

SD40-2

OPERATOR'S MANUAL



OPERATING MANUAL

SD40-2 DIESEL-ELECTRIC LOCOMOTIVES

**FOR BNSF ROAD NUMBERS:
6773 – 8029**

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Based on an actual SD40-2 operating and service manuals.

These instructions do not purport to cover all details or variations in equipment represented in-game nor to provide for every possible contingency to be met in connection with operation. Should further information be desired or should particular problems arise which are not covered sufficiently for the user's purposes, the matter should be referred to Searchlight Simulations.

This document may not be reproduced.

THIS OPERATING MANUAL IS INTENDED FOR THE USE IN TRAIN SIMULATOR ONLY. SPECIFIC PORTIONS OF THE ORIGINAL MANUAL HAVE BEEN INTENTIONALLY LEFT OUT. DO NOT ATTEMPT TO USE FOR REAL-LIFE TRAINING.

■ Revisions are indicated by margin bars.



FOREWORD

This Operating Manual is arranged in sections: INTRODUCTION, OPERATING CONTROLS, OTHER EQUIPMENT, ALARMS, OPERATING PROCEDURES, OPERATION, ADVANCED FEATURES AND USER CONFIGURATION.

The INTRODUCTION Section describes the first steps when entering a new scenario and gives a general overview of the Locomotive, including general locomotive data and required keybindings.

The OPERATING CONTROLS Section continues this overview by identifying the associated hardware located in the operating cab.

The OTHER EQUIPMENT Section explain the basic steps on setting up the radio equipment and Head Of Train Device on-board.

The ALARMS Section lists, describes, and illustrates the various Alarms, Safeguards an operator may encounter.

The OPERATING PROCEDURES Section gives step-by-step instructions for locomotive operation as well as listing various functions available for use. The OPERATING PROCEDURES Section will guide the Operating Crew in operation of this locomotive.

The OPERATION Section explain the basic use of the dynamic brakes and use of the air brakes during dynamic braking.

The ADVANCED FEATURES Section gives insights on certain features found on this product.

The USER CONFIGURATION Section describes how configurable this product is and how the end user can configure it.

While it may not be entirely necessary to know all of the locomotive's functions running in the background, reading about them in the manual might save you the hard climb if you know what signs to look out for. We STRONGLY advice to carefully read through this Operating Manual before attempting to use this product.



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PRODUCT ACTIVATION / INSTALLATION

IMPORTANT INFORMATION

THIS PRODUCT REQUIRES AN ACTIVE INTERNET CONNECTION DURING FIRST RUN-TIME TO PERFORM A PRODUCT LICENSE CHECK. CONTINUOUS INTERNET ACCESS IS NOT REQUIRED.



64
bit

THIS PRODUCT WILL ONLY RUN ON TRAIN SIMULATOR 64-BIT EDITION. TRAIN SIMULATOR 32-BIT EDITION IS NOT SUPPORTED.

PRODUCT ACTIVATION

NOTE: YOU WILL UPON PURCHASE RECEIVE A SEPARATE EMAIL LABELLED "SEARCHLIGHT SIMULATIONS PRODUCT ACTIVATION" . ALL FURTHER STEPS ON HOW TO ACTIVATE THE PRODUCT ARE EXPLAINED WITHIN THAT EMAIL. CHECK ALL YOUR INBOX/SPAM FOLDERS IF YOU CAN'T SEEM TO FIND THE ACTIVATION EMAIL ON FIRST SIGHT. MAKE A BACKUP OF THE PRODUCT ACTIVATION EMAIL AND KEEP IT SOMEWHERE SAFE, DO NOT DELETE IT OR YOU WON'T BE ABLE TO RE-ACTIVATE YOUR PRODUCT. YOUR PRODUCT LICENSE IS VALID FOR TWO UNIQUE ACTIVATIONS. A THIRD ATTEMPT WILL DISABLE YOUR PRODUCT KEY.

PRODUCT INSTALLATION

This product is delivered in a packaged, ready-to-install archive (.ZIP file extension). In order to access the executable auto installer inside the archive, you will require a free or commercial copy of either WinRAR or 7ZIP, available from the links below.

- www.7-zip.org
- www.win-rar.com

Inside the archive you'll find a executable auto installer for the product. Double click the installer to run it and follow the steps to install your product.

NOTE: Make sure to adjust the default installation path on the installer to match your default Railworks install location if needed, otherwise the product won't show up in-game. Should you be unsure of your default Railworks install location, run a windows search for "Railworks" on your system. This will point you to the correct install location.



LIMITATIONS OF CORE SOFTWARE

AUDIO

Our SD40 simulation requires a lot of game resources to deliver the all-around experience and in such it will consume most of the 256 available sound slots the game is capable to run simultaneously. This means that often you will “run” out of available sound slots and thus no longer hear certain sounds. This can occur when switching from the in-cab view to any of the external cameras. Since we require more external than internal sounds, you will run out of external sounds with too many locomotives running in your consist or with heavy AI traffic. Even though you won't always run out of sound slots in-game, it is a common occurrence from time to time.

In order to “reset” the sound slots, simply switch back into the cab view.

NOTE: TRAIL AND AI Engines run on a minimum number of sounds to help improve performance. If you notice a TRAIL or AI Engine without sound, it is most likely due to all available sound slots already used up.

ANIMATION SPEED

Animations are unfortunately bound to in-game performance (fps). If you experience slow animations (wipers for instance), it's due to your low in-game performance.

3rd PARTY DLC COMPATIBILITY

Unfortunately due to limitations we can not offer compatibility to 3rd party locomotive DLCs. Our locomotives are only compatible among each other, locomotives released in cooperation with Jointed Rail, our enhancement packs and default locomotives.

CONTROL INTERLOCKS

The **Engine Run**, **Generator Field** and **Engine Control/Fuel Pump** switches on the control stand are locked with the locomotive Reverser in either the FWD (Forward) or RVS (Reverse) position.



GETTING STARTED

ENGINE INITIALIZATION

Upon scenario start you will notice a small alert message window come up in the top right hand corner of the screen. The message window display "INITIALIZATION IN PROGRESS..." and will stay visible for about five seconds. During the initialization time, the core locomotive systems are automatically set-up and the locomotive functions are inaccessible by the player.

