

# **SPECIFICATIONS**

**GENERAL MOTORS**

**1750 H.P. "LEAD" UNIT**

**DIESEL - ELECTRIC**

**LOCOMOTIVE**



**ELECTRO - MOTIVE DIVISION**

**GENERAL MOTORS CORPORATION**

**LA GRANGE, ILLINOIS, U.S.A.**

**Specification 8026**

**Sept. 10, 1953**

**F9A**

**REVISION "A" MAY, 1956**

**REVISION "B" APRIL 1, 1958**

# GENERAL MOTORS

1750 H.P. "LEAD" UNIT

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LOCOMOTIVE

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## SECTION 1

# General Information and Identification

**GENERAL MOTORS**  
LOCO. MOTIVES

<b>Model</b>	F9—"Lead"—1750 Horsepower Locomotive.	
<b>Type</b>	A.A.R. designation ( <i>B-B</i> ). Common designation ( <i>0440</i> ).	
<b>Arrangement</b>	The general arrangement of the locomotive is shown on Elevation and Floor Plan Drawing attached.	
	The locomotive consists of one unit complete with engine, generator, trucks and all necessary auxiliaries, with a control cab at the front which identifies it as a "Lead" unit.	
<b>Major Dimensions</b>	Distance pulling face of front coupler to centerline of No. 1 truck . . .	10' 8"
	Distance between bolster centers . . . . .	30' 0"
	Truck—rigid wheel base . . . . .	9' 0"
	Distance, pulling face front coupler to rear coupler . . . . .	50' 8"
	Width over body posts . . . . .	9' 10"
	Width over handholds . . . . .	10' 8"
	Height, top of rail to top of carlines . . . . .	14' 0½"
	Overall height, over horns . . . . .	15' 0"
<b>Drive</b>	Driving motors . . . . .	Four
	Driving wheels . . . . .	4 Pair
	Diameter wheels . . . . .	40"
<b>Weights and Supplies</b>	Total loaded weight on rails . . . . . ( <i>approximately</i> )	232,500 lbs.
	Carbody and Equipment . . . . . ( <i>approximately</i> )	152,500 lbs.
	Trucks—Total 2 . . . . .	80,000 lbs.
	Fuel . . . . .	1200 gal.
	Sand . . . . .	16 cu. ft.
	Cooling water . . . . .	226 gal.
	Lubricating oil . . . . .	200 gal.
<b>Clearances</b>	EMD Clearance Diagram included on outline drawing illustrates clearance conditions for Body, Truck, Motors, Running Gear and miscellaneous underneath equipment. Truck swing designed for 23° curve or 250' radius, with 2¼" free lateral motion in the truck bolster and ⅜" in Hyatt journal boxes.	
<b>Safety Appliances</b>	All steps, grab handles and other safety appliances cover EMD interpretation of Interstate Commerce Commission requirements.	

## SECTION 2

# Carbody Construction

GENERAL MOTORS  
LOCOMOTIVES

- Framing** Carbody framing designed to simulate bridge construction using a modified Howe truss arrangement. The underframe has center sills joined to the side framing through cross members and side sills. The upper or roof portion is tied together with arched frames and carlines to form a turtle back roof. Ample jacking pads are provided for blocking the locomotive. Front and rear framing is arranged to provide collision protection. The complete assembly is of welded construction throughout, with reinforcing plates used at joints, placed so that no transverse welds are used.
- Hatches** Hatches designed to blend with the contour of the turtle back roof and located to provide access for removal of equipment.
- Outside Finish** The outside finish consists of paneling, mounted by use of battens, with allowance for deflection of body without buckling of panels. The finish does not assist in the support of the carbody. Stainless steel grill provided covering air intake openings in upper belt section.
- Roof sheets are welded directly to the carlines and framing.
- Flooring** Consists of plates welded to the underframe acting as a base for application of anti-skid flooring in aisles.
- Body Center Plates** High grade steel drop forging, welded to body bolster assembly. Wear plates applied to bottom and outside surfaces.
- Control Cab** The control cab, an integral part of the body, is located ahead and above the locomotive floor, leaving an unobstructed view for the operating crew.
- The cab is insulated where possible with 2" insulation, fire and moisture proof, and equipped with two upholstered swivel type seats with arm and back rests. The inside finish consists of ceiling lined acoustical treatment, while the cab floor is wood within steel framing, linoleum covered.
- Cab Sash** Windshield sash. Stationary  $\frac{3}{16}$ " safety plate glass. Mounted in a frame at an approximate angle of 15° from vertical and also slanting toward outside of car from center to form a wide "V" which, in combination with the vertical slant, will tend to shed rain, offering better visibility.
- Side Sash** Retractable  $\frac{1}{4}$ " safety plate glass in the doors and windows next to the operators, mechanically operated with a crank. Forward portion pivoted for controlled ventilation.

## SECTION 3

# Trucks



### **Truck Assemblies**

Two (2) four (4) wheel truck assemblies are provided per locomotive and are interchangeable and reversible. Improved riding qualities and greater stability are obtained by a new arrangement of load suspension, strictly an EMD development.

Fully flexible bolster supported on springs providing lateral movement. The truck frame is supported on each of the four journal boxes by twin group coil springs.

Each of the four motors is supported by the driving axle to which it is geared, and a special suspension on the truck transom provides a flexible support, dampening out the torque shocks of the motor.

### **Axles**

Oversize ATEA E-12 with oversize wheel and gear seat and journals to suit Hyatt roller bearings. Axle material conforms to physical properties of current A.A.R. specifications.

### **Wheels**

Rolled steel heat treated, 40" diameter, 2½" rim. Wheel tread ground smooth and concentric after assembly on axle.

### **Journal Boxes**

Locomotive equipped with Hyatt Roller Bearings 6½" journals of special EMD design. Lateral thrust is taken through a cushioning arrangement directly by the box. Journal box pedestal guides provided with spring steel wear plates.

### **Truck Frame and Bolster**

EMD design, fully flexible.

### **Pedestals**

Lined with spring steel plates bolted to frame.

### **Pedestal Tie Bars**

Fitted and applied at the lower end of the pedestal legs, held in position by bolts.

### **Truck Center Plates**

Truck center plate provided with wear plates and dust guard.

### **Side Bearings**

Friction type side bearings.

### **Interlocks**

Body and truck interlocks provided each side of the center plate, serving as anti-sluing device in case of derailment.

SECTION 3

**Trucks**



**Truck Brakes** Clasp brake rigging provided on each wheel, operated by individual brake cylinders.

**Brake Pins** All pins and bushings hardened and ground, large size. All holes in brake rigging bushed.

**Hand Brake** Hand brake provided for the locomotive connected to one brake cylinder lever only. All trucks provided with lever for hand brake connection, making trucks interchangeable.

## SECTION 4

# Power Plant and Transmission

GENERAL MOTORS  
LOCOMOTIVES

- Engine** G.M. Diesel sixteen (16) cylinder, 2 cycle, 45°V, 8½" bore, 10" stroke with unit injection, Roots blower scavenging through cylinder wall intake, and multi-valve exhaust. Water cooled cylinder liners and heads, oil cooled pistons, ten (10) bearing crankshaft, drop forged connecting rods, and floating piston assembly. Isochronous governor speed control, separate overspeed trip.
- Main Generator** EMD, nominal 600 volt direct current, ventilated by blower. Single bearing direct connected to engine crankshaft through alternator rotor and flexible coupling. Capacity suitable to continuously transmit to traction motors the rated output of the engine under all conditions for which the locomotive is offered.
- Alternator** EMD A.C. 170V, 3 phase, 16 pole, built integral with main generator, to supply A.C. power to induction motors driving engine cooling fans and traction motor blowers.
- Traction Motors** Four EMD direct current, series wound, roller bearings, force ventilated, axle hung motors.
- Auxiliary Generator** A direct current generator with direct drive from the engine gear train, provides current for control circuits, lighting, battery charging, and separate excitation of main generator. The voltage is automatically controlled by a voltage regulator.
- Load Regulator** A load regulator is provided which automatically maintains a constant horsepower output, corresponding to each throttle position, over the entire range of locomotive speeds.
- Engine Starting** By motoring of the main generator through use of special starting fields energized by the locomotive storage battery.
- Engine Cooling** Consisting of two direct driven centrifugal water pumps on the engine, radiators and 4 A.C. motor driven cooling fans located in hatch above engine. Full ceiling with removable light weight sections separates cooling air from engine room. The water cooled oil cooler and water tank mounted as a unit directly in front of the governor end of engine. Automatic water temperature control and hot engine alarm.
- Engine Lubrication** The engine lubricating oil system is a pressure system using two positive displacement gear type pumps combined in a single unit. One pump delivers oil for the pressure lubricating system, the other for piston cooling. The oil supply to these pumps is drawn from the oil strainer chamber through a common suction pipe. A scavenging oil pump is used to draw oil from the engine oil pan through a strainer, pump it through the lube oil filter to the cooler core section of the oil cooler tank and return it to the strainer chamber. Low oil pressure and high suction protection is provided.

**Order Lights** Separate order lights provided for the engineer and fireman.

**Local Control Station** A local control station located at the governor end of the engine on the cooling water tank is used to individually control the engine and includes the following apparatus:

- a) Engine start and stop buttons.
- b) Isolation switch.
- c) Master relay for electro hydraulic throttle.
- d) Fuel pump contactor and switch.
- e) Oil pressure and engine water temperature gauges.

**Signal Alarm System** Alarm bell connected to hot engine and low oil pressure and high suction switches with respective lights to indicate the circuit in trouble. No-voltage protection and alarm is provided for the alternator. Pneumatic control switch, with indicating light, is provided with automatic reset when throttle is returned to idle position.

**Engineer's Instrument Panel** Directly in front of the engineer on the dash is located a panel having air brake gauges, wheel slip light, traction motor ammeter, windshield wiper valve and cab heater switch.

**Speedometer** A combination speedometer, recorder, maximum speed limit switch and odometer located to the left of the engineer's instrument panel.



## SECTION 5

# Air Brakes

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LOCOMOTIVES

**Air Brakes** Automatic and independent brakes are provided on all wheels, with suitable end connections. 24-RL brake schedule with D-24 automatic brake valve and maximum speed control without time delay or suppression (see section 7).

**Foundation Brakes** 9" x 8" cylinders, 5.65:1 lever ratio, 14" brake shoes, 290,000 lb. braking force @ 100 lb. cylinder pressure.

**Brake Piping** Wrought steel pipe with A.A.R. fittings are used. All piping  $\frac{5}{8}$ " O.D. and under uses nominal size copper tubing with S.A.E. tube fittings.

All brake equipment mounted in a rack requiring a minimum amount of piping and readily accessible for inspection or replacement.

**Main Reservoir** Main reservoirs are carbon steel with all-welded seams and heads, 26 $\frac{1}{2}$ " x 50", capacity 25,000 cubic inches.

One reservoir is located under the cab floor while the second unit is mounted under the locomotive between the battery boxes in front of the fuel tank for a total capacity of 50,000 cubic inches. Reservoirs are fitted with drain cocks.

**Air Compressor** One, two stage, three cylinder, water cooled direct coupled compressor, having displacement of 235 cu. ft. per min. at 835 RPM. Pro rata delivery in proportion to engine speed.

Air compressor governor adjusted to provide constant main reservoir pressure with 10 lb. differential, including synchronized control between units.

**Brake Cooling System** Extra heavy steel pipe cooling coils are located on the roof.

**Sanding** Single line sanding system with sand traps at outboard end of each truck with leading truck sanded through manually operated valve or automatically during wheel slip.

**Sand Capacity** Four sand boxes, capacity 4 cu. ft. each, total 16 cu. ft.

## SECTION 6

# Equipment



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LOCOMOTIVES

- Cab Heaters** Two hot water cab heaters with fan driven air circulating system in each cab, hot water taken from engine cooling system. Each heater has a three speed switch for the fan.
- Defroster** Two defroster blowers—motor driven.
- Sun Visors** Four adjustable metal sun visors per cab.
- Warning Devices** Three diaphragm type air horns, two pointing forward, and one to the rear with common horn cord.  
One 12" locomotive bronze bell with internal ringer.
- Fire Extinguisher** 1 quart carbon tetrachloride—in control cab.  
1 gallon carbon tetrachloride—in engine room.
- Windshield Wipers** Two large size—pneumatic type.
- Toilet** Coach type—double hopper, foot operated, with seat but without lid, independent water tank. Water tank is provided with steam heating.
- Steam Trainline** 2½" diameter extra heavy steel steam trainline pipe and 300 lb. extra heavy fittings. Trainline lagged over complete length. (See Section 7.)
- Headlight** Twin sealed beam headlight equipped with two 200W 30V sealed beam units, "bright-dim" switch located in cab.

## SECTION 7

# Locomotive Modifications



The following modifications can be supplied on request to satisfy various operating requirements. The base price of the locomotive which is described in this specification does not include any of these modifications.

**Brakes** 10"x8" cylinders, 5.95 levers, 18" shoes, 370,000 lb. @ 100 lb. cylinder pressure in place of basic combination.

The following modifications in the air brake schedule may be obtained:

- a) Electro-Pneumatic braking.
- b) Automatic sanding in emergency.
- c) Safety control from foot pedal and/or brake valve handle with or without time delay.
- d) Sanding from bail on brake valve in place of manual operated valve.
- e) Maximum speed control with or without time delay or suppression feature.

**Couplers** In addition to Type "E" couplers which are supplied basically, Tightlock couplers are available upon request. Units can also be linked together when required.

**Dynamic Brakes** Variable dynamic brakes available on request. The traction motors are used as generators, the power being dissipated through force ventilated grid resistors located in the roof hatch. The transition lever is used as the excitation control lever.

**Steam Generator** When the locomotive is desired for Passenger service, a 2750 lb. steam generator is available for train heating. Without dynamic brakes, 800 gallons of water are available. 2" or 2½" steam end connectors may be installed upon request. Modification includes 18KW auxiliary generator.

**Third Cab Seat** A third cab seat can be provided located either adjacent to fireman's seat or against the rear cab partition.

**Electric Water Cooler** Electric water cooler in cab with removable one gallon jug. Total capacity including coil, two gallons. Sanitary paper cup dispenser included.

**Winterization** Winterization arrangement available to facilitate locomotive operation under extreme cold weather conditions.

## SECTION 8

# Painting



**General** Only the best quality materials available are used, with special attention given to both the selection of materials and methods of application to insure a maximum of protection and durability.

**Cab** Inside finished in Suede Grey.

**Engine Room** Inside finished in Suede Grey.  
All air, fuel, water and lube oil piping color coded at points of connection.

**Outside Finish** Color arrangement and design to agree with Railroad's requirement.

**Under Carriage** Black, unless otherwise specified.

**Trucks & Tanks** Black, unless otherwise specified.

**Engine  
Exhaust and  
Boiler  
Manifold** Heat resistant paint.

SECTION 9

# Performance Data



**Gear Ratio:**

<b>Option</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
<b>GEARS</b>	65-12	62-15	61-16	60-17	59-18	58-19	57-20	56-21
<b>RATIO</b>	5.416	4.135	3.81	3.53	3.28	3.05	2.85	2.66
<b>MAX.SPEED</b>	55	65	71	77	83	89	95	102

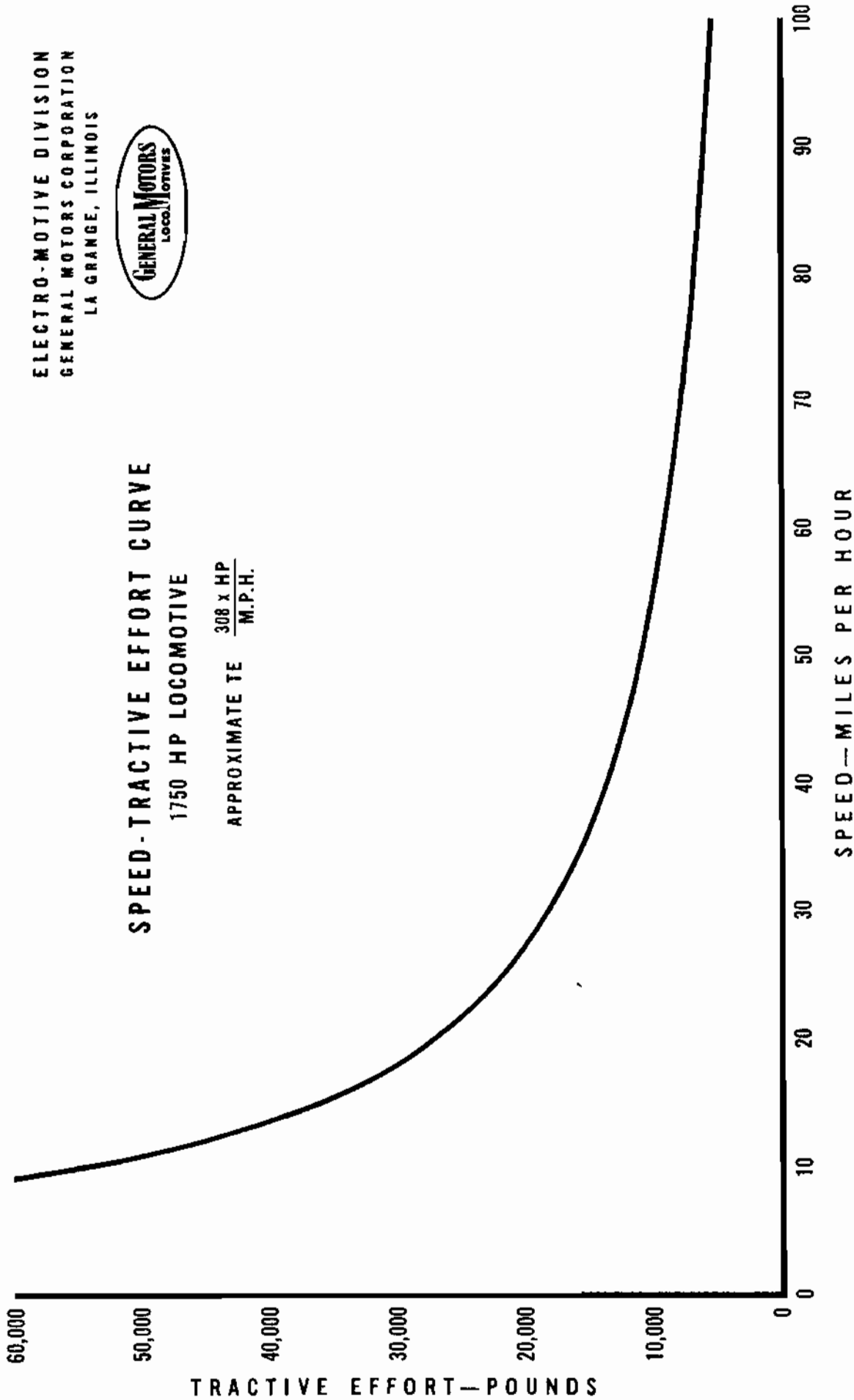
*See speed-tractive effort curve.*

ELECTRO-MOTIVE DIVISION  
GENERAL MOTORS CORPORATION  
LA GRANGE, ILLINOIS



**SPEED-TRACTIVE EFFORT CURVE**  
1750 HP LOCOMOTIVE

APPROXIMATE  $\frac{308 \text{ x HP}}{\text{M.P.H.}}$



TRACTION EFFORT—POUNDS

SPEED—MILES PER HOUR

## SECTION 10

# Warranty and Patents

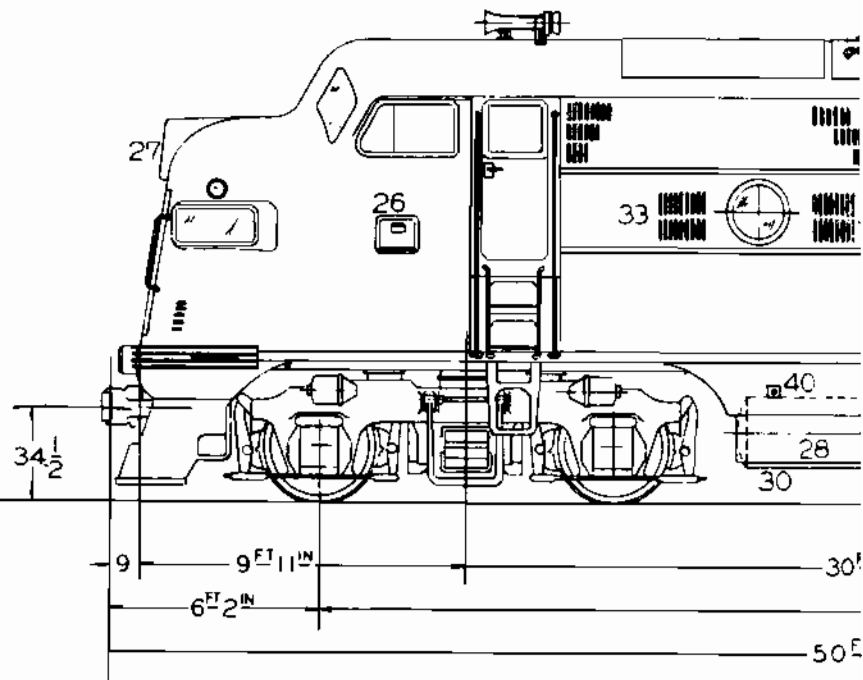
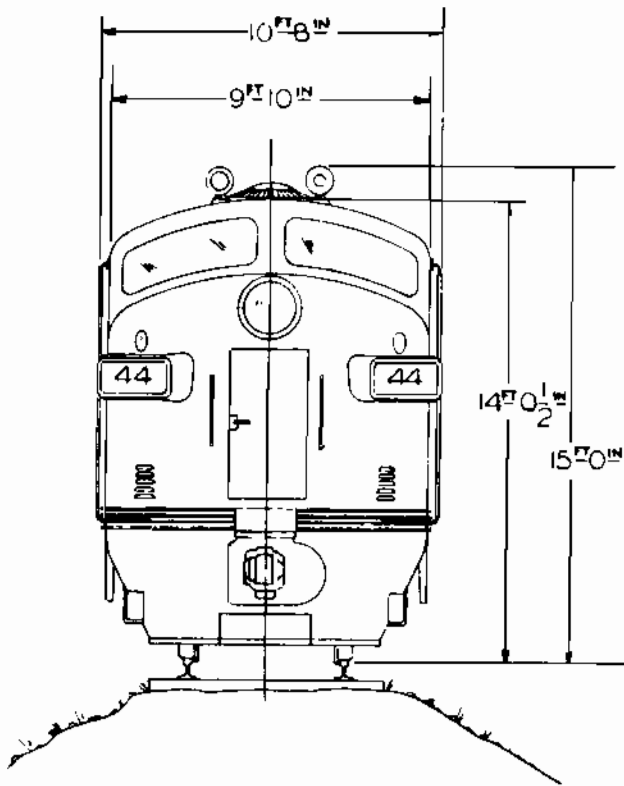


**Warranty:** "The manufacturer warrants each locomotive manufactured or rebuilt by it, including all equipment and accessories, and replacement parts therefor, except tools or facilities, supplied by the manufacturer in accordance with its specifications, to be free from defects in material and workmanship under normal use and service, its obligation under this warranty being limited to making good at its factory, any part or parts thereof which shall, within one year after being placed in service by the original purchaser or before being operated 100,000 miles, whichever event shall first occur, be returned to it upon request with transportation charges prepaid and which its examination shall disclose to its satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and all other obligations or liabilities on its part and it neither assumes nor authorizes any other person to assume for it any other liability in connection with its products.

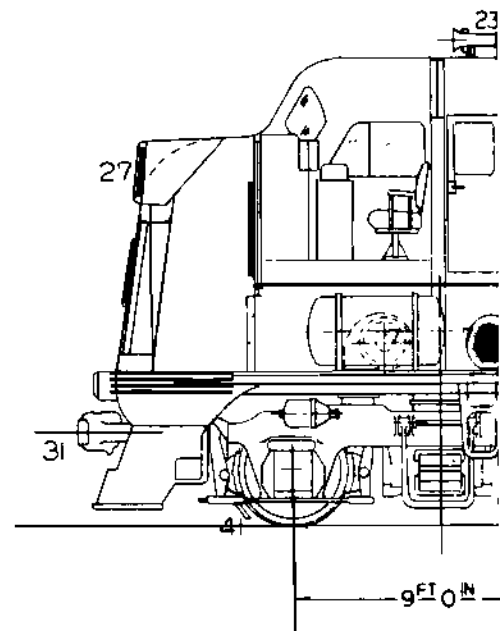
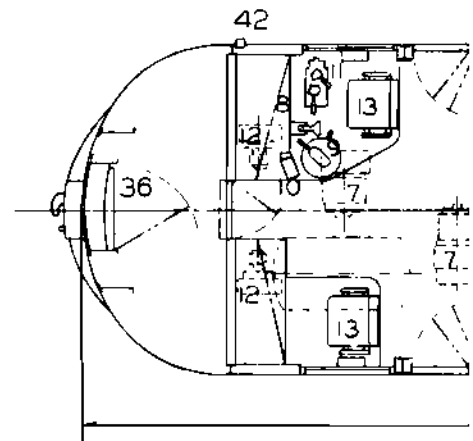
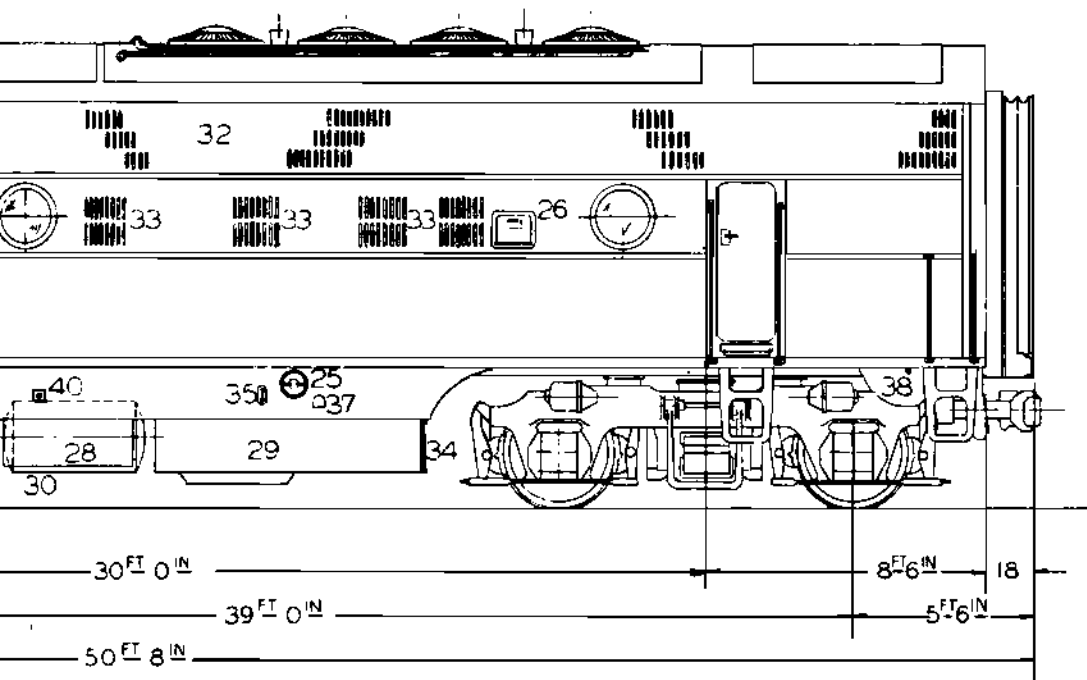
"This warranty shall not apply to any locomotive or component thereof which shall have been repaired or altered by other than an authorized Electro-Motive representative in any way so as in the judgment of the manufacturer to affect its stability and reliability nor which has been subject to misuse, negligence, or accident.

"The manufacturer reserves the right to make any changes in design or add improvements to equipment at any time, without incurring any obligation to install same on locomotives previously sold and delivered by it."

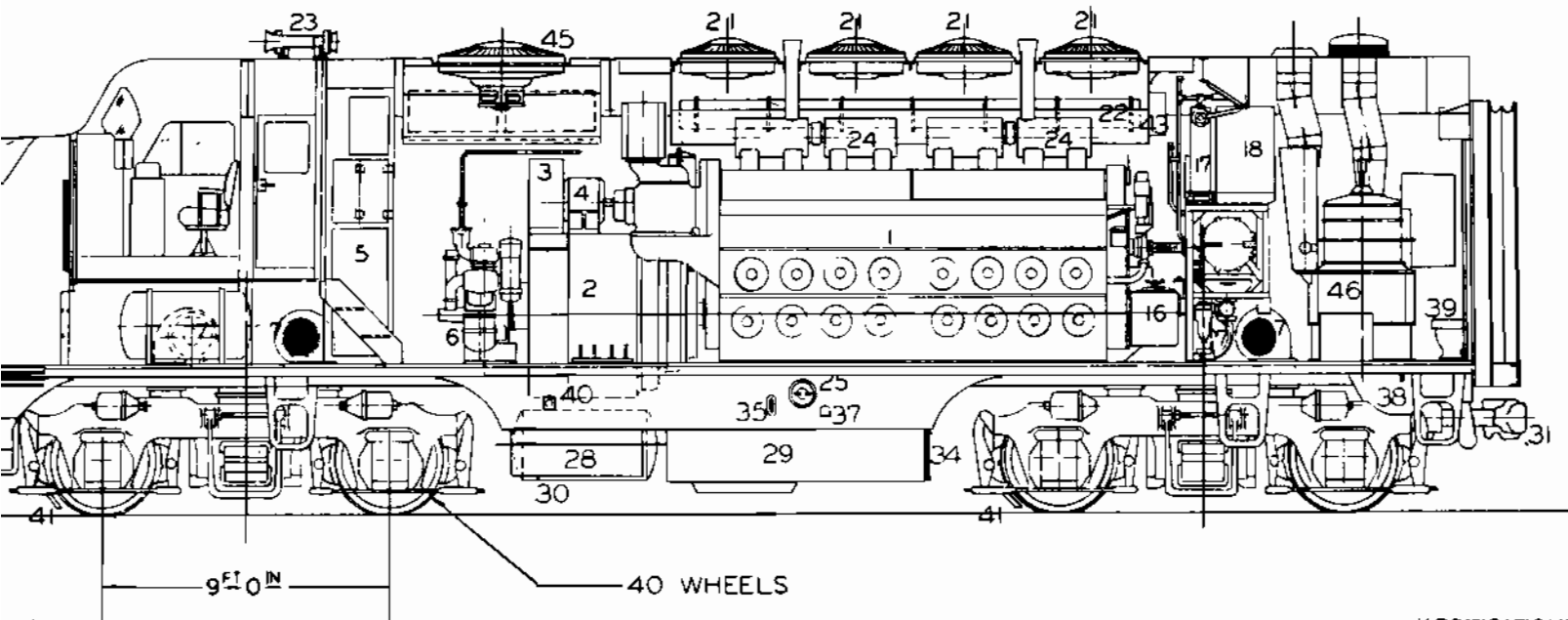
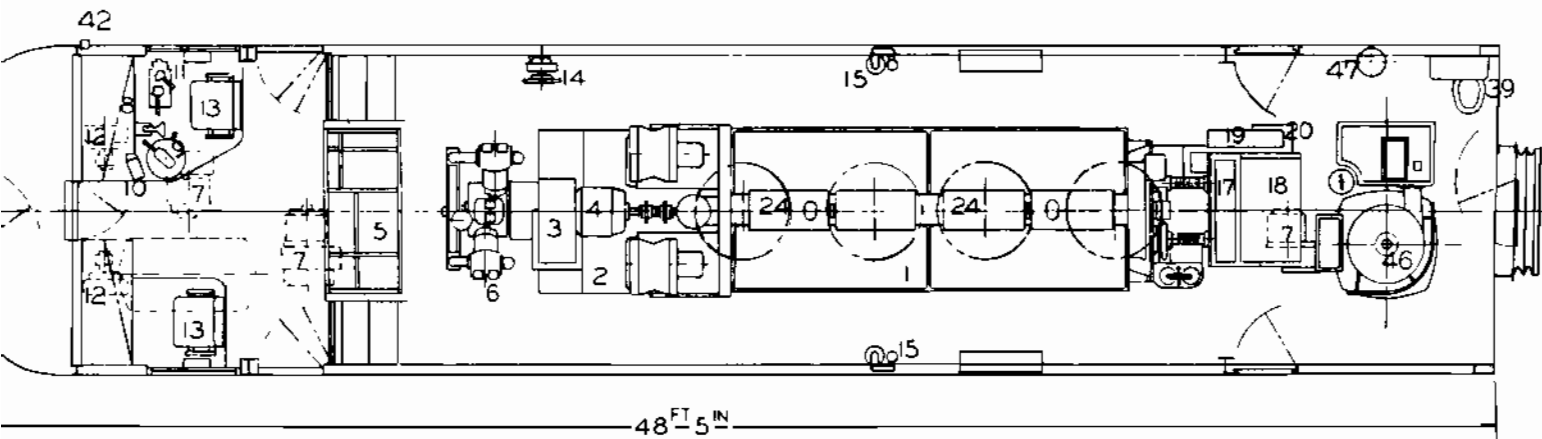
**Patents:** The Electro-Motive Division, General Motors Corporation, will not assume liability for patent infringement by reason of purchase, manufacture, sale, or use of devices or equipment not included in and covered by this Specification.





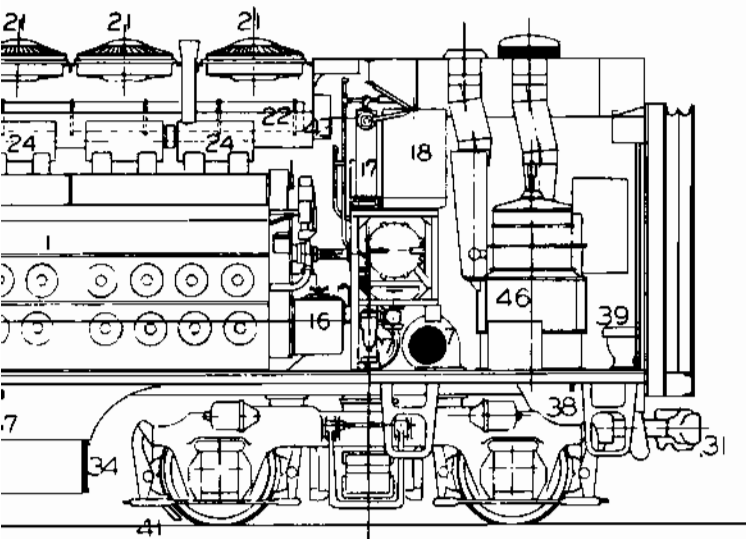
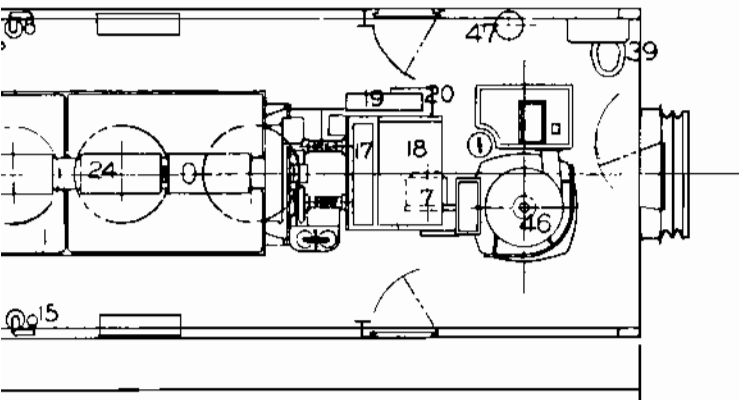


**1750 H.P. LOCOMOTIVE "LEAD" UNIT—MOD**



● MODIFICATIONS

**UNIT—MODEL F-9A**



- 52 LIFTING LUGS
- 51 ENCLOSED COUPLER PILOT
- 50 FUEL TANK—1500 GAL.
- 49 WINTERIZATION HATCH
- 48 HATCH TANK WATER FILLER—BOTH SIDES
- 47 LIQUID WATER TREATMENT
- 46 STEAM GENERATOR
- 45 DYNAMIC BRAKE HATCH OR WATER TANK—600 GAL.
- 44 NUMBER BOX
- 43 A.C. CABINET
- 42 BLUE FLAG BRACKET
- 41 SANDING NOZZLES
- 40 BATTERY CHARGING RECEPTABLE—LEFT SIDE ONLY
- 39 TOILET
- 38 ENGINE WATER FILLER—BOTH SIDES
- 37 EMERGENCY FUEL CUTOFF
- 36 DOOR—PLAIN
- 35 FUEL TANK GAUGE
- 34 FUEL TANK SIGHT GLASS
- 33 ENGINE ROOM AIR INTAKE
- 32 AIR INTAKE—SHUTTERS & GRILLE
- 31 COUPLER
- 30 MAIN AIR RESERVOIR
- 29 FUEL TANK—1200 GAL.
- 28 BATTERIES
- 27 HEADLIGHT—FIXED BEAM
- 26 SAND BOX FILLER
- 25 FUEL FILLER
- 24 EXHAUST MANIFOLD
- 23 HORN
- 22 RADIATOR
- 21 36" FAN & MOTOR
- 20 LOAD REGULATOR
- 19 ENGINE CONTROL & INSTRUMENT PANEL
- 18 ENGINE WATER TANK
- 17 LUBE OIL COOLER
- 16 LUBE OIL FILLER
- 15 FUEL TANK VENT WITH FLAME ARRESTOR
- 14 HAND BRAKE
- 13 SEAT
- 12 CAB HEATER
- 11 AIR BRAKE VALVE
- 10 SPEEDOMETER RECORDER
- 9 CONTROL STAND
- 8 INSTRUMENT BOARD
- 7 TRACTION MOTOR BLOWER
- 6 AIR COMPRESSOR
- 5 CONTROL CABINET
- 4 AUXILIARY GENERATOR
- 3 GENERATOR BLOWER
- 2 MAIN GENERATOR & ALTERNATOR EMD MODEL
- 1 ENGINE EMD MODEL 16-567-C

• MODIFICATIONS



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