M.I. 9547
*Rev. B

ELECTRO-MOTIVE DIVISION • GENERAL MOTORS CORPORATION
SERVICE DEPARTMENT

MAINTENANCE INSTRUCTION

MODERNIZATION RECOMMENDATION

UTILIZATION OF 645 POWER ASSEMBLIES IN 567BC, 567C, 567CR, 567D1, 567D2, 567D3, & 567D3A ENGINES

PURPOSE:

1. Standardization of power assemblies in 645 and subject 567 engines, to reduce parts inventory.

2. Provide information needed to raise locomotive horsepower to 2000 in conjunction with 645 power assemblies in 16-567D1 engines.

APPLICATION:

12 & 16 567BC Engines	567C, 567CR, & 16-567D1 Engines	567D2 Engines	567D3 Engines	567D3A Engines
F2, F3, F7, FP7, E8, BL1, BL2, GP7, SD7, SW9, NW5, TR5	F9, FP9, GP9, SD9, E9, SW1200, SW900, GP18, SD18, GP28, SD28	GP20	GP30, SD24	GP35, SD35, SDP35, DD35, DD35A

Application of 645 power assemblies results in new engine model designations. This amounts to substituting "645" in place of "567" in the designations, i.e. 16-567C becomes 16-645C.

REFERENCE: Figs. 1, 2, 3, tables in this bulletin, and applicable Engine Maintenance Manual.

NEW MATERIAL REQUIRED:

1. The following material is required for converting blower-type 8-567CR, 12 and 16-567BC, 12 and 16-567C, and 16-567D1 engines.

*This bulletin is revised and supersedes previous issues of this number.

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Quantity 567CR*	567BC		567C		567D1	Part No.	Description
8	12	16	12	16	16		
8	12	16	12	16	16	8415993	Liner - 18 Port
8	12	16	12	16	16	8481489	Piston Assy. - W/Rings
8	12	16	12	16	16	8453422	Piston Cooling Tube
16	24	32	24	32	32	181339	Bolt - Flange To Manifold
8	12	16	12	16	16	8472070	Seal Kit - Head to Liner
8				16	16	5229510	Fuel Injector
	12	16	12			5229500	Fuel Injector 00 9500
					16**	5229200	Fuel Injector
					16**	8424464	Cylinder Head Assy
1				1	1	8285799	Governor Rack Stop Block
2				2	2	120217	Washer - No. 10 Lock
2				2	2	8284048	Washer - Plain
2				2	2	147119	Screw - No. 10-32x1" Socket Head
		2		2	2	8350517	Camshaft Counterweight - Rear, R. & L. Bank
		1		1	1	8350516	Camshaft Counterweight - Front, L. Bank
		1		1	1	8350518	Overspeed Trip Assy. - Front R. Bank
	1		1			8367950	Camshaft Counterweight - Rear, R. Bank
	1		1			8367951	Camshaft Counterweight - Rear, L. Bank
	1		1			8367949	Camshaft Counterweight - Front, L. Bank
	1		1			8383745	Overspeed Trip Assy. - Front, R. Bank
1						8371520	Camshaft Counterweight - Rear, L. Bank
1						8371521	Camshaft Counterweight - Rear, R. Bank
1						8371519	Camshaft Counterweight - Front, L. Bank
1						8371518	Overspeed Trip Assy. - Front, R. Bank
					4**	8369675	Blower Bearing Assy. - R. & L. Bank
					2**	8362081	Blower Drive Gear
					1**	8369720	Blower Drain Line - R. Bank
					1**	8369719	Blower Drain Line - L. Bank
	6	8				8159138	Connecting Rod - Blade
	6	8				8159354	Connecting Rod - Fork
	12	16				8269842	Piston Pin
	24	32				8159340	Bolt Assy. - Includes Spacer
	12	16				8135330	Thrust Washer
	12	16				8059699	Snap Ring
	12	16				8367800	Piston Carrier
	12	16				8361565	Carrier Insert Bearing
	12	16				8028743	Seal - Cylinder Head - Upper
	12	16				8092584	Seal - Cylinder Head - Lower

*This modification is only applicable to 8-567CR engines. It does not apply to 8-567C engines.

**These items required only if output of 16-567D1 engine is increased to 2000 HP. The blower drain lines can be replaced or reworked as described under "Procedure."

