BAJAJ
MOTORCYCLES

Training Notes

pulsar RS 200
(Fuel Injection)

The Training Notes are a comprehensive training guide on service and maintenance operations and procedures to be followed by service personnel at authorised service centres and dealerships whilst attending to the Bajaj Pulsar RS200. The Training Note covers standard workshop procedures, simplified for easy learning and understanding for service technicians worldwide.

NOTICE

All information contained in this Training Note is based on the latest product information at the time of publication. Bajaj Auto Limited accepts no liability for any inaccuracies or omissions in this publication, although every possible care has been taken to make it as complete and accurate as possible. All procedures and specifications subject to change without prior notice. The right is reserved to make such changes at any time without prior notice.

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- Understanding the Complete Anatomy of the Vehicle
- Technical Specifications and Performance Parameters
- Briefing and Educating the Customer on Appropriate Riding and Usage Discipline, and Routine Maintenance

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I Read ..... I Learn

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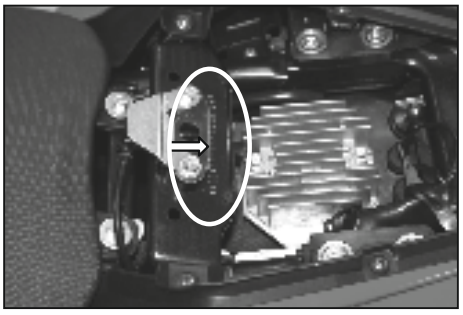
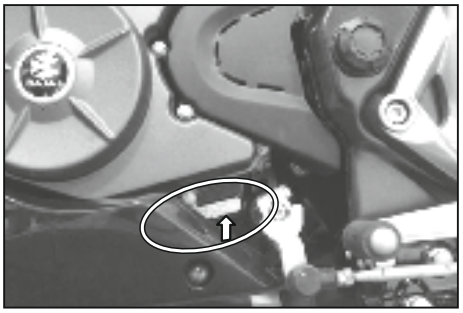
Identification

Chassis Number & Engine Number Location

The Frame and Engine serial numbers are used to register the motorcycle. They are the unique alpha-numeric codes to identify your particular vehicle from others of the same model and type.



Frame Number Location
On Seat Lock Mounting Bracket
(Alpha - Numeric - 17 Digits)



Engine Number Location
On LH Side Crankcase Near Gear
Change Lever (Alpha-Numeric - 11 Digits)

Instrument Cluster Information

Identification

Speedometer display will work when both Ignition switch & kill switch are in 'ON' position.

1. **Fuel Level Indicator** : It shows fuel level in fuel tank.
2. **Tachometer Dial** : It shows engine speed in RPM.
3. **Turn Signal Indicator (LH & RH)** : When Turn signal switch is pushed to Left or Right, Turn Signal Indicator - LH or RH will flash.
4. **Neutral Indicator** : When the transmission is in Neutral, Neutral indicator will glow.
5. **Hi Beam Indicator** : When Headlight is 'ON' & Hi beam is selected with engine running, Hi beam indicator will glow.
6. **Low Oil Pressure Indicator ( )** : It blinks when engine oil pressure is low.
7. **Malfunction Indicator** : It blinks whenever any abnormality is noticed in functioning of FI system related components.
8. **Coolant Temperature Indicator ( )** : It blinks when engine coolant Temperature is more than 115^0 centigrade.
9. **Low Battery Indicator** : It indicates battery needs charging.
10. **Bajaj Logo** : Bajaj logo flying ' ' glows continuously.
11. **Mode Button** : Mode button used for changing the mode while selecting & setting Trip1, Trip2, ODO, Clock & Service reminder.
12. **Set Button** : Set button used for setting Clock & Service reminder.
13. **Engine Rev Indicator** : It blinks when engine RPM reaches 9500 RPM.
14. **Service Reminder ( )** : 'Wrench' symbol glows when ODO meter reading reaches to set Kms. **It indicates vehicle is due for periodic service.**

    This Icon will flash at -

    1^{st} : 450 km **2^{nd} : 4950 km,**

    3^{rd} : 9950 km, **4^{th} : 14950 km**

    and subsequently at each 5000 kms. Icon will continue to glow till it is reset. This icon is to be reset after service is carried out.
15. **Side Stand Indicator** : When side stand is 'ON', the side stand indicator will glow (Ignition & Kill switch 'ON').
16. **Digital Clock** : It indicates **time in HR : MM** (AM/PM)
17. **Speedometer** : Vehicle speed will be displayed in digital form in Km/Hr.
18. **Odometer** : The Odometer shows the total distance that the vehicle has covered. Odometer can not be reset to 'Zero'.
19. **Trip Meter** : Trip 1 & Trip 2 shows the distance traveled since it was last reset to zero. Rolls over to zero after 999.9 km & continue updating.
20. **ABS Indicator ( )** : With Ignition switch ON & Kill switch ON the ABS indicator glows.

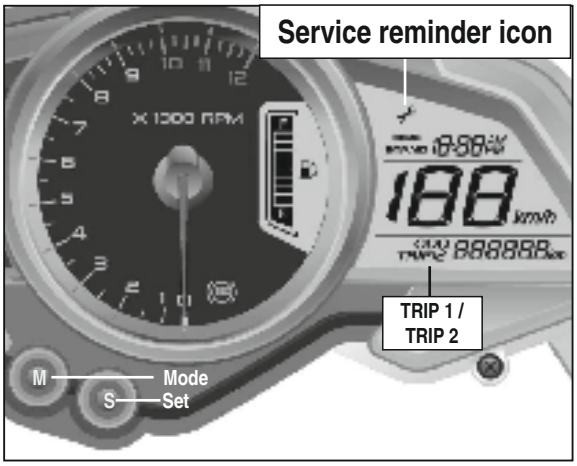
    When vehicle speed is more than 10 KM/Hr the ABS indicator goes off, if this indicator glows while vehicle is running, it means there is problem in ABS unit.
21. **Low Fuel Level Indicator** : It blinks incase of low fuel level (1 bar or less)

Note : After switching 'ON' the ignition switch & kill switch, the following indications will remain 'ON' till engine is started.

- ***Coolant Temperature Indicator***
- ***Low Battery Indicator***
- ***Low Oil Pressure***
- ***Malfunction Indicator***

Identification

Speedometer Setting



1. Trip Meter Reset :

- Mode & Set push button is provided for selecting & resetting 'ODO/TRIP1/TRIP2'.

1	Press mode push button for less than 2 sec.	Mode changes from 'ODO/TRIP1/TRIP2'
2	Press set push button for more than 5 sec.	Selected 'TRIP1/TRIP2' will reset. Other TRIP mode will continue updating.

2. Service Reminder Reset ( ) :

'Wrench' symbol glows when ODO meter reading reaches to set Kms for service.

This icon will glow at -

1st : 450 Kms 2nd : 4450 Kms

3rd : 9450 Kms 4th : 14450 Kms

& subsequently at each 5000 Kms. Icon will glow till it is reset.

This icon is to be reset after service is carried out.

Service Reminder Reset :

Note: 1. To reset service reminder icon vehicle speed & engine RPM should be zero.

2. **Service reminder re-set can be done in ODO / TRIP 1 / TRIP 2.**

Sr. No.	Step	Result	Illustration
1	Press 'MODE' push button & Turn ON ignition switch, Hold MODE push button for more than 10 seconds.	Service reminder icon will start blinking.	

Identification

Sr. No.	Step	Result	Illustration
2.	Release mode push button & within the 10 seconds, press SET button for more than 5 seconds	Service reminder icon will get reset (Service reminder symbol turn off)	
3.		Next service schedule in Km. is displayed as shown in photo. ODO/TRIP 1/TRIP 2 (text) will turn OFF for 5 seconds	
4.		After 5 seconds text will reappear with respective Km reading.	

Note: Prior service reminder reset is allowed only when DISTANCE TO SERVICE is less than or equal to 450 Kms.

(DISTANCE TO SERVICE = NEXT SERVICE SCHEDULE – PRESENT ODO)

Case – 1 = if distance to service is less than 450 Kms, then follow the steps given in above table.

Case – 2 = if distance to service is more than 450 Kms, then Service icon will not reset (blinking continues), ODO / TRIP 1 / TRIP 2 icon will blank out & ODO / TRIP 1 / TRIP 2 digit field will display next service schedule km reading for duration of 5 seconds.

Identification

e.g. 4th Service

Defined Km range for 4th Service = 14500 ~ 15000 Kms.

Service reminder icon will be ON at 14450 Kms.

Customer reported for service at ODO reading = 13150 Kms.

DISTANCE TO SERVICE = 14500-13150 = 1350 kms which is greater than 450 Kms.

Results:

- Service reminder icon will not reset
- Service reminder icon blinks continuously in selection mode and even while displaying next service schedule as per below point 4.
- ODO / TRIP 1 / TRIP 2 text will turn off
- ODO / TRIP 1 / TRIP 2 digit field will displays 14450 Kms (next service schedule) for duration of 5 seconds.

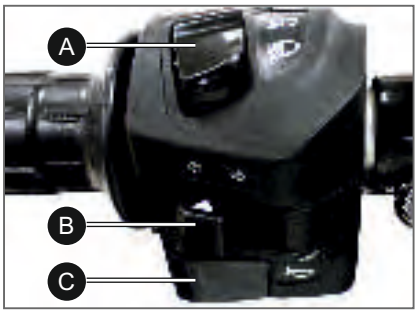
3. Clock Reset :

- Digital clock indicates time in HR & MM separated by colon ':'
- It is 12 hour clock.
- Initially ':' will be blinking
- Clock setting is possible in TRIP 1 mode only.

1.	Press mode push button for less than 2 seconds.	TRIP1 Mode selected
2.	Press mode & set push button together for more than 2 seconds	':' stops blinking Digits starts blinking
3.	Press mode button for less than 1 sec.	Hour digits will increase.
4.	Press set button for less than 1 sec.	Minutes digits will increase.
5.	Press mode & set button together for more than 2 sec.	Set value will be saved Exit clock setting mode Digits stop blinking ':' start blinking
6.	Clock set mode is selected & no editing is carried out for more than 5 sec.	Auto exit without saving set value. If engine/vehicle rpm is given then system will exit from clock set mode without saving set value.

Identification

Control Switches



Left Handle Bar Switches

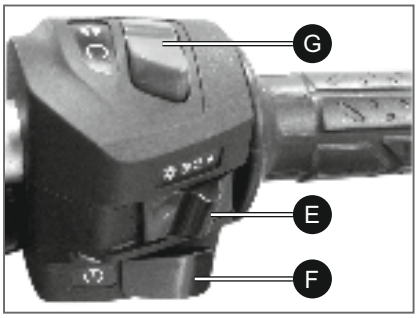
A. Hi / Lo Beam Switch : In engine running condition, when headlight is ON, High or Low beam can be selected with this switch. Hi beam indicator light located on Speedo console will glow when high beam is selected.

: High Beam : Low beam

B. Turn Signal Switch : When the turn signal knob is pushed to Left (⇦) or Right (⇨) respective indicator will start blinking. To stop blinking push the knob in & release.

C. Horn Button : (📯) Press button for sounding horn.

D. Pass Switch : Press the switch to put on Hi Beam filament of head light. It is used to give signal to vehicles coming from opposite side while overtaking.



RH Control Switch

D. Head Light Switch : It has 3 positions.

●	All lamps 'OFF'.
≡00≡	While engine running, Tail lamp, Meter lamp and Pilot lamps & number plate lamp will glow.
☼	While engine running, Head lamp, Pilot lamps, Tail lamp and Meter number plate lamp will glow.

F. Starter Button : Starter button operates the electric starter. It is recommended to start the engine with the transmission in neutral.

Vehicle in Gear - Press clutch lever & operate starter button to start the engine.

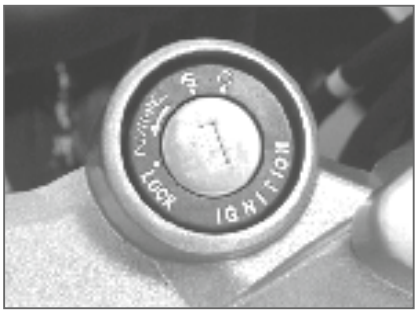
G. Engine Kill Switch : The engine kill switch is for emergency use. During emergency put the engine kill switch to the 'OFF' (🏍) position to stop engine.

Speedometer display will work when both Ignition switch & kill switch are in 'ON' position.

⚠ CAUTION : While starting ensure that engine kill switch is in 'ON' (🔄) position. Keeping the kill switch in 'OFF' position, engine will not start.

Identification

Steering Cum Ignition Switch



It has three positions.

Key Position	Function
●	**LOCK:** Steering locked. Ignition OFF.
	**OFF:** Steering unlock. Ignition OFF.
	**ON:** Steering unlock. Ignition ON.

To Lock the Steering : To lock the steering, turn the handle bar to the left side. Turn the handle bar to the left or right. Push & Rotate the key to **"LOCK"** position & remove the key. **Steering lock can be done on left hand side only.**

To Unlock the Steering : Insert the key in steering cum ignition lock. Push & Rotate it clockwise to **"OFF"** or **"ON"** position.

Key : A common key is used for **'Steering cum Ignition lock'**, '**Fuel tank cap**' & **'Rear Seat'.**

Salient Features

Performance

Key Features	Advantages	Benefits
• 4 Valve Liquid cooled Engine with 3 spark plugs • Engine power: 24.47 Ps at 9750 rpm. • Engine torque: 18.3 Nm at 8000 rpm.	• More power, Smooth power delivery • Optimum engine torque at variable engine speed. • Complete utilization of engine torque • Better drivability & knock free performance.	• Razor sharp response to throttle inputs. • More power at all load conditions, better torque at low rpm, less emissions. • Smooth gear shifting
• Advanced programed Engine Management System controlled by ECU. • DC ignition system.	• Consistent engine performance – Power, Pick up & Mileage • Seamless changes in ignition maps for good engine performance	
• Cylinder block with coolant circulation passage. • Molycote piston	• Good cooling of piston crown, reduced friction of piston	
• Oil jet in lubrication circuit.	• Improved life of engine components	
• Heavy duty gear box.	• Suited for high speed driving.	

Safety

Attribute	Key Features	Advantages	Benefits
Safety			
		• Prevents the wheels of vehicle from locking during braking situations	• Safety on road in high speed driving. • Bright illumination all the time. • Highest stability & road grip.
	• Tubeless tyres.	• Smooth ride, slow deflation in case of punctures for good control	
	• High strength robust perimeter frame.	• Good rigidity and stability	
	• Powerful DC twin projector head lamps	• Constant bright beam from head light even at low vehicle speeds and during idling too.	

Salient Features

Style

Attribute	Key Features	Advantages	Benefits
 	• Full Fairing • Stylish split seats. • Grab handle integrated in seat cowl • Twin projector type Headlamps • Clip on - split type handlebar. • Naked endless chain. • New refreshing colors. • Centrally placed, split type under belly silencer. • LED blinkers.	• Bold assertive stance, Sporty looks, brawny and definitely bold.	• Style that lets you break free.

Convenience

Key Features	Advantages	Benefits
• LCD speedo console.	• Fully equipped with fault/safety Indications, clock, service reminder &Trip meter with digital fuel gauge.	• Ready information to customer available at his fingertips.
• Low Battery level indicator.	• Early warning to prevent battery getting fully discharged.	
• High coolant temp indicator.	• Early warning to save damages to engine.	
• Low Engine oil pressure indicator	• Early warning to save damages to engine.	
• Digital speed indication.	• Easy to read at a glance.	
• FI ( ) & ABS ( ) Malfunction indicator lamp(MIL)	• Any malfunctioning in EMS & ABS is indicated	• Indication for customer to take remedial action.
• Engine over speed limiter.	• Warns the rider to control revving of engine.	
• Tachometer for engine speed.	• For monitoring engine speed and optimum sport riding.	
• Maintenance free sealed battery.	• Topping up not required for its life.	• Easy to ride without any driving/ operating/ maintenance hassles.
• Sealed endless drive chain.	• Long life of drive chain less wear /tear.	

Technical Specifications

Engine & Transmission

- Type : 4 stroke, Water cooled, Fuel injected
- No. of cylinders : One
- Bore : 72.0 mm
- Stroke : 49.0 mm
- Engine displacement : 199.5 cc
- Idling Speed : 1400 ± 100 rpm
- Max. net power : 24.47 PS @ 9750 rpm
- Max. net torque : 18.3 N-m @ 8000 rpm
- Ignition System : 12V DC, controlled by ECU
- Fuel Injection system : Engine Management System, Single point fuel injection into manifold
- Spark Plug : 3 nos. (LHS-RHS : BOSCH UR6CE, Central : BOSCH YR5NEO)
- Spark Plug Gap : 0.7 ~ 0.9 mm
- Lubrication : Wet sump forced Lubrication
- Transmission : 6 Speed constant mesh
- Gear shifting pattern : 1 Down 5 Up
- Primary reduction : 72 / 22 (3.272)
- Gear Ratios
  - 1st Gear : 34 / 12 (2.833)
  - 2nd Gear : 31 / 15 (2.067)
  - 3rd Gear : 28 / 18 (1.556)
  - 4th Gear : 26 / 21 (1.238)
  - 5th Gear : 23 / 22 (1.045)
  - 6th Gear : 22 / 24 (0.917)
- Final Drive Ratio : 40 / 14 (2.857)

Frame

- Frame type : Perimeter
- Suspension
  - Front : Telescopic front fork with anti friction bush, 120 mm fork travel.
  - Rear : Nitrox mono shock absorber, 110 mm fork travel.
- Brakes
  - Front ABS : Hydraulic disc brake with single channel ABS, Disc diameter 300 mm
  - Front Non-ABS : Hydraulic disc brake, Disc diameter 300 mm
  - Rear : Hydraulic disc brake, Disc diameter 230 mm
- Tyres
  - Front : 100 / 80, 17, 52 P Tubeless
  - Rear : 130 / 70, 17, 61 P Tubeless
- Tyre Pressure
  - Front : 1.75 Kg/Cm^2 (25 PSI)
  - Rear (Solo) : 2.00 Kg/Cm^2 (28 PSI)
  - Rear (with Pillion) : 2.25 Kg/Cm^2 (32 PSI)
- Rims
  - Front : 2.5 x 17, 10 Spoke alloy wheel
  - Rear : 3.5 x 17, 10 Spoke alloy wheel
- Fuel Tank Capacity : 13 Liters

Controls

- Steering : Handlebar
- Accelerator : On handle bar, RH grip
- Gears : Left foot pedal operated, 1 down 5 up, Step shift
- Brakes
  - Front : On handle bar, RH lever
  - Rear : Pedal operated by RH foot

Electricals

- System : 12 V (DC)
- Battery : 12V 8Ah, VRLA
- Head lamp : Twin projector 55W-Low beam & 65W-High beam
- Stop / Tail lamp : LED
- Side indicator lamp : LED (4 Nos)
- Position lamp : LED

Technical Specifications

- Speedometer lamp :Amber, LCD
- Neutral indicator : Green, LED
- Turn signal indicator : Green, LED
- Hi-beam indicator : Blue, LED
- Fuel level indicator : LCD bar type
- Low oil pressure indicator : Red, LED
- Malfunction indicator : Yellow, LED
- Coolant temperature indicator : Red, LED
- Low battery indicator : Red, LED
- Bajaj logo : Blue LED
- Reserve indicator : LCD symbol to blink
- Service reminder : LCD
- Side stand indicator : LCD
- ABS indicator : Yellow, LED
- Rear number plate lamp : LED
- Horn : 12 V DC

Dimensions

- Length : 1999 mm
- Width : 759 mm
- Height : 1114 mm
- Wheel base : 1352 mm
- Saddle height : 810 mm
- Ground clearance : 157 mm

Weights

- Vehicle kerb weight : 165 Kg - For ABS
  163 Kg - For Non ABS
- Gross vehicle weight : 295 Kg - For ABS
  293 Kg - For Non ABS

Note :

- *Values given above are nominal & for guidance only, 15% variations is allowed to center for production & measurement.*
- *All dimensions are under un-laden condition.*
- *Definitions of the terminologies wherever applicable are as per the relevant IS / ISO Standards.*
- *Specifications are subject to change without notice.*

Oil / Grease / Loctite Matrix

S.N.	Lubricant/Loctite	Grade	Application
1.	Engine oil	Bajaj DTS-I 10000 API SL JASO MA2 Grade SAE 20W50	Quantity : Refill at Service - 1200 ml / Engine O/H - 1400 ml
2.	Fork oil	SAE 10W20	Quantity / fork leg : 285 ± 5 ml
3.	Gasket	Liquid Gasket	Crankcase joining surface.
4.	Grease	HP Lihton RR-3 Grease	Steering races & balls
5.	Spray	OKS Spray	Sealed type drive chain
6.	Grease	All purpose	• Front & rear wheel axle. • Swing arm shaft • Brake pedal pivot pin • Center stand shaft • Side stand U bracket • Gear shifter pivot • Clutch lever
7.	Oil for drive chain	SAE 90	Sealed type drive chain Cleaning
8.	Electrical contact cleaning spray	WD-40 Spray	Ignition switch / Brake & clutch switch / LH/RH control switch.
9	Loctite	Thread locker 243	• Cam sprocket allen bolt • Pick up coil screws • Gear starter clutch stopper plate screws • Kick guide bolts • Cam sprocket allen bolt • Output sprocket bolts • Oil pump mtg bolt • I/P Shaft bearing stopper screws • Chain guide bolt • Inhibitor nut • Clutch nut • Bolt shift change • Neutral switch • Stator myg bolts • Stator harness clamp screws
10.	Grease	Molybdenum di-sulphide grease	• Engine Valve stem • Gear shifter shaft • Clutch lever • Oil seals lip • Fork bushes
11.	Engine oil	API SL JASO MA2 Grade SAE 20W50	• All ball bearings & needle roller brg. • Crank shaft big end bearing • Transmission shaft & gear teeths • Fork shaft • Drum groove & cam drum change • Block /piston skirt • Cam shaft lobes • Clutch damper spring • Cam chain • Oil pump rotor while assly.

Periodic Maintenance Chart

Sr. No.	PM Check Points	RECOMMENDED FREQUENCY								Remarks
		Servicing	1st	2nd	3rd	4th	5th	6th	7th	
		Kms	500 ~ 750	4500 ~ 5000	9500 ~ 10000	14500 ~ 15000	19500 ~ 20000	24500 ~ 25000	29500 ~ 30000	
1.	Clean the vehicle with water wash & dry completely		✓	✓	✓	✓	✓	✓	✓	Ensure to prevent water entry in Petrol tank, Silencer and Electrical parts. Use caustic free detergent for washing.
2.	Engine oil (Bajaj DTSi 10000) & Engine oil filter	C,R	R	Top-up	R	Top-up	R	Top-up	R	BGO DTSi 20W50
3.	Oil strainer	CL	CL		CL		CL		CL	Oil strainer cleaning at the time of oil change.
4.	Spark plug	CL,C,A					CL,A			C&A at 20,000 kms. Replace after 40,000 kms.
5.	Air cleaner element	R					R			Cleaning not required. Replace after every 20,000 kms.
6.	In line fuel filter	R					R			Replace after every 20,000 kms
7.	Fuel pipe	C,R					C,R			Replace if required.
8.	Valve tappet clearance	C, A					C, A			C&A at every 20,000 kms
9.	Sealed drive chain cleaning & lubrication	CL,L,A	CL,L,A	CL,L,A	CL,L,A	CL,L,A	CL,L,A	CL,L,A	CL,L,A	Customer to apply OKS chain lub spray at every 500 Kms.
10.	Air filter drain tube	CL					CL			Clean at every 20000kms.
11.	Silencer drain hole cleaning	CL		CL	CL	CL	CL	CL	CL	
12.	End chamber tail pipe cleaning	CL		CL	CL	CL	CL	CL	CL	End chamber to be cleaned using brush.
13.	Brake pedal pivot pin	C,L,R	C	C,L,R	C,L,R	C,L,R	C,L,R	C,L,R	C,L,R	Use recommended AP grease.
14.	Brake lining or pad - Check wear indicator	C,R	C,R	C,R	C,R	R	C,R	C,R	R	Replace brake shoes / pad at every 15000 Kms.
15.	Brake fluid level - Top-up / Replace	C,A,R				C,A			R	Use recommended brake fluid (DOT3/DOT4)
16.	Disc brake assly ---- Check functionality, leakage or any other damage.	C			C		C		C	
17.	All cables & rear brake pedal free play	C,A	C,A	C,A	C,A	C,A	C,A	C,A	C,A	
18.	Wiring harness & Battery connections - routing tie bands & clamps tightness.	C,A,T	C,A,T	C,A,T	C,A,T	C,A,T	C,A,T	C,A,T	C,A,T	
19.	Steering play	C,A	C,A	C,A	C,A	C,A	C,A	C,A	C,A	
20.	Ignition switch barrel cleaning & handlebar control switches contacts cleaning.	C,CL	C,CL	C,CL	C,CL	C,CL	C,CL	C,CL	C,CL	Use recommended WD40 spray
21.	Steering stem bearing & Cap steering bearing (Plastic)	C,CL, L,R			C,CL, L,R		C,CL, L,R		C,CL, L,R	Check & replace if damaged Use HP Lithon RR3 grease for lubrication.

Periodic Maintenance Chart

Sr. No.	PM Check Points	RECOMMENDED FREQUENCY								Remarks
		Servicing	1st	2nd	3rd	4th	5th	6th	7th	
		Kms	500 ~ 750	4500 ~ 5000	9500 ~ 10000	14500 ~ 15000	19500 ~ 20000	24500 ~ 25000	29500 ~ 30000	
22.	Side stand pin	CL,L			CL,L		CL,L		CL,L	Use recommended AP grease.
23.	All fasteners tightness	C,T	C,T	C,T	C,T	C,T	C,T	C,T	C,T	
24.	General lubrication - Clutch lever, front brake lever	L	L	L	L	L	L	L	L	Use recommended AP grease
25.	Coolant level in expansion tank	C,A	C,A	C,A	C,A	C,A	C,A	C,A	C,A	Use recommended 'Ready to use coolant'.
26.	Coolant hose damage / clamps / leakage	C		C	C	C	C	C	C	
27.	Radiator fins	C		C	C	C	C	C	C	

* It is strongly recommended to use only Bajaj genuine oil, In case of any other engine oil of same specifications is used the frequency would be every 5000 kms.

C: Check, A: Adjust, CL: Clean, R: Replace, T: Tighten, L: Lubricate

Following items are chargeable to Customer.
Oil, Coolant, Filters, All types of greases, Cleaning agents, Cables, Wear & tear parts, Rubber O rings/oil seals/pipes, Gaskets etc.

Pre-Delivery Inspection Checklist

Following is the checklist for carrying out PDI of "Pulsar RS 200" motorcycle. This checklist is to understand various check points those are to be checked / inspected before delivery of the new vehicle.

Whether BAL Service Executive carries out sample PDI or Dealer staff does, each vehicle should be checked as per the points given below. This ensures trouble free vehicle delivery to the customer.

Dealer's Name	**Dealer's code:**
PDI Check sheet-Pulsar RS 200	
Frame No.	Date of PDI
Engine No.	PDI done by

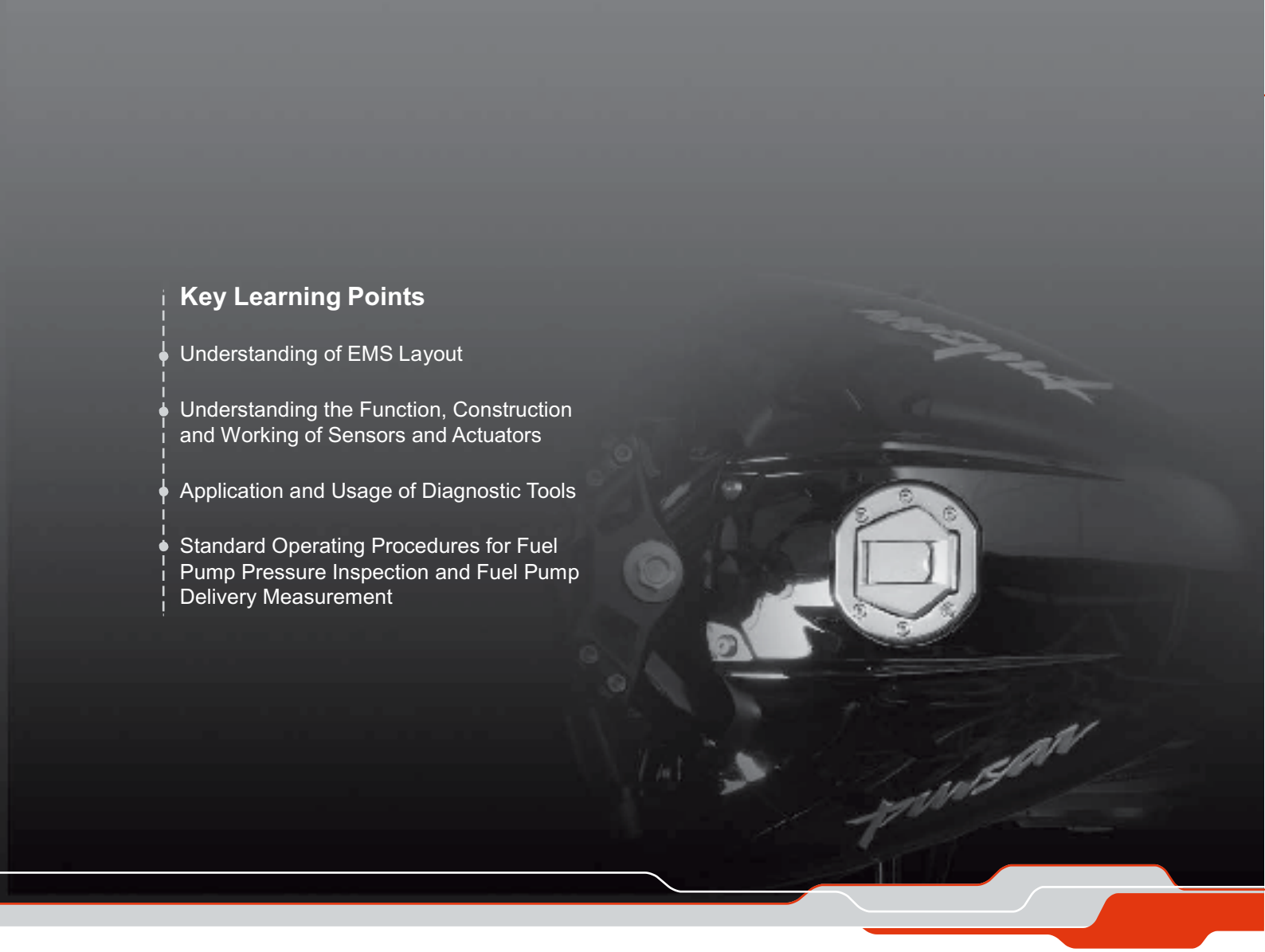
Please ensure that following checks are carried out during PDI before delivery of vehicle.

To Check	**Check for**	**✓ if OK X if NOT**	**Remarks**
Check & Correct the below check points before starting the vehicle.			
Engine oil	Oil level between upper and lower mark of oil level gauge / Top up if required	c	
Fuel Tank / Pipes	No leakage / Correct fitment	c	
Mirror	Fitment & Adjustment to ensure clear rear view	c	
Coolant	Coolant level between MIN & MAX mark, Top up if required in cold condition	c	
	Ensure no leakage	c	
Lock operation	Steering cum ignition lock, Seat lock, Petrol tank cap lock	c	
Battery	Terminal voltage 12.4 V DC for MF battery & 12.8 V DC for VRLA battery using battery tester. Charge battery if required using recommended battery charger	c	
	Tightness of battery terminals / cables / petroleum jelly application.	c	
Tyre pressure	Front : 1.75 Kg/Cm^2 (25 PSI)	c	
	Rear (with Pillion) : 2.25 Kg/Cm^2 (32 PSI)	c	
Brakes	Front brake cable free play 4 ~ 5mm - Not applicable	c	
	Rear brake pedal free play 20 ~ 30 mm - Not applicable	c	
Clutch/throttle cable	Free play 2 ~ 3 mm	c	
Drive chain	Slackness 2 ~ 3 mm	c	
	Equal marking of chain adjuster on both side	c	
	No touching to chain case	c	
Fasteners (Check torque) Recommended torque wrench to be used for applying torque on nut-bolts as mentioned in PDI check sheet using reference torque chart. However if any major parts required to be removed (except side covers & seat) for accessibility of torque wrench. In those cases the tightness can be ensured using open end / ring spanner / box type spanner as applicable without removing those major parts.	Engine foundation bolts (Front & Rear only) Same as 200 NS		
	Front axle nut - 10 Kg.m		
	Rear axle nut - 10 Kg.m		
	Swingarm shaft nut - 14 Kg.m		
	RSA mounting upper / lower nut - 3.2 ~ 3.8 Kg.m		
	Front fork top bolts -		
	Front fork under bracket bolts - 2.5 ~ 3.0 Kg.m		
	Rider footrest bolts - 1.8 ~ 2.2 Kg.m		

Pre-Delivery Inspection Checklist

To Check	Check for	✓ if OK X if NOT	Remarks
Check and correct the below check points during / after starting the vehicle			
Switch operation	RH / LH control switch, ignition switch, clutch switch & brake switch (Front & Rear)	C	
Horn	Ensure not distorted sound	C	
All bulbs working (As applicable)	Head light, Tail / stop lamp, Side indicators, Speedo bulb, Number plate lamp	C	
Speedometer (As applicable)	Working of speedometer, odometer, trip meter, fuel gauge, clock	C	
	Working of all signal indicator icons (Neutral, turn signal, high beam, clock, low battery indicator, service reminder & bajaj logo	C	
Headlamp	Focus confirmation	C	
Check & correct the below check points during test ride			
Gear shifting	Smooth operation	C	
Driveability	Throttle response	C	
	Front & Rear - brake effectiveness	C	
Engine noise	No abnormal noise	C	
Front fork / steering	Smooth working by pumping movement & smooth operation (No play / No sticky movement)	C	
Oil / coolant leakages	Specify source of leakage	C	
Idling RPM / CO% - Not applicable Check & correct the below check points in engine warm condition - Not applicable			
Idling RPM - Not applicable	Check in warm up condition at 60°C - 1400 ± 100 RPM	C	
CO% check - Not applicable	CO should be 1.5 ~ 2.5 % in engine warm condition at idling RPM	C	
Visual inspection for dent, scratches, rust.....			

