



Ferrari North America

Technical Information

Date: May 2019
Bulletin #: 2553
Campaign #:
Supersedes:
Section: 7

Model Type: GTC4Lusso/LussoT, Portofino, 812Superfast
Subject: Calibration procedure for ADAS systems

Please find enclosed the correct calibration procedures for ADAS systems. The operations described as follows must only be performed after checking that the suspension setup and wheel alignment of the vehicle are as indicated in the workshop manual.

- IMPORTANT -

ADAS systems play a fundamental role in vehicle safety. It is therefore imperative that the calibration procedure is carried out exactly in accordance with the instructions given in this Technical Information.

The procedure consists of two stages: initial static calibration at the dealership, followed by a dynamic calibration test drive (at least 40 km to calibrate the radar system and at least 30 km to calibrate the camera system) to allow the systems involved to complete the respective self-acquisition and compensation routines. To ensure that the aforementioned routines are completed successfully:

- 1) Include a combination of city and highway driving in the test drive route (e.g., choose main roads, city roads and high speed roads such as divided highways, and avoid backroads with little traffic and without proper signage), ensuring that:
 - the systems have adequate opportunity to detect normal road traffic (other vehicles) and static objects by the roadside;
 - the route includes clearly identifiable horizontal and vertical signage, and clearly visible lane markings.
- 2) Drive moderately (i.e. avoid 'sporty' driving behavior, such as drifting and oversteering), without sudden acceleration. Try to remain in the center of the lane as much as possible.

At the end of the test drive, the calibration parameters must be printed out and evaluated for final approval of the vehicle.

The Authorized Ferrari Dealer is responsible for ensuring that the ADAS system calibration routines are carried out correctly, and must follow the procedures indicated by the manufacturer, using the proper equipment and tools.



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The following conditions must be met to ensure that the ADAS system calibration procedure is successful:

- The vehicle must be in proper running condition, with no passengers on board, with a full fuel tank and with all other fluids filled to the correct levels.
- The vehicle must be aligned correctly with the calibration kit;
- The front lid must remain closed throughout the calibration procedure;
- The floor in the area used for calibration must be perfectly level. The most ideal surface is continuous linoleum flooring with no joints/breaks.
- The target panel of the calibration kit must be fully lit;
- Do not use lamps which could glare the camera mounted on the windshield (HALF);
- Ensure that the area in which calibration is carried out is sufficiently illuminated (recommended light levels: 350 to 450 lux);
- Remove all dirt or any other foreign matter from the windscreen before starting calibration (HALF);
- There must be no obstacles (vehicles, large tools, etc.) in the vicinity of the vehicle and the calibration kit.

- IMPORTANT -

All the screenshots relative to DEIS cycles contained in this Technical Information were accurate at the time of compilation. However, as the DEIS software is subject to upgrades, certain images or procedures may not appear as shown.

Radar calibration procedure (DASM)

The calibration procedure is necessary in any of the following cases (note that none of the operations described may modify the characteristics of the vehicle declared by the manufacturer):

- Removal or replacement of front bumper or bumper grill;
- Repair on suspension/adjustment of suspension setup;
- If the relative warning lamp illuminates;
- Replacement of the radar.



- IMPORTANT -

The following is necessary when replacing the radar with a new unit:

- Update the DASM with the latest SW version available for the type of vehicle on which the radar is installed.
- Perform the cycle “NBC Proxy Alignment” with the DEIS diagnostic tool.

If the new radar unit received from the spare parts department is not pre-programmed, and the relative SW activities are not available on the DEIS server, contact the Ferrari Help Desk (technicalsupport_FNA@ferrari.com) for assistance with updating the unit.

Centering the vehicle correctly with the calibration kit

- Remove the section of front grill covering the front radar, undoing the fasteners indicated by the yellow arrows. Also remove the plastic cover to allow access to the radar adjustment screw (1) - Fig.1.

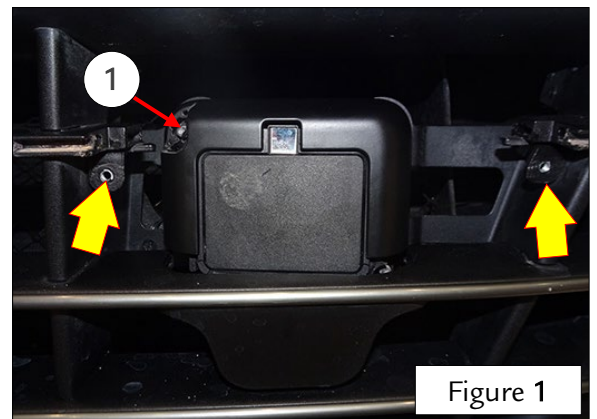


Figure 1

- Move the vehicle to your designated area for the calibration procedure – Fig.2.

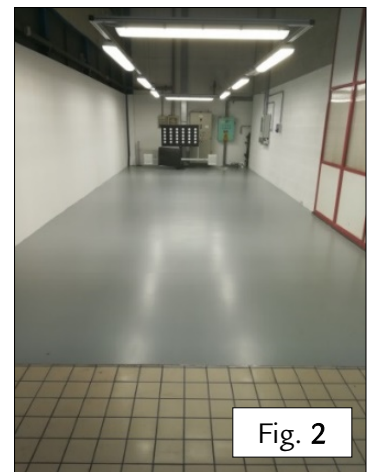
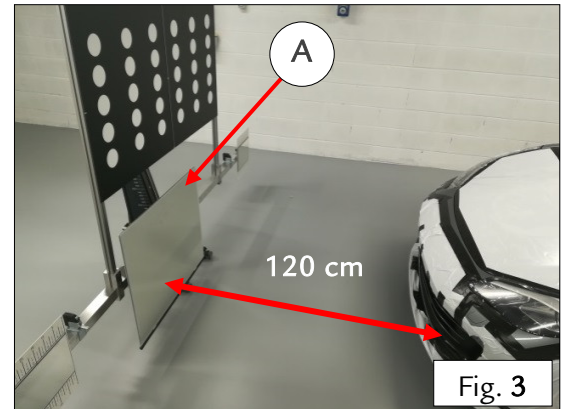


Fig. 2

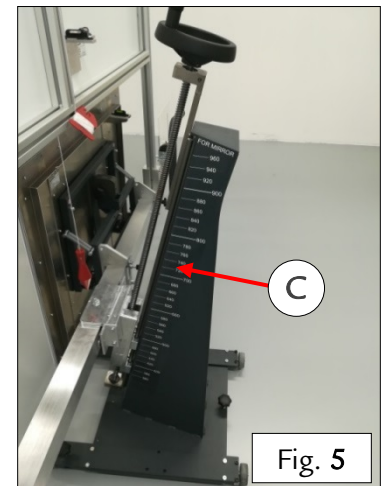
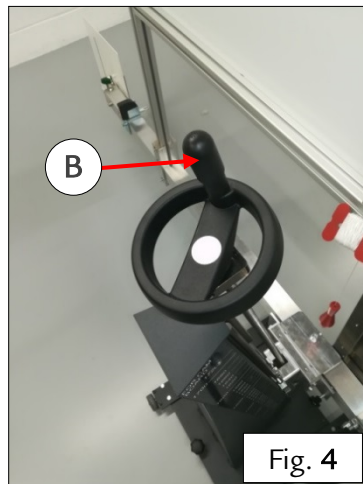


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- Place the calibration tool with the center mirror (A) facing towards the vehicle in position 2 (perfectly vertical). Ensure that there is a distance of **120 cm (+/- 5cm)** between the radar unit installed in the front bumper and the mirror – Fig. 3.



- Use the adjuster wheel (B, Fig.4) to set the height of the mirror, referring to the scale (C, Fig.5) on the side marked “For Mirror”. Adjust the position so that the centers of the radar unit and mirror are perfectly aligned.



- Fit the “Multi-quick” mounting brackets onto the rear wheels as follows:
 1. The knobs (1) and (2) are adjustable to fit the diameter of the wheel; make sure that they are set to **20”**. Fit the hooks of the mounting bracket in place on the wheel, so that they grip against the outer edge of the wheel. Ensure the spokes do not impede mounting (Fig.6). Tighten the knobs of the hooks in the order: (1) - (2) to fasten them in position. Leave the other knob (5) loosened (Fig.7).



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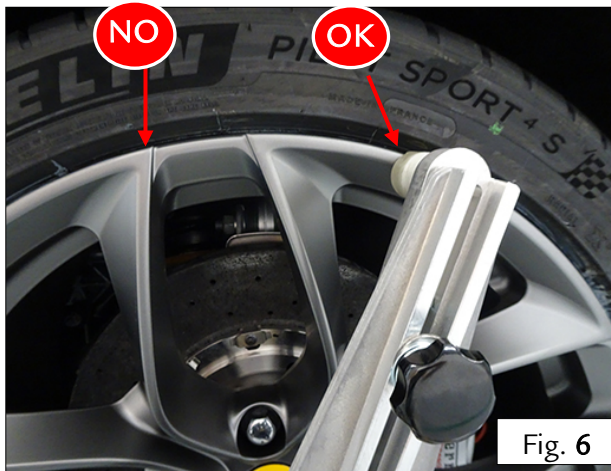


Fig. 6

2. Use the levers (3) and (4) to fasten the clamps into the first longitudinal groove of the tire tread. (Fig. 7).

Note: As the number and size of longitudinal grooves vary depending on the type (winter or all-season) and manufacturer of the tire, adjust the right and left hand clamps to the same length and with the tension necessary to hold the two levers in a correctly aligned position once the mounting bracket is fitted (Fig.7).

