



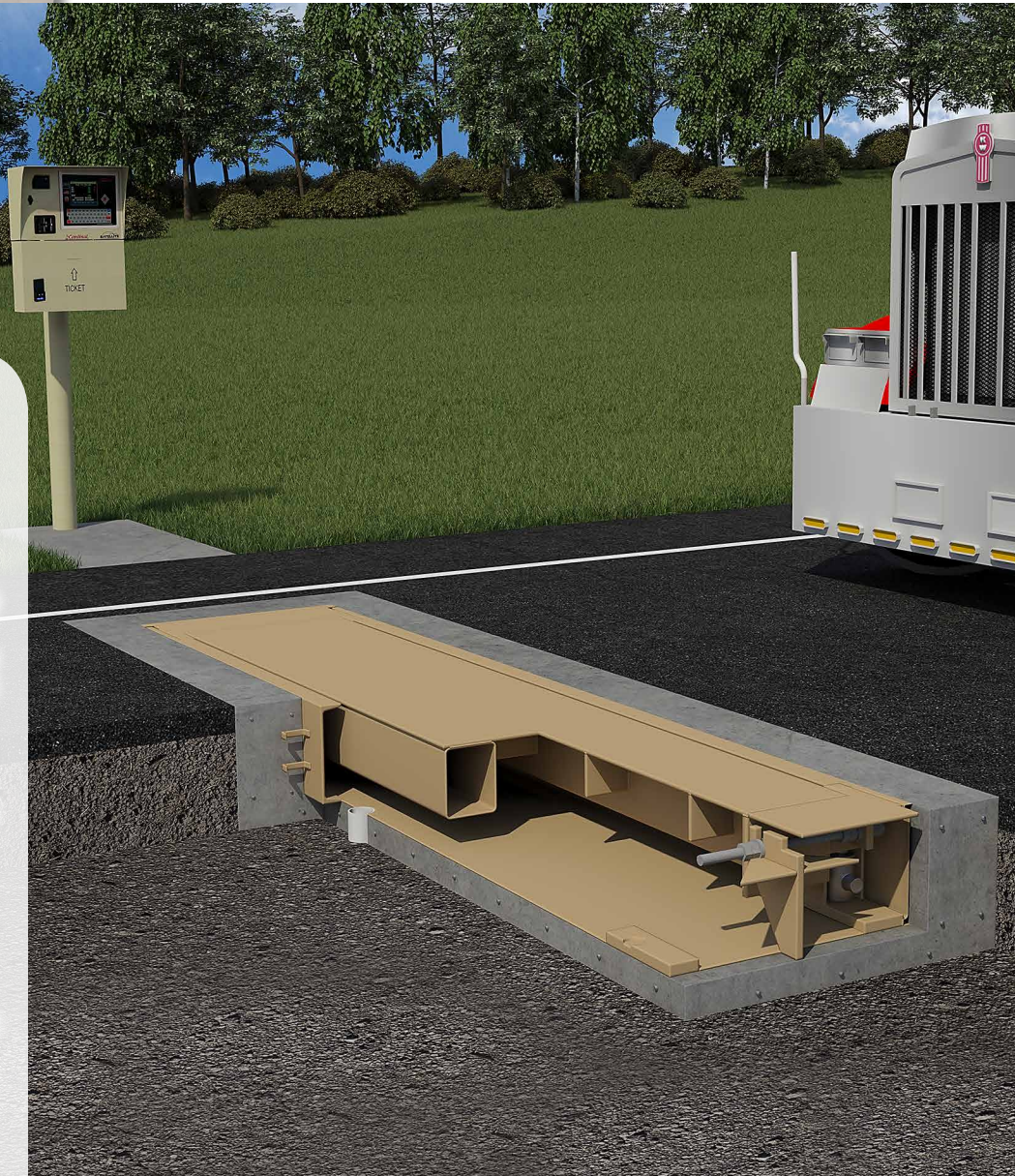
FREQUENTLY ASKED QUESTIONS

Q *Is the SWIM scale adequate for using in place of a static truck scale for buying and selling products by weight?*

A There are no WIM weigh-in-motion systems (manufactured by Cardinal Scale or anyone else) that are legal for trade in the US. Some states do use them for enforcement of legal weights, but even that is a gray area. As an industry, scale manufacturers are working on creating the NTEP requirements to someday allow a legal-for-trade WIM scale, but that could still be many years away from reality. While we are confident that our SWIM scale will produce consistent in-motion weights that are within 1-2% of actual static measurements, that is not accurate enough to legally exchange money for products sold by weight.

