Smart Vision 360

Manual Calibration

CAMMSYS

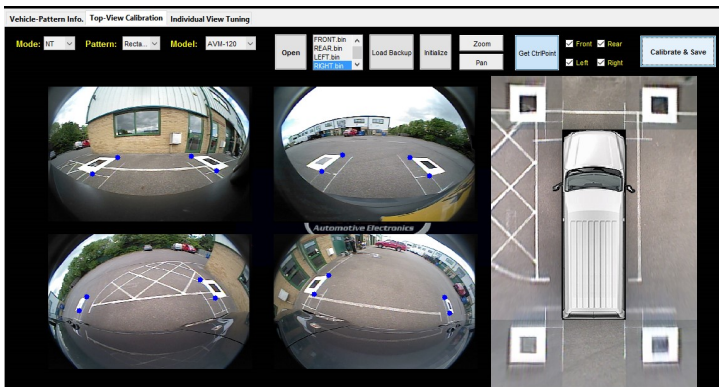# Table of Contents

1. Manual calibration introduction

1.1. Purpose

Manual calibration involves the user inputting the image coordinates and manually setting the figures in the PC software.
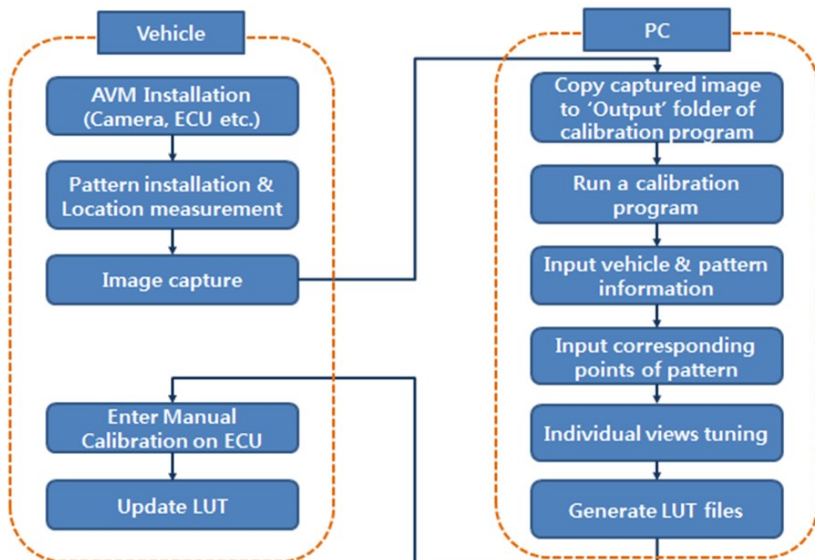
1.2. Manual calibration software

Recommended PC operating system:

Windows 7, Windows 8, Windows 8.1

2. Manual calibration overview

3. Manual calibration process

3.1 Setup MCR program

First, find out what bit version your PC is running by taking the following steps :
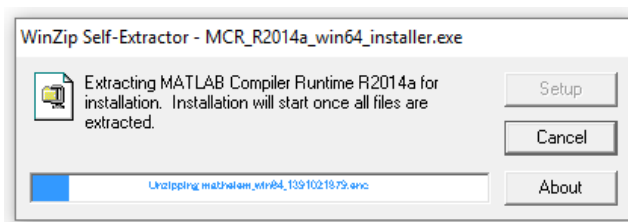
- Click Start, and then click 'Control Panel'.

- Click on 'System & Security', then 'System'

- The operating system is displayed under 'System type:'

MCR must be installed in order to run the calibration software. **N.B. MCR only needs to be installed once on the PC it is being used.**

If you have a 64-bit PC, run installer called: 'MCR_R2014a_win64_installer' from the SD card provided.

Manual Calibration Software	07/06/2016 10:34	File folder	
360 programming mat	14/06/2016 13:42	Adobe Acrobat D...	21 KB
360 programming mat	14/06/2016 13:36	PNG File	33 KB
Manual calibration V2	21/06/2016 16:54	Adobe Acrobat D...	7,323 KB
☑ MCR_R2014a_win64_installer	24/05/2016 12:48	Application	602,458 KB

The files will then be extracted:

WinZip Self-Extractor - MCR_R2014a_win64_installer.exe

Extracting MATLAB Compiler Runtime R2014a for installation. Installation will start once all files are extracted.

Unzipping mathslam_win64_139102187.enc

Setup   Cancel   About

If you are running a 32-bit PC, run installer called: 'MCR_R2014a_win32_installer' instead

Manual Calibration Software	07/06/2016 10:34	File folder	
360 programming mat	14/06/2016 13:42	Adobe Acrobat D...	21 KB
360 programming mat	14/06/2016 13:36	PNG File	33 KB
Manual calibration V2	28/07/2016 08:57	Adobe Acrobat D...	7,321 KB
MCR_R2014a_win32_installer	07/06/2016 10:38	Application	550,062 KB
MCR_R2014a_win64_installer	24/05/2016 12:48	Application	602,458 KB

