

AXLE PAD SCALE SYSTEM User Manual

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I. INTRODUCTION

This user manual describes the Massload Axle Pad weighing system specifications, installations procedures, operation procedures, calibration procedures, troubleshoot flow & procedures, and maintenance notes.

I.A. Safety Precautions

Practice safe lifting method during installation.

Keep children away during installation.

Do not overload the axle pad scale.

Do not change or modify settings without guidance from qualified personnel.

Read and follow this user manual for safe installation, operation and maintenance.

II. SPECIFICATIONS

System

- 6" Low profile axle deck
- Available in length of 30", 84", 144" and 168"
- Made of heavy-duty high strength steel
- Static accuracy of <= 0.25%
- Safe overload of 150% at full-scale capacity
- Traffic light controlled auto axle-weighing
- Ticket printing at the end of auto axle-weighing

M1 Indicator

- 5V excitation voltage up to 4 pcs 350 Ohms or 8 pcs 700 Ohms load cells
- 6 digits, 7 segments LED display
- MENU, GR/NET, TARE, ZERO, PRINT key button functions
- 8 annunciators light
- Durable stainless steel enclosure construction
- Easy to use to program and calibrate
- RS232 serial communication
- AC input: 90 240 VAC
- Power consumption: 500 mW
- Operating temperature range: -10°C to 40°C
- 9" x 5.5" x 3" dimension

Aurora LED Remote Display

- 5" Red and Green Traffic light
- 6 digits 4.5" high, 7 segments display
- 4 annunciators light
- Mild steel powder-coated enclosure
- Easy to read High-Contrast LED display
- Auto-Learn Technology to reduce set up time
- 5 button keypad for parameter programming
- RS232 serial communication
- AC input: 100 240 VAC
- Power consumption: 1 Amp
- Operating temperature range: -40°C to 50°C
- 32" x 12" x 5" dimension

Thermal Printer

- Intelligent, small size, lightweight, user-friendly thermal printer
- 58 mm paper width
- Power adapter: 12 Vdc 2 Amp output, 100 264 VAC input
- Operating temperature range: 0°C to 50°C

Load cell

• 700 Ohms bridge resistance

II.I Types of AXLE pad system

- a. 168" (14') AXLE with Auto weighing
- b. 144" (12') AXLE with Auto Weighing
- c. 84" (7') AXLE with Auto Weighing. See notes in blue for 7' AXL
- d. Any size (7', 12', 14') AXLE with wireless system and MAWS software See notes in blue for Wireless AXL

III. INSTALLATION GUIDE

III.A. Recommendation on site selection and preparation

- 1. A hard and level surface such as concrete, asphalt, and hard-packed gravel.
- 2. Avoid areas with poor water drainage.
- 3. Select an area that allows straight entry and exit of at least a truck length.
- 4. The axle pad decks can be installed on a recessed road surface.
- 5. Suggested Deck spacing:



To verify that the decks are parallel and aligned, measure corner to corner of the top deck. Both measurements should be close to the same.

III.B. Installation Procedure

1. Remove the shrink wrap.



2. Cut off the steel strap and take off the instrumentation box.



3. Place Deck 1-1 at the target position.



4. Place and join Deck 1-2 to Deck 1-1.



5. Place Deck 2-1 in-front of Deck 1-2 with the gray boxes facing towards each other.



6. Place and join Deck 2-2 to Deck 2-1.



 Install the joiner plate between Deck 1-1/Deck 1-2 and Deck 2-1/Deck 2-2. Hand-tight the bolt. Do not bind the joiner plate to the decks.



NOTE: For 7' AXLE you only have 2 sets of decks as shown on below photo. It will be Deck 1 and Deck 2 only. The joining of decks (example Deck 1-1 and Deck1-2) is not applicable for 7'

8. Open the instrumentation box and take out the M1 indicator, Aurora Display, and the thermal printer.





9. Take out the two interconnect cables and install them between the two sum boxes of Deck 1-1 & Deck 1-2 and Deck 2-1 & Deck 2-2. Insert the mating connector and turn clockwise the coupling nut all the way in.



NOTE: For 7' AXLE the interconnect cable is not applicable

10. Connect the Y-cable ends to the sum box of Deck 1-1 and Deck 2-1. Insert the mating connector and turn clockwise the coupling nut all the way in.





