Maintenance–Electrical

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BATTERY

The battery supplies the current to the starter motor and serves as a back-up source of power to operate the electrical equipment whenever the engine is turning over too slowly for the dynamo to supply sufficient power.

With proper care, the battery can be expected to last several years, but it may be completely ruined long before that if it is mistreated. Following a few simple rules will greatly extend the life of the battery.

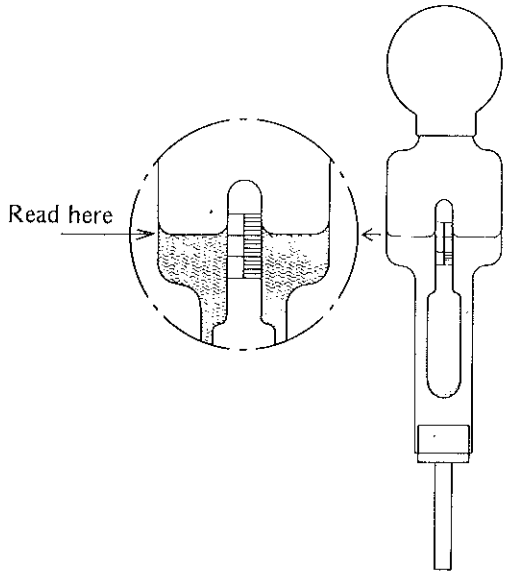
1. **When the level of the electrolyte in the battery is low, add only distilled water to each cell, until the level is at the upper level line marked on the outside of the battery. Ordinary tap water is not a substitute for distilled water and will shorten the life of the battery.**
2. **Never ad sulphuric acid solution to the battery. This will make the electrolyte solution too strong and will ruin the battery within a very short time.**
3. **Avoid quick-charging the battery. A quick-charge will damage the battery plates.**
4. **Never let a good battery stand for more than 30 days without giving it a supplemental charge, and never let a discharged battery stand without charging it. If a battery stands for any length of time, it slowly self-discharges. Once it is discharged, the plates sulphate (turn white), and the battery will no longer take a charge.**
5. **Keep the battery well charged during cold weather so that the electrolyte does not freeze andcrack open the battery. The more discharged the battery becomes, the more easily it freezes.**
6. **Always keep the battery vent hose free of obstruction, and make sure it does not get pinched, crimped, or melted shut by contact with the hot muffler. If battery gases cannot escape through this hose, they will explode the battery.**
7. **DON'T INSTALL THE BATTERY BACKWARDS. The negative side is grounded.**

Electrolyte

The electrolyte is dilute sulphuric acid. The standard specific gravity of the electrolyte is 1.280 at 20°C (68°F). The water in this solution changes to a gaseous mixture due to chemical action in the battery and escapes, which concentrates theacid in a charged battery. Consequently, when the level of the electrolyte becomes low, only distilled water should be added. If sulphuric acid is added, the solution will become too strong for proper chemical action and will damage the plates. Metal from the damaged plates collects in the bottom of the battery. This sediment will eventually cause an internal short circuit.

The specific gravity of the electrolyte is measured with a hydrometer and is the most accurate indication of the condition of the battery. When using the hydrometer, read the electrolyte level at the bottom of the meniscus (curved surface of the fluid). Fig. K2 shows the relationship between the specific gravity of the solution at 20°C (68°F) and the percentage of battery charge. Since specific gravity varies with temperature, and since the temperature of the solution being checked is likely to be other than 20°C (68°F); the formula given below should be used to compute the equivalent specific gravity for any temperature. When the temperature goes up, the specific gravity goes down, and vice versa.

Hydrometer (K1)



○Calsius

$S_{20}=S_t + [0.0007\ (t-20)]$

○Fahrenheit

$S_{68}=S_t + [0.0004\ (t-68)]$

S_t=specific gravity at the present temperature

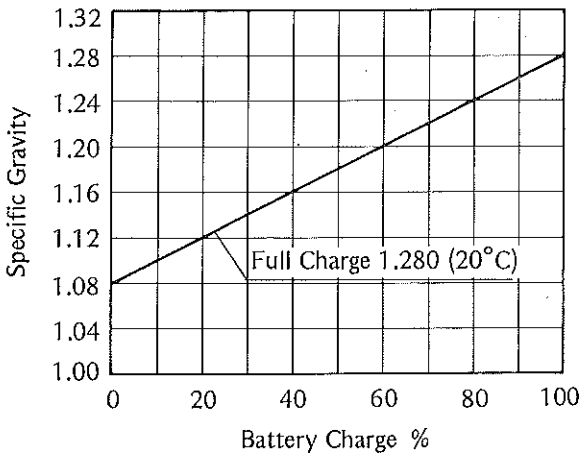
S_{20}=specific gravity at 20°C

S_{68}=specific gravity at 68°F

t=present temperature of solution

Generally speaking, a battery should be charged if a specific gravity reading shows it to be discharged to 50% or less of full charge.

Specific Gravity/Battery Charge Relationship (K2)



Initial charge

New batteries for Kawasaki motorcycles are dry charged and can be used directly after adding the

electrolyte. However, the effect of the dry charge deteriorates somewhat during storage, especially if any air has entered the battery from imperfect sealing. Therefore, it is best to give the battery an initial charge before using it in order to ensure long battery life.

WARNING **Because the battery gives off an explosive gas mixture of hydrogen and oxygen, keep any sparks or open flame away from the battery during charging.**

- Pour a 1.280 (specific gravity at 20°C or 68°F) sulphuric acid solution into each cell of the battery up to the upper level line.
- Let the battery stand for 30 minutes, adding more acid if the level drops during this time.

NOTES: 1. If the temperature of the solution is over 30°C (85°F) cool the solution before pouring it into the battery.

2. After pouring the acid into the battery, start charging the battery within 12 hours.

- Leaving the caps off the cells, connect the battery to a charger, set the charging rate at 1/10 the battery capacity, and charge it for 10 hours. For example, if the battery is rated at 16AH, the charging rate would be 1.6 ampere. If a constant voltage charger is used, the voltage must be adjusted periodically to keep the current at a constant value.

CAUTION **If the temperature of the electrolyte rises above 45°C (115°F) during charging, reduce the charging rate to bring down the temperature, and increase the charging time proportionately.**

- After charging, check the electrolyte level in each cell. If the level has dropped, add distilled water to bring it back up to the upper level line.
- Check the results of charging by measuring the specific gravity of each cell and by measuring battery voltage. Battery voltage of a 12 volt battery directly after the completion of charging should be 15 to 16 volts.

Ordinary charge

WARNING **Because the battery gives off an explosive gas mixture of hydrogen and oxygen, keep any sparks or open flame away from the battery during charging.**

- Clean off the battery using a solution of baking soda and water. Make especially sure that the terminals are clean.
- If the electrolyte level is low in any cell, fill to over the lower level line but not up to the upper level line since the level rises during charging. Figure the charging rate to be between 1/10 and 3/10 of battery capacity. For example, the maximum charging rate for a 16AH battery would be 3/10 x 16 which equals 4.8 amperes.

CAUTION **Charging the battery at a rate higher than specified above could ruin the battery. Charging at a higher rate causes excess heat, which can warp the plates and cause internal shorting. Higher than normal charging rates also cause the plates to shed active material. Deposits will accumulate, and can cause internal shorting.**

- Measure the specific gravity of the electrolyte, and use the graph, Fig. K2, to determine the percentage of discharge. Multiply the capacity of the battery by the percentage of discharge to find the amount of discharge in ampere-hours. Use this figure in the formula below to compute charging time.

$$\text{Charging time (hour)} = \frac{\text{Amount of discharge (AH)}}{\text{charging current (A)}} \times 1.2 \sim 1.5$$

- Remove the caps from all the cells, and begin charging the battery at the rate just calculated. If a constant voltage charger is used, the voltage will have to be adjusted periodically to maintain charging current at a constant value.

CAUTION **If the temperature of the electrolyte rises above 45°C (115°F) during charging, reduce the charging rate to bring down the temperature, and increase charging time proportionately.**

- After charging, check the electrolyte level in each cell. If the level has dropped, add distilled water to bring it back up to the upper level line.
- Check charging results by measuring the specific gravity of each cell and by measuring battery voltage. Battery voltage of a 12 volt battery directly after the completion of charging should be 15 to 16 volts and the specific gravity of the electrolyte should be more than 1.250. If the voltage is lower than this, the battery is not completely charged or can no longer take a full charge. If the specific gravity of any one cell is lower than 1.250, there may be damage in the cell.

Test charging

When the battery is suspected of being defective, first inspect the points noted in the Table below. The battery can be restored by charging it with the ordinary charge. If it will take a charge so that the voltage and specific gravity come up to normal, it may be considered good except in the following case:

★ If the voltage suddenly jumps to over 13 volts just after the start of charging, the plates are probably sulphated. A good battery will rise to 12 volts immediately

Table K1 Battery Troubleshooting Guide

	Good Battery	Suspect Battery	Action
Plates	(+) chocolate color (–) gray	white (sulphated); + plates broken or corroded	Replace
Sediment	none, or small amount	sediment up to plates, causing short	Replace
Voltage	above 12 volts	below 12 volts	Test charge
Electrolyte level	above plates	below top of plates	Fill and test charge
Specific Gravity	above 1.200 in all cells; no two cells more than 0.020 different	below 1.100, or difference of more than 0.020 between two cells	Test charge

and then gradually go up to 12.5 ~ 13 volts in about 30 to 60 minutes after charging it started.

★ If one cell produces no gas bubbles, or has a very low specific gravity, it is probably shorted.

★ If there does not appear to be enough sediment to short the plates, but one cell has a low specific gravity after the battery is fully charged, the trouble may be just that there is insufficient acid in that cell. In this instance only, sulphuric acid solution may be added to correct the specific gravity.

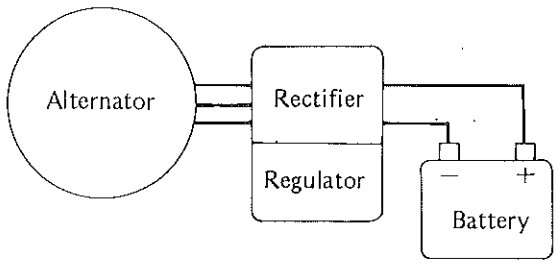
★ If a fully charged battery not in use loses its charge after 2 to 7 days, or if the specific gravity drops markedly, the battery is defective. The self-discharge rate of a good battery is only about 1% per day.

CHARGING SYSTEM

The charging system consists of an alternator and regulator/rectifier.

The alternator generates the current required by the electrical circuits. The generated current is a 3 phase alternating current (AC), which is changed to direct current (DC) and controlled by a solid-state regulator/rectifier to supply an even voltage to the circuit components.

Charging System (K3)



There are a number of important precautions that are musts when servicing the charging system. Cautions that are applied to the individual sections are mentioned in each section. Failure to observe these rules can result in serious system damage. Learn and observe all the rules below.

CAUTION **When handling the regulator/rectifier, observe the following to avoid damage to the regulator/rectifier.**

1. **Do not reverse the battery lead connections. This will burn out the zener diode.**
2. **For the regulator/rectifier to function properly, the battery must be charged to newar capacity. If the battery is badly discharged, charge it before installing it in the motorcycle.**

When handling the alternator rotor:

3. **Do not allow the rotor to suffer sharp impacts such as striking it with a hammer or letting it fall on a hard surface. Such a shock to the rotor can cause the magnets to loss their magnetism.**

When there are any problem indications in the charging system, give the system a quick initial inspection or check before starting a series of time consuming tests, or worse yet, removing parts for repair or replacement. Such a check will often turn up the source of the trouble.

Make sure all connectors in the circuit are clean and tight. Examine wires for signs of burning, fraying, etc. Poor wires and bad connections will affect electrical system operation. Check the regulator/rectifier and alternator for evidence of physical damage.

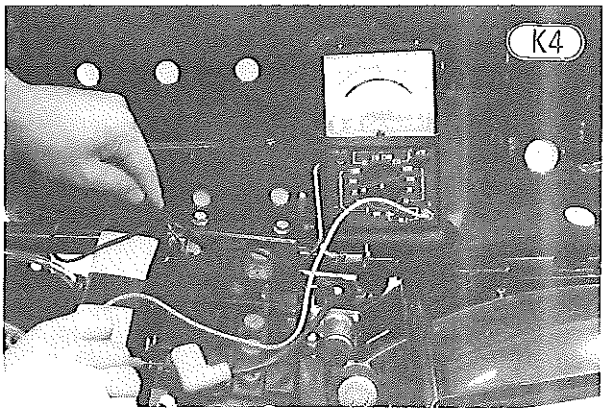
A worn out or badly sulphated battery will produce numerous problems that cannot be corrected until the battery is replaced. **ALWAYS CHECK BATTERY CONDITION BEFORE CONDEMNING OTHER PARTS OF THE SYSTEM. A FULLY CHARGED BATTERY IS A MUST FOR CONDUCTING ACCURATE SYSTEMS TESTS.**

Charging system malfunctions can be traced to either the battery, alternator, regulator/rectifier, or the wiring. Troubles may involve one unit or in some cases, all units. Never replace a defective unit without determining what **CAUSED** the failure. If the failure was brought on by some other unit or units, they too must be repaired or replaced, or the new replacement will soon fail.

Initial inspection

Before making this test, check the condition of the battery (Pg. 218). If the battery voltage is less than 12 volts, charge the battery. Before starting the charging voltage test warm up the engine to obtain actual alternator operating conditions.

- Unlock the seat and swing it open.
- Set the multimeter to the 20V DC range, and connect the meter + lead to the battery + terminal and the meter – lead to the battery – terminal.



- Start the engine, and run the engine at the rpm in Table K2. Note the voltage reading.

Table K2 Charging Voltage

Meter	Connections	Reading @4,000 rpm
20V DC	Meter (+) ↔ Battery (+) Meter (–) ↔ Battery (–)	about 14.5V

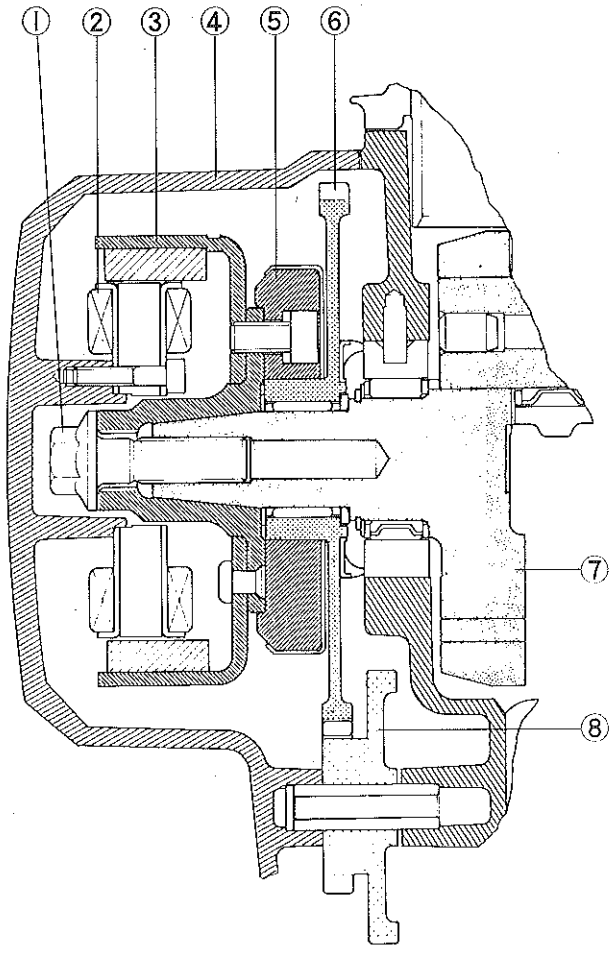
●If the reading is much higher than the values specified in the table, the regulator/rectifier is defective or its leads are loose or open. If the reading does not rise as the engine speed increases, check the alternator output and regulator/rectifier (Pg. 222) to determine which part is defective.

Alternator

The alternator is made of a rotor ③ and stator ②. The stator is mounted in the alternator cover ④, while the rotor is secured to the left end of the crankshaft ⑦ and rotates at engine rpm. Permanent magnets in the rotor supply the magnetic field for the stator so that no slip rings or brushes are necessary, making the alternator practically maintenance free.

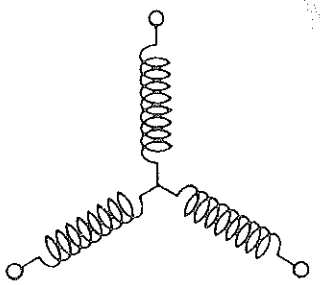
The stator consists of three sets of coils wound on laminated steel cores. These coils are connected in a wye connetion to produce a 3 phase alternating current. Since the voltages of these 3 phases overlap, there is a continuous, even supply of current for the circuit components.

Alternator Construction (K5)

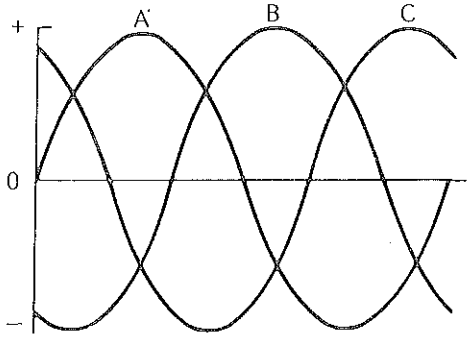


1. Rotor Bolt
2. Stator Coil
3. Alternator Rotor
4. Alternator Cover
5. Starter Motor Clutch
6. Clutch Gear
7. Crankshaft
8. Idle Gear

Wye Connection (K6)



Alternator Current (K7)



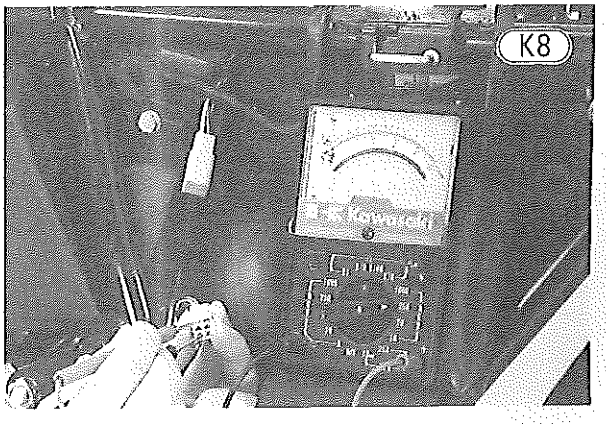
Alternator failure

If the battery, regulator/rectifier, leads, and connectors are all good, but there is still low voltage or insufficient charging current, the alternator may be defective. There are three types of alternator failures: short, open (wire burned out), or loss in rotor magnetism. A short or open in one of the coil wires will result in either a low output, or no output at all. A loss in rotor magnetism, which may be caused by dropping or hitting the rotor, leaving it near an electromagnetic field, or just by aging, will result in low output.

Alternator output test

Before starting alternator output test warm up the engine to obtain actual alternator operating condition.

●Remove the left side cover, and disconnect the 6-pin connector from the alternator. Set the multimeter to the 250V AC scale, and connect one meter leads to each yellow lead from the alternator.



- Start the engine, run it at the rpm given in Table K3, and note the voltage reading. A much lower reading than the given in the table indicates that the alternator is defective.

Table K3 Alternator Output

Meter	Reading @4,000 rpm
250V AC	about 50V

Stator coil resistance check

- Disconnect the meter leads from the 6-pin connector.
- Set the multimeter to the x 1 Ω range, and measure for continuity between each of the three yellow leads. If there is more resistance than shown in Table K4, or not meter reading, the stator coil has an open and must be replaced.

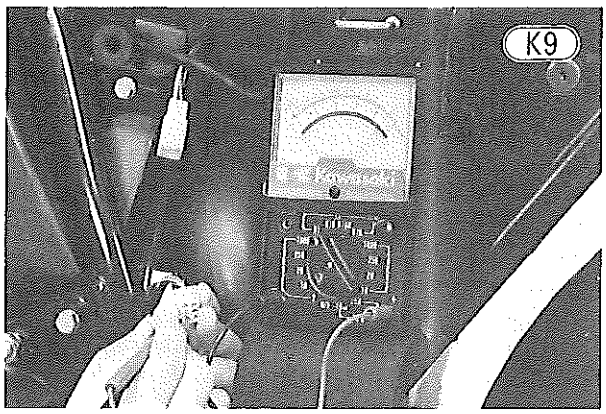


Table K4 Stator Coil Resistance

Meter	Reading
x 1 Ω	0.52 ~ 0.64 Ω

- Using the highest resistance range of the multimeter, measure the resistance between each of the yellow leads and chassis ground. Any meter reading less than infinity (∞) indicates a short, necessitating stator replacement.

