COMMANDER 30*i*

Aircraft Container and Pallet Loader

Technical Specification

OSHKOSH™ AEROTECH

COMMANDER 30i

Technical Specification

Version 2
Edition 4

This technical specification supersedes all editions and revisions prior to:

April 2024
English Language

For use with equipment serial numbers
C30i24001 and subsequent with
specifications CS-1102-YY-NNNN

This technical specification includes the following options:

- Deutz Diesel Tier 3 / Stage IIIA
- Cummins Diesel Tier 4 / Stage V
- Electrical Power Unit
- CE Required Options
- Bridge Tilt
- Crew Lift
- APD System (Addendum)
- Key Reset Panel (with (APD)
- Hand Throttle

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TECHNICAL SPECIFICATION

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Section 1. Description

1. GENERAL

NOTE: REFER TO CHAPTER 1, SECTION 3 FOR EMERGENCY PROCEDURES.

The Commander 30i, Aircraft Container and Pallet Loader is a single-operator, self-propelled vehicle capable of lifting and conveying cargo. It can handle containers or pallets and service a variety of aircraft. Refer to Figure 1.

Design concept utilizes the latest in technology and incorporates modular power units, improved conveying system, electrical systems and hydraulic components. Power units can be a variety of diesel engines or electric motor. The electrical system is PLC controlled and the hydraulic system is closed-center and load-sensing. Two hydraulic motors power the planetary drive wheels to propel the vehicle.

There is an electric power module option in place of the standard diesel engine. All functions are the same, except for the power module. The electrical power module contains a charge port for use with external chargers.

For the Commander 30i Electric, references for 'Electrical Units' are provided for items pertaining only to them. When no reference is provided, items would apply to both Diesel and Electrical units.

The Commander 30i vehicles are available in different configurations. The various configurations and features available are described in this section.

2. CAPABILITIES

The minimum height of the platform facilitates transfer of cargo from surface vehicles. The turning radius and precision positioning capability of the propulsion system provide safe and precise control for positioning the vehicle.

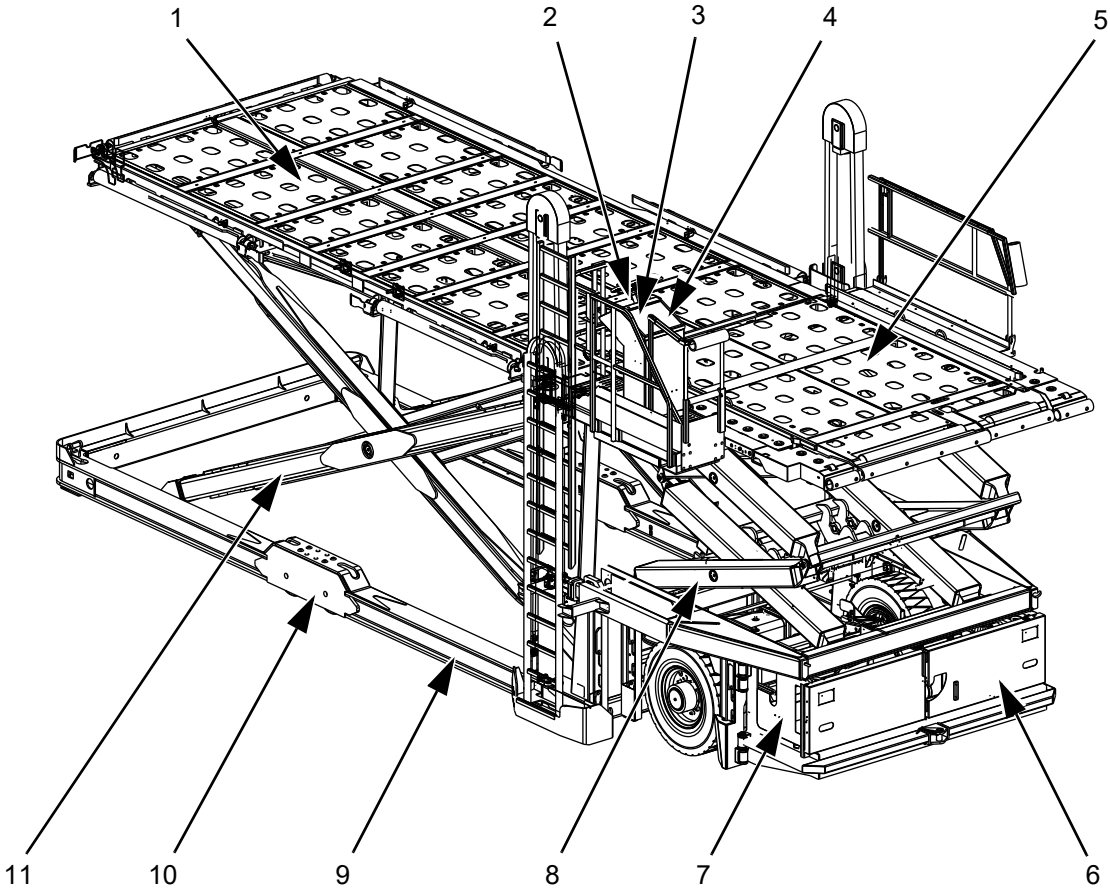
3. MAJOR COMPONENTS

A. CHASSIS

Refer to Figure 1.

The chassis is a rigid steel framework on which all other components are mounted. Two steerable drive wheels support the chassis at the front and two bogie wheel assemblies support the rear of the chassis. The drive wheels propel the chassis hydraulically by means of two planetary gear hubs.

The bogie wheel assemblies are supplied with hydraulic height adjustment. Brakes and steering are also hydraulically powered. During cargo transfer, the chassis is supported by stabilizers that are hydraulically controlled to provide a stable platform for cargo transfer.

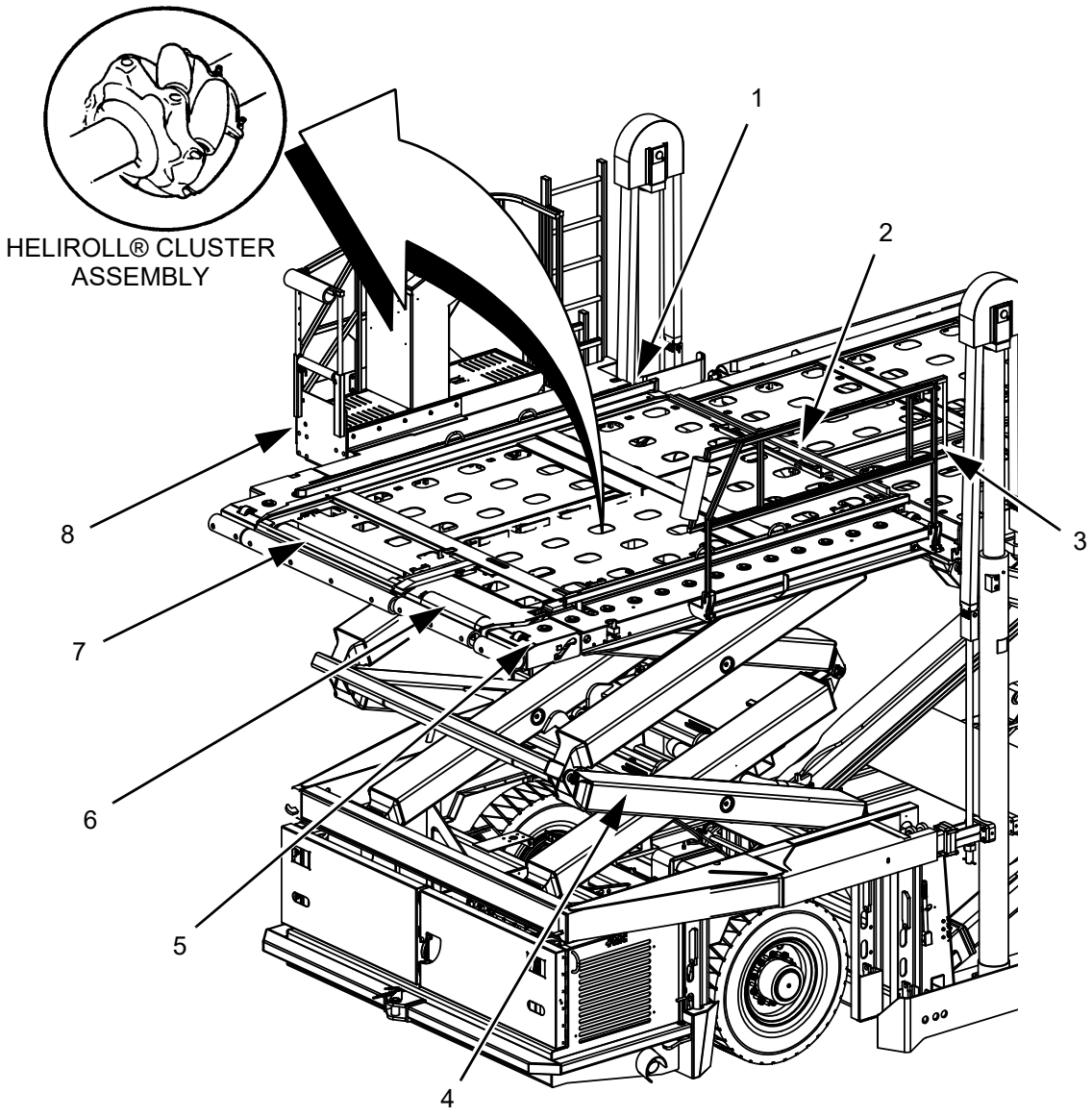


1. PLATFORM
2. DRIVING PANEL
3. EMERGENCY STOP (E-STOP)
4. OPERATION PANEL
5. BRIDGE
6. POWER MODULE
7. POWER MODULE (MAIN) CONTROL PANEL (GAUGES)
8. BRIDGE SCISSORS
9. CHASSIS
10. BOGIE WHEELS
11. PLATFORM SCISSORS

Figure 1
COMMANDER 30I, AIRCRAFT CONTAINER AND PALLET LOADER

B. BRIDGE

A scissors assembly lifts and lowers the bridge, powered by two hydraulic cylinders. The cargo convey system allows to convey and move fore and aft, and side to side cargo loads on the bridge. Refer to Figure 2 and Figure 3.



