Installation and Evaluation of Weigh-In-Motion Utilizing Quartz-Piezo Sensor Technology

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16. Abstract
The objective of the research study was: to install a quartz-piezo based WIM system, and to determine sensor survivability, accuracy and reliability under actual traffic conditions in Connecticut's environment. If the systems prove dependable and durable, and if additional installations are made for statistical data gathering or for screening at weight enforcement locations, the expected benefits from this study are: accurate traffic statistics and better estimates of traffic loading; improved pavement design and subsequent longer pavement lives. The improved technology also offers the potential for easy installation and reduced maintenance and less costly calibration checking than for Piezo electric ceramic sensors.

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Metric Conversion Factors

APPROXIMATE CONVERSIONS TO SI UNITS				
SYMBOL	**WHEN YOU KNOW**	**MULTIPLY BY**	**TO FIND**	**SYMBOL**
LENGTH				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
AREA				
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
VOLUME				
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
NOTE: volumes greater than 1000 L shall be shown in m^3				
MASS				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
TEMPERATURE (exact degrees)				
^oF	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	^oC
ILLUMINATION				
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
FORCE and PRESSURE or STRESS				
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

Table of Contents

List of Figures

List of Tables

Background

The Research Section at the Connecticut Department of Transportation (ConnDOT) is responsible for the coordination of data collection for the FHWA Long Term Pavement Performance (LTPP) Study in Connecticut. As part of this activity, ConnDOT collects and submits traffic statistical data on types, numbers and weights of vehicles at the LTTP General Pavement Study (GPS) and Special Pavement Study (SPS) sections. Connecticut's only LTPP SPS-9A study site for Superpave was constructed in 1997. It was decided to include a full- time automated traffic data collection (weigh-in-motion) system at the site on Route 2 in Lebanon. Although ConnDOT has extensive experience with piezo electric ceramic coaxial cables and portable capacitance pads, the Research staff felt that a more accurate system should be pursued. It was reported in a previous study that piezo electric ceramic sensors are temperature dependent, and the quality of data collected is site dependent. The compensation methods employed by the equipment manufacturers to overcome these drawbacks provide questionable results. It was also found that drifting of the systems occurred over time and that large pavement temperature swings during a given time period (even within a single day) resulted in data of questionable accuracy and consistency. In addition, this made it very difficult to calibrate to desired standards.

In late 1996, research staff made inquiries of other state's experiences with weigh-in-motion (WIM) sensors. Some of the systems considered include: fiber optics, bending plates, load cells, variations of piezo electric cable embedded directly (without a track), and piezoelectric quartz crystals. Of particular interest was the quartz-piezo sensor, which had been installed in Switzerland as part of a European COST 323 WIM study. In that study, the sensors were found to be independent of temperature and vehicle speeds down to 2.5 mph [1]. The only known U.S. installation at the time was on a test track at Pennsylvania State University in State College, Pennsylvania.

A proposal was prepared in January 1997, to purchase, install and evaluate the quartz-piezo sensors in Connecticut, for the LTPP site on Route 2 under the FHWA Priority Technologies Program (PTP). The Quartz-Piezo sensor study is well suited for the PTP program because it involves leading edge technology, results within a short time, potential for greater use beyond the immediate project, and public or private partnerships that leverage other resources. Approval for the project was received from FHWA, formerly Region 1 Office in Albany New York, in April of 1997.

Objectives and Expected Benefits

The objective of the research study was: to install a quartz-piezo based WIM system, and to determine sensor survivability, accuracy and reliability under actual traffic conditions in Connecticut's environment. If the systems prove dependable and durable, and if additional installations are made for statistical data gathering or for screening at weight enforcement locations, the expected benefits from this study are: accurate traffic statistics and better estimates of traffic loadings; improved pavement design and subsequent longer pavement lives. The improved technology also offers the potential for easy installation and reduced maintenance and less costly calibration checking than for Piezo electric ceramic sensors.

The scope of the study involves purchase, installation and evaluation of a quartz-piezo sensor-based WIM system having the capability to provide continuous vehicle classification and

weight data, over all lanes of both directions of route 2, in the vicinity of the Superpave SPS 9A site.

Methods

Test Location

This test represents the first installation of the Quartz-Piezo sensor technology on a highway in the United States. The test site is located on Connecticut Route 2 in both the Eastbound (EB) and Westbound (WB) directions at milepost 29.61, in the town of Lebanon. Route 2 is a four-lane, median divided highway, functionally classified as a principal arterial. It is also part of the National Highway System (NHS) established as a result of ISTEA. The test location selected was based on the need to measure traffic for the FHWA-LTPP SPS-9A program, the availability of power and telephone, the roadway grade and proximity to nearby structures. The pavement is a Superpave bituminous mix, which was placed on existing bituminous pavement that had undergone partial depth milling. The Superpave surface layer was placed during 1997 and therefore in excellent condition at the time of the study. Connecticut Route 2, with two lanes in each direction carries an average daily traffic volume of 22,300 vehicles per day (1999 count). Approximately 4% of the vehicles are classified as heavy trucks. The grade is under 3% and the cross-grade is less than 1% slope.

Pavement Materials

In 1997, in order to accommodate the testing needs of the FHWA-LTPP SPS-9 Program, the full-depth asphalt pavement was overlayed with a single 63.5 mm lift course. Both directions were paved with SuperPave Mix designs. The Eastbound (lanes 3 and 4) pavement mix design was a 64-28 performance-graded binder with 5% asphalt content. The Westbound (lanes 1 and 2) pavement mix contained 20% recycled asphalt pavement (RAP) and used a 58-34 performance-graded binder and 5% asphalt content. Complete details regarding the installation of this site are available [6].

The Quartz-Piezo Sensor

A quartz-piezo sensor is made up of a quartz-sensing element, placed in a high-strength aluminum alloy extrusion and surrounded with elastic material (Figure 1). A load pad of epoxy-silica sand compound is attached to the top of the aluminum housing during the manufacturing process. The sides of the load pad are wrapped with closed-cell foam padding to isolate any side forces caused by a volume change in the pavement. The sensors are manufactured in one-meter lengths. A one-meter length sensor has twenty quartz-disks, under a pre-load, distributed evenly throughout. When a force is applied to the sensor surface, i.e., the load pad, the quartz disks yield an electric charge proportional to the applied force as a result of the piezoelectric effect. The electric charge is converted by a charge amplifier into the proportional voltage [2]. This signal is utilized through an appropriate electronics interface to determine axle or wheel loads.

The sensor installs in a slot cut into the pavement surface which is then grouted with a proprietary compound of epoxy and silica sand. The sensor is flush with the surface. Normally a 2 1/8 inch deep by 2¾ inch wide channel is cut in the pavement to accommodate the Quartz-Piezo sensors. The pavement overlay at this location on route 2 was placed in a 2½ inch thick lift to accommodate the testing needs of the FHWA-LTPP SPS-9A program. To avoid any thin or

loose material remaining in the sensor channel, a dry-cut 2½ inch deep channel was made for the sensor placement. During installation, the epoxy surface is leveled as much as possible using a trowel. When dry to the touch, the surface is ground using a rotary or belt sander to remove any high points and ensure a smooth transition with the surrounding pavement.

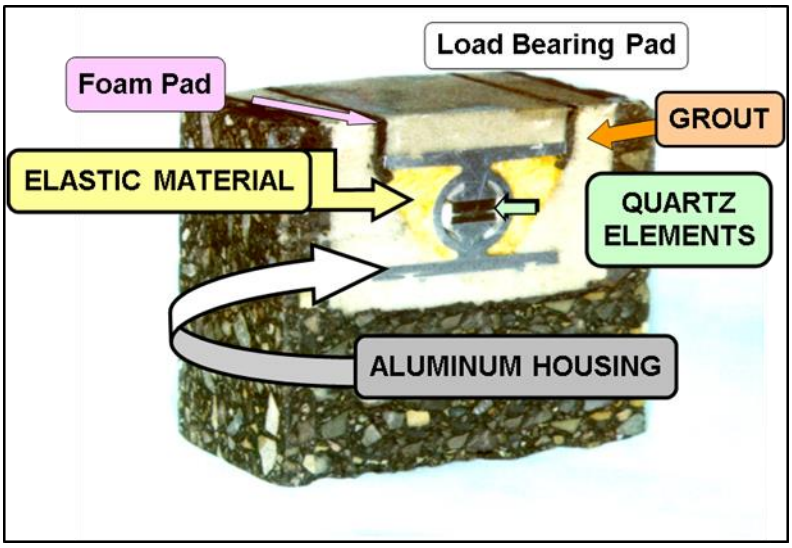


Figure 1: Cross Section of Quartz-Piezo Sensor

WIM Sensor Layout

The sensor layout was selected in order to gather data in a manner similar to previously evaluated piezoelectric WIM systems. The layout configuration is an induction loop, two full lane-width strips of Quartz WIM sensors and a second induction loop (Figure 2). The full lane-width strip of quartz-piezo sensors is assembled by laying four, one-meter sensors end-to-end. The sensors are attached to each other with a metal plate screwed to the base ends of the sensors (shown upside-down in Figure 3). A distance of sixteen feet between sensors was recommended by the sensor manufacturer based on the average speed of vehicles at the location. At the time of installation, the posted speed limit was 55mph. This speed limit was increased to 65mph on October 1, 1998.

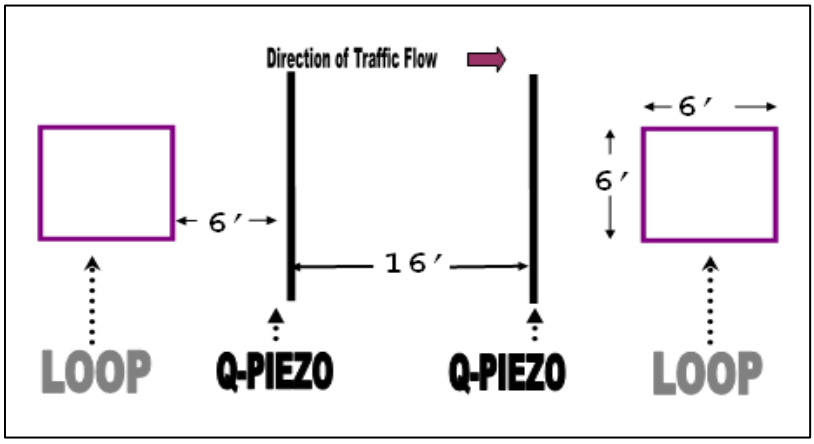


Figure 2: WIM Sensor layout for a Typical Lane

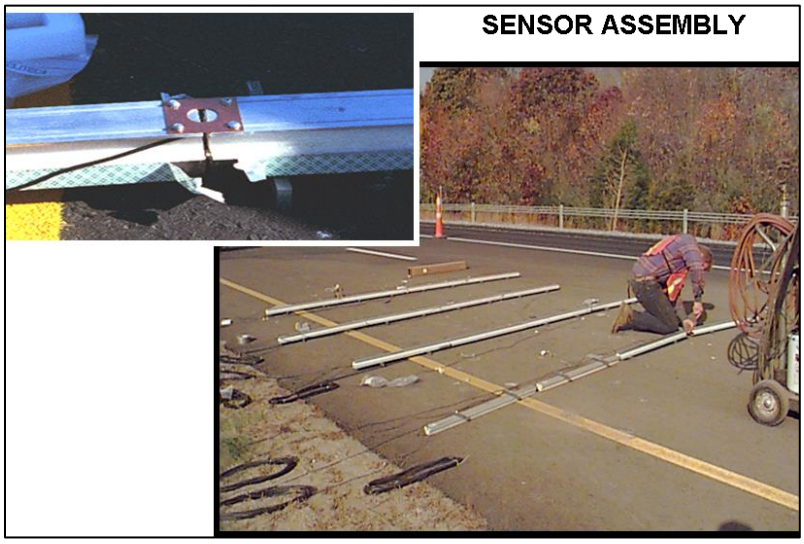


Figure 3: Sensor Assembly

Both lanes in each direction were instrumented, for a total of four lanes of WIM (Figure 4A and 4B). The sensors are Kistler LINEAS 9195B. They were placed from the center of the white skip line mark to 1.11ft (0.34m) into the shoulder (both left and right), in order to accommodate the four one-meter sensors within the 12ft (3.66m) lane width. At the time of purchase, the sensors were only manufactured in one-meter lengths. A traffic control type cabinet on a concrete foundation was installed in the median of the highway to house the electronics for both the EB and WB directions.

The quartz-piezo sensors are supposed to collect data without a need for temperature correction. One temperature sensor was installed in the WB high-speed lane at the specific request of ConnDOT research personnel, in case the need arose to monitor pavement temperature.

The Quartz WIM system design has the capability to differentiate between right and left wheel-path. For this study, it was decided to collect wheel-path specific data in the slow-speed lane of each direction only. The electronic interface used at this site had a finite (12 channel) capability that did not allow the collection of wheel-path specific data in the high-speed lane. If needed, this electronic package can be modified for future installations that include more lanes.

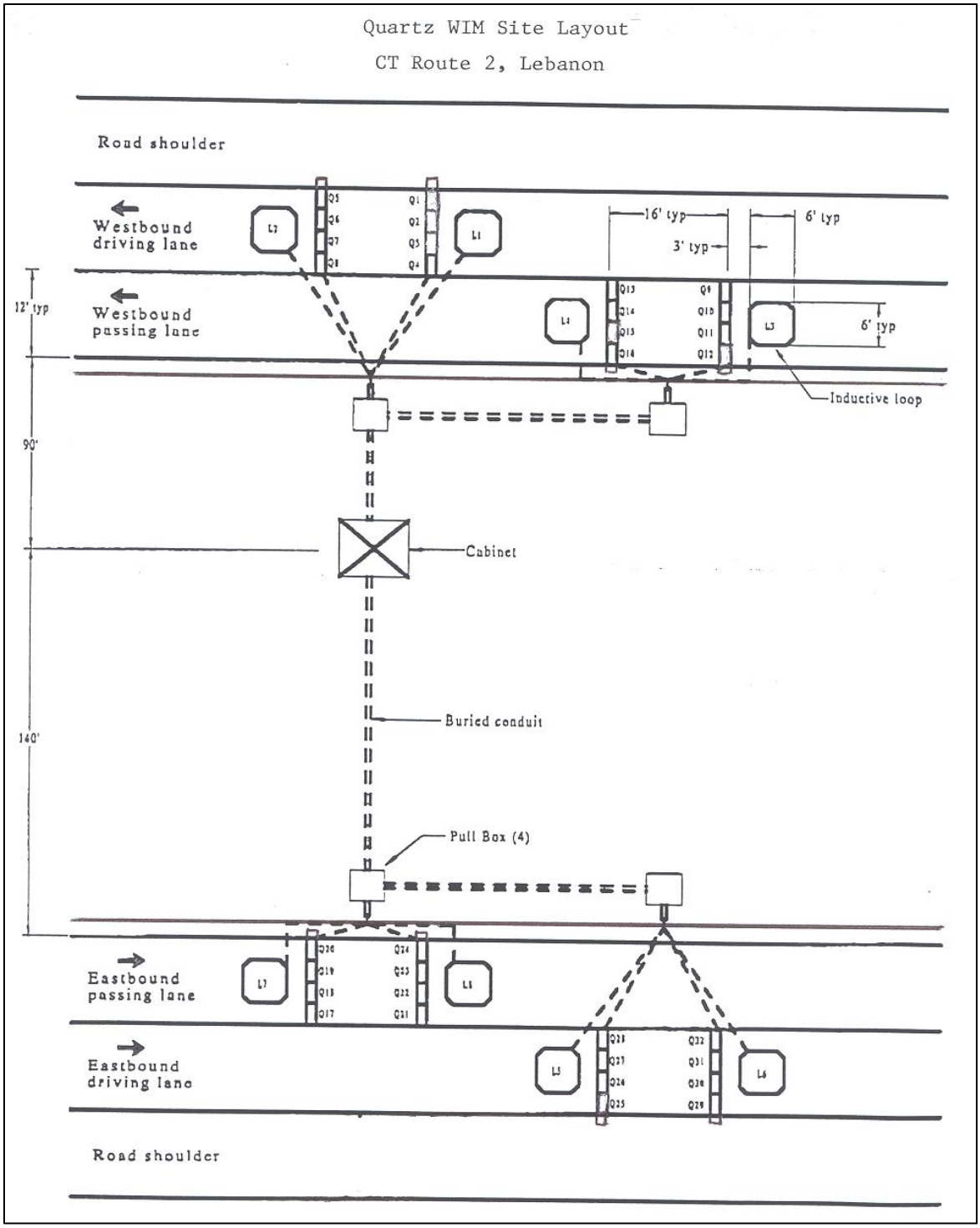


Figure 4A: Site Layout

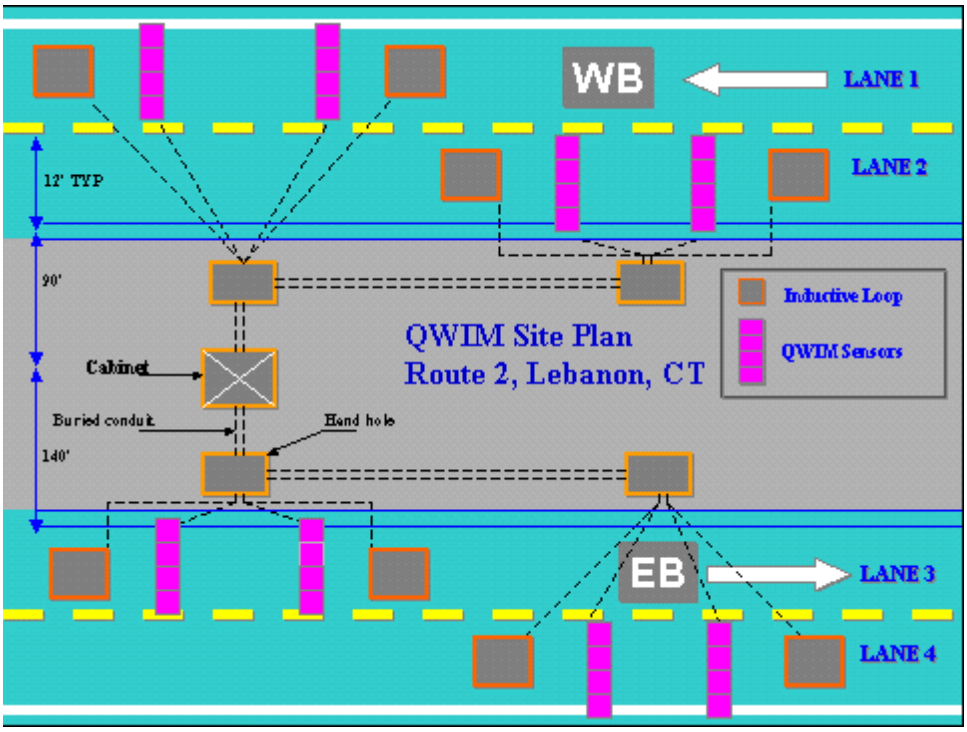


Figure 4B: Site Layout

Quartz WIM Installation

The sensor installation was delayed but completed on October 23 and 24, 1997, primarily due to the paving work required at the test site prior to the instrumentation. These dates are on the fringe of the temperature dependent fieldwork season in Connecticut. On the installation dates, the weather sustained approximately 45 degree Fahrenheit temperatures; unseasonably cold, however, warm enough to install the grout. The minimum temperature recommended for grout installation is 40 degree Fahrenheit.

The sensor manufacturer delivered the sensors to the site. Normally, a 21/8 inch high by 2¾ inch wide channel is cut in the pavement to accommodate the Quartz-Piezo sensors. The pavement overlay was placed in a 2½ inch lift at this location to accommodate the testing needs of the FHWA-LTPP SPS-9A program. In order to not have any lose material in the sensor channel, a dry-cut 2½ inch deep channel was removed for the sensor placement.

The sensors were installed using a proprietary compound of epoxy and silica-sand grout. The system is designed to not cover the top of the sensor but instead to embed the sensor into the grout and then to level the surface as much as possible using a trowel. When dry to the touch, the surface is designed to be sanded to remove any high points. Due to the low ambient temperature, the sanding of the grout could not be successfully accomplished on the same day as placement. The EB sensors were then opened to traffic and sanded the next day, October 24, 1997. The WB sensors were installed on October 24, 1997, and sanded a couple of weeks later on November 6, 1997, when lane-closure was available. Upon installation, the sensor manufacturer representative checked the sensor signals at the cabinet and all were found to be within the desirable range.

During the WB sanding of the sensors on November 6, 1997, it was observed that very fine and tight (less than 1/32 inch) cracks existed at one location in each strip of sensors. The crack was located between the mid-point of the four sensors in seven of the eight strips and at the one-quarter mark in the eighth strip. It was determined that the cracking was formed from the top-surface down because sanding temporarily removed the cracking in the WB direction.

The electronics were scheduled for installation during the week of December 16, 1997. During the set-up of the electronics it was discovered that four sensors (located as shown by 'X' in Figure 5) did not produce a signal in the desirable range. Investigation by the sensor manufacturer determined that the problem was not in the wiring from the cabinet to the handholes. Oddly, the sensor malfunctions were distributed evenly, one per lane, but not in the same location per lane.

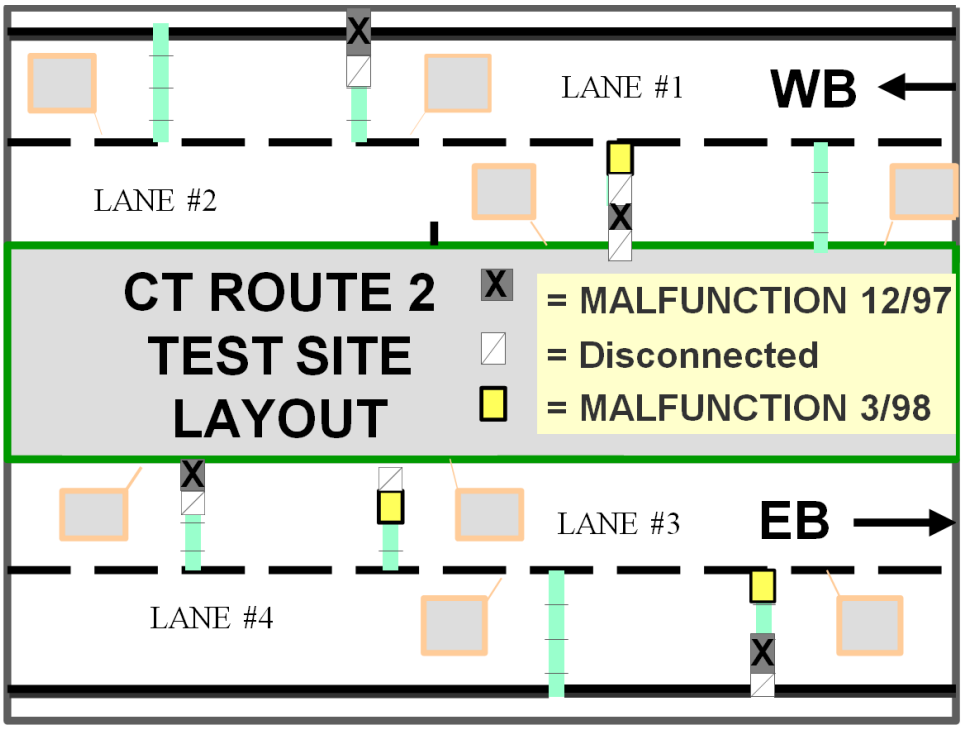


Figure 5: Problematic Sensors

Due to the unique configuration of these sensor strips, it was possible to reconfigure the installations to function, by removing ability to isolate data collection by wheel-path for the one malfunctioning sensor in each lane. The cold temperatures in December meant that the immediate reinstallation of the problematic sensors was not an option. The decision was made to calibrate the systems using trucks of known weight according to the contract specifications in the interim.

Results / Findings / Implementation

Calibration Results from December 1997

After all adjustments to the sensors were conducted, two trucks of known weight (from an approved calibrated scale) were used to conduct 25 passes in each lane. The two trucks were specified to be fully loaded FHWA Class 9, five-axle semitrailers, one air-suspension and the other conventional-suspension. The trucks that were acquired by the contractor were bulk-hauler type trailers. The results from the data collection effort are included in Appendix A. These tables contain only three points of WIM measurement for each vehicle pass.

Speed data were checked using radar and were deemed acceptable. Testing of the vehicle-type classification was found to be acceptable based on a comparison using Digital-S format images that were acquired from the Connecticut Department of Transportation Photolog vans. In actuality, classification is more a function of the software algorithm than the WIM sensors.

On January 12, 1998 and February 24, 1998, the twenty-eight sensor signals were tested at the cabinet. All signals registered in the desirable range (Figure 6).

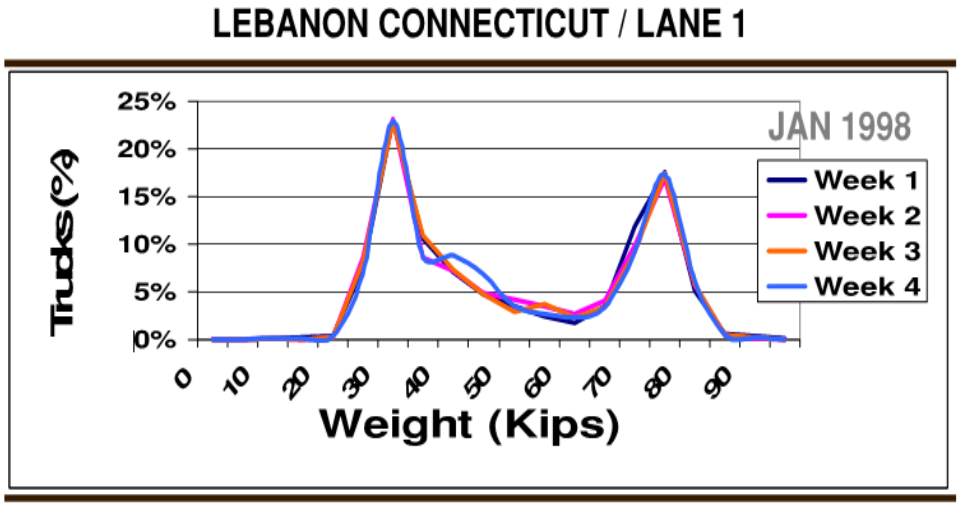


Figure 6: Distribution of Gross Vehicle Weight; January 1998

Calibration Results from April 1998

On March 16, 1998, the signals were tested again and three additional sensors did not have output in the desirable range. At the time, it was not possible to determine whether the new problems were located in the wiring between the handhole and the cabinet. The sensor manufacturer was contacted regarding these new findings.

In April 1998, an opportunity arose where a lane closure and a State two-axle dump truck were available at the WIM location. Although the 2-axle dump truck is characteristically not a very good vehicle for calibration/validation practices, it could serve for informational purposes. Data was collected for three travelling speeds (15, 22 and 50 mph). Appendix B shows the data collected. No temperature adjustment factors were applied over the four months of system

operation, and yet, the output was within three percent of the static weight. These results were encouraging.

Sensor Replacement

In the spring of 1998, rather than replace only the malfunctioning sensors, the sensor manufacturer offered to replace all the sensors with an improved design at no cost to the State. The improved design ruggedized the cabling including: stranded versus solid core conductor cable; a Teflon inner-jacket; double-thickness-braided shield; PVC outer-jacket; and an improved cabling exit from the sensor. In addition, an 18-inch reinforcing rope was to be embedded in the grout in a design to strengthen areas where fine cracking was observed previously.

The replacement of all 32, one-meter sensors occurred on July 14-15, 1998. Kistler LINEAS 9195C sensors were installed. The old (Oct 1997) sensors were removed by saw cutting immediately parallel and adjacent to the previous cuts. Saw depth was set 1/8 inch deeper than the original slots to facilitate removal of old sensors and epoxy grout. Water was observed by ConnDOT personnel draining from one of the removed sensors. It is not known how water would have infiltrated the sensors.

As a result of the presentation made at the National Traffic Monitoring Exhibition and Conference (NATMEC '98) in Charlotte, North Carolina, in May of 1998, there were a number of states that had become interested in the quartz technology. Interested parties from Rhode Island DOT, Connecticut DOT, Florida DOT and FHWA observed the re-installation process in the field. Information, documentation and photographs taken by FHWA, Travel Monitoring Division, were subsequently presented at the Traffic Monitoring Guide Workshop in August 1998 and the HPMS Seminar in Washington D.C. in November 1998. (See letter in Appendix C).

On July 20, 1998, it was determined that five of the one-meter sensors installed five days earlier did not produce output in the desired range of $1x10^{11}$ ohms (sensors Q1, Q2, Q3, Q12, Q15, Q25) (see Figure 4A and B). Given the site layout and recent rain, it appeared likely that moisture existed in the conduits. It was deduced that moisture in the cabling once again played a role in causing this problem. It was believed that the installation procedure was faulty. According to the manufacturer, at least some of the connectors were not shrink-wrapped for watertight protection prior to pulling the cables through the lengthy metal conduit that runs from the roadside handholes to the controller cabinet. The manner in which the sensors were pulled through the conduit, resulted in the infiltration and wicking of moisture into the cabling.

An attempt was made to create a capacitance in these lines to dissipate unwanted DC voltage but this did not resolve the problem when it was attempted on August 17, 1998. It was decided that four strips or 16 one-meter sensors would once again be replaced at no cost to the State.

These sensors were replaced a second time on September 21 and 23, 1998. Procedures were similar to the previous replacement. However, integral cables were used so that no connections at the sensors were needed. Also, BNC's installed at the end of the cables for use in

checking the output of the sensors prior to installation were removed after pulling through the conduit so as to remove any water contaminated connections or cable. These cut cables were then connected to an interface box. This revised construction procedure and cabling design worked well. All sensors functioned properly upon reinstallation, including those that were installed in July of 1998, which were not replaced.

Calibration Results from October 1998

Representatives of the sensor manufacturer (Kistler Instrument) and the WIM electronics system controller supplier (International Road Dynamics, Inc. [IRD]) performed the calibration of the Quartz WIM system on October 26-28, 1998. The initial determination of appropriate scaling factors for the sensors and the subsequent calibration and verification was done using two FHWA class 9 trucks (5-axle bulk haulers) employed by Kistler (see Figure 7A and 7B). The process was performed to be consistent with the ConnDOT specification that required 25 passes over each of the four lanes with a class 9 truck with air-ride suspension and a class 9 with conventional spring suspension. The two trucks were loaded and pre-weighed on a static weigh scale. Weights for the steering axle, the drive axle group and the trailer axle group were obtained, as well as a summation for the gross vehicle weight (GVW). These four weights for each truck were used as "ground truth" to check the accuracy of the WIM system. The ConnDOT specification required 15% accuracy 95% of the time for individual axles, and 10% accuracy 95% of the time for the GVW. Because the individual axle weights could not be determined at the static scale, tandem axle group weights were used for the acceptance testing.

Figure 7A: Air Ride Suspension, Bulk Hauler (Class 9) Vehicle Used During Calibration, October 1998

Figure 7B: Conventional Suspension, Bulk Hauler (Class 9) Vehicle Used During Calibration, October 1998

Prior to the start of acceptance testing, the fully loaded air suspension truck was used to traverse all lanes with five passes per lane. The WIM output was averaged for GVW in each lane and compared to the measured static weight. The operator selectable software scaling constants for each of the 12 channels were adjusted to produce an output from the WIM system that matched the static GVW.

The 25 passes per lane were carried out at 55-65mph. An Excel™ Spreadsheet was used to enter the data for each pass outputted by the system for steering axle, drive axle group, trailer axle group and GVW. The spreadsheets were preprogrammed to automatically calculate the percentage errors on the axle and GVWs relative to the static weights. This allowed the system performance to be assessed on the fly.

While checking the weights in the field, the WIM system was operated in a calibration mode provided by the electronics software, so that the output of each sensor group including the right and left wheel path of the low-speed lanes could be monitored. The data in the Excel™ spreadsheets were analyzed for average weight as a percent of the true static weight (percent error) and standard deviation of the error. Under this scenario, changing the scaling factors to adjust the scale output to match the static weight was done to reduce the percent error.

The standard deviation of the error represents the dispersion of the results and is not adjustable. The dispersion is an indication of repeatability or precision of the measurements. This precision can be an indicator of how well the system measures weights. However, the ability to measure can be masked by dynamic weight variability, which in turn can be caused by road surface roughness and vehicle suspension characteristics. The type of vehicle suspension appears to be a significant factor in the weights measured by the system. The standard deviation of the percent errors was found to be higher with the conventional spring suspension vehicle than with the air ride suspension [2].

An acceptance report was prepared by the companies (IRD/Kistler) and submitted to ConnDOT for approval in November 1998. The results of the calibration, after the final adjustments were made are shown in Table 1. In this table, ConA and ConB both represent conventional-suspension vehicles. Different trailers (A and B) were used as a result of observed wheel wobble on one of the trailer axles of the vehicle A on the first day of calibration. The air-ride vehicle had a GVW of 80240lbs. The conventional truck weighed 77670lbs. for ConA and 79400lbs. for ConB. Two of the tests failed the 15% and/or 10% for 95% of the time requirement specified by the contract. The WIM contractors indicated that the reason for failure was due to wheel wobble observed on the trucks with the conventional suspension (initially on ConA and then also to a lesser extent on ConB). The failure of the test was due to erratic data obtained from the trailer tandem axle for this one vehicle, in one lane, for five of the 25 passes. ConnDOT accepted the results and the explanation of wheel wobble. The complete data sets for each lane and each vehicle used during the calibration are given in Appendix D.

Following the calibration, a thirty-day operational test was conducted, where, the scaling factors were not changed and the WIM system was set to collect continuous, uninterrupted data from all four lanes. The thirty-day test was a requirement of the construction contract under which the system was installed. The test occurred from October 29, 1998 through November 28, 1998. ConnDOT approved the WIM system for acceptance in December 1998. A one-year warranty went into effect on November 29, 1998.

Physical Condition of WIM Sensors and Adjacent Pavement

One of the objectives of this study, as identified previously, is to monitor survivability of the sensors. This is a concern based on Connecticut's experience with piezoelectric sensors. Our experience has been that due to aging and deterioration of the hot-mix asphalt pavement, the sensors become loose and eventually are dislodged from the roadway surface by traffic or snowplows.

With this in mind, the Quartz-Piezo sensors are monitored in the field on a periodic basis. It was noted that as early as the first winter period, from November 1997 through spring of 1998, cracks had formed both in the pavement immediately adjacent to the epoxy used at the interface between the sensor and exit wiring, and in some cases in the epoxy over the junction of the one meter sensors. The cracks in the epoxy were assumed to be the result of the sensors flexing when the wheels pass over. These cracks at the sensor junctions did not return after the sensors were replaced in July 1998, or in October 1998, when additional sensors were replaced. However, cracking in the HMA pavement has continued to develop near the ends of the sensors where the grout was used to cover saw cuts made for plastic conduits containing wires. Some of these cracks at the sensors that were not removed during October 1998 were filled with loop sealant or a rubber modified crack sealant. The cracks have continued to form from November 1998 through the summer of 1999. Some examples are shown in Figures 8A and 8B. During October of 1999, the Kistler representative was asked to visit the site to observe the cracking and make recommendations. At the same time, one of the sensors in lane 3, which had risen above the surface of the pavement by about ¼ inch near the left shoulder, was ground using a rotary disk sander (see Figure 9). This was done to prevent snowplow damage in the future. All other cracks were sealed with cold applied rubber modified bituminous crack sealant on November 1, 1999. The long-term effect of these cracks will be monitored.

Table 1

Summary of Computed Statistics on Measurement Errors
During Calibration of October 1998

Type	Lane	Steering	Drive	Trailer	GVW	# of Passes
Air Avg	1	0.76%	0.22%	0.41%	0.19%	25
Air Std Dev		2.78%	2.71%	2.48%	2.02%	
Air Avg	2	-2.79%	-0.30%	2.43%	0.59%	25
Air Std Dev		6.38%	2.60%	2.34%	2.44%	
Air Avg	3	-4.00%	-1.64%	1.29%	-0.64%	25
Air Std Dev		2.45%	6.23%	5.85%	5.28%	
Air Avg	4	-3.32%	0.17%	-0.64%	-0.55%	25
Air Std Dev		1.40%	1.85%	2.27%	1.50%	
ConA Avg	1	3.58%	6.29%	1.05%	3.31%	25
ConA Std Dev		4.72%	1.98%	2.92%	2.01%	
ConB Avg	2	-2.75%	-3.05%	1.93%	-0.53%	25
ConB Std Dev		6.92%	3.96%	2.74%	3.02%	
ConB Avg	3	-0.43%	-1.47%	7.10%	2.93%	25
ConB Std Dev		4.86%	3.19%	12.88%	6.90%	
ConA Avg	4	-5.00%	-4.91%	-3.08%	-3.98%	25
ConA Std Dev		3.34%	2.89%	2.50%	2.39%	
With “wildpoints” removed:						
ConB Avg	3	-0.43%	-1.47%	1.03%	-0.12%	20
ConB Std Dev		4.86%	3.19%	4.16%	3.12%	

Air = Air Ride Suspension
ConA & ConB = Conventional Suspension
Lanes 1 & 2 = WB high and low speed lanes respectively.
Lanes 3 & 4 = EB high and low speed lanes resp.

Figure 8A: Cracking Along End of Sensor Where Cables Exit Through the Conduits

Figure 8B: Cracking and Pavement Deterioration At End of Sensor in Lane 2

Figure 9: Grinding the Edge of Grout That Has Risen Above Shoulder Pavement Surface

Calibration Results from March 1999

After letting the WIM system collect data continuously from October 1998 through March 1999, ConnDOT performed another calibration check (without the WIM contractor present) on March 16 & 17, 1999. Three trucks were used for this purpose; one class 5 (2-axle) ConnDOT Maintenance dump; one class 9 (5-axle) air-ride suspension (air ride in cab only); and one class 10 (6-axle) conventional spring suspension dump (see Figure 10). The class 10 truck was not originally requested, however, it was used when it showed up at the site in order to avoid postponement of the calibration. The class 9 and 10 trucks were rented from contractors who provide rental trucks to ConnDOT under a state contract. The configuration for the class 10 vehicle was: front steering axle; dual (tandem) tractor cab drive axle; and, triple (tridem) trailer axle. Due to time constraints, the three vehicles were able to provide at least 20 passes in the low speed lanes of both directions of route 2, but only 5 passes in the two high-speed lanes. As was done in October 1998, the results were summarized by percent error of the average for each steering, drive and trailer axle group, and percent standard deviation. Table 2 gives the overall statistics for the multiple passes. Appendix E contains the spreadsheets for all of the passes of the three trucks in every lane.

The most important finding from this calibration was that the system was still accurate enough so as to not warrant any changes to the scaling factors. The results were thus obtained with the sensors having not been adjusted since October 1998.

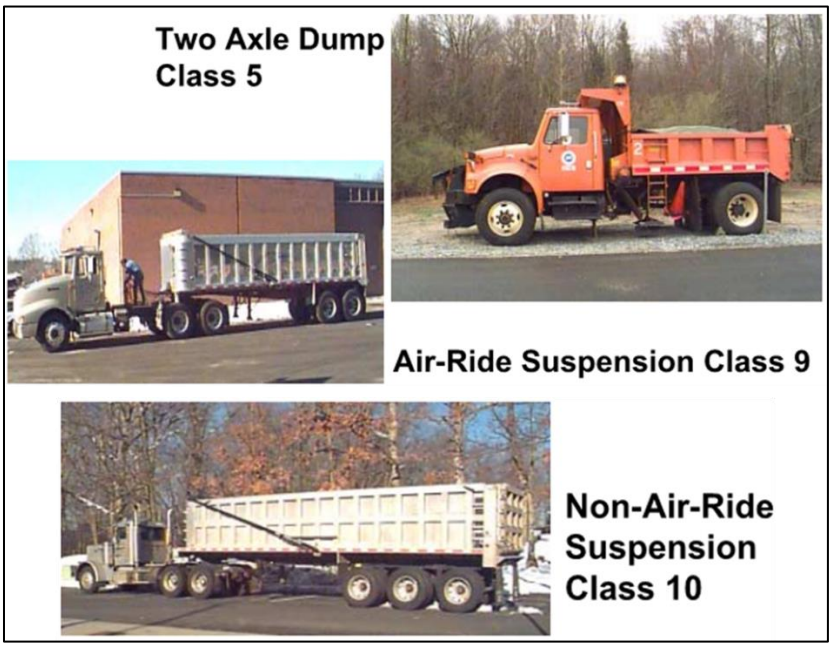


Figure 10: Trucks Used During Calibration, March 1999

Table 2

Summary of Computed Statistics on Measurement Errors
During Calibration of March 1999

Type Lane		Steering	Drive	Trailer	GVW	# of Passes
Air Avg	1	-1.20%	0.92%	3.11%	1.62%	21
Air Std Dev		3.27%	1.92%	1.42%	1.51%	
Air Avg	2	-1.11%	1.34%	8.74%	4.38%	6
Air Std Dev		5.29%	2.66%	10.07%	5.10%	
Air Avg	3	-5.55%	-2.07%	2.80%	-0.34%	6
Air Std Dev		1.74%	2.79%	1.56%	1.43%	
Air Avg	4	-3.23%	-1.18%	1.98%	-0.03%	24
Air Std Dev		2.63%	1.88%	1.88%	1.77%	
Conv Avg	1	-0.56%	1.44%	-2.12%	-0.60%	21
Con Std Dev		4.54%	2.54%	4.64%	3.13%	
Conv Avg	2	-10.16%	0.08%	2.19%	-0.08%	5
Con Std Dev		9.08%	2.24%	4.89%	2.92%	
Conv Avg	3	-8.74%	0.73%	4.16%	1.33%	6
Con Std Dev		0.99%	1.08%	1.82%	0.91%	
Conv Avg	4	-8.01%	-0.51%	-4.94%	-3.64%	24
Con Std Dev		3.09%	2.50%	5.35%	3.77%	
Dump Avg	1	-2.97%	0.27%	---	-0.75%	21
Dump Std Dev		2.62%	2.78%	---	2.23%	
Dump Avg	2	0.49%	0.60%	---	0.57%	6
Dump Std Dev		7.63%	2.56%	---	3.41%	
Dump Avg	3	-1.98%	2.82%	---	1.31%	5
Dump Std Dev		1.88%	1.67%	---	0.87%	
Dump Avg	4	-6.50%	-1.98%	---	-3.40%	21
Dump Std Dev		1.91%	1.39%	---	1.25%	

Calibration Results from October 1999

In October 1999, a calibration check was performed on Route 2. This time only two rented trucks, both Class 9, were used. One truck was air-ride suspension on all axles. The other was a conventional-suspension (see Figure 11A and 11B). Both trucks were loaded at ConnDOT's Colchester Maintenance Facility with sand and then weighed at Cargil Animal Nutrition static weigh scale, Franklin, CT. The calibration occurred on October 5-6, 1999. Five passes were made with both trucks in all four lanes prior to making any adjustments to the scaling factors. After the five runs were made, the data were reviewed and it was determined that adjustments to the scaling factors was necessary for lanes 1 and 3 only. Lanes 2 and 4 appeared to be within 1% for the air-ride truck, and thus did not merit any change. Lane 1 showed an average of the five runs that was about 4% high. Lane 3 showed about 3% low. A scaling factor was calculated that would produce about half of this correction and was put into the WIM software so that future runs would be adjusted accordingly. Five additional passes were then made in lanes 1 and 3. It was then determined that the full adjustment was necessary. The scaling factors for both lanes were then adjusted a second time to achieve the full correction. From this point on passes were made in all the lanes with a goal to achieve 20 passes after the final change in scaling factors was made.

The resultant data set was 20 passes for lanes 1 and 4, and 16-17 passes for the high speed lanes, lanes 2 & 3. The data for lanes 1, 2 and 4 indicated that the expected results occurred. However, the data for lane 3 continued to decline during the day, such that by the end of the 18 runs, lane 3 averaged 3% low once again. No further attempt was made (since two full days of truck usage had occurred) to change lane 3 a third time.

The summary results for the October 1999 calibration are provided in Table 3. Appendix F contains the spreadsheets for the five pre-calibration check passes. Data for the final 18-20 passes made after the last change to any scaling factors are given in Appendix G. The adjustments made to the scaling factors in October 1999 were the first adjustments ever made to the WIM system since the installation in October 1998.

Figure 11A: Air Ride Suspension Class 9 Vehicle Used During Calibration, October 1999

Figure 11B: Conventional Suspension Class 9 Vehicle Used During Calibration, October 1999

Table 3

Summary of Computed Statistics on Measurement Errors
During Calibration of October 1999

Type	Lane	Steering	Drive	Trailer	GVW	# of Passes
Air Avg	1	-0.94%	-0.52%	2.07%	0.54%	20
Air Std Dev		2.83%	3.10%	2.38%	2.35%	
Air Avg	2	-4.69%	-1.95%	2.69%	-0.36%	17
Air Std Dev		4.43%	1.93%	1.87%	1.08%	
Air Avg	3	-5.21%	-4.47%	-1.04%	-3.09%	17
Air Std Dev		3.29%	2.38%	2.58%	2.17%	
Air Avg	4	-3.92%	-0.10%	3.81%	1.00%	20
Air Std Dev		1.75%	2.74%	2.03%	2.02%	
_____						
Conv Avg	1	-1.78%	2.73%	-4.68%	-0.99%	20
Con Std Dev		3.05%	3.62%	3.13%	2.99%	
Conv Avg	2	-3.97%	-3.93%	2.15%	-1.41%	17
Con Std Dev		6.18%	2.79%	3.58%	2.29%	
Conv Avg	3	-7.62%	-7.14%	1.03%	-3.81%	16
Con Std Dev		4.17%	3.38%	3.12%	3.10%	
Conv Avg	4	-3.61%	-2.42%	3.12%	-0.29%	20
Con Std Dev		1.43%	2.38%	1.75%	1.48%	

Analysis of Class 9 Vehicles

In addition to performing the calibration using trucks of known measured static weight, the total population of vehicles passing the WIM site 24 hours a day for the period December 1998 through September 1999 was reviewed. Few analyses of class 9 vehicles were performed. In particular, GVW histogram plots (frequency polygon) and front axle weight (FAW) histogram plots of class 9 trucks were made. Class 9 vehicles are the most common type of truck on U.S. highways. Vehicles in this class have many common attributes that make tracking and analysis an attractive option. The overlay of weekly frequency polygon plots can be used as an indicator of either the variability of the loads carried by the trucks or the variability of the WIM system to accurately measure the trucks. For instance, the empty or unloaded GVW of class 9 vehicles is usually in the 28,000-36,000lb range [3]. The loaded trucks will generally approach the allowable GVW for a given state, which in the case of Connecticut is 80,000lbs.

At the Route 2 WIM site, the total Average Daily Traffic Volume measured in 1999 is approximately 22,300 vehicles per day. The percentage of vehicles classified as heavy trucks (class 6 and higher) is approximately 4%. There are approximately 1100-1400 class 9 trucks per week traveling through the site. Since most class 9 vehicles are used for long hauls of goods, the greatest percentage of these vehicles are either empty or full. Thus, there are two peaks that result when the number or percent of class 9 vehicles is plotted as a function of weight range. A sample graph for the week of January 12-18, 1999 for lane 1, the WB direction low-speed lane, is given as Figure 12. From this Figure, it is noted that 18% of the trucks weighed 32,000-36,000lbs, and 11% weighed 76,000-80,000lbs. This represents approximately 1/3 of all the class 9 trucks.

Figure 13 shows the frequency polygons for each week when superimposed onto one graph. This Figure shows all the class 9 trucks for lane 1 for each week from December 1, 1998 – September 27, 1999. It can be noted from this figure that there was a shift in the peaks during the latter months. This is especially evident for the loaded vehicles 76,000+ lbs. The calibration check performed in October 1999, discussed previously, verified that there may have been a shift in sensor measurements toward the heavier weight for this lane. The scaling factor for lane 1 was adjusted to reduce the load by approximately 5%, based on the two class 9 trucks used during the calibration.

Figures 14-16 show the GVW of class 9 vehicles for lanes 2, 3 and 4, December 1998 – September 1999. Varying amounts of shifting of the peaks can be noted in these figures as well. It was found, however, during calibration in October 1999 that lanes 2 or 4 were not weighing heavy for the two class 9 vehicles used. Lane 3 was adjusted upward during the calibration process, since it appeared to be measuring as much as 3% low for the two calibration trucks. In Figure 15, it can be noted that lane 3 showed a decrease in the peaks, or shift toward the left, which corresponds with our field findings during calibration.

Graphs were also plotted for front axle weights (FAW) of class 9 vehicles for each of the four lanes (Figures 17-20). They indicate a single peak, generally occurring between 8500 and 11500lbs. The weights of front axles are almost entirely dependent on the manufacturer's design of the truck cab (although some states have found the front axle weight is dependent on the load being carried). For Figures 17 and 20, which are lanes 1 and 4 respectively, it is observed that the

front axle weights have increased gradually over time from December 1998 through September 1999. For instance, it appears that in lane 1 in December 1998, the majority of FAWs fell between 8500-10,500lbs. By September 1999, these weights were between 10,000-12,000lbs. We have no evidence or reason to believe that the weights of the front axles for the population of class 9 vehicles has increased by 1500lbs over 10 months.

For lane 4, the weights appear to have increased by approximately 1000lbs over 10 months. Lanes 2 and 3, which have much lower truck volumes do not appear to have changed discernibly. No obvious trend is observed from these graphs in Figures 18 and 19.

In summary, it appears that some type of change in output has occurred with the Quartz-Piezo system over time, although it is fairly small, ranging from 1-5% per lane. It is not known whether this is permanent or due to some temperature (seasonal) variation. The next six-month period from November 1999 – April 2000 should provide information to answer this question.

Another method of monitoring the performance of the WIM system is to check the number of error vehicles versus total vehicles passing through each lane per week. This provides a gross estimate of functionality of the WIM system. When this was performed for the period December 1, 1998 – September 27, 1999, it was found that typically the errors for each of the four lanes were between 1 and 2% from December 1, 1998 through March 8, 1999. These levels of errors continued for lanes 1, 2 and 4 through July 1999. However, for lane 3, (high-speed EB direction), there was a 2X to 10X increase in error counts between March 8 and May 1, 1999. Although the errors reduced in lane 3 after that time, they did not return to previous levels until mid-September 1999. The variation in the error counts for lane 3 can be seen in Figure 21. It was determined that most of these error vehicles were automobiles as opposed to any type of truck. This would indicate the possibility that one of the sensors in lane 3 was temporarily unable to detect light axle loads, less than 2000lbs for example, for the period.

