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MANUAL

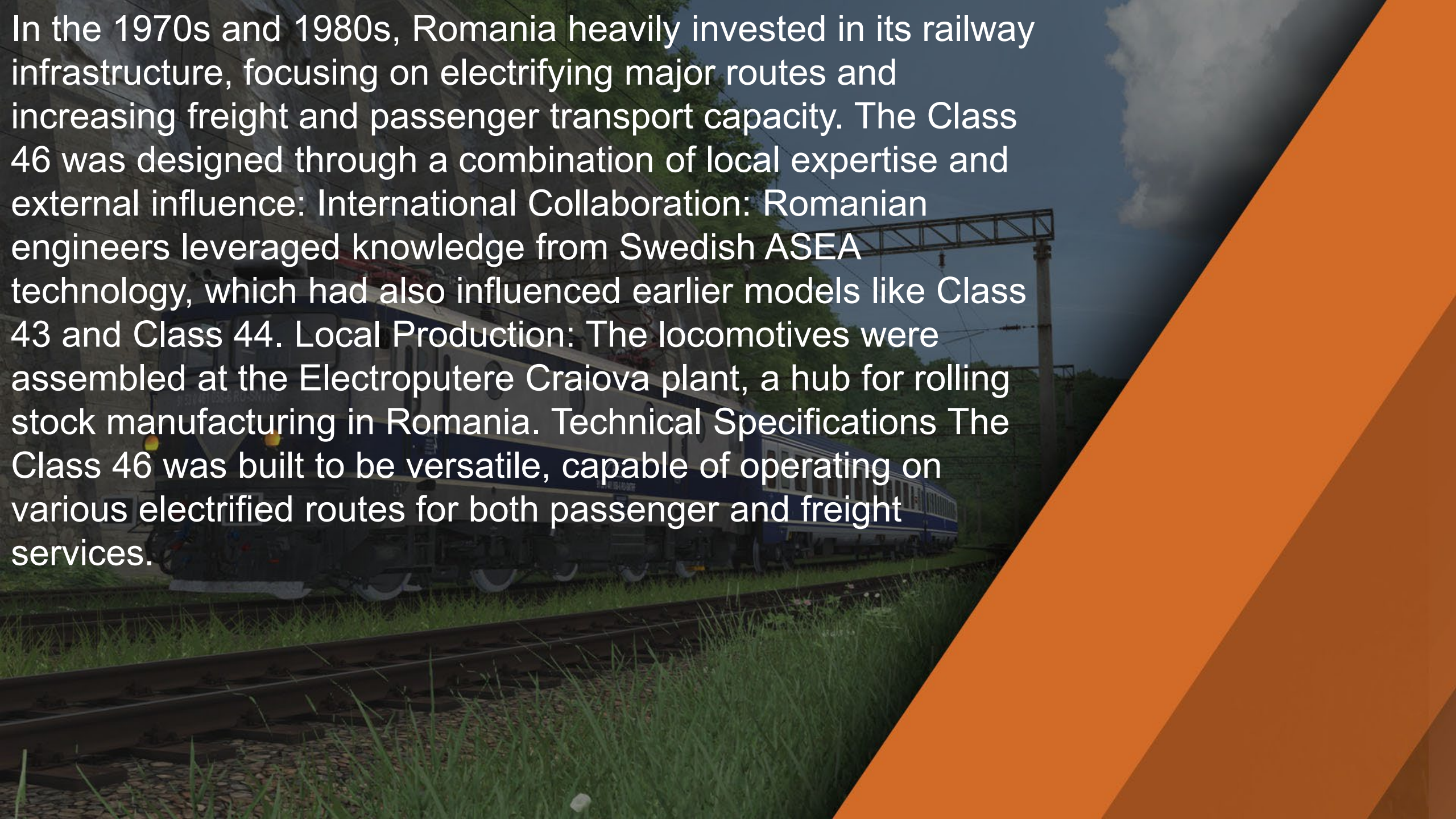


Brief history and description

A photograph of a Class 46 electric locomotive pulling a train on a railway track. The locomotive is white with blue accents and is pulling several passenger cars. The train is moving along a track with overhead power lines. The background shows a clear blue sky with some clouds and green foliage. The image is partially obscured by a large orange diagonal graphic on the right side.

The Class 46 electric locomotive, known as the "Promat," is one of the most iconic locomotives developed to serve the railway networks of Eastern Europe, particularly Romania. It emerged as a result of post-war technological innovation, addressing the growing need for efficient and modern railway transportation.

Type of Current: Powered by 25 kV AC, 50 Hz. Power Output: Approximately 4400 kW, allowing it to haul heavy trains. Maximum Speed: 160 km/h, making it suitable for rapid and intercity trains. Modular Design: It featured a robust, easy-to-maintain chassis and reliable electrical components.

A blue and white passenger train is shown on tracks, moving from left to right. The train has a white upper section and a blue lower section. The tracks are surrounded by green grass. In the background, there are trees and a utility pole with overhead wires. A large orange diagonal graphic is overlaid on the right side of the image.

In the 1970s and 1980s, Romania heavily invested in its railway infrastructure, focusing on electrifying major routes and increasing freight and passenger transport capacity. The Class 46 was designed through a combination of local expertise and external influence: International Collaboration: Romanian engineers leveraged knowledge from Swedish ASEA technology, which had also influenced earlier models like Class 43 and Class 44. Local Production: The locomotives were assembled at the Electroputere Craiova plant, a hub for rolling stock manufacturing in Romania. Technical Specifications The Class 46 was built to be versatile, capable of operating on various electrified routes for both passenger and freight services.