1. SIDE GUIDES (2)
2. LOAD STOP
3. LEFT HANDRAIL
4. SCISSORS ASSEMBLY
5. FOLDING WING
6. FOLDING WING (STANDARD)
7. CYLINDRICAL ROLLER
8. OPERATOR'S CAB

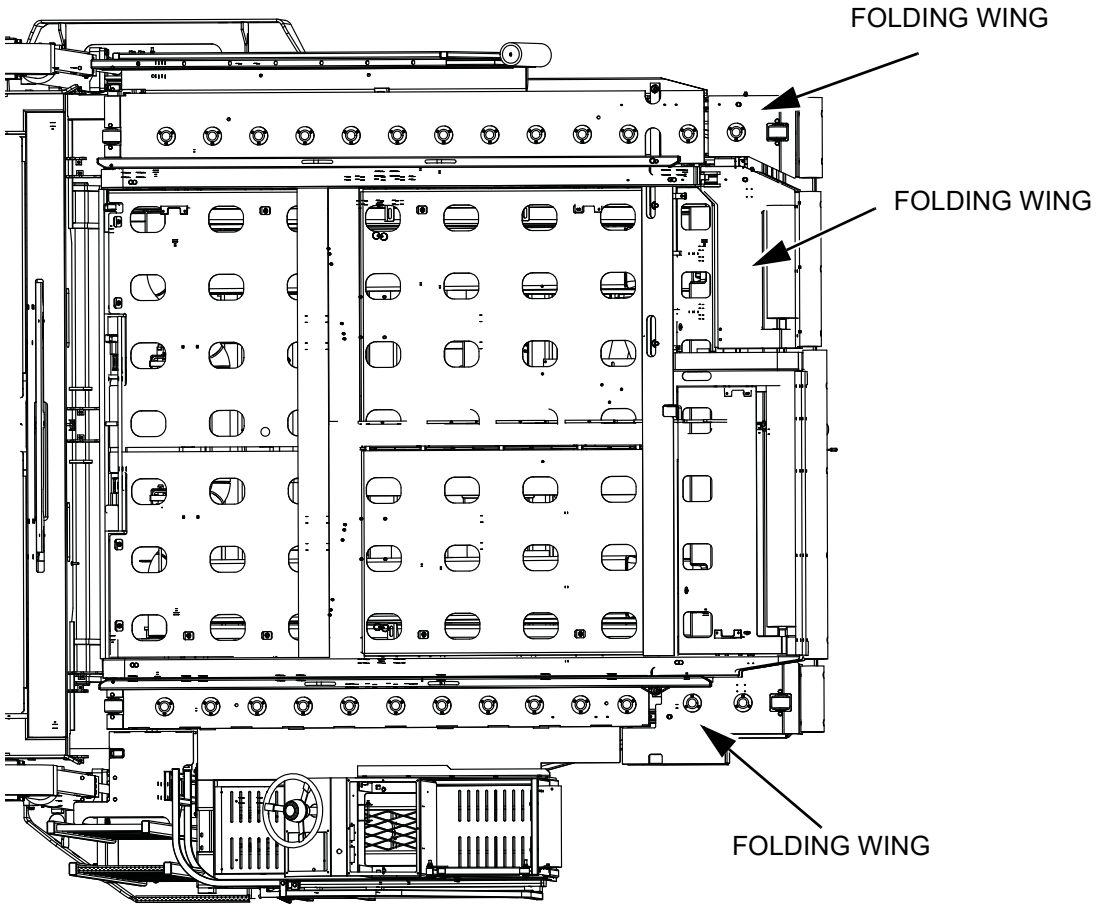
Figure 2
BRIDGE COMPONENTS

Cargo convey is accomplished by hydraulic cylindrical roller and HeliRoll® cluster assemblies, and its direction is controlled by joystick switches on the operator's control panel. Hydraulic motors provide the necessary power through sprockets and roller chains.

When cargo is conveyed forward or rearward, all roller assemblies rotate in the same direction. For movement to either side, some roller assemblies are driven in one direction while others are driven in the opposing direction. The various combinations of rotation allow the operator to control cargo position without being required to manually shift it.

One guide, hydraulically adjustable from side to side, assist in aligning cargo for transfer onto the aircraft. The front of the bridge may be equipped with folding wings so that the vehicle can be used to transfer cargo to or from aircraft with varying door widths.

A load stop is located at the rear of the bridge. It is normally in the extended (up) position, except when the platform is at the same level as the bridge. The stop is mechanically operated and automatically prevents cargo movement off the bridge unless the platform is in a position to accept the cargo. A powered cylindrical roller at the front of the bridge supports and transfers cargo as it is conveyed on or off the bridge. A fixed or hinged and telescoping handrail is installed on the opposite side of the bridge from the cab.



FOLDING WINGS ARE HYDRAULICALLY RAISED AND LOWERED

Figure 3
BRIDGE, FIXED AND FOLDING WINGS

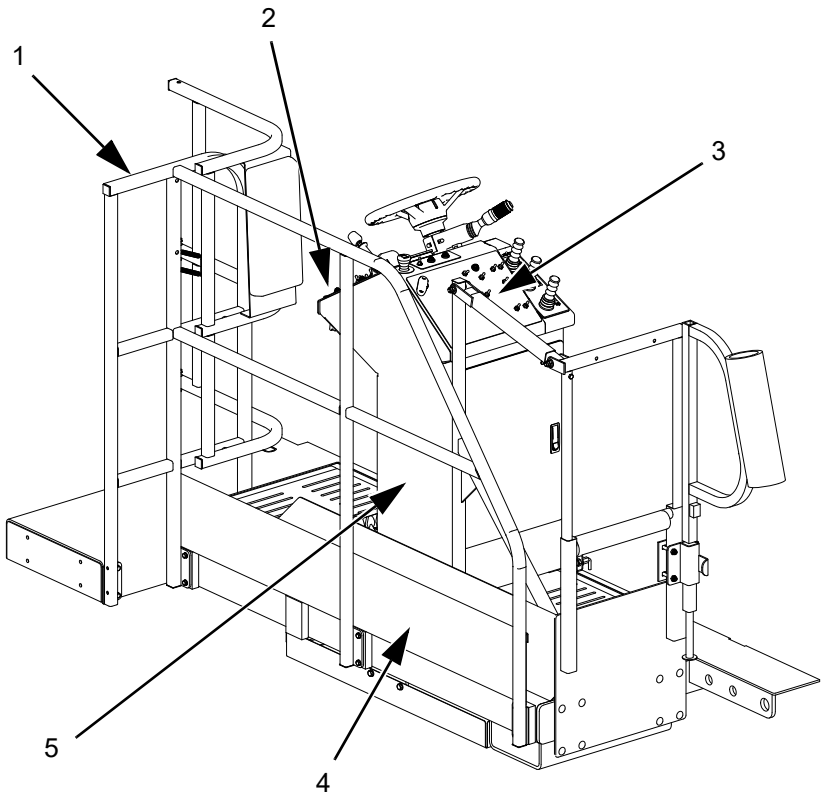
C. OPERATOR'S CAB

The operator's cab contains all controls required to drive the vehicle and transfer cargo. Its design for operation while standing up offers good visibility, as well as safe and convenient access to vehicle and aircraft controls. The operator's cab, hydraulically operated, is adjustable fore (extend) and aft (retract) to allow the operator to gain access to aircraft controls during cargo transfer. Refer to Figure 4.

Controls and indicators used to drive the vehicle and position cargo are located on two panels on the operator's cab. Indicators are placed on the driver's panel so that operation of the vehicle can be monitored. Controls for propulsion speed and direction are also included. Located on the operator's panel are the switches used to position and transfer the cargo to raise and lower the bridge and platform, and to operate the side and rear stops. Refer to Chapter 1, Section 2, “Operation” for driving and operation panels.

An emergency pump switch is located on the driver’s console in the cab. It is used in case of engine failure to supply hydraulic oil and control power so that the platform, bridge can be lowered and stabilizers can be raised. This pump must not be operated for more than 60 seconds at a time. At least ten minutes must be allowed for cooling time between use periods.

An accelerator pedal that proportionally controls the speed of the vehicle is provided. The proportional control feature allows for slow moving and precise positioning of the vehicle when the aircraft is approached. A brake pedal allows to actuate on the hydraulic brakes. Handrails are an integral part of the platform for operator safety during operation of the vehicle.



