LEKTRO 88/89 SERIES

AIRCRAFT TOWING VEHICLE

OPERATION MANUAL

LEKTRO

AUTHORED BY ANTHONY HERNANDEZ - (415)786-2081 - anthony94122@outlook.com

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JBT LEKTRO, Inc.
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97146-9692, U.S.A.

THIS MANUAL DESCRIBES STANDARD LEKTRO TRACTOR FEATURES AND EQUIPMENT ONLY. WHEN REQUESTED BY A CUSTOMER, JBT LEKTRO, INC. WILL PROVIDE NON-STANDARD FEATURES AND EQUIPMENT ON A PER-ORDER BASIS. THESE NON-STANDARD ITEMS MAY BE PROVIDED IN ADDITION TO AND/OR INSTEAD OF THE STANDARD ITEMS.

TRACTORS EQUIPPED WITH NON-STANDARD ITEMS WILL INCLUDE SUPPLEMENTAL DOCUMENTATION AS NEEDED. ALL INFORMATION AND INSTRUCTIONS CONTAINED IN ANY SUPPLEMENTAL DOCUMENTATION THAT CONFLICTS WITH THIS MANUAL WILL SUPERSEDE THIS MANUAL UNLESS SPECIFICALLY NOTED OTHERWISE.

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TABLE OF DANGER, WARNING, AND CAUTION STATEMENTS

DANGER

A DANGER STATEMENT INDICATES A SITUATION THAT MUST BE AVOIDED. FAILURE TO COMPLY WITH THE DANGER STATEMENT WILL RESULT IN SERIOUS BODILY INJURY, DEATH OR PROPERTY DAMAGE, INCLUDING DAMAGE TO THE VEHICLE!

WARNING

A WARNING INDICATES A PROCEDURE THAT MUST BE FOLLOWED OR A CONDITION THAT MUST BE OBSERVED. FAILURE TO COMPLY WITH THE WARNING MAY RESULT IN SERIOUS BODILY INJURY, DEATH OR PROPERTY DAMAGE, INCLUDING DAMAGE TO THE VEHICLE!

CAUTION

A CAUTION INDICATES A PROCEDURE THAT MUST BE FOLLOWED OR A CONDITION THAT MUST BE OBSERVED. FAILURE TO COMPLY WITH THE CAUTION MAY RESULT IN DAMAGE TO VEHICLE AND VOID WARRANTY, OR DAMAGES TO OTHER PROPERTY, INCLUDING THE AIRCRAFT!

The following statements of danger, warnings and cautions are used in this manual. Read all of them and follow the instructions when performing the procedures.

DANGER

FAILURE TO FOLLOW ALL OF THE GENERAL SAFETY PRECAUTIONS IN THIS SECTION PLUS THE OTHER SAFETY WARNINGS AND CAUTIONS IN THIS MANUAL MAY CAUSE DEATH, PERSONAL INJURY, AND/OR PROPERTY DAMAGE. 1-5

DANGER

OPERATING THE TRACTOR WITH A LOOSE CONTROL CONSOLE MAY CAUSE YOU TO LOSE CONTROL OF THE VEHICLE. ALWAYS VERIFY THAT THE CONTROL CONSOLE IS SECURELY LOCKED IN POSITION BEFORE OPERATING THE VEHICLE. 4-7

CAUTION

THIS SWITCH OVERRIDES BOTH THE FENDER-MOUNTED CONTROL SWITCH AND THE WINCH LIMIT SWITCH. DO NOT OVER-RETRACT THE WINCH. 4-9

CAUTION

EXCEEDING THE VEHICLE MAXIMUM SAFE DESIGN SPEED CAN DAMAGE THE MOTOR. NEVER DRIVE THE VEHICLE FASTER THAN THE MAXIMUM SAFE DESIGN SPEED. 4-9

CAUTION

DO NOT APPLY THE BRAKES WHILE THE VEHICLE IS MOVING, UNLESS YOU NEED TO MAKE AN EMERGENCY STOP. 4-11

CAUTION

MANY JURISDICTIONS MANDATE PRE-USE INSPECTIONS AND/OR CHECKS BY LAW. 5-2

DANGER

NEVER OPERATE OR DRIVE THE TRACTOR WHEN THE BRAKES HAVE BEEN MECHANICALLY RELEASED, AS THIS WILL RENDER THE TRACTOR PRONE TO RUNAWAY WHEN STANDING AND IMPOSSIBLE TO STOP WHEN MOVING, AND MAY CAUSE A COLLISION. 5-6

DANGER

DO NOT OPERATE THE TRACTOR UNTIL THE BRAKES HAVE BEEN REPAIRED, ADJUSTED, AND TESTED ACCORDING TO THE PROCEDURES DESCRIBED IN THE BRAKES SECTION OF THE SERVICE MANUAL. 5-6

DANGER

KEEP YOUR FEET CLEAR OF THE CRADLE TO AVOID POSSIBLE CRUSHING INJURY. 5-8

CAUTION

DO NOT ALLOW THE CRADLE TO CONTACT THE GROUND. THE WEIGHT OF THE AIRCRAFT LANDING GEAR ON THE CRADLE COULD SANDWICH IT IN PLACE AND MAKE IT IMPOSSIBLE TO MOVE THE TRACTOR. 5-8

DANGER

DO NOT OPERATE THE TRACTOR UNTIL THE BRAKES HAVE BEEN REPAIRED, ADJUSTED, AND TESTED ACCORDING TO THE PROCEDURES DESCRIBED IN THE BRAKES SECTION OF THE SERVICE MANUAL. 5-10

CAUTION

TOWING THE TRACTOR AT SPEEDS EXCEEDING THE MAXIMUM SAFE TOWING SPEED FOR THAT SPECIFIC MODEL OF TRACTOR WILL DAMAGE THE DRIVE MOTOR. 5-10

CAUTION

AVOID PLACING EXCESSIVE TORQUE LOADS ON THE AIRCRAFT NOSE LANDING GEAR WHEN LIMITS ARE DISABLED BY LIMITING ACCELERATION, BRAKING, AND TURNING. 5-11

WARNING

IF THE TORQUE WARNING ALARM IS TRIGGERED, THEN THE AIRCRAFT NOSE LANDING GEAR MUST BE INSPECTED FOR DAMAGE BEFORE MOVING THE AIRCRAFT. 5-12

CAUTION

AVOID PLACING EXCESSIVE TORQUE LOADS ON THE AIRCRAFT NOSE LANDING GEAR WHEN LIMITS ARE DISABLED BY LIMITING ACCELERATION, BRAKING, AND TURNING. 5-12

CAUTION

AVOID PLACING EXCESSIVE TORQUE LOADS ON THE AIRCRAFT NOSE LANDING GEAR WHEN LIMITS ARE DISABLED BY LIMITING ACCELERATION, BRAKING, AND TURNING. 5-12

WARNING

IF THE TORQUE WARNING ALARM IS TRIGGERED, THEN THE AIRCRAFT NOSE LANDING GEAR MUST BE INSPECTED FOR DAMAGE BEFORE MOVING THE AIRCRAFT. 5-13

DANGER

NEVER POSITION THE TRACTOR DIRECTLY IN THE TAXI PATH FORWARD OF A JET ENGINE INTAKE OR SPINNING PROPELLER. 5-14

WARNING

ALWAYS REMAIN CLEAR OF THE AIRCRAFT ENGINE OPERATING AND POTENTIAL MOVEMENT AREA DURING AND AFTER THE START SEQUENCE. 5-14

DANGER

NEVER APPROACH THE AIRCRAFT AFTER ENGINE START UNTIL THE PILOT SIGNALS THAT IT IS SAFE TO DISCONNECT THE GPU EXTENSION CABLE. 5-15

DANGER

SELECTING THE WRONG VOLTAGE MAY CAUSE A FIRE OR BATTERY EXPLOSION. IT MAY ALSO RESULT IN SERIOUS DAMAGE TO THE AIRCRAFT ELECTRICAL AND ELECTRONICS SYSTEMS AND/OR THE GPU SYSTEM ON HE TRACTOR. 5-15

DANGER

FAILURE TO FOLLOW EACH OF THE WARNINGS LISTED IN THIS SECTION MAY RESULT IN ELECTROCUTION, THERMAL OR CHEMICAL BURNS, AND/OR OTHER INURY AND PROPERTY DAMAGE. 5-17

WARNING

ALWAYS FASTEN YOUR SEAT BELT BEFORE MOVING THE TRACTOR. 6-3

WARNING

ALWAYS VERIFY THAT YOU HAVE SELECTED THE CORRECT DIRECTION REGARDLESS OF THE OPERATOR STATION YOU ARE USING OR THE DIRECTION YOU ARE FACING. SELECTING THE WRONG DIRECTION COULD CAUSE A COLLISION RESULTING IN DEATH, INJURY, AND/OR DAMAGE TO EQUIPMENT OR OTHER PROPERTY. 6-4

CAUTION

NEVER DRIVE OR TOW THE TRACTOR FASTER THAN ITS MAXIMUM SAFE DESIGN SPEED, AS THIS MAY DAMAGE OR DESTROY THE DRIVE MOTOR. ..6-6

CAUTION

DO NOT USE PLUG BRAKING WHILE TOWING AN AIRCRAFT, EXCEPT IN CASE OF EMERGENCY. 6-8

WARNING

ALL PERSONNEL RESPONSIBLE FOR OPERATING, MAINTAINING, AND/OR REPAIRING THE LEKTRO 88/89 SERIES TRACTOR MUST READ, UNDERSTAND, AND COMPLY WITH ALL APPLICABLE COMPONENT SUPPLIER INSTRUCTIONS, WARNINGS, AND SAFETY DATA SHEETS (SDS) CONTAINED IN THE SERVICE MANUAL BEFORE PERFORMING ANY OF THE TASKS DESCRIBED IN THIS SECTION. B-3

CAUTION

DISCHARGING THE BATTERIES BELOW 50% DURING THE FIRST FIVE CHARGING CYCLES MAY REDUCE BATTERY CAPACITY AND/OR BATTERY LIFE. B-4

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CHAPTER 1

INTRODUCTION

This chapter introduces JBT LEKTRO, Inc. and this *Operation Manual*, and provides safety information.

WELCOME 2
ABOUT THIS MANUAL 3
GENERAL SAFETY 5
CONTACTING JBT LEKTRO, INC. 7

1.1 WELCOME

Welcome to the JBT LEKTRO, Inc. Family! Thank you for entrusting the safety and ground handling of your aircraft to JBT LEKTRO, Inc. by purchasing and taking delivery of your new LEKTRO Model 88/89 Series tractor. LEKTRO tractors have earned a worldwide reputation as the safest, most efficient, best designed, and highest quality tow vehicles available. We hope you will agree that your new 88/89 Series tractor is one of the best purchases you have ever made.

Some of the compelling benefits and savings of LEKTRO 88/89 Series tractors include:

- Replacing the standard tow bar with an adjustable ramp and winch offers unparalleled control and safety.
- The smooth and quiet battery-powered motor emits no pollution and provides safe, gentle, and exceptionally maneuverable towing that your employees and customers will appreciate.
- Optional draw bar pull adjusts to varying traction requirements under different aircraft nose weights.
- The electronic drive system reduces energy and maintenance costs while meeting present and future emission control requirements.

Complete customer satisfaction has been a policy of LEKTRO's since we opened for business in 1945, and that commitment continues following our acquisition by JBT. We welcome and encourage your questions, comments, and suggestions about our current and future products and services. Please feel free to contact us anytime.

- **Toll-free phone:** 1-800-535-8767 (U.S. and Canada)
- **Worldwide phone:** 1-503-861-2288
- **Fax:** 1-503-861-2283

Operator and aircraft safety come first at JBT LEKTRO, Inc. It is vital that all personnel involved with the operation and servicing of your new LEKTRO be fully trained and qualified. This manual contains detailed operations procedures for the LEKTRO 88/89 Series. All personnel who are involved with operating and/or servicing LEKTRO 88/89 Series tractors should read and understand this *Operation Manual* before using or working on the vehicle. Service personnel should also read both the 88/89 Series *Service Manual* and *Parts & Schematics Manual*. In addition, the *Aircraft Towing Procedures Manual* describes detailed capture procedures for a wide variety of aircraft. Personnel involved with towing aircraft must be familiar with the capture methods specific to each model aircraft they tow. JBT LEKTRO, Inc. will issue update notices and/or updated manuals when needed, thereby ensuring that your documentation remains current.

Thank you for placing your confidence with JBT LEKTRO, Inc. We will strive to ensure your continued satisfaction.

Eric W. Paulson
JBT LEKTRO, Inc.

1.2 ABOUT THIS MANUAL

This section describes the formatting and general organization of this 88/89 Series *Operation Manual*. It also describes the additional documentation supplied with your LEKTRO tractor.

1.2.1 FORMATTING CONVENTIONS

This manual uses several formatting conventions to present information of special importance.

Lists of items, points to consider, or procedures that do not need to be performed in a specific order appear in bullet format:

- Item 1
- Item 2

Procedures that must be followed in a specific order appear in numbered steps:

1. Perform this step first.
2. Perform this step second.

This manual also contains safety callouts where appropriate, as described in *"TABLE OF DANGER, WARNING, AND CAUTION STATEMENTS" on page xi*.

1.2.2 ORGANIZATION

This manual contains the following chapters:

- **CHAPTER 1: INTRODUCTION:** Introduces you to LEKTRO 88/89 Series tractors with a welcome letter from JBT LEKTRO Inc., and descriptions of both this manual and related 88/89 Series manuals. This chapter also includes information for contacting JBT LEKTRO, Inc. See *"INTRODUCTION" on page 1-1*.
- **CHAPTER 2: 88 SPECIFICATIONS:** Lists the specifications for select models in the LEKTRO 88 Series. See *"88 SPECIFICATIONS" on page 2-1*.
- **CHAPTER 3: 89 SPECIFICATIONS:** Lists the specifications for select models in the LEKTRO 89 Series. See *"89 SPECIFICATIONS" on page 3-1*.
- **CHAPTER 4: COMPONENTS & CONTROLS:** Lists and describes the key components and controls of LEKTRO 88/89 Series tractors. See *"COMPONENTS & CONTROLS" on page 4-1*.
- **CHAPTER 5: BASIC OPERATION:** How to safely operate a LEKTRO 88/89 Series tractor, including routine and emergency operations. See *"BASIC OPERATIONS" on page 5-1*.
- **CHAPTER 6: DRIVING:** How to safely drive a LEKTRO 88/89 Series tractor, including startup and shut down procedures and moving the vehicle. See *"DRIVING" on page 6-1*.
- **APPENDIX A: OPERATOR PRE-USE SAFETY CHECKLIST:** Contains a pre-formatted *Operator Pre-Use Safety Checklist* form to use when documenting vehicle actions, such as inspections and repair requests. See *"OPERATOR PRE-USE SAFETY CHECKLIST" on page A-1*.
- **APPENDIX B: RECEIVING:** Describes the procedures to follow when receiving a new LEKTRO 88/89 Series tractor before placing that vehicle into service. These procedures will help ensure safe operations, minimize maintenance and repair, and prolong the life of your tractor. This chapter also contains the LEKTRO Gold Seal Limited Warranty.
See *"RECEIVING" on page B-1*.

1.2.3 RELATED DOCUMENTATION

The following additional documentation is available for your LEKTRO tractor:

- **Aircraft Towing Procedures:** Describes aircraft capture, towing, and release operations, including procedures by aircraft type.
- **Service Manual:** Describes preventive and corrective maintenance procedures to keep your LEKTRO tractor running reliably.
- **Parts Manual:** Lists the parts included in your LEKTRO tractor should you ever need to order replacements.

1.3 GENERAL SAFETY

DANGER

FAILURE TO FOLLOW ALL OF THE GENERAL SAFETY PRECAUTIONS IN THIS SECTION PLUS THE OTHER SAFETY WARNINGS AND CAUTIONS IN THIS MANUAL MAY CAUSE DEATH, PERSONAL INJURY, AND/OR PROPERTY DAMAGE.

1.3.1 RESPONSIBILITY

The tractor operator, tractor owner, and JBT LEKTRO, Inc. have the following responsibilities:

- **Operator:** The tractor operator has overall responsibility for the safe operation of the tractor and aircraft under tow, as well as the safety of all personnel affected by the towing operation. Where required, the operator will assign wing walkers and/or signaling personnel to assist in the safe movement of the tractor and aircraft. This responsibility extends to performing and documenting pre-use safety checks before first use of the tractor on each work shift, as described in this manual.
- **Owner:** The tractor owner is responsible for ensuring the following:
  - > Operating personnel are formally trained and qualified to operate the tractor.
  - > The tractor is maintained and serviced only by qualified and authorized personnel as prescribed in both this manual and the accompanying *Service Manual*, unless specifically directed otherwise by JBT LEKTRO, Inc.
- **JBT LEKTRO, Inc.:** JBT LEKTRO, Inc. is responsible for ensuring that all information pertinent to safe tractor operation, maintenance, and service is both current and available to the owner or owner's agent on a timely basis.

1.3.2 PRECAUTIONS

- Always report any tractor damage or serviceability issue to a supervisor immediately.
- Always understand all operating instructions before using the tractor.
- Always comply with all published operating instructions and airport traffic safety regulations while using the tractor.
- Always drive the tractor only while properly positioned completely within the Operator Compartment, with either the arm rests in the horizontal deployed position or the seat belt fastened, depending on tractor equipment.
- Always ensure that all loads being moved are secured.

- Always ensure that the tractor is moving at a speed of 2 mph (3 km/h) or greater before applying maximum drive power.
- Always avoid sudden stops.
- Always apply the brake gradually when towing aircraft.
- Always reduce speed and increase braking distance when driving in wet or slippery conditions.
- Always remain completely within the Operator Station until the tractor is completely stopped and properly secured.
- Always turn the Motive Power Switch to the OFF position before leaving the tractor unattended.
- Always leave the corresponding battery compartment deck cover(s) open while charging the Motive Power Battery and/or GPU batteries.
- Never transport any passengers on any portion of the tractor other than in the passenger position in the Operator Compartment.
- Never exceed the rated maximum towing capacity of the tractor.
- Never tow aircraft at speeds exceeding the maximum safe towing speed for the specific LEKTRO tractor model.
- Never initiate turns at high speed.

1.4 CONTACTING JBT LEKTRO, INC.

JBT LEKTRO, Inc. is proud to offer the finest customer service in the industry. Need to buy a tractor, obtain a part, or have a support question? We are here to help! You may contact JBT LEKTRO, Inc. via any of the following methods:

- **Mailing Address:**
  1190 SE Flightline Drive
  Warrenton, Oregon 97146-9692
- **Phone:**
  1-800-535-8767 (U.S. and Canada)
  1-503-861-2288 (worldwide)
- **Fax:**
  1-503-861-2283
- **Email**:
  - > **Tractor sales:** sales.lektro@jbtc.com
  - > **Tractor parts:** parts.lektro@jbtc.com
- **Website:**
  http://www.lektro.com

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CHAPTER 2

88 SPECIFICATIONS

This chapter provides the specifications for the following selected LEKTRO 88 Series tractors:

88 SERIES MODELS 2
8800SDA 3
8800SDA-EZ 6
8850SDA-EZ 9
8850SDA 12
8850SDA-AL-100 15
8850SDA-M 18

2.1 88 SERIES MODELS

This chapter lists the specifications for the following models in the LEKTRO 88 Series of tractors. See the following sections:

- *"8800SDA" on page 2-3*
- *"8800SDA-EZ" on page 2-6*
- *"8850SDA-EZ" on page 2-9*
- *"8850SDA" on page 2-12*
- *"8850SDA-AL-100" on page 2-15*
- *"8850SDA-M" on page 2-18*

Note

The images in this section may show some optional equipment.

Note

JBT LEKTRO, Inc. reserves the right to change these specification at any time without notice or obligation.

Note

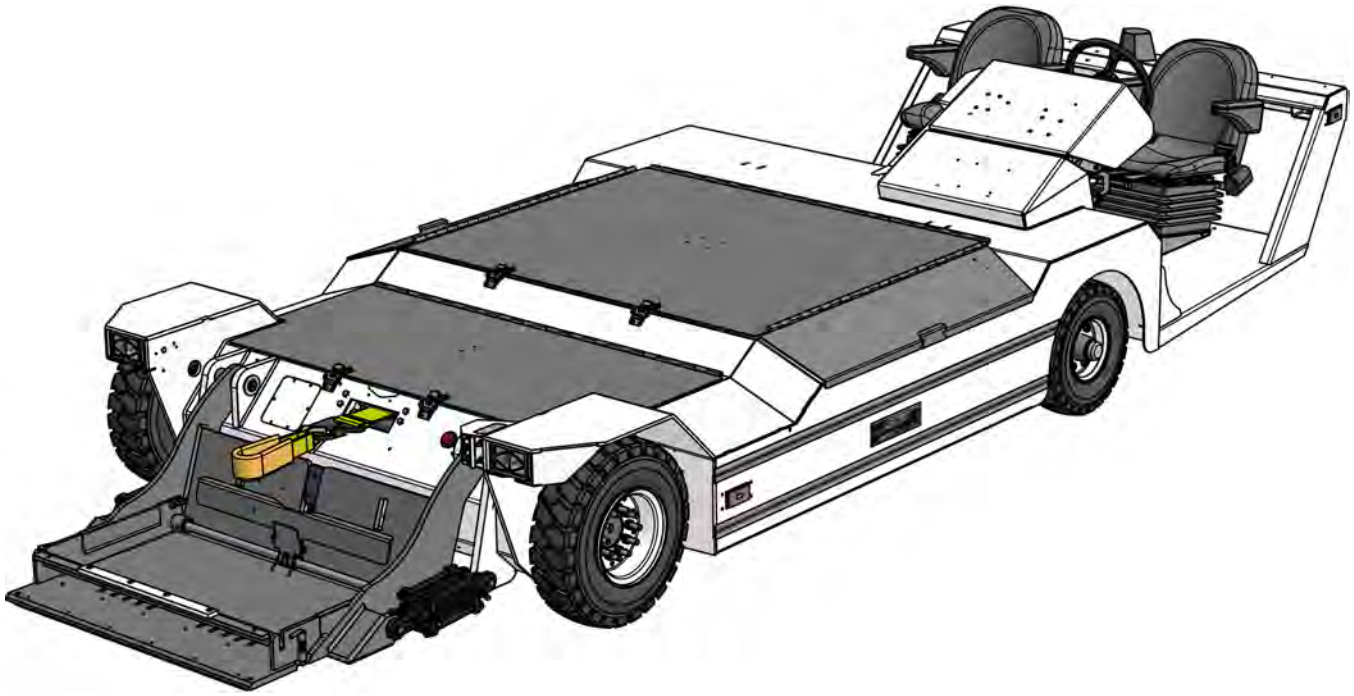
LEKTRO 88/89 Series tractors are protected by U.S. patent numbers 5,151,033 / 5,302,075 / 9,067,691. Additional patents are pending.

JBT LEKTRO, INC. OFFERS ADDITIONAL 88 SERIES TRACTORS FOR GENERAL, AIRLINE, AND MILITARY USE THAT ARE NOT DESCRIBED IN THIS MANUAL.

PLEASE CONTACT JBT LEKTRO, INC. FOR DETAILS.

2.2 8800SDA

The LEKTRO 8800SDA is designed to tow aircraft up to 90,000 lbs/40,824 kg.



2.2.1 FEATURES

- **Vehicle Drive:** 33.1 HP/24.8 kW, 72 VDC traction motor mated with an Auburn/Dana 44 differential.
- **Motor Speed Control:** EVT1000 with on-board diagnostics. Speed controlled by foot accelerator pedal.
- **Batteries:** Six 12 VDC, 372 AMP-HR batteries (6-hour rate), wired in series. Single-point watering system is optional.
- **GPU:** Built-in independent 12/24/28 VDC / 1175 CCA batteries and charging system are optional.
- **Motive Battery Charger:** External fully-automatic 40 AMP DC / 220 VAC / 50-60 Hz / 1-PH charger.
- **Nose Gear Lift Cradle:** Patented lift cradle activated by a hydraulic pump assembly capable of handling dual- and single-wheel aircraft. Hold-down adapter for light-nose aircraft, aircraft selection system, and patented torque adapter are optional.
- **Winch:** Hydraulic winch with automatic safety cut-off. Winch and strut straps included.
- **Steering:** Hydraulic power steering controlled by an automotive-type tilt wheel requiring minimal effort with very responsive steering action. Automatic hydraulic time-out when tractor not in use, increasing battery shift life. Simple double-ended cylinder steering axle with tapered roller bearing kingpins.
- **Service Brakes:** Foot-operated dual hydraulic disc brakes with boost-assisted master cylinder for maximum braking with minimal effort.
- **Parking Brake:** Hand-activated electric switch controlling spring-applied/hydraulic-released calipers mounted on each service brake disc.
- **Drive Tires:** Single 6.5 x 10 10-ply pneumatic traction tread. Siping, poly foam, auto socks, and chains are optional.

- **Steer Tires:** Single 5.00 x 8 10-ply pneumatic traction tread mounted to a fully suspended steer axle. Poly foam is optional.
- **Lighting:** Forward and aft LED headlights and four amber reflectors. Amber strobe light mounted center rear. Four flashing amber LED running lights. LED brake/turn lights are optional.
- **Operator Compartment:** Operator and passenger seats, forward facing. Premium grade including armrests (available in black or light gray). Operator's seat features a fully suspended, adjustable setting for height, fore/aft, and weight. Seat belts and dual-facing operator's helm and cab with heater, defroster, and windshield wipers are optional.
- **Camera and Monitors:** Camera at aircraft capture area with color monitors at the "A" and "B" station are optional.
- **Construction:** Welded steel plate and polymers preserved with primer and automotive high-gloss red or white enamel paint with protective polyurethane coating to prevent rust, scratches, and corrosion. Steel side rub rails and custom colors are optional.

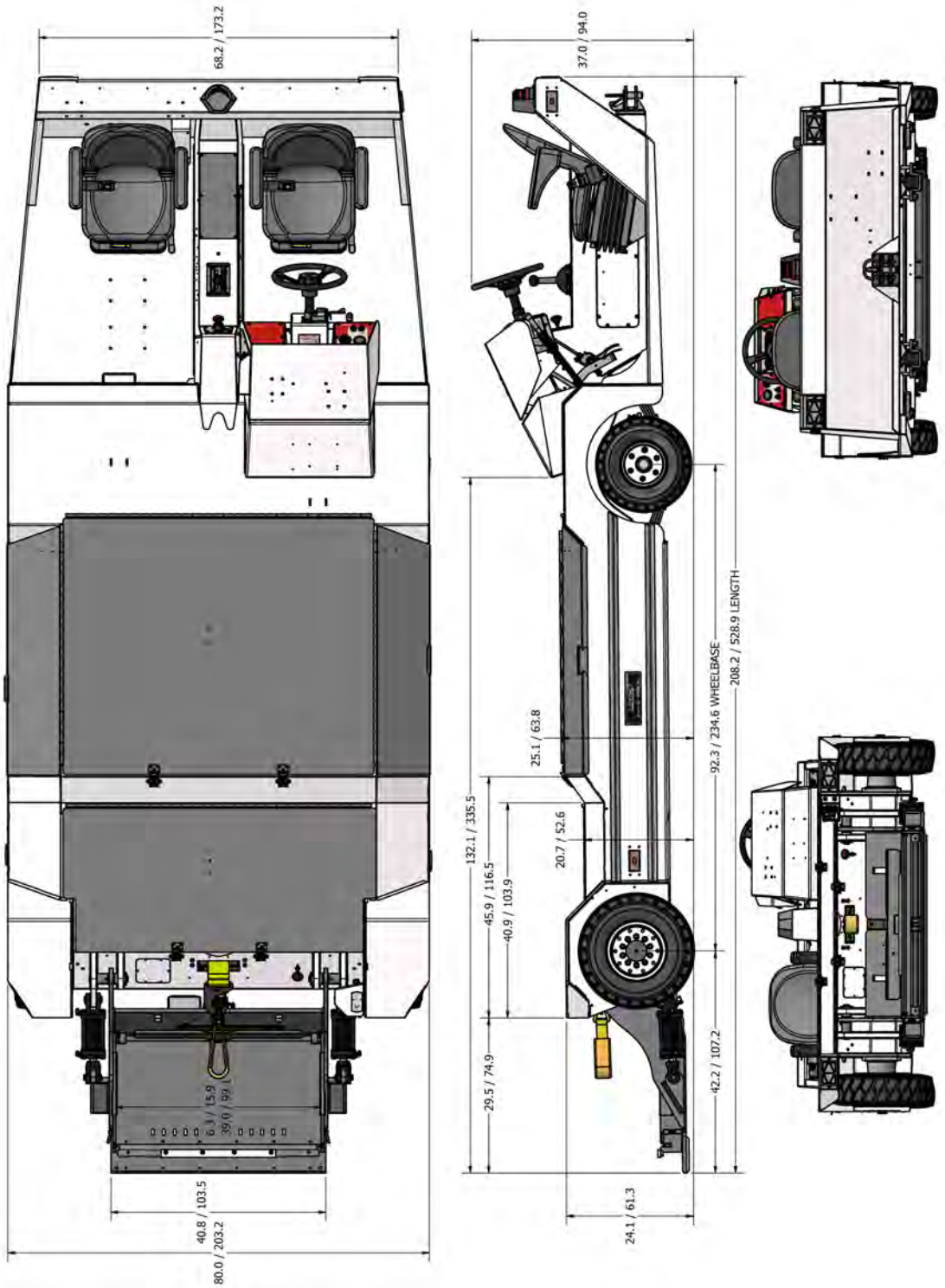
2.2.2 SPECIFICATIONS

- **Length:** .....208.2 in / 528.29cm
- **Width:** .....80 in / 203 cm
- **Height (at lowest steering tilt setting):** .....37 in / 94 cm
- **Turning Radius:** .....180 in / 457 cm
- **Wheelbase:** .....92.3 in / 234.6 cm
- **Vehicle Speed (empty):** .....9 MPH / 14.5 KPH
- **Vehicle Speed (loaded to max. vehicle capacity):** .....4 MPH / 6.4 KPH
- **Lift Cradle Capacity:** .....9,000 LBS / 4082 KG**
- **Nose Gear Cradle Lifting Height:** .....9 in / 23 cm
- **Ground Clearance:** .....5 in / 12.7 cm
- **Shipping Weight (w/o batteries & charger):** ..... 5,330 LBS / 2418 KG
- **Shipping Weight (w/ motive batteries & charger):** ..... 7,000 LBS / 3175 KG
- **Shipping Weight (w/o motive & GPU batteries & charger):** ..... 7,350 LBS / 3334 KG
- **Additional Options:** Draw bar pin, specialized aircraft towing adapters, and custom high-lift adapters (consult LEKTRO)

**Lift capacity is calculated using a 30 in / 76.2 cm diameter aircraft tire in the lift cradle, with the aircraft tire center line at 26 in / 66 cm from the drive tire center line.

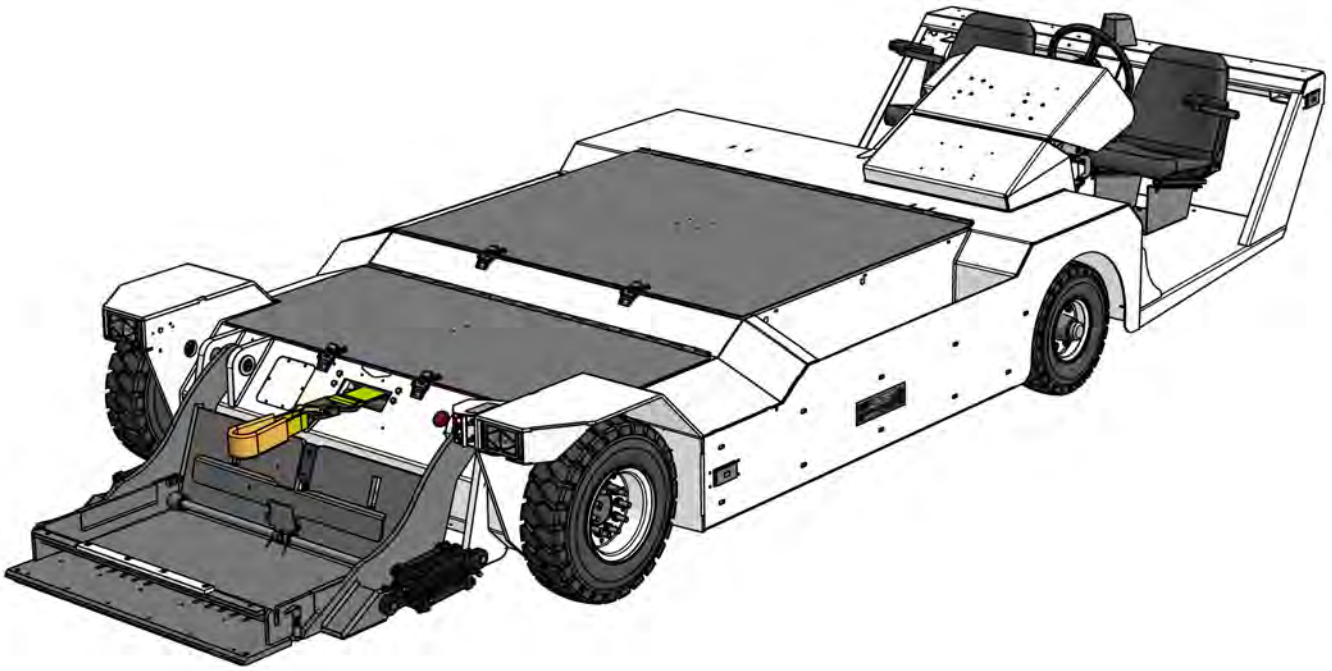
2.2.3 LAYOUT

This image displays the top, right side, front, and back of the LEKTRO 8800SDA tractor.



2.3 8800SDA-EZ

The LEKTRO 8800SDA-EZ is designed to tow aircraft up to 90,000 lbs/40,824 kg.



2.3.1 FEATURES

- **Vehicle Drive:** 33.1 HP/24.8 kW, 72 VDC traction motor mated with an Auburn/Dana 44 differential.
- **Motor Speed Control:** EVT1000 with on-board diagnostics. Speed controlled by foot accelerator pedal.
- **Batteries:** Six 12 VDC, 372 AMP-HR batteries (6-hour rate), wired in series. Single-point watering system is optional.
- **GPU:** Built-in independent 12/24/28 VDC / 1175 CCA batteries and charging system are optional.
- **Motive Battery Charger:** External fully-automatic 40 AMP DC / 220 VAC / 50-60 Hz / 1-PH charger.
- **Nose Gear Lift Cradle:** Patented lift cradle activated by a hydraulic pump assembly capable of handling dual- and single-wheel aircraft. Hold-down adapter for light-nose aircraft, aircraft selection system, and patented torque adapter are optional.
- **Winch:** Hydraulic winch with automatic safety cut-off. Winch and strut straps included.
- **Steering:** Hydraulic power steering controlled by an automotive-type tilt wheel requiring minimal effort with very responsive steering action. Automatic hydraulic time-out when tractor not in use, increasing battery shift life. Simple double-ended cylinder steering axle with tapered roller bearing kingpins.
- **Service Brakes:** Foot-operated dual hydraulic disc brakes with boost-assisted master cylinder for maximum braking with minimal effort.
- **Parking Brake:** Hand-activated electric switch controlling spring-applied/hydraulic-released calipers mounted on each service brake disc.
- **Drive Tires:** Single 6.5 x 10 10-ply pneumatic traction tread. Siping, poly foam, auto socks, and chains are optional.

- **Steer Tires:** Single 5.00 x 8 10-ply solid-pneumatic traction tread mounted to a fully suspended steer axle. Poly foam is optional.
- **Lighting:** Forward LED headlights and four amber reflectors. Aft LED headlights. Amber strobe light mounted center rear, four flashing amber LED running lights, and LED brake/turn lights are optional.
- **Operator Compartment:** Operator and passenger seats, forward facing. Industrial grade, weather resistant, including armrests and seat suspension (operator only; passenger optional). Dual-facing operator's helm and cab with heater, defroster, and windshield wipers are optional.
- **Camera and Monitors:** Camera at aircraft capture area with color monitors at the "A" and "B" station are optional.
- **Construction:** Welded steel plate and polymers preserved with primer and automotive high-gloss red or white enamel paint with protective polyurethane coating to prevent rust, scratches, and corrosion. Steel side rub rails and custom colors are optional.