On November 1, 1999, it was actually determined that sensor Q18 (see Figure 4A and B) was not producing the expected output. This was determined from measuring sensor output insulation resistance and by driving an automobile over this sensor. It is now believed that this sensor is the cause of the 3% variation noted during calibration in October 1999, and shown in Figure 15 for lane 3. The entire strip of sensors in lane 3 was proposed to be replaced during the spring of 2000 by the sensor manufacturer.

Dissemination of Results

"Getting the word out" is one of the objectives of the PTP program. As such, ConnDOT's Research Section made efforts to disseminate the results as they become available. This Office has attempted to accomplish this in other ways as well. During January 1998, numerous presentations about Quartz Piezo and Piezo Electric research studies were given to Construction inspectors and engineers as part of their annual training program. In May 1998, a presentation on this study was made at the North American Travel Monitoring Exhibition and Conference as well as a paper published in the conference proceedings. In March 1999, ConnDOT Research personnel made a presentation to ConnDOT and outside consultants on this study at a Research Showcase. In June 1999, a presentation on Quartz Piezo was made at the FHWA LTPP North Atlantic Regional Meeting in Bedford, New Hampshire. In addition to these planned media

events, there have been numerous inquiries from other states about our experiences with Quartz Piezo WIM. This includes telephone and e-mail inquiries from Alaska, Maryland, Washington, Maine, New Hampshire, FHWA, Florida, Rhode Island, Minnesota, Iowa, California, Arizona, Montana, Wyoming, and Mississippi, as well as numerous companies, vendors and consultants from the private sector. Data collected with the Quartz WIM, including the calibrations, have also been sent to some of these states upon request. Status reports on the study were also made verbally at the Expert Task Group on LTPP Traffic Data Collection and Analysis Meetings held in 1998 and 1999. It is likely that these activities and our initial positive findings have influenced some states and consultants. Quartz Piezo WIM sites have been installed in at least four states (Maine, New Hampshire, Washington and Illinois) during 1999.

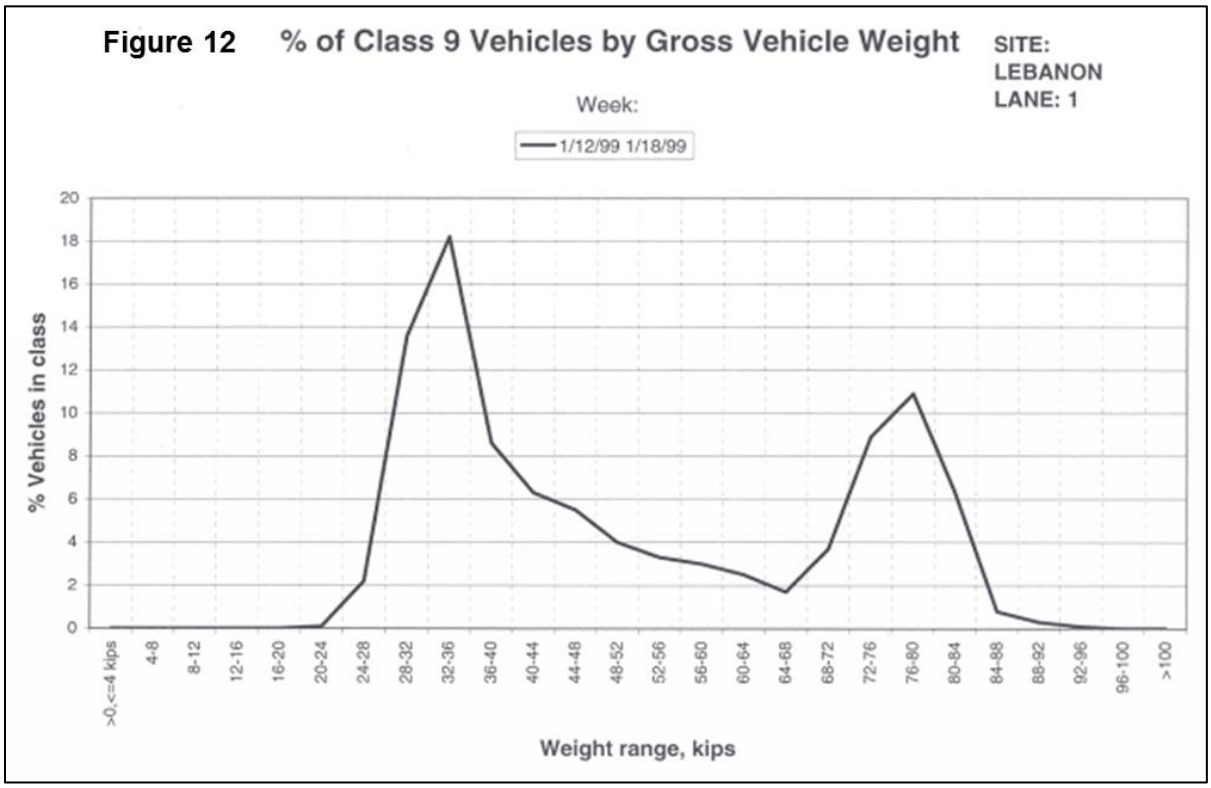


FIGURE 13

% Class 9 Vehicles By Gross Vehicle Weight
(Summarized Weekly)
Site: Lebanon, Lane 1 (12/1/1998-9/27/1999)

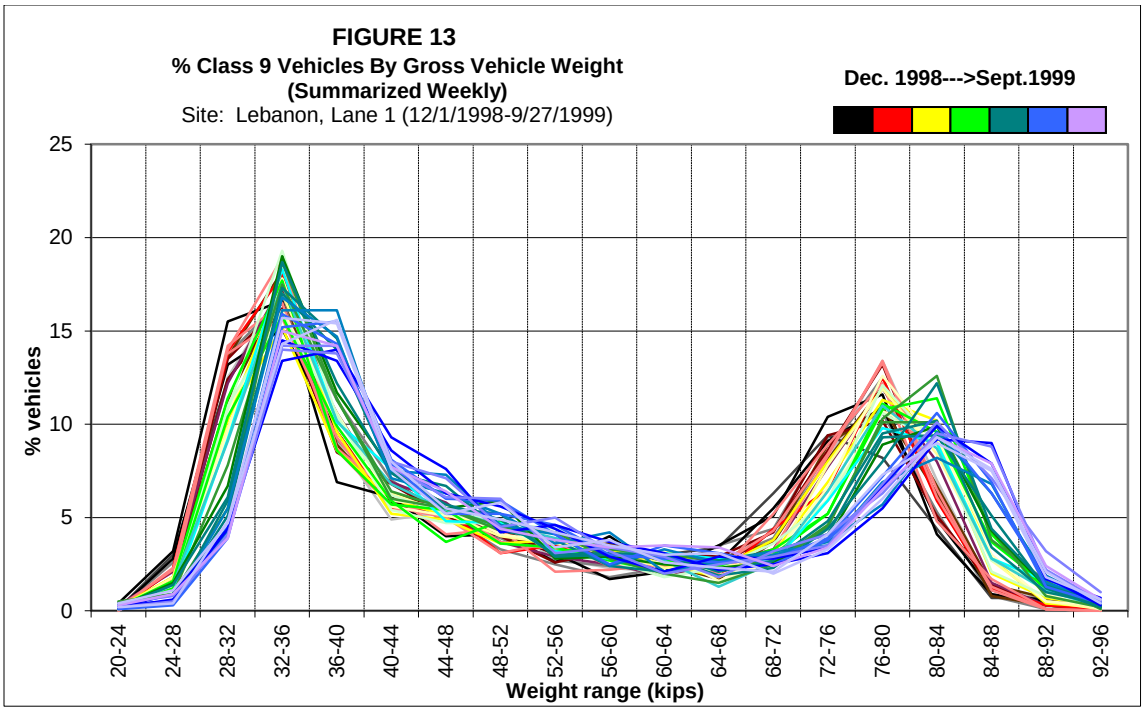
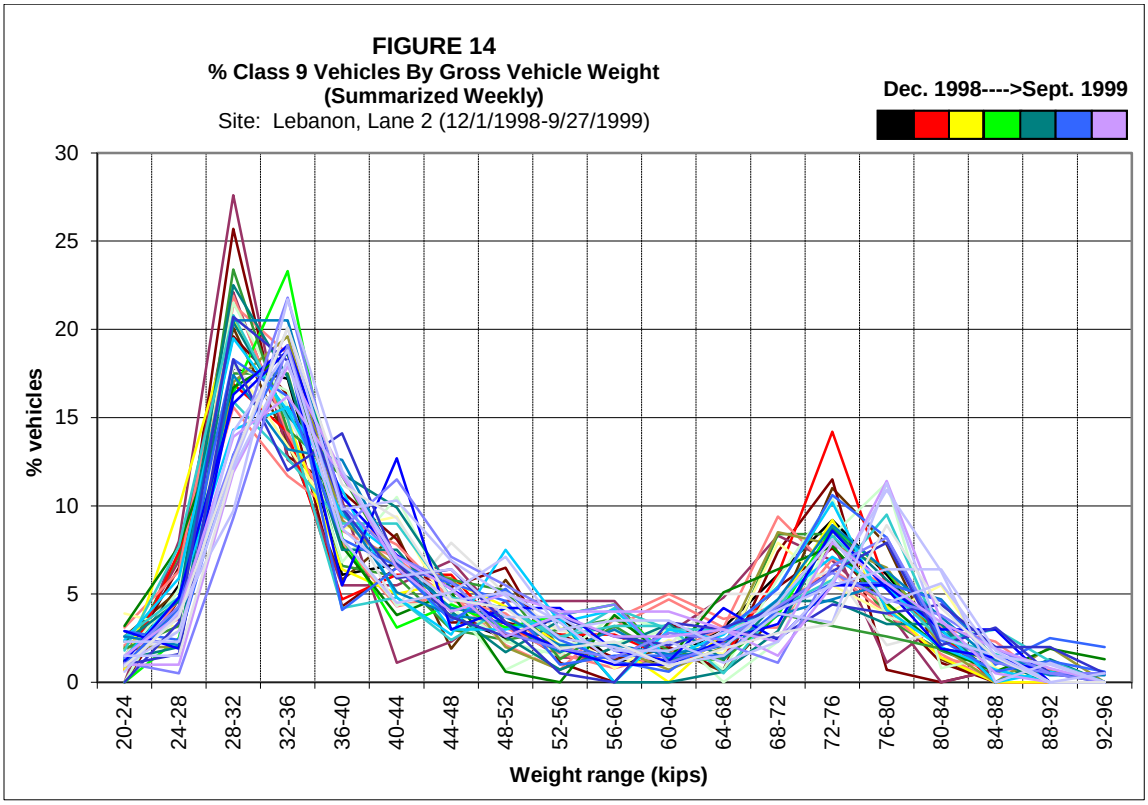


FIGURE 14

% Class 9 Vehicles By Gross Vehicle Weight
(Summarized Weekly)
Site: Lebanon, Lane 2 (12/1/1998-9/27/1999)



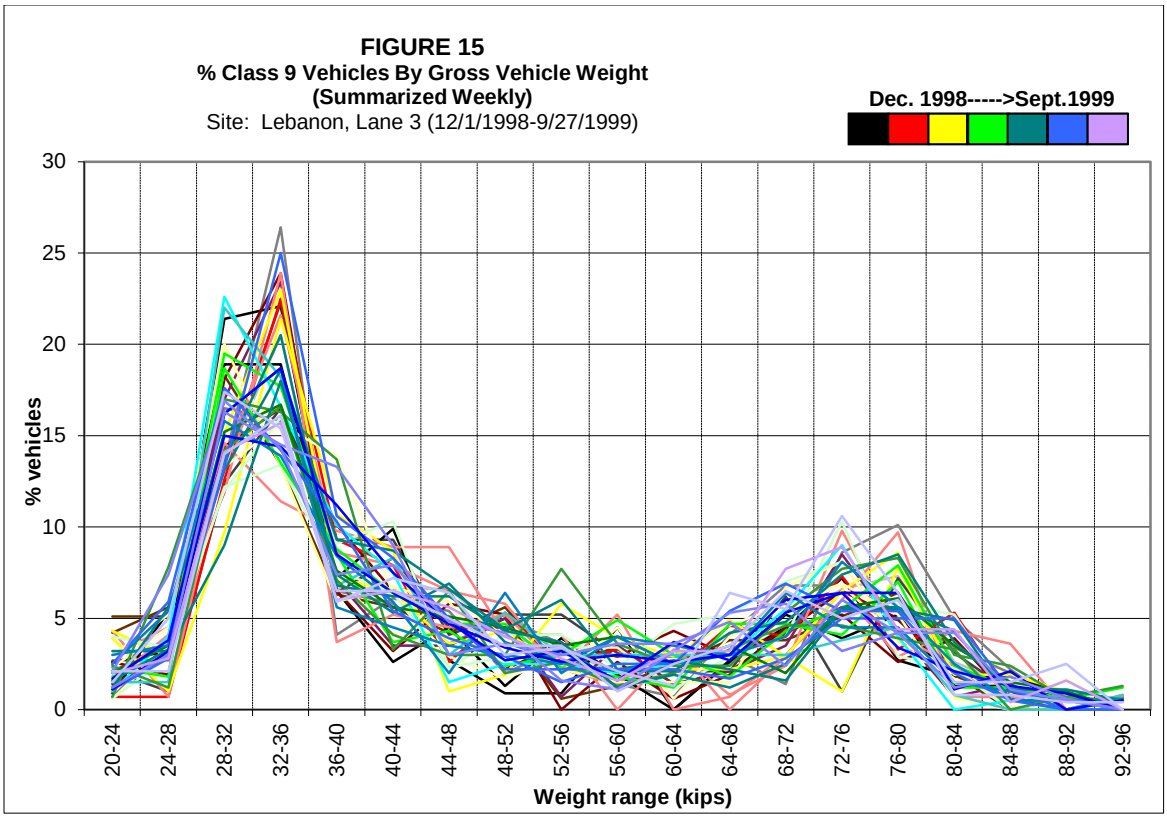


FIGURE 15
% Class 9 Vehicles By Gross Vehicle Weight
(Summarized Weekly)
Site: Lebanon, Lane 3 (12/1/1998-9/27/1999)
Dec. 1998----->Sept.1999
% vehicles
0
5
10
15
20
25
30
20-24
24-28
28-32
32-36
36-40
40-44
44-48
48-52
52-56
56-60
60-64
64-68
68-72
72-76
76-80
80-84
84-88
88-92
92-96
Weight range (kips)

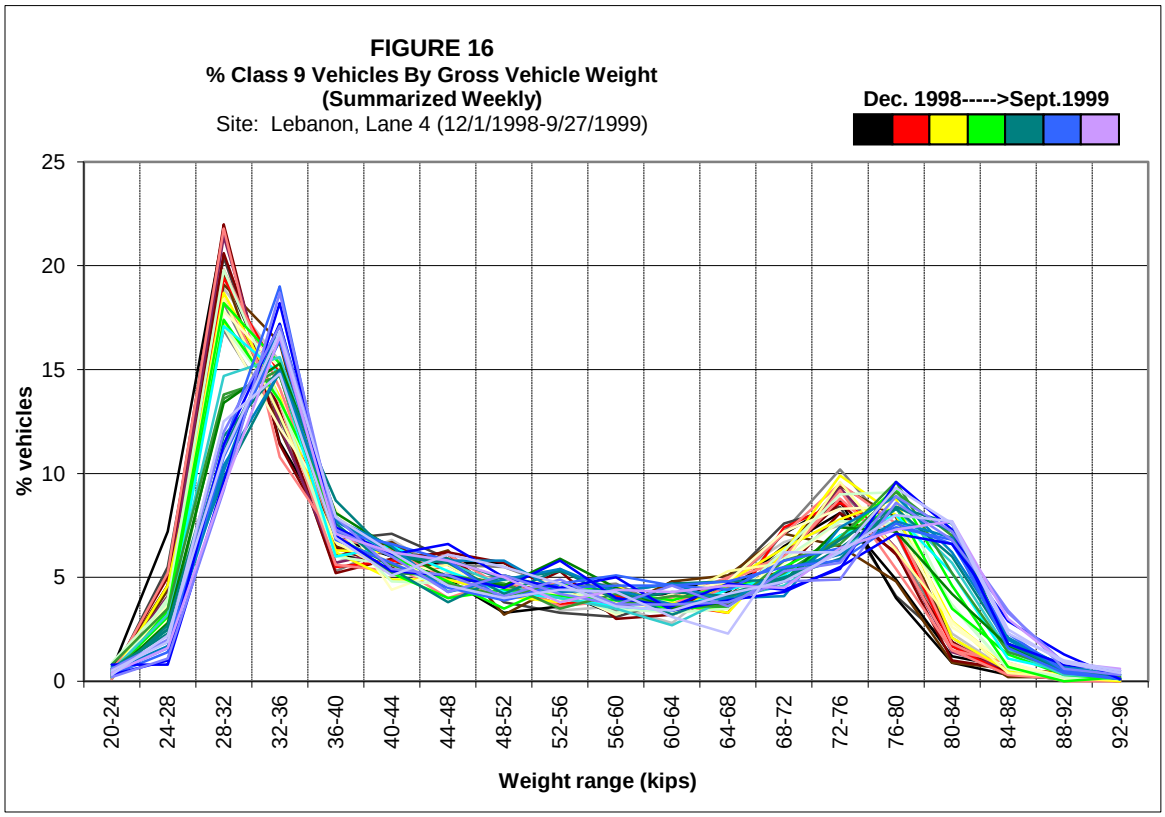


FIGURE 16
% Class 9 Vehicles By Gross Vehicle Weight
(Summarized Weekly)
Site: Lebanon, Lane 4 (12/1/1998-9/27/1999)
Dec. 1998----->Sept.1999
% vehicles
0
5
10
15
20
25
20-24
24-28
28-32
32-36
36-40
40-44
44-48
48-52
52-56
56-60
60-64
64-68
68-72
72-76
76-80
80-84
84-88
88-92
92-96
Weight range (kips)

Figure 17
Front-Axle Weight Distribution - Class 9 Vehicles
Site: Lebanon -- Lane: 1 (Period from 12/1/1998 - 9/27/1999)

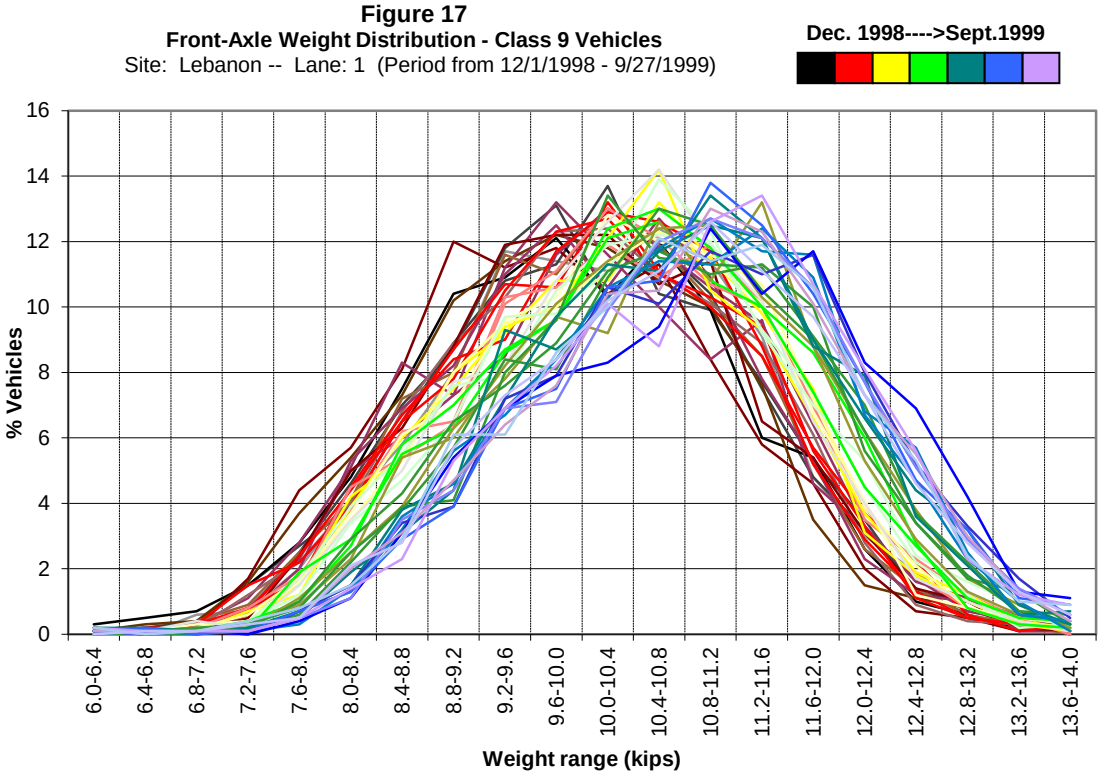
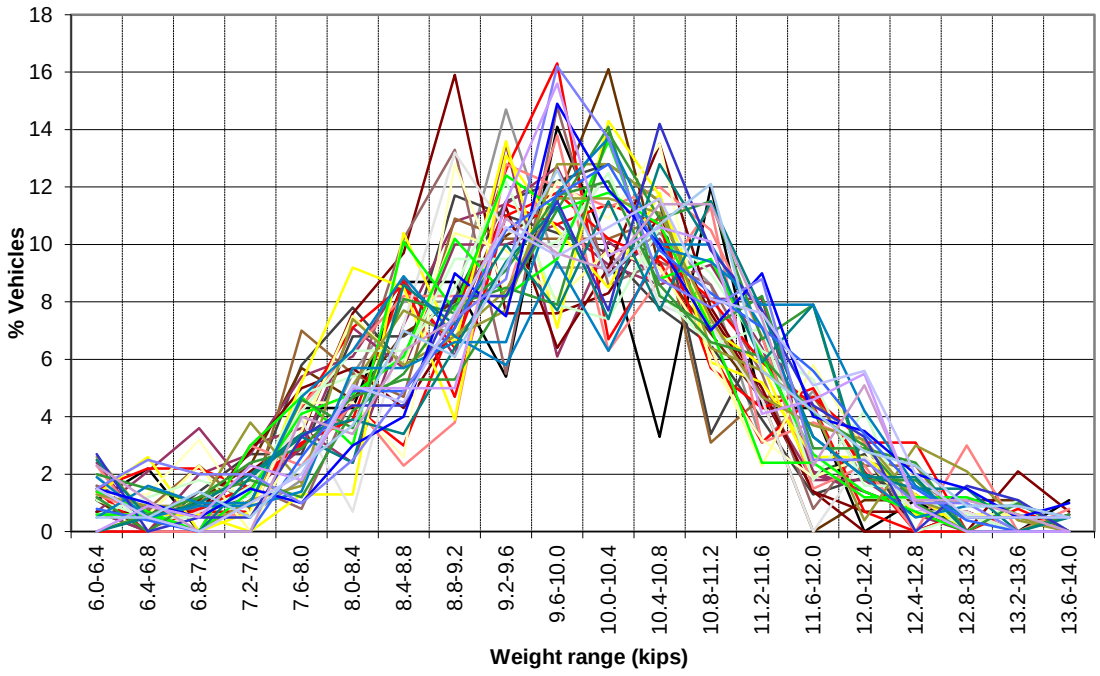


Figure 18
Front-Axle Weight Distribution - Class 9 Vehicles
Site: Lebanon -- Lane: 2 (Period from 12/1/1998 - 9/27/1999)



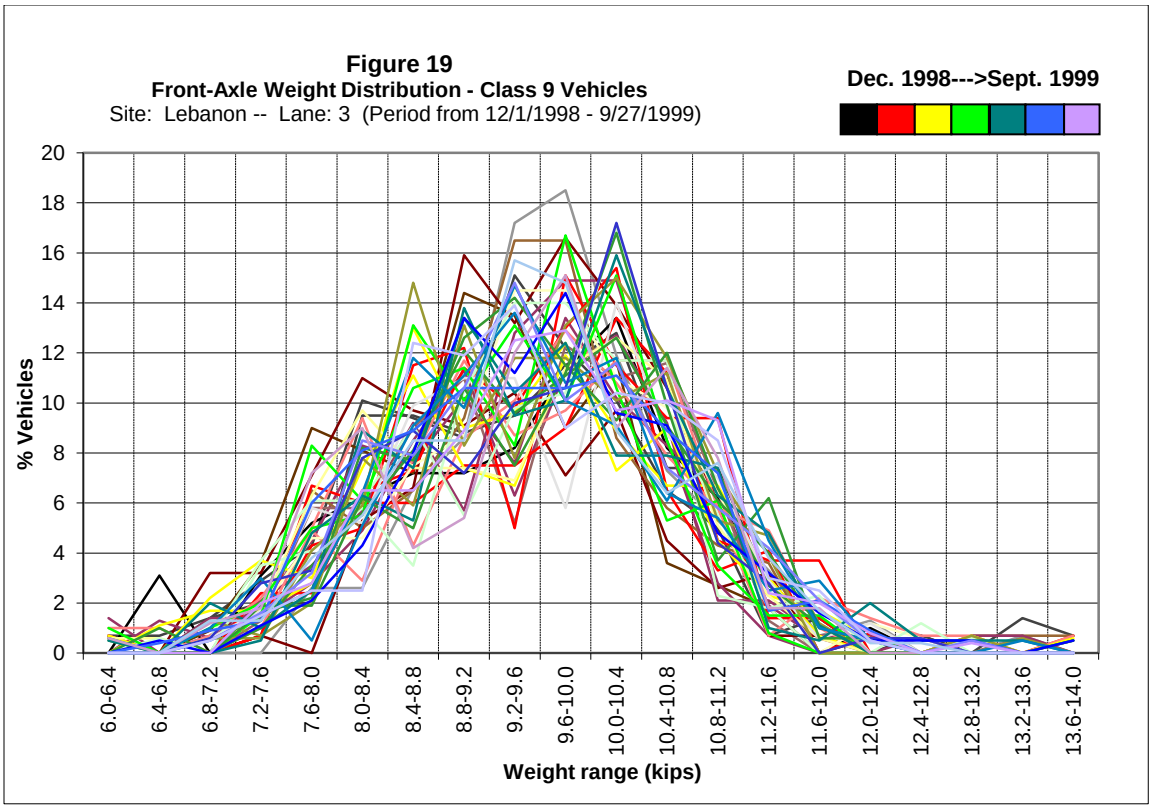


Figure 19
Front-Axle Weight Distribution - Class 9 Vehicles
Site: Lebanon -- Lane: 3 (Period from 12/1/1998 - 9/27/1999)
Dec. 1998--->Sept. 1999
% Vehicles
0
2
4
6
8
10
12
14
16
18
20
6.0-6.4
6.4-6.8
6.8-7.2
7.2-7.6
7.6-8.0
8.0-8.4
8.4-8.8
8.8-9.2
9.2-9.6
9.6-10.0
10.0-10.4
10.4-10.8
10.8-11.2
11.2-11.6
11.6-12.0
12.0-12.4
12.4-12.8
12.8-13.2
13.2-13.6
13.6-14.0
Weight range (kips)

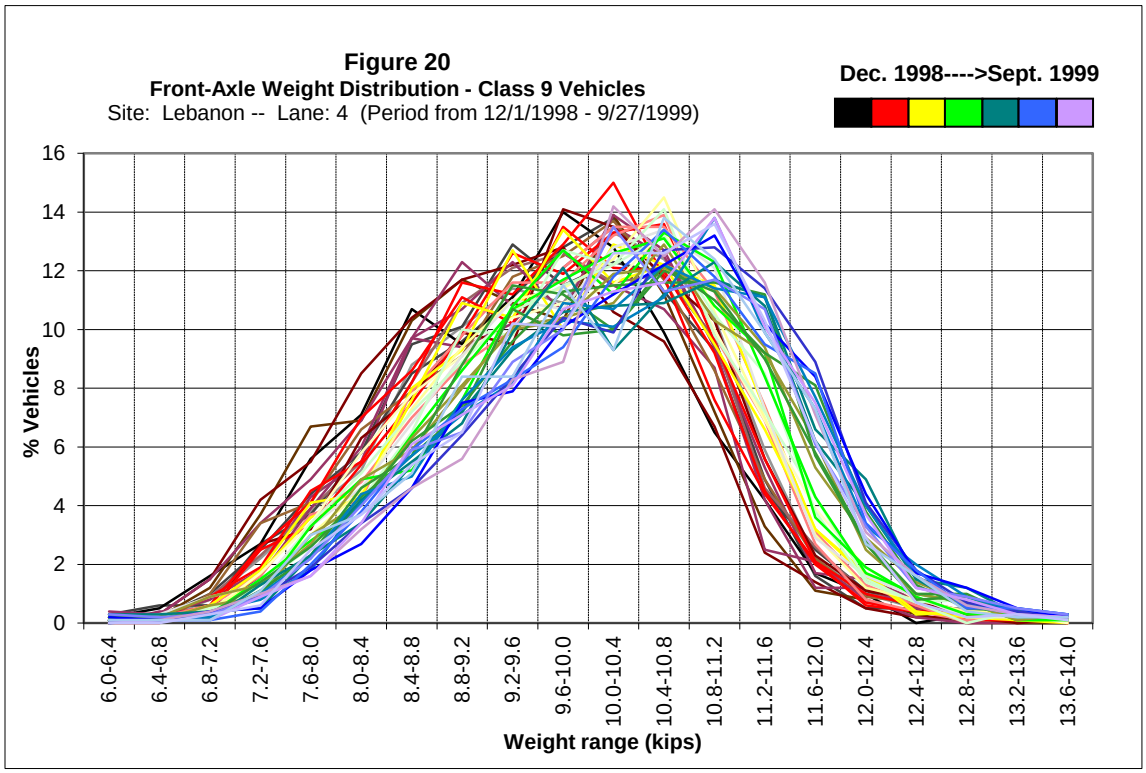
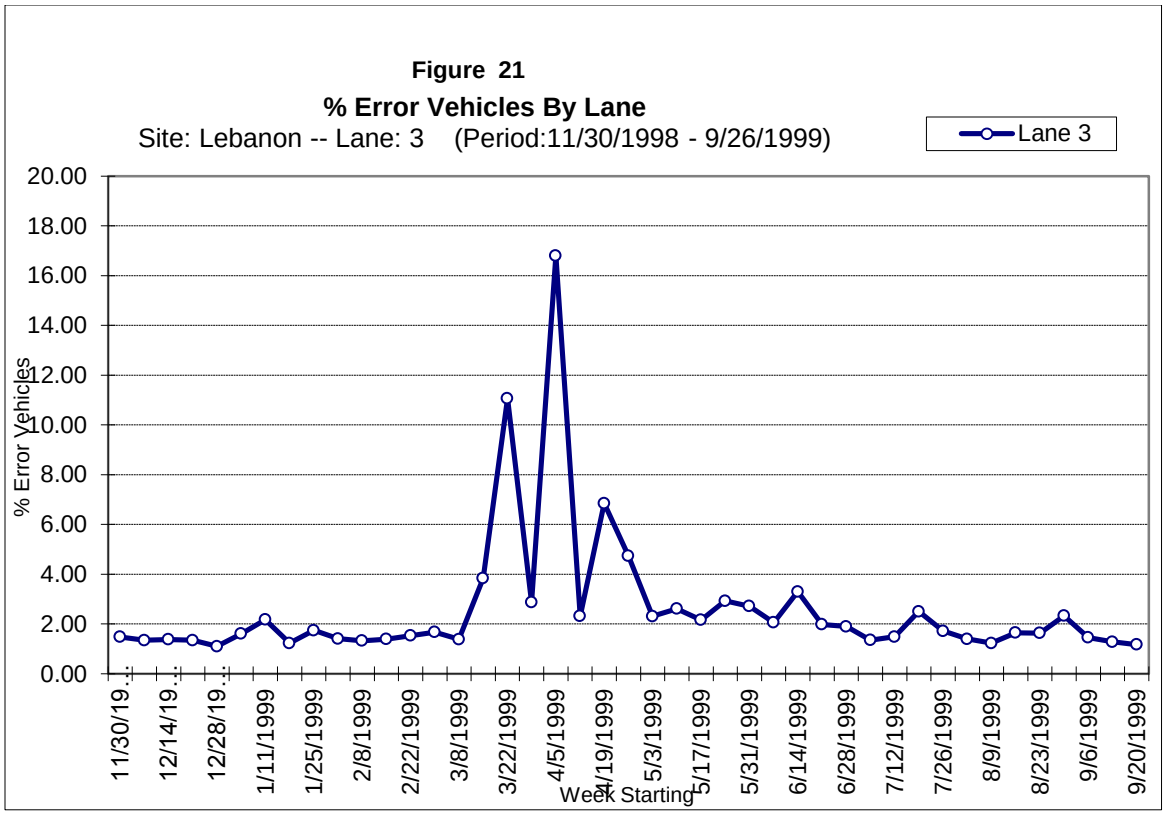


Figure 20
Front-Axle Weight Distribution - Class 9 Vehicles
Site: Lebanon -- Lane: 4 (Period from 12/1/1998 - 9/27/1999)
Dec. 1998---->Sept. 1999
% Vehicles
0
2
4
6
8
10
12
14
16
6.0-6.4
6.4-6.8
6.8-7.2
7.2-7.6
7.6-8.0
8.0-8.4
8.4-8.8
8.8-9.2
9.2-9.6
9.6-10.0
10.0-10.4
10.4-10.8
10.8-11.2
11.2-11.6
11.6-12.0
12.0-12.4
12.4-12.8
12.8-13.2
13.2-13.6
13.6-14.0
Weight range (kips)



Calibration Results from April 2000

In October 1999, the results from Lanes 2 & 4 did not warrant adjustment, but lane 1 was running low and therefore, the factors were reduced by 4%. Lane 3 required a 3% increase in the calibration factors. It was noticed that lighter truck weights were a problem. Consequently, the sensor manufacturer checked the sensors in November 1999. It was determined that one sensor in Lane 3 did not provide the desirable signal resistance. Reviewing the number of errors that the system was producing further supported the existence of the problem. As a result, the configuration of Lane 3 was temporarily changed in February 2000, until the new sensors can be installed. The new configuration is measuring the half-lane left and then upstream a distance, half-lane right.

It was anticipated that from the field calibration data gathered in 1999, and the ongoing office review of the data that the long-term data quality of the sensor system could be evaluated. We did instead encounter software problems that hampered our data collection and investigation. The software is sold separately from the sensors and is therefore treated as a separate aspect from the sensors themselves in this study. The software vendor decided that as other changes were being conducted to make the software year 2000 compliant (Y2K), then it was an appropriate time for other adjustments and corrections. Unfortunately, changes had a direct impact as to how the system should be set-up. As a result, when the complete software was installed during January 2000, it was believed that the system was recording loads to be 50% higher than intended and the calibration factor was changed immediately. When the field calibration was conducted in April of 2000, it was discovered that the discrepancy was not a simple factor of 2 (50%) as was previously thought. In fact, that by using trucks of known weight in the field it was discovered that field calibrations were necessary. Specifically, the calibration factors needed

reductions of 13% in lane 1, 5% in lane 2, 7% in lane 3 and 10% in lane 4. These necessary calibration changes were later determined to be the result of other parameters that were changed in the new (revised) software. The end result was that the data and tracking of the data were not reliable between December and April 2000 for the experiment and LTPP purposes. Tracking of the data was continued in order to monitor long-term status of the sensor system.

There are two questions to address when assessing the data: How well did the system perform using the calibration by trucks of known weight and how repeatable was the data over time? The calibration data until October 1999 is available in Appendix A-G. The calibration data from April 2000 is available in Table 4.

Table 4: Calibration Results from April 2000

Type	Lane	Steering	Drive	Trailer	GVW	# of Passes	Speed
Non-Air Avg	1	-4.43%	6.49%	-3.37%	0.72%	20	60
Non-Air Std Dev		3.87%	3.20%	4.27%	1.88%		
Non-Air Avg	2	-13.37%	11.95%	-8.50%	-9.96%	10	60
Non-Air Std Dev		6.27%	3.67%	5.40%	2.46%		
Non-Air Avg	3	-7.33%	-4.94%	2.70%	-2.57%	10	60
Non-Air Std Dev		4.99%	3.76%	4.14%	3.76%		
Non-Air Avg	4	-3.70%	-1.55%	1.96%	-0.32%	29	60
Non-Air Std Dev		3.07%	2.96%	4.81%	3.32%		
Air Avg	1	0.45%	3.27%	-0.31%	1.16%	18	60
Air Std Dev		2.95%	3.22%	2.78%	2.86%		
Air Avg	2	-4.71%	-0.71%	-0.94%	-1.45%	10	60
Air Std Dev		3.54%	3.66%	10.01%	5.42%		
Air Avg	3	-10.69%	-6.08%	-7.40%	-7.49%	15	65
Air Std Dev		3.88%	5.10%	5.41%	4.85%		
Air Avg	4	-4.27%	1.26%	0.84%	0.19%	23	60
Air Std Dev		3.08%	3.59%	3.45%	3.35%		
		-3.25%	1.69%	--------	0.18%	3	40
		2.10%	5.04%	--------	3.45%		
Dump Avg	1	2.45%	0.97%	--------	1.77%	10	50
Dump Std Dev		1.87%	6.27%	--------	4.26%		
		0.43%	0.00%	--------	0.51%	9	60
		1.05%	4.74%	--------	3.00%		
Dump Avg	2	-6.27%	3.42%	--------	0.35%	3	55
Dump Std Dev		4.12%	8.20%	--------	5.78%		
Dump Avg	3	-11.04%	-0.27%	--------	-3.72%	2	59
Dump Std Dev		3.07%	1.89%	--------	0.18%		
Dump Avg	4	-12.36%	-3.55%	--------	-6.08%	7	40
Dump Std Dev		1.79%	2.86%	--------	2.21%		
		-9.20%	-8.76%	--------	-8.83%	10	50
		2.32%	4.28%	--------	3.31%		
		-7.81%	-2.25%	--------	-3.87%	12	60
		1.09%	3.73%	--------	2.40%		
Non-Air Ride = 5 Axle Semi-Trailer (FHWA Class 9), standard suspension.							
Air = 5 Axle Semi-Trailer (FHWA Class 9), air ride supspension trailer.							
Dump = 2 Axle (FHWA Class 5), dump truck							

The Figure 22 shows the calibration data over time for lane 1, which is representative of 20 to 25 passes of the air-ride truck during each field validation. The data for lane 1, gross vehicle weights easily comply with the ASTM 1318 / Ref 5/ Margin of +/- 10% and 95% confidence interval using the t-test. We obtained similar successful results for Lane 4 from October 1998 to April 2000. Lanes 2 & 3 does not provide the same level of results, as shown in Figure 23. Work

needs to be conducted to determine why the difference in variability from Lanes 1& 4 and 2 & 3 exists. Lanes 1 & 4 are the slow speed lanes, the LTPP lanes, which carry a higher percentage of the trucks and are calibrated using a larger sample of truck passes.

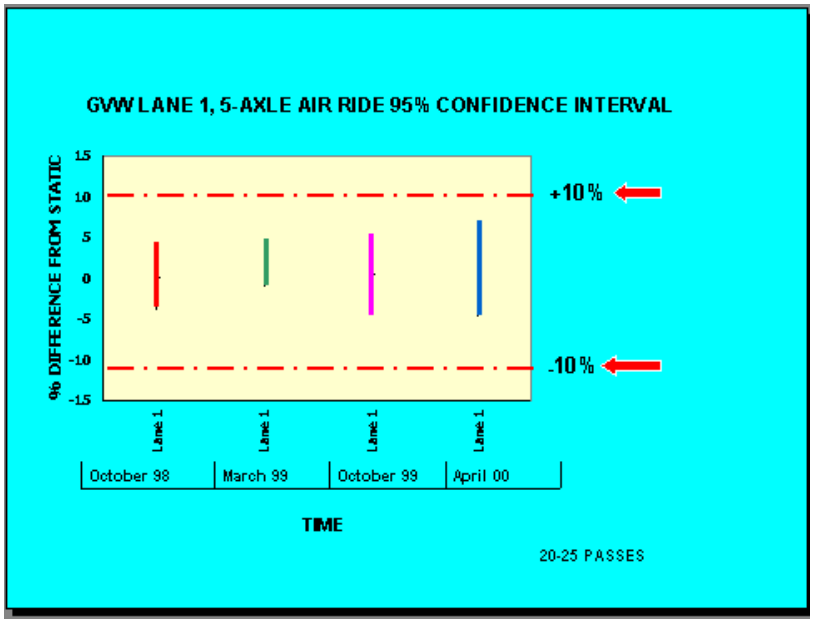


Figure 22: GVW 95% Confidence Interval for Lane 1, 5-Axle Air Ride

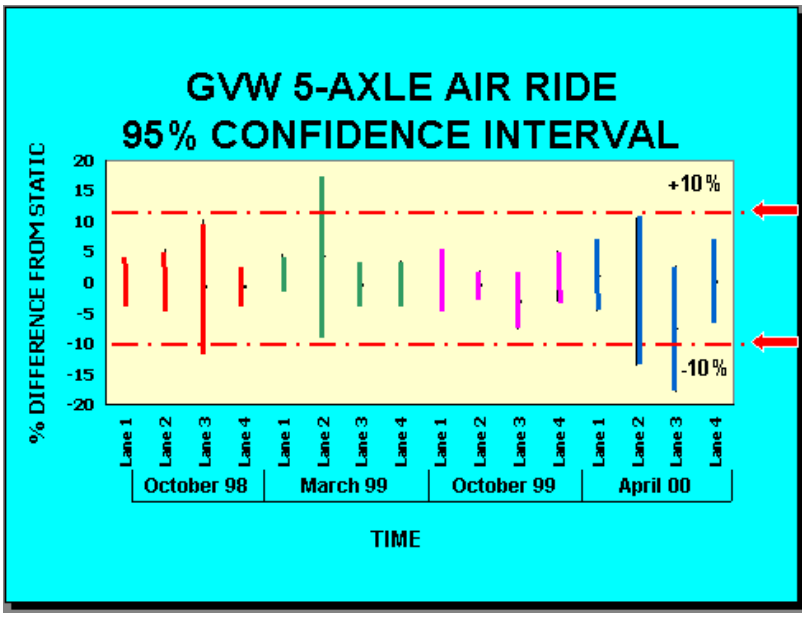


Figure 23: GVW 5-Axle Air Ride, 95% Confidence Interval for All Lanes

The variability in the weight data can be caused by the sensors, the pavement condition, the software algorithm, the trucks or the sampling procedures. It is possible that these lanes are physically different than the other lanes. To attempt to quantify this, profile data was collected prior to installation of the systems in 1997 and again in the year 2000. It is anticipated that work

proposed in the LTPP program will be helpful in learning how to interpret these profile data in the future.

WIM Data was analyzed for each of the axle groups. The steering or front-axle met the ASTM range of +/- 1 20%, 95% of the time for all lanes using the air-ride truck from October 1998 to April 2000. Similarly, the GVW, lanes 1 & 4 provided the best data in comparison to Lanes 2 & 3. These data are depicted in the Figure 24.

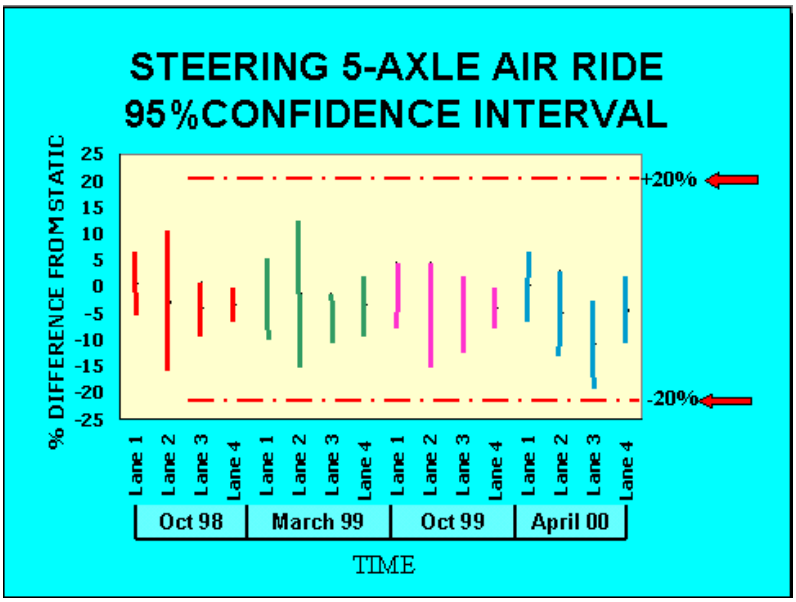


Figure 24: Front-Axle, 5-Axle Truck, 95% Confidence Interval, All Lanes

Office Monitoring of Data

The monitoring of traffic data from the office is necessary to check the data quality over time. From our experience, the traffic data at this test site is suitable for applying of the distribution of gross vehicle weight (GVW) and front-axle weight (FAW) distribution methods, as first introduced by Minnesota [4]. Therefore, for each week of WIM data that is collected, the gross vehicle weight distribution, front-axle weight distribution and the percent errors are determined by lane. As shown in Figures 25 and 26, these FAW and GVW data have demonstrated excellent repeatability in the slow lanes.

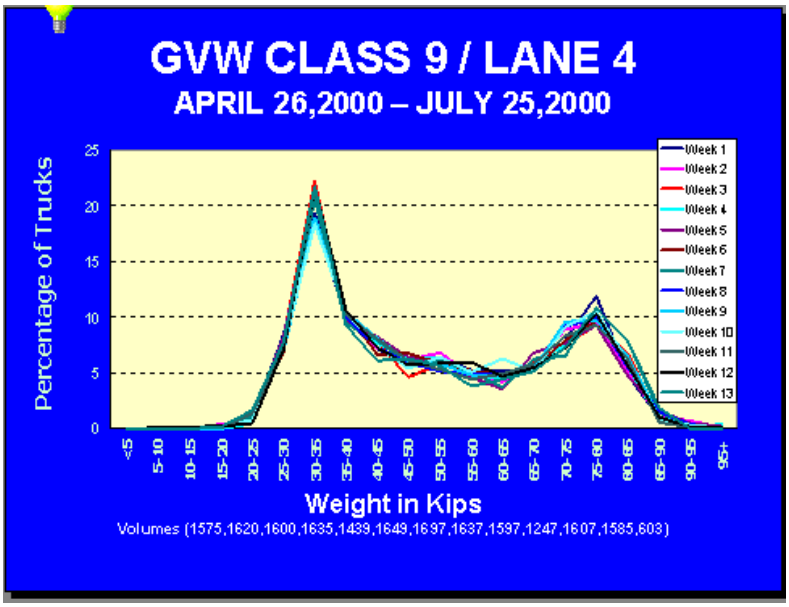


Figure 25: Gross Vehicle Weight (GVW) Distribution

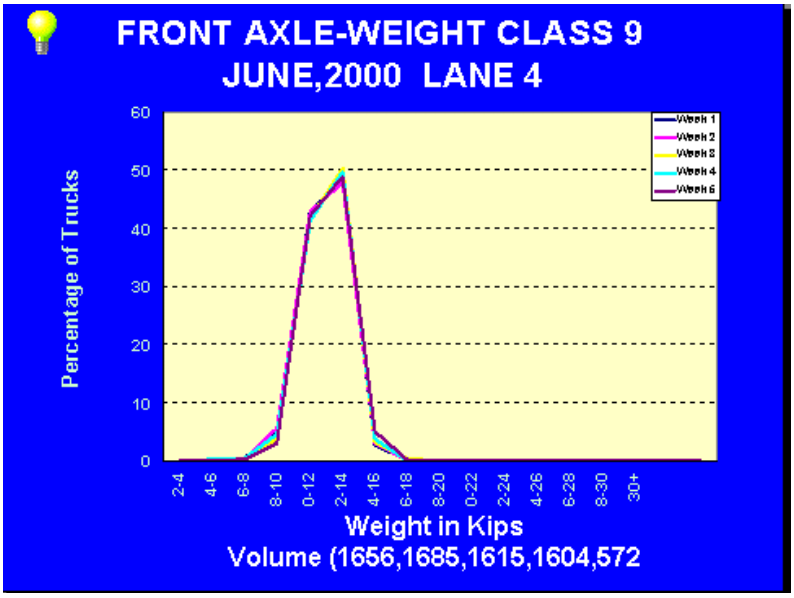


Figure 26: Front-Axle Weight (FAW) Distribution

Connecticut Traffic Data Analysis Tools

State traffic monitoring programs have limited resources available to conduct office WIM data monitoring for standard operations. Therefore, this research used cooperative education students from local universities to process and view data. A software tool was developed to add automation to this process and to assess changes in data trends. In addition, data could be converted from the FHWA W format into a Microsoft Excel spreadsheet for basic plotting.

Technique for Analysis of Traffic Data Shifts

For several years, the plots of Gross Vehicles Weight (GVW) and Front Axle Weight (FAW) data were examined visually. Therefore, we developed a method to determine if and how much shift has taken place mathematically. It is anticipated that this method can be used to further automate the analysis of data.

Essentially, we examined the curves generated by the GVW distribution. Values are selected to isolate the areas of the graph for unloaded and the loaded vehicles gross weights for the Class 9 vehicles. The average value for the isolated range area is determined for a specified amount of time (example: one week). These average points are then plotted (Figure 27). A regression analysis is done (it is assumed the points are linear). The slope of the regression equation line is determined. The value of the slope of the line is diagnostic of the existence and magnitude of any shift or change in the distribution over time. Obviously, the closer the slope of the line is to zero, the more likely there is no shift over time. Conversely, the larger the slope (positive or minus value), the greater the chance and magnitude of change over time.

