle
- 30 Split pin
- 31 Spacer
- 32 Bolt
- 33 Final drive sprocket
- 34 Locking plate – 2 off
- 35 Nut – 4 off
- 36 Chain
- 37 Joining link
- 38 Plate washer
- 39 Circlip
- 40 Collar
- 41 Dust cover
- 42 Washer
- 43 Castellated nut
- 44 Torque arm
- 45 Bolt
- 46 Washer – 2 off
- 47 Spring washer
- 48 Nut
- 49 Split pin – 2 off
- 50 Bolt
- 51 Nut



13.5a Remove the split pin and nut to allow ...



13.5b ... the rear wheel spindle to be withdrawn



13.6 Tilt rear wheel and remove from the fork

14 Rear brake: removal, examination and replacement

Disc brake models

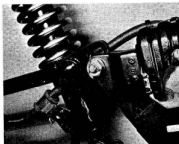
1 The rear disc brake caliper and disc are similar components to those used on the front brake of the machine, and for this reason both maintenance and overhaul are fundamentally the same. Refer to the relevant section covering the front brake when carrying out any work.

XS 360 drum rear brake models

The rear drum brake fitted to the XS360C and XS360-2D is of the conventional single leading shoe type. When carrying out overhaul or inspection refer to Section 9 which covers the twin leading shoe drum brake unit fitted to the front wheel of XS 360-2D models. Bear in mind that only one fulcrum pin (camshaft) and operating arm is used and hence no link rod is employed.



14.1a Rear disc caliper bolt has flat milled for location



14.1b ALWAYS renew the caliper bolt split pin

15 Rear brake master cylinder: removal, examination and renewing seals

- 1 The rear brake master cylinder is attached to the right-hand rear frame downtube and is operated from a foot pedal via a push rod connected to the pedal by a clevis fork and pin. The master cylinder reservoir is integral with the cylinder and has a cap held by three countersunk screws.
- 2 Disconnect the brake hose at the caliper unit by removing the banjo bolt. Drain the fluid by applying the rear brake until no more fluid emerges. Do not allow fluid to escape onto any cycle parts or rubber components; it is a first class solvent. Detach the hose at the master cylinder where it is held by a banjo bolt.
- 3 The master cylinder is retained on the frame lug by two bolts. After removal of the bolts, the cylinder unit may be lifted upwards so that the operating pushrod leaves the cylinder.
- 4 Examination and dismantling of the master cylinder may be carried out in a manner similar to that given for the front brake master cylinder in Section 7.
- 5 After reassembly and replacement of the rear brake master cylinder components which may be made by reversing the dismantling procedure - bleed the rear brake system of air by referring to Section 17 of this Chapter.

16 Rear brake pedal height: adjustment

- 1 The pivot shaft upon which the rear brake pedal is mounted is splined to allow adjustment of the pedal height to suit individual requirements.
- 2 To adjust the height, loosen and remove the pinch bolt which passes into the rear of the pedal. Draw the pedal off the splines and refit it at the required angle. Ideally the pedal should be fitted, so that it is positioned just below the rider's right foot, when the rider is seated normally. In this way the foot does not have to be lifted before the brake can be applied.
- 3 The upper limit of travel of the brake pedal may be adjusted by means of the bolt and locknut fitted to the pedal pivot mounting bracket. On drum brake models the rear brake adjustment should be checked after making pedal height adjustment by means of the stop bolt.
- 4 On disc brake models it will be seen that adjustment of pedal height by this method will impart a small degree of movement to the master cylinder piston and so apply the brake slightly. To rectify this, slacken the locknut on the master cylinder pushrod and screw the rod into the clevis fork until free play can be felt between the end of the rod and the master cylinder piston. Unscrew the rod until it contacts the piston lightly and

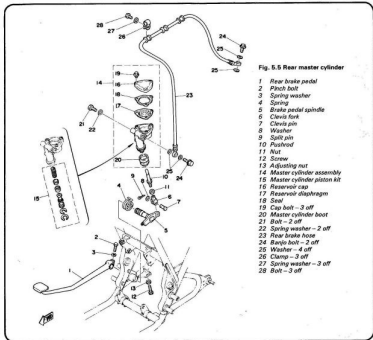


Fig. 5.5 Rear master cylinder

- 1 Rear brake pedal
- 2 Pinch bolt
- 3 Spring washer
- 4 Spring
- 5 Brake pedal spindle
- 6 Clevis fork
- 7 Clevis pin
- 8 Washer
- 9 Split pin
- 10 Postrod
- 11 Nut
- 12 Screw
- 13 Adjusting nut
- 14 Master cylinder assembly
- 15 Master cylinder piston kit
- 16 Reservoir cap
- 17 Reservoir diaphragm
- 18 Seal
- 19 Cap bolt - 3 off
- 20 Master cylinder body
- 21 Bolt - 2 off
- 22 Spring washer - 2 off
- 23 Rear brake hose
- 24 Banjo bolt - 2 off
- 25 Washer - 4 off
- 26 Clamp - 3 off
- 27 Spring washer - 3 off
- 28 Bolt - 3 off

then turn it back $1 - 1\frac{1}{2}$ turns to give the correct free play. Without allowing the pushrod to turn, tighten the locknut. A tiny pin hole in the pushrod is incorporated to show when the pushrod is screwed out of the clevis fork further than is safe. If the pin hole shows above the locknut there is some danger of the rod flexing at the threads. Re-adjust to correct this.

5 Adjustment of the pedal may necessitate readjustment of the rear stop lamp switch.

17 Disc brake: bleeding the hydraulic system

1 Removal of all the air from the hydraulic system is essential to the efficiency of the braking system. Air can enter the system due to leaks or when any part of the system has been dismantled for repair or overhaul. Topping the system up will not suffice, as air pockets will still remain, even small amounts, causing dramatic loss of brake pressure.

2 Check the level in the reservoir, and fill almost to the top. Again, beware of spilling the fluid on to painted or plastic surfaces.

3 Place a clean jar below the brake caliper unit and attach a clear plastic tube from the caliper bleed screw to the container. Place some clean hydraulic fluid in the container so that the pipe is always immersed below the surface of the fluid.

4 Unscrew the bleed screw one complete turn and pump the handlebar lever slowly. As the fluid is ejected from the bleed screw the level in the reservoir will fall. Take care that the level does not drop too low whilst the operation continues, otherwise air will re-enter the system, necessitating a fresh start.

5 Continue the pumping action with the lever until no further air bubbles emerge from the end of the plastic pipe. Hold the brake lever against the handlebars and tighten the caliper bleed screw. Remove the plastic tube after the bleed screw is closed.

6 Check the brake action for sponginess, which usually denotes there is still air in the system. If the action is spongy, continue the bleeding operation in the same manner, until all traces of air are removed.

7 When all traces of air have been removed from the system, top up the reservoir and refit the diaphragm and cap or cover, as appropriate. Check the entire system for leaks, and check also that the brake system in general is functioning efficiently before using the machine on the road.

8 Bleeding of the rear brake system should be carried out in a similar manner, using the rear brake pedal in place of the handlebar lever.

9 Brake fluid drained from the system will almost certainly be contaminated, either by foreign matter or more commonly by the absorption of water from the air. All hydraulic fluids are to some degree hygroscopic, that is, they are capable of drawing

water from the atmosphere, and thereby degrading their specifications. In view of this, and the relative cheapness of the fluid, old fluid should always be discarded.

18 Rear wheel sprocket: examination and replacement

1 The rear wheel sprocket is retained on the left-hand side of the hub by a large circlip, and is located by four pegs which pass into the cush drive in the hub and are retained by hexagonal nuts.

