



# Soldier Summit Provo to Helper, Utah

dovetail  
GAMES



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## 1 Route Information

### 1.1 Background

At the crest of the Wasatch Plateau, Soldier Summit is a 69.4 mile broad valley pass and is the highest point on the Denver and Rio Grande railroad in Utah. The grassy pass is surrounded by high, but moderately sloping mountains with forests on the slopes.

In July of 1861, a group of soldiers were caught on the pass in a freak summer blizzard. History now tells us these summer snowstorms are not totally unheard of in the area. The army buried two soldiers on the summit while camped there. It is not clear how the soldiers died, but the summit is now named after them. When the railroad was first constructed across the pass it had a passing siding and turning wye. This was slowly expanded until 1919 when the entire division point was moved from Helper to Soldier Summit based on orders from the "main office." Someone thought efficiency could be improved with the new division point located on the top of the pass. As it turned out this was a horrible idea. Nevertheless, the railroad built new classification yards, passenger and freight stations, a Round House and Turntable, Locomotive Shops, over 70 homes, hotels, swimming pool and even a YMCA. It was lovely but it remained a frozen desert most of the year.

The population at the summit reached 2500 in the 1920's and the crews did their best to make the new division point a success. But, the fact was, that it worked out better when things were done in Helper where there was at least some shelter from the storms, and where the locomotives were actually needed at the base of the pass instead of on top.

In 1930 the division point was moved back down to Helper where it has remained ever since. All the equipment and buildings were hauled down from the summit to Helper, the original division point. Soldier Summit approached ghost town status with just a large stock loading facility remaining behind.

Originally the grades down the west side of the summit were four percent. In 1920 the alignment was modified at Gilluly by adding long horseshoe curves producing a two percent grade. This meant that one locomotive could haul the same number of cars that used to take three locomotives.



## 2 SD40T-2 “Tunnel Motor”

### 2.1 SD40T-2

A total of 312 examples of this locomotive were built for North American railroads between April 1974 and July 1980. This locomotive, along with the SD45T-2, are popularly called tunnel motors, but are officially referred to as SD40-2s with "cooling system modifications" because they were specifically designed to be more effective when operating in tunnels.

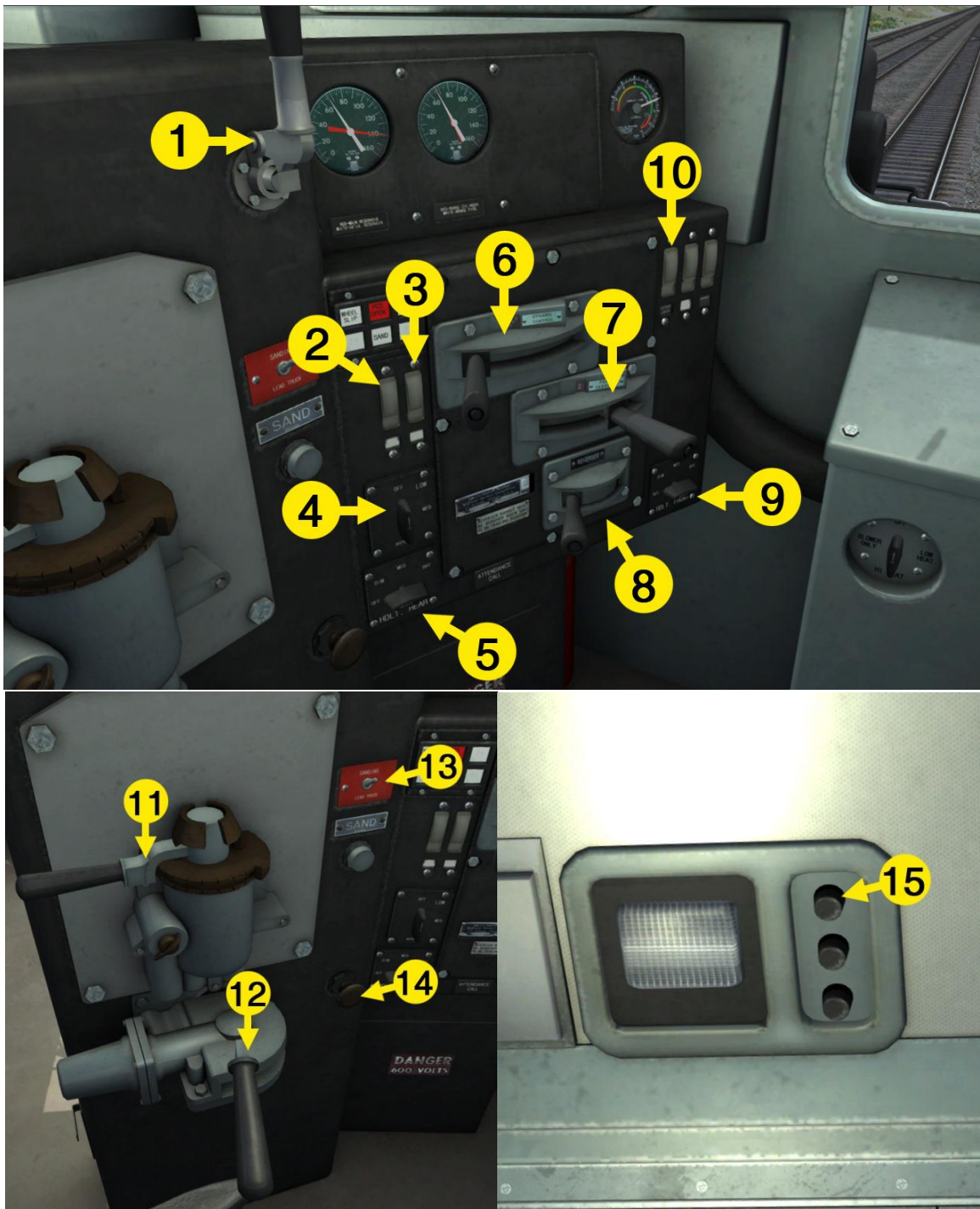
The major differences between this locomotive and the non-tunnel motor SD40-2, are the radiator intakes and radiator fan grills located at the rear of the locomotive. The radiator air intakes in this model are located along the deck to allow more fresh, cooler air to enter and less hot exhaust fumes lingering around the tunnel's ceiling.

