

COMMANDER 15*i*

Container and Pallet Loader



Operator's Handbook





GROUND SUPPORT AROUND THE WORLD

For assistance or questions with set-up, warranty or parts, please contact your closest JBT Sales and Service Center.

Location	Warranty and Service	Part Sales
Orlando Headquarters John Bean Technologies Corp. 7300 Presidents Drive Orlando, Florida 32809 USA	Telephones +1.407.850.4207 worldwide 1.800.327.1686 within USA +1.407.850.4221 Fax orlando.service@jbtc.com	Telephones +1.407.850.4208 worldwide 1.800.821.3019 within USA +1.407.850.4221 Fax parts.orders@jbtc.com
Madrid John Bean Technologies AeroTech S.L. Aerotía A-2, km 34,4 28805 Alcalá de Henares, Madrid, Spain	+34.91.877.5880 Telephone +34.91.877.5881 Fax madrid.parts@jbtc.com	+34.91.877.5883 Telephone +34.91.877.5884 Fax madrid.parts@jbtc.com
London John Bean Technologies Ltd. Arnold Hawker House Central Way Feltham, England Middlesex, United Kingdom TW14 0XQ	+44.208.587.0666 Telephone +44.208.587.0660 Fax london.service@jbtc.com	+44.208.831.2200 Telephone +44.208.587.0660 Fax london.parts@jbtc.com
Singapore John Bean Technologies Singapore Pte. Ltd. 6 Loyang Lane #03-00 Young Heng Industrial Building Singapore 508920	+65.6542.9255 Telephone +65.6542.7493 Fax singapore.jbtparts@jbtc.com	+65.6542.9255 Telephone +65.6542.7493 Fax singapore.jbtparts@jbtc.com
Comments or suggestions regarding our manuals? At JBT Technical Publications we are always improving our technical documentation. If you have any comments or suggestions, please contact us.	Technical Publications John Bean Technologies 7300 Presidents Drive Orlando, Florida 32809 USA	+1.407.850.4205 Telephone +1.407.850.4221 Fax technical.publications@jbtc.com

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INTRODUCTION



WARNING

BEFORE ATTEMPTING TO OPERATE OR MAINTAIN THE VEHICLE, COMPLETELY READ AND UNDERSTAND THE OPERATION AND MAINTENANCE MANUAL, INCLUDING ALL DANGER, WARNING, AND CAUTION STATEMENTS. VEHICLE MAINTENANCE MUST BE PERFORMED EXCLUSIVELY BY TRAINED AND QUALIFIED TECHNICIANS AND ACCORDING TO MAINTENANCE SCHEDULES AND MANUFACTURERS' RECOMMENDATIONS. FAILURE TO COMPLY WITH THIS WARNING MAY RESULT IN SERIOUS BODILY INJURY, DEATH, OR PROPERTY DAMAGE, INCLUDING DAMAGE TO THE VEHICLE! IF YOU HAVE ANY QUESTIONS REGARDING THE SAFE OPERATION OR PROPER MAINTENANCE, PLEASE CONTACT YOUR LOCAL JBT SERVICE CENTER BEFORE PROCEEDING.

1. PURPOSE

This technical manual presents operation, maintenance, service and parts procurement information for the Commander 15i Container and Pallet Loader manufactured by JBT.

2. SCOPE

This manual describes the procedures for safe operation, maintenance and repair of the Commander 15i, and ordering of spare parts. This manual does not provide procedures or guidelines specific to the operation of the vehicle on airports or the handling of aircraft. This manual assumes that operators are aware of all applicable rules and regulations for operating the vehicle in traffic, on the airport and with aircraft, and that the operator has been properly trained in the operation of the vehicle. This manual also assumes that persons performing maintenance and repairs are skilled and experienced in work on heavy industrial vehicles.

3. TERMS

Throughout this manual, the Commander 15i will be referred to as the "vehicle" or "unit." The terms "right" and "left" in the descriptive paragraphs refer to the operator's right and left from a normal operating position. For additional terms and acronyms used in this manual refer to Description in Chapter 1, Section 1.

NOTE: MAINTENANCE IS DEFINED AS, BUT NOT LIMITED TO, INSPECTIONS, CHECKS, ADJUSTMENTS, TROUBLESHOOTING, REPAIRS, REMOVAL, REPLACEMENT OF COMPONENTS, MODIFICATIONS OR ANY OTHER WORK, REQUIRED FOR THE VEHICLE TO OPERATE.

4. IMPORTANT SAFETY NOTICE

This manual contains instructions, warnings and cautions based on normal operation and maintenance practices. JBT has no control over the actual operation and maintenance of the vehicle and cannot foresee all possible situations. In addition to the instructions in this manual, operators and maintenance



personnel should follow all locally applicable guidelines and regulations, and use common sense to maintain the vehicle in optimum condition and avoid hazardous situations. For safety and reliability use only JBT replacement parts. A safety conscious operator and a well cared for vehicle make a safe and efficient combination.

Your vehicle may operate slightly different depending on specifications and optional features.

5. VEHICLE MODIFICATIONS OR TAMPERING

Modifications, including changing of settings, replacement of parts with non OEM parts and addition of components or features may affect the safety and operational ability of the vehicle. Do not make modifications without prior written approval from JBT, Orlando, Florida, USA.

Tampering with emission control devices by means of removing, by-passing, defeating, damaging or in any way rendering ineffective any vehicle emission control device or element, including diesel exhaust fluid (DEF) to be used or installed on the vehicle is prohibited and will void all warranties and subject to federal, state and local laws and fines.

6. TECHNICAL ADVISORIES

JBT may issue Technical Advisories, during the life span of the vehicle. These Technical Advisories are intended to improve the reliability of the vehicle or address any safety related issues that may arise. Unless the Technical Advisory instructs otherwise, please insert it immediately after the List of Warnings and Cautions located in the front of this manual.

To receive these important Technical Advisories it is required that you inform JBT in the event the contact information of the person responsible for this equipment has changed, the vehicle has moved to a different location, or the vehicle has transferred ownership.

Required Information:

Equipment type
Serial number(s)
Vehicle's operating location address
Technical Advisory mailing information (No P.O. boxes please)
Contact personnel (GSE Manager, Safety Manager)
Telephone number(s)
E-mail address(es)

Please send this information to:

Technical Publications Dept.
JBT, Ground Support Equipment
7300 Presidents Drive
Orlando, Florida 32809
USA

technical.publications@jbtc.com

7. CE COMPLIANCE

This vehicle meets or exceeds the following CE requirements:

- Machinery Directive - Annex IV 2006/42/EC



EC Declaration of Conformity

This document declares that the machinery fulfills the relevant provisions of 2006/42/EC.

EC Type Examination Certificate Number "0404/13/2374"

Certificate issued by SMP Svensk Maskinprovning AB
THE SWEDISH MACHINERY TESTING INSTITUTE
PO Box 7035,
SE-750 07 Uppsala, Sweden
NB No.: 0404

This Machine also fulfills the applicable requirements of the following EC Directives:

2006/95/EC, Low voltage directive
2004/108/EC, EMC-directive

Standards taken into consideration:

Inspection is based on ECE 1015-1..013 and EN 12312-9:2013.

Place of Manufacture:

John Bean Technologies Corporation
JBT AeroTech
7300 Presidents Drive
Orlando, Florida 32809
United States of America
Phone 407.851.3377
Fax 407.850.2839

Technical Documentation Contact

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CO: Engineering Manager
Autovía A-2, km 34 400
28805 Alcalá de Henares
Madrid, Spain
Phone +34.91.877.5880
Fax +34.91.877.5881

Type of Equipment:

Container and Pallet Loader
Model: Commander 15i, 15ie
Serial No.:
Spec No.:

Signature: _____

Name
Title
JBT AeroTech

Date:

2015-02-05

NOTE: CERTIFICATES ARE ISSUED FOR EACH VEHICLE BASED ON INDIVIDUAL CUSTOMER SPECIFICATION.

8. VEHICLE IDENTIFICATION PLATE

The vehicle identification plate contains specific information about your vehicle such as model, specification number, serial number, manufacturing date, and other pertinent information. Refer to [Figure 1](#) for the location of your vehicle's identification plate.

NOTE: BE SURE TO HAVE THE INFORMATION FROM THE VEHICLE IDENTIFICATION PLATE READILY AVAILABLE WHEN CALLING JBT FOR PARTS OR SERVICE.

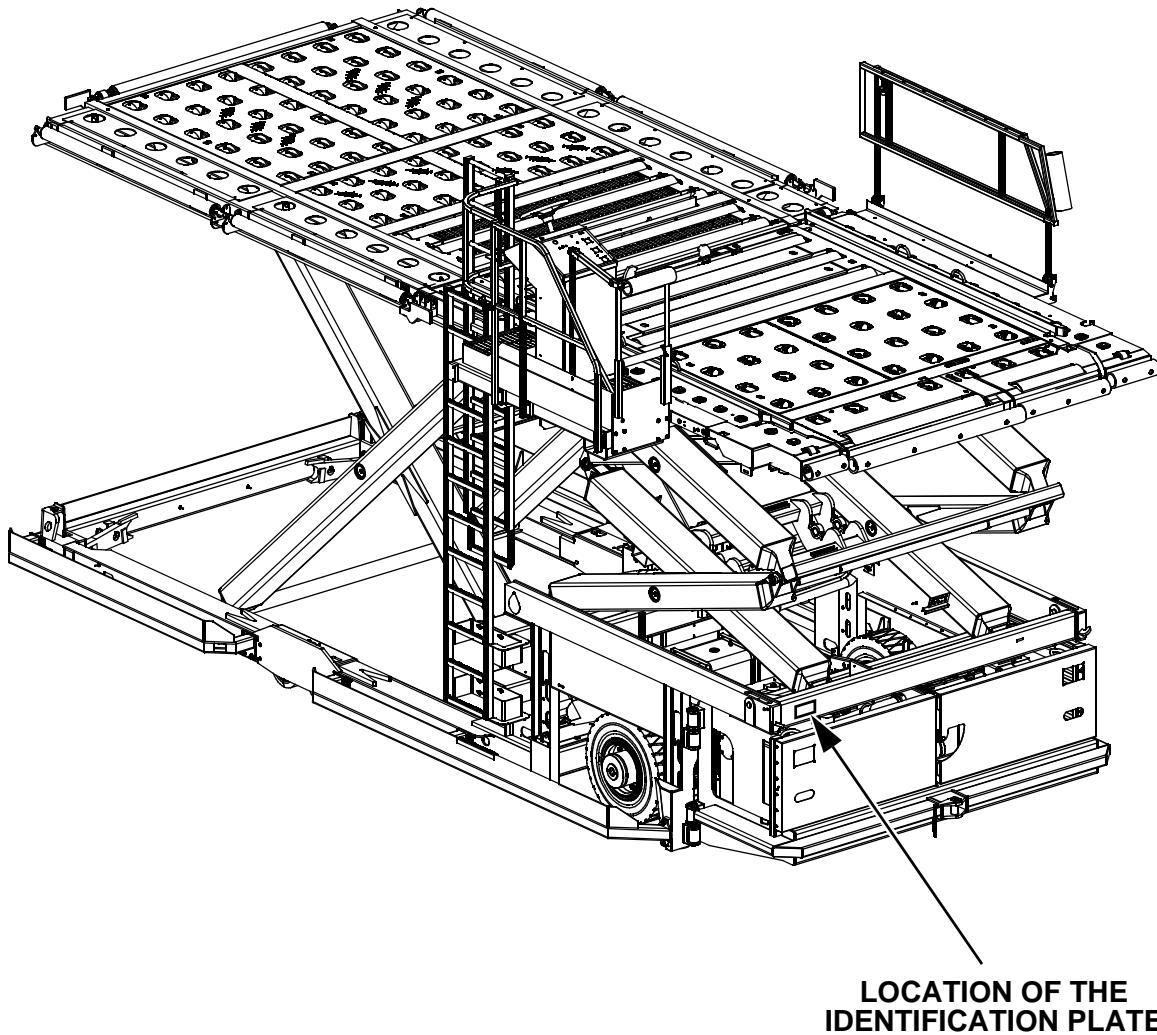


Figure 1
VEHICLE IDENTIFICATION PLATE



GENERAL TABLE OF CONTENTS

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COMMANDER 15*i*

OPERATOR'S HANDBOOK

Original Instructions

**Version 1
Edition 17**

This handbook supersedes all editions and revisions prior to:

**August 2015
English Language**

For use with equipment serial numbers
C15i15055 and subsequent

This handbook includes the following options:

- Cummins Engine Tier 3
- Deutz Engines Tier 3 and 4
- Electrical Power Unit
- Extension Decks
- A380 Bridge Wings
- APD System
- Winterization System

Refer to Volume II for Illustrated Parts List

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RECORD OF REVISIONS

All pages in this issue are original.

The following pages have had changes incorporated:

Change Date	Edition / Revision	List of Effective Pages	Change Description
Aug. 2003	Edition 1	Volume I	New edition.
Apr. 2004	Revision 1	Volume I	Update: general.
May 2004	Edition 2	Volume I	New edition.
Aug. 2004	Revision 1	Volume I	Update: general.
June 2005	Revision 2	Front Matter	Update: general.
Nov. 2005	Revision 3	Volume I	Updated: address for England and logo.
Apr. 2006	Revision 4	Chapter 2	Updated: schematic 521-3004 A.
June 2006	Revision 5	Chapter 2	Updated: schematic revision.
July 2006	Revision 6	Chapter 2	Updated: schematic revision D.
Feb. 2008	Edition 3	Volume I	Updated: Deutz and Cummins Tier 3 engines.
May 2008	Revision 1	Volume I	Updated: general update.
Aug. 2008	Edition 4	Volume I	Updated: JBT changes.
Dec. 2008	Revision 1	Volume I	Updated: general revision.
Sep. 2009	Edition 5	Volume I	Added: electrical power unit, bolt torque specifications, schematics 521-3009 - and 627-4185 B. Updated: danger, warnings, and caution statements.
Sep. 2009	Revision 1	Chapter 2, Section 5	Added: electric motor and controller and battery maintenance, battery charging and watering procedures.
Mar. 2010	Edition 5.1	Volume I	Updated: schematic 521-3009 A.
Apr. 2010	Edition 5.2	Volume I	Updated: schematic 521-3007 A.
Apr. 2010	Edition 6	Volume I	Updated: CE Machinery Directives, Annex IV, 2006/42/EG.
Aug. 2010	Edition 6.1	Volume I	Updated: schematics 521-3005 A and 521-3009 B.

Change Date	Edition / Revision	List of Effective Pages	Change Description
Sep. 2011	Edition 7	Volume I	Added: electric capacitors precautions, PDM navigation diagrams. Updated: hydraulic oil and maintenance specifications, general warnings and cautions, schematic 521-3009 C. Deleted: PDM screenshots.
Apr. 2012	Edition 8	Chapter 1, Sections 1 and 4; Chapter 2, Sections 4 and 7	Added: electrical schematics 521-3702 - and 521-704 -. Updated: fuel designations, extension deck, hydraulic capacities and hydraulic oil recommendations, schematic 521-3009 D.
June 2012	Edition 9	Chapter 1, Sections 1, 2, 4; Chapter 2, Sections 2 and 4	Added: APD system option. Updated: environmental limitations, fluids and lubricants specifications and capacities.
Oct. 2012	Edition 9.1	Chapter 2, Section 7	Updated: electrical schematic 521-3704 B and hydraulic schematic 627-4185 C.
Dec. 2012	Edition 10	Chapter 1, Sections 3 and 5; Chapter 2, Sections 1 and 8	Added: Section 8, APD System. Updated: lift towing and lifting instructions, maintenance stands.
May 2013	Edition 10.1	Introduction Chapter 2, Section 7	Updated: SMP certificate address, hydraulic schematic 627-4185 D.
June 2013	Edition 10.2	Chapter 2, Section 7	Updated: electrical schematic 521-3007 B, and hydraulic schematic 627-4185 E.
Nov. 2013	Edition 11	Chapter 1, Section 4, Chapter 2, Section 4, 5, 7, and 8	Added: vehicle jacking requirements. Updated: maintenance specifications and procedures, schematic 521-3014 A, APD system 628-5530 C.
Dec. 2013	Revision 1	Introduction Chapter 1, Sections 2 and 4	Added: aircraft accommodation. Updated: scope, warnings.
Feb. 2014	Edition 12	Warranty page, Introduction Chapter 1, Section 4; Chapter 2, Section 7	Added: Tier 4 engine, electrical schematic 521-3015 -. Updated: London office address, SMP certificate.
Feb. 2014	Revision 1	Chapter 1, Sections 1 and 2	Added: access stairs and bridge barrier options; power handrail switch.
May 2014	Edition 13	Introduction Chapter 1, Section 1 and 2; Chapter 2, Sections 3, 4, 7, and 8	Added: vehicle emissions tampering. Updated: extension deck information, shut down engine, battery maintenance, bolt identification chart, schematic 521-3704 C, APD system 628-5530 D.



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LIST OF WARNINGS AND CAUTIONS USED IN THIS MANUAL



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 danger, warning and caution statements are used in this manual. Read all of them and follow the instructions when performing the procedures.



DANGER

DIESEL FUELS, KEROSENE, HYDRAULIC OIL, LUBRICANTS AND GLYCOLS ARE FLAMMABLE. USE EXTREME CAUTION TO PREVENT SPILLS AND AVOID HEAT OR OPEN FLAMES. DO NOT OVERFILL THE FUEL TANK WHEN REFUELING. ALWAYS ALLOW ROOM FOR EXPANSION OF FUEL.



DANGER

ELECTRICAL CURRENT FROM FACILITIES POWER, BATTERY, AND LIGHTNING IS HAZARDOUS. TO REDUCE THE RISK OF ELECTRICAL SHOCK: DO NOT CONNECT OR DISCONNECT ANY ELECTRICAL CABLES DURING AN ELECTRICAL STORM, CONNECT FACILITIES POWER UTILIZING ONLY THE PROPER CONNECTORS PROVIDED, USE ONE HAND ONLY TO CONNECT OR DISCONNECT CABLES, AND TURN OFF AND LOCK OUT ALL ELECTRICAL POWER SOURCES BEFORE PERFORMING ANY MAINTENANCE ON THE VEHICLE.

**DANGER**

BEFORE PERFORMING ANY MAINTENANCE ON ELECTRIC-POWERED VEHICLES, DISCONNECT THE HIGH-VOLTAGE BATTERIES AND COMPLETELY DISCHARGE THE ELECTRIC CAPACITORS. WAIT FOR AT LEAST 30 MINUTES BEFORE WORKING ON THE VEHICLE.

**DANGER**

HIGH VOLTAGE MAY ARC OVER CONSIDERABLE DISTANCE AND EXCEED THE INSULATING CAPACITY OF STANDARD TOOLS. ENSURE ALL ELECTRIC ENERGY SOURCES ARE ISOLATED AND RENDERD INOPERATIVE BEFORE PERFORMING ANY MAINTENANCE ON THE VEHICLE.

**WARNING**

TO CALIFORNIA CUSTOMERS: CALIFORNIA PROPOSITION 65 STATES THAT DIESEL EXHAUST AND SOME OF ITS CONSTITUENTS ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS, OR OTHER REPRODUCTIVE HARM.

**WARNING**

BEFORE ATTEMPTING TO OPERATE OR MAINTAIN THE VEHICLE, COMPLETELY READ AND UNDERSTAND THE OPERATION AND MAINTENANCE MANUAL, INCLUDING ALL DANGER, WARNING, AND CAUTION STATEMENTS.

**WARNING**

THE BRIDGE AND PLATFORM MUST BE FULLY LOWERED AND THE VEHICLE MUST BE PROPERLY PARKED BEFORE BOARDING OR LEAVING THE UNIT. USE THE LADDER LOCATED BEHIND THE OPERATOR'S CAB TO GET ON AND GET OFF THE VEHICLE. ENSURE THE LADDER AND PLATFORM AREA, BOTH ON AND BELOW, ARE CLEAR OF PERSONS AND FREE OF ANY OBJECTS, WHILE OPERATING THE VEHICLE. DO NOT RELY SOLELY ON SENSORS AND WARNING LIGHTS.

**WARNING**

USE EXTREME CAUTION AT ALL TIMES WHEN WALKING ON BRIDGE OR PLATFORM. DO NOT STEP ON ROLLERS OR CLUSTER ROLLER ASSEMBLIES. AVOID ALL MARKED WARNING AREAS AND FOLDING WINGS, AND KEEP A MINIMUM DISTANCE OF 1 M (3 FT.) FROM THE FRONT AND REAR OF THE BRIDGE.

**WARNING**

ENSURE THE LADDER OR STAIRS, AND AREA NEAR THE REAR OF THE BRIDGE ARE CLEAR OF PERSONS WHILE DRIVING AND OPERATING THE VEHICLE.

**WARNING**

APPLY THE PARKING BRAKE AND TURN OFF THE IGNITION SWITCH BEFORE LEAVING THE VEHICLE UNATTENDED.

**WARNING**

DO NOT ALLOW PERSONS ON THE PLATFORM WHILE IN MOTION OR IN AN ELEVATED POSITION. PLATFORM MAINTENANCE MAY BE PERFORMED FROM UNDERNEATH USING SAFETY SUPPORTS.

**WARNING**

NEVER EXCEED THE RECOMMENDED MAXIMUM WEIGHT LIMITS FOR THIS EQUIPMENT.

**WARNING**

NORMAL LOADING OPERATIONS SHOULD NOT BE PERFORMED WHILE AIRCRAFT IS BEING REFUELED WITHOUT HAVING FACILITY AND REGULATORY APPROVAL. OPERATOR MUST ENSURE THAT NO HYDRAULIC LEAKS OR UNSAFE CONDITIONS ARE PRESENT ON THE VEHICLE.

**WARNING**

USE CAUTION WHILE REFUELING THE VEHICLE TO AVOID FUEL SPILLS. CLEAN SPILLS PROMPTLY.

**WARNING**

AT THE BEGINNING OF EACH SHIFT ENSURE THAT ALL SCHEDULED SERVICES HAVE BEEN PERFORMED, INCLUDING VERIFICATION OF TIRE CONDITION, FUEL AND FLUID LEVELS, AND OVERALL CHECK FOR LOOSE OR MISSING HARDWARE AND GENERAL CONDITION OF THE VEHICLE.

**WARNING**

AN OBSERVER ON THE GROUND SHOULD BE USED TO GUIDE THE OPERATOR WHEN DRIVING THE VEHICLE IN REVERSE.

**WARNING**

THE VEHICLE IS DESIGNED TO BE DRIVEN ON PAVED OR CEMENT SURFACES APPROVED TO SUPPORT THE WEIGHT AND USE OF GROUND SUPPORT EQUIPMENT VEHICLES.

**WARNING**

DO NOT LIFT PERSONS WITH THE VEHICLE. THE LOADER IS NOT INTENDED FOR LIFTING OF PERSONS OTHER THAN THE DRIVER.

**WARNING**

DO NOT ALLOW PERSONS UNDER BRIDGE OR PLATFORM UNLESS ADEQUATE SUPPORTS ARE IN PLACE.

**WARNING**

DO NOT ATTEMPT TO OPERATE THE VEHICLE WITHOUT BEING PROPERLY TRAINED IN OPERATION AND SAFETY REQUIREMENTS.

**WARNING**

BEFORE STARTING THE POWER UNIT, ENSURE POWER MODULE TEE BOLT IS SECURELY FASTENED, AND ALL PERSONS ARE CLEAR OF THE VEHICLE.

**WARNING**

DO NOT OPERATE EQUIPMENT WHILE UNDER INFLUENCE OF DRUGS, ALCOHOL, OR MEDICATION THAT MAY PREVENT FULL ABILITY TO CONTROL THE VEHICLE.

**WARNING**

FOLLOW ALL APPLICABLE PROCEDURES AND REGULATIONS FOR OPERATING IN THE AIRPORT AND FOR HANDLING AIRCRAFT.

**WARNING**

WHEN USING BRIDGE TILT, ENSURE ADEQUATE CLEARANCE BETWEEN LOADER AND AIRCRAFT.

**WARNING**

DO NOT USE MAXIMUM SPEED RANGE (RABBIT) IF VEHICLE IS CLOSER THAN 3 M (10 FT.) TO AIRCRAFT.

**WARNING**

ONLY APPLY E-STOP TO DISABLE THE VEHICLE IN CASE OF EMERGENCY. PRESSING THE EMERGENCY STOP PUSH-BUTTON WILL COMPLETELY SHUTDOWN THE VEHICLE.

**WARNING**

BEFORE TOWING, ATTACH TOW VEHICLE WITH TOW BAR AND/OR CHOCK WHEELS BEFORE DISENGAGING PARK BRAKE.

**WARNING**

BEFORE DISENGAGING DRIVE HUBS, CHOCK FRONT AND BACK OF BOTH DRIVE WHEELS TO PREVENT MOVEMENT IN EITHER DIRECTION.

**WARNING**

DO NOT EXCEED 11 KM/H (7 MPH) WHEN TOWING VEHICLE.

**WARNING**

IF DRIVE WHEEL HUBS ARE NOT IMMEDIATELY ENGAGED, PLACE SUITABLE WARNING SIGN ON VEHICLE TO ENSURE THAT ALL PERSONNEL ARE AWARE OF THE CONDITION.

**WARNING**

DO NOT ALLOW PERSONS DIRECTLY IN FRONT OF THE VEHICLE. KEEP AREA CLEAR DURING LIFTING.

**WARNING**

ENGAGE DRIVE HUBS BEFORE REMOVING FRONT AND BACK CHOCKS FROM BOTH DRIVE WHEELS TO PREVENT MOVEMENT IN EITHER DIRECTION.

**WARNING**

BEFORE REMOVING OR INSTALLING VEHICLE COMPONENTS, ENSURE THE VEHICLE IS ON LEVEL GROUND, WHEELS ARE SECURELY CHOKEDED AND ELECTRICAL SYSTEM IS SWITCHED OFF.

**WARNING**

LIFT VEHICLE ONLY BY PROPER HOISTING POINTS AND IN ACCORDANCE WITH THE DESCRIBED METHOD. DO NOT USE FORKLIFTS.

**WARNING**

ALWAYS PROTECT WEBBING TO PREVENT RIPPING.

**WARNING**

PERFORM THE RE-COMMISSIONING MAINTENANCE PROCEDURES BEFORE RETURNING THE VEHICLE INTO SERVICE AFTER STORAGE.

CAUTION

WHEN OPERATING THE VEHICLE IN FREEZING CONDITIONS, OCCASIONALLY TURN THE STEERING WHEEL SLOWLY TO PREVENT THERMAL SHOCK IN THE STEERING VALVE.

CAUTION

DO NOT PLACE THE EQUIPMENT INTO SERVICE WITHOUT PERFORMING ALL THE RECOMMENDED MAINTENANCE.

CAUTION

DO NOT DRIVE THE VEHICLE WITH THE BRIDGE OR PLATFORM LOADED.

CAUTION

DO NOT OPERATE THE ENGINE WITH THE OIL LEVEL BELOW THE 'MIN' MARK OR ABOVE THE 'MAX' MARK ON THE DIPSTICK.

CAUTION

DO NOT DISCONNECT THE BATTERY OR TURN OFF OPTIONAL BATTERY DISCONNECT SWITCH WITH THE ENGINE RUNNING TO AVOID A VOLTAGE SURGE IN THE ALTERNATOR CHARGING SYSTEM.

CAUTION

WHEN STARTING THE ENGINE, RELEASE THE IGNITION SWITCH IF THE ENGINE FAILS TO START WITHIN 20 SECONDS. AFTER A SECOND ATTEMPT, ALLOW THE STARTER MOTOR TO COOL DOWN FOR ONE MINUTE BEFORE ATTEMPTING TO RESTART THE ENGINE.

CAUTION

SHUT DOWN ENGINE IMMEDIATELY IF OIL PRESSURE INDICATOR LIGHT DOES NOT TURN OFF WITHIN THREE SECONDS AFTER STARTING ENGINE. DO NOT ATTEMPT TO RESTART ENGINE. NOTIFY MAINTENANCE PERSONNEL IMMEDIATELY.

CAUTION

THE AIRCRAFT PROXIMITY DETECTOR (APD) SYSTEM (OPTIONAL) WILL NOT BE ACTIVATED IF THE BRIDGE IS IN THE FULLY LOWERED POSITION. THE OPERATOR SHOULD NOT RELY SOLELY ON THE SENSORS AND WARNING LIGHTS.

CAUTION

OPEN AIRCRAFT CARGO DOOR CAREFULLY.

CAUTION

FOR OPERATION OVER THE GAP, POSITION THE LOADER SO THAT RUBBER BUMPERS ON BRIDGE FRONT EDGE ARE CLOSE TO, BUT DO NOT TOUCH THE AIRCRAFT.

CAUTION

DO NOT SHUT DOWN POWER UNIT WITH LOADER IN POSITION TO TRANSFER CARGO. DO NOT LEAVE VEHICLE UNATTENDED.

CAUTION

IT IS NECESSARY TO ADJUST BRIDGE HEIGHT AS AIRCRAFT POSITION CHANGES DURING CARGO TRANSFER.

CAUTION

CLOSE AND SECURE AIRCRAFT CARGO DOOR CAREFULLY.

CAUTION

TO PREVENT DAMAGE TO THE STABILIZER CYLINDER ASSEMBLIES, DO NOT SET THE MODE SWITCH TO "OPERATE" WHEN THE UNIT IS PARKED AS THIS WILL EXTEND THE STABILIZERS.

CAUTION

DO NOT ENERGIZE HYDRAULIC EMERGENCY PUMP DURING NORMAL VEHICLE OPERATION.

CAUTION

CONTINUOUS OPERATION OF HYDRAULIC EMERGENCY PUMP FOR MORE THAN ONE MINUTE WILL OVERHEAT THE ELECTRICAL MOTOR. IF EMERGENCY PROCEDURES CANNOT BE COMPLETED WITHIN ONE MINUTE, PUMP MUST BE ALLOWED TO COOL FOR AT LEAST 10 MINUTES BEFORE CONTINUING.

CAUTION

ENSURE WHEEL HUBS ARE DISENGAGED WHILE TOWING.

CAUTION

ENSURE BOGY WHEELS ARE RETRACTED AND UPPER THREADED PINS ARE SET TO HOLD BOGY WHEEL ASSEMBLIES BEFORE LIFTING THE VEHICLE.

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 ENGINES.

CAUTION

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

CAUTION

COMPLY WITH ALL LOCAL AND GOVERNMENT REGULATIONS FOR DISPOSING OF ENVIRONMENTALLY SENSITIVE MATERIALS SUCH AS TIRES, BELTS, BATTERIES, MOTOR OILS, GREASE, HYDRAULIC OIL, FUELS, REFRIGERANT GASES, AND GLYCOLS.

CAUTION

USE CLEAN LINT-FREE RAGS FOR CLEANING OF TANKS AND COMPONENTS.

CAUTION

DO NOT USE PLASTIC SHEETING FOR STORAGE. PLASTIC SHEETING USED FOR STORAGE WILL CREATE CONDENSATION WHICH MAY CAUSE METAL SURFACES TO RUST OR PIT.

