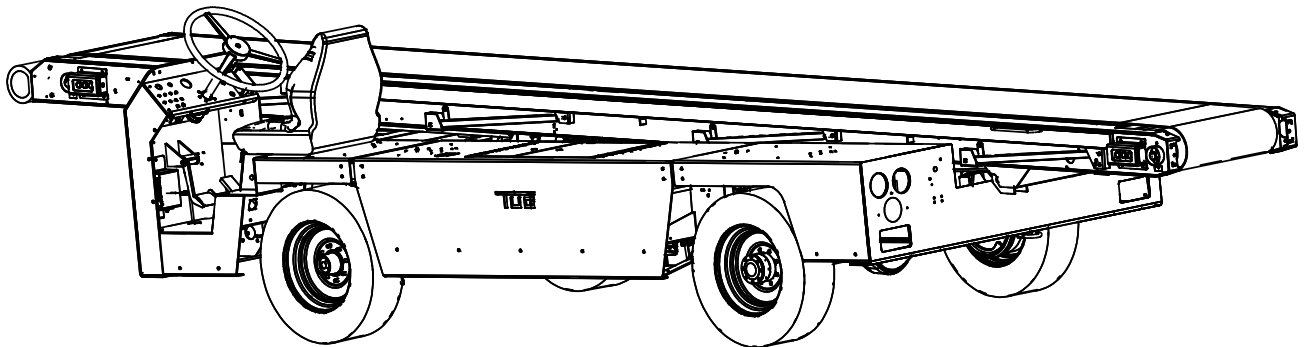
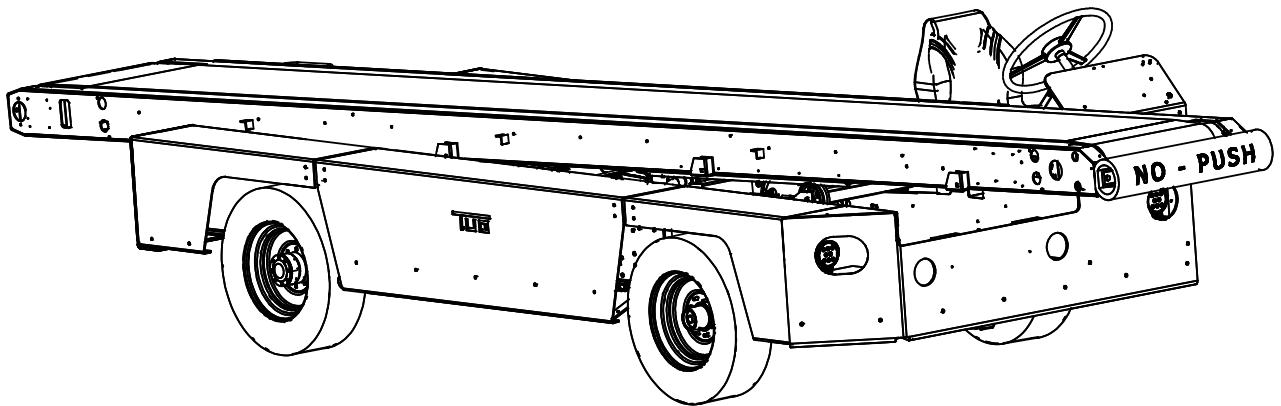


MOBILE BELT LOADER MODEL 660 & 663



OPERATION MANUAL

Volume 1 of 1

Originally Issued December 2015

COPYRIGHT NOTICE

This manual is copyright © 2015 Tug Technologies Corporation (TUG). All rights reserved.

This manual contains confidential and proprietary information.

This document and any information contained herein, may not be reproduced or redistributed in any form whatsoever without the express, written consent of TUG.

Any attempt to alter the contents of this manual in any way by anyone other than an authorized agent of TUG shall be construed as copyright infringement and punishment will be pursued under all applicable laws.

All vendor literature contained in this manual is the copyrighted property of the respective vendors, protected by the same laws governing this manual.



RECORD OF REVISIONS

Property of: _____

Company: _____

Address: _____

City: _____ State/Province: _____

Country: _____ Zip/Postal Code: _____

REVISION DATA

Check each revision received, and insert the revised and supplementary pages in your manual. Tug Technologies Corporation assumes no liability for personal injury or equipment failure due to any operation performed without heed to manual revisions.

Date of original publication: December 2015

Table Introduction - 1 - 1: Revisions

Revision Number	Date	Brief Description

LIST OF EFFECTIVE PAGES

Only pages that have been revised are listed in Table Introduction - 1 - 2: List of Effective Pages.

Table Introduction - 1 - 2: List of Effective Pages

Page	Revision	Date	Page	Revision	Date



TABLE OF CONTENTS

Copyright Notice	Introduction - 1 - ii
Record of Revisions	Introduction - 1 - iii
Revision Data.....	Introduction - 1 - iii
List of Effective Pages	Introduction - 1 - iv
Table of Contents	Introduction-1-v
List of Figures	Introduction-1-xi
List of Tables	Introduction-1-xiii
Unit Identification	Introduction - 1 - 1
Model Number	Introduction - 1 - 2
Warranty Information	Introduction - 1 - 3
Introduction	Introduction - 1 - 3
Pre-delivery Procedures	Introduction - 1 - 3
Authorization Requirements - Repairs Requiring Prior Approval.....	Introduction - 1 - 3
Warranty	Introduction - 1 - 4
Warranty Statements	Introduction - 1 - 4
Warranty Policy And Coverage.....	Introduction - 1 - 4
Service Recalls or Owner Notification Programs	Introduction - 1 - 4
Warranty Cancellation.....	Introduction - 1 - 5
Warranty Exclusions	Introduction - 1 - 5
Warranty Claim Process	Introduction - 1 - 6
Contact TUG Technologies.....	Introduction - 1 - 6
Parts.....	Introduction - 1 - 7
Return Parts	Introduction - 1 - 7
Labor	Introduction - 1 - 7
Aircraft Ground Support Equipment	Introduction - 1 - 8
Warranty Policy Statement	Introduction - 1 - 8
General Warranty Terms & Conditions	Introduction - 1 - 8
Warranty Labor Flat Rate Guide	Introduction - 1 - 10
Technical Assistance	Introduction - 1 - 17
How to Use This Manual	Introduction - 1 - 19
Safety	Safety - 1 - 1
Section 1: General Safety Guidelines	Safety - 1 - 1
1.1 Introduction	Safety - 1 - 1
1.2 Standard Safety Features	Safety - 1 - 1
1.3 Optional Safety Features	Safety - 1 - 3
1.4 Safety Responsibilities.....	Safety - 1 - 4
1.5 Operator Safety Responsibility	Safety - 1 - 5
1.6 Mechanic Safety Responsibility	Safety - 1 - 7
1.7 Emergency Procedures	Safety - 1 - 8
1.7.1 Disabled or Stalled Vehicle	Safety - 1 - 8
1.7.1.1 Operational Engine	Safety - 1 - 8
1.7.1.2 Operational Engine - Unable to Move	Safety - 1 - 9
1.7.1.3 Inoperable Engine With Electrical Power	Safety - 1 - 10
1.7.1.4 Inoperable Engine With Loss of Electrical Power	Safety - 1 - 10
1.7.2 Recommended Fire Procedure	Safety - 1 - 11
1.7.3 Collisions.....	Safety - 1 - 12
Section 2: IATA Flightline Safety Guidelines	Safety - 2 - 13
2.1 IGOM Chapter 4: Aircraft Handling Procedures.....	Safety - 2 - 13

2.1.1 Ramp Safety in Aircraft Handling	Safety - 2 - 13
2.2 General Ramp Safety	Safety - 2 - 13
2.2.1 Danger Areas	Safety - 2 - 13
2.2.2 Engine Intake Area	Safety - 2 - 14
2.2.3 Equipment Restraint Area & Equipment Restraint Line	Safety - 2 - 17
2.2.3.1 FOD - Foreign Object Debris	Safety - 2 - 17
2.2.3.2 FOD Checks.....	Safety - 2 - 18
2.3 Safety Instructions for Operating Motorized Vehicles on Ramp	Safety - 2 - 19
2.3.1 General Safety Instructions for Ground Support Equipment (GSE).....	Safety - 2 - 19
2.3.2 Basic Operating Requirements for GSE	Safety - 2 - 19
2.3.3 Belt Loader Aircraft Loading Equipment	Safety - 2 - 20
2.3.4 Ground Support Equipment Safety Driving and Parking Inside ERA.....	Safety - 2 - 21
2.4 Adverse Weather Conditions	Safety - 2 - 21
2.4.1 Winter or Slippery Apron Conditions	Safety - 2 - 21
2.4.2 Thunderstorms.....	Safety - 2 - 22
2.4.3 High Wind Conditions	Safety - 2 - 22
2.5 ISO 7000 and 7010 Safety Guidelines.....	Safety - 2 - 22
2.5.1 International Decals and Symbols.	Safety - 2 - 22
Material Data Safety Sheet Information	Safety - 2 - 25
2.5.2 Links for products:.....	Safety - 2 - 26
Operation	Operation - 1 - 1
Section 1: System Overview	Operation - 1 - 4
1.1 Safety Precautions.....	Operation - 1 - 4
1.2 Purpose of Equipment	Operation - 1 - 4
1.3 General Description	Operation - 1 - 4
1.4 Major Components.....	Operation - 1 - 4
1.4.1 Power Package	Operation - 1 - 4
1.4.2 Engine	Operation - 1 - 4
1.4.2.1 Gasoline and LPG - Ford 2.5L	Operation - 1 - 4
1.4.2.2 Diesel - Deutz 2.9L.....	Operation - 1 - 5
1.4.3 Transmission.....	Operation - 1 - 5
1.4.4 Drive Shaft	Operation - 1 - 5
1.4.5 Drive Axle.....	Operation - 1 - 5
1.4.6 Steer Axle	Operation - 1 - 5
1.4.7 Brakes.....	Operation - 1 - 5
1.4.7.1 Hydraulic	Operation - 1 - 5
1.4.7.2 Park Brake	Operation - 1 - 5
1.4.8 Chassis	Operation - 1 - 5
1.4.9 Body.....	Operation - 1 - 5
1.4.10 Conveyor.....	Operation - 1 - 6
1.4.11 Operator's Compartment	Operation - 1 - 6
1.4.12 Electrical System	Operation - 1 - 7
1.4.13 Hydraulic System	Operation - 1 - 7
1.4.13.1 General Hydraulics Operation.....	Operation - 1 - 7
1.4.13.2 Steer and Braking	Operation - 1 - 7
1.4.13.3 Lift Cylinders and Conveyor Motor.....	Operation - 1 - 8
Section 2: Operational Procedures	Operation - 2 - 11
2.1 Instrument Panel Controls and Indicators.....	Operation - 2 - 11
2.1.1 Ford 2.5L.....	Operation - 2 - 11
2.1.2 Deutz 2.9L Tier 4F	Operation - 2 - 11



2.1.3 Maneuvering Controls	Operation - 2 - 15
2.1.4 Conveyor Controls	Operation - 2 - 16
2.1.5 Electrical Supply	Operation - 2 - 17
2.1.6 Preliminary Checks	Operation - 2 - 17
2.1.7 Maneuvering Procedures	Operation - 2 - 18
2.1.7.1 Engine Start Procedure (Gas).....	Operation - 2 - 18
2.1.7.2 Engine Start (Diesel).....	Operation - 2 - 19
2.1.7.3 Release parking brake.....	Operation - 2 - 19
2.1.7.4 Transmission Drive (FWD/REV) Selection.....	Operation - 2 - 19
2.1.7.5 Depress foot throttle.....	Operation - 2 - 20
2.1.7.6 Maneuver vehicle with steering wheel.....	Operation - 2 - 20
2.1.7.7 Maneuvering the baggage loader around the aircraft	Operation - 2 - 21
2.1.8 Belt Loader Towing Instructions.....	Operation - 2 - 21
2.1.8.1 Towing Requirements	Operation - 2 - 21
2.1.9 Conveyor Safety Props	Operation - 2 - 23
2.2 IATA.....	Operation - 2 - 24
2.3 SAE.....	Operation - 2 - 24
2.4 ISO EMC Evaluation.....	Operation - 2 - 24
2.5 ISO Product Safety Evaluation	Operation - 2 - 25
2.6 Locations of Technical Construction Files	Operation - 2 - 25
Section 3: Specifications	Operation - 3 - 27
3.1 General Specifications of the 660.....	Operation - 3 - 27
3.1.1 Dimensions	Operation - 3 - 27
3.2 Torque Values.....	Operation - 3 - 28
3.2.1 Metric Fasteners	Operation - 3 - 28
3.2.2 Graded Bolts	Operation - 3 - 29
3.3 Performance	Operation - 3 - 31
3.3.1 Specifications.....	Operation - 3 - 31
3.3.2 Environmental Operating Limits.....	Operation - 3 - 32
3.3.3 Environmental Vibration Information.....	Operation - 3 - 32
3.3.4 Environmental Sound Information.....	Operation - 3 - 32
3.4 Engines.....	Operation - 3 - 35
3.4.1 Gasoline.....	Operation - 3 - 35
3.4.1.1 Ford MSG-425 2.5L	Operation - 3 - 35
3.4.2 Diesel.....	Operation - 3 - 35
3.4.2.1 Deutz D2.9L	Operation - 3 - 35
3.5 Transmission.....	Operation - 3 - 36
3.5.1 Gear Ratios.....	Operation - 3 - 36
3.6 Standard Conveyor Heights and Angles.....	Operation - 3 - 37
3.7 Compatible Aircraft	Operation - 3 - 38
3.8 Fluids	Operation - 3 - 42
3.9 Coolant.....	Operation - 3 - 43
3.10 Recommended Spare Parts.....	Operation - 3 - 43
3.11 Safety Features.....	Operation - 3 - 44
3.11.1 Shifter / Parking Brake Safety.....	Operation - 3 - 44
3.11.2 Shifter Guard.....	Operation - 3 - 44
3.11.3 Neutral Safety Start Switch	Operation - 3 - 44
3.11.4 Anti-Restart Ignition Switch.....	Operation - 3 - 44
3.11.5 Engine Control Module (ECM) Starter Protection	Operation - 3 - 45
3.11.5.1 Ford 2.5L.....	Operation - 3 - 45

3.11.5.2 Deutz 2.9L.....	Operation - 3 - 45
3.11.6 Emergency Stop Switch.....	Operation - 3 - 45
3.11.7 Park Brake	Operation - 3 - 45
3.11.8 Pilot-Operated Hydraulic Check Valves.....	Operation - 3 - 45
3.11.9 Safety Props	Operation - 3 - 46
3.11.10 Side / Hand Rails	Operation - 3 - 46
3.11.11 Finger Guards	Operation - 3 - 46
3.11.12 Rubber Bumper Roll	Operation - 3 - 46
3.11.13 Steel Hoop Guard (Optional)	Operation - 3 - 46
3.11.14 Grit Paper.....	Operation - 3 - 46
Section 4: Shipping	Operation - 4 - 47
4.1 Shipping Preparation	Operation - 4 - 47
4.1.1 Fuel Tank Preparation	Operation - 4 - 47
4.1.2 Battery Preparation	Operation - 4 - 47
4.1.3 Pre-shipping Verification	Operation - 4 - 47
4.2 Receiving	Operation - 4 - 48
4.2.1 Preparing for Operation	Operation - 4 - 48
4.2.1.1 Battery.....	Operation - 4 - 48
4.2.1.2 Emergency Hydraulic Pump.....	Operation - 4 - 48
4.2.1.3 Radiator.....	Operation - 4 - 48
4.2.1.4 Fuel Cell.....	Operation - 4 - 48
Section 5: Storage	Operation - 5 - 49
5.1 Short Term Storage	Operation - 5 - 49
5.1.1 Gasoline Engine.....	Operation - 5 - 49
5.1.1.1 Ford 2.5 L Engine.....	Operation - 5 - 49
5.1.1.2 Transmission.....	Operation - 5 - 49
5.1.1.3 Drive Axle.....	Operation - 5 - 49
5.1.1.4 Tires	Operation - 5 - 50
5.1.1.5 Lubrication.....	Operation - 5 - 50
5.1.1.6 Battery.....	Operation - 5 - 50
5.1.1.7 Fluid Levels.....	Operation - 5 - 50
5.1.2 Diesel Engine.....	Operation - 5 - 50
5.1.2.1 Deutz 2.9L Engine.....	Operation - 5 - 50
5.1.2.2 Transmission.....	Operation - 5 - 50
5.1.2.3 Drive Axle.....	Operation - 5 - 50
5.1.2.4 Tires	Operation - 5 - 51
5.1.2.5 Lubrication.....	Operation - 5 - 51
5.1.2.6 Battery.....	Operation - 5 - 51
5.1.2.7 Fluid Levels.....	Operation - 5 - 51
5.2 Returning the Vehicle to Operation After Short Term Storage.....	Operation - 5 - 51
5.2.1 Tires	Operation - 5 - 51
5.2.2 Battery.....	Operation - 5 - 51
5.2.3 Engine.....	Operation - 5 - 52
5.2.4 Transmission.....	Operation - 5 - 52
5.3 Long Term Storage.....	Operation - 5 - 52
5.3.1 Gasoline Engine.....	Operation - 5 - 52
5.3.1.1 Ford 2.5L Engine.....	Operation - 5 - 52
5.3.1.2 Engine Exterior.....	Operation - 5 - 53
5.3.2 Transmission.....	Operation - 5 - 53
5.3.2.1 Drive Axle.....	Operation - 5 - 54



5.3.3 Tires	Operation - 5 - 54
5.3.4 Lubrication	Operation - 5 - 54
5.3.5 Fluid Levels	Operation - 5 - 54
5.3.6 Battery	Operation - 5 - 54
5.3.7 Diesel Engine	Operation - 5 - 55
5.3.7.1 Deutz 2.9L Engine	Operation - 5 - 55
5.3.8 Transmission	Operation - 5 - 56
5.3.9 Drive Axle	Operation - 5 - 56
5.3.10 Exhaust	Operation - 5 - 57
5.3.11 Tires	Operation - 5 - 57
5.3.12 Lubrication	Operation - 5 - 57
5.3.13 Levels	Operation - 5 - 57
5.3.14 Wheel Bearings	Operation - 5 - 57
5.3.15 Battery	Operation - 5 - 57
5.3.16 Fuel System	Operation - 5 - 58
5.3.17 Engine Exterior	Operation - 5 - 58
5.3.18 Tagging	Operation - 5 - 59
5.4 Returning the Vehicle to Operation After Long-Term Storage	Operation - 5 - 59
5.4.1 Tires	Operation - 5 - 59
5.4.2 Battery	Operation - 5 - 59
5.4.3 Engine	Operation - 5 - 59
5.4.4 Transmission	Operation - 5 - 60
5.4.5 Drive Axle	Operation - 5 - 60
5.4.6 Pre-Operational Checks	Operation - 5 - 60
5.5 Cold Weather Storage	Operation - 5 - 60
5.6 Returning the Vehicle to Operation After Cold Weather Storage	Operation - 5 - 61
5.6.1 Refill Fluids	Operation - 5 - 61



THIS PAGE INTENTIONALLY BLANK



LIST OF FIGURES

Figure Introduction - 1 - 1 - TUG Identification Plate	Introduction-1-1
Figure Introduction - 1 - 2 - Model Numbers	Introduction-1-2
Figure Safety - 2 - 1 - Idle Power - Engine Intake Area NO Zone.....	Safety-2-15
Figure Safety - 2 - 2 - Breakaway Power - Engine Blast Area NO Zone	Safety-2-16
Figure Safety - 2 - 3 - Equipment Restraint Area.....	Safety-2-17
Figure Safety - 2 - 4 - Fasten Seat Belts (White on Blue Background).....	Safety-2-24
Figure Safety - 2 - 5 - Use Hearing Protection (White on Blue Background).....	Safety-2-24
Figure Safety - 2 - 6 - Hot Surface (Yellow Field with Black Border)	Safety-2-25
Figure Operation - 2 - 1 - Instrument Panel - Ford 2.5L.....	Operation-2-12
Figure Operation - 2 - 2 - Instrument Panel - Deutz 2.9L.....	Operation-2-14
Figure Operation - 2 - 3 - Maneuvering and Conveyor Controls.....	Operation-2-16
Figure Operation - 2 - 4 - Conveyor Controls.....	Operation-2-17
Figure Operation - 2 - 5 - Belt Loader with Props Engaged.....	Operation-2-23
Figure Operation - 3 - 1 - Capscrew Examples.....	Operation-3-28
Figure Operation - 3 - 2 - Sound - Engine Idle - Conveyor Down - Belt Stationary	Operation-3-33
.....	Operation-3-33
Figure Operation - 3 - 3 - Sound - Engine Max - Conveyor Down - Belt Max Speed	Operation-3-33
.....	Operation-3-33
Figure Operation - 3 - 4 - Sound - Engine Idle - Conveyor Up - Belt Stationary ..	Operation-3-34
Figure Operation - 3 - 5 - Sound - Engine Max - Conveyor Up - Belt Max Speed	Operation-3-34
.....	Operation-3-34
Figure Operation - 3 - 6 - Conveyor - Full Down Rear, Full Up Front	Operation-3-37
Figure Operation - 3 - 7 - Conveyor - Full Up Rear, Full Up Front.....	Operation-3-37
Figure Operation - 3 - 8 - Conveyor - Full Down Rear, Full Down Front.....	Operation-3-38
Figure Operation - 3 - 9 - Conveyor - Full Up Rear, Full Down Front	Operation-3-38

THIS PAGE INTENTIONALLY BLANK



LIST OF TABLES

Table Introduction - 1 - 1: Revisions	Introduction-1-iii
Table Introduction - 1 - 2: List of Effective Pages	Introduction-1-iv
Table Introduction-1-1: Service Recalls/Notification	Introduction-1-4
Table Introduction-1-2: Flat Rate Labor Guide	Introduction-1-10
Table Safety-1-1: Standard Safety Equipment	Safety-1-1
Table Safety-1-2: Optional Safety Equipment.....	Safety-1-3
Table Safety-1-3: Operator Safety Responsibilities	Safety-1-5
Table Safety-1-4: Mechanic Safety.....	Safety-1-7
Table Safety-2-1: Examples of FOD	Safety-2-18
Table Safety-2-2: FOD Checks.....	Safety-2-18
Table Operation-2-1: Instrument Panel Description - Ford 2.5L	Operation-2-12
Table Operation-2-2: Instrument Panel Description - Deutz 2.9L	Operation-2-14
Table Operation-3-1: Dimensions and Measurements	Operation-3-27
Table Operation-3-2: Torque Values for Metric Fasteners	Operation-3-28
Table Operation-3-3: Torque Values for Graded Bolts	Operation-3-29
Table Operation-3-4: Performance Data.....	Operation-3-31
Table Operation-3-5: Specification Data.....	Operation-3-31
Table Operation-3-6: Environmental Limits	Operation-3-32
Table Operation-3-7: Ford MSG-425 (2.5 L).....	Operation-3-35
Table Operation-3-8: Deutz D2.9L.....	Operation-3-35
Table Operation-3-9: Gear Ratios.....	Operation-3-36
Table Operation-3-10: Conveyor Positions.....	Operation-3-38
Table Operation-3-11: Aircraft Compatibility.....	Operation-3-39
Table Operation-3-12: Hydraulic Fluid	Operation-3-42
Table Operation-3-13: Engine Oil	Operation-3-42
Table Operation-3-14: Fluids	Operation-3-42

THIS PAGE INTENTIONALLY BLANK



UNIT IDENTIFICATION

The information and instructions in this manual are intended to acquaint the operator with the important operating features of the TUG Mobile Belt Loader Model 660. The various controls, gauges, switches, and operating features are explained and illustrated throughout this manual. Personnel responsible for operation of the vehicle should read this manual carefully.

To aid the technician in repair or service work on this unit, a TUG identification plate is located in the operator's compartment.


		TUG TECHNOLOGIES CORPORATION 1995 DUNCAN DRIVE KENNESAW, GEORGIA 30144				
		MODEL #	<input type="text"/>	SERIAL NUMBER	<input type="text"/>	MFG DATE
UNLADEN WEIGHT w/OUT CAB	<input type="text" value="7,000"/>	POUNDS	<input type="text" value="3,175"/>	KILOGRAMS		
WITH CAB	<input type="text" value="7,200"/>	POUNDS	<input type="text" value="3,266"/>	KILOGRAMS		
MAXIMUM SPEED	<input type="text" value="25"/>	MPH	<input type="text" value="40"/>	KPH		
PERMISSABLE TOTAL PAYLOAD EVENLY DISTRIBUTED ON THE BOOM AT MAXIMUM AND MINIMUM ANGLE IS:						
	<input type="text" value="2,000"/>	POUNDS	<input type="text" value="907"/>	KILOGRAMS		
MAXIMUM SINGLE LOAD ON THE BOOM IS	<input type="text" value="500"/>	POUNDS	<input type="text" value="227"/>	KILOGRAMS		
660-4-3728						

Figure Introduction - 1 - 1: TUG Identification Plate

The serial number identification of each unit will appear on the nameplate along with the date of manufacture. The mailing address of TUG is also located at the top of the data plate opposite the TUG logo. This necessary information will ensure the customer a fast and accurate response to any parts and/or service request.

