



Enginemen's
Operating
Manual

MODEL G.P.7

DIESEL LOCOMOTIVE
OPERATING MANUAL NO. 2312
FOR
ROAD SWITCHING LOCOMOTIVE
MODEL GP7

With Vapor Car Steam Generator

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ELECTRO-MOTIVE DIVISION

General Motors Corporation
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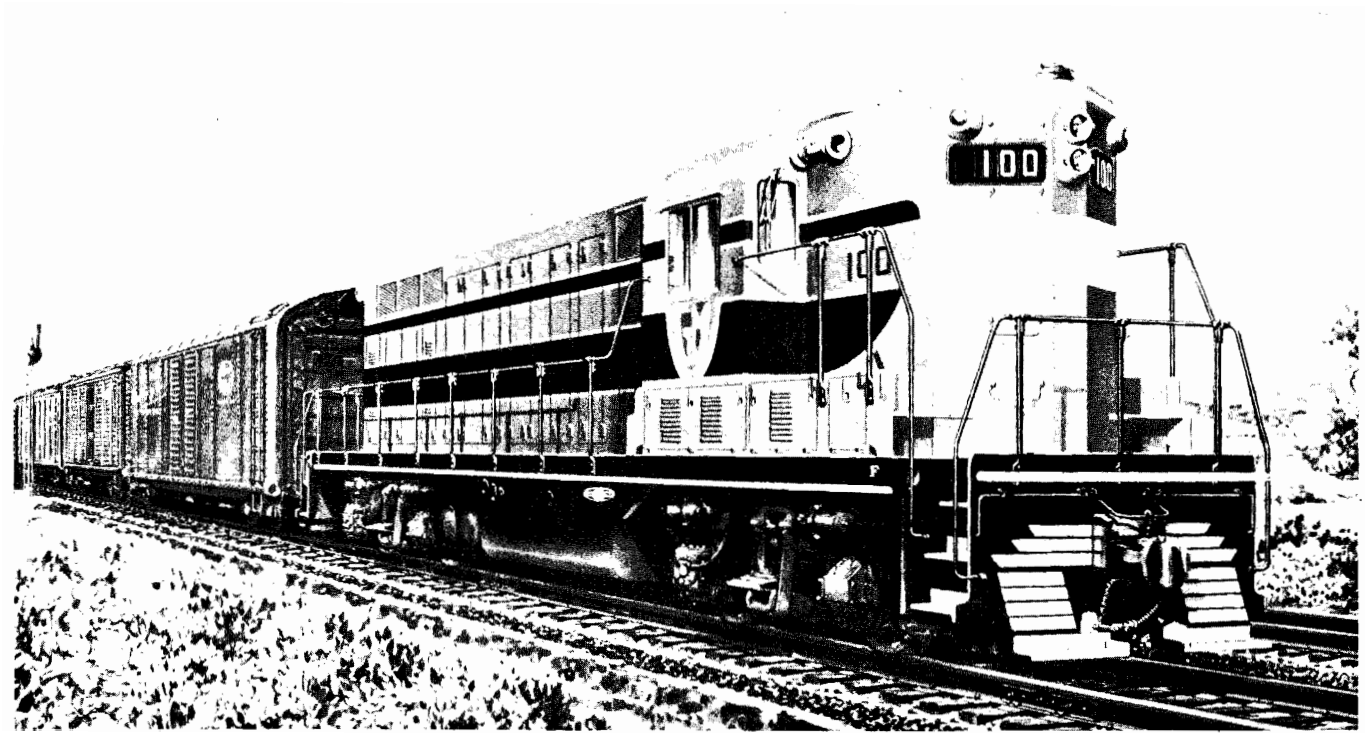
INTRODUCTION

This manual has been produced to assist the engineman in the operation of the Model GP7 locomotive. It covers basic (standard) equipment, as well as the most commonly used "extras."

The first three sections of this manual are devoted to a description of the locomotives, normal operation over the road, and special conditions and problems during operation. Section 4 consists of a general description of the cooling, lubricating oil and fuel oil systems and other necessary information for operation of the locomotive. Section 5 consists of a reprint of the TS-4 "On-the-Road Trouble Shooting" booklet. Section 6 covers the steam generator.

The principal articles of each section are numbered consecutively for ready reference, as is each page of the section. Articles and pages are numbered in the 100 series type of numbering, a page in the 300's is in Section 3 as is any article numbered in the 300's.

A "General Arrangement, Drains and Fillers" chart follows Section 5.



GENERAL DATA

	U. S. Gals.	Imp. Gals.
Fuel Oil Capacity	800	666
Lube Oil Capacity	200	167
Cooling Water Capacity ("G" Valve Level)	230	192
Steam Generator Water Capacity	800	666

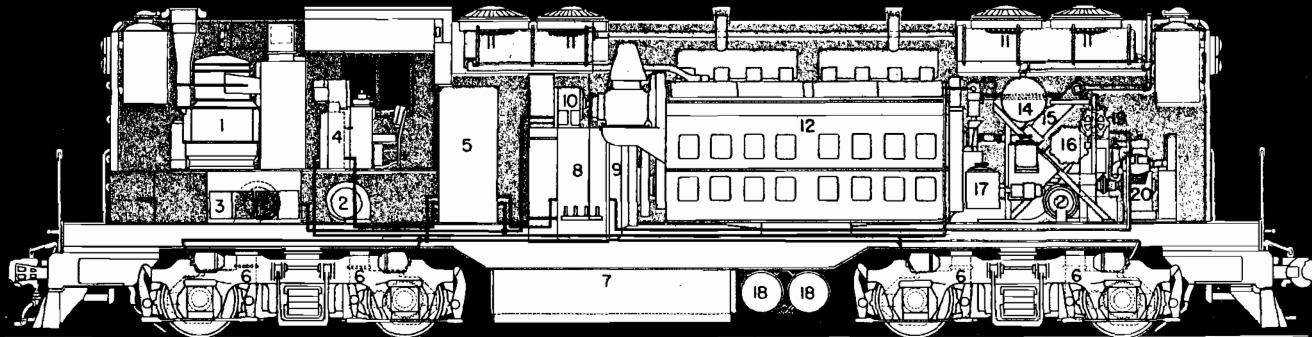
Gear Ratios and Maximum Speeds:

65/12	55 MPH
62/15	65 MPH
61/16	71 MPH
60/17	77 MPH
59/18	83 MPH
58/19	89 MPH

Weight - Fully Loaded (Approx.)	240,000 lbs.
Couplers	Type "E"
Sand Capacity	18 cu. ft.
Number Of Drivers	4 pair
Wheel Diameter	40"
Weight On Drivers	100%
Truck Centers	31' 0"
Truck Rigid Wheelbase	9' 0"
Minimum Curve Radius Coupled To Car	150' (39°)
Coupled To Another Locomotive Of Same Type With Type "E" Coupling	274' (21°)
Length Between Coupler Pulling Faces	55' 9"
Maximum Height Above Rail	14' 6"
Width Over Handrails	10' 3"

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- 1 STEAM GENERATOR
- 2 TRACTION MOTOR BLOWERS
- 3 BATTERIES
- 4 ENGINEER'S CONTROLS

- 5 ELECTRICAL CABINET
- 6 TRACTION MOTORS
- 7 FUEL AND WATER TANKS
- 8 D.C. GENERATOR

- 9 A.C. GENERATOR
- 10 AUX. GENERATOR
- 11 COOLING FANS
- 12 DIESEL ENGINE

- 13 PG GOVERNOR
- 14 ENGINE WATER TANK
- 15 LUBE OIL COOLER
- 16 LUBE OIL FILTER

- 17 LUBE OIL STRAINERS
- 18 MAIN AIR RESERVOIR
- 19 LOAD REGULATOR
- 20 AIR COMPRESSOR

PRIME MOVER
 TRANSMISSION AND CONTROL
 A.C. CURRENT
 CABLE

FOR EDUCATIONAL USE ONLY

SECTION 1

GENERAL DESCRIPTION

A description and general location of equipment on the basic GP7 locomotive is given in this section.

A locomotive consists of one unit rated at 1500 horsepower, however in some cases two or more units may be coupled together for multiple unit operation.

The locomotive may be equipped with either of two types of brake equipment. In order to differentiate between the two types of air brake equipment, the model designations "GP7L" or "GP7R" are used. The GP7L is equipped with 6 BL (USA) or 6 SL (Canadian) brake equipment while the GP7R is equipped with 24 RL brake equipment.

100 Diesel Engines Each locomotive has a 16 cylinder, 2 cycle, Model 567B Diesel engine which drives the main generator and auxiliaries described later.

101 Main Generator And Alternator The main generator and alternator assembly are directly connected to the Diesel engine crankshaft through a flexible coupling. Two electrically separate sections are mounted on the same shaft and designated as Model D12-D14. The D12 portion produces direct current at a nominal voltage of 600 volts for operation of the traction motors. The D14 section, built into the engine end of the main generator frame is a three phase, 80 KW alternating current generator which furnishes power to drive the engine water cooling fans and the traction motor blowers.

102 Traction Motors Four Model D27 traction motors are used in each unit, mounted one on each axle. Each motor is geared to the axle, which it drives, by a motor pinion gear meshing with an axle gear. The gear ratio between these gears is expressed as a double number such as 62/15. In this case the axle gear has 62 teeth while the pinion has 15 teeth.

During acceleration, two steps of traction motor electrical connections (called transition) are used:

1. Series-Parallel
2. Parallel

Transition is the term applied to the changing of traction motor connections on a Diesel-electric locomotive so that full power may be obtained from the main generator, within the range of its current and voltage limits. There is no provision for effecting manual transition on a GP7 locomotive as this takes place automatically (forward and backward).

103 Auxiliary Equipment Auxiliary equipment in the GP7 locomotive is driven entirely by direct drive from the Diesel engine or by separate electric motors. No belts are used in the locomotive.

Locomotives with steam generators are equipped with an 18 KW auxiliary generator. Locomotives without a steam generator have a 10 KW auxiliary generator. The auxiliary generator is driven directly by the Diesel engine. It produces direct current at approximately 74 volts to charge the storage batteries and supply the low voltage circuits for lighting, control, generator field excitation, fuel pump operation, etc.

A 5 HP electric driven blower is provided for each traction motor. These blowers supply cooling air for the traction motors. Four 9 HP electric driven cooling fans, thermostatically controlled, supply the air for the engine cooling water radiators.

The locomotive is basically equipped with a Gardner-Denver 3-cylinder, two stage Model WXE air compressor driven through a flexible coupling and an extension shaft from the front end of the engine. The WXE air compressor is rated at 178 CFM at 800 RPM. Air compressor Models WXO or WXG are supplied on special order. The WXO is rated at 225 CFM while the WXG is rated at 356 CFM (at 800 RPM). The WXG is a 6-cylinder air compressor.

ENGINEMAN'S CONTROLS

Two levers and the two brake valve handles control the entire operation of the locomotive. These are the throttle and reverse levers which are mounted in the control stand, and the independent and the automatic brake valve handles.

104 Throttle Lever This lever controls the speed of the engine and the train speed in normal operation. The position of the throttle is shown in the illuminated indicator above the lever. The throttle has ten positions, stop, idle, and running speeds 1 to 8. Stop can be obtained by depressing the emergency stop button on the end of the throttle lever and pushing the throttle lever one step beyond the idle position, stopping the engine. Idle position is as far forward as the throttle lever can be moved without depressing the emergency stop button. Each running notch on the throttle (above Run 1) increases the engine speed 75 RPM from 275 RPM at idle to 800 RPM at full throttle. Mechanical interlocks (if used) prevent the throttle from being opened more than one notch at a time to prevent rough train handling.

105 Reverse Lever The reverse lever must be moved **ONLY** when the locomotive is standing still.

Direction of the locomotive is controlled by movement of this lever to the forward or reverse position. In neutral the power contactors will not close when the throttle is opened.

The series contactors (S13, S24) close when the reverse lever is moved to the forward or reverse position even though the throttle may be in "Idle."

The reverse lever can be removed from the control stand only when the lever is placed in the neutral position, provided the throttle is in "Idle" and the transition lever (if used) is in "Off." This locks the operating controls in the control stand.

106 Transition Lever The basic GP7L locomotive is not equipped with a transition lever. There are, however, certain types of the GP7 that are equipped with transition levers, even though transition (forward and backward) is fully automatic on the GP7 locomotive. The inclusion of such a lever is principally for use with dynamic brakes, or for the purpose of providing a means for effecting manual transition in other type units (not equipped with automatic transition) when such a unit is being used in multiple unit operation with a GP7. Thus, the transition lever has 5 positions: OFF, 1, 2, 3 and 4; if the locomotive is equipped with dynamic brakes, an additional position "B" (braking range) is also included.

Earlier production GP7 locomotives that were equipped with transition levers had this lever arranged to control the Road-Service feature. On those locomotives, the placing of the transition lever in the OFF position caused the locomotive to start with the "teaser" type of starting; placing the transition lever in the #1 position caused modified maximum field starting to be obtained. Present production locomotives, however, have a toggle switch (located on the side of the con-

troller) to control the Road-Service feature, see Art. 108. Thus, the controller on the GP7 has mechanical interlocking of the levers identical to that found on "F" type locomotives, see Art. 109.

107 Transition Forestalling Switch This switch is located on the engineman's control panel and is used to forestall an undesired forward transition.

When the switch is in the "UP-AUTO" position, forward transition will take place automatically at the proper time.

When forward transition is not desired, the switch is placed in the "DOWN-SERIES" position. Traction motor connections will then stay in series-parallel, regardless of locomotive speed, generator voltage or position of load regulator arm, Fig. 1-6.

The transition forestalling switch should not be moved from the "SERIES" to the "AUTO" position unless the throttle is in the 6th position, or lower. However, if the speed of the locomotive is below the forward transition speed, it is permissible to move the switch to the "AUTO" position with full throttle operation. This will prevent any possibility of forward transition taking place at an excessively high voltage.

Movement of the switch from the "AUTO" to the "SERIES" position may be done at any time, as this will not cause backward transition to take place. Backward transition is determined only by the operation of the backward transition relay, or by reducing the throttle to the "Idle" position.

The operation of the transition forestalling switch is not trainlined. In multiple unit operation, the forestalling switch in each unit must be placed in the position in which it is desired to operate the locomotive.

108 **Road Service Switch** The road service switch is a toggle switch located on the right side of the controller, Fig. 1-1. This switch has two positions SWITCHING (up) and ROAD (down). The switch is not mechanically interlocked with the control levers and allows the engineman to select either a fast or slow start, depending on the type of service being performed.

In the ROAD position, normal modified maximum field starting is provided which assures a slow smooth start. With the switch in the SWITCHING position a faster start is provided by use of the "teaser" circuit, which allows the engineman to more fully control the loading of the main generator by the throttle position.

In multiple unit operation the road service switches in all units should be placed in the same position to assure that all units start uniformly.

109 **Mechanical Interlocks On The Controller** The levers on the control stand are interlocked so that:

1. The reverse lever can be operated only with the transition lever in either No. 1 or OFF position and the throttle at IDLE.
2. The reverse lever can be removed from the control stand only with the transition lever in OFF and the throttle at IDLE; this locks against movement of the levers.
3. The throttle can be moved to STOP with any position of transition or reverse levers. With the throttle in STOP the reverse lever cannot be moved.
4. The transition lever cannot be moved from position 2 to 3 or 3 to 2 unless the throttle is in Run 6 or lower.
5. The throttle cannot be opened if the transition lever is in OFF.

ENGINEMAN'S INSTRUMENT PANEL

The instrument panel contains gauges and light indicators to guide the engineman in the proper operation of the locomotive, Fig. 5-1.

110 Air Gauges These are standard gauges. Each gauge is clearly labeled as to its function.

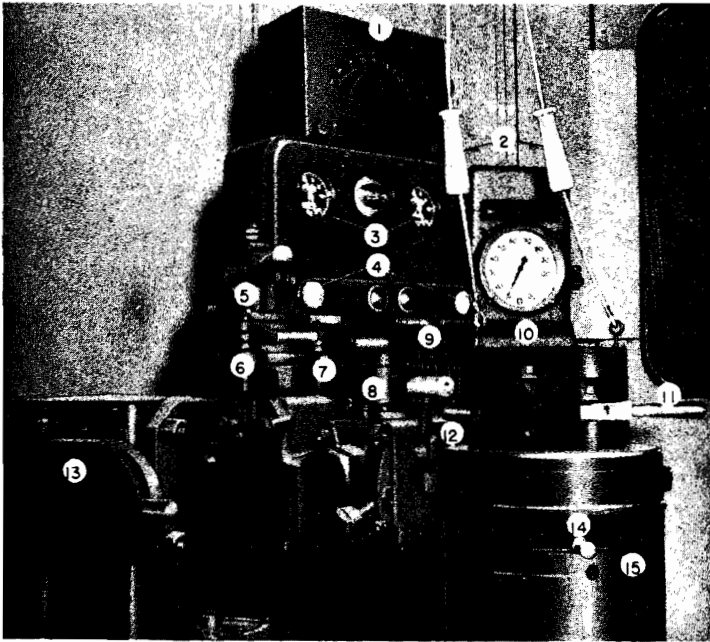
111 Load Indicating Meter This meter is basic on all production GP7 locomotives and is mounted above the engineman's control panel. The meter is connected into the leads of the No. 2 motor, but as the amperage is the same in all motors, each motor is getting the amount of current as shown on the meter. Fig. 1-1 and 3-1.

Total main generator output (amperes) is TWICE the amount shown on the meter when in SERIES-PARALLEL and FOUR TIMES the amount shown on the meter when in full PARALLEL.

An instruction plate mounted below the meter shows the permissible short time ratings; these ratings are accumulative. Also shown on the instruction plate is the maximum permissible amperage to use in dynamic braking, should the locomotive be so equipped.

112 Wheel Slip And Dynamic Brake Warning Light

If the locomotive is equipped with dynamic braking this light will serve as both the wheel slip light and the dynamic brake warning light. This is possible since an interlock on the cam switch prevents the wheel slip relay from lighting this light when the dynamic brake is in use. Without dynamic brakes this light, of course, will only indicate wheel slip action.



1. Load Indicator
2. Horn Pull Cords
3. Air Gauges
4. Alarm Lights
5. Automatic Brake Valve
6. Sander Valve
7. Bell Ringer Valve
8. Independent Brake Valve
9. Control Switches (Circuit Breakers)
10. Speed Recorder
11. Throttle Lever
12. Transition Lever (If Used)
13. Headlight Control — Dim And Bright
14. Reverse Lever
15. Road Service Switch Location

Engineman's Controls
Fig. 1-1

The lighting of this light during power application indicates that the wheels are slipping. The wheel slip light may flash when transition is made from series-parallel to parallel, Fig. 5-1.

When using the dynamic brake, the lighting of this light will indicate that one, or more, of the units in the consist is overloaded and the brake should be reduced.

SWITCHES

The engineman's control switches are mounted on a panel between the throttle stand and the automatic brake valve. Fig. 5-1 and Fig. 1-1.

These switches are in reality circuit breakers and are plainly marked for their respective uses. There are no fuses connected to these switches. The switch lever moves to the "OFF" position when the circuit is overloaded, giving a visual indication as to which circuit is open.

The "Control," "Lights" and "Main Battery" knife switches in the Electrical Control Cabinet (rear wall of operating cab) should all be closed for normal operation, Fig. 5-2.

113 PC Switch (If Used) The pneumatic control switch (PC) is an air operated electric switch. This switch is tripped by any "penalty" application of the air brakes. On most locomotives an emergency application of the brake will also trip the "PC" switch. When this switch is tripped, it automatically reduces the speed of the engines to idle and shuts off all fuel pumps. If the throttle is in the 5th or 6th notch when the "PC" switch is tripped, the engine will stop. Some locomotives are equipped with an indicating light which will show when the switch is tripped. To reset the

switch the throttle must be returned to idle and the brake "recovered." When this has been accomplished the "PC" switch will reset itself and the indicating light will go out. See Art. 310.

AIR BRAKE EQUIPMENT

114 **General** The GP7L locomotive is equipped with the 6 BL (USA) or 6 SL (Canadian) air brake equipment. The GP7R locomotive is equipped with the 24 RL air brake equipment.

The equipment and operation of the 6 BL or 6 SL brake is practically the same as that of the 6 ET brake, with the exception of a self lapping independent brake valve, and a few other modifications.

As all enginemen are more or less familiar with the operation of the 6 ET brake, no detailed operation of the 6 BL or 6 SL will be included. See Art. 209.

With the number of combinations and modifications possible, no attempt will be made to enumerate them here, as it would be far beyond the scope of this manual to do so. Special instructions for special applications may be had from locomotive manufacturer upon request by the customer.

The 24 RL brake is generally applied to road locomotives and its application to locomotives designed for branch line service is comparatively new. Operating instructions are covered briefly in this manual. More definite instructions may be obtained by contacting the proper railroad officials.

The air brake gauges are located on the instrument panel to the left of the engineman. In general, the cab air brake equipment (24 RL) consists of the automatic

brake valve, the independent brake valve and the K-2-A Rotair Valve, a manually operated valve having four positions. The automatic brake valve handle has 6 positions — release, running, first service, lap, service and emergency; and may be of the rigid or hinged handle type. The automatic brake valve handle (rigid or hinged handle) is removable in the running position. The handle should be removed when the locomotive is being operated from the opposite end. The hinged handle, if required by the railroad, is used to suppress a safety control from the foot pedal (if used) by depressing the handle to a horizontal position. On some railroads a sanding bail provides sanding by further depressing the handle.

The brake valve, Fig. 1-2, also contains:

1. Brake valve cutout cock, located on the filling piece portion.
2. Safety control cutout cock, located on the service application portion.
3. First service position cock.
4. Full release selector cock.

115 Independent Brake Valve The S-40-F independent brake valve handle has two positions, release and full application, with the application zone between the two positions. The brake valve is of the self-lapping type which automatically laps off the flow of air and maintains brake cylinder pressure, when the application pressure reaches the value corresponding to the position of the brake valve handle in the application zone. Locomotive brakes may be released after automatic application by depressing the independent brake valve handle in release position.

116 K-2-A Rotair Valve The four positions of the K-2-A Rotair valve are "FRGHT," "FRGHT LAP"

DESCRIPTION

GP7-1-1050

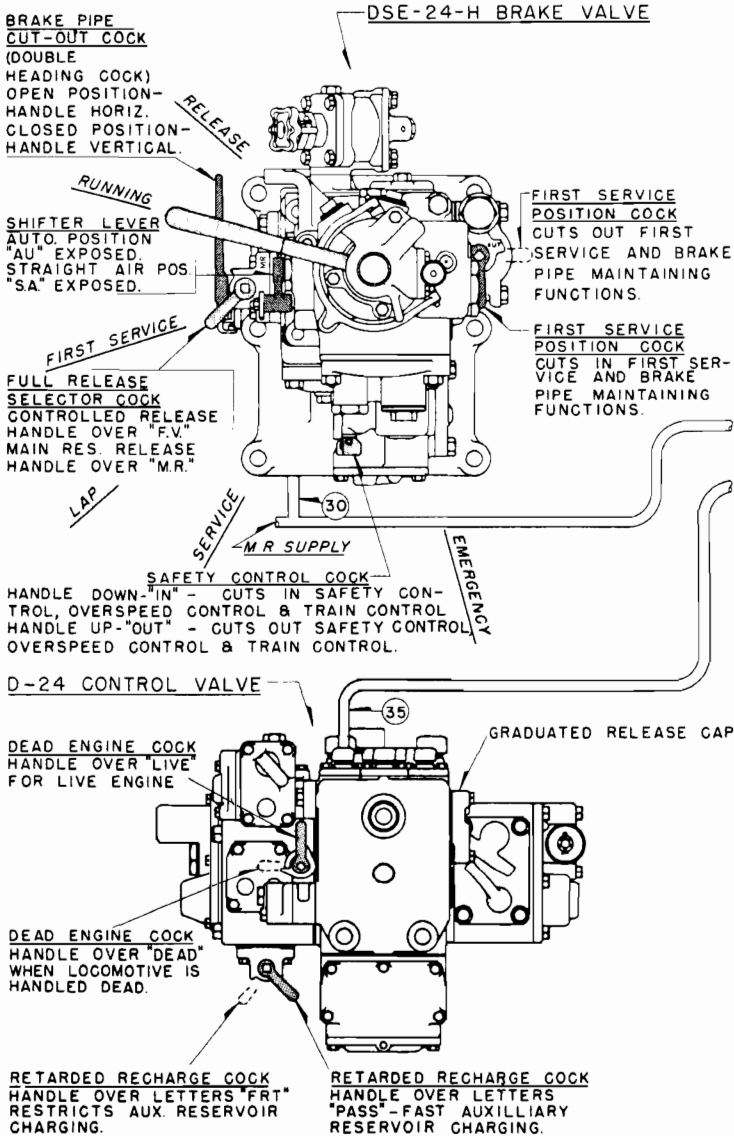
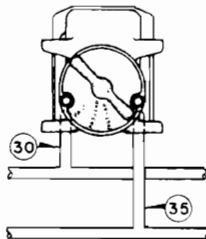


Fig. 1-2

K-2-A ROTAIR VALVE



HANDLE OVER LETTERS "FRGT"

CUTS IN CONTROLLED EMERGENCY FEATURE, SPLIT SERVICE REDUCTION, & INDEPENDENT BRAKE VALVE.

HANDLE OVER LETTERS "FRGT LAP" *

CUTS OUT INDEPENDENT BRAKE VALVE. CONTROLLED EMERGENCY STILL IN EFFECT.

HANDLE OVER LETTERS "PASS LAP" *

CUTS OUT CONTROLLED EMERGENCY & THE INDEPENDENT BRAKE VALVE.

HANDLE OVER LETTERS "PASS"

ALL FEATURES REMAIN CUTOUT AS IN "PASS LAP," EXCEPT INDEPENDENT BRAKE VALVE IS CUT IN

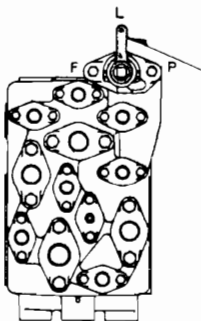
* POSITION USED FOR TRAILING "A" UNITS.

TO INDEPENDENT BRAKE VALVE →

"B" UNIT CONTROL VALVE SECTION

NOTE: WHEN DOUBLE HEADING, THE ROTAIR VALVE ON THE SECOND OPERATING UNIT SHOULD BE LEFT IN A LIVE POSITION, "FRGT" OR "PASS", TO RETAIN USE OF INDEPENDENT BRAKE VALVE.

WHEN OPERATING A "B" UNIT ALONE WITH THE HOSTLER'S CONTROL, THE CONTROLLED EMERGENCY SELECTOR COCK MUST BE PLACED IN "PASS" POSITION TO EFFECT QUICK ACTING EMERGENCY IF NEEDED.



HANDLE OVER "F"

CUTS IN CONTROLLED-EMERGENCY BRAKE CYLINDER PRESSURE DEVELOPMENT FEATURE.

HANDLE OVER "L"

POSITION NOT USED WITH OUR EQUIPMENT. HANDLE MUST BE IN PASSENGER OR FREIGHT POSITION.

HANDLE OVER "P"

CUTS OUT CONTROLLED-EMERGENCY BRAKE CYLINDER PRESSURE DEVELOPMENT FEATURE

VIEW OF PIPE BRACKET FOR CONTROL VALVES
SHOWING CONTROLLED-EMERGENCY CUT-OUT COCK IN "B" UNITS.

24 RL Brake Cock Handle Positions
All Types Of Service
Fig. 1-2

"PASS LAP" and "PASS." See Art. 203, Item C, for handling of this valve.

117 Safety Control Foot Pedal The safety control foot pedal (if used) is located in front of the engineman's seat. On locomotives equipped with the DS-24-H brake valve, having the hinged automatic brake valve handle, the handle provides an alternate control when it is depressed sufficiently to just contact the sanding bail. Either the pedal or the automatic brake valve handle must be kept depressed at all times except when the locomotive is stopped and the locomotive brakes are applied (30 pounds or more brake cylinder pressure). If both the foot pedal and the automatic brake valve are released, a penalty application of the brakes will result.

MISCELLANEOUS EQUIPMENT

118 Sanding Valve When the locomotive is equipped with 24 RL brake with the hinged automatic brake valve handle, sanding is accomplished by depressing the lever beyond the safety control position previously described. This movement operates the sanding bail which opens a port to supply air to the sanding equipment. On locomotives having a rigid handle on the 24 RL automatic brake valve, an independent sanding valve is installed. This valve is operated by moving the lever forward or backward until it latches.

119 Speed Recorder The speed recorder, located in front of the control stand, is a hydraulically operated speed indicator with a speed recording tape and an odometer. It is driven from the number 2 axle of the unit, through a flexible cable. Fig. 1-1.

120 **Windshield Wipers** The windshield wipers, four in number, are controlled by valves over the cab windows, two on each side of the cab. The wipers operate independently of each other. They should not be run on a dry window as dirt on the glass or blade will scratch the glass.

121 **Horn Valves** The horns are operated by air valves which are controlled by pull-cords, above the control stand. The horn shut-off valve is located in the nose compartment to the right of the access door from operating cab, just above the floor level.

122 **Locomotive Bell** The locomotive signal bell is under the locomotive floor behind the pilot or switchman's footboards on the right side of front end of locomotive. It is operated by an air valve located at the engineman's station.

123 **Cab Heaters** Two cab heaters are located behind the rear wall of operating cab, above the electrical control panels.

The No. 1 cooling fan cutout switch must be in "Off" position and manually operated shutters for No. 1 section of radiators must be closed in order for the cab heaters to function.

Warm air from the cooling radiators is forced through ducts by the heater fans into the operating cab. The fan motors are controlled individually by four position switches mounted on rear wall of operating cab.

124 **Defrosters** There are no individual defrosters used on the GP7 locomotive. When the cab heater

motors are turned on, warm air blows onto the front and rear windows keeping them clear of condensation.

125 Classification Lights Four permanently fixed clear bull's-eye lenses are provided, two on the front of the locomotive hood and two on the rear of the locomotive. Inside the hood and behind each bull's-eye, a small compartment contains the classification light bulb and colored lenses. Red and green lenses are provided in each compartment which can be moved into a position between the bulb and the bull's-eye. To accomplish this, a locking pin is removed, the desired lens swung into place and the locking pin replaced. The colored lenses are accessible from the inside of the hood through hinged doors in the compartments. When both red and green lenses are out of position the permanent bull's-eye lens will show a white light, thus making three colors available.

ENGINE ROOM

The two ends of the engine are designated "FRONT" and "REAR" as shown in Fig. 1-3 which will serve to identify the cylinder locations, ends and sides of the engine, as they are referred to in this manual. The governor, water pumps, and lubricating oil pumps are on the "FRONT END." The blowers, oil separator and generator are mounted on the "REAR END."

The engine is placed so that its rear end is toward the front end of the locomotive when the locomotive is operating in its normally forward direction.

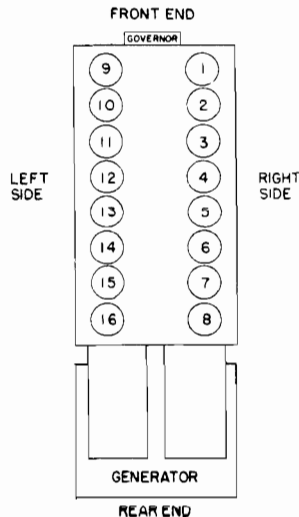


Fig. 1-3

126 Engine Control The engine control equipment is conveniently located in the operating cab instead of in the engine room. "START" and "STOP" buttons and the isolation switch are within the engineman's reach, Fig. 5-2. Engine lube oil pressure, control air pressure and water temperature gauges and the signal light panel are on the rear wall of operating cab, above the electrical control cabinet, Fig. 3-3. Fuel and boiler water tank level gauges are mounted on the front wall of operating cab, above the steam generator operating controls, Fig. 3-2.

127 Isolation Switch This switch has two positions "START" (handle horizontal) and "RUN" (handle vertical). In "START" position, the power plant is disconnected from the control circuit, and engine is reduced to idle speed. The engine will remain at idle speed and will not respond to throttle control. The power contactors in the electrical control cabinet will not operate. The "Alternator Failure" alarm is inoperative. The "START" and "STOP" buttons are effective only when the isolation switch is in "START" position, Fig. 5-2.

128 Governor, Governor Speed And Safety Control The engine is equipped with a Woodward Governor which includes an electro-hydraulic governor speed control, and an unloader (ORS) used during transition. In case of low oil pressure or high vacuum on the suction side of the lube oil pump, the engine governor will stop the engine, and the alarm bells will sound. The yellow "Low Oil" and the blue "Alternator Failure" signal light will show. When the governor safety control stops the engine, the push button on the front of the governor housing moves out approximately 3/8" exposing a red band around the shaft of the button, Fig. 5-4. The governor reset push button must be pressed in to extinguish the "Low Oil" alarm lights and the isolation switch moved

to "START" position to extinguish the "Alternator Failure" alarm lights. Both actions are necessary to stop alarm bells. The push button will not trip if the engine stops due to placing of throttle in emergency stop position, operation of manual layshaft control lever, tripping of ground protective relay when throttle is in Run 5 or 6, or use of the "STOP" button for normal shutdown. In these instances, the "Low Oil" alarm lights will not light but the "Alternator Failure" alarm will function (except when the "STOP" button is used) to serve as a warning that an engine is stopped. When the engine is stopped by governor control action, the push button must be reset before the engine can be started. When the engine is started and run at idling speed, the governor will stop the engine again after approximately forty seconds, if the condition still exists which caused the original shutdown. This time delay is provided to allow a check to determine the cause of the shutdown. However, if an attempt is made to run the engine above idling speed during the delay period, the governor will stop the engine at once should the oil pressure be low or the oil pump suction be high.

129 Electrical Control Cabinet The electrical control cabinet contains the various contactors, relays, and other equipment necessary for the electrical and electro-pneumatic control of the locomotive. Figs. 3-4 and 3-5 show the arrangement of the electrical cabinet with dynamic brake; Figs. 5-2 and 5-3 without dynamic brake.

130 Control Air Pressure Regulator The control air for operating power contactors, reverser and cam-switch is supplied from the main reservoir and reduced to 90 ± 3 pounds by the control air pressure regulator. The pressure regulator is located in the lower right hand corner of the electrical control cabinet on the rear wall of operating cab, Fig. 5-2. The pressure is indicated on a gauge, mounted on the rear wall of the operating cab, over the electrical control cabinet.

131 Load Regulator The load regulator is located under the engine hood, adjacent to the air compressor. The operation of the load regulator is controlled by a pilot valve and a dump valve (ORS) in the engine governor. The function of the load regulator is to vary the battery field current in the main generator. Two tumble switches LRS and FTS have been added to the load regulator, which are actuated by the movement of a three fingered plate that is bolted onto the load regulator arm shaft.

When the load regulator arm is in minimum field (4 o'clock) position, one finger of the plate moves LRS switch down. An open interlock on LRS prevents the shunt field contactor from closing. At the same time, a closed interlock on LRS energizes LRC, which partially establishes the circuit for the throttle controlled "Teaser" circuit. With the switch in this position, the amount of battery field current is varied by each throttle position, Fig. 1-4. When load regulator arm reaches mid-position (12 o'clock) a second finger moves LRS to opposite position. This allows the shunt field contactor to close, making main generator excitation normal, and cuts out the throttle controlled "Teaser" circuit. LRS switch will stay in this position until load regulator arm returns to full minimum field position, Fig. 1-5. When load regulator arm reaches maximum field (8 o'clock) position, the third finger closes the other tumble switch FTS, changing the motor connections from series-parallel to parallel, Fig. 1-6. FTS will open as the load regulator arm moves back away from maximum field, but the motor connections will stay in parallel until the backward transition relay is energized by approximately 2500 amperes main generator current. When the throttle is closed to idle, all P contactors open, and the S contactors close. As the throttle is reopened, the motor connections will be series-parallel, remaining so until the load regulator arm reaches maximum field, when the transition cycle is repeated.

132 Layshaft Manual Control Lever The layshaft manual control lever is attached to the end of the injector layshaft, at the left front corner of the engine. Because the engine controls are located in the electrical control cabinet in the operating cab of the GP7 locomotive, this lever cannot be readily used for controlling engine speed manually while taking an engine "off the line" or while putting an engine back "on the line" if the locomotive should be used in multiple unit operation.

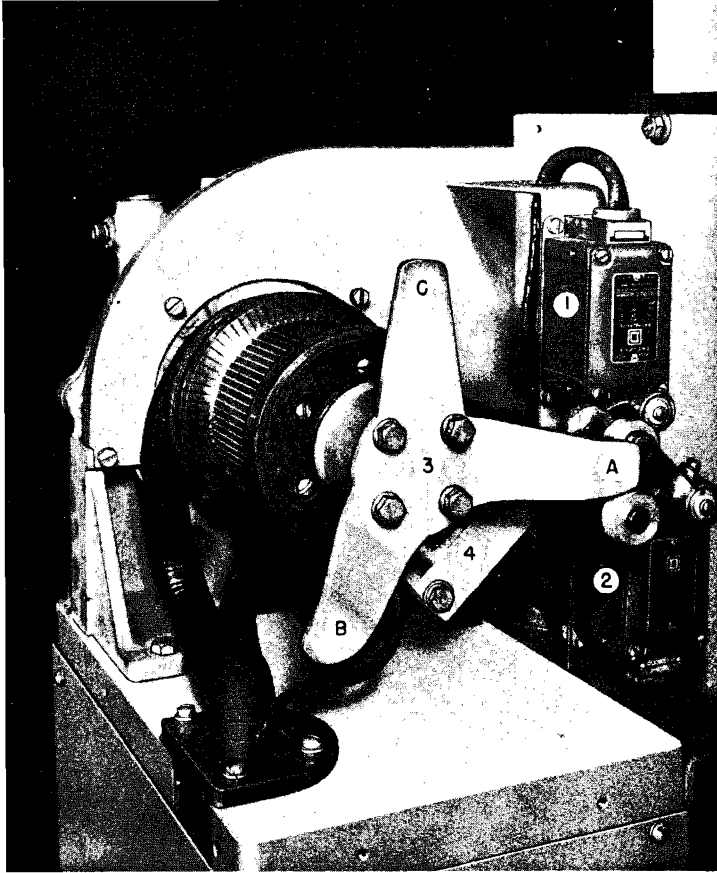
133 Indicators, Gauges And Protective Devices The gauges and alarm lights are mounted on the rear wall of the operating cab, above the electrical control cabinet, Fig. 3-3.

134 Engine Overspeed Trip If the engine speed exceeds approximately 910 RPM, an engine over-speed device, located on the front of the engine behind the engine governor, See Fig. 5-5, Section 5, will trip and bring the engine to a stop.

135 Hand Brake The hand brake is mounted on the outside of the engineroom hood, and on the rear platform of the locomotive.

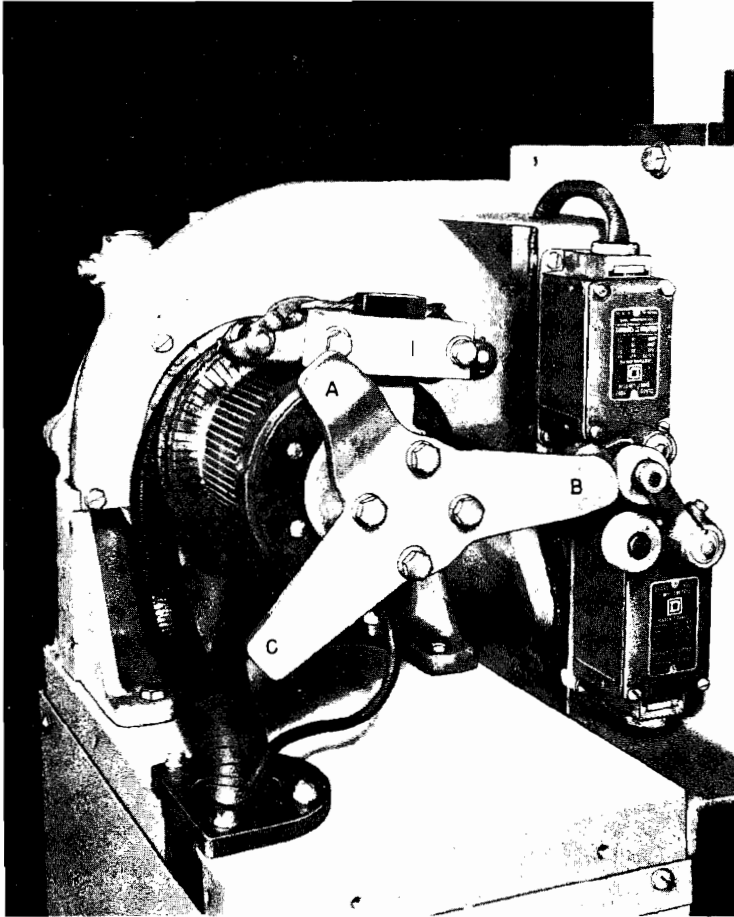
The hand brake is applied by pumping the long handle up and down and released by pulling on the short release lever. It is effective on one pair of wheels only.

Whenever anyone is working around the locomotive trucks, the hand brake should be applied.



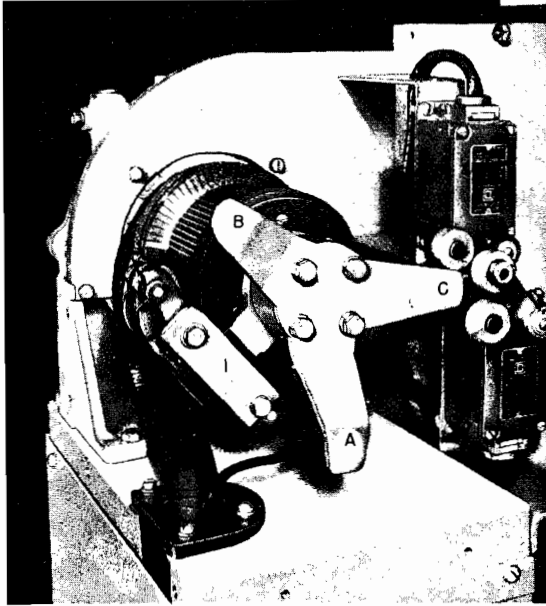
1. Forward Transition Switch (FTS)
2. Load Regulator Shunting Switch (LRS)
3. Actuating Fingers — A,B,C
4. Load regulator arm, minimum field (4 o'clock) position, LRS interlocks CD closed, energizing LRC. This partially completes the throttle controlled "Teaser" circuit in the generator battery field circuit. The open AB interlock prevents the generator shunt field contactor from closing.

Load Regulator Arm — Minimum Position
Fig. 1-4



Load regulator arm "1" in mid (12 o'clock) position. "B" finger has tripped LRS, opening CD interlock which de-energizes LRC, cutting out "Teaser" circuit. AB interlock closes, allowing generator shunt field to close. Battery field excitation of main generator normal.

Load Regulator Arm — Mid-Position
Fig. 1-5



Load regulator arm "1" in maximum field (8 o'clock) position. "C" finger has tripped FTS, closing FTS interlock CD which energizes parallel relay PR, causing forward transition to take place from series-parallel to full parallel.

As the load regulator arm moves away from maximum field, "C" finger also moves away from FTS, allowing FTS to assume its normal position. PR relay stays energized through its holding circuit, and the traction motors stay in parallel.

The motors remain in parallel until generator amperage has increased to the pickup value of the backward transition relay BTR. This action de-energizes PR, opening power contactors P1-P2-P3 and P4. The series contactors S13-S24 close, changing the motor connections back to series-parallel normal battery field, closing the throttle to idle will also change the motor connections back to series-parallel, normal battery field.

The "Teaser" circuit remains cut out until the load regulator arm gets back to minimum field (4 o'clock) position, when "A" finger trips LRS back to effect this change.

Load Regulator Arm — Maximum Field Position

Fig. 1-6

