generator output increases with engine rpm. On models equipped with low output generators, this does not create any problem. Models equipped with higher output generators require a current limiter or voltage regulator to protect the battery from being overcharged during prolonged high rpm operation.

The solid state current limiter uses a zener diode which differs from the previously described rectifier diodes in that it does not always completely block reverse current. A reverse-biased zener diode will pass current when voltage exceeds a predetermined level, and then it passes only the amount of current exceeding that level. A solid state current limiter, containing a zener diode, is connected in the charging circuit in parallel with the battery to bleed off the excess current that would otherwise overcharge the battery at high rpm.

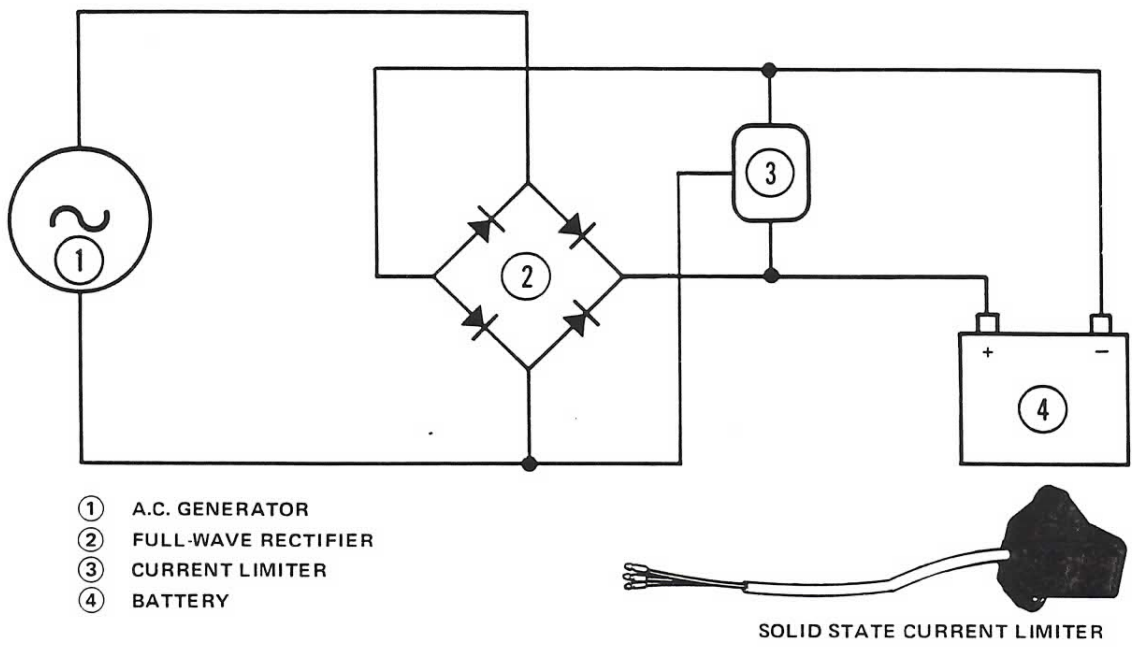

Fig. 26 Charging System with Solid State Current Limiter

THREE-PHASE CHARGING SYSTEMS

A three-phase charging system is used in Honda four cylinder motorcycles. This system is composed of a three-phase A.C. generator, a six-diode rectifier, and a voltage regulator.

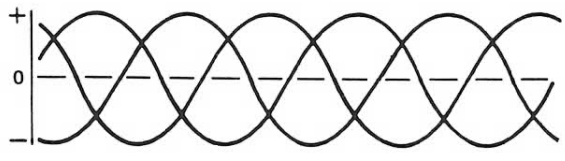

Fig. 27 Alternating Current Wave Form from Three-Phase A.C. Generator

The generator is referred to as "three-phase" because it has three single-phase windings spaced so that the voltage induced in each winding is 120° out of phase with the voltage in the other two windings. A representation of the alternating current wave forms (Fig. 27) is similar in appearance to the wave forms which would be generated by three separate single-phase generators (see pages 8 & 9) phased 120° apart.

The three-phase A.C. generator used in Honda GL-1000 engines has two major components; rotor and stator (Fig. 28). The rotor is permanently magnetized and revolves around the stator. Current is generated in the manner described on pages 8 & 9, but the stator windings produce a three-phase output.

Three-phase A.C. generators used in other Honda four cylinder engines have three major components (Fig. 29). The rotor is bolted directly to the end of the crankshaft and revolves in the space between the field coil and stator. The field coil and stator are held stationary in the generator housing.