Please verify the serial number on the identification nameplate of the unit and enter your unit serial number here: _____

If applicable, enter your company identification number here: _____

MODEL NUMBER

Tug numbers models according to the diagram in Figure Introduction - 1 - 2 Model Numbers.

Model Number Coding

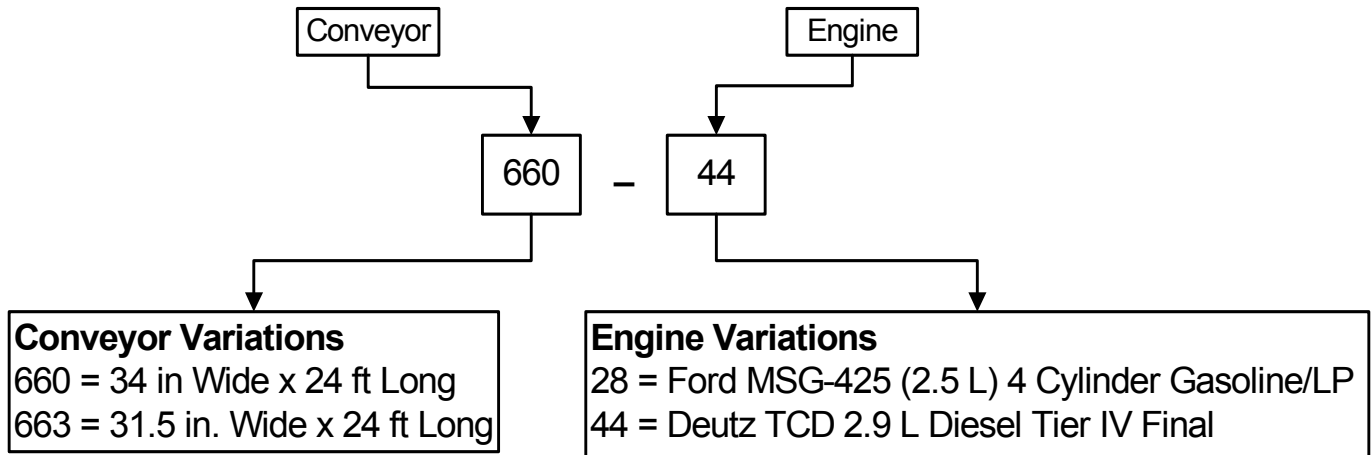


Figure Introduction - 1 - 2: Model Numbers



WARRANTY INFORMATION

INTRODUCTION

The primary goal of warranty adjustment is to satisfy our customers. Every satisfied customer strengthens the components of our whole organization - all aspects of the products themselves and the service that backs them up. This manual is directed to TUG Technologies' distributors and customers of TUG Equipment. It should be used to implement the Warranty Program at every level.

This Warranty Policy and Procedures Manual includes the warranties of TUG Technologies' products. It explains warranty policy and coverage, and describes the warranty claim process.

TUG Technologies is responsible for handling warranty and policy adjustments promptly and in accordance with the provisions of the Sales and Service Agreement, TUG Technologies Warranty Statements and this manual. Customers who recognize the manual as the "heart" of the warranty system and train their personnel in its use may expect service personnel qualified to submit claims that are properly completed and fully-substantiated, resulting in prompt claims payment.

NOTE:

The guidelines and requirements in this manual apply to warranty claims submitted to TUG Technologies for reimbursement to the customer.

PRE-DELIVERY PROCEDURES

Establish pre-delivery procedures that ensure the appropriate inspections and adjustments are made prior to equipment being placed in service.

AUTHORIZATION REQUIREMENTS - REPAIRS REQUIRING PRIOR APPROVAL

Certain repairs and claims require prior approval. Any repair which will take more than 2 hours labor to complete must have prior approval.

WARRANTY

A warranty is a specific document that guarantees the quality of goods to a purchaser within a specified length of time and according to usage limitations. The TUG Technologies warranty statement defines the conditions of the warranty. A warranty:

1. Remains in force for the specified period, provided that an occurrence has not taken place to render the warranty inapplicable.
2. Assures the owner that if, under the conditions specified, a defect in factory workmanship or material is encountered, it will be corrected at no charge or on a prorata basis.
3. Extension of coverage by any manufacturer does not change what is covered in the basic, expressed limited warranty.

WARRANTY STATEMENTS

TUG Technologies Warranty Statements provide detailed information regarding coverage and usage limitations for TUG products.

WARRANTY POLICY AND COVERAGE

Service Recalls or Owner Notification Programs

TUG TECHNOLOGIES may establish a program to resolve extensive customer concern about a component beyond warranty coverage. Owners are notified to contact TUG Technologies for replacement/repair. Customers will be notified by TUG TECHNOLOGIES with information that:

- Identifies the component and condition.
- Outlines the inspection and repair procedure required to correct the condition.
- Defines reimbursement.

Table Introduction-1-1: Service Recalls/Notification

Component	Disposition
Shipment	TUG will ship components for service recalls and / or approved warranty claims free of charge.
Freight Charges	Return of recalled components is covered when shipped via the prepaid RGA tag or another approved, least-expensive method.
Labor for Service	Reimbursed at the approved hourly warranty labor rate.
Non-TUG Parts	Only covered with prior approval from TUG.



Warranty Cancellation

Certain situations cause a warranty to be canceled. Examples of such situations include, but are not limited to:

- Damaged due to accidents.
- Damage due to abuse, improper operation or poor maintenance practices.

Total or partial warranty cancellation is registered in TUG Technologies' records.

WARRANTY EXCLUSIONS

The following items are examples of some of the non-reimbursable items under the Warranty and Policy Program. Non-reimbursable repairs include:

- Any repair to a unit on which the mileage/hours or date of first use reported has been misrepresented.
- Any repair to a unit on which the odometer / hour meter has been altered so that the true mileage / hours cannot be determined.

NOTE: This item applies only to cases in which mileage / hours are a condition of the warranty.

- Any repair for which the date on the order has been misrepresented or altered to place an out-of-warranty component within the warranty provisions.
- Any repair made to a product that has been misused or mistreated, or upon which a conversion, modification, or installation of a non-TUG part has been made affecting the performance, reliability or stability of a part.

NOTE: Any failure to a TUG-supplied part resulting from such action is not covered by the warranty.

- Parts handling charges.
- Parts damaged due to accident.

The warranty on parts damaged because of accident or an act of nature will be canceled.

NOTE: Repairs on accident claims or conditions that could have contributed to personal injury or property damage must not begin until approval is obtained. Do not scrap allegedly defective parts that may have contributed to injury or damage until written approval is received.

-
- Repairs required because of inadequate or incorrect protection in storage and / or preparation for storage.
 - Repairs of damage or failure caused by poor outside workmanship.
 - Any repair operation that changes the existing specifications of the equipment or component.
 - Repair techniques beyond the appropriate shop manual limits.
 - Labor performed by anyone other than an authorized TUG technician without prior approval, unless the situation is an emergency.
 - Use of any other than genuine TUG parts, unless used in an emergency.
 - A second or subsequent repair or adjustment necessitated by an incomplete or improper original repair or adjustment.
 - Adjustments made to improve appearance or performance beyond normal standards.
 - Maintenance and normal replacement of service items. For example, replacement of filters and fluids, tightening of bolts, nuts, or fittings. Minor, labor-only repairs are reimbursable.
 - Any repair to a part that is found not to be defective.
 - Replacement of assembly rather than repair if replacement costs exceed repair costs, and parts are available. Replacement requires prior approval.
 - Labor operations such as additional diagnostic time, abnormal accessibility or diagnosis time, hot testing and testing of new parts after repair. Standard labor allowances are included in warranty labor time standards.
 - Replacement parts damaged in shipment (carrier responsibility).
 - Towing expense or transportation for moving equipment between the customer's location and the repair location.

WARRANTY CLAIM PROCESS

NOTE: No warranty invoice will be accepted unless TUG Technologies has been contacted prior to the start of work being done to the unit.

Contact TUG Technologies

Phone: 1-800-989-8499 Ext. 1 or 770-422-8021
Email (preferred): warranty@tugtech.com





To expedite the claim process please provide the following information:

1. Unit S/N
2. Hours of operation
3. Description of problem or symptoms
4. List of parts required for repairs
5. Shipping address
6. Contact name
7. Contact phone number(s)

Parts

TUG Technologies will ship warranty parts at no charge once the claim has been received and accepted.

Return Parts

Not all failed parts need to be returned to TUG Technologies. If parts are to be returned, an RGA tag will be sent with the replacement warranty parts. The tag must be filled out completely and attached to the return part(s).

NOTE: Parts not returned within 30 days of claim will be charged to your account.

TUG Technologies reserves the right to invoice for parts being returned for the reasons but not limited to the reasons listed below.

- If deemed caused by an unwarrantable failure.
- If part is damaged due to inadequate packaging.
- Part was not supplied by TUG Technologies
- Proper documentation was not provided or sent back with faulty part.

Labor

TUG Technologies will reimburse labor based on the Standard Labor Rate Chart. Any work which will exceed the times outlined in this chart requires prior approval. All warranty labor is subject to TUG Technologies Warranty Approval Process.

AIRCRAFT GROUND SUPPORT EQUIPMENT

WARRANTY POLICY STATEMENT

This Policy Statement sets forth the terms of the warranty provided by TUG Technologies Corp. with respect to ground power units, air start units, tow tractors, cargo tractors and other equipment sold for use in the commercial aviation industry ("Aircraft Ground Support Equipment" "Industrial").

The foregoing warranty gives Buyer specific legal rights that may vary from state to state. Some states do not permit the limitation of incidental or consequential damages or limitation of remedies under warranties. The above limitations apply only to the extent permitted by applicable law.

GENERAL WARRANTY TERMS & CONDITIONS

TUG Technologies warrants that each new item of equipment is of good workmanship and is free of mechanical defects, provided that:

1. The equipment is installed and operated in accordance with the TUG Technologies Operation and Maintenance Manual.
2. The equipment is used under normal operating conditions, for which it was designed.
3. The equipment is not subject to misuse, negligence, or accident.
4. The equipment is properly maintained by qualified technicians in accordance with the TUG Technologies Operation and Maintenance Manual.

This warranty expires, unless otherwise agreed by TUG Technologies in a special provision, 24 months after being shipped or after 2000 operating hours. TUG Technologies warranty does not apply to fluids, oils, fuses, bulbs, accumulators, paint, seals, tires, bumpers, brakes, or wearable parts, bulbs, batteries, etc.

All warranty claims must be sent to the warranty department for processing. All information pertaining to specific claim must be provided for claim to be processed in a timely manner.

All the expenses related to a warranty claim will be invoiced to the buyer until TUG Technologies has evaluated the claim. Whatever the circumstances, the buyer should not refuse or delay the payment. If the evaluation concludes as TUG's full responsibility, a credit will be issued in the favor of the buyer.

This warranty is extended by TUG Technologies only to the buyer of new products from TUG Technologies or its authorized distributors. The products purchased under this warranty are intended for use exclusively by the buyer. There shall be no third party beneficiary of this warranty.

Under no circumstances whatsoever shall TUG Technologies be liable for any special or consequential damages, whether based on lost goodwill, lost resale profits, work stoppage, impairment of other goods or otherwise, and whether arising out of breach of any express or implied war-



warranty, breach of contract, negligence, or otherwise, except in the case of personal injury as may be required by applicable law.

The warranty is automatically void by TUG Technologies in the following cases:

1. The product has received some modification not authorized or completed according to TUG Technologies requirements.
2. Some original parts have been replaced by parts not provided by TUG Technologies.

WARRANTY LABOR FLAT RATE GUIDE

Table Introduction-1-2, "Flat Rate Labor Guide," lists the labor rates for various task.

Table Introduction-1-2: Flat Rate Labor Guide

Part	Hours
R&R Cooling System	
Fan	0.2
Radiator, Transfer Shroud	0.5
Top or Bottom Hose	0.5
Heater Hose	1.0
Water Pump	1.5
Thermostat	0.5
R&R Controls	
Shifter	1.0
Shifter Cable & Adjust	1.0
Neutral Safety Switch	0.5
Adjust Neutral Safety Switch	0.5
Park Brake Link	1.0
Accelerator Cable & Adjust	1.0
Accelerator Pedal, Hookup, & Adjust	0.5
R&R Drive Axle & Mounting	
Axle Assembly	4.0
Input Seal	0.5
Input Flange	0.5
Axle Shaft Seal	1.5
Shaft O-Ring Seal	
Axle Shaft & Axle Bearing	1.0
R&R Drive Shaft	
Drive Shaft	1.0
One U Joint	0.5

Table Introduction-1-2: Flat Rate Labor Guide (Continued)

Part	Hours
Body	
Repaint	8.0
Repaint Cab	2.0
R&R Brakes	
Master Cylinder & Bleed	1.5
Brake Booster	1.0
Adjust Brake Booster	
Hard Brake Lines & Bleed	1.5
Master Cylinder Cover Gasket	0.2
Brake Pedal	0.5
Brake Return Spring	0.2
Hub Front	1.0
One Stud	1.0
Park Brake Cable to Rear Wheels / Linkage	1.0
Axle Shaft Leak	1.5
Brake Wheel Cylinder	2.0
R&R Brakes, Front Axle	
Caliper & Bleed	1.0
Rotor	1.0
Wheel Bearings	1.0
Wheel Stud	1.0
Cab (Option - Call for Standard Rates)	
R&R Electrical	
Troubleshoot Short or No Power	2.0
Coolant Temp Sensor	0.5
Coolant Gauge	0.5

Table Introduction-1-2: Flat Rate Labor Guide (Continued)

Part	Hours
Hour Meter	0.5
Ammeter	0.5
Electric Fuel Gauge	1.0
Electric Fuel Sender	1.0
Kysor Coolant Temp Sensor	0.5
Kysor Oil Pressure Sensor	0.5
Kysor Override Switch	0.5
Light Switch	0.5
Battery Cable	0.5
Wire Harness	5.0
Kysor Warning Light	0.5
Start Relay	0.5
Horn	0.3
Horn Relay	0.3
Battery	0.3
Turn Signal Light	0.3
Turn Signal Flasher	0.3
Tighten Battery Cable	0.3
Glow Plug Switch	0.3
Brake Switch	0.3
Adjust Brake Switch	
R&R Engine	
Starter Relay	0.3
Starter	1.0
Alternator	1.0
Fuel Pump or Lift Pump	1.0
Battery	0.5
Valve Cover Gasket	1.0



Table Introduction-1-2: Flat Rate Labor Guide (Continued)

Part	Hours
Spark Plug Wires	0.5
Engine Assembly	7.0
Oil Pan	2.0
Front Crankshaft Seal	2.0
R&R Exhaust	
Exhaust Pipe	0.5
Muffler	0.5
Tail Pipe	0.5
R&R Front Suspension & Steering	
Front Spring	1.0
Front Axle and Transfer Springs	1.5
Tie Rod End & Adjust Toe In	0.5
King Pin	1.0
Drag Link	0.5
Pitman Arm - Gas	0.5
Pitman Arm - Diesel	0.5
Steer Cylinder	1.0
Steer Hose - Valve to Cylinder	0.5
Steer Pump	1.0
Steer Hose - Pump to Valve	0.5
Steer Sector	1.0
Steering Wheel	0.5
Horn Button Kit	0.5
Steer Valve	1.5
Upper Steering Bearing	0.5
Steering Wheel	0.3

Table Introduction-1-2: Flat Rate Labor Guide (Continued)

Part	Hours
R&R Fuel System	
Fuel Cell	2.5
Fuel Line Steel	0.5
LP Lock Off Valve	1.0
LP Regulator	1.0
Miscellaneous	
Install Rubber Bumper	1.0
R&R Hood Latch	0.3
Install Decal	0.3
R&R Seating	
Seat Frame	0.5
Bucket Seat	0.3
R&R Transmission	
Transmission	3.0
Transmission Front Oil Seal - Gas	3.0
Transmission Rear Oil Seal	1.0
Modulator Valve	0.3
Modulator Cable	0.8
Pan Gasket & Refill	1.0
Shifter Interlock Solenoid	0.5
Shifter Interlock Brake Switch	0.5
R&R Conveyor	
Troubleshoot Conveyor Electrical	2.0
Switch-in Box	0.5
Control Relay	0.5
Relay Under Instrument Panel	0.5
Conveyor Kill Button	0.5

Table Introduction-1-2: Flat Rate Labor Guide (Continued)

Part	Hours
Conveyor Kill Switch	0.5
Conveyor Kill Switch Wiring Harness	0.5
Electric Eyes	0.5
Glow Plug Relay	0.5
R&R Hydraulics	
Hydraulic Pump	1.0
Hydraulic Pump Pulley	0.5
Main Manifold	1.0
Steering, Brakes Relief, & Adjustment Valve	0.5
2-Lever Valve Under Seat	1.0
Valve Lever	0.3
Relief Valve Under Seat	1.0
Main Hydraulic Pressure Relief Valve	0.5
Repair Hydraulic Leak	0.5
Electric Control Valve Assembly	1.0
Conveyor Hydraulic Motor	1.5
Conveyor Drive Roller Chain	0.5
Hoses Through Lift Arm to Conveyor	0.5
Hoses to Lift Cylinder	
Front or Rear Lift Cylinder	2.0
Cylinder Holding Valve	1.0
Front Lift Arm	2.5
Rear Lift Arm	1.5
Small Manifold Valve Under Front of Conveyor	1.0
Adjust Conveyor Reverse Direction Holding Valve	1.0
Direction Valve Under Conveyor	1.0
Front or Manual Controls	1.0
Repair Direction Valve Spool Seal	1.0

Table Introduction-1-2: Flat Rate Labor Guide (Continued)

Part	Hours
Hydraulic Tank	2.0
Drain and Refill Hydraulic Tank	1.0
R&R Conveyor	
Conveyor Belt	2.5
Front Drive Roller (Includes Belt)	3.0
Front Drive Roller Bearing (Includes Belt)	3.0
Front Drive Roller Sprocket	3.0
Rear Idler Roller (Includes Belt)	3.0
Rear Idler Roller Bearing (Includes Belt)	3.0
Rear Idler Roller Bearing Adjusting Rod	3.0
Crowder Roller	3.0
Crowder Roller Bearings	3.0
Conveyor Roller	3.0
Conveyor Control Rod - Rear Part	3.0
Conveyor Control Rod - Front Part	3.0
Conveyor Control Detent	0.5
Conveyor Valve Control Arm	1.0
Adjust Belt Speed Control Link at Accelerator Pedal	0.5
Front Finger Guard	0.5
Front Roll Bumper	0.5



TECHNICAL ASSISTANCE

Direct any questions concerning the operation of the 660 Mobile Belt Loader to:

TUG Technologies Corporation

1995 Duncan Dr.
Kennesaw, GA 30144
USA
Email: info@tugtech.com



Direct any questions concerning parts for the 660 Mobile Belt Loader to:

Parts Department

USA: 1-800-989-8499
International: 00 + 1 + (770) 422-8021
Fax: 1-770-422-8730
Email: tugshop@tugtech.com



Direct any questions concerning sales of the 660 Mobile Belt Loader to:

Equipment Sales

Phone: (770) 422-7230
Fax: (770) 428-7315
Email: sales@tugtech.com



Direct any questions concerning warranty for the 660 Mobile Belt Loader to:

Warranty Department

Phone: (770) 422-8021
Toll Free: (800) 989-8499
Fax: 770-422-8730
Email: warranty@tugtech.com



All information in this manual is based on the latest production information available at the time of publication.

Direct any questions concerning the contents or format of this manual to:

Technical Publications

Email: TechPub@Tugtech.com





THIS PAGE INTENTIONALLY BLANK



HOW TO USE THIS MANUAL

NOTE: **Important Notice:** TUG recommends that the vehicle operator thoroughly study the contents of this manual before attempting to operate the vehicle.

This manual contains an introduction, safety information, and one chapter. Refer to the Table of Contents at the front of this manual and in the chapter for details of content.

The page numbering system in this manual is a three-part number. The first number represents the chapter in which the page appears, the second number indicates the section within that chapter, and the third number is the page number within that chapter.

The following symbols are examples of the Warnings, Cautions, and Notes used in this manual. These Warnings, Cautions, and Notes will appear immediately prior to the procedure.

- The **WARNING** provides notice of potential safety issues that could, if ignored, result in serious personal injury or, possibly, death.
- The **Caution** provides notice of potential safety issues that could, if ignored, result in damage to equipment.
- **Notes** highlight issues or specific information that should be paid particular attention to allow for an error-free procedure or provides important information concerning the procedure.



WARNING: SAFETY NOTES THAT MUST BE FOLLOWED TO AVOID SERIOUS INJURY TO PERSONNEL OR EVEN DEATH.



CAUTION: Safety notes that need to be followed to prevent damage to equipment.

NOTE: Important non-hazard information for the user.



THIS PAGE INTENTIONALLY BLANK

Safety

Section 1: General Safety Guidelines

1.1 Introduction

Operator and mechanic safety is important at TUG. During the design and production of every product, a thorough safety review of all components is standard operating procedure. As a result of this review, safety warnings, cautions, and notes are provided throughout this manual. It is important that operators and mechanics become familiar with all of these safety requirements.

To reinforce this action, this part of the manual has been devoted to safety.



CAUTION: Every operator and mechanic involved with this equipment must read and abide by this safety section.

The safety part of this manual covers the following:

- Introduction
- Standard Safety Features
- Optional Safety Items
- Operator Safety Responsibility
- Mechanic Safety Responsibility
- IATA Flightline Safety Guidelines

It is strongly recommended that this chapter be reproduced and bound in the operator's book, along with your station safety rules.

1.2 Standard Safety Features

The following safety features are standard.

Table Safety-1-1: Standard Safety Equipment

No.	Equipment
1	Recessed headlights
2	Combination tail and stop lights
3	Back-up lights

Table Safety-1-1: Standard Safety Equipment (Continued)

No.	Equipment
4	Turn signals with Hazard Warnings
5	Dual independent brake systems with brake warning light
6	Power-boosted front disc brakes and rear drum brakes
7	Adjustable over-center park brake hand lever
8	Lighted transmission shift control
9	Shift control with hand throttle interlock
10	Transmission shift lever guard
11	Neutral only start switch in shifter control
12	Angled right front corner
13	Ease of maneuverability
14	Center of steering wheel operated horn
15	Labeled controls
16	Left front driver position for excellent visibility
17	Conveyor lifting emergency pump
18	Conveyor safety props
19	Hydraulic steering
20	Pilot pressure operated cylinder holding valves
21	Pilot pressure operated reverse belt holding valve
22	Belt drive cushion valve
23	Hydraulic system pressure designed at 1500 psi (10.34 MPa or 102.07 atm) max.
24	All hydraulic hoses rated at 3250 psi (22.41 MPa or 221.15 atm). Always use OEM hoses during replacement
25	Lagged belt driving roller
26	Hand and / or Guide Rails on either side of the conveyor
27	Non-slip fender surfaces
28	Boot cutouts in rear bumper for safe access to belt as walkway
29	Bolted down hydraulic tank and battery cover
30	Retracting Seat belts

Table Safety-1-1: Standard Safety Equipment (Continued)

No.	Equipment
31	Independent expanding shoe and drum park brake on transmission output shaft or in rear axle
32	Non slip covering on floor board
33	Non slip surface on brake and accelerator pedal
34	High coolant temperature/low oil pressure shutdown (Ford 2.5L only) (optional on other engines)

1.3 Optional Safety Features

The following table contains a list of optional safety items.

Table Safety-1-2: Optional Safety Equipment

No.	Items
1	Backup alarm
2	Amber flashing light
3	Amber strobe light
4	Mud and snow tires
5	Work lights
6	Reflective striping
7	Engine kill E-Stop buttons on conveyor and instrument panel
8	Conveyor up/down movement alarm
9	Transmission neutral only and park brake applied safety circuit for belt conveyor movement interlock (Must be in neutral, park brake applied for conveyor to operate)
10	Gap filler strip between conveyor belt and front rubber bumper
11	Rubber bumper roll across the rear of the conveyor frame
12	Steel hoop guard across the rear of the conveyor frame
13	Cooling fan cover
14	Alternator belt
15	Manifold cover

1.4 Safety Responsibilities

General rules cannot be written to cover every possible situation that may arise with each job function, task, or procedure. Therefore, certain definite responsibilities rest with the individual. These responsibilities include:

- Protection of yourself
- Protection of fellow employees
- Proper care of tools and equipment.

Report:

- unsafe conditions
- unsafe equipment
- unsafe operation

to the proper authorities. If unsure of an operating procedure, consult your supervisor for guidance.

