EMD MAINTENANCE INSTRUCTION

HORSEPOWER MEASUREMENT AND TESTING REBUILT ENGINES

INTRODUCTION

This bulletin contains the necessary information for horsepower measurement, testing rebuilt engines, and horsepower calculation.

I. HORSEPOWER MEASUREMENT

Maintenance Instruction 6830 contains complete information regarding the electrical connections to be made on various model locomotives for load testing.

The nomographs, Figs. 1 and 2, for converting voltage, amperage and ambient air temperature readings into horsepower, are based on 93.8% generator efficiency. This efficiency is automatically obtained when locomotive is loaded by connecting to the dynamic brake grids. When using any other loading arrangement, the generator amperage should be within the range given in Table 1 for the specific generator concerned, in order to attain 93.8% generator efficiency.

TABLE I
MAIN GENERATOR AMPERAGE RANGE FOR 93.8% EFFICIENCY

Generator Model	Amperage Range
D4	700-900
D8	1000-1200
D15	1000-1100
D12	1400-1600
D22	1600-2000

The determination of locomotive horsepower for tractive purposes requires that ambient air temperature be measured. For normally aspirated engines measure air temperature at engine blower intake. For turbocharged engines measure ambient air temperature outside the unit.

TEST

1. Make electrical connections.
2. Run engine without load until water reaches 120° F.
3. Load engine and bring up to full speed and load.
4. Run engine approximately 30 minutes at full load with all engine room doors closed, before taking voltage, amperage and air temperature readings.
5. Using correct nomograph, Fig. 1 or 2, determine horsepower into the generator for tractive purposes, adjusted for existing ambient air temperature. Table II lists the rated horsepower for the various locomotives.
6. Test results obtained at altitudes above 1000 feet should be adjusted to sea level by using the correct factor from Fig. 3, 4, 5, or 6.

II. TESTING COMPLETELY REBUILT ENGINES

When rebuilding engines, it is recommended that the latest edition of the applicable 567 Engine Maintenance Manual be consulted for the necessary specifications, settings, adjustments and assembly procedure. After being rebuilt, the engine is usually inspected and tested following installation in a locomotive. This work can, however, be performed prior to installation provided that special load testing facilities are available.

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

MOTORES ROOTS.

BOMBA DE BARRIDO.