2 To remove the sprocket, detach the large circlip and the spacing plate which lies below. The sprocket can be removed completely with drive pegs, but it is probable that the pegs are seized in the steel sleeves bonded to the flexible rubbers. If this is the case, knock down the ears of the tab washers and remove the peg securing nuts. The sprocket can then be lifted off with ease.

3 Check the condition of the sprocket teeth. If they are hooked, chipped or badly worn, the sprocket must be renewed. It is considered best practice to renew one sprocket on its own. The final drive sprockets should always be renewed as a pair and a new chain fitted, otherwise rapid wear will necessitate even earlier renewal on the next occasion.

4 The sprocket may be refitted by reversing the dismantling procedure. It is important that the recesses in the rear of the sprocket are engaged correctly by the milled flats on each cush drive pin.

19 Rear wheel cush drive: examination and renovation

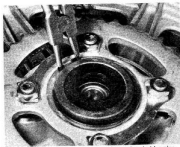
1 The cush drive assembly consists of four tubular rubber bushes located in the hub. The four special pegs retained by nuts on the sprocket locate with these bushes, to give a cushioning effect to the sprocket and drive.

2 To obtain access to the bushes, the sprocket has to be removed by detaching its circlip and pulling it from the wheel hub. Renewal of the bushes is required when there is excessive sprocket movement. As stated in the previous Section the pegs may seize after a considerable length of time. If this occurs, the sprocket complete with pegs should be drawn from the hub using a sprocket puller. A blanking plate or bar, fabricated from mild steel, will have to be made and placed over the bearing. The sprocket puller screw can then bear against the bar.

3 Removal of the flexible bushes is almost impossible without the use of a special expanding extractor. It is recommended that the wheel be returned to a Yamaha dealer who can carry out the work without risk of damage to the wheel.



18.2 A = Pedal height bolt, B = Push rod adjuster nuts



18.2a Displace circlip to remove sprocket and cush drive pins



Tyre removal: Deflate inner tube and insert lever in close proximity to tyre valve



Use two levers to work bead over the edge of rim



When first bead is clear, remove tyre as shown



Tyre fitting: Inflate inner tube and insert in tyre



Lay tyre on rim and feed valve through hole in rim



Work first bead over rim, using lever in final section



Use similar technique for second bead, finish at tyre valve position



Push valve and tube up into tyre when fitting final section, to avoid trapping



18.2b To separate sprocket from pins remove nuts



18.2c Note spacers on cush drive pins

20 Final drive chain: examination and lubrication

- 1 The final drive chain is fully exposed, with only a light chainguard over the top run. Periodically the tension will need to be adjusted, to compensate for wear. This is accomplished by placing the machine on the centre stand and slackening the wheel nuts on the left-hand side of the rear wheel so that the wheel can be drawn backward by means of the drawbolt adjuster in the fork ends. On drum brake models the torque arm bolt should be slackened after removal of the split pin, to allow the brake back plate to move.
- 2 The chain is in correct tension if there is approximately 20 mm ($\frac{3}{4}$ inch) slack in the middle of the lower run. Always check when the chain is at its tightest point as a chain rarely wears evenly during service.
- 3 Always adjust the drawbolts an equal amount in order to preserve wheel alignment. The fork ends are clearly marked with a series of vertical lines above the adjusters, to provide a simple, visual check. If desired, wheel alignment can be checked by running a plank of wood parallel to the machine, so that it touches the side of the rear tyre. If the wheel alignment is correct, the plank will be equidistant from each side of the front wheel tyre, when tested on both sides of the rear wheel. It will not touch the front wheel tyre because this tyre is of smaller cross section. See accompanying diagram.
- 4 Do not run the chain overtight to compensate for uneven wear. A tight chain will place undue stress on the gearbox and rear wheel bearings, leading to their early failure. It will absorb a surprising amount of power.
- 5 After a period of running, the chain will require lubrication. Lack of oil will greatly accelerate the rate of wear of both the chain and the sprockets and will lead to harsh transmission. The application of engine oil will act as a temporary expedient, but it is preferable to remove the chain and clean it in a paraffin bath before it is immersed in molten lubricant such as 'Linklife' or 'Chainguard'. These lubricants achieve better penetration of the chain links and rollers and are less likely to be thrown off when the chain is in motion.
- 6 To check whether the chain is due for replacement, lay it lengthwise in a straight line and compress it endwise so that all the play is taken up. Anchor one end and measure the length. Now pull the chain with one end anchored firmly, so that the chain is fully extended by the amount of play in the opposite direction. If there is a difference of more than $\frac{1}{2}$ inch per foot in the two measurements, the chain should be replaced in conjunction with the sprockets. Note that this check should be made AFTER the chain has been washed out, but BEFORE any lubricant is applied, otherwise the lubricant may take up some of the play.

7 When replacing the chain, make sure that the spring link is seated correctly, with the closed end facing the direction of travel.

8 Replacement chains are now available in standard metric sizes from Renold Limited, the British chain manufacturer. When ordering a new chain, always quote the size, the number of chain links and the type of machine to which the chain is to be fitted.

21 Tyres: removal and replacement

- 1 At some time or other the need will arise to remove and replace the tyres, either as a result of a puncture or because replacements are necessary to offset wear. To the inexperienced, tyre changing represents a formidable task, yet if a few simple rules are observed and the technique learned, the whole operation is surprisingly simple.
- 2 To remove the tyre from either wheel, first detach the wheel from the machine. Deflate the tyre by removing the valve insert and when it is fully deflated, push the bead from the tyre away from the wheel rim on both sides so that the bead enters the centre well of the rim. Remove the locking cap and push the tyre valve into the tyre itself.
- 3 Insert a tyre lever close to the valve and lever the edge of the tyre over the outside of the wheel rim. Very little force should be necessary; if resistance is encountered it is probably due to the fact that the tyre beads have not entered the well of the wheel rim all the way round the tyre.
- 4 Once the tyre has been edged over the wheel rim, it is easy to work around the wheel rim so that the tyre is completely free on one side. At this stage, the inner tube can be removed.
- 5 Working from the other side of the wheel, ease the other edge of the tyre over the outside of the wheel rim until the tyre is free completely from the rim.
- 6 If a puncture has necessitated the removal of the tyre, reinflate the inner tube and immerse in a bowl of water to trace the source of the leak. Mark its position and deflate the tube. Dry the tube and clean the area around the puncture with a petrol soaked rag. When the surface has dried, apply rubber solution and allow this to dry before removing the backing from the patch and applying the patch to the surface.
- 7 It is best to use a patch of self-vulcanising type, which will form a very permanent repair. Note that it may be necessary to remove a protective covering from the top surfaces of the patch, after it has sealed into position. Inner tubes made from synthetic rubber may require a special type of patch and adhesive. If a satisfactory bond is to be achieved.

- 8 Before replacing the tyre, check the inside to make sure the agent that caused the puncture is not trapped. Check the outside of the tyre, particularly the tread area, to make sure nothing is trapped that may cause a further puncture.
- 9 If the inner tube has been patched on a number of past occasions, or if there is a tear or large hole, it is preferable to discard it and fit a replacement. Sudden deflation may cause an accident, particularly if it occurs with the front wheel.
- 10 To replace the tyre, inflate the inner tube sufficiently for it to assume a circular shape but only just. Then push it into the tyre so that it is enclosed completely. Lay the tyre on the wheel at an angle and insert the valve through the rim tape and the hole in the wheel rim. Attach the locking cap on the first few threads, sufficient to hold the valve captive in its correct location.
- 11 Starting at the point furthest from the valve, push the tyre bead over the edge of the wheel rim until it is located in the central well. Continue to work around the tyre in this fashion until the whole of one side of the tyre is on the rim. It may be necessary to use a tyre lever during the final stages.
- 12 Make sure there is no pull on the tyre valve and again commencing with the area furthest from the valve, ease the other bead of the tyre over the edge of the rim. Finish with the area close to the valve, pushing the valve up into the tyre until the locking cap touches the rim. This will ensure the inner tube is not trapped when the last section of the bead is edged over the rim with a tyre lever.
- 13 Check that the inner tube is not trapped at any point.

