

### Rotating Assembly Components

Refer to "Rotating Components" section of Schematic Diagram on Sheet 5.

In this brushless excitation system, the exciter stationary DC field induces three-phase AC into the rotating exciter armature. The armature leads (3) are attached to the motor shaft and connect to the rotating three-phase bridge rectifier. The DC output of the rotating rectifier is applied to the DC rotating field of the synchronous motor, with these leads also being fastened to the motor shaft, so that no bushes, commutator, or slip rings are required. The rotating assembly, often referred to as the Diode Wheel, in addition to the rotating rectifiers, also carries the field discharge resistors, the Syncrite® Field Application Module, the Syncrite® Filter, and the Silicon Controlled Rectifiers (SCR's) used for the application of the DC field for synchronous operation (SCR1) and to discharge the voltage induced in the rotating field (SCR2) during motor start-up.

### Inspecting Rotating Field Assembly Components Electric Machinery 4500 HP Synchronous Motor



Opposite Drive End  
(ODE)  
Pedestal Bearing

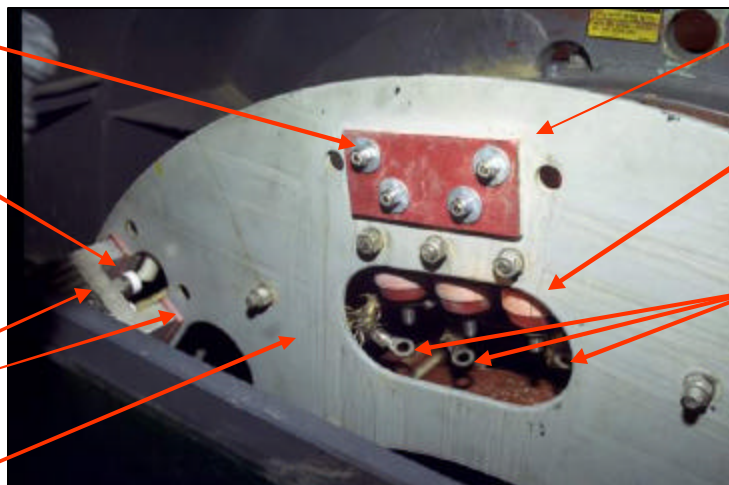
Inspection cover removed.

Rotating Assembly  
(Diode Wheel)

Motor Shaft

Kilowatt Classroom Photo

### Rotating Assembly Close-Up View



Syncrite Filter  
Mounting bolts and  
insulator.

Positive Bus Diodes  
(3) Stud Cathode Units

DC Positive Heat Sink  
Heat Sink Insulator

Top portion of  
Rotating Assembly  
(Diode Wheel)

Syncrite® Filter  
Mounted on back (inboard)  
side of diode wheel.

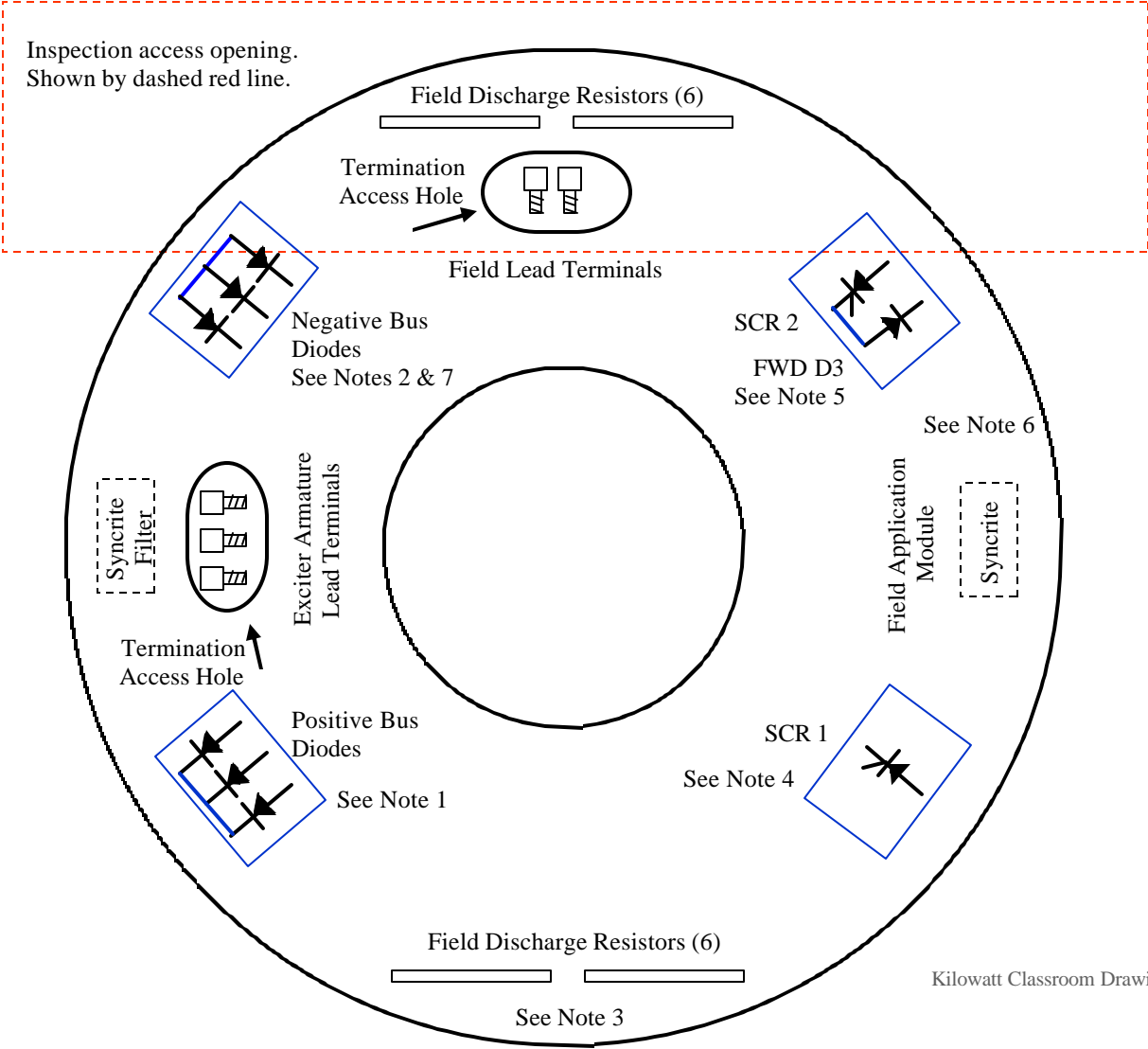
Insulated stand-off bushings  
(3) for connection of exciter  
armature leads to three-phase  
diode assembly.