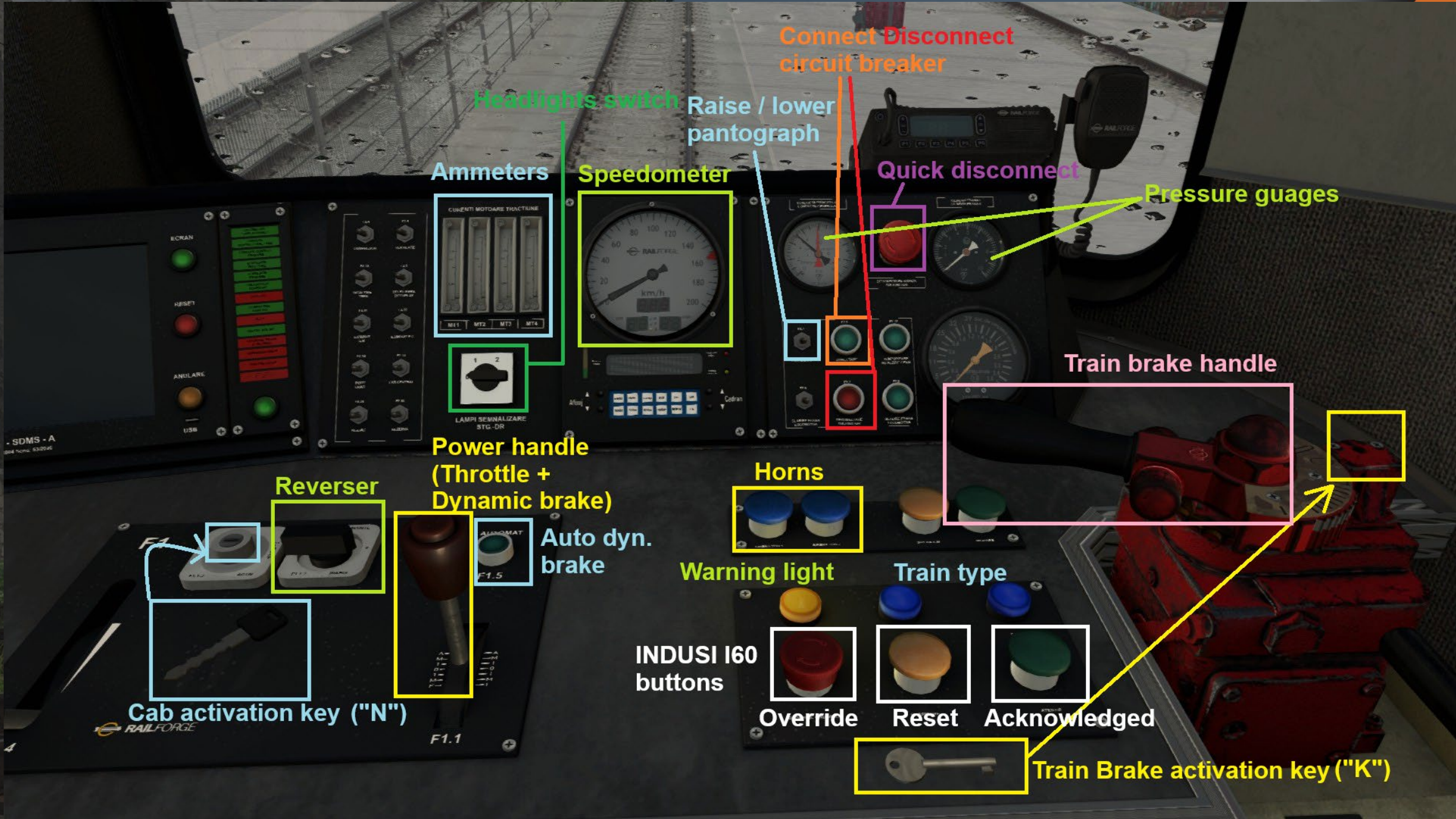
A blue and white Class 46 electric locomotive is pulling a passenger train on a railway track. The locomotive is the primary focus, with the train cars extending into the distance. The background shows a clear blue sky with some clouds and green foliage. The image is overlaid with a large orange diagonal graphic on the right side.

Initially, the Class 46 locomotive was deployed on key Romanian routes such as: European Corridor IV: Bucharest - Braşov - Sighişoara - Arad, for fast passenger trains. Freight Transport: On industrial routes, with the capacity to haul heavy trains efficiently. Over time, the Class 46 became a staple of the Romanian Railways (CFR), appreciated for its reliability and low operating costs.

The "Promat" Nickname The "Promat" name originates from the company that supplied the primary electrical components for certain series of this locomotive. This reflects the collaboration between various industry entities to create a high-performance locomotive.

A blue and white electric locomotive is pulling a passenger train through a stone viaduct. The locomotive is the primary focus, with its headlights on. The train is moving along tracks that are part of a large, multi-arched stone structure. The background shows a clear blue sky with some clouds. The overall scene is a realistic simulation of a train in a scenic environment.

CONTROLS OVERVIEW



Headlights switch

Raise / lower pantograph

Connect Disconnect circuit breaker

Ammeters

Speedometer

Quick disconnect

Pressure gauges

Train brake handle

Power handle (Throttle + Dynamic brake)

Horns

Warning light

Train type

Auto dyn. brake

Reverser

Cab activation key ("N")

INDUSI 160 buttons

Override

Reset

Acknowledged

Train Brake activation key ("K")

PROMAT module



Compressor

Ventilation



Train heating



Cab light



Train schedule light



Central beam light

Wipers switch



Speed control



F3.23 START climatizare PC

RAILFORGE

LAMPI SEMNALIZARE STG-DR

MT1 MT2 MT3 MT4

CURRENTI MOTOAR

ECRAN

RESET

ANULARE

USB

F1

F1.13

ACTIV

F3.23.23

PARANTE

INAPOI

F1.5

AUTOMAT

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ST 412004 Seria: 532026

RAILFORGE

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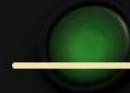
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ULFORGE