Reinflate the inner tube, and check that the tyre is seating correctly around the wheel rim. There should be a thin rib moulded around the wall of the tyre on both sides, which should be equidistant from the wheel rim at all points. If the tyre is unevenly located on the rim, try bouncing the wheel when the tyre is at the recommended pressure. It is probable that one of the beads has not pulled clear of the centre well.

14 Always run the tyres at the recommended pressures and never under or over-inflate. The correct pressures for solo use are given in the Specification Section of this Chapter.

15 Tyre replacement is aided by dusting the side walls, particularly in the vicinity of the beads, with a liberal coating of french chalk. Washing-up liquid can also be used to good effect, but this has the disadvantage of causing the inner surfaces of the wheel rim to rust or corrode.

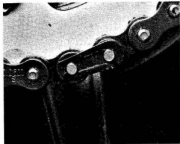
16 Never replace the inner tube and tyre without the rim tape in position. If this precaution is overlooked there is a good chance of the end of the spoke nipples chafing the inner tube and causing a crop of punctures.

17 Never fit a tyre that has a damaged tread or side walls. Apart from the legal aspects, there is a very great risk of a blow-out, which can have serious consequences on any two-wheeled vehicle.

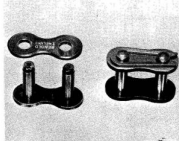
18 Tyre valves rarely give trouble, but it is always advisable to check whether the valve itself is leaking before removing the tyre. Do not forget to fit the dust cap, which forms an effective second seal.



20.3 Fork ends are marked to aid wheel alignment



20.7 Spring link closed and must point in direction of chain travel



20.8 A British-made chain of equivalent type is available

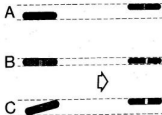


Fig. 5.6 Method of checking wheel alignment

A and C incorrect
B correct

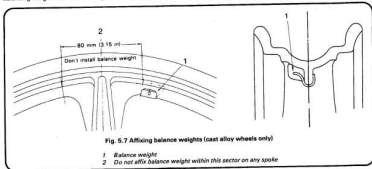
22 Front wheel balancing

- 1 The front wheel should be statically balanced, complete with tyre. An out of balance wheel can produce dangerous wobbling at high speed.
- 2 Some tyres have a balance mark on the sidewall. This must be positioned adjacent to the valve. Even so, the wheel still requires balancing.
- 3 With the front wheel clear of the ground, spin the wheel several times. Each time, it will probably come to rest in the same position. Balance weights should be attached diametrically opposite the heavy spot, until the wheel will not come to rest in any set position, when spun.
- 4 Balance weights, which clip round the spokes, are available in 5, 10 or 20 gramme weight. If they are not available, wire solder wrapped round the spokes and secured with insulating tape will make a substitute.
- 5 It is possible to have a wheel dynamically balanced at some dealers. This requires its removal.
- 6 There is no need to balance the rear wheel under normal road conditions, although any tyre balance mark should be aligned with the valve.
- 7 Machines fitted with cast aluminium wheels require special balancing weights which are designed to clip onto the centre

rim flange, much in the way that weights are affixed to car wheels. When fitting these weights, take care not to affix any weight near than 40 mm (1.54 in) to the radial centre line of any spoke. Refer to the accompanying diagram.

23 Tyre valve dust caps

- 1 Tyre valve dust caps are often left off when a tyre has been replaced, despite the fact that they serve an important two-fold function. Firstly they prevent dirt or other foreign matter from entering the valve and causing the valve to stick open when the tyre pump is next applied. Secondly, they form an effective second seal so that in the event of the tyre valve sticking, air will not be lost.
- 2 Isolated cases of sudden deflation at high speed have been traced to the omission of the dust cap. Centrifugal force has tended to lift the tyre valve off its seating and because the dust cap is missing, there has been no second seal. Racing inner tubes contain provision for this happening because the valve inserts are fitted with stronger springs, but standard inner tubes do not, hence the need for the dust cap.
- 3 Note that when a dust cap is fitted for the first time, the wheel may have to be rebalanced.



24 Fault diagnosis: wheels, brakes and tyres

Symptom	Cause	Remedy
Handlebars oscillate at low speeds	Buckle or flat in wheel rim, most probably front wheel Tyre not straight on rim	Check rim alignment by spinning wheel. Correct by retensioning spokes or having wheel rebuilt on new rim. Check tyre alignment.
Machine lacks power and accelerates poorly	Brakes binding	Hot brake drums provide best evidence. Readjust brakes (drum brakes). Caliper slide bolt binding, remove and lubricate bolt and bush.
Brakes grab when applied gently	Ends of brake shoes not chamfered Elliptical brake drum (drum brakes)	Chamfer with file. Lightly skim in lathe (specialist attention needed).
Brake pull-off sluggish	Brake cam binding in housing Weak brake shoe springs	Free and grease. Replace, if brake springs not displaced.
Harsh transmission	Worn or badly adjusted chains Hooked or badly worn sprockets	Adjust or replace as necessary. Replace as a pair, together with chain.

Chapter 6 Electrical System

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Specifications

	360 2D model	All other models
Battery		
Make	G-S	F-B or Yuasa
Type	12N7-38-1	12N12-4A-1
Voltage	12V	12V
Capacity	7Ah	12Ah
Earth	Negative	Negative
Alternator		
Type	Excited rotor, fixed coil	
Output	14.5V, 13A @ 5,000 rpm	
Stator Coil resistance	0.72 ohms \pm 10% at 20°C (68°F)	
Field Coil resistance	4.04 ohms \pm 10% at 20°C (68°F)	
Voltage regulator		
Type	Electro-mechanical, three point	
Regulating voltage	14.5 \pm 0.5V	
Starter motor (except XS360 2D)		
Make	Mitsuba	
Type	SM2238	
Output	0.5Kw	
Brush length	11–12.5 mm (0.43–0.49 in)	
Wear limit	6.0 mm (0.24 in)	
Armature Coil resistance	0.005 ohms \pm 10% at 20°C (68°F)	
Field Coil resistance	0.011 ohms \pm 10% at 20°C (68°F)	
Commutator diameter (min)	27 mm (1.06 in)	
Mica undercut	0.7 mm (0.03 in)	

Bulbs

Headlamp	...	...	40/45W (40/30W USA)
Pilot lamp	...	...	3W (UK only)
Tail/Stop lamp	...	...	8/21W x 2
Flashing indicators	...	...	27W x 4
Flasher warning lamp	...	...	3.4W x 2
Instrument light	...	...	3.4W x 2
Neutral indicator light	...	...	3.4W
Oil pressure warning light	...	...	3.4W
High beam indicator	...	...	3.4W

All bulbs rated at 12V

1 General description

The Yamaha XS250, 360 and 400 models are all fitted with electrical systems of similar type.

Power is generated by a 12 volt alternator, the fabricated rotor of which is fixed to the extreme left-hand end of the crankshaft. The stator coil is fitted within the alternator cover, together with a field coil which induces a magnetic field in the rotor. The ac current is converted to dc by a silicon rectifier, to allow the battery and electrical ancillaries to be fed. The charging voltage is controlled by an electro-mechanical voltage regulator, which is interconnected with the field coil.

2 Charging system: General

1 As stated above, the electrical charging system consists of an alternator, a rectifier and a voltage control unit. If the charging system output is suspect, the performance of the system as a whole should be checked first. If the output is found lacking, the various components should be checked individually to eliminate the faulty item.