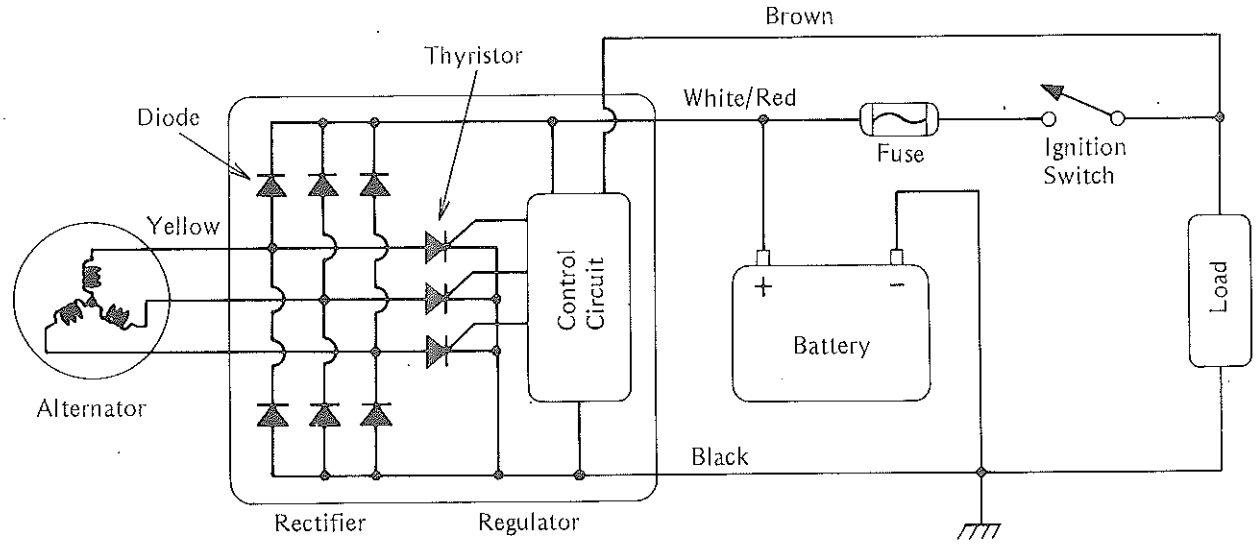
If the stator windings have normal resistance, but the voltage check showed the alternator to be defective, then the rotor magnets have probably weakened, and the rotor must be replaced.

Regulator/Rectifier

The regulator and rectifier are solid-state type, and integrated into one unit. Since it contains no contacts or other moving parts, it does not wear out and never needs to be adjusted. It is therefore manufactured as a sealed unit, and must be replaced as a unit should it become defective. The rectifier in the unit rectifies (change to direct current, DC) the three-phase alternating current (AC) from the alternator. It contains six silicon diodes which are connected in a bridge circuit arrangement for efficient, full-wave rectification. The regulator in the unit keeps the battery + terminal voltage level to a maximum of the specified range. The control circuit in the diagram checks on the voltage level, and triggers the thyristors.

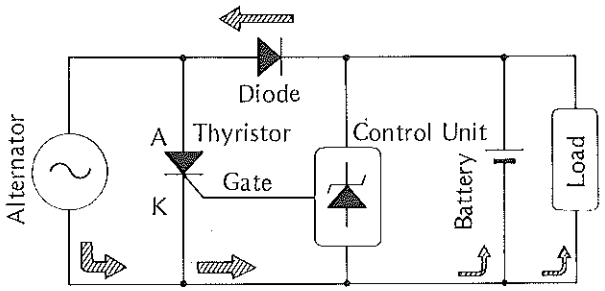
Though the actual regulator/rectifier circuit performs full-wave rectification and regulates each phase of the three-phase alternator output, a simplified single-phase circuit of half-wave rectification is explained here to aid the technician in troubleshooting and in understanding test procedures. Fig. K11 shows the basic circuit of the regulator/rectifier. The main components of the regulator/rectifier circuit are a thyristor (Th), or Silicon Controlled Rectifier (SCR) as it is also called, and a diode. The diode, thyristor (Th), and zener diode (ZD) function as follows:

Regulator/Rectifier (K10)

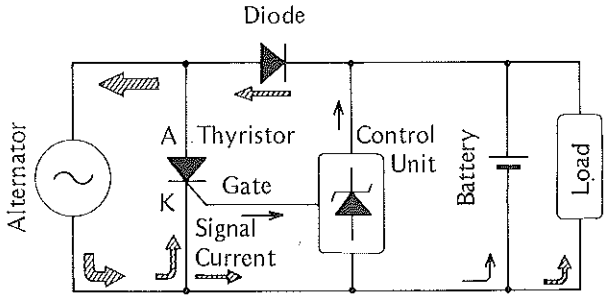


Basic Regulator/Rectifier Circuit (K11)

1. When battery voltage is low. (Thyristor is off.)



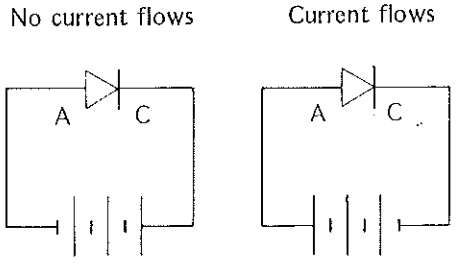
2. When battery voltage is high. (Thyristor is on to provide bypass.)



1. Diode

A current of electrons can flow only from the cathode to the anode of the diode. However, a defective diode will either conduct in both directions (a short) or not conduct at all (an open). If any of the diodes is shorted or open, the voltage from the regulator/rectifier will be below normal, and the battery may not be charged adequately.

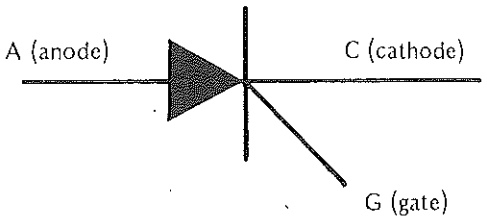
Diode Current Flow (K12)



2. Thyristor

The current of electrons will flow from the cathode to the anode but will not flow in the reverse direction. The thyristor differs from a diode in two respects: (a) even through a voltage of the correct polarity (negative to cathode) may be applied, the thyristor will not conduct until a signal is received at the gate input lead; (b) once started, it will not stop conducting (even if the gate lead signal voltage stops) until the anode to cathode voltage is removed or reversed.

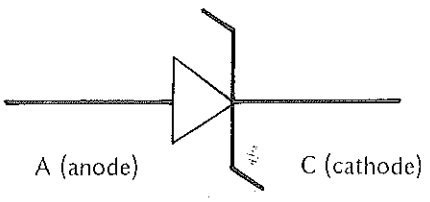
Thyristor (K13)



3. Zener diode

As in a normal diode, current will flow easily from the cathode to anode, and will not usually flow in the opposite direction. Unlike a normal diode, however, the zener diode will "break down", or conduct in the reverse direction, if enough voltage is applied in the reverse direction. When this voltage is lowered or removed, the diode will stop conducting and return to its normal state. The voltage at which the diode begins reverse conduction, is called the breakdown voltage, and is set at the desired level when the diode is manufactured. This property of the zener diode makes it very useful in voltage regulator circuits.

Zener Diode (K14)



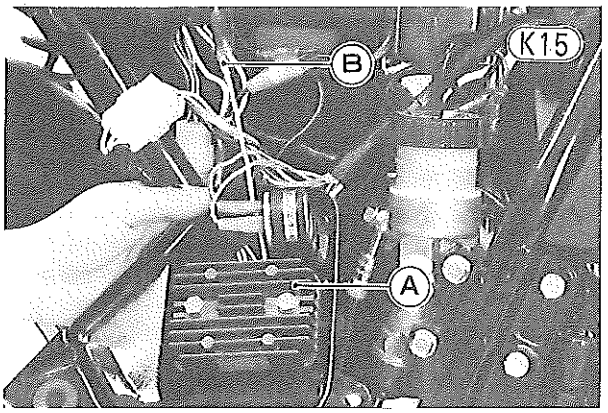
In the regulator/rectifier circuit, the diode is connected in series with the alternator to rectify the alternator output, and the thyristor is connected in parallel with the alternator. Detailed circuit operation is as follows:

When the battery voltage is lower than the specified value, the zener diode does not conduct and the control unit does not trigger the thyristor. At this time, the thyristor does not conduct, and all alternator output current flows through the battery and loads to supply adequate charging current.

When the battery voltage is equal to or higher than the predetermined voltage, the zener diode conducts and the control unit signals the thyristor to start conducting. Then, instead of current going through the battery and overcharging it, it flows through the thyristor and then directly back to the alternator.

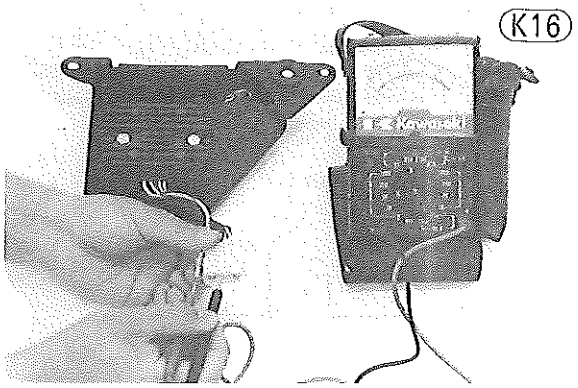
Rectifier inspection

●With the ignition switch turned off, remove the right side cover and electrical cover, and disconnect the regulator/rectifier white/red lead and white connector.



A. Regulator/Rectifier **B. White/Red Lead**

●Using the x 10 or x 100 Ω range, check the resistance in both directions between the white/red lead and each yellow lead, and between the black lead and each yellow lead. There is a total of 12 measurements. The resistance should be low in one direction and more than ten times as much in the other direction. If any two leads are low or high in both directions, the rectifier is defective and must be replaced.



NOTE: The actual meter reading varies with the meter used and the individual rectifier, but, generally speaking, the lower reading should be within 1/3 scale of zero ohms.

Regulator test

To test the regulator out of circuit, use three 12V batteries and a test light made from a 12V 3~6W bulb in a socket with leads.

●Remove the regulator/rectifier from the frame.

●Using auxiliary leads, connect one of the yellow leads to the battery (–) terminal, and connect the test light between the black lead and the battery (+) terminal. At this time the bulb should not be lit.

CAUTION **The test light works as an indicator and also as a current limiter to protect the regulator/rectifier from excessive current. Do not use an ammeter instead of a test light.**

●Connect the brown lead to the other battery (+) terminal and connect the black lead to the battery (–) terminal momentarily. At this time the bulb should not be lit.

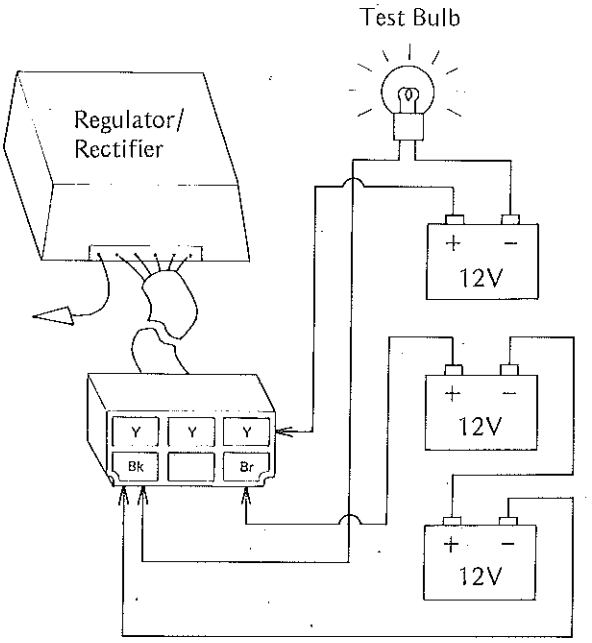
●To apply 24V to the regulator/rectifier, connect two 12V batteries in series, and connect the brown lead to the battery (+) terminal and the black lead to the battery (+) terminal and the black lead to the battery (–) terminal momentarily. The bulb should now light and stay on until the bulb circuit is opened.

CAUTION **Do not apply more than 24 volts. If more than 24 volts is applied, the regulator/rectifier may be damaged. Do not apply 24 V more than a few seconds. If 24 volts is applied for more than a few seconds, the regulator/rectifier may be damaged.**

●Replace the regulator/rectifier if the bulb does not light as described above.

NOTE: The above test is not foolproof. If the above checks show the regulator/rectifier is not damaged, but there is still trouble in the charging system, first carefully inspect the alternator, battery, wiring, and all connections. Replace the regulator/rectifier if all these other components turn out good.

Regulator Test (K17)



IGNITION SYSTEM

The ignition system for this model is essentially a battery and coil ignition system where the battery supplies the current for the primary circuit in the ignition system. However, this ignition system is transistorized

and controls the current for the primary circuit by use of a solid state electronic switching unit called a Darlington power transistor. The power transistors are triggered by pick-up coils and there are no mechanical breaker points, so the only periodic maintenance needed is automatic timing advancer lubrication (Pg. 10). Since contact breaker heel wear (with resultant retarded ignition timing) and breaker point pitting or burning are eliminated, periodic inspection and adjustment of the ignition timing are not required.

Ordinarily in a 4-stroke engine, a spark jumps across the spark plug electrodes only every other time that the piston for that spark plug rises (once every 720° of crankshaft rotation). This is because between each compression stroke, in which a fuel/air mixture ready for combustion is in the cylinder, there is an exhaust stroke, in which the piston rises only to push out the burned gases. However, even if a spark does jump across the electrodes during the exhaust stroke, there is no effect since there is no compression and no fuel to burn. Therefore, to eliminate any need for a distributor (thus simplifying the system and making it more reliable), the system is constructed so that both spark plugs fire every time both pistons rise (once every 360° of crankshaft rotation) although one piston is on the compression stroke and the other on the exhaust stroke.

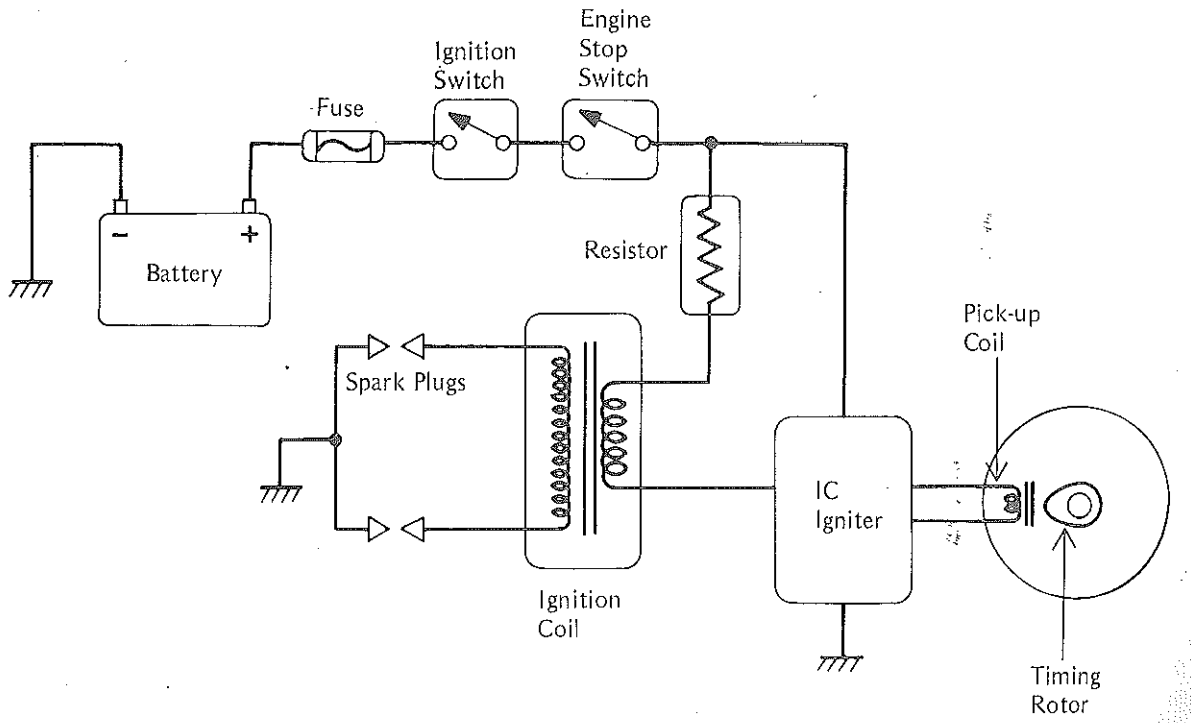
Because the two spark plugs are connected in series, the current through one spark plug laos must go through the other. Consequently, if a spark will not jump across the electrodes of one spark plug (due to dirty electrodes, faulty plug lead, etc.), no spark will jump across the electrodes of the other plug as well.

The working electrical part of the ignition system consists of a battery, two pick-up coils, an IC igniter, two ignition coils, a resistor, and four spark plugs. To advance the ignition timing as engin erpm rises, an automatic centrifugal-type timing advancer is used. The resistor limits the amount of primary current flowing through the coil to a safe maximum to prevent overheating of the ignition coil primary winding whose electrical resistance is low to ensure a high performance spark. The ignition system comprises two parts; one part fires #1 and #4 cylinders, and the other part #2 and #3 cylinders. A schematic wiring diagram of one half the system is shown in Fig. K18. The other half is identical. Both work as follows.

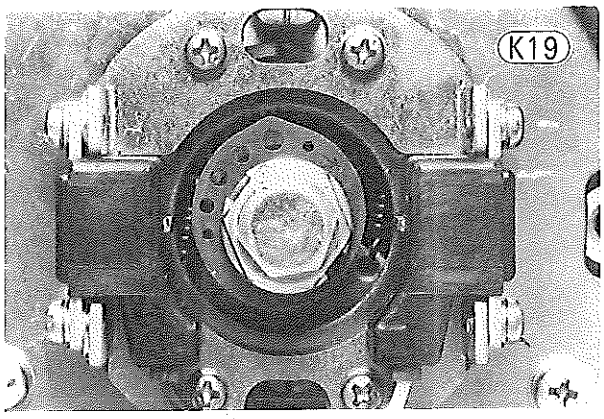
Pick-up Coil

The pick-up coil assembly (a magnetic impulse generator) resembles the standard contact breaker assembly in most respects except that the two sets of breaker points have been eliminated. In their places is an iron timing rotor and two magnetic pick-up coils. Each pick-up coil assembly consists of a pair of permanent magnets and a pick-up coil on a mounting plate. The timing rotor which is attached to the timing advancer has one projection. As the projection on the timing rotor passes through the magnetic field created by the permanent magnets on the mounting plate, a magnetic field alternately builds up and collapses. Each time the projection passes a pick-up coil core an electric current is developed. Each voltage pulse is conducted to the IC igniter where it is amplified and switches the Darlington

Ignition Circuit (K18)



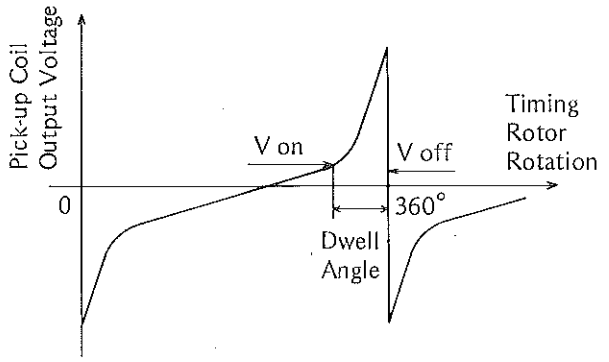
power transistor on and off to control the primary current.



IC Igniter

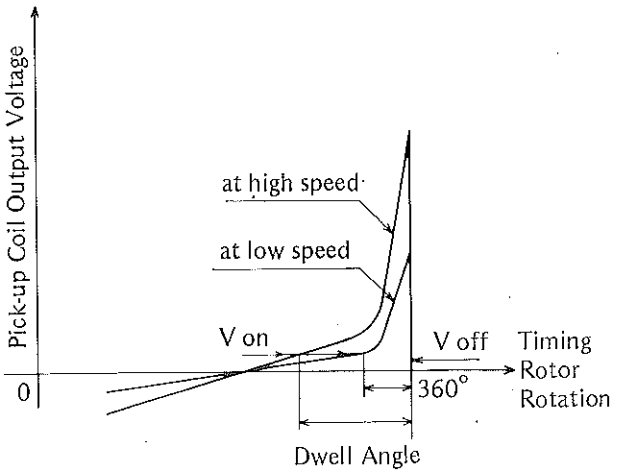
The IC igniter utilizes the voltage pulse sent from the pick-up coil as follows to obtain stable induced high tension voltage from low to high engine speeds. The output voltage of the pick-up coil alternates as shown in Fig. K20.

Output Voltage of Pick-up Coil (K20)

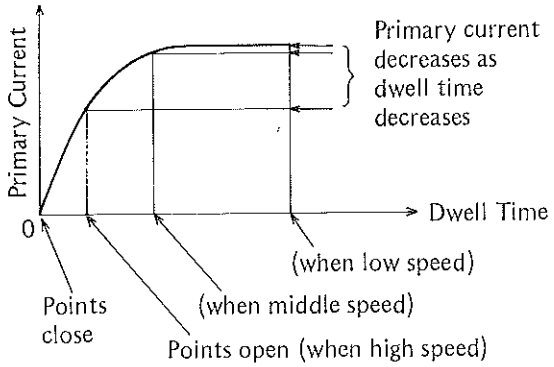


With rotation of the timing rotor the output voltage rises, and the power transistor conducts and permits primary current to flow when the pick-up coil output reaches the preset voltage (V on). When the output voltage drops to the other preset voltage (V off) after passing the voltage peak, the power transistor no longer conducts stopping the current flow in the ignition coil primary winding and inducing a high tension voltage that jumps across the spark plug electrodes. In the case of a standard breaker point ignition system the dwell time (the time during which current can flow in the primary circuit) decreases as the engine speed increases. This results in less current flow through the ignition coil primary winding and decreased induced voltage at high rpm. Conversely the dwell time in this transistorized ignition system is kept relatively constant by virtue of the pick-up coil output voltage. This is because the faster the engine runs, the higher the output voltage of the pick-up coil becomes and the sooner the V on voltage is reached. Therefore the dwell angle increases to keep the dwell time long enough at high engine rpm so that the induced high voltage does not decrease.