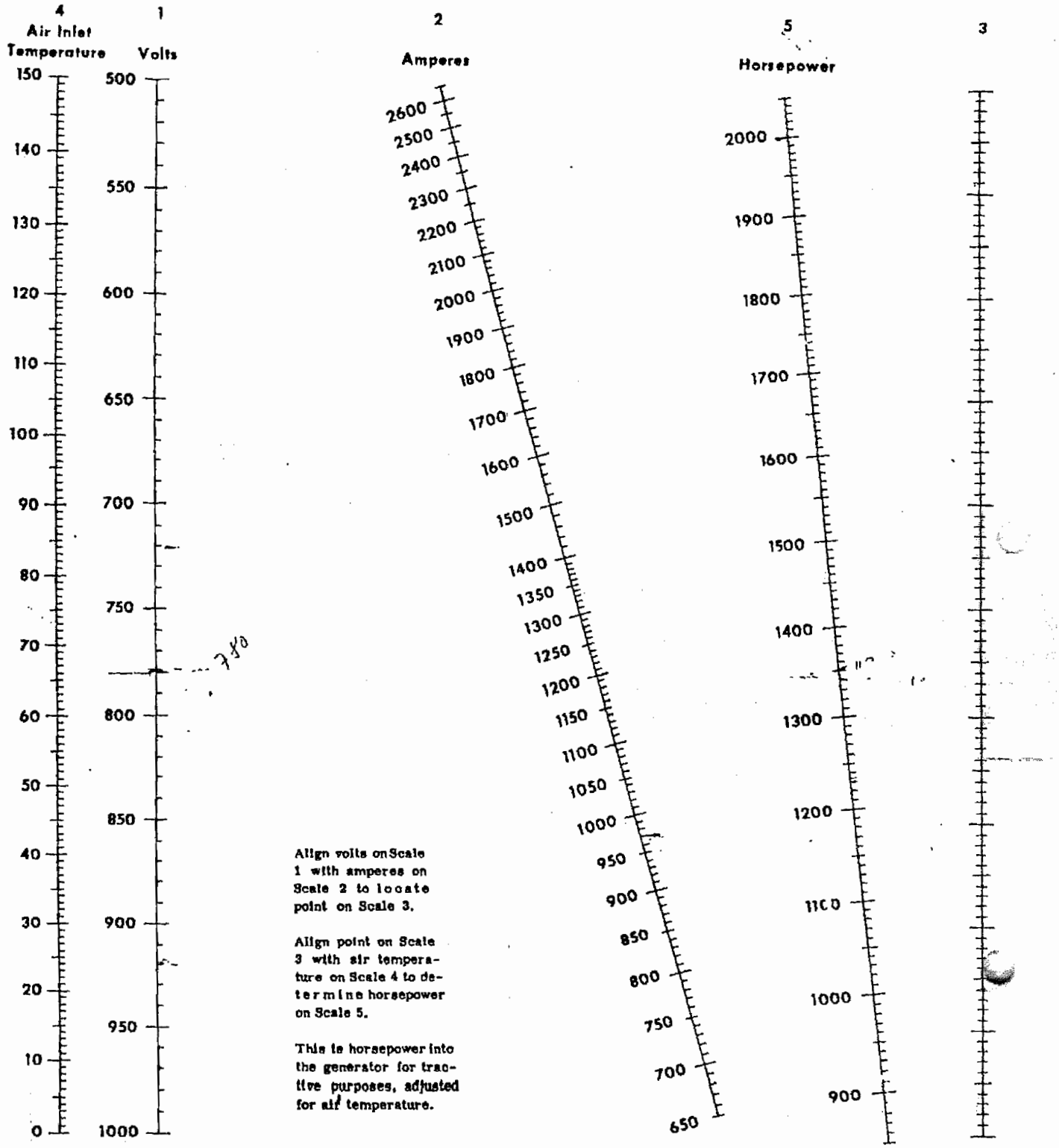


Fig. 1 - Horsepower Nomograph For Normally Aspirated Engines

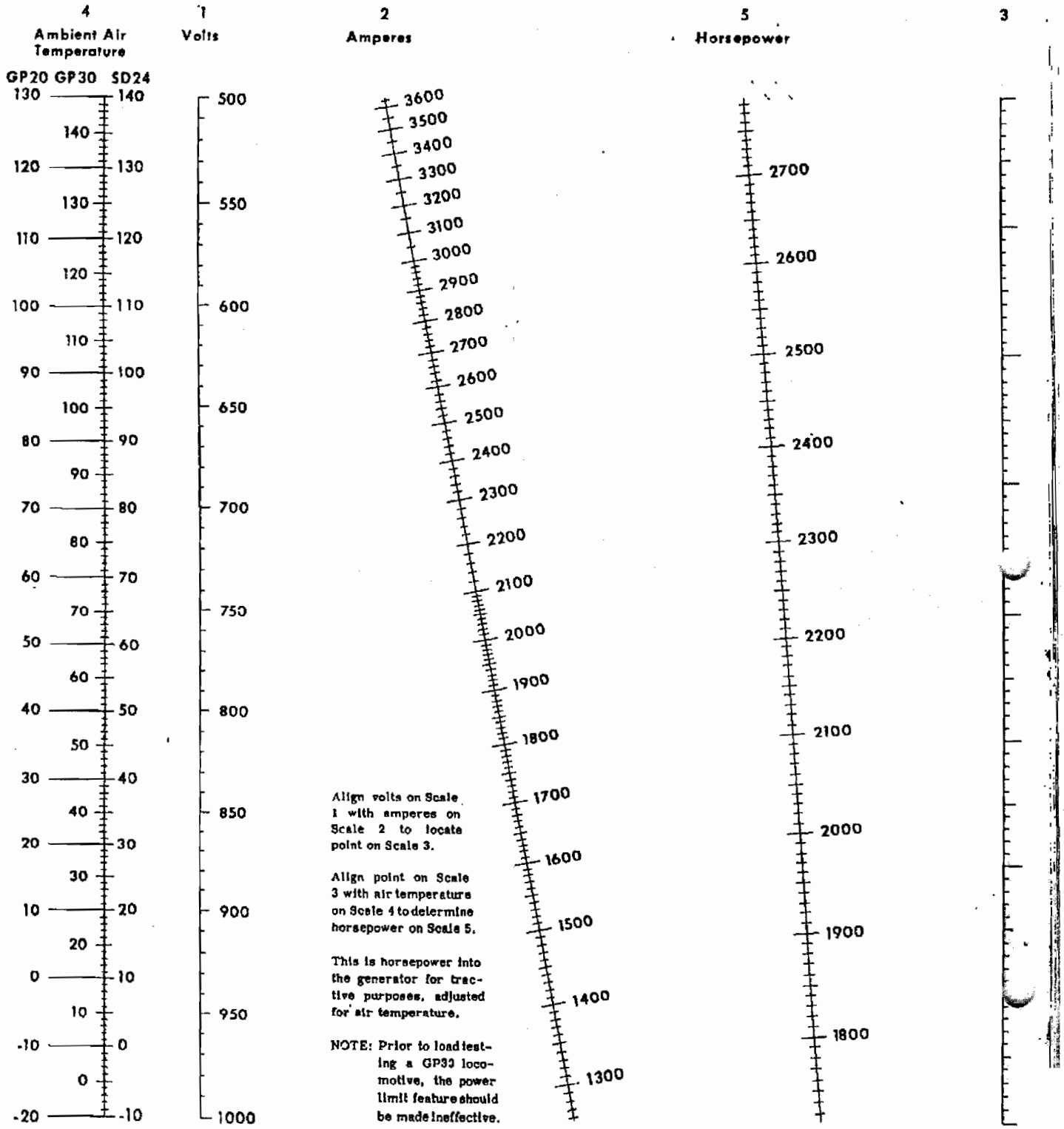


Fig. 2 - Horsepower Nomograph For Turbocharged Engines

The following Maintenance Facility Drawings contain the necessary construction details for a permanent testing arrangement incorporating fuel, cooling and lubricating oil systems.

Drawing #286 - Fuel System
Drawing #290 - Lubricating Oil System
Drawing #292 - Cooling System
Drawing #294 - Combined Arrangement of Individual Testing Facilities

These drawings are available on request from Electro-Motive District or Regional Representatives. Overseas railroads should direct their requests to the Service Manager, Locomotive Products Division, General Motors Overseas Operations, New York 17, New York, or to the associate locomotive manufacturer.

Engine Installation

Installation of the engine in the locomotive and alignment of connected rotating equipment should be performed according to information contained in Maintenance Instruction 1753. After installation and alignment has been completed, bar engine over at least one revolution to make sure it is free to rotate.

Preliminary Engine Inspection

Before starting the engine and proceeding with the necessary tests, it is advisable that the following preliminary inspections be carefully made.

1. Fuel System

Using the type of fuel oil recommended in Maintenance Instruction 1750, circulate fuel through the system at a

TABLE II

LOCOMOTIVE HORSEPOWER SPECIFICATIONS

Locomotive Model	Rated Standard HP (For Traction)	No. Cylinders	Total Standard HP (Minimum)
SW1, SW600	600	6	615
GM6	600	6	650
SW8, TR6, GA8	800	8	850
GL8, G8	875	8	950
SW900	900	8	950
NW-2-3-5	1000	12	1100
E7	1000 (2)	12	1100 (2)
E8	1125 (2)	12	1250 (2)
SW7, SW9, SW1200, TR5	1200	12	1275
E9	1200 (2)	12	1275 (2)
G12, GR12	1310	12	1420
GA12	1200	12	1275
G-12U, G-12W	1310	12	1420
RS1325	1325	12	1400
FT, F2	1350	16	1440
F3-5-7, GP7, SD7	1500	16	1650
F9, FP9, GP9, SD9	1750	16	1850
G16	1800	16	1950
G-16U, G-16W	1800	16	1950
GP18, SD18	1800	16	1950
GP20	2000	16	2150
GP30	2250	16	2415
SD24, GT16	2400	16	2600

pressure of approximately 15 psi for at least one-half hour. Observe jumper pipe connections to injectors and manifolds as well as the filters and external piping connections for leakage.