SAFETY SYMBOLS



MANDATORY ACTION
REFER TO OPERATION AND
MAINTENANCE MANUAL
INSTRUCTIONS



WARNING
STOP - AUTHORIZED ACCESS
ONLY



WARNING
NO PERSONS ON PLATFORM
WHEN LIFTING OR WHILE IN
MOTION



WARNING
NO PERSONS ON LADDER
WHEN LOADER IS IN
OPERATION



WARNING
DO NOT DRIVE VEHICLE WITH
LOADS ON BRIDGE OR
PLATFORM



WARNING
HAZARD



WARNING
OVERHEAD CRUSH HAZARD



WARNING
FALL HAZARD



WARNING
BODY CRUSH HAZARD



WARNING
HAND PINCH HAZARD



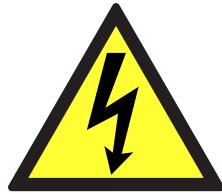
WARNING
FOOT CRUSH HAZARD



WARNING
HAND CRUSH HAZARD



WARNING
ELECTRICAL SHOCK HAZARD



WARNING
ELECTRICAL SHOCK HAZARD



WARNING
FALL HAZARD



WARNING
FALL FROM WING HAZARD



WARNING
OVERHEAD OBSTRUCTION
HAZARD



WARNING
FAN BLADE HAZARD

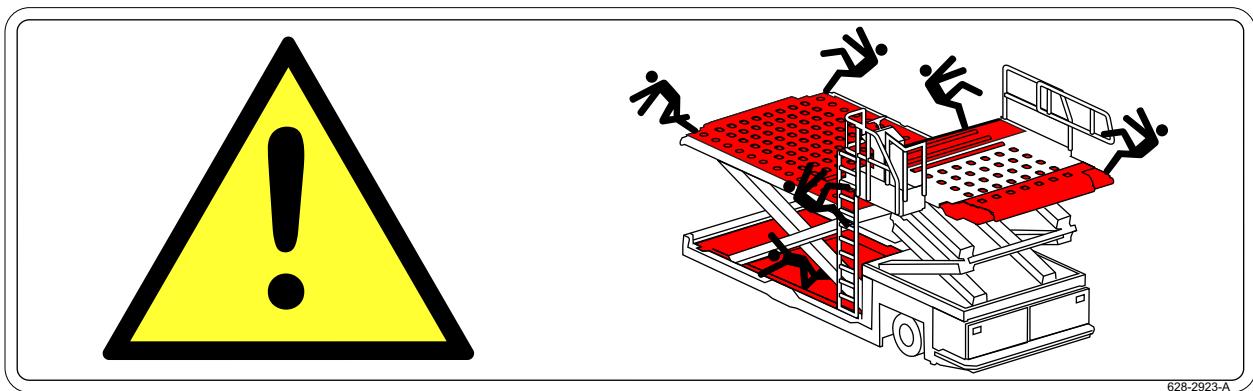


WARNING
HOT SURFACE HAZARD



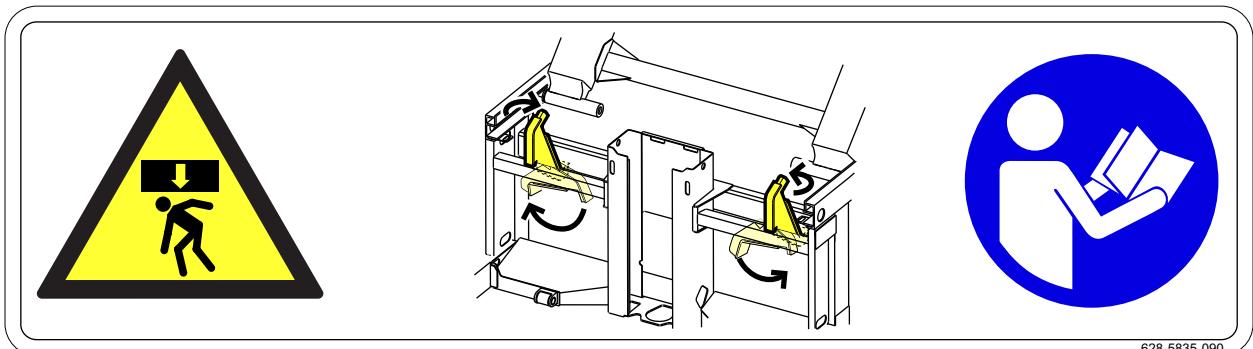
WARNING
HIGH PRESSURE HYDRAULIC
LINE HAZARD

SAFETY RELATED DECALS



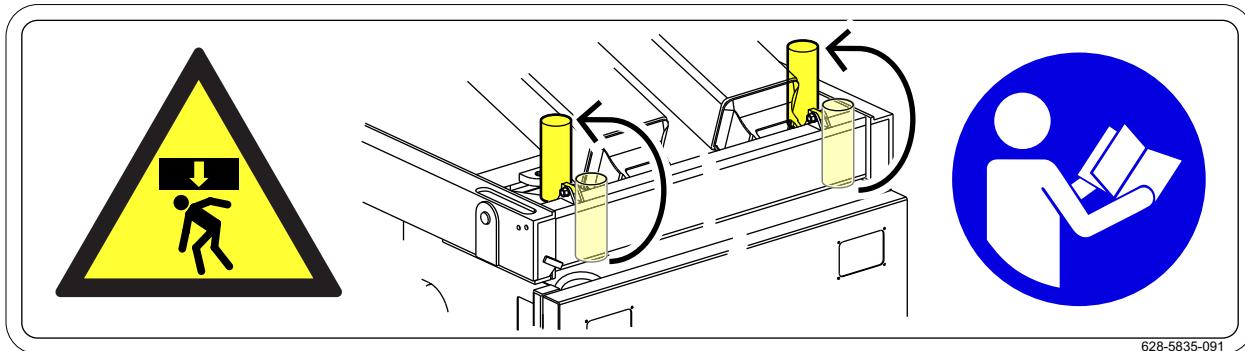
628-2923-A

WARNING: MULTIPLE FALL AND CRUSH HAZARDS. USE EXTREME CAUTION WHEN ACCESSING THESE AREAS.

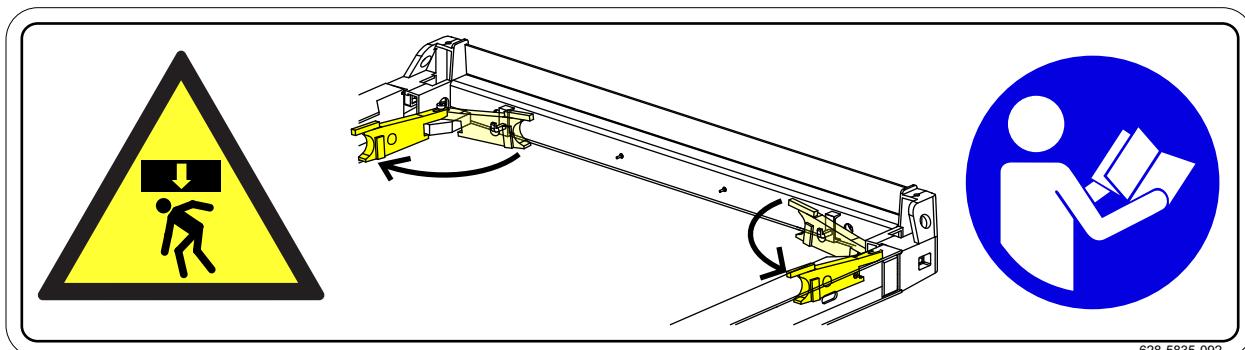


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WARNING: OVERHEAD CRUSH HAZARD. ALWAYS INSTALL BRIDGE REAR SAFETY SUPPORT STANDS BEFORE ACCESSING UNDER THE BRIDGE.



WARNING: OVERHEAD CRUSH HAZARD. ALWAYS INSTALL BRIDGE FRONT SAFETY SUPPORT STANDS BEFORE ACCESSING UNDER THE BRIDGE (MAIN DECK CAPABLE LOADER).



WARNING: OVERHEAD CRUSH HAZARD. ALWAYS INSTALL PLATFORM REAR SAFETY SUPPORT STANDS BEFORE ACCESSING UNDER THE PLATFORM.

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Section 6. Storage

CHAPTER 1. GENERAL INFORMATION AND OPERATING INSTRUCTIONS

Section 1. Description

1. GENERAL

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

The Commander 15i 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](#) and [Figure 2](#).

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 engine or electric. The electrical system is a PLC-based system, 24-volt DC, and the hydraulic system is closed-center and load-sensing. Two hydraulic motors power the planetary drive wheels to propel the loader.

A number of components of the vehicle are available in different configurations. For instance, the platform can be supplied for rear loading only, or for right side or left side and rear loading, or right, left, and rear loading. Other components are standard for all loaders.

2. CAPABILITIES

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

A double-scissors assembly is available to increase the bridge lift height for main deck operation.

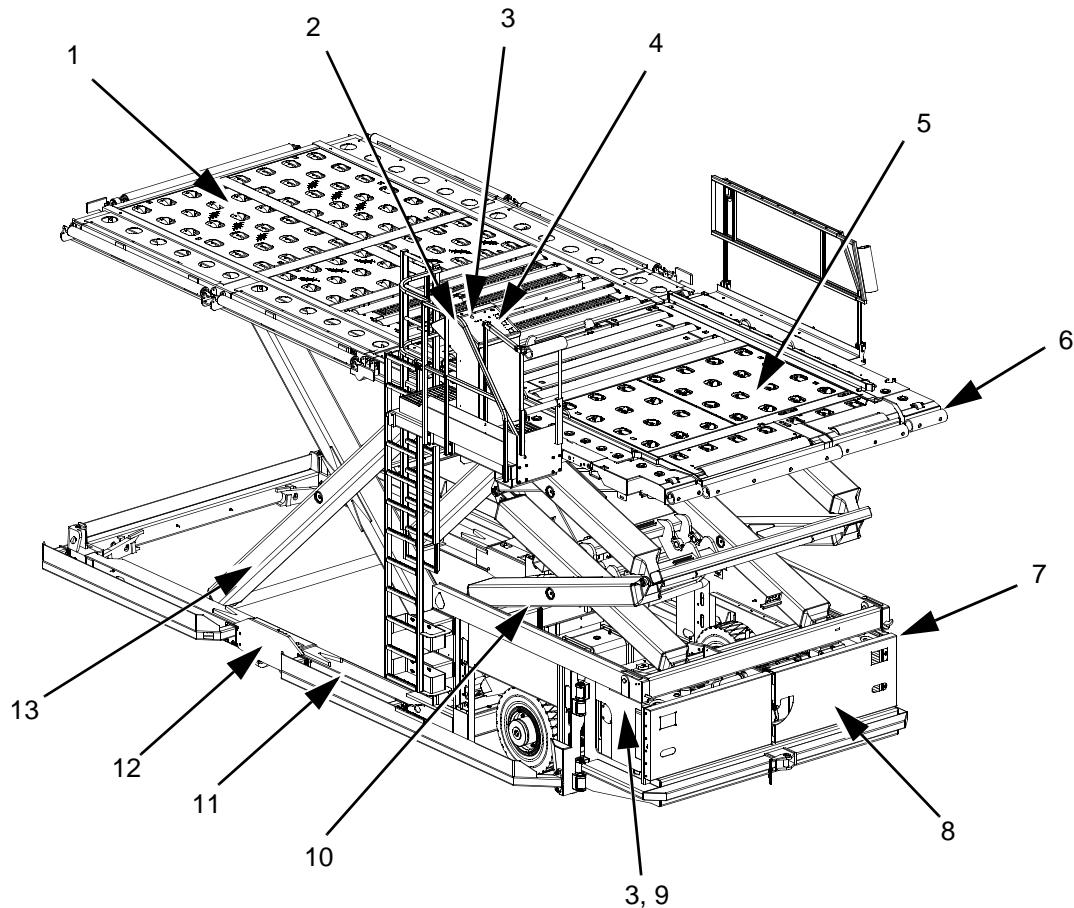
3. MAJOR COMPONENTS

A. CHASSIS

Refer to [Figure 1](#) and [Figure 2](#).

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 bogy wheel assemblies, consisting of two wheels each, support the rear of the chassis. The drive wheels propel the chassis hydraulically by means of two planetary gear hubs.

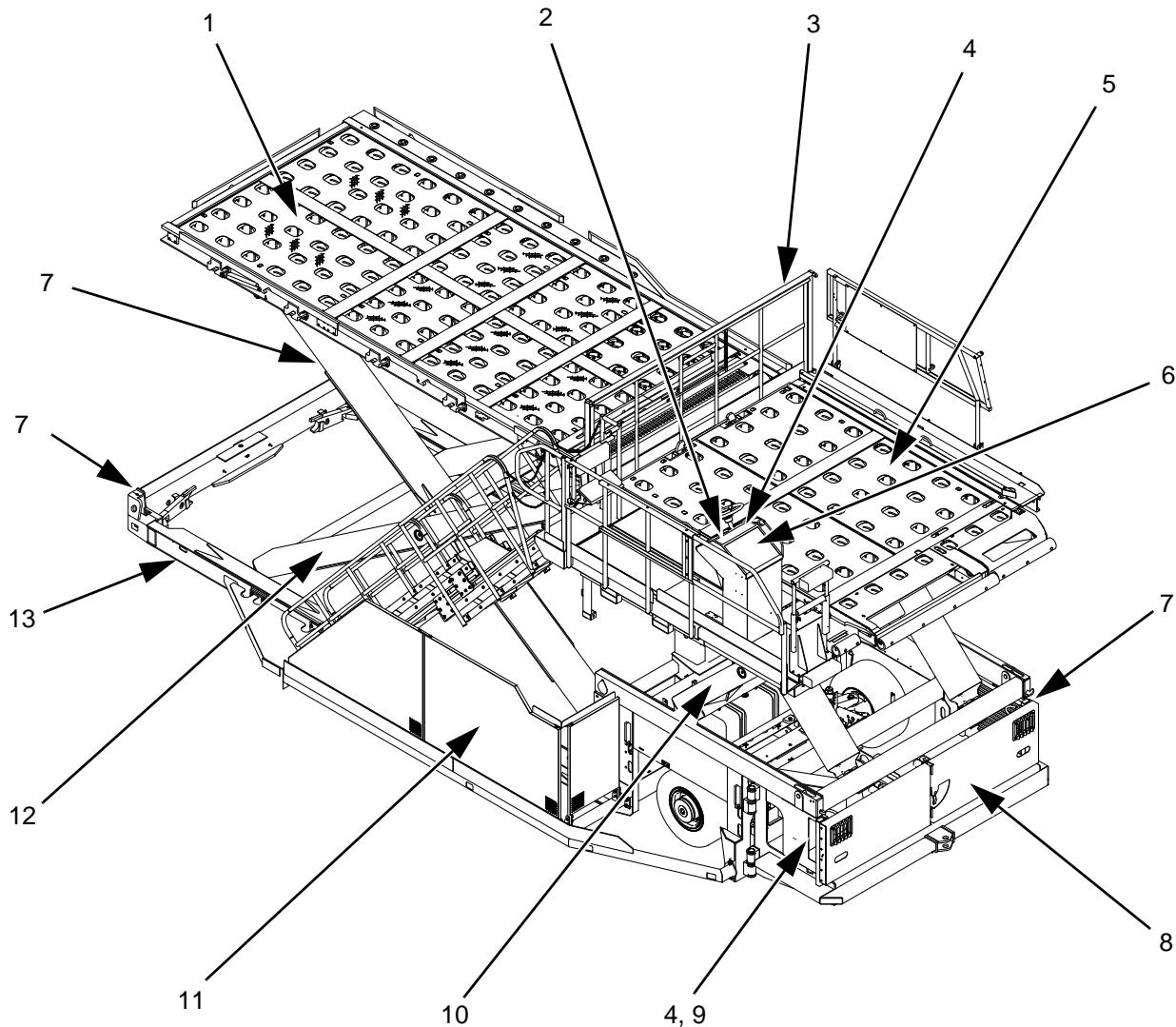
The bogy wheel assemblies are supplied with hydraulic height adjustment. Brakes and steering are also hydraulically powered. During cargo transfer, the chassis is supported by six stabilizers that are hydraulically controlled to provide a stable platform.



- | | |
|--|-----------------------|
| 1. PLATFORM | 7. OPTIONAL E-STOP |
| 2. DRIVER'S PANEL | 8. POWER UNIT |
| 3. EMERGENCY STOP (E-STOP) | 9. MAIN CONTROL PANEL |
| 4. OPERATOR'S PANEL | 10. FORWARD SCISSORS |
| 5. BRIDGE | 11. CHASSIS |
| 6. FOLDING WING (STANDARD)
FIXED WING (A380 OPTION) | 12. BOGY WHEEL |
| | 13. REAR SCISSORS |

UNIVERSAL LOADER SHOWN

Figure 1
COMMANDER 15I STANDARD LOADER WITH LADDER



- | | |
|------------------------------|-------------------------------|
| 1. PLATFORM | 8. POWER MODULE |
| 2. DRIVER'S PANEL | 9. MAIN CONTROL PANEL |
| 3. BRIDGE BARRIER (OPTIONAL) | 10. FORWARD SCISSORS |
| 4. EMERGENCY STOP (E-STOP) | 11. STAIRS BARRIER (OPTIONAL) |
| 5. BRIDGE | 12. REAR SCISSORS |
| 6. OPERATOR'S PANEL | 13. CHASSIS |
| 7. OPTIONAL EMERGENCY STOP | |

Figure 2
COMMANDER 15I LOADER WITH OPTIONAL STAIRS

B. BRIDGE

Refer to [Figure 3](#) and [Figure 4](#).

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.

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.

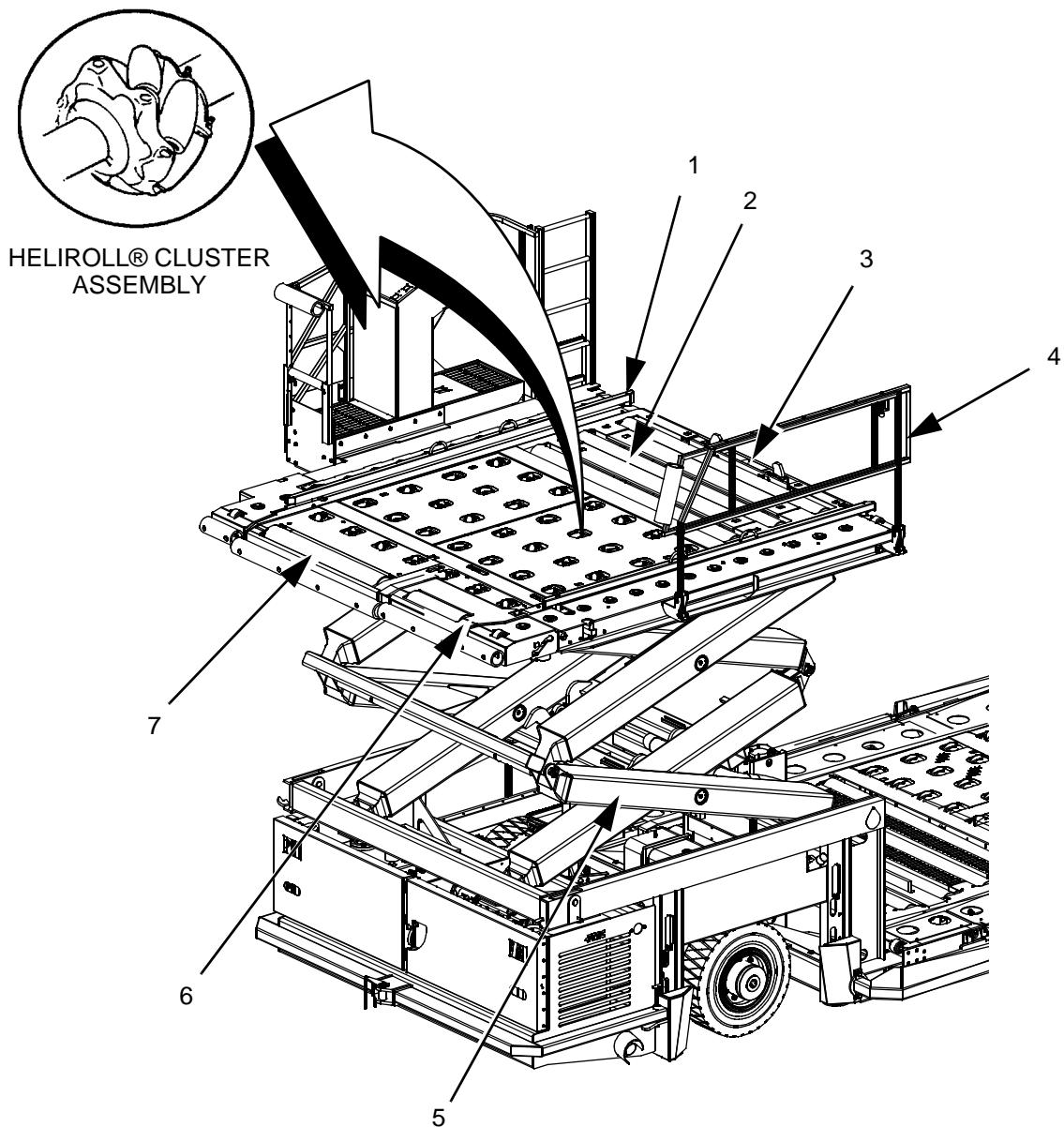
Two guides, hydraulically adjustable from side to side, assist in aligning cargo for transfer onto the aircraft. The front of the bridge may be equipped with three folding wings so that the loader can be used to transfer cargo to or from aircraft with varying door widths.

The "wide option" loader is equipped with three folding wings, and are raised and lowered hydraulically. The one-wing version is standard, and it can be hydraulically raised or lowered.

A load stop at the rear of the bridge, which is normally in the up position, is automatically lowered when the platform is at the same level as the bridge. It prevents cargo to move off the bridge when the platform is not in a position to accept the load.

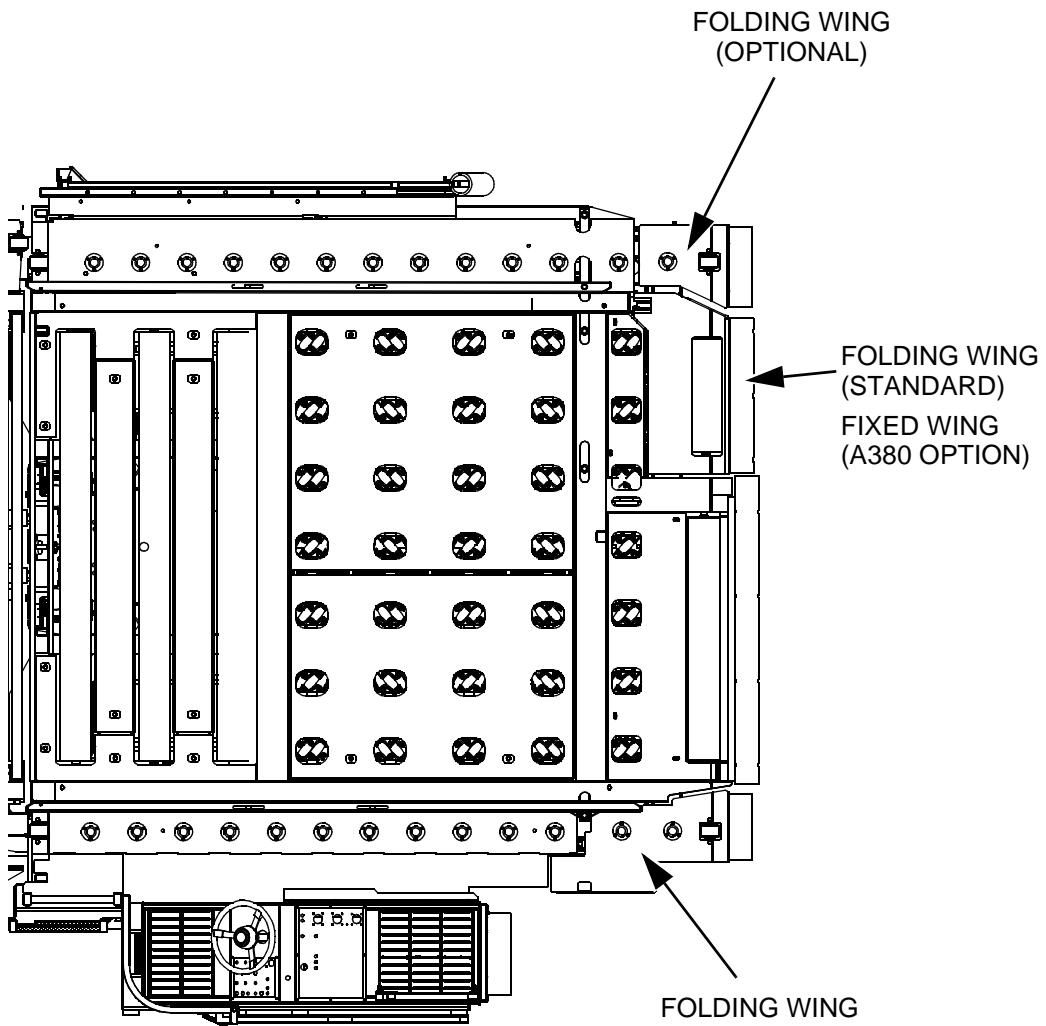
A powered cylindrical roller at the front of the bridge supports and transfers cargo as it is conveyed on or off the bridge. A hinged, telescoping handrail is installed on the left side of the bridge.

An optional aircraft following sensor that automatically adjusts bridge height to compensate for change in aircraft height as cargo is transferred. The sensor roller assembly touches the aircraft at one point only. This automatic feature can be by-passed by the operator, if necessary.



- 1. SIDE GUIDES (2)
- 2. CYLINDRICAL ROLLER
- 3. LOAD STOP
- 4. HANDRAIL
- 5. SCISSORS ASSEMBLY
- 6. FOLDING WING (STANDARD)
FIXED WING (A380 OPTION)
- 7. CYLINDRICAL ROLLER

Figure 3
BRIDGE COMPONENTS



FOLDING WINGS ARE HYDRAULICALLY RAISED AND LOWERED

Figure 4
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 loader and aircraft controls. The operator's cab is adjustable fore and aft to allow the operator to gain access to aircraft controls during cargo transfer. Refer to [Figure 5](#).

Controls and indicators provided to drive the loader and position cargo are located on two panels. Indicators are placed on the driver's panel so that operation of the loader can be monitored. Controls for propulsion speed and direction are also included. The operator's panel contains the controls to position and transfer cargo loads, raise and lower the bridge and platform, and operate the side and rear stops.

Handrails provide a safeguard for the operator while driving and operating the vehicle.

An emergency pump switch is located at the bottom right hand side on the driver's console in the cab. It activates the emergency pump, which is available in case of engine failure to supply hydraulic oil and control power, so that the platform and 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 10 minutes must be allowed for cooling time between operation periods.

An accelerator pedal that proportionally controls the speed of the loader is provided. This proportional control feature allows for slow moving and precise positioning of the loader when the aircraft is approached. A brake pedal allows to actuate on the hydraulic service brakes to stop the vehicle.

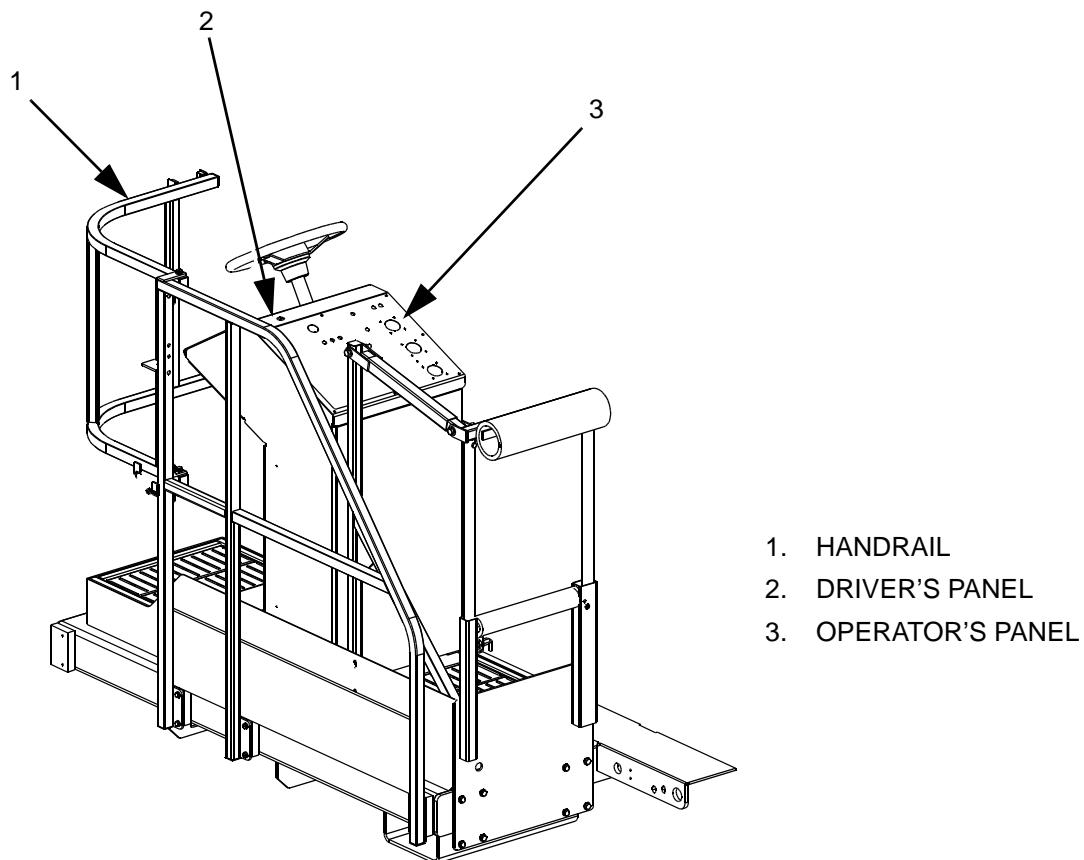


Figure 5
OPERATOR'S CAB COMPONENTS

D. PLATFORM

Refer to [Figure 6](#) and [Figure 7](#).

The platform supported by a scissors assembly, is raised and lowered by three hydraulic cylinders in conjunction with lift chain assemblies to position the platform.

Based on the configuration of the platform, a different combination of rollers and HeliRoll® cluster assemblies are provided. Hydraulic load stops, automatically or manually operated prevent unintentional off loading of cargo.

Proximity switches prevent manual operations when the platform is not in the proper position for loading or unloading. Also, proximity switches on the bridge sense correct position of the platform before cargo can be transferred to or from the platform.

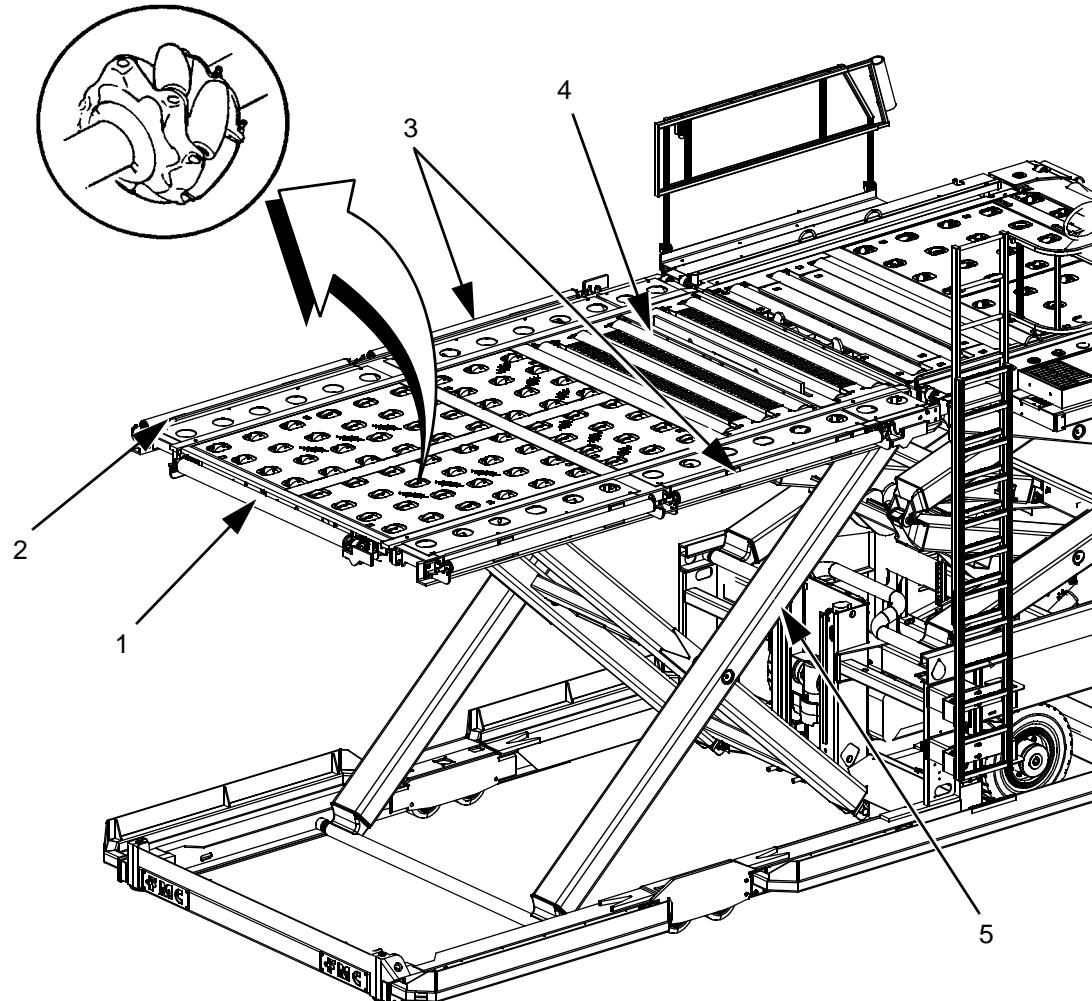
Two configurations of the platform are available and types of rollers, number of movable stops, and other hardware vary with the configuration of a particular platform. All configurations allow the operator to shift sideways and rotate containers on the platform.

Optional forward load stops are available for LD-1 or LD-3 aviation containers.

(1) Right and Left Pallet Side Load - Container Rotation

Allows the operator to transfer palletized or containerized cargo to or from the right and left sides of the loader and to or from the rear. Nine rows of cluster roller assemblies and five cylindrical rollers move the cargo. Two hydraulically powered cylindrical rollers on each side and one at the rear assist in transferring cargo to and from the transporting vehicle.

Hydraulically powered stops for the right and left sides and the rear are provided for this configuration.