NOTE: *The player may select the locomotive at any given time during scenario run-time. The initialization process will run only once the locomotive has been actively selected by the player in-game, provided a "driver" has previously been attached to it.*

NOTE: *During initialization, all available control surfaces within the operator cab will automatically be reset to their respective position. DO NOT ATTEMPT TO MOVE ANY CONTROL SURFACES DURING INITIALIZATION.*

NOTE: *In-game engine Initialization may fail for the following reasons.*

- *Missing serial*
- *Serial verification failed*
- *Serial activation failed*
- *Key verification failed*
- *TS running in 32-Bit*

LOCOMOTIVE DESIGNATION WITHIN THE EDITOR

Within the editor, there's five specific locomotive types available to place within a player controlled or AI consist. They can be identified as followed:

1. *[Lead] – Place this engine as the leader of the player controlled consist.*
2. *[Trail] – Place this engine as the trailing unit of the player controlled consist. You can place as many trailing locomotives in your consist as you wish, mid-train or at the rear.*
3. *[AI Lead] – Place this engine as the leader of none player controlled consists ONLY. This engine can not be driven by the player.*
4. *[AI Trail] – Place this engine as the trailing unit of none player controlled consists ONLY. Position of placement of this engine within none player controlled consists does not matter. This engine can not be driven by the player.*

NOTE: *Only the player controlled [Lead] unit has to be set-up for operation. Trailing locomotives come pre-configured, ready to run.*

TRAILING LOCOMOTIVES

NOTE: *Trailing locomotives do not have cab sounds. This was done to cut down on active sounds playing and more game resources available for the player controlled [Lead] locomotive.*



GETTING STARTED

AI CONTROLLED LOCOMOTIVES

None player controlled locomotives feature our in-house AIX simulation. In short this means that AI locomotives will dynamically throttle up and down, produce accurate sounds and light effects based on their acceleration. This was done to add more life to AI traffic and to ensure that AI controlled locomotives respond more natural to movement and speed. You will notice how headlights come on and off on AI controlled engines as they accelerate or come to a stop along with dynamic throttle changes which add to a better and overall more realistic running experience.

NOTE: *Headlight light casting on AI locomotives will come on/off automatically based on the season and time.*

Winter: 0600 - 1800 = OFF

Spring: 0530 - 1830 = OFF

Summer: 0515 - 2030 = OFF

Autumn: 0530 - 1900 = OFF

MU (MULTIPLE UNIT) REQUIREMENTS

Locomotives placed at the mid or rear of your train will respond to input from the lead locomotive provided the Isolation switch in the respective unit is set in “RUN”, the Engine Run and Control/Fuel Pump switches are in the “UP” position. This will however require rolling stock that's set up to forward consist messages. Since most default rolling stock does not come equipped with consist messaging, we highly suggest you only use rolling stock provided by either Searchlight Simulations or Jointed Rail.

NOTE: *Rolling stock equipped with consist messaging can be downloaded for free on our store.*

SIMPLE CONTROLS AND EXTERNAL 3rd PARTY CONTROLLERS

This locomotive will not properly work with simple controls, or other external controllers such as Xbox or Playstation. Nevertheless, external controllers can be used in conjunction with this locomotive, however note that optimal results are achieved with expert controls and mouse/keyboard input only.

LOCOMOTIVE IN-GAME NOISE LEVELS

We've scripted our audio in a way to automatically lower overall external engine noise levels based on the total locomotive count in your consist. That way we can maintain healthy and balanced audio levels for accessory audio such as horn/bell, radiator/dynamic brake fans etc.. Internal noise levels will remain the same, no matter the locomotive count in your consist.

EQUIPMENT DEFECT DETECTOR COMPATIBILITY

The locomotives provided with this pack come equipped with our in-house Equipment Defect Detector capability.

NOTE: *Our Equipment Defect Detectors can be downloaded for free on our store.*



GETTING STARTED

TRAIN SIMULATOR GRAPHICS SETTINGS

DYNAMIC LIGHTING

This product does not specifically require dynamic lighting to be enabled, however for the visual, aesthetic value of the product we highly suggest you running it only with dynamic lighting enabled.

HEADLIGHT FLARES

This product requires headlight flares to be enabled in your main Train Simulator settings tab.

NOTE: Without headlight flares enabled in your Train Simulator settings tab, the headlights flares will not be visible and the headlights will not cast any light on the ground.

LIGHT CONTROL

TRAILING UNITS

Lights on player controlled trailing units have to be manually changed.

DAY VS NIGHT LIGHTING

Our SD40-2s come equipped with the ability to cycle between day and night gage lights provided the gage lights are turned on. See **Keybindings** Section of this manual.

HEADLIGHT LIGHT CASTING

You can control the headlight light casting through a keybind. This is in place to avoid the headlights spilling light during daylight. Thanks to this feature you can disable the light casting during daylight but toggle it back on in tunnels for instance. See **Keybindings** Section of this manual.

SHADOW CASTING LIGHTS

Certain external light sources can be toggled on or off to cast shadows. Shadow casting is extremely performance impacting and we do NOT suggest running with shadow casting enabled at all times. The ability to toggle shadow casting lights has been added so the user can take realistic night screenshots in-game. See **Keybindings** Section of this manual.



GENERAL LOCOMOTIVE DATA

Controls	AAR
Wheel Arrangement	C-C
Engine Data:	
Horsepower – Traction	3000
Number of Cylinders	16
Model	EMD 645
RPM	904
Compression Ratio	14.5:1
Cycle	2
Turbocharged	Yes
Type	E3
Traction Equipment:	
Traction Motors (6)	D78
Major Dimensions (Approximate):	
Length	68 ft. -10 in.
Height	15 ft. -07.125 in.
Width	10 ft. -03.125 in.
Driving Wheel Diameter (in.)	40
Weight (lbs, maximum)	396,000
Maximum Continuous Tractive Effort (lbf) / Speed (mph)	82,100/11
Maximum Starting Tractive Effort (lbf)	115,000
Peak Braking Effort (lbf/mph)	60,000/24.5
Gear Ratio	62/15
Maximum Speed (mph) – worn wheels	70
Supplies:	
Fuel Tank (usable gallons)	3200
Coolant (gallons)	260
Lubricating Oil (gallons)	343
Sand (cu. ft.)	65
Compressor, Air:	
Compressor Drive	Shaft Driven
Maximum Displacement (cfm)	200



KEYBINDINGS

Combined Throttle	
Increase	A
Decrease	D
Reverser	
Increase	W
Decrease	S
Automatic Brake	
Increase	'
Decrease	;
Independent Brake	
Increase]
Decrease + Actuate	[
Horn	Space
Bell (Toggle)	B
Front Headlight	
Increase	H
Decrease	Shift + H
Rear Headlight	
Increase	Ctrl + H
Decrease	Ctrl + Shift + H
Engine Control	
Increase	I
Decrease	Shift + I
Alerter Reset	Q
Alerter Override (Toggle)	Backspace
Engine Prime	Shift + P
Engine Start	Shift + K
Engine Shutdown	Shift + L
Head + Rearlight Light Casting (Toggle)	Ctrl + Shift + L
Gage Lights Day/Night (Toggle)	Ctrl + L
Shadow Casting (Toggle)	Return
Isolation Switch	
Increase	I
Decrease	Shift + I
Engine Base Pitch Shift	
Increase	Shift + E
Decrease	Shift + Q
Train Data Request	Ctrl + I