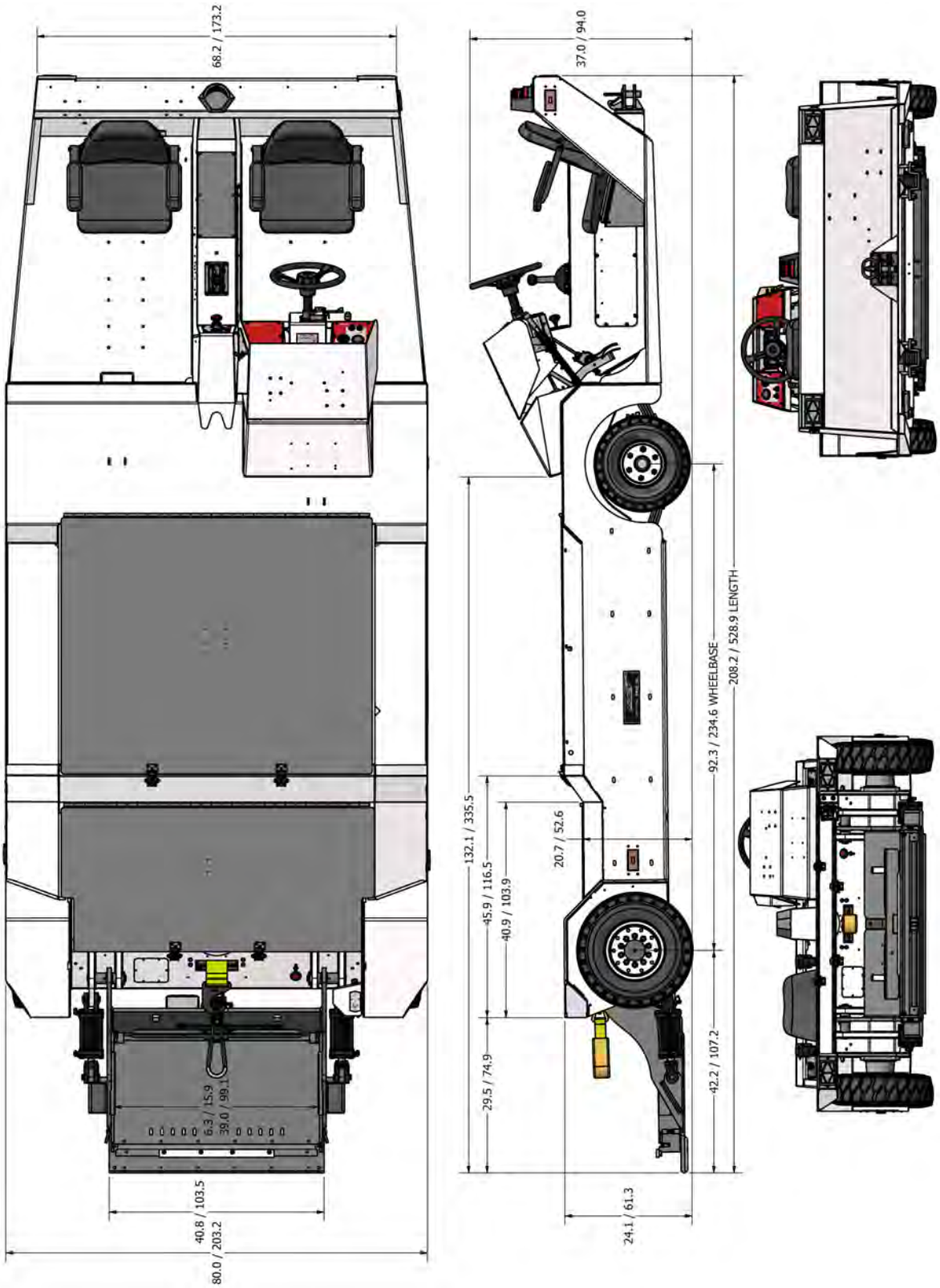
2.3.2 SPECIFICATIONS

- **Length:** ..... 208.2 in / 528.9 cm
- **Width:** ..... 80 in / 203 cm
- **Height (at lowest steering tilt setting):** ..... 37 in / 94 cm
- **Turning Radius:** ..... 180 in / 457 cm
- **Wheelbase:** ..... 92.3 in / 234.6 cm
- **Vehicle Speed (empty):** ..... 9 MPH / 14.5 KPH
- **Vehicle Speed (loaded to max. vehicle capacity):** ..... 4 MPH / 6.4 KPH
- **Lift Cradle Capacity:** ..... 9,000 LBS / 4082 KG**
- **Nose Gear Cradle Lifting Height:** ..... 9 in / 23 cm
- **Ground Clearance:** ..... 5 in / 12.7 cm
- **Shipping Weight (w/o batteries & charger):** ..... 5,330 LBS / 2418 KG
- **Shipping Weight (w/ motive batteries & charger):** ..... 7,000 LBS / 3175 KG
- **Shipping Weight (w/o motive & GPU batteries & charger):** ..... 7,350 LBS / 3334 KG
- **Additional Options:** Draw bar pin, specialized aircraft towing adapters, and custom high-lift adapters (consult LEKTRO)

**Lift capacity is calculated using a 20 in / 51 cm diameter aircraft tire in the lift cradle, with the aircraft tire center line at 23 in / 58 cm from the drive tire center line.

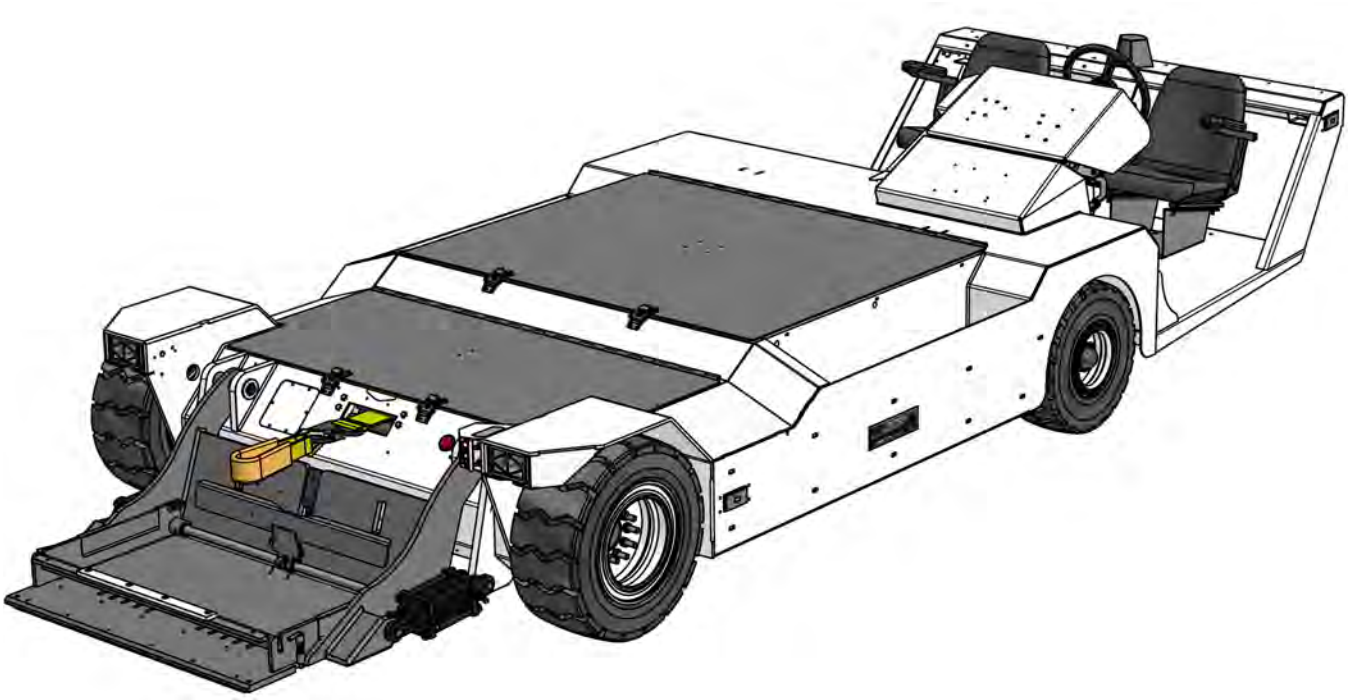
2.3.3 LAYOUT

This image displays the top, right side, front, and back of the LEKTRO 8800SDA-EZ tractor.



2.4 8850SDA-EZ

The LEKTRO 8850SDA-EZ is designed to tow aircraft up to 120,000 lbs/54,432 kg.



2.4.1 FEATURES

- **Vehicle Drive:** 45.3 HP/33.8 kW, 72 VDC traction motor mated with an Auburn/Dana 44 differential.
- **Motor Speed Control:** EVT1000 with on-board diagnostics. Speed controlled by foot accelerator pedal.
- **Batteries:** Six 12 VDC, 372 AMP-HR batteries (6-hour rate), wired in series. 550 AH and single-point watering system are optional.
- **GPU:** Built-in independent 12/24/28 VDC / 1175 CCA batteries and charging system are optional.
- **Motive Battery Charger:** External fully-automatic 40 AMP DC / 220 VAC / 50-60 Hz / 1-PH charger. 208-240 VAC / 50 or 60 Hz - 90 or 100 AMP / 1- or 3-PH are optional.
- **Nose Gear Lift Cradle:** Patented lift cradle activated by a hydraulic pump assembly capable of handling dual- and single-wheel aircraft. Hold-down adapter for light-nose aircraft, aircraft selection system, and patented torque adapter are optional.
- **Winch:** Hydraulic winch with automatic safety cut-off. Winch and strut straps included.
- **Steering:** Hydraulic power steering controlled by an automotive-type tilt wheel requiring minimal effort with very responsive steering action. Automatic hydraulic time-out when tractor not in use, increasing battery shift life. Simple double-ended cylinder steering axle with tapered roller bearing kingpins.
- **Service Brakes:** Foot-operated dual hydraulic disc brakes with boost-assisted master cylinder for maximum braking with minimal effort.
- **Parking Brake:** Hand-activated electric switch controlling spring-applied/hydraulic-released calipers mounted on each service brake disc.

- **Drive Tires:** Single 23 x 10 x 12 18-ply pneumatic traction tread. Siping, solid pneumatic tires, auto socks, and chains are optional.
- **Steer Tires:** Single 21 x 8-9 solid-pneumatic traction tread mounted to a fully suspended steer axle.
- **Lighting:** Forward LED headlights and four amber reflectors. Aft LED headlights. Amber strobe light mounted center rear, four flashing amber LED running lights, and LED brake/turn lights are optional.
- **Operator Compartment:** Operator and passenger seats, forward facing. Premium grade including armrests (available in black or light gray). Operator's seat features a fully suspended, adjustable setting for height, fore/aft, and weight. Seat belts and dual-facing operator's helm and cab with heater, defroster, and windshield wipers are optional.
- **Camera and Monitors:** Camera at aircraft capture area with color monitors at the "A" and "B" station are optional.
- **Construction:** Welded steel plate and polymers preserved with primer and automotive high-gloss red or white enamel paint with protective polyurethane coating to prevent rust, scratches, and corrosion. Steel side rub rails and custom colors are optional.

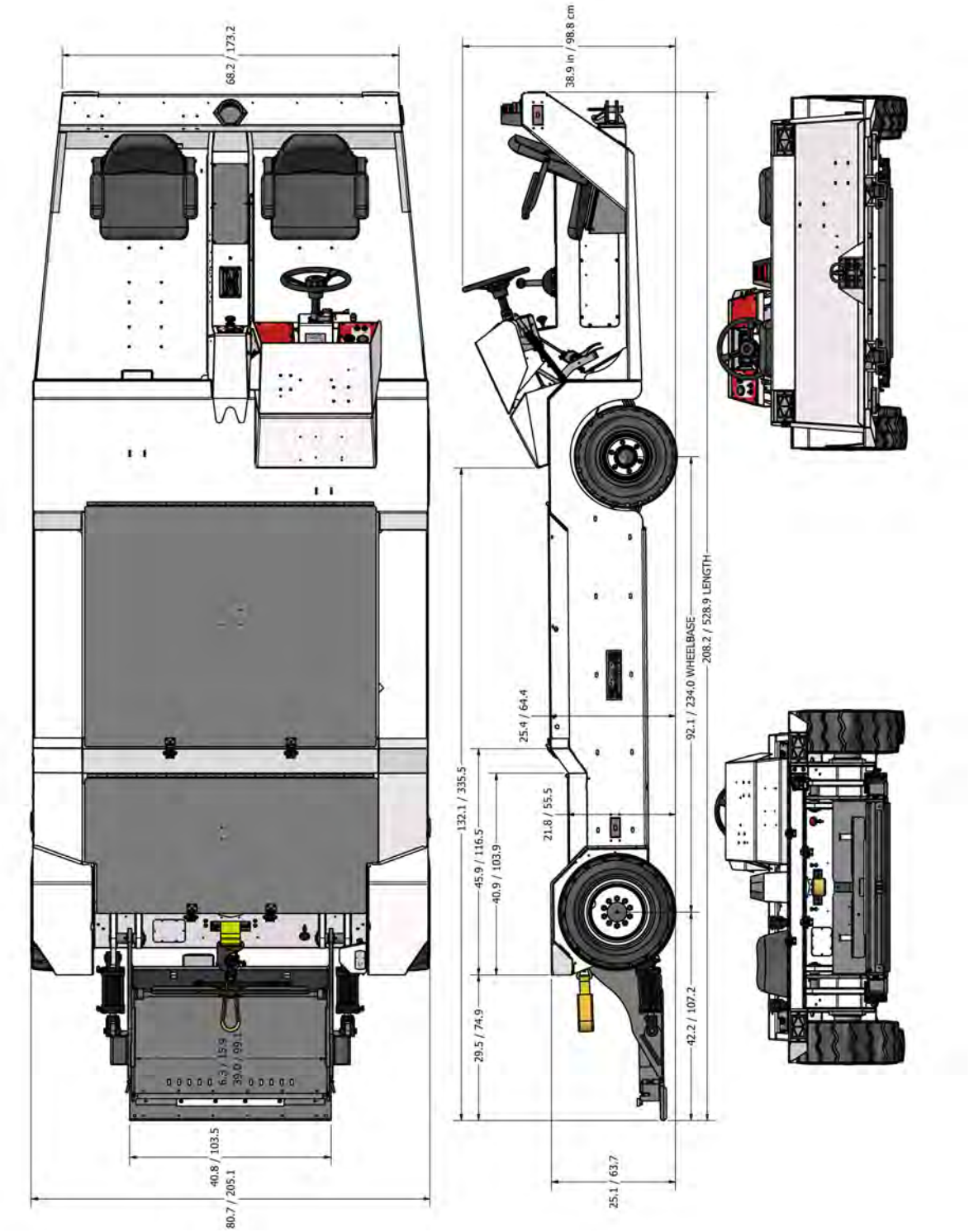
2.4.2 SPECIFICATIONS

- **Length:** .....208.2 in / 528.9 cm
- **Width:** .....80.7 in / 205.1 cm
- **Height (at lowest steering tilt setting):** .....38.9 in / 98.8 cm
- **Turning Radius:** .....180 in / 457 cm
- **Wheelbase:** .....92.1 in / 234 cm
- **Vehicle Speed (empty):** .....9 MPH / 14.5 KPH
- **Vehicle Speed (loaded to max. vehicle capacity):** .....4 MPH / 6.4 KPH
- **Lift Cradle Capacity:** .....12,000 LBS / 5443 KG**
- **Nose Gear Cradle Lifting Height:** .....9 in / 23 cm
- **Ground Clearance:** .....5 in / 12.7 cm
- **Shipping Weight (w/o batteries & charger):** ..... 5,330 LBS / 2418 KG
- **Shipping Weight (w/ motive batteries & charger):** ..... 8,850 LBS / 4014 KG
- **Shipping Weight (w/o motive & GPU batteries & charger):** ..... 9,200 LBS / 4173 KG
- **Additional Options:** Draw bar pin, specialized aircraft towing adapters, and custom high-lift adapters (consult LEKTRO)

**Lift capacity is calculated using a 30 in / 76.2 cm diameter aircraft tire in the lift cradle, with the aircraft tire center line at 26 in / 66 cm from the drive tire center line.

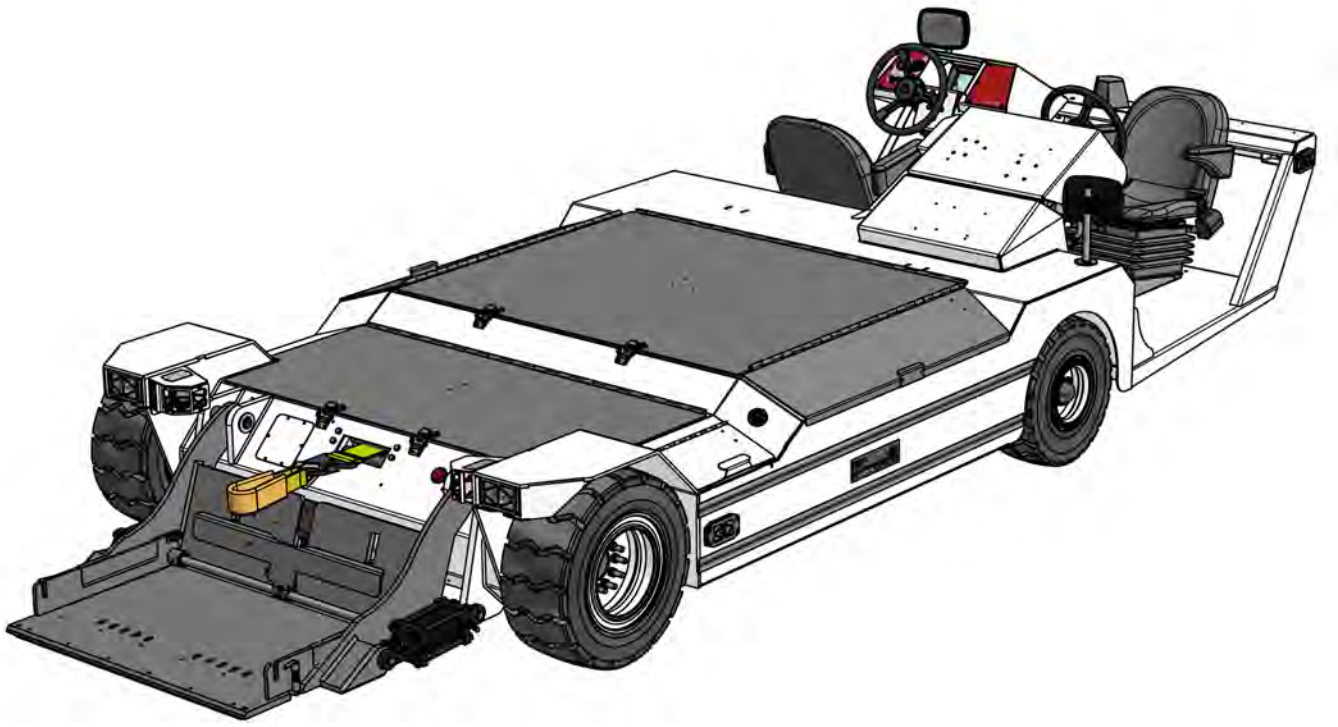
2.4.3 LAYOUT

This image displays the top, right side, front, and back of the LEKTRO 8850SDA-EZ tractor.



2.5 8850SDA

The LEKTRO 8850SDA is designed to tow aircraft up to 120,000 lbs/54,432 kg.



2.5.1 FEATURES

- **Vehicle Drive:** 45.3 HP/33.8 kW, 72 VDC traction motor mated with an Auburn/Dana 44 differential.
- **Motor Speed Control:** EVT1000 with on-board diagnostics. Speed controlled by foot accelerator pedal.
- **Batteries:** Two 36 VDC industrial, 440 AMP-HR batteries (6-hour rate), wired in series. 550 AH, 750 AH, and single-point watering system are optional.
- **GPU:** Built-in independent 12/24/28 VDC / 1175 CCA batteries and charging system are optional.
- **Motive Battery Charger:** External fully-automatic 90 AMP DC / 208-480 VAC / 60 Hz / 1-PH charger. 50 Hz, 3-PH, and/or 100 AMP are optional.
- **Nose Gear Lift Cradle:** Patented lift cradle activated by a hydraulic pump assembly capable of handling dual- and single-wheel aircraft. Hold-down adapter for light-nose aircraft, aircraft selection system, and patented torque adapter are optional.
- **Winch:** Hydraulic winch with automatic safety cut-off. Winch and strut straps included.
- **Steering:** Hydraulic power steering controlled by an automotive-type tilt wheel requiring minimal effort with very responsive steering action. Automatic hydraulic time-out when tractor not in use, increasing battery shift life. Simple double-ended cylinder steering axle with tapered roller bearing kingpins.
- **Service Brakes:** Foot-operated dual hydraulic disc brakes with boost-assisted master cylinder for maximum braking with minimal effort.
- **Parking Brake:** Hand-activated electric switch controlling spring-applied/hydraulic-released calipers mounted on each service brake disc.

- **Drive Tires:** Single 23 x 10 x 12 18-ply pneumatic traction tread. Siping, solid pneumatic tires, auto socks, and chains are optional.
- **Steer Tires:** Single 21 x 8-9 solid-pneumatic traction tread mounted to a fully suspended steer axle.
- **Lighting:** Forward and aft LED headlights. Four amber reflectors. Amber strobe light mounted center rear. LED brake/turn lights are optional.
- **Operator Compartment:** Operator and passenger seats, forward facing. Premium grade including armrests (available in black or light gray). Operator's seat features a fully suspended, adjustable setting for height, fore/aft, and weight. Seat belts and dual-facing operator's helm and cab with heater, defroster, and windshield wipers are optional.
- **Camera and Monitors:** Camera at aircraft capture area with color monitors at the "A" and "B" station are optional.
- **Construction:** Welded steel plate and polymers preserved with primer and automotive high-gloss red or white enamel paint with protective polyurethane coating to prevent rust, scratches, and corrosion. Steel side rub rails and custom colors are optional.

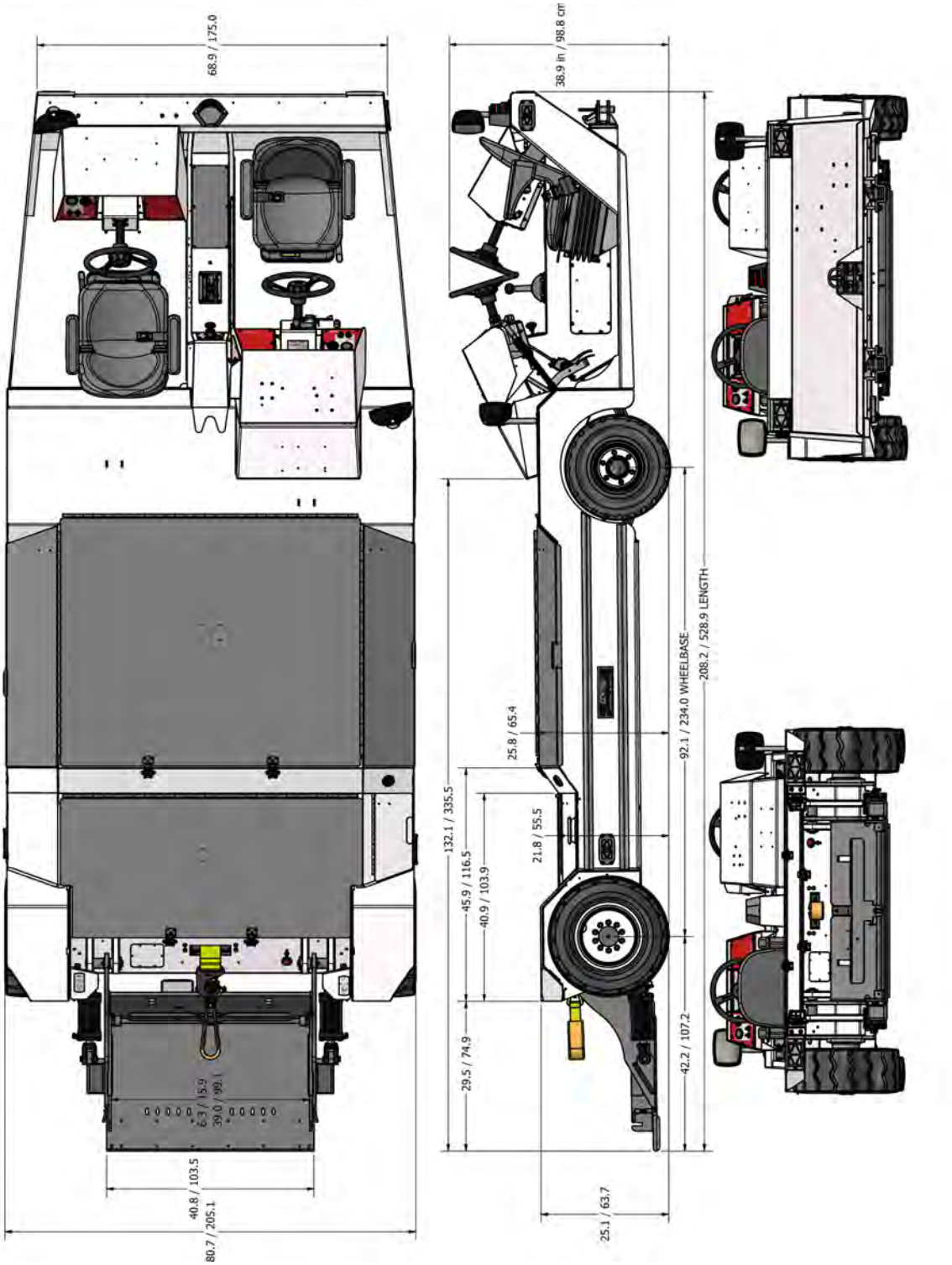
2.5.2 SPECIFICATIONS

- **Length:** ..... 208.2 in / 528.9 cm
- **Width:** ..... 80.7 in / 205.1 cm
- **Height (at lowest steering tilt setting):** ..... 38.9 in / 98.8 cm
- **Turning Radius:** ..... 180 in / 457 cm
- **Wheelbase:** ..... 92.1 in / 234 cm
- **Vehicle Speed (empty):** ..... 9 MPH / 14.5 KPH
- **Vehicle Speed (loaded to max. vehicle capacity):** ..... 4 MPH / 6.4 KPH
- **Lift Cradle Capacity:** ..... 12,000 LBS / 5443 KG**
- **Nose Gear Cradle Lifting Height:** ..... 9 in / 23 cm
- **Ground Clearance:** ..... 5 in / 12.7 cm
- **Shipping Weight (w/o batteries & charger):** ..... 5,330 LBS / 2418 KG
- **Shipping Weight (w/ motive batteries & charger):** ..... 9,300 LBS / 4218 KG
- **Shipping Weight (w/o motive & GPU batteries & charger):** ..... 9,650 LBS / 4377 KG
- **Additional Options:** Draw bar pin, specialized aircraft towing adapters, and custom high-lift adapters (consult LEKTRO)

**Lift capacity is calculated using a 30 in / 76 cm diameter aircraft tire in the lift cradle, with the aircraft tire center line at 26 in / 66 cm from the drive tire center line.

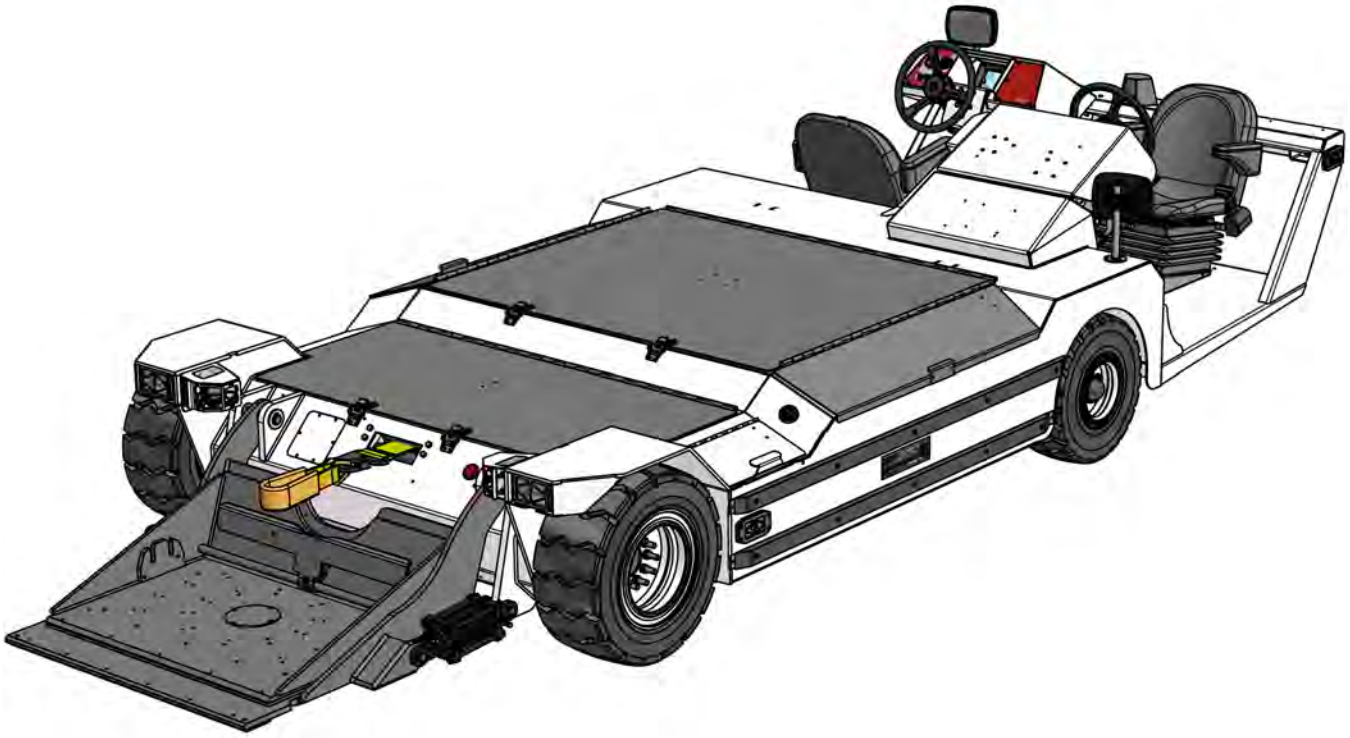
2.5.3 LAYOUT

This image displays the top, right side, front, and back of the LEKTRO 8850SDA tractor.



2.6 8850SDA-AL-100

The LEKTRO 8850SDA-AL-100 is designed to tow aircraft up to 120,000 lbs/54,432 kg.



2.6.1 FEATURES

- **Vehicle Drive:** 45.3 HP/33.8 kW, 72 VDC traction motor mated with an Auburn/Dana 44 differential.
- **Motor Speed Control:** EVT1000 with on-board diagnostics. Speed controlled by foot accelerator pedal.
- **Batteries:** Two 36 VDC industrial, 440 AMP-HR batteries (6-hour rate), wired in series with single-point watering system. 550 AH or 750 AH are optional.
- **GPU:** Built-in independent 12/24/28 VDC / 1175 CCA batteries and charging system are optional.
- **Motive Battery Charger:** External fully-automatic 90 AMP DC / 208-480 VAC / 60 Hz / 1-PH charger. 50 Hz and/or 100 AMP are optional.
- **Nose Gear Lift Cradle:** Patented lift cradle activated by a hydraulic pump assembly capable of handling dual- and single-wheel aircraft. Hold-down adapter for light-nose aircraft, aircraft selection system, and patented torque adapter are optional.
- **Winch:** Hydraulic winch with automatic safety cut-off. Winch and strut straps included.
- **Steering:** Hydraulic power steering controlled by an automotive-type tilt wheel requiring minimal effort with very responsive steering action. Automatic hydraulic time-out when tractor not in use, increasing battery shift life. Simple double-ended cylinder steering axle with tapered roller bearing kingpins.
- **Service Brakes:** Foot-operated dual hydraulic disc brakes with boost-assisted master cylinder for maximum braking with minimal effort.
- **Parking Brake:** Hand-activated electric switch controlling spring-applied/hydraulic-released calipers mounted on each service brake disc.

- **Drive Tires:** Single 23 x 10 x 12 solid-pneumatic traction tread. Siping, auto socks, and chains are optional.
- **Steer Tires:** Single 21 x 8-9 solid-pneumatic traction tread mounted to a fully suspended steer axle.
- **Lighting:** Forward and aft LED headlights. Four amber reflectors. Amber strobe light mounted center rear. LED brake/turn lights are optional.
- **Operator Compartment:** Operator and passenger seats, forward facing. Premium grade including armrests (available in black or light gray). Operator's seat features a fully suspended, adjustable setting for height, fore/aft, and weight. Seat belts and dual-facing operator's helm and cab with heater, defroster, and windshield wipers are optional.
- **Camera and Monitors:** Camera at aircraft capture area with color monitors at the "A" and "B" station are optional.
- **Construction:** Welded steel plate and polymers preserved with primer and automotive high-gloss red or white enamel paint with protective polyurethane coating to prevent rust, scratches, and corrosion. Steel side rub rails and custom colors are optional.

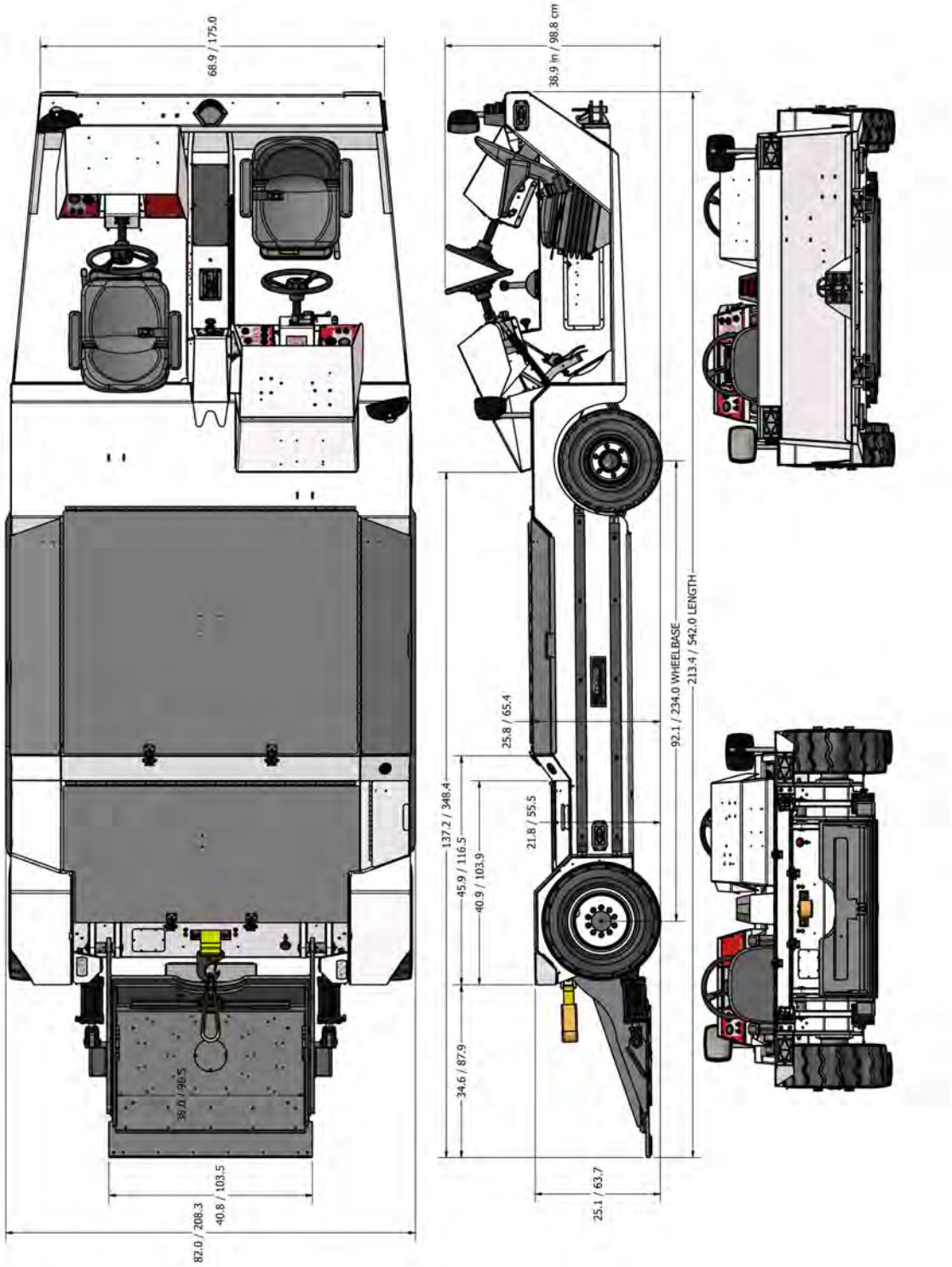
2.6.2 SPECIFICATIONS

- **Length:** .....213.4 in / 542 cm
- **Width:** .....82 in / 208.3 cm
- **Height (at lowest steering tilt setting):** .....38.9 in / 98.8 cm
- **Turning Radius:** .....180 in / 457 cm
- **Wheelbase:** .....92.1 in / 234 cm
- **Vehicle Speed (empty):** .....9 MPH / 14.5 KPH
- **Vehicle Speed (loaded to max. vehicle capacity):** .....4 MPH / 6.4 KPH
- **Lift Cradle Capacity:** .....12,000 LBS / 5443 KG**
- **Nose Gear Cradle Lifting Height:** .....9 in / 23 cm
- **Ground Clearance:** .....5 in / 12.7 cm
- **Shipping Weight (w/o batteries & charger):** ..... 5,330 LBS / 2418 KG
- **Shipping Weight (w/ motive batteries & charger):** ..... 9,400 LBS / 4264 KG
- **Shipping Weight (w/o motive & GPU batteries & charger):** ..... 9,750 LBS / 4423 KG
- **Additional Options**: Draw bar pin, specialized aircraft towing adapters, and custom high-lift adapters (consult LEKTRO)

**Lift capacity is calculated using a 30 in / 76 cm diameter aircraft tire in the lift cradle, with the aircraft tire center line at 26 in / 66 cm from the drive tire center line.

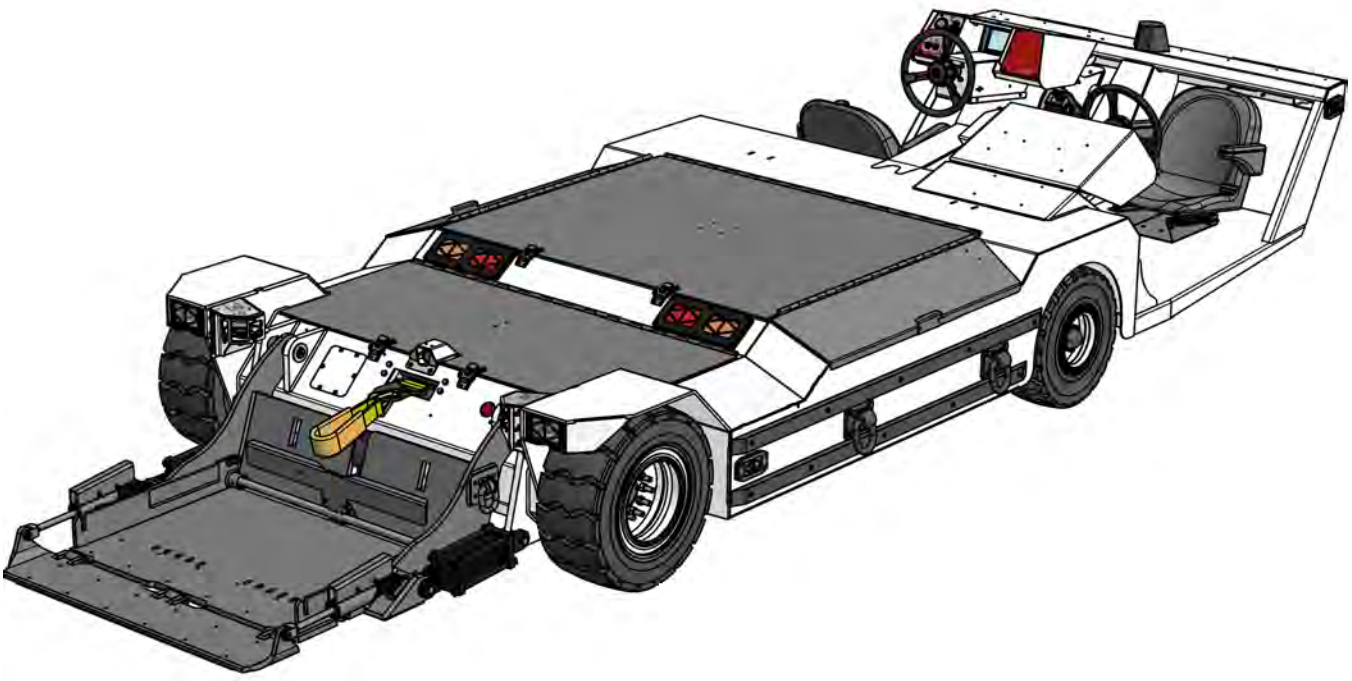
2.6.3 LAYOUT

This image displays the top, right side, front, and back of the LEKTRO 8850SDA-AL-100 tractor.