HELIROLL® CLUSTER
ASSEMBLY

- | | |
|-----------------|-----------------------|
| 1. REAR ROLLER | 4. CYLINDRICAL ROLLER |
| 2. SIDE STOP | 5. SCISSOR ASSEMBLY |
| 3. SIDE ROLLERS | |

Figure 6
PLATFORM COMPONENTS

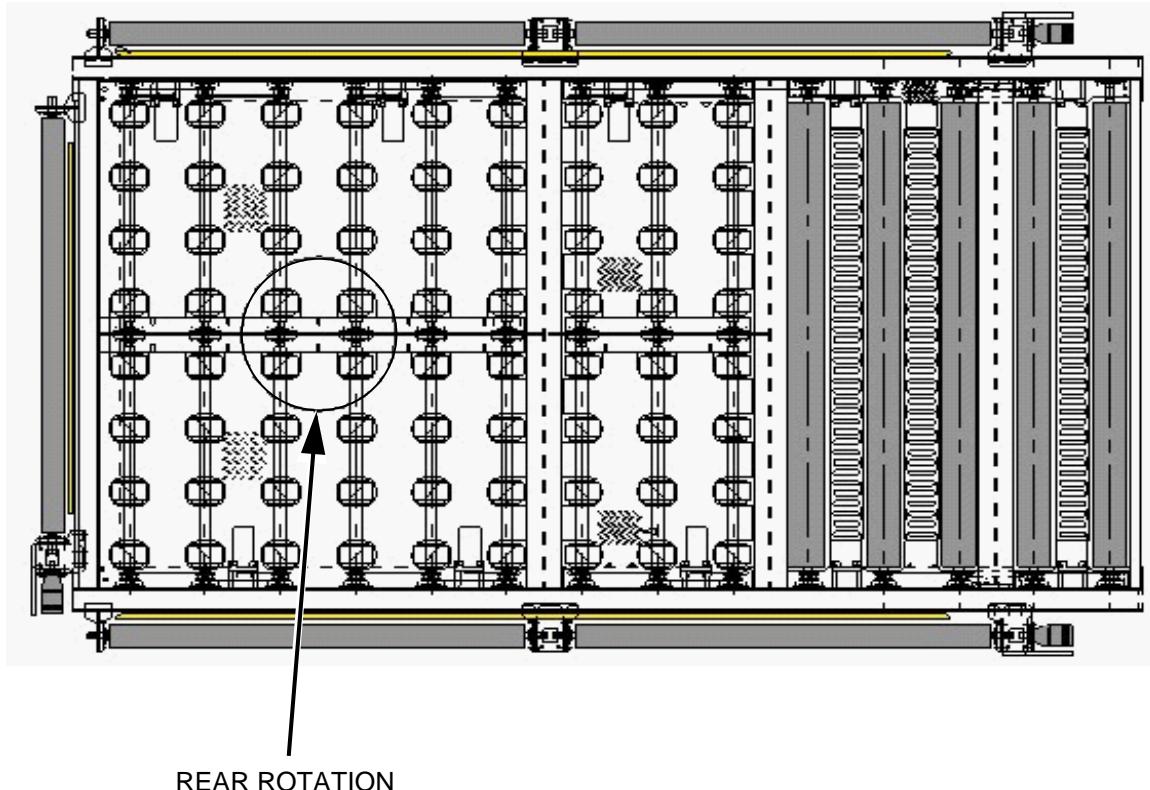


Figure 7
RIGHT AND LEFT PALLET SIDE LOAD - CONTAINER ROTATION

(2) Right and Left Pallet Side Shift Extended Side Load - Pallet Rotation

Allows the operator to transfer palletized or containerized cargo to or from the right and left sides of the loader and to or from the rear. Refer to [Figure 8](#).

Twelve rows of cluster roller assemblies and two front cylindrical rollers move the cargo fore and aft. Hydraulically powered cylindrical rollers at the right side and rear assist in transferring cargo to and from the transporting vehicle. See rotation point.

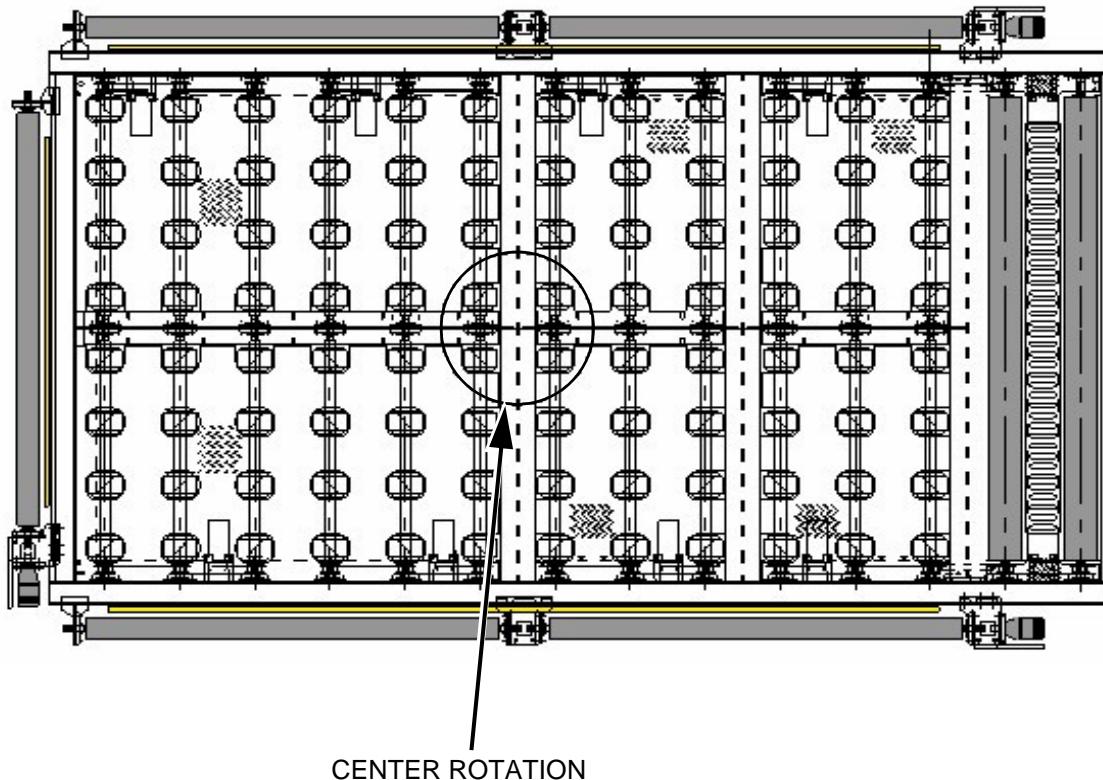


Figure 8
RIGHT AND LEFT PALLET SIDE SHIFT EXTENDED SIDE LOAD - PALLET ROTATION

E. EXTENSION DECK (OPTIONAL)

The extension deck is an additional platform with load transfer capabilities (refer to [Figure 9](#)). It is equipped with heavy duty swivel casters, and can be towed and pushed to place it in proper position.

Conveying functions are performed with hydraulic motors through rollers and HeliRoll[®] assemblies, electrically controlled with solenoid valves on manifolds mounted on the extension deck.

The extension deck can be mechanically attached to the rear of the loader through attachment couplings in the front of the deck.

It is hydraulically connected to the rear of the loader through the use of quick disconnect couplings, and it is also electrically connected using solid pin external connectors.

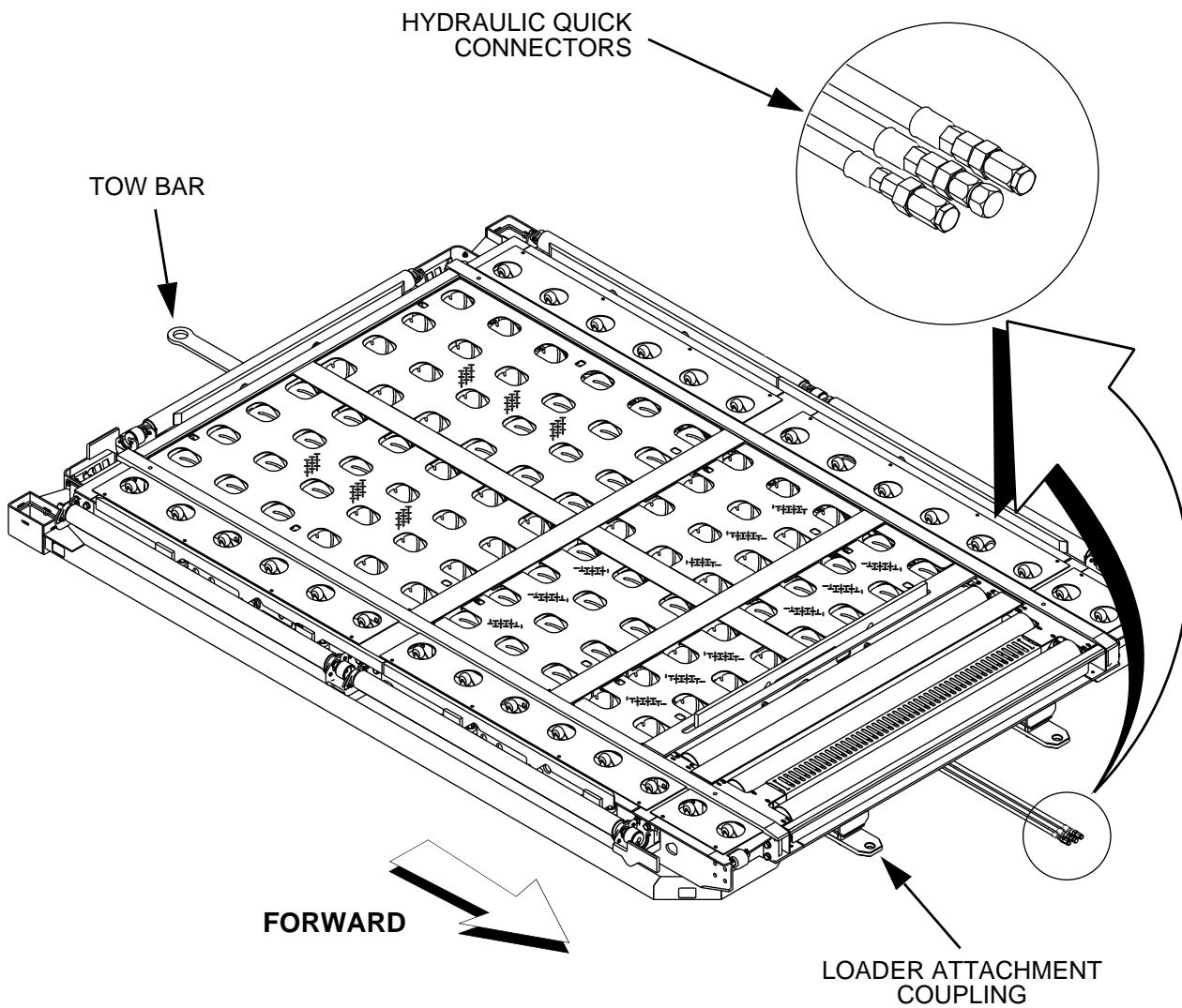
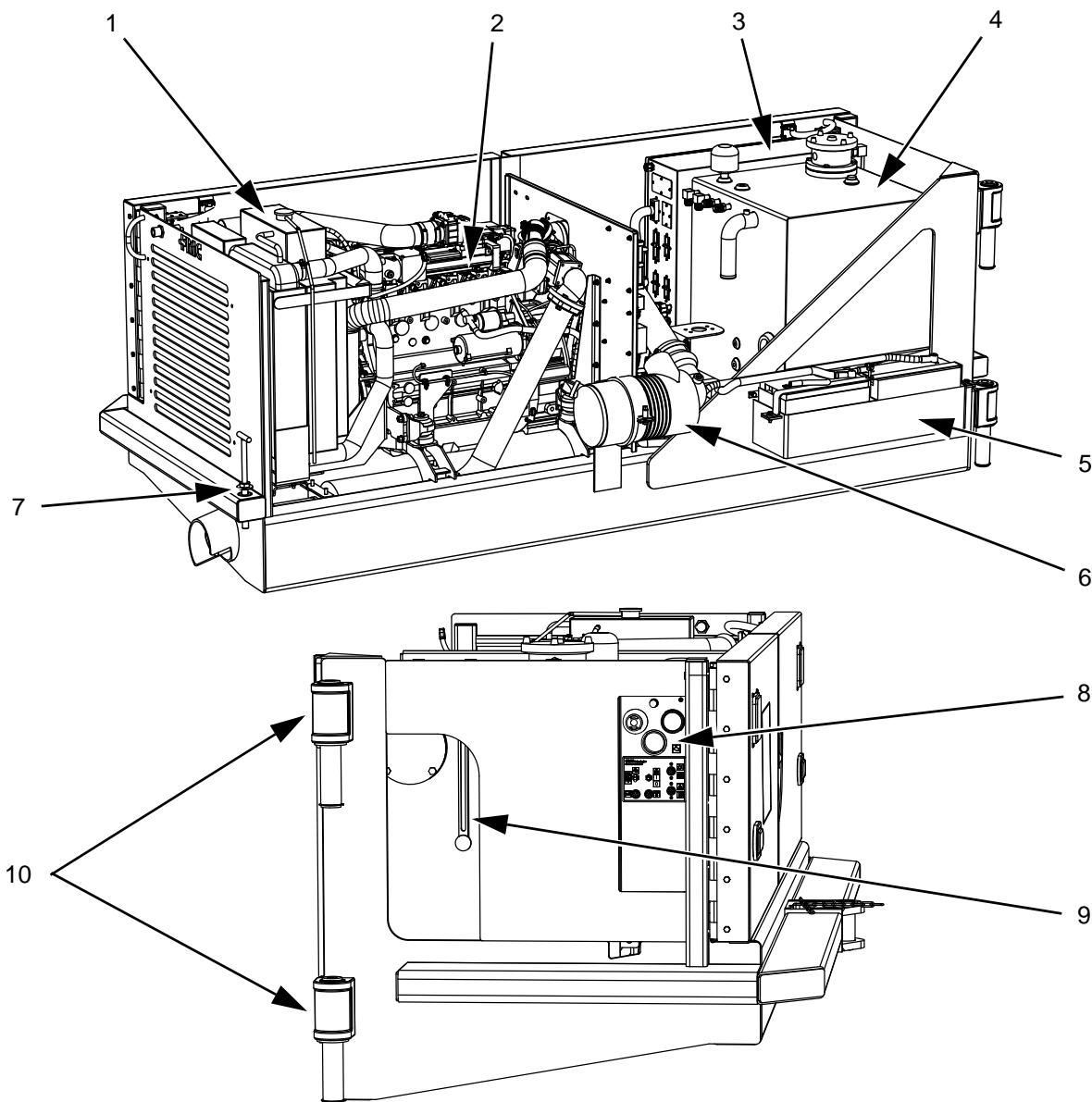


Figure 9
EXTENSION DECK (OPTIONAL)

F. POWER MODULE

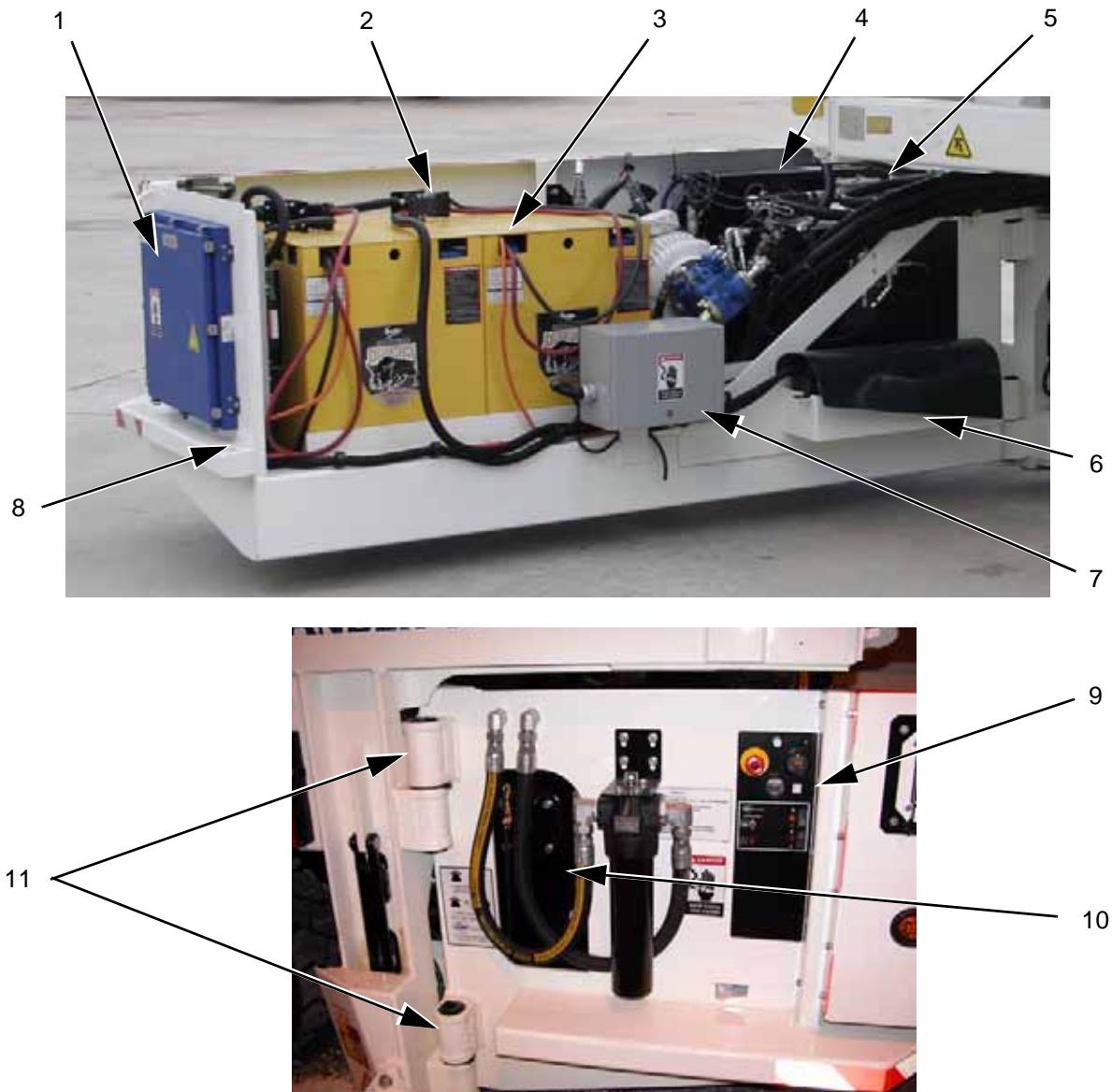
The power module is located at the front of the loader. It is a modular unit hinged on the right side of the loader. Removal of a single bolt on the left side allows the power module to swing out for complete access for maintenance. A power control panel on the right side of the module contains controls and indicators to operate the power unit at ground level (refer to [Figure 10](#)).

A diesel engine power unit is standard, and an optional electrical power unit is available (refer to [Figure 11](#)).



- | | |
|--------------------------|--|
| 1. COOLING RADIATOR | 7. TEE BOLT HOLDER |
| 2. DIESEL ENGINE | 8. MAIN CONTROL PANEL |
| 3. MAIN ELECTRICAL PANEL | 9. HYDRAULIC FLUID LEVEL AND
TEMPERATURE GAUGES |
| 4. HYDRAULIC RESERVOIR | 10. POWER MODULE HINGES |
| 5. BATTERY BANK | |
| 6. AIR CLEANER ASSEMBLY | |

Figure 10
DIESEL POWER MODULE



- | | |
|--|--|
| 1. MOTOR CONTROLLER | 7. CONTACTOR AND FUSE BOX |
| 2. BATTERY CONNECTORS | 8. TEE BOLT HOLDER |
| 3. HIGH-AMP BATTERIES (PROVIDED BY CUSTOMER) | 9. MAIN CONTROL PANEL |
| 4. MAIN ELECTRICAL PANEL | 10. HYDRAULIC FLUID LEVEL AND TEMPERATURE GAUGES |
| 5. HYDRAULIC OIL RESERVOIR | 11. POWER MODULE HINGES |
| 6. 24 VDC BATTERY BANK | |

Figure 11
ELECTRICAL POWER MODULE (OPTIONAL)

G. HYDRAULIC SYSTEM

The vehicle is equipped with a closed-center pressure compensated, hydraulic system with load-sensing controls. It has an axial piston pump directly attached to the engine's flywheel, providing hydraulic power for the cargo transfer, raising and lowering the bridge and platform, proportional propulsion, steering and braking, and operation of the load stops and guides for safe cargo handling. A dynamic braking feature is also provided by the system, for a smooth deceleration when the accelerator pedal is released.

Solenoid valves control fluid flow at correct pressure to operate the loader'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.

H. ELECTRICAL SYSTEM

A 24-volt 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-volt DC batteries, connected in series to supply 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, two high-amperage 80 VDC rechargeable batteries provide current for the electrical motor.

NOTE: THE 80-VOLT BATTERIES REQUIRED ON OPTIONAL ELECTRICAL POWERED UNITS ARE NOT PROVIDED WITH THE VEHICLE. REFER TO SPECIFICATIONS IN CHAPTER 1, SECTION 4 FOR BATTERY SPECIFICATION REQUIREMENTS.

The electrical control system utilizes a combination of relays and several Programmable Logic Controllers (PLC's). Wherever possible, all control logic functions are performed by the PLC's.

Individual circuit protection is achieved by the use of circuit breakers. Operator controls consist of a series of environmentally sealed toggle switches and joysticks mounted on lighted control panels. Electrical components are housed in an easy to access, environmentally sealed, main panel enclosure located behind the power module doors.

System troubleshooting can be performed by a trained technician 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 (refer to Troubleshooting in Chapter 2, Section 6).

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. The technician will also be able to use the display module to manually monitor inputs and activate outputs for more advanced troubleshooting.

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

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 sensors at the front and around of the vehicle.

Refer to Operation in Chapter 1, Section 2, and Aircraft Proximity Detector (APD) in Chapter 2, Section 8.

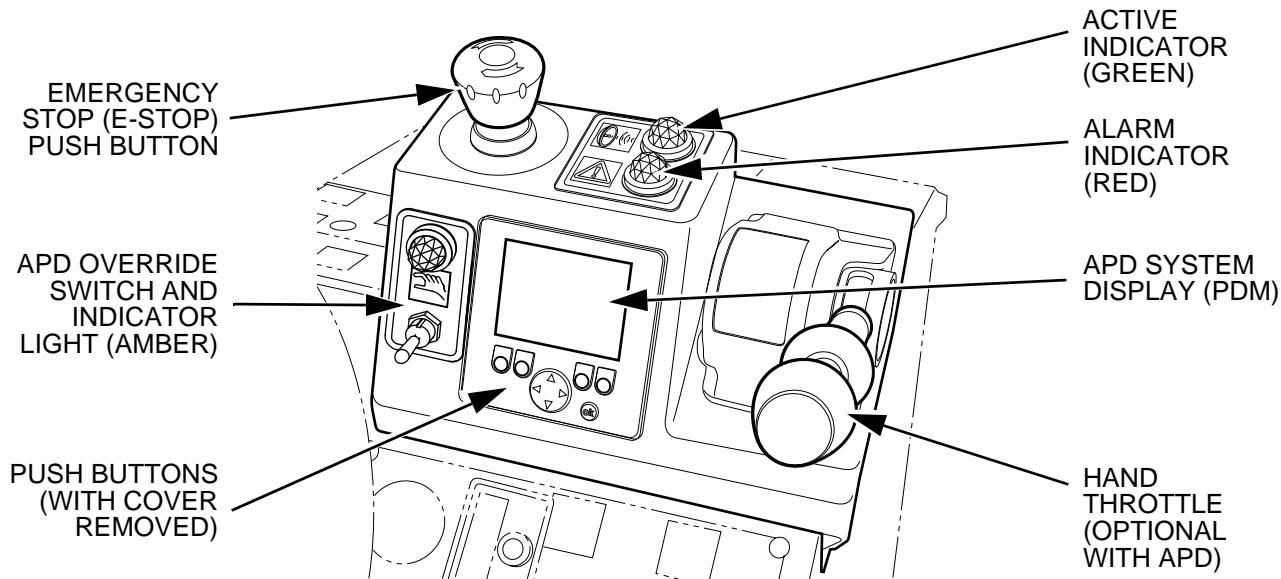


Figure 12
APD OPERATOR'S PANEL (OPTIONAL)

J. MISCELLANEOUS COMPONENTS

(1) Lights

Sealed beam headlights and front and rear taillights 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 available as options.

(2) Horn

An electrical automotive type horn is included.

(3) Audible Alarm

An Alarm sounds when the loader is propelled in reverse, platform lower, or bridge lower.

(4) Powered Bogy Wheels

Hydraulically powered bogy wheel 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.

K. UNDER PLATFORM CAMERA (OPTIONAL)

An optional camera can be provided for the operator to monitor activity under the platform. A display screen is mounted on the operator's panel side. For night operations, the camera system requires under platform lights which are also optional.

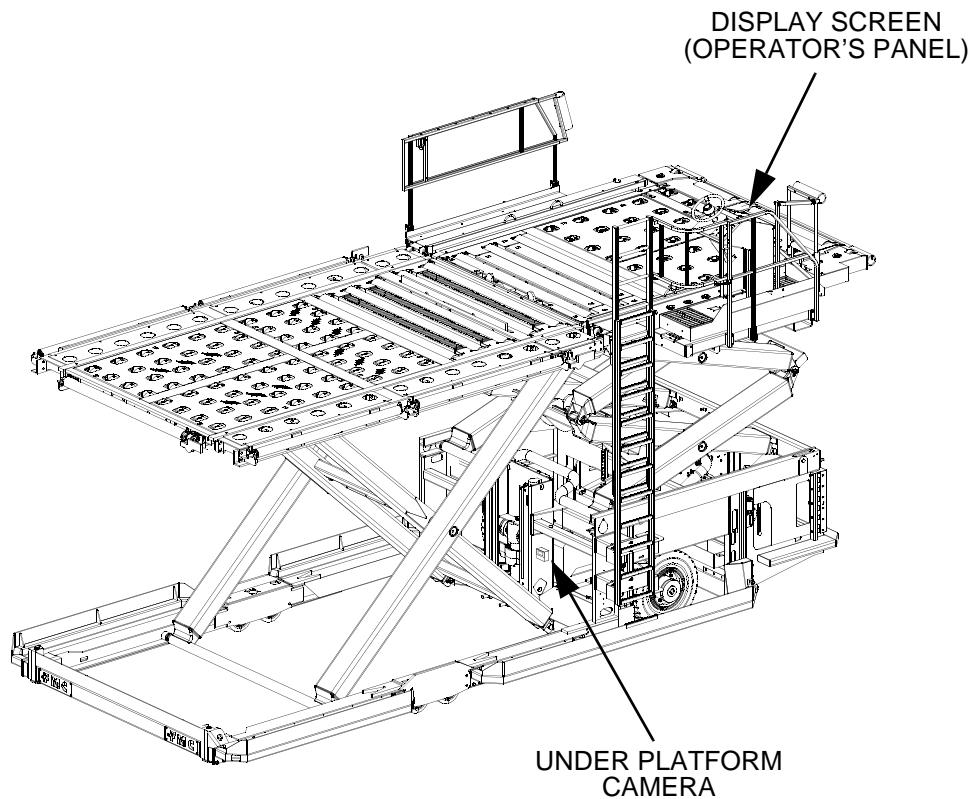


Figure 13
UNDER PLATFORM CAMERA AND DISPLAY (OPTIONAL)

4. ADDITIONAL FEATURES

- Bridge tilt provides flexibility for uneven ramp conditions. Bridge can be tilted to align with aircraft doorway.
- Battery disconnect switch provides isolators of both positive and negative from the 24 VDC system batteries. The lever must be installed and turned in order for machine to work. Once disabled, lever maybe removed so that no one else can turn system on.
- Any combination of platform configurations is available with cargo transfer. A container and pallet rotation feature can also be supplied.
- Flashing beacon mounted on the operator's cab.
- Hydraulically extendable and retractable cab, controlled from the operator's console.
- CE package.

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Section 2. Operation

1. GENERAL

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

This section contains operation instructions for the Commander 15i. A discussion of the principles of operation is given to aid in understanding of its operation.

The operator must use approved procedures for approaching, loading, unloading, conveying or transferring, and departing aircraft. All procedures followed should be approved by the airline, the local aviation authority, and based on the recommendations of the aircraft manufacturer.



WARNING

BEFORE ATTEMPTING TO OPERATE OR MAINTAIN THE VEHICLE, COMPLETELY READ AND UNDERSTAND THE OPERATION AND MAINTENANCE MANUAL, INCLUDING ALL DANGER, WARNING, AND CAUTION STATEMENTS.



WARNING

THE BRIDGE AND PLATFORM MUST BE FULLY LOWERED AND THE VEHICLE MUST BE PROPERLY PARKED BEFORE BOARDING OR LEAVING THE UNIT. USE THE LADDER LOCATED BEHIND THE OPERATOR'S CAB TO GET ON AND GET OFF THE VEHICLE. ENSURE THE LADDER AND PLATFORM AREA, BOTH ON AND BELOW, ARE CLEAR OF PERSONS AND FREE OF ANY OBJECTS, WHILE OPERATING THE VEHICLE. DO NOT RELY SOLELY ON SENSORS AND WARNING LIGHTS.



WARNING

USE EXTREME CAUTION AT ALL TIMES WHEN WALKING ON BRIDGE OR PLATFORM. DO NOT STEP ON ROLLERS OR CLUSTER ROLLER ASSEMBLIES. AVOID ALL MARKED WARNING AREAS AND FOLDING WINGS, AND KEEP A MINIMUM DISTANCE OF 1 M (3 FT.) FROM THE FRONT AND REAR OF THE BRIDGE.



WARNING

ENSURE THE LADDER OR STAIRS, AND AREA NEAR THE REAR OF THE BRIDGE ARE CLEAR OF PERSONS WHILE DRIVING AND OPERATING THE VEHICLE.



WARNING

APPLY THE PARKING BRAKE AND TURN OFF THE IGNITION SWITCH BEFORE LEAVING THE VEHICLE UNATTENDED.

2. **SAFETY PRECAUTIONS**

- Before operating the vehicle, the operator should read this manual and become completely familiarized with the vehicle.
- Learn how your vehicle is operated. Know the location and functions of all controls, indicators, caution instructions and warning and safety devices.
- Always perform the maintenance checks. Proper maintenance is necessary to ensure the maximum performance of your equipment.
- Follow the correct starting, warm-up, operating, stopping, and parking procedures.
- Remember that it only takes one unsafe action to cause an accident. Use the general safety guidelines recommended by S.A.E., specification S.A.E. J153, and follow your employer's safety rules and instructions to develop safe working habits. A careful operator is the best safety device there is.



WARNING

DO NOT ALLOW PERSONS ON THE PLATFORM WHILE IN MOTION OR IN AN ELEVATED POSITION. PLATFORM MAINTENANCE MAY BE PERFORMED FROM UNDERNEATH USING SAFETY SUPPORTS.



WARNING

NEVER EXCEED THE RECOMMENDED MAXIMUM WEIGHT LIMITS FOR THIS EQUIPMENT.



WARNING

NORMAL LOADING OPERATIONS SHOULD NOT BE PERFORMED WHILE AIRCRAFT IS BEING REFUELED WITHOUT HAVING FACILITY AND REGULATORY APPROVAL. OPERATOR MUST ENSURE THAT NO HYDRAULIC LEAKS OR UNSAFE CONDITIONS ARE PRESENT ON THE VEHICLE.



WARNING

USE CAUTION WHILE REFUELING THE VEHICLE TO AVOID FUEL SPILLS. CLEAN SPILLS PROMPTLY.



WARNING

AT THE BEGINNING OF EACH SHIFT ENSURE THAT ALL SCHEDULED SERVICES HAVE BEEN PERFORMED, INCLUDING VERIFICATION OF TIRE CONDITION, FUEL AND FLUID LEVELS, AND OVERALL CHECK FOR LOOSE OR MISSING HARDWARE AND GENERAL CONDITION OF THE VEHICLE.

**WARNING**

AN OBSERVER ON THE GROUND SHOULD BE USED TO GUIDE THE OPERATOR WHEN DRIVING THE VEHICLE IN REVERSE.

**WARNING**

THE VEHICLE IS DESIGNED TO BE DRIVEN ON PAVED OR CEMENT SURFACES APPROVED TO SUPPORT THE WEIGHT AND USE OF GROUND SUPPORT EQUIPMENT VEHICLES.

**WARNING**

DO NOT LIFT PERSONS WITH THE VEHICLE. THE LOADER IS NOT INTENDED FOR LIFTING OF PERSONS OTHER THAN THE DRIVER.

**WARNING**

DO NOT ALLOW PERSONS UNDER BRIDGE OR PLATFORM UNLESS ADEQUATE SUPPORTS ARE IN PLACE.

CAUTION

WHEN OPERATING THE VEHICLE IN FREEZING CONDITIONS, OCCASIONALLY TURN THE STEERING WHEEL SLOWLY TO PREVENT THERMAL SHOCK IN THE STEERING VALVE.

CAUTION

DO NOT PLACE THE EQUIPMENT INTO SERVICE WITHOUT PERFORMING ALL THE RECOMMENDED MAINTENANCE.

CAUTION

DO NOT DRIVE THE VEHICLE WITH THE BRIDGE OR PLATFORM LOADED.

3. **OPERATOR'S CONTROLS AND INDICATORS**

Operating controls are located within the operator's panel, driver's panel, and main control panel. Procedures requiring activity external to the driver and operator posts are covered later on this section of the manual. Operators shall consult their company operating procedures and management for external operating requirements specific to their company policy and procedures.