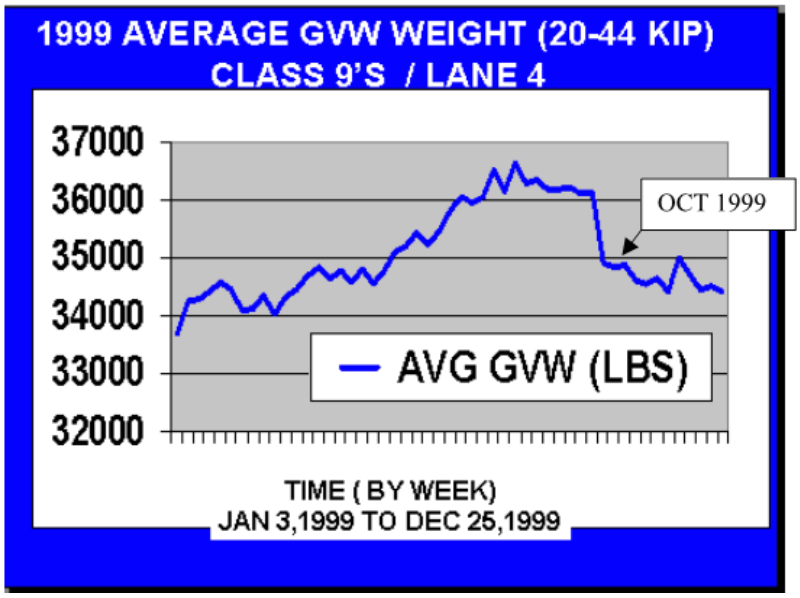


Figure 27: 1999 Average Unloaded GVW Weight Over Time, Lane 4

Using this technique, it was determined (as shown in Figures 13 and 17) that the weight data demonstrated a change over time for the year of 1999. Such a change was not demonstrated in the April 2000 data that was collected and analyzed thus far. The cause(s) for these changes over time have not been determined. Changes over time could result from the sensors, pavement, environment or actual changes to the traffic stream. It was determined however, that long continuous periods of time are best to assess changes. We have never collected full years of highly accurate data (because we did not own equipment capable of collecting it) by which to determine if such fluctuations occur systematically or randomly. This plotting method was then used to determine if the results from the 1999 data correlated well with the finding of the field calibration in October. In the field in October, it was found that calibration adjustments were needed in Lane 1 but not in Lane 4. Lane 4 returned to the same range just prior to the field

calibration and therefore did not require adjustment and the graph in Figure 27 supports this finding. This technique will continue to be used to determine its application to different data sets.

Field Sensor Inspections and Replacement of Malfunctioning Sensors

As part of the evaluation of the sensors, field inspections were conducted to determine the condition. The sensors that were installed in July 1998, cracking was observed between the sensors and the connection points, as is shown in Figure 28. Additional cracking and deterioration of the sensors was noticeable in the high-speed shoulder area for the EB direction. (shown in Figure 28). In the fall of 1999, this sensor was also observed to be higher than the pavement surface. It was then ground to match the pavement surface. It is unknown if the sensor was higher than the pavement or the pavement had sunk from the sensor. Additional cracking around the sensors were sealed prior to the winters in efforts to reduce moisture infiltration and damage due to freezing and thawing. It is unknown if any cracking is the result of sawing and replacing sensors during 1998.

Representatives from the quartz-piezo sensor manufacturer tested all the sensors at the site in August 2000, and determined one sensor in lane 1 yielded less than desirable resistance and the one sensor in lane 3 was still in need of replacement. The sensor strips containing these sensors were replaced in November 2000 with 750mm length sensors. It is unknown what effect, if any, the reinstallation process had on the quality of the subsequent set of sensors and data. It was evident after each sensor removal that the sensor, grout and pavement had created a good permanent bond. Due to the unique configuration of these sensor strips, it was possible to reconfigure the existing installation to produce useable data by bypassing the malfunctioning sensor(s) in each lane. This practice was conducted each time there were sensor problems, thus allowing continued data collection with a reduced number of data collection points.

Figure 28: Field Inspection Images of Worse Case Conditions

Pavement Profile

In April 2001, FHWA-LTPP collected field calibration data using the proposed Pavement Smoothness Specifications for LTPP SPS WIM Locations, FHWA-LTPP, 2001. This protocol includes the collection of data for a total of 152.5m beginning on the approach to the site (122m measured to the center of the installation and 30.5m from the center of the installation) to exit of the WIM system. Five passes each measuring right and left profiles collected data on three wheel-paths locations within the lane, for a total of fifteen passes per lane. The International Roughness Index (IRI) values are represented in Table 5. These values correlated with the ConnDOT single-pass results. The FHWA-LTPP roughness specification addresses short-wavelength surface irregularities by measuring whether a 150mm wide and 3mm thick disk can pass under a 3.65m long straightedge, these locations are termed, "divots". The LTPP contractor used simulation software to complete this procedure. Table 5 identifies the maximum number of divots per lane section.

Table 5: Roughness Measurements Determined By LTPP (April 2001)

Lane	IRI range (m/km) (average Left/Right)	COV Range (%)	Maximum Number of Divots Identified
1	**1.35-1.46**	**1.3-1.9**	**18**
2	**1.34-1.51**	**0.6-2.2**	**18**
3	**0.90-1.06**	**0.7-2.1**	**7**
4	**1.01-1.06**	**1.0-1.6**	**7**

The prominent divots were found in Lanes 1 and 2 at a bridge located 88m upstream of the WIM site. This corresponds with field observations. In Lane 3, a divot was identified that stretches across the entire lane, 79m upstream of the WIM. In Lane 4, there appear to be divots across the lane, 103m from the WIM. Although, comprehensive analysis involving the relationship between test truck configuration, driver behavior and pavement profile to the dynamic tire forces are outside the scope of this investigation, the pavement profile information is presented here because it is recognized that the product of any weigh-in-motion system can only be as good as site characteristics, including pavement profile.

Sensor Field Issues

Drainage: From the onset, it was recognized that both the pavement, areas surrounding the cabinet and handholes had inadequate drainage, based on visual inspections. After periods of heavy rains, two of the handholes were found to contain standing water. In addition, in 1999, two of the concrete-based handholes became fractured, allowing for more water infiltration.

Rodent Infestation: Beginning in 1999, rodent (mice) infestation of the handholes in the EB direction was detected. Precautions were taken to evict the mice and restore the handholes in such a manner that the mice were not able to enter through the caps. In the year 2000, additional precautions were taken, including generous amounts of poison placed in the handholes. The handholes were monitored in the fall of 2000, and it was presumed that poison was enough of a long-term deterrent to prevent re-infestation. In 2001, it was discovered that mice had heavily infested three of the four handholes, and the metal conduit. In addition, on two occasions, they had caused visible damage by chewing on the cable wires. The only handhole the mice do not appear to have infested has not shown signs of signal reduction in the years 1999-2001. It is concluded that the handhole design used is simply inadequate for the deterrence of mice at WIM

installations. This issue is being discussed with other Offices of ConnDOT. Alternatives being considered to deter mice or other animal infestation include: electronic frequency deterrents, foul tasting wire coating, and alternative handhole designs. Mice can cause significant destruction of property but can also represent a serious health threat to humans, as they are potential carriers of the life-threatening Hantavirus.

The extensive rodent infestation, coupled with the drainage issues, is a likely cause for the continued sensor failures and signal reductions.

Calibration Results from December 2000, April 2001 and November 2001

Field calibrations were conducted using pre-weighed vehicles to determine the WIM system accuracy of measurements and repeatability. The vehicles were pre-weighed at state certified static weigh scales. The certified scale used for the March 1999, October 1999, January 2000, April 2000 and November 2001 was located at a grain supply company in the vicinity of the test site. It was a single-draft weighing device capable of measuring the entire vehicle gross weight. This same scale was used to measure the axle loads by moving the single and tandem axles onto the level aprons, while supporting all wheels in a level plane. During December 2000 and April 2001, alternative certified scales were located because the same scale was unavailable. When deemed necessary, some of the weights were checked either at their point of origin or at additional scales.

The vehicles were hired for the field work, based on availability. It was attempted to have a least two five-axle vehicles, one with air-ride suspension and the other with conventional, leaf-spring. The same exact air-ride vehicle was used for the calibrations during March 1999, October 1999, April 2000, April 2001 and November 2001 and is denoted in bold type in Tables 7-10. The leaf-spring suspension vehicle hired for December 2000 and April 2001 was older and appeared to have less than desirable suspension characteristics. The results do not account for the differences in load due to the fuel used over the course of the calibration. In most cases, the 5-axle trucks used approximately 705lbs of fuel during one day.

The field calibration portion of the study involved the change of any system factors necessary to compensate for systematic error based on the repeated runs of pre-weighed vehicles. Table 6 indicates when recalibration adjustment factors were deemed necessary. The recalibration changes required in October 1999 seem to correspond to the sensors that needed replacement in the year 2000. Software changes conducted by the electronics supplier in conjunction with their software upgrade to account for the year 2000 issues were not immediately reported to or detected by ConnDOT. These system changes were completely corrected during the April calibration.

Table 6: Recalibration Adjustment Factor Changes

Date	Lane 1	Lane 2	Lane 3	Lane 4
March 1999	**0 %**	**0 %**	**0 %**	**0%**
October 1999	**4 %**	**0 %**	**3 %**	**0%**
January 2000	**Y2K Software Changes - 50% All Lanes**			
April 2000	**-13 %**	**-5 %**	**-7 %**	**-10 %**
April 2000 Field Adjustments due to unresolved Y2K software changes				
Sensors Reinstalled in Lanes 1 & 3				
December 2000	**5 %**	**6 %**	**-10 %**	**10 %**
Human Error During Dec 2000 Lane 4 Calibration				
April 2001	**-5 %**	**-6 %**	**11 %**	**-9 %**
November 2001	**0 %**	**0 %**	**0 %**	**0 %**

The December 2000 calibration followed the replacement of sensors in November 2000 in Lanes 1 and 3. The December 2000 calibration had several complicating factors, including use of different calibration trucks and static scale, high winds (40mph) on the second day of calibration, and application of an incorrect calibration setting. For these reasons, this data is italicized in Tables 7-10. The December calibration adjustments were supported by information gathered from plotting the distribution of loads from the continuous data collection. In April 2001, it was determined that the sensor calibration factors (prior to Dec 2000) were appropriate. It is uncertain what caused the apparent need to change the factors so dramatically in December 2000 or the need to set the factors back to the original settings in April 2001. The validation results indicate that different calibration trucks can provide significantly different results. The November 2001 calibration results indicated that additional adjustments were not necessary, thus supporting the April 2001 changes. The value of the percent error can be a function of the calibration methods. The calibration method was to adjust the system according to our consideration of the "best" running truck(s). This method does not account for the variability that existed between trucks or for variability that could exist between trucks in the actual traffic stream.

Calibrations were performed using pre-weighed vehicles. Tables 7-10 provide summary results from the field validations conducted from October 1998 to November 2001. A primary focus was to accomplish the needed number of passes in the Lanes 1 and 4 for LTPP calibration requirements. As many passes as were safely feasible were conducted, in lanes 2 and 3, in the time allowed after completing the LTPP passes, resulting in reduced sample sizes. The speed was not varied during the field calibrations conducted prior to 2001. Both calibrations conducted in 2001, included a speed variation within range of 10mph. The software did not have any form of compensation factors enabled. As shown in the summary tables, results in lanes 1 and 4 were more consistent. There does not seem to be an obvious relationship between the roughness data and the standard deviation results between the lanes. It is possible, that it is not only the number of divots but the location and clustering according to calibration truck-type which has the greater influence on the standard deviation.

Table 7: Lane 1 Truck Calibration Data Summary from Oct. 98 – Nov. 01

Date	Truck	(GW)	No.	GW		Steer		Drive		Trailer	
	Code*	(kg)	Passes	Error	StdDev	Error	StdDev	Error	StdDev	Error	StdDev
				%	%	%	%	%	%	%	%
Oct-98	5AB	36397	25	0.19	2.02	0.76	2.78	0.22	2.71	0.41	2.48
Oct-98	5LB	35231	25	3.31	2.01	3.58	4.72	6.29	1.98	1.05	2.92
Mar-99	**5AD**	34619	21	1.62	1.51	-1.2	3.27	0.92	1.92	3.11	1.42
Mar-99	6LD	36492	21	-1.67	5.26	-0.56	4.54	1.44	2.54	-2.12	4.64
Mar-99	2LD	14071	21	-0.75	2.23	-2.97	2.62	0.27	2.78	-	-
Oct-99	**5AD**	33475	20	0.54	2.35	-0.94	2.83	-0.52	3.1	2.07	2.38
Oct-99	5LD	32940	20	-0.99	2.99	-1.78	3.05	2.73	3.62	-4.68	3.13
Apr-00	**5AD**	31525	25	1.16	2.86	0.45	2.95	3.27	3.22	-0.31	2.78
Apr-00	2LD	12791	27	0.25	2.57	2.32	6.35	2.38	4.16	-	-
Dec-00	*5AH*	*29901*	*27*	*1.26*	*4.74*	-	-	-	-	-	-
Dec-00	*5LD*	*35036*	*6*	*-13.67*	*6.87*	-	-	-	-	-	-
Apr-01	5LD	36233	64	0.46	5.53	-11.04	4.96	-0.2	6.24	3.8	8.63
Apr-01	5AH	30695	53	0.8	4.14	-0.46	3.15	0.51	4.08	1.29	6.24
Apr-01	**5AD**	33249	48	2.46	4.26	-3.63	3.04	1.98	4.36	4.9	6.37
Nov-01	**5AD**	29774	27	-4.81	2.86	-7.37	1.8	-1.12	3.41	-7.14	4.22
Nov-01	5AH	29702	27	-0.17	3.68	-3.79	2.78	-0.79	3.01	1.61	5.85

Table 8: Lane 2 Truck Calibration Data Summary from Oct. 98 – Nov. 01

Date	Truck	(GW)	No.	GW		Steer (%)		Drive		Trailer	
	Code*	(kg)	Passes	Error	StdDev	Error	StdDev	Error	StdDev	Error	StdDev
				%	%	%	%	%	%	%	%
Oct-98	5AB	36397	27	0.59	2.44	-2.79	6.38	-0.3	2.6	2.43	2.34
Oct-98	5LB	36016	25	-0.53	3.02	-2.75	6.92	-3.05	3.96	1.93	2.74
Mar-99	**5AD**	34619	6	4.38	5.1	-1.11	5.29	1.34	2.66	8.74	10.07
Mar-99	6LD	36492	5	-0.08	2.92	-10.16	9.08	0.08	2.24	2.19	4.89
Mar-99	2LD	14071	6	0.57	3.41	0.49	7.63	0.6	2.56	-	-
Oct-99	**5AD**	33475	18	-0.36	1.08	-4.69	4.43	-1.95	1.93	2.69	1.87
Oct-99	5LD	32940	18	-1.41	2.29	-3.97	6.18	-3.93	2.79	2.15	3.58
Apr-00	**5AD**	31525	13	-1.45	5.42	-4.71	3.54	-0.71	3.66	-0.94	10.01
Apr-00	2LD	12791	3	0.35	5.78	-6.27	4.12	3.42	8.2	-	-
Apr-01	**5AD**	30695	12	-3.51	1.84	-7.43	5.8	-2.78	2.38	-2.78	2.12
Apr-01	**5AD**	33249	14	2.11	4.53	-2.55	4.86	-2.85	3.37	8.55	7.7
Apr-01	4LD	30445	4	-3.61	1.69	-6.94	3.21	-	-	-2.62	1.64
Nov-01	**5AD**	29774	6	-14.7	18.68	-5.1	1.03	-7.45	3.56	-1.98	1.42
Nov-01	5AH	29702	6	-4.26	2.75	2.27	2.6	-4.4	1.59	-6.71	5.97

Table 9: Lane 3 Truck Calibration Data Summary from Oct. 98 – Nov. 01

Date	Truck	(GW)	No.	GW		Steer		Drive		Trailer	
				Error	StdDev	Error	StdDev	Error	StdDev	Error	StdDev
	Code*	(kg)	Passes	%	%	%	%	%	%	%	%
Oct-98	5AB	36397	28	-0.64	5.28	-4	2.45	-1.64	6.23	1.29	5.85
Oct-98	5LB	36016	25	2.93	6.9	-0.43	4.86	-1.47	3.19	7.1	12.88
Mar-99	**5AD**	34619	6	-0.34	1.43	-5.55	1.74	-2.07	2.79	2.8	1.56
Mar-99	6LD	36492	6	1.33	0.91	-8.74	0.99	0.73	1.08	4.16	1.82
Mar-99	2LD	14071	5	1.31	0.87	-1.98	1.88	2.82	1.67	-	-
Oct-99	**5AD**	33475	18	-3.09	2.17	-5.21	3.29	-4.47	2.38	-1.04	2.58
Oct-99	5LD	32940	18	-3.81	3.1	-7.62	4.17	-7.14	3.38	1.03	3.12
Apr-00	**5AD**	31525	15	-7.49	4.85	-10.69	3.88	-6.08	5.1	-7.4	5.41
Apr-00	2LD	12791	2	-3.72	0.18	-11.04	3.07	-0.27	1.89	-	-
Apr-01	**5AD**	30695	12	-6.27	6.17	-10.93	4.68	-2.39	7.53	-8.5	6.83
Nov-01	**5AD**	29774	6	-4.15	3.6	-11.88	3.49	-1.62	4.47	-3.41	3.69
Nov-01	5AH	29702	6	-4.65	5.09	-4.7	4.37	-5.56	3.4	-3.77	8.42

Table 10: Lane 4 Truck Calibration Data Summary from Oct. 98 – Nov. 01

Date	Truck	(GW)	No.	GW		Steer		Drive		Trailer	
				Error	StdDev	Error	StdDev	Error	StdDev	Error	StdDev
	Code*	(kg)	Passes	%	%	%	%	%	%	%	%
Oct-98	5AB	36397	25	-0.55	1.5	-3.32	1.4	0.17	1.85	-0.64	2.27
Oct-98	5LB	35231	25	-3.98	2.39	-5	3.34	-4.91	2.89	-3.08	2.5
Mar-99	**5AD**	34619	24	-0.03	1.77	-3.23	2.63	-1.18	1.88	1.98	1.88
Mar-99	6LD	36492	24	-4.33	6.2	-8.01	3.09	-0.51	2.5	-4.94	5.35
Mar-99	2LD	14071	21	-3.4	1.25	-6.5	1.91	-1.98	1.39	-	-
Oct-99	**5AD**	33475	20	1	2.02	-3.92	1.75	-0.1	2.74	3.81	2.03
Oct-99	5LD	32940	20	-0.29	1.48	-3.61	1.43	-2.42	2.38	3.12	1.75
Apr-00	**5AD**	31525	26	0.19	3.35	-4.27	3.08	1.26	3.59	0.84	3.45
Apr-00	2LD	12791	29	-14.78	8.19	-22.68	9.4	-11.62	8.86	-	-
Dec-00	*5AH*	*29901*	*27*	*0.87*	*5.22*	-	-	-	-	-	-
Dec-00	*5LD*	*35036*	*8*	*-3.71*	*5.83*	-	-	-	-	-	-
Apr-01	5LD	36233	59	3.14	5.22	-4.12	3.15	-4.14	2.78	10.5	9.88
Apr-01	5AH	30695	46	1.3	1.49	-0.55	2.29	1.81	1.78	1.5	1.98
Apr-01	**5AD**	33249	47	-3.41	3.42	-0.89	4.06	-4.7	4.01	-3.02	4.13
Nov-01	**5AD**	29774	25	-1.7	1.34	-5.02	1.61	-0.32	1.77	-1.65	1.89
Nov-01	5AH	29702	26	-2.26	1.75	-1.94	1.94	-3.1	2.12	-2.32	3.06

***Table Truck Code: Number of Axles, Suspension (Air-Ride, Leaf-Spring), Trailer Type: Dump, Bulk, Household Carrier Example: 5AD= 5-Axle, Air-ride, Dump Truck.**

Individual Sensor Outputs

The electronics were set to record the loads on four sensor locations for lanes 1 and 4, during certain periods of the validations. It was concluded that the sensor right/left results are not meaningful, because the individual sensors or combined sensor sets have never been calibrated according to a known loads in the field. The percent error by sensor is not in itself meaningful,

but the standard deviation is informative to learn from the dispersion of results. We are studying the variation of each sensor, as to determine the implications of site configuration, sensor position, lane, truck and number of sensors. Table 11 provides an example of the multi-factor data being studied.

Table 11: Example of Individual Sensor Standard Deviation From One Calibration

(November 2001)		Total	1st Left Sensor	1st Right Sensor	2nd Right Sensor	2nd Left Sensor
Truck	Lane	Passes	Standard Deviation (%)			
(1) 5-axle air-ride	1	19	1.16	1.19	0.92	2.39
(1) 5-axle air-ride	4	18	1.05	1.24	1.31	1.19
(2) 5-axle air-ride	1	19	1.69	1.50	1.63	2.96
(2) 5-axle air-ride	4	20	1.63	0.98	1.80	0.73

The sensor segmentation provides flexibility in the field installation configuration. Recent installations at various locations in the USA vary in their configurations. It is recommended that personnel consider the best configuration for balancing data quality, cost, potential redundancy for reduced lane closures and probably the most important, for reducing the impact of vehicle dynamics as published [7].

Speed

In April 2001 and November 2001, the vehicle speeds were varied between 56mph and 65mph after the calibration and initial validation runs were completed. To determine if there is a relationship with speed, the percent error for gross-vehicle weight and front-axle loads were plotted versus the speed for each truck pass, according to lane from the April and November 2001 data. From the limited data sets, the linear regression analysis yielded regression lines with low coefficients of determination, (range: $1x10^{-6}$ to 0.29). Therefore, a strong correlation could not be found between speed and gross-vehicle weight or front-axle loads.

Evaluation of Continuous Data

Continuous traffic data was collected at the site and complete weight records for FHWA Class 4 through 13 were recorded, formatted and submitted to the FHWA-LTPP Program for inclusion in the LTPP traffic database. The data was reviewed for total volume consistency, percentage errors and the repeatability of the Class 9 vehicle (five-axle semi-trailer), gross-vehicle weight (GW), and front-axle loads (FAL) to determine the system repeatability over time. Graphs were plotted of GW and FAL data for Class 9 vehicles for the period of Dec-1998 through Sept-1999. Assessment of these graphs indicates that some shifting of the data occurred resulting in movement of the FAL peaks, i.e. change in average axle-loads. It was questioned at the time if the shifts in peaks were due to system drifting or season variations in the trucking population. The October 1999 calibration adjustments seemed to indicate system drift for lanes 3 and 1, the same lanes that required sensor replacements in the year 2000. It remains unclear why there were consistent shifts in the graphed plots for the 1999 data for all lanes. To determine if there were other system drifts or seasonal changes, data from periods of time with no other complicating factors (i.e. software problems, loop errors) were plotted for the time periods of April 2000 – November 2000; April 2001-December 2001. These periods of monitoring remained consistent using the methods of graphing described. Therefore, it was determined that

along with the results from field calibrations using pre-weighed vehicles, system drift was not a systematic issue.

Pavement Cracking at Sensors

The quartz piezoelectric sensors were monitored in the field on a periodic basis. It was noted that as early as the first season, cracks formed in the pavement immediately adjacent to the interface between the sensor and exit wiring. Improvements were made to the sensor design after the first installation and these epoxy cracks did not return. The cracking in the asphalt however continued. The cracks were predominant at the end of the sensor rows and connectors. Every November, from 1998 to 2001, cold-applied rubber-modified bituminous crack sealant was applied to the cracked areas, in attempts to prevent moisture infiltration. The cracking is considered to be a result of the difference between the rigid properties of the sensor, the grout, and the flexible qualities of the asphalt. As of November 2001, the cracking has not resulted in dislodging of any sensors or pavement.

Comparison with Accepted Standards and Specifications

The validation test results were compared to the American Society for Testing and Materials Specification E-1318 Type I Performance Requirements (ASTM, 1999). During the majority of circumstances, the air-ride suspension vehicle data were within limits, for lanes 1 and 4. A notable exception was the GW and tandem-axle set for a test truck during November 2001. This was due to the variability between trucks and the calibration method. Therefore, a complete representation of truck population variability is needed to assess the functional performance of the site.

The European WIM Specification, (COST 323,1999) was applied to the truck calibration data collected from 1998 to 2001 by the personnel from the Laboratoire Central des Ponts et Chaussées (LCPC). The results for the whole population of trucks over the whole test period (Oct. 1998 - Nov. 2001) are given in Table 12, in limited reproducibility condition (R1) and full environmental reproducibility condition (III). It should be noted that the conditions of the COST 323 Specification are not exactly fulfilled, while some recalibrations were done during the test period. Therefore, the accuracy classes found are better than those expected if the system had worked independently. However, the calibration truck samples were not used in the accuracy checks, and therefore the tolerances of in-service checks were considered.

Table 12: Accuracy Analysis according to the COST 323 European Specification of WIM test conditions (R1 - III)

Lane 1	Number	Mean	Std dev	p_o	Class	d	d_{min}	d_c	p	Accepted class
Entity		(%)	(%)	(%)		(%)	(%)	(%)	(%)	
gross weight	464	0,41	3,94	93,8	B(10)	10	7,8	7,8	98,5	B(10)
group of axles	724	0,94	5,24	94,1	B(10)	13	10,4	7,4	98,2	
single axle	458	-2,75	5,30	93,8	B(10)	15	11,6	7,5	98,6	
axle of group	568	-0,61	6,39	93,9	B+(7)	14	12,6	6,3	96,4	

Lane 2	Number	Mean	Std dev	p_o	Class	d	d_{min}	d_c	p	Accepted class
Entity		(%)	(%)	(%)		(%)	(%)	(%)	(%)	
gross weight	142	-1,60	3,78	92,7	B(10)	10	8,0	8,0	97,7	C(15)
group of axles	268	-1,22	4,58	93,4	B+(7)	10	9,3	6,5	95,3	
single axle	150	-4,26	6,68	92,8	C(15)	20	15,3	10,3	98,5	
axle of group	189	-2,47	6,95	93,1	B(10)	20	14,4	7,2	99,0	

Lane 3	Number	Mean	Std dev	p_o	Class	d	d_{min}	d_c	p	Accepted class
Entity		(%)	(%)	(%)		(%)	(%)	(%)	(%)	
gross weight	145	-2,75	4,62	92,7	C(15)	15	10,4	10,4	99,3	C(15)
group of axles	276	-2,23	5,66	93,4	B(10)	13	11,9	8,9	95,7	
single axle	152	-6,33	5,95	92,8	C(15)	20	16,0	11,0	98,3	
axle of group	210	-1,57	6,31	93,2	B+(7)	14	12,8	6,4	95,6	

Lane 4	Number	Mean	Std dev	p_o	Class	d	d_{min}	d_c	p	Accepted class
Entity		(%)	(%)	(%)		(%)	(%)	(%)	(%)	
gross weight	330	-1,45	2,79	93,6	B+(7)	7	6,1	6,1	96,8	B+(7)
group of axles	606	-0,91	3,43	94,0	A(5)	7,14	7,0	4,9	94,7	
single axle	357	-3,24	3,44	93,6	B+(7)	11	8,9	5,6	98,3	
axle of group	590	-1,00	4,81	94,0	A(5)	10	9,6	4,8	94,9	

In Table 12, the following data are used:

- P_0: minimum required level of confidence (proportion for large samples), of the relative error with respect to the static reference weight/load, to be within the specified tolerance, for each criterion (e.g. gross weight, single axles, group of axles, axles of groups),
- d : tolerance of the relative error for each criterion (half of the confidence interval width),
- d_{min} : half of confidence interval width, for a level of confidence p=p0,
- d_c : standardized value of d_{min} related to gross weight criterion,
- p : true level of confidence of the interval [-d;d].

The accepted class is the lower class of the four criteria considered.

The global results from this analysis on all test vehicles indicate good accuracy. The results indicate lane 4 had the best accuracy with a B+(7) Accepted Class, followed by lane 1 with a B(10) Accepted Class and lanes 2 and 3 with C(15) Accepted Class accuracies. These ratings are consistent with the field observations. The following details are provided as contributing factors to explain the different results between the lanes. The use of pre-weighed test vehicles is considered limited reproducibility condition. The data from lane 3 includes reduced sensor

configurations during some test periods when awaiting sensor replacements. Lanes 2 and 3 had reduced calibration sample sizes. As mentioned in Section 2.3, the WIM in lanes 1 and 2 are located downstream from a bridge, therefore measuring a greater number of divots in the pavement approach. Finally, the influence of the recalibration adjustments listed in Table 6, must be considered. A conclusion of the LCPC team was that there were calibration issues when considering the entire test period and that an improved calibration could help improve the reached accuracy class. The replacement of sensors and the Y2K software adjustments as well as the system operators influenced adjustments to the system and therefore the analysis outcome.

Conclusions

Although this report lists a number of problems that occurred with the Quartz Piezoelectric Weigh-In-Motion sensors system, ConnDOT is generally very pleased with the accuracy and repeatability of the sensors, especially in comparison to other systems. The sensor longevity based on the cracking in the surrounding asphalt pavement, remains to be a concern. Poor drainage and infestation of mice undoubtedly caused premature failure and hampered the investigation. These sensors demonstrated the ability to hold their calibration settings for extended periods of time (≥ 6 months). Periodic field validations and system checks are essential. The work conducted further supports the need to gain a better understanding of the relationship between WIM data quality and pavement profile. It is hoped that the findings from this study can be used to create a better generation of WIM system that incorporates the good accuracy and repeatability of the quartz piezoelectric sensors and is better equipped to handle the environmental elements.

In addition to meeting the objectives set-forth in the study, the accuracy and quality of the data produced from the quartz sensors allowed us to reconsider the methods used for testing equipment and data quality. Much of the data analyses conducted as part of this study were extremely labor-intensive. Additional methodologies and improved automated processes are still necessary to ensure system-wide application of improved assessment of quality data. The higher degree of accuracy enabled by the quartz piezoelectric sensor, has also enabled us to further realize the importance of the test vehicles chosen, pavement profile, and calibration/validation techniques. From these improved methods, it is hoped that a better understanding can be reached between the information gained by the use of test vehicles and the actual loads applied from the traffic stream.

Lessons Learned During the Field Installations

A few items are worth noting from the field installations to improve the process for future work. It would be a valuable savings of time to assemble the sensor strips and attach them to each other before entering the field. In addition, the dry sawing to remove the sensors and the grinding of the surface using the rotary hand grinding equipment can generate clouds of dust. The grout compound includes silica sand. Long-term exposure to fine silica particles is documented to cause Silicosis, an irreversible and possibly life-threatening disease. It is recommended that every precaution be taken to protect all those in proximity. A device that properly entraps the dust particles for disposal would help to alleviate this situation. It is also recommended that any agency using these sensors also invest in a Mega Ohmmeter capable of measuring the full range of potential signal readings, for trouble-shooting purposes.

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Appendix A

Measurements Obtained With Vehicle Passes During Calibration of December 1997

AIR-RIDE, 5-AXLE SEMI-TRAILER

LANE #1, SLOW LANE WESTBOUND
ROUTE 2, LEBANON CT
(DECEMBER 1997)

		FIELD DATA														CALCULATED DATA			
		Front	Drive (lbs.)			Trailer (lbs.)			(lbs.)	(inches)				(feet)	(mph)				
		Axle	Axle 2	Axle 3	Total	Axle 4	Axle 5	Total	GVW	Axle 1-2	Axle 2-3	Axle 3-4	Axle 4-5	Length					
	Actual	8760			37230			33160	79150	182	53	374	49	60		Steer	Drive	Trailer	GVW
PASS	Veh No.	1st Axle	2nd Axle	3rd Axle	Total	4th Axle	5th Axle	Total	GVW	Axle 1-2	Axle 2-3	Axle 3-4	Axle 4-5	Length	Speed	% DIFF	% DIFF	% DIFF	% DIFF
1	5173	8487	17841	18066	35907	15757	16992	32749	77143	181	52	374	48	64	55	-3.12%	-3.55%	-1.24%	-2.54%
2	5452	8891	17766	18041	35807	16288	16249	32537	77235	181	52	374	49	64	54	1.50%	-3.82%	-1.88%	-2.42%
3	5722	8849	18425	18262	36687	16795	16198	32993	78529	181	52	374	49	64	54	1.02%	-1.46%	-0.50%	-0.78%
4	5965	8593	17706	18158	35864	16149	16414	32563	77020	181	52	374	49	63	54	-1.91%	-3.67%	-1.80%	-2.69%
5	6197	8346	18831	18180	37011	16200	16229	32429	77786	181	52	374	49	61	55	-4.73%	-0.59%	-2.20%	-1.72%
6	9577	8055	18738	18881	37619	16414	16716	33130	78804	181	52	374	49	64	57	-8.05%	1.04%	-0.09%	-0.44%
7	10798	8185	18346	18449	36795	16238	16526	32764	77744	181	52	374	49	65	57	-6.56%	-1.17%	-1.19%	-1.78%
8	11130	8185	17786	18641	36427	16024	16163	32187	76799	181	52	375	49	63	56	-6.56%	-2.16%	-2.93%	-2.97%
9	11443	8544	18394	18480	36874	16132	15995	32127	77545	181	52	375	48	63	57	-2.47%	-0.96%	-3.12%	-2.03%
10	255	8335	17616	18339	35955	16030	15845	31875	76165	181	52	374	48	63	56	-4.85%	-3.42%	-3.88%	-3.77%
11	665	8154	18284	18564	36848	16209	16518	32727	77729	181	52	374	49	64	55	-6.92%	-1.03%	-1.31%	-1.80%
12	1110	8203	18288	18701	36989	16432	15889	32321	77513	181	52	373	49	63	57	-6.36%	-0.65%	-2.53%	-2.07%
13	1542	7973	18476	18134	36610	16482	16471	32953	77536	181	52	374	49	62	55	-8.98%	-1.67%	-0.62%	-2.04%
14	1999	8913	19038	18491	37529	16518	16937	33455	79897	181	52	374	49	64	56	1.75%	0.80%	0.89%	0.94%
16	3698	8813	19386	19184	38570	16985	16738	33723	81106	181	52	373	49	63	57	0.61%	3.60%	1.70%	2.47%
17	4006	8558	16729	17964	34693	16487	16507	32994	76245	181	52	374	49	64	54	-2.31%	-6.81%	-0.50%	-3.67%
18	4314	8454	18229	18057	36286	16152	16030	32182	76922	181	52	374	49	63	57	-3.49%	-2.54%	-2.95%	-2.81%
19	4608	8955	19012	18623	37635	16612	16657	33269	79859	181	52	374	49	64	55	2.23%	1.09%	0.33%	0.90%
20	4917	8211	18434	17946	36380	15395	16257	31652	76243	181	52	374	48	64	54	-6.27%	-2.28%	-4.55%	-3.67%
21	5187	8416	18264	18191	36455	16121	16260	32381	77252	181	52	374	49	63	57	-3.93%	-2.08%	-2.35%	-2.40%
22	5465	8361	16418	18035	34453	16429	16432	32861	75675	181	52	373	49	63	54	-4.55%	-7.46%	-0.90%	-4.39%
23	5752	8361	17662	17887	35549	16370	16304	32674	76584	181	52	374	49	64	54	-4.55%	-4.52%	-1.47%	-3.24%
24	6337	8494	18368	18612	36980	16249	16251	32500	77974	181	52	375	49	62	54	-3.04%	-0.67%	-1.99%	-1.49%
25	6854	8428	18242	18522	36764	16324	16663	32987	78179	181	52	373	49	63	56	-3.79%	-1.25%	-0.52%	-1.23%
26	10510	8736	18370	17680	36050	16310	16588	32898	77684	181	52	374	49	63	54	-0.27%	-3.17%	-0.79%	-1.85%
															average	-3.42%	-1.94%	-1.46%	-1.90%
															std dev	3.17%	2.40%	1.45%	1.59%

CONVENTIONAL SUSPENSION, 5-AXLE SEMI-TRAILER

LANE #1, SLOW LANE WESTBOUND
ROUTE 2, LEBANON CT
(DECEMBER 1997)

		FIELD DATA														CALCULATED DATA			
		Front	Drive (lbs.)			Trailer (lbs.)			(lbs.)	(inches)				(feet)	(mph)				
		Axle	Axle 2	Axle 3	Total	Axle 4	Axle 5	Total	GVW	Axle 1-2	Axle 2-3	Axle 3-4	Axle 4-5	Length					
	Actual	8280			37460			32870	78610	164	51	365	49	57		Steer	Drive	Trailer	GVW
PASS	Veh No.	1st Axle	2nd Axle	3rd Axle	Total	4th Axle	5th Axle	Total	GVW	Axle 1-2	Axle 2-3	Axle 3-4	Axle 4-5	Length	Speed	% DIFF	% DIFF	% DIFF	% DIFF
1	5180	8326	21882	17916	39798	16851	16694	33545	81669	162	51	366	48	58	55	0.56%	6.24%	2.05%	3.89%
2	5454	7737	18107	19322	37429	16696	16227	32923	78089	162	50	367	48	58	55	-6.56%	-0.08%	0.16%	-0.66%
3	5724	7532	19117	20804	39921	17098	16174	33272	80725	162	50	367	48	59	55	-9.03%	6.57%	1.22%	2.69%
4	5972	8441	17843	19810	37653	15999	16844	32843	78937	162	50	367	48	59	54	1.94%	0.52%	-0.08%	0.42%
5	6200	8377	17995	18187	36182	17847	16637	34484	79043	162	50	367	48	58	55	1.17%	-3.41%	4.91%	0.55%
6	10802	7848	24965	20678	45643	18370	16824	35194	88685	162	50	367	48	57	55	-5.22%	21.84%	7.07%	12.82%
7	11133	8291	21223	19655	40878	15605	16361	31966	81135	162	50	367	48	57	57	0.13%	9.12%	-2.75%	3.21%
8	11450	7191	18994	20526	39520	16132	16661	32793	79504	161	50	367	47	57	55	-13.15%	5.50%	-0.23%	1.14%
9	261	7810	19649	18593	38242	17005	16701	33706	79758	162	50	367	48	59	54	-5.68%	2.09%	2.54%	1.46%
10	667	8024	20787	18564	39351	17051	16696	33747	81122	162	50	367	48	60	56	-3.09%	5.05%	2.67%	3.20%
11	1118	8498	20244	20127	40371	16884	16321	33205	82074	161	50	367	48	58	56	2.63%	7.77%	1.02%	4.41%
12	1547	7872	20127	20249	40376	16418	16308	32726	80974	162	50	368	48	58	55	-4.93%	7.78%	-0.44%	3.01%
13	2004	7956	23750	20537	44287	17036	16474	33510	85753	162	50	367	48	58	55	-3.91%	18.22%	1.95%	9.09%
14	3701	7878	17552	20692	38244	16780	16352	33132	79254	162	50	367	48	58	56	-4.86%	2.09%	0.80%	0.82%
16	4009	7905	21069	20365	41434	16983	16910	33893	83232	162	50	367	47	59	55	-4.53%	10.61%	3.11%	5.88%
17	4319	8533	16855	20652	37507	17347	16282	33629	79669	163	50	367	48	57	57	3.06%	0.13%	2.31%	1.35%
18	4610	7777	18319	20066	38385	16154	16564	32718	78880	162	50	367	48	58	55	-6.07%	2.47%	-0.46%	0.34%
19	4919	8441	23380	18654	42034	16941	16853	33794	84269	161	50	367	48	58	54	1.94%	12.21%	2.81%	7.20%
20	5194	7263	18921	18917	37838	17393	16544	33937	79038	162	50	367	48	60	56	-12.28%	1.01%	3.25%	0.54%
21	5477	7881	18101	19722	37823	16339	16687	33026	78730	162	50	367	48	57	54	-4.82%	0.97%	0.47%	0.15%
22	5756	8011	18130	19190	37320	16743	16670	33413	78744	161	50	367	48	59	55	-3.25%	-0.37%	1.65%	0.17%
23	9466	7486	21644	18189	39833	17327	16643	33970	81289	162	50	367	48	58	54	-9.59%	6.33%	3.35%	3.41%
24	9719	7453	19181	18866	38047	17069	16952	34021	79521	163	50	366	47	59	55	-9.99%	1.57%	3.50%	1.16%
25	9957	8024	21510	19406	40916	17675	16033	33708	82648	162	50	366	48	58	55	-3.09%	9.23%	2.55%	5.14%
26	10222	7940	20751	22553	43304	16584	16743	33327	84571	162	50	367	48	57	61	-4.11%	15.60%	1.39%	7.58%
															average	-4.11%	5.96%	1.79%	3.16%
															std dev	4.53%	6.21%	1.99%	3.29%

AIR-RIDE, 5-AXLE SEMI-TRAILER

LANE #2, WESTBOUND HIGH SPEED LANE
ROUTE 2, LEBANON CT
(DECEMBER 1997)

		FIELD DATA														CALCULATED DATA			
		Front	Drive (lbs.)			Trailer (lbs.)			(lbs.)	(inches)				(feet)	(mph)				
		Axle	Axle 2	Axle3	Total	Axle 4	Axle 5	Total	GVW	Axle 1-2	Axle 2-3	Axle 3-4	Axle 4-5	Length					
	Actual	8760			37230			33160	79150	182	53	374	49	60		Steer	Drive	Trailer	GVW
PASS	Veh No.	1st Axle	2nd Axle	3rd Axle	Total	4th Axle	5th Axle	Total	GVW	Axle 1-2	Axle 2-3	Axle 3-4	Axle 4-5	Length	Speed	% DIFF	% DIFF	% DIFF	% DIFF
1	6439	9138	18716	18643	37359	16562	16747	33309	79806	182	52	376	49	60	52	4.32%	0.35%	0.45%	0.83%
2	6689	8794	18694	18346	37040	17062	16637	33699	79533	182	52	376	49	62	54	0.39%	-0.51%	1.63%	0.48%
3	7115	8919	18727	18645	37372	16804	16698	33502	79793	182	52	376	49	60	54	1.82%	0.38%	1.03%	0.81%
4	7349	8835	17682	18496	36178	17025	16659	33684	78697	182	53	376	49	60	56	0.86%	-2.83%	1.58%	-0.57%
5	7629	8943	18952	18798	37750	17062	16811	33873	80566	182	52	376	49	59	56	2.09%	1.40%	2.15%	1.79%
6	7848	8802	19157	18661	37818	17464	17142	34606	81226	182	52	376	49	61	56	0.48%	1.58%	4.36%	2.62%
7	8080	8851	18363	18723	37086	16829	17148	33977	79914	181	52	376	49	62	59	1.04%	-0.39%	2.46%	0.97%
8	8403	8774	19056	18862	37918	17025	17267	34292	80984	182	52	375	49	60	56	0.16%	1.85%	3.41%	2.32%
9	9305	8734	19367	18692	38059	17082	16577	33659	80452	182	52	376	49	60	58	-0.30%	2.23%	1.50%	1.64%
10	9831	8540	18491	18665	37156	17358	17380	34738	80434	182	53	376	49	59	57	-2.51%	-0.20%	4.76%	1.62%
11	10110	8628	19144	18657	37801	17184	16869	34053	80482	182	52	376	49	59	55	-1.51%	1.53%	2.69%	1.68%
12	10483	8862	18187	17993	36180	16582	16372	32954	77996	182	52	375	49	54	55	1.16%	-2.82%	-0.62%	-1.46%
13	6009	8639	18928	18835	37763	16800	16553	33353	79755	182	52	376	49	62	55	-1.38%	1.43%	0.58%	0.76%
14	6622	8827	17525	18374	35899	16859	16804	33663	78389	182	52	375	49	60	55	0.76%	-3.58%	1.52%	-0.96%
16	7142	8800	17591	18665	36256	15528	17089	32617	77673	181	52	375	49	60	57	0.46%	-2.62%	-1.64%	-1.87%
17	7441	8829	19243	18749	37992	17303	17106	34409	81230	182	52	376	49	61	56	0.79%	2.05%	3.77%	2.63%
18	7715	8529	18434	18998	37432	17243	16674	33917	79878	182	52	376	49	60	57	-2.64%	0.54%	2.28%	0.92%
19	7977	8906	18198	18773	36971	16998	16257	33255	79132	181	52	375	49	59	55	1.67%	-0.70%	0.29%	-0.02%
20	8202	8672	18776	18676	37452	17164	17236	34400	80524	182	52	376	48	60	57	-1.00%	0.60%	3.74%	1.74%
21	8937	8829	18811	18597	37408	18094	16654	34748	80985	182	52	376	49	60	56	0.79%	0.48%	4.79%	2.32%
22	9197	8738	19448	18436	37884	17093	16923	34016	80638	182	52	376	49	60	59	-0.25%	1.76%	2.58%	1.88%
23	9463	8705	18222	18105	36327	16987	16418	33405	78437	181	52	375	49	61	55	-0.63%	-2.43%	0.74%	-0.90%
24	9718	8765	18469	18683	37152	17073	17126	34199	80116	182	52	376	49	58	54	0.06%	-0.21%	3.13%	1.22%
25	9956	8542	18070	18310	36380	17325	16504	33829	78751	182	52	376	49	59	56	-2.49%	-2.28%	2.02%	-0.50%
26	10219	8454	18187	18310	36497	16584	16313	32897	77848	182	52	376	49	59	59	-3.49%	-1.97%	-0.79%	-1.64%
															average	0.03%	-0.17%	1.94%	0.73%
															std dev	1.73%	1.78%	1.71%	1.37%

CONVENTIONAL SUSPENSION, 5-AXLE SEMI-TRAILER

LANE #2 WESTBOUND HIGH SPEED LANE
ROUTE 2, LEBANON CT
(DECEMBER 1997)

	FIELD DATA														CALCULATED DATA			
		Front	Drive (lbs.)			Trailer (lbs.)			(lbs.)	(inches)				(feet)	(mph)				
		Axle	Axle 2	Axle 3	Total	Axle 4	Axle 5	Total	GVW	Axle 1-2	Axle 2-3	Axle 3-4	Axle 4-5	Length					
	Actual	8280			37460			32870	78610	164	51	365	49	57		Steer	Drive	Trailer	GVW
PASS	Veh No.	1st Axle	2nd Axle	3rd Axle	Total	4th Axle	5th Axle	Total	GVW	Axle 1-2	Axle 2-3	Axle 3-4	Axle 4-5	Length	Speed	% DIFF	% DIFF	% DIFF	% DIFF
1	5180	8915	17148	16584	33732	16701	16921	33622	76269	162	51	367	48	56	55	7.67%	-9.95%	2.29%	-2.98%
2	5454	8747	16253	19016	35269	16359	16970	33329	77345	162	50	368	48	56	56	5.64%	-5.85%	1.40%	-1.61%
3	5724	8401	19016	17836	36852	16893	16359	33252	78505	163	51	368	48	56	57	1.46%	-1.62%	1.16%	-0.13%
4	5972	8434	13995	18778	32773	16421	15949	32370	73577	163	50	367	48	55	55	1.86%	-12.51%	-1.52%	-6.40%
5	6200	9038	17861	18835	36696	17351	16729	34080	79814	163	50	367	48	56	55	9.15%	-2.04%	3.68%	1.53%
6	10802	8873	19909	20568	40477	16992	15854	32846	82196	162	50	367	48	55	55	7.16%	8.05%	-0.07%	4.56%
7	11133	8275	17867	18346	36213	16418	16368	32786	77274	162	50	368	48	56	56	-0.06%	-3.33%	-0.26%	-1.70%
8	11450	8888	15839	19267	35106	17677	17228	34905	78899	163	50	367	48	55	56	7.34%	-6.28%	6.19%	0.37%
9	261	9045	15581	18908	34489	15980	16108	32088	75622	163	51	368	48	56	57	9.24%	-7.93%	-2.38%	-3.80%
10	667	8344	16659	18319	34978	15691	16313	32004	75326	163	51	368	48	55	57	0.77%	-6.63%	-2.63%	-4.18%
11	1118	8692	17532	18859	36391	16549	16601	33150	78233	163	51	367	48	55	55	4.98%	-2.85%	0.85%	-0.48%
12	1547	8388	15521	17922	33443	16738	16293	33031	74862	163	51	367	48	54	56	1.30%	-10.72%	0.49%	-4.77%
13	2004	8600	17863	20326	38189	17111	17384	34495	81284	163	50	368	48	55	55	3.86%	1.95%	4.94%	3.40%
14	3701	8450	16831	19649	36480	16698	16716	33414	78344	163	50	367	48	54	55	2.05%	-2.62%	1.66%	-0.34%
16	4009	9131	16701	18392	35093	16619	17003	33622	77846	163	50	367	48	55	55	10.28%	-6.32%	2.29%	-0.97%
17	4319	8128	17162	17166	34328	17730	16983	34713	77169	163	50	367	48	55	55	-1.84%	-8.36%	5.61%	-1.83%
18	4610	7539	15281	17181	32462	15764	15503	31267	71268	163	50	368	48	55	57	-8.95%	-13.34%	-4.88%	-9.34%
19	4919	8600	18421	17267	35688	15733	16493	32226	76514	163	50	368	48	56	57	3.86%	-4.73%	-1.96%	-2.67%
20	5194	7775	16074	20103	36177	16595	16965	33560	77512	163	50	367	48	57	55	-6.10%	-3.42%	2.10%	-1.40%
21	5477	8238	15863	20804	36667	16736	17014	33750	78655	162	50	368	48	54	56	-0.51%	-2.12%	2.68%	0.06%
22	5756	7995	16855	19642	36497	16685	16011	32696	77188	163	50	367	48	56	55	-3.44%	-2.57%	-0.53%	-1.81%
23	9466	8525	17894	18593	36487	16209	16716	32925	77937	163	51	369	48	55	57	2.96%	-2.60%	0.17%	-0.86%
24	9719	8304	13029	17717	30746	15808	16295	32103	71153	163	50	368	48	56	57	0.29%	-17.92%	-2.33%	-9.49%
25	9957	8666	20756	20665	41421	17067	16712	33779	83866	162	51	367	48	55	54	4.66%	10.57%	2.77%	6.69%
26	10222	8970	13887	19278	33165	17530	16379	33909	76044	163	50	376	48	56	55	8.33%	-11.47%	3.16%	-3.26%
															average	2.88%	-4.98%	0.99%	-1.66%
															std dev	4.84%	6.24%	2.72%	3.69%

AIR-RIDE SUSPENSION, 5-AXLE SEMI-TRAILER

LANE # 3 EASTBOUND DIRECTION, HIGH SPEED LANE
ROUTE 2, LEBANON CT
(DECEMBER 1997)