2. Lubricating Oil System

Fill engine to proper level with lubricating oil of the type recommended in Maintenance Instruction 1752. Connect an external pump from a separate container to the main lube oil inlet manifold at the front of the engine. Circulate new clean oil through the engine and observe carefully for proper lubrication of main and connecting rod bearings, as well as all operating mechanisms in top deck areas. Rotate crankshaft at least one revolution while circulating oil.

Connect the external pump to the piston cooling oil inlet manifold at the front of the engine. Using oil under 20-25 psi pressure, observe flow from each of the piston cooling oil pipes.

3. Cooling System

Blank off inlet and outlet piping leaving one outlet flange loose. Fill engine cooling system with properly treated water through drain connection until it appears at outlet flange and then tighten flange.

Apply 50-60 psi pressure to the cooling system and check for leakage at all sealed and gasketed areas. After testing, remove blanking flanges and fill cooling system to operating level.

4. Fill governor to proper level with lubricating oil recommended in Maintenance Instruction 1752. Check injector control linkage for freedom of operation.

5. Air Intake Filters

Clean air intake filters should be installed on the engine. If oil bath type filters are used, refer to Maintenance Instruction 431 for recommendations covering oil to be used and proper amount to be added.

6. Settings And Adjustments

A final check should be made of engine and governor settings and adjustments. On the engine, select one cylinder in each bank and check valve timing, lash adjuster setting, injector timing and injector rack setting. If any discrepancies are found, check the other cylinders and reset as necessary.

Engine Load Testing

After completing engine installation in locomotive and performing the work indicated in the six preceding steps, the engine is ready for load testing. The preferred method is a stationary test, since performance observations can be made and specific detailed data accumulated under stable operating conditions. However, in instances where a stationary load test is not possible, the engine should be given a modified break-in run and then be released for service as outlined under "Testing Without Load Facilities."

NOTE: It should be recognized that horsepower data obtained under road operating conditions will not be accurate since the horsepower produced will vary, depending on whether the locomotive is accelerating or decelerating.

BREAK-IN RUN

When electrical connections for load testing have been completed, the engine break-in run should be performed in accordance with the following steps:

1. Start engine and run at idle speed (275 RPM) and no load for 10 minutes. Stop engine and inspect main and connecting rod bearings visually and by

touch to detect any overheating or other abnormal condition.

2. Start engine and after loading run in #2 throttle for one-half hour. Stop engine and again inspect for hot crankshaft bearings.

3. Start engine and, with load applied, run in #5 throttle position for one-half hour.

4. Advance throttle to #6 position and run for one-half hour.

5. Advance throttle to #7 position and run for one-half hour. (Turbocharged engines one hour.)

6. Run engine at full speed and rated horsepower for one hour. During this last run, the following items should be checked:

   a. Engine water temperature and lube oil pressure should fall within limits given in Engine Maintenance Manual.

   b. During this and the preceding runs, check engine speeds with an accurate tachometer and reset governor solenoids as necessary. If the full speed setting is changed, it will be necessary to reset the governor load control pilot valve.

NOTE: For turbocharged engines equipped with a rebalancing governor, adjustments to the load control pilot valve must be made on a governor test stand in order to obtain the proper balance point after the adjustments have been made.

   c. Energize governor overriding solenoid to check operation.

   d. Check speed at which overspeed trip functions. When tripped, engine should stop immediately.

   e. Restart engine and check operation of governor low oil pressure shutdown mechanism by pulling out oil shutdown plunger on front of governor. Engine should shut down immediately.

   f. Restart engine and check operation of governor high lube oil suction mechanism by pressing in on the Allen screw located on the back face of the governor. Engine should stop immediately.

NOTE: Information pertaining to specifications, settings, and adjustments of preceding items can be found in the proper Engine Maintenance Manual.

7. Stop engine and make a careful inspection for any deficiencies. Observe cylinder liners for scoring or dirt scratches. Check tightness of all external engine cap screws and nuts. Lube oil relief valve setting should be checked for agreement with specifications in proper Engine Maintenance Manual. Wipe engine clean before proceeding with the full load run.

FULL LOAD RUN

Accurate instruments should be installed in order that data can be taken during the test operation. Maintenance Instruction 6830 covering load testing illustrates a typical log sheet for recording the various readings needed when checking engine performance. Several specific readings are required for "Horsepower Standardization" which is covered in Section III of this bulletin. These readings include main generator voltage and amperage, engine intake air temperature or ambient air temperature, fuel temperature and auxiliary load such as number of cooling fans running.

On normally aspirated engines the preferable way of measuring engine air temperature is by modifying two air box inspection covers to accommodate dial thermometers. For test purposes one such cover is applied to the air box near the center on each side of the engine. The alternative method is to simply hang precision thermometers in the engine room near the engine blower air intakes.

Engine air temperatures on locomotives with turbocharged engines are best determined by measuring ambient air temperature (Fahrenheit) and adding a correction factor. With all engine room doors closed, the engine (compressor) intake air temperature is 10° above ambient on SD24 locomotives, 20° higher than ambient on GP20 locomotives, and 5° above ambient on GP30 locomotives.

Test Procedure

1. Start engine and allow it to warm up without load until water temperature is at least 120° F.

2. Run engine for six (6) hours at rated speed and horsepower. During this full load run, observe the following points:

   a. Check governor power piston dimension or injector rack length indicator to make certain that setting is proper for the particular engine being tested.

   b. Using data accumulated, calculate adjusted engine horsepower as outlined under "Horsepower Calculation." Refer to Table II for specifications.

   c. Check engine speed each hour. If correction affecting the full speed setting is necessary, it will be necessary to reset the governor load control pilot valve.

NOTE: For turbocharged engines equipped with a rebalancing governor, adjustments to the load control pilot valve must be made on a governor test stand in order to obtain the proper balance point after the adjustments have been made.

   d. Engine water temperature and lube oil pressure should fall within limits given in Engine Maintenance Manual.

3. At the end of the full load run period, check overspeed trip by completely removing load. Overspeed trip should not function during this loss of full load.

4. Reduce engine speed to idle. Check speed and reset if necessary. While idling, and with the engine oil still hot, check main bearing lubricating oil pressure. Compare result with specification in proper Engine Maintenance Manual.

Engine Qualification Without Load Facilities

Performance of rebuilt engines cannot be evaluated satisfactorily under road operating conditions. In instances where it is not possible to make the preceding stationary locomotive load tests, the following points should be observed.