A. DRIVER'S CONSOLE

Refer to [Figure 1](#).

- (1) OPERATOR'S PANEL - Opposite to the driver's panel, allows for cargo load operations.
- (2) HORN SWITCH - Push button at center of steering wheel, sounds horn when pressed.
- (3) EMERGENCY STOP SWITCH - When pushed in, shuts down vehicle and applies parking brake. Switch is not to be used for routine shutdown of power unit. Ignition light and fault lights remain ON when emergency stop is pushed.

Twisting and pulling up the emergency stop button will release the switch. The vehicle will then be enabled to restart the engine and resume normal operation.

- (4) DRIVER'S CONTROL PANEL - Encloses all controls, gauges, and indicators that allow the operator to monitor and operate the vehicle. The steering wheel is integrated with the console on the driver's side.
- (5) EMERGENCY PUMP SWITCH - Located under right corner of driver's console. Provides emergency hydraulic power for all loader functions except drive and platform lift when master start switch is ON.
- (6) ACCELERATOR - Foot pedal, regulates drive speed of vehicle.
- (7) BRAKE - Foot pedal, applies service brakes.
- (8) MANUAL CAB LOCK - When lever is pulled, it will release the lock and allow the cab to be repositioned fore and aft.
- (9) TURN SIGNAL LEVER SWITCH (Optional) - Activates turn signal lights to indicate direction of turn. It actuates on a flasher to produce the blinking signal.

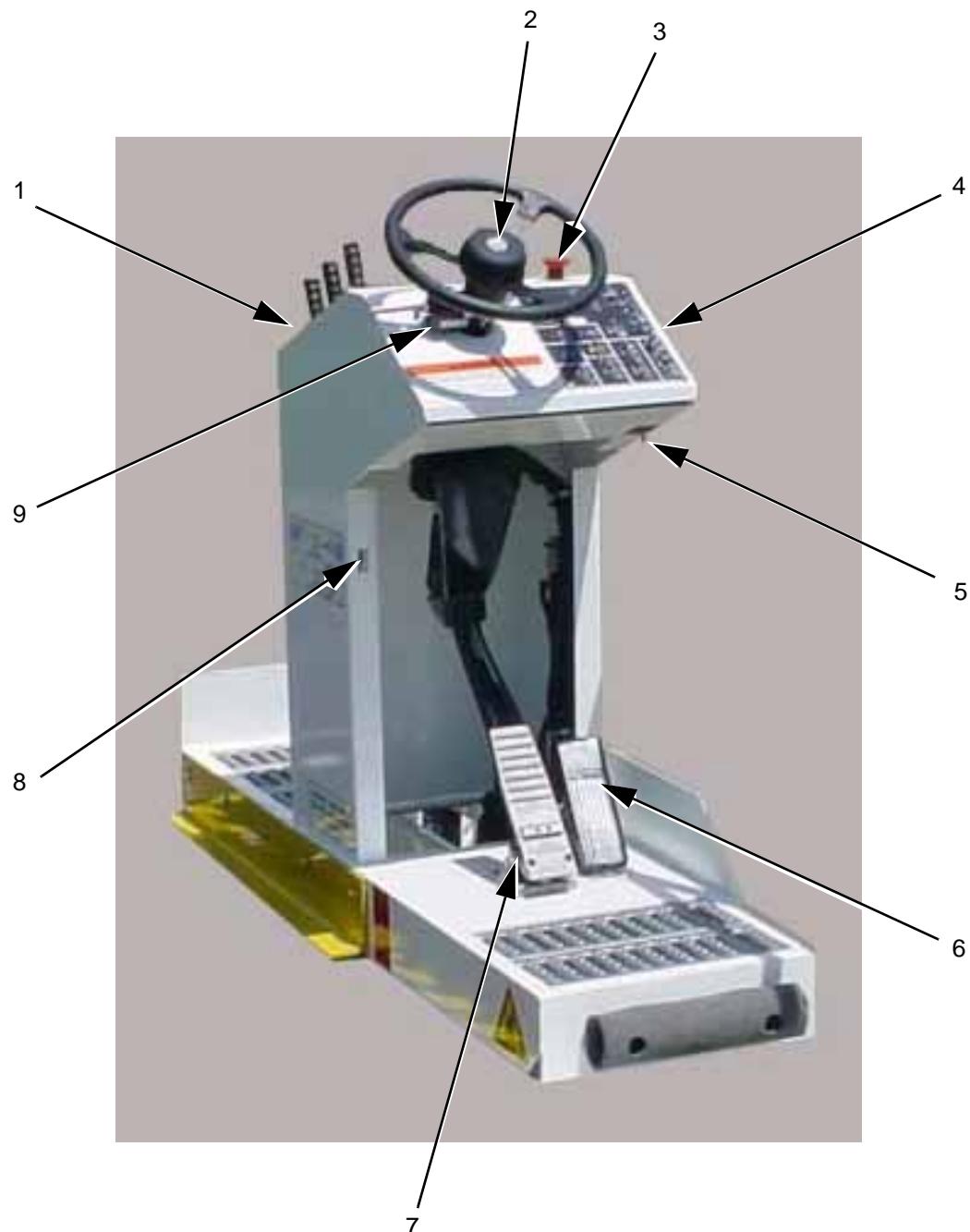
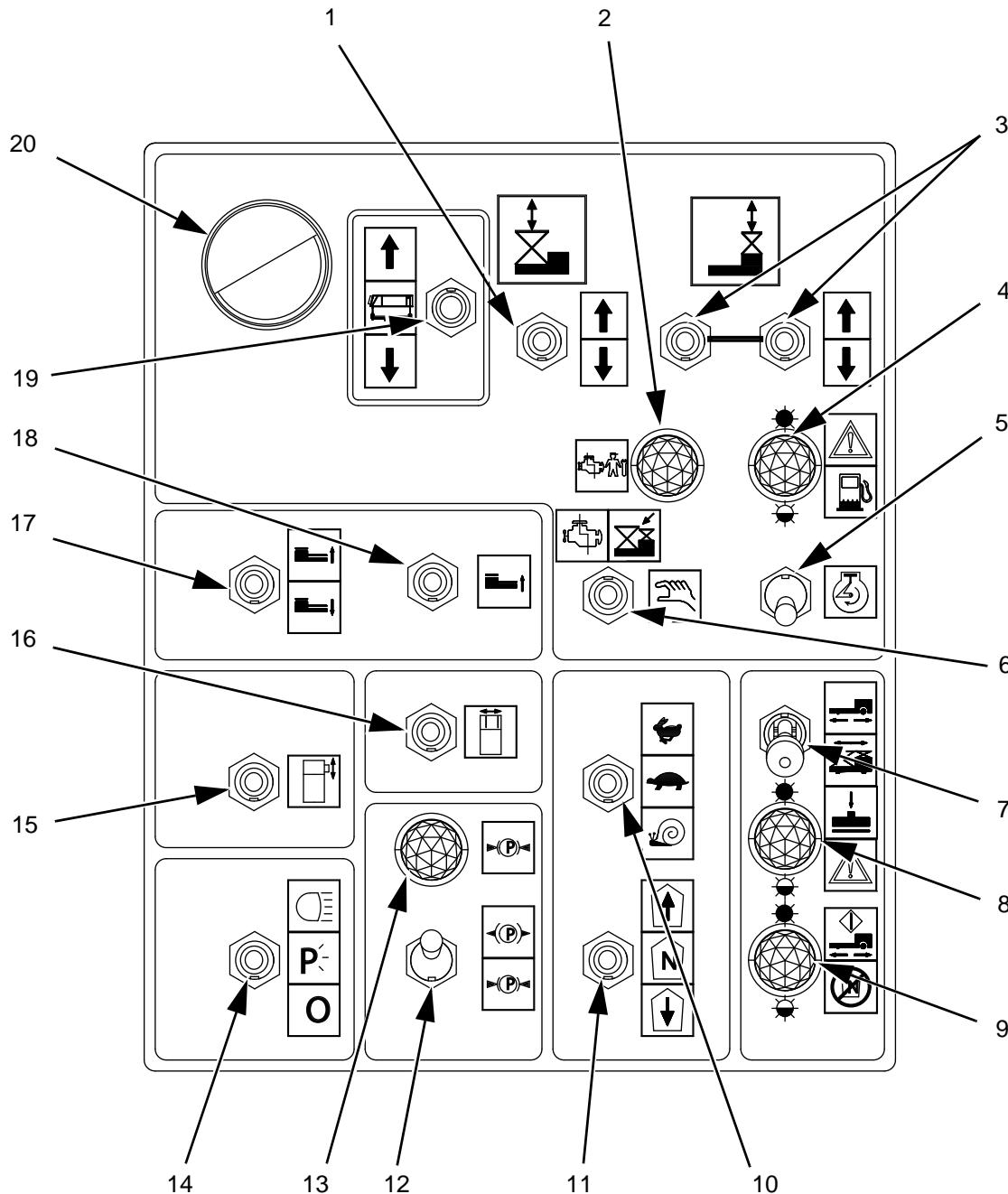


Figure 1
DRIVER'S CONSOLE

B. DRIVER'S PANEL CONTROLS

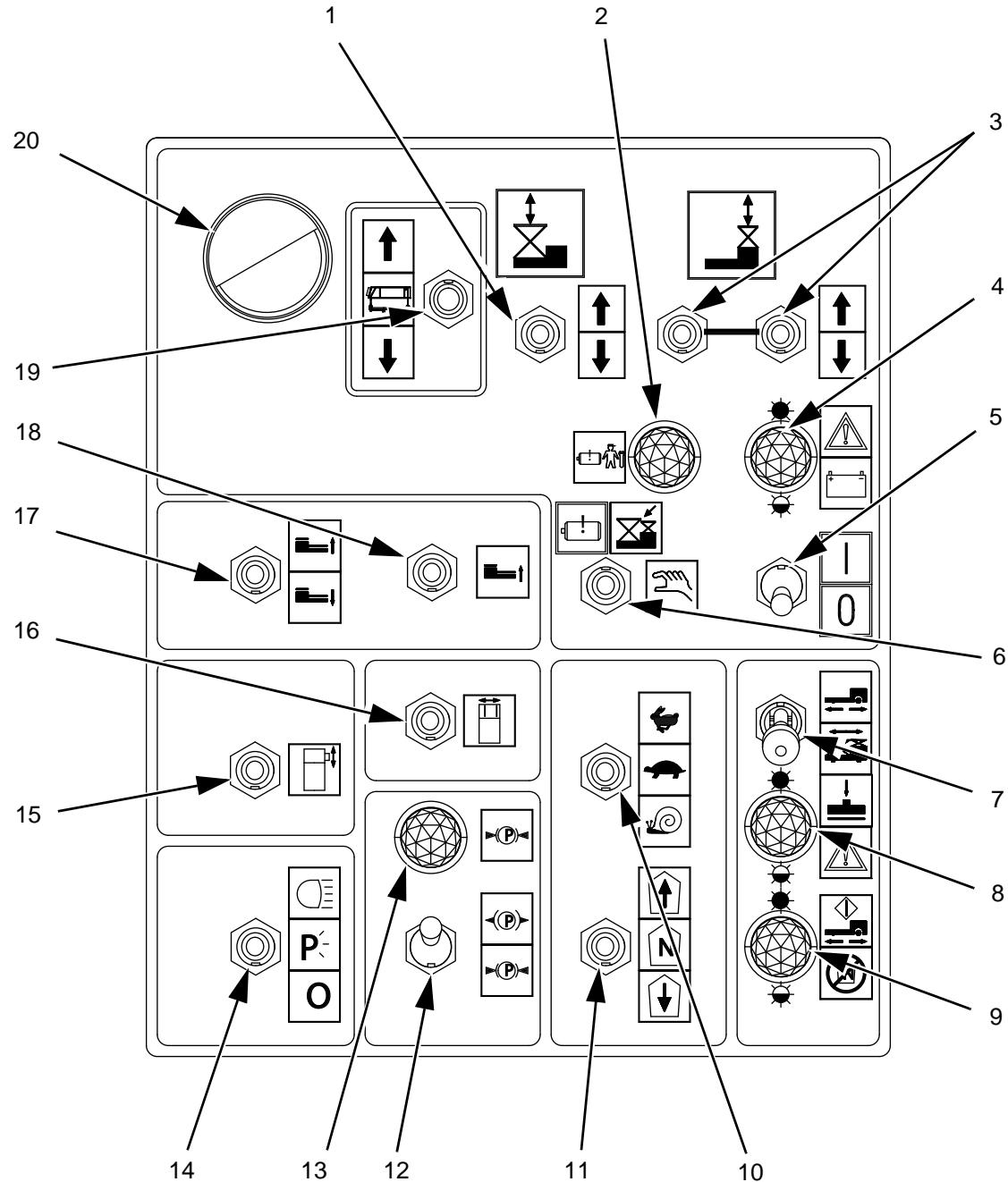
NOTE: REFER TO [FIGURE 2](#) AND [FIGURE 3](#) FOR PANELS, AND [FIGURE 4](#) AND [FIGURE 5](#) FOR PICTOGRAMS.

- (1) PLATFORM LIFT SWITCH - Three-position switch spring-loaded to center off position; raises and lowers platform.
- (2) ENGINE FAULT INDICATOR (RED) - Illuminates when engine is at fault or check engine status.
- (3) BRIDGE LIFT SWITCHES - Two three-position switches spring-loaded to center off position: raises bridge when both switches are up, and lowers bridge when both switches are down.
- (4) LOW FUEL INDICATOR (Flashing RED) (Diesel Power Module) - Illuminates when fuel is low.
LOW BATTERY LEVEL (Flashing RED) (Electric Power Module - Optional) - Illuminates when battery charge level is low.
FAULT INDICATOR (Steady RED) - Illuminates when there is a motor or engine fault, hydraulic oil temperature, generator, foot pedal or a Programmable Logic Controller (PLC) is at fault. (Refer to display module for a description of the type of fault.)
- (5) AUXILIARY START SWITCH (Diesel Power Module) - Two-position toggle switch starts power unit when set to START on diesel powered unit. The MASTER START SWITCH on the main control panel must be ON.
ON - OFF SWITCH (Electric Power Module) - Two-position switch enables and disables the electric motor to operate.
- (6) MANUAL OVERRIDE SWITCH - OVERRIDE to operate with electric motor or engine fault, NORMAL when engine running or motor not at fault.
Hold the MANUAL OVERRIDE SWITCH in OVERRIDE in the event of platform overtravel to bypass shutdown during cranking. Switch must remain in OVERRIDE to keep engine running.
- (7) MODE SWITCH - Two-position switch: extends (lowers) stabilizers and rear chassis when placed in operate position, and retracts stabilizers when placed in drive position and platform fully lowered. Amber indicator illuminates when stabilizers are fully extended. Locking switch standard. Switch must be lifted out of position prior to changing selection or damage could result to switch if excessive force is used.
- (8) STABILIZERS DOWN INDICATOR (AMBER) - Illuminates when stabilizers are down
- (9) PROPEL ENABLE INDICATOR (GREEN) - Illuminates steady when loader is ready to drive and illuminates flashing for shift to neutral.
- (10) PROPEL SPEED SWITCH - Three-position control used to select ranges of speed in forward and reverse direction. The fast (rabbit) position provides maximum speed for direction selected with drive control, slow (turtle) position provides a medium speed, and creep (snail) position provides minimum speed control.
- (11) PROPEL SWITCH - Three-position control used to select a forward direction, a neutral position, and a reverse direction.



NOTE: REFER TO [FIGURE 4](#) AND [FIGURE 5](#) FOR SYMBOL IDENTIFICATION.

Figure 2
DRIVER'S PANEL - DIESEL POWERED UNIT



NOTE: REFER TO [FIGURE 4](#) AND [FIGURE 5](#) FOR SYMBOL IDENTIFICATION.

Figure 3
DRIVER'S PANEL - ELECTRICAL POWERED UNIT (OPTIONAL)

(1)		PLATFORM RAISE AND LOWER		OVERTAKE START ENABLE
(2)		BRIDGE RAISE AND LOWER		MANUAL OVERRIDE
(3), (7)		FAULT (INDICATOR)		MODE
		FUEL, LOW LEVEL (DIESEL UNIT ONLY)	(6)	DRIVE MODE
		BATTERY, LOW LEVEL (ELECTRIC UNIT ONLY)		OPERATE MODE
(4)		START - DIESEL UNIT ONLY (STANDARD)	(7)	STABILIZERS DOWN (INDICATOR)
		ON		PROPEL ENABLE
		OFF	(8)	PROPEL ENABLED READY TO PROPEL (INDICATOR)
(5)		DIESEL ENGINE FAULT (STANDARD)		STEADY LIGHT: READY TO PROPEL
		ELECTRIC MOTOR FAULT (OPTIONAL)		FLASHING LIGHT: NEUTRAL
				SHIFT TO NEUTRAL (INDICATOR)

Figure 4
PICTOGRAMS FOR DRIVER'S PANEL CONTROLS

PROPEL SPEED		LIGHTS	
(9)		FAST - RABBIT	(13)
			HEADLIGHTS AND PARKING LIGHTS
		SLOW - TURTLE	(14)
			PARKING LIGHTS
		CREEP - SNAIL	(15)
			OFF
PROPEL		CHASSIS	
(10)		FORWARD	(16)
			RAISE
		NEUTRAL	(17)
			LOWER
		REVERSE	
PARKING BRAKE		CHASSIS RAISED (INDICATOR)	
(11)		OFF	(18)
			CHASSIS RAISED (INDICATOR)
		ON	
			ENGINE FAULT (INDICATOR)
(12)		PARKING BRAKE ENGAGED (INDICATOR)	
			ELECTRIC MOTOR SYSTEM FAULT

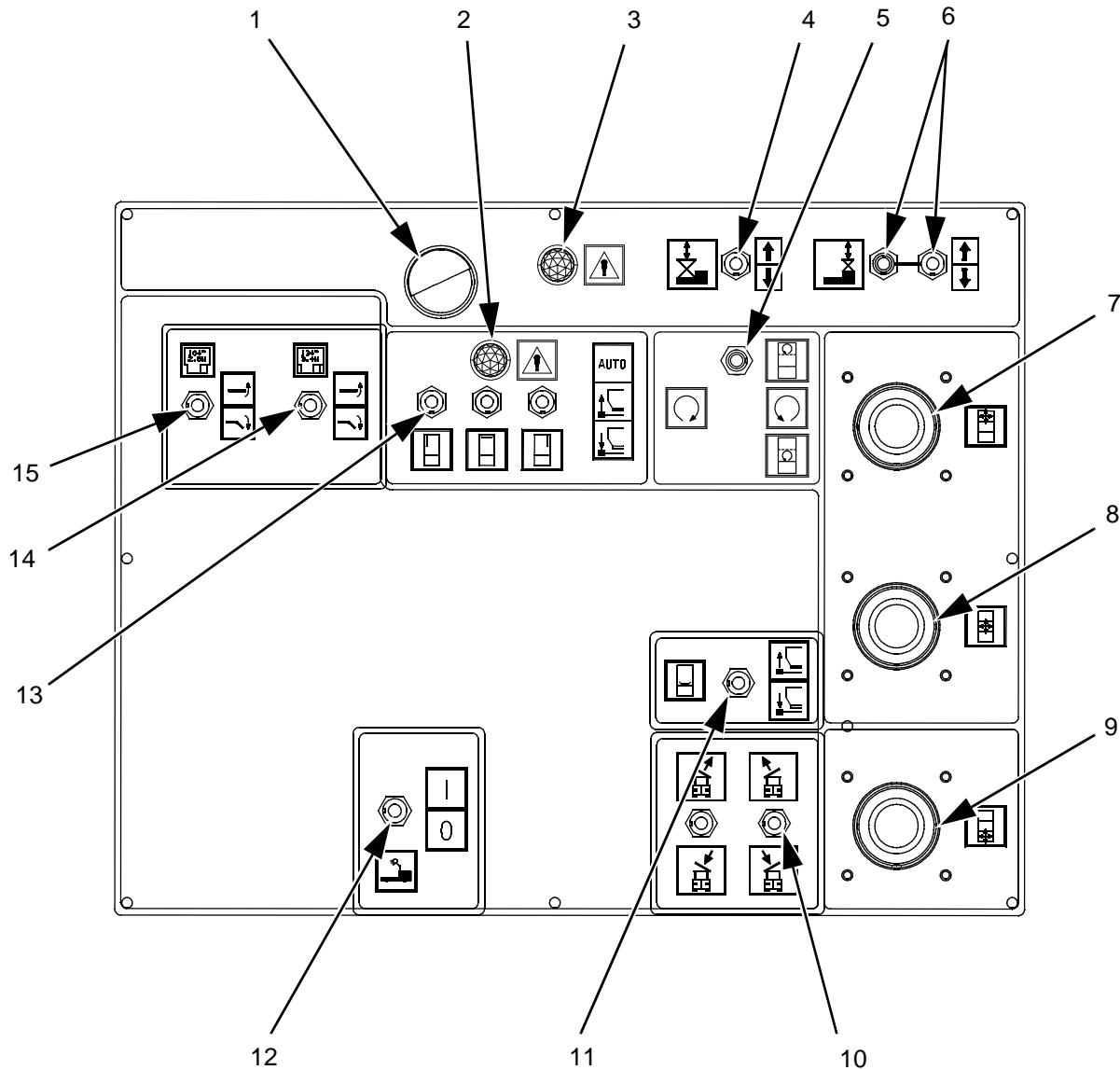
Figure 5
PICTOGRAMS FOR DRIVER'S PANEL CONTROLS

- (12) PARKING BRAKE SWITCH - Two-position switch. Applies parking brake when set to ON and illuminates (Red) indicator to show that brake is applied. Releases brake when set to OFF and causes red indicator to turn off. Parking brake is automatically applied when mode switch is set to operate position.
- (13) PARKING BRAKE INDICATOR (RED) - Illuminates when parking brake is ON.
- (14) LIGHTS SWITCH - Three-position switch turns head lamps and running lights on when switch is up; turns parking lights on when switch is in center position; turns lights off when switch is down.
- (15) CAB EXTENSION SWITCH (Optional) - Three-position switch spring-loaded to OFF position; extends operator's cab when switch is up; retracts operator's cab when switch is down.
- (16) BRIDGE SIDE GUIDES SWITCH - Three-position switch spring-loaded to center (OFF) position; shifts guides left when momentarily placed in left position, or to right when placed in right position.
- (17) CHASSIS SWITCH - Three-position momentary switch (OFF at center position). Raises or lowers the rear chassis by extending or retracting bogie wheel cylinders.
- (18) RAISE CHASSIS INDICATOR (Optional) (Flashing RED) - Flashes unless chassis is raised.
- (19) POWER HANDRAIL SWITCH (Optional) - Three-position switch spring-loaded to center (OFF) position; extends the power handrail when switch is up; retracts the handrail when switch is down.
- (20) PANEL LIGHTS - Illuminates panel when parking lights are on.

C. OPERATOR'S CONTROL PANEL

Refer to [Figure 6](#), [Figure 7](#) and [Figure 8](#).

- (1) PANEL LIGHTS - Illuminate panel when parking lights are on.
- (2) GUIDE FAULT LIGHT (RED) - Illuminates when faults are detected in guide sensors.
- (3) PLATFORM FAULT LIGHT (RED) - Illuminates when faults are detected in platform height sensors.
- (4) PLATFORM LIFT SWITCH - Three-position switch spring-loaded to off position; raises and lowers platform.
- (5) ROTATION SWITCH - Three-position toggle switch spring-loaded to off position. When set to the right, causes cargo to rotate counterclockwise on rear platform.
- (6) BRIDGE LIFT SWITCHES - Two three-position switches spring-loaded to off position: raises bridge when switch is up, and lowers bridge when switch is down.
- (7) PLATFORM CONVEY JOYSTICK - Five-position joystick moves cargo on rear section of platform in direction of arrows on switch placard: Fwd, Aft, Left, Right; and Off at the center position.
- (8) PLATFORM CONVEY JOYSTICK - Five-position joystick moves cargo on front section of platform in direction of arrows on switch placard: Fwd, Aft, Left, Right; and Off at the center position.



NOTE: REFER TO [FIGURE 7](#) AND [FIGURE 8](#) FOR SYMBOL IDENTIFICATION.

Figure 6
OPERATOR'S CONTROL PANEL

(1)	NO SYMBOL	ILLUMINATION LIGHT		
(2)		GUIDE FAULT (INDICATOR)	(8)	
(3)		PLATFORM FAULT (INDICATOR)	(9)	
(4)		PLATFORM RAISE AND LOWER		
				BRIDGE TILT LEFT
		PLATFORM ROTATION	(10)	
(5)		CLOCKWISE		UP
		COUNTERCLOCKWISE		DOWN
				BRIDGE TILT RIGHT
(6)		BRIDGE RAISE AND LOWER		
				UP
(7)		PLATFORM CONVEY FIVE POSITION REAR SECTION		
				DOWN

Figure 7
PICTOGRAMS FOR OPERATOR'S CONTROL PANEL

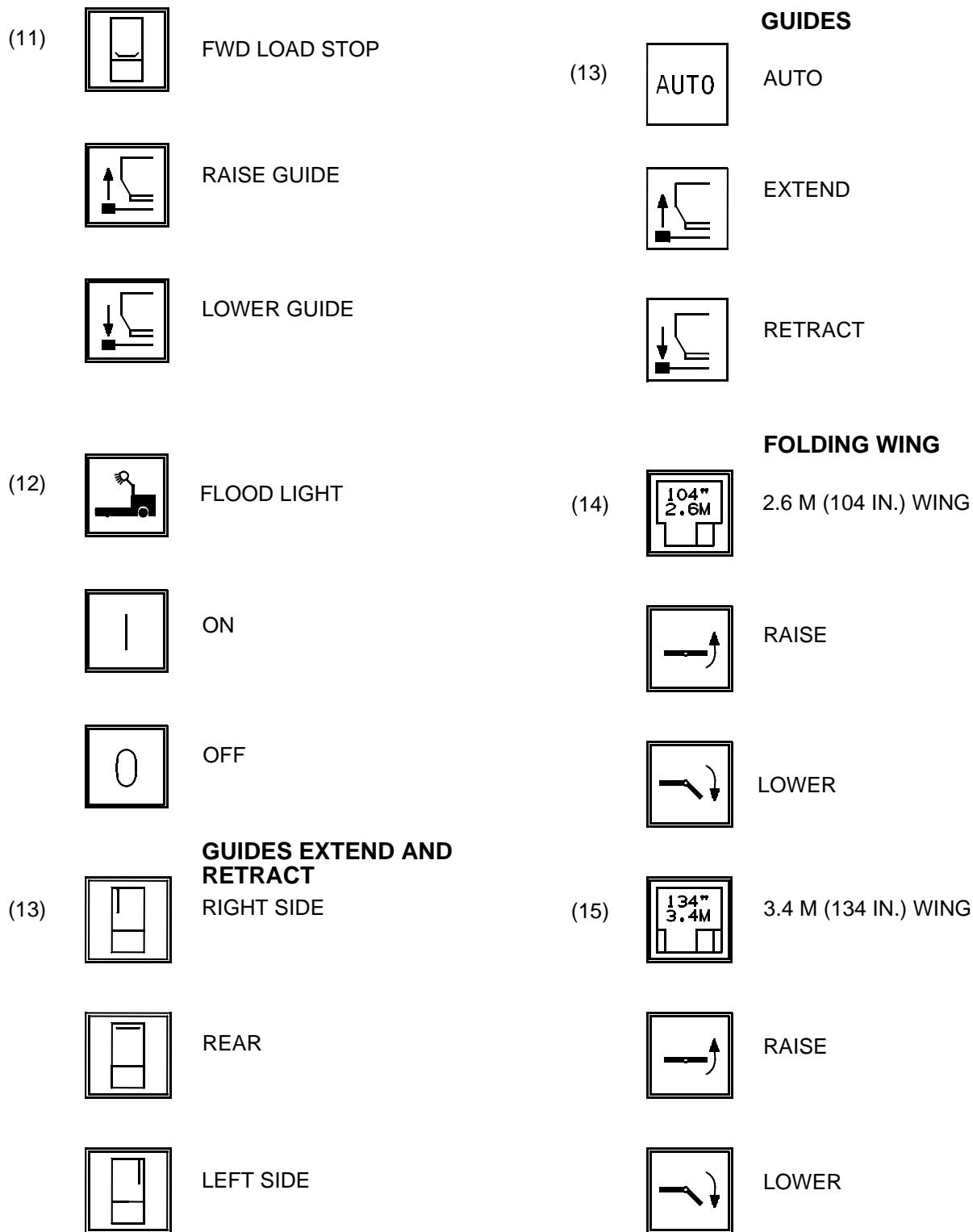


Figure 8
PICTOGRAMS FOR OPERATOR'S CONTROL PANEL

- (9) BRIDGE CONVEY JOYSTICK - Five-position switch moves cargo on bridge in direction of arrows on switch placard: Fwd, Aft, Left, Right; and Off at the center position.
- (10) BRIDGE TILT (Optional) - Three-position toggle switch on operation bridge tilt left and right.
- (11) FORWARD LOAD STOP (Optional) - Two-position toggle switch; lowers stop.
- (12) FLOODLIGHT SWITCH (Optional) - Two-position toggle switch to turn lights on or off.
- (13) RIGHT, REAR, AND LEFT GUIDE SWITCHES - Three three-position toggle switches (with platform down):
 - (a) UP POSITION (AUTO) - The selected guide automatically lowers when platform is below 600 mm (24 in.)
 - (b) CENTER POSITION - The selected guide remains up.
 - (c) DOWN POSITION - The operator can momentarily lower the selected guide when platform is below 600 mm (24 in.) (or below 1520 mm [60 in.] with truck transfer option).
- (14) FOLDING WING SWITCH 2.60 m (104 in.) - Three-position toggle switch; spring-loaded to off position. Raises or lowers bridge wing when bridge is fully down.
- (15) FOLDING WING SWITCH 3.40 m (134 in.) (Optional) - Three-position toggle switch; spring-loaded to off position. Raises or lowers bridge wings.

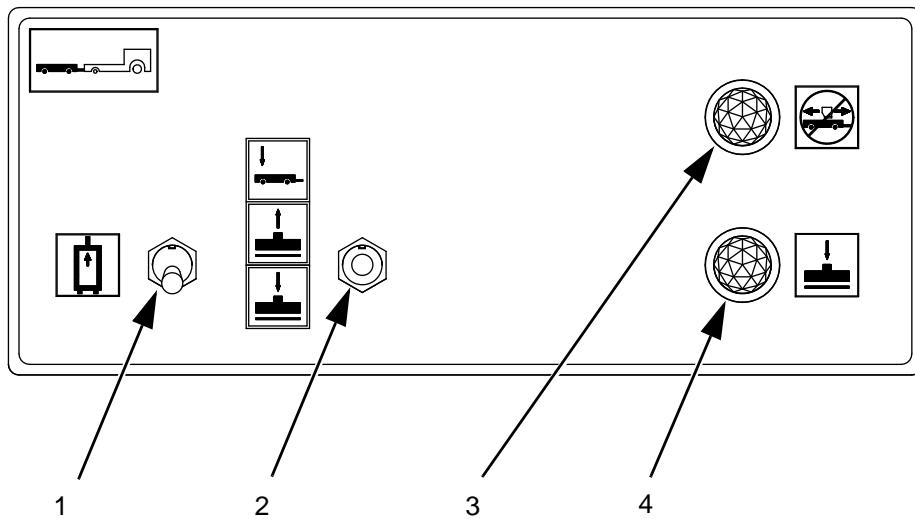
D. EXTENSION DECK CONTROL PANEL IN BRIDGE (OPTIONAL)

When present, this control panel is incorporated into the operator's panel, on the center left side. The extension deck must be properly attached and connected to the hydraulic and electrical system to operate. Refer to [Figure 9](#).

- (1) CONVEY FORWARD SWITCH - Two-position switch (OFF - ON) to move cargo load forward on extension deck onto the platform. The operator cannot convey cargo loads from the platform into the extension deck from the control panel in the bridge.

NOTE: THE CONVEY SWITCH WILL ONLY OPERATE IF THE STABILIZERS ARE DOWN (EXTENDED).

- (2) REAR STABILIZERS SWITCH - Three-position switch (ON - OFF - ON) to raise (retract) and lower (extend) the extension deck rear stabilizers.
- (3) CONVEY FAULT WARNING LIGHT (RED) - Illuminates when there is a fault in the system indicating that no load transfer can be made on the extension deck.
- (4) STABILIZERS NOT RETRACTED WARNING LIGHT (RED) - Illuminates when the rear stabilizers are not retracted and the loader is set to DRIVE MODE.



NOTE: REFER TO [FIGURE 10](#) FOR SYMBOL IDENTIFICATION.