Pick-up Coil Output Voltage at Low and High Speed (K21)



Dwell Time and Primary Current (Braker Point System) (K22)



Ignition Coils

With the ignition switch on and the IC igniter on, current flows in the primary circuit, including the ignition coil primary winding where the magnetic field (which accompanies electron flow) is concentrated (due to the winding). When the IC igniter off, this circuit is broken stopping the electron flow and collapsing the magnetic field. As this field collapses, magnetic flux cuts through the secondary winding inducing voltage in the winding. The induced voltage, depending on the number of turns in the secondary winding and the speed of the drop in the primary winding current, is much greater than the voltage in the primary winding. It is this high voltage that causes a spark to jump across the spark plug electrodes. A greater ratio of secondary winding turns over primary winding turns and a sharper drop of primary winding current increase the secondary winding voltage that is produced. For this reason, a certain ratio of turns in the ignition coil has been chosen and a certain current drop sharpness (determined by capacitor and breaker point performance) has been designed into the ignition system so that a spark of sufficient but not excessive strength will be produced.

Timing Advancer

The timing advancer is a device that advances the ignition timing (makes the spark plugs fire sooner) as engine rpm rises. It consists of two weights and two springs connected to the timing rotor. The more the engine speed rises, th further the weights are thrown out against spring tension, turning the rotor in the direction of crankshaft rotation and causing the spark plugs to fire sooner.

If the mechanism is damaged, has a weak or broken spring(s), or does not move smoothly, the ignition timing will not advance smoothly or it may stick in one position. This will result in incorrect timing at certain engine speeds, causing poor engine performance. Failure to advance at all will cause poor high speed performance, and excessive advance will cause knocking and poor low speed performance.

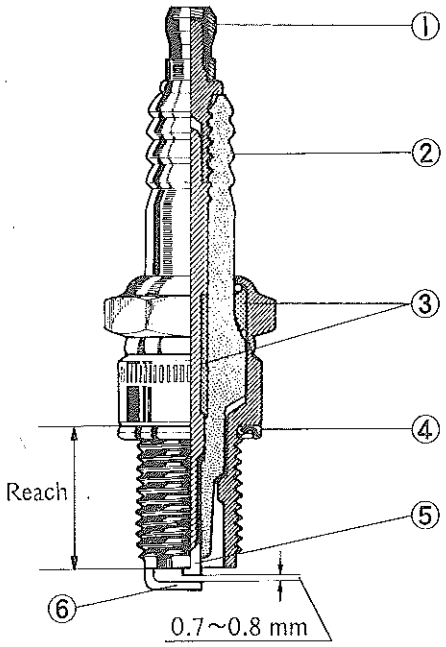
Spark Plugs

The spark plugs ignite the fuel/air mixture in the combustion chamber. To do this effectively and at the proper time, the correct spark plugs must be used, and the spark plugs must be kept clean and adjusted.

Test have shown the NGK B8ES or ND W24ES-U set to a 0.7~0.8 mm gap to be the best plug for general use.

If a plug of the wrong heat range is used, the electrodes may not hot enough to keep all the carbon burned off, but cool enough to keep from damaging the engine and the plug itself — about 400~800°C (750~1,450°F).

Spark Plug (K23)



1. Terminal
2. Insulator
3. Cement
4. Gasket
5. Center Electrode
6. Side Electrode

CAUTION **The carbon on the electrodes conducts electricity, and can short the center electrode to ground by either coating the ceramic insulator or bridging across the gap. Such a short will prevent an effective spark. Carbon build-up on the plug can also cause other troubles. It can heat up red-hot and cause preignition and knocking, which may eventually burn a hole in the top of the piston. The heat range of the spark plug functions like a thermostat for the engine. Using the wrong type of spark plug can make the engine run too hot (resulting in engine damage) or too cold (with poor performance, misfiring, and stalling). The standard plug has been selected to match the normal usage of this motorcycle in combined street and highway riding.**

Table K5 Spark Plug Specifications

Required Plug Threads	Type
Diameter: 14 mm Pitch: 1.25 mm Reach: 19.0 mm	B8ES W24ES-U

Ignition system troubleshooting guide

If trouble is suspected in the ignition system, check the system by the following procedure.

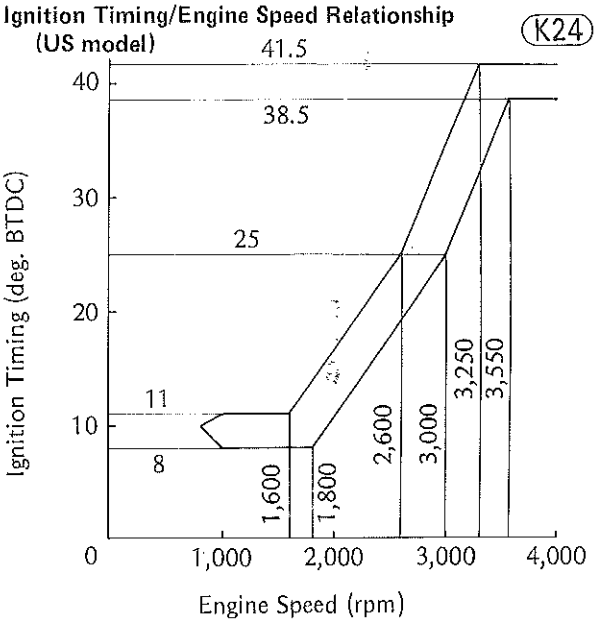
An example of troubleshooting is shown in Fig. K25. To use this chart, follow the arrows on the chart selecting a "yes" or "no" arrow at each diamond-shaped step until you reach the "end". Each test procedure is explained individually on the pages after the chart. This chart is for one half of the ignition circuit; use the same chart for the other half.

Description of Each Testing Procedure

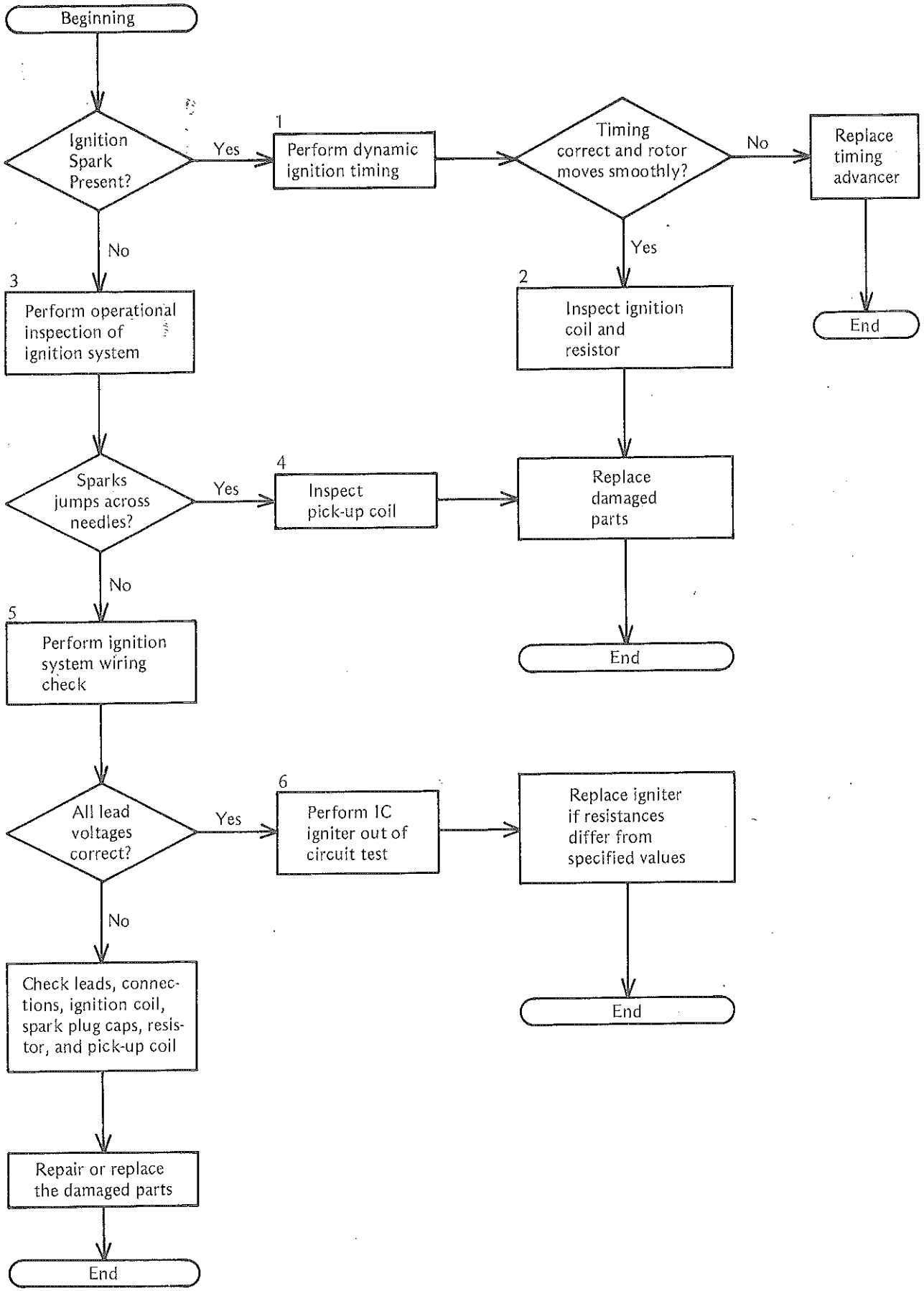
1. Dynamo Ignition Timing Test

Check the ignition timing with a strobe light for both low and high speed operation. Timing advance begins at 1,600 ~ 1,800 rpm (Other than US model: 1,350 ~ 1,550 rpm) and reaches the maximum advance at 3,250 ~ 3,550 rpm. As a result, the timing must be checked at idle and then at above 3,550 rpm (2,450 rpm) when it is fully advanced.

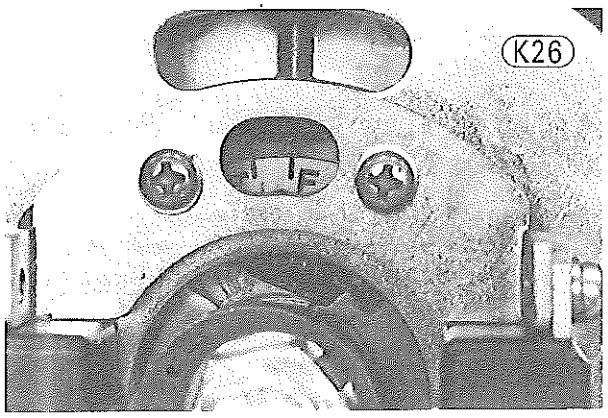
Ignition Timing/Engine Speed Relationship (US model) (K24)



Ignition System Troubleshooting Guide (K25)



Check the timing as follows:
- Connect a strobe light to the #1 or #4 spark plug lead in the manner prescribed by the manufacturer in order to check the ignition timing under operating conditions.
- Turn on the ignition switch and engine stop switch. Start the engine, and direct the strobe light at the timing marks.
- Below 1,600 rpm (Other than US model: 1,350 rpm), the "F" mark on the timing advancer must be aligned with the timing mark above the advancer for correct low rpm ignition timing (Fig. K28A).



- Above 3,550 rpm (2,450 rpm), the advanced timing mark (the vertical lines to the right of the "4" mark) must be aligned with the timing mark above the advancer for correct high rpm ignition timing (Fig. K28B).

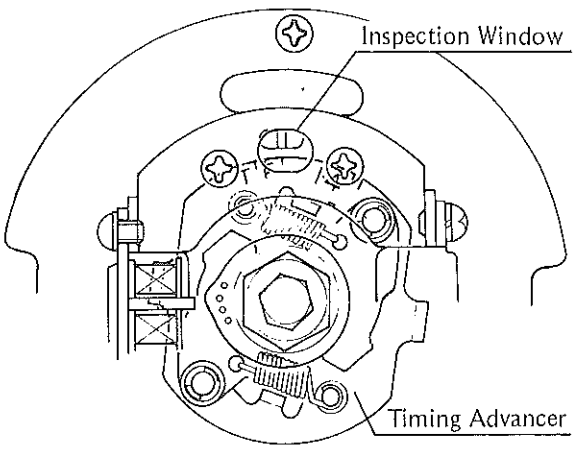
Table K6 Timing Advancing

	Engine Speed (rpm)
Advance Begins	1,600~1,800 ◎ 1,350~1,550
Full Advance	3,250~3,550 ◎ 2,250~2,450

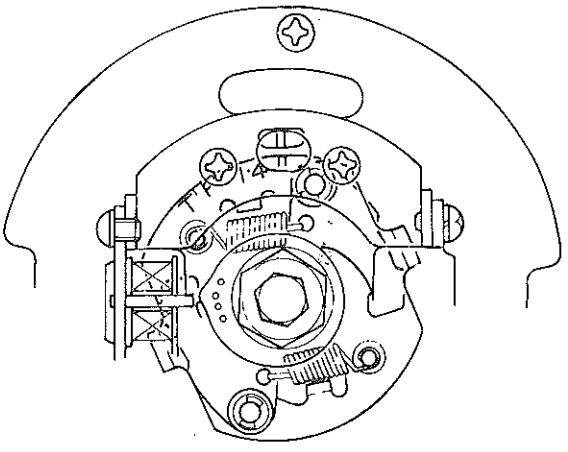
◎ : Other than US model

- If the timing is not correct, check that the rotor on the timing advancer turns smoothly on the shaft by hand and that no parts are visually damaged.

Timing Marks



A. Before Advance



B. Full Advance

- If the timing advancer binds on the shaft, lubricate it and re-check the ignition timing.
- A damaged timing advancer must be replaced with a new one. If advancer lubrication does not remedy the problem, replace the advancer with a new one.

2. Ignition Coil, Resistor Inspection

To check the resistor:
- Remove the left side cover, and disconnect the resistor leads (red and pink).
- Measure for continuity between the resistor leads. If there is more or less resistance than shown in Table K7, replace the resistor.

Resistor Resistance Measurement K27

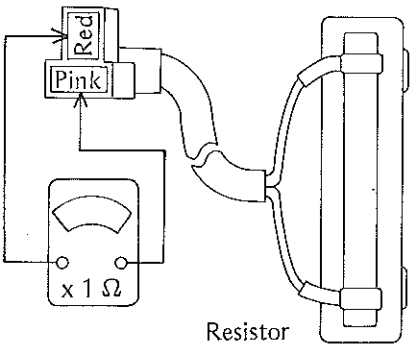


Table K7 Resistor Resistance

Meter	Reading
x 1 Ω	1.5~1.9 Ω

- Using the highest resistance range of the multimeter, measure the resistance between the resistor lead and chassis ground. Any meter reading less than infinity (∞) indicates a short, necessitating armature replacement.

To check the coil:

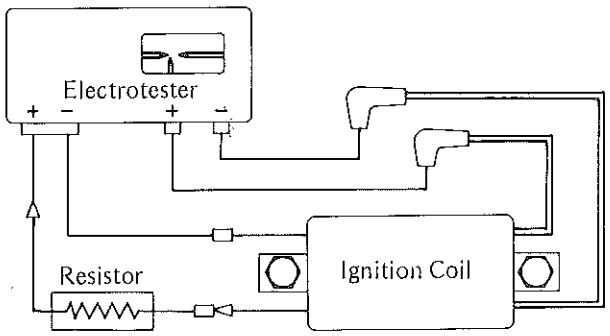
The most accurate test for determining the condition of the ignition coil is made by measuring arcing distance

K28

with the Kawasaki Electrotester. Since a tester other than the Kawasaki Electrotester may produce a different arcing distance, the Kawasaki Electrotester is recommended for reliable results.

- Remove the ignition coil and the resistor.
- Connect the ignition coil with its resistor to the Kawasaki Electrotester as shown in the figure. Do not forget to connect the resistor in series with the ignition coil primary winding.

Ignition Coil Test (K29)



- Turn on the tester switches.

WARNING **Do not touch the coil or leads to avoid extremely high voltage shocks.**

- Gradually slide the arcing distance adjusting knob from left to right (small distance to large distance) carefully watching the arcing.
- Stop moving the knob at the point where the arcing begins to fluctuate, and note the knob position in mm. The reading should show the value in Table K8.

Table K8 Arcing Distance*

Standard
7 mm or more

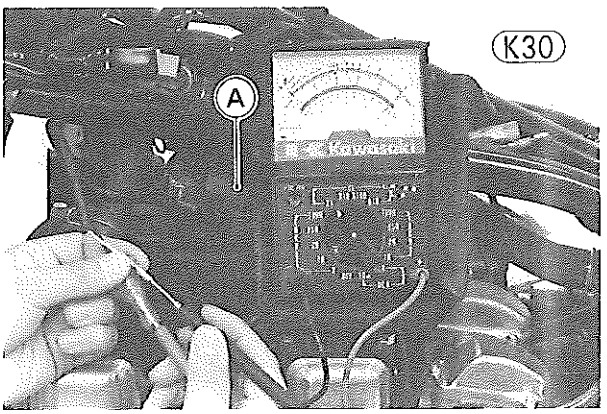
*1. Measure with the Kawasaki Electrotester.
2. Check the resistor before the measurement.

If the distance reading is less than the value shown in the table, the ignition coil or spark plug caps are defective. To determine which part is defective, measure the arcing distance again with the spark plug caps removed from the ignition coil. If the arcing distance is subnormal as before, the trouble is with the ignition coil itself. If the arcing distance is now normal, the trouble is with the spark plug caps.

If an Electrotester is not available, the coil can be checked for a broken or badly shorted winding with an ohmmeter. However, an ohmmeter cannot detect layer shorts and shorts resulting from insulation breakdown under high voltage.

To measure the primary winding resistance:

- Remove the fuel tank (Pg. 41), and disconnect the ignition coil leads.
- Set the ohmmeter to the x 1 Ω range, and connect one ohmmeter lead to the pink lead and the other to the green or black lead from the ignition coil.



A. Ignition Coil

To measure the secondary winding resistance:

- Unscrew the spark plug caps from the spark plug leads.
- Set the ohmmeter to the x 1 kΩ range, and connect one ohmmeter lead to one of the spark plug leads and the other ohmmeter lead to the remaining spark plug lead.

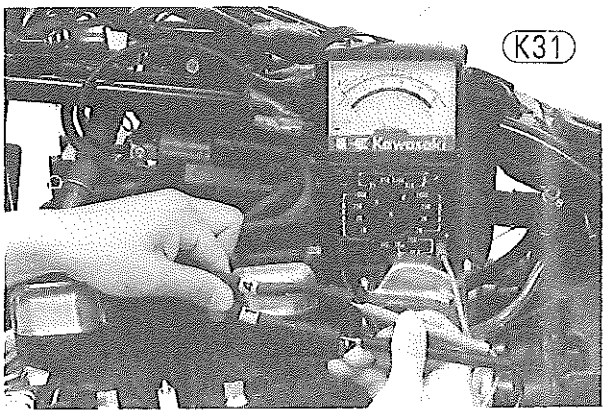


Table K9 Ignition Coil Resistance

	Meter Range	Reading
Primary Winding	x 1 Ω	1.47 ~ 1.63 Ω
Secondary Winding	x 1 kΩ	13.5 ~ 16.5 kΩ

If the coil does not produce an adequate spark, or if either the primary or secondary winding does not have the correct resistance, replace the ignition coil.

With the highest ohmmeter range, check for continuity between each ignition coil pink lead, and one spark plug lead and the coil core (two tests on each coil). If there is any reading, the coil is shorted and must be replaced. Also, replace the ignition coil if either spark plug lead shows visible damage.

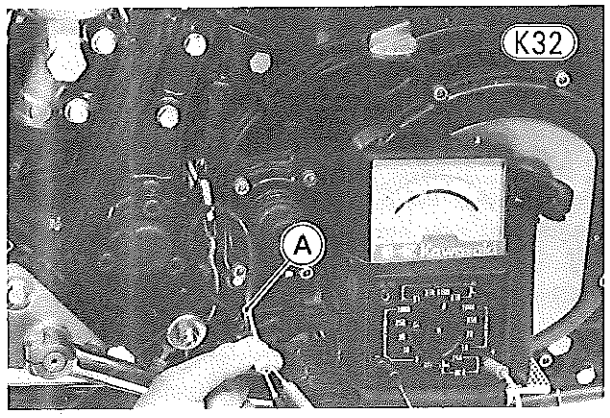
3. Operational Inspection of the Ignition System

- Have a DC voltage source of 6 ~ 12 volts output such as a motorcycle battery.
- Pull off the right side cover, and disconnect the 4-pin connector which connects the IC igniter and the pick-up coils.