Leads (3) from exciter  
armature. Shown discon-  
nected for insulation  
resistance test of armature  
winding and to use the  
Diode Wheel Tester (See  
description on Sheet 13).

Kilowatt Classroom Photo

See next page for layout of components on the Diode Wheel.

**Rotating Assembly Component Arrangement**  
 Viewed from inspection access opening. Shaft must be rotated for all components to be visible.  
 Refer to "Rotating Components" section of Schematic Diagram on Sheet 5.



Kilowatt Classroom Drawing

**Notes**

1. Positive Bus heatsink with three (3) stud cathode diodes.
2. Negative Bus heatsink with three (3) stud anode diodes.
3. Field Discharge Resistors (12 units) are 24 ohms each and are connected in series/parallel for 4 ohms total. (Depending on the size of the rotating field, different wattage and ohmic values are used - consult instructions.)
4. SCR 1 applies rectified DC to the rotating field of the synchronous motor when fired by the Syncrite® Field Application Module.
5. SCR 2 connects synchronous motor rotating field to the field discharge resistors during start as induction motor. Free-Wheeling Diode D3 protects SCR 2 against high counter-emf voltage produced by collapsing motor field.
6. Syncrite® modules, six field discharge resistors, exciter and field termination insulators/studs, and interconnecting wiring harnesses are mounted on back (inboard) side of wheel.
7. Blue rectangles are heatsinks for stud-mounted diodes and SCR's. Heatsinks are insulated from diode wheel.

**Synchro-Pac® and Syncrite® are registered trademarks of the Electric Machinery Division of Dresser-Rand.**

### Component Testing

While brushless excitation systems eliminate the need for brushes, a commutator, and slip rings, testing and adjustment of the systems can be difficult because the components cannot be checked or adjusted with the unit in service. Because all the excitation components are rotating, the equipment must be shut-down for inspection and maintenance.

To assist the user in making the necessary tests, EM developed two specialized testers. The Syncrite® Module Tester (shown below) is used to test the Syncrite® Field Application Module and the Syncrite® Filter Module. A Diode Wheel Tester is used to test the diodes and SCRs mounted on the rotating assembly (see following page).

The only adjustment that is necessary is the synchronizing speed adjustment on the Syncrite® Field Application Module (shown below). Module tests include: Zener Voltage Test, Zero Slip Test, Slip Trigger Test - Low Slip (99% of speed or 1% slip), Slip Trigger Test - High Slip (95% of speed or 5% slip), Out-of-Step Inhibit Test, and Positive Hold Test. The Syncrite Filter Module is tested for proper Zener operation.

### Syncrite® Module Tester Tests Field Application and Filter Modules.

Syncrite® Field Application Module to be tested is plugged into mating connector on top of tester. If desired, unit can be tested without removal from diode wheel by using the appropriate interconnecting cable.

Syncrite® Filter Modules are tested by connecting the permanently-attached module leads to the tester banana posts. Patch cords are also available to permit in-place filter tests.