3. Now tighten the knob of the remaining hook (5) (Fig.7).

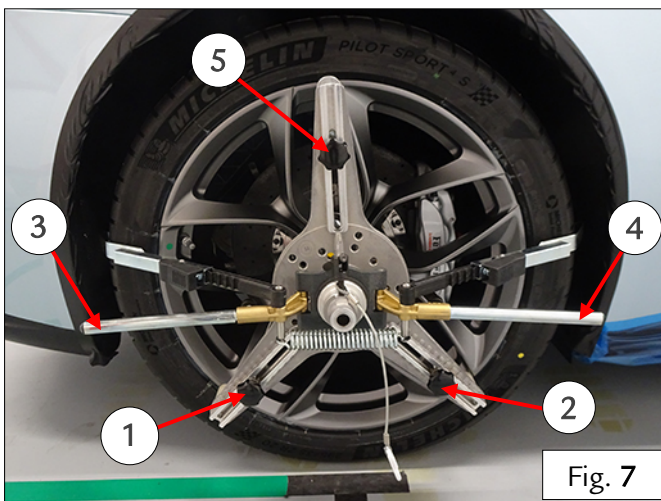


Fig. 7

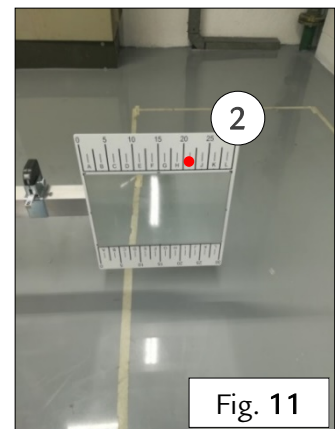
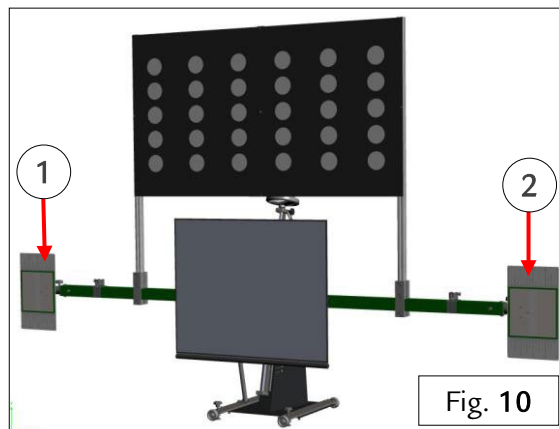
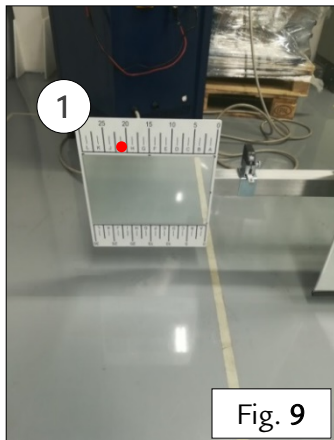


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- Fit the lasers onto the rear “Multi-quick” mounting brackets and switch them on – Fig.8.



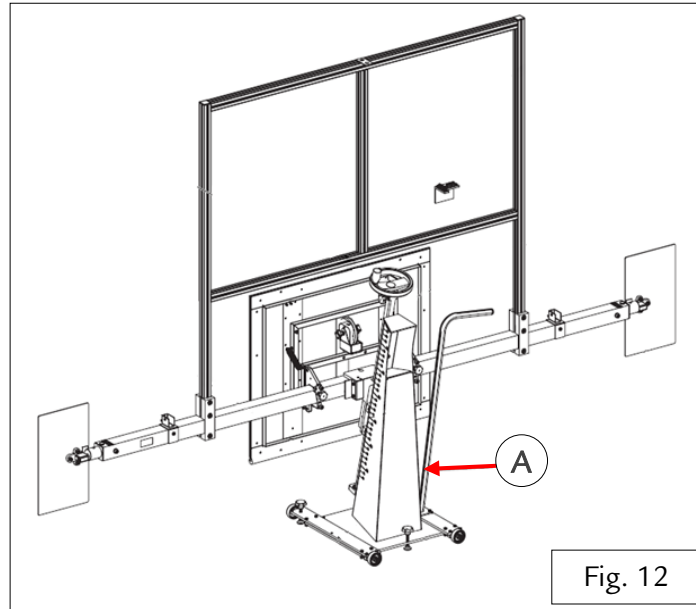
- The beams produced by the lasers on the rear wheels must strike the target panels (1) and (2). Check that the laser dot hits the same coordinates on both target panels – Fig. 9, 10 and 11.



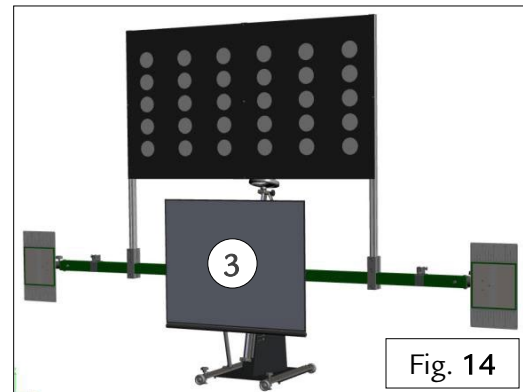
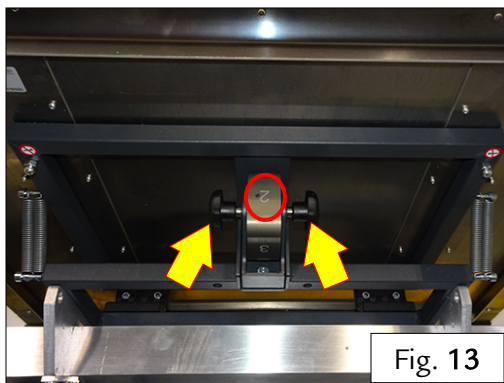


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- To align as precisely as possible, use the handle (A) to shift the entire structure sideways in slow, small increments – Fig.12.



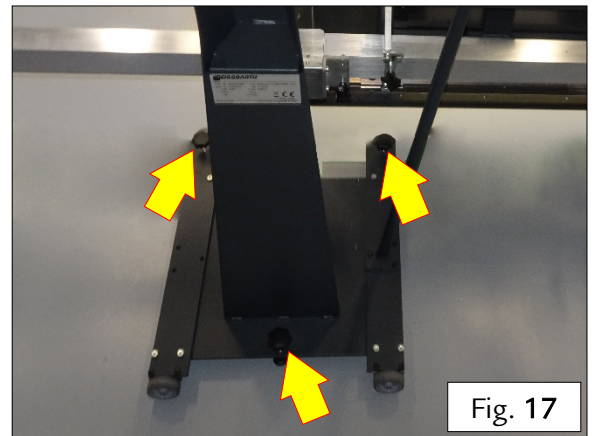
- Use the adjustment knobs to set the front mirror (3) of the equipment into position 2 (perfectly vertical) – Fig. 13 and 14.



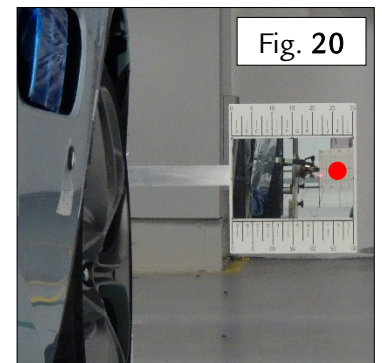
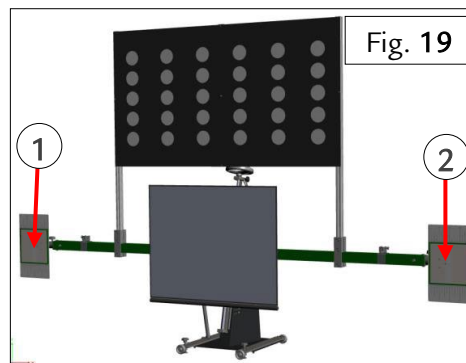
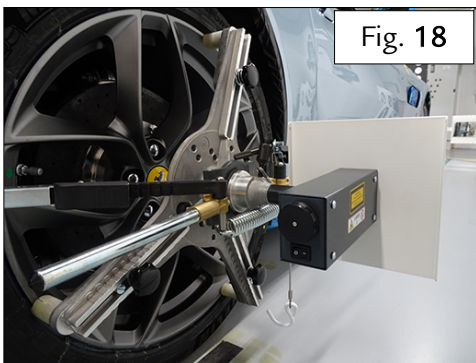


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- To ensure that the stand is levelled precisely, use the three adjustment knobs at the base of the structure (Fig. 17), referring to the three levels (one on the mirror and two on the board). It is particularly important that the level on the mirror is perfectly level – Fig. 15, 16.