		FIELD DATA														CALCULATED DATA			
		Front	Drive (lbs.)			Trailer (lbs.)			(lbs.)	(inches)				(feet)	(mph)				
		Axle	Axle 2	Axle3	Total	Axle 4	Axle 5	Total	GVW	Axle 1-2	Axle 2-3	Axle 3-4	Axle 4-5	Length		Steer	Drive	Trailer	GVW
	Actual	8760			37230			33160	79150	182	53	374	49	60					
PASS	Veh No.	1st Axle	2nd Axle	3rd Axle	Total	4th Axle	5th Axle	Total	GVW	Axle 1-2	Axle 2-3	Axle 3-4	Axle 4-5	Length	Speed	% DIFF	% DIFF	% DIFF	% DIFF
1	6364	8955	19543	19613	39156	16520	17067	33587	81698	181	52	374	48	60	56	2.23%	5.17%	1.29%	3.22%
2	6620	9466	18562	19133	37695	16771	17587	34358	81519	181	52	374	48	61	58	8.06%	1.25%	3.61%	2.99%
3	6926	8871	18987	19583	38570	16665	17025	33690	81131	181	52	375	48	60	57	1.27%	3.60%	1.60%	2.50%
4	7273	9142	19292	19351	38643	16692	17100	33792	81577	181	52	374	49	59	57	4.36%	3.80%	1.91%	3.07%
5	7541	8699	18083	19351	37434	16383	16500	32883	79016	180	52	374	49	60	56	-0.70%	0.55%	-0.84%	-0.17%
6	7795	8974	19206	19748	38954	16769	16875	33644	81572	181	52	375	49	61	59	2.44%	4.63%	1.46%	3.06%
7	8008	8981	18399	19647	38046	15986	17241	33227	80254	181	52	375	49	60	58	2.52%	2.19%	0.20%	1.39%
8	8328	8961	19757	19611	39368	16480	17146	33626	81955	181	52	375	49	60	57	2.29%	5.74%	1.41%	3.54%
9	8575	8540	19252	19375	38627	16954	16692	33646	80813	181	52	375	49	60	57	-2.51%	3.75%	1.47%	2.10%
10	9246	8999	18044	19856	37900	17051	16879	33930	80829	181	52	374	49	60	57	2.73%	1.80%	2.32%	2.12%
11	9509	9237	19230	19521	38751	16579	17267	33846	81834	181	52	374	49	61	57	5.45%	4.09%	2.07%	3.39%
12	9750	9034	19080	19960	39040	16842	17029	33871	81945	181	52	374	49	60	57	3.13%	4.86%	2.14%	3.53%
13	10030	8851	19823	19680	39503	17023	17532	34555	82909	181	52	375	49	61	59	1.04%	6.11%	4.21%	4.75%
14	10394	8783	18584	19583	38167	17060	17208	34268	81218	181	52	375	49	61	55	0.26%	2.52%	3.34%	2.61%
16	10707	9515	19455	19631	39086	16787	17038	33825	82426	181	52	374	48	60	57	8.62%	4.99%	2.01%	4.14%
17	11027	9047	19527	19311	38838	16842	16809	33651	81536	181	52	375	49	60	58	3.28%	4.32%	1.48%	3.01%
18	6258	8816	18974	19704	38678	16807	17170	33977	81471	181	52	375	49	59	56	0.64%	3.89%	2.46%	2.93%
19	6556	8685	18789	19327	38116	16308	16974	33282	80083	181	52	375	48	59	55	-0.86%	2.38%	0.37%	1.18%
20	6792	9358	18881	19492	38373	16370	16626	32996	80727	181	52	374	49	61	56	6.83%	3.07%	-0.49%	1.99%
21	7059	9482	18698	19481	38179	16866	16886	33752	81413	181	52	375	49	60	57	8.24%	2.55%	1.79%	2.86%
22	7365	9153	19594	19512	39106	16760	17378	34138	82397	181	52	375	48	60	57	4.49%	5.04%	2.95%	4.10%
23	7638	8979	18926	19406	38332	16676	17023	33699	81010	181	52	375	49	60	57	2.50%	2.96%	1.63%	2.35%
24	7893	8685	18654	19016	37670	17073	16650	33723	80078	181	52	374	49	61	56	-0.86%	1.18%	1.70%	1.17%
25	8135	8738	19228	19636	38864	16231	16546	32777	80379	181	52	374	49	60	56	-0.25%	4.39%	-1.16%	1.55%
26	8379	9246	18692	19201	37893	16632	17042	33674	80813	181	52	374	49	60	57	5.55%	1.78%	1.55%	2.10%
															average	2.83%	3.46%	1.62%	2.62%
															std dev	3.04%	1.51%	1.28%	1.09%

CONVENTIONAL SUSPENSION, 5-AXLE SEMI-TRAILER

LANE #3 EASTBOUND, HIGH SPEED DIRECTION

ROUTE 2, LEBANON CT

(DECEMBER 1997)

	FIELD DATA														CALCULATED DATA			
		Front	Drive (lbs.)			Trailer (lbs.)			(lbs.)	(inches)				(feet)	(mph)				
		Axle	Axle 2	Axle 3	Total	Axle 4	Axle 5	Total	GVW	Axle 1-2	Axle 2-3	Axle 3-4	Axle 4-5	Length					
	Actual	8280			37460			32870	78610	164	51	365	49	57		Steer	Drive	Trailer	GVW
PASS	Veh No.	1st Axle	2nd Axle	3rd Axle	Total	4th Axle	5th Axle	Total	GVW	Axle 1-2	Axle 2-3	Axle 3-4	Axle 4-5	Length	Speed	% DIFF	% DIFF	% DIFF	% DIFF
1	6368	8353	21433	19190	40623	17508	17913	35421	84397	161	50	366	48	55	55	0.88%	8.44%	7.76%	7.36%
2	6624	8884	21287	18114	39401	16352	18193	34545	82830	161	50	367	48	55	57	7.29%	5.18%	5.10%	5.37%
3	6928	9032	17517	17250	34767	16630	16972	33602	77401	161	50	367	48	55	55	9.08%	-7.19%	2.23%	-1.54%
4	7276	8114	18242	18077	36319	17505	17984	35489	79922	161	50	367	48	56	55	-2.00%	-3.05%	7.97%	1.67%
5	7544	8194	18216	18873	37089	16932	17270	34202	79485	161	50	367	47	55	56	-1.04%	-0.99%	4.05%	1.11%
6	7797	8033	15137	18601	33738	16851	18346	35197	76968	161	50	367	48	55	55	-2.98%	-9.94%	7.08%	-2.09%
7	8010	7883	15611	17406	33017	17865	18795	36660	77560	161	50	367	48	57	55	-4.79%	-11.86%	11.53%	-1.34%
8	8330	7920	18372	18127	36499	17508	18021	35529	79948	161	50	366	48	55	55	-4.35%	-2.57%	8.09%	1.70%
9	8578	8128	19550	16632	36182	17843	17133	34976	79286	161	50	367	48	56	55	-1.84%	-3.41%	6.41%	0.86%
10	9247	8445	16646	17991	34637	14090	12538	26628	69710	161	50	366	48	54	54	1.99%	-7.54%	-18.99%	-11.32%
11	9512	9018	15510	17880	33390	16776	16923	33699	76107	161	50	366	48	55	55	8.91%	-10.86%	2.52%	-3.18%
12	9752	8125	18890	18707	37597	17741	18368	36109	81831	161	50	367	48	55	55	-1.87%	0.37%	9.85%	4.10%
13	10033	8917	16952	16893	33845	16504	16526	33030	75792	161	50	367	48	55	54	7.69%	-9.65%	0.49%	-3.58%
14	10397	7574	21093	20013	41106	18037	17737	35774	84454	161	50	366	48	55	55	-8.53%	9.73%	8.83%	7.43%
16	10711	7735	16024	18590	34614	17175	18348	35523	77872	161	50	365	48	55	55	-6.58%	-7.60%	8.07%	-0.94%
17	11028	7914	18112	19816	37928	17519	18767	36286	82128	161	50	366	48	57	55	-4.42%	1.25%	10.39%	4.48%
18	6260	8064	16996	17841	34837	17655	16967	34622	77523	161	50	366	48	55	54	-2.61%	-7.00%	5.33%	-1.38%
19	6557	7806	15389	17786	33175	16807	18824	35631	76612	161	50	366	48	55	55	-5.72%	-11.44%	8.40%	-2.54%
20	6793	7927	16491	18438	34929	17691	16182	33873	76729	161	51	366	48	55	54	-4.26%	-6.76%	3.05%	-2.39%
21	7061	8079	17477	20555	38032	17199	17810	35009	81120	161	50	367	48	56	53	-2.43%	1.53%	6.51%	3.19%
22	7367	8670	16235	18273	34508	18930	17126	36056	79234	161	50	367	48	56	54	4.71%	-7.88%	9.69%	0.79%
23	7641	7402	16482	17245	33727	18213	17880	36093	77222	161	50	367	48	55	55	-10.60%	-9.97%	9.81%	-1.77%
24	7894	8626	17746	19649	37395	16560	16723	33283	79304	161	50	368	48	55	54	4.18%	-0.17%	1.26%	0.88%
25	8137	7358	18013	18820	36833	17867	18134	36001	80192	161	50	366	48	55	55	-11.14%	-1.67%	9.53%	2.01%
26	8380	8238	14829	19477	34306	18238	17662	35900	78444	161	50	367	48	54	55	-0.51%	-8.42%	9.22%	-0.21%
															average	-1.24%	-4.06%	5.77%	0.35%
															std dev	5.70%	6.09%	6.00%	3.94%

AIR-RIDE, 5-AXLE SEMI-TRAILER

LANE #4 EASTBOUND SLOW LANE
ROUTE 2, LEBANON CT
(DECEMBER 1997)

	FIELD DATA														CALCULATED DATA			
	Front	Drive (lbs.)			Trailer (lbs.)			(lbs.)	(inches)				(feet)	(mph)				
	Axle	Axle 2	Axle3	Total	Axle 4	Axle 5	Total	GVW	Axle 1-2	Axle 2-3	Axle 3-4	Axle 4-5	Length					
Actual	8760			37230			33160	79150	182	53	374	49	60		Steer	Drive	Trailer	GVW
PASS	*1st Axle*	*2nd Axle*	*3rd Axle*	*Total*	*4th Axle*	*5th Axle*	*Total*	*GVW*	Axle 1-2	Axle 2-3	Axle 3-4	Axle 4-5	Length	Speed	% DIFF	% DIFF	% DIFF	% DIFF
1	6364	8068	19402	19479	38881	17530	17212	34742	81691	181	52	374	48	59	56	-7.90%	4.43%	4.77%	3.21%
2	5369	9135	18623	18599	37222	15825	17014	32839	79196	181	52	374	49	59	59	4.28%	-0.02%	-0.97%	0.06%
3	5663	8893	18540	18727	37267	16705	16665	33370	79530	181	52	375	49	59	55	1.52%	0.10%	0.63%	0.48%
4	5892	9347	18604	18507	37111	16513	16661	33174	79632	181	52	374	49	60	56	6.70%	-0.32%	0.04%	0.61%
5	6129	8529	19466	19708	39174	17596	17558	35154	82857	181	52	375	49	59	55	-2.64%	5.22%	6.01%	4.68%
6	160	9078	19417	18879	38296	17400	17117	34517	81891	181	52	374	49	59	58	3.63%	2.86%	4.09%	3.46%
7	527	9376	18407	18610	37017	16811	16888	33699	80092	181	52	374	49	60	56	7.03%	-0.57%	1.63%	1.19%
8	971	9093	18648	18826	37474	15854	16385	32239	78806	181	52	375	48	58	57	3.80%	0.66%	-2.78%	-0.43%
9	11348	8846	18235	19029	37264	16906	16820	33726	79836	181	52	374	49	58	57	0.98%	0.09%	1.71%	0.87%
10	1427	9272	19093	18707	37800	16745	16939	33684	80756	181	52	374	48	59	57	5.84%	1.53%	1.58%	2.03%
11	1853	9082	18892	18634	37526	16350	16595	32945	79553	181	52	374	49	60	56	3.68%	0.80%	-0.65%	0.51%
12	3923	9005	18780	18879	37659	15889	16809	32698	79362	181	52	374	49	60	55	2.80%	1.15%	-1.39%	0.27%
13	4229	8476	18842	18720	37562	16851	16652	33503	79541	181	52	375	49	60	55	-3.24%	0.89%	1.03%	0.49%
14	4514	8260	19638	19567	39205	17060	17336	34396	81861	181	52	374	48	60	55	-5.71%	5.30%	3.73%	3.43%
16	4825	8147	19219	19435	38654	17977	17964	35941	82742	181	52	374	49	60	55	-7.00%	3.82%	8.39%	4.54%
17	5118	8897	18365	18998	37363	17239	16877	34116	80376	181	52	374	49	61	55	1.56%	0.36%	2.88%	1.55%
18	5396	9556	19225	19082	38307	16586	16412	32998	80861	181	52	374	49	59	57	9.09%	2.89%	-0.49%	2.16%
19	5670	9195	18330	18846	37176	16930	16824	33754	80125	181	52	375	48	60	56	4.97%	-0.15%	1.79%	1.23%
20	5939	9085	18361	18817	37178	16612	16103	32715	78978	181	52	375	48	60	55	3.71%	-0.14%	-1.34%	-0.22%
21	9119	9219	18597	18773	37370	17051	16811	33862	80451	181	52	375	49	59	58	5.24%	0.38%	2.12%	1.64%
22	9389	9122	18599	18908	37507	16818	16632	33450	80079	181	52	375	49	60	57	4.13%	0.74%	0.87%	1.17%
23	9641	9166	18657	18859	37516	16418	17053	33471	80153	181	52	375	49	59	52	4.63%	0.77%	0.94%	1.27%
24	9864	9316	19093	18723	37816	16361	16681	33042	80174	181	52	374	49	59	58	6.35%	1.57%	-0.36%	1.29%
25	9956	8542	18070	18310	36380	17325	16504	33829	78751	182	52	376	49	59	56	-2.49%	-2.28%	2.02%	-0.50%
26	10159	8496	19203	19453	38656	17380	17384	34764	81916	181	52	375	49	60	56	-3.01%	3.83%	4.84%	3.49%
														average		1.92%	1.36%	1.64%	1.54%
														std dev		4.63%	1.94%	2.58%	1.49%

CONVENTIONAL SUSPENSION, 5-AXLE SEMI-TRAILER

LANE # 4 EASTBOUND SLOW LANE

ROUTE 2, LEBANON CT
(DECEMBER 1997)

		FIELD DATA														CALCULATED DATA			
		Front	Drive (lbs.)			Trailer (lbs.)			(lbs.)	(inches)				(feet)	(mph)				
		Axle	Axle 2	Axle3	Total	Axle 4	Axle 5	Total	GVW	Axle 1-2	Axle 2-3	Axle 3-4	Axle 4-5	Length					
	Actual	8280			37460			32870	78610	164	51	365	49	57		Steer	Drive	Trailer	GVW
PASS	Veh No.	1st Axle	2nd Axle	3rd Axle	Total	4th Axle	5th Axle	Total	GVW	Axle 1-2	Axle 2-3	Axle 3-4	Axle 4-5	Length	Speed	% DIFF	% DIFF	% DIFF	% DIFF
1	5101	8130	19139	19464	38603	16835	15532	32367	79100	163	50	367	48	55	55	-1.81%	3.05%	-1.53%	0.62%
2	5371	8978	16696	18339	35035	16562	16410	32972	76985	162	50	367	48	54	54	8.43%	-6.47%	0.31%	-2.07%
3	5666	8165	18335	20145	38480	16793	15691	32484	79129	162	50	367	48	55	54	-1.39%	2.72%	-1.17%	0.66%
4	5894	8747	18032	19095	37127	17517	16046	33563	79437	161	50	367	48	55	54	5.64%	-0.89%	2.11%	1.05%
5	6136	8214	21314	21095	42409	16782	16760	33542	84165	162	50	367	48	55	54	-0.80%	13.21%	2.04%	7.07%
6	11348	8679	20306	19012	39318	16310	15536	31846	79843	161	50	367	48	56	56	4.82%	4.96%	-3.12%	1.57%
7	165	8015	20731	19373	40104	18789	15753	34542	82661	162	50	367	48	55	55	-3.20%	7.06%	5.09%	5.15%
8	535	7724	19106	18154	37260	15876	15755	31631	76615	162	50	367	48	54	54	-6.71%	-0.53%	-3.77%	-2.54%
9	975	7821	18769	19880	38649	17283	15973	33256	79726	162	50	367	48	56	54	-5.54%	3.17%	1.17%	1.42%
10	1430	7729	18903	18769	37672	16588	14957	31545	76946	162	50	367	48	53	54	-6.65%	0.57%	-4.03%	-2.12%
11	1863	8090	20934	19258	40192	14443	15799	30242	78524	161	50	367	48	54	54	-2.29%	7.29%	-8.00%	-0.11%
12	3926	8670	19543	18407	37950	16657	15547	32204	78824	162	50	368	48	55	54	4.71%	1.31%	-2.03%	0.27%
13	4233	9199	20039	21369	41408	16679	14882	31561	82168	162	50	366	48	54	54	11.10%	10.54%	-3.98%	4.53%
14	4519	9210	17184	18723	35907	17924	16264	34188	79305	163	50	367	48	55	55	11.23%	-4.15%	4.01%	0.88%
16	4827	8573	17633	21397	39030	15402	15812	31214	78817	163	50	366	48	56	54	3.54%	4.19%	-5.04%	0.26%
17	5121	8862	18165	19927	38092	16976	16024	33000	79954	162	50	368	48	54	54	7.03%	1.69%	0.40%	1.71%
18	5399	8196	21942	18564	40506	17199	15521	32720	81422	162	50	367	48	55	55	-1.01%	8.13%	-0.46%	3.58%
19	5672	9060	17481	18692	36173	16866	15728	32594	77827	162	50	367	48	56	54	9.42%	-3.44%	-0.84%	-1.00%
20	5941	7632	17468	20191	37659	16853	15786	32639	77930	161	50	367	48	55	55	-7.83%	0.53%	-0.70%	-0.87%
21	9126	9109	18372	18804	37176	16809	15265	32074	78359	162	50	367	48	54	54	10.01%	-0.76%	-2.42%	-0.32%
22	9390	7865	19153	18835	37988	17012	16022	33034	78887	161	50	367	48	55	54	-5.01%	1.41%	0.50%	0.35%
23	9644	9157	17256	18370	35626	16127	15433	31560	76343	162	50	367	48	55	52	10.59%	-4.90%	-3.99%	-2.88%
24	9868	8683	22899	17631	40530	16628	15816	32444	81657	161	50	366	48	54	55	4.87%	8.20%	-1.30%	3.88%
25	9957	8024	21510	19406	40916	17675	16033	33708	82648	162	50	366	48	58	55	-3.09%	9.23%	2.55%	5.14%
26	10163	8529	21572	20641	42213	17620	16584	34204	84946	162	50	368	48	54	54	3.01%	12.69%	4.06%	8.06%
															average	1.96%	3.15%	-0.81%	1.37%
															std dev	6.24%	5.37%	3.14%	2.92%

Appendix B

Measurements Obtained With Vehicle Passes During Calibration of April 1998

Route 2, Lebanon CT LANE #1 CONNDOT 2-AXLE DUMP TRUCK Speed approx. 15 mph

		FIELD DATA APRIL 2, 1998										CALCULATED DATA				
		Axle 1	Axle 1	Axle 1	Axle 2	Axle 2	Axle 2	GVW	Axle 1-2	Length	Speed					
		LEFT	RIGHT	Total	LEFT	RIGHT	Total	lbs.	inches	feet	mph					
	Static	→	→	10980	→	→	19760	30740				1st axle	2nd axle	GVW	% Diff	%Diff
	Veh ID	Axle 1	Axle 1	Total	Axle 2	Axle 2	Total	GVW	Axle 1-2	Length	Speed	% diff	% diff	% diff	L to R	L to R
Pass No.		left	right		left	right									1st axle	2nd Axle
1	8263	5054	5385	10439	8024	9823	17847	28286	168	24	11	-4.93%	-9.68%	-7.98%	-6.55%	-18.31%
2	8276	5237	5429	10666	9371	9731	19102	29768	167	25	13	-2.86%	-3.33%	-3.16%	-3.67%	-3.70%
3	8289	5127	5457	10584	9603	10375	19978	30562	168	24	13	-3.61%	1.10%	-0.58%	-6.44%	-7.44%
4	8298	5462	5834	11296	8840	8851	17691	28987	168	24	13	2.88%	-10.47%	-5.70%	-6.81%	-0.12%
5	8328	5429	5532	10961	9314	9945	19259	30220	168	24	14	-0.17%	-2.54%	-1.69%	-1.90%	-6.34%
6	8354	5257	5651	10908	8738	9695	18433	29341	168	24	14	-0.66%	-6.72%	-4.55%	-7.49%	-9.87%
7	8374	4880	5180	10060	8335	11455	19790	29850	167	23	13	-8.38%	0.15%	-2.90%	-6.15%	-27.24%
8	8423	4853	5325	10178	9210	10383	19593	29771	168	24	14	-7.30%	-0.85%	-3.15%	-9.73%	-11.30%
9	8448	5255	5449	10704	9748	10101	19849	30553	167	24	14	-2.51%	0.45%	-0.61%	-3.69%	-3.49%
10	8466	5202	5385	10586	9206	10575	19781	30367	168	24	14	-3.59%	0.11%	-1.21%	-3.52%	-12.95%
11	8490	4963	5354	10317	8747	10366	19113	29430	168	24	14	-6.04%	-3.27%	-4.26%	-7.88%	-15.62%
12	8504	5171	5356	10527	6485	12564	19049	29576	168	23	14	-4.13%	-3.60%	-3.79%	-3.58%	-48.38%
13	8527	4979	5341	10320	9102	10573	19675	29995	168	24	14	-6.01%	-0.43%	-2.42%	-7.27%	-13.91%
14	8548	4800	5153	9953	9612	10375	19987	29940	168	24	14	-9.35%	1.15%	-2.60%	-7.35%	-7.35%
15	8568	5142	5554	10696	10251	9777	20028	30724	168	23	16	-2.59%	1.36%	-0.05%	-8.01%	4.85%
16	8590	5660	6033	11693	9814	10308	20122	31815	168	24	15	6.49%	1.83%	3.50%	-6.59%	-4.79%
17	8606	4911	5700	10611	8882	9878	18760	29371	168	25	14	-3.36%	-5.06%	-4.45%	-16.07%	-10.08%
18	8643	5027	5453	10480	8760	10273	19033	29513	168	24	14	-4.55%	-3.68%	-3.99%	-8.47%	-14.73%
19	8659	5102	5407	10509	8086	10513	18599	29108	168	24	14	-4.29%	-5.88%	-5.31%	-5.98%	-23.09%

Average % Diff	-3.42%	-2.60%	-2.89%	-6.69%	-12.31%
Standard Dev	3.74%	3.68%	2.50%	3.04%	11.65%

Route 2, Lebanon CT LANE #1 CONNDOT 2-AXLE DUMP TRUCK Speed approx. 22 mph

		FIELD DATA APRIL 2, 1998										CALCULATED DATA				
		Axle 1	Axle 1	Axle 1	Axle 2	Axle 2	Axle 2	GVW	Axle 1-2	Length	Speed					
		LEFT	RIGHT	Total	LEFT	RIGHT	Total	lbs.	inches	feet	mph					
	Static	→	→	10980	→	→	19760	30740				1st axle	2nd axle	GVW	% Diff	%Diff
	Veh ID	Axle 1	Axle 1	Total	Axle 2	Axle 2	Total	GVW	Axle 1-2	Length	Speed	% diff	% diff	% diff	L to R	L to R
Pass No.		left	right		left	right									1st axle	2nd Axle
1	7793	5094	5464	10558	9962	11354	21316	31874	168	25	19	-3.84%	7.87%	3.69%	-7.26%	-12.26%
2	7833	5281	5111	10392	10262	10893	21155	31547	168	24	21	-5.36%	7.06%	2.63%	3.22%	-5.79%
3	7978	5360	5398	10758	8886	10692	19578	30336	168	24	21	-2.02%	-0.92%	-1.31%	-0.71%	-16.89%
4	8006	5193	5327	10520	10339	11003	21342	31862	168	24	19	-4.19%	8.01%	3.65%	-2.58%	-6.03%
5	8039	5541	5585	11126	9607	11212	20819	31945	168	24	19	1.33%	5.36%	3.92%	-0.79%	-14.32%
6	8066	5592	5658	11250	8553	10061	18614	29864	168	24	18	2.46%	-5.80%	-2.85%	-1.18%	-14.99%
7	8081	5856	5945	11801	9424	11010	20434	32235	168	24	18	7.48%	3.41%	4.86%	-1.52%	-14.41%
8	8109	5440	5486	10926	10487	10928	21415	32341	167	24	19	-0.49%	8.38%	5.21%	-0.85%	-4.04%
9	8127	5332	5226	10558	9515	11358	20873	31431	168	23	19	-3.84%	5.63%	2.25%	1.99%	-16.23%
10	8149	5466	5486	10952	9224	10423	19647	30599	168	24	19	-0.26%	-0.57%	-0.46%	-0.37%	-11.50%
11	8171	5162	5559	10721	9704	10824	20528	31249	168	25	19	-2.36%	3.89%	1.66%	-7.69%	-10.35%
12	8190	5473	5726	11199	8527	10480	19007	30206	168	24	19	1.99%	-3.81%	-1.74%	-4.62%	-18.64%
13	8212	5603	5971	11574	8910	10359	19269	30843	168	24	18	5.41%	-2.48%	0.34%	-6.57%	-13.99%
14	8223	5250	5541	10791	8710	10055	18765	29556	168	24	20	-1.72%	-5.04%	-3.85%	-5.54%	-13.38%
15	8705	4941	5140	10081	8873	10725	19598	29679	168	24	22	-8.19%	-0.82%	-3.45%	-4.03%	-17.27%
16	8716	4974	5385	10359	8145	10796	18941	29300	168	23	22	-5.66%	-4.14%	-4.68%	-8.26%	-24.56%
17	8762	5246	5281	10527	9519	8957	18476	29003	168	23	24	-4.13%	-6.50%	-5.65%	-0.67%	6.27%
18	8797	5398	5166	10564	6406	13133	19539	30103	169	23	22	-3.79%	-1.12%	-2.07%	4.30%	-51.22%
19	8820	5272	5100	10372	9107	9665	18772	29144	168	23	21	-5.54%	-5.00%	-5.19%	3.26%	-5.77%
20	8850	5162	5316	10478	8930	11358	20288	30766	168	24	20	-4.57%	2.67%	0.08%	-2.98%	-21.38%
21	8874	4968	5449	10417	8271	9894	18165	28582	168	23	21	-5.13%	-8.07%	-7.02%	-9.68%	-16.40%
22	8907	5773	5510	11283	9087	9369	18456	29739	168	24	22	2.76%	-6.60%	-3.26%	4.56%	-3.01%
23	8937	5546	5241	10787	9530	9975	19505	30292	168	24	22	-1.76%	-1.29%	-1.46%	5.50%	-4.46%
24	8966	5038	5343	10381	9726	11193	20919	31300	169	25	21	-5.46%	5.87%	1.82%	-6.05%	-13.11%
25	8999	5100	5435	10535	9534	10683	20217	30752	168	23	21	-4.05%	2.31%	0.04%	-6.57%	-10.76%
26	9021	5303	5949	11252	8869	8714	17583	28835	168	24	22	2.48%	-11.02%	-6.20%	-12.18%	1.78%
27	9047	2075	5360	7435	2655	10595	13250	20685	169	22	21	-32.29%	-32.95%	-32.71%	-158.31%	-74.94%
28	9077	5052	5431	10483	9378	10419	19797	30280	168	23	21	-4.53%	0.19%	-1.50%	-7.50%	-9.99%
29	9110	5693	5759	11452	9166	11043	20209	31661	169	24	22	4.30%	2.27%	3.00%	-1.16%	-17.00%
Average % Diff												-2.79%	-1.15%	-1.73%	-8.08%	-14.99%
Standard Dev												6.85%	8.09%	6.89%	29.25%	15.26%
w/o #27 AVG% Diff												-1.74%	-0.01%	-0.63%	4.34%	13.42%
w/o #27STDev												3.90%	5.39%	3.53%	3.10%	9.37%

wimcal19.xls

Route 2, Lebanon CT LANE #1 CONNDOT 2-AXLE DUMP TRUCK Speed approx. 50 mph

		FIELD DATA APRIL 2, 1998										CALCULATED DATA				
		Axle 1 LEFT	Axle 1 RIGHT	Axle 1 Total	Axle 2 LEFT	Axle 2 RIGHT	Axle 2 Total	GVW lbs.	Axle 1-2 inches	Length feet	Speed mph					
	Static	→	→	10980	→	→	19760	30740				1st axle	2nd axle	GVW	% Diff	%Diff
	Veh ID	Axle 1	Axle 1	Total	Axle 2	Axle 2	Total	GVW	Axle 1-2	Length	Speed	% diff	% diff	% diff	L to R	L to R
Pass No.		left	right		left	right									1st axle	2nd Axle
1	10512	5129	5812	10941	8697	11356	20053	30994	172	22	49	-0.36%	1.48%	0.83%	-13.32%	-23.41%
2	10666	4974	5592	10566	8818	10375	19193	29759	163	20	47	-3.77%	-2.87%	-3.19%	-12.42%	-15.01%
3	10831	5259	5890	11149	8996	10086	19082	30231	165	20	47	1.54%	-3.43%	-1.66%	-12.00%	-10.81%
4	10986	5409	5508	10917	8827	10022	18849	29766	166	20	45	-0.57%	-4.61%	-3.17%	-1.83%	-11.92%
5	11145	4990	5856	10846	7559	10300	17859	28705	165	20	45	-1.22%	-9.62%	-6.62%	-17.35%	-26.61%
6	11286	4933	5281	10214	9669	9206	18875	29089	166	20	45	-6.98%	-4.48%	-5.37%	-7.05%	5.03%
7	11430	5519	5793	11312	10079	10097	20176	31488	165	20	45	3.02%	2.11%	2.43%	-4.96%	-0.18%
8	11591	5063	5691	10754	9107	9903	19010	29764	166	20	49	-2.06%	-3.80%	-3.18%	-12.40%	-8.04%
9	11775	4825	5118	9943	8441	10271	18712	28655	169	20	47	-9.44%	-5.30%	-6.78%	-6.07%	-17.82%
											Average % Diff	-2.20%	-3.39%	-2.97%	-9.71%	-12.09%
											Standard Dev	3.97%	3.53%	3.14%	4.95%	10.21%

Appendix C

FHWA Correspondence on Installation of Quartz WIM

U.S. Department
of Transportation
Federal Highway
Administration

400 Seventh SI, SW
Washington, D.C. 20590

July 29, 1998

Refer To: HPM-30

Mr. Keith R. Lane
Director, Office of Research and Materials
Connecticut Department of Transportation
280 West Street
Rocky Hill, Connecticut 06067-3502

Dear Mr. Lane:

This letter is in reference to my recent visit, July 13-16, 1998, at the installation and calibration of the quartz-piezo sensor weigh-in-motion (WIM) system on highway route 2 in Lebanon, Connecticut. The Connecticut Department of Transportation is the first State agency to install and evaluate this new and promising sensor technology in the United States. The data gathered at the site was very informative providing me with valuable information on the installation of this new sensor. At the Federal Highway Administration, I manage WIM data submitted to us by State Department of Transportations for the Truck Weight Study (TWS), and also maintain a WIM and Automatic Vehicle Classification (AVC) equipment database. This database provides States with information such as: manufacturers name, equipment type, State Department of Transportations using the equipment, also name and phone number of State representative operating the system. This information can be useful to managers considering purchasing new AVC or WIM equipment.

I have documentation and pictures taken by me, and from members of your staff, on steps involved in the installation process. This information will be shared with participants attending the Traffic Monitoring Guide workshop we are conducting in Jackson, Mississippi on August 25-26, and also at our Highway Performance Monitoring System seminar on November 16-19, in Washington, D.C..

Please give my thanks to Mrs. Anne Marie McDonnell for her assistance in making my visit a very productive one. Her management of site activities, providing pictures, technical information, maps, information on lodging, and overall management of the project was commendable.

Thank you for your office support in this important program area. I look forward to receiving the report evaluating the performance of this technology when the project is completed.

Sincerely yours,

David L. Jones
Transportation Specialist
Travel Monitoring Division

CC: Amy D. Jack-son-Grove, FHWA CT-DIV
CC: Paul Mooney, FHWA CT-DIV
CC: John Dewar,, FHWA REG-I
CC: Ralph Gillmann, FHWA HQ-OHIM
CC: Frank Jarema, FHWA HQ-OHIM

Appendix D

Measurement Errors Obtained With Vehicle Passes During the Calibration of October 1998

Air-ride in Lane 1

Measured values (lbs) | **Measurement errors (%)**

			Steer	Drive			Trailer			GVW					
				1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5						
			8660			37380			34200	80240		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**4540**	**1**	4194	9537	8992	18529	9058	8421	17479	40202	**1**				
		2	4470	10106	9709	19815	8831	9215	18046	42331					
		3	4298	8423	9078	17501	8666	8039	16705	38504					
		4	4467	10304	9997	20301	8624	8419	17043	41811					
AT Wgt			8715	19185	18888	38073	17590	17047	34637	81424		0.63%	1.85%	1.28%	1.48%
2	**4848**	**1**	4163	9018	9367	18385	9036	8860	17896	40444	**2**				
		2	4139	10571	9367	19938	8708	9069	17777	41854					
		3	4324	8229	9737	17966	9250	9186	18436	40726					
		4	4253	9085	8941	18026	8035	7998	16033	38312					
AT Wgt			8440	18452	18706	37158	17515	17557	35071	80668		-2.55%	-0.60%	2.55%	0.53%
3	**5169**	**1**	4414	8725	9007	17732	8622	7914	16536	38682	**3**				
		2	5032	9920	9166	19086	7889	8282	16171	40289					
		3	4090	9160	9698	18858	8622	8450	17072	40020					
		4	4022	9770	8611	18381	7768	8004	15772	38175					
AT Wgt			8779	18788	18241	37029	16451	16325	32776	78583		1.37%	-0.94%	-4.17%	-2.07%
4	**5447**	**1**	4432	8791	9186	17977	8694	8562	17256	39665	**4**				
		2	4293	10154	9482	19636	8842	8992	17834	41763					
		3	4238	9678	9702	19380	9012	8335	17347	40965					
		4	4463	9252	8948	18200	8324	8322	16646	39309					
AT Wgt			8713	18938	18659	37597	17436	17106	34542	80851		0.61%	0.58%	1.00%	0.76%
5	**5721**	**1**	4348	8218	9448	17666	9261	9398	18659	40673	**5**				
		2	3753	9420	9470	18890	8580	8659	17239	39882					
		3	4262	9781	9812	19593	9188	9177	18365	42220					
		4	4212	8833	8758	17591	8178	7821	15999	37802					
AT Wgt			8288	18126	18744	36870	17604	17528	35131	80289		-4.30%	-1.36%	2.72%	0.06%
6	**5973**	**1**	4311	9576	9616	19192	9327	9023	18350	41853	**6**				
		2	3777	10619	9614	20233	8692	8615	17307	41317					
		3	4128	8434	9995	18429	9479	8893	18372	40929					
		4	4483	9680	9082	18762	8211	8315	16526	39771					
AT Wgt			8350	19155	19154	38308	17855	17423	35278	81935		-3.59%	2.48%	3.15%	2.11%
7	**6237**	**1**	4567	9598	9029	18627	9111	8432	17543	40737	**7**				
		2	4520	8507	9837	18344	8306	8342	16648	39512					
		3	4143	8055	9541	17596	8661	8716	17377	39116					
		4	4099	9157	9023	18180	8558	7819	16377	38656					
AT Wgt			8665	17659	18715	36374	17318	16655	33973	79011		0.05%	-2.69%	-0.67%	-1.53%
8	**6505**	**1**	4456	8917	8910	17827	8518	8295	16813	39096	**8**				
		2	4862	9440	9018	18458	8657	8712	17369	40689					
		3	4212	7956	9777	17733	8416	8342	16758	38703					
		4	3883	9482	8791	18273	7720	7867	15587	37743					
AT Wgt			8707	17898	18248	36146	16656	16608	33264	78116		0.54%	-3.30%	-2.74%	-2.65%
9	**6752**	**1**	4540	7967	9093	17060	9164	8884	18048	39648	**9**				
		2	4633	9248	8478	17726	8017	8033	16050	38409					
		3	4306	9248	9737	18985	8913	8708	17621	40912					
		4	3938	8880	8677	17557	7323	7554	14877	36372					
AT Wgt			8709	17672	17993	35664	16709	16590	33298	77671		0.56%	-4.59%	-2.64%	-3.20%
10	**6996**	**1**	4361	10119	9693	19812	9060	8807	17867	42040	**10**				
		2	4121	9539	9618	19157	8547	8311	16858	40136					
		3	4403	9208	10185	19393	9014	8930	17944	41740					
		4	4754	8092	9217	17309	8558	8719	17277	39340					
AT Wgt			8820	18479	19357	37836	17590	17384	34973	81628		1.84%	1.22%	2.26%	1.73%
11	**7246**	**1**	4381	9063	9603	18666	9224	8838	18062	41109	**11**				
		2	4902	10112	9728	19840	9343	9784	19127	43869					
		3	4306	9784	10214	19998	9190	8723	17913	42217					
		4	4646	10196	9080	19276	7909	8084	15993	39915					
AT Wgt			9118	19578	19313	38890	17833	17715	35548	83555		5.28%	4.04%	3.94%	4.13%
12	**7581**	**1**	4470	9795	9316	19111	8688	8690	17378	40959	**12**				
		2	4538	9676	9667	19343	9120	8055	17175	41056					
		3	4044	9246	9971	19217	8979	8480	17459	40720					
		4	4688	9737	9504	19241	8454	8465	16919	40848					
AT Wgt			8870	19227	19229	38456	17621	16845	34466	81792		2.42%	2.88%	0.78%	1.93%
13	**7816**	**1**	4838	9631	9614	19245	9067	8688	17755	41838	**13**				
		2	4035	9687	9563	19250	8659	7477	16136	39421					
		3	4178	7565	10000	17565	9063	8469	17532	39275					
		4	4247	9830	9060	18890	8267	8672	16939	40076					
AT Wgt			8649	18357	19119	37475	17528	16653	34181	80305		-0.13%	0.25%	-0.06%	0.08%
14	**8064**	**1**	4496	8895	9570	18465	9349	8765	18114	41075	**14**				
		2	3927	10434	9598	20032	8829	8811	17640	41599					
		3	4101	9660	9971	19631	8765	8727	17492	41224					
		4	4516	9155	8990	18145	8350	8251	16601	39262					
AT Wgt			8520	19072	19065	38137	17647	17277	34924	81580		-1.62%	2.02%	2.12%	1.67%
15	**8312**	**1**	4201	9199	9365	18564	8919	8443	17362	40127	**15**				
		2	4192	9343	9283	18626	8637	8910	17547	40365					
		3	4214	8244	9742	17986	9160	8401	17561	39761					
		4	4242	10220	8809	19029	8004	8414	16418	39689					
AT Wgt			8425	18503	18600	37103	17360	17084	34444	79971		-2.72%	-0.74%	0.71%	-0.34%
16	**8573**	**1**	4196	9102	9806	18908	9521	9177	18698	41802	**16**				

Air-ride in Lane 1

Measured values (lbs) | **Measurement errors (%)**

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			8660			37380			34200	80240		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
		2	3696	10513	9206	19719	8571	8430	17001	40416					
		3	4311	8412	9870	18282	9418	9043	18461	41054					
		4	4514	9131	8822	17953	8044	8319	16363	38830					
AT Wgt			8359	18579	18852	37431	17777	17485	35262	81051		-3.48%	0.14%	3.10%	1.01%
17	**785**	**1**	3932	7912	6738	14650	7173	7080	14253	32835	**17**				
		2	6194	10970	12807	23777	10106	10930	21036	51007					
		3	4081	7107	6670	13777	6919	6807	13726	31584					
		4	4295	10571	10842	21413	8606	8844	17450	43158					
AT Wgt			9251	18280	18529	36809	16402	16831	33233	79292		6.82%	-1.53%	-2.83%	-1.18%
18	**1043**	**1**	4615	8595	9197	17792	8463	8454	16917	39324	**18**				
		2	5111	9078	8939	18017	8311	8851	17162	40290					
		3	3980	9746	9510	19256	8335	8300	16635	39871					
		4	4088	9612	8774	18386	7982	7993	15975	38449					
AT Wgt			8897	18516	18210	36726	16546	16799	33345	78967		2.74%	-1.75%	-2.50%	-1.59%
19	**1345**	**1**	4359	10119	9759	19878	9237	8716	17953	42190	**19**				
		2	4097	10136	9605	19741	8425	8593	17018	40856					
		3	4196	9054	10229	19283	8855	8536	17391	40870					
		4	4855	9349	9162	18511	8542	8853	17395	40761					
AT Wgt			8754	19329	19378	38707	17530	17349	34879	82339		1.08%	3.55%	1.98%	2.62%
20	**1615**	**1**	4317	9279	9523	18802	8904	8670	17574	40693	**20**				
		2	4137	10511	9651	20162	8919	8646	17565	41864					
		3	4300	10086	9995	20081	8798	8776	17574	41955					
		4	4661	9695	9466	19161	8763	8476	17239	41061					
AT Wgt			8708	19786	19318	39103	17692	17284	34976	82787		0.55%	4.61%	2.27%	3.17%
21	**1888**	**1**	4538	9085	9014	18099	8372	8394	16766	39403	**21**				
		2	4900	8891	9001	17892	8410	8350	16760	39552					
		3	4174	8289	9590	17879	8683	8575	17258	39311					
		4	3982	8928	8974	17902	7762	7810	15572	37456					
AT Wgt			8797	17597	18290	35886	16614	16565	33178	77861		1.58%	-4.00%	-2.99%	-2.96%
22	**2188**	**1**	4447	9082	9254	18336	8606	8428	17034	39817	**22**				
		2	4765	10240	9799	20039	9188	8591	17779	42583					
		3	4119	8774	9570	18344	8505	8602	17107	39570					
		4	4836	10558	9925	20483	9007	8533	17540	42859					
AT Wgt			9084	19327	19274	38601	17653	17077	34730	82415		4.89%	3.27%	1.55%	2.71%
23	**2512**	**1**	4470	8434	8972	17406	8339	8068	16407	38283	**23**				
		2	5285	10480	9129	19609	7962	8073	16035	40929					
		3	4185	8745	9347	18092	8600	8421	17021	39298					
		4	4088	9142	8813	17955	8196	8068	16264	38307					
AT Wgt			9014	18401	18131	36531	16549	16315	32864	78409		4.09%	-2.27%	-3.91%	-2.28%
24	**2835**	**1**	4280	10478	9581	20059	8584	8641	17225	41564	**24**				
		2	4245	10540	9784	20324	8650	8476	17126	41695					
		3	4465	9104	10017	19121	9576	8754	18330	41916					
		4	4820	9768	9162	18930	9027	9215	18242	41992					
AT Wgt			8905	19945	19272	39217	17919	17543	35462	83584		2.83%	4.91%	3.69%	0.00%
25	**3172**	**1**	4507	8807	9104	17911	9345	8586	17931	40349	**25**				
		2	4575	9384	9118	18502	8522	8326	16848	39925					
		3	3923	9567	9607	19174	8648	8655	17303	40400					
		4	4229	8502	8816	17318	8189	7870	16059	37606					
AT Wgt			8617	18130	18323	36453	17352	16719	34071	79140		-0.50%	-2.48%	-0.38%	-1.37%

	Steering	Drive	Trailer	GVW
Avg	0.76%	0.22%	0.41%	0.19%
Std Dev	2.78%	2.71%	2.48%	2.02%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result	Pass	Pass	Pass	Pass

Air-ride in Lane 2

Measured values (lbs)

Measurement errors (%)

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			8660			37380			34200	80240		% err	% err	% err	% err
Pass No	Run No	Sens No	1st Axle	2nd Axle	3rd Axle	2+3	4th Axle	5th Axle	Tot 4+5	GVW	Pass No	Steer	Drive	Trailer	GVW
1	3526	1	8873	20017	19331	39348	17750	17827	35577	83798	1				
		2	8939	19078	19402	38480	18383	18449	36832	84251					
AT Wgt			8906	19548	19367	38914	18067	18138	36205	84025		2.84%	4.10%	5.86%	4.72%
2	4576	1	8652	18743	18568	37311	17201	17142	34343	80306	2				
		2	8683	19184	18566	37750	17938	17638	35576	82009					
AT Wgt			8668	18964	18567	37531	17570	17390	34960	81158		0.09%	0.40%	2.22%	1.14%
3	3555	1	8785	17428	17805	35233	17087	16597	33684	77702	3				
		2	7751	16048	17946	33994	17298	17056	34354	76099					
AT Wgt			8268	16738	17876	34614	17193	16827	34019	76901		-4.53%	-7.40%	-0.53%	-4.16%
4	3960	1	8730	18136	17876	36012	17166	17144	34310	79052	4				
		2	8377	19012	19014	38026	17353	17442	34795	81198					
AT Wgt			8554	18574	18445	37019	17260	17293	34553	80125		-1.23%	-0.97%	1.03%	-0.14%
5	4299	1	8170	17836	17788	35624	16749	16870	33619	77413	5				
		2	7667	16432	18959	35391	17025	17300	34325	77383					
AT Wgt			7919	17134	18374	35508	16887	17085	33972	77398		-8.56%	-5.01%	-0.67%	-3.54%
6	4628	1	8758	19602	18271	37873	16943	17093	34036	80667	6				
		2	7667	18533	18846	37379	17371	17442	34813	79859					
AT Wgt			8213	19068	18559	37626	17157	17268	34425	80263		-5.17%	0.66%	0.66%	0.03%
7	4960	1	8291	17759	18315	36074	17270	17135	34405	78770	7				
		2	7296	17896	18776	36672	17340	17973	35313	79281					
AT Wgt			7794	17828	18546	36373	17305	17554	34859	79026		-10.01%	-2.69%	1.93%	-1.51%
8	5372	1	9204	19025	18348	37373	17292	17433	34725	81302	8				
		2	9398	19836	19031	38867	18476	18066	36542	84807					
AT Wgt			9301	19431	18690	38120	17884	17750	35634	83055		7.40%	1.98%	4.19%	3.51%
9	5647	1	7951	19384	18257	37641	17391	18147	35538	81130	9				
		2	7424	16500	19025	35525	17966	17988	35954	78903					
AT Wgt			7688	17942	18641	36583	17679	18068	35746	80017		-11.23%	-2.13%	4.52%	-0.28%
10	5921	1	8648	18937	18200	37137	17252	17669	34921	80706	10				
		2	8994	18242	18544	36786	17739	18050	35789	81569					
AT Wgt			8821	18590	18372	36962	17496	17860	35355	81138		1.86%	-1.12%	3.38%	1.12%
11	6191	1	8935	19995	18509	38504	17534	15905	33439	80878	11				
		2	9089	18996	19186	38182	18193	18324	36517	83788					
AT Wgt			9012	19496	18848	38343	17864	17115	34978	82333		4.06%	2.58%	2.27%	2.61%
12	4659	1	8791	19717	18639	38356	17594	17543	35137	82284	12				
		2	9041	17076	19221	36297	18116	17591	35707	81045					
AT Wgt			8916	18397	18930	37327	17855	17567	35422	81665		2.96%	-0.14%	3.57%	1.78%
13	6722	1	8033	17252	17958	35210	16690	16729	33419	76662	13				
		2	7409	18396	18840	37236	18304	16846	35150	79795					
AT Wgt			7721	17824	18399	36223	17497	16788	34285	78229		-10.84%	-3.10%	0.25%	-2.51%
14	6969	1	7779	20301	17966	38267	17164	16945	34109	80155	14				
		2	7107	17084	18791	35875	17691	17250	34941	77923					
AT Wgt			7443	18693	18379	37071	17428	17098	34525	79039		-14.05%	-0.83%	0.95%	-1.50%
15	7219	1	8888	19801	18178	37979	17636	17614	35250	82117	15				
		2	8846	17034	18877	35911	18601	18963	37564	82321					
AT Wgt			8867	18418	18528	36945	18119	18289	36407	82219		2.39%	-1.16%	6.45%	2.47%
16	7494	1	8641	19543	18659	38202	17898	17486	35384	82227	16				
		2	9334	19920	19543	39463	18745	18288	37033	85830					
AT Wgt			8988	19732	19101	38833	18322	17887	36209	84029		3.78%	3.89%	5.87%	4.72%
17	7753	1	8972	19622	18440	38062	17236	17669	34905	81939	17				
		2	8734	18061	19351	37412	17935	17719	35654	81800					
AT Wgt			8853	18842	18896	37737	17586	17694	35280	81870		2.23%	0.96%	3.16%	2.03%
18	7999	1	8218	19250	18257	37507	17364	17091	34455	80180	18				
		2	7250	17230	18864	36094	17611	17541	35152	78496					
AT Wgt			7734	18240	18561	36801	17488	17316	34804	79338		-10.69%	-1.55%	1.76%	-1.12%
19	9402	1	7815	18901	18180	37081	17016	16897	33913	78809	19				
		2	8286	17889	19069	36958	18057	17686	35743	80987					
AT Wgt			8051	18395	18625	37020	17537	17292	34828	79898		-7.04%	-0.96%	1.84%	-0.43%
20	9654	1	8280	18573	18286	36859	17382	17009	34391	79530	20				
		2	7210	20535	18826	39361	18249	16784	35033	81604					
AT Wgt			7745	19554	18556	38110	17816	16897	34712	80567		-10.57%	1.95%	1.50%	0.41%
21	9885	1	8388	18207	18496	36703	16160	17307	33467	78558	21				
		2	7561	18650	19000	37650	17510	17761	35271	80482					
AT Wgt			7975	18429	18748	37177	16835	17534	34369	79520		-7.92%	-0.54%	0.49%	-0.90%
22	10145	1	8765	18725	18337	37062	17098	17166	34264	80091	22				
		2	7479	17664	18866	36530	17095	17662	34757	78766					
AT Wgt			8122	18195	18602	36796	17097	17414	34511	79429		-6.21%	-1.56%	0.91%	-1.01%
23	10397	1	8593	18044	19763	37807	18227	18138	36365	82765	23				
		2	9477	18703	20222	38925	19395	18738	38133	86535					
AT Wgt			9035	18374	19993	38366	18811	18438	37249	84650		4.33%	2.64%	8.92%	5.50%
24	10709	1	8840	18983	18196	37179	17173	16932	34105	80124	24				
		2	8236	19475	19093	38568	16721	17358	34079	80883					
AT Wgt			8538	19229	18645	37874	16947	17145	34092	80504		-1.41%	1.32%	-0.32%	0.33%
25	10992	1	8955	17971	18035	36006	16639	17029	33668	78629	25				
		2	8136	18866	18557	37423	17772	17190	34962	80521					
AT Wgt			8546	18419	18296	36715	17206	17110	34315	79575		-1.32%	-1.78%	0.34%	-0.83%