1. Break-in Run

   Complete Steps 1 and 2 listed in the preceding instructions for a shop break-in run except in this instance Step 2 cannot be run with load.

2. Full Load Run

   Due to the fact that this test is performed with the locomotive in operation, the preceding instructions for a shop full load run do not apply.

Final Inspection

Following the full load run performed either in the shop or on the road, a final inspection should be made.

NOTE: Refer to the proper Engine Maintenance Manual for torque specifications and engine inspection procedures.

If any major component such as a piston, liner, connecting rod or bearing requires replacement, it is recommended that after being replaced another one hour break-in run be performed. The engine should then be stopped and the new part inspected.

III. HORSEPOWER STANDARDIZATION

The tractive effort of a diesel-electric locomotive is determined by the electrical power received by the traction motors from the main generator. It is, therefore, desirable to know what horsepower the diesel engine is putting into the main generator that can be converted into electrical power, and it is for this reason that the horsepower rating of a diesel-electric locomotive is the horsepower of the diesel engine delivered to the main generator.

With the usual methods of load testing locomotives, the engine output horsepower is most conveniently measured at the output of the main generator. The electrical power out of the main generator may be converted to mechanical horsepower. In order to obtain the actual output of the diesel engine in this manner, a main generator efficiency correction must be made to the voltage and amperage readings taken from the main generator output. Thus, the formula for calculating diesel engine output horsepower into the main generator is:

$$\text{Eng. HP Into Gen.} = \frac{\text{Main Gen. Volts} \times \text{Amps}}{746 \text{ Watts/HP} \times \text{Gen. Efficiency}} \quad (1)$$

Considering the frictional losses, the wind losses, and the heat losses, the main generator is 93.8% efficient. When applying this efficiency, the horsepower formula becomes:

$$\text{Eng. HP Into Gen.} = \frac{\text{Volts} \times \text{Amps}}{700} \quad (2)$$

Use of equation (2) only gives observed horsepower at the prevailing conditions of the load test, but does not give the actual horsepower of the engine. In order to get the actual engine horsepower, the observed horsepower must be corrected to the standard conditions of rating diesel engines as defined by EMD in designing the engine. These standard conditions are sea level barometric pressure, .835 specific gravity fuel, 60° F. fuel temperature, and 60° F. engine air intake temperature. When load test conditions vary from any of these standards, a correction factor must be applied to the horsepower formula to obtain standard condition horsepower.

When corrections are being made to obtain the actual engine horsepower at standard conditions, the total horsepower of the engine must be considered instead of just the output horsepower to the generator. Then the total observed engine horsepower includes the observed engine horsepower into the main generator, plus the horsepower required by the locomotive auxiliary equipment.

When correction factors from the above mentioned variable are applied to the total observed horsepower, the actual horsepower of the engine is obtained. If the auxiliary load horsepower is subtracted from this figure, then the actual engine horsepower into the main generator is obtained. This figure may then be compared to the rated engine horsepower to determine locomotive performance.

When applying the correction factors to the formula, the total engine horsepower becomes:

$$\text{Eng. HP} = \frac{\frac{\text{Volts} \times \text{Amps}}{700} + \text{Aux. HP}}{(a)(x)(y)(z)} \quad (3)$$

Where:

(a) Air intake temperature correction factor
(x) Fuel density correction factor
(y) Fuel temperature correction factor
(z) Altitude correction factor

Then the total horsepower delivered to the main generator for tractive purposes is the answer from equation (3) minus the auxiliary horsepower requirements and is given by the following equation:

$$\text{Eng. HP Into Gen.} = \left[\frac{\frac{\text{Volts} \times \text{Amps}}{700} + \text{Aux. HP}}{(a)(x)(y)(z)}\right] - \text{Aux. HP} \quad (4)$$

For normally aspirated engines, the values of (a), (x), (y), and (z) are obtained from scales in Fig. 3 and Fig. 4.

For turbocharged engines, the values of (x) and (y) are obtained from the scales in Fig. 5. Because the engine is turbocharged, the values of (a) and (z) are no longer independent as in the case of normally aspirated engines. The turbocharger creates an operating condition such that these values are dependent on each other and are correlated by the graphs in Fig. 6. Using the point of intersection of the barometric pressure or altitude with the correct temperature line, a correction factor value is obtained representing (a) (z). This single value is used to correct for barometric pressure and air temperature simultaneously.

TABLE III

AUXILIARY HORSEPOWER

NOTE: The horsepower requirements of the auxiliary equipment listed are correct only if the engine is operating at rated speed and load.

A. Domestic Locomotives

For domestic model locomotives, a fixed load value is given since the only variable is the number of cooling fans in operation. This fixed load is based on the air compressor being unloaded. Horsepower for cooling fans is corrected for alternator and motor efficiencies and shows power required at engine.

AUXILIARY LOAD VALUES

Model	Auxiliary Horsepower
1. 800 RPM — Engine Speed	
F7A, FP7A F7B, GP7 GP7B, F3	55.5 HP plus 13 HP for each cooling fan in operation. Maximum 107.5 HP.
E8A, E8B E9A, E9B	47.5 HP per engine plus 13 HP for each cooling fan in operation on the engine being tested. Maximum 86.5 HP.
E7	70 HP per engine.
SD7	85 HP plus 13 HP for each cooling fan in operation Maximum 137.0 HP.
FT	94 HP with four cooling fans operating.
SW8, TR6	39 HP
SW600	33.5 HP
SW9, SW1200 TR5, TR12	69.5 HP