2.7 8850SDA-M

The LEKTRO 8850SDA-M is designed to tow aircraft up to 120,000 lbs/54,432 kg.



2.7.1 FEATURES

- **Vehicle Drive:** 45.3 HP/33.8 kW, 72 VDC traction motor mated with an Auburn/Dana 44 differential.
- **Motor Speed Control:** EVT1000 with on-board diagnostics. Speed controlled by foot accelerator pedal.
- **Batteries:** Two 36 VDC industrial, 550 AMP-HR batteries (6-hour rate), wired in series with single-point watering system. 750 AH is optional.
- **GPU:** Built-in independent 12/24/28 VDC / 1175 CCA batteries and charging system are optional.
- **Motive Battery Charger:** External fully-automatic 100 AMP DC / 208-480 VAC / 60 Hz / 1-PH charger. 50 Hz is optional.
- **Nose Gear Lift Cradle:** Patented lift cradle activated by a hydraulic pump assembly capable of handling dual- and single-wheel aircraft. Hold-down adapter for light-nose aircraft, aircraft selection system, and patented torque adapter are optional.
- **Winch:** Hydraulic winch with automatic safety cut-off. Winch and strut straps included.
- **Steering:** Hydraulic power steering controlled by an automotive-type tilt wheel requiring minimal effort with very responsive steering action. Automatic hydraulic time-out when tractor not in use, increasing battery shift life. Simple double-ended cylinder steering axle with tapered roller bearing kingpins.
- **Service Brakes:** Foot-operated dual hydraulic disc brakes with boost-assisted master cylinder for maximum braking with minimal effort.
- **Parking Brake:** Hand-activated electric switch controlling spring-applied/hydraulic-released calipers mounted on each service brake disc.

- **Drive Tires:** Single 23 x 10 x 12 solid-pneumatic traction tread. Siping, auto socks, and chains are optional.
- **Steer Tires:** Single 21 x 8-9 solid-pneumatic traction tread mounted to a fully suspended steer axle.
- **Lighting:** Forward and aft LED headlights. Four amber reflectors. Amber strobe light mounted center rear. LED brake/turn lights.
- **Operator Compartment:** Operator and passenger seats, forward facing. Premium grade including armrests (available in black or light gray). Operator's seat features a fully suspended, adjustable setting for height, fore/aft, and weight. Seat belts and dual-facing operator's helm and cab with heater, defroster, and windshield wipers are optional.
- **Camera and Monitors:** Camera at aircraft capture area with color monitors at the "A" and "B" station are optional.
- **Construction:** Welded steel plate and polymers preserved with primer and automotive high-gloss red or white enamel paint with protective polyurethane coating to prevent rust, scratches, and corrosion. Steel side rub rails and custom colors are optional.
- **Aircraft Towing Vehicle Transport:** Six "D" rings and rear drawbar hitch for transport tie down. Steer axle with hydraulic lift for ramp loading is optional.

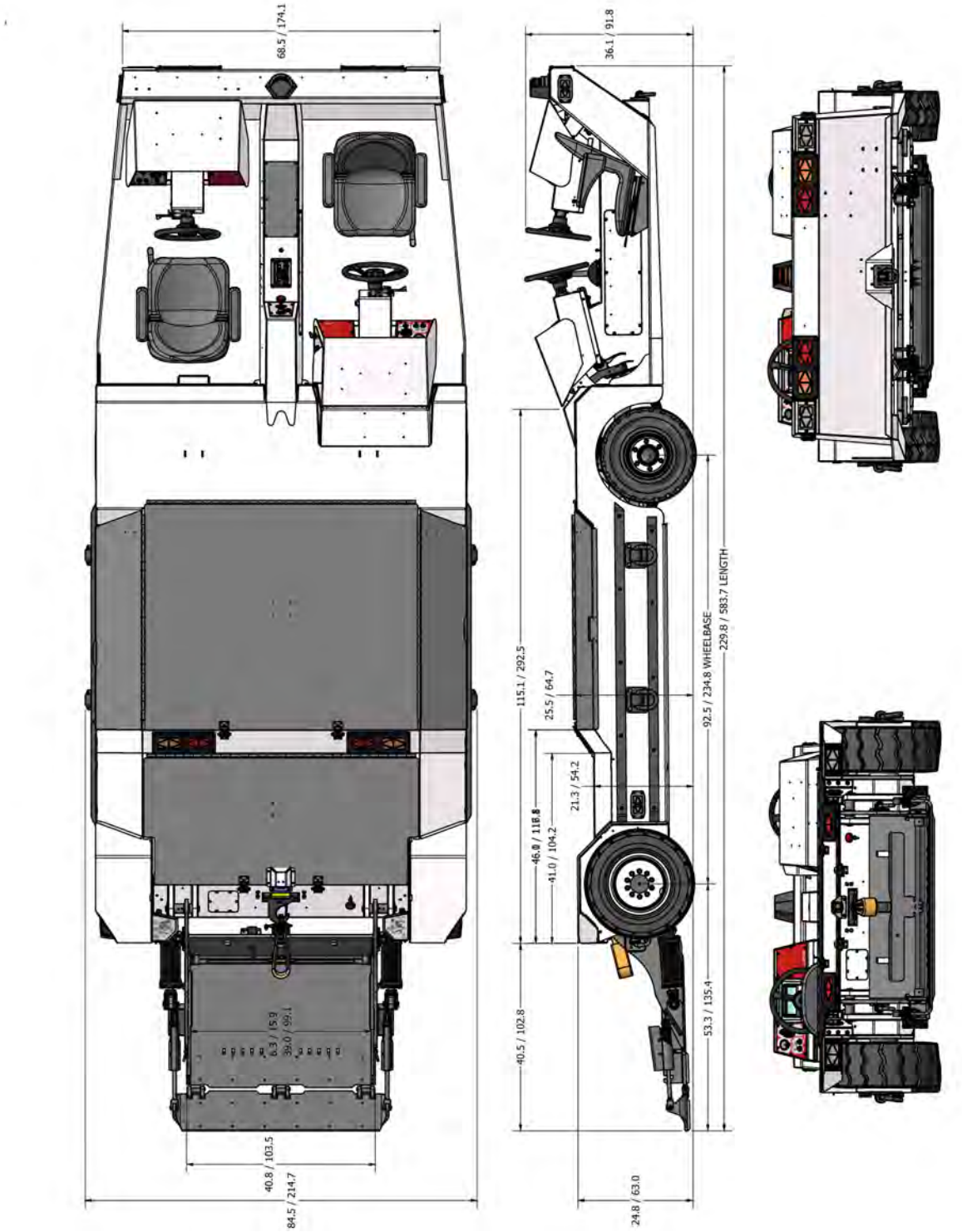
2.7.2 SPECIFICATIONS

- **Length:** ..... 229.8 in / 583.7 cm
- **Width:** ..... 84.5 in / 214.7 cm
- **Height (at lowest steering tilt setting):** ..... 36.1 in / 91.8 cm
- **Turning Radius:** ..... 204 in / 518 cm
- **Wheelbase:** ..... 92.5 in / 234.8 cm
- **Vehicle Speed (empty):** ..... 9 MPH / 14.5 KPH
- **Vehicle Speed (loaded to max. vehicle capacity):** ..... 4 MPH / 6.4 KPH
- **Lift Cradle Capacity:** ..... 12,000 LBS / 5443 KG**
- **Nose Gear Cradle Lifting Height:** ..... 16 in / 40.6 cm
- **Ground Clearance:** ..... 5 in / 12.7 cm
- **Shipping Weight (w/o batteries & charger):** ..... 5,990 LBS / 2717 KG
- **Shipping Weight (w/ motive batteries & charger):** ..... 9,960 LBS / 4518 KG
- **Shipping Weight (w/o motive & GPU batteries & charger):** ..... 10,310 LBS / 4677 KG
- **Additional Options:** Draw bar pin, specialized aircraft towing adapters, and custom high-lift adapters (consult LEKTRO)

**Lift capacity is calculated using a 30 in / 76.2 cm diameter aircraft tire in the lift cradle, with the aircraft tire center line at 26 in / 66 cm from the drive tire center line.

2.7.3 LAYOUT

This image displays the top, right side, front, and back of the LEKTRO 8850SDA-M tractor.



CHAPTER 3

89 SPECIFICATIONS

This chapter provides the specifications for the following selected LEKTRO 88 Series tractors:

89 SERIES MODELS 2
8900SDB 3
8950SDB 6
8925SDB-AL/HS-200 9
8950SDB-AL-200 12
8950SDB-AL-250 15
8950SDB-M 18

3.1 89 SERIES MODELS

This chapter lists the specifications for the following models in the LEKTRO 89 Series of tractors. See the following sections:

- *"8900SDB" on page 3-3*
- *"8950SDB" on page 3-6*
- *"8925SDB-AL/HS-200" on page 3-9*
- *"8950SDB-AL-200" on page 3-12*
- *"8950SDB-AL-250" on page 3-15*
- *"8950SDB-M" on page 3-18*

Note

The images in this section may show some optional equipment.

Note

JBT LEKTRO, Inc. reserves the right to change these specification at any time without notice or obligation.

Note

LEKTRO 88/89 Series tractors are protected by U.S. patent numbers 5,151,033 / 5,302,075 / 9,067,691. Additional patents are pending.

JBT LEKTRO, INC. OFFERS ADDITIONAL 89 SERIES TRACTORS FOR GENERAL, AIRLINE, AND MILITARY USE THAT ARE NOT DESCRIBED IN THIS MANUAL.

PLEASE CONTACT JBT LEKTRO, Inc. FOR DETAILS.

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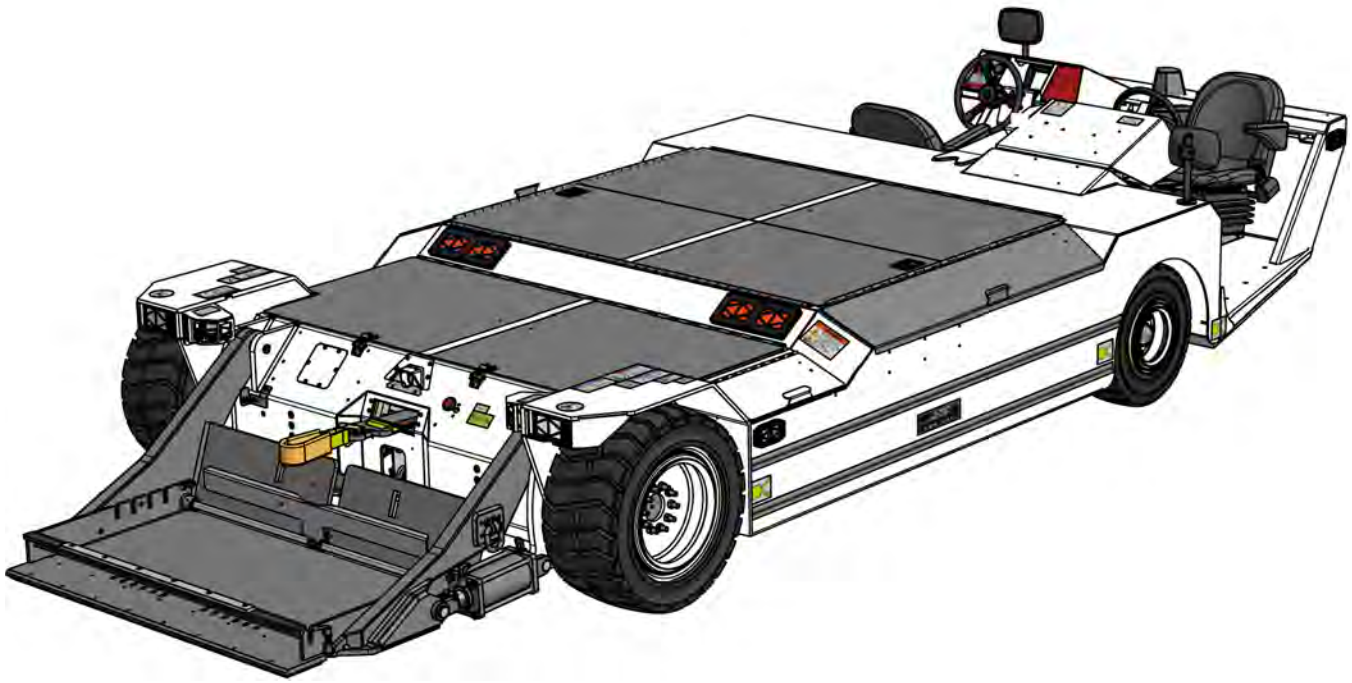
3.2 8900SDB

The LEKTRO 8900SDB is designed to tow aircraft up to 150,000 lbs/68,040 kg.



3.2.1 FEATURES

- **Vehicle Drive:** 58.3 HP/45.5 kW, 80 VDC traction motor mated with an Auburn/Dana 44 differential.
- **Motor Speed Control:** EVT1000LV IGBT with on-board diagnostics. Speed controlled by foot accelerator pedal.
- **Batteries:** Two 40 VDC industrial, 595 AMP-HR batteries (6-hour rate), wired in series. Single-point watering system is optional.
- **GPU:** Built-in independent 12/24/28 VDC / 1175 CCA batteries and charging system are optional.
- **Motive Battery Charger:** External fully-automatic 120 AMP DC / 208-480 VAC / 60 Hz / 3-PH charger. 50 Hz is optional.
- **Nose Gear Lift Cradle:** Patented lift cradle activated by a hydraulic pump assembly capable of handling dual- and single-wheel aircraft. Aircraft Protection System and patented torque adapter are optional.
- **Winch:** Hydraulic winch with automatic safety cut-off. Winch and strut straps included.
- **Steering:** Hydraulic power steering controlled by an automotive-type tilt wheel requiring minimal effort with very responsive steering action. Automatic hydraulic time-out when tractor not in use, increasing battery shift life. Simple double-ended cylinder steering axle with tapered roller bearing kingpins.
- **Service Brakes:** Foot-operated dual hydraulic disc brakes with boost-assisted master cylinder for maximum braking with minimal effort.

- **Parking Brake:** Hand-activated electric switch controlling spring-applied/hydraulic-released calipers mounted on each service brake disc.
- **Drive Tires:** Single 28 x 12.5-15 solid-pneumatic traction tread. Siping, auto socks, and chains are optional.
- **Steer Tires:** Single 23 x 9-10 solid-pneumatic traction tread mounted to a fully suspended steer axle.
- **Lighting:** Forward and aft LED headlights. Four flashing amber LED running lights and amber strobe light mounted center rear. LED brake lights and turn signals are optional.
- **Operator Compartment:** Operator and passenger seats, forward facing. Premium grade including armrests (available in black or light gray). Operator's seat features a fully suspended, adjustable setting for height, fore/aft, and weight. Seat belts and dual-facing operator's helm and cab with heater, defroster, and windshield wipers are optional.
- **Camera and Monitors:** Camera at aircraft capture area with color monitors at the "A" and "B" station are optional.
- **Construction:** Welded steel plate and polymers preserved with primer and automotive high-gloss red or white enamel paint with protective polyurethane coating to prevent rust, scratches, and corrosion. Steel side rub rails and custom colors are optional.

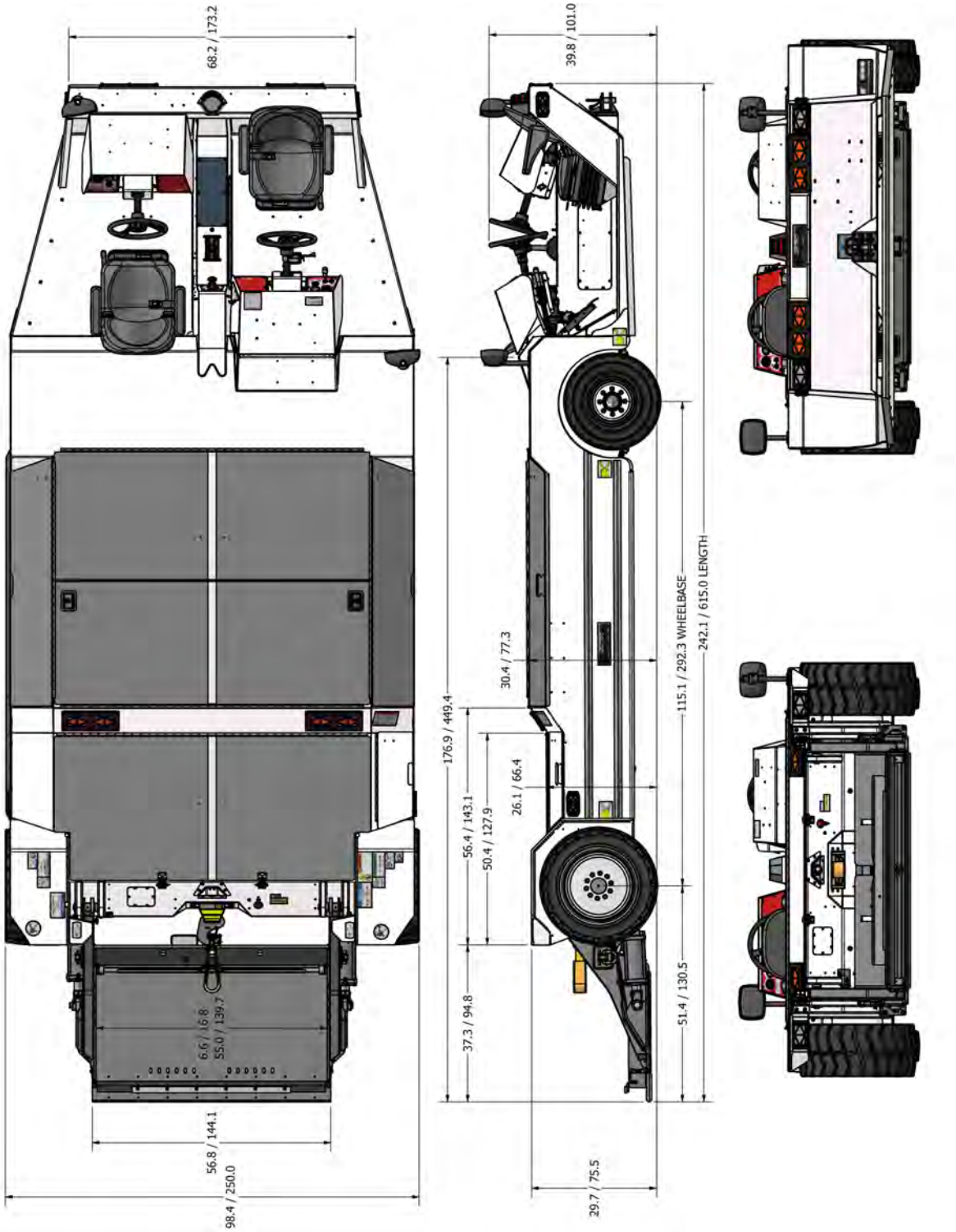
3.2.2 SPECIFICATIONS

- **Length:** ..... 242.1 in / 615 cm
- **Width:** ..... 98.4 in / 250 cm
- **Height (at lowest steering tilt setting):** ..... 38.9 in / 101 cm
- **Turning Radius:** ..... 209 in / 531 cm
- **Wheelbase:** ..... 115.1 in / 292.3 cm
- **Vehicle Speed (empty):** ..... 8.5 MPH / 13.6 KPH
- **Vehicle Speed (loaded to max. vehicle capacity):** ..... 4 MPH / 6.4 KPH
- **Lift Cradle Capacity:** ..... 15,000 LBS / 6804 KG**
- **Nose Gear Cradle Lifting Height:** ..... 11 in / 28 cm
- **Ground Clearance:** ..... 5 in / 12.7 cm
- **Shipping Weight (w/o batteries & charger):** ..... 9,450 LBS / 4286 KG
- **Shipping Weight (w/ motive batteries & charger):** ..... 15,000 LBS / 6804 KG
- **Shipping Weight (w/o motive & GPU batteries & charger):** ..... 15,350 LBS / 6963 KG
- **Additional Options:** Draw bar pin, specialized aircraft towing adapters, and custom high-lift adapters (consult LEKTRO)

**Lift capacity is calculated using a 30 in / 76.2 cm diameter aircraft tire in the lift cradle, with the aircraft tire center line at 26 in / 66 cm from the drive tire center line.

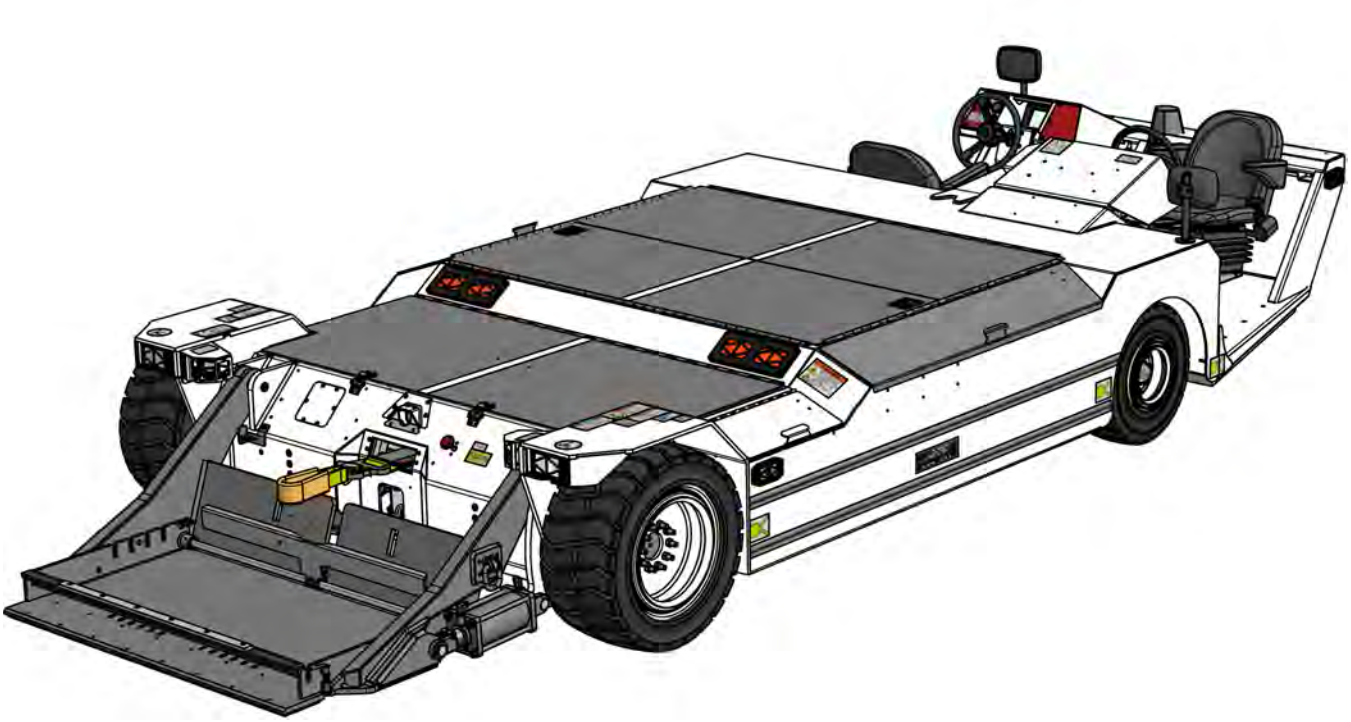
3.2.3 LAYOUT

This image displays the top, right side, front, and back of the LEKTRO 8900SDB tractor.



3.3 8950SDB

The LEKTRO 8950SDB is designed to tow aircraft up to 180,000 lbs/81,648 kg.



3.3.1 FEATURES

- **Vehicle Drive:** 58.3 HP/45.5 kW, 80 VDC traction motor mated with an Auburn/Dana 44 differential.
- **Motor Speed Control:** EVT1000LV IGBT with on-board diagnostics. Speed controlled by foot accelerator pedal.
- **Batteries:** Two 40 VDC industrial, 595 AMP-HR batteries (6-hour rate), wired in series. 680 AH and single-point watering system are optional.
- **GPU:** Built-in independent 12/24/28 VDC / 1175 CCA batteries and charging system are optional.
- **Motive Battery Charger:** External fully-automatic 120 AMP DC / 208-480 VAC / 60 Hz / 3-PH charger. 135 AMP and/or 50 Hz are optional.
- **Nose Gear Lift Cradle:** Patented lift cradle activated by a hydraulic pump assembly capable of handling dual- and single-wheel aircraft. Aircraft selection system and patented torque adapter are optional.
- **Winch:** Hydraulic winch with automatic safety cut-off. Winch and strut straps included.
- **Steering:** Hydraulic power steering controlled by an automotive-type tilt wheel requiring minimal effort with very responsive steering action. Automatic hydraulic time-out when tractor not in use, increasing battery shift life. Simple double-ended cylinder steering axle with tapered roller bearing kingpins.
- **Service Brakes:** Foot-operated dual hydraulic disc brakes with boost-assisted master cylinder for maximum braking with minimal effort.
- **Parking Brake:** Hand-activated electric switch controlling spring-applied/hydraulic-released calipers mounted on each service brake disc.

- **Drive Tires:** Single 28 x 12.5-15 solid-pneumatic traction tread. Siping, auto socks, and chains are optional.
- **Steer Tires:** Single 23 x 9-10 solid-pneumatic traction tread mounted to a fully suspended steer axle.
- **Lighting:** Forward and aft LED headlights. Four flashing amber LED running lights and amber strobe light mounted center rear. LED brake lights and turn signals are optional.
- **Operator Compartment:** Operator and passenger seats, forward facing. Premium grade including armrests (available in black or light gray). Operator's seat features a fully suspended, adjustable setting for height, fore/aft, and weight. Seat belts and dual-facing operator's helm and cab with heater, defroster, and windshield wipers are optional.
- **Camera and Monitors:** Camera at aircraft capture area with color monitors at the "A" and "B" station are optional.
- **Construction:** Welded steel plate and polymers preserved with primer and automotive high-gloss red or white enamel paint with protective polyurethane coating to prevent rust, scratches, and corrosion. Steel side rub rails and custom colors are optional.

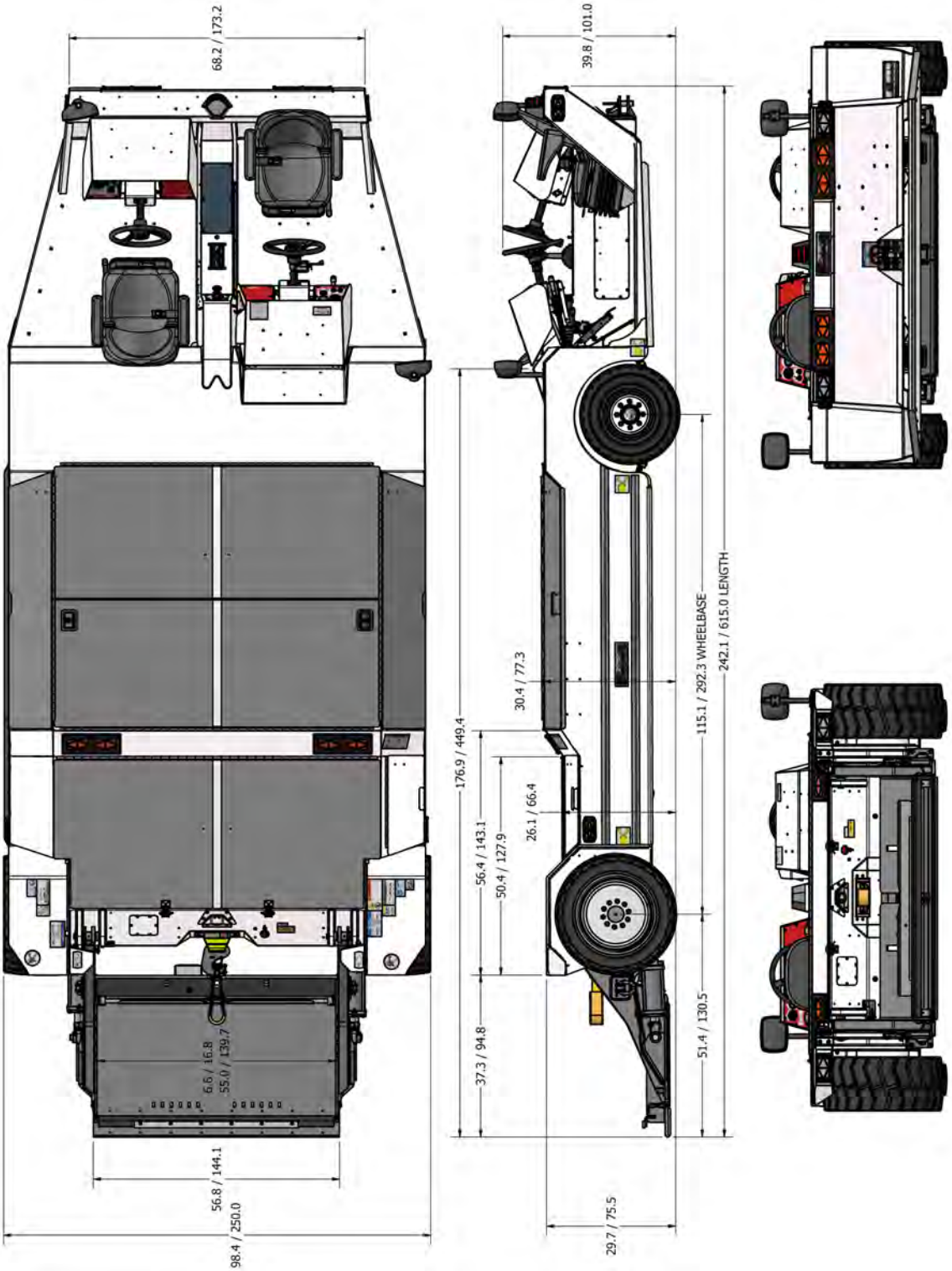
3.3.2 SPECIFICATIONS

- **Length:** ..... 242.1 in / 615 cm
- **Width:** ..... 98.4 in / 250 cm
- **Height (at lowest steering tilt setting):** ..... 39.8 in / 101 cm
- **Turning Radius:** ..... 209 in / 531 cm
- **Wheelbase:** ..... 115.1 in / 292.3 cm
- **Vehicle Speed (empty):** ..... 7.5 MPH / 12 KPH
- **Vehicle Speed (loaded to max. vehicle capacity):** ..... 4 MPH / 6.4 KPH
- **Lift Cradle Capacity:** ..... 29,000 LBS / 13154 KG**
- **Nose Gear Cradle Lifting Height:** ..... 11 in / 28 cm
- **Ground Clearance:** ..... 5 in / 12.7 cm
- **Shipping Weight (w/o batteries & charger):** ..... 10,330 LBS / 4686 KG
- **Shipping Weight (w/ motive batteries & charger):** ..... 19,330 LBS / 8768 KG
- **Shipping Weight (w/o motive & GPU batteries & charger):** ..... 19,680 LBS / 8927 KG
- **Additional Options:** Draw bar pin, specialized aircraft towing adapters, and custom high-lift adapters (consult LEKTRO)

**Lift capacity is calculated using a 30 in / 76.2 cm diameter aircraft tire in the lift cradle, with the aircraft tire center line at 26 in / 66 cm from the drive tire center line.

3.3.3 LAYOUT

This image displays the top, right side, front, and back of the LEKTRO 8950SDB tractor.



3.4 8925SDB-AL/HS-200

The LEKTRO 8925SDB-AL/HS-200 is designed to tow aircraft up to 115,000 lbs/52,163 kg.

3.4.1 FEATURES

- **Vehicle Drive:** 91.4 HP/68.2 kW, 120 VDC traction motor mated with an Auburn/Dana 44 differential.
- **Motor Speed Control:** EVT1000HV IGBT with on-board diagnostics. Speed controlled by foot accelerator pedal.
- **Batteries:** Dual set of two 60 VDC industrial, 850 AMP-HR batteries (6-hour rate), wired in series-parallel with single-point watering system.
- **GPU:** Built-in independent 12/24/28 VDC / 1175 CCA batteries and charging system are optional.
- **Motive Battery Charger:** Two external fully-automatic 130 AMP DC / 208-480 VAC / 60 Hz / 3-PH charger. 50 Hz is optional.
- **Nose Gear Lift Cradle:** Patented lift cradle activated by a hydraulic pump assembly capable of handling dual- and single-wheel aircraft. Aircraft selection system and patented torque adapter are optional.
- **Winch:** Hydraulic winch with automatic safety cut-off and dual right/left cradle fender controls. Winch and strut straps included.
- **Steering:** Hydraulic power steering controlled by an automotive-type tilt wheel requiring minimal effort with very responsive steering action. Automatic hydraulic time-out when tractor not in use, increasing battery shift life. Simple double-ended cylinder steering axle with tapered roller bearing kingpins.
- **Service Brakes:** Foot-operated dual hydraulic disc brakes with boost-assisted master cylinder for maximum braking with minimal effort.

- **Parking Brake:** Hand-activated electric switch controlling spring-applied/hydraulic-released calipers mounted on each service brake disc.
- **Drive Tires:** Single 28 x 15-15 solid-pneumatic traction tread. Siping, auto socks, and chains are optional.
- **Steer Tires:** Single 23 x 10-12 solid-pneumatic traction tread mounted to a fully suspended steer axle.
- **Lighting:** Forward and aft LED headlights. Four flashing amber LED running lights. Two cab-mounted amber strobe lights. Also includes LED brake lights and turn signals.
- **Operator Compartment:** Dual premium-grade operator and passenger seats of molded polyurethane, including armrests. Features a fully suspended, adjustable setting for height, fore/aft, and weight. Seat belts and cab with heater, defroster, and windshield wipers are also included.
- **Camera and Monitors:** Camera at aircraft capture area with color monitors at the “A” and “B” station are optional.
- **Construction:** Welded steel plate and polymers preserved with primer and automotive high-gloss red or white enamel paint with protective polyurethane coating to prevent rust, scratches, and corrosion. Steel side rub rails and custom colors are optional.

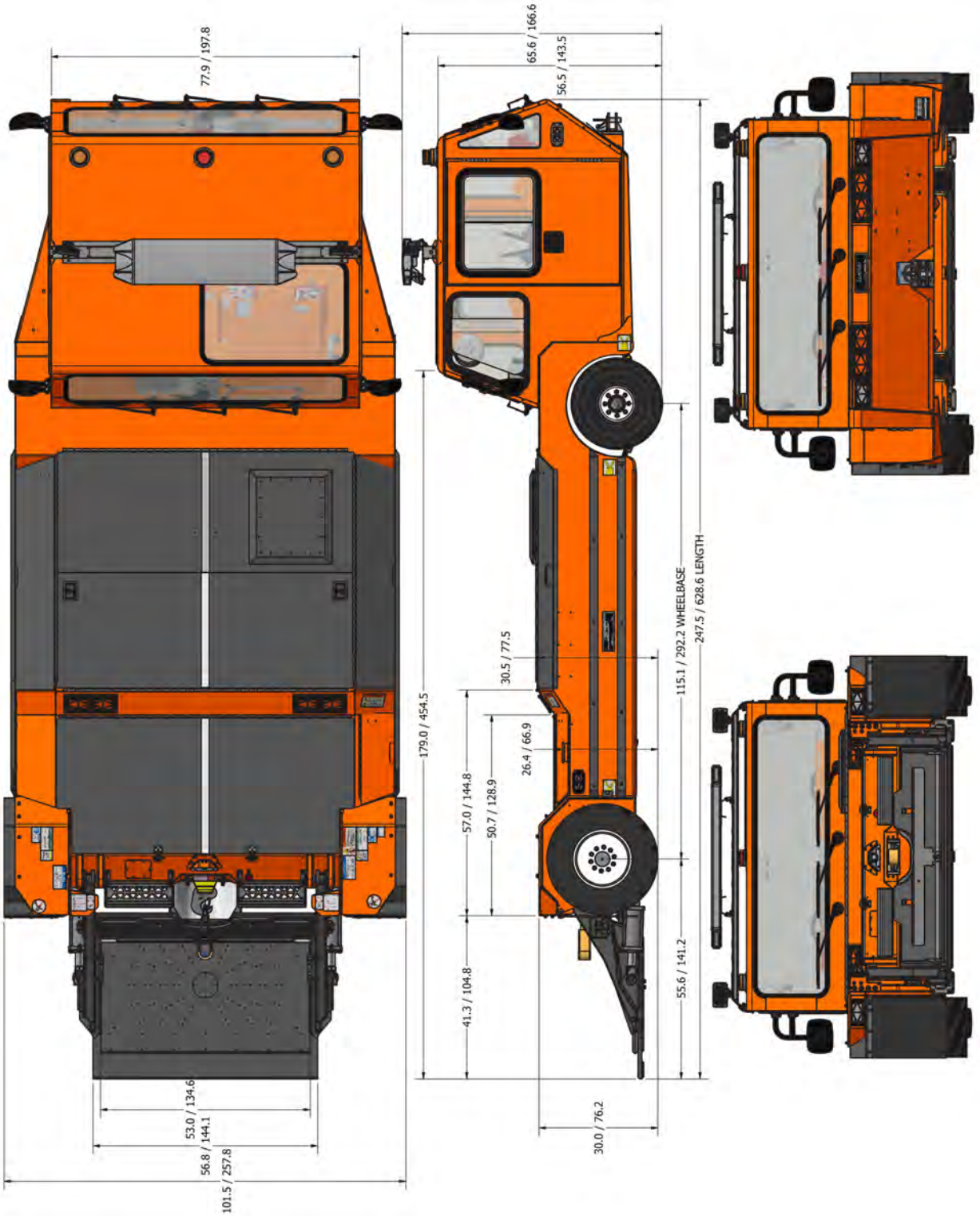
3.4.2 SPECIFICATIONS

- **Length:** ..... 247.5 in / 628.6 cm
- **Width:** ..... 101.5 in / 257.8 cm
- **Height (at lowest steering tilt setting):** ..... 65.6 in / 166.6 cm
- **Turning Radius:** ..... 209 in / 531 cm
- **Wheelbase:** ..... 115.1 in / 292.3 cm
- **Vehicle Speed (empty):** ..... 17 MPH / 27 KPH
- **Vehicle Speed (loaded to max. vehicle capacity):** ..... 14 MPH / 22 KPH
- **Lift Cradle Capacity:** ..... 25,300 LBS / 11476 KG**
- **Nose Gear Cradle Lifting Height:** ..... 11 in / 28 cm
- **Ground Clearance:** ..... 5 in / 12.7 cm
- **Shipping Weight (w/o batteries & charger):** ..... 12,000 LBS / 5443 KG
- **Shipping Weight (w/ motive batteries & charger):** ..... 21,300 LBS / 9662 KG
- **Shipping Weight (w/o motive & GPU batteries & charger):** ..... 21,700 LBS / 9843 KG
- **Additional Options:** Draw bar pin, specialized aircraft towing adapters, and custom high-lift adapters (consult LEKTRO)

**Lift capacity is calculated using a 30 in / 76 cm diameter aircraft tire in the lift cradle, with the aircraft tire center line at 26 in / 66 cm from the drive tire center line.