OPERATING CONTROLS

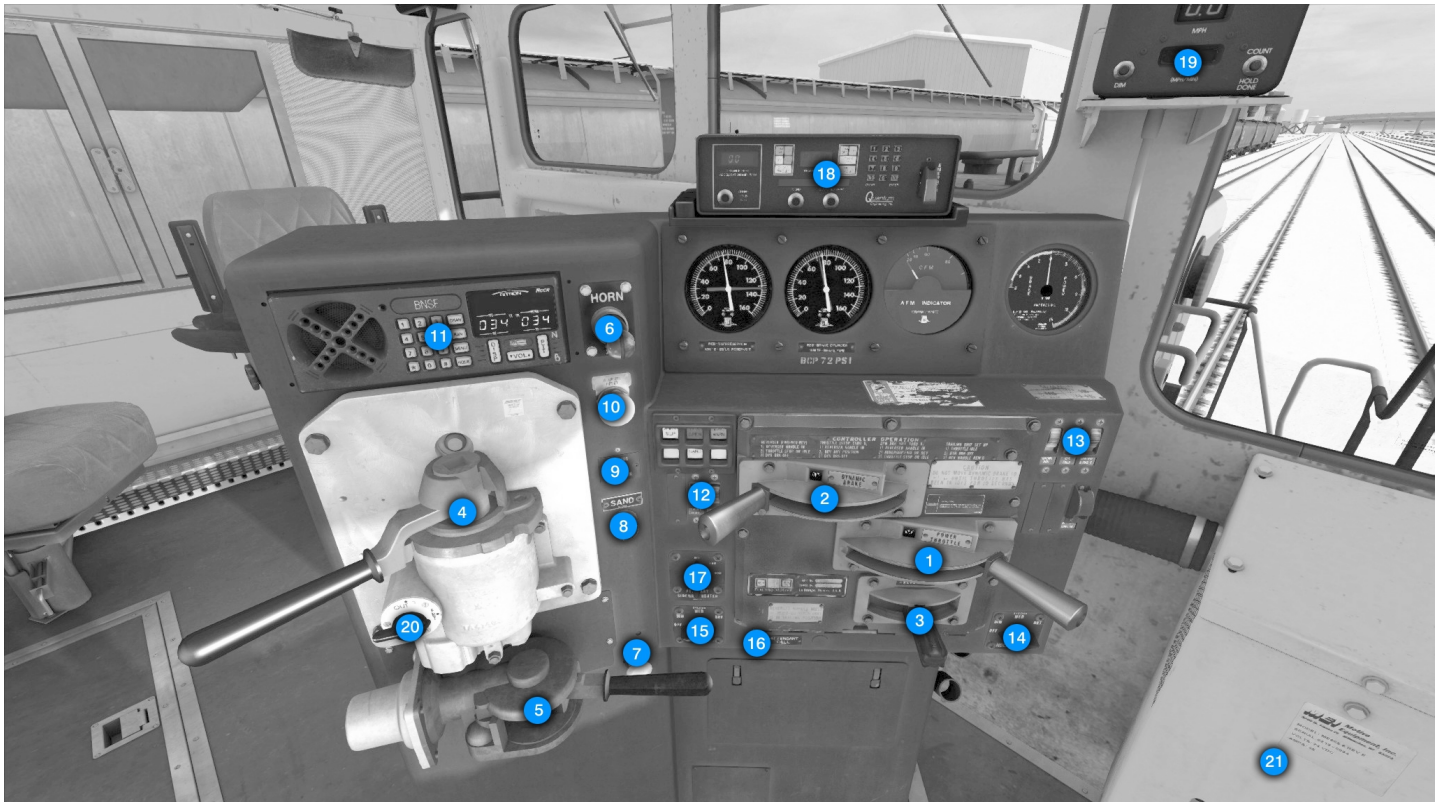


FIG. 1.

REF DESCRIPTION

1. THROTTLE HANDLE
2. DYNAMIC BRAKE HANDLE
3. REVERSER HANDLE
4. AUTOMATIC BRAKE HANDLE
5. INDEPENDENT BRAKE HANDLE
6. HORN VALVE
7. BELL VALVE
8. SAND PUSHBUTTON
9. LEAD AXLE SAND PUSHBUTTON
10. ALERTER RESET BUTTON
11. RADIO EQUIPMENT
12. GAGE / GND / STEP LIGHT SWITCHES
13. ENGINE RUN, GEN FIELD AND ENGINE CONTROL / FUEL PUMP SWITCHES
14. FRONT HEADLIGHT SWITCH
15. REAR HEADLIGHT SWITCH
16. ATTENDANT CALL PUSHBUTTON
17. AUX SIDEWALL HEATER SWITCH
18. HOTD (HEAD OF TRAIN DEVICE)
19. SPEEDOMETER / ACCELEROMETER / ALERTER
20. 26L CUT-OUT VALVE
21. MAIN CAB HEATER CONTROL



FIG. 2.

REF DESCRIPTION

- 1. ENGINE STOP PUSHBUTTON
- 2. ENGINE ISOLATION SWITCH
- 3. DYNAMIC BRAKE CUTOUT SWITCH
- 4. HORN CUT-OUT SWITCH
- 5. FRONT NUMBERBOARD LIGHT SWITCH
- 6. REAR NUMBERBOARD LIGHT SWITCH
- 7. FRONT CLASSLIGHT SWITCH
- 8. REAR CLASSLIGHT SWITCH
- 9. ENGINE COMPARTMENT LIGHT SWITCH
- 10. PLATFORM LIGHTS SWITCH
- 11. MU HEADLIGHT CONTROL SWITCH
- 12. PACESETTER SELECTOR SWITCH (INOP)
- 13. ZTR SHUTDOWN DELAY BUTTON
- 14. ZTR ENGINE START BUTTON
- 15. ZTR INDICATOR LIGHT



RCCR RADIO

RCCR RADIO CONTROL

Channel Selection

To enter a Narrow Band AAR frequency pair press the **CHAN** button. Next enter the first three digits of the transmitting TX channel by pressing the corresponding digits on the numeric keypad. Repeat the same for the three digits of the receiving RX channel.

Invalid Channel Entries

If an invalid AAR channel entry is attempted “INVALID” will momentarily show across the top of the display and no changes will be made. Valid AAR channels are 001-099.

Volume Control

Pressing the right side of the **VOL** button will increase speaker volume while pressing the left side will decrease volume. As the volume is changed the display will indicate the volume level and a tone will be heard. Volume can be set to a value between 1 and 20. The volume level can be adjusted by pressing the **VOL** button for each increment, or by holding the **VOL** button down to automatically increment.