2. 835 RPM — Engine Speed

F9A, FP9A F9B, FL9 GP9, GP9B	61.5 HP plus 15 HP for each cooling fan in operation. Maximum 121.5 HP.
GP9, GP18 2-48"-6 Blade Cooling Fans	61.5 HP plus 27.5 for each cooling fan in operation Maximum 116.5 HP.
GP20 2 - 48" - 8 Blade Fans 1 - 36" Fan	61.5 HP plus 15 HP for 36" cooling fan operation and 36.0 HP for each 48" cooling fan in operation. Maximum 148.5 HP.
GP20 2 - 48" - 6 Blade Fans 1 - 36" Fan	61.5 HP plus 15 HP for 36" cooling fan operation and 27.5 HP for each 48" cooling fan in operation. Maximum 131.5.
GP30	93.5 HP plus 15 HP for 36" cooling fan operation and 27.5 HP for each 48" cooling fan in operation. Maximum 163.5 HP.
SD9	94.0 HP plus 15 HP for each cooling fan in operation. Maximum 154.0 HP.
SD9, SD18 2 - 48" - 6 Blade Cooling Fans	94.0 HP plus 27.5 HP for each cooling fan in operation. Maximum 149.0 HP.
SD24 3 - 48" - 6 Blade Cooling Fans	94.0 HP plus 53 HP for each cooling fan in operation. Maximum 253.0 HP.
SD24 3 - 48" - 6 Blade Cooling Fans	94.0 HP plus 27.5 HP for each cooling fan in operation. Maximum 176.5 HP.
RS1325	81.5 HP
SW900, TR9	56.0 HP

B. Export Locomotives

The auxiliary horsepower figures for export locomotives are listed separately for each locomotive since the auxiliaries may vary according to the locomotive model.

Model GM6 Locomotive (800 RPM)	HP
Auxiliary Generator	7.0
Traction Motor Blower	7.0
54" Cooling Fan	29.5
ABO or ADJ Air Compressor unloaded	7.0
TOTAL - Auxiliary Horsepower	50.5

Model GA8 Locomotive (800 RPM)	
Auxiliary Generator	7.0
Traction Motor Blower	13.0
54" Cooling Fan	29.5
ABO or ADJ Air Compressor unloaded	7.0
TOTAL - Auxiliary Horsepower	56.5

Model GA8 Locomotive (835 RPM)	HP
Auxiliary Generator	7.0
Traction Motor Blower	14.5
54" Cooling Fan	33.5
ABO or ADJ Air Compressor unloaded	5
TOTAL - Auxiliary Horsepower	62.5

Model GL8 Locomotive (835 RPM)	
Auxiliary Generator	7.0
Two Traction Motor Blowers	30.0
ABO or ABJ Air Compressor unloaded	7.5
50" Cooling Fan	22.0
54" Cooling Fan	33.5
TOTAL with 50" Cooling Fan	66.5
TOTAL with 54" Cooling Fan	78.0

B. Export Locomotives (Continued)

	HP
Model G8 and B8 Locomotives (835 RPM)	
Auxiliary Generator	7.0
Two Traction Motor Blowers	30.0
50" Cooling Fan	26.0
WBO or WXO Air Compressor unloaded	16.5
WXOV Compressor-Exhauster unloaded	36.0
WXE Air Compressor unloaded	14.0
TOTAL - with WBO or WXO Compressor unloaded	79.5
TOTAL - with WXOV Compressor Exhauster unloaded	99.0
TOTAL - with WXE Compressor unloaded	77.0
Model G12 and B12 Locomotive (835 RPM)	
Auxiliary Generator	7.0
Two Traction Motor Blowers	30.0
54" Cooling Fan	40.0
WBO or WXO Air Compressor unloaded	16.5
WXOV Compressor-Exhauster unloaded	36.0
WXE Air Compressor unloaded	14.0
TOTAL - with WBO or WXO Compressor unloaded	93.5
TOTAL - with WXOV Compressor-Exhauster unloaded	113.0
TOTAL - with WXE Compressor unloaded	91.0
Model GR12 Locomotive (835 RPM)	
Auxiliary Generator	7.0
Two Traction Motor Blowers	24.0
54" Cooling Fan	40.0
WBO or WXO Air Compressor unloaded	16.5
WXOV Compressor-Exhauster unloaded	36.0
WXE Air Compressor unloaded	14.0
TOTAL - with WBO or WXO Compressor unloaded	87.5
TOTAL - with WXOV Compressor-Exhauster unloaded	107.0
TOTAL - with WXE Compressor unloaded	85.0

	HP
Model JL8	
Auxiliary Generator	7.0
Two Traction Motor Blowers	30.0
50" Cooling Fan	26.0
54" Cooling Fan	40.0
ABO Air Compressor unloaded	7.5
TOTAL - with 50" cooling fan	70.5
TOTAL - with 54" cooling fan	84.5
Model GA12 Locomotive	
Auxiliary Generator	7.0
Traction Motor Blower	18.0
54" Cooling Fan	35.0
WBO or WXO Air Compressor unloaded	15.0
WXOV Compressor-Exhauster unloaded	34.5
WXE Air Compressor unloaded	12.0
TOTAL - with WBO or WXO Compressor unloaded	75.0
TOTAL - with WXOV Compressor Exhauster unloaded	84.5
TOTAL - with WXE Compressor unloaded	72.0
Model G16 Locomotive (835 RPM)	
Applies to all units shipped prior to and including Order LXO 700054 (shipped June, 1961) and Order LXO 702914 (shipped June through October, 1961).	
Auxiliary Generator	7.0
Two Traction Motor Blowers	56.0
66" Cooling Fan	57.0
WBO or WXO Air Compressor unloaded	16.5
WXOV Compressor-Exhauster unloaded	36.0
WXE Air Compressor unloaded	14.0
TOTAL - with WBO or WXO Air Compressor unloaded	136.5
TOTAL - with WXOV Compressor-Exhauster unloaded	156.0
TOTAL - with WXE Compressor unloaded	134.0