Clean the vehicle thoroughly before delivery to customer



Key Learning Points

- Understanding of EMS Layout
- Understanding the Function, Construction and Working of Sensors and Actuators
- Application and Usage of Diagnostic Tools
- Standard Operating Procedures for Fuel Pump Pressure Inspection and Fuel Pump Delivery Measurement

CHAPTER 2
Fuel System & EMS

DTS-Fi Engine Management System

Working of Systems

Fuel Injection - Advantages over Carburetion

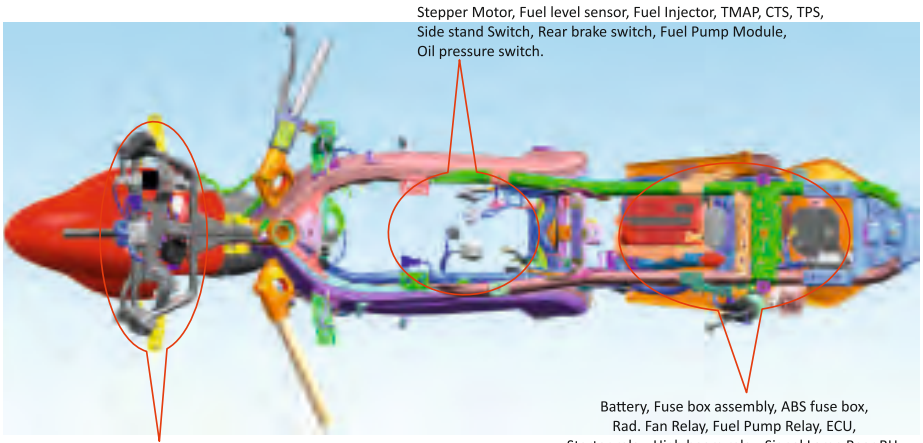
Engine Management Systems

EMS Sensor & Actuators

Malfunction Indication

DTS-Fi Engine Management System

Location of parts



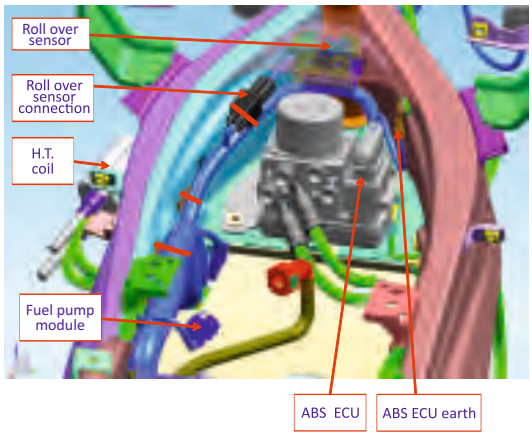
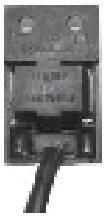


Photo	Part Name	Remark
	H.T. Coil 1	For Central spark plug
	H.T. Coil 2	For LH & RH spark plug
	Roll Over Sensor	Sends ignition cut of signal to ECU when bike inclination angle > 68°

DTS-Fi Engine Management System

Location of important parts / couplers

DTS-Fi Engine Management System

Location of important parts / couplers

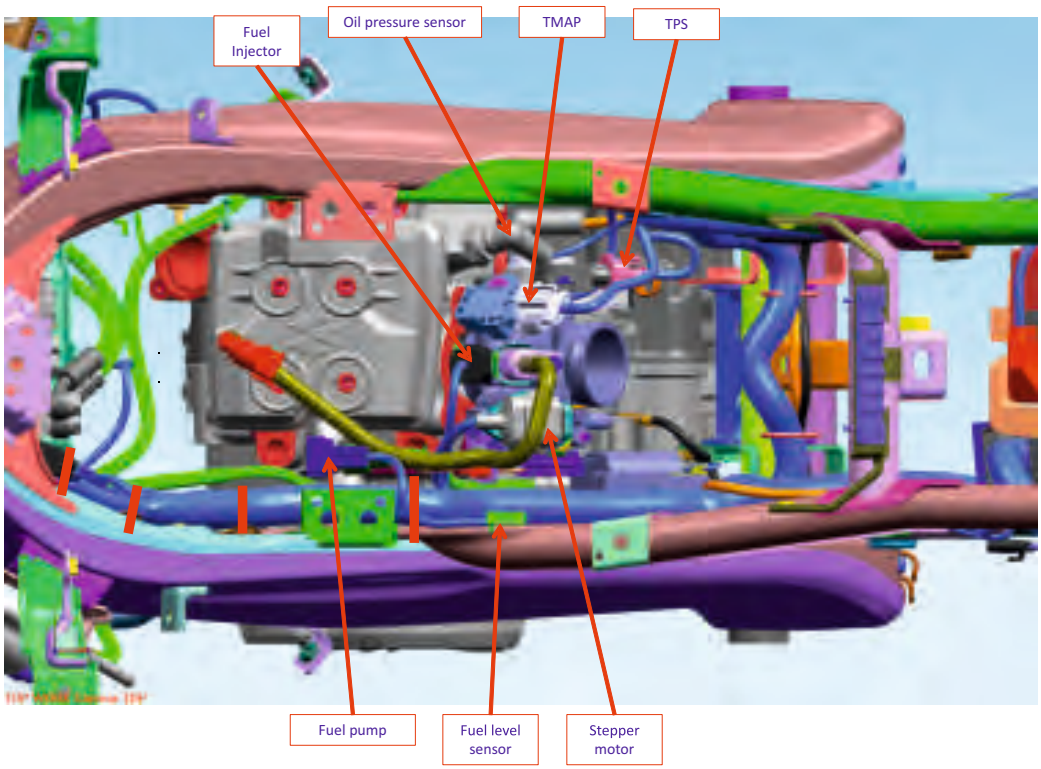
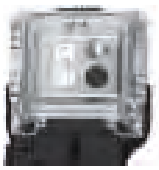
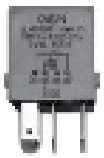
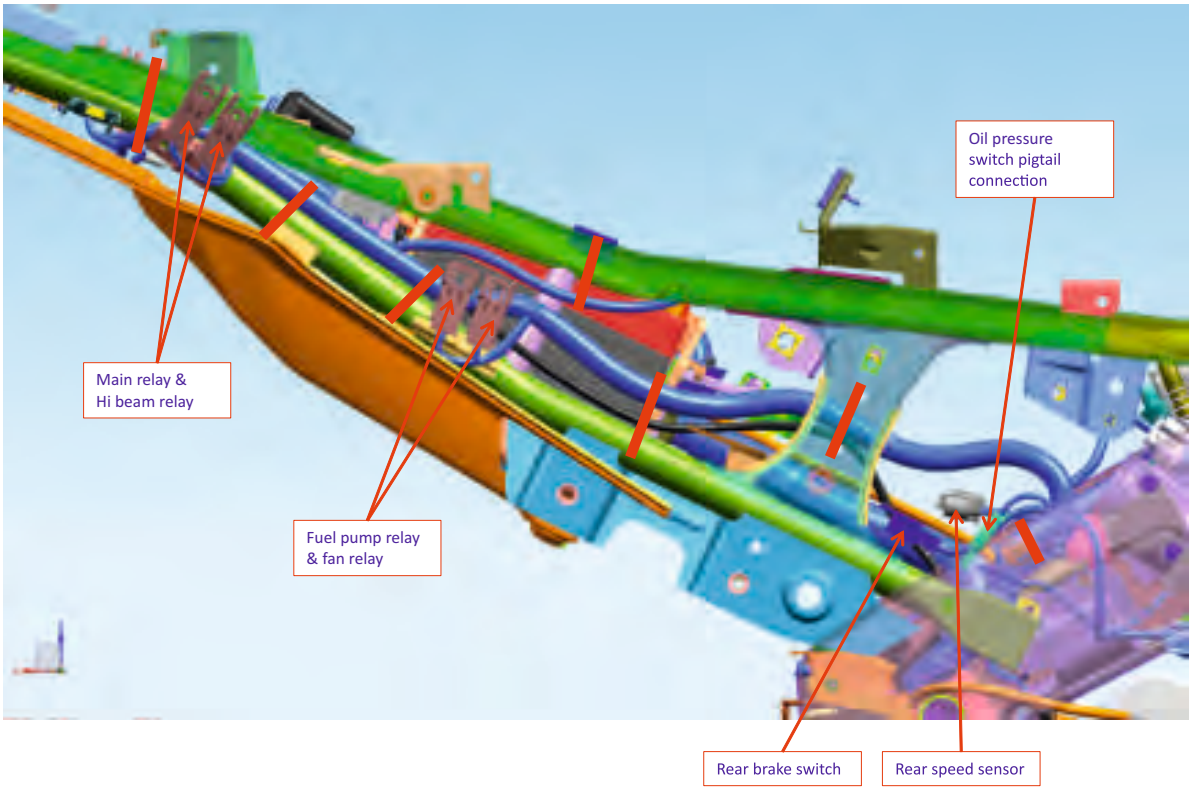


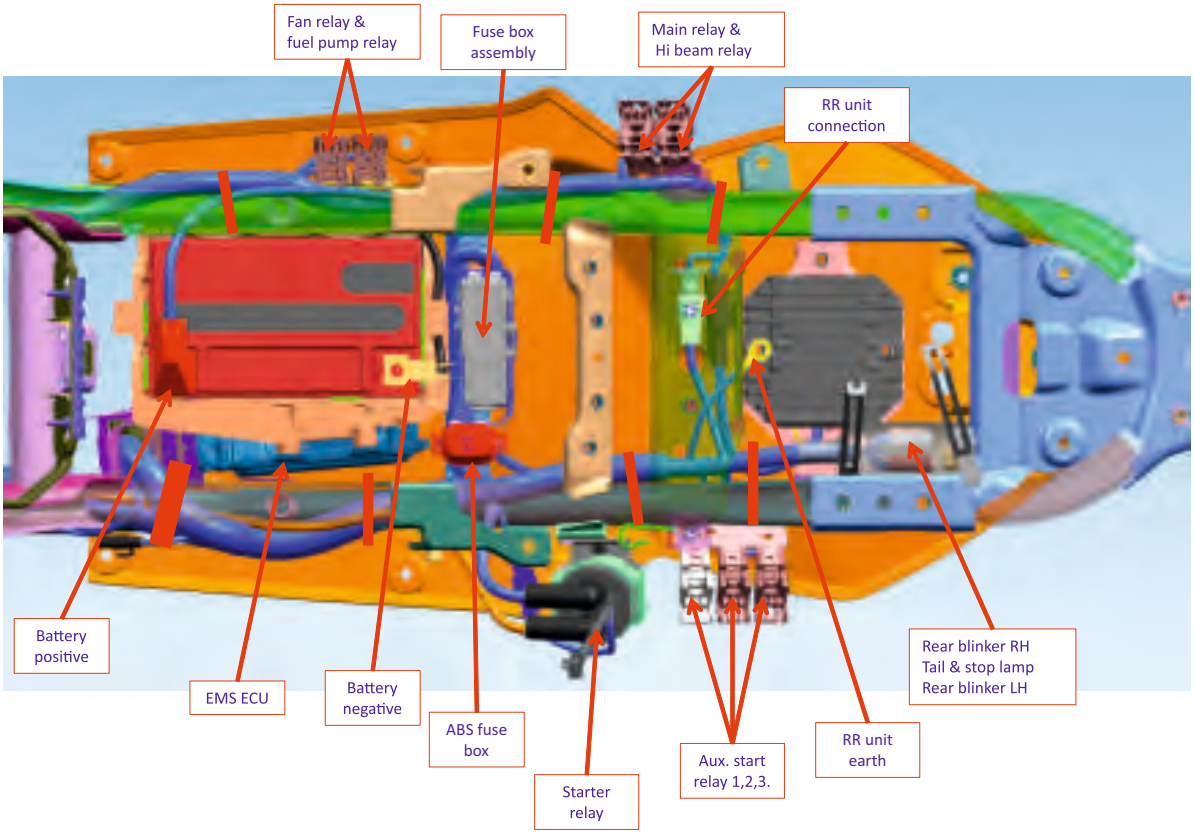
Photo	Part Name	Remark
	Fuel injector	To inject the fuel into the intake manifold until the electric signal from solenoid is cut of by ECU.
	Oil pressure sensor	It measures the pressure of the engine oil flowing thru the internal oil galleries and communicates the signal to the speedometer.
	TMAP	It is a micromechanical sensor that measures the absolute pressure in the intake manifold and compares it with a reference vacuum, not with the ambient pressure.
	TPS	To measure the exact position of the throttle valve opening and to send this measurement signal in voltage form to ECU
	Stepper motor	Stepper motor is a brushless DC electric motor that divides a full rotation into a number of equal steps. The motor's position can then be commanded to move and hold at one of these steps without any feedback sensor

Photo	Part Name	Remark
	ECU	To collect information from various sensors & insure that correct quantity of fuel is injected into the intake manifold at precise timing at various engine load & speed condition
	Main relay	A relay is an electrically operated switch. Most relays use an electromagnetic to mechanically operate a switch. Relays are used where it is necessary to control a circuit by a low- power signal
	Fuel pump relay	
	Radiator fan relay	

DTS-Fi Engine Management System

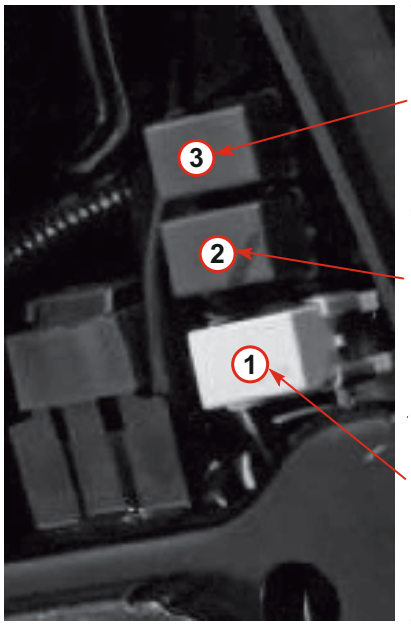
Location of important parts / couplers





DTS-Fi Engine Management System

Function of Aux Starter Relay



AUX Starter Relay 3

Incorporated for clutch & neutral switch interlocking in starter circuit.

AUX Starter Relay 2

Its function is to isolate starter circuit from ECU. If this relay fails engine can not be crank.

AUX Starter Relay 1

It is grey in color. It has a diode that is provided for suppressing voltage surge. If vehicle is driven without this relay ECU may fail.

Notes

Working of Systems

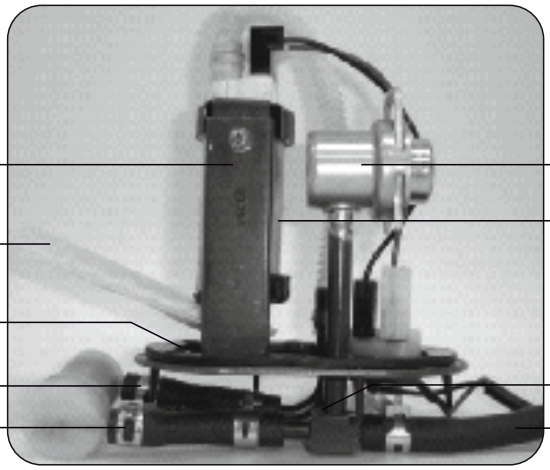
Fuel Pump

Function

To draw the fuel from the fuel tank and push it along the fuel lines to the injector rail and keeping a constant pressure in the system. Also the fuel pump needs to ensure a high level of fuel flowing through the fuel line thus maintaining constant fuel delivery pressure.

Construction

Fuel pump module assembly



Working

The fuel is pumped from the fuel tank by a roller cell pump through a fuel filter into a fuel rail at the end of which is a fuel pressure regulator.

In order to keep the injector pressure differential constant despite variations of inlet manifold depression with load, the fuel pressure regulator senses the difference between pumping pressure and that of the inlet manifold. Excess fuel is returned to the fuel tank, the continuous flushing keeps the fuel cool and avoids formation of pockets of fuel vapor.

The fuel pump is lubricated and cooled by the fuel flowing through the motor, including the brushes and across the armature hence it is important that never run the pump without adequate fuel inside the fuel tank.

The fuel filter strains impurities out of the fuel. This is an important measure in preventing the fuel pump, fuel injector nozzles from clogging.

Fuel Pump Resistance = 2.7 + 0.1 Ohms

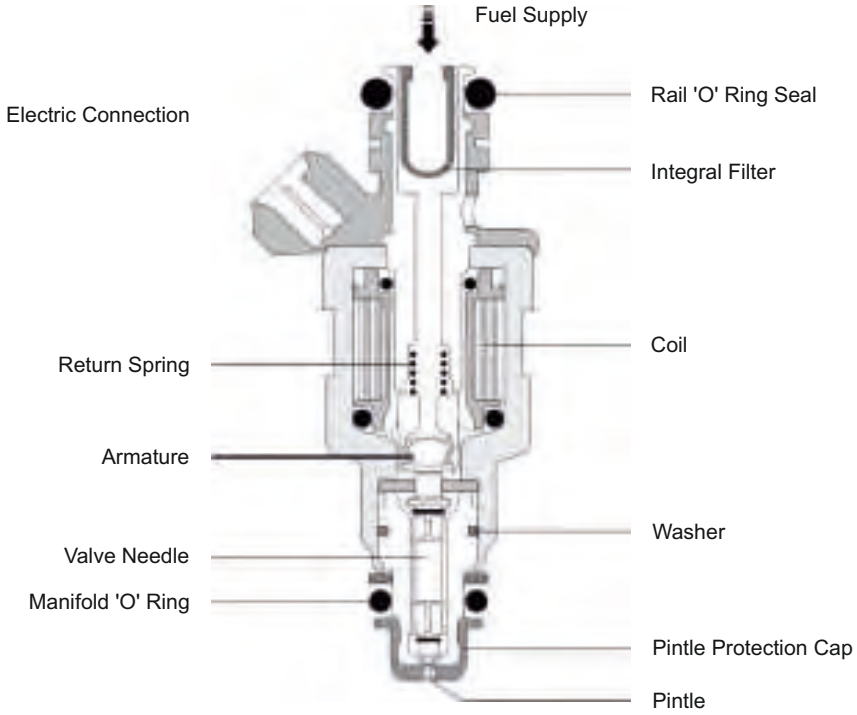
Working of Systems

Fuel Injector

Function

To inject the fuel into the intake manifold until the electric signal from solenoids is cut off by ECU.

Construction



Working

The fuel injector supplies the fuel in the form of a spray from the injector pintle which is located on intake manifold.

The injector have the nozzles which are opened and closed by solenoid wound (coil) in the injector body.

When the windings are energized the armature is attracted due to magnetism and compresses the spring which lifts the needle valve. Thus pintle automises the fuel into a fine spray form with a pressure about 2.5 bars (36 lbf / in2) until the electric signal in the solenoid is cut off by the ECU.

The injector internal movement is restricted just to < 0.1 mm. Also period that an injector remains open is very low (between 1.5 and 10 milliseconds). Thus the opening and closing time is critical for accurate fuel metering.

The fuel spray mixes with the incoming air as both move towards the inlet valve giving a precisely metered combustion mixture.

Working of Systems

Engine Control Unit (ECU)

Introduction

The automotive engine has two power generation systems named as 'Carburetion System' & 'Ignition System' respectively.

The Carburettor supplies atomized / vaporized air fuel mixture to the engine maintaining the desired air fuel ratio as per engine requirement.

The Ignition system supplies electric igniting spark at the spark plug tip as per precise engine demand (timing) to burn the compressed air fuel mixture inside the combustion chamber.

However these 2 systems like Carburetion and Ignition has been dealt separately.

In digital ignition circuits a microprocessor is used in the CDI unit. This microprocessor is capable of controlling various tasks. Hence it was logical to use this spare capacity for controlling fueling also.

Thus then developed a digital electronic control system for fuel injection and combined it with the digital ignition control to form a single unit controller. This unit is named as “Electronic Control Unit”.

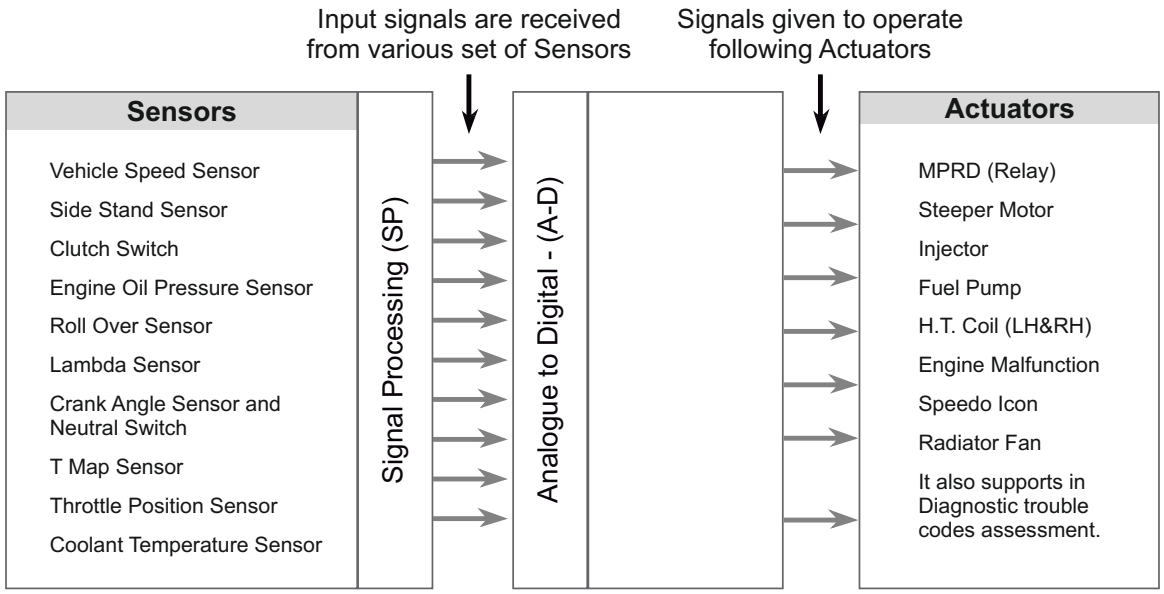
Function

It collects information from various sensors and ensure that a correct quantity fuel is injected into the intake manifold at precise time considering various engine load and speed conditions.

It is brain of the engine and controls various devices. Also it controls / supports on vehicle diagnostic instrument for diagnosing the problem in fuel injection system.

Construction

It consists of a micro computer A - D Convertor (Analog to Digital) and I - O Unit (Input - Output).



Working of Systems

Engine Control Unit (ECU)

Working

The ignition and fuel injection is controlled by a single control unit named as 'ECU'.

In ECU the inputs from various sensors are fed into a signal processor circuits to ensure that all outputs to the computer are in the form of digital pulses.

These inputs received may be steady or slowly varying voltages. These are said to be in analogue form and which are converted into equivalent digital valves by an analogue to digital (AD) converter.

The digital output are fed to the input I output rail for transporting to the main heart of the computer. Thus the ECU collects all signals, calculates them and process them to actuators to delivery precise ignition advance timing and fuel injection requirement for the engine at various load and speed conditions.

Set of Various Sensors

A sensor is a device which detects or measures a quantity, usually in electrical form so that it may be used in measurement or control. The analogue signal processing is added to the sensor, this improves the resistance to interference.

Set of Various Actuators

Actuators is a general term used to describe a control mechanism i.e. a device that converts electrical signals into mechanical movement e.g. -

Fuel injector

Fuel pump

Solenoid starter relay

Notes

Working of Systems

Throttle Position Sensor

Function

To measure the exact position of the throttle valve open- ing and to send this measurement signal in voltage form to ECU.

Construction

The throttle body has a throttle valve mounted on the intake manifold. The throttle valve is connected by accelerator cable and its opening and closing is controlled by accelerator twist grip mounted on RH side of handle bar. The throttle position sensor mounted on the throttle valve continuously reports the throttle position to the ECU.

This is a rotary throttle position sensor having a variable resistor also called as a potentiometer. Internally it has a coil resistance wire in the form of a half circle. One end connects to the ground and other end is connected to a 5 volt source from ECU.

The wiper blade has a contact that rides on the coil and connects to the throttle valve shaft.

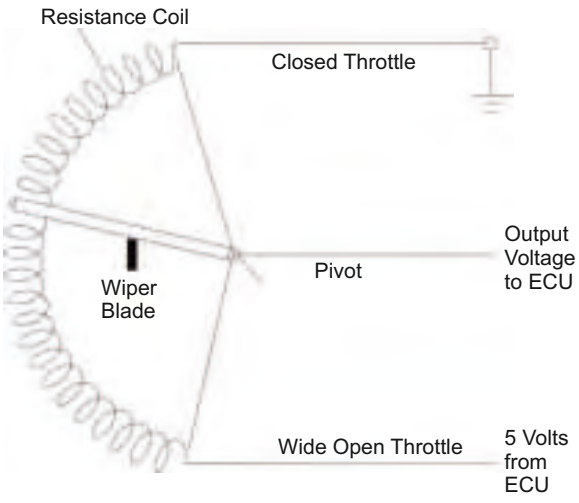
Also the position of the throttle valve is important in controlling the idling rpm.

Working

Upon acceleration the throttle valve position changes. The wiper type blades moves over the coil winding as it is pivoted directly on the throttle valve shaft.

Throttle position at zero (closed} position When the throttle valve is closed, the blade is at the grounded end of the coil. A small voltage signal is send to ECU at this position which senses that the throttle position is at zero.

Further movement of throttle position As the throttle valve moves towards the open position, the wiper type blade swings towards 5 volt end of the coil. This sends an increasing voltage signal to the ECU. Thus the continuously charging voltage regularly communicates the ECU the exact position of the throttle valve.



Working of Systems

Engine Temperature Sensor

Function

To measure the engine / engine oil temperature up to 200^{0}C.

Construction

The principal methods of temperature measurement is are done by the thermistor.

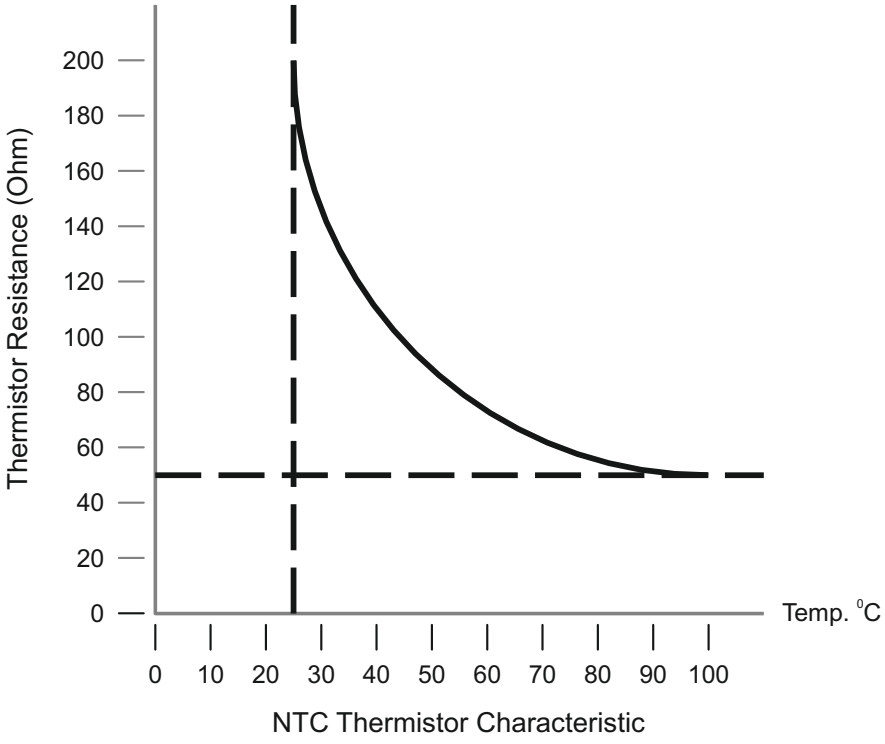
The thermistor is made from semi conductor material such as cobalt or nickel oxides and is encapsulated in a brass sleeve for mechanical protection.

Working

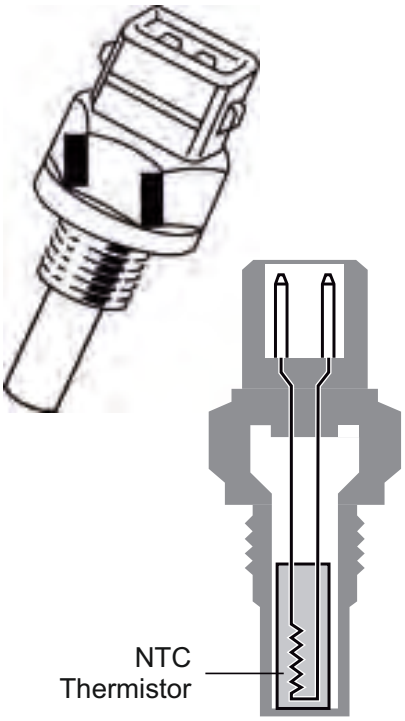
The thermistors are semi conductor resistors which change their resistance valve with temperature. The resistance decreases with an increase in engine temperature as it has a negative temperature coefficient (NTC) and vice versa.

The characteristic of engine temperature is represented graphically. (The values do not match exactly, it is just a representation for understanding).

This NTC type thermistor is used to measure the engine temperature in engine management system.



NTC Thermistor Characteristic

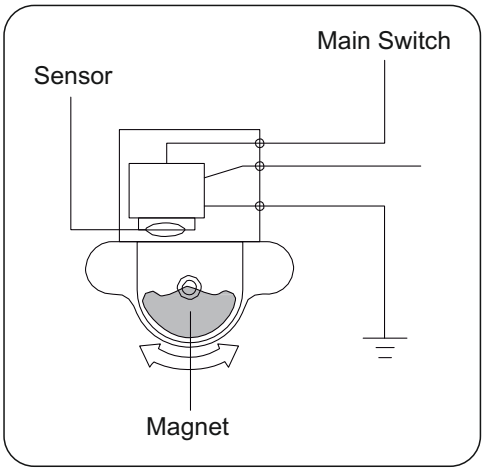


Working of Systems

Roll Over Sensor

Function

To send the ignition cut off signal to ECU for shutting down the engine if the bike exceeds the inclination angle beyond 60° on either of the side.



Construction

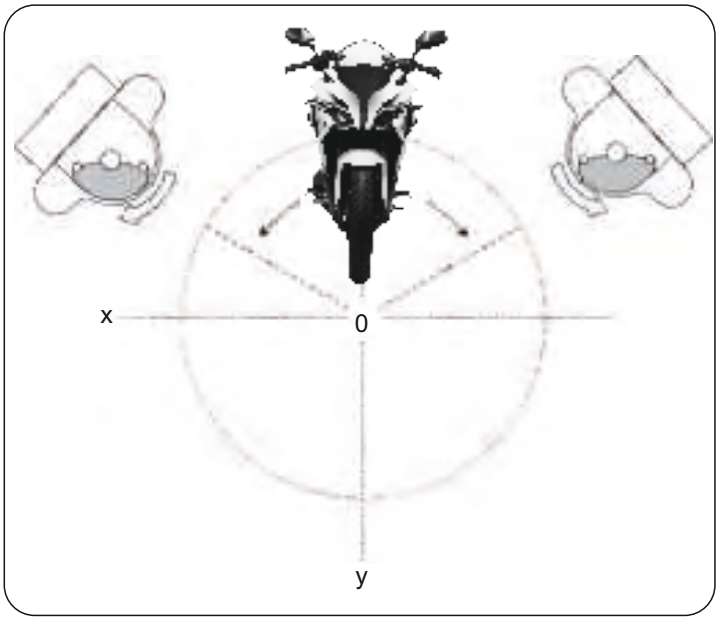
The roll over sensor is a sealed sensor unit and that contains moving weight which is suspended freely on a shaft. This is mounted below the air filter box onto the chassis.

Please note, even if roll over sensor is not connected (coupler open) the vehicle does not start (to ensure safety) and the malfunction will be shown on speedometer.

Working

The moving weights are suspended freely. When the vehicle leans down on either of the LH I RH side the position of these weights changes. The change of position of the weights is sensed by the sensor. If the inclination angle exceeds beyond 60° to the vertical the sensor will give signal to ECU to cut off the ignition system.

This is a useful safety feature because inclination angle exceeding 60° indicates that the rider has dropped the bike or is involved in an accident. Thus safety of the bike and rider is ensured.

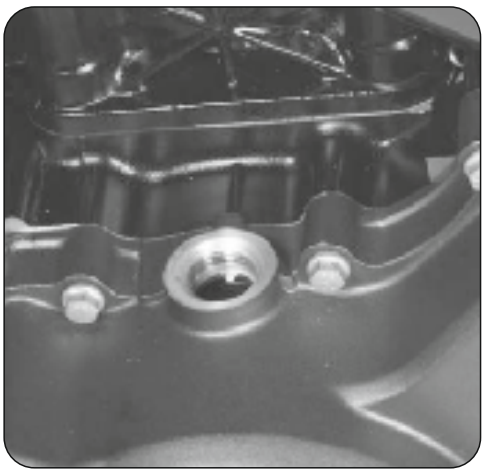


Working of Systems

Crank Angle Sensor

Function

To communicate the ECU how fast the crankshaft is rotating per minute and help ECU in delivering precise fuel metering and ignition spark advance.



Construction

A magnetic sensor located in magneto cover facing towards square notched I square block on the rotor periphery.

Working

As the rotor rotates the notched square blocks on the rotor periphery causes voltage pulses in the sensor. These pulses are sent to the ECU. The ECU counts the number of pulses per second and understands at what RPM the engine is operating and accordingly precise fuel metering and ignition spark advance is controlled.

There are 23 square notches I square blocks on the rotor outer periphery and are placed equidistance.

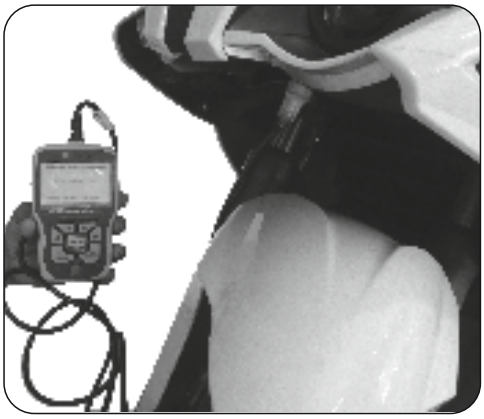
At a particular location there is wide gap seen between 2 square notches I square blocks. This can also be determined as square notch missing.

This missing square notch area represents the BTDC position. At this BTDC position voltage pulse is sensed by the crank angle sensor and is communicated to ECU.

ECU uses this information to control ignition spark advance.

Working of Systems

Malfunction Indicator Light



Function

When certain troubles develop in the electronic control system, the ECU stores in its memory or number or trouble code for each fault. This turns a Malfunction Red Indicator Light ( ) on the speedometer (next to Hi-beam light).

This alerts the driver that there is some problem and repair / service in needed.

If a single sensor or its harness part fails the ECU may substitute a value for failed sensor. This allows the engine to appear to run normal. A fault that turns on the malfunction indicator light may also put the engine into its limp-in mode. This means that limited operation strategy (LOS) chip in the ECU has taken over. It provides basic instructions to the microprocessor if a part of the electronic system fails. The engine runs but with fixed ignition timing and air fuel ratio. The injector pulse width does not change. This allows the vehicle to be driven but with greatly reduced performance. The benefit of this is the vehicle can be limp- in for service instead of being towed or transported into a cargo.

The technician can retrieve the stored trouble code from ECU memory using the diagnostic tool. To use the code the technician can refer the Diagnostic Chart or the Flash Code. This chart explains where lies the problem and its probable cause.

Notes

Fuel Injection - Advantages over Carburetion

Fuel Injection - Advantages over Carburetion

Advantages of Fuel Injection

Increased power output per unit of displacement.

Higher torque at low engine rpm.

Improved cold start, warm up and sudden acceleration (No chance of wetting intake manifold).

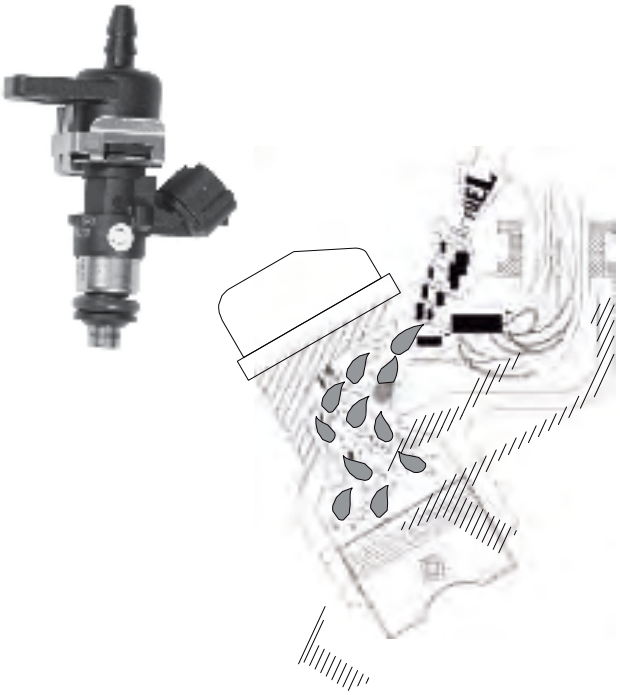
Lower fuel consumption.

Overall superb drive-ability.

Lower maintenance cost.

Communicates malfunctioning of fuel injection system, if any.

Low emission level.



Limitations`of Carburettor

Restricted air flow due to venture design causes power loss (volumetric efficiency is limited).

As intake manifold contains combustible mixture, danger of back fire from the cylinder into the manifold is always there.

At high altitude or in warm weather, possibility of vapour lock.

After burning noise in silencer on sudden deceleration.

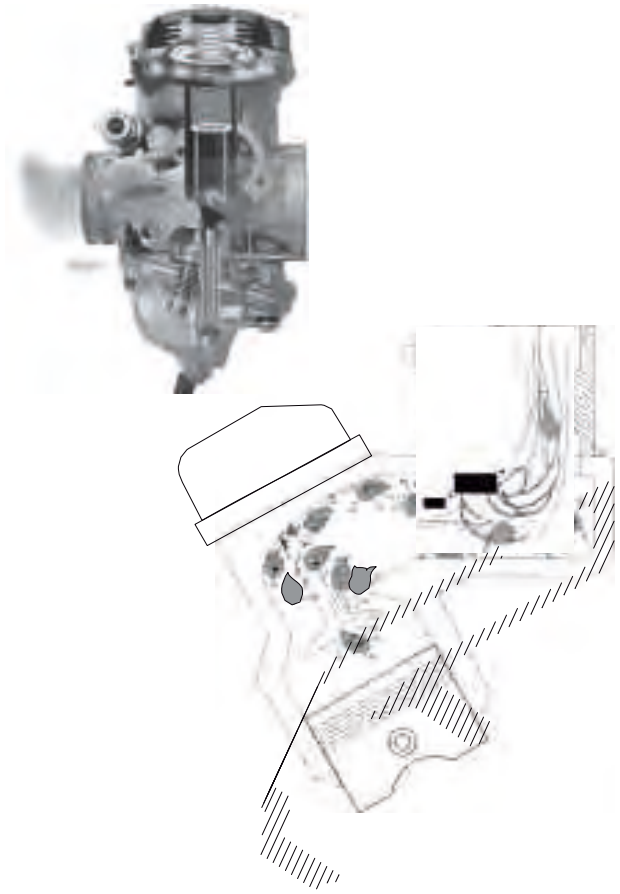
Does not support sudden acceleration.