Once extracted, the setup window will open automatically. Press 'Next' to continue the setup.
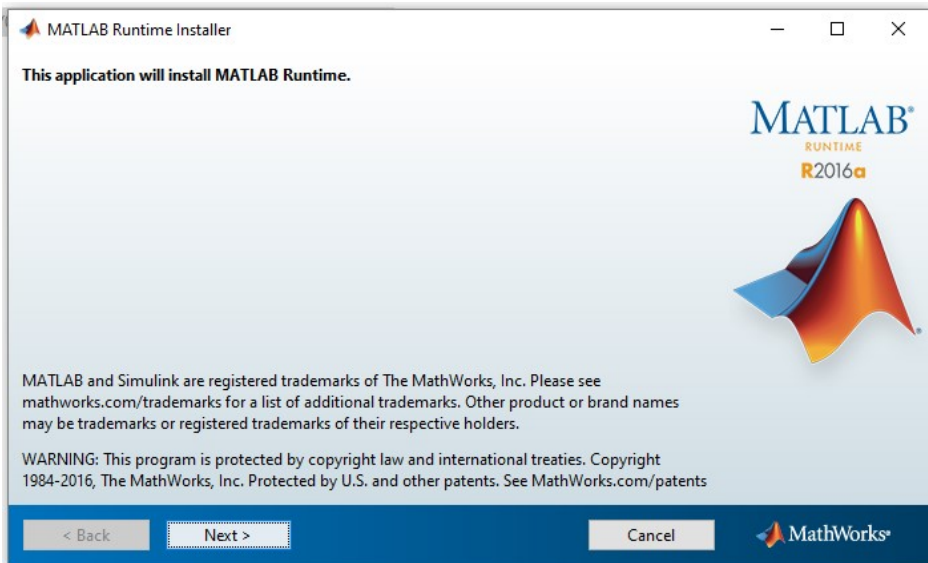
Agree to the licensing terms and conditions by selecting 'Yes' and then press 'Next' to continue.
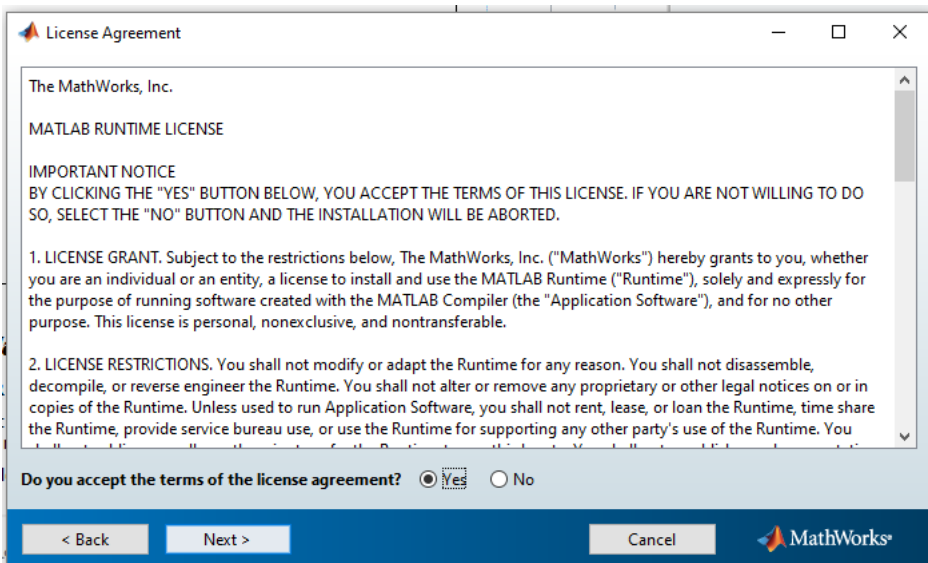
Select the location for the files to be installed by clicking 'Browse', then press 'Next'. Select 'Yes' in the popup window to create a new folder.
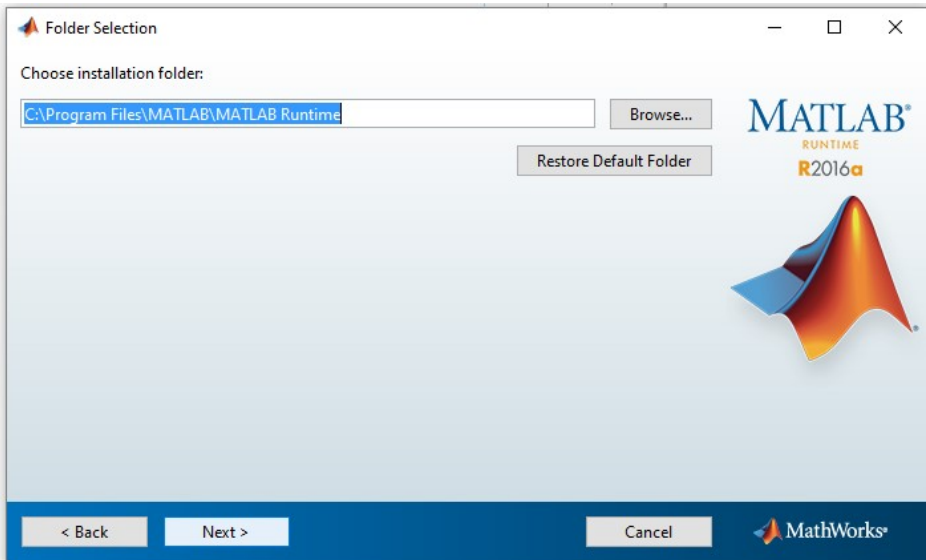
Review the installation folder on the next screen and then when satisfied press 'Install'. N.B. installation takes 2-3 minutes to complete.
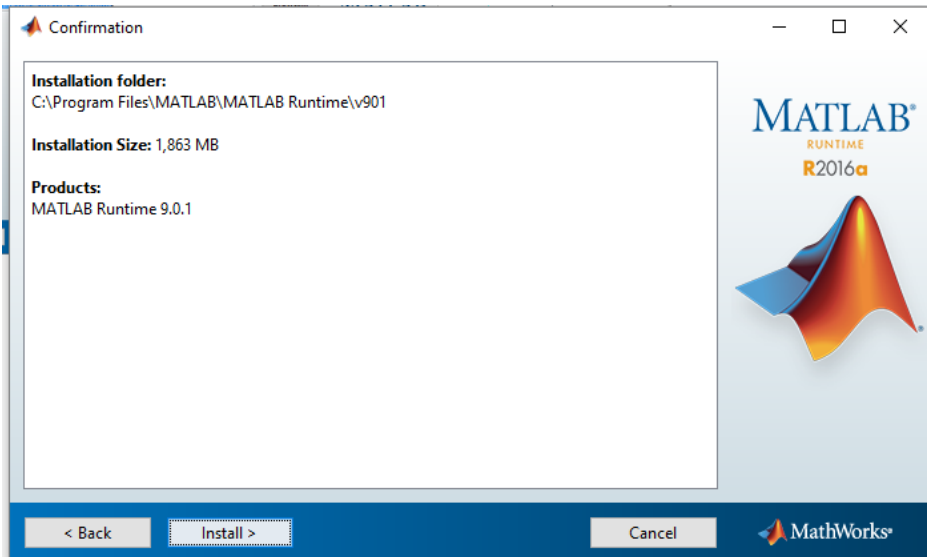
Installation window:
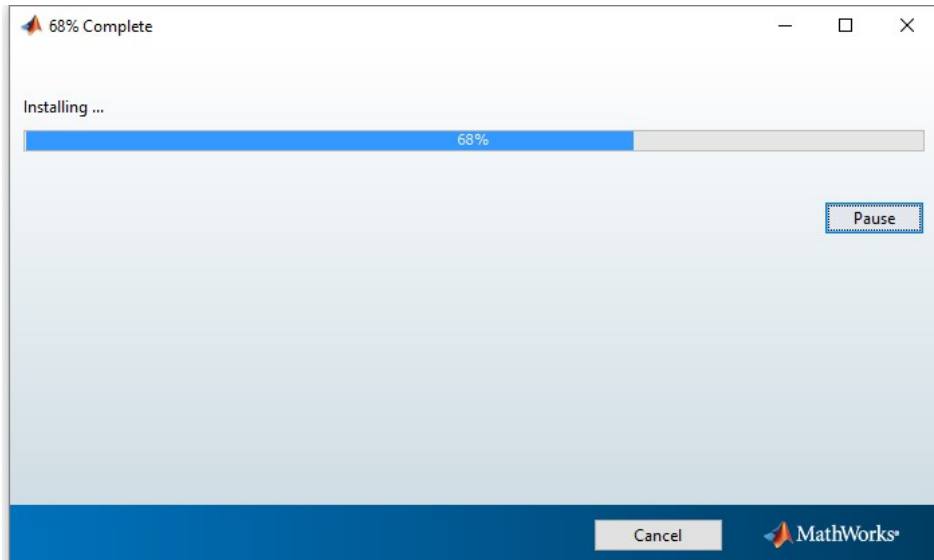
Installation complete:
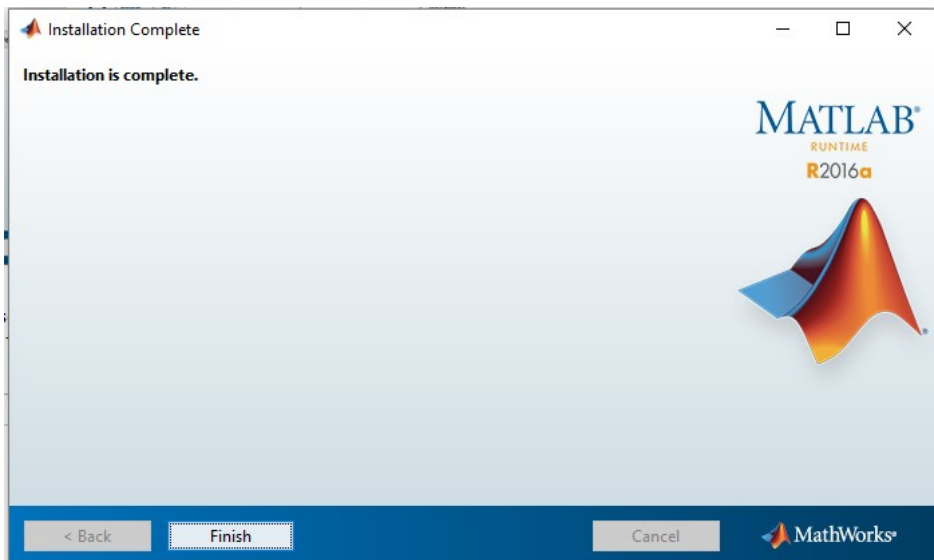
Once the installation is complete, press 'Finish' to complete the MCR setup.

Next, run the .exe file called 'Synergy_Calibration' from the SD card provided.