Unlike other Honda motorcycle generators, the rotor is not permanently magnetized, but is temporarily magnetized through interaction with the field coil. Current from the battery to the field coil determines the strength of the magnetic field and hence the output of the generator.

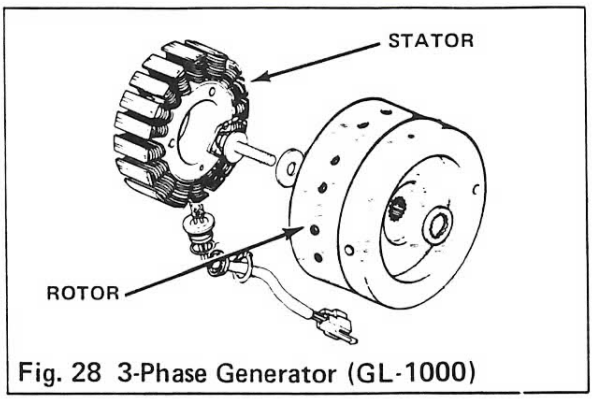

Fig. 28 3-Phase Generator (GL-1000)

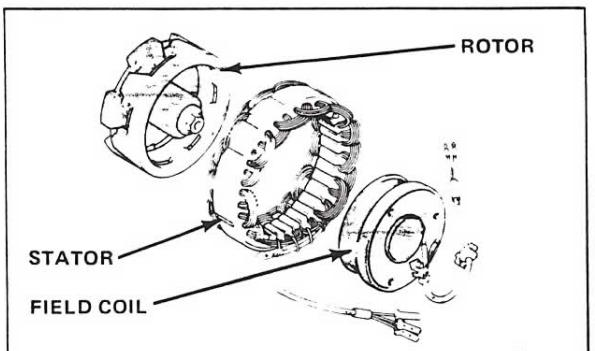

Fig. 29 3-Phase Generator (other models)

Voltage Regulation for A.C. Generators Equipped with Field Coils (all Honda four cylinder models except GL-1000):

The voltage regulator (Fig. 30) for these generators provides three operating modes which are selected according to the battery's state of charge. The regulator enables low battery voltage to cause high generator output, and vice versa.

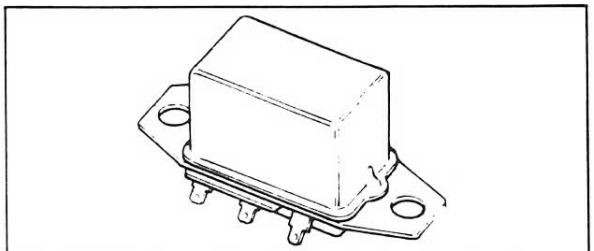
Fig. 30 Voltage Regulator (exterior view)

Changes from one operating mode to another are achieved by a relay coil and contact points within the regulator (Fig. 31). The relay coil is an electromagnet (see page 7) which can cause the circuits to be switched by attracting the contact point armature.

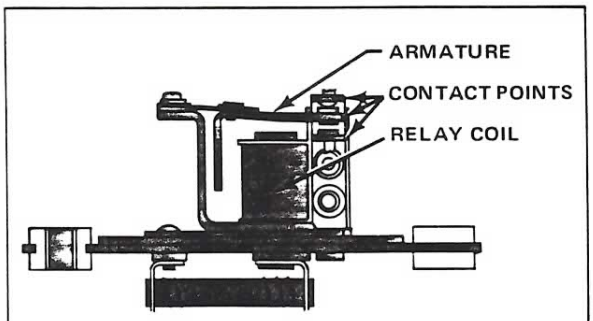

Fig. 31 Voltage Regulator (interior view)

MODE 1 (Fig. 32) – Battery Voltage is Low:

Current flows from the battery to terminal I of the voltage regulator. Inside the regulator, current flows through a relay coil and to ground through terminal E.

Because battery voltage is low (the battery needs charging), there is not enough current flowing through the regulator relay coil to open the contact points, so current also flows from terminal I, through the contact points, through terminal F, and directly to the field coil.

In this mode, the battery is directly connected to the field coil and provides the maximum field current (1.6 amps). Maximum field current causes high generator output for high battery charging voltage.