<u>NOTE:</u> If you have a 12' and 14' wireless system, connect the Y – cable with transmitter or the cable 1/cable 2 with transmitter to the junction box as shown on above photo.

If you have a 7' connect the the Y – cable with transmitter or the cable 1/cable 2 with transmitter to the Deck 1 and Dec 2 Junction box

11. Connect the printer cable to the RS 232 port and DC plug of the AC adapter of the thermal printer.



- 12. Follow the power sequence:
 - a. Plug-in the AC power cord of the M1 indicator
 - b. Plug-in the AC power cord of the Aurora Display
 - c. Plug-in the AC adapter of the thermal printer

Note: Thermal Printer status red light indicator

Continuous On = Normal operation Blink 1 pec sec = Out of paper Blink 2 per sec = Mechanism overheat

Do a simple test weight on the scale.



13. Power off the scale then installs the Aurora Display, M1 indicator, and thermal printer on the desired location.

Repeat Power Sequence. The axle pad system is ready to use.

NOTE: for Wireless AXLE please refer to Massload Advance Weigh Scale Software Manual for the system set up.

IV. TRUCK WEIGH OPERATION

- 1. At green traffic light, drive the 1st axle on the scale.
- 2. Stop the truck when the traffic light turns red.
- 3. Axle A1 weight is captured & displayed. Printer prints 1st axle weight.
- 4. The traffic light turns green.
- 5. Drive the 2nd axle or group of axles on the scale.
- 6. Stop the truck when the traffic light turns red.
- 7. Axle A2 weight is captured & displayed. Printer prints 2nd axle weight.
- 8. The traffic light turns green.
- 9. Repeat steps #5 to 8 for the remaining axle or group of axles.
- 10. After the last axle weight is printed, drive off the truck from the scale.
- 11. The traffic light turns red.
- 12. The printer prints the total weight and Aurora Display the Total Weight.
- 13. The traffic light turns green. Weight returns to 0.
- 14. Ready for the next truck to weigh.

V. CALIBRATION PROCEDURE

Calibration Keys



- 1. Power off the Thermal printer.
- 2. Enter Calibration Mode:
 - 2.1. Press and hold together the TARE or LEFT and ZERO or RIGHT keys.
 - 2.2. "CAL" is displayed then "PASS" then "0000"
 - 2.3. Press MENU or UP key to change blinking "0" to "1" then press PRINT or ENTER key.



Blicking "C" should appear on the left side of the M1 display.

- 3. Set the Graduation size:
 - 3.1. Press the UP or DOWN key until "P1.0" is displayed then press ENTER.
 - 3.2. Press UP or DOWN key to select "20d" if calibrating in lbs or "10d" if calibrating in kgs.
- 4. Set the Scale capacity:

168" or 14' axle pad capacity = 90,000 lbs or 40,820 kgs 144" or 12' axle pad capacity = 90,000 lbs or 40,820 kgs 84" or 7' axle pad capacity = 60,000 or 27,200 kgs

- 4.1. Press the UP or DOWN key until "P1.4" is displayed then press ENTER.
- 4.2. Press LEFT or RIGHT to move between digits then UP or DOWN to select the digit value. The active digit is blinking.
- 4.3. When the target capacity is displayed, press ENTER.

- 5. Set the Calibration unit:
 - 5.1. Press the UP or DOWN key until "P1.6" is displayed then press ENTER.
 - 5.2. Press UP or DOWN to set "1" or "2". Set to "1" if kgs or "2" if lbs.
 - 5.3. When the target unit value is displayed, press ENTER.
- 6. Set the Power On unit:
 - 6.1. Press the UP or DOWN key until "P1.7" is displayed then press ENTER.
 - 6.2. Press UP or DOWN to set "1" or "2". Set to "1" if kgs or "2" if lbs. **P1.6 and P1.7 should be in the same unit.**
 - 6.3. When the target unit value is displayed, press ENTER.
- 7. Set the Alternate Unit:
 - 7.1. Press the UP or DOWN key until "P1.8" is displayed then press ENTER.
 - 7.2. Press UP or DOWN to set "1" or "2". Set to "1" if kgs or "2" if lbs. **P1.7 and P1.8 should have a different value.**
 - 7.3. When the target unit value is displayed, press ENTER.
- 8. Set the Zero range percentage:
 - 8.1. Press the UP or DOWN key until "P2.0" is displayed then press ENTER.
 - 8.2. Press the UP or DOWN key until "10PC" is displayed then press ENTER.
- 9. Calibrate the No-load condition:
 - 9.1. Make sure there's no load at the scale.
 - 9.2. Press the UP or DOWN key until "P1.2" is displayed then press ENTER.
 - 9.3. The M1 displays "E SCL" then press ENTER.
- 10. Calibrate the Span condition:
 - 10.1. Apply known load at the scale.
 - 10.2. Press the UP or DOWN key until "P1.3" is displayed then press ENTER.
 - 10.3. Press LEFT or RIGHT to move between digits then UP or DOWN to select the digit value. The active digit is blinking.
 - 10.4. When the target load weight is displayed, press ENTER.