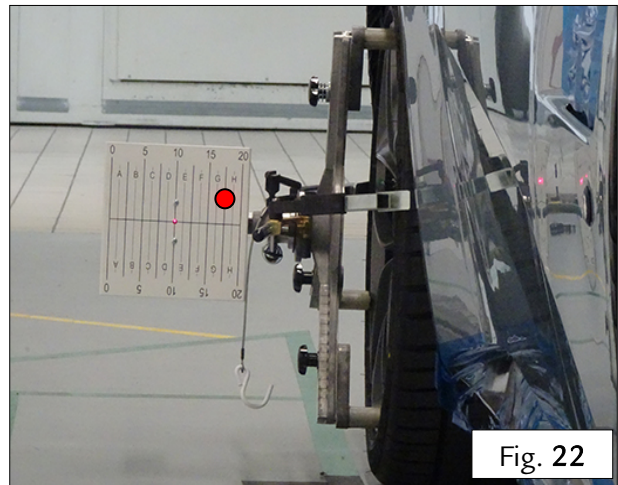
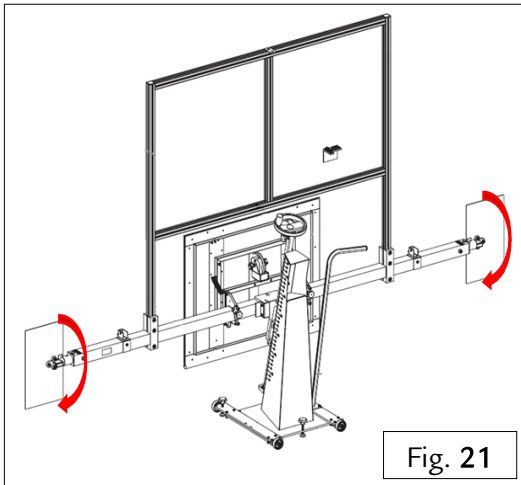
- Now check the horizontal alignment of the structure with the vehicle again, checking that the two laser beams still strike the target panels at the same coordinates as before. Before continuing to the next step in the procedure, make sure that the structure is perfectly level (referring to the mounted levels) and aligned correctly horizontally.
- Adjust the inclination of the two lasers on the rear wheels (Fig. 18) so that the beams strike the mirrors (1) and (2) to the sides of the structure – Fig.19 and 20.



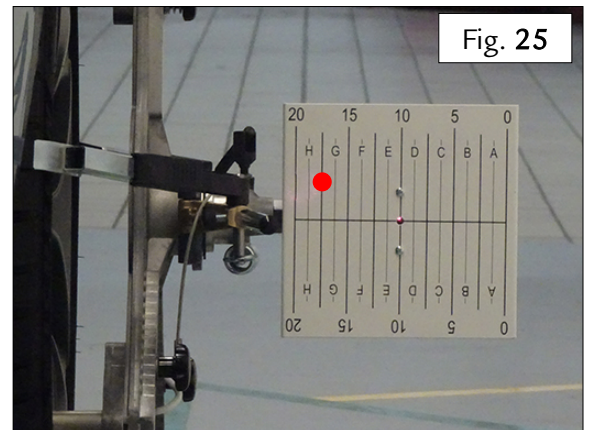
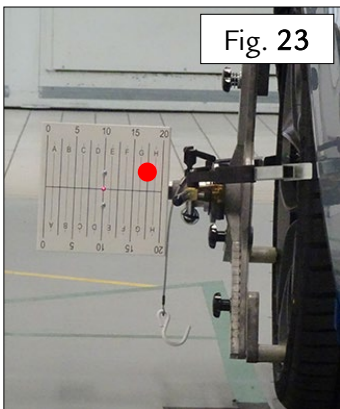


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- Now adjust the inclination of the mirrors manually so that the reflected laser dots strike the target panels mounted on the rear wheels – Fig. 21, 22.



- Set the adjustment knobs indicated (Fig. 24) so that the laser dots strike the same coordinates on both of the target panels mounted on the rear wheels – Fig.23, 25.



- The equipment is now set up correctly and the calibration procedure for the **DASM** radar may begin.



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Calibrating the front radar (DASM)

- IMPORTANT -

Adjusting the mirror in any of the three axes will cause the structure to shake. After each adjustment, wait until the structure has settled completely before carrying out the next step in the calibration procedure prompted by the DEIS. If this precaution is not observed, it is highly likely that the calibration procedure will be unsuccessful.

- IMPORTANT -

The procedure consists of two stages: initial calibration in the shop, followed by a dynamic calibration test drive (at least 40 km) with the Adaptive Cruise Control system active, to allow the system to complete the necessary self-acquisition and compensation routine. To ensure that the aforementioned routine is completed successfully:

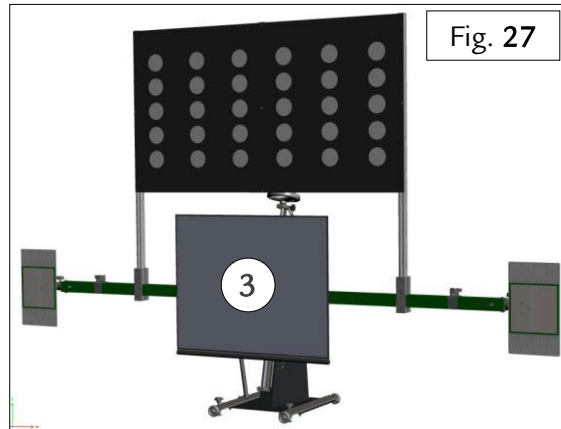
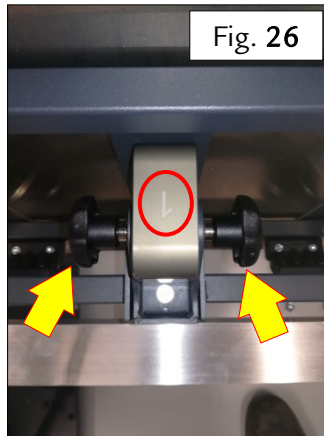
- 1) Include a combination of city and highway driving in the test route (e.g.: choose main roads, city roads and high speed roads such as divided highways, and avoid side streets with little traffic and without proper signage), ensuring that:
 - the radar has adequate opportunity to detect normal road traffic (other vehicles) and static objects by the roadside;
 - the route includes clearly identifiable horizontal and vertical signage.
- 2) Drive moderately (i.e. avoid 'sporty' driving behavior, such as drifting and oversteering), without sudden acceleration. Try to remain in the center of the lane as much as possible.

At the end of the test drive, the calibration parameters must be printed out and evaluated for final approval of the vehicle.



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- Adjust the front mirror (3) to position 1 and wait for the structure to stabilize – Fig. 26 & 27



Connect the battery conditioner to the vehicle, ensuring that it is working properly, and then connect the DEIS diagnostic tool to the OBD port of the vehicle

- Switch on the instrument panel, perform the SCAN IN procedure, cycle the ignition off and on again and cancel all errors.
- Check that there are no active DTC error codes related to DASM radar faults. In the case of any DTC error codes relative to calibration errors, continue with the cycle. With any other DTC error codes, contact the Ferrari Help Desk.

- IMPORTANT -

DTC error codes are generated when the radar is replaced with a new unit. In the case of maintenance of the DASM (removing/refitting the same radar unit, disconnecting and reconnecting the connector etc.), no DTC error codes are generated but the calibration procedure is still necessary.

- Switch on the instrument panel and perform the DEIS cycle: “**DASM COMPLETE TEST**”.
- The tester requests a key OFF/key ON cycle to check for any new errors in the system.
- A password must be obtained from the Help Desk to enable access to the cycle.



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- Follow the instructions displayed by the DEIS, which prompts the user to set the mirror adjustment to position 2. Wait 30 seconds to let the mirror stabilize, and then carry out the cycle “DASM COMPLETE TEST”.
- Follow the instructions displayed by the DEIS, which prompts the user to set the mirror adjustment to position 3. Wait 30 seconds to let the mirror stabilize, and then carry out the cycle “DASM COMPLETE TEST”.
- Once the cycle is complete, the DEIS informs the user of the adjustments necessary to calibrate the radar correctly – Fig.28.