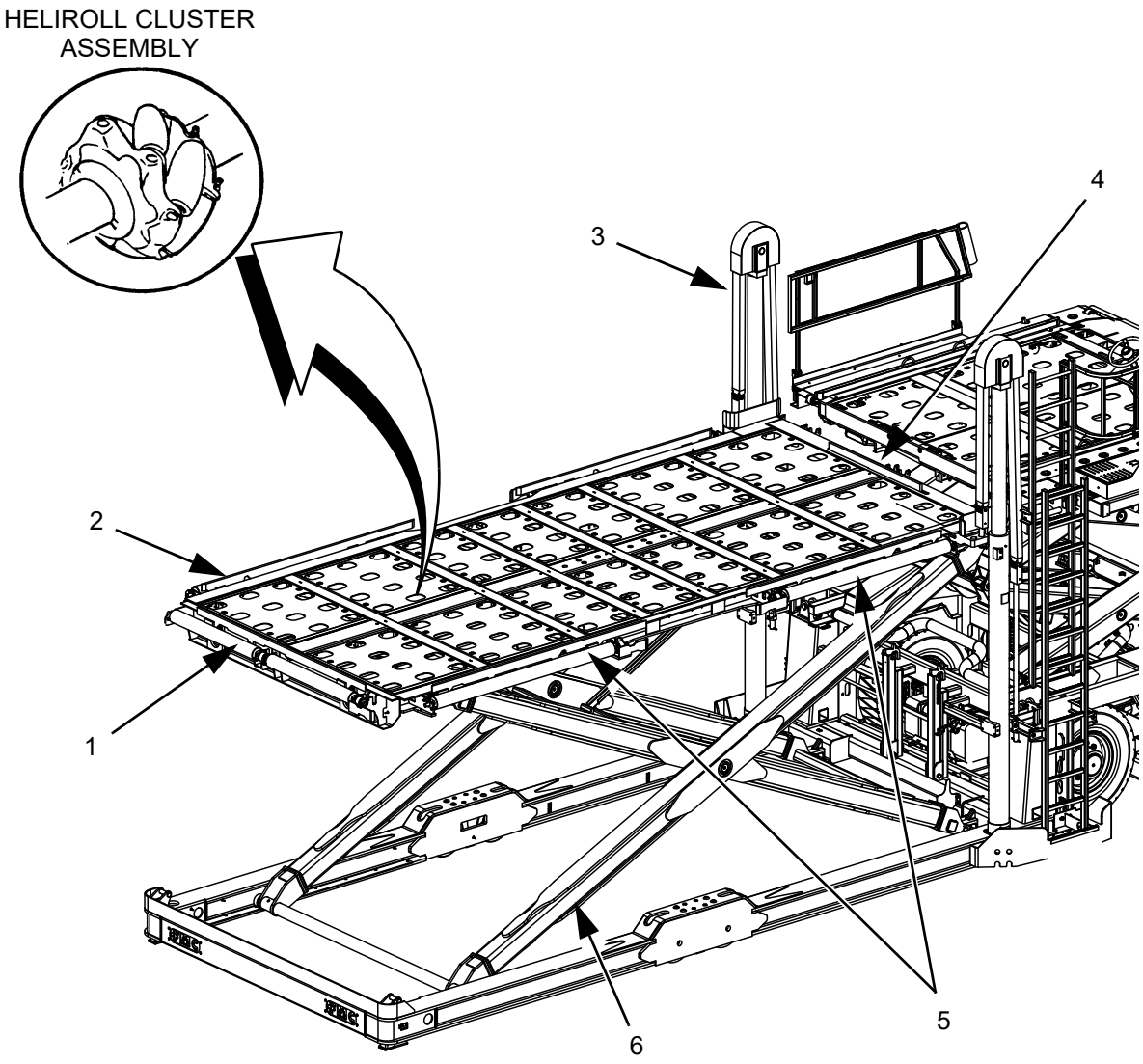
1. HANDRAIL
2. DRIVING PANEL (DRIVING SIDE)
3. OPERATION PANEL (OPERATION SIDE)
4. OPERATOR’S CAB
5. OPERATOR’S CONSOLE

Figure 4
OPERATOR’S CAB COMPONENTS

D. PLATFORM

Refer to Figure 5.

The platform, supported by a scissors assembly, is raised and lowered by two hydraulic cylinders.



1. REAR ROLLER
2. SIDE STOP
3. LIFT CYLINDER
4. LOAD STOP
5. SIDE ROLLERS
6. SCISSORS ASSEMBLY

Figure 5
PLATFORM COMPONENTS

With the offered configuration of the platform, a combination of rollers, ball mats and HeliRoll® rollers are used for conveying cargo. Hydraulically operated stops prevent unintentional off loading of cargo. The load stops can be automatically or manually operated. Proximity switches prevent manual operation when the platform is not in the proper position for loading or unloading.

Proximity switches on the bridge must also sense correct position of the platform before cargo can be transferred to or from the platform.

The platform configuration allows the operator to side shift and rotate containers or pallets on the platform.

E. POWER MODULE

The power module is located at the front of the vehicle. It is a modular unit that is hinged on the right side of the vehicle. A single bolt on the left side can be removed to permit the module to swing out for complete access to components when maintenance is required. A power panel on the right side of the module contains controls and indicators used to start and operate the power unit at ground level.

F. DIESEL POWER MODULE (STANDARD)

A diesel engine power unit is standard as the primary source of power for the vehicle, with a hydraulic pump for all functions and services. Refer to Figure 6.

G. ELECTRICAL POWER MODULE (OPTIONAL)

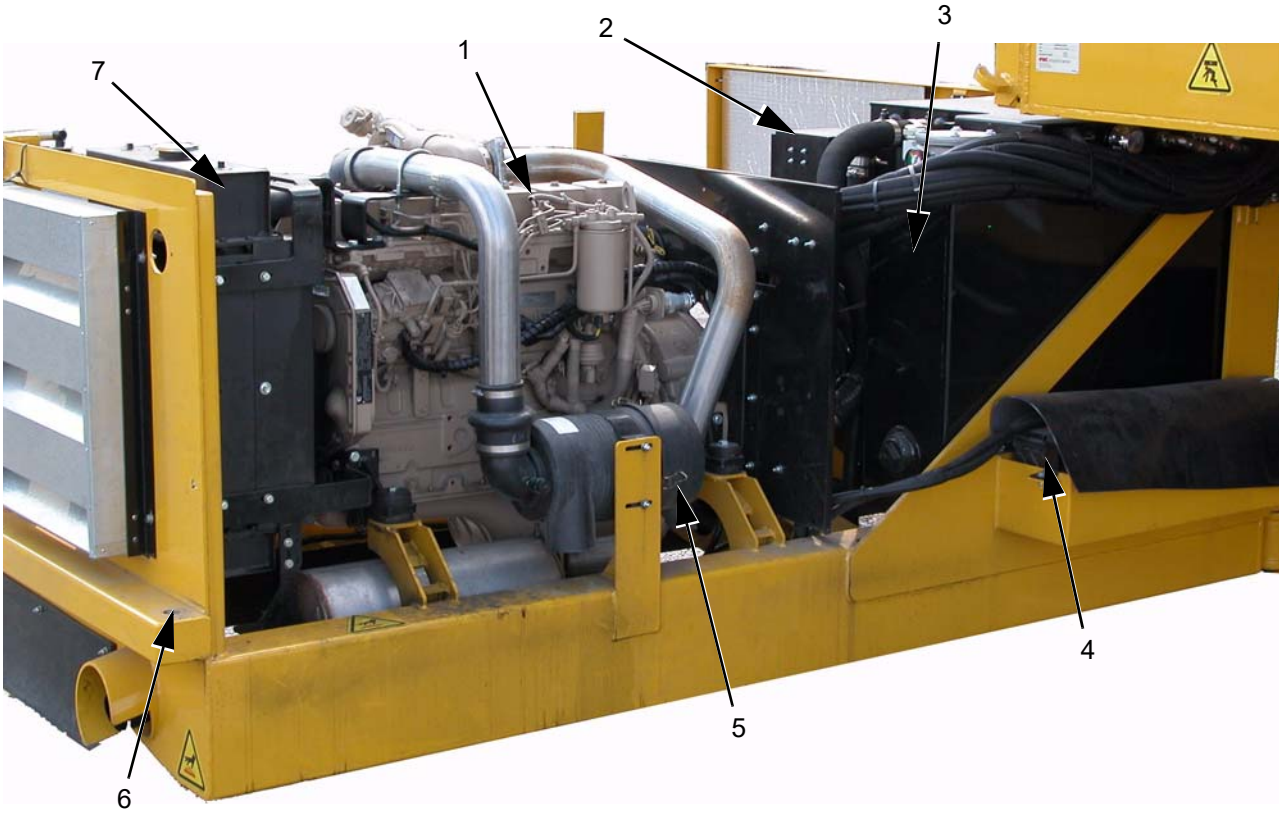
An optional electrical power unit is available in place of the standard diesel engine. All the vehicle functions remain the same as with the diesel power module. Refer to Figure 7.

The electrical power module contains a single charge port input to connect to an external charger. A dual-port input is available as an option for faster charge.

The charge port connection provides charging power to the batteries. The unit cannot be operated while it is plugged in and charging. The ignition circuit is automatically turned off when the charge port door is open.