Figure 9
EXTENSION DECK CONTROL PANEL IN BRIDGE (OPTIONAL)

EXTENSION DECK CONVEY		WARNING LIGHTS	
(1)		CONVEY FORWARD	(3)
EXTENSION DECK STABILIZERS		CONVEY FAULT (NO LOAD TRANSFER)	
(2)		REAR STABILIZERS	(4)
		STABILIZERS NOT RAISED (RETRACTED) IN DRIVE MODE	
		STABILIZERS RAISED (RETRACTED)	
		STABILIZERS DOWN (EXTENDED)	

Figure 10
EXTENSION DECK CONTROL PANEL - PICTOGRAMS

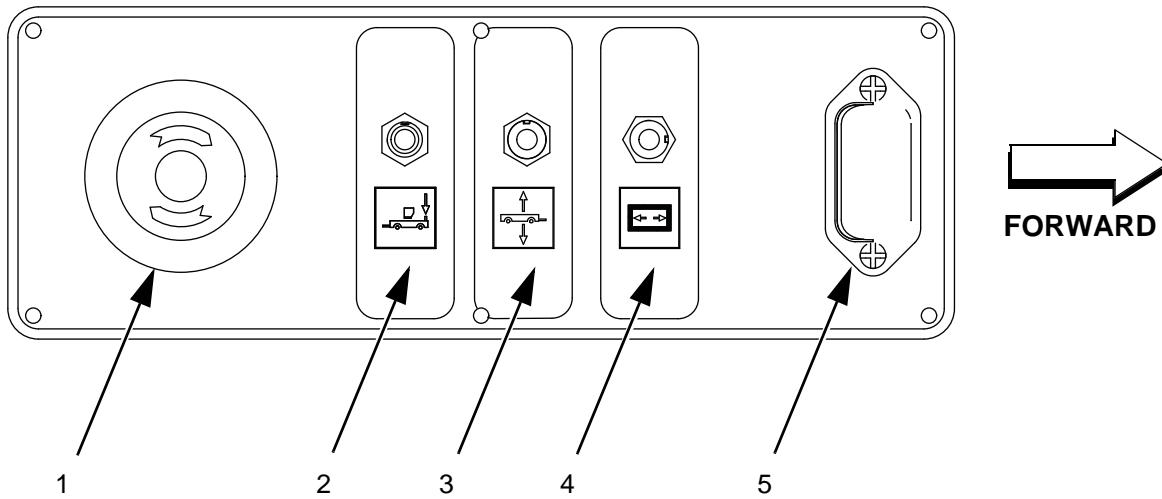
E. EXTENSION DECK CONTROL PANEL PODS (OPTIONAL)

Control panel pods with emergency stop push-button switches are installed at the rear on both sides of the extension deck (refer to [Figure 11](#) and [Figure 12](#)).

- (1) EMERGENCY STOP (E-STOP) PUSH-BUTTON - Depressing any of the E-stop buttons will disable the extension deck and the loader, shutting down the vehicle.
- (2) REAR LOAD STOP SWITCH - Three-position switch (ON - AUTO - ON) to raise (retract) and lower (extend) the extension deck rear load stop.
- (3) REAR STABILIZERS SWITCH - Three-position switch (ON - OFF - ON) to raise (retract) and lower (extend) the extension deck rear stabilizers.
- (4) CONVEY FORWARD SWITCH - Three-position switch (ON - OFF - ON) to move load forward and backwards on extension deck.

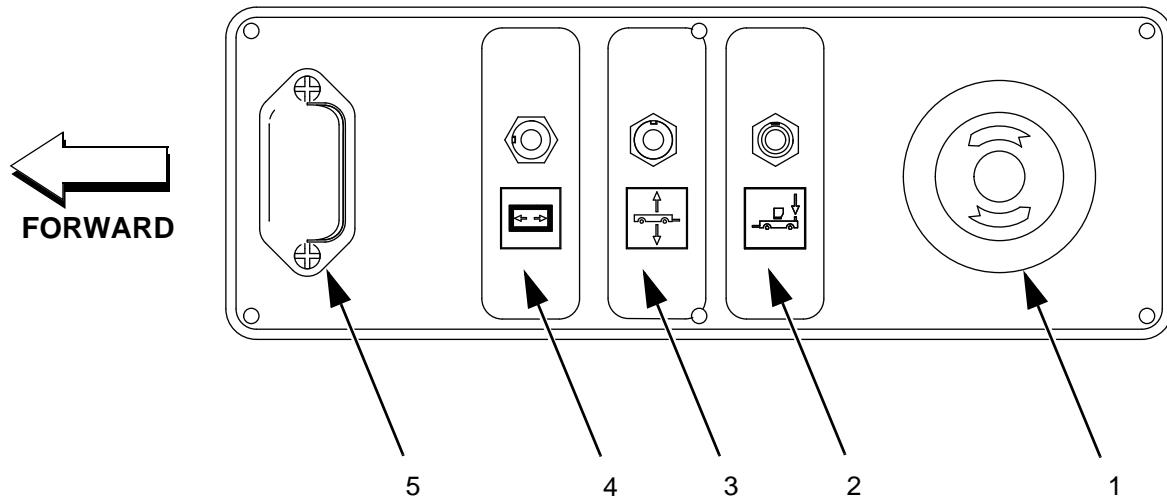
NOTE: THE CONVEY SWITCH WILL ONLY OPERATE IF THE STABILIZERS ARE DOWN (EXTENDED).

- (5) PANEL LIGHT - Illuminates panel when parking lights are on.



NOTE: REFER TO [FIGURE 13](#) FOR SYMBOL IDENTIFICATION.

Figure 11
EXTENSION DECK RIGHT SIDE POD (OPTIONAL)



NOTE: REFER TO [FIGURE 13](#) FOR SYMBOL IDENTIFICATION.

Figure 12
EXTENSION DECK LEFT SIDE POD (OPTIONAL)

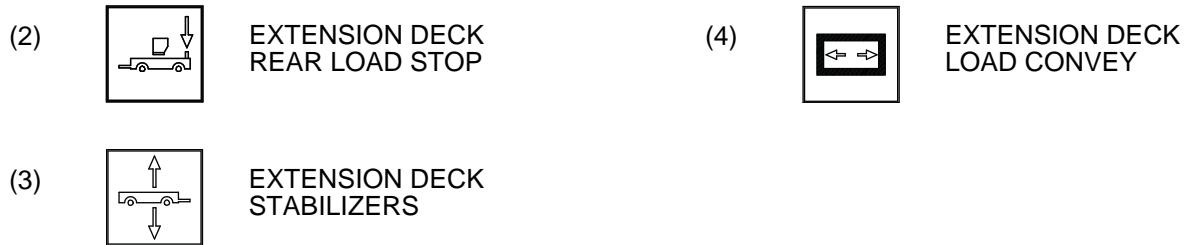


Figure 13
EXTENSION DECK CONTROL PANEL PODS - PICTOGRAMS

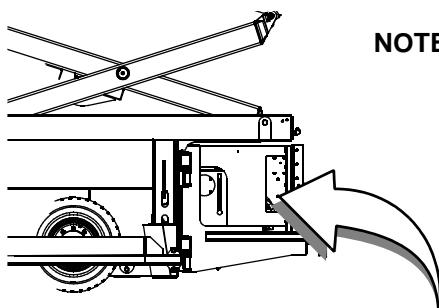
F. MAIN CONTROL PANEL - DIESEL POWERED UNIT

Refer to [Figure 14](#) and [Figure 15](#).

- (1) PANEL LIGHT - Illuminates panel when parking lights are ON.
- (2) FUEL LEVEL GAUGE - Indicator shows approximate level of fuel in tank. Red area at lower left shows limited amount of fuel available and indicates that loader should be refueled to ensure that operations can be continued without interruption.
- (3) SHIFT TO NEUTRAL INDICATOR AND IGNITION LAMP (AMBER)
 - (a) Flashes when PROPEL SWITCH is not set to N (NEUTRAL) and DRIVE is selected.
 - (b) IGNITION LAMP illuminates steady when master start switch is ON.
- (4) LOW FUEL INDICATOR (Flashing RED) - Illuminates when fuel is low.
FAULT INDICATOR (Steady RED) - Illuminates when engine fault, hydraulic temperature, generator, foot pedal or Programmable Logic Controller (PLC) is at fault. (For a description of the type of fault, refer to Interface Module in Chapter 2, Section 6, Troubleshooting).
- (5) MASTER START SWITCH - Three-position switch; momentary ON: starts engine, ON: engine running; OFF: engine shutdown.
- (6) WAIT-TO-START LIGHT (AMBER) - Do not start vehicle with light illuminated.

NOTE: DO NOT ATTEMPT TO START THE ENGINE UNTIL THE INDICATOR LIGHT IS OFF.

- (7) ENGINE FAULT INDICATOR (RED) - Illuminates when engine is at fault or check engine status.
- (8) MANUAL OVERRIDE SWITCH - NORMAL - OVERRIDE to start, or ignition and operate with engine fault.
- (9) HOURMETER - Indicates total hours of engine operation.
- (10) EMERGENCY STOP SWITCH - When pushed in, shuts off power unit. Switch is not to be used for routine shutdown of power unit. Ignition light and fault lights remain ON when emergency stop is pushed.
- (11) OIL PRESSURE GAUGE (Optional) - Indicator in green area shows satisfactory engine oil pressure. Indicator in red area shows that pressure is low.
- (12) COOLANT TEMPERATURE GAUGE (Optional) - Indicator in green area indicates satisfactory operating temperature range. Indicator in red area indicates excessively hot temperature.
- (13) TACHOMETER (Optional) - For engine protection, indicates engine RPM.
- (14) VOLTS GAUGE (Optional) - Indicates voltage output from generator.



NOTE: REFER TO [FIGURE 15](#) FOR SYMBOL IDENTIFICATION.

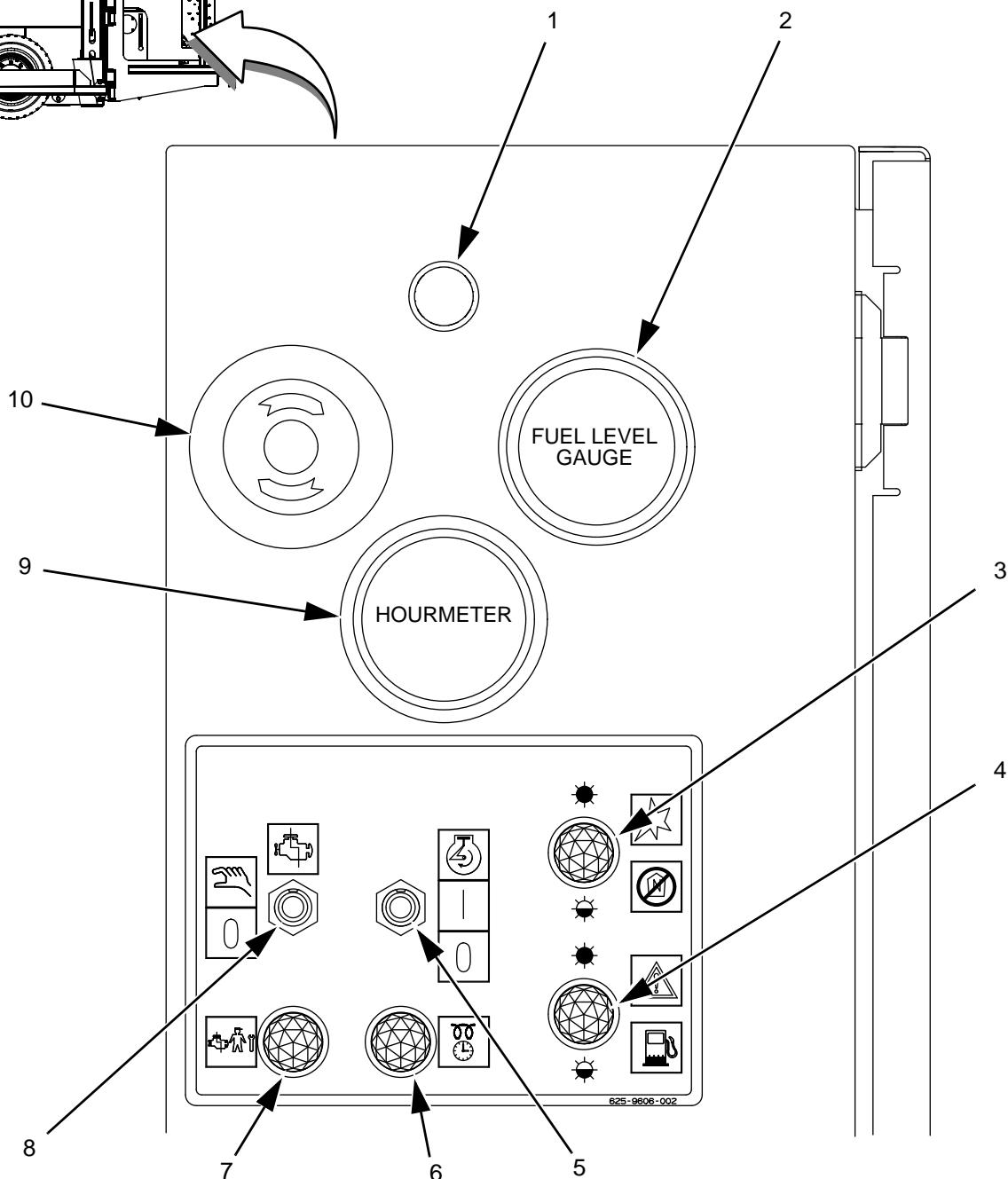


Figure 14
MAIN CONTROL PANEL - DIESEL POWERED UNIT

(1)	NO SYMBOL	IGNITION LIGHT	(5)		START
(2)	NO SYMBOL	FUEL GAUGE			ON
(3)		IGNITION LIGHT (INDICATOR)			OFF
		STEADY LIGHT: IGNITION	(6)		WAIT-TO-START (INDICATOR)
		FLASHING LIGHT: NEUTRAL	(7)		ENGINE FAULT (INDICATOR)
(4)		FAULT (INDICATOR)	(8)		OVERRIDE ENGINE FAULT
		STEADY LIGHT: FAULT			MANUAL OVERRIDE
		FLASHING LIGHT: LOW FUEL LEVEL			OFF - NORMAL
		FUEL, LOW LEVEL (INDICATOR)	(9)	NO SYMBOL	HOURMETER
			(10)	NO SYMBOL	EMERGENCY STOP PUSH-BUTTON

Figure 15
PICTOGRAMS FOR MAIN CONTROL PANEL - DIESEL

G. MAIN CONTROL PANEL - ELECTRICAL POWERED UNIT (OPTIONAL)

Refer to [Figure 16](#) and [Figure 17](#).

- (1) PANEL LIGHT - Illuminates panel when parking lights are ON.
- (2) BATTERY 1 CHARGE LEVEL GAUGE - Indicator shows charge level of first battery bank. Solid illuminated circles show the amount of current available and when no circles are present indicates that battery should be recharged.
- (3) SHIFT TO NEUTRAL INDICATOR AND IGNITION LAMP (AMBER)
 - (a) Flashes when PROPEL SWITCH is not set to N (NEUTRAL) and DRIVE is selected.
 - (b) IGNITION LAMP (AMBER) - Illuminates steady when master start switch is ON.
- (4) LOW BATTERY CHARGE LEVEL INDICATOR (Flashing RED) - Illuminates when battery current level is low.
FAULT INDICATOR (Steady RED) - Illuminates when there is a system fault, current failure, foot pedal or Programmable Logic Controller (PLC) is at fault. (For a description of the type of fault, refer to Interface Module in Chapter 2, Section 6, Troubleshooting).
- (5) MASTER IGNITION SWITCH - Three-position switch: system OFF, system ON, system RESET.
- (6) MOTOR FAULT INDICATOR (RED) - Illuminates when electrical motor is at fault or check electrical system status.
- (7) MANUAL OVERRIDE SWITCH - Two-position switch; NORMAL (0), momentary OVERRIDE to operate with electric motor or system fault.
- (8) BATTERY 2 CHARGE LEVEL GAUGE - Indicator shows charge level of second battery bank. A solid illuminated bar between 0 and 1 shows the amount of current available and when the bars is closer to 0 indicates that battery should be recharged.
HOURMETER - Indicates total hours of operation.
- (9) EMERGENCY STOP SWITCH - When pushed in, shuts off power unit. Switch is not to be used for routine shutdown of power unit. Ignition light and fault lights remain ON when emergency stop is pushed.

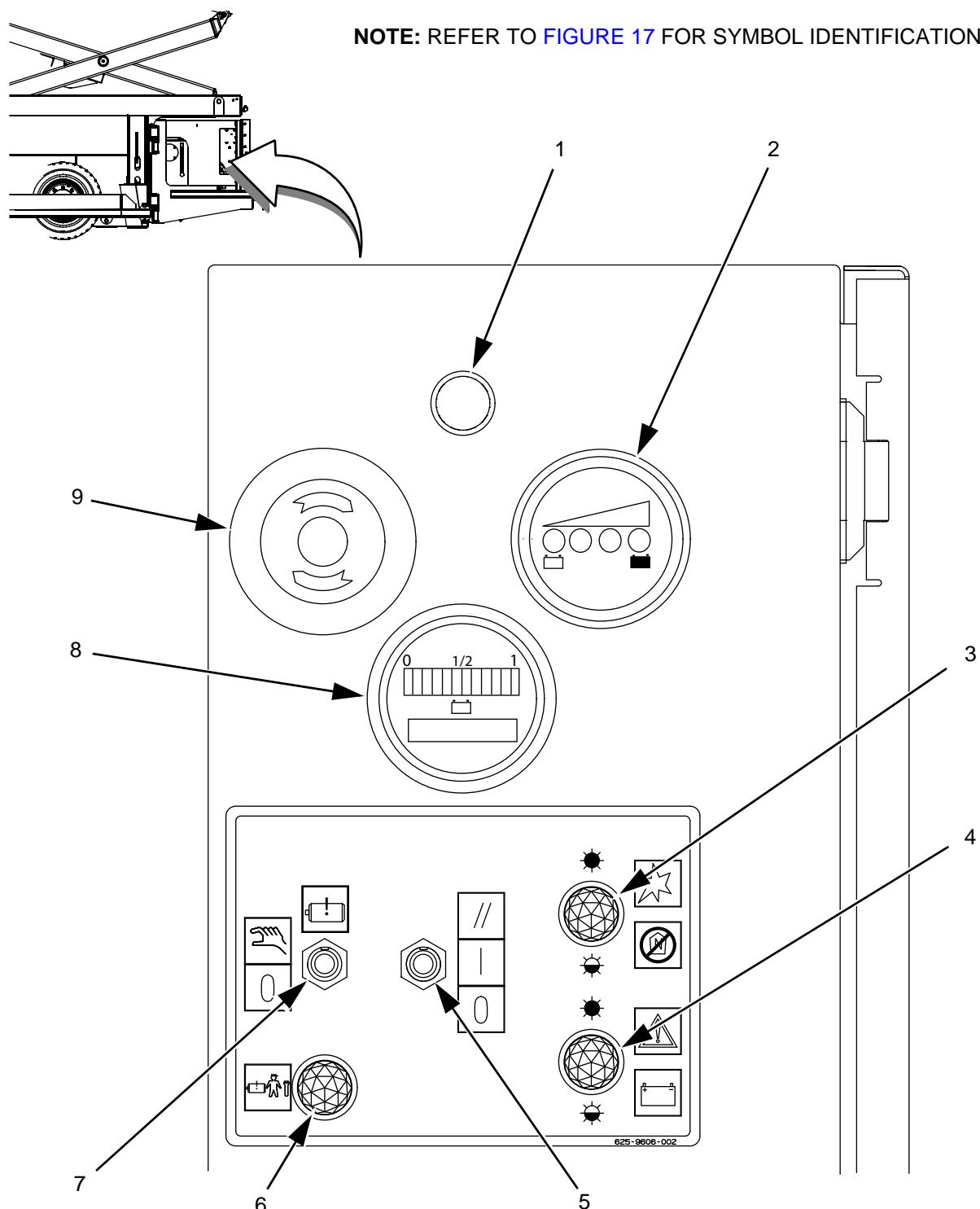


Figure 16
MAIN CONTROL PANEL - ELECTRICAL POWERED UNIT

(1)	NO SYMBOL	PANEL ILLUMINATION LIGHT	(5)		RESET SYSTEM
(2)	NO SYMBOL	FUEL GAUGE			ON
(3)		IGNITION LIGHT (INDICATOR)			OFF
		STEADY LIGHT: IGNITION	(6)		ELECTRIC MOTOR SYSTEM FAULT (INDICATOR)
		FLASHING LIGHT: NEUTRAL	(7)		OVERRIDE MOTOR SYSTEM FAULT
		SHIFT TO NEUTRAL (INDICATOR)			MANUAL OVERRIDE
(4)		FAULT (INDICATOR)			OFF - NORMAL
		STEADY LIGHT: FAULT	(8)	NO SYMBOL	BATTERY CHARGE LEVEL GAUGE AND HOURMETER
		FLASHING LIGHT: LOW CHARGE LEVEL	(9)	NO SYMBOL	EMERGENCY STOP PUSH-BUTTON
		BATTERY CHARGE, LOW LEVEL (INDICATOR)			

Figure 17
PICTOGRAMS FOR MAIN CONTROL PANEL - ELECTRIC

H. SUPERVISOR KEY RESET PANEL (OPTIONAL WITH APD)

This panel is available as an option with the APD system to reset an alarm that can lock a function on the vehicle on conditions specified through the APD system configuration (refer to [Figure 18](#)). Refer to Aircraft Proximity Detector (APD) in Chapter 2, Section 8.

If installed, the panel is located below the main control panel on the power module. Otherwise, system alarms must be reset through the display module (PDM) mounted on the APD operator's panel. A supervisor must input a special code to reset the APD system if no supervisor key reset panel is installed.

- (1) APD Alarm Warning Indicator Light (RED) - Illuminates when an APD alarm has been triggered due to contact of the bridge with the aircraft. This indicator light will turn OFF once the reset is done.
- (2) APD Supervisor Key Switch - Two-position rotary switch (OFF - Momentary ON).

To reset the APD system alarm that caused the lock-up, insert the supervisor key into the switch and turn clockwise 45 degrees. The key must be held in the unlock position for more than three (3) seconds to unlock loader functions whenever an alarm locks the vehicle.

The key switch must be in the up position for normal operation (without the supervisor key).

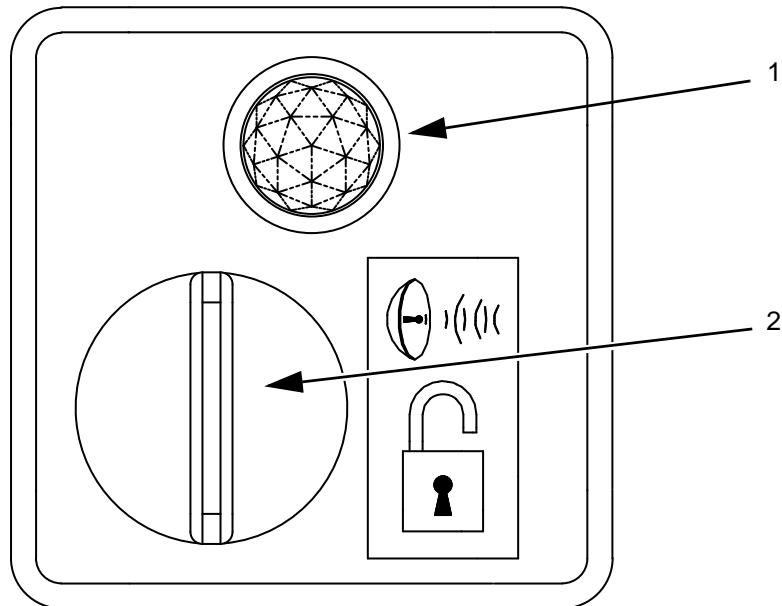


Figure 18
SUPERVISOR KEY RESET (OPTIONAL WITH APD)

4. **SAFETY AND CONTROL DEVICES**

A. EMERGENCY STOP PUSH-BUTTONS

Two red push-buttons are provided on the vehicle. One is located on the main panel, on the power module, and the second push-button on the operator's console. When the operator depresses this switch, it will immediately cut off the electric power, stop engine and all the vehicle's systems.

The switch is a self lock-down type, that twists for unlocking. Optionally, this button could be luminous, so it lights when it is pushed. As an option, additional emergency stop push-buttons on the chassis can be provided.

NOTE: EMERGENCY STOP PUSH-BUTTONS ARE INTENDED ONLY FOR EMERGENCY SHUTDOWN OF THE POWER UNIT, AND NOT FOR ROUTINELY TURNING OFF THE ENGINE.

B. WARNING DEVICES

Warning lights on the instrument panel warn the operator when certain situations become unsafe.

- Platform fault light
- Guide fault light

C. ENGINE AUTOMATIC SHUTDOWN (SAFETY CIRCUIT)

(1) Engine Fault Detection

When the engine controller detects an engine fault, the engine will slow down or stop.

(2) Engine Shutdown due to Low Hydraulic Oil Level (Optional)

A sensor inside the hydraulic oil tank detects when the hydraulic oil is at the minimum safe operating level, cutting-off the fuel supply to the engine.

(3) Engine Shutdown due to Alternator Failure

The engine will shutdown if there is alternator loss failure.

5. OPERATING PROCEDURES



WARNING

DO NOT ATTEMPT TO OPERATE THE VEHICLE WITHOUT BEING PROPERLY TRAINED IN OPERATION AND SAFETY REQUIREMENTS.



WARNING

BEFORE STARTING THE POWER UNIT, ENSURE POWER MODULE TEE BOLT IS SECURELY FASTENED, AND ALL PERSONS ARE CLEAR OF THE VEHICLE.



WARNING

DO NOT OPERATE EQUIPMENT WHILE UNDER INFLUENCE OF DRUGS, ALCOHOL, OR MEDICATION THAT MAY PREVENT FULL ABILITY TO CONTROL THE VEHICLE.



WARNING

FOLLOW ALL APPLICABLE PROCEDURES AND REGULATIONS FOR OPERATING IN THE AIRPORT AND FOR HANDLING AIRCRAFT.

NOTE: AT BEGINNING OF EACH SHIFT, ENSURE THAT ALL SCHEDULED SERVICES HAVE BEEN PERFORMED INCLUDING CHECK OF TIRE CONDITION, FUEL LEVEL OR BATTERY CHARGE AS APPLICABLE, FLUID LEVELS, AND OVERALL CHECK FOR LOOSE OR MISSING HARDWARE AND GENERAL CONDITION OF THE VEHICLE.

NOTE: THE EQUIPMENT PRE-OPERATIONAL CHECKLIST SHOULD BE UTILIZED WHEN COMMISSIONING NEW EQUIPMENT, AND FOR RE-COMMISSIONING AFTER A MAJOR REPAIR, OVERHAUL, RECOMMENDED ANNUAL MAINTENANCE, OVER-THE-ROAD TRANSPORTATION, AND IF THE MACHINE HAS BEEN OUT OF SERVICE FOR MORE THAN SIX MONTHS.

NOTE: BEFORE STARTING THE UNIT, HAVE THE 8-HOUR (DAILY) CHECK PERFORMED BY THE OPERATOR. REFER TO PREVENTATIVE MAINTENANCE IN CHAPTER 2, SECTION 3.

A. STARTING ENGINE - DIESEL POWERED UNIT

CAUTION

DO NOT OPERATE THE ENGINE WITH THE OIL LEVEL BELOW THE 'MIN' MARK OR ABOVE THE 'MAX' MARK ON THE DIPSTICK.

CAUTION

DO NOT DISCONNECT THE BATTERY OR TURN OFF OPTIONAL BATTERY DISCONNECT SWITCH WITH THE ENGINE RUNNING. THIS WILL CAUSE A VOLTAGE SURGE IN THE ALTERNATOR CHARGING SYSTEM.

- (1) Set PROPEL SWITCH to 'N' (NEUTRAL).
- (2) Ensure that all EMERGENCY STOP SWITCHES (on gauge panel and driver's console) are pulled out.
- (3) Ensure that PARKING BRAKE SWITCH is set to ON.
- (4) Hold MASTER START SWITCH to ON and wait for WAIT-TO-START light to go out.
- (5) Set MASTER START SWITCH to START until engine starts, then release switch to ON after engine starts.

If the engine fails to start after a few attempts, shutdown the unit and notify maintenance personnel. Refer to the engine operation manual in Manufacturers' Appendices in Chapter 5.

CAUTION

WHEN STARTING THE ENGINE, RELEASE THE IGNITION SWITCH IF THE ENGINE FAILS TO START WITHIN 20 SECONDS. AFTER A SECOND ATTEMPT, ALLOW THE STARTER MOTOR TO COOL DOWN FOR ONE MINUTE BEFORE ATTEMPTING TO RESTART THE ENGINE.

- (6) After the engine starts, idle engine until the oil pressure gauge indicates normal oil pressure. Oil pressure should rise within three seconds.

CAUTION

SHUT DOWN ENGINE IMMEDIATELY IF OIL PRESSURE INDICATOR LIGHT DOES NOT TURN OFF WITHIN THREE SECONDS AFTER STARTING ENGINE. DO NOT ATTEMPT TO RESTART ENGINE. NOTIFY MAINTENANCE PERSONNEL IMMEDIATELY.

- (7) Observe gauges (optional) to ensure that all indicators show normal operation.
- (8) Allow engine to warm up for several minutes.
- (9) If fault lights are illuminated, check with maintenance personnel.
- (10) Refer to paragraphs **B.** through **E.** below for required operational procedures.

B. ENABLING ELECTRICAL MOTOR - ELECTRICAL POWERED UNIT (OPTIONAL)

- (1) Set PROPEL SWITCH to 'N' (NEUTRAL).
- (2) Ensure that all EMERGENCY STOP SWITCHES (on gauge panel and driver's console) are pulled out.
- (3) Set IGNITION SWITCH from position '0' (OFF) to position '1' (ON). If system needs to be reset, move this switch to the temporary position '//' (RESET).
- (4) If fault lights are illuminated, check with maintenance personnel.

C. BRIDGE TILT (OPTIONAL)

**WARNING**

WHEN USING BRIDGE TILT, ENSURE ADEQUATE CLEARANCE BETWEEN LOADER AND AIRCRAFT.

With loader in position at the aircraft doorway, operate either BRIDGE TILT SWITCH to obtain desired interface angle.

The vehicle may be equipped with an auto lower mode. When the bridge is fully lowered, all bridge tilt cylinders will be actuated in down direction for a few seconds to ensure both sides of the bridge are level. The auto lower mode will be canceled if any of the bridge tilt switches is actuated.

D. APPROACHING AIRCRAFT FOR CARGO TRANSFER

- (1) Perform safety walk around the vehicle to ensure the immediate area is clear and no one else is in or near the vehicle, before operating the unit.

NOTE: IF APD SYSTEM INSTALLED, REFER TO AIRCRAFT PROXIMITY DETECTOR (APD) IN CHAPTER 2, SECTION 8.

- (2) Start power unit
- (3) Retract the operator's cab fully.
- (4) Retract the left side handrail.
- (5) Verify the platform is fully retracted (down).
- (6) Actuate BRIDGE TILT SWITCHES (optional) so that both sides are at their lowest height.
- (7) Check area to be sure that intended drive path is free of obstructions.
- (8) Set MODE SWITCH to DRIVE.
- (9) Hold CHASSIS SWITCH up until red flashing RAISE CHASSIS INDICATOR (optional) goes out.
- (10) Ensure that STABILIZERS DOWN INDICATOR goes out.
- (11) Set PARKING BRAKE SWITCH to OFF and note that indicator goes out.
- (12) Set PROPEL SWITCH to the forward or reverse position without actuating accelerator pedal.

**WARNING**

DO NOT USE MAXIMUM SPEED RANGE (RABBIT) IF VEHICLE IS CLOSER THAN 3 M (10 FT.) TO AIRCRAFT.

- (13) Set PROPEL SPEED SWITCH to desired speed. Start with switch in mid-range (TURTLE), then set to high range (RABBIT).

- (14) Press accelerator pedal; as soon as loader moves, release accelerator pedal and press brake pedal to check for smooth and positive brake operation.
- (15) Raise the bridge at least 250 mm (10 in.) before approaching the aircraft.
- (16) Drive loader to within 3 m (10 ft.) of aircraft and stop the vehicle.
- (17) Set PROPEL SPEED SWITCH to low range (SNAIL).

If the APD system (optional) is installed and the bridge is raised, the speed will change to SNAIL. If the hand throttle (optional with APD) is installed and calibrated, the accelerator foot pedal will be disabled, allowing the vehicle to move forward using the hand throttle.

The hand throttle control (optional with APD system) is enabled ONLY in FORWARD direction of PROPEL mode. For reverse driving, the accelerator pedal must be actuated, since the hand throttle will have no effect.

Acceleration control of the vehicle is switched from the accelerator foot pedal to the hand throttle control lever (APD system optional ONLY), under the following conditions:

- (a) Vehicle PROPEL switch is in FORWARD position
- (b) Vehicle is within a pre-defined distance range from aircraft (usually 3 m [10ft.]), or front object, and the APD system (optional) is installed and enabled.
- (c) Bridge is NOT fully retracted (down)
- (d) Hand throttle is in RELEASED position

From this point forward, the accelerator foot pedal is disabled and the final approach must be done actuating the hand throttle control.