2 The tests described in the following section, all of which relate to the charging system, require the use of a multimeter with resistance functions. It is recommended that unless this equipment is available, and unless some previous experience in its operation has been gained, the machine be returned to a Yamaha Service Agent who will have the necessary equipment and expertise to carry out the work. Irreparable damage to the electrical components may result from injudicious use of the equipment or errors in test wiring.

3 If testing is to be carried out, the following points should be noted:

- 1) Ensure that the battery is fully charged when making voltage checks.
- 2) NEVER disconnect the leads from the battery whilst the alternator is operating.
- 3) NEVER reverse the polarity of the battery terminals.
- 4) Take especial care to avoid incorrect connection of wires or short circuiting live wires against earth points.
- 5) Do not connect the rectifier directly to the battery in an attempt to make a continuity test.
- 6) Always disconnect the battery before removing electrical components.

3 Alternator: checking output performance

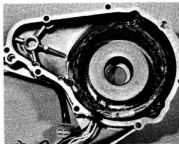
1 Connect a dc voltmeter, across the two battery terminals. Start the engine and raise the engine speed to 2000 rpm or more. The correct voltage reading is 14.5 \pm 0.3V.

2 If a voltage reading above or below the recommended figure is recorded, the alternator winding resistance values should be checked as follows.

Disconnect the two main leads which run from the alternator casing to the block connectors behind the left-hand side panel. Separate the connectors. Select the field winding lead (Green, Green, Orange, Grey) and, using the multimeter set to the resistance function, check the resistance of the field winding across the two green wires. The resistance should be 4.0 ohms \pm 15% at 20°C (68°F). If the reading does not conform to that given, the coil is faulty and should be renewed, or a wiring connection has become loose. Select the second main lead from the alternator (three white wires) and test the resistance across each successive pair of wires. Three readings should be taken. Each reading should show a resistance of 0.72 ohms \pm 10% at 20°C (68°F). Incorrect readings indicate faulty wiring or damaged coils.

3 When taking resistance readings, it should be noted that variations in ambient temperature will have a proportionate effect on the values that are given.

4 If the resistance value of the coils is found to be correct, the alternator can be considered to be in good condition. Continue the testing of the charging circuit by referring to the following Section.



3.2 Make a visual check of the alternator coil for loose wires

4 Silicon rectifier: location and testing

1 The rectifier is located behind the frame left-hand side cover, where it is secured to the battery box by a single screw. The rectifier is a sealed unit, which converts ac current from the alternator to dc current. If the charging system has malfunctioned, but the alternator is found to be in good condition, the rectifier should be checked.

- 2 Disconnect the rectifier lead at the block connector. Set the multimeter to the resistance function and connect the positive probe to the red (+) rectifier terminal. Check the continuity between this terminal and each of the remaining four leads in turn. Continuity should be registered on each test. Now connect the positive probe to the black (-) terminal on the rectifier and repeat the test. Continuity should be registered. Repeat both tests but with the multimeter probes reversed. In this latter case no continuity should be found.
- 3 If any incorrect readings are given, the rectifier should be renewed.

5 Voltage regulator: operating principle, testing and adjustment

- 1 The voltage regulator is fitted within the electrical system to control the current from the generator and keep it constant, as engine speed variations would otherwise make the power output rise and fall. By decreasing the field current when the engine speed is high and increasing it when it is low, the generated voltage is maintained at a constant level, regardless of engine speed variations. The voltage regulator has been designed to conform to these operating conditions.
- 2 If problems with the charging system have developed, but the alternator and rectifier have been tested and found to be in working order, the regulator may be checked using a dc voltmeter with a range of 0-20 volts. The battery should be fully charged for this test.
- 3 Start the engine and disconnect the wire running from the battery positive (red) terminal to the fuse box. Connect the voltmeter from the wire to a suitable earth point. Increase the engine speed to 2500 rpm and check the reading, which should be 14.5 - 15.0 volts. If the voltage is outside the range given, stop the engine and remove the voltage regulator cover, which is held by two small screws. A small screw bearing against a spring steel plate is provided to allow a limited amount of adjustment to be made to the regulator. Turning the screw clockwise will increase the charging voltage and turning it outwards will reduce the voltage.
- 4 If the voltage regulator will not respond to adjustment, or functions erratically, the complete unit should be renewed.



5.1 Voltage regulator is mounted below fuse box

6 Battery: examination and maintenance

- 1 A Funakawa or Yussu battery of 12 amp hours capacity is fitted as standard to all but the XS360 - 2D model. The XS360-2D has a battery of only 7 amperes per hour capacity because it

is not fitted with a starter motor and therefore does not have to supply additional current.

2 The transparent plastic case of the battery permits the upper and lower levels of the electrolyte to be observed when the battery is fitted from its housing below the dustseal. Maintenance is normally limited to keeping the electrolyte level between the prescribed upper and lower limits and by making sure the vent pipe is not blocked. The lead plates and their separators can be seen through the transparent case, a further guide to the general condition of the battery.

3 Unless acid is split, 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 split on any of the machine, it should be neutralised with an alkali such as washing soda and washed away with plenty of water, otherwise serious corrosion will occur. Top up with sulphuric acid of the correct specific gravity (1.260 - 1.280) only when spillage has occurred. Check that the vent pipe is well clear of the frame tubes or any of the other cycle parts, for obvious reasons.

7 Battery: charging procedure

- 1 The correct charging rate for the 12 Ah battery is 1.2 amps, and for the 7 Ah battery is 0.7 amps. A 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 re-connected 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.

8 Fuse: location and replacement

- 1 A bank of fuses is contained within a small plastic box located to the rear of the battery box. The box contains four 10A fuses and two 20A fuses, of which one of each type is spare.
- 2 Before replacing a fuse that has blown, check that no obvious short circuit has occurred, otherwise the replacement fuse will blow immediately it is inserted. It is always wise to check the electrical circuit thoroughly, to trace the fault and eliminate it.
- 3 When a fuse blows while the machine is running and no spare is available, a 'get you home' remedy is to remove the blown fuse and wrap it in silver paper before replacing it in the fuseholder. The silver paper will restore the 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 'doctored' fuse at the earliest possible opportunity, to restore full circuit protection.

9 Headlamp: replacing bulbs and adjusting beam height

- 1 In order to gain access to the headlamp unit the rim must be removed. Remove the two screws from just behind the rim in the 8 o'clock and 4 o'clock positions and pull the rim out at the lower edge. The rim complete with the unit will pull free. Pull the wiring socket off the rear of the reflector unit.
- 2 On UK models the headlamp bulb is secured in the rear of the reflector unit by a spring loaded bayonet fitting collar or by a plastic screw collar. The bulb in the former type may be released by depressing the spring loaded collar and twisting it to the left. Release the collar and pull out the bulb. On the latter unit

unscrew the collar. In both cases the bulb locates positively in the reflector so that it can be refitted only in one position.

3 The pilot light holder is a push fit in the reflector, the bulb being of the bayonet fitting type. To release, press the bulb inwards and twist to the left.

4 On machines of USA specification no bulb as such is fitted. A single sealed unit comprising the headlamp glass reflector and the twin light filament is utilised. Consequently if either or both filaments fail, the complete unit must be renewed. No provision is made for a pilot bulb.

5 To remove the rim from the sealed beam unit and the unit housing, first detach the long adjuster screw which passes through the rim on the left-hand side. Note the sequence of the spacer washer and spring. Unscrew the two screws at the upper and lower rim brackets and detach the rim. The replacement sealed unit can be fitted by reversing the dismantling procedure.

6 Vertical adjustment of the headlamp can be made by slackening the two mounting bolts. Provision for horizontal adjustment is given only on sealed beam units and is made using the screw in the headlamp rim. The headlamp adjustments should be arranged so that the main beam 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.