2. The following equipment changes are required if the output of the 16-567D1 engine is increased to 2000 horsepower:

Qty.	Part No.	Description
2	8310416	Cooling Fan - 48", 8 Blade
2	8257494	Closure Plate - Oil Cooler Inlet Slot
1	8320705	Lube Oil Filter Bypass Valve
7	8345482	Lube Oil Filter Element
1	8394275	Air Filter Frame - L. Bank
1	8394274	Air Filter Frame - R. Bank
4	8356192	Oil Bath Filter
1	8347200	Air Compressor Filter Assy.

In addition to the above changes, there are electrical modifications required if the horsepower is increased to 2000. Due to the fact that electrical modifications differ between customers, the required parts list and wiring diagram will be furnished on request.

3. The following material is required for converting turbocharged 16 cylinder 567D2, D3, and D3A engines:

Quantity			Part	
D2	D3	D3A	No.	Description
16	16	16	8415993	Liner - 18 Port
16	16	16	8467251	Piston Assy. - W/Rings
16	16	16	8453422	Piston Cooling Tube
32	32	32	181339	Bolt - Flange to Manifold
16	16	16	8472070	Seal Kit - Head to Liner
16	16	16	5229250	Fuel Injector
16	16	16	8367800	Piston Carrier - Center Feed Oil Hole
				NOTE: Carriers 8396056 and 8269840 may be used if modified by drilling a 1/2" hole on the vertical centerline through the upper pilot.
16	16	16	8361565	Carrier Insert Bearing Shell
2	2	2	8350517	Camshaft Counterweight - Rear, R. & L. Bank
1	1	1	8350516	Camshaft Counterweight - Front, L. Bank
1	1	1	8350518	Overspeed Trip Assy. - Front, R. Bank

COST OF MATERIAL:

The approximate cost of material is $4573.08 for the 8-567CR; $9947.17 for the 12-567BC; $13,162.09 for the 16-567BC; $6429.94 for the 12-567C, and $8311.69 for the 16-567C and 16-567D1. If the output of the D1 engine is increased to 2000 horsepower, the approximate cost (w/cyl. heads), excluding electrical modifications, will be $18,690.81. The cost of applying this modification to 16 cylinder 567D2, D3 and D3A engines will be $10,048.65 for each engine.

These prices are for job estimating purposes only. Material will be billed at prices in effect at time of shipment. Material should be accumulated before locomotive is removed from service for modification.

Substantial savings can be realized by converting injectors presently in use. For blower-type engines, spherical and needle valve injectors can be converted to 5229510 (UTEX 9081164) for 8 and 16 cylinder engines or to 5229500 (UTEX 9081163) for 12 cylinder engines. For turbocharged engines, needle valve injectors can be converted to 5229310 (UTEX 8478051) in lieu of applying new 5229250 injectors. These conversions consist basically of application of a new "LOW SAC" spray tip and calibration slide.

It is not considered economical to convert 567 injectors to the 645E3 injector 5229250 due to the difference in bushing bores, fuel passage size, and rack location in the body.

PROCEDURE

BLOWER-TYPE ENGINES

Conversion of 8-567CR, 12 and 16-567BC, and 12 and 16-567C engines requires engine changes only. The 16-567D1 engine requires engine changes only, if the original horsepower rating is retained.

Modifications involve replacement of cylinder assembly components and camshaft counterweights with part numbers listed under "New Material Required" for the respective engine. Reference to appropriate Engine Maintenance Manual is recommended.

A governor rack stop block, Fig. 1, should be applied to 8 and 16 cylinder 567C and 16-567D1 blower-type engines to reduce overfueling of the engine. Overfueling is a major factor in piston ring breakage and valve blow. Application procedure is as follows, see Fig. 2:

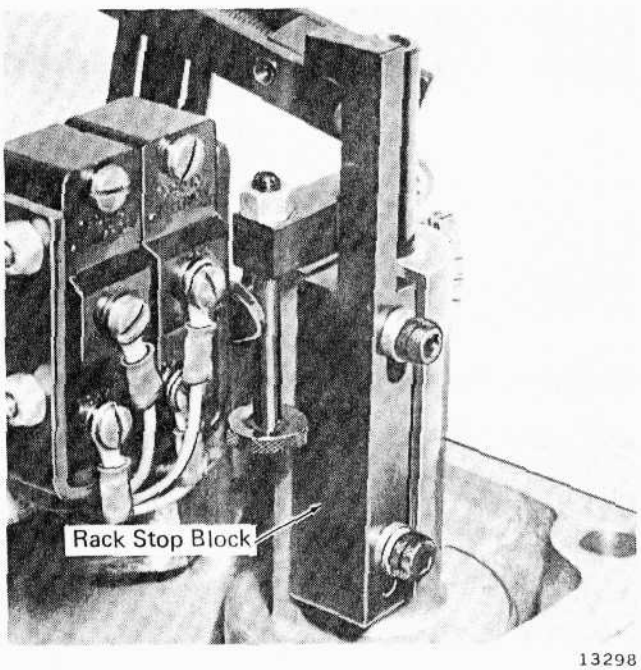

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Fig. 1 – Governor Rack Stop Block

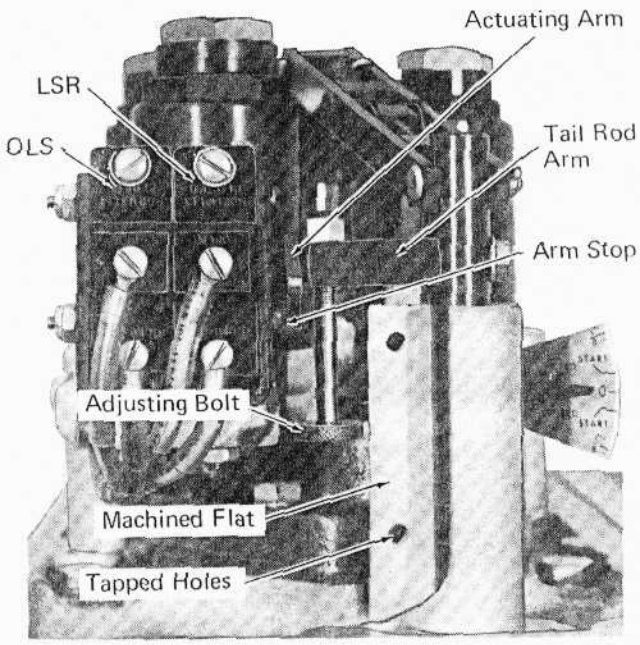

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Fig. 2 – Stop Block Mounting Details

1. Position stop block 8285799 on the machined flat of the power piston spring guard so that the right angle hook extends over the tail rod arm.

2. Insert the two socket head screws 147119 with washers 120217 and 8284048 through the slotted holes in the stop block, and screw them into the tapped holes in the power piston spring guard.

3. Using the injector control lever or a tail rod jack, position the power piston so that the terminal shaft scale is aligned with the pointer. (See table following.)

4. Slide the stop block down until the right angle hook rests firmly on the tail rod arm. Tighten screws.

5. Make sure LRS is correctly adjusted, as specified in the table following.

6. Adjust the OLS switch by raising the power piston tail rod until the proper setting on the terminal shaft scale aligns with the pointer. (See table following.)

7. Loosen the allen screw locknut, Fig. 3, on OLS lever, and turn screw to cause overriding solenoid to be energized.

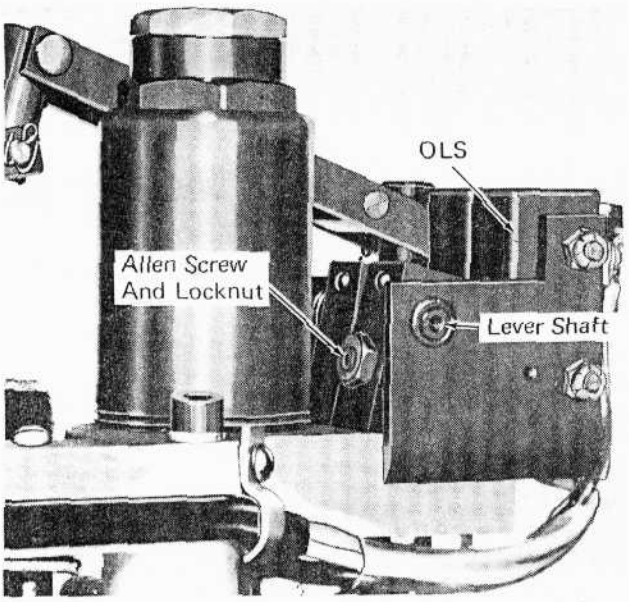

Fig. 3 -- OLS Switch Adjustment Points

Loco Models	Rack Stop	LRS	OLS
F9, FP9, GP9, SD9, GP18, SD18, GP28, SD28	.79	.92	.83
SW900	.75	.87	.79

Governor speed and full load balance settings will remain the same as original equipment application.