1.5 Operator Safety Responsibility



WARNING: DO NOT DRIVE A BELT LOADER WITH DEFECTIVE BRAKES, STEERING, TIRES, HORN, PARKING BRAKE, CONVEYOR BELT, OR LIGHTS. COMMUNICATE THESE PROBLEMS TO YOUR SUPERVISOR.

NOTE: Follow station safety rules. If you do not have a written list of safety rules, ask for one prior to operating this belt loader.

Table Safety-1-3: Operator Safety Responsibilities

No.	Operator Responsibility
1	Use proper hearing protection.
2	Follow training provided by your company.
3	Check before operating belt loader: <ul style="list-style-type: none"> • Lights • Brakes • Parking Brake • Steering • Horn • Tires • Conveyor Belt for damaged or raised hooks
4	Keep hands and feet away from rotating parts and tires.
5	Wear secure clothing.
6	Bring belt loader to a complete halt and set parking brake before dismounting.
7	Use seat belts at all times when belt loader is in motion.
8	Do not shift transmission into gear with engine above idle speed. Keep foot off accelerator when shifting.
9	Bring belt loader to a complete stop before shifting from reverse to drive or from drive to reverse.
10	Check the path is clear behind the belt loader prior to driving in reverse direction. <ul style="list-style-type: none"> • Check local station rules and, if allowed, blow horn before reversing • If not permitted, follow station rules for alerting other personnel prior to backing.
11	Use caution when in congested areas and around blind corners and rows of carts. Be alert for other equipment and personnel.
12	Never operate at speeds inconsistent with operating conditions. Limit speed to allow adequate time for braking in an emergency.

Table Safety-1-3: Operator Safety Responsibilities (Continued)

No.	Operator Responsibility
13	Do not allow the belt loader to be pushed by other equipment or use the belt loader to push other equipment. Use proper towing equipment.
14	Do not tamper with engine.
15	Do not use the belt loader as a hoist for other personnel. Use proper equipment for personnel.
16	Do not walk on fenders when icy or wet.
17	Walk ONLY on the conveyor and not on the painted frame. The painted frame is slippery when wet.
18	Do not ride on the belt, conveyor, or fenders.
19	In event of a malfunction, stop operations and move the loader to a safe area, if possible, then notify a supervisor.
20	Do not stand on the belt when it is moving.
21	Use handrails when walking on the conveyor belt.
22	Keep hands, feet, and clothing away from the underside of the conveyor.
23	Do not put hands underneath the conveyor.
24	Do not wear rings on fingers when using the conveyor belt.
25	Check that the chain guards and finger guard at the rear roller are secured and the finger guard is adjusted as close to the roller as possible.
26	Know and understand the conveyor belt control stations operation, especially the "E" Stops.
27	Do not insert the conveyor through the cargo door.
28	Do not approach the aircraft when personnel are present in the doorway.
29	Operate at creep speed when approaching aircraft or within 20 ft. of aircraft.
30	Always approach aircraft with the conveyor in the lowered position. Stop five feet from the aircraft, raise the conveyor as required and creep into position.
31	Do not exceed 2000 pounds (907.2 kg) of weight on the conveyor belt.
32	Carry no passengers unless a seat with seatbelt is provided.
33	Work stations are at the right rear and left front of the conveyor (other locations optional).

1.6 Mechanic Safety Responsibility



WARNING: ALWAYS USE THE SAFETY PROPS WHEN WORKING UNDER THE CONVEYOR.

Table Safety-1-4: Mechanic Safety

No.	Mechanic Safety
1	Keep hands and clothing away from rotating parts
2	Wear secured clothing
3	Use the conveyor safety prop whenever working under conveyor
4	Allow engine to cool before adjusting the alternator belt or hydraulic pump belt
5	Keep hands, gloves, and clothing clear of cooling fan
6	Disconnect the battery positive cable when working on or under the conveyor
7	Do not substitute throttle return springs with lighter or other springs
8	Check brakes and fill master cylinder with DOT3 brake fluid.
9	If belt tracking, stop the belt while making adjustments on the left front corner, since the drive chain is in that area. The other three corners can be adjusted with the belt running, but keep hands out from under conveyor.
10	Inspect seat belts and attachment points regularly. Replace if damaged. Do not bleach or red-dye seat belts, clean with soap and water.
11	Visually check for hydraulic leaks. Do not use hands or fingers to locate leaks
12	Verify all E Stops are functional
13	Check horns and lights
14	Check neutral start only switch for proper adjustment and operation.
15	Check tire and wheel condition, especially proper inflation pressures
16	Torque lug nuts to 125 ft-lbs (169.5 Nm).
17	Use proper lifting equipment when removing or replacing heavy components.
18	When working underneath belt loader, ensure it is properly supported on secure jack stands that are rated. Do not rely on hydraulic jacks to support the belt loader.
19	If the belt loader is on a hydraulic or air-operated lift, make sure to place safety support or jack stands in position prior to working under the belt loader.
20	Use a proper transmission jack when removing or replacing the transmission.

Table Safety-1-4: Mechanic Safety (Continued)

No.	Mechanic Safety
21	Jack the drive wheels off the floor and support the belt loader with rated jack stands when troubleshooting the drive system.
22	Take nothing for granted when safety of the vehicle or operator is at stake.
23	Keep good maintenance records.



WARNING: DO NOT REMOVE THE RADIATOR CAP WHEN HOT! SERIOUS BURNS MAY RESULT. ALLOW TIME TO COOL.

1.7 Emergency Procedures



CAUTION: Every operator and mechanic involved with this equipment must read and understand emergency procedures prior to operation.

It is the operator's responsibility to safeguard the unit and others when the unit or trailer is disabled or in a collision. The following emergency procedures describe recommended steps to follow, in the event of mechanical breakdown or equipment malfunction. Apply and/or adapt these procedures to your company's/station's emergency procedures as necessary.



WARNING: IN CASE OF AN EMERGENCY - APPLY E-STOP TO DISABLE THE VEHICLE. THE UNIT IS COMPLETELY INOPERABLE WHEN THE E-STOP PUSH-BUTTON IS ENGAGED. FAILURE TO COMPLY MAY RESULT IN DEATH, SERIOUS INJURY, OR PROPERTY DAMAGE.

1.7.1 Disabled or Stalled Vehicle

The Model 660 is equipped with an emergency hydraulic pump activated from the operator's station actuated by a spring-loaded two-position switch. This emergency pump supplies hydraulic pressure for the service brake and steering.

1.7.1.1 Operational Engine

When the engine is operational and the unit can be moved, perform the following steps:

1. Move the unit as far away from the traffic area as safely possible.

2. Turn on the emergency hazard warning signals.



CAUTION: Turn on headlights when/if visibility is limited.

3. If unable to move the tow tractor out of the traffic area and when visibility is limited, set out one type of emergency warning device (i.e. red cones, etc.) to the front and rear of the unit.

1.7.1.2 Operational Engine - Unable to Move

When the engine is operable but the unit cannot be moved, perform the following steps:

1. Use a tow bar to attach the disabled unit to an operational tow tractor.
2. Release the park brake.
3. Ensure steering is operational in the disabled unit by turning the steering wheel.

NOTE: The disabled unit should be steered to follow the towing unit.



CAUTION: CAUTION: Towing speed must NOT exceed 6 mph (10 km/h). Do NOT tow the disabled unit more than 6 mi. (10 km).

4. Tow unit.
5. Once towing destination is reached, place transmission of the towing vehicle in neutral, apply the park brake, and turn the ignition key to the OFF position.
6. Chock wheels of the disabled unit.
7. Disconnect the vehicles by removing the tow bar.

1.7.1.3 Inoperable Engine With Electrical Power

When the engine is inoperable it will experience loss of power.

1. Release the park brake.



CAUTION: Engaging the emergency hydraulic pump for more than one minute will cause the electric motor to overheat. If emergency procedures cannot be completed within one minute, disengage and allow the pump to cool for at least 10 minutes before re-engaging. Failure to comply may result in vehicle damage.

2. Engage the emergency hydro-steering pump by holding the toggle switch. Release the toggle switch to disengage or shut off the hydro-steering pump.
3. Ensure steering is operational in the disabled unit by turning the steering wheel.

NOTE: Steer the disabled unit to follow the towing unit.



CAUTION: Towing speed must NOT exceed 3 mph (5 km/h). Do NOT tow the disabled unit more than 6 mi. (10 km).

4. Tow unit.
5. Once towing destination is reached, place transmission of the towing vehicle in neutral, apply the park brake and turn the ignition key to the OFF position.
6. Chock wheels of the disabled unit.
7. Disconnect the vehicles by removing the tow bar.

1.7.1.4 Inoperable Engine With Loss of Electrical Power

An inoperable engine will experience loss of electrical power. When there is not enough electrical power to engage the emergency steering pump, perform the following steps:

1. Use a tow bar to attach the disabled unit and an operational tow tractor.
2. Release the park brake.



CAUTION: Towing speed must NOT exceed 3 mph (5 km/h). Do NOT tow the disabled unit more than 6 miles (10 km). The disabled unit will be difficult to steer as there is no hydraulic pressure available.

3. Tow unit.
4. Once towing destination is reached, place transmission of the towing vehicle in neutral, apply the park brake and turn the ignition key to the OFF position.
5. Chock wheels of the disabled unit.
6. Disconnect the vehicles by removing the tow bar.

1.7.2 Recommended Fire Procedure



WARNING: HAZARD EXISTS WHEN REFUELING AND DEFUELING THE TRACTOR - NO SMOKING, NO OPEN FLAMES, NO ELECTRICAL DEVICE OPERATIONS.

Operators should know how to prevent fires and have a basic understanding of fire-fighting techniques. Some common causes of vehicle fires are as follows:

- Operating with low pressure tires.
- Overheated brakes.
- Leaking exhaust system.
- Leaking fuel system.
- Carelessly placed emergency flares or lamps.
- Short circuits in the electrical system

Following are recommended basic steps to perform when a fire occurs. Apply and/or adapt these procedures in accordance with your company's/station's procedures as circumstances warrant.

1. Stop the unit in a safe position away from buildings and other vehicles.
2. Notify the appropriate emergency contacts (as outlined in your company's/station's emergency policies and procedures) and inform them what type of fire is burning.

NOTE: Use all extinguishers according to the manufacturer's instructions.

3. Based on type of fire, take all possible steps to extinguish the fire using the unit's fire extinguisher without endangering yourself or others.
4. If the fire is thought to be due to a short-circuit, engage the battery disconnect button.

1.7.3 Collisions

**WARNING**

WARNING: IN A COLLISION, INJURIES, POSSIBLE FUEL LEAKS, OR DAMAGE TO THE VEHICLE CAN OCCUR.

Every operator must take precautions to prevent collisions. If a collision occurs, remain calm and perform the following steps:

1. Refer and adhere to your company's/station's emergency policies and procedures.
-

**WARNING**

WARNING: IN CASE OF A FUEL LEAK - NO SMOKING, NO OPEN FLAMES, NO ELECTRICAL DEVICE OPERATIONS.

2. All engines of units involved in the collision should be turned off.
3. Notify emergency personnel and supervisory personnel as outlined in your company's/station's emergency policies and procedures.



Section 2: IATA Flightline Safety Guidelines

2.1 IGOM Chapter 4: Aircraft Handling Procedures

This section of the TUG Operators Manual has been created from the IATA ground Operations Manual (IGOM). This section provides general guidelines for GSE handling, including safety procedures. The ground support equipment operator must always follow the training and equipment operating rules of their employer.

2.1.1 Ramp Safety in Aircraft Handling

Ramp safety rules and procedures promote safe ground handling. Therefore, the minimum safety rules and procedures defined in this section shall always be applied and understood by all personnel working on the ramp.

Aircraft damage can endanger passengers, employees, and aircraft. Disruptions may also negatively impact safe airline operations.

Even a slight scratch or dent on an aircraft may result in a serious accident. If you observe or cause any aircraft damage, you **MUST** report it. Refer to the operating airline's policy regarding reporting of aircraft damage.

2.2 General Ramp Safety

2.2.1 Danger Areas

Blast damage or injury from an aircraft engine's exhaust or intake is very dangerous. The risk is further increased when an aircraft comes to a stop and then re-applies the additional thrust required to "break away" and continue taxiing.

Vehicles and personnel must remain clear of aircraft danger areas when aircraft engines are running and/or the anti-collision lights are on.

In order to prevent incidents and accidents caused by aircraft engines, you must never position yourself or equipment in the following critical areas before or during aircraft departure and arrival:

- Engine Intake Area
- Engine Blast Area
- Propeller Rotation Area (where applicable)

NOTE: The length of these areas vary for each aircraft type based on whether the engines are IDLE or BREAKAWAY thrust.

Refer to each aircraft type specific manual for applicable distances and the Company's instructions for guidance. Ground personnel and loose equipment must stay clear of the intake and blast areas.

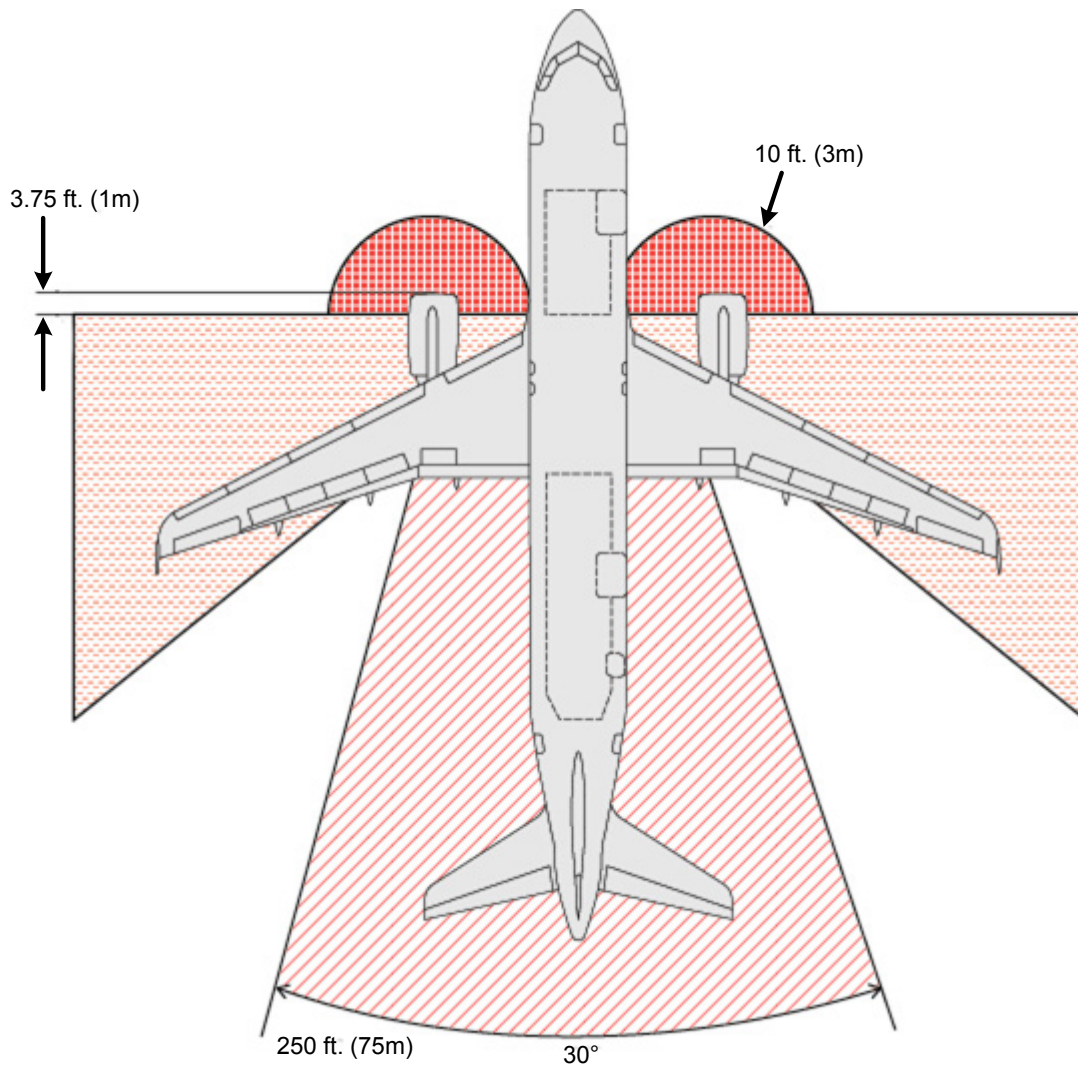
2.2.2 Engine Intake Area

Make sure the engine intake area is clear:

- At arrival, until the engines have been switched off and are spooling down
- At departure or just before pushback
- At all times while engines are running.
- It is forbidden to pass through the blast area while engines are running.

Refer to the operating airline's Ground Operation Manual (GOM) for distances applicable to the specific aircraft type involved in the operation.

Sample Engine Danger Area for A330-300 and A330-200 aircraft are shown in Figure Safety - 2 - 1 and Figure Safety - 2 - 2.



*Figure Safety - 2 - 1: Idle Power - Engine Intake Area **NO** Zone*

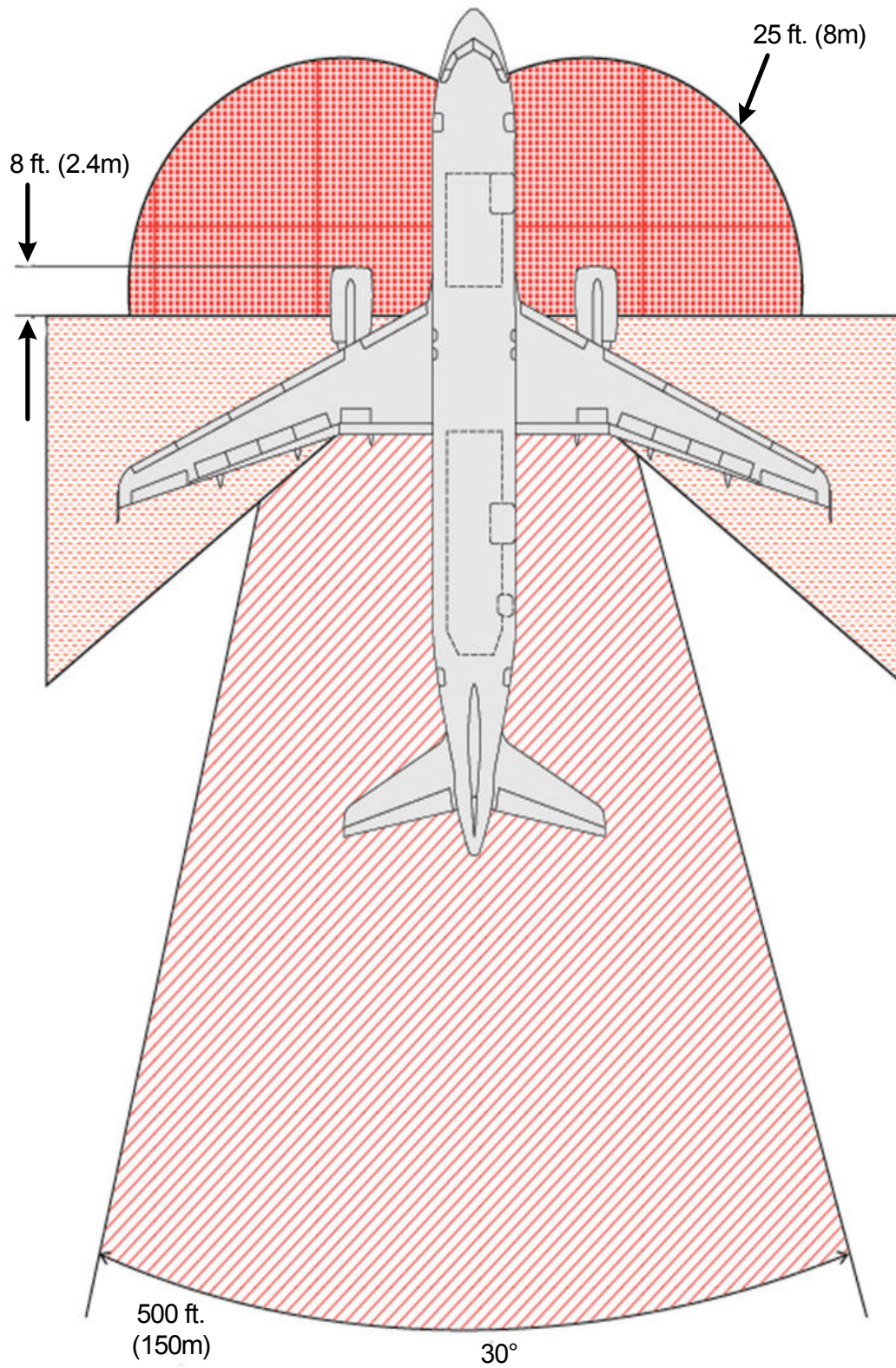


Figure Safety - 2 - 2: Breakaway Power - Engine Blast Area **NO** Zone

2.2.3 Equipment Restraint Area & Equipment Restraint Line

The Equipment Restraint Area (ERA) is defined as the area of the apron bordered by a red line known as the Equipment Restraint Line, or otherwise indicated, in which an aircraft is parked during ground operations.

NOTE: If no markings exist, local procedures must establish safe parking areas.

The illustration below provides an example of the markings used in some locations.

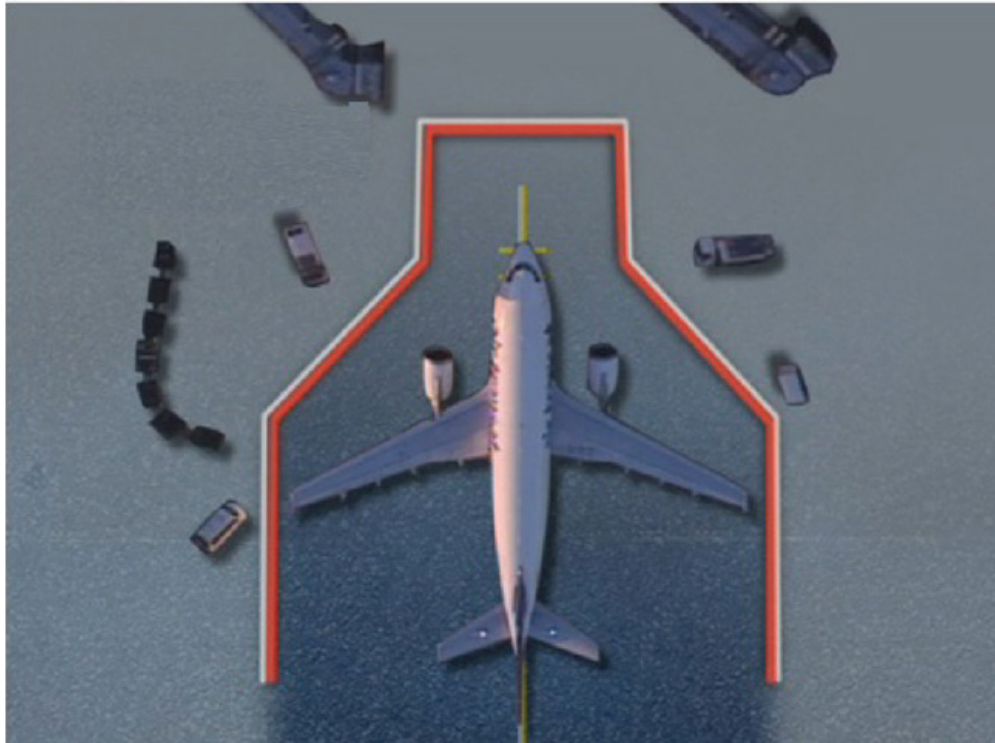


Figure Safety - 2 - 3: Equipment Restraint Area

The ERA must be free of obstructions and Foreign Object Debris (FOD) before and during aircraft arrival and departure.

2.2.3.1 FOD - Foreign Object Debris

Foreign Object Debris (FOD) is a general term which applies to all loose objects which are a danger to the safety and integrity of an aircraft and must not be left in any area where they would constitute a hazard.

Every individual has a responsibility to ensure that the risk of damage to aircraft from FOD is minimized. All FOD must be removed and properly disposed when found.

Table Safety-2-1: Examples of FOD

No.	Example
1	Metal nuts and bolts
2	Plastic and paper bags
3	Rags
4	Empty oil and hydraulic cans
5	Tools and equipment
6	Natural objects: <ul style="list-style-type: none"> • Rocks • Pebbles • Wood
7	Other debris: <ul style="list-style-type: none"> • Burst ballast bags • Luggage handles, wheels, and tags



CAUTION: Foreign object debris may be ingested into aircraft engines causing damage leading to engine failure. This is especially critical if FOD damage occurs in flight, particularly during the take-off phase. In addition, damage caused by FOD can occur to tires, the undercarriage, control systems and other parts of the airframe. All such damage could lead to inflight failures.