Difficult cold starting and requires choke for starting.

In cold conditions, fuel wets the wall of the induction manifold causing running difficulties.

Difficult cold starting and requires choke for starting.

Inconsistence in fuel efficiency. Maintenance cost is reasonably more. High emission level.



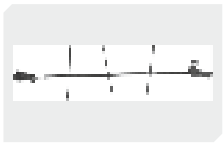
Engine Management Systems

Input to ECU

Measure the Coolant Temp. and assist ECU to adjust the fuel injection volume

COOLANT TEMP SENSOR

It detects the side stand position and gives signal to ECU.

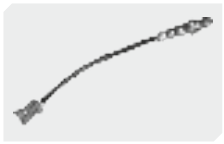


SIDE STAND SWITCH

Detect the tilt angle of motorcycle & if it is more than 60° ECU disable the ignition & fuel supply

ROLLOVER SENSOR

Measure the oxygen proportion in exhaust & assist ECU to adjust the amount of fuel to be injected.



OXYGEN SENSOR

Measure the rotational speed of crankshaft & assist ECU to determine injection & Ignition timing

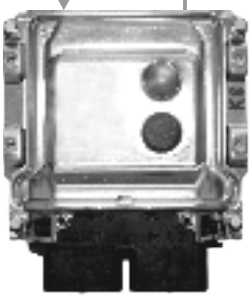
CRANK ANGLE SENSOR

Measures the intake air temp. & pressure and assist the ECU to adjust the fuel injection volume.

TEMPERATURE / MANIFOLD PRESSURE SENSOR

Detect the throttle position.

THROTTLE POSITION SENSOR



ECU calculates & determines the volume of fuel to be injected and the injection & ignition timing.

Output from ECU

FUEL PUMP

Supply the pressurized fuel to injector.

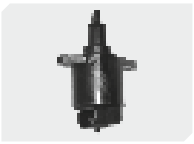
FUEL INJECTOR

Injects the precise amount of fuel based on the ECU data.

H.T. COIL

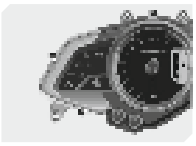
Ignites appropriately based on the ECU data

STEPPER MOTOR



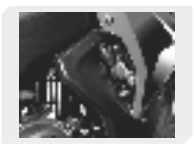
Adjust the idle speed of engine base on input from ECU.

MALFUNCTION INDICATOR



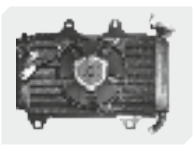
Blinks if there is any malfunctioning in FI system

DIAGNOSTIC TOOL COUPLER



For connecting the diagnostic tool.

RADIATOR FAN



Start when coolant temp reach 98 & stop at 92 degree centigrade.

EMS Sensors & Actuators

Sensors & Actuators

Purpose :

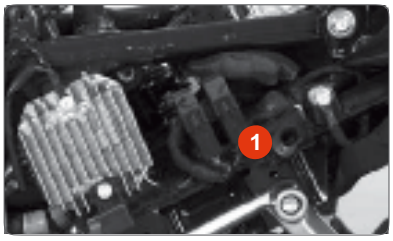
To control precisely air fuel mixture as per the engine RPM and to ge optimum engine performance.

Advantages over Carburettor System :

- Increased power output per unit of displacement.
- Higher torque at low engine rpm.
- Improved cold startability, roll over & sudden acceleration.
- Lower fuel consumption - better mileage.
- Overall superb drive-ability.
- Low maintenance cost.
- Communicates malfunctioning of fuel injection system, if any.
- Low emission level.

Notes

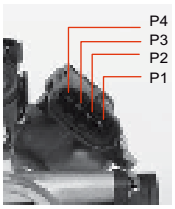
EMS Sensors & Actuators



1 - MPRD (Relay)

Steeper Motor

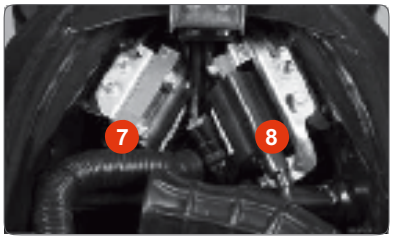
3 - Injector



4 - T MAP Sensor

5 - TPS

6 - Fuel Pump



7 - H. T. Coils (LH)

8 H. T. Coils (RH)

-

Engine Malfunction Indicator (MIL)

10 - Diagnostic Coupler

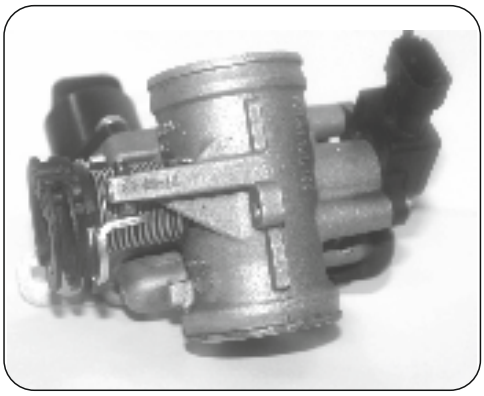
Radiator Fan

EMS Sensors & Actuators

Fuel Injection System Sensors - Working & Malfunction Effect

S.N.	Input to ECU	Input Details	How ECU Uses Input	Effect incase of abnormability
1	**Coolant Temperature Sensor**	Temperature of coolant	Radiator fan relay gets ON. Adjusts temperature based Ignition timing.	1. Radiator fan will not work & coolant temperature may shoot up affecting engine performance. 2. High coolant temperature icon may not blink. 3. Startability, fuel consumption & power-pickup will be affected.
2	**Engine Oil Pressure Sensor**	Engine oil pressure	Glowing of Engine oil pressure icon	Running of engine on low oil level may result in early wear of engine parts.
3	**Roll Over Sensor**	Voltage of 2 VDC in vehicle tilted condition	ECU cuts off main relay & ignition is cut off	Engine will keep running in case of accident or vehicle slips & may result in serious injury to rider and damage to vehicle.
4	**Side Stand Switch**	Voltage of 5 VDC in case when vehicle is parked on side side stand	ECU will switch ON side stand indication in speedo console & will cut off ignition system.	No indication of side stand ON in speedo console. Vehicle will not run in gear.
5	**Oxygen Sensor**	Voltage signal depending on amount of oxygen in exhaust	ECU determines air fuel mixture & adjusts accordingly.	Malfunctioning of Oxygen sensor will result in either rich mixture causing black smoke or lean mixture resulting in vehicle driveability.
6	**Crank Angle Sensor**	It senses rotation of crank shaft & gives pulse input to ECU	ECU calculates no.of pulses per revolution & indicates engine RPM on Tachometer dial. Gives input to ECU for ignition circuit	Wrong indication of Engine RPM in speedo. Malfunction in Ignition system. No start situation in case of open circuit.
7	**Throttle Position Sensor**	Monitors position of throttle & gives voltage input to ECU in POT to WOT modes.	ECU increases or reduces fuel rate to Engine suitably.	Fuel consumption & power - pickup will be affected.
8	**TMAP Sensor**	Monitors temperature & pressure of air entering manifold & gives 5VDC signal to ECU.	ECU increases or reduces Air supply rate to Engine suitably	Startability, Fuel consumption & power - pickup will be affected.

EMS Sensors & Actuators



Important :

Do not disturb the position of throttle adjuster screw. If done it will affect the vehicle performance and claim will not be accepted under warranty.

Fuel Injection System - Actuators

S.N.	Output from ECU	Input Details	Effect incase of abnormability
1	**Fuel Pump**	Fuel pump relay gets ON through ECU	Malfunctioning of fuel pump will result in intermittent fuel supply causing hesitation /misfiring, no start.
2	**Fuel Injector**	Earthing signal from ECU	Malfunctioning of fuel Injector will result in either rich or lean mixture causing smokey exhaust / misfiring problems. Knocking/Combustion noise.
3	**HT Coils**	Earthing signal from ECU	Misfiring or hesitation problems. No spark resulting in no start.
4	**Radiator Fan**	Radiator fan motor relay gets ON	Radiator fan will not work & coolant temperature may increase excessively affecting engine components. Icon glows in speedometer at 115 degree Centigrade & vehicle can not be accelerated above 4000 rpm. At 120 Degree Centigrade engine will get cut-Off.
5	**Malfunction Indicator**	Malfunction in FI system signal from ECU	Malfunctioning in FI system will go un noticed
6	**Stepper Motor**	Signal from ECU	Unstable idling RPM. Startability will be affected.
7	**Diagnostic tool port**	CAN high /Low input from ECU	No communication with BOSCH Diagnostic tool - show link error

Malfunction Indication

List of Diagnostic Trouble Codes

SR No	Codes	"Blink code"	"Drive Cycle"	DTC meaning
1	P0123	06	3	Throttle/Pedal Position Sensor/Switch "A" Circuit High
2	P0122	06	3	Throttle/Pedal Position Sensor/Switch "A" Circuit Low
3	P0507	11	1	Idle Air Control System RPM Higher Than Expected
4	P0506	11	1	Idle Air Control System RPM Lower Than Expected
5	P0108	09	3	"Manifold Absolute Pressure/Barometric Pressure Circuit High"
6	P0107	09	3	Manifold Absolute Pressure/Barometric Pressure Circuit Low
7	P0629	41	1	Fuel Pump "A" Control Circuit High
8	P0628	41	1	Fuel Pump "A" Control Circuit Low
9	P0627	41	1	Fuel Pump "A" Control Circuit/Open
10	P0336	02	3	Crankshaft Position Sensor "A" Circuit Range / Performance
11	P0262	33	1	Cylinder 1 Injector Circuit High
12	P0261	33	1	Cylinder 1 Injector Circuit Low
13	P0201	33	1	Injector Circuit/Open – Cylinder 1
14	P1611	14	**	Fuel consumption signal output short to Battery
15	P1610	14	**	Fuel consumption signal output short to Ground
16	P1609	14	**	Fuel consumption signal output open
17	P0032	45	3	HO2S Heater Control Circuit High Bank 1 Sensor 1
18	P0031	45	3	HO2S Heater Control Circuit Low Bank 1 Sensor 1
19	P0030	45	3	HO2S Heater Control Circuit Bank 1 Sensor 1
20	P0692	16	1	Radiator Fan Control Circuit High
21	P0691	16	1	Radiator Fan Control Circuit Low
22	P0480	16	1	Radiator Fan Relay Control Circuit fault
23	P0132	17	3	O2 Sensor Circuit High Voltage Bank 1 Sensor 1
24	P0131	17	3	O2 Sensor Circuit Low Voltage Bank 1 Sensor 1
25	P0130	17	3	O2 Sensor Circuit Bank 1 Sensor 1
26	P0134	17	3	O2 Sensor Circuit No Activity Detected Bank 1 Sensor 1
27	P1605	18	**	Malfunction Indicator Lamp (MIL) Control Circuit High
28	P1604	18	**	Malfunction Indicator Lamp (MIL) Control Circuit Low
29	P0650	18	**	Malfunction Indicator Lamp (MIL) Control Circuit
30	*P1504	15	1	Roll over sensor Short Circuit to battery
31	*P1503	15	1	Roll over sensor Short Circuit to Ground
32	*P1501	15	1	Roll over sensor circuit signal non-plausible
33	*P1502	15	1	Roll over sensor circuit open

Malfunction Indication

List of Diagnostic Trouble Codes

SR No	Codes	"Blink code"	"Drive Cycle"	DTC meaning
34	P1603	19	**	Rest tank Fuel Indicator Circuit High
35	P1602	19	**	Rest tank Fuel Indicator Circuit Low
36	P1601	19	**	Rest tank Fuel Indicator Circuit open
37	*P1508	25	1	Side Stand sensor Short Circuit to battery
38	*P1507	25	1	Side Stand sensor Short Circuit to Ground
39	*P1505	25	1	Side Stand sensor circuit signal non-plausible
40	*P1506	25	1	Side Stand sensor circuit open
41	P0509	49	3	Idle Air Control System Circuit High
42	P0508	49	3	Idle Air Control System Circuit Low
43	P0511	49	3	Idle Air Control Circuit
44	P0689	21	**	ECM/PCM Power Relay Sense Circuit Low
45	P0112	13	**	Intake Air Temperature Sensor 1 Circuit Low
46	P0113	13	**	Intake Air Temperature Sensor 1 Circuit High
47	P0117	12	3	Engine Coolant Temperature Sensor 1 Circuit Low
48	P0118	12	3	Engine Coolant Temperature Sensor 1 Circuit High
49	P1608	22	**	Engine Speed Signal Circuit High
50	P1607	22	**	Engine Speed Signal Circuit Low
51	P1606	22	**	Engine Speed Signal Circuit Open
52	P0563	24	**	System Voltage High
53	P0562	24	**	System Voltage Low
54	P1510	24	**	System Voltage sensing failure in ECU
55	P0501	23	3	Vehicle Speed Sensor "A" Range/Performance
56	P0643	26	3	Sensor Reference Voltage "A" Circuit High
57	P0642	26	3	Sensor Reference Voltage "A" Circuit Low
58	P0653	27	1	Sensor Reference Voltage "B" Circuit High
59	P0652	27	1	Sensor Reference Voltage "B" Circuit Low

Key Learning Points

- Appropriate Torque Application for Various Engine Components
- Standard Operating Procedures for Oil Pressure Inspection
- Removal of Crank Angle Sensor
- Understanding of Standard Limits and Service Limits for all Engine Components

CHAPTER 3
Engine & Transmission

Special Tools

Service Limits

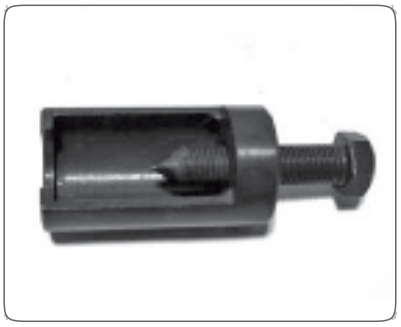
Tightening Torques

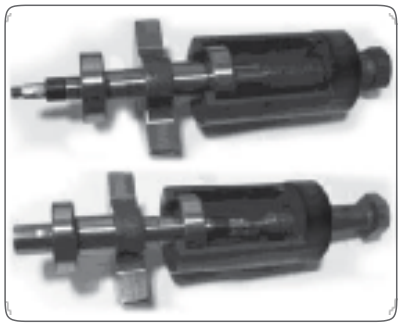
Dos & Don'ts

Important Skill Tips

Special Tools

Special Tool Application - Engine

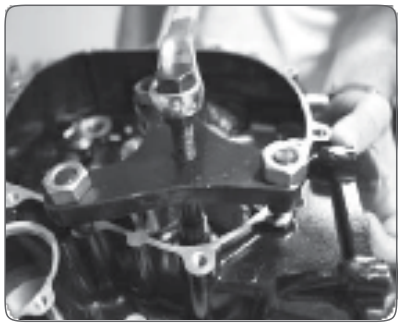




Camshaft Big end bearing & Balancer bearing puller

Part No. : 37 1042 57

Application : For removing balancer and big bearing of cam shaft



Crank Shaft remover

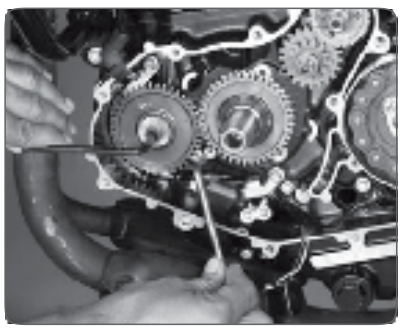
Part No. : 37 1042 52

Application : Tool for splitting the crankcase

Spark Plug Spanner 3 in one

Part No. : 37 1042 55

Application : For removing LHS / RHS and Central spark plug from cylinder head when engine is mounted on vehicle



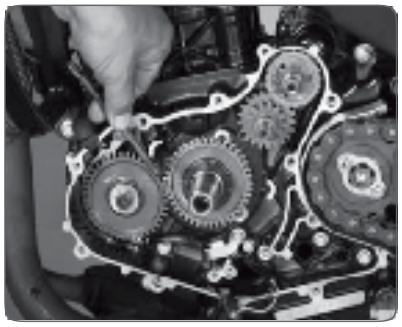
Primary gear holder+Balancer Drive / Driven gear holder

Part No. : 37 0041 59

Application : Special tool for holding Balancer drive and driven gears during tightening / loosening the nut

Special Tools

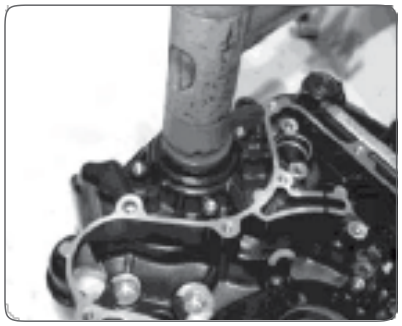
Special Tool Application - Engine



Balancer lock nut tightening/ removing tool

Part No. : 37 0041 60

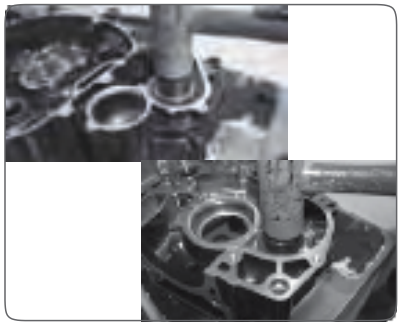
Application : Special tool for Balancer drive gear lock nut (tightening / loosening)



Output shaft oil seal fitment tool

Part No. : 37 1041 56

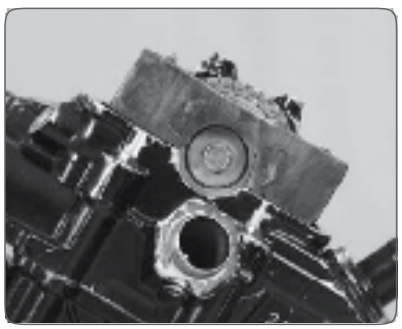
Application : For pressing oil seal on the output shaft



Balancer + Radiator pump oil seal fitment tool

Part No. : 37 0042 56

Application : For fitting 2 nos back to back oil seals for balancer and Radiator pump



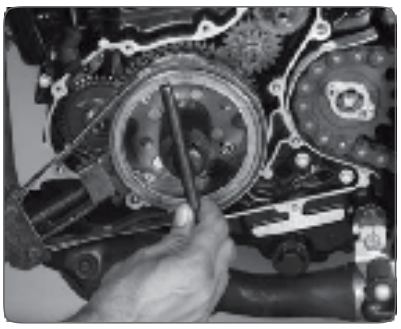
Cam Sprocket Holder

Part No. : 37 1042 54

Application : For holding cam sprocket during removal and re-fitting of cam sprocket bolt.

Special Tools

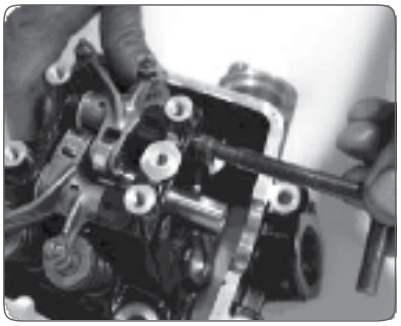
Special Tool Application - Engine



Magneto Rotor Puller

Part No. : 37 0041 55

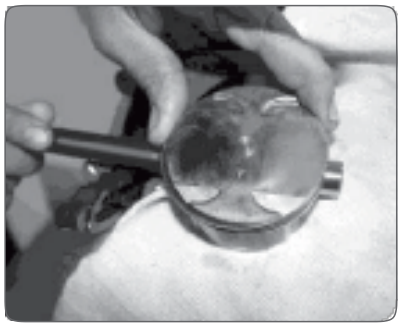
Application : For pulling out magneto rotor from crank shaft



Rocker Shaft remover

Part No. : 37 10DH 35

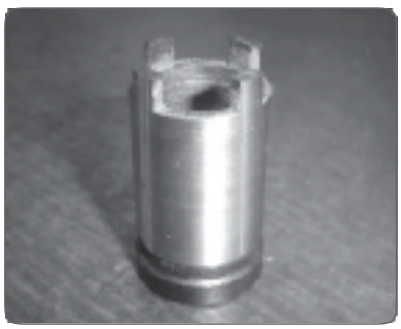
Application : For removing rocker arm shaft

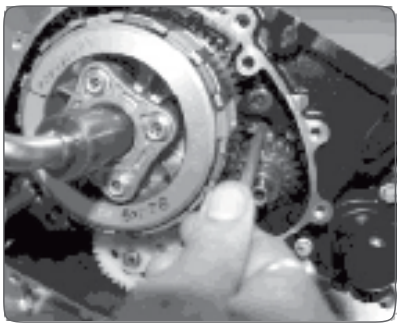


Drift Piston Pin

Part No. : 37 10DS 27

Application : For removing piston pin.





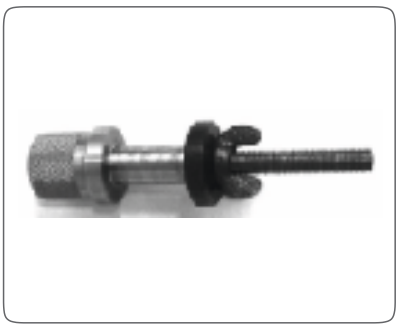
Clutch special nut remover

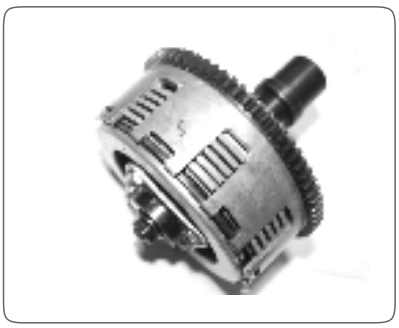
Part No. : 37 10DJ 43

Application : To remove and fit clutch nut. Rocker Shaft remover

Special Tools

Special Tool Application - Engine

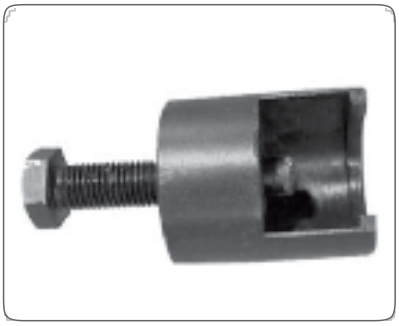




Clutch Dismantling ool

Part No. : T 10111 68

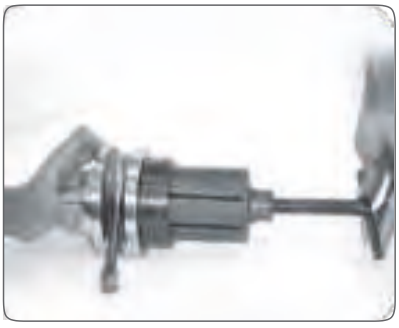
Application : For dismantling and assembly of clutch assembly.



Camshaft Small Bearing Puller

Part No. : 37 10DH 31

Application : For removing small bearing of cam shaft



Bearing Driver Set

Part No. : 37 1030 61

Application : For removing bearings from crank case.

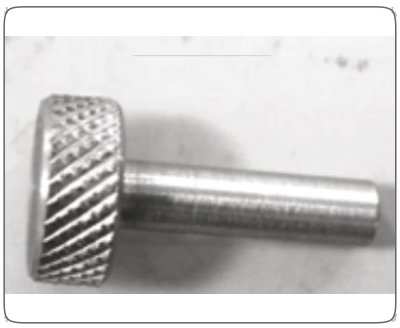
Magneto Rotor Holder

Part No. : H6 0721 00

Application : For holding rotor assembly while loosening bolt.

Special Tools

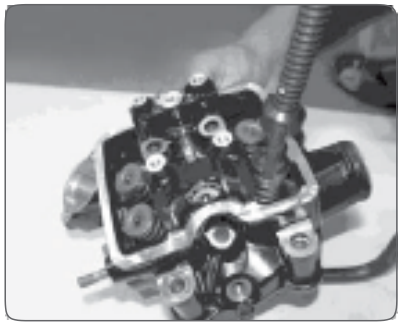
Special Tool Application - Engine



Tappet Setting ool

Part No. : 37 1043 15

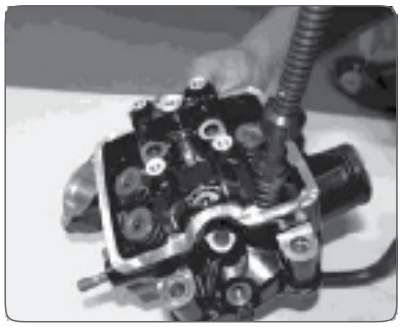
Application : For adjusting valve tappet clearance.



Valve Spring Compressor

Part No. : 37 1031 07

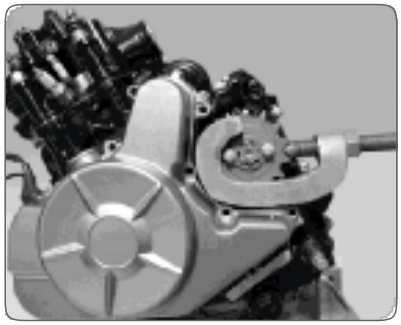
Application : For compressing valve springs for easy removal of intake and exhaust valves.



Adaptor for Valve Spring Compressor

Part No. : 37 1031 08

Application : For compressing valve springs for easy removal of intake and exhaust valves.



Output Sprocket Holder

Part No. : 37 1030 53

Application : To hold out put sprocket while removing sprocket bolt.

Special Tools

Special Tool Application - Engine

Ratchet screw drive set

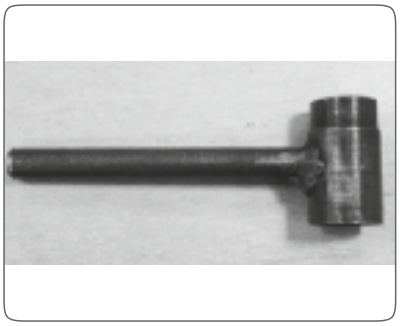
Part No. : 37 0040 14

Application : For loosening and tightening of various nut & bolts of vehicle body parts.

Coolant clamp plier

Part No. : 37 2540 35

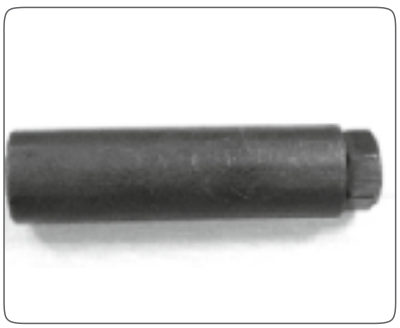
Application : For removal & re-fitment of coolant hose clamps.



LHS spark plug removal tool

Part No. : 37 2540 34

Application : For removing & re-fitting of LH side & central spark plugs.



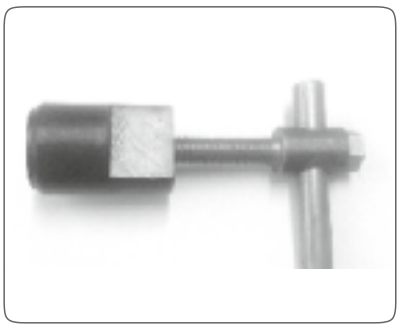
RHS spark plug removal tool

Part No. : 37 2540 38

Application : For removing & re-fitting of RHS side spark plugs.

Special Tools

Special Tool Application - Engine



Magneto rotor puller

Part No. : 37 0042 76

Application : For removal of magneto rotor.

Exclusive Special Tool - Engine & Frame

BOSCH diagnostic tool

Part No. : 37 2040 33

Application : For finding malfunctioning parts of of Fuel injection & ABS during troubleshooting

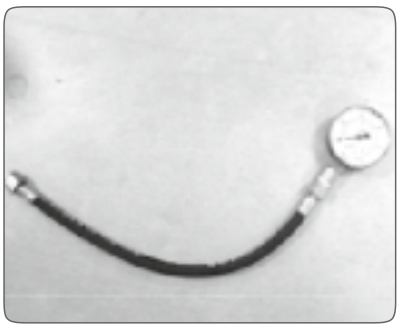
Diagnostic tool pig tail

Part No. : 37 0043 12

Application : For connecting diagnostic tool to diagnostic coupler in vehicle.

Special Tools

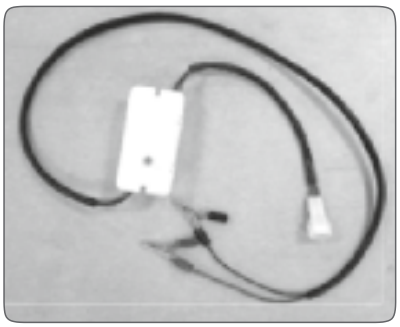
Exclusive Special Tool - Engine & Frame



Engine oil pressure checking unit

Part No. : 37 2040 31

Application : For checking engine oil pressure



Fuel pump delivery output checking unit

Part No. : 37 2040 30

Application : For checking fuel pump delivery output

Fuel pump pressure checking unit

Part No. : 37 2040 32

Application : For checking fuel pump pressure

Overhead Structure with Chain Pulley

Part No. : 37 2540 31

Application : For lifting the vehicle during various jobs like steering stem bearing lubrication, swing arm replacement etc.

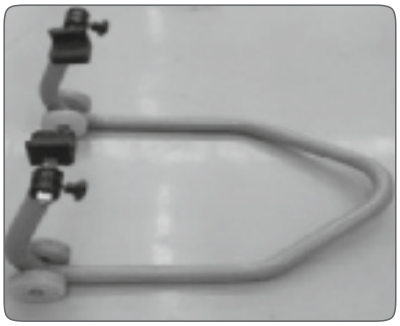
Special Tools

Exclusive Special Tool - Engine & Frame

Body Parts Trolley

Part No. : 37 2540 36

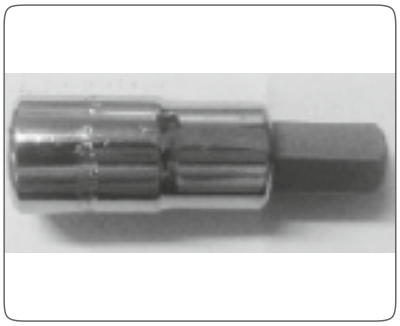
Application : For keeping vehicle dismantled body parts.



Rear Wheel Stand

Part No. : 37 2540 32

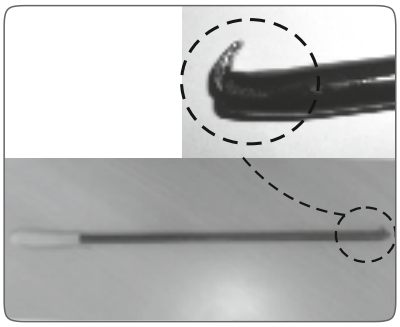
Application : For lifting the vehicle from rear side during rear wheel jobs.



14 mm Allen Socket

Part No. : 37 2540 33

Application : For loosening & tightening of fork center bolt.



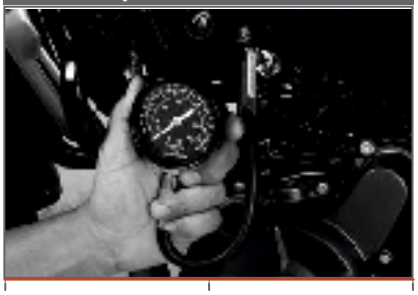
Speedo Flap Snap Clip Removing Special Tool

Part No. : 37 0043 11

Application : For removing speedo flap snap clips during speedo flap removal.