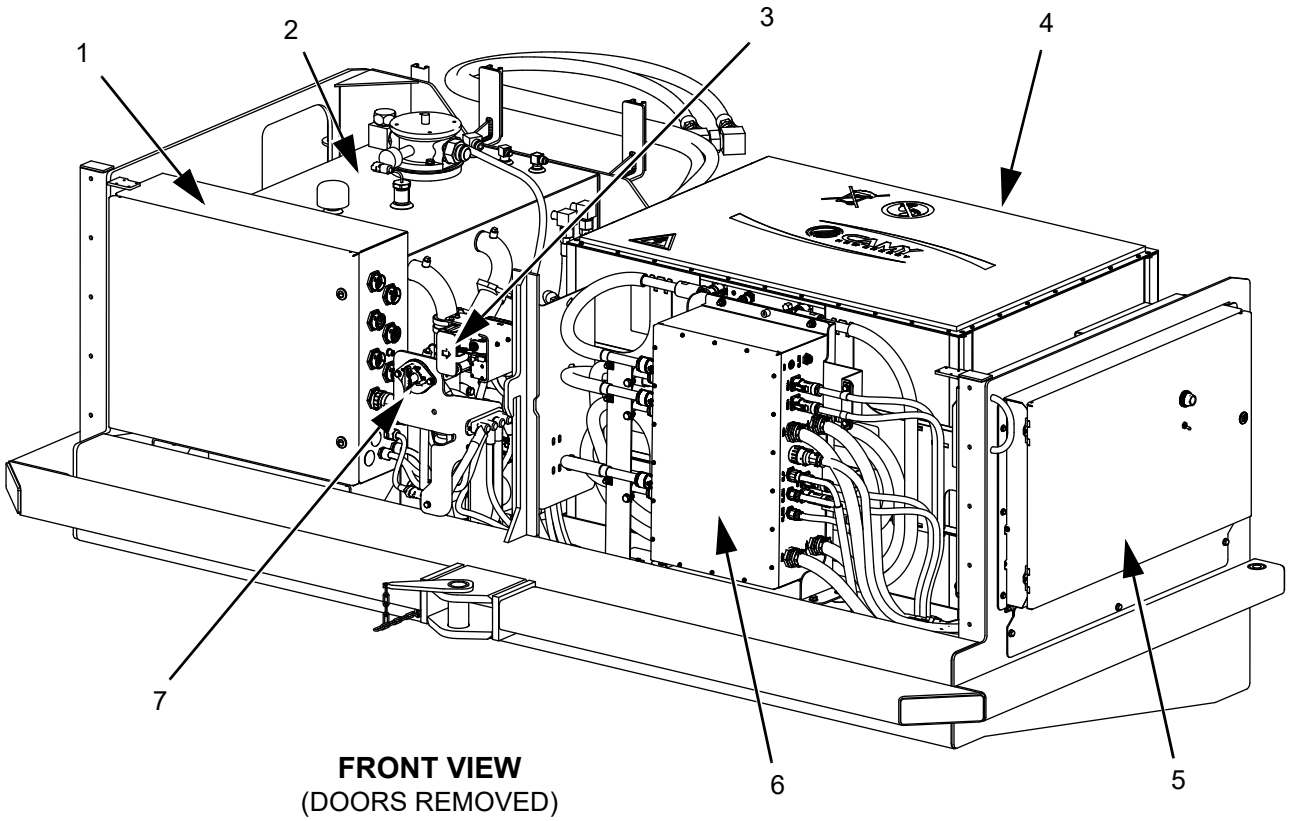
Two motor controllers for two separate electric motors, each coupled with a hydraulic pump, provides the power to the hydraulic circuits on the vehicle.

There will be some limitation on the duty cycle of this vehicle based on the on-board battery capacity. Please consult with Oshkosh AeroTech on drive and operate capabilities.

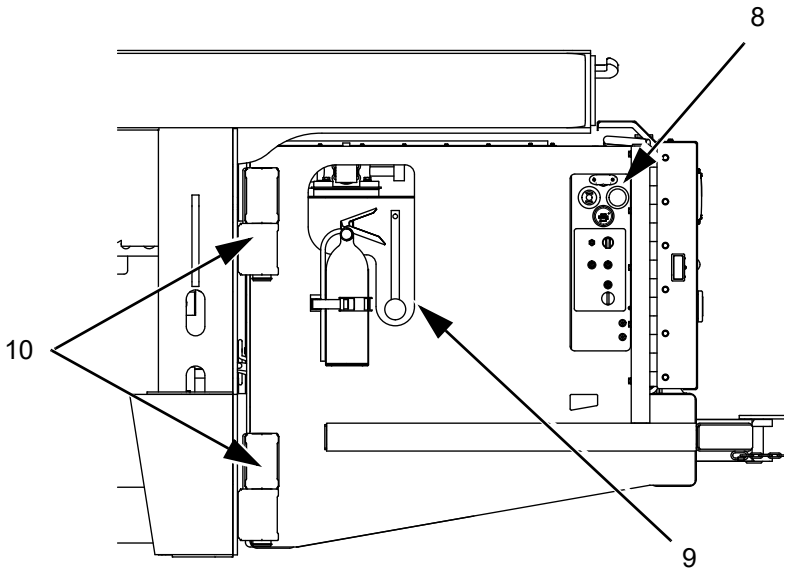


1. DIESEL ENGINE
2. MAIN ELECTRICAL PANEL
3. HYDRAULIC RESERVOIR
4. 24 VDC BATTERY BANK
5. AIR CLEANER
6. TEE BOLT HOLDER
7. RADIATOR
8. GAUGES AND START PANEL (POWER MODULE PANEL)
9. HYDRAULIC FLUID LEVEL AND TEMPERATURE GAUGES
10. MODULE HINGES

Figure 6
DIESEL POWER MODULE



FRONT VIEW
(DOORS REMOVED)



RIGHT SIDE VIEW

1. MAIN ELECTRICAL PANEL
2. HYDRAULIC RESERVOIR
3. BATTERY CHARGE PORT
4. HIGH-VOLTAGE BATTERY
5. MOTOR CONTROLLER
6. CONVERTER
7. 24V BATTERY CUT-OFF SWITCH
8. GAUGES AND START PANEL (POWER MODULE PANEL)
9. HYDRAULIC FLUID LEVEL AND TEMPERATURE GAUGES
10. MODULE HINGES

Figure 7
ELECTRICAL POWER MODULE

H. AXLES AND WHEELS

The front axle consists of two wheel drive hubs, hydraulically powered and integrated with hydraulic steering. Front tires are solid type.

The rear axle consists of two sets of bogie wheels with integrated height adjustment cylinders, which hydraulically lift and lower the load platform. Bogie wheels are not powered solid type and do not drive the vehicle.

I. BRAKES

Service brakes are hydraulic and act on the front wheels only while parking brake is spring applied and hydraulically released (SAHR). The vehicle has also hydrostatic braking action on deceleration.

J. HYDRAULIC SYSTEM

The vehicle is equipped with a closed-center, load-sensing hydraulic system. It provides hydraulic power for the cargo transfer, raising and lowering the bridge and platform, proportional propulsion, steering and braking, and operation of the various guides for safe cargo handling. A dynamic braking feature is also incorporated into the hydraulic system to provide smooth deceleration when the operator releases the accelerator.

Solenoid valves control fluid flow at correct pressure to operate the vehicle's hydraulic components. Check valves prevent load-bearing hydraulic cylinders from retracting if hydraulic pressure is not properly maintained in the system. An electrically driven emergency pump is included to allow the operator to perform emergency procedures if the power unit or main hydraulic pump should fail.

K. ELECTRICAL SYSTEM

A 24 VDC electrical system is utilized in the vehicle to power all components, including electro-hydraulic valves, lights and indicators, and other electrical accessories. Two heavy-duty 12 VDC batteries, connected in series to provide 24 VDC to the system.

On standard diesel powered units, the 24 VDC system provides power for the engine ignition and starter. An engine driven alternator maintains battery charge and system load requirements.

On optional electrical powered units, high-voltage batteries provide current for the electric motors, and power output for charging of the 24 VDC system batteries.

NOTE: REFER TO CHAPTER 1, SECTION 4, “SPECIFICATIONS” FOR BATTERY SPECIFICATION REQUIREMENTS.

The electrical control system utilizes a combination of common relays and PLC controllers. Wherever possible, all control logic functions are performed by the PLC's. Relays are utilized for switching of higher current circuits. Individual circuit protection is achieved by the use of automotive style blade fuses. Certain high current circuits are protected by manual reset circuit breakers or automotive style mega-fuses. Operator controls consist of a series of environmentally sealed toggle switches or joysticks mounted on easy to access, lighted, and permanently marked control panels. With exception of the control panels, cab mounted PLC, and PLC1 and PLC2 which are mounted on the frame with a cover, all electrical components are housed in an easy to access, environmentally sealed, main electrical panel enclosure located behind the power module doors.

System troubleshooting can be performed by anyone with a basic understanding of automotive electrical systems and schematics. Easy to understand ladder logic schematics, detailed service manuals and convenient test points greatly simplifies the troubleshooting process. Additionally, a display module mounted inside the main electrical panel, will provide a complete system status indicating the presence of operator selected input signals and controller output signals.

L. MISCELLANEOUS COMPONENTS

(1) Lights

Sealed beam headlights, front lights and rear tail lights are supplied for night operations. Rear reverse lights are supplied to indicate the vehicle is in reverse gear and light the ground area around the unit. Front and rear turn signals and side marker lamps are included with the unit. Optional LED headlights are available.

(2) Horn

An electrical automotive type horn is included.

(3) Audible Alarm

An alarm sounds when the vehicle is propelled in reverse, or the platform or bridge are lowering, as well as when chassis and stabilizers are lowered.

(4) Hydraulic Bogie Wheels

Hydraulically powered bogie wheels assemblies increase the ground clearance at the rear of the chassis while propelling.

(5) Handrail

Folding and extendable handrail located on left side of forward bridge for added operator protection.

(6) Beacons

Flashing beacons are standard mounted on the operator's cab, under the platform, and at the bottom of the bridge.

M. AIRCRAFT PROXIMITY DETECTOR (APD) SYSTEM (OPTIONAL)

APD is a configurable system that makes use of various optional components such as radars, contact bumpers, and proximity sensors around the vehicle for object proximity detection.

Activated when the vehicle is within a pre-defined distance range from aircraft with bridge raised, transferring acceleration control from foot pedal to hand throttle control lever. Proximity detection through radar system and bump sensors at the front of the vehicle, and proximity sensors around the vehicle. Refer to Figure 8.

Refer to “Addendum: Aircraft Proximity Detector (APD) (Optional)”.