Error Message

An **INVALID** error message will appear momentarily any time an invalid channel entry is made. If an invalid AAR CHAN button entry is attempted, “**INVALID**” will momentarily show across the top of the display and no changes will be made.

Operation Guideline

CHANNEL NUMBERS:

Yard: AAR 054-054
Road 1: AAR 070-070
Road 2: AAR 087-087



JEM RADIO

JEM RADIO CONTROL

Channel Selection

To enter a Narrow Band AAR frequency pair press the **CHAN** button. Next enter the first three digits of the transmitting TX channel by pressing the corresponding digits on the numeric keypad. Repeat the same for the three digits of the receiving RX channel. After entering 6 digits, “**BSY**” will momentarily appear in the lower right of the VF display and the radio will wait approximately 3 seconds before accepting the entry as a narrow band channel pair.

DTMF Tones

DTMF tones can be sent by hitting the number keys as well as the # and * key. The number keys will not send DTMF tones when in the channel or tone selection mode. Sequenced DTMF tones can be sent by first hitting the DTMF button and then hitting the number keys in succession to select a number sequence. The T/D field of the VF display will change to “**D**” and the first number selected. Each following number pressed will send the corresponding DTMF tone but the display will not change.

Invalid Channel Entries

Valid AAR channels are 001-099.

Volume Control

Pressing the right side of the **VOL** button will increase speaker volume while pressing the left side will decrease volume. As the volume is changed the display will indicate the volume level and a tone will be heard. Volume can be set to a value between 1 and 20. The volume level can be adjusted by pressing the **VOL** button for each increment, or by holding the **VOL** button down to automatically increment.

Operation Guideline

CHANNEL NUMBERS:

Yard: AAR 054-054
Road 1: AAR 070-070
Road 2: AAR 087-087



QUANTUM - HEAD OF TRAIN DEVICE



FIG. 3.

QUANTUM - HEAD OF TRAIN DEVICE (HOTD)

Device Unarmed

Whenever the HOTD is unarmed or communications with the EOTD temporarily lost, the **COMM LOSS** indicator will show. Whenever an EOTD (End Of Train Device) is attached to your train, the HOTD will switch into armed mode.

If armed, the **EMERG DISABLED** indicator will turn off and the **EMERG ENABLED** indicator come on. The HOTD will now show a pressure reading from the rear of your train and the HOTD status display will change to show your EOTID and armed status. With the locomotive speed greater than 1MPH, you may initiate a manual Emergency Brake Application by engaging the guard switch and flipping down the Emergency Switch on the HOTD.

NOTE: *Uncoupling cars with the locomotive speed 1MPH or greater will result in a automatic Emergency Brake Application and will require a full PCS reset. Refer to the ALARMS AND SAFEGUARDS section of this manual.*

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 Searchlight Simulations EOTD (End Of Train Device) can be downloaded for free on our store (Jointed Rail Freight Car Pack 01).*



FIG. 4.

Device Armed

The **HVM ON** (HIGH VISIBILITY MARKER ON) and **HVM OFF** (HIGH VISIBILITY MARKER OFF) indicators display the status of the High Visibility Marker Light on the EOTD at the rear of your train.

NOTE: The High Visibility Marker Light on the EOTD will come ON/OFF depending on the time of day. During daylight operation, the High Visibility Marker Light will remain off, therefore showing **HVM OFF**.

The **STP** (STOP) and **MOV** (MOVE) indicators display train movement at the rear of the train. The **STP** indicator will change from **STP** to **MOV** whenever the EOTD senses a movement of the train.

The displayed Brake Pipe Pressure readout on the rear pressure display is the actual pressure at the rear of the train. The propagation of the air pressure wave is simulated through our advanced brakes so that the pressure readout changes a short time after the actual pressure readings on the air gauges on the control stand.

By default the HOTD will display the current acceleration of the train in MPH per minute. Whenever the acceleration mode is engaged, the **ACC** (ACCELEROMETER) indicator will show. Pressing the COUNT/HOLD/DONE button once on the HOTD will engage the odometer/counter mode and disengage the acceleration mode. The **ODO** (ODOMETER) indicator will show and the traveled distance in Feet displayed until the counter mode is disengaged and the counter hold mode engaged. In the counter hold mode, the measured counter distance will remain displayed. Pressing the COUNT/HOLD/DONE button once more will disengage the counter hold mode and the HOTD will return to the acceleration mode.



PULSE - HEAD OF TRAIN DEVICE



FIG. 5.

PULSE - HEAD OF TRAIN DEVICE (HOTD)

Device Unarmed

By default, the HOTD (Head Of Train Device) will be unarmed. Whenever an EOTD (End Of Train Device) is attached to your train, the HOTD will switch into armed mode.

If armed, the **EMERG DISABLED** indicator will turn off and the **EMERG ENABLED** indicator come on. The HOTD will now show a pressure reading from the rear of your train. With the locomotive speed greater than 1MPH, you may initiate a manual Emergency Brake Application by engaging the guard switch and flipping down the Emergency Switch on the HOTD.

NOTE: *Uncoupling cars with the locomotive speed 1MPH or greater will result in a automatic Emergency Brake Application and will require a full PCS reset. Refer to the ALARMS AND SAFEGUARDS section of this manual.*

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 Searchlight Simulations EOTD (End Of Train Device) can be downloaded for free on our store (Jointed Rail Freight Car Pack 01).*

