

XL-1000 WIM Calibration Procedure

This document outlines the procedure for performing a calibration of a XL-1000 Weigh-in-Motion (WIM) system. Calibration must be performed when the system is first installed and, at a minimum, annually thereafter. The system must also be calibrated if the piezoelectric sensors are replaced or the system is moved to a different set of sensors.

Performance of the WIM system is highly dependent on the condition of the road surface and correct calibration. It is recommended that the site conditions follow those detailed in the ASTM E1318 standard. Less than ideal site conditions can lead to degradation in performance. Similarly, poor calibration will lead to sub-optimal performance of the WIM system.

The calibration of a WIM system involves the use of statically measured reference vehicles that are driven over the system multiple times in order to generate the factors for associating sensor reading with vehicle weights. A user will utilise the Site Monitor program to flag reference vehicles as they pass the site. Due to the need for each vehicle to make multiple passes, and depending on the number of lanes, calibration can typically last from half a day up to a full day.

Selection of reference vehicles for calibration

Two different classes of vehicles that are representative of those typically observed at the site location are required for the calibration procedure. For typical sites, these two classes would include a two-axle, six-tyre, single unit truck and a six-axle, single trailer truck. At a minimum, there must be one of each of these classes of vehicles. It is recommended that there are two of each of these classes for more reliable calibration data. Where possible, the reference vehicles should be loaded up to 90% of the gross vehicle mass. Care must be taken to avoid vehicles with loads that are unsymmetrical or capable of shifting (for example, fluid loads).

Measuring reference vehicles

The reference vehicles must be statically weighed to obtain axle weights. This can be accomplished using any type of equipment, such as axle or wheel scales, provided that it has been recently calibrated and is shown to provide a high degree of confidence in the measurements.

Measurements should be preferably taken using axle scales for each axle of the vehicle simultaneously with the gross weight being the sum of all the axle scales. The vehicle should be measured with the breaks fully released. The measurement process should be repeated a minimum of three times for increased accuracy with the arithmetic mean being used as the end result. Any statistically significant outliers should be discarded and a new measurement performed.

The reference vehicles should also have the distance between successive axles from centre-to-centre measured and recorded. Tyre pressures should be checked to be consistent across all tyres and within manufacturer recommended values and recorded.