Backup	24/05/2016 09:33	File folder		
Output	24/05/2016 09:33	File folder		
OverlayFiles	24/05/2016 09:33	File folder		
VehicleData	24/05/2016 09:33	File folder		
background_img	31/07/2015 15:51	JPG File	11 KB	
pattern_Location	17/09/2015 17:45	PNG File	392 KB	
sample	24/05/2016 08:53	Text Document	1 KB	
seon_bg	23/05/2016 21:58	BMP File	2,487 KB	
splash	23/05/2016 21:37	PNG File	504 KB	
☑ Synergy_Calibration	25/04/2016 16:12	Application	7,814 KB	

The calibration tool opens up as follows:
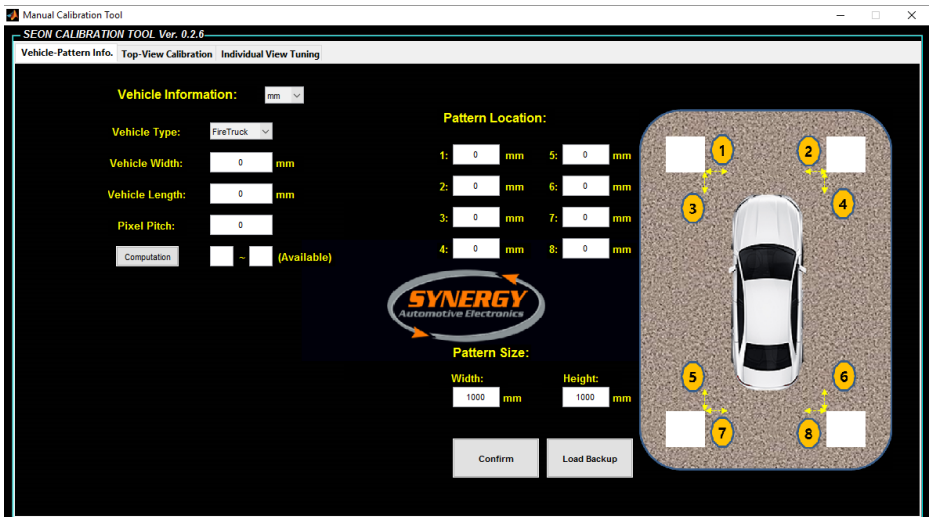
Before proceeding to the next stage — format an SD card so that it is blank, and insert it into the Smart Vision ECU. This is where the calibration images will be stored.

3.2 Calibration pattern positioning
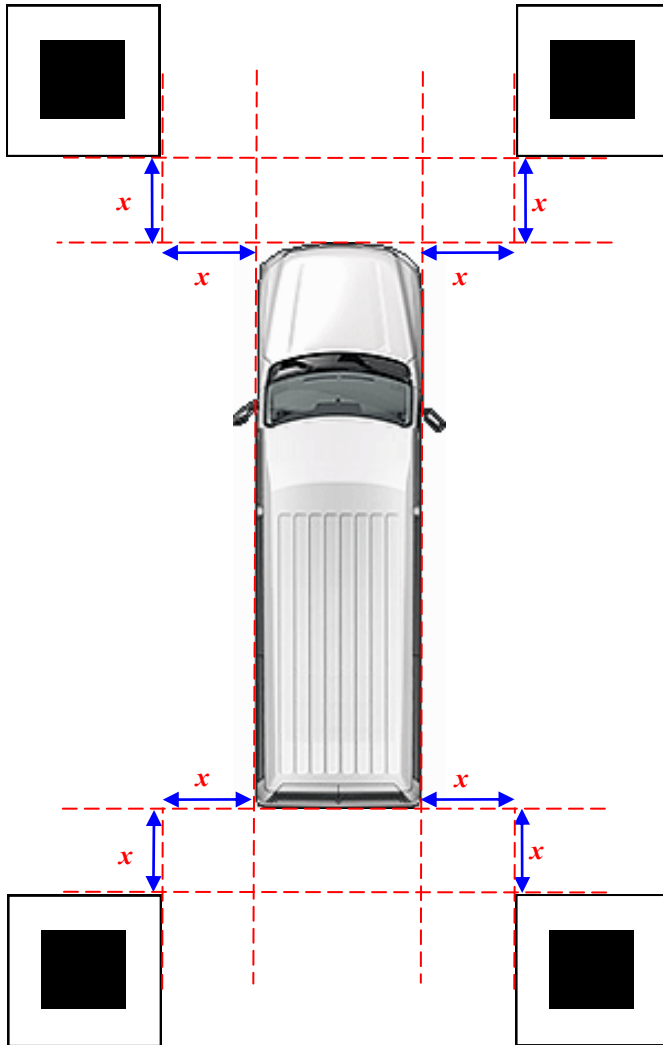
x = 500 mm

Drawing not to scale

$\Rightarrow$ Run a tape measure or straight edge along one side of the vehicle, ensuring that it is absolutely parallel to the tyres.

$\Rightarrow$ Use a T-square to run from the very front (i.e. the point furthest forward) of the vehicle to the ground, and mark this point.

⇒ Use a rule to continue this point to where it meets the tape measure.

⇒ Use the T-square to continue the line approximately 750 mm beyond the tape measure.

