MS-96 – Carpack Kit

USER MANUAL

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TABLE

1 CARPACK KIT

The *CARPACK Kit* includes:

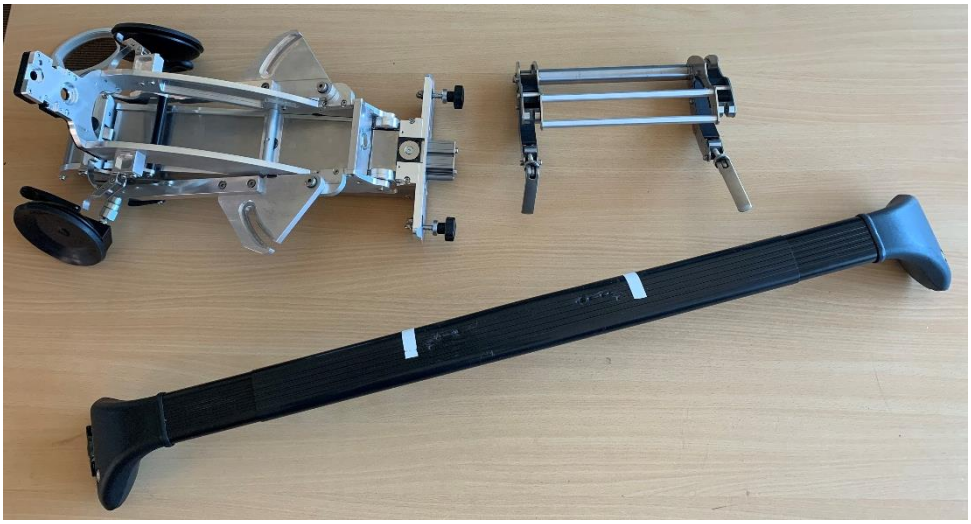
1. A chassis for mounting on a vehicle:
2. The Main Chassis
3. A mini-bar on two suction cups
4. A clamp
5. A 3m cable for the connection between the remote box and the MS-96 system
6. One DC/DC cigarette lighter power supply

2 SET-UP

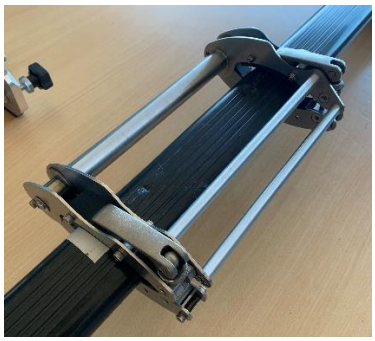
The chassis for vehicle assembly has many adjustment points allowing it to adapt to different vehicles.

2.1 CONFIGURATION #1

The first configuration consists of installing the chassis on the roof of a vehicle using a roof rack, which is itself attached to the vehicle.



1- Install the "clamp" on the roof rack and tighten the clamp using the clamping knobs
Depending on the bar types, the clamp can be positioned vertically.



2- Install the bar on the vehicle

3- Deploy the chassis by following the steps below

Figure 1: Unfold the chassis

Figure 2: Unfold both arms of the suction cups and tighten the knobs in the groove

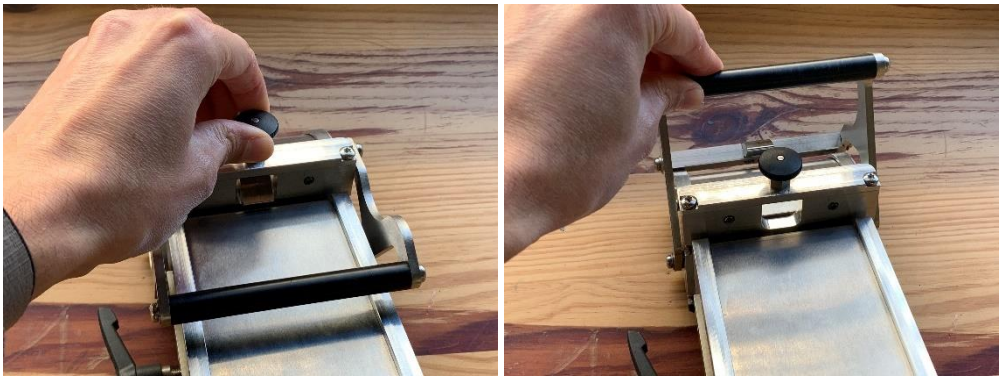


Figure 3: Lift the pin and open the jaw forward

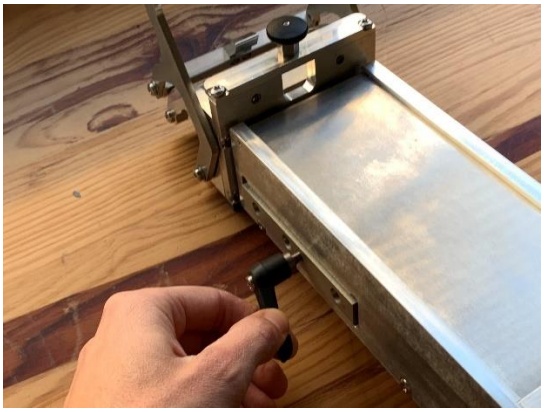


Figure 4: Loosen the telescopic arm clamp lever

4- Position the chassis on the roof of the vehicle

Figure 5: Engage the front jaw on the clamp

Figure 6: Close the jaw and make sure the pin is engaged

5- Adjust the chassis trim on the roof of the vehicle

Figure 7: Adjust the trim by adjusting the angles of the two side arms using the rear knobs

6- Secure the suction cups on the bodywork. These must be able to be positioned as far back as possible from the vehicle


7- Squeeze the telescopic arm lever

2.2 Configuration #2

The second setup is to use the two-suction cup mini-bar as a replacement for the clamp on the roof rack.

1- Position the mini-bar on the roof of the vehicle
2- Repeat to step 3- above to position the chassis and make the necessary adjustments.

Figure 8: configuration with 4x suction cups

3- Align the chassis: Configuration #1 will naturally align the chassis axis with the vehicle axis. In configuration #2, the operator must visually make sure that the chassis is aligned with the vehicle axis.

2.3 MS-96 INSTALLATION

The operator can then install the system:

1- Connect the 3m cable to the dock of the MS-96
2- Run the cable through a window of the vehicle to connect it to the remote box

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WARNING#1. The remote box must necessarily be positioned in the vehicle cabin (interior). It must never be located outside.

3- Position the MS-96 on the dock and close the *SmartConnect*

4- Secure the MS-96 with the closure of two side hooks

2.4 POWER SUPPLIED BY THE VEHICLE

Figure 9: Connectors for 19V external power supply for vehicles

The remote box can be connected to the supplied power supply to benefit from a permanent power source in addition to the two on-board batteries. Thus, the system has a permanent power supply while benefiting from a "buffer" energy thanks to the on-board batteries.

2.5 Set-up Diagram

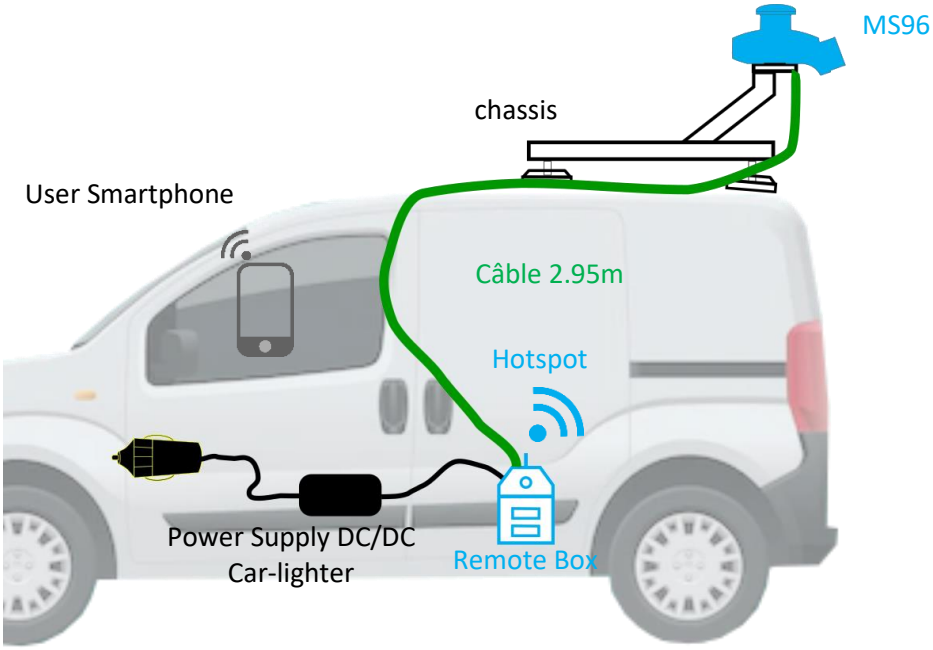

Figure 10: Carpack Configuration

3 Recommendations

3.1 Preparation

- In one way or another, it is preferable to carry out a reconnaissance phase of the site before starting the mission.
- Predict the trajectory in order to optimize the operation with the trajectory overlap to optimize the loop search
- The operator will be able to load trajectories (polylines) or work areas (polygons) representing his site into the system in order to visualize the areas to be covered on site.

3.2 Kinematic model

In the case of the carpack, the system mounted on a car, the user will be able to enter a new model, customized to its configuration, vehicle, assembly.
They will then be asked to:

- The presence or absence of a positioning aid (single or dual antenna GNSS, prism)
- The main lever arm
- The lever arm of the second antenna in the case of the dual antenna

These lever arms must be expressed in a specific reference frame and relative to a particular reference point.

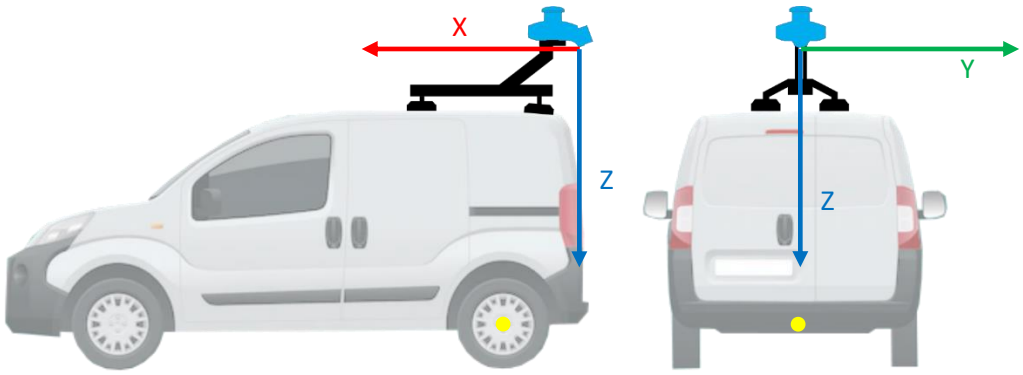

Figure 11: Axis orientation for measuring lever arms

The measurement of the main lever arm consists of giving ±5cm the coordinates expressed in meters of the yellow dot above (corresponding to the middle of the rear axle) with respect to the reference point of the MS-96 system (rubber located below the oblique LiDAR sensor).

Figure 12: Position of the reference point in red

Typically, as an example, this point has coordinates of the type:

$$\begin{cases} X = \text{Positive value between 0 and 1.5m} \\ Y \simeq 0 \\ Z = \text{positive value between 1.5m and 2.5m} \end{cases}$$

In the same way, the definition of the lever arm of the second antenna will respect the same axes.

3.3 Initialization of the system

Once installed on the vehicle, it is necessary to activate the dynamic navigation mode ("*Full Nav*"). To do this, the user moves the vehicle a few meters with good GNSS reception.

WARNING#2. The position on the map will only be active when the system has its navigation mode active.

Then, it is recommended to drive for five (5) to ten (10) minutes, without any special procedure, with good GNSS reception, to let the sensors warm up and reach their internal working temperatures. Once this warm-up period has been completed, the operator can start his first scan.

3.4 Outdoor event

We remind you that the system is not designed to operate under the following climatic or environmental conditions:

- Rain or other precipitation
- Dense dust
- Saturated humidity

Regarding unpaved roads, it is prudent to drive at a suitable speed to keep the system on the vehicle.

Configuration #1 will be preferred in the following situations:

- Strong vibrations (unpaved path/road)
- Strong wind or gusts
- High vehicle speed (over 30km/h)
- Increased air humidity (over 90%)

WARNING#3. Check the suction force of the suction cups

It is highly recommended to check the fasteners and suction cups several times a day. The vacuum generated by the suction cups can change over time, especially with the outside temperature which can affect the density of the air.

3.5 How to Get Around - Trajectory

No special precautions are required regarding the trajectories to be followed. Any maneuver authorized by the Highway Code is permitted by the system.

In the case of an urban road network, each crossing can be useful for closing the loop during the calculations. It will therefore not be necessary to drive several times on the same road. On the other hand, passing in opposite directions of the same street can improve density and limit masks.

On motorways, it may be necessary to pass several times in the same direction, on different lanes, for reasons of density and completeness over the entire width of the road.

4 Table of Figures