●Remove the fuel tank, and pull the spark plug caps off the spark plugs.
●Connect the spark plug leads to the Electrotester in the same way as for measuring the arcing distance. For this test, the Electrotester need not be supplied with electric power.
●Slide the adjusting knob to set the arcing distance to 5~8 mm.
●In the 4-pin connector from the IC igniter, connect the DC voltage source positive (+) lead to the black lead and the negative (–) lead to the blue lead for the #1 and #4 ignition coil (voltage source positive (+) lead to the yellow lead and the negative (–) lead to the red lead for the #2 and #3 ignition coil).
●Turn the ignition switch to the ON position, and switch the DC voltage source on and off.
●As the DC voltage source is switched, sparks should jump across the needles in the Electrotester.

4. Pick-up Coil Inspection

●Connect the multimeter to the pick-up coil leads to measure the coil resistance as shown in the table.



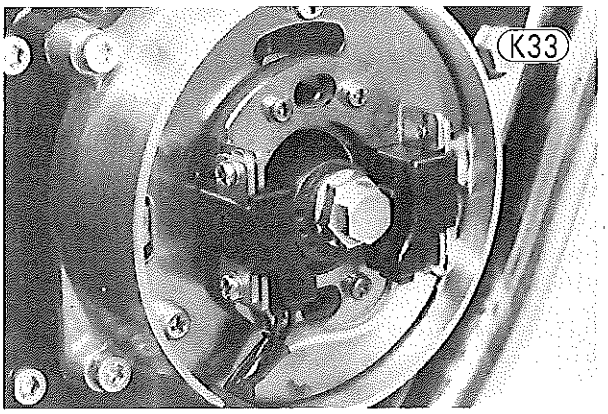
A. Pick-up Coil Leads

Table K10 Pick-up Coil Resistance

Meter Range	Connections	Reading
x100 Ω	One meter lead → Black lead (Yellow†) The other lead → Blue lead (Red†)	405~495 Ω

† Leads for #2 and #3 pick-up coil

●If there is more resistance than shown in the table, the coil has an open lead and must be replaced. Much less than this resistance means the coil is shorted, and must be replaced.
●Using the highest resistance range of the multimeter, measure the resistance between the pick-up coil leads and chassis ground. Any meter reading less than infinity (∞) indicates a short, necessitating replacement of the pick-up coil assembly.
●Visually inspect the pick-up coil assembly. If the permanent magnets and coils are damaged, replace the pick-up coil assembly.



5. Ignition System Wiring Check

●Reconnect all leads and connectors which were disconnected.

Operational Inspection of the Ignition System

K34

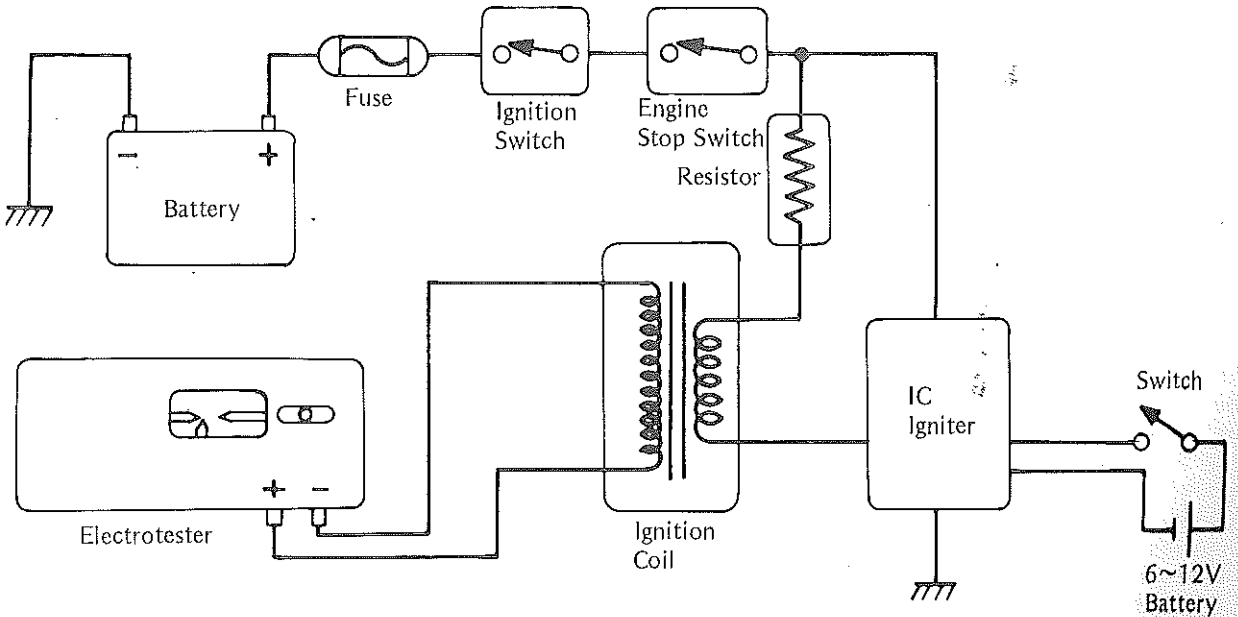


Table K11 Wiring Inspection

Meter Range	Connections*	Location	Reading
20V DC	Meter (+) → Red, Black, or Green	At the frame top tube	Battery voltage
	Meter (+) → Black, Blue, Yellow, or Red	At the 4-pin connector	0.5~1.0 V

*Connect the meter (–) lead to ground.

Table K12 IC Igniter out of Circuit Test

Meter Range	Connections	Location	Reading †
x 1 kΩ	Meter (+) → Black/Yellow Meter (–) → Black or Green	Black/Yellow: inside right side cover	∞
x 100 Ω	Meter (+) → Black or Green Meter (–) → Black/Yellow		200~500 Ω
	Meter (+) → Red Meter (–) → Black/Yellow	Black, Green, and Red: at frame top tube	200~600 Ω
	Meter (+) → Black/Yellow Meter (–) → Red		300~700 Ω
x 1 kΩ	Meter (+) → Blue (Red) Meter (–) → Black (Yellow)	at 4-pin connector	25~45 kΩ
	Meter (+) → Black (Yellow) Meter (–) → Blue (Red)		20~40 kΩ

† Measured with the Kawasaki Hand Tester (P/N 57001-983).
A tester other than the Kawasaki Hand Tester may show slightly different readings.

- Connect the multimeter to the IC igniter leads as shown in the table, turn on the ignition switch, and note the meter readings. Measure the lead voltages with the engine stopped.

6. IC Igniter Out of Circuit Test

- Turn off the ignition switch, and disconnect all the IC igniter leads and connector.
- Connect the multimeter as shown in the table K12 to check the internal resistance of the igniter.

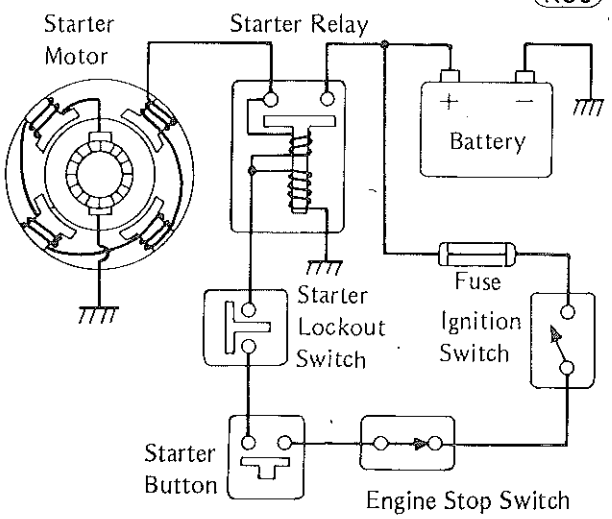
ELECTRIC STARTER SYSTEM

Starter Motor Circuit

The starter motor circuit includes the starter button (switch), starter lockout switch, starter relay, battery, and starter motor. The starter lockout switch mounted on the clutch lever holder is designed to prevent starter motor operation unless the clutch is disengaged. When the ignition switch is on, the clutch lever is pulled (the starter lockout switch is on), and the starter button is pushed, a small amount of current flows through the switch and the relay coil. This current magnetizes the relay core, which then pulls the armature to it, closing the relay contacts. The closed contacts complete a circuit for the starter motor, and the motor turns. The reason for using a relay instead of using the switch to turn on the starter motor directly is that the starter motor requires much current – enough that relatively thick wire is necessary to carry the current to the starte motor. Because it is not practical to put a heavy switch on the handlebar and have large wires running to it, the starter switch is made to carry just the light relay coil current, and heavy contacts inside the relay carry the starter motor current.

CAUTION **Because of the large amount of current, never keep the starter button pushed any time that the starter motor will not turn over, or the current may burn out the starter motor windings.**

Starter Motor Circuit (K35)

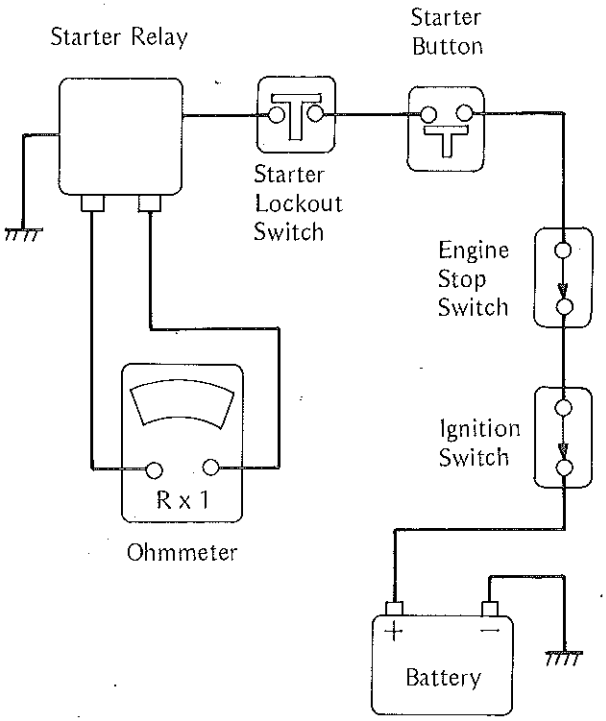


Starter relay test

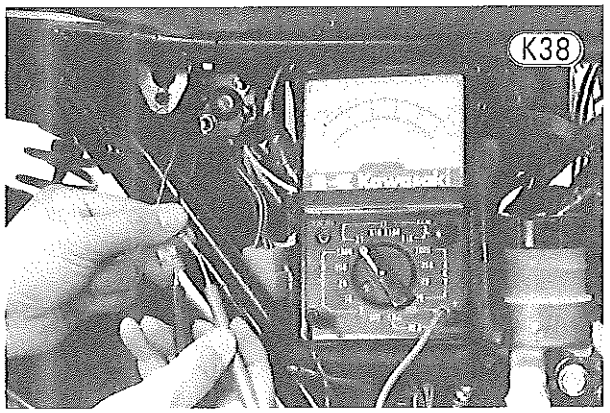
Remove the right side cover and electrical cover. Disconnect both starter motor leads from the starter relay, and connect an ohmmeter set to the x 1 Ω range across the relay terminals. Pulling the clutch lever, push the starter button, and see if the meter reads zero ohms. If the relay makes a single clicking sound and the meter reads zero, the relay is good. If the relay clicks but the meter does not read zero, the relay is defective and must be replaced.

A. Starter Relay

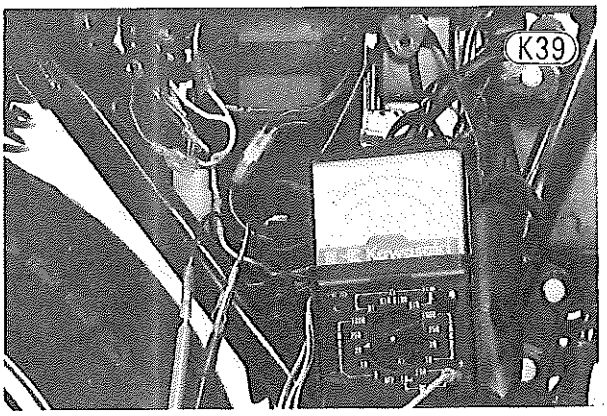
Starter Relay Contact Test (K37)



If the relay does not click at all, disconnect the other two leads, and measure the resistance across them. There should be a few ohms resistance. If the resistance is infinity (no reading) or zero ohms, the relay is defective.

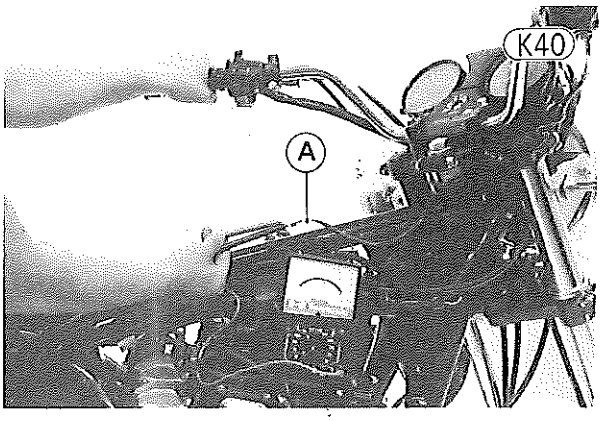


However, if there are a few ohms resistance, the relay may be good; check that there is actually voltage to the relay before deciding that the relay is defective. To check for the voltage, first turn the meter to 20V DC, connect the – meter lead to the balck/yellow lead which was disconnected from the relay, and connect the + meter lead to the black lead. Pulling the clutch lever, push the starter button, and see if the meter reads battery voltage. If the meter does not, there is wiring, starter lockout switch, or starter switch trouble. If the meter reads battery voltage but the relay does not click, the relay is defective.



Starter lockout switch test

Remove the fuel tank (Pg. 41), and disconnect the two starter lockout switch black leads. Connect an ohmmeter set to the x 1 Ω range across the two black leads. Pull the clutch lever, and see if the meter reads zero ohms. If the meter does not, the starter lockout switch is defective and must be replaced.



A. Starter Lockout Switch Black Leads

Starter switch test

Remove the fuel tank (Pg. 41), and disconnect the 4-pin connector and black lead from the right switch housing. Connect an ohmmeter set to the x 1 Ω range across the brown and the black leads. Push the starter button, and see if the meter reads zero ohms. If the meter does not, the starter switch is defective and the entire right switch housing assembly must be replaced.

Starter Motor

The starter motor is installed in a constant-mesh arrangement to transmit starter motor rotation to the crankshaft. A clutch disengages the starter motor once the engine starts. (See the Starter Motor Clutch Paragraph, Pg. 236).

Fig. K43 shows starter motor construction. The field coils ⑪ are wound around four cores ⑧, forming the yoke ①, and the armature windings ⑨ are connected to the commutator ⑭ and receive their current through the brushes ⑬. If the brushes are not making good contact, no starter motor current will flow since the field coils and armature windings are connected in series, and the motor will not turn over. A short or open in a coil or winding may also cause the motor to be inoperative. Particles from brush wear may be another cause of starter motor failure; these particles may get into the bearing at the rear of the motor, causing heat seizure.

Carbon brushes

Worn brushes or weak springs will cause poor brush contact.

Measure the length of the brushes, and replace both if either one is worn down to less than the service limit.

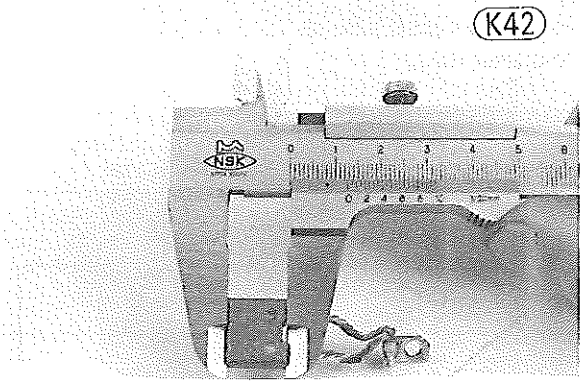
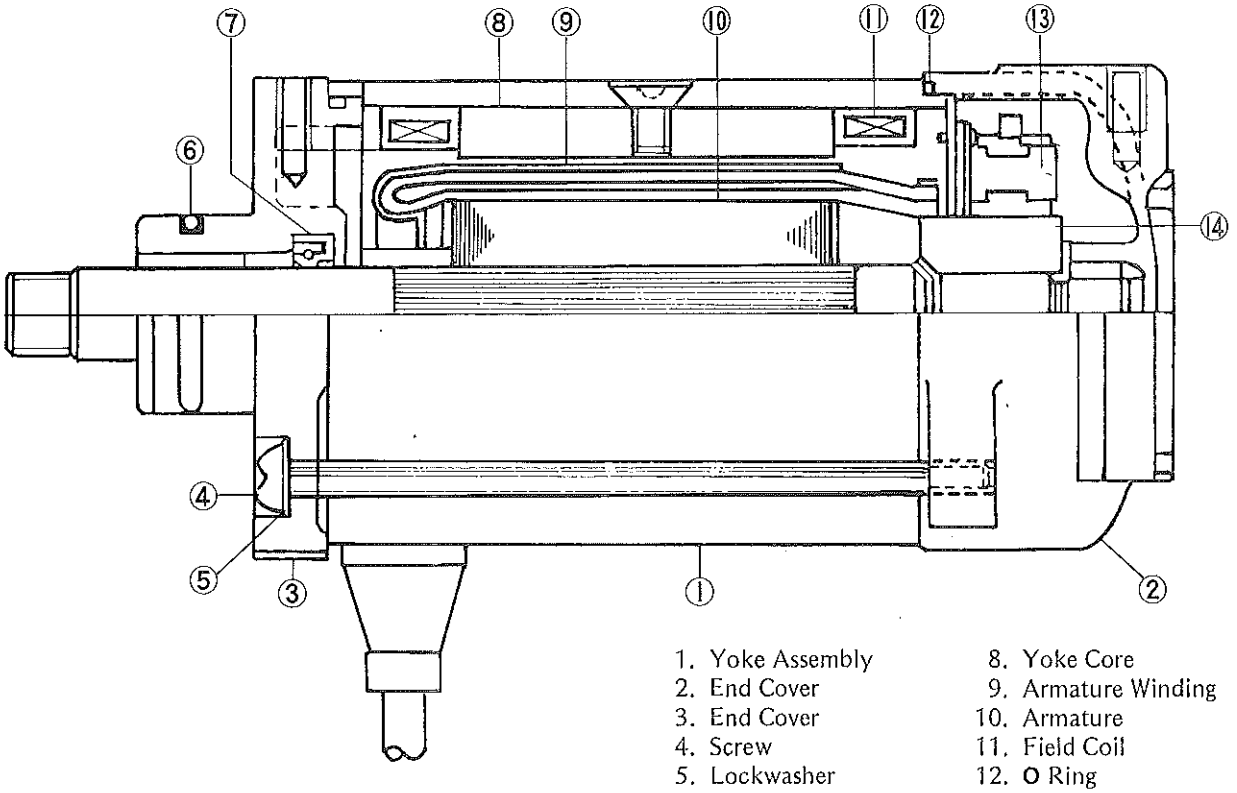


Table K13 Starter Motor Brush Length

Standard	Service Limit
12.0 ~ 13.0 mm	6 mm

Starter Motor Construction



1. Yoke Assembly
2. End Cover
3. End Cover
4. Screw
5. Lockwasher
6. O Ring
7. Grease Seal
8. Yoke Core
9. Armature Winding
10. Armature
11. Field Coil
12. O Ring
13. Brush
14. Commutator

Brush spring

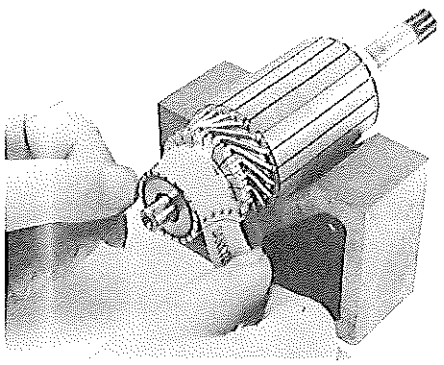
Spring tension should be 560~680 grams but a spring can be considered serviceable if it will snap the brush firmly into place.

Commutator

A dirty or damaged commutator will result in poor brush contact and cause the brushes to wear down quickly. In addition, particles from brush wear accumulating between commutator segments may cause partial shorts.

Smooth the commutator surface if necessary with fine emery cloth, and clean out the grooves as illustrated. Determine as accurately as possible the depth of the grooves between commutator segments. Replace the armature with a new one if the groove depth is less than the service limit.