Air-ride in Lane 2

Measured values (lbs)

				Drive			Trailer					**Measurement errors (%)**			
			Steer	**1st axle**	**2nd axle**	**Tot 2+3**	**1st axle**	**2nd axle**	**Tot 4+5**	**GVW**					
			8660			37380			34200	80240		***% err***	***% err***	***% err***	***% err***
Pass No	***Run No***	***Sens No***	***1st Axle***	***2nd Axle***	***3rd Axle***	***2+3***	***4th Axle***	***5th Axle***	***Tot 4+5***	***GVW***	***Pass No***	***Steer***	***Drive***	***Trailer***	***GVW***
26	**11302**	**1**	8849	19344	18421	37765	17543	17402	34945	81559	**26**				
		2	9559	19669	19256	38925	17677	17618	35295	83779					
AT Wgt			9204	19507	18839	38345	17610	17510	35120	82669		6.28%	2.58%	2.69%	3.03%
27		**1**				0			0	0	**27**				
		2	4			0			0	4					
AT Wgt			2	0	0	0	0	0	0	2					

	Steering	Drive	Trailer	GVW
Avg	-2.79%	-0.30%	2.43%	0.59%
Std Dev	6.38%	2.60%	2.34%	2.44%
Number of pts exceeding 15% axle or 10% GVW	1	0	0	0
Pass/fail result	Pass	Pass	Pass	Pass

Air-ride in Lane 3

Measured values (lbs) | **Measurement errors (%)**

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			8660			37380			34200	80240		% err	% err	% err	% err
Pass No	Run No	Sens No	1st Axle	2nd Axle	3rd Axle	2+3	4th Axle	5th Axle	Tot 4+5	GVW	Pass No	Steer	Drive	Trailer	GVW
1	3810	1	8498	17347	19217	36564	18363	19206	37569	82631	1				
		2	7863	16218	18641	34859	16934	16657	33591	76313					
AT Wgt			8181	16783	18929	35712	17649	17932	35580	79472		-5.54%	-4.46%	4.04%	-0.96%
2	4250	1	8377	19439	19252	38691	18096	17887	35983	83051	2				
		2	7720	17894	18387	36281	17049	16926	33975	77976					
AT Wgt			8049	18667	18820	37486	17573	17407	34979	80514		-7.06%	0.28%	2.28%	0.34%
3	4888	1	8189	18015	18313	36328	17695	17622	35317	79834	3				
		2	8822	15300	18337	33637	16769	16791	33560	76019					
AT Wgt			8506	16658	18325	34983	17232	17207	34439	77927		-1.78%	-6.41%	0.70%	-2.88%
4	3463	1	8198	17512	18469	35981	16421	17362	33783	77962	4				
		2	8600	17137	17960	35097	16683	16654	33337	77034					
AT Wgt			8399	17325	18215	35539	16552	17008	33560	77498		-3.01%	-4.93%	-1.87%	-3.42%
5	3839	1	8123	19029	18582	37611	17408	17345	34753	80487	5				
		2	8899	17267	17955	35222	16884	16853	33737	77858					
AT Wgt			8511	18148	18269	36417	17146	17099	34245	79173		-1.72%	-2.58%	0.13%	-1.33%
6	4199	1	8271	17900	18568	36468	17907	17836	35743	80482	6				
		2	8705	15528	17949	33477	16141	16447	32588	74770					
AT Wgt			8488	16714	18259	34973	17024	17142	34166	77626		-1.99%	-6.44%	-0.10%	-3.26%
7	4537	1	8432	18526	18623	37149	18831	17236	36067	81648	7				
		2	8434	16582	18171	34753	16976	16921	33897	77084					
AT Wgt			8433	17554	18397	35951	17904	17079	34982	79366		-2.62%	-3.82%	2.29%	-1.09%
8	4868	1	7990	17971	18193	36164	16749	16705	33454	77608	8				
		2	7901	19439	19034	38473	16515	16815	33330	79704					
AT Wgt			7946	18705	18614	37319	16632	16760	33392	78656		-8.25%	-0.16%	-2.36%	-1.97%
9	5288	1	8092	20121	19166	39287	18224	17874	36098	83477	9				
		2	7797	19234	19267	38501	16983	17362	34345	80643					
AT Wgt			7945	19678	19217	38894	17604	17618	35222	82060		-8.26%	4.05%	2.99%	2.27%
10	5562	1	7766	18006	17975	35981	17208	17082	34290	78037	10				
		2	8837	18546	19029	37575	17007	17126	34133	80545					
AT Wgt			8302	18276	18502	36778	17108	17104	34212	79291		-4.14%	-1.61%	0.03%	-1.18%
11	5859	1	8626	18881	19362	38243	18200	18130	36330	83199	11				
		2	8136	18895	18586	37481	17880	16840	34720	80337					
AT Wgt			8381	18888	18974	37862	18040	17485	35525	81768		-3.22%	1.29%	3.87%	1.90%
12	6121	1	8165	17748	18094	35842	17042	16507	33549	77556	12				
		2	8383	18712	18983	37695	16833	16432	33265	79343					
AT Wgt			8274	18230	18539	36769	16938	16470	33407	78450		-4.46%	-1.64%	-2.32%	-2.23%
13	6375	1	7975	18436	18374	36810	17629	17737	35366	80151	13				
		2	8959	15095	18566	33661	16416	17208	33624	76244					
AT Wgt			8467	16766	18470	35236	17023	17473	34495	78198		-2.23%	-5.74%	0.86%	-2.55%
14	6639	1	8185	16418	18032	34450	16994	17034	34028	76663	14				
		2	8624	17591	18562	36153	17305	16538	33843	78620					
AT Wgt			8405	17005	18297	35302	17150	16786	33936	77642		-2.95%	-5.56%	-0.77%	-3.24%
15	6889	1	8273	16663	18573	35236	17830	17239	35069	78578	15				
		2	8555	17622	18685	36307	16917	17053	33970	78832					
AT Wgt			8414	17143	18629	35772	17374	17146	34520	78705		-2.84%	-4.30%	0.93%	-1.91%
16	7162	1	8227	19177	18337	37514	16804	16917	33721	79462	16				
		2	8904	19064	18277	37341	17303	17067	34370	80615					
AT Wgt			8566	19121	18307	37428	17054	16992	34046	80039		-1.09%	0.13%	-0.45%	-0.25%
17	7397	1	8529	39417	19252	58669	18923	17080	36003	103201	17				
		2	8284	17737	18864	36601	36108	16727	52835	97720					
AT Wgt			8407	28577	19058	47635	27516	16904	44419	100461		-2.93%	27.43%	29.88%	25.20%
18	7673	1	7770	17953	17728	35681	17071	17003	34074	77525	18				
		2	7958	18914	18815	37729	17131	16690	33821	79508					
AT Wgt			7864	18434	18272	36705	17101	16847	33948	78517		-9.19%	-1.81%	-0.74%	-2.15%
19	7919	1	7649	16136	17611	33747	16709	17020	33729	75125	19				
		2	8108	16917	17858	34775	16385	16163	32548	75431					
AT Wgt			7879	16527	17735	34261	16547	16592	33139	75278		-9.02%	-8.34%	-3.10%	-6.18%
20	8181	1	8176	17422	18769	36191	18004	16857	34861	79228	20				
		2	8674	18052	18824	36876	17102	15905	33007	78557					
AT Wgt			8425	17737	18797	36534	17553	16381	33934	78893		-2.71%	-2.26%	-0.78%	-1.68%
21	9581	1	8520	18321	18443	36764	17528	17536	35064	80348	21				
		2	8831	18193	18136	36329	17530	17303	34833	79993					
AT Wgt			8676	18257	18290	36547	17529	17420	34949	80171		0.18%	-2.23%	2.19%	-0.09%
22	9829	1	7742	17649	17609	35258	16491	16127	32618	75618	22				
		2	8386	17693	18368	36061	15953	16423	32376	76823					
AT Wgt			8064	17671	17989	35660	16222	16275	32497	76221		-6.88%	-4.60%	-4.98%	-5.01%
23	10061	1	8211	18178	19135	37313	17783	18019	35802	81326	23				
		2	8564	17329	17942	35271	16152	16679	32831	76666					
AT Wgt			8388	17754	18539	36292	16968	17349	34317	78996		-3.15%	-2.91%	0.34%	-1.55%
24	10328	1	7940	17953	18365	36318	17267	16549	33816	78074	24				
		2	8906	18612	18529	37141	16842	17270	34112	80159					
AT Wgt			8423	18283	18447	36730	17055	16910	33964	79117		-2.74%	-1.74%	-0.69%	-1.40%
25	10623	1	8152	18754	18645	37399	17600	17503	35103	80654	25				
		2	8608	15406	18105	33511	16449	17272	33721	75840					
AT Wgt			8380	17080	18375	35455	17025	17388	34412	78247		-3.23%	-5.15%	0.62%	-2.48%

Air-ride in Lane 3

Measured values (lbs)

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			8660			37380			34200	80240		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
26	**10905**	**1**	8311	17558	19095	36653	17841	18251	36092	81056	**26**				
		2	8604	19441	18515	37956	16538	16851	33389	79949					
AT Wgt			8458	18500	18805	37305	17190	17551	34741	80503		-2.34%	-0.20%	1.58%	0.33%
27	**11214**	**1**	8024	17340	18663	36003	17492	17717	35209	79236	**27**				
		2	8657	17693	18412	36105	16771	17087	33858	78620					
AT Wgt			8341	17517	18538	36054	17132	17402	34534	78928		-3.69%	-3.55%	0.98%	-1.64%
28	**11535**	**1**	8256	18443	18156	36599	17393	17433	34826	79681	**28**				
		2	8183	20215	18976	39191	16950	17067	34017	81391					
AT Wgt			8220	19329	18566	37895	17172	17250	34422	80536		-5.09%	1.38%	0.65%	0.37%

Measurement errors (%)

	Steering	Drive	Trailer	GVW
Avg	-4.00%	-1.64%	1.29%	-0.64%
Std Dev	2.45%	6.23%	5.85%	5.28%
Number of pts exceeding 15% axle or 10% GVW	0	1	1	1
Pass/fail result	Pass	Pass	Pass	Pass

Air-ride in Lane 4

Measured values (lbs) | **Measurement errors (%)**

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			8660			37380			34200	80240		% err	% err	% err	% err
Pass No	Run No	Sens No	1st Axle	2nd Axle	3rd Axle	2+3	4th Axle	5th Axle	Tot 4+5	GVW	Pass No	Steer	Drive	Trailer	GVW
1	4753	1	3998	9144	8937	18081	8943	8783	17726	39805	1				
		2	4295	9314	9764	19078	8159	8024	16183	39556					
		3	4514	7768	8908	16676	8712	8342	17054	38244					
		4	4326	8573	9834	18407	8264	7881	16145	38878					
AT Wgt			8567	17400	18722	36121	17039	16515	33554	78242		-1.08%	-3.37%	-1.89%	-2.49%
2	5073	1	4042	8450	9250	17700	8932	8723	17655	39397	2				
		2	4190	9206	9881	19087	8156	8209	16365	39642					
		3	4178	9153	9235	18388	9177	8269	17446	40012					
		4	4450	9484	9693	19177	8350	8339	16689	40316					
AT Wgt			8430	18147	19030	37176	17308	16770	34078	79684		-2.66%	-0.55%	-0.36%	-0.69%
3	5369	1	4031	8009	8979	16988	9625	9230	18855	39874	3				
		2	3958	10357	9506	19863	7815	6994	14809	38630					
		3	4009	8705	9312	18017	9219	8979	18198	40224					
		4	4231	9715	9698	19413	8262	8084	16346	39990					
AT Wgt			8115	18393	18748	37141	17461	16644	34104	79359		-6.30%	-0.64%	-0.28%	-1.10%
4	5647	1	3960	9510	8904	18414	8692	8955	17647	40021	4				
		2	4137	10670	9942	20612	7956	7740	15696	40445					
		3	4414	10035	9012	19047	8992	8796	17788	41249					
		4	4428	10421	9841	20262	8262	9740	18002	42692					
AT Wgt			8470	20318	18850	39168	16951	17616	34567	82204		-2.20%	4.78%	1.07%	2.45%
5	5906	1	4282	9279	9065	18344	8994	9074	18068	40694	5				
		2	3920	10198	9616	19814	7984	7914	15898	39632					
		3	4099	10229	9473	19702	8774	9281	18055	41856					
		4	4240	9444	9819	19263	8227	8125	16352	39855					
AT Wgt			8271	19575	18987	38562	16990	17197	34187	81019		-4.50%	3.16%	-0.04%	0.97%
6	6170	1	3998	8478	8999	17477	10103	8527	18630	40105	6				
		2	4282	9528	9151	18679	5841	8017	13858	36819					
		3	4240	8566	9497	18063	9151	8498	17649	39952					
		4	4298	9874	9737	19611	8458	8099	16557	40466					
AT Wgt			8409	18223	18692	36915	16777	16571	33347	78671		-2.90%	-1.24%	-2.49%	-1.96%
7	6420	1	4095	9698	9283	18981	9254	8904	18158	41234	7				
		2	4024	9587	9647	19234	8275	8491	16766	40024					
		3	4295	9186	9673	18859	9420	8674	18094	41248					
		4	4150	9781	9715	19496	8624	8013	16637	40283					
AT Wgt			8282	19126	19159	38285	17787	17041	34828	81395		-4.36%	2.42%	1.83%	1.44%
8	6677	1	4088	8697	9201	17898	9272	8952	18224	40210	8				
		2	4033	9523	9310	18833	7898	8044	15942	38808					
		3	4042	8604	9484	18088	9153	9069	18222	40352					
		4	4229	9226	9773	18999	8333	7762	16095	39323					
AT Wgt			8196	18025	18884	36909	17328	16914	34242	79347		-5.36%	-1.26%	0.12%	-1.11%
9	6926	1	4042	8436	8862	17298	8818	8754	17572	38912	9				
		2	4174	10194	9625	19819	8154	8489	16643	40636					
		3	4240	9653	9065	18718	9082	8811	17893	40851					
		4	4234	9343	9647	18990	8474	8110	16584	39808					
AT Wgt			8345	18813	18600	37413	17264	17082	34346	80104		-3.64%	0.09%	0.43%	-0.17%
10	7171	1	4002	9407	9096	18503	9080	9014	18094	40599	10				
		2	4242	9947	9850	19797	7923	7907	15830	39869					
		3	4095	9543	9237	18780	9115	8972	18087	40962					
		4	4298	9402	9594	18996	8207	7958	16165	39459					
AT Wgt			8319	19150	18889	38038	17163	16926	34088	80445		-3.94%	1.76%	-0.33%	0.25%
11	7392	1	4333	9889	9310	19199	9074	9160	18234	41766	11				
		2	4481	9660	9872	19532	7748	7817	15565	39578					
		3	3923	8756	8408	17164	8163	7837	16000	37087					
		4	4278	9770	9603	19373	8163	7552	15715	39366					
AT Wgt			8508	19038	18597	37634	16574	16183	32757	78899		-1.76%	0.68%	-4.22%	-1.67%
12	7757	1	4337	9186	9173	18359	7243	8888	16131	38827	12				
		2	4472	10685	9605	20290	7998	7973	15971	40733					
		3	3989	7713	8487	16200	8291	7715	16006	36195					
		4	4253	9865	9737	19602	7896	7508	15404	39259					
AT Wgt			8526	18725	18501	37226	15714	16042	31756	77507		-1.55%	-0.41%	-7.15%	-3.41%
13	7990	1	3918	8663	8866	17529	8886	9012	17898	39345	13				
		2	4223	9310	9878	19188	7896	7993	15889	39300					
		3	4174	9920	9012	18932	9188	9014	18202	41308					
		4	4311	9737	9592	19329	8432	7898	16330	39970					
AT Wgt			8313	18815	18674	37489	17201	16959	34160	79962		-4.01%	0.29%	-0.12%	-0.35%
14	8237	1	3947	8267	9063	17330	9074	8869	17943	39220	14				
		2	4104	9453	9649	19102	8121	8385	16506	39712					
		3	4240	8857	9160	18017	9201	8813	18014	40271					
		4	4357	10031	9978	20009	8333	8326	16659	41025					
AT Wgt			8324	18304	18925	37229	17365	17197	34561	80114		-3.88%	-0.40%	1.06%	-0.16%
15	8489	1	4070	8586	8714	17300	9695	9186	18881	40251	15				
		2	4046	8657	9605	18262	8423	8185	16608	38916					
		3	3810	9321	9362	18683	9058	9144	18202	40695					
		4	4320	9283	9715	18998	8399	7874	16273	39591					
AT Wgt			8123	17924	18698	36622	17788	17195	34982	79727		-6.20%	-2.03%	2.29%	-0.64%

Air-ride in Lane 4

Measured values (lbs) | **Measurement errors (%)**

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			8660			37380			34200	80240		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
16	**8726**	**1**	4306	8802	8875	17677	8758	8719	17477	39460	**16**				
		2	4390	10057	9702	19759	7786	8134	15920	40069					
		3	3702	8902	8011	16913	7777	7288	15065	35680					
		4	4357	10110	9662	19772	8959	7759	16718	40847					
AT Wgt			8378	18936	18125	37061	16640	15950	32590	78028		-3.26%	-0.85%	-4.71%	-2.76%
17	**960**	**1**	4163	8818	8948	17766	8972	8990	17962	39891	**17**				
		2	4086	10108	9713	19821	7949	7885	15834	39741					
		3	4253	9398	9334	18732	9316	8780	18096	41081					
		4	4317	10264	9770	20034	8401	7806	16207	40558					
AT Wgt			8410	19294	18883	38177	17319	16731	34050	80636		-2.89%	2.13%	-0.44%	0.49%
18	**1247**	**1**	4461	8800	9184	17984	9201	9590	18791	41236	**18**				
		2	4282	9812	9532	19344	7479	7477	14956	38582					
		3	3579	8251	8258	16509	8073	7826	15899	35987					
		4	4231	9338	9281	18619	8017	7490	15507	38357					
AT Wgt			8277	18101	18128	36228	16385	16192	32577	77081		-4.43%	-3.08%	-4.75%	-3.94%
19	**1536**	**1**	4090	9448	8935	18383	9230	9063	18293	40766	**19**				
		2	4227	8977	9755	18732	8123	8194	16317	39276					
		3	4231	9651	9325	18976	9345	8948	18293	41500					
		4	4322	9620	10112	19732	8467	7803	16270	40324					
AT Wgt			8435	18848	19064	37912	17583	17004	34587	80933		-2.60%	1.42%	1.13%	0.86%
20	**1801**	**1**	4053	9080	9012	18092	9091	8386	17477	39622	**20**				
		2	4190	10174	9739	19913	8425	8661	17086	41189					
		3	4262	9208	9369	18577	9228	8405	17633	40472					
		4	4549	10183	9773	19956	8491	8540	17031	41536					
AT Wgt			8527	19323	18947	38269	17618	16996	34614	81410		-1.54%	2.38%	1.21%	1.46%
21	**2106**	**1**	4037	8902	8741	17643	8778	8436	17214	38894	**21**				
		2	4178	8024	10017	18041	8015	8134	16149	38368					
		3	4410	9945	9025	18970	8899	8943	17842	41222					
		4	4203	10222	9951	20173	8474	8443	16917	41293					
AT Wgt			8414	18547	18867	37414	17083	16978	34061	79889		-2.84%	0.09%	-0.41%	-0.44%
22	**2411**	**1**	4059	9389	9056	18445	8979	9173	18152	40656	**22**				
		2	4150	9195	9812	19007	8172	8381	16553	39710					
		3	4386	9678	9338	19016	8932	8666	17598	41000					
		4	4287	9076	9854	18930	8628	7958	16586	39803					
AT Wgt			8441	18669	19030	37699	17356	17089	34445	80585		-2.53%	0.85%	0.71%	0.43%
23	**2751**	**1**	4044	8101	8875	16976	9007	9325	18332	39352	**23**				
		2	4253	10002	9554	19556	7887	7839	15726	39535					
		3	4181	8597	9122	17719	9834	9016	18850	40750					
		4	4031	10231	9739	19970	8225	7792	16017	40018					
AT Wgt			8255	18466	18645	37111	17477	16986	34463	79828		-4.68%	-0.72%	0.77%	-0.51%
24	**3068**	**1**	4302	9032	9058	18090	8714	9135	17849	40241	**24**				
		2	4108	9402	9638	19040	7733	8028	15761	38909					
		3	4262	9149	9190	18339	9321	9235	18556	41157					
		4	4353	9343	9550	18893	8432	7766	16198	39444					
AT Wgt			8513	18463	18718	37181	17100	17082	34182	79876		-1.70%	-0.53%	-0.05%	-0.45%
25	**3429**	**1**	4161	9323	9003	18326	9254	9052	18306	40793	**25**				
		2	4218	9010	9473	18483	8057	8399	16456	39157					
		3	4075	9012	9252	18264	9201	8869	18070	40409					
		4	4465	9552	9625	19177	8147	7892	16039	39681					
AT Wgt			8460	18449	18677	37125	17330	17106	34436	80020		-2.32%	-0.68%	0.69%	-0.27%

	Steering	Drive	Trailer	GVW
Avg	-3.32%	0.17%	-0.64%	-0.55%
Std Dev	1.40%	1.85%	2.27%	1.50%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result	Pass	Pass	Pass	Pass

ConA in Lane 1

Measured values (lbs) | **Measurement errors (%)**

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			8720			29240			39710	77670		% err	% err	% err	% err
Pass No	Run No	Sens No	1st Axle	2nd Axle	3rd Axle	2+3	4th Axle	5th Axle	Tot 4+5	GVW	Pass No	Steer	Drive	Trailer	GVW
1	4546	1	4322	6999	7654	14653	8357	8564	16921	35896	1				
		2	5409	9087	9486	18573	11825	11704	23529	47511					
		3	4183	6668	6452	13120	9003	8974	17977	35280					
		4	4963	8542	8048	16590	10842	9272	20114	41667					
AT Wgt	4857		9439	15648	15820	31468	20014	19257	39271	80177		8.24%	7.62%	-1.11%	3.23%
2		1	4152	7460	7764	15224	9298	9021	18319	37695	2				
		2	5380	7995	8871	16866	10661	10937	21598	43844					
		3	3960	6511	7568	14079	9579	4651	14230	32269					
		4	4377	7314	7087	14401	9614	8571	18185	36963					
AT Wgt			8935	14640	15645	30285	19576	16590	36166	75386		2.46%	3.57%	-8.92%	-2.94%
3	5184	1	4368	7729	8282	16011	8941	9058	17999	38378	3				
		2	5490	8022	9327	17349	10919	10996	21915	44754					
		3	4287	7530	7530	15060	9777	9768	19545	38892					
		4	4994	7546	7093	14639	10037	9762	19799	39432					
AT Wgt			9570	15414	16116	31530	19837	19792	39629	80728		9.74%	7.83%	-0.20%	3.94%
4	5462	1	4242	7742	7808	15550	8617	8719	17336	37128	4				
		2	5733	8403	8802	17205	11356	12315	23671	46609					
		3	4183	6461	6474	12935	8977	8771	17748	34866					
		4	5118	7700	7367	15067	10798	9327	20125	40310					
AT Wgt			9638	15153	15226	30379	19874	19566	39440	79457		10.53%	3.89%	-0.68%	2.30%
5	5738	1	4300	7490	7700	15190	8738	8738	17476	36966	5				
		2	5124	8756	9036	17792	11905	11603	23508	46424					
		3	4108	7435	7614	15049	9953	9751	19704	38861					
		4	4721	8103	7934	16037	10805	10449	21254	42012					
AT Wgt			9127	15892	16142	32034	20701	20271	40971	82132		4.66%	9.56%	3.18%	5.74%
6	5981	1	4117	7235	8489	15724	8666	8721	17387	37228	6				
		2	4273	7552	8335	15887	10644	11645	22289	42449					
		3	4280	7460	7418	14878	9662	9246	18908	38066					
		4	4911	8013	8203	16216	11510	10319	21829	42956					
AT Wgt			8791	15130	16223	31353	20241	19966	40207	80350		0.81%	7.22%	1.25%	3.45%
7	6248	1	4064	7916	7949	15865	8624	8443	17067	36996	7				
		2	3920	7834	7953	15787	10456	12363	22819	42526					
		3	4194	7296	6824	14120	9545	9594	19139	37453					
		4	4619	8143	7230	15373	12086	10167	22253	42245					
AT Wgt			8399	15595	14978	30573	20356	20284	40639	79610		-3.69%	4.56%	2.34%	2.50%
8	6529	1	4220	7742	7623	15365	8480	8586	17066	36651	8				
		2	5221	8450	9248	17698	10888	12829	23717	46636					
		3	4167	7047	6974	14021	9843	9698	19541	37729					
		4	4825	7819	7894	15713	11526	9812	21338	41876					
AT Wgt			9217	15529	15870	31399	20369	20463	40831	81446		5.69%	7.38%	2.82%	4.86%
9	6764	1	4106	7903	7980	15883	8608	8866	17474	37463	9				
		2	3995	7411	8178	15589	10518	10897	21415	40999					
		3	3965	7071	7113	14184	10088	9936	20024	38173					
		4	4619	7208	7534	14742	11561	11334	22895	42256					
AT Wgt			8343	14797	15403	30199	20388	20517	40904	79446		-4.33%	3.28%	3.01%	2.29%
10	7009	1	4302	7592	8123	15715	8394	8725	17119	37136	10				
		2	4816	8661	8774	17435	11479	11406	22885	45136					
		3	4018	7204	7347	14551	10121	9609	19730	38299					
		4	4743	8229	7283	15512	11234	10888	22122	42377					
AT Wgt			8940	15843	15764	31607	20614	20314	40928	81474		2.52%	8.09%	3.07%	4.90%
11	7260	1	4137	7682	8260	15942	8928	8771	17699	37778	11				
		2	3989	7649	8203	15852	10053	11135	21188	41029					
		3	4300	7078	7027	14105	9795	9601	19396	37801					
		4	4840	7792	7318	15110	11477	9918	21395	41345					
AT Wgt			8633	15101	15404	30505	20127	19713	39839	78977		-1.00%	4.32%	0.32%	1.68%
12	7587	1	4035	8006	7951	15957	8798	9171	17969	37961	12				
		2	3967	7863	8159	16022	11047	10443	21490	41479					
		3	4119	7142	7457	14599	10042	10247	20289	39007					
		4	4672	8271	7896	16167	11601	12044	23645	44484					
AT Wgt			8397	15641	15732	31373	20744	20953	41697	81466		-3.71%	7.29%	5.00%	4.89%
13	?	1				0			0	0	13				
	missed	2				0			0	0					
	pass	3				0			0	0					
		4				0			0	0					
AT Wgt			0	0	0	0	0	0	0	0					
14	8074	1	4245	7171	7742	14913	8644	8798	17442	36600	14				
		2	4869	8414	9642	18056	10752	10756	21508	44433					
		3	4077	7173	7098	14271	9495	9598	19093	37441					
		4	4697	8048	6813	14861	10266	9640	19906	39464					
AT Wgt			8944	15403	15648	31051	19579	19396	38975	78969		2.57%	6.19%	-1.85%	1.67%
15	8322	1	4284	7731	7810	15541	8674	8869	17543	37368	15				
		2	5365	8877	9545	18422	11938	11151	23089	46876					
		3	4024	7259	7107	14366	9967	9537	19504	37894					
		4	4533	7332	7376	14708	10357	10209	20566	39807					
AT Wgt			9103	15600	15919	31519	20468		40351	80973		4.39%	7.79%	1.61%	4.25%

ConA in Lane 1

Measured values (lbs) | **Measurement errors (%)**

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			8720			29240			39710	77670		% err	% err	% err	% err
Pass No	Run No	Sens No	1st Axle	2nd Axle	3rd Axle	2+3	4th Axle	5th Axle	Tot 4+5	GVW	Pass No	Steer	Drive	Trailer	GVW
16	**8579**	**1**	4134	7669	7828	15497	9003	8866	17869	37500	**16**				
		2	3793	8101	8017	16118	10930	11250	22180	42091					
		3	4220	7153	7495	14648	9971	9936	19907	38775					
		4	4750	8242	7638	15880	11733	9876	21609	42239					
AT Wgt			8449	15583	15489	31072	20819	19964	40783	80303		-3.11%	6.26%	2.70%	3.39%
17	**793**	**1**	4289	7418	7468	14886	8635	9321	17956	37131	**17**				
		2	5790	8685	9841	18526	11839	11691	23530	47846					
		3	4152	7354	6525	13879	9199	10297	19496	37527					
		4	4977	7687	7076	14763	10899	11973	22872	42612					
AT Wgt			9604	15572	15455	31027	20286	21641	41927	82558		10.14%	6.11%	5.58%	6.29%
18	**1056**	**1**	4346	7519	7967	15486	9166	9272	18438	38270	**18**				
		2	5177	7671	7592	15263	10613	11232	21845	42285					
		3	4190	7157	6939	14096	9212	9554	18766	37052					
		4	4703	7819	6935	14754	10180	8710	18890	38347					
AT Wgt			9208	15083	14717	29800	19586	19384	38970	77977		5.60%	1.91%	-1.86%	0.40%
19		**1**				0			0	0	**19**				
	missed	**2**				0			0	0					
		3				0			0	0					
		4				0			0	0					
AT Wgt			0	0	0	0	0	0	0	0					
20	**1626**	**1**	4209	7687	7799	15486	8754	8646	17400	37095	**20**				
		2	4432	7945	8229	16174	10542	11523	22065	42671					
		3	4192	7268	7446	14714	9693	9759	19452	38358					
		4	4908	8644	7945	16589	11380	9995	21375	42872					
AT Wgt			8871	15772	15710	31482	20185	19962	40146	80498		1.73%	7.67%	1.10%	3.64%
21	**1897**	**1**	4117	7671	7632	15303	8200	8359	16559	35979	**21**				
		2	4388	7581	8613	16194	10685	11956	22641	43223					
		3	4132	6593	6542	13135	9552	9369	18921	36188					
		4	4922	8084	8216	16300	11847	10068	21915	43137					
AT Wgt			8780	14965	15502	30466	20142	19876	40018	79264		0.68%	4.19%	0.78%	2.05%
22	**2200**	**1**	4454	7587	8154	15741	8514	8582	17096	37291	**22**				
		2	5680	9142	9398	18540	11122	11550	22672	46892					
		3	3951	6802	7360	14162	9653	9563	19216	37329					
		4	4564	7432	6985	14417	11098	9945	21043	40024					
AT Wgt			9325	15482	15949	31430	20194	19820	40014	80768		6.93%	7.49%	0.76%	3.99%
23	**2531**	**1**	4253	7594	7949	15543	8624	8705	17329	37125	**23**				
		2	5651	8968	9294	18262	11678	11208	22886	46799					
		3	4117	7138	6977	14115	9735	9537	19272	37504					
		4	4807	7964	7442	15406	10860	9889	20749	40962					
AT Wgt			9414	15832	15831	31663	20449	19670	40118	81195		7.96%	8.29%	1.03%	4.54%
24		**1**				0			0	0	**24**				
	missed	**2**	0			0			0	0					
		3				0			0	0					
		4				0			0	0					
AT Wgt			0	0	0	0	0	0	0	0					
25	**3183**	**1**	4220	7658	8000	15658	8977	8871	17848	37726	**25**				
		2	5742	8390	9442	17832	11620	12584	24204	47778					
		3	4293	6990	7299	14289	10068	9799	19867	38449					
		4	4939	7989	7325	15314	10752	9250	20002	40255					
AT Wgt			9597	15514	16033	31547	20709	20252	40961	82104		10.06%	7.89%	3.15%	5.71%

	Steering	Drive	Trailer	GVW
Avg	3.58%	6.29%	1.05%	3.31%
Std Dev	4.72%	1.98%	2.92%	2.01%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result	Pass	Pass	Pass	Pass

ConB in Lane 2

Measured values (lbs) | **Measurement errors (%)**

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			8540			31140			39720	79400		% err	% err	% err	% err
Pass No	Run No	Sens No	1st Axle	2nd Axle	3rd Axle	2+3	4th Axle	5th Axle	Tot 4+5	GVW	Pass No	Steer	Drive	Trailer	GVW
1	3215	1	8485	14163	15082	29245	15953	18348	34301	72031	1				
		2	7971	15217	15270	30487	20143	20776	40919	79377					
AT Wgt			8228	14690	15176	29866	18048	19562	37610	75704		-3.65%	-4.09%	-5.31%	-4.65%
2	3586	1	8050	13523	15627	29150	16615	19049	35664	72864	2				
		2	7426	15148	14652	29800	21585	21896	43481	80707					
AT Wgt			7738	14336	15140	29475	19100	20473	39573	76786		-9.39%	-5.35%	-0.37%	-3.29%
3	3971	1	7980	14035	15069	29104	17561	19433	36994	74078	3				
		2	7049	15038	14796	29834	22478	20897	43375	80258					
AT Wgt			7515	14537	14933	29469	20020	20165	40185	77168		-12.01%	-5.37%	1.17%	-2.81%
4	4310	1	8253	13966	14579	28545	16573	19578	36151	72949	4				
		2	6970	15433	13971	29404	20703	21353	42056	78430					
AT Wgt			7612	14700	14275	28975	18638	20466	39104	75690		-10.87%	-6.95%	-1.55%	-4.67%
5	4644	1	8946	14011	16015	30026	17406	19265	36671	75643	5				
		2	9058	15686	15005	30691	23880	22266	46146	85895					
AT Wgt			9002	14849	15510	30359	20643	20766	41409	80769		5.41%	-2.51%	4.25%	1.72%
6	4969	1	9023	14288	15400	29688	16972	19111	36083	74794	6				
		2	8410	14826	13922	28748	22773	21882	44655	81813					
AT Wgt			8717	14557	14661	29218	19873	20497	40369	78304		2.07%	-6.17%	1.63%	-1.38%
7	5380	1	8161	13651	15627	29278	16407	18886	35293	72732	7				
		2	6756	14606	14586	29192	22623	21583	44206	80154					
AT Wgt			7459	14129	15107	29235	19515	20235	39750	76443		-12.66%	-6.12%	0.07%	-3.72%
8	5671	1	8289	14090	15164	29254	15836	19236	35072	72615	8				
		2	7007	14798	14202	29000	22451	22074	44525	80532					
AT Wgt			7648	14444	14683	29127	19144	20655	39799	76574		-10.44%	-6.46%	0.20%	-3.56%
9	5939	1	8006	13964	14996	28960	17364	19426	36790	73756	9				
		2	7208	15378	15208	30586	23316	22712	46028	83822					
AT Wgt			7607	14671	15102	29773	20340	21069	41409	78789		-10.93%	-4.39%	4.25%	-0.77%
10	6208	1	8694	14480	15942	30422	17148	20458	37606	76722	10				
		2	7620	14037	14661	28698	20584	21534	42118	78436					
AT Wgt			8157	14259	15302	29560	18866	20996	39862	77579		-4.48%	-5.07%	0.36%	-2.29%
11	6471	1	9111	14423	15971	30394	18240	20116	38356	77861	11				
		2	8910	15338	14679	30017	22317	20701	43018	81945					
AT Wgt			9011	14881	15325	30206	20279	20409	40687	79903		5.51%	-3.00%	2.43%	0.63%
12	6749	1	8851	14454	15561	30015	18209	19847	38056	76922	12				
		2	8394	15237	14954	30191	22427	21435	43862	82447					
AT Wgt			8623	14846	15258	30103	20318	20641	40959	79685		0.97%	-3.33%	3.12%	0.36%
13	7014	1	8747	14108	16103	30211	15589	19318	34907	73865	13				
		2	7272	14639	14590	29229	23386	21474	44860	81361					
AT Wgt			8010	14374	15347	29720	19488	20396	39884	77613		-6.21%	-4.56%	0.41%	-2.25%
14	7253	1	9056	14714	16414	31128	17472	20088	37560	77744	14				
		2	9195	15658	14771	30429	21556	22478	44034	83658					
AT Wgt			9126	15186	15593	30779	19514	21283	40797	80701		6.86%	-1.16%	2.71%	1.64%
15	7505	1	9131	14189	15459	29648	17367	19865	37232	76011	15				
		2	9001	15506	15025	30531	24700	22917	47617	87149					
AT Wgt			9066	14848	15242	30090	21034	21391	42425	81580		6.16%	-3.37%	6.81%	2.75%
16	7766	1	8685	14643	14906	29549	16601	19991	36592	74826	16				
		2	7519	14732	14833	29565	21294	21852	43146	80230					
AT Wgt			8102	14688	14870	29557	18948	20922	39869	77528		-5.13%	-5.08%	0.38%	-2.36%
17	8032	1	8888	14355	15598	29953	17228	19340	36568	75409	17				
		2	8020	14194	14288	28482	23119	21691	44810	81312					
AT Wgt			8454	14275	14943	29218	20174	20516	40689	78361		-1.01%	-6.17%	2.44%	-1.31%
18	9408	1	8064	14063	16024	30087	16743	19664	36407	74558	18				
		2	7310	15252	14635	29887	23565	22279	45844	83041					
AT Wgt			7687	14658	15330	29987	20154	20972	41126	78800		-9.99%	-3.70%	3.54%	-0.76%
19	9672	1	8536	14046	15479	29525	18096	19814	37910	75971	19				
		2	8205	14235	15417	29652	21827	21898	43725	81582					
AT Wgt			8371	14141	15448	29589	19962	20856	40818	78777		-1.98%	-4.98%	2.76%	-0.79%
20	9894	1	8132	14304	16081	30385	18227	20145	38372	76889	20				
		2	6906	14586	14961	29547	21164	20632	41796	78249					
AT Wgt			7519	14445	15521	29966	19696	20389	40084	77569		-11.96%	-3.77%	0.92%	-2.31%
21	10163	1	8383	13695	15693	29388	16324	19949	36273	74044	21				
		2	7797	14604	15067	29671	20533	22806	43339	80807					
AT Wgt			8090	14150	15380	29530	18429	21378	39806	77426		-5.27%	-5.17%	0.22%	-2.49%
22	10423	1	8926	15909	17841	33750	19492	21878	41370	84046	22				
		2	8454	15490	15644	31134	22099	19944	42043	81631					
AT Wgt			8690	15700	16743	32442	20796	20911	41707	82839		1.76%	4.18%	5.00%	4.33%
23	10720	1	9210	14617	17214	31831	19153	21166	40319	81360	23				
		2	8659	16784	15495	32279	24008	22112	46120	87058					
AT Wgt			8935	15701	16355	32055	21581	21639	43220	84209		4.62%	2.94%	8.81%	6.06%
24	11010	1	9012	17098	18066	35164	18696	22200	40896	85072	24				
		2	9109	16383	16873	33256	20965	19977	40942	83307					
AT Wgt			9061	16741	17470	34210	19831	21089	40919	84190		6.09%	9.86%	3.02%	6.03%
25	11329	1	9133	16213	17596	33809	19036	21415	40451	83393	25				
		2	9274	14798	15949	30747	20288	19486	39774	79795					
AT Wgt			9204	15506	16773	32278	19662	20451	40113	81594		7.77%	3.65%	0.99%	2.76%

ConB in Lane 2

Measured values (lbs)

				Drive			Trailer				
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW	
			8540			31140			39720	79400	
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*

Measurement errors (%)

Pass No	*% err Steer*	*% err Drive*	*% err Trailer*	*% err GVW*
	Steering	Drive	Trailer	GVW
Avg	-2.75%	-3.05%	1.93%	-0.53%
Std Dev	6.92%	3.96%	2.74%	3.02%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result	Pass	Pass	Pass	Pass

ConB in Lane 3

Measured values (lbs) | **Measurement errors (%)**

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			8540			31140			39720	79400		% err	% err	% err	% err
Pass No	Run No	Sens No	1st Axle	2nd Axle	3rd Axle	2+3	4th Axle	5th Axle	Tot 4+5	GVW	Pass No	Steer	Drive	Trailer	GVW
1	3480	1	8428	15684	14324	30008	19325	20361	39686	78122	1				
		2	8379	15393	16804	32197	17770	19470	37240	77816					
AT Wgt			8404	15539	15564	31103	18548	19916	38463	77969		-1.60%	-0.12%	-3.16%	-1.80%
2	3857	1	8231	14943	14553	29496	20901	19953	40854	78581	2				
		2	8079	15106	15753	30859	17988	20167	38155	77093					
AT Wgt			8155	15025	15153	30178	19445	20060	39505	77837		-4.51%	-3.09%	-0.54%	-1.97%
3	4216	1	8315	14976	15486	30462	21225	20943	42168	80945	3				
		2	8436	15466	16152	31618	19999	19704	39703	79757					
AT Wgt			8376	15221	15819	31040	20612	20324	40936	80351		-1.93%	-0.32%	3.06%	1.20%
4	4548	1	8176	14952	15960	30912	21400	21962	43362	82450	4				
		2	8637	14504	15788	30292	18103	19847	37950	76879					
AT Wgt			8407	14728	15874	30602	19752	20905	40656	79665		-1.56%	-1.73%	2.36%	0.33%
5	4878	1	9334	16319	15413	31732	20392	21049	41441	82507	5				
		2	9045	14859	15270	30129	17625	20099	37724	76898					
AT Wgt			9190	15589	15342	30931	19009	20574	39583	79703		7.61%	-0.67%	-0.35%	0.38%
6	5291	1	8452	16160	15547	31707	22822	21377	44199	84358	6				
		2	7453	14716	16077	30793	19064	19717	38781	77027					
AT Wgt			7953	15438	15812	31250	20943	20547	41490	80693		-6.88%	0.35%	4.46%	1.63%
7	5582	1	8767	16789	16317	33106	23832	22707	46539	88412	7				
		2	8121	15248	15719	30967	17805	19375	37180	76268					
AT Wgt			8444	16019	16018	32037	20819	21041	41860	82340		-1.12%	2.88%	5.39%	3.70%
8	5880	1	8919	15536	15406	30942	22032	21583	43615	83476	8				
		2	8895	14957	16167	31124	18403	19042	37445	77464					
AT Wgt			8907	15247	15787	31033	20218	20313	40530	80470		4.30%	-0.34%	2.04%	1.35%
9	6129	1	8240	17243	16249	33492	22259	22581	44840	86572	9				
		2	7393	15702	16379	32081	18385	19212	37597	77071					
AT Wgt			7817	16473	16314	32787	20322	20897	41219	81822		-8.47%	5.29%	3.77%	3.05%
10	6393	1	9285	16264	15741	32005	21799	21327	43126	84416	10				
		2	8950	14890	14758	29648	17677	19585	37262	75860					
AT Wgt			9118	15577	15250	30827	19738	20456	40194	80138		6.76%	-1.01%	1.19%	0.93%
11	6659	1	8346	15517	15404	30921	23091	22617	45708	84975	11				
		2	8569	14661	15594	30255	18063	18978	37041	75865					
AT Wgt			8458	15089	15499	30588	20577	20798	41375	80420		-0.97%	-1.77%	4.17%	1.28%
12	6920	1	9155	15885	14941	30826	23135	22052	45187	85168	12				
		2	8754	14555	15878	30433	17444	19018	36462	75649					
AT Wgt			8955	15220	15410	30630	20290	20535	40825	80409		4.85%	-1.64%	2.78%	1.27%
13	7184	1	8869	15574	15071	30645	21038	21095	42133	81647	13				
		2	8948	14710	15680	30390	18055	19098	37153	76491					
AT Wgt			8909	15142	15376	30518	19547	20097	39643	79069		4.31%	-2.00%	-0.19%	-0.42%
14	7429	1	8284	15243	14961	30204	45529	19620	65149	103637	14				
		2	8769	13958	15426	29384	18136	19223	37359	75512					
AT Wgt			8527	14601	15194	29794	31833	19422	51254	89575		-0.16%	-4.32%	29.04%	12.81%
15	7693	1	8035	14897	15713	30610	22054	21666	43720	82365	15				
		2	8390	15122	16471	31593	19075	20822	39897	79880					
AT Wgt			8213	15010	16092	31102	20565	21244	41809	81123		-3.83%	-0.12%	5.26%	2.17%
16	7948	1	9362	16807	16392	33199	49586	21258	70844	113405	16				
		2	9100	14595	16705	31300	19525	20826	40351	80751					
AT Wgt			9231	15701	16549	32250	34556	21042	55598	97078		8.09%	3.56%	39.97%	22.26%
17	8215	1	8992	14981	14366	29347	45580	19975	65555	103894	17				
		2	8584	14498	14650	29148	17642	19567	37209	74941					
AT Wgt			8788	14740	14508	29248	31611	19771	51382	89418		2.90%	-6.08%	29.36%	12.62%
18	9593	1	8315	15622	15234	30856	23302	20760	44062	83233	18				
		2	8714	14527	15772	30299	17179	17711	34890	73903					
AT Wgt			8515	15075	15503	30578	20241	19236	39476	78568		-0.30%	-1.81%	-0.61%	-1.05%
19	9839	1	8544	15517	14937	30454	43558	19905	63463	102461	19				
		2	7942	15223	16454	31677	17345	19492	36837	76456					
AT Wgt			8243	15370	15696	31066	30452	19699	50150	89459		-3.48%	-0.24%	26.26%	12.67%
20	10083	1	8573	16355	16304	32659	23347	22584	45931	87163	20				
		2	8562	14904	15799	30703	18914	20518	39432	78697					
AT Wgt			8568	15630	16052	31681	21131	21551	42682	82930		0.32%	1.74%	7.46%	4.45%
21	10335	1	8397	14240	13431	27671	21325	19858	41183	77251	21				
		2	8602	14202	14357	28559	18152	18612	36764	73925					
AT Wgt			8500	14221	13894	28115	19739	19235	38974	75588		-0.47%	-9.71%	-1.88%	-4.80%
22	10635	1	7812	14198	14392	28590	18035	19779	37814	74216	22				
		2	8403	13920	15437	29357	14167	17684	31851	69611					
AT Wgt			8108	14059	14915	28974	16101	18732	34833	71914		-5.06%	-6.96%	-12.30%	-9.43%
23	10926	1	7665	15188	14090	29278	17964	19942	37906	74849	23				
		2	7777	14399	16218	30617	18824	20385	39209	77603					
AT Wgt			7721	14794	15154	29948	18394	20164	38558	76226		-9.59%	-3.83%	-2.93%	-4.00%
24	11242	1	8229	15133	15089	30222	44074	21285	65359	103810	24				
		2	7914	14974	16509	31483	18917	20855	39772	79169					
AT Wgt			8072	15054	15799	30853	31496	21070	52566	91490		-5.49%	-0.92%	32.34%	15.23%
25	11568	1	9723	14566	14923	29489	21474	21177	42651	81863	25				
		2	8304	14394	15951	30345	17307	19922	37229	75878					
AT Wgt			9014	14480	15437	29917	19391	20550	39940	78871		5.54%	-3.93%	0.55%	-0.67%

ConB in Lane 3

Measured values (lbs)

			Steer	Drive			Trailer			GVW
				1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	
			8540			31140			39720	79400
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*

Measurement errors (%)

Pass No	*% err Steer*	*% err Drive*	*% err Trailer*	*% err GVW*
	Steering	Drive	Trailer	GVW
Avg	-0.43%	-1.47%	7.10%	2.93%
Std Dev	4.86%	3.19%	12.88%	6.90%
Number of pts exceeding 15% axle or 10% GVW	0	0	5	5
Pass/fail result	Pass	Pass	Fail	Fail

