



MAINTENANCE INSTRUCTION

MAIN GENERATOR—TYPES D32, D22, D12

DESCRIPTION

The Model D32, D22, and D12 generators are similar in appearance and construction. The primary external difference between the Model D32 and the Models D22 and D12 generators is the removal of the external bus bars on the D32 generator, Fig. 1.



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Fig.1 – D32 Generator Assembly

The primary external differences between the various D32 generators involve leads, generator feet, bus bars, the location of the air box, and whether the generator is self-ventilated or force-ventilated.

The Models D32D and D32E have a separately excited field in place of a combination battery field plus a shunt field. The two models differ only in the type of field coils which their stator assemblies contain. The D32D and D32E generators are interchangeable as an assembly and their stators may be interchanged as an assembly.

The data contained in this Maintenance Instruction will apply to Models D32, D22, and D12 generators unless specifically identified.

The generator is directly connected to the diesel engine by a flexible coupling. The engine rotates the generator which produces a nominal 600 volts DC. Output of the generator is applied to the locomotive traction motors. Changes in motor connections across the generator, as well as application of shunting resistance around the traction motor fields occur automatically as train speed increases. These changes are accomplished in order to stay within the voltage limitations of the generator at higher locomotive speeds and within the current limitations at heavy drag load speeds.

The generator is made with numerous windings, Figs. 2, 3, and 4, that perform the following:

1. Starting Field

Energized by the locomotive battery during engine start in order to motor the generator and crank the diesel engine.

2. Interpole

Assists reversal of current in the armature windings during commutation.

*This bulletin is revised and supersedes previous issues of this number.
 Areas of change are indicated by vertical bars in the margins.