(K44)



Commutator

(K45)

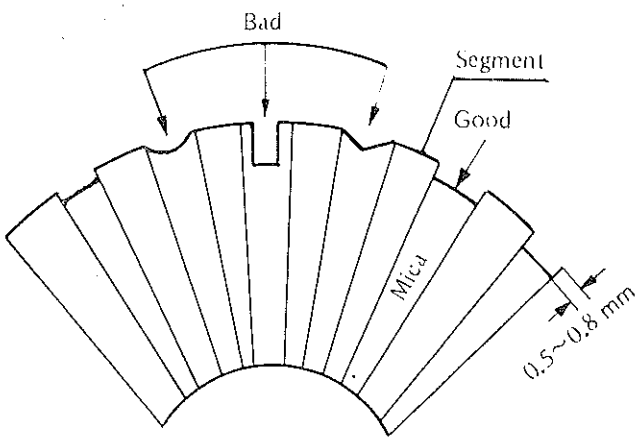
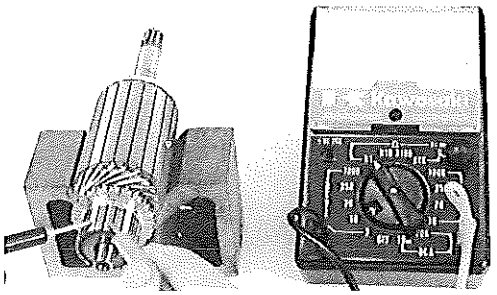


Table K14 Commutator Groove Depth

Standard	Service Limit
0.5~0.8 mm	0.2 mm

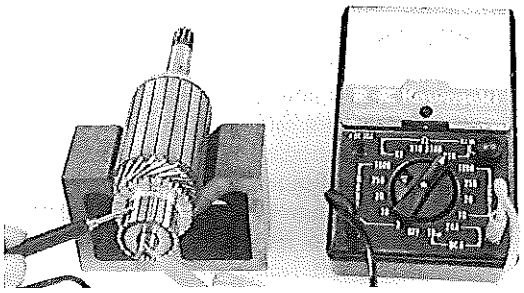
Using the x 1 Ω ohmmeter range, measure the resistance between any two commutator segments. If there is a high resistance or no reading between any two segments, a winding is open and the armature must be replaced.

(K46)



Using the highest ohmmeter range, measure the resistance between the commutator and the shaft. If there is any reading at all, the armature has a short and must be replaced.

(K47)

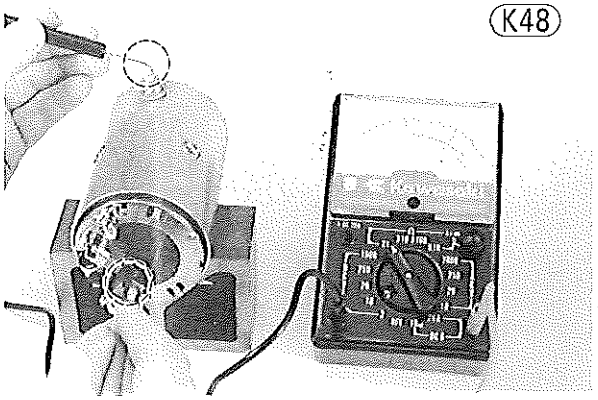


Even if the foregoing checks show the armature to be good, it may be defective in some manner not readily detectable with an ohmmeter. If all other starter motor and starter motor circuit components check good, but the starter motor still does not turn over or only turns over weakly, replace the armature with a new one.

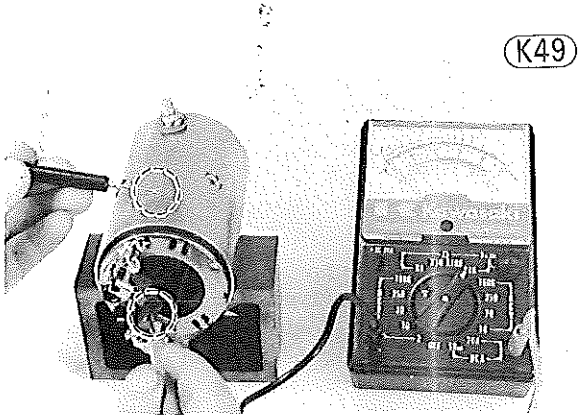
Field coils

Using the x 1 Ω ohmmeter range, measure the resistance between the + side carbon brush and the starter motor terminal. If there is not close to zero ohms, the field coils have an open and the yoke assembly must be replaced.

(K48)



Using the highest ohmmeter range, measure the resistance between the + side carbon brush and the yoke (housing). If there is any meter reading, the coils are shorted to ground and the yoke assembly must be replaced.



Starter Motor Clutch

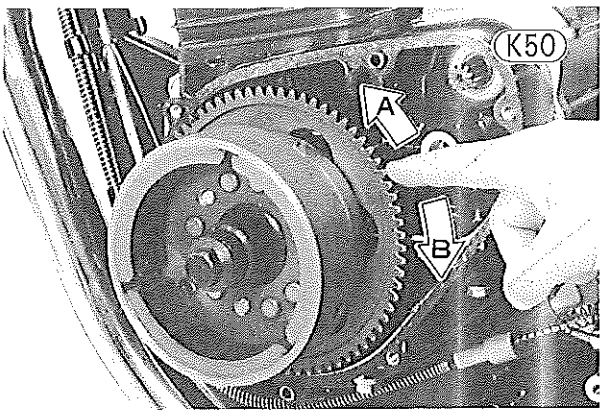
Fig. K51 shows starter motor clutch construction. The clutch body ② is fixed to the crankshaft ④ through the dynamo rotor. When the starter clutch gear ① rotates in the direction of the arrow, each of the three rollers ③, pushed by its spring ⑥, is wedged into the narrower space between the clutch body and the starter clutch gear hub (the portion jutting out from the gear), thereby locking the clutch body and starter clutch gear together. With these two locked, starter motor rotation is transmitted to the crankshaft through the idle gear, starter clutch gear, rollers, clutch body, and rotor.

When the engine starts, friction with the starter clutch gear (and at higher speeds, inertia) moves the rollers back against the tension of their springs so that they no longer serve as wedges locking the clutch body and starter clutch gear together. In this manner, the engine rotates freely without forcing the starter motor to turn with it.

If the rollers or the starter clutch gear hub becomes damaged or worn, the rollers may lock in place so that the starter motor will not disengage when the engine starts. On the other hand, roller or sprocket hub damage could prevent the clutch from engaging properly, causing the starter motor to run freely without transmitting rotation.

Clutch inspection

Remove the alternator cover and starter idle gear (Pg. 77), and turn the starter clutch gear by hand. The starter clutch gear should turn clockwise freely, but should not turn counterclockwise. If the clutch does not operate as it should or if it makes noise, disassemble the starter clutch (Pg. 77), examine each part visually, and replace any worn or damaged parts.

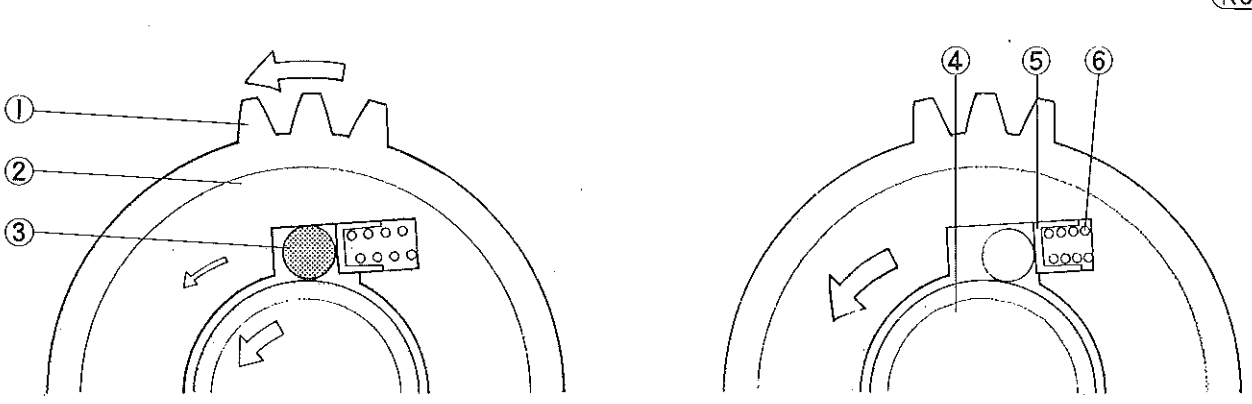


A. Should not turn. **B. Should turn freely.**

IGNITION SWITCH

The ignition switch has three positions: off, on, and park. In the off position all circuits are turned off and the key can be removed from the switch. In the on position the motorcycle can be started and all electrical equipment can be used. The key cannot be removed from the switch when it is in the on position. In the park position the tail light is on and hazard circuit can be used, but all other circuits are cut off and the key can be removed from the switch.

Starter Motor Clutch Operation

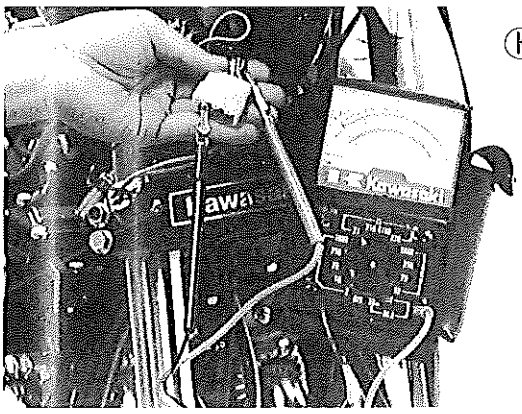


1. Clutch Gear
2. Clutch Body
3. Roller
4. Crankshaft
5. Spring Cap
6. Spring

This provides added visibility when the motorcycle is parked.

Testing the switch

Table (Pg. 254 or 255) shows the internal connections of the ignition switch for each switch position. To check the switch, remove the headlight unit, and disconnect the 6-pin connector and brown lead from the switch. Then use an ohmmeter to verify that all the connections listed in the table are making contact (zero ohms between those wires), and that no other wires are connected. If there are any opens or shorts in the switch, replace it with a new one.



K52

LIGHTING SYSTEM

Headlight Circuit

In the US and Canadian models, there is no headlight switch, and when the ignition switch is turned on, the headlight circuit is completed.

In the European model, the center "PO" position of the headlight switch turns on the small city light, tail light, and meter lights for driving in the city after dark. When the switch is turned to the "ON" position, the headlight illuminates and the city light stays on. With the dimmer switch, high and low beam can be selected only when the headlight switch is in the "ON" position.

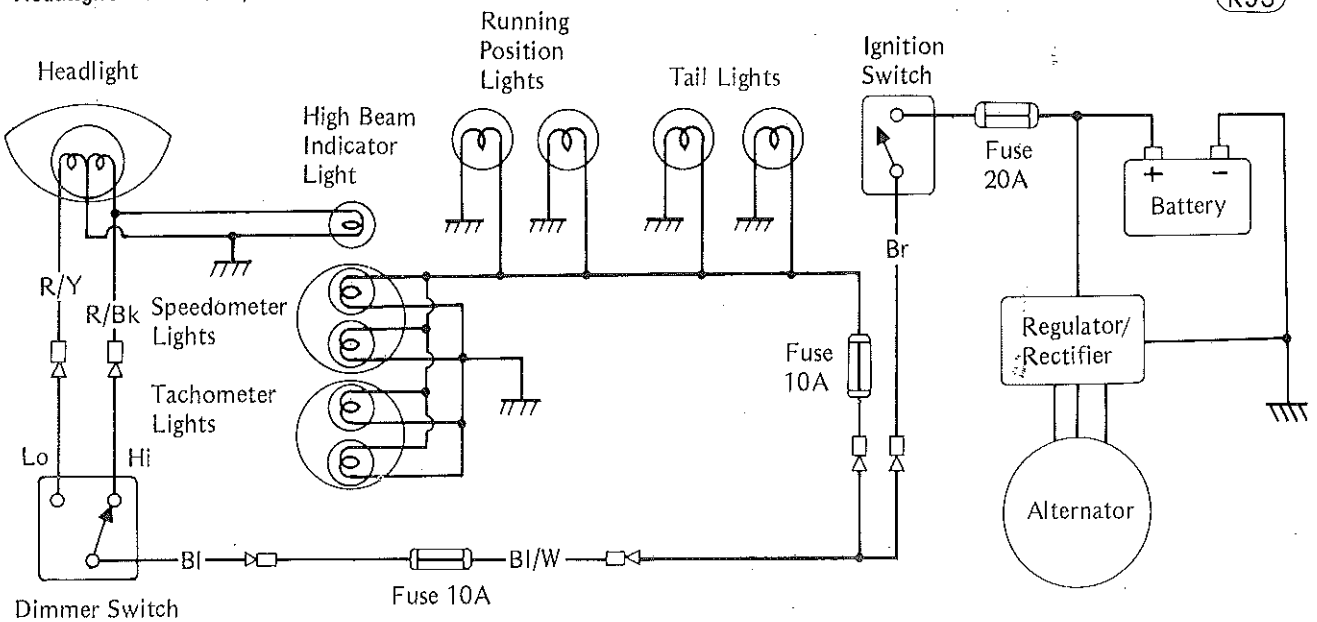
In the European model, there is also a passing and horn button. This button is spring loaded and when the button is pushed to pass, the high beam light (but not the tail light) comes on as a passing signal to the driver of the vehicle ahead. The passing button will light the high beam light regardless of the headlight switch position, and the button will spring back and turn the light off as soon as it is released.

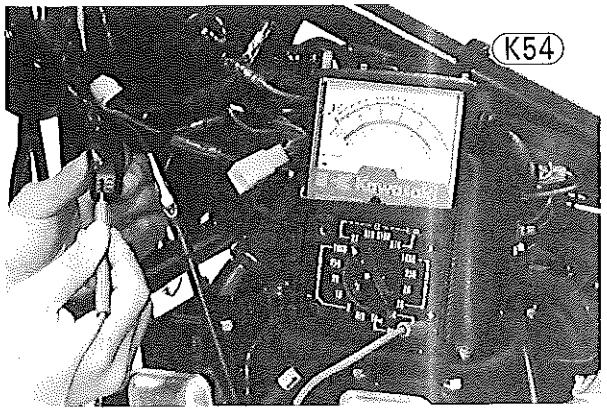
Headlight trouble

If the headlight does not light, check to see if the bulb has burned out or fuses have blown. If the bulb on the US or Canadian model has burned out, the sealed beam unit must be replaced. A blown fuse should be replaced. On the European model the headlight or the city light can be replaced separately, as the headlight is of semi-sealed construction. If the bulb and fuses are good, check the dimmer switch and the headlight switch. Remove the fuel tank (Pg. 41), and disconnect the 6-pin connector to the dimmer switch. On the European model, disconnect also the brown lead to the passing button or the 4-pin connector and blue/white lead to the headlight switch. Use an ohmmeter to see that only the connections shown in the tables (Pg. 255) have continuity (zero ohms). If the switch has an open or a short, it can be disassembled for repair. The contact surfaces may be cleaned, but no internal parts are available for replacement. If any parts are not repairable, the switch must be replaced as a unit. If the procedure above does not remedy the problem, check the ignition switch and the wiring.

Headlight Circuit (US, Canadian model)

K53





If the headlight lights but does not light brightly, the trouble may be that the headlight is of improper wattage or the alternator is not supplying sufficient current. However, the trouble may also be caused by a short or a component drawing too much current in some other part of the electrical system.

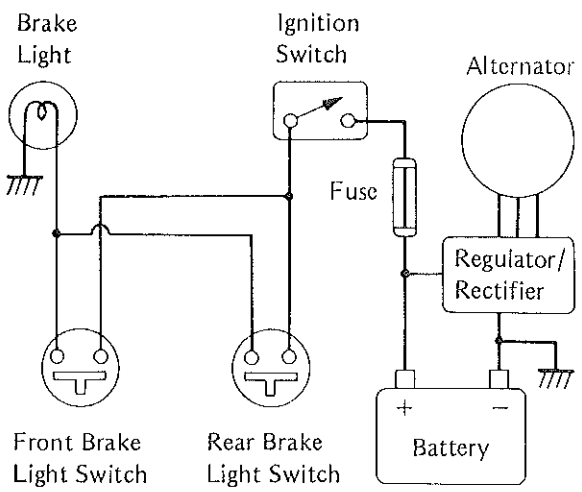
Tail light trouble

If the tail light does not go on when the circuit is closed, the filament is probably burned out. However, if the bulb is good, check the fuses, wiring, ignition switch, headlight switch, and battery.

Brake Light Circuit

The brake light circuit is shown in Fig. K55. When the ignition switch is turned on, the brake light goes on whenever the circuit is closed by either the front or rear brake light switch. The same bulb is used for both the brake and tail lights as explained in the preceding section.

Brake Light Circuit (K55)



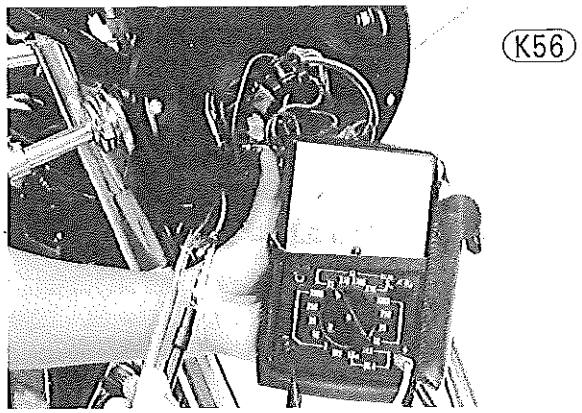
The front brake light switch, mounted on the front brake lever holder, is actuated when pressed by the front brake lever. The front brake light switch never requires adjustment and so is not designed to be adjusted. It cannot be disassembled for repair and must be replaced when defective.

The rear brake light switch is a plunger type switch actuated by a spring attached to the rear brake pedal. It can be adjusted by changing its position higher or lower in the mounting bracket (See Pg. 25).

Brake light circuit inspection involves the front brake light switch, rear brake light switch, brake light, and wiring.

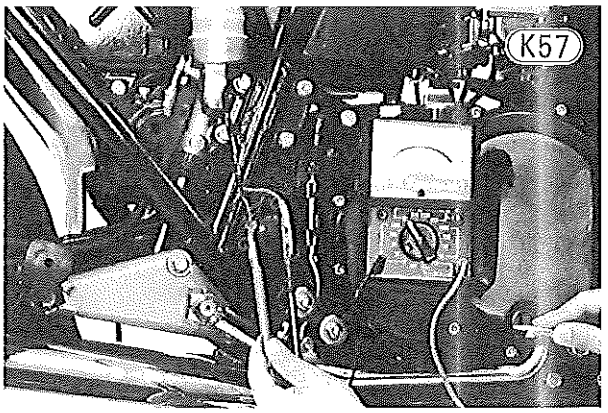
Front brake light switch inspection

- Remove the headlight unit (Pg. 137).
- Disconnect the front brake light switch leads (Brown, blue).
- Set an ohmmeter to the x 1 Ω range, connect the meter to the switch leads, and determine whether or not there is continuity whenever the front brake lever is squeezed. If there is no continuity, replace the switch.



Rear brake light switch inspection

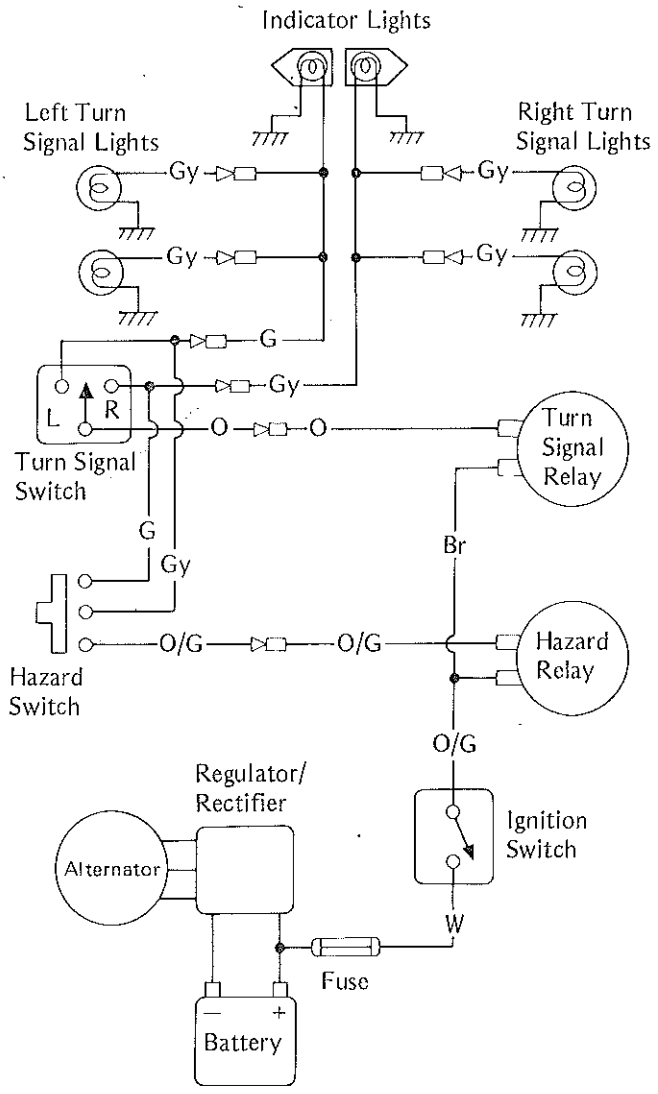
- Disconnect the rear brake light switch leads in the right side cover.
- Inspect in the same way that the front brake light switch was inspected. If there is no continuity whenever the rear brake pedal is depressed, replace the switch.