NOTE: IF THE HAND THROTTLE CONTROL DOES NOT ENGAGE, FULLY STOP THE VEHICLE AND ENSURE THE HAND THROTTLE IS RELEASED; THEN MOVE THE PROPEL SWITCH TO NEUTRAL AND BACK TO FORWARD.

CAUTION

THE AIRCRAFT PROXIMITY DETECTOR (APD) SYSTEM (OPTIONAL) WILL NOT BE ACTIVATED IF THE BRIDGE IS IN THE FULLY LOWERED POSITION. THE OPERATOR SHOULD NOT RELY SOLELY ON THE SENSORS AND WARNING LIGHTS.

- (18) Lower chassis fully; RAISE CHASSIS INDICATOR (optional) will flash.
- (19) Adjust height of bridge as required so that aircraft cargo door will clear bridge when loader is positioned and door is opened.
- (20) Lower bridge and platform and safety rails (where applicable) to provide appropriate clearance to aircraft fuselage.

NOTE: SOME AIRCRAFT CONFIGURATIONS REQUIRE BRIDGE TO BE FULLY LOWERED.

- (21) Set right handrail down, if necessary to provide clearance to aircraft.
- (22) Left handrail must be fully retracted.

- (23) Center the bridge load guides.
- (24) Slowly drive loader toward aircraft; stop when bridge is approximately 300 mm (12 in.) from aircraft. Be sure that loader is squarely positioned relative to aircraft fuselage.

NOTE: IF BRIDGE "BUMPERS" TOUCH THE AIRCRAFT AND THE OPTIONAL APD SYSTEM IS INSTALLED AND ENABLED, THE LOADER FUNCTIONS WILL BE LOCKED. REFER TO '[H. SUPERVISOR KEY RESET PANEL \(OPTIONAL WITH APD\)](#)'.

- (25) Set PARKING BRAKE SWITCH to ON and note that indicator illuminates.
- (26) Lower (fold down) left hand handrail (if required for aircraft door clearance).
- (27) Open aircraft cargo door.

CAUTION

OPEN AIRCRAFT CARGO DOOR CAREFULLY.

- (28) Adjust height of bridge to aircraft.
- (29) Set PARKING BRAKE SWITCH to OFF and drive loader forward until in position with aircraft door.

CAUTION

FOR OPERATION OVER THE GAP, POSITION THE LOADER SO THAT RUBBER BUMPERS ON BRIDGE FRONT EDGE ARE CLOSE TO, BUT DO NOT TOUCH THE AIRCRAFT.

- (30) Move PROPEL SWITCH to 'N' (NEUTRAL). Set MODE SWITCH to OPERATE (this will automatically set parking brake and extend stabilizers). Note that PARKING BRAKE INDICATOR and STABILIZERS DOWN INDICATOR illuminate.
- (31) Move BRIDGE SIDE GUIDES SWITCH to left or right position to align side guides and door for cargo transfer.
- (32) Position bridge height for proper alignment with aircraft.
- (33) Extend operator's cab as required for cargo transfer (Optional).
- (34) Extend safety rails where applicable.

CAUTION

DO NOT SHUT DOWN POWER UNIT WITH LOADER IN POSITION TO TRANSFER CARGO. DO NOT LEAVE VEHICLE UNATTENDED.

For transferring cargo from aircraft to ground equipment, refer to '[E. TRANSFERRING CARGO FROM AIRCRAFT](#)'.

For transferring cargo to aircraft, refer to '[F. TRANSFERRING CARGO TO AIRCRAFT](#)'.

E. TRANSFERRING CARGO FROM AIRCRAFT

CAUTION

IT IS NECESSARY TO ADJUST BRIDGE HEIGHT AS AIRCRAFT POSITION CHANGES DURING CARGO TRANSFER.

NOTE: IT IS EXPECTED THAT ALL PROCEDURES FOR APPROACHING THE AIRCRAFT HAVE BEEN PERFORMED, REFER TO '[D. APPROACHING AIRCRAFT FOR CARGO TRANSFER](#)'.

- (1) Hold PLATFORM LIFT SWITCH up until platform automatically stops at same level as bridge. Note that STOP at rear of bridge retracts.
- (2) When cargo is in position to be moved onto bridge, hold BRIDGE JOYSTICK to aft convey position until cargo is completely on bridge.
- (3) Adjust position of cargo on bridge by operating BRIDGE JOYSTICK in required directions until cargo is laterally centered on bridge.
- (4) Ensure that side and rear stops on platform are extended.
- (5) Hold all three joysticks simultaneously to aft position until cargo is as far back as possible on platform.

NOTE: IT MAY BE NECESSARY TO ROTATE CARGO ON PLATFORM. USE ROTATION SWITCH AS REQUIRED.

- (6) If another container is to be transferred, repeat steps (3) through (5) but do not operate rear PLATFORM JOYSTICK; then continue to step (7) below.
- (7) Hold down PLATFORM LIFT SWITCH until platform is at the same level as the ground vehicle.
- (8) Set GUIDES SWITCH to AUTO or DOWN to retract left, right, or rear stop on platform (whichever is closest to ground vehicle).
- (9) Hold PLATFORM JOYSTICK to move cargo onto ground vehicle, then release PLATFORM JOYSTICK and GUIDES SWITCH (if not in AUTO position).
- (10) If more cargo is to be transferred, repeat steps (1) through (9). If transfer is complete, continue to step (11) below.
- (11) Hold PLATFORM LIFT SWITCH down until platform stops automatically, then perform procedures in '[G. DEPARTING FROM AIRCRAFT](#)'.

F. TRANSFERRING CARGO TO AIRCRAFT

CAUTION

IT IS NECESSARY TO ADJUST BRIDGE HEIGHT AS AIRCRAFT POSITION CHANGES DURING CARGO TRANSFER.

NOTE: IT IS EXPECTED THAT ALL PROCEDURES FOR APPROACHING THE AIRCRAFT HAVE BEEN PERFORMED (REFER TO '[D. APPROACHING AIRCRAFT FOR CARGO TRANSFER](#)').

- (1) Operate PLATFORM LIFT SWITCH until platform is at same level as ground vehicle that contains cargo.
- (2) Set GUIDES SWITCH to AUTO position or hold in retract position to retract left, right, or rear stop on platform (whichever is closest to ground vehicle).
- (3) Hold PLATFORM JOYSTICK to move cargo onto platform, release JOYSTICK when cargo is approximately centered laterally on platform, then release GUIDES SWITCH (if not in AUTO).

NOTE: IF A SECOND CONTAINER IS TO BE MOVED ONTO PLATFORM, OPERATE REAR AND CENTER JOYSTICKS SIMULTANEOUSLY TO MOVE FIRST CONTAINER TO FRONT OF PLATFORM, THEN REPEAT STEPS [\(2\)](#) AND [\(3\)](#) ABOVE. USE ROTATION SWITCH AS REQUIRED TO POSITION CONTAINER.

- (4) Hold PLATFORM LIFT SWITCH up until platform automatically stops at same level as bridge. Note that stops at rear of bridge retract.
- (5) Hold center and forward joysticks to forward position until container is on bridge.
- (6) Hold BRIDGE JOYSTICK to forward position until cargo is on aircraft.

NOTE: FOR SECOND CONTAINER, OPERATE JOYSTICKS SIMULTANEOUSLY TO MOVE CONTAINER ONTO BRIDGE, THEN REPEAT STEPS [\(5\)](#) AND [\(6\)](#) ABOVE.

- (7) Hold PLATFORM LIFT SWITCH down until platform is again at same level as ground vehicle that contains cargo.
- (8) If more cargo is to be transferred, repeat steps [\(2\)](#) through [\(7\)](#). If transfer is complete, go to step [\(9\)](#) below.
- (9) Hold PLATFORM LIFT SWITCH down until platform stops automatically, then perform procedures for departing from the aircraft in '[G. DEPARTING FROM AIRCRAFT](#)'.

G. DEPARTING FROM AIRCRAFT

- (1) Check area to be sure that intended drive path is free of obstructions.
- (2) Red PARKING BRAKE INDICATOR and Amber STABILIZERS DOWN INDICATOR should be illuminated.
- (3) Retract operator's cab so that it will clear aircraft when bridge is moved.

- (4) Lower bridge so that it will clear cargo door when it is closed.
- (5) Carefully close and latch cargo door.

CAUTION**CLOSE AND SECURE AIRCRAFT CARGO DOOR CAREFULLY.**

- (6) Set MODE SWITCH to DRIVE. Note that stabilizers retract and STABILIZERS DOWN INDICATOR goes out.
- (7) Raise Chassis. (Optional RAISE CHASSIS INDICATOR flashes when rear chassis is raised with switch.)
- (8) Set PROPEL SWITCH to reverse position.
- (9) Set PARKING BRAKE SWITCH to OFF and note that indicator goes out.
- (10) Slowly back loader away from aircraft.
- (11) Lower bridge until it stops automatically.
- (12) Set PROPEL SPEED SWITCH to low range (SNAIL).

If the APD system (optional) is installed and the bridge is raised, the speed will change to SNAIL. Verify the APD system is active (GREEN light on APD panel).

The hand throttle control (optional with APD system) is enabled ONLY in FORWARD direction of PROPEL mode. For reverse driving, the accelerator pedal must be actuated, since the hand throttle will have no effect.

- (13) Drive slowly and be alert to any interference to the vehicle's path with aircraft or other vehicles in the vicinity.
If the APD system is enabled, be alert to audible alarms and warnings displayed on the APD interface module display.
- (14) Drive loader to assigned location with propel speed switch set to mid-range (TURTLE) or high range (RABBIT).
- (15) If no further operations are required, park loader and turn off power unit as instructed in '[H. PARKING THE VEHICLE](#)'.

H. PARKING THE VEHICLE

- (1) Set PROPEL SWITCH to 'N' (NEUTRAL).
- (2) Set the PARKING BRAKE SWITCH to ON and note that the PARKING BRAKE INDICATOR illuminates.

CAUTION

TO PREVENT DAMAGE TO THE STABILIZER CYLINDER ASSEMBLIES, DO NOT SET THE MODE SWITCH TO "OPERATE" WHEN THE UNIT IS PARKED AS THIS WILL EXTEND THE STABILIZERS.

- I. SHUTTING DOWN ENGINE - DIESEL POWERED UNIT
 - (1) Ensure the PROPEL SWITCH is set to 'N' (NEUTRAL).
 - (2) Verify that PARKING BRAKE SWITCH is ON and note that indicator is illuminated.
 - (3) Let engine idle for 3 or 4 minutes to properly cool down and allow engine temperatures to stabilize.
 - (4) Set MASTER START SWITCH to OFF to shut down the vehicle and any other lights or accessories that are still operating. DO NOT USE EMERGENCY STOP (E-STOP) BUTTON TO SHUT DOWN THE VEHICLE.
 - (5) Wait for two more minutes before disconnecting battery, or setting battery cut-off switch to OFF (if applicable).

NOTE: NEXT TIME THE ENGINE IS STARTED MIGHT GIVE AN ERROR IF NOT ENOUGH TIME IS ALLOWED AFTER TURNING ENGINE OFF.

 - (6) Winterization (Optional) - Connect the winterization cable to the designated electrical power outlet, if applicable.
- J. DISABLING ELECTRICAL MOTOR - ELECTRICAL POWERED UNIT (OPTIONAL)
 - (1) Ensure the PROPEL SWITCH is set to 'N' (NEUTRAL).
 - (2) Verify that PARKING BRAKE SWITCH is ON and note that indicator is illuminated.
 - (3) Set IGNITION SWITCH to OFF (position '0').

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Section 3. Emergency Procedures

1. GENERAL



WARNING

ONLY APPLY E-STOP TO DISABLE THE VEHICLE IN CASE OF EMERGENCY. PRESSING THE EMERGENCY STOP PUSH-BUTTON WILL COMPLETELY SHUTDOWN THE VEHICLE.

The vehicle is equipped with an electrical-driven emergency hydraulic pump activated from the driver's cab actuating on a spring-loaded two-position switch. This pump allows for emergency maneuvers, such as lowering bridge and platform, and retracting stabilizers. Also, a hand-operated emergency hydraulic pump is provided with the vehicle. This pump has a removable handle, and can be used for emergency operations when no other hydraulic source or electrical power is available.

Emergency procedures in this section describe the necessary steps to follow, in case of mechanical breakdown or equipment malfunctions.

NOTE: IT IS IMPORTANT TO COMPLETELY READ AND UNDERSTAND THIS EMERGENCY PROCEDURES SECTION BEFORE OPERATING THE LOADER.

CAUTION

DO NOT ENERGIZE HYDRAULIC EMERGENCY PUMP DURING NORMAL VEHICLE OPERATION.

2. EMERGENCY PROCEDURES



WARNING

BEFORE TOWING, ATTACH TOW VEHICLE WITH TOW BAR OR CHOCK WHEELS BEFORE DISENGAGING PARK BRAKE.

CAUTION

CONTINUOUS OPERATION OF HYDRAULIC EMERGENCY PUMP FOR MORE THAN ONE MINUTE WILL OVERHEAT THE ELECTRICAL MOTOR. IF EMERGENCY PROCEDURES CANNOT BE COMPLETED WITHIN ONE MINUTE, PUMP MUST BE ALLOWED TO COOL FOR AT LEAST 10 MINUTES BEFORE CONTINUING.

A. **MANEUVERS WITH ELECTRIC POWER ONLY AND PLC'S OPERABLE**

These procedures must be followed if the power unit or main hydraulic pump are inoperable, but electrical power is available and PLC's are in operating condition. The operator can verify PLC

operation on the DISPLAY MODULE screen, located in the main electrical panel in the power module (refer to System Overview in Chapter 2, Section 2 for display module navigation).

Under these conditions, the operator will use the hydraulic power provided by the electric-driven EMERGENCY PUMP by actuating on the emergency pump switch.

- (1) Ensure the MASTER START SWITCH is in the ON position, and verify that indicator lights are on.
- (2) Open the emergency pump switch guard (optional) located under the driver's panel, pull and hold the EMERGENCY PUMP SWITCH and note that the pump starts.

If the emergency pump does not operate, a problem with the pump may be present, or electrical power is not being provided to the pump. Refer to paragraph '[C. MANEUVERS WITH NO ELECTRICAL POWER AND PLC'S INOPERABLE](#)'.

NOTE: TO REDUCE THE RISK OF OVERHEATING THE EMERGENCY PUMP ACTIVATE THE CORRESPONDING FUNCTION SWITCH FIRST, AND THEN ACTUATE ON THE EMERGENCY PUMP SWITCH.

NOTE: CONVEY SPEED USING THE EMERGENCY PUMP IS HALF NORMAL SPEED.

- (3) Actuate joystick switches ONLY TO REMOVE cargo from loader to aircraft or to a ground vehicle. DO NOT CONTINUE LOADING. If the joystick switch does not work, verify that traction joystick is in neutral position.

If joystick and other switches do not operate, a problem on PLC's may be present. Refer to '[B. MANEUVERS WITH ELECTRICAL POWER ONLY AND PLC'S INOPERABLE](#)'.

- (4) Disengage aircraft following sensor (optional), if engaged.
- (5) Hold PLATFORM DOWN SWITCH until platform stops automatically.
- (6) Retract operator's cab slightly to clear aircraft before bridge is lowered.
- (7) Position bridge to allow cargo door to be closed and secured.
- (8) At ground level chock drive wheels to prevent movement until tow vehicle is properly attached.
- (9) On the operator's cab set MODE SWITCH to DRIVE. Note that stabilizers retract and STABILIZERS DOWN INDICATOR goes out.
- (10) Release emergency pump switch and note that pump stops. Close emergency pump switch guard (optional).
- (11) Set MASTER START SWITCH to OFF.
- (12) Disengage drive wheel hubs. Refer to '[A. DISENGAGING DRIVE HUBS - STANDARD CONNECTOR](#)' or '[B. DISENGAGING DRIVE HUBS - QUICK CONNECTOR \(OPTIONAL\)](#)'.
- (13) Tow loader from aircraft to a safe parking or maintenance area (refer to '[A. TOWING](#)').

B. MANEUVERS WITH ELECTRICAL POWER ONLY AND PLC'S INOPERABLE

These procedures must be followed if the engine or main hydraulic pump are inoperable, electrical power is available, BUT PLC's are NOT in operating condition. The operator can verify that PLC's are inoperable on the display module screens, located in the main electrical panel in the power module (refer to Troubleshooting in Chapter 2, Section 6 for display module screens).

Under these conditions, the operator will use the hydraulic power provided by the electric-driven EMERGENCY PUMP by actuating on the emergency pump switch and manually actuating the solenoid valve override knobs.

- (1) Ensure the MASTER START SWITCH is in the ON position, and verify that indicator lights are on.
- (2) Open the emergency pump switch guard (optional) located under the driver's panel, pull and hold the EMERGENCY PUMP SWITCH and note that the pump starts. Release switch.

If the emergency pump does not operate, a problem with the pump may be present, or electrical power is not being provided to the pump. Refer to '[C. MANEUVERS WITH NO ELECTRICAL POWER AND PLC'S INOPERABLE](#)'.

NOTE: TO REDUCE THE RISK OF OVERHEATING THE EMERGENCY PUMP ACTIVATE THE FUNCTION SWITCH FIRST, AND THEN ACTUATE ON THE EMERGENCY PUMP SWITCH.

- (3) On the operator's cab disengage optional following sensor, if engaged.
- (4) At the ground level remove the "T" bolt and swing the power module to gain access to the solenoid valve central control manifold (refer to [Figure 1](#)).
- (5) Locate solenoid valve SOL30 (lower platform), then push and right twist to lock-in the override knob.
- (6) On the operator's cab hold the EMERGENCY PUMP SWITCH and observe that platform starts lowering. Continue until platform is completely down and stops automatically. Remember to allow the emergency pump to cool down if operates for more than one minute.

If a second qualified operator is available to assist the vehicle's operator, this person may actuate on solenoid valve SOL24, pushing in the center point of the valve knob with a pointy pin or screwdriver. This action will allow for lowering the platform faster (refer to [Figure 1](#) for valve location).

- (7) Proceed ONLY TO REMOVE cargo from loader to aircraft or to a ground vehicle. DO NOT CONTINUE LOADING.
- (8) Return override knob on SOL30 back to its normal position (twist left and release).
- (9) Locate solenoid valve SOL29 (raise stabilizers), then push and right twist to lock-in the override knob.
- (10) On the operator's cab hold the EMERGENCY PUMP SWITCH and observe that stabilizers start raising. Continue until all stabilizers are completely retracted and stop automatically.

Remember to allow the emergency pump to cool down if operates for more than one minute.

- (11) Return override knob on SOL29 back to its normal position (twist left and release).
- (12) Release electrical pump switch and note that pump stops. Close switch guard (optional).
- (13) Set MASTER START SWITCH to OFF.
- (14) Swing the power module to close it and secure the "T" bolt in place.
- (15) Chock drive wheels to prevent movement until tow vehicle is properly attached.
- (16) Disengage drive wheel hubs. Refer to '[A. DISENGAGING DRIVE HUBS - STANDARD CONNECTOR](#)' or '[B. DISENGAGING DRIVE HUBS - QUICK CONNECTOR \(OPTIONAL\)](#)'.
- (17) Tow loader from aircraft to a safe parking or maintenance area (refer to '[A. TOWING](#)').

C. MANEUVERS WITH NO ELECTRICAL POWER AND PLC'S INOPERABLE

NOTE: THIS PROCEDURE APPLIES ONLY IF MANUAL EMERGENCY PUMP (OPTIONAL) IS INSTALLED IN THE VEHICLE.

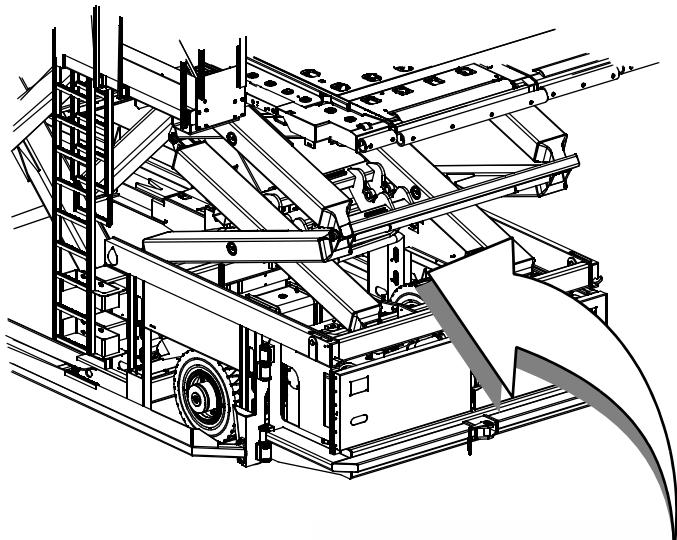
These procedures must be followed if the engine or main hydraulic pump are inoperable, no electrical power is available, and PLC's are NOT in operating condition. With no electrical power, the display module and PLC's will be inoperable.

Under those conditions, the operator will use the hydraulic power provided by the manual EMERGENCY PUMP by actuating on the pump handle and manually actuating the solenoid valve knobs.

- (1) Remove the "T" bolt and swing the power module open to gain access to the solenoid valve central control module (refer to [Figure 1](#)).
- (2) Locate solenoid valve SOL63, then push and lock-in override button.
- (3) Locate solenoid valve SOL30 (lower platform), then push and right twist to lock-in the override knob.
- (4) Open power unit compartment doors to locate manual emergency pump (optional) and attach handle to the pump.
- (5) Actuate on the manual emergency pump and observe that platform starts lowering. Continue until platform is completely down.

If a second qualified operator is available to assist the vehicle's operator, this person may actuate on solenoid valve SOL24, pushing in the center point of the valve knob with a pointy pin or screwdriver. This action will allow for lowering the platform faster (refer to [Figure 1](#) for valve location).

- (6) Return override knob on SOL30 back to its normal position (twist left and release).



NOTE: POWER MODULE MUST BE OPEN TO GAIN ACCESS TO THE CENTRAL CONTROL MANIFOLD.

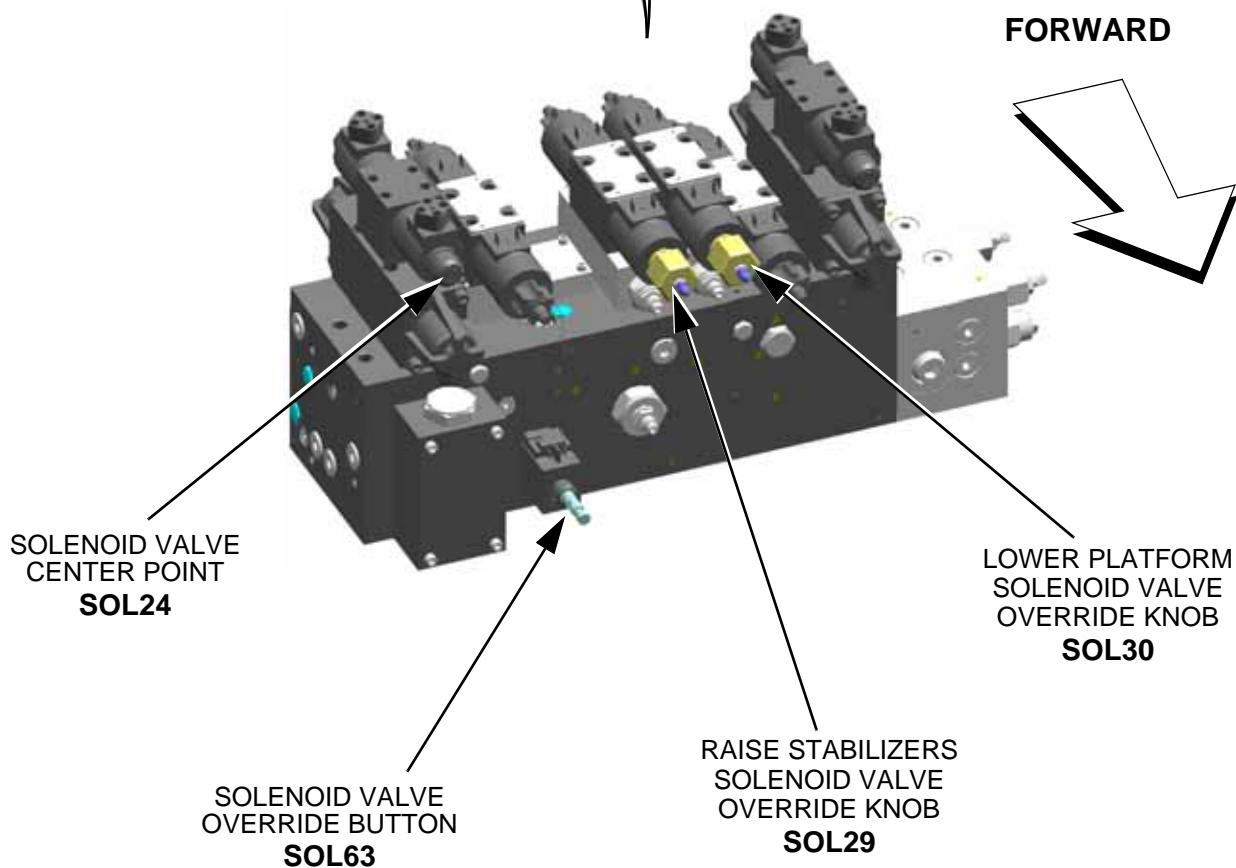


Figure 1
CENTRAL CONTROL MANIFOLD

- (7) Locate solenoid valve SOL29 (raise stabilizers), then push and right twist to lock-in the override knob.
- (8) Actuate on the manual emergency pump and observe that stabilizers start raising. Continue until all stabilizers are completely retracted.
- (9) Return override knob on SOL29 back to its normal position (twist left and release).
- (10) Return override button on SOL63 back to its normal position (push and release).
- (11) Swing the power module close it and secure the "T" bolt in place.
- (12) Set MASTER START SWITCH to OFF.
- (13) Detach handle from manual emergency pump (optional), then close and secure power unit compartment doors.
- (14) Chock drive wheels to prevent movement until tow vehicle is properly attached.
- (15) Disengage drive wheel hubs. Refer to '[A. DISENGAGING DRIVE HUBS - STANDARD CONNECTOR](#)' or '[B. DISENGAGING DRIVE HUBS - QUICK CONNECTOR \(OPTIONAL\)](#)'.
- (16) Tow loader from aircraft to a safe parking or maintenance area (refer to '[A. TOWING](#)').

3. DISENGAGING DRIVE HUBS



BEFORE DISENGAGING DRIVE HUBS, CHOCK FRONT AND BACK OF BOTH DRIVE WHEELS TO PREVENT MOVEMENT IN EITHER DIRECTION.

- A. DISENGAGING DRIVE HUBS - STANDARD CONNECTOR
- (1) Chock drive wheels front and back to prevent movement in either direction.
 - (2) Clean thoroughly the outside of the hub cap, then remove disconnect cap on one hub by removing two bolts and pulling cap away from hub (refer to [Figure 2](#)).
 - (3) Reverse position of cap so that nipple faces inward, place against hub, then install and tighten the bolts.
 - (4) Repeat steps (2) and (3) above for the other wheel hub.

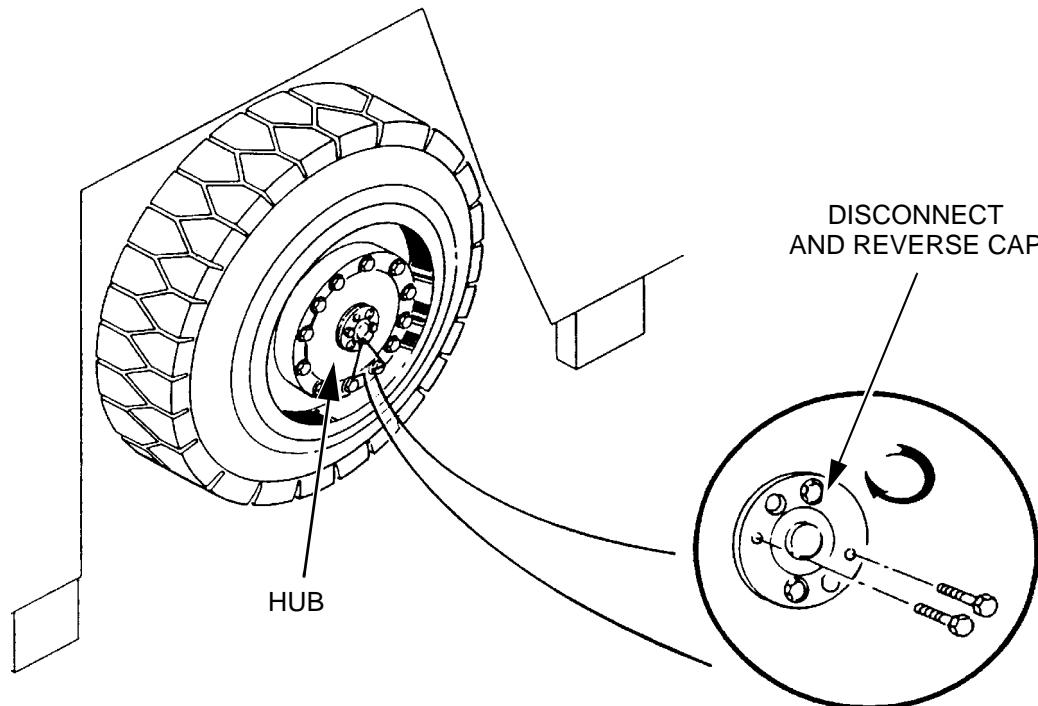


Figure 2
DRIVE HUB STANDARD CONNECTOR

B. DISENGAGING DRIVE HUBS - QUICK CONNECTOR (OPTIONAL)

- (1) Chock drive wheels front and back to prevent movement in either direction.
- (2) Push in center plunge on one hub to disengage drive hub (refer to [Figure 3](#)).
- (3) Repeat step (2) above for the other wheel hub.

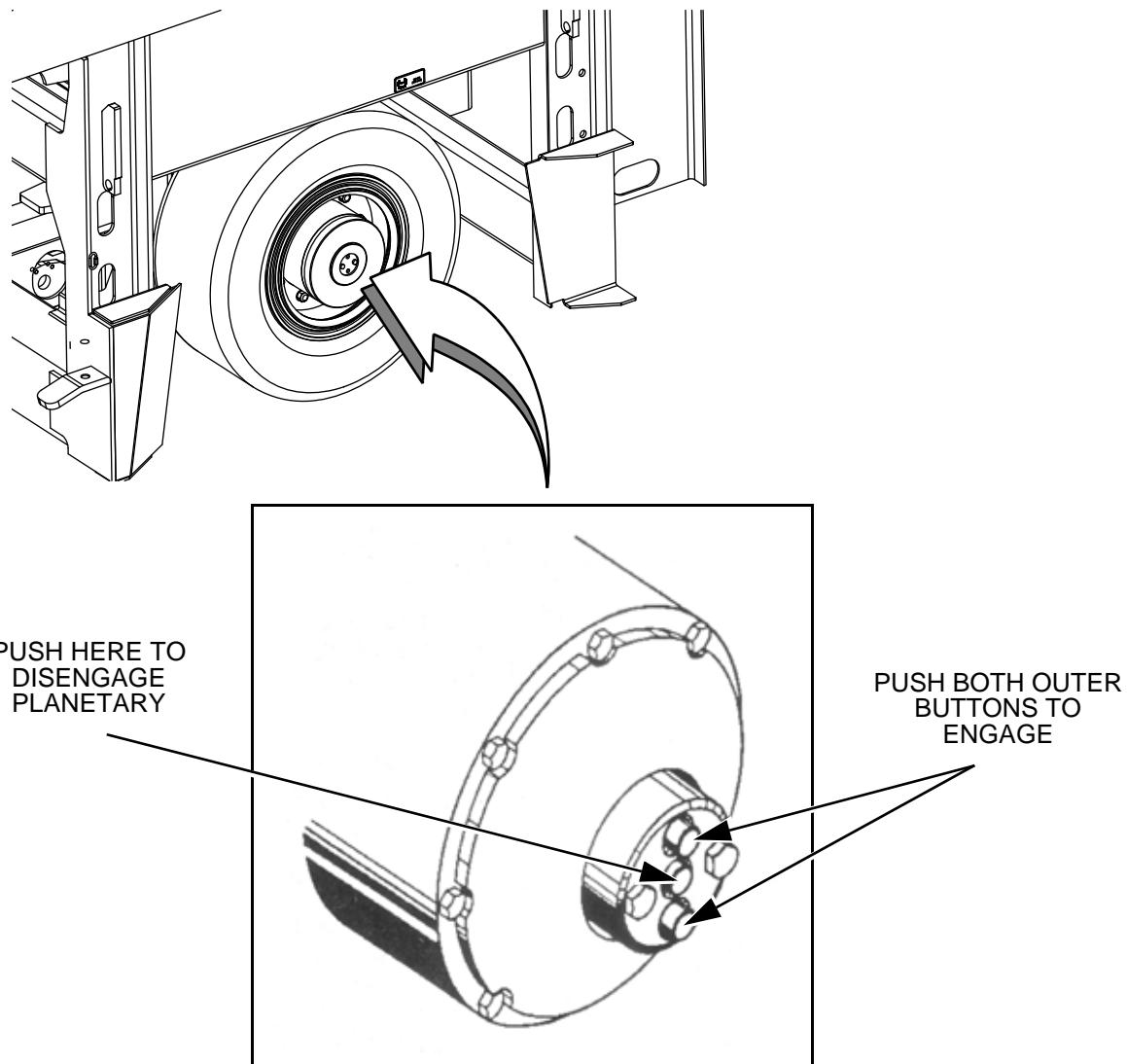


Figure 3
DRIVE HUB QUICK CONNECTOR (OPTIONAL)

4. TOWING VEHICLE

A. TOWING



WARNING

DO NOT EXCEED 11 KM/H (7 MPH) WHEN TOWING VEHICLE.