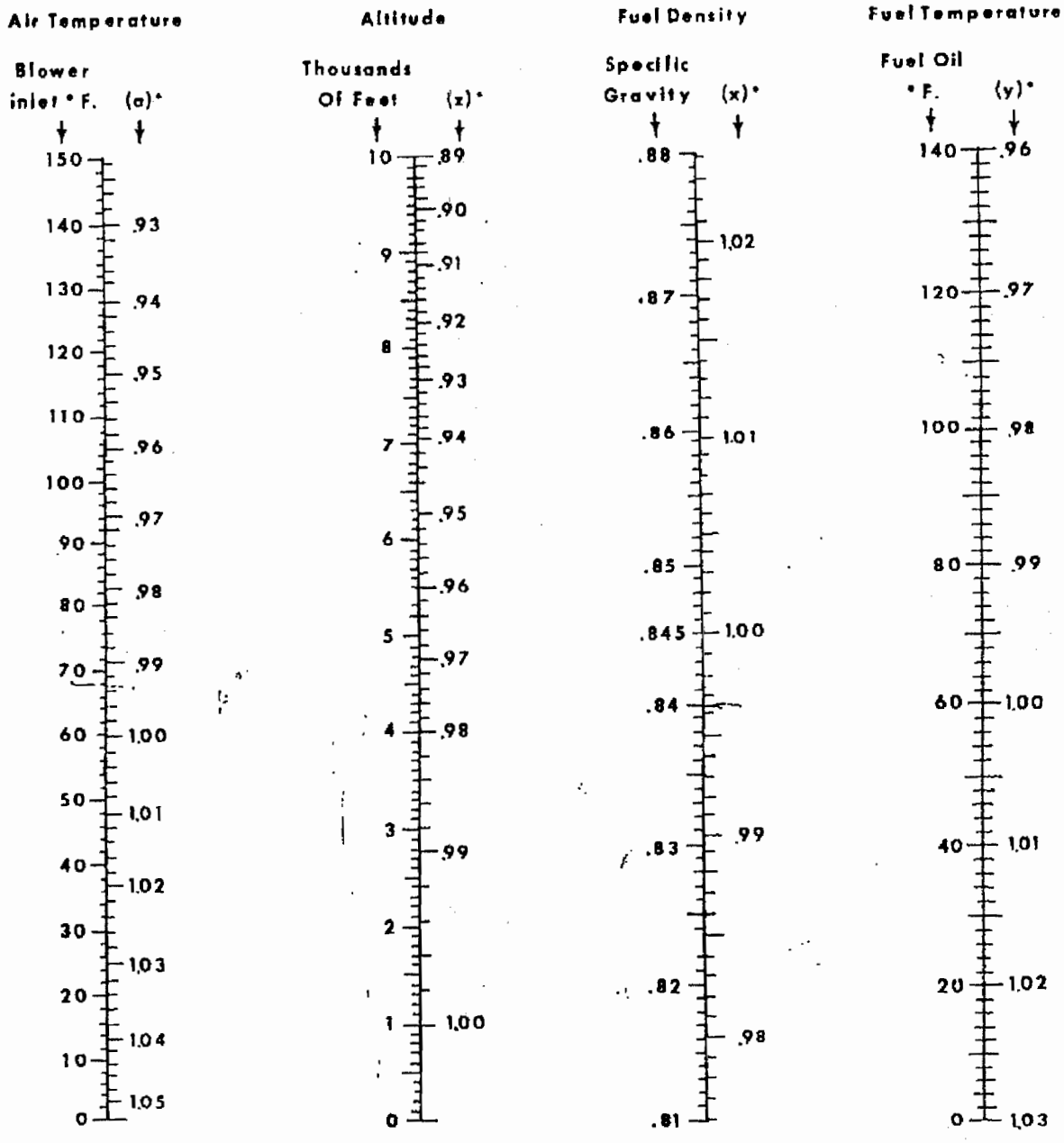
Model GT16 Locomotive (835 RPM) (3-48" - 6 Blade Cooling Fans)	HP
Auxiliary Generator	7.0
No. 1 Traction Motor Blower	20.0
No. 2 Traction Motor Blower	31.0
WBO or WXO Air Compressor unloaded	16.5
WXOV Compressor-Exhauster unloaded	36.0
WXE Air Compressor unloaded	14.0
TOTAL - with WBO or WXO Compressor unloaded 74.5 HP plus 27.5 HP for each cooling fan in operation. Maximum 157.0 HP.	
TOTAL - with WXOV Compressor-Exhauster unloaded 94.0 HP plus 27.5 HP for each cooling fan in operation. Maximum 176.5 HP.	
TOTAL - with WXE Compressor unloaded 72.0 HP plus 27.5 HP for each cooling fan in operation. Maximum 154.5 HP.	

Model GT16 Locomotive (835 RPM) (3-48" 8 Blade Cooling Fans)	HP
Auxiliary Generator	7.0
No. 1 Traction Motor Blower	20.0
No. 2 Traction Motor Blower	31.0
WBO or WXO Air Compressor unloaded	16.5
WXOV Compressor-Exhauster unloaded	36.0
WXE Air Compressor unloaded	14.0
TOTAL - with WBO or WXO Compressor unloaded 74.5 HP plus 36 HP for each cooling fan in operation. Maximum 182.5 HP.	
TOTAL - with WXOV Compressor-Exhauster unloaded 94.0 HP plus 36 HP for each cooling fan in operation. Maximum 202.0 HP.	
TOTAL - with WXE Compressor unloaded 72.0 HP plus 36 HP for each cooling fan in operation. Maximum 180.0 HP.	

Model G16 Locomotive (835 RPM)