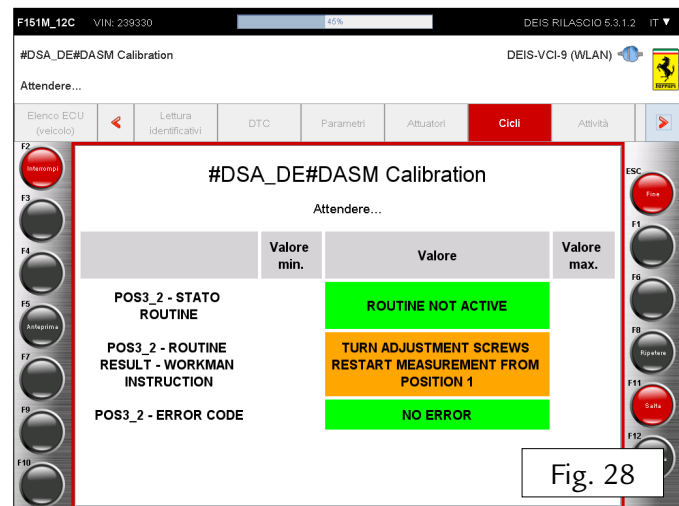


Fig. 28

- The radar is adjusted with two screws, which must be turned in the direction ('Left' or Right') and by the number of turns indicated by the diagnostic tool – Fig 29.

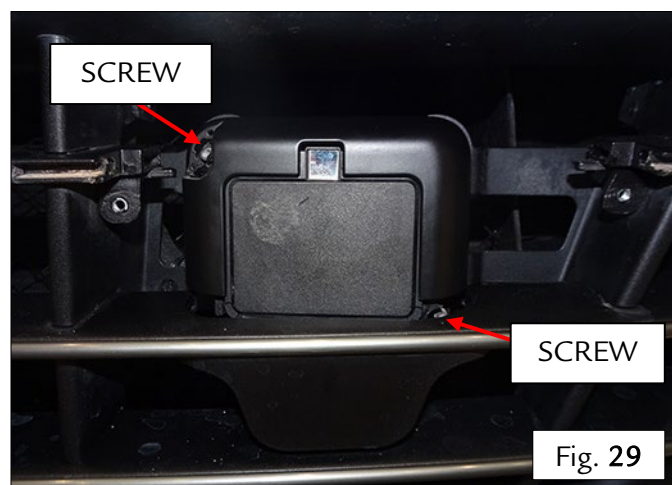


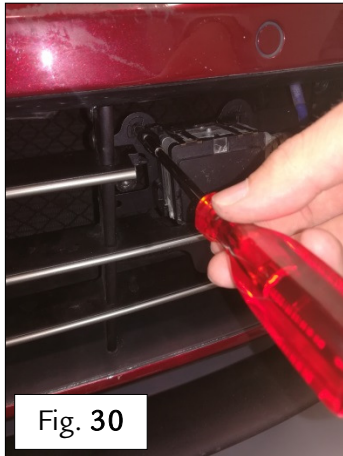
Fig. 29



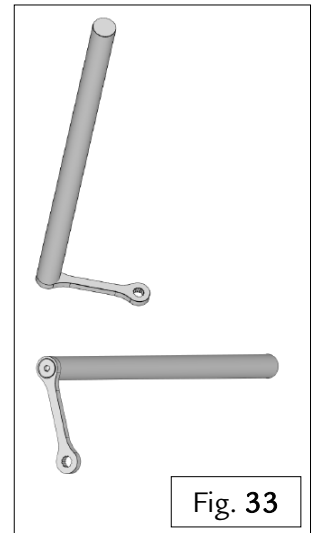
- IMPORTANT -

The tools necessary to adjust the aforementioned screws are a commercially available 3.5 mm hex head screwdriver (Fig. 30 and 31) and the ADAS RADAR ADJUSTMENT WRENCH. P/N 95978848 (Fig. 32 and 33), orderable from the Ferrari Spare Parts Department.

Screw #1 -
Passenger side



Screw #2 -
Driver side



- After adjusting the radar, refit the section of front grille covering the radar, fastening the indicated fasteners - Fig.34.

Note: refit the section of grill very carefully to avoid altering the settings made.





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- In the following screenshot, given as an example, the user is prompted to turn screw 2 to the right by one complete turn (1.00) using the specific **ADAS RADAR ADJUSTMENT WRENCH ADAS (P/N 95978848)** – Fig. 35.

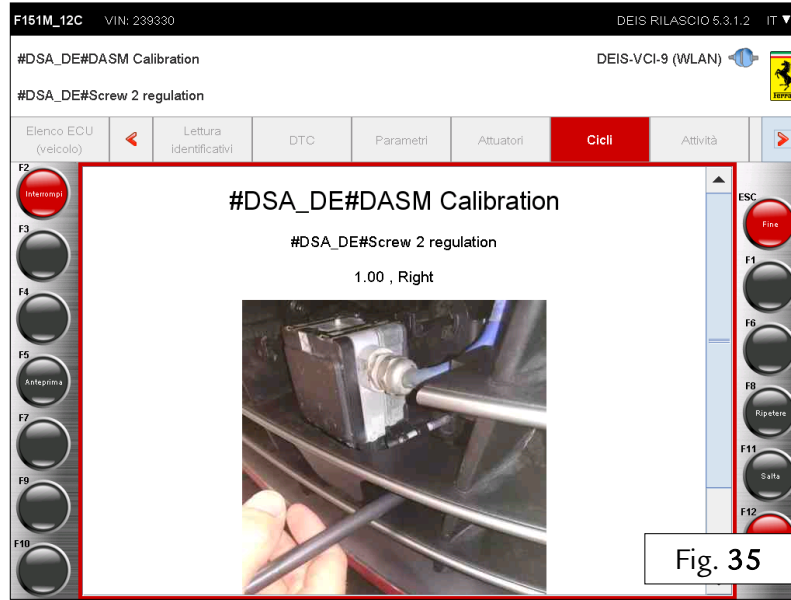


Fig. 35

- Once the requested adjustments have been made, the routine restarts automatically from the beginning to check the calibration again.
- If the calibration cycle has been completed successfully, no other adjustments are necessary. – Fig. 36.

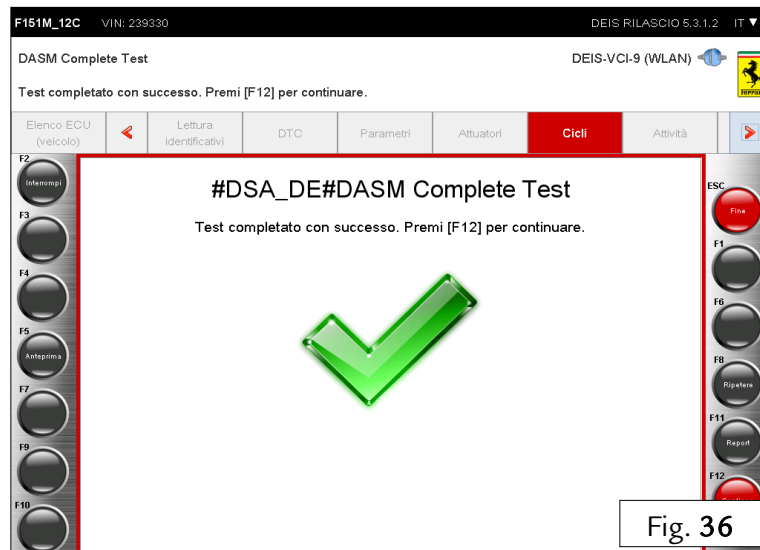


Fig. 36



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Results analysis – cycle results print-out

- Once the cycle is complete, open the automatically generated results printout – Fig. 37.

Parametri/errori		Data di stampa	
FERRARI TRAINING CENTER		Ora	27.12.2018
		Codice dealer	095638
		Versione	5.3.1.2
Italia	VIN	ZFF82WNB000239330	
	Modello	F151M_12C	
	Nome	GTC4Lusso	
	Odometro	1509 km	

#DSA DE#DASM COMPLETE TEST	2018-12-27T07:23:16.435-07:00	OK
Identificazione		
ID MODULO	1	
NUMERO DI SERIE TESTER	8F54639C	
DATA PROGRAMMAZIONE	18-10-23	
PART NUMBER COSTRUTTORE VEICOLO	782500	
FORNITORE SISTEMA ECU NUMERO HARDWARE	MRR1evo14F	
FORNITORE SISTEMA ECU NUMERO VERSIONE HARDWARE	00	
FORNITORE SISTEMA ECU NUMERO SOFTWARE	R_05_00_IF	
FORNITORE SISTEMA ECU NUMERO VERSIONE SOFTWARE	0503	
EXHAUST REGULATION TYPE APPROVAL NUMBER		
ISO CODE	9208019707	
Cancellazione DTC		
CANCELLAZIONE DTC	2018-12-27T07:23:20.295-07:00	OK
Ciclo chiave		
1 - CHIAVE OFF	2018-12-27T07:24:29.201-07:00	OK
2 - ACCENSIONE ON		OK
#DSA DE#DASM Calibration		
Password	2018-12-27T07:26:48.779-07:00	OK
	XX XX XX DA 97	OK

Fig. 37

- The values highlighted in the red square in Fig. 38 are particularly important for the performance of the radar. These values must be as close to zero (0.0) as possible. The closer these values are to zero, the more precisely the equipment is aligned with the rear axle.