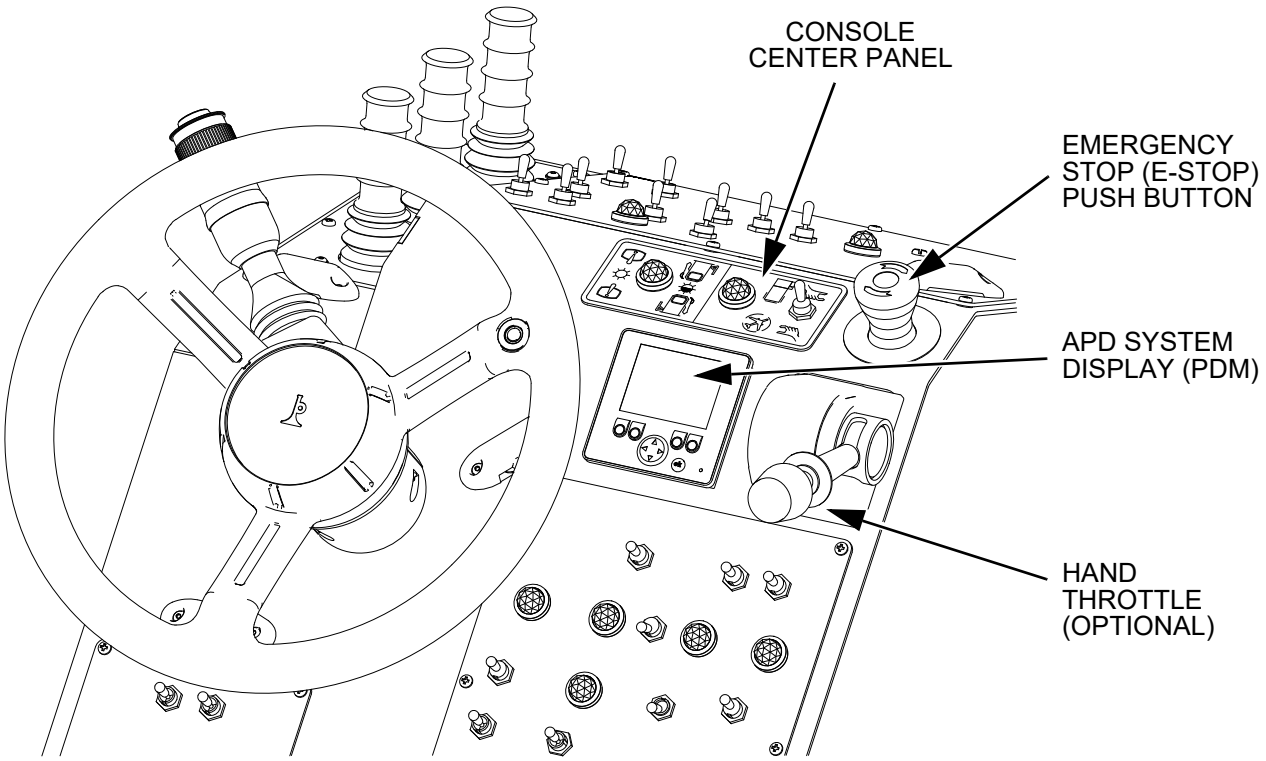


Figure 8
APD OPERATOR'S PANEL

4. ADDITIONAL FEATURES AND OPTIONS

- Bridge tilt allows the angle of the front edge of the bridge to be adjusted to provide flexibility for uneven ramp conditions and to align with the aircraft doorway.
- Battery disconnect switch provides isolation of the positive wire from the 24 VDC engine batteries. The lever must be installed and turned ON in order for the vehicle to work.
- Hydraulic manually operated emergency pump.
- Platform crew lift.
- CE package.

Section 2. Specifications

1. GENERAL

This vehicle specification outlines the product definition of the Commander 30i offered by Oshkosh AeroTech, Ground Support Equipment.

Vehicles in this line are equipped with diesel powered engines driving a tandem of hydraulic traction and services pumps. The vehicle is hydraulically driven providing propulsion to the front wheels.

NOTE: MAINTENANCE SPECIFICATIONS ARE CONTAINED IN CHAPTER 2, SECTION 4. ALL REFERENCES TO GALLONS ARE FOR U.S. GALLONS.

NOTE: VEHICLE SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE, DUE TO DESIGN IMPROVEMENTS AND CUSTOMERS' SPECIFIC REQUIREMENTS.

2. MODEL DEFINITION

Vehicle name:	Commander 30i, Aircraft Container and Pallet Loader
Designation:	Commander 30i, Commander 30ie
Vehicle type:	Aircraft Container and Pallet Loader
Power unit:	Diesel (standard), Electrical (optional)
Gross vehicle weight:	Refer to 'GENERAL DIMENSIONS AND WEIGHTS'.
Maximum cargo load:	Refer to 'OPERATING CHARACTERISTICS'.

3. AIRCRAFT ACCOMODATION

The Commander 30i can service a wide variety of lower and main deck aircraft intended for containerized cargo, with different door still heights, including main decks. The vehicle can handle a variety of cargo with Unit Load Devices (ULD's) comprised of flat bottom. Refer to 'General Performance'.

4. OPERATING CHARACTERISTICS

General Performance

- Bridge lift capacity (maximum) . . . . . 7500 kg (16 500 lb.)
  15 000 kg (33 000 lb.) optional
- Platform lift capacity (maximum) . . . . . 15 000 kg (33 000 lb.)
- Load capacity . . . . . Up to two pallets
  3.18 m x 2.44 m (125 in. x 96 in.)
- Maximum speed . . . . . 11 km/h (7 mph)

- Wind speed (maximum during operation). . . . . 73 km/h (45 mph)
- Wind speed (withstand-stability). . . . . 161 km/h (100 mph)
- Transfer speed . . . . . 18.30 m/min. (60 fpm)

Lift Speeds

- Bridge (main deck capable) . . . . . 4.50–5.50 m/min. (15–18 fpm)
- Platform . . . . . 15.20 m/min. (50 fpm)

Minimum Transfer Height (to roll plane)

- Bridge (standard loader). . . . . 2007 ± 25 mm (79 ± 1 in.) or 1981–2032 mm (78–80 in.)
- Bridge (heavy loader) . . . . . 2311 ± 25 mm (91 ± 1 in.) or 2286–2337 mm (90–92 in.)
- Platform (fully lowered). . . . . 496 mm (19.5 in.) approx.

Maximum Transfer Height (to roll plane)

- Bridge (main deck capable) . . . . . 5639 ± 50 mm (222 ± 2 in.) or 5588–5690 mm (220–224 in.)
- Platform (fully raised) . . . . . 5588 mm (220 in.) approx.

5. GENERAL DIMENSIONS AND WEIGHTS

A. VEHICLE WEIGHT

- Standard unit* . . . . . 29 100 kg (64 100 lb.)
- Electrical unit* (Optional) . . . . . 29 900 kg (65 900 lb.)

NOTE: *MINIMUM TOTAL WEIGHT. TOTAL WEIGHT WILL BE DEPENDING ON CONFIGURATION AND FEATURES SUPPLIED.

- Pressure on ground . . . . . 7590 kPa / 76 bar (1100 psi) (under normal operation and design load)

B. OPERATOR'S CAB WEIGHT CAPACITY

- Driving and Operation sides (each side) . . . . . 160 kg (350 lb.) maximum
- Total capacity (both sides) . . . . . 320 kg (700 lb.) maximum

C. GENERAL DIMENSIONS

- Total length. . . . . 11 196 mm (441 in.)
- Total width . . . . . 4629 mm (182 in.)

- Height (to highest point)
  - To top of inner ladder . . . . . 6655 mm (262 in.) (maximum)
  - To top of outer ladder . . . . . 3937 mm (155 in.) (minimum)
- Bridge width (between guides) . . . . . 3226 mm (127 in.) (maximum)
2489 mm (98 in.)
2261 mm (89 in.)
1600 mm (63 in.) (minimum)
- Platform length (between load stops) . . . . . 7041 mm (277 in.)
- Platform width (between guides). . . . . 3228 mm (127 in.)
- Wheelbase (to center of bogie wheels). . . . . 4944 mm (195 in.)
- Stopping distance (at full speed). . . . . 4.60 m (15.09 ft.) approx.

Track Widths

- Front axle . . . . . 2362 mm (93 in.)
- Rear axle (bogie wheels) . . . . . 3349 mm (132 in.)

Distance Between Stabilizers

- Inner stabilizers . . . . . 2845 mm (112 in.)
- Outer stabilizers . . . . . 3647 mm (144 in.)

Ramp Angles with Bogie Wheels Fully Retracted (Chassis Lowered)

- Approach angle 10º
- Break-over angle 2º
- Departure angle 1º

Ramp Angles with Bogie Wheels Fully Extended (Chassis Raised)