$\Rightarrow$ Measure 500 mm along the line from the tape measure and mark this point. Then measure 500 mm along the perpendicular line and mark this point. Use a rule to draw lines (approximately 750 mm in length) from the two points just marked to form a square that will be 500 x 500 mm.
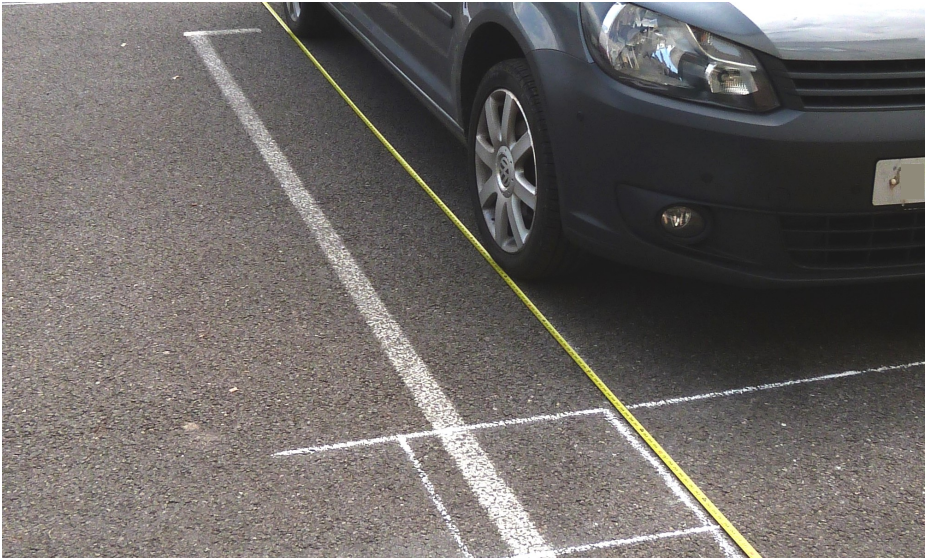
$\Rightarrow$ Place the calibration pattern so that one corner of it is adjacent to the furthest corner of the square that has just been marked, ensuring that it is parallel to the guide lines.
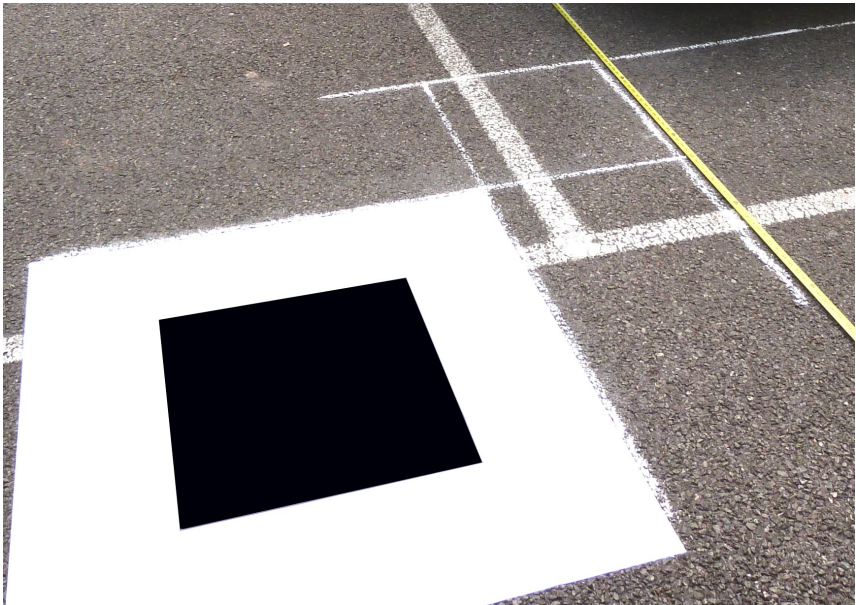
⇒   Repeat this process on the other front side of the vehicle, then repeat for rear left and rear right. Please check the below image for reference on how all four calibration patterns should look when positioned correctly.
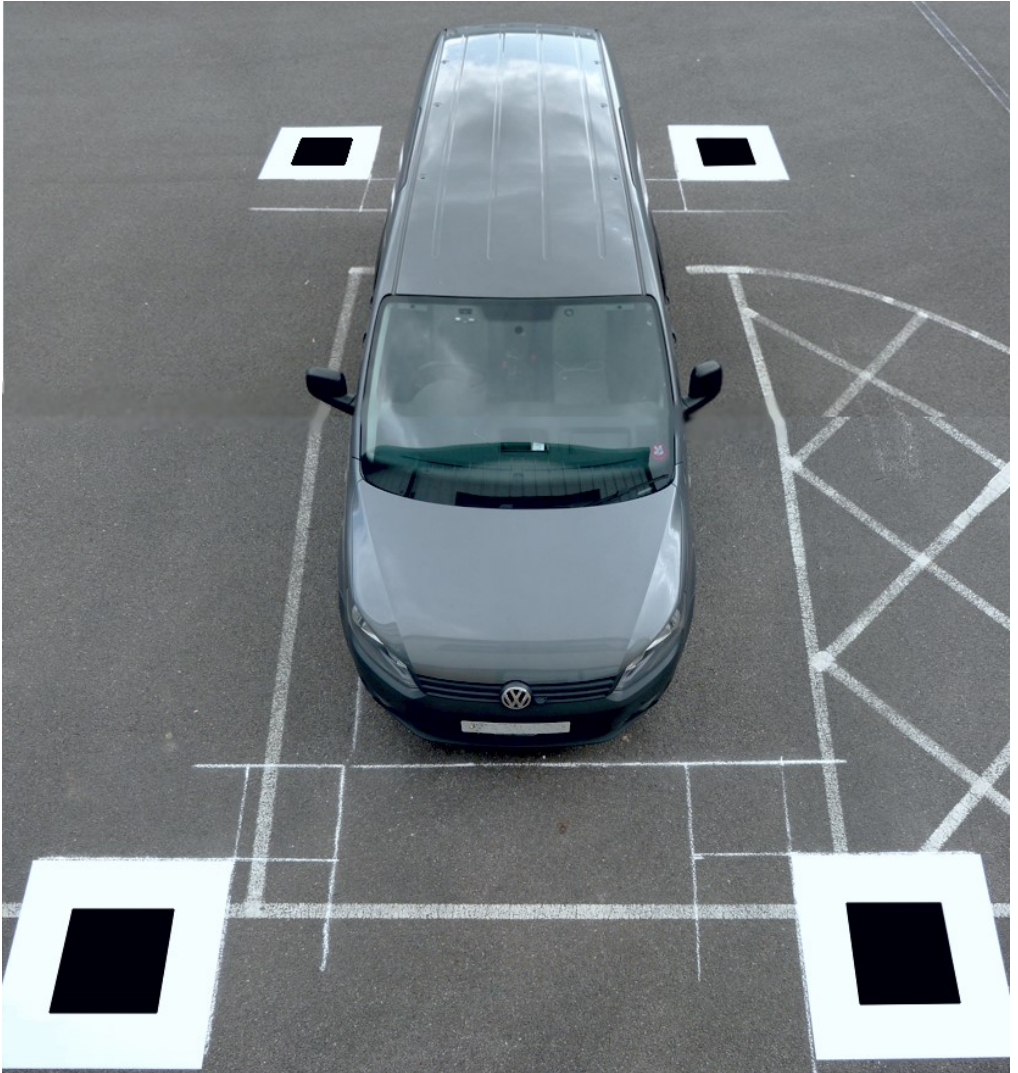
N.B. Ensure that all the doors are closed and the area around the vehicle is clear before beginning the pattern capturing process!

3.3 Capturing pattern image

Ensuring that there is a **blank SD card in the ECU**, enter calibration mode on the main menu.
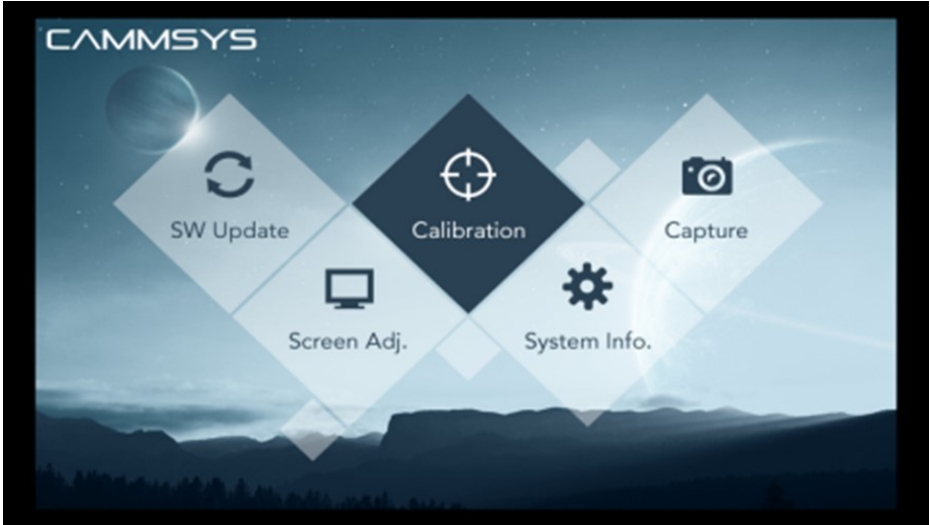
View 'Front/Rear/Left/Right' menus in turn to check that two patterns are fully visible in each view.
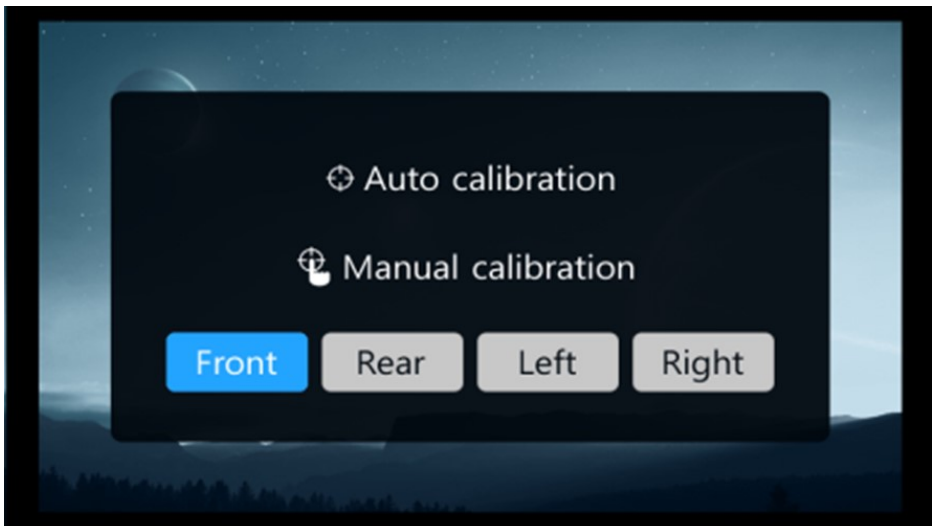
Front view

Rear view

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Left view

Right view

⇒   After checking all 4 camera images, return to the main menu by pressing the 'Full' key on the remote control.