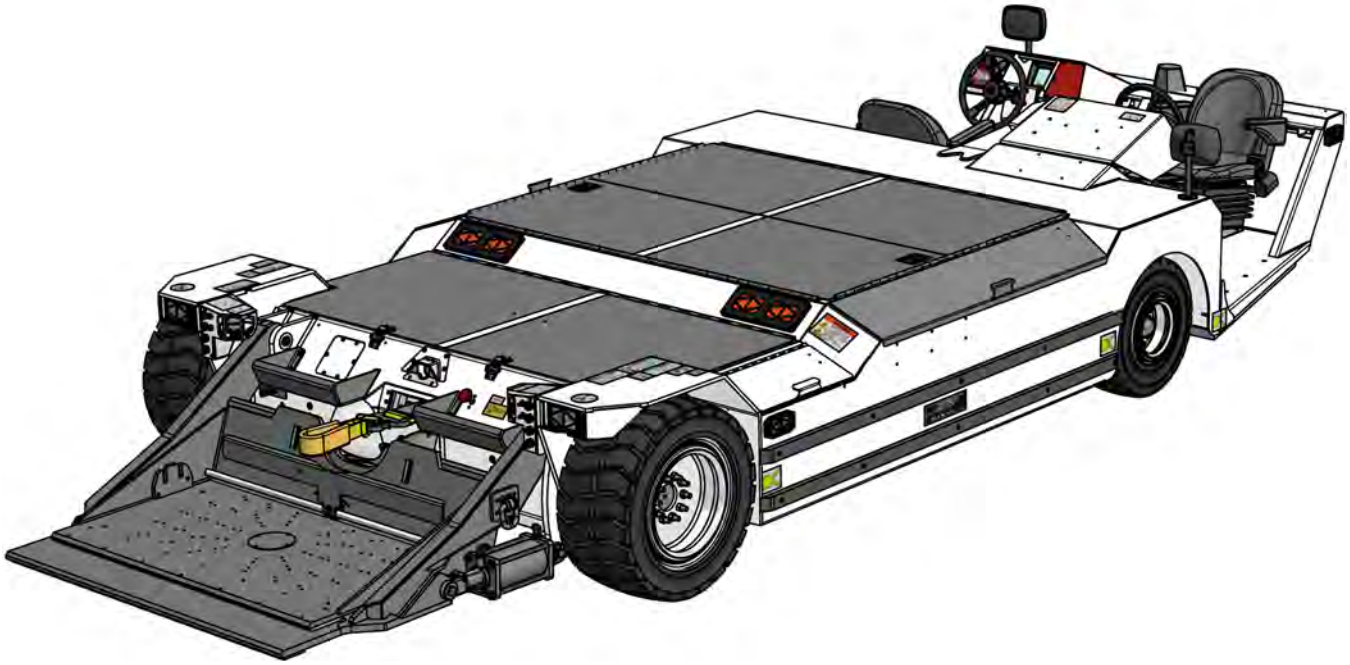
3.4.3 LAYOUT

This image displays the top, right side, front, and back of the LEKTRO 8925SDB-AL/HS-200 tractor.



3.5 8950SDB-AL-200

The LEKTRO 8950SDB-AL-200 is designed to tow aircraft up to 210,000 lbs/95,256 kg.



3.5.1 FEATURES

- **Vehicle Drive:** 58.3 HP/45.5 kW, 80 VDC traction motor mated with an Auburn/Dana 44 differential.
- **Motor Speed Control:** EVT1000LV IGBT with on-board diagnostics. Speed controlled by foot accelerator pedal.
- **Batteries:** Dual set of two 40 VDC industrial, 680 AMP-HR batteries (6-hour rate), wired in series-parallel with single-point watering system.
- **GPU:** Built-in independent 12/24/28 VDC / 1175 CCA batteries and charging system are optional.
- **Motive Battery Charger:** Two external fully-automatic 120 AMP DC / 208-480 VAC / 60 Hz / 3-PH chargers. 50 Hz is optional.
- **Nose Gear Lift Cradle:** Patented lift cradle activated by a hydraulic pump assembly capable of handling dual- and single-wheel aircraft. Aircraft selection system and patented torque adapter are optional.
- **Winch:** Hydraulic winch with automatic safety cut-off. Winch and strut straps included.
- **Steering:** Hydraulic power steering controlled by an automotive-type tilt wheel requiring minimal effort with very responsive steering action. Automatic hydraulic time-out when tractor not in use, increasing battery shift life. Simple double-ended cylinder steering axle with tapered roller bearing kingpins.
- **Service Brakes:** Foot-operated dual hydraulic disc brakes with boost-assisted master cylinder for maximum braking with minimal effort.
- **Parking Brake:** Hand-activated electric switch controlling spring-applied/hydraulic-released calipers mounted on each service brake disc.

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- **Drive Tires:** Single 28 x 12.5-15 solid-pneumatic traction tread. Siping, auto socks, and chains are optional.
- **Steer Tires:** Single 23 x 9-10 solid-pneumatic traction tread mounted to a fully suspended steer axle.
- **Lighting:** Forward and aft LED headlights. Four flashing amber LED running lights and amber strobe light mounted center rear. LED brake lights and turn signals.
- **Operator Compartment:** Operator and passenger seats, forward facing. Premium grade including armrests (available in black or light gray). Operator's seat features a fully suspended, adjustable setting for height, fore/aft, and weight. Seat belts and dual-facing operator's helm and cab with heater, defroster, and windshield wipers are optional.
- **Camera and Monitors:** Camera at aircraft capture area with color monitors at the "A" and "B" station are optional.
- **Construction:** Welded steel plate and polymers preserved with primer and automotive high-gloss red or white enamel paint with protective polyurethane coating to prevent rust, scratches, and corrosion. Steel side rub rails and custom colors are optional.

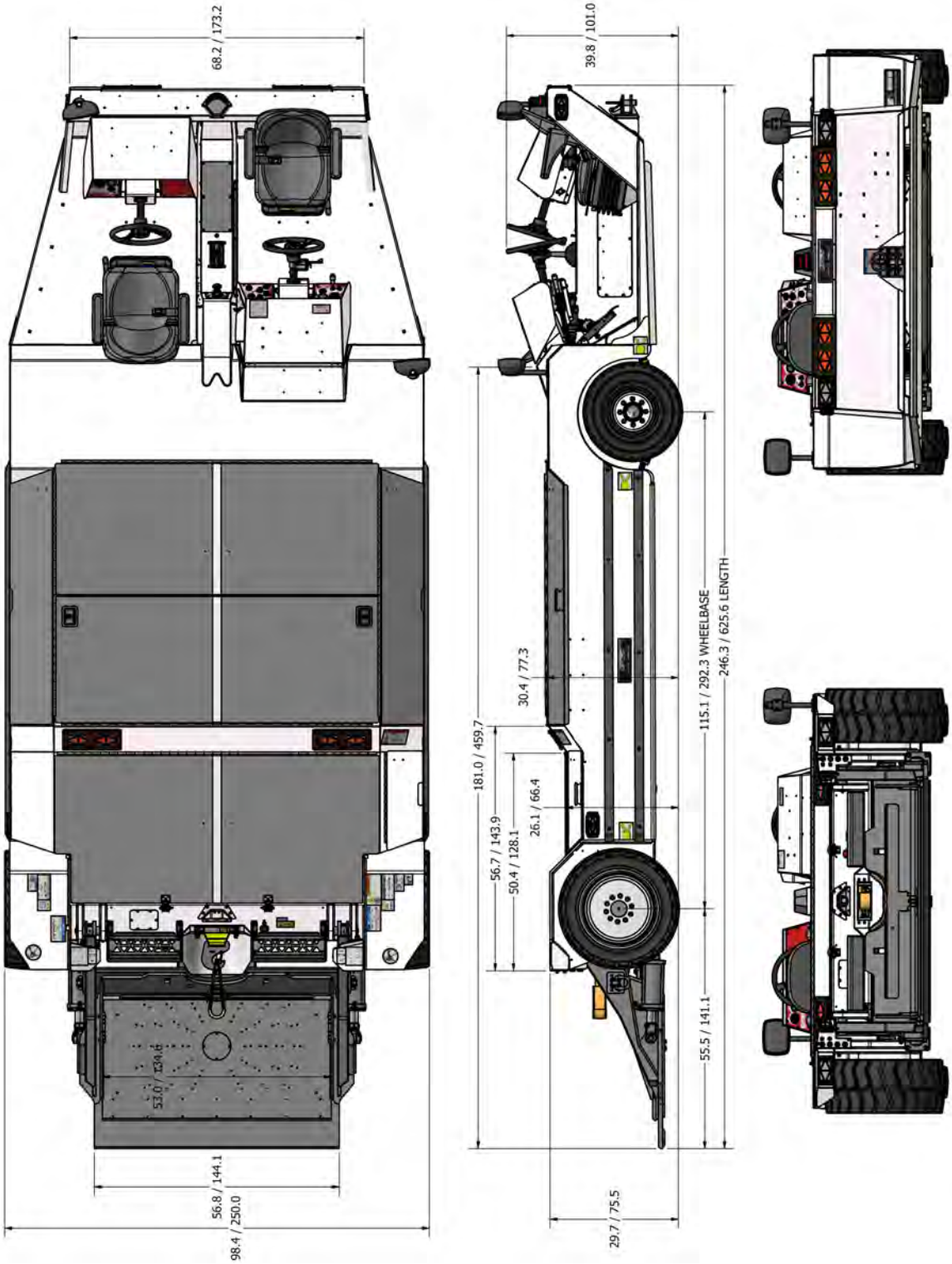
3.5.2 SPECIFICATIONS

- **Length:** ..... 246.3 in / 625.6 cm
- **Width:** ..... 98.4 in / 250 cm
- **Height (at lowest steering tilt setting):** ..... 39.8 in / 101 cm
- **Turning Radius:** ..... .209 in / 531 cm
- **Wheelbase:** ..... .115.1 in / 292.3 cm
- **Vehicle Speed (empty):** ..... 7.5 MPH / 12 KPH
- **Vehicle Speed (loaded to max. vehicle capacity):** ..... 4 MPH / 6.4 KPH
- **Lift Cradle Capacity:** ..... 29,000 LBS / 13154 KG**
- **Nose Gear Cradle Lifting Height:** ..... 11 in / 28 cm
- **Ground Clearance:** ..... 5 in / 12.7 cm
- **Shipping Weight (w/o batteries & charger):** ..... 11,430 LBS / 5185 KG
- **Shipping Weight (w/ motive batteries & charger):** ..... 21,130 LBS / 9584 KG
- **Shipping Weight (w/o motive & GPU batteries & charger):** ..... 21,530 LBS / 9766 KG
- **Additional Options:** Draw bar pin, specialized aircraft towing adapters, and custom high-lift adapters (consult LEKTRO)

**Lift capacity is calculated using a 30 in / 76 cm diameter aircraft tire in the lift cradle, with the aircraft tire center line at 26 in / 66 cm from the drive tire center line.

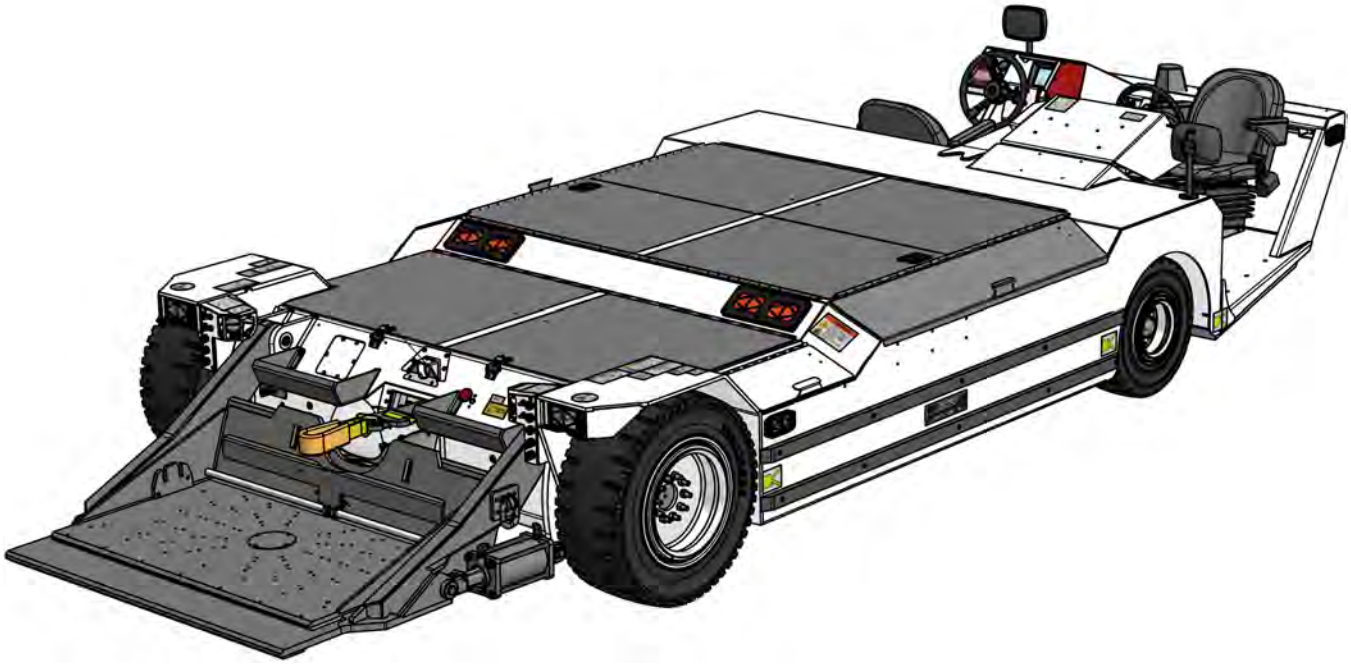
3.5.3 LAYOUT

This image displays the top, right side, front, and back of the LEKTRO 8950SDB-AL-200 tractor.



3.6 8950SDB-AL-250

The LEKTRO 8950SDB-AL-250 is designed to tow aircraft up to 280,000 lbs/127,006 kg.



3.6.1 FEATURES

- **Vehicle Drive:** 91.4 HP/68.2 kW, 120 VDC traction motor mated with an Auburn/Dana 44 differential.
- **Motor Speed Control:** EVT1000HV IGBT with on-board diagnostics. Speed controlled by foot accelerator pedal.
- **Batteries:** Two 60 VDC industrial, 850 AMP-HR batteries (6-hour rate), wired in series with single-point watering system.
- **GPU:** Built-in independent 12/24/28 VDC / 1175 CCA batteries and charging system are optional.
- **Motive Battery Charger:** Two external fully-automatic 130 AMP DC / 208-480 VAC / 60 Hz / 3-PH charger. 50 Hz is optional.
- **Nose Gear Lift Cradle:** Patented lift cradle activated by a hydraulic pump assembly capable of handling dual- and single-wheel aircraft. Aircraft selection system and patented torque adapter are optional.
- **Winch:** Hydraulic winch with automatic safety cut-off and dual right/left cradle fender controls. Winch and strut straps included.
- **Steering:** Hydraulic power steering controlled by an automotive-type tilt wheel requiring minimal effort with very responsive steering action. Automatic hydraulic time-out when tractor not in use, increasing battery shift life. Simple double-ended cylinder steering axle with tapered roller bearing kingpins.
- **Service Brakes:** Foot-operated dual hydraulic disc brakes with boost-assisted master cylinder for maximum braking with minimal effort.

- **Parking Brake:** Hand-activated electric switch controlling spring-applied/hydraulic-released calipers mounted on each service brake disc.
- **Drive Tires:** Single 29.5 x 12.5-15 solid-pneumatic traction tread. Siping and chains are optional.
- **Steer Tires:** Single 23 x 9-10 solid-pneumatic traction tread mounted to a fully suspended steer axle.
- **Lighting:** Forward and aft LED headlights. Four flashing amber LED running lights and amber strobe light mounted center rear. LED brake lights and turn signals.
- **Operator Compartment:** Operator and passenger seats, forward facing. Premium grade including armrests (available in black or light gray). Operator's seat features a fully suspended, adjustable setting for height, fore/aft, and weight. Seat belts and dual-facing operator's helm and cab with heater, defroster, and windshield wipers are optional.
- **Camera and Monitors:** Camera at aircraft capture area with color monitors at the "A" and "B" station are optional.
- **Construction:** Welded steel plate and polymers preserved with primer and automotive high-gloss red or white enamel paint with protective polyurethane coating to prevent rust, scratches, and corrosion. Steel side rub rails and custom colors are optional.

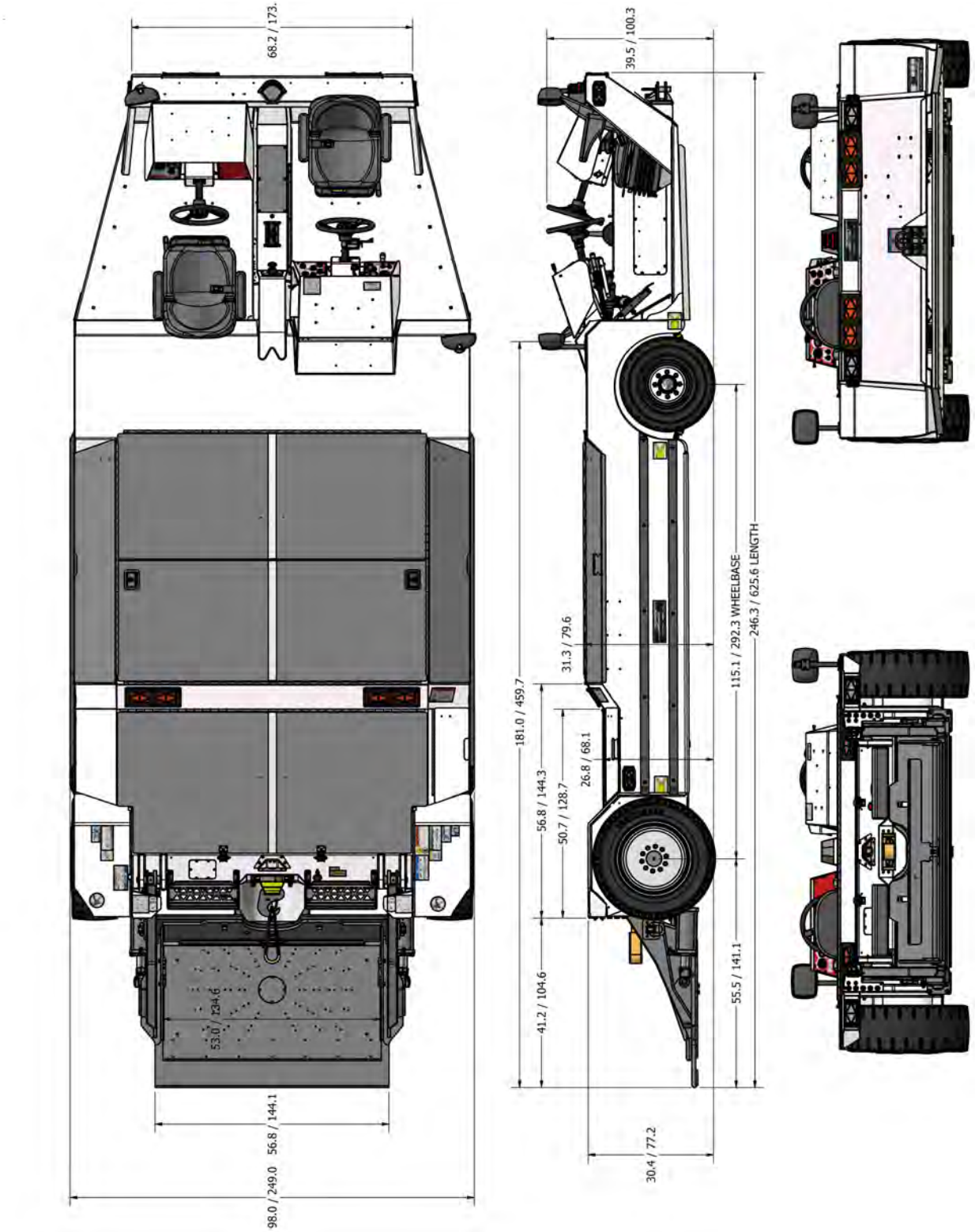
3.6.2 SPECIFICATIONS

- **Length:** ..... 246.3 in / 625.6 cm
- **Width:** ..... 98 in / 249 cm
- **Height (at lowest steering tilt setting):** ..... 39.5 in / 100.3 cm
- **Turning Radius:** ..... 209 in / 531 cm
- **Wheelbase:** ..... 115.1 in / 292.2 cm
- **Vehicle Speed (empty):** ..... 10.25 MPH / 16/5 KPH
- **Vehicle Speed (loaded to max. vehicle capacity):** ..... 4.5 MPH / 7.2 KPH
- **Lift Cradle Capacity:** ..... 33,000 LBS / 14969 KG**
- **Nose Gear Cradle Lifting Height:** ..... 11 in / 28 cm
- **Ground Clearance:** ..... 5 in / 12.7 cm
- **Shipping Weight (w/o batteries & charger):** ..... 12,200 LBS / 5534 KG
- **Shipping Weight (w/ motive batteries & charger):** ..... 21,500 LBS / 9752 KG
- **Shipping Weight (w/o motive & GPU batteries & charger):** ..... 21,900 LBS / 9933 KG
- **Additional options:** Draw bar pin, specialized aircraft towing adapters, and custom high-lift adapters (consult LEKTRO)

**Lift capacity is calculated using a 30 in / 76.2 cm diameter aircraft tire in the lift cradle, with the aircraft tire center line at 26 in / 66 cm from the drive tire center line.

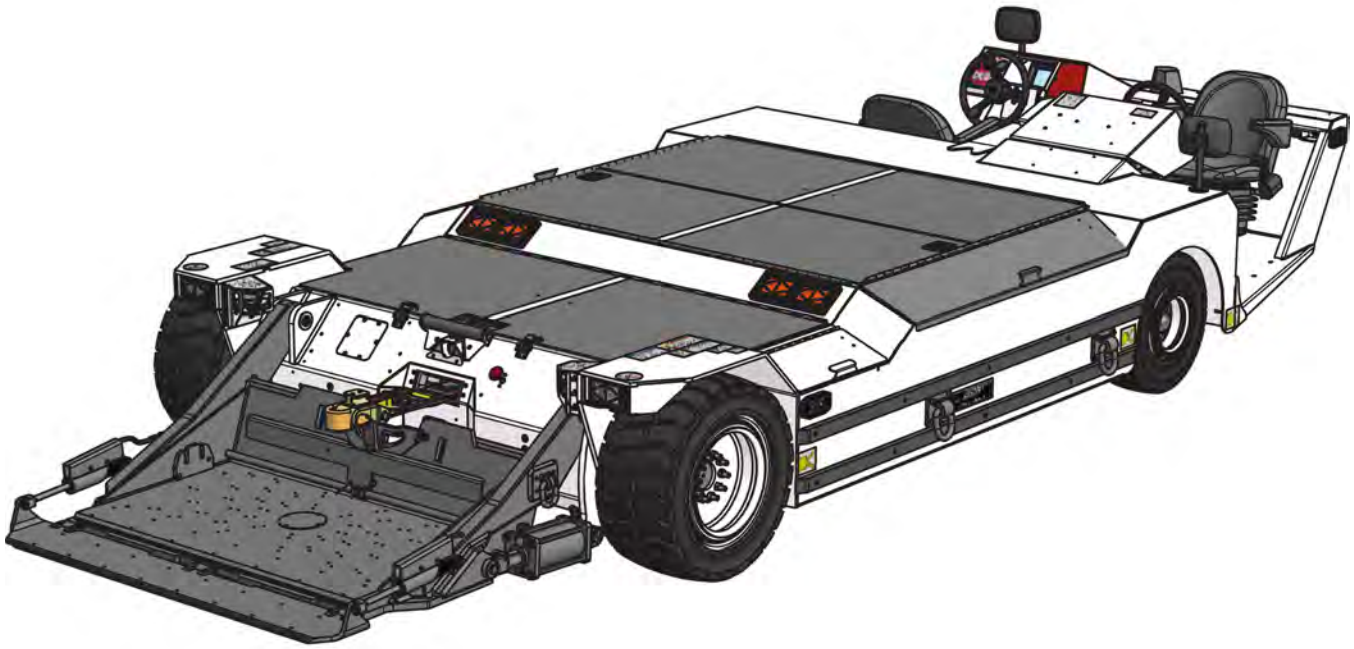
3.6.3 LAYOUT

This image displays the top, right side, front, and back of the LEKTRO 8950SDB-AL-250 tractor.



3.7 8950SDB-M

The LEKTRO 8950SDB-M is designed to tow aircraft up to 180,000 lbs/81,648 kg.



3.7.1 FEATURES

- **Vehicle Drive:** 58.3 HP/45.5 kW, 80 VDC traction motor mated with an Auburn/Dana 44 differential.
- **Motor Speed Control:** EVT1000LV IGBT with on-board diagnostics. Speed controlled by foot accelerator pedal.
- **Batteries:** Dual set of two 40 VDC industrial, 595 AMP-HR batteries (6-hour rate), wired in series-parallel with single-point watering system. 680 AH is optional.
- **GPU:** Built-in independent 12/24/28 VDC / 1175 CCA batteries and charging system are optional.
- **Motive Battery Charger:** External fully-automatic 120 AMP DC / 208-480 VAC / 60 Hz / 3-PH charger. 135 AMP and/or 50 Hz are optional.
- **Nose Gear Lift Cradle:** Patented lift cradle activated by a hydraulic pump assembly capable of handling dual- and single-wheel aircraft. Aircraft selection system and patented torque adapter are optional.
- **Winch:** Hydraulic winch with automatic safety cut-off and dual right/left cradle fender controls. Winch and strut straps included.
- **Steering:** Hydraulic power steering controlled by an automotive-type tilt wheel requiring minimal effort with very responsive steering action. Automatic hydraulic time-out when tractor not in use, increasing battery shift life. Simple double-ended cylinder steering axle with tapered roller bearing kingpins.
- **Service Brakes:** Foot-operated dual hydraulic disc brakes with boost-assisted master cylinder for maximum braking with minimal effort.

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- **Parking Brake:** Hand-activated electric switch controlling spring-applied/hydraulic-released calipers mounted on each service brake disc.
- **Drive Tires:** Single 28 x 12.5-15 solid-pneumatic traction tread. Siping, auto socks, and chains are optional.
- **Steer Tires:** Single 23 x 9-10 solid-pneumatic traction tread mounted to a fully suspended steer axle.
- **Lighting:** Forward and aft LED headlights. Four flashing amber LED running lights and amber strobe light mounted center rear. LED brake lights and turn signals are optional.
- **Operator Compartment:** Premium low-profile operator and passenger seats wit dual-facing helms including armrests, seat belts, and fore/aft settings. Cab with heater, defroster, fans, and windshield wipers is optional.
- **Camera and Monitors:** Camera at aircraft capture area with color monitors at the “A” and “B” station are optional.
- **Construction:** Welded steel plate and polymers preserved with primer and automotive high-gloss red or white enamel paint with protective polyurethane coating to prevent rust, scratches, and corrosion. Steel side rub rails and custom colors are optional.
- **Transport:** Six D rings and rear draw bar hitch for transport tie down. Steer axle with hydraulic lift for ramp loading is optional.

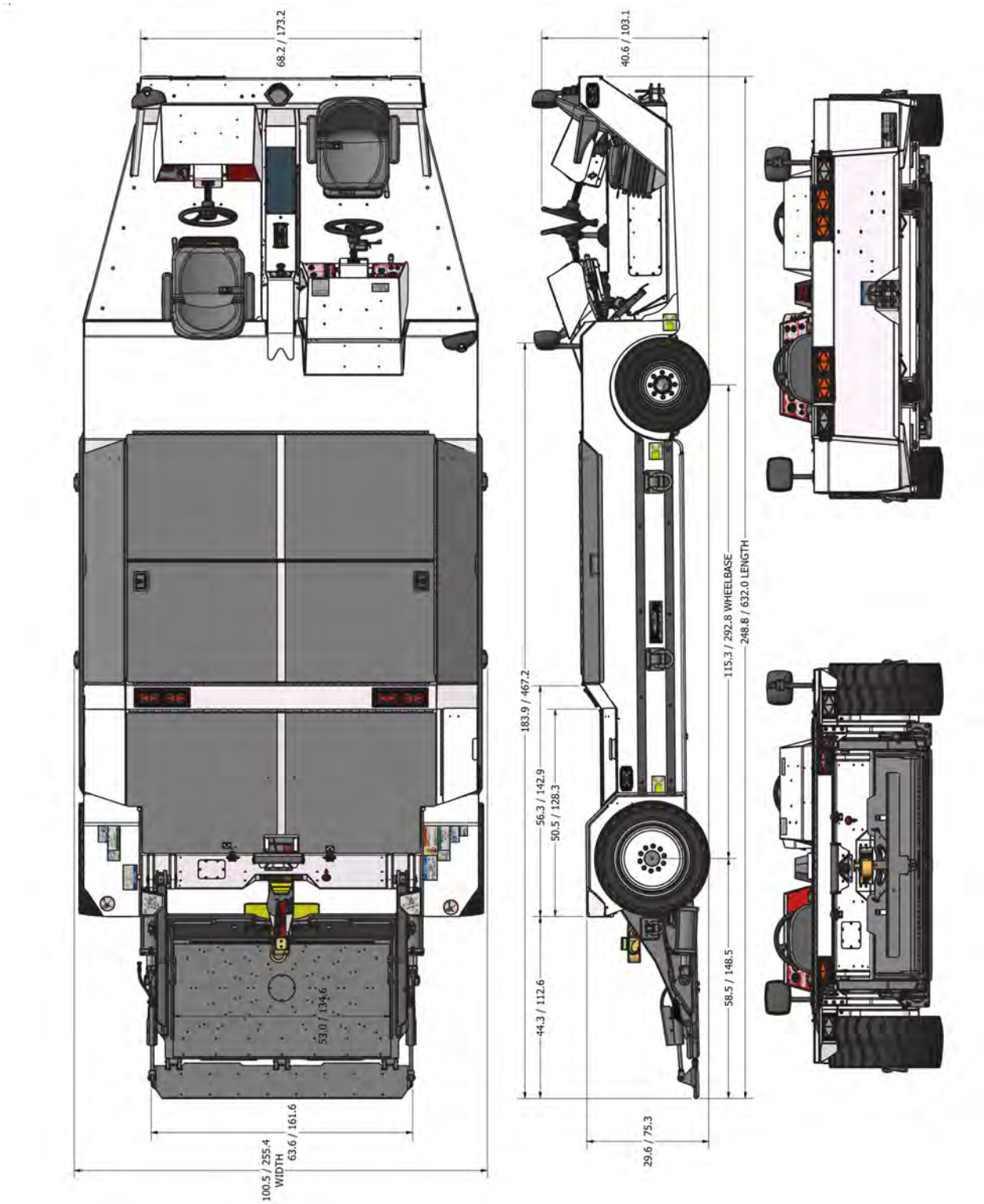
3.7.2 SPECIFICATIONS

- **Length:** .....248.8 in / 632 cm
- **Width:** .....100.5 in / 255.4 cm
- **Height (at lowest steering tilt setting):** .....40.6 in / 103.1 cm
- **Turning Radius:** .....209 in / 531 cm
- **Wheelbase:** .....115.3 in / 292.8 cm
- **Vehicle Speed (empty):** .....7.5 MPH / 12 KPH
- **Vehicle Speed (loaded to max. vehicle capacity):** .....4 MPH / 6.4 KPH
- **Lift Cradle Capacity:** .....18,000 LBS / 8165 KG**
- **Nose Gear Cradle Lifting Height:** ..... 11 in / 28 cm
- **Ground Clearance:** .....5 in / 12.7 cm
- **Shipping Weight (w/o batteries & charger):** ..... 9000 LBS / 4082 KG
- **Shipping Weight (w/ motive batteries & charger):** ..... 18,000 LBS / 8165 KG
- **Shipping Weight (w/o motive & GPU batteries & charger):** ..... 18,350 LBS / 8323 KG
- **Additional Options:** Draw bar pin, specialized aircraft towing adapters, and custom high-lift adapters (consult LEKTRO)

**Lift capacity is calculated using a 30 in / 76.2 cm diameter aircraft tire in the lift cradle, with the aircraft tire center line at 26 in / 66 cm from the drive tire center line.

3.7.3 LAYOUT

This image displays the top, right side, front, and back of the LEKTRO 8950SDB-M tractor.



CHAPTER 4

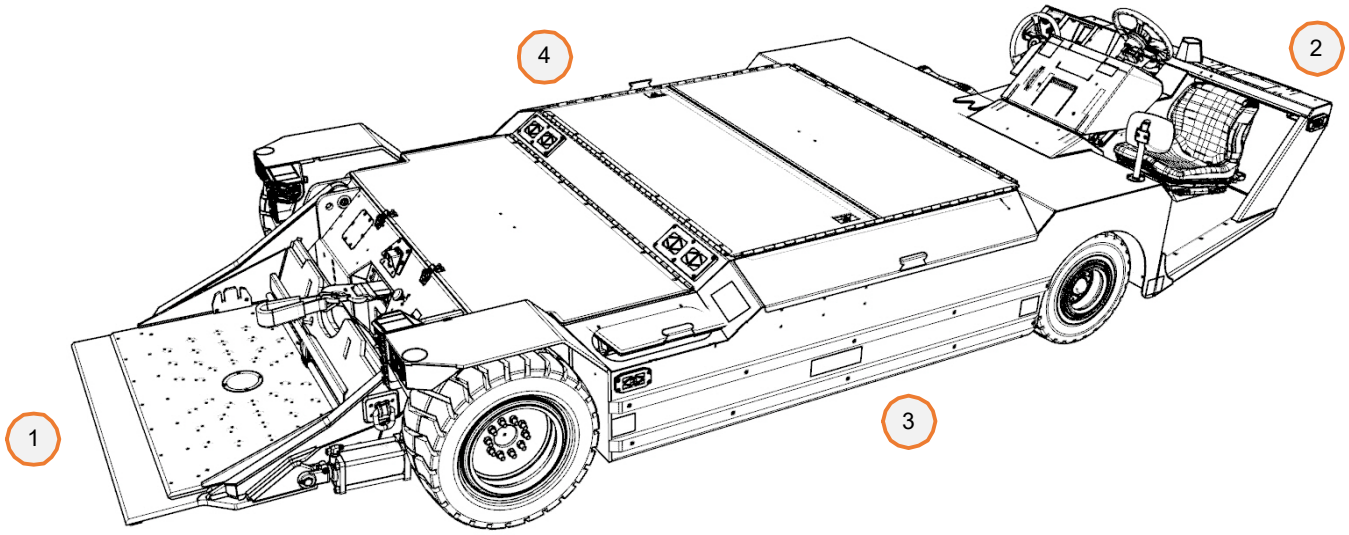
COMPONENTS & CONTROLS

This chapter describes the layout of the tractor, including the following components and controls:

ORIENTATION 2
GENERAL LAYOUT 3
OPERATOR COMPARTMENT 5
CRADLE & WINCH ASSEMBLY 13
FORWARD COMPARTMENT 25
REAR COMPARTMENT 27
TRACTOR POWER DC CONNECTOR 28
SIDE/GPU COMPARTMENTS 29
PARKING & EMERGENCY BRAKES 30
OPTIONAL AIRCRAFT PROTECTION SYSTEM 31
OPTIONAL GPU SYSTEM 35

4.1 ORIENTATION

LEKTRO 88/89 Series tractors are oriented as shown here:



In this diagram:

- The Cradle and Winch are at the FRONT of the tractor (1).
- The Operator Compartment is at the REAR of the tractor (2).
- The LEFT (or “A”) side of the tractor is on the left as seen from the rear of the tractor (3).
- The RIGHT (or “B”) side of the tractor is on the right as seen from the rear of the tractor (4).
- Driving the tractor toward the Cradle and Winch is FORWARD.
- Driving the tractor away from the Cradle and Winch is REVERSE.

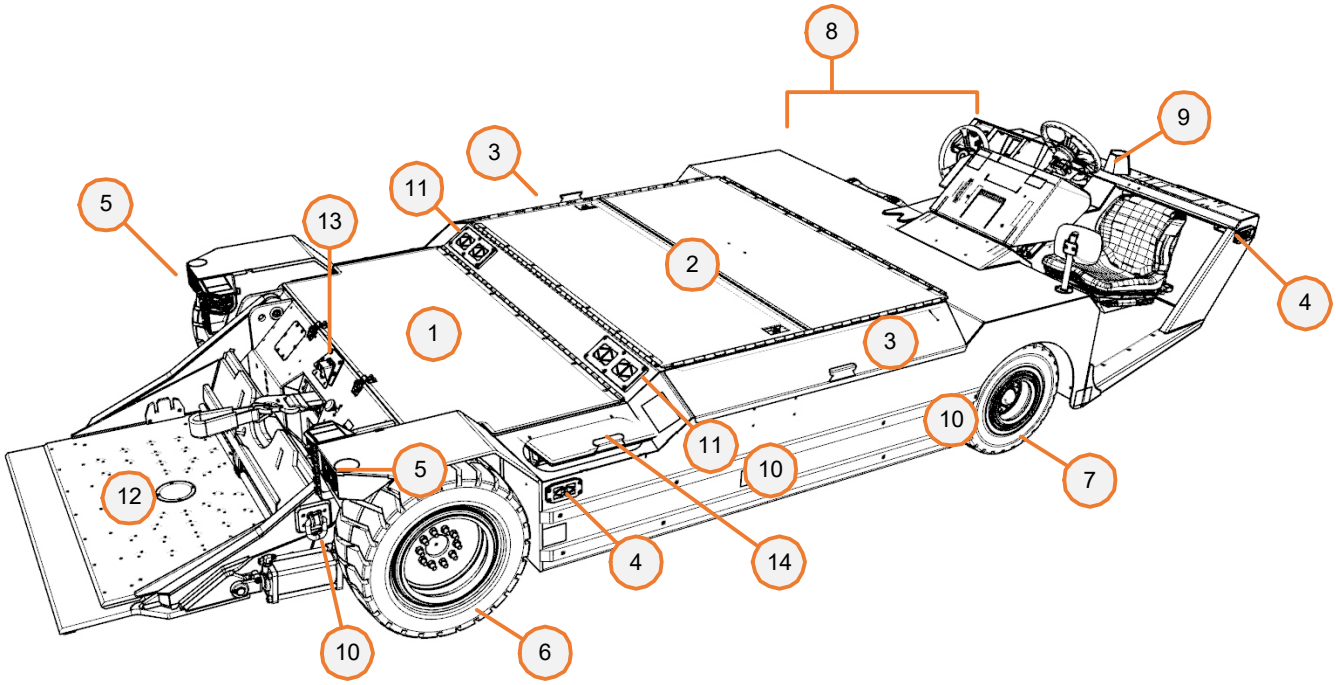
All instructions in this manual reflect this orientation.