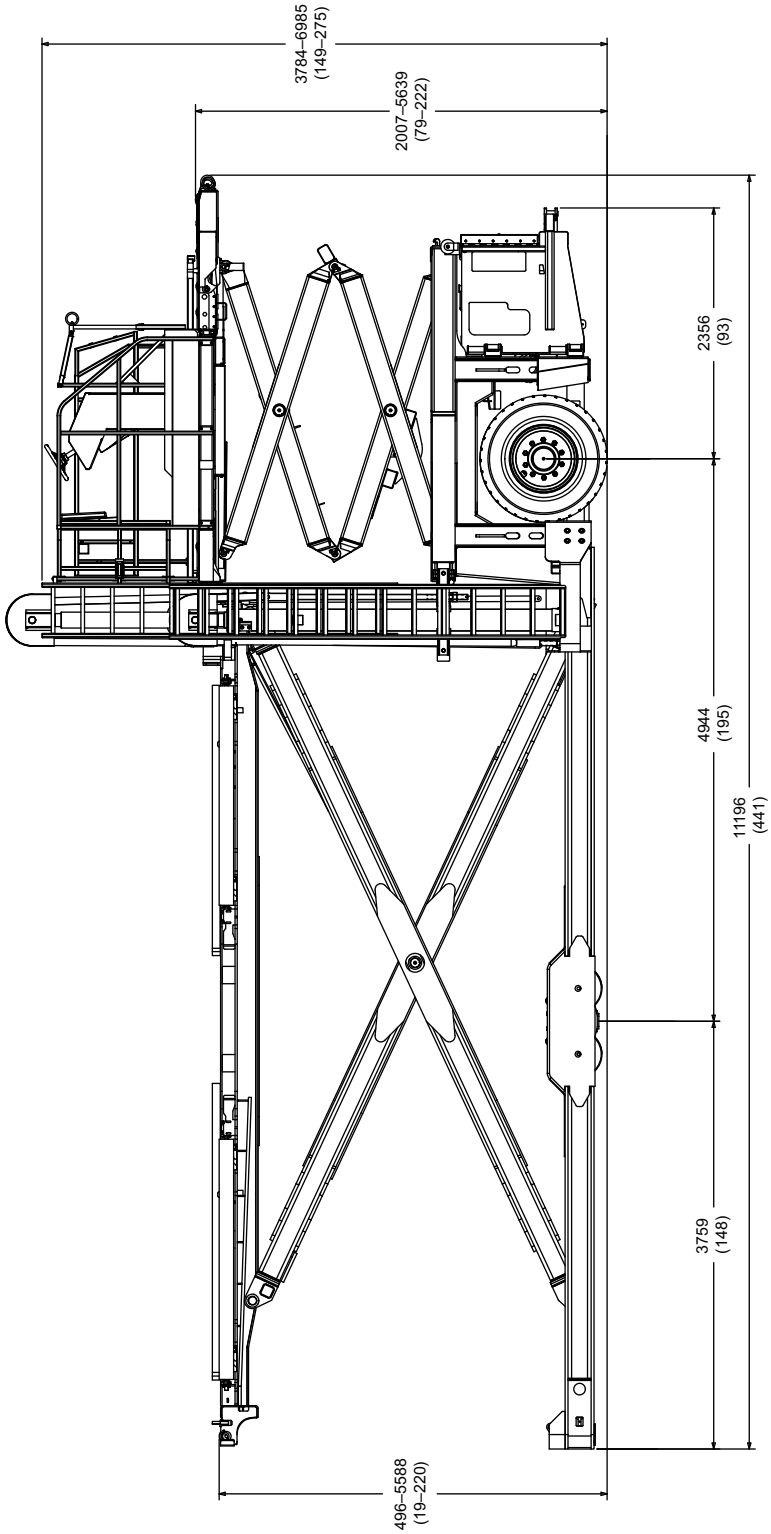
- Approach angle 9º
- Break-over angle 3º
- Departure angle 3º

Turning Radius

- Outermost front point (swept) . . . . . 10.83 m (35.54 ft.) approx.
- Exterior turn radius (outside of front wheel) . . . 9.20 m (30.18 ft.) approx.
- Interior radius (inner forward bogie wheel) . . . . 4.80 m (15.76 ft.) approx.
- Outer front tire angle (maximum) . . . . . 33.6º approx.
- Inner front tire angle (maximum). . . . . 41.2º approx.

NOTE: ALL DIMENSIONS ARE APPROXIMATE ONLY AND SUBJECT TO MANUFACTURING VARIANCES.

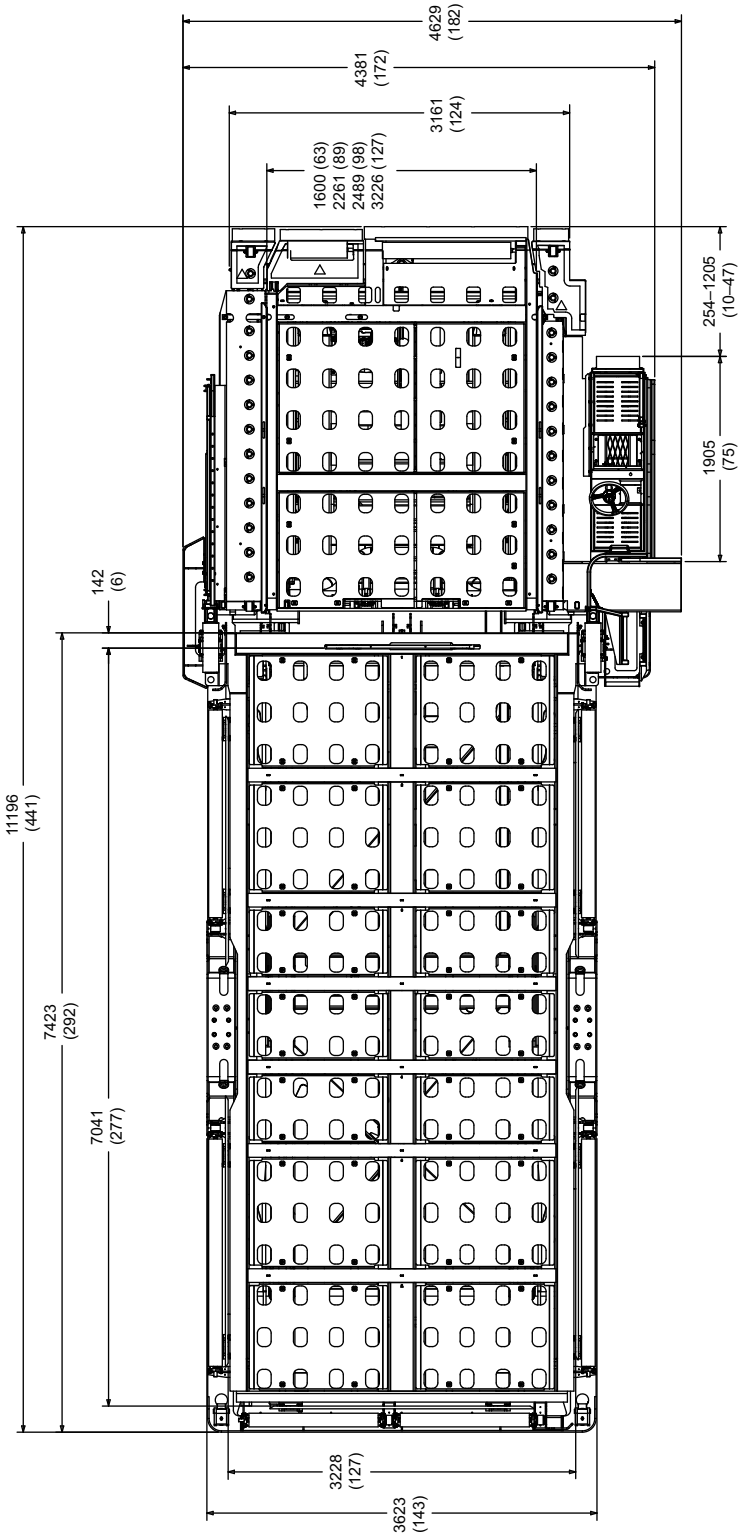
DIMENSIONS IN MILLIMETERS (INCHES)



NOTE: DIMENSIONS ARE APPROXIMATE ONLY AND ARE SUBJECT TO MANUFACTURING VARIANCES.

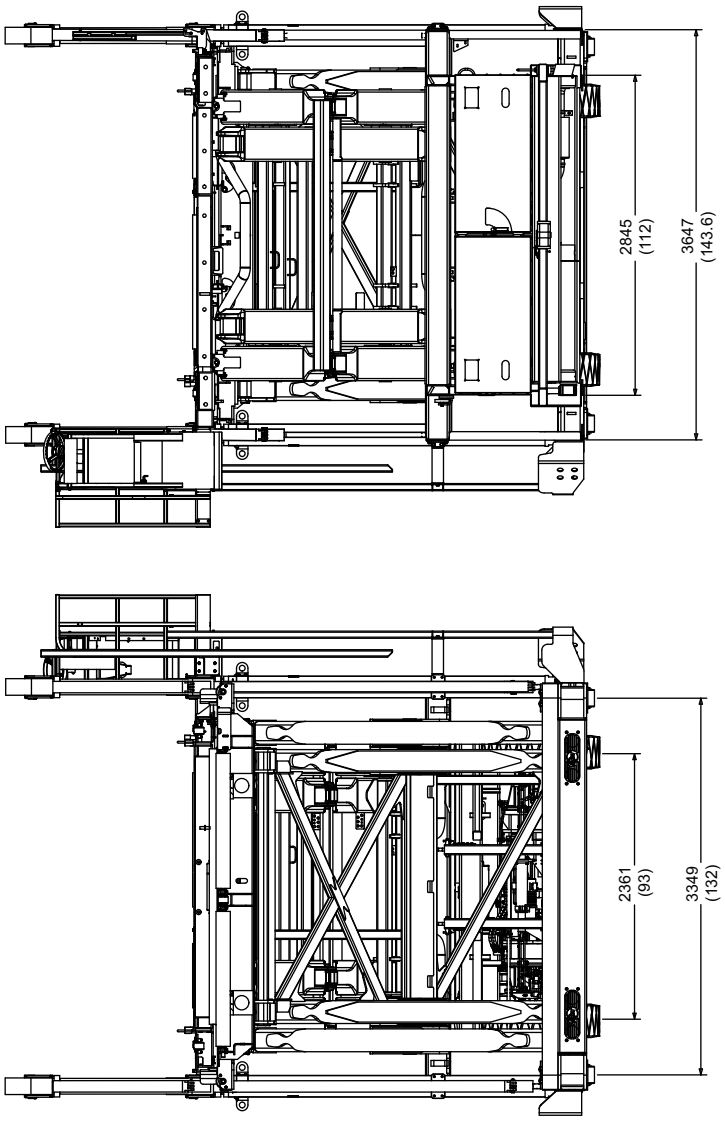
Figure 1
GENERAL DIMENSIONS

DIMENSIONS IN MILLIMETERS (INCHES)



NOTE: DIMENSIONS ARE APPROXIMATE ONLY AND ARE SUBJECT TO MANUFACTURING VARIANCES.