ConA in Lane 4

Measured values (lbs) | **Measurement errors (%)**

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			8720			29240			39710	77670		% err	% err	% err	% err
Pass No	Run No	Sens No	1st Axle	2nd Axle	3rd Axle	2+3	4th Axle	5th Axle	Tot 4+5	GVW	Pass No	Steer	Drive	Trailer	GVW
1	4757	1	3790	7030	7100	14130	9091	8842	17933	35853	1				
		2	4443	6802	7581	14383	9177	8399	17576	36402					
		3	3493	6397	5471	11868	9085	8414	17499	32860					
		4	4392	7202	6306	13508	11065	11078	22143	40043					
AT Wgt			8059	13716	13229	26945	19209	18367	37576	72579		-7.58%	-7.85%	-5.38%	-6.55%
2	591	1	3757	6985	7482	14467	9574	9468	19042	37266	2				
		2	4443	6888	8143	15031	9451	8571	18022	37496					
		3	4006	7418	6425	13843	10143	9477	19620	37469					
		4	4414	7565	6730	14295	11025	11071	22096	40805					
AT Wgt			8310	14428	14390	28818	20097	19294	39390	76518		-4.70%	-1.44%	-0.81%	-1.48%
3	5392	1	4022	7034	7647	14681	9563	9572	19135	37838	3				
		2	4260	6412	7122	13534	8785	9384	18169	35963					
		3	3643	6480	5700	12180	9336	8344	17680	33503					
		4	4395	6635	5887	12522	10778	9290	20068	36985					
AT Wgt			8160	13281	13178	26459	19231	18295	37526	72145		-6.42%	-9.51%	-5.50%	-7.11%
4	5663	1	3881	6816	7587	14403	9246	9254	18500	36784	4				
		2	4575	6688	8011	14699	9678	9499	19177	38451					
		3	4115	7316	6350	13666	9735	9164	18899	36680					
		4	4291	7307	6664	13971	10756	10637	21393	39655					
AT Wgt			8431	14064	14306	28370	19708	19277	38985	75785		-3.31%	-2.98%	-1.83%	-2.43%
5	5913	1	3863	6888	7290	14178	9508	8827	18335	36376	5				
		2	4095	6333	7343	13676	8813	7733	16546	34317					
		3	2833	6028	5199	11227	8999	8086	17085	31145					
		4	4381	7058	6269	13327	10752	10535	21287	38995					
AT Wgt			7586	13154	13051	26204	19036	17591	36627	70417		-13.00%	-10.38%	-7.77%	-9.34%
6	6182	1	3806	7096	7468	14564	9164	9135	18299	36669	6				
		2	4392	6935	7768	14703	9453	9797	19250	38345					
		3	3766	6633	6051	12684	9468	8805	18273	34723					
		4	4443	7268	6181	13449	10853	9817	20670	38562					
AT Wgt			8204	13966	13734	27700	19469	18777	38246	74150		-5.92%	-5.27%	-3.69%	-4.53%
7	6442	1	3674	6383	7501	13884	9658	9201	18859	36417	7				
		2	4366	6822	7100	13922	9085	9334	18419	36707					
		3	3945	7431	6522	13953	10518	9484	20002	37900					
		4	4350	6970	6747	13717	11589	10388	21977	40044					
AT Wgt			8168	13803	13935	27738	20425	19204	39629	75534		-6.34%	-5.14%	-0.21%	-2.75%
8	6691	1	4110	6983	7391	14374	9554	9731	19285	37769	8				
		2	4619	7052	7499	14551	7369	8042	15411	34581					
		3	4181	7323	6178	13501	10203	9186	19389	37071					
		4	4326	6780	6293	13073	10167	10529	20696	38095					
AT Wgt			8618	14069	13681	27750	18647	18744	37391	73758		-1.17%	-5.10%	-5.84%	-5.04%
9	6945	1	3671	6941	7574	14515	9477	9115	18592	36778	9				
		2	4101	7336	7834	15170	8924	8489	17413	36684					
		3	3984	7133	6600	13733	10604	9894	20498	38215					
		4	4267	7153	6333	13486	10414	10381	20795	38548					
AT Wgt			8012	14282	14171	28452	19710	18940	38649	75113		-8.13%	-2.69%	-2.67%	-3.29%
10	7185	1	4057	7307	7636	14943	10031	10039	20070	39070	10				
		2	4178	6910	7909	14819	8225	9157	17382	36379					
		3	3971	6635	6170	12805	9413	8600	18013	34789					
		4	4324	6847	6485	13332	10765	8820	19585	37241					
AT Wgt			8265	13850	14100	27950	19217	18308	37525	73740		-5.22%	-4.41%	-5.50%	-5.06%
11	7401	1	3883	6904	7362	14266	9552	9501	19053	37202	11				
		2	4586	6787	7206	13993	9515	9343	18858	37437					
		3	3987	6926	6339	13265	9969	9404	19373	36625					
		4	4401	7817	6560	14377	10963	10597	21560	40338					
AT Wgt			8429	14217	13734	27951	20000	19423	39422	75801		-3.34%	-4.41%	-0.73%	-2.41%
12	7766	1	3894	7184	7953	15137	9583	9881	19464	38495	12				
		2	4578	6756	7819	14575	9689	8518	18207	37360					
		3	4090	7281	6540	13821	10436	9587	20023	37934					
		4	4450	7179	6187	13366	10187	10734	20921	38737					
AT Wgt			8506	14200	14250	28450	19948	19360	39308	76263		-2.45%	-2.70%	-1.01%	-1.81%
13	8006	1	3854	7409	8114	15523	9742	9830	19572	38949	13				
		2	4163	6869	7925	14794	9023	9658	18681	37638					
		3	4130	7270	6785	14055	10121	9512	19633	37818					
		4	4064	6586	6505	13091	10941	9087	20028	37183					
AT Wgt			8106	14067	14665	28732	19914	19044	38957	75794		-7.05%	-1.74%	-1.90%	-2.42%
14	8245	1	3744	7354	7592	14946	9596	9437	19033	37723	14				
		2	4485	6990	7964	14954	9583	8119	17702	37141					
		3	4000	7923	6560	14483	10205	9715	19920	38403					
		4	4348	7367	6520	13887	11107	11334	22441	40676					
AT Wgt			8289	14817	14318	29135	20246	19303	39548	76972		-4.95%	-0.36%	-0.41%	-0.90%
15	8495	1	3925	7023	7521	14544	9420	9329	18749	37218	15				
		2	4207	6820	7455	14275	8771	9303	18074	36556					
		3	3453	6073	5246	11319	9534	8701	18235	33007					
		4	4388	6547	6542	13089	11005	9153	20158	37635					
AT Wgt			7987	13232	13382	26614	19365	18243	37608	72208		-8.41%	-8.98%	-5.29%	-7.03%

ConA in Lane 4

Measured values (lbs) | **Measurement errors (%)**

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			8720			29240			39710	77670		% err	% err	% err	% err
Pass No	Run No	Sens No	1st Axle	2nd Axle	3rd Axle	2+3	4th Axle	5th Axle	Tot 4+5	GVW	Pass No	Steer	Drive	Trailer	GVW
16		1				0			0	0	16				
	missed	2				0			0	0					
		3				0			0	0					
		4				0			0	0					
AT Wgt			0	0	0	0	0	0	0	0					
17	968	1	3943	7186	7682	14868	9334	9252	18586	37397	17				
		2	4494	6712	8002	14714	9530	9162	18692	37900					
		3	4006	7001	6364	13365	9889	9226	19115	36486					
		4	4381	7422	6342	13764	10782	10677	21459	39604					
AT Wgt			8412	14161	14195	28356	19768	19159	38926	75694		-3.53%	-3.02%	-1.97%	-2.54%
18	1263	1	3532	6873	7007	13880	9453	8871	18324	35736	18				
		2	4139	6375	7629	14004	8575	8674	17249	35392					
		3	3809	5638	4785	10423	9153	7643	16796	31028					
		4	4328	7290	6249	13539	10580	9230	19810	37677					
AT Wgt			7904	13088	12835	25923	18881	17209	36090	69917		-9.36%	-11.34%	-9.12%	-9.98%
19	1543	1	3918	6597	7265	13862	9404	9336	18740	36520	19				
		2	4567	6732	7671	14403	9373	10103	19476	38446					
		3	4068	7274	6123	13397	9559	9175	18734	36199					
		4	4494	7382	6383	13765	11062	9528	20590	38849					
AT Wgt			8524	13993	13721	27714	19699	19071	38770	75007		-2.25%	-5.22%	-2.37%	-3.43%
20	1813	1	3771	7199	6985	14184	9583	9384	18967	36922	20				
		2	4165	7060	7605	14665	9349	8055	17404	36234					
		3	3843	7667	6833	14500	10180	9698	19878	38221					
		4	4595	7385	6015	13400	11517	11380	22897	40892					
AT Wgt			8187	14656	13719	28375	20315	19259	39573	76135		-6.11%	-2.96%	-0.35%	-1.98%
21	2121	1	3627	7060	8015	15075	9746	9343	19089	37791	21				
		2	4145	7173	7598	14771	7393	7303	14696	33612					
		3	4062	7429	6366	13795	10763	9792	20555	38412					
		4	4467	7179	6337	13516	11188	9709	20897	38880					
AT Wgt			8151	14421	14158	28579	19545	18074	37619	74348		-6.53%	-2.26%	-5.27%	-4.28%
22	2424	1	4079	6869	7162	14031	9590	9488	19078	37188	22				
		2	4800	6412	7296	13708	8913	9759	18672	37180					
		3	4137	7358	6507	13865	10174	9616	19790	37792					
		4	4611	6761	5894	12655	11027	9627	20654	37920					
AT Wgt			8814	13700	13430	27130	19852	19245	39097	75040		1.07%	-7.22%	-1.54%	-3.39%
23	2763	1	4183	7047	7224	14271	9567	8961	18528	36982	23				
		2	5014	6930	7506	14436	9473	8399	17872	37322					
		3	4035	6926	5629	12555	9279	8723	18002	34592					
		4	4745	7261	6432	13693	11023	11268	22291	40729					
AT Wgt			8989	14082	13396	27478	19671	18676	38347	74813		3.08%	-6.03%	-3.43%	-3.68%
24	3082	1	3868	7164	7471	14635	9762	9642	19404	37907	24				
		2	4256	6994	7795	14789	9155	9347	18502	37547					
		3	4101	7237	6580	13817	10617	9911	20528	38446					
		4	4256	6886	6425	13311	11091	9534	20625	38192					
AT Wgt			8241	14141	14136	28276	20313	19217	39530	76046		-5.50%	-3.30%	-0.45%	-2.09%
25	3447	1	3777	7060	7398	14458	9354	9484	18838	37073	25				
		2	4553	7025	7612	14637	9618	9131	18749	37939					
		3	4006	6944	6578	13522	9567	9133	18700	36228					
		4	4622	7054	6708	13762	11318	11164	22482	40866					
AT Wgt			8479	14042	14148	28190	19929	19456	39385	76053		-2.76%	-3.59%	-0.82%	-2.08%

	Steering	Drive	Trailer	GVW
Avg	-5.00%	-4.91%	-3.08%	-3.98%
Std Dev	3.34%	2.89%	2.50%	2.39%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result	Pass	Pass	Pass	Pass

Appendix E

Measurement Errors Obtained With Vehicle Passes During the Calibration of March 1999

Measured values (lbs) | **Measurement errors (%)**

5-Axle Air Ride

Lane 1 March 1999

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			11240	14880	15070	29950	17900	17230	35130	76320		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**7365**	**1**	5219	6480	7085	13565	7755	7085	14840	33624	**1**				
		2	7127	8939	9612	18551	10904	10767	21671	47349					
		3	5116	6353	6458	12811	7773	7656	15429	33356					
		4	5482	7806	6862	14668	9305	9616	18921	39071					
AT Wgt			11472	10767	15009	29798	17869	17562	35431	76700		2.06%	-0.51%	0.86%	0.50%
2	**7651**	**1**	5387	6174	7124	13298	7415	7153	14568	33253	**2**				
		2	5506	8758	8262	17020	10754	10516	21270	43796					
		3	5387	6445	6681	13126	7744	7455	15199	33712					
		4	6211	9080	7806	16886	10749	10999	21748	44845					
AT Wgt			11246	15229	14937	30165	18331	18062	36393	77803		0.05%	0.72%	3.59%	1.94%
3	**7895**	**1**	5627	6445	7173	13618	7808	7080	14888	34133	**3**				
		2	6820	9693	9336	19029	11631	11237	22868	48717					
		3	5541	6560	6723	13283	7654	7693	15347	34171					
		4	5797	8084	7563	15647	10017	10013	20030	41474					
AT Wgt			11893	15391	15398	30789	18555	18012	36567	79248		5.81%	2.80%	4.09%	3.84%
4	**8138**	**1**	5504	6386	6937	13323	7682	7036	14718	33545	**4**				
		2	5270	9131	8769	17900	11018	10822	21840	45010					
		3	5543	6904	6463	13367	7958	7629	15587	34497					
		4	6011	9221	7609	16830	10269	10361	20630	43471					
AT Wgt			11164	15821	14889	30710	18464	17924	36388	78262		-0.68%	2.54%	3.58%	2.54%
5	**9341**	**1**	5305	6062	7387	13449	7693	6981	14674	33428	**5**				
		2	5874	8447	8807	17254	10805	10835	21640	44768					
		3	5433	6441	6390	12831	7870	7548	15418	33682					
		4	6156	8747	8379	17126	10833	11111	21944	45226					
AT Wgt			11384	14849	15482	30330	18601	18238	36838	78552		1.28%	1.27%	4.86%	2.92%
6	**9619**	**1**	5111	6776	7082	13858	8119	7596	15715	34684	**6**				
		2	5127	8613	8163	16776	10681	10474	21155	43058					
		3	5596	7310	8044	15354	7909	7490	15399	36349					
		4	5667	8672	7931	16603	9870	9898	19768	42038					
AT Wgt			10751	15686	15610	31296	18290	17729	36019	78065		-4.35%	4.49%	2.53%	2.29%
7	**9882**	**1**	5100	6350	7030	13380	7501	7054	14555	33035	**7**				
		2	5528	8560	9052	17612	10317	10500	20817	43957					
		3	5354	6128	6747	12875	8079	7609	15688	33917					
		4	5526	7815	7490	15305	10531	10452	20983	41814					
AT Wgt			10754	14427	15160	29586	18214	17808	36022	76362		-4.32%	-1.22%	2.54%	0.05%
8	**10205**	**1**	5371	6646	8035	14681	8229	7757	15986	36038	**8**				
		2	5316	7949	7376	15325	10308	9631	19939	40580					
		3	5513	6902	7270	14172	8295	7870	16165	35850					
		4	5085	7534	7001	14535	9470	9442	18912	38532					
AT Wgt			10643	14516	14841	29357	18151	17350	35501	75500		-5.32%	-1.98%	1.06%	-1.07%
9	**10524**	**1**	5409	7129	7164	14293	8304	7757	16061	35763	**9**				
		2	5021	7843	8192	16035	10906	10668	21574	42630					
		3	5413	6827	7362	14189	8326	7698	16024	35626					
		4	5314	7861	7570	15431	9287	9217	18504	39249					
AT Wgt	**10818**		10579	14830	15144	29974	18412	17670	36082	76634		-5.89%	0.08%	2.71%	0.41%
10		**1**	5310	6833	7279	14112	8075	7473	15548	34970	**10**				
		2	6372	8648	8633	17281	11693	11389	23082	46735					
		3	5146	6743	7837	14580	7918	7632	15550	35276					
		4	5702	8388	7682	16070	9711	9792	19503	41275					
AT Wgt			11265	15306	15716	31022	18699	18143	36842	79128		0.22%	3.58%	4.87%	3.68%
11	**11103**	**1**	5290	7230	7003	14233	8233	7729	15962	35485	**11**				
		2	5402	8176	7338	15514	10423	10147	20570	41486					
		3	5345	6765	7693	14458	8375	7649	16024	35827					
		4	5338	8262	8075	16337	9517	9314	18831	40506					
AT Wgt			10688	15217	15055	30271	18274	17420	35694	76652		-4.92%	1.07%	1.60%	0.44%
12	**11414**	**1**	5204	6536	6952	13488	8227	7590	15817	34509	**12**				
		2	5376	8061	8862	16923	11118	10758	21876	44175					
		3	5360	7371	7168	14539	8128	7519	15647	35546					
		4	5658	8983	7938	16921	9552	9781	19333	41912					
AT Wgt			10799	15476	15460	30936	18513	17824	36337	78071		-3.92%	3.29%	3.43%	2.29%
13	**11728**	**1**	5325	6399	7398	13797	7746	7168	14914	34036	**13**				
		2	5332	9219	8119	17338	11279	10679	21958	44628					
		3	5546	6996	7429	14425	7830	7521	15351	35322					
		4	5740	8796	7689	16485	10200	10419	20619	42844					
AT Wgt			10972	15705	15318	31023	18528	17894	36421	78415		-2.39%	3.58%	3.67%	2.75%
14	**5596**	**1**	5131	5940	6593	12533	7684	7191	14875	32539	**14**				
	Day 2	**2**	5744	8913	8509	17422	11182	10580	21762	44928					
		3	5656	6822	7065	13887	7929	7279	15208	34751					
		4	6172	8714	7927	16641	10308	10236	20544	43357					
AT Wgt			11352	15195	15047	30242	18552	17643	36195	77788		0.99%	0.97%	3.03%	1.92%
15	**5925**	**1**	5486	6401	7398	13799	8106	7332	15438	34723	**15**				
		2	5409	8379	8066	16445	10734	10372	21106	42960					
		3	5568	6514	7202	13716	7949	7830	15779	35063					
		4	5993	8256	7362	15618	10240	10247	20487	42098					
AT Wgt			11228	14775	15014	29789	18515	17891	36405	77422		-0.11%	-0.54%	3.63%	1.44%
16	**6263**	**1**	5376	6286	7111	13397	7792	7122	14914	33687	**16**				
		2	5312	8236	8697	16933	10322	10092	20414	42659					

Measured values (lbs) | **Measurement errors (%)**

5-Axle Air Ride

Lane 1 March 1999

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			11240	14880	15070	29950	17900	17230	35130	76320		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
		3	5230	6549	6913	13462	7497	7658	15155	33847					
		4	5424	8110	7204	15314	9618	10022	19640	40378					
AT Wgt			10671	14591	14963	29553	17615	17447	35062	75286		-5.06%	-1.33%	-0.19%	-1.36%
17	**6551**	**1**	5521	6536	7453	13989	8037	7433	15470	34980	**17**				
		2	6002	7740	7345	15085	10937	10593	21530	42617					
		3	5226	6783	6926	13709	8033	7711	15744	34679					
		4	6185	8518	7775	16293	10209	10571	20780	43258					
AT Wgt			11467	14789	14750	29538	18608	18154	36762	77767		2.02%	-1.38%	4.65%	1.90%
18	**6843**	**1**	5206	6370	7468	13838	7969	7755	15724	34768	**18**				
		2	5349	8267	8463	16730	10293	10198	20491	42570					
		3	5612	6313	7429	13742	8286	7515	15801	35155					
		4	5252	7649	6944	14593	9969	9603	19572	39417					
AT Wgt			10710	14300	15152	29452	18259	17536	35794	75955		-4.72%	-1.66%	1.89%	-0.48%
19	**7131**	**1**	5221	6348	7168	13516	7905	7219	15124	33861	**19**				
		2	5517	8723	8328	17051	10628	10491	21119	43687					
		3	5479	6994	6776	13770	7720	7792	15512	34761					
		4	6132	8597	7543	16140	10524	10679	21203	43475					
AT Wgt			11175	15331	14908	30239	18389	18091	36479	77892		-0.58%	0.96%	3.84%	2.06%
20	**7446**	**1**	5449	6339	6655	12994	7539	7332	14871	33314	**20**				
		2	5510	8390	8721	17111	10780	10602	21382	44003					
		3	5590	6549	7202	13751	7982	7519	15501	34842					
		4	6059	8434	7623	16057	10379	10652	21031	43147					
AT Wgt			11304	14856	15101	29957	18340	18053	36393	77653		0.57%	0.02%	3.59%	1.75%
21	**7733**	**1**	5455	6586	7272	13858	8095	7700	15795	35108	**21**				
		2	6458	8452	8467	16919	11345	11905	23250	46627					
		3	5457	6553	7010	13563	7960	7457	15417	34437					
		4	6002	8886	8242	17128	9907	9779	19686	42816					
AT Wgt			11686	15239	15496	30734	18654	18421	37074	79494		3.97%	2.62%	5.53%	4.16%

	Steering	Drive	Trailer	GVW
Avg	-1.20%	0.92%	3.11%	1.62%
Std Dev	3.27%	1.92%	1.42%	1.51%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0

Measured values (lbs) | **Measurement errors (%)**

5-Axle Air Ride

Lane 2 March 1999

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			11240	14880	15070	29950	17900	17230	35130	76320		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**8040**	**1**	11140	16401	14842	31243	18571	17561	36132	78515	**1**				
		2	11779	15726	16928	32654	19677	19338	39015	83448					
AT Wgt			11460	16064	15885	31949	19124	18450	37574	80982		1.95%	6.67%	6.96%	6.11%
2	**9151**	**1**	11323	14617	14154	28771	**38874**	16390	55264	95358	**2**				
		2	11878	15106	15554	30660	18645	17984	36629	79167					
AT Wgt			11601	14862	14854	29716	28760	17187	45947	87263		3.21%	-0.78%	30.79%	14.34%
3	**9411**	**1**	11131	15444	14833	30277	18094	17715	35809	77217	**3**				
		2	10650	14857	14996	29853	18809	18266	37075	77578					
AT Wgt			10891	15151	14915	30065	18452	17991	36442	77398		-3.11%	0.38%	3.73%	1.41%
4	**9691**	**1**	11166	16295	14776	31071	18529	17876	36405	78642	**4**				
		2	12553	14273	16158	30431	19580	19131	38711	81695					
AT Wgt			11860	15284	15467	30751	19055	18504	37558	80169		5.51%	2.67%	6.91%	5.04%
5	**10007**	**1**	10529	14476	15539	30015	17697	17252	34949	75493	**5**				
		2	9647	14531	14831	29362	18443	18410	36853	75862					
AT Wgt			10088	14504	15185	29689	18070	17831	35901	75678		-10.25%	-0.87%	2.19%	-0.84%
6	**10282**	**1**	11054	14897	16044	30941	17739	17117	34856	76851	**6**				
		2	10527	14350	14575	28925	18418	18279	36697	76149					
AT Wgt			10791	14624	15310	29933	18079	17698	35777	76500		-4.00%	-0.06%	1.84%	0.24%

	Steering	Drive	Trailer	GVW
Avg	-1.11%	1.34%	8.74%	4.38%
Std Dev	5.29%	2.66%	10.07%	5.10%
Number of pts exceeding 15% axle or 10% GVW	0	0	1	1

Measured values (lbs) | **Measurement errors (%)**

5-Axle Air Ride

Lane 3 March 1999

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			11240	14880	15070	29950	17900	17230	35130	76320		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**7970**	**1**	10696	15120	14568	29688	18057	18634	36691	77075	**1**				
		2	10767	13576	14346	27922	17719	17980	35699	74388					
AT Wgt			10732	14348	14457	28805	17888	18307	36195	75732		-4.52%	-3.82%	3.03%	-0.77%
2	**8215**	**1**	10577	14522	14339	28861	17633	18070	35703	75141	**2**				
		2	11118	13790	13530	27320	17682	17790	35472	73910					
AT Wgt			10848	14156	13935	28091	17658	17930	35588	74526		-3.49%	-6.21%	1.30%	-2.35%
3	**9342**	**1**	10577	16222	16308	32530	18295	18544	36839	79946	**3**				
		2	9931	14917	14269	29186	18304	18901	37205	76322					
AT Wgt			10254	15570	15289	30858	18300	18723	37022	78134		-8.77%	3.03%	5.39%	2.38%
4	**9599**	**1**	10427	15724	15905	31629	17558	17739	35297	77353	**4**				
		2	10902	14019	13358	27377	17492	17993	35485	73764					
AT Wgt			10665	14872	14632	29503	17525	17866	35391	75559		-5.12%	-1.49%	0.74%	-1.00%
5	**9918**	**1**	10372	14134	14280	28414	17737	17931	35668	74454	**5**				
		2	10591	15395	15104	30499	18725	18637	37362	78452					
AT Wgt			10482	14765	14692	29457	18231	18284	36515	76453		-6.75%	-1.65%	3.94%	0.17%
6	**10209**	**1**	10529	15678	14886	30564	18081	18163	36244	77337	**6**				
		2	10904	14224	13759	27983	17552	18145	35697	74584					
AT Wgt			10717	14951	14323	29274	17817	18154	35971	75961		-4.66%	-2.26%	2.39%	-0.47%

	Steering	Drive	Trailer	GVW
Avg	-5.55%	-2.07%	2.80%	-0.34%
Std Dev	1.74%	2.79%	1.56%	1.43%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0

Measured values (lbs) | **Measurement errors (%)**

5-Axle Air Ride

Lane 4 March 1999

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			11240	14880	15070	29950	17900	17230	35130	76320		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**6823**	**1**	5272	6225	7462	13687	8326	7453	15779	34738	**1**				
		2	5067	6461	7541	14002	8364	8134	16498	35567					
		3	4302	5607	6154	11761	7495	6944	14439	30502					
		4	5495	8412	7702	16114	9894	9960	19854	41463					
AT Wgt			10068	13353	14430	27782	17040	16246	33285	71135		-10.43%	-7.24%	-5.25%	-6.79%
2	**7285**	**1**	5124	6130	6877	13007	8491	7909	16400	34531	**2**				
		2	5261	7179	7751	14930	8932	8606	17538	37729					
		3	5499	6690	7435	14125	8869	8326	17195	36819					
		4	5118	8908	7559	16467	9973	9923	19896	41481					
AT Wgt			10501	14454	14811	29265	18133	17382	35515	75280		-6.57%	-2.29%	1.09%	-1.36%
3	**7565**	**1**	5164	5989	7415	13404	8233	7583	15816	34384	**3**				
		2	5466	7936	8348	16284	9859	9451	19310	41060					
		3	5579	7138	7179	14317	8617	8198	16815	36711					
		4	6000	8428	8108	16536	10260	10218	20478	43014					
AT Wgt			11105	14746	15525	30271	18485	17725	36210	77585		-1.21%	1.07%	3.07%	1.66%
4	**7835**	**1**	4970	5958	7118	13076	8487	8037	16524	34570	**4**				
		2	5579	6871	6957	13828	9329	8948	18277	37684					
		3	5755	7426	6723	14149	8820	8185	17005	36909					
		4	5790	8674	7526	16200	10057	9997	20054	42044					
AT Wgt			11047	14465	14162	28627	18347	17584	35930	75604		-1.72%	-4.42%	2.28%	-0.94%
5	**8054**	**1**	5241	6547	6500	13047	8366	7541	15907	34195	**5**				
		2	5473	7927	7960	15887	9640	9717	19357	40717					
		3	5627	7082	6679	13761	8884	8238	17122	36510					
		4	6046	9010	8196	17206	10441	10291	20732	43984					
AT Wgt			11194	15283	14668	29951	18666	17894	36559	77703		-0.41%	0.00%	4.07%	1.81%
6	**8294**	**1**	4963	6388	7407	13795	8055	7605	15660	34418	**6**				
		2	5477	8214	8458	16672	9808	9451	19259	41408					
		3	5676	6873	6805	13678	8520	8020	16540	35894					
		4	5817	8736	8077	16813	10341	10200	20541	43171					
AT Wgt			10967	15106	15374	30479	18362	17638	36000	77446		-2.43%	1.77%	2.48%	1.47%
7	**9267**	**1**	5113	6469	6476	12945	8165	7876	16041	34099	**7**				
		2	5279	7548	6910	14458	9365	9349	18714	38451					
		3	5638	7157	7157	14314	8734	7901	16635	36587					
		4	5960	8776	8174	16950	10443	10328	20771	43681					
AT Wgt			10995	14975	14359	29334	18354	17727	36081	76409		-2.18%	-2.06%	2.71%	0.12%
8	**9536**	**1**	5135	6070	7105	13175	8489	7742	16231	34541	**8**				
		2	4919	7378	8225	15603	8767	8507	17274	37796					
		3	5510	6807	6807	13614	8412	8037	16449	35573					
		4	5371	8639	8244	16883	10203	10242	20445	42699					
AT Wgt			10468	14447	15191	29638	17936	17264	35200	75305		-6.87%	-1.04%	0.20%	-1.33%
9	**9797**	**1**	5045	6705	7127	13832	8214	7605	15819	34696	**9**				
		2	5239	7671	7975	15646	9572	9239	18811	39696					
		3	5826	7091	6820	13911	8714	8379	17093	36830					
		4	5590	8921	7852	16773	10289	10326	20615	42978					
AT Wgt			10850	15194	14887	30081	18395	17775	36169	77100		-3.47%	0.44%	2.96%	1.02%
10	**10122**	**1**	5299	6818	6813	13631	8505	8017	16522	35452	**10**				
		2	5250	7565	7510	15075	9343	9093	18436	38761					
		3	5585	7433	7351	14784	9210	8372	17582	37951					
		4	5956	8741	7585	16326	10178	9967	20145	42427					
AT Wgt			11045	15279	14630	29908	18618	17725	36343	77296		-1.73%	-0.14%	3.45%	1.28%
11	**10452**	**1**	4913	6445	7060	13505	8165	7962	16127	34545	**11**				
		2	5131	7323	7806	15129	9201	8899	18100	38360					
		3	5596	7338	6899	14237	8902	8611	17513	37346					
		4	5669	8249	7733	15982	9964	9962	19926	41577					
AT Wgt			10655	14678	14749	29427	18116	17717	35833	75914		-5.21%	-1.75%	2.00%	-0.53%
12	**10732**	**1**	5180	6595	6606	13201	8311	7784	16095	34476	**12**				
		2	5402	8057	7261	15318	9691	9420	19111	39831					
		3	5354	6778	7135	13913	8211	7909	16120	35387					
		4	5543	9241	8915	18156	10348	10128	20476	44175					
AT Wgt			10740	15336	14959	30294	18281	17621	35901	76935		-4.45%	1.15%	2.19%	0.81%
13	**11018**	**1**	5283	6295	7323	13618	8723	8015	16738	35639	**13**				
		2	5215	7173	7795	14968	9135	8921	18056	38239					
		3	5691	6769	7082	13851	8727	8192	16919	36461					
		4	5484	8452	7991	16443	10119	10130	20249	42176					
AT Wgt			10837	14345	15096	29440	18352	17629	35981	76258		-3.59%	-1.70%	2.42%	-0.08%
14	**11331**	**1**	5120	6304	6410	12714	8350	7768	16118	33952	**14**				
		2	5232	7252	6858	14110	9261	9336	18597	37939					
		3	5411	7336	6741	14077	8747	8123	16870	36358					
		4	5854	9045	8035	17080	9803	10306	20109	43043					
AT Wgt			10809	14969	14022	28991	18081	17767	35847	75646		-3.84%	-3.20%	2.04%	-0.88%
15	**11954**	**1**	5021	6474	7146	13620	7662	7506	15168	33809	**15**				
		2	5235	7554	8009	15563	9184	8637	17821	38619					
		3	5376	6840	7131	13971	8555	8088	16643	35990					
		4	5195	8661	7949	16610	10147	10308	20455	42260					
AT Wgt			10414	14765	15118	29882	17774	17270	35044	75339		-7.35%	-0.23%	-0.25%	-1.29%
16	**11966**	**1**	5113	5923	7045	12968	8198	7629	15827	33908	**16**				
		2	5345	7676	7512	15188	9177	9029	18206	38739					

Measured values (lbs) | **Measurement errors (%)**

5-Axle Air Ride

Lane 4 March 1999

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			11240	14880	15070	29950	17900	17230	35130	76320		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
		3	5700	6679	7440	14119	8708	7967	16675	36494					
		4	5477	8791	8092	16883	9991	10042	20033	42393					
AT Wgt			10818	14535	15045	29579	18037	17334	35371	75767		-3.76%	-1.24%	0.68%	-0.72%
17	**5464**	**1**	5241	6189	7184	13373	8313	7512	15825	34439	**17**				
	Day 2	**2**	5477	7931	7978	15909	9852	9307	19159	40545					
		3	5651	6738	6646	13384	8580	8159	16739	35774					
		4	6070	8882	7722	16604	10286	10117	20403	43077					
AT Wgt			11220	14870	14765	29635	18516	17548	36063	76918		-0.18%	-1.05%	2.66%	0.78%
18	**5830**	**1**	5076	6000	7435	13435	8641	7649	16290	34801	**18**				
		2	5369	7232	8070	15302	9153	9087	18240	38911					
		3	5519	7592	6999	14591	8959	8408	17367	37477					
		4	5945	8840	7552	16392	10044	10136	20180	42517					
AT Wgt			10955	14832	15028	29860	18399	17640	36039	76853		-2.54%	-0.30%	2.59%	0.70%
19	**6161**	**1**	5085	6593	7133	13726	8476	7912	16388	35199	**19**				
		2	5336	7495	7321	14816	9254	9144	18398	38550					
		3	5740	7041	7706	14747	8800	8297	17097	37584					
		4	5804	8494	8130	16624	10211	10240	20451	42879					
AT Wgt			10983	14812	15145	29957	18371	17797	36167	77106		-2.29%	0.02%	2.95%	1.03%
20	**6470**	**1**	5001	6390	7118	13508	8306	7781	16087	34596	**20**				
		2	5369	7400	8073	15473	8880	8549	17429	38271					
		3	5605	6972	6910	13882	8935	8214	17149	36636					
		4	5669	8474	7735	16209	10258	10136	20394	42272					
AT Wgt			10822	14618	14918	29536	18190	17340	35530	75888		-3.72%	-1.38%	1.14%	-0.57%
21	**6769**	**1**	5325	6055	7506	13561	8335	7537	15872	34758	**21**				
		2	5583	7541	7784	15325	9773	9362	19135	40043					
		3	5629	6439	7329	13768	8375	8189	16564	35961					
		4	5759	8873	7645	16518	10242	10319	20561	42838					
AT Wgt			11148	14454	15132	29586	18363	17704	36066	76800		-0.82%	-1.22%	2.66%	0.63%
22	**7054**	**1**	5213	6011	7153	13164	8205	7517	15722	34099	**22**				
		2	5696	7960	7678	15638	9911	9539	19450	40784					
		3	5806	6525	7010	13535	8745	8262	17007	36348					
		4	5859	8774	8125	16899	10238	10359	20597	43355					
AT Wgt			11287	14635	14983	29618	18550	17839	36388	77293		0.42%	-1.11%	3.58%	1.27%
23	**7348**	**1**	5210	6134	7102	13236	8408	7797	16205	34651	**23**				
		2	5590	7334	7781	15115	9673	9193	18866	39571					
		3	5797	6893	6853	13746	9058	8315	17373	36916					
		4	5901	8813	8273	17086	10278	10238	20516	43503					
AT Wgt			11249	14587	15005	29592	18709	17772	36480	77321		0.08%	-1.20%	3.84%	1.31%
24	**7643**	**1**	5166	6644	7404	14048	8895	8070	16965	36179	**24**				
		2	4974	6959	7645	14604	8818	8542	17360	36938					
		3	5338	7552	7100	14652	8694	8289	16983	36973					
		4	5643	7901	7175	15076	10008	9936	19944	40663					
AT Wgt			10561	14528	14662	29190	18208	17419	35626	75377		-6.05%	-2.54%	1.41%	-1.24%

	Steering	Drive	Trailer	GVW
Avg	-3.23%	-1.18%	1.98%	-0.03%
Std Dev	2.63%	1.88%	1.88%	1.77%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0

Measured values (lbs) | **Measurement errors (%)**

6-Axle Conv. Ride

Lane 1 March 1999

				Drive			Trailer									
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	3rd axle	Tot 4+5+6	GVW		% err	% err	% err	% err
			9590	15260	14930	30190	11670	14770	14230	40670	80450					
Pass No	Run No	Sens No	1st Axle	2nd Axle	3rd Axle	2+3	4th Axle	5th Axle	6th Axle	Tot 4+5+6	GVW	Pass No	Steer	Drive	Trailer	GVW
1	7350	1	4364	7515	7713	15228	5352	5422	5782	16556	36148	1				
		2	4866	8280	9294	17574	6591	9473	10143	26207	48647					
		3	4470	7164	6485	13649	4814	5521	6132	16467	34586					
		4	3962	7098	7775	14873	4833	8154	8361	21348	40183					
AT Wgt			8831	15029	15634	30662	10795	14285	15209	40289	79782		-7.91%	1.56%	-0.94%	-0.83%
2	7630	1	4364	7179	7221	14400	4825	5363	4948	15136	33900	2				
		2	5341	8271	9519	17790	5971	10189	9206	25366	48497					
		3	4498	7213	6622	13835	3486	5954	5773	15213	33546					
		4	4604	7371	7720	15091	4983	7947	8236	21166	40861					
AT Wgt			9404	15017	15541	30558	9633	14727	14082	38441	78402		-1.94%	1.22%	-5.48%	-2.55%
3	7884	1	4474	7321	7336	14657	4571	6097	4961	15629	34760	3				
		2	5378	8161	9517	17678	7519	10919	10522	28960	52016					
		3	4536	8011	6990	15001	4864	6990	7012	18866	38403					
		4	5151	8088	7806	15894	5404	9636	10000	25040	46085					
AT Wgt			9770	15791	15825	31615	11179	16821	16248	44248	85632		1.87%	4.72%	8.80%	6.44%
4	8117	1	4562	7074	7288	14362	4134	5224	5678	15036	33960	4				
		2	5682	8454	9554	18008	6070	9539	9870	25479	49169					
		3	4769	7058	6315	13373	3965	6148	5936	16049	34191					
		4	5228	7583	7918	15501	5696	8950	8926	23572	44301					
AT Wgt			10121	15085	15538	30622	9933	14931	15205	40068	80811		5.53%	1.43%	-1.48%	0.45%
5	9330	1	4769	7296	7488	14784	4558	4970	4675	14203	33756	5				
		2	5912	8465	9508	17973	7034	9398	9975	26407	50292					
		3	4802	7770	6842	14612	4556	6229	6119	16904						
		4	5182	7812	7843	15655	5283	8615	8745	22643	43480					
AT Wgt			10333	15672	15841	31512	10716	14606	14757	40079	63764		7.74%	4.38%	-1.45%	-20.74%
6	9604	1	4840	7027	7314	14341	3069	4767	4066	11902	31083	6				
		2	4977	7687	9285	16972	4807	9032	9354	23193	45142					
		3	4450	7243	6544	13787	3484	6079	5468	15031	33268					
		4	3903	7466	7625	15091	4886	8593	9501	22980	41974					
AT Wgt			9085	14712	15384	30096	8123	14236	14195	36553	75734		-5.27%	-0.31%	-10.12%	-5.86%
7	9870	1	4326	7122	7279	14401	4320	5420	5521	15261	33988	7				
		2	4981	8247	9651	17898	5682	9859	9808	25349	48228					
		3	4644	7219	6586	13805	3859	6251	5940	16050	34499					
		4	4941	7563	7978	15541	5806	8972	8827	23605	44087					
AT Wgt			9446	15076	15747	30823	9834	15251	15048	40133	80401		-1.50%	2.10%	-1.32%	-0.06%
8	10193	1	4454	7303	7455	14758	3984	5554	5382	14920	34132	8				
		2	4370	7951	9457	17408	4361	10139	10434	24934	46712					
		3	4644	7837	6626	14463	3909	6833	6106	16848	35955					
		4	5133	7748	8253	16001	6337	10203	9574	26114	47248					
AT Wgt			9301	15420	15896	31315	9296	16365	15748	41408	82024		-3.02%	3.73%	1.81%	1.96%
9	10513	1	4642	7336	7404	14740	3991	5166	5193	14350	33732	9				
		2	5931	8824	10017	18841	5612	10904	11171	27687	52459					
		3	4562	7389	6690	14079	3422	6796	5689	15907	34548					
		4	5063	7729	8002	15731	4902	9358	8888	23148	43942					
AT Wgt			10099	15639	16057	31696	8964	16112	15471	40546	82341		5.31%	4.99%	-0.30%	2.35%
10	10812	1	4452	7164	7138	14302	4214	4988	4487	13689	32443	10				
		2	5618	8478	9676	18154	6390	11131	9938	27459	51231					
		3	4417	7464	6833	14297	4573	6275	5976	16824	35538					
		4	5235	8125	7848	15973	5446	8921	8919	23286	44494					
AT Wgt			9861	15616	15748	31363	10312	15658	14660	40629	81853		2.83%	3.89%	-0.10%	1.74%
11	11086	1	4617	7376	7413	14789	4300	4933	4670	13903	33309	11				
		2	5614	8368	9321	17689	5845	9788	9565	25198	48501					
		3	4516	7700	7076	14776	4216	6269	6185	16670	35962					
		4	5124	7914	7841	15755	5579	8580	8403	22562	43441					
AT Wgt			9936	15679	15826	31505	9970	14785	14412	39167	80607		3.60%	4.35%	-3.70%	0.19%
12	11400	1	4752	7045	7235	14280	4042	4957	4018	13017	32049	12				
		2	5879	8258	9517	17775	5852	8957	9027	23836	47490					
		3	4752	7471	6608	14079	4386	5942	5497	15825	34656					
		4	5243	7400	7501	14901	5052	8840	8553	22445	42589					
AT Wgt			10313	15087	15431	30518	9666	14348	13548	37562	78392		7.54%	1.08%	-7.64%	-2.56%
13	11709	1	4626	7484	7312	14796	4395	4683	4540	13618	33040	13				
		2	4597	8042	8884	16926	5954	8996	9164	24114	45637					
		3	4670	7433	6573	14006	4033	6313	6125	16471	35147					
		4	5138	8189	8170	16359	5570	10017	9755	25342	46839					
AT Wgt			9516	15574	15470	31044	9976	15005	14792	39773	80332		-0.78%	2.83%	-2.21%	-0.15%
14	5613	1	4668	6822	7184	14006	4525	5852	4683	15060	33734	14				
		2	5382	7071	8741	15812	5991	9080	9475	24546	45740					
		3	4714	7678	6650	14328	3689	6176	5737	15602	34644					
		4	4344	7235	6646	13881	4392	8467	8538	21397	39622					
AT Wgt			9554	14403	14611	29014	9299	14788	14217	38303	76870		-0.38%	-3.90%	-5.82%	-4.45%
15	5941	1	4428	7100	7153	14253	4558	5722	5094	15374	34055	15				
		2	4765	8066	8895	16961	6452	10873	9431	26756	48482					
		3	4514	7519	6712	14231	4522	6628	6375	17525	36270					
		4	5135	8081	8145	16226	6306	9429	9609	25344	46705					
AT Wgt			9421	15383	15453	30836	10919	16326	15255	42500	82756		-1.76%	2.14%	4.50%	2.87%
16	6285	1	4498	7431	7446	14877	4968	6236	5332	16536	35911	16				
		2	3859	7453	8639	16092	6242	9841	9508	25591	45542					
		3	4644	7753	6968	14721	4957	6705	6710	18372	37737					
		4	4624	7713	7991	15704	5354	10000	9812	25166	45494					
AT Wgt			8813	15175	15522	30697	10761	16391	15681	42833	82342		-8.11%	1.68%	5.32%	2.35%
17	6573	1	4617	7206	7371	14577	4675	5651	4732	15058	34252	17				
		2	4454	7444	8330	15774	5782	9318	9135	24235	44463					
		3	4679	7579	6595	14174	5283	6445	6048	17776	36629					
		4	4377	7473	7464	14937	5266	9208	9034	23508	42822					

Measured values (lbs) | **Measurement errors (%)**

6-Axle Conv. Ride

Lane 1 March 1999

				Drive			Trailer									
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	3rd axle	Tot 4+5+6	GVW		% err	% err	% err	% err
			9590	15260	14930	30190	11670	14770	14230	40670	80450					
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*6th Axle*	*Tot 4+5+6*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
AT Wgt			9064	14851	14880	29731	10503	15311	14475	40289	79083		-5.49%	-1.52%	-0.94%	-1.70%
18	**6853**	**1**	4730	7155	7005	14160	4311	4941	4123	13375	32265	**18**				
		2	4913	7120	8573	15693	5155	8593	8496	22244	42850					
		3	4564	7433	6624	14057	4357	6293	5837	16487	35108					
		4	4137	7601	7069	14670	5660	8710	8787	23157	41964					
AT Wgt			9172	14655	14636	29290	9742	14269	13622	37632	76094		-4.36%	-2.98%	-7.47%	-5.42%
19	**7144**	**1**	4783	6902	7118	14020	3799	4827	4216	12842	31645	**19**				
		2	5069	7440	8514	15954	4317	8919	8765	22001	43024					
		3	4628	7451	6668	14119	4064	6024	6081	16169	34916					
		4	4062	7259	7168	14427	5704	8659	8736	23099	41588					
AT Wgt			9271	14526	14734	29260	8942	14215	13899	37056	75587		-3.33%	-3.08%	-8.89%	-6.05%
20	**7458**	**1**	4615	7239	7314	14553	3731	4699	4408	12838	32006	**20**				
		2	4694	7883	8644	16527	5748	9490	8873	24111	45332					
		3	4633	7171	6677	13848	3164	6002	5951	15117	33598					
		4	5164	8039	8066	16105	6086	9446	9537	25069	46338					
AT Wgt			9553	15166	15351	30517	9365	14819	14385	38568	78637		-0.39%	1.08%	-5.17%	-2.25%
21	**7739**	**1**	4503	7184	7338	14522	4361	4578	4439	13378	32403	**21**				
		2	4373	7695	8906	16601	4939	9629	9126	23694	44668					
		3	4732	7336	6710	14046	3885	6185	6172	16242	35020					
		4	5215	8013	7678	15691	6569	10136	9792	26497	47403					
AT Wgt			9412	15114	15316	30430	9877	15264	14765	39906	79747		-1.86%	0.79%	-1.88%	-0.87%

	Steering	Drive	Trailer	GVW
Avg	-0.56%	1.44%	-2.12%	-1.67%
Std Dev	4.54%	2.54%	4.64%	5.26%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0

Measured values (lbs) | **Measurement errors (%)**

6-Axle Conv. Ride

Lane 2 March 1999

				Drive			Trailer									
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	3rd axle	Tot 4+5+6	GVW					
			9590	15260	14930	30190	11670	14770	14230	40670	80450		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*6th Axle*	*Tot 4+5+6*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1		**1**	7557	14403	15003	29406	8630	15594	16366	40590	77553	**1**				
		2	7987	16374	16339	32713	10302	16268	16943	43513	84213					
AT Wgt			7772	15389	15671	31060	9466	15931	16655	42052	80883		-18.96%	2.88%	3.40%	0.54%
2		**1**	8046	14463	13858	28321	10161	17722	17217	45100	81467	**2**				
		2	8606	15384	16271	31655	9080	16191	17137	42408	82669					
AT Wgt			8326	14924	15065	29988	9621	16957	17177	43754	82068		-13.18%	-0.67%	7.58%	2.01%
3		**1**	7261	14127	13755	27882	10743	16171	15009	41923	77066	**3**				
		2	8147	15925	16994	32919	9779	15190	15717	40686	81752					
AT Wgt			7704	15026	15375	30401	10261	15681	15363	41305	79409		-19.67%	0.70%	1.56%	-1.29%
4		**1**	8264	13435	13345	26780	10061	14831	14363	39255	74299	**4**				
		2	10633	15153	16158	31311	8403	13775	14416	36594	78538					
AT Wgt			9449	14294	14752	29046	9232	14303	14390	37925	76419		-1.48%	-3.79%	-6.75%	-5.01%
5		**1**	8743	14366	14101	28467	11601	16359	15592	43552	80762	**5**				
		2	10913	15779	16901	32680	10756	15124	16097	41977	85570					
AT Wgt			9828	15073	15501	30574	11179	15742	15845	42765	83166		2.48%	1.27%	5.15%	3.38%

	Steering	Drive	Trailer	GVW
Avg	-10.16%	0.08%	2.19%	-0.08%
Std Dev	9.08%	2.24%	4.89%	2.92%
Number of pts exceeding 15% axle or 10% GVW	2	0	0	0

Measured values (lbs) | **Measurement errors (%)**

6-Axle Conv. Ride

Lane 3 March 1999

				Drive			Trailer									
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	3rd axle	Tot 4+5+6	GVW					
			9590	15260	14930	30190	11670	14770	14230	40670	80450		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*6th Axle*	*Tot 4+5+6*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**7973**	**1**	9115	16167	16438	32605	11338	15642	16022	43002	84722	**1**				
		2	8319	14185	15259	29444	8529	15239	15576	39344	77107					
AT Wgt			8717	15176	15849	31025	9934	15441	15799	41173	80915		-9.10%	2.76%	1.24%	0.58%
2		**1**	8606	15400	16573	31973	9616	15858	15486	40960	81539	**2**				
		2	9111	13997	14116	28113	9151	16769	16641	42561	79785					
AT Wgt	**9350**		8859	14699	15345	30043	9384	16314	16064	41761	80662		-7.63%	-0.49%	2.68%	0.26%
3		**1**	8857	15001	16061	31062	9991	15442	15106	40539	80458	**3**				
		2	8333	14696	14485	29181	10152	17005	16496	43653	81167					
AT Wgt			8595	14849	15273	30122	10072	16224	15801	42096	80813		-10.38%	-0.23%	3.51%	0.45%
4	**9614**	**1**	8860	15964	16800	32764	10443	16791	16044	43278	84902	**4**				
		2	8617	13702	14676	28378	9362	16976	16299	42637	79632					
AT Wgt			8739	14833	15738	30571	9903	16884	16172	42958	82267		-8.88%	1.26%	5.62%	2.26%
5	**9924**	**1**	9076	15576	16238	31814	11287	15951	15459	42697	83587	**5**				
		2	8372	14392	14659	29051	10000	17062	16200	43262	80685					
AT Wgt			8724	14984	15449	30433	10644	16507	15830	42980	82136		-9.03%	0.80%	5.68%	2.10%
6	**10217**	**1**	9056	15468	16083	31551	10366	16346	15435	42147	82754	**6**				
		2	8703	14372	14613	28985	10278	17993	15986	44257	81945					
AT Wgt			8880	14920	15348	30268	10322	17170	15711	43202	82350		-7.41%	0.26%	6.23%	2.36%

	Steering	Drive	Trailer	GVW
Avg	-8.74%	0.73%	4.16%	1.33%
Std Dev	0.99%	1.08%	1.82%	0.91%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0