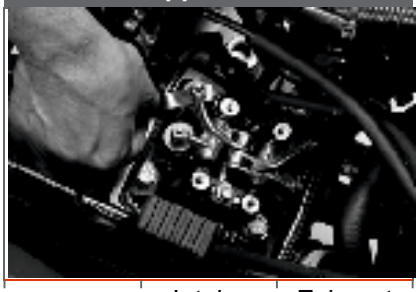
Service Limits

Compression Pressure



Std. Limit	11 ~ 13 kg/cm²
Ser. Limit	9.5 kg/cm²

Valve Tappet Clearance

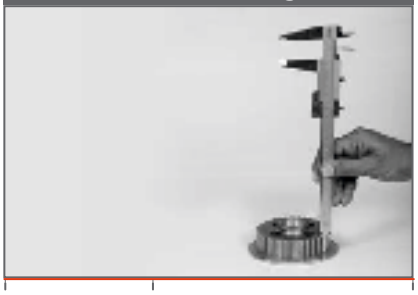


	Intake	Exhaust
Std. Limit	0.05 mm	0.08 mm
Ser. Limit	-	-

Clutch Spring Free Length

Std. Limit	38.4 mm
Ser. Limit	37.3 mm

Clutch Hub Height



Std. Limit	21.0 ~ 21.2 mm
Ser. Limit	21.4 mm

Clutch Stackup Height

Std. Limit	22.17 ~ 21.57 mm
Ser. Limit	20.3 mm

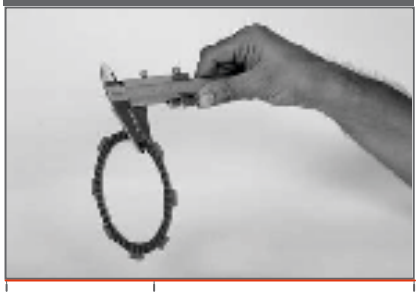
Crankshaft Runout

Std. Limit	0.02 mm
Ser. Limit	-

Steel Plate Thickness

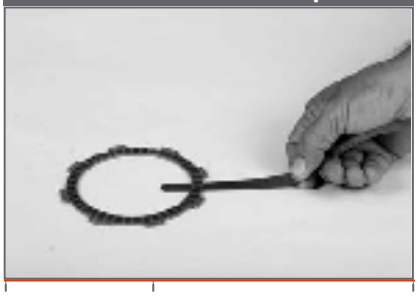
Std. Limit	1.6 mm
Ser. Limit	-

Friction Plate Thickness



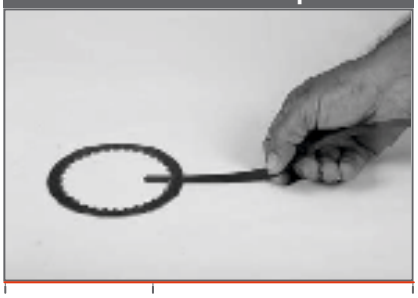
Std. Limit	2.92 ~ 3.08 mm
Ser. Limit	2.72 mm

Friction Plate Wrap



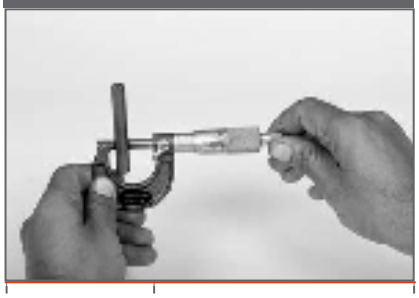
Std. Limit	0.1 mm
Ser. Limit	-

Steel Plate Wrap



Std. Limit	0.1 mm
Ser. Limit	-

Rocker Arm Shaft Diameter



Std. Limit	9.0 mm
Ser. Limit	-

Cam Sprocket Diameter

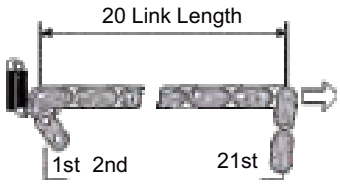
Std. Limit	65.52 mm
Ser. Limit	65.22 mm

Service Limits

Cam Lobe Height

	Intake	Exhaust
Std. Limit	30.34 mm	30.29 mm
Ser. Limit	30.29 mm	30.24 mm

Camshaft Chain Length



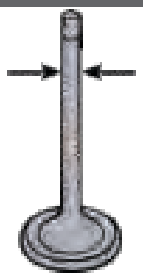
MEASURE THIS LENGTH

Std. Limit	129.4 mm
Ser. Limit	129.85 mm

Valve Spring free Length

Std. Limit	38.9 mm
Ser. Limit	37.9 mm

Valve Stem Diameter

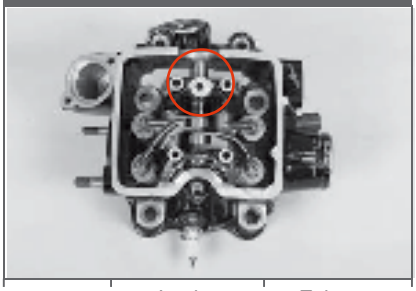


	Intake	Exhaust
Std. Limit	4.483 mm	4.463 mm
Ser. Limit	4.465 mm	4.445 mm

Valve Stem Bend

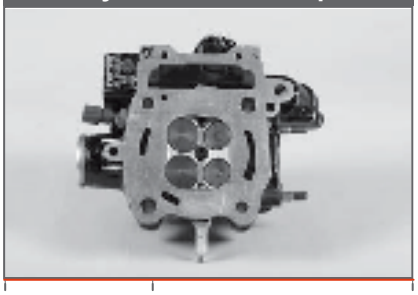
Std. Limit	TIR 0.01 mm
Ser. Limit	TIR 0.015 mm

Valve Stem to Guide Clearance



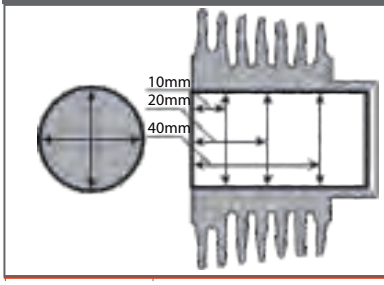
	Intake	Exhaust
Std. Limit	0.01~0.037 mm	0.03~0.057 mm
Ser. Limit	0.047 mm	0.067 mm

Cylinder Head Warp



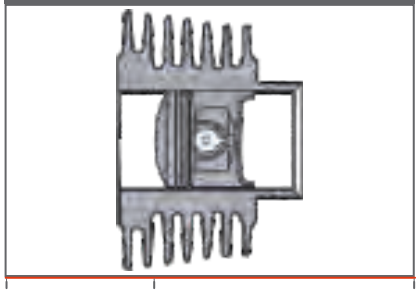
Std. Limit	0.05 mm
Ser. Limit	-

Cylinder Inside Diameter



	mm

Cylinder Piston Clearance



Std. Limit	0.03 ~ 0.049 mm
Ser. Limit	0.09 mm

Piston Diameter

Group A	71.964 ~ 71.976 mm
Group B	-

Piston Ring End Gap

	Top	Second	Oil Ring
	0.030 mm	0.050 mm	0.70 mm
Ser. Limit	-	-	-

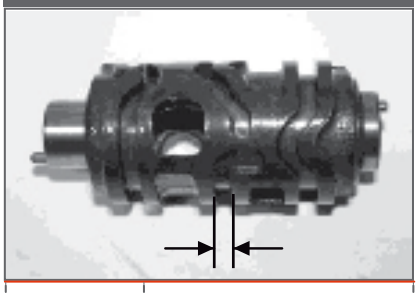
Piston Ring Groove Clearance

	Top	Second	Oil Ring
	0.055 mm	0.060 mm	0.110 mm
Ser. Limit	-	-	-

Service Limits

Shaft Fork Shift O.D	
	
Std. Limit	11.966 ~ 11.984 mm
Ser. Limit	-

Fork Shift I.D	
	
Std. Limit	12.0 mm
Ser. Limit	-

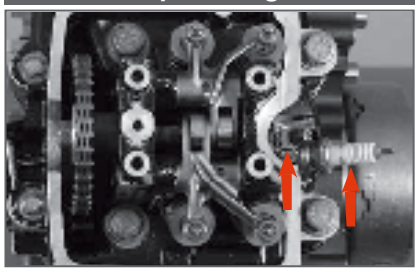
Gear Shift Drum Groove Width	
	
Std. Limit	4.55 ~ 4.70 mm
Ser. Limit	4.75 mm

Gear Shift Fork Guide Pin Diameter	
	
Std. Limit	4.45 ~ 4.49 mm
Ser. Limit	4.4 mm

Notes

Tightening Torques

Spark Plug

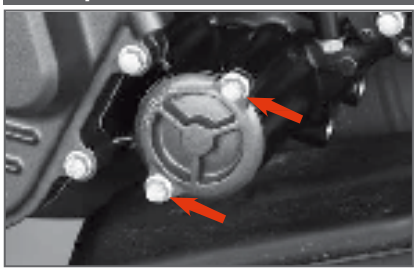


Tightening torque - 1.3 ~ 1.5 kgm

Oil Strainer Cap (18 mm A/F)

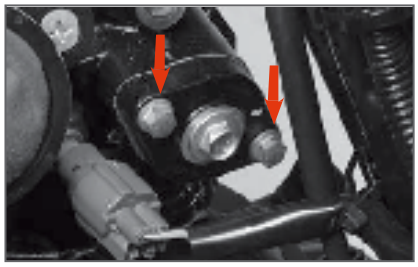
Tightening torque - 0.8 ~ 1.0 kgm

Cap Oil Filter Cover Bolts



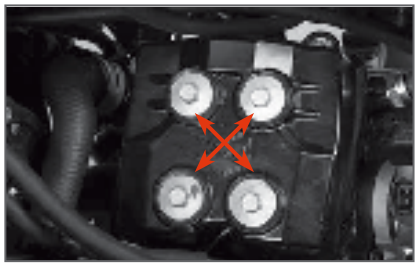
Tightening torque - 1.0 ~ 1.2 kgm

Chain Tensioner Mounting Bolts



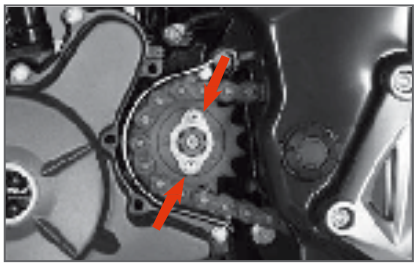
Tightening torque - 1.0 ~ 1.2 kgm

Cylinder Head Cover Bolts



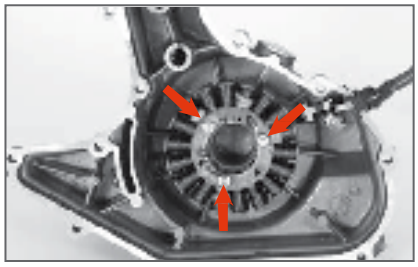
Tightening torque - 1.0 ~ 1.2 kgm

Output Sprocket Bolts



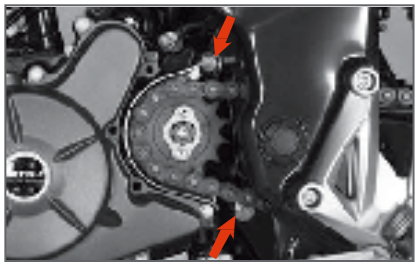
Tightening torque - 1.0 ~ 1.2 kgm

Stator Plate Mtg. Bolts



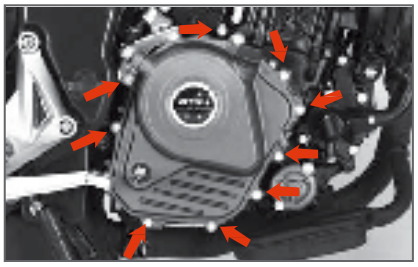
Tightening torque - 0.7 ~ 0.8 kgm

Eng. Mtg. Rr. Upper/Lower Bolts



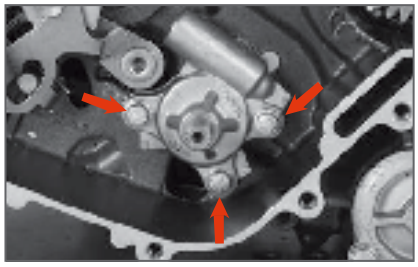
Tightening torque - 2.5 ~ 3.0 kgm

Clutch Cover Bolts



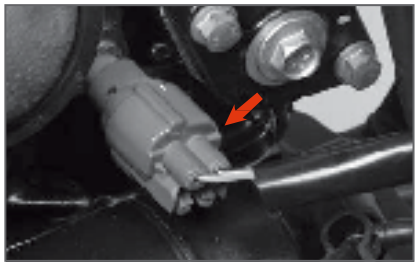
Tightening torque - 1.0 ~ 1.2 kgm

Oil Pump Mounting Bolts



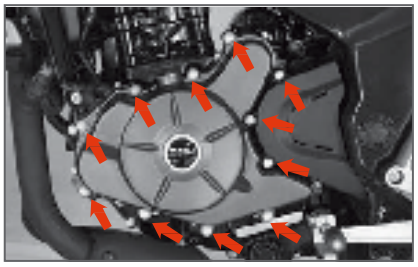
Tightening torque - 1.0 ~ 1.2 kgm

Coolant Temperature Sensor



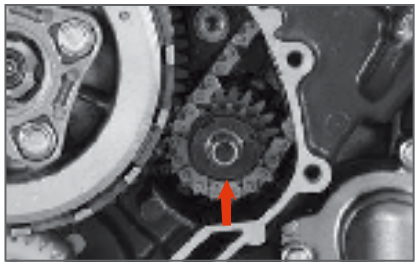
Tightening torque - 1.2 ~ 1.4 kgm

Magneto Cover Bolts



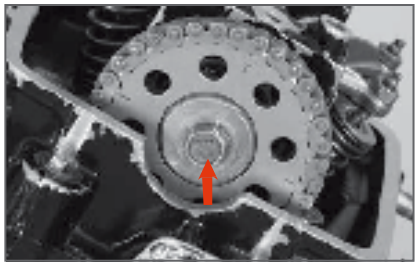
Tightening torque - 1.0 ~ 1.2 kgm

Primary Gear Nut



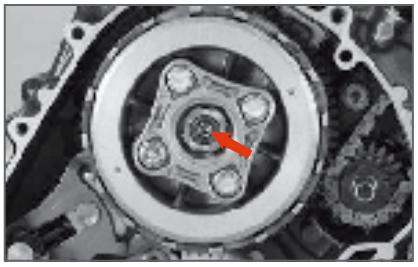
Tightening torque - 5.9 ~ 6.1 kgm

Cam Shaft Sprocket Bolt



Tightening torque - 2.5 kgm

Nut Securing Clutch Assly.



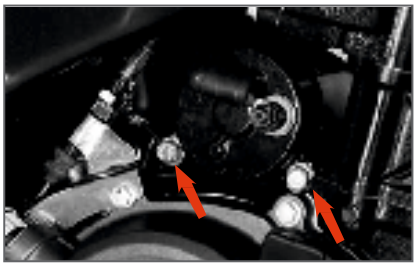
Tightening torque - 7.0~7.1 kgm

Tightening Torques

Magneto Rotor Mounting Nut

Tightening torque - 5.9~6.1 kgm

Stator Motor Mounting Nut



Tightening torque - 1.0~1.2 kgm

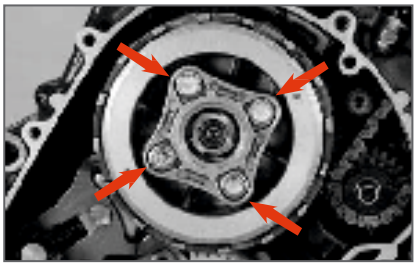
Inhibitor Nut

Tightening torque - 1.0~1.2 kgm

Guide Gear Allen Bolt

Tightening torque - 1.0 ~ 1.2 kgm

Clutch Holder Bolts



Tightening torque - 1.0 ~ 1.1 kgm

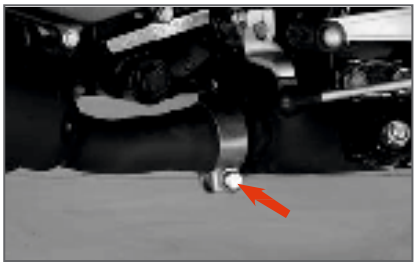
LH/RH Engine Stay Upper Bolts

Tightening torque - 2.5 ~ 2.7 kgm

LH/RH Engine Stay Lower Bolts

Tightening torque - 2.5 ~ 3.0 kgm

Silencer Joining Nut

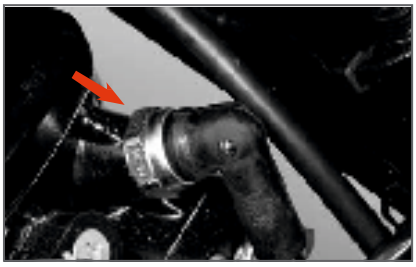


Tightening torque - 1.0 ~ 1.1 kgm

Injector Mounting Bolt

Tightening torque - 0.8 ~ 1.0 kgm

Oil Pressure Sensor Nut



Tightening torque - 1.1 ~ 1.5 kgm

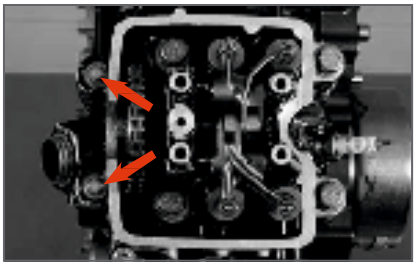
Bal. Driver Gear Mounting

Tightening torque - 5.9 ~ 6.0 kgm

Bal. Driven Gear Mounting (Allen)

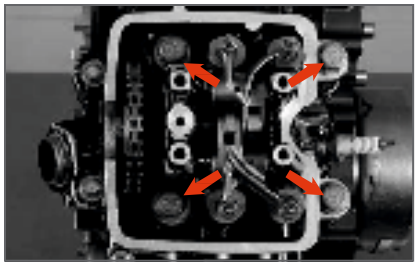
Tightening torque - 2.2 ~ 2.5 kgm

Cylinder Head Small Bolts



Tightening torque - 1.0 ~ 1.2 kgm

Cylinder Head Big Bolts



Tightening torque - 4.4 ~ 4.6 kgm

Dos & Don'ts

Dos

Always replace gasket 'O' rings of engine If dismantled.

Don'ts

Don't reuse 'O' rings, gasket, Oil seals, Circlip locks as they use their strength and properties, once they are opened.

Dos

Whenever installing Spark Plug, first screw by hand and then tighten to specified torque.

Don'ts

Don't adjust spark plug electrode gap by hacksaw blade or with judgment of eye otherwise it will affect the engine performance.

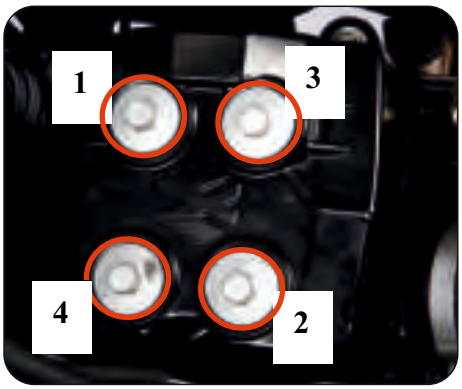
Dos

Always below light pressure compressed air from inside while cleaning 'Oil strainer' that is opposite to the direction of flow of oil.

Don'ts

Don't reuse torn 'Oil strainer' otherwise it will affect lubrication system of engine and subsequently would lead to seizure.

Important Skill Tips



Cylinder Head Cover Dismantling

Always loosen 4 bolts in crisscross pattern.

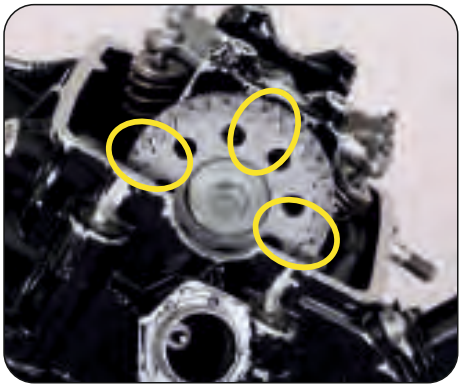
Tightening Torque : 1.0 ~ 1.2Kg.m

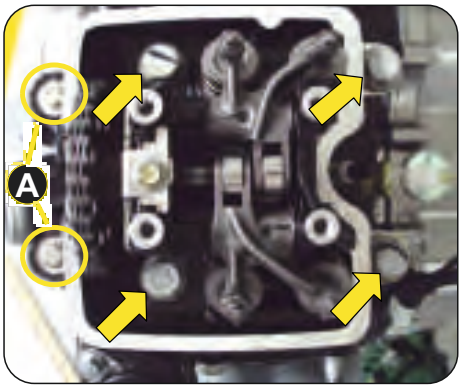
TDC Position for Valve Timing

Check piston TDC position, Valve timing & Valve Tappet clearance before dismantling cylinder head.

Intake Valve
Tappet clearance: 0.05 mm

Exhaust valve
Tappet clearance: 0.08 mm





Cylinder Head Bolts Loosening Sequence

Always loosen cylinder head short bolts (A) first and then loosen cylinder head long bolts (4 nos) in crisscross pattern.

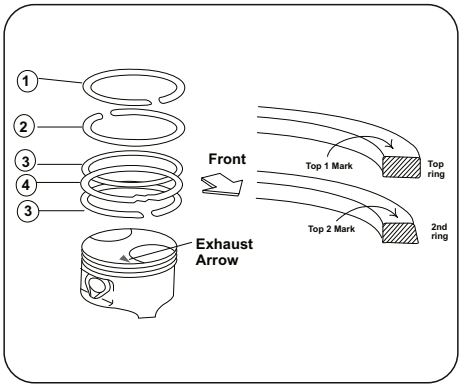
Important Skill Tips

Piston Pin Circlip

While removing / refitting piston pin circlip (snap ring), cover the crankcase bore with clean lint free cotton cloth to arrest circlip / snap ring falling inside the engine so as to avoid subsequent un- necessary opening of engine.

Primary Gear Holding

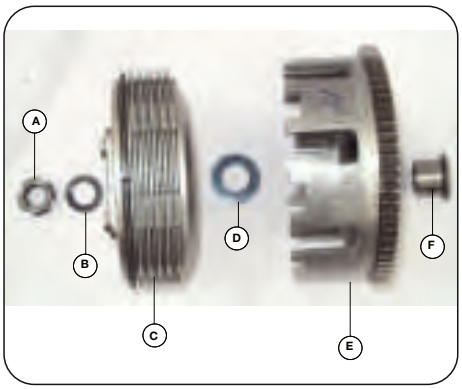
While loosening 'Primary Gear Nut' & 'Clutch Special Nut', hold 'Primary Gear' and 'Clutch Housing Gear' by placing special tool from top.



Piston Ring Fitment

- Piston rings must always be fitted with respect to exhaust mark on the piston
- First place the bottom oil rail ring with end gap 30º towards left of the exhaust mark in the last groove.
- Place oil expander ring with butting end downward & end gap facing opposite to the exhaust mark.
- Now fit top oil rail ring on the expander ring with end gap 30º towards right of the exhaust mark.
- Fit the second piston ring with 'Top 2' mark facing upward and end gap facing opposite to the exhaust mark.
- Finally fit the first ring with 'Top 1' mark upward and end gap facing towards the exhaust mark.
- Remember fitment of 2nd ring upside down may lead to passing of oil above the piston and ultimately leading to smoky exhaust.

Important Skill Tips



Clutch Washer Sequence

A : Special nut

B : Belleville washer

C : Clutch stack

D : Plain washer

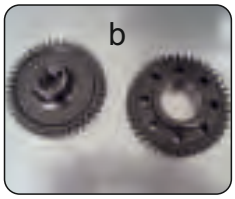
E : Clutch housing

F : Collar bush

Counter Gear Washers

a. When fitting spacer on allen bolt ensure that plain side of spacer face outside.

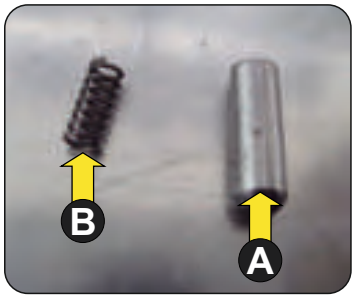
b. When fitting ensure that bal. driven & driving gear collar side face inside.



Cylinder Head Bolts Loosening Sequence

Always loosen cylinder head short bolts (A) first and then loosen cylinder head long bolts (4 nos) in crisscross pattern.

Ensure pin (A) & spring (B) is to be collected & carefully on removal of neutral switch.



Important Skill Tips

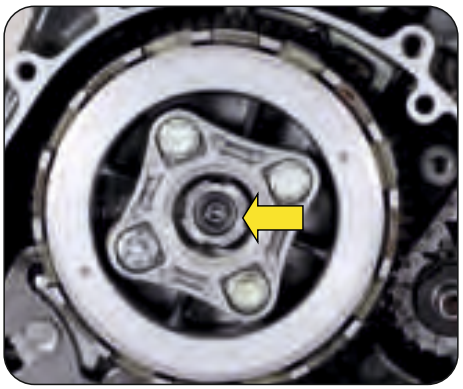
When dismantling engine .....

Do not insert a sharp object in-between water pump rotor & crank case.

Tab the balancer shaft to remove rotor

When removing oil filter .....

Use external expanding circlip plier to pull out the oil filter.



Clutch Special Nut

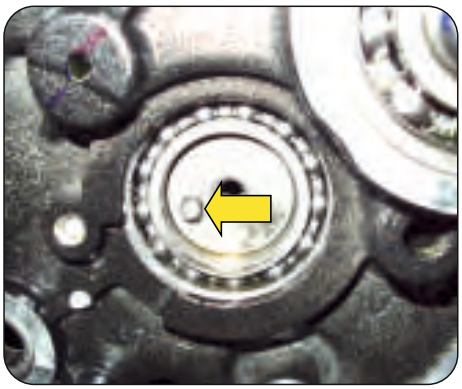
- Special nut for clutch on Input shaft is having left hand threading.

  Loosening direction : Clockwise

  Tightening direction : Counter-clockwise.

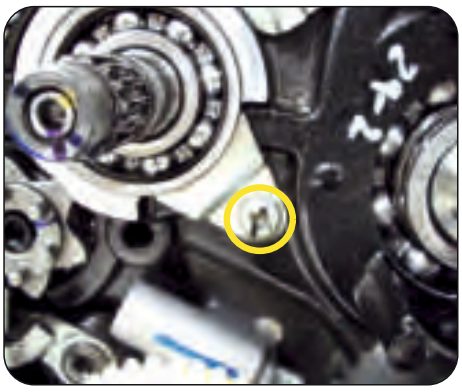
- Use special tool while loosening / tightening special nut.

Important Skill Tips



Collect guide gear pin on removal of guide gear.

Ensure fitment of spacer when assembly guide gear



Remove input shaft bearing stopper on clutch side for fitment of crank case splitting tool.

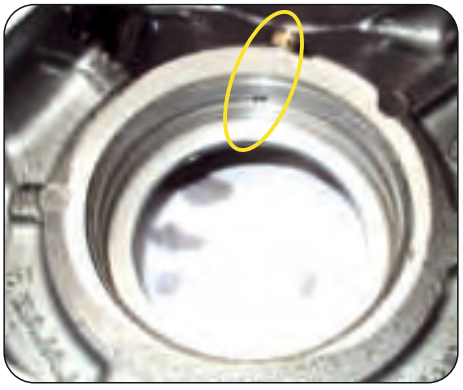
Crank case splitting tool

Crank case splitting tool resting on bearing stopper location

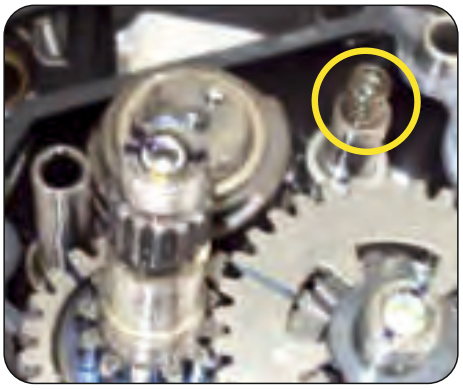
Important Skill Tips

Using engine heater heat the crank case clutch side for smooth & easy fitment of crankshaft bearing.

Ensure oil passages are not blocked.

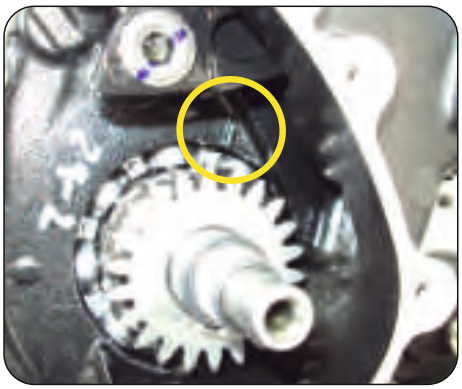


- Ensure that the oil passage going towards orifice is cleared.
- The orifice outlet is cleared.



Use grease to fix the springs when assembling. This is to avoid falling of the spring.

Important Skill Tips



When aligning the marks for bal. driven & driver gear always ensure...

- Piston is at TDC position.
- Primary gear mark is align with crankcase mark.

Balancer driven & driver gear marks are inline with each other.

Close the bore of magnet side crank case using a lint free cloth when fitting the harness guide. This is to avoid bolt falling inside the crank case.

Key Learning Points

- Appropriate Torque Application for Various Frame Components
- Understanding of Standard Limits and Service Limits for all Frame Components

CHAPTER 4
Frame & Suspension

Special Tools

Service Limits

Tightening Torques

Standard Operating Procedure

ABS - Anti Lock Braking System

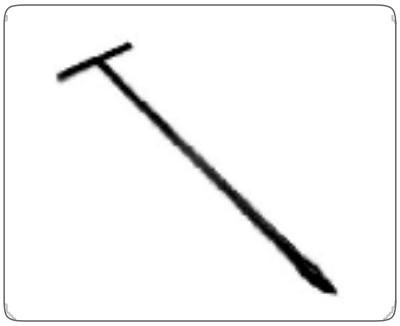
Special Tools

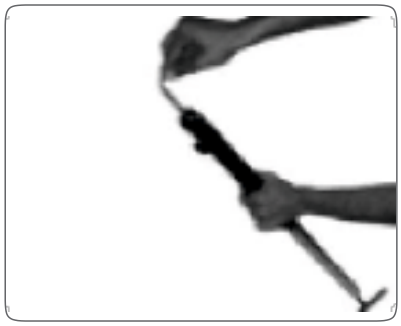
Special Tools Application : for Frame Repairs

Fork oil seal fitment punch

Part No. : 37 1740 03

Application : To remove anti-friction and oil seal bush from front fork outer pipe.





Fork cylinder holder handle with adaptor

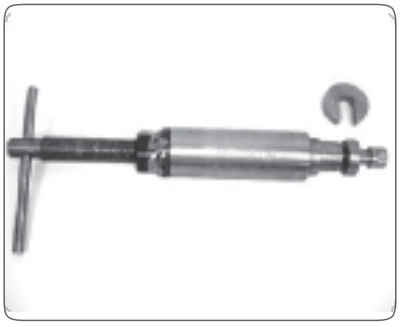
Part No. : 37 1740 05

Application : For holding cylinder piston

Installer Upper & Lower Bearing Race Frame

Part No. : 37 1801 06

Application : To install upper and lower steering races / cones into their seats inside frame.



Swing arm needle roller bearing extractor & fitment tool

Part No. : 74 9309 93

Application : For removal and fitting of needle roller bearing in swing arm

Special Tools

Special Tools Application : for Frame Repairs

Steering Nut tightening tool

Part No. : 37 1801 01

Application : For tightening / loosening of steering nut

Rear Mono Suspension Adjuster

Part No. : 37 0041 70

Application : For adjustment of mono rear suspension setting

Stem Bearing Driver

Part No. : 37 1830 05

Application : To fit bearing race on fork under holder bracket

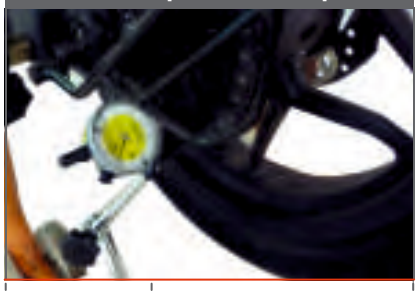
Notes

Service Limits

Disc Pad Thickness

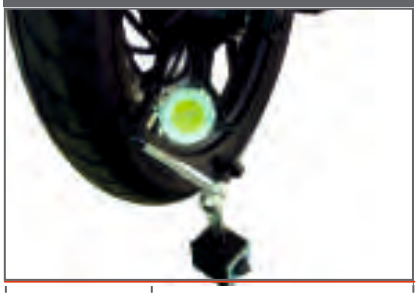
Std. Limit	Fr -7.4mm	Rr -7.3mm
Ser. Limit	Fr -3.8mm	Rr -2.0mm

Rear Sprocket Warp



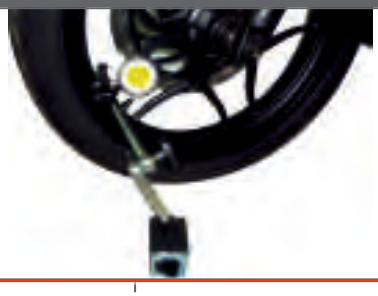
Std. Limit	TIR 0.4 mm or Less
Ser. Limit	TIR 0.5 mm

Axial Wheel Run Out



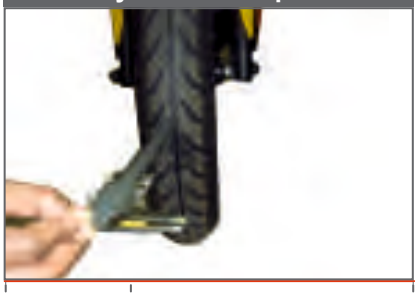
Std. Limit	TIR 1.0 mm or Less
Ser. Limit	TIR 2.0 mm

Radial Wheel Run Out



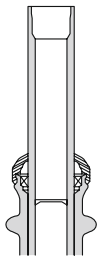
Std. Limit	TIR 0.8 mm or Less
Ser. Limit	TIR 2.0 mm

Tyre Tread Depth



Std. Limit	Fr.: 5.0mm, Rr : 6.0mm
Ser. Limit	Upto TWI 1.0

Front Fork Oil Grade & Capacity



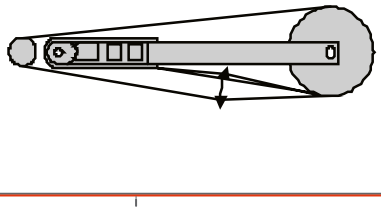
Grade :
SAE 10W20 Bajaj Genuine Fork Oil

Quantity Per Fork Leg :
O/H: 320 ml

Drain & Refill: 295±2.5ml

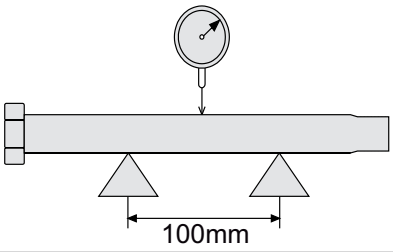
Std. Limit	-
Ser. Limit	-

Drive Chain Slack



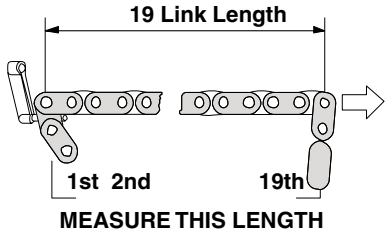
Std. Limit	15 ~ 25 mm
Ser. Limit	30 ~ 40 mm

Axle Run Out



Std. Limit	TIR 0.1mm or Less
Ser. Limit	TIR 0.2

Drive Chain Length



Std. Limit	301.6 ~ 302.1 (19 link)
Ser. Limit	307

Tightening Torques

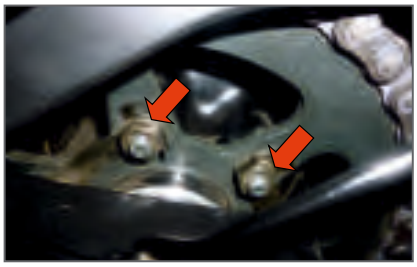
Front Axle Nut

Tightening torque 9.0 ~ 10.0 kgm

Rear Axle Nut

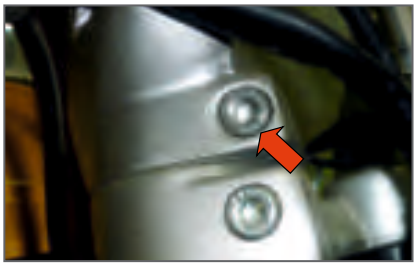
Tightening torque 10.0 ~ 12.0 kgm

Rear Sprocket Mounting Nut



Tightening torque 3.2 ~ 3.8 kgm

Handle Bar Holder Bolts



Tightening torque 1.8 ~ 2.0 kgm

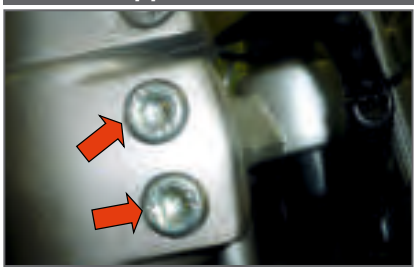
Fork Center Nut

Tightening torque 4.8 ~ 5.2 kgm

Steering Stem Nut Slotted

Tightening torque 0.5 kgm

Fork Upper Bracket Bolts



Tightening torque 1.8 ~ 2.0 kgm

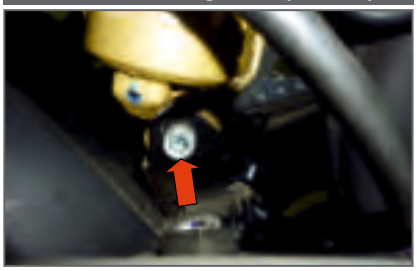
Fork Under Bracket Bolts

Tightening torque 2.5 ~ 3.0 kgm

RSA Mounting Bolt (Upper)

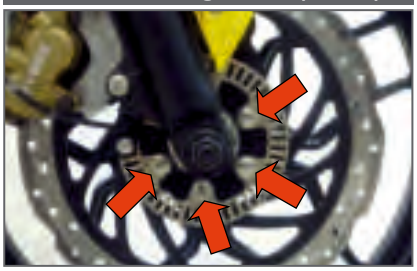
Tightening torque 3.2 ~ 3.8 kgm

RSA Mounting Bolt (Lower)



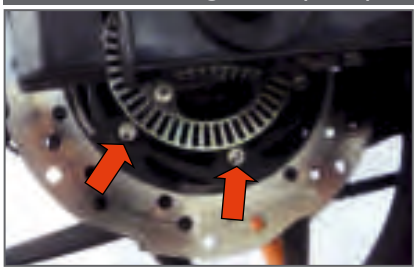
Tightening torque 3.2 ~ 3.8 kgm

Disc Mounting Bolts (Front)



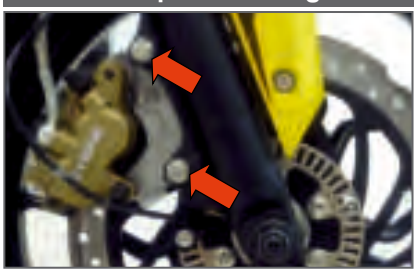
Tightening torque 2.6 ~ 3.2 kgm

Disc Mounting Bolts (Rear)



Tightening torque 2.6 ~ 3.2 kgm

Front Caliper Mounting Bolt

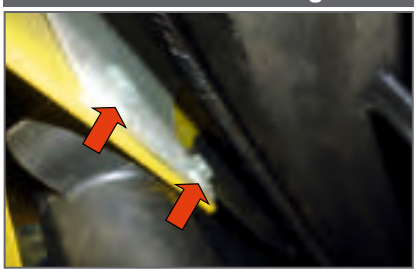


Tightening torque 4.0 ~ 5.0 kgm

Front Fender Mounting

Tightening torque 0.8 ~ 1.0 kgm

Brace Fender Mounting Bolt



Tightening torque 2.0 ~ 2.2 kgm

Tightening Torques

Rear Brake Pedal Mtg. Bolt

Tightening torque 2.0 ~ 2.2 kgm

Bracket Rear Number Plate

Tightening torque 1.8 ~ 2.2 kgm

Side Stand Mounting Bolt

Tightening torque 2.5 ~ 3.0 kgm

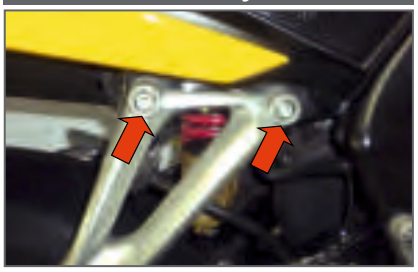
Handlebar End Weight Bolt

Tightening torque 0.8 ~ 1.2 kgm

Tank Mounting Bolt

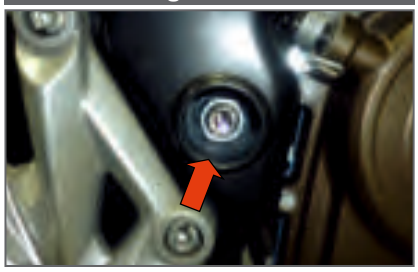
Tightening torque 1.8 ~ 2.2 kgm

LH & RH Stay Bolts



Tightening torque 1.6 ~ 1.8 kgm

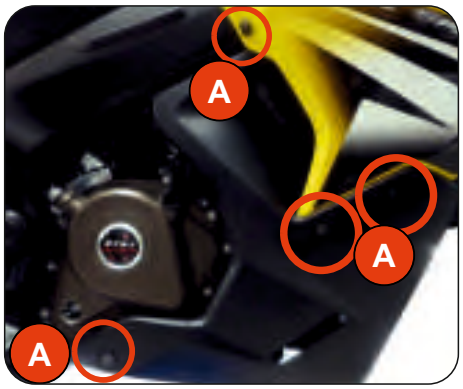
Swing Arm Shaft



Tightening torque 13.0 ~ 15.0 kgm

Standard Operating Procedure

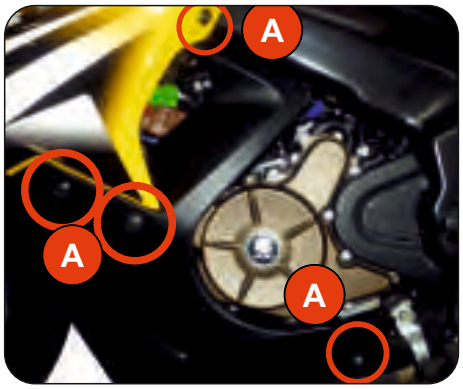
Side Fairing Removal

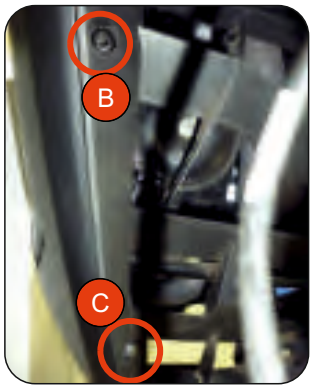


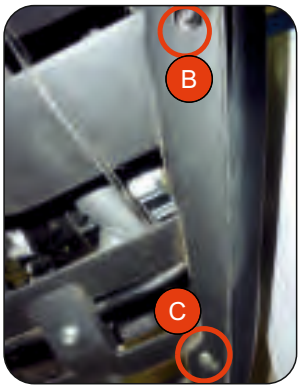
Using Phillips set screw driver

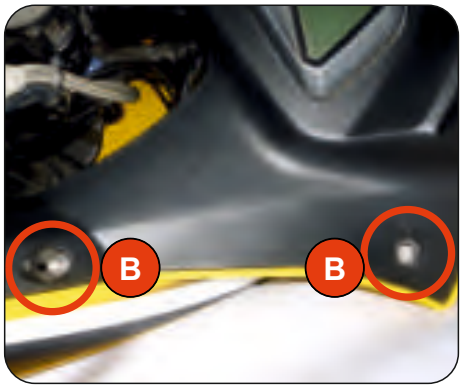
Remove:

- RH & LH lower fairing mounting screws (5+5=10) & 8 metalic washers (A) & 2 plastic washers (C)
- Push pull plug (1+1=2) (B)







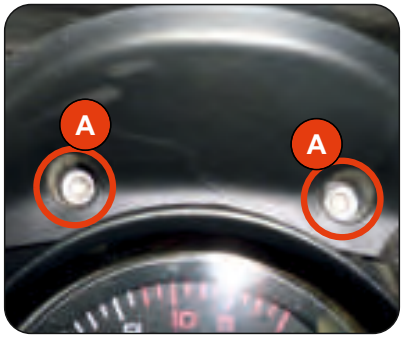


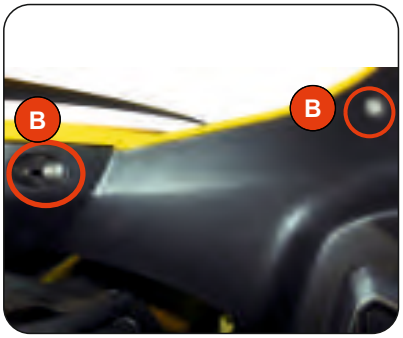
Using 4mm allen key

Remove:

- Speedo flap mounting 6 allen bolts (A) & 4 plastic washers (B).
- Pull out the speedo flap with the help of speedo flap removing tool. (C)

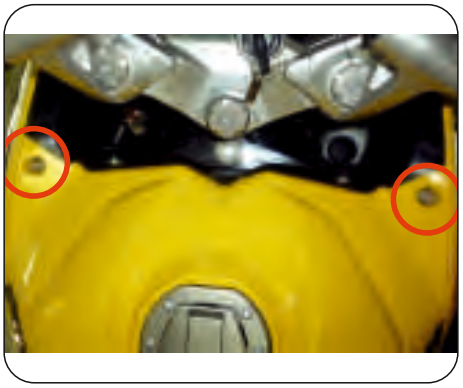
Skill tips:
Ensure 3 clip snaps are available at its location.