Figure 2
BRIDGE AND PLATFORM DIMENSIONS



DIMENSIONS IN MILLIMETERS (INCHES)

NOTE: DIMENSIONS ARE APPROXIMATE ONLY AND ARE SUBJECT TO MANUFACTURING VARIANCES.

Figure 3
VEHICLE TRACK WIDTHS AND STABILIZERS

6. POWER MODULES

A. ENGINE SPECIFICATIONS - DIESEL UNIT

TABLE 1 - ENGINE SPECIFICATIONS AND OPERATING RPM

Engine Model*	Low Idle (No Load)	Peak Torque**	Rated Power**
Deutz Diesel TCD 2012 L04 4.0 L (246 cu.in.) EPA Tier 3 (EU Stage IIIA)	1200 rpm	520 N·m (384 lbf-ft.) @ 1600 rpm	103 kW (138 hp) @ 2400 rpm
Cummins Diesel F3.8 3.8 L (229 cu.in.) EPA Tier 4F / EU Stage V	1200 rpm	620 N·m (457 lbf-ft.) @ 1500 rpm	115 kW (154 hp) @ 2500 rpm
* All engines four-stroke turbocharged, direct injection, four cylinders in line, liquid cooling system. ** Approximate information data. Refer to specific placard on the engine, and to the engine manual in Chapter 5, **MANUFACTURERS' APPENDICES** for additional information.			

B. MOTOR SPECIFICATIONS - ELECTRICAL UNIT (OPTIONAL)

TABLE 2 - ELECTRIC MOTOR SPECIFICATIONS

Model	Low Idle High Idle	Current	Rated Power
DANA TM4 SRI-200	0 rpm 2500 rpm	N/A	N/A

- Motor controller . . . . . DANA TM4

7. FUEL SPECIFICATIONS AND RECOMMENDATIONS (DIESEL UNITS)

TABLE 3 - FUEL SPECIFICATIONS AND DESIGNATIONS

Fuel Type	Sulfur Contents	% By Mass	Fuel Designation	EPA Requirement
Non-road Diesel	< 500 ppm	< 0.05%	Low Sulfur	Tier 2
Highway Diesel				Tier 3
Non-road Diesel	≤ 15 ppm	≤ 0.0015%	Ultra-Low Sulfur (ULSD)	Tier 3
Highway Diesel				Tier 4
All Diesel fuel				EU Stage V

CAUTION

WHEN USING DIESEL FUELS WITH SULFUR CONTENTS GREATER THAN 500 PPM (0.05% BY MASS) AND THE ENGINE EQUIPPED WITH AN EXTERNALLY COOLED EGR (TIER 3 ENGINES), LARGER FILTERS WITH TIGHTER MICRON FILTRATION MUST BE USED. CONSULT THE ENGINE MANUFACTURER FOR MODIFICATIONS NEEDED.

CAUTION

DO NOT USE DIESEL FUELS WITH SULFUR CONTENTS GREATER THAN 15 PPM (0.0015% BY MASS) IN EPA TIER 4, EU STAGE V AND LATER ENGINES.

CAUTION

DO NOT USE JET A1 FUEL IN THIS VEHICLE. REFER TO ENGINE MANUFACTURER FOR SPECIFIC RECOMMENDATIONS.

8. FUEL SYSTEM (DIESEL UNITS)

A. FUEL TYPE

Refer to 'FUEL SPECIFICATIONS AND RECOMMENDATIONS (DIESEL UNITS)' and cautions above.

- Diesel fuel, Tier 3 engines . . . . . ASTM D975-07, No. 1-D and No. 2-D
- Diesel fuel, Tier 4 engines and later . . . . . EN 590, DIN 51628 and ASTM D975 No. 1-D S15 and No. 2-D S15
- Turbine fuel . . . . . JP-8 or Jet A-1 (only if fuel lubricity is adequate; special filters required)

B. FUEL TANK CAPACITY

- Fill capacity . . . . . 98 L (26 gal.)
- Diesel Exhaust Fluid (DEF) fill capacity . . . . . 19 L (5.0 gal.) (Tier 4F engines)

C. FILTER TYPE

- Primary filter . . . . . Cartridge type, fuel and water separator
- Secondary filter . . . . . Canister type
- Fuel and water separator . . . . . Optional with heater

NOTE: FUEL WAXING MAY OCCUR AT LOW TEMPERATURES, CLOGGING THE FUEL SYSTEM AND REDUCING THE ENGINE EFFICIENCY. IF THE AMBIENT TEMPERATURE IS LESS THAN 0 ºC (32 ºF), WINTER-GRADE FUEL (SUITABLE DOWN TO -23 ºC [-10 ºF]) SHOULD BE USED. FOR TEMPERATURES BELOW -9 ºC (16 ºF) REFER TO THE ENGINE OPERATION MANUAL IN CHAPTER 5.

NOTE: FOR OPERATION AT TEMPERATURES BELOW -23 ºC (-10 ºF), A FUEL FILTER HEATER IS RECOMMENDED. REFER TO ENGINE MANUFACTURER'S MANUAL IN CHAPTER 5 FOR FURTHER INFORMATION.

9. AXLES

• Front drive steering axle	The front axle is formed by two wheel drive hubs, hydraulically powered and integrated with hydraulic steering.
• Drive wheel hubs	Planetary torque hubs
• Hub cap screws torque	Refer to Chapter 2, Section 4, “Maintenance Specifications”.
• Front wheel lug nuts torque	Refer to Chapter 2, Section 4, “Maintenance Specifications”.
• Rear axle	Two sets of bogie wheels with integrated height adjustment cylinders, which hydraulically lift and lower the load platform. Bogie wheels are not powered and do not drive the vehicle.

10. WHEELS AND TIRES

• Front axle, drive wheel rims	8.00 in. x 20 in. (10 stud holes)
• Front tires (standard)	12 x 10 - 8.00 (solid)
• Inflation air pressure (pneumatic tires only)	Refer to Chapter 2, Section 4, “Maintenance Specifications”.
• Rear axle, bogie wheels	16.25 x 6 x 11.25 (solid type)

11. BRAKES

• Hydrostatic brake	Hydrostatic braking action on deceleration, when releasing accelerator pedal.
• Service brakes	Brake acting on front wheels, hydraulically powered, mechanically applied with pedal.
• Parking brake	Spring-applied, hydraulically released
• Brake fluid	Hydraulic oil from services system

12. STEERING

• System	The vehicle is equipped with a hydraulic power driven steering system, mechanically activated by the steering wheel, directly coupled to an Orbitrol valve.
• Activation	By a double-acting hydraulic cylinder connected through a tie rod to the rocking arms on the front wheels.
• Steering angle	43º maximum

13. HYDRAULIC SYSTEM

A. GENERAL

Closed center system, pressure compensated, with load sensing detection.

B. FLUID TYPE

NOTE: SPECIFICATIONS AND CHARACTERISTICS OF THE HYDRAULIC FLUID TO BE USED WITH THE VEHICLE WILL DEPEND ON THE WEATHER OPERATING CONDITIONS.

This vehicle is shipped with a specified hydraulic fluid, but depending on weather operating conditions it may be required to replace it with a fluid of the proper characteristics.

NOTE: FOR FLUID TYPES AND OIL OPERATING TEMPERATURE RANGES, REFER TO 'HYDRAULIC OIL RECOMMENDATIONS' IN CHAPTER 2, SECTION 4, "MAINTENANCE SPECIFICATIONS".

Hydraulic tanks for the diesel unit and the electrical unit are of the same size and capacity. Refer to the Fluids and Lubricants Specifications decal on the vehicle.

C. HYDRAULIC PUMPS

On Diesel units, one axial piston pump is directly coupled and driven by the power unit and provides hydraulic flow to power all functions in the vehicle.

On electrical units, two axial piston pumps are directly coupled to a dedicated electrical motor each. Both pumps provide hydraulic flow to power all functions in the vehicle, but depending on the demand of the function performed, one or both pumps provide hydraulic flow.

D. EMERGENCY ELECTRIC PUMP

An electrical motor-driven hydraulic pump is provided for emergency operations (refer to Chapter 1, Section 3, "Emergency Procedures").

This pump must be manually activated by the operator when the vehicle is moving and the braking or steering pressure drops. Also, it can be manually activated to return to zero position, release parking brake, or other emergency procedures.

E. OTHER HYDRAULIC COMPONENTS

- Traction motors
- Hydraulic cylinders
- Hydraulic motors
- Relief and flow control valves
- Pressure reducing valves

F. FILTERS

• Breather	Replaceable, furnished with water disposal element
• Pressure filter (optional)	Replaceable, 3-micron element
• Return filter	Replaceable, in-tank return filter with 5-micron element
• Case drain filters	Cartridge type, replaceable

G. HOSE ASSEMBLIES

Pressure Hoses

• Diameter 6.4–12.7 mm (0.25–0.50 in.)	SAE 100R2, SAE standard J517
• Diameter 19–31.8 mm (0.75–1.25 in.)	SAE 100R12, SAE standard J517

Suction Hoses

• All diameters	SAE 100R4, SAE standard J517

H. OPERATING PRESSURES

NOTE: REFER TO CHAPTER 2, SECTION 4, “MAINTENANCE SPECIFICATIONS” FOR OPERATING PRESSURES.

14. ELECTRICAL SYSTEM

A. MAIN ELECTRICAL COMPONENTS

- 24 VDC system, powered by alternator on engine (Diesel units); stored on two 12 VDC batteries
- Headlights, and rear stop and reverse lights
- Turn signal lights (optional)
- Beacon
- Working lamps (optional)

B. FUSES AND CIRCUIT BREAKERS

Fuses or circuit breakers are provided to protect start switch, heater, beacon, instrument panel, services, horn and other components.