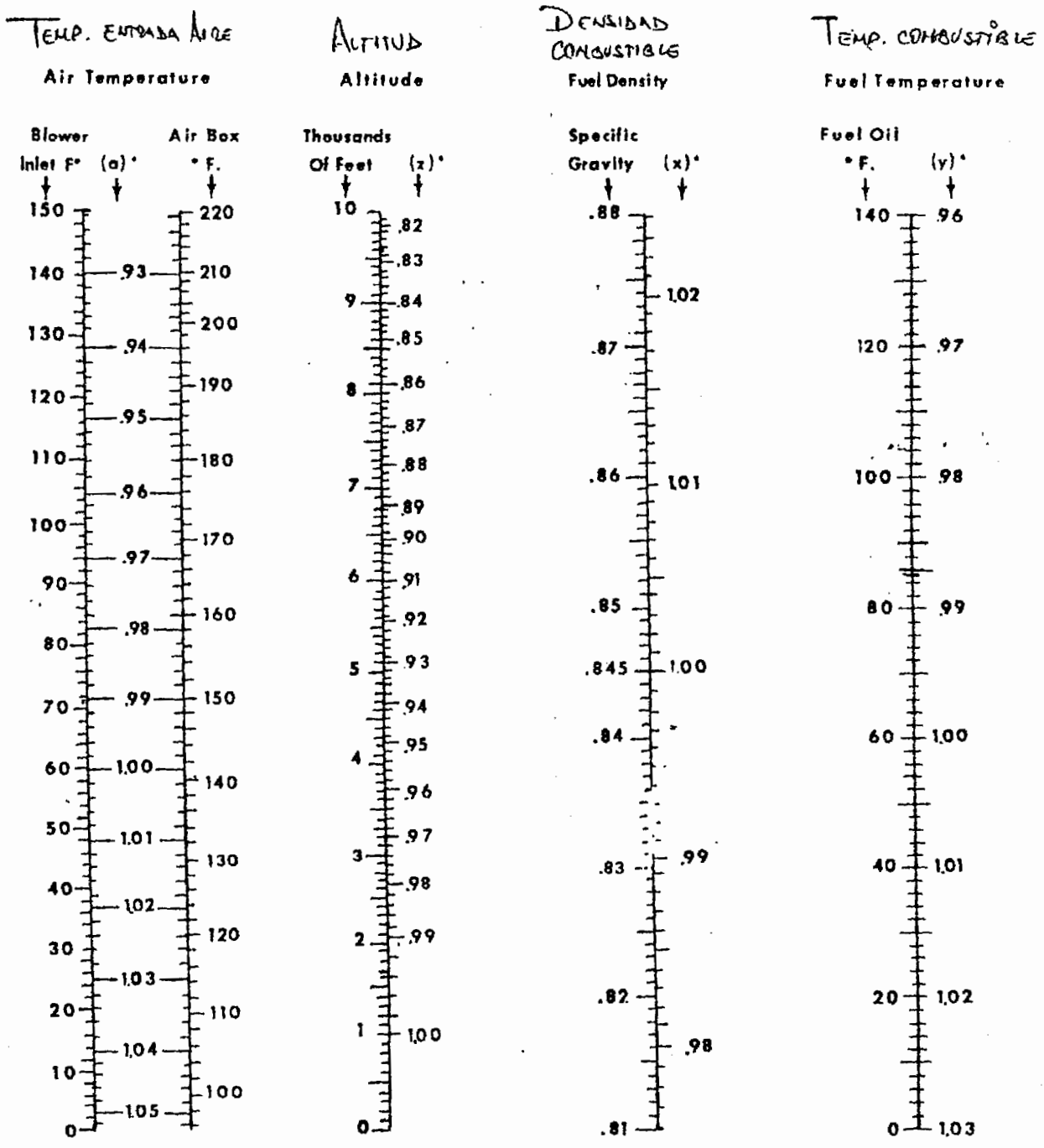
Applies to all units shipped beginning August, 1961, except Order LXO 702914.

Auxiliary Generator	7.0
Two Traction Motor Blowers	26.0
66" Cooling Fan	57.0
WBO or WXO Air Compressor unloaded	16.5
WXOV Compressor-Exhauster unloaded	36.0
WXE Air Compressor unloaded	14.0
TOTAL - with WBO or WXO Compressor	106.5
TOTAL - with WXOV Compressor Exhauster unloaded	126.0
TOTAL - with WXE Compressor unloaded	104.0



* Use factor as divisor to adjust observed horsepower to standard condition.

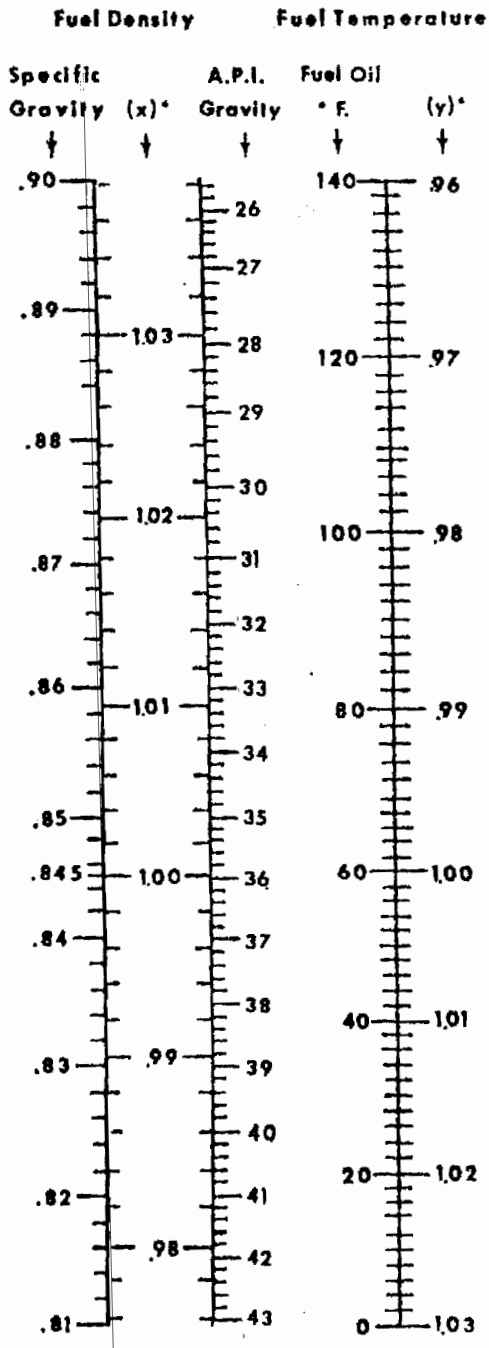
Fig. 3 - Correction Factors For All 567 Engines Rated At Less Than 110 Total Corrected Horsepower Per Cylinder



* Use factor as divisor to adjust observed horsepower to standard condition.