Standard Operating Procedure

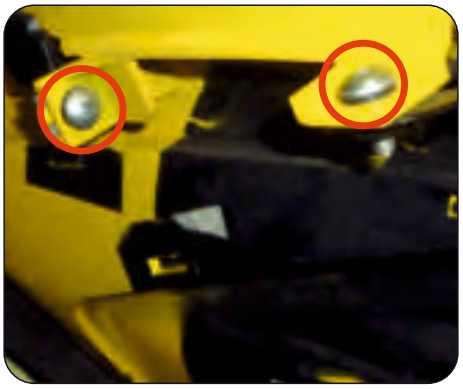
Side Fairing Removal



Using 5mm allen key

Remove:

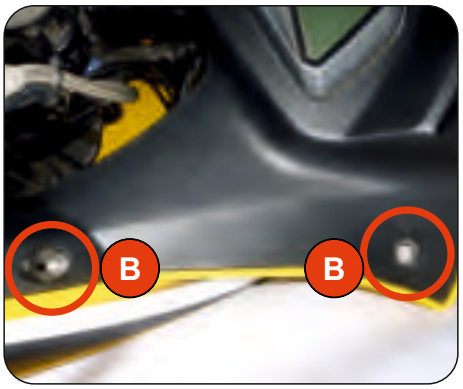
- Tank cover mounting top 2 allen bolts.



Using Phillips set screw driver and 8mm Ring spanner

Remove:

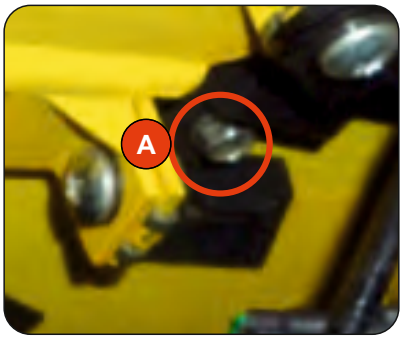
- LH & RH Side fairing under speedo flap screws (2+2=4).

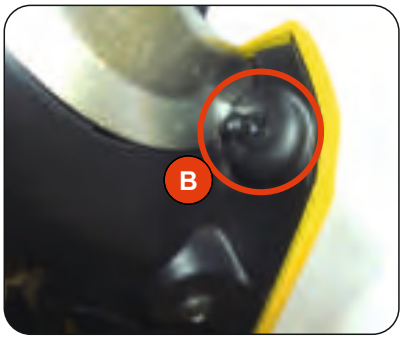


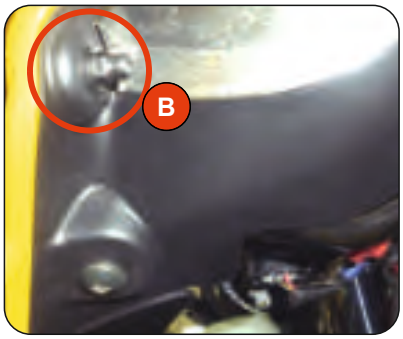
Using Phillips set screw driver & 8mm Ring spanner

Remove:

- Flange bolt (1+1=2)(A) & 2 plastic washers
- Side fairing mounting below front fairing dome nut (1+1=2) & 2 screws (1+1)(B)







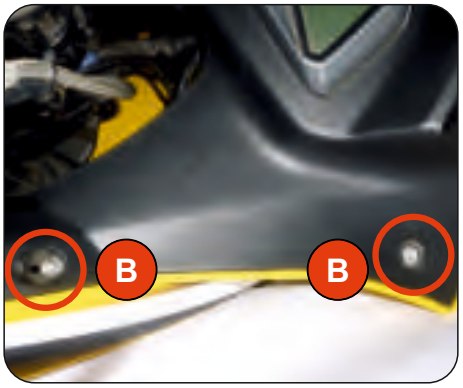
Standard Operating Procedure

Side Fairing Removal

- Pull out RH & LH side fairing lugs from petrol tank cover.

Standard Operating Procedure

Front Fairing Removal

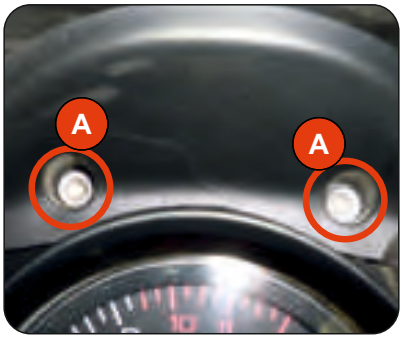


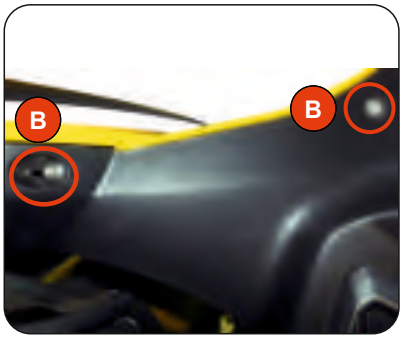
Using 4mm allen key

Remove:

- Speedo flap mounting 6 allen bolts (A) & 4 plastic washers (B).
- Pull out the speedo flap with the help of speedo flap removing tool. (C)

Skill tips:
Ensure 3 clip snaps are available at its location.





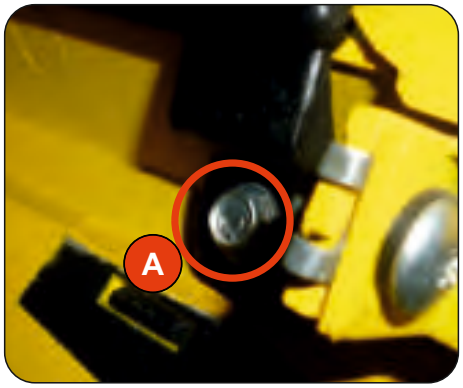
Using Phillips set screw driver and 8mm Ring spanner

Remove:

- LH & RH Side fairing under speedo flap screws (2+2=4).

Standard Operating Procedure

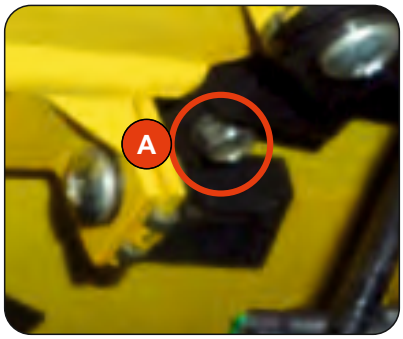
Front Fairing Removal

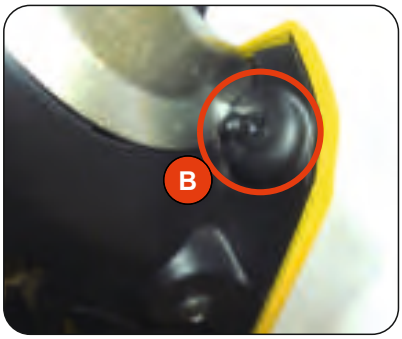


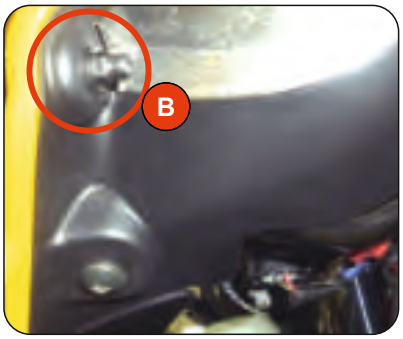
Using Phillips set screw driver & 8mm Ring spanner

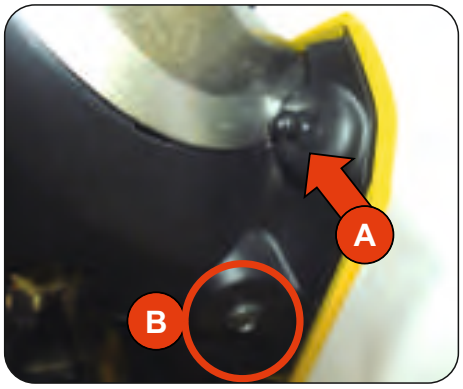
Remove:

- Flange bolt (1+1=2)(A) & 2 plastic washers
- Side fairing mounting below front fairing dome nut (1+1=2) & 2 screws (1+1)(B)



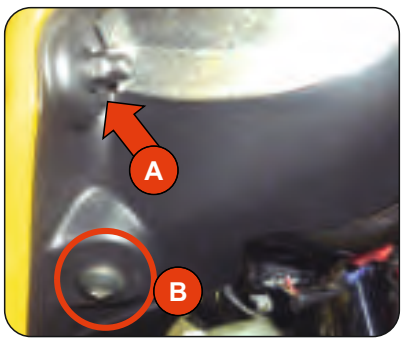






Remove:

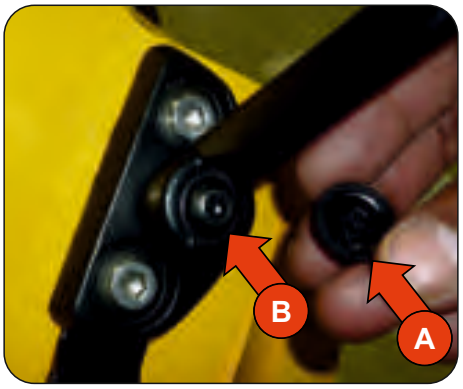
- 3 nos Philips head screws (A)
- 2 dome nuts (B)
- Lower cover located below projector lamps.



Standard Operating Procedure

Front Fairing Removal

- Disconnect RH and LH indicator coupler connection.



Using 4 mm allen key

Remove:

- RH & LH mirror rubber cap (A)
- RH & LH Mirror mounting allen bolt. (B)

Using 4 mm allen key

Remove:

- RH & LH mirror rubber cap (A)
- RH & LH Mirror mounting allen bolt. (B)

- LH and RH mirror base rubber damper

Standard Operating Procedure

Front Fairing Removal

- Take out front fairing by pulling RH and LH side fairing.

Standard Operating Procedure

Seat Cowl Removal

Using vehicle key

Remove:

- Pillion seat.

Using 10 mm 'T' spanner

Remove:

- Rider seat mounting 2 bolts
- Pull the rider seat at back side

Using 6 mm allen key

Remove:

- LH Pillion step holder mounting 2 allen bolts

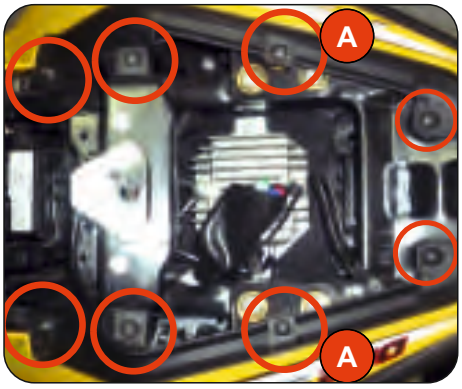
Disconnect tail lamp coupler connections using 12mm Box spanner

Remove :

- Tail lamp mounting 3 flange bolts
- Tail lamp

Standard Operating Procedure

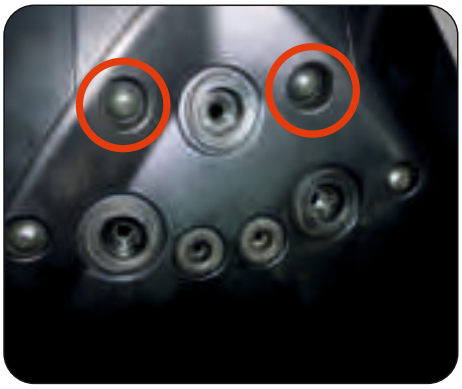
Seat Cowl Removal



Using Phillips set screw driver

Remove:

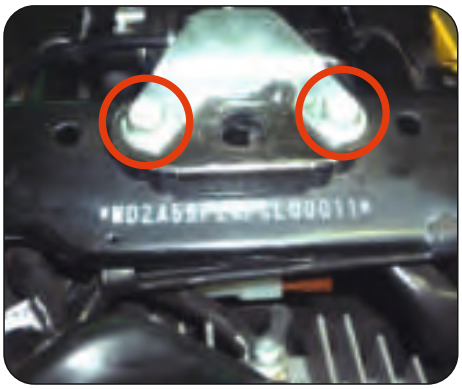
- Seat cowl inner mounting 8 screws, 6 metal washers and 2 plastic washers (A)
- Seat cowl inner



Using Phillips set screw driver

Remove:

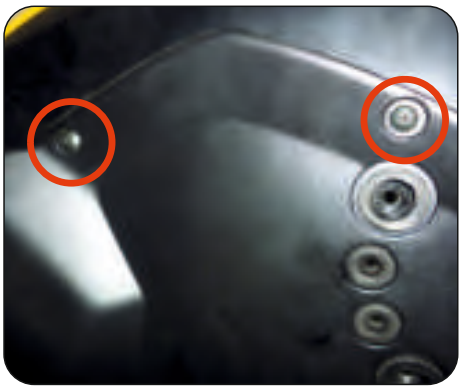
- Seat cowl center top mounting bottom 2 screws
- Seat cowl center top by pulling upside



Using 10 mm 'T' spanner

Remove:

- Seat lock mounting 2 bolts
- Seat lock bracket



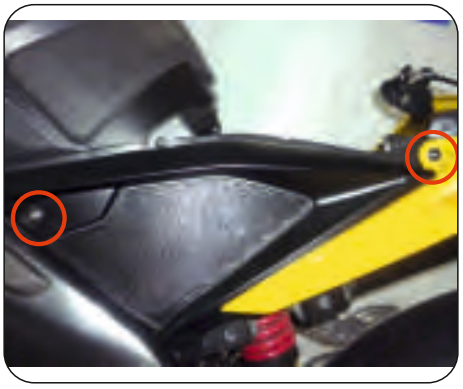
Using Phillips set screw driver

Remove :

- LH seat cowl mounting bottom 4 screws & 1 plastic washer

Standard Operating Procedure

Seat Cowl Removal



Using Phillips set screw driver

Remove:

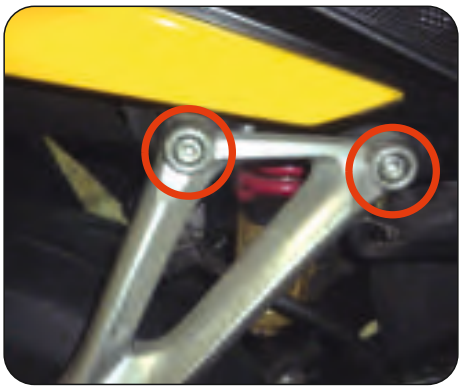
- Seat cowl LH mounting 2 screws
- Seat cowl mounting upper 1 screw & 1 metal washer

Using 6mm allen key

Remove:

- Grab handle mounting 2 allen bolts

- Take out LH seat cowl



Using 6mm Allen key & 10 mm 'T' spanner

Remove :

- RH Pillion step holder mounting 2 allen bolts
- Rear brake reservoir mounting 1 bolt

Standard Operating Procedure

Seat Cowl Removal

Using Phillips set screw driver

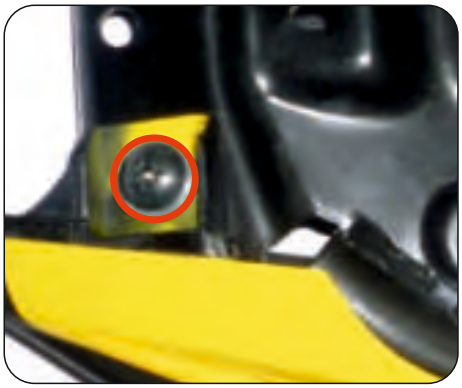
Remove:

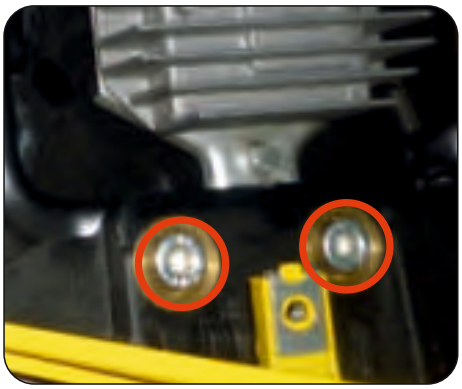
- RH seat cowl mounting bottom 4 screws, 3 metal washers & 1 plastic washer (A).

Using Phillips set screw driver

Remove:

- Seat cowl RH mounting 2 screws
- Seat cowl mounting upper 1 screw





Using 6 mm allen key

Remove :

- Grab handle mounting 2 allen bolts

- Take out RH seat cowl

Standard Operating Procedure

Petrol Tank Cover & Tank Removal

Using vehicle key

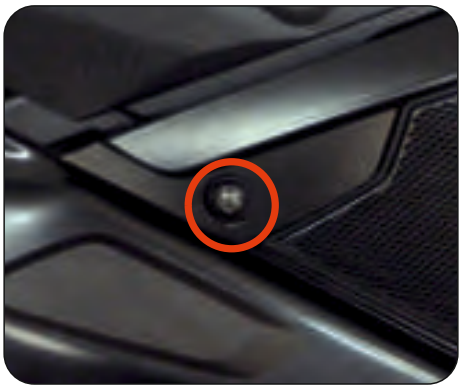
Remove:

- Pillion seat

Using 10 mm 'T' spanner

Remove :

- Rider seat mounting 2 bolts
- Pull the rider seat at back side



Using 10 mm 'T' spanner

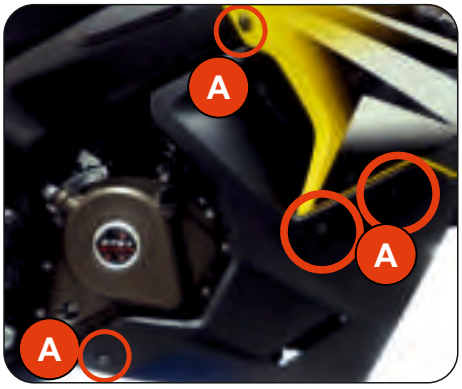
Remove :

- RH and LH seat cowl mounting screws (1+1=2)

- Petrol tank cover rear mounting 2 screws

Standard Operating Procedure

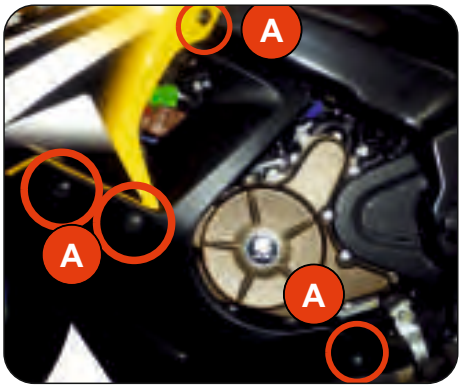
Petrol Tank Cover & Tank Removal

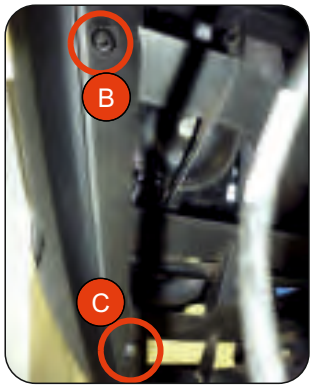


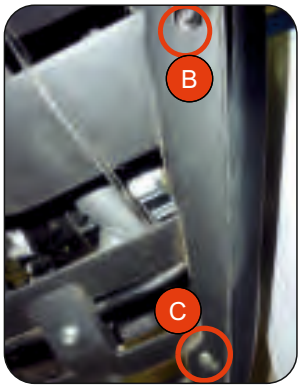
Using Phillips set screw driver

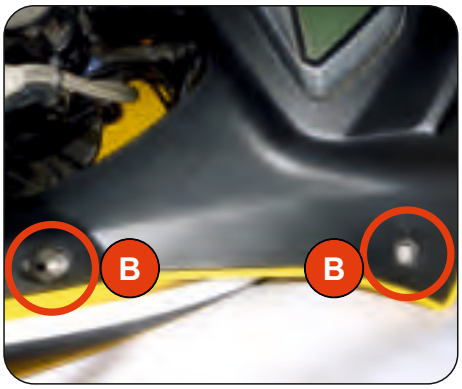
Remove:

- RH & LH lower fairing mounting screws (5+5=10) & 8 metallic washers (A) & 2 plastic washers ©
- Push pull plug (1+1=2) (B)







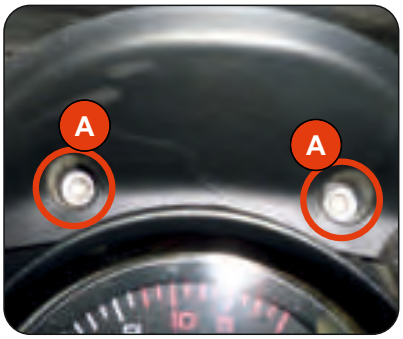


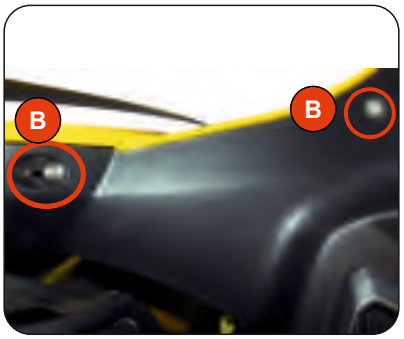
Using 4mm allen key

Remove:

- Speedo flap mounting 6 allen bolts (A) & 4 plastic washers (B).
- Pull out the speedo flap with the help of speedo flap removing tool. (C)

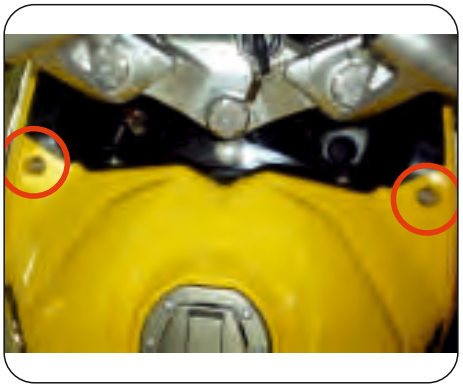
Skill tips:
Ensure 3 clip snaps are available at its location.





Standard Operating Procedure

Petrol Tank Cover & Tank Removal



Using 5mm allen key

Remove:

- Tank cover mounting top 2 allen bolts.
- Tank cover mounting front 2 allen bolts

Using 10mm 'T' spanner

Remove:

- Pull out RH & LH side fairing lugs from petrol tank cover

Using 10mm 'T' spanner

Remove:

- Tank cover mounting under side fairing front 2 step bolts

Using 10mm 'T' spanner

Remove:

- Take out petrol tank cover

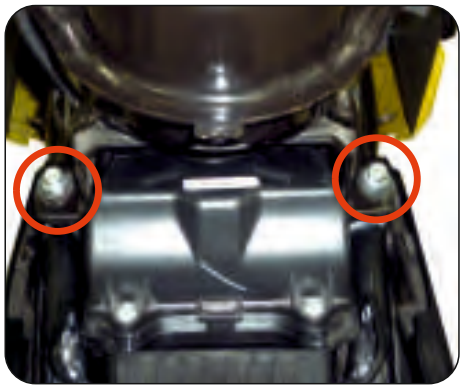
Standard Operating Procedure

Petrol Tank Cover & Tank Removal

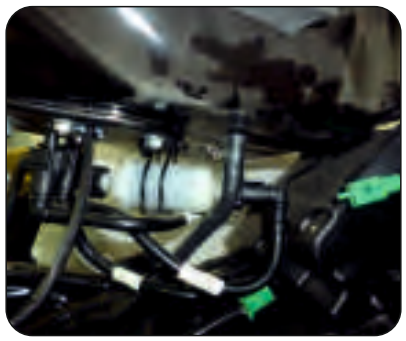
Using 12mm box spanner

Remove:

- Petrol tank mounting 3 flange bolts



- Disconnect the fuel gauge coupler and fuel pump coupler connection.
- Pull up the petrol tank from front side
- Disconnect the Injector hose from inline fuel filter.
- Take out the petrol tank.



ABS - Anti Lock Braking System

Function :

To prevent the wheels of vehicle from sudden locking during braking situations .

Benefits :

- Increase motorcycle stability & riding comfort.
- Best possible deceleration without wheel lock up.
- Reduced braking distance under many conditions.

Working :

In ABS system, the ABS unit detects the possibility of wheels getting locked by taking input from speed sensor located at both wheels. When the wheels are about to lock, the hydro-electrical controller controls brake caliper fluid pressure & thus prevent wheels from getting locked, avoiding possibility of accident.

Components of the ABS System :

ABS unit is a combination of Electrical & hydraulic controls. The ABS ECU receives pulse signal from both wheel speed sensors, accordingly it controls flow of brake fluid to caliper.

ABS unit is located below fuel tank. The master cylinder to caliper assembly hydraulic connection of front wheel is routed through ABS unit. The signal from the wheel sensors opens or closes the solenoid valves in ABS unit there by controls flow of hydraulic oil to caliper assembly.

Solenoid Valve (Inlet) :

It allows flow of brake fluid to caliper while braking.

Solenoid Valve (Outlet) :

In case of wheel locking situation, it releases braking force applied on disc by allowing brake fluid to flow back to temporary reservoir.

ABS Indication Lamp :

When ignition switch is turned ON, ABS Indicator will stay ON, until wheel speed is more than 10 km / hr, then ABS Indicator goes OFF. If there is any problem with ABS system, the ABS Indicator will blink indicating the problem in ABS system.

Wheel Speed Sensors :

These are HALL effect type speed sensors. They sense the pulse from sensor disc mounted on wheels & convey it to ABS Unit.

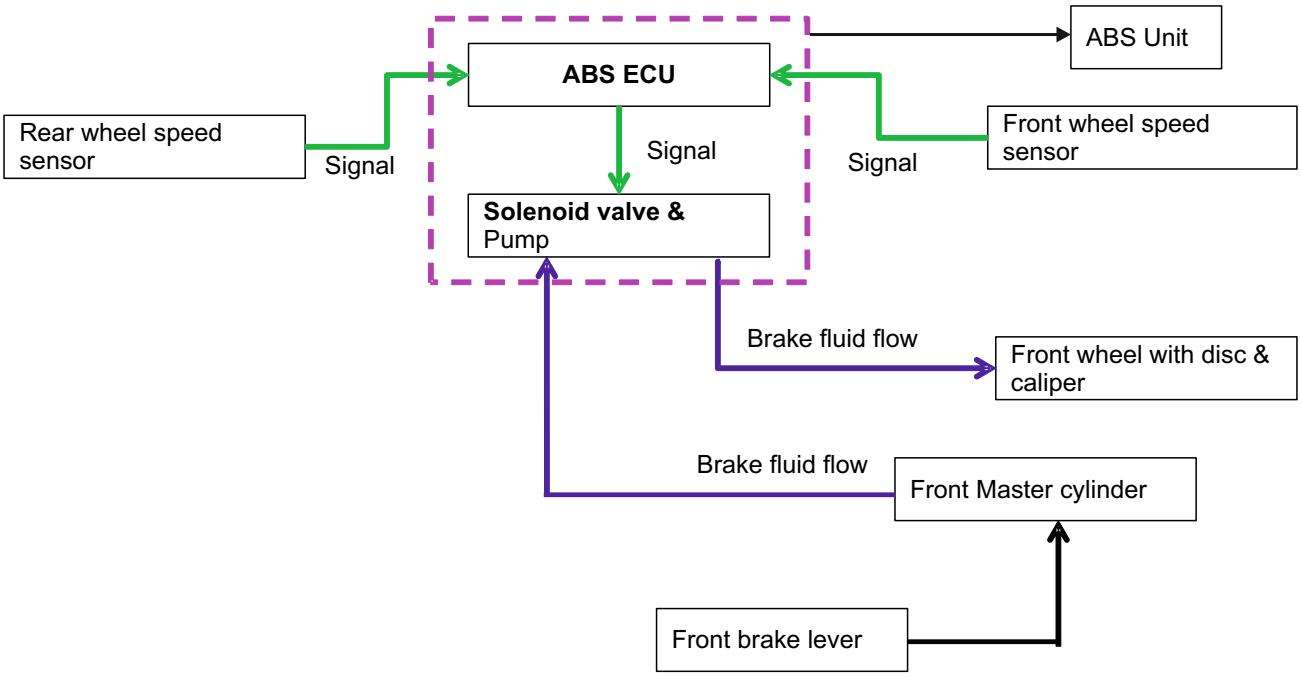
Pump :

To built the pressure whenever is required.

Note: In case of ABS system failure Brake system will work as a normal hydraulic brake.

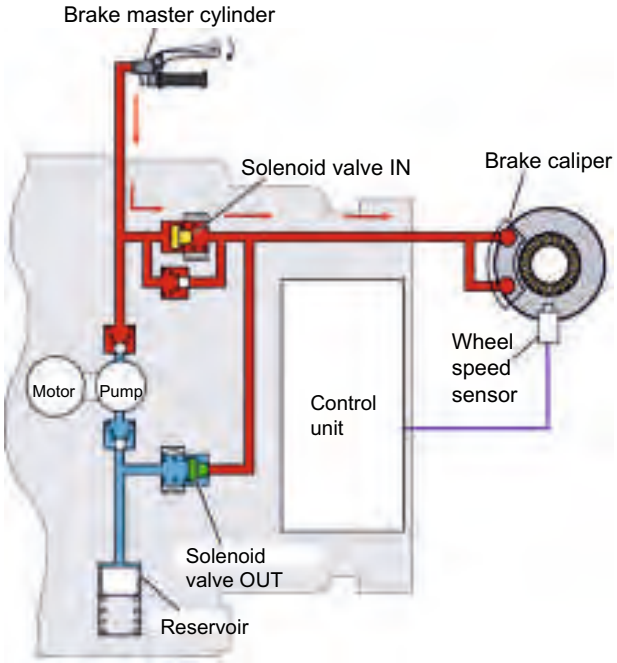
ABS - Anti Lock Braking System

Block Diagram :



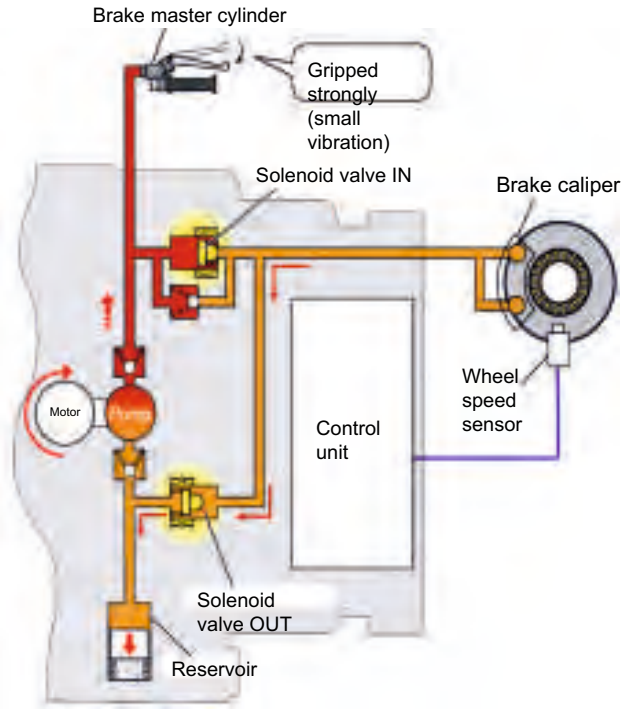
Normal braking (ABS not activated)

When the ABS is not activated, the electric signal from the control unit is off, the solenoid valve IN is open, and the solenoid valve OUT is closed. The fluid pressure in the master cylinder during braking is transmitted directly to the caliper through the solenoid valve IN. This is normal braking and the rider directly controls braking with the brake lever.