- 11. Exit calibration mode:
 - 11.1. Press and hold together the TARE or LEFT and ZERO or RIGHT keys.
 - 11.2. M1 display "CAL" then "SAVE".
- 12. Verify the calibration:
 - 12.1. Remove and apply the load. The M1 should display the correct weight.
- 13. Power on Thermal Printer. The scale is ready to use.

VI. PRELIMINARY INSPECTION FLOW





В

1. Run fingers along the length of the cable.





- 2. Check if there's a break or damage to the cable jacket.
- If there is a break or damage on the cable jacket, check the four-conductor wires.
- 1. Guideline in repairing cables:
 - a. Connect the wires of the same color.
 - b. Prevent shorting of different colored wires.
 - c. Prevent moisture from entering the fixed/repaired cable part. Moisture will cause instability and drifting in the weight readout.
- 2. Guideline in replacing cables:
 - a. Identify which cable to replace. Here's the list of cables:
 - Interconnect molded cable (sum box between deck)
 - Molded Y-cable (deck to M1 indicator)
 - Blue run cable (M1 indicator to Aurora Display)
 - Blue load cell cable (load cell to sum box)
 - b. Contact Massload to order the cable.

С

1. Unplug the mating connectors on the sum boxes.





2. Inspect the 4 male pins connectors on the sum boxes.



3. Inspect the 4 female pins connectors on the cables.



D

1. Clean male pins:

- 1.1. Grab Q-tips or cotton buds, alcohol, and a mini brush.
- 1.2. Dip the cotton bud in alcohol and rub it around the male pins.
- 1.3 Use another cotton bud to absorb the dirty alcohol that drips inside the connector.
- 1.4. Dry with air if pressurized or compressed air is available.
- 2. Clean female pins:
 - 2.1. Dip the mini brush in alcohol.
 - 2.2. Insert the mini brush inside the female pins and spin the brush.
 - 2.3. Drain the dirty alcohol.
 - 2.4. Dry with air if pressurized or compressed air is available.
 - Note: If using another cleaning chemical, make sure it is compatible with electronic parts.
- 3. Plug the mating connectors back into the sum box.



- 1. Look for signs of damage on the sum box that would allow water or moisture to leak inside the sum box.
- 2. If there is no damage on the sum box skip to step 4, otherwise continue to step 3.
- 3. If the damage is too severe, contact Massload for the replacement sum box. If the damage is not severe, repair the damage on the sum box. Use any adhesive sealant that will stick to the material of the sum box.
- 4. Use a Philips screwdriver to remove the front lid.



- 5. Check for a loose connection.
 - 5.1. Pull each wire connected to the terminal strip.



If there is a loose wire, re-tighten it.

- 6. Check for signs of moisture inside the sum box.
 - 6.1. If there is a sign of moisture, let it dry.
 - 6.2. If the moisture keeps coming back, replace the sum box.
 - Note: Old axle pad sum box is made of plastic which was upgraded to aluminum to prevent moisture problems.
- 7. Check for signs of corrosion on the terminal strip.

If there are signs of corrosion then replace the terminal strip.

7.1. To replace the terminal strip, remember the position of the wires.

7.2. Use a flat screwdriver and turn counterclockwise to loosen the wires to pull it out.



7.3. On the new terminal strip, insert back the wires and turn the screwdriver clockwise.

Note: Same colored wires should be on each terminal.

8. Put back the front lid.

F

1. Check if there is debris build-up on the leg mount where the load cell is mounted.







Debris build-up can interfere with the load cell and will cause false weight reading.