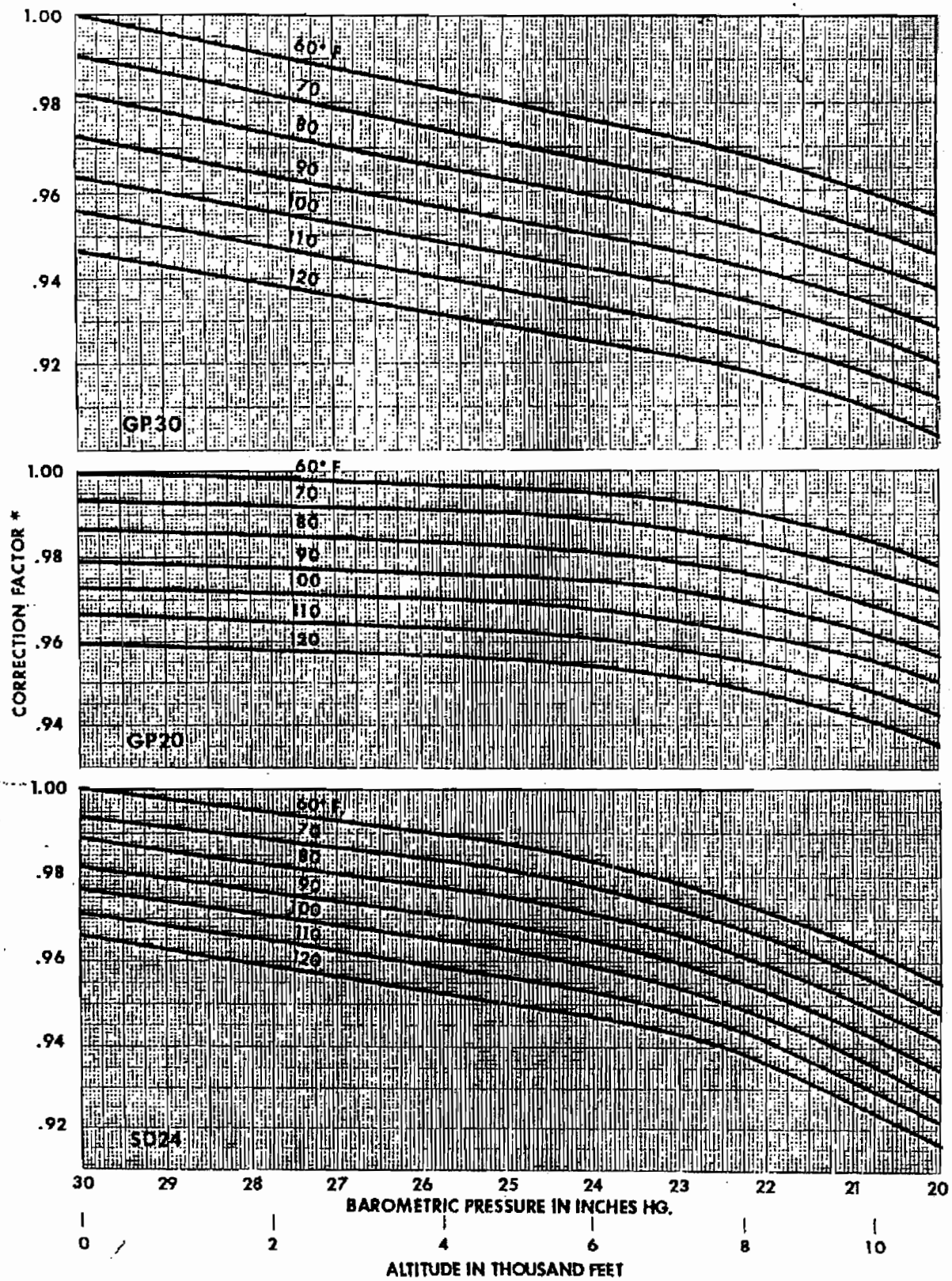
Fig. 4 - Correction Factors For All 567C And D1 Engines Rated At 110 Or More Total Corrected Horsepower Per Cylinder

567 C



* Use factor as divisor to adjust observed horsepower to standard condition.

Fig. 5 — Fuel Density and Fuel Temperature Correction Factors for 567D2 and D3 Turbocharged Engines



*Use factor as divisor to adjust observed horsepower to standard condition.

Fig. 6 — Altitude-Temperature Correction Factors
For 567D2 And D3 Turbocharged Engines

$$HP = \frac{\text{Volts Gen Prom} \times \text{Amp. Gen Prom}}{\text{Factor Eficiencia Gen.}} = \frac{\text{Volts} \times \text{Amperes}}{1HP\,(746\ \text{watts})(93.8\%)}$$

1425

$$Hp = \frac{\text{Volts} \times \text{Amperes}}{700} = \text{Potencia Real}$$

Potencia Corregida.

$$HP = \frac{\frac{\text{Volts} \times \text{Amp}}{700} + HP_{\text{de Auxiliares}}}{(a)(x)(y)(z)}$$

a = Factor de corrección Temperatura de entrada de Aire (Ambiente).

x = Factor de corrección Densidad de Combustible (Petroleo).

y = Factor de corrección de Temperatura del Combustible (Petroleo)

z = Factor de corrección de Altitud.

1425

$$HP = \frac{\text{Volts Gen Prm} \times \text{Amp. Gen Prm}}{\text{Factor Eficiencia Gen.}} = \frac{\text{Volts} \times \text{Amperes}}{1\,HP\,(746\ \text{watts})(93.8\%)}$$

$$Hp = \frac{\text{Volts} \times \text{Amperes}}{700} = \text{Potencia Real}$$

Potencia Corregida.

$$HP = \frac{\frac{\text{Volts} \times \text{Amp}}{700} + HP\ \text{de Auxiliares}}{(a)(x)(y)(z)}$$

a = Factor de corrección Temperatura de entrada de Aire (Ambiente).

x = Factor de corrección Densidad de Combustible (Petroleo).

y = Factor de corrección de Temperatura del Combustible (Petroleo)

z = Factor de corrección de Altitud.

3/29/99

EJEMPLO: PARA DETERMINAR POTENCIA CORREGIDA.

FERRONOR
12 h30

Loc. 705

$V = 780$
$\Delta Amp = 1200$

$$HP = \frac{V \times \Delta Amp}{700} = \frac{(780)(1200)}{700}$$

$$HP = 1{,}337 \text{ (POTENCIA REAL)}$$

$$HP_{CORREGIDA} = \frac{HP_{REAL} + HP_{AUXIARES}}{(A)(x)(Y)(Z)}$$

$A = 22°C = 71.6°F$	$\longrightarrow$	$P_{BAR\ VERTASCA}$	$= 0.990$	T. AMBIENTE
$x = 0.840 = 0.840$	$\longrightarrow$	" " "	$= 0.997$	DENSIDAD COMBUSTIBLE 2 COPEC
$Y = 40°C = 104°F$	$\longrightarrow$	" " "	$= 0.978$	TEMP. COMBUSTIBLE T° ESTANQUE
$Z = 120\ FT = 120\ FT$	$\longrightarrow$	" " "	$= 1.000$	ALTITUD.

$$(A)(x)(Y)(Z) = 0.965$$

$$HP_{CORREGIDA} = \frac{1337 + 87.5}{0.965} = \frac{1424.5}{0.965}$$

137[illegible] 1287.6.

$HP_{CORREGIDA} = 1{,}476$ ✓✓