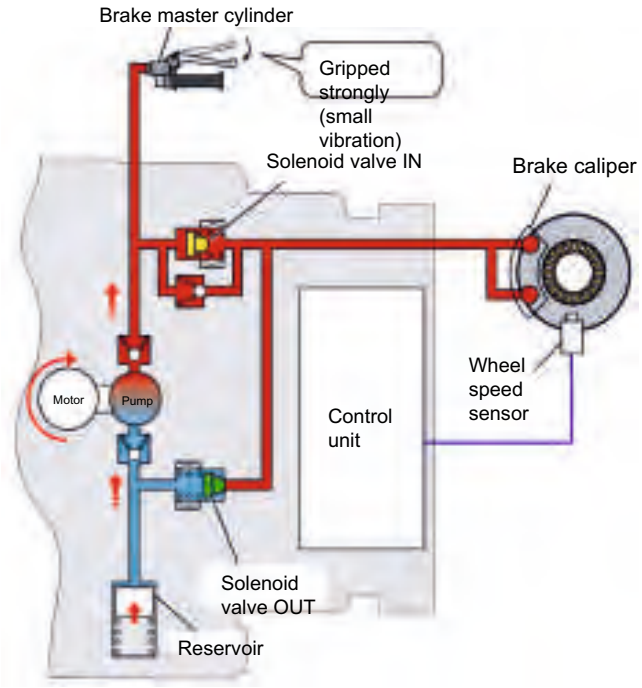


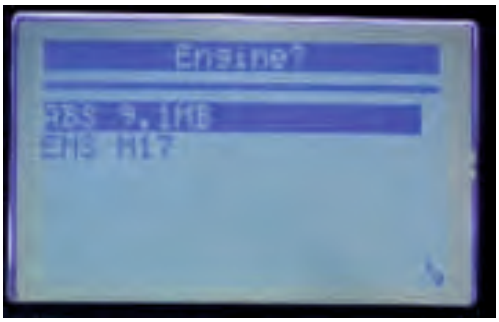
ABS - Anti Lock Braking System

When the ABS is activated
Pressure decrease



Pressure increase





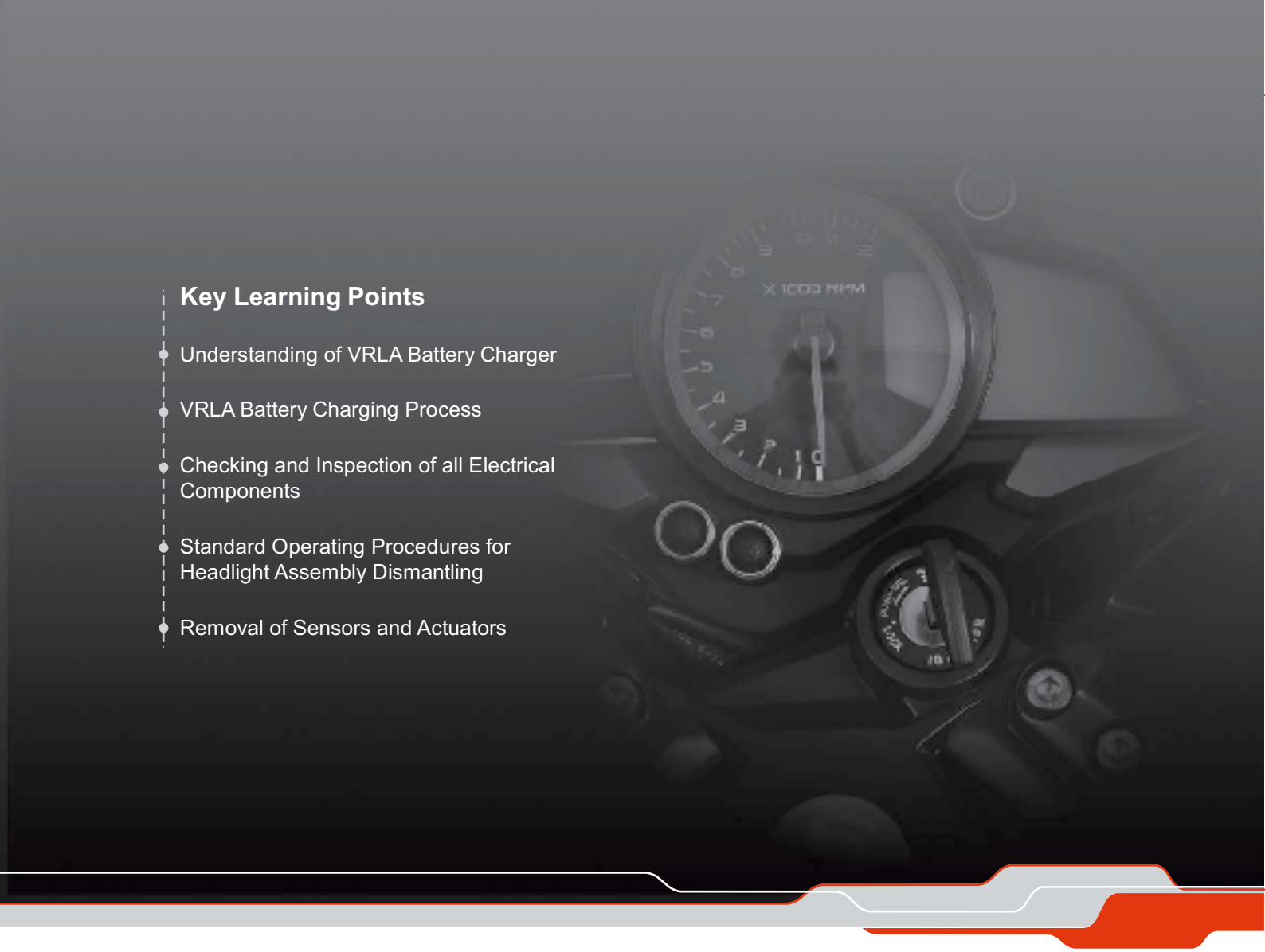
Even though vehicle control is improved during emergency braking, always maintain a safe distance between you and objects ahead. Vehicle speeds should always be reduced during extreme road conditions. The braking distance for motorcycle equipped with an anti-lock braking system may be longer than for those without it on rough road conditions. During these conditions the vehicle should be driven at reduced speeds.

The ABS continuously senses the speed of the wheels. If the wheels are going to lock, the ABS system repeatedly modulates the hydraulic brake pressure to the wheels.

When you apply Front brake under conditions which may lock the wheels, rider will feel a corresponding sensation (pulsation) in the Front Brake Lever. This is normal and it means your ABS is active.

ALSO IT IS RECOMMENDED TO USE BOTH FRONT & REAR BRAKES SIMULTANEOUSLY. USING FRONT BRAKE WILL GIVE MAXIMUM EFFECTIVE BRAKING.

Always slow down when cornering. The anti-lock brake system cannot prevent accidents resulting from excessive speeds. If the ABS warning light is on and stays on, you may have a problem with the ABS. In this case, however, your regular brakes will work normally.



Key Learning Points

- Understanding of VRLA Battery Charger
- VRLA Battery Charging Process
- Checking and Inspection of all Electrical Components
- Standard Operating Procedures for Headlight Assembly Dismantling
- Removal of Sensors and Actuators

CHAPTER 5
Electricals

Battery

Checking Procedure

Standard Operating Procedure

Dos & Don'ts

Electrical Diagram

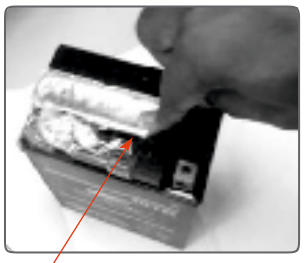
VRLA Battery Initial Filling

Filling Procedures

Step 1: Get the battery ready

Place the battery on a flat leveled and preferably on a insulated surface.

Remove the filler port seal of the battery.



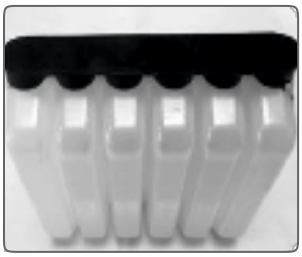
Step 2: Get the electrolyte ready

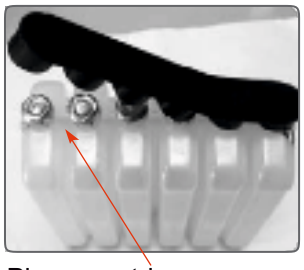
Remove electrolyte container from the packing.

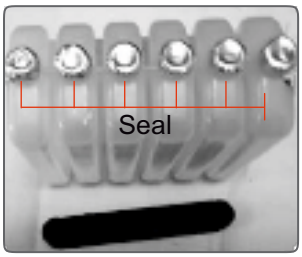
Remove the sealing cap plug strip.

Keep the sealing cap plug strip aside as this is to be used as battery sealing plug strip later.

Note: *Do not puncture the seals manually.*







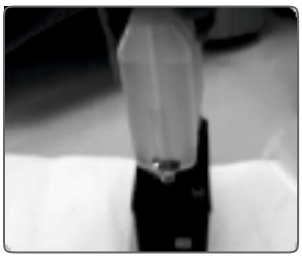
Step 3: Fill the battery

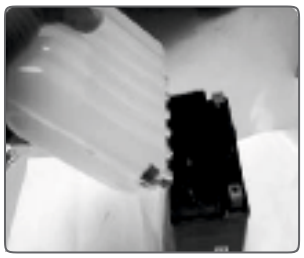
Hold the electrolyte container upside down.

Place the container upright on battery. Match the 6 seals with the respective filler ports.

Note: *Ensure the container is upright and not tilled. If tilled the electrolyte might fail to flow.*

Now force the container down until seals get pierced, and electrolyte flows into the battery.

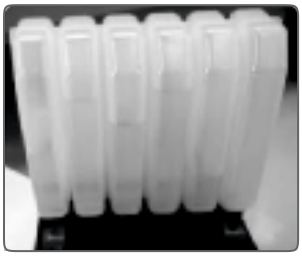




Step 4: Check the electrolyte flow

Make sure that air bubbles are visible in the electrolyte and which is seen in all the 6 tubes of the container.

Leave the container on the battery as it is for 30 minutes.



VRLA Battery Initial Filling

Step 5: Take away the bottles

Be sure that the entire electrolyte has flown down inside the battery.

Tap the bottom of the container and gently remove the empty container.

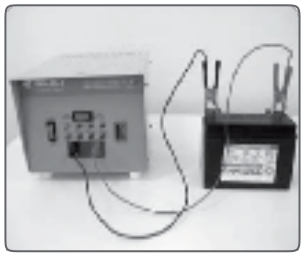
Step 6: Attach the sealing cap

Fit the sealing cap plug strip tightly on the filler ports of the battery.

Ensure by pressing firmly that the cap has become flush with the top surface of battery.

Step 7: Charge the battery

Charge the battery on BAL recommended VRLA battery charger as per std. SOP.



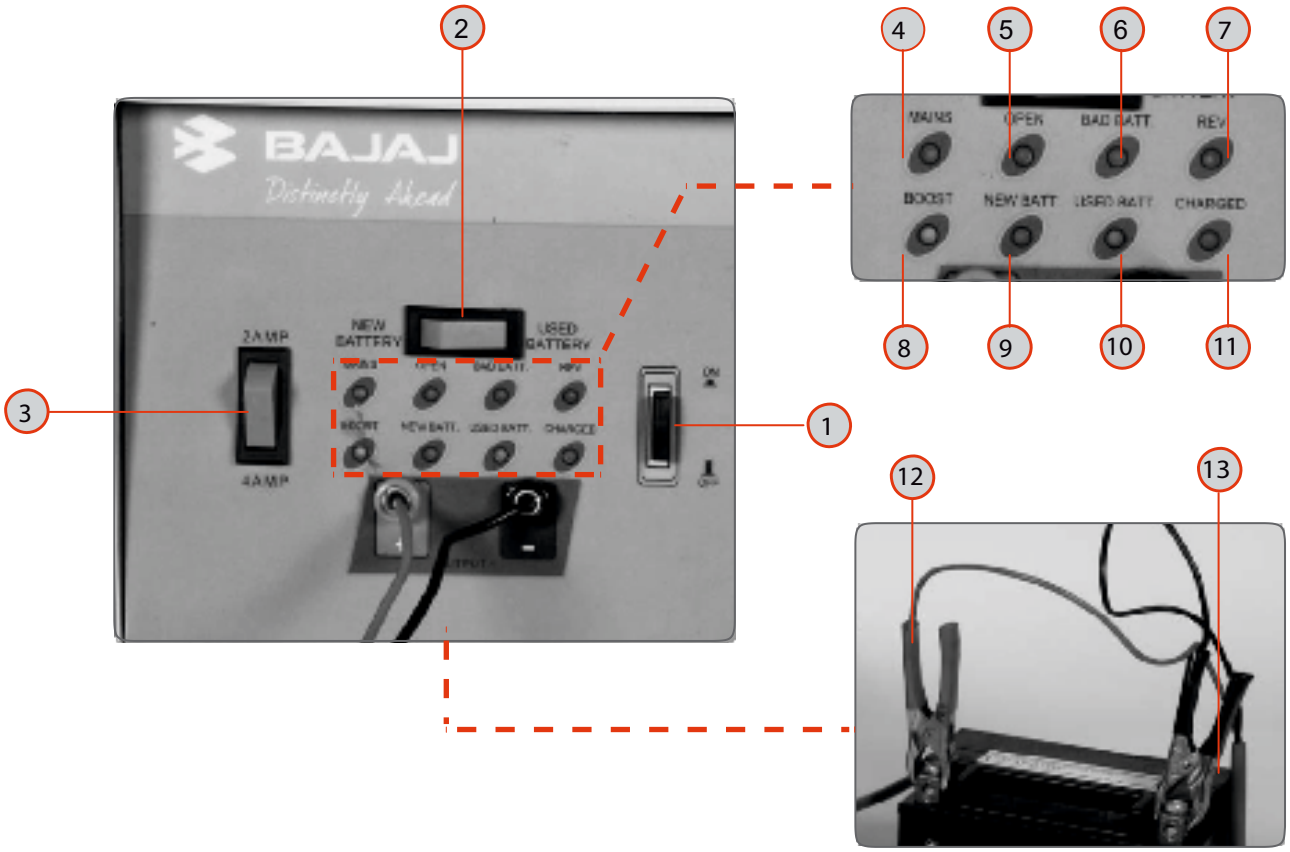
Caution

Never use conducting materials like screw drivers which can produce the spark near battery terminals.

Do not add any additional electrolyte.

VRLA Battery Initial Filling

Metafab VRLA Battery Charger Indication Display



1. On / off Switch
2. New battery / use battery switch
3. 2 Amp / 4 Amp current selection Switch
4. Main power supply indication light (Green)
5. Open circuit indication light (Red)
6. Bad battery indication light (Red)
7. Reverse polarity indication light (Red
8. Boost indication light (White)
9. New battery indication light (Yellow)
10. Use battery indication light (Blue
11. Charged indication light (Green)
12. -ve terminal (Black)
13. +ve terminal (Red)

VRLA Battery Charger & Its Charging SOP

Battery Charging Procedure for Metafab make VRLA Battery Charger

Charging SOP	Refer Charger Photo
Remove battery from vehicle and Clean battery thoroughly.	-
Connect battery charger to 230 V AC single phase power supply and switch on the button of main supply.	-
"Connect battery charger leads to battery terminals. Red lead to +ve terminal and Black lead to-ve terminal."	13 12
Switch on the battery charger main switch. Green LED will glow.	4
If Red LED glows it indicates reverse polarity connection.	7
"Select charging current 2 Amps or 4 Amps. ***(2 Amps for 3 Ah / 4 Ah / 5 Ah VRLA batteries, 4 Amps for 6 Ah / 8 Ah / 10 Ah VRLA batteries)."***	3
Select and press the charging switch for new battery or use battery (Green and Blue LED glow for new and use battery)	2 4 10
If Red LED blinks it indicates open circuit situation.	5
Battery charger detects the battery voltage. If it is less than 5 volts it will switch over to Boost charging mode White LED below the "Boost" will glow	8
"Battery charger detects battery voltage after every 3 minutes. If voltage increases above 5 volts it switches over to selected charging mode ie NEW/ USED."	9 10
Charging duration in this mode is 30 minutes. If the battery voltage is less than 5 volts after 30 minutes a Red LED indicating a bad battery will glow. This indicates the battery is not suitable for charging.	6
"If battery charger is switches to NEW/USED charging mode, the battery would undergo charging for 5 to 14 hours depending on battery condition."	-
After completion of battery charging a Green LED will glow to indicate completion of charging.	11
Switch off the main switch and disconnect the battery from the charger	-
Reconnect the battery terminals on vehicle.	-
Apply petroleum jelly to battery terminals.	-

Note: *During charging if the battery is disconnected, an audio indicator will beep for 2 minutes with a Red LED blinking to indicate open circuit situation.*

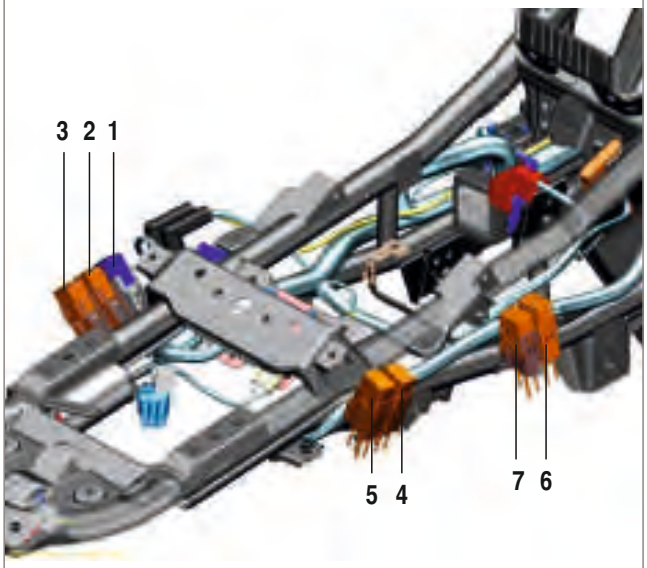
Checking Procedure

Relay Checking Procedure

Sr. No.	Relays	Location
1. 2. 3.	Aux relay - 1 Aux relay - 2 Aux relay - 3	Mounted on frame tube bracket inside seat cowling LHS
4. 5. 6. 7.	Main relay Hi beam relay Radiator relay Fuel pump relay	Mounted on frame tube bracket inside seat cowling RHS

Aux relay - 1

Aux relay - 2, Aux relay - 3
Main relay, Hi beam relay
Radiator relay, Fuel pump relay



Auxiliary Relays :

1. **Auxiliary Starter Relay - 1 :**
   It is gray in colour. For identification purpose the relay base colour is also gray.
   - Diode is provided for suppressing voltage surge.
   - Its function is to provide earth connection for auxiliary relay 2.
   - If vehicle is driven with relay 1 in disconnected condition, ECU may fail.

2. **Auxiliary Starter Relay - 2 :**
   Its function is to isolate starter circuit from ECU i.e. even if ECU resets starter circuit will be unaffected. Relay & relay base are brown in colour. If this relay fails engine can not be cranked.

3. **Auxiliary Starter Relay - 3 :**
   For incorporating clutch & neutral switch interlocking in starter circuit. Relay & relay base are brown in colour.

4. **Main Relay :**
   This is used in starter circuit & ignition circuit. Main relay is switched ON by ECU giving GND signal to main relay for completing coil circuit. Main relay contacts output is used for -
   - ECU battery supply input.
   - Fuel injector.
   - Fuel pump relay coil.
   - Radiator fan relay coil.
   - Heater of oxygen sensor.

If this relay fails, then the vehicle will not start.

Checking Procedure

5. Hi beam Relay :

This relay is used for switching ON & OFF head lamp Hi beam filament. Low beam filament power is 55 W & when Hi beam filament is switched ON another 65W load comes on the system. Conditions when Hi-beam filament gets ON-

- Pass switch is pressed.
- Vehicle is driven with Hi / Lo beam switch in Hi beam mode.

Hence total load becomes 120W i.e. 10ADC current would flow through wiring harness.

To reduce wire size the Hi beam relay is introduced.

6. Radiator Relay :

This relay is used for switching ON / OFF radiator fan motor. The fan motor power is 30W & hence to avoid 2.5ADC current flowing through wiring harness, radiator relay is fitted.

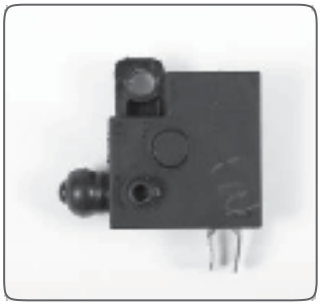
Fuel Pump Relay :

Fuel pump motor power is 18W. This motor is of continuous duty type & as long as the vehicle is running the fuel pump module will remain ON & 1.6A Max current will continuously flow through wiring harness. To avoid this fuel pump relay is provided.

Checking Procedure

Front & Rear Brake Light Switch

Measuring & Testing Equipment : Multimeter



	Brown	Blue	Continuity check by multimeter
Lever Pressed	●	●	Continuity is shown
Lever Released	●	●	No continuity

SOP :

Turn 'ON' the ignition switch.

The brake light should glow brightly when the front brake lever / rear brake pedal is pressed.

If it does not, check the front brake switch.

Side Stand Switch

Measuring & Testing Equipment : Multimeter

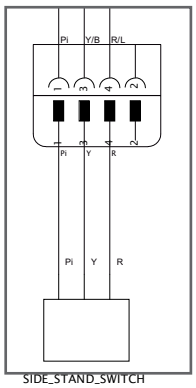
Sr. No.	Parameter	Magnet Position	Wire connection		Std. Reading
			Meter +ve	Meter -ve	
1	Input voltage (Side stand position-any)	N.A.	Red/ Blue	Yellow/ Black	5 VDC
2	Output voltage (Side stand position-OFF)	Magnet in front of side stand switch	Pink	Yellow/ Black	2~2.2 VDC
	Side stand position-ON	Magnet away from side stand switch	Pink	Yellow/ Black	5.0 VDC

SOP :

Switch ON ignition switch and kill switch.

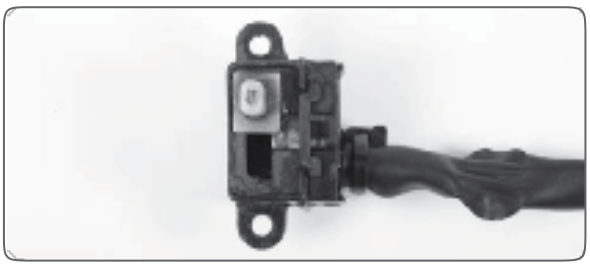
Set multimeter to 20 VDC.

Connect multimeter as shown in table given below.



SIDE_STAND_SWITCH

Clutch Switch

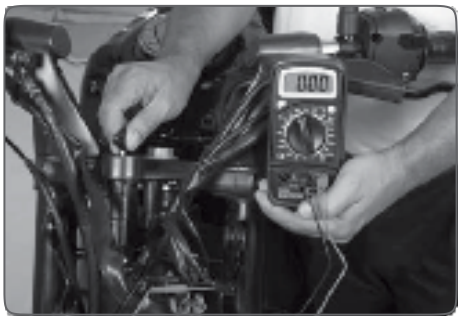


Meter Range	Yellow / Green	Black / Yellow
OFF – Clutch lever not pressed	●	●
ON – Clutch lever pressed	●	●

Checking Procedure

Ignition Switch

Measuring & Testing Equipment : Multimeter



Meter Range	Wire Connections		Continuity Check
Continuity Mode	Meter +ve	Meter –ve	OFF – No Continuity
	Brown	White wire	ON – Continuity

SOP :

Switch OFF Ignition key.

Disconnect Ignition switch's coupler.

Check continuity between wires in 'ON' and 'OFF' position.

Standard Value :

Beep Sound and Continuity in 'ON' position. No continuity in 'OFF' position..

Engine Kill Switch

Measuring & Testing Equipment : Multimeter

Meter Range	Wire Connections		Condition	Result
Continuity Mode	Meter +ve	Meter –ve	Engine OFF condition	Continuity is shown
	Gray / Red	Brown / Blue	Engine ON condition	No Continuity

SOP :

Put ignition switch OFF.

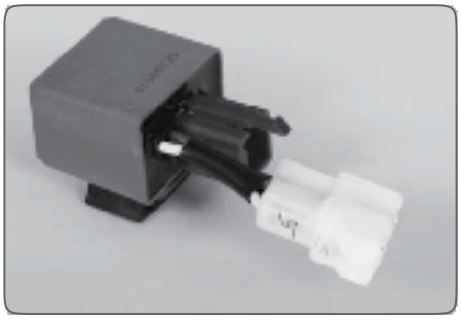
Put kill switch OFF.

Set multimeter at continuity range.

Connect multimeter as shown in the table given below.

Light Control Module (LCM) r.

Measuring & Testing Equipment : Multimeter



S No.	Parameter	Wire Connections		Std. Reading
		Meter +ve	Meter –ve	
1	Engine is OFF (Pass light OFF)	Violet	Yellow/ Black	14.5 VDC
2	Engine is running - H/L switch ON.	Red/ Black	Yellow/ Black	13.5 VDC

This unit is a combination of head light controller and flasher unit. It switches on the head light only when engine is running.

Checking Procedure

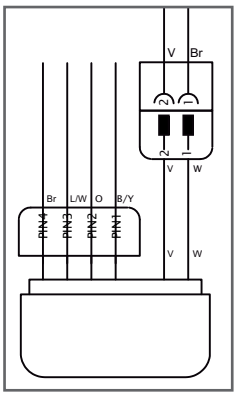
Light Control Module (LCM)

SOP :

Switch ON ignition switch and kill switch.

Set multimeter to 20 VDC.

Connect multimeter as shown in table given below.



DC Charging Voltage Measurement

Measuring & Testing Equipment : Multimeter & Battery Load Tester

Meter Range	Wire Connections		Specified at 4500 RPM
	Meter +ve	Meter –ve	
20 V DC	Battery +ve terminal	Battery +ve terminal	14.5 V + 0.2 V DC

SOP :

SOP :

Put Ignition switch ON.

Put Kill switch ON.

Set multimeter at 20 VDC.

Connect multimeter as shown.

Start engine and run at 4500 RPM.

Note :

1. Before conducting this test ensure battery voltage is 13.1 ± 0.1 Volts (Fully charged battery)

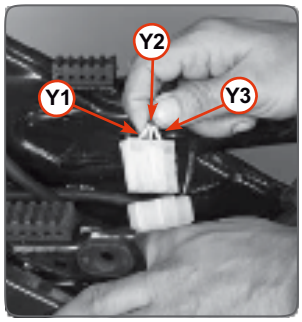
2. For DC voltage measurement connect multimeter in parallel with circuit.

Checking Procedure

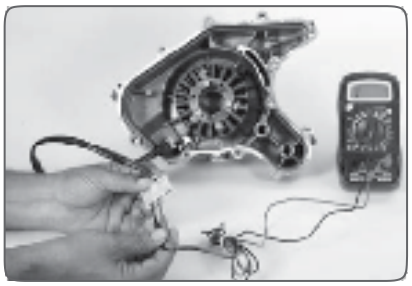
Stator Plate (Battery Charging Coil)

Measuring & Testing Equipment : Multimeter

This is 3 phase starter winding (oil dipped type)



Sr.No.	Meter Range	Wire Connections		Std. esistance Value
		Meter +ve	Meter –ve	
1	200 Ohm	Y1	Y3	1 Ohm
		Y1	Y2	
		Y2	Y3	

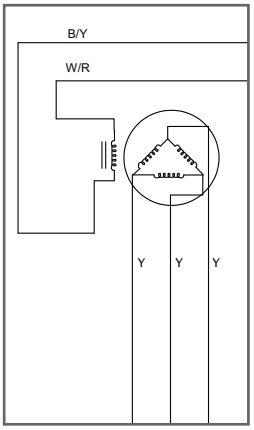


SOP :

Disconnect magneto coupler.

Set multimeter at 200 Ohm range.

Connect multimeter as shown and note reading.



Starter Motor Current Drawn

Measuring & Testing Equipment : Clamp Meter

Meter Range	Conditions	Standard Value
200 DC A	Encircle clamp meter transformer jaws around thick Red wire of starter motor	40~45 Ampere (Spark plug caps removed)

SOP :

Disconnect all 3 spark plug caps

Switch 'ON' Ignition switch and kill switch.

Select range and set clamp meter zero reading.

Encircle red input wire of starter motor into the clamp meter jaws.

Crank the engine for 3 seconds .

Observe the cranking current displayed on clamp meter.

Checking Procedure

Starter Motor Armature Inspection

(For Each Segment Checking)

Measuring & Testing Equipment : Multimeter & Battery Load Tester

Meter Range	Wire Connections		Continuity Check
Continuity Mod	Meter +ve	Meter –ve	No continuity to be shown
	Commutator segment	Shaft	

SOP :

Dismantle starter motor and take out the Armature.

Check the continuity between starter motor shaft and each segment on Commutator.

Replace armature if continuity is shown.

Measuring & Testing Equipment : Multimeter

Meter Range	Wire Connections		Continuity Check
Continuity Mode	Meter +ve	Meter –ve	Continuity is shown
	Any Commutator on segment	Adjacent segment on Commutator	

SOP :

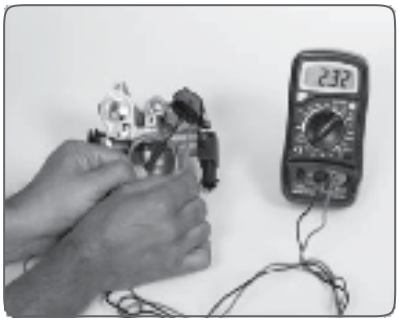
Dismantle starter motor and take out armature

Check continuity between each pair of adjacent segments on Commutator.

Replace armature if 'No' continuity is shown between any two adjacent pair of Commutator segments.

Steeper Motor

Measuring & Testing Equipment : Multimeter



Sr. No.	Wire Connections		Standard Value
1	Meter +ve	Meter -ve	
	Pin no. 1	Pin no. 4	51 Ω
2	Pin no. 2	Pin no. 3	51 Ω

SOP :

Ensure ignition switch and kill switch is OFF.

Remove harness side coupler.

Set multimeter on 200 Ohm range and connect as shown in above table.

Checking Procedure

Steeper Motor

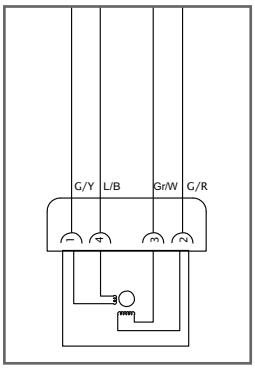
Measuring & Testing Equipment : Multimeter

SOP :

Ensure ignition switch and kill switch is OFF.

Remove harness side coupler.

200 Ohm range and connect as shown.



STEEPER_MOTOR

Crank Angle Sensor & Neutral Switch

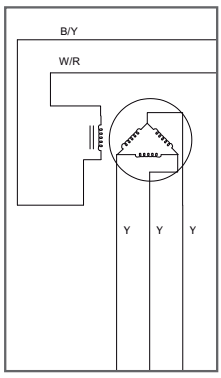
Measuring & Testing Equipment : Multimeter

Sr. No.	Component	Meter range	Wire Connections		Standard Value	Results
			Meter +ve	Meter -ve		
1	Crank angle sensor	Resistance 2 Ohms	White/ Red	Black/ Yellow	365 ~ 385 Ohms	OK
2	Neutral switch	Continuity	Light Green	Black/ Yellow	Beep sound	OK
					No Beep sound	Defective

SOP :

Switch OFF ignition switch and kill switch.

Connect multimeter as shown.



Starter Relay Coil

Measuring & Testing Equipment : Multimeter

Meter Range	Wire Connections		Meter Range
	Meter +ve	Meter -ve	
200 Ohms	Starter relay coil Red-Yellow wire	Starter relay coil Black wire	3.9 Ohms ± 10%

Checking Procedure

Starter Relay Coil

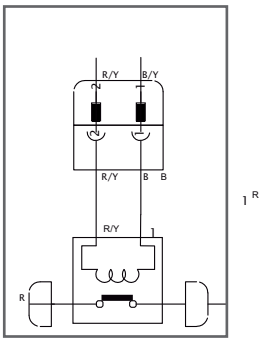
SOP :

Switch OFF engine.

Disconnect coupler from Relay.

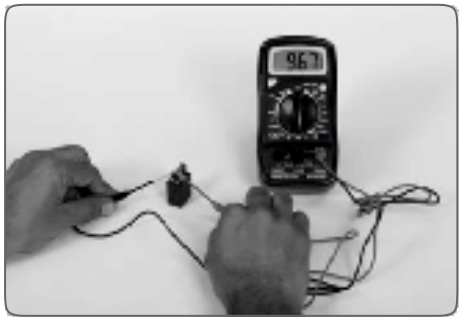
Connect multimeter to Starter Relay coil terminals.

Check resistance.



Relay Coil

Measuring & Testing Equipment : Multimeter



Meter Range	Wire Connections		Continuity Check
200 Ohms	Meter +ve	Meter -ve	80 ~140 Ohms
	Relay coil terminal 1	Relay coil terminal 2	

SOP :

Switch OFF engine.

Remove relay from coupler.

Connect multimeter to relay coil terminals.

Check resistance.

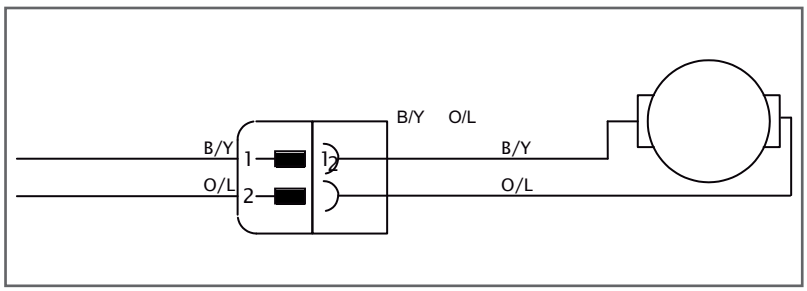
Fuel Pump

Measuring & Testing Equipment : Multimeter

Meter Range	Wire Connections		Continuity Check
200 Ohms	Meter +ve	Meter -ve	2.1 Ohms
	Orange/ Blue	Black/ Yellow	

Note:

1. *Battery should be fully charged.*
2. *Fuse and ignition switch should be OK.*
3. *Audible sound will be heard which will confirm fuel pump is working.*
4. *Check main relay first if fuel pump is not working.*



Checking Procedure

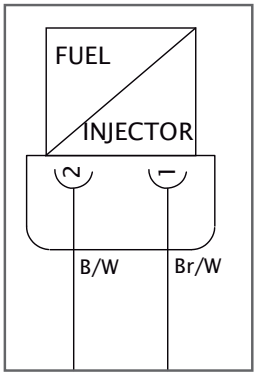
Injector

Measuring & Testing Equipment : Multimeter

Sr. No.	Parameter	Meter Range	Wire Connections		Standard Reading
1	Resistance	200 Ohms	Meter +ve	Meter -ve	12 ± 0.6 Ohms @ 25°C
			Pin no. 1	Pin no. 2	

- **SOP :**
  - Remove petrol tank cover and petrol tank.
  - Remove air filter cover along with paper filter element.
  - Disconnect the injector coupler.
  - Connect multimeter to Pin 1 and Pin 2 of injector as shown.

FUEL_INJECTOR



Fuel Gauge – Tank Unit

Measuring & Testing Equipment : Multimeter

Meter Range	Wire Connections		Continuity Check
200 Ohms	Meter +ve	Meter -ve	As per chart
	White/ Yellow	Black/ Yellow	

Standard Valve:

Resistance (+ 2 Ohms)	Bars on Speedometer	Resistance (+ 2 Ohms)	Bars on Speedometer
18	8	87	2
38	7	97	1
48	6	100	0
57	5		
67	4		
77	3		

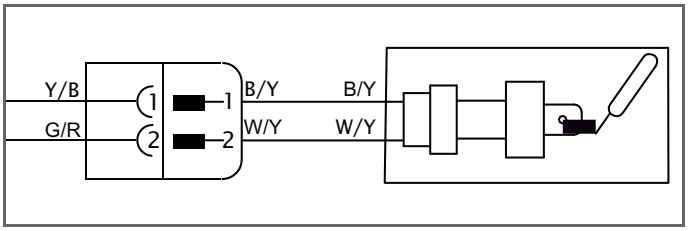
Checking Procedure

Fuel Gauge – Tank Unit

Note:

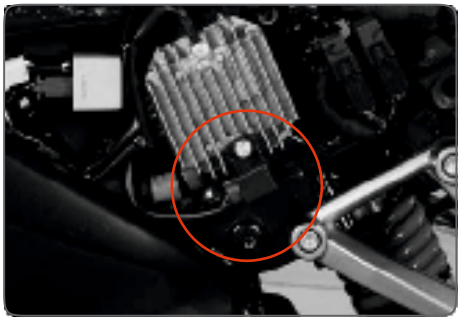
If display in speedo console is not proper then please check following

1. *Battery Voltage*
2. *Speedometer coupler and fuel gauge tank unit coupler connection is firm.*



Capacitor

Measuring & Testing Equipment : Nil



Checking method :

Touch +ve wire of capacitor to earth. Spark will occur. This indicates capacitor is OK.

Note:

Capacitor is very important for ECU functioning, so ensure capacitor coupler is always firmly connected.