7 To obtain the correct beam height, place the machine on level ground facing a wall 25 feet distant, with the rider seated normally. The height of the beam centre should be equal to the height of the centre of the headlamp from the ground, when the dip switch is in the main beam position. Furthermore, the concentrated area of light should be centrally disposed. Adjustments in either direction are made by rearranging the angle of the headlamp, as described in the preceding paragraph. Note that a different beam setting will be needed when a pillion passenger is carried. If a pillion passenger is carried regularly,

the passenger should be seated in addition to the rider when the beam setting adjustment is made.

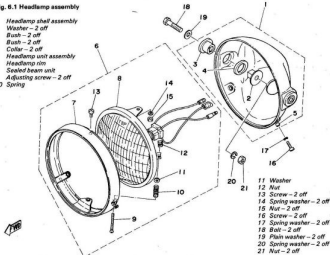
8 The above instructions for beam setting relate to the requirements of the United Kingdom's transport lighting regulations. Other settings may be required in countries other than the UK.



8.1 Spare fuses as contained in the fuse box lid

Fig. 6.1 Headlamp assembly

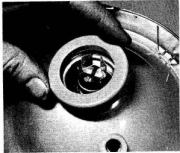
- 1 Headlamp shell assembly
- 2 Washer - 2 off
- 3 Bush - 2 off
- 4 Bush - 2 off
- 5 Collar - 2 off
- 6 Headlamp unit assembly
- 7 Headlamp rim
- 8 Sealed beam unit
- 9 Adjusting screw - 2 off
- 10 Spring



- 11 Washer
- 12 Nut
- 13 Screw - 2 off
- 14 Spring washer - 2 off
- 15 Nut - 2 off
- 16 Screw - 2 off
- 17 Spring washer - 2 off
- 18 Bolt - 2 off
- 19 Plain washer - 2 off
- 20 Spring washer - 2 off
- 21 Nut - 2 off



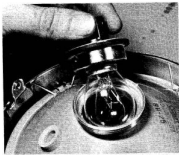
9.1 Remove screws passing through shell to release reflector unit



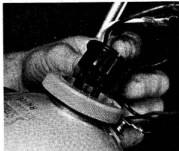
9.2a Unscrew the plastic screw collar



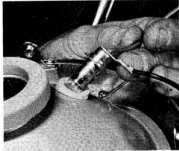
9.2b Note the special backing washers



9.2c Projection on bulb holder locates bulb in correct position



9.2d Wiring socket is a push fit on bulb pins



9.3 Pilot bulb is a bayonet fit

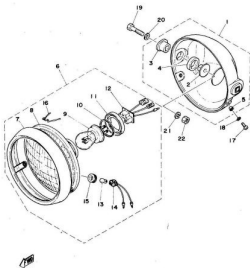


Fig. 6.2 Headlamp assembly

- 1 Headlamp shell assembly
- 2 Special washer - 2 off
- 3 Bush - 2 off
- 4 Bush - 2 off
- 5 Collar - 2 off
- 6 Reflector unit
- 7 Rim
- 8 Reflector/glass assembly
- 9 Headlamp bulb
- 10 Ring
- 11 Screw collar
- 12 Socket
- 13 Pilot bulb
- 14 Bulb holder
- 15 Grommet
- 16 Spring clip - 4 off
- 17 Screw - 2 off
- 18 Washer - 2 off
- 19 Bolt - 2 off
- 20 Washer - 2 off
- 21 Spring washer
- 22 Nut - 2 off

10 Handlebar switches: function and replacement

- 1 The dipswitch forms part of the left-hand dummy twist grip which contains the horn button and the indicator lamp switch. The right-hand twist grip assembly incorporates the lighting master switch and a three position ignition positive cut-out switch.
- 2 In the event of failure of any of these switches, the switch assembly must be replaced as a complete unit since it is not practicable to effect a permanent repair.

11 Stop and tail lamp: replacing the bulbs

- 1 The tail lamp is fitted with two twin filament bulbs of 12 volt, 8/23 rating, to illuminate the rear number plate and rear of the machine, and to give visual warning when the rear brake is applied. To gain access to the bulbs remove the plastic lens cover, which is retained by two long screws. Check that the gasket between the lens cover and the main body of the lamp is in good condition.
- 2 The bulbs have a bayonet fitting and have staggered pins to prevent the bulb contacts from being reversed.
- 3 If the tail lamp bulbs keep blowing, suspect either vibration of the rear mudguard or more probably, an intermittent earth connection.

12 Flashing indicator lamps

- 1 The forward facing indicator lamps are connected to stalks

which are attached to the ends of the fork shrouds. The hollow stalks carry the leads to the lens unit. The rear facing lamps are mounted on similar, shorter stalks, at a point immediately to the rear of the dualast.

- 2 In each case, access to the bulb is gained by removing the plastic lens cover, which is retained by two screws. Bayonet fitting bulbs of the single filament type are used, each with a 12 volt/27W rating.

13 Flasher unit: location and replacement

- 1 The flasher relay unit is located under the dualast, being rubber-mounted on the frame.
- 2 If the flasher unit is functioning correctly, a series of audible clicks will be heard when the indicator lamps are in action. If the unit malfunctions and all the bulbs are in working order, the usual symptom is one initial flash before the unit goes dead: it will be necessary to replace the unit complete if the fault cannot be attributed to any other cause.
- 3 In addition to the flasher unit, an electronic flasher cancelling unit is incorporated in the indicator system on all but XS360-2D models. The unit automatically turns the flasher light off a certain time after the flasher switch has been operated. The time lapse is dependent on the speed of the machine. If the machine is travelling fast, the unit cancels automatically after a short time. The slower the machine is travelling, the longer the time taken for cancellation. The system may be overridden manually by pushing the indicator switch button inwards.
- 4 Take great care when handling either unit because they are easily damaged if dropped.



11.1a Stop/tail lamp lens is held by two screws as are ...



11.1b ... the flashing indicator lamp lenses



11.1c Stop/tail lamp has two double filament bulbs



13.1 Flasher unit located forward of battery box



13.3 Self-cancelling flasher unit is located above flasher unit

14 Starter motor: removal, examination and replacement

All except XS360-2D models

1 An electric starter motor, operated from a small push-button on the right-hand side of the handlebars, provides an alternative and more convenient method of starting the engine, without having to use the kickstart. The starter motor is mounted within a compartment at the rear of the cylinder block, closed by an oblong, chromium plated cover. Current is supplied from the battery via a heavy duty solenoid switch and a cable capable of carrying the very high current demanded by the starter motor on the initial start-up.

2 The starter motor drives a free running clutch immediately behind the generator rotor. The clutch ensures the starter motor drive is disconnected from the primary transmission immediately the engine starts. It operates on the centrifugal principle: spring loaded rollers take up the drive until the centrifugal force of the rotating engine overcomes their resistance and the drive is automatically disconnected.

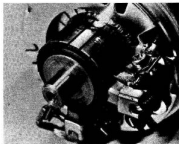
3 To remove the starter motor from the engine unit, first disconnect the positive lead from the battery, then the starter motor cable from the solenoid switch. Pull the starter cable down through the frame so that it may be detached still connected to the starter motor. The alternator cover must be removed from the left-hand side of the engine to enable reaming the starter drive sprocket with the splined starter shaft, during reassembly. Remove the two bolts in the chromium plated cover over the starter motor housing and lift the cover away, complete with gasket. The starter motor is secured to the crankcase by two bolts which pass through the right-hand end of the motor casing. When these bolts are withdrawn, the motor can be prised out of position and lifted out of its compartment, with the heavy duty cable still attached.