Turn Signal and Hazard Circuit

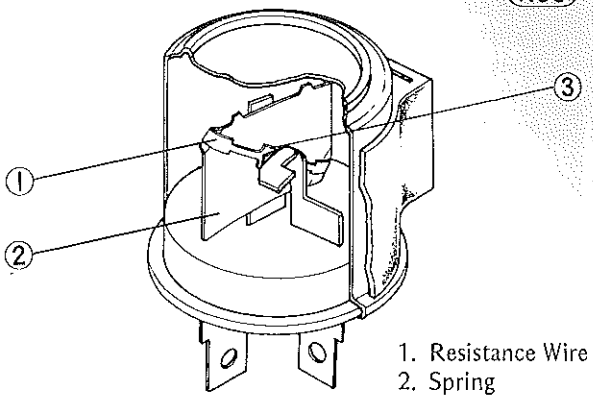
A wiring diagram of the turn signal circuit is shown in Fig. K58. When the ignition switch is on and the turn signal switch is turned to R or L, a ground is provided for the circuit so current can flow. Current to the right or left turn signals flow through the closed contacts and the resistance wire inside the turn signal relay, and the turn signals go on. The resistance wire quickly, heats up, expands, and allows a spring to pull the contacts open. When the contacts have opened, the circuit is broken, the turn signals go off, and the resistance wire cools and contacts, closing the contacts so that the cycle can begin again. The indicator light in the turn signal circuit flashes on and off with the turn signals to indicate that they are working properly.

Turn Signal and Hazard Circuit (K58)



When the hazard switch is pushed with the ignition switch in the ON or PARK positions, all the turn signal lights and indicator lights flash on and off.

Turn Signal Relay (K59)



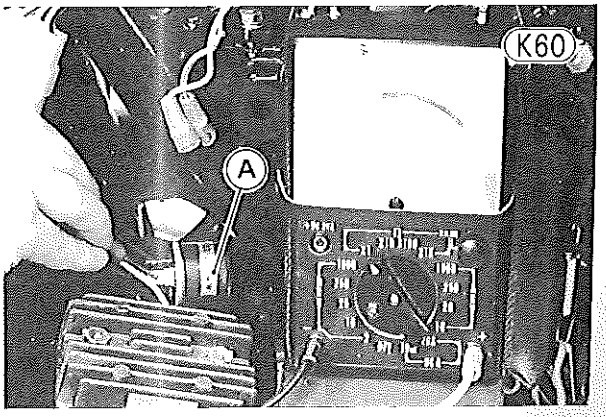
1. Resistance Wire
2. Spring
3. Contacts

Since the turn signal relay is designed to operate correctly only when two turn signals (one front and one rear) and the turn signal indicator light are properly connected in the circuit, trouble may result from a burned out bulb, a bulb of incorrect wattage, loose wiring, as well as from a defect in the relay itself. In general, if the trouble with the circuit is common to both right and left turn signals, it is probably caused by a defective turn signal relay, although it may be due to a bad switch, wiring or battery. If the trouble is with only one side — either right or left — then the relay is not at fault since the same relay is used for both sides.

Turn signal trouble

(1)Neither right nor left turn singals come on at all:

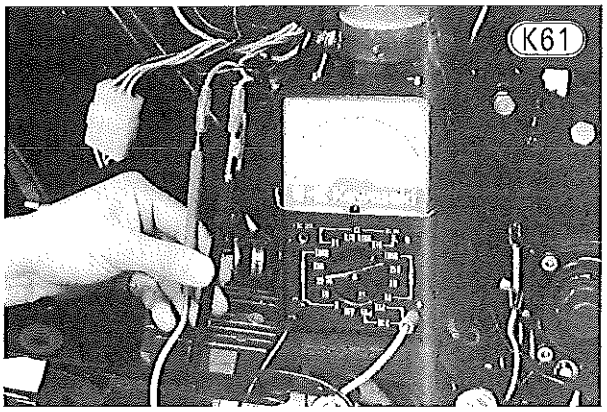
- Check that battery voltage is normal.
- Remove the electrical cover.
- Unplug the relay leads from the relay, and use an ohmmeter to check that there is continuity (close to zero ohms) between the relay terminals. If there is no ohmmeter reading, or if there is several ohms resistance, replace the relay with a new one.



A. Turn Signal Relay

- If the relay check good, turn the meter to the 20V DC range, connect the + meter lead to the orange/green lead that was disconnected from the relay, and connect the — meter lead to the

orange lead. With the ignition switch on and with the hazard switch off, first switch the turn signal switch to the R and then to the L position. The meter should register battery voltage at either position. If it does not, the fuse, ignition switch, or wiring is at fault. If battery voltage is read on the meter but the turn signals still will not work when the relay is reconnected, then recheck all wiring connections.



(2) Both right or both left turn signals come on and stay on or flash too slowly:
- Check that battery voltage is normal.
- Check that all wiring connections are good.
- Check that the turn signal bulbs and indicator bulbs are of the correct wattage.
- If all of the above check good, replace the relay.

(3) A single light on one side comes on and stays on:
- Either the light that does not come on is burned out or of the incorrect wattage, or the wiring is broken or improperly connected.

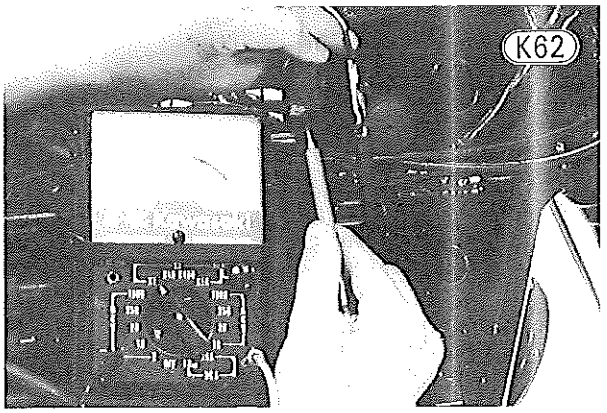
(4) Neither light on one side comes on:
- Unless both lights for that side are burned out, the trouble is with the turn signal switch.

(5) Flashing rate is too fast:
- If this occurs on both the right and left sides, check that the battery is not being overcharged (indicating a defective regulator). If the regulator and the battery voltage are normal, replace the turn signal relay.
- If this occurs on only one side, one or both of the turn signal bulbs are of too high a wattage.

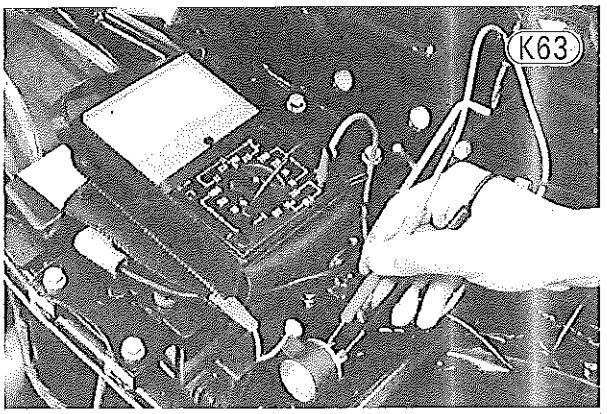
Testing the hazard circuit

Before testing the hazard circuit, check the ignition switch connections and turn signal operation.

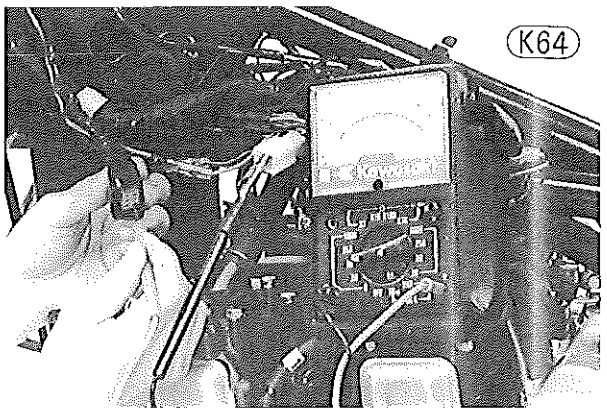
- Tables on Pg. 254 or 255 show the internal connections of the hazard switch. To check the switch, disconnect the 6-pin connector and orange/green lead from the hazard switch under the fuel tank, and use an ohmmeter to verify that there is continuity between all the connections that are listed in the table. If the switch has an open or short, the switch must be replaced.



- Disconnect the hazard relay leads under the seat, and check the resistance between the relay terminals. There should be about 60 Ω. If there is no ohmmeter reading, or if there is zero ohms resistance, replace the relay with a new one.



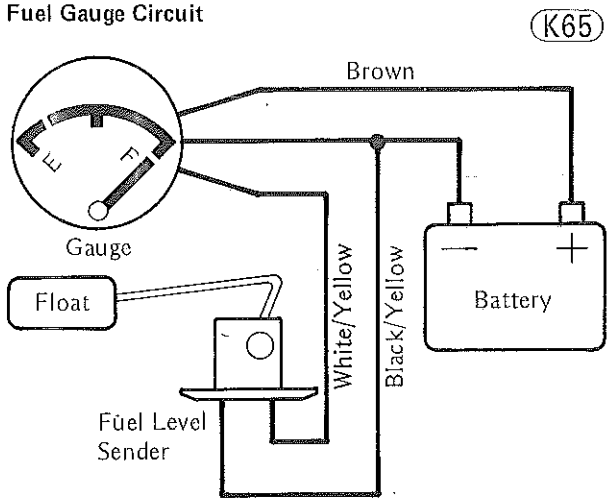
- If the relay and hazard switch are good, go on to the following check.
- Connect the hazard switch green/orange lead under the fuel tank.
- Set the multimeter to the 20V DC range, connect the + meter lead to the gray lead from the left switch housing, and connect the – meter lead to the other gray lead. With the hazard switch on, first switch the ignition switch to the ON position and then to the PARK position. Do the same with the green lead from the left switch housing. The meter should register battery voltage at both positions. If it does not, the fuse, hazard switch, or wiring is at fault.



FUEL GAUGE

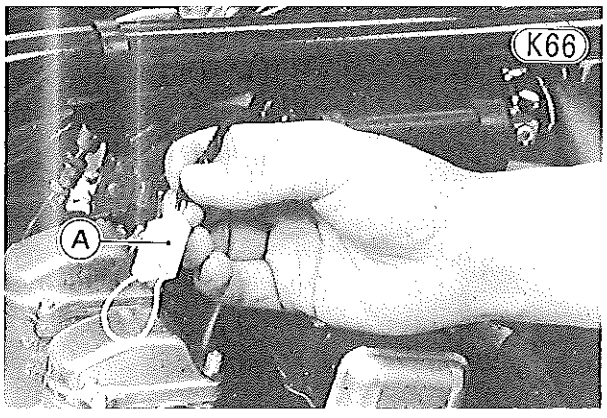
The fuel gauge is electrically operated through a sender in the fuel tank. A float in the tank rides up and down with the level of the fuel, changing the internal resistance of the sender and in this way changing the amount of current flowing through the meter. The gauge is of the bimetal type with a 7-volt voltage regulator built into it for over voltage protection.

Fuel Gauge Circuit



Gauge circuit check

- Disconnect the 2-pin connector to the sender underneath the fuel tank, and turn on the ignition switch. At this time the gauge should read E.
- Short together the black/yellow and white/yellow leads on the gauge side of the 2-pin connector. At this time the gauge should read F.

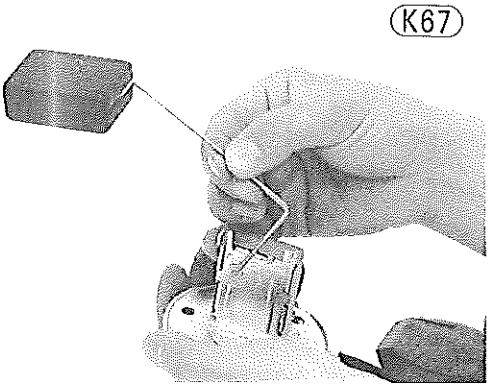


A. 2-pin Connector

- If the above E and F readings are correct, the fuel level sender is bad. If these reading are not obtained, the trouble is with the gauge or wiring.

Fuel level sender check

- Remove the fuel tank (Pg. 41), and remove the fuel level sender (Pg. 42).
- Check that the float moves up and down smoothly without binding or hitting the fuel tank. It should go down under its own weight. If the float does not move smoothly, replace the sender.



- Measure the resistance of the fuel level sender with an ohmmeter.

Table K15 Resistance of Fuel Level Sender

Tank	Resistance
Fuel (Highest position)	1~5 Ω
Empty (Lowest position)	103~117 Ω

- If the ohmmeter does not show the valves in the table or the reading does not vary smoothly as the float level changes, replace the sender.
- Inspect the leads and connector. If they show any damage, replace the sender.

Gauge check

- Remove the headlight unit (Pg. 137), and disconnect the 4-pin connector from the gauge meter. Check the resistance of the meter using an ohmmeter as shown in Table K16. If the resistance in this test is found to be less than the proper value, there is a short in the meter. No reading (∞) indicates an open circuit. In either case, replace the gauge meter.

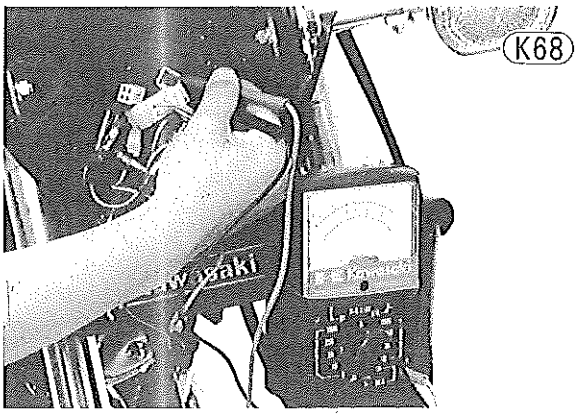


Table K16 Gauge Resistance

Connections	Reading
One meter lead → Terminal for brown lead	60~80 Ω
The other meter lead → Bk/Y lead terminal	

Wiring check

- Connect the brown lead to the fuel gauge.

- Connect a voltmeter to the 4-pin connector from the main harness as show in the table, and turn on the ignition switch. If the voltmeter reading does not correspond to the table, the wiring is bad. Check the leads and connectors, and replace or repair any damaged wiring.

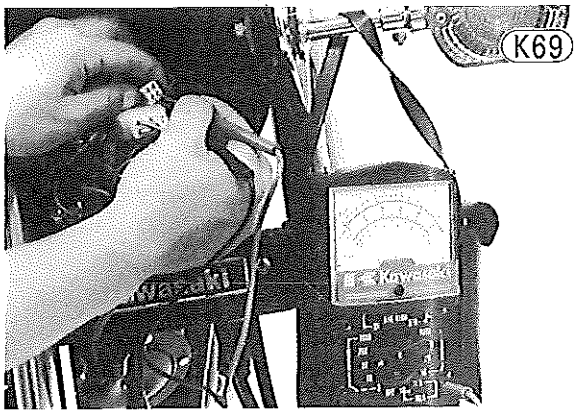


Table K17 Wiring Check

Meter Range	Connections	Reading
20V DC	Meter (+) → Brown Lead	Battery voltage
	Meter (–) → Black/Yellow Lead	

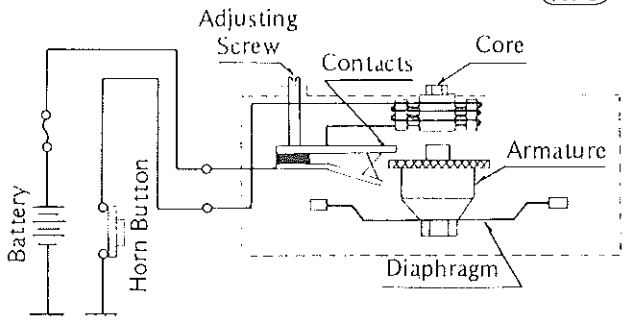
NOTE: With one exception the gauge is considered to be good even if the voltmeter needle fluctuates. The exception is when the trouble is over-indication on the gauge (or indicating near the "F" mark when empty).

HORN

The horn circuit and construction are shown in Fig. K70. When the horn button is pressed with the ignition switch on, the horn is grounded to complete the horn circuit. Current then flows through the horn contacts and horn coil, magnetizing the iron core. The magnetized iron core pulls on the armature and diaphragm assembly, themovement of which pushes open the contacts, interrupting the current flow. Since the core now loses its magnetism, the armature and diaphragm assembly springs back to its original position, closing the contacts. This cycle repeats until the horn button is released. Since each cycle takes only a fraction of a second, the diaphragm moves fast enough to produce sound.

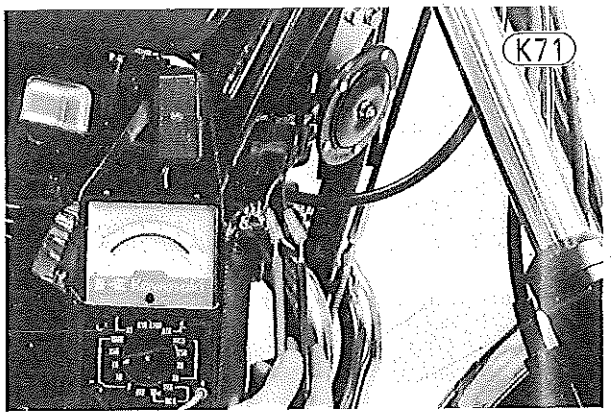
The contacts wear down after long use, requiring adjustment from time to time (Pg. 28). If the horn itself is determined to be at fault and adjustment fails to correct the trouble, the contacts or some other component in the horn is defective. The horn cannot be disassembled and must be replaced if defective.

Horn Construction (K70)



Horn trouble

- Check that battery voltage is normal.
- Disconnect the leads to the horn, and connect to the horn terminals a multimeter set to the x 1 Ω range to check for continuity (close to zero ohms). If the reading is several ohms or if there is no reading at all, replace the horn.
- If the reading is very close to zero, set the multimeter to the 20V DC range, and connect the meter to the leads that were disconnected from the horn. The + meter lead goes to the brown lead, and the – meter lead goes to the black/white lead. With the ignition switch on, press the horn button. The meter should register battery voltage. If it does not, the fuse, ignition switch, or the wiring is at fault.



- If the meter does show battery voltage, indicating that the horn trouble lies within the horn itself, and adjustment fails to correct the trouble, replace the horn.

CAUTION **Do not loosen the armature mounting since doing so would alter the armature position such that the horn probably would have to be replaced.**

SPEEDOMETER, TACHOMETER

The speedometer and tachometer are sealed units which cannot be disassembled. If either fails to work satisfactorily, it must be replaced as a complete unit.

The speedometer and tachometer lights and the indicator lights are independent and can be removed for replacement if necessary.

There is damping oil around the meter needle shaft which damps needle flutter and makes the needle move smoothly. If the meters are left upside down or sideways for any length of time, the damping oil will spill out of the reservoir, and the meters will malfunction.

Troubleshooting—Guide

Engine Doesn't Start; Starting Difficulty

Starter motor not rotating
- Clutch lever not pulled
- Starter motor defective
- Battery voltage low
- Relay not contacting or operating
- Starter button not contacting
- Wiring open or shorted
- Ignition switch defective
- Engine stop switch defective
- Engine stop switch off
- Fuse blown
- Starter lockout switch defective

Starter motor rotating but engine doesn't turn over
- Starter motor clutch defective
- Alternator rotor bolt loosened

Engine won't turn over
- Valve seizure
- Valve lifter seizure
- Cylinder, piston seizure
- Crankshaft seizure
- Connecting rod small end seizure
- Connecting rod big end seizure
- Transmission gear or bearing seizure
- Camshaft seizure
- Kick ratchet gear not engaging
- Primary reduction gear broken

No fuel flow
- No fuel in tank
- Fuel tap turned off
- Tank cap air vent obstructed
- Fuel tap clogged
- Fuel line clogged
- Float valve clogged

Engine flooded
- Fuel level too high
- Float valve worn or stuck open
- Starting technique faulty
- (When flooded, kick with the throttle fully open to allow more air to reach the engine.)

No spark; spark weak
- Ignition switch not on
- Engine stop switch turned off
- Battery voltage low
- Spark plug dirty, defective, or maladjusted
- Spark plug cap or high tension wiring defective
- Spark plug cap not in good contact
- IC igniter defective
- Pick-up coil defective
- Ignition coil defective
- Ignition or engine stop switch shorted
- Wiring shorted or open

Compression low
- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston rings bad (worn, weak, broken, or sticking)
- Piston ring/land clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

Poor Running at Low Speed

Spark wear
- Battery voltage low
- Spark plug dirty, defective, or maladjusted
- Spark plug cap or high tension wiring defective
- Spark plug cap not in good contact
- Spark plug incorrect
- IC igniter defective
- Pick-up coil defective
- Ignition coil defective

Fuel/air mixture incorrect
- Air screw(s) maladjusted
- Pilot jet, or air passage clogged
- Air bleed pipe bleed holes clogged
- Air cleaner clogged, poorly sealed, or missing
- Air cleaner duct poorly sealed
- Starter plunger stuck open
- Fuel level too high or too low
- Fuel tank air vent obstructed
- Carburetor holders loose

Compression low
- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston rings bad (worn, weak, broken or sticking)
- Piston ring/land clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

Acceleration poor
- Accelerator pump defective

Other
- Timing not advancing (spring broken or stretched)
- Carburetors not synchronizing
- Throttle valves don't slide smoothly
- Engine oil viscosity too high
- Brakes dragging
- Air suction valve defective
- Air switch valve defective

Poor Running or No Power at High Speed

Firing incorrect
- Spark plug dirty, defective, or maladjusted
- Spark plug cap or high tension wiring defective
- Spark plug cap not in good contact
- Spark plug incorrect
- IC igniter defective
- Pick-up coil defective
- Ignition coil defective
- Timing not advancing

Fuel/air mixture incorrect
- Main jet clogged or wrong size
- Jet needle or needle jet worn
- Jet needle clip in wrong position
- Fuel level too high or too low
- Air bleed pipe bleed holes clogged
- Air cleaner clogged, poorly sealed, or missing
- Air cleaner duct poorly sealed
- Starter plunger stuck open
- Water or foreign matter in fuel
- Carburetor holders loose
- Fuel tank air vent obstructed
- Fuel tap clogged
- Fuel line clogged

Compression low
- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston rings bad (worn, weak, broken, or sticking)
- Piston ring/land clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface.)