"Locomotive ready to go" indicator

ECRAN



Dynamic brake contactors

LOGOMOTIVA "DATA FORNIRE"

CONTROL CONTACTOARE LINIE

CONTROL CONTACT. FRANARE

VENTILATIE TRACTIUNE

VENTILATIE FRANARE

DISJUNCTOR CONECTAT

U$47.5kV$

COMPRESOR AUXILIAR

D.S.V

CURRENT NUL MT

SATURARE PRANA ELECTRICA

SUPRASARCINA IT

PUNTI BLOCATE

Ventilation for dynamic braking status

Line voltage lower than 17.5 kV warning

RESET



No current on engines (less than 100A)

Train heating overload

ANULARE



USB

Traction contactors

Ventilation for traction status

Circuit breaker connected indicator

DSV warning light

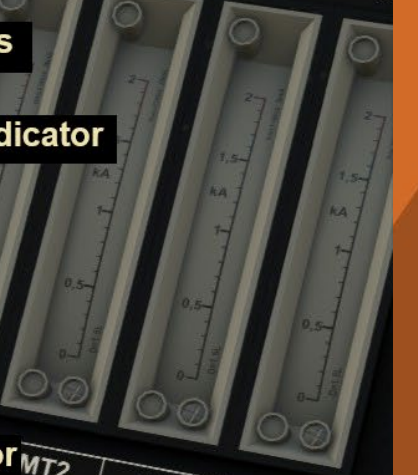
Dynamic brake saturation

Traction blocked warning indicator

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CURRENTI MOTOARE TRACTIUNE



ILUMINAT S M

F2.18

PORT ORAR

F2.14

FAR CENTRAL

F2.28

REZ.IAC

F2.30

REZERVA



LAMPI SEMNALIZARE STG.-DR

F3

Individual engine powering off (no effect)



AC status

F3.23 START climatizare PC F3.26 Functionare climatizare F3.24 STOP climatizare PC



Start Air conditioner Stop



INDUSI activation switch



Various heaters (no effect)



Horns



DSU alarm reset button

DSV pedal ("Space" key)



DSV control pedal

A blue and white electric locomotive is pulling a passenger train through a stone viaduct. The locomotive is the primary focus, with the train extending into the distance. The scene is set in a lush, green environment with a large stone structure in the background. The sky is blue with some clouds. A large orange diagonal graphic is on the right side of the image.

STARTUP PROCEDURE

1) Press “**B**” key on the keyboard to connect the battery:



2) Press “N” key on the keyboard to activate the cab:

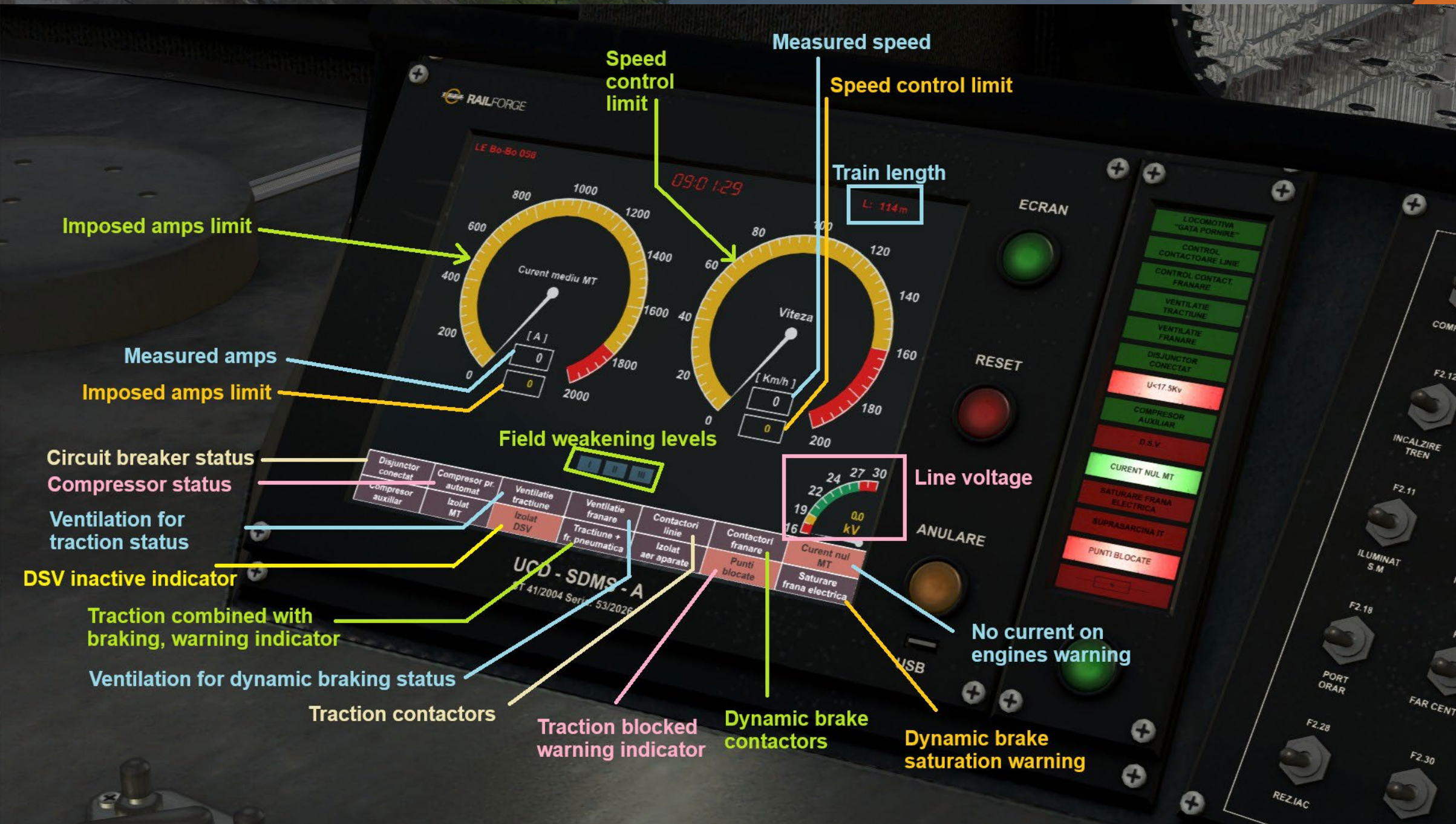


3) The 3 coloured buttons (green, red and yellow) start flashing. Wait!