4 The parts of the starter motor most likely to require attention are the brushes. The end cover is retained by the two long screws which pass through the lugs cast on both end pieces. If the screws are withdrawn, the end cover can be lifted away and the brush gear exposed.

5 Lift up the spring clips which bear on the end of each brush and remove the brushes from their holders. Each brush should have a length of 11.0 - 12.5 mm (0.43 - 0.49 in). The minimum allowable brush length is 6 mm (0.25 in). If the brush is shorter it must be renewed.

6 Before the brushes are replaced, make sure that the commutator is clean. The commutator is the copper segments on which the brushes bear. Clean the commutator with a strip of glass paper. Never use emery cloth or 'wet-or-dry' as the small abrasive fragments may embed themselves in the soft brass of the commutator and cause excessive wear of the brushes. Finish off the commutator with metal polish to give a smooth surface and finally wipe the segments over with a methylated spirits soaked rag to ensure a grease free surface. Check that the mica insulators, which lie between the segments of the commutator are undercut. The standard groove depth is 0.7 mm (0.028 in) but if the average groove depth is less than 0.2 mm (0.008 in) the armature should be renewed or returned to a Yamaha Service Agent for re-cutting.

7 Replace the brushes in their holders and check that they slide quite freely. Make sure the brushes are replaced in their original positions because they will have worn to the profile of the commutator. Replace and tighten the end cover, then replace the starter motor and cable in the housing, tighten down and remake the electrical connection to the solenoid switch. Check that the starter motor functions correctly before replacing the compartment cover and sealing gasket.



14.6a Check condition of commutator segments and ...

15 Starter solenoid switch: function and location

1 The starter motor switch is designed to work on the electromagnetic principle. When the starter motor button is depressed, current from the battery passes through windings in the switch solenoid and generates an electro-magnetic force which causes a set of contact points to close. Immediately the points close, the starter motor is energised and a very heavy current is drawn from the battery.

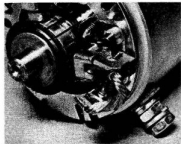
2 This arrangement is used for at least two reasons. Firstly, the starter motor current is drawn only when the button is depressed and is cut off again when pressure on the button is released. This ensures minimum drainage on the battery. Secondly, if the battery is in a low state of charge, there will not be sufficient current to cause the solenoid contacts to close. In consequence, it is not possible to place an excessive drain on the battery which, in some circumstances, can cause the plates to overheat and shed their coatings. If the starter will not operate, first suspect a discharged battery. This can be checked by trying the horn or switching on the lights. If this check shows the battery to be in good shape, suspect the starter switch which should come into action with a pronounced click. It is located below the dualseat to the right of the battery box and can be identified by the heavy duty starter cable connected to it. It is not possible to effect a satisfactory repair if the switch malfunctions: it must be renewed.

16 Starter motor free running clutch: examination and renovation

1 To gain access to the starter clutch, the alternator cover and the alternator rotor must be removed as described in Chapter 1, Section 9.

2 To check whether the clutch is operating freely and smoothly push the starting sprocket into the clutch (and hence the rotor) and rotate it whilst holding the rotor. If the sprocket is rotated clockwise as viewed from the sprocket side it should lock the clutch. If rotated in an anti-clockwise direction it should be free to run smoothly. If the movement is unsatisfactory, check the condition of the rollers and springs.

3 The rollers, plungers and springs may be prised from position for inspection. If there is any wear or obvious damage to the springs or rollers new replacements will have to be obtained. Replacement of these items requires some dexterity due to spring loading and obstructed access to the spring housings.



14.6b ... inspect brushes for excessive wear

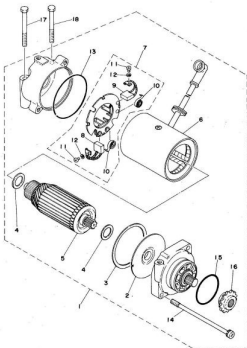
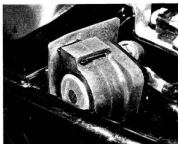
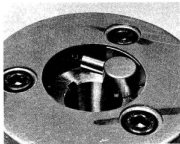


Fig. 6.3 Starter motor

- 1 Starter motor assembly complete
- 2 Plate
- 3 Gasket
- 4 Washer
- 5 Armature
- 6 Yoke
- 7 Brush holder
- 8 Positive brush
- 9 Negative brush
- 10 Brush spring - 2 off
- 11 Screw - 2 off
- 12 Washer - 2 off
- 13 O'ring
- 14 Screw - 2 off
- 15 O'ring
- 16 Drive sprocket
- 17 Bolt
- 18 Bolt



15.1 Starter solenoid is mounted in rubber carrier



16.3 Check rollers and springs for damage

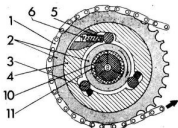


Fig. 6.4 Starter motor free running clutch

- 1 Starting chain
- 2 Starting sprocket
- 3 Roller
- 4 Clutch outer
- 5 Roller spring cap
- 6 Roller spring
- 10 Left crankshaft
- 11 Bush

17 Speedometer and tachometer head: replacement of bulbs

- 1 The speedometer and tachometer head contain three and two bulbs respectively, all of which are rated 12v 3.4W and are of the bayonet fitting type.
- 2 The bulbholders are a push fit into the base of the instrument where they are retained by their outer moulded rubber sleeves. Access to the bulbholders can be made after removing the two dome nuts which hold each head in place in its separate outer shell.

18 Warning lamp console: replacement of bulbs

- 1 In addition to the five bulbs fitted within the instrument heads, a further four warning bulbs are fitted within a warning console to the rear of the instrument assembly. Again, each bulb is rated at 3.4W and is of the bayonet type.
- 2 Access to the bulbs may be made after removing the console top cover, which is held in place by four screws.

19 Stop lamp switches: location and replacement

- 1 Two stop lamp switches are fitted to the machine, which work independently of one another, depending on which brake is operated.
- 2 The front brake switch is fitted to the handlebar lever stock and is a mechanical push-off type, being operated when the lever is moved. The switch is a push fit in the housing boss, and is detached by depressing a small pin in the underside with a piece of wire or a small screwdriver.
- 3 The rear brake switch is mounted on the frame on the right-hand side, above the rear brake pedal. It can be adjusted by means of a locknut, and should be set so that the light comes on as soon as the pedal is depressed. This is especially important when the rear brake has been readjusted.

20 Horn: location and examination

- 1 The horn is located on the top frame tube, immediately below the petrol tank. It has no external means of adjustment, if it malfunctions, it must be renewed: it is a statutory requirement that the machine must be fitted with a horn in working order.

