SD40-2

OPERATOR'S MANUAL

SEARCHLIGHT SIMULATIONS

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3rd Edition

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SEARCHLIGHT SIMULATIONS JR

• • • • • • A SERVICE DEPARTMENT PUBLICATION • • • • • •

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NOTICE

The purpose of this manual is to act as a guide in the operation of the locomotive and its equipment. The information was compiled for a typical locomotive with basic equipment and frequently requested extras. The equipment selected for coverage was chosen as representative and not intended as an indication of availability or use on a particular unit or order.

Information contained in this manual is based on data available when released for printing.

Minor equipment differences are due to changes made after the manual was published. Later editions will cover these changes.

This manual has been prepared as a guide for railroad personnel engaged in the operation of the 3000 horsepower General Motors Model SD40-2 turbocharged diesel-electric locomotive.

Locomotive description and operating instructions are divided into three sections as follows:

1. General Information - Describes principal equipment components.

2. Locomotive Operation - Outlines procedures for locomotive operation.

To be of most benefit to the reader, these sections should be read in sequence.

MU (MultipleUnit) Setup

Our locomotives will **NOT** respond to throttle input from the lead locomotive if the lead locomotive is not provided by Searchlight Simulations/JointedRail. This is due to advanced scripting.

Missing Startup/Shutdown HUD elements

The default startup and shutdown simulation on our units has been upgraded with a fully scripted start/shutdown simulation, hence the missing “original” HUD elements.

See Section 2. General Information — Starting System — Engine startup for details.

Light Control

All Lights must be manually set on all units.

Pusher engines

Locomotives placed at the rear-end of your train will only respond to input from the lead locomotive if the rolling stock is supplied by Searchlight Simulations/JointedRail and with the isolation switch set in “RUN”, engine run and fuel pump switches in the “UP” position.

Regular freight cars do not have the ability to pass on custom consist messages. Locomotives placed at the rear of your train as pushers will not respond to input from the lead locomotive because default rolling stock lacks aforementioned feature.

Simple Controls, RailDriver, XBOX and other external Controllers

This locomotive will not properly work with simple controls, a RailDriver and Xbox or other external controllers. Optimal results are achieved with expert controls and mouse/keyboard input only.

Headlight Flares

Please make sure to have headlight flares enabled in your main train simulator settings tab in the main menu to see headlight flares in-game.

Headlight Light Cast

Our headlights are scripted to automatically cast light only during night and morning hours for better realism. During daylight, headlights will not visually cast a light on the ground however you still will see the headlight flares turn on.

Shadow Casting Lights

Our locomotives come equipped with toggable shadow casting vs none casting lights. For better peformance only the steplights come currently equipped with this feature. By default, shadow casting is turned off. It can however be toggled back on by pressing “Return” on your keyboard and vise versa.

Selecting locomotives in the editor

Double click the wheels/trucks or any road numbers in order to select the locomotive in the editor. Selecting the main engine body will not work.

Clean Cab Radio

To select a radio channel, press the TONE button. This will prompt you to enter a tone number. Select one of the DTMF numbers [0-9] to enter a tone number. Next up, press the CHAN button on the radio. This will blank out the transmitting (TX) and receiving (RX) channels and will prompt you to enter the first digit of the transmitting channel.

Press the channel number to enter it and it will prompt you to enter the second channel number for the transmitting channel.

Repeat the same process for the receiving channel.

NOTICE:

Press the CHAN button again to overwrite/reset your active TX and RX channels.

UP Radio Channel

Road 1 TX 27 RX 27
Road 2 TX 32 RX 32

Unmanned locomotives

None player driven/none player selected/controlled consists or single locomotives will automatically switch into the Ready-To-Run state.

In the Ready-To-Run state, the locomotive isolation switch will automatically be set to "RUN", the engine run and engine control/fuel pump switches (See, Cab Controls, Fig. 2-1.) will automatically switch in the "UP" position and the locomotive(s) will rev to normal idle speed as opposed to low idle and turn their headlights on dim.

This also applies to rear pusher or trailing locomotives even if they have been previously player driven or at least part of an active player driven consist.

Every time a rear pusher or trailing locomotive is disconnected from the player driven consist, the disconnected locomotive(s) will switch back into the Ready-To-Run state. A slight delay might occur before this happens.

A locomotive already set in the Ready-To-Run state can still be operated as usual when selected by the player. Prior to moving a locomotive in the Ready-To-Run state, make sure to center the reverser again in order to reset the idle speed and make sure to set the generator field switch (See, Cab Controls, Fig. 2-1.) in the "UP" position.

NOTICE

The Ready-To-Run state will not directly occur on a scenario start or scenario restart. An active timer of 5-7 seconds is in-place to allow the player to select his/her consist BEFORE any locomotives in said consist switch into the Ready-To-Run state.

This is in place for players who wish to set-up all of their active locomotives in their consist manually for the run ahead. If you don't feel like setting every locomotive up manually and just want to get going, wait until your consist switches in the Ready-To-Run state BEFORE selecting your consist.

Fiddling with cab controls when operating

Please do not try to fiddle with the engine run, generator field, engine control/fuel pump switches (See, Cab Controls, Fig. 2-1.), dynamic brake cut-out or engine isolation switch(See, Cab Controls, Fig. 2-2.) when the locomotive speed is greater than zero, throttle notch higher than idle and dynamic brake in setup or any higher setting.

Disregarding the aforementioned warning might result in unexpected behavior of the locomotive. We do not offer any assistance in scenarios exceeding normal locomotive operation.

SECTION 1

GENERAL DESCRIPTION

INTRODUCTION

The Electro-Motive Diesel Model SD40-2 diesel-electric locomotive, is equipped with a turbocharged 16 cylinder diesel engine which drives the main generator. Electrical power from the main alternator is distributed to the traction motors through the high voltage control cabinet. Each of the six traction motors is geared directly to a pair of driving wheels. The maximum rated traction motor speed and the gear ratio of the traction motor to the wheel axle determines the maximum operating speed of the locomotive.

The basic locomotive is arranged and equipped so that the cab end is considered the front or forward part of the unit. However, the locomotive operates equally well in either direction except for visibility when leading in a long-hood forward operation.

While each locomotive is an independent power source, several may be combined in multiple operation to increase load capacity. The operating controls on each unit are jumpered or "trainlined" to allow all the locomotives to be simultaneously controlled from the lead unit.

Model Designation SD40-2
Locomotive Type ..... (C-C) 0660
Locomotive Horsepower 3000
Diesel Engine
- Model 645E3
- Number Of Cylinders 16
- Type . . . . . Turbocharged
- N8 Speed . . . . . 904 RPM
- N7 Speed . . . . . 829 RPM
- N6 Speed . . . . . 726 RPM
- N5 Speed . . . . . 636 RPM
- N4 Speed . . . . . 570 RPM
- N3 Speed . . . . . 497 RPM
- N2 Speed . . . . . 388 RPM
- Idle/N1 Speed . . . . . 318 RPM
- Low Idle Speed . . . . . 255 RPM

Gear Ratio 62:15
Max Speed 70MPH
Trucks ..... Flexicoil C*, HT-C
- Configuration . . . . . C-C

Traction Motors
- Model D78
- Number 6

Air Compressor
- Model . . . . . .WBO

Air Brakes .....Type 26L
Wheel Slip Control .....Dash 2
Major Dimensions
- Height
  - To Top Cab . . . . . 15'-07.125"
- Cab Width . . . . . .10'-03.125"
- Length Over Coupler Pulling Faces . . . . . 68'-10"
- Approximate Weight On Rails . . . . . 368,000 lbs**.

Tractive Effort

- Starting . . . . . 115,000 lbs.
- Continous . . . . . 82,100 lbs@11mph.

Dynamic Braking Effort .....56.000 lbs.

Supplies

- Lube Oil System Capacity . . . . . 343 gal.
- Cooling System Capacity . . . . . 260 gal.
- Sand Capacity (Total) . . . . . 65 Cu. Ft.
- Fuel Capacity . . . . . 3200 gal***.

** Flexicoil Cs optioned by Conrail only. HT-Cs standard.*

*** Weight Dependent on Operator specifications. Weights varied from as little as 368klbs to as much as 425klbs.*

**** Fuel Capy Dependent on Operator specifications. Capacity varied from as little as 3200 gals, to 4000 gals.*

Throttle

Increase . . . . . **A**

Decrease . . . . . **D**

Reverser

Forward . . . . . **W**

Reverse . . . . . **S**

Automatic Brake

Increase . . . . . **'**

Decrease . . . . . **;**

Independent Brake

Increase . . . . . **]**

Decrease . . . . . **[**

Horn . . . . . **Space**

Bell . . . . . **B**

Headlights Front

Increase . . . . . **H**

Decrease . . . . . **Shift + H**

Headlights Rear

Increase . . . . . **Ctrl + H**

Decrease . . . . . **Shift + Ctrl + H**

Starting System

Shutdown . . . . . **Shift + L**

Startup . . . . . **Shift + K**

Isolation Switch (Toggle) . . . . . **I**

Cab Light (Engineer Side) (Toggle) . . . . . **L**

Sander (Toggle) . . . . . **X**

Engine Prime

Increase . . . . . (Button Down) **Shift + P**

Decrease . . . . . (Button Up) **Shift + P**

Shadow Casting (Toggle) . . . . . **Return**

Class Lights Front*

Increase . . . . . **Ctrl + C**

Decrease . . . . . **Shift + Ctrl +C**

Class Lights Rear*

Increase . . . . . **Ctrl + V**

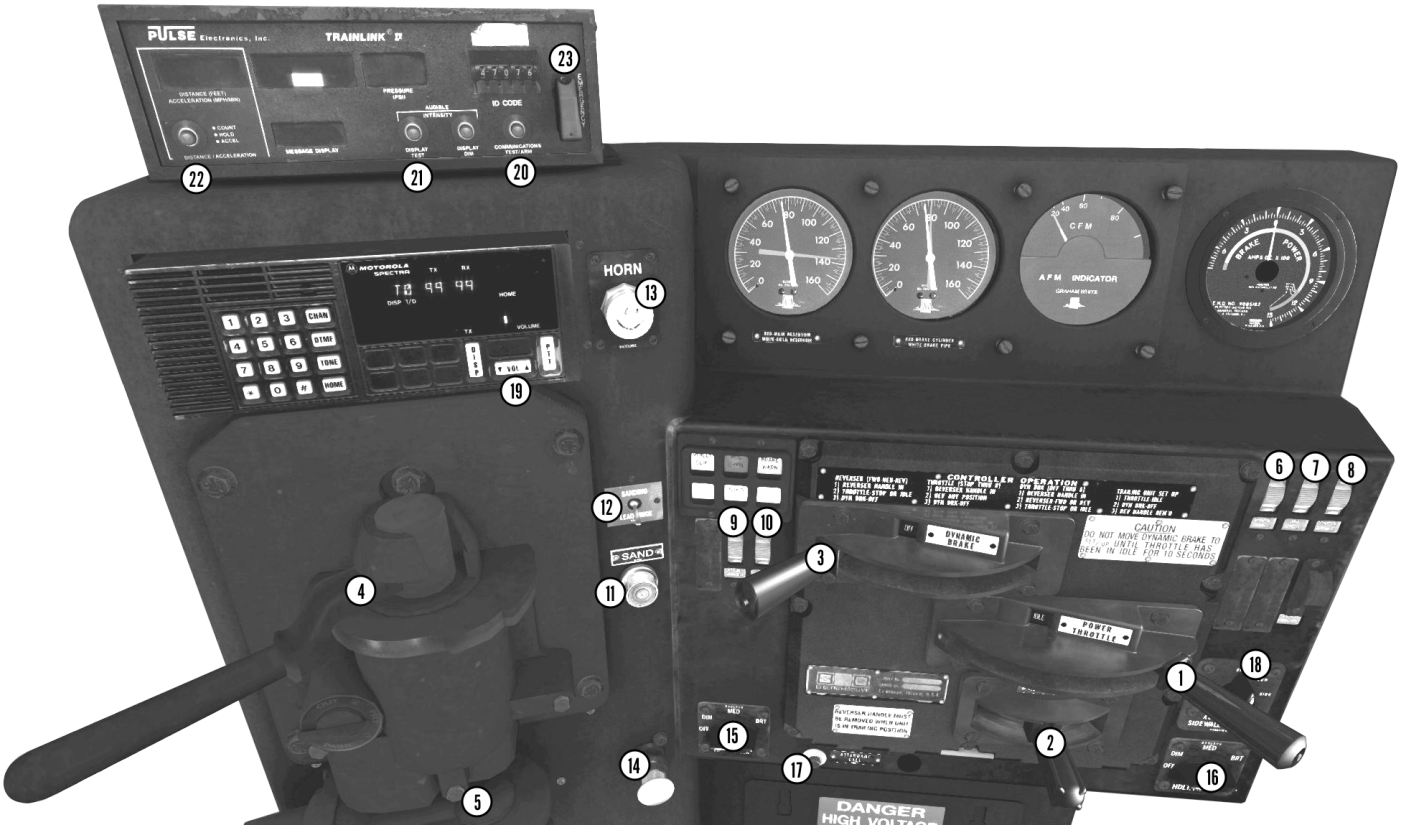
Decrease . . . . . **Shift + Ctrl + V**

*Switch must be in ON (up) position on the Engine Control panel on back wall.

Strobe (Toggle) ..... **Shift + S**

SECTION 2

ENGINE STARTING AND CAB CONTROLS



22179

1. Throttle Handle
2. Reverser Handle
3. Dynamic Brake Handle
4. 26-L Automatic Brake Valve
5. 26-L Independent Brake Valve
6. Engine Run Switch
7. Generator Field Switch
8. Control/Fuel Pump Switch
9. Ground & GA. Lights Switch
10. Steplights Switch
11. Sand Push Button
12. Lead Axle Sand Toggle Switch
13. Horn Valve
14. Bell Push Button
15. Rear Headlight Switch
16. Front Headlight Switch
17. Attendant Call Push Button
18. Aux Sidewall Heater Switch
19. Clean Cab Radio Volume Control
20. HOTD Comm Test/Arm Push Button
21. HOTD Display Test Push Button
22. HOTD Distance/Acceleration Push Button
23. HOTD EOT Emergency Switch

Fig. 2-1 - Typical Operators Control Stand

20058

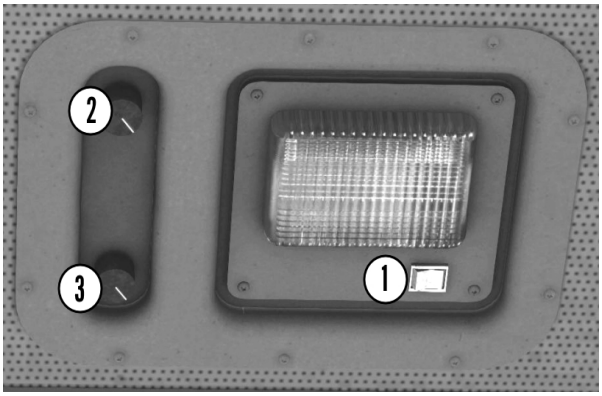
1. Dynamic Brake CutOut Switch
2. Front Numberboard Light Switch
3. Rear Numberboard Light Switch
4. Front Classlight MainSwitch
5. Rear Classlight Main Switch
6. Engine Compartment Light Switch
7. Platform Lights Switch
8. Engine Stop Push Button
9. Isolation Switch
10. Autostart Push Button
11. Auto Shutdown Delay Push Button
12. Autostart Indicator Light

Fig. 2-2 - Alternate Engine Control Panel

20048

1. Dynamic Brake CutOut Switch
2. Front Numberboard Light Switch
3. Rear Numberboard Light Switch
4. Front Classlight MainSwitch
5. Rear Classlight Main Switch
6. Engine Compartment Light Switch
7. Platform Lights Switch
8. Engine Stop Push Button
9. Isolation Switch

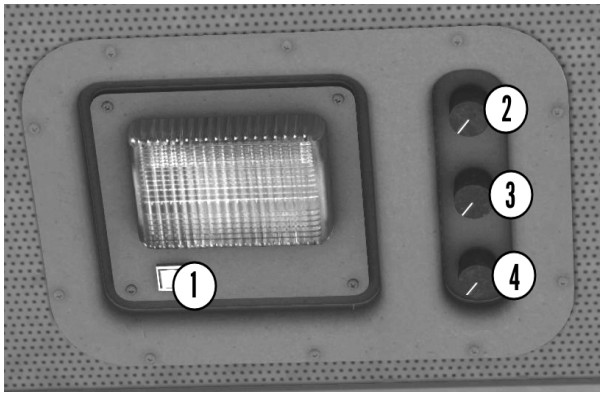
Fig. 2-3 - Typical Engine Control Panel



18020

1. Fireman Cablight Switch
2. Fireman Rear Window Wiper
3. Fireman Front Window Wiper

Fig. 2-4 - Fireman Wiper Control Panel



18021

1. Engineer Cablight Switch
2. Engineer Rear Window Wiper
3. Mid Front Window Wiper
4. Engineer Front Window Wiper

Fig. 2-5 - Engineer Wiper Control Panel

The Electro-Motive Diesel Model SD40-2 diesel-electric locomotive as represented by our version, is by default not equipped with AESS. Any start up or shutdown will have to be manually initiated.

Only the rebuild variants “N” or “R” are equipped with AESS.

NOTICE:

Manual Shutdown

The Engine can be manually shut down by pressing the Emergency Fuel Cut-Off Switch. See procedures below for further information.

Procedures

Automatic engine shutdown: Option 1

Press Shift+L to initiate a manual engine shutdown. A manual engine shutdown requires the following conditions to be TRUE.

1a. Reverser in CNTR, Throttle in IDLE, Independent Brake applied (minimum 15%), Unit Isolated (Isolation Switch set in ”START/STOP/ISO”).
1b. Engine Run Switch in the ON position, Generator Field Switch in the OFF position, Control/Fuel Pump Switch in the ON position.

Automatic engine shutdown: Option 2

Press and hold the Emergency Fuel Cut-Off Button (See, Cab Controls, Fig. 2-2.) for at least 5 seconds in order to manually shut the prime mover down. A manual engine shutdown requires the following conditions to be TRUE.

1a. Reverser in CNTR, Throttle in IDLE, Independent Brake applied (minimum 15%), Unit Isolated (Isolation Switch set in ”START/STOP/ISO”).
1b. Engine Run Switch in the ON position, Generator Field Switch in the OFF position, Control/Fuel Pump Switch in the ON position.

NOTICE:

Automatic Shutdown

Engines equipped with AESS (Auto Engine Start/Stop System) will automatically shut down to conserve fuel. The following conditions must exist for 10 minutes prior to an initial automatic engine shutdown and for subsequent shutdowns.

1. Reverser in CNTR
2. Throttle in IDLE
3. Independent Brake applied (minimum 11%)
4. Unit Isolated (Isolation switch set in ”START/STOP/ISO”).

If an automatic shutdown is about to occur, the Autostart Indicator Light (See, Cab Controls, Fig. 2-2.) will start flashing Red/Green and a warning bell will sound, notifying operating and maintenance personnel that an automatic engine shutdown is about to occur.

NOTE: If an automatic shutdown is already in progress, pressing the Auto Shutdown Delay push button (See, Cab Controls, Fig. 2-2.) will not cancel the auto shutdown.

The Autostart Indicator Light (See, Cab Controls, Fig. 2-2.) will change to solid Red once the locomotive is shut down and the Auxiliary Lube Pump Light will light up and stay illuminated for 30 minutes after an initial locomotive shutdown. From this point onward, an engine start can be initiated.

See **Automatic Engine Start** for details.

Manual Engine Start

A manual engine start requires you to prime the engine before attempting to start it if the locomotive is not equipped with AESS (Auto Engine Start/Stop System). With the engine fully shut down, press and hold Shift + P for at least 6 seconds. Once past 6+ seconds, release both Keys at the same time in order to stop priming the engine.

Next press Shift + K in order crank the engine. Release Shift + K once you hear the starting motor turn the engine.

NOTICE

An engine start requires the following conditions to be TRUE.

1. Reverser in CNTR
2. Throttle in IDLE
3. Independent Brake applied (minimum 11%)
4. Unit Isolated (Isolation switch set in ”START/STOP/ISO”).
5. Engine Run Switch in the UP position
6. Generator Field Switch in the DOWN position
7. Control/Fuel Pump Switch in the UP position

Failure to comply with the above conditions will result in the engine not starting up.

Automatic Engine Start

An automatic engine start can be initiated either by pressing the Autostart Push Button (See, Cab Controls, Fig. 2-2.) or by throwing the reverser either into **FWD** (Forward) or **RVS** (Reverse).

Doing the latter will sound a warning bell for a split second before an automatic start is initiated by the AESS (Auto Engine Start/Stop System).

If an automatic start is about to occur, the Autostart Indicator Light (See, Cab Controls, Fig. 2-2.) will start flashing Red/Green and a warning bell will sound, notifying operating and maintenance personnel that an automatic engine start is about to occur.

The Autostart Indicator Light (See, Cab Controls, Fig. 2-2.) will change to solid Green once the locomotive is running. From this point onward, an engine shutdown can be initiated.

The SD40-2 diesel-electric locomotive comes with a fully scripted temperature and cooling simulation. Depending on the load on the engine, the temperature will increase at a rate of 19F±/min @1500 amps or maximum load. All Fans are individually controlled and will come on/off at certain temperatures to start working against the temperature increase and cool the engine down.

Cooling Fan Figures

	Temp	Speed
"Fan01"	179F±	0%
	180F±	100%

Fig. 2-7 - Cooling Fan 01 Temperature Curve 17042

	Temp	Speed
"Fan02"	189F±	0%
	190F±	100%

Fig. 2-8 - Cooling Fan 02 Temperature Curve 17043

	Temp	Speed
"Fan03"	199F±	0%
	200F±	100%

Fig. 2-8 - Cooling Fan 03 Temperature Curve 17044

The Fans are directly linked to the engine RPM and auxiliary alternator and will spin at a higher rate when the engine is turning at full speed. The Fan Control relays will select randomly to keep bearings from spalling.

The Dynamic Brake Cooling Fans are directly linked to the braking current and will always spin at a double rate of the current braking current on the braking resistor grids.

Maximum Dynamic Brake Cooling Fan Speed:

1400RPM at maximum 700 amperes braking current.

NOTICE:

All fans carry rotational inertia so they will come to a stop over time once they cycle off.

By default, (If not already in the “Ready-To-Run” state), all locomotives in your consist will start off in a "Tied Down" state, meaning that they have been placed in "Isolate" and will not respond to input from the lead locomotive. In order for any trailing units to receive data from the lead locomotive, you have to jump cabs and set the isolation switch, engine run switch and engine control/fuel pump switch in those units respectively. See SECTION 1 — Key Bindings for proper information.

SECTION 3

LOCOMOTIVE OPERATION

CONTROLLER INTERLOCKS

The reverser handle is the lowest handle on the controller panel. It has three detent positions; left, centered, and right. When the handle is moved to the right toward the short hood end of the unit, circuits are set up for the locomotive to move in that direction. When the handle is moved to the left toward the long hood end, the locomotive will move in that direction when power is applied. With the reverser handle centered, mechanical interlocking prevents movement of the dynamic brake handle, but the throttle handle can be moved to increase engine speed. In such case, power will not be applied to the traction motors.

The handles on the controller are interlocked so that:

1 . With the reverser handle in neutral (centered) -
   a. Dynamic brake handle can not be moved out of OFF position.
   b. Throttle can be moved to any position.
   c. Reverser handle can be removed from controller if throttle is in IDLE position.

2. Reverser handle in forward or reverse -
   a. Throttle can be moved to any position if dynamic brake handle is in OFF position.
   b. Dynamic brake handle can be moved to any position if throttle is in IDLE position.

3 . Reverser handle removed from controller -
   a. Throttle locked in IDLE position.
   b. Dynamic brake handle locked in OFF position.

4. Throttle in IDLE position -
   a. Dynamic brake handle can be moved to any position if reverser is in forward or reverse position.
   b. Reverser handle can be placed in neutral, forward, or reverse position if dynamic brake handle is in OFF position.

5. Throttle above IDLE position -
   a. Dynamic brake handle can not be moved.
   b. Reverser handle can not be moved.

6. Dynamic brake handle in OFF position -
   a. Throttle can be moved to any position.
   b. Reverser handle can be moved to any position if throttle is in IDLE position.

7. Dynamic brake handle moved out of OFF position -
   a. Throttle can not be moved out of IDLE position into power positions, but can be moved into STOP position.
   b. Reverser handle can not be moved out of forward or reverse into OFF position.

STARTING A TRAIN

The method to be used in starting a train depends upon many factors such as, the type of locomotive being used; the type, weight and length of the train and amount of slack in the train; as well as the weather, grade and track conditions. Since all of these factors are variable, specific train starting instructions cannot be provided and it will therefore be up to the operator to use good judgment in properly applying the power to suit requirements. There are, however, certain general considerations that should be observed. They are discussed in the following paragraphs.

A basic characteristic of the diesel locomotive is its HIGH STARTING TRACTIVE EFFORT, which makes it imperative that the air brakes be completely released before any attempt is made to start a train. On an average 100 car freight train having uniformly distributed leakage, it may take 10 minutes or more to completely release the brakes after a reduction has been made. It is therefore important that sufficient time be allowed after stopping, or otherwise applying brakes, to allow them to be fully released before attempting to start the train.

The locomotive possesses sufficiently high tractive effort to enable it to start most trains without taking slack. The practice of taking slack indiscriminately should thus be avoided. There will, however, be instances in which it is advisable (and sometimes necessary) to take slack in starting a train. Care should be taken in such cases to prevent excessive locomotive acceleration which will cause undue shock to draft gear and couplers, and lading.

Proper throttle handling is important when starting trains, since it has a direct bearing on the power being developed. As the throttle is advanced, a power increase occurs almost immediately, and power applied is at a value dependent upon throttle position. It is therefore advisable to advance the throttle one notch at a time when starting a train. A train should be started in as low a throttle position as possible, thus keeping the speed of the locomotive at a minimum until all slack has been removed and the train completely stretched. Sometimes it is advisable to reduce the throttle a notch or two at the moment the locomotive begins to move in order to prevent stretching slack too quickly or to avoid slipping. When ready to start, the following general procedure is recommended:

I .Move the reverser handle to the desired direction, either forward or reverse.

2 . Place engine run and generator field switches in the ON (up) position.

3 . Release both automatic and independent air brakes.

4. Open the throttle one notch every few seconds as follows :

a. To No. 1 - The engine will quickly load, but the loading will stop at a specific low value. This may be noted on the load indicating meter. At an easy starting place the locomotive may start the train.

NOTE: The design of the locomotive power control system makes it generally unnecessary to apply locomotive independent brakes or to manipulate the throttle between No. 1 and Idle during starting.

b. To No. 2, 3, or higher (experience and the demands of the schedule will determine this) until the locomotive moves.

5 . Reduce throttle one or more notches if acceleration is too rapid.

6. After the train is stretched, advance throttle as desired.

NOTE: When operating at full throttle to climb a hill or to accelerate, the wheel slip control system reacts so rapidly to correct minor slips by means of power reduction and sanding that the wheel slip light seldom comes on to indicate severe slips. This wheel slip corrective action is often seen at the load current indicating meter as a steady reduction of load current below that which is normally expected at full throttle for a given speed. Do not misinterpret this power reduction as a fault. It is merely the wheel slip control system doing its job and maintaining power at a level within the adhesion conditions established by track and grade.

ACCELERATING A TRAIN

After the train has been started, the throttle can be advanced as rapidly as desired to accelerate the train. The speed with which the throttle is advanced depends upon demands of the schedule and the type of locomotive and train involved. In general, however, advancing the throttle one notch at a time is desired to prevent slipping. The load indicating meter provides the best guide for throttle handling when accelerating a train. By observing this meter it will be noted that the pointer moves toward the right (increased amperage) as the throttle is advanced. As soon as the increased power is absorbed, the meter pointer begins moving toward the left. At that time, the throttle may again be advanced. Thus for maximum acceleration without slipping, the throttle should be advanced one notch each time the meter pointer begins moving toward the left until full power is reached in throttle position 8.

WHEEL SLIP CORRECTION

Instantaneous reduction of locomotive power together with automatic sanding functions to correct wheel slip. After adhesion is regained, a timed application of sand continues while power is smoothly restored. The system functions entirely automatically, and no action is required by the locomotive operator. Depending upon the seriousness of the slipping condition, the wheel slip light may or may not flash on and off as the wheel slip control system functions to correct the slips. However, the wheel slip control system reacts so rapidly to correct minor slips that the wheel slip light seldom comes on to indicate severe slips. The wheel corrective action is often seen at the load current indicating meter as a steady reduction of load current below that which is normally expected at full throttle for a given speed. Do not misinterpret this power reduction as a fault. It is simply the wheel slip control system doing its job and maintaining power at a level within the adhesion conditions established by track and grade.

NOTE: Whenever possible, operation on grades should be at full throttle position. Throttle reduction during wheel slip is recommended only when:

1. Repeated wheel slip conditions cause severe lurching that may pull a train apart. (Such severe conditions may indicate the need for a helper or the need to take the train up the hill in two parts.)
2. In unusual conditions, simultaneous wheel slips may be incurred at low or stall speed. In this situation the performance of the equipment is directly related to the skill and judgment of the operator. Therefore, the operator must determine to apply sand to the rail and/or reduce throttle.

DYNAMIC BRAKING

Dynamic braking, on locomotives so equipped, can prove extremely valuable in retarding train speed in many phases of locomotive operation. It is particularly valuable while descending grades, thus reducing the necessity for using air brakes. Depending on locomotive gear ratio, the maximum braking strength is obtained between 19 and 23 MPH. At train speeds higher than the optimum, braking effectiveness gradually declines as speed increases . For this reason, it is important that dynamic braking be started BEFORE train speed becomes excessive. While in dynamic braking, the speed of the train should not be allowed to "creep" up by careless handling of the brake.

To operate dynamic brakes, proceed as follows:

1. The reverser handle must be positioned in the direction of the locomotive movement.

2. Return throttle to Idle and hold it in Idle for 10 seconds before proceeding.

WARNING: The 10 second delay must be accomplished before the braking handle is moved into SET UP position. Braking delay occurs automatically. Do not misinterpret the delay as failure of the dynamic braking system. It is possible for a sudden surge of braking effort to occur if the dynamic braking handle is open when the automatic delay times out.

3. Move the braking handle into SET UP position. This establishes the dynamic braking circuits. It will also be noted that a slight amount of braking effort occurs, as evidenced by the load current indicating meter.

4. After the slack is bunched, the dynamic braking handle is moved to control dynamic braking strength. As it is advanced out of SET UP, it will be noted that the engine speed automatically increases.

5. Braking effort may be increased by slowly advancing the handle to FULL 8 position if desired. Maximum braking current, limited to 700 amperes, can occur over a wide range of braking handle positions. This range allows braking effort to increase as train speed increases. The tendency is to hold train speed relatively constant for a given braking handle position when conditions result in less than the maximum allowable current.

LEAVING LOCOMOTIVE UNATTENDED

If at any time it is necessary to leave the locomotive unattended while the engine is running, the following procedure should be adhered to.

1. Observe all railroad safety precautions.
2. Place engine run and generator field switches in the off (down) position.
3. Place throttle in IDLE and dynamic brake handle in OFF position.

TRACTION TRANSITION SIMULATION

The Jointed Rail EMD SD40-2 brings the first North American locomotive to properly simulate transition on EMD locomotives with more than 4 Axles. This means that throughout the operational power band of the locomotive, the transition relays will automatically change between Series and Parallel. What this means is the locomotive “shifts gears” in a sense to get the most power out of the 6 D78 motors possible.

Electrical motors experience a weakening of motor winding fields as their rotational speeds increase, this is called Back Electromotive Flow. Back-EMF for short. This causes the voltage from the Main Alternator, which has limits before overheating after a period of time.

To overcome this, it is necessary to change how the traction motors are connected to reduce the amount of voltage demand on the MA as you gain speed. This could have been done by keeping the motors permanently connected in parallel, but then current draw would be far too much per-motor, and a locomotive wouldn't be able to start a train due to the weakened fields of the motors.

A transition will occur if the following conditions are TRUE.

1a. Locomotive speed exceeds 24 MPH (Miles Per Hour).
1b. Throttle is in notch 5 or any higher notch of throttle.
1c. No dragging brakes are applied.

NOTICE:

If a transition has occurred and the locomotive speed drops again below 24 MPH (Miles Per Hour), the locomotive will transition back from parallel to series with the throttle in notch 5 or any higher notch.

ADVANCED EXHAUST EFFECTS

The exhaust effects on the JointedRail EMD SD40-2 are fully scripted. Depending on the several external factors such as season, engine load, engine speed, engine temperature, and random built up oil residue, you'll experience different types of exhaust effects on every journey. One thing you can observe for instance is white smoke during autumn and winter. The locomotive will start up in a “cold” state, meaning the engine block is not yet warmed up to optimal operating temperatures. As the engine temperature rises, the exhaust color changes dynamically. Every locomotive in your consist will be different. Some might produce thicker and more noticable smoke than others.

ADVANCED BRAKES

The JointedRail EMD SD40-2 is equipped with an advanced braking simulation that takes in account a number of critical variables that affect air brake performance. The effective ability for braking is impacted by things such as ambient temperature, train length, brake valve type, and brake pipe leakage. The colder the ambient temperature, the higher the leakage your train will experience due to material shrinkage reducing the effective seals between rail cars. The longer the train you have, the longer it will take to charge the brake pipe and auxiliary reservoirs, and depending on the age of the cars, they may be equipped with more efficient brake valves that propagate changes in brake pipe pressure faster and are more resilient to leaks.

Operating the brake, you will find that the control valve is selected in the freight mode only. This means that the brake will only release when the handle is fully in the release position. When you, the operator, make a reduction to increase braking effort, you are controlling the Equalizing Reservoir's pressure, the reduction in pressure will make the control valve move to a position in which the brake pipe pressure is reduced at a service rate in order to reach equilibrium with the EQ Res. Every control valve on locomotive or freight cars will roughly equate 1 psi in BP pressure decrease to a 2.5 psi brake cylinder pressure increase. Example: 10 lb brake pipe reduction will equal 25 lbs increase in the brake cylinder at each local control valve. Equilibrium between the brake pipe volume and brake cylinder volume will occur at around 64.7 psi, thusly you will not experience any greater brake force reducing your brake pipe pressure past this. Actuating your independent brake will reduce the brake cylinder pressure by 20 lbs.

NOTE: The independent brake is springed and will (if actuated) automatically return into it's default position once you let loose of the handle.

In the event of an emergency, there is a fail safe mechanic in every control valve that will detect a rapid reduction in BP pressure and immediately push all of the air in the emergency reservoir into the brake cylinders, while also locally venting brake pipe pressure at each car in order to propagate the change in brake pressure faster throughout the train. This is called an Emergency Application, and can be triggered in the game by moving your automatic brake handle fully to the right, throwing the EOTD emergency brake application switch on the HOTD (Head Of Train Device) or by disconnecting cars from your train at speeds greater than 1MPH. An emergency brake application will require a full PCS reset.

ADVANCED BRAKES

EMERGENCY BRAKE APPLICATION PCS RESET

An emergency brake application will cut power, reduce the engine speed to Idle and illuminate the PCS OPEN indicator light on the control stand.
The PCS (Pneumatic Control Switch) can be reset if the following conditions are TRUE.

1. Reverser in CNTR
2. Throttle in IDLE
3. Locomotive speed zero

To reset the PCS, move the train brake handle all the way to the right into the emergency position. With the train handle in the emergency position, the PCS will reset automatically after 60 seconds and the PCS OPEN indicator light will extinguish and the brakes will begin to release.

NOTE: Do not attempt to move the train brake handle away from the emergency position if the PCS Reset Timer is active. Doing so will reset the 60 second PCS Reset Timer and will require you to repeat the above described process once again.

HEAD OF TRAIN DEVICE/DISTANCE COUNTER

19004

Fig. 3-1 - HOTD DEVICE (NOT ARMED)

By default, the HOTD or (Head Of Train Device) will be unarmed. If an EOTD (End Of Train Device) is coupled up to your train, you may press the Communications Test/Arm push button to arm the HOTD.

The HOTD will now be armed and show a pressure reading from the rear of your train. Notice the Emergency Capability status light come on (EMERG ENABLED). If the locomotive speed is 1MPH or greater, you may initiate an Emergency Brake Application by flipping the Emergency Switch on the HOTD and throwing the rear of your train into emergency. Uncoupling cars with the locomotive speed 1MPH or greater will result in a automatic Emergency Brake Application and will require a full PCS reset.

NOTE: Your consist must be entirely made up of JointedRail/Searchlight Simulations rolling stock in order for the HOTD to show a rear pressure reading. Regular rolling stock does not have the ability to pass on consist messaging which is essential for this feature to operate and work as intended.

The JointedRail/Searchlight Simulations EOTD (End Of Train Device) is available on the Searchlight Simulations Store for free download as well as all rolling stock.

HEAD OF TRAIN DEVICE/DISTANCE COUNTER

19005

Fig. 3-2 - HOTD DEVICE (ARMED)

The HVM (High Visibility Marker) will come ON/OFF depending on the time of day. During daylight operation, the HVM will remain off on the EOTD (If connected) and the HVM OFF indicator will show on the HOTD.

The STP (STOP) and MOV (MOVE) status lights indicate whether the EOTD is moving or not. The status light will not change from STP to MOV until the EOTD senses a movement. Depending on the length of your train, it may take a few seconds before the light changes on the HOTD display.

The displayed Brake Pipe Pressure readout on the pressure display is the actual pressure at the rear of the train. The propagation of the air pressure wave is simulated so that the pressure readout changes a short time after the actual pressure readings on the air gauges on the control stand. The time delay for the rear pressure change depends on the length of the train, considering a average propagation speed of 200 ft/s (FEET PER SECOND). Due to leaks, the propagation speed will vary depending on the season.

DISTANCE COUNTER/ACCELEROMETER

By default the HOTD will display the current acceleration (MPH PER MINUTE) of the train. Pressing the Distance/Acceleration button on the HOTD will bring the distance counter. The counter will count up from 0 and display the measured distance in Feet.

With the counter actively counting, pressing the Distance/Acceleration button once again will stop the counter and the measured distance will remain displayed on the HOTD until the Distance/Acceleration button is pressed once again. This will erase the previously measured distance and bring the accelerometer back up.

19006

Fig. 3-1 - HOTD DEVICE (DISPLAY TEST)

DISPLAY TEST

Pressing the Display Test button on the HOTD will test the display for the duration the button is pressed. A display test can be performed at any given time.

AIR POWERED WINDSHIELD WIPERS

The windshield wipers are fully scripted and operate all individually. The speed at which each wiper clears the rain depends on the setting of the respective needle valve. The higher the setting, the faster does the wiper clear the rain.

NOTE: A Wiper can NOT be moved manually when the respective needle valve is open and the wiper is being powered by air.

TROUBLESHOOTING

Locomotive won't rev up from a stop:

Check that you have the Engine Run, and Control/Fuel Pump Switches in the UP position and that the locomotive isolation switch is in RUN.

Locomotive won't load but engine revs:

Check that the Generator Field switch is in the UP position.

Locomotive revs seem erratic:

Check your sensitivity settings on the main menu and ensure the sensitivity is no greater or lesser than 50%.

Locomotive doesn't rev immediately on throttle position change:

Try jiggling the throttle to get it to settle in a notch position. Seriously. This actually happens in real life as the roller switches in the control stand wear out.

AFTERWORD

Thank you for purchasing the SD40-2 Locomotive Pack brought to you by Jointed Rail and Searchlight Simulations. We hope that you enjoy this pack, as we are quite excited to finally bring over some good quality content to Train Simulator that has been sorely lacking for the last 10 years.

Stay tuned for future content! Find us on Facebook at facebook/@SearchlightSimulations

Or check out our dedicated forum page on Railworks America!
http://railworksamerica.com/forum/viewforum.php?f=77

NOTICE:

All product related support inquiries are handled solely by Searchlight Simulations. Please do not try to contact the JointedRail support with product related support inquiries specific to any product published by Searchlight Simulations.

For proper support inquiries related to this product and or others, please use our support form on the our website or directly contact us at support@searchlight-simulations.com .

Based on an actual EMD SD40-2 manual, circa 1968.
ABTH Guideline, BNSF ABTH Rulebook.

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SEARCHLIGHT SIMULATIONS JR

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