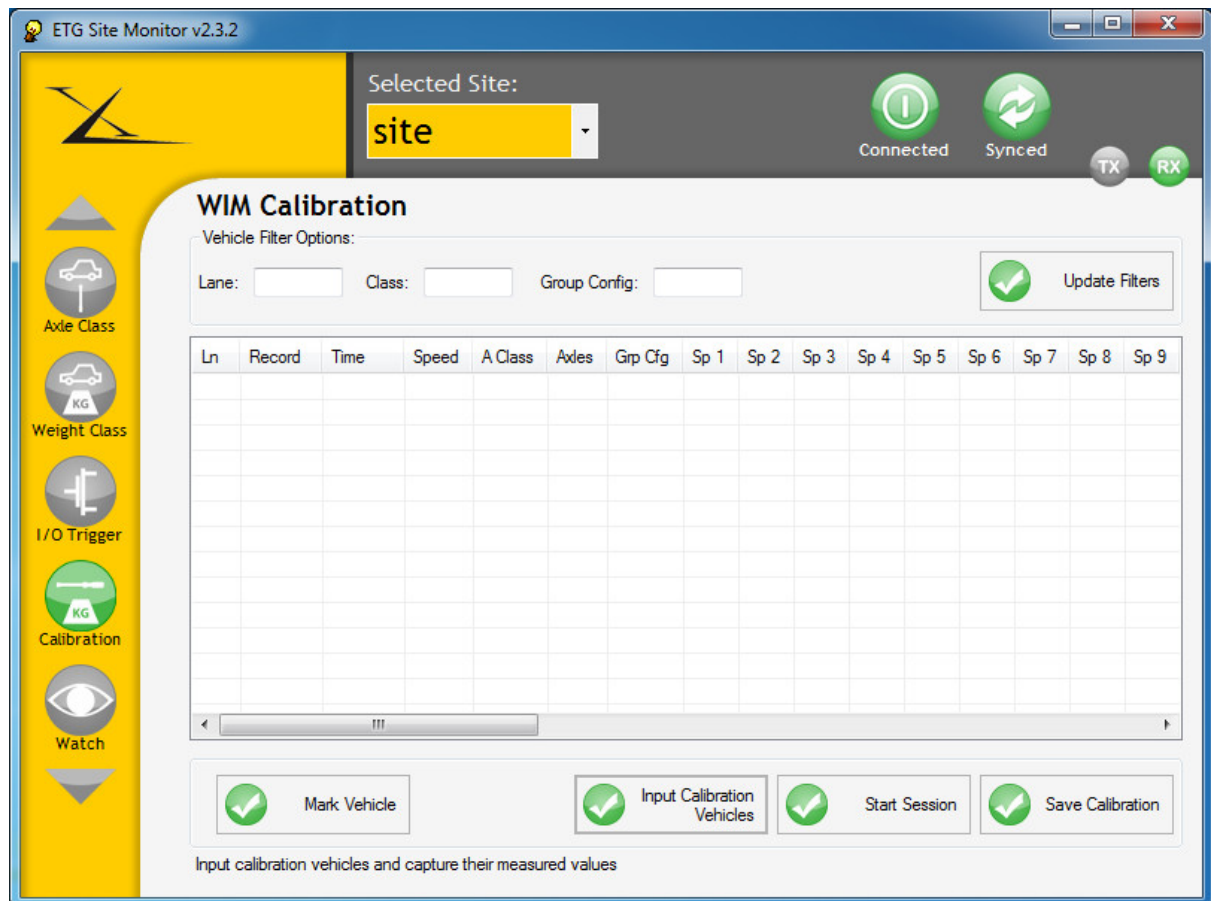
Performing calibration

Calibration involves recording the properties of reference vehicles as they are measured by the WIM system multiple times. The properties of the reference vehicle can be recorded using the Site Monitor program as described in the following section. At least ten successfully measured passes of each vehicle are recommended during the calibration procedure. When the calibration procedure has been completed the WIM system will calculate its factors from the provided data.

The set of measured passes should be split into two speed groups representative of the velocity range for the site. This would typically be at the posted speed limit and 10km/h below it. The passes should be split with roughly 60% at the posted speed limit and 40% at the lower speed limit.

Using Site Monitor to record calibration data

Open the Site Monitor program and connect to the WIM system. Once connected, navigate to the Calibration page.