21 Wiring: layout and examination

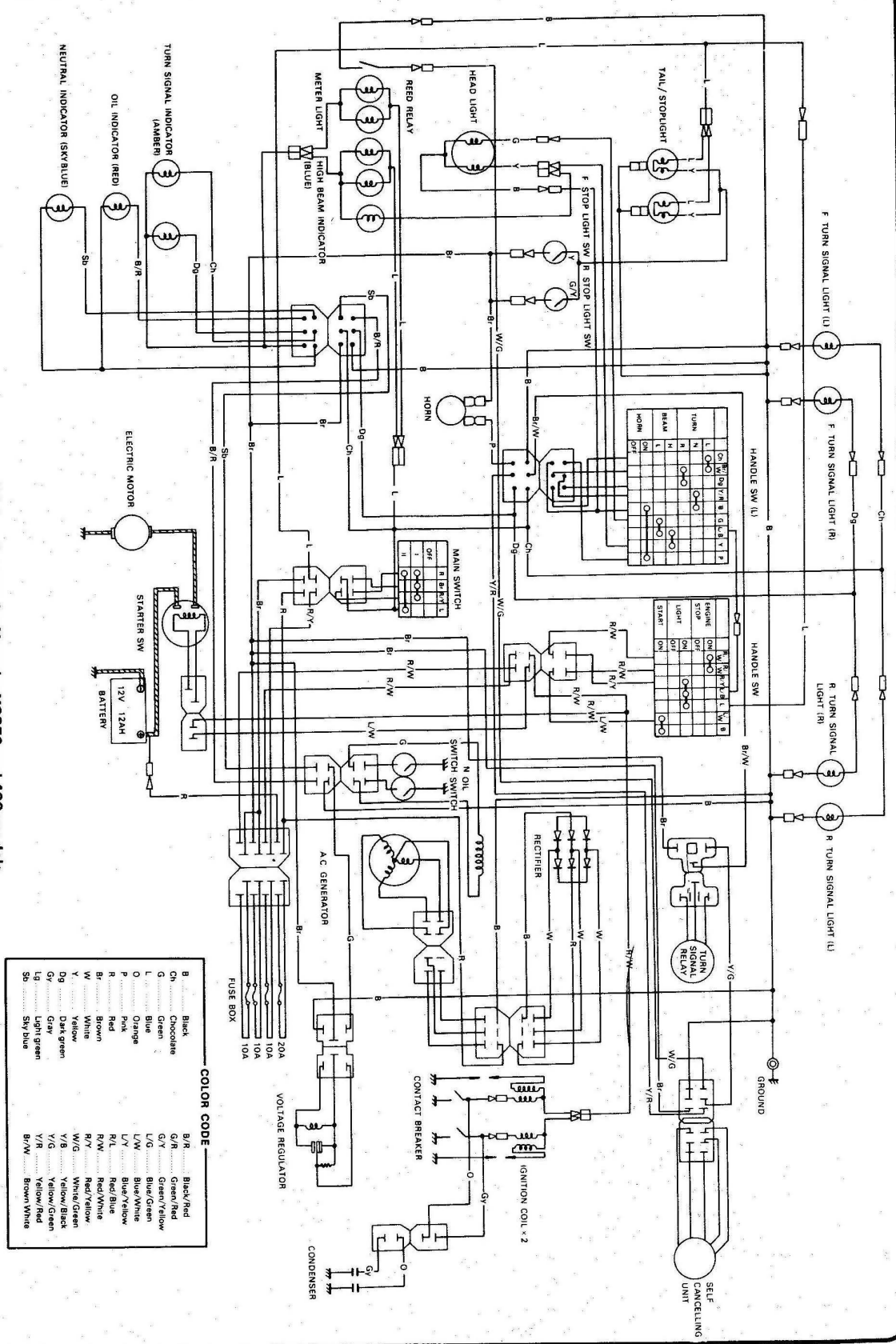
- 1 The wiring harness is colour-coded and will correspond with the accompanying wiring diagram. Where socket connectors are used, they are designed so that reconnection can be made in the correct position only.
- 2 Visual inspection will show whether there are any breaks or frayed outer coverings which will give rise to short circuits. Another source of trouble may be the snap connectors and sockets, where the connector has not been pushed fully home in the outer housing.
- 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.

22 Ignition and lighting switch

- 1 The ignition and lighting switch is combined in one unit, bolted to the top fork yoke. It is operated by a key, which cannot be removed when the ignition is switched on.
- 2 The number stamped on the key will match the number of the steering head lock and that of the lock in the petrol filler cap. A replacement key can be obtained if the number is quoted; if either of the locks or the ignition switch is damaged, additional keys will be required.
- 3 It is not practicable to replace the ignition switch if it malfunctions. It should be renewed with a new switch and key to suit.

23 Fault diagnosis: electrical system

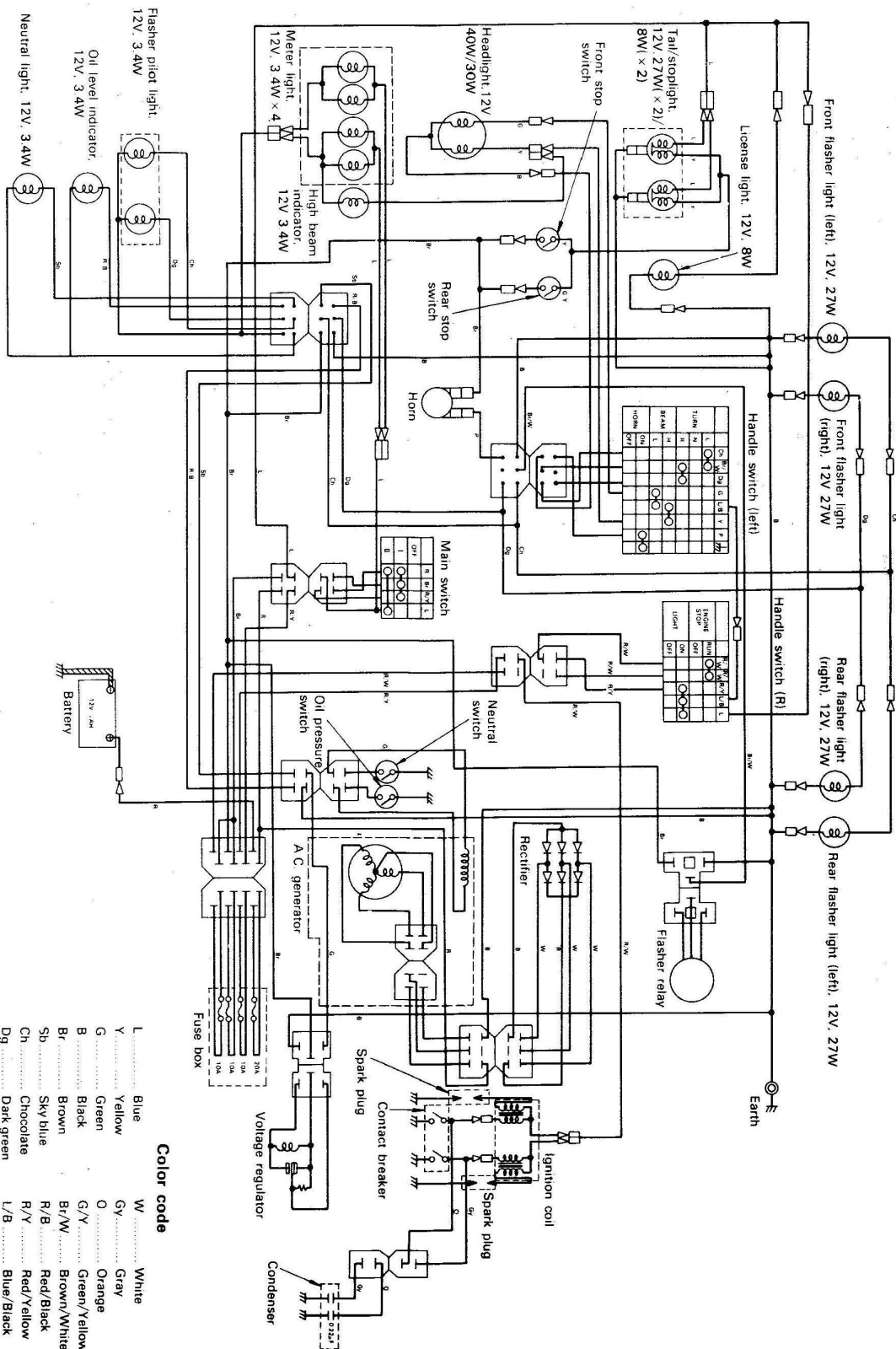
Symptom	Cause	Remedy
Complete electrical failure	Blown fuse	Check wiring and electrical components for short circuit before fitting new fuse. Check battery connections, also whether connections show signs of corrosion.
	Isolated battery	
Dim lights, horn inoperative	Discharged battery	Recharge battery with battery charger and check whether alternator is giving correct output (electrical specialist).
Constantly 'blowing' bulbs	Vibration, poor earth connection	Check whether bulb holders are secured correctly. Check earth return or connections to frame.