NOTE: REFER TO CHAPTER 4, **ILLUSTRATED PARTS LIST** FOR CIRCUIT BREAKERS, FUSES, RELAYS AND LAMP BULBS QUANTITIES AND SPECIFICATIONS.

15. ADDITIONAL FEATURES AND EMERGENCY DEVICES

- Engine safety
- Traction safety
- Emergency stop push-button switches
- Warning indicators
- Traction circuit by-pass valve (optional)
- Platform overtravel shutdown feature
- Load transfer circuit protection
- Load transfer by-pass valves (optional)

16. VEHICLE JACKING REQUIREMENTS

A. JACK CAPACITY

- Minimum working capacity (each axle) . . . . . 25 400 kg (56 000 lb. [28 ton])

B. MAINTENANCE STANDS CAPACITY

- Minimum number of stands . . . . . Four (2 front, 2 rear)
- Minimum working capacity (each) . . . . . 21 800 kg (48 000 lb. [24 ton])

C. PRESSURE EXERTED BY VEHICLE

- At stabilizers (loaded). . . . . 7590 kPa / 76 bar (1100 psi)
- Minimum at maintenance stands (unloaded) . . . 4140 kPa / 42 bar (600 psi)
- Maximum pressure exerted by vehicle. . . . . 7590 kPa / 76 bar (1100 psi)

D. JACK AND MAINTENANCE STANDS SUPPORT SURFACE

- Reinforced concrete surface (required) . . . . . 24 MPa (3500 psi) minimum

NOTE: SOME CONCRETE AND MOST ASPHALT SURFACES MAY NOT COMPLY WITH THE MINIMUM RESISTANCE REQUIRED. INCREASING SUPPORT PAD AREA OF JACKS AND MAINTENANCE STANDS CAN REDUCE THE STRESS ON THE GROUND SUPPORT SURFACE.

NOTE: ENSURE THE SUPPORT SURFACE IS STRONG ENOUGH TO WITHSTAND THE STRESS EXERTED BY THE VEHICLE WEIGHT, TRANSFERED THROUGH THE JACKS AND MAINTENANCE STANDS.

17. ENVIRONMENTAL LIMITATIONS

A. OPERATING TEMPERATURES

TABLE 4 - AMBIENT OPERATING CONDITIONS

Operating Condition*	Ambient Temperature Range**	Recommendation
Normal	-29 ºC to +51 ºC (-20 ºF to +123 ºF)	Engine does not require assisted starts.
Extremely cold	Below -29 ºC (-20 ºF)	Requires vehicle to be pre-heated (engine block, oil pan and fuel filter).
Extremely hot	Above 51 ºC (123 ºF)	Refer to engine manual for requirements.

* Outside the normal operating temperature range, consider the use of an environment package that corresponds to the extreme weather conditions in which the equipment will operate.

** Refer to Chapter 5, **MANUFACTURERS' APPENDICES** for engine operating temperature ranges and oil specifications, and related information for other components. Contact Oshkosh AeroTech, Ground Support Equipment for operating conditions in extreme weather.

B. WINTERIZATION OPTION

The Commander 30i is designed with an engine that will start with no additional aids other than the standard grid heater set down to -18 ºC (0 ºF). The winterization option includes battery heaters, immersion engine block heater and hydraulic tank immersion heaters which maintain functionality at a minimum of -40 ºC (-40 ºF).

A cold weather hydraulic oil may also be used for extremely cold operating conditions.

Wiring harness connections are fitted with boot seals for harsh environments.

C. HOT WEATHER OPERATION

A heat exchanger, hot weather hydraulic oil or a combination of both may be used for extremely hot conditions.

18. OPERATOR'S VIBRATION AND SOUND LEVELS

A. SOUND LEVEL EMISSION DATA

TABLE 5 - SOUND LEVEL EMISSION DATA

Test Locations and Conditions* (All results in dBA)				
Engine / Motor	**Operator's Cab**		**Exterior Position**	
	Standstill	**Driving**	**Standstill**	**Driving**
Deutz TCD 2012	L_{pA} = 71 K_{pA} = 4	L_{pA} = 79 K_{pA} = 4	N / A	L_{pA} = 87 K_{pA} = 4
Cummins F3.8	L_{pA} = 80 K_{pA} = 4	L_{pA} = 84 K_{pA} = 4	L_{pA} = 94 K_{pA} = 4	L_{pA} = 84 K_{pA} = 4
Electrical motors	L_{pA} = 72 K_{pA} = 4	L_{pA} = 80 K_{pA} = 4	L_{pA} = 85 K_{pA} = 4	L_{pA} = 82 K_{pA} = 4
L_{pA} = A-weighted emission sound pressure; K_{pA} = Uncertainty of L_{pA}. L_{WA} = A-weighted emission sound power level; K_{WA} = Uncertainty of L_{WA}. * Tests performed without a hush kit installed.				

- Standard. . . . . EN 1915-4 and ISO 11201
- Driver (operator) position . . . . . Standing
- Sound power tests . . . . . Stationary, driving
- Technical measures for noise reduction (Diesel units) . . . . . Hush kit
- Possible ways to minimize noise exposure . . . . . Wear hearing protection

B. VIBRATION LEVEL DATA

- Standard. . . . . EN 1915-3
- Driver position . . . . . Standing
- Vibration values (maximum). . . . . a_{WZF} = 28.2 m/s^2 (92.5 ft./s^2)
- Coefficient of variation . . . . . $C_V \leq 0.13$
- Test uncertainty (K = 0.3 a_{WZ}) . . . . . 2.0 m/s^2 (6.6 ft./s^2)
- Technical measures for vibration reduction . . . . . Not applicable
- Possible ways to minimize vibration exposure. . . . . Not applicable

19. SIDE LOAD PLATFORMS ATTACHMENT CAPABILITY

The Commander 30i vehicle has been designed with attachment points for side load platforms. The vehicle is approved for use with a side load platform.

- Maximum total mass of side load platform . . . . . 8165 kg (18 000 lb.)

Commander 30i vehicles are designed to support the specific load of a side load platform in both static mode (load operations) and in dynamic mode (driving with both the vehicle and the side load platform unloaded).

Vehicle stopping distance, from full speed using both hydrostatic braking and service brake:

- Unburdened. . . . . 4.6 m (15.1 ft.)
- Burdened with side load platform mass. . . . . 5.4 m (17.7 ft.)

20. UNITS OF MEASUREMENT

Base and derived units of measurement used in this manual are in accordance to the International System of Units (SI) of the International Bureau of Weights and Measures (BIPM).

TABLE 6 - METRIC AND STANDARD UNITS AND CONVERSIONS

Metric to Standard						Standard to Metric					
mm	(millimeter)	x	0.039	=	**in.**	**in.**	(inch)	x	25.4	=	**mm**
m	(meter)	x	39.37	=	**in.**			x	0.0254	=	**m**
		x	3.281	=	**ft.**	**ft.**	(foot)	x	0.3048	=	**m**
		x	1.094	=	**yd.**	**yd.**	(yard)	x	0.914	=	**m**
km	(kilometer)	x	0.621	=	**mi.**	**mi.**	(mile)	x	1.609	=	**km**
km/h	(kilometers per hour)	x	0.621	=	**mph**	**mph**	(miles per hour)	x	1.609	=	**km/h**
m^2	(square meter)	x	10.764	=	**sq.ft.**	**sq.ft.**	(square foot)	x	0.093	=	**m^2**
m^3	(cubic meter)	x	35.315	=	**cu.ft.**	**cu.ft.**	(cubic foot)	x	0.028	=	**m^3**
L	(liter)	x	61.024	=	**cu.in.**	**cu.in.**	(cubic inch)	x	0.0164	=	**L**
		x	0.264	=	**gal.**	**gal.**	(gallon)	x	3.785	=	**L**
		x	1.057	=	**qt.**	**qt.**	(quart of a gallon)	x	0.946	=	**L**
		x	0.035	=	**cu.ft.**	**cu.ft.**	(cubic foot)	x	28.317	=	**L**
L/min.	(liters per minute)	x	0.264	=	**gpm**	**gpm**	(gallons per minute)	x	3.785	=	**L/min.**
kg	(kilogram)	x	2.205	=	**lb.**	**lb.**	(pound)	x	0.454	=	**kg**
t	(tonne) (metric ton)	x	2204.6	=	**lb.**			x	0.00045	=	**t**
		x	1.102	=	**tn**	**tn**	(ton) (short)	x	0.907	=	**t**
bar	(pressure)	x	14.504	=	**psi**	**psi**	(pounds per square inch)	x	0.069	=	**bar**
kPa	(kilopascal)	x	0.145	=	**psi**			x	6.895	=	**kPa**
N·m	(Newton·meter)	x	0.738	=	**lbf-ft.**	**lbf-ft.**	(foot-pound)	x	1.356	=	**N·m**
		x	8.851	=	**lbf-in.**	**lbf-in.**	(inch-pound)	x	0.113	=	**N·m**
N	(Newton)	x	0.225	=	**lbf**	**lbf**	(pound force)	x	4.448	=	**N**
kW	(kilowatt)	x	1.341	=	**hp**	**hp**	(horse power)	x	0.746	=	**kW**
ºC	(Celsius)	x	1.8 + 32	=	**ºF**	**ºF**	(Fahrenheit)	-	32 / 1.8	=	**ºC**
$ºC_d$	(temperature differential*)	x	1.8	=	**$ºF_d$**	**$ºF_d$**	(temperature differential*)	x	0.556	=	**$ºC_d$**

* Temperature differential refers to the difference between two temperature points, not to a specific temperature expressed in both ºC and ºF.