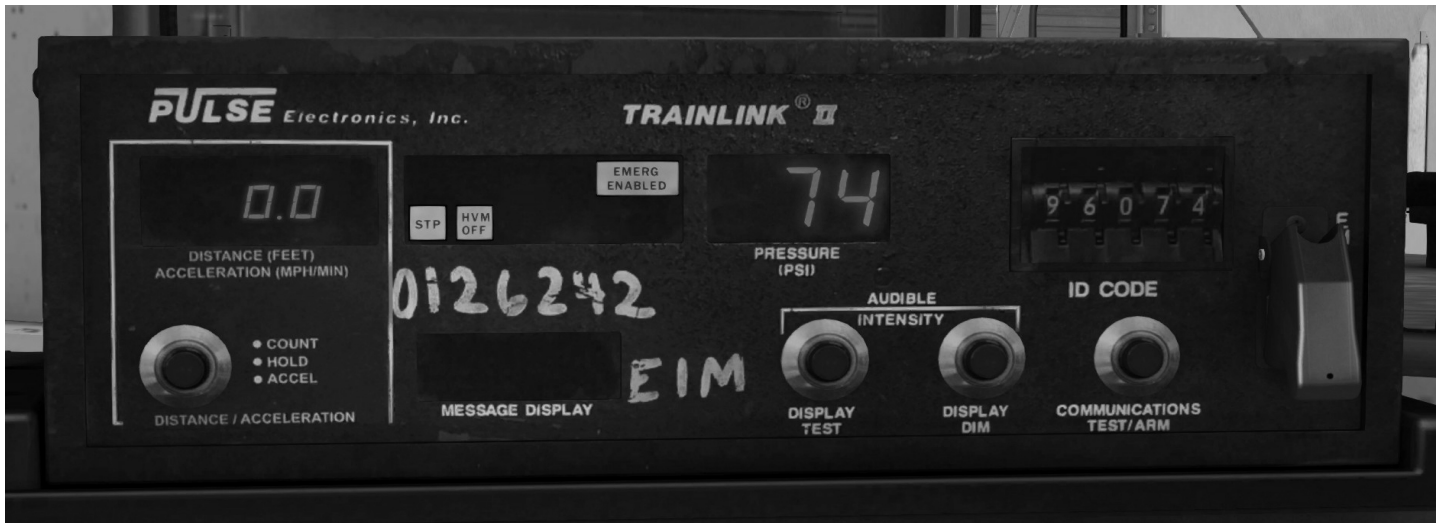


FIG. 6.

Device Armed

NOTE: 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 through our advanced brakes so that the pressure readout changes a short time after the actual pressure readings on the air gauges on the control stand.

By default the HOTD will display the current acceleration of the train in MPH per minute. Pressing the COUNT/HOLD/ACCEL button once on the HOTD will engage the odometer/counter mode and disengage the acceleration mode. The display will show the traveled distance in Feet until the counter mode is disengaged and the counter hold mode engaged. In the counter hold mode, the measured counter distance will remain displayed. Pressing the COUNT/HOLD/ACCEL button once more will disengage the counter hold mode and the HOTD will return to the acceleration mode.



ALARMS AND SAFEGUARDS

ALERTER

The Alerter promotes safe train operation by monitoring various operator movements to ensure the alertness of the operating crew. If a proper control movement is not detected within a predetermined reset time period, an alarm sequence including audible and visual alarms is started requesting an acknowledgement. Lack of response to the system during this time will result in a penalty brake application by de-energizing the Alerter Magnet Valve. This action will command a full service brake application bringing the locomotive to a stop.

The Alerter starts counting down from sixty seconds. After sixty seconds and with no acknowledgement it will begin to flash. With no response, an audible alarm will sound eight seconds later. The operator is then given another ten seconds to respond before a penalty brake application is automatically initiated.

NOTE: *The Alerter Function is disabled when Brake Cylinder pressure is greater than 25 psi or the Alerter Override is enabled.*

The following control movements will reset the Alerter:

- Operating the Alerter reset pushbutton
- Operating the Bell switch, Horn valve, or movement of the Reverse handle or Throttle handle
- Movement of the Automatic Brake handle, Independent Brake handle, or Bail-off
- Change in Dynamic Brake

EMERGENCY SANDING

Emergency sanding is automatically applied in FORWARD and REVERSE directions during all Emergency Brake applications for a sufficient time to stop the train.



PCS FUNCTION OPERATION

An emergency brake application will cut power, reduce the engine speed to Idle and illuminate the PCS OPEN indicator light on the control stand.

To reset the PCS Function:

1. Move the Throttle to IDLE.

NOTE: *If the PCS Function has been activated while in dynamic braking, the Braking handle must be returned to OFF to reset the circuit. Dynamic braking will be retained when PCS is open.*

2. For **Penalties**, proceed to **Step a**. For **Emergencies**, proceed to **Step b**.
 - a. Move the Automatic Brake Handle to SUPPRESSION and wait at least eight seconds for Power Up, Over-speed, or other Penalty applications.
 - b. Move the Automatic Brake Handle to EMERGENCY and wait at least 60 seconds for Trainline, Operator, EOT, or Brake Valve Emergencies.
3. Move the Automatic Brake Handle, when instructed and ready, to RELEASE.

NOTE: *Penalty applications can be reset “on the fly” meaning the locomotive does not need to come to a full stop before the penalty can be reset.*

WHEELSLIP

The WS10 wheel slip control system continuously monitors axle amperage averages against the the No. 2 Axle generator speed. If a slip is detected under power, total alternator output and output to the affected axle pairs is reduced until all motors have returned to an acceptable average variation. If slide is detected under dynamic braking, total braking resistance is reduced until sliding stops. Under both circumstances, automated sand application may occur. If the operator anticipates a scenario where slip is very likely to occur, they may choose to apply sand manually via either the lead axle sand switch, or the momentary sanding button found on the control stand.

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 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.*



BRAKE PIPE LEAKAGE TEST

NOTE: A brake pipe pressure leakage test can only be performed with the train brake handle in the release position and the brake pipe pressure charged to within 15 pounds of the regulating valve or feed valve setting on the locomotive.

To perform a brake pipe pressure leakage test:

1. Apply brakes and make a 20 pound brake pipe service reduction.
2. After brake pipe exhaust seizes, change the brake cut-out valve on the 26L brake stand to the “OUT” position and wait one minute for the air pressure to stabilize.
3. Once complete, change the brake cut-out valve back to the “FRT” position and release the train brakes.

NOTE: Brake pipe pressure leakage must NOT exceed 5 pounds per minute!



STARTING ENGINE

A manual engine shutdown will require a manual restart of the engine. The following conditions must exist.

1. *Reverser in CNTR position.*
2. *Engine Run and Engine Control/Fuel Pump switch are in the ON position.*
3. *Generator Field switch in the OFF position.*
4. *Isolation Switch in START/STOP/ISO position.*
5. *Independent Brake fully applied.*

With the above conditions met, press and hold Shift + P for at least 5 seconds. Next release both Keys to stop priming the engine.

Shift + K will then engage the starter. Release Shift + K once you hear the starter turn the engine.

ZTR SMART START CONTROL

An autostart sequence can be initiated either by pressing the Engine Start push button (Item 14, Fig. 2) or by throwing the reverser momentarily into the FWD (Forward) or RVS (Reverse) position.

Once initiated, the indicator light (Item 15, Fig. 2) will flash Red/Green and a warning bell will sound, notifying operating and maintenance personnel that an automatic engine start is about to occur.

After initial priming, the engine will automatically start up. With the engine running, the indicator light will turn solid green. From this point onward, an engine shutdown sequence or manual shutdown can be initiated.