Wiring diagram for Yamaha XS250 and 400 models

COLOR CODE

B	Black	B/R	Black/Red
Ch	Chocolate	G	Green
G	Green	G/Y	Green/Yellow
L	Blue	L/G	Blue/Green
O	Orange	L/W	Blue/White
R	Red	L/Y	Blue/Yellow
W	White	R/L	Red/Blue
Y	Yellow	R/W	Red/White
Dg	Dark green	B/Y	Black/Yellow
Gy	Gray	W/G	White/Green
Lg	Light green	Y/B	Yellow/Black
Sb	Slate blue	Y/G	Yellow/Green
		Y/R	Yellow/Red
		B/W	Brown/White



Wiring diagram for Yamaha XS360 - 2D model

Color code

L	Blue	W	White
Y	Yellow	Gy	Gray
G	Green	O	Orange
B	Black	G/Y	Green/Yellow
Br	Brown	Br/W	Brown/White
Sb	Sky blue	R/B	Red/Black
Ch	Chocolate	R/Y	Red/Yellow
Dg	Dark green	L/B	Blue/Black
R	Red	R/W	Red/White
P	Pink		

Metric conversion tables

Inches	Decimals	Millimeters	Millimeters to Inches		Inches to Millimeters	
			mm	Inches	Inches	mm
1/64	0.015625	0.3969	0.01	0.00039	0.001	0.0254
1/32	0.03125	0.7937	0.02	0.00079	0.002	0.0508
3/64	0.046875	1.1906	0.03	0.00118	0.003	0.0762
1/16	0.0625	1.5875	0.04	0.00157	0.004	0.1016
5/64	0.078125	1.9844	0.05	0.00197	0.005	0.1270
3/32	0.09375	2.3812	0.06	0.00236	0.006	0.1524
7/64	0.109375	2.7781	0.07	0.00276	0.007	0.1778
1/8	0.125	3.1750	0.08	0.00315	0.008	0.2032
9/64	0.140625	3.5719	0.09	0.00354	0.009	0.2286
5/32	0.15625	3.9687	0.1	0.00394	0.01	0.254
11/64	0.171875	4.3656	0.2	0.00787	0.02	0.508
3/16	0.1875	4.7625	0.3	0.01181	0.03	0.762
13/64	0.203125	5.1594	0.4	0.01575	0.04	1.016
7/32	0.21875	5.5562	0.5	0.01969	0.05	1.270
15/64	0.234375	5.9531	0.6	0.02362	0.06	1.524
1/4	0.25	6.3500	0.7	0.02756	0.07	1.778
17/64	0.265625	6.7469	0.8	0.03150	0.08	2.032
9/32	0.28125	7.1437	0.9	0.03543	0.09	2.286
19/64	0.296875	7.5406	1	0.03937	0.1	2.54
5/16	0.3125	7.9375	2	0.07874	0.2	5.08
21/64	0.328125	8.3344	3	0.11811	0.3	7.62
11/32	0.34375	8.7312	4	0.15748	0.4	10.16
23/64	0.359375	9.1281	5	0.19685	0.5	12.70
3/8	0.375	9.5250	6	0.23622	0.6	15.24
25/64	0.390625	9.9219	7	0.27559	0.7	17.78
13/32	0.40625	10.3187	8	0.31496	0.8	20.32
27/64	0.421875	10.7156	9	0.35433	0.9	22.86
7/16	0.4375	11.1125	10	0.39370	1	25.4
29/64	0.453125	11.5094	11	0.43307	2	50.8
15/32	0.46875	11.9062	12	0.47244	3	76.2
31/64	0.484375	12.3031	13	0.51181	4	101.6
1/2	0.5	12.7000	14	0.55118	5	127.0
33/64	0.515625	13.0969	15	0.59055	6	152.4
17/32	0.53125	13.4937	16	0.62992	7	177.8
35/64	0.546875	13.8906	17	0.66929	8	203.2
9/16	0.5625	14.2875	18	0.70866	9	228.6
37/64	0.578125	14.6844	19	0.74803	10	254.0
19/32	0.59375	15.0812	20	0.78740	11	279.4
39/64	0.609375	15.4781	21	0.82677	12	304.8
5/8	0.625	15.8750	22	0.86614	13	330.2
41/64	0.640625	16.2719	24	0.90551	14	355.6
21/32	0.65625	16.6687	24	0.94488	15	381.0
43/64	0.671875	17.0656	25	0.98425	16	406.4
11/16	0.6875	17.4625	26	1.02362	17	431.8
45/64	0.703125	17.8594	27	1.06299	18	457.2
23/32	0.71875	18.2562	28	1.10236	19	482.6
47/64	0.734375	18.6531	29	1.14173	20	508.0
3/4	0.75	19.0500	30	1.18110	21	533.4
49/64	0.765625	19.4469	31	1.22047	22	558.8
25/32	0.78125	19.8437	32	1.25984	23	584.2
51/64	0.796875	20.2406	33	1.29921	24	609.6
13/16	0.8125	20.6375	34	1.33858	25	635.0
53/64	0.828125	21.0344	35	1.37795	26	660.4
27/32	0.84375	21.4312	36	1.41732	27	685.8
55/64	0.859375	21.8281	37	1.45669	28	711.2
7/8	0.875	22.2250	38	1.49606	29	736.6
57/64	0.890625	22.6219	39	1.53543	30	762.0
29/32	0.90625	23.0187	40	1.57480	31	787.4
59/64	0.921875	23.4156	41	1.61417	32	812.8
15/16	0.9375	23.8125	42	1.65354	33	838.2
61/64	0.953125	24.2094	43	1.69291	34	863.6
31/32	0.96875	24.6062	44	1.73228	35	889.0
63/64	0.984375	25.0031	45	1.77165	36	914.4

1 Imperial gallon = 8 Imp pints = 1.16 US gallons = 277.42 cu in = 4.5469 litres

1 US gallon = 4 US quarts = 0.862 Imp gallon = 231 cu in = 3.785 litres

1 Litre = 0.2199 Imp gallon = 0.2642 US gallon = 61.0263 cu in = 1000 cc

Miles to Kilometres

1	1.61
2	3.22
3	4.83
4	6.44
5	8.05
6	9.66
7	11.27
8	12.88
9	14.48
10	16.09
20	32.19
30	48.28
40	64.37
50	80.47
60	96.56
70	112.65
80	128.75
90	144.84
100	160.93

Kilometres to Miles

1	0.62
2	1.24
3	1.86
4	2.49
5	3.11
6	3.73
7	4.35
8	4.97
9	5.59
10	6.21
20	12.43
30	18.64
40	24.85
50	31.07
60	37.28
70	43.50
80	49.71
90	55.92
100	62.14

lb f ft to Kg f m

1	0.138
2	0.276
3	0.414
4	0.553
5	0.691
6	0.829
7	0.967
8	1.106
9	1.244
10	1.382
20	2.765
30	4.147

Kg f m to lb f ft

1	7.233
2	14.466
3	21.699
4	28.932
5	36.165
6	43.398
7	50.631
8	57.864
9	65.097
10	72.330
20	144.660
30	216.990

lb f/in² : Kg f/cm²

1	0.07
2	0.14
3	0.21
4	0.28
5	0.35
6	0.42
7	0.49
8	0.56
9	0.63
10	0.70
20	1.41
30	2.11

Kg f/cm² : lb f/in²

1	14.22
2	28.50
3	42.67
4	56.89
5	71.12
6	85.34
7	99.56
8	113.79
9	128.00
10	142.23
20	284.47
30	426.70

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