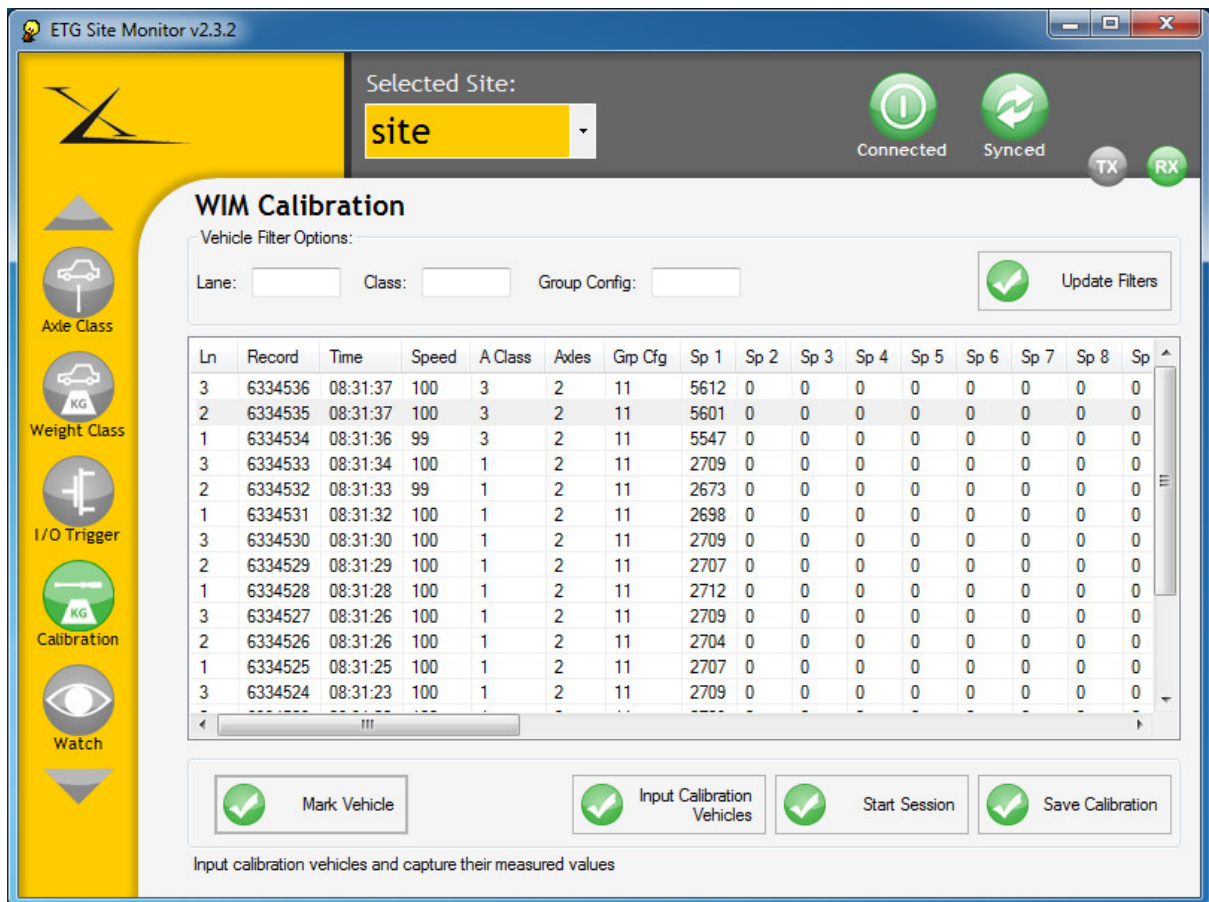
The first step is to enter the details of the reference vehicles that will be used for calibration. Press the Input Calibration Vehicles button. A window is displayed that allows the details of each reference vehicle to be entered.

WIM Calibrated Vehicle Creation

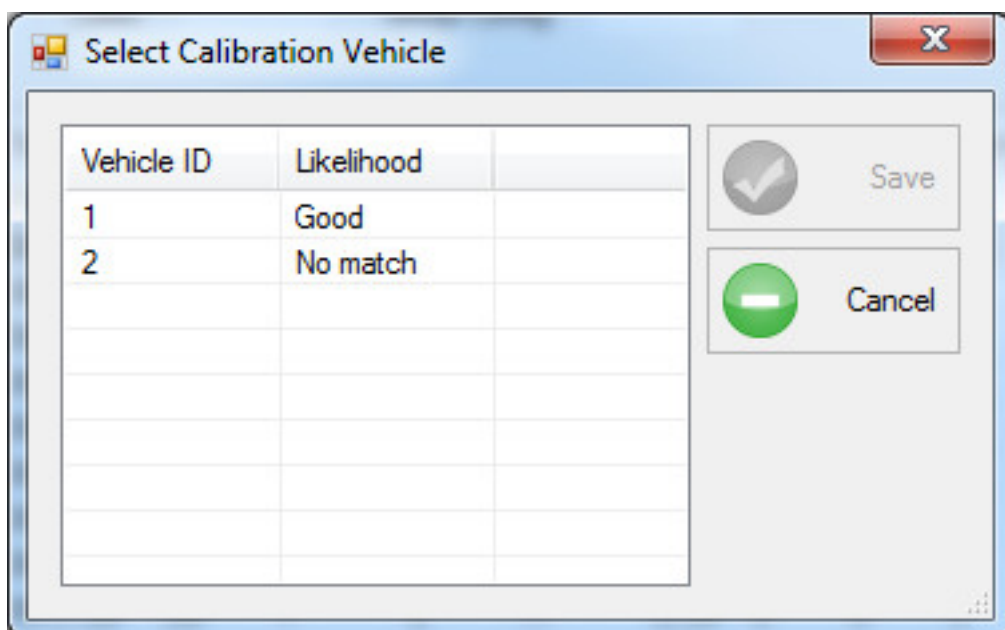
ID	Sp 1	Sp 2	Sp 3	Sp 4	Sp 5	Sp 6	Sp 7	Sp 8	Wt 1	Wt 2	Wt 3	Wt 4	Wt 5	Wt 6	Wt 7	Wt 8	Wt 9
1	5612	0	0	0	0	0	0	0	4679	4065	0	0	0	0	0	0	0
2	3604	1315	6838	1266	1272	0	0	0	5173	4517	4590	3715	3780	3682	0	0	0