2.2.3.2 FOD Checks

The following checks must be conducted prior to any aircraft movement or servicing operation:

Table Safety-2-2: FOD Checks

No.	Checks
1	Check apron and stand areas
2	Check ground equipment staging and parking areas in the area of operation
3	Check ground equipment (Including floors of enclosed cabins)
4	Check garbage bin areas for cleanliness and secure covers fitted
5	Make sure anything carried in or on a vehicle is secure
6	Conduct a FOD walk of the aircraft parking stand removing all FOD found

Table Safety-2-2: FOD Checks (Continued)

No.	Checks
7	Pick up and dispose all FOD in designated garbage bins

2.3 Safety Instructions for Operating Motorized Vehicles on Ramp

2.3.1 General Safety Instructions for Ground Support Equipment (GSE)

Follow these procedures when operating GSE on ramp:



CAUTION: Only trained and authorized personnel are allowed to drive or operate specific GSE.

CAUTION: When operating equipment, check the equipment contact zone for possible aircraft damage and immediately report any damage found.

Use all safety devices fitted on GSE (e.g. bumpers, handrails, stabilizers, etc.) during aircraft handling and servicing.

Ensure protective rubber bumpers ARE NOT compressed against the aircraft fuselage.

2.3.2 Basic Operating Requirements for GSE

- Check all GSE involved in aircraft handling at the start of a shift (at least once per day). In particular the check the parking brake, rubber protective bumpers, 'E' Stops and other safety systems and all other proximity sensors.
- Perform a vehicle/equipment walk around check prior to its use.
- Apply parking brakes and place the gear selector in the "PARK or "NEUTRAL" position on all GSE when it is parked or positioned.
- When positioning GSE, maintain clearance between all GSE and the aircraft to allow for vertical movement of the aircraft during the entire ground handling process to prevent contact between the aircraft and equipment.
- Do not carry extra personnel during GSE movement without an approved seat - apply the "no seat-no ride" principle.
- Do not operate vehicles or equipment while using hand-held portable electronic devices.
- After positioning equipment on the aircraft, raise all safety rails on conveyor belts, loaders and other devices - except where restricted by aircraft type.
- If needed, walk only on the rubberized conveyor belt portion of the conveyor.
- Do not walk on the conveyor while the vehicle or belt are in motion

-
- Do not leave any vehicle unattended with its engine running.
 - Do not drive GSE with lifting devices in the raised position, except for final positioning of the GSE onto the aircraft.
 - Do not allow any GSE such as tractor, pallet transported, baggage/cargo carts and dollies to move or be positioned under the aircraft fuselage.
 - Do not move any GSE towards the aircraft unless all of the following criteria are met:
 - a. Aircraft has come to a complete stop;
 - b. Engines have been switched off and are spooling down;
 - c. Anti-collision lights are switched off;
 - d. Wheel chocks are positioned;
 - e. Ground/Flight Crew communication has been established, and clearance has been given, if applicable.

NOTE: The above does not apply for ground power units (GPUs).

2.3.3 Belt Loader Aircraft Loading Equipment

The following precautions must be taken when operating a belt loader:

- The boom of the belt loader must never be positioned inside the cargo hold of any aircraft.
- Position and remove a belt loader in a straight line with the cargo hold door at a 90 degree angle to the aircraft fuselage.
- Make sure the boom is clear of the aircraft or other obstacles before making a turn.
- The rubber bumpers on a conveyor belt loader must NEVER make contact with the aircraft. The minimum distance to be maintained at all times is 1 in. (2.5 cm) from the fuselage.
- Always raise side handrails as soon as belt loader is positioned. Make sure they do not touch the aircraft fuselage.
- Specially designed belt loaders (e.g. Ramp Snake or Powerstow) require the equipment to be positioned inside the cargo hold.
- Do not sit or stand on a conveyor belt while it is in operation (up or down).

2.3.4 Ground Support Equipment Safety Driving and Parking Inside ERA

Apply the following precautions when driving or parking Ground Support Equipment (GSE) within the ERA:

- Make a minimum of one complete stop with all motorized vehicles/equipment prior to entering the ERA.
 - Conduct a “Brake Check” or “Safety Stop” by coming to a full and complete stop to confirm the serviceability of the brake system on the vehicle and to test the apron surface.



CAUTION: This action **MUST** be carried out even if there is no Equipment Restraint Line marked on the apron. This stop must be conducted at a distance of no less than 15 ft (5 m) from the aircraft.

- Do not drive GSE faster than walking speed.
- Maneuver GSE carefully in order to prevent personnel injury and/or aircraft damage.



CAUTION: When reversing vehicles or equipment with limited rear-view visibility inside the ERA, make sure you are guided by an agent using standard IATA signals and/or assisted by means of a rear-view video or mirror.

- Any moving vehicle that is not positioning at the aircraft must stay outside the operational safety buffer zone.
- Do not drive or park under the aircraft fuselage and/or wing.
- Safety cones are a caution sign for drivers to maintain required safety clearances. Cones protect parts of the aircraft against collision by GSE.

2.4 Adverse Weather Conditions

Adverse or poor weather conditions may have a negative impact on aircraft handling activities and ground safety.

2.4.1 Winter or Slippery Apron Conditions

Winter weather brings extra hazards which require awareness and more care on the part of personnel working on the aprons to prevent accidents.

NOTE: Plan additional time for all ramp activities and take extra care when walking across apron surfaces which can be slippery.



CAUTION: Take extra care when driving, especially approaching the aircraft. Remember that vehicles require greater distance to stop safely.

CAUTION: Reduce speeds in slippery apron conditions. Adjust all activities and operations on the ramp to suit conditions.

2.4.2 Thunderstorms

Refer to local airport or operating airline policy. Thunderstorm communication may be implemented in alert phases and the following represents a minimum standard.



WARNING: DO NOT WEAR A HEADSET CONNECTED TO THE AIRCRAFT DURING A THUNDERSTORM OR IF A WARNING HAS BEEN ISSUED.

WARNING: WHEN LIGHTNING IS PRESENT: DO NOT COMMUNICATE WITH THE FLIGHT DECK USING A CONNECTED COMMUNICATION HEADSET. IF NECESSARY, COMMUNICATE USING STANDARD HAND SIGNALS AS SHOWN IN IGOM.

WARNING: DO NOT STAY IN OPEN AREAS, UNDER THE AIRCRAFT LOADING BRIDGE OR NEAR ANY POLE.

WARNING: STOP ALL GROUND HANDLING OPERATIONS.

2.4.3 High Wind Conditions

High winds pose a great risk of damage and the following minimum precautions should be taken:

- Make sure parking brakes are set on all parked GSE.

2.5 ISO 7000 and 7010 Safety Guidelines

2.5.1 International Decals and Symbols.

TUG Technologies produces Aerospace Ground Support Equipment used all over the world. Operator safety makes it imperative to avoid language barriers caused by decals written in Western-style English. International Standards ISO 7000 and ISO 7010 (Registered Safety Signs) are becoming accepted for universal, non-verbal communication.

These guidelines define:

- Safety Signs,
- Mandatory Action Signs,
- Prohibition Signs, and
- Warning Signs using only symbols and colors and no words.



-
- Safety Signs are green and square
 - Mandatory Action Signs are blue and circular
 - Prohibition Signs are a red circle with a red diagonal
 - Warning Signs are safety yellow color and triangular

This page is being added to all TUG Service Manuals to aid interpretation of the graphic symbols being used on TUG Technologies equipment. TUG Technologies strongly suggests using this information as training material for operators of TUG equipment.

Since ISO 7000 and 7010 are under constant revision, TUG Technologies will maintain this page, keeping TUG Technologies manuals current as ISO 7000 and ISO 7010 evolve.

NOTE: As decals become worn or damaged, new decals can easily be ordered by referring to the TUG Part Number written on the damaged decal. The Decal Part Number is also listed in the Decal Location Guide in the 660 Maintenance Manual.

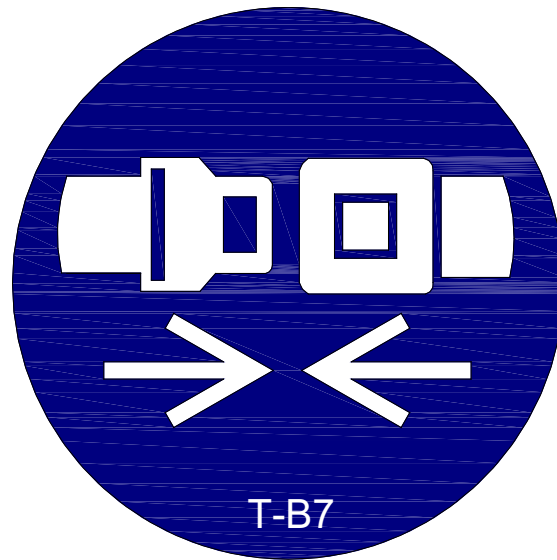


Figure Safety - 2 - 4: Fasten Seat Belts (White on Blue Background)



Figure Safety - 2 - 5: Use Hearing Protection (White on Blue Background)



Figure Safety - 2 - 6: Hot Surface (Yellow Field with Black Border)

MATERIAL DATA SAFETY SHEET INFORMATION

A Material Safety Data Sheet (MSDS) is a written document that outlines information and procedures for handling and working with chemicals

MSDS documents contain

- physical and chemical property information,
- potential hazard information,
- emergency procedures, and
- manufacturer contact information.

MSDS documents are legal documents containing information on the potential effects on your health from exposure to chemicals. Each MSDS is a nine-section document, dealing with

- toxicity,
- use,
- storage,
- handling, and
- emergency procedures.

It describes the

- possible hazards involved with the product,
- how to use it safely, and

- what to expect when the safety recommendations are not followed.
- In addition, it explains what to do when accidents occur and how to recognize symptoms of overexposure.

The MSDS listed within this Service manual apply to all models of the belt loader, it is recommended they be communicated to your company's Health & Safety Organization for reference in an emergency

TUG has listed MSDS that are from American Sources. Because MSDS vary from country to country, it is strongly advised to access the manufacturers web site to obtain the specific MSDS / SDS / PDS for your country.

Below are hyperlinks that you will find useful.

2.5.2 Links for products:

MSDS for Castrol Heavy Duty Multipurpose ATF:

[http://msdspds.castrol.com/msdspds/msdspds.nsf/CastrolResults?Open-Form&c=USA%20\(US\)&l=English%20\(US\)&p=&n=465389&b=All&t=MSDS&autosearch=No&autoload=No&siteland=EN&output=Full&spu=Lubricants&unrestrictedmb=No&cols=0](http://msdspds.castrol.com/msdspds/msdspds.nsf/CastrolResults?Open-Form&c=USA%20(US)&l=English%20(US)&p=&n=465389&b=All&t=MSDS&autosearch=No&autoload=No&siteland=EN&output=Full&spu=Lubricants&unrestrictedmb=No&cols=0)

MSDS for Dexron VI ATF

<https://mobiloil.com/en/automatic-transmission-fluid/dexron-vi-atf>

MSDS for Castrol Universal Tractor Fluid

[http://msdspds.castrol.com/msdspds/msdspds.nsf/CastrolResults?Open-Form&c=USA%20\(US\)&l=English%20\(US\)&p=&n=459088&b=All&t=MSDS&autosearch=No&autoload=No&sitelang=EN&output=Full&spu=Lubricants&unrestrictedmb=No&cols=0](http://msdspds.castrol.com/msdspds/msdspds.nsf/CastrolResults?Open-Form&c=USA%20(US)&l=English%20(US)&p=&n=459088&b=All&t=MSDS&autosearch=No&autoload=No&sitelang=EN&output=Full&spu=Lubricants&unrestrictedmb=No&cols=0)

MSDS for Castrol Tecton Extra 15W-40(CJ-4)

[http://msdspds.castrol.com/msdspds/msdspds.nsf/CastrolResults?Open-Form&c=USA%20\(US\)&l=English%20\(US\)&p=&n=465297&b=All&t=MSDS&autosearch=No&autoload=No&sitelang=EN&output=Full&spu=Lubricants&unrestrictedmb=No&cols=0](http://msdspds.castrol.com/msdspds/msdspds.nsf/CastrolResults?Open-Form&c=USA%20(US)&l=English%20(US)&p=&n=465297&b=All&t=MSDS&autosearch=No&autoload=No&sitelang=EN&output=Full&spu=Lubricants&unrestrictedmb=No&cols=0)

MSDS for Lead Acid Battery Wet, Filled With Acid

<http://www.dekabatteries.com/assets/base/a.pdf>

MSDS for Windshield Washer Antifreeze (+32)

<http://southwinltd.com/msds-request/>

MSDS for Castrol Limited Slip 80W-90

[http://msdspds.castrol.com/msdspds/msdspds.nsf/CastrolResults?Open-Form&c=USA%20\(US\)&l=English%20\(US\)&p=&n=459027&b=All&t=MSDS&autosearch=No&autoload=No&sitelang=EN&output=Full&spu=Lubricants&unrestrictedmb=No&cols=0](http://msdspds.castrol.com/msdspds/msdspds.nsf/CastrolResults?Open-Form&c=USA%20(US)&l=English%20(US)&p=&n=459027&b=All&t=MSDS&autosearch=No&autoload=No&sitelang=EN&output=Full&spu=Lubricants&unrestrictedmb=No&cols=0)

MSDS for NAPA DOT 3 Brake Fluid

[http://s7d9.scene7.com/is/content/GenuinePartsCompany/715873pdf?\\$PDF\\$](http://s7d9.scene7.com/is/content/GenuinePartsCompany/715873pdf?PDF)

MSDS for CHEVRON Supreme Prediluted 550/50 Antifreeze Coolant (Contains Bitterant)

<https://cglapps.chevron.com/msdspds/MSDSDetailPage.aspx?docDataId=34258&docFormat=PDF>

MSDS for Castrol Pyroplex Red EP 2

[http://msdspds.castrol.com/msdspds/msdspds.nsf/CastrolResults?Open-Form&c=USA%20\(US\)&l=English%20\(US\)&p=&n=464255&b=All&t=MSDS&autosearch=No&autoload=No&sitelang=EN&output=Full&spu=Lubricants&unrestrictedmb=No&cols=0](http://msdspds.castrol.com/msdspds/msdspds.nsf/CastrolResults?Open-Form&c=USA%20(US)&l=English%20(US)&p=&n=464255&b=All&t=MSDS&autosearch=No&autoload=No&sitelang=EN&output=Full&spu=Lubricants&unrestrictedmb=No&cols=0)

Link for CASTROL MSDS in different languages

<http://msdspds.castrol.com/msdspds/msdspds.nsf/CastrolSearch?Open-Form&sitelang=EN>

Link for CHEVRON MSDS in different languages

<https://cglapps.chevron.com/msdspds/MSDSPage.aspx?language=en&country=®ion=EAME>



THIS PAGE INTENTIONALLY BLANK



Operation

Section 1: System Overview	Operation-1-4
1.1 Safety Precautions.....	Operation-1-4
1.2 Purpose of Equipment	Operation-1-4
1.3 General Description	Operation-1-4
1.4 Major Components.....	Operation-1-4
1.4.1 Power Package.....	Operation-1-4
1.4.2 Engine.....	Operation-1-4
1.4.3 Transmission.....	Operation-1-5
1.4.4 Drive Shaft	Operation-1-5
1.4.5 Drive Axle.....	Operation-1-5
1.4.6 Steer Axle	Operation-1-5
1.4.7 Brakes.....	Operation-1-5
1.4.8 Chassis	Operation-1-5
1.4.9 Body.....	Operation-1-5
1.4.10 Conveyor.....	Operation-1-6
1.4.11 Operator's Compartment	Operation-1-6
1.4.12 Electrical System	Operation-1-7
1.4.13 Hydraulic System.....	Operation-1-7
Section 2: Operational Procedures	Operation-2-11
2.1 Instrument Panel Controls and Indicators.....	Operation-2-11
2.1.1 Ford 2.5L.....	Operation-2-11
2.1.2 Deutz 2.9L Tier 4F	Operation-2-11
2.1.3 Maneuvering Controls.....	Operation-2-15
2.1.4 Conveyor Controls	Operation-2-16
2.1.5 Electrical Supply	Operation-2-17
2.1.6 Preliminary Checks	Operation-2-17
2.1.7 Maneuvering Procedures.....	Operation-2-18
2.1.8 Belt Loader Towing Instructions.....	Operation-2-21
2.1.9 Conveyor Safety Props	Operation-2-23
2.2 IATA.....	Operation-2-24
2.3 SAE.....	Operation-2-24
2.4 ISO EMC Evaluation.....	Operation-2-24
2.5 ISO Product Safety Evaluation	Operation-2-25
2.6 Locations of Technical Construction Files	Operation-2-25
Section 3: Specifications	Operation-3-27
3.1 General Specifications of the 660	Operation-3-28
3.1.1 Dimensions	Operation-3-28
3.2 Torque Values.....	Operation-3-28
3.2.1 Metric Fasteners	Operation-3-29
3.2.2 Graded Bolts	Operation-3-30
3.3 Performance	Operation-3-31
3.3.1 Specifications.....	Operation-3-31
3.3.2 Environmental Operating Limits.....	Operation-3-32
3.3.3 Environmental Vibration Information.....	Operation-3-32
3.3.4 Environmental Sound Information.....	Operation-3-32
3.4 Engines	Operation-3-36
3.4.1 Gasoline.....	Operation-3-36



3.4.2 Diesel	Operation-3-36
3.5 Transmission.....	Operation-3-37
3.5.1 Gear Ratios	Operation-3-37
3.6 Standard Conveyor Heights and Angles.....	Operation-3-38
3.7 Compatible Aircraft	Operation-3-39
3.8 Fluids	Operation-3-43
3.9 Coolant.....	Operation-3-44
3.10 Recommended Spare Parts.....	Operation-3-44
3.11 Safety Features.....	Operation-3-45
3.11.1 Shifter / Parking Brake Safety	Operation-3-45
3.11.2 Shifter Guard.....	Operation-3-45
3.11.3 Neutral Safety Start Switch	Operation-3-45
3.11.4 Anti-Restart Ignition Switch.....	Operation-3-45
3.11.5 Engine Control Module (ECM) Starter Protection	Operation-3-46
3.11.6 Emergency Stop Switch.....	Operation-3-46
3.11.7 Park Brake	Operation-3-46
3.11.8 Pilot-Operated Hydraulic Check Valves	Operation-3-46
3.11.9 Safety Props	Operation-3-47
3.11.10 Side / Hand Rails	Operation-3-47
3.11.11 Finger Guards	Operation-3-47
3.11.12 Rubber Bumper Roll	Operation-3-47
3.11.13 Steel Hoop Guard (Optional)	Operation-3-47
3.11.14 Grit Paper.....	Operation-3-47
Section 4: Shipping	Operation-4-47
4.1 Shipping Preparation	Operation-4-47
4.1.1 Fuel Tank Preparation	Operation-4-47
4.1.2 Battery Preparation	Operation-4-47
4.1.3 Pre-shipping Verification	Operation-4-47
4.2 Receiving	Operation-4-48
4.2.1 Preparing for Operation	Operation-4-48
Section 5: Storage	Operation-5-49
5.1 Short Term Storage	Operation-5-49
5.1.1 Gasoline Engine.....	Operation-5-49
5.1.2 Diesel Engine.....	Operation-5-51
5.2 Returning the Vehicle to Operation After Short Term Storage.....	Operation-5-52
5.2.1 Tires	Operation-5-52
5.2.2 Battery.....	Operation-5-52
5.2.3 Engine.....	Operation-5-53
5.2.4 Transmission.....	Operation-5-53
5.3 Long Term Storage.....	Operation-5-53
5.3.1 Gasoline Engine.....	Operation-5-53
5.3.2 Transmission.....	Operation-5-54
5.3.3 Tires	Operation-5-55
5.3.4 Lubrication	Operation-5-55
5.3.5 Fluid Levels	Operation-5-55
5.3.6 Battery.....	Operation-5-55
5.3.7 Diesel Engine.....	Operation-5-56
5.3.8 Transmission.....	Operation-5-57
5.3.9 Drive Axle.....	Operation-5-57



5.3.10 Exhaust	Operation-5-58
5.3.11 Tires	Operation-5-58
5.3.12 Lubrication	Operation-5-58
5.3.13 Levels	Operation-5-58
5.3.14 Wheel Bearings	Operation-5-58
5.3.15 Battery	Operation-5-58
5.3.16 Fuel System	Operation-5-59
5.3.17 Engine Exterior	Operation-5-59
5.3.18 Tagging	Operation-5-60
5.4 Returning the Vehicle to Operation After Long-Term Storage	Operation-5-60
5.4.1 Tires	Operation-5-60
5.4.2 Battery	Operation-5-60
5.4.3 Engine	Operation-5-60
5.4.4 Transmission	Operation-5-61
5.4.5 Drive Axle	Operation-5-61
5.4.6 Pre-Operational Checks	Operation-5-61
5.5 Cold Weather Storage	Operation-5-61
5.6 Returning the Vehicle to Operation After Cold Weather Storage	Operation-5-61
5.6.1 Refill Fluids	Operation-5-61

Section 1: System Overview

This section provides an introduction to the Mobile Belt Loader Model 660. Summary descriptions of the unit are provided including descriptions of the major systems.

1.1 Safety Precautions

All operators and mechanics should refer to the information located in the Safety section, and to the Warnings, Cautions, and Notes throughout this manual.

1.2 Purpose of Equipment



CAUTION: Every operator and mechanic involved with this equipment must read and abide by the Safety section.

The TUG Mobile Belt Loader Model 660 is a self-propelled vehicle designed to load and unload baggage, light freight, and mail into and out of the lower hold of aircraft. The conveyor may also be used to transfer freight from trucks or between any two points at the same or differing elevations.

1.3 General Description

Following topics describe the components that make up the Mobile Belt Loader Model 660.

- The power package (engine and drive train),
- The brakes,
- The belt loader portion of this vehicle,
- The operator's compartment and controls, and
- The hydraulic system.

1.4 Major Components

1.4.1 Power Package

The tractor is equipped with an industrial type engine [4-cylinder Diesel, Gasoline (EFI), Liquefied Petroleum Gas (LPG, HD5 grade only), or Compressed Natural Gas (CNG)] with an automatic transmission. The engine is certified by the manufacturer to meet the emissions standards required by USA law applicable as of the date of manufacture. The gasoline engine is designed to operate satisfactorily using 87 Octane no-lead fuel, and the diesel engine operates satisfactorily using Ultra Low Sulfur Diesel (ULSD).

1.4.2 Engine

1.4.2.1 Gasoline and LPG - Ford 2.5L

The gasoline engine is a heavy duty, industrial type with a short stroke and exhaust valve rotators.



1.4.2.2 Diesel - Deutz 2.9L

The diesel engine is a heavy duty, industrial type four cycle with Common Rail Direct Injection (CRDI).

1.4.3 Transmission

The transmission is a GM 4L70 automatic with abuse protection valve body and torque converter.

1.4.4 Drive Shaft

The tractor's drive shaft is an automotive type with double universal joints and slip yokes.

1.4.5 Drive Axle

The rear (drive) axle is a Dana Model 60 with full floating axles and drum brakes.

1.4.6 Steer Axle

The front (steer) axle is a Brierton with disc brakes.

1.4.7 Brakes

1.4.7.1 Hydraulic

Hydraulic service brakes are provided on all four wheels. The master cylinder is mounted on the rear side of the front bumper. Pressure is transmitted to all four brake assemblies by depressing the brake pedal.

1.4.7.2 Park Brake

A cable-actuated parking brake is provided, and is engaged by the brake lever mounted to the right of the seat in the operator's compartment.

1.4.8 Chassis

The 660 Mobile Belt Loader is built on a heavy duty chassis which includes the power package and running gear. The chassis has a 110 in. (279.4 cm) wheel base, formed steel channel frame supported by the front and rear axles.

1.4.9 Body

The vehicle's body panels are formed from 3/16in. (0.476 cm) steel and bolted to the chassis. The front and rear fenders are installed with standard mounting hardware and are independently replaceable from the center section.

The 3/16 in. (0.476 cm) formed steel body panels are fabricated in 6 sections (3 sections on right and 3 sections on the left side of vehicle). The front and rear fenders are mounted separately from the center section and may be replaced independently.

A body panel support structure is integrated in chassis which incorporates the pivot and attaching points for the front and rear lift frames and the lift cylinders.

Protective rub strips can be attached to the full length of both sides of the vehicle to provide further protection for the body panels.

1.4.10 Conveyor

The conveyor is fabricated from structural shapes and formed steel, and is attached to the chassis through front and rear lifting frames.

The front cylinder, supporting the front lifting frame, raises the conveyor to 170 in. (431.8 cm) on the Model 660.

The conveyor frame is 34 in. (86.36 cm) wide on 660 and 31.5 in. (80.009 cm) on 663. The conveyor belt is 24 in. (60.96 cm) wide on all models and is supported by 2 in. (5.08 cm) diameter rollers and is hydraulic motor-driven through a roller chain reduction. The front roller is mounted in a flange block with a screw-adjustable take-up that allows 6 in. (15.24 cm) of adjustment. Crowder rollers under the support rollers direct the return side of the belt into areas where required clearances around fixed components is maintained. An inverted angle iron track on the lower forward section of the conveyor maintains lateral stability through V-shaped rollers mounted to the front lift frame.