Knocking
- Carbon built up in combustion chamber
- Fuel poor quality or incorrect
- Spark plug incorrect

Miscellaneous
- Throttle valve won't fully open
- Throttle valves don't slide smoothly
- Timing not advancing
- Brakes dragging
- Clutch slipping
- Overheating
- Engine oil level too high
- Engine oil viscosity too high
- Air suction valve defective
- Air switch valve defective

Overheating

Firing incorrect
- Spark plug dirty, damaged, or maladjusted
- Spark plug incorrect

Fuel/air mixture incorrect
- Main jet clogged
- Fuel level too low
- Carburetor holders loose
- Air cleaner poorly sealed, or missing
- Air cleaner duct poorly sealed

Compression high
- Carbon built up in combustion chamber

Engine load faulty
- Clutch slipping
- Engine oil level too high
- Engine oil viscosity too high
- Brakes dragging

Lubrication inadequate
- Engine oil level too low
- Engine oil poor quality or incorrect

Clutch Operation Faulty

Clutch slipping
- No clutch lever play
- Friction plates worn or warped
- Steel plates worn or warped
- Clutch springs broken or weak
- Clutch release maladjusted
- Clutch inner cable catching
- Clutch release mechanism defective
- Clutch hub or housing unevenly worn

Clutch not disengaging properly
- Clutch lever play excessive
- Clutch plates warped or too rough
- Clutch spring tension uneven
- Engine oil deteriorated
- Engine oil of too high a viscosity
- Engine oil level too high
- Clutch housing frozen on drive shaft
- Clutch release mechanism defective
- Loose clutch hub nut

Gear Shifting Faulty

Doesn't go into gear; shift pedal doesn't return
- Clutch not disengaging
- Shift fork(s) bent or seized
- Gear(s) stuck on the shaft
- Shift drum positioning pin binding
- Shift pedal return spring weak or broken
- Shift lever broken
- External shift mechanism pawl broken
- Shift return spring pin loose
- Pawl spring broken

Jumps out of gear
- Shift fork(s) worn
- Gear groove(s) worn
- Gear dogs, dog holes, and/or dog recesses worn
- Shift drum groove(s) worn
- Shift drum positioning pin spring weak or broken
- Shift fork pin(s) worn
- Drive shaft, output shaft, and/or gear splines worn

Overshifts
- Shift drum positioning pin spring weak or broken
- Pawl spring weak or broken

Abnormal Engine Noise

Knocking
- Carbon built up in combustion chamber
- Fuel poor quality or incorrect
- Spark plug incorrect

Piston slap
- Cylinder/piston clearance excessive
- Cylinder, piston worn
- Connecting rod bent
- Piston pin, piston holes worn

Valve noise
- Valve clearance incorrect
- Valve spring broken or weak
- Camshaft bearings worn
- Valve lifter worn

Other noise
- Connecting rod small end clearance excessive

Connecting rod big end clearance excessive
Piston ring(s) worn, broken, or stuck
Piston seizure damage
Cylinder head gasket leaking
Exhaust pipe leaking at cylinder head connection
Crankshaft runout excessive
Engine mounting loose
Crankshaft bearings worn
Camshaft chain tensioner defective
Camshaft chain, sprocket, guides worn
Loose alternator rotor
Air injection valve damaged
Vacuum switch valve damaged

Abnormal Drive Train Noise

Clutch noise
Clutch housing/friction plate clearance excessive
Wear or damaged shock rubber damper(s)
Cam damper damaged

Transmission noise
Bearings worn
Transmission gears worn or chipped
Metal chips jammed in gear teeth
Engine oil insufficient
Kick ratchet gear not properly disengaging from kick gear

Drive line noise
Bevel gear bearings worn
Bevel gears worn or chipped
Bevel gears maladjustment
Cam damper damaged
Rear wheel coupling splines damaged
Insufficient lubricant

Abnormal Frame Noise

Front fork noise
Oil insufficient or too thin
Spring weak or broken

Rear shock absorber noise
Shock absorber defective

Disc brake noise
Pad B loose
Pad A installed reversely
Pad surface glazed
Disc warped

Other noise
Brackets, nuts, bolts, etc. nor properly mounted or tightened

Oil Pressure Indicator Light Goes On

Engine oil pump defective
Engine oil screen clogged
Engine oil level too low
Engine oil viscosity too low
Camshaft bearings worn
Crankshaft bearings worn
Oil pressure switch defective
Wiring defective
Relief valve stuck open

Exhaust Smokes Excessively

White smoke
Piston oil ring worn
Cylinder worn
Valve oil seal damaged
Valve guide worn
O rings at the cylinder oil passage orifices are damaged
Engine oil level too high

Black smoke
Air cleaner clogged
Main jet too large or fallen off
Starter plunger stuck open
Fuel level too high
Acceleration pump defective

Brown smoke
Main jet too small
Fuel level too low
Carburetor intake ducts loose
Air cleaner poorly sealed or missing

Handling and/or Stability Unsatisfactory

Handlebar hard to turn
Steering stem locknut too tight
Bearing(s) damaged
Race(s) dented or worn
Steering stem lubrication inadequate
Steering stem bent
Tire air pressure too low

Handlebar shakes or excessively vibrates
Tire(s) worn
Swing arm bearing(s) worn
Rim(s) warped, or not balanced
Wheel bearing(s) worn
Handlebar clamps loose
Steering stem head bolt and/or clamp bolt loose

Handlebar pulls to one side
Frame bent
Wheel misalignment
Swing arm bent or twisted
Steering stem bent
Front fork bent
Right/left front fork oil level uneven
Right/left rear shock absorbers unbalanced

Shock absorption unsatisfactory
Too hard:
Front fork oil excessive
Front fork oil viscosity too high
Tire air pressure too high
Shock absorber maladjusted
Front fork bent
Too soft:
Front fork oil insufficient and/or leaking
Front fork oil viscosity too low
Front fork, rear shock absorber spring(s) weak
Rear shock absorber oil leaking

Brakes Don't Hold

Air in the brake line
Pad or disc worn
Brake fluid leak

Disc warped
Contaminated pads
Brake fluid deteriorated
Primary or secondary cup defective
Master cylinder scratched inside

Battery Discharged

Battery faulty (e.g., plates sulphated, shorted through sedimentation, electrolyte level too low)
Battery leads making poor contact
Load excessive (e.g., bulb of excessive wattage)
Ignition switch defective
Regulator/Rectifier defective
Stator coil open or short
Wiring faulty

Battery Overcharged

Regulator/Rectifier defective
Battery defective

NOTE: This is not an exhaustive list, giving every possible cause for each problem listed. It is meant simply as a rough guide to assist the troubleshooting for some of the more common difficulties. Electrical troubleshooting is not covered here due to its complexity. For electrical problems, refer to the appropriate heading in the Maintenance Section.

Appendix

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ADDITIONAL CONSIDERATIONS FOR RACING

This motorcycle has been manufactured for use in a reasonable and prudent manner and as a vehicle only. However, some may wish to subject this motorcycle to abnormal operation, such as would be experienced under racing conditions. KAWASAKI STRONGLY RECOMMENDS THAT ALL RIDERS RIDE SAFELY AND OBEY ALL LOWS AND REGULATIONS CONCERNING THEIR MOTORCYCLE AND ITS OPERATION.

Racing should be done under supervised conditions, and recognized sanctioning bodies should be contacted for further details. For those who desire to participate in competitive racing or related use, the following technical information may prove useful. However, please note the following important points.

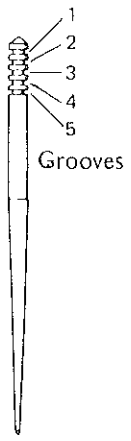
- You are entirely responsible for the use of your motorcycle under abnormal conditions such as racing, and Kawasaki shall not be liable for any damages which might arise from such use.
- Kawasaki's Limited Motorcycle Warranty and Limited Emissio Control Systems Warranty specifically exclude motorcycles which are used in competitive or related uses. Please read the warranty carefully.
- Motorcycle racing is a very sophisticated sport, subject to many variables. The following information is theoretical only, and Kawasaki shall not be liable for any damages which might arise from alterations utilizing this information.
- When the motorcycle is operated on public roads, it **must** be in its original state in order to ensure safety and compliance with applicable emission regulations.

Carburetors

Sometimes an alteration may be desirable for improved performance under special conditions when proper mixture is not obtained after the carburetor has been properly adjusted, and all parts cleaned and found to be functioning properly.

A certain amount of adjustment can be made by changing the position of the needle. There are five grooves at the top of the needle. Changing the position of the clip to a groove closer to the bottom raises the needle, which makes the mixture richer at a given position of the throttle valve.

Jet Needle (M1)



NOTE: The last digit of the jet needle number ("3" of 5CN17-3) is not stamped on the needle, but is the number of the standard groove in which the clip is set. The groove numbers are counted from the top of the needle, 1 being the topmost groove, and 5 being the lowest groove.

If the engine still exhibits symptoms of overly lean carburetion after all maintenance and adjustments are correctly performed, the main jet can be replaced with a larger one. A larger numbered jet gives a richer mixture.

Spark Plugs

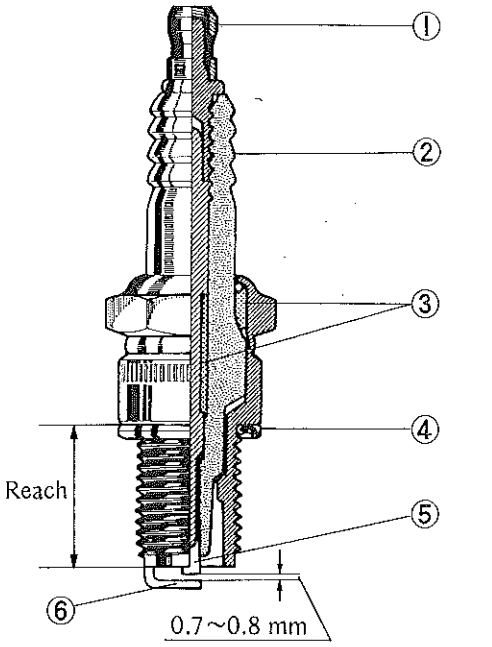
The spark plugs ignite the fuel/air mixture in the combustion chamber. To do this effectively and at the proper time, the correct spark plugs must be used, and the spark plugs must be kept clean and adjusted.

Test have shown the NGK B8ES, or ND W24ES-U set to a 0.7 ~ 0.8 mm gap to be the best plug for general use.

Since spark plug requirements change with the ignition and carburetion adjustments and with riding conditions, whether or not spark plugs of a correct heat range are used should be determined by removing and inspecting the plugs.

When a plug of the correct heat range is being used, the electrodes will stay hot enough to keep all the carbon burned off, but cool enough to keep from damaging the engine and the plug itself. This temperature is about 400 ~ 800°C (750 ~ 1,450°F) and can be judged by noting the condition and color of the ceramic insulator around the center electrode. If the ceramic is clean and of a light brown color, the plug is operating at the right temperature.

Spark Plug (M2)



1. Terminal
2. Insulator
3. Cement
4. Gasket
5. Center Electrode
6. Side Electrode

The carbon on the electrodes conducts electricity, and can short the center electrode to ground by either coating the ceramic insulator or bridging across the gap. Such a short will prevent an effective spark. Carbon build-up on the plug can also cause other troubles. It can heat up red-hot and cause preignition and knocking, which may eventually burn a hole in the top of the piston.

To check the spark plugs:

Remove each plug and inspect the ceramic insulator. Whether or not the right temperature plug is being used can be ascertained by noting the condition of the ceramic insulator around the electrode. A light brown color indicates the correct plug is being used.

CAUTION **If the spark plugs are replaced with a type other than those mentioned below, make certain the replacement plugs have the same thread pitch and reach (length of threaded portion) as the standard plugs.**

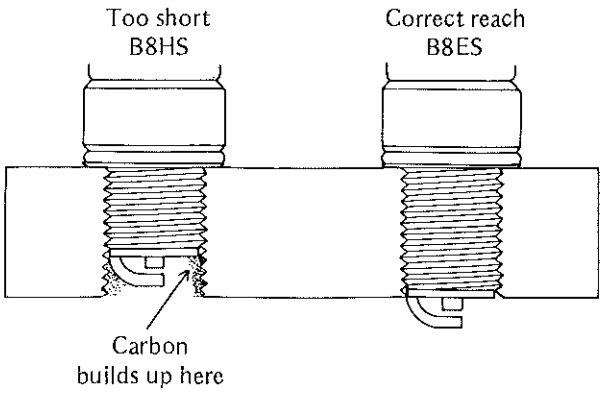
Table M1 Spark Plug

Required Plug Threads	Type
Diameter: 14 mm Pitch: 1.25 mm Reach: 19.0 mm	NGK B8ES ND W24ES-U

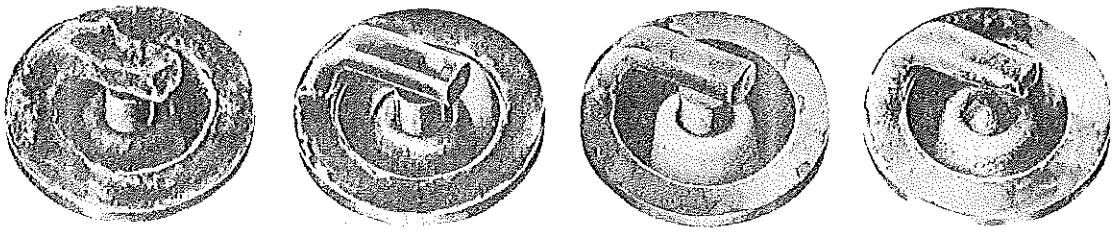
If the plug reach is too short, carbon will build up on the plug hole threads in the cylinder head, causing overheating and making it very difficult to insert the correct spark plug later.

If the reach is too long, carbon will build up on the exposed spark plug threads causing overheating, preignition, and possibly burning a hole in the piston top. In addition, it may be impossible to remove the plug without damaging the cylinder head.

Plug Reach (M3)

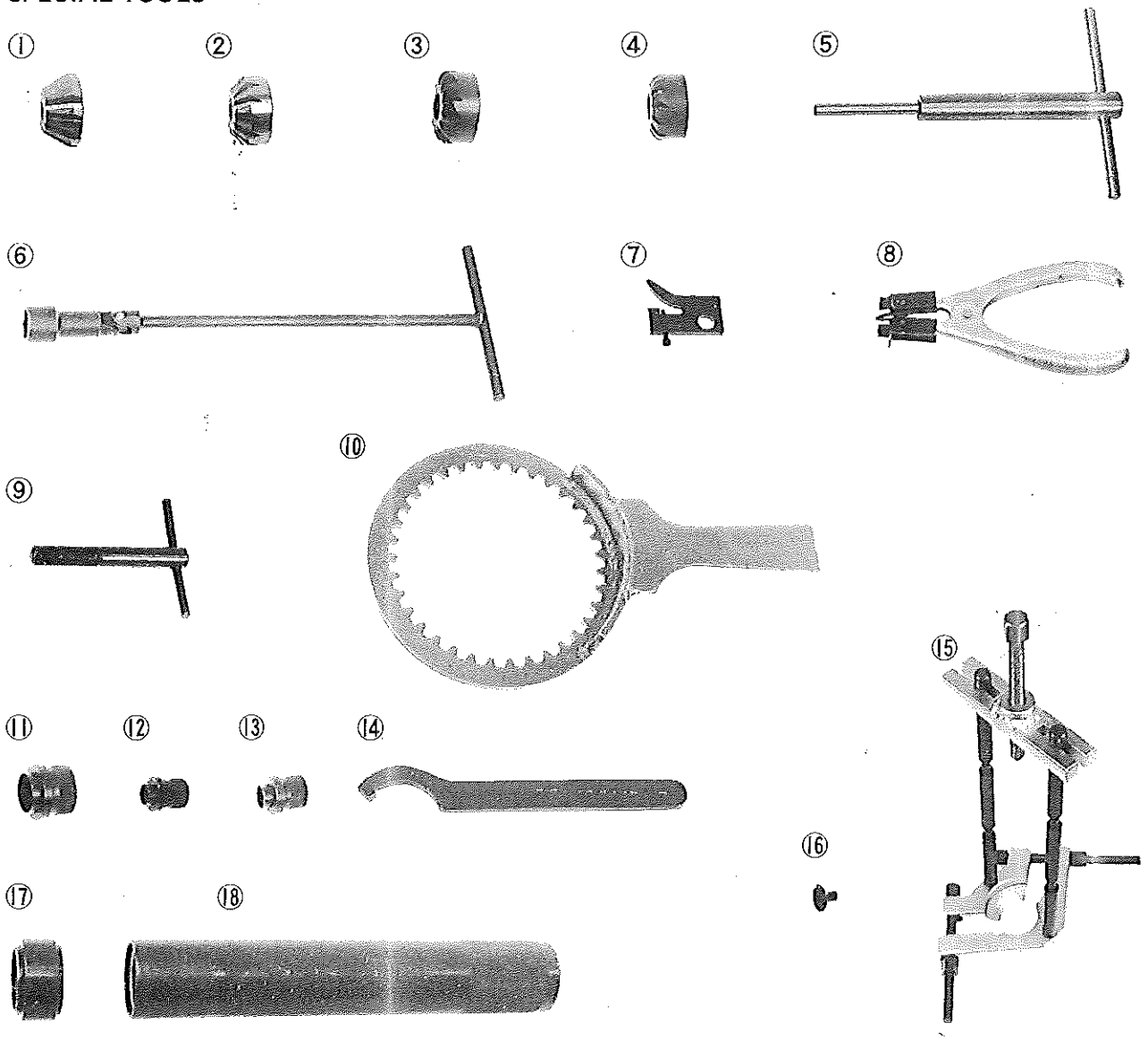


Spark Plug Condition (M4)