4.2 GENERAL LAYOUT

This section describes the general layout of your LEKTRO 88/89 Series tractor.

Note

The following illustrations may show optional equipment (89 shown).



The major components of the LEKTRO 88/89 Series tractor are:

- **Forward Deck Cover (1):** Covers the Forward Compartment and optional GPU Compartment, which contain the Drive and Winch Motor, Differential, Brakes, and other vehicle components. See *"FORWARD COMPARTMENT" on page 4-25*.
- **Battery Deck Cover (2):** Covers the Rear Compartment, which contains the Motive Batteries that power the Drive Motor and other vehicle components. See *"REAR COMPARTMENT" on page 4-27*.
- **Side Compartment Cover (3):** Covers the Side Compartment(s), which can store components such as an Extended Rear Gate (see *"EXTENDED REAR GATE" on page 4-17*) or Front Gate (see *"FRONT GATE (STANDARD CRADLE)" on page 4-19*). See *"SIDE/GPU COMPARTMENTS" on page 4-29*.
- **Running & Parking Lights (4):** Used at night, during periods of low visibility, or in accordance with airport policy.

- **Headlights (5):** Used at night, during periods of low visibility, or in accordance with airport policy.
- **Drive Wheels (6):** Transmit power from the Drive Motor and Differential to the tarmac to move the vehicle.
- **Steer Wheels (7):** Turn the vehicle.
- **Operator Compartment (8):** Contains one or two operator stations. See *"OPERATOR COMPARTMENT" on page 4-5*.
- **Strobe Light (9):** Used to enhance safety at night, during periods of low visibility, or in accordance with airport policy.
- **"D" Ring Tie-Downs (10; *optional*):** If equipped, these six rings prevent the vehicle from shifting during transport or extended storage.
- **Turn Signal/Brake Lights (11; *optional*):** If equipped, used to alert nearby personnel when the vehicle is about to turn or when the brakes are being applied.
- **Cradle (12):** Holds the aircraft wheel.
- **Hydraulic Front Gate (*optional*; *not shown*):** If equipped, can be raised or lowered using the fender-mounted and/or Instrument Panel controls. See *"HYDRAULIC FRONT GATE (OPTIONAL)" on page 4-20*.
- **Cradle Camera (13; *optional*):** If equipped, streams live video of the Cradle area to a color monitor mounted on the left Instrument Panel on the Control Console. See *"INSTRUMENT PANEL (LEFT)" on page 4-8*.
- **GPU Connections and GPU Battery Gauge (14; *if equipped*):** The GPU connections provide 12, 24, or 28 volt power to start aircraft engines, and the GPU Battery Gauge displays the level of charge of the GPU Batteries. See *"OPTIONAL GPU SYSTEM" on page 35*.

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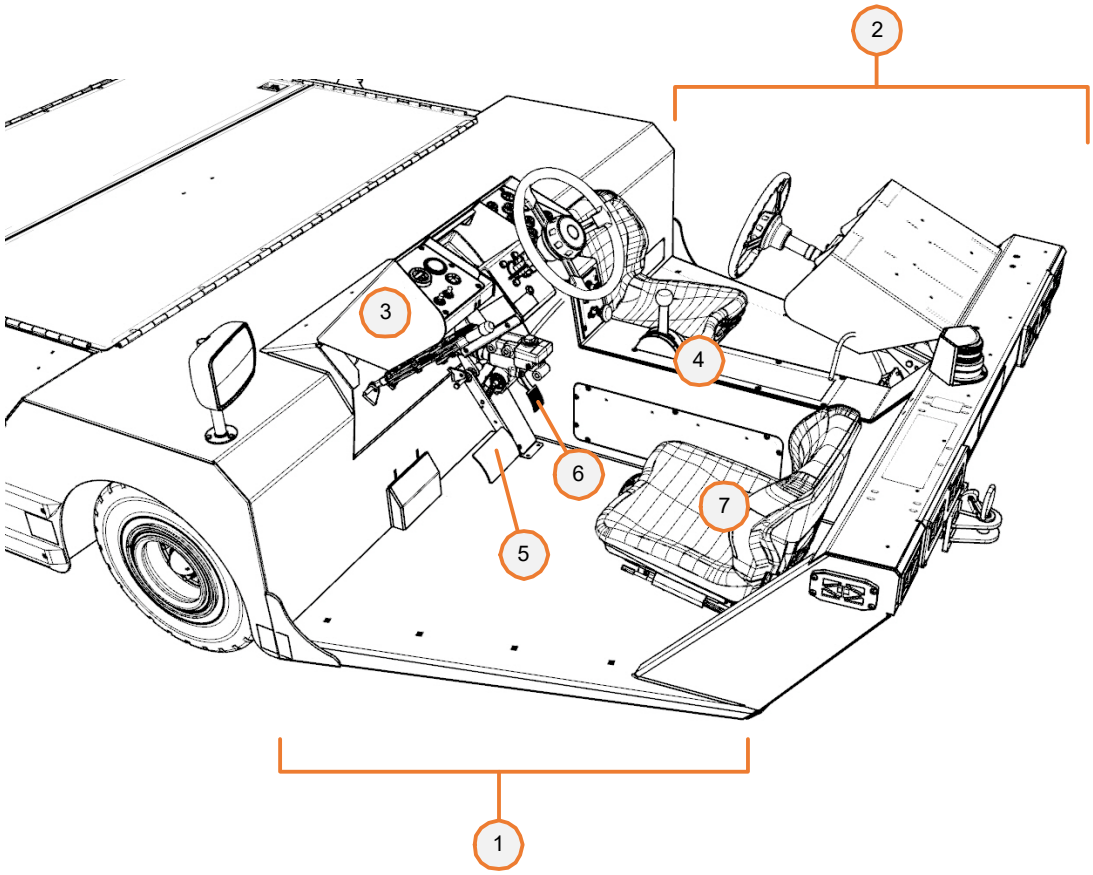
4.3 OPERATOR COMPARTMENT

The Operator Compartment is laid out as follows:



This area contains the following components and controls:

- **Operator Station A (1):** This station faces the front of the vehicle.
- **Operator Station B (2):** If equipped, this station faces the rear of the vehicle.
- **Control Console (3):** Your vehicle is equipped with one or two Control Console Assemblies. See *"CONTROL CONSOLE" on page 4-7*.
- **Center Console (4):** See *"CENTER CONSOLE" on page 4-11*.
- **Service Brake Pedal (5):** Applies the brakes. Depressing the pedal further applies the brakes more strongly.
- **Accelerator Pedal (6):** Engages the drive motor and moves the vehicle. Depressing the pedal further makes the vehicle move faster.

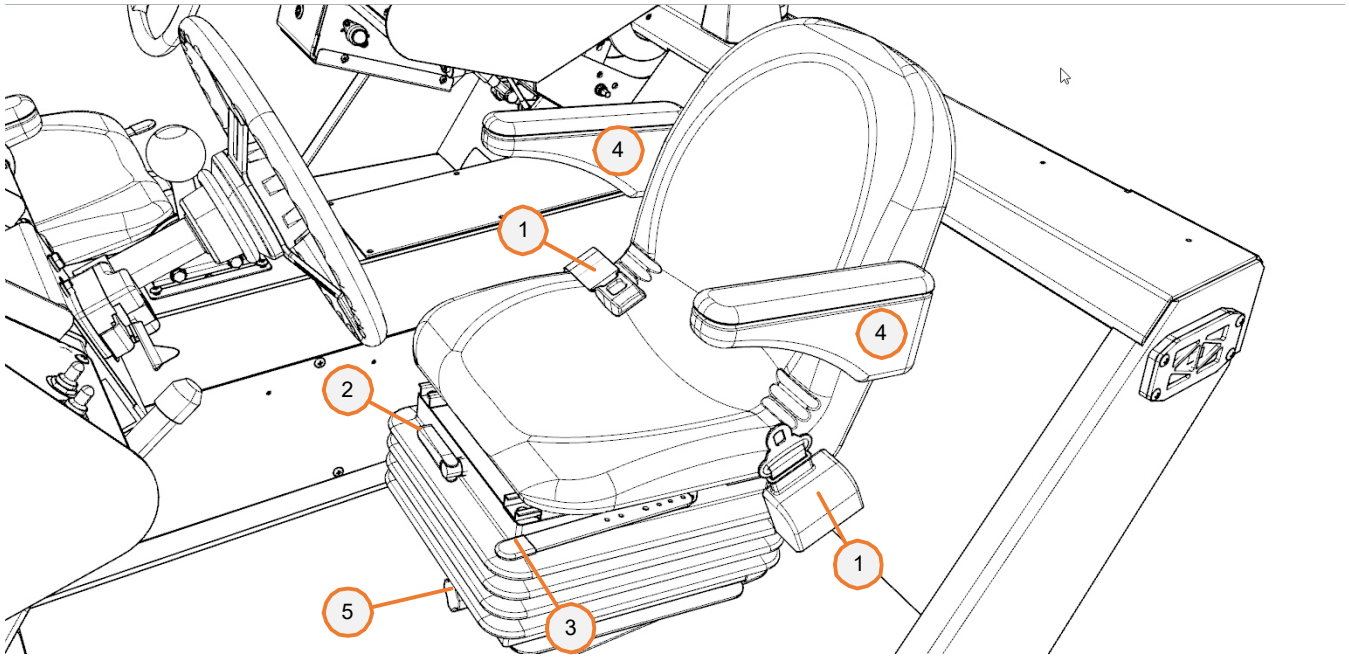
  > Apply gradual pressure to move the vehicle.

> If the vehicle does not move when the accelerator is pressed, lift your foot and let the accelerator pedal return before trying again. If this fails, see the *General* section of the 88/89 Series *Service Manual*.

- **Seats (7):** Your LEKTRO tractor is equipped with two seats (Operator / Passenger, or Operator A / Operator B).

4.3.1 OPERATOR SEAT(S)

Each seat is equipped with several operator safety and/or comfort controls.



Each seat may include some or all of the following components and controls:

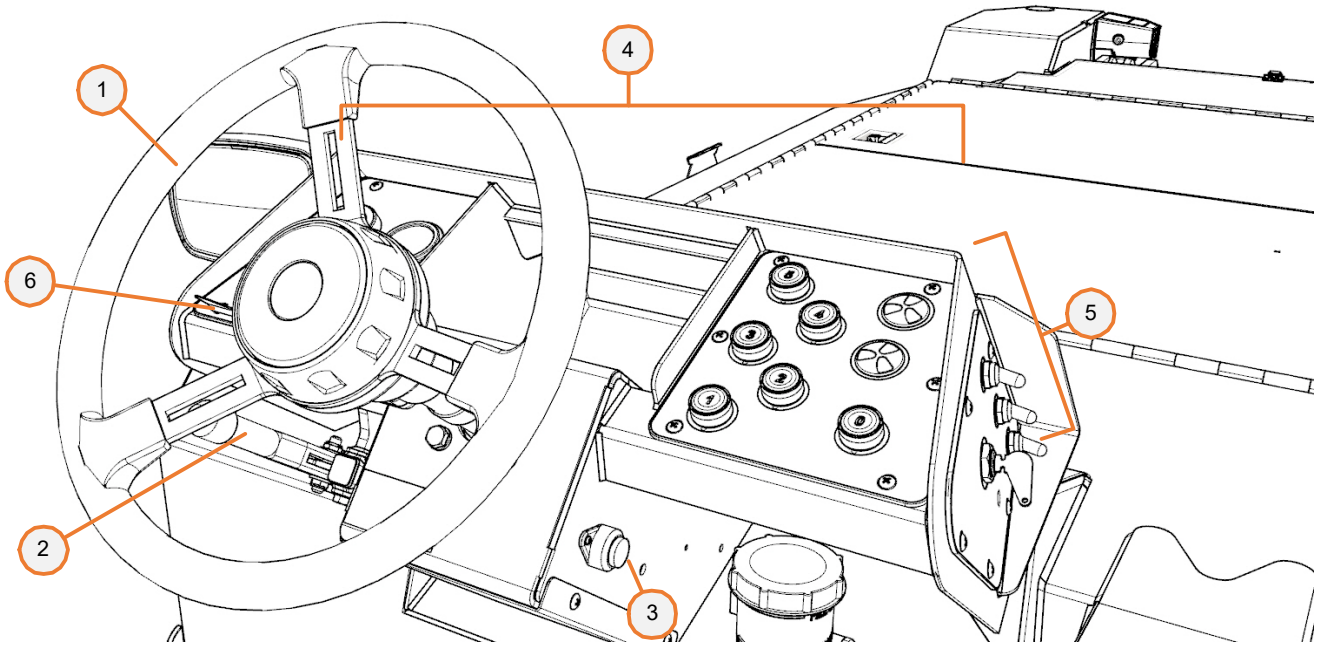
- **Seat Belt (1; *if equipped*):** Operate the seat belt in the same manner as an automotive seat belt. If the seat belt uses a manual recoil spool, pull the release lever on the belt storage spool to lock the belt length. Press this lever to retract the belt when unfastening the seat belt.
- **Seat Height Adjustment Knob/Lever (2):** Use this control to adjust the seat to the desired height.
- **Forward/Aft Adjustment Lever (3):** Adjust the seat position by pulling the adjustment lever, sliding the seat to the desired position, and then releasing the adjustment lever.
- **Arm Rests (4):** Lift or lower the arms rests as desired for comfort and ease of access.
- **Ride Comfort Knob (5):** Adjust the seat suspension firmness by rotating the comfort knob until the window on the left front side of the seat base indicates the operator's weight.

Note

Seat controls and locations may vary depending on your tractor configuration.

4.3.2 CONTROL CONSOLE

The Control Console is laid out as follows:



This area includes the following controls:

- **Steering Wheel (1):** Turns the steer wheels located just forward of the operator's position, with power assist from the vehicle hydraulic system. The vehicle responds similarly to a forklift when turning.
- **Console Release Lever (2):** Allows you to raise or lower the Control Console for ease of access or operator comfort. An adjustable knob at the end of the lever allows you to adjust the locking mechanism tightness.

  > Move the Console Release Lever away from the steering column to release it, then move the Control Console up or down.

  > Always verify that the Control Console is securely locked in position before driving.

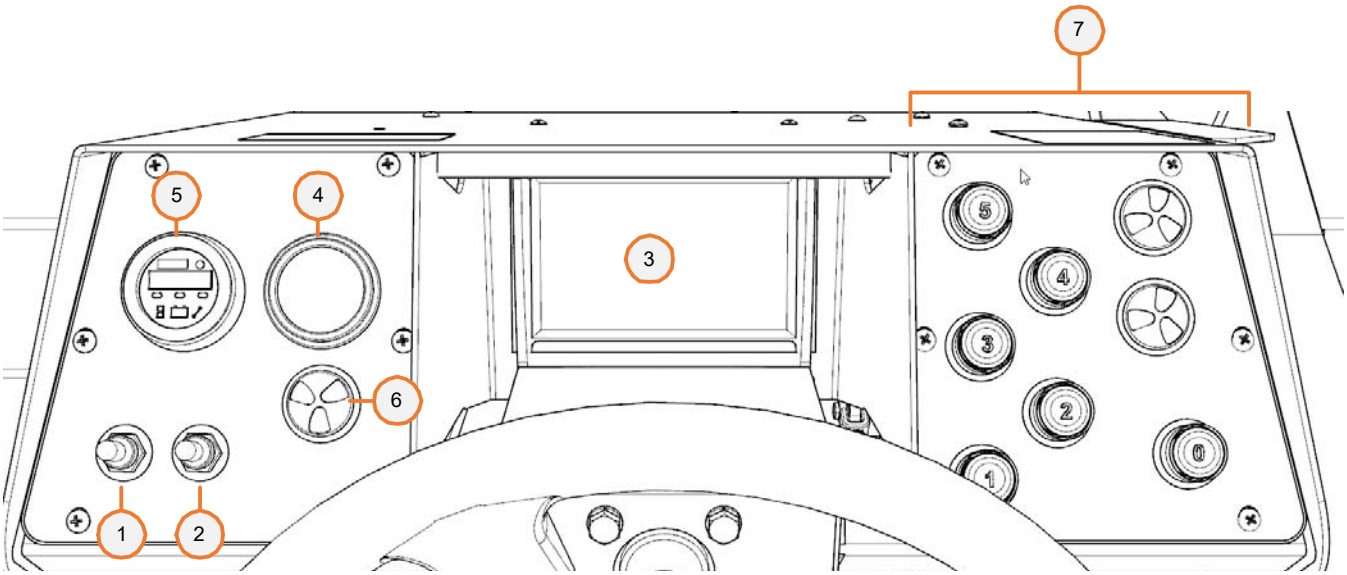
DANGER

OPERATING THE TRACTOR WITH A LOOSE CONTROL CONSOLE MAY CAUSE YOU TO LOSE CONTROL OF THE VEHICLE. ALWAYS VERIFY THAT THE CONTROL CONSOLE IS SECURELY LOCKED IN POSITION BEFORE OPERATING THE VEHICLE.

- **Safety Horn Button (3):** Sounds the vehicle horn.
- **Instrument Panels:** Each Control Console has two instrument panels.
  - > **Left (4):** See *"INSTRUMENT PANEL (LEFT)" on page 4-8*
  - > **Right (5):** See *"INSTRUMENT PANEL (RIGHT)" on page 4-10*.
- **Turn Signal Lever (6; *if equipped*):** Activates the left- or right-hand turn signal lights, as follows:
  - > Pull the lever down to indicate a left turn.
  - > Push the lever up to indicate a right turn.

4.3.2.1 INSTRUMENT PANEL (LEFT)

The left instrument panel faces the operator.



This panel includes the following controls:

- **Cradle Raise/Lower Switch (1; *if equipped*):** This spring-loaded, three-position toggle switch raises or lowers the Cradle, as follows:
  - > Pushing and holding the switch down lowers the Cradle.
  - > Pushing and holding the switch up raises the Cradle.
  - > Release the switch when the Cradle reaches the desired height.
- **Winch Strap Motor Control Switch (2; *if equipped*):** This spring-loaded, three-position toggle switch extends or retracts the Winch Strap, as follows:
  - > Pushing and holding the switch up extends the strap.
  - > Pushing and holding the switch down retracts the Cradle.

> Release the switch when the strap reaches the desired length

CAUTION

THIS SWITCH OVERRIDES BOTH THE FENDER-MOUNTED CONTROL SWITCH AND THE WINCH LIMIT SWITCH. DO NOT OVER-RETRACT THE WINCH.

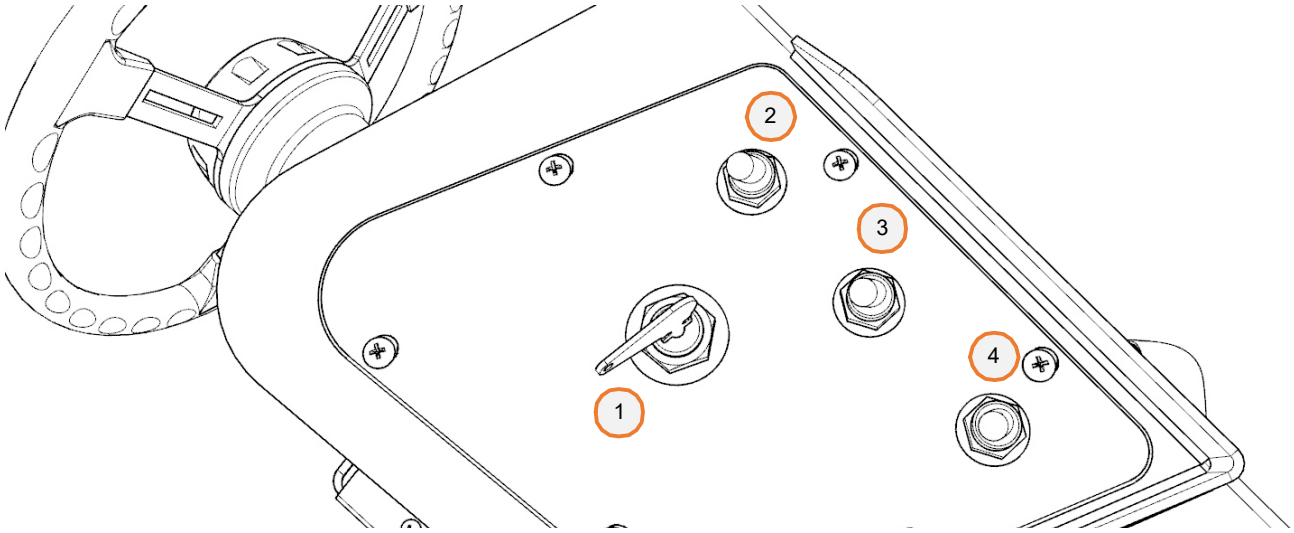
- **Hydraulic Front Gate Switch (*not shown*; *if equipped*):** This spring-loaded, three-position toggle switch raises or lowers the Hydraulic Front Gate, as follows:
  > Pushing and holding the switch up raises the Hydraulic Front Gate.
  > Pushing and holding the switch down lowers the Hydraulic Front Gate.
  > Release the switch when the Hydraulic Front Gate reaches the desired length.
- **CCTV Monitor (3; *optional*):** If equipped, displays video from the Cradle Camera located at the front of the vehicle.
- **Battery Indicator Gauge (4; *optional*):** If equipped, indicates the battery charge status. Do not use this gauge when the tractor is being charged, as it will read a full charge.
- **EVT1000 Drive Controller Dash Display (*5; B station is optional*):** If equipped, indicates status codes and battery discharge from the EVT1000 Drive Controller.
  > When the Motive Power Switch is turned ON, the gauge will display the percentage of remaining battery power.
  > If a fault occurs, the wrench LED will illuminate and the gauge will display a fault code.
- **Motor Overspeed Indicator Light (6):** Illuminates when the motor is running above its maximum rated RPM.
- **Aircraft Protection System controls (7):** If equipped, this area will be configured as appropriate for the installed Aircraft Protection System. See *"OPTIONAL AIRCRAFT PROTECTION SYSTEM" on page 4-31*.

CAUTION

EXCEEDING THE VEHICLE MAXIMUM SAFE DESIGN SPEED CAN DAMAGE THE MOTOR. NEVER DRIVE THE VEHICLE FASTER THAN THE MAXIMUM SAFE DESIGN SPEED.

4.3.2.2 INSTRUMENT PANEL (RIGHT)

The right instrument panel is on the right side of the Console Control Assembly as seen from the operator's station.

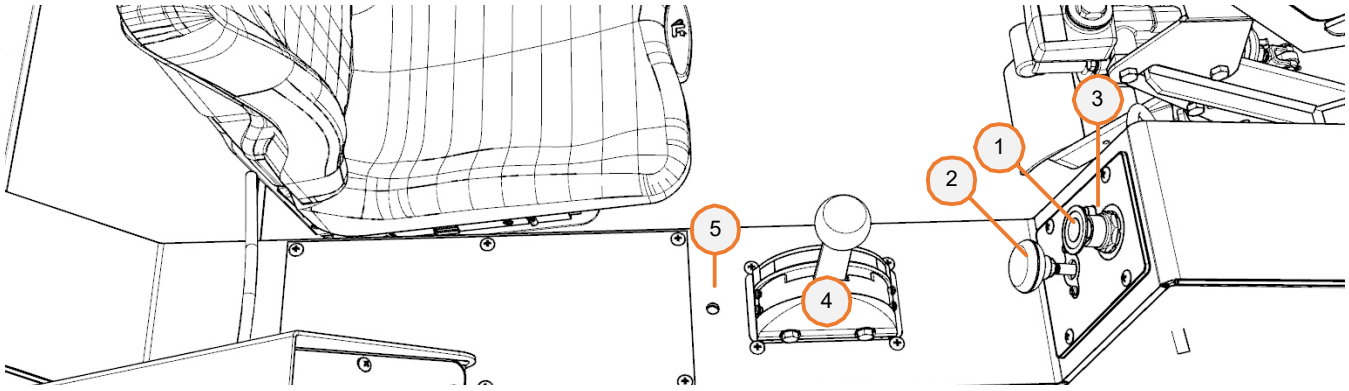


This panel includes the following controls:

- **Motive Power Switch (1):** Two-position on/off power switch. This will either be a lever or a key switch. To use this switch:
  a. If equipped with a key switch, insert the key with the teeth facing downward.
  b. Turn the lever or key clockwise to turn power ON.
  c. Turn the lever or key counterclockwise to turn power OFF.
- **Rear Headlight Switch (2):** Turns the two rear-mounted headlights on or off. The Motive Power Switch must be in the ON position.
- **Running Light Switch (3):** Turns the flashing amber running lights on or off.
- **Front Headlight Switch (4):** Turns the two front-mounted headlights on or off. The Motive Power Switch must be in the ON position.

4.3.3 CENTER CONSOLE

The Center Console is located between the operator stations.



This console includes the following controls:

- **Main Power Disconnect Switch (1):** Switches main power on or off and engages/ disengages the Parking Brake.
  - > Pushing this switch down turns main power OFF and engages the Parking Brake.
  - > Pulling this switch up turns main power ON and releases the Parking Brake.

  See *"TRACTOR STARTUP" on page 6-2* and *"TRACTOR SHUTDOWN" on page 6-10*.
- **Parking Brake Knob (2):** Applies or releases the brakes.
  - > Pulling the knob out applies the brakes and turns the Brake Pressure Warning Light ON.
  - > Pushing the knob in releases the brakes and turns the Brake Pressure Warning Light OFF.

  CAUTION

  DO NOT APPLY THE BRAKES WHILE THE VEHICLE IS MOVING, UNLESS YOU NEED TO MAKE AN EMERGENCY STOP.

  See *"PARKING & EMERGENCY BRAKES" on page 4-30*.
- **Brake Pressure Warning Light (3):** This red LED illuminates when the brakes are engaged.
- **Direction Selector (4):** Three-position lever that selects the direction of travel.
  - > Pushing the lever toward the front of the vehicle selects FORWARD.
  - > Centering the lever selects NEUTRAL.
  - > Pulling the lever toward the rear of the vehicle selects REVERSE.

- **Driver Select Toggle Switch (5):** On vehicles equipped with dual operator positions, this switch selects the operator station that will control the vehicle.
  - > Moving the switch left selects Station A.
  - > Moving the switch right selects Station B.
- **12 V Power Outlet (*optional; not shown)*:** Standard “cigarette lighter” power outlet for plugging in a radio or other 12 VDC equipment. 100 watts maximum.

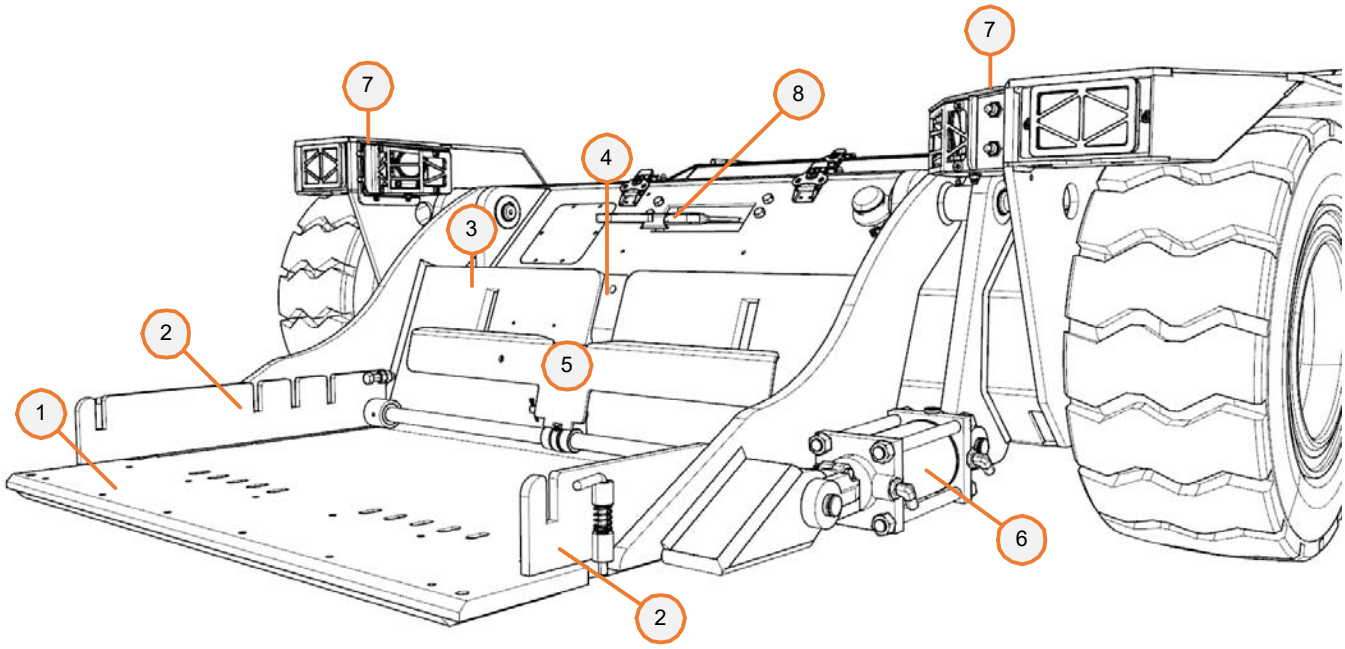
4.4 CRADLE & WINCH ASSEMBLY

The hydraulic Cradle and Winch Assembly carries the aircraft wheel during towing operations. This area will be configured in one of two ways:

- **Standard:** See *"STANDARD WINCH/CRADLE CONFIGURATION" on page 4-13*.
- **Turntable:** See *"TURNTABLE WINCH/CRADLE CONFIGURATION" on page 4-15*.

4.4.1 STANDARD WINCH/CRADLE CONFIGURATION

The standard Cradle and Winch Assembly does not include a turntable with torque-sensing load cell.



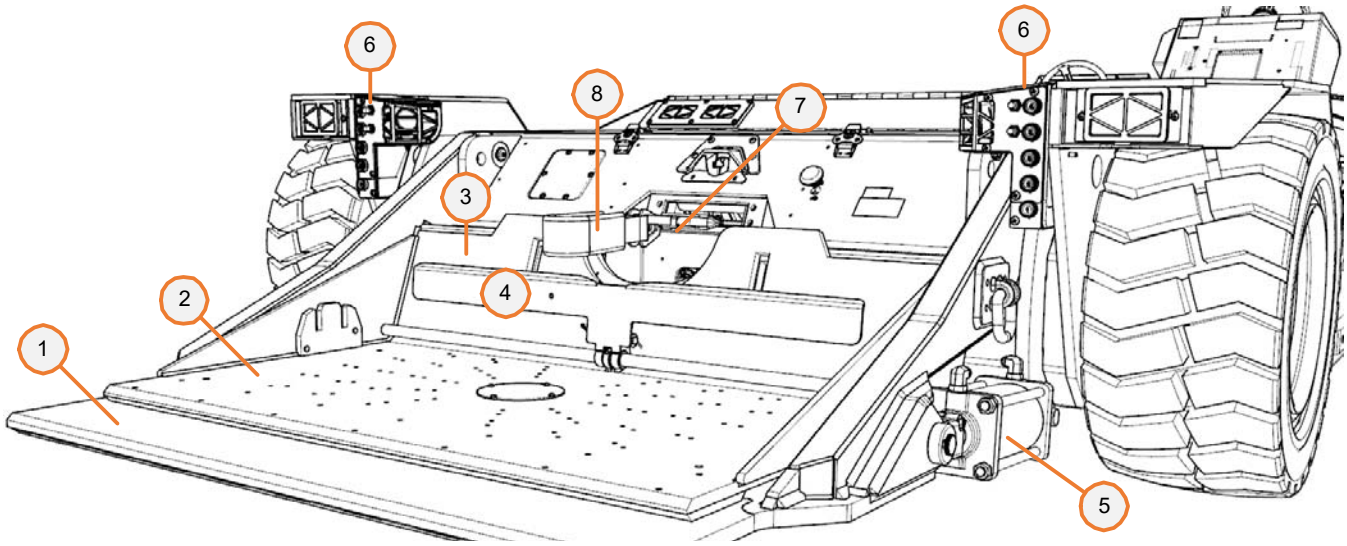
This area includes the following components:

- **Cradle (1):** Carries the aircraft nose gear during towing operations. The front portion of the Cradle lowers to capture the aircraft, and raises to provide ground clearance during towing operations. The Cradle includes a Wear Plate on the underside that protects the Cradle and aircraft from excessive wear. This will be either:
  - > UHMW high-density plastic Wear Plate that protects hangar floors.
  - > AR steel Wear Plate is standard for operations that do not require protecting hangar floors and that have high wear exposure, such as airline ramp operations.

- **Side Gates (2):** These gates can be adjusted either outward to allow the aircraft wheel to pivot or inward to prevent wheel movement. See *"SIDE GATES (STANDARD CRADLE)" on page 4-16*.
- **Rear Gate (3):** Limits how far the aircraft wheel can advance on the Cradle. See *"FIXED EXTENDED REAR GATE" on page 4-18*.
- **Extended Rear Gate (*not shown*):** Used when towing aircraft with torque links or other protrusions that extend beyond the front of the wheel. See *"EXTENDED REAR GATE" on page 4-17*.
- **Front Gate (*not shown*):** Prevents the aircraft wheel from rolling off the Cradle. See *"FRONT GATE (STANDARD CRADLE)" on page 4-19*. The tractor may optionally be fitted with a Hydraulic Front Gate (not shown). See *"HYDRAULIC FRONT GATE (OPTIONAL)" on page 4-20*.
- **Cradle Adapter Post (4):** Allows attaching a variety of adapters. See *"CRADLE ADAPTER POST (STANDARD CRADLE)" on page 4-20*.
- **Winch Limit Switch (5):** Stops the Winch Motor when contacted by the aircraft wheel.
- **Cradle Lift Cylinders (6):** Lift and lower the Cradle.
- **Fender-Mounted Winch/Cradle Controls (7):** Allow the operator to control the Cradle and Winch functions, and to raise/lower the Hydraulic Front Gate (if equipped). See *"FENDER-MOUNTED CONTROLS" on page 4-22*.
- **Winch Strap and Hook (8):** Winches the aircraft onto the Cradle and hooks onto the Strut Strap.
- **Strut Strap (*not shown*):** Secures the aircraft wheel or strut to the tractor. Includes a protective sleeve.

4.4.2 TURNTABLE WINCH/CRADLE CONFIGURATION

The turntable Cradle and Winch Assembly includes a turntable with torque-sensing load cell, which is part of a single- or multi-level Aircraft Protection System. See *"OPTIONAL AIRCRAFT PROTECTION SYSTEM" on page 4-31*.



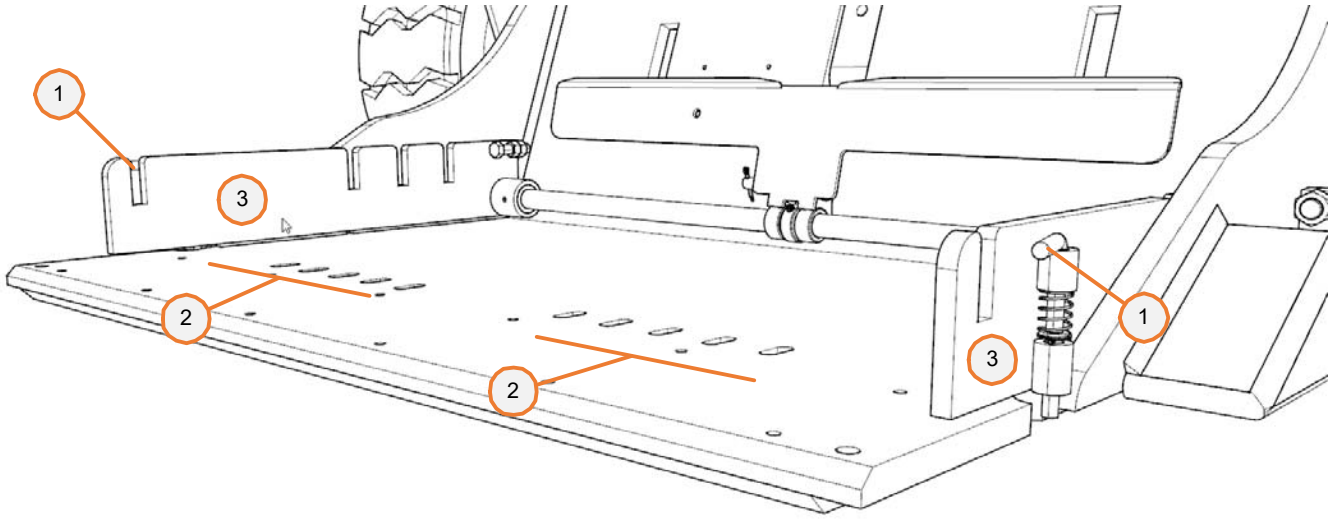
This area includes the following components:

- **Cradle (1):** Carries the aircraft nose gear during towing operations. The front portion of the Cradle lowers to capture the aircraft, and raises to provide ground clearance during towing operations. The Cradle includes a Wear Plate on the underside that protects the Cradle and aircraft from excessive wear. This will be either:
  - > UHMW high-density plastic Wear Plate that protects hangar floors.
  - > AR steel Wear Plate is standard for operations that do not require protecting hangar floors and that have high wear exposure, such as airline ramp operations.
- **Hydraulic Front Gate (*optional*; *not shown*):** If equipped, can be raised or lowered using the fender-mounted and/or Instrument Panel controls. See *"HYDRAULIC FRONT GATE (OPTIONAL)" on page 4-20*.
- **Turntable (2):** Includes a torque-sensing load cell that measures torque forces being applied to the aircraft nose landing gear.
- **Rear Gate (3):** Limits how far the aircraft wheel can advance on the Cradle.
- **Winch Limit Switch (4):** Stops the Winch Motor when contacted by the aircraft wheel.
- **Cradle Lift Cylinders (5):** Lift and lower the Cradle.
- **Fender-Mounted Winch/Cradle Controls (6):** Allow the operator to control the Cradle and Winch functions, and to raise/lower the Hydraulic Front Gate (if equipped). See *"FENDER-MOUNTED CONTROLS" on page 4-22*.