4) After the sequence ends the promat screen display is on:





Imposed amps limit

Measured amps

Imposed amps limit

Measured speed

Speed control limit

Train length

L: 114m

Field weakening levels

Line voltage

Circuit breaker status

Compressor status

Ventilation for traction status

DSV inactive indicator

Traction combined with braking, warning indicator

Ventilation for dynamic braking status

Traction contactors

Traction blocked warning indicator

Dynamic brake contactors

Dynamic brake saturation warning

No current on engines warning

RAILFORGE

LE Bo-Bo 058

09:0 1:29



Disjunctori conectati	Compresor pr. automat	Ventilatie tractiune	Ventilatie franare	Contactori linie	Contactori franare	Curent nul MT
Compresor auxiliar	Izolati MT	Izolati DSV	Tractiune + fr. pneumatica	Izolati aer aparate	Punti blocate	Saturare frana electrica

UCD - SDMS - A
T 41/2004 Series 53/2026

ECRAN

RESET

ANULARE

USB

REZ.IAC

COMP

F2.12

INCALZIRE TREN

F2.11

ILUMINAT S.M

F2.18

PORT ORAR

FAR CENT

F2.28

F2.30

5) Now raise the pantograph (by default the rear one) by pressing “**P**”. To change the pantograph press “**M**” / “**Shift + M**” until the desired one is selected. To lower the pantograph press “**Shift + P**”



6) Check outside to see it touches the line



6) Connect the circuit breaker by pressing “Z” or the green lit button next to the pantograph one (to disconnect, press “X” key):



6) Notice how the indicators on the PROMAT module have changed status and also line voltage guage now shows a value between 24 and 27

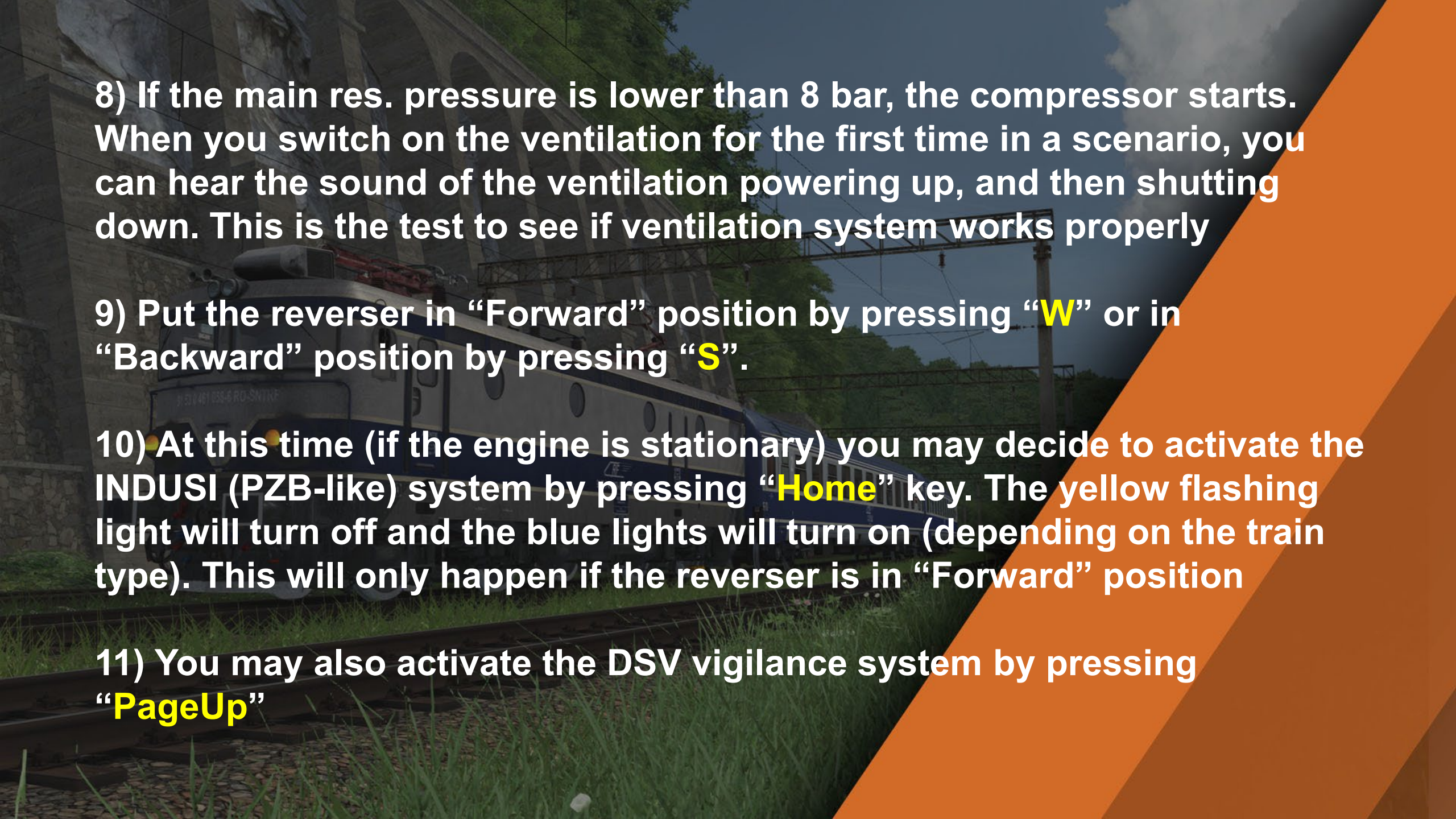


7) Unlock the train brake handle by inserting key. Press “K”



8) Switch on the automatic compressor and ventilation by manipulating their switches or by pressing “C”, respectively “V”.