NOTE: *Locomotive throttle response and loading are disabled for one minute after an autostart. After one minute, the attendant call (Item 16, Fig. 1) will sound for a split second to inform the operator that the locomotive is now ready to load.*

FASTER AIR PUMPING

To provide faster air pumping on locomotive, when reservoirs have been drained or after the locomotive has been coupled to a train, proceed as follows:

1. *Leave the Generator Field switch in the OFF position.*
2. *Place Reverser in CNTR position.*
3. *Advance Throttle above IDLE.*

BEFORE MOVING LOCOMOTIVE

1. *Place Rear and Forward Headlight switch in the proper position for required operation.*
2. *Set Isolation switch into the RUN position.*
3. *Make an Independent air brake application.*
4. *Release the hand brake and remove any blocking from the wheels. The train is now ready for operation. Refer to the OPERATION section of this manual.*



MOVING A TRAIN

1. *Set the Generator Field switch to ON.*
2. *Move the Reverser Handle to the desired direction of movement.*
3. *Release the brakes completely.*
4. *Advance the Throttle. The Throttle has notches, with each successive notch representing an increase in power, or locomotive tractive effort.*

STOPPING A TRAIN

Move the Throttle to IDLE, and apply the dynamic or air brakes according to Railroad Regulations. Also refer to Applying Dynamic Brakes paragraph located later in this section. If leaving the engineer's position after the train has stopped, center the Reverser.

STOPPING ENGINE

1. *Move the Throttle to IDLE.*
2. *Set the Generator Field switch to OFF.*
3. *Set the Isolation switch to START/STOP/ISO position.*
4. *Press the Engine Stop pushbutton on the Engine Control Panel and hold it in for at least five seconds or press Shift + L and hold it in for at least five seconds.*

ZTR SMART START CONTROL

Engines equipped with ZTR smart start will automatically shut down after two minutes of inactivity to conserve fuel. The following conditions must exist for two minutes.

1. *Throttle in IDLE.*
2. *Dynamic Brake OFF position.*
3. *Reverser in CNTR position.*

Once initiated, the indicator light (Item 15, Fig. 2) will flash Red/Green and a warning bell will sound, notifying operating and maintenance personnel that an automatic engine shutdown is about to occur.

Pressing the Shutdown Delay button (Item 13, Fig. 2) will delay the shutdown sequence and extend engine idle time by 10 minutes.

NOTE: *Pressing the Shutdown Delay button will not override an auto shutdown sequence once initiated.*

With the engine shut down, the indicator light will turn solid red. From this point onward, an engine start sequence or manual start can be initiated.



DYNAMIC BRAKE OPERATION

Applying Dynamic Brakes

Applying dynamic braking is done in the following manner:

1. *Move the Throttle to IDLE.*
2. *Advance the Dynamic Brake as desired.*
After the slack is bunched, manipulate the Dynamic Brake until the desired braking effort is obtained. Observe and correct braking effort during the initial period of Dynamic Brake application.
3. *The amount of braking effort obtainable varies with the position of the Dynamic Brake for various speeds. Maximum braking effort is obtained in the FULL BRAKING position at around 24 MPH.*

Use Of Air Brakes during Dynamic Braking

NOTE: Use of independent air brake does not affect the braking effort from dynamic brake. Independent brake and dynamic brake can be applied at the same time with no reduction in either braking capability.

When necessary, the automatic air brake may be used in conjunction with the dynamic brake.

Use of Air Brakes during normal Operation

Applying or Reapplying Automatic Brakes

When applying or reapplying automatic brakes, make brake pipe reductions according to these guidelines:

1. *Make an initial brake pipe reduction as follows:*
 - *For a fully charged system, reduce the brake pipe at least 6 psi, or*
 - *For an uncharged system, reduce the brake pipe 5 psi below the previous reduction.*
2. *Use split reductions for planned slowdowns and stops. Make an initial (minimum) brake deduction of 6 to 8 psi followed by additional reductions in 2-3 psi increments spaced 30 seconds apart.*
3. *Limit brake pipe reduction to 15 psi or less to control speed.*
Make a final reduction when operating conditions permit and train is nearing a stop to prevent a run out of slack. A final reduction is a brake pipe reduction made in such a way as to result in brake pipe pressure exhausting as the train comes to a stop.

Use of Automatic Brakes during cold weather conditions

During extreme cold temperatures (Below Zero Degrees Fahrenheit) when operating conditions and outstanding instructions permit, throttle manipulations and dynamic braking must be used in lieu of train air brakes whenever possible in controlling and stopping freight trains.

If automatic brakes are to be used, plan ahead and initiate a minimum brake reduction far in advance of a planned stop to warm up the brake shoes on the train so braking will be effective.

Cycle Braking

Avoid frequent application and release of the automatic brake to avoid complete loss of braking due to air supply in the railcars being exhausted.



BASE ENGINE PITCH SHIFT

BASE ENGINE PITCH SHIFT CONTROL

In-game you have the ability to manually turn the engine audio base pitch shift up and down. This feature was introduced to reduce the chance of the “swoosh” effect on audio that basically occurs whenever identical audio files are played in-game.

By the default, every locomotive placed in-game will automatically be assigned a random base pitch value on initialization. In some occasions however this still results in certain locomotive pairs sharing the same base pitch. To correct this, simply switch/cylce to the respective locomotive in your consist and manually adjust the base pitch shift until you've reached a more natural mix in overall engine audio.

Press **Shift + E** to increase and **Shift + Q** to decrease the base pitch shift. The pitch will change in .02 increments and will be displayed through a small alert message in the top right corner (Fig. 7).

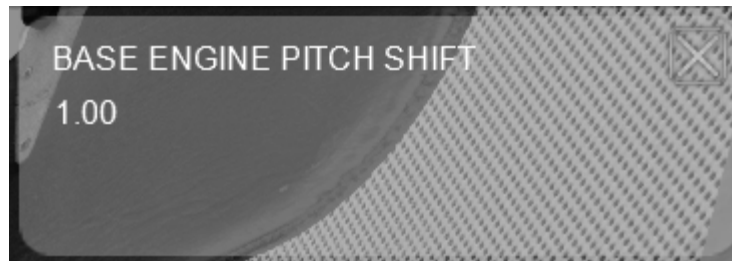


FIG. 7.

NOTE: Valid base pitch values are within the **0.96 – 1.04** range.



ENGINE WINTERIZATION

ENGINE WINTERIZATION

AUTOMATIC WINTERIZATION

When equipped with the automatic winterization feature (See **User Configuration** Section of this manual), the engine will run up to Notch 3 speed when idling under cold ambient temperatures. Auto winterization will automatically engage after a 45 seconds delay if the following conditions are met.

1. *Throttle in IDLE position.*
2. *Isolation switch in RUN position.*

MANUAL WINTER ISOLATION

When equipped with the manual winter isolation feature (See **User Configuration** Section of this manual), the engine will run up to Notch 3 speed whenever the isolation switch (Item 2, Fig. 2) is placed in the **WINTER ISOLATE** position (arrow pointing down).