⇒   Enter 'Capture' menu.
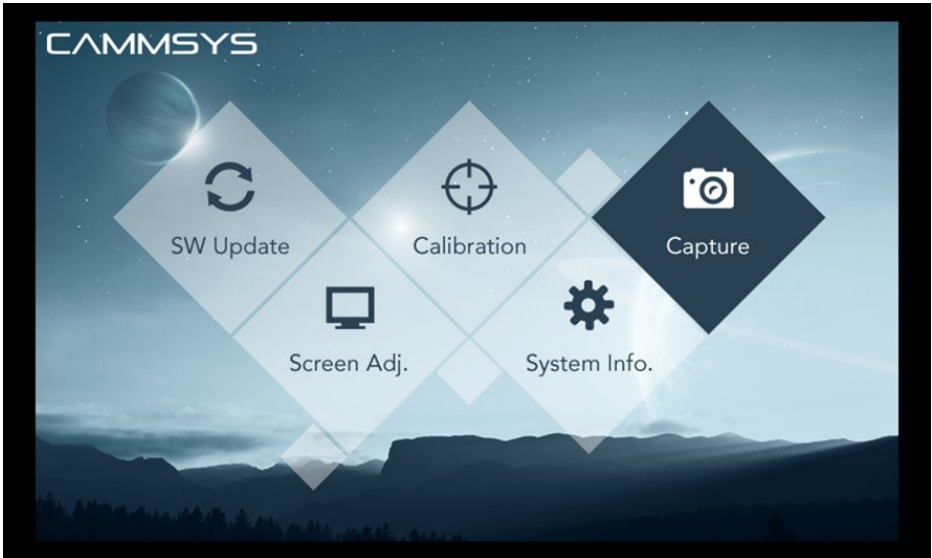
Image capture will run as follows, and generate the following files on the SD card: 'FRONT.bin', 'REAR.bin', 'LEFT.bin', 'RIGHT.bin'
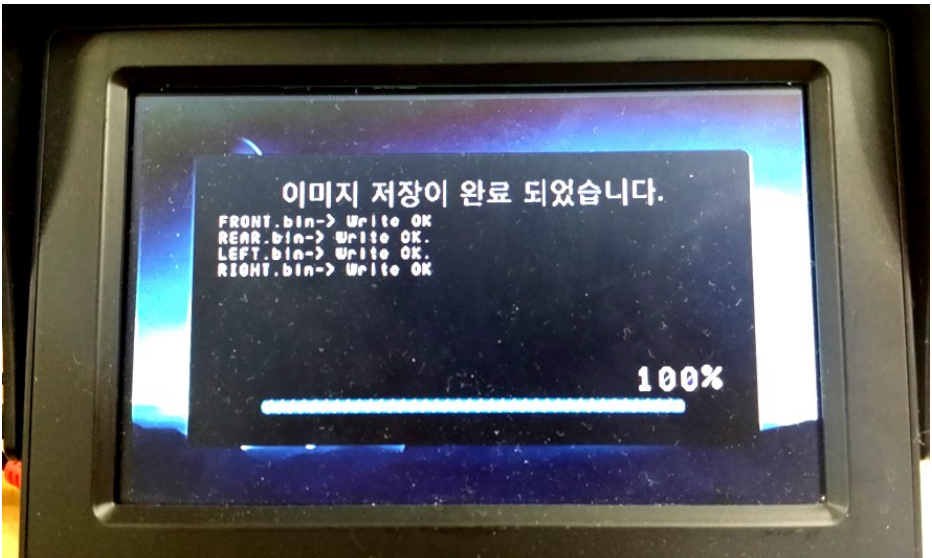
When image capture has reached 100%, switch off ignition, remove the SD card from the ECU and check that all four .bin files are present. Then copy these files to the 'Output' folder within the main 'Synergy_Calibration' folder on your PC. If the folder already contains files of same names, then replace them.

3.4 Using the Synergy Calibration tool

$\Rightarrow$ Run the program 'Synergy_Calibration'

1. Enter vehicle details here, including width and length (in millimetres)

Manual Calibration Tool

— SEON CALIBRATION TOOL Ver. 0.2.6 —

| Vehicle-Pattern Info. | Top-View Calibration | Individual View Tuning |

Vehicle Information: mm ▾

Pattern

Vehicle Type: CargoVan ▾

Vehicle Width: 1780 mm   1: 50

Vehicle Length: 4900 mm   2: 50

Pixel Pitch: 20   3: 50

Computation   20 ~ 20 (Available)   4: 50

SYNE
Automotive Ele

Patt

Width
100
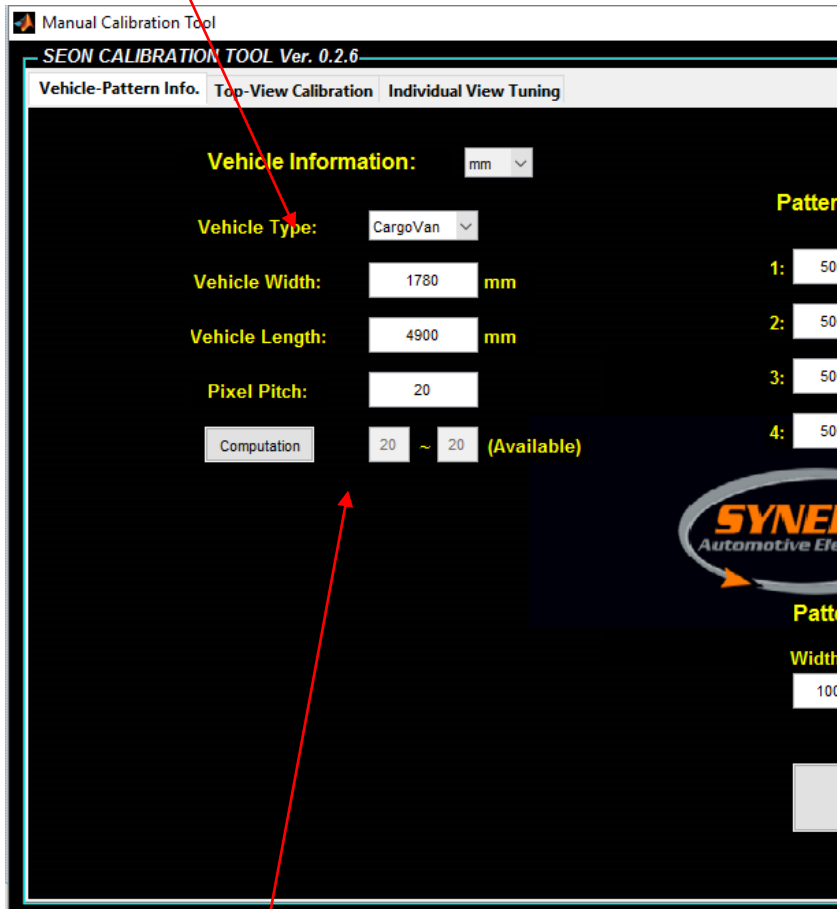
2. The 'Pixel Pitch' value will be calculated automatically based on the vehicle details when the 'Computation' button is pressed

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3. All eight values here refer to the distances be-
tween the vehicle and the calibration patterns i.e.
500 mm

n Location:

0	mm	5:	500	mm
0	mm	6:	500	mm
0	mm	7:	500	mm
0	mm	8:	500	mm

ern Size:

	Height:	
00 mm	1000	mm

Confirm   Load Backup
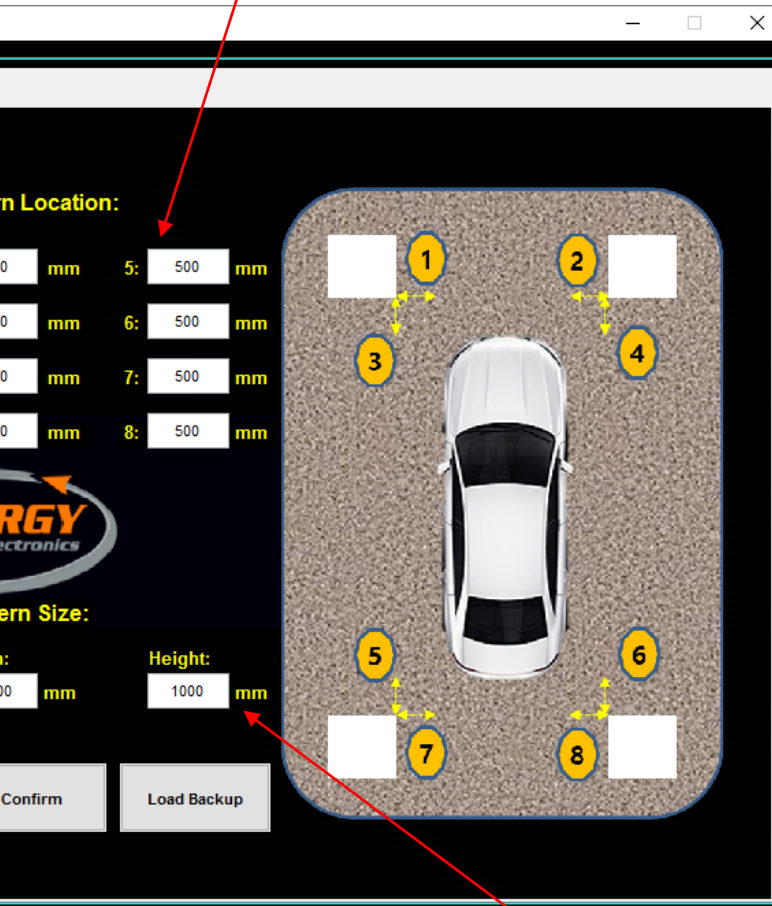
4. The pattern size is the same as the default
values here i.e. **1000** by **1000 mm.** This refers
to the dimensions of the calibration patterns

⇒ Click 'Confirm' when the settings are correct. This will generate the vehicle and pattern information files. **(N.B. this process can take a couple of minutes).** Press 'OK' on the popup window when the process is complete.
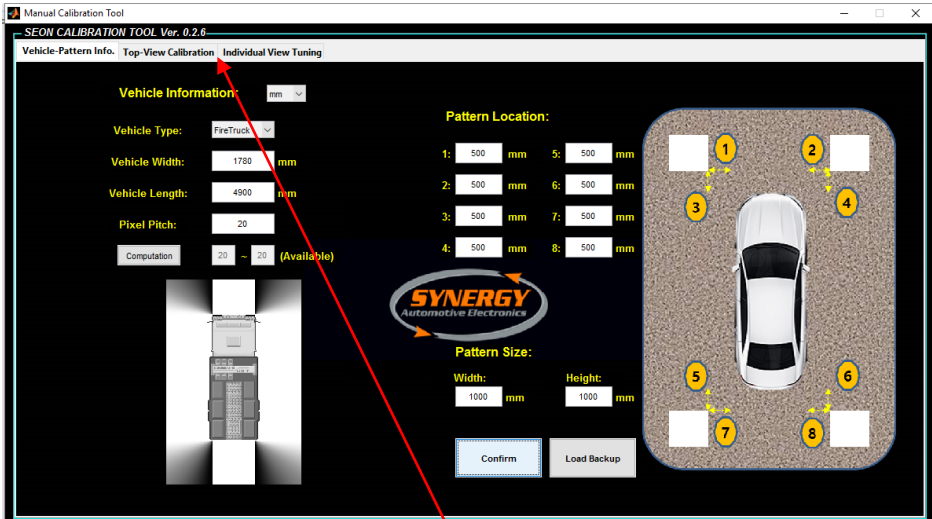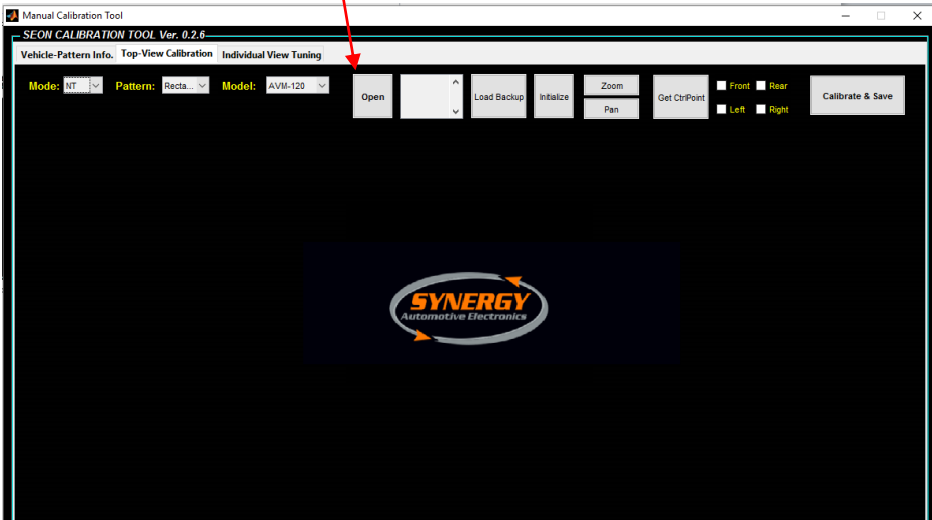

⇒ Go to the second tab - 'Top View Calibration'. This page is used to pick out the corners of the calibration patterns in the captured camera images.

⇒ Click 'Open' and select the 'Output' folder on the PC (**do not open the folder, just select it**), then press 'Choose folder'. This tells the calibration software where the .bin image files are being read from.

⇒ The image files will be loaded into the calibration software as shown below ('Front.bin' first). The next step is to select the two nearest corners of each calibration pattern.
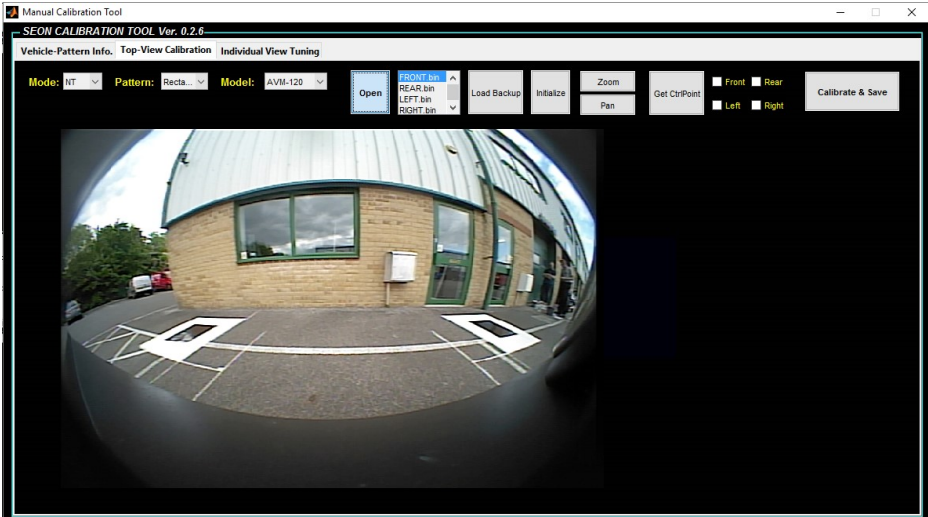
⇒ View each pattern close up by clicking the 'Zoom' button (turns yellow when in Zoom mode) and then clicking the image until the desired zoom level is reached. To zoom back out hold the SHIFT key whilst clicking. To exit Zoom mode, click the 'Zoom' button again. Pan mode behaves the same way, and lets the user grab the image and move it as desired.
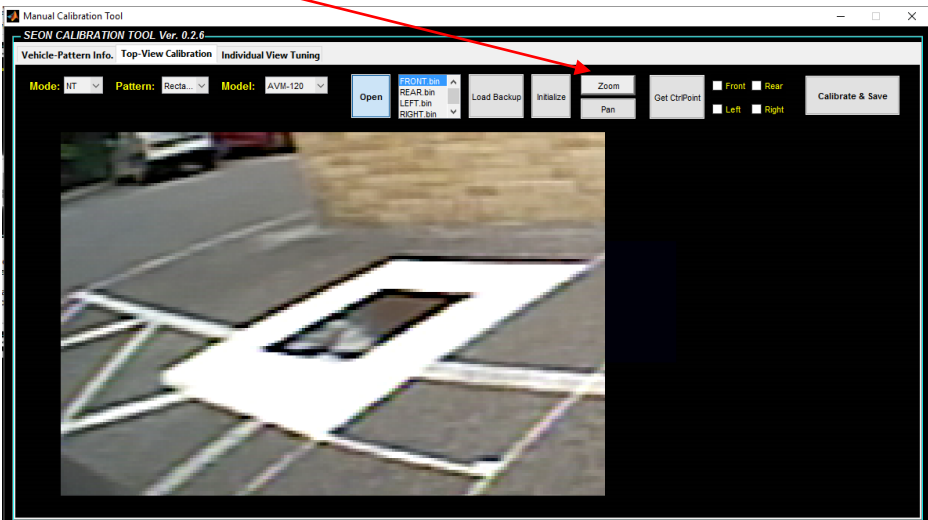
Ensure that Zoom and Pan mode have been exited before placing corner points