CAUTION

ENSURE WHEEL HUBS ARE DISENGAGED WHILE TOWING.

- (1) Ensure that wheel hubs have been disengaged before proceeding.
- (2) Ensure that all stabilizers are fully retracted, "T" bolt on power module is properly secured, platform and bridge are fully lowered, and no cargo load is on the vehicle.
- (3) Connect tow bar between towing vehicle and disabled unit.
- (4) Remove chocks and tow disabled unit to desired location.
- (5) Upon arrival at selected location, immediately chock drive wheels and disconnect tow bar.
- (6) Engage drive hubs as soon as possible. Refer to '[A. ENGAGING DRIVE HUBS - STANDARD CONNECTOR](#)' or '[B. ENGAGING DRIVE HUBS - QUICK CONNECTOR \(OPTIONAL\)](#)'.



WARNING

IF DRIVE WHEEL HUBS ARE NOT IMMEDIATELY ENGAGED, PLACE SUITABLE WARNING SIGN ON VEHICLE TO ENSURE THAT ALL PERSONNEL ARE AWARE OF THE CONDITION.

B. LIFT TOWING

- (1) Ensure stabilizers are retracted and drive hubs are disengaged before proceeding.
- (2) Retract bogy wheel cylinders by lowering the chassis completely. Set threaded screws to hold bogy wheel assemblies (refer to [Figure 4](#)).
- (3) Locate steering lock pin in wheel well on right side of loader with power module open. Move pin from stow position to the steering lock position (refer to [Figure 5](#)).
- (4) Close power module and ensure that "T" bolt on power module is properly secured, platform and bridge are fully lowered, and no cargo load is on the vehicle.



WARNING

DO NOT ALLOW PERSONS DIRECTLY IN FRONT OF THE VEHICLE. KEEP AREA CLEAR DURING LIFTING.

CAUTION

ENSURE BOGY WHEELS ARE RETRACTED AND UPPER THREADED PINS ARE SET TO HOLD BOGY WHEEL ASSEMBLIES BEFORE LIFTING THE VEHICLE.

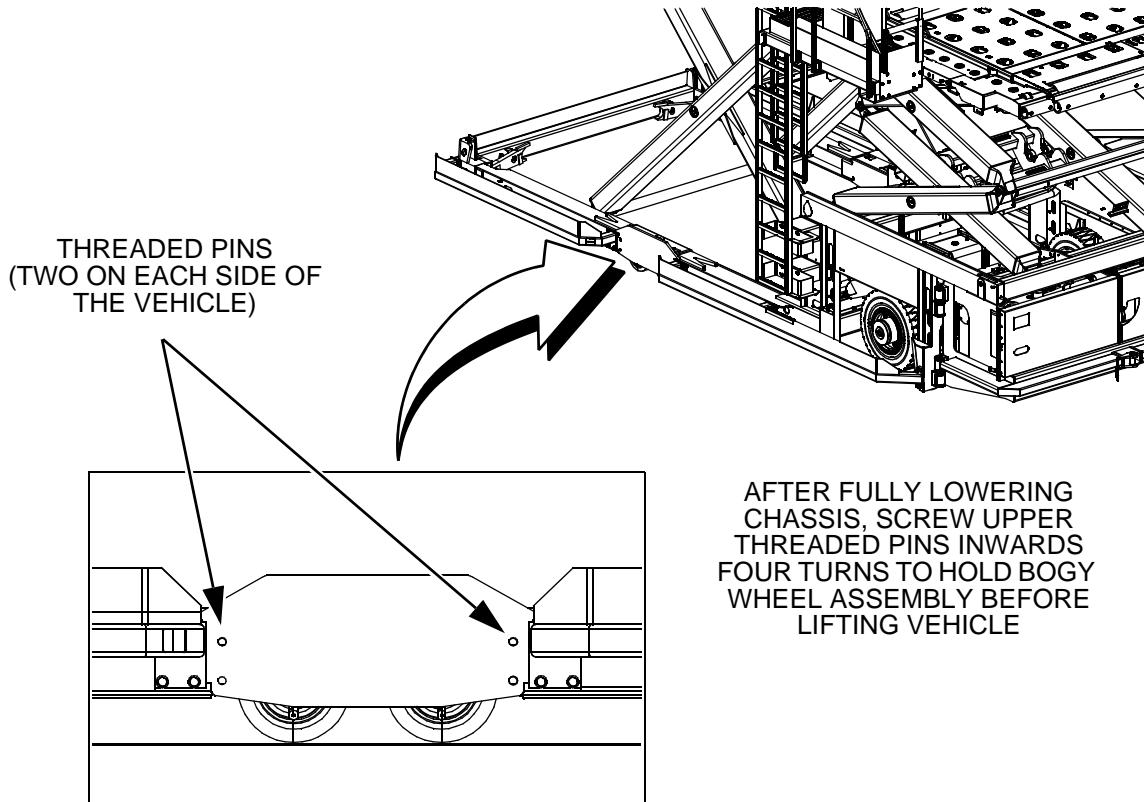


Figure 4
SECURING BOGY WHEELS BEFORE LIFTING

- (1) Use a 9-ton (8200 kg [18 000 lb.]) lift capacity tow truck and raise loader from rear chassis a maximum of 450 mm (18 in.). Inspect front of loader from operator side of vehicle for ground clearance.
- (2) Slowly tow loader to maintenance location. Do not exceed maximum towing speed.
- (3) Upon arrival at selected location, lower loader onto ground surface and immediately chock drive wheels.
- (4) Stow the steering lock pin.
- (5) Release bogy wheel assemblies by unscrewing upper threaded pins outwards four turns, reversing the action performed on step (2), before actuating the bogy wheel cylinders to raise the chassis.

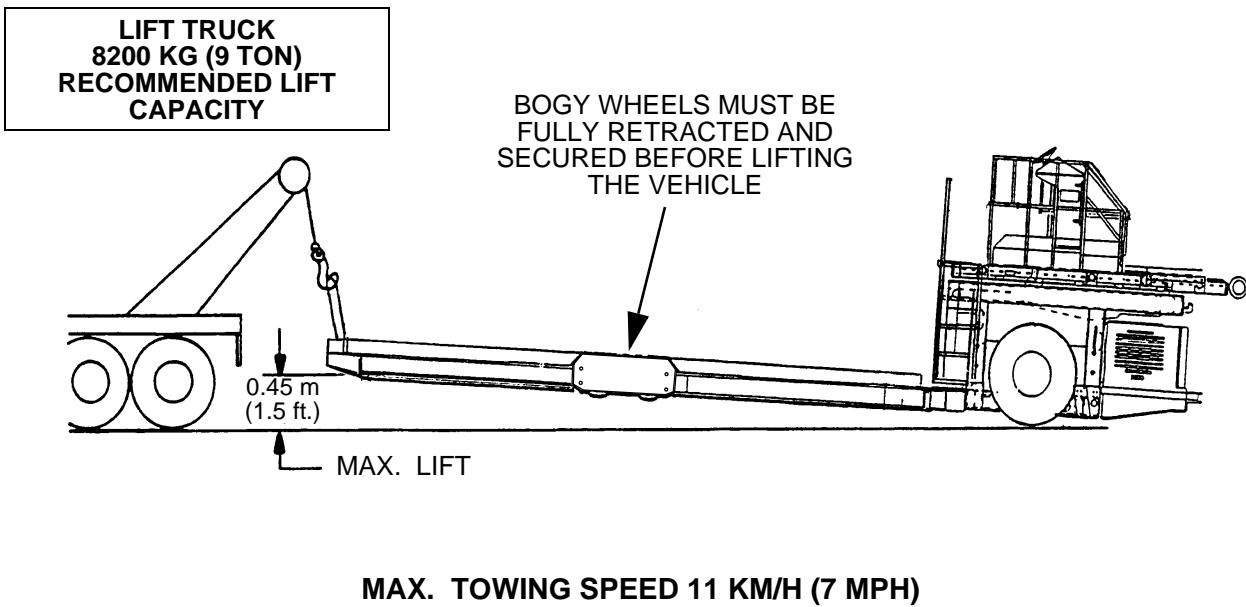
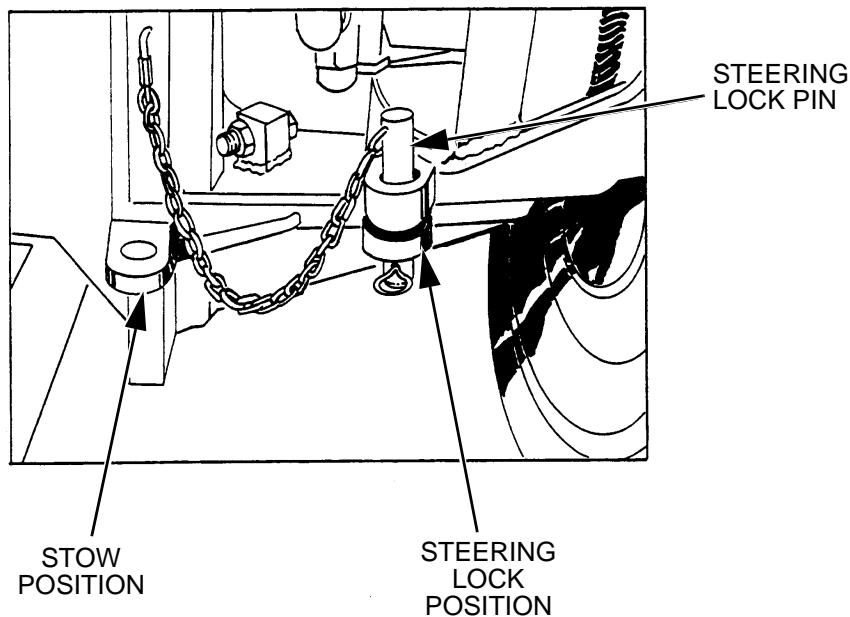


Figure 5
LIFT TOWING

5. ENGAGING DRIVE HUBS



ENGAGE DRIVE HUBS BEFORE REMOVING FRONT AND BACK CHOCKS FROM BOTH DRIVE WHEELS TO PREVENT MOVEMENT IN EITHER DIRECTION.

A. ENGAGING DRIVE HUBS - STANDARD CONNECTOR

- (1) If wheels are not already chocked, chock them front and back.

NOTE: WHEN PERFORMING STEP [\(2\)](#) BELOW, REMOVE CAP SLOWLY TO PREVENT DISCONNECTED ROD FROM COMING OUT OF THE HUB.

- (2) Remove disconnect cap on one hub by removing two cap screws and slowly pulling cap away from hub (refer to [Figure 2](#)).
- (3) Reverse position of cap so that nipple faces outward, place cap against hub, then install cap screws and torque according to specification (refer to Specifications in Chapter 1, Section 4).
- (4) Repeat steps [\(2\)](#) and [\(3\)](#) for the other hub.

B. ENGAGING DRIVE HUBS - QUICK CONNECTOR (OPTIONAL)

- (1) If wheels are not already chocked, chock them front and back.
- (2) Push in outer plungers on one hub to engage drive hub (refer to [Figure 3](#)).
- (3) Repeat step [\(2\)](#) for the other hub.

Section 4. Specifications

1. GENERAL

This vehicle specification outlines the product definition of the Commander 15i offered by JBT, Ground Support Equipment.

Vehicles in this line are equipped with diesel powered engines or electrical power units 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 15i Container and Pallet Loader
Designation:	Commander 15i
Vehicle type:	Aircraft Container and Pallet Loader
Power unit:	Diesel (standard), Electrical (optional)
Gross vehicle weight:	15 650 kg (34 500 lb.) (standard)
Maximum cargo load:	7050 kg (15 500 lb.)

3. AIRCRAFT ACCOMODATION

The Commander 15i can service a wide variety of lower and main deck aircraft intended for containerized cargo with door sill heights from 1.83 m to 3.58 m (72 in. to 141 in.). The vehicle can handle a variety of cargo with Unit Load Devices (ULD's) comprised of a flat bottom (refer to 'General Performance' below).

4. OPERATING CHARACTERISTICS

General Performance

- Bridge lift capacity (maximum) 7050 kg (15 500 lb.)
- Platform lift capacity (maximum) 7050 kg (15 500 lb.)
- Load capacity Two containers (LD-1 or LD-3) (or similar dimensions) or one pallet
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 (standard) 3.60 m/min. (12 fpm)
- Bridge (main deck capable) 4.60 m/min. (15 fpm)
- Platform 13.70 m/min. (45 fpm)

Minimum Transfer Height

- Bridge (standard) 1753–1803 mm (69–71 in.)
- Bridge (with APD)..... 1803–1854 mm (71–73 in.)
- Bridge (main deck capable) 1981–2032 mm (78–80 in.)
- Platform 508 mm (20 in.) approx.

Maximum Transfer Height

- Bridge (standard) 3581–3683 mm (141–145 in.)
- Bridge (with APD)..... 3581–3683 mm (141–145 in.)
- Bridge (main deck capable) 5588–5690 mm (220–224 in.)
- Platform 3600 mm (142 in.) approx.

5. GENERAL DIMENSIONS AND WEIGHTS

A. WEIGHT

- Standard loader 15 650 kg (34 500 lb.) or more, depending on configuration and features supplied
- Wide loader 16 330 kg (36 000 lb.)
- Universal loader 17 125 kg (37 750 lb.)

B. DIMENSIONS

• Length	8690 mm (342 in.)
• Length (long loader)	9738 mm (383 in.)
• Width (wide loader).....	4224 mm (166 in.)
• Width (wide long loader)	3920 mm (154 in.)
• Height (to highest point) (wide loader)	4826 mm (190 in.) (maximum) 3200 mm (126 in.) (minimum)
• Height (to highest point) (universal)	6858 mm (270 in.) (maximum) 3200 mm (126 in.) (minimum)
• Minimum height at bridge roll plane	1930 mm (76 in.)
• Maximum height at bridge roll plane	5600 mm (220 in.) (universal) 3600 mm (142 in.) (wide loader)
• Platform length (between load stops)	4140 mm (163 in.) (maximum) 3810 mm (150 in.) (minimum)
• Platform length (long loader).....	5810 mm (229 in.)
• Platform width (between guides).....	3234 mm (127 in.)
• Bridge length (front to load stop).....	1018 mm (40 in.) (maximum) 679 mm (27 in.) (minimum)
• Bridge width (between guides)	3226 mm (127 in.) (maximum) 2489 mm (98 in.) 2261 mm (89 in.) 1600 mm (63 in.) (minimum)
• Wheelbase (to center of bogy wheels)	3252 mm (128 in.)
• Front axle track width	2285 mm (90 in.)
• Rear axle (bogy wheels) track width	2851 mm (112 in.)
• Exterior turn radius (swept).....	7920 mm (312 in.) approx.
• Stopping distance (at full speed).....	4600 mm (180 in.) approx.

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

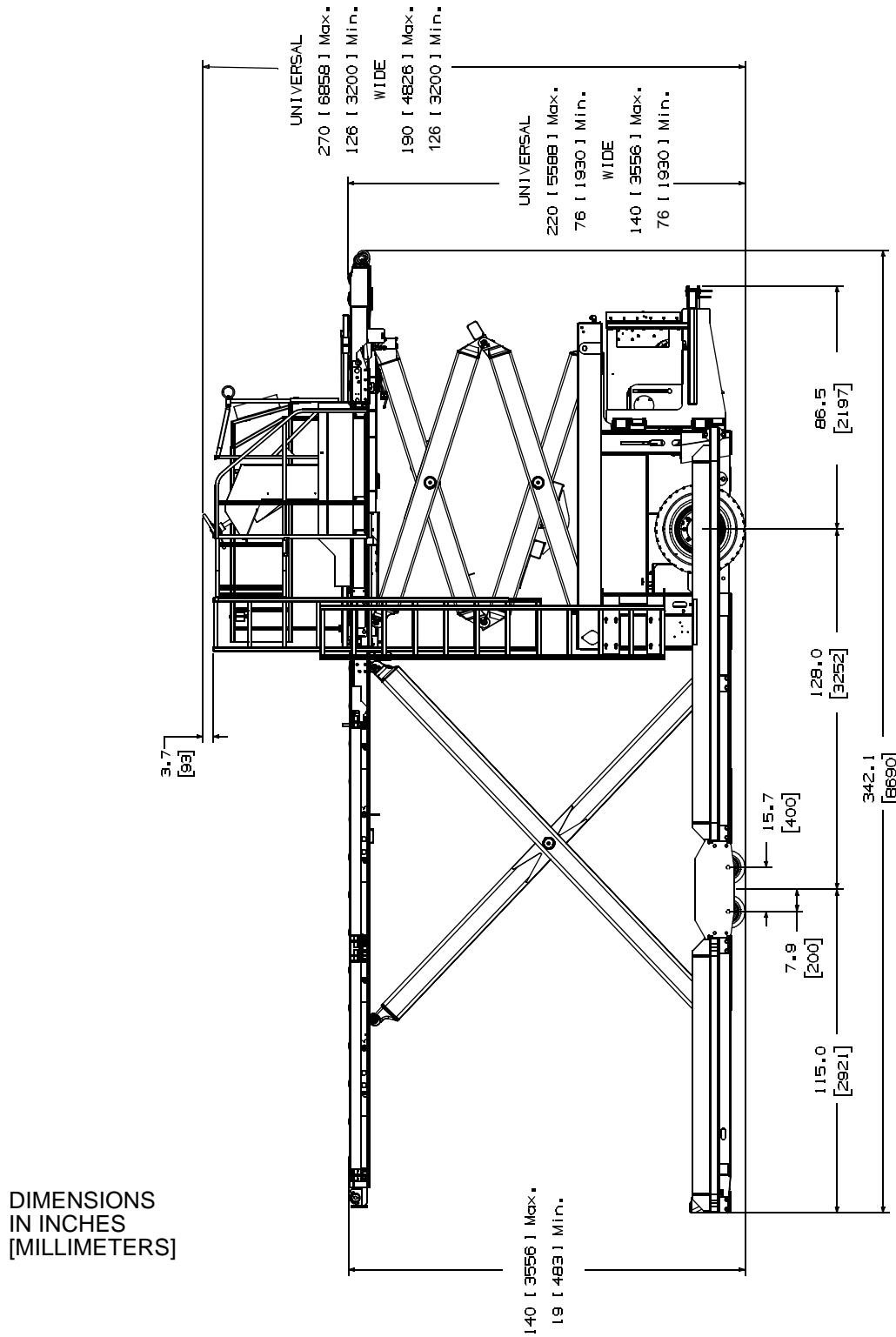


Figure 1
GENERAL DIMENSIONS

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

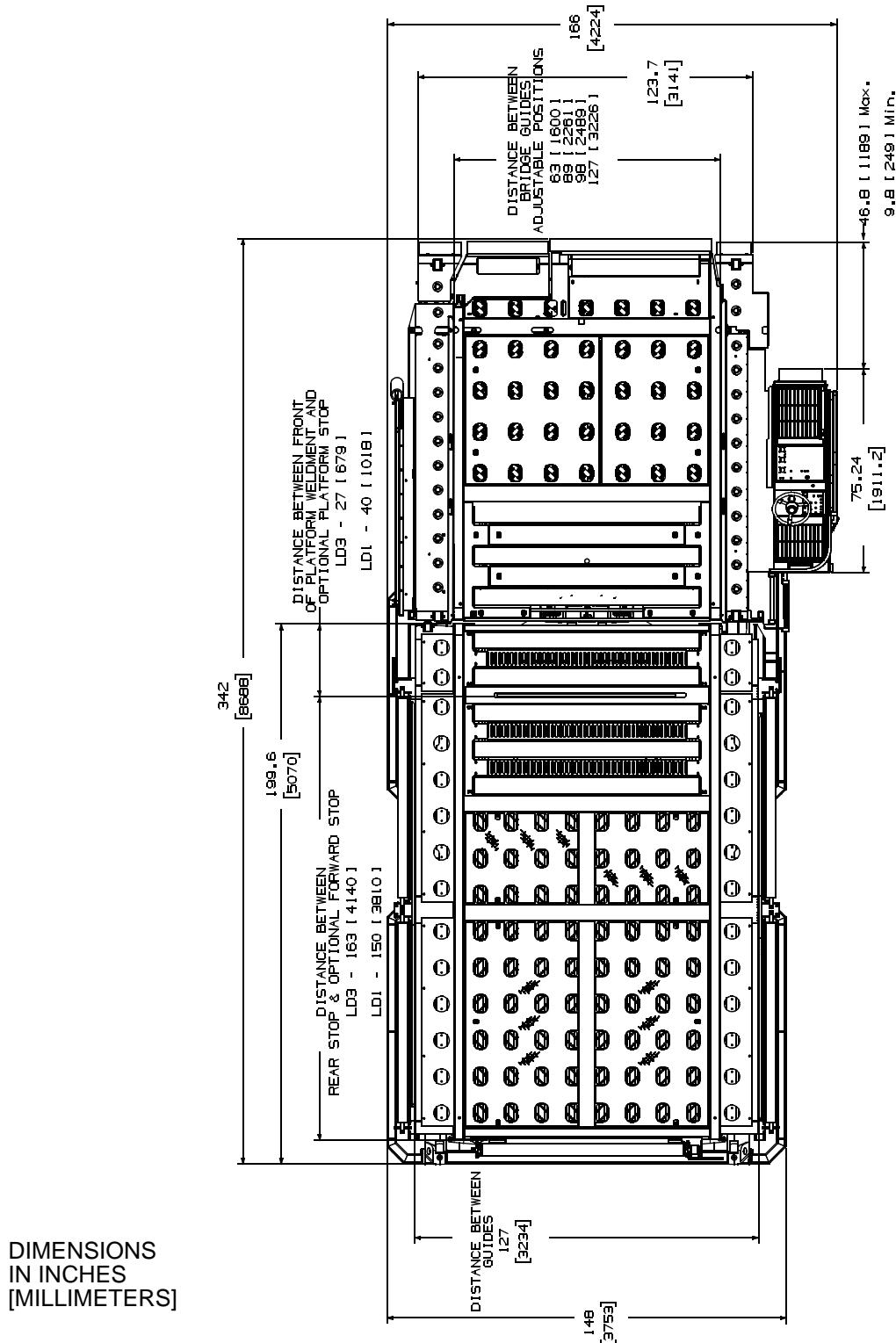


Figure 2
BRIDGE AND PLATFORM DIMENSIONS

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

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

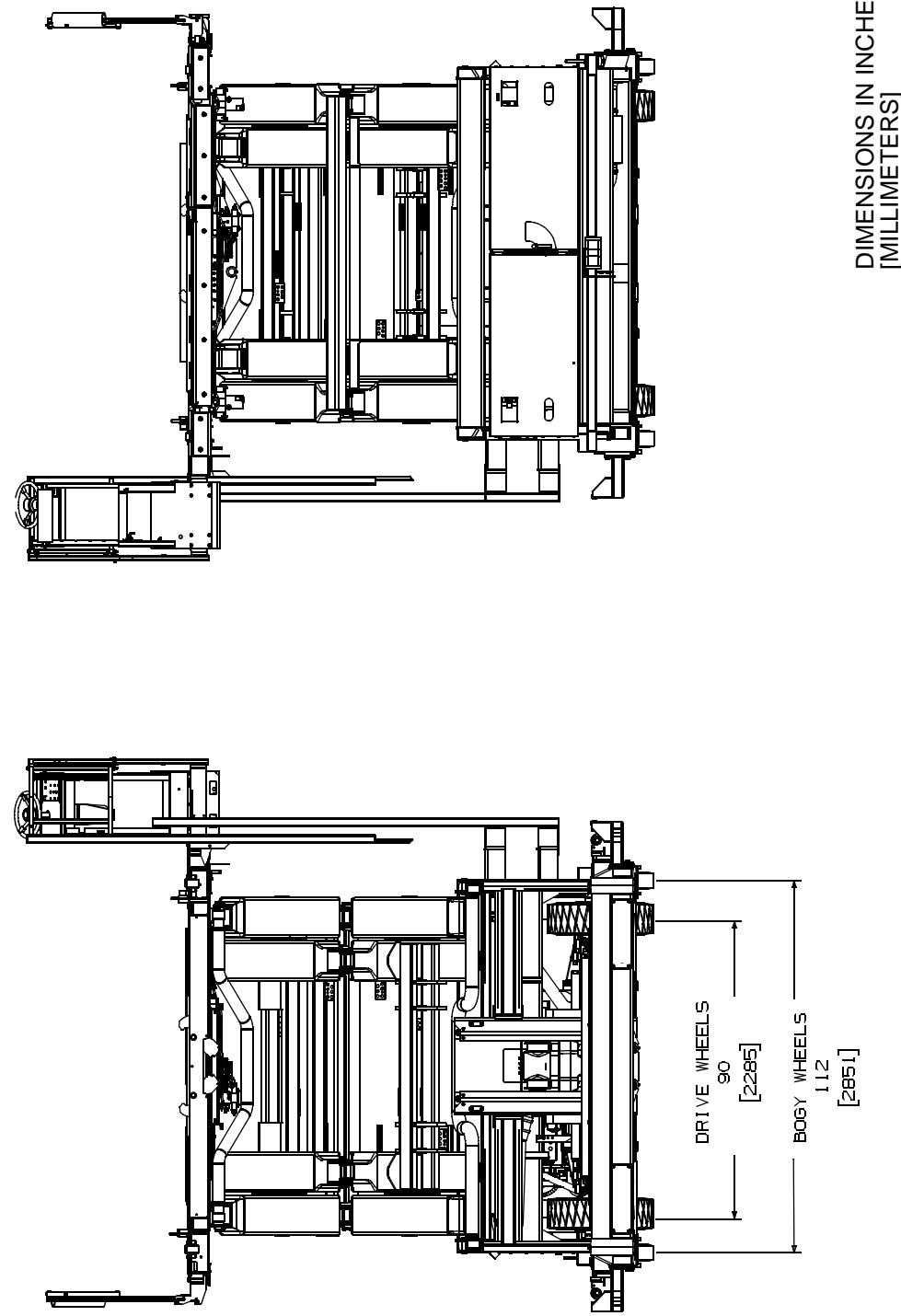


Figure 3
VEHICLE TRACK WIDTHS

6. POWER MODULES

A. ENGINE SPECIFICATIONS - DIESEL POWERED UNIT

TABLE 1 - ENGINE SPECIFICATIONS AND OPERATING RPM

ENGINE MODEL*	LOW IDLE (NO LOAD)	PEAK TORQUE**	RATED POWER**
Cummins Diesel QSB 4.5 4.5 L (275 cu.in.) EPA Tier 3, EU Stage IIIA	1200 rpm	465 N·m (343 lbf-ft.) @ 1200 rpm	82 kW (110 hp) @ 2200 rpm
Deutz Diesel TCD 2012 L04 2V 4.0 L (246 cu.in.) EPA Tier 3, EU Stage IIIA	1200 rpm	420 N·m (309 lbf-ft.) @ 1600 rpm	75 kW (100 hp) @ 2400 rpm
Deutz Diesel TD 3.6 L4 T4 3.6 L (221 cu.in.) EPA Tier 4, EU Stage IV	1200 rpm	330 N·m (243 lbf-ft.) @ 1600 rpm	55.4 kW (74.3 hp) @ 2200 rpm
<p>* All engines four-stroke turbocharged, direct injection, four cylinders in line, liquid cooling system. Tier 4 (Stage IIIB, IV) engines may be equipped with Particulate Matter (PM) filter with active self-regeneration, and variable displacement turbocharger.</p> <p>** Approximate information data. Refer to specific placard on the engine, and to the engine manual in Manufacturers' Appendices, Chapter 5, for additional information.</p>			

B. MOTOR SPECIFICATIONS - ELECTRICAL POWERED UNIT (OPTIONAL)

TABLE 2 - ELECTRIC MOTOR SPECIFICATIONS

MODEL	LOW IDLE	CURRENT	RATED POWER
Baldor Electric	0 rpm	880 A	70 kW (94 hp)

- Motor controller Samenco
- Contactor (base mount). 700 A, 80 VDC

7. FUEL SPECIFICATIONS AND RECOMMENDATIONS (DIESEL ENGINE)

TABLE 3 - FUEL SPECIFICATIONS AND DESIGNATIONS

FUEL TYPE	SULFUR CONTENTS	% BY MASS	FUEL DESIGNATION	EPA REQUIREMENT
Non-road Diesel fuel	<500 ppm	<0.05%	Low Sulfur Fuel	EPA Tier 2
Highway Diesel fuel*				EPA Tier 3
Non-road Diesel fuel**	<15 ppm	<0.0015%	Ultra-Low Sulfur*	EPA Tier 3
Highway Diesel fuel*				EPA Tier 4

* EPA mandated for the U.S. that by October 2010 all on-road Diesel fuel must be 15 ppm Ultra-Low Sulfur Diesel (ULSD), and off-road Diesel fuel must be 500 ppm. The exception was the State of California that required all Diesel fuel to be 15 ppm ULSD since January 2007, and it applies to all vehicles and equipment with no exceptions. EPA also required for all the U.S. that 2007 model year and newer vehicles must use ULSD fuel, called also 'Sulfur-free' Diesel fuel.

**In 2004, EPA defined Tier 4 standards to be phased-in over 2008–2015, requiring substantial emission reductions and more stringent limits through the use of control technologies.

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 ENGINES.

CAUTION

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

8. FUEL SYSTEM - DIESEL POWERED UNIT

A. FUEL TYPE

Refer to FUEL SPECIFICATIONS AND RECOMMENDATIONS, and cautions above.

- Diesel fuel, Tier 3 engines ASTM D975-07, No. 1-D and No. 2-D
- Diesel fuel, Tier 4 engines 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 121 L (32 gal.)

C. FILTER TYPE

- Primary filter Cartridge type, fuel and water separator
- Secondary filter Canister type
- Heated fuel and water separator Optional

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 °C (32 °F), WINTER-GRADE FUEL (SUITABLE DOWN TO -23 °C [-10 °F]) SHOULD BE USED. FOR TEMPERATURES BELOW -9 °C (16 °F) REFER TO THE ENGINE OPERATION MANUAL IN CHAPTER 5.

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

9. BATTERY REQUIREMENTS - ELECTRICAL POWERED UNIT (OPTIONAL)

These requirements apply only to the optional electrical powered unit. Two batteries supply energy to the electrical motor which powers the vehicle.

NOTE: THESE HIGH-AMP BATTERIES REQUIRED ON OPTIONAL ELECTRICAL POWERED UNITS ARE NOT PROVIDED WITH THE VEHICLE. REFER TO THE MANUFACTURER'S DATA SPECIFIC FOR THE BATTERIES TO BE USED IN THE VEHICLE.

• Battery capacity (each)	80 VDC, 300 A·h (Minimum)
• Battery type	Flooded lead acid
• Finishing rate	Min. 12.0 A; Max. 15.0 A
• Specific gravity	1.28
• Dimensions (approx.)	969 mm x 916 mm (38 in. x 36 in.)
• Total weight (approx.)	2195 kg (4840 lb.)

10. WHEELS AND TIRES

• Front axle drive wheels	8.00 x 15 - Standard 9.75 x 15 - Main Deck
• Front tires	Solid soft rubber, 300 x 15 NHS (standard loader) 355/65 x 15 (main deck capable) Pneumatic tires optional
• Inflation air pressure (pneumatic tires only)	Refer to Maintenance Specifications in Chapter 2, Section 4.
• Rear axle wheels	Bogy wheels (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. 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 Maintenance Specifications in Chapter 2, Section 4.
- Front wheel lug nuts torque Refer to Maintenance Specifications in Chapter 2, Section 4.
- Rear axle Two sets of bogy wheels with integrated height adjustment cylinders, which hydraulically lift and lower the load platform. Bogy wheels are not powered, and do not drive the vehicle.

13. STEERING

- System The vehicle is equipped with a hydraulic power assisted 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. 43° maximum

14. HYDRAULIC SYSTEM

A. GENERAL

Closed center system, pressure compensated with load sensing controls.

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 MAINTENANCE SPECIFICATIONS, CHAPTER 2, SECTION 4.

C. HYDRAULIC PUMP

An axial piston pump, directly coupled and driven by the power unit provides hydraulic flow to power all functions in the vehicle.

D. EMERGENCY ELECTRIC PUMP

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

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 ASSEMBLIESPressure 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: FOR OPERATING PRESSURES REFER TO MAINTENANCE SPECIFICATIONS IN CHAPTER 2, SECTION 4.

