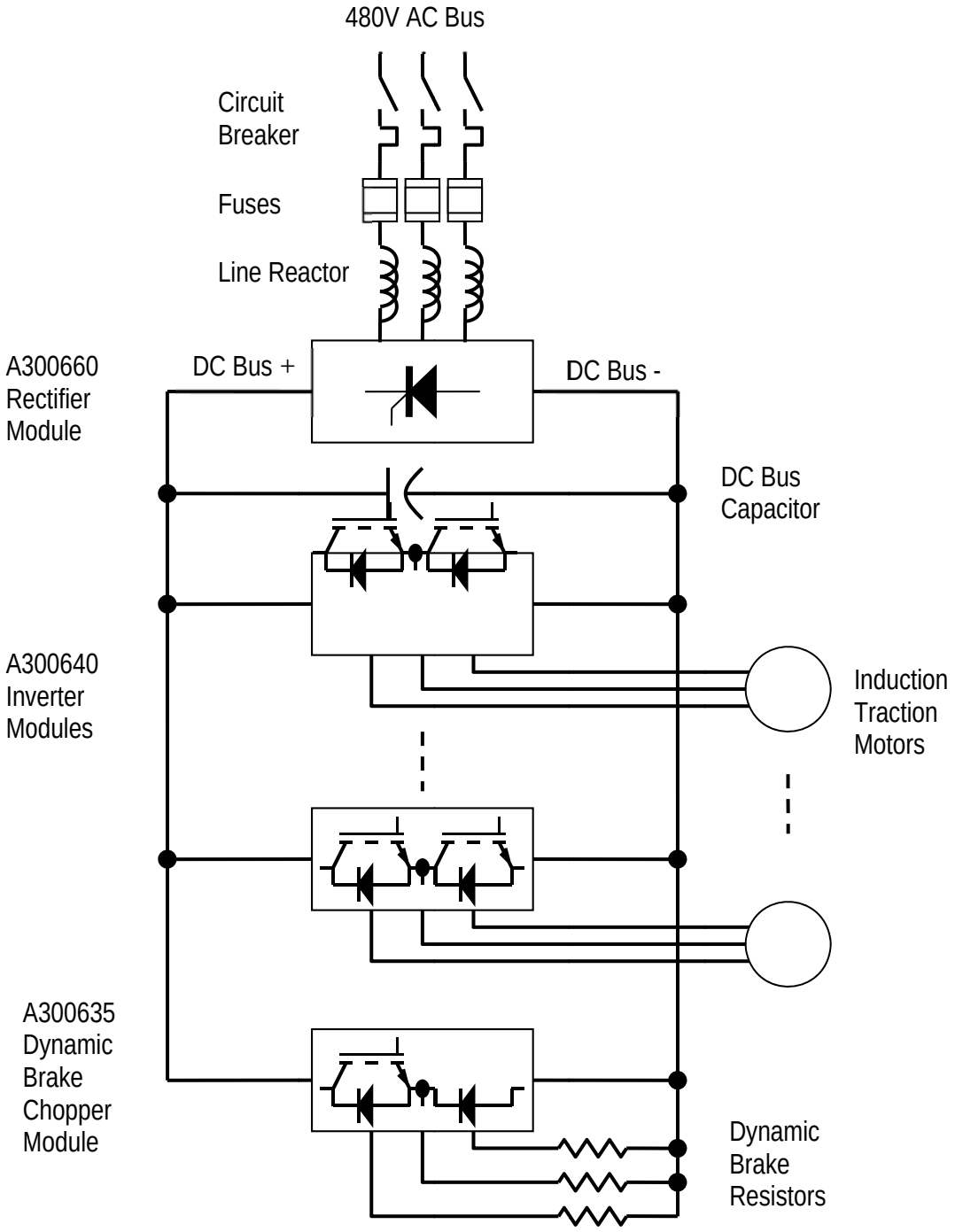
Typical 480V GenSet AC Traction Motor System



Description of Modules

The **A300660 Rectifier Module** converts 460V 3-phase AC power to 650V DC power. The rectifier delivers pulses of current into the DC bus capacitors. The capacitors are sufficiently large to absorb the rectifier current pulse with minimal voltage ripple. The inductors in the AC lines reduce the amplitude and increase the duration of the current pulses so as to reduce the harmonic currents drawn from the AC bus. The rectifier consists of diodes connected to the negative bus and SCRs connected to the positive bus. On first application of the AC supply, the SCRs are used to control the rate of charging of the DC bus capacitor so as to limit the inrush current to an acceptable level.

The **A300640 Inverter Module** and the **A300635 Chopper Module** are power converters designed to operate over a DC bus voltage range of 500V to 800V. They are used as components of a power conversion system consisting of several modules sharing a common DC bus filter capacitor.

When the **A300640 Inverter Module** is used to control an AC traction motor, it controls the stator current by applying pulses of the DC bus voltage directly to the terminals. The pulse width and the polarity of the pulses are varied in accordance with the voltage required by each terminal. This requirement is determined by high-speed current regulators which continuously seek to maintain the output current levels required to maintain the motor flux at the correct level and motor torque at a level consistent with the traction reference. The mean current drawn from the DC bus is proportional to the average duty cycle of the pulses as well as the power factor of the stator current. This means that the inverter can supply the stator with a very large amount of current at low speed while consuming a relatively small amount of current from the DC bus. The Inverter Module also receives a direction-encoded speed feedback signal from the motor that it is driving. This serves two purposes. Firstly, detection of the change in rotor position is used by the current regulators to position the stator current pattern so as to produce the correct flux and torque. Secondly, the motor speed is used to calculate the axle speed which is continuously compared with a reference input derived from a non-driven axle. For the purpose of controlling wheel-spin or wheel-slide, a speed regulator overrides the traction reference with a lower value if the axle speed deviates outside a small band of acceptable values.

The **A300640 Inverter Module** can also operate very effectively as a dynamic brake down to very low speeds. It achieves this by rearranging the current pattern in the stator so that negative torque is produced. This change occurs as a seamless transition when the polarity of the traction reference is reversed.

Energy recovered from the traction motors during dynamic braking is returned to the DC bus. All of the energy returned to the bus must be dissipated without resulting in a large increase in voltage. The excess power is absorbed in dynamic brake resistors controlled by the **A300635 Dynamic Brake Chopper**. The Dynamic Brake Chopper normally operates independently by responding only to the increase in DC bus voltage that occurs when power absorbed by the inverter is returned to the DC bus. A self-load mode is provided for the purpose of applying a test load to the traction power system while the car is stationary.