Q *What is the capacity of the SWIM scale?*

A Our SWIM is supported by four 50,000-lb load cells. This means that the SWIM could accurately measure a single axle up to 100 tons; however, the weighbridge itself is not rated for that amount of load. Based on the bridge capacity, you could safely weigh up to 80,000 lbs on any single axle. Because each axle is recorded independently and summed after the vehicle has passed, the total gross weight of the vehicle is unlimited. You could cross the scale with a five-axle truck with each axle weighing 80,000 lbs and the indicator would display a gross vehicle weight of 400,000 lbs. Or, hypothetically, you could cross the WIM bridge with a 100-axle truck and show a gross weight of 8 million pounds. This is an interesting aspect of the SWIM scale that isn't possible in a typical static truck scale.



Q What separates Cardinal Scale's SWIM from the competitors?

A Cardinal Scale's SWIM is the only slow-speed weigh-in-motion truck scale using compression load cells. Because of the high resonance of this system, we see less spurious weight signals than our competitor's shear beam cells. This makes filtering the samples easier and results in higher accuracy. Additionally, Cardinal Scale also manufactures our own load cells at the company's factory in Webb City, MO, including the 50K-SCA stainless steel compression load cells used in the SWIM. Cardinal Scale is unique in the US scale manufacturing world in that we make our own load cells and tightly monitor our own manufacturing quality according to ISO and VCAP standards.



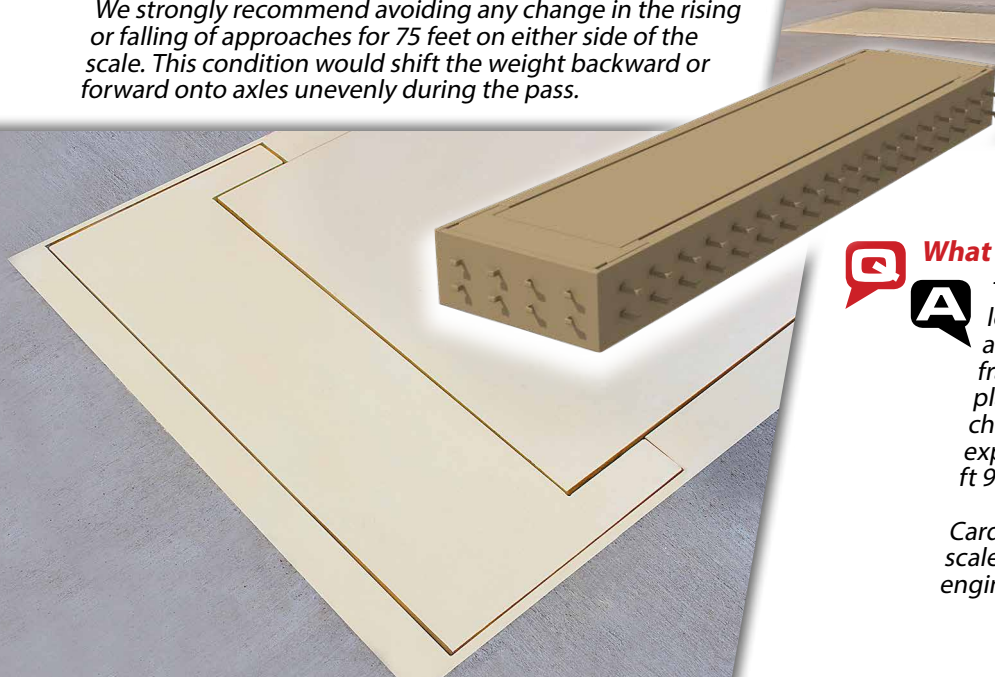
SPEED		ACCURACY
Static		
(Static) 0 km/h (0 mph)		Gross wt. $\pm 0.5\%$ of applied
Dynamic		
0-5 km/h (0-3 mph)		Gross wt. $\pm 1.0\%$ of applied
5-10 km/h (3-6 mph)		Gross wt. $\pm 1.5\%$ of applied
10-20 km/h (6-12 mph)		Gross wt. $\pm 2.0\%$ of applied

Q How accurate is the SWIM scale?

A The SWIM is designed to be used at speeds of less than 12 mph. The slower the vehicle speed the more accurate the measurement. The SWIM can also be used to weigh statically, and in static mode should meet or exceed NTEP tolerances (however, it would still not be legal for trade as it is not approved for this type use).

Q What are the site conditions that need to be met for a WIM scale to perform well?

- A** To achieve the highest accuracy, the following conditions should be met:
- The vehicle needs to approach and exit the scale in a straight line. Turning the vehicle during the weighment should be avoided. A straight approach and exit of 75 feet should be dictated.
 - All effort should be made to avoid conditions which would cause the vehicle to rock, sway, bounce, or have the suspension excited in any way. This requires pavement to be in good condition in advance and beyond the scale.
 - The vehicle should remain on a consistent grade during approach and exit of the scale. This does not mean it has to be level (up to 2% grade is acceptable), but all axles should remain on the same plane during the entire pass. We strongly recommend avoiding any change in the rising or falling of approaches for 75 feet on either side of the scale. This condition would shift the weight backward or forward onto axles unevenly during the pass.