Operator stations for controlling the conveyor belt are located on the left side at each end of the conveyor. Alternative positions are available as options.

1.4.11 Operator's Compartment

The operator's compartment contains all the required controls to drive the vehicle and to control the lifting and lowering of the conveyor.

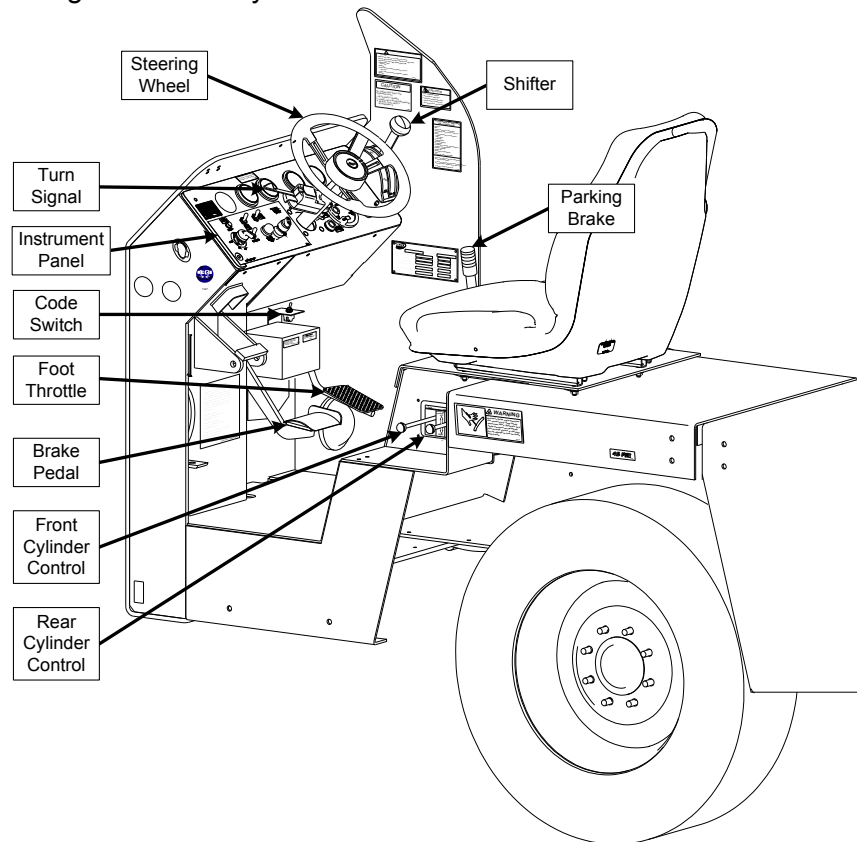


Figure Operation - 1 - 1: Operator's Compartment



Engine controls are mounted in the operator's compartment instrument panel and include hour meter, ignition switch, and light switches.

1.4.12 Electrical System

Electrical power is supplied by an alternator, belt-driven, mounted on the side of the engine. The system is a 12-volt, direct current system with negative ground.

All operating circuits are wired through the ignition switch and are protected by circuit breakers.

1.4.13 Hydraulic System

1.4.13.1 General Hydraulics Operation

The hydraulic schematic (see the Maintenance Manual) represents an open center system that supplies power to raise and lower the conveyor and to drive the conveyor belt.

Hydraulic power is supplied by a hydraulic pump, belt- or gear-driven, mounted on the engine. The pump supplies 9 gpm (34.08 lpm) at 1500 rpm to raise and lower the conveyor and to drive the conveyor belt.

Both lift cylinders are locked in any position by holding valves. The orbital motor has incorporated a counterbalance and cushion valve in the circuit.

All hydraulic hose connections are Gates brand Mega Crimp. Mega Crimp connectors join the reinforcing wire inside the hose. This is more reliable than the grip on the rubber of the hose. Mega Crimp connections are plated to resist damage from corrosion. The Mega Crimp connections are rated at 3000 psi (US) (20.68 MPa or 204.14 atm) working pressure. All hydraulic hoses are Gates brand Mega 3000 rated for 3250 psi (22.41 MPa or 221.15 atm) working pressure. All pipes are constructed from Benteler hydraulic piping rated for 3000 PSI (20.68 MPa 204.14 atm) working pressure.

Hydraulic fluid is drawn from the hydraulic oil reservoir to the hydraulic pump at a rate of six gals (22.71 l) to ten gals (37.85 l) per minute into a pipe manifold. From the pump, fluid is directed to a pressure-compensated flow divider valve in the valve manifold, located under the driver's seat. The pressure-compensated flow divider valve separates the hydraulic system into a steering and braking section and a lift cylinder and conveyor motor section.

1.4.13.2 Steer and Braking

The pressure-compensated flow divider valve provides a constant 2 gpm (7.57 lpm) of oil flow to the Steering / Braking portion of the hydraulic system. Hydraulic fluid pressure for the steering and braking section is limited by a pressure relief valve, set at 1000 psi (6.9 MPa or 68.05 atm), in the hydraulic manifold. Hydraulic oil then flows to the hydraulic brake system assist valve via port, then to the hydraulic steering motor.

Fluid from the hydraulic brake system assist valve and the hydraulic steering motor return to the manifold. This fluid then exits the manifold. Fluid passes through the return line hydraulic filter before returning to the hydraulic oil reservoir.

When the brake pedal is depressed, pressurized hydraulic fluid enters the hydraulic brake system assist valve and exerts pressure on a spring loaded check valve, closing the hydraulic fluid

line that returns oil to the hydraulic oil reservoir through ports on the valve manifold assembly. When the brake pedal is released, pressure is reduced and the spring loaded check valve opens, allowing hydraulic fluid to return to the hydraulic oil reservoir through ports on the valve manifold assembly and the return line hydraulic filter.

Hydraulic fluid also flows to the hydraulic steering motor which controls the hydraulic steer cylinder.

When the steering wheel position is altered, pressurized hydraulic fluid enters the steering valve through port. Depending on the direction of steering input, flow is diverted through ports to the appropriate side of the steer cylinder through hydraulic lines. Flow out of the steering cylinder and excess flow coming in through port returns to the manifold via ports. This fluid then exits the manifold via port. Fluid passes through the return line hydraulic filter before returning to the hydraulic oil reservoir.

1.4.13.3 Lift Cylinders and Conveyor Motor

Pressurized hydraulic oil not being used by the steering/braking systems bypasses the flow divider valve and then flows into an adjustable relief valve that allows hydraulic fluid to return to the hydraulic oil reservoir through port on the valve manifold assembly and the return line hydraulic filter.

When the two manual levers for the front and back lift cylinders or the motor driven directional valve are activated, the upstream adjustable relief valve closes at the set pressure of 1500 psi (10.34 MPa or 102.07 atm).

The adjustable relief valve, located downstream of the front lift cylinder, closes at the set pressure of 900 psi (6.2 MPa or 62.24 atm), keeping the front cylinder from applying excessive downwards force.

The two manual levers control the front and rear lift cylinders and the motor driven directional valve controls the conveyor hydraulic motor / CBV assembly.

When a manual lever is actuated, the lever mechanically shifts the spool valve position, porting fluid to that side of the lift cylinder to be pressurized. Spool Valve movement also opens a channel for the non-pressurized portion of the lift cylinder piston to allow unpressurized oil to return to the hydraulic oil reservoir through port on the valve manifold assembly and the return line hydraulic filter.

Likewise, when the conveyor motor control valve is actuated in either direction, its electric solenoid shifts the spool valve position, porting fluid to the forward or reverse side of the conveyor motor/CBV assembly. Spool valve movement also opens a channel for the non-pressurized portion of the conveyor motor/CBV assembly to allow unpressurized oil to return to the hydraulic oil reservoir through port on the valve manifold assembly and the return line hydraulic filter.

With the manual control levers in their neutral state, the front and rear cylinders are locked in the current position by load holding valves, located on their respective cylinders.

DC Emergency Pump

In the case of Main Hydraulic Pump failure, the DC-operated Emergency Pump is available for the temporary activation of the Hydraulic Lift Cylinders and the Conveyor Motor. The emergency pump cannot operate the steering and braking system.

The 660 belt loader is equipped with an electrically operated emergency hydraulic pump to allow short term operation of the hydraulic system for raising or lowering the conveyor, in the event of an engine failure. The hydraulic pump relies on the 12 volt starter battery for energy.



CAUTION: The emergency hydraulic pump should only be operated when the regular propulsion engine is OFF or NOT operating.

The purpose of the emergency hydraulic pump is to enable lowering of the conveyor into its normal down position, or to retrieve luggage that may be on the belt at the time of engine failure. It may also be used to gain access to the engine compartment if the conveyor is in the down position.



CAUTION: Use the safety props to support the conveyor at all times when performing maintenance under the conveyor.

The emergency hydraulic pump is not to be used to load or unload luggage to or from the hold of the plane at any time.

The emergency hydraulic pump is activated by a button on the instrument panel that is labeled "*Emergency Hydraulic Pump*". Pressing the button down activates the pump, releasing the button stops the operation of the pump, thus all the time hydraulic power is required during emergency conditions the button should be depressed.

NOTE:

There is an electrical safety circuit for the emergency pump, located next to the hydraulic tank, it will trip if the current drawn from the battery to operate the emergency pump exceeds preset limits. It may be reset by pressing down the red button marked **105**.

The Emergency Hydraulic Pump should be tested daily before equipment use, any concerns about its operation should be reported to the crew supervisor.



THIS PAGE INTENTIONALLY BLANK



Section 2: Operational Procedures

2.1 Instrument Panel Controls and Indicators

2.1.1 Ford 2.5L

Table Operation-2-1, "Instrument Panel Description - Ford 2.5L," lists the controls, indicators, and equipment found on the instrument panel for the 660 belt loader with the Ford 2.5L gasoline engine, and explains the specific function of each. Reference Table Operation - 2 - 1, "Instrument Panel - Ford 2.5L," for the location of the items listed.

2.1.2 Deutz 2.9L Tier 4F

"Figure Operation - 2 - 2" lists the controls, indicators, and equipment found on the instrument panel for the 660 Belt loader with the Deutz Tier 4F engine, and explains the specific function of each. Reference Table Operation-2-2, "Instrument Panel Description - Deutz 2.9L," for a description of the items shown.

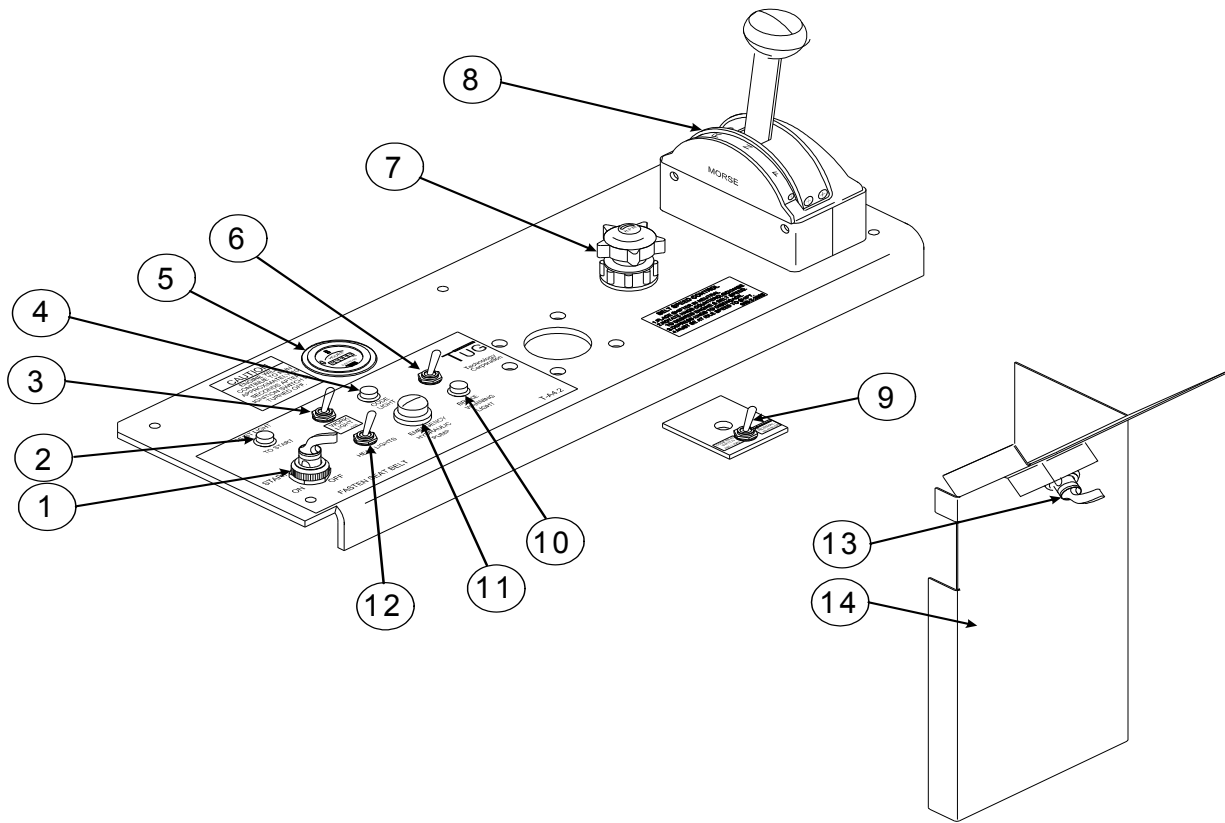


Figure Operation - 2 - 1 Instrument Panel - Ford 2.5L

Table Operation-2-1 Instrument Panel Description - Ford 2.5L

No.	Name	Description
1	Ignition Switch	Turn this switch to start or turn off the engine.
2	Warning Light (Green)	This light will not illuminate if an e-stop on the vehicle is activated.
3	Spot Light Switch (Optional)	This switch turns the spotlight on. Press down for off, or up for on.
4	Warning Code Light (Red)	This light illuminates briefly during engine start and when an engine fault occurs.
5	Hour Meter	This gauge displays the number of operation hours on the tractor.
6	Fuel Select Toggle Switch (Optional)	This switch controls the dual fuel operation. Select LP or gasoline as the engine fuel source.

Table Operation-2-1 Instrument Panel Description - Ford 2.5L (Continued)

No.	Name	Description
7	Conveyor Hand Throttle	This knob controls the engine speed only while the unit is in neutral and the parking brake is applied. Turn the knob counterclockwise and the engine will speed up. Depress the hand throttle knob and the engine will return to idle.
8	Morse Shifter	This is the main drive control for forward or reverse direction. The shifter is labeled: F=Forward , R=Reverse , and N=Neutral .
9	Code Toggle Switch	Press this switch to read fault codes via the diagnostic lamp.
10	Brake Warning Light (Red)	This light illuminates if the brake system pressure falls below a preset level.
11	Emergency Steering Switch	This switch activates the emergency steering pump. Press and hold the switch to start the pump, or release the switch to stop the pump. The emergency steering pump activates only if hydraulic pressure is low.
12	Head Light Switch	This switch turns the tractor's headlights on or off. Pressing down turns lights off and pressing up turns lights on.
13	Ignition Switch (Optional Location)	This switch starts or turns off the tractor's engine.
14	Left Front Headlight Cover	This cover is installed below the dash and conceals the tractor's wiring harnesses.

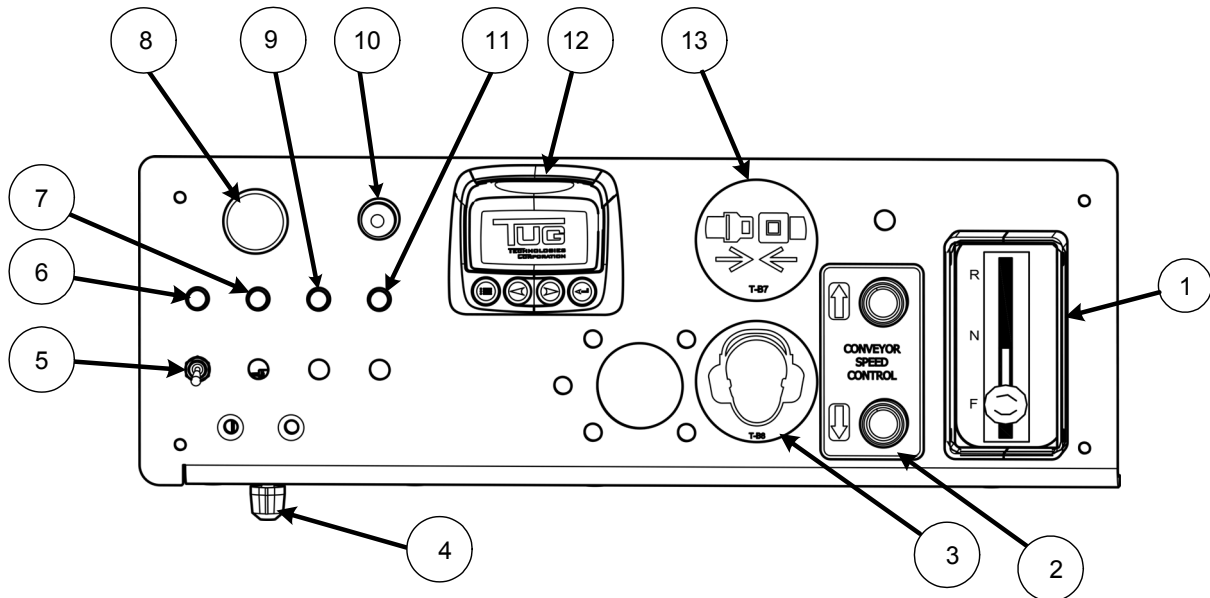


Figure Operation - 2 - 2 Instrument Panel - Deutz 2.9L

Table Operation-2-2 Instrument Panel Description - Deutz 2.9L

No.	Name	Description
1	Shifter	This is the main drive control for forward or reverse direction. The shifter is labeled: F=Forward , R=Reverse , and N=Neutral .
2	Converter Speed Control	These buttons control the engine speed only while the belt loader is in neutral and the parking brake is applied. Press the button closest to the UP arrow: engine RPMs and belt speed increases. Press the DOWN arrow: engine RPMs and belt speed decreases.
3	Hearing Protection Decal	Always wear hearing protection.
4	Ignition Switch	Turn this switch to start or turn off the engine.
5	Headlight Switch	This switch turns the headlights on or off. Flip switch up to turn lights ON and down to turn lights OFF.
6	Warning Light	This warning light illuminates when headlights are on.



Table Operation-2-2 Instrument Panel Description - Deutz 2.9L (Continued)

No.	Name	Description
7	Deutz Cold Start Wait Light	When the ignition switch is turned on, this light illuminates. When the light goes out, it shows that the glow plugs are heated and the vehicle can be started.
8	Emergency Stop Switch	Press the switch down to shut the engine off. The switch must be rotated clockwise and pulled out to allow the engine to restart.
9	Warning Light	Optional warning light.
10	Emergency Lift Pump Switch	Press this button for emergency hydraulic pressure to the conveyor.
11	Warning Light	Optional warning light.
12	Murphy CAN Display	Information displayed is provided by the ECM and may include: <ul style="list-style-type: none"> • Engine Speed • Engine Torque • Coolant Temperature • Intake Air Temperature • Exhaust Gas Temperature • Oil Pressure • Coolant Pressure • Fuel Level • Battery Voltage • Total Operating Hours • Error Messages
13	Fasten Seat Belt Decal	Always fasten seat belt before operating the Mobile Belt Loader Model 660.

2.1.3 Maneuvering Controls

1. Steering Wheel
2. Brake Pedal
3. Foot Throttle
4. Turn Signal
5. Shifter

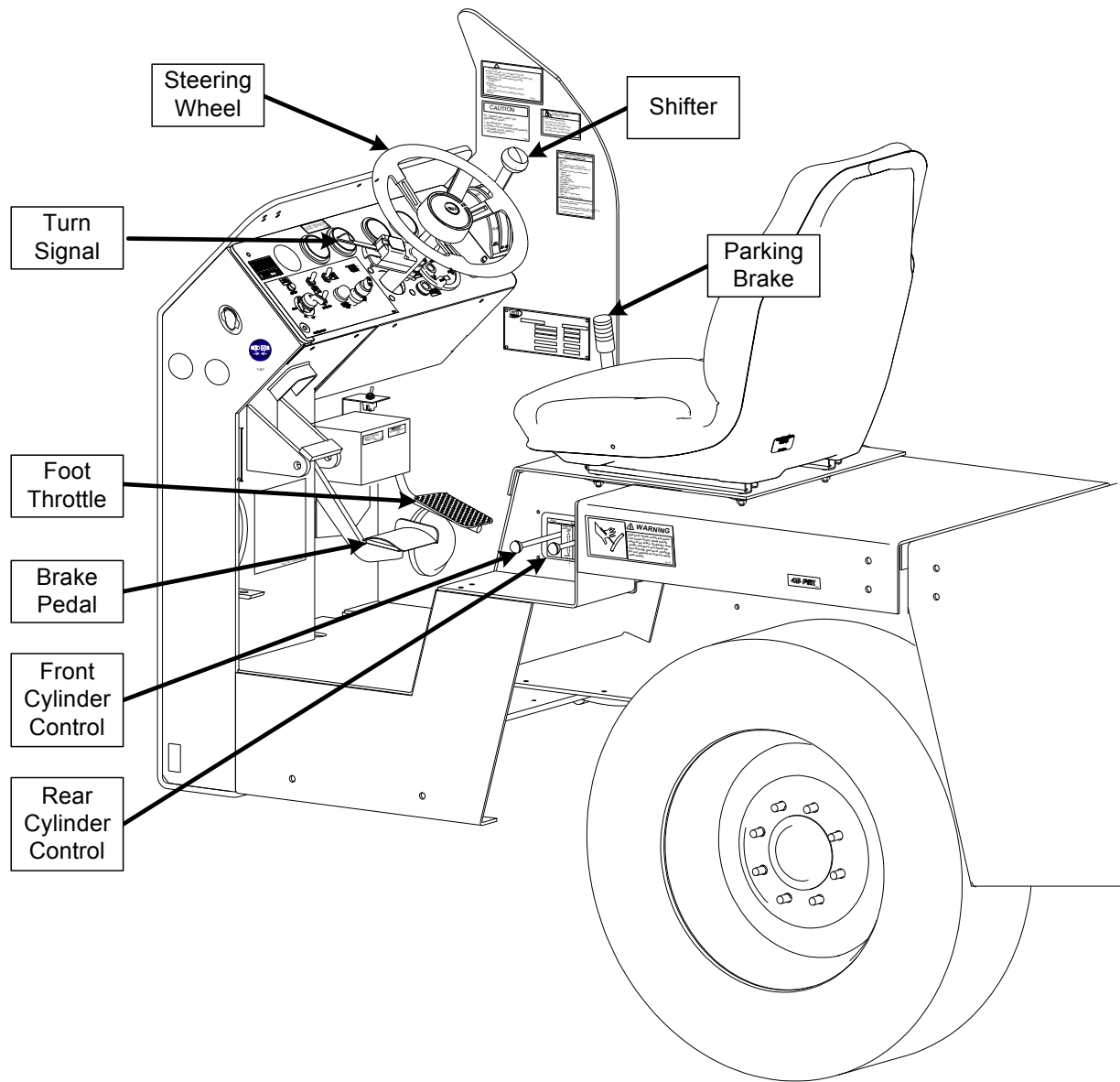


Figure Operation - 2 - 3 Maneuvering and Conveyor Controls

2.1.4 Conveyor Controls

Conveyor height controls in the operator's compartment (located below driver's seat) are limited to:

1. Front Cylinder: Raises / lowers front of conveyor. See Figure Operation - 2 - 3
2. Rear cylinder: Raises / lowers back of conveyor. See Figure Operation - 2 - 3

Electrical belt drive controls may be located at any combination of the conveyor's four corners. On the Ford 2.5L, the conveyor hand throttle controls engine speed while in neutral. Turn the knob counterclockwise and the engine will speed up. Depress the hand throttle knob and the engine will return to idle.

On the Deutz, the conveyor speed control is located on the instrument panel. Push buttons control the conveyor speed (see callout #2 on Figure Operation - 2 - 2), while in neutral. Push the button with the arrow pointing up to increase engine speed or push the button with the arrow pointing down to return to idle.