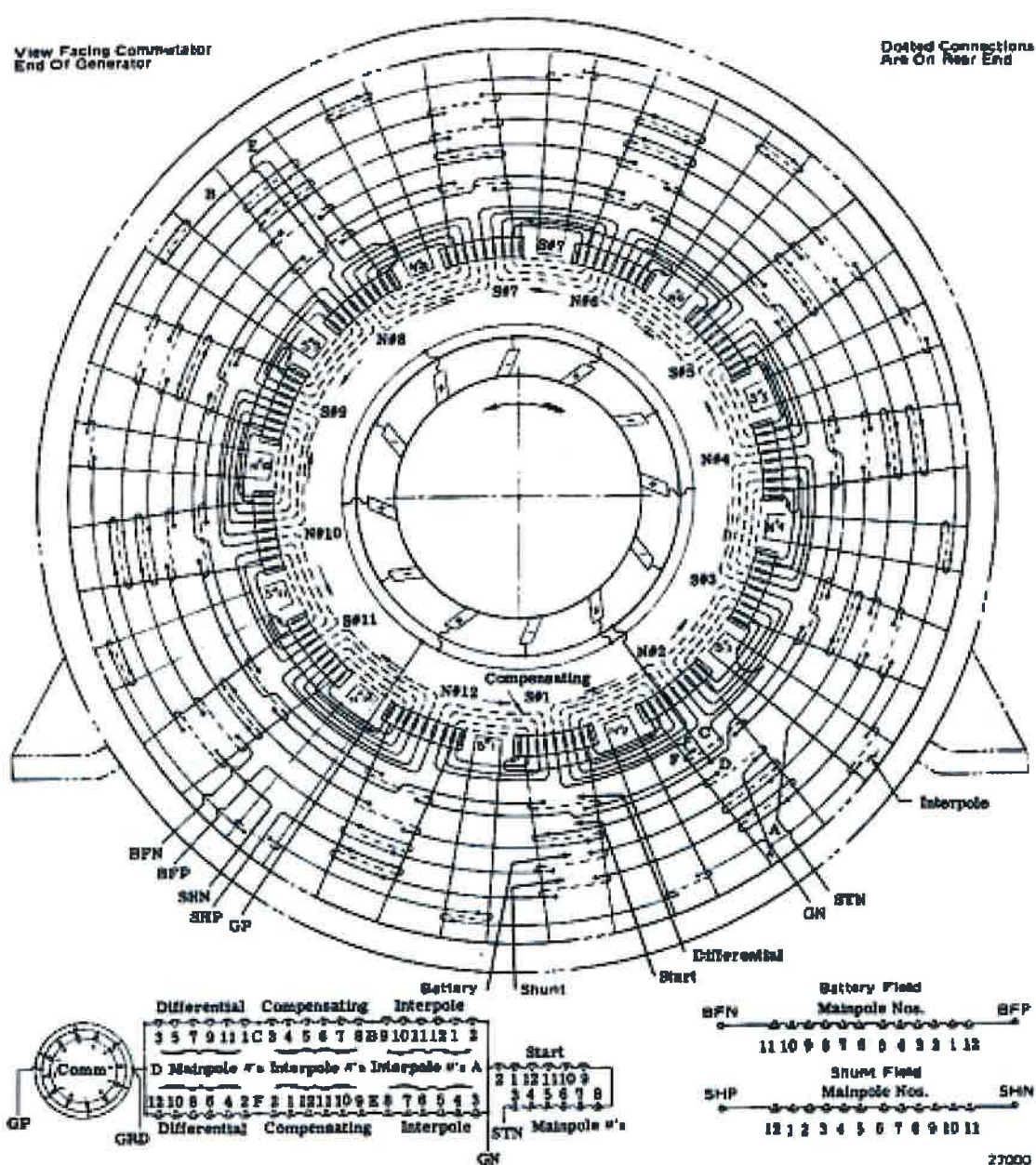


Fig.3 - Model D32 (Except D32D And D32E) Generator, Wiring Diagram

horsepower demand on the engine for any ampere demand within the capacity of the generator and load regulator.

6. Shunt Field (Not on Model D32D or D32E)

A small portion of generator output is fed back and used to excite the shunt field. An external resistance connected in series with the shunt field is used to change generator characteristics

in relation to the number and connection of motors powered by the generator.

7. Separately Excited Field (Models D32D and D32E only)

The D32D and D32E generators are not self excited and do not contain a shunt field. All generator excitation is provided by a separately excited field. The field is made up of two coils on each main pole as follows:

View Facing Commutator
End Of Generator

**Dotted Connections
Are On Rear End**

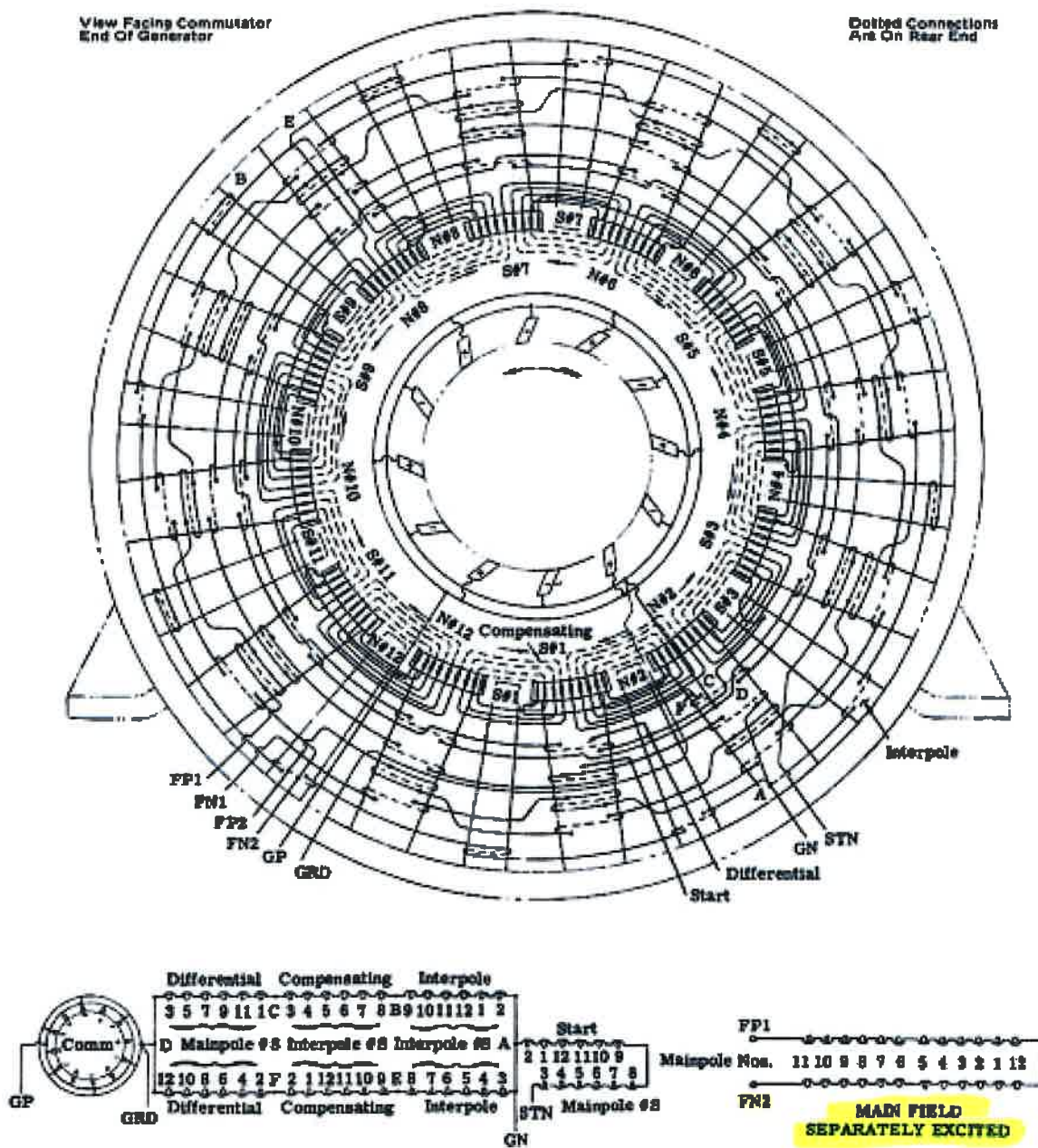


Fig.4 – Model D32D And D32E Generator, Wiring Diagram

Model D32D

- a. Inner coil consisting of nominally 47 turns. The inner coil is wound in a "crossed" manner.
- b. Outer coil consisting of nominally 97 turns. The outer coil is wound in an "open" manner.

Model D32E

- a. Inner coil consisting of nominally 66 turns. The inner coil is wound in a "crossed" manner.
- b. Outer coil consisting of nominally 78 turns. The outer coil is wound in an "open" manner.

The separately excited field consists of 12 main poles and a total of 24 main pole coils. The coils are connected in two series groups of 12 coils each, with the coils connected alternately inner and outer on adjacent poles. This is possible due to the fact that the coils are wound alternately crossed and open, permitting opposite polarity at adjacent poles. The two series groups of 12 coils are connected to provide a total series of 24 coils.

Most Models D12, D22, and D32 generators have an auxiliary alternator assembly bolted directly to the generator stator frame. The alternator rotor is bolted directly to the generator armature spider. When connected the alternator becomes an internal part of the generator.

The alternator provides a means of driving accessories such as cooling fans and inertial filter blower motor. On locomotives equipped with D32D or D32E generators, it provides generator excitation current.

For maintenance of the D14 alternator, refer to Maintenance Instruction M.I. 3306. For maintenance of the D18 alternator, refer to Maintenance Instruction M.I. 3307.

The extent of maintenance required is determined by the operation and service to which the generator is subjected. Inspections and maintenance should be performed on the systematic basis outlined in the Scheduled Maintenance Program.

GENERATOR CLEANING

Both the exterior and interior of the generator should be kept clean and free of dust, dirt, oil, and water which are likely to have a detrimental effect on insulation and performance.