Engine Oil Pressure Sensor

Measuring & Testing Equipment : Multimeter

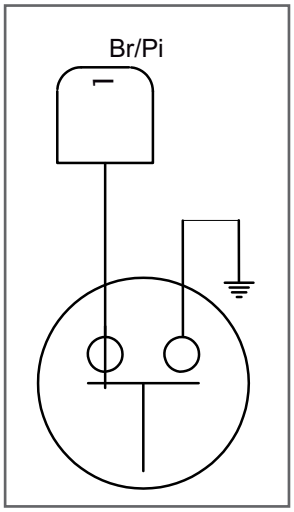
Meter Range	Wire Connections		Continuity Check
Continuity Mode	Meter +ve	Meter -ve	Continuity will be shown
	Brown-Blue	Black/ Yellow	

SOP :

If engine oil pressure is OK (i.e if 0.9 to 1.1 bar pressure is shown on pressure gauge) then continuity will be shown on multimeter.

Note:

Oil pressure icon will blink if engine RPM greater than 3500 rpm, Coolant temperature in the range of 50 ^{0}C to 60 ^{0}C and oil pressure less than 0.9 bar for time greater than 20 seconds are meet.



Checking Procedure

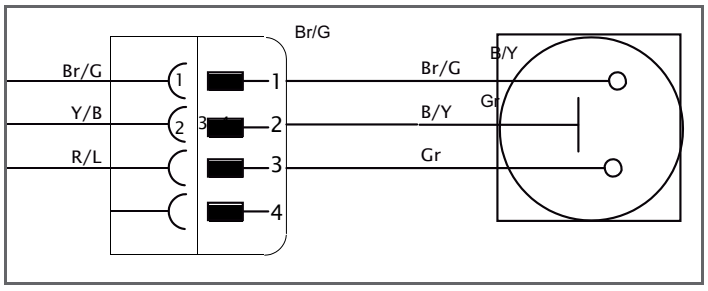
Roll Over Sensor

Measuring & Testing Equipment : Multimeter

Sr. No.	Parameter	Vehicle position	Wire Connections		Standard Reading
			Meter +ve	Meter -ve	
1	Input voltage	NA	Red/Blue	Yellow/ Black	5 VDC
2	Output voltage	Normal position	Brown/ Green	Yellow/ Black	4.8~4.9 VDC
		Tilled position (> 60^0)	Brown/ Green	Yellow/ Black	2~2.2 VDC

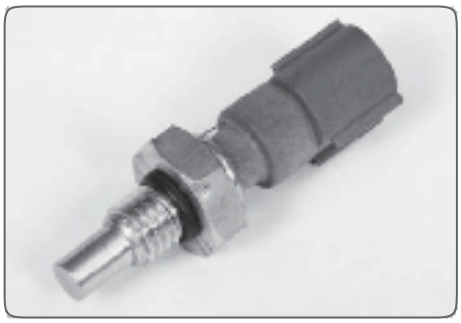
SOP :

Switch ON ignition switch and kill switch.
Set multimeter to 20 VDC.
Connect multimeter as shown.



Coolant Temperature Sensor

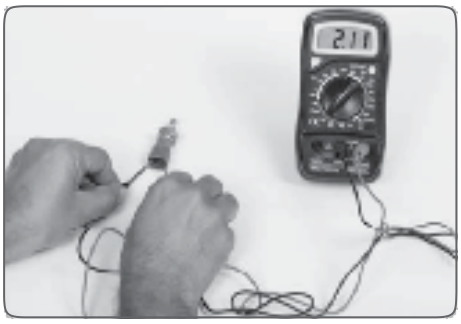
Measuring & Testing Equipment : Multimeter



Meter Range	Wire Connections		Standard Reading	
	Meter +ve	Meter -ve	Temperature in Degree Centigrade	Resistance in Ohms
2 K Ohms	Coupler Pin 1	Coupler Pin 2	25	1.88~2.12
			50	0.75~0.86

Checking Procedure

Coolant Temperature Sensor

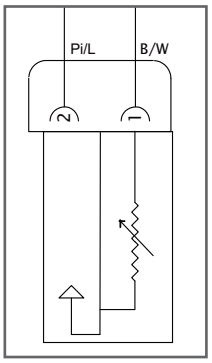


SOP :

Ensure engine is off.

Remove coupler of coolant temperature sensor using 18 mm tube spanner.

Connect multimeter as shown and check resistance value.



Oxygen (Lambda) Sensor

Measuring & Testing Equipment : Multimeter

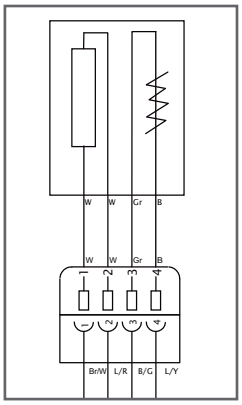
Sr. No.	Wire Connections		Continuity Check
Continuity Mode	Meter +ve	Meter -ve	Continuity will be shown
1	Pin no. 1	Pin no. 2	9 + 10 Ohm @ 25°C
2	Pin no. 3	Pin no. 4	Meter displays 1 @ 25°C (open circuit)

SOP :

Ensure ignition switch is OFF.

Remove the harness side lambda sensor coupler.

Set multimeter on 200 Ohm range and connect as per table.



TMAP Sensor

Measuring & Testing Equipment : Multimeter

Sr. No.	Parameter	Meter Range	Wire Connections		Standard Reading
			Meter +ve	Meter -ve	
1	Resistance	20 K Ohms	Pin no. 1	Pin no. 2	1.5 ~ 2.5 Ohms @ 25°C
2	Input voltage	20 VDC	Red/Blue	Yellow/ Black	5 VDC
3	Output voltage	20 VDC	White/ Red	Yellow/ Black	3.15 ~ 4.45 VDC

Checking Procedure

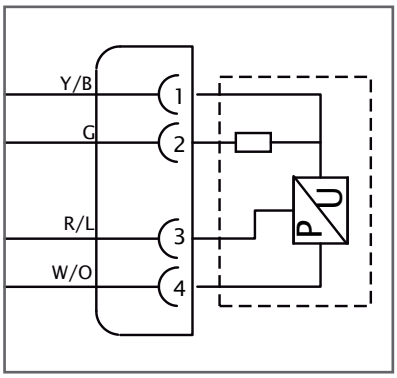
TMAP Sensor

Measuring & Testing Equipment : Multimeter

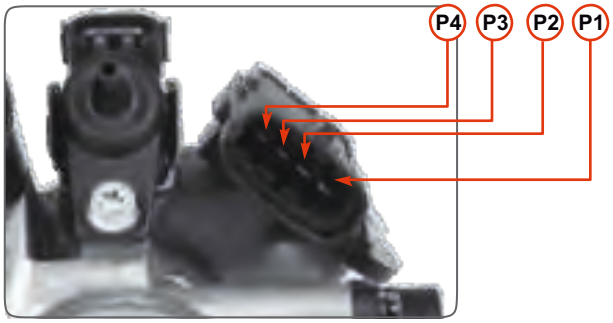
SOP :

Remove petrol tank and air filter cover along with paper filter element.

Connect multimeter as shown in table.



TMAP_SENSOR



Note:

For resistance checking remove coupler of TMAP sensor and connect the multimeter prob to Pin 1 and Pin 2 as shown.

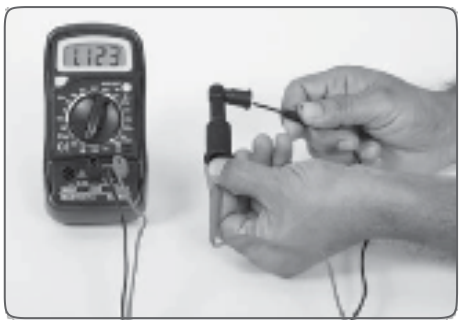
Input Voltage Checking

Output Voltage Checking

Note:

For input or output voltage checking connect coupler of TMAP sensor.

Spark Plug Cap



SOP :

Remove spark plug cap from HT coil cable.

Set multimeter on 2 K Ohms range.

Connect multimeter probes as shown and measure the value.

Standard value, 1 K Ohm ± 150 Ohm.

Checking Procedure

Termination Unit

Function:

It has transil diode for filtration of voltage surge / ripple in mains supply line there by protect ECU from voltage fluctuations.

It also consist two diodes that are used for clutch switch and neutral switch circuit.

These diodes are called reverse protection diodes. Reverse protection diodes provide correct neutral indication in speedo console.

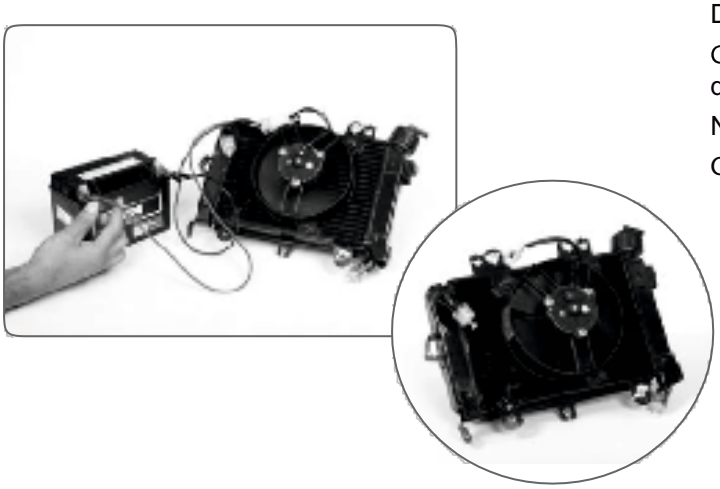
Symptoms of malfunctioning : Glowing of neutral indication in speedo console when vehicle is in gear and on pressing of clutch lever.

Note :

1. No checking method using multimeter is recommended for checking this unit

2. Checking by replacement method only.

Radiator Fan Motor

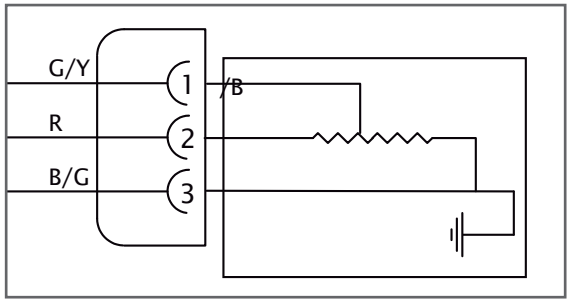


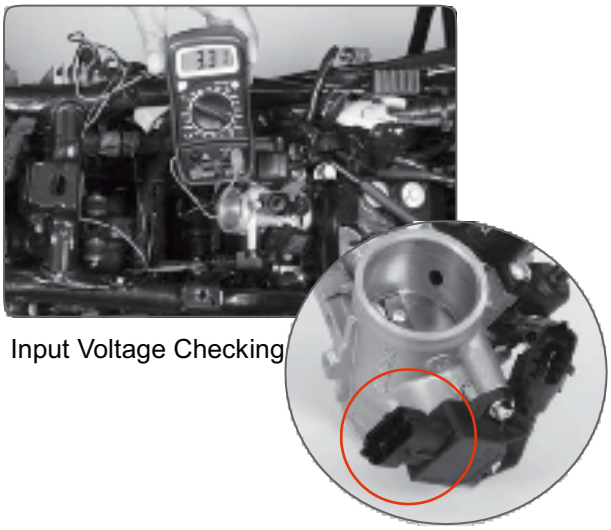
- **SOP :**
  - Disconnect coupler of fan motor.
  - Connect external 12 V DC supply to disconnected coupler of fan motor.
  - Now the fan motor will start running.
  - Observe the fan running smoothly.

Checking Procedure

TPS

Measuring & Testing Equipment : Multimeter





Input Voltage Checking

Sr. No.	Parameter	Wire Connections		Standard Reading
		Meter +ve	Meter -ve	
1	Input voltage	Red/Black	Black/ Green	3.3 VDC
2	Output voltage idle throttle	Red/Black	Black/ Green	0.3 ~ 0.65 VDC
3	Output voltage wide open throttle	Red/Black	Black/ Green	2.7 ~ 3.0 VDC
3	Coil Resistance	Pin 2	Pin 3	1.6 ~ 2.4 Ohms

SOP :

Remove petrol tank cover and petrol tank.

Remove air filter cover along with paper filter element.

Connect multimeter as shown in table given below.

Central H. T. Coil

Measuring & Testing Equipment : Multimeter

Primary Winding Resistance Checking

Meter Range	Wire Connections		Standard Value
	Meter +ve	Meter -ve	
200 Ohms	Orange/ White Pin-1	Black Pin-2	0.513 ~ 0.627 Ohms

Secondary Winding Resistance Checking

Meter Range	Wire Connections		Standard Value
	Meter +ve	Meter -ve	
20 K Ohms	HT output	Pin of Orange / White	4.23 ~ 5.17 K Ohms

Checking Procedure

Twin H. T. Coil

Measuring & Testing Equipment : Multimeter

Primary Winding Resistance Checking

Meter Range	Wire Connections		Standard Value
	Meter +ve	Meter -ve	
200 Ohms	Black / Red	Pin of Orange / White	0.63 ~ 0.77 Ohms

Secondary Winding Resistance Checking

Meter Range	Wire Connections		Standard Value	Remark
20 K Ohms	Meter +ve	Meter -ve	10.8 ~ 16.2 K Ohms	To be measure between to H.T. outputs
	HT output	HT output		

Horn

Measuring & Testing Equipment : DC Clamp Meter

Meter Range	Wire Connections	Standard Value
200 DC A	Encircle clamp meter jaws around Brown wire of horn	2.2 Amps

SOP :

Encircle clamp meter jaws around Brown wire of Horn.

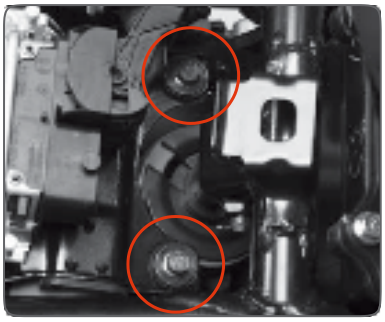
Press horn switch and check the current drawn by horn.

Battery Replacement SOP

Insert Key and open the lock

- **Remove**
  - Pillion seat

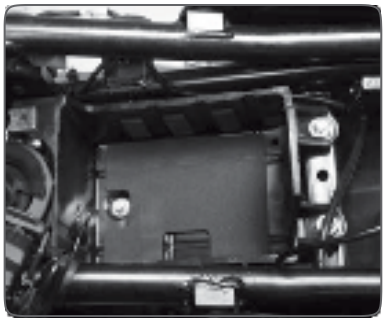
- **Remove**
  - 2 Bolts
  - Rider seat



- **Remove**
  - 2 Bolts
  - 2 Collared bush

Slide away ECU from battery bracket

- **Remove**
  - Battery terminal caps
  - Battery +ve and then -ve terminal
  - Lift out battery



- **Remove**
  - Battery

Roll Over Sensor SOP

Note : *Follow the earlier mentioned SOP's till petrol tank removal to proceed for Roll over sensor removal.*

Remove

Disconnect the coupler

2 Bolts

H. T. Coil (RH Side) SOP

Note : *Follow the earlier mentioned SOP's till petrol tank removal to proceed for Roll over sensor removal.*

Remove

2 Bolts

Earthing connection

Remove

Disconnect coupler

Remove

Plug cap LH and RH

Take out HT coil

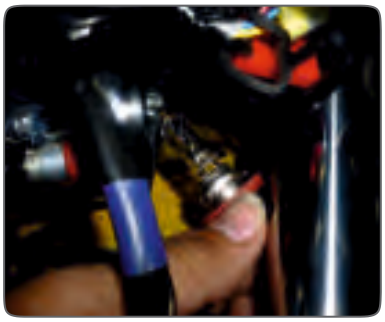
RH Head Lamp Bulb Removal SOP

Remove

Disconnect coupler connections

Rotate RH head light bulb (Hi-beam) at anti-clockwise direction

Pull out the head light bulb



Disconnect coupler connections

Rotate LH head light bulb (Low-beam) at anti-clockwise direction

Pull out the head light bulb

Dos & Don'ts

Battery

Dos

- DO Apply petroleum jelly to terminal post

- DO – Use proper equipment for testing

- DO – Use correct tools

Don'ts

- DON'T Apply Grease to terminal post

- DON'T Short circuit the terminal post

- DON'T – Use wrong tools

Dos & Don'ts

Horn

Dos

- Adjust horn sound by rotating the Phillips screw in the direction of arrow provided on horn.

Don'ts

- Never adjust the nut on horn cap side and bracket end (horn back side) as it will result in horn malfunctioning and failure.
- Do not remove silicon sealant from adjustment screw as it will result in water entry inside the horn.

Switches

Dos

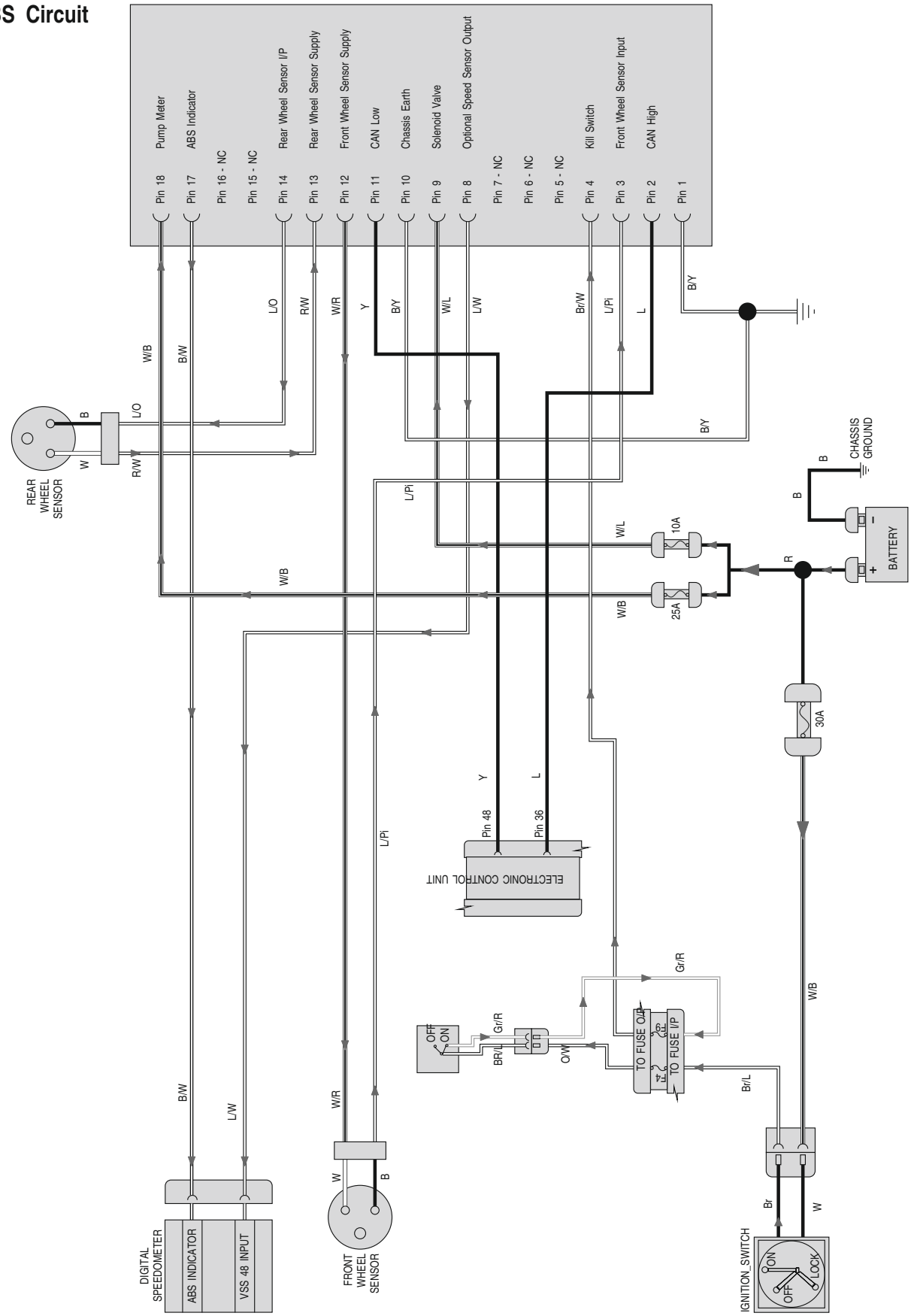
- After washing the vehicle ensure to apply dry air on switches before operation.
- Ensure that grommets provided on clutch switch, front brake switch and rear brake switch are intact.

Don'ts

- Do not apply direct pressurized water jet on control switches.
- Do not lubricate electrical switches by oil or grease.
- Do not over tighten the switch mounting screw.