NOTE: *A locomotive may be equipped with both the automatic winterization and manual winter isolation feature at once. In either case, a small “WINTER ISOLATE” label will appear on the rear engine control panel (Fig. 2) if the locomotive is equipped with either feature.*



ADVANCED BRAKES AND EXHAUST EFFECTS

ADVANCED BRAKES

The SD40-2s come 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.

We have furthermore simulated tread brakes with dynamic brake forces that increase as the train speed is decreased.

NOTE: *Be mindful of how many times you apply and release the train brakes during descents and braking phases as you can exhaust all of your available air within the system, resulting in a “runaway” situation.*

EXHAUST EFFECTS

The exhaust effects on our locomotives are fully configurable for each leading “[Lead]” unit individually and uniformly for all trailing units “[Trail]”. You may pick between a “Normal” and “Oil” exhaust type and further adjust base factors within the supplied configuration files to achieve different effects. (See **User Configuration** Section of this manual).

NOTE: *The current in-game season will be factored in with the overall base thickness/intensity of the “Oil” type exhaust setting in your configuration file. You will therefore experience very subtle “Oil” exhausts effects during Summer time for instance than compared to colder seasons, such as Autumn or Winter.*



TRAIN DATA REQUEST

TRAIN DATA REQUEST MESSAGE

Pressing Ctrl + I will request current train data to be displayed. This new feature is extremely helpful for improving your train handling skills. The output data will dynamically change with your train. Isolating locomotives for instance will result in lower available gross/net horsepower, thus resulting in a lower HP/T (horsepower per ton) rating and lower calculated max speed.

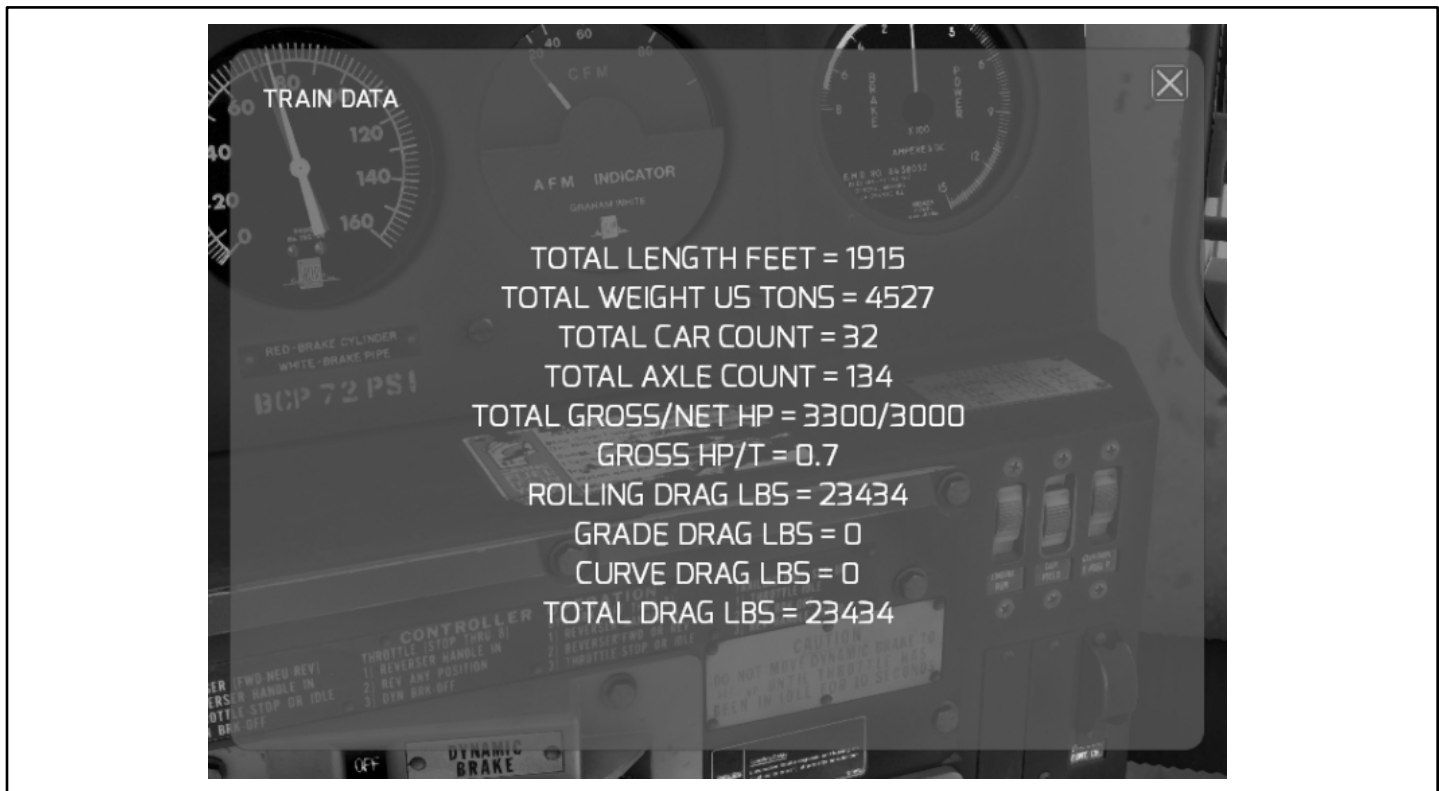


FIG. 8.

Train simulator uses the lead axle of your train as the only reference point to get the current grade, curvature and speed value from. This means that proper physics calculations for the entire length of your train are quite essentially impossible to run. The core game does not allow for proper calculations on a car-to-car or axle-to-axle basis. Hence the displayed drag values only properly account for constant grade and curvature track.

NOTE: Once displayed, the train data message window will pause your game. Close the window to return to your session.

Only products marked with “Train Data Capability” are equipped with our train data request feature.



CONFIGURATION FILES

CONFIGURATION FILES

Configuration files are designed to allow the user to fully customize their in-game experience when using our products. With the help of locomotive based configuration files, you get to change features, change settings or swap certain equipment on your lead and trailing locomotives (within limits).

NOTE: Configuration files can be found under each respective locomotive folder. Check the listed paths below for the respective locomotive you wish to configure. For player controlled [Lead] locomotive, modify the file “CONFIG_LEAD_INI” and “CONFIG_TRAIL_INI” for trailing locomotives in your consist.