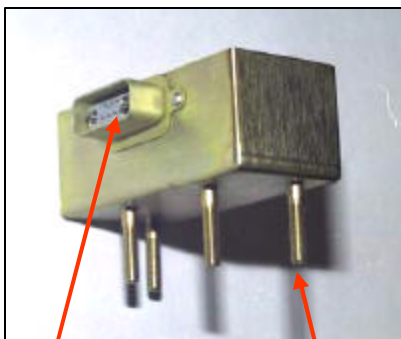


Kilowatt Classroom Photo

### Syncrite® Field Application Module

Size: 4-1/2" x 2" x 1-3/4"

#### Rear View



9-pin Cable Connector

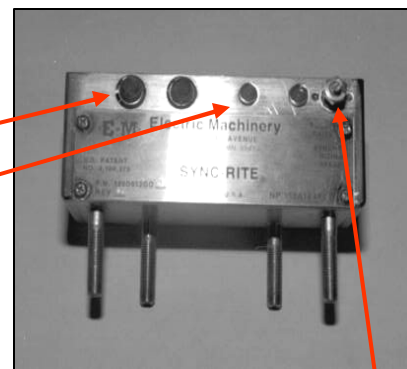
1/4 - 28 Mounting Studs  
Attach unit to diode wheel.

#### Front View

Module Status Indicating Lights

2 Red - FDR in Circuit

2 Green - Field Off



Kilowatt Classroom Photos

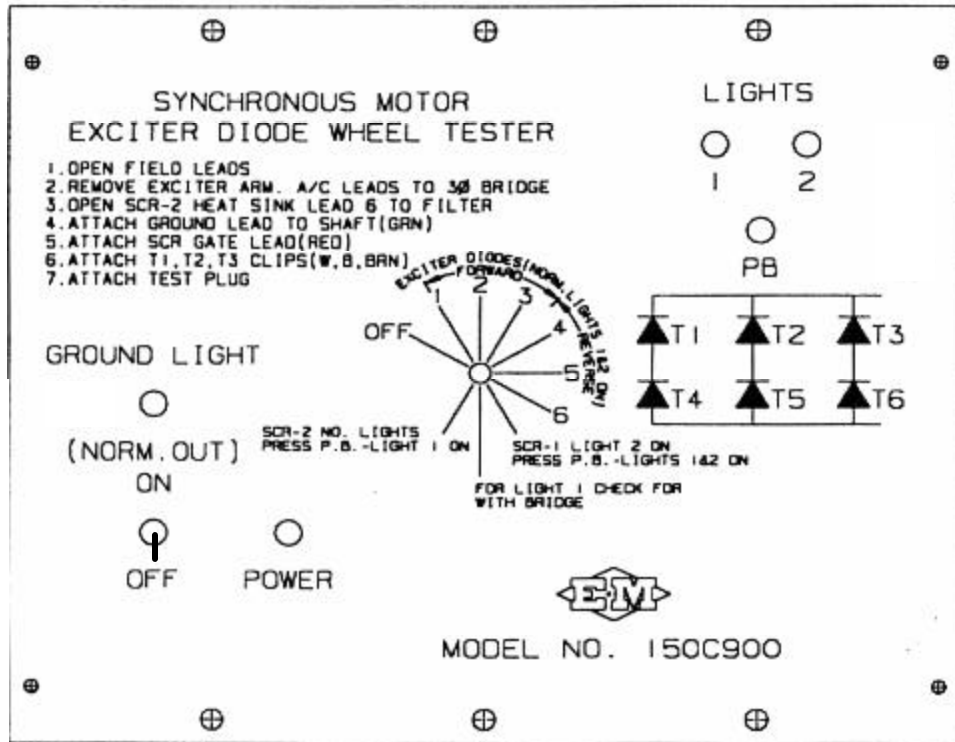
Synchronizing Speed Adjustment Potentiometer sets rotor slip rate at which the DC voltage is applied to the motor rotating field.

### Exciter Diode Wheel Tester

A companion test set in the same style case as the Syncrite® Module Tester shown on the preceding page is available for testing the diodes and SCRs used in the Synchro-Pac® System. The semiconductors do not need to be removed from the diode wheel for testing. A drawing to the test set control panel is shown below.

The Exciter Diode Wheel Test Set will indicate shorted or open power diodes, silicon controlled rectifiers (SCRs), and an open field discharge resistor (FDR). It also checks for proper SCR firing and checks for grounded components (inadvertent connection to the motor shaft).

The tester is easy-to-operate with the connection steps and appropriate light sequences shown on the nameplate.



### Multimeter Tests

The primary advantages of the Diode Wheel Tester are its ease-of-operation and the fact that it tests the components at their rated voltage. If this tester is not available, the semiconductor components, field discharge resistors, and wiring harnesses can also be checked with a conventional multimeter. The SCRs and diodes need to be checked using the meters DIODE CHECK function. A multimeter does not draw enough current through large SCRs to provide a “seal-in” of the device, but they can be checked for shorts and opens. See the *Electrician’s Notebook* articles *Semiconductor Diodes and Rectifier Circuits* and *The Silicon Controlled Rectifier* for further details on semiconductor testing.



Kilowatt Classroom Photo

### Ohmmeter Testing of Field Discharge Resistors

The photo at the left shows ohmmeter checks being made on the FDRs of a Synchro-Pac® system. The wattage and ohmic value of the resistors will vary depending on the size of the rotating field of the machine. Various series/parallel combinations are utilized and the instruction manual for the exact piece of equipment needs to be consulted for the value employed in a particular system.