Measured values (lbs) | **Measurement errors (%)**

6-Axle Conv. Ride

Lane 4 March 1999

				Drive			Trailer									
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	3rd axle	Tot 4+5+6	GVW		% err	% err	% err	% err
			9590	15260	14930	30190	11670	14770	14230	40670	80450					
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*6th Axle*	*Tot 4+5+6*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**6808**	**1**	4800	7914	7850	15764	4933	5175	6412	16520	37084	**1**				
		2	4141	7146	8205	15351	5510	7186	7713	20409	39901					
		3	3744	6441	6461	12902	4988	4959	4492	14439	31085					
		4	4258	7151	7841	14992	5711	8271	7870	21852	41102					
AT Wgt			8472	14326	15179	29505	10571	12796	13244	36610	74586		-11.66%	-2.27%	-9.98%	-7.29%
2	**7276**	**1**	4309	7581	7464	15045	4880	5565	7131	17576	36930	**2**				
		2	4066	7063	8322	15385	4979	7920	9074	21973	41424					
		3	4705	7382	7358	14740	5023	5574	5801	16398	35843					
		4	4450	7945	9052	16997	6880	8763	8957	24600	46047					
AT Wgt			8765	14986	16098	31084	10881	13911	15482	40274	80122		-8.60%	2.96%	-0.97%	-0.41%
3	**7554**	**1**	4677	7453	7779	15232	3281	5191	6836	15308	35217	**3**				
		2	4403	7025	8313	15338	5149	7288	7618	20055	39796					
		3	3345	6024	5799	11823	3883	4472	4258	12613	27781					
		4	4366	7243	7757	15000	5757	8644	7213	21614	40980					
AT Wgt			8396	13873	14824	28697	9035	12798	12963	34795	71887		-12.46%	-4.95%	-14.45%	-10.64%
4	**7825**	**1**	4606	7479	7744	15223	4758	4941	5923	15622	35451	**4**				
		2	4421	7012	8344	15356	5363	7277	7689	20329	40106					
		3	3532	6152	5691	11843	4110	5221	4370	13701	29076					
		4	4584	7071	7823	14894	5874	9695	7634	23203	42681					
AT Wgt			8572	13857	14801	28658	10053	13567	12808	36428	73657		-10.62%	-5.07%	-10.43%	-8.44%
5	**8044**	**1**	4262	7669	7704	15373	3422	5576	5812	14810	34445	**5**				
		2	4388	6939	8020	14959	4694	6584	7501	18779	38126					
		3	3023	5793	5621	11414	2538	5341	4123	12002						
		4	4474	7193	7931	15124	4732	8520	7382	20634	40232					
AT Wgt			8074	13797	14638	28435	7693	13011	12409	33113	56402		-15.81%	-5.81%	-18.58%	-29.89%
6	**8282**	**1**	4705	7634	7885	15519	3674	5349	6289	15312	35536	**6**				
		2	4507	7340	8533	15873	4723	7453	7841	20017	40397					
		3	4110	6648	6055	12703	4240	5799	4549	14588	31401					
		4	4772	7186	7790	14976	5208	9133	8095	22436	42184					
AT Wgt			9047	14404	15132	29536	8923	13867	13387	36177	74759		-5.66%	-2.17%	-11.05%	-7.07%
7	**9259**	**1**	4659	7662	7905	15567	3726	5349	6558	15633	35859	**7**				
		2	4311	7096	8423	15519	4198	7629	7830	19657	39487					
		3	4004	6439	6017	12456	4256	5951	5096	15303	31763					
		4	4417	7100	7967	15067	5479	9792	7464	22735	42219					
AT Wgt			8696	14149	15156	29305	8830	14361	13474	36664	74664		-9.33%	-2.93%	-9.85%	-7.19%
8	**9514**	**1**	4434	7501	8031	15532	4902	5828	6659	17389	37355	**8**				
		2	4309	7056	8467	15523	4902	8024	7909	20835	40667					
		3	4331	7354	6972	14326	5111	6664	5442	17217	35874					
		4	4639	7354	7995	15349	6110	10154	8218	24482	44470					
AT Wgt			8857	14633	15733	30365	10513	15335	14114	39962	79183		-7.65%	0.58%	-1.74%	-1.57%
9	**9789**	**1**	4324	7349	7687	15036	4794	5268	6269	16331	35691	**9**				
		2	4428	7012	8990	16002	5113	8328	8057	21498	41928					
		3	4293	7230	6789	14019	5162	6935	5729	17826	36138					
		4	4465	7671	8015	15686	6317	10743	8935	25995	46146					
AT Wgt			8755	14631	15741	30372	10693	15637	14495	40825	79952		-8.71%	0.60%	0.38%	-0.62%
10	**10111**	**1**	4558	7587	7748	15335	4849	5409	6487	16745	36638	**10**				
		2	4668	7334	8919	16253	5731	8476	8555	22762	43683					
		3	4494	6864	6529	13393	5127	6145	4302	15574	33461					
		4	4567	7579	8055	15634	5508	10432	8355	24295	44496					
AT Wgt			9144	14682	15626	30308	10608	15231	13850	39688	79139		-4.66%	0.39%	-2.41%	-1.63%
11	**10440**	**1**	4421	6787	7391	14178	4955	4915	5501	15371	33970	**11**				
		2	4739	7241	8743	15984	5660	8295	8006	21961	42684					
		3	4675	7310	6518	13828	4800	6933	5369	17102	35605					
		4	4840	7788	7720	15508	5971	9856	8293	24120	44468					
AT Wgt			9338	14563	15186	29749	10693	15000	13585	39277	78364		-2.63%	-1.46%	-3.43%	-2.59%
12	**10709**	**1**	4156	7521	7803	15324	4452	5263	6536	16251	35731	**12**				
		2	4529	7504	9016	16520	5354	9102	8692	23148	44197					
		3	4571	7374	7127	14501	5444	6152	5762	17358	36430					
		4	4622	7768	8337	16105	5855	10295	8024	24174	44901					
AT Wgt			8939	15084	16142	31225	10553	15406	14507	40466	80630		-6.79%	3.43%	-0.50%	0.22%
13	**10999**	**1**	4494	7232	7834	15066	5131	5274	5892	16297	35857	**13**				
		2	4430	7292	8985	16277	5572	8657	8560	22789	43496					
		3	4626	7504	6851	14355	4752	7082	5521	17355	36336					
		4	4763	7773	7912	15685	6417	10438	9085	25940	46388					
AT Wgt			9157	14901	15791	30692	10936	15726	14529	41191	81039		-4.52%	1.66%	1.28%	0.73%
14	**11310**	**1**	4465	7411	7437	14848	4185	5202	6456	15843	35156	**14**				
		2	4467	7460	9109	16569	5649	8727	9054	23430	44466					
		3	4631	7235	7025	14260	3949	5854	4853	14656	33547					
		4	4498	7601	8566	16167	6648	9484	7892	24024	44689					
AT Wgt			9031	14854	16069	30922	10216	14634	14128	38977	78929		-5.83%	2.42%	-4.16%	-1.89%
15	**11631**	**1**	4492	7424	7967	15391	5365	5848	5874	17087	36970	**15**				
		2	4425	7151	8895	16046	5140	7775	8423	21338	41809					
		3	4443	7290	6818	14108	5475	6935	5415	17825	36376					
		4	4681	7398	7898	15296	6873	10214	8630	25717	45694					
AT Wgt			9021	14632	15789	30421	11427	15386	14171	40984	80425		-5.94%	0.76%	0.77%	-0.03%
16	**11946**	**1**	4657	7506	8057	15563	2893	5429	6333	14655	34875	**16**				
		2	4800	7263	8703	15966	5105	7801	8306	21212	41978					
		3	4459	7036	6672	13708	4547	5583	4653	14783	32950					
		4	4593	7415	7980	15395	5830	9391	7848	23069	43057					
AT Wgt			9255	14610	15706	30316	9188	14102	13570	36860	76430		-3.50%	0.42%	-9.37%	-5.00%
17	**5467**	**1**	4463	7398	7766	15164	3096	5312	6269	14677	34304	**17**				
		2	4302	7065	8487	15552	4560	7649	7488	19697	39551					
		3	3671	6293	5965	12258	4571	5517	4884	14972	30901					
		4	4507	7078	7925	15003	5698	9689	8132	23519	43029					

Measured values (lbs) **Measurement errors (%)**

6-Axle Conv. Ride

Lane 4 March 1999

				Drive			Trailer									
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	3rd axle	Tot 4+5+6	GVW		% err	% err	% err	% err
			9590	15260	14930	30190	11670	14770	14230	40670	80450					
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*6th Axle*	*Tot 4+5+6*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
AT Wgt			8472	13917	15072	28989	8963	14084	13387	36433	73893		-11.66%	-3.98%	-10.42%	-8.15%
18	**5841**	**1**	4287	7305	7482	14787	3678	5515	6022	15215	34289	**18**				
		2	4278	6983	8604	15587	5967	9012	8802	23781	43646					
		3	4531	7561	6999	14560	3876	7257	5960	17093	36184					
		4	4571	7837	8086	15923	6178	10308	8769	25255	45749					
AT Wgt			8834	14843	15586	30429	9850	16046	14777	40672	79934		-7.89%	0.79%	0.00%	-0.64%
19	**6169**	**1**	4311	7821	8289	16110	4661	5513	6573	16747	37168	**19**				
		2	4434	6981	8529	15510	5069	8249	8297	21615	41559					
		3	4328	7113	7186	14299	5096	6410	5363	16869	35496					
		4	4377	7314	8143	15457	4922	9834	7627	22383	42217					
AT Wgt			8725	14615	16074	30688	9874	15003	13930	38807	78220		-9.02%	1.65%	-4.58%	-2.77%
20	**6475**	**1**	4258	7523	7598	15121	4701	6042	7047	17790	37169	**20**				
		2	4346	6906	8264	15170	4736	8456	8569	21761	41277					
		3	4604	7387	7182	14569	4337	5753	5468	15558	34731					
		4	4553	7598	8097	15695	6079	9177	7362	22618	42866					
AT Wgt			8881	14707	15571	30278	9927	14714	14223	38864	78022		-7.40%	0.29%	-4.44%	-3.02%
21	**6780**	**1**	4231	7784	7583	15367	5049	5962	6937	17948	37546	**21**				
		2	4260	7043	8353	15396	4844	8655	8432	21931	41587					
		3	4507	7360	7184	14544	5321	5804	5473	16598	35649					
		4	4743	7596	8042	15638	6732	9285	7495	23512	43893					
AT Wgt			8871	14892	15581	30473	10973	14853	14169	39995	79338		-7.50%	0.94%	-1.66%	-1.38%
22	**7076**	**1**	4214	7235	7799	15034	3691	5155	5967	14813	34061	**22**				
		2	4165	6851	8626	15477	5704	7596	7909	21209	40851					
		3	4216	7131	6897	14028	4772	7153	5585	17510	35754					
		4	4331	7415	7799	15214	6840	10055	8368	25263	44808					
AT Wgt			8463	14316	15561	29877	10504	14980	13915	39398	77737		-11.75%	-1.04%	-3.13%	-3.37%
23	**7366**	**1**	4269	7067	7468	14535	4672	5175	6637	16484	35288	**23**				
		2	4408	7246	8880	16126	5285	9111	8758	23154	43688					
		3	4690	7263	6723	13986	5266	6600	4983	16849	35525					
		4	4809	7704	8165	15869	6178	10209	8842	25229	45907					
AT Wgt			9088	14640	15618	30258	10701	15548	14610	40858	80204		-5.23%	0.23%	0.46%	-0.31%
24	**7659**	**1**	4379	7133	7605	14738	4858	5274	5819	15951	35068	**24**				
		2	4304	7175	8588	15763	5839	8734	7931	22504	42571					
		3	4575	7296	6990	14286	5221	6686	5722	17629	36490					
		4	4520	7632	8154	15786	6306	10099	8666	25071	45377					
AT Wgt			8889	14618	15669	30287	11112	15397	14069	40578	79753		-7.31%	0.32%	-0.23%	-0.87%

	Steering	Drive	Trailer	GVW
Avg	-8.01%	-0.51%	-4.94%	-4.33%
Std Dev	3.09%	2.50%	5.35%	6.20%
Number of pts exceeding 15% axle or 10% GVW	1	0	1	2

Measurement errors (%)

2-Axle Dump

Lane 1 March 1999

			Steer	Drive 1st axle	GVW				
			9760	21260	31020		% err	% err	% err
Pass No	Run No	Sens No	1st Axle	2nd Axle	GVW	Pass No	Steer	Drive	GVW
1	7337	1	4430	10220	14650	1			
		2	4119	10467	14586				
		3	5089	11874	16963				
		4	5153	10796	15949				
AT Wgt			9396	21679	31074		-3.73%	1.97%	0.17%
2	7616	1	4560	10760	15320	2			
		2	4253	11040	15293				
		3	5100	11733	16833				
		4	4970	10004	14974				
AT Wgt			9442	21769	31210		-3.26%	2.39%	0.61%
3	7870	1	4871	10024	14895	3			
		2	5142	11091	16233				
		3	4472	11576	16048				
		4	4994	10727	15721				
AT Wgt			9740	21709	31449		-0.21%	2.11%	1.38%
4	8108	1	5210	10456	15666	4			
		2	4780	11100	15880				
		3	4679	11656	16335				
		4	4108	9627	13735				
AT Wgt			9389	21420	30808		-3.81%	0.75%	-0.68%
5	9314	1	4556	10178	14734	5			
		2	4141	10615	14756				
		3	4628	11261	15889				
		4	4533	11387	15920				
AT Wgt			8929	21721	30650		-8.51%	2.17%	-1.19%
6	9590	1	4668	10386	15054	6			
		2	4844	10707	15551				
		3	4809	11197	16006				
		4	4952	10820	15772				
AT Wgt			9637	21555	31192		-1.27%	1.39%	0.55%
7	9859	1	4963	10070	15033	7			
		2	4331	11331	15662				
		3	4869	11287	16156				
		4	4428	9316	13744				
AT Wgt			9296	21002	30298		-4.76%	-1.21%	-2.33%
8	10186	1	4472	10050	14522	8			
		2	4445	11772	16217				
		3	5102	11025	16127				
		4	5283	10423	15706				
AT Wgt			9651	21635	31286		-1.12%	1.76%	0.86%
9	10494	1	4807	10591	15398	9			
		2	4498	11111	15609				
		3	4754	11823	16577				
		4	5166	10189	15355				
AT Wgt			9613	21857	31470		-1.51%	2.81%	1.45%
10	10799	1	4864	9521	14385	10			
		2	4880	10015	14895				
		3	4633	10946	15579				
		4	4339	8935	13274				
AT Wgt			9358	19709	29067		-4.12%	-7.30%	-6.30%
11	11076	1	4902	10229	15131	11			
		2	4414	10813	15227				
		3	4908	11001	15909				
		4	4324	9587	13911				
AT Wgt			9274	20815	30089		-4.98%	-2.09%	-3.00%
12	11383	1	4414	9837	14251	12			
		2	4236	10610	14846				
		3	5049	11446	16495				

Measurement errors (%)

2-Axle Dump

Lane 1 March 1999

			Steer	Drive 1st axle	GVW				
			9760	21260	31020		% err	% err	% err
Pass No	Run No	Sens No	1st Axle	2nd Axle	GVW	Pass No	Steer	Drive	GVW
		4	5072	9620	14692				
AT Wgt			9386	20757	30142		-3.84%	-2.37%	-2.83%
13	11701	1	4498	10330	14828	13			
		2	4417	10833	15250				
		3	4459	11435	15894				
		4	4500	10145	14645				
AT Wgt			8937	21372	30309		-8.43%	0.52%	-2.29%
14	5585	1	4635	10075	14710	14			
		2	4644	10289	14933				
		3	5063	11468	16531				
		4	4730	10890	15620				
AT Wgt			9536	21361	30897		-2.30%	0.48%	-0.40%
15	5916	1	4736	10875	15611	15			
		2	4430	11821	16251				
		3	4840	11444	16284				
		4	4580	9623	14203				
AT Wgt			9293	21882	31175		-4.78%	2.92%	0.50%
16	6247	1	4811	10425	15236	16			
		2	5246	11122	16368				
		3	4877	11940	16817				
		4	4745	9592	14337				
AT Wgt			9840	21540	31379		0.81%	1.31%	1.16%
17	6541	1	4873	9563	14436	17			
		2	4710	10379	15089				
		3	4593	10604	15197				
		4	4392	9184	13576				
AT Wgt			9284	19865	29149		-4.88%	-6.56%	-6.03%
18	6835	1	4697	9495	14192	18			
		2	5367	11413	16780				
		3	4580	11071	15651				
		4	5058	10807	15865				
AT Wgt			9851	21393	31244		0.93%	0.63%	0.72%
19	7124	1	4677	9909	14586	19			
		2	4470	11748	16218				
		3	5058	11228	16286				
		4	4798	10597	15395				
AT Wgt			9502	21741	31243		-2.65%	2.26%	0.72%
20	7439	1	4772	10606	15378	20			
		2	4745	11001	15746				
		3	4853	10782	15635				
		4	4950	11246	16196				
AT Wgt			9660	21818	31478		-1.02%	2.62%	1.47%
21	7722	1	4844	10275	15119	21			
		2	4778	11021	15799				
		3	4692	11206	15898				
		4	5404	9680	15084				
AT Wgt			9859	21091	30950		1.01%	-0.79%	-0.23%

	Steering	Drive	GVW
Avg	-2.97%	0.27%	-0.75%
Std Dev	2.62%	2.78%	2.23%
Number of pts exceeding 15% axle or 10% GVW	0	0	0

Measurement errors (%)

2-Axle Dump

Lane 2 March 1999

			Steer	Drive 1st axle	GVW				
			9760	21260	31020		% err	% err	% err
Pass No	Run No	Sens No	1st Axle	2nd Axle	GVW	Pass No	Steer	Drive	GVW
1	8037	1	9096	19885	28981	1			
		2	10419	21303	31722				
AT Wgt			9758	20594	30352		-0.03%	-3.13%	-2.16%
2	9137	1	8064	19894	27958	2			
		2	8423	22099	30522				
AT Wgt			8244	20997	29240		-15.54%	-1.24%	-5.74%
3	9410	1	8961	21172	30133	3			
		2	10926	22919	33845				
AT Wgt			9944	22046	31989		1.88%	3.69%	3.12%
4	9681	1	9457	20604	30061	4			
		2	11651	22081	33732				
AT Wgt			10554	21343	31897		8.14%	0.39%	2.83%
5	9989	1	9462	19900	29362	5			
		2	11135	22562	33697				
AT Wgt			10299	21231	31530		5.52%	-0.14%	1.64%
6	10274	1	9349	20632	29981	6			
		2	10754	23602	34356				
AT Wgt			10052	22117	32169		2.99%	4.03%	3.70%

	Steering	Drive	GVW
Avg	0.49%	0.60%	0.57%
Std Dev	7.63%	2.56%	3.41%
Number of pts exceeding 15% axle or 10% GVW	1	0	0

Measurement errors (%)

2-Axle Dump

Lane 3 March 1999

			Steer	Drive 1st axle	GVW				
			9760	21260	31020		% err	% err	% err
Pass No	Run No	Sens No	1st Axle	2nd Axle	GVW	Pass No	Steer	Drive	GVW
1	8203	1	9870	22107	31977	1			
		2	9195	21252	30447				
AT Wgt			9533	21680	31212		-2.33%	1.97%	0.62%
2	9335	1	9975	21841	31816	2			
		2	9468	20751	30219				
AT Wgt			9722	21296	31018		-0.39%	0.17%	-0.01%
3	9593	1	9799	22046	31845	3			
		2	9305	21924	31229				
AT Wgt			9552	21985	31537		-2.13%	3.41%	1.67%
4	9897	1	9790	22621	32411	4			
		2	9759	21333	31092				
AT Wgt			9775	21977	31752		0.15%	3.37%	2.36%
5	10196	1	9792	22024	31816	5			
		2	8710	22696	31406				
AT Wgt			9251	22360	31611		-5.22%	5.17%	1.91%

	Steering	Drive	GVW
Avg	-1.98%	2.82%	1.31%
Std Dev	1.88%	1.67%	0.87%
Number of pts exceeding 15% axle or 10% GVW	0	0	0

Measurement errors (%)

2-Axle Dump

Lane 4 March 1999

			Steer	Drive 1st axle	GVW				
			9760	21260	31020		% err	% err	% err
Pass No	Run No	Sens No	1st Axle	2nd Axle	GVW	Pass No	Steer	Drive	GVW
1	7530	1	4379	11700	16079	1			
		2	4373	9676	14049				
		3	4505	9819	14324				
		4	4904	10207	15111				
AT Wgt			9081	20701	29782		-6.96%	-2.63%	-3.99%
2	7810	1	4439	12231	16670	2			
		2	4152	10143	14295				
		3	4467	9680	14147				
		4	4264	9027	13291				
AT Wgt			8661	20541	29202		-11.26%	-3.38%	-5.86%
3	8039	1	4525	11246	15771	3			
		2	4721	10666	15387				
		3	4600	9669	14269				
		4	4913	10507	15420				
AT Wgt			9380	21044	30424		-3.90%	-1.02%	-1.92%
4	9251	1	4344	12324	16668	4			
		2	4220	9825	14045				
		3	4527	9942	14469				
		4	4520	10163	14683				
AT Wgt			8806	21127	29933		-9.78%	-0.63%	-3.51%
5	9502	1	4456	11585	16041	5			
		2	4472	9382	13854				
		3	4580	11109	15689				
		4	4631	9294	13925				
AT Wgt			9070	20685	29755		-7.07%	-2.70%	-4.08%
6	9778	1	4339	11784	16123	6			
		2	4613	9504	14117				
		3	4443	10577	15020				
		4	4664	9495	14159				
AT Wgt			9030	20680	29710		-7.48%	-2.73%	-4.22%
7	10102	1	4348	11036	15384	7			
		2	5014	10741	15755				
		3	4439	9684	14123				
		4	4893	10505	15398				
AT Wgt			9347	20983	30330		-4.23%	-1.30%	-2.22%
8	10431	1	4694	12311	17005	8			
		2	4337	9817	14154				
		3	4529	10507	15036				
		4	4622	9334	13956				
AT Wgt			9091	20985	30076		-6.85%	-1.30%	-3.04%
9	10696	1	4838	12050	16888	9			
		2	4970	9396	14366				
		3	4317	10939	15256				
		4	4342	10732	15074				
AT Wgt			9234	21559	30792		-5.39%	1.40%	-0.74%
10	10990	1	4229	11144	15373	10			
		2	4317	10050	14367				
		3	4719	10569	15288				
		4	4595	9455	14050				
AT Wgt			8930	20609	29539		-8.50%	-3.06%	-4.77%
11	11303	1	4505	11567	16072	11			
		2	4097	10205	14302				
		3	4392	9916	14308				
		4	4818	9656	14474				
AT Wgt			8906	20672	29578		-8.75%	-2.77%	-4.65%
12	11626	1	4489	12569	17058	12			
		2	4536	10154	14690				
		3	4637	10388	15025				
		4	4754	9682	14436				
AT Wgt			9208	21397	30605		-5.66%	0.64%	-1.34%

Measurement errors (%)

2-Axle Dump

Lane 4 March 1999

			Steer	Drive 1st axle	GVW				
			9760	21260	31020		% err	% err	% err
Pass No	Run No	Sens No	1st Axle	2nd Axle	GVW	Pass No	Steer	Drive	GVW
13	11939	1	4384	11801	16185	13			
		2	4267	10028	14295				
		3	4705	10090	14795				
		4	4714	9757	14471				
AT Wgt			9035	20838	29873		-7.43%	-1.98%	-3.70%
14	5448	1	4542	9997	14539	14			
		2	4503	9446	13949				
		3	5041	11484	16525				
		4	4675	11283	15958				
AT Wgt			9381	21105	30486		-3.89%	-0.73%	-1.72%
15	5814	1	4525	11034	15559	15			
		2	4298	9014	13312				
		3	4580	11426	16006				
		4	4862	10434	15296				
AT Wgt			9133	20954	30087		-6.43%	-1.44%	-3.01%
16	6146	1	4417	10560	14977	16			
		2	4472	9307	13779				
		3	4750	10491	15241				
		4	5083	10851	15934				
AT Wgt			9361	20605	29966		-4.09%	-3.08%	-3.40%
17	6466	1	4712	10410	15122	17			
		2	4269	9018	13287				
		3	4423	11080	15503				
		4	4893	11016	15909				
AT Wgt			9149	20762	29911		-6.27%	-2.34%	-3.58%
18	6747	1	4608	10747	15355	18			
		2	4492	8875	13367				
		3	4642	11371	16013				
		4	4631	10628	15259				
AT Wgt			9187	20811	29997		-5.88%	-2.11%	-3.30%
19	7039	1	4485	10505	14990	19			
		2	4298	8738	13036				
		3	4558	10948	15506				
		4	4906	10436	15342				
AT Wgt			9124	20314	29437		-6.52%	-4.45%	-5.10%
20	7336	1	4560	10518	15078	20			
		2	4666	9400	14066				
		3	4750	10674	15424				
		4	4677	10236	14913				
AT Wgt			9327	20414	29741		-4.44%	-3.98%	-4.12%
21	7624	1	4642	10410	15052	21			
		2	4478	9817	14295				
		3	4677	10586	15263				
		4	4593	10846	15439				
AT Wgt			9195	20830	30025		-5.79%	-2.02%	-3.21%

	Steering	Drive	GVW
Avg	-6.50%	-1.98%	-3.40%
Std Dev	1.91%	1.39%	1.25%
Number of pts exceeding 15% axle or 10% GVW	0	0	0

Appendix F

Pre-Calibration Measurement Errors Obtained With Vehicle Passes, October 1999

Measured values (lbs) | **Measurement errors (%)**

Pre-Calibration 10/5/99
Air Ride Lane 1

				Drive			Trailer								
			Steer	**1st axle**	**2nd axle**	**Tot 2+3**	**1st axle**	**2nd axle**	**Tot 4+5**	**GVW**					
			11520	15420	14700	30120	15820	16340	32160	73800		*% err*	*% err*	*% err*	*% err*
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**6460**	**1**	5598	6514	7365	13879	7078	6483	13561	33038	**1**				
		2	6520	9991	8143	18134	10957	10690	21647	46301					
		3	5718	6972	7523	14495	7402	6983	14385	34598					
		4	6423	9113	7698	16811	10055	10059	20114	43348					
AT Wgt			12130	16295	15365	31660	17746	17108	34854	78643		5.29%	5.11%	8.38%	6.56%
2	**6717**	**1**	5559	5654	6295	11949	5909	5647	11556	29064	**2**				
		2	6970	8959	8747	17706	10999	10694	21693	46369					
		3	5762	6406	6798	13204	6794	6348	13142	32108					
		4	5673	8502	8042	16544	9850	9649	19499	41716					
AT Wgt			11982	14761	14941	29702	16776	16169	32945	74629		4.01%	-1.39%	2.44%	1.12%
3	**6990**	**1**	5517	6051	6939	12990	7069	6196	13265	31772	**3**				
		2	6282	8672	9391	18063	10236	10465	20701	45046					
		3	5643	6906	6939	13845	7634	6966	14600	34088					
		4	5193	7810	8494	16304	9270	9384	18654	40151					
AT Wgt			11318	14720	15882	30601	17105	16506	33610	75529		-1.76%	1.60%	4.51%	2.34%
4	**7297**	**1**	5951	6769	7303	14072	7548	6860	14408	34431	**4**				
		2	7848	9903	9742	19645	10738	11049	21787	49280					
		3	5764	7605	7455	15060	7607	7113	14720	35544					
		4	6412	8668	8097	16765	9093	9316	18409	41586					
AT Wgt			12988	16473	16299	32771	17493	17169	34662	80421		12.74%	8.80%	7.78%	8.97%
5	**7557**	**1**	5563	6454	6864	13318	7199	6611	13810	32691	**5**				
		2	6110	9138	8205	17343	10461	10502	20963	44416					
		3	5689	6796	7327	14123	7729	6899	14628	34440					
		4	5845	8798	7731	16529	9545	9523	19068	41442					
AT Wgt			11604	15593	15064	30657	17467	16768	34235	76495		0.72%	1.78%	6.45%	3.65%

	Steering	Drive	Trailer	GVW
Avg	4.20%	3.18%	5.91%	4.53%
Std Dev	4.93%	3.48%	2.18%	2.86%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result				

Measured values (lbs) | **Measurement errors (%)**

Pre-Calibration 10/5/99
Air Ride Lane 2

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			11520	15420	14700	30120	15820	16340	32160	73800		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**7821**	**1**	10714	14613	14509	29122	16749	16253	33002	72838	**1**				
		2	10714	14613	14509	29122	16749	16253	33002	72838					
AT Wgt			10714	14613	14509	29122	16749	16253	33002	72838		-7.00%	-3.31%	2.62%	-1.30%
2	**8052**	**1**	10844	14906	14901	29807	16185	16070	32255	72906	**2**				
		2	10809	14507	15384	29891	17056	17012	34068	74768					
AT Wgt			10827	14707	15143	29849	16621	16541	33162	73837		-6.02%	-0.90%	3.11%	0.05%
3	**8294**	**1**	11164	14357	14873	29230	15991	15603	31594	71988	**3**				
		2	10787	14613	15627	30240	16895	16529	33424	74451					
AT Wgt			10976	14485	15250	29735	16443	16066	32509	73220		-4.73%	-1.28%	1.09%	-0.79%
4	**8549**	**1**	11457	14837	14712	29549	16224	16066	32290	73296	**4**				
		2	11111	14577	16068	30645	17190	16533	33723	75479					
AT Wgt			11284	14707	15390	30097	16707	16300	33007	74388		-2.05%	-0.08%	2.63%	0.80%
5	**8810**	**1**	10467	15389	14321	29710	15883	15506	31389	71566	**5**				
		2	11554	14357	15226	29583	17164	17267	34431	75568					
AT Wgt			11011	14873	14774	29647	16524	16387	32910	73567		-4.42%	-1.57%	2.33%	-0.32%

	Steering	Drive	Trailer	GVW
Avg	-4.84%	-1.43%	2.36%	-0.31%
Std Dev	1.67%	1.07%	0.68%	0.72%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result				

Measured values (lbs) | **Measurement errors (%)**

Pre-Calibration 10/5/99
Air Ride Lane 3

				Drive			Trailer								
			Steer	**1st axle**	**2nd axle**	**Tot 2+3**	**1st axle**	**2nd axle**	**Tot 4+5**	**GVW**					
			11520	15420	14700	30120	15820	16340	32160	73800		*% err*	*% err*	*% err*	*% err*
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**7755**	**1**	11173	14121	13587	27708	15133	15159	30292	69173	**1**				
		2	11272	14165	13087	27252	15523	15138	30661	69185					
AT Wgt			11223	14143	13337	27480	15328	15149	30477	69179		-2.58%	-8.76%	-5.23%	-6.26%
2	**7896**	**1**	10372	14756	14194	28950	16354	16526	32880	72202	**2**				
		2	10284	14163	14414	28577	16097	15794	31891	70752					
AT Wgt			10328	14460	14304	28764	16226	16160	32386	71477		-10.35%	-4.50%	0.70%	-3.15%
3	**8243**	**1**	10685	15360	14970	30330	16976	16855	33831	74846	**3**				
		2	10330	14094	14099	28193	15675	15237	30912	69435					
AT Wgt			10508	14727	14535	29262	16326	16046	32372	72141		-8.79%	-2.85%	0.66%	-2.25%
4	**8474**	**1**	10873	14983	15384	30367	16370	16657	33027	74267	**4**				
		2	10864	14138	13814	27952	15781	15827	31608	70424					
AT Wgt			10869	14561	14599	29160	16076	16242	32318	72346		-5.66%	-3.19%	0.49%	-1.97%
5	**8745**	**1**	10690	15018	14496	29514	15874	16116	31990	72194	**5**				
		2	10946	13358	13312	26670	14586	14485	29071	66687					
AT Wgt			10818	14188	13904	28092	15230	15301	30531	69441		-6.09%	-6.73%	-5.07%	-5.91%

	Steering	Drive	Trailer	GVW
Avg	-6.69%	-5.21%	-1.69%	-3.91%
Std Dev	2.69%	2.24%	2.83%	1.82%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result				

Measured values (lbs) | **Measurement errors (%)**

Pre-Calibration 10/5/99
Air Ride Lane 4

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			11520	15420	14700	30120	15820	16340	32160	73800		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**6395**	**1**	5614	6333	7043	13376	7442	6882	14324	33314	**1**				
		2	5808	8242	8139	16381	9400	9204	18604	40793					
		3	5352	6862	6635	13497	7854	7140	14994	33843					
		4	6216	9554	8447	18001	9638	10103	19741	43958					
AT Wgt			11495	15496	15132	30628	17167	16665	33832	75954		-0.22%	1.68%	5.20%	2.92%
2	**6634**	**1**	5625	6562	6606	13168	7548	6899	14447	33240	**2**				
		2	5740	7832	7751	15583	9063	8893	17956	39279					
		3	5365	6862	6785	13647	7592	6957	14549	33561					
		4	5755	9206	8377	17583	10136	10200	20336	43674					
AT Wgt			11243	15231	14760	29991	17170	16475	33644	74877		-2.41%	-0.43%	4.61%	1.46%
3	**6918**	**1**	5208	6234	7105	13339	7634	7032	14666	33213	**3**				
		2	5737	8419	7658	16077	9265	9074	18339	40153					
		3	5665	6963	7025	13988	7409	6851	14260	33913					
		4	6114	9497	8838	18335	10106	10397	20503	44952					
AT Wgt			11362	15557	15313	30870	17207	16677	33884	76116		-1.37%	2.49%	5.36%	3.14%
4	**7221**	**1**	5204	6664	6529	13193	7151	6734	13885	32282	**4**				
		2	5698	8622	9038	17660	9396	9365	18761	42119					
		3	5541	6553	6813	13366	7574	7091	14665	33572					
		4	6196	9508	8897	18405	10297	10441	20738	45339					
AT Wgt			11320	15674	15639	31312	17209	16816	34025	76656		-1.74%	3.96%	5.80%	3.87%
5	**7482**	**1**	5698	6167	6871	13038	7643	6836	14479	33215	**5**				
		2	5965	8163	7493	15656	8652	8333	16985	38606					
		3	4648	5453	5896	11349	7107	6516	13623	29620					
		4	5998	9003	7790	16793	9773	9627	19400	42191					
AT Wgt			11155	14393	14025	28418	16588	15656	32244	71816		-3.17%	-5.65%	0.26%	-2.69%

	Steering	Drive	Trailer	GVW
Avg	-1.78%	0.41%	4.25%	1.74%
Std Dev	0.99%	3.35%	2.03%	2.35%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result				

Measured values (lbs) | **Measurement errors (%)**

Pre-Calibration 10/5/99
Conv. Ride Lane 1

				Drive			Trailer								
			Steer	**1st axle**	**2nd axle**	**Tot 2+3**	**1st axle**	**2nd axle**	**Tot 4+5**	**GVW**					
			10330	15650	16470	32120	13760	16410	30170	72620		*% err*	*% err*	*% err*	*% err*
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**6445**	**1**	5151	8749	7837	16586	6097	7477	13574	35311	**1**				
		2	5389	8747	9012	17759	8059	10405	18464	41612					
		3	5332	9016	9016	18032	5726	6705	12431	35795					
		4	5197	8251	9532	17783	6679	8586	15265	38245					
AT Wgt			10535	17382	17699	35080	13281	16587	29867	75482		1.98%	9.22%	-1.00%	3.94%
2		**1**				0			0	0	**2**				
		2				0			0	0					
		3				0			0	0					
		4				0			0	0					
AT Wgt			0	0	0	0	0	0	0	0					
3	**6955**	**1**	5559	8088	7058	15146	6465	5788	12253	32958	**3**				
		2	5568	7934	8141	16075	8738	10529	19267	40910					
		3	5918	9742	8500	18242	5885	7751	13636	37796					
		4	5643	8694	9074	17768	7113	9248	16361	39772					
AT Wgt			11344	17229	16387	33616	14101	16658	30759	75718		9.82%	4.66%	1.95%	4.27%
4	**7250**	**1**	5559	7501	6974	14475	6077	6727	12804	32838	**4**				
		2	6123	7817	7806	15623	8379	11001	19380	41126					
		3	5746	9124	7649	16773	5537	7347	12884	35403					
		4	4966	9680	8450	18130	6406	8952	15358	38454					
AT Wgt			11197	17061	15440	32501	13200	17014	30213	73911		8.39%	1.18%	0.14%	1.78%
5	**7508**	**1**	5490	9462	8394	17856	6055	7552	13607	36953	**5**				
		2	5288	9065	9706	18771	8264	10507	18771	42830					
		3	5590	8525	9334	17859	6278	7036	13314	36763					
		4	5374	8244	8893	17137	7294	8639	15933	38444					
AT Wgt			10871	17648	18164	35812	13946	16867	30813	77495		5.24%	11.49%	2.13%	6.71%

	Steering	Drive	Trailer	GVW
Avg	6.36%	6.64%	0.80%	4.17%
Std Dev	3.02%	4.00%	1.30%	1.75%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result				

Pre-Calibration 10/5/99

Conv. Ride Lane 2

Measured values (lbs)

				Drive			Trailer					**Measurement errors (%)**			
			Steer	**1st axle**	**2nd axle**	**Tot 2+3**	**1st axle**	**2nd axle**	**Tot 4+5**	**GVW**					
			10330	15650	16470	32120	13760	16410	30170	72620		*% err*	*% err*	*% err*	*% err*
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**7813**	**1**	10434	15256	16844	32100	13830	17492	31322	73856	**1**				
		2	10434	15256	16844	32100	13830	17492	31322	73856					
AT Wgt			10434	15256	16844	32100	13830	17492	31322	73856		1.01%	-0.06%	3.82%	1.70%
2	**8041**	**1**	10178	14599	16055	30654	14002	17439	31441	72273	**2**				
		2	9501	14745	16192	30937	13133	17825	30958	71396					
AT Wgt			9840	14672	16124	30796	13568	17632	31200	71835		-4.75%	-4.12%	3.41%	-1.08%
3		**1**				0			0	0	**3**				
		2				0			0	0					
AT Wgt			0	0	0	0	0	0	0	0					
4	**8536**	**1**	10059	14941	15461	30402	14030	16648	30678	71139	**4**				
		2	9764	15475	17173	32648	13217	17918	31135	73547					
AT Wgt			9912	15208	16317	31525	13624	17283	30907	72343		-4.05%	-1.85%	2.44%	-0.38%
5	**8799**	**1**	9248	15561	14829	30390	13938	17133	31071	70709	**5**				
		2	9212	14818	16714	31532	13585	17669	31254	71998					
AT Wgt			9230	15190	15772	30961	13762	17401	31163	71354		-10.65%	-3.61%	3.29%	-1.74%

	Steering	Drive	Trailer	GVW
Avg	-4.61%	-2.41%	3.24%	-0.38%
Std Dev	4.13%	1.60%	0.50%	1.29%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result				

Pre-Calibration 10/5/99

Conv. Ride Lane 3

Measured values (lbs)

				Drive			Trailer					**Measurement errors (%)**			
			Steer	**1st axle**	**2nd axle**	**Tot 2+3**	**1st axle**	**2nd axle**	**Tot 4+5**	**GVW**					
			10330	15650	16470	32120	13760	16410	30170	72620		*% err*	*% err*	*% err*	*% err*
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**7733**	**1**	9876	13398	15320	28718	13578	15382	28960	67554	**1**				
		2	10180	14718	15276	29994	13376	17186	30562	70736					
AT Wgt			10028	14058	15298	29356	13477	16284	29761	69145		-2.92%	-8.61%	-1.36%	-4.79%
2	**7972**	**1**	9962	13966	15598	29564	12011	13975	25986	65512	**2**				
		2	9850	15018	14478	29496	14769	17150	31919	71265					
AT Wgt			9906	14492	15038	29530	13390	15563	28953	68389		-4.10%	-8.06%	-4.04%	-5.83%
3	**8238**	**1**	9627	13731	14670	28401	12703	15047	27750	65778	**3**				
		2	10205	14407	14873	29280	14269	17664	31933	71418					
AT Wgt			9916	14069	14772	28841	13486	16356	29842	68598		-4.01%	-10.21%	-1.09%	-5.54%
4	**8462**	**1**	9812	13576	15422	28998	12315	14802	27117	65927	**4**				
		2	9766	15788	15140	30928	14134	17565	31699	72393					
AT Wgt			9789	14682	15281	29963	13225	16184	29408	69160		-5.24%	-6.72%	-2.53%	-4.76%
5		**1**	9682	14381	15960	30341	15856	15406	31262	71285	**5**				
		2	9649	15076	15576	30652	14326	16716	31042	71343					
AT Wgt			9666	14729	15768	30497	15091	16061	31152	71314		-6.43%	-5.05%	3.25%	-1.80%

	Steering	Drive	Trailer	GVW
Avg	-4.54%	-7.73%	-1.15%	-4.54%
Std Dev	1.20%	1.74%	2.44%	1.43%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result				

Measured values (lbs) | **Measurement errors (%)**

Pre-Calibration 10/5/99
Conv. Ride Lane 4

				Drive			Trailer								
			Steer	**1st axle**	**2nd axle**	**Tot 2+3**	**1st axle**	**2nd axle**	**Tot 4+5**	**GVW**					
			10330	15650	16470	32120	13760	16410	30170	72620		*% err*	*% err*	*% err*	*% err*
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**6373**	**1**	4844	7632	7667	15299	6606	8125	14731	34874	**1**				
		2	4820	8084	8026	16110	7224	9303	16527	37457					
		3	4672	8233	7179	15412	6461	7658	14119	34203					
		4	5164	8004	8061	16065	7475	9746	17221	38450					
AT Wgt			9750	15977	15467	31443	13883	17416	31299	72492		-5.61%	-2.11%	3.74%	-0.18%
2	**6619**	**1**	4831	7740	7898	15638	7080	8251	15331	35800	**2**				
		2	4800	7718	8233	15951	6756	8771	15527	36278					
		3	5173	7753	6952	14705	6364	7702	14066	33944					
		4	4941	7640	7729	15369	7724	9658	17382	37692					
AT Wgt			9873	15426	15406	30832	13962	17191	31153	71857		-4.43%	-4.01%	3.26%	-1.05%
3	**6879**	**1**	4791	7751	8948	16699	7109	8518	15627	37117	**3**				
		2	4668	7989	7856	15845	6992	8697	15689	36202					
		3	5270	9041	8220	17261	7400	7676	15076	37607					
		4	5294	7687	7634	15321	7257	9098	16355	36970					
AT Wgt			10012	16234	16329	32563	14379	16995	31374	73948		-3.08%	1.38%	3.99%	1.83%
4	**7178**	**1**	4963	7856	8738	16594	5993	8273	14266	35823	**4**				
		2	4586	7711	8099	15810	6738	9082	15820	36216					
		3	4997	8862	7210	16072	6326	7629	13955	35024					
		4	5321	8053	7598	15651	7523	9627	17150	38122					
AT Wgt			9934	16241	15823	32064	13290	17306	30596	72593		-3.84%	-0.18%	1.41%	-0.04%
5	**7449**	**1**	4946	7179	8414	15593	7232	8644	15876	36415	**5**				
		2	4723	7539	8262	15801	7232	9204	16436	36960					
		3	5352	9197	8198	17395	6544	7568	14112	36859					
		4	5109	8271	7640	15911	7512	9369	16881	37901					
AT Wgt			10065	16093	16257	32350	14260	17393	31653	74068		-2.57%	0.72%	4.91%	1.99%

	Steering	Drive	Trailer	GVW
Avg	-3.91%	-0.84%	3.46%	0.51%
Std Dev	1.07%	1.97%	1.16%	1.20%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result				

Appendix G

Measurement Errors Obtained With Vehicle Passes During the Calibration of October 1999

Measured values (lbs) | **Measurement errors (%)**

Post-Calibration 10/6/99
Air Ride Lane 1

				Drive			Trailer								
			Steer	**1st axle**	**2nd axle**	**Tot 2+3**	**1st axle**	**2nd axle**	**Tot 4+5**	**GVW**					
			11520	15420	14700	30120	15820	16340	32160	73800		*% err*	*% err*	*% err*	*% err*
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**2241**	**1**	5349	6295	6406	12701	6699	5914	12613	30663	**1**				
		2	6196	9642	8319	17961	10427	10136	20563	44720					
		3	5471	6390	7380	13770	7005	6719	13724	32965					
		4	6057	8597	7385	15982	9894	10225	20119	42158					
AT Wgt			11537	15462	14745	30207	17013	16497	33510	75253		0.14%	0.29%	4.20%	1.97%
2	**2500**	**1**	5541	6820	6458	13278	6849	6112	12961	31780	**2**				
		2	7466	9519	9263	18782	10434	10505	20939	47187					
		3	5433	6536	6921	13457	7093	6655	13748	32638					
		4	6110	8317	7720	16037	8904	9296	18200	40347					
AT Wgt			12275	15596	15181	30777	16640	16284	32924	75976		6.55%	2.18%	2.38%	2.95%
3	**2831**	**1**	5303	5856	7078	12934	6858	6253	13111	31348	**3**				
		2	6026	8328	7695	16023	10106	9698	19804	41853					
		3	5435	6734	7060	13794	7325	6571	13896	33125					
		4	5217	7874	7025	14899	9212	9274	18486	38602					
AT Wgt			10991	14396	14429	28825	16751	15898	32649	72464		-4.60%	-4.30%	1.52%	-1.81%
4	**3235**	**1**	5329	6445	6196	12641	6880	6152	13032	31002	**4**				
		2	5995	9032	8416	17448	10152	10311	20463	43906					
		3	5310	6564	7140	13704	6961	6511	13472	32486					
		4	5797	8780	7810	16590	9896	9786	19682	42069					
AT Wgt			11216	15411	14781	30192	16945	16380	33325	74732		-2.64%	0.24%	3.62%	1.26%
5	**3567**	**1**	5407	6053	6571	12624	6741	6112	12853	30884	**5**				
		2	6860	9543	8533	18076	10767	10670	21437	46373					
		3	5266	6615	7005	13620	6754	6430	13184	32070					
		4	6174	8553	7896	16449	9301	9742	19043	41666					
AT Wgt			11854	15382	15003	30385	16782	16477	33259	75497		2.89%	0.88%	3.42%	2.30%
6	**3966**	**1**	5272	6220	6397	12617	6725	6128	12853	30742	**6**				
		2	5920	9354	8771	18125	9962	10222	20184	44229					
		3	5310	6114	6756	12870	7063	6633	13696	31876					
		4	5942	9318	8692	18010	9896	10066	19962	43914					
AT Wgt			11222	15503	15308	30811	16823	16525	33348	75381		-2.59%	2.29%	3.69%	2.14%
7	**4357**	**1**	5318	6114	6403	12517	6666	6130	12796	30631	**7**				
		2	5925	8921	9029	17950	10692	10390	21082	44957					
		3	5574	6622	6785	13407	6966	6619	13585	32566					
		4	5751	8646	8084	16730	10214	9960	20174	42655					
AT Wgt			11284	15152	15151	30302	17269	16550	33819	75405		-2.05%	0.60%	5.16%	2.17%
8	**4805**	**1**	5510	6066	6463	12529	6377	6181	12558	30597	**8**				
		2	7140	10163	9380	19543	10496	10637	21133	47816					
		3	5318	6525	7021	13546	6924	6615	13539	32403					
		4	6026	8342	7770	16112	8767	8904	17671	39809					
AT Wgt			11997	15548	15317	30865	16282	16169	32451	75313		4.14%	2.47%	0.90%	2.05%
9	**5139**	**1**	5387	6401	6291	12692	6933	6174	13107	31186	**9**				
		2	6198	9279	8048	17327	10412	10119	20531	44056					
		3	5457	6242	7407	13649	7111	6644	13755	32861					
		4	6081	8416	7731	16147	9587	9678	19265	41493					
AT Wgt			11562	15169	14739	29908	17022	16308	33329	74798		0.36%	-0.71%	3.63%	1.35%
10	**5430**	**1**	5173	5826	6566	12392	6302	5782	12084	29649	**10**				
		2	6350	9318	9704	19022	10560	10125	20685	46057					
		3	5321	6467	6677	13144	6957	6602	13559	32024					
		4	5942	9098	8500	17598	9665	9812	19477	43017					
AT Wgt			11393	15355	15724	31078	16742	16161	32903	75374		-1.10%	3.18%	2.31%	2.13%
11	**5714**	**1**	5477	6727	6935	13662	7124	6150	13274	32413	**11**				
		2	6258	8624	7775	16399	9969	9755	19724	42381					
		3	5508	6723	7307	14030	7135	6871	14006	33544					
		4	5896	9096	7748	16844	9393	9618	19011	41751					
AT Wgt			11570	15585	14883	30468	16811	16197	33008	75045		0.43%	1.15%	2.64%	1.69%
12	**6041**	**1**	5363	6022	6606	12628	6877	6145	13022	31013	**12**				
		2	6300	8794	8152	16946	10551	10068	20619	43865					
		3	5429	7118	6860	13978	7184	6869	14053	33460					
		4	6046	8443	8009	16452	9678	9561	19239	41737					
AT Wgt			11569	15189	14814	30002	17145	16322	33467	75038		0.43%	-0.39%	4.06%	1.68%
13	**6352**	**1**	5323	5746	6611	12357	6110	5645	11755	29435	**13**				
		2	6434	8600	9118	17718	9735	9753	19488	43640					
		3	5285	5879	6483	12362	6895	6430	13325	30972					
		4	5171	7998	7497	15495	9199	9041	18240	38906					
AT Wgt			11107	14112	14855	28966	15970	15435	31404	71477		-3.59%	-3.83%	-2.35%	-3.15%
14	**6649**	**1**	5422	6143	7027	13170	6569	6282	12851	31443	**14**				
		2	6150	8657	7971	16628	10077	9898	19975	42753					
		3	5484	7210	7332	14542	7451	7003	14454	34480					
		4	5839	7920	8079	15999	9164	9418	18582	40420					
AT Wgt			11448	14965	15205	30170	16631	16301	32931	74548		-0.63%	0.16%	2.40%	1.01%
15	**6917**	**1**	5541	6046	6313	12359	6511	5905	12416	30316	**15**				
		2	6507	7905	8035	15940	9638	9418	19056	41503					
		3	5413	6395	6498	12893	6522	6403	12925	31231					
		4	5056	8048	7609	15657	8619	8639	17258	37971					
AT Wgt			11259	14197	14228	28425	15645	15183	30828	70511		-2.27%	-5.63%	-4.14%	-4.46%
16	**7171**	**1**	5321	6020	6774	12794	6939	6408	13347	31462	**16**				
		2	6090	8597	8064	16661	10055	10108	20163	42914					

Measured values (lbs) | **Measurement errors (%)**

Post-Calibration 10/6/99
Air Ride Lane 1

				Drive			Trailer								
			Steer	**1st axle**	**2nd axle**	**Tot 2+3**	**1st axle**	**2nd axle**	**Tot 4+5**	**GVW**					
			11520	15420	14700	30120	15820	16340	32160	73800		*% err*	*% err*	*% err*	*% err*
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
		3	5338	6800	6959	13759	7407	6527	13934	33031					
		4	5649	8236	7224	15460	9517	9541	19058	40167					
AT Wgt			11199	14827	14511	29337	16959	16292	33251	73787		-2.79%	-2.60%	3.39%	-0.02%
17	**7438**	**1**	5334	6366	5980	12346	6787	6187	12974	30654	**17**				
		2	6117	9459	9418	18877	10132	9978	20110	45104					
		3	5517	6566	6866	13432	7283	6613	13896	32845					
		4	5832	8432	8348	16780	9519	9843	19362	41974					
AT Wgt			11400	15412	15306	30718	16861	16311	33171	75289		-1.04%	1.98%	3.14%	2.02%
18	**7708**	**1**	5314	6789	6866	13655	6763	6342	13105	32074	**18**				
		2	6042	8390	9071	17461	9936	10006	19942	43445					
		3	5332	6884	7096	13980	7109	6772	13881	33193					
		4	5854	8888	8639	17527	9713	9764	19477	42858					
AT Wgt			11271	15476	15836	31312	16761	16442	33203	75785		-2.16%	3.96%	3.24%	2.69%
19	**8085**	**1**	5281	6106	6529	12635	6917	6324	13241	31157	**19**				
		2	5942	8039	7596	15635	9865	9676	19541	41118					
		3	5546	6167	6547	12714	7407	6630	14037	32297					
		4	5056	8342	7089	15431	8727	9045	17772	38259					
AT Wgt			10913	14327	13881	28208	16458	15838	32296	71416		-5.27%	-6.35%	0.42%	-3.23%
20	**8379**	**1**	5435	5883	6130	12013	6617	6236	12853	30301	**20**				
		2	6414	7731	7810	15541	9883	9453	19336	41291					
		3	5296	6838	7195	14033	6895	6370	13265	32594					
		4	5206	7764	7224	14988	8611	8818	17429	37623					
AT Wgt			11176	14108	14180	28288	16003	15439	31442	70905		-2.99%	-6.08%	-2.23%	-3.92%

	Steering	Drive	Trailer	GVW
Avg	-0.94%	-0.52%	2.07%	0.54%
Std Dev	2.83%	3.10%	2.38%	2.35%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result				