- 2. Use pressurized water to clean the area around the load cell especially underneath the load cell.
- G
 - 1. Power on the axle pad system.
 - 2. Check if the M1 indicator has a stable zero readout at no-load condition.
 - 3. Apply a known weight on the scale.

If no problem is observed and the weight readout is good then the scale is ready to use.

If the problem still exists, proceed to Troubleshoot.









End

- A
- 1. Power off the axle pad system.
- 2. Use a Philips screwdriver to remove back cover screws. Gently pull out the back cover.





3. Gently pull each wire at the load cell terminal.



If there is a loose wire, re-tighten the screw lock.

- 4. Power on the axle pad system. Check if the problem is resolved.
- В
- 1. Power on the M1 indicator.
- 2. Locate the Exc+ (red wire) and Exc- (black wire) at the load cell terminal.



- 3. Use a multimeter and set it to V dc range.
- 4. Put red probe at Exc+ while the black probe at Exc- terminal.



5. Good excitation voltage is 5 +/-0.1 V.

If the excitation voltage is unstable or drifting, the M1 is defective.

If the excitation voltage is out of tolerance, the M1 is defective.

С

1. Locate the Sig+ (green wire) and Sig- (white wire) at the load cell terminal.



- 2. Use a multimeter and set it to mV dc range.
- 3. Put red probe at Sig+ while the black probe at Sig- terminal.



4. Good mV voltage at no-load condition is <=0.5 mV.

D

Е

F

1. If the mV is stable and within acceptable range but the M1 readout is unstable or drifts then the M1 is defective.

- 2. Power off M1.
- 3. Record the connection at each terminal.
- 4. Remove all the wires connected at each terminal.
- 5. Put the M1 back cover.
- 6. Contact Massload for M1 repair or new M1 purchase.
- 1. Repeat C steps 1,2, and 3.
- 1. Power off the M1.
- 2. Remove the wires at the M1 load cell terminal.



- 3. Use a multimeter and set it to resistance Ohms range.
- 4. Short the red and black probe to measure the offset resistance.

In this example, the offset is 1.2 Ohms.



5. Measure the excitation resistance at red and black wires.



Actual value = 118.9 - 1.2 = 117.7 Ohm Shown is an axle pad with 6 load cells.

6. Measure the signal resistance at green and white wires.



Actual value = 119.5 - 1.2 = 118.3 Ohm Shown is an axle pad with 6 load cells.

- 7. Reference good resistance values:
 - 7.1. Axle pad with 8 load cells: 87.5 +/- 2 Ohms
 - 7.2. Axle pad with 6 load cells: 117 +/- 2 Ohms
 - 7.3. Axle pad with 4 load cells: 175 +/- 2 Ohms

Resistance value way over or less than this range indicates a faulty load cell/s or defective Y-cable.

G

1. Unplug the Y-cable mating connectors at the sum box 1-1 and 2-1.



2. Use a multimeter and set it to resistance Ohms range.

3. Remove the front lid of sum box 1-1 & 2-1 using a Philips screwdriver.





4. Measure the excitation resistance at red and black wires.



Actual value = 234.1 – 1.2 = 232.9 Ohm Shown is a deck with 3 load cells. (Deck = Deck 1-1 & Deck 1-2 or Deck 2-1 & Deck 2-2)

5. Measure the signal resistance at green and white wires.



Actual value = 234.8 - 1.2 = 233.3 Ohm Shown is a deck with 3 load cells.

- 6. Reference good resistance values:
 - 6.1. Axle pad deck with 4 load cells: 175 +/- 2 Ohms
 - 6.2. Axle pad deck with 3 load cells: 233 +/- 2 Ohms
 - 6.3. Axle pad deck with 2 load cells: 350 +/- 2 Ohms Deck with resistance way over or less than this range indicates a faulty load cell/s.

1. Remove the load cell wires from the terminal strip.

Н



Shown is a deck with 3 load cells

2. Measure the excitation (red & black) and signal(green & white) resistance for each load cell.



3. Reference good resistance: Excitation & Signal resistance: 700 +/- 3 Ohms A defective load cell typically has very high or very low resistance.

1. Disconnect E1 Y cable end at sum box 1-1. Connect E2 Y cable end at sum box 2-1.







- 2. Use a multimeter and set to mV dc range.
- 3. Put red probe at green wire terminal while the black probe at white wire terminal.