8) If the main res. pressure is lower than 8 bar, the compressor starts. When you switch on the ventilation for the first time in a scenario, you can hear the sound of the ventilation powering up, and then shutting down. This is the test to see if ventilation system works properly

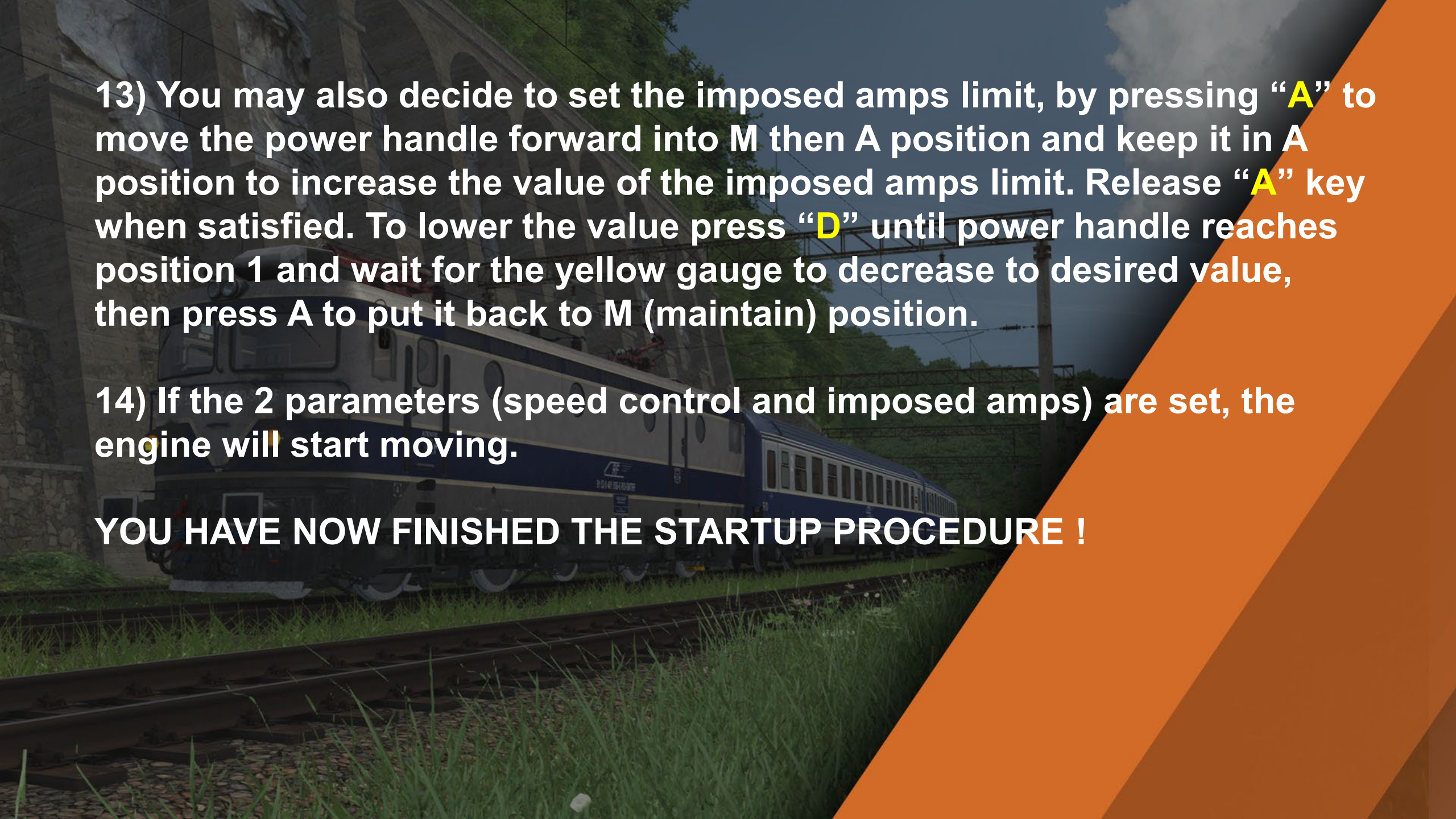
9) Put the reverser in “Forward” position by pressing “**W**” or in “Backward” position by pressing “**S**”.

10) At this time (if the engine is stationary) you may decide to activate the INDUSI (PZB-like) system by pressing “**Home**” key. The yellow flashing light will turn off and the blue lights will turn on (depending on the train type). This will only happen if the reverser is in “Forward” position

11) You may also activate the DSV vigilance system by pressing “**PageUp**”

12) Next, we need two more things to get moving: Imposed Amps and Speed control limit. Press “E” to unlock the Power handle and while pressing, press “A” key to move it to “1” position forward.





13) You may also decide to set the imposed amps limit, by pressing “**A**” to move the power handle forward into M then A position and keep it in A position to increase the value of the imposed amps limit. Release “**A**” key when satisfied. To lower the value press “**D**” until power handle reaches position 1 and wait for the yellow gauge to decrease to desired value, then press A to put it back to M (maintain) position.

14) If the 2 parameters (speed control and imposed amps) are set, the engine will start moving.

YOU HAVE NOW FINISHED THE STARTUP PROCEDURE !

A blue and white electric locomotive is pulling a passenger train through a stone viaduct. The locomotive is in the foreground, and the train extends into the distance. The viaduct is made of stone and has several arches. The sky is blue with some clouds. The text "OTHER OPERATIONS" is overlaid in white on the image.