Measured values (lbs) | **Measurement errors (%)**

Post-Calibration 10/6/99
Air Ride Lane 2

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			11520	15420	14700	30120	15820	16340	32160	73800		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**7821**	**1**	10714	14613	14509	29122	16749	16253	33002	72838	**1**				
		2	10714	14613	14509	29122	16749	16253	33002	72838					
AT Wgt			10714	14613	14509	29122	16749	16253	33002	72838		-7.00%	-3.31%	2.62%	-1.30%
2	**8052**	**1**	10844	14906	14901	29807	16185	16070	32255	72906	**2**				
		2	10809	14507	15384	29891	17056	17012	34068	74768					
AT Wgt			10827	14707	15143	29849	16621	16541	33162	73837		-6.02%	-0.90%	3.11%	0.05%
3	**8294**	**1**	11164	14357	14873	29230	15991	15603	31594	71988	**3**				
		2	10787	14613	15627	30240	16895	16529	33424	74451					
AT Wgt			10976	14485	15250	29735	16443	16066	32509	73220		-4.73%	-1.28%	1.09%	-0.79%
4	**8549**	**1**				0			0	0	**4**				
		2				0			0	0					
AT Wgt			0	0	0	0	0	0	0	0					
5	**8810**	**1**	10467	15389	14321	29710	15883	15506	31389	71566	**5**				
		2	11554	14357	15226	29583	17164	17267	34431	75568					
AT Wgt			11011	14873	14774	29647	16524	16387	32910	73567		-4.42%	-1.57%	2.33%	-0.32%
6	**8636**	**1**	10644	14798	15234	30032	16008	15962	31970	72646	**6**				
		2	12000	13715	15170	28885	16987	17003	33990	74875					
AT Wgt			11322	14257	15202	29459	16498	16483	32980	73761		-1.72%	-2.20%	2.55%	-0.05%
7	**9600**	**1**	10756	14961	15206	30167	16059	15347	31406	72329	**7**				
		2	11226	15031	15303	30334	17109	17609	34718	76278					
AT Wgt			10991	14996	15255	30251	16584	16478	33062	74304		-4.59%	0.43%	2.80%	0.68%
8	**9887**	**1**	10672	15422	14665	30087	15922	15492	31414	72173	**8**				
		2	11497	15104	15351	30455	17591	17583	35174	77126					
AT Wgt			11085	15263	15008	30271	16757	16538	33294	74650		-3.78%	0.50%	3.53%	1.15%
9	**10167**	**1**	11228	14716	14487	29203	15607	14950	30557	70988	**9**				
		2	12430	13794	14399	28193	16970	16930	33900	74523					
AT Wgt			11829	14255	14443	28698	16289	15940	32229	72756		2.68%	-4.72%	0.21%	-1.42%
10	**10435**	**1**	10710	15314	16028	31342	16612	15942	32554	74606	**10**				
		2	10284	14465	14489	28954	17203	17045	34248	73486					
AT Wgt			10497	14890	15259	30148	16908	16494	33401	74046		-8.88%	0.09%	3.86%	0.33%
11	**10707**	**1**	11717	15442	14319	29761	16749	16445	33194	74672	**11**				
		2	11847	13572	14725	28297	17759	17276	35035	75179					
AT Wgt			11782	14507	14522	29029	17254	16861	34115	74926		2.27%	-3.62%	6.08%	1.53%
12	**10972**	**1**	11232	15190	14652	29842	16714	15916	32630	73704	**12**				
		2	10639	14718	14897	29615	17078	17073	34151	74405					
AT Wgt			10936	14954	14775	29729	16896	16495	33391	74055		-5.07%	-1.30%	3.83%	0.34%
13	**11456**	**1**	11058	15243	14890	30133	16432	15900	32332	73523	**13**				
		2	9962	14333	14317	28650	16837	16974	33811	72423					
AT Wgt			10510	14788	14604	29392	16635	16437	33072	72973		-8.77%	-2.42%	2.83%	-1.12%
14	**11768**	**1**	10862	15025	14295	29320	15850	15334	31184	71366	**14**				
		2	11076	14046	14566	28612	17726	17755	35481	75169					
AT Wgt			10969	14536	14431	28966	16788	16545	33333	73268		-4.78%	-3.83%	3.65%	-0.72%
15	**12072**	**1**	10297	15578	15078	30656	16372	15790	32162	73115	**15**				
		2	10068	14392	15261	29653	16915	17285	34200	73921					
AT Wgt			10183	14985	15170	30155	16644	16538	33181	73518		-11.61%	0.11%	3.17%	-0.38%
16	**12446**	**1**	10522	14815	14835	29650	16099	15810	31909	72081	**16**				
		2	10344	15212	14639	29851	17689	17466	35155	75350					
AT Wgt			10433	15014	14737	29751	16894	16638	33532	73716		-9.44%	-1.23%	4.27%	-0.11%
17	**12812**	**1**	10899	15300	14906	30206	16522	16083	32605	73710	**17**				
		2	10099	14815	14579	29394	16787	16676	33463	72956					
AT Wgt			10499	15058	14743	29800	16655	16380	33034	73333		-8.86%	-1.06%	2.72%	-0.63%
18	**13174**	**1**	11629	14189	13406	27595	15175	15400	30575	69799	**18**				
		2	12546	13737	14804	28541	16313	15528	31841	72928					
AT Wgt			12088	13963	14105	28068	15744	15464	31208	71364		4.93%	-6.81%	-2.96%	-3.30%

	Steering	Drive	Trailer	GVW
Avg	-4.69%	-1.95%	2.69%	-0.36%
Std Dev	4.43%	1.93%	1.87%	1.08%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result				

Measured values (lbs) | **Measurement errors (%)**

Post-Calibration 10/6/99

Air Ride Lane 3

				Drive			Trailer								
			Steer	**1st axle**	**2nd axle**	**Tot 2+3**	**1st axle**	**2nd axle**	**Tot 4+5**	**GVW**					
			11520	15420	14700	30120	15820	16340	32160	73800		*% err*	*% err*	*% err*	*% err*
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**7115**	**1**	11371	13938	13378	27316	15375	15005	30380	69067	**1**				
		2	10862	14890	14815	29705	16485	16610	33095	73662					
AT Wgt			11117	14414	14097	28511	15930	15808	31738	71365		-3.50%	-5.34%	-1.31%	-3.30%
2	**7362**	**1**	11314	13975	13561	27536	15226	15325	30551	69401	**2**				
		2	10959	14643	14174	28817	16370	16061	32431	72207					
AT Wgt			11137	14309	13868	28177	15798	15693	31491	70804		-3.33%	-6.45%	-2.08%	-4.06%
3	**7625**	**1**	11526	15398	14152	29550	16246	16542	32788	73864	**3**				
		2	11155	14672	14507	29179	16425	16004	32429	72763					
AT Wgt			11341	15035	14330	29365	16336	16273	32609	73314		-1.56%	-2.51%	1.39%	-0.66%
4	**8012**	**1**	10919	16050	15219	31269	17408	17153	34561	76749	**4**				
		2	11166	14643	15230	29873	16557	16348	32905	73944					
AT Wgt			11043	15347	15225	30571	16983	16751	33733	75347		-4.14%	1.50%	4.89%	2.10%
5	**8290**	**1**	11636	14423	14727	29150	15104	15215	30319	71105	**5**				
		2	11107	14919	13309	28228	15825	16097	31922	71257					
AT Wgt			11372	14671	14018	28689	15465	15656	31121	71181		-1.29%	-4.75%	-3.23%	-3.55%
6	**8560**	**1**	11038	15938	15060	30998	17506	16948	34454	76490	**6**				
		2	11089	14370	13369	27739	15777	14957	30734	69562					
AT Wgt			11064	15154	14215	29369	16642	15953	32594	73026		-3.96%	-2.50%	1.35%	-1.05%
7	**8831**	**1**	10950	14321	14147	28468	15170	15170	30340	69758	**7**				
		2	10582	14826	14366	29192	16833	16542	33375	73149					
AT Wgt			10766	14574	14257	28830	16002	15856	31858	71454		-6.55%	-4.28%	-0.94%	-3.18%
8	**9804**	**1**	9224	12807	12348	25155	13748	13481	27229	61608	**8**				
		2	11393	15327	15162	30489	17334	17245	34579	76461					
AT Wgt			10309	14067	13755	27822	15541	15363	30904	69035		-10.52%	-7.63%	-3.91%	-6.46%
9	**10098**	**1**	11331	14641	13720	28361	15217	14840	30057	69749	**9**				
		2	10421	14945	15151	30096	16646	16760	33406	73923					
AT Wgt			10876	14793	14436	29229	15932	15800	31732	71836		-5.59%	-2.96%	-1.33%	-2.66%
10	**10368**	**1**	11627	14465	13865	28330	15124	15254	30378	70335	**10**				
		2	10890	15005	14090	29095	16244	16187	32431	72416					
AT Wgt			11259	14735	13978	28713	15684	15721	31405	71376		-2.27%	-4.67%	-2.35%	-3.29%
11		**1**				0			0	0	**11**				
		2				0			0	0					
AT Wgt			0	0	0	0	0	0	0	0					
12	**10899**	**1**	11552	13744	13761	27505	15058	14928	29986	69043	**12**				
		2	10780	15031	14121	29152	16227	16154	32381	72313					
AT Wgt			11166	14388	13941	28329	15643	15541	31184	70678		-3.07%	-5.95%	-3.04%	-4.23%
13	**11189**	**1**	11532	14101	13850	27951	14994	15102	30096	69579	**13**				
		2	10705	14379	14445	28824	16826	16531	33357	72886					
AT Wgt			11119	14240	14148	28388	15910	15817	31727	71233		-3.49%	-5.75%	-1.35%	-3.48%
14	**11688**	**1**	9779	13841	13603	27444	15082	15217	30299	67522	**14**				
		2	10214	14976	14632	29608	16220	16531	32751	72573					
AT Wgt			9997	14409	14118	28526	15651	15874	31525	70048		-13.22%	-5.29%	-1.97%	-5.08%
15	**11994**	**1**	11446	13997	13708	27705	15243	15406	30649	69800	**15**				
		2	10782	13486	13660	27146	15389	15662	31051	68979					
AT Wgt			11114	13742	13684	27426	15316	15534	30850	69390		-3.52%	-8.95%	-4.07%	-5.98%
16		**1**	10322	14533	14425	28958	14767	15122	29889	69169	**16**				
		2	10242	14540	14756	29296	16727	16480	33207	72745					
AT Wgt			10282	14537	14591	29127	15747	15801	31548	70957		-10.75%	-3.30%	-1.90%	-3.85%
17	**12732**	**1**	11320	15581	14538	30119	17841	17569	35410	76849	**17**				
		2	10558	14573	14608	29181	16061	15909	31970	71709					
AT Wgt			10939	15077	14573	29650	16951	16739	33690	74279		-5.04%	-1.56%	4.76%	0.65%
18	**13083**	**1**	11208	13812	13563	27375	14910	15027	29937	68520	**18**				
		2	10289	14396	15073	29469	16383	16368	32751	72509					
AT Wgt			10749	14104	14318	28422	15647	15698	31344	70515		-6.70%	-5.64%	-2.54%	-4.45%

	Steering	Drive	Trailer	GVW
Avg	-5.21%	-4.47%	-1.04%	-3.09%
Std Dev	3.29%	2.38%	2.58%	2.17%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result				

Post-Calibration 10/6/99

Air Ride Lane 4

Measured values (lbs)

				Drive			Trailer					**Measurement errors (%)**			
			Steer	**1st axle**	**2nd axle**	**Tot 2+3**	**1st axle**	**2nd axle**	**Tot 4+5**	**GVW**					
			11520	15420	14700	30120	15820	16340	32160	73800		*% err*	*% err*	*% err*	*% err*
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**6395**	**1**	5614	6333	7043	13376	7442	6882	14324	33314	**1**				
		2	5808	8242	8139	16381	9400	9204	18604	40793					
		3	5352	6862	6635	13497	7854	7140	14994	33843					
		4	6216	9554	8447	18001	9638	10103	19741	43958					
AT Wgt			11495	15496	15132	30628	17167	16665	33832	75954		-0.22%	1.68%	5.20%	2.92%
2	**6634**	**1**	5625	6562	6606	13168	7548	6899	14447	33240	**2**				
		2	5740	7832	7751	15583	9063	8893	17956	39279					
		3	5365	6862	6785	13647	7592	6957	14549	33561					
		4	5755	9206	8377	17583	10136	10200	20336	43674					
AT Wgt			11243	15231	14760	29991	17170	16475	33644	74877		-2.41%	-0.43%	4.61%	1.46%
3	**6918**	**1**	5208	6234	7105	13339	7634	7032	14666	33213	**3**				
		2	5737	8419	7658	16077	9265	9074	18339	40153					
		3	5665	6963	7025	13988	7409	6851	14260	33913					
		4	6114	9497	8838	18335	10106	10397	20503	44952					
AT Wgt			11362	15557	15313	30870	17207	16677	33884	76116		-1.37%	2.49%	5.36%	3.14%
4	**7221**	**1**	5204	6664	6529	13193	7151	6734	13885	32282	**4**				
		2	5698	8622	9038	17660	9396	9365	18761	42119					
		3	5541	6553	6813	13366	7574	7091	14665	33572					
		4	6196	9508	8897	18405	10297	10441	20738	45339					
AT Wgt			11320	15674	15639	31312	17209	16816	34025	76656		-1.74%	3.96%	5.80%	3.87%
5	**7482**	**1**	5698	6167	6871	13038	7643	6836	14479	33215	**5**				
		2	5965	8163	7493	15656	8652	8333	16985	38606					
		3	4648	5453	5896	11349	7107	6516	13623	29620					
		4	5998	9003	7790	16793	9773	9627	19400	42191					
AT Wgt			11155	14393	14025	28418	16588	15656	32244	71816		-3.17%	-5.65%	0.26%	-2.69%
6	**2144**	**1**	5182	6487	6604	13091	7374	6659	14033	32306	**6**				
		2	5671	8708	8904	17612	9389	9228	18617	41900					
		3	5539	6540	6260	12800	7784	7109	14893	33232					
		4	6020	9027	8441	17468	10039	10061	20100	43588					
AT Wgt			11206	15381	15105	30486	17293	16529	33822	75513		-2.73%	1.21%	5.17%	2.32%
7	**2415**	**1**	5321	6492	6383	12875	7625	6884	14509	32705	**7**				
		2	5479	8476	8004	16480	9193	8860	18053	40012					
		3	5257	7140	7027	14167	7991	7254	15245	34669					
		4	5834	9398	8165	17563	9671	10070	19741	43138					
AT Wgt			10946	15753	14790	30543	17240	16534	33774	75262		-4.99%	1.40%	5.02%	1.98%
8	**2716**	**1**	5307	6395	7019	13414	7687	7019	14706	33427	**8**				
		2	5365	8547	8727	17274	8988	8580	17568	40207					
		3	5250	6666	6452	13118	7865	7252	15117	33485					
		4	5812	9329	8447	17776	9971	10081	20052	43640					
AT Wgt			10867	15469	15323	30791	17256	16466	33722	75380		-5.67%	2.23%	4.86%	2.14%
9	**3149**	**1**	5429	6796	6877	13673	8242	6979	15221	34323	**9**				
		2	5409	7978	8024	16002	8741	8725	17466	38877					
		3	5537	6869	6630	13499	7673	7277	14950	33986					
		4	5647	8950	8383	17333	10033	10070	20103	43083					
AT Wgt			11011	15297	14957	30254	17345	16526	33870	75135		-4.42%	0.44%	5.32%	1.81%
10	**3455**	**1**	5303	7096	6895	13991	7850	6888	14738	34032	**10**				
		2	5440	8469	7568	16037	8895	8736	17631	39108					
		3	5266	6935	6622	13557	7532	7318	14850	33673					
		4	5466	9393	9007	18400	9662	9984	19646	43512					
AT Wgt			10738	15947	15046	30993	16970	16463	33433	75163		-6.79%	2.90%	3.96%	1.85%
11	**3856**	**1**	5329	6256	6933	13189	7612	6977	14589	33107	**11**				
		2	5396	8042	7993	16035	9113	8988	18101	39532					
		3	5513	7113	6589	13702	7629	7179	14808	34023					
		4	5740	8807	8289	17096	9726	10057	19783	42619					
AT Wgt			10989	15109	14902	30011	17040	16601	33641	74641		-4.61%	-0.36%	4.60%	1.14%
12	**4262**	**1**	5689	6353	7250	13603	7418	6904	14322	33614	**12**				
		2	5636	7665	8174	15839	8937	8584	17521	38996					
		3	4743	6117	5515	11632	6813	6383	13196	29571					
		4	5592	8657	7845	16502	9918	9920	19838	41932					
AT Wgt			10830	14396	14392	28788	16543	15896	32439	72057		-5.99%	-4.42%	0.87%	-2.36%
13	**4698**	**1**	5625	6306	6877	13183	7466	6908	14374	33182	**13**				
		2	5497	7720	7446	15166	8641	8476	17117	37780					
		3	4919	5832	5484	11316	6961	6370	13331	29566					
		4	5823	8966	7700	16666	9486	9508	18994	41483					
AT Wgt			10932	14412	13754	28166	16277	15631	31908	71006		-5.10%	-6.49%	-0.78%	-3.79%
14	**5048**	**1**	5799	6780	7155	13935	7795	7327	15122	34856	**14**				
		2	5678	7912	8147	16059	8666	8372	17038	38775					
		3	4586	5700	5684	11384	6712	6500	13212	29182					
		4	6121	8716	8053	16769	9290	9323	18613	41503					
AT Wgt			11092	14554	14520	29074	16232	15761	31993	72158		-3.72%	-3.47%	-0.52%	-2.22%
15	**5346**	**1**	5290	6630	6818	13448	7700	7063	14763	33501	**15**				
		2	5735	8463	7823	16286	9186	8972	18158	40179					
		3	5660	6776	6774	13550	7257	6882	14139	33349					
		4	6013	9014	8317	17331	9662	9795	19457	42801					
AT Wgt			11349	15442	14866	30308	16903	16356	33259	74915		-1.48%	0.62%	3.42%	1.51%
16	**5634**	**1**	5078	6531	6633	13164	7907	7096	15003	33245	**16**				
		2	5684	8489	7607	16096	9155	9153	18308	40088					

Measured values (lbs) | **Measurement errors (%)**

Post-Calibration 10/6/99
Air Ride Lane 4

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			11520	15420	14700	30120	15820	16340	32160	73800		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
		3	5457	6505	7038	13543	7570	7239	14809	33809					
		4	6062	9365	8073	17438	9739	9859	19598	43098					
AT Wgt			11141	15445	14676	30121	17186	16674	33859	75120		-3.29%	0.00%	5.28%	1.79%
17	**5928**	**1**	5378	6483	6454	12937	7179	6690	13869	32184	**17**				
		2	5382	8410	7770	16180	9429	9151	18580	40142					
		3	5246	6399	7058	13457	7506	7038	14544	33247					
		4	5934	9005	9212	18217	9951	10300	20251	44402					
AT Wgt			10970	15149	15247	30396	17033	16590	33622	74988		-4.77%	0.91%	4.55%	1.61%
18	**6259**	**1**	5089	6183	6992	13175	7773	6705	14478	32742	**18**				
		2	5521	8547	8110	16657	9252	9060	18312	40490					
		3	5314	7153	6461	13614	7504	7228	14732	33660					
		4	5810	9224	8198	17422	9706	10031	19737	42969					
AT Wgt			10867	15554	14881	30434	17118	16512	33630	74931		-5.67%	1.04%	4.57%	1.53%
19	**6579**	**1**	5180	6549	6547	13096	7581	7089	14670	32946	**19**				
		2	5561	8231	8086	16317	9100	8939	18039	39917					
		3	5338	6670	6580	13250	7475	6708	14183	32771					
		4	5782	9089	8679	17768	9806	9845	19651	43201					
AT Wgt			10931	15270	14946	30216	16981	16291	33272	74418		-5.12%	0.32%	3.46%	0.84%
20	**6843**	**1**	5184	6602	7250	13852	7806	7007	14813	33849	**20**				
		2	5462	7290	7748	15038	8891	8910	17801	38301					
		3	5387	6820	7153	13973	8092	7422	15514	34874					
		4	5832	8917	8174	17091	9585	9914	19499	42422					
AT Wgt			10933	14815	15163	29977	17187	16627	33814	74723		-5.10%	-0.47%	5.14%	1.25%

	Steering	Drive	Trailer	GVW
Avg	-3.92%	-0.10%	3.81%	1.00%
Std Dev	1.75%	2.74%	2.03%	2.02%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result				

Post-Calibration 10/6/99

Conv. Ride Lane 1

Measured values (lbs)

				Drive			Trailer					**Measurement errors (%)**			
			Steer	**1st axle**	**2nd axle**	**Tot 2+3**	**1st axle**	**2nd axle**	**Tot 4+5**	**GVW**					
			10330	15650	16470	32120	13760	16410	30170	72620		*% err*	*% err*	*% err*	*% err*
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**2247**	**1**	5206	8745	7863	16608	5076	6941	12017	33831	**1**				
		2	5807	9153	8791	17944	7228	10236	17464	41215					
		3	5118	8214	8476	16690	6090	6769	12859	34667					
		4	4836	8178	9100	17278	6906	7830	14736	36850					
AT Wgt			10484	17145	17115	34260	12650	15888	28538	73282		1.49%	6.66%	-5.41%	0.91%
2	**2515**	**1**	5219	8536	8156	16692	5493	7151	12644	34555	**2**				
		2	6059	9332	9989	19321	8328	11468	19796	45176					
		3	4882	7625	8009	15634	6553	5625	12178	32694					
		4	4893	9065	8705	17770	6966	8721	15687	38350					
AT Wgt			10527	17279	17430	34709	13670	16483	30153	75388		1.90%	8.06%	-0.06%	3.81%
3	**2828**	**1**	4926	7065	6205	13270	4952	5967	10919	29115	**3**				
		2	5689	10551	10194	20745	8507	12994	21501	47935					
		3	4754	6084	7254	13338	4584	5041	9625	27717					
		4	3901	8236	9049	17285	6553	8090	14643	35829					
AT Wgt			9635	15968	16351	32319	12298	16046	28344	70298		-6.73%	0.62%	-6.05%	-3.20%
4	**3248**	**1**	5160	8655	8181	16836	5045	6820	11865	33861	**4**				
		2	5226	8600	8388	16988	7250	9956	17206	39420					
		3	4882	7413	8553	15966	5676	6503	12179	33027					
		4	3883	7521	8538	16059	7157	8353	15510	35452					
AT Wgt			9576	16095	16830	32925	12564	15816	28380	70880		-7.30%	2.50%	-5.93%	-2.40%
5	**3573**	**1**	5316	7998	7826	15824	5089	7166	12255	33395	**5**				
		2	5266	8106	8703	16809	6807	9942	16749	38824					
		3	5010	7486	7594	15080	6553	6600	13153	33243					
		4	4020	7294	8145	15439	6699	8095	14794	34253					
AT Wgt			9806	15442	16134	31576	12574	15902	28476	69858		-5.07%	-1.69%	-5.62%	-3.80%
6	**3974**	**1**	5215	8372	6472	14844	5539	6721	12260	32319	**6**				
		2	5369	8529	7920	16449	7332	9376	16708	38526					
		3	5160	8192	8150	16342	4606	5259	9865	31367					
		4	4309	7967	9504	17471	6531	8392	14923	36703					
AT Wgt			10027	16530	16023	32553	12004	14874	26878	69458		-2.94%	1.35%	-10.91%	-4.35%
7	**4366**	**1**	5345	9175	9038	18213	4238	6447	10685	34243	**7**				
		2	4796	7243	8600	15843	6811	9592	16403	37042					
		3	5407	7288	7826	15114	5868	6670	12538	33059					
		4	4758	7594	7872	15466	7226	8597	15823	36047					
AT Wgt			10153	15650	16668	32318	12072	15653	27725	70196		-1.71%	0.62%	-8.11%	-3.34%
8	**4781**	**1**	5080	8419	7385	15804	4728	7230	11958	32842	**8**				
		2	5345	8020	8297	16317	7274	10112	17386	39048					
		3	5191	8289	8205	16494	5901	6988	12889	34574					
		4	4966	7969	8785	16754	6774	7627	14401	36121					
AT Wgt			10291	16349	16336	32685	12339	15979	28317	71293		-0.38%	1.76%	-6.14%	-1.83%
9	**5115**	**1**	5204	8869	7277	16146	6200	7045	13245	34595	**9**				
		2	5151	9014	8771	17785	7351	10196	17547	40483					
		3	5127	7947	8963	16910	5627	6972	12599	34636					
		4	5038	8156	8652	16808	6752	7724	14476	36322					
AT Wgt			10260	16993	16832	33825	12965	15969	28934	73018		-0.68%	5.31%	-4.10%	0.55%
10	**5410**	**1**	5177	7576	6732	14308	6110	7920	14030	33515	**10**				
		2	5199	7484	7632	15116	8315	10081	18396	38711					
		3	5363	9104	8666	17770	5687	7049	12736	35869					
		4	4906	8428	9279	17707	6106	7898	14004	36617					
AT Wgt			10323	16296	16155	32451	13109	16474	29583	72356		-0.07%	1.03%	-1.95%	-0.36%
11	**5699**	**1**	5387	8163	7958	16121	6068	7005	13073	34581	**11**				
		2	5726	8747	8165	16912	7023	9958	16981	39619					
		3	5215	7581	8275	15856	5707	6750	12457	33528					
		4	4315	7210	8004	15214	6322	8015	14337	33866					
AT Wgt			10322	15851	16201	32052	12560	15864	28424	70797		-0.08%	-0.21%	-5.79%	-2.51%
12	**6019**	**1**	5063	7451	6765	14216	5301	6853	12154	31433	**12**				
		2	5438	8862	8377	17239	7572	11215	18787	41464					
		3	4957	8033	8176	16209	5380	5435	10815	31981					
		4	3991	7991	8595	16586	5698	6977	12675	33252					
AT Wgt			9725	16169	15957	32125	11976	15240	27216	69065		-5.86%	0.02%	-9.79%	-4.90%
13	**6328**	**1**	5279	8368	6888	15256	5916	7237	13153	33688	**13**				
		2	5499	8432	7808	16240	7217	10315	17532	39271					
		3	5153	8516	8119	16635	5283	6818	12101	33889					
		4	4322	7753	8355	16108	5850	7797	13647	34077					
AT Wgt			10127	16535	15585	32120	12133	16084	28217	70463		-1.97%	0.00%	-6.47%	-2.97%
14	**6630**	**1**	4869	7980	7349	15329	6084	7179	13263	33461	**14**				
		2	5175	7718	7063	14781	6205	10807	17012	36968					
		3	5288	8780	8328	17108	5482	6873	12355	34751					
		4	4648	8525	8355	16880	6258	8192	14450	35978					
AT Wgt			9990	16502	15548	32049	12015	16526	28540	70579		-3.29%	-0.22%	-5.40%	-2.81%
15	**6897**	**1**	5442	7854	6613	14467	6187	7448	13635	33544	**15**				
		2	5524	7054	7340	14394	7982	9647	17629	37547					
		3	5215	9151	8593	17744	5901	7135	13036	35995					
		4	4262	8941	8880	17821	6044	8231	14275	36358					
AT Wgt			10222	16500	15713	32213	13057	16231	29288	71722		-1.05%	0.29%	-2.93%	-1.24%
16	**7161**	**1**	5140	7786	7400	15186	5737	7541	13278	33604	**16**				
		2	5215	8053	8059	16112	7691	10302	17993	39320					

Measured values (lbs) | **Measurement errors (%)**

Post-Calibration 10/6/99
Conv. Ride Lane 1

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			10330	15650	16470	32120	13760	16410	30170	72620		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
		3	4966	8780	8432	17212	5770	6372	12142	34320					
		4	4589	8816	9250	18066	6659	7942	14601	37256					
AT Wgt			9955	16718	16571	33288	12929	16079	29007	72250		-3.63%	3.64%	-3.85%	-0.51%
17	**7421**	**1**	5407	8593	7700	16293	6134	7464	13598	35298	**17**				
		2	5277	9041	8767	17808	8203	11098	19301	42386					
		3	5418	8593	9254	17847	5982	5607	11589	34854					
		4	5576	9784	9680	19464	7168	8902	16070	41110					
AT Wgt			10839	18006	17701	35706	13744	16536	30279	76824		4.93%	11.16%	0.36%	5.79%
18	**7688**	**1**	5559	8575	7429	16004	6108	7605	13713	35276	**18**				
		2	5255	8765	6849	15614	7030	9733	16763	37632					
		3	5263	8128	8996	17124	6670	6736	13406	35793					
		4	4454	7817	8081	15898	6434	7740	14174	34526					
AT Wgt			10266	16643	15678	32320	13121	15907	29028	71614		-0.62%	0.62%	-3.79%	-1.39%
19	**8069**	**1**	5299	9669	7515	17184	6483	7433	13916	36399	**19**				
		2	5135	8624	8465	17089	8401	10359	18760	40984					
		3	5096	9122	9281	18403	6152	6747	12899	36398					
		4	5444	8388	10005	18393	7246	8827	16073	39910					
AT Wgt			10487	17902	17633	35535	14141	16683	30824	76846		1.52%	10.63%	2.17%	5.82%
20	**8359**	**1**	5206	8271	6864	15135	6227	7290	13517	33858	**20**				
		2	5206	7801	8024	15825	7643	9775	17418	38449					
		3	4990	8688	8478	17166	5909	6635	12544	34700					
		4	4410	8397	9239	17636	6553	7991	14544	36590					
AT Wgt			9906	16579	16303	32881	13166	15846	29012	71799		-4.10%	2.37%	-3.84%	-1.13%

	Steering	Drive	Trailer	GVW
Avg	-1.78%	2.73%	-4.68%	-0.99%
Std Dev	3.05%	3.62%	3.13%	2.99%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result				

Measured values (lbs) | **Measurement errors (%)**

Post-Calibration 10/6/99
Conv. Ride Lane 2

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			10330	15650	16470	32120	13760	16410	30170	72620		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**7813**	**1**	10434	15256	16844	32100	13830	17492	31322	73856	**1**				
		2	10434	15256	16844	32100	13830	17492	31322	73856					
AT Wgt			10434	15256	16844	32100	13830	17492	31322	73856		1.01%	-0.06%	3.82%	1.70%
2	**8041**	**1**	10178	14599	16055	30654	14002	17439	31441	72273	**2**				
		2	9501	14745	16192	30937	13133	17825	30958	71396					
AT Wgt			9840	14672	16124	30796	13568	17632	31200	71835		-4.75%	-4.12%	3.41%	-1.08%
3		**1**				0			0	0	**3**				
		2				0			0	0					
AT Wgt			0	0	0	0	0	0	0	0					
4	**8536**	**1**	10059	14941	15461	30402	14030	16648	30678	71139	**4**				
		2	9764	15475	17173	32648	13217	17918	31135	73547					
AT Wgt			9912	15208	16317	31525	13624	17283	30907	72343		-4.05%	-1.85%	2.44%	-0.38%
5	**8799**	**1**	9248	15561	14829	30390	13938	17133	31071	70709	**5**				
		2	9212	14818	16714	31532	13585	17669	31254	71998					
AT Wgt			9230	15190	15772	30961	13762	17401	31163	71354		-10.65%	-3.61%	3.29%	-1.74%
6	**8619**	**1**	9482	14789	16412	31201	15391	17356	32747	73430	**6**				
		2	9378	15530	16310	31840	13521	18705	32226	73444					
AT Wgt			9430	15160	16361	31521	14456	18031	32487	73437		-8.71%	-1.87%	7.68%	1.13%
7	**9584**	**1**	9149	14244	15221	29465	14981	16324	31305	69919	**7**				
		2	9662	15250	18055	33305	12441	19007	31448	74415					
AT Wgt			9406	14747	16638	31385	13711	17666	31377	72167		-8.95%	-2.29%	4.00%	-0.62%
8	**9875**	**1**	9986	14116	14809	28925	13093	17316	30409	69320	**8**				
		2	9892	16414	16238	32652	12595	16727	29322	71866					
AT Wgt			9939	15265	15524	30789	12844	17022	29866	70593		-3.79%	-4.15%	-1.01%	-2.79%
9	**10149**	**1**	10822	13464	13986	27450	13036	16220	29256	67528	**9**				
		2	11254	15212	16343	31555	11523	17173	28696	71505					
AT Wgt			11038	14338	15165	29503	12280	16697	28976	69517		6.85%	-8.15%	-3.96%	-4.27%
10	**10425**	**1**	9365	14798	15682	30480	15190	17225	32415	72260	**10**				
		2	9146	15087	17772	32859	13387	18601	31988	73993					
AT Wgt			9256	14943	16727	31670	14289	17913	32202	73127		-10.40%	-1.40%	6.73%	0.70%
11	**10684**	**1**	9206	15153	15409	30562	13843	17245	31088	70856	**11**				
		2	9420	14732	17045	31777	13521	17845	31366	72563					
AT Wgt			9313	14943	16227	31170	13682	17545	31227	71710		-9.85%	-2.96%	3.50%	-1.25%
12	**10960**	**1**	10028	14513	15234	29747	14163	16526	30689	70464	**12**				
		2	9528	15876	17031	32907	13380	17413	30793	73228					
AT Wgt			9778	15195	16133	31327	13772	16970	30741	71846		-5.34%	-2.47%	1.89%	-1.07%
13	**11436**	**1**	8835	14628	15339	29967	13248	15325	28573	67375	**13**				
		2	8994	15300	16220	31520	14469	18566	33035	73549					
AT Wgt			8915	14964	15780	30744	13859	16946	30804	70462		-13.70%	-4.29%	2.10%	-2.97%
14	**11750**	**1**	9645	13261	14242	27503	13847	16718	30565	67713	**14**				
		2	10948	14650	16403	31053	11603	17058	28661	70662					
AT Wgt			10297	13956	15323	29278	12725	16888	29613	69188		-0.32%	-8.85%	-1.85%	-4.73%
15	**12057**	**1**	10255	14926	15137	30063	14996	17239	32235	72553	**15**				
		2	11823	16284	17962	34246	13962	17512	31474	77543					
AT Wgt			11039	15605	16550	32155	14479	17376	31855	75048		6.86%	0.11%	5.58%	3.34%
16	**12431**	**1**	10551	14527	13720	28247	12851	15902	28753	67551	**16**				
		2	11082	15184	16079	31263	11609	16418	28027	70372					
AT Wgt			10817	14856	14900	29755	12230	16160	28390	68962		4.71%	-7.36%	-5.90%	-5.04%
17	**12796**	**1**	9076	14262	14165	28427	15168	16921	32089	69592	**17**				
		2	10055	15420	17552	32972	13012	18376	31388	74415					
AT Wgt			9566	14841	15859	30700	14090	17649	31739	72004		-7.40%	-4.42%	5.20%	-0.85%
18	**13150**	**1**	9852	12965	13966	26931	14235	15966	30201	66984	**18**				
		2	11025	15437	16092	31529	12388	17536	29924	72478					
AT Wgt			10439	14201	15029	29230	13312	16751	30063	69731		1.05%	-9.00%	-0.36%	-3.98%

	Steering	Drive	Trailer	GVW
Avg	-3.97%	-3.93%	2.15%	-1.41%
Std Dev	6.18%	2.79%	3.58%	2.29%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result				

Measured values (lbs) | **Measurement errors (%)**

Post-Calibration 10/6/99
Conv. Ride Lane 3

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			10330	15650	16470	32120	13760	16410	30170	72620		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**7099**	**1**	10075	14103	16094	30197	13501	14998	28499	68771	**1**				
		2	9709	15801	15686	31487	15704	17927	33631	74827					
AT Wgt			9892	14952	15890	30842	14603	16463	31065	71799		-4.24%	-3.98%	2.97%	-1.13%
2	**7353**	**1**	9645	13914	15514	29428	13038	14463	27501	66574	**2**				
		2	9660	15095	15034	30129	15730	17933	33663	73452					
AT Wgt			9653	14505	15274	29779	14384	16198	30582	70013		-6.56%	-7.29%	1.37%	-3.59%
3	**7606**	**1**	9651	15120	16123	31243	14469	16163	30632	71526	**3**				
		2	10333	14837	14811	29648	14333	17517	31850	71831					
AT Wgt			9992	14979	15467	30446	14401	16840	31241	71679		-3.27%	-5.21%	3.55%	-1.30%
4	**7978**	**1**	9649	13420	15517	28937	13858	15314	29172	67758	**4**				
		2	10295	15109	16709	31818	14643	18714	33357	75470					
AT Wgt			9972	14265	16113	30378	14251	17014	31265	71614		-3.47%	-5.42%	3.63%	-1.39%
5		**1**				0			0	0	**5**				
		2				0			0	0					
AT Wgt			0	0	0	0	0	0	0	0					
6	**8548**	**1**	9567	16434	16566	33000	14407	16438	30845	73412	**6**				
		2	9519	14694	15543	30237	14597	16637	31234	70990					
AT Wgt			9543	15564	16055	31619	14502	16538	31040	72201		-7.62%	-1.56%	2.88%	-0.58%
7	**8819**	**1**	10000	15197	16643	31840	15841	16705	32546	74386	**7**				
		2	10555	16260	15508	31768	14906	17311	32217	74540					
AT Wgt			10278	15729	16076	31804	15374	17008	32382	74463		-0.51%	-0.98%	7.33%	2.54%
8		**1**				0			0	0	**8**				
		2				0			0	0					
AT Wgt			0	0	0	0	0	0	0	0					
9	**10072**	**1**	9003	13384	13929	27313	12809	13777	26586	62902	**9**				
		2	9310	14818	15453	30271	15682	17146	32828	72409					
AT Wgt			9157	14101	14691	28792	14246	15462	29707	67656		-11.36%	-10.36%	-1.53%	-6.84%
10	**10357**	**1**	8921	12864	14326	27190	13616	15126	28742	64853	**10**				
		2	9254	15629	15497	31126	14405	18584	32989	73369					
AT Wgt			9088	14247	14912	29158	14011	16855	30866	69111		-12.03%	-9.22%	2.31%	-4.83%
11	**10614**	**1**	10278	13808	16044	29852	12758	14957	27715	67845	**11**				
		2	9526	15578	14661	30239	15633	17933	33566	73331					
AT Wgt			9902	14693	15353	30046	14196	16445	30641	70588		-4.14%	-6.46%	1.56%	-2.80%
12	**10890**	**1**	9768	16273	16661	32934	14299	17431	31730	74432	**12**				
		2	9228	14747	14723	29470	14341	14873	29214	67912					
AT Wgt			9498	15510	15692	31202	14320	16152	30472	71172		-8.05%	-2.86%	1.00%	-1.99%
13	**11169**	**1**	9689	13005	15038	28043	12577	14835	27412	65144	**13**				
		2	9195	16037	15051	31088	15587	17955	33542	73825					
AT Wgt			9442	14521	15045	29566	14082	16395	30477	69485		-8.60%	-7.95%	1.02%	-4.32%
14	**11665**	**1**	8253	12244	13649	25893	12247	13479	25726	59872	**14**				
		2	9404	14418	16255	30673	14804	17633	32437	72514					
AT Wgt			8829	13331	14952	28283	13526	15556	29082	66193		-14.54%	-11.95%	-3.61%	-8.85%
15	**11986**	**1**	7964	13102	14114	27216	11742	13636	25378	60558	**15**				
		2	9870	15071	15188	30259	14659	16864	31523	71652					
AT Wgt			8917	14087	14651	28738	13201	15250	28451	66105		-13.68%	-10.53%	-5.70%	-8.97%
16	**12344**	**1**	9872	12976	14707	27683	13325	15228	28553	66108	**16**				
		2	9201	15461	15124	30585	15534	17909	33443	73229					
AT Wgt			9537	14219	14916	29134	14430	16569	30998	69669		-7.68%	-9.30%	2.74%	-4.06%
17	**12714**	**1**	8476	13519	13503	27022	12317	13439	25756	61254	**17**				
		2	9499	14890	15764	30654	15995	16760	32755	72908					
AT Wgt			8988	14205	14634	28838	14156	15100	29256	67081		-13.00%	-10.22%	-3.03%	-7.63%
18	**13071**	**1**	9817	12394	14288	26682	13697	16571	30268	66767	**18**				
		2	10176	16176	14396	30572	12930	17155	30085	70833					
AT Wgt			9997	14285	14342	28627	13314	16863	30177	68800		-3.23%	-10.87%	0.02%	-5.26%

	Steering	Drive	Trailer	GVW
Avg	-7.62%	-7.14%	1.03%	-3.81%
Std Dev	4.17%	3.38%	3.12%	3.10%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result				

Post-Calibration 10/6/99

Conv. Ride Lane 4

Measured values (lbs)

				Drive			Trailer					**Measurement errors (%)**			
			Steer	**1st axle**	**2nd axle**	**Tot 2+3**	**1st axle**	**2nd axle**	**Tot 4+5**	**GVW**					
			10330	15650	16470	32120	13760	16410	30170	72620		*% err*	*% err*	*% err*	*% err*
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
1	**6373**	**1**	4844	7632	7667	15299	6606	8125	14731	34874	**1**				
		2	4820	8084	8026	16110	7224	9303	16527	37457					
		3	4672	8233	7179	15412	6461	7658	14119	34203					
		4	5164	8004	8061	16065	7475	9746	17221	38450					
AT Wgt			9750	15977	15467	31443	13883	17416	31299	72492		-5.61%	-2.11%	3.74%	-0.18%
2	**6619**	**1**	4831	7740	7898	15638	7080	8251	15331	35800	**2**				
		2	4800	7718	8233	15951	6756	8771	15527	36278					
		3	5173	7753	6952	14705	6364	7702	14066	33944					
		4	4941	7640	7729	15369	7724	9658	17382	37692					
AT Wgt			9873	15426	15406	30832	13962	17191	31153	71857		-4.43%	-4.01%	3.26%	-1.05%
3	**6879**	**1**	4791	7751	8948	16699	7109	8518	15627	37117	**3**				
		2	4668	7989	7856	15845	6992	8697	15689	36202					
		3	5270	9041	8220	17261	7400	7676	15076	37607					
		4	5294	7687	7634	15321	7257	9098	16355	36970					
AT Wgt			10012	16234	16329	32563	14379	16995	31374	73948		-3.08%	1.38%	3.99%	1.83%
4	**7178**	**1**	4963	7856	8738	16594	5993	8273	14266	35823	**4**				
		2	4586	7711	8099	15810	6738	9082	15820	36216					
		3	4997	8862	7210	16072	6326	7629	13955	35024					
		4	5321	8053	7598	15651	7523	9627	17150	38122					
AT Wgt			9934	16241	15823	32064	13290	17306	30596	72593		-3.84%	-0.18%	1.41%	-0.04%
5	**7449**	**1**	4946	7179	8414	15593	7232	8644	15876	36415	**5**				
		2	4723	7539	8262	15801	7232	9204	16436	36960					
		3	5352	9197	8198	17395	6544	7568	14112	36859					
		4	5109	8271	7640	15911	7512	9369	16881	37901					
AT Wgt			10065	16093	16257	32350	14260	17393	31653	74068		-2.57%	0.72%	4.91%	1.99%
6	**2166**	**1**	5078	7740	7404	15144	5947	8119	14066	34288	**6**				
		2	4930	8377	8238	16615	7574	9673	17247	38792					
		3	4919	7834	6745	14579	6163	7420	13583	33081					
		4	5343	8059	7665	15724	7947	9682	17629	38696					
AT Wgt			10135	16005	15026	31031	13816	17447	31263	72429		-1.89%	-3.39%	3.62%	-0.26%
7	**2435**	**1**	4972	7030	8035	15065	6560	8278	14838	34875	**7**				
		2	4560	7596	8639	16235	6996	9519	16515	37310					
		3	5085	7501	6573	14074	6469	7204	13673	32832					
		4	5197	8028	7184	15212	7193	9336	16529	36938					
AT Wgt			9907	15078	15216	30293	13609	17169	30778	70978		-4.09%	-5.69%	2.01%	-2.26%
8	**2738**	**1**	5171	8000	7839	15839	6518	8403	14921	35931	**8**				
		2	4613	7722	8086	15808	7067	9257	16324	36745					
		3	4769	8090	7082	15172	6326	7830	14156	34097					
		4	5008	8278	7546	15824	7495	9243	16738	37570					
AT Wgt			9781	16045	15277	31322	13703	17367	31070	72172		-5.32%	-2.49%	2.98%	-0.62%
9	**3158**	**1**	4908	8147	8869	17016	6474	7923	14397	36321	**9**				
		2	4916	7958	8176	16134	7025	9687	16712	37762					
		3	4979	7768	7501	15269	6240	7603	13843	34091					
		4	5102	7345	6985	14330	7570	9618	17188	36620					
AT Wgt			9953	15609	15766	31375	13655	17416	31070	72397		-3.65%	-2.32%	2.98%	-0.31%
10	**3467**	**1**	5202	7671	8487	16158	5850	8736	14586	35946	**10**				
		2	4844	8831	8924	17755	6822	9493	16315	38914					
		3	5230	7316	7314	14630	6251	7852	14103	33963					
		4	5047	7903	7460	15363	7905	9583	17488	37898					
AT Wgt			10162	15861	16093	31953	13414	17832	31246	73361		-1.63%	-0.52%	3.57%	1.02%
11	**3865**	**1**	4866	7358	8050	15408	5960	8161	14121	34395	**11**				
		2	4708	8293	8421	16714	7288	9834	17122	38544					
		3	5221	7565	7592	15157	5091	6809	11900	32278					
		4	5109	8017	7759	15776	7640	8456	16096	36981					
AT Wgt			9952	15617	15911	31528	12990	16630	29620	71099		-3.66%	-1.84%	-1.82%	-2.09%
12	**4274**	**1**	4972	8064	8141	16205	7082	8141	15223	36400	**12**				
		2	4668	8198	8250	16448	7310	9678	16988	38104					
		3	5166	8838	8280	17118	6681	7318	13999	36283					
		4	4758	8050	7528	15578	7466	9512	16978	37314					
AT Wgt			9782	16575	16100	32675	14270	17325	31594	74051		-5.30%	1.73%	4.72%	1.97%
13	**4683**	**1**	4668	7230	7733	14963	6304	8507	14811	34442	**13**				
		2	5118	7852	7978	15830	6818	8979	15797	36745					
		3	5124	7654	6397	14051	6948	7063	14011	33186					
		4	5561	8004	6930	14934	7301	9195	16496	36991					
AT Wgt			10236	15370	14519	29889	13686	16872	30558	70682		-0.91%	-6.95%	1.28%	-2.67%
14	**5029**	**1**	4533	7208	7887	15095	6311	8236	14547	34175	**14**				
		2	4743	7682	7987	15669	7060	9521	16581	36993					
		3	4900	7512	7612	15124	6256	7265	13521	33545					
		4	5285	7587	8035	15622	7885	9766	17651	38558					
AT Wgt			9731	14995	15761	30755	13756	17394	31150	71636		-5.80%	-4.25%	3.25%	-1.36%
15	**5334**	**1**	4816	7228	8222	15450	6525	9007	15532	35798	**15**				
		2	4818	7817	8608	16425	7016	8655	15671	36914					
		3	5164	7912	6624	14536	6813	6220	13033	32733					
		4	5407	7759	7546	15305	7385	9080	16465	37177					
AT Wgt			10103	15358	15500	30858	13870	16481	30351	71311		-2.20%	-3.93%	0.60%	-1.80%
16	**5622**	**1**	4441	7365	8026	15391	6633	8597	15230	35062	**16**				
		2	4772	7530	8280	15810	7065	9515	16580	37162					

Measured values (lbs) | **Measurement errors (%)**

Post-Calibration 10/6/99
Conv. Ride Lane 4

				Drive			Trailer								
			Steer	1st axle	2nd axle	Tot 2+3	1st axle	2nd axle	Tot 4+5	GVW					
			10330	15650	16470	32120	13760	16410	30170	72620		% err	% err	% err	% err
Pass No	*Run No*	*Sens No*	*1st Axle*	*2nd Axle*	*3rd Axle*	*2+3*	*4th Axle*	*5th Axle*	*Tot 4+5*	*GVW*	*Pass No*	*Steer*	*Drive*	*Trailer*	*GVW*
		3	5065	7526	7160	14686	6487	8042	14529	34280					
		4	5299	7365	6789	14154	7175	8308	15483	34936					
AT Wgt			9789	14893	15128	30021	13680	17231	30911	70720		-5.24%	-6.54%	2.46%	-2.62%
17	**5911**	**1**	4688	7766	8015	15781	6421	7964	14385	34854	**17**				
		2	4763	8450	8648	17098	7596	10269	17865	39726					
		3	4805	7354	7462	14816	6483	7036	13519	33140					
		4	5530	7640	7883	15523	8035	9881	17916	38969					
AT Wgt			9893	15605	16004	31609	14268	17575	31843	73345		-4.23%	-1.59%	5.54%	1.00%
18	**6240**	**1**	4622	8037	8701	16738	6518	8897	15415	36775	**18**				
		2	4805	7146	8838	15984	7259	9523	16782	37571					
		3	4972	7643	7665	15308	6824	7773	14597	34877					
		4	5389	7565	8061	15626	7299	9618	16917	37932					
AT Wgt			9894	15196	16633	31828	13950	17906	31856	73578		-4.22%	-0.91%	5.59%	1.32%
19	**6560**	**1**	4880	7171	8053	15224	6983	8776	15759	35863	**19**				
		2	4880	6904	8447	15351	7056	9457	16513	36744					
		3	5217	8685	7268	15953	6507	7565	14072	35242					
		4	5312	8055	7206	15261	7709	9204	16913	37486					
AT Wgt			10145	15408	15487	30895	14128	17501	31629	72668		-1.80%	-3.82%	4.83%	0.07%
20	**6827**	**1**	5001	7658	8084	15742	6778	8260	15038	35781	**20**				
		2	4862	8189	8147	16336	7071	9367	16438	37636					
		3	5180	7720	8022	15742	6750	7160	13910	34832					
		4	5065	7751	7594	15345	7687	9398	17085	37495					
AT Wgt			10054	15659	15924	31583	14143	17093	31236	72872		-2.67%	-1.67%	3.53%	0.35%

	Steering	Drive	Trailer	GVW
Avg	-3.61%	-2.42%	3.12%	-0.29%
Std Dev	1.43%	2.38%	1.75%	1.48%
Number of pts exceeding 15% axle or 10% GVW	0	0	0	0
Pass/fail result				