К

J

- 1. Disconnect E2 Y-cable end from Sumbox 2-1.
- 2. Connect E1 Y-cable end to Sumbox 2-1.



1. On the active deck, remove the green and white wires from the terminal strip.



- 2. Use a multimeter and set to mV dc range.
- 3. Measure each load cell mV output. Put the red probe at the green wire while the black probe at the white wire.

Load cell#1

L



Load cell#2



Load cell#3



1. Connect E1 Y cable end at sumbox 1-1. Disconnect E2 Y cable end at sum box 2-1.



Ν

Μ

- 1. Disconnect E1 Y-cable end from Sumbox1-1.
- 2. Connect E2 Y-cable end to Sumbox 1-1.



0

1. Remove the Y-cable wires connection at the M1 load cell terminal.



2. Loosen the dome connector lock nut.



3. Pull the Y cable out from the dome connector.



4. Re-do steps 3 to 1 to put in the new Y-cable.

Р

1. Remove the load cell wires from the terminal strip.



2. Use a 5/8 or 15mm wrench to loosen the pigtail to pull out the cable from the sumbox.



3. Use #12 hex to loosen the cable clamp to pull out the cable.



4. Use ³/₄ hex to remove the three top bolt on top of the load cell.



- 5. Use a lifting device to lift the deck on top of the load cell.
- 6. When the deck is off the top of the load cell, place wood under the deck and pull out the leg mount.





7. Remove the two bottom bolts of the load cell.



8. Re-do steps 7 to 1 to install the new load cell.

0

1. See V. Calibration Procedure

Z

- 1. Test the axle pad scale against the issue encountered.
- 2. Observed if the issue is still present or has been resolved.
- 3. Routine test process.
 - 3.1. Check the weight displayed against a known weight.
 - 3.2. Check that the displayed return to zero when the load is removed.
 - 3.3. Check if the weight displayed is stable.
 - 3.4. One at a time, stand on top of each load cell. The weight displayed will be the same if there's no problem.

VIII. AURORA TROUBLESHOOT FLOW





- 2. Check if there's a break or damage on the cable jacket.
- 3. If there is a break or damage on the cable jacket, check the fourconductor wires.



А

1. Guideline in repairing cables:

- a. Connect the wires of the same color.
- b. Prevent shorting of different colored wires.
- c. Prevent moisture from entering the fixed/repaired cable part. Moisture will cause instability and drifting in the weight readout.



- 1. Power off M1 and Aurora.
- 2. Remove the 2 screws on each side of the Aurora display.



- 3. Lift the front glass cover.
- 4. Loosen the 3 screws that hold the display boards.



- 5. Power on M1 and Aurora.
- 6. Locate the RS232 LED on the mainboard.



D

- 1. Power off the Aurora display.
- 2. Remove the 3 wires at the RS 232 terminals.
- 3. Tighten the 3 screws that hold the display board.
- 4. Put back the glass cover.
- 5. Put back the 2 screws at each side.
- 6. Power off M1 and remove the back cover.
- 7. Record the connection at each terminal.



- 8. Remove all the wires connected at each terminal.
- 9. Loosen the connector to pull cable 1, 2, & 3 out of the back cover.
- 10. Put the M1 back cover.



1. Do step D in reverse order.

1. Apply weight on the scale.

2. Check if M1 and Aurora are showing the same weight value.

G

F

1. See V. Calibration Procedure

IX. MAINTENANCE

- 1. Clean up and remove any debris around and under the axle pad. Debris build-up will cause weighing errors.
- 2. Make sure the location where M1 is installed or mounted does not exceed 40°C. If mounted on an enclosure, make sure there is sufficient ventilation.

Operating the M1 outside it's operating temperature will cause the M1 to fail and will not be covered under warranty.

- 3. If the scale system will be unused for long period, power off the scale.
- 4. If the thermal print out is not clear, clean the printer head with cotton moistened by alcohol. Power off the printer before cleaning the printer head.
- 5. Avoid dust build-up on the thermal printer.
- 6. If the Y-cable is disconnected from the sumbox, put electrical tape on the 4-pin Amphenol to prevent dirt buildup on the pins.
- 7. Check the water drainage around the scale. If the scale is submerged underwater for a long time will cause load cell failures.