15. ELECTRICAL SYSTEM

A. MAIN ELECTRICAL COMPONENTS

- 24-volt DC system, powered by alternator on engine; stored on two 12-volt batteries (Diesel powered units)
- 24/160 VDC system, powered by and stored on two 80-volt batteries, and provided with an inverter to power AC motor (Electric powered units)
- AC controller to power the hydraulics and an inverter to change the control 24 VDC system batteries (Electrical powered unit only)
- Headlights, and rear stop and reverse lights
- Turn signal lights (optional)
- Beacon (optional)
- Working lamps (optional)

B. FUSES AND CIRCUIT BREAKERS

Fuses or circuit breakers are provided to protect ignition 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.

16. ADDITIONAL FEATURES AND EMERGENCY DEVICES

- Engine safety (Diesel powered unit only)
- Traction safety
- Emergency stop push-button switches
- Warning indicators
- Traction circuit by-pass valve (optional)
- Platform over-travel shutdown feature
- Load transfer circuit protection
- Load transfer circuit by-pass valves (optional)

17. VEHICLE JACKING REQUIREMENTS

A. JACK CAPACITY

- Minimum working capacity (each axle) 14 600 kg (32 000 lb. [16 ton])

B. MAINTENANCE STANDS CAPACITY

- Minimum number of stands Four (2 front, 2 rear)
- Minimum working capacity (each) 11 800 kg (26 000 lb. [13 ton])

C. PRESSURE EXERTED BY VEHICLE

- At stabilizers (loaded) 4830 kPa / 49 bar (700 psi)
- Minimum at maintenance stands (unloaded) .. 2760 kPa / 28 bar (400 psi)
- Maximum pressure exerted by vehicle 5520 kPa / 55 bar (800 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, TRANSFERRED THROUGH THE JACKS AND MAINTENANCE STANDS.

18. ENVIRONMENTAL LIMITATIONS

A. OPERATING TEMPERATURES

TABLE 4 - AMBIENT OPERATING CONDITIONS

OPERATING CONDITION*	AMBIENT TEMPERATURE RANGE**	RECOMMENDATION
Normal	-29 °C to +51 °C (-20 °F to +123 °F)	Engine does not require assisted starts.
Extremely cold	Below -29 °C (-20 °F)	Requires vehicle to be pre-heated (engine block, oil pan, and fuel filter).
Extremely hot	Above 51 °C (123 °F)	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 Manufacturers' Appendices in Chapter 5 for engine operating temperature ranges and oil specifications, and related information for other components. Contact JBT, Ground Support Equipment for operating conditions in extreme weather.

B. WINTERIZATION OPTION

The Commander 15i is designed with an engine that will start with no additional aids other than the standard grid heater set down to -18 °C (0 °F). The winterization option includes battery heaters, immersion engine block heater, and hydraulic tank immersion heaters which maintain functionality at a minimum of -40 °C (-40 °F).

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.

19. **OPERATOR'S VIBRATION AND SOUND LEVELS**

A. SOUND LEVEL EMISSION DATA

TABLE 5 - SOUND LEVEL EMISSION DATA

	Test Locations and Conditions*		
	Driver's Cab		Exterior
Engine / Motor	Standstill	Driving	Driving
Deutz TCD 2012	70.1 dBA	79.0 dBA	87.6 dBA
Cummins QSB 4.5**	Not available	Not available	Not available
Electric motor	Not available	Not available	Not available

* Tests performed without a hush kit installed. ** Commander 15*i* with Cummins engine not tested to CE standards.

- Standard EN 1915-4 and ISO 11201
- Driver or operator position Standing
- Sound power tests Stationary, driving
- Test uncertainty ($K = 1.6 \cdot \sigma_R$) 4 dB
- Technical measures for noise reduction Hush kit
- Possible ways to minimize noise exposure Wear hearing protection

B. VIBRATION LEVEL DATA

- Standard EN 1915-3
- Driver position Standing
- Vibration values $a_{WZ}F = 18.3 \text{ m/s}^2 (60.0 \text{ ft./s}^2)$
- Coefficient of variation $C_V \leq 0.15$
- Test uncertainty ($K = 0.3 a_{WZ}$) $2.0 \text{ m/s}^2 (6.6 \text{ ft./s}^2)$
- Technical measures for vibration reduction Not applicable
- Possible ways to minimize vibration exposure Not applicable

**20. TRANSITION DECK ATTACHMENT CAPABILITY**

The Commander 15i loader has been designed with attachment points for transition decks. The loader is approved for use with a transition deck.

- Maximum total mass of transition deck 2177 kg (4800 lb.)

Commander 15i loaders are designed to support the specific load of a transition deck in both static mode (load operations) and in dynamic mode (driving with both the loader and the transition deck unloaded).

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

- Unburdened..... 4.6 m (15.1 ft.)
- Burdened with transition deck mass 4.9 m (16.1 ft.)

21. 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
m (meter)	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)	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)	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
°C (Celsius)	x 1.8 + 32 = °F	°F (Fahrenheit)	- 32 / 1.8 = °C
°C (temperature differential*)	x 1.8 = °F (diff.)	°F (temperature differential*)	x 0.556 = °C (diff.)

* Temperature differential refers to the difference between two temperature points as opposed to a specific temperature expressed in both °C and °F.

Section 5. Shipping and Transportation

1. GENERAL

This section contains general information on preparation of the loader for transportation. Check regulations of the states and countries through which the loader will be transported for specific requirements such as dimensional limitations, whether or not the loader can be transported with fuel, fluids, etc.

Also, review Chapter 1, Section 6 for storage requirements and information on protection that may be required, if time en route is expected to be more than a week.

NOTE: THE EQUIPMENT PRE-OPERATIONAL CHECKLIST SHOULD BE UTILIZED WHEN COMMISSIONING NEW EQUIPMENT, AND FOR RE-COMMISSIONING AFTER A MAJOR REPAIR, OVERHAUL, RECOMMENDED ANNUAL MAINTENANCE, OVER-THE-ROAD TRANSPORTATION, AND IF THE MACHINE HAS BEEN OUT OF SERVICE FOR MORE THAN SIX MONTHS.

NOTE: REFER TO EQUIPMENT PRE-OPERATIONAL CHECKLIST IN CHAPTER 2, SECTION 3.

NOTE: REFER TO SPECIFICATIONS IN CHAPTER 1, SECTION 4 FOR WEIGHT, GENERAL DIMENSIONS, AND OTHER DETAILS BEFORE TRANSPORTING THE VEHICLE.



WARNING

BEFORE REMOVING OR INSTALLING VEHICLE COMPONENTS, ENSURE THE VEHICLE IS ON LEVEL GROUND, WHEELS ARE SECURELY CHOCKED AND ELECTRICAL SYSTEM IS SWITCHED OFF.



WARNING

LIFT VEHICLE ONLY BY PROPER HOISTING POINTS AND IN ACCORDANCE WITH THE DESCRIBED METHOD. DO NOT USE FORKLIFTS.



WARNING

ALWAYS PROTECT WEBBING TO PREVENT RIPPING.

2. PREPARATION OF THE UNIT FOR SHIPPING

A. DISASSEMBLY AND ASSEMBLY INSTRUCTIONS

The vehicle is shipped with the parking brake released, engine switched "OFF", electrical power disconnected and traction circuit disengaged. Some components may need to be removed prior to transportation. Fragile components should be packed in separate box(es).

NOTE: FOR OPTIONAL ELECTRICAL POWERED UNITS IT IS RECOMMENDED TO REMOVE THE TWO CUSTOMER PROVIDED MAIN SUPPLY BATTERIES BEFORE LIFTING AND TRANSPORTING THE VEHICLE.

B. PREPARATION

Preparation of the vehicle is very important, especially if transportation will be by sea, or it is expected to last for more than a week. It must be considered that the vehicle may be exposed to unusual weather conditions during transportation.

- (1) Retract bogy wheel cylinders by lowering the chassis completely. Set threaded screws to hold bogy wheel assemblies. Refer to LIFT TOWING in Chapter 1, Section 3, Emergency Procedures.
- (2) Lubrication (refer to Maintenance Specifications in Chapter 2, Section 4)
 - (a) Retract hydraulic cylinders and apply grease to exposed piston rods.
 - (b) Disconnect battery cables and apply grease to cable ends.
 - (c) Apply grease to door hinges and latches.
- (3) Remove batteries, and crate for shipment. Cover terminals with protective grease.
- (4) Protect engine (Diesel powered vehicles). If shipment will keep the vehicle out of service for an extended period of time, follow storage instructions in the engine's manual (refer to Manufacturers' Appendices in Chapter 5).

3. SHIPPING WEIGHT AND DIMENSIONS

NOTE: REFER TO SPECIFICATIONS IN CHAPTER 1, SECTION 4 FOR DIMENSIONS AND WEIGHT FOR SPECIFIC VEHICLE. SHIPPING DIMENSIONS MAY VARY IF ADDITIONAL COMPONENTS ARE REMOVED. TOTAL WEIGHT WILL DEPEND ON OPTIONS INCLUDED IN THE VEHICLE.

- Shipping length 8690 mm (342 in.)
- Shipping width (wide unit) 3753 mm (148 in.)
- Shipping height (with cab removed) 1930 mm (76 in.)
- Total volume 63 m³ (2225 cu.ft.)

TABLE 1 - VEHICLE AXLE WEIGHTS

Axle	C15i Standard kg (lb.)		C15i Wide kg (lb.)		C15i Universal kg (lb.)	
Front axle	9752 (21 500)	62%	10 092 (22 250)	62%	10 886 (24 000)	64%
Rear axle	5897 (13 000)	38%	6237 (13 750)	38%	6237 (13 750)	36%
Total weight	15 649 (34 500)	100%	16 329 (36 000)	100%	17 123 (37 750)	100%

NOTE: REFER TO SPECIFIC PLACARD IN VEHICLE FOR GVW, AND BY-AXLE AND TOTAL VEHICLE WEIGHT FOR THE CONFIGURATION PROVIDED.

4. SURFACE TRANSPORTATION

Refer to Specifications in Chapter 1, Section 4, for vehicle weight and dimensions to determine the load carrying requirements for the vehicle to be used for transportation. Occasionally, to comply with surface transportation standards, it may be necessary to remove the operator's cab before transporting the vehicle.

A. LIFTING

CAUTION

ENSURE BOGY WHEELS ARE RETRACTED AND UPPER THREADED PINS ARE SET TO HOLD BOGY WHEEL ASSEMBLIES BEFORE LIFTING THE VEHICLE.

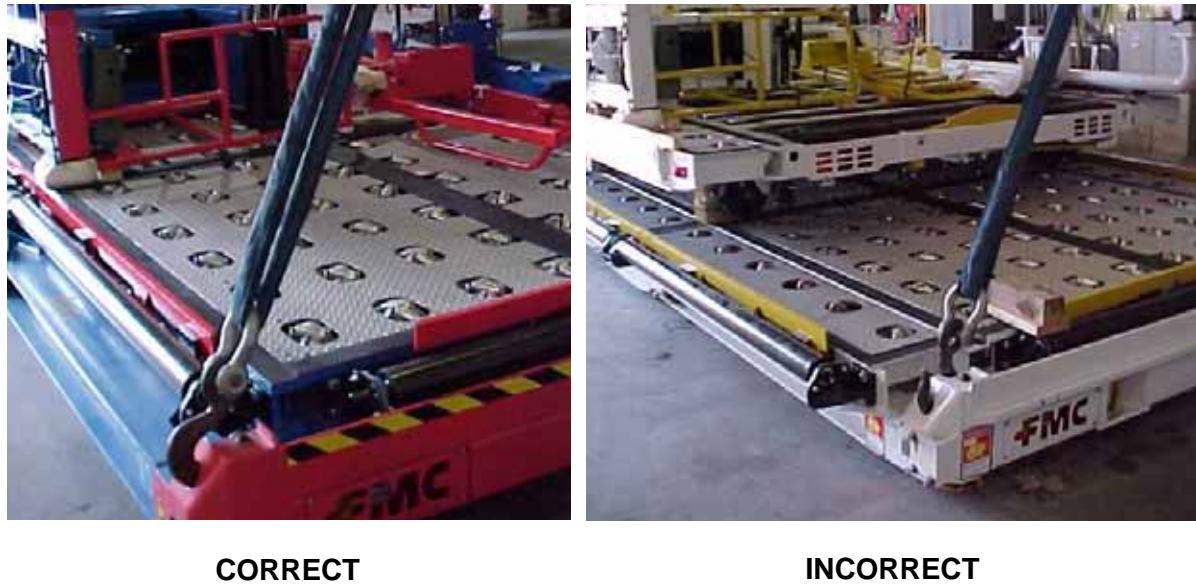
- (1) Recommended Equipment List - **Narrow Unit**
 - (a) A two crane lifting system capable of lifting 22 700 kg (50 000 lb.)
 - (b) Two (2) lifting hooks rated for 8200 kg (18 000 lb.) capacity each, to attach to rear lifting points.
 - (c) Two (2) lifting straps rated for 8200 kg (18 000 lb.) capacity each, to wrap around front frame, or
 - (d) Two (2) lifting hooks rated for 8200 kg (18 000 lb.) capacity each, to attach to front lifting pins.

Access slot measures 50.8 mm x 269.9 mm (2.00 in. x 10.63 in.) with a 38 mm (1.5 in.) diameter lifting pin.

- (2) Recommended Equipment List - **Wide Unit**
 - (a) A two crane lifting system capable of lifting 22 700 kg (50 000 lb.)
 - (b) Two (2) lifting hooks rated for 8200 kg (18 000 lb.) capacity each, to attach to rear lifting points.
 - (c) Two (2) lifting straps rated for 8200 kg (18 000 lb.) capacity each, to wrap around front frame.
- (3) General Procedure - **Wide and Narrow Units**
 - (a) Power module door pin must be in place prior to lifting of the machine.

NOTE: TIE-DOWN HOOKS ON THE FRONT OF THE MACHINE ARE ONLY TO BE USED TO RESTRAIN THE UNIT DURING SHIPPING. THEY ARE NOT DESIGNED FOR LIFTING OR TOWING.

- (b) Position one of the cranes directly overhead of the rear cross-member of the frame.
- (c) Attach one of the 6800 kg (15 000 lb.) hooks to each of the lifting points on the rear frame as shown in [Figure 1](#). Notice the orientation of the lifting hook, the hook enters the hole in the corner casting from the outside. Incorrect insertion of lifting hook will damage rear stabilizer cylinders.



CORRECT

INCORRECT

Figure 1
REAR LIFTING POINT - WIDE AND NARROW UNITS

- (d) [Figure 2](#) shows lifting hooks on both lift points. Align the crane in the center of the loader and directly above the lifting points as shown.



Figure 2
REAR LIFTING POINTS - WIDE AND NARROW UNITS

- (e) Using nylon webbing straps, wrap around each front corner of the front frame as shown in [Figure 3](#). Notice how webbing goes up between bridge frame and wing.



Figure 3
RIGHT HAND FRONT LIFTING POINT - WIDE MACHINE

- (f) Always protect nylon webbing when pulling up against another structure. As in the case of [Figure 4](#), the webbing is being protected from touching the bridge.



Figure 4
WEBBING PROTECTION - RIGHT HAND SIDE, WIDE MACHINE

- (g) [Figure 5](#) shows the nylon webbing around the left-hand corner of the frame. The webbing is passed through the slot for the guide bar in the bridge wide extension, as shown in [Figure 6](#).



Figure 5
LEFT HAND FRONT LIFTING POINT - WIDE MACHINE



Figure 6
LIFTING STRAP THROUGH GUIDE BAR SLOT - RIGHT HAND SIDE, WIDE MACHINE

- (h) Align the crane in the center (side to side) of the loader and directly above the lifting points as shown in [Figure 7](#).



Figure 7
LIFTING POSITION OF CRANE - WIDE MACHINE

- (i) Operate both cranes simultaneously to lift the loader up evenly. [Figure 8](#) shows an overall picture with both cranes attached to the loader.



Figure 8
OVERALL VIEW OF LOADER BEING LIFTED - NARROW MACHINE

(4) Alternate Procedure - Narrow Unit

- (a) Repeat steps Paragraph (3) (a) thru (d).
- (b) With the absence of wings on a narrow unit, access to the lifting pins allows the use of lifting hooks of 8200 kg (18 000 lb.) of capacity. Access slot measures 50.8 mm x 269.9 mm (2.00 in. x 10.63 in.) with a 38.1 mm (1.5 in.) diameter lifting pin. [Figure 9](#) shows a lifting hook engaged on the lifting pin.
- (c) Align the crane in the center (side to side) of the loader and directly above the lifting points as shown in [Figure 7](#).
- (d) Operate both cranes simultaneously to lift the loader up evenly. [Figure 8](#) shows an overall picture with both cranes attached to the loader.



Figure 9
HOOK ON LIFTING PIN - LEFT HAND SIDE, NARROW MACHINE

(5) Alternate Procedure Using One Crane

One crane may be used only when a spreader bar is used in the lifting system. The lifting system must still be capable of lifting 22 700 kg (50 000 lb.). Arrange cables and lifting straps as pictured in [Figure 10](#). Angle 'A', must be 90° when lifting a wide machine, this will protect the unit from damage during lifting.

NOTE: FAILURE TO LIFT STRAIGHT UP ON THE FRONT CABLES AND NYLON WEBBING WILL DAMAGE THE EXTENSIONS ON A WIDE MACHINE. WHEN LIFTING A NARROW MACHINE, ANGLE 'A' MAY BE REDUCED AS REQUIRED, PROVIDING PROPER LIFTING STANDARDS ARE ADHERED TO. ENSURE THAT ANGLE 'B' IS NOT TOO SMALL THAT DAMAGE WILL OCCUR TO THE LOADER AND THAT ALL LIFTING STANDARDS ARE ADHERED TO.

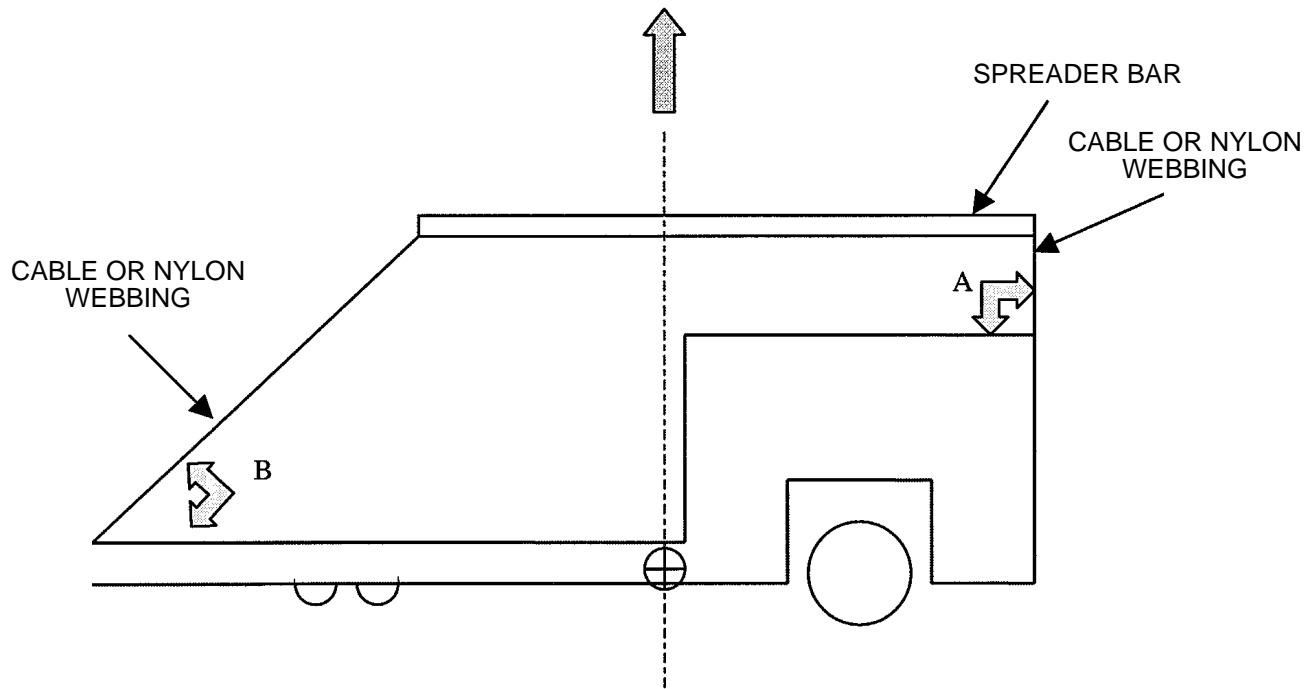


Figure 10
ALTERNATE METHOD FOR USING ONE CRANE

B. RESTRAINT

Restrain the loader with universal tie-down straps, chains and over-center tensioning devices, and chocks. Do not route tie-downs across handrails or ladders. Refer to [Figure 1](#) through [Figure 10](#) for tie-down location and use a cross-tie method when securing vehicle. Do not use tie-down hooks for towing or lifting of loader.

Inspect all attaching points to ensure that the restraints are secure and that straps (if used) do not bear against angular surfaces that may cause failure en route due to chafing or vibration.

Check for presence of any loose items. If necessary, pack the items separately and place in a secure location.

5. AIR TRANSPORTATION

Depending on type of aircraft used for transportation, it may be necessary to remove the operator's cab, platform lift cylinders and ladder prior to transporting the loader. If removing these items from the vehicle, cover all hydraulic line connectors with protective caps, or plugs. Secure lines and electrical conductors to prevent damage during transportation.

If the loader will be towed, ensure that the hub drives are disengaged.



Restrain the loader with universal tie-down straps, chains and over-center tensioning devices, and chocks. Do not route tie-downs across handrails or ladders. Do not route tie-downs across handrails or ladders. Refer to [Figure 1](#) through [Figure 10](#) for tie-down location and use a cross-tie method when securing vehicle. Do not use tie-down hooks for towing or lifting the loader.

Inspect all attaching points to ensure that the restraints are secure and straps (if used) do not bear against angular surfaces that may cause failure en route due to chafing or vibration.

Check for presence of any loose items. If necessary, pack the items separately and place in a secure location.

Section 6. Storage

1. GENERAL

It is very important to properly prepare a vehicle that will be de-commissioned, or removed from service for a period of time. The main purpose of a proper preparation before storage is to avoid, or at least minimize, potential damage due to moisture, rust and corrosion, and possible component seizing.

In addition, a proper preparation of the vehicle previous to storage, as well as periodic verification during storage, will allow to readily place the vehicle back into service with minimum effort, and without major problems.

NOTE: THE EQUIPMENT PRE-OPERATIONAL CHECKLIST SHOULD BE UTILIZED WHEN COMMISSIONING NEW EQUIPMENT, AND FOR RE-COMMISSIONING AFTER A MAJOR REPAIR, OVERHAUL, RECOMMENDED ANNUAL MAINTENANCE, OVER-THE-ROAD TRANSPORTATION, AND IF THE MACHINE HAS BEEN OUT OF SERVICE FOR MORE THAN SIX MONTHS.

NOTE: REFER TO EQUIPMENT PRE-OPERATIONAL CHECKLIST IN CHAPTER 2, SECTION 3.

NOTE: MAINTENANCE SPECIFICATIONS ARE CONTAINED IN CHAPTER 2, SECTION 4.

CAUTION

COMPLY WITH ALL LOCAL AND GOVERNMENT REGULATIONS FOR DISPOSING OF ENVIRONMENTALLY SENSITIVE MATERIALS SUCH AS TIRES, BELTS, BATTERIES, MOTOR OILS, GREASE, HYDRAULIC OIL, FUELS, REFRIGERANT GASES, AND GLYCOLS.

2. STORAGE - ONE MONTH (MAXIMUM)

A. VEHICLE

No special action needed.

B. ENGINE (DIESEL POWERED UNIT ONLY)

- (1) Drain the engine crankcase.
- (2) Fill the crankcase to the proper level with the recommended viscosity and grade oil.
- (3) Fill the fuel tank with the recommended grade of fuel oil. Operate the engine for two minutes, or until the engine is warm, at 1200 rpm at no load.
- (4) Check the air cleaner and service it if necessary.
- (5) If freezing weather is expected during the storage period, add an ethylene-glycol based antifreeze solution in accordance with the manufacturer's recommendations.

(6) Clean the outside of the engine (except the electrical system) with fuel oil. Dry it with compressed air.

(7) Seal all of the engine openings. The material used for this purpose must be waterproof, vapor proof, and possess sufficient physical strength to resist puncture or damage from the expansion of entrapped air.

C. ELECTRICAL MOTOR (ELECTRICAL POWERED UNIT ONLY)

No special action needed.

D. BATTERIES

All units (Diesel and electrical powered)

Disconnect and remove the two 12-volt batteries and store them in a cool, and dry location.

Electrical powered units (Optional)

Disconnect the two 80-volt batteries and store them in a cool, and dry location, if possible. Protect and cover all battery and electrical connectors.

E. TRACTION SYSTEM (PUMP AND DRIVE MOTORS)

No special action needed.

F. AXLES

No special action needed.

G. WHEELS AND TIRES

Chock drive wheels front and rear to prevent movement in any direction.

H. HYDRAULIC SYSTEM

Minimize exposed cylinder rods by lowering platform and bridge fully, retracting powered operator's cab, and insuring stabilizer cylinders are retracted.

I. GENERAL COMPONENTS

Coat all exposed unpainted metal surfaces with rust preventative. Especially important are exposed hydraulic cylinder rods, roller chains, sprockets, and lift chains.

3. STORAGE - INDEFINITE PERIOD

A. VEHICLE

(1) Touch up all worn or damaged paint to prevent rust.

(2) Ensure that all points are lubricated with specified grease, oil, etc.

(3) Attach a tag to the steering wheel stating: "CAUTION: ALL LUBRICANTS HAVE BEEN DRAINED FROM THIS VEHICLE".

- (4) Once all recommended steps are performed, refer to Equipment Shelter below in this section for recommended protection of the equipment.

B. ENGINE (DIESEL POWERED UNIT ONLY)

- (1) Drain the cooling system and flush with clean, soft water. Refill with clean, soft water and add a rust inhibitor to the cooling system.
- (2) Remove, check, and recondition the injectors, if necessary, to make sure they will be ready to operate when the engine is restored to service.
- (3) Reinstall the injectors, time them, and adjust the exhaust valve clearance.
- (4) Circulate the coolant by operating the engine until normal operating temperature is reached.
- (5) Turn off the engine.
- (6) Drain the engine crankcase, then reinstall and tighten the drain plug. Install new lubricating oil, filter elements and gaskets.
- (7) Fill the crankcase to the proper level with a 30-weight preservative lubricating oil.
- (8) Drain the fuel tank. Refill with enough clean, No. 1 diesel fuel (or pure kerosene) to permit the engine to operate for about ten minutes. If it isn't convenient to drain the fuel tank, use a separate approved container to supply the recommended fuel.
- (9) Drain and disassemble the fuel filter and strainer. Discard the used elements and gaskets. Wash the shells in clean, No. 1 diesel fuel (or pure kerosene), and insert new elements.
- (10) Fill the cavity between the element and shell with No. 1 diesel fuel (or pure kerosene) and reinstall on the engine. If spin-on fuel filters and strainers are used, discard the used cartridges, fill the new ones with No. 1 diesel fuel (or pure kerosene), and install on the engine.
- (11) Operate the engine for five minutes to circulate the clean fuel oil throughout the fuel system.
- (12) Service the air cleaner.
- (13) Apply a non-friction, rust preventative compound to all exposed parts.
- (14) Drain the engine cooling system.
- (15) Drain the preservative oil from the engine crankcase. Reinstall and tighten the drain plug.
- (16) Remove and clean batteries and battery cables with a baking soda solution and rinse them with fresh water. Do not allow the soda solution to enter the batteries.
- (17) Apply belt dressing to pulleys and belts to prevent sticking.
- (18) Seal all openings in the engine, including the exhaust outlet, with moisture-resistant tape. Use cardboard, plywood, or metal covers where practical.
- (19) Clean and dry the exterior, painted surfaces of the engine and spray with a suitable liquid automotive body wax, a synthetic resin varnish, or a rust preventative compound.

NOTE: REFER TO MANUFACTURERS' APPENDICES IN CHAPTER 5 FOR ADDITIONAL INFORMATION ON ENGINE MAINTENANCE AND PRESERVATION.

- (20) Protect the engine with a good, weather-resistant tarpaulin and store it under cover, preferably in a dry building which can be heated during the winter months.
- (21) The stored engine should be inspected periodically. If there are any indications of rust or corrosion, corrective steps must be taken to prevent damage to the engine parts. Perform a complete inspection at the end of one year and apply additional treatment as required.

C. ELECTRICAL MOTOR (ELECTRICAL POWERED UNIT ONLY)

Electrical motor must be covered for protection against dirt and moisture.

D. BATTERIES (DIESEL AND ELECTRICAL UNITS)

- (1) After batteries have been removed from the vehicle, add distilled water to the electrolyte if necessary, and applicable. Fully charge them.
- (2) Store the batteries in a cool dry place, between 0 °C (32 °F) and 32 °C (90 °F), not exposed to direct sunlight.
- (3) Keep batteries fully charged, or give them a slow charge every one to two months.
- (4) Check the level and the specific gravity of the electrolyte regularly.
- (5) Batteries must be covered for protection against dirt and moisture.

E. TRACTION SYSTEM (PUMP AND DRIVE MOTORS)

Refer to recommendations for hydraulic system in this section.

F. AXLES

No special action needed.

G. WHEELS AND TIRES

The vehicle should be raised and chassis blocked so that all wheels are off ground. Tires should be sprayed with a rubber preservative.

H. HYDRAULIC SYSTEM

CAUTION

USE CLEAN LINT-FREE RAGS FOR CLEANING OF TANKS AND COMPONENTS.

- (1) Minimize exposed cylinder rods by fully lowering platform and bridge, retracting powered operator's cab, and ensuring stabilizer cylinders are retracted.
- (2) Seal all openings with moisture-proof covers or tape.
- (3) Periodically inspect the hydraulic system. If there are any indications of rust or corrosion, corrective steps must be taken to prevent damage to the hydraulic components.

I. GENERAL COMPONENTS

Coat all exposed unpainted metal surfaces with rust preventative. Especially important are exposed hydraulic cylinder rods, roller chains, sprockets, and lift chains.

J. EQUIPMENT SHELTER

Ideally, the vehicle should be stored in a shelter to protect it from the weather, since outdoor storage of engines and transmissions is not recommended. Nevertheless, in some cases, outdoor storage may be unavoidable. If the vehicle must be kept outdoors, follow all preparation and storage instructions.

- (1) Protect the engine with a good, weather-resistant tarpaulin and store it under cover, preferably in a dry building which can be heated during the winter months.
- (2) Protect the vehicle with quality, weather-resistant tarpaulins (or other suitable covers) ensuring proper air circulation.

CAUTION

DO NOT USE PLASTIC SHEETING FOR STORAGE. PLASTIC SHEETING USED FOR STORAGE WILL CREATE CONDENSATION WHICH MAY CAUSE METAL SURFACES TO RUST OR PIT.

- (3) If shelter is not available, cover bridge and platform with tarpaulins or other protective material. Cover and tape instrument panels to provide a moisture-proof seal.
- (4) The stored vehicle should be inspected periodically. If there are any indications of rust or corrosion, corrective steps must be taken to prevent further damage. Perform a complete inspection at the end of one year and apply additional treatment as required.

4. RETURNING VEHICLE TO SERVICE



WARNING

PERFORM THE RE-COMMISSIONING MAINTENANCE PROCEDURES BEFORE RETURNING THE VEHICLE INTO SERVICE AFTER STORAGE.

A. RE-COMMISSIONING AFTER A SHORT PERIOD OF STORAGE

When returning the equipment to service after a short time period, several items should be act upon, as follows:

- (1) Perform a general inspection of the vehicle in accordance to recommendations (refer to the EQUIPMENT PRE-OPERATIONAL CHECKLIST in Chapter 2, Section 3).
- (2) Replenish or replace all fluids, including oil, fuel, and coolant, according to maintenance and lubrication recommendations and guidelines (refer to Preventative Maintenance in Chapter 2, Section 3).
- (3) Inspect tires for damage, cracks, and dry rot. Inflate to specifications, and remove chocks.

- (4) As a minimum, perform the recommended daily and quarterly maintenance according to Maintenance Schedules in Chapter 2, Section 3.

B. RE-COMMISSIONING AFTER AN EXTENDED PERIOD OF INACTIVITY

It is very important to properly prepare the vehicle, before placing it into service after an extended storage period. An exhaustive inspection, and a comprehensive maintenance should be performed on the equipment to ensure proper operation, and minimize breakdown and downtime.

- (1) Perform a general inspection of the vehicle in accordance to recommendations (refer to the EQUIPMENT PRE-OPERATIONAL CHECKLIST in Chapter 2, Section 3).
- (2) Replenish or replace all fluids, including oil, fuel, and coolant, according to maintenance and lubrication recommendations and guidelines (refer to Preventative Maintenance in Chapter 2, Section 3, and Manufacturers' Appendices in Chapter 5).
- (3) Inspect tires for damage, cracks, and dry rot. Inflate to specifications, and remove vehicle from raising blocks.
- (4) Before placing the vehicle into operation, fully recharge the batteries before installing them back in the vehicle.
- (5) Perform ALL the recommended maintenance (daily, quarterly, and annually) according to Maintenance Schedules in Chapter 2, Section 3.