Q What is the footprint size of the SWIM scale?

A The standard size SWIM model has a 12 ft long x 2.5 ft weighbridge to accommodate a standard 12-ft wide traffic lane width. The frame itself is longer because there are access plates on both ends to access the scale's checking and SCA load cells. The overall exposed dimensions of the lower frame are 13 ft 9.25 inches x 3 ft 1.5 inches.

Cardinal Scale can manufacture the SWIM scale in various lengths if needed. Additional engineering costs will apply.



Q What is the installation process?

A The SWIM scale is installed by the user excavating a hole. After the pit is prepared, then the scale's steel lower frame is suspended over the opening via Cardinal Scale-provided beams. The pit is then backfilled with concrete to encase the steel lower frame. After the concrete has cured, the support beams are removed and the load cells and weighbridge are lowered into place. Due to this type of installation, there is no separate pit coping.

An installation/owner's manual is available upon request. Also, if you go online to www.wimsscales.com you can see more 3D color renderings of the scale as well as a PowerPoint presentation.

Q What is included with the standard system and what is the cost?

A The SWIM listed in the Cardinal Scale price guide is a package deal for \$19,599 list price. The SWIM as priced comes with the scale, loop detector and wire, indoor desk-mounted 825 weight indicator (with SWIM software loaded), and P600 ticket printer. If you purchase the standard package, then you will need a scale house or a weather-tight enclosure nearby to put the 825 indicator inside.

There is the option of purchasing an upgrade to get the SAT825 outdoor enclosure which is shown in the 3D rendering of the SWIM bulletin.

Q This is a shallow scale pit. How are the electronics protected from water?

A Because the SWIM pit is so shallow, the trim board is mounted above ground in a pole-mounted box or inside the scale house. If a SAT825 outdoor enclosure is purchased, then the trim board may also go inside of that above-ground enclosure. Typically, the loop detector is also mounted in the same enclosure. This prevents sensitive electronic equipment from being flooded if the pit drain fails. This also allows the scale technician to make adjustments while standing out of the traffic lane and without accessing the pit.

Q How does the SWIM scale work?

A By default, the SWIM is always ready to accept a vehicle for weightment. As soon as the first vehicle axle comes onto the scale, the 825 indicator begins sampling the load cells at a rate of 200 samples/second. The software watches the weight come up and then down as the axle exits. The sample is filtered to remove the rising and falling measurements from the sample as well as any spurious signals. Then it is averaged to determine the axle weight. That axle weight is then displayed as Axle 1 on the indicator and the system awaits the next axle. The SWIM must have a trigger to indicate that the end of the vehicle has passed so that 825 knows when to total the Gross vehicle weight. This is done by means of an inductive coil of wire placed in the pavement just after the scale. When the back bumper of the vehicle has passed the inductive loop, the system interprets that the weighment is over and displays the total of all axles, i.e. the gross vehicle weight. The user can pre-set limits for single axles and/or gross weight. Over-weight readings will display in red. Weights within acceptable range will remain green.





Q How does this scale ship?

A The SWIM scale ships on a flatbed truck. It arrives assembled with load cells installed and the level beams on top all banded together. This skid with the scale measures 165 in x 36 in x 15 in. Additionally, there is a separate cardboard box with the indicator, checkrods, and printer. This box is 48 in x 40 in x 17 in. The total combined weight of both the skid and box is 4,331 lb shipping weight.

Q Do you have more information, photos, or a training video I can view?

A If you are not already familiar, Cardinal Scale has a dedicated WIM Web site: www.wimscales.com. This Web site covers all our WIM offerings, including the high-speed in-motion systems. You can go there online to view a PowerPoint presentation for the SWIM, view 3D renderings of the SWIM, see example views of the 825 SWIM weight display, and view peripheral device options.

Please give Cardinal Scale a call if you have any questions. We would be happy to discuss all your in-motion weighing options: (800) 441-4237 or cardinal@cardet.com.



Q Are there additional peripheral devices I can add to the system to gather more information than just weight?

A All WIM systems are available with a large number of options for peripheral devices: license plate reading cameras, overview cameras, traffic control devices, remote displays, RF readers, recording software, etc. The best plan for figuring out what you need is to describe to our sales staff the sequence of events you envision for your WIM system and then they will help with a suggested layout of products. We also have short WIM questionnaire we can share with you if you would like a tool for describing your needs.



Upcoming Tra

Cardinal Scale Manufa will be exhibiting the latest weigh-in-motion system products at Commercial Vehic Alliance (CVSA) An Conference & Ex September 17-21 Whitehorse, Yuko come by Cardin visit with us and staff.

[Learn Abou](#)

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