Conversion of the 16-567D1 engine to operate at 2000 horsepower requires the changes outlined above and, in addition, the blower drive gears, blowers, and blower drain lines will require changes to accomplish this conversion.

It will be necessary to replace blower drive gears 8130889 (30 tooth) with blower drive gears 8362081 (29 tooth). The blowers can be reworked by replacing both bearing assemblies 8028146 in each blower with bearing assemblies 8369675. The blower drain lines can be replaced with part numbers listed under "New Material Required," or they can be reworked by cutting off the stand pipe portion of the tube flush with the top of the mounting flange.

Engine speed on this conversion will become 900 RPM at full speed, and the overspeed trip should be set to trip at 990-1005 RPM. The governor balance point and rack stop settings should be set as shown below:

Loco. Models	Loco. HP	Full Engine RPM	Full Load Inj. Rack	Rack Stop	LRS	OLS
GP18, SD18, GP28, SD28	2000	900	.83	.69	.79	.71

SYSTEM EQUIPMENT CHANGES

If the 16-567D1 engine used in GP18 and SD18 models is increased to 2000 horsepower, the following system equipment changes are required.

Air Filtration System

Engine – On GP18 and SD18 locomotive models, it will be necessary to replace the present air filters and air filter frames with part numbers listed under "New Material Required." This modification is not required on GP28 and SD28 locomotive models.

Air Compressor – The air compressor must be equipped with inlet filter 8347200.

Lube Oil System

The lube oil cooler core should be removed, cleaned, and reassembled, being certain that the cooler is equipped with discharge baffle. The oil return slot on bottom header must be closed off at both ends with cover 8257494, if open.

Lube oil filters will contain seven pleated paper elements 8345482.

The lube oil filter housing must have a 40 psi relief valve, either external type 8320705, or internal type 8277458. Present 20 psi relief valves can be converted to 40 psi as follows:

1. Seven Element Housings With Five Internal Bypass Valves

   Remove the five valve springs from the housing and replace with springs 8282144. Cost of conversion material is approximately $5.00.

2. Seven Element Housing With External Bypass Valve

Qty.	Part No.	Description
1	8317190	Spring - Compression 40 psi
3	8316866	Spring - Valve Retainer
1	8296030	Gasket - Valve Port

   The above material is directly interchangeable with the 20 psi valve parts, however, it will be necessary to grind additional relief in the spring keeper casting to accommodate the heavier 40 psi spring. The valve cover plate should be stamped "40 psi spring" to identify the new spring. Cost of *conversion material is approximately $5.00.*

Cooling System

Two 48", 8 blade cooling fans 8310416 are required.

It will be necessary to relocate a portion of the engine water discharge pipe from the engine to the radiators for application of the replacement engine air filters on GP18 locomotives. This change is not required on SD18, GP28, and SD28 locomotives.

This modification consists of a revision to the 3" discharge pipe to clear the top of the oil separator, and the repositioning of the flexible pipe couplings. In addition, due to the increased height of the pipe in the new location, it will be necessary to apply 1/2" copper tubing from the bottom of the "Y" casting to the discharge elbow casting on the engine, to provide a complete drain back to the engine.

TURBOCHARGED ENGINES

Conversion of 16-567D2, D3, and D3A engines requires engine changes only. Modifications involve replacement of cylinder assembly components and camshaft counterweights with part numbers listed under "New Material Required" for the respective engine. Reference to the appropriate Engine Maintenance Manual is recommended.

The following table should be used for governor and fuel limiter settings:

Loco. Model	Loco. HP	Engine RPM	Full Load Inj. Rack		Fuel Limiter	
			Rack Length	Abs. Air Box Press.	Rack	Abs. Air Box Press.
GP20	2000	835	1.10	48	.99	48
GP30	2250	835	1.02	52	.99	48
SD24	2400	835	.98	55	.99	48
GP35, SD35, SD35, DD35, DD35A	2500	900	.96	55	.99	48