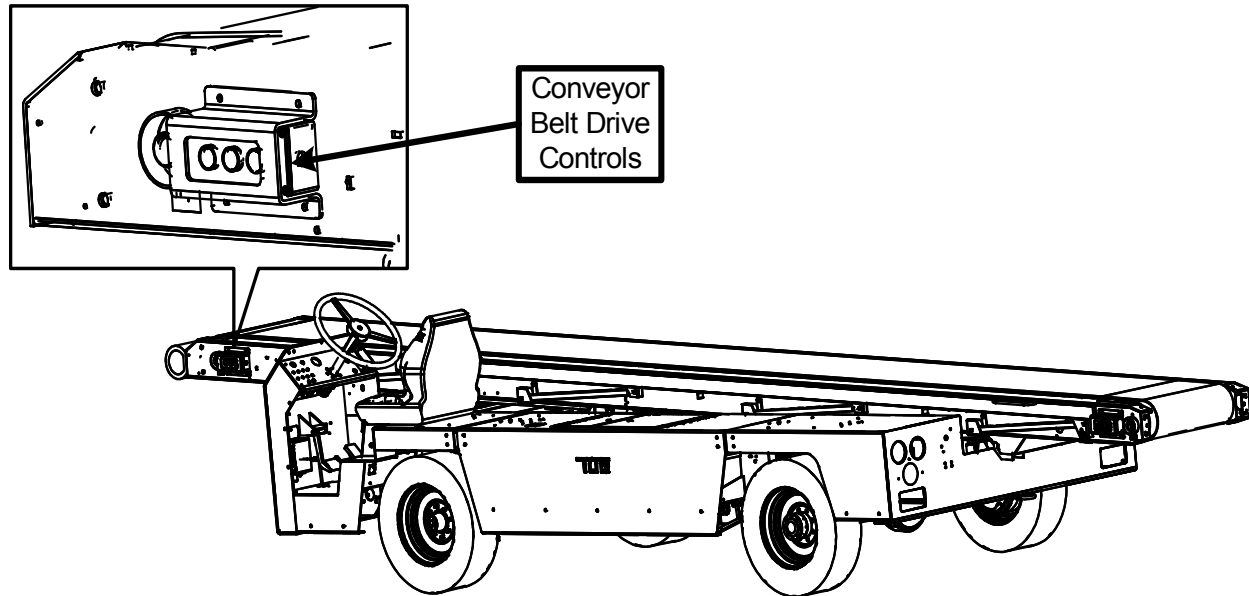


Figure Operation - 2 - 4 Conveyor Controls

Control relays for the electrical conveyor belt drive solenoid control valves are located on the conveyor frame.

2.1.5 Electrical Supply

The main electrical supply panel is located

- Ford: below the instrument panel
- Deutz: in the battery compartment.

NOTE: See the electrical schematics in the Maintenance Manual for description of electrical components.

2.1.6 Preliminary Checks

Procedures for preliminary checks before maneuvering the vehicle to an aircraft shall include (but may not be limited to) the following items:

-
1. Fuel Level
 2. Tire Inflation
 3. Engine Oil Level
 4. Transmission Oil Level
 5. Seatbelt Serviceability
 6. Service Brake Effectiveness
 7. Parking Brake Effectiveness
 8. Vehicle Drive Forward
 9. Vehicle Drive Reverse
 10. Check the hydraulic fluid level with the conveyor down
 11. Conveyor Belt Drives in Forward direction
 12. Conveyor Belt Drives in Reverse direction
 13. Front Cylinder Extension: Raises front of conveyor
 14. Front Cylinder Retraction: Lowers front of conveyor
 15. Rear Cylinder Extension: Raises back of conveyor
 16. Rear Cylinder Retraction: Lowers back of conveyor
 17. Verify all "E" Stops function correctly

2.1.7 Maneuvering Procedures

Procedures for maneuvering the vehicle to an aircraft are outlined below:



WARNING: OBSERVE ALL SAFETY PRECAUTIONS DISCUSSED IN THE SAFETY SECTION OF THIS MANUAL.

2.1.7.1 Engine Start Procedure (Gas)

1. Apply parking brake.
2. Move transmission selector to Neutral. (Starter motor will not activate unless selector is in Neutral).



3. Move ignition switch to “Start”.
4. Allow ignition switch to return to “On” upon engine start.

NOTE: Switch must be returned to “Off” (reset) before it can be moved to start again.

2.1.7.2 Engine Start (Diesel)

1. Apply parking brake.
2. Move transmission selector to Neutral. (Starter motor will not activate unless selector is in Neutral).
3. Move ignition switch to “Start”.
4. Wait for “Wait-to-Start” light to go out.
5. Allow ignition switch to return to “On” upon engine start.

NOTE: Switch must be returned to “Off” (reset) before it can be moved to start again.

2.1.7.3 Release parking brake.

The parking brake is a cable-actuated type attached to the brake shoes in the rear axle.

NOTE: The parking brake is located to the right of the driver’s seat in the driver’s compartment. See Figure Operation - 2 - 3.

1. To apply parking brake, pull up.
2. To release parking brake, push down.

2.1.7.4 Transmission Drive (FWD/REV) Selection.

A Morse control is connected to the transmission shift lever through a flexible push/pull cable.

To select a vehicle drive direction in a USA configured belt loader:

1. Move transmission drive selector lever up (toward instrument panel) to select reverse drive direction.
2. Move transmission drive selector lever down (toward driver’s seat) to select forward drive direction.
3. Neutral is located midway between forward and reverse and is indicated by a positive stop notch into which the spring loaded lever will fall when shifting.

4. Select transmission drive (FWD/REV)

To select a vehicle drive direction in a CE configured belt loader:

1. Move transmission drive selector lever up (toward instrument panel) to select forward drive direction.
2. Move transmission drive selector lever down (toward driver's seat) to select reverse drive direction.
3. Neutral is located midway between forward and reverse and is indicated by a positive stop notch into which the spring loaded lever will fall when shifting.
4. Select transmission drive (FWD/REV)..

This transmission is equipped with Abuse Protection Valve Body. To shift into Reverse (R) or Drive (D), all three of the following conditions must be met:

1. Throttle position must be less than 25%.
2. Engine RPM must be less than 1500 RPM.
3. Vehicle speed must be 0 MPH.

NOTE:

If any of the above conditions are not met, the transmission will be placed into a neutral state until all three conditions are met. This neutral state may slightly drag the forward or reverse clutch, moving the vehicle very slowly and give the impression that the transmission is slipping. To fully engage the desired gear, simply come to a complete stop with the engine at idle.

2.1.7.5 Depress foot throttle.

The foot throttle is a conventional automobile accelerator connected to the ECM by electrical connection.

- To increase speed, depress foot throttle.
- To decrease speed, release foot throttle.

2.1.7.6 Maneuver vehicle with steering wheel.

The steering system is a hydrostatic type powered from the belt-driven hydraulic pump.

- To turn left, rotate the steering wheel counterclockwise.
- To turn right, rotate the steering wheel clockwise.

2.1.7.7 Maneuvering the baggage loader around the aircraft

1. Approach the aircraft to a distance of two or three feet.
2. Move transmission selector to Neutral.
3. Apply parking brake.
4. Raise the front and rear of the conveyor to the correct heights for the aircraft.
5. Release the parking brake
6. Move transmission selector to FWD and slowly approach the cargo door opening
7. When in the correct position, move the transmission selector to Neutral.
8. Apply the parking brake.
9. Make final height adjustments.
10. When baggage loading is complete, reverse the above steps.

2.1.8 Belt Loader Towing Instructions

Occasionally, due to a mechanical failure, a TUG Belt Loader may require towing for some distance. If at all possible, the Belt Loader should be moved with a suitable tow truck or on a flat bed tow truck. If this is not practical, the Belt Loader can be towed with all four wheels on the ground. In this situation, extreme diligence is required.



CAUTION: Do not tow the Belt Loader if it has experienced a hydraulic failure as the unit may not be steerable! The maximum tow distance with the driveshaft installed is 1 mile at a speed of no more than 5 mph. If the required towing distance is more than 1 mile, the driveshaft must be removed from the Belt Loader to avoid transmission damage. The maximum towing speed without the driveshaft is 5 mph.

2.1.8.1 Towing Requirements



WARNING: FAILURE TO USE PROPER TOWING GEAR CAN CAUSE SERIOUS INJURY OR DEATH.

CAUTION: Do not tow the Belt Loader unless absolutely necessary.

CAUTION: Do not allow the Belt Loader to be pushed by other equipment.

CAUTION: Verify the steering system operates properly. The steering wheel should turn the front wheels of the vehicle. Steering effort will be greater than normal, but should be possible. If the Belt Loader cannot be steered, do not tow the Belt Loader.



CAUTION: Use a properly sized tow vehicle for the vehicle being towed and the conditions present. Connect the other end of the tow straps to an appropriate location on the towing vehicle.

CAUTION: Tow only with suitably sized tow straps rated for the weight of the Belt Loader (7,200 lbs or 3265.9 kg).

1. Connect the tow straps to the D-rings located under the front bumper. The D-rings should be marked with decals labeled **TOW**.
2. Put the transmission in Neutral.
3. While applying the foot brake, release the parking brake using the parking brake handle.
4. Tow only as fast as the conditions allow, but no faster than 5 mph (8.05 kph).
5. Tow only the minimum distance required to get the belt loader to a safe location for repairs.
6. Once the tow is complete, reapply the parking brake and chock the wheels of the belt loader.
7. Disconnect the tow straps and make repairs prior to returning the belt loader to service.

2.1.9 Conveyor Safety Props



WARNING: ALWAYS USE THE SAFETY PROPS WHEN WORKING UNDER THE CONVEYOR.

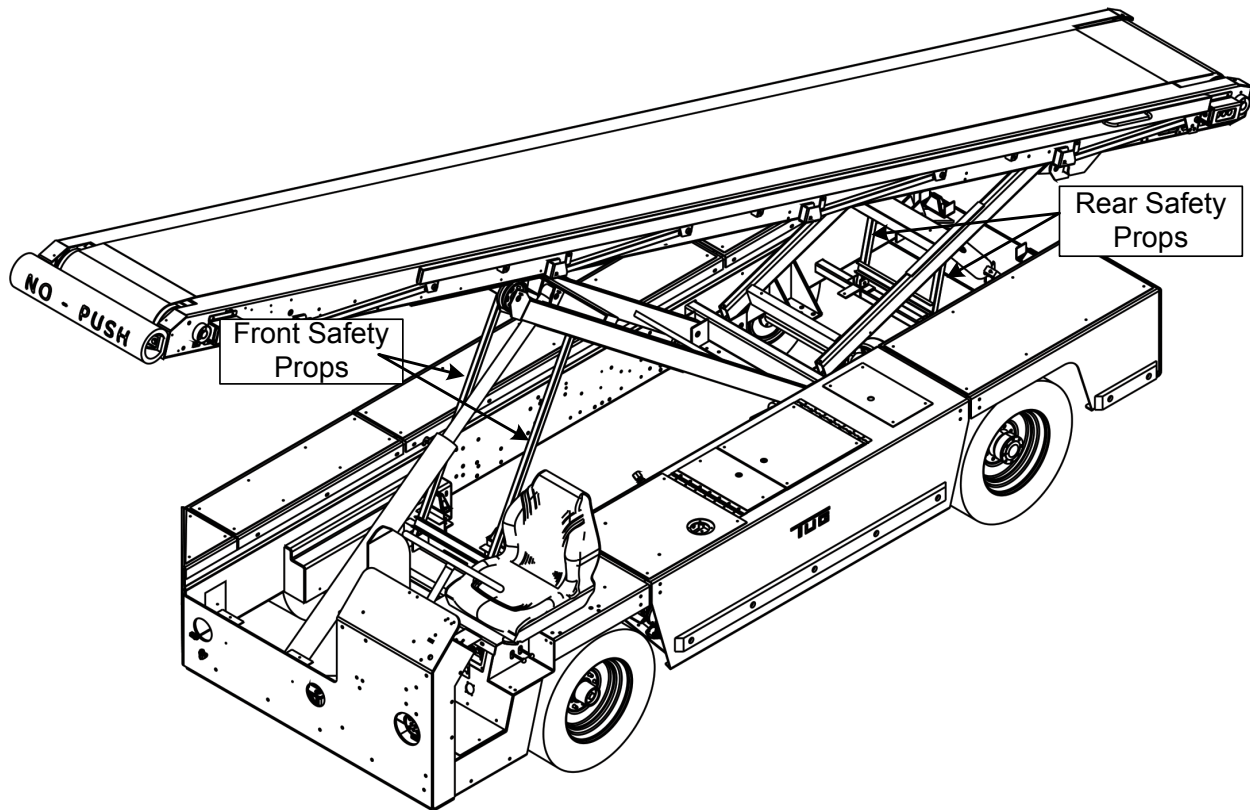


Figure Operation - 2 - 5 Belt Loader with Props Engaged

1. The safety props are provided to support the front and rear of the conveyor for maintenance, checking oil, etc.
2. To engage the safety props:
 - raise the front or rear of the conveyor to a height that permits the safety prop to be rotated to the “UP” position.
 - Raise the safety prop to the “UP” position.

-
- Slowly let the conveyor down until the safety prop aligns with sockets on bottom of the lift arm.



CAUTION: Make sure the safety prop is fully engaged inside sockets before working under the conveyor.

CAUTION: Lower the conveyor GENTLY onto yellow safety props or structural failure may result.

2.2 IATA

The following are IATA standards that TUG follows when designing GSE.

- AHM 913: Basic Requirements for Aircraft Ground Support Equipment
- AHM 914: Compatibility of Ground Support Equipment for Aircraft Types
- AHM 915: Standard Controls
- AHM 925: Functional Specification for Self-Propelled Conveyor-Belt Loader
- IATA: Ground Operations Manual (Effective April 2013)

2.3 SAE

The following are SAE standards that TUG follows when designing GSE.

- AIR 1336A: Vehicle Electrical Systems
- AIR 1375C: Minimum Safety Requirements for Special Purpose Airline Ground Support Equipment
- AIR 4286: Maintenance of Ground Support Equipment
- AIR 4905: Wheel Chocks
- ARP1247D: Aircraft Ground Support equipment - General Requirements
- ARP1287A: SAE Standards for Use in the Design of Aerospace, Vehicular Ground Equipment
- AS4828A: Technical Manual requirements for Ground Support Equipment

2.4 ISO EMC Evaluation

The following are ISO EMC Evaluation standards that TUG follows when designing GSE.

- EN 12895: Industrial Trucks Electromagnetic Compatibility
- EN 55011: Radiated Emission
- EN 61000-4-3: Radiated Immunity
- EN 61000 -4-2: ESD Immunity
- EN 12100: Safety of machinery General principles for design
- EN 4413: Hydraulic fluid power General rules and safety requirements
- EN 4413: Hydraulic fluid power General rules and safety requirements
- EN 13849-1: Safety of machinery Safety related parts of control systems
- EN 60204-1: Safety of machinery Electrical equipment of machines
- EN 62061-1: Safety of machines Functional safety of safety related electrical, electronic, and programmable electronic control systems
- EN 60259: Degrees of protection provided by enclosures



- EN 12312-3: Aircraft ground support equipment Part 3 Conveyor Belt Vehicle
- EN 1915-1: Aircraft ground support equipment - Part 1 Basic safety requirements
- EN 1915-2: Aircraft ground support equipment - Part 2 Stability and strength requirements
- EN 1915-3: Aircraft ground support equipment - Part 3 Vibration measurement
- EN 1915-4: Aircraft ground support equipment - Part 4 Noise measurement
- EN 1915-4: Safety of machinery Sound level test

2.5 ISO Product Safety Evaluation

The following are ISO Product Safety standards that TUG follows when designing GSE.

- EN 12100: Safety of machinery: general principles for design. Risk assessment and risk reduction
- EN 4413: Hydraulic fluid power: General rules and safety requirements for systems and their components
- EN 13849-1: Safety of machinery: Safety related parts of control systems Part 1 General principles of design
- EN 60204-1: Safety of machinery: Electrical equipment of machines
- EN 60204-1: Safety of machinery: Electrical equipment of machines
- EN 60204-1: Safety of machinery: Electrical equipment of machines
- EN 62061: Safety of machinery: Functional safety of safety related electrical, electronic and programmable electronic control systems
- EN 60259: Degrees of protection provided by enclosures EN 12312-3 -Aircraft ground support equipment - specific requirements - Part 3: conveyor belt vehicle

2.6 Locations of Technical Construction Files

The Technical Construction Files are in two places:

1. F2 Labs, Ohio, USA (CE Certifying Body)
2. TUG Technologies Corporation, Kennesaw, GA, USA

The Technical File at TUG will be made available at our premises if requested.



THIS PAGE INTENTIONALLY BLANK

Section 3: Specifications

This section contains information about the specifications for the Mobile Belt Loader Model 660.

3.1 General Specifications of the 660

3.1.1 Dimensions

Table Operation-3-1: Dimensions and Measurements

Dimension	Measurement
Length	300 in (762 cm)
Width (excluding side bumpers)	78 in (198.1 cm)
Height	59 in (149.9 cm)
Ground Clearance	7.5 in. (19.05 cm)
Wheel Base	110 in (279.4 cm)
Conveyor Length (less front bumper)	294 in (746.7 cm)
Conveyor Width (less side rails) - Standard Width	34 in (86.4 cm)
Conveyor Width (less side rails) - Narrow Width	31.5 in (80 cm)
Belt Width	24 in (61 cm)
Gross Vehicle Weight with Cab	7,200 lb (3266 kg)
Gross Vehicle Weight without Cab	7,000 lb (3175 kg)

3.2 Torque Values

Metric capscrews and nuts are identified by the grade number stamped on the head of the cap-screw or surface of a nut; while Standard capscrews are identified by a series of lines:

- Grade 5: three (3) lines
- Grade 8: six (6) lines

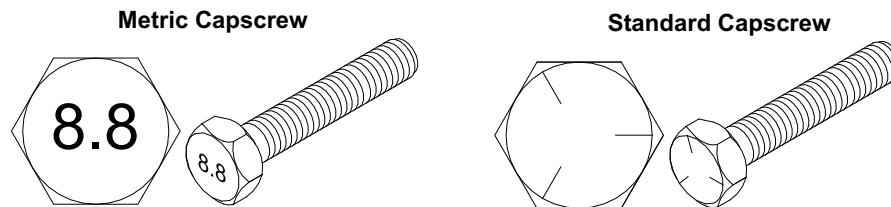


Figure Operation - 3 - 1: Capscrew Examples

The following torque tables apply to graded metric and standard fasteners used on the Model 660. The listed values apply to bolts threaded into either nuts or tapped holes in iron or steel. These torque values are not a replacement for torque values specified elsewhere in this manual.

3.2.1 Metric Fasteners

Table Operation-3-2: Torque Values for Metric Fasteners

Nominal Diameter (mm)	Pitch (mm)	Class 8.8 (Nm)	Class 10.9 (Nm)	Class 12.9 (Nm)
4	0.7	2.576	3.661	4.339
5	0.8	5.288	7.457	8.813
6	1	8.948	12.745	14.914
7	1	14.914	21.422	24.947
8	1.25	21.693	31.048	36.200
10	1.5	42.844	61.283	71.723
12	1.75	74.706	106.974	125.006
14	2	119.448	170.969	199.848
16	2	185.747	265.740	310.482
18	2.5	256.250	366.070	428.438
20	2.5	362.003	517.922	604.695
22	2.5	493.518	706.381	825.693
24	3	625.032	894.840	1045.336

Table Operation-3-2: Torque Values for Metric Fasteners (Continued)

Nominal Diameter (mm)	Pitch (mm)	Class 8.8 (Nm)	Class 10.9 (Nm)	Class 12.9 (Nm)
27	3	916.533	1312.432	1533.430
30	3.5	1243.285	1778.833	2079.825
33	3.5	1692.060	2421.491	2829.592
36	4	2173.376	3110.246	3634.948

NOTE: The listed torque values are based on the use of zinc plated, dry threads (or as received for the 12.9).

3.2.2 Graded Bolts

Table Operation-3-3: Torque Values for Graded Bolts

Nominal Diameter (in.)	Threads per Inch	SAE J429 Grade 5 (ft-lbs)	SAE J429 Grade 8 (ft-lbs)
Unified Coarse Thread Series			
1/4	20	7.2	10
5/16	18	15	21
3/8	16	26	37
7/16	14	42	59
1/2	13	64	90
9/16	12	92	130
5/8	11	128	180
3/4	10	227	320
7/8	9	365	515
1	8	547	772
1 1/4	7	952	1545
1 1/2	6	1657	2688
Fine Thread Series			
1/4	28	8.3	12
5/16	24	16	23

Table Operation-3-3: Torque Values for Graded Bolts (Continued)

Nominal Diameter (in.)	Threads per Inch	SAE J429 Grade 5 (ft-lbs)	SAE J429 Grade 8 (ft-lbs)
3/8	24	30	42
7/16	20	47	66
1/2	20	72	102
9/16	18	103	146
5/8	18	144	204
3/4	16	253	357
7/8	14	403	568
1	14	614	867
1 1/4	12	1055	1710
1 1/2	12	1865	3024

NOTE: The listed torque values are based on the use of zinc plated, dry threads.

3.3 Performance

Table Operation-3-4: Performance Data

Unit	Performance
660 Top Speed	25 mph (43 kph)
Conveyor Capacity (to 15° angle)	2000 lb (907 kg)
Maximum Conveyor Load	2000 lb (907 kg)
Maximum Conveyor Load	200 lb per ft ² (976.4 kg per m ²)
Belt Control	Electric
Conveyor Belts Speeds	45 to 90 ft/min (14 to 27 m/min)
Turning Radius	27 ft, measured to the outside front wheel (8.2 m)
Aircraft Capability	Will service aircraft with door sills height from 40 to 170 in (101 to 431 cm)

3.3.1 Specifications

Table Operation-3-5: Specification Data

Item	Specification
Battery	12 Volt
Ground	Negative
Fuel Tank Capacity	15 gal (US) (56.78 l)
Hydraulic Reserve Capacity	10 gal (US) (37.81 l)
Hydraulic Hose Rating	3000 psi (US) (22.407 MPa)
Service Brakes - Rear	Hydraulic, internal-expanding, drum-type, self-adjusting
Service Brakes - Front	Hydraulic Disc
Rear Axle	Dana, single-speed, limited slip differential, full-floating
Tire and Rims	8.00 x 16.5, 6-ply tubeless on 16.5 x 6.0 G rims

3.3.2 Environmental Operating Limits

Table Operation-3-6: Environmental Limits

Condition	Minimum	Maximum
Operating Temperature	-25° F (-31° C)	125° F (52° C)
Storage Temperature	-25° F (-31° C)	125° F (52° C)
Operating Humidity	0%	100%
Recommended Operating Altitude	Sea Level	10,000 Ft (3048 m)

Please contact Tug Technologies for operating procedures in colder environments.

3.3.3 Environmental Vibration Information

The following information covers vibrations transmitted by the machinery to the hand-arm system or to the whole body:

- The hand-arm vibration does not exceed 8.202 ft/s² (2.5 m/s²).
- The highest root mean square value of weighted acceleration to which the whole body is subjected is less than 1.64 ft/s² (0.5 m/s²).
- The measured vibration at the driver's position with the vehicle idling and the belt running at full speed is: 9.843 ft/s² (3.0 m/sec²) pk 5.249 ft/s² rms (1.6 m/sec² rms).
- The measured vibration at the driver's position without the belt running is: 4.265 ft/s² (1.3m/s²) pk 1.312 ft/s² rms (0.4 m/sec² rms).

3.3.4 Environmental Sound Information

The following diagrams indicate the Sound Pressure Levels (SPL) that were measured in accordance with:

- BS EN ISO 1915-4 Aircraft ground support equipment, General requirements Part 4 Noise measurement methods
- BS EN ISO 11201 Determination of emission sound pressure levels at a work station in an essentially free field over a reflecting plane with negligible environmental corrections.



All measurements were taken in an acoustic free field over a concrete surface using an Extech brand SPL meter in the "A" Weighted Mode.