- **Winch Strap and Hook (7):** Winches the aircraft onto the Cradle and hooks onto the Strut Strap.
- **Strut Strap (8):** Secures the aircraft wheel or strut to the tractor. Includes a protective sleeve.

4.4.3 SIDE GATES (STANDARD CRADLE)

The Side Gates are attached to a slide bar on the rear of the Cradle. Each gate includes locks that secure the gates to the Cradle in the required positions and secure the aircraft tire to the Cradle.



The Side Gates have the following components:

- **Side Gate Anchors (1):** Secure the Side Gates in position when inserted into the Side Gate Anchor Hole (2).
- **Side Gate Anchor Holes (2):** Secure the Side Gate Anchors to lock the Side Gates.
- **Side Gates (3):** Restrict sideways movement of the aircraft tire during towing operations.
- **Chine Protectors (*not shown*):** If needed, place these on the Side Gates to prevent damaging the aircraft tire chine.

The Side Gates are normally left in their outermost positions to allow the aircraft wheel to pivot on the Cradle, but can be moved inward when needed to prevent movement of the aircraft wheel. See the *Aircraft Towing Procedures Manual* for information on using Gates.

4.4.4 EXTENDED REAR GATE

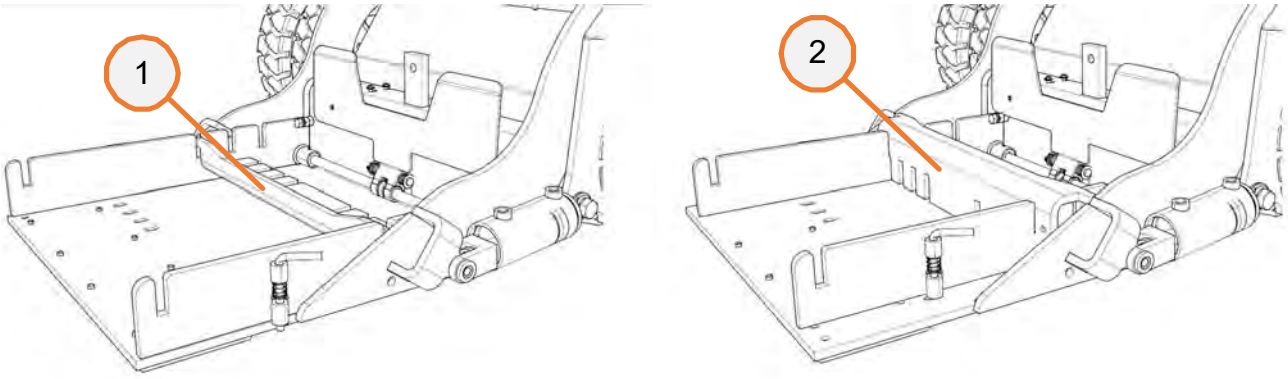
The Extended Rear Gate is used when towing an aircraft with a nose wheel of approximately 12” (30cm) diameter that is also equipped with torque links or other protrusions that extend beyond the front of the wheel. The protrusions must be at least 4” (10cm) above the ground in order to use the Extended Rear Gate.

There are two types of Extended Rear Gate:

- **Removable:** See *"SMALL REMOVABLE EXTENDED REAR GATE (STANDARD CRADLE)” on page 4-17* and *"LARGE REMOVABLE EXTENDED REAR GATE (STANDARD CRADLE)” on page 4-18*.
- **Fixed:** See *"FIXED EXTENDED REAR GATE” on page 4-18*.

4.4.4.1 SMALL REMOVABLE EXTENDED REAR GATE (STANDARD CRADLE)

The small removable Extended Rear Gate can be installed and removed as needed.



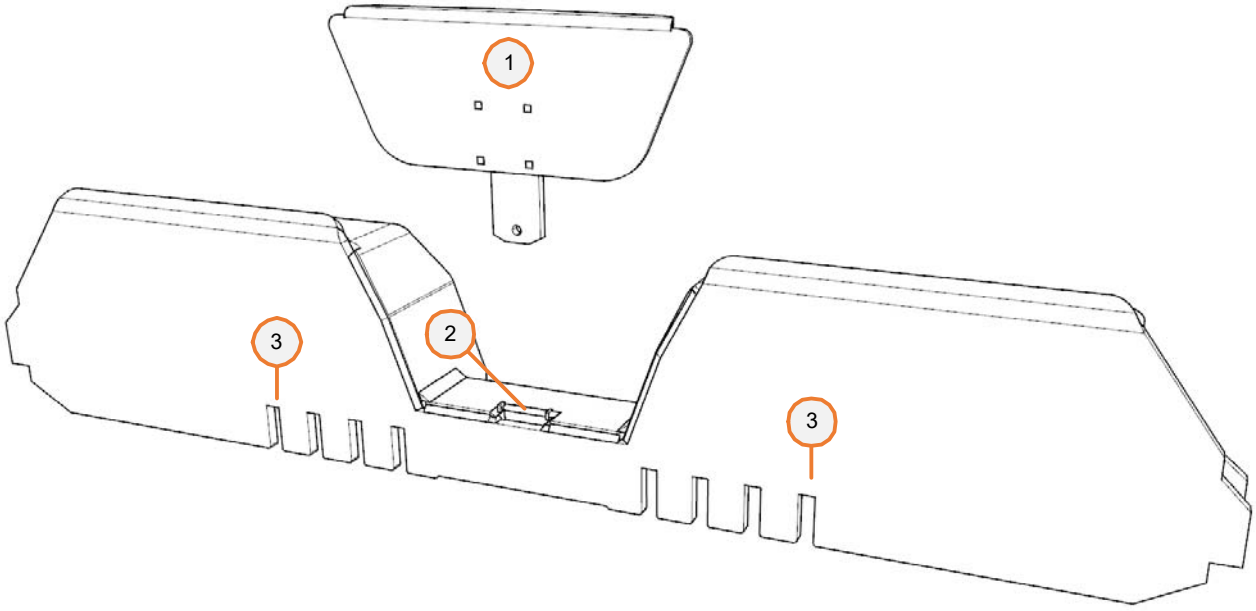
The small removable Extended Rear Gate may be mounted as follows:

- **Horizontal (1):** For aircraft with wheel pants or fairings, along with a Hold Back Bar, by moving the Side Gates to their outermost positions and then fitting the tabs in the short side of the gate into the slots in the Side Gates.
- **Vertical (2):** For normal operations, by fitting the slots in the tall side of the gate over the Side Gates.

See the *Aircraft Towing Procedures Manual* for instructions on using the small removable Extended Rear Gate and Hold Back Bar.

4.4.4.2 LARGE REMOVABLE EXTENDED REAR GATE (STANDARD CRADLE)

The removable Extended Rear Gate can be installed and removed as needed.



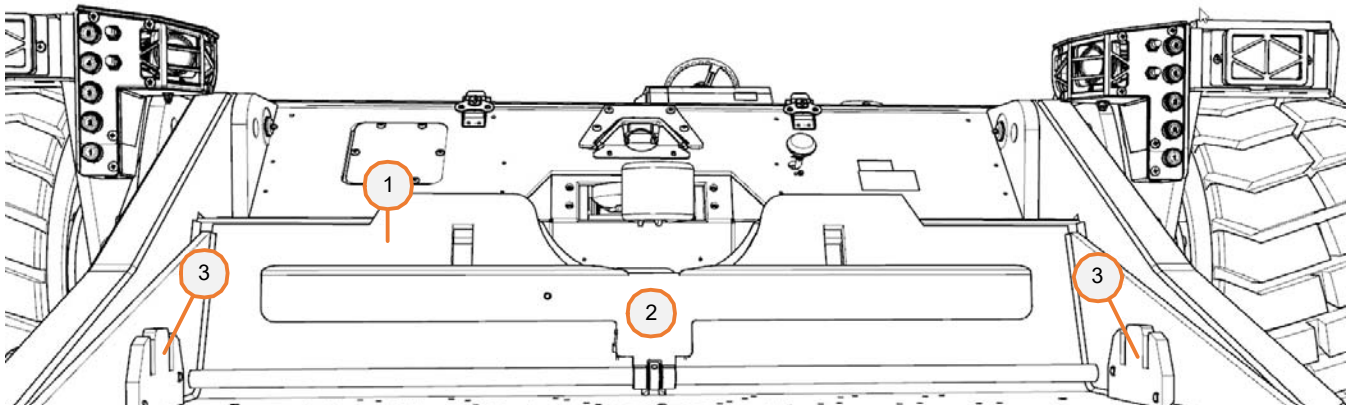
The removable Extended Rear Gate has the following components:

- **Fill Plate (1):** Insert this plate when towing an aircraft with a single wheel. Remove this plate when towing an aircraft with dual wheels.
- **Pocket (2):** Secures the Fill Plate into position.
- **Slots (3):** Fit over the Side Gates, if equipped.

See the *Aircraft Towing Procedures Manual* for information on using Gates.

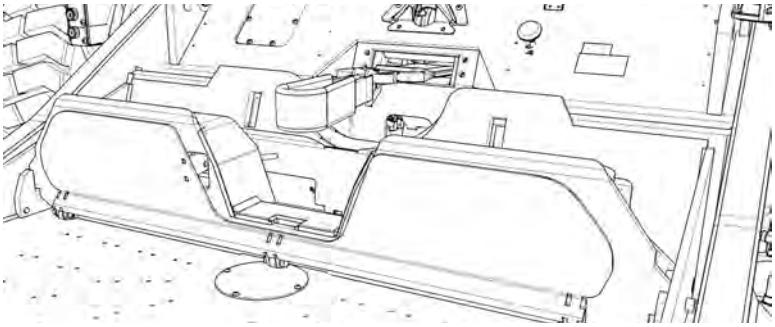
4.4.4.3 FIXED EXTENDED REAR GATE

The Cradle includes a permanently-mounted Rear Gate.



The permanently-mounted Rear Gate (1) includes a Winch Limit Switch (2), which stops the Winch Motor when the aircraft nose wheel contacts the switch. A linkage connects this switch to the Winch Limit Switch on the back wall of the Cradle.

LEKTRO offers optional fixed Extended Rear Gates for a variety of aircraft models that fit into the Receiving Brackets (3) on the Cradle. A Fixed Extended Rear Gate includes a Winch Limit Plate that connects to the Winch Limit Switch on the permanently-mounted Rear Gate via a linkage.



For example, the Dash 8/Falcon 20 fixed Extended Rear Gate may be used for both these aircraft types and any other aircraft type nose landing gear with protruding torque links, trailing arm knuckles, or other between-tire fittings that are less than 11" (28cm) wide. This gate keeps the protrusion clear of the back wall of the Cradle while providing automatic Winch cutoff.

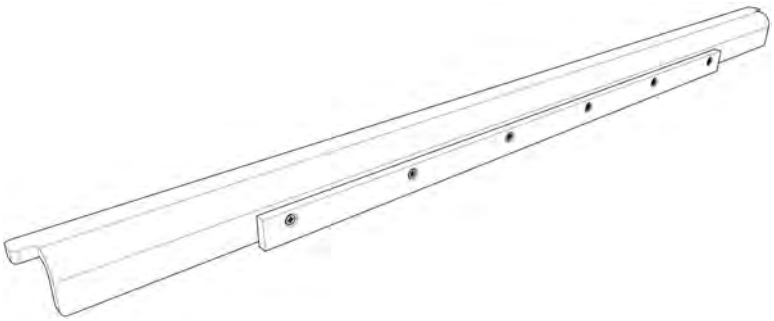
Note

The Dash 8/Falcon 20 fixed Extended Rear Gate with Fill Plate installed must be used on single-wheel or narrow dual-wheel aircraft.

4.4.5 FRONT GATE (STANDARD CRADLE)

The removable Front Gate can be installed on the Side Gates to:

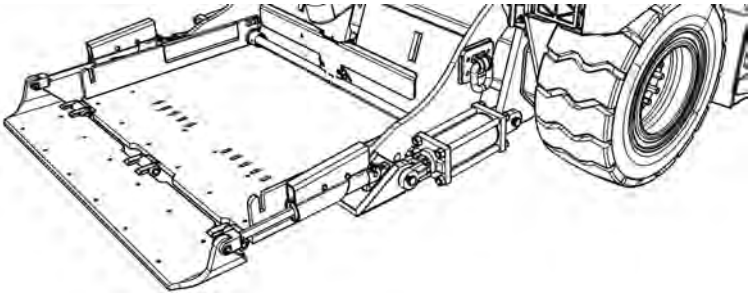
- Help prevent the aircraft wheel from rolling off the Cradle in the event of Winch Strap or associated component failure.
- Prevent the Tow Bar from contacting the Side Gates when turning while towing with a Pintle Hook.



The Front Gate is normally stored in a Side Pocket when not installed. See the *Aircraft Towing Procedures Manual* for information on using Gates.

4.4.6 HYDRAULIC FRONT GATE (OPTIONAL)

The optional Hydraulic Front Gate is mounted across the front edge of the Cradle to:



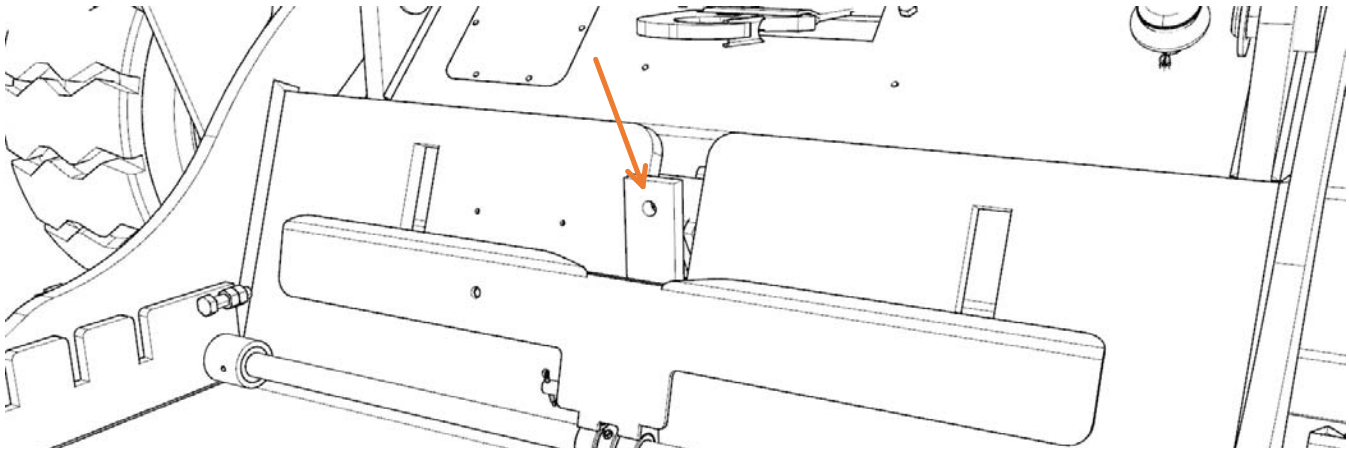
- Help prevent the aircraft wheel from rolling off the Cradle in the event of Winch Strap or associated component failure.
- Prevent the Tow Bar from contacting the Side Gates when turning while towing with a Pintle Hook.

The Hydraulic Front Gate can be controlled using the controls mounted at either or both of the following locations:

- *"FENDER-MOUNTED CONTROLS" on page 4-22*.
- *"INSTRUMENT PANEL (LEFT)" on page 4-8*

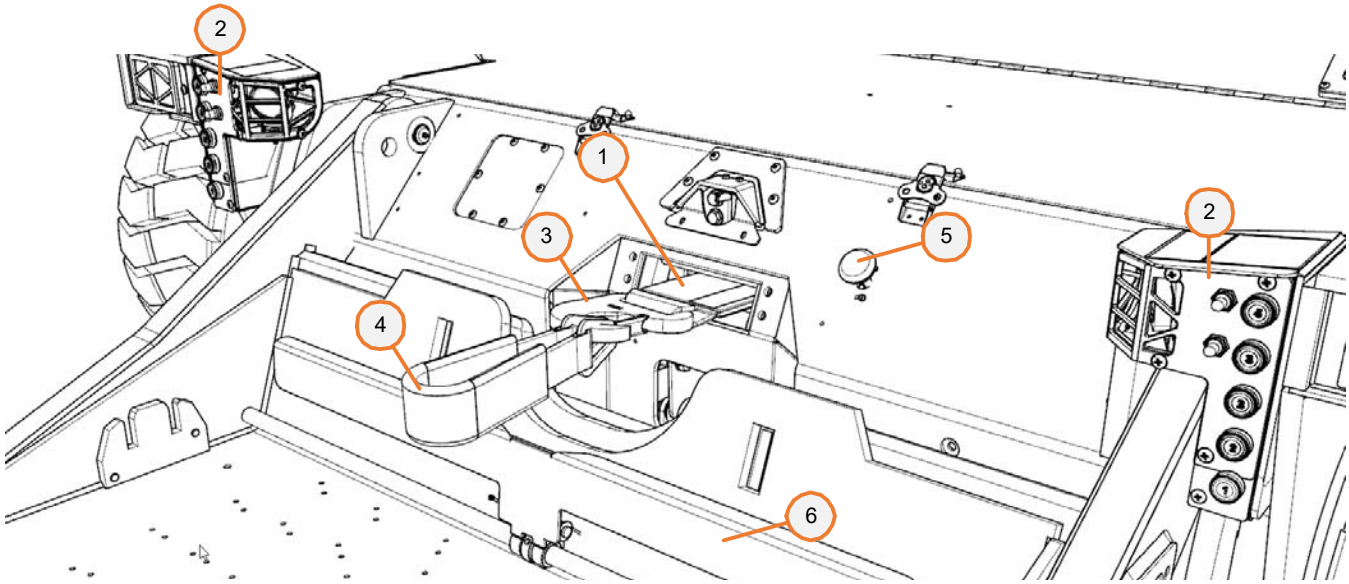
4.4.7 CRADLE ADAPTER POST (STANDARD CRADLE)

The back wall of the Cradle may include a retractable Cradle Adapter Post that can secure a variety of adapters. See the *Aircraft Towing Procedures Manual* for information on using the Cradle Adapter Post.



4.4.8 WINCH ASSEMBLY

The Winch Assembly secures the aircraft to the tractor.



This assembly includes the following components:

- **Winch Strap (1):** Connects the Strut Strap to the Winch.
- **Winch Motor (*not shown*):** Powers the Winch Assembly. This hydraulic motor and attached Winch Spool holds the Winch Strap that pulls the aircraft wheel onto the Cradle and secures it during towing. The Winch Spool also includes a Winch Spool Release Lever to manually release the Winch, if needed. See *"EMERGENCY AIRCRAFT RELEASE" on page 5-9*.
- **Fender-Mounted Winch and Cradle Controls (2):** Allows the operator to control the Winch Motor and Cradle without having to return to the Operator Compartment. If equipped, also allows raising and lowering the Hydraulic Front Gate. See *"FENDER-MOUNTED CONTROLS" on page 4-22*.
- **Winch Strap Hook (3):** Secures the "D" Rings on the Strut Strap to the Winch Strap.
- **Strut Strap (4):** Wraps around the aircraft landing gear strut and attaches to the Winch Strap Hook with two "D" rings. This strap includes a Protective Sleeve that helps prevent damage to the aircraft oleo strut. See *"STRUT STRAP" on page 4-22* and the *Aircraft Towing Procedures Manual* for both general capture instructions and specific capture procedures by aircraft type.
- **Hydraulic Power Disconnect Button (5):** This is a two-position switch. Pushing it in turns hydraulic power to the Winch OFF. Its primary use is in case the Winch Motor fails to shut off while capturing an aircraft. See *"EMERGENCY AIRCRAFT RELEASE" on page 5-9*.
- **Winch Limit Switch (6):** Stops the Winch Motor when contacted by the aircraft wheel. This safety feature overrides the operator.

- **Winch Hook Basket (*not shown*):** Some tractors include a flexible plastic Winch Hook Basket that fills the space between the tractor body and Rear Gate to prevent the Winch Hook from falling behind the Cradle and possibly causing damage.

4.4.8.1 STRUT STRAP

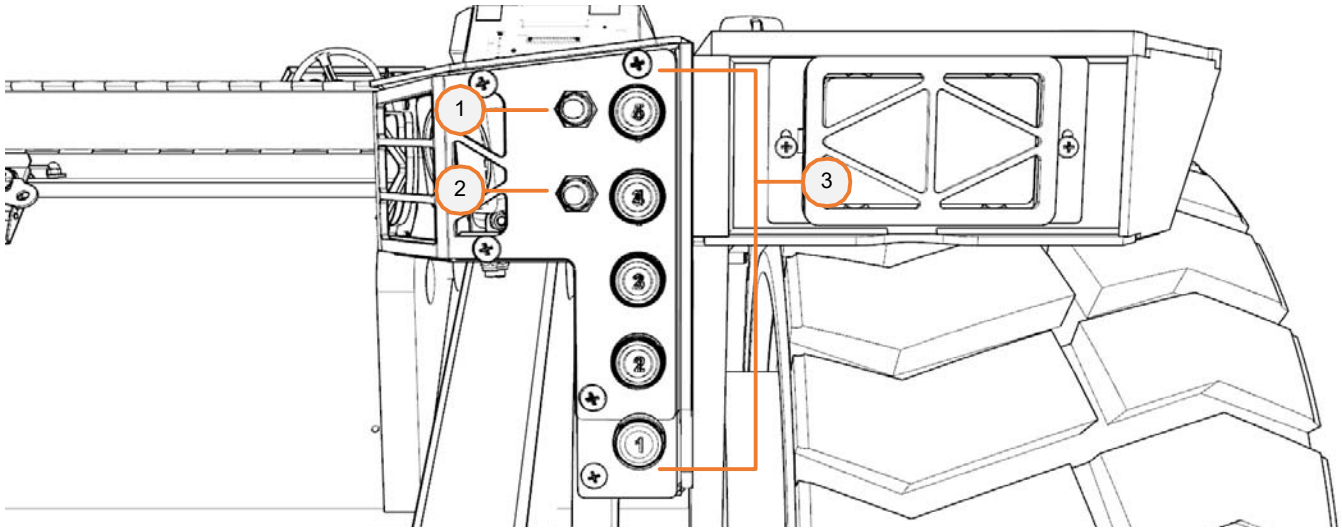
A variety of Strut Straps are available to suit a wide array of towing needs. Some of the available options include:

- Length.
- Width.
- Single or dual ply construction.
- Metal “D” rings to attach the Strut Strap to the Winch Strap.

For most aircraft types, use a Strut Strap length that ensures that the “D” rings (if equipped), Winch Strap Hook, and aircraft oleo strut will not be damaged. The Strut Strap is equipped with a replaceable Protective Sleeve that protects sensitive areas on the aircraft wheel strut. See the *Aircraft Towing Procedures Manual* for information on using a Strut Strap.

4.4.9 FENDER-MOUNTED CONTROLS

The inside of the front fender holds a mount with two spring-loaded, three-position switches.



These switches are:

- **Winch Control Switch (1):** Extends and retracts the Winch Strap. This switch is interconnected to the Winch Stop Switch that overrides the operator and stops winch retraction when contacted by the aircraft wheel.
- **Cradle Control Switch (2):** Lifts and lowers the Cradle.
- **Hydraulic Front Gate Switch (*not shown*; *if equipped*):** Raises and lowers the Hydraulic Front Gate. See the *Aircraft Towing Procedures Manual* for information on using Gates.

- **Aircraft Protection System controls (3; *optional*):** If equipped, allow you to specify an aircraft weight range by pressing the proper numbered button. See *"OPTIONAL AIRCRAFT PROTECTION SYSTEM" on page 4-31*.

> **Note**
>
> *The Cradle Switch(es), Winch Strap Motor Control Switch(es), and any Aircraft Protection System switches located on the left Instrument Panel(s) override the fender-mounted Winch and Cradle controls to allow adjustments while towing.*

4.4.10 OPTIONAL TOWING ADAPTERS

Your LEKTRO 88/89 Series tractor may be fitted with one of the following optional towing adapters:

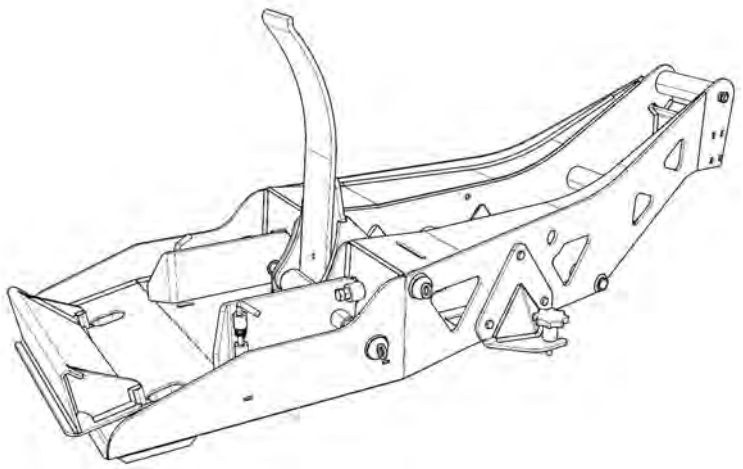
- **Long Reach:** See *"LONG-REACH ADAPTER" on page 4-23*.
- **High Lift:** See *"HIGH-LIFT ADAPTER" on page 4-24*.

4.4.10.1 LONG-REACH ADAPTER

The aluminum Long-Reach Adapter mounts to the Cradle. It is intended for use in the following towing scenarios:

- Aircraft with long reaches and low clearances to the nose or tail wheel. See the *Aircraft Towing Procedures Manual*.
- Aircraft that require a high lift to lower the tail height to clear hangar doors and/or roof beams. See the *Aircraft Towing Procedures Manual*.

This adapter is available for aircraft with both single and dual nose wheels.

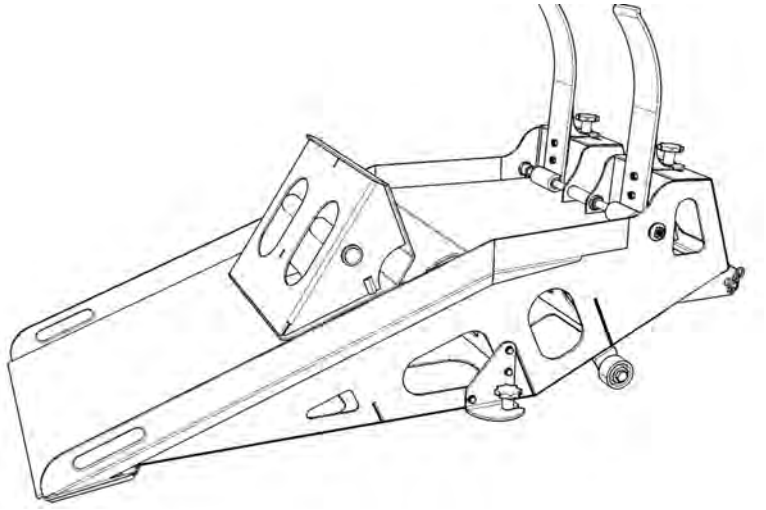


TRACTOR MODEL	MAX. NOSE WHEEL LIFT[a]	CAPACITY[b]	NOTE
8800/50SDA/EZ	17 3/8" (17.375") / 44.1cm	3200 lbs / 1451 kg	Hold-Down Spring height and radius depends on tire size.
8900/50 SDB	19 3/8" (19.375") / 49.2cm	3200 lbs / 1451 kg	

a. Typical for average nose wheel size.
b. NLG weight.

4.4.10.2 HIGH-LIFT ADAPTER

The High-Lift Adapter (also referred to as a “Highlift Adapter” mounts to the Cradle. It is intended for use when hangar door and/or roof beam overhead clearances are too low for the aircraft tail height. See the *Aircraft Towing Procedures Manual*.



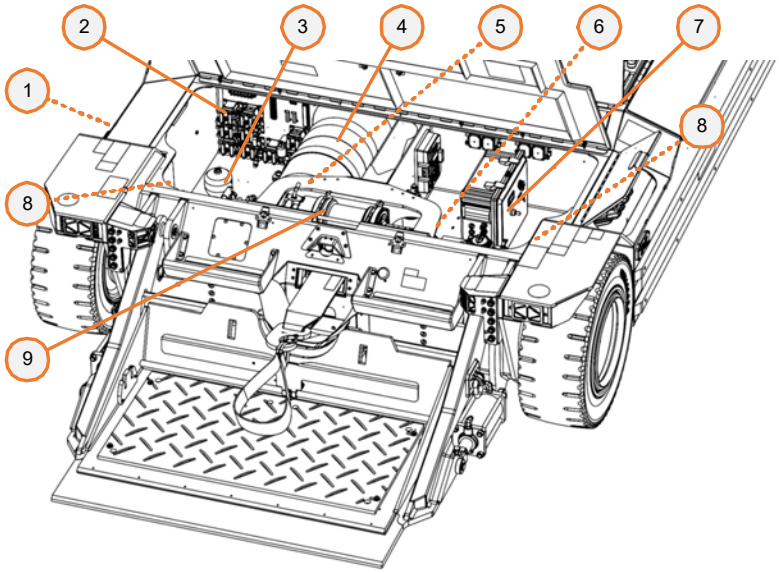
This adapter is designed to accommodate the aircraft's dual nose wheel tire tracks and the required NLG Door clearance on capture and release. It is available in either 24” / 61 cm or 27” / 68.6 cm widths, and may be configured to tow specific aircraft nose landing gear before or after being installed on the tractor.

TRACTOR MODEL	MAX. NOSE WHEEL LIFT[a]	CAPACITY[b]	NOTE
8800/50SDA	22” / 55.9”	10,000 lbs / 4535 kg	Hold-Down Spring height and radius depends on tire size.
8900/50SD	23 1/4” (22.25”) / 59 cm	10,000 lbs / 4535 kg	

a. Typical for average nose wheel size.
b. NLG weight.

4.5 FORWARD COMPARTMENT

The Forward Compartment is located at the front of the tractor, just behind the Drive Wheels.



This compartment contains the following components:

- **Drivetrain:** The mechanical Drivetrain consists of the following components:
  - > **Contactor Panel (1; *hidden*):** Interfaces between the operator controls and various high-amperage components, such as the Drive Motor.
  - > **Drive Controller (2):** Heavy duty EVT1000 Electronic Drive Controller assembly, controlled by the Accelerator Pedal.
  - > **Drive Motor (4):** A heavy duty 80 or 120 VDC electric traction motor provides the motive power for the tractor.
  - > **Differential (5; *hidden*):** Heavy duty, helical-geared automotive differential.
  - > **Brakes (8; *hidden*):** The dual independent hydraulic disc brakes operate on the final wheel drive gearing to slow or stop the vehicle while moving, and to prevent rolling when parked. The brakes can be actuated by the foot-operated Brake Pedal or by the hand-operated Parking Brake Knob.

Note

This section groups Forward Compartment components into Drivetrain and non-Drivetrain components.

- **Hydraulic Manifold (3):** Routes high-pressure hydraulic fluid to the brakes and Cradle Lift Cylinders. This assembly also includes the following:
  - > Emergency Brake Release Knob and manual jack socket that can be used to release the brakes if normal means fail. See *"EMERGENCY BRAKE RELEASE" on page 5-6*.
  - > Emergency Cradle Lower Knob that can be used to lower the Cradle if power and/or hydraulic pressure is lost. See *"EMERGENCY CRADLE LOWER" on page 5-8*.
- **Hydraulic Power Unit (6; *hidden*):** This continuous duty, 80 volt DC motor provides hydraulic power to the Cradle Lift Cylinders, power steering system, and the Winch Motor.
- **Aircraft Protection System PLC (7; *if equipped*):** Contains the logic circuits for the optional Aircraft Protection System. See *"OPTIONAL AIRCRAFT PROTECTION SYSTEM" on page 4-31*.
- **Winch Motor and Winch Drum (9):** This heavy duty, electrically controlled, hydraulic motor extends and retracts the Winch Strap. This motor includes an automatic safety cut-off feature and adjustable maximum settings for aircraft load requirements.
- **GPU Batteries (*optional; not shown*):** If equipped, this independent 1175 AMP cold cranking battery set powers the optional Ground Power Unit. These batteries are located in the GPU Compartment next to the Forward Compartment.

4.6 REAR COMPARTMENT

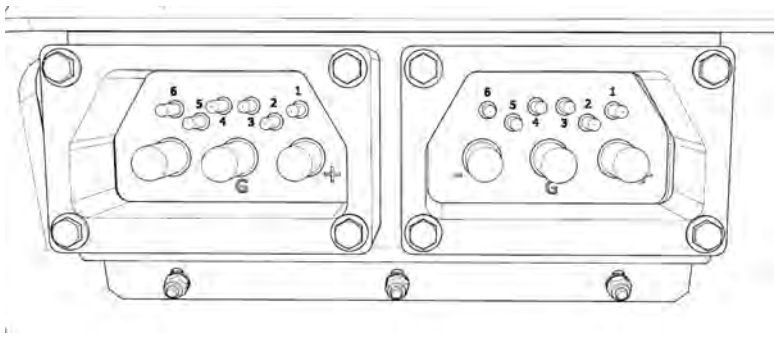
The Rear Compartment is located just behind the Forward Compartment, as shown in *"GENERAL LAYOUT" on page 4-3*. This compartment contains the Motive Batteries, which power the Drive Motor and other vehicle components. The battery configuration will depend on your specific model of LEKTRO 88/89 Series tractor. Please see the following:

- **88 Series:**
  - > *"8800SDA" on page 2-3*
  - > *"8800SDA-EZ" on page 2-6*
  - > *"8850SDA-EZ" on page 2-9*
  - > *"8850SDA" on page 2-12*
  - > *"8850SDA-AL-100" on page 2-15*
  - > *"8850SDA-M" on page 2-18*
- **89 Series:**
  - > *"8900SDB" on page 3-3*
  - > *"8950SDB" on page 3-6*
  - > *"8925SDB-AL/HS-200" on page 3-9*
  - > *"8950SDB-AL-200" on page 3-12*
  - > *"8950SDB-AL-250" on page 3-15*
  - > *"8950SDB-M" on page 3-18*

IF YOUR SPECIFIC TRACTOR MODEL IS NOT LISTED HERE, THEN PLEASE REFER TO THE SPECIFICATION SHEET FOR YOUR TRACTOR MODEL AND/OR THE DOCUMENTATION PROVIDED WITH YOUR TRACTOR FOR INFORMATION ABOUT YOUR SPECIFIC BATTERY CONFIGURATION.

4.7 TRACTOR POWER DC CONNECTOR

A tractor Power DC Connector is provided for recharging the batteries. This connector will vary depending on tractor/battery configuration.



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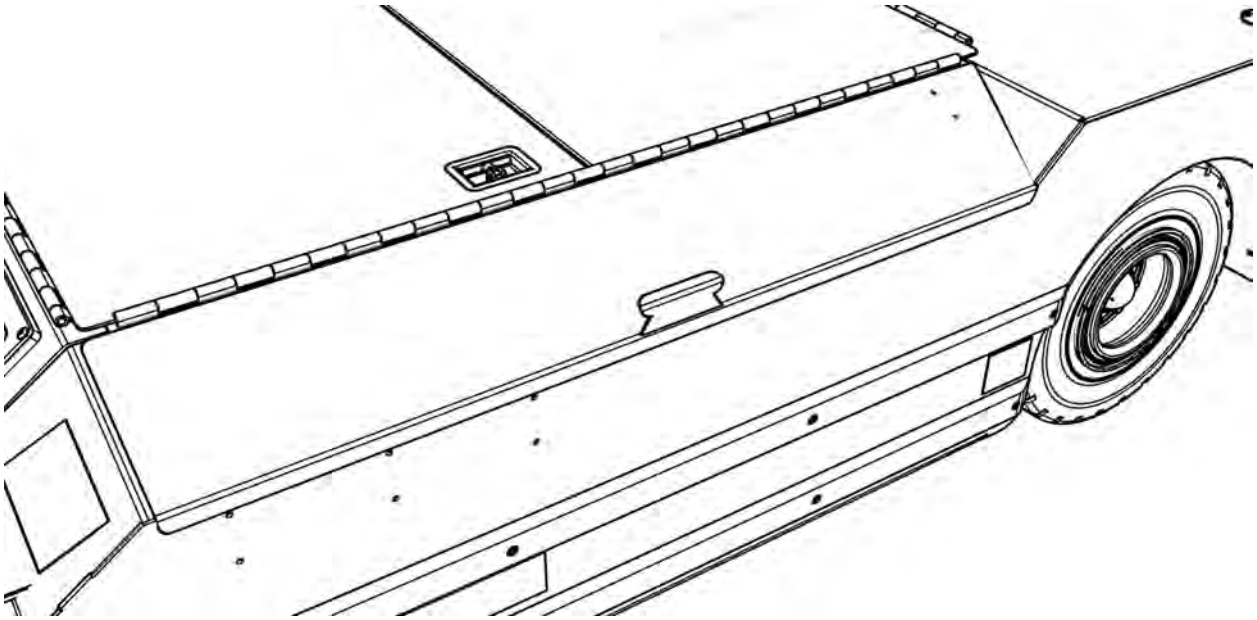
4.8 SIDE/GPU COMPARTMENTS

The two Side Compartments are located on the left and right sides of the tractor, as shown in *"GENERAL LAYOUT" on page 4-3*. These Side Compartments are used to store wheel chocks, aircraft adapters, strut straps, and other accessories.



If your LEKTRO 88/89 Series tractor includes the GPU option, then it will also be equipped with a GPU Compartment and three separate outlets to provide 12, 24, and 28 volt power for starting aircraft engines. The GPU option includes:

- Extension cables.
- Aircraft adapters.
- Battery power gauge indicator.

4.9 PARKING & EMERGENCY BRAKES

The parking / emergency brakes on the LEKTRO 88/89 Series tractor are unique in that they require power to be released. A loss of power or system leak removes hydraulic pressure and applies the brakes. This system is intended as a “failsafe” to help ensure that the vehicle will not move accidentally.

- **Manual operation:** During normal operations, the brakes are intentionally engaged by pulling the Parking Brake Knob located on the Center Console (see *"CENTER CONSOLE” on page 4-11*) up to the APPLIED position.
- **Automatic operation:** The brakes will engage automatically if one of the following conditions exists:
  - > Electrical power is not available from the Motive Battery.
  - > Electrical failures occur which affect the drive circuits.
  - > Leakage or loss of pressure occurs in the hydraulic system.
  - > The red Main Power Disconnect Switch is in the OFF position.

See *"USING THE PARKING BRAKE” on page 5-4* for instructions on using the brakes.