2 - HORIZONTAL DEVIATION	-0.3	0.008	0.3	°	OK	
2 - VERTICAL DEVIATION	-0.3	-0.038	0.3	°	OK	
Elenco DTC						
[DASM - Driver Assistance System Module (V1)] NESSUN DTC MEMORIZZATO. []					2018-12-28T03:26:12.654-07:00	OK

Fig. 38

- After completing the radar calibration cycle, refit all parts to restore the definitive configuration of the vehicle (e.g. fit the section of bumper grill in front of the radar) and remove the “Multi-Quick” mounting brackets from the rear wheels.
- Test drive the vehicle (for at least 40 km) with the **Adaptive Cruise Control system active**, to allow the system to complete the necessary self-learn and compensation routine. Include a combination of city and highway roads in the test drive route (e.g.: choose main roads, city roads and high speed roads such as divided highways, and avoid side streets with little traffic and without proper signage), ensuring that:
 - the radar has adequate opportunity to detect normal road traffic (other vehicles) and static objects by the roadside;



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- The route includes clearly identifiable horizontal and vertical signage.

Drive CALMLY (i.e. avoid 'sporty' driving behavior, such as drifting and oversteering), without sudden acceleration. Try to remain in the center of the lane as much as possible.

- Once the vehicle returns to the shop, print out the **DASM** radar parameters from the DEIS.
- An example of the main parameters print-out, generated immediately after the self-calibration dynamic test drive, is given below (Fig. 39).

PARAMETER PRINT-OUT GENERATED AFTER TEST DRIVE

DASM_01	FerDN: 782500	HWn: MRR1evo14F	HWv: 00	SWn: R_05_00_IF	SWv: 0503
FAST MISALIGNMENT ANGLE			0.4626		
SLOW MISALIGNMENT ANGLE			0.4626		

Fig. 39

- Note that the longer the distance driven during the combined test route, the more precisely the parameters FAST MISALIGNMENT ANGLE and SLOW MISALIGNMENT ANGLE will be calculated by the calibration process. The more precise these parameters, the more accurately the system will be able to compensate for the physical misalignment of the radar.

After test drive:

➤ **RADAR ALIGNMENT OK.**

If the FAST MISALIGNMENT ANGLE and SLOW MISALIGNMENT ANGLE values are within the range between - 0.5° and +0.5°, the alignment procedure has been successful.

➤ **REVIEW CALIBRATION PROCESS.**

If the FAST MISALIGNMENT ANGLE and SLOW MISALIGNMENT ANGLE values are within the range between -1° and -0.5°, or between +0.5° and +1°, the calibration procedure must be reviewed with the corrective action and improvements indicated* (see page 18) to ensure that the FAST MISALIGNMENT and SLOW MISALIGNMENT values obtained after the next test drive cycle are within the optimum range between - 0.5° and +0.5°. If the results of the calibration process cannot be improved even after following the instructions, contact Ferrari Help Desk.



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➤ **RADAR ALIGNMENT NOT OK.**

If the FAST MISALIGNMENT ANGLE and SLOW MISALIGNMENT ANGLE values are below -1° or greater than $+1^\circ$, the alignment procedure and test drive cycle must be repeated, making sure that all the steps indicated in this procedure are followed correctly.

$< -1^\circ$	-1° to -0.5°	-0.5° to $+0.5^\circ$	$+0.5^\circ$ to $+1^\circ$	$> +1^\circ$
NOT OK Recalibrate radar and repeat test drive.	Review calibration process and repeat with more precision.	OK Radar aligned successfully	Review calibration process and repeat with more precision.	NOT OK Recalibrate radar and repeat test drive.

➤ In the case of the outcome “**REVIEW CALIBRATION PROCESS**”, with regards to:

- the length of the test route;
- the type of roads constituting the route;
- and the driving style adopted;

follow the respective INSTRUCTIONS given to improve the likelihood that the next calibration process will be successful.



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	Follow the INSTRUCTION given in the column on the right based on the criteria below	INSTRUCTION
Mileage of route	≥ 40Km	Distance as required by procedure -> <i>No correction necessary for subsequent calibration procedure.</i>
	< 40Km	Distance less than value required by procedure -> <i>Increase length of route to at least 40 km.</i>
Type of roads constituting the route	MIXED CITY + HIGHWAY DRIVING	Route as required by procedure -> <i>No correction necessary for subsequent calibration procedure.</i>
	HIGHWAY only	No city driving included in this route -> <i>Drive in normal traffic conditions to allow the radar to detect more vehicles and objects in a city driving setting.</i>
Driving style	NORMAL (no drifting, oversteer, understeer, or exceeding speed limits)	Driving style as required by procedure -> <i>No correction necessary for subsequent calibration procedure.</i>
	SPORTY	Driving style not meeting requirements of procedure -> <i>Modify driving style, observing speed limits and avoiding drifting, oversteering and understeering.</i>



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Calibration procedure for camera (HALF)

The HALF calibration procedure is necessary in any of the following cases:

1. Malfunction of camera;
2. Replacement of camera and/or windshield. Calibration is also necessary if the camera is removed and refitted.
3. Work on suspension or adjustment of suspension setup.

- IMPORTANT -

The following is necessary when replacing the HALF camera with a new unit:

- Update the camera with the latest SW version available for the type of vehicle on which the camera is installed.
- Perform the cycle “NBC Proxy Alignment” with the DEIS diagnostic tool.

If the relative SW activities are not available on the DEIS server, contact the Ferrari Help Desk (technicalsupport_FNA@ferrari.com) for assistance.

- IMPORTANT -

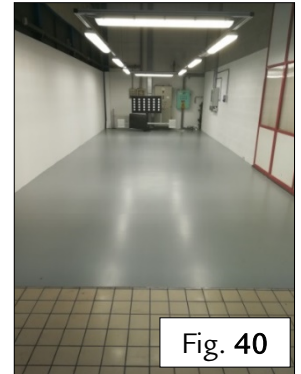
A number of values, such as the ride height of the vehicle, must be noted before starting the calibration cycle. As a result, drive the vehicle briefly, if possible, to allow the shock absorbers to settle if the vehicle has been on the lift.



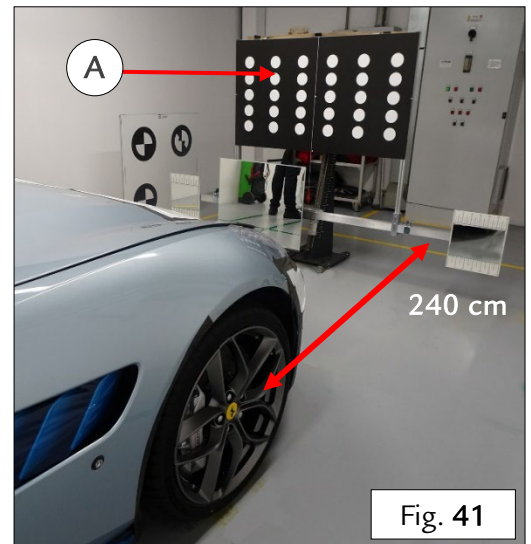
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Centering the vehicle correctly with the calibration kit

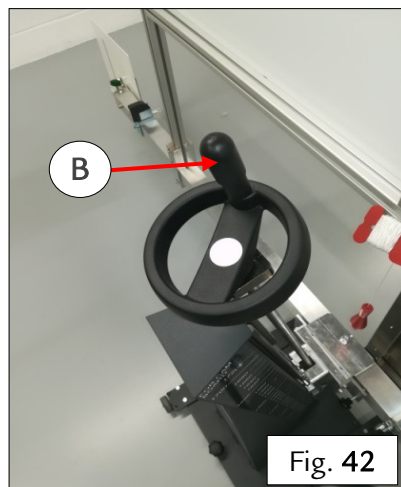
Move the vehicle to your designated area for the calibration procedure – Fig.40.



- Place the calibration tool in position, with the board (A) facing the vehicle. Ensure that there is a distance of 240 cm (+/- 30cm) between the center of the front wheels and the board (A) – Fig.41.



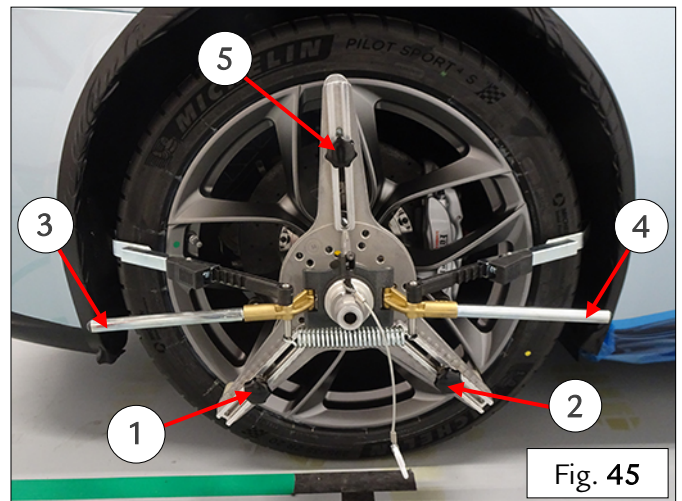
- Use the adjuster wheel (B, Fig.42) to set the height of the target panel to 1350 mm, referring to the scale (C) on the side marked “For Cam Board” Fig.43.