BS EN 1915 - 4 Noise measurement methods 660-28 1 M from contour and 1.6 M above ground level
All measurements are "A" Weighted dB

Belt Loader Stationary
Conveyor Down
Engine Idle
Belt Stationary

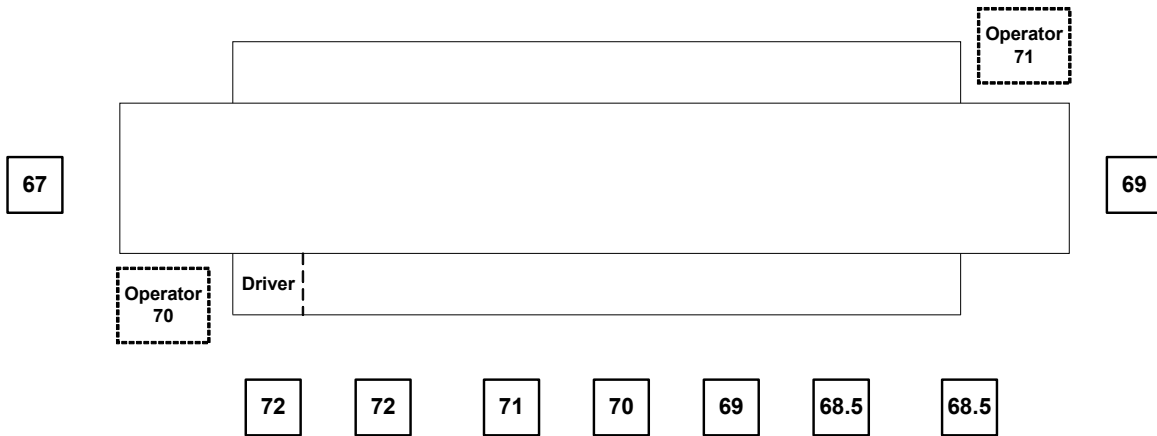


Figure Operation - 3 - 2: Sound - Engine Idle - Conveyor Down - Belt Stationary

BS EN 1915 - 4 Noise measurement methods 660-28 1 M from contour and 1.6 M above ground level
All measurements are "A" Weighted dB

Belt Loader Stationary
Conveyor Down
Engine Max RPM
Belt Max Speed

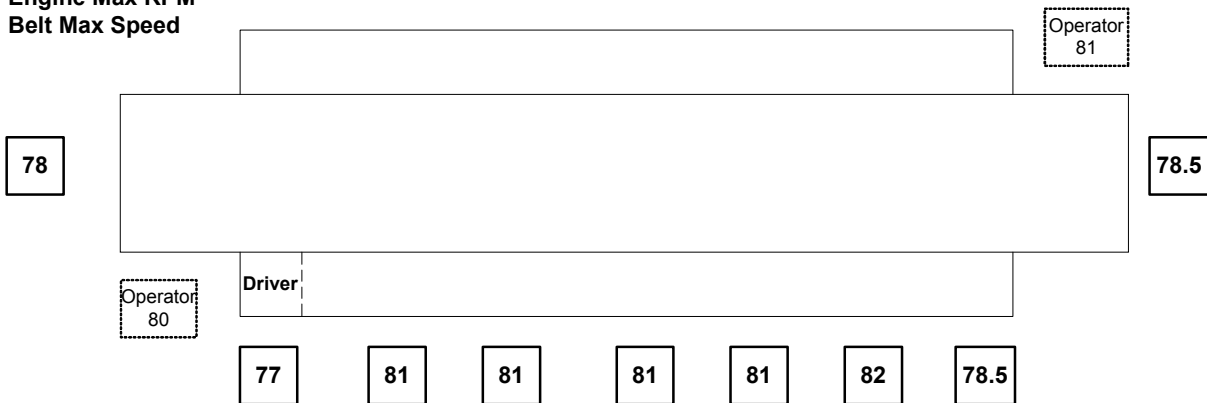


Figure Operation - 3 - 3: Sound - Engine Max - Conveyor Down - Belt Max Speed

BS EN 1915 - 4 Noise measurement methods

660-28

1 M from contour and 1.6 M above ground level
All measurements are "A" Weighted dB

Belt Loader Stationary
Conveyor Up
Engine Idle
Belt Stationary

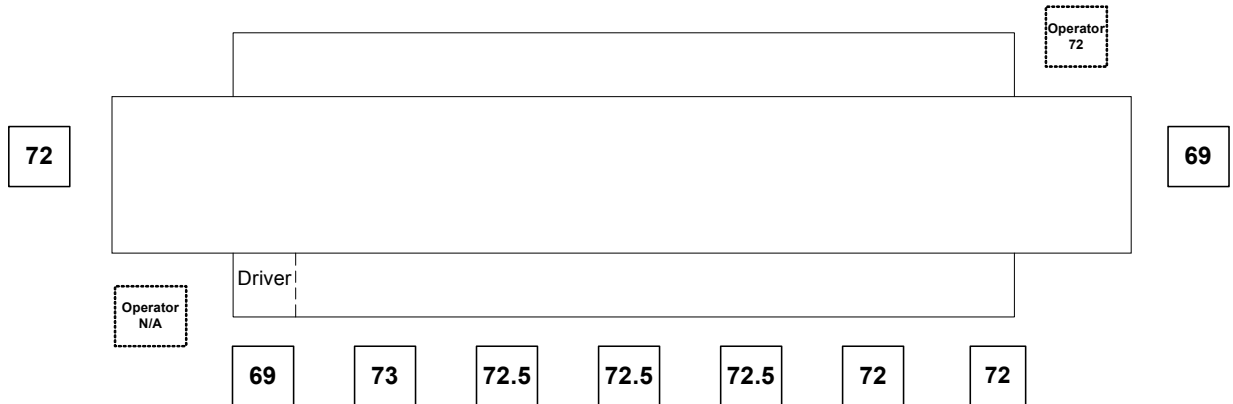


Figure Operation - 3 - 4: Sound - Engine Idle - Conveyor Up - Belt Stationary

BS EN 1915 - 4 Noise measurement methods

660-28

1 M from contour and 1.6 M above ground level
All measurements are "A" Weighted dB

Belt Loader Stationary
Conveyor Up
Engine Max RPM
Belt Max Speed

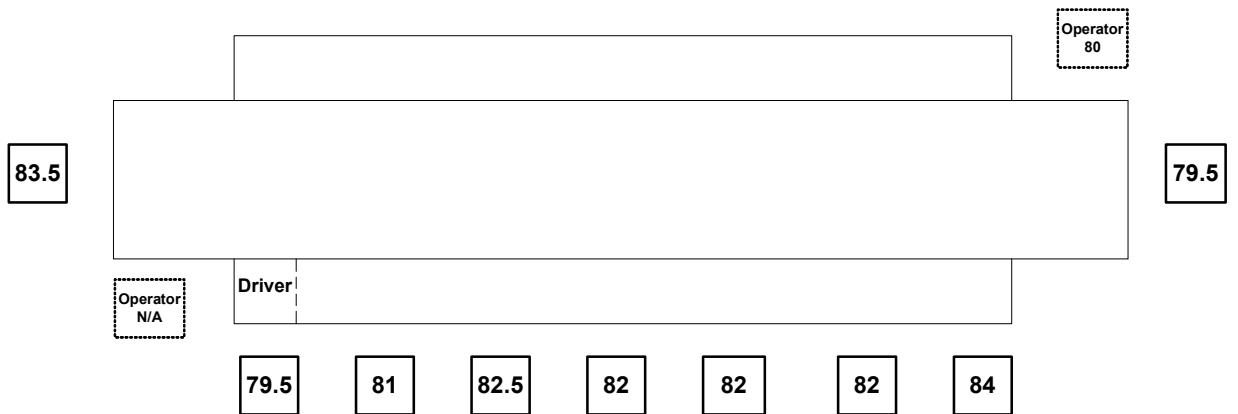


Figure Operation - 3 - 5: Sound - Engine Max - Conveyor Up - Belt Max Speed

3.4 Engines

3.4.1 Gasoline

3.4.1.1 Ford MSG-425 2.5L

Table Operation-3-7: Ford MSG-425 (2.5 L)

Item	Specification
Type	In-Line 4-Cylinder
Bore and Stroke	3.50 in x 3.94 in (89 x 100 mm)
Total Displacement	152.5 CID (2.5 L)
Compression Ratio	9.7:1
Firing Order	1-3-4-2
Fuel	Unleaded Gasoline or LPG*
Oil Capacity	7.0 qt (6.6 L) with Oil Filter
Alternator Size	95 Amps

*LPG requires optional fuel system

NOTE: See Ford Operator's Manual for detailed engine data.

3.4.2 Diesel

3.4.2.1 Deutz D2.9L

Table Operation-3-8: Deutz D2.9L

Item	Specification
Type	In-Line 4-Cylinder
Bore and Stroke	3.6 in x 4.3 in (92 mm x 110mm)
Total Displacement	176.9 CID (2.9 L)
Compression Ratio	18.4:1
Firing Order	1-3-4-2
Fuel	Diesel
Oil Capacity	2 gal (7.57 L)
Alternator Size	95 Amps

NOTE: Deutz Operator's Manual for more detailed engine data.

3.5 Transmission

The 4-speed automatic transmission is equipped with a torque converter.

3.5.1 Gear Ratios

The following table lists the gear ratios for the transmission.

Table Operation-3-9: Gear Ratios

Gear	Ratios
First	3.059
Second	1.625
Third	1.000
Fourth	2.294
Reverse	2.294

3.6 Standard Conveyor Heights and Angles

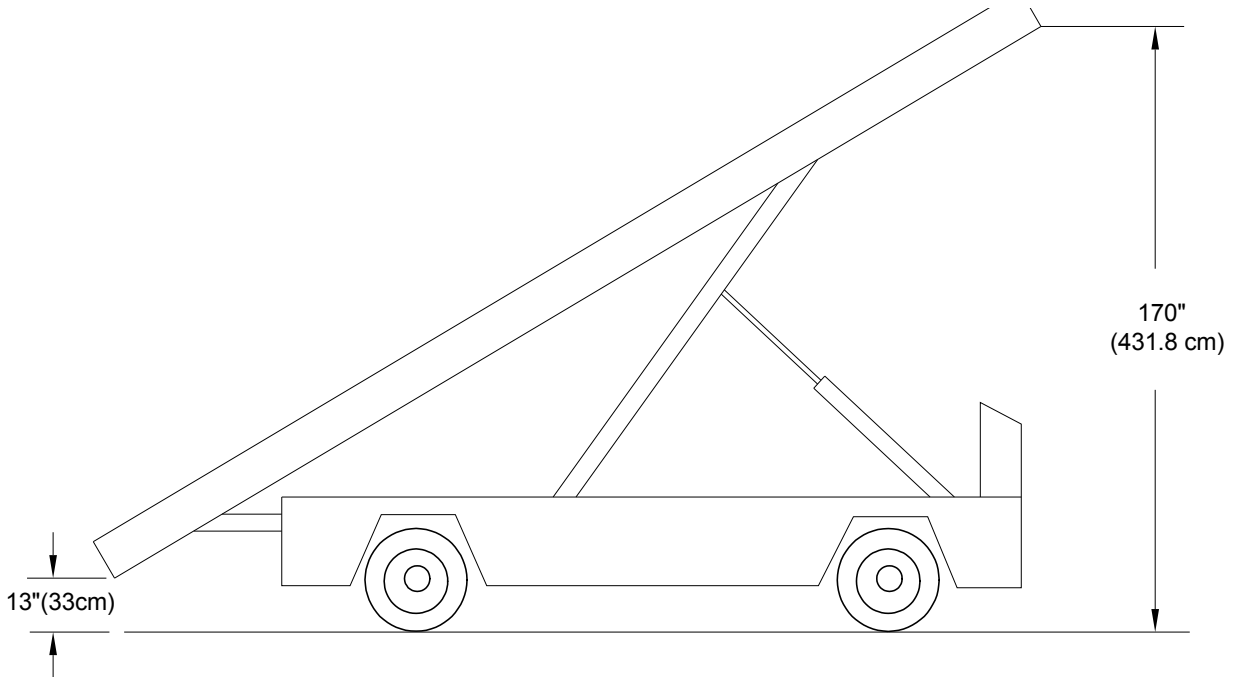


Figure Operation - 3 - 6: Conveyor - Full Down Rear, Full Up Front

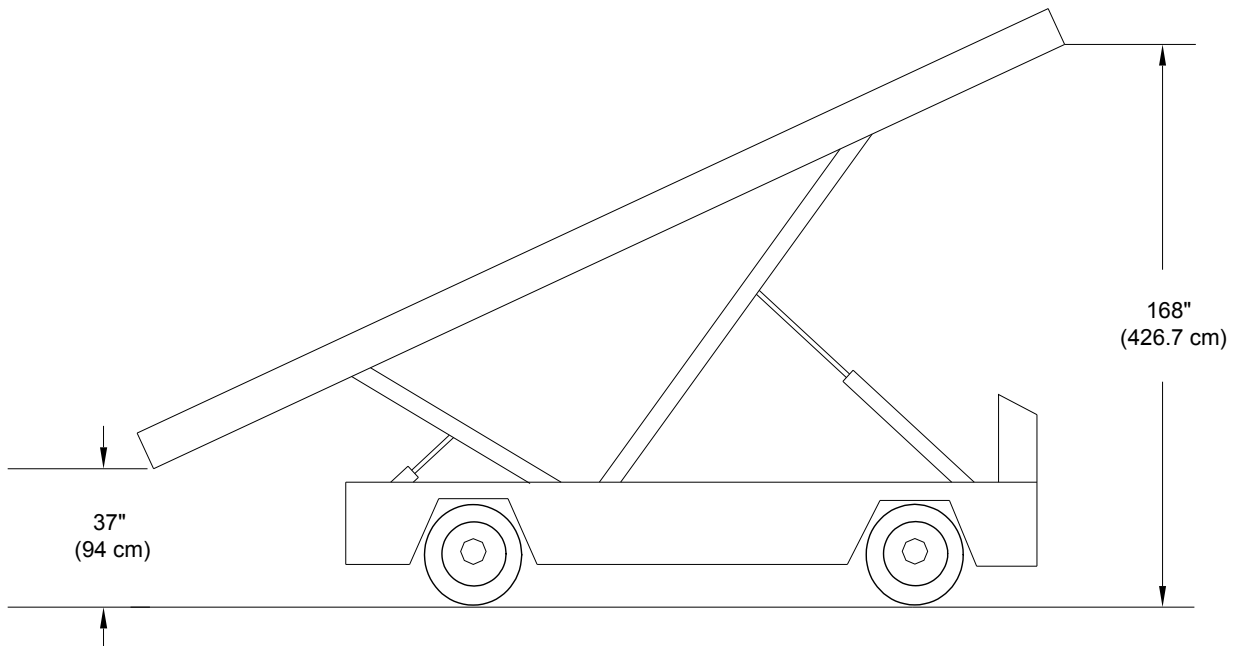


Figure Operation - 3 - 7: Conveyor - Full Up Rear, Full Up Front

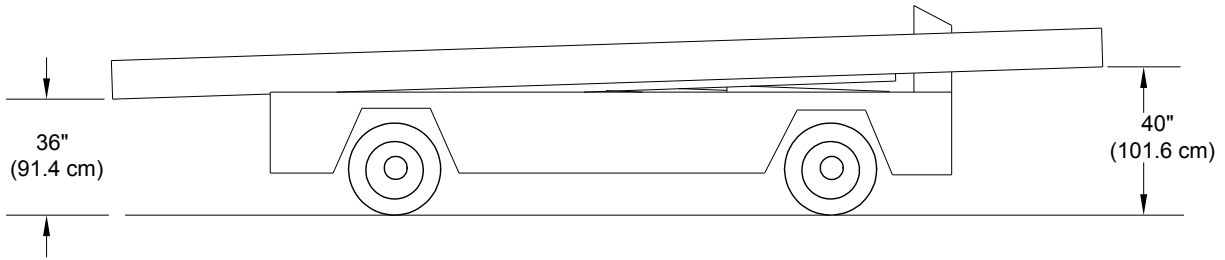


Figure Operation - 3 - 8: Conveyor - Full Down Rear, Full Down Front

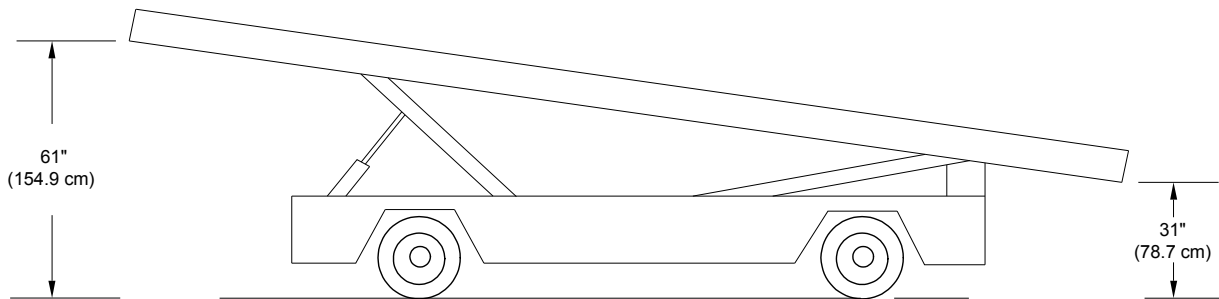


Figure Operation - 3 - 9: Conveyor - Full Up Rear, Full Down Front

Table Operation-3-10: Conveyor Positions

Conveyor Attitude	Front	Rear	Angle
Front Up, Rear Down	170 in. (431.8 cm)	13 in. (33.02 cm)	35°
Front Up, Rear Up	168 in. (426.72 cm)	37 in. (93.98 cm)	27°
Front Down, Rear Down	40 in. (101.6 cm)	36 in. (91.44 cm)	1°
Front Down, Rear Up	31 in. (78.74 cm)	61 in. (154.94 cm)	-6°

3.7 Compatible Aircraft

Table Operation-3-11, "Aircraft Compatibility," provides a list by aircraft manufacturers and models showing the front and rear cargo door heights with an additional 30 in. (76.2 cm) conveyor height above the door sill to allow for ease of loading and unloading of cargo. The rear of the conveyor is set at 30 in. (76.2 cm) above ground level.

The listed aircraft are compatible with the Mobile Belt Loader Model 660. The height measurements are from the *IATA Airport Handling Manual (AHM) 904 "Aircraft Doors, Servicing Points and System Requirements for the Use of Ground Support Equipment."*

Table Operation-3-11: Aircraft Compatibility

Aircraft Type	Front Door	Rear Door
Airbus A300 B2 320-B2/C4	137.5 in.(349.25 cm)	152.04 in. (386.18 cm)
Airbus A300 F4-600	134.52 in. (341.68 cm)	155.16 in. (394.11 cm)
Airbus A310-200/200C	133.32 in. (338.63 cm)	136.32 in. (346.25 cm)
Airbus A318	111.6 in. (283.46 cm)	121.2 in. (307.85 cm)
Airbus A319	103.08 in. (261.82 cm)	118.68 in. (301.45 cm)
Airbus A320	110.88 in. (281.64 cm)	113.28 in. (287.73 cm)
Airbus A321	111.6 in. (283.46 cm)	118.8 in. (307.75 cm)
Airbus A330-200F	152.4 in. (387.096cm)	168.6 in. (428.24 cm)
Airbus A300-300	136.2 in. (345.95 cm)	165 in. (419.1 cm)
Airbus A340-200/300	137.4 in. (348.97 cm)	165.72 in. (420.93 cm)
Airbus A340-500/600	143.28 in.(363.93 cm)	169.08 in. (429.46 cm)
Airbus A380-800/800F	121.1 in. (307.6 cm)	152.4 in. (387.1 cm)
AN24	81.2 in. (206.25 cm)	85.1 in. (216.15 cm)
AN26	N/A	87.9 in. (2233.27 cm)
AN30	81.2 in. (206.25 cm)	85.1 in. (216.15 cm)
AN32	87.1 in. (221.23 cm)	89.8 in. (228.09 cm)
ATR42 100/200	73 in. (185.42 cm)	N/A
AVRO RJ70	63 in. (160.02 cm)	63 in. (160.02 cm)
AVRO RJ85	62 in. (157.48 cm)	61 in. (154.94 cm)
AVRO RJ100	62 in. (157.48 cm)	61 in. (154.94 cm)
Boeing B707-320B/320C	84 in. (213.36 cm)	88 in. (223.52 cm)
Boeing B727-100/100C	81 in. (205.74 cm)	81 in. (205.74 cm)
Boeing B727-200	80 in. (203.2 cm)	76 in. (193.04 cm)
Boeing B737-100/200/200C	81 in. (205.74 cm)	91 in. (231.14 cm)
Boeing B737-300/40/500	85 in. (215.9 cm)	84 in. (213.36 cm)
Boeing B737-600/700/700C	87 in. (220.98 cm)	100 in. (254 cm)
Boeing B737-800/900/900ER	87 in. (220.98 cm)	101 in. (256.54 cm)

Table Operation-3-11: Aircraft Compatibility (Continued)

Aircraft Type	Front Door	Rear Door
Boeing B747-100/200/300	134 in. (340.36 cm)	136 in. (345.44 cm)
Boeing B747-400/400C	136 in. (345.44 cm)	141 in. (358.14 cm)
Boeing B747 SP	138 in. (350.52 cm)	144 in. (365.76 cm)
Boeing B757-200	127 in. (322.58 cm)	123 in. (312.42 cm)
Boeing B767-200/200 ER	119 in. (302.26 cm)	119 in. (302.26 cm)
Boeing B767-300/300 ER/300 Freighter	120 in. (304.8 cm)	116 in. (294.64 cm)
Boeing B767-400 ER	124 in. (314.96 cm)	146 in. (370.84 cm)
Boeing B777-200/200 LR	141 in. (358.14 cm)	157 in. (398.78 cm)
Boeing B777-300/300 ER/300 Freighter	141 in. (358.14 cm)	157 in. (398.78 cm)
Boeing B787-8	126 in. (320.04 cm)	140 in. (355.6 cm)
BAC 1-11-400	69 in. (175.26 cm)	77 in. (195.58 cm)
BAC 1-11-500	69 in. (175.26 cm)	76 in. (193.04 cm)
BAe ATP (J61)	107 in. (271.78 cm)	100 in. (254 cm)
BAe (H.S.) - 748	N/A	102 in. (259.08 cm)
C-212	N/A	62 in. (157.48 cm)
CL-44	N/A	144 in. (365.76 cm)
CL-65 (CRJ 100/200)	90 in. (228.6 cm)	92 in. (233.68 cm)
CN-235	N/A	77 in. (195.58 cm)
Caravelle	78 in. (198.12 cm)	71 in. (180.34 cm)
DC8-40/50 F Series	99 in. (251.46 cm)	118 in. (299.72 cm)
DC8-61/61 F & 62/62 F & 63/63 F	105 in. (266.7 cm)	112 in. (284.48 cm)
DC9-15/21, 32, 41, & 51	65 in. (165.1 cm)	69 in. (175.26 cm)
DC10-10/10 CF	138 in. (350.52 cm)	134 in. (340.36 cm)
DC10-30/40 & 30/40 CF	139 in. (353.06 cm)	135 in. (342.9 cm)
DHC-7	N/A	88 in. (223.52 cm)
DHC DASH 8	73 in. (185.42 cm)	N/A
Dornier 328 Jet	N/A	73.7 in. (187.199 cm)
Embraer EMB-120-Brasilia	N/A	94 in. (238.76 cm)

Table Operation-3-11: Aircraft Compatibility (Continued)

Aircraft Type	Front Door	Rear Door
Embraer EMB-135	88.82 in. (225.6 cm)	95.75 in. (243.0 cm)
Embraer EMB-140	88.41 in. (224.56 cm)	95.61 in. (242.85 cm)
Embraer EMB-145	88.2 in. (224.03 cm)	95.4 in. (242.32 cm)
Embraer 170 & 175	128 in. (325.12 cm)	120 in. (304.8 cm)
Embraer 190 & 195	129 in. (327.66 cm)	146 in. (370.84 cm)
F-27 MK-200 & MK-400/600 & MK-400 M	N/A	78 in. (198.12 cm)
F-27 MK-500 C & MK-500 F	N/A	81 in. (205.74 cm)
F-28 MK 1000/1000C/3000/3000C	82 in. (208.28 cm)	88 in. (223.52 cm)
F-28 MK 2000/4000	82 in. (208.28 cm)	86 in. (218.44 cm)
Fokker 50 (F27 MK 050) & (F27 MK 0502)	72 in. (182.88 cm)	71 in. (180.34 cm)
Fokker 70 (F28 MK 0070)	77 in. (195.58 cm)	89 in. (226.06 cm)
Fokker 100 (F28 MK 0100)	84 in. (213.36 cm)	87 in. (220.98 cm)
IL-18	108.3 in. (275.08 cm)	107.2 in. (272.29 cm)
IL-62	107 in. (271.78 cm)	107 in. (271.78 cm)
IL-62M	107 in. (271.78 cm)	103 in. (261.62 cm)
IL-76T	79 in. (200.66 cm)	75 in. (190.5 cm)
IL-86	113 in. (287.02 cm)	111 in. (281.94 cm)
IL-96	124 in. (314.96 cm)	132 in. (335.28 cm)
IL-114	103 in. (261.62 cm)	115 in. (292.1 cm)
L-100/20-30 Series	N/A	79.2 in. (201.17 cm)
L1011-1/100/200/250/500	137 in. (347.98 cm)	135 in. (342.9 cm)
Lockheed L188 Electra	91.5 in. (232.41 cm)	97 in. (246.38 cm)
MD-11	140 in. (355.6 cm)	134 in. (340.36 cm)
MD-80	73 in. (185.42 cm)	85 in. (215.9 cm)
Saab SF-340	N/A	94 in. (238.76 cm)
Shorts 330/200 & 360	N/A	77 in. (195.58 cm)
TU-134	124 in. (314.96 cm)	131.2 in. (333.25 cm)
TU-134A	124 in. (314.96 cm)	126 in. (320.04 cm)

Table Operation-3-11: Aircraft Compatibility (Continued)

Aircraft Type	Front Door	Rear Door
TU-154B	94 in. (238.76 cm)	95 in. (241.3 cm)
TU-204	111.4 in. (282.96 cm)	104.3 in. (264.92 cm)
YAK-40	102.8 in. (261.11 cm)	N/A
YAK-42	99.7 in. (253.24 cm)	94.4 in. (239.78 cm)

3.8 Fluids

The following tables contain information about fluids used in the Mobile Belt Loader Model 660. These fluids must be checked daily.

