

# **SPECIFICATIONS**

**GENERAL MOTORS**

**1500 H.P. "BOOSTER" UNIT**

**DIESEL - ELECTRIC**

**LOCOMOTIVE**



**ELECTRO - MOTIVE DIVISION**

**GENERAL MOTORS CORPORATION**

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

**Specification 8014**  
**August 3, 1948**

**FB**

**GENERAL MOTORS  
1500 H.P. "BOOSTER" UNIT  
DIESEL-ELECTRIC  
LOCOMOTIVE**

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**I N D E X**

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SECTION 1

# General Information and Identification



<b>Model</b>	F-7—"Booster"—1500 Horsepower Locomotive.																
<b>Type</b>	A.A.R. designation (B-B). Common designation (0440).																
<b>Arrangement</b>	<p>The general arrangement of the locomotive is shown on Elevation and Floor Plan Drawing attached.</p> <p>The locomotive consists of one unit complete with engine, generator, trucks and all necessary auxiliaries, to be operated <i>with</i> a "Lead" unit.</p>																
<b>Major Dimensions</b>	<table border="0"> <tr> <td>Distance pulling face of front coupler to centerline of No. 1 truck..</td> <td>10' 0"</td> </tr> <tr> <td>Distance between bolster centers.....</td> <td>30' 0"</td> </tr> <tr> <td>Truck—rigid wheel base.....</td> <td>9' 0"</td> </tr> <tr> <td>Distance, pulling face front coupler to rear coupler.....</td> <td>50' 0"</td> </tr> <tr> <td>Width over body posts.....</td> <td>9' 10"</td> </tr> <tr> <td>Width over handholds.....</td> <td>10' 8"</td> </tr> <tr> <td>Height, top of rail to top of carlines.....</td> <td>14' 0½"</td> </tr> <tr> <td>Overall height, over fan housings.....</td> <td>15' 0"</td> </tr> </table>	Distance pulling face of front coupler to centerline of No. 1 truck..	10' 0"	Distance between bolster centers.....	30' 0"	Truck—rigid wheel base.....	9' 0"	Distance, pulling face front coupler to rear coupler.....	50' 0"	Width over body posts.....	9' 10"	Width over handholds.....	10' 8"	Height, top of rail to top of carlines.....	14' 0½"	Overall height, over fan housings.....	15' 0"
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<b>Clearances</b>	<p>EMD Clearance Diagram No. 8097194 illustrates clearance conditions for Body, Truck, Motors, Running Gear and miscellaneous underneath equipment.</p> <p>Truck swing designed for 23° curve or 250' radius, with 2¼" free lateral motion in the truck bolster and ⅜" in Hyatt Journal boxes.</p>																
<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.
- Engine Compartment Sash**  $\frac{1}{4}$ " safety plate glass. Round sash all stationary with the exception of one sash on each side of locomotive which is hinged, swinging out.
- Gutters** Gutters are provided above doors.
- Centering Device** A centering device is used at each end of locomotive, preventing excessive offset with multiple unit operation.
- Draft Gear** National Malleable type M-380 rubber draft gear (*front and rear*).
- Yoke** Special EMD design for low overhang.
- Coupler** Type "E" (*See Section 7*).
- Draw Bar Carrier** Spring supported, part of centering device

SECTION 2

## Carbody Construction



<b>Uncoupling Device</b>	Operated from both sides of locomotive.
<b>Coupler Swing</b>	Normal 13° swing.
<b>Front and Rear Connections</b>	Air brake and signal lines fitted with shut-off valves.
<b>Body End and Side Doors</b>	All doors are hinged, fabricated box type. The door locks are of special EMD design "L" handle, latched in horizontal position. Left and right hand doors of engine room provided with a lock and Railway Coach key.
<b>Weather Stripping</b>	For sash—rubber of special design to provide good cushioning and water-tight assembly. For outside doors—rubberized canvas covered sponge rubber at sides, top and bottom. One extra rubber strip at bottom towards outside.
<b>Signal Brackets</b>	Combination flag and oil marker light brackets located at rear of unit. Flags and marker lights furnished by railroad.
<b>Diaphragms</b>	Attached to body end posts, with standard EMD face plate.
<b>Engine Room Ventilation</b>	All openings provided for engine room ventilation are equipped with panel type filters with deflectors on inside face of filters.

## SECTION 3

# Trucks

GENERAL MOTORS  
LOCOMOTIVES

- 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.
- The truck frame is supported on each of the four journal boxes by twin group coil springs. Bolster springs rest on each end of the spring plank which in turn is carried by swing hangers *pivoted from outside of truck frame*.
- 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. A.A.R. material specification M-126, Class D.
- 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 plate.
- Truck Frame and Bolster Pedestals** Steel casting, heat treated, EMD design.  
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, dust guard, and lubricating arrangement.
- 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.
- Swing Hangers** Made from the same kind of steel as the axles.
- Bolster Springs** Full elliptic.

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, bore  $8\frac{1}{2}$ ", stroke 10", 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, floating piston pin bushings, and floating piston assembly. Isochronous governor speed control, separate overspeed trip, lubricating oil and water pumps.
- Main Generator** EMD, nominally 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. 149V, 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** Constant voltage provides current for control circuits, lighting and battery charging, with automatic 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 energizes 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.
- Engine Turning Jack** Provided for engine timing and inspection. Constructed for one man operation.



## SECTION 4

# Power Plant and Transmission



- Engine Fuel System** Return flow, single D.C. motor driven gear pump, protected by suction filter in addition to discharge filters to insure clean fuel for the engine. An assembly of sight glasses and relief valves offers visual indication of any system trouble plus protection against excessive pressures.
- Engine Exhaust** Dual fabricated chambers, each with independent exhaust.
- Fuel Tank** Tank built of heavy gauge steel, with baffle plates. Capacity 1200 gallons, located underneath the locomotive body. Filling station each side, vents equipped with flame arrestors. Double sumps with cleanout plugs and non-removable water drains located at bottom of tank. Each fuel filling station has I.C.C. approved direct reading fuel gauge, indicating fuel level  $4\frac{1}{2}$ " from top of tank. Tank is also supplied with a hydrostatic distant type level gauge, indicating levels to within 1" of the bottom. Each filling station fitted with pull ring for emergency fuel cut-off. Similar pull cord located in engine room.
- Electrical Control Cabinet** Cabinet houses the locomotive high and low voltage control equipment.
- 1) High and low voltage control for Main Generator, Alternator, and Traction Motors
  - 2) Battery charging control
  - 3) Engine starting
  - 4) Distribution panel
- The cabinet is ventilated and readily accessible for service or unit replacement.
- Locomotive Control** Fully automatic transition forward and backward. High voltage circuits are safeguarded by ground protective relay.
- Storage Battery** 32 cell, 64 volt, 426 ampere hour—(8 hour rating) battery located underneath locomotive in two cabinets, one on each side of the locomotive directly in front of the fuel tank, accessible for servicing outside locomotive. A 64 volt battery charging receptacle provided on left side.
- 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 contractor, fuse and switch
  - e) Oil pressure, suction and engine water temperature gauges
  - f) Fuel gauge
- 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.

## SECTION 5

# Air Brakes

GENERAL MOTORS  
LOCOMOTIVES

- Air Brakes** Automatic and independent brakes are provided on all wheels, with suitable end connections. 24-RL brake schedule. (See Section 7.)
- Foundation Brakes** 9"x8" cylinders, 5.65:1 lever ratio, 14" brake shoes, 290,000 lb. braking force @ 100 lb. cylinder pressure.
- Brake Piping** I.P.S. copper tubing and 300 lbs. solder fittings except at end valves where wrought iron pipe with A.A.R. malleable iron 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 reservoir is carbon steel with all-welded seams and heads, 26 $\frac{1}{2}$ "x50" capacity 25,000 cubic inches.
- Reservoir is mounted under the locomotive between the battery boxes in front of the fuel tank. Reservoir is fitted with drain cock.
- Air Compressor** One, two stage, three cylinder, air cooled direct coupled compressor, having displacement of 180 cu. ft. per min. at 800 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** Finned type cooling coils placed between air compressor and main reservoir.
- Sanding** Single line sanding system with sand traps at outboard end of each truck with leading truck sanded through manually operated sanding valve in control cab of Lead unit. This combination provides forward sanding on three trucks with any consist of Lead and Booster units.
- Sand Capacity** Four sand boxes, capacity 4 cu. ft. each, total 16 cu. ft.

## SECTION 6

# Equipment

**GENERAL MOTORS**  
LOCOMOTIVES

**Fire  
Extinguisher**

1 gallon carbon tetrachloride—in engine room.

**Steam  
Trainline**

2½", 300 lb. extra heavy fittings, lagged and protected where necessary with metal covering. Standby heating connection at right side forward of bolster. (See section 7).

## SECTION 7

# Locomotive Modifications

**GENERAL MOTORS**  
LOCOMOTIVES

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.

**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.

**Steam Generator** When the locomotive is desired for Passenger service, two steam generators are available for train heating, 1600 lbs. and 3000 lbs. capacity. Without dynamic brakes, the maximum water supply with the 1600 lb. steam generator is 2000 gallons: With the 3000 lbs. size, 1800 gallons. With dynamic brakes, the water supply is reduced by 600 gallons.

**Hostler Control Station** Includes the following items, provided on units equipped with couplers:

- a) Controller
- b) Brake valve
- c) Forward and reverse switch
- d) Air gauge
- e) Bell
- f) Horn

**Back Up Headlight** Portable or permanent.

## SECTION 8

# Painting

**GENERAL MOTORS**  
LOCO. MOTIVES

- 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.
- Engine Room** Inside finished in Suede Grey, trimmed in black.  
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

**GENERAL MOTORS**  
LOCOMOTIVES

Although Section 1 specifies 62:15 gear ratio, other gear combinations are available when requested to suit operating requirements. The following table and curve show the characteristics of these gear combinations:

**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>CONT. T. E.*</b>	52,400	40,000	37,000	34,000	32,000	29,500	27,500	25,500
<b>MAX. SPEED</b>	55	65	71	77	83	89	95	102

\*Continuous tractive effort is given per 1500 H.P. unit.  
See speed-tractive effort curve.

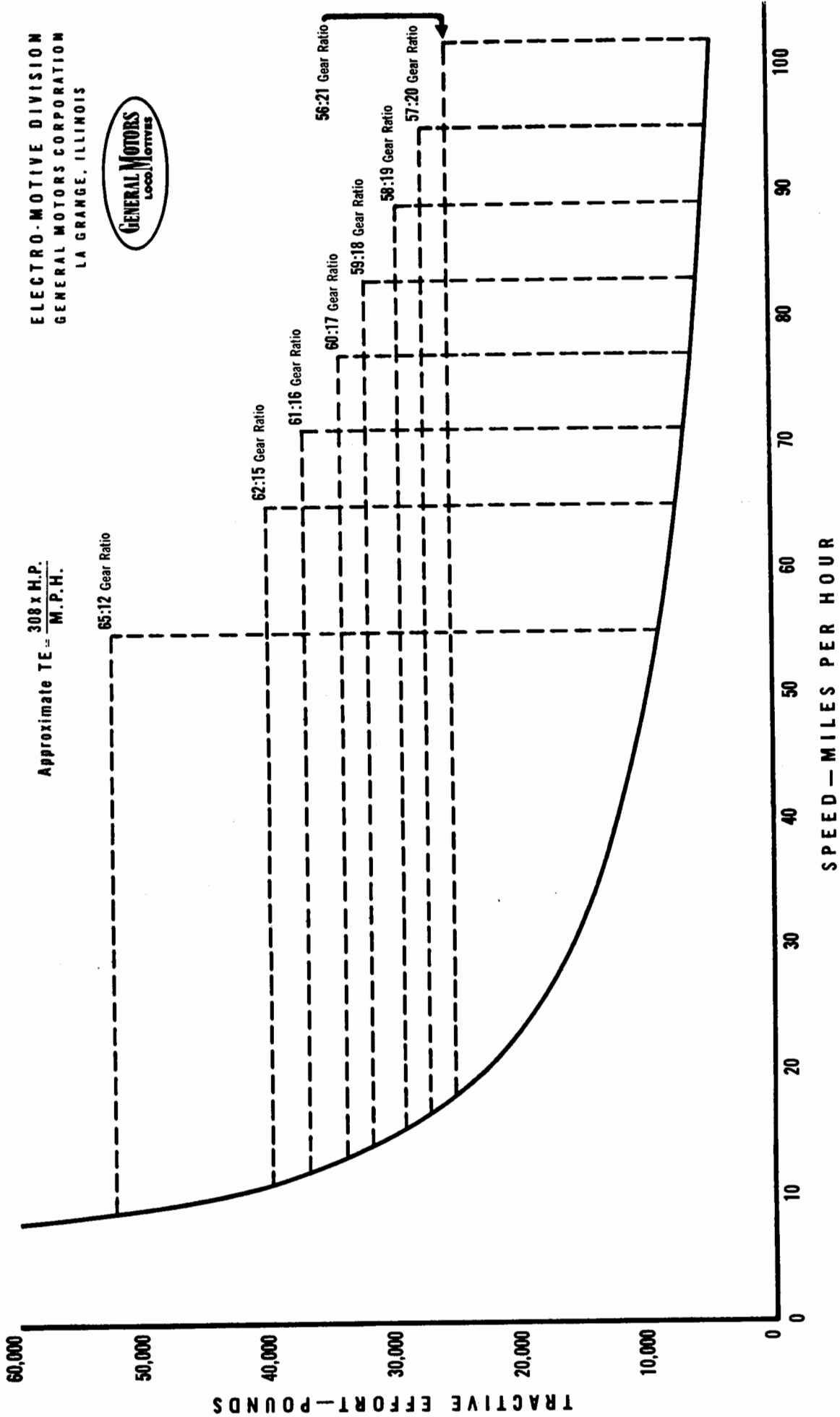
# SPEED-TRACTION EFFORT CURVE

## 1500 H.P. LOCOMOTIVE

ELECTRO-MOTIVE DIVISION  
 GENERAL MOTORS CORPORATION  
 LA GRANGE, ILLINOIS



Approximate TE =  $\frac{308 \times \text{H.P.}}{\text{M.P.H.}}$



## SECTION 10

# Warranty and Patents

**GENERAL MOTORS**  
LOCOMOTIVES

**Warranty:**

THIS IS TO CERTIFY that we, ELECTRO-MOTIVE DIVISION, GENERAL MOTORS CORPORATION, LaGrange, Illinois, warrant all new locomotives manufactured by us to be free from defects in material and workmanship under normal use and service; our obligation under this Warranty being limited to making good at our factory any part or parts thereof, which shall within one (1) year after delivery of such equipment to the original purchaser, or before the locomotives have been 100,000 miles in scheduled service, whichever event shall first occur, be returned to us with transportation charges prepaid, and which our examination shall disclose to our satisfaction to have been thus defective.

This Warranty being expressly in lieu of all other Warranties expressed or implied and of all other obligations or liabilities on our part, and we neither assume nor authorize any person to assume for us any other liability in connection with the sale of our equipment.

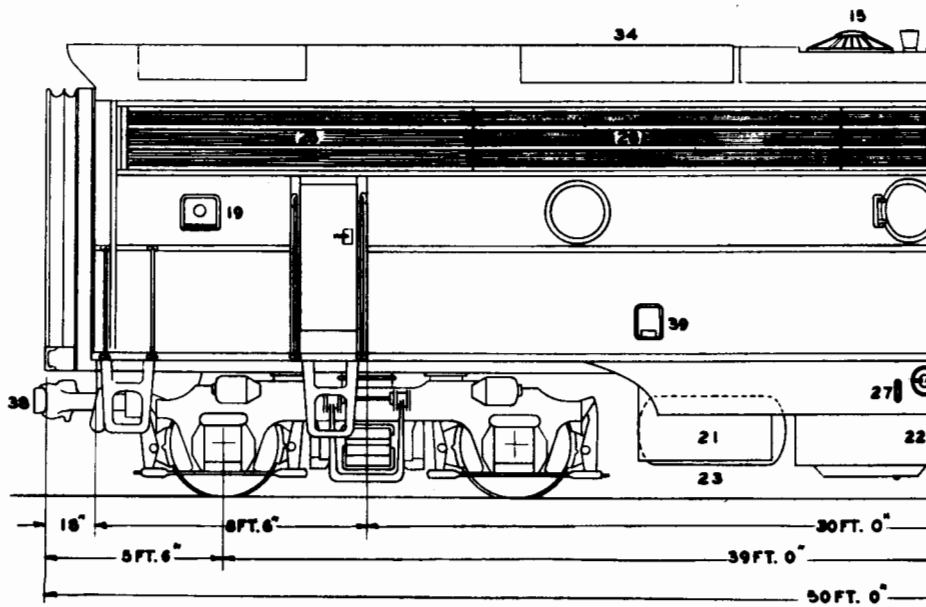
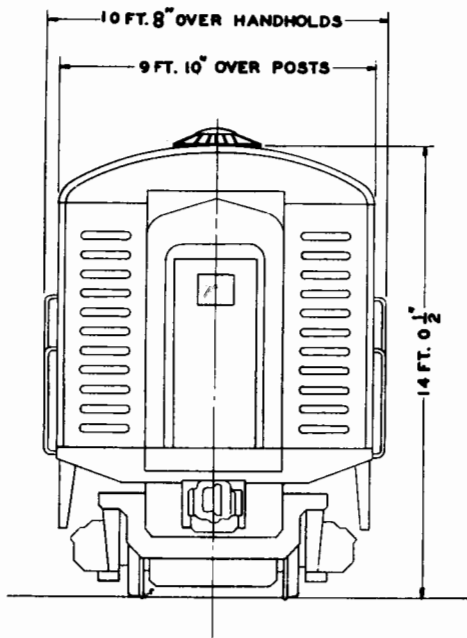
This Warranty shall not apply to any locomotive components which shall have been repaired or altered unless repaired or altered by us or by our authorized service representatives, if, in our judgment, such repairs or alterations affect the stability or reliability of the equipment, or if the equipment has been subject to misuse, negligence or accident.

We reserve the right to make changes in design or add any improvements on equipment at any time without incurring any obligation to install same on equipment previously purchased.

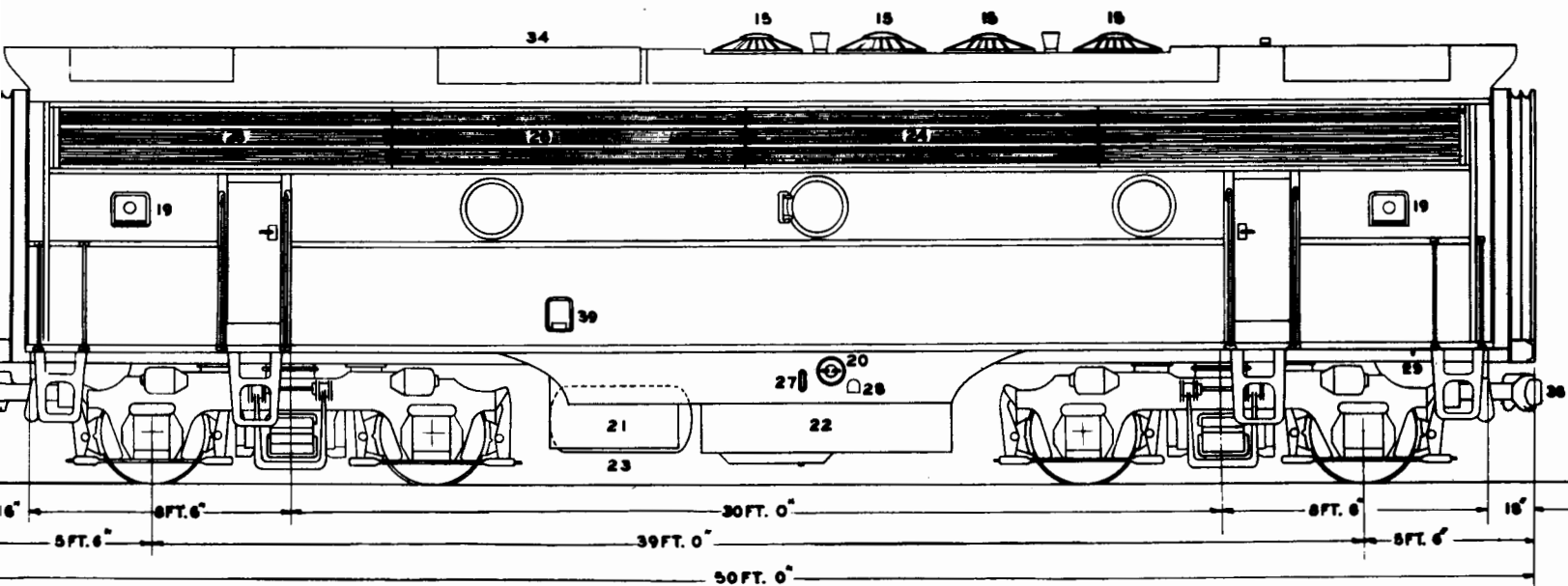
**Patents:**

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.



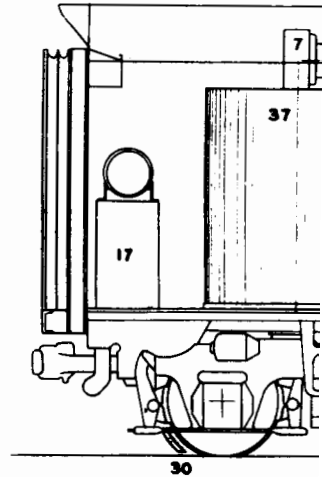
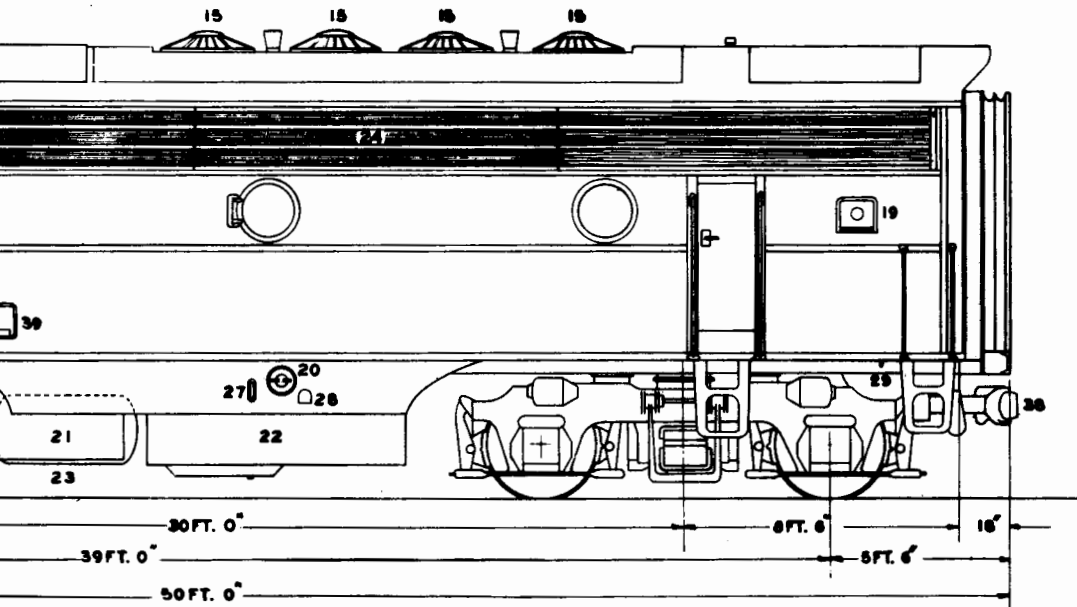
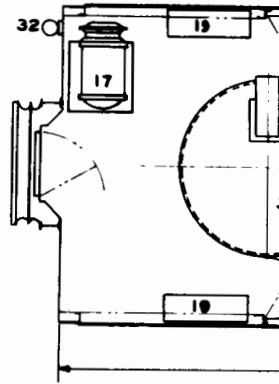


SUPPLIES	
FUEL	1200 GAL.
COOLING WATER	215 GAL.
SAND	16 CU. FT.
● BOILER WATER	1400 OR 2000 GAL.
LUB. OIL	200 GAL.



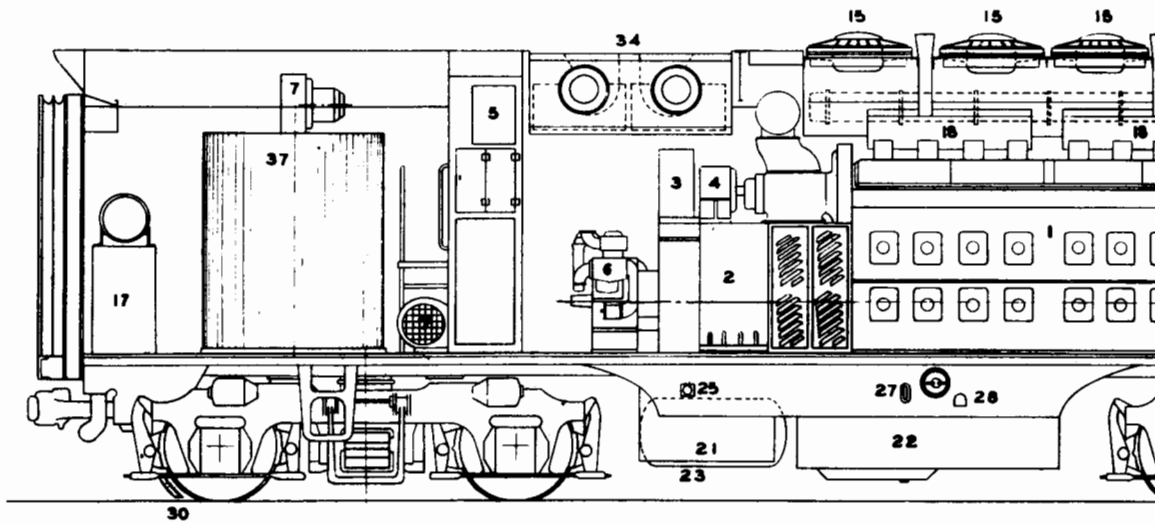
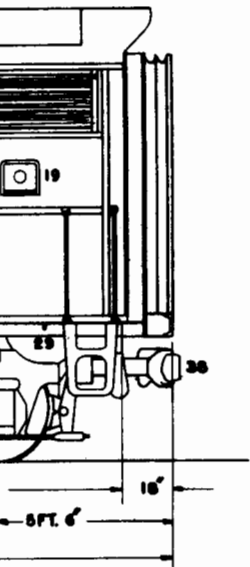
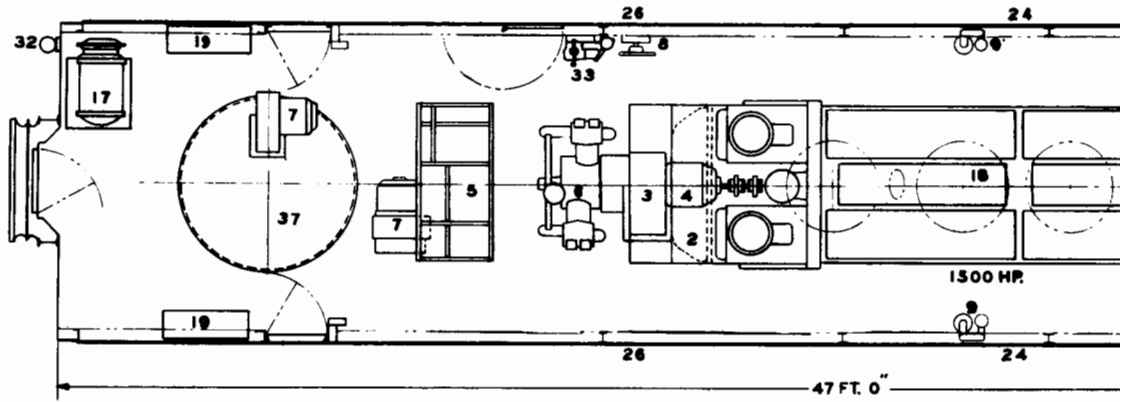
1500 H.P. MODEL F7 LO

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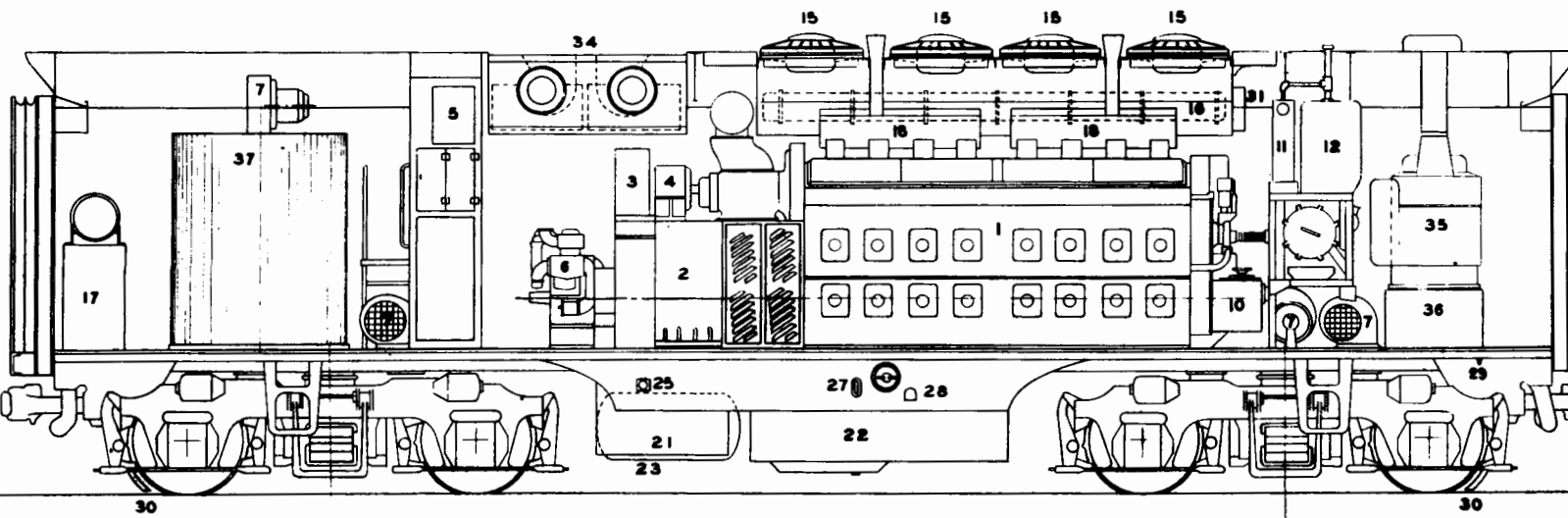
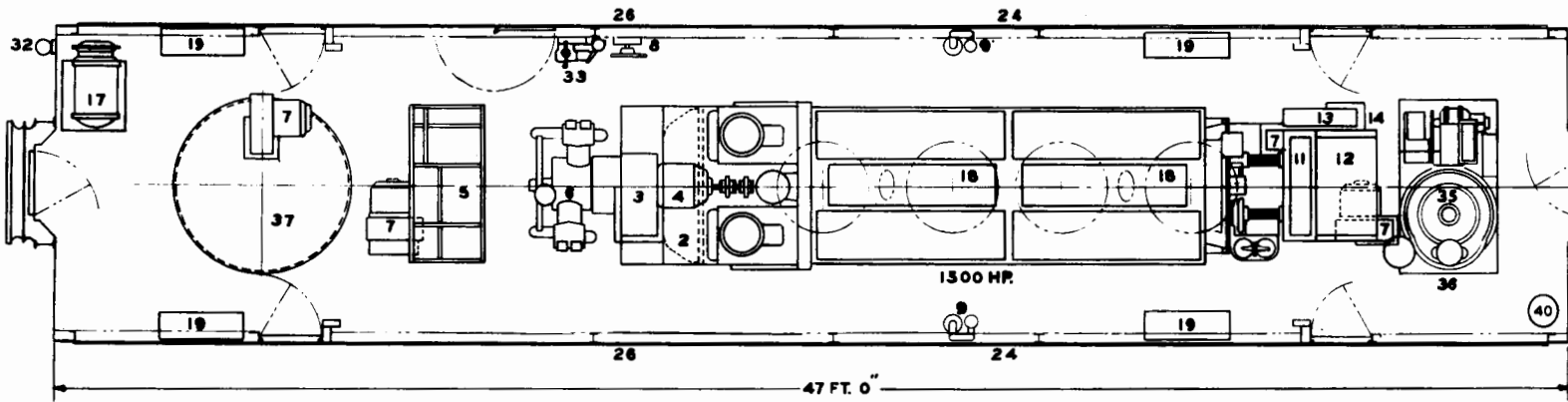


**1500 H.P. MODEL F7 LOCOMOTIVE "BOOSTER"**

GAL.
GAL.
J. FT.
OR 2000 GAL.
GAL.

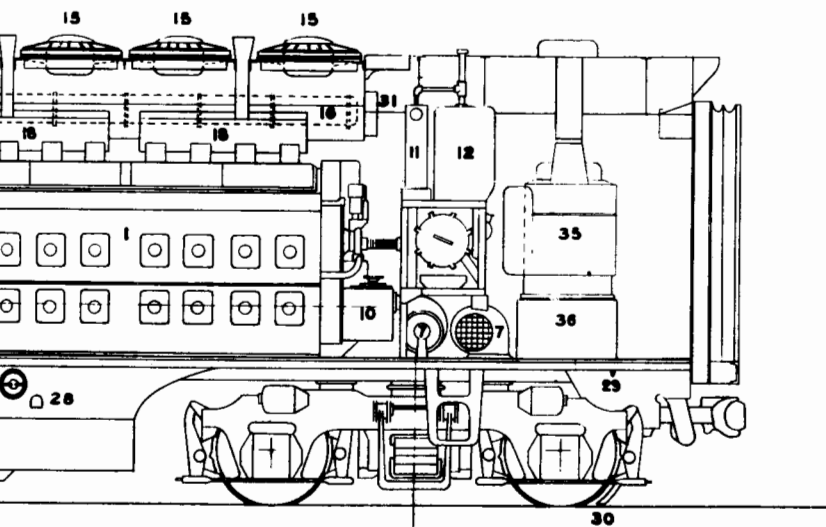
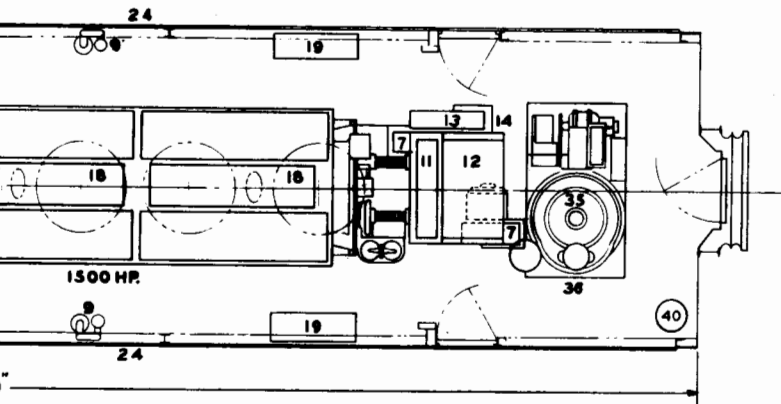


**DEL F7 LOCOMOTIVE "BOOSTER" UNIT**



● MOD

**"BOOSTER" UNIT**



- 40 BOILER WATER SOFTENER
- 39 BOILER WATER TANK FILLER (1200 GAL.)
- 38 COUPLERS BETWEEN UNITS
- 37 BOILER WATER TANK—1200 GAL.
- 36 BOILER WATER TANK—200 GAL.
- 35 BOILER
- 34 DYNAMIC BRAKE GRIDS & BLOWERS
- 33 HOSTLER CONTROL
- 32 HORN
- 31 A-C CONTACTOR CABINET
- 30 SANDING NOZZLES
- 29 ENGINE WATER FILLER (BOTH SIDES)
- 28 EMERGENCY FUEL CUT-OFF
- 27 FUEL TANK GAUGE
- 26 AIR INTAKE FOR GRIDS & ENGINE ROOM
- 25 BATTERY CHARGING RECEPTACLE (LEFT SIDE ONLY)
- 24 AIR INTAKE & SHUTTERS
- 23 MAIN AIR RESERVOIR
- 22 FUEL TANK—1200 GAL.
- 21 BATTERIES
- 20 FUEL FILLER
- 19 SAND BOX
- 18 EXHAUST MANIFOLD
- 17 AIR BRAKE EQUIPMENT
- 16 RADIATOR
- 15 34" FAN & MOTOR
- 14 LOAD REGULATOR
- 13 ENGINE CONTROL & INSTRUMENT PANEL
- 12 ENGINE WATER TANK
- 11 LUB. OIL COOLER
- 10 LUB. OIL FILLER
- 9 FUEL TANK VENT WITH FLAME ARRESTOR
- 8 HAND BRAKE
- 7 TRACTION MOTOR BLOWER
- 6 AIR COMPRESSOR
- 5 CONTROL CABINET
- 4 AUX. GENERATOR
- 3 GENERATOR BLOWER
- 2 MAIN GENERATOR & ALTERNATOR
- 1 ENGINE E.M.D. MODEL 16-567 B

● MODIFICATIONS



ELECTRO-MOTIVE DIVISION  
GENERAL MOTORS CORPORATION  
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