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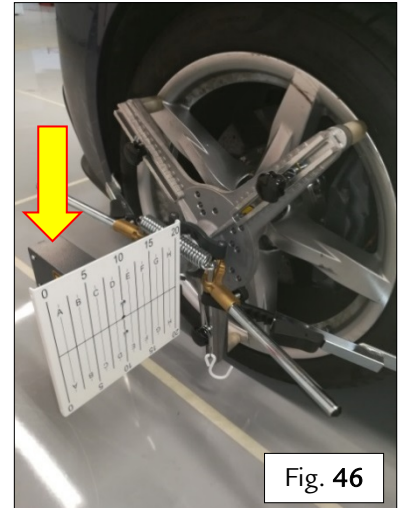
- Fit the “Multi-quick” mounting brackets onto the rear wheels as follows:
1. The knobs (1) and (2) are adjustable to fit the diameter of the wheel; make sure that they are set to **20”**. Fit the hooks of the mounting bracket in place on the wheel, so that they grip against the outer edge of the wheel. Do not fit the hooks over spokes (Fig.44). Tighten the knobs of the hooks in the order: (1) - (2) to fasten them in position. Leave the other knob (5) loose. (Fig.45)
 2. Use the levers (3) and (4) to fasten the clamps into the first longitudinal groove of the tire tread (Fig.45).
- Note: As the number and size of longitudinal grooves vary depending on the type (winter or all-season) and manufacturer of the tire, adjust the right and left hand clamps to the same length and with the tension necessary to hold the two levers in an aligned position once the mounting bracket is fitted (Fig.45).
3. Now tighten the knob of the remaining hook (5) (Fig.45).



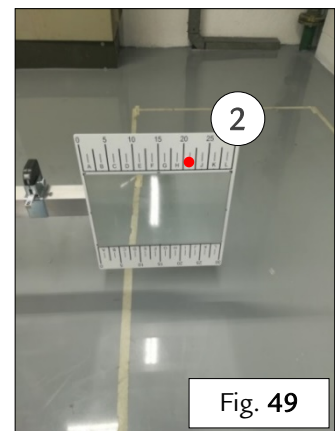
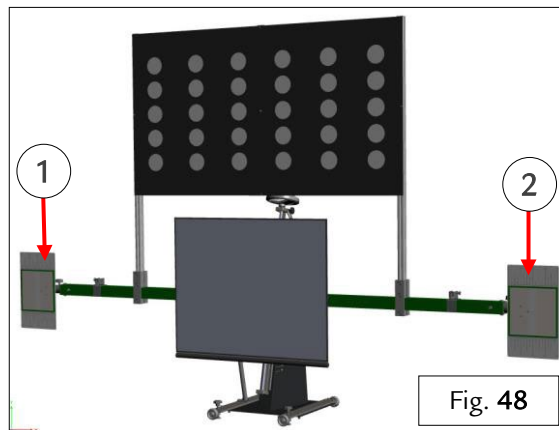
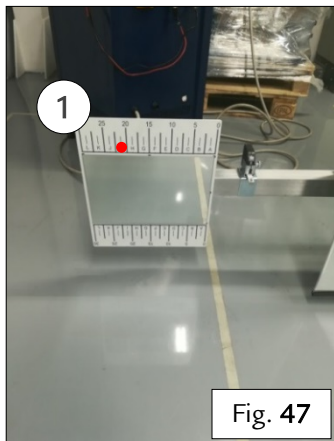


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- Fit the lasers onto the rear “Multi-quick” mounting brackets and switch them on – Fig.46.



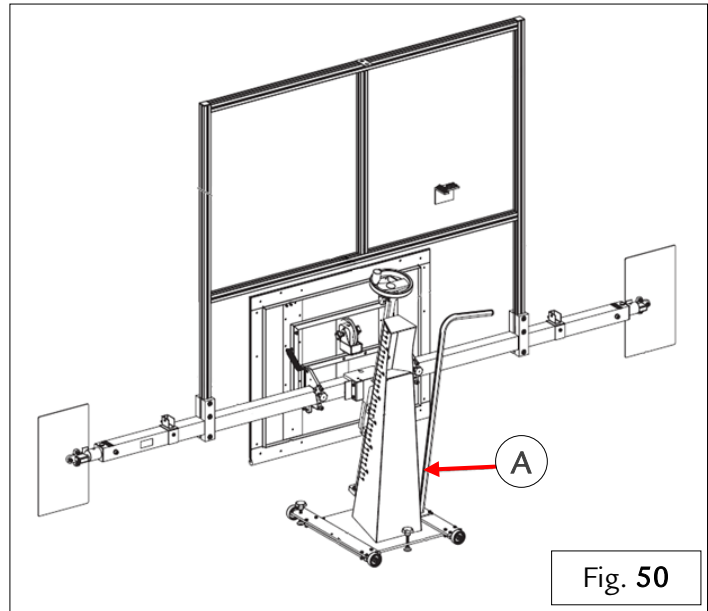
- The light beams produced by the lasers on the rear wheels must strike the target panels (1) and (2). Check that the laser dot hits the same coordinates on both target panels – Fig. 47, 48 and 49.



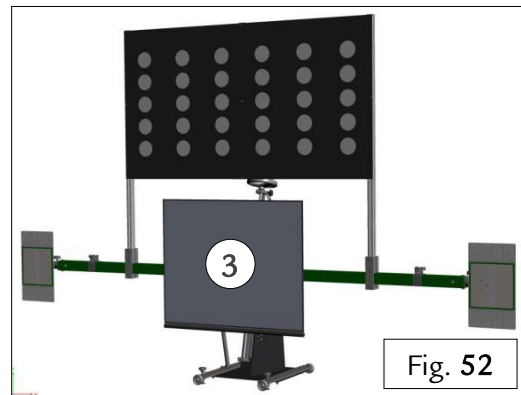
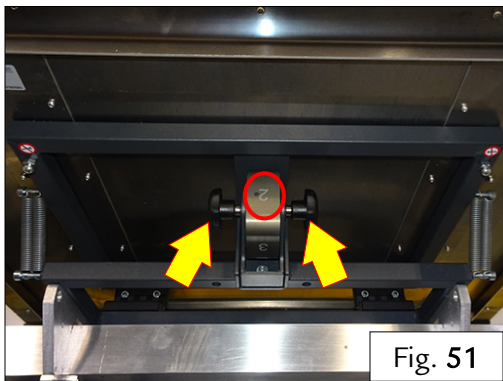


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- To align as precisely as possible, use the handle (A) to shift the entire structure sideways in slow, small increments – Fig.50.



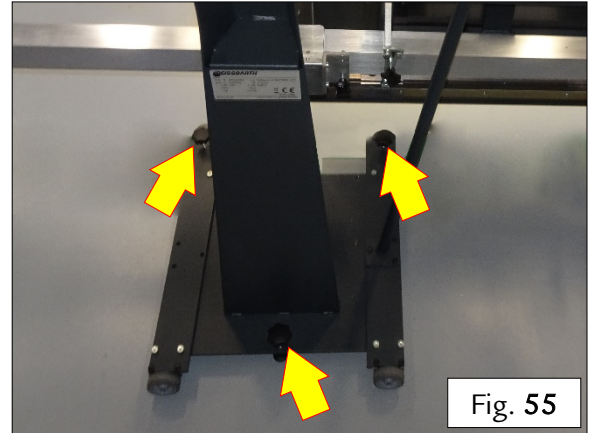
- Use the adjustment knobs to set the front mirror (3) of the equipment into position 2 (perfectly vertical) – Fig. 51 and 52.



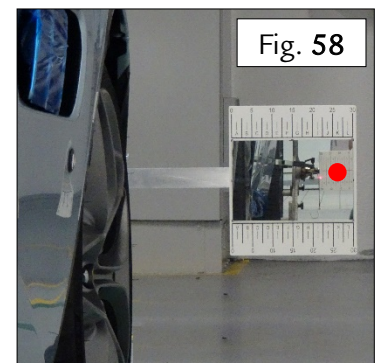
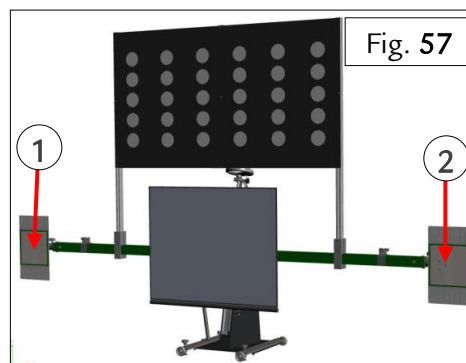
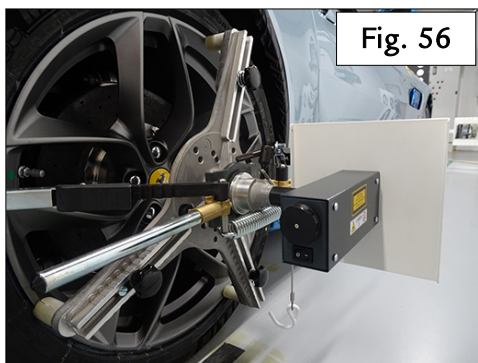


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- To ensure that the stand is levelled precisely, use the three adjustment knobs at the base of the structure (Fig. 55), referring to the three levels (one on the mirror and two on the board). In particular, make sure that the levels on the board are perfectly level (Fig. 53) – Fig. 53, 54.