OTHER OPERATIONS

RADIO STATION: Press the On/Off button for 4 seconds to start the Radio



RADIO STATION: You should hear a sound then the channel displayed on the small screen



AIR CONDITIONER: Press the green button to activate, red button to stop. If the AC is running you should hear a specific sound and the big green light is turned on:



SPEEDOMETER - IVMS: Various controls



TRAIN HEATING: Turn on the switch. You should see a new gauge appear on the PROMAT screen, on the lower left corner:



PROMAT MODULE TEST: Press the lowest green button to test all the light indicators, release the button to return to normal:



AUTO DYNAMIC (ELECTRIC) BRAKE: Press the teal button behind the power handle to activate this function. Notice the yellow gauge of speed control limit now turns red:



AUTO DYNAMIC (ELECTRIC) BRAKE: When this is active, the locomotive will automatically switch to dynamic brake and modulate its power to maintain controlled speed limit set by the driver. When it switches to dynamic brake, the yellow gauge of imposed amps, now turns red and displays a limit of 960 A.



AUTO DYNAMIC (ELECTRIC) BRAKE: When this is inactive, you'll have to apply the brakes yourself to prevent the locomotive from going overspeed in case of a descent. Also, the red gauge of imposed braking amps now starts from 0, and you'll have to increase that value by lowering the power handle into F position and holding it there until you get the desired value. Release it to M position to maintain value, or raise it to 1 to decrease dynamic braking:



HEADLIGHTS: The headlight switch has 4 positions:
0 – Off, 1 – Full, 2 – Dim, 3 – Red light
Manipulate it by pressing “**L**” or “**Shift + L**” on your keyboard



LIMITATION ZONE PASSING HELPER: Press the yellow button on the PROMAT module (or “Numpad Enter”) to activate the helper. This will show you, based on the train length, when your train has completely passed the point when this was activated (Example: a speed limit sign)



LIMITATION ZONE PASSING HELPER: A green bar appears with a yellow slider that represents your train and the remaining train length still to pass displayed with green digits. The red vertical line is the reference.



LIMITATION ZONE PASSING HELPER: When the train has completely passed that point you will see this message displayed:



FIELD WEAKENING LEVELS: There are 3 levels of field weakening displayed on the promat screen. They will activate depending on speed and current applied to the electric engines:



INDUSI SYSTEM: The INDUSI i60 security system is by default deactivated

To activate it press “**Home**” or click on the switch found on the central lower console. The system remains active if:

- Switch is on **and**
- Reverser is in “Forward” (**INAINTE**) position **and**
- Pressure in brake cylinders is greater than **3,5 bar**

Depending on type of consist, or selected rank we have 3 cases:

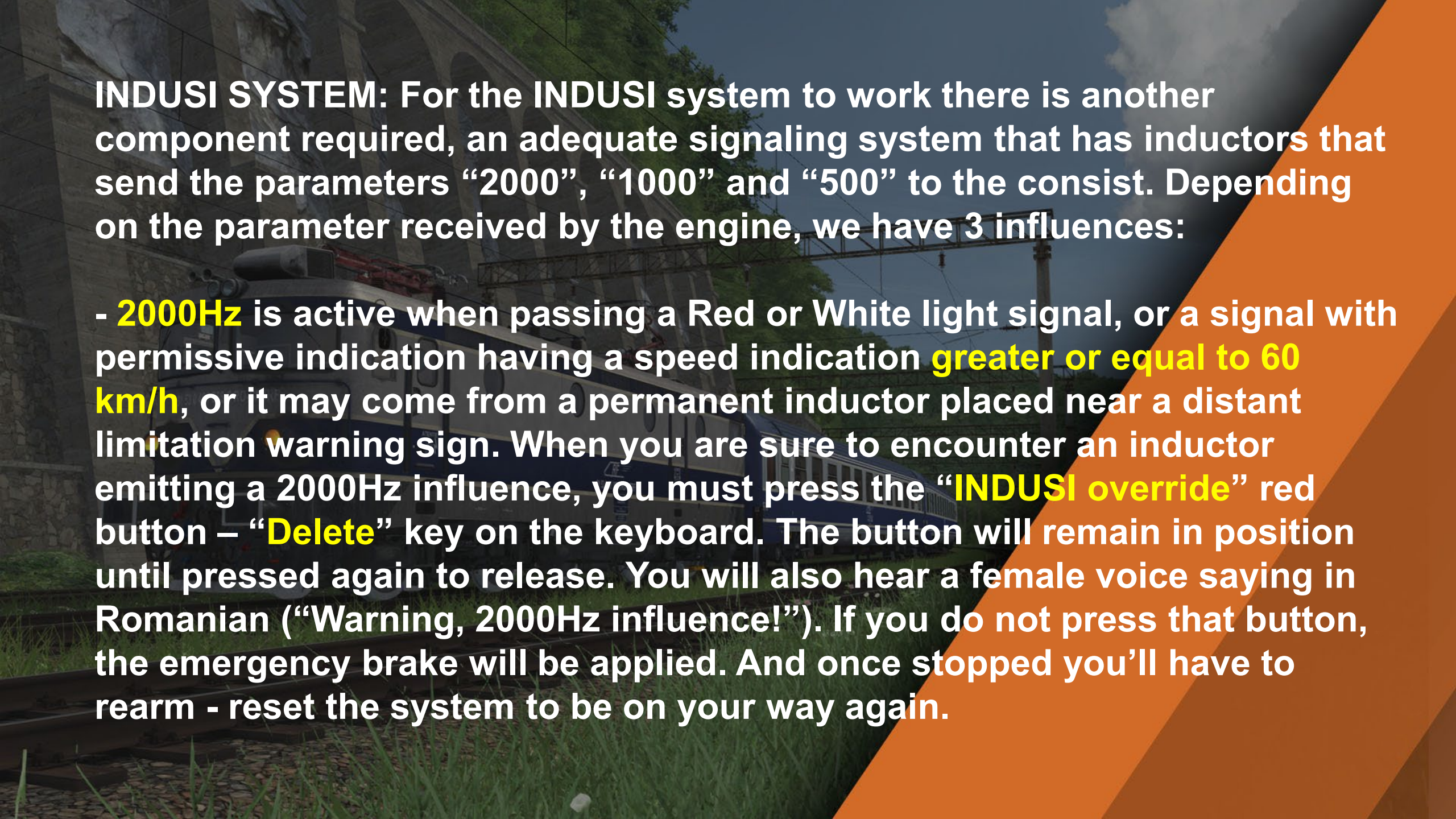
Inactive

Freight

Slow Passenger

Fast Passenger





INDUSI SYSTEM: For the INDUSI system to work there is another component required, an adequate signaling system that has inductors that send the parameters “2000”, “1000” and “500” to the consist. Depending on the parameter received by the engine, we have 3 influences:

- **2000Hz** is active when passing a Red or White light signal, or a signal with permissive indication having a speed indication **greater or equal to 60 km/h**, or it may come from a permanent inductor placed near a distant limitation warning sign. When you are sure to encounter an inductor emitting a 2000Hz influence, you must press the “**INDUSI override**” red button – “**Delete**” key on the keyboard. The button will remain in position until pressed again to release. You will also hear a female voice saying in Romanian (“Warning, 2000Hz influence!”). If you do not press that button, the emergency brake will be applied. And once stopped you’ll have to rearm - reset the system to be on your way again.

INDUSI SYSTEM:

- **1000Hz** is active when passing a Yellow light signal (with a speed indication of 30 km/h or lower or with no indication at all), a flashing yellow signal, or a flashing green signal with a distant speed indication of 30 or less while not having a signal speed indication greater than 30. It may also be encountered near a yellow sign that warns about a section of weakened track that has restrictive speed.

When you are sure to encounter this case, when passing over the inductor you have 4 seconds to press “INDUSI Acknowledge” button (“Atentie”) or the “**PageDown**” key on the keyboard. Failing to do so, results in emergency braking. You will also hear a female voice saying in Romanian – “Warning, 1000Hz influence!”. Once you press the button, the yellow light on the indusi board turns on, and it will stay on for an amount of time in which your train must reach a speed lower than a certain value called V1, which depends on the train type or rank selected.

INDUSI SYSTEM – 1000Hz and 500Hz influence:

When the time passes, if the current speed is lower than **V1**, the yellow light will turn off and nothing else will happen. If the speed is still greater than **V1**, the emergency brakes will be applied, and you'll have to rearm the system once stopped.

500Hz – This is only encountered when passing over an inductor placed 250m before the next signal which has its inductor active at 2000Hz or when the signal has a speed indication of 30 km/h or less. You will hear a female voice saying: “Warning, 500Hz influence”.

Before you reach this inductor, active at 500Hz, your train speed must be lower than a certain value called **V2**, that depends on the train type or selected rank. If the speed is lower, you'll see a multicolored light flashing rapidly for a few seconds (to the left of the speedometer). If the speed is greater than **V2**, the emergency brakes are applied and you'll have to rearm the system once stopped.

INDUSI SYSTEM – Parameters V1, V2, time to reach speed V1:

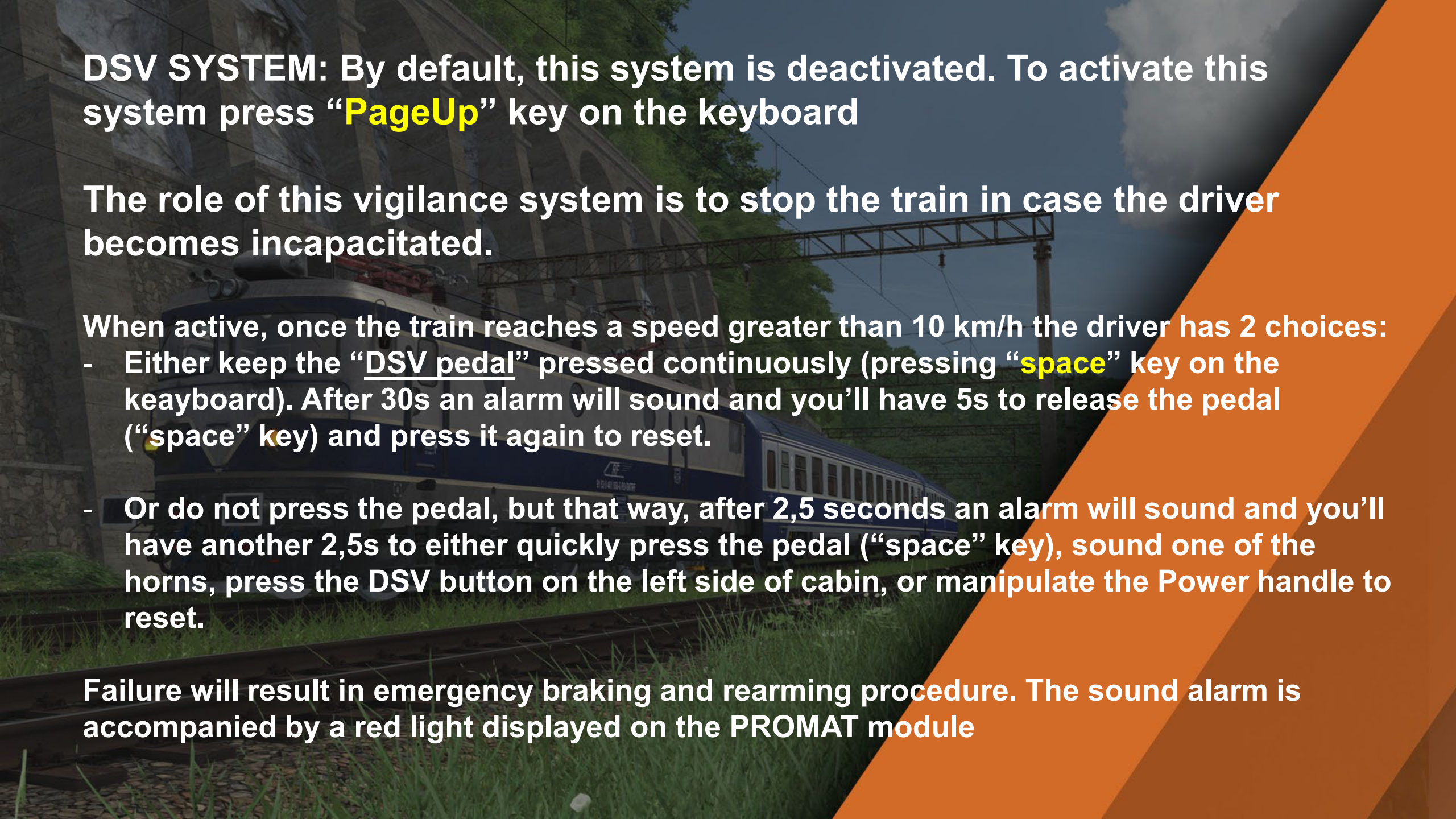
Train type / Rank	V1 (km/h)	Time to reach speed lower than V1 (in sec)	V2 (Km/h)
Freight	50	34	40
Slow passenger	65	26	50
Fast passenger	90	20	65

INDUSI SYSTEM – Rearming (resetting):

If you unfortunately got caught by the INDUSI system, being in an illegal situation and your train has come to a halt with emergency brakes on, here's what you need to do to start over:

- Put the train brake lever into Neutral position “**NEUTRU**”
- Put the controller – power handle into “**0**” position
- Press “INDUSI reset” button or “**End**” key on the keyboard
- Release the brakes (by pushing the train brake lever forward)
- Wait for pressure to build up, and the blue lights of the indusi board to turn back on and then you are good to go.

This procedure is exactly the same in case you get stopped by the DSV system – see next slide.



DSV SYSTEM: By default, this system is deactivated. To activate this system press “**PageUp**” key on the keyboard

The role of this vigilance system is to stop the train in case the driver becomes incapacitated.

When active, once the train reaches a speed greater than 10 km/h the driver has 2 choices:

- Either keep the “DSV pedal” pressed continuously (pressing “**space**” key on the keyboard). After 30s an alarm will sound and you’ll have 5s to release the pedal (“**space**” key) and press it again to reset.
- Or do not press the pedal, but that way, after 2,5 seconds an alarm will sound and you’ll have another 2,5s to either quickly press the pedal (“**space**” key), sound one of the horns, press the DSV button on the left side of cabin, or manipulate the Power handle to reset.

Failure will result in emergency braking and rearming procedure. The sound alarm is accompanied by a red light displayed on the PROMAT module

PASSING THROUGH NEUTRAL ZONE - This is only valid for the Romanian signaling system and routes that have these 2 signals installed:



Zone entry signal



Zone exit signal



PASSING THROUGH NEUTRAL ZONE – ENTERING THE ZONE

WARNING!!! Before passing the zone entry signal, be sure to have the “Circuit Breaker” **disconnected** or all of this components:

- **Ventilation** switched off
- **Compressor** switched off
- **0 Amps** measured current on the engines (best if **Power handle is in 0**)
- **Central beam headlight** switched off (or risk of permanent damage to it)

If the headlights are on, or the cablight is on, but the circuit breaker is still connected, you'll see a short outage caused by the time required to switch to battery.

If the conditions are not met, you'll receive a 60 seconds penalty during which your locomotive will have its power cut off, and you'll have to do the rearming procedure as described in the INDUSI section (this will be removed in V2 of the add-on)

PASSING THROUGH NEUTRAL ZONE – EXITING THE ZONE

Once you pass the “neutral zone exit sign” you may connect the circuit breaker by pressing “Z” key or if it wasn’t disconnected, you may now switch back on the compressor, ventilation, central beam light and manipulate the Power Handle to increase current to the engines.

PLEASE NOTE !!! While the INDUSI and DSV systems are by default deactivated, this Neutral Zone feature is always active, so caution is advised.

The entry signal sends the following parameter to the consist:

“intrare_neutra”

The exit signal sends the following parameter to the consist:

“iesire_neutra”

INPUT MAPPERS

B: Connect battery

N: Activate cab

Home: Activate Indusi

U: Activate DSV

P: Raise pantograph

Shift + P: Lower pantograph

M / Shift + M: Select pantograph

Z: Connect circuit breaker

X: Disconnect circuit breaker

K: Unlock train brake handle

C: Turn on compressor

V: Turn on ventilation

W: Set reverser to forward

S: Set reverser to backward

Home: Activate INDUSI

PageUp: Activate DSV vigilance system

Q: Increase speed control limit

Shift + Q: Decrease speed control limit

E: Unlock amps

A: Increase amps

D: Lower amps

Radio: Hold On/Off button for 4 seconds

L: Toggle headlights

Shift + L: Change headlight mode

Numpad Enter: Activate limitation zone passing helper

Delete: INDUSI 2000hz

PageDown: INDUSI 1000hz

End: INDUSI rearming

Space: Press DSV pedal

A blue and grey electric locomotive is pulling a passenger train through a stone viaduct. The locomotive has the number 21 51 461 030-5 RO-SNTNF on its front. The train is moving along tracks that are part of a large stone structure with multiple arches. The scene is set in a lush, green environment with trees and grass. The sky is blue with some clouds. The text "THE END" is overlaid in white on the locomotive.

THE END