As often as conditions warrant, the generator should be blown out with low pressure air. Avoid excessive air pressure which could cause damage to the insulation.

Clean, bound-edge, lintless wiping cloths should be used as necessary to remove oil, grease, and accumulations of dirt.

In cases where air and dry wiping cloths prove incapable of removing caked grease and dirt, a stiff brush and soft wood or fibre scrapers may be used. In severe cases it may be necessary to dampen a cloth in solvent such as Stoddards Solvent to loosen and remove imbedded deposits. Every precaution should be taken to keep the solvent off the commutator and copper parts as well as insulated coils and windings.

CAUTION

Ensure there is adequate ventilation and safety precautions are observed when handling inflammable fluids such as Stoddards Solvent which has a flash point of 46° C (115° F).

Chlorinated hydrocarbon type cleaning solvents are not recommended for use on the equipment because of the possibility of insulation damage. This type solvent can deteriorate semi-cured silicone rubber and can swell ethylene-propylene rubber, natural rubber, neoprene, and hypalon during extended soaking periods. The vapor state at 70° C (160° F) attacks uncured silicone rubber within 20 minutes. The vapors of these solvents also have an adverse effect on commutation. Special care is also necessary to avoid subjecting the polyester glass insulated brush holder studs to alkaline type cleaning solutions.

BEARING MAINTENANCE

The bearing requires maintenance at intervals recommended in the Scheduled Maintenance Program. This can be accomplished either by removing the generator from the installation and performing the Generator Disassembly procedure of this instruction or by maintaining the bearing with the generator in place.

BEARING MAINTENANCE WITH GENERATOR IN PLACE

Perform the entire following procedure for a generator-alternator unit. If the generator does not have an attached alternator and therefore no collector ring assembly, perform only Steps 7 through 18.

1. Remove collector ring cover, Fig. 5.

NOTE

On older units equipped with a compressor coupling, remove compressor guard.

2. Remove brushes from collector ring brush holders and remove brush holder cable connections. Remove brush holders.
3. Remove field lead connections from terminal posts of collector ring assembly.
4. Remove shaft flange and conduit bushing from end of shaft.
5. Place an extension cup around field leads and bolt extension cup to shaft as shown in Fig. 6.

SERVICE DATA (CONT'D)

RESISTANCE MEASUREMENT LIMITS (IN OHMS AT 75° C)

Use the following formula to convert resistance measured at any temperature to resistance at 75° C (167° F):

$$\text{resistance at } 75^{\circ} \text{ C} = \frac{\text{measured resistance} \times 309.5}{234.5 + \text{temperature of item being tested in } ^{\circ} \text{C}}$$

Model D32 Generator

	<u>Min.</u>	<u>Max.</u>
Armature	.00260	.00270
Armature (1-10)	.00174	.00191
Main Circuit A-D	.00445	.00463
Interpole A-B	.00221	.00230
A-E	.00221	.00231
Differential Field C-D	.00136	.00142
D-F	.00137	.00142
Compensating Field E-F	.00348	.00362
B-C	.00350	.00366
Starting Field	.00572	.00596
*Shunt Field (F+ and F-)	90.78	94.48
*Battery Field	1.15	1.21
**Separately Excited Fields:		
FP1-FN2 (with FN1 connected to FP2)	2.13	2.21
***Separately Excited Fields:		
FP1-FN2 (with FN1 connected FP2)	2.02	2.10

*Not on Model D32D and D32E

**Model D32D only

***Model D32E only

Model D22 Generator

	<u>Min.</u>	<u>Max.</u>
Armature	.00306	.00318
Armature (1-10)	.00204	.00212
Main Circuit A-D	.00480	.00498
Interpole A-B	.00220	.00228
A-E	.00222	.00231
Differential Field B-C	.00140	.00146
F-D	.00140	.00146
Compensating Field E-F	.00393	.00409
C-D	.00396	.00412
Starting Field	.00561	.00583
Shunt Field (F+ and F-)	90.78	94.48
Battery Field	1.15	1.21