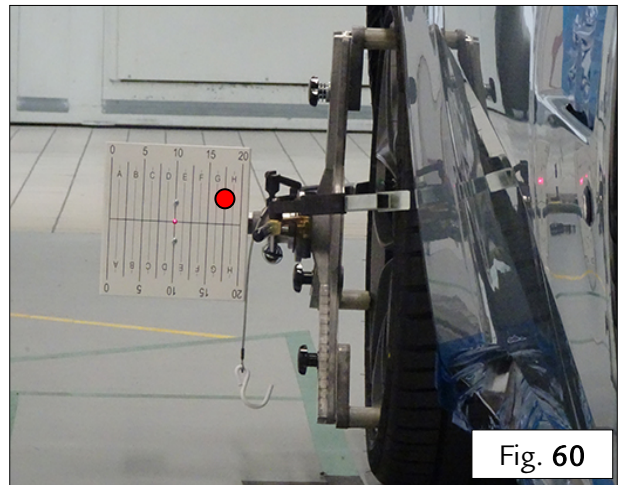
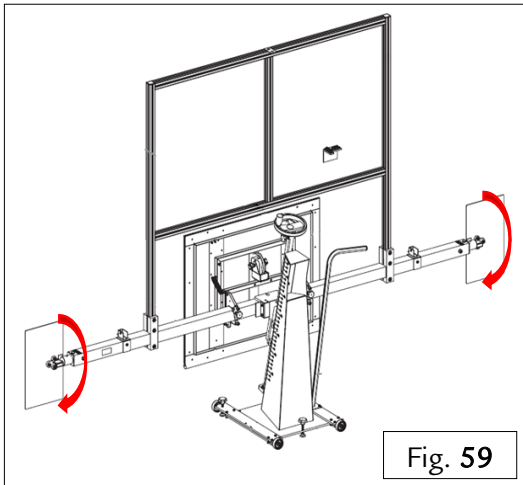
- Now check the horizontal alignment of the structure with the vehicle again, checking that the two laser beams still strike the target panels at the same coordinates as before. Before continuing to the next step in the procedure, make sure that the structure is perfectly level (referring to the on the stand levels) and aligned correctly horizontally.
- Adjust the inclination of the two lasers on the rear wheels (Fig. 56) so that the beams strike the mirrors (1) and (2) to the sides of the structure – Fig.57 and 58.



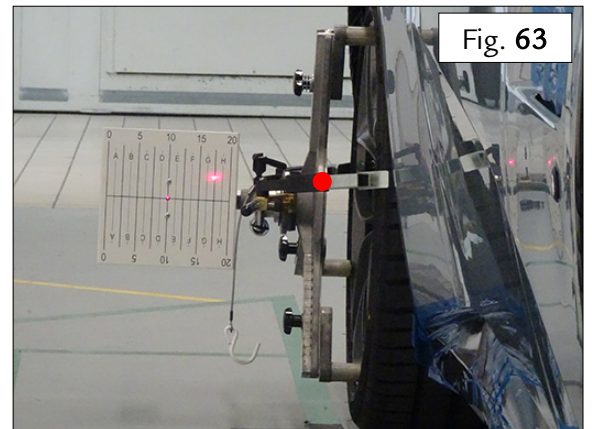
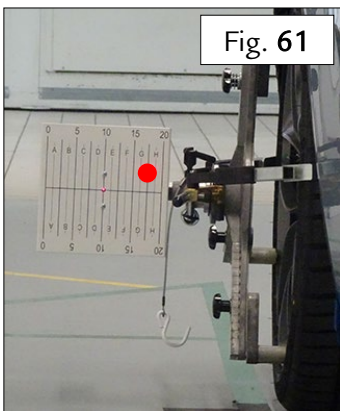
- Now adjust the inclination of the mirrors manually so that the reflected laser dots strike the target panels mounted on the rear wheels – Fig. 59, 60.



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- Set the adjustment knobs indicated (Fig. 62) so that the laser dots strike the same coordinates on both of the target panels mounted on the rear wheels – Fig.61, 63.



- The equipment is now set up correctly and the calibration procedure for the **HALF** front camera may begin.



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Calibration procedure for front camera (HALF)

- IMPORTANT -

The procedure consists of two stages: initial static calibration in the shop, followed by a dynamic calibration test drive (at least 30 km), with the LWD (lane marker line recognition) and TSR (road sign recognition) systems active, to allow the system to complete the necessary self-acquisition and compensation routine. To ensure that the aforementioned routine is completed successfully:

- 1) The test drive must be performed with only the driver on board, to replicate the static calibration conditions as closely as possible.
- 2) Include a combination of city and highway driving in the test route (e.g.: choose main roads, city roads and high speed roads such as divided highways, and avoid side streets with little traffic and without proper signage), ensuring that:
 - the camera has adequate opportunity to detect normal road traffic (other vehicles);
 - the route includes clearly identifiable horizontal road marker lines and vertical signage.
- 3) Drive CALMLY (i.e. avoid 'sporty' driving behavior, such as drifting and oversteering), without sudden acceleration. Try to remain in the center of the lane as much as possible.
- 4) The test drive should not be conducted at dawn or dusk, when the sun is close to the horizon.
- 5) The route must consist predominantly of roads where the sun is not in front of the vehicle.
- 6) Do not conduct the test drive in heavy rain, snow, fog or other adverse weather conditions that reduce the visibility of road marker lines and road signs.
- 7) Drive at speeds between 80 and 120 Km/h, maintaining a distance of at least 50 meters from any vehicles in front of you.

At the end of the test drive, the calibration parameters must be printed out and evaluated for final approval of the vehicle.

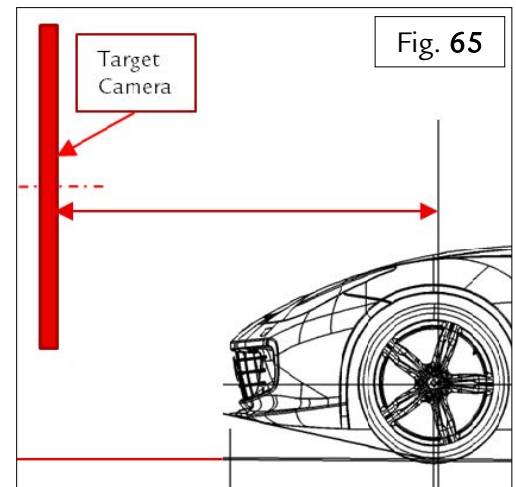


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- Measure and note the height from the ground at the top of the wheel arch for all four wheels, measuring along the vertical centerline of the wheel. This gives four height values in millimeters – Fig.64.



- Measure and note the distance in millimeters from the center of the front wheel to the calibration target panel – Fig. 65



- Connect the battery conditioner to the vehicle, ensuring that it is working correctly, and then connect the DEIS diagnostic tool to the OBD port of the vehicle.
- Switch on the instrument panel, perform the SCAN IN procedure and then switch the ignition off and on again and cancel all errors.



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- Check that there are no active DTC error codes related to HALF camera faults. In the case of any DTC error codes relative to calibration errors, continue with the cycle. With any other

- IMPORTANT -

DTC error codes are generated when the camera is replaced with a new unit. In the case of maintenance of the HALF (removing/refitting the same camera, disconnecting and reconnecting the connector etc.), no DTC error codes are generated but the calibration procedure is still necessary.

DTC error codes, contact the Ferrari Help Desk.

- Switch on the instrument panel and perform the DEIS cycle: “**HALF COMPLETE TEST**”.
- Enter the values, in millimeters, previously measured and noted in the correct sequence.
- After completing the camera calibration cycle, remove the “Multi-Quick” mounting brackets from the rear wheels.
- Now perform a test drive (of at least 30 km, with only the driver on board), with the **LWD** (lane marker line recognition) and **TSR** (road sign recognition) systems active, to allow the system to complete the necessary self-acquisition and compensation routine. To ensure that the aforementioned routine is completed successfully:
 - Include a combination of city and highway driving in the test route (e.g.: choose main roads, city roads and high speed roads such as divided highways, and avoid side streets with little traffic and without proper signage), ensuring that:
 - the camera has adequate opportunity to detect normal road traffic (other vehicles);
 - the route includes clearly identifiable horizontal road marker lines and vertical signage.
 - Drive **CALMLY** (i.e. avoid 'sporty' driving behavior, such as drifting and oversteering), without sudden acceleration. Try to remain in the center of the lane as much as possible.
 - The test drive should not be conducted at dawn or dusk, when the sun is close to the horizon.
 - The route must consist predominantly of roads where the sun is not in front of the vehicle.