⟹ Click the corner of the calibration pattern to add a point. Click and hold in order to move a point after it has been placed. A point should be placed on the two corners closest to the vehicle.
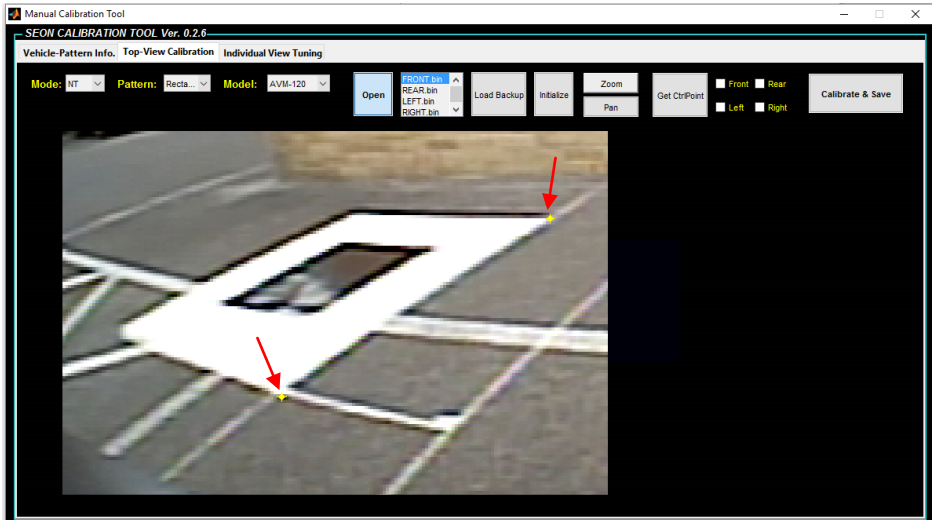
⟹ Repeat the process for the other visible calibration pattern in the front image.
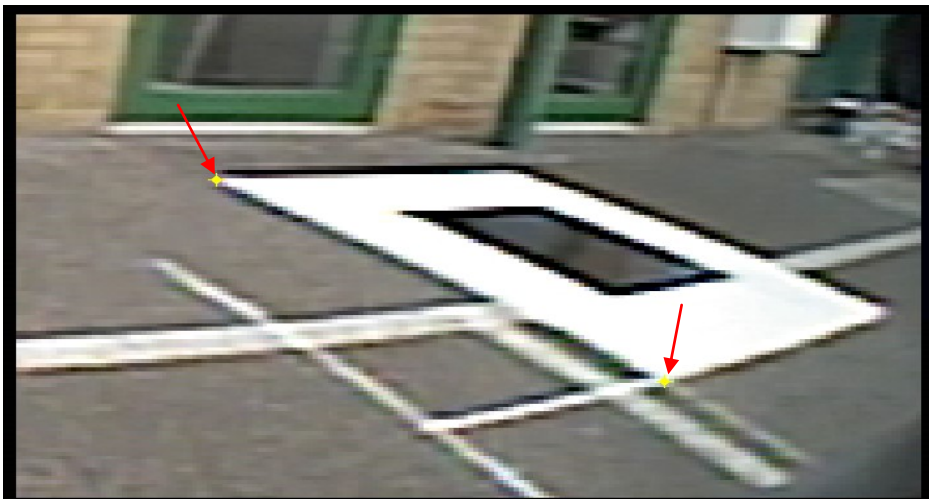
⟹ Once all four points have been selected, move to the next camera image by clicking 'Get CtrlPoint'.

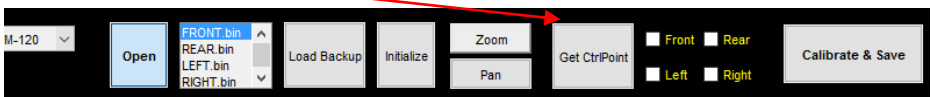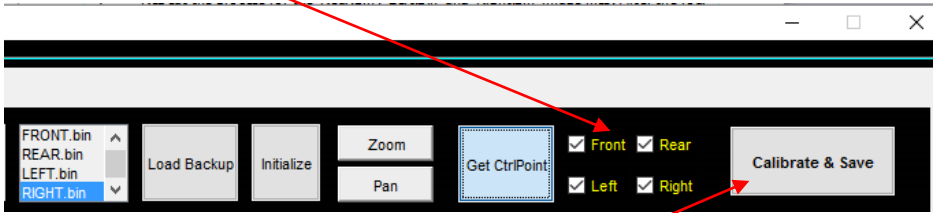$\Rightarrow$ Repeat the process for the 'Rear.bin', 'Left.bin' and 'Right.bin' image files. After the four corner points have been added to each captured image, all the checkboxes will be ticked as shown:

$\Rightarrow$ This indicates calibration is complete, click 'Calibrate & Save' and the screen will appear as below, with the yellow corner points now visible in blue:

$\Rightarrow$ Move to the next tab 'Individual View Tuning' to fine tune each image.

3.5 Fine tuning side images

⇒ Click 'Input Image' button and select the same 'Output' folder as before.

⇒ This screen allows the user to individually adjust the left and right camera images.

⇒ **Roll:** Rotates the image

⇒ **W-scale:** stretches image vertically

⇒ **H-scale:** stretches image horizontally

⇒ **Trans. H:** adjusts the position of the image horizontally

⇒ **Trans. V:** adjusts the position of the image vertically

After adjusting the images as required, click 'Apply' and then 'Save'. This will save the new settings back to the 'Output' folder on the PC.
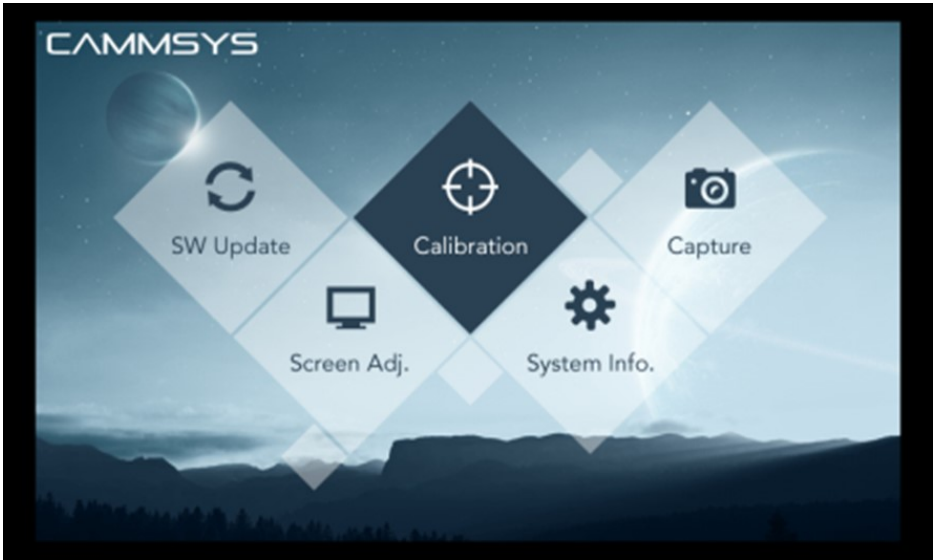
Re-format the SD card so that it is blank again, and this time copy ALL the files from the 'Output' folder onto it.
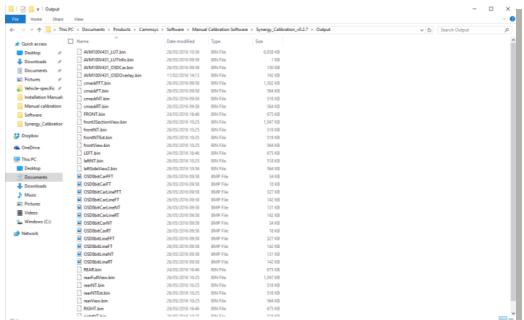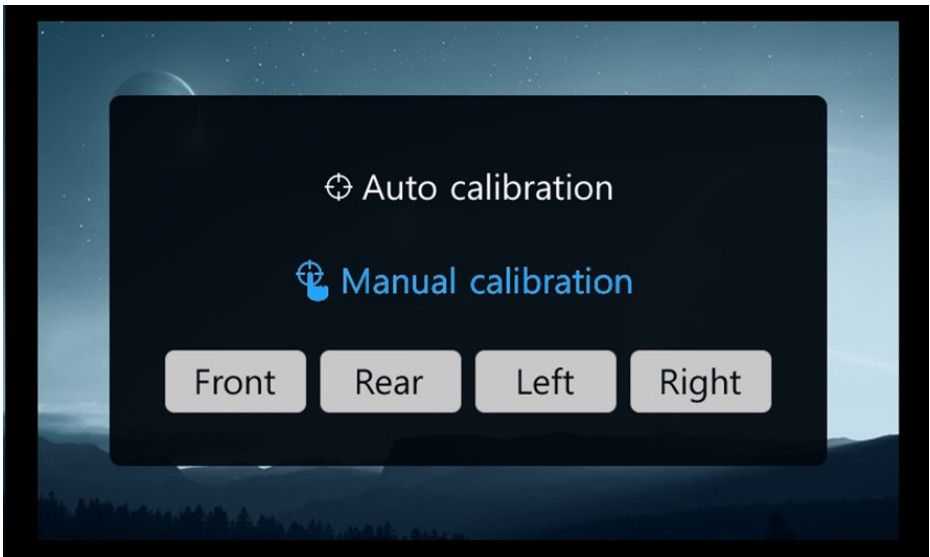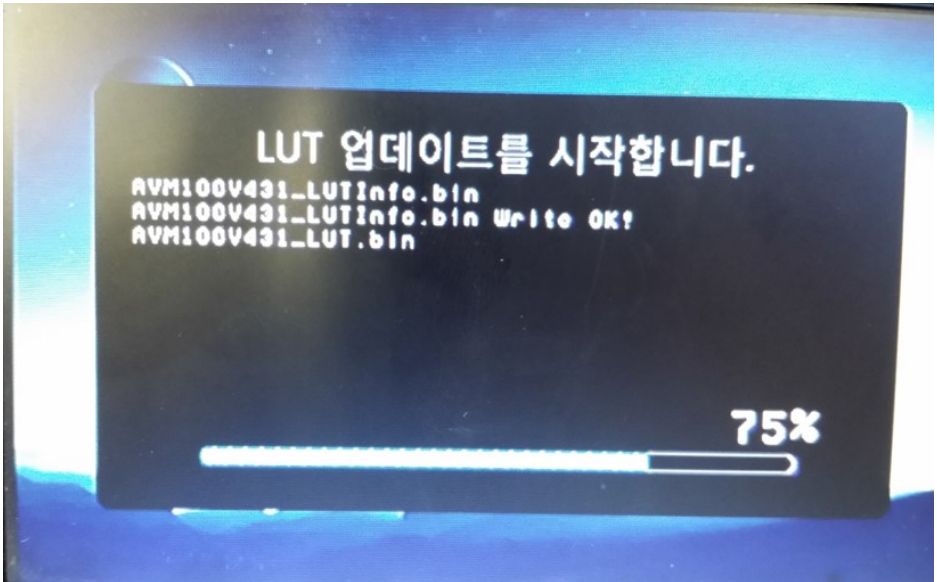
3.6 Updating ECU

⇒ Ensuring that the system is off, insert SD card into the ECU, and then boot up.

⇒ Select 'Calibration' from the main menu to update the ECU with the new settings. On the next screen choose 'Manual calibration'
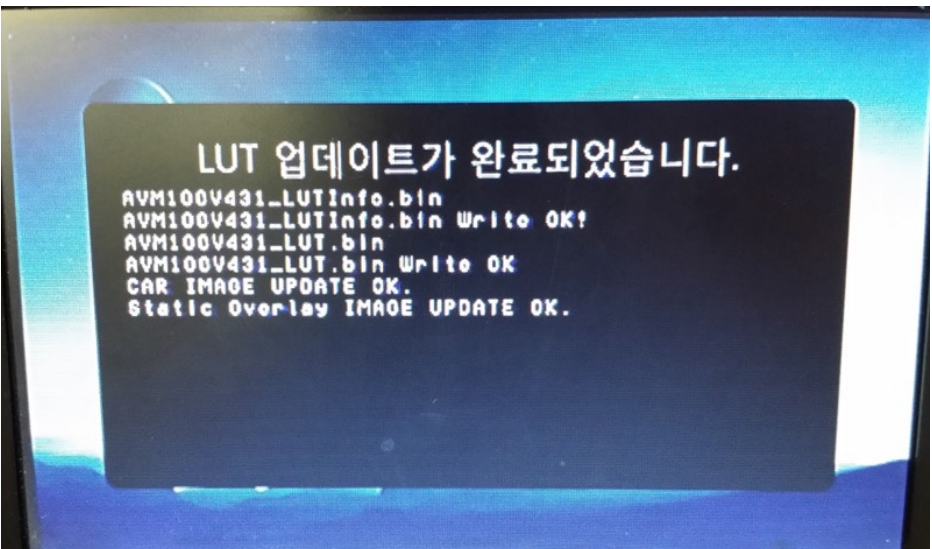
$\Rightarrow$ This will begin the calibration update:

$\Rightarrow$ When the ECU is updating, an amber LED flashes on the unit housing.
     When the update is finished, the LED is on constant.
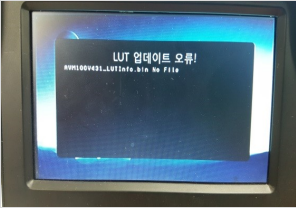
$\Rightarrow$ When the following window appears, turn off the vehicle ignition, re-
     move the SD card, then reboot the system.

⇒ Completed calibration will appear as follows:

4. Calibration failure and solutions

Situation	Cause
Cannot read the file AVM100V431_LUTInfo.bin No File	Cause: When calibration update file is missing or SD card format was not done correctly. **Solution:** **Format SD card properly and check update file on SD card. Insert SD card into ECU and run calibration again.**
Update failure AVM100V431_OSDOverlay.bin Update failure AVM100V431_LUT.bin is updated incorrectly	Cause: Due to invalid files or unusual situations such as car engine stalled so that ECU turns off, the manual calibration does not run properly. **Solution:** **Format corrupted files and SD card and then copy calibration file again. Run calibration again.** **When manual calibration is running, maintain circumstances until update is done.**

5. Calibration restrictions

No	Environmental conditions	Comment	Notes
1	Height difference in road	Road and vehicle is not horizontal in the field of view e.g.) if left or right side of the road is a cliff, or if the road has a slope.	Find flat spots and then run manual calibration.
2	If the object is detached from the road surface	The object hung in midair, for example	Check the image and reinstall the object.
3	If foreign material adheres to the lens	Deformed images of camera due to dusty or wet lens	Check the camera and keep clean.
4	If the position of the camera is changed	If external force has changed camera position or if camera position is moved because of the door opening and closing	Run re-calibration
5	Vehicle size and camera position	Vehicle size presents over 30 percent contrast to the full width and height of the standards. Height of installation of cameras presents over 30 percent contrast to the standards.	Rerun calibration fulfilling the requirements.
6	Camera malfunction	At least one of the cameras used for Smart Vision 360 is not operating properly.	Replace camera
7	If you see the vehicle bumper in the front/rear image	If you can see the vehicle bumper over than 30% of image from the front and rear images (This can raise showing the bumper from the top-view image.)	
8	If the angle of the vehicle twisted violently in the side image	If the angle of the vehicle is over ±10˚ twisted on the basis of the standard images. (This can raise twisted image from the Top-view image)	
9	If the pattern is badly damaged	The pattern is badly damaged so cannot be applied to manual calibration.	Replace pattern