



MARSEILLE TO AVIGNON TGV



1 ROUTE INFORMATION	3
1.1 History.....	3
1.2 The Route.....	4
1.3 Focus Time Period	4
2 GETTING STARTED	5
2.1 Recommended Minimum Hardware Specification	5
3 SNCF TGV DUPLEX	6
4 DRIVING THE SNCF TGV DUPLEX.....	7
4.1 Cab Controls.....	7
4.2 Hotkeys Controls.....	8
5 SIGNALLING	9
5.1 History.....	9
5.2 Automatic Block Signalling	9
5.3 Signal Heads and Aspects	9
5.3.1 <i>Stop Aspects</i>	10
5.3.2 <i>Restricting Aspects</i>	10
5.3.3 <i>Junction Speed Signals</i>	11
5.3.4 <i>Proceed Aspects</i>	12
5.4 Route Direction Indication	12
5.5 Additional Speed Signalling	13
5.6 Fixed Line Speed Changes	14
5.7 Power Related Line Side Signs	14
5.8 Other Line Side Signs	14
6 TVM	16
7 KVB	18
8 POWER MANAGEMENT	20
9 CRUISE CONTROL & VACMA	21
10 SCENARIOS	22
8.1 [TGV] 01. BAL Signalling Tutorial.....	22
8.2 [TGV] 02. TVM430 Signalling Tutorial	22
8.3 [TGV] 03. Avignon to Marseille Saint-Charles	22
8.4 [TGV] 04. Marseille Saint-Charles to Avignon	22
8.5 [TGV] 05. Aix-en-Provence to Marseille Depot	22
8.6 [TGV] 06. Aix-en-Provence to Avignon	22
8.7 [TGV] 07. Avignon to Marseille Saint-Charles	22
11 RAILFAN MODE SCENARIOS	23
11.0 [RailfanMode] Marseille Saint-Charles	23
11.1 [RailfanMode] Aix-en-Provence TGV	23
11.2 [RailfanMode] Gare d'Avignon TGV	23
12 CREDITS	24

1 ROUTE INFORMATION

1.1 History

Construction of the LGV Méditerranée or LGV Med as it is also known, began in 1996. It was designed as a dedicated high speed line that spans over 160 miles to connect the South-East of France to the North. The line extends from the end of the LGV Sud-Est in Valence and travels via Avignon before terminating in Marseille. The route opened in 2001.

The LGV Méditerranée is operated by SNCF with TGV Duplex high speed trains and also with TGV Réseau, TGV Sud-Est, TGV TMST, operating on the 25kV AC catenary system, and are capable of reaching 320 km/h.

Journey times from Paris to the South coast of France are comparable to airlines, with the TGVs now handling a vast majority of all journeys, covering some 750 km (470 miles) in around 3 hours.

The line serves a total of 4 stations 3 of which were newly constructed for the line. These are Gare de Valence TGV, a uniquely built multi-level station allowing easy transfer between the high speed and local services, Gare d'Avignon TGV, made popular by its close proximity to Avignon city centre and Gare d'Aix-en-Provence TGV, popular for allowing easy travel into the north of Marseille and Marseille Airport, which is accessible by a regular bus service from the station. The final station is Marseille-Saint-Charles, a terminus station previously built to serve the surrounding area and the French Riviera. Access to this station is via the classic French main lines.

Due to the undulating nature of the terrain in Southern France, the LGV Méditerranée features many steep inclines and declines, not to mention the impressive number of cuttings, tunnels and viaducts that traverse the landscape, the longest tunnel being over 8 km (5 Miles) long.

The route is equipped with the TVM430 (Transmission Voie-Machine) signalling system, a revolutionary in-cab signalling system designed for operating high speed trains in high capacity. Conventional signalling is not practical for very high speed routes, as drivers have very little time to see and react to what flies past the windscreen. TVM430 displays information in the cab telling the driver what speed he should be travelling at, without the need for conventional track-side equipment.

On the 15th December, 2013 the route was connected to the Spanish High Speed (AVE) Network. This new route is used by the Spanish (RENFE) Series 100 trains, and also the SNCF TGV Duplex, running between Madrid, Barcelona and Marseille, with some stopping at Avignon, Aix-en-Provence and Marseille.

As of the Summer 2015, Eurostar began operating services from London to Marseille via the LGV Méditerranée, the services are currently operated by the classic Class 373 e300.

1.2 The Route

The route reproduces the -65 mile section of the LGV Méditerranée between Avignon TGV and Marseille St-Charles in the South of France as it operates today as a modern high speed line.

There are 4 stations located along its length, 3 of which are stopping stations.



1.3 Focus Time Period

The time period for this Route DLC is based around the present day (2015).

2 GETTING STARTED

2.1 Recommended Minimum Hardware Specification

The Marseille to Avignon route is highly detailed, feature rich and incorporates detailed night lighting. Therefore, it will benefit from a higher PC specification.

- Windows Vista / Windows 7 / Windows 8
- Processor: 2.8 GHz Core 2 Duo (3.2 GHz Core 2 Duo recommended), AMD Athlon MP
- RAM - 2.0GB
- GFX - 512 MB with Pixel Shader 3.0 (AGP PCIe only)
- SFX - Direct X 9.0c compatible

3 SNCF TGV DUPLEX



4 DRIVING THE SNCF TGV DUPLEX

4.1 Cab Controls



- | | | | |
|----|---------------------------|----|-----------------------------------|
| 1 | Emergency Pantograph Down | 2 | Pantograph Controls |
| 3 | Horn (High / Low) | 4 | Acknowledge |
| 5 | Reverser | 6 | Combined Throttle & Dynamic Brake |
| 7 | Headlight Dimmer | 8 | Desk Light |
| 9 | Wiper Control | 10 | Manual Wiper Control |
| 11 | Emergency Brake Plunger | 12 | Independent Brake |
| 13 | Train Brake | 14 | Cab light |
| 15 | Headlights | 16 | Sander |

4.2 Hotkeys Controls

Key Equivalent	Action
T	Load/Unload passengers or freight.
H	Increase Headlight switch
Shift + H	Decrease Headlight switch
Q	Acknowledge button for the KVB
X	Press and hold to activate sander, let go to release.
L	Toggle the Cab light on and off.
I	Toggle the Instrument Light on and off
P	Raise / lower the Pantograph
Space	Horn. Sound the horn's high tone
B	Horn. Sound the horn's low tone
V	Increase windscreen wiper switch
Shift + V	Decrease windscreen wiper switch
/	Handbrake. Toggle the train Handbrake on and off
Ctrl + Shift + C	Couple manually
Y	Increase Cruise-Control target speed
C	Decrease Cruise-Control target speed
Ctrl + D	Toggle the VACMA vigilance system
NumpadEnter	Acknowledge the VACMA alarm
Ctrl + NumpadEnter	Toggle the KVB system
Ctrl + Numpad+	Toggle the TVM system
W / S	Increase / decrease Reverser
A / D	Increase / decrease combined Throttle and Brake
' / ;	Increase / decrease Train brake application
] / [Increase / decrease Locomotive brake application

5 SIGNALLING

5.1 History

Until 1930 railway companies across France had designed and implemented their own bespoke signalling systems. With the advent of the First World War in 1914, many of these networks became interconnected and traffic traversed them as one network. With the many differing signalling systems in operation, the flow was often hindered by misunderstandings resulting in near misses and accidents.

In May 1926, a commission to compose a unified signalling system, directed by *Eugène Verlant* was instigated. Verlant was the Chief Operating Officer of the *Compagnie des chemins de fer de Paris à Lyon et à la Méditerranée (PLM)* between 1919 and 1932. The PLM was a railway company formed in the mid-1800s from the Paris-Lyon and Lyon-Méditerranée companies, with its main line joining Paris, Lyon and Marseille. This new, unified signalling system became known as the *Verlant Code* and was accepted by the Ministry of Engineering on 1st August 1930, with total system conversion being completed by late 1936.

5.2 Automatic Block Signalling

Fixed signal blocks are laid out to a length, which will allow sufficient distance for a train to come to a complete stop in the worst conditions. Two types of automatic block signalling are used on the network. *Bloc automatique à permissivité restreinte (BAPR)* is used where traffic is low and consists of blocks of up to 15km in length.

Bloc Automatique Lumineux (BAL) with a block length of approx. 1500m is used along high traffic lines, such as into Marseille.

5.3 Signal Heads and Aspects

As with most signal systems, the following rules apply...

- A green signal aspect indicates the line ahead is clear to the next block signal.
- A yellow aspect requires the train to be slowed in order to stop at the next signal.
- A red stop aspect is the most restrictive, forcing the train to a complete halt.

It is suggested that you review the in game *Academy* tutorial [TGV] 01. *BAL Signalling Tutorial* in addition to the following documentation to gain a broader understanding of BAL signalling.

Signals are either *Permissive* or *Non-permissive* signals. They are identified by a plate fixed to each signal.

Non-Permissive or *Absolute* Signals are identified by an **Nf** plate attached to them. These will also be accompanied by an *œillette* lamp, which if lit indicates the driver may proceed. If the *œillette* lamp is unlit an absolute stop applies and the signal shall not be passed without express permission from a line controller.

Permissive Signals are identified by an **F** plate attached to them. These signals will not be accompanied by an *œillette* lamp. A single red (*Semaphore*) aspect can be passed by the driver only after stopping and then they may proceed at no faster than 30km/h.

5.3.1 Stop Aspects

There are 4 variants of the stop aspect.

A double red (**Carré**) aspect is the most restrictive and cannot be passed. They will always have an *Nf* plate attached and an œilleton lamp, which will be not display its light. This aspect will commonly control access to sections where train paths will cross.



A single red (**Sémaphore**) aspect displayed can be passed at no more 30km/h only if the œilleton is lit.



A single flashing red (**Feu Rouge Clignotant**) aspect will indicate running on sight at a speed no greater than 15km/h.

A lit stop bar (**Guidon d'arrêt / GA**) indicator on top of a signal is used to force a stop at a signal before starting a shunt or to proceed running on sight, both at no more than 30km/h.

In sidings, a violet light (**Carré Violet**) will be displayed. A single steady violet aspect is equivalent to the *Carré* aspect and used to control access to the mainline.



5.3.2 Restricting Aspects

A single yellow (**Avertissement**) aspect advises the driver to expect to stop at the next signal, which may be presenting any one of the stop aspects laid out above.



Where the distance between signals is shorter than the normal braking distance (as low as 400m) a flashing yellow (**Feu Jaune Clignotant**) aspect will inform the driver of the reduced stopping distance.



This is a **Bande lumineuse jaune horizontale / BJ** and it indicates to the driver that the track they are entering is reduced or shorter in length. This is usually caused by the presence of other vehicles or by the closing of an intermediate signal (protection of a junction, etc.)."

5.3.3 Junction Speed Signals

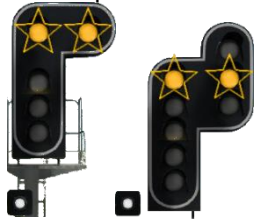
Note: Due to software limitations with how speed changes work with signalling, speed changes apply from the signal head, not from the start of the junction at the V chevron signs as happens on the real-world railway.

Where the next signal controls passage across to a diverging route, the previous signal will pre-warn any speed reduction.

Two horizontal yellow lights (**Ralentissement-30**) indicate the train should proceed no faster than 30kmh past the next signal.



Two flashing horizontal lights (**Ralentissement-60**) indicate the train should proceed no faster than 60kmh past the next signal.



For both of the above, a single flashing lower yellow can be employed where the junction signal is at a reduced braking distance.

The next signal (at the junction) will always be a style G or H reminder signal.

These will reflect the above (style E/F) aspects but on style G/H head where the yellow lights will be vertical rather than horizontal.

Two vertical yellow lights (**Rappel-30**) indicate the train should proceed no faster than 30kmh over the junction.

Two flashing vertical lights (**Rappel-60**) indicate the train should proceed no faster than 60kmh over the junction.



Where the route crosses a series of junction signals, both the horizontal and vertical aspects will not be shown together. Only the vertical aspect reminding the next junction speed will be shown, with the horizontal lights being replaced by one solid single light at the bottom of the head.



5.3.4 Proceed Aspects

A single green (**Feu Vert**) aspect indicates a proceed, line clear aspect.



A flashing green (**Feu Vert Clignotant**) aspect can be used for trains capable of travelling at faster than 160kmh. This aspect indicates that the train should reduce below 160kmh before the next signal.

In sidings, a white light (**Feu Blanc**) is used in place of the green lamp to indicate proceed at reduced speed, keeping to below 30kmh over points. This can be used to release a train onto the main line.



A single flashing white light (**Feu Blanc Clignotant**) in sidings indicate proceed for shunting over a short distance. This does not allow a train out on to the main line.



5.4 Route Direction Indication

When a train is routed onto a diverging line a Direction Indicator on top of the signal head will show which way the train will be going. On the French railways these indicators work geographically rather than:



No lights indicating no route is available to traffic.

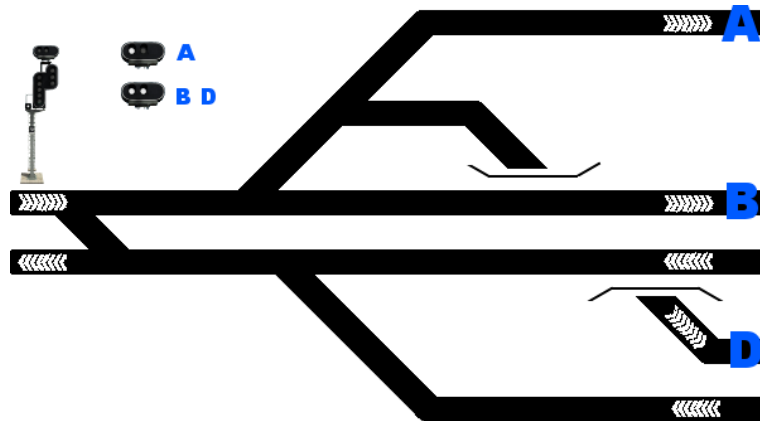


1 light indicating the active route is geographically to the left of the current route.



2 lights indicating the active route is geographically not left of the current route.

The following diagram describes their operation further when approaching from left to right.



Route **A** goes geographically to the left and so only one light will show

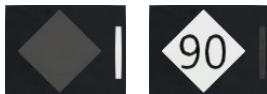
Route **B** goes straight ahead – but not left so will display two lights

Route **D** ultimately heads right and so displays two lights. Even though it initially goes left it is its ultimate direction that determines the number of lights.

5.5 Additional Speed Signalling

With the signal heads only being able to show a junction line speed of 30km/h or 60km/h, different speeds are indicated by a set of indicators above the signal head.

To forewarn of an oncoming speed change a TIV-D indicator is used.



If the open route is unaffected by any speed change then a white bar will be displayed down the right side and the main display will be off.

If however a diverging route is set the relevant speed will be displayed and the white bar extinguished.

The TIV-D forewarns of a speed change further up the line. The signal marking the junction with the speed change will have a TIV-R indicator above its head.



This will show the speed in kilometres per hour for the diverging route in numbers, or a solid white bar in the middle indicating line speed. If nothing is displayed then the speed will be indicated by the signal (30km/h or 60km/h)



The point of execution for a speed limit would apply from the chevron or Z sign.

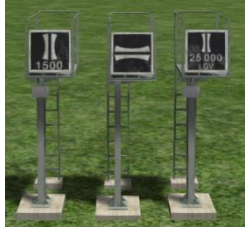
Note that due to implementation limitations within the software the actual location of the speed change will be at the previous signal.

5.6 Fixed Line Speed Changes

Where a line speed changes to a different fixed speed, the location will be prewarned with a diamond board and marked with a square TIV board displaying the speed in km/h.



5.7 Power Related Line Side Signs



Power Changeover signs depicting the point at which the pantographs should be fully raised for the correct power supply (1500V for the domestic lines out of Marseille, 25,000V for the LGV line towards Paris). Prepare to raise pantograph when passing the upcoming 'REV' board.

The middle sign advises that power changeover should begin with the un-required pantograph being dropped.

Neutral Power Section boards are provided beside the tracks warning from 1km.



The second sign advises of the start of a neutral power section.

The third sign denotes the end of the neutral power section.

5.8 Other Line Side Signs

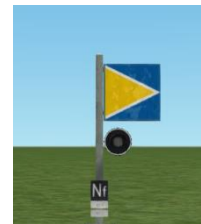


Where a signal may be hard to see due to lineside restrictions such as geography, structures, etc. countdown boards every 100m may be provided at certain locations.

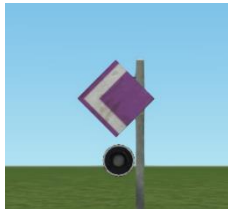
6 TVM

TVM (translated as track-to-train transmission) is a fixed block continuous transmission in cab signalling system for the French high speed TGV project.

Running on dedicated lines at speeds of 300km/h and faster, it is difficult for a driver to accurately see, process and act upon traditional line side signals with sufficient clarity. Instead, signal information is transmitted directly to the train's control panel allowing the driver to operate the train more safely within sufficient time. Activate in-game with CTRL Numpad +, acknowledge the command with Numpad +.



The line is split into blocks of approximately 1,500 metres (roughly 1 mile) with the block boundaries being marked by a blue board with a yellow arrow. Refer to **5.3 Signal Heads and Aspects** for the difference between F and Nf signals.



Junction signals are marked by a diamond shaped mauve board with a white arrow.

If a train enters a block which is already occupied, their speed will be limited to 30km/h, with speeds of 35km/h or greater causing an emergency brake application until the train is brought to a halt. An enforced speed limit between 35km/h and 170km/h has an allowed overspeed of up to 10km/h. With speed limits greater than 170km/h having a 15km/h overspeed allowance before the emergency brake is activated.

The target speeds for the current and subsequent block are displayed to the driver on the control panel by way of a colour coded numbering system.

- Full line speed is indicated by black boarded numerals on a green background. This is the current absolute maximum speed of TVM.



- Warning for an upcoming slower speed, adjust speed accordingly. Indicated by black numbers on white diamond background.



- Slower aspects are shown in white numerals on a black background. This limit is an execution speed that must not be exceeded.



- Warning for upcoming stop aspect. Black text on red diamond background.



- Full stop aspects are given on a red background. Do not pass.



If the subsequent block is slower than the current, the warning speed display will flash.

TVM Speed Chart

Line Speed	Warning Speed	Execute Speed

7 KVB

The KVB system ensures the train speed does not exceed the current line speed or pass a danger signal. It can control deceleration, execution speeds and crossing of non-permissive (Nf plated) stop signals. Activate in-game with CTRL Numpad Enter.



The orange display shows control information regarding warning speeds, while the green display shows signal or line speed information.



Active Cruise Control, the maximum authorized speed is greater than 160 km / h. This indication is made only crossing of a green signal.



Distant signal control (target speed = 160 km / h).



Speed control at 160 km / h. This indication is only for trains capable of traveling at a speed greater than 160 km / h.



Active Cruise Control, the maximum allowed speed is less than or equal to 160 km / h.



Temporary speed restriction announcement.



Temporary speed restriction commencement.

Stop

signal



announcement,
approach at 30 km / h.



Stop signal announcement approach speed of 10 km/h

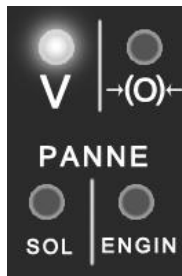


Speed control at 30 km / h (on sight).

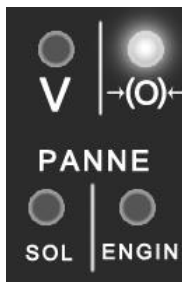


Emergency brake application.

Alerts are displayed to the driver using the lights on the middle section of the upper panel of the in cab display unit.



Speed exceeds current enforced speed by 5km/ h.



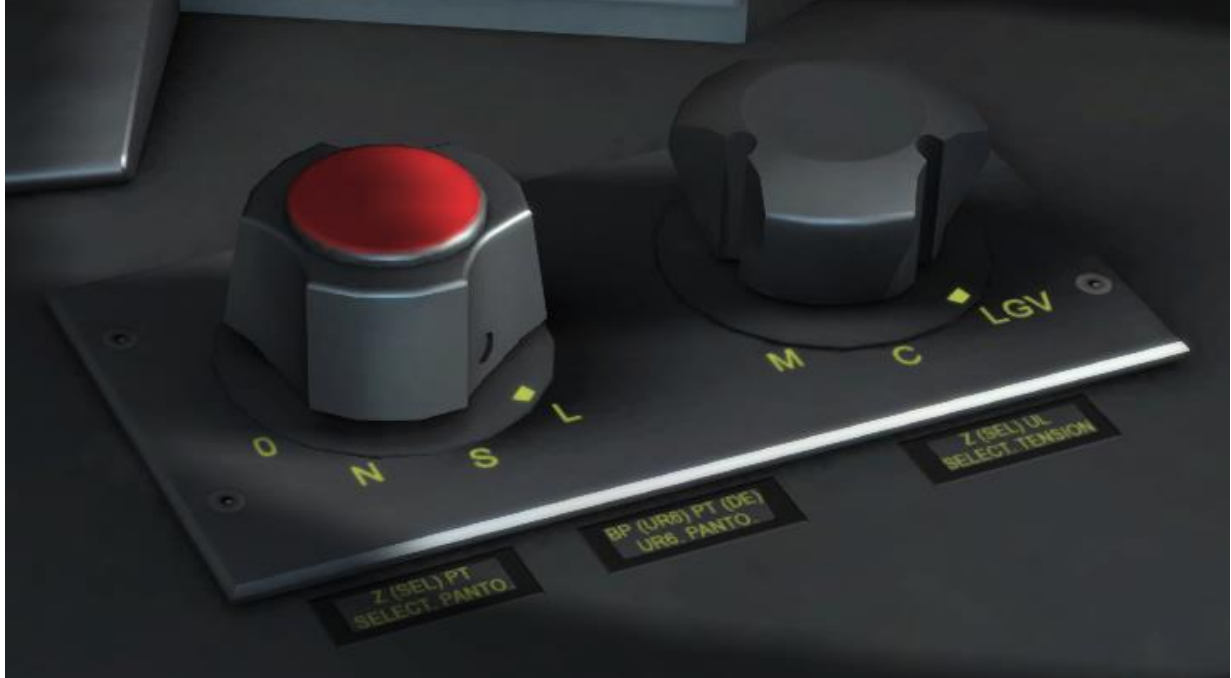
Computer has triggered automatic emergency braking.

For a signal at danger or warning, an audible horn will sound in the cabin. The orange light on the KVB display panel will also flash. The driver must acknowledge the non-clear aspect by pressing the yellow button on the control desk (Q) to stop the flashing. A steady lamp will then display until the next clear aspect is signalled. If not acknowledged within 5 seconds an emergency brake application will be made.

If another non-clear aspect is passed consecutively there is an automatically enforced 30km/h limit regardless of the line or signal speed. This will give any traffic in front time to clear the next block. This is also cleared when passing a clear signal.

8 POWER MANAGEMENT

The TGV can operate under two different power voltages within Marseille to Avignon. When switching between these points the pantograph needs to be set to the appropriate voltage in order to take power from the line.



The red dial controls the selection of the pantographs

- 0 – Lower all pantographs.
- N – Select rear pantograph.
- S or L – Select front pantograph.

The black dial controls the voltage by raising the pantograph to a set height

M – Raises selected pantograph on the rear unit for 25Kv power mode. The pantograph is not raised to its maximum extension.

C – Raises selected pantograph on both the front and rear units for 1500V power mode. The pantograph is not raised to its maximum extension.

LGV – Raises selected pantograph on the rear unit for 25Kv power mode. The pantograph is raised to its limited extension of 5.08m.

9 CRUISE CONTROL & VACMA

Vitesse imposée (Cruise Control)

To help maintain speed the TGV is fitted with a cruise control system. This allows the driver to select a speed and let the train automatically accelerate and maintain it.

The speed is incremented in 10kph notches that is increased by pressing the Y key and decreased by pressing the C key. If throttle power is applied and the brakes are released the train will begin to match the set speed.

VACMA

VACMA acts as a vigilance system used to check the driver is present and aware when driving a locomotive. When the player is travelling above 8km/h an alarm will sound every sixty seconds if no input control is detected. This must be acknowledged within five seconds or an emergency brake application will be applied.

To toggle the system, use the hotkey CTRL + D. To acknowledge the warning, press the hotkey Numpad-Enter.

10 SCENARIOS

****For driving tutorials, please visit the Academy from the main TS2016 menu screen****

8.1 [TGV] 01. BAL Signalling Tutorial

Learn how to read the BAL (Bloc Automatique Lumineux) Signalling System.

Duration: 10 Minutes
Difficulty: Very Easy
Type: Tutorial

8.2 [TGV] 02. TVM430 Signalling Tutorial

Learn how use the TVM430 signalling system.

Duration: 5 Minutes
Difficulty: Easy
Type: Tutorial

8.3 [TGV] 03. Avignon to Marseille Saint-Charles

Drive an express passenger service from Avignon to Marseille Saint-Charles.

Duration: 25 Minutes
Difficulty: Easy
Type: Career

8.4 [TGV] 04. Marseille Saint-Charles to Avignon

Drive a high-speed TGV service from Marseille to Avignon.

Duration: 30 Minutes
Difficulty: Easy
Type: Career

8.5 [TGV] 05. Aix-en-Provence to Marseille Depot

TGV 206 is part way through its final service of the day from Avignon to Marseille. Take over at Aix-en-Provence where passengers are waiting to board. You'll need to leave this train at Marseille Saint-Charles overnight.

Duration: 20 Minutes
Difficulty: Medium
Type: Career

8.6 [TGV] 06. Aix-en-Provence to Avignon

A forerunning broken TGV service disrupts the routine express passenger run.

Duration: 20 Minutes
Difficulty: Medium
Type: Career

8.7 [TGV] 07. Avignon to Marseille Saint-Charles

Drive a high-speed express passenger service from Avignon TGV to Marseille Saint-Charles.

Duration: 30 Minutes
Difficulty: Easy
Type: Career

11 RAILFAN MODE SCENARIOS

Railfan Mode provides a unique chance to observe and enjoy the operations of trains without the pressure and involvement of driving them. Railfan Mode scenarios are positioned at various key points along the route and provide camera functionality to sit back and watch the action unfold.

These scenarios are located on the Drive screen under the Career tab.

11.0 [RailfanMode] Marseille Saint-Charles

Duration: 5 Minutes

11.1 [RailfanMode] Aix-en-Provence TGV

Duration: 5 Minutes

11.2 [RailfanMode] Gare d'Avignon TGV

Duration: 5 Minutes

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