28



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- Do not conduct the test drive in heavy rain, snow, fog or other adverse weather conditions that reduce the visibility of road marker lines and road signs.
- Drive at speeds between 80 and 120 Km/h, maintaining a distance of at least 50 meters from vehicles in front of you.
- Once the vehicle returns to the shop, print out the HALF front camera parameters from the DEIS.

Results analysis – cycle results print-out

- Once the static calibration cycle is complete, open the automatically generated results printout. **The following information** may be reviewed from the parameters highlighted by red boxes in the figure below (Fig. 66):

- **MILEAGE OF THE CURRENT CALIBRATION (A):** Mileage between one calibration cycle and the next;
- A number of important parameters relative to the suspension setup of the vehicle and the height of the camera may be determined from the values highlighted in the box (B):

CURRENT STATIC CALIBRATION RESULT PITCH ANGLE - Fig. 66.

CURRENT STATIC CALIBRATION RESULT ROLL ANGLE - Fig. 66.

CURRENT STATIC CALIBRATION RESULT YAW ANGLE - Fig. 66.

CURRENT STATIC CALIBRATION RESULT – CAMERA HEIGHT - Fig. 66.

CURRENT STATIC CALIBRATION ERROR CODE	NO CALIBRATION RELEVANT ERROR	OK
CURRENT STATIC CALIBRATION - TIMESTAMP OF THE CURRENT CALIBRATION - MINUTE	15	OK
CURRENT STATIC CALIBRATION - MILEAGE OF THE CURRENT CALIBRATION (A)	1509	km OK
CALIBRATION ERROR CODE	INITIAL STATIC CALIBRATION GARAGE OK	OK
CURRENT STATIC CALIBRATION RESULT - PITCH ANGLE (B)	-0.750	° OK
CURRENT STATIC CALIBRATION RESULT - ROLL ANGLE (B)	-0.043	° OK
CURRENT STATIC CALIBRATION RESULT - YAW ANGLE (B)	-0.090	° OK
CURRENT STATIC CALIBRATION RESULT - CAMERA HEIGHT (B)	1225	mm OK

Fig. 66



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Pitch, Roll and Yaw: the values for these parameters must remain within the ranges indicated in the following table.

Parameter	Range
Pitch angle	Between -2.54° and $+1.14^{\circ}$
Roll angle	Between -2.84° and $+2.84^{\circ}$
Yaw angle	Between -1.85° and $+1.85^{\circ}$

- Any pitch, roll, or yaw angles not within the respective indicated range after the static calibration cycle will generate DTC error codes and, as a result, are considered 'NOT OK' conditions. **Repeat the static calibration cycle with more precision and check that the camera is installed correctly in its seat.**

- IMPORTANT -

Static pitch, roll and yaw values within the aforementioned ranges do not necessarily mean that the calibration cycle has been successful. The effective accuracy of the static calibration can only be confirmed with the test drive.

Camera Height: The permissible values for the static **Camera Height** parameter are specific for each model and are indicated in the following table:

Model	Camera Height
GTC4 Lusso / GTC4 Lusso T	Between 1175 mm and 1275 mm
812 Superfast	Between 1110 mm and 1210 mm
Portofino	Between 1179 mm and 1279 mm



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- Camera Height values not within the respective indicated range after the static calibration cycle will generate DTC error codes and, as a result, are considered 'NOT OK' conditions. Repeat the static calibration cycle with more precision and check that the camera is installed correctly in its seat.
- The ONLINE values always reset to zero after static calibration of the HALF camera. Now test drive the vehicle – Fig. 67.

HALF_01	FerDN: 875001	HWn: MPC25PLUS	HWv: 01	SWn: FER0404	SWv: 0404
ONLINE CALIBRATION DYNAMIC - DETAILS: ONLINE			0.0000000		km
CALIBRATION DYNAMIC - DISTANCE ACTIVE					
ONLINE CALIBRATION DYNAMIC - RESULT: ONLINE			0		mm
CALIBRATION DYNAMIC OFFSET FOR CAMERA HEIGHT					
ONLINE CALIBRATION DYNAMIC - RESULT: ONLINE			0.000		°
CALIBRATION DYNAMIC OFFSET FOR ROLL ANGLE					
ONLINE CALIBRATION DYNAMIC - RESULT: ONLINE			0.000		°
CALIBRATION DYNAMIC OFFSET FOR PITCH ANGLE					
ONLINE CALIBRATION DYNAMIC - RESULT: ONLINE			0.000		°
CALIBRATION DYNAMIC OFFSET FOR YAW ANGLE					
ONLINE CALIBRATION DYNAMIC - STATUS			UNKNOWN		

Fig. 67

- By observing the results printout generated **AFTER** the test drive cycle, more detailed information may be determined from the parameters “DISTANCE ACTIVE” and “OFFSET FOR CAMERA HEIGHT”, as shown below – Fig.68.

ONLINE CALIBRATION DYNAMIC - DETAILS: ONLINE			7.0000000		km
CALIBRATION DYNAMIC - DISTANCE ACTIVE					
ONLINE CALIBRATION DYNAMIC - RESULT: ONLINE			0		mm
CALIBRATION DYNAMIC OFFSET FOR CAMERA HEIGHT					

Fig. 68



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DISTANCE ACTIVE: this parameter indicates the precision of the self-diagnostic calculations. The longer the test drive, the greater the precision. The permissible values are indicated in the following table:

Distance Active Value	Calibration Outcome
Values >5	OK Test drive cycle performed correctly.
Values between 3 and 5 [inclusive]	Value is permissible, but review test route as it can be improved to achieve greater precision.
Values < 3	NOT OK Test drive cycle not performed correctly. Repeat test drive cycle following the instructions given in the procedure.

OFFSET FOR CAMERA HEIGHT: this parameter may be used to check whether the camera height is correct. The permissible values are indicated in the following table:

Offset For Camera Height Value	Outcome
Values between - 50mm and +50 mm	OK Value within specified range
Values < - 50mm or >+ 50mm	NOT OK Values not within permitted range, generating a relative DTC error code. Repeat entire calibration procedure (including static calibration).

- Now continue analyzing the post-test drive results by observing the parameters shown in Fig. 69:



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- ONLINE CALIBRATION DYNAMIC OFFSET FOR ROLL ANGLE;
- ONLINE CALIBRATION DYNAMIC OFFSET FOR PITCH ANGLE;
- ONLINE CALIBRATION DYNAMIC OFFSET FOR YAW ANGLE;

ONLINE CALIBRATION DYNAMIC - RESULT: ONLINE CALIBRATION DYNAMIC OFFSET FOR ROLL ANGLE	0.358	°	
ONLINE CALIBRATION DYNAMIC - RESULT: ONLINE CALIBRATION DYNAMIC OFFSET FOR PITCH ANGLE	0.181	°	
ONLINE CALIBRATION DYNAMIC - RESULT: ONLINE CALIBRATION DYNAMIC OFFSET FOR YAW ANGLE	0.276	°	
ONLINE CALIBRATION DYNAMIC - STATUS	ATTIVO		

Fig. 69

➤ CAMERA CALIBRATION OK.

If the values “ONLINE CALIBRATION DYNAMIC OFFSET FOR ROLL/PITCH/ROLL ANGLE” are between - 0.5° and +0.5°, the calibration procedure has been successful.

➤ REVIEW CALIBRATION PROCESS.

If the values “ONLINE CALIBRATION DYNAMIC OFFSET FOR ROLL/PITCH/ROLL ANGLE” are between -1° and -0.5°, or between +0.5° and +1°] (inclusive of the values -1° and +1°), the calibration procedure must be reviewed with the corrective action and improvements indicated to comply with all the instructions and requirements indicated in this procedure and to ensure that the values obtained after the next test drive cycle are within the optimum range between - 0.5° and +0.5°. If the results of the calibration process cannot be improved even after following all the instructions given herein, contact Ferrari Help Desk

➤ CAMERA CALIBRATION NOT OK.

If the ONLINE CALIBRATION DYNAMIC OFFSET FOR ROLL/PITCH/ROLL ANGLE values are below -1° or greater than +1°, the alignment procedure and test drive cycle must be repeated, making sure that all the steps indicated in this procedure are followed correctly.



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< -1°	-1° to -0.5°	-0.5° to +0.5°	+0.5° to +1°	> +1°
NOT OK Camera not calibrated. Repeat complete procedure	Review calibration process and repeat with more precision.	OK Camera calibrated successfully	Review calibration process and repeat with more precision.	NOT OK Camera not calibrated. Repeat complete procedure

Thank you for your co-operation