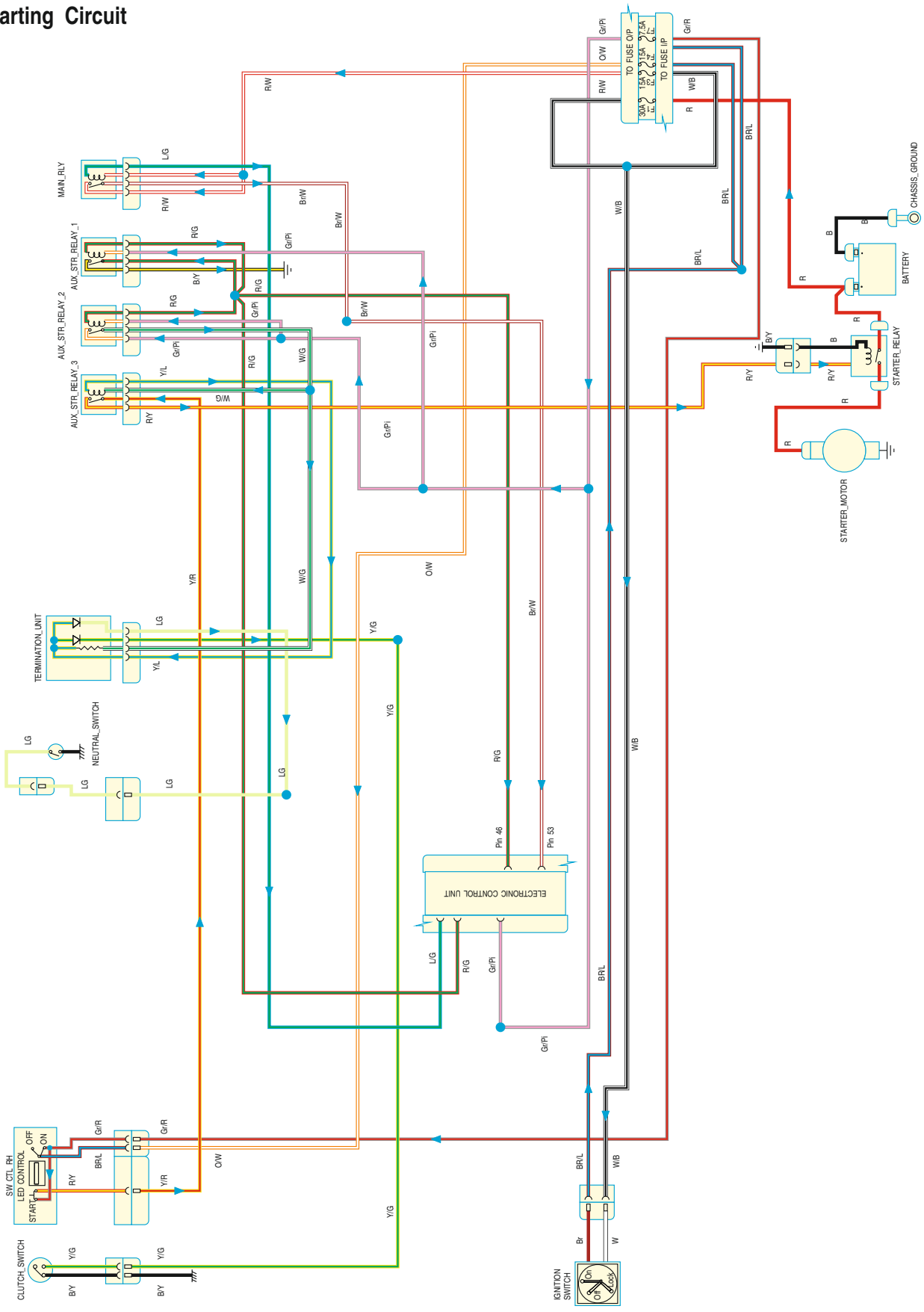
Electrical Diagrams

ABS Circuit



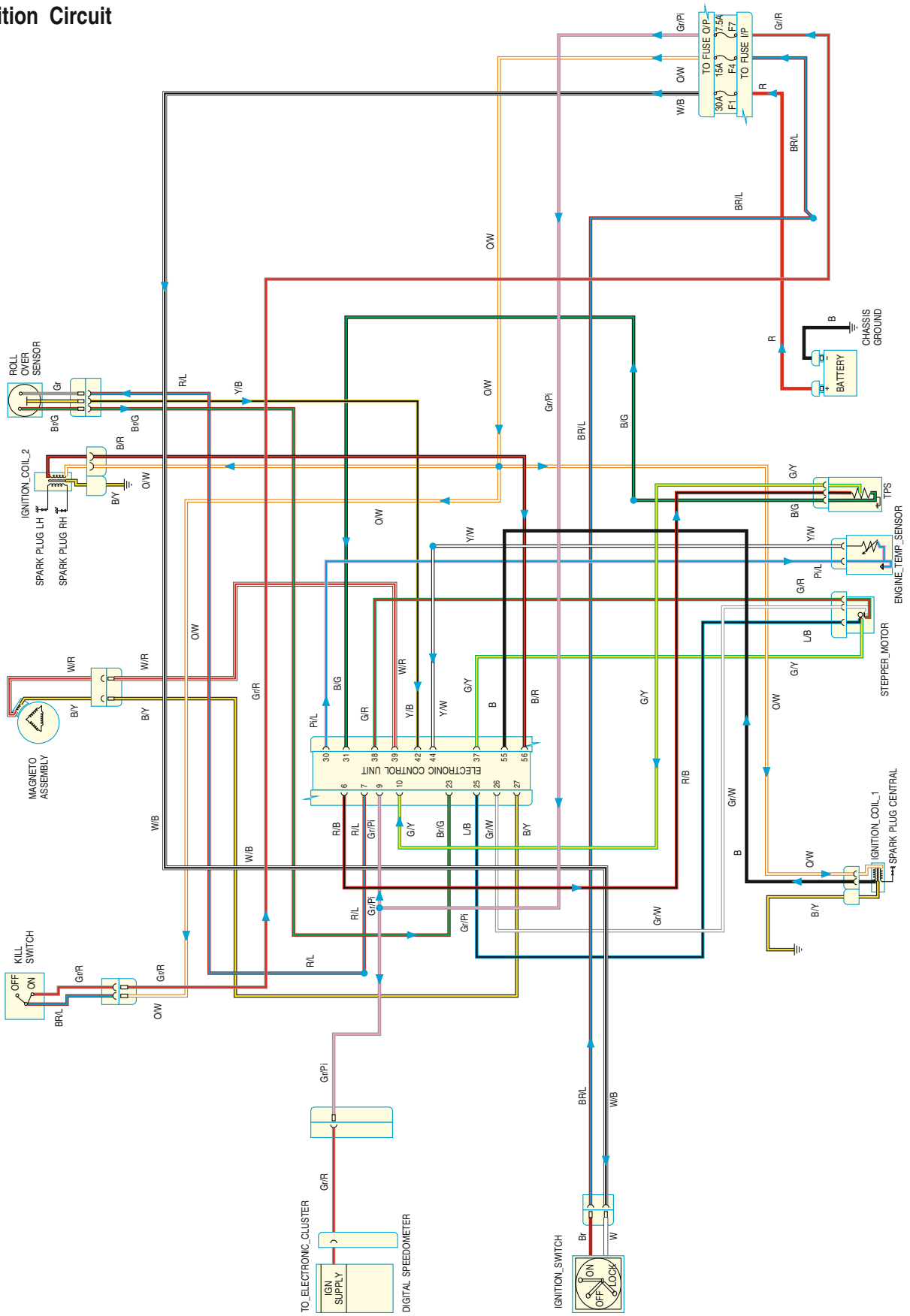
Electrical Diagrams

Starting Circuit



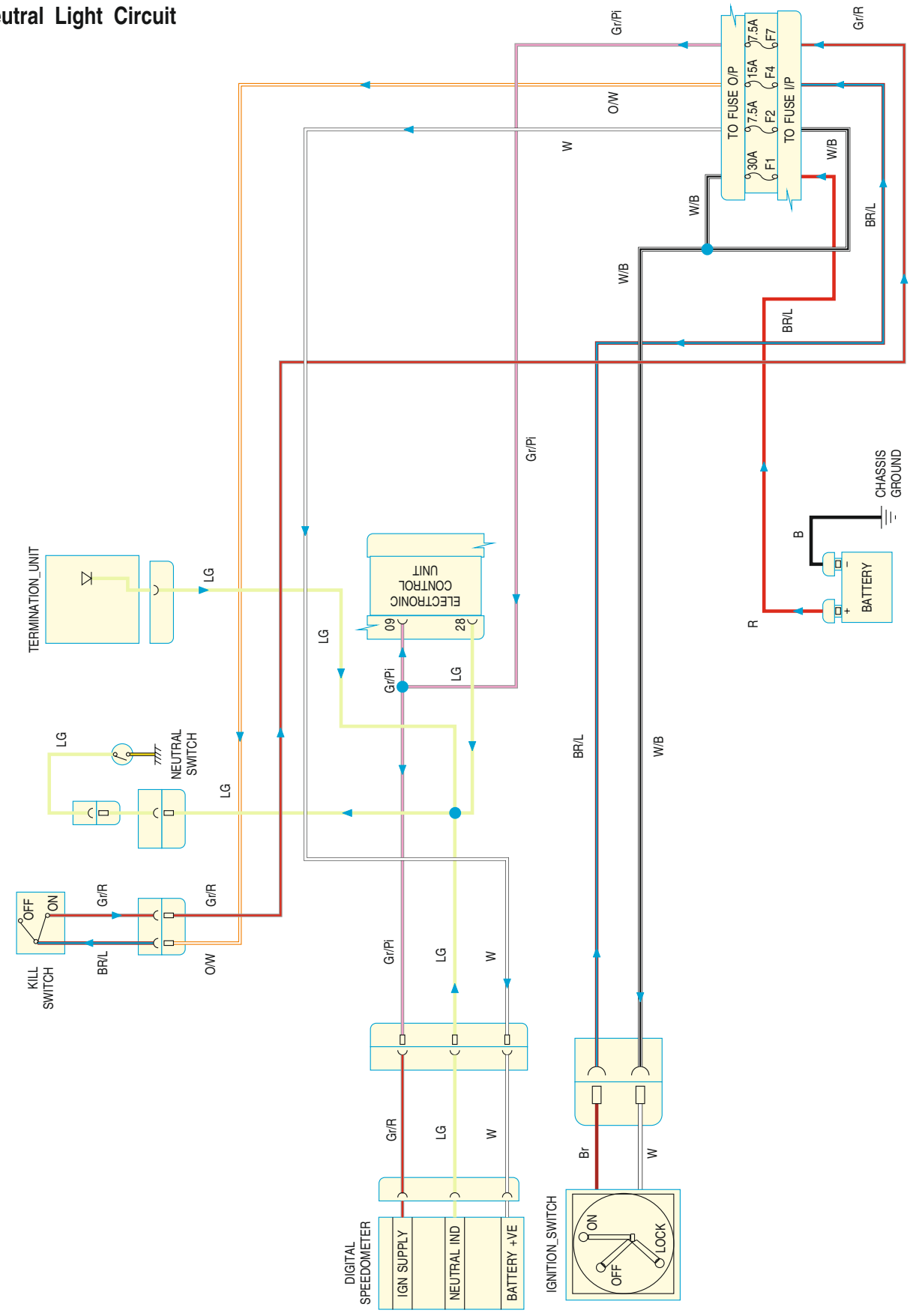
Electrical Diagrams

Ignition Circuit



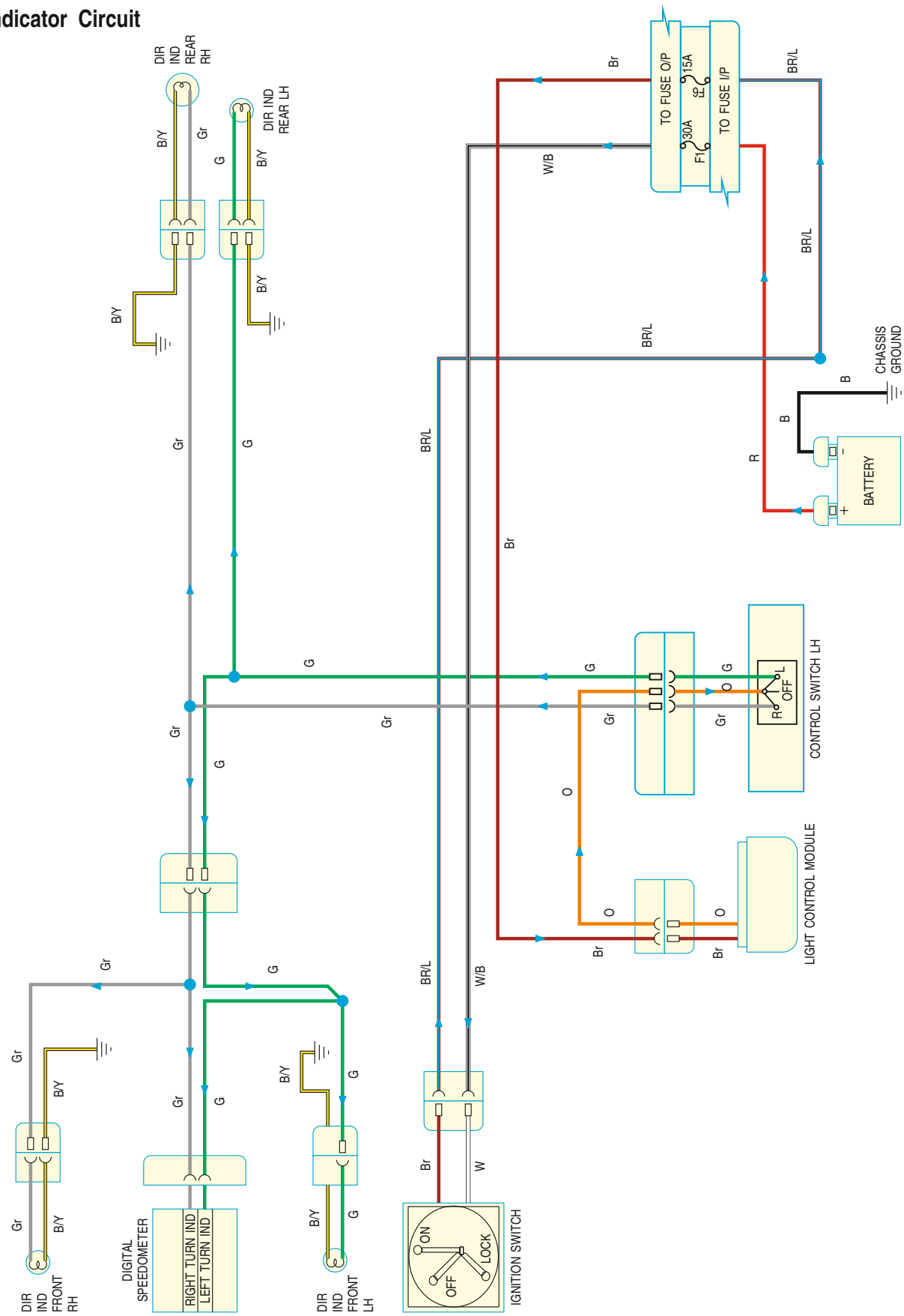
Electrical Diagrams

Neutral Light Circuit



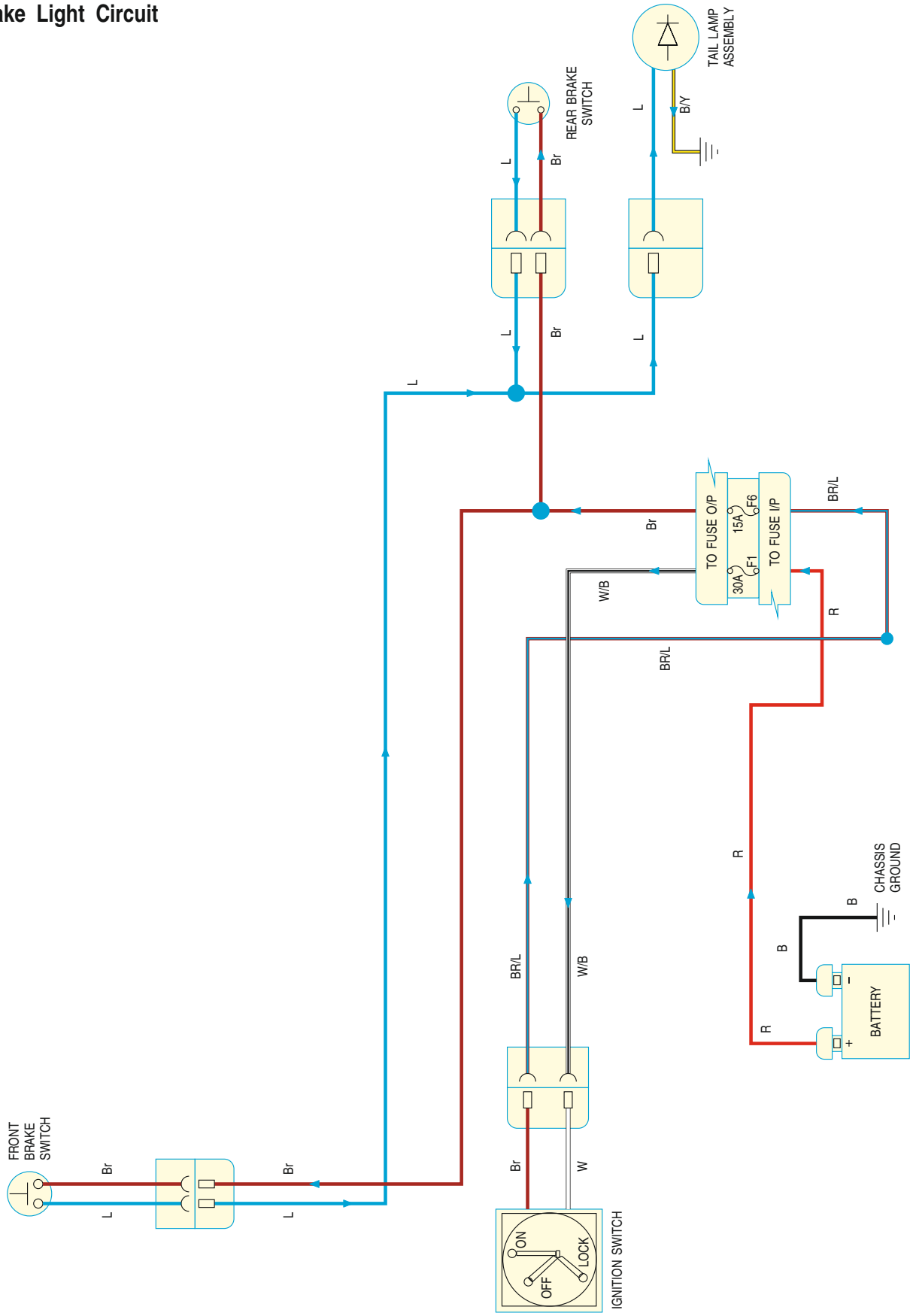
Electrical Diagrams

Side Indicator Circuit



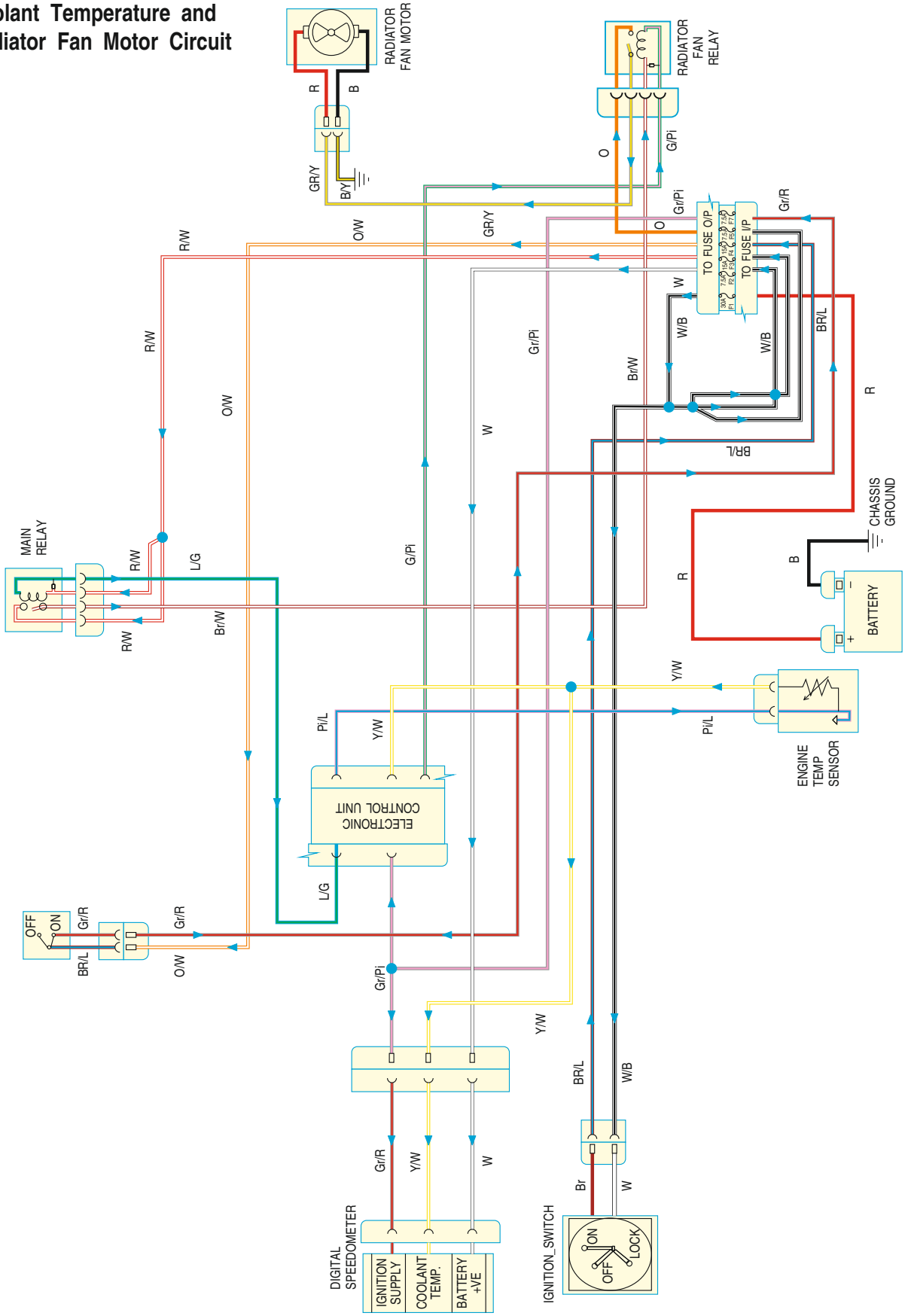
Electrical Diagrams

Brake Light Circuit



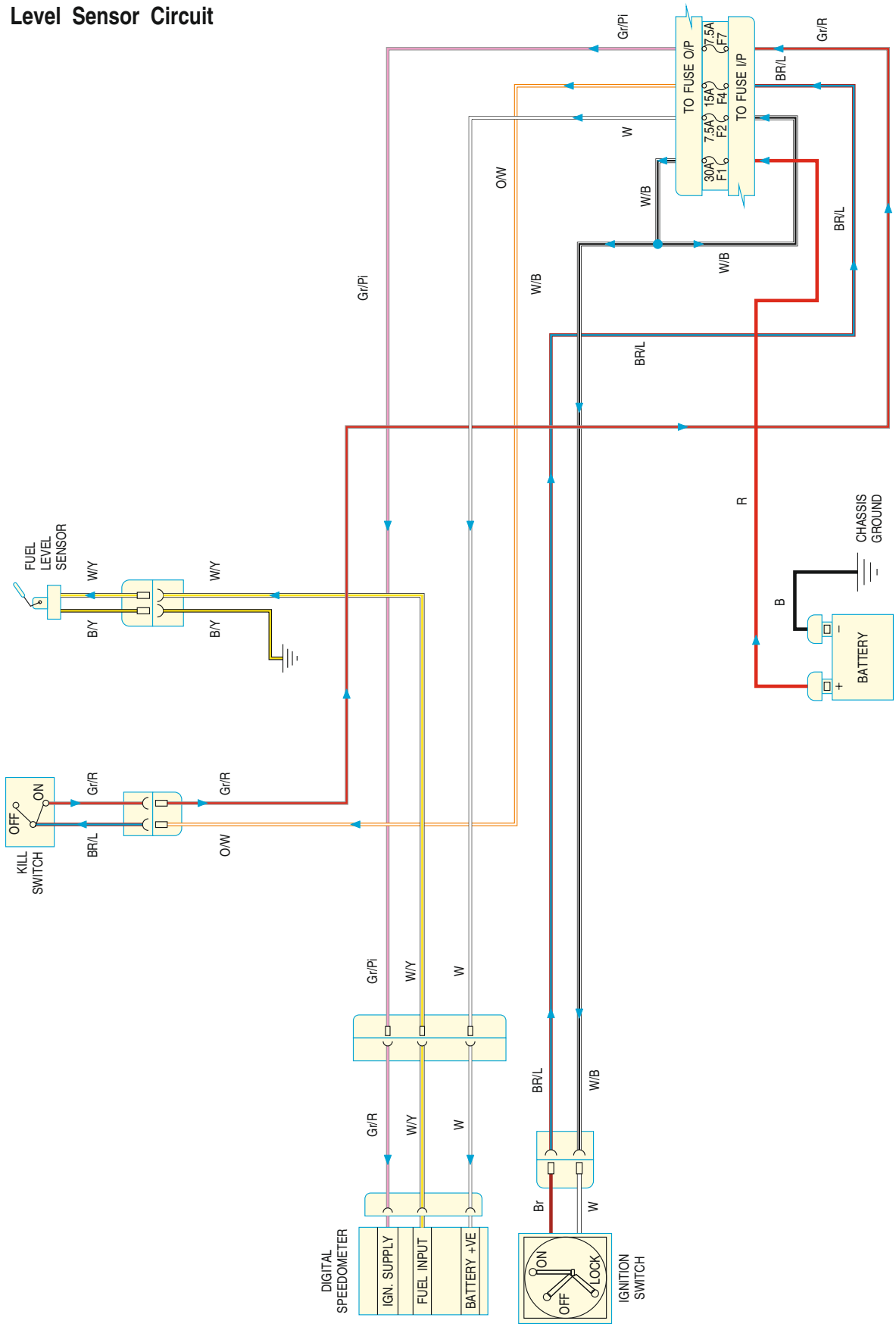
Electrical Diagrams

Coolant Temperature and Radiator Fan Motor Circuit



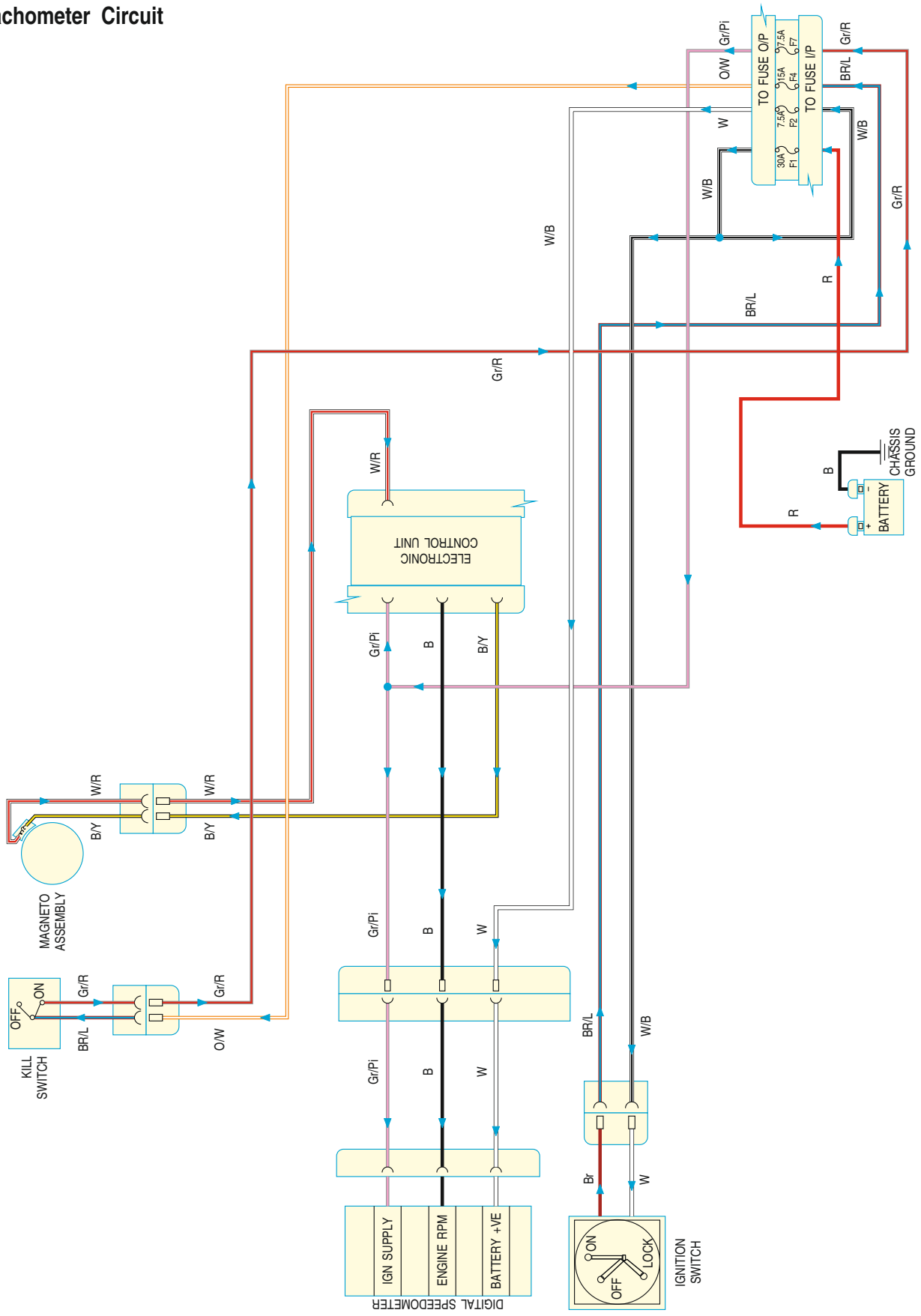
Electrical Diagrams

Fuel Level Sensor Circuit



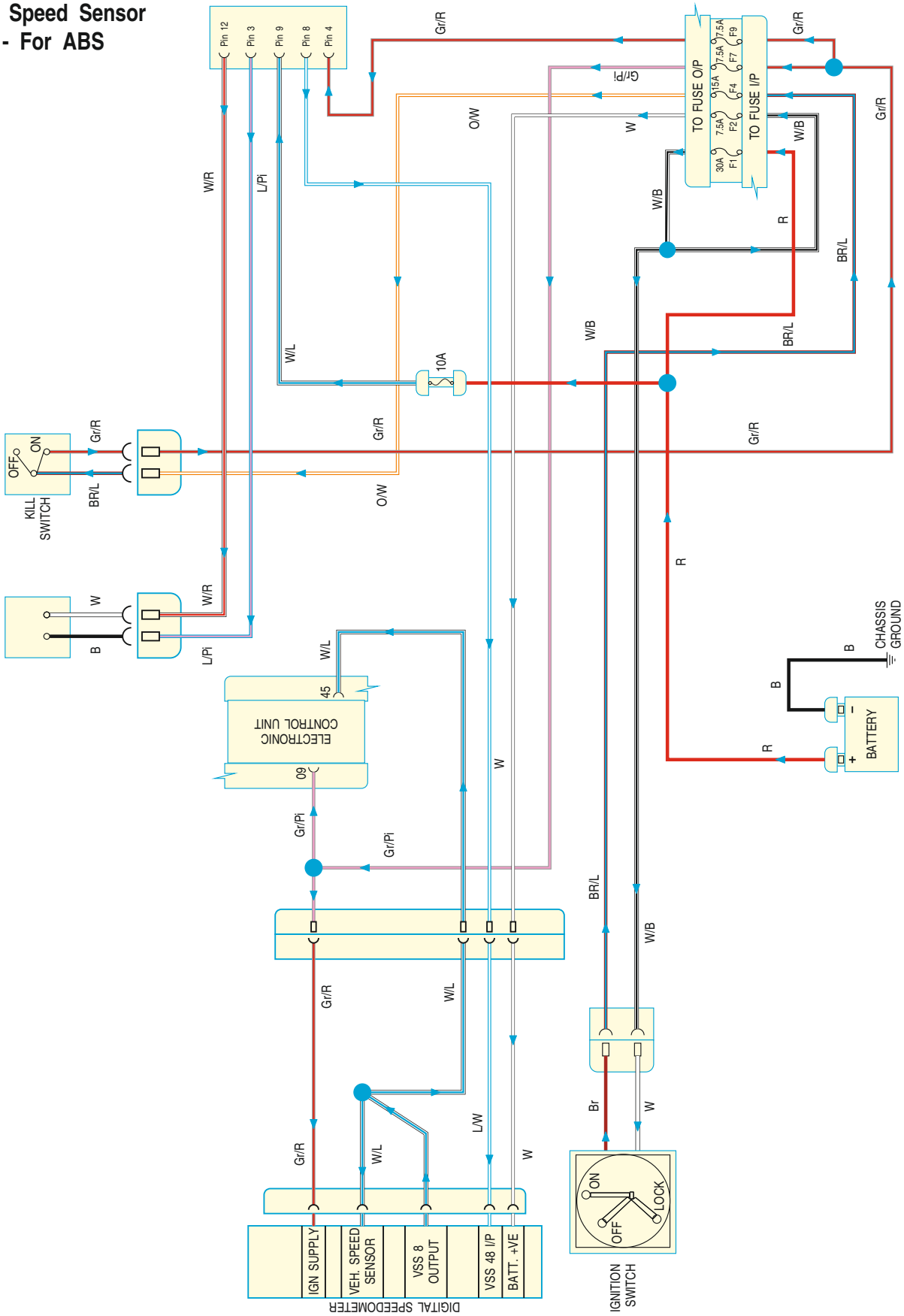
Electrical Diagrams

Tachometer Circuit



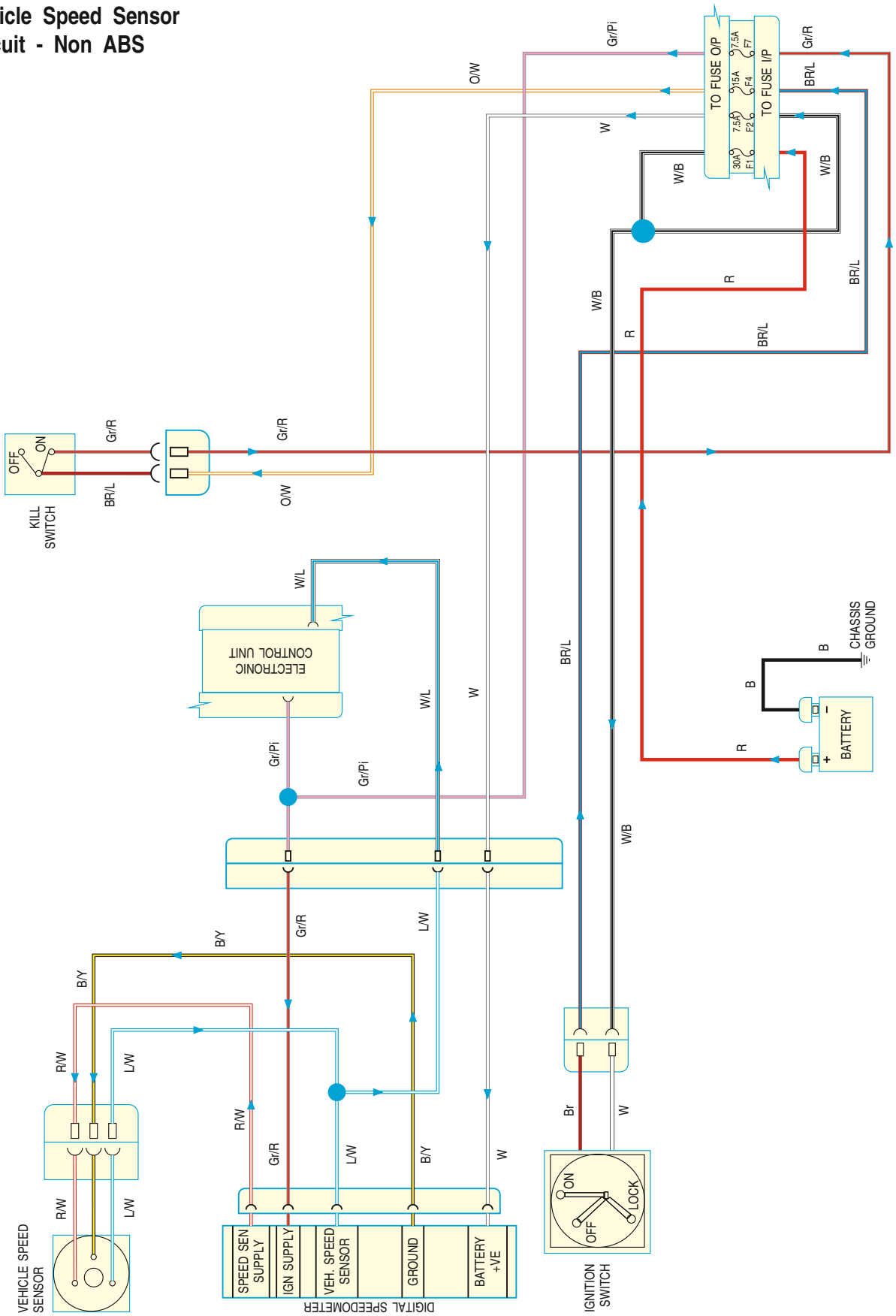
Electrical Diagrams

Vehicle Speed Sensor Circuit - For ABS



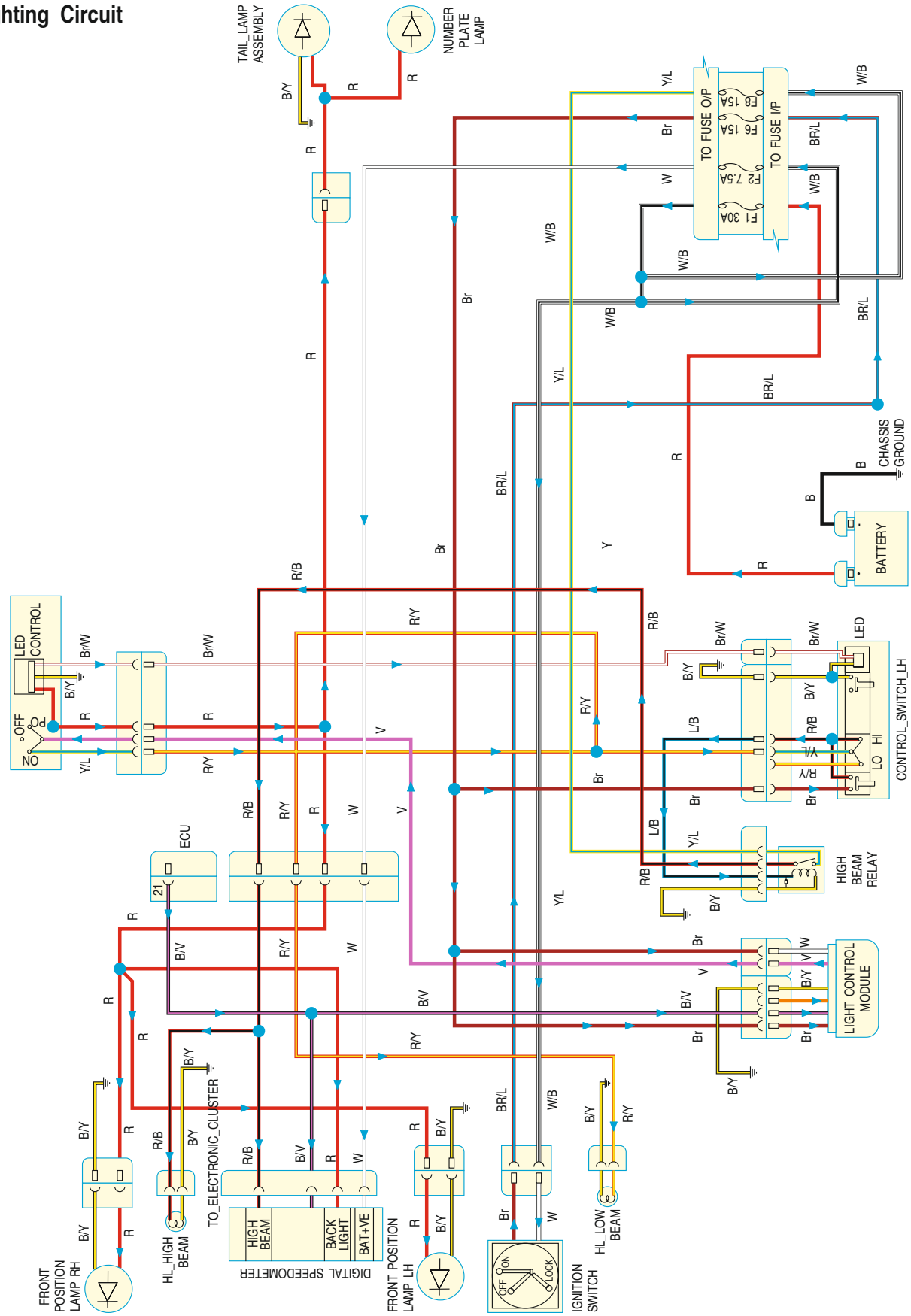
Electrical Diagrams

Vehicle Speed Sensor Circuit - Non ABS



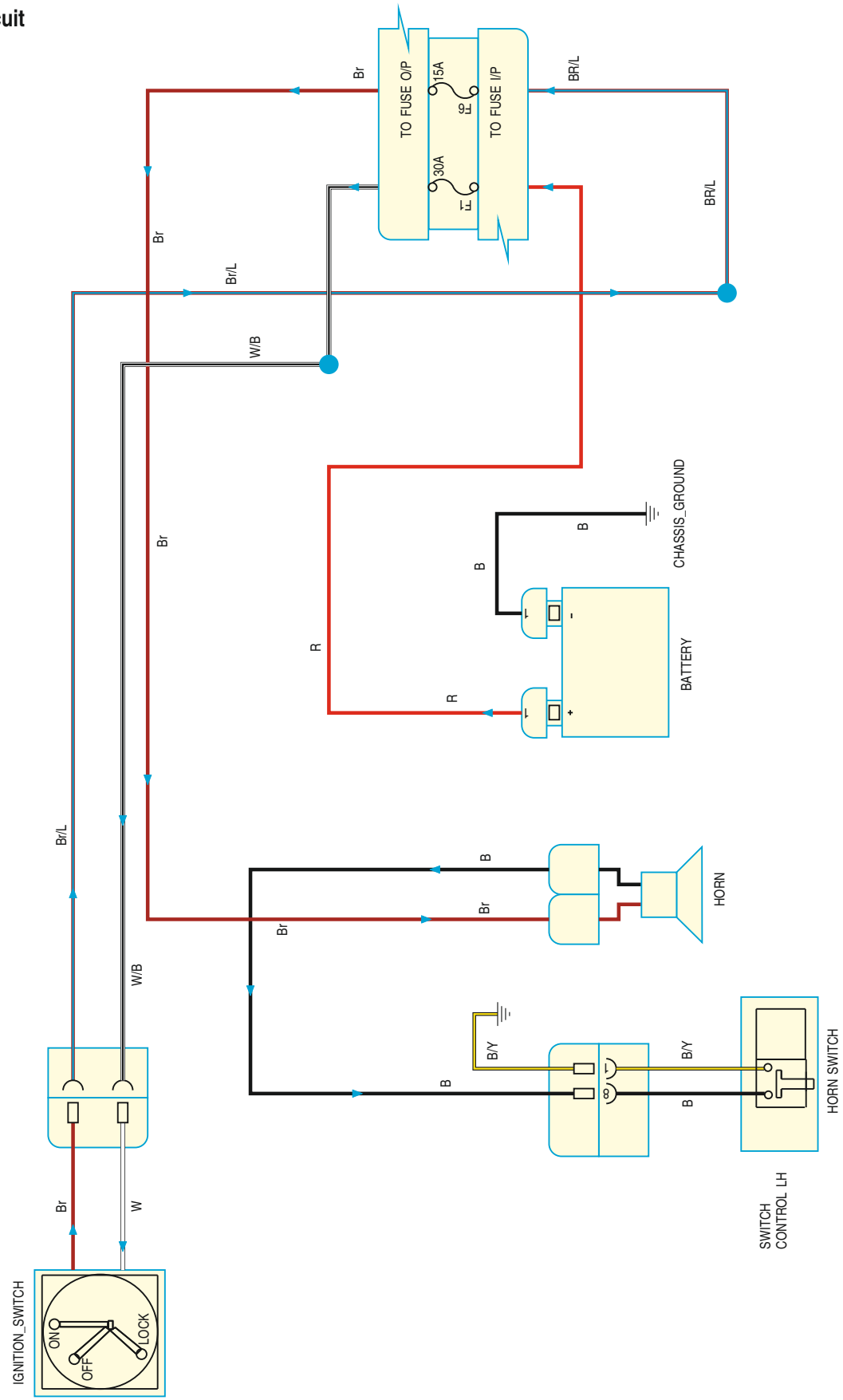
Electrical Diagrams

Lighting Circuit



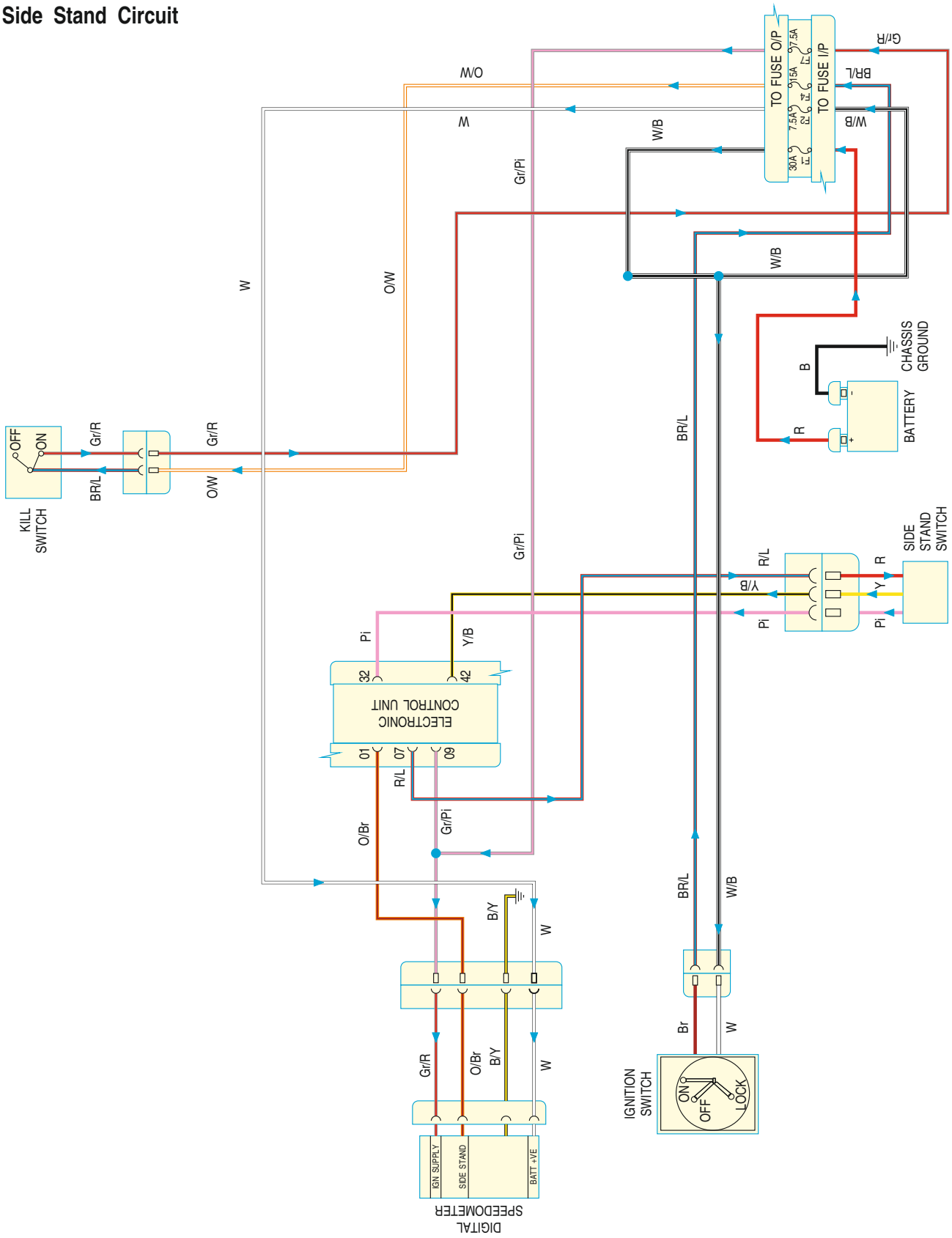
Electrical Diagrams

Horn Circuit



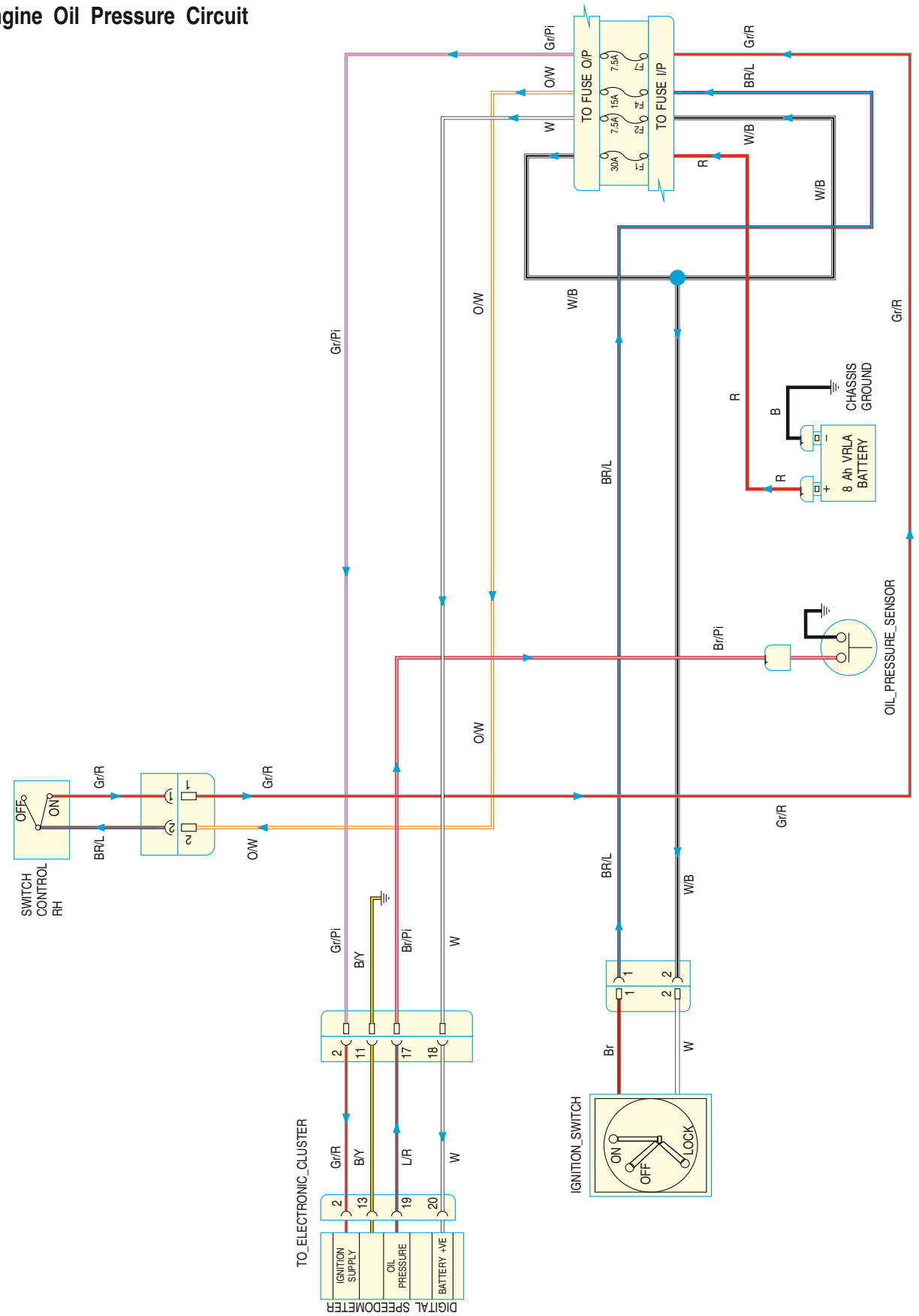
Electrical Diagrams

Side Stand Circuit



Electrical Diagrams

Engine Oil Pressure Circuit



Electrical Diagrams

Battery Charging Circuit