Table Operation-3-12: Hydraulic Fluid

Item	Ambient Temperature	Hydraulic Fluid Type
1	-60° F (-51° C) to +50° F (+10° C)	Mobil DTE II
2	-15° F (-26° C) to +140° F (+60° C)	Mobil DTE I3

Table Operation-3-13: Engine Oil

Item	Ambient Temperature	Oil (Must meet API Service SE/CC)
1	-10° F (-23° C) to +90° F (+32° C)	Gasoline Engine: 10W-40 SJ
		Diesel Engine: 15W-40 CJ-4

Table Operation-3-14: Fluids

Item	Component	Interval	Lubricant
1	Transmission	Check level weekly	Dexron VI ATF
2	Brake Cylinder	Check level weekly	DOT3 Heavy Duty Brake Fluid
3	Conveyor Drive Chain	Lube weekly	Same as engine oil
4	Rear Axle	Check at 6 months	85W-90 Limited Slip
5	Zerk Fittings	Lube at 6 months	Chassis Grease
6	Wheel Bearings	Repack at 24 months	Wheel Bearing Grease

3.9 Coolant

Tug recommends Delco® Extended Life Coolants for the Mobile Belt Loader Model 660. Recommended service life is 12,000 hours or 8 years.



CAUTION: Do NOT add conventional Coolants or SCAs. Top off with Delco ELC Prediluted 50/50 only (CPS 227811). Adjust freeze point with Delco ELC concentrate (CPS 227808).

Delco Extended Life Coolants meet or exceed:

- ASTM D 6210
- ASTM D 3306

3.10 Recommended Spare Parts

1. Oil Filters
2. Hydraulic Filters
3. Fuel Filters
4. Air Filters
5. Hydraulic Oil
6. Engine Oil
7. Transmission Fluid
8. Transmission Filters and Gaskets
9. Spark Plugs (Gasoline only)
10. Lubrication Grease
11. Axle Oil
12. Tires
13. Brake Shoes and Brake Caliper Pads
14. Engine Belt

3.11 Safety Features

3.11.1 Shifter / Parking Brake Safety

The following safety features are provided:

- The foot throttle will only function when the parking brake is in the **OFF/DOWN** position.
- The hand throttle (knob or push button) will only function when the parking brake is in the **ON/UP** position **AND** the shifter is in **neutral**.
- The conveyor belt will only function when the parking brake is in the **ON/UP** position **AND** the shifter is in **neutral**.
- The engine is automatically returned to idle speed when either the parking brake is placed in the **OFF/DOWN** position **OR** if the shifter is placed into **FWD** or **REV**.
- **OPTIONAL:** Conveyor will not raise or lower unless the shifter is in **neutral AND** the parking brake is in the **ON/UP** position.

3.11.2 Shifter Guard

Integral with the right-hand side of the Instrument Panel, the Shifter Guard prevents cargo falling off the conveyor belt, knocking the belt loader unintentionally into gear.

3.11.3 Neutral Safety Start Switch

The Neutral Safety Start Switch is located in the shifter / throttle assembly and is wired between the ignition and the starter. The Neutral Safety Start Switch closes when the shifter is in the **NEUTRAL** position, allowing the starter to engage. If the shifter is in the **FORWARD** or **REVERSE** position, the Neutral Safety Start Switch is open and the starter will not engage.

3.11.4 Anti-Restart Ignition Switch

The Anti-Restart Ignition Switch prevents starter engagement while the engine is running. To engage the starter, the Anti-Restart Ignition Switch must be turned to the **OFF** position and then turned to the **START** position. The starter cannot be engaged from the **START** position without first cycling through the **OFF** position.

3.11.5 Engine Control Module (ECM) Starter Protection

The following starter protections are provided by the engine ECMs.

3.11.5.1 Ford 2.5L

Over Crank Protection

The starter cannot be engaged for more than 8 consecutive seconds. Then it must rest for 20 seconds. Once 24 total seconds of cranking is reached, the key switch (ignition voltage to the GCP) must be recycled.

Starter

The starter cannot be re-engaged once the engine is running.

Engine Shutdown

During engine shutdown, the GCP monitors the engine speed and is timed to prevent the starter re-engaging until the engine has come to a complete stop.

3.11.5.2 Deutz 2.9L

Over Crank Protection

The starter cannot be engaged for more than **8 consecutive seconds**. Then it must cool down for **24 seconds**.

Starter

The ECM checks engine speed. If the engine displays any RPMs the starter will not engage.

Engine Shutdown

The ECM checks engine speed during shutdown and prevents the starter re-engaging until the engine has come to a complete stop.

3.11.6 Emergency Stop Switch

The Emergency Stop Switch is a push-button switch located on the dash and all control points on the conveyor belt assembly and the belt loader. The Emergency Stop Switch stops the conveyor and engine immediately in an emergency situation. The Emergency Stop Switch must be reset before the unit can be restarted.

3.11.7 Park Brake

The Park Brake is located on the drive shaft and is activated by an Orschelin over-center lever. With the Park Brake engaged, the loader will not move even when shifted into gear.

3.11.8 Pilot-Operated Hydraulic Check Valves

The Pilot-Operated Hydraulic Check Valves are located on both lift cylinders and the reverse travel direction of the conveyor belt motor. The Conveyor Belt Motor Counter-balance Valve prevents the free wheeling of the conveyor belt if the belt is stopped with the conveyor at an incline. The check valves prevent the cylinders from lowering unless pressurized.

3.11.9 Safety Props

Safety Props are located at the front and rear of the vehicle under the conveyor. Painted yellow, these manually-engaged safety devices prevent the conveyor from possibly drifting down during maintenance work. The Safety Props should be engaged any time the conveyor is in the raised position during maintenance or daily equipment checks.

3.11.10 Side / Hand Rails

The Side Rails are mounted on the side of the conveyor to prevent cargo from falling off the conveyor belt. The operator holds the Hand Rails when climbing the conveyor to rearrange the load. When not needed, these rails hinge down to conveyor belt level.

3.11.11 Finger Guards

Finger guards painted yellow and are located on the front, rear, and bottom of the conveyor. When used correctly, the adjustable guards prevent the operator from getting fingers caught between the conveyor belt and the conveyor frame. The guards are adjustable as the belt stretches.

3.11.12 Rubber Bumper Roll

A Rubber Bumper Roll across the front of the conveyor frame protects the frame from damage.

3.11.13 Steel Hoop Guard (Optional)

A Steel hoop guard across the rear of the conveyor frame protects the belt from damage.

3.11.14 Grit Paper

Grit paper is positioned on the working platforms and the floor of the cab for better walking traction and safer operation. The grit paper on working platforms should be inspected monthly and replaced when found to be torn or worn off.

Section 4: Shipping

4.1 Shipping Preparation



WARNING: HAZARD EXISTS WHEN REFUELING AND DEFUELING THE TRACTOR - NO SMOKING, NO OPEN FLAMES, NO ELECTRICAL DEVICE OPERATIONS.

4.1.1 Fuel Tank Preparation

1. Drain fuel from fuel tank into appropriate container.

NOTE: Drain is located under unit immediately below tank.

2. Disconnect fuel line at lowest accessible connection and drain fuel from fuel line.
3. Reconnect fuel lines.
4. Leave fuel cap on tank, but loosened.

4.1.2 Battery Preparation

1. Use emergency hydraulic pump to lower conveyor, if required.
2. Disconnect battery terminals from battery posts.
3. Leave battery in battery box.

4.1.3 Pre-shipping Verification

NOTE: On tractors so equipped, make certain in-line fuel shut-off valve is open.

1. Make certain fuel line is connected.
2. Make certain shut-off valve on radiator is closed.
3. Make certain fuel cell drain valve is closed.

4.2 Receiving

4.2.1 Preparing for Operation



WARNING: MAKE CERTAIN ALL FUEL LINES ARE PROPERLY CONNECTED FROM TANK TO FUEL PUMP TO FUEL RAIL (GASOLINE) OR INJECTOR PUMP (DIESEL).

4.2.1.1 Battery

- Connect battery terminals to battery posts.

4.2.1.2 Emergency Hydraulic Pump

1. Use emergency hydraulic pump to raise conveyor, if required.
2. Insert safety props.

4.2.1.3 Radiator

1. Make certain that radiator drain valve is closed.
2. Add required amount of coolant / water mixture to radiator.

4.2.1.4 Fuel Cell

1. Add fuel to fuel tank.
 2. Check all fuel lines for leaks.
-



WARNING: WHEN SHIPPED TO THE EUROPEAN UNION, THE BELT LOADER WILL NOT BE FITTED WITH LP TANKS.

NOTE:

For the LP engine option, the vehicle is built in the United States with non-EU components and tested to US standards. These components are removed prior to shipment to EU destinations.

Section 5: Storage

5.1 Short Term Storage

NOTE: Short term storage applies to equipment that is to be stored for a period of 30 to 120 days.

5.1.1 Gasoline Engine

5.1.1.1 Ford 2.5 L Engine

1. Add fuel stabilizer.



CAUTION: Ford part number E8AZ-19C544-A, or an equivalent additive can be used, for any length of storage. It is imperative in any application where the fuel will not be consumed within thirty days. Without additives, fuel in the fuel tank will cause varnish and contaminants to form. This causes problems in fuel delivery by clogging fuel injectors.

NOTE: Ford fuel stabilizer comes in an 8 fl. oz. (236.6 cc) bottle available through all EDI Distributors. The correct ratio is 2 fl. oz.(59.15 cc) stabilizer to 5 gals. (18.9 L) of gasoline.

2. While the engine is running, treat upper cylinders by spraying engine fogging agent (from your local aftermarket supplier) into the air intake for about two minutes.
3. Open throttle for short burst of speed.
4. Shut off engine
5. Allow engine to come to a stop while continuing to spray into the air intake.
6. Leave spark plugs in holes or seal spark plug holes with suitable threaded metal plugs
7. Cover all openings into engine with dust-proof caps or shields (suitable non-hygroscopic material).
8. Check coolant fluid levels.

5.1.1.2 Transmission

No special attention needed unless the engine is without transmission. Then, spray flywheel and ring gear with one part recommended engine oil and one part Stoddard Solvent, or equivalent.

5.1.1.3 Drive Axle

No special requirements.

5.1.1.4 Tires

1. Raise the vehicle
2. Chock the axles to prevent tire contact with the ground.



WARNING: TO AVOID INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ALWAYS USE LIFTING EQUIPMENT, SAFETY JACKS, AND CHAINS WITH A SAFE MINIMUM CAPACITY OF ONE AND A HALF TIMES THE WEIGHT OF THE VEHICLE BEING LIFTED.

3. Reduce tire air pressure to 15 psi (103.42 Kpa or 1.02 atm).

5.1.1.5 Lubrication

Lubricate all points with specified grease, oil, etc. See Lubrication schematic in the maintenance manual (Ch.1, Sect. 1).

5.1.1.6 Battery

Disconnect battery terminals. Keep the battery fully charged during storage.

5.1.1.7 Fluid Levels

All fluid levels should be checked and topped off as necessary.

5.1.2 Diesel Engine

5.1.2.1 Deutz 2.9L Engine.

Check coolant protection.

5.1.2.2 Transmission

No special attention needed unless the engine is without transmission. If so, then spray the fly-wheel and ring gear with a mix of one part recommended engine oil and one part Stoddard Solvent, or equivalent.

5.1.2.3 Drive Axle

No special attention needed.

5.1.2.4 Tires

1. Using a forklift or a crane, raise the vehicle
2. Chock the axles to remove tire contact with the ground.



WARNING: TO AVOID INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ALWAYS USE LIFTING EQUIPMENT, JACK STANDS, AND CHAINS WITH A SAFE MINIMUM CAPACITY OF ONE AND A HALF TIMES THE WEIGHT OF THE VEHICLE BEING LIFTED.

3. Reduce tire pressure to 15 psi (103.42 Kpa or 1.02 atm).

5.1.2.5 Lubrication

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

5.1.2.6 Battery

Disconnect battery terminals. Keep the battery fully charged during storage.

5.1.2.7 Fluid Levels

All fluid levels should be checked and topped off as necessary.

5.2 Returning the Vehicle to Operation After Short Term Storage

5.2.1 Tires

1. Check the tire pressure.

NOTE: If required, inflate tires to 45 psi (310 kPa) - Standard.

2. Use a forklift or a crane to lift the vehicle off the chocks.



WARNING: TO AVOID INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ALWAYS USE LIFTING EQUIPMENT, JACK STANDS, AND CHAINS WITH A SAFE MINIMUM CAPACITY OF ONE AND A HALF TIMES THE WEIGHT OF THE VEHICLE BEING LIFTED.

3. Remove the blocks from beneath the vehicle.
4. Lower the vehicle to the ground.

5.2.2 Battery

1. Clean the battery posts and cable clamps.

2. Check the electrolyte levels and service the battery, if required.

NOTE: TUG installs maintenance-free batteries on the belt loader. This step is only required if the battery has been replaced with a non-maintenance-free type.

3. Charge the battery, if required.
4. Lightly coat the battery clamps and posts with petroleum jelly.
5. Connect the battery cables.

5.2.3 Engine

- Visually inspect the engine systems to ensure integrity.
- Check the fluid levels and service as required.

5.2.4 Transmission

Service as required. (See Maintenance Manual).

5.3 Long Term Storage

NOTE: Long term storage is defined as a period of time exceeding 120 days.

5.3.1 Gasoline Engine

5.3.1.1 Ford 2.5L Engine

1. Add fuel stabilizer, Ford part number E8AZ-19C544-A, or equivalent.



CAUTION: Fuel stabilizer is critical where fuel will not be consumed over thirty days. Without additives, fuel will cause varnish and contaminants to form and cause problems in fuel delivery with clogged fuel injectors.

2. While the engine is running, treat upper cylinders by spraying engine fogging agent into the air intake for about two minutes.
3. Open throttle for short bursts, shut off engine and continuing spraying into air intake until engine stops.
4. Run engine until completely out of fuel.
5. **Gasoline only:** Restart and run on unleaded gasoline mixed with stabilizer for at least 10 minutes.
6. While engine is still running, treat upper cylinders by spraying fogging agent into the air intake for two minutes.

7. Open throttle for short burst of speed, shut off engine and continue spraying into air intake until engine stops.
8. Completely enclose the air cleaner with dark plastic bag and seal with tape.
9. Drain crankcase completely and renew the oil filter.
10. Drain antifreeze from radiator and engine block.
11. Attach a tag on steering wheel stating:



CAUTION: Oil and antifreeze have been removed from engine.

12. Clean exterior surface of engine and loosen belt tension.
13. Leave spark plugs in holes or seal holes with suitable threaded metal plugs.
14. Seal all openings in engine and accessories with non-hygroscopic material. Mask off (seal) all areas with electrical contacts. Place and seal the plastic cover over the dipstick.
15. Ensure all surfaces are dry, then spray all taped openings, all engine accessories including ignition wiring, and all exterior surfaces of engine with Insulation Compound.

5.3.1.2 Engine Exterior

1. Apply multipurpose grease on moving parts such as rod threads, linkage, and joints.
2. Check all openings of the engine to ensure that plastic covers are in place and sealed.
3. Secure a waterproof cover over the engine.

NOTE: Remove the waterproof cover every 2 to 3 months and check for corrosion and integrity of sealed areas. If any sealed system appears open, refer to the appropriate system and repeat the application.

5.3.2 Transmission

See manufacturer's recommendation in the transmission service manual.

NOTE: Prolonged storage may be detrimental to transmission seals.

If the engine is less transmission, then spray flywheel and ring gear with one part recommended engine oil, and one part Stoddard Solvent, or equivalent.

5.3.2.1 Drive Axle

1. Drain drive axle by removing drain plug located on the underside of the differential carrier housing.
2. Reinstall plug after draining.
3. Attach a tag on steering wheel stating:



CAUTION: Oil has been removed from the drive axle.

5.3.3 Tires

1. Raise the vehicle and chock the axles to prevent tire contact with ground.
2. Reduce air pressure to 15 psi (103.42 Kpa or 1.02 atm).
3. Spray tires with a rubber preservative.

5.3.4 Lubrication

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

1. Repack wheel bearings.
2. Drain crankcase completely and renew the oil filter.
3. Drain antifreeze from radiator and engine block.

5.3.5 Fluid Levels

All fluid levels should be serviced, as necessary.

5.3.6 Battery

Remove the battery and store separately. Store in a cool dry place not in direct sunlight. Maintain storeroom temperature from 32° F (0° C) to 90° F (32° C). If stored outside, cover the battery for protection against dirt and moisture. Slow charge the battery every one to two months.

5.3.7 Diesel Engine

5.3.7.1 Deutz 2.9L Engine

Crankcase and Filter Elements.

NOTE: Oil filter elements do not need to be changed if the engine oil has been used 50 hours or less, leave it in the sump and add 3 to 4% by volume of VCI.

If the oil has more than 50 hours of use, change the oil.

1. Run engine until reaching normal operating temperature.
 2. Turn the engine off.
 3. Drain oil from crankcase.
 4. Replace the oil filter.
 5. Re-fill the engine with new oil.
 6. Add 3 to 4% of VCI.
-



CAUTION: Oil will be hot.

7. Place and seal the plastic cover over the dipstick and the crankcase breather.
 8. Use tape to seal any openings.
 9. Drain antifreeze from radiator and engine block (excluding Deutz diesel units).
 10. Attach a tag on steering wheel stating,
-



CAUTION: Oil and antifreeze have been removed from engine.

11. Clean exterior surface of engine.

Use volatile corrosion inhibitors (VCI) (NOX-RUST VCI#10 oil), black or dark colored plastic bags, and sealing tape (Kendall No. 231) to prevent internal engine damage from moisture. Use an air compressor with a sprayer attachment to apply oil. After application, completely seal the engine to prevent the vapors from escaping. For information on VCI, contact:

NOTE: Customer Service
Daubert Chemical Co.
4700 S. Central Avenue
Chicago, Illinois 60638
Telephone: (800) 688-0459
Fax: 708-496-7367
Outside U.S.: 708-496-7350
<http://www.daubertchemical.com>

12. Seal all openings in engine and accessories with non-hygroscopic material.
13. Mask off (seal) all areas with electrical contacts.
14. Ensure all surfaces are dry
15. Spray all taped openings, all engine accessories, including ignition wiring, and all exterior surfaces of engine with Insulation Compound.
16. Loosen belt tension.
17. Apply multipurpose grease on moving parts such as rod threads, linkage, and joints.
18. Check all openings of the engine to ensure that plastic covers are in place and sealed.
19. Secure a waterproof cover over the engine

NOTE: Remove the waterproof cover every 2 to 3 months and check the engine for corrosion and integrity of its sealed areas. If any sealed system appears open, refer to the appropriate system and repeat the application.

5.3.8 Transmission

Refer to the manufacturer's recommendation contained in the transmission service manual in the maintenance manual.

5.3.9 Drive Axle

1. Drain drive axle by removing drain plug located on the underside of the differential carrier housing.

2. Reinstall plug after draining.
3. Attach a tag on steering wheel stating:



CAUTION: Oil has been removed from drive shaft.

5.3.10 Exhaust

1. Disconnect the exhaust system at the engine exhaust manifolds.
2. Use a sprayer to apply a mixture of 50% VCI oil and 50% engine oil into the exhaust manifold openings.

NOTE: A minimum application is 2 oz (60 ml).

3. Connect the exhaust system.
4. Seal the exhaust pipe with tape and plastic.

5.3.11 Tires

1. Raise the vehicle and chock the axles to prevent tire contact with ground.
2. Reduce air pressure to 15 psi (103.42 Kpa or 1.02 atm).
3. Spray tires with a rubber preservative.



WARNING: TO AVOID INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ALWAYS USE LIFTING EQUIPMENT, JACK STANDS, AND CHAINS WITH A SAFE MINIMUM CAPACITY OF ONE AND A HALF TIMES THE WEIGHT OF THE VEHICLE BEING LIFTED.

5.3.12 Lubrication

Ensure all points are lubricated with specified grease, oil, etc. (See Ch.2, Sect. 1 in Maintenance Manual)

5.3.13 Levels

Service all fluid levels.

5.3.14 Wheel Bearings

Repack wheel bearings.

5.3.15 Battery

1. Disconnect the battery cables.

-
2. Remove the battery and store separately.

Store the battery in a cool dry well ventilated area not exposed to direct sunlight.

NOTE: A recommended storeroom temperature of 32° F (0° C) to 90° F (32° C) should be maintained. If stored outside, cover the battery for protection against dirt and moisture.

3. Slow charge the battery every one to two months.

5.3.16 Fuel System

1. Drain the fuel tank.
2. Use a sprayer to apply 1 oz (30 ml) of VCI oil for each 7.50 gal (30 L) of tank capacity.
3. Seal the tank opening.
4. Remove the fuel filter, drain, and reinstall.
5. Clean the primary fuel filter (if equipped).
6. Remove the fuel injectors, check them, and recondition them, if necessary.
7. Spray 1 oz (30 ml) of 50% VCI oil and 50% engine oil in each cylinder.
8. Install the fuel injectors and tighten them to 30 ft/lb (40 Nm).
9. Using a bar or turning tool, turn the engine over slowly to lubricate the cylinder walls.

5.3.17 Engine Exterior

1. Apply multipurpose grease on moving parts such as rod threads, linkage, and joints.
2. Check all openings of the engine to ensure that plastic covers are in place and sealed.
3. Secure a waterproof cover over the engine.

NOTE: Remove the waterproof cover every 2 to 3 months and check the engine for corrosion and integrity of its sealed areas. If any sealed system appears open, refer to the appropriate system (listed above) and repeat the application.

5.3.18 Tagging

Fasten a tag to the starting switch on the control panel stating:



WARNING: DO NOT START THE ENGINE! UNIT IN STORAGE! ALL SYSTEMS DRAINED OR PRESERVED!

5.4 Returning the Vehicle to Operation After Long-Term Storage

5.4.1 Tires

1. Inflate the tires to 45 psi (310 kPa or 1.06 atm) - Standard.



WARNING: TO AVOID INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ALWAYS USE LIFTING EQUIPMENT, JACK STANDS, AND CHAINS WITH A SAFE MINIMUM CAPACITY OF ONE AND A HALF TIMES THE WEIGHT OF THE VEHICLE BEING LIFTED.

2. Using a forklift or a crane, lift the unit.
3. Remove the blocks from beneath the tractor.
4. Lower the tractor to the ground.

5.4.2 Battery

1. Check the battery levels and service them, if required.
2. Install the batteries in the vehicle.
3. Clean the battery cables and posts.
4. Lightly coat the clamps and the battery posts with petroleum jelly.
5. Connect the battery cables to the posts.
6. Charge the batteries.

5.4.3 Engine

1. Remove the plastic covers and tape from all engine and fuel tank openings.
2. Drain the oil sump, if needed.
3. Replace the filters, if needed.
4. Refill the oil sump.
5. Tighten the alternator and water pump belt.

6. Replace the fuel filter and the water separator.
7. Fill the fuel tank and prime the system.
8. Check the coolant system and service the system, if required.
9. Using a bar or turning tool, turn the engine in its normal direction of rotation
10. Ensure there are no hydraulic locks or resistance.

5.4.4 Transmission

Refer to the manufacturer's recommendation contained in the transmission service manual.

5.4.5 Drive Axle

Refill the drive axle, if needed.

5.4.6 Pre-Operational Checks

1. Perform pre-operational checks.
2. Remove the warning tag from the operator compartment or cab, if equipped.
3. Start the unit.

NOTE: The unit may run rough and smoke for a few minutes until it has cleared all the pre-servatives from the system.

4. Operate the system at no load conditions to ensure that all the systems are operating correctly before returning the unit to service.

5.5 Cold Weather Storage

The Belt Loader can be stored at temperatures down to -40° F (-40° C) in the standard configuration. It can be stored down to -65° F (-54° C) if the following steps are taken:

1. Perform all steps for the long term storage in previous section.
2. Ensure the following components are removed from the vehicle and stored in a safe, warm location:
 - a. Batteries
 - b. Serpentine belt
 - c. Drain
 - The radiator and engine block of coolant.
 - Drain the windshield washer fluid (If equipped).



5.6 Returning the Vehicle to Operation After Cold Weather Storage

The following components, which were removed from the tractor and stored in a safe, warm location need to be installed back on the tractor:

- Batteries
- Serpentine belt

5.6.1 Refill Fluids

Follow this procedure to ready the tractor for operation.

1. Refill radiator and engine block of coolant
2. Refill windshield washer tank
3. Perform all steps for returning the tractor to operation after long term storage.



THIS PAGE INTENTIONALLY BLANK