4.10 OPTIONAL AIRCRAFT PROTECTION SYSTEM

The optional Aircraft Protection System limits tractor Winch power, Cradle height, Motor power, and braking force to prevent torque damage to the aircraft nose gear. This system measures the amount of torque during a tow and alerts the operator if safe levels have been exceeded. The Aircraft Protection System consists of the following components:

- **Load Pins:** Each Lift Cylinder includes a Load Pin that measures aircraft node gear weight.
- **Turntable Cradle:** The Cradle includes a Turntable with Torque Cell to measure the amount of torque being applied to the aircraft nose landing gear.
- **Cradle Height Limiter:** Restricts the maximum Cradle height, to prevent false alarms and reduce torque on the aircraft nose landing gear.
- **Pressure Reducing Valve:** Controls hydraulic pressure to the Winch motor, to limit Winch force.
- **Programmable Logic Controller:** Interprets the Load Pin and load cell readings, specified recognition level, and other parameters to limit tractor acceleration, deceleration, and Winch force as needed to prevent damage to the aircraft nose landing gear. The PLC includes a Key Switch that is used to reset the system if a torque warning is triggered. See *"RESETTING THE AIRCRAFT PROTECTION SYSTEM" on page 5-13*.

If equipped, the Aircraft Protection System may be configured as either:

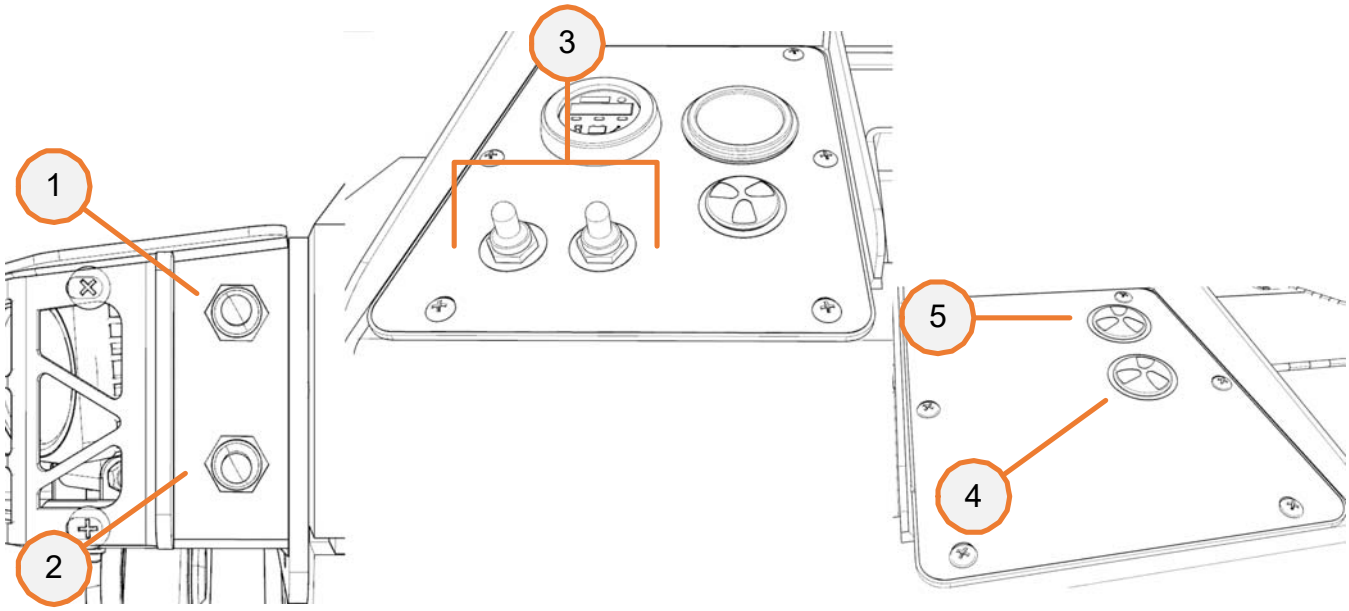
- **Single-level:** A single-level Aircraft Protection System is calibrated for a single aircraft type. See *"SINGLE-LEVEL AIRCRAFT PROTECTION SYSTEM" on page 4-32*.
- **Multiple-level:** A multi-level Aircraft Protection System is calibrated for multiple aircraft types. The tractor operator presses the appropriate button for the type of aircraft being towed, and the tractor adjusts to the specified level. See *"MULTI-LEVEL AIRCRAFT PROTECTION SYSTEM" on page 4-33*.

Note

If the tractor is not equipped with an Aircraft Protection System, then the right side of the left Instrument Panel will not have any lights or controls.

4.10.1 SINGLE-LEVEL AIRCRAFT PROTECTION SYSTEM

Tractors equipped with a single-level Aircraft Protection System will include the following controls:

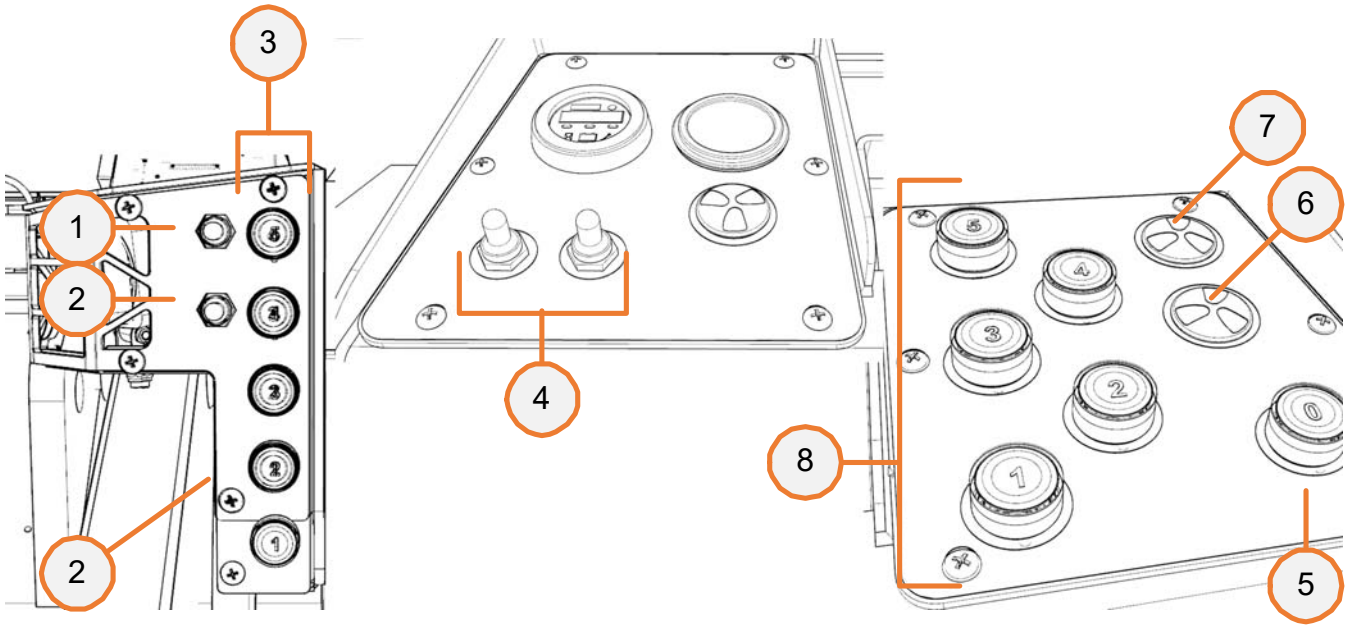


- **Fender-mounted Winch control (1):** See *"FENDER-MOUNTED CONTROLS" on page 4-22*.
- **Fender-mounted Cradle control (2):** See *"FENDER-MOUNTED CONTROLS" on page 4-22*.
- **Instrument panel Winch and/or Cradle switches (3; *if equipped*):** See *"INSTRUMENT PANEL (LEFT)" on page 4-8*.
- **Yellow Torque Caution Light (4):** This light illuminates and an alarm sounds when the towing operation exceeds the configured maximum safe torque for the aircraft being towed. The alarm stops sounding and the light turns off when the torque falls below the safe maximum. You may continue the towing operation.
- **Red Torque Warning Light (5):** This light illuminates and an alarm sounds when the towing operation exceeds a level that could damage the aircraft nose landing gear. If this happens, see *"RESETTING THE AIRCRAFT PROTECTION SYSTEM" on page 5-13*.

See the *Aircraft Towing Procedures Manual* for instructions on using the Aircraft Protection System.

4.10.2 MULTI-LEVEL AIRCRAFT PROTECTION SYSTEM

Tractors equipped with a multiple-level Aircraft Protection System will include the following controls:



- **Fender-mounted Winch control (1):** See *"FENDER-MOUNTED CONTROLS" on page 4-22*.
- **Fender-mounted Cradle control (2):** See *"FENDER-MOUNTED CONTROLS" on page 4-22*. As the Cradle is raised, the Programmable Logic Controller senses the weight of the aircraft nose gear and selects the appropriate protection level.
- **Fender-mounted APS Level Buttons (3):** Series of buttons, typically four or five. Each button corresponds to a configured aircraft nose landing gear weight, which will range from 1 (lightest) to either 4 or 5 (heaviest).
- **Instrument Panel Winch and/or Cradle switches (4; *if equipped*):** See *"INSTRUMENT PANEL (LEFT)" on page 4-8*.
- **Green Zero Light (5):** This light illuminates when the Aircraft Protection System is not enabled. In this case, the Motor brakes are unlimited, and the Winch force is limited to the configured Level 1 (lowest) setting.
- **Yellow Torque Caution Light (6):** This light illuminates and an alarm sounds when the towing operation exceeds the configured maximum safe torque for the aircraft being towed. The alarm stops sounding and the light turns off when the torque falls below the safe maximum. You may continue the towing operation.
- **Red Torque Warning Light (7):** This light illuminates and an alarm sounds when the towing operation exceeds a level that could damage the aircraft nose landing gear. If this happens, see *"RESETTING THE AIRCRAFT PROTECTION SYSTEM" on page 5-13*.

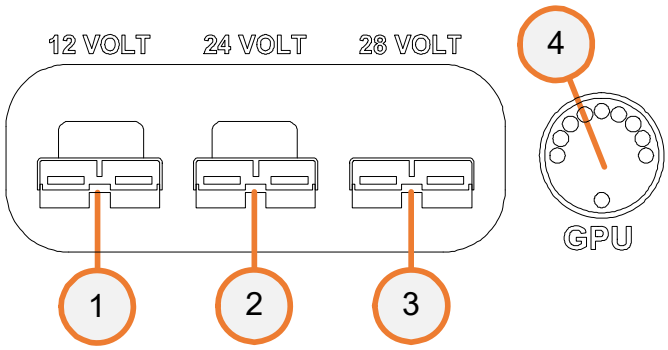
- **Instrument Panel APS Level Buttons (8):** Series of buttons, typically four or five. Each button corresponds to a configured aircraft nose landing gear weight, which will range from 1 (lightest) to either 4 or 5 (heaviest).

> **Note**
>
> *If the tractor is used to tow ATR aircraft (such as the ATR-72), then one of the level buttons will read ATR. This level must be selected whenever the tractor is being used to tow an ATR aircraft.*

See the *Aircraft Towing Procedures Manual* for instructions on using the Aircraft Protection System.

4.11 OPTIONAL GPU SYSTEM

If your tractor is equipped with optional GPU Batteries, this system will appear as follows:



The GPU system includes the following components:

- **12 VDC Outlet (1):** Provides 12 volts of power.
- **24 VDC Outlet (2):** Provides 24 volts of power.
- **28 VDC Outlet (3):** Provides 28 volts of power.
- **GPU Battery Power Gauge (4):** Displays the current charge level of the GPU Batteries.
- **GPU Extension Cable (*not shown*):** Connects the appropriate VDC outlet to the appropriate Aircraft Adapter. Each end of this cable is fitted with a DC Connector. This cable is 15' (4.5 m) long.
- **Aircraft GPU Adapter (*not shown*):** Used to connect the GPU Extension Cable to the aircraft. A variety of adapters are available for different aircraft makes/models.

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CHAPTER 5

BASIC OPERATIONS

This chapter describes how to perform the following basic operations on the tractor:

PRE-USE SAFETY CHECKS 2
ACCESSING COMPARTMENTS 3
USING THE PARKING BRAKE 4
EMERGENCY PROCEDURES 6
USING THE OPTIONAL AIRCRAFT PROTECTION SYSTEM 11
USING THE OPTIONAL GPU 14
CHARGING THE BATTERIES 16

5.1 PRE-USE SAFETY CHECKS

The tractor operator is fully responsible for operating the vehicle in a safe manner, in accordance with all applicable JBT LEKTRO, Inc. procedures and airport policies/regulations. It is critical to involve operators in creating and maintaining safe operating conditions by having them perform a pre-use visual and/or functional check of all vehicle components that could directly or indirectly affect the safety of all persons, equipment, and property exposed to operation of that vehicle.

CAUTION

MANY JURISDICTIONS MANDATE PRE-USE INSPECTIONS AND/OR CHECKS BY LAW.

This safety check occurs before the first working use for each day, shift, or period of exposure for a specific operator. This check neither supersedes nor is superseded by scheduled technical servicing and inspection; rather, it is an independent activity whereby operator exercises her/his responsibility to ensure that the tractor is safe from a user viewpoint, and that all safety-related defects are attended to on an appropriately prioritized and controlled basis.

The *Operator Pre-Use Safety Checklist* form provides the pre-use safety check procedure and allows the operator to record the results of each inspection. See *"OPERATOR PRE-USE SAFETY CHECKLIST" on page A-1*. This checklist lists critical components, provides evaluation methods for each component, and helps prioritize repairs. It can serve as either the basis for an employee/operator maintained program or as a serviceability guide for the owner/operator.

Note

An experienced person can accomplish the pre-use safety check in a few minutes of coordinated walk-around and driving activity as she/he readies the tractor for the first job.

JBT LEKTRO, Inc. suggests making a two-sided master copy of the *Operator Pre-Use Safety Checklist* form (see *"OPERATOR PRE-USE SAFETY CHECKLIST" on page A-1*). This master copy can then be used to:

- Generate forms as needed. These forms are checked off and signed on a daily basis.
- Serve as a master guide for the safety check. In this scenario, defects are documented using safety tags on the affected component(s).

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5.2 ACCESSING COMPARTMENTS

This section describes how to open and close the Front, Rear, and/or Side Compartments.

5.2.1 OPENING A COMPARTMENT

To open a compartment:

1. Release the deck latches, and then lift up.
2. Lift the deck cover to its full open position.

5.2.2 CLOSING A COMPARTMENT

To close and lock the deck cover when you have finished accessing the compartment:

1. Push the deck cover to its full down position.
2. Secure the deck latches.

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5.3 USING THE PARKING BRAKE

This section describes how to release and engage the Parking Brake. It also describes how to restore hydraulic pressure to release the brakes, if the normal procedure does not work.

5.3.1 APPLYING THE PARKING BRAKE

To apply the Parking Brake, you may either:

- Push the red Main Power Disconnect Switch on the Center Console down to the OFF position. The red Brake Pressure Warning Switch will either turn or remain OFF.
- Pull the amber Parking Brake Knob out. The red Brake Pressure Warning Light will illuminate.

You will typically apply the Parking Brake as follows:

- **During operation:** You will pull the Parking Brake Knob out but leave the Main Power Disconnect Switch ON. The red Brake Pressure Warning Light will illuminate.
- **When securing from operation**: You will pull the Parking Brake Knob out and push the Main Power Disconnect Switch down to the OFF position. The red Brake Pressure Warning Switch will either turn or remain OFF.

5.3.2 RELEASING THE BRAKE

To release the Parking Brake:

1. If needed, move the Direction Selector to the NEUTRAL position.
2. Pull the Main Power Disconnect Switch on the Center Console to the ON position.
3. Turn the Motive Power Switch on the right side of the Console Control Assembly to the ON position.

   > The red Brake Pressure Warning Light is ON when the Brake is applied.

4. Push the amber Parking Brake Knob on the Center Console down to release the Brake.
5. Verify that the Brake Pressure Warning Light is OFF.

If this procedure does not release the Parking Brake and the Brake Pressure Warning Light remains ON, this indicates a loss of hydraulic brake pressure. See *"EMERGENCY BRAKE RELEASE" on page 5-6*.

6. You may now:

   > Switch the Direction Selector to FORWARD or REVERSE and begin driving. See *"DRIVING" on page 6-1*.

   > Operate the Cradle or Winch Motor.

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5.4 EMERGENCY PROCEDURES

This section describes the following emergency procedures:

- *"EMERGENCY BRAKE RELEASE" on page 5-6*.
- *"EMERGENCY AIRCRAFT RELEASE" on page 5-9*.
- *"TOWING THE TRACTOR" on page 5-10*.

5.4.1 EMERGENCY BRAKE RELEASE

The following conditions may lock the brakes in the engaged position and require mechanical release in order to tow the tractor for safety or operational reasons:

- Electric motive power is not available.
- Hydraulic pressure fails.
- Mechanical seizure due to mechanical damage or mis-adjustment.

Release the Brake using one of the following methods, as appropriate for your tractor:

- *"HYDRAULIC MANIFOLD (IF EQUIPPED)" on page 5-6*.
- *"JAM NUT AND BOLT" on page 5-7*.

DANGER

NEVER OPERATE OR DRIVE THE TRACTOR WHEN THE BRAKES HAVE BEEN MECHANICALLY RELEASED, AS THIS WILL RENDER THE TRACTOR PRONE TO RUNAWAY WHEN STANDING AND IMPOSSIBLE TO STOP WHEN MOVING, AND MAY CAUSE A COLLISION.

DANGER

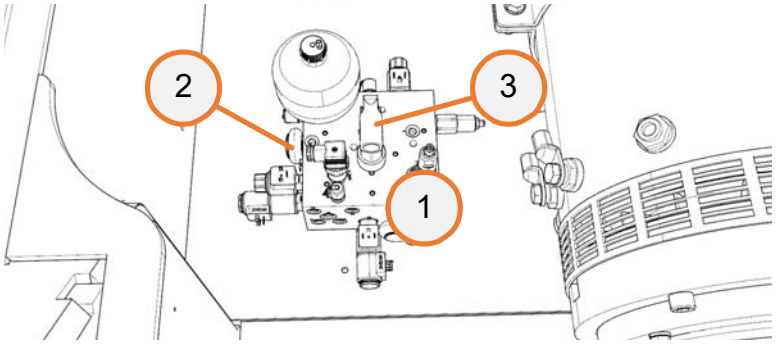
DO NOT OPERATE THE TRACTOR UNTIL THE BRAKES HAVE BEEN REPAIRED, ADJUSTED, AND TESTED ACCORDING TO THE PROCEDURES DESCRIBED IN THE BRAKES SECTION OF THE SERVICE MANUAL.

5.4.1.1 HYDRAULIC MANIFOLD (IF EQUIPPED)

To mechanically release the Brake using the Hydraulic Manifold (if equipped):

1. Chock the Drive Wheels.
2. Push the Main Power Disconnect Switch on the Center Console to the OFF position.

3. Open the Forward Compartment, as described in *"ACCESSING COMPARTMENTS" on page 5-3*.
4. Insert a jack handle into the Jack Socket (3) on the top of the Hydraulic Manifold.
5. On the Hydraulic Manifold (1), locate the black Parking Brake Release Knob (2) on the right-hand side, and then push the knob in and hold it in position.
6. Pump the jack handle until the Brake is released.

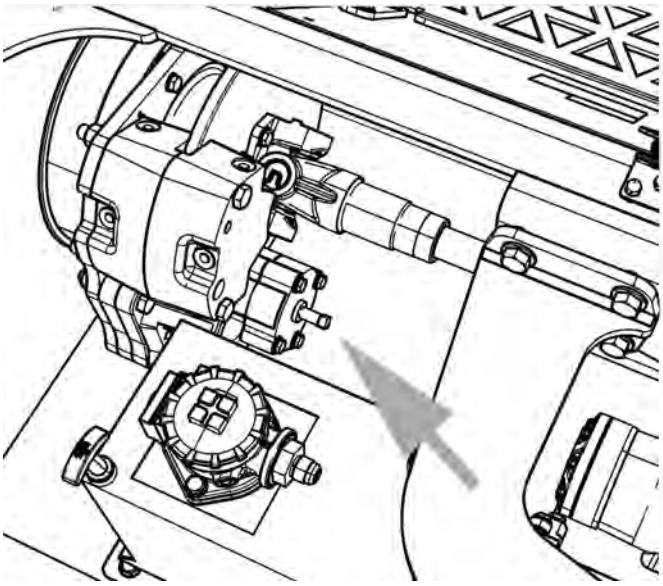


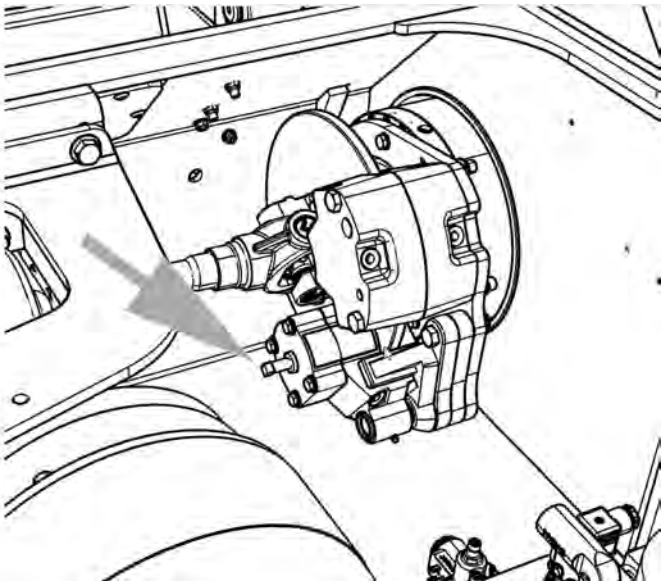
You may now tow the tractor.

5.4.1.2 JAM NUT AND BOLT

If your tractor is not equipped with a Hydraulic Manifold, then you will need to release the brakes manually by releasing a Jam Nut and Bolt on each of the two brakes. To do this:

1. Chock the Drive Wheels.
2. Push the Main Power Disconnect Switch on the Center Console to the OFF position.
3. Open the Forward Compartment, as described in *"ACCESSING COMPARTMENTS" on page 5-3*.
4. Locate the Jam Nut and Bolt on each Brake, as shown here.





5. Release the Jam Nut by rotating it counterclockwise until it is well clear of the Brake assembly.
6. Release the Bolt by rotating it counterclockwise until the Brake releases.

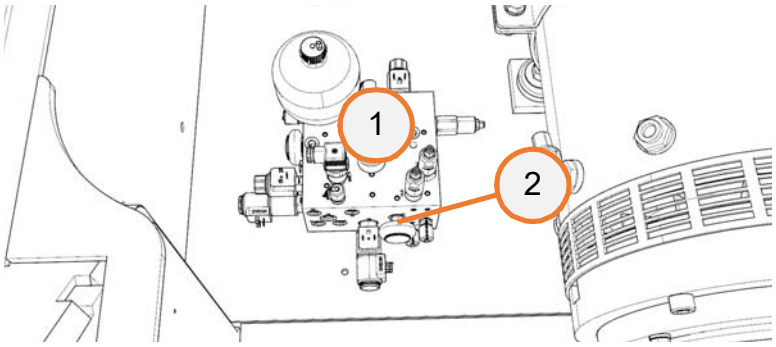
You may now tow the tractor.

5.4.2 EMERGENCY CRADLE LOWER

The Cradle may be lowered manually if electric motive power is not available or if hydraulic pressure fails. If no aircraft is on the Cradle, or if you are on Step 6 of the Emergency Aircraft Release procedure (see *"EMERGENCY AIRCRAFT RELEASE" on page 5-9*), then you may lower the Cradle as follows:

1. Open the Forward Compartment, as described in *"ACCESSING COMPARTMENTS" on page 5-3*.
2. Locate the Hydraulic Manifold (1) and Emergency Cradle Lower Knob (2). See *"FORWARD COMPARTMENT" on page 4-25*.
3. Pull the Emergency Cradle Lower Knob to release hydraulic pressure to the Lift Cylinders.

   The Cradle will begin lowering.



DANGER

KEEP YOUR FEET CLEAR OF THE CRADLE TO AVOID POSSIBLE CRUSHING INJURY.

4. When the Cradle is lowered sufficiently, release the Emergency Cradle Lower Knob.

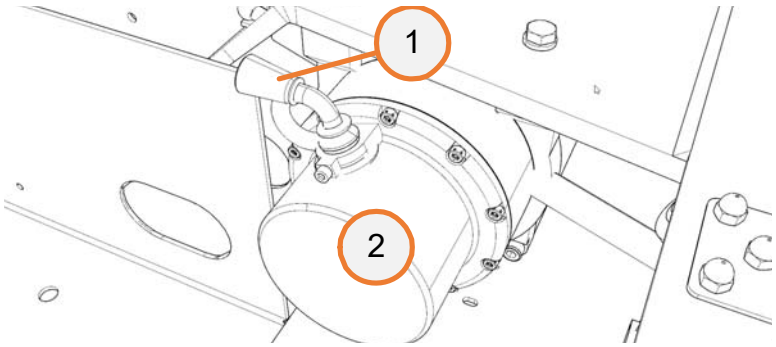
CAUTION

DO NOT ALLOW THE CRADLE TO CONTACT THE GROUND. THE WEIGHT OF THE AIRCRAFT LANDING GEAR ON THE CRADLE COULD SANDWICH IT IN PLACE AND MAKE IT IMPOSSIBLE TO MOVE THE TRACTOR.

5.4.3 EMERGENCY AIRCRAFT RELEASE

If the tractor cannot be operated safely and an aircraft is on the Cradle, the aircraft must be released prior to moving the tractor. To do this:

1. Secure the aircraft by placing chocks on the main gear and/or setting the aircraft parking brake, as appropriate.
2. Open the Forward Compartment, as described in *"ACCESSING COMPARTMENTS" on page 5-3*. Be sure to lift the deck lid as high as possible.
3. Locate the Winch Release Lever (1) on the Winch Spool (2), and then release the Winch Spool by rotating the lever counterclockwise.
4. Grasp and manually pay out the Winch Strap, being sure to prevent the Winch Strap Hook or the "D" rings on the Strut Strap, if used, from contacting the aircraft.



Note

Consider placing a soft, clean, lint-free cloth between the Winch Hook and the "D" rings, and the aircraft strut, to prevent damage. Alternatively, consider having a helper manage the Winch Strap or release the Brake.

Note

If Steps 3 and/or 4 fail to release or pay out the Winch Strap, then use a sharp knife to cut the Winch Strap, being careful to not allow the Winch Hook or "D" rings on the Strut Strap, if used, to contact the aircraft.

5. Release the brakes, as described in *"EMERGENCY BRAKE RELEASE" on page 5-6*.
6. Lower the Cradle, as described in *"EMERGENCY CRADLE LOWER" on page 5-8*.
7. If used, remove the Pawl Adapter from the aircraft.
8. Manually push the tractor away from the aircraft to a safe location, and then chock the Drive Wheels. The tractor operator must be seated in the appropriate Operator Station (A or B, depending on tractor configuration), with at least two helpers pushing the tractor.

5.4.4 TOWING THE TRACTOR

You may need to tow the tractor if it has lost power or is otherwise unable or unsafe to move under its own power. To do this:

1. Chock the tractor Drive Wheels.
2. Release the brakes, as described in *"EMERGENCY BRAKE RELEASE" on page 5-6*.
3. Proceed as follows:
   > **If no aircraft is on the Cradle:** Lower the Cradle, as described in *"EMERGENCY CRADLE LOWER" on page 5-8*.
   > **If an aircraft is on the Cradle:** Release the aircraft, as described in *"EMERGENCY AIRCRAFT RELEASE" on page 5-9*.
4. Tow the tractor, using either a tow bar or tow truck.

DANGER

DO NOT OPERATE THE TRACTOR UNTIL THE BRAKES HAVE BEEN REPAIRED, ADJUSTED, AND TESTED ACCORDING TO THE PROCEDURES DESCRIBED IN THE BRAKES SECTION OF THE SERVICE MANUAL.

CAUTION

TOWING THE TRACTOR AT SPEEDS EXCEEDING THE MAXIMUM SAFE TOWING SPEED FOR THAT SPECIFIC MODEL OF TRACTOR WILL DAMAGE THE DRIVE MOTOR.

5.5 USING THE OPTIONAL AIRCRAFT PROTECTION SYSTEM

This system describes how to use the optional Aircraft Protection System. See the following:

- *"NORMAL APS STARTUP" on page 5-11*.
- *"APS FAULTS AND TROUBLESHOOTING" on page 5-11*.
- *"RESETTING THE AIRCRAFT PROTECTION SYSTEM" on page 5-13*.

Please also see the *Aircraft Towing Procedures Manual* for information on using the Aircraft Protection System while towing an aircraft.

5.5.1 NORMAL APS STARTUP

When starting the tractor:

- If the tractor is equipped with a single-level Aircraft Protection System, then the yellow Torque Caution Light and red Torque Warning Light should flash and an alarm should sound momentarily.
- If the tractor is equipped with a multi-level Aircraft Protection System, then the green Zero Load Light, yellow Torque Caution Light and red Torque Warning Light should flash and an alarm should sound momentarily.

See *"TRACTOR STARTUP" on page 6-2*.

5.5.2 APS FAULTS AND TROUBLESHOOTING

The Aircraft Protection System lights will flash and an alarm may sound if a fault is detected, as follows:

- **Startup failure:** If the lights and/or alarm fail to activate when starting the tractor, then the system has experienced a failure. You may continue using the tractor, however all limits on acceleration, braking, Winch force, and Cradle heights are disabled.

CAUTION

AVOID PLACING EXCESSIVE TORQUE LOADS ON THE AIRCRAFT NOSE LANDING GEAR WHEN LIMITS ARE DISABLED BY LIMITING ACCELERATION, BRAKING, AND TURNING.

- **Red Torque Warning Light illuminates and alarm sounds:** The towing operation has exceeded a level that could damage the aircraft nose landing gear. The light and alarm will remain on and all tractor movement will be disabled until the Aircraft Protection System has been reset, as described in *"RESETTING THE AIRCRAFT PROTECTION SYSTEM" on page 5-13*.

WARNING

IF THE TORQUE WARNING ALARM IS TRIGGERED, THEN THE AIRCRAFT NOSE LANDING GEAR MUST BE INSPECTED FOR DAMAGE BEFORE MOVING THE AIRCRAFT.

- **Yellow Torque Caution Light illuminates and alarm sounds:** The towing operation exceeds the configured maximum safe torque for the aircraft being towed. The alarm stops sounding and the light turns off when the torque falls below the safe maximum. You may continue the towing operation, being cautious to avoid high-torque maneuvers.
- **Green Zero Light is flashing:** The system has lost communications with both of the Load Pins mounted near the Lift Cylinders. You may continue using the tractor, however all limits on acceleration, braking, Winch force, and Cradle heights are disabled.

CAUTION

AVOID PLACING EXCESSIVE TORQUE LOADS ON THE AIRCRAFT NOSE LANDING GEAR WHEN LIMITS ARE DISABLED BY LIMITING ACCELERATION, BRAKING, AND TURNING.

- **Alarm sounds three times every 10 seconds:** The system has lost communications with the Torque Cell in the Turntable. You may continue using the tractor, however all limits on acceleration, braking, Winch force, and Cradle heights are disabled.

CAUTION

AVOID PLACING EXCESSIVE TORQUE LOADS ON THE AIRCRAFT NOSE LANDING GEAR WHEN LIMITS ARE DISABLED BY LIMITING ACCELERATION, BRAKING, AND TURNING.

- **Flashing APS Level Buttons and Green Zero Light:** The system has detected a weight outside the parameters of any programmed levels. This typically indicates a Load Pin problem. You may continue using the tractor, however all limits on acceleration, braking, Winch force, and Cradle heights are disabled.

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5.5.3 RESETTING THE AIRCRAFT PROTECTION SYSTEM

The Aircraft Protection System must be reset when a torque warning is triggered. This warning:

- Continually illuminates the red Torque Warning Light.
- Continually sounds the alarm.
- Disables all tractor movement.

To reset the Aircraft Warning System:

1. Open the Forward Compartment, as described in *"OPENING A COMPARTMENT" on page 5-3*.
2. Insert the PLC Key into the Key Switch on the PLC, if not already present.
3. Turn the Key clockwise until it stops.
4. Return the Key to its original position by turning it counterclockwise.
5. If mandated by company policy, remove the Key from the PLC and return the Key to its designated storage location.
6. Inspect the aircraft nose landing gear for damage, and then determine how to proceed based on the inspection results.

WARNING

IF THE TORQUE WARNING ALARM IS TRIGGERED, THEN THE AIRCRAFT NOSE LANDING GEAR MUST BE INSPECTED FOR DAMAGE BEFORE MOVING THE AIRCRAFT.

5.6 USING THE OPTIONAL GPU

Your LEKTRO 88/89 Series tractor may be equipped with an optional GPU capability that offers an 1175 cold-cranking ampere power supply at 12, 24, or 28 volts. See *"OPTIONAL GPU SYSTEM" on page 4-35*.

The GPU Batteries must have at least 25% charge available before starting an aircraft, to avoid deep-discharge damage. The GPU Battery Power Gauge displays the current charge level. Be aware that cold temperatures may increase the aircraft demand.

5.6.1 POSITIONING EQUIPMENT & PERSONNEL

Position the tractor such that neither it nor attending personnel will be exposed to the engine intake or potential propeller arc and roll-ahead path during any part of the aircraft starting procedure or immediately thereafter.

DANGER

NEVER POSITION THE TRACTOR DIRECTLY IN THE TAXI PATH FORWARD OF A JET ENGINE INTAKE OR SPINNING PROPELLER.

When positioning equipment and personnel:

1. Chock the aircraft to prevent movement, as follows:
   - > **Aircraft with nose-mounted propeller/intake:** Forward and aft of the main gear.
   - > **Aircraft with wing-mounted engines:** Forward and aft of the nose wheel (tricycle gear) or tail wheel (conventional/taildragger).
2. Position the tractor and personnel, as follows:
   - > **Aircraft with nose-mounted propeller/intake:** Position the tractor behind the propeller/intake danger zone. Servicing personnel must always be behind the tractor.
   - > **Other aircraft:** Position the tractor directly in front of the aircraft nose at 90 degrees to the aircraft centerline. This adds safety by making the tractor the first point of contact in case the aircraft brake fails or is released prematurely, instead of a spinning propeller or jet intake.

WARNING

ALWAYS REMAIN CLEAR OF THE AIRCRAFT ENGINE OPERATING AND POTENTIAL MOVEMENT AREA DURING AND AFTER THE START SEQUENCE.

DANGER

NEVER APPROACH THE AIRCRAFT AFTER ENGINE START UNTIL THE PILOT SIGNALS THAT IT IS SAFE TO DISCONNECT THE GPU EXTENSION CABLE.

3. After engine start and disconnecting the GPU Extension Cable, move the tractor clear of the aircraft taxi path, and then remove the chocks and marshal the aircraft clear of the area.

5.6.2 CONNECTING THE GPU EXTENSION CABLE

To connect the GPU Extension Cable:

1. Determine the aircraft voltage requirements.
2. Select the correct Aircraft GPU Adapter. See *"OPTIONAL GPU SYSTEM" on page 4-35* for the available adapter types.
3. Connect the Aircraft GPU Adapter to the GPU Extension Cable.
4. Open the GPU Panel Cover.
5. Select the correct VDC Outlet (12, 24, or 28 VDC).
6. Connect the GPU Extension Cable to the selected VDC Outlet.
7. Verify that you have selected the correct voltage for the specific aircraft you are starting.

DANGER

SELECTING THE WRONG VOLTAGE MAY CAUSE A FIRE OR BATTERY EXPLOSION. IT MAY ALSO RESULT IN SERIOUS DAMAGE TO THE AIRCRAFT ELECTRICAL AND ELECTRONICS SYSTEMS AND/OR THE GPU SYSTEM ON THE TRACTOR.

8. When directed, connect the Aircraft GPU Adapter to the aircraft, being sure not to reverse the polarity.

5.6.3 DISCONNECTING THE GPU EXTENSION CABLE

To disconnect the GPU Extension Cable:

1. Wait until the pilot signals that ground power can be disconnected.
2. Disconnect the GPU Extension Cable from the VDC Outlet on the tractor.
3. Close the GPU Panel Cover.
4. Disconnect the Aircraft GPU Adapter from the aircraft.
5. Stow the GPU Extension Cable and Aircraft GPU Adapter in one of the Side Compartments.

5.7 CHARGING THE BATTERIES

LEKTRO tractors are equipped with lead-acid deep discharge batteries. These batteries are designed to be substantially discharged during long periods of use and then fully charged with one continuous charge. Ideally, the tractor should not be operated when the battery charge falls below 20%. Always charge the batteries before they are depleted to this level.

Note

By contrast, regular automotive batteries are designed to be only partially discharged (e.g. when starting the engine) and then continuously charged while the engine is running.

A battery will sustain a finite number of charging cycles. A cycle is a single period of continuous or intermittent discharging followed by recharging. This is true whether the battery is drained to 75% or 30% before recharging; however, the depth of each cycle affects the remaining cycle life. For example, discharging a battery below 20% and then recharging that battery counts as far more than one cycle. In general, a deeper discharge requires more equivalent cycles to recharge the battery to 100%. A single discharge can equal three (3) equivalent cycles, which can significantly reduce battery life.

Maximizing the battery life span therefore requires striking a balance between the longest discharges to get more cycles per period of operational use and avoiding excessively deep discharges. Actual tractor operational needs will sometimes involve trading off a shorter cycle to allow opportunity charging if extended tractor or GPU use beyond the normal operating frequency or demand is forecast.

Note

Opportunity charging is acceptable, provided that the batteries are on charge for no less than 60 minutes (one hour).

Always connect the charger to an AC power outlet that will supply uninterrupted power overnight. A charger that shuts off when the facility closes for the night may not fully charge the battery and may also waste cycles.

5.7.1 MEASURING THE BATTERY CHARGE

If the tractor is equipped with a Battery Indicator Gauge, this can give a good indication of the amount of charge remaining in the battery. This gauge should never be used when the tractor is connected to a charger, because it will read a full charge.

Measuring the specific gravity of the battery electrolyte is accurate under all conditions.

- A fully-discharged battery has a specific gravity of 1.110 or less.
- If equipped, the minimum GPU Battery charge required to safely start an aircraft has a specific gravity of 1.155.
- A fully-charged battery has a specific gravity of approximately 1.265.

Note

These values assume an electrolyte temperature of 80° F (26.7° C), which is the standard hydrometer reference temperature.

5.7.2 BATTERY CHARGING WARNINGS

DANGER

FAILURE TO FOLLOW EACH OF THE WARNINGS LISTED IN THIS SECTION MAY RESULT IN ELECTROCUTION, THERMAL OR CHEMICAL BURNS, AND/OR OTHER INURY AND PROPERTY DAMAGE.