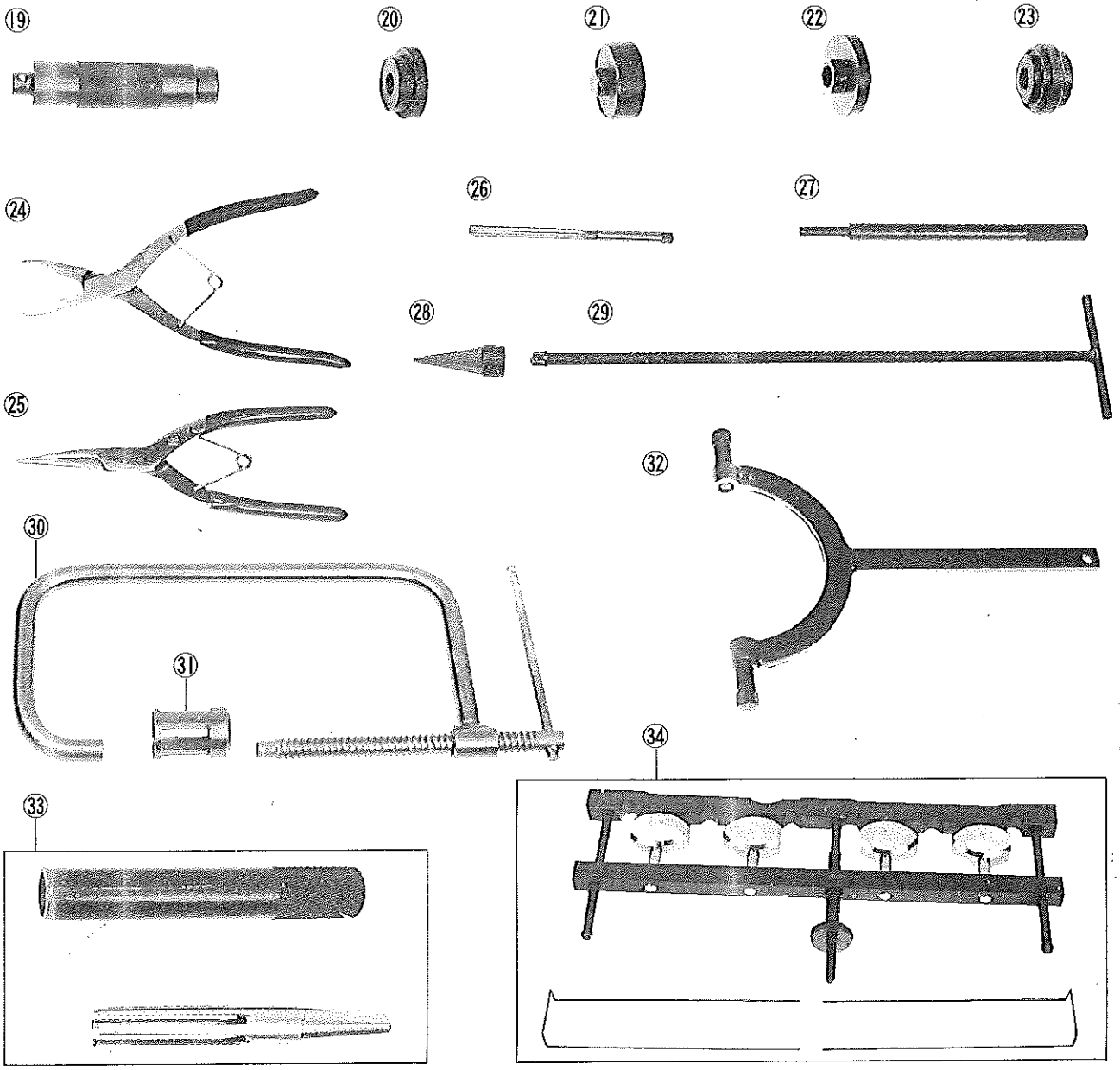


Carbon Fouling | Oil Fouling | Normal Operation | Overheating

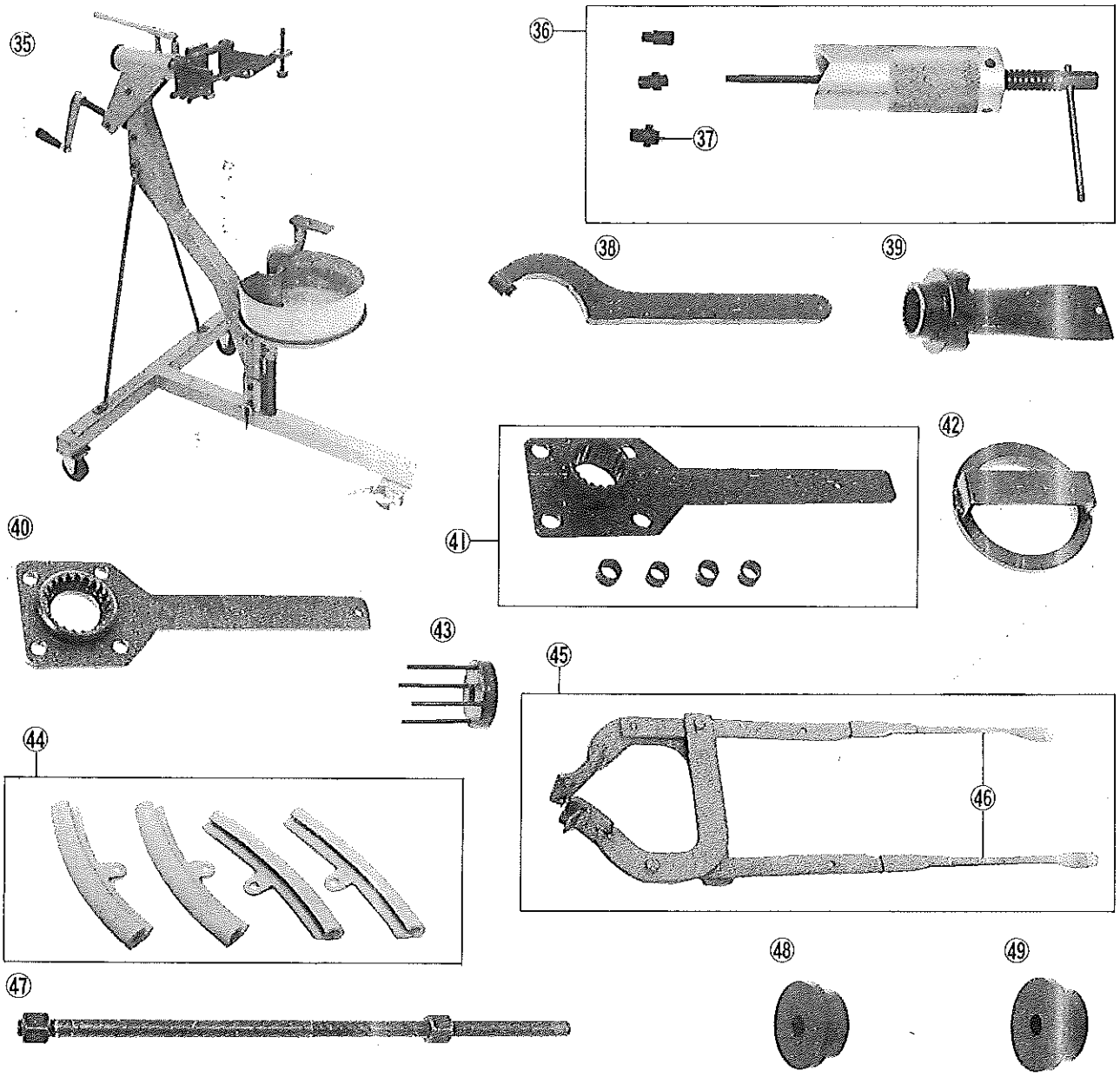
SPECIAL TOOLS



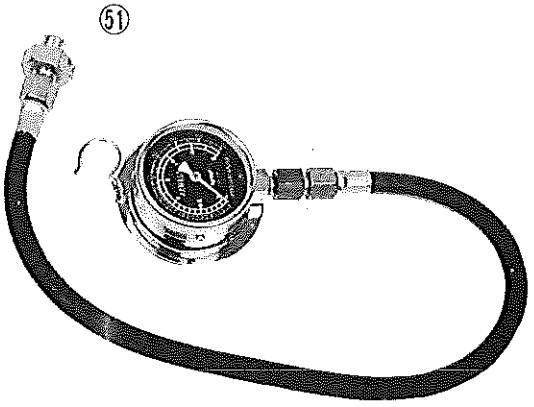
REF. NO.	PART NO.	DESCRIPTION	Q'TY
1	57001-101	VALVE SEAT CUTTER (30°)	1
2	57001-102	VALVE SEAT CUTTER (45°)	1
3	57001-103	VALVE SEAT CUTTER (IN 60°)	1
4	57001-104	VALVE SEAT CUTTER (EX 60°)	1
5	57001-106	VALVE SEAT CUTTER HOLDER	1
6	57001-110	SPARK PLUG WRENCH	1
7	57001-113	VALVE LIFTER HOLDER	1
8	57001-115	PISTON RING PLIERS	1
9	57001-1016	ROTOR PULLER	1
10	57001-119	CLUTCH HUB HOLDER (or P/No. 57001-305)	1
11	57001-131	OIL SEAL GUIDE (KICK SHAFT)	1
12	57001-261	OIL SEAL GUIDE (CLUTCH RELEASE)	1
13	57001-266	OIL SEAL GUIDE (SHIFT SHAFT)	1
14	57001-134	STEM NUT WRENCH	1
15	57001-158	BEARING PULLER	1
16	57001-317	BEARING PULLER ADAPTER	1
17	57001-1074	STEM BEARING DRIVER ADAPTER	1
18	57001-137	STEM BEARING DIRVER	1

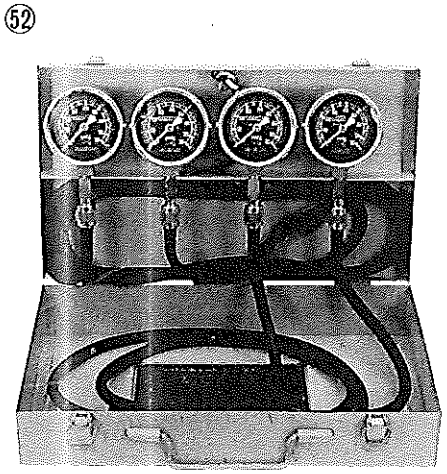


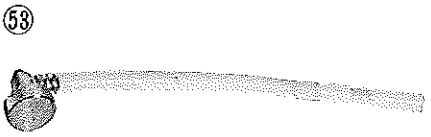
REF. NO.	PART NO.	DESCRIPTION	Q'TY
19	57001-139	BEARING DRIVER HOLDER	1
20	57001-140	BEARING DRIVER	1
21	57001-290	BEARING DRIVER	1
22	57001-296	BEARING DRIVER	1
23	57001-1053	BEARING DRIVER	1
24	57001-143	CIRCLIP INSIDE PLIERS	1
25	57001-144	CIRCLIP OUTSIDE PLIERS	1
26	57001-162	VALVE GUIDE REAMER	1
27	57001-163	VALVE GUIDE ARBOR	1
28	57001-1057	FRONT FORK CYLINDER HOLDER ADAPTER	1
29	57001-183	FRONT FORK CYLINDER HOLDER HANDLE	1
30	57001-241	VALVE SPRING COMPRESSOR ASSY	1 set
31	57001-243	VALVE SPRING COMPRESSOR ADAPTER	1
32	57001-308	FLYWHEEL HOLDER	1
33	57001-380	TRANSMISSION CIRCLIP DRIVER (Used to install the transmission ball bearings)	1 set
34	57001-532	PISTON RING COMPRESSOR ASSY	1 set

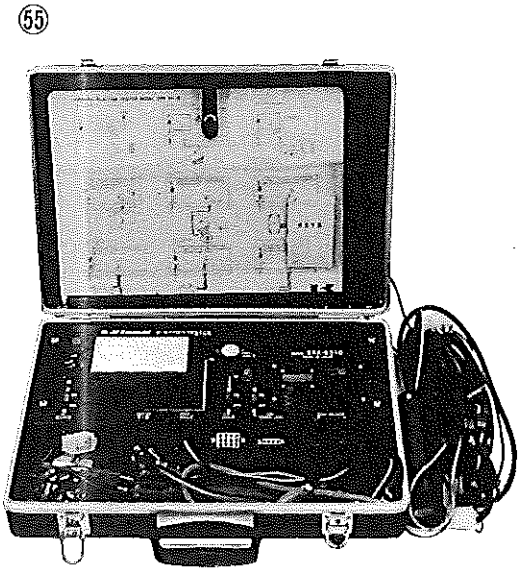


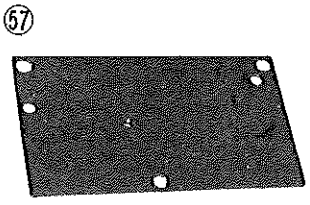
REF. NO.	PART NO.	DESCRIPTION	Q'TY
35	57001-900	ENGINE STAND	1 set
36	57001-910	PISTON PIN PULLER ASSY	1 set
37	57001-914	PISTON PIN PULLER ADAPTER	1
38	57001-1025	DAMPER CAM HOLDER	1
39	57001-1026	DRIVE GEAR HOLDER	1
40	57001-1027	DRIVEN GEAR HOLDER	1
41	57001-1028	PINION GEAR HOLDER	1 set
42	57001-1029	OIL SEAL DRIVER	1
43	57001-1052	OIL SEAL REMOVER	1
44	57001-1063	RIM PROTECTOR	1 set
45	57001-1072	BEAD BREAKER ASSY	1 set
46	57001-1073	TIRE IRON	1 set
47	57001-1075	DRIVER PRESS SHAFT	1
48	57001-1076	BEARING DRIVER	1
49	57001-1077	BEARING DRIVER	1





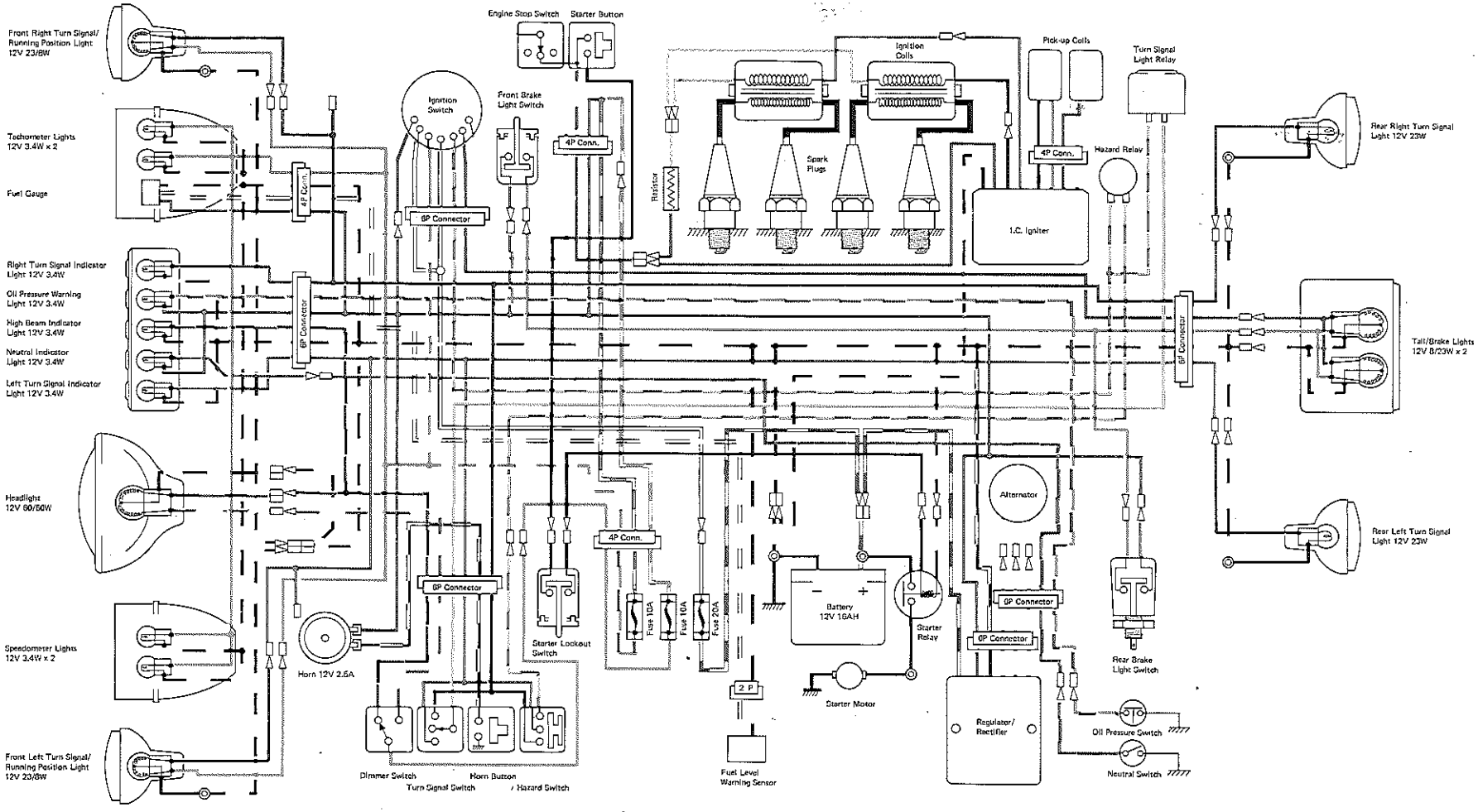






REF. NO.	PART NO.	DESCRIPTION	Q'TY
50	57001-123	COMPRESSION GAUGE	1
51	57001-125	OIL PRESSURE GAUGE	1
52	57001-127	VACUUM GAUGE SET	1
53	57001-208	FUEL LEVEL GAUGE	1
54	57001-226	VACUUM GAUGE	1
55	57001-980	ELECTROTESTER	1
56	57001-983	HAND TESTER	1
57	57001-1049	DIAL GAUGE HOLDER	1

KZ1000-E1 Wiring Diagram (US, Canadian Model)



LEFT HANDLEBAR SWITCH CONNECTIONS

	Dimmer Switch			Turn Signal Switch				Horn Button			Hazard Switch		
	Bk/R	Blue	R/Y		Green	Orange	Gray		Bk/W			O/G	Green	Gray
HI	●		●	R		●								
								Push	●	●	Push	●	●	●
LO		●		L	●									

IGNITION SWITCH CONNECTIONS

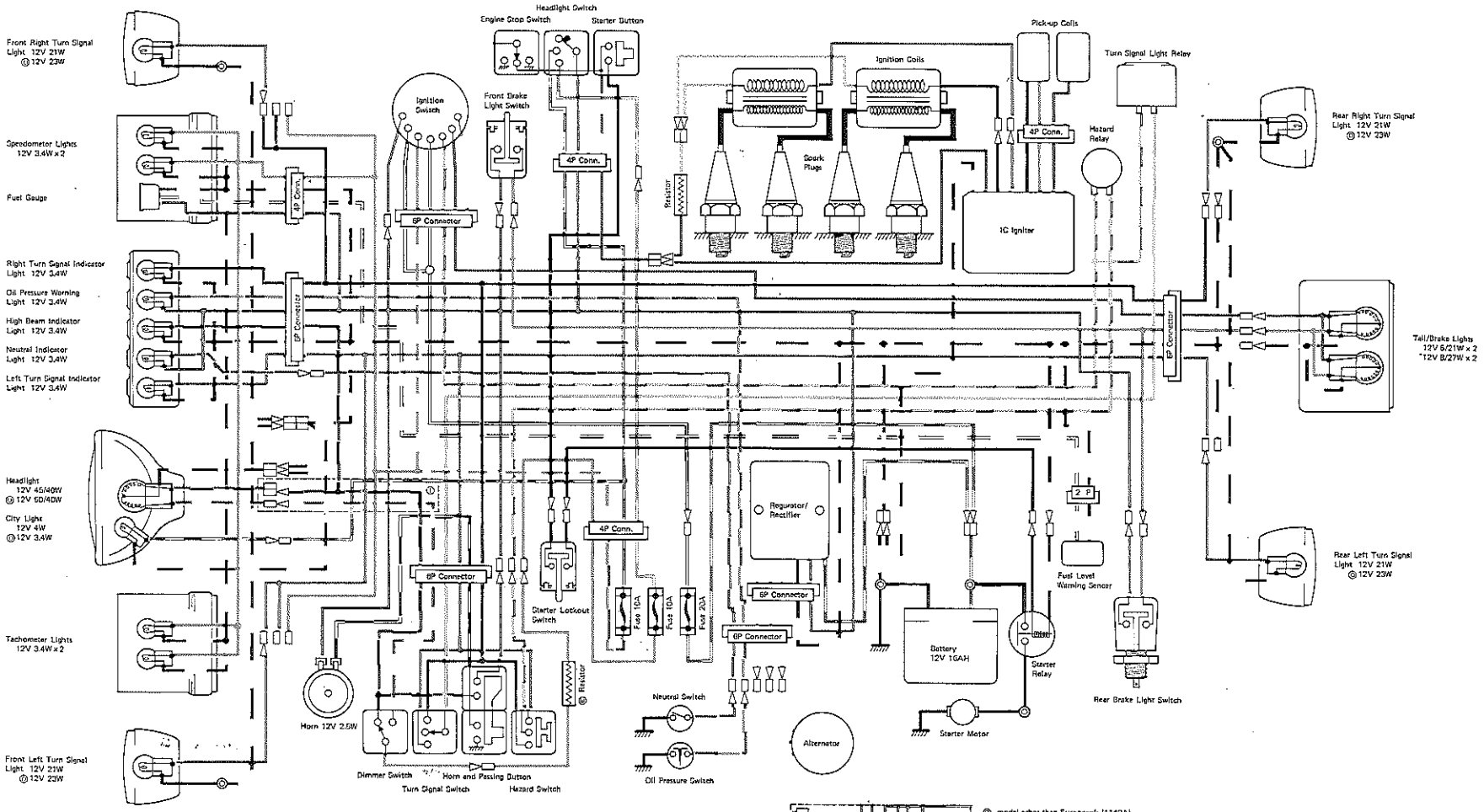
	Battery 1	Ignition	Tail 4	Tail 1	Tail 2	Battery 2	Tail 3
	White	Yellow	Brown	Blue	Red	White	O/G
OFF							
ON	●	●		●	●	●	
P(PARK)	●					●	●

(1126C)

RIGHT HANDLEBAR SWITCH CONNECTIONS

Engine Stop Switch			Starter Button		
	R/Y	Brown		Black	R/Y
OFF					
RUN	●		Push	●	●
OFF					

KZ1000-E1 Wiring Diagram
(European Model)



① only on Italian model (1141A)

@ model other than European's (1142A)
* model other than European's except Australian model
@ only on European model

LEFT HANDLEBAR SWITCH CONNECTIONS

Dimmer Switch				Turn Signal Switch			Horn Button		Passing Button			Hazard Switch		
	Bk/R	Blue	R/Y		Green	Orange	Gray		Bk/W		Brown	R/Bk		O/G	Green	Gray
HI	○	———		R		○	———									
								Push	○	———	Push	○ ———	Push	○	———	
LO		———	○	L	○	———										

IGNITION SWITCH CONNECTIONS

	Battery 1	Ignition	Tail 4	Tail 1	Tail 2	Battery 2	Tail 3
	White	Yellow	Brown	Blue	Red	White	O/G
OFF							
ON	○	———	○	———	○	———	○
P(PARK)	○	———	○	———		○	———

(1140A)

RIGHT HANDLEBAR CONNECTIONS

Engine Stop Switch			Headlight Switch			Starter Button		
	Yellow	Y/R		Brown	Bl/W	Br/W		Black	Y/R
OFF			OFF					
RUN	○	———	○	○	———	○	Push	○	———
OFF			RUN	○	———	○			

KAWASAKI
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