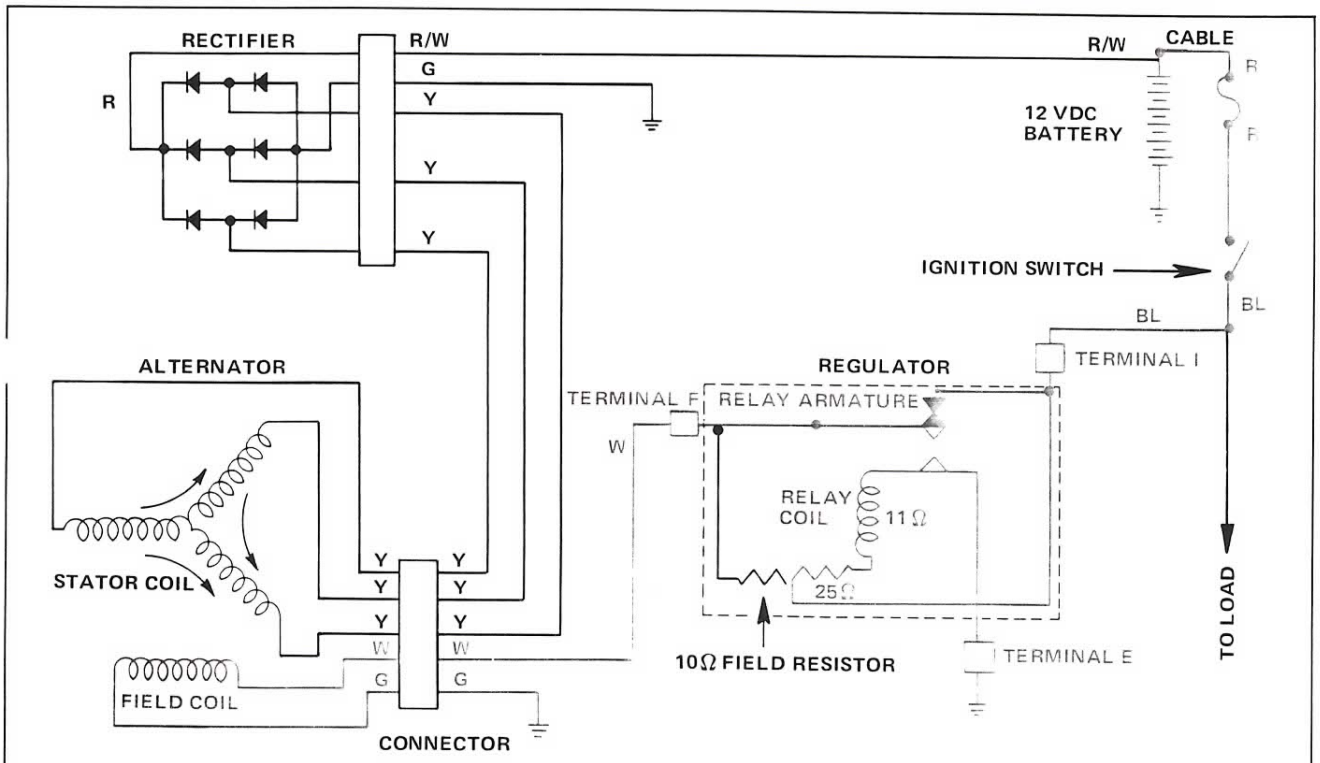

Fig. 32 Three-Phase Charging System. Red lines show MODE 1 current path.

MODE 2 (Fig. 33) – Battery Voltage is Normal:

With normal battery voltage, there is sufficient current flowing through the regulator relay coil to open the contact points. Current may now reach terminal F only by passing through a resistor which reduces field current. Lower field current results in lower generator output.

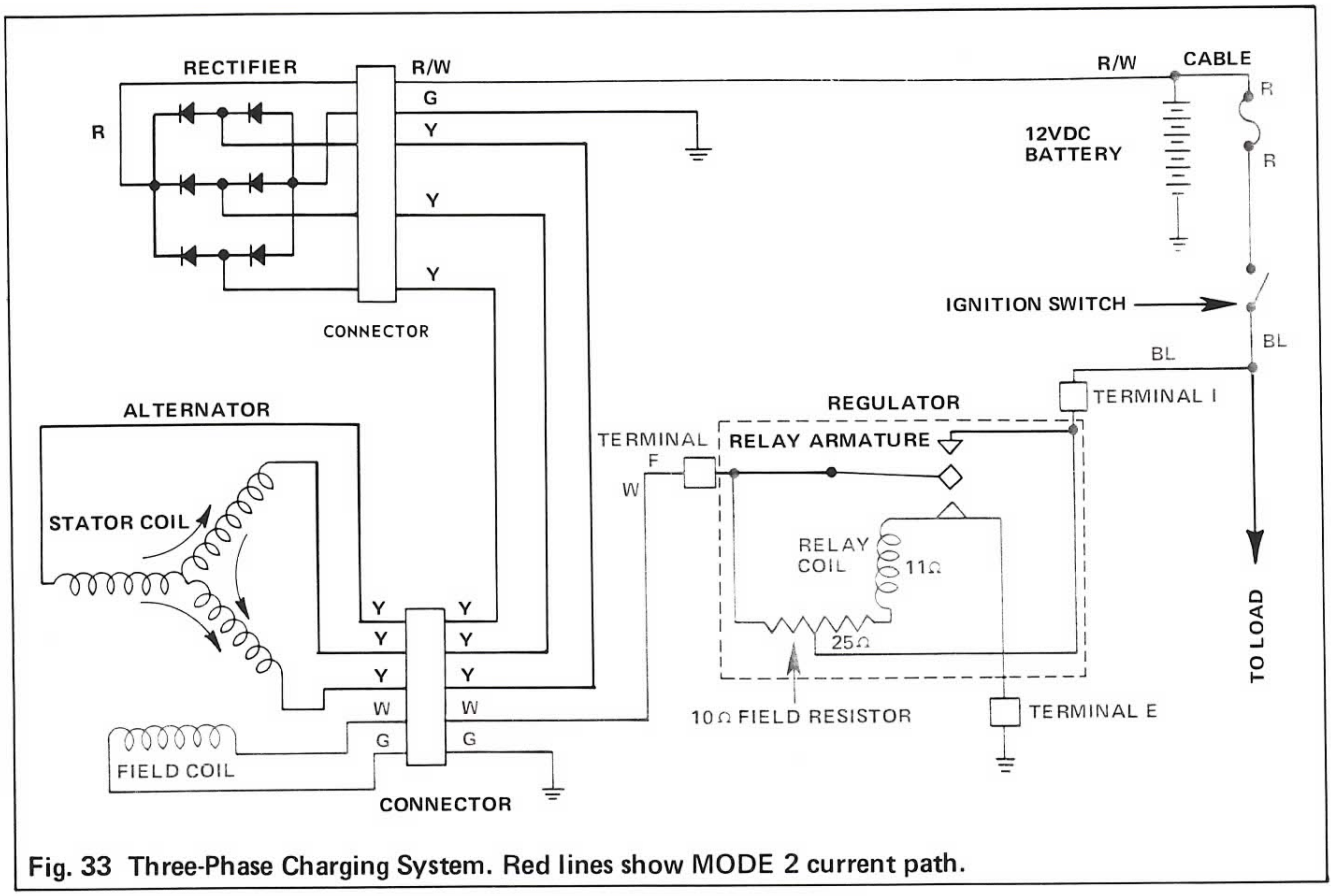

Fig. 33 Three-Phase Charging System. Red lines show MODE 2 current path.

MODE 3 (Fig. 34) –
Battery Voltage is Excessive:

When battery voltage is excessive, there is enough current flowing through the regulator relay coil to cause the contact points to complete a ground circuit. Current flows from the battery, through resistance, to ground. No current reaches the field coil, and therefore there is no generator output.

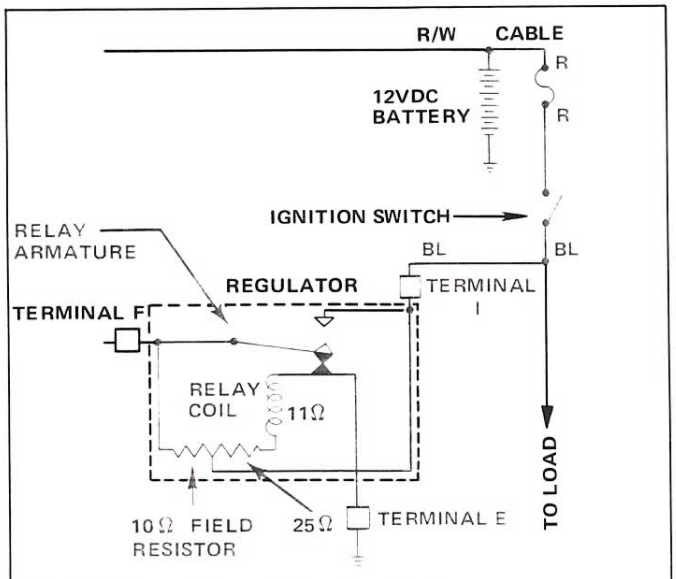

Fig. 34 Three-Phase Charging System.
Red lines show MODE 2 current path.