- **Water conducts electricity:** Always charge batteries in a designated indoor or protected outdoor area away from rain, snow, and condensing moisture. Never handle electrical cables while standing in water.
- **Chargers that are not matched to the battery can cause a fire or explosion, and may damage the battery:** Always use battery chargers supplied by or approved by JBT LEKTRO, Inc. or the battery manufacturer.
- **Batteries release hydrogen and oxygen gases while charging:** Always keep the battery compartment cover open during charging, and ensure that these gases are free to vent directly to the atmosphere.
- **Battery acid can cause severe chemical burns:** Always wear appropriate Personal Protective Equipment (PPE) when servicing batteries. See the Battery section of the *Service Manual* for detailed information.
- **Hydrogen is extremely flammable:** Never smoke or use any open flame or electrical tool, motor, or other spark-producing equipment in the vicinity of a charging battery. Post appropriate standard warning signs in the battery charging area.

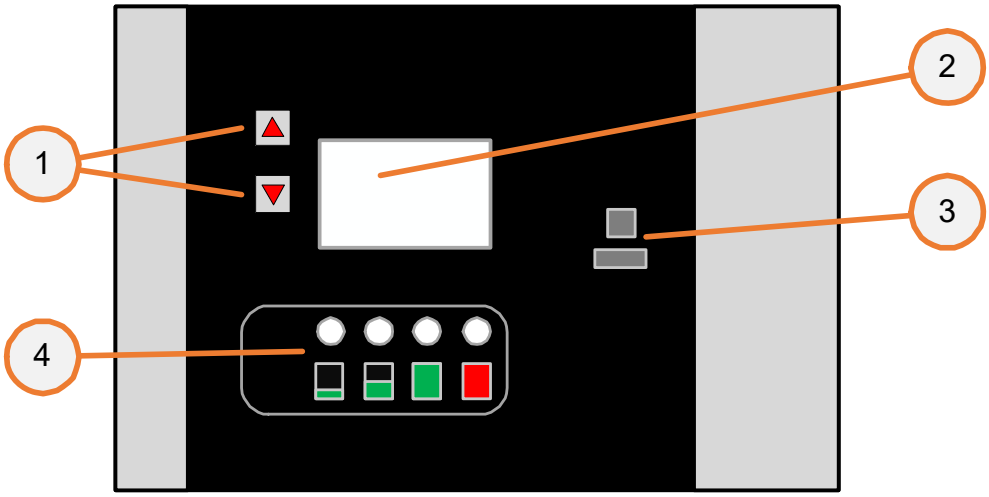
- **Vibration can damage battery chargers:** Never store battery chargers in the tractor motor compartment.
- **Excessive charging can damage the batteries:** Never leave batteries unattended on the charger for more than 48 hours, in case the charger auto shutoff fails.
- **Battery fluid level may rise during charging:** Never fill the battery cells prior to charging. See the Battery section of the *Service Manual* for detailed information.

5.7.3 MOTIVE BATTERIES

This section describes the Motive Battery Charger and how to charge the Motive Batteries.

5.7.3.1 MOTIVE BATTERY CHARGER

JBT LEKTRO, Inc. supplies a Motive Battery Charger that is compatible with the Motive Batteries in LEKTRO 88/89 Series tractors.



The Motive Battery Charger includes the following indicators and controls:

- **Settings buttons (1):** Allow the user to navigate the display and alter some charger settings. Refer to the manual included with the charger.
- **Volt/Ampere Display (2):** Indicates the amount of battery voltage or current being drawn by the charger. Higher amperage readings indicate a more discharged battery.
- **USB/Network ports (3):** Do not plug anything in to these ports. They are intended for troubleshooting and repair purposes only.
- **Status LED (4):** These LED illuminate from left to right to indicate the battery charge level. When lit, the red LED indicates a problem. All lights turn off when the battery is fully charged.

5.7.3.2 CHARGING THE MOTIVE POWER BATTERIES

To charge the Motive Batteries:

1. Position the tractor and charger in a well-ventilated area on a stable surface, away from precipitation, standing water, and condensation.
2. Open the Battery Deck Cover to allow the explosive gases generated by the charging process to ventilate. See *"OPENING A COMPARTMENT" on page 5-3*.
3. Check the electrolyte level in the Motive Batteries to verify that the plates in the battery cells are covered with electrolyte and that the cells are below the maximum fill level.
4. Connect the tractor Charger Output Cable from the Motive Battery Charger to the tractor Power DC Connector on the Motive Batteries. See *"REAR COMPARTMENT" on page 4-27* for the receptacle location.
5. Connect the AC Power Cable from the Motive Battery Charger to the incoming AC power supply.
6. Check the Volt/Ampere Display to verify that the charger is supplying power to the tractor.
   - > A battery discharged to 20% remaining power should show a maximum ampere draw.
   - > A battery nearly fully charged should show a draw of approximately 10 amperes.
   - > The amperage reading should gradually taper off until the finished rate of approximately 5 to 10 amps is reached.
7. When the batteries are fully charged (Status LEDs are off), disconnect the Motive Battery Charger from the incoming AC power supply first.
8. Disconnect the Motive Battery Charger from the tractor Power DC Connector.
9. Close the Battery Deck Cover. See *"CLOSING A COMPARTMENT" on page 5-3*.

Charging the Motive Batteries will take approximately eight to ten hours when the batteries have been discharged to the 20% level.

Note

The fully automatic Motive Battery Charger supplied with this tractor will automatically shut off when a full charge is reached. You may leave this charger unattended overnight, because overcharging is not normally a concern.

5.7.3.3 EQUALIZING THE MOTIVE BATTERIES

An “equalizing charge” is a controlled overcharge that brings up low cells and/or removes sulfur from the plates in the Motive Batteries. This process is essential for obtaining full battery performance. JBT LEKTRO, Inc. recommends performing an equalizing charge every month. To do this:

1. Wait until the Motive Batteries are fully charged and the Motive Battery Charger has sequenced through the finishing automatic ON/OFF cycles and is finally shut off.
2. Press the yellow Equalize Button on the Motive Battery Charger.
3. Wait approximately one hour for the automatic equalizing charge to occur.

Note

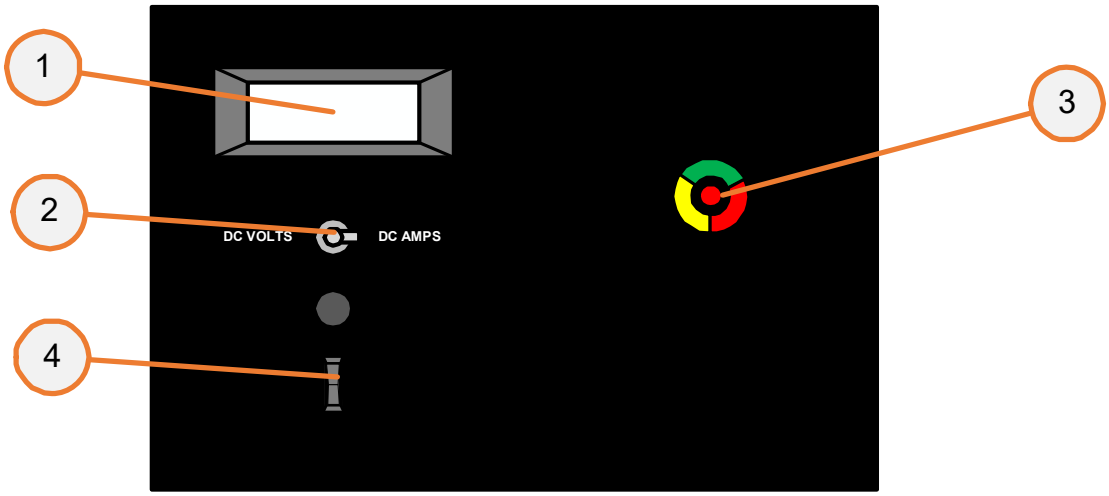
Some replacement chargers may have a different “equalizing” feature. Refer to the manufacturer's instructions in this case.

5.7.4 OPTIONAL GPU BATTERIES

This section describes the GPU Battery Charger and how to charge the GPU Batteries, if equipped.

5.7.4.1 GPU BATTERY CHARGER

If the tractor is equipped with optional GPU Batteries, then JBT LEKTRO, Inc. will supply a GPU Battery Charger that is compatible with the GPU Batteries.



The GPU Battery Charger includes the following indicators and controls:

- **Volt/Ampere Display (1):** Indicates the amount of battery voltage or current being drawn by the charger. Higher amperage readings indicate a more discharged battery.
- **Volts/Amps Switch (2):** Switches the Volt/Ampere Display between battery voltage and charger current.
- **Status LED (3):** This LED illuminates as follows:
  - > **Red:** Battery charge is less than 80%.
  - > **Yellow:** Battery charge is above 80%.
  - > **Green:** Charger is either off (steady light) or in maintenance mode (flickering light).
- **Power Switch (4):** Turns the charger on or off.

5.7.4.2 CHARGING THE GPU BATTERIES

To charge the GPU Batteries:

1. Position the tractor and charger in a well-ventilated area on a stable surface, away from precipitation, standing water, and condensation.
2. Open the GPU Deck Cover to allow the explosive gases generated by the charging process to ventilate. See *"OPENING A COMPARTMENT" on page 5-3*.
3. Check the electrolyte level in the GPU Batteries to verify that the plates in the battery cells are covered with electrolyte and that the cells are below the maximum fill level.
4. Connect the tractor Charger Output Cable from the GPU Battery Charger to the tractor GPU Power Connector on the GPU Batteries.
5. Connect the AC Power Cable from the GPU Battery Charger to the incoming AC power supply.
6. Check the Volt/Ampere Display to verify that the charger is supplying power to the tractor.
   - > A battery discharged to 20% remaining power should show a maximum ampere draw.
   - > A battery nearly fully charged should show a draw of approximately 10 amperes.
   - > The Volt/Ampere Display reading should gradually taper off until the finished rate of approximately 5 to 10 amps is reached.
7. When the batteries are fully charged, disconnect the GPU Battery Charger from the incoming AC power supply first.
8. Disconnect the GPU Battery Charger from the tractor GPU Power Connector.
9. Close the GPU Deck Cover. See *"CLOSING A COMPARTMENT" on page 5-3*.

Charging the GPU Batteries will take approximately eight to ten hours when the batteries have been discharged to the 20% level.

Note

The fully automatic GPU Battery Charger supplied with this tractor will automatically shut off when a full charge is reached. You may leave this charger unattended overnight, because overcharging is not normally a concern.

5.7.4.3 EQUALIZING THE GPU BATTERIES

An “equalizing charge” is a controlled overcharge that brings up low cells and/or removes sulfur from the plates in the GPU Batteries. This process is essential for obtaining full battery performance. JBT LEKTRO, Inc. recommends performing an equalizing charge every month. To do this:

1. Wait until the GPU Batteries are fully charged and the GPU Battery Charger has completed the finishing cycles.
2. Disconnect the GPU Battery Charger from the incoming AC power supply.
3. Reconnect the GPU Battery Charger to the incoming AC power supply. This force-restarts the charger, which will run for at least its 45-minute auto-timed base period up to approximately two hours, depending on electrolyte and ambient temperatures.

Note

JBT LEKTRO, Inc. recommends repeating this sequence no more than two (2) times. The supplied GPU Battery Charger has a higher designed finishing rate than manual chargers, and too many restarts may damage the GPU Batteries because of excessive heat.

Note

Some replacement chargers may have a different “equalizing” feature. Refer to the manufacturer's instructions in this case.

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CHAPTER 6

DRIVING

This chapter describes driving the tractor, which encompasses the following topics:

BEFORE DRIVING 2
DRIVING THE TRACTOR 4
EXITING THE TRACTOR 7
BRAKING 8
TRACTOR SHUTDOWN 10

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6.1 BEFORE DRIVING

Driving the LEKTRO 88/89 Series tractor is similar to driving a forklift, in that the steering wheel controls the rear wheels rather than the front wheels. This allows the operator to more accurately control the positioning of aircraft; however, additional caution must be exercised when driving the vehicle forward, especially at high speeds.

Note

All of the instructions in this manual use the orientation described in "ORIENTATION" on page 4-2.

6.1.1 DRIVING DIRECTION

The tractor is usually driven in the following directions when moving over longer distances:

- **While towing an aircraft:** Reverse.
- **While not towing an aircraft:** Forward, unless the tractor is equipped with dual Operator Stations. If so equipped, the tractor may be driven either forward or in reverse.

6.1.2 TRACTOR STARTUP

To start the tractor at the beginning of each shift or operational period:

1. Perform a Pre-Use Safety Inspection and complete an *Operator Pre-Use Safety Checklist* Fform, as described in *"OPERATOR PRE-USE SAFETY CHECKLIST" on page A-1*.
2. Perform a walk-around inspection to ensure that the vehicle is free to move without causing damage, and that all objects on the vehicle are secured.
3. Lift the Control Console as described in *"CONTROL CONSOLE" on page 4-7* to provide access to the Operator Seat.
4. Sit in the Seat.
5. Lower and adjust the Control Console as required for operator safety and comfort, and then lock the assembly into place.
6. Adjust the seat for personal safety comfort, as described in *"OPERATOR SEAT(S)" on page 4-6*, making sure that you can easily reach and operate all driving controls.
7. If the tractor is equipped with two Operator Stations, then repeat Steps 3-6 for the second Operator Station.
8. Dismount the tractor, and then remove the wheel chock(s).
9. Sit in the seat, and then fasten the seat belt low and snug across your hips, if equipped.

WARNING

ALWAYS FASTEN YOUR SEAT BELT BEFORE MOVING THE TRACTOR.

10. Pull the Main Power Disconnect Switch up to turn it ON. See *"CENTER CONSOLE" on page 4-11*.

11. Turn the Motive Power Switch (either key or lever) clockwise to turn it ON. See *"INSTRUMENT PANEL (RIGHT)" on page 4-10*.

    > If the tractor is equipped with a single-level Aircraft Recognition System, then the yellow Torque Caution Light and red Torque Warning Light should flash and an alarm should sound momentarily.

    > If the tractor is equipped with a multi-level Aircraft Recognition System, then the green Zero Load Light, yellow Torque Caution Light and red Torque Warning Light should flash and an alarm should sound momentarily.

    See *"APS FAULTS AND TROUBLESHOOTING" on page 5-11* if the Aircraft Recognition System does not respond in this manner.

12. Verify that sufficient charge remains to accomplish the required task. If equipped, you can do this using the Battery Indicator Gauge. See *"INSTRUMENT PANEL (RIGHT)" on page 4-10*.

6.2 DRIVING THE TRACTOR

To drive the tractor:

1. Perform the startup procedure described in *"TRACTOR STARTUP" on page 6-2*.
2. If the tractor is equipped with dual operator stations, then move the Driver Select Toggle Switch on the Center Console toward the station from which you will be driving.
   > Station A is on the left side and faces the front of the tractor. Use this station when towing an aircraft over short distances, such as during pushback.
   > Station B is on the right side and faces the rear of the tractor. Use this station when not towing an aircraft, or when towing an aircraft over a longer distance, such as from the ramp to a hangar.
3. Push the Parking Brake Knob in to release the Parking Brake, and then verify that the red Brake Pressure Warning Light is OFF.
4. Turn on lights as required for safety based on the time of day, weather conditions, and airport policy. In general, running and parking lights draw little power and may be left on when driving or when parked in a congested area. Headlights and strobes draw more power and should only be turned on when needed.
5. Move the Direction Selector to NEUTRAL, and then move it in the direction that you want to drive.
   > Pushing the lever toward the front of the vehicle selects FORWARD.
   > Centering the lever selects NEUTRAL.
   > Pulling the lever toward the rear of the vehicle selects REVERSE.

WARNING

ALWAYS VERIFY THAT YOU HAVE SELECTED THE CORRECT DIRECTION REGARDLESS OF THE OPERATOR STATION YOU ARE USING OR THE DIRECTION YOU ARE FACING. SELECTING THE WRONG DIRECTION COULD CAUSE A COLLISION RESULTING IN DEATH, INJURY, AND/OR DAMAGE TO EQUIPMENT OR OTHER PROPERTY.

Note

The FORWARD and REVERSE directions are relative to the front of the vehicle, and not to the operator station or the direction the operator is facing. In general, move the Direction Selector toward where you want to go.

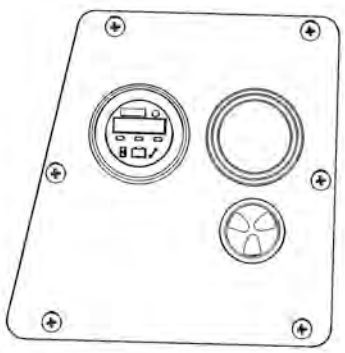
6. Gradually press the Accelerator Pedal as required to move the vehicle.
   > If the vehicle does not move on initial accelerator application, then lift your foot and let the Accelerator Pedal return, and then press the Accelerator Pedal again. This will reset the Controller and the vehicle should begin moving.
7. Control the vehicle speed using the Accelerator Pedal and Brake Pedal as required.
8. Turn as required using the Steering Wheel.
9. If needed, sound the horn by using your thumb to press the Horn Button on the right side of the steering column behind the Steering Wheel.
10. Stop the vehicle by pressing the Brake Pedal.

While driving:

- The following chart lists the Maximum Safe Design Speed for select models in the LEKTRO 88/89 Series of tractors.

TRACTOR MODEL	MAX. SPEED (EMPTY)	MAX. SPEED (FULLY LOADED)
8800SDA-EZ	9.0 MPH / 14.4 KPH	4 MPH / 6.4 KPH
8800SDA	9.0 MPH / 14.4 KPH	4 MPH / 6.4 KPH
8850SDA-EZ	9.0 MPH / 14.4 KPH	4 MPH / 6.4 KPH
8850SDA	9.0 MPH / 14.4 KPH	4 MPH / 6.4 KPH
8850SDA-AL-100	9.0 MPH / 14.4 KPH	4 MPH / 6.4 KPH
AP8850SDA-M	9.0 MPH / 14.4 KPH	4 MPH / 6.4 KPH
8900SDB	8.5 MPH / 13.6 KPH	4 MPH / 6.4 KPH
8950SDB	7.5 MPH / 12 KPH	4 MPH / 6.4 KPH
8950SDB-M	7.5 MPH / 12 KPH	4 MPH / 6.4 KPH
8925SDB-AL/HS-200	17 MPH / 27.3 KPH	14 MPH / 22 KPH
8950SDB-AL-200	10 MPH / 16.1 KPH	4 MPH / 6.4 KPH
8950SDB-AL-250	10 MPH / 16.1 KPH	4 MPH / 6.4 KPH

- Driving or towing the tractor too fast down an incline will overspeed the drive motor. The drive motor may be damaged or destroyed by overspeed.
- The left side of the instrument panel(s) includes the Speedometer, Motor Overspeed Warning Placard, and red Motor Overspeed Indicator Light.



CAUTION

NEVER DRIVE OR TOW THE TRACTOR FASTER THAN ITS MAXIMUM SAFE DESIGN SPEED, AS THIS MAY DAMAGE OR DESTROY THE DRIVE MOTOR.

6.2.1 USING THE STEERING WHEEL

The Steering Wheel turns the dual Steer Wheels located at the rear of the tractor just ahead of the Operator Platform. When turning, the tractor behaves similarly to a forklift with rear wheel steering. JBT LEKTRO, Inc. recommends using the Steering Knob on the Steering Wheel to always allow one-handed steering control, even when turning the steering wheel rapidly through multiple revolutions.

- When driving FORWARD:
  - > To turn the tractor to the right relative to the direction of travel, rotate the Steering Wheel counterclockwise. This swings the rear of the tractor to the left to allow the front of the tractor to change direction to the right.
  - > To turn the tractor to its left relative to the direction of travel, rotate the Steering Wheel clockwise. This swings the rear of the tractor to the right to allow the front of the tractor to change direction to the left.
- When driving in REVERSE:
  - > To turn the tractor to its right relative to the direction of travel, rotate the Steering Wheel clockwise. This swings the rear of the tractor to the right and allows the front of the tractor to follow.
  - > To turn the tractor to its left relative to the direction of travel, rotate the Steering Wheel counterclockwise. This swings the rear of the tractor to the left and allows the front of the tractor to follow.

6.3 EXITING THE TRACTOR

If you need to temporarily exit the vehicle, such as when capturing or releasing an aircraft:

1. Press the Brake Pedal to apply the brakes, until the vehicle comes to a complete stop.
2. Pull the Parking Brake Knob up to engage the Parking Brake, and then verify that the red Brake Pressure Warning Light is ON.
3. Turn the Motive Power Switch counterclockwise to turn it OFF.

Note

This procedure is intended to temporarily secure the tractor. See "TRACTOR SHUTDOWN" on page 6-10 for instructions on how to shut down the tractor at the end of the shift or operating period.

6.4 BRAKING

The vehicle can be stopped in several ways:

- Pressing the Brake Pedal to bring the tractor to a gradual and controlled stop. See *"DRIVING THE TRACTOR" on page 6-4*.
- Moving the Direction Selector to the position opposite to the current direction of travel, and then applying controlled pressure to the Accelerator Pedal. This is called "plug braking," and is described in *"PLUG BRAKING" on page 6-8*.
- Emergency braking by applying the Parking Brake. See *"EMERGENCY BRAKING" on page 6-9*.

6.4.1 PLUG BRAKING

Plug braking is unique to electric vehicles. It uses the Drive Motor as a brake to slow the vehicle and then reverse direction in a single motion. This method is safe and will not damage the vehicle. To use plug braking:

- With the vehicle moving in one direction, lift your foot off the Accelerator Pedal.
- Move the Direction Selector to the direction opposite the current direction of travel.
- Apply pressure to the Accelerator Pedal to stop the vehicle. If you keep pressing the Accelerator Pedal after the vehicle stops, it will begin moving in the opposite direction. The amount of foot pressure on the Accelerator Pedal determines the resulting braking and acceleration force.

CAUTION

DO NOT USE PLUG BRAKING WHILE TOWING AN AIRCRAFT, EXCEPT IN CASE OF EMERGENCY.

Using plug braking while towing an aircraft can damage or destroy the Drive Motor for the following reasons:

- The heavier load applies the braking force more suddenly and with coarser control compared to pressing the Brake Pedal. This places excessive loads on the tractor and aircraft and could cause the aircraft wheel to escape the Cradle gates.
- JBT LEKTRO, Inc. presets plug braking to safely and smoothly stop the tractor when empty. The weight of the captured aircraft weight proportionally increases the overall force required to stop the tractor, and this may exceed Drive Motor limits.

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6.4.2 EMERGENCY BRAKING

Emergency braking should only be performed when applying the Brake Pedal fails to stop the vehicle. This procedure should only be done in an emergency, because it will bring the vehicle to an abrupt stop.

6.4.2.1 COLLISION IMMINENT

To stop the tractor if the Brake Pedal fails and a collision is imminent:

1. Pull the Parking Brake Knob up to engage the Brake and stop the tractor.
2. If Step 1 fails, use plug braking to stop the tractor, as described in *"PLUG BRAKING" on page 6-8*.

6.4.2.2 COLLISION NOT IMMINENT

To stop the tractor if the Brake Pedal fails and a collision is not imminent:

1. Use plug braking to stop the tractor, as described in *"PLUG BRAKING" on page 6-8*.
2. Pull the Parking Brake Knob up to engage the Brake once the tractor is stopped.

6.5 TRACTOR SHUTDOWN

Perform this procedure to shut down the tractor when it will be left unattended for an extended period of time, such as between shifts or operational periods:

1. Center the Steer Wheels.
2. Press the Brake Pedal to apply the brakes.
3. Move the Direction Selector to the NEUTRAL position.
4. Pull the Parking Brake Knob up to engage the Parking Brake.
5. Ensure that the Cradle is lowered.
6. Turn the Motive Power Switch counterclockwise to turn it OFF.

If you are parking the tractor where there is a risk of unauthorized persons tampering with the tractor, then push the Main Power Disconnect Switch in to turn main power OFF. If equipped, remove the key from the Motive Power Switch.

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APPENDIX A

OPERATOR PRE-USE SAFETY CHECKLIST

This chapter contains a pre-formatted *Operator Pre-Use Safety Checklist* form that can be copied and used when performing the tractor safety inspection described in *"BASIC OPERATIONS" on page 5-1*.

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LEKTRO

88/89 SERIES
OPERATOR PRE-USE SAFETY CHECKLIST

VEHICLE SERIAL # OR IDENT. CODE	DATE	TIME

GUIDE: Before first use of the day or shift, the operator of the tractor must check each of the applicable items listed below during a quick visual walk-around followed by a brief functional test drive, following the instructions on reverse side of this sheet. Place a check mark in the appropriate SERVICEABLE (SVBLE) or WITHDRAWAL priority box.

PRIORITY 1 (P1)	Tag the vehicle and route for immediate repair.
PRIORITY 2 (P2)	Tag the vehicle & route for repair within 24 hrs. or as soon as practicable.
— = Priority not applicable for this item.	

#	ITEM	SVBLE	WITHDRAWAL		REMARKS
			P1	P2	
1	POWER DISCONNECT BUTTON(S)				
2	STEERING				
3	ACCELERATOR PEDAL				
4	BRAKE PEDAL				
5	PARKING BRAKE				
6	LIGHTS				
7	ANTI-SKID SURFACES				
8	TIRES				
9	WINCH HOOK				
10	WINCH LIMIT SWITCH				
11	Winch Strap				
12	STRUT STRAP				
13	STRUT STRAP PROTECTIVE SLEEVE				
14	ACFT. RECOGNITION SYSTEM (IF EQUIPPED)				
15	GPU CONNECTORS/CABLES (IF EQUIPPED)				
16	BATTERY CHARGER CONNECTORS/CABLES				
17	AIRCRAFT WHEEL CHOCKS				
18	FIRE EXTINGUISHER (IF EQUIPPED)				
19	MISC: _____				

OPERATOR SIGNATURE: _____ **DATE:** _____

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INSTRUCTIONS - 88/89 SAFETY CHECK

POWER DISCONNECT BUTTONS - Verify that motive and hydraulic power or hydraulic and winch power is cut off when respective button is pushed to OFF position by subsequent application of Accelerator/Winch functions. **PRIORITY 1 ONLY**.

STEERING - While driving forward at slow speed, perform a lock-to-lock steering maneuver to verify that steering force is smooth and steady. **PRIORITY 1:** If irregular and/or jams or severe ratcheting felt. **PRIORITY 2:** If stiff but constant.

ACCELERATOR PEDAL - Ensure pedal has rubber tread. Once tractor is in motion, verify that speed control responds smoothly and proportional to Accelerator Pedal input. **PRIORITY 1:** If undemanded sudden speed-surges or hesitations occur while tractor is moving. **PRIORITY 2:** If minor undemanded speed fluctuation occurs, report & monitor until repaired.

BRAKE PEDAL - Ensure pedal has rubber tread. Once tractor is in motion, press the Brake Pedal. Pedal should not depress more than 3" (7 cm) from its rest position before braking action is felt, and the pedal should feel firm and not spongy. Braking action should be positive and proportional to applied pedal effort. **PRIORITY 1 ONLY**.

PARKING BRAKE - Release Parking Brake. Select FORWARD or REVERSE. Gradually press Accelerator Pedal until slow creeping speed reached. Holding this accelerator position, move the Direction Control to NEUTRAL and the Parking Brake Knob to ON. Tractor should stop rapidly and hold. **PRIORITY 1 ONLY.**

LIGHTS (IF EQUIPPED) - Ensure all lights are operational. **PRIORITY 1:** If regulatory requirement or tractor to be used on high density airport traffic corridor at night., then repair prior to dusk. **PRIORITY 2:** In other cases.

ANTI-SKID SURFACES - Anti-skid strips on the Operator Platform are intact and not excessively worn. **PRIORITY 2 ONLY**.

TIRES - Visually check the Drive Tires to ensure adequate inflation, if pneumatic. Tires should not bulge on bottom ground contact area with tractor empty. Rear Steer Tires are solid and not inflation-critical. **PRIORITY 1 ONLY**.

WINCH HOOK - Inspect Winch Hook for damage. Push Winch Strap hook safety catch to the OPEN position. Ensure that the return spring on the catch supplies enough force to fully close catch and that catch is free-moving. **PRIORITY 1:** If hook is damaged and/or spring inoperable or catch jammed. **PRIORITY 2:** If catch operation is sticky.

WINCH LIMIT SWITCH - Activate the fender-mounted Winch Control Switch switch to the IN direction and hold while using your foot to the Winch Limit Switch until it is fully against the Cradle back wall. Winch Strap inward motion should STOP. *(Note: Outward Winch Strap motion via the Winch Control Switch set to OUT will intentionally still function with the Winch Limit Switch activated.)* If performing a live pushback or tow, complete the aircraft capture task using manual adjustment of winch and strut strap tension, and then after completion of the aircraft move, tag the tractor for repair of the Winch Limit Switch function. **PRIORITY 2 ONLY**.

WINCH AND STRUT STRAPS - Visually confirm Winch Strut Strap condition. Strut Strap "D" ring and hook attachment stitching in good condition. **PRIORITY 1:** If failure imminent under tow loads. **PRIORITY 2:** If in state of advanced wear.

STRUT STRAP PROTECTIVE SLEEVE - Touch to ensure free of grease build-up and grit that could scratch shiny aircraft nose wheel oleo strut. Wipe off any grit before use, then wash with detergent at first opportunity. Order replacement if missing. **PRIORITY 2 ONLY**.

AIRCRAFT RECOGNITION SYSTEM - Confirm that all Aircraft Recognition System lights flash and an alarm sounds briefly when the tractor is powered ON.

GPU ELECTRICAL CONNECTORS AND CABLES (IF EQUIPPED) - Inspect GPU extension, aircraft adapters, and tractor GPU outlet connectors. Ensure cable and connector components are not damaged or worn. **PRIORITY 1:** If wear or damage severe enough to risk electrical insulation integrity do not use GPU until repaired. **PRIORITY 2:** If lesser wear or damage, monitor during GPU use. Route affected components for repair when practical.

BATTERY CHARGER CABLES AND CONNECTORS - Inspect charger input and output wires, and the connector plugs. Ensure not damaged or worn. **PRIORITY 1:** If risk of electrical insulation integrity loss, do not use charger until repaired. **PRIORITY 2:** If lesser damage or wear, continue to use but tag for repair as soon as practical.

AIRCRAFT WHEEL CHOCKS - Ensure adequate supply of serviceable chocks, sized for aircraft type(s) to be moved, are secured on the tractor or available on site for both sides of both main gear, regardless of whether aircraft brakes are set or not when aircraft released. **PRIORITY 1 ONLY**.

FIRE EXTINGUISHER (IF EQUIPPED) - On tractors so equipped by owner, check for damaged handle, pins, levers, mounting bracket and broken seal. If gauge type, verify gauge registers in "CHARGED" zone. Remove unserviceable extinguisher from tractor and operational area immediately. **PRIORITY 1:** Replace immediately if extinguisher mandatory by regulation or no other "first response" extinguisher of same agent type near operating site. **PRIORITY 2:** If not regulatory requirement and other extinguisher of same agent type is available near operating site, replace at first opportunity.

MISCELLANEOUS - Any additional defect(s) that the operator feels is a direct and immediate safety risk, e.g. sharp protrusion due to a component break that constitutes an injury hazard.

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APPENDIX B

RECEIVING

This chapter contains the JBT LEKTRO, Inc. Gold Seal Limited Warranty and describes the procedure for receiving, setting up, and running in a new LEKTRO 88/89 Series tractor.

B.1 GOLD SEAL LIMITED WARRANTY

This ONE YEAR GOLD SEAL LIMITED WARRANTY covers equipment manufactured by JBT LEKTRO, Inc., (the “Equipment”). JBT LEKTRO, Inc. warrants that the Equipment is free from defects in material and workmanship, and is fit for the purpose for which we recommend it.

Provided that the Equipment is used in accordance with JBT LEKTRO, Inc. guidelines, is not abused, and is serviced in accordance with JBT LEKTRO, Inc.'s recommended servicing guidelines, JBT LEKTRO, Inc. agrees that, for a period of one (1) year after the date of delivery to the party who purchases the Equipment from us, JBT LEKTRO, Inc. will replace or repair, at our option, any defective material, parts or workmanship which, in our judgment, does not conform to this limited warranty. The Equipment requiring service or repair under this limited warranty shall be returned to JBT LEKTRO, Inc.’s factory in Warrenton, Oregon at the owner's expense, and will be returned to the owner transportation collect. In the event that any technician from JBT LEKTRO, Inc. is required to travel to the owner's place of business or elsewhere to perform service or repair under this limited warranty, the owner will be responsible for all costs of travel, meals, lodging and other incidental expenses of JBT LEKTRO, Inc.

Notwithstanding the foregoing, no warranty is made with respect to tires, batteries, other wear items, and any parts or accessories used with or incorporated into the Equipment which were not manufactured by JBT LEKTRO, Inc. JBT LEKTRO, Inc. agrees to assign to each purchaser of Equipment all of its rights under any warranties given by the manufacturers of such parts and accessories.

This limited warranty sets forth all obligations of JBT LEKTRO, Inc. in the event defects appear in the Equipment. In the event repair or replacement of Equipment is in JBT LEKTRO, Inc.'s judgment impossible, JBT LEKTRO, Inc.’s liability is limited to the amount it actually received for such Equipment. JBT LEKTRO, Inc. shall in no event be liable to any party for lost profits, diminution of good will or any other incidental or consequential damages, or loss of use, or any other commercial losses, however occasioned.

B.2 RECEIVING, SETUP, AND RUN-IN

This section describes how to set up your new LEKTRO 88/89 Series tractor and how to properly run it in to help prolong its useful life while ensuring maximum battery usability and minimizing future maintenance needs.

WARNING

ALL PERSONNEL RESPONSIBLE FOR OPERATING, MAINTAINING, AND/OR REPAIRING THE LEKTRO 88/89 SERIES TRACTOR MUST READ, UNDERSTAND, AND COMPLY WITH ALL APPLICABLE COMPONENT SUPPLIER INSTRUCTIONS, WARNINGS, AND SAFETY DATA SHEETS (SDS) CONTAINED IN THE SERVICE MANUAL BEFORE PERFORMING ANY OF THE TASKS DESCRIBED IN THIS SECTION.

B.2.1 RECEIVING CHECK

When you receive a new LEKTRO 88/89 Series tractor:

1. Inspect the tractor thoroughly before accepting it from the shipper.
2. Remove all wrappings and look for structural and component damage, battery electrolyte spill corrosion in the battery compartment and any misaligned components caused by tie-down stress, vibration, and/or impact during shipping.
3. Verify that all attachments, adapter, and charger items detailed in the *LEKTRO Component Location For Shipping Confirmation* list are on hand and checked off before signing.
4. Check the packing list for any additional pre-operation instructions that are not included in the *Operation Manual*.
5. Pull the Main Power Disconnect knob to the ON position, turn the Motive Power Switch ON, and then verify that all primary and motive controls described in *"COMPONENTS & CONTROLS" on page 4-1* are functioning properly and to verify that there is no hidden transportation damage.
6. In the event of transportation damage or loss, it is your responsibility to file a claim with the shipping company. Failure to do so could result in the shipping company denying your claim.

B.2.2 POST-DELIVERY INSTALLATION

88/89 Series tractors may ship with some or all external components removed, depending on the mode of transport, packaging needs, customer instructions, and shipping exposure protection. If your 88/89 shipment includes any removed external components, then refer to the appropriate section(s) in the 88/89 Series *Service Manual* for step-by-step instructions.

B.2.3 BATTERIES

Inspect the battery compartment(s) and batteries, as follows:

1. Check the battery compartment for signs of electrolyte overflow.
2. If any electrolyte has overflowed, then flush the tops and surrounding battery compartment surfaces with a solution of 1 lb. baking soda dissolved in 1 gallon of water (0.5 kg. to 4 liters).
3. Refer to the Batteries section of the *88 Series tractor Service Manual* or *89 Series tractor Service Manual* for step-by-step instructions on how to check and fill the electrolyte levels in all battery cells.
4. Charge the batteries to their 100% charge level.

CAUTION

DISCHARGING THE BATTERIES BELOW 50% DURING THE FIRST FIVE CHARGING CYCLES MAY REDUCE BATTERY CAPACITY AND/OR BATTERY LIFE.

B.2.4 CHARGER INSTALLATION

Refer to one or both of the following resources for detailed charger installation instructions:

- Batteries section in the 88/89 Series *Service Manual*.
- Charger manual attached to the charger.

You will need to:

- Verify that the adjustable Input Voltage tap setting matches your power source.
- Set the Hour switch. For heavy-use applications, JBT LEKTRO, Inc. recommends setting this to 12 hours.

B.2.5 TRACTOR RUN-IN:

Perform all of the following checks after the first 30 hours of tractor use:

- Open all access panels and decks.
- Check for loose bolts, chafe points, and loose wire connections.
- Check all hydraulic line connection fittings for leaks.
- Check the hydraulic reservoir level and add fluid, if required. Refer to the Hydraulics section in the 88/89 Series *Service Manual* for step-by-step instructions.

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B.2.6 INITIAL SAFETY & TRACTOR CARE PREPARATIONS

- Review *"COMPONENTS & CONTROLS" on page 4-1*, *"BASIC OPERATIONS" on page 5-1*, and any Alert Bulletins included with your tractor.
- Copy the Safety Data Sheet (SDS) for tractor Motive Batteries and (if equipped) GPU Batteries, and then place/post in a designated employee-accessible place per applicable industrial safety regulations.
- Implement an Operator Pre-Use Safety Check program using the procedure described in *"PRE-USE SAFETY CHECKS" on page 5-2* and the form provided in *"OPERATOR PRE-USE SAFETY CHECKLIST" on page A-1*.
- Implement an Inspection and Service Schedule per the Service Manual.
- Set up a Spare Parts Stock per the recommendations in the Service Manual that is tailored to your operations, with a focus on having spare Strut Straps and a Winch Strap/Winch Hook assembly on hand for either:
  - > Unscheduled replacement.
  - > The mandatory three-month replacement schedule.
- For optimum battery performance and life span, never deep-discharge the Motive Batteries and (if equipped) GPU Batteries to deep discharges below a 20% charge level. New batteries require at least 30 discharge / recharge cycles to build up full rated endurance and performance. New batteries will also deplete more quickly under load, especially as the charging level drops below 50%.
- The battery manufacturer recommends not allowing the batteries to discharge below 50% for the first 15 charge cycles.
- Review *"CHARGING THE BATTERIES" on page 5-16* for information on how to maintain the batteries while maximizing battery life, including appropriate charging protocols.

88/89 SERIES AIRCRAFT TOWING VEHICLE OPERATION MANUAL

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