	Axle 1	Axle 2	Axle 3	Axle 4	Axle 5	Axle 6	Axle 7	Axle 8	Axle 9
Axle Weights (kg):	5173	4517	4590	3715	3780	3682	0	0	0
Axle Spacings (mm):	3604	1315	6838	1266	1272	0	0	0	

Press the Start Session button. The program will now display all vehicles that have been detected by the system.



When a reference vehicle has been measured by the system select it from the list of all vehicles and press the Mark Vehicle button. A selection box will pop up that contains a list of the reference vehicle IDs that were entered at the beginning and a likelihood of the selected vehicle being any of the reference vehicles based on a match between the entered and measured axle spacings. Select the reference vehicle ID that matches the vehicle that was observed passing the site and press the Save button.



Continue marking the reference vehicle passes until there have been a sufficient number across all reference vehicles and all lanes as described previously. When calibration has finished, press the Save Calibration button. A new window will be displayed showing a review of all marked vehicle events. From here it is possible to remove events that were incorrectly selected by highlighting the erroneous vehicle event and pressing the Remove button. It is also possible to add missed vehicle events by pressing the Add button that will display a new page containing all vehicle events that occurred during the calibration session and allowing them to be added to the marked list.

The screenshot shows a window titled "Review Calibration Passes" with a table of data and control buttons at the bottom. The table has 17 columns: Calibration ID, Ln, Record, Time, Speed, A Class, Axles, Grp Cfg, Sp 1, Sp 2, Sp 3, Sp 4, Sp 5, Sp 6, Sp 7, Sp 8, and Sp 9. The data is as follows:

Calibration ID	Ln	Record	Time	Speed	A Class	Axles	Grp Cfg	Sp 1	Sp 2	Sp 3	Sp 4	Sp 5	Sp 6	Sp 7	Sp 8	Sp 9
1	2	6334535	08:31:37	100	3	2	11	5601	0	0	0	0	0	0	0	0
2	2	6334778	08:36:30	100	9	6	123	3584	1319	6822	1250	1257	0	0	0	0
2	3	6334779	08:36:31	100	9	6	123	3596	1305	6832	1255	1256	0	0	0	0
2	1	6334807	08:37:06	100	9	6	123	3598	1306	6807	1264	1250	0	0	0	0
2	2	6334808	08:37:07	100	9	6	123	3589	1312	6817	1249	1259	0	0	0	0
2	3	6334809	08:37:08	100	9	6	123	3585	1302	6813	1260	1246	0	0	0	0
1	3	6334806	08:37:04	100	3	2	11	5612	0	0	0	0	0	0	0	0
1	2	6334805	08:37:03	100	3	2	11	5602	0	0	0	0	0	0	0	0
1	1	6334804	08:37:02	100	3	2	11	5595	0	0	0	0	0	0	0	0

At the bottom of the window, there are four buttons: "Remove" (with a minus sign icon), "Add..." (with a plus sign icon), "Cancel" (with a minus sign icon), and "Save" (with a checkmark icon).

Press the Save button once the list has been verified or press the Cancel button to return to the Calibration page to continue calibration.