NAME:	PATH:
LRC	Assets\SearchlightSimulations\EMD\JRSD40-2\RailVehicles\Diesel\BNSF_H1\Scripts\CONFIG_INI\BNSF_H1_LRC
VMV	Assets\SearchlightSimulations\EMD\JRSD40-2\RailVehicles\Diesel\BNSF_H1\Scripts\CONFIG_INI\BNSF_H1_VMV
EX-BN 01	Assets\SearchlightSimulations\EMD\JRSD40-2\RailVehicles\Diesel\BNSF_Ex-BN_01\Scripts\CONFIG_INI\BNSF_Ex-BN_01
EX-BN 02	Assets\SearchlightSimulations\EMD\JRSD40-2\RailVehicles\Diesel\BNSF_Ex-BN_02\Scripts\CONFIG_INI\BNSF_Ex-BN_02

NOTE: All trailing locomotives will run off of the “CONFIG_TRAIL_INI” configuration file.

All configuration files are self explanatory and feature annotations for each configurable setting or variable within. To edit a configuration file, simply open it with any text editor such as **Notepad** or **Notepad++**.

EXAMPLE CONFIGURATION FILE

```
--BNSF EMD SD40-2 BUNDLE-----
--CONFIGURATION FILE (LEAD) // BNSF H1 LRC //-----
(c:\Searchlight Simulations 2021, OPEN SOURCE)-----
--LOAD UP MAIN ENGINE SCRIPT (DO NOT MODIFY)
require("Assets/SearchlightSimulations/EMD/JRSD40-2/RailVehicles/Diesel/BNSF_H1/Scripts/SD40_EngineScriptMain.out")
-----
--AUDIO SECTION--
-----
--THIS CONTROLS WHETHER OR NOT THE "LOCKBACK" SOUND IS PRESENT ON THE BELL [ON = true, OFF = false]
BELL_LOCKBACK = true
--THIS CONTROLS THE BELL CYCLE TIME [DEFAULT = 0.9 SECONDS, POSSIBLE VALUES: 0-2]
BELL_CYCLE_TIME = 0.9
--THIS CONTROLS WHETHER A BELL SOUND IS AUDIBLE WHENEVER THE ISOLATION SWITCH IS SET IN THE "RUN" POSITION [YES = true, NO = false]
ISOLATION_BELL_OVERRIDE = false
--THIS CONTROLS THE VOLUME LEVEL OF THE TURBO FEEDBACK AUDIO (OPTIONAL) [DEFAULT = 1, POSSIBLE VALUES: 0-1]
TURBO_NOISE_BASE_VOLUME = 1
--THIS CONTROLS THE VOLUME LEVEL OF THE EXHAUST FEEDBACK AUDIO (OPTIONAL) [DEFAULT = 0.95, POSSIBLE VALUES: 0-1]
EXHAUST_FEEDBACK_VOLUME = 0.95
--[[THE BASE VALUE IS DEPENDENT ON THE IN-GAME SEASON. IF YOU WANT TO SIMULATE A SILENCED EXHAUST FOR INSTANCE, SET THE VALUE BELOW
TO "0".]]
EXHAUST_NOTE_BASE_VOLUME_MODIFIER = 0.95
-----
--CONTROL SECTION--
-----
--THIS CONTROLS WHETHER THIS ENGINE IS EQUIPPED WITH A REVERSER BASED, LOW IDLE FEATURE [YES = true, NO = false]
--[[IF FALSE, ENGINE WILL RETURN TO LOW IDLE SPEED WITH THE ISOLATION SWITCH SET IN THE "START/STOP/ISO" POSITION
NOTE: HI-IDLE ONLY OPTION IS NOT AVAILABLE]]
LOW_IDLE_REVERSER_BASED = true
--THIS CONTROLS WHETHER THIS ENGINE IS EQUIPPED WITH AN AUTOMATIC, ISOLATION SWITCH BASED, WINTERIZATION FEATURE [YES = true, NO = false]
--[[IF TRUE, ENGINE WILL RUN UP TO NOTCH 3 SPEED AFTER A 45 SECONDS DELAY IF AMBIENT TEMPERATURE FALLS BELOW 40F, THE ISOLATION SWITCH
IS SET IN THE "RUN" POSITION AND THE THROTTLE SET IN IDLE]]
AUTOMATIC_WINTER_ISOLATION = false
--THIS CONTROLS WHETHER THIS ENGINE IS EQUIPPED WITH A MANUAL, ISOLATION SWITCH BASED, WINTERIZATION FEATURE [YES = true, NO = false]
--[[IF TRUE, ENGINE WILL RUN UP TO NOTCH 3 SPEED WITH THE ISOLATION SWITCH SET IN THE "WINTER ISOLATE" POSITION]]
MANUAL_WINTER_ISOLATION = true
--THIS CONTROLS WHETHER OR NOT THIS ENGINE IS EQUIPPED WITH EXTENDED RANGE DYNAMIC BRAKES [YES = true, NO = false]
EXTENDED_RANGE_DYNAMICS = true
--THIS CONTROLS WHETHER OR NOT THIS ENGINE IS EQUIPPED WITH ZTR SMART START (AESS) [YES = true, NO = false]
--[[NOTE: ZTR SMART START IS ONLY AVAILABLE IN CONJUNCTION WITH THE "LOW_IDLE_REVERSER_BASED" FEATURE]]
ZTR_SMART_START = true
--THIS CONTROLS THE EXHAUST OVERRIDE FUNCTION [YES = true, NO = false]
--[[IF TRUE, THE EXHAUST EFFECTS ON THE LEAD ENGINE WILL BE CONTROLLED THROUGH THE VARIABLES PROVIDED BELOW]]
EXHAUST_OVERRIDE = true
--THIS CONTROLS WHETHER THIS ENGINE IS BURNING OIL [OIL = 1, REGULAR = 0]
EXHAUST_TYPE = 0
--THIS CONTROLS THE OVERALL EXHAUST EFFECTS THICKNESS [DEFAULT = 0.5, POSSIBLE VALUES: 0-1]
--[[THE HIGHER THE VALUE, THE THICKER THE BASE EXHAUST EFFECTS]]
EXHAUST_BASE_FACTOR = 1
--THIS CONTROLS THE EXHAUST EFFECTS THICKNESS WHEN HOLDING A NOTCH [DEFAULT = 0.5, POSSIBLE VALUES: 0-1]
--[[THE HIGHER THE VALUE, THE THICKER THE EXHAUST EFFECTS WHEN HOLDING A NOTCH]]
EXHAUST_HOLD_MODIFIER = 0.5
--THIS CONTROLS THE EXHAUST PARTICLE VELOCITY [DEFAULT = 1.15, POSSIBLE VALUES: 1-1.5]
--[[THE HIGHER THE VALUE, THE HIGHER THE VELOCITY OF PARTICLES EXITING THE EXHAUST]]
EXHAUST_VELOCITY_MODIFIER = 1.15
-----
```



CREDITS

Thank you to our entire team, all our beta testers, our scenario writer, our network engineer and JointedRail.

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 .

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