### 2.2 Design & Specification

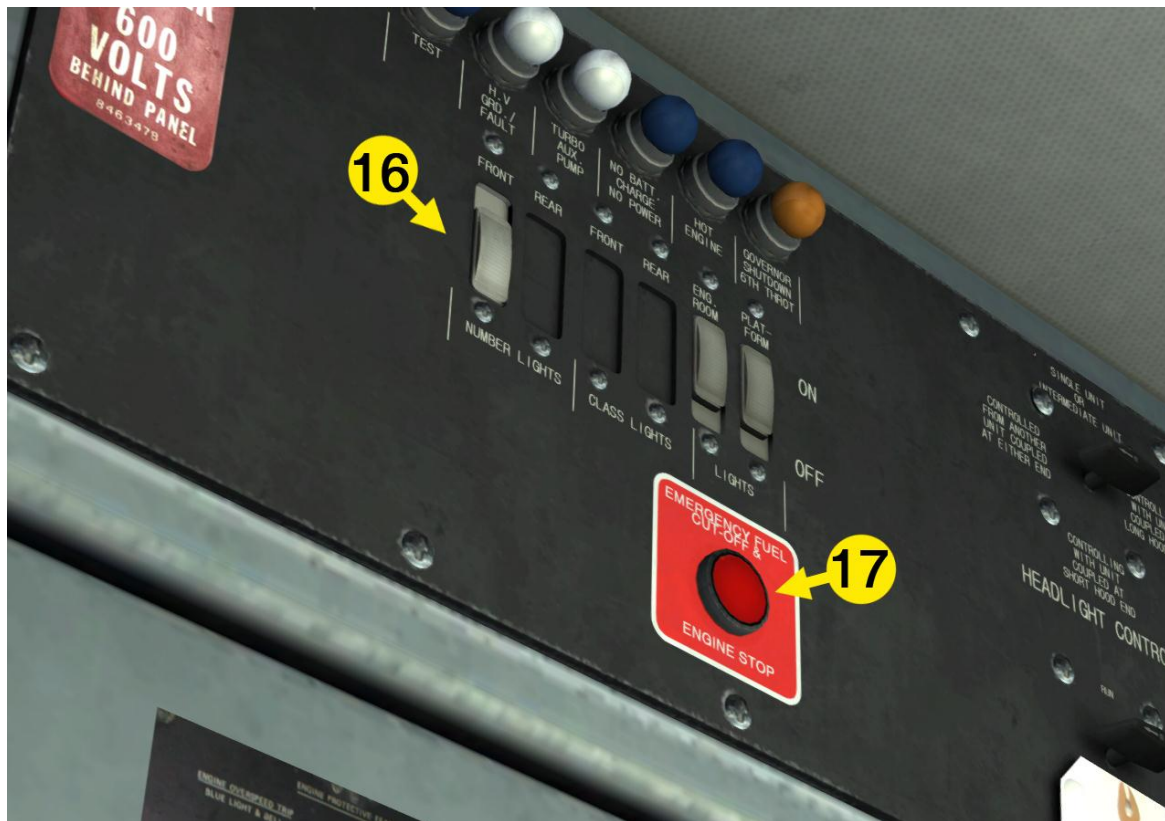
<b>Manufacturer</b>	Electro-Motive Division
<b>AAR Wheel Arrangement</b>	C-C
<b>Unit Weight</b>	368,000lb
<b>Vehicle Length</b>	70ft 8in
<b>Vehicle Width</b>	10ft 3in
<b>Vehicle Height</b>	15ft 7in
<b>Power Output</b>	3,000hp
<b>Fuel Capacity</b>	4,400 US Gallons
<b>Design Speed</b>	70mph
<b>Total Built</b>	312



## 2.3 Cab Controls







- |   |                   |    |   |
|---|-------------------|----|---|
| 1 | Horn              | 10 | Rotary Light                              |
| 2 | Step Lights       | 11 | Train Brake                               |
| 3 | Instrument Lights | 12 | Independent Brake, push down for bail-off |
| 4 | Windscreen Wipers | 13 | Sander                                    |
| 5 | Rear Headlights   | 14 | Bell                                      |
| 6 | Dynamic Brake     | 15 | Cab Light                                 |
| 7 | Throttle          | 16 | Number Lights                             |
| 8 | Reverser          | 17 | Emergency Stop/Start                      |
| 9 | Headlights        |    |   |

## 2.4 Advanced Braking Controls

The SD40T-2 locomotive included in the route contains all new scripting, based upon a 26L brake stand, to provide prototypical braking performance.

There are four levels of 'braking difficulty' which may be changed by pressing Ctrl-Shift-1 to decrease the setting and Ctrl-Shift-2 to increase.

Level 1 – Easiest	All scripting is bypassed
Level 2 – Easy	1/3 <sup>rd</sup> full brake timing simulation implemented
Level 3 – Medium	2/3 <sup>rd</sup> full brake timing simulation implemented
Level 4 – Hard	Full brake timing simulation implemented

When braking it is important to monitor the information shown on the two brake gauges.

The left-hand gauge shows the pressures held Main Reservoir (red needle) and Equalising Reservoir (white needle), and the right-hand gauge shows pressures in the locomotive Brake Cylinder (red needle) and the Brake Pipe pressure (white needle).

Moving the Train Brake lever forwards to set the brakes and rearwards to release them directly affects the equalising reservoir pressure, which would normally be at 90psi and reduces as the braking level increases.



In the example above the brakes are released and both the Equalising Reservoir gauge and Brake Pipe gauge show 90psi.



The Train Brake lever has a series of distinct stages to aid the driver. From the release position the first stage produces an almost instantaneous initial reduction of 6psi.



By moving the Train Brake lever further forwards (after a brief pause) the pressure in the Equalising Reservoir will rapidly reduce and show the 'target' Brake Pipe pressure. Air will be released from the system until the Brake Pipe pressure matches that of the Equalising Reservoir and how rapidly the air is released is dependent upon the train length. In the picture above the Brake Pipe pressure is dropping while the Brake Cylinder pressure is increasing.





After a period of time the Brake Pipe pressure matches that of the Equalising Reservoir and the desired brake application has been made.

Bear in mind that the brakes are self-lapped, so if the Train Brake lever on the HUD (for ease of reference) is moved to 48% the pressure in the Equalising Reservoir will be reduced **at that rate** until a full brake application has been made.

Once the desired Equalising Reservoir pressure has been reached the Train Brake lever may be moved back to the step prior to the Release position so that the Equalising Reservoir pressure is stabilised.

**Note also that the Brake Cylinder needle indicates locomotive braking effort and not that applied to the entire train.**

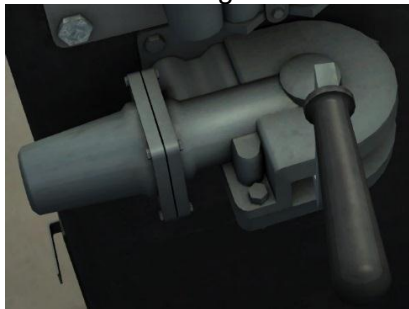


With the Equalisation Reservoir and Brake Pipe pressures balanced the locomotive Independent Brake may be 'Bailed Off' (by moving the Independent Brake lever backwards slightly). This practice removes the danger of the locomotive skidding under braking. In the above picture the locomotive brakes have been Bailed Off with the Train Brake application as before.

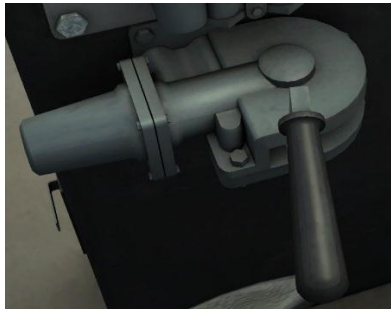
It should also be noted that prior to Bail Off the 'J' Valve in the locomotive brakes will 'remember' the value initially set by the Train Brake application. This allows additional effort to be applied to the locomotive brakes if desired, although it will not reduce below that initially set by the Train Brake until the locomotive brakes are Bailed Off.

The pictures below show the two positions for the Independent Brake lever.

Normal Running Position:



Bail Off Position:



***\*\*If an emergency brake application is required a brief pause is required before the Train Brake lever can be moved between its maximum application setting and the Emergency Brake setting to avoid accidental application.\*\****

In the event of an emergency brake application the locomotive Pneumatic Control Switch (PCS) has been simulated and is indicated both by a Popup message and the illumination of the 'PCS Open' light in the cab.



Once the PCS has been tripped all locomotive engines will be returned to Idle regardless of the Throttle setting.

Should the PCS have not been tripped by a manual application (e.g. if a train brake pipe breaks) it requires resetting by moving the Train Brake lever into the Emergency Brake position before moving it back to Release, which will only take effect once the Brake Pipe pressure has reached 0psi. The locomotive Throttle lever will also need to be moved to the idle position.



A Popup will appear to indicate that the PCS has been reset and the 'PCS Open' light will be extinguished.

Partially releasing the train brakes is not an option and so caution should be exercised when they are first applied and the locomotive Dynamic brakes should be used as much as possible!

The train brakes will release and locomotive gauges will appear normal a long time before each car in the consist has fully recharged its own reservoir from the brake pipe. There is no indication of the actual state of the car's reservoir pressures either prototypically or in the simulation, and repeated application and release of the train brake will result in running out of air and a subsequent run-away!

## F40PH “California Zephyr”

### 2.5 F40PH

The California Zephyr is a service which runs between Chicago, Illinois and Emeryville, California via Illinois, Colorado, Utah, Nevada and California. Before Amtrak, the *California Zephyr* (the CZ, or "Silver Lady") was a passenger train operated by the Chicago, Burlington & Quincy (CB&Q), Denver & Rio Grande Western (D&RGW) and Western Pacific railroads, all of which dubbed it "the most talked about train in America" on March 19, 1949, with the first departure the following day. It was scheduled to pass through the most spectacular scenery on its route in the daylight. The original train ceased operation in 1970, though the D&RGW continued to operate its own passenger service, the *Rio Grande Zephyr*, between Salt Lake City and Denver using the original equipment until 1983. Since 1983 the *California Zephyr* name has been applied to the Amtrak service, which operates daily and is a hybrid of the route of the original *Zephyr* and its former rival, the *City of San Francisco*.

The EMD F40PH is a four-axle 3,000hp (2.2mW) B-B diesel-electric locomotive, built by General Motors Electro-Motive Division in several variants from 1975 to 1992 and used by Amtrak and commuter railroads on passenger trains. F40PH variants were also built by MK Rail and Motive Power Industries from 1991 to 2000.

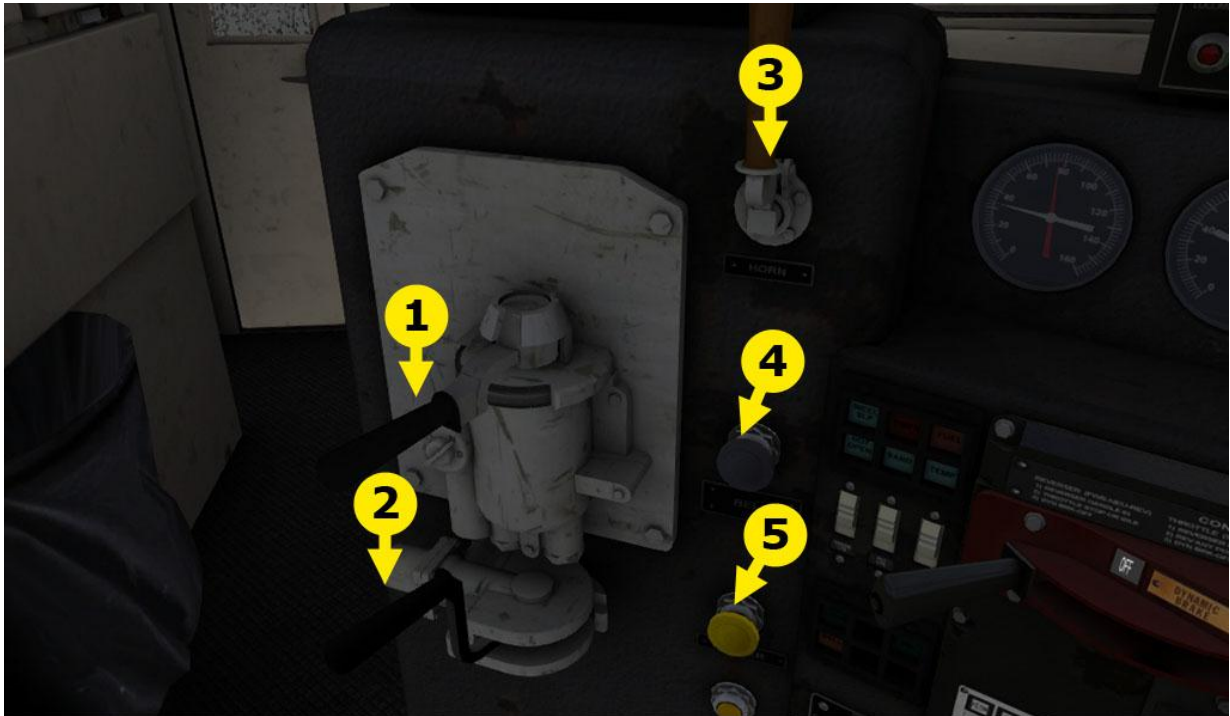
### 2.6 Design & Specification

<b>Power Type</b>	Diesel-Electric
<b>Locomotive Weight</b>	260,145lbs (118t)
<b>Vehicle Length</b>	56ft 02" (17.11m)
<b>Build Date</b>	1991
<b>Vehicle Power</b>	3,200hp (2,387kW)
<b>Top Speed</b>	110mph (177km/h)
<b>Brake Types</b>	Auto Brake, Independent Brake, Dynamic Brake















## 2.7 Cab Controls















- |   |                   |    |                   |
|---|-------------------|----|-------------------|
| 1 | Auto Brake        | 8  | Reverser          |
| 2 | Independent Brake | 9  | Instrument Lights |
| 3 | Horn              | 10 | Wipers            |
| 4 | Bell              | 11 | Headlights        |
| 5 | Sander            | 12 | Cab Light         |
| 6 | Dynamic Brake     |    |                   |
| 7 | Throttle          |    |                   |

## 2.8 Locomotive Keyboard Controls

Key Equivalent	Action
 	Decrease or Increase Power Handle.
 	Move Reverser Control Forward or Backward.
 	Decrease or Increase the Auto Brake (Train Brake).
 	Decrease or Increase the Independent Brake (Locomotive Brake).
 	Decrease or Increase the Dynamic Brake.

## 2.9 General Keyboard Controls

Key Equivalent	Action
	<b>Load/Unload.</b> Press once to load/unload passengers or freight.
	<b>Lights.</b> Repeatedly pressing will cycle through headlight states where appropriate.
	<b>Windscreen Wipers.</b> Press once to switch on and again to switch off.
	<b>(Expert) Engine Stop/Start.</b> By default engines will already be running at the start of a scenario. Press this button to stop and then again to restart the engine.
	<b>(Expert) Alerter.</b> The Alerter is a system used on some trains to ensure that the driver has seen a signal. If the alert sounds (a black/yellow striped symbol is shown on the Driver's display), this must be acknowledged by pressing the Alerter button or the emergency brakes will be applied.
	<b>(Expert) Sander.</b> Causes sand to be laid on the rails next to the wheels to assist with adhesion. Press once to apply sand and again to stop.
	<b>Horn.</b> Press to sound the horn.
	<b>Bell.</b> Press once to sound the bell.
	<b>Handbrake On/Off.</b> This icon is displayed in the Coupling view.
  	<b>Couple manually.</b>



## **2.10 Formation**

Typically the California Zephyr of the 1980s ran with the following coach configuration:

- 2x F40PH locomotives
- 1x Baggage car
- 3x Sleeper Cars
- 1 x Dinner Car
- 1x Amfleet II Sightseer Lounge
- 3x Coaches

## 3 GP9

### 3.1 GP9

Built by General Motors' Electro-Motive Division (EMD) between January 1954 and August 1963, the GP9 general purpose road switcher is powered by the EMD 567C series 16 cylinder, two-stroke diesel prime mover unit producing 1,750hp. This series of prime movers has proven extremely reliable and withstood the rigours of time. Today, a large number of the engines are still in service with short line railroads and industrial operators as well as several in preservation.

4,000+ units of the GP9 were produced between January 1954 and August 1963. Affectionately known as 'Geeps' the GP9 was the successor to the EMD GP7 and the predecessor to the GP15 (produced between 1976 and 1982).

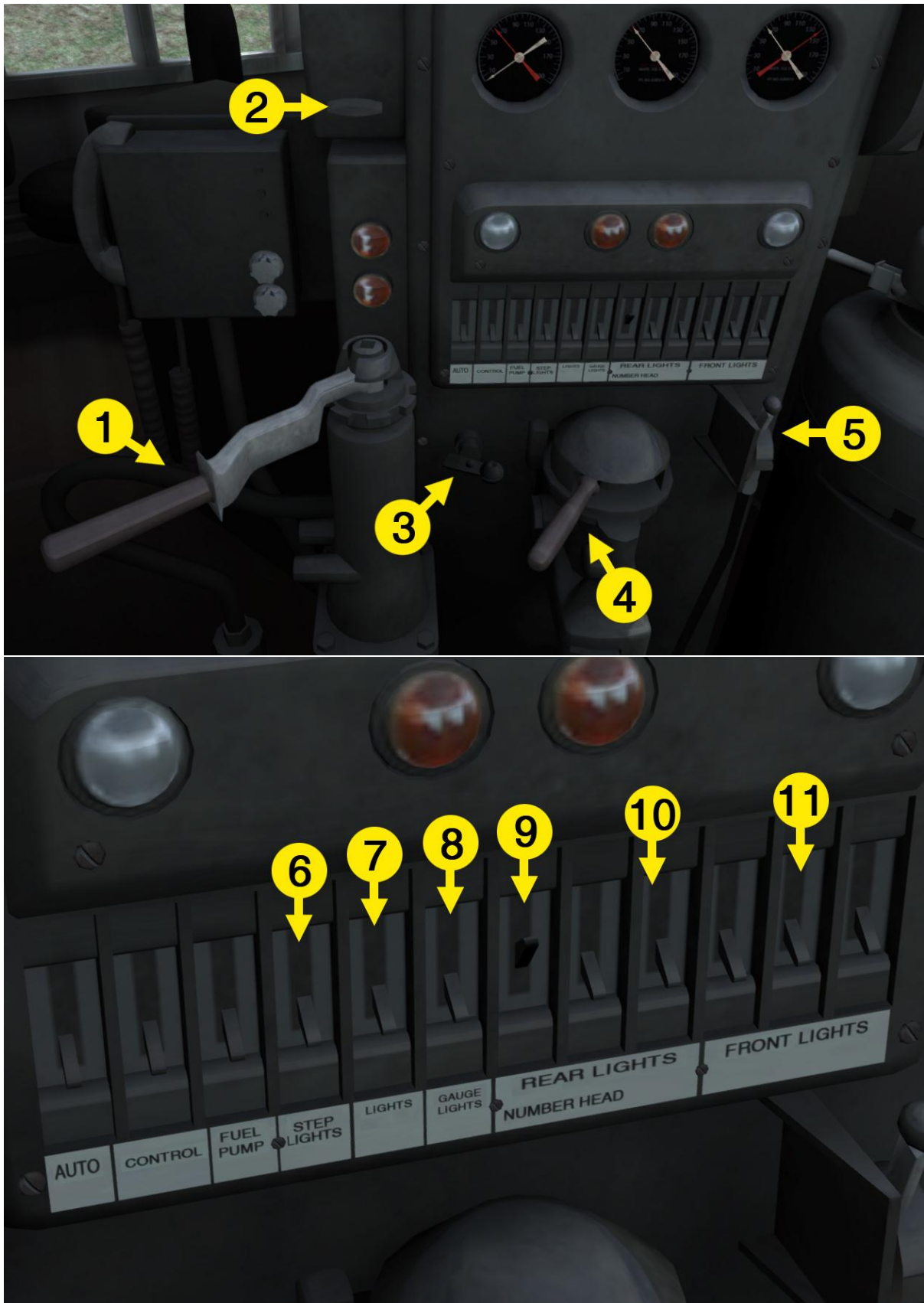
A total of 3,000+ units of this locomotive model were built for American railroads, with an additional 646 for Canadian railroads and ten for Mexican railroads. 40 GP9M units built within those produced for the United States railroads. A GP9M was built with parts from older EMD locomotives, either an F or a damaged GP7. The use of parts from these older locomotives caused the GP9Ms to have a lower power rating being either 1,350hp if the donor locomotive was an FT/F2 or 1,500hp from an F3/F7 or GP9.

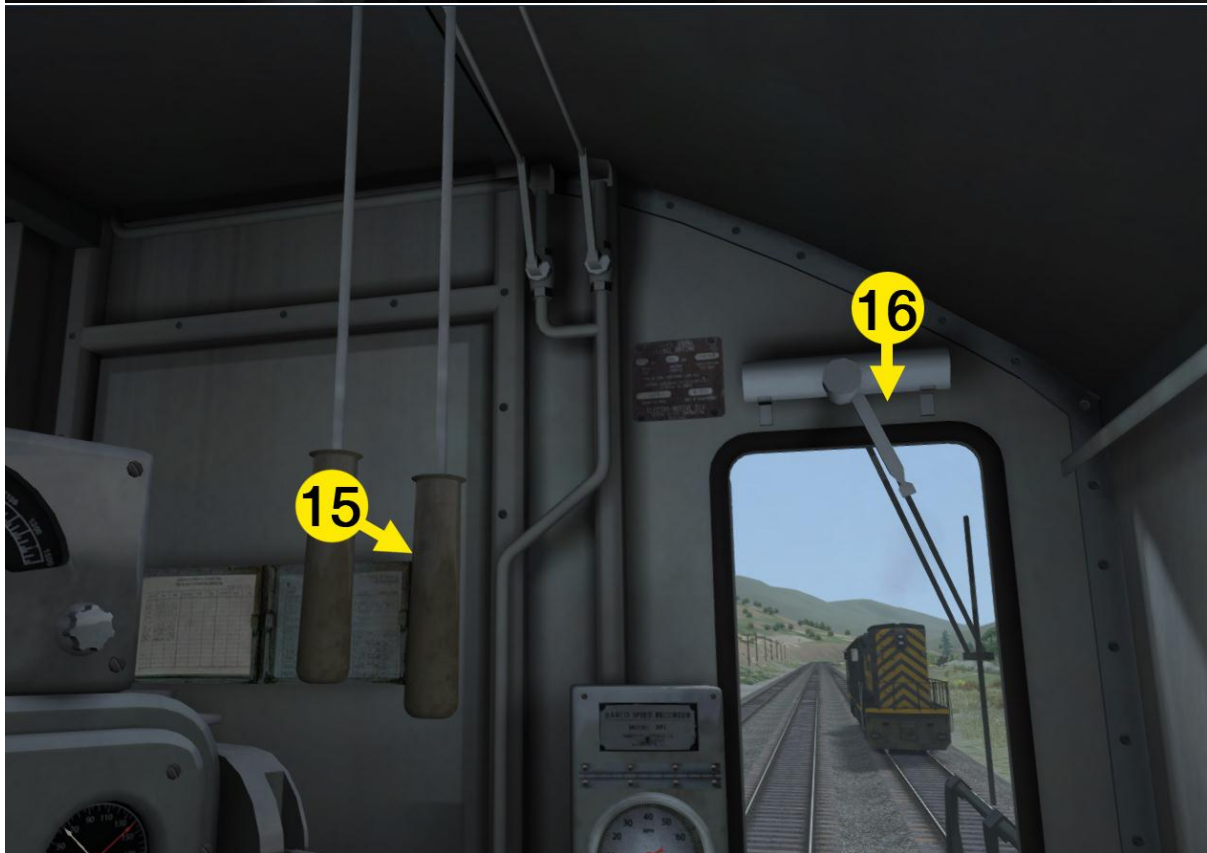
### 3.2 Design & Specification

<b>Build Dates:</b>	1954-63	<b>Units Produced:</b>	4,112
<b>AAR Wheel Arr:</b>	B-B	<b>Cylinders:</b>	V16
<b>Height above Rails:</b>	14ft 6in	<b>Cylinder Size:</b>	8.5in x 10in
<b>Length:</b>	56ft 2in	<b>Loco Brakes:</b>	Straight Air
<b>Weight:</b>	248,000lb	<b>Train Brakes:</b>	Air
<b>Truck Wheelbase:</b>	9ft	<b>Engine Type</b>	2-Stroke Diesel
<b>Maximum Speed:</b>	60mph	<b>Power Output:</b>	1,750hp



### 3.3 Cab Controls





Train Simulator 2015 – Soldier Summit – Provo to Helper

- |   |                   |    |                  |
|---|-------------------|----|------------------|
| 1 | Auto Brake        | 10 | Rear Highlights  |
| 2 | Wiper Switch      | 11 | Front Headlights |
| 3 | Bell              | 12 | Dynamic Brake    |
| 4 | Independent Brake | 13 | Reverser         |
| 5 | Sander            | 14 | Throttle         |
| 6 | Step Lights       | 15 | Horn             |
| 7 | Cab Light         | 16 | Manual Wiper     |
| 8 | Instrument Lights |    |                  |
| 9 | Number Lights     |    |                  |



## 4 Rolling Stock

### 4.1 SS SD40T-2 D&RGW



### 4.2 [SS] EMD F40PH Amtrak Phase III



#### 4.3 [SS] F40 Baggage Heritage\_ph II



#### 4.4 [SS] F40 Baggage Heritage\_ph III





#### 4.5 [SS] F40 Baggage\_ph II



#### 4.6 [SS] F40 Baggage\_ph III





#### 4.7 [SS] F40 Coach\_ph II



#### 4.8 [SS] F40 Coach\_ph III





#### 4.9 [SS] F40 Dining\_ph II



#### 4.10 [SS] F40 Dining\_ph III





#### 4.11 [SS] F40 Sightseer Lounge\_ph II



#### 4.12 [SS] F40 Sightseer Lounge\_ph III





#### 4.13 [SS] F40 Sleeper\_ph II



#### 4.14 [SS] F40 Sleeper\_ph III



#### 4.15 [SS] F40 Transition Sleeper II



#### 4.16 [SS] F40 Transition Sleeper III





#### 4.17 [SS] EMD GP9 D&RGW





#### 4.18 [SS] 100 Ton Wagon



#### 4.19 [SS] Caboose





#### 4.20 [SS] F40 Flat Car Pipe Load



#### 4.21 [SS] F40 Hopper 3-Bay





#### 4.22 [SS] Low Gondola



#### 4.23 [SS] Tank 16,000gal Silver



#### 4.24 [SS] Van Box Car Brown





## 5 Signalling

### 5.1 Signalling

The signalling along the Soldier Summit route is in accordance with the following practices.

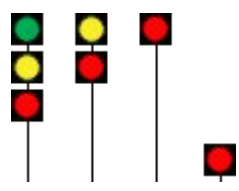
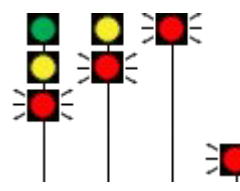
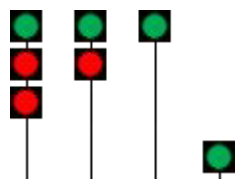
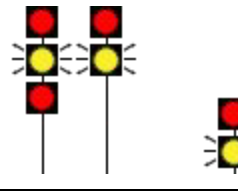
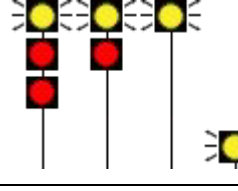
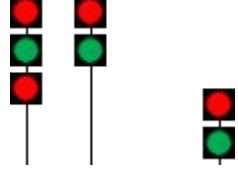
Signalling speeds are defined as follows:

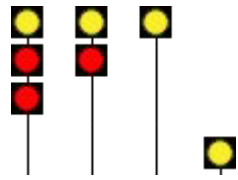
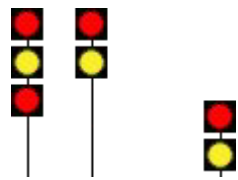
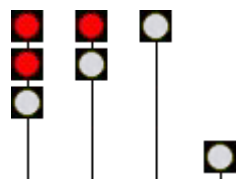
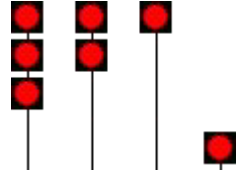
**Medium Speed:** A speed not exceeding 30mph.

**Restricted Speed:** A speed not exceeding 20mph.

**Reduced Speed:** A speed that will permit stopping short of any obstruction or another train.

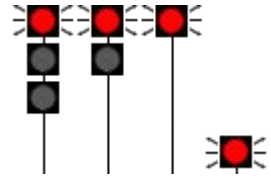
### 5.2 Multi-Aspect Colour Light Signals

	3 Heads 2 Heads Single Head Ground Signal		Signal aspect displaying a flashing light.
RULE	ASPECT	NAME	INDICATION
201		Clear	Proceed at line speed.
281-B		Diverging Approach Medium	Proceed at authorised speed through turnout or crossover, approaching the next signal at no faster than Medium Speed.
282		Approach Medium	Proceed at authorised speed not exceeding Medium Speed
283		Diverging Clear	Proceed at authorised speed through turnout or crossover.

RULE	ASPECT	NAME	INDICATION
285		Approach	Proceed, prepared to stop at the next signal. Trains exceeding Medium Speed must reduce to Medium Speed.
286		Diverging Approach	Proceed at Medium Speed through turnout or crossover, be prepared to stop at the next signal. Unless otherwise stated, if the route leaves a main track proceed at Reduced Speed, but not to exceed 30mph.
290		Restricting	Proceed at Restricted Speed to the next signal. If routed onto a non-signalled track proceed through turnout or crossover at authorised speed.
292		Stop	Danger. Do not pass the signal.

Repeater signals are used where a direct line of sight between the cab and a signal are not possible. On Soldier Summit, such a situation exists at Kyune Tunnel when travelling between Helper and Provo. The signals governing the entrance to the Kyune Loop are close to the tunnel exit, so not visible from the cab.

Repeater signals are marked with an R plate under their head. They are for information only so no need to stop at them. They will reflect the next signal's aspect, with the only notable exception being a stop aspect, which will show a single flashing red light.

ASPECT	INDICATION
	The following signal is indicating Stop. Proceed at Reduced Speed being prepared to stop.

## 6 Speed Signs

### 6.1 Speed Signs

Speeds over switches, crossovers and sidings are controlled by fixed signals, described in the previous section. At other locations between these points speed reductions and increases are denoted by wayside signs.

### 6.2 Permanent Speed Sign



Where the speed limit decrease, a sign showing the maximum speed will be placed 2,500 ft (762 m) ahead of the reduction.

Where the speed limit increases, a sign showing the maximum speed will be placed at the increase.

Passenger trains must proceed past this point no faster than the upper speed indicated.

All other trains must proceed past this point no faster than the lower speed indicated.

## 7 Scenarios

### 7.1 [F40PH] Eastbound Zephyr: Part 1

Take the engineer's seat in the California Zephyr between Provo and Helper. Part one will have you finishing at Gilluly having been held up by DRGW Train 178.

**Difficulty:** Easy  
**Duration:** 60 Minutes  
**Engine:** EMD F40PH

### 7.2 [F40PH] Eastbound Zephyr: Part 2

The second part of a two part passenger run from Provo to Helper. With the freight train pulling ahead, you're able to continue to Helper.

Once the freight train pulls away, you're clear to continue to Helper for your next passenger pickup.

**Difficulty:** Easy  
**Duration:** 50 Minutes  
**Engine:** EMD F40PH

### 7.3 [GP9] Provo Yard Duties

This winter's afternoon, you have been tasked with assembling a manifest train consisting of various freight for transport.

Hi Engineer. Follow your conductor's instructions to assemble a manifest train for transport.

**Difficulty:** Easy  
**Duration:** 40 Minutes  
**Engine:** EMD GP9

### 7.4 [GP9] Supply and Demand

Starting at Provo, you are tasked with assembling a short manifest train for delivery to nearby businesses.

Hi Engineer, you'll need to get a scrap metal consignment to the pipe works, and some powder to the local food factory. Assemble this manifest train and then proceed with the deliveries.

**Difficulty:** Medium  
**Duration:** 25 Minutes  
**Engine:** EMD GP9

### 7.5 [SD40T-2] Part 1 - Provo to Detour

Spare locomotives are thin on the ground today and there is no option other than taking this manifest train towards Helper with insufficient motive power.

Starting at Provo, a shortage of locos means you'll be taking this underpowered manifest train to Helper.

**Difficulty:** Medium  
**Duration:** 70 Minutes  
**Engine:** EMD SD40T-2



## 7.6 [SD40T-2] Part 2 - Detour to Helper

Restarting at Detour, the long climb to Summit is almost over. How will you fare on the descent to Helper? Only time will tell.

**Difficulty:** Very Hard  
**Duration:** 90 Minutes  
**Engine:** EMD SD40T-2

## 7.7 [SD40T-2] Price River Run

Starting at Helper Yard you're tasked with hauling a unit train of coal cars, bound for Provo yard, as far as Price River where you'll stop to uncouple your swing helpers at Summit.

**Difficulty:** Very Hard  
**Duration:** 65 Minutes  
**Engine:** EMD SD40T-2

## 8 Advanced Braking Quick Reference Guide

### 8.1 Getting Moving

- Move the Train Brake handle towards Release - it will latch around 17%
- Release the keyboard button
- Wait a second
- Move it towards release again and it will move towards 0% and release
- Observe ER moves to 90psi
- Observe BP rises towards 90psi
- Observe BC drops towards 0psi
- Once BC is at 0psi, brakes are released on the loco and will begin releasing down the length of the train
- Apply Run 1 throttle and wait for the train to begin to move, once it begins to move you can start to apply more power

### 8.2 Going Down Hill

- Move the Dynamic Brake handle to Setup
- Move the Train Brake towards Apply, it will latch at around 24% for Initial Application
- Observe the ER moves to 84psi (6lb application)
- Observe BP rapidly drops to 84psi to follow
- Observe BC rapidly applies and stabilises around XYZpsi
- Brakes are now on a minimum application at the loco, the rest of the brakes on the train should respond relatively rapidly
- Once approximately 10 seconds have elapsed after the Dynamic Brake handle was moved to Setup, begin moving it further towards Apply in order to achieve more braking
- If Dynamic Brakes are not holding the loco, gently move the Train Brake a small amount to apply some more air brake but note that beyond the initial application the brakes are much slower to respond and it will take time to get the extra braking effort along the length of the train

- If you find yourself slowing too much even without Dynamic Brakes then you should bring the train to a stop, then release the brakes. It will take some time for the brake pipe to recharge and if you try to release the brakes while moving you may be going too fast before you can re-apply the brakes.

- At the top of a steep incline, you may wish to set handbrakes on some wagons using the coupling view - this is equivalent to standard railroad practice of using retainer valves to maintain air brake pressure on some freight cars which would allow a minimum amount of braking even if you've released the main air brakes. Stop your train before applying hand brakes and then proceed.

- Above all, braking requires a lot of forward thinking and careful management. Remember, safety first - if in doubt, stop the train. If you need to stop the train and release the brakes while on a gradient in order to allow a full recharge of the brake pipe then set all the hand brakes first.

### 8.3 Stopping

- Move the Train Brake towards Apply, it will latch at around 24% for Initial Application

- Observe the ER moves to 84psi (6lb application)

- Observe BP rapidly drops to 84psi to follow

- Observe BC rapidly applies and stabilises around XYZpsi

- Brakes are now on a minimum application at the loco, the rest of the brakes on the train should respond fairly rapidly.

- If you need further application to come to a stop then continue to move the train brake towards Apply gently, remember that the more air you let out of the BP the longer it will take to get the BP recharged again once you get going.

### 8.4 PCS Light Illuminated

- Ensure the Throttle handle is in the Idle position

- Move the Train Brake into the Emergency position before moving it back into Release

### 8.5 FAQ

The train won't move when the brake cylinder says the brakes are off

Remember all the gauges on the front refer only to the state of the brakes on the locomotive, as you use the air brakes a pressure wave makes its way down the train and it can take sometimes minutes for the effect of your braking to take effect along the length of the train. Therefore, make small changes and wait for their effect. Forward thinking and small, careful changes are crucial in the safe operation of US freight trains.

The train won't slow down even though the BC is at 65psi!

You've most likely run out of air in the reservoirs down the train which can happen after a number of repeated applications and releases without allowing time for all the reservoirs to recharge.

There is no way to know what pressure the car reservoirs are holding so it is important to allow the train plenty of time after a brake release for everything to recharge, more so if the last application was a strong application since more air would have been used.

If you find yourself in this situation, move the Train Brake handle to its maximum application position, wait a second or two and then move it further to the Emergency position. This will make an emergency application of the brakes using a separate dedicated emergency reservoir and bring the train to a stop.

You should now set ALL handbrakes on the train so that it is pinned down safely and then you can release the Train Brake handle and let the brake system fully recharge, which may take 10-20 minutes on the hardest difficulty setting.

Once recharged you can make a minimum service application, release all the